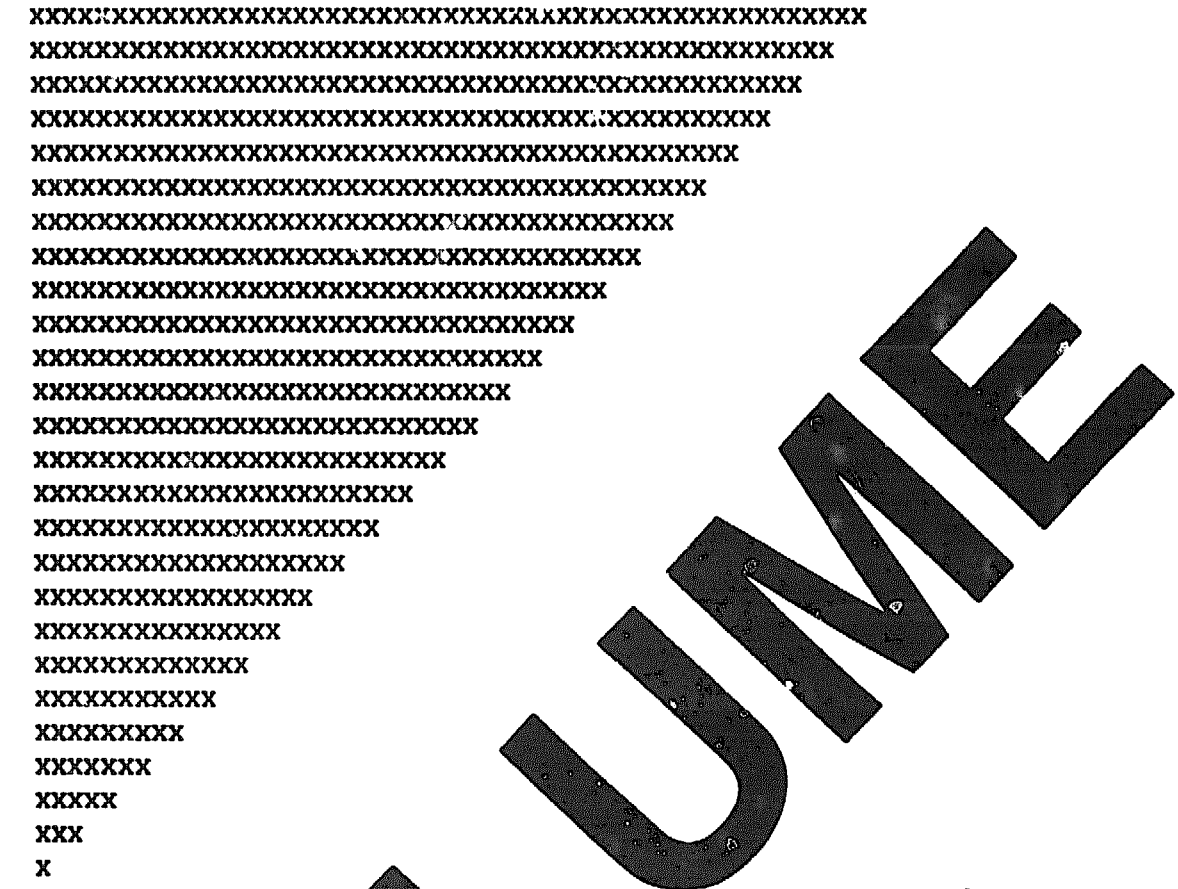
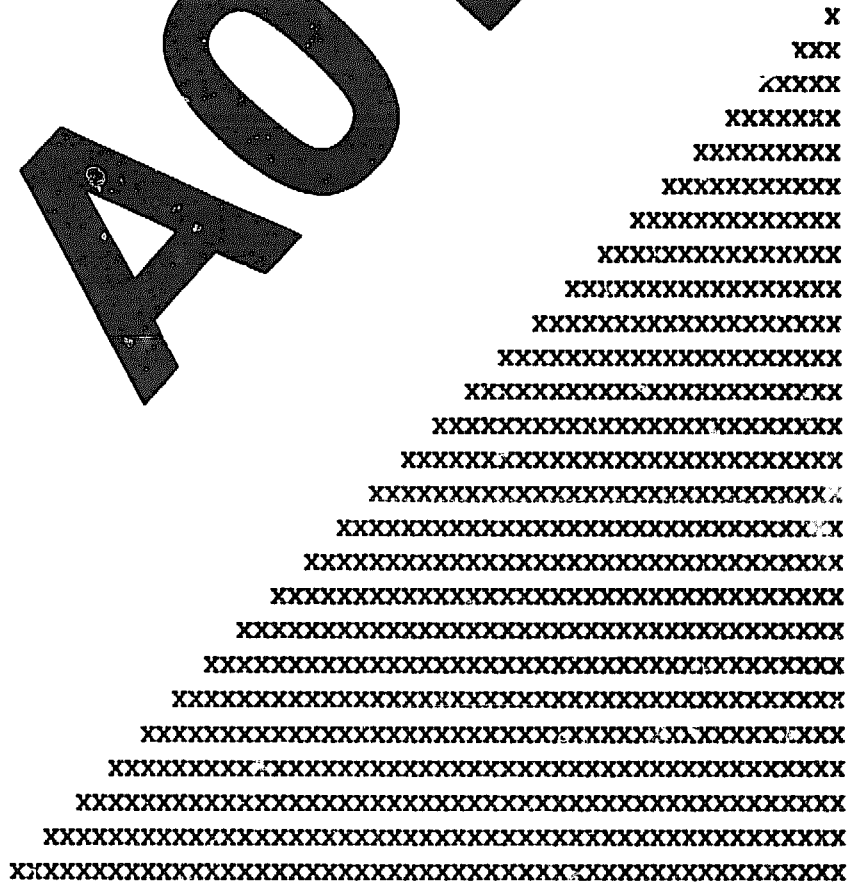


VOLUME 01




COLLATING LIST
OF PAGES

Collating List of Pages

This reference drawing contains the collating sequence, page side, and EC level of pages for *Digital TA90 Magnetic Tape Subsystem Maintenance Guide (MG) Volume A01*.

The part number of the divider tab list is 13F5762.

This reference drawing is to be placed at the front of the manual.

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13F5764

13F5764

PUBLICATIONS REFERENCE DRAWING

MACHINE TYPE/MODEL NO. TA90

MACHINE NAME - Magnetic Tape Subsystem

E C NO.	DESCRIPTION / COMMENTS
C04824	VOL. A01 - Maintenance Guide
C13764	VOL. A01 - Maintenance Guide

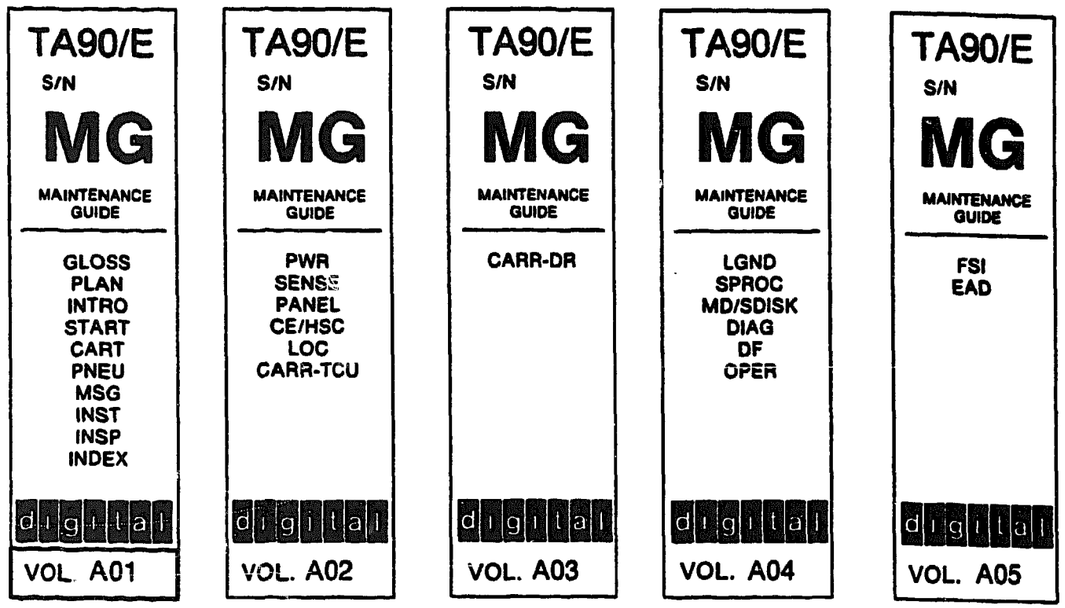
digital					DATE	CHANGE NO	
NAME. PUB REF DWG (PRD)				REL	4/28/89	C04824	
					3/15/90	C13764	
DESIGN			SHT OF				
DETAIL							
CHECK			CLASSIFICATION	MUST CONFORM TO ENG SPEC	DEVELOPMENT NO	LOGIC PG NO	
APPRO						RD001	

DATE	CHANGE NO

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B

digital **Maintenance Guide**



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Logic Diagrams	**Vols. C01 and D01**

TA90/E Magnetic Tape Subsystem

EK-PTA90-MG-002

Preface

This manual contains maintenance information about the Digital TA90 Magnetic Tape Subsystem and is intended for customer engineers responsible for servicing the TA90 tape subsystem

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Prerequisite Knowledge

It is assumed that you have a background in data processing concepts and that you are familiar with the hexadecimal numbering system, stored program concepts, and have a basic understanding of tape subsystems and their relationship within a system/cluster.

Related Documents

TA90 Operator s Manual. EK-OTA90-OM

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DECwriter	Professional	STI	VT
DIBOL			Work Processor

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SAFETY

Safety

This product meets Digital safety standards.

The following information has been included in this publication for the use and safety of Digital personnel.

Use these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during maintenance and after completing it.
- Use only field-supply items (such as adhesives, cleaning fluids, lubricants, paints, and solvents) that have been approved by Digital, that is, are supplied under a Digital part number.
- When lifting any heavy object:

  1. Ensure that you can stand safety without slipping.
  2. Balance the weight of the object between your two feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that you think are too heavy for you.*

- Do not perform any action that causes hazards to the customer or that makes the equipment unsafe.
- Put removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Always keep your tool case away from walk areas so that other persons will not trip over it, for example, put it under a desk or table.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or are rolled up above the elbows. If your hair is long, fasten it. Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

  Remember: A metal object lets more current flow if you touch a live conductor.

- Insert the ends of your necktie or scarf inside other clothing or fasten the necktie with a clip, preferably nonconductive, approximately 8 centimeters (3 inches) from the ends.
- Wear safety glasses when you are:
  - Using a hammer to drive pins or similar parts
  - Drilling with a power hand-drill
  - Using spring hooks or attaching springs
  - Soldering parts
  - Cutting wire or removing steel bands
  - Cleaning parts with solvent, chemicals, or cleaning fluids
  - Working in any other conditions that might be hazardous to your eyes.
-
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- After maintenance, reinstall all safety devices such as shields, guards, labels, and ground wires. Exchange any safety device that is worn or defective for a new one.

  Remember: Safety devices protect personnel from hazards. You destroy the purpose of the devices if you do not reinstall them before completing your service call.
- Reinstall all covers correctly before returning the machine to the customer.

Safety with Electricity

Observe these additional rules when working on equipment powered by electricity:

- Find the room emergency power-off (EPO) switch or disconnecting switch. If an electrical accident occurs, you can then operate the switch quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages. Always inform your manager of any possible problems or if you must work alone.
- Disconnect all power:
  - Before removing or installing main units
  - Before working near power supplies
  - Before doing a mechanical inspection of power supplies
  - Before installing changes in machine circuits.
- Before you start to work on the machine, unplug the machine's power cable. If you cannot unplug the cable easily, ask the customer to switch off the wall box switch that supplies power to the machine, and lock the wall box switch in the off position.
- If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:
  - Ensure that another person, who is familiar with the power-off controls, is near you.

    Remember: Another person must be there to switch off the power, if necessary.
  - **CAUTION:**

    Some Digital hand tools have handles covered with a soft material that does not insulate you when working with live electrical circuits.

    Use only those tools and testers that are suitable for the job you are doing.
  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

    Remember: There must be a complete circuit to cause electrical shock. By observing the above rules, you may prevent a current from passing through the vital parts of your body.
  - When using testers, set the controls correctly and use the Digital-approved probe leads and accessories intended for that tester.
  - **CAUTION:**

    Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this wrong type of mat to protect yourself from electric shock.

    Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.
- Use extreme care when measuring high voltages.
- Do not use tools or testers that have not been approved by Digital. Ensure that electrical hand tools, such as power drills and Wire-Wrap[1] tools, are inspected regularly.
- Do not use worn or broken tools and testers.
- Never *assume* that power has been disconnected from a circuit. First, *check* that it has been switched off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are: moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the glass surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Unless the maintenance information specifically lets you, do not service the following parts *with power on them* when they are removed from their normal operating places in a machine:

  Power supply units
  Pumps
  Blowers and fans
  Motor generators

  and similar units. (This rule ensures correct grounding of the units.)
- If an electrical accident occurs:
  - Use caution; do not become a victim yourself.
  - Switch off power.
  - Send another person to get medical aid.
  - If the victim is not breathing, decide whether to give rescue breathing.

[1] Trademark of the Gardner-Denver Co.

SAFETY 10

Safety

Danger Notices

A danger notice is used to notify the customer engineer that potentially lethal or extremely hazardous conditions exits.

The danger safety notices and their page locations contained in the MG are shown below.

DANGER

Electric shock. The Drive Power switch removes dc voltages to that drive only, and does not affect the other drive in the tape transport unit

CARR-DR 8.

DANGER

Electric shock. Hazardous voltages are present on the ac power circuit breaker and the line cord.

CARR-DR 8

DANGER

Electric shock. When setting the control unit ac power circuit breaker off, hazardous voltages are still present on the ac power circuit breaker and on the ac power line cord.

CARR-TCU 6.

DANGER

Hazardous electrical voltages are present in the receptacle.

INST 6

DANGER

Hazardous electrical voltages are present in the connector. Do not touch the outlet case with anything other than test probes until step 3 is completed.

INST 6.

DANGER

Electric shock. Hazardous voltages can be present in the ac line cord connectors.

CARR-TCU 1440, 1490

DANGER

Hazardous electrical voltages are present. Do not touch the internal parts (pins and sockets) of the outlet until step 5 is completed.

INST 6.

DANGER

Hazardous electrical voltages are present. Do not touch the outlet before meeting the following requirements of steps 1 and 2.

INST 6

DANGER

Hazardous voltages are present. If the measured voltage values are less than 1.0 V ac, you can touch the outlet. Avoid contact with the internal parts (pins and sockets) of the outlet.

INST 6.

DANGER

Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

INST 10.

CAUTION:
TILT HAZARD. Do NOT open both drives of a tape transport unit that is not bolted to another tape transport unit or tape control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape transport unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

INST 4, 11, 20, 135, 180.

INSP 15.

DANGER

Make sure the circuit breaker that supplies power to the customer receptacle is off.

If you are installing a Dual Tape Control Unit subsystem, power to both customer receptacles must be off.

INST 60.

DANGER

Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured.

Capacitors are possible exploding devices. Wear safety glasses when working in the power area. Always install all safety covers before powering on the machine.

PWR 130-1, 400-1.

DANGER

High Voltage.

PWR 400-7.


TAB
LIST

Tab List

Volume A01

GLOSS	Glossary
PLAN	Maintenance Plan
INTRO	TA90 Introduction
START	Start Maintenance
CART	Cartridge Analysis
PNEU	Pneumatic Analysis
MSG	Errorlog messages
INST	Installation/Removal
INSP	Safety Check Procedures
INDEX	Index

Volume A02

PWR	Power Maps
SENSE	Sense/Status
PANEL	Panel
CE/HSC	Customer Engineering Panel/HSC Diagnostics
LOC	Locations
CARR-TCU	Tape Control Unit Checks/Adjustments/Removal/Replacement

Volume A03

CARR-DR	Drive Checks Adjustments/Removal/Replacement

Volume A04

LGND	Legend
SPROC	Support Procedures
MD/SDISK	Maintenance Device/MD Support Diskette Procedures
DIAG	Support Diagnostic Descriptions
DF	Data Fields and Registers
OPER	Theory of Operation

Volume A05

FSI	Fault Symptom Index
EAD	Error Analysis Diagrams


GLOSS

Glossary and Abbreviations

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication

This glossary includes definitions from:

- The *American National Dictionary for Information Processing*, published by the Computer and Business Equipment Manufacturers Association. This material is reproduced from the American National Dictionary for Information Processing, copyright 1977 by the Computer and Business Equipment Manufacturers Association, copies of which may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. These definitions are identified by an asterisk (*).
- The *ISO Vocabulary of Data Processing*, developed by the International Standards Organization, Technical Committee 97, Subcommittee 1. Definitions from published sections of this vocabulary are identified by the symbol "(ISO)" preceding the definition. Definitions from draft proposals and working papers under development by the ISO/TC97 vocabulary subcommittee are identified by the symbol "(TC97)," indicating that final agreement has not yet been reached among its participating members.

access method. A technique for moving data between processor storage and input/output devices.

adj. Adjustment.

ALD. Automated logic diagram.

allocation. See *resource allocation*.

alter. To change.

amplifier. A device whose output is an enlarged reproduction of its input.

analog. Pertaining to data in the form of continuous variables, which are related to measurable physical quantities.

ANALYZE/ERROR. The VMS command that invokes ERF.

ASCII. American National Standard Code for Information Interchange.

assigning a device. The establishing of the relationship of a device to a running task, process, job or program.

assignment. The naming of a specific device to perform a function.

assistance. Aid.

asynchronous. Pertaining to events that are scheduled as the results of a signal asking for the event; pertaining to that which is without any specified time relation.

att. Attachment.

available. One state of a mass storage device used on the STI bus. When powered on, the device is considered available (but not online) to any controller in a configuration.

backhitch. A slight motion in the backward direction just before moving tape in a forward direction.

backup. To make additional copies of documents or software for safekeeping, in case the original copy is accidentally damaged or destroyed.

BCC. Buffer channel command register.

BCPC. Buffer channel pad counter register.

BCPH. Buffer channel pointer high register.

BCPL. Buffer channel pointer low register.

BCR. Buffer channel remainder register.

BCSE. Buffer channel status/error register.

BCSH. Buffer channel stop high register.

BCSL. Buffer channel stop low register.

BCSS. Buffer channel storage sars register.

BDAT. Buffer data not real register.

BDC. Buffer device command register.

BDG0. Buffer diagnostic 0 register.

BDG1. Buffer diagnostic 1 register.

BDPH. Buffer device pointer high register.

BDPL. Buffer device pointer low register.

BDR. Buffer device remainder register.

BDSE. Buffer device status/error register.

BDSS. Buffer device storage sars register.

beginning-of-tape (BOT). The location on a magnetic tape that indicates the start of the permissible recording area.

bfr. Buffer.

BM/bill of materials. A list of specific types and amounts of direct materials expected to be used to produce a given job or quantity of output.

BMR. Buffer mode register.

BOB. Beginning-of-block.

BOC. Bus-out check.

BOM. Bill of materials

boot. To bring a device or system to a defined state where it can operate on its own. See also *bootstrap*.

bootstrap. To cause an operating system to load itself and prepare itself.

BOR. Beginning-of-record.

BOT. Beginning-of-tape.

bpi. Bits per inch.

BSB. Backspace block.

BSF. Backspace file.

buffer. * A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another.

bus. A group of signal lines that convey information from source to destination. There may be many destinations, but only one source at a given time.

BWRP. Buffer wrap register.

CA. Channel adapter.

card extractor. A field engineer tool.

Card. Logic card (Board).

CARR. Checks-Adjustments-Removal-Replacement.

CART. Cartridge Analysis.

CAUTION (Notice). A word to call attention to possible personal harm to people. Contrast with *DANGER*.

CB. Circuit breaker.

centimeter. One hundredth of a meter. See *meter*.

CCA. Channel card address register.

CCB. Communication control block.

CCC. Channel card control register.

CCR. Channel command retry.

ccw. Counterclockwise.

CCW. Channel command word.

CDR. Channel data register.

CDTI. Channel diagnostic tag-in register.

CE. Customer engineer; field engineer

CE Panel. Hand held diagnostic tool.

CER. Channel error register.

channel command. An instruction that directs a data channel, control unit, or device to perform an operation or set of operations.

char. Character.

checklist. A list of items to be checked.

CHK. Check.

CHL. Channel.

CHPID. Channel path identification.

clk. Clock.

cluster. A collection of processors called nodes, attached to each other by a high-speed bus.

cm. Centimeter.

CMD. Command.

CMR. Channel modifier register.

command. A control signal that initiates an action or the start of a sequence of actions.

concurrent. Refers to diagnostic procedures that can be run on one tape control unit while the rest of the subsystem remains available for customer applications.

contaminant. Something that contaminates.

contingent connection. A connection between a channel path and a drive caused when a unit check occurs during an I/O operation.

control unit. A device that controls input/output operations of one or more devices.

controller. The part of a mass storage system responsible for interfacing between drives and host computers.

CP. Circuit protector.

CPS. Cycles per second. See *Hz*.

CRC. Cyclic redundancy check.

CRR Channel request register

CS Control storage

CSC Customer Support Center

CST Command status table

CSW Channel status word.

CTO Channel tag out

ctr Counter.

ctrl Control.

CU See *TCU*.

CUA Channel unit address.

CUT Control unit operations table.

DANGER (Notice) A word to call attention to possible lethal harm to people Contrast with *CAUTION*

data * Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

data buffer The storage buffer in the tape control unit. This buffer is used to increase the data transfer rate between the tape control unit and the channel.

data check A synchronous or asynchronous indication of a condition caused by invalid data or incorrect positioning of data. Some data checks can be suppressed.

DBI Data buffer in.

DBO Data buffer out

dc Direct current.

DCB Data control block.

DCK Data check.

DCR Device control register.

DE device end.

degauss To demagnetize an object.

degradation A decrease in quality of output or throughput or increase in machine error rate.

degraded Decreased in quality of output or throughput or increased machine error rate.

demark Mark to show that the buffer segment is not usable.

deserialize To change from serial-by-bit to parallel-by-byte.

designed Has as a purpose

detent A mechanical device for holding moving parts in position

detented Held in position by a detent

DEV Device

DF Data Fields and Registers.

DGHELO Diagnostic hardware error log.

DGOVLY Diagnostic overlay log.

DIAG Diagnostic.

DIDO Data in data out bus.

DIR Device interrupt register.

direct access storage (1) * A storage device in which the access time is in effect independent of the location of the data. (2) (TC97) A storage device that provides direct access to data. (2) See also *immediate access storage*.

DLR Device level register.

DOT Device operation table.

Double-stick cellophane tape Cellophane tape that has adhesive on both sides of the tape.

drive, magnetic tape (ISO) A mechanism for moving magnetic tape and controlling its movement.

DSC Device secondary clock register.

DSE Data security erase.

DSE (register) Device status and error register.

DSH Control unit serial high register.

DSL Control unit serial low register.

DSR Device secondary register.

DTR Device tag register.

dual porting (dual access) Ability of a disk or tape drive to be accessed by two controllers.

EAD Error Analysis Diagrams.

EBCDIC Extended binary-coded decimal interchange code.

EC Edge connector. Engineering change.

ECC Error correction code.

ECO Engineering change order.

EDF Extented Data Format (Improved Data Recording Capability)

elsewhere To or at another place.

end of block (EOB) A code that marks the end of a block of data.

end of file (EOF) A code that marks the end of a file of data.

end of tape (EOT) The end of the recording area on a tape.

EOB End of block.

EOF End of file.

EOJ End of job.

EOR End of record.

EOT End of tape.

EPO Emergency power off.

EQC Equipment check.

EQU Equate.

equipment check An asynchronous indication of a malfunction.

ERA Error register A register.

ERB Error register B register.

ERF A VAX/VMS utility that selectively reports the contents of an error log file.

ERG Erase gap.

ERPA Error recovery procedure action.

Error log A binary file that is used to record hardware and software failures and a selected amount of context of the failure.

exchange (1) The act of removing an old or imperfect part and installing a new or perfect part. (2) Contrast with *swap*.

explosive Can explode or cause to explode.

F Fuse.

fault symptom code (FSC) A hexadecimal code generated by the drive or tape control unit microcode in response to a detected subsystem error. This code is used as an MG entry point by the field engineer.

FE Field engineer; customer engineer.

FEALD Field Engineering automated logic diagram.

field replaceable unit (FRU) An assembly that is replaced in its entirety when any one of its components fails.

FIFO First in first out.

file * (ISO) A set of related records, treated as a unit, for example, in stock control, a file could consist of a set of invoices.

file protection Prevention of the destruction of data recorded on a volume by disabling the write head of a unit.

FIPS Federal Interface Processing Standard.

firmware Software that is stored in a fixed (wired-in) or 'firm' way, usually in a read-only memory; a set of instructions designed to help hardware perform its assigned functions.

format * (ISO) The arrangement or layout of data on a data medium.

formatter Part of a magnetic tape subsystem that performs data conversion, speed matching, encoding, first level error recovery, and interfaces to one or more tape transports.

FP File protect.

frayed Damaged as if by an abrasive substance.

FRU Field replaceable unit.

FSB Forward space block.

FSC Fault symptom code.

FSF Forward space file.

FSI Fault symptom index.

functional Of, connected with, or being a function.

Functional microcode Microcode that is resident in the machine during normal customer operation.

FVP Functional verify program.

GMP Good Machine Path

gnd Ground. A voltage reference point in a system that has zero voltage potential.

g Gram.

hertz (Hz) Unit of frequency. One hertz equals one cycle per second.

hex Hexadecimal.

HV. High voltage.

Hz. Hertz (cycles per second).

I/O. Input/output.

IBG. Interblock gap.

ID. Identification.

identifier. That difference by which one thing can be distinguished from another.

ILEXER. HSC diagnostic that simultaneously exercises up to 12 tape drives. ILEXER does not provide for fault isolation.

ILTAPE. HSC diagnostic that tests a specific tape formatter dedicated to the test.

ILTCOM. An inline compatibility test for tapes possibly written on different system and different drives.

IML. Initial microprogram load , same as *boot*.

immediate access storage. * A storage device whose access time is negligible in comparison with other operating times.

IMR. Interrupt mask register.

inertia. Tendency to remain at rest or continue in the same direction.

initial microprogram load (IML). The action of loading a microprogram from an external storage to writable control storage ; see *bootstrap*.

INST. Installation.

interblock gap (IBG). (1) * An area on a data medium to indicate the end of a block or physical record. (2) (TC97) The space between two consecutive blocks on a data medium.

interface. * A shared boundary. An interface might be a hardware component to link two devices, or it might be a portion of storage or registers accessed by two or more computer programs.

intervention required. Manual action is needed.

INTLK. Interlock.

INTRO. Introduction.

ips. Inches per second.

irrecoverable error [n.]. (1) (TC97) An error that makes recovery impossible without the use of recovery techniques external to the computer program or run. (2) In item (1), the recovery techniques would be external to those that are incorporated, not only within the program that failed but also within the system, and would include human action such as analysis by a program support representative.

ITA. Interval timer A register.

ITB. Interval timer B register.

ITC. Interval timer C register.

JAL. Jump address low register.

JAH. Jump address high register.

K. (1) * When referring to storage capacity, two to the tenth power; 1024 in decimal notation. (2) Kelvin.

kb. Kilobyte; a unit of 1024 bytes.

land pattern. Wires and connections on or below the surface of a circuit board.

LD. Load.

LED. * Light-emitting diode.

LGND. Legend.

load point. See *beginning of tape*.

LOC. Locations.

locate block. A subsystem operation in which a tape is moved so that a specific block is available for processing.

LRC. Longitudinal redundancy check.

LSB. Least-significant bit.

LSI. Large scale integration technology.

LSP. Local storage page register.

LSR. Local storage register.

LWR. Loop write-to-read.

m. Meter.

M/T. Multiple track.

magnetic recording. * (ISO) A technique of storing data by selectively magnetizing portions of a magnetizable material.

magnetic tape. (TC97) A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

maintenance agreement. A contract between Digital and a customer for supplying service to the customer.

maintenance package. The maintenance aids that Digital supplies for servicing the TA90 subsystem.

MAP. Maintenance analysis procedure.

mask. * (ISO) (1) A pattern of characters that is used to control the retention or elimination of portions of another pattern of characters. (2) To use a pattern of characters to control the retention or elimination of portions of another pattern of characters.

master file. * (ISO) A file used as an authority in a given job and that is relatively permanent, even though its contents may change. Synonymous with main file.

MCR. Maintenance control register.

MD. Maintenance device. Microcode diagrams.

MDA. Maintenance device adapter.

MDD. Maintenance device display.

MDI. Maintenance data in register.

MDO. Maintenance data out register.

media capacity. The amount of data that can be contained on a storage medium, such as tape, expressed in bytes of data.

meter (m). A unit of measure equal to 0.9144 yard.

MG. Maintenance Guide

MICR. Micro instruction register.

micro. One millionth of.

MICRO. Microcode.

microcode. (1) One or more micro instructions. (2) A code, representing the instructions of an instruction set, implemented in a part of storage that is not program-addressable. (2) To design, write, and test one or more micro instructions. (3) See also *microprogram*.

microdiagnostic routine. A program that runs under the control of a supervisor, usually to isolate field replaceable units.

microdiagnostic utility. A program that is run by the customer engineer to test the machine.

micro instruction. A basic or elementary machine instruction.

microprogram. * (1) (ISO) A sequence of elementary instructions that corresponds to a specific computer operation, that is maintained in special storage, and whose execution is started by the introduction of a computer instruction into an instruction register of a computer. (2) A group of micro instructions that, when executed, performs a preplanned function.

Note: The term microprogram represents a dynamic arrangement or selection of one or more groups of micro instructions for execution in order to perform a particular function. The term microcode represents micro instructions used in a product as an alternative to "hard-wired" circuitry to implement certain functions of a processor or other system component.

microprogram load. See *initial microprogram load*.

milli. One thousandth of.

millimeter. One thousandth part of a meter.

MLC. Machine level control.

mm. Millimeter.

modifier. That which changes the meaning.

mount a device. To assign an I/O device by means of a request to the operator.

MP. Microprocessor.

MPL. Microprogram load.

ms. Millisecond.

MSB. Most-significant bit.

MSG. Message.

MTE. Multiple track error.

MTI. Maintenance tag in register.

MTO. Maintenance tag out register.

multipath. Pertaining to using more than one path.

nano. One billionth part of.

N/A. Not applicable.

net wire list. A list that shows the wiring connections for the logic boards.

net. Network.

network. The interconnection of electrical components.

node. Intelligent entities in a distributed computing configuration.

NOP. No operation.

NRZI. Non-return-to-zero change-on-ones recording.

ns. Nanosecond.

OCP Operator control panel, contains any switches and indicators necessary to provide operator information and control over the drive.

offline. (TC97) Pertaining to the operation of a functional unit without the continual control of a computer. Contrast with *online*.

online. (TC97) Pertaining to the operation of a functional unit that is under the continual control of a computer. Contrast with *offline*.

OP. Operator panel.

OPER. Operation.

osc. Oscillator.

oscillator. A device that periodically varies a voltage.

OSU panel. Operator setup panel.

outstanding. Waiting for processing.

ov. Over voltage.

overrun. Loss of data because a receiving device is unable to accept data at the rate it is transmitted.

owner. One who owns something.

parameter. * (ISO) A variable that is given a constant value for a specified application and that may denote the application

part. Part number.

p bit. Parity bit.

PC. Parity check.

PCR. Processor control register.

PDR. Processor diagnostic register.

PE. Parity error.

PER. Processor error register.

PG. Parity generator.

pgm. Program.

PGID. Path group identification.

PGM (map). Path group map.

PGT. Path group ID table.

PLAN. Maintenance Plan.

PM. Preventive maintenance.

PNEU. Pneumatics.

pneumatic. The parts of the subsystem that control the pressurized air and vacuum.

polling. (1) A process in which the microcomputer interrogates certain command or status registers, one at a time, to determine if service is required. (2) A process in which the STI-FIPS adapter sequentially senses each drive, one at a time, to check for a change of status.

POR. Power-on reset.

primed. Pertaining to a condition of a tape drive when the controlling computer has addressed the drive but the drive was not in a ready state.

PS. Power supply.

PSR. Processor status register. Program support representative.

PST. Product support trained.

PT. Product trained.

PWR. Power.

R/W. Read/write.

RAM. Random access memory.

Random access memory. See *direct access storage*.

RCR. Read control register.

RD. Read.

RDB. Read backward.

RDC. (1) Read diagnostic control register. (2) Remote Diagnosis Center.

RDF. Read forward.

RECL. Record length.

reconnect. To physically or electrically put back together.

record. * (ISO) A collection of related data or words, treated as a unit; for example, in stock control, each invoice could constitute one record.

recording density. The number of bits in a single linear track measured per unit of length of the recording medium.

recoverable error. (1) An error condition that permits continued execution of a program. (2) Contrast with *irrecoverable error.*

ref. Reference.

reg. Register.

reinstall. To put back the original part that was removed.

remove. To take a part off of the machine.

RER. Read error register.

resource allocation. (ISO) The assignment of the facilities of a data processing system for the accomplishment of jobs.

resume. To continue.

retry. To attempt again.

REW. Rewind.

ROS. Read-only storage.

RPM. Revolutions per minute.

RPR. Read pattern register.

RRC. Read residual count register.

RSR. Read status register.

RUN. Rewind-unload.

SAR. Storage address register.

SB. Sense byte.

SCR. Silicon-controlled rectifier.

SDR. Statistical data recorder. Storage data register.

s. Second(s) of time.

saturate. To completely fill.

sel. Select.

segment. A part.

SERDES. Serializer/deserializer.

serialize. To change from parallel-by-byte to serial-by-bit.

serializer. (ISO) A device that converts a space distribution of simultaneous states representing data into a corresponding time sequence of states.

SR. Service Representative, see also *CE*.

servo [n.], servos. An adjectival noun for use in qualifying some part or aspect of a servomechanism.

servomechanism [n.]. * A feedback control system in which at least one of the system signals represents mechanical motion.

special feature. A feature that can be ordered to enhance the capability, storage capacity, or performance of a Digital product, but is not essential for its basic work.

SNERRH. Sense error history table.

SNS. Sense.

SPEAR. Standard Package for Error Analysis and Reporting

SS. Status store.

ST. *Store.*

standard feature. The significant design elements of a Digital product that are included as part of the fundamental product.

START. Start maintenance.

STI. Standard tape interconnect

Stoplock. A position-hold mode used when the tape is in a stopped position and under tension.

subsystem. A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system.

SUPP. Support.

swap. (1) The act of interchanging two identical field-replaceable units within the same machine for test purposes. (2) Contrast with *exchange*.

sync. Synchronous, synchronize.

synchronous. (1) (ISO) Pertaining to two or more processes that depend upon the happening of specific events such as common timing signals. (2) Occurring with a regular or predictable time relationship.

tach. Tachometer.

tachometer. A device that emits pulses that are used to measure/check speed or distance.

tailored. Changed to meet individual specifications.

tape cartridge. A container holding magnetic tape that can be processed without separating it from the container.

tape void. An area in the tape in which no signal can be detected; may be caused by a machine failure.

TB. Terminal board.

TCC. Top-card connector.

tape cartridge. A container holding magnetic tape that can be processed without separating it from the container.

tape void. An area in the tape in which no signal can be detected; may be caused by a machine failure.

TB Terminal board.

TCC. Top-card connector.

TCU. Tape Control Unit

tension [n.]. (1) The force tending to produce elongation. (2) The condition of being stretched.

thread/load operation. A procedure that places tape along the tape path.

TI. Tape indicate.

TIE. Track in error.

TM. Tapemark.

tp. Test point.

TTU. Tape Transport Unit

TU. Tape Unit.

TUBI. Tape unit bus in.

TUBO. Tape unit bus out.

UEPO. Unit emergency power off.

unload. Prepare the tape cartridge for removal from the drive.

utilities. Utility programs.

Utility programs. (1) * (ISO) A computer program in general support of the processes of a computer; for instance, a diagnostic program. (2) a program that enables the field engineer to maintain (or prepare to maintain) data or other programs.

uv. Under voltage.

VAXsimPLUS. VAX system integrity monitor; an interactive error reporting tool.

VES. Volume error statistics.

virtual circuit. A logical connection path between two nodes in a cluster.

volume. (ISO) A certain portion of data, together with its data carrier, that can be handled conveniently as a unit.

VOM. Volt ohmmeter.

VRC. Vertical redundancy check.

WARNING (Notice). A word to call attention to possible damage to a program, device, or system. Contrast with *CAUTION*.

WCR. Write control register.

word. (1) (ISO) A character string that is convenient for some purpose to consider as an entity. (2) In TA90 and VAX, 16 bits, or 2 bytes.

WSE. Write status/error register.

WRITE. Write command.

WTM. Write tape mark.

XR. External register.

XRA. External register address register.


PLAN

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TA90 Maintenance Summary

The TA90 maintenance package has two parts, the maintenance diskettes and the TA90 Maintenance Guide manual.

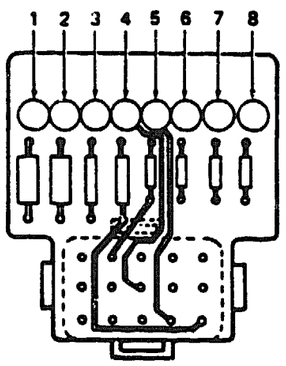
The TA90 maintenance package supplies two diskettes. GMP (concurrent) diagnostics are resident on the TCU functional diskette. Non-concurrent ("standalone") diagnostics are resident on the TCU support diskette.

There is a third diskette available for use with the maintenance device (MD) for area support. This diskette contains subsystem display and alter controls, support utility programs, and microcode patch programs.

Special Tools and Test Equipment

DC Test Tool

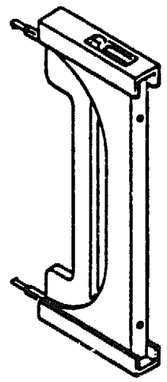
This tool (PN 23-27465-01) is shipped with the subsystem. Use this tool to determine if subsystem power supplies are supplying output voltages. See PWR 10 or PWR 12 for a description of this tool and a description of how to use it.



DC Test Tool

Card Extractor

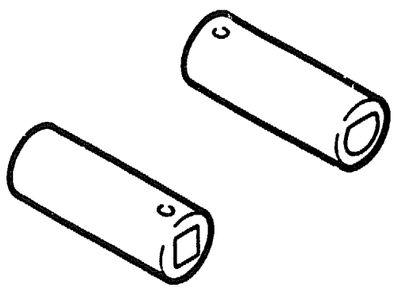
This tool (PN 25-27466-01) is shipped with the subsystem. It is used to remove logic cards from the subsystem.



Card Extractor

Tape Removal Tool

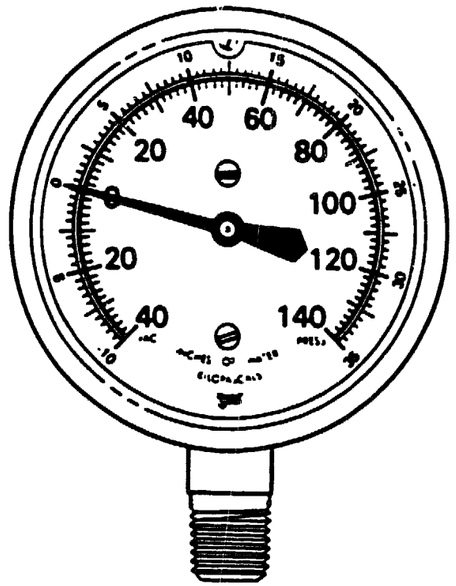
This tool (PN 29-27467-01) is shipped with the subsystem. Use it to rewind tape into the cartridge when the tape must be rewound by hand. See CART 12 for instructions on how to use the tape removal tool.



Tape Removal Tool

Pressure/Vacuum Gauge

This tool (PN 29-27268-01) is used to measure the pneumatic system pressure or vacuum. See PWR 5 for instructions on how to use the pressure/vacuum gauge.



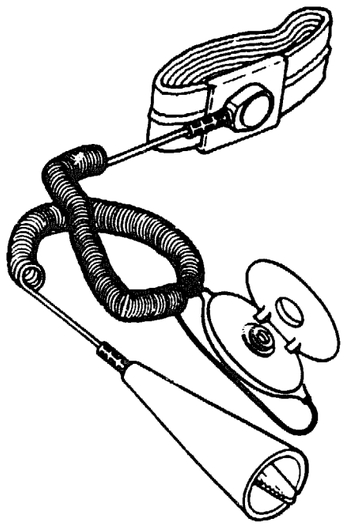
Pressure/Vacuum Gauge

Pressure/Vacuum Kit

This kit contains hoses, fittings and the Pressure/Vacuum gauge (shown above) for measuring the pneumatic system pressure or vacuum. This kit is not shipped with the subsystem and must be ordered.

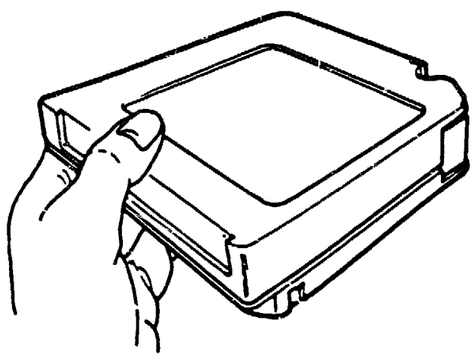
ESD Grounding Wrist Strap Tool

This tool (use the most current part number available) is used to prevent damage when you work with electrostatic discharge (ESD) sensitive parts. See CARR-TCU 1-9 or CARR-DR 1-9 for information on using the ESD grounding wrist strap tool. This tool is shipped with the subsystem.



Cleaning Cartridge

This tool (PN 30-30326-01) is used to clean the head guide assembly. To use, load the cartridge on a drive, and the cleaning procedure occurs automatically. The cartridge unloads when the cleaning procedure is done. This tool is shipped with the subsystem.



Leader Block Replacement Kit

The Leader Block Replacement Kit (PN 29-27468-01) is shipped with the subsystem. It includes the clutch tool and the attachment tool. See Cart 20 for information on using these tools.

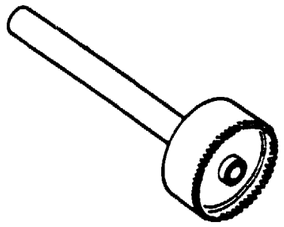
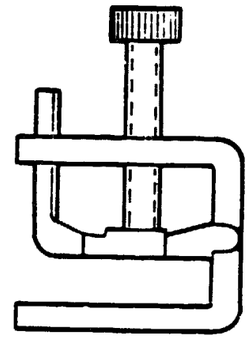


Figure 1. Clutch Tool

Figure 2. Attachment Tool

Hose Clamp Tool

This tool (PN 29-27469-01) is used to clamp various air pressure hoses for use in FRU isolation and for concurrent maintenance. See CARR-DR 3-1 for information on how to use the hose clamp tool. This tool is shipped with the subsystem.



File Protect Gauge

This tool (PN 29-27470-01) is used to adjust the file protect switch to ensure correct contact is made with the tape cartridge. This tool is shipped with the subsystem.

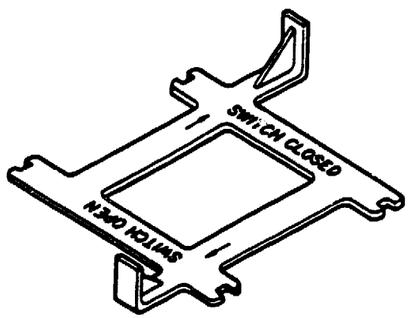


Figure 3. File Protect Gauge

Maintenance Guide Description

This section describes the TA90 Maintenance Guide and explains how to use the maintenance guide to repair the TA90.

The maintenance guide (MG) is a five-volume manual that supplies maintenance procedures and theory of operation information. This information is contained in the following five volumes:

- A01--Maintenance procedures
- A02--Maintenance procedures and tape control unit checks, adjustments, removals, and replacements
- A03--Drive checks, adjustments, removals, and replacements
- A04--Support procedures
- A05--Error analysis diagrams.

Each volume of the maintenance guide is divided into sections that are marked with tabs for quick identification and access. The following describes the sections contained in each of the maintenance guide volumes.

Volume A01 – Maintenance Procedures

The sections contained in this volume supply maintenance procedures and repair information needed to diagnose and repair the TA90.

GLOSS

This section supplies descriptions of terms and abbreviations used in the TA90 Maintenance Guide. Use this section to look up the meaning of any word or abbreviation that you do not understand.

PLAN

This section (the section you are now using) describes the TA90 Maintenance Guide, supplies a summary of the maintenance package, and explains how to use the maintenance guide to repair the TA90. Use this section to learn what aids the maintenance package supplies and how to use the maintenance package to service the subsystem.

INTRO (Introduction)

This section supplies a summary of the TA90 Magnetic Tape Subsystem, describes the tape cartridge, and describes the subsystem features. Use this section to learn what the subsystem consists of and what it does.

START

This section supplies the initial entry into the maintenance package. It contains problem-finding procedures that guide the field engineer to a diagnostic or repair procedure. Use this section to start your analysis of a problem. This section aids you in analyzing the problem or instructs you to use the CE Panel to analyze the problem.

CART (Cartridge)

This section contains analysis and error-recovery procedures for tape cartridge problems. The START section or the CE panel will send you to the CART section to perform specific repair procedures.

PNEU (Pneumatics)

This section supplies analysis procedures to isolate failures in the pneumatic system. The START section or the CE panel will send you to the PNEU section.

MSG (Message)

This section describes the error log messages and VAXsimPLUS summaries. It contains examples of error log printouts and explains how to use the information. Use this section to analyze the printouts from the error log report program. This analysis will send you to the correct entry in the START section.

INST (Installation/Removal)

This section supplies the information necessary for you to install or remove the subsystem. Use this section when the customer wants the subsystem (or a machine from the subsystem) installed, removed, or relocated.

INSP (Safety Check Procedures)

This section supplies the safety check procedures to ensure that a machine that has not been under a Digital Maintenance Contract has the needed safety items installed and that no other changes were made to make it unsafe.

INDEX

This section supplies an alphabetic list of key words and phrases in maintenance information volumes A01, A02, A03, A04, and A05. Use this section to find the subject you want.

Volume A02 – Maintenance Procedures and Tape Control Unit Checks, Adjustments, Removals, and Replacements

The sections contained in this volume supply maintenance procedures and repair information needed to diagnose and repair the TA90 and the removal and replacement procedures for all FRUs in the tape control unit.

PWR (Power)

This section contains the MAPs to isolate failures in the power areas. It also contains voltage reference tables and charts, wiring diagrams, and a description of the dc test card. The START section or the CE panel will send you to the PWR section to analyze power failures.

SENSE

This section supplies summary charts and descriptions of the subsystem sense bytes and the channel status byte. This section describes how to analyze the sense bits. Use this section to determine the correct entry point to the START section.

PANEL

This section describes the switches and indicators on the tape control unit and tape transport unit panels, and supplies tape drive operating instructions. Use this section to learn the function of the tape control unit and tape transport unit panels. You can also use this section for directions about performing operations as instructed by the START section.

CE/HSC

This section describes the maintenance device (MD), MD messages, and MD menus. Instructions on how to use the MD are provided. use of the CE Panel and HSC to run subsystem diagnostics and GMP. Use this section to learn about the CE Panel and how to use it with the TA90 subsystem.

LOC (Locations)

This section shows the location of FRUs, assemblies, and parts in the tape control unit and tape transport unit. Use this section to find the locations of items you are sent to by other sections of this manual.

CARR-TCU (Tape Control Unit Checks, Adjustments, Removals, and Replacements)

This section supplies the removal and replacement procedures for all FRUs in the tape control unit. The check or adjustment procedures are included. At the front of the section is a list of all FRU numbers, which you can use for FRU identification and to find required procedures. Use this section when the START section instructs you to check, adjust, or exchange a FRU in the tape control unit.

Volume A03 – Drive Checks, Adjustments, Removals, and Replacements

This volume contains the section that supplies the drive removal and replacement procedures.

CARR-DR (Drive Checks, Adjustments, Removals, and Replacements)

This section supplies the removal and replacement procedures for all FRUs in the tape transport unit. The check or adjustment procedures are included. At the front of the section is a list of all FRU numbers, which you can use for FRU identification and to find required procedures. Use this section when the START section instructs you to check, adjust, or exchange a FRU in the tape transport unit.

Volume A04 – Support Procedures

The sections contained in this volume supply diagnostic procedures and information, theory of operation, microcode data field, and register information to aid you in diagnosing problems.

LGND (Legend)

This section describes with graphics the symbols used in the maintenance guide. In addition, examples and descriptions of logic, net wire, and voltage pin lists are supplied. Use this section to learn how to read the diagrams in the maintenance package.

SPROC (Support Procedures)

This section provides a step by step procedure for entering and using the support maintenance package. It reminds you of what error data is available and gives hints on analyzing that data.

MDISDISK (MD Support Diskette Procedures)

This section describes the MD support diskette procedures and gives directions on using the maintenance device (MD) to display registers, run the trace program, and do other support MD operations that are resident on the support diskette.

DIAG (Support Diagnostics)

This section contains a description of the diagnostic control program and the diagnostic tests resident on the TCU Support diskette.

Maintenance Information Description (Continued) PLAN 11

DF (Data Fields)

This section describes the tape control unit and drive microcode data fields, logs, and registers that are useful to you in diagnosis of subsystem hardware failures.

The data field definitions are predominantly used to define bit meanings within a register or field when EADs make reference to them. Additionally, support diagnostics display register contents, and the data fields section can be used to define their meanings.

OPER (Theory of Operation)

This section supplies the theory information necessary to understand subsystem operations. Included are card, command, and data flow descriptions.

Volume A05 – Error Analysis Diagrams

This volume contains a Fault Symptom Index (FSI) and Error Analysis Diagrams (EAD) that are used to diagnose problems when detailed troubleshooting is necessary.

FSI (Fault Symptom Index)

This section contains a listing of error codes generated by the tape control unit or drive. A description of each error code, a FRU list associated with the error code, and troubleshooting references are provided. Use this section when you are sent here by the Support Procedures to diagnose problems that were not corrected by running GMP.

EAD (Error Analysis Diagrams)

This section contains error diagrams, error condition theory, and troubleshooting guides for error codes that are generated by the tape control unit or drive. Use this section when you are sent here by the FSI for diagnosing problems that were not corrected by running GMP.

TA90 Maintenance Package Summary

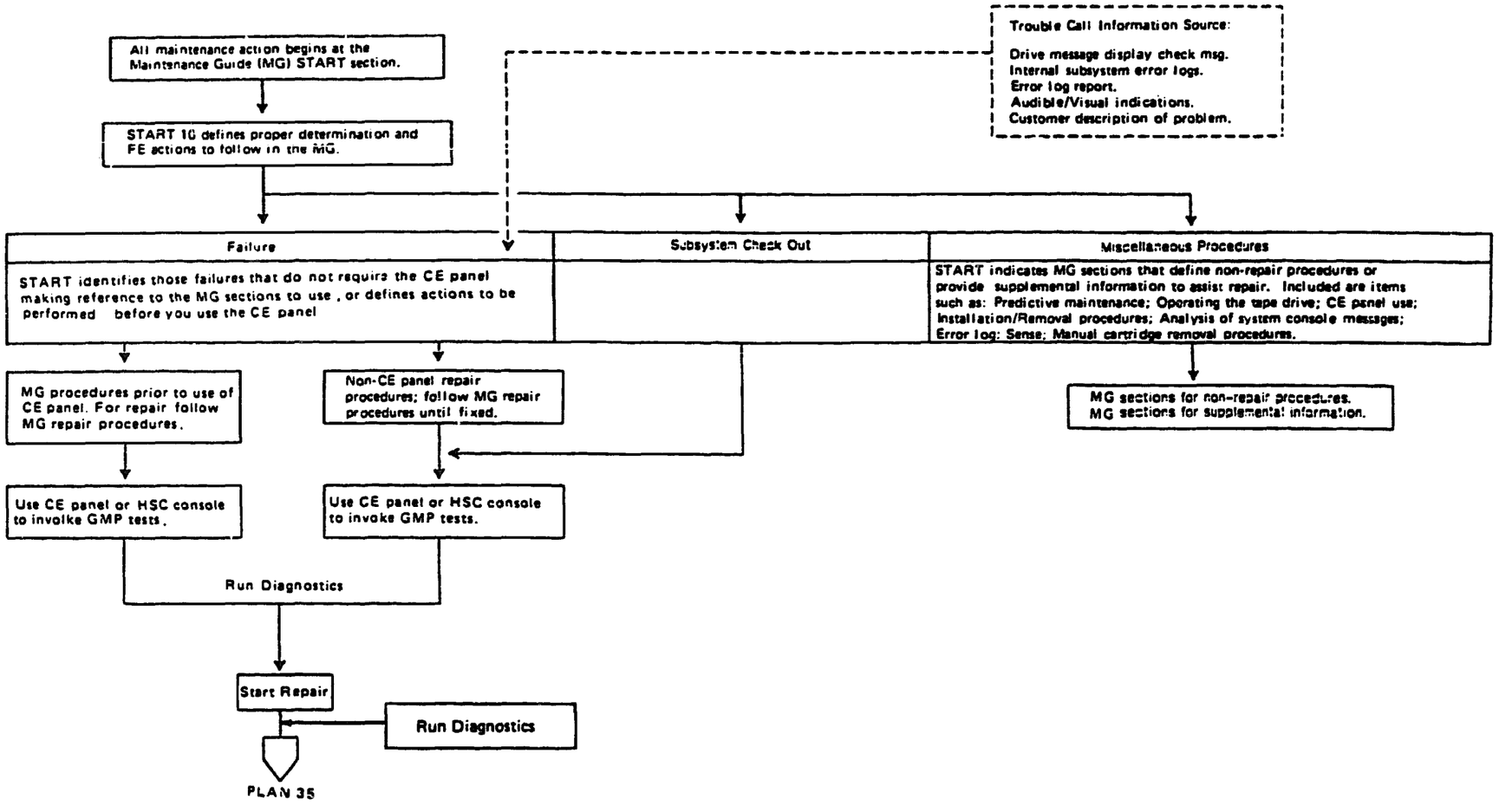
The flowcharts on pages PLAN 30 through PLAN 51 show the process that the maintenance package follows to lead you to a repair. The flowcharts do not make up a repair procedure. The repair procedure is completely contained in the sections starting at START.

PLAN 30 shows the process up to the selection of the GMP.

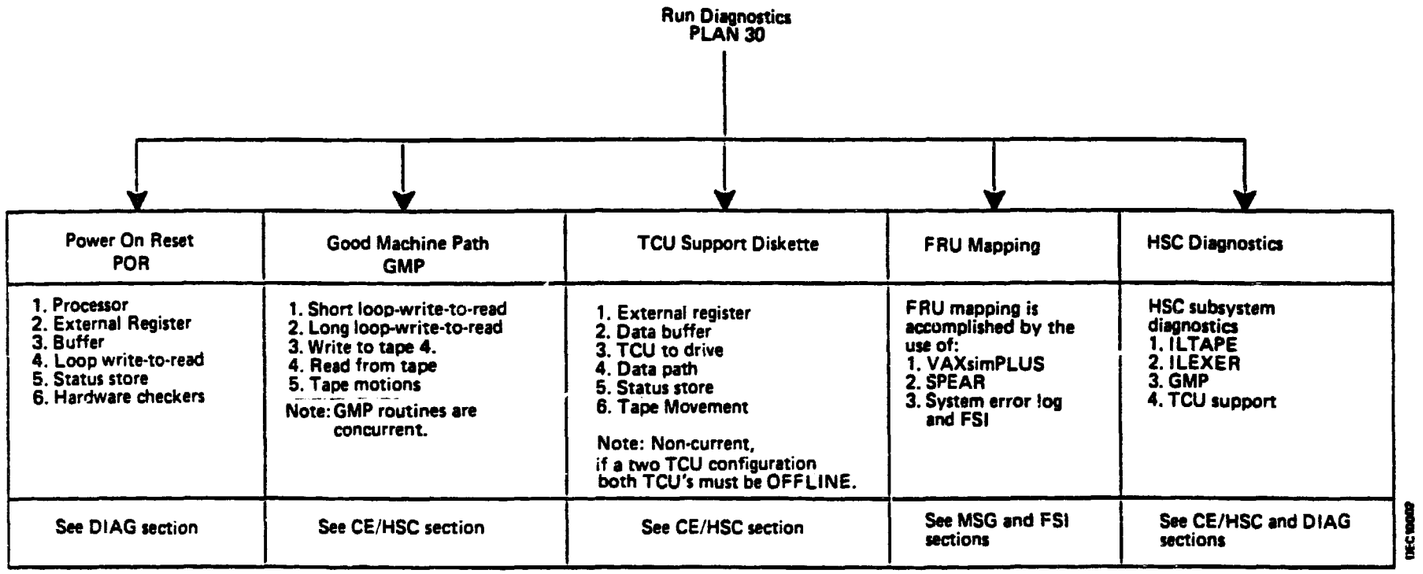
PLAN 35 shows the process the maintenance package follows for an interrupted service procedure. PLAN 35 also shows the procedure that the maintenance package follows when you want to test the subsystem for correct operation.

PLAN 50 and PLAN 51 describe the maintenance package tools available to the service representative with support education.

TA90 Maintenance Package Summary (Continued) PLAN 30



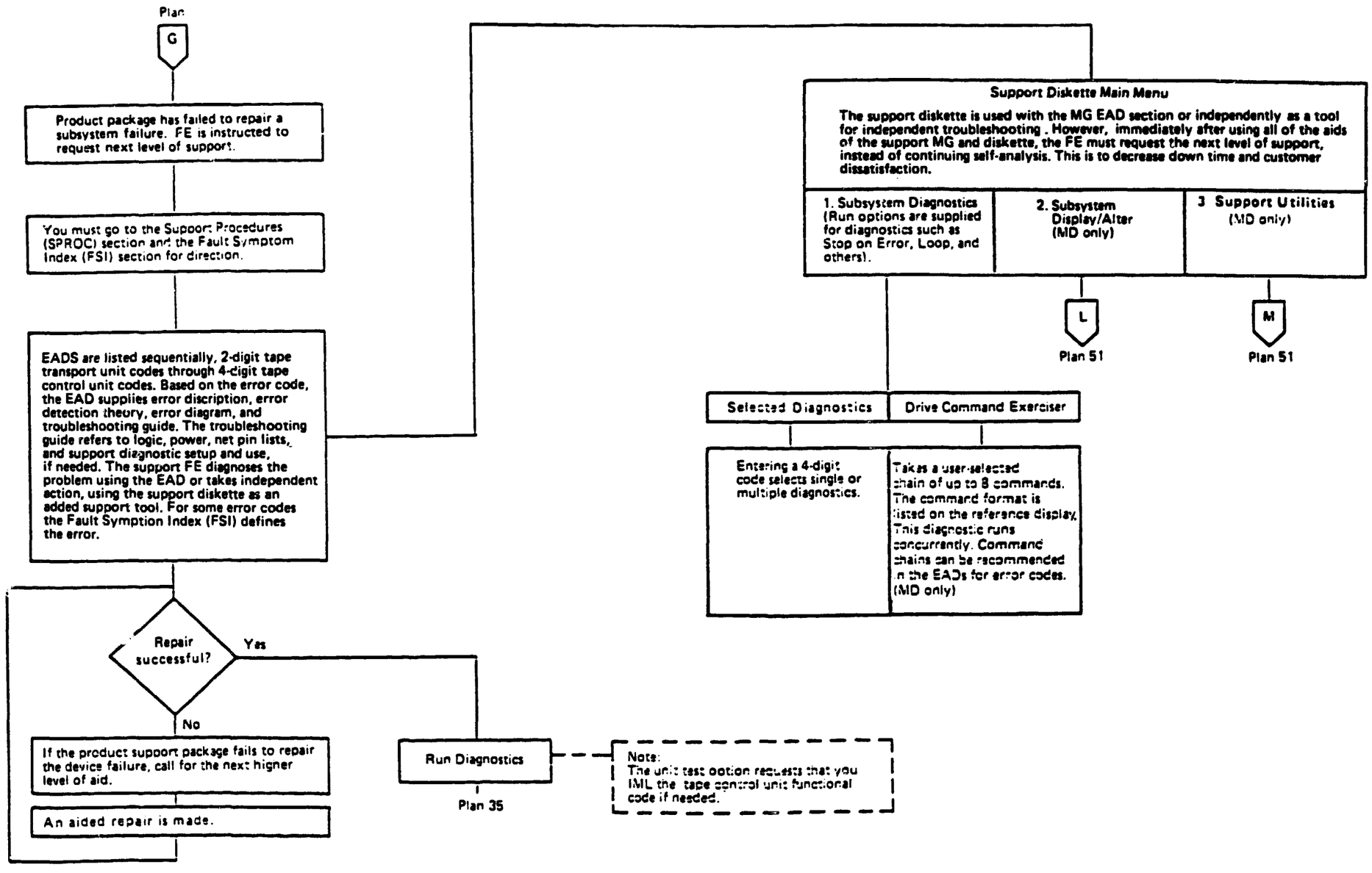
TA90 Maintenance Package Summary (Continued) PLAN 35



Power On Reset POR	Good Machine Path GMP	TCU Support Diskette	FRU Mapping	HSC Diagnostics
1. Processor 2. External Register 3. Buffer 4. Loop write-to-read 5. Status store 6. Hardware checkers	1. Short loop-write-to-read 2. Long loop-write-to-read 3. Write to tape 4. 4. Read from tape 5. Tape motions Note: GMP routines are concurrent.	1. External register 2. Data buffer 3. TCU to drive 4. Data path 5. Status store 6. Tape Movement Note: Non-current, if a two TCU configuration both TCU's must be OFFLINE.	FRU mapping is accomplished by the use of: 1. VAXsimPLUS 2. SPEAR 3. System error log and FSI	HSC subsystem diagnostics 1. ILTAPE 2. ILEXER 3. GMP 4. TCU support
See DIAG section	See CE/HSC section	See CE/HSC section	See MSG and FSI sections	See CE/HSC and DIAG sections

TA90 Product Support Summary PLAN 50

Note: Registers displayed by programs/diagnostics on the support diskettes are useful in isolating hardware failures and are explained in the DF (Data Fields) section. See "Contents" on DF 1.



Plan 50

L

1. Storage Display/Alter	2. Register Display/Alter
Supplies access to the tape control unit tables, tape control unit storage, channel storage, status storage, and drive storage.	Supplies access to the tape control unit and drive external registers and local storage registers, and the tape control unit scan ring

Plan 50

M

1. Tape control unit trace/match control	2. Microprocessor control	3. Tape control unit subsystem dump
Prompts the user for setup data. Action taken at the time selected errors occur.	Permits control operations in these areas: maintenance adapter registers and microprocessor, control storage, and maintenance adapter commands.	Dump files can be written for the tape control unit and drives, in long or short format. Dump files are written on the support diskette.

Product maintenance adapter registers	Microprocessor commands	Control storage commands	Product maintenance adapter commands
Displays the following registers: MCR, MS3, MTI, ADR, and D REG.	Provides microprocessor control similar to an SR panel. (For example: stop, step, start, reset, etc.)	Allows control storage read and write operations.	Allows product maintenance adapter control via commands. (For example: set address, comp sync/stop, ignore errors, etc.)

Dismount Procedures

Before you perform a maintenance action on a drive, the drive address must be offline to the operating system. Before you perform a maintenance action on a tape control unit, all drives attached to the tape control unit must be offline to the operating system in a single tape control unit configuration or have the paths offline for all drives in a dual tape control unit configuration. Failure to do so could affect customer operations.

How to Take a Drive Offline (Single or Dual Tape Control Unit Subsystem)

Have the customer:

1. Deallocate all of the systems that have access to the drive.
2. Dismount each of these addresses offline to the operating system.

Be sure to verify that the customer has completed the offline procedure before starting the maintenance procedure.

How to Take a Subsystem Offline (Single or Dual Tape Control Unit Subsystem)

Have the Customer:

1. Deallocate all channel paths that have access to the subsystem.
2. Dismount all channel path addresses, to each drive that is attached to the tape control unit, offline to the operating system.

   Be sure to verify that the customer has completed the offline procedure before starting the maintenance procedure.

Do the following:

1. Switch the tape control unit Online Test/Offline Test switch to the Offline Test position.

   Note: A delay can be expected because the Offline green LED does not light until all channel processes have stopped.

2. If the Offline green LED does not light, press the IML/Reset switch to the Reset position.

   Note: Check with the customer to ensure that the subsystem has been taken offline completely before pressing Reset.

Procedures (Continued)

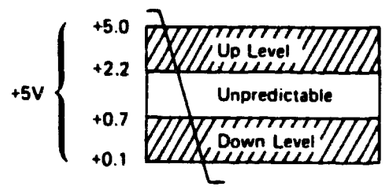
Scoping (Using Oscilloscope)

An oscilloscope, Tektronix [1] 454A, 475, or equivalent, may be used.

Set the oscilloscope controls as follows:

Use a X10 probe, sync = auto, volts = 1 volt/cm, sweep = as required.

1. Probe the points as directed by the MAPs.
2. If the MAP indicates the UP light is on, the line level should be in the up signal level area. See the voltage signal levels below.
3. If the MAP indicates the DOWN light is on, the line level should be in the down signal level area. See the voltage signal levels below.
4. If the MAP indicates the light is flashing, the line level should be changing between up and down level. Ensure that the up and down levels are within limits. See the voltage signal levels below.



[1] Trademark of Tektronix, Inc.


INTRO

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Introduction to the TA90 Subsystem

The TA90 is a high performance buffered magnetic tape storage subsystem.

The subsystem consists of a Tape Control Unit and up to four Tape Transport Units. Each tape transport unit contains two drives. Therefore, each tape control unit can have a maximum of eight drives connected to it. By adding the Dual Tape Control Unit Communication feature, a second tape control unit and up to four tape transport units can be connected to the first tape control unit to form a two-tape control unit, sixteen-drive subsystem.

The TA90 subsystem attaches to the HSC/HSX controller. The STI-FIPS Adapter card interconnects the FIPS-60 interface of the tape control unit with the interface bus. The TA90 subsystem attaches to the VAX processors via the HSC/HSX.

The TA90 provides dual ported capability at all levels—Transport, Tape Control Unit and STI-FIPS adapter.

Operating Characteristics

Some of the subsystem operating characteristics are:

- A compact design with front loading
- A small reel of half-inch tape enclosed in a compact cartridge for greater tape protection
- Automatic tape threading
- A tape control unit with a 1024K-byte data buffer and a microprocessor that controls the data flow within the subsystem
- A Dual Tape Control Unit Communication feature that has the ability to interconnect two tape control units into a single subsystem configuration
- A drive with microprocessor control that moves tape without capstans or vacuum columns
- A message display panel for each drive that provides visual information for the operator or service representative.

Operating Systems

The programming support for the subsystem is provided within the following operating systems and their future extensions:

- VMS
- ULTRIX

Optional Features

The TA90 Subsystem has the following optional feature:

- Improved Data Recording Capability

The TA90 tape drive has the following optional feature:

- An automatic cartridge loading feature that handles up to six cartridges that load and unload automatically.

Physical Characteristics

Dimensions

- Tape Control Unit:

  Height: 1.000 m (39.37 in.)
  Width: .660 m (25.98 in.)
  Depth: .750 m (29.53 in.)

- Tape Transport Unit:

  Height: 1.000 m (39.37 in.)
  Width: .517 m (20.11 in.)
  Depth:
  Without Automatic Cartridge Loaders, .750 m (29.53 in.)
  With Automatic Cartridge Loaders, .930 m (36.63 in.)

Recording Media

- Tape cartridge

  Tape width: 12.7 mm (0.5 in.)
  Mean usable tape length: 154 m (505 ft.)

Tape Transport

- Type: Reel-to-reel, automatic self threading
- Number of tracks: 18
- Reading speed: 2000 mm/sec (78.7 in./sec)
- Load time:
  Without Automatic Cartridge Loaders, 5 to 10 seconds.
  With Automatic Cartridge Loaders, 7 to 30 seconds
- Unload time: 5 to 10 seconds
- Rewind speed: 4000 mm/sec (157 in./sec)
- Rewind time: maximum 48 seconds.

Introduction to the TA90 Subsystem

Cartridge

The drive uses a compact cartridge that has a nominal data capacity of 200 megabytes

The tape cartridge remains closed during storage and handling to protect the tape from external contaminants When a cartridge is inserted into a drive, the drive automatically pulls the tape from the cartridge and threads it onto a fixed machine reel

Each cartridge has a physical file protect selector When the selector is set to file protect, data is prevented from being written on or erased from tape. For additional cartridge information see the CART section.

Drive Message Display

Each drive has an operator panel on the top of the tape transport unit, which contains an eight-character visual message display The operator panel is mounted on a swiveling fixture that can be adjusted by hand to make the message display visible from various operator positions

The drive microprocessor, the error sensing logic, and the host software can cause the following types of messages to be displayed for the operator or the service representative.

- Error message
- Service representative information
- Drive status

Addressing

The drive addresses and tape control unit address are set during installation.

The tape control unit address can be either 0 or 1.

The drive address can be any value in the range of hexadecimal 0 through 7 for a single tape control unit subsystem (tape control unit 0) . When dual control units are installed, the address can be any address within the range of hexadecimal 0 through F. However, all drives physically attached to a tape control unit must be addressed within the group of hexadecimal 0 through 7 or the group of hexadecimal 8 through F.

Two STI-FIPS adapter cards are included with each tape control unit, left (L) and right (R). The L adapter controls those drives attached to its TCU which have even drive address (not TCU unit numbers). The R adapter controls odd numbered drives. These numbers are set by thumbwheel switches located by the TTU bottom door.

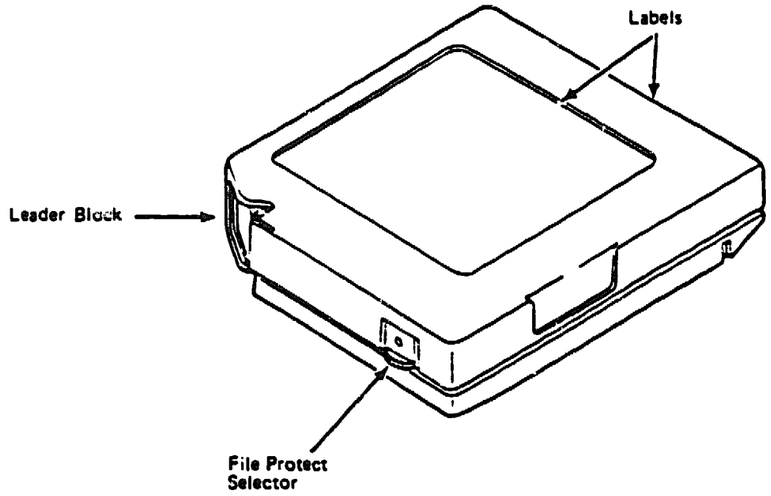
Initial Microprogram Load (IML)

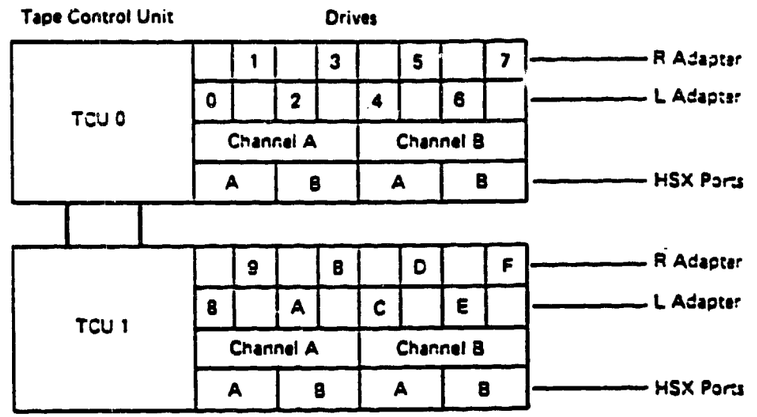
During an IML, a microcode image that permits the subsystem to become functional is loaded into the tape control unit.

The IML diskette contains the microcode image and patches for the tape control unit. This diskette must be kept in the IML device at all times. The microcode image and patches contained on the IML diskette are related to the EC level of the tape control unit and attached drives, therefore, only the specific IML diskette designated for a tape control unit should be used in that tape control unit.

Anytime the tape control unit is powered on, or the IML button is pushed on an offline tape control unit, the tape control unit will attempt to IML itself from the diskette in its IML device. The IML device is also accessed when drive patches are loaded.

Note: Ensure following an IML command, that the tape control unit is in the online test position.





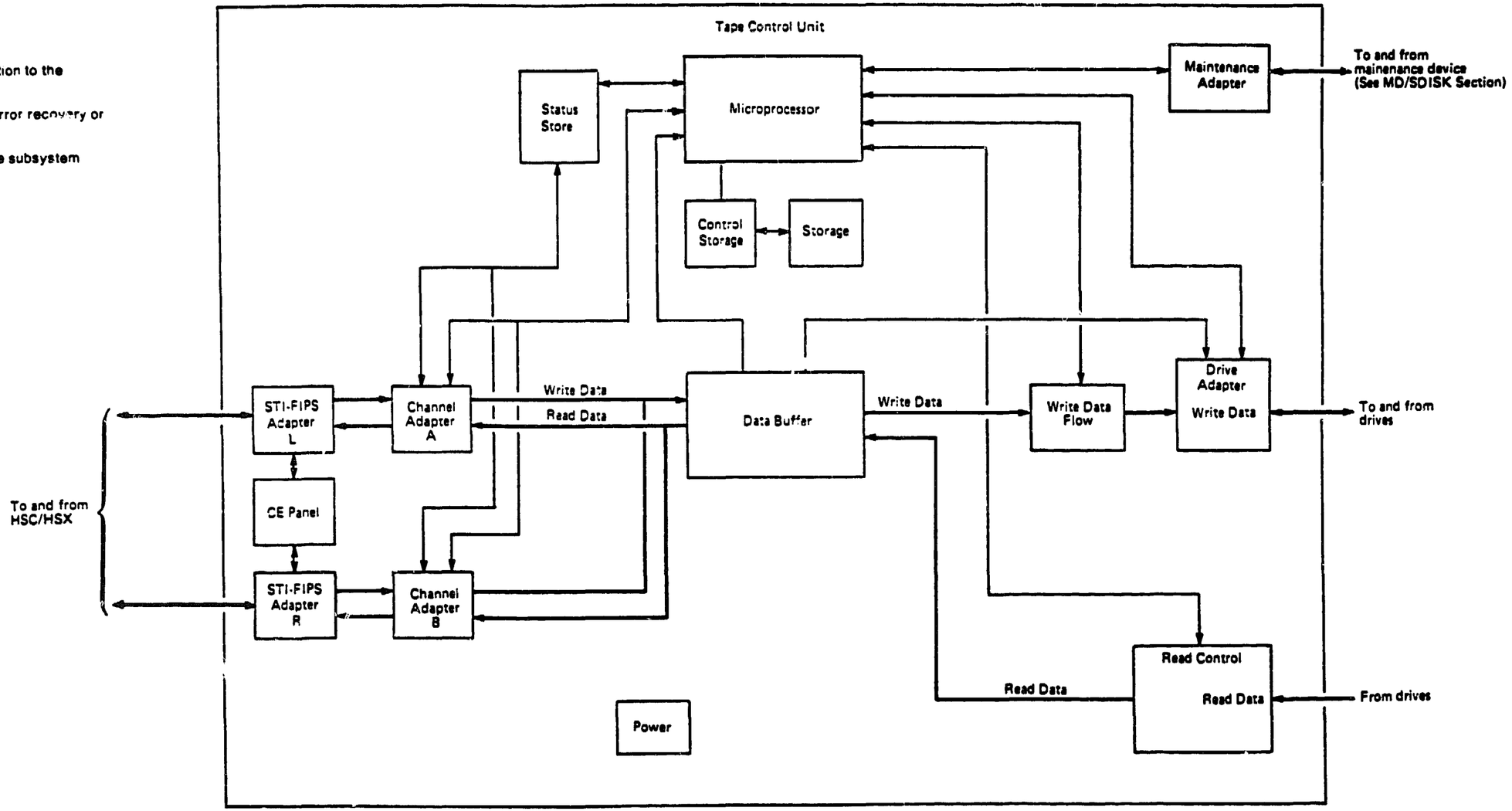
Introduction to the TA90 Tape Control Unit

The tape control unit, under control of the microprocessor, moves read and write data between the STI-FIPS adapter, the data buffer, and the attached drives. In addition, the tape control unit:

- Receives, interprets, and executes data commands from the STI-FIPS adapter
- Generates and sends control commands to the attached drives
- Processes read and write data into and out of the data buffer
- Schedules various I/O and drive operations
- Detects tape control unit errors
- Collects and sends sense and status information to the STI-FIPS adapter
- Stores the sense and status information for error recovery or analysis
- Performs stand alone error recovery on some subsystem failures.

Tape Control Unit Diagram

This is a high level drawing showing theory only. For detailed point-to-point wiring see the machine logics.



Introduction to the TA90 Tape Control Unit (Continued)

Data Buffer

The data buffer provides data buffering between the drives and the STI-FIPS adapter.

All data transferred between the STI-FIPS adapter and the tape control unit passes through the data buffer.

If Improved Data Recording Capability is installed, data is compacted before entering the buffer on a write operation and uncompacted after leaving the buffer on a read operation.

Write Data Flow Card

The write data flow card receives data that is to be written on tape from the data buffer. It contains the logic required to process and format the data and to control the write operation. It also generates clocking and parity lines that are transferred with the data to a selected drive through the tape control unit drive adapter.

Read Control

The read control area consists of:

- A read clock and format card
- A read ECC/correction card
- A read detect card
- Three read skew cards
- A read buffer card.

The read area receives data from the drive; interprets, verifies and formats the data; and transfers it to the data buffer.

Maintenance Adapter

The maintenance adapter (MA) card provides a means for the maintenance device (MD) to monitor and change the status of the tape control unit. The adapter logic permits the MD to communicate with the subsystem components, to load and run diagnostics, and to interrogate registers.

Note: The MD is used as an engineering support tool in the laboratory. It is used for integrating, testing, and debugging, as well as continuing product engineering.

Status Store and Status Store Communication

The status store provides a common storage area for status information in the tape control unit and contains the status of each drive. Drive status information is used by the microprocessor and channel adapter areas for allocation of common resources. The channel adapter and microprocessor use this drive status information to keep track of each drive's status. The status store communication card provides a communication path between tape control units when the dual-control-unit communication cables are installed.

Microprocessor and Control Storage

The microprocessor card contains the microprocessor, storage for the local store register, and associated logic for control of and communication with the other areas of the tape control unit. In addition, all processor related external registers, the external interrupt hardware, and most of the processor error detection and reporting logic are located on this card. The processor executes microprograms to control and monitor tape control unit activity through external registers that are accessed by way of the external register bus.

Control storage consists of tables accessible only by the microprograms and the microprocessor. It contains the initial microprogram load (IML) data that has been read from the IML diskette. Any time the microprocessor needs a microprogram to perform a function, it communicates with control storage to obtain the microprogram.

Power

The power area of the tape control unit consists of an AC power supply and two DC power supplies. The AC power supply furnishes power for the DC power supplies, the cooling fans, and the AC power for each of the tape transport units. The DC power supply PS02 furnishes dc power to the tape control unit only. The dc power supply PS03 furnishes power to the gate containing the STI-FIPS adapter cards. DC power for the tape transport units is developed within the tape transport units.

Voltage Regulator

The voltage regulator card, located in the 01A-A1 logic board controls the voltages needed for the storage cards in the tape control unit.

Power-On Reset and Undervoltage Detector

The power-on reset (POR) card contains POR and undervoltage circuitry. In addition to resetting the tape control unit circuitry power on, the POR and undervoltage pulses are used to provide POR to the channels and the STI-FIPS adapters . A POR during a power off clamps the channel interface off before power is lost During a power-on sequence, the STI-FIPS adapter (Reset) is clamped off for approximately 800 ms to permit the voltages to stabilize.

Introduction to the TA90 Tape Control Unit (Continued) INTRO 22

Writing Data

Two modes of writing can be selected by the host system when using this subsystem: buffered write and tape write. When in buffered write mode, the tape control unit signals completion as soon as the data has been written correctly to the buffer. The subsystem does any error recovery required to physically write the data block on tape. Tape write mode is for writing critical, non-restartable data files.

Buffered Write Mode (Cached Operation)

When the tape control unit receives a write command from the channel in buffered write mode, write data is accepted from the STI controller and acknowledged. This frees the STI link for other operations while the data is transferred to the tape control unit, and eventually, the tape media. The tape control unit writes the buffered data blocks when the drive is available. This increases channel efficiency by freeing the channel before the data is written.

During cached operations, sending data between the STI-FIPS adapter and the tape control unit can occur simultaneously (can overlap) with data operations between the TA90 and its STI controller (HSX). Data can be loaded into the buffer for the next record while the current write operation finishes; drive motion is maintained and writing continues. This is called streaming.

Tape Write Mode

Tape Write Mode (Non-Cached Operation)

When the tape control unit receives a write command in tape write mode, it moves the data from the channel adapter into the buffer at channel speed. As soon as the drive is moving tape at recording speed the data is sent to the drive.

During non-cached operation, write data is accepted and transferred to the tape control unit, the drive, and the tape media. Acknowledgement is sent to the STI controller, making for ultra-reliable operation at the expense of time. Non-cached operations can be much slower than cached operations. Errors in writing to the tape media are reported in both cases.

Reading Data

Data is read from the drives into a tape control unit buffer. On STI read commands, records are requested from the TCU and are transferred to the STI controller (HSX). The STI-FIPS adapter prereads and maintains the next record to be read in its buffer.

Read Caching

For good performance, whenever STI read operations are performed, "read ahead" records are maintained in the adapter. This ensures the next record is immediately available.

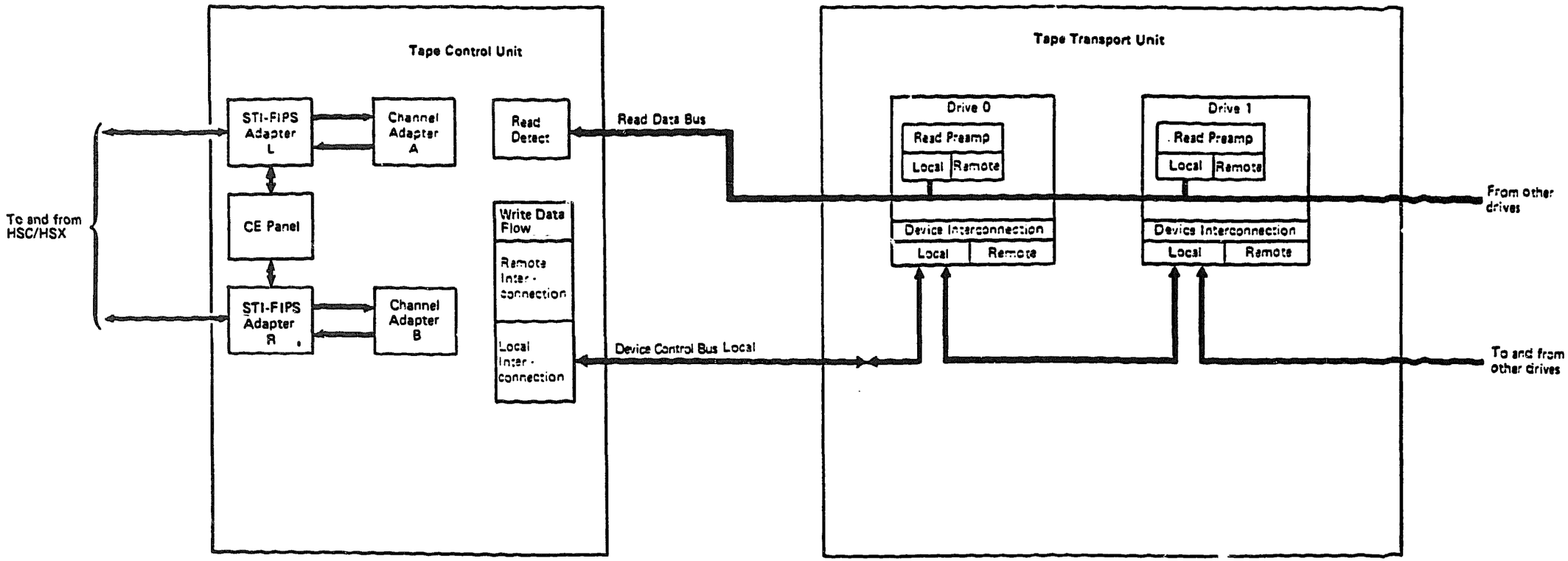
Improved Data Recording Capability

The Improved Data Recording Capability feature supports both buffered and tape write modes but does not support read backward or synchronous write mode.

Introduction to the TA90 Tape Control Unit (Continued)

Single Tape Control Unit Subsystem Diagram

This is a high level drawing showing theory only. For detailed point-to-point wiring see the machine logics.



Introduction to the TA90 Tape Control Unit (Continued)

Channel Adapter

The tape control unit has two channel adapters as part of the base equipment.

The channel adapter connects the tape control unit to the STI-FIPS adapter. The STI-FIPS adapter has command retry capability .

The channel adapter moves data between the STI-FIPS adapter and the tape control unit buffer. Data is also compacted and uncompacted if the data compaction feature is installed. The following type of channel and its rate is used:

- **3 Megabyte Data Streaming:** The tape control unit clocks the data rate to 3.0 megabytes per second, ± 5 percent.

Each channel adapter operates as an asynchronous unit. It decodes all commands and provides initial status for each command. The channel adapter also causes the channel to disconnect, using channel command retry, if the command cannot be executed immediately.

When a channel adapter is processing an I/O operation for a specific drive, the other channel adapter in the tape control unit can process I/O operations for other drives.

STI-FIPS Adapter

The STI-FIPS adapters are housed within the tape control unit

Each tape control unit holds two adapters (L and R), as shown in the diagram on INTRO 15. Each STI-FIPS adapter:

- Receives, interprets, and executes STI commands from the STI controller (HSC or HSX)
- Generates and sends FIPS commands to the TCU
- Buffers data to be transferred to the TCU or STI controller
- Passes drive and tape control unit error information to the host for logging
- Records significant local errors in its own EEROM for use by Digital maintenance
- Converts drive addresses from the numbers set on the drives to unit numbers for a cluster.

Drive Adapter

The drive adapter provides the write data and control information path between the tape control unit and:

- One serial string of up to eight drives in a single tape control unit subsystem
- Two serial strings of up to eight drives each in a dual tape control unit subsystem.

The tape control unit drive adapter contains two interconnections, local and remote. In a single-tape control unit subsystem, the drives must be connected to the local interconnection. The remote interconnection is not used. In a dual-tape control unit subsystem, each tape control unit has one set of drives connected to the local interconnection and another set of drives connected to the remote interconnection.

The drives physically attached to a tape control unit are connected to that tape control unit's local interconnection. The drives physically attached to the other tape control unit are connected to the remote interconnection. Therefore, each drive is connected to the local interconnection on one tape control unit, and the remote interconnection on the other tape control unit, at the same time.

The primary drives attached to tape control unit 0 (TCU0) are addressed hexadecimal 0 through 7, and the primary drives attached to tape control unit 1 (TCU1) are addressed hexadecimal 8 through F. Drives 0 through 7 are attached to the local interconnection of TCU0, and the remote interconnection of TCU1. Drives 8 through F are attached to the local interconnection of TCU1 and the remote interconnection of TCU0.

The device control bus is a single flat cable that connects the tape control unit drive adapter to the drives. There is one device control bus for the drives attached to the local interconnection, and another device control bus for the drives attached to the remote interconnection. The device control bus is terminated at the last drive on a set of drives.

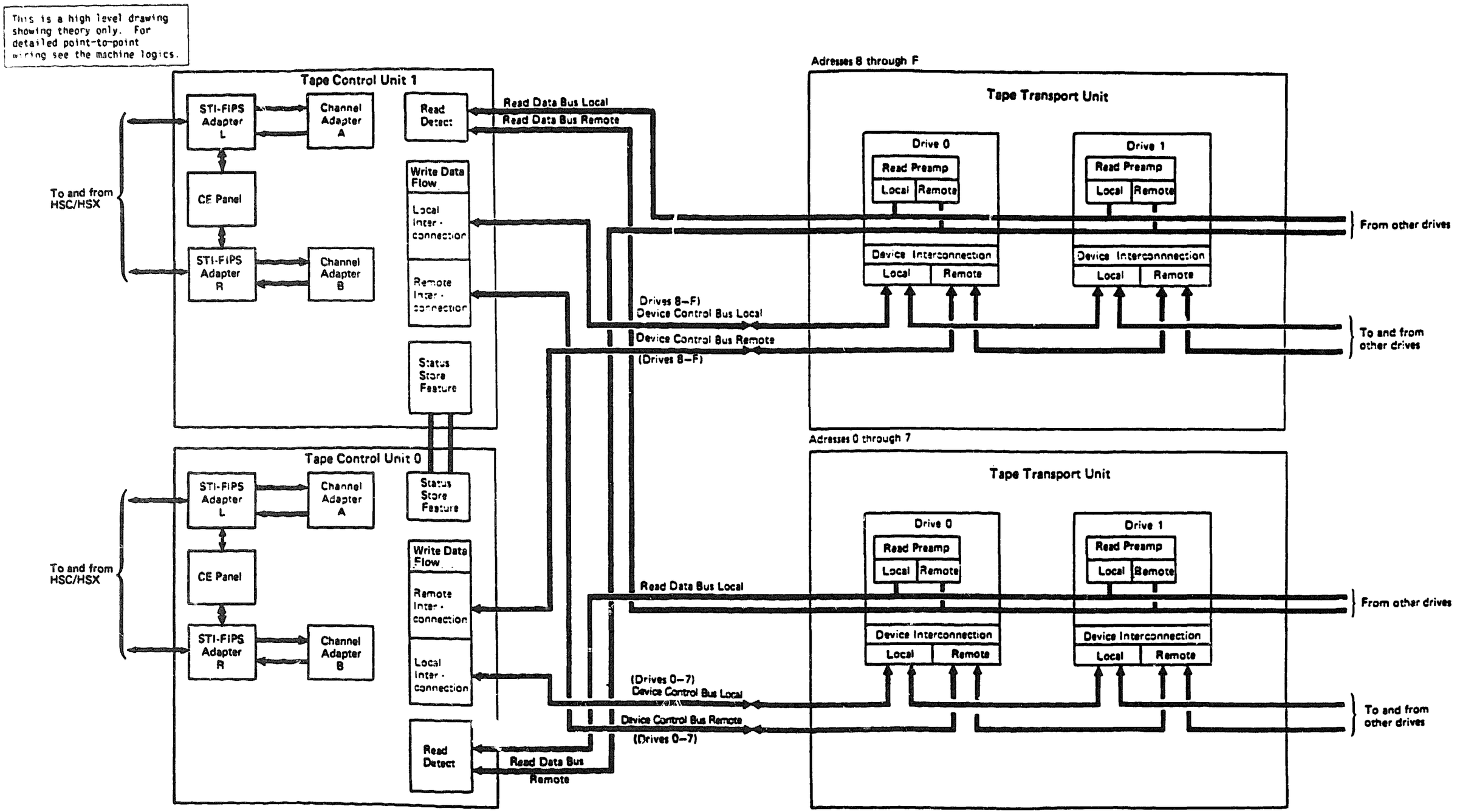
Note: Due to STI constraints, the STI-FIPS adapter can physically address only four drives. The "L" adapter interfaces with channel adapter A and addresses the even numbered drives locally (normally) connected to its TCU. The "R" adapter interfaces with channel adapter B and addresses the odd numbered drives locally (normally) connected to its TCU

Read Data Bus

The read data bus sends analog read data from the drives to the tape control unit. The read data bus is a single flat cable that connects the drive read buffer directly to the tape control unit read clock/detect cards. The devices are connected to this bus similar to the way the devices are connected to the device control bus. The read data bus consists of two selectable groups, A and B. Each group has 18 line pairs that send the analog data on the 18 read data tracks to the tape control unit.

Introduction to the TA90 Tape Control Unit (Continued)

Dual Tape Control Unit Subsystem Diagram



Introduction to the TA90 Tape Control Unit (Continued) INTRO 40

Dual Tape Control Unit

Two tape control units can be connected together for dual tape control unit operation. With dual tape control units, load balancing between the resources of the two tape control units is automatically performed under control of the microprocessors in the tape control units. When I/O operations are directed to a drive, they can be handled in either tape control unit, depending on the internal subsystem load.

Each tape control unit will have two channel adapters, permitting the entire subsystem to be accessible from a maximum of four STI paths. Each channel adapter on either tape control unit can communicate at full internal data path speeds with the data buffer in either tape control unit. While such data movement is going on, each tape control unit data buffer can also move data to or from a drive. Therefore, the entire dual-tape control unit subsystem can move data with four operations occurring at the same time. The microprocessors in each tape control unit agree and establish the internal data paths to be used between the drive and the STI path. This agreement is independent of VMS program control.

The status store communication card provides the tape control unit-to-tape control unit communication path. It also permits the two tape control units to share control and status information about all the drives in the subsystem.

Drive Attachment

The drives are attached to each tape control unit as shown in the following table:

TCU ID	ADAPTER	DR ADR	BUS
0	L	0,2,4,6	Local
0	R	1,3,5,7	Local
0	-	8-F	Remote
1	-	0-7	Remote
1	L	8,A,C,E	Local
1	R	9,B,D,F	Local

Introduction to the TA90 Tape Transport Unit

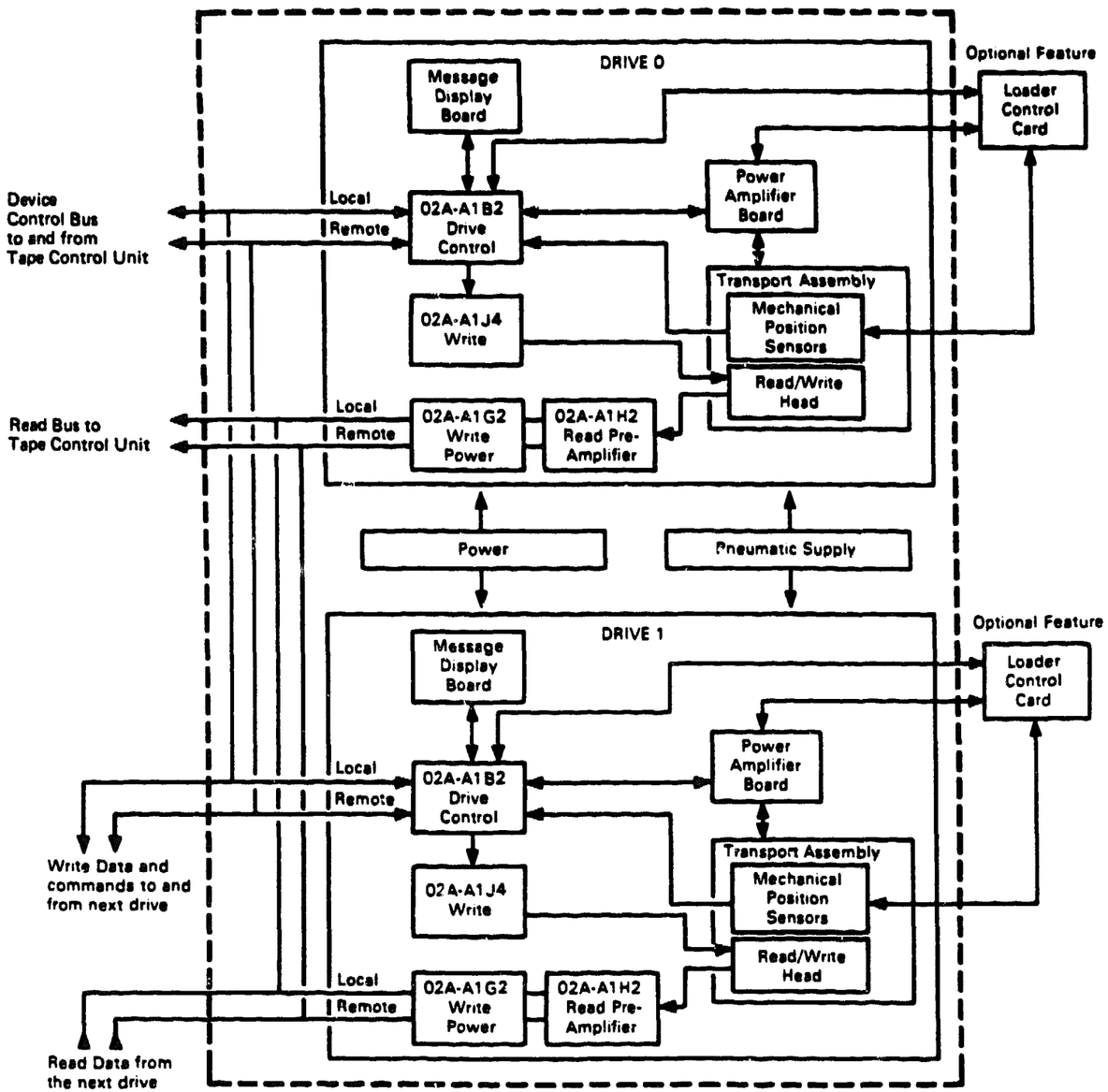
A tape transport unit consists of two drives (drive 0 and drive 1) The drives operate independently of each other except for the shared use of the tape transport unit pneumatic supply and the tape transport unit dc power supply.

A drive, under control of the tape control unit:

- Receives, interprets, and performs data commands sent from the tape control unit
- Receives, interprets, and performs motion control commands sent from the tape control unit
- Sends and receives read and write data to and from the tape control unit
- Sends sense and status information to the tape control unit.

Tape Transport Unit Diagram

These are high level drawings showing theory only. For detailed point-to-point wiring see the machine logics.



Introduction to the TA90 Tape Transport Unit (Continued)

Power

The tape transport unit ac power is supplied by the tape control unit. Up to 4 tape transport units (8 drives) can be connected to a single tape control unit, and the ac power is cabled from the tape control unit to the first tape transport unit then cabled from that tape transport unit to the next tape unit and so on.

The dc power for the tape transport unit is developed in each tape transport unit's dc power supply. The dc power supply furnishes the dc power for both drives in that tape transport unit.

Pneumatic Supply

The tape transport unit contains one pneumatic supply that is shared by both drives. The pressure side of the pneumatic supply consists of a pump, a regulator, and an output filter. The vacuum side of the pneumatic supply uses the same pump and an inlet filter.

Drive Logic

The drive logic controls the data flow and tape motion within the tape transport unit.

Drive Control Card

The Drive control card controls all functions within the drive. Write data and commands are received by the adapter section and are passed, under control of the microprocessor section, to the digital servo section and the write card. Read data is read from the tape by the read head and sent to the read preamplifier card, under control of the digital servo section, as directed by the microprocessor section. All motion controls are controlled by the digital servo section, power amplifier card, and the microprocessor section.

Microprocessor Section

The microprocessor section of the drive control card contains the microprocessor, storage for the local storage register, and associated logic for control and communication.

Some external registers (XRs), the external interrupt hardware, and most of the processor error detection and reporting logic are located in this part of the card.

The microprocessor performs microcode to control and monitor control unit activity through the external registers, which are accessed by way of the external register interconnection.

Digital Servo Section

The digital servo section of the drive control card serves as a buffer and interconnection to and from the processor and the rest of the drive. The digital servo section gathers information from sensors, mechanical switches, and error lines from other cards in the drive and presents these to the drive processor.

Because the drive is a microprocessor based system operating in a real time mode and because tight control is needed to maintain proper tape tension and tape velocity, high speed control processing is required. The digital servo section is designed to relieve the processor of having to do certain simple housekeeping work.

Adapter Section

A drive can attach to one or two tape control units. The adapter section of the drive control card contains two buses and the controls that permit communication between the drive and one or both of the tape control units.

In the two-control-unit environment, only one tape control unit is permitted to communicate with a specific drive at any one time. The other tape control unit cannot access the drive until the first tape control unit has finished its operation.

Message Display

The message display provides the operator with visual messages sent from the host processor or the tape subsystem. The message display, using eight LEDs and two bar LEDs, displays messages sent from the microprocessor through the digital servo.

Write Card

The write card contains the 18 write drivers, the head connector, parity checking circuits, and error checking circuits. The error checking circuits check for open head or head cable, shorted write drivers, and various other write problems.

Read Preamplifier Card

The read preamplifier card amplifies the 18 read signals generated at the read/write head. The card sends the read data to the tape control unit by way of read bus local or remote. The bus is selected by the tape control unit.

The read preamplifier card also provides isolation from the read bus when the drive is powered off.

Power Amplifier Board

The power amplifier board accepts digital current inputs from the processor through the digital servo, converts them to analog signals, and applies necessary gain and phase shifting to drive the reel motors.

The power amplifier board uses the input from the tension transducer to keep correct tension on the tape. The power amplifier board also controls power on, power off, and power-on reset.

Loader Control Card

The automatic cartridge loader - loader control card has its own microprocessor and storage. The storage is loaded from the tape control unit IML diskette using the "Patching Path" each time the drive patches are loaded. This code is used by the loader control card to control the functions within the automatic cartridge loader. The loader control card uses the information from sensors, mechanical switches, and cards in the drive to control the loading and unloading of the tape cartridge.

Drive Transport Assembly

The drive transport contains the read/write head, the mechanical components, sensors, and motors necessary to thread the tape, and move the tape forward or backward. The microprocessor controls all mechanical motion in the drive transport, using the digital servo and power amplifier to change the digital signals into analog signals and to drive the motors. The sensors feed back information to the digital servo to indicate motion errors and tape position so the digital servo can modify the velocity or direction of tape motion. The sensors also signal irrecoverable tape motion errors.

Tape Loading and Unloading

On drives without the automatic cartridge loaders tape loading is an automatic operation. The operation starts after a cartridge has been inserted, latched in place, and the sensors in the tape transport have been checked by the sensor checking circuits of the digital servo.

On drives with the automatic cartridge loaders tape loading starts after a cartridge has been inserted, the load assembly cammed down to the load position, and the sensors in the tape transport have been checked by the sensor checking circuits of the digital servo.

To load tape, the threader arm pulls the leader block from the cartridge. After the threading operation begins, the machine reel is positioned so that it can receive the leader block. A tach pulse senses when the leader block is contained in the machine reel hub. Once the leader block is contained, the tape is moved to BOT.

BOT is the beginning-of-tape and is the first place that a record can be written on tape.

Tape unloading begins when the Unload switch is pressed with the Ready/Not Ready switch in the Not Ready position. Tape unloading can also result from a Rewind/Unload command. Tape rewinds onto the file reel at high speed until BOT is detected. At this point tape motion is slowed to permit the threader mechanism to pull the leader block from the machine reel and to remove the tape from the transport. The threader motor is driven clockwise until tape path sensor A is blocked, at which point the cartridge is automatically unlatched.

Note: On drives without the automatic cartridge loaders the cartridge latch should be closed when the tape drive is not being used. (A cartridge need not be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.

Motion Control

The drive motion control logic is used for tape tension control, velocity control, backhitch (reposition) control, and stoplock (position) control.

The tension control function provides constant tape tension, essential for motion control.

The velocity control provides controlled acceleration up to recording speed or rewind speed, precise control of recording speed independent of the distribution of tape on the reels, and controlled deceleration. Control is provided for both forward and backward tape movement.

The stoplock (position-hold) condition is used when the tape is stopped and under tension.

Stoplock Positions

Once loaded, the drive maintains one of three stoplock positions in anticipation of the next command:

- Read forward stoplock, ready for a read forward.
- Read backward stoplock, ready for a read backward.
- Write stoplock, ready for a write.

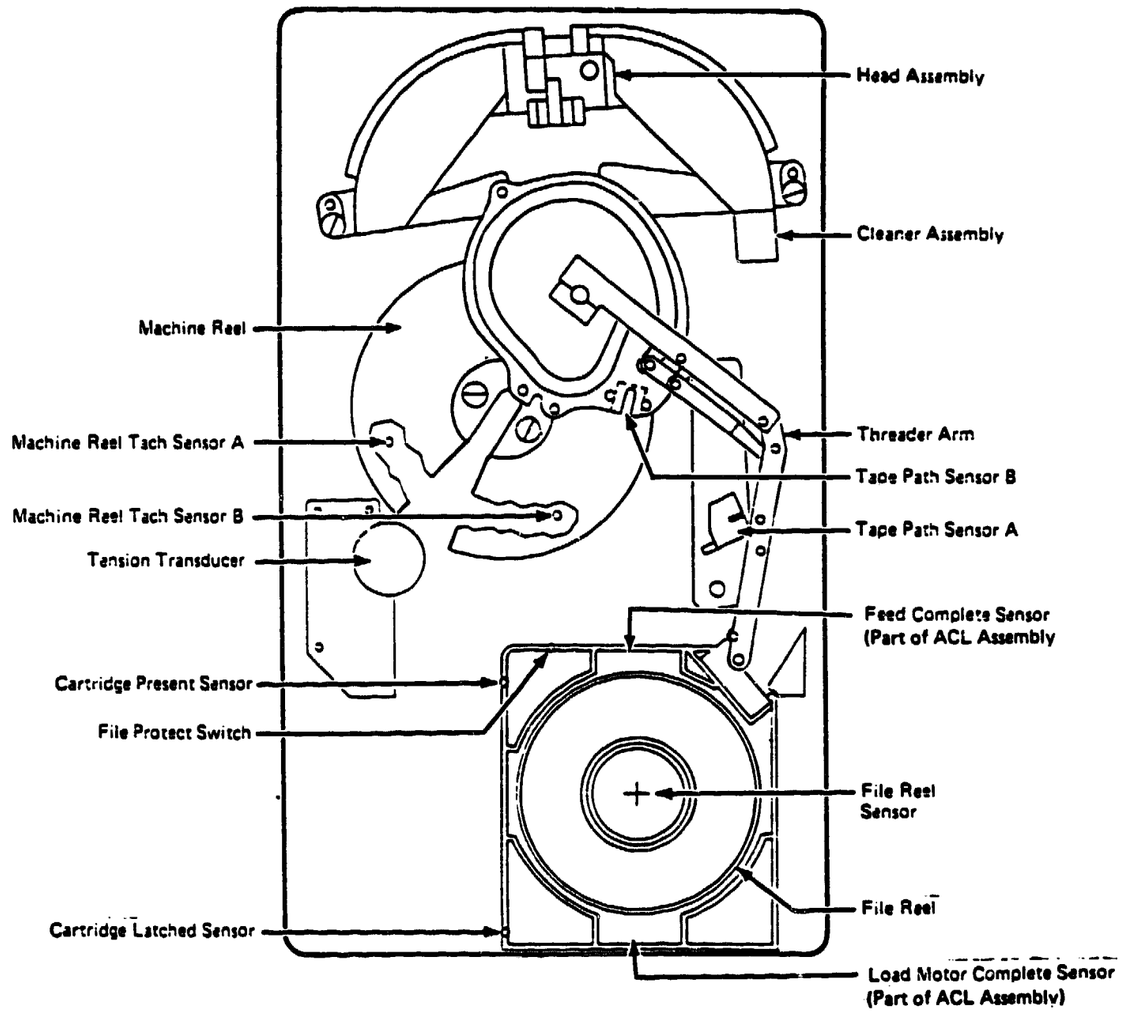
All of these stoplock positions are achieved automatically by the drive and are based on the command just executed. At the end of a particular command where no similar command is immediately following, the drive always prepares for the next command to be performed to be of the same type as the last one. The drive therefore repositions to the correct stoplock to accomplish the next (like) command. The exception to this is a Backspace Block command, which repositions to the read forward stoplock to prepare for a subsequent Read command.

Tape Transport Sensors

Sensing devices in the drive transport area monitor tape velocity and tension, protection status of the tape, and loading and unloading operations. Transport monitoring is accomplished by:

- Cartridge present sensor, which indicates that a tape cartridge has been inserted into the drive.
- Cartridge latched sensor, which indicates that the cartridge is latched in place.
- Tape path sensor A, which indicates that the tape leader block is at the file reel.
- Tape path sensor B, which indicates when the tape leader block is at the machine reel.
- Machine reel tach sensor A, which senses the position of the machine reel. Machine reel tach sensor A is used in conjunction with machine reel tach sensor B to generate a tach pulse.

- Machine reel tach sensor B, which senses the position of the machine reel. Machine reel tach sensor B is used in conjunction with machine reel tach sensor A.
- Tension transducer, which senses tension of the tape. The microprocessor uses the tension transducer to control the reel motor power amplifiers.
- File reel tachometer (tach 2), which monitors speed and direction of the file reel motor.



Introduction to Channel Commands

The tape control unit operates on the FIPS-60 The TA90 tape control unit executes the channel commands described in the following channel command summary table.

The STI-FIPS adapter converts standard STI Level 1 and Level 2 commands to the FIPS-60 commands

Channel Command Summary

CHANNEL COMMAND	HEX CODE	DESCRIPTION
Assign	B7	Reserves the addressed drive to a specified channel path.
Backspace Block	27	Causes the drive to move the tape backward to the last block ID.
Backspace File	2F	Causes the drive to move the tape backward to the last tape mark.
Control Access	E3	Permits a specified drive to be used by a host processor to which it is not assigned.
Data Security Erase	97	Causes the drive to erase the tape to the end of the tape.
Erase Gap	17	Causes the drive to write an erase gap pattern.
Forward Space Block	37	Causes the drive to move the tape forward to the next block ID.
Forward Space File	3F	Causes the drive to move the tape forward to the next tape mark.
Load Display	9F	Causes a message to be displayed on the message display panel and is also used to control the automatic cartridge loader.
Locate Block	4F	Causes the drive to move the tape to the specified location of data.
Mode Set	DB	Causes a drive to be set to a specified operating mode.
No Operation	03	No operation is performed.
Perform Sub-system Function	77	Passes up to 3 bytes of control information to the subsystem.
Read Backward	0C	Causes the drive to read in a backward direction.
Read Block ID	22	Causes the tape block ID to be sent to the host processor.
Read Buffer	12	Causes the buffer data to be sent to the host processor.
Read Buffered Log	24	Causes the stored buffered log data to be sent to the host processor.
Read Device Characteristics	64	Causes up to 64 bytes of data containing installed feature information to be sent to the STI-FIPS adapter.
Read	02	Causes the drive to read in a forward direction.
Rewind	07	Causes the drive to rewind the tape to the load point.
Rewind Unload	0F	Causes the drive to rewind the tape and unload the cartridge.
Sense	04	Causes the TCU to send 32 bytes of sense data to the STI-FIPS adapter.
Sense ID	E4	Causes the TCU to send 7 bytes of subsystem ID information to the STI-FIPS adapter.
Sense Path Group ID	34	Causes the TCU to send the path state byte and the 11 bytes of path group ID information to the STI-FIPS adapter.
Set Path Group ID	AF	Sends the function control byte and 11 path group ID bytes to the tape control unit.
Suspend Multipath Reconnection	5B	Causes a temporary connection between the addressed drive and the channel path that issued the command.
Synchronize	43	Causes the drive to be synchronized with the host processor after a buffered operation.
Test I/O	00	Causes the TCU to send the status byte to the STI-FIPS adapter.
Unassign	C7	Releases the addressed drive from the channel path group to which it had been reserved.
Write	01	Causes the drive to write data on the tape.
Write Tape Mark	1F	Causes the drive to write a tape mark pattern on the tape.


START

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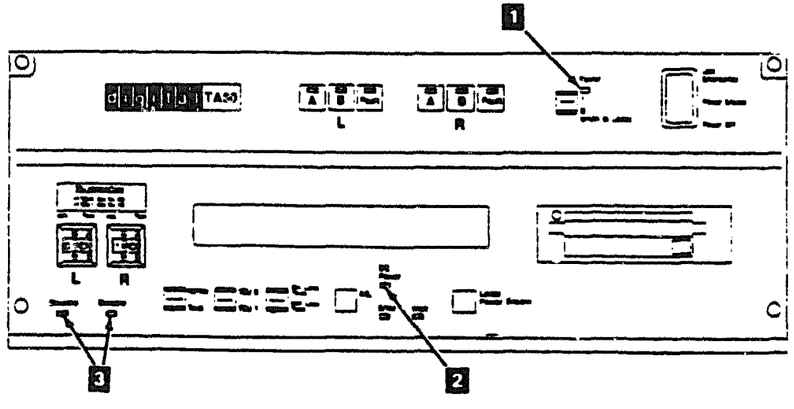
Maintenance Starting Point

* See Note at bottom of page

Begin all maintenance action here. Find the reason you're here in the left column and perform the stated action in the right column.

IF YOU'RE HERE FOR THIS REASON	PERFORM THIS ACTION
Service call (solid and intermittent failures).	Note: Go to **ACTION:** in the next column.
Device(s) failing with excessive temporary Read/Write errors of ECC count.	
Install the TA90	Go to "TA90 Installation," see INST 1.
Relocate or discontinue the TA90.	Go to "TA90 Relocate or Discontinue," see INST 1.
Inspection for maintenance agreement qualification.	See "General Instructions" on INSP 10 for safety inspection procedures.

MISCELLANEOUS PROCEDURES	
Dismount a drive.	Go to PLAN 55
Dismount a device.	Go to PLAN 55
Operate the drive.	Go to Panel 5
Use the CE Panel with the TA90	Go to CE/HSC 1
Hardcopy analyze an error log printout.	Go to MSG 100
Run HSC subsystem diagnostics.	Go to CE/HSC 1
Analyze sense bytes.	Go to SENSE 100
Remove a cartridge by hand.	Go to CART 10
Replace a leader block.	Go to CART 20
Attach tape to a cartridge hub.	Go to CART 30
Review how to use the TA90 maintenance guide.	Go to PLAN 10
Locate switches and indicators.	Go to LOC 1 (Tape Control Unit) LOC 1 (Tape Transport Unit)
Drive operator panel messages.	Go to PANEL 30



ACTION:

Write down any failing indications such as a "CHK XX" (XX equals a hexidecimal error code) or other messages and indications on the drive message display for future use.

IF YOU HAVE THIS PROBLEM	PERFORM THIS ACTION
The tape control unit Power On indicator is off. 1	Go to "MAP 0100 - Power Start" Entry A on PWR 100-1.
The tape control unit DC Power indicator is off. 2	Go to "MAP 0400 - Tape Control Unit DC Power" Entry A on PWR 400-1.
The tape control unit DC Power indicator in ON and you suspect tape transport unit drive power problems.	Go to "MAP 0200 - Drive DC Power (Single Drive" on PWR 200-1, or "MAP 0210 - Drive DC Power (Same Symptom Both Drives)" on PWR 200-1.
You suspect STI-FIPS Adapter power problems... If all LED's are off...	Go to "MAP 0300 - STI Power Check" on PWR 300-1.
The tape control unit Error Indicator is on or blinking, or... See PANEL 10 for Information on Indicators.	1. If VAXsimPLUS or ERF indicate a COMTAB entry, use the COMTAB entry. If VAXsimPLUS provides a FRU callout, change the indicated FRU. If VAXsimPLUS is not present, but ERF indicates a COMTAB entry, go to START 22, entry point 007. If VAXsimPLUS or ERF do not indicate a COMTAB entry and at least one of the "Disable" indicators 3 is off, use the CE Panel to access COMTAB. 2. If changing the indicated FRU's did not fix the problem, or if there is no COMTAB entry, use the CE Panel. Note: To read the COMTAB from the CE Panel, go to CE/HSC 1. 3. GMP tests: see START 310 to determine the FSC. 4. If you are unable to run GMP, go to START 20.
Use the CE Panel or HSC Console to invoke the GMP tests. Note: To find out how to use the CE Panel, see "How to use the CE Panel with the TA90" on CE/HSC 1.	

* **NOTE:** It may be necessary to remove the automatic loader decorator cover from an adjacent drive for some service procedures. If it is necessary to remove the decorative cover, go to CARR-DR 2-9.

START 20

PAGE 1 OF 4

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0010	A	1	001
0021	B	4	014
0021	C	1	002
0021	D	2	009

001
(ENTRY POINT A)

CHECK 1 ENTRY POINT.

REMOVE THE DISKETTE CONTAINING THE FUNCTIONAL MICROCODE FROM THE IML DISK DRIVE AND INSERT THE SUPPORT DISKETTE INTO THE DISK DRIVE.

MAP DESCRIPTION: THIS MAP IS USED TO DETERMINE WHY THE TAPE CONTROL UNIT ERROR LED CAME ON.

START CONDITIONS: YOU WERE DIRECTED TO THIS MAP FROM START 10.

NOTE: THE DISKETTE MUST NOT BE WRITE PROTECTED. (SLIDE THE WRITE PROTECT TAB AWAY FROM THE EDGE OF THE DISKETTE SO THAT THE SMALL WINDOW IS COVERED.)

SET THE ONLINE TEST/OFFLINE TEST SWITCH TO THE OFFLINE TEST POSITION.

PRESS THE IML SWITCH TO INITIATE THE SUPPORT DISKETTE MICROCODE.

IMLING THE SUPPORT DISKETTE CAUSES THE SAME SET OF POWER ON DIAGNOSTICS TO EXECUTE AS THOSE FOUND ON THE FUNCTIONAL MICROCODE DISKETTE.

SET THE ONLINE TEST/OFFLINE TEST SWITCH TO THE ONLINE TEST POSITION.
(Step 001 continues)

(Step 001 continued)

IS THE TAPE CONTROL UNIT ERROR LIGHT ON SOLID?
Y N

002

(ENTRY POINT C)

IS THE TAPE CONTROL UNIT ERROR LIGHT FLASHING?
Y N

003

THE POWER ON RESET DIAGNOSTICS HAVE EXECUTED AND MAY HAVE POSTED INFORMATION ON THE DRIVE DISPLAY PODS. SCAN THE DISPLAYS AT THIS TIME.

ARE THERE ANY MESSAGES POSTED ON ANY DRIVE DISPLAY POD?
Y N

004

THE FAILURE ORIGINALLY POSTED DID NOT OCCUR AGAIN.

REFER TO THE DIAG SECTION OF THE MG AND RUN DIAGNOSTIC E010.

2 2 ?
A B _

C START 20
1

PAGE 2 OF 4

005

THE MESSAGE IS DISPLAYED IN TWO PARTS. ONE PART CONTAINS THE DIAGNOSTIC WHICH DISCOVERED THE ERROR CODE. THE OTHER PART DISPLAYS THE ERROR CODE.

YOU MAY NOW ATTEMPT TO REPAIR THE PROBLEM OR TO RUN FURTHER TESTS.

DO YOU WANT TO REPAIR THE PROBLEM BEING REPORTED?
Y N

006

TO RUN FURTHER TESTS, REFER TO THE DIAG SECTION OF THE MG AND RUN THE DIAGNOSTIC SUGGESTED BY THE DISPLAY.

007

REFER TO THE DIAG SECTION (POR CODES) OF THE MG TO CONVERT THE FSC (POR) CODE DISPLAYED TO A SUPPORT ERROR CODE (FAILURE ID). THEN REFER TO THE SUGGESTED DIAGNOSTIC IN THE DIAG SECTION TO GET A FRU LIST FOR THE ERROR CODE.

AFTER FRU REPLACEMENT, POWER UP WILL CAUSE THE POWER ON DIAGNOSTICS TO RE-EXECUTE.
GO TO PAGE 4, STEP 014,
ENTRY POINT B.

A B
1 1

008

THE POWER ON DIAGNOSTICS HAVE DETECTED A PROBLEM BUT ARE UNABLE TO REPORT IT IN THE CONVENTIONAL MANNER.

THE FIRST MOST LIKELY SUSPECT IS THE INTERFACE BETWEEN THE TAPE CONTROL UNIT AND THE TAPE TRANSPORT UNIT.

REFER TO THE FSI SECTION OF THE MG AND USE D4NN AS THE ERROR CODE TO GET A SUGGESTED FRU LIST.

AFTER FRU REPLACEMENT, POWER UP WILL CAUSE THE POWER ON DIAGNOSTICS TO RE-EXECUTE.
GO TO PAGE 4, STEP 014,
ENTRY POINT B.

009

(ENTRY POINT D)
THE POWER ON DIAGNOSTICS HAVE DETECTED A PROBLEM BUT ARE UNABLE TO REPORT IT IN THE CONVENTIONAL MANNER.

THE MOST LIKELY SUSPECT IS A FAULTY DISKETTE OR DISK DRIVE

HAVE YOU REPLACED THE DISKETTE YET?
Y N

HAVE YOU REPLACED THE DISKETTE YET?
Y N

3 3
D E

D E START 20
2 2

PAGE 3 OF 4

C10
REMOVE THE DISKETTE FROM THE IML DISK DRIVE AND INSERT A NEW SUPPORT DISKETTE INTO THE DISK DRIVE.
PRESS THE IML SWITCH TO INITIATE THE SUPPORT DISKETTE MICROCODE.
GO TO PAGE 4, STEP C14,
ENTRY POINT B.

C11

A LOGIC CARD PROBLEM IS NOW INDICATED.

REFER TO THE FSI SECTION OF THE MG AND USE E100 AS THE ERROR CODE TO GET A SUGGESTED FRU LIST.

HAVE YOU REPLACED FRUS AS SUGGESTED?
Y N

C12

THE PRIMARY FRU BUCKET IS:

SEE LOC FOR LOGIC BOARD POSITIONS (CARD SIDE).

117,115,134,135

THE SECONDARY FRU BUCKET IS:

114,118,121,119,116,120,122.

EXCHANGE FRUS.

AFTER FRU REPLACEMENT, POWER UP WILL CAUSE THE POWER ON DIAGNOSTICS TO RE-EXECUTE.
GO TO PAGE 4, STEP C14,
ENTRY POINT B.

F

F

C13

REPLACE THE DISKETTE DRIVE.
GO TO PAGE 4, STEP C14,
ENTRY POINT B.

Start 24

Start 26 START 26

START 20

PAGE 4 OF 4

014
(ENTRY POINT B)

ENTRY AT THIS POINT IS TO VERIFY THAT FRUS REPLACED HAVE CORRECTED THE FAILURE.

POWERING UP AFTER FRU REPLACEMENT OR RE-IML HAS CAUSED THE POWER ON DIAGNOSTICS TO RE-EXECUTE.

IS THE TAPE CONTROL UNIT ERROR LED ON?
Y N

015
THE REPAIR ACTION WAS SUCCESSFUL.

REFER TO THE DIAG SECTION OF THE MG AND RUN DIAGNOSTIC E010.

016

CURRENT REPAIR ACTION FAILED.

HAVE YOU COMPLETED ALL RECOMMENDED REPAIR ACTIONS?
Y N

017

IS THE TAPE CONTROL UNIT ERROR LIGHT ON SOLID?
Y N

018

GO TO PAGE 2, STEP 009,
ENTRY POINT D.

G H

G H

019

GO TO PAGE 1, STEP 002,
ENTRY POINT C.

020

CALL YOUR NEXT LEVEL OF SUPPORT.

START 40

PAGE 1 OF 2

ENTRY POINTS

FROM MAP NUMBER	ENTER THIS MAP: ENTRY POINT	PAGE NUMBER	STEP NUMBER
0010	A	1	001

001
(ENTRY POINT A)

START40 ENTRY POINT.

MAP DESCRIPTION: THIS MAP IS USED TO DETERMINE THE NEXT COURSE OF ACTION.

START CONDITIONS: YOU WERE DIRECTED TO THIS MAP FROM START 10.

THE FUNCTIONAL MICROCODE MAY HAVE POSTED INFORMATION ON THE DRIVE DISPLAY PODS. SCAN THE DISPLAYS AT THIS TIME.

ARE THERE ANY MESSAGES POSTED ON ANY DRIVE DISPLAY POD?
Y N

002

IF AN ACL IS ATTACHED, THERE MAY BE MESSAGES IN THE ACL LEDS WHICH ARE LOCATED UNDER THE ACL COVER. IS AN ACL ATTACHED TO A TAPE TRANSPORT UNIT?
Y N

003

RUN THE GOOD MACHINE PATH DIAGNOSTICS (GMP). — SEE CE/MSC

A B

A B

004
OPEN THE ACL FRONT COVER(S) AND CHECK FOR ERROR CODES IN THE ACL LEDS.
ARE ANY ACL ERROR CODES PRESENT?
Y N

AN ACL IS ATTACHED

005

RUN THE GOOD MACHINE PATH DIAGNOSTICS (GMP). — SEE CE/MSC

006

TO REPAIR, REFER TO THE FSI SECTION OF THE MG AND REPLACE FRUS SUGGESTED BY THE ERROR CODE POSTED ON THE DISPLAY. — PREFIX THE ACL ERROR CODE WITH E? AND USE THE RESULT AS AN ERROR CODE FOR THE FSI REFERENCE.

007

THE MESSAGE DISPLAYED MAY BE A CHECK CODE POINTING TO DRIVE FAULTS OR ACL FAULTS IF AN ACL IS INSTALLED. — ACL CHECK CODES ARE CHKEC,CHKED,CHKEE OR CHKEF.

ARE THERE ANY ACL CHECK CODES PRESENT?
Y N

008

TO REPAIR, REFER TO THE FSI SECTION OF THE MG AND REPLACE FRUS SUGGESTED BY THE ERROR CODE POSTED ON THE DISPLAY. — REPLACE THE CHARACTERS CHK WITH 00 AND USE THE RESULT AS AN ERROR CODE FOR THE FSI REFERENCE.

Start 42 START 42

C START 40
1

PAGE 2 OF 2

009
OPEN THE ACL FRONT COVER AND RECORD THE ERROR CODE IN THE ACL LEDS.

TO REPAIR, REFER TO THE FSI SECTION OF THE MG AND REPLACE FRUS SUGGESTED BY THE ERROR CODE POSTED ON THE DISPLAY.

AN ACL ERROR IS FLAGGED BY THE DRIVE.

PREFIX THE ACL ERROR CODE WITH E7 AND USE THE RESULT AS AN ERROR CODE FOR THE FSI REFERENCE.

Fault Symptom Codes Caused by other than TA90 Hardware Failures

You are here because of FSC data received after you had entered requested sense data, or by the FSI section. This is a listing of fault symptom codes (FSC) that can also be caused by other than TA90 hardware failures. It also provides a definition of the FSC, the causes, and the action you should perform.

Find your fault symptom code in the FSC column (beginning on this page) and do the actions in the Action column.

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
1600	The two tape control units are not at the same microcode EC level.	This error could result from operating condition.	The EC level of the tape control unit microcode is different in a two tape control unit subsystem. Check the diskettes and ensure they are at the same EC level.
1601	The two tape control units do not have the same Checksums. (The two tape control units are not at the same microcode EC level.)	This error is an operating condition.	The EC level of the tape control unit microcode is different in a two tape control unit subsystem. Check the diskettes and ensure they are at the same EC level.
2200	A channel transfer time-out between the adapter and TCU occurred on a write operation.	Possible STI-FIPS adapter problem or overrun condition.	See "Possible STI-FIPS Adapter Problem or Overrun Condition" on START 135.
2201	A channel transfer time-out between the adapter and TCU occurred on a read operation.	Possible STI-FIPS adapter problem or overrun condition.	See "Possible STI-FIPS Adapter Problem or Overrun Condition" on START 135.
2600	A System Reset was received on the last path of a path group.	The HSC or STI-FIPS adapter caused a system reset during error recovery.	1. Search your sense data for a previous record for the same device. 2. Refer to the CE/HSC section and run GMP.
3300	A channel command retry has been stacked or refused by the channel after a channel adapter command retry attempt.	Possible STI-FIPS adapter problem or overrun condition.	See "Possible STI-FIPS Adapter Problems or Overrun Condition" on START 135.
33E4	The addressed drive is assigned to a path group that does not contain the channel path on which the command was received.	Possible software problem or STI-FIPS adapter problem or overrun condition.	1. See "Possible Adapter Firmware Problem" on START 130. 2. If the GMP runs error-free, see "Possible STI-FIPS Adapter Problems or Overrun Condition" on START 135.
33E5	A command reject occurred because of an invalid command code.	Possible software problem or STI-FIPS adapter problem or overrun condition.	1. See "Possible Adapter Firmware Problem" on START 130. 2. If the GMP runs error-free, see "Possible STI-FIPS Adapter Problems or Overrun Condition" on START 135.
33E7	The drive is not online.	The Power On/Off switch is set to Off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not, set the switches to the following position: • The Power On/Off switch to On • The Online/Offline switch to online • The Drive Address switch to the correct address. 2. Refer to the CE/HSC section and run GMP.

FSC	FSC Definition	Causes Other than Hardware Failures	Action
33E8	The drive is not ready	The Ready/Not Ready switch is set to Not Ready, the tape is not loaded in the drive or the drive dc power supply voltages are out of tolerance	1. Verify that the Ready/Not Ready switch is set to the Ready position and that tape has been loaded. If not, set the Ready/Not Ready switch to Ready and insert a cartridge into the drive. 2. Do one of the following: • If the Ready/Not Ready switch was determined to be in the wrong position at the time this error occurred, run GMP. • If the Ready/Not Ready switch was determined to be in the correct position at the time this error occurred, measure the drive dc power supply voltages using a voltmeter. Reference PWR 20 for tolerance charts. If the voltages are out of tolerance, exchange the drive dc power supply (FRU 095), then run GMP.
33E9	The drive is file protected.	The cartridge File Protect switch is set to File Protect.	Verify that the File Protect switch, on the customer's volume being used at the time this error occurred, was set to the File Protect position.
3A10	A channel command was received before the adapter firmware error recovery actions were completed after a permanent write error had occurred on a different channel.	The STI-FIPS adapter error recovery actions had not completed, were not desired, or a second STI-FIPS adatper attempted to gain access to a shared device.	1. Search your sense data for a previous record for the same device. 2. Refer to the CE/HSC section and run GMP.
3C60	An incorrect byte count was detected during a channel-to-control-unit operation.	Possible adapter firmware problem.	See "Possible Adapter Firmware Problem" on START 130.
3F13	Information only; shows that a previous permanent write error had occurred.	The adapter firmware error recovery actions did not complete or were not started.	1. Search your sense data for a previous record for the same device. 2. Refer to the CE/HSC section and run GMP.
3F14	The drive is not online to either tape control unit.	The Power On/Off switch is set to Off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not, set the switches to the following position: • The Power On/Off switch to On • The Online/Offline switch to online • The Drive Address switch to the correct address. 2. Do the following: • If any of these switches were determined to be in the wrong position at the time this error occurred, run GMP.

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
4200	An invalid tape-format bit combination was detected in the TA90 Mode Set command	Possible software problem	See "Possible Software Problem" on START 130
4204	Bit 4 of a mode set command specifying write data should be in the &dci mode it was issued to a tape control unit that does not have the &dci feature	Possible software problem	See "Possible Software Problem" on START 130
4260	No channel paths in the grouped state for this drive that have a path group ID matching the path group received as the argument to the Assign command	Possible software problem	See "Possible Software Problem" on START 130
4261	The channel path that issued an Unassign command did not have assignment of the drive	Possible software problem.	See "Possible Software Problem" on START 130.
4262	The Unassign command was issued and no channel paths with path group IDs matching the Unassign command argument have assignment of the drive	Possible software problem.	See "Possible Software Problem" on START 130
4263	The drive is not online	The Power On/Off switch is set to Off The Online/Offline switch is set to offline The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position. If not set the switches to the following positions: • The Power On/Off switch to On. • The Online/Offline switch to Online. • The Drive Address switch to the correct address. 2. Do one of the following: • If any of these switches were determined to be in the wrong position at the time this error occurred, correct the switch settings. Refer to the CE/HSC section and run GMP. • If these switches were determined to be in the correct position at the time this error occurred, refer to the CE/HSC section and run GMP.
4280	An invalid function-control byte has been received, an invalid function was specified	Possible software problem	See "Possible Software Problem" on START 130
47B0	The Space File operation is not making any progress down the tape	The tape was blank or the tape had been positioned beyond the last written data.	Refer to the CE/HSC section and run GMP.
4B20	A Set Path Group ID command was received with an invalid function control byte in the argument; bits 3 through 7 were not 0	Possible software problem.	See "Possible Software Problem" on START 130.
4B21	A path group ID in the argument of the Set Path Group ID command is equal to 0	Possible software problem.	See "Possible Software Problem" on START 130.
4B22	The path group ID in the argument of the Set Path Group ID command does not match the path group ID received in a prior Set Path Group ID command over the same channel.	Possible software problem	See "Possible Software Problem" on START 130
4B23	The received path mode bit in the function-control byte does not match the path mode set in a prior Set Path Group ID command addressed to a channel interface with the same path group ID as the interface that issued the current command.	Possible software problem	See "Possible Software Problem" on START 130
4B24	The received path mode bit was on, indicating multipath mode. Multipath mode is not supported by this machine	Possible software problem.	See "Possible Software Problem" on START 130.
4D70	The received password for the Control Access command is zero. Multipath mode is not supported by this machine	Possible software problem	See "Possible Software Problem" on START 130.
4D71	An invalid function byte has been received for the Control Access command.	Possible software problem	See "Possible Software Problem" on START 130
4D72	The password received with the Control Access command does not match the password received during a prior Control Access command.	Possible software problem	See "Possible Software Problem" on START 130
4D73	A Control Access command attempted to establish a password, but the channel path that issued the command did not have assignment of the drive	Possible software problem.	See "Possible Software Problem" on START 130.

Fault Symptom Codes Caused by other than TA90 Hardware Failures (Continued)

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
4D74	A Control Access command attempted the temporary unassign function, but a prior command had not established a password.	Possible software problem.	See "Possible Software Problems" on START 130.
4D75	A Control Access command attempted the generalized unassign function, but the channel path that issued the command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problems" on START 130.
4D8D	The Perform Subsystem Command received an invalid order or flag byte.	Possible software problem.	See "Possible Software Problems" on START 130.
4E80	An invalid function-control byte has been received.	Possible software problem.	See "Possible Software Problems" on START 130.
4E8A	The drive is not online.	The Power On/Off switch is set to off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not, set the switches to the following position: The Power On/Off switch is set to on. The Online/Offline switch is set to online. The Drive Address switch is not set to the correct address. 2. Do one of the following: If any of these switches are determined to be in the wrong position at the time this error occurred, correct the switch settings. Refer to the CE/HSC section and run GMP. If these switches were determined to be in the correct position at the time this error occurred, refer to the CE/HSC section and run GMP.
4E8B	The addressed drive is assigned to a path group that does not contain the channel path on which the command was received.	Possible software problem.	See "Possible Software Problem" on START 130.

Fault Symptom Codes Caused by other than TA90 Hardware Failures (Continued)

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
52nn	The channel command did not match	Possible channel adapter hardware or firmware problem	See "Possible Software Problem " on START 130.
5343	A TCU-TCU message was invalid or lost	Both TCU ID switches are set to the same ID.	See "Setting the Tape Control Unit Addresses" on PANEL 12. • If the switches are correct, run GMP. • If the switches are incorrect: 1. IML the tape control unit (see PANEL 7). 2. Refer to the CE/HSC section and run GMP.
5605	The channel adapter detected a parity error on a channel command.	Possible channel adapter hardware or firmware problem.	See "Channel Adapter Hardware or Firmware Problems" on START 135.
5AD4	A Collision Detect was sensed as the tape control unit was coming up.	Both TCU ID switches are set to the same ID.	See "Setting the Tape Control Unit Addresses" on PANEL 12. • If the switches are set correctly, refer to the CE/HSC section and run GMP. • If the switches are incorrectly set: 1. IML the tape control unit (see PANEL 7). 2. Refer to the CE/HSC section and run GMP.
5B30	The buffer switch was made free because of no activity on the channel path. Sense byte 9 contains the failing channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Possible channel adapter hardware or firmware problem.	See "Channel Adapter Hardware or Firmware Problems" on START 135.
5BB1	The buffer switch was made free because of no activity on the channel path. Sense byte 9 contains the failing channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Possible channel adapter hardware or firmware problem.	See "Channel Adapter Hardware or Firmware Problems" on Start 135.
7093	In read mode, an interblock gap was not detected within 2.0 mm (0.08 in.) after 'gap in'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7094	The status from the drive did not indicate 'beginning of tape' or 'density mark successfully written' at 'gap in' time in a write operation. The tape control unit ERP will be called to rewind and retry the write density mark operation.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
70C2	A block ID mismatch occurred on a read forward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored; or a read was done after the end of current data on the tape.	Run GMP.
70C3	A block ID mismatch occurred on a read backward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	Refer to the CE/HSC section and run GMP.

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
7093	In read mode, an interblock gap was not detected within 2.0 mm (0.08 in.) after 'gap in'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7094	The status from the drive did not indicate 'beginning of tape' or 'density mark successfully written' at 'gap in' time in a write operation. The tape control unit ERP will be called to rewind and retry the write density mark operation.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
70C2	A block ID mismatch occurred on a read forward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored; or a read was done after the end of current data on the tape.	Refer to the CE/HSC section and run GMP.
70C3	A block ID mismatch occurred on a read backward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	Refer to the CE/HSC section and run GMP.
70D2	A block ID mismatch occurred on a read forward operation in extended data format. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	Refer to the CE/HSC section and run GMP.
70D3	A block ID mismatch occurred on a read backward operation in extended data format. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	Refer to the CE/HSC section and run GMP.

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
7141	A density mark criteria was not met after five retries. A valid density pattern must be detected in 40 out of 50 samples of the read pattern register (RPR) (every 500 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7142	A time-out occurred after waiting 2.5 milliseconds for the 'density separator' (beginning of block interrupt, level 2 interrupt).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7143	A time-out occurred after waiting 1.3 milliseconds for the 'interblock gap' that follows the 'density separator'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7144	A time-out occurred after waiting 1.3 milliseconds for 'write end' in the write status/error (WSE) register when trying to write a 'density separator'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7152	A read back check of an 'interblock gap' detected that the 'interblock gap' was too long. Maximum 'interblock gap' length is 3.0 mm (0.12 in.).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7153	A void was detected during a read operation.	The tape was blank or the tape had been positioned beyond the last written data.	Run GMP.
7154	A data transfer time-out was detected during a read operation. No valid 'interblock gap' was detected within 67 milliseconds after 'beg sync' was detected. (The timer is not set if the subsystem is in synchronous mode).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7155	A data transfer time-out was detected during a read back check operation. No valid 'interblock gap' was detected within 67 milliseconds after 'beg sync' was detected. (The timer is not set if the subsystem is in synchronous mode).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7159	A read back check time-out occurred waiting for the 'interblock gap' following an 'erase gap'. 'Interblock gap' must be detected with 6.1 milliseconds after the 'write erase gap' is started.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7161	'Density separator' was not detected before 45 sets of samples were taken (1025 mm - 40.4 in.).	Attempted to read a blank tape.	Run GMP.
7162	'Density separator' was detected, but no set of samples met the read criteria.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
7171	When in synchronous mode, the device transfer overran the channel transfer.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
74nn	A read back check error occurred on the last record.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7503	During the read back check of a record, the microprocessor received a level 3 interrupt because 'end sync' timed out waiting for 'interblock gap' (100 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
76nn	A read error occurred on the last record. A level 3 interrupt was received because 'end sync' timed out waiting for 'interblock gap' (100 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7702	256 'erase gaps' have been read without detecting a block or tape mark.	Tape was written with only 'erase gaps'.	Refer to the CE/HSC section and run GMP.
8100	No patches are available for this drive's EC level.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8101	Possible hardware EC compatibility problem.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8102	Possible hardware EC compatibility problem.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8202	The Unload switch was pressed.	The operator manually unloaded a drive.	1. Search your sense data for a previous record for the same device. 2. Refer to the CE/HSC section and run GMP.
8204	Manual rewind.	The operator pressed the Rewind switch.	
86C0	Bit 0 of status byte 2 from the drive did not indicate the correct interface. tape control unit	A drive or drives are set to the wrong range of logical addresses. Drives attached to tape control unit 0 must be addressed from 0-7. Drives attached to tape control unit 1 must be addressed from 8-F. Both Tape Control Unit ID switches are set to the same ID.	Check the drive logical address and the Tape Control Unit ID switches. If the drive address and Tape Control Unit ID switches are set correctly, return to the procedure that sent you here and continue with that procedure. If the drive address or Tape Control Unit ID switches are set incorrectly, set the switches correctly. Refer to the CE/HSC section and run GMP.
9000	Two drives with logical address in sense byte 9 and sense byte 30 are indicating the same physical address.	Two drives may have the same physical address set in their Physical Address switches.	Check the drive physical address switch settings for the two indicated drives. If the physical address switches are not set to the same value, return to procedure that sent you here and continue with that procedure. If the physical address switches are set to the same value, change one or both physical address switches to a unique value. Refer to the CE/HSC section and run GMP.
A112	A packet ID mismatch occurred on a read operation in TA90 extended data format. The data read from the tape does not have the expected packet ID sequence number.	The tape was written with the wrong packet ID or a permanent write error ERPA was ignored.	Refer to the CE/HSC section and run GMP.
A130	A buffer-to-channel transfer caused a check 2 condition.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
A170	A channel-to-buffer transfer caused a check 2 condition.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.

FSC	FSC Definition	Causes Other than TA90 Hardware Failures	Action
A2nn	A buffer-to-channel transfer caused a check 2 condition	Possible host processor channel problem or overrun condition	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135
A3nn	A buffer-to-channel transfer caused a check 2 condition	Possible host processor channel problem or overrun condition	See "STI-FIPS Adapter Hardware or Firmware Problems " on START 135
A5nn	A buffer-to-channel transfer caused a check 2 condition	Possible host processor channel problem or overrun condition	See "STI-FIPS Adapter Hardware or Firmware Problems " on START 135
A6nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrun condition.	See "STI-FIPS Adapter Hardware or Firmware Problems " on START 135.
A7nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrun condition.	See "STI-FIPS Adapter Hardware or Firmware Problems " on START 135.
A8nn	A buffer-to-channel transfer caused a check 2 condition	Possible host processor channel problem or overrun condition.	See "STI-FIPS Adapter Hardware or Firmware Problems " on START 135.
CCDD	Fifty consecutive errors have occurred	Possible host processor channel problem or overrun condition.	Using VAXim PLUS or ERF, look for other sense records with a different FSC for this tape control unit. Use the newly determined FSC for troubleshooting.
CCEE	An error occurred during a synchronous read or write operation. **Note:** Error recovery is not performed for errors that occur in 'synchronous mode'.	Possible host processor channel problem or overrun condition.	Using VAXsimPLUS or ERF, look for other sense records with a different FSC for this tape control unit. Use the newly determined FSC for troubleshooting.
D0nn	The read status register (RSR) contains active bits 5, 6, or 7. The nn indicates which bits are active in the RSR.	Possible host processor channel problem or overrun condition.	See "Possible Tape Media Problems" on START 130.
D584	During channel/buffer communication, a buffer checker had detected an error.	Possible host processor channel problem or overrun condition.	See "STI-FIPS Adapter Ha[illegible] or Firmware Problems" on START 135.
DAnn	The CMS register indicates an error, where nn = the BCSE register.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
DCnn	The CMS register indicates an error, where nn = the CTXE or CPEO register.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
E501	The STI-FIPS adapter has failed to communicate with the channel adapter.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E502	The STI-FIPS adapter has failed to communicate with the channel adapter.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E505	The STI-FIPS adapter has failed to communicate with the channel adapter. Possible host processor channel problem or overrun condition. Possible STI-FIPS adapter hardware or firmware problem.	Possible ST-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E511	The STI-FIPS adapter has failed to communicate with the channel adapter.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E513	The STI-FIPS adapter has failed to communicate with the channel adapter.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E514	The STI-FIPS adapter has failed to communicate with the channel adapter.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E520	The STI-FIPS adapter has failed to communicate with the channel adapter.	Possible STI-FIPS adapter hardware or firmware problem.	See "STI-FIPS Adapter Hardware or Firmware Problems" on START 135.
E900	There are too many temporary data errors based on Format 21 sense records from error log message information.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.

Actions for Possible Non-FRU Caused Error Codes.

Possible Tape Media Problems

The following error codes can indicate possible tape media problems.

4788	7143	7161	D0nn
7893	7144	7162	DAnn
7894	7152	7163	DCnn
78C2	7153	74nn	E888
78C3	7154	7583	
7141	7155	76nn	
7142	7159	7782	

Errors detected in the data-flow area of the TA90 subsystem can also be caused by the tape media. The FSC/Error Code correctly points to the possible subsystem hardware FRUs. However, sometimes the replacement of these FRUs does not correct the problem. You should determine if the problem was caused by the tape media before replacing the subsystem FRUs.

This procedure assumes that you have an error code that is listed in the above list. This error code came from the VAXsimPLUS or ERF. To determine if the problem could be caused by the tape media, do the following action.

Perform analysis to determine if the problem is related to a unique tape volume.

- If the VAXsimPLUS analysis indicates that the tape media *is not* the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.
- If the VAXsimPLUS analysis indicates that tape media *is* the problem and multiple cartridges are failing, go to Media Contamination Fault Determination Criteria on START 140.
- If the VAXsimPLUS analysis indicates that the tape media *is* the problem and a single cartridge is failing, go to Single Cartridge Fault Determination Criteria on START 140.

Possible Adapter Firmware or Software Problems

The following error codes can indicate possible software problems.

33E4	4260	4B20	4D70	4D75
33E5	4261	4B21	4D71	4E80
3C60	4262	4B22	4D72	4E81
3F13	4280	4B23	4D73	4E8A
4200	4780	4B24	4D74	4E88
4204				

There are error codes that can be caused by either hardware or software problems. For example:

- The adapter sent an illegal TA90 TCU subsystem command.
- The TA90 hardware could have a malfunction that decodes a correct command as an illegal command.

For these possible software problems suspect:

1. New VMS releases have been installed.
2. New applications of existing programs or jobs are being run.
3. Configuration changes have been made and the description of the error code relates to assignment or path group problems.

Fault Symptom Codes Caused by other than TA90 Hardware Failures (Continued)

Possible Channel Adapter Hardware or Firmware Problems

The following error codes can indicate possible channel adapter hardware or firmware problems.

2200	5880	A5nn	E501 (CC=3)
2201	5881	A6nn	E502
3300	7171	A7nn	E503
33E4	A130	A8nn	E513
33E5	A170		E514
52nn	A2nn		E520
5605	A3nn		

Run ILEXER to determine that the subsystem operates correctly with the STI-FIPS adapter.

Possible EC Level Compatibility Problems

The following error codes can indicate possible EC compatibility problems.

8100 - Microcode patches not available
8101 - Possible hardware EC compatibility problem
8102 - Possible hardware EC compatibility problem

There are several types of EC level compatibility problems. The most common mismatches are:

- In the drive compared to the tape control unit
- In the tape control unit functional microcode compared to the hardware.

TA90 Media Fault Determination Criteria START 140

Note: You were sent to this page because of a possible media problem with multiple cartridges and/or multiple drives. There should be a pattern of similar unscheduled service calls.

This procedure should be followed for each suspected media service call. After following this procedure, do **NOT** approach the customer about a potential media problem until further analysis is completed by the next level of support. Notify your manager at this time of a possible media problem.

Description/Definition

Tape media can create a number of failure modes similar to those caused by actual hardware problems and the severity can be significant if not properly handled. For this reason, it is important that careful analysis and problem determination be made if a media failure is suspected.

One failure mode is media generated debris. Debris can be caused by minute particles separating from the tape and will normally appear as a thin line of deposits (very difficult to see without magnification) across the tape, the Read/Write head or the cleaner blade.

Some typical failure modes commonly associated with media problems include but are not limited to:

- Permanent read or write errors caused by:
  - deposits transferred to and from the cleaner blade
  - transfer of media particles to the Read/Write head
  - media particles left on the tape surface may cause the tape to be lifted from the head thereby causing a failure.
- Dropping records due to debris deposits and subsequent loss of tape position indicated by block sequence errors.
- High temporary error rate.
  - evidenced by highly erratic drive performance day to day
  - not definable to a single drive, tape control unit or subsystem
  - not the result of repeat failures on a particular volume.

The following information provides some basic considerations and guidelines relative to handling media problems.

ISOLATION

ENSURE HARDWARE

The integrity of the hardware must be established. This requires utilization of the maintenance package to ensure there are no hardware malfunctions in the subsystem which could be causing the degradation. The hardware must be able to run all diagnostics error free.

Once hardware problems have been eliminated as the reason for poor performance, and media is suspected, the following items need to be verified:

ENSURE ENVIRONMENT

Temperature and humidity of both the tape storage area and the computer room should be observed to assure they are within acceptable limits. The operating limits are given in the *TA90 Owner's Manual*, EK-OTA90-OM.

ENSURE ADEQUATE DRIVE CLEANING

Customer drive cleaning procedures should be studied. The drives should be cleaned by the customer:

- whenever a 'CLEAN' message is displayed on the pod
- every 8 hours
- after every permanent R/W error
- whenever an increase in temporary errors is observed.

If the failure is the result of a media oriented problem, contact your next level of support for further media analysis. Notify your manager of a possible media problem. **DO NOT** notify the customer of the possible media problem at this time.

Single Cartridge Fault Determination Criteria

The hardware has been verified by running all diagnostics error free.

You were sent to this page because a single cartridge is failing for one of the following reasons:

1. The maintenance package has found a physical defect with this cartridge such as a broken tape.
2. A single cartridge fails on multiple drives.
3. VAXsimPLUS analysis indicates a single cartridge in the tape library is causing a high number of read/write problems.

If the failure is caused by a single cartridge, notify the customer to purge the tape from the library.

Determining a Fault Symptom Code

The Determining a Fault System Code procedures are written to guide you through the process of determining which sense byte error code to use as a fault symptom code (FSC). Normally, VAXsimPLUS identifies the fault symptom code, determines the corrective action, and prompts you to perform the corrective action. However there can be conditions where you would manually determine a fault symptom code. The following is a list of these conditions.

- To develop fault symptom codes from sense records in ERF reports.
- To determine FRUs ahead of time for a problem when you are away from the subsystem.
- To develop multiple fault symptom codes from several sense records in ERF reports.

If you have any of these conditions, or should you choose to manually determine a fault symptom code for any reason; use the following table to determine the fault symptom code. After you have determined the fault symptom code, return to the procedure that sent you here.

Look for sense error codes that are used to select an FSC in the following sense bytes: (four digit error codes) 10-11, 12-13, 14-15, 16-17, (two digit error codes) 21, and 23. When the two digit error codes (from sense bytes 21 or 23) are described in the maintenance guide (MG) , they are preceded by two zeros (example: drive error code 82 in sense byte 21 becomes error code 0082).

If You Have This Error Code or Indication...	Do This Action...
VAXsimPLUS not available to provide FSC/FRU callout. **Audible/visual** **Host detected errors**	Use ERF (Analyze/Error) to manually determine your fault symptom code.
All other drive CHK codes that are only displayed on a single drive.	Use the drive CHK code as the fault symptom code. Adding two high order zeros (example: CHK21 = 0021).
All other sense records that indicate a single drive failure.	Look at sense bytes 21, 16-17, and 10-11 in sequence and use the first non-zero data as the fault symptom code.
All other sense records that indicate a multiple drive failure where there are no drive CHK codes, sense byte 21 equals 00, or multiple sense records have errors across multiple drive addresses of the same subsystem.	Look at sense bytes 16-17 and 10-11, in sequence, and use the first non-zero data as the fault symptom code. **Note:** See "Error Path Isolation" on START 400 to determine the failing path if you have a dual tape control unit subsystem or if the FSC relates to a channel adapter problem.

Determining a Fault Symptom Code from the ACL LEDs

A two position Error Display Indicator is located on the Loader Control Card.

- Blank: Indicates the microcode for the Automatic Cartridge Loader is not loaded.
- 00: Indicates the Automatic Cartridge Loader is functional.
- nn: Indicates the last error that occurred on the Automatic Cartridge Loader.

  Note: E7 must be added to the beginning of the nn value.

For example, if the nn value is 28, the Fault Symptom Code is E728.

Determining an Error Code from the A, B and Fault Indicators

The FAULT indicator lights to show that a potentially fatal error has been detected in the formatter. When FAULT stays lit, perform the following procedure.

1. Press and release the FAULT button. All three TA90 control panel indicators light in a lamp test. The A, B, and FAULT indicators stay on for as long as you press the FAULT button. After you release the FAULT button, the A, B, and FAULT indicators light (blink) to display a binary error code. The code, defined in the following table, identifies one of four areas in the formatter that may have caused the error.
2. Record the displayed fault number.
3. Press the FAULT button again for about one second and release it. The formatter then tries to clear the error. All three indicators light as long as you press the FAULT button or until the clear attempt is finished. If the error is cleared, the FAULT indicator turns off and PORT SELECT A and PORT SELECT B return to thier normal meaning. If the error remains, FAULT stays on and the PORT SELECT A and PORT SELECT B are off.
4. If the FAULT indicator stays on, run GMP (see CE/HSC).

TA90 Control Panel Error Codes

Indicator A	Indicator B	FAULT	Possible Cause
Off	Off	On	Reserved
Off	On	Off	Reserved
Off	On	On	Reserved
On	Off	Off	Buffer RAM error
On	Off	On	STI interface error
On	On	Off	TCU interface error
On	On	On	CE panel interface error

Note: On = Indicator blinking; Off = Indicator always off

Determining a Fault Symptom Code (Continued)

This procedure is written to guide you through the complete process of determining which sense byte error code to use as a fault symptom code (FSC)

001

(Basic Starting Point)

Do you have a drive CHK code?

YES NO

002
Is sense data available?

YES NO

003
Use ERF (Analyze/Error) to obtain sense data. Go to 004.

004
Does sense byte 7 equal 20?

YES NO

005
Go to MSG 100.

006
Go to START 315, Entry Point A.

007
Does the drive CHK code equal 82?

YES NO

008
Use the drive CHK code as the FSC.
Go to START 325, Entry Point D.

009
Check for sense data from the tape control unit that is physically attached (bolted) to the drive with the drive CHK 82.

Is format 20 sense data available for this drive address and this tape control unit?

YES NO

010
Go to step 013.

011
Do sense bytes 10-11 equal 8007?

YES NO

012
Does sense byte 21 equal 82?

YES NO

A B C

A B C

013
Check for sense data from the tape control unit NOT physically attached (NOT bolted) to the drive with the drive CHK 82.

Is format 20 sense data available for this drive address and tape control unit?

YES NO

014
Format 20 sense records are not related to drive CHK 82. Drive CHK 82 can be an intermittent drive interconnection problem. You should troubleshoot the drive CHK 82 problem, not the cause of the format 20 sense data.

Use drive 8007 as the FSC.
Go to START 325, Entry Point D.

017
For this tape control unit sense data and this drive address, do sense bytes 10-11 equal 8007?

YES NO

018
Does sense byte 21 equal 82?

YES NO

019
Go to step 014.

020
An FSC has been determined.
Record the other tape control unit's address and sense bytes. You will need this information to determine the correct control unit connection in a two tape control unit configuration.

Use 8007 as the FSC.
Go to START 325, Entry Point D.

A B D

A B D

021
An FSC has been determined. Record this tape control unit's address and sense bytes. You will need this information to determine the correct tape control unit connection in a dual tape control unit subsystem.

Use 8007 as the FSC.
Go to START 325, Entry Point D.

022
Go to step 020.

023
An FSC has been determined.
Record this tape control unit's address and sense bytes. You will need this information to determine the correct unit connection in a two tape control unit configuration.

Use 8007 as the FSC.
Go to START 325, Entry Point D.

Format 20 Sense Analysis

023

(Entry Point A)

Does sense byte 21 equal 82?

YES NO

024
Does sense byte 21 equal 64, 75, A3, or FF?

YES NO

025
Does sense byte 21 equal 00?

YES NO

026
Use sense byte 21 as the FSC.
Go to START 325, Entry Point D.

027
Do sense bytes 10-11 equal 0000?

YES NO

028
Do sense bytes 10-11 equal
33E7-33E9, 8202, or 8294?

YES NO

029
Do sense bytes 16-17
equal 0000?

YES NO

030
Use sense bytes 16-17
as the FSC.
Go to START 325, Entry Point D.

031
Do sense bytes 10-11
equal 2100 or 8E06?

YES NO

032
Do sense bytes 10-11
equal 2000 or 2010?

YES NO

033
Use sense bytes 10-11
as the FSC.
Go to START 325, Entry Point D.

034
Do sense bytes 12-13
equal 0060?

YES NO

035
Use sense bytes 12-13
as the FSC.
Go to START 325, Entry Point D.

036
Call your next level
of support.

037
Do sense bytes 12-13
equal 2000 or 2010?

YES NO

038
Do sense bytes 10-11
equal 2100?

YES NO

039
Do sense bytes 12-13
equal 0000?

YES NO

040
Do sense bytes
12-13 equal 8E06?

YES NO

041
Use sense bytes
12-13 as the FSC.
Go to START 325,
Entry Point D.

042
Do sense bytes 14-15
equal 0000
or 8E06?

YES NO

043
Use sense bytes
14-15 as the FSC.
Go to START 325,
Entry Point D.

044
Go to step 048.

045
Go to step 048.

046
Call your next level
of support.

047
Use sense bytes 12 and 13 as
the FSC.
Go to START 325, Entry Point D.

048
This can be a normal operating
condition. Using the last non-
zero error code that sent
you to this step (as an FSC), see
the FSI and determine if the pro-
blem has a non-FRU cause. Perform
any action as necessary.

Is the problem a non-FRU?

YES NO

049
Do sense bytes 16 and 17
equal 0000?

YES NO

050
Use sense bytes 16 and 17
as the FSC.
Go to START 325, Entry
Point D.

051
Use the last non-zero error
code that sent you to this
step as the FSC.
Go to START 325, Entry Point D.

052
Is other sense data available for
this tape control unit's address?

YES NO

053
Go to START 320, Entry Point B,
and determine if any other symp-
toms need to be analyzed to
determine an FSC.

054
Go to START 310, step 004.
to determine an FSC for this addi-
tional sense data.

055
Call your next level of support.

056
Does sense byte 23 equal 82?

YES NO

057
Does sense byte 23 equal 00, 64, 75, or A3?

YES NO

058
Use sense byte 23 as the FSC.
Go to START 325, Entry Point D.

059
Go to step 027.

060
Go to step 061.

061
Is format 19 or 20 sense data available for
this drive address?

YES NO

062
Use drive CHK code 82 as the FSC.
Go to START 325, Entry Point D.

063
Do sense bytes 10-11 equal 0007?

YES NO

064
An FSC has been determined.
Record the tape control unit's
address for the sense record that
does not have sense bytes 21 or 23
equal to 82. You will need this
information to determine the correct
tape control unit connection.

Use 0007 as the FSC.
Go to START 325, Entry Point D.

065
An FSC has been determined.
Record this tape control unit's address for
this sense record. You will need this
information to determine the correct
tape control unit connection.

Use 0007 as the FSC.
Go to START 325, Entry Point D.

Determining a Fault Symptom Code (Continued) **START 320**

(Entry Point B)

You are here because of a repeated problem without a drive CHK code.

This procedure determines FRUs and FSCs for audible, visual, and host-detected problems.

Use the FSC provided by VAXsimPLUS or ERF. If the FSC is not available, go to START 325, Entry Point D.

(Entry Point C)

This is format 21 sense for statistical data or frequent temporary errors.

Is there other format 20 sense data available for this tape control unit address?

YES NO

866
Are you here because of frequent temporary errors?

YES NO

867
Go to Entry Point B.

868
Perform ERF analysis for temporary errors.
See MSG 100.

Did the ERF error analysis indicate any temporary error problems?

YES NO

869
Consult with RDC or remote support for advice/assistance.

870
Use E800 as the FSC.
Go to START 325, Entry Point D.

871
Go to START 315, Entry Point A, using the format 20 sense data.

An FSC has been determined. FRUs for this FSC can now be identified and ordered.

001

(Entry Point D)

Do you wish to perform corrective action and is the subsystem hardware (TCU or drive) relating to this FSC available for corrective action?

YES NO

002
Use the FRU list provided by VAXsimPLUS.

2. Maintenance Guide (MG) FSI FRU list

   Use ERF to obtain the FSC.
   Look up the FRUs and possible additional causes of failure for the FSC in the FSI and EAD, if applicable.

   Record the FRU list for later use in your corrective action. Schedule, with the customer, a time for corrective action. These FRUs can be obtained in advance so that when you perform the corrective action, the FRUs are available for exchanging. Also, have the sense data available.

   Return to the step that brought you here, and continue any remaining actions.

003
Is this a two tape control unit configuration?

YES NO

004
Does the FSC error description in the FSI or EAD relate to a channel adapter problem?

YES NO

A B C

A B C

005
BEFORE YOU START CORRECTIVE ACTION, YOU SHOULD REVIEW THE CUSTOMER'S CLEANING PROCEDURE. THEN DETERMINE THE CLEANLINESS OF THE SUSPECTED DRIVE HEAD AND GUIDE ASSEMBLY AS DESCRIBED ON CARR-DR 130 (SEE "HEAD, DECOUPLER, AND CLEANER BLOCK CLEANING PROCEDURE"). IF THE HEAD AND GUIDE ASSEMBLY NEEDS CLEANING, CLEAN THE DRIVE USING THE TAPE CLEANER CARTRIDGE. (SEE THE TA90 MAGNETIC TAPE SUBSYSTEM OWNER'S MANUAL, EK-OTA90-OI). IF ADDITIONAL CLEANING IS NEEDED, PERFORM THE CLEANING PROCEDURE DESCRIBED ON CARR-DR 130. REQUEST THE CUSTOMER CLEAN THEIR DRIVES MORE OFTEN.

1. Follow the dismount procedure on PLAN 55 and have the customer dismount the units needed for corrective action.

2. Run GMP.

3. GMP passed?

   YES NO

   006
   1. Change the FRU on the list provided by VAXsimPLUS and/or by the FSI.

   2. Run GMP again.

   3. GMP passed?

      Yes No

A B D E F

A B D E F

Reinstall the FRU just changed.
Change the next FRU on the list.

Has the complete list been changed?

YES NO

Go to step 002.

Go to the FSI/EAD for the FSC.

008
Consider the error that was detected by the GMP to be the same error that was identified by your analysis.

Any more corrective actions to be performed?

YES NO

Repair action is completed.

Return to the procedure step that brought you here, and continue with any remaining actions.

009
Repeat this procedure for each identified error that you are to perform corrective action on.

1. Run GMP to verify subsystem operation and to complete the end of call actions.

2. Have the customer mount the drives that were dismounted.

3. Return to the procedure step that brought you here, and continue with any remaining actions.

A B D

A B D

010
Change all the FRUs on the list provided by VAXsimPLUS and the FSI.

011
Follow the "Error Path Isolation" procedures (see START 400) to determine the failing channel adapter (A-B) for the channel adapter FRU to be exchanged.

Go to step 005.

012
Follow the "Determining the Tape Control Unit Procedure" (see START 420) to determine which FRUs should be exchanged in which tape control unit.

Go to step 005.

Error Path Isolation

The purpose of the following procedure is to identify the failing path and to determine which tape control unit and which channel adapter (CA) to test for a problem, and which tape control unit FRUs are to be exchanged in which tape control unit.

1. Analyze sense byte 2 bit 4 to determine the tape control unit that detected the failure. This will determine in which tape control unit you should exchange the FRUs (except for the channel adapter) and to which tape control unit you should run GMP.

2. Use the error description theory of the EAD or the FSI for the fault symptom code (FSC) selected by the CE or the FSC you determined from "Determining a Fault Symptom Code" procedure (see START 300).

   If the error description relates to the channel adapter or a channel adapter FRU is identified, look at sense byte 9, of the sense record for the FSC. This will determine the failing channel adapter (A or B) for the tape control unit identified by sense byte 2 bit 4. You should replace the identified FRU in the channel adapter identified in sense byte 9.

3. Return to the MG section that sent you here. Run GMP diagnostics on the tape control unit with the failure as defined by sense byte 2 bit 4.

4. Replace all FRUs (except the channel adapter) in the tape control unit specified by sense byte 2 bit 4. For channel adapter FSCs, or when a channel adapter FRU is identified, replace the channel adapter specified in sense byte 9, in the tape control unit specified in sense byte 2 bit 4.

When errors occur in multi-path processors or in TA90 dual tape control unit subsystems, it may be necessary to determine the actual path to the failing device. The system error log lists the errors of its selected CUA while the TA90 subsystem is using another tape control unit for a data path. For example, data load balancing can cause this condition.

Error Path Sense Byte Definitions

Sense Byte 2 - Reporting Path and Failing Path (Except Channel Adapter) Definitions

Bits 0, 1 and 2 – Indicates the channel adapter reporting the problem for the tape control unit that detected the problem as specified in bit 4.

001 = Channel adapter A reported the problem.

010 = Channel adapter B reported the problem.

Bit 3 – Indicates the tape control unit location of the channel adapter reporting the problem.

0 = The channel adapter reporting the problem is in tape control unit 0.

1 = The channel adapter reporting the problem is in tape control unit 1.

Note: Bits 0 through 3 have very little meaning for troubleshooting. For troubleshooting, bit 4, and for channel adapter problems, sense byte 9 provides useful information.

Bit 4 – Indicates the tape control unit that detected the failure. This bit determines in which tape control unit the tape control unit FRUs (except the channel adapter) should be exchanged, and to which tape control unit GMP should be run on.

0 - Tape Control Unit 0 detected this error.

1 - Tape Control Unit 1 detected this error.

Sense Byte 9 - Failing Channel Adapter Identified for Channel Adapter FSCs

For channel adapter FSCs, sense byte 9 identifies the failing channel adapter (A or B) that is in the tape control unit that detected this error, as defined by sense byte 2 bit 4. Only sense byte 9 bits 0 through 3 have meaning to identify the failing channel adapter for channel adapter FSCs.

Sense Byte 9 Bits 0-3	Failing Channel Adapter
1000	A
0100	B

The tape control unit is specified by sense byte 2 bit 4.

Examples of Sense Data Identification of a Data Path

Single TA90 Tape Control Unit

See Figure 1 and assume the following conditions:

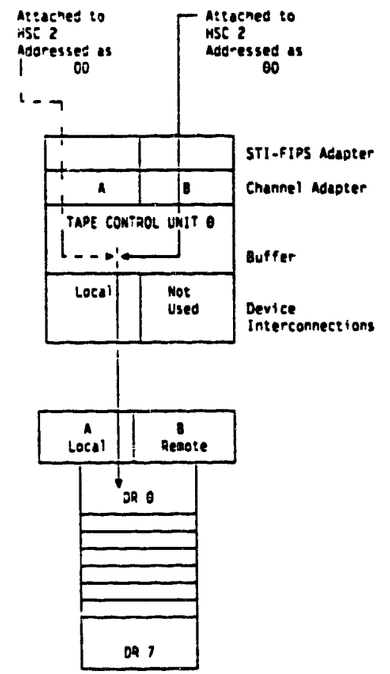
- The drive selected at the time of the error is drive 0.

When instances such as the above occur, sense byte 2 has no useful information. Because there is only one tape control unit, sense byte 2 bit 4 will always be zero. Only the channel adapter must be determined if the FSC error description relates to the channel adapter or a channel adapter FRU is identified. For channel acapter FSCs, sense byte 9 bits 0 through 3 identify the failing channel adapter.

Assume the FSC is 5CC3, and sense byte 9 is 0100xxxx. In this example, sense byte 9 indicates channel adapter B, which is attached to HSC 2.

If interface or HSC problems are indicated by the FSC, or other error indicators, run HSC and STI-FIPS Adapter diagnostics.

To determine the STI-FIPS adapter connection to the TA90 tape control unit channel adapter, see the customer's host processor channel configuration drawing or the I/O GEN.



- - - Possible failing data path determined by system errorlog sense bytes.
——— Actual Failing Data Path

Figure 1. Single Tape Control Unit

Examples of Sense Data Identification of a Data Path

Dual TA90 Tape Control Units

See Page 420 and assume the following conditions:

- The drive selected at the time of the error is drive 8.
- In tape control unit 1, channel adapter A is addressed as 1.
- All TA90 channel adapters in tape control unit 0 are addressed as 0.
- Drive 8 is selected in tape control unit 1, however, tape control unit 0 has the least data load. The TA90 routes the data through the channel adapter in tape control unit 1, through tape control unit 0's buffer and drive interconnections, to drive 8.
- An error occurs while drive 8 is processing the data. The system error log will report the PCUA as 180, which is not the true data path.

In cases such as the above, the actual data path will be defined in sense byte 2 bit 4, and for channel adapter FSCs the actual failing channel adapter will be defined in sense byte 9 bits 0 through 3.

For the following two examples, the data path at the time of failure is the same, and is shown in Figure 1 on START 401. However, because each example has a failure in a different part of the subsystem, the sense data troubleshooting information is different.

Example A:

Assume the FSC is 70E4 (buffer problem), sense byte 2 is hexadecimal 30 and sense byte 9 contains no useful information.

```
Sense Byte 2 = 30
0 1 2 3 4 5 6 7
0 0 0 0 0 X X X
─────── ─ ─────
   │    │  └─ Does not apply.
   │    └──── Indicates that TCU 0 was the
   │           failing tape control unit.
   └─ Indicates the reporting channel adapter
      and tape control unit at the time of the
      error, not useful for troubleshooting.
```

Looking up the 70E4 FSC in the FSI indicates that the problem relates to a buffer error. As a result, sense byte 9 has no useful meaning. In this case, all tape control unit FRUs identified by the 70E4 FSC are in tape control unit 0, as defined by sense byte 2 bit 4.

Example B:

Assume the FSC is 5CC1 (channel adapter problem), sense byte 2 is hexadecimal 08 and sense byte 9 contains 0100xxxx.

```
Sense Byte 2 = 08
0 1 2 3 4 5 6
0 0 0 0 1 X X X
─────── ─ ─────
   │    │  └─ Does not apply.
   │    └──── Indicates that TCU 1 was the
   │           failing tape control unit.
   └─ Indicates the reporting channel adapter
      and tape control unit at the time of the
      error, not useful for troubleshooting.
```

Looking up the 5CC1 FSC in the FSI indicates that the problem relates to a channel adapter error. As a result, sense byte 9 identifies the failing channel adapter. In this case, sense byte 9 contains 0100 xxxx and indicates the channel adapter is for channel B in tape control unit 1 (as defined by sense byte 2 bit 4).

For any other FSCs in sense data, run GMP on the tape control unit specified by sense byte 2 bit 4. For any other error condition, (audible, or visual), run GMP on the tape control unit with the error condition.

- Run HSC diagnostics to the identified tape control unit channel adapter as determined for channel adapter FSCs by sense byte 2 bit 4, and sense byte 9, in the sense data or to the tape control unit and channel adapter connected to the host processor that reported the host detected error. When a failure is found, isolation between the tape control unit and the host processor channel or cables must be determined. Use diagnostics as follows:
  - Run HSC (ILEXER, ILTAPE) diagnostics.
  - Run STI-FIPS adapter diagnostics.
  - Run GMP diagnostics.

To determine which tape control unit is tape control unit 0 and which is tape control unit 1, look at the position of the TCU 0/TCU 1 switch on the tape control unit. (See LOC 1).

In some cases an error can be caused by either tape control unit. When this occurs, it may be necessary to use the maintenance package on both tape control units.

For single drive failures, the data path will have less meaning, and GMP can be used with either tape control unit to troubleshoot the failing drive.

- Use the FSC supplied by VAXsimPLUS or by or by following the "Determining a Fault Symptom Code" procedure. See START 300.

Determining the Tape Control Unit involved

This flowchart determines which FRUs are exchanged in which tape control unit, in a 2 tape control unit configuration, and in which channel adapter the channel adapter FRU should be exchanged

001 (Entry Point A)

Does the FSC equal 8007?

YES NO

002
Does the FSC equal a CHK code or 00nn?

YES NO

004
Do sense bytes 10 and 11 or 12 and 13 equal 2000?

YES NO

005
Do sense bytes 10 and 11 or 12 and 13 equal 2019?

YES NO

006
Use sense byte 2 to find the failing path.
See START 400.

See the FSI for the description of the failing FSC.

Does the FSC relate to a channel adapter problem?

YES NO

007
Unless otherwise specified by the FRU list, exchange all the tape control unit unit FRUs specified by sense byte 2 bit 4.

A B C D E

A B C D E F

008
In the tape control unit specified in sense byte 2 bit 4, replace the channel adapter FRU in the channel adapter specified in sense byte 9 bits 0-3.

009
Replace FRUs in TCU1.

010
Replace FRUs in TCU0.

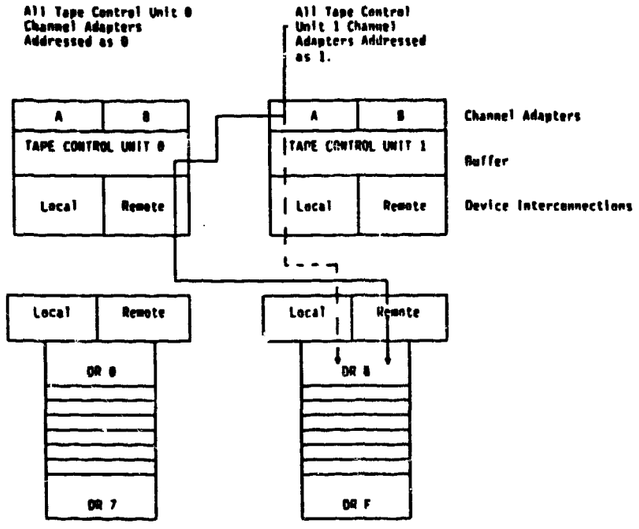
014
Replace FRUs in the failing drive, and TCU FRUs in the TCU that detected an error.

015
Any tape control unit FRUs called out are for the tape control unit specified by this tape control unit's address.

Determining the Failing TCU

Use the following information to determine which is the failing tape control unit:

- For any problem, the failing tape control unit is specified by sense byte 2 bit 4.
- Use the error description from the EAD or the FSI.
- If the error description indicates a channel adapter problem, sense byte 9 (indicates the failing channel adapter). This is the failing channel adapter that should be exchanged when a channel adapter FRU is called out.
- For single drive failures, GMP can be used with either tape control unit to troubleshoot the failing drive.



- - - Failing Data Path Assumed
——— Actual Failing Data Path (As Established by the Load Balancing), and detailed in sense data

Figure 1. Dual Tape Control Units


CART

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Cartridge Description

A magnetic tape cartridge is used in the TA90 subsystem. Within the cartridge is:

- A single reel of magnetic tape
- A leader block
- The cartridge file protect mechanism
- The clutch surface.

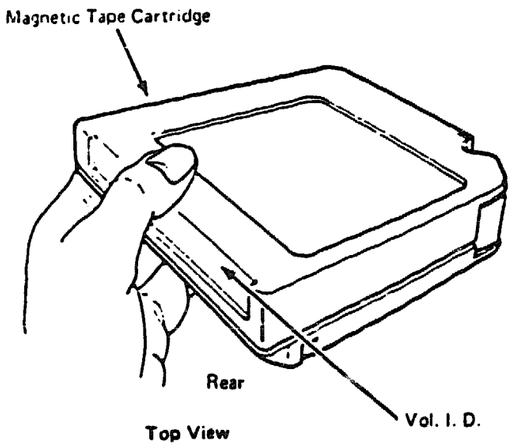
The leader block 1 is attached to the end of the magnetic tape. During the threading operation, the leader block is pulled out of the cartridge by the threader pin and moved along the tape path to the machine reel.

The cartridge file protect mechanism 2 is a thumbwheel that is moved by hand to either the File Protected or the Not File Protected position. A white dot on the face of the thumbwheel indicates that the cartridge is file protected.

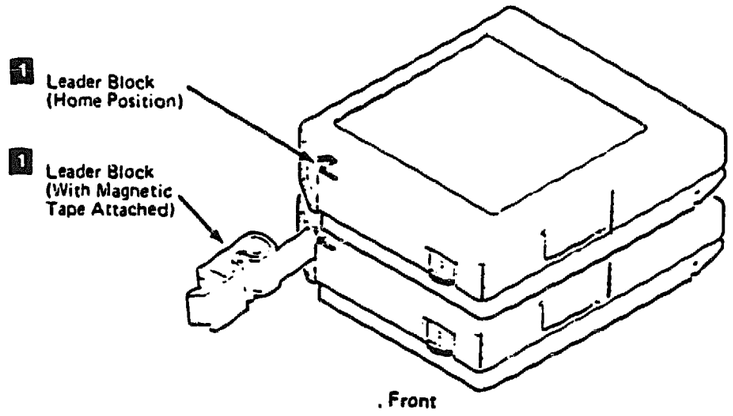
The clutch surface 3 is engaged by the file reel clutch to rotate the tape reel.

On the outside of the cartridge housing can be found:

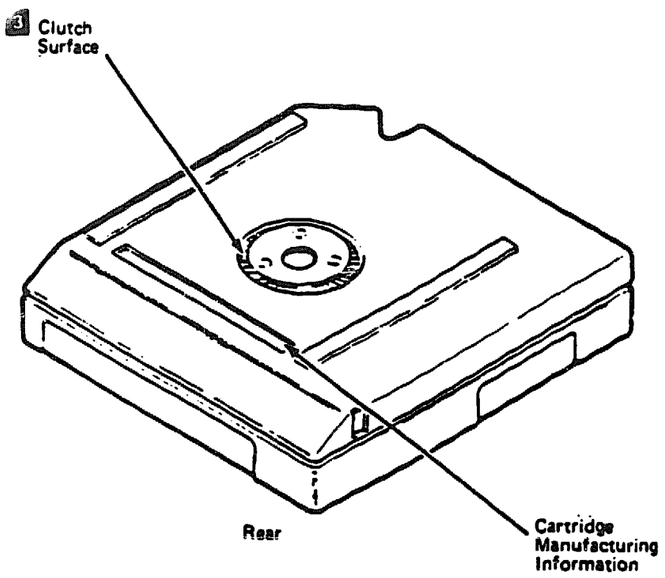
- Space for the volume identification, which is at the rear of the cartridge housing.
- Cartridge manufacturing information, which is stamped on the bottom of the cartridge housing.



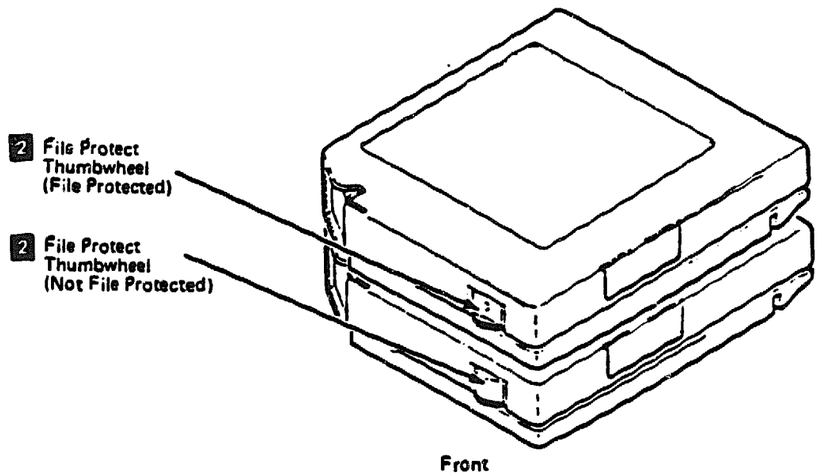
Top View



Top View



Bottom View



Top View

Cartridge Removal by Hand

This procedure aids you in removing a cartridge from a drive when it cannot be removed following an unload operation.

Use this page and the following pages as an aid in determining the condition of the cartridge and/or magnetic tape. After you have determined the condition, you will be directed to a procedure that will aid you in removing the cartridge.

Before You Begin

First, if you haven't already done so, attempt to remove the cartridge under power using the following procedure:

Notes:

1. For drives without the automatic cartridge loader go to procedure A.
2. For drives with the automatic cartridge loader go to procedure B.

Procedure A, Drives Without Automatic Cartridge Loader

1. Set the drive Ready/Not Ready switch to Not Ready (see LOC 1).
2. Press the drive Unload switch (see LOC 1)

   Note: It may take up to 3.5 minutes for the cartridge to rewind and unload.

3. If the cartridge latch 1 opens and you can remove the cartridge, do one of the following:

   - Using a different blank cartridge, run GMP.
   - Return to the MAP or procedure that sent you here.

4. If the latch does not open and move the cartridge into position for removal, go to step 1 of "Identifying the Cartridge and/or Tape Condition" on this page.

Procedure B, Drives With Automatic Cartridge Loader

1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Set the drive Ready/Not Ready switch to Not Ready, see LOC 1.
5. Press the drive Unload switch, see LOC 1.

   Note: It may take up to 3.5 minutes for the cartridge to rewind and unload.

6. If the feed assembly moves the cartridge back to the feed station 2 and you can remove the cartridge, do one of the following:

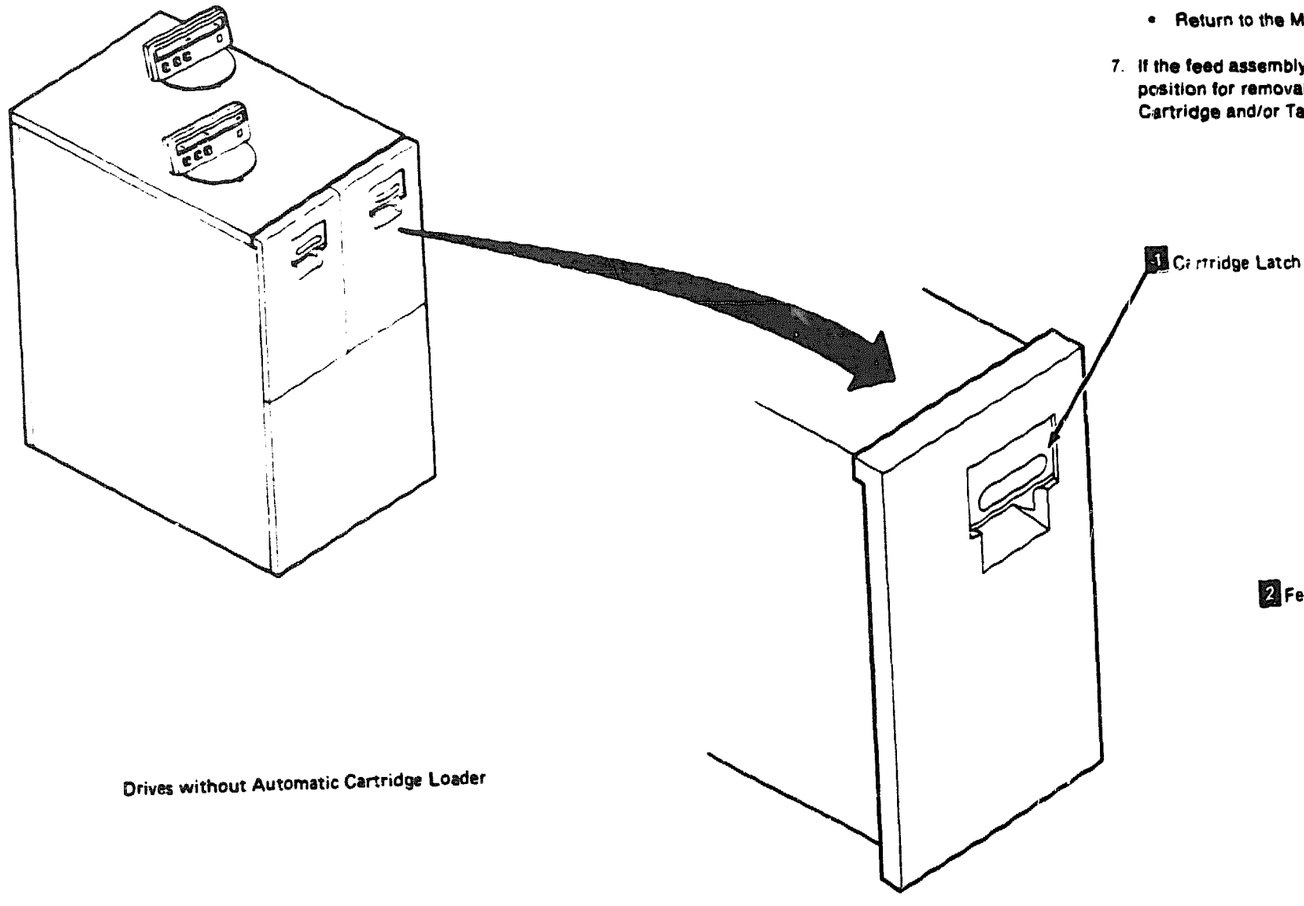
   - Using a different blank cartridge, run GMP.
   - Return to the MAP or procedure that sent you here.

7. If the feed assembly does not move the cartridge into position for removal, go to step 1 of the Identifying the Cartridge and/or Tape Condition on this page.

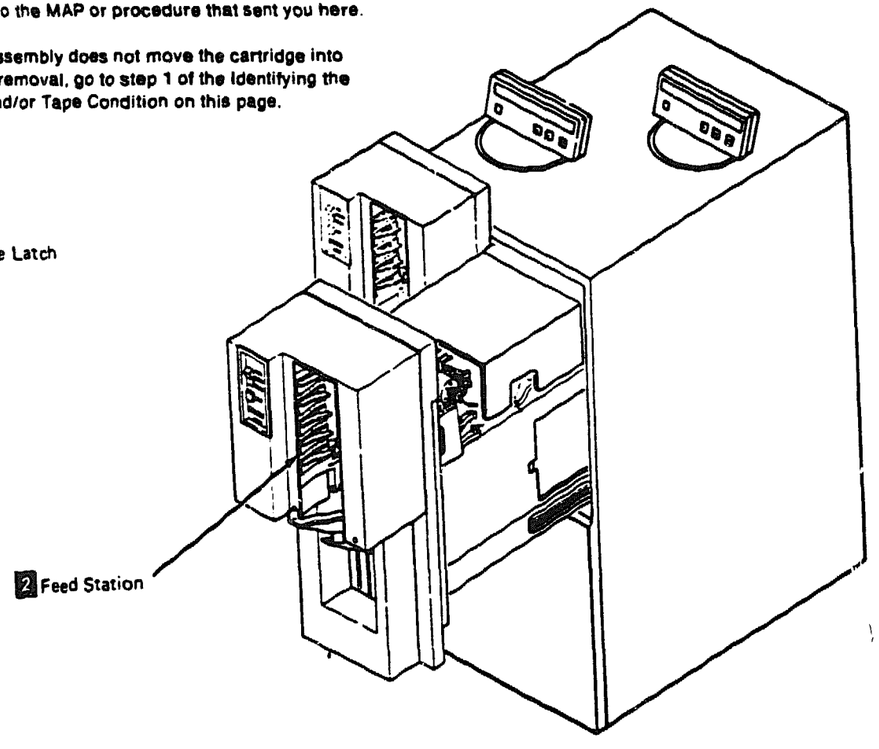
Identifying the Cartridge and/or Tape Condition

Perform the following steps to determine the cartridge and/or tape condition:

1. Set the Online/Offline switch to Offline (see LOC 1).
2. Go to CARR-DR 8 for the procedure to *power off* the drive or the tape transport unit.
3. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
4. Inspect the drive for the cartridge and/or tape conditions shown on CART 10-1, CART 10-2, and CART 10-3. Match the cartridge/tape condition with the example and follow the directions given with that example.



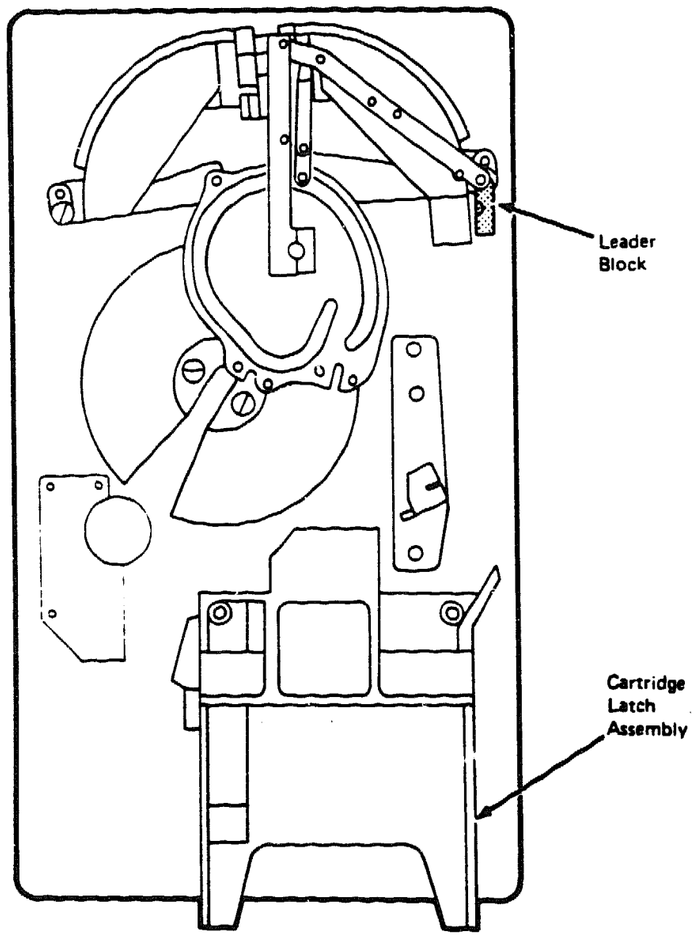
Drives without Automatic Cartridge Loader



Drives with Automatic Cartridge Loader

Example of a Leader Block Separated From the Magnetic Tape

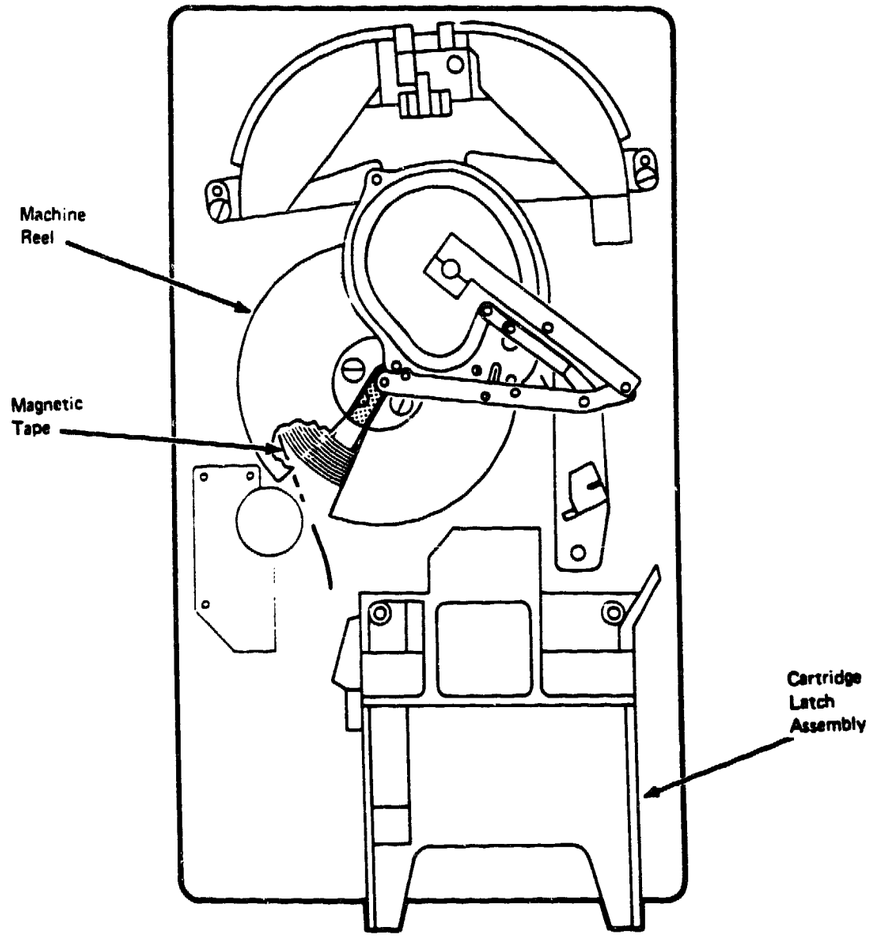
If the cartridge/tape condition matches this example, do the "Leader Block Replacement Procedure" on CART 20.



Top View

Example of Magnetic Tape Pulled Out of the Cartridge

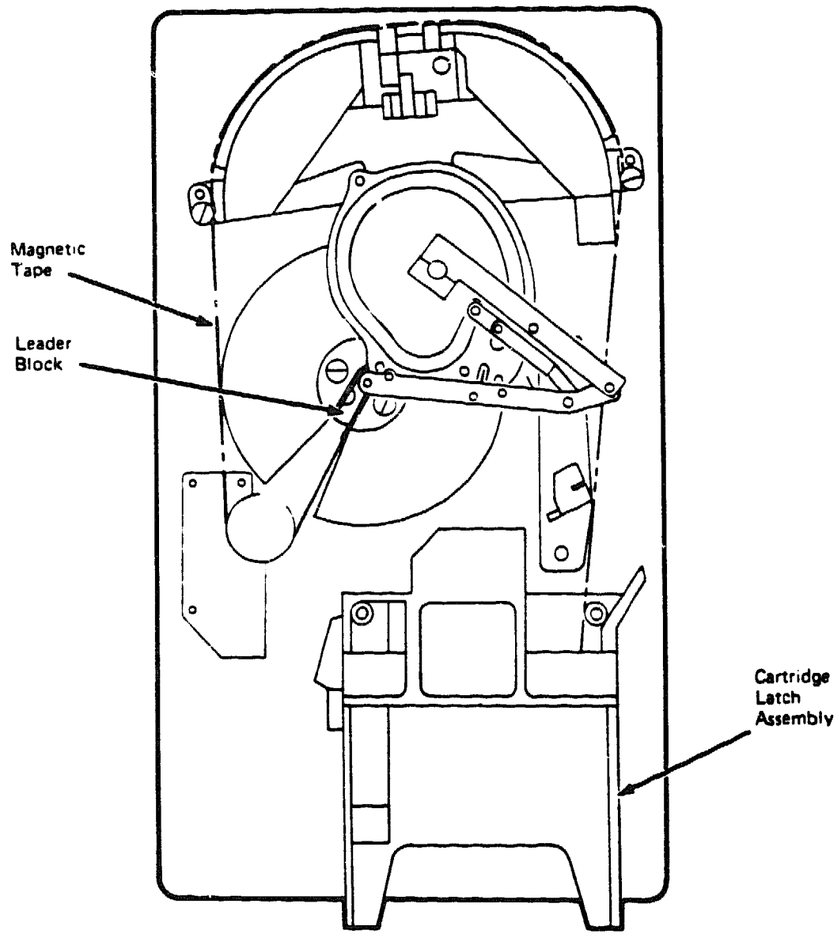
If the cartridge/tape condition matches this example, the magnetic tape has pulled out of the cartridge and has wound onto the machine reel. Do the "Magnetic Tape Attachment Procedure" on CART 30.



Top View

Example of the Leader Block and Threader Pin in the Machine Reel Hub

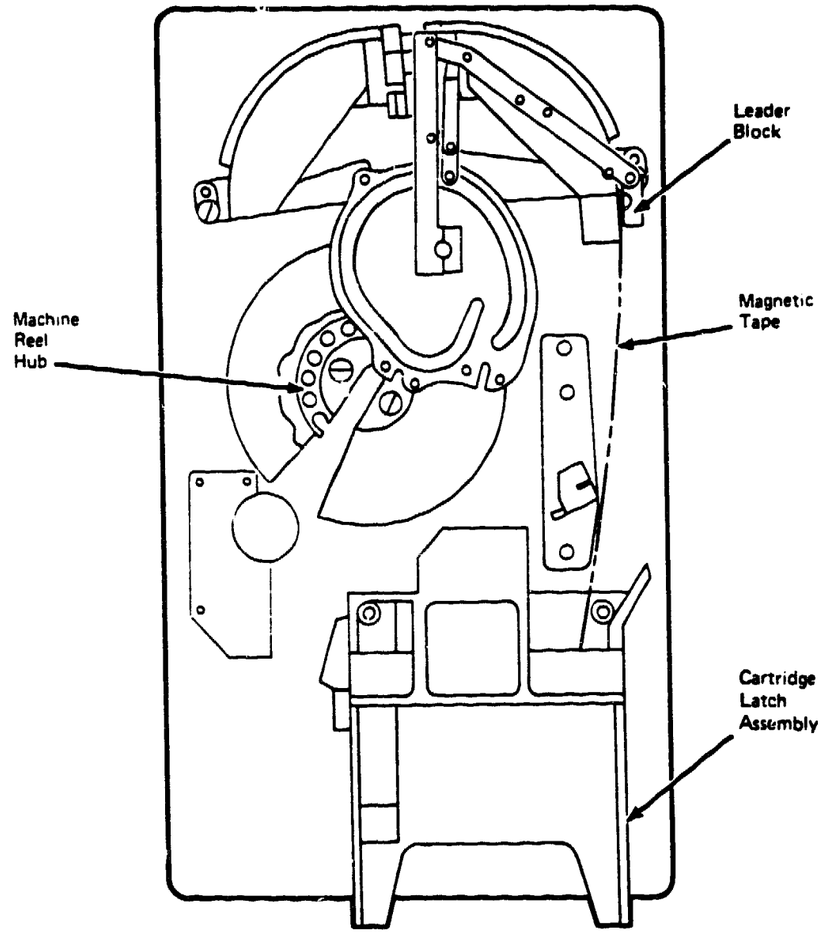
If the cartridge/tape condition matches this example, the leader block and threader pin are in the machine reel hub. Do the "Leader Block and Threader Pin in the Machine Reel Hub" procedure on CART 12.



Top View

Example of the Leader Block and Threader Pin Stopped in the Tape Path

If the cartridge/tape condition matches this example, the leader block and threader pin have stopped in the tape path between the machine reel hub and the cartridge latch assembly. Do the "Leader Block and Threader Pin Stopped in the Tape Path" procedure on CART 14.

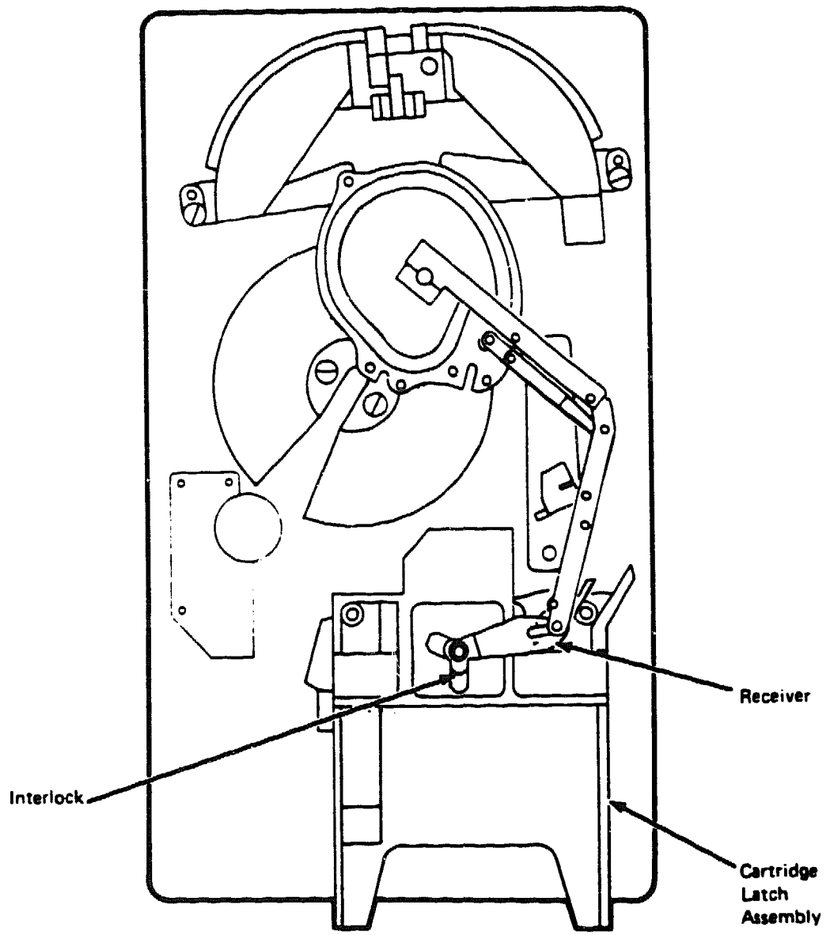


Top View

Cartridge Removal by Hand (Continued)

Example of the Leader Block and Threader Pin at the Cartridge Latch Assembly

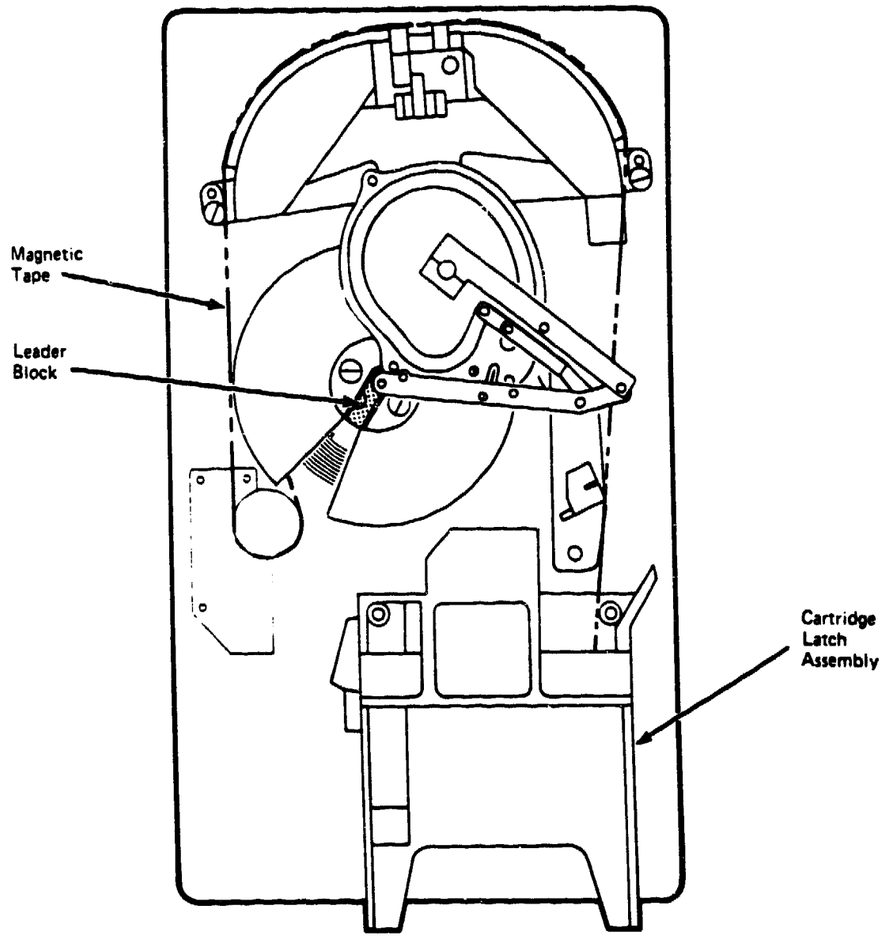
If the cartridge/tape condition matches this example, the leader block and threader pin are at the cartridge latch assembly (home position), but the interlock has not rotated away from the latch. Do the "Leader Block and Threader Pin at the Cartridge Latch Assembly" procedure on CART 16.



Top View

Example of Operation Stopped with Tape on the Machine Reel

If the cartridge/tape condition matches this example, the operation has stopped with tape on the machine reel. Do the "Leader Block and Threader Pin in the Machine Reel Hub" procedure on CART 12.



Top View

Cartridge Removal by Hand (Continued)

Leader Block and Threader Pin In the Machine Reel Hub

Perform the following steps to remove the cartridge by hand when the leader block and threader pin are still in the machine reel hub.

Note: **See CART 13 for the following locations.**

CAUTION:
The motor and shaft may be hot.

1. Find the file reel motor shaft 3. Attach the tape removal tool 2 to your socket wrench handle 1.
2. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft.
3. Turn the tool clockwise (as seen from the top of the drive) to wind the tape into the cartridge. **Warning:** Do not touch the magnetic tape because you may damage it and affect tape guiding.

   If the machine reel motor binds so that the file reel motor cannot move the tape, place your finger on the machine reel hub 4 as shown.
4. Move the hub counterclockwise, and at the same time turn the file reel motor shaft clockwise to move the tape.
5. Turn the hub until the file reel motor shaft is free to turn.
6. Continue to turn the file reel motor shaft until the leader block 5 is in position to leave the machine reel hub as shown.
7. Find the threader arm pivot point 6 above the threader assembly. Move the arm clockwise and at the same time rotate the file reel motor shaft clockwise until the leader block is in the cartridge.

   The threader pin will move the receiver 7 when the leader block is in the cartridge.

   Notes:

   a. For drives with the automatic cartridge loader go to procedure B.

   b. For drives without the automatic cartridge loader go to procedure A.

Procedure A, Drives Without Automatic Cartridge Loader

1. Press down on the latch assembly 11 to open the cartridge latch.

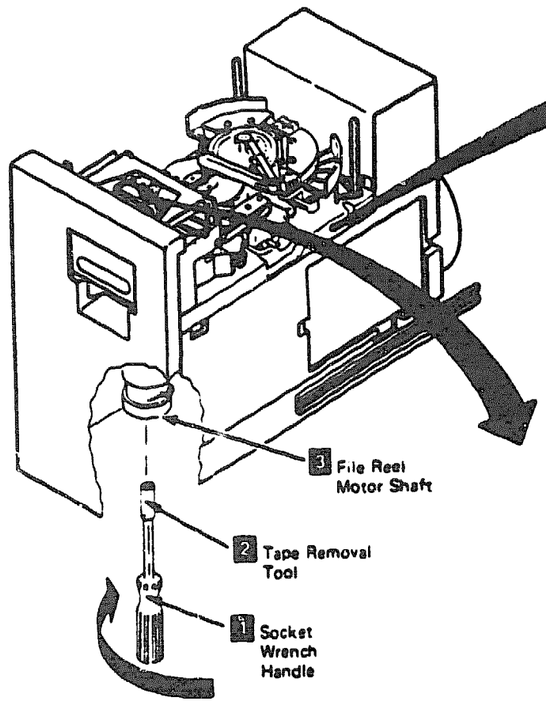
   If the latch does not open, go to step 3.
2. If the latch opens and the cartridge has moved into position for removal, remove the cartridge and return to the MAP or procedure that sent you here.
3. Look at the top of the latch assembly and find the pivot position 8 where the receiver 7 and the interlock 9 overlap. Move the pivot so the interlock rotates away from the latch assembly, as shown 10.
4. Press down on the latch assembly 11 to open the cartridge latch.

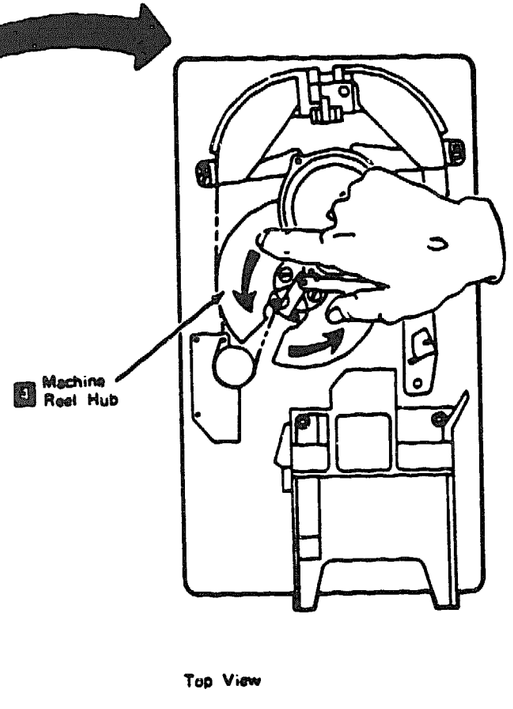
   If the latch does not open, request aid from your next level of support.
5. If the latch bar opens and the cartridge has moved into position for removal, remove it and return to the MAP or procedure that sent you here.

Procedure B, Drives With Automatic Cartridge Loader

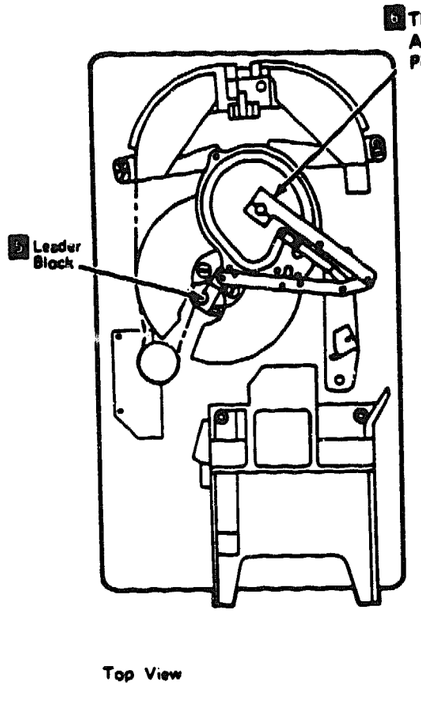
1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Turn the knurled knob 13 on the load motor counterclockwise (as viewed from the end of the motor) until the latch is fully raised.
5. Place your finger on the cartridge at the point indicated 12 and push toward the front of the machine until the cartridge can be removed from the feed assembly.
6. Continue the repair action by returning to the MAP or procedure that sent you here.

Cartridge Removal by Hand (Continued) CART 13

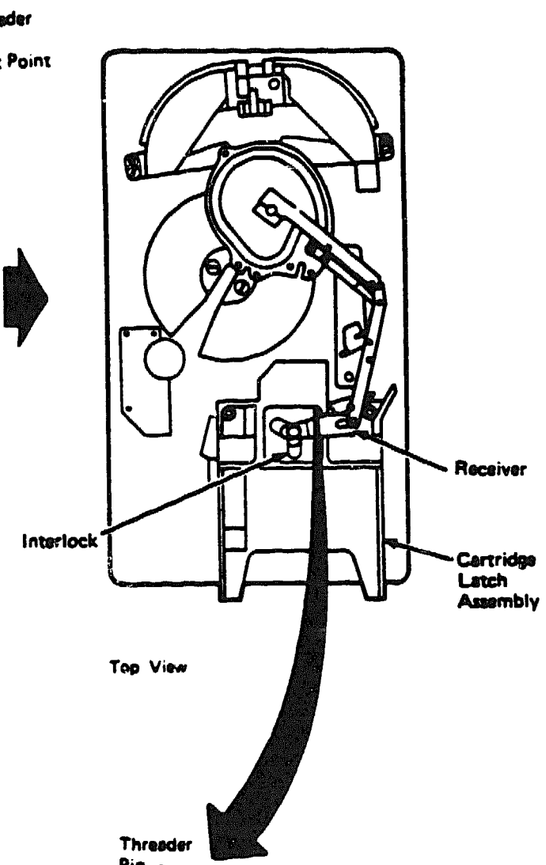




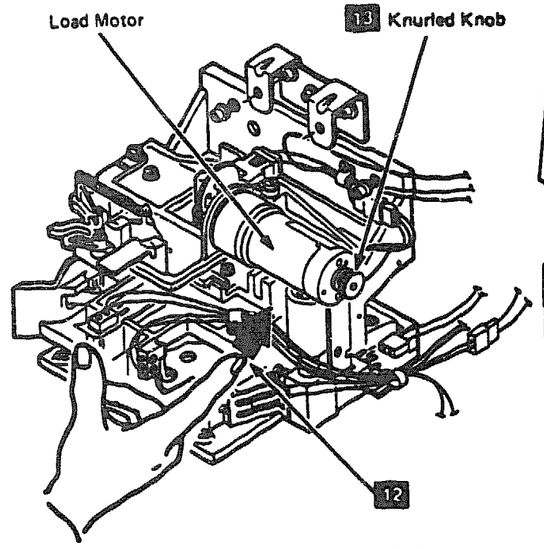
Top View



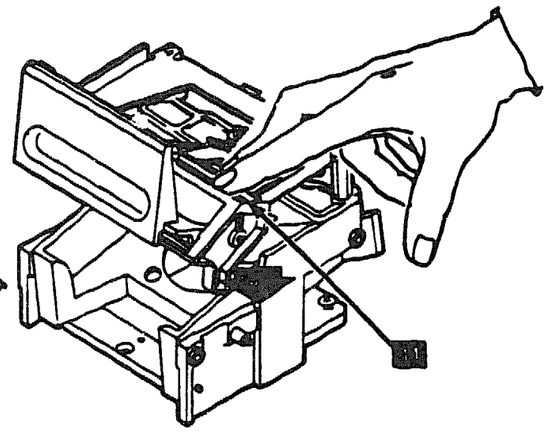
Top View



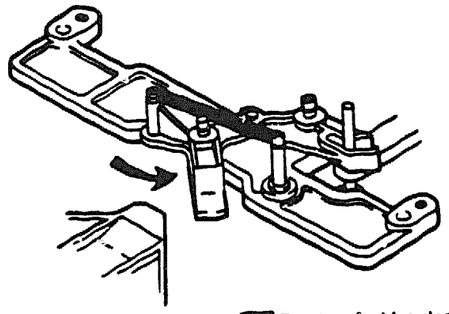
Top View



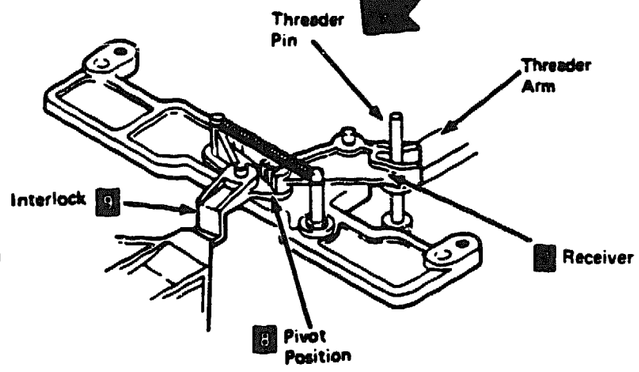
Load Assembly (Drives With Automatic Cartridge Loader)



Cartridge Latch Assembly



10 Receiver And Interlock In The Correct Position



Leader Block and Threader Pin Stopped In the Tape Path

Perform the following steps to remove the cartridge by hand when the leader block and threader pin have stopped in the tape path between the machine reel hub and the cartridge latch assembly

Note: See CART 15 for the following locations.

CAUTION:
The motor and shaft may be hot.

1. Find the file reel motor shaft 3. Attach the tape removal tool 2 to your socket wrench handle 1. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft.
2. Find the threader arm pivot point 5 above the threader assembly. Move the threader arm clockwise and at the same time turn the file reel motor shaft clockwise (as seen from the top of the drive) to wind the tape into the cartridge.
3. Continue winding the tape into the cartridge until the leader block 4 is in the cartridge

   Notes:

   a. The threader pin will move the receiver 6 when the leader block is in the cartridge.
   b. For drives with the automatic cartridge loader go to procedure B.
   c. For drives without the automatic cartridge loader go to procedure A.

Procedure A, Drives Without Automatic Cartridge Loader

1. Press down on the latch assembly 10 to open the cartridge latch.

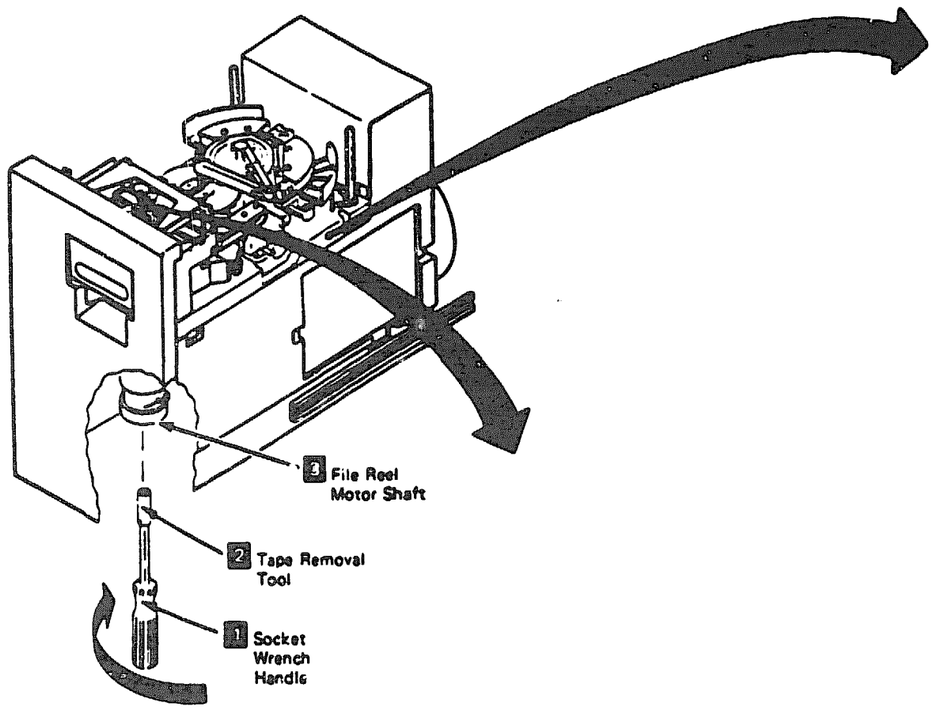
   If the latch does not open, go to step 3

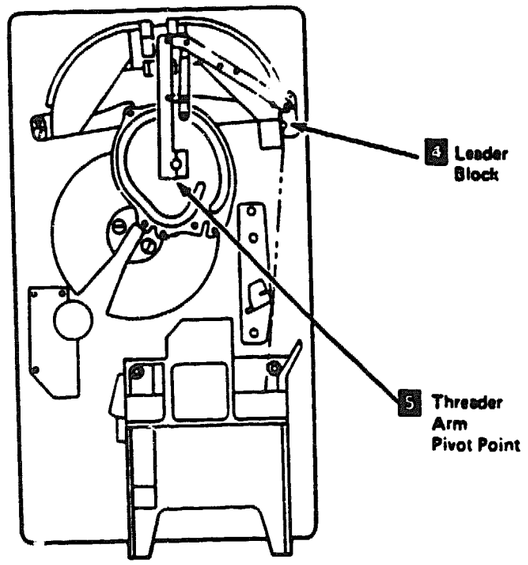
2. If the latch opens and the cartridge has moved into position for removal, remove the cartridge and return to the MAP or procedure that sent you here.
3. Look at the top of the latch assembly and find the pivot position 7 where the receiver 6 and the interlock 8 overlap. Move the pivot so the interlock rotates away from the latch assembly, as shown 9.

Procedure B, Drives With Automatic Cartridge Loader

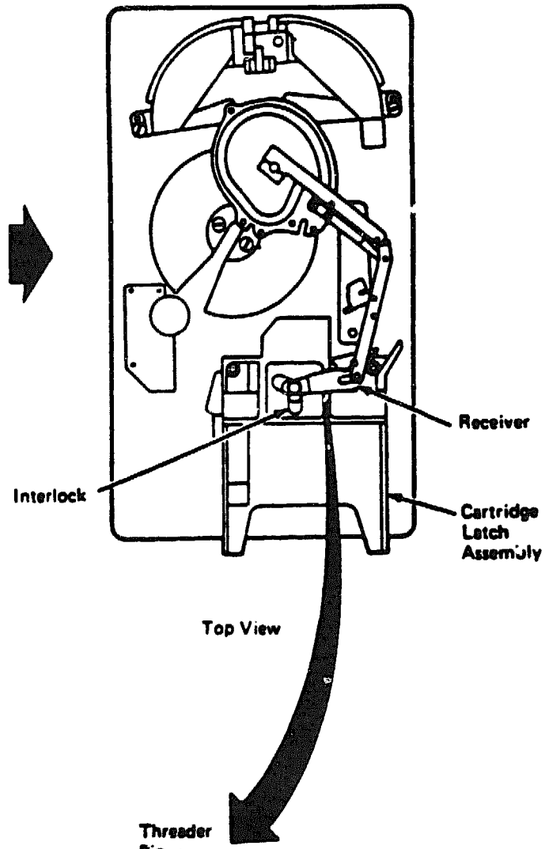
1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Turn the knurled knob 12 on the load motor counterclockwise (as viewed from the end of the motor) until the latch is fully raised.
5. Place your finger on the cartridge at the point indicated 11 and push toward the front of the machine until the cartridge can be removed from the feed assembly.
6. Continue the repair action by returning to the MAP or procedure that sent you here.

Cartridge Removal by Hand (Continued) CART 15

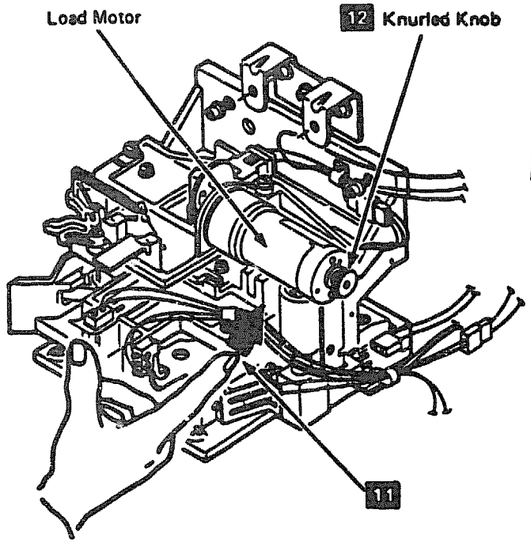




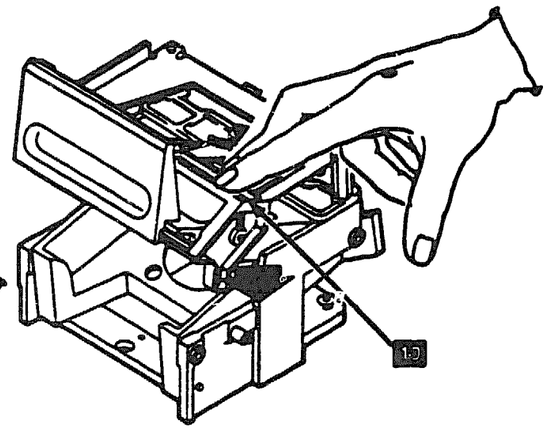
Top View



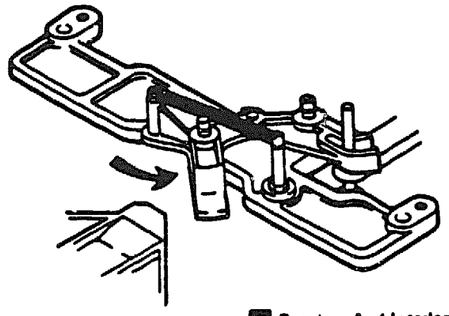
Top View



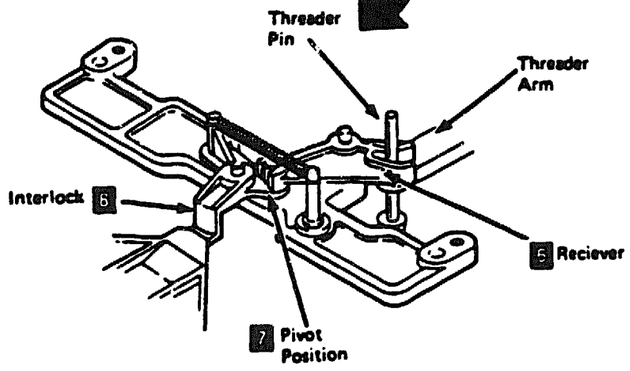
Load Assembly (Drives With Automatic Cartridge Loader)



Cartridge Latch Assembly



9 Receiver And Interlock In The Correct Position



Cartridge Removal by Hand (Continued)

Leader Block and Threader Pin at The Cartridge Latch Assembly

Perform the following steps to remove the cartridge by hand when the leader block and threader pin are at the cartridge latch assembly (home position), but the interlock has not rotated away from the latch.

Note: See CART 17 for the following locations.

1. Look at the top of the latch assembly and find the pivot position [1] where the receiver [2] and the interlock [3] overlap.
2. Move the pivot so the interlock rotates away from the latch assembly, as shown [3].

   Notes:

   a. For drives with the automatic cartridge loader go to procedure B.

   b. For drives without the automatic cartridge loader go to procedure A.

Procedure A, Drives Without Automatic Cartridge Loader

1. Press down on the latch assembly [3] to open the cartridge latch.

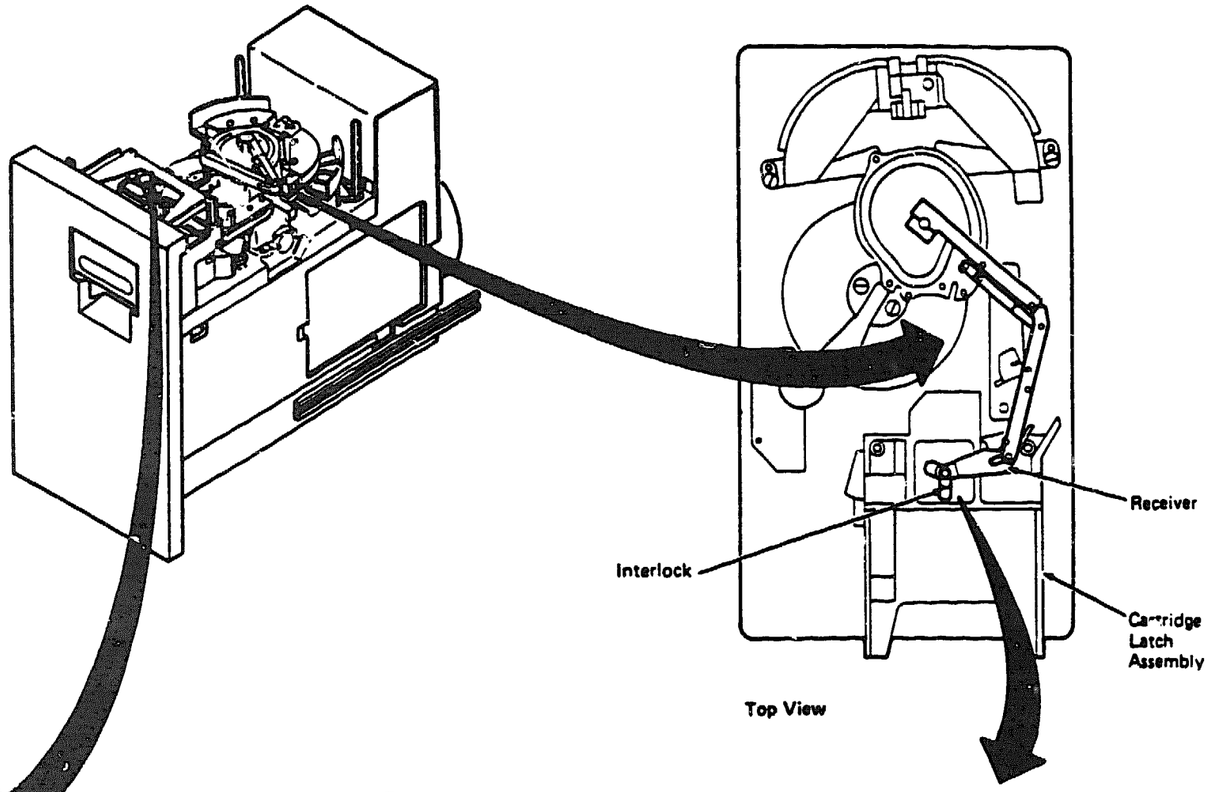
   If the latch does not open, request aid from your next level of support.

2. If the latch opens and the cartridge has moved into position for removal, remove the cartridge and return to the MAP or procedure that sent you here.

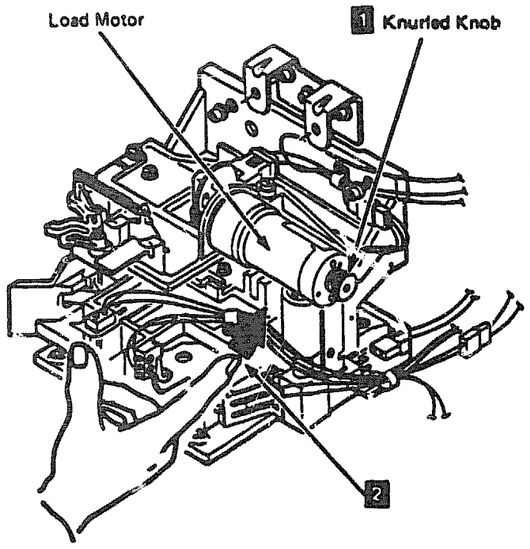
Procedure B, Drives With Automatic Cartridge Loader

1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Turn the knurled knob [1] on the load motor counterclockwise (as viewed from the end of the motor) until the latch is fully raised.
5. Place your finger on the cartridge at the point indicated [2] and push toward the front of the machine until the cartridge can be removed from the feed assembly.
6. Continue the repair action by returning to the MAP or procedure that sent you here.

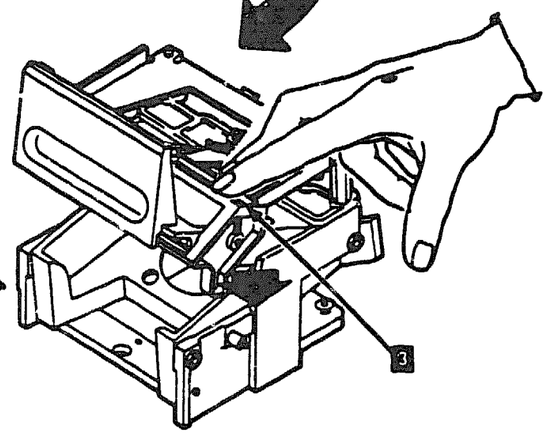
Cartridge Removal by Hand (Continued)



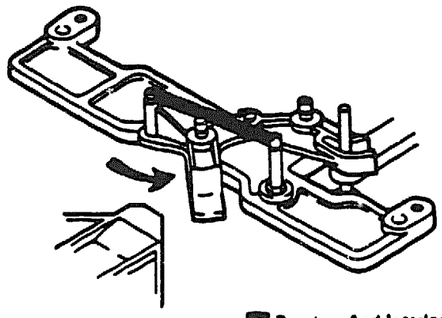
Top View



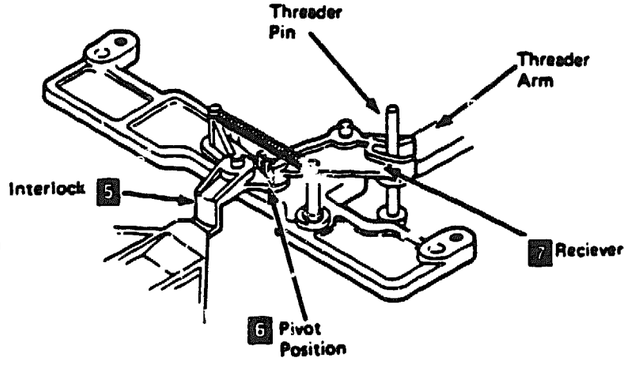
Load Assembly (Drives With Automatic Cartridge Loader)



Cartridge Latch Assembly



4 Receiver And Interlock In The Correct Position



Leader Block Replacement Procedure

Perform the following steps to replace the leader block when it has separated from the magnetic tape

Note: **See CART 20 and 21 for the following locations.**

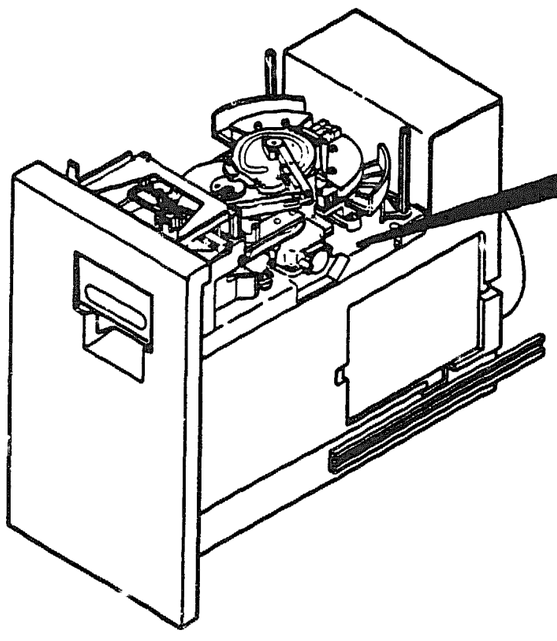
Warning: This procedure should be used only when data must be copied onto another cartridge. Use of this procedure may affect the performance of the leader block during threading and unloading. Recommend that the customer destroy the cartridge after the data has been copied.

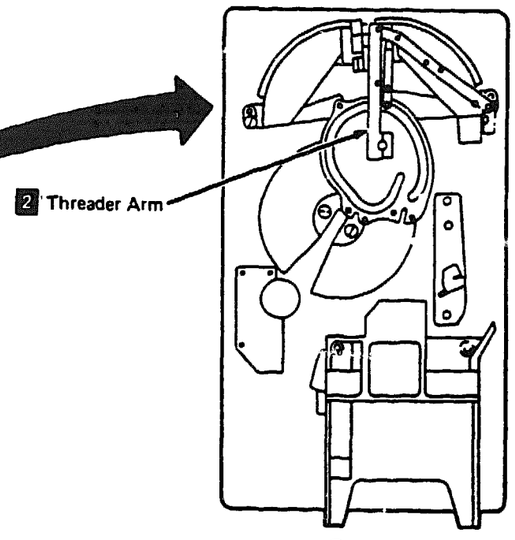
The use of any tool to remove the customer's tape may cause damage to the tape. Inform the customer before continuing with this procedure.

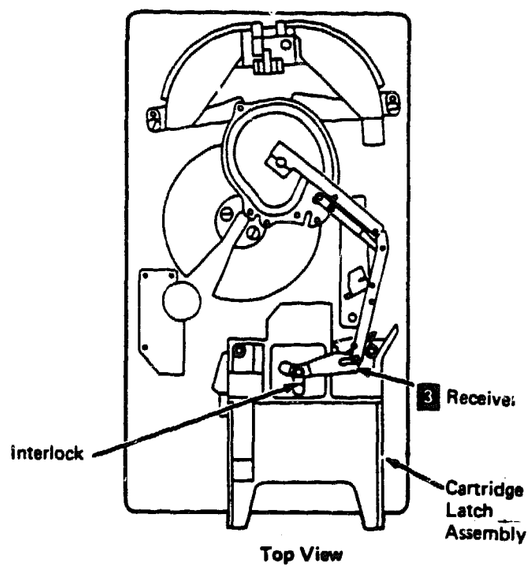
Do not damage the edges of the tape because edge damage can affect tape guiding.

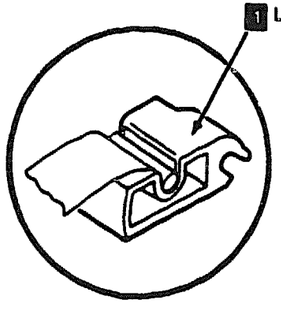
1. Remove the leader block 1 from the threader pin.
2. Move the threader arm 2 clockwise until the threader pin is at the cartridge and causes the receiver 3 to move.
3. On drives with the automatic cartridge loaders go to CART 14 for the procedure to remove the cartridge by hand, and when completed return to step 5.

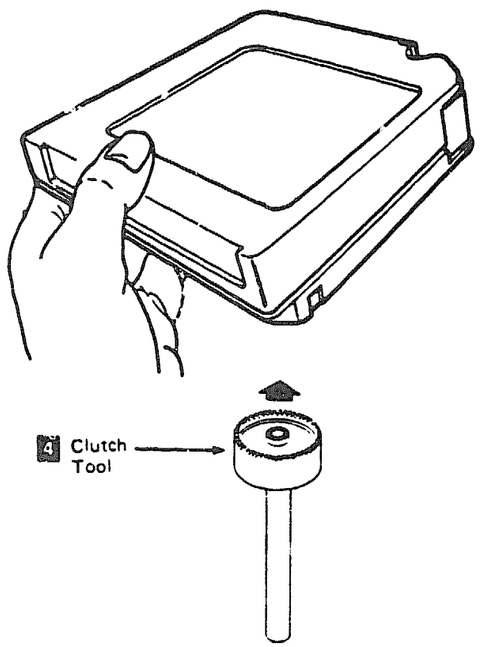
   On drives without the automatic cartridge loaders press down on the latch assembly 5 to open the cartridge latch.
4. Remove the cartridge.
5. Use the clutch tool 4 to release the clutch in the cartridge. Then turn the tool to unwind about 12 inches of tape from the cartridge. Use care so as not to damage the tape.
6. Remove the clutch tool.
7. Cut the tape end so that it is 90° to the tape edge.
8. Place a new leader block in the cavity 6 of the attachment tool 8 .
9. Place the tape so that the inside (the side facing the center of the cartridge) is up, in the guide groove 7 and over the leader block. Move the end of the tape against the end of the guide cavity.
10. Close the insert guide as shown 10 , and then place the insert pin 11 into the opening of the guide.
11. Close the insertion lever 9 until it touches the insert pin.
12. Push on the handle of the insertion lever to force the insert pin and the tape into the leader block.
13. Open the insertion lever and the insert guide.
14. Remove the leader block from the attachment tool.
15. Make sure that edges of the tape are aligned with the edges of the leader block. If the edges are not aligned, go back to step 7 and repeat the procedure.
16. Use the clutch tool to wind the tape back into the cartridge.
17. Put the leader block in the cartridge.
18. Using the clutch tool carefully turn the tape reel to tighten the tape inside the cartridge.
19. Remove the clutch tool.
20. Continue the repair action by returning to the MAP or procedure that sent you here.

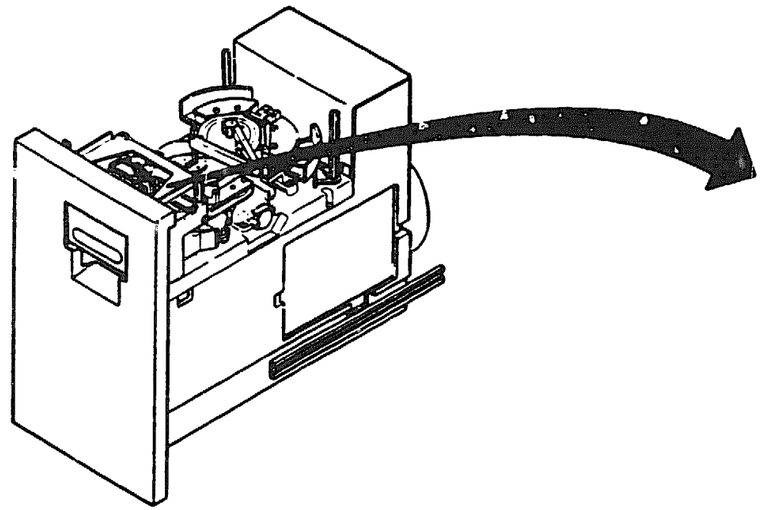


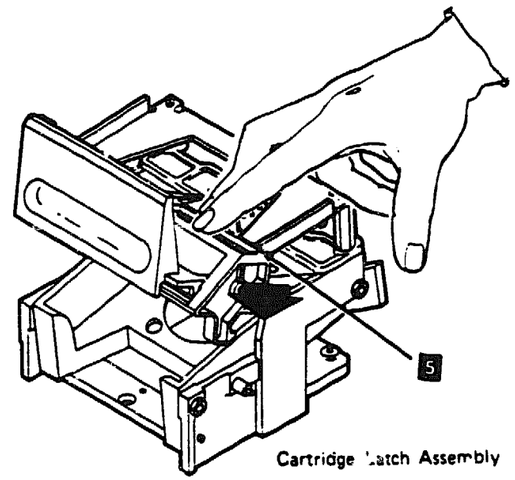


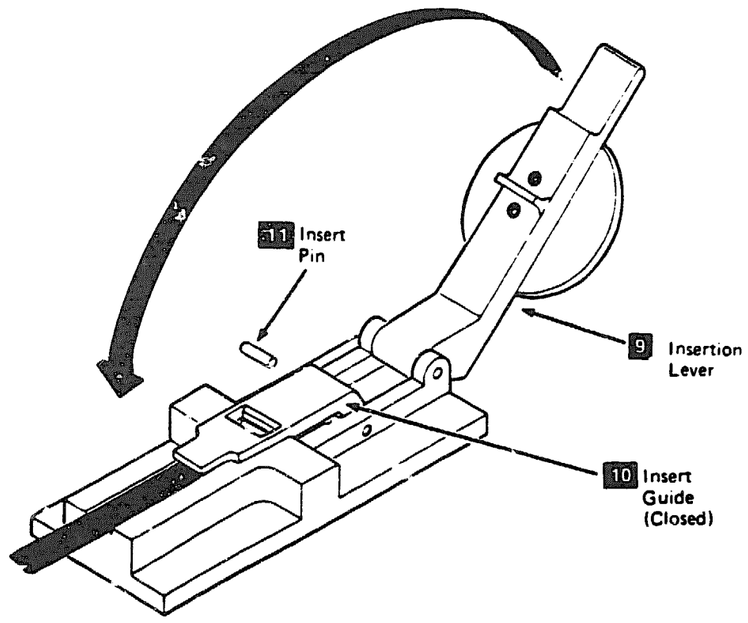


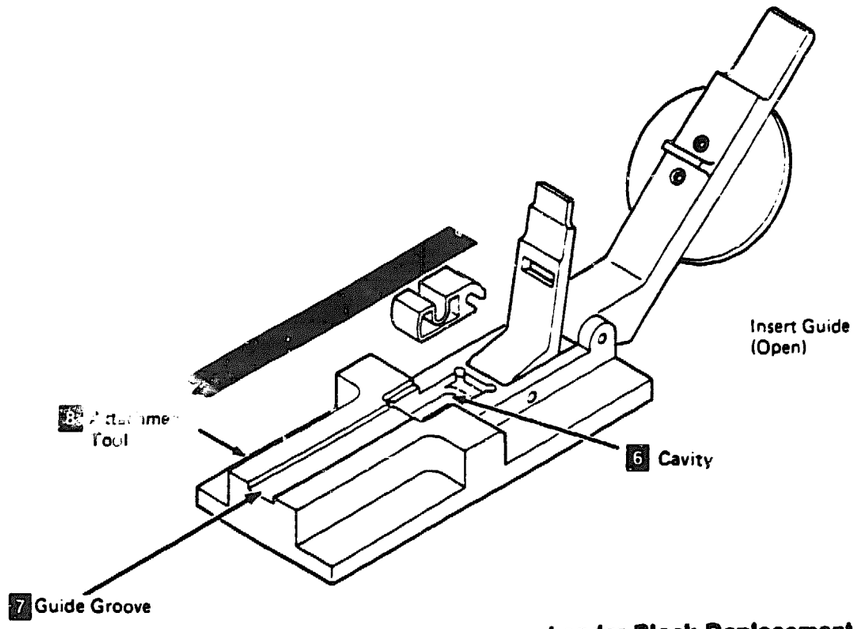



4 Clutch Tool




5
Cartridge Latch Assembly


11 Insert Pin
9 Insertion Lever
10 Insert Guide (Closed)


Insert Guide (Open)
6 Cavity
7 Guide Groove

Magnetic Tape Attachment Procedure

Perform the following steps when the end of the magnetic tape has pulled out of the cartridge and has wound onto the machine reel. **Warning:** This procedure should be used only when data must be copied onto another cartridge. Use of this procedure may affect the performance of the leader block during threading and unloading. Recommend that the customer destroy the cartridge after the data has been copied.

The use of any tool to remove the customer's tape may cause damage to the tape. Inform the customer before continuing with this procedure.

Do not damage the edges of the tape because edge damage can affect tape guiding.

1. Pull the tape by hand along the tape path until it is at the opening to the cartridge.

   Note: If the machine reel motor binds and does not allow the tape to move, place your finger on the machine reel hub 1 as shown. Move the hub counterclockwise, and at the same time move the magnetic tape.

2. Attach a 5 centimeter (2-inch) piece of double-stick cellophane tape to the shiny side of the magnetic tape. Leave a 2.5 centimeter (1-inch) overlap of cellophane tape.

   Attach the protruding end of the cellophane tape to the eraser end of a pencil or similar object.

   Note: Make sure the cartridge is in the latched position.

3. Insert the pencil and the tape with the cellophane tape into the cartridge opening and attach the cellophane tape to the cartridge hub 2. Remove the pencil without disturbing the cellophane tape that is attached to the hub.

CAUTION:
The motor and shaft may be hot.

4. Find the file reel motor shaft 3. Attach the tape removal tool 4 to your socket wrench handle 5.

5. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft.

6. Turn the tool clockwise (as seen from the top of the drive) to wind the magnetic tape onto the cartridge. Make at least one complete revolution of the hub.

   Note: If the cellophane tape pulls off the hub, attach the cellophane tape again.

7. Rotate the machine reel hub counterclockwise, and at the same time rotate the file reel motor shaft clockwise to make it easier to wind the tape onto the cartridge hub.

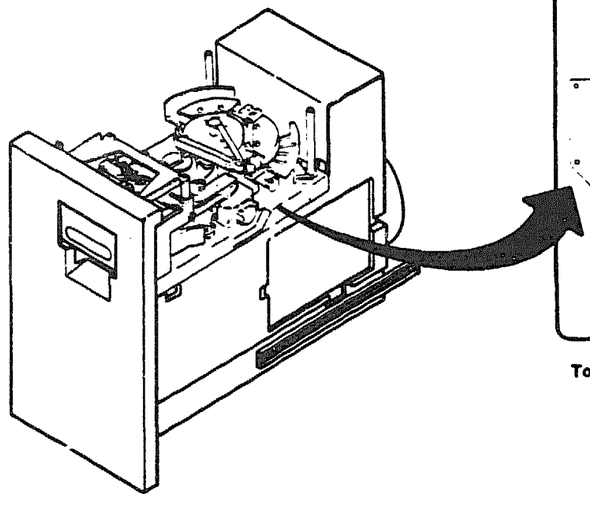
8. Set the Drive Power switch or the ac power circuit breaker to On (see LOC 1).

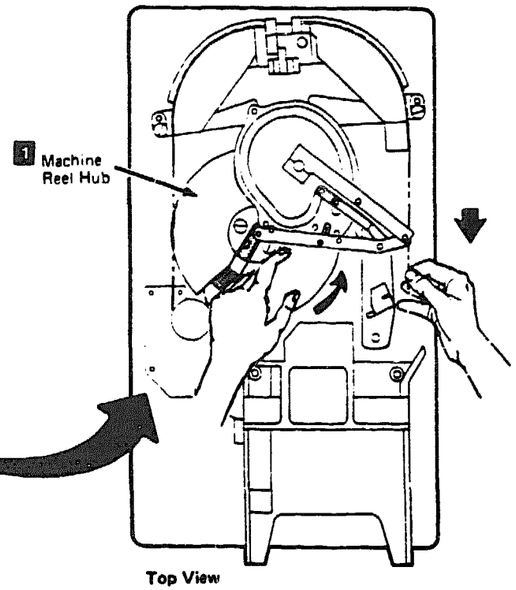
9. Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

10. Press the Unload switch to fully wind the tape into the cartridge. If the tape does not fully wind into the cartridge, request aid from your next level of support.

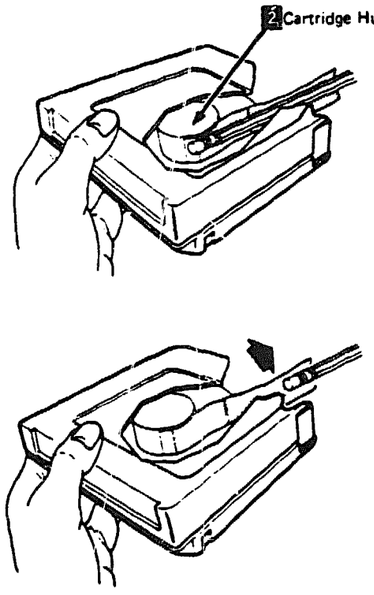
11. Remove the cartridge from the drive.

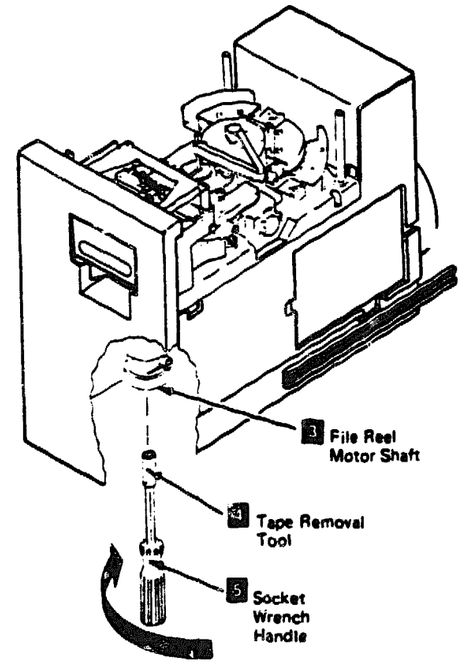
12. Continue the repair action by returning to the MAP or procedure that sent you here.





Top View





Procedure to Determine if the Cartridge Caused the Failure

This page contains the steps needed to determine if the drive failure is caused by a cartridge. Follow the procedure on this page for the CHK Codes you have.

CHK 14

CHK 14 occurs when the drive times out while trying to remove tape slack (loose wraps) at the beginning of the load operation, before the thread operation starts. The file reel motor is slowly turned backwards until it is stopped by the tape which is attached to the leader block.

CHK 14 can be caused by a cartridge if:

- There are excessive loose wraps in the cartridge.
- The tape is not attached to the leader block.

1. Load a cartridge, other than from the cartridge that caused the original failure on the drive.
2. Does CHK 14 appear on the drive display ?

   YES - Go to Chart A.

   NO - Go to Chart B.

CHK 21

CHK 21 occurs when the drive threading mechanism is slow or stalled. This can occur at the time the leader block is being put into the slot in the machine reel.

CHK 21 can be caused by a cartridge if:

- The leader block is not attached to the tape correctly.
- The leader block is damaged (burrs or marks).
- The cartridge clutch is sticking.

1. Load a cartridge other than the cartridge that caused the original failure on the drive.
2. Does CHK 21 appear on the drive display ?

   YES - Go to Chart A.

   NO - Go to Chart B.

CHK 25

CHK 25 occurs when the drive threading mechanism is slow or stalled during an unload operation, or the leader block is not attached during a load retry.

CHK 25 can be caused by a cartridge if the leader block is loose when the cartridge is loaded.

If the leader block is loose, the threader pin doesn't catch the leader block when the load operation starts. When the drive tries to recover, it cannot return to the home position because the leader block is in the way.

1. Load a cartridge, other than from the cartridge that caused the original failure on the drive.
2. Does CHK 25 appear on the drive display ?

   YES - Go to Chart A.

   NO - Go to Chart B.

CHK 28

CHK 28 occurs when the tape is not attached to the threader pin, or the file reel motor turns backwards during the threading operation.

CHK 28 can be caused by a cartridge if, during a threading operation:

- The leader block falls off the threader pin.
- The tape breaks or is damaged.

1. Load a cartridge other than the cartridge that caused the original failure on the drive.
2. Does CHK 28 appear on the drive display ?

   YES - Go to Chart A.

   NO - Go to Chart B.

CHK 2B

CHK 2B occurs when the drive times out while trying to remove tape slack after tape tension is lost as a result of a power failure or a device hard error condition. The file reel motor is slowly turned backwards until two machine reel revolutions have been detected. Then an unload operation is performed automatically.

CHK 2B can be caused by a cartridge if:

- The leader block is not attached to the tape.
- The cartridge clutch is sticking.
- The tape breaks or is damaged.
- Some foreign object is between the file reel and the cartridge.

1. Load a cartridge other than the cartridge that caused the original failure on the drive.
2. Does CHK 2B appear on the drive display ?

   YES - Go to Chart A.

   NO - Go to Chart B.

CHART A

Press the Unload button and remove the cartridge from the drive

Because the problem occurs on more than one cartridge, the problem is NOT caused by a cartridge.

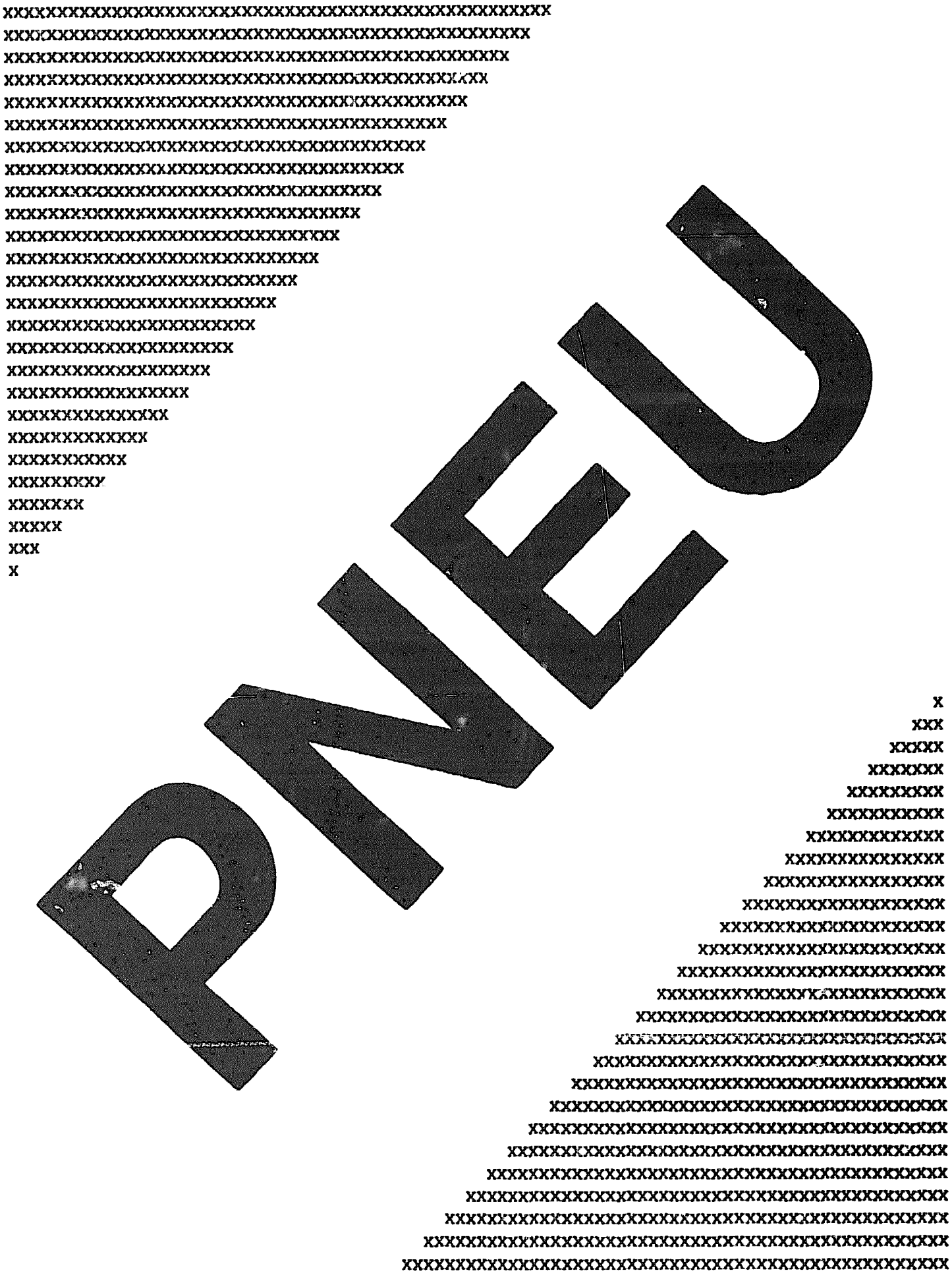
CHART B

Remove the cartridge from this drive and load the cartridge that failed into several different drives.

Does that cartridge fail on other drives?

```
YES NO
 |   |
 |   The problem is NOT caused by the cartridge.
 |
 |   Go to the EAO Section for this CHK for
 |   additional troubleshooting information.
 |
The problem is caused by the cartridge.

Go to START 140.
```


PNEU

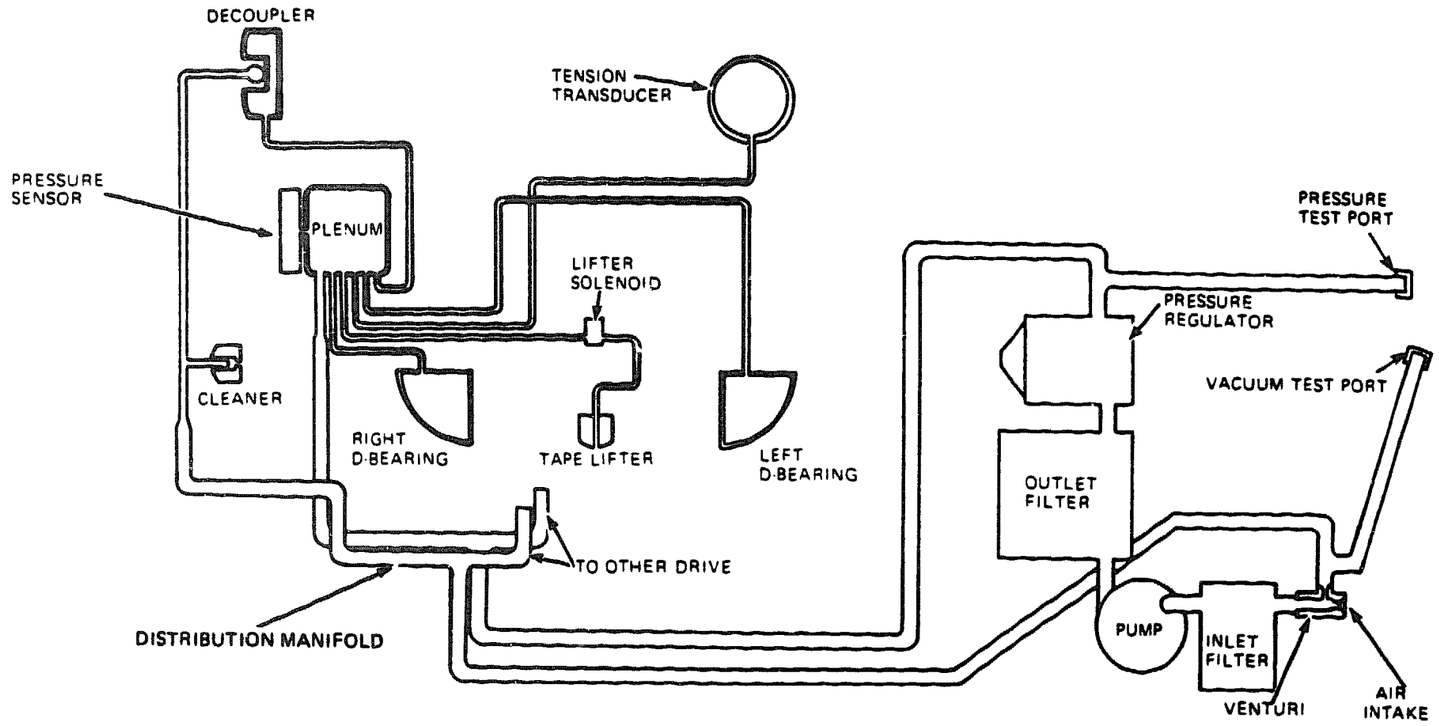
Contents

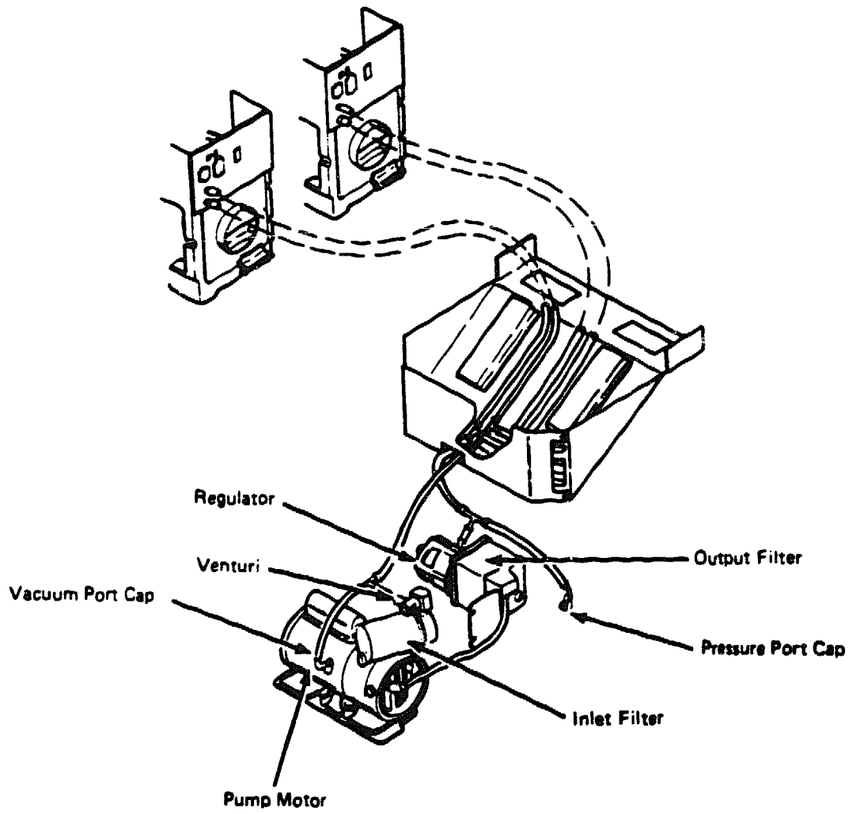
Pneumatic System 3

Pneumatic System Measurements 5
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Analysis Procedure 30





Pneumatics Supply Assembly

Pneumatic System Measurements

The following procedures are for measuring the air pressure and the vacuum of the pneumatic system. Use pressure/vacuum gauge kit to take the measurements.

Note: See PNEU 6 for the following locations.

Warning: Ensure that both drives in the tape transport unit are offline to the system before continuing with the following measurements or adjustments.

Pressure Measurement

1. Set the tape transport unit ac power circuit breaker to off (see LOC 1).
2. Remove the pressure port cap [ ].

   Connect a hose between the pneumatic assembly pressure port and the gauge.
4. Set the tape transport unit ac power circuit breaker to on.
5. Load tapes into both drives of the tape transport unit.
6. The meter should indicate 31 + 3, - 0.6 kilopascals (125 + 12, - 2.5 inches). Record the pressure.

   If regulator adjustment is required, go to Step 7; if adjustment is not required, go to Step 10.

To Adjust the Regulator

Note: Do not make any regulator adjustments unless the pneumatic system for this tape transport unit has been checked for a dirty filter, or hoses that are loose, clogged, open or pinched. A defect in the pneumatic system can give false pressure readings.

7. Remove the small plastic plug from the adjustment port (end, center) of the regulator.
8. Insert an allen wrench into the adjustment port and engage the recessed adjustment screw
9. To decrease the pressure, turn the adjustment screw clockwise. To increase the pressure, turn the adjustment screw counterclockwise.
10. When the pressure is correct (31 + 3, - 0.6 kilopascals), remove the wrench and replace the plastic plug.
11. Remove the tapes from both the drives of the tape transport unit.
12. Set the tape transport unit ac power circuit breaker to OFF (see LOC 1).
13. Disconnect the hose from the pressure/vacuum gauge to the pressure port.
14. Replace the pressure port cap.
15. Set the tape transport unit ac power circuit breaker to on.
16. Continue by returning to the MAP or procedure that sent you here.

Vacuum Measurement

1. Set the tape transport unit ac power circuit breaker to off (see LOC 1).
2. Remove the vacuum port cap [ ].
3. Connect a hose between the pneumatic assembly vacuum port and the gauge.
4. Set the tape transport unit ac power circuit breaker to on.
5. Load tapes into both drives of the tape transport unit.
6. The gauge should indicate 5.75 ± 2.25 kilopascals (23 ± 9.0 inches).

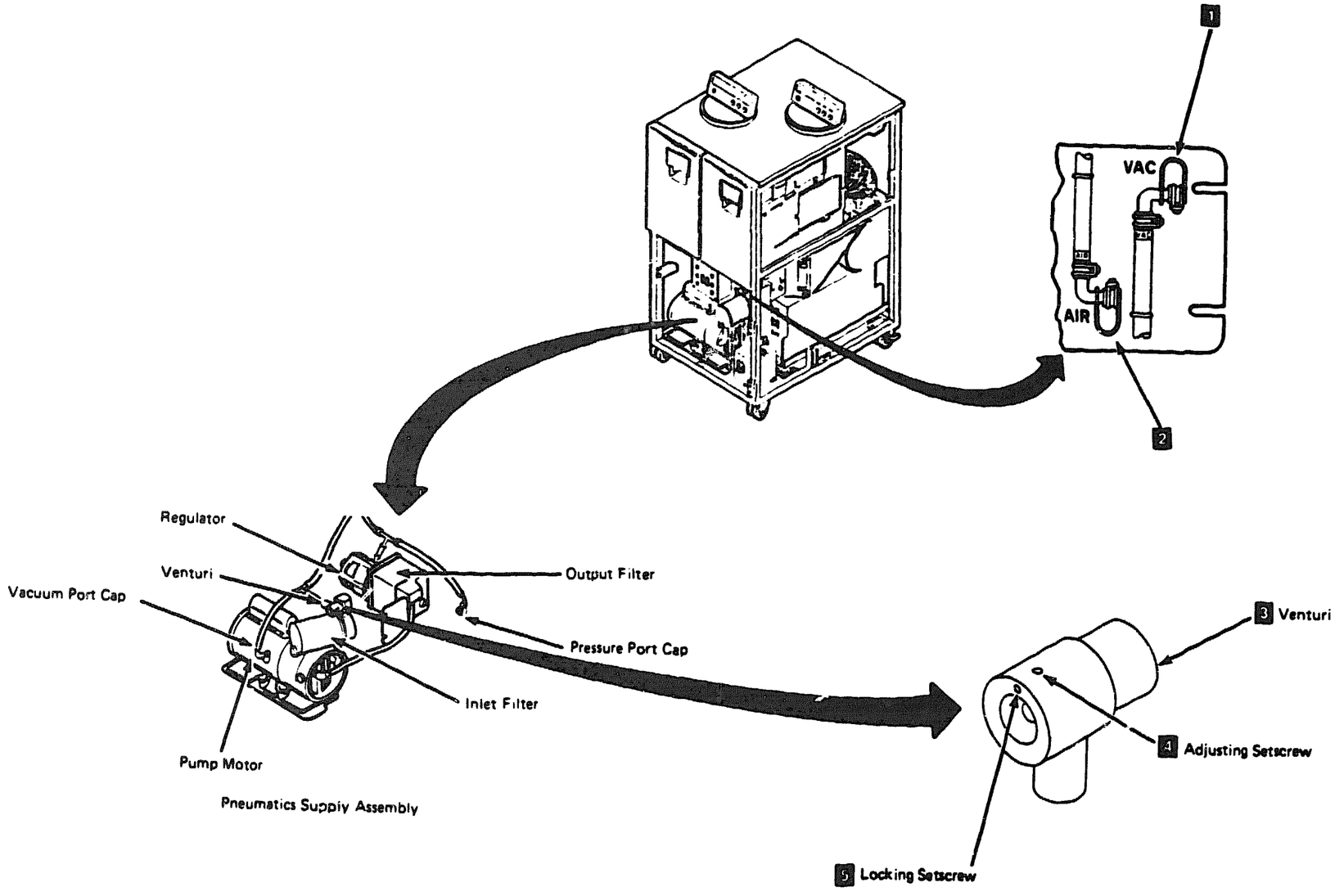
   If vacuum adjustment is required, go to step 7; if adjustment is not required, go to Step 8.

To Adjust the Vacuum

Note: Do not make any vacuum adjustments unless the pneumatic system for this tape transport unit has been checked for a dirty filter, or hoses that are loose, clogged, open, or pinched. A defect in the pneumatic system can give false vacuum readings.

7. The venturi [ ] has a locking setscrew and an adjusting setscrew.
   a. Loosen the locking setscrew [ ].
   b. Turn the adjusting setscrew [ ] until the vacuum gauge is correct (5.75 ± 2.25 kilopascals).
   c. Tighten the locking setscrew.
8. Remove the tapes from both the drives of the tape transport unit.
9. Set the tape transport unit ac power circuit breaker to off.
10. Disconnect the hose from the pneumatic assembly.
11. Replace the vacuum port cap.
12. Set the tape transport unit ac power circuit breaker to on.
13. Continue by returning to the MAP or procedure that sent you here.

Pneumatic System Measurements (Continued)



Pneumatics Supply Assembly

Air Pressure Loss

The following procedure helps you in isolating pneumatic system failures when the problem indication is CHK 46

A CHK 46 occurs when the plenum pressure sensor does not get enough air pressure to close the pressure sensor contacts

Follow this procedure, unless otherwise directed, until the repair is made. After the repair is made, this procedure will direct you to your next action.

Note: See PNEU 11 for the following locations.

Before You Begin

Set the drive Online/Offline switch to Offline on both drives (see LOC 1).

If there is a cartridge in either drive, try to remove it using the following procedure. If the cartridge cannot be removed, go to "Cartridge Removal by Hand" on CART 10 for further aid.

1. Set the drive Ready/Not Ready switch on both drives to Not Ready (see LOC 1).
2. Remove the cover on pin side of the drive logic board [1], and jumper pin 02A-A1G6A02 (+ air pressure loss) to pin 02A-A1B2U08 (Ground).
3. Press the Reset switch (see LOC 1).
4. Press the Unload switch (see LOC 1).
5. After the cartridge has unloaded, remove the jumper.
6. Remove the cartridge.

Analysis Procedure

7. Remove the tape transport unit front cover (See CARR-DR 2-1), and find the pump motor [2].
8. Determine if the pump motor is running.

   Note: To determine if the pump motor is running, listen for the sound of the motor running or remove the pressure port cap [3] and feel for escaping air.

001
Is the pump motor running?

YES NO
- NO → 002
  Check for 220 V ac at J4 on the tape transport unit dc power supply (see LOC 1) as follows:

  a. Remove plug P4.

  b. Measure the voltage between pins 1 and 3. See PWR 20 for the voltage tolerance.

  Is the voltage within tolerance?

  YES NO
  - NO → 003
    Exchange the following FRU.
    For the removal and replacement procedures, see CARR-DR 1-1.

      FRU095 - DC power supply

    Is the voltage within tolerance now?

    YES NO
    - NO → 004
      Request aid from your next level of support.
    - YES → 005
      Replace plug P4.

      Go to "Exit Procedure" on this page.
  - YES → 006
    Exchange the following FRU. For the removal and replacement procedures, see CARR-DR 1-1.

      Note: If the pump motor (FRU030) or the regulator (FRU031) is exchanged, the output filter (FRU032) must also be exchanged.

      FRU030 - Pump motor

    Is the pump motor running now?

    YES NO
    - NO → 007
      Request aid from your next level of support.
    - YES → 008
      Go to "Exit Procedure" on this page.
- YES → 009
  Go to step 010.

010
Measure the pressure at the regulator (see PNEU 5).

DO NOT attempt to adjust the pressure regulator during the failure isolation procedure.

Is the pressure out of tolerance (see PNEU 5)?

YES NO
- NO → 011
  Because the pressure is within tolerance, the problem must be a single drive failure.

  Go to PNEU 20, "Pneumatics Problem on a Single Drive," for the failing drive.
- YES → 012
  The pressure is out of tolerance. Clamp the plenum supply hose [redacted] on drive 0. See CARR-DR 3-1. Measure the pressure at the regulator.

  Is pressure within tolerance (see PNEU 5)?

  YES NO
  - NO → 013
    Go to step 018.
  - YES → 014
    Remove the clamp from drive 0. Clamp the plenum supply hose on drive 1. Measure the pressure at the regulator.

    Is pressure within tolerance (see PNEU 5)?

    YES NO
    - NO → 015
      Remove the clamp from drive 1.

      Go to PNEU 20, "Pneumatics Problem on a Single Drive," for drive 0.
    - YES → 016
      Go to step 017.

017
The failure is in the primary pneumatic system and not in either drive.

Remove any clamps on the plenum supply hoses.

See PNEU 3 for a diagram of the pneumatic system, and PNEU 5 for the correct pressure and vacuum tolerances; then go to "Analysis Procedure" on PNEU 12 and follow the steps.

018
Remove the clamp from drive 0. Clamp the plenum supply hose on drive 1. Measure the pressure at the regulator.

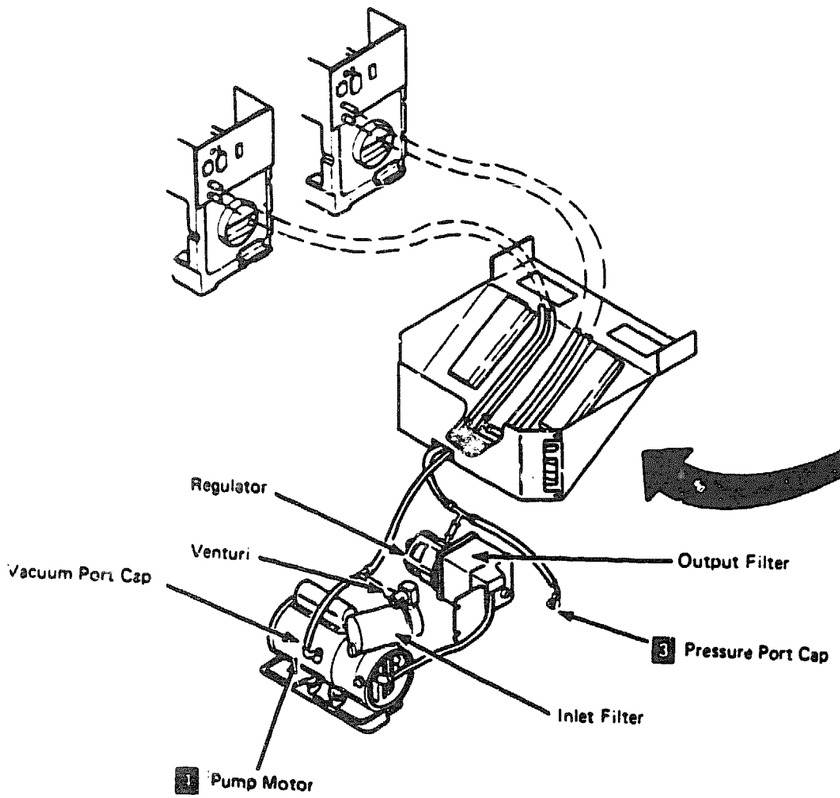
Is pressure within tolerance (see PNEU 5)?

YES NO
- NO → 019
  Go to step 017.
- YES → 020
  Remove the clamp from drive 1.

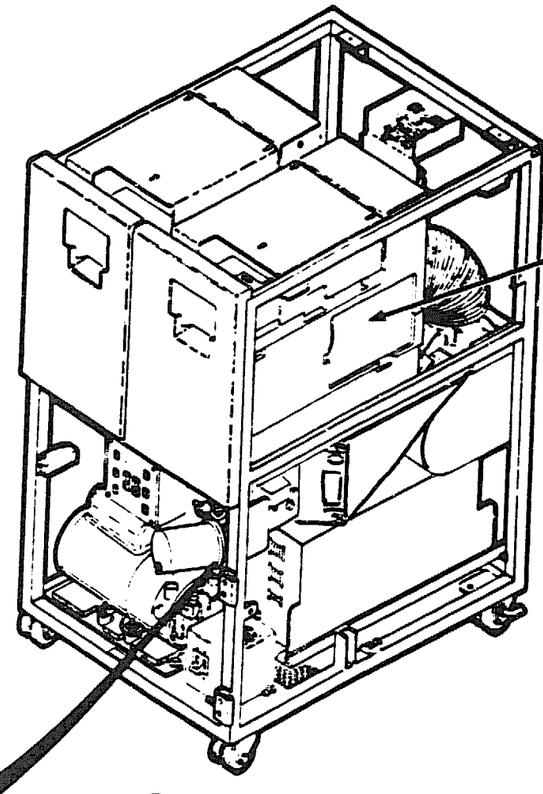
  Go to PNEU 20, "Pneumatics Problem on a Single Drive," for drive 1.

Exit Procedure

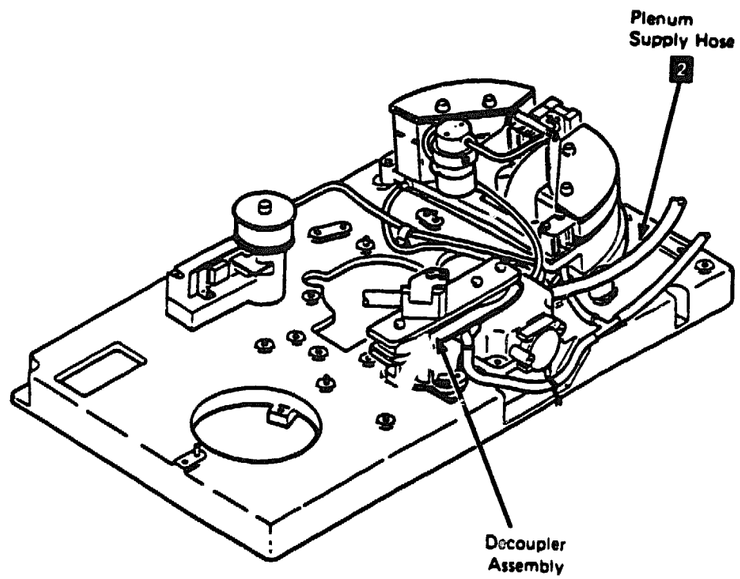
1. Refer to PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. Set the Online/Offline switch to Online on BOTH drives.
3. Install a scratch tape and run GMP.



Pneumatics Supply Assembly



Tape Transport Unit



Tape Deck - Top View

Air Pressure Loss (Continued)

You were sent here after the preceding procedures showed a failure in the primary pneumatics system. This procedure will isolate the problem.

Failure in the Primary Pneumatics System

```
001
Is the pressure high?

YES NO
 |
 001
 The pressure is low.

 Is the vacuum high?

 YES NO
  |
  002
  Is the vacuum low?

  YES NO
   |
   003
   The vacuum is within tolerance.
   Exchange the following FRUs.  For
   the removal/replacement procedures
   see CARR-DR 1-1.

     Note:  If the pump motor (FRU030)
     or the regulator (FRU031) is
     exchanged, the output filter
     (FRU032) must also be exchanged.

     FRU031 - Regulator
     FRU032 - Output filter
     FRU034 - Pressure hose assembly
     FRU037 - Manifold-in pressure hose
     FRU03y - Plenum supply hose

   Go to "Exit Procedure" on this page.

  004
  Remove the inlet filter (FRU033) and
  canister from the pump motor.  See
  CARR-DR 1-1 to find the removal page
  for FRU033.

  Do not replace the canister at this
  time.

  Set the tape transport unit ac power circuit
  breaker to ON (see LOC 1).

  Refer to PNEU 5 and measure, but
  DO NOT adjust, the pressure.

  Is the pressure within tolerance?

  YES NO
   |   |
   |   |
   |   |
A  B   C  D
```

```
A  B  C  D
|  |  |  |
|  |  |  005
|  |  |  Exchange the following FRUs.  For
|  |  |  the removal/replacement procedures
|  |  |  see CARR-DR 1-1.
|  |  |
|  |  |    Note:  If the pump motor (FRU030)
|  |  |    or the regulator (FRU031) is
|  |  |    exchanged, the output filter
|  |  |    (FRU032) must also be exchanged.
|  |  |
|  |  |    FRU030 - Pump motor
|  |  |    FRU031 - Regulator
|  |  |    FRU032 - Output filter
|  |  |    FRU065 - Pump to output filter hose
|  |  |    FRU037 - Manifold-in pressure hose
|  |  |
|  |  |  Go to "Exit Procedure" on this page.
|  |  |
|  |  006
|  |  Exchange the following FRU.  For the
|  |  removal/replacement procedures see
|  |  CARR-DR 1-1.
|  |
|  |    FRU033 - Inlet filter
|  |
|  |  Go to "Exit Procedure" on this page.
|  |
|  007
|  Exchange the following FRUs.  For the
|  removal/replacement procedures see
|  CARR-DR 1-1.
|
|    Note:  If the pump motor (FRU030) or the
|    regulator (FRU031) is exchanged, the
|    output filter (FRU032) must also be
|    exchanged.
|
|    FRU030 - Pump motor
|    FRU031 - Regulator
|    FRU065 - Pump to output filter hose
|    FRU037 - Manifold-in pressure hose
|
|  Go to "Exit Procedure" on this page.
|
008
Exchange the following FRU.  For the
removal/replacement procedures see
CARR-DR 1-1.

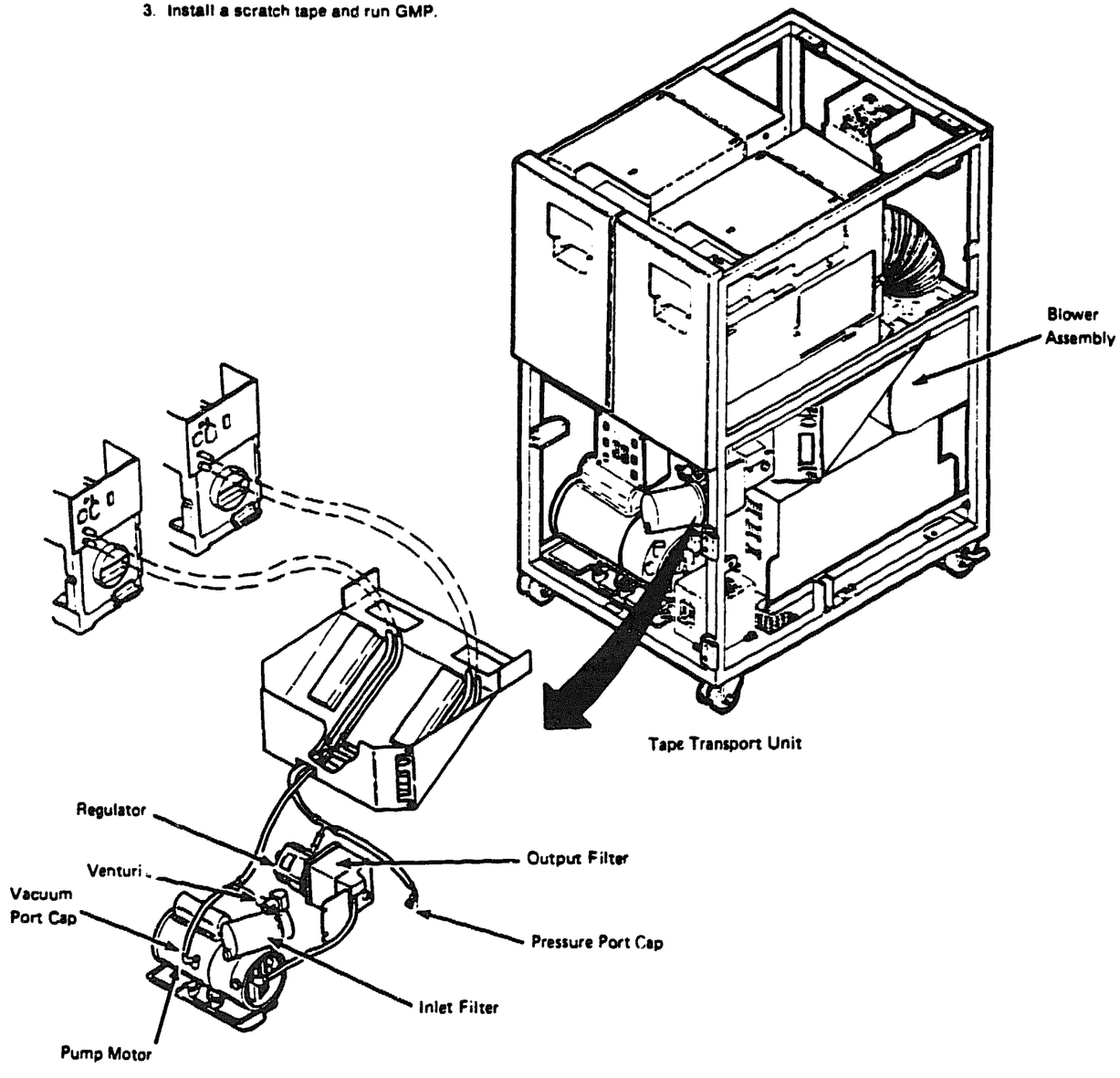
  Note:  If the pump motor (FRU030) or the
  regulator (FRU031) is exchanged, the
  output filter (FRU032) must also be
  exchanged.

  FRU031 - Regulator

Go to "Exit Procedure" on this page.
```

Exit Procedure

1. Refer to PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. Set the Online/Offline switch to Online on BOTH drives.
3. Install a scratch tape and run GMP.



Pneumatics Problem on a Single Drive

You were sent here for further problem isolation, after ti measurements taken on the primary pneumatics system w..re correct.

Pneumatics Problem on a Single Drive

001
Press the reset switch on the drive.

Does CHK 46 appear on the drive display?

YES NO
| |
| 002
| Exchange the following FRUs. For the
| removal/replacement procedures see
| CARR-DR 1-1.
|
| FRU040 - Pressure sensor
| FRU085 - Drive control card
|
| Go to "Exit Procedure" on this page.
|
003
Remove the cover on pin side of the drive logic board 1, and jumper pin 02A-A1G6A02 (+ air pressure loss) to pin 02A-A1B2U08 (Ground).

Press the Reset switch (see LOC 1).

Did the CHK 46 disappear?

YES NO
| |
| 004
| Remove the jumper and exchange the
| following FRU. For removal/replacement
| procedures, see CARR-DR 1-1.
|
| FRU085 - Drive control card
|
| Go to "Exit Procedure" on this page.
|
A

A
|
005
Remove the jumper.

Pinch each hose that leaves the plenum 2, one at a time (except the plenum supply hose), and press the drive reset switch.

Did the CHK 46 reappear on the display after each hose was pinched and the drive reset?

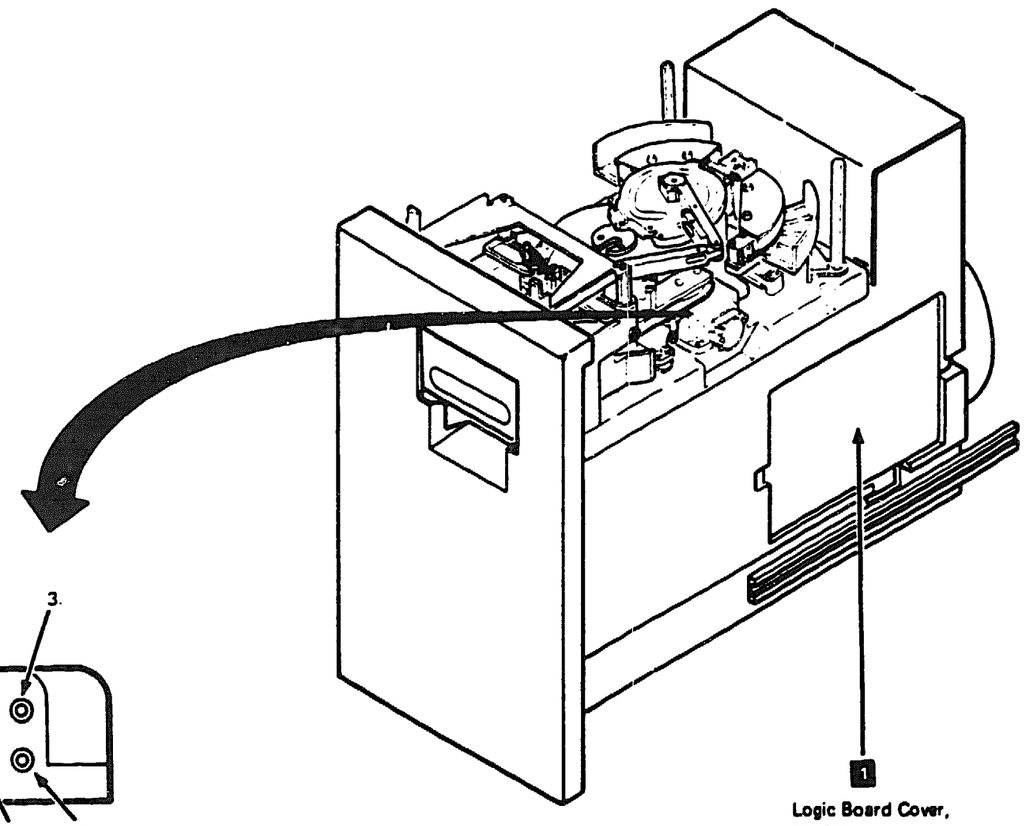
YES NO
| |
| 006
| Exchange or attach the hose causing the
| failure.
|
| Go to "Exit Procedure" on this page.
|
007
Exchange the following FRUs. For the removal-replacement procedures, see CARR-DR 1-1.

FRU040 - Pressure sensor
FRU041 - Plenum assembly
FRU039 - Plenum supply hose
FRU034 - Pressure hose assembly
FRU037 - Manifold-in pressure hose

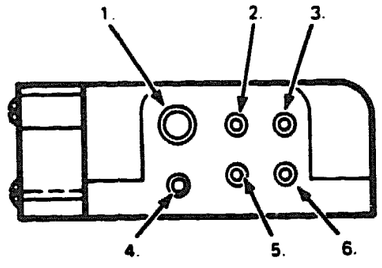
Go to "Exit Procedure" on this page.

Exit Procedure

1. Refer to PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. Set the Online/Offline switch to Online on BOTH drives.
3. Install a scratch tape and run GMP.



1 Logic Board Cover, Pin Side



2 Plenum Hose Locations
1. Plenum Supply
2. Tape Lifter Solenoid
3. Decoupler Pressure
4. Right Guide Bearing
5. Transducer
6. Left Guide Bearing

Pneumatic Checkout Procedure

Introduction

Read/write and data check errors can be caused by vacuum missing at the tape cleaner assembly or at the decoupler assembly. Pneumatic pressure problems are indicated by CHK 46 (air pressure loss) on the operator panel, but there is no indication of a detached or clogged vacuum hose.

Vacuum Checks

See CARR-LOC 2-3 for cover removal. Figure 2 shows the components that are on the top of the tape deck (some pressure hoses have been removed for clarity). Figure 1 shows the pneumatic components at the front of the tape transport unit.

Analysis Procedure

1. Set the drive Online/Offline switch to Offline (see LOC 1).

2. With power on the drive, detach the vacuum supply hose 1 from the vacuum distribution tee and sense for vacuum by covering the hose end with a finger.

```
001
Is there vacuum?

YES NO
 |   |
 |   002
 |   Reconnect the vacuum supply hose to the
 |   vacuum distribution tee.  Open the vacuum
 |   port cap 2 and sense for vacuum as before.
 |
 |   Is there vacuum?
 |
 |   YES NO
 |    |   |
 |    |   003
 |    |   Reseat or exchange the following FRU.
 |    |   See CARR-DR 1-1 for the removal and
 |    |   replacement procedures if necessary.
 |    |
 |    |     Note:  If the pump motor (FRU030) or
 |    |     the regulator (FRU031) is exchanged,
 |    |     the output filter (FRU032) must also
 |    |     be exchanged.
 |    |
 |    |     FRU030 - Pump motor
 |    |
 |    |   Close the vacuum port cap.
 |    |
 |    |   Go to "Exit Procedure" on this page.
 |    |
A   B

A   B
 |  |
 |  004
 |  Reseat or exchange the following FRU.
 |  See CARR-DR 1-1 for the removal and
 |  replacement procedures if necessary.
 |
 |    FRU035 - Vacuum hose assembly
 |    FRU212 - Vacuum supply hose
 |    FRU038 - Manifold-in vacuum hose
 |
 |  Close the vacuum port cap.
 |
 |  Go to "Exit Procedure" on this page.
 |
005
Reseat or exchange the following FRUs.
See CARR-DR 1-1 for the removal and
replacement procedures if necessary.

  FRU043 - Decoupler vacuum hose
  FRU047 - Cleaner supply hose.
  FRU219 - Vacuum distribution tee

Reconnect the vacuum supply hose.

Go to "Exit Procedure" on this page.
```

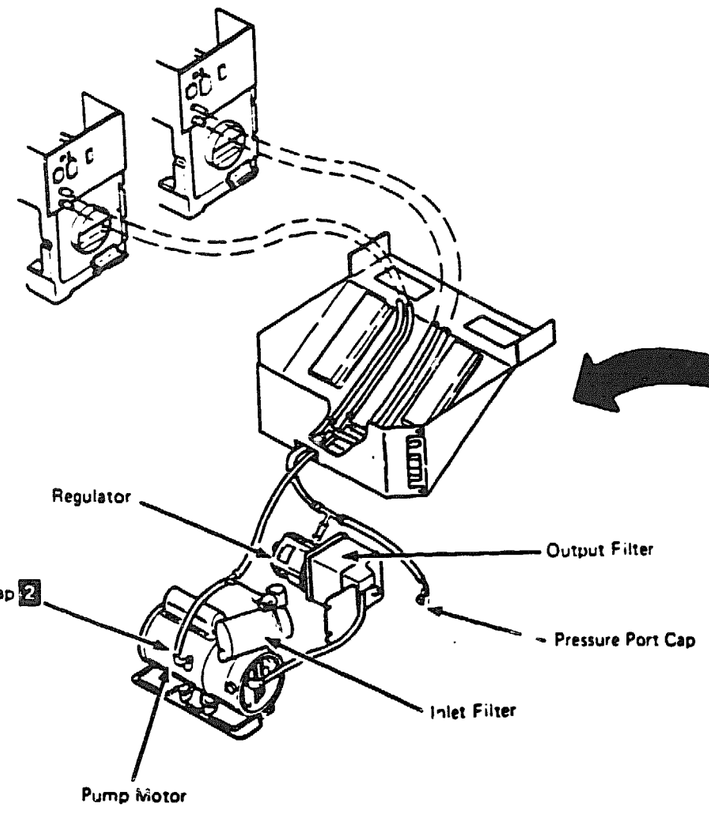


Figure1. Pneumatics Supply Assembly

Exit Procedure

1. See PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. Set the Online/Offline switch to Online on BOTH drives.
3. Install a scratch tape and run GMP.

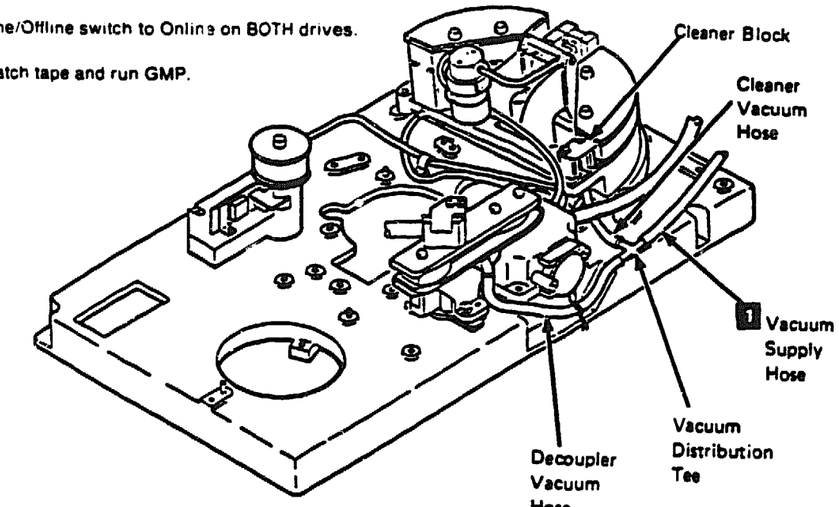
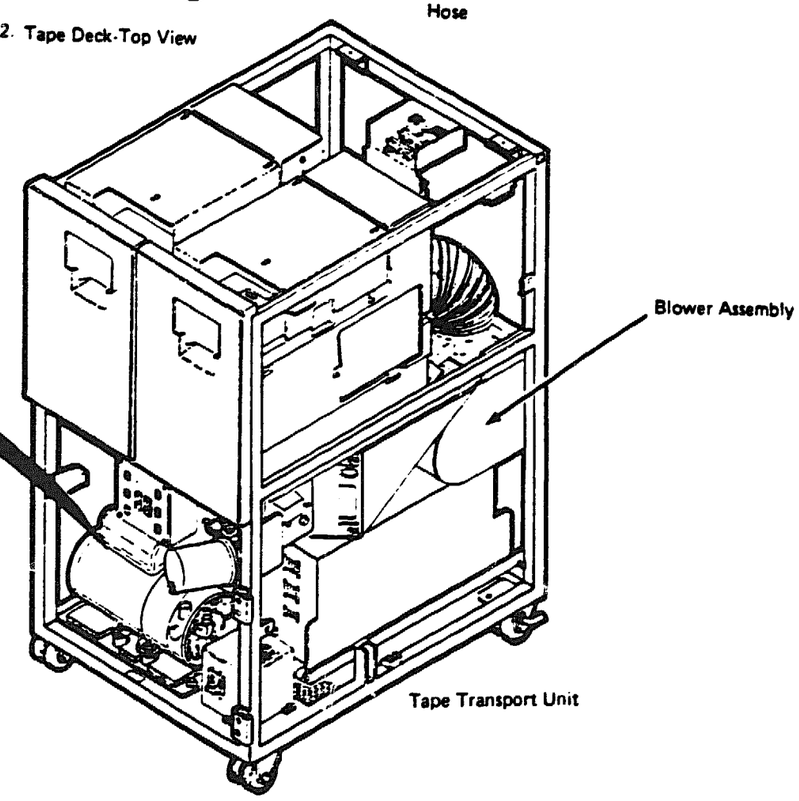


Figure 2. Tape Deck-Top View




MSG

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Message List For Pseudo Sense Builder

Message Number (Hex)	Message Description (Not Exact Text)	Action
01	Invalid Message Pointer	Call next level of support.
11	Microprocessor Failure From Diagnostics	Replace FRU 117.
12	Diagnostic completed and failed (from diagnostics)	None (internal use only).
13	Microcode error (from support diagnostics)	Call next level of support.
14	Diagnostic completed successfully (from diagnostics)	None (internal use only).
19	Microcode error (from diagnostics)	Call Next level of support.
22	Invalid application ID	Rekey your request.
23	Invalid application suffix	Rekey your request.
24	Invalid loop option	Rekey your request.
25	Invalid drive selection	Rekey your request.
28	Unit check due to command reject (ERA 27)	External program error. Call next level of support.
29	Byte 1 should be '80'x	Rekey your request.
2A	Byte 1 should be '00'x	Rekey your request.
2B	Data should be zero	Rekey your request.
2C	Byte 6 should be 'A0'x or '03'x	Rekey your request.
2D	Byte 0 is invalid	Rekey your request.
31	Diskette drive error	Try a new diskette. If the problem persists, replace the diskette drive.
32	Diagnostic aborted due to Channel 'B' interrupt	Terminate activities on Channel B.
34	Diagnostic aborted due to Channel 'A' interrupt	Terminate activities on Channel A.
36	All parameters are valid	For code debugging purpose only.
39	Cannot continue, MD attached	Detach the MD and restart.
42	Interface disconnect occurred	Re-IPL. If the problem persists call the next level of support.
43	Selective reset occurred	Re-IPL. If the problem persists call the next level of support.
System reset occurred	Re-IPL. If the problem persists call the next level of support.	
45	SDM received unrecognized command	Call the next level of support.
46	Unit check due to channel sequence error	Program error.
47	Unit check due to command sequence error	Program error.
48	Unit check due to device reserved to other	Issue a system reset.
49	Unit check due to a diagnostic state command reject	Program error. Call the next level of support.
4C	Unit check due to bus out parity	Check interface between the TA90 and the HSC.
4D	Unit check due to deferred unit check	Call the next level of support.
4E	Unit check due to device not ready	Call the next level of support.
4F	Unrecognized channel interrupt occurred	Call the next level of support.
50	Data transfer to channel truncated	Reissue the command.
51	Data transfer from channel truncated	Reissue the command.
52	Channel adapter error occurred during data transfer	Call the next level of support.
53	Unrecognized channel adapter interrupt during data transfer	Call the next level of support.
54	Channel adapter 'B' error	Replace channel adapter B.
58	Channel adapter 'A' error	Replace channel adapter A.
59	Device has already been assigned	Re-IML. If the problem persists, call the next level of support.
63	Unable to present channel status	Re-IML. If the problem persists, call the next level of support.

Error Recovery Procedures Actions List

This list provides reference information about the system recovery actions and operator actions that are unique to the TA90 Subsystem

ERPA #	System Description	Definition of Error	System Recovery Action	Operator Action
45	Drive Assigned Elsewhere	The drive is not assigned to the channel path that issued the command	Permanent error indicated Error message generated	Verify that the drive is mounted
49	Bus-Out Parity Check	A bus-out parity error was detected on the command or parameter bytes. (Does not include bus-out parity during data transfer type commands.)	Permanent error indicated Error message generated Error Log report	Call for service
39	Backward at BOT	The beginning of tape (BOT) was reached during a backward command	Permanent error indicated Error message generated	
27	Command Reject	Command reject can occur for any of the following • Invalid argument for a command • Command sequence error • A DSE command is not chained to an erase gap command. • An unidentified command	Permanent error indicated Console message generated	May be a software problem. Rerun the job using another drive.
25 25	Write Data Check (deferred unit check) Write Data Check (postponed unit check)	• The data is contained in the buffer but has not been correctly written. • Error Recovery Procedures (ERP) has retried erase gaps and rewrites, but has been unable to successfully complete the write operation. • A permanent error was detected during a write data, IBG or tape mark operation. Retries have not been successful. • A temporary error has been detected with mode set bit 7 equal to 1.	Permanent error indicated Console message generated. Error Log report Increase permanent read/write SDR counter	Call for service
23	Read Data Check	A permanent read error or a temporary read error (mode set bit 7 = 1) has occurred.	Permanent error indicated Console message generated Error Log report Increase the permanent read/write SDR counter.	Call for service.

ERPA #	System Description	Definition of Error	System Recovery Action	Operator Action
2D	Data Security Erase Failure	The drive became not-ready after a DSE command was issued, or an error occurred while processing a DSE command	Permanent error indicated Error message generated Error Log report	Verify that the drive is ready Retry the job Call for service
21	Data Streaming Not Operational	After attempts to transfer data in streaming mode, the TCU has switched to "DC interlock" mode until system reset or demount	Permanent error indicated Error message generated Error Log report	Call for service.
38	Physical End-of-Tape	The physical end of the tape was encountered while processing a read or write type of command	Permanent error indicated Error message generated	Notify the user of a possible program failure If the problem remains, call for service
2C	Permanent Equipment Check	Set either of two ways. 1 The tape control unit can't determine the correct recovery because of a Invalid error code b Sense builder error c Microprogram error 2 Error recovery was attempted and failed	Permanent error indicated Error message generated Error Log report	Call for service
28	Write ID Mark Check	The ID mark could not be written at BOT. The data remains in the buffer.	Permanent error indicated Error message generated. Error Log report	Call for service.
35	Drive Equipment Check	The drive detected an error from which the ERPA was unable to recover or a CHK message is currently in the drive message display, and a load display command is issued (drive display busy).	Permanent error indicated Console message generated Error Log report	Call for service
36	Drive Patch Load Failure	The tape control unit could not successfully load microprogram patches to the drive	Permanent error indicated Console message generated Error Log report	Call for service
30	File Protected	A write operation was attempted on a file protected tape	Permanent error indicated. Error message generated.	Verify the file protection of the tape. If correct, cancel the job and call for service. If not correct, set to the proper status and rerun the job.

Error Description List (Continued) MSG 21-1

ERPA #	System Description	Definition of Error	System Recovery Action	Operator Action
33	Load Failure	1 The cartridge has not loaded correctly in the drive 2 The load operation could not complete properly due to a hardware failure in the drive	Console message generated Error Log report Reissue the command, if unsuccessful post 'permanent error '	If a permanent error, call for service
34	Manual Load Failure	The drive cannot maintain tape tension and control tape movement during an 'unload command	Console message generated. Error Log report Reissue the command, if unsuccessful post 'permanent error '	If a permanent error, call for service
3A	Drive Reset by Operator	The manual reset switch on the drive has been pressed and the drive is not ready	Console intervention required message is generated to ready the drive. After the drive is ready, reissue the command.	A normal condition. Call for service only if the drive continues to go not ready for no apparent reason, or cannot be made ready
43	Intervention Required	A Start I/O command was issued to a drive that does not have a volume properly mounted.	Console message generated No Error Log report Retry the failing CCW.	Verify that the volume is mounted correctly. If the problem remains, call for service.

ERPA #	System Description	Definition of Error	System Recovery Action	Operator Action
	I/O Error	I/O Error caused by 1. Sense failure 2. Invalid ERPA code (less than 20 or greater than 4C)	Permanent error indicated Console message generated Error Log report	May be a firmware problem. Rerun the job using another drive. Call for service.
24	Load Display Check	A load display command was issued to a drive while the cartridge was being loaded.	Permanent error indicated Console message generated. Error Log report	May be a software problem. Rerun the job using another drive. If the problem remains on a single drive, call for service.
2E	Not Capable	The density mark could not be read properly because of: 1. Void at tape beginning 2. Timeout before the density separator was detected. 3. Density mark unreadable. The block ID read by the tape control unit is invalid. Bit 0 or bits 8-11 are nonzero.	Permanent error indicated Error message generated Error Log report	Call for service.
4B	No Patch Available	A tape control unit has sensed a model or microcode mismatch between itself and an attached drive.	Permanent error indicated Error message generated. Error Log report	Call for service
44	Locate Block Unsuccessful	The tape control unit cannot locate the block preceding the desired block.	Permanent error indicated. Error message generated.	Call for service.
46	Drive Offline	A command requiring drive activity was issued to a drive that is not online.	Permanent error indicated. Error message generated.	Verify the drive is powered on and is online. If the problem remains, call for service.
40	Overrun	A data overrun between the channel and the tape control unit buffer occurred while processing a large block that does not fit in the buffer.	Permanent error indicated. Console message generated. Error Log report	Call for service.
22	Path Equipment Check	Path equipment check can be caused by the following: A device interface error occurred. Buffer error between buffer and drive could not recover. No internal path is usable.	Permanent error indicated Console message generated Error Log report Increase the permanent read/write SDR counter.	Call for service
4A	Error Recovery Failed	While trying to recover from a drive data handling failure, the tape control unit recovery procedure failed.	Permanent error indicated. Console message generated. Error Log report	Call for service.
	Sense Failure	A unit check was detected at the host system during a sense command. The sense data received is not considered valid, and is not printed in the console message	Permanent error indicated. Console message generated Error Log report	Determine if the problem relates to the TA90 Subsystem. If it only occurs on the TA90, call for service. If the problem occurs on other units, contact the field engineer (FE) responsible for the host system.

ERPA #	System Description	Definition of Error	System Recovery Action	Operator Action
47	Tape Control Unit Check One Error	The tape control unit had a severe error condition, reinitialized itself, and continued processing activities.	Permanent error indicated. Error message generated.	Call for service.
29	Demark Data Buffer Error (Data Buffer Error)	A buffer error (memory or control) has been detected, and part of the buffer is flagged as unusable.	Permanent error indicated. Error message generated. Error Log report.	The TA90 subsystem will operate with a partial buffer. Call and inform the FE of the degradation.
32	Tape Tension Lost	The tape control unit has detected a loss of tape tension on an attached drive.	Permanent error indicated. Error message generated. Error Log report.	Call for service.
37	Tape Length Check	The tape length in the cartridge is too short. The error could occur when the leader block was replaced (the length of tape ahead of the BOT has been trimmed).	Permanent error indicated. Error message generated.	If the problem is on more than one volume, call for service.
38	Volume Unloaded By Operator	Tape motion has taken place on a drive, the Rew/Unl switch has been operated, and another motion command has been issued to the drive.	Permanent error indicated. Console message generated. Error Log report.	If the problem remains, call for service.
31	Tape Void	No patterns or data were found on the tape during a read operation.	Permanent error indicated. Console message generated. Error Log report.	Call for service.

VMS Error Log Messages

Tape Report Description

The following section describes the format and content of the TA90 tape reports produced by ERF (Analyze/Error)

This section gives samples of ERF (Analyze/ErrorLog) output messages from the VMS Error Log. As will be seen in the following examples, the Error Log would be more appropriately named the error/event log. The VAX/VMS system automatically writes messages to the latest version of an error log file name SYS$ERRORLOG ERRORLOG SYS as the following events occur

- Errors — Device errors, device timeouts, machine checks, bus errors, memory errors (hard or soft error correcting code (ECC) errors), asynchronous write errors, undefined interrupts, and bugchecks
- Volume Changes — Volume mounts and dismounts.
- System events — Cold start-ups, warm start-ups, system failure (crash) start-ups, messages from the Send Message to Error Logger ($SNDERR) system service, or time stamps.

TA90 Subsystem Messages

This section provides information on TA90-dependent error log message types. Examples will be given for several error log message types

- Tape data transfer errors (Format 5)
- STI drive requested error log (Format 7)
- STI formatter requested error log (Format 8)
- STI informational and media logs ((Format 8).

The STI drive requested error messages indicate that the TCU had sense data available describing an error event. The message will contain sense data format 20. Each time one of the format 7 messages appears, it will be followed by a tape data transfer error message (format 5) with the same command reference number.

The drive error packet (format 7) can be used to analyze the error event. The transfer packet indicates either successful recovery, or that retries failed to recover from the error.

In addition, there are informational messages (STI format 8) that are media quality reports for use by VMS backup, and statistical counters from the subsystem. The media quality reports are event code 0068, and contain format 19 (forced logging) sense data. The statistical entries are event code 0016 and contain format 21 (statistics) sense data (without data compaction) or format 30 (statistics) sense data (with data compaction).

Statistical entries are put in the error log when a statistical counter in the TCU overflows or when a tape is unloaded. These statistics provide information about the use and the error rate of this particular tape.

STI Drive Requested Error Log (Format 7)

Field Definitions

DATE/TIME 1

The date and time of the error event

I/O SUB-SYSTEM, UNIT 2 is the subsystem unit number including the HSC node In this example the HSC node is T

MSLG$L_CMD_REF 3 is the command reference number All messages in the error log with the same command reference number refer to the same event

MSLG$B_FORMAT 4 is the STI message format indicating a drive error

MSLG$W_EVENT 5 is the event code

MSLG$Q_UNIT_ID 6 is the MSCP device type identifier

```
 V A X / V M S        SYSTEM ERROR REPORT      COMPILED  6-JUN-1988 15:26
                                                        PAGE   3.

*******************************ENTRY      10. ***************************
ERROR SEQUENCE 1129                          LOGGED ON:      SID 06FF01DD
DATE/TIME  1-JUL-1988 15:27:54.72  1                      SYS_TYPE 010009F8

ERL$LOGMESSAGE ENTRY  KA87    REV# 127.  LEFT CPU
                      SCS NODE:  WACHU3, CPU # 1.

I/O SUB-SYSTEM, UNIT _TSMUA1:  2

      MESSAGE TYPE        0002
                                        TAPE MSCP MESSAGE
      MSLG$L_CMD_REF  886C0008  3
      MSLG$W_UNIT         0001
                                        UNIT #1.
      MSLG$W_SEQ_NUM      0007
                                        SEQUENCE #7.
      MSLG$B_FORMAT         07  4
                                        STI DRIVE ERROR  4
      MSLG$B_FLAGS          00
      MSLG$W_EVENT        FF6B  5
                                        DRIVE ERROR
                                        TAPE DRIVE REQSTED ERROR LOG  5
      MSLG$Q_CNT_ID   0000FB04                                        .
                      01200000
                                        UNIQUE IDENTIFIER, 00000000FB04 (x)
                                        MASS STORAGE CONTROLLER
                                        HSC70
      MSLG$B_CNT_SVR        27
                                        CONTROLLER SOFTWARE VERSION #39.
      MSLG$B_CNT_HVR        00
                                        CONTROLLER HARDWARE REVISION #0.
      MSLG$W_MULT_UNT     0061
      MSLG$Q_UNIT_ID  718057G1
                      03070700
                                        UNIQUE IDENTIFIER, 07007:805701 (x)
                                        TAPE CLASS DEVICE  6
                                        TA90
      MSLG$B_UNIT_SVR       00
                                        UNIT SOFTWARE VERSION #0.
      MSLG$B_UNIT_HVR       00
                                        UNIT HARDWARE REVISION #0.
      MSLG$L_GAP_CNT  00000DC7
                                        GAP COUNT = 3527.
      MSLG$B_FMTR_SVR       08
                                        FORMATTER SOFTWARE VERSION #8.
      MSLG$B_FMTR_HVR       01
                                        FORMATTER HARDWARE REVISION #1.

GET EXTENDED DRIVE STATUS (GEDS TEXT FIELD)
                                                        .
      SPEED                 4E
                                        78. IPS TAPE DRIVE
      DENSITY               01
                                        TA90 NORMAL DENSITY
      UNIT                00C1
                                        MSCP UNIT NUMBER = 1.
```

STI Drive Requested Error Log (Format 7) (Continued)

TA90 Extended Sense Information

TA90 extended sense information 7 is information that comes from the TCU. The sense bytes are described in SENSE VOL A02 of the Maintenance Guide.

Field Definitions

SENSE BYTE 3 8 contains the Error Recovery Procedure Action (ERPA) list (see MSG-20). The ERPA code describes the action that the controlling computer should take to recover from an error within the subsystem. In this example, the code hexadecimal 3A indicates that the Drive Reset switch was operated, and the drive is not ready.

SENSE BYTE 7 9 identifies the format of sense bytes 8 through 31. In this case, byte 7 contains hexadecimal 20, and the format represents error sense data (format 20).

SENSE BYTE 20 10 identifies the command active or last given at the time that a drive error code 1 occurred.

SENSE BYTE 21 11 contains the first error detected since the last device Sense command. For a specific error code description, see the FSI section.

SENSE BYTES 24 - 31 12 contain information about the tape control unit/tape transport unit features, microcode revisions, serial numbers and drive characteristics.

```
V A X / V M S       SYSTEM ERROR REPORT      COMPILED  6-JUN-1988 15:26
                                                        PAGE    4.

      GAPCNT          00000000

                                        GAP COUNT = 0.

TA90 EXTENDED SENSE INFORMATION 7

      SENSE BYTE 0        40
                                        INTERVENTION REQUIRED
      SENSE BYTE 1        44
                                        WRITE STATUS
                                        DEVICE ONLINE
      SENSE BYTE 2        40
                                        CONTROL UNIT ID 0.
                                        CHANNEL ASSIGNMENT 0.
                                        CHANNEL ADAPTER B
      SENSE BYTE 3        3A 8
                                        DRIVE RESET BY OPERATOR
      SENSE BYTE 4-6    000DC6
                                        BLOCK ID = 3526.
      SENSE BYTE 7        20 9
                                        ERROR SENSE DATA
      SENSE BYTE 8        6C
                                        MANUAL ACTION REQ/EQUIPMENT CHECK
      SENSE BYTE 9        0C
                                        1ST FSC MODIFIER
      SENSE BYTE 10-11    8E06
                                        1ST FLT SYMPTOM CODE
      SENSE BYTE 12-13    0000
                                        2ND FLT SYMPTOM CODE
      SENSE BYTE 14-15    0000
                                        3RD FLT SYMPTOM CODE
      SENSE BYTE 16-17    0000
                                        CU HW ERROR CODE
      SENSE BYTE 18       06
                                        DRIVE FLAG 1
      SENSE BYTE 19       02
                                        DRIVE MODE B22
      SENSE BYTE 20       0A 10
                                        DRIVE COMMAND CODE 1
      SENSE BYTE 21       75 11
                                        DRIVE ERROR CODE 1
      SENSE BYTE 22       00
                                        DRIVE COMMAND CODE 2
      SENSE BYTE 23       00
                                        DRIVE ERROR CODE 2
      SENSE BYTE 24       C6 12
                                        3 MEGABYTE STREAMING
                                        CHANNEL ADAPTER B
                                        CHANNEL ADAPTER A
      SENSE BYTE 25       00
                                        DUAL CONTROL UNIT FEATURE
      SENSE BYTE 26       05
                                        CU UCODE EC LEVEL = 5.
                                        CU UCODE COMPOSITE LEVEL = 0.
      SENSE BYTE 27-29  718057
                                        CONTROL UNIT S/N = 98391.
                                        MODEL B0X DRIVES ATTACHED
      SENSE BYTE 30       11
```

Tape Transfer Error (Format 5)

Field Definitions

COMMAND REFERENCE NUMBER [1] Note that this number is the same as the preceding example, indicating that the drive and command error message refer to the same error event

TAPE ERROR [2] indicates that this is a Format 5, tape transfer error

FRMTR RETRY SEQ EXHAUSTED [3] indicates that the drive was unable to recover from the error, and the data transfer operation did not succeed. This is a fatal error

```
V A X / V M S        SYSTEM ERROR REPORT      COMPILED  6-JUN-1988 15:26
                                                        PAGE   7.

*******ENTRY 11., ERROR SEQUENCE 1131.  LOGGED ON SIDE 06FF01DD

ERLSLOGMESSAGE ENTRY  KA67    REV# 127.  LEFT CPU
                      SCS NODE:  WACHU3, CPU # 1.

I/O SUB-SYSTEM, UNIT _$MUA1:

      MESSAGE TYPE        0002
                                        TAPE MSCP MESSAGE
      MSLG$L_CMD_REF  886C0C3B [1]
      MSLG$W_UNIT         0001
                                        UNIT #1.
      MSLG$W_SEQ_NUM      0009
                                        SEQUENCE #9.
      MSLG$B_FORMAT         05
                                        TAPE ERROR [2]
      MSLG$B_FLAGS          00
      MSLG$W_EVENT        FF68
                                        DATA ERROR
                                        FRMTR RETRY SEQ EXHAUSTED [3]
      MSLG$Q_CNT_ID   00C0FB04
                      01200000
                                        UNIQUE IDENTIFIER, 00000000FB04 (x)
                                        MASS STORAGE CONTROLLER
                                        HSC70
      MSLG$B_CNT_SVR        27
                                        CONTROLLER SOFTWARE VERSION #39.
      MSLG$B_CNT_HVR        00
                                        CONTROLLER HARDWARE REVISION #0.
      MSLG$W_MULT_UNT     0061
      MSLG$Q_UNIT_ID  71805701
                      03070700
                                        UNIQUE IDENTIFIER, 070071805701 (x)
                                        TAPE CLASS DEVICE
                                        TA90
      MSLG$B_UNIT_SVR       00
                                        UNIT SOFTWARE VERSION #0.
      MSLG$B_UNIT_HVR       00
                                        UNIT HARDWARE REVISION #0.
      MSLG$B_LEVEL          FF
      MSLG$B_RETRY          FF
      MSLG$L_GAP_CNT  0000CDC7
                                        GAP COUNT = 3527.
      MSLG$B_FMTR_SVR       08
                                        FORMATTER SOFTWARE VERSION #8.
      MSLG$B_FMTR_HVR       01
                                        FORMATTER HARDWARE REVISION #1.
```

STI Formatter Requested Error Log (Format 8)

Field Definitions

COMMAND REFERENCE NUMBER 1 in this case, is the same number as the preceding drive requested error log message, therefore, it refers to the same error event.

FORMATTER UNAVAILABLE/OFFLINE 2 indicates that the STI-FIPS adapter has crashed or has gone offline.

DRIVE DETECTED ERROR 3 drive 0 position lost. Note that this is STI drive 0 on this adapter. The STI drive numbers map to the unit numbers as follows:

TCU0

L Adapter

STI Drive	Unit #
0	base addrs +0
1	base addrs +2
2	base addrs +4
3	base addrs +6

R Adapter

STI Drive	Unit #
0	base addrs +1
1	base addrs +3
2	base addrs +5
3	base addrs +7

TCU1

L Adapter

STI Drive	Unit #
0	base addrs +8
1	base addrs +10
2	base addrs +12
3	base addrs +14

R Adapter

STI Drive	Unit #
0	base addrs +9
1	base addrs +11
2	base addrs +13
3	base addrs +15

Since this is unit 1, the formatter is the "R" formatter of TCU0 and the base address of the subsystem is 0.

```
V A X / V M S      SYSTEM ERROR REPORT      COMPILED 6-JUN-1988 15:26
                                                    PAGE   5.

                                        PHYSICAL DRIVE ADDRESS = 1.
                                        LO-ORDER LOGICAL DRIVE ADDR = 1.

    SENSE BYTE 31:        00

                                        DATA BYTE COUNT = 0. KB
********ENTRY 11., ERROR SEQUENCE 1130.  LOGGED ON SID 06FF01DD

ER_SLOGMESSAGE ENTRY  KA87    REV# 127.  LEFT CPU
                      SCS NODE:  WACH03, CPU # 1.

I/O SUB-SYSTEM, UNIT _TSMUA1:

    MESSAGE TYPE        0002

                                        TAPE MSCP MESSAGE

    MSLGSL_CMD_REF  886C0008 1
    MSLGSw_UNIT         0001

                                        UNIT #1.

    MSLGSw_SEQ_NUM      0008

                                        SEQUENCE #8.

    MSLGSB_FORMAT         06

                                        STI COMMUNICATION OR CMD FAILURE

    MSLGSB_FLAGS          00
    MSLGSw_EVENT        00E8

                                        DRIVE ERROR
                                        DRIVE DETECTED ERROR

    MSLGSQ_CNT_ID   0000FB04
                    01200000

                                        UNIQUE IDENTIFIER, 00000000FB04 (x)
                                        MASS STORAGE CONTROLLER
                                        HSC70

    MSLGSB_CNT_SVR        27

                                        CONTROLLER SOFTWARE VERSION #39.

    MSLGSB_CNT_HVR        00

                                        CONTROLLER HARDWARE REVISION #0.

    MSLGSw_MULT_UNT     0061
    MSLGSQ_UNIT_ID  71805701
                    03070700

                                        UNIQUE IDENTIFIER, 07007180570l (x)
                                        TAPE CLASS DEVICE
                                        TA90

    MSLGSB_UNIT_SVR       00

                                        UNIT SOFTWARE VERSION #0.

    MSLGSB_UNIT_HVR       C0

                                        UNIT HARDWARE REVISION #0.

    MSLGSL_GAP_CNT  0000DDC7

                                        GAP COUNT = 3527.

    MSLGSB_FMTR_SVR       C8

                                        FORMATTER SOFTWARE VERSION #8.

    MSLGSB_FMTR_HVR       01

                                        FORMATTER HARDWARE REVISION #1.

SUCCESSFUL RESPONSE INFORMATION

    SUMMOD              0A

                                        PORT A/B ENABLED
                                        FORMATTER UNAVAILABLE/OFFLINE 2
                                        DRIVE 0 ATTENTION
```

```
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    SUMERR              00
    SUMMO2              05
                                        RETRIED TRANSFER
                                        FAILED
                                        PORT A ACTIVE

    CONBYT              00
    DR0MOD              08

                                        DRIVE ONLINE STATE (TO FRMTR)

    DR0ERR              20

                                        POSITION LOST 3

    DR1MOD              28

                                        DRIVE ONLINE STATE (TO FRMTR)
                                        BOT

    DR1ERR              00
    DR2MOD              28

                                        DRIVE ONLINE STATE (TO FRMTR)
                                        BOT

    DR2ERR              00
    DR3MOD              28

                                        DRIVE ONLINE STATE (TO FRMTR)
                                        BOT

    DR3ERR              00
```

STI Informational and Media Logs (Format B)

STI Format B contains informational messages that are media quality reports for use by VMS backup and statistical entries containing sense data.

If sense byte 7 contains 21 (hexadecimal) the format represents operating condition data (without data compaction) If sense byte 7 contains 30 (hexadecimal) the format represents operating condition data (with data compaction)

```
**********ENTRY   67714. **********
ERROR SEQUENCE 7412.                    LOGGED ON:      SID 0A000005
DATE/TIME 24-OCT-1989 00:43:17.64                   SYS_TYPE 02410201

ERLSLOGMESSAGE ENTRY  KA62A   CPU REV# 6.   FW REV# 4.1
                      SCS NODE:  STA284, XMI NODE # 1.

I/O SUB-SYSTEM, UNIT _MSC002$MUA3:

      MESSAGE TYPE        0002
                                    TAPE MSCP MESSAGE

      MSLG$L_CMD_REF  00000000
      MSLG$W_UNIT         0003
                                    UNIT #3.

      MSLG$W_SEQ_NUM      0086
                                    SEQUENCE #182.

      MSLG$B_FORMAT         08
                                    SENSE DATA LOG

      MSLG$B_FLAGS          82
                                    NON-ERROR/INFORMATIONAL EVENT
                                    OPERATION SUCCESSFUL

      MSLG$W_EVENT        0016

                                    INFORMATIONAL LOG
                                    STATISTICS

      MSLG$Q_CNT_ID   92405502
                      01200000
                                    UNIQUE IDENTIFIER, 000092405502 (X)
                                    MASS STORAGE CONTROLLER
                                    HSC70

      MSLG$B_CNT_SVR        27
                                    CONTROLLER SOFTWARE VERSION #39.

      MSLG$B_CNT_HVR        00
                                    CONTROLLER HARDWARE REVISION #0.

      MSLG$W_MULT_UNT     0093
      MSLG$Q_UNIT_ID  00000000
                      00000000

                                    UNIQUE IDENTIFIER, 000000000000 (X)
                                    CLASS = 0.
                                    MODEL = 0.

      MSLG$B_UNIT_SVR       00
                                    UNIT SOFTWARE VERSION #0.

      MSLG$B_UNIT_HVR       00
                                    UNIT HARDWARE REVISION #0.

TA90 EXTENDED SENSE INFORMATION

      SENSE BYTE 0          40
                                    INTERVENTION REQUIRED

      SENSE BYTE 1          48
                                    BOT
                                    DEVICE ONLINE

      SENSE BYTE 2          44
                                    MORE CARTRIDGES TO PROCESS
                                    CONTROL UNIT ID 0.
                                    CHANNEL ASSIGNMENT 0.
                                    CHANNEL ADAPTER B

      SENSE BYTE 3          25
                                    UNLOAD STATUS PRESENT

      SENSE BYTE 4-5    000000
                                    BLOCK ID = 0.

      SENSE BYTE 7          21
                                    BUFFERED LOG DATA

      SENSE BYTE 8          0C
                                    READ FWD DATA CHECKS = 0.

      SENSE BYTE 9          00
                                    RD BCKWD DATA CHECKS = 0.

      SENSE BYTE 10         00
                                    WRITE DATA CHECKS = 0.

      SENSE BYTE 11         00
                                    READ BLOCKS CORRECTED = 0.

      SENSE BYTE 12         0B
                                    WRITE BLOCKS CORRECTED = 11.

      SENSE BYTE 13         00
                                    CU EQUIPMENT CHECKS = 0.

      SENSE BYTE 14-15    0001
                                    READ BYTES PROCESSED = 4. KB

      SENSE BYTE 16-17    DE3B
                                    WRITE BYTES PROCESSED = 228204 KB

      SENSE BYTE 18         00
                                    READ BLOCKS PROCESSED <11:04> = 00 (X)
                                    _READ BLOCKS PROCESSED = 0.

      SENSE BYTE 19         0E
                                    WRITE BLOCKS PROCESSED <11:04> = 0E (X)
                                    _WRITE BLOCKS PROCESSED = 3600.

      SENSE BYTE 20         00
                                    WRT TRANSIENT CONDITIONS = 0

      SENSE BYTE 21         00
                                    RD TRANSIENT CONDITIONS = 0.      (X)

      SENSE BYTE 22         00
                                    CRITERIA WRT DATA CHECKS = 0.      (X)

      SENSE BYTE 23         00
                                    CRITERIA RD DATA CHECKS = 0.

      SENSE BYTE 24         00
                                    ERASE GAP COUNT = 0.

      SENSE BYTE 25         01
                                    DRIVE DETECTED ERRORS = 1.        (X)

      SENSE BYTE 26         01
                                    WRITE BLOCKS PROCESSED <03:00>  = 1 (X)
                                    READ BLOCKS PROCESSED <03:00>  = 1 (X)

      SENSE BYTE 27-29  301201
                                    _CONTROL UNIT S/N = 00001201.
                                    MODEL B22 DRIVES ATTACHED

      SENSE BYTE 30         00
                                    RD RECOVERY RETRY CNT = 0.

      SENSE BYTE 31         33
                                    .
                                    PHYSICAL DRIVE ADDRESS = 3.
                                    LO-ORDER LOGICAL DRIVE ADDR = 3.
```

```
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********************** ENTRY      6. LOGGED ON SIDE 06FFD1DD

ERLSLOGMESSAGE ENTRY  KA865   REV# 2.  SERIAL# 1041.  MFG PLANT 7.
                      SCS NODE:  WACHUB, CPU # 1.
I/O SUB-SYSTEM, UNIT _MSCP095MUA11:

      MESSAGE TYPE        0002
                                      TAPE MSCP MESSAGE

      MSLGSL_CMD_REF  00000000
      MSLGSW_UNIT         0008
                                      UNIT #11.

      MSLGSW_SEQ_NUM      0CF7
                                      SEQUENCE #3319.

      MSLGSB_FORMAT         08
                                      SENSE DATA LOG

      MSLGSB_FLAGS          82
                                      NON-ERROR/INFORMATIONAL EVENT
                                      OPERATIONAL SUCCESSFUL

      MSLGSW_EVENT        0816
                                      INFORMATIONAL LOG
                                      STATISTICS

      MSLGSQ_CNT_ID   0009F609
                      01210000
                                      UNIQUE IDENTIFIER, 00000009F609 (X)
                                      MASS STORAGE CONTROLLER
                                      HSC40

      MSLGSB_CNT_ID         27
                                      CONTROLLER SOFTWARE VERSION #39.

      MSLGSB_CNT_HVR        00
                                      CONTROLLER HARDWARE REVISION #0.

      MSLGSW_MULT_UNT     0042
                                      UNIT SOFTWARE VERSION #0.

      MSLGSQ_UNIT_ID  30099201
                      03070700
                                      UNIQUE IDENTIFIER, 070030099201 (X)
                                      TAPE CLASS DEVICE
                                      TA90      "

      MSLGSB_UNIT_SVR       00
                                      UNIT SOFTWARE VERSION #0.

      MSLGSB_UNIT_HVR       00
                                      UNIT HARDWARE REVISION #0.

TA90 EXTENDED SENSE INFORMATION

      SENSE BYTE 0        40
                                      INTERVENTION REQUIRED

      SENSE BYTE 1        48
                                      BOT
                                      DEVICE ONLINE

      SENSE BYTE 2        40
                                      CONTROL UNIT ID 0.
                                      CHANNEL ASSIGNMENT 0.
                                      CHANNEL ADAPTER 8.

      SENSE BYTE 3        52
                                      UNLOAD STATUS PRESENT
```

```
V A X / V M S       SYSTEM ERROR REPORT      COMPILED 27-OCT-1989 08:15
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      SENSE BYTE 4-6   000000
                                      BLOCK ID = 0.

      SENSE BYTE 7        30
                                      SENSE DATA LOG

      SENSE BYTE 8        00
                                      READ FWD DATA CHECKS = 0.

      SENSE BYTE 9        00
                                      WRITE DATA CHECKS = 0.

      SENSE BYTE 10       00
                                      READ BCKWD DATA CHECKS = 0.

      SENSE BYTE 11       00
                                      RESERVED

      SENSE BYTE 12       00
                                      READ CRITERIA DATA CHECKS = 0.

      SENSE BYTE 13       00
                                      WRITE CRITERIA DATA CHECKS = 0.

      SENSE BYTE 14       00
                                      READ RECOVERY RETRIES = 0.

      SENSE BYTE 15       00
                                      WRITE RECOVERY ERASE GAPS = 0.

      SENSE BYTE 16       00
          READ TRANSIENT CONDITIONS = 0
      SENSE BYTE 17       00
          WRITE TRANSIENT CONDITIONS = 0
      SENSE BYTE 18       00
                                      READ BLOCKS CORRECTED = 0.

      SENSE BYTE 19       00
                                      WRITE BLOCKS CORRECTED = 0.

      SENSE BYTE 20-21  0000
                                      RESERVED

      SENSE BYTE 22       00
                                      READ DATA REQUEST TIMEOUTS = 0.

      SENSE BYTE 23       00
                                      WRITE DATA REQUEST TIMEOUTS = 0.

      SENSE BYTE 24       00
                                      CHANNEL TRANSFER EQUIP CHKS = 0.

      SENSE BYTE 25       01
                                      DRIVE DETECTED ERRORS = 0.

      SENSE BYTE 26       00
                                      RESERVED

      SENSE BYTE 27-29  306992
                                      CONTROL UNIT S/N = 2450.
                                      MODEL 822 DRIVES ATTACHED.

      SENSE BYTE 30       00
                                      DRIVE COMMAND CODE 1 = 0.

      SENSE BYTE 31       00
                                      RESERVED
```

```
V A X / V M S       SYSTEM ERROR REPORT      COMPILED 27-OCT-1989 08:15
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      SENSE BYTE 32-34  000001
                                      CHANNEL READ BYTES PROC (X4K) = 4 K

      SENSE BYTE 35-37  012C83
                                      CHANNEL WRITE BYTES PROC (X4K)=315109 K

      SENSE BYTE 38-40  000001
                                      READ BYTES PROCESSED (X4K) = 4 K

      SENSE BYTE 41-43  006670
                                      WRITE BYTES PROCESSED (X4K) = 196548 K

      SENSE BYTE 44-46  000003
          CHANNEL READ BLOCKS PROC = 3
      SENSE BYTE 47-49  000667
          CHANNEL WRITE BLOCKS PROC = 1.639 K
      SENSE BYTE 50-52  000001
          READ BLOCKS PROC = 1
      SENSE BYTE 53-55  000335
          WRITE BLOCKS PROC = .821 K
```

Field Definitions

DATE/TIME 1 is the date and time of the entry

UNIT_T$MUA7 2 is the unit number, including HSC node name. In this example, the HSC node name is "T"

VOLUME LABEL "D7" 3 is the tape label name

QIO OPERATIONS 4 is the count of QIO's and errors for this tape volume.


```
V A X / V M S        SYSTEM ERROR REPORT      COMPILED  6-JUN-1988 15:26
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      1. QIO OPERATIONS THIS VOLUME,  0. ERRORS THIS VOLUME
*****************************ENTRY      20. ***************************
ERROR SEQUENCE 1143                          LOGGED ON:       SID 06FF01DD
DATE/TIME  1-JUL-1988 15:43:34.54 [1]                     SYS_TYPE 010009F8

MOUNT VOLUME  KA87    REV# 127.  LEFT CPU
              SCS NODE:  WACHU3, CPU # 1.
                         [2]
      UNIT _T$MUA7:, VOLUME LABEL "D7" [3]

      59. QIO OPERATIONS THIS VOLUME,  0. ERRORS THIS VOLUME
*****************************ENTRY      21. ***************************
ERROR SEQUENCE 1144                          LOGGED ON:       SID 06FF01DD
DATE/TIME  1-JUL-1988 15:44:07.08 [1]                     SYS_TYPE 010009F8

MOUNT VOLUME  KA87    REV# 127.  LEFT CPU
              SCS NODE:  WACHU3, CPU # 1.
                         [2]
      UNIT _T$MUA7:, VOLUME LABEL "D7" [3]

      60. QIO OPERATIONS THIS UNIT,  0. ERRORS THIS UNIT  [4]
      1. QIO OPERATIONS THIS VOLUME,  0. ERRORS THIS VOLUME
```

When media errors occur, you receive a message similar to the one shown on this page. There are messages that are due to excessive ECC rate, excessive recovery rate, and permanent (unrecoverable) rates. The text of these messages may vary, but the formats will be similar.

MEDIA ERRORS

1. Tape ID (from label)
2. Count: number of times that Volume (Tape) was mounted
3. Number of events (in this example, write ECC corrections).
4. Rate: the number of records per event. (Event = read ECC corrections)
5. Number of events (in this example, read ECC corrections)
6. Rate: the number of records per event. (Event = read ECC corrections)
7. Number of events (in this example, the number of times write was retried/recovered).
8. Rate: the number of MBytes per event. (Event = write recoveries).
9. Number of events (in this example, the number of times read was retried/recovered).
10. Rate: the number of MBytes per event. (Event = read recoveries).
11. The number of unrecoverable (permanent) write errors on this volume.
12. The number of unrecoverable (permanent) read errors on this volume.

```
Attn:    Customer
Device:  FORCE$MUA3  (TA90 S/N: 70032159503)
   Software Revision Level:  0
   Hardware Revision Level:  0
Error:   Single Tape Volume - Excessive Read Recovery Rate
Theory:  [2.11.5.3]

Suspect:

Bad Volume - Label:  L29

   The tape volume listed has exceeded the threshold for media defects
   while reading.  The errors are currently RECOVERABLE and present little
   or no immediate data integrity risk.  However, further action may be
   required to maintain future tape library data integrity.  These errors
   may also be caused by faulty hardware.  If this drive has experienced
   experienced similar problems with different volumes, notify Digital Field Service
   with the reported Theory number.

   Suggested Recovery Procedure:

1. If the volume is defective and is part of the site
   library, discard the tape after you copy its data to a
   new volume.  The media may have been damaged in handling
   or may be worn out.

2. If the volume is defective and is not part of the site
   library, notify the creator of possible media, drive, or
   tape handling problems.

Evidence:

VOLUME  MOUNT  WRITE ECC    READ ECC    WRITE RECOV   READ RECOV    VOL PERMANENT
LABEL   COUNT  RATE         RATE        RATE          RATE          WRITE
------  -----  --BLK/ERR    (ERRCNT)-   ----MB/ERR    (ERRCNT)----  ----ERRCNT---READ
L29         1  1173 (24)    1771 (15)         0 (0)         52(4)      0       0
 1          2   4   3        6   5            8  7          10  9      11      12

NOTE:  Volume Theories may be incorrect if each tape volume
does not have a unique label.  All media should be initialized
with unique ANSI standard labels to take full advantage of
Volume Fault Management.

A complete Volume Report is available using SPEAR SUMMARIZE.

SYSTEM LIMITS (PER VOLUME):

   WRITE ECC RATE     READ ECC RATE  WRITE RECOV  READ RECOV  VOL PERMANENT
   BAD   MARGINAL     BAD  MARGINAL  8 D          BAD         WRITE    READ
   ------------BLKS/ERR------------  ----MB/ERR   (ERRCNT)--- --ERRCNT-----
   1000        2000   350       650       40 (3)     200 (1)      1        1

Time of error:  3-APR 17:34:12
```


INIST

TA90 Installation Checklist

This checklist is for FE's who have performed installations before

Go to the INST pages listed in parenthesis if you need more information to successfully complete a step

Initial Setup Procedures

1 Go to INST 6 and perform all the safety checks, then return here (INST 6)

__ 2 If the dual tape control unit configuration feature is to be installed, place the dual tape control unit communication cables, and the STI-FIPS cables, in position for installation

__ 3 Place the tape control units (TCUs) and tape transport units (TTUs) into position and connect them (INST 10 and 11)

__ 4 On the last tape transport unit attached to the tape control unit, install the terminators and the ac power connector safety cover (INST 22)

__ 5 Connect the dual tape control unit communicator cables and status store card (if present) (INST 30, 31, 35)

__ 6 Set the tape control unit channel addresses (INST 40)

__ 7 Set the drive logical and physical address switches, and attach the drive address labels (INST 50)

__ 8 Verify that the tape control unit and tape transport unit power supply jumpers are set correctly (INST 55 and 56)

__ 9 On the tape control unit, set both the Power On/Off switch and the Unit Emergency Power Off (UEPO) switch off (INST 60)

__ 10 Connect the ac power cable to the customer receptacle then power up (INST 60)

__ 11 Check the UEPO switch for proper operation (INST 60)

Subsystem Checkout

As you progress through the tests, note the address of any drives that do not show the display response expected, and note whether the drive failed during checkout from TCU0 or TCU1

1 Check all drive switches for correct function (TCU0 INST 70) (TCU1 INST 76)

2 Start the Offline Checkout procedure (TCU0 INST 70-74) (TCU1 INST 76-83)

   a Set both TCUs to Offline Test and set the Test/Normal switches to Test

   b Power both TCUs off, then back on

3 On the tape control unit 0 switch panel, set the Online Test/Offline Test switch to Online Test (TCU0 INST 78) (TCU1 INST 81)

4 On the tape control unit 1 switch panel, set the Online Test/Offline Test switch to Offline Test (TCU0 INST 78) (TCU1 INST 83)

5 Test each drive from TCU0. Set the Test/Normal switch to Normal when finished

6 Repeat steps 3, 4, and 5 for TCU1

Checking the Initial Microprogram Load (IML)

__ 1 On both TCU0 and TCU1, set the Power On/Off switch to Off, then to On (INST 83)

Final Setup Procedures

1 Attach the STI cables to the TCUs (INST 90)

2 Connect any UEPO cables, if used, from the host system(s) to the TCUs (INST 120)

3 Install the radio frequency interference (RFI) shields (INST 130)

4 Replace all covers (INST 130)

Running HSC Subsystem Diagnostics

__ 1 Run GMP from either the CE panel or the HSC (see CE/HSC 1)

__ 2 Run the ILEXER and ILTAPE. For a dual tape control unit subsystem (see INST 35, step 6)

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Before Installation

CAUTION:

TILT HAZARD CAUTION

Do NOT open both drives of a tape transport unit that is not bolted to another tape transport unit or tape control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape transport unit that is not bolted to another unit will tilt forward with about 20 pounds of force applied to the top of either automatic cartridge loader.

This procedure describes all installation actions in detail, step-by-step. Mark off each step as it is completed. Two FEs are needed for the mechanical installation of a dual tape transport unit subsystem, to reduce installation time. Only one FE is needed to run the checkout and diagnostic procedures.

The Installation Overview chart shows the sequence of steps to complete the installation, however, the chart provides an overview only. Follow the step by step instructions as you proceed through the installation.

Preparation

__ Inventory the items on each Bill of Material to verify that all items were received.

Tools and Test Equipment Needed

The following items are needed to complete the installation

- Cleaner cartridge
- IML Diskette

  Note: For dual TCU installations, ensure that all IML diskettes are at the same EC level

- ILEXER and ILTAPE routines
- Blank scratch cartridge.

  Note: Only one blank cartridge is required, however, a second blank cartridge, if available, reduces the installation time.

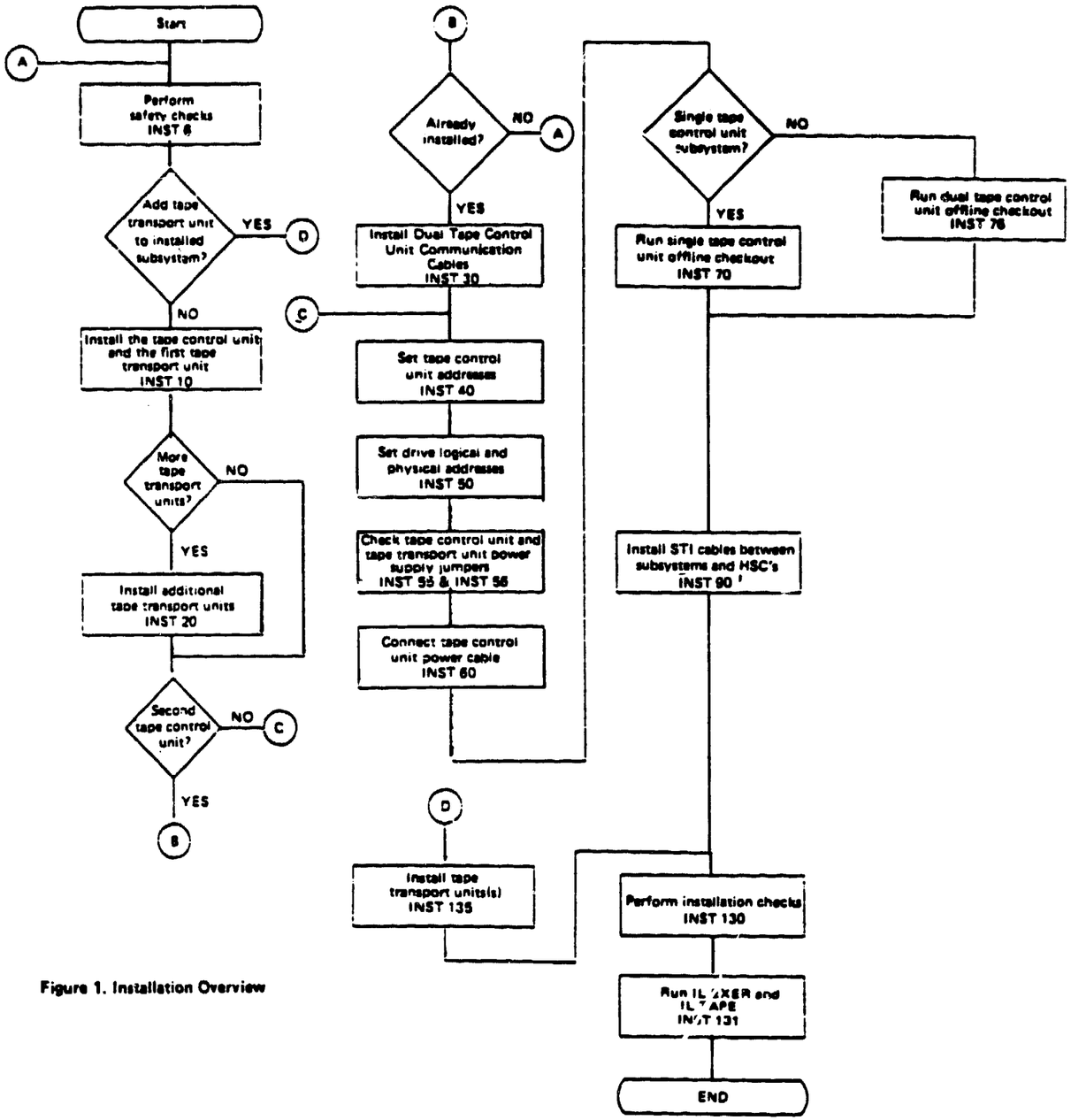


Figure 1. Installation Overview

TA90 Installation Instructions

ACTION Messages

The following procedures are used to correct or help isolate drive problems The FE is sent here from the INST section following an ACTION message on a drive display ACTION messages are generated for problems encountered after loading a cartridge into a drive during the installation checkout procedures

Go to the message that matches the message on the drive display that sent you here and perform the actions listed in the Actions column

Return to the procedure that sent you here when you have completed the actions listed in the Actions column

Messages	Description	Actions
ACTION 1	The cartridge failed to load correctly	1 Unload and reload the cartridge 2 If the same failure occurs, stop testing and note the address of the failing drive and the TCU controlling that drive 3 Return to the procedure that sent you here and continue testing with the next drive displaying TEST.
ACTION 2	The cartridge may be set to file protect.	1 Unload the cartridge and check to see that it is not set to file protect. 2 Reload the cartridge and if it fails again, try a different cartridge. 3 If the second cartridge fails in the same way, stop testing and note the address of the failing drive and the TCU controlling that drive. Return to the procedure that sent you here and continue testing with the next drive displaying TEST.
ACTION 3	Incorrect address.	1. Restart testing using the next drive. 2. If the next drive to be tested fails in the same way, a cable connection problem may exist. 3. Note the address(es) of the failing drive(s) and the TCU controlling the drive(s), then return to the procedure that sent you here and continue testing.
ACTION 4	Channel address parity error.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run GMP, then return to the procedure that sent you here and continue testing.
ACTION 5	Drive did not get patches correctly. This could be the drive patch or the Automatic Cartridge Loader code load.	1. Ensure that the IML diskette is the correct one for the subsystem. If not, replace it and start the installation checkout again from power on. 2. If the diskette is correct, continue using only the drives that display TEST.
ACTION A	Channel address parity error on channel A.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run GMP, then return to the procedure that sent you here and continue testing.
ACTION B	Channel address parity error on channel B.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run GMP, then return to the procedure that sent you here and continue testing.

TA90 Installation Instructions

Before starting the installation perform the following safety checks

Safety Checks

Machine Ground Wire Check

__ 1 **DANGER**

> **Hazardous electrical voltages are present in the receptacle.**

Use the volt/ohm meter to ensure that:

a. The resistance between the machine frame and the ground pin on the power plug is less than 0.1 ohm.

b. The resistance between the machine frame and ground pin (pin 4) on the output socket of the tape control unit and each tape transport unit is less than 0.1 ohm. See diagram A below

c. The resistance between the machine frame and ground pin (pin 4) on the input cable assembly connector of each tape transport unit is less than 0.1 ohm. See diagram B below

If the resistance is greater than 0.1 ohm, determine the cause and correct it before proceeding with the installation.

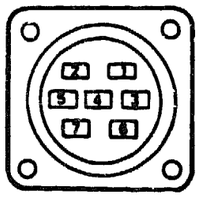


Diagram A
Output Socket (TCU and TTU)



Diagram B
Input Cable Assembly (TTU)

Branch Circuit CB Switched Off Check

__ 1 **DANGER**

> **Hazardous electrical voltages are present in the connector. Do not touch the outlet case with anything other than test probes until step 3 is completed.**

Have the customer find and switch off the branch circuit CB.

__ 2. Check the voltage from the outlet case to the building ground for less than 1.0 V ac. (Begin with the meter scale that is appropriate for normal line voltage checks.)

__ 3. Check the voltage from the ground pin to the building ground for less than 1.0 V ac. If the voltage is less than 1.0 V ac, the outlet is now safe to touch.

__ 4 **DANGER**

> **Hazardous electrical voltages are present. Do not touch the internal parts (pins and sockets) of the outlet until step 5 is completed.**

Check the resistance from the ground pin to the outlet case for a reading of less than 0.1 ohm.

Check the resistance from the ground pin to the building ground for reading of less than 0.1 ohm.

A reading of less than 0.1 ohm indicates the presence of a safe, continuous grounding conductor.

__ 5. Measure the phase-to-phase voltage and the phase-to-ground voltage at the outlet.

Measure the phase-to-neutral voltage (if present) and the neutral-to-ground voltage (if present).

All voltage values are to be less than 1.0 V ac.

Branch Circuit CB Switched On Check

__ 1. **DANGER**

> **Hazardous electrical voltages are present. Do not touch the outlet before meeting the following requirements of steps 1 and 2.**

Have the customer switch on the CB that supplies voltage to the receptacle.

__ 2. **DANGER**

> **Hazardous voltages are present. If the measured voltage values are less than 1.0 V ac, you can touch the outlet. Avoid contact with the internal parts (pins and sockets) of the outlet.**

Measure the voltages from the outlet case to the building ground and the outlet case to the ground pin. Voltage values are to be less than 1.0 V ac.

__ 3. At the outlet, measure the voltages from the ground pin and the neutral pin (if present) to all phases, and measure the voltages from phase to phase. This ensures that the outlet is wired correctly.

__ 4. Have the customer's branch circuit CB switched off before connecting the TA90 power cord into the outlet.

Installing the Tape Control Unit and the First Tape Transport Unit

Tape Control Unit

__ 1 Before you start installation

__ a. Place the cables that run between the tape control units (on dual tape control unit subsystems) position for installation. Either end of the cables attaches to either of the tape control units.

__ b. Place the STI cables that come from the HSC/HSX position for installation.

These steps ensure that the cables are easily accessible when it is time to install them.

__ 2 Place the tape control unit (TCU) in the position where it is to be installed

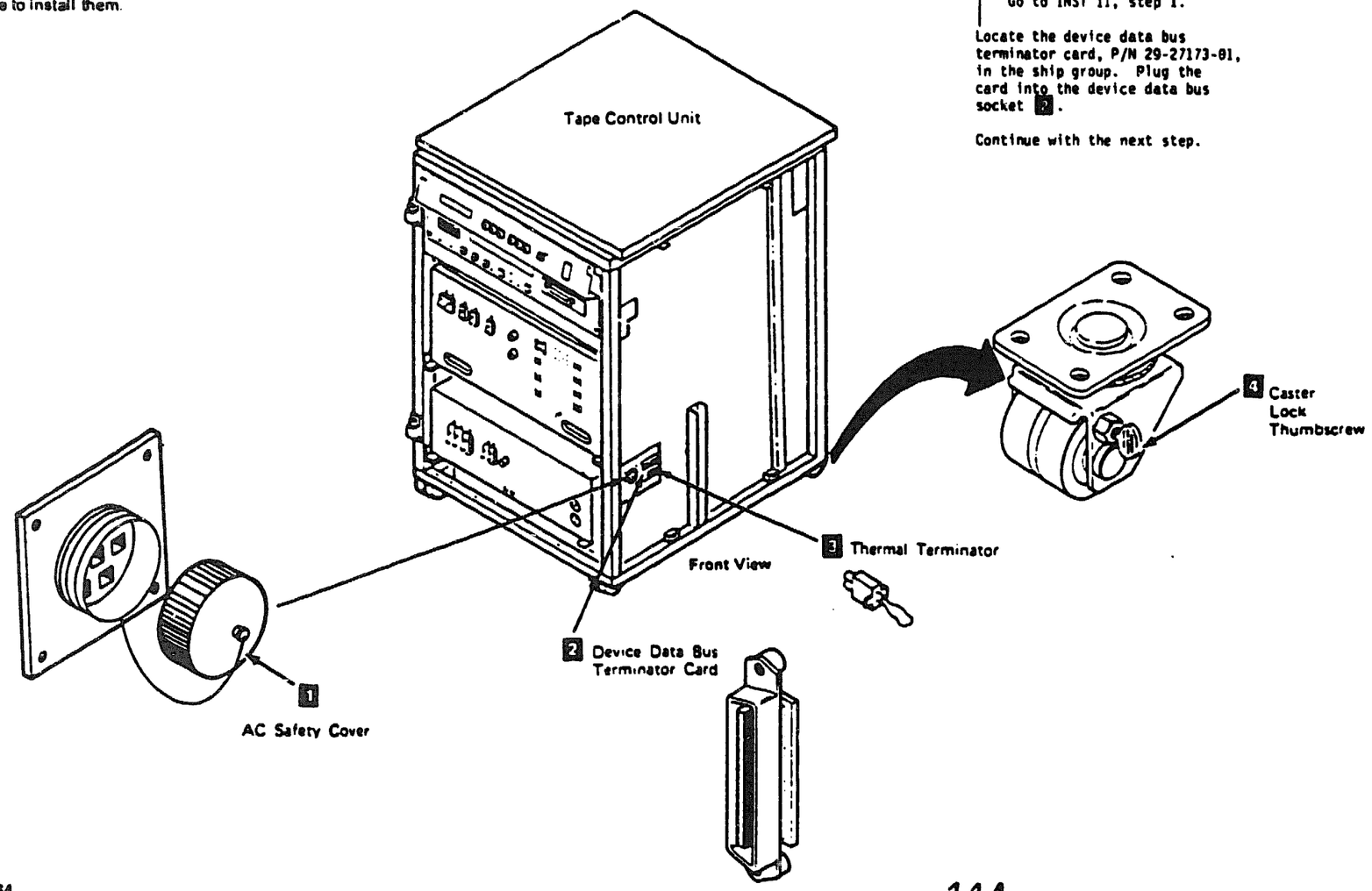
__ 3 Place the rear casters of the TCU so that the caster lock thumbscrews 4 are accessible

__ 4 Lock the rear casters by turning the caster lock thumbscrews clockwise until they are tight.

__ 5 Open the front and rear covers.

__ 6 Remove the left and right outside covers. See CARR-TCU 2-1 for procedures to remove the covers from the tape control unit.

The covers are not reinstalled until after the hardware is completely installed.



__ 7 Remove the rear safety cover. See CARR-TCU 2-1 for the tape control unit cover removal procedures.

Do not reinstall the safety cover until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

__ 8. Remove the drip-screen guard. See CARR-TCU 2-1 for the tape control unit cover removal procedures.

Do not reinstall the drip-screen guard until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

__ 9. Is this tape control unit being installed without any tape transport units attached?

```
YES NO
 |   |
 |   Go to INST 11, step 1.
 |
Locate the device data bus
terminator card, P/N 29-27173-01,
in the ship group.  Plug the
card into the device data bus
socket 2.

Continue with the next step.
```

__ 10. Install the safety cover 1 on the ac power cable socket.

DANGER

> **Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.**

__ 11. Plug the thermal terminator into the thermal connector 3.

__ 12. Go to INST 22, step 18.

Installing the Tape Control Unit and the First Tape Transport Unit (Continued)

First Tape Transport Unit

CAUTION:

TILT HAZARD CAUTION

Do NOT open both drives of a tape transport unit that is not bolted to another tape transport unit or tape control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape transport unit that is not bolted to another unit will tilt forward with about 20 pounds of force applied to the top of either automatic cartridge loader.

__ 1. Place the tape transport units near the area where they are to be installed.

__ 2. Place the first tape transport unit 2, to the right of the tape control unit 1, (as you face the front of the tape control unit) about 20 cm (8 in.) from the tape control unit.

__ 3. Open the front and rear covers.

__ 4. Plug the tape transport unit AC power connector 7 into the tape control unit AC socket 10.

Ensure that the AC power cable is routed away from the compressor motor and is fastened to the back of the frame 11 to prevent pinching the cable when the units are moved together.

__ 5. Connect the read bus cables 6 from the tape transport unit to the tape control unit read bus connectors 5.

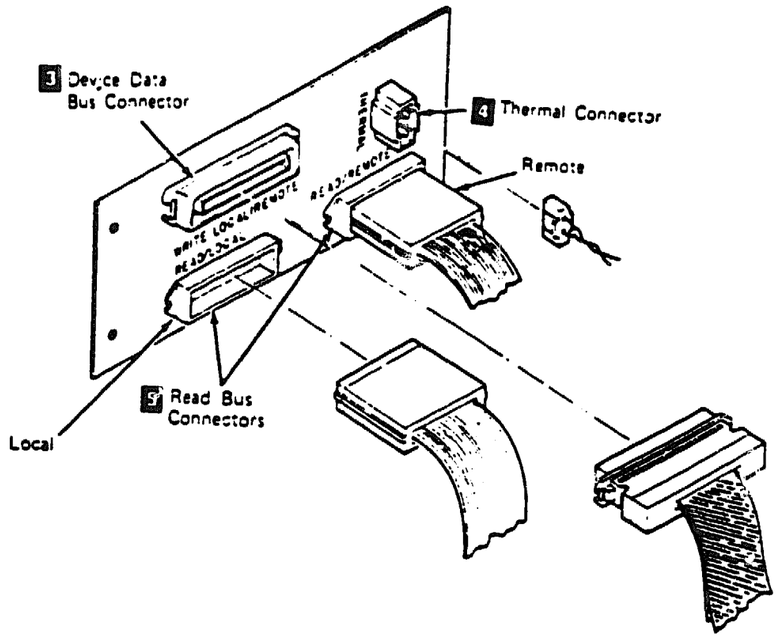
Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape control unit, making sure they are not crossed.

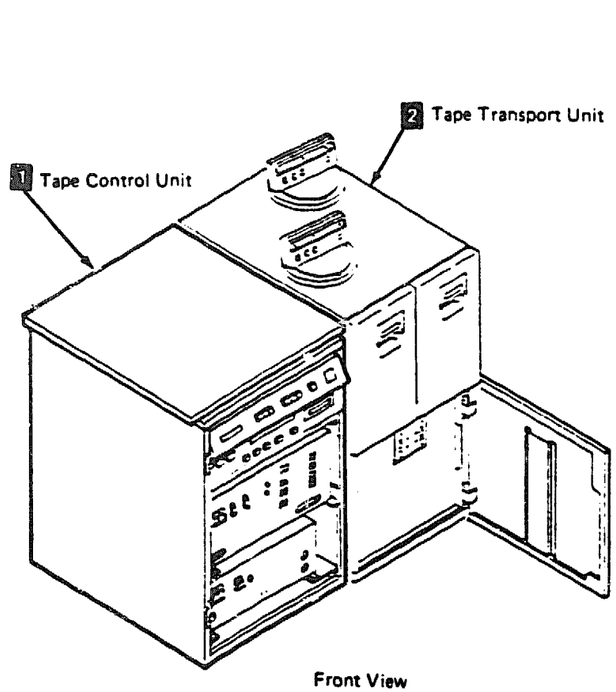
__ 6. Connect the device data bus cable 9 from the tape transport unit to the tape control unit device data bus connector 3.

Fasten the cable in place with the retaining screws.

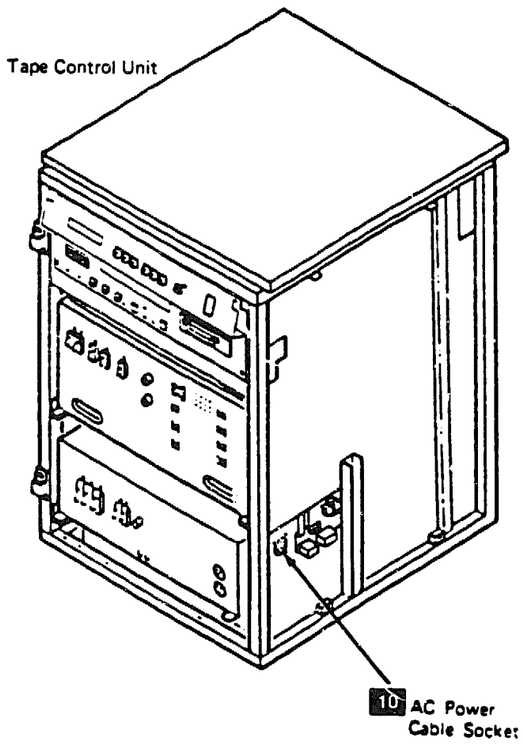
__ 7. Connect the thermal cable 8, on the tape transport unit to the thermal connector 4, on the tape control unit.

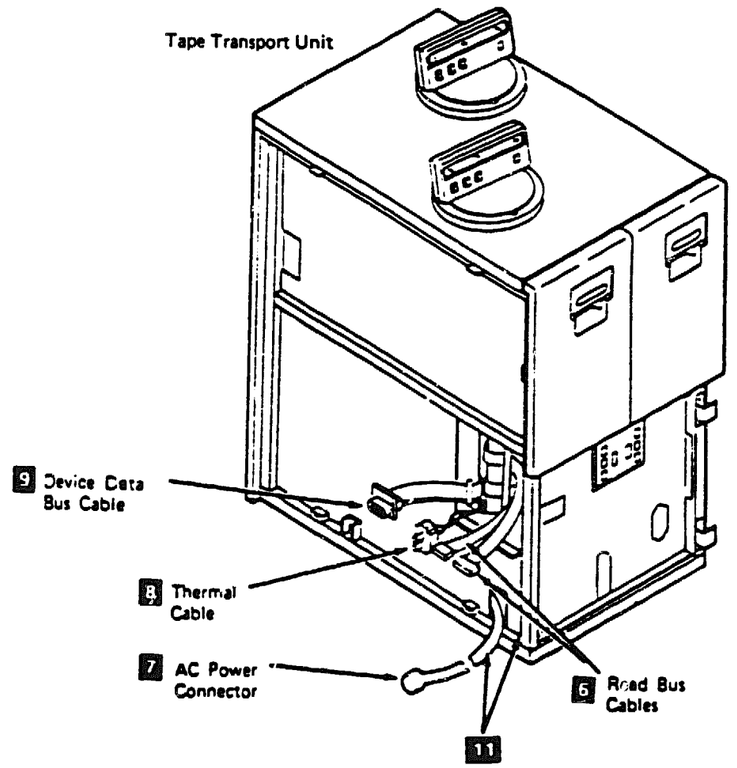
__ 8. Continue to the next step on INST 13.





Front View





TA90 Installation Instructions

Installing the Tape Control Unit and the First Tape Transport Unit (Continued)

First Tape Transport Unit (Continued)

__ 9 **Warning:** Be careful that the cables do not get pinched between the frames or covers.

The device data and read bus cables should be folded in toward the middle of the machines. Ensure the power cable is not pinched between the machine frames.

Push the tape transport unit against the tape control unit.

Note: Be sure the position of the casters does not prevent the tape transport unit frame from fitting snugly against the tape control unit frame.

__ 10 Fasten the tape control unit to the tape transport unit by installing a hex bolt and washer at the rear of the tape control unit [1], and at the front of the tape transport unit [2]. It may be necessary to remove the Tape Transport Unit Front Safety cover to install hex bolt [2]. See CARR-DR 2-1 if the cover needs to be removed.

Hex bolts and washers are part of the ship group.

Note: If the tape control unit and tape transport unit are not correctly aligned, the covers may bind. Ensure that the covers are not binding.

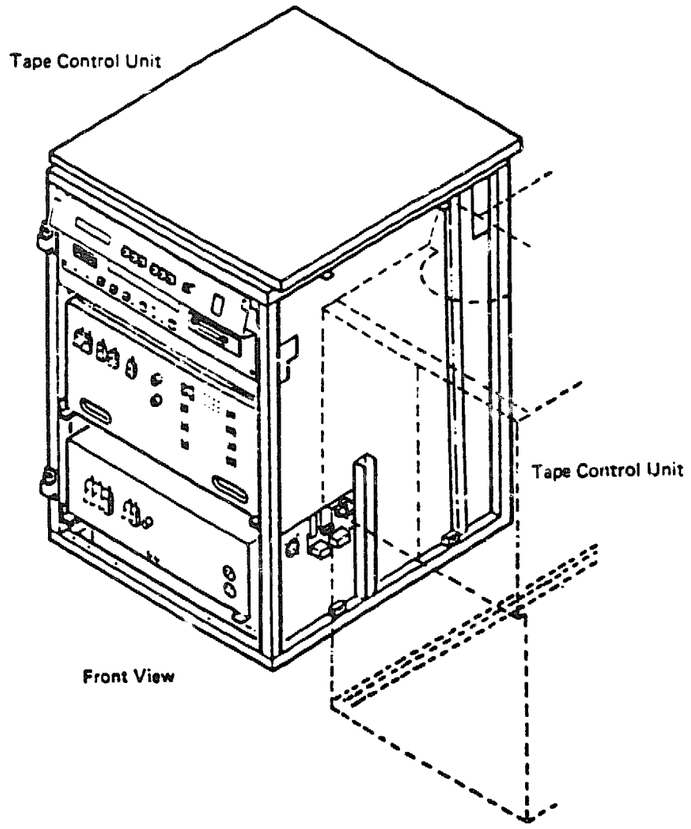
__ 11. Place the rear casters so the caster lock thumbscrews [3] are accessible

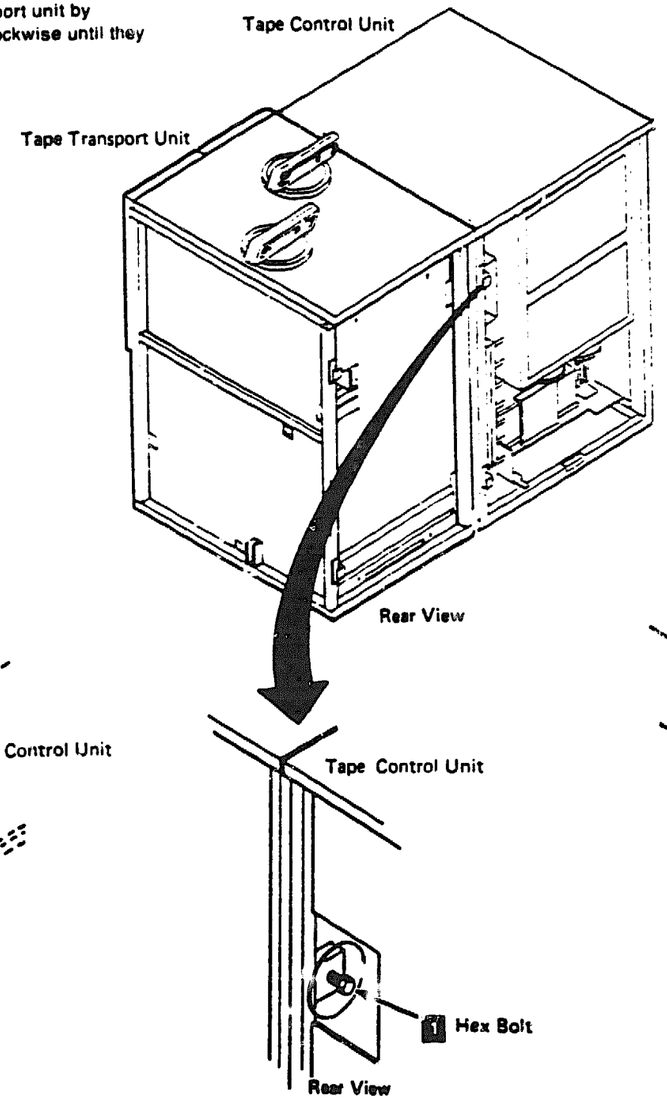
__ 12. Lock the rear casters on the tape transport unit by turning the caster lock thumbscrews clockwise until they are tight.

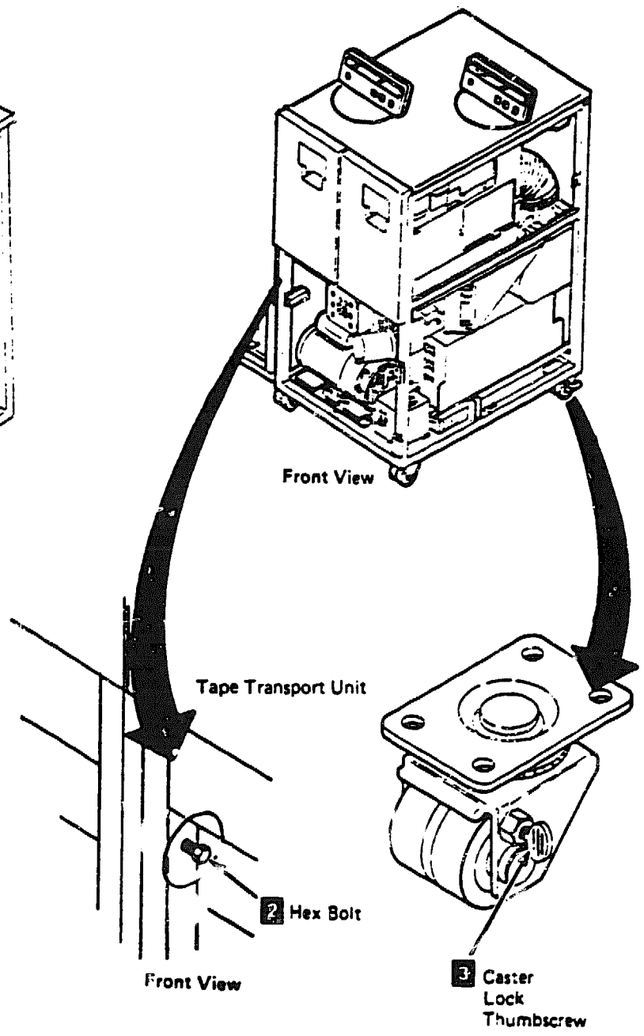
Before You're Through...

Are you installing additional tape transport units to this tape control unit?

```
YES NO
|   |
|   Go to INST 22, step 14.
|
Go to INST 20 to install additional tape
transport units.
```







Installing Additional Tape Transport Units

CAUTION:

TILT HAZARD CAUTION

Do NOT open both drives of a tape transport unit that is not bolted to another tape transport unit or tape control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape transport unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

__ 1. Place the the next tape transport unit into position.

__ 2. Open the front and rear covers.

Warning: Ensure that the power cable is not pinched between the machine frames.

__ 3. If the safety cover has the retainer tightened over it, loosen the screw holding the retainer to the ac power cap, rotate the retainer and retighten the screw.

__ 4. Connect the next tape transport unit's ac power cable 5 to the preceding tape transport unit's power cable socket 8 after removing the socket safety cover (if not already removed).

Ensure that the ac power cable is routed away from the compressor motor and is fastened to the back of the frame 9 to prevent pinching the cable when the units are moved together.

__ 5. Connect the device data bus cable 7 from the next tape transport unit to the preceding tape transport unit 3.

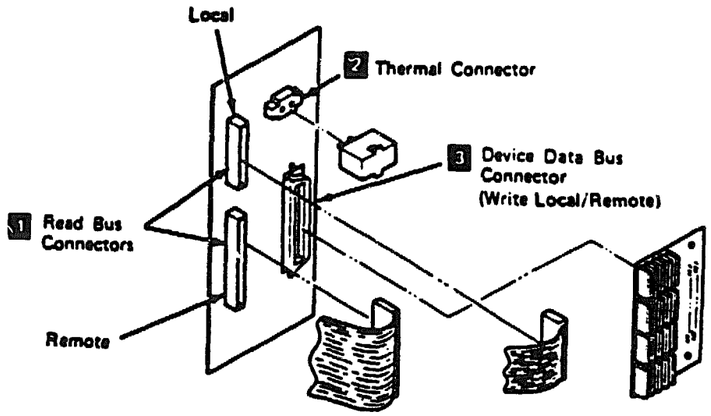
Fasten the cable in place with the retaining screws.

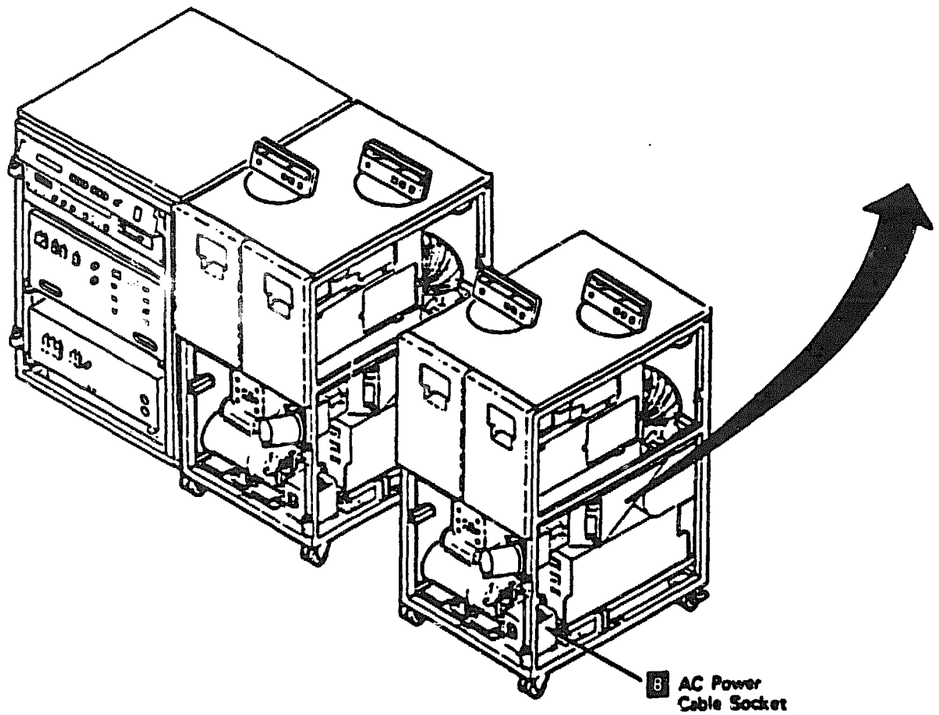
__ 6. Connect the two read bus cables 4 from the next tape transport unit to the preceding tape unit 1.

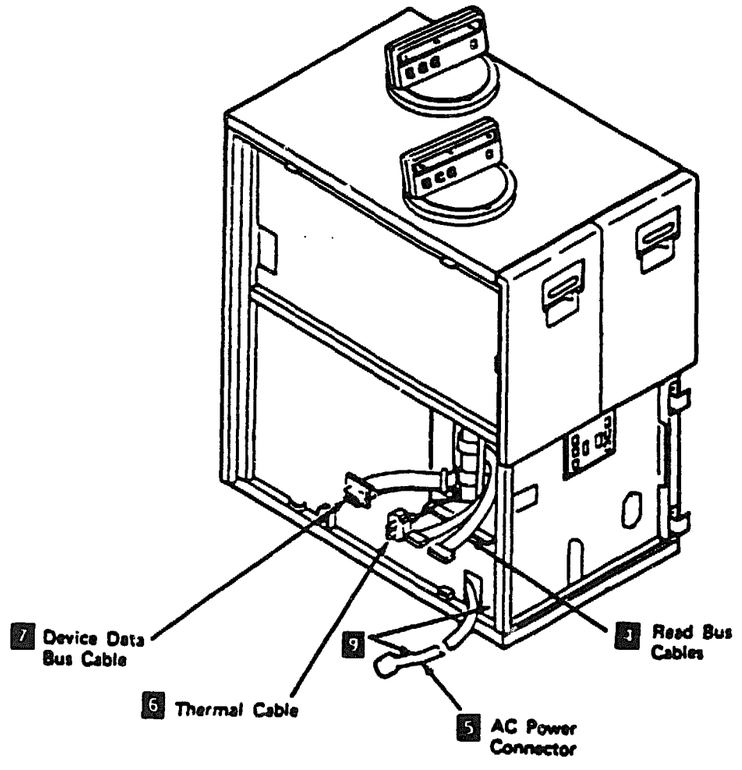
Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape transport unit, making sure they are not crossed.

__ 7. Connect the thermal cable 6 on the next tape transport unit to the thermal connector 2 on the preceding tape transport unit.

__ 8. Continue with the next step on INST 21.







Installing Additional Tape Transport Units (Continued)

__ 9 Place the next tape transport unit against the preceding tape unit.

Warning: When installing a tape transport unit to a tape transport unit with the automatic cartridge loader feature installed on drive 1, drive 1 must be opened approximately 5 cm (2 in.) to prevent the conductive seal from being pinched between the tape transport unit frames.

Note: Be sure the position of the casters does not prevent the tape transport units from fitting snugly together.

__ 10. Fasten the new tape transport unit to the preceding tape unit by installing a hex bolt and washer at the rear of the tape transport unit 1, and at the front of the tape transport unit 2. It may be necessary to remove the Tape Transport Unit Front Safety cover to install hex bolt 2. See CARR-DR 2-1 if the cover needs to be removed.

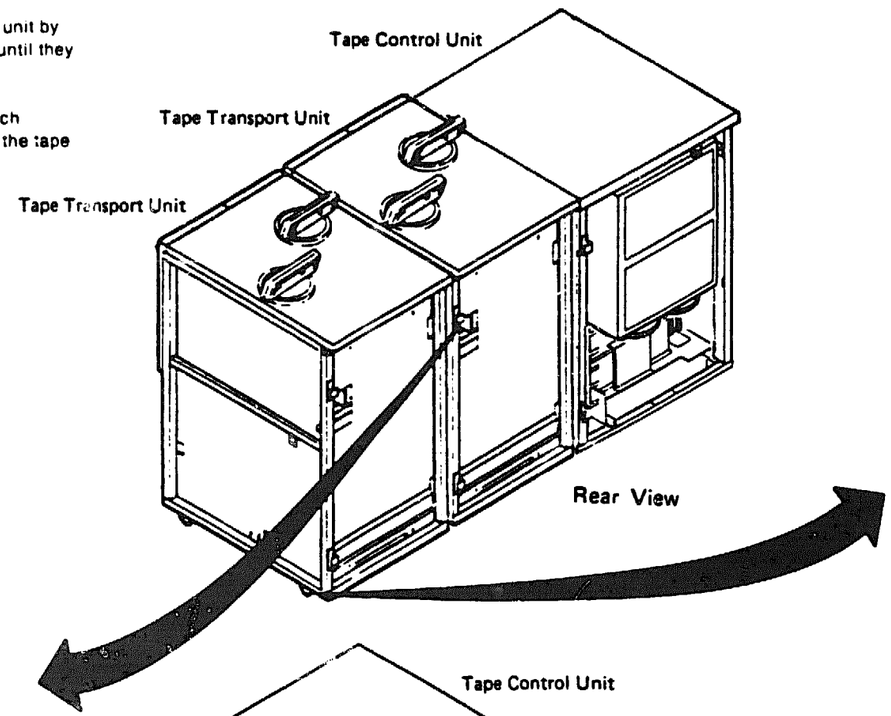
Note: If the tape transport units are not correctly aligned, the covers may bind. Ensure that the covers are not binding.

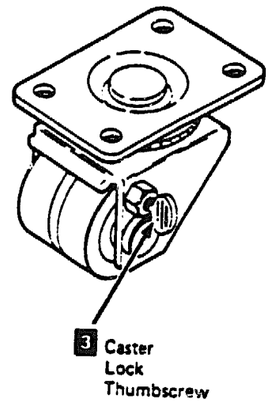
__ 11 Place the rear casters on the new tape transport unit so the caster lock thumbscrews 3 are accessible.

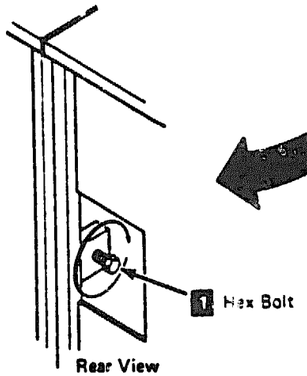
__ 12. Lock the rear casters on the new tape transport unit by turning the caster lock thumbscrews clockwise until they are tight.

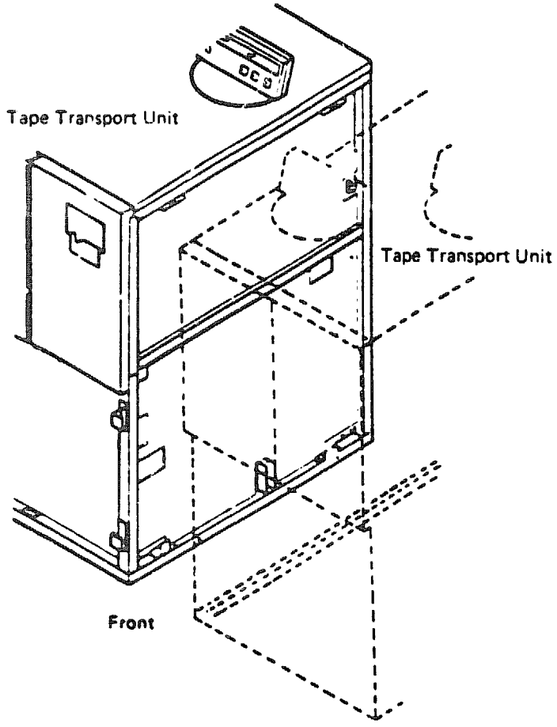
__ 13. Repeat the steps on INST 20 and INST 21, for each additional tape transport unit that is attached to the tape control unit.

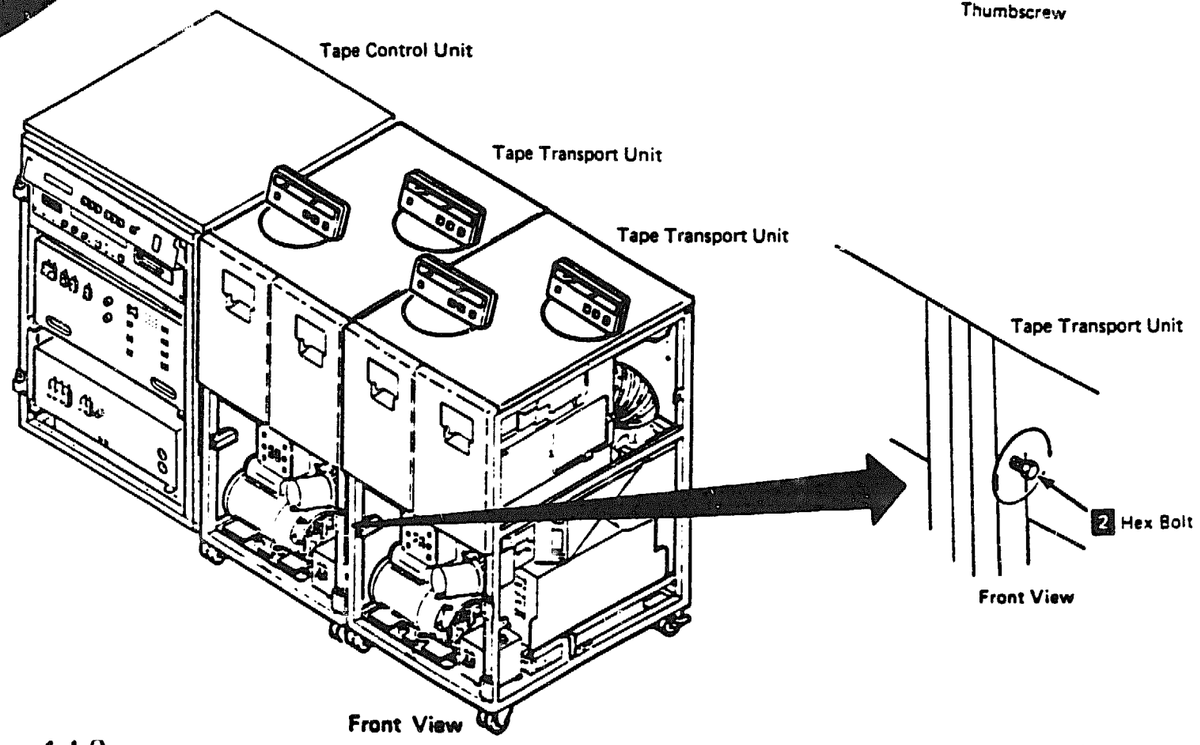
__ 14. Go the next step on INST 22.











Installing Additional Tape Transport Units (Continued)

On the last tape transport unit attached to the tape control unit:

__ 15 Locate the device data bus terminator card P/N 29-27173-01, in the ship group. Plug the card into the device data bus socket 4.

__ 16 Screw the safety cover 1 onto the ac power cable socket.

DANGER

Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

__ 17. After the safety cover is in place, loosen the screw holding retainer 5 to the ac power box. Rotate the retainer and tighten the screw with the retainer positioned to prevent the safety cover from being removed.

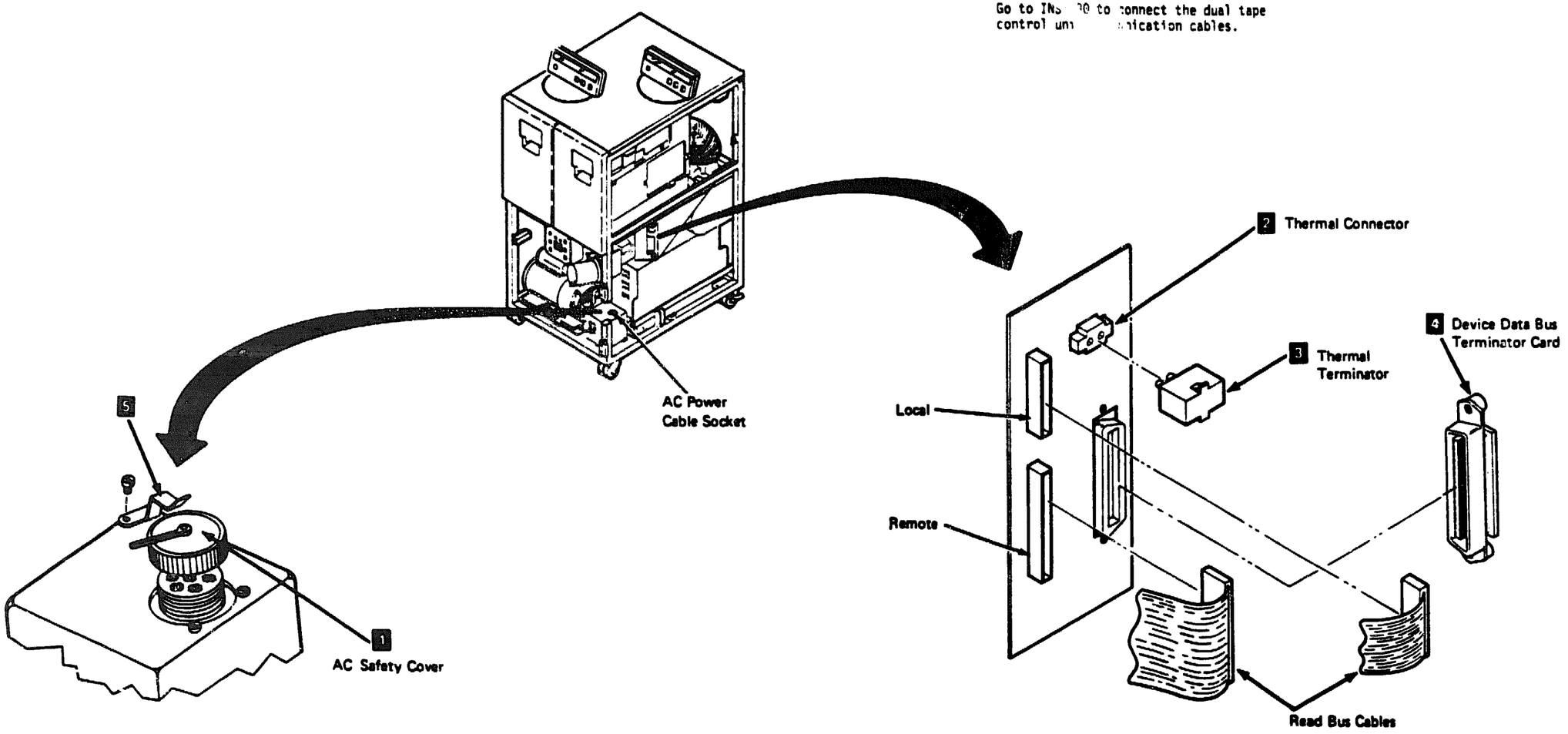
__ 18. Plug the thermal terminator 3 in the thermal connector 2.

__ 19. Are you installing a second tape control unit that is to be attached to this tape control unit with feature cables?

```
YES NO
 |   |
 |   Go to INST 40.
 |
Have you already installed the second
tape control unit and the attached
tape transport unit?

YES NO
 |   |
 |   Return to INST 10 and repeat the
 |   procedure for the second
 |   tape control unit
 |
For a dual tape control unit subsystem, each
tape control unit has a unique identity: TCU0
or TCU1. The identification switches
will be set later during the installation.

Go to INST 30 to connect the dual tape
control unit communication cables.
```



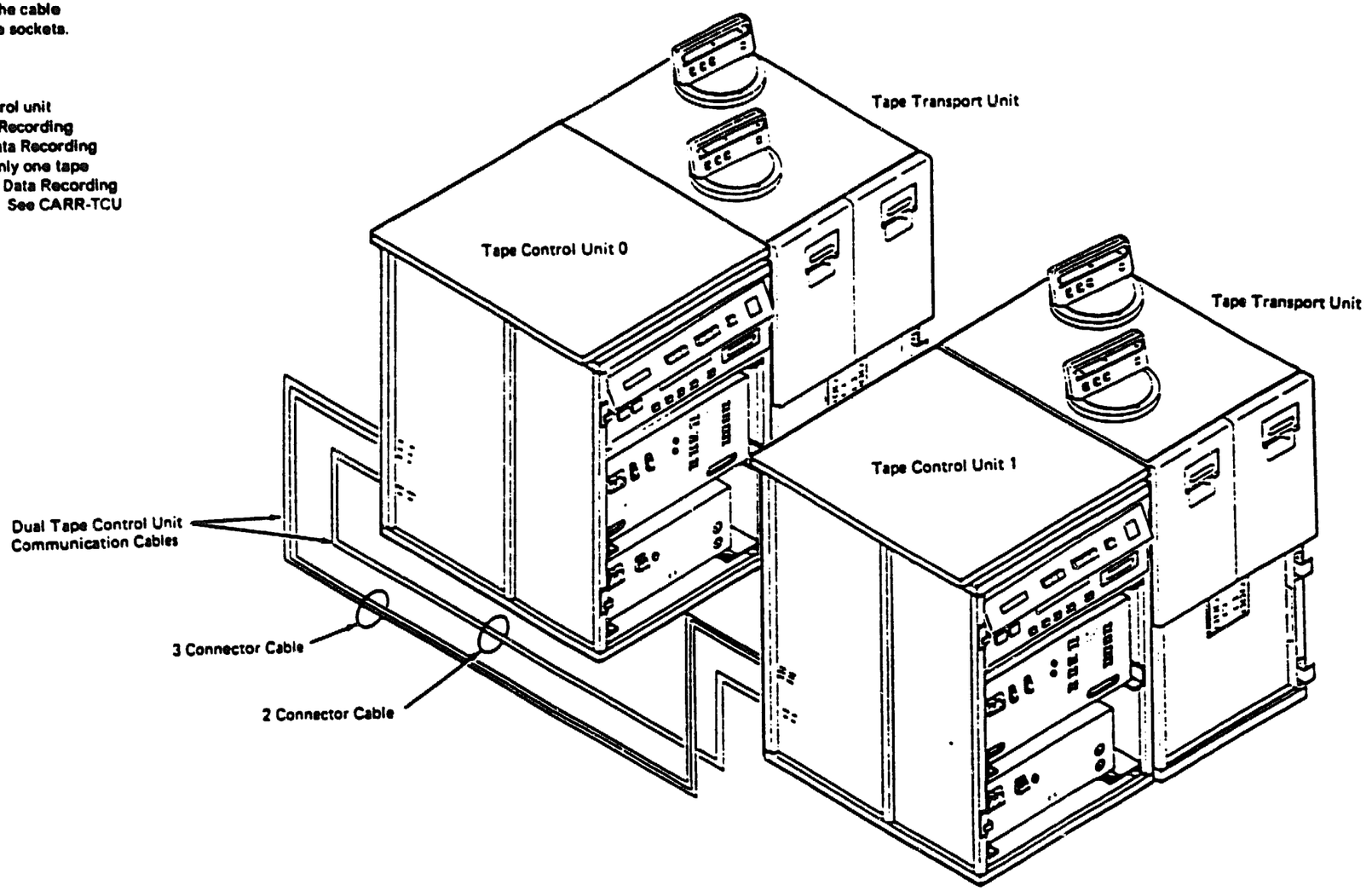
Connecting the Dual Tape Control Unit Communication Feature Cables

__ 1 Bring the cable ends up from the bottom of the tape control unit, inside the machine frame, at the rear of the tape control unit.

Note: Ensure that the cables are positioned so the cable connectors line up correctly with the cable sockets.

__ 2. Continue to the next step on INST 31.

Note: Both tape control units of a dual tape control unit subsystem must have the Improved Data Recording Capability feature before the Improved Data Recording Capability allowed switch can be set. If only one tape control unit has the feature, the Improved Data Recording Capability allowed switch must be set off. See CARR-TCU 1200 for switch position assignments.



TA90 Installation Ins'ructions

Connecting the Dual Tape Control Unit Communication Feature Cables (Continued)

__ 3. Before installing the cables, press the cable contacts firmly against the ESD pad 8 to remove any electrostatic discharge

__ 4. Connect the grounding strip from the 3-connector cable. Attach the braided ground strap to the frame at 5.

__ 5. Connect the grounding strip from the 2-connector cable. Attach the strip to the wingnut at 8

__ 6. Plug the 2-connector cable connectors 2 in sockets A1, and A2.

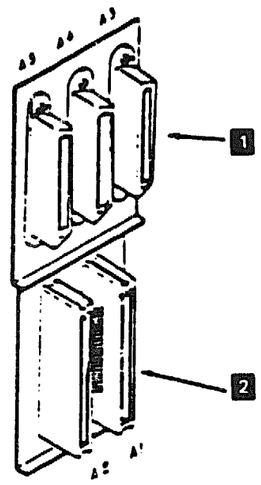
__ 7. Plug the 3-connector cable connectors A3, A4, and A5 1 in sockets A3, A4, and A5, and fasten them in place with the retaining screws.

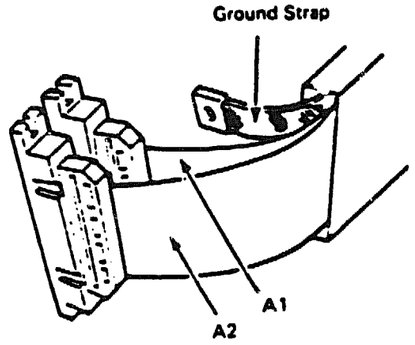
__ 8. Loosen the wingnuts 3 on the cable retaining brackets 4 and rotate the brackets away from the center guide post.

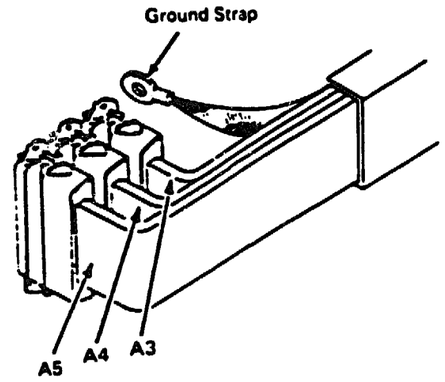
__ 9. Place the cables between the guide posts 6 and rotate the retaining brackets in to the center guide post 7.

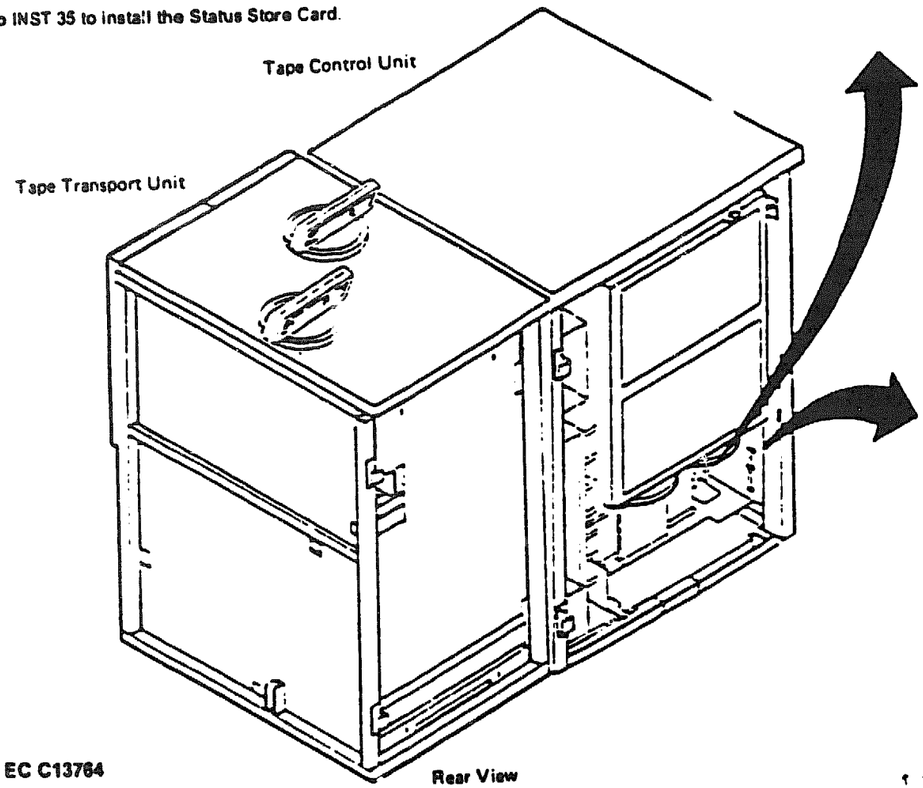
__ 10. Tighten the wingnuts on the retaining brackets.

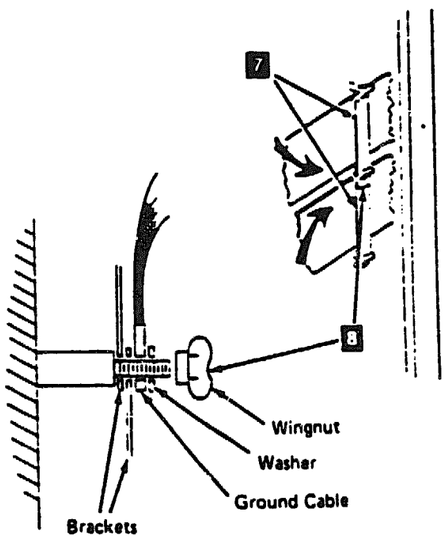
__ 11. Go to INST 35 to install the Status Store Card.

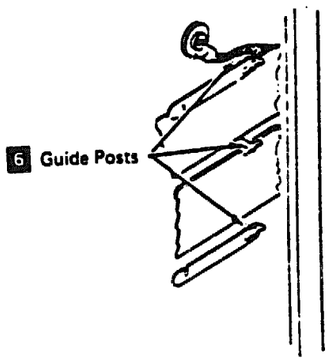


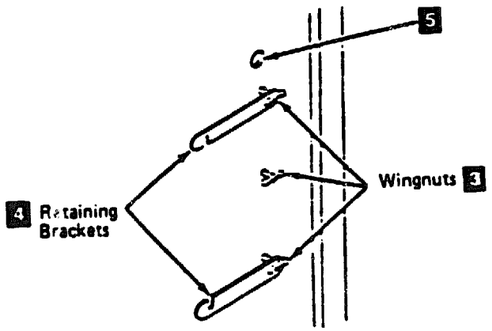












Installing the Status Store Card

Note: If a logic card is installed in location 01A-A1F2 go to step 6.

__ 1 Remove the logic card retainers 1 top and bottom from card locations 01A-A1B2 through 01A-A1G2 top and bottom.

__ 2 Remove the dummy card from location 01A-A1F2 2.

__ 3 Install the Status Store Communication Card into card location 01A-A1F2 2.

__ 4 Reinstall logic card retainers 1 top and bottom in card locations 01A-A1B2 through 01A-A1G2.

__ 5 Install top card connectors (TCC) 3 at card locations 01A-A1WFG, 01A-A1XFG, 01A-A1YFG, and 01A-A1ZFG 4.

__ 6 Testing the Dual Communication feature.

Note: This feature must be installed in both Tape Control Units before proceeding with the test procedure.

__ 7 Go to INST 40 to set the Tape Control Unit addresses and return here when complete.

__ 8 Go to INST 50 to set the Drive logical and physical addresses and return here when complete.

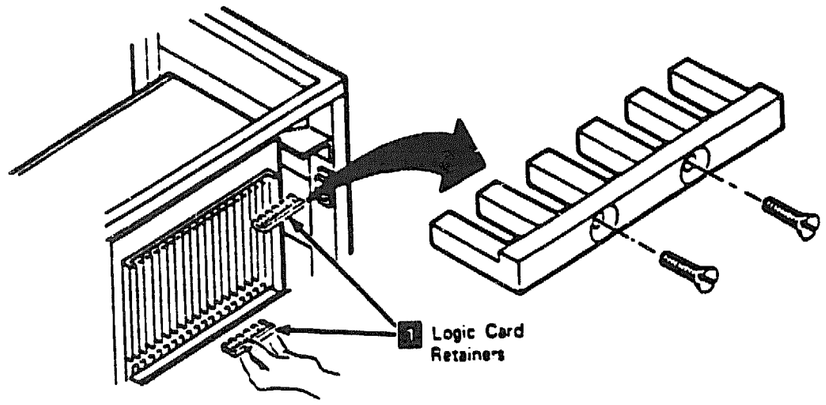
__ 9 On the Tape Control Unit that has drive addresses 0 - 7, using the CE Panel (see CE/HSC) pin drive 0 remotely and run ILTAPE for 5 minutes on drive 0.

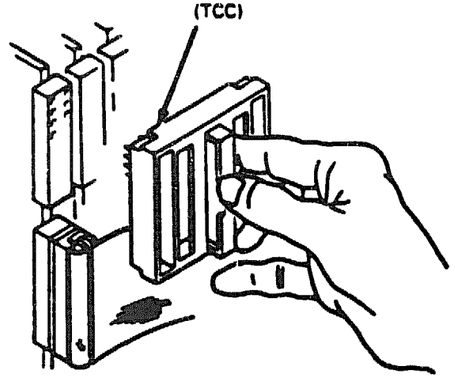
__ 10 Press DIAG on the CE Panel to unpin the drive.

__ 11 On the Tape Control Unit that has drive addresses 8 - 15, using the CE Panel (see CE/HSC) pin drive 8 remotely and run ILTAPE for 5 minutes on drive 8.

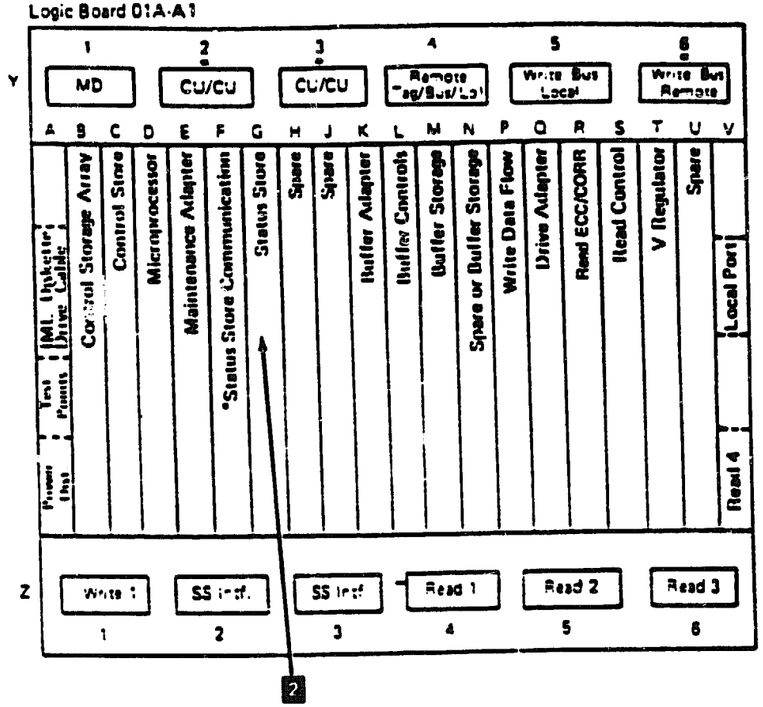
__ 12 Press DIAG on the CE Panel to unpin the drive.

__ 13 Put the TA90-DC serial number label 5 on both Tape Control Units.

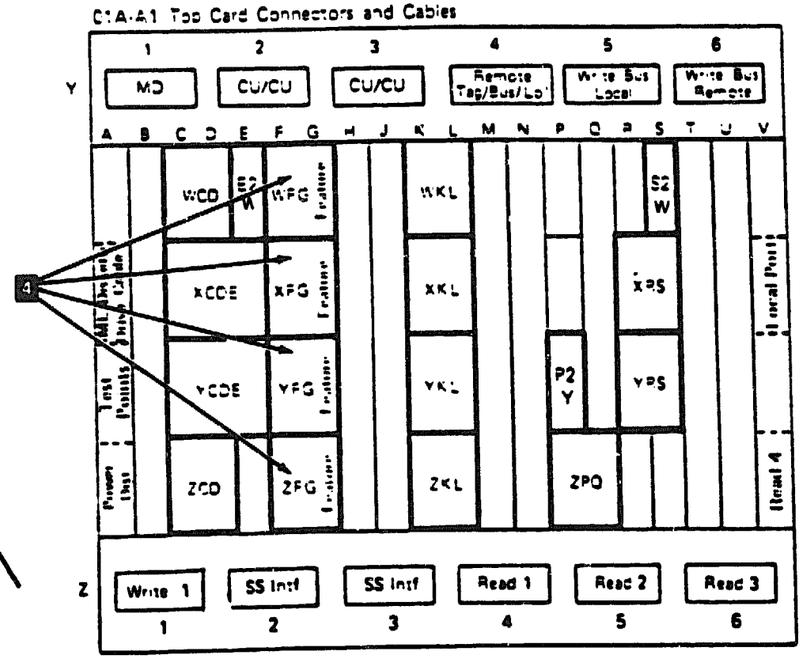


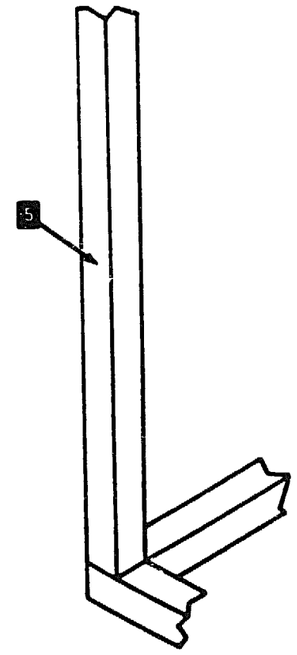


Logic Board 01A-A1



01A-A1 Top Card Connectors and Cables





TA90 Installation Instructions

Each switch pair has two thumbwheel switches. The left switch is set to the tape control unit address. The right switch is set to a Mode/Type value to be determined by the Switch Setting Chart.

Setting the Tape Control Unit TCU0/TCU1 Switch

On a single tape control unit subsystem:

__ 1. Set the TCU0/TCU1 switch 1 to TCU0.

__ 2. Set the thumbwheel switches 2 to 0D.

On a dual tape control unit subsystem:

__ 1. On TCU0, set the TCU0/TCU1 switch 1 to TCU0.

Note: TCU0 has drive addresses 0 – 7 physically attached to the tape control unit.

__ 2. On TCU0, set the thumbwheel switches to 0D.

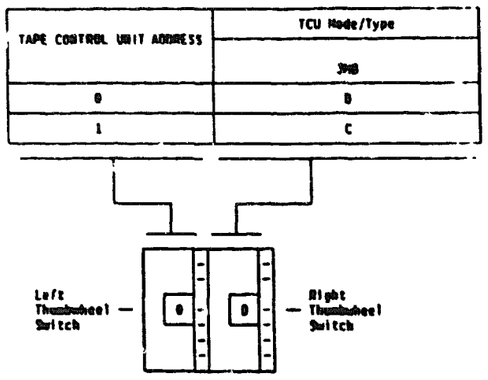
__ 3. On TCU1, set the TCU0/TCU1 switch 1 to TCU1.

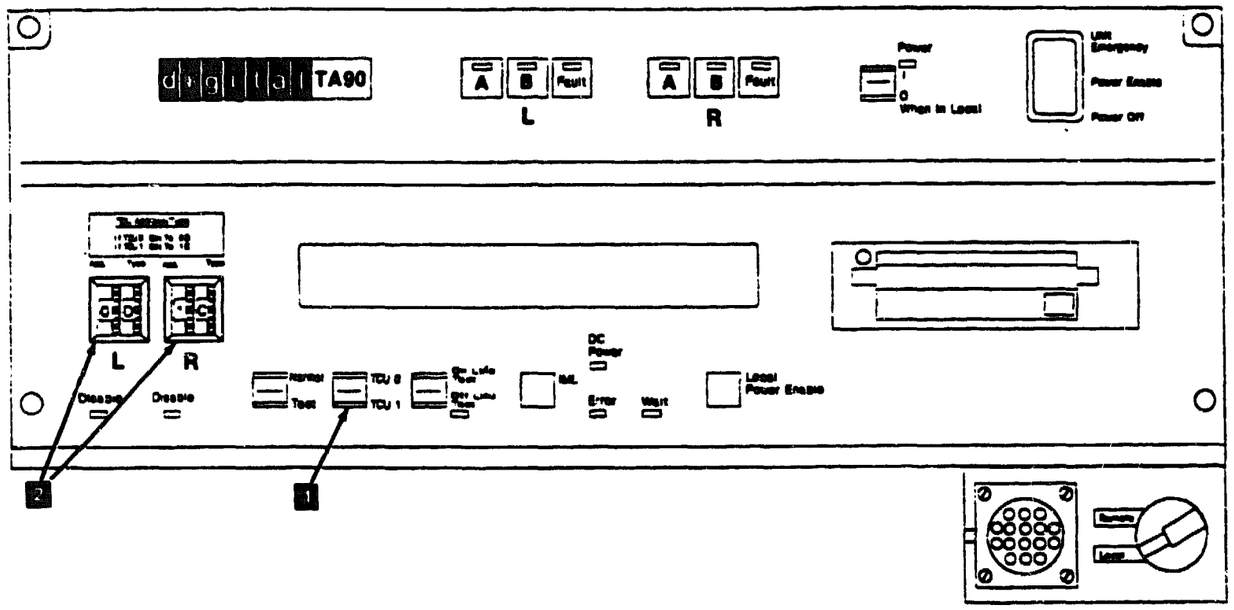
Note: TCU1 has drive addresses 8 – F physically attached to the tape control unit.

__ 4. On TCU1, set the thumbwheel switches 2 to 1C.

Switch Setting Chart

TAPE CONTROL UNIT ADDRESS	TCU Mode/Type
	3MB
0	D
1	C





Setting the Drive Logical and Physical Addresses

Use the following procedures to set the drive logical address and physical address. There are separate procedures for a single tape control unit subsystem and a dual tape control unit subsystem --- be sure to use the correct procedure.

Single Tape Control Unit Subsystem

__ 1. Set the drive logical address switches [1] to 0 through 7, set the drive next to the tape control unit to 0, set the next drive to 1, and so forth. See figure 1.

__ 2. Open the rear cover of the tape transport units.

__ 3. Find the physical address switch [3] on the back of the drive drawer.

__ 4. Set the drive physical address switches to match the logical address switches.

__ 5. Close the rear cover of the tape transport units.

__ 6. Ensure that the logical and physical address switches are set on all drives before continuing.

__ 7. Go to INST 55 to check the tape control unit power supply jumpers.

Dual Tape Control Unit Subsystem

__ 1. Set the drive logical address switches [1] on the drives attached to TCU0, to 0 through 7; set the drive next to the tape control unit to 0, set the next drive to 1, and so forth. See figure 1.

__ 2. Set the drive logical address switches [1] on the drives attached to TCU1, to 8 through F; set the drive next to the tape control unit to 8, set the next drive to 9, and so forth. See figure 1.

__ 3. Open the rear cover of the tape transport units.

__ 4. Find the physical address switch [3] on the back of the drive drawer.

__ 5. Set the drive physical address switches to match the logical address switches.

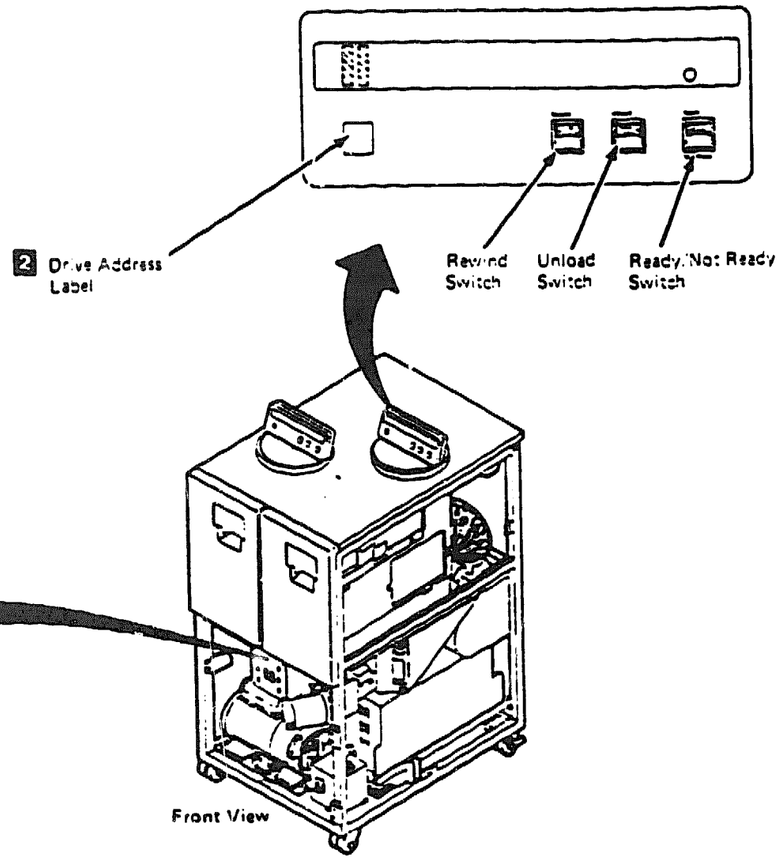
__ 6. Close the rear cover of the tape transport units.

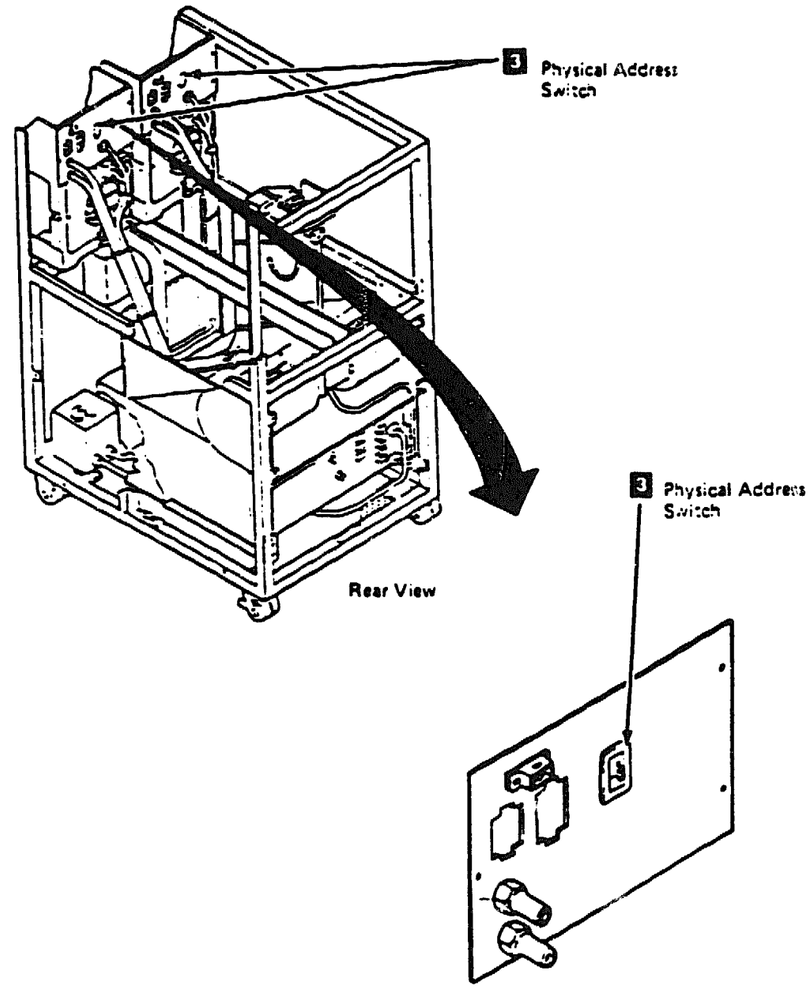
__ 7. Ensure that the logical and physical address switches are set on all drives before continuing.

__ 8. Go to INST 55 to check the tape control unit power supply jumpers.

CU0	0	1	2	3	4	5	6	7
CU1	8	9	A	B	C	D	E	F

Figure 1. Required Drive Address Values





Checking Tape Control Unit Power Supply Jumpers

Check the jumpers for the tape control unit ac (PS01) power supply. If the installation is a dual tape control unit subsystem, check both tape control units.

__ 1. Remove the safety cover.

__ 2. Use one of the following two tables to check the voltage settings. Ensure the jumpers are installed correctly for the voltage being used.

Note: For 50 Hz (except Japan) machines, if the Delta/Wye jumper has to be changed (J09 and J10 on TCU-PS01), ensure that the cap is reinstalled on the empty socket.

TAPE CONTROL UNIT VOLTAGE JUMPERS 60 HZ AND 50 HZ JAPAN		
TCU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPER	REF
200/208 V ac	J09	4
220 V ac	J10	4
230/240 V ac	J11	4
CONVENIENCE OUTLET		
100 V ac	J12	3
120 V ac	J13	3

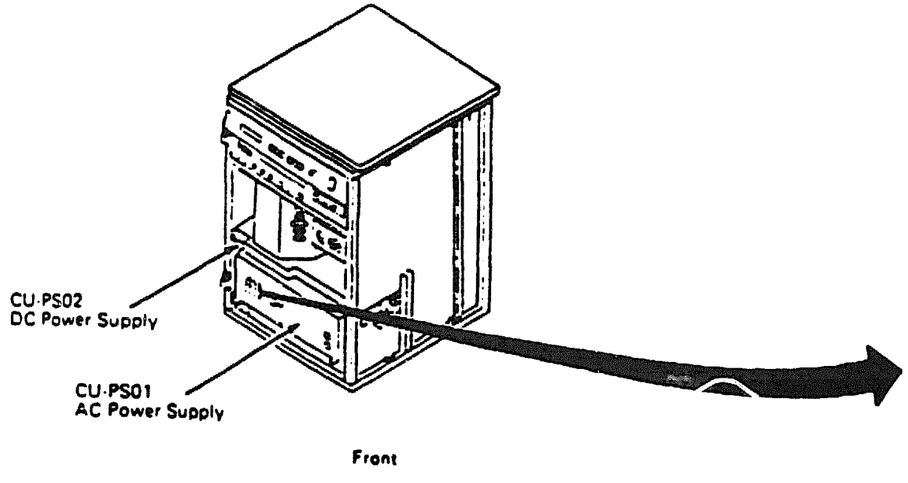
TAPE CONTROL UNIT VOLTAGE JUMPERS 50 HZ (EXCEPT JAPAN)		
TCU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPERS	REF
200/208 V ac	J09, J11, J13	5
220 V ac	J09, J11, J14	5
230/240 V ac	J09, J11, J15	5
380 V ac	J10, J12, J14	5
400 V ac	J10, J12, J15	5
415 V ac	J10, J12, J15	5

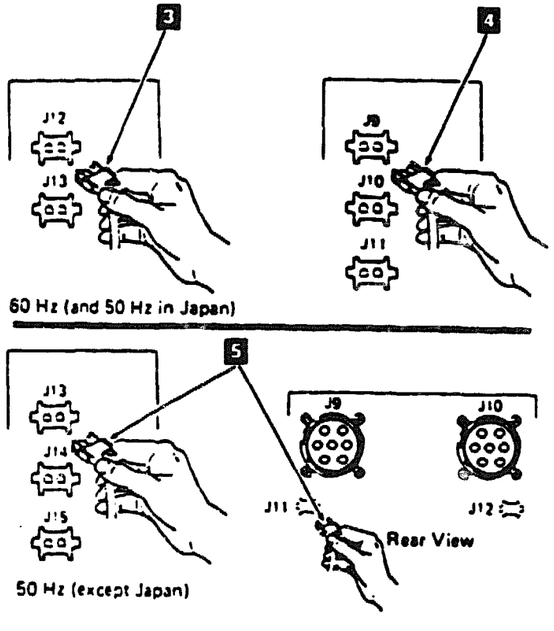
__ 3. Switch all of the circuit breakers on each tape control unit off then back on. See LOC 1 for the TCU dc and ac power supplies.

__ 4. Open the back of each TCU and ensure that the Service switch mounted on the gate is in the On position. See LOC 1.

__ 5. Go to INST 60 if no tape transport units are to be connected to this tape control unit.

__ 6. Go to INST 58 to check the tape transport unit power supply jumpers.





Checking Tape Transport Unit Power Supply Jumpers

Use the following table to check for correct voltage jumpering on each tape transport unit dc power supply

Attention: The correct position of the tape transport unit's dc (PS01) jumper is determined by the tape control unit's input voltage, NOT the tape transport unit's input voltage. See the table below

__ 1 Open the rear cover to gain access to the dc power supply

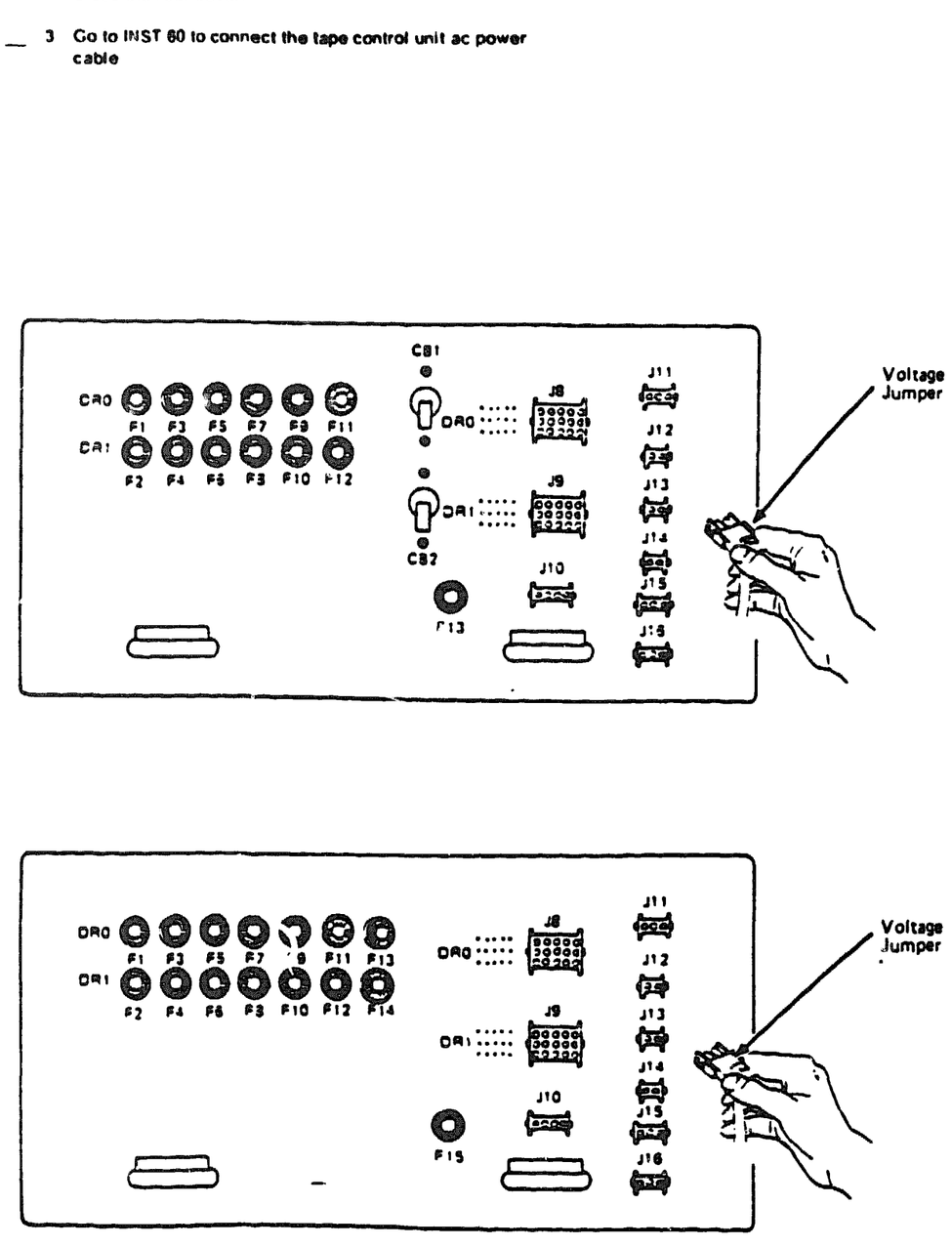
There are two dc power supplies. see the illustrations to determine which supply is in the tape transport unit

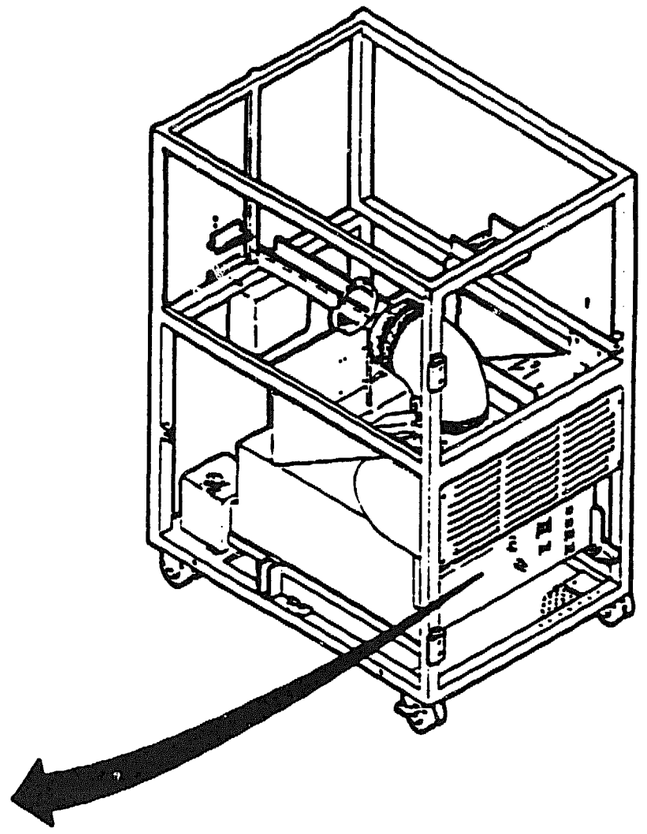
TAPE TRANSPORT UNIT VOLTAGE JUMPER	
TCU INPUT VOLTAGE	POSITION OF DC (PS01) JUMPER
200/200 V ac	J12
220 V ac	J13
230/240 V ac	J14
380 V ac	J13
400 V ac	J14
415 V ac	J14

__ 2 Switch all circuit breakers on each tape transport unit off then back on. See LOC 1 for circuit breaker locations.

Close the rear cover.

__ 3 Go to INST 60 to connect the tape control unit ac power cable





Connecting the Tape Control Unit AC Power Cable

DANGER

Make sure the circuit breaker that supplies power to the customer's receptacle is OFF.

If you are installing a dual tape control unit subsystem, power to both customer receptacles must be OFF.

Make sure that there are no cables attached to the I/O tailgate assembly in the bottom rear of the tape control unit.

Note: See INST 61 for the following locations.

__ 1. On the tape control unit operator setup (OSU) panel, set the Power On/Off switch 3 to Off. Set the Unit Emergency Power Off (UEPO) switch 4 to Power Off.

Are you satisfied that the customer receptacle and tape control unit power connector are wired correctly? See INST 6 for safety checks.

```
YES NO
 |   |
 |   Inform the customer to have the
 |   wiring corrected.
 |
Continue to the next step.
```

__ 2. Connect the tape control unit ac power connector 12 to the customer receptacle.

__ 3. On the tape control unit operator setup panel:

__ a. Set the Power On/Off switch 3 to On.

__ b. Set the Online Test/Offline Test switch 2 to Offline Test.

__ c. Set the Local/Remote switch 6 to Local.

__ 4. On each drive switch panel:

__ a. Set the Drive Power switches 13 to On.

__ b. Set the Online/Offline switches 14 to Online.

__ 5. Have the customer switch on the circuit breaker that supplies power to the customer receptacle.

__ 6. On the tape control unit operator setup panel:

__ a. Set the UEPO switch 4 to Power Enable.

__ b. Press the Local Power Enable switch 5 to supply power to the tape control unit and its attached drives.

Is the DC Power light on the tape control unit operator setup panel 1 On?

```
YES NO
 |   |
 |   Is the Service switch on the 01A
 |   gate in the TCU 9 set to On?
 |
 |   YES NO
 |    |   |
 |    |   Set the switch to On and press
 |    |   the Local Power Enable switch 5.
 |    |
 |    |   Is the DC Power light on the TCU
 |    |   operator setup panel 1 On?
 |    |
 |    |   YES NO
 |    |    |   |
 |    |    |   Go step 7 on this page.
 |    |    |
 |    |    Go step 15 on this page.
 |    |
 |   Go step 7 on this page.
 |
Go step 15 on this page.
```

__ 7. Vibration or temperatures exceeding operating temperatures during shipping may trip the upper or lower thermal switches on the logic gate.

Set the UEPO switch 4 to Off.

__ 8. Loosen the two screws 10 on the top of the logic gate 7, and raise the top cover to gain access to the upper thermal switch 8.

__ 9. Press the reset button located on the upper thermal switch, then lower the top cover, and tighten the two top cover screws.

__ 10. Locate the lower thermal switch 11 on the bottom of the logic gate.

__ 11. Press the lower thermal switch reset button.

__ 12. Reset the upper and lower thermals in the STI gate (refer to LOC 45).

__ 13. Set the UEPO switch 4 to Power Enable.

__ 14. Press the Local Power Enable switch 5 to supply power to the tape control unit and its attached drives.

Is the DC Power light on the tape control unit operator setup panel 1 On?

```
YES NO
 |   |
 |   Go to MAP 0100-Power Start, on PWR
 |   100, to repair the power failure;
 |   then return to this page, INST 60,
 |   step 2 and continue.
 |
Continue with the next step.
```

Checking the Unit Emergency Power Off (UEPO) switch

__ 15. Set the tape control unit Power On/Off switch 3 to the Off position.

__ 16. Set the UEPO switch 4 to the Power Off position.

__ 17. Attempt to power on the tape control unit with the UEPO switch in the Power Off position, by doing the following:

__ a. Set the Power On/Off switch 3 to the On position.

__ b. Press the Local Power Enable switch 5.

Does the tape control unit power on with the UEPO switch in the Power Off position?

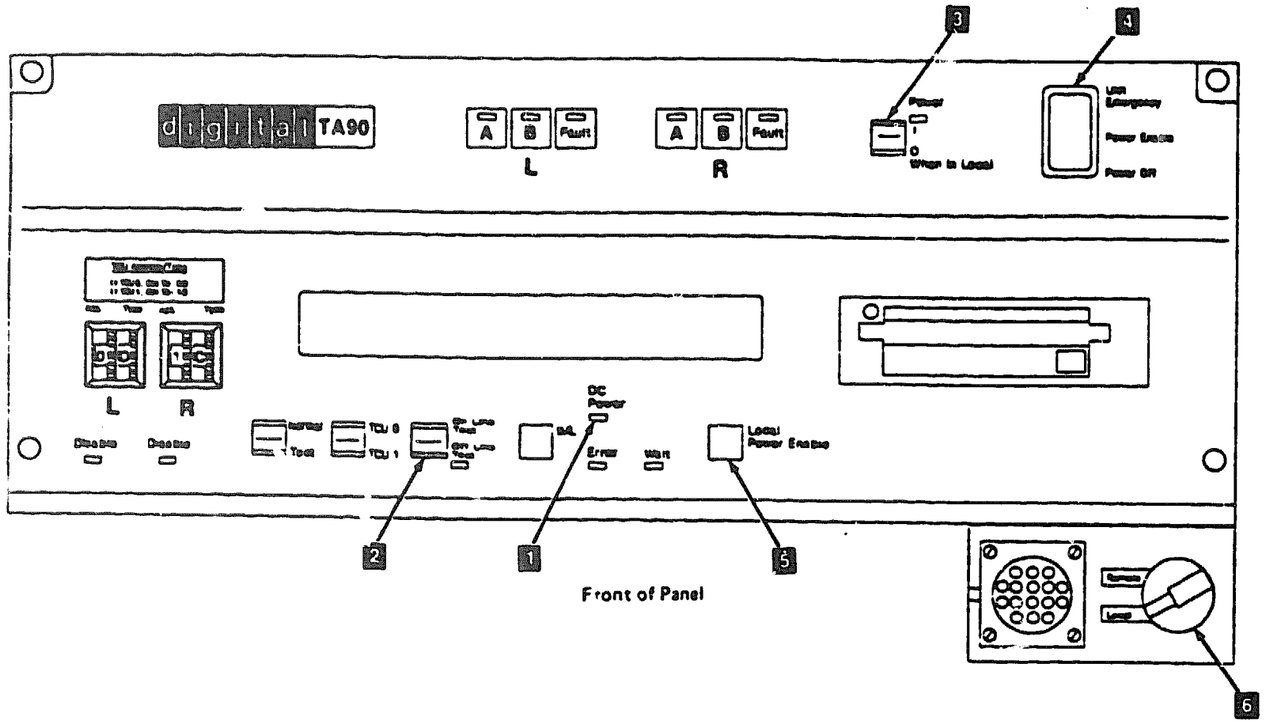
```
YES NO
 |   |
 |   Go to step 18 on this page.
 |
There is a problem with the UEPO switch
(FRU198) or the ac power supply (FRU144).
Follow the instructions in the CARR-TCU
section of the Maintenance Guide
for the removal and replacement of those
FRUs.  Return here and repeat steps 14
through 16 after each FRU is replaced.

Does the tape control unit power on with the
UEPO switch in the Power Off position?

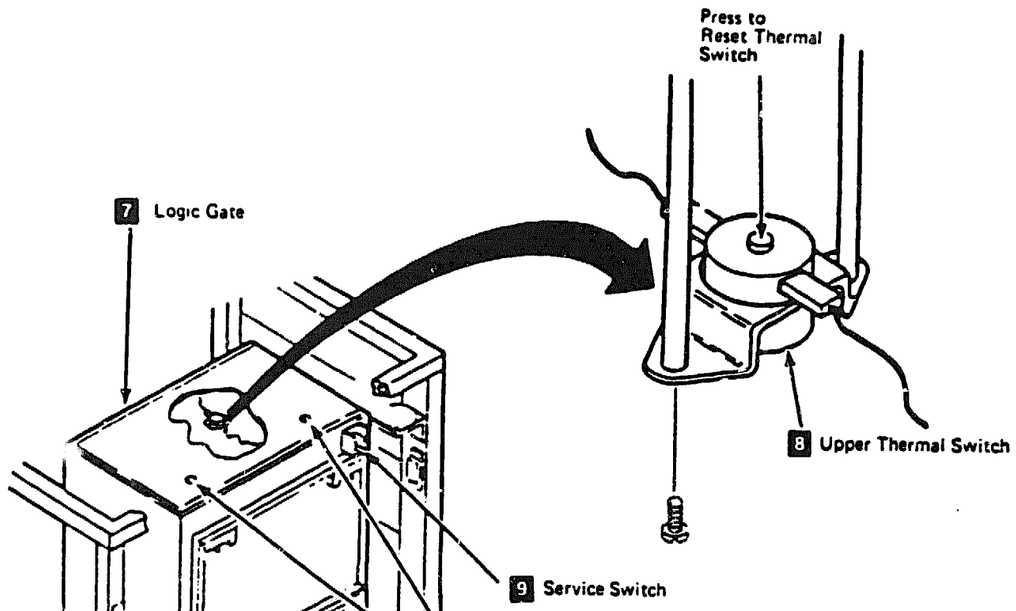
YES NO
 |   |
 |   Go to step 18 on this page.
 |
Go to MAP 0100-Power Start, on PWR 100,
to repair the power failure; then return
here to complete the installation.
```

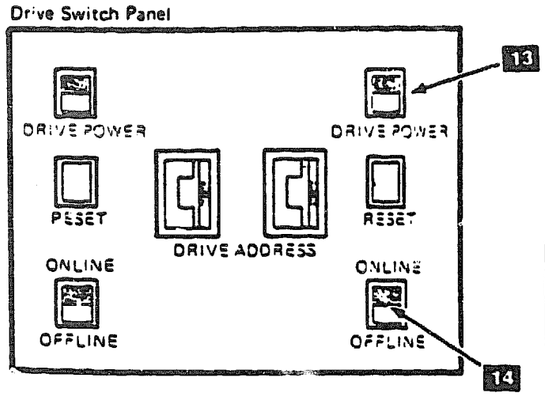
__ 18. Are you installing a single tape control unit subsystem?

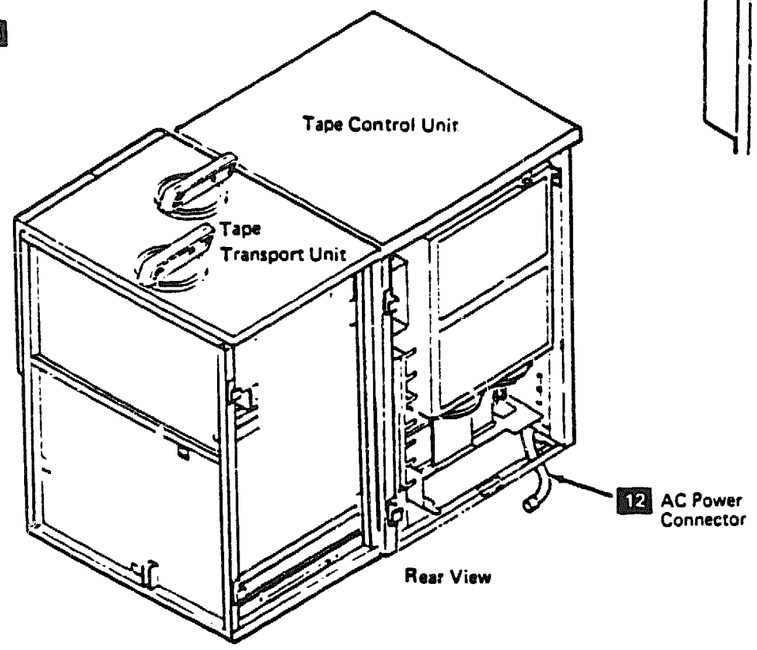
```
YES NO
 |   |
 |   Are two FE's installing
 |   this subsystem at the same time?
 |
 |   YES NO
 |    |   |
 |    |   Repeat steps 1 through 17 for
 |    |   the second tape control unit, then
 |    |   set the Power ON/OFF switch 3
 |    |   to OFF on both tape control units
 |    |   and go to INST 76.
 |    |
 |   Set Power ON/OFF switch 3 to OFF
 |   and go to INST 70.
 |
Set Power ON/OFF switch 3 to OFF
and go to INST 70.
```



Front of Panel







Running Offline Checkout for a Single Tape Control Unit Subsystem

Note: See INST 71 for the physical locations.

This procedure is used for offline checkout of a single tape control unit subsystem only. Go to INST 76 if you have a dual tape control unit subsystem.

The offline checkout tests whether the tape control unit can communicate with all the drives in the subsystem.

As you progress through the tests, you are asked to note the address of any drive that does not show the display response expected. After the offline checkout is complete, you will be sent to INST 90 to analyze the drives that failed during the checkout.

The error light 3 will light when certain portions of the offline tests are run. This condition is normal and does not indicate a failure in the tape control unit unless you are asked to note the status of the error light.

Setting Up for the Checkout

Note: If you are adding a tape transport unit to a previously installed subsystem, do the following procedures testing only that tape transport unit you are adding.

__ 1. On the tape control unit operator setup panel:

- __ a. Verify that the Power On/Off switch 5 is set to Off.
- __ b. Set the Normal/Test switch 1 to Test.
- __ c. Verify that the TCU0/TCU1 switch 2 is set to TCU0. (Required for single tape control unit subsystems).
- __ d. Verify that the Online Test/Offline Test switch 4 is set to Offline Test.

__ 2. On each drive operator panel:

- __ a. Set the Ready/Not Ready switch 12 to Ready.

__ 3. On each drive switch panel:

- __ a. Verify that the Drive Power switch 9 is set to On.
- __ b. Verify that the Online/Offline switch 11 is set to Online.

__ 4 On each drive with the Automatic Cartridge Loader feature, set the Loader switch 13 to Auto.

__ 5 On the tape control unit:

- __ a. Push the release button on the IML disk drive 8 and remove the head protector.
- __ b. Insert the Functional diskette, making sure the diskette is not write-protected (the window is closed) before insertion.
- __ c. Set the Power On/Off switch 5 to On.

Switching on the Power

__ 6 Ensure that the main circuit breaker on the tape control unit (CB1 on the ac power supply) is off; then switch it on

__ 7 Set Unit Emergency Power Off switch on the tape control unit 6 to Power Enable.

__ 8. Press the Local Power Enable pushbutton 7 on the tape control unit operator setup panel.

__ 9. Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
 |   |
 |   Are all the switches set correctly?
 |
 |   YES NO
 |    |   |
 |    |   Switch off the mainline circuit
 |    |   breaker (CB1 on the ac power
 |    |   supply) and set the switches as
 |    |   specified in steps 1, 2, and 3;
 |    |   then perform steps 5 through 7.
 |    |
 |    |   Does a single asterisk show for
 |    |   ten seconds or longer on each
 |    |   drive message display?
 |    |
 |    |   YES NO
 |    |    |   |
 |    |    |   Note the drive addresses
 |    |    |   without a single
 |    |    |   asterisk and continue to
 |    |    |   the next step.
 |    |    |
 |    |   Continue to the next step.
 |    |
 |   Note the drive addresses
 |   without a single asterisk and
 |   continue to the next step.
 |
Continue to the next step.
```

__ 10. On each drive switch panel, set the Drive Power switch 9 to Off; then set it back to On.

Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
 |   |
 |   Note the drive addresses without
 |   a single asterisk and continue to
 |   the next step.
 |
Continue to the next step.
```

__ 11. On each drive switch panel, press then release the Reset switch 10.

Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
 |   |
 |   Note the drive addresses
 |   without a single asterisk and
 |   continue to the next step.
 |
Continue to the next step.
```

__ 12. On each drive switch panel, set the Online/Offline switch 11 to Offline.

Do special box-shaped symbols show in the first and last positions of the message display?

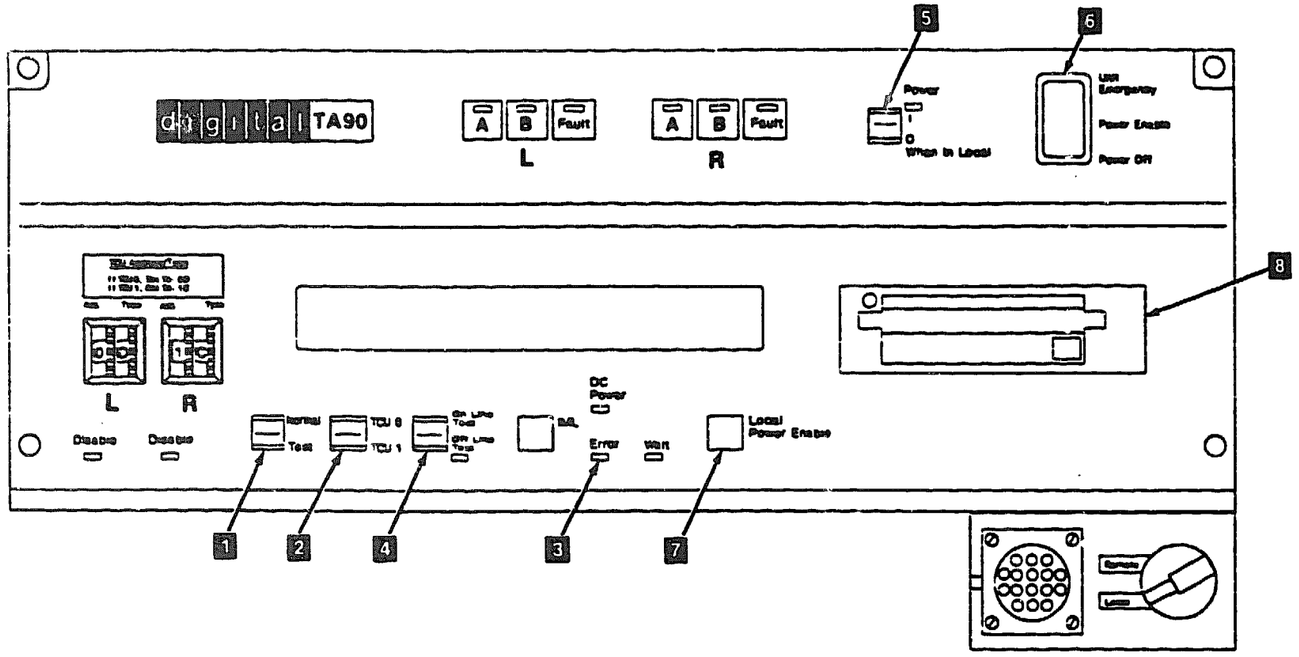
```
YES NO
 |   |
 |   Note the drive addresses
 |   without the special box-shaped
 |   symbols and continue to the next
 |   step.
 |
Continue to the next step.
```

__ 13. On the drive switch panel, set the Online/Offline switch 11 to Online and verify that the special box-shaped symbols go away.

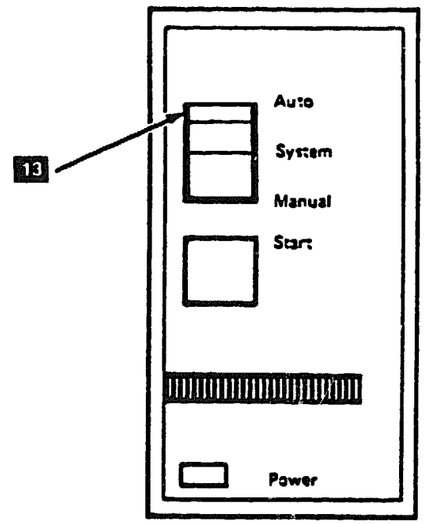
Do the special box-shaped symbols go away?

```
YES NO
 |   |
 |   Note the drive addresses where the
 |   special box-shaped symbols do not go
 |   away, and continue with the next step.
 |
Continue with the next step.
```

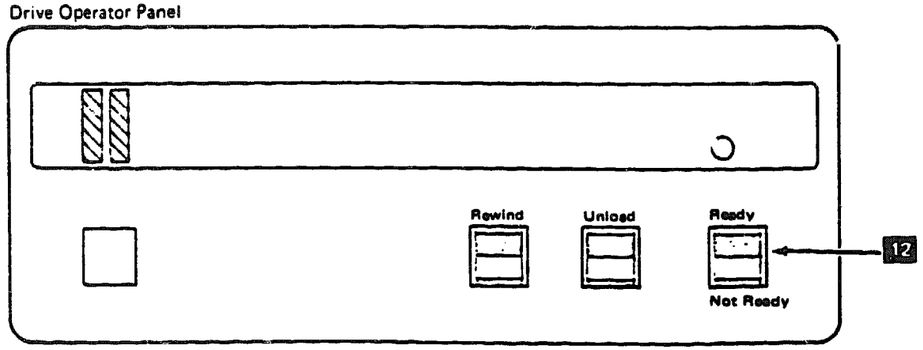
__ 14. Go to INST 72 to continue the offline checkout.



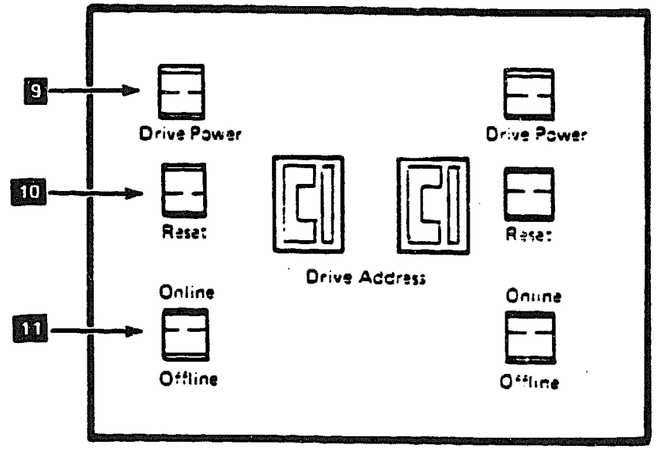
Automatic Cartridge Loader Operator Panel



Drive Operator Panel



Drive Switch Panel



Running Offline Checkout for a Single Tape Control Unit Subsystem (Continued)

Note: See INST 73 for the following locations.

Checking the Addresses

__ 15. On the tape control unit operator setup panel, set the Online Test/Offline Test switch 2 to Online Test.

After a short delay (1 1/2 minutes or less) does "L=x P=x" (x being any number between 0 and 7) appear on any drive display?

```
YES NO
 |
 Power off the tape control unit with the
 Power On/Off switch 3 and verify that
 the switches are set correctly on the
 tape control unit and tape transport unit panels.  See
 "Setting Up for the Checkout" steps 1,
 2, and 3 on INST 70 for the correct
 switch settings.  Correct any switch
 settings that are wrong.  Power up and
 repeat the actions you performed in
 step 14.

 Does "L=x P=x" appear on any tape
 drive display?

 YES NO
  |
  The TCU will not load the micro-
  program and must be fixed to
  continue.  Set the Normal/Test
  switch 1 to Normal and press
  the INL switch 3.
  Run GMP/TA90 Support Diagnostics to
  isolate the problem and return
  here when the problem is fixed.

  Set the Normal/Test switch to Test
  and check the TCU and tape transport unit
  switch settings again.  See
  "Setting Up for the Checkout" steps
  1, 2, and 3 on INST 70 for the
  correct switch settings.  Correct
  any switch settings that are wrong.
  Power up and repeat the actions
  you performed in step 15.

  Does "L=x P=x" appear on any tape
  drive display?

  YES NO
   |  |
   |  |
A  B  C  D
```

```
A  B  C  D
|  |  |  |
|  |  |  Go to EAD 1, Drive Interconnect
|  |  |  Problems, then return to step 15.
|  |  |
|  |  Note the addresses of any dri es
|  |  that do not show the correct
|  |  display, then continue with the
|  |  next step.
|  |
|  Note the addresses of any drives that
|  do not show the correct display, then
|  continue with the next step.
|
Note the addresses of any drives that do
not show the correct display, then
continue with the next step.
```

__ 16. Compare the "L=x" (logical address) portion of each drive display to the address label 6 on each display.

```
Does each drive display match the label?

YES NO
 |
 Ensure that all the drive logical
 addresses are set correctly.  See
 "Setting the Drive Logical and
 Physical Addresses" on INSV 50.

 Leaving the tape control unit online, power
 it off then back on again.  Note the
 addresses of any drives whose display
 labels 6 still do not match the "L=x"
 portion of the display, then continue
 to the next step.

Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive?

```
YES NO
 |
 Ensure that all of the drive physical
 addresses are set correctly.  See
 "Setting the Drive Logical and
  Physical Addresses" on INST 50.

 Leaving the tape control unit online, power
 it off then on again.  Note any drive
 physical addresses that are still
 incorrect and continue to the next step.

Continue with the next step.
```

Checking Read/Write

__ 17. On the tape control unit operator setup panel, set the Online Test/Offline Test switch 2 to Offline Test.

After a delay of 1 1/2 minutes or less, does TEST show with the indicator bars 5 flashing on the message display of any drive?

Note: If an Action message appears on any drive display, go to INST 5 and perform the action described for that message. Return here when finished, and set the Power On/Off switch 4 to Off then On and go to step 15 on this page.

```
YES NO
 |
 The TCU will not load the microprogram
 and must be fixed to continue.  Set
 the Normal/Test switch 1 to Normal
 and press the INL switch 3.
 Run GMP/TA90 Support Diagnostics to
 isolate the problem and return here
 when the problem is fixed.

 Set the Normal/Test switch 1 to Test
 and the Online Test/Offline Test switch
 2 to Online Test.
 Wait until addresses appear on
 the drive displays, then repeat step 16
 on this page.

Continue to the next step.
```

__ 18. Set a blank cartridge 7 to not file protect.

__ 19. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 20. Insert the cartridge into the drive that is nearest the tape control unit and displaying TEST. Close the cartridge latch and skip the next TWO steps.

__ 21. Put a cartridge in the top position of the loader on the drive nearest the tape control unit and displaying TEST.

__ 22. Ensure that the Loader mode switch 8 is set to Auto mode and press the Start switch 9.

__ 23. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 5 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 24. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 25. While the first drive is being tested, set another blank cartridge 7 to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 26. When the first drive UNLOADs, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

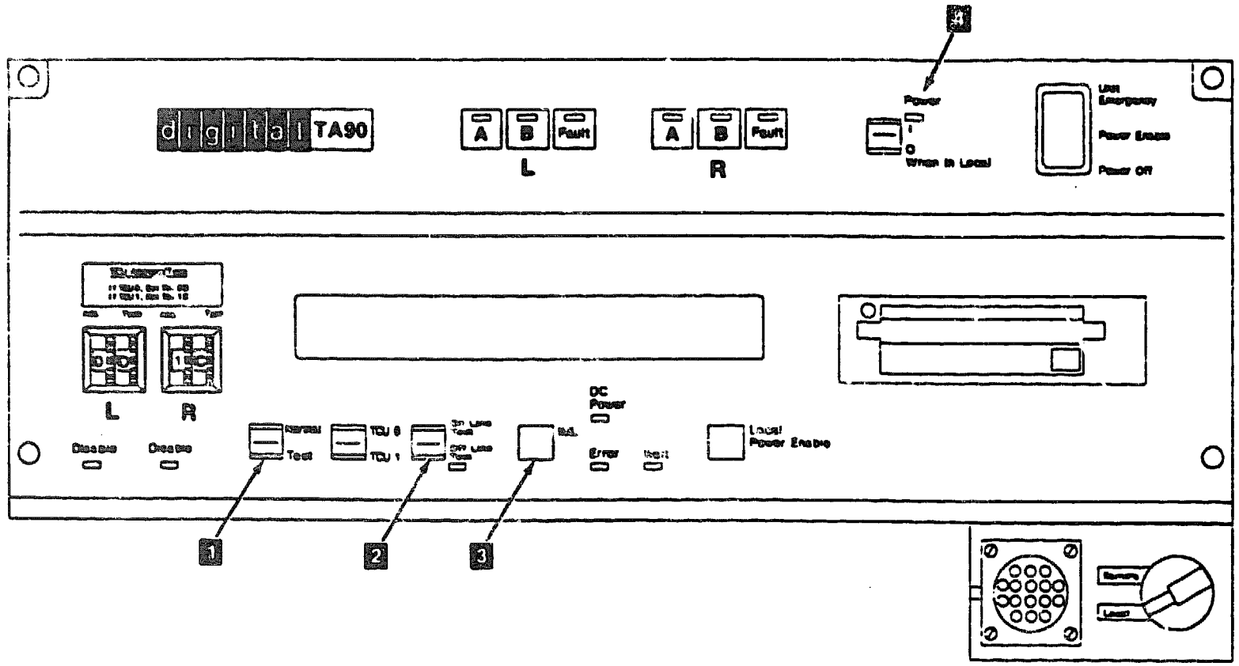
__ 27. Repeat this procedure for all drives in the subsystem showing TEST.

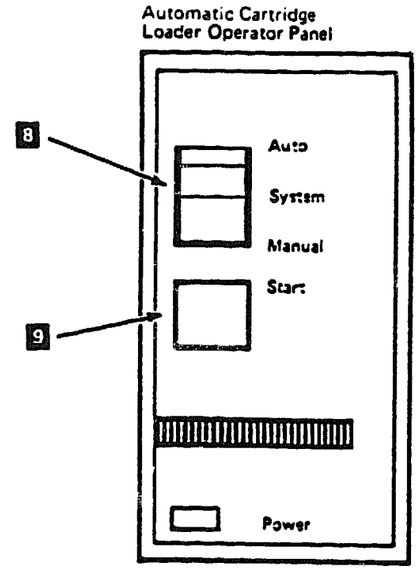
__ 28. If failures occur on multiple drives in a string, there may be a cable connection problem. Check the seating of the device data and read bus cables, and the dual tape control unit communication cables (for dual control unit subsystems). See LOC 1 for the tape control unit and tape transport unit cable locations.

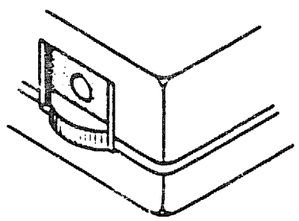
When you have finished checking the cables, insert a cartridge into those drives that were failing and rerun the tests.

__ 29. If any drives will not run the tests to completion, note the failing drive addresses and that TCU0 was running the test. This will be used later on INST 90 when the GMP diagnostics are run.

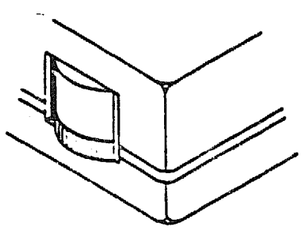
__ 30. Go to the next step on INST 74.



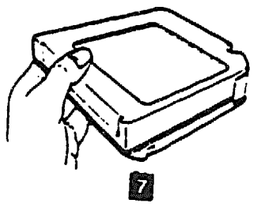




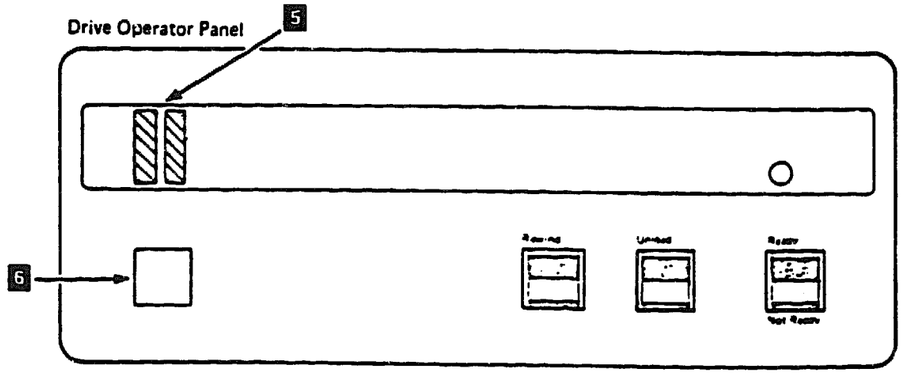
File Protect Position



Not File Protect Position



Blank Cartridge



Running Offline Checkout for a Single Tape Control Unit Subsystem (Continued)

Final Checkout

__ 31 On the tape control unit operator setup panel, set the Normal/Test switch [1] to Normal.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
|   |
|   Is the Normal/Test switch [1] set
|   to Normal?
|
|   YES NO
|   |   |
|   |   Set the switch to Normal and
|   |   repeat step 26.
|   |
|   |   Do eight asterisks show on all
|   |   drive displays not showing TEST?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses
|   |   |   that do not show eight
|   |   |   asterisks or TEST and
|   |   |   continue to the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that do
|   not show eight asterisks or TEST
|   and continue to the next step.
|
Continue to the next step.
```

__ 32 Set the Online Test/Offline Test switch [3] to Online Test.

Checking the Initial Microprogram Load (IML)

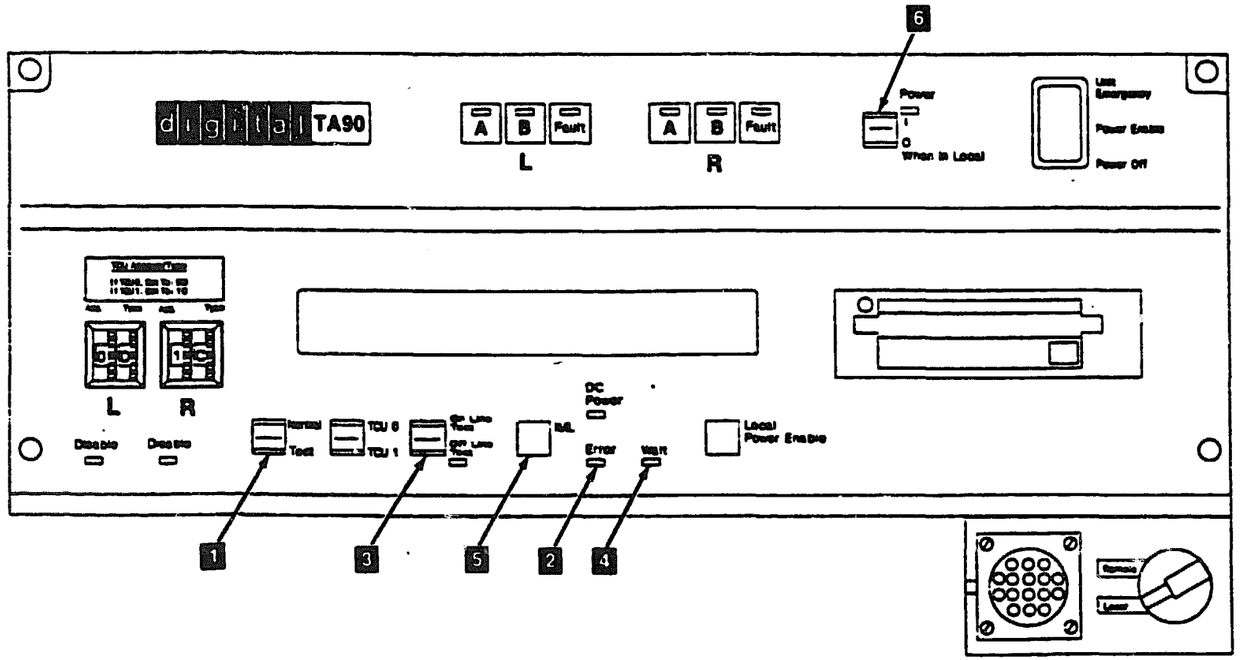
__ 33 Ensure that the functional diskette is not write-protected (the window is closed).

__ 34 On the tape control unit operator setup panel, set the Power On/Off switch [6] to Off, then On.

After approximately 2 minutes the Wait light [4] on the tape control unit operator setup panel should be on solidly, and the Error light [2] should be off.

Are all the lights correct?

```
YES NO
|   |
|   The tape control unit will not load the micro-
|   program and must be fixed to continue.
|   Ensure the Normal/Test switch [1] is set
|   to Normal and the Online Test/Offline Test
|   switch [3] is on Online Test.
|   Press the IML switch [5].
|   Run GHP/TA90 Support Diagnostics to isolate
|   the problem, and return here when the
|   problem is fixed.
|
Go to INST 90, the Offline checkout is complete.
```



Running Offline Checkout for a Dual Tape Control Unit Subsystem

Note: See INST 77 for the physical locations.

This procedure is used for offline checkout of a dual tape control unit subsystem only. Go to INST 70 if you have a single tape control unit subsystem.

The offline checkout tests whether both tape control units can communicate with all the drives in the subsystem. Therefore, some steps in the following procedure appear to be repeated.

As you progress through the tests, you are asked to note the addresses of any drives without the display response expected. Also, you should note whether the drive failed during checkout from TCU0 or TCU1. After the offline checkout is complete, you will be sent to INST 90 to analyze any drives that failed during the checkout.

The error light 3 will light when certain portions of the offline tests are run. This condition is normal and does not indicate a failure in the tape control unit unless you are asked to note the status of the error light.

Setting Up for the Checkout

Note: The offline checkout should be performed by only one CE.

__ 1. On both tape control unit operator setup panels:

- __ a. Verify that the Power On/Off switch 5 is set to Off.
- __ b. Set the Normal/Test switch 1 to Test.
- __ c. Verify that the TCU0/TCU1 switch 2 is set to TCU0 on tape control unit 0 and is set to TCU1 on tape control unit 1.
- __ d. Verify that the Online Test/Offline Test switch 4 is set to Offline Test.

__ 2. On all drive operator panels:

- __ a. Set the Ready/Not Ready switches 12 to Ready.

__ 3. On all drive switch panels:

- __ a. Verify that the Drive Power switches 9 are set to On.
- __ b. Verify that the Online Test/Offline Test switches 11 are set to Offline Test.

__ 4 On each drive with the Automatic Cartridge Loader feature, set the Loader switch 13 to Auto.

__ 5 On both tape control units:

- __ a. Push the release button on the IML disk drive 8 and remove the head protector.
- __ b. Insert the Functional diskette, making sure the diskette is not write-protected (the window is closed) before insertion.
- __ c. Set the Power On/Off switch 5 to On.

Switching on the Power

__ 6 Ensure that the main circuit breaker on the TCU (CB1 on the ac power supply) is off; then switch it On.

__ 7 On both tape control units, set the Unit Emergency Power switch 6 to Power Enable.

__ 8 Press the Local Power Enable pushbutton 7 on both tape control units.

__ 9 Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
 |  |
 |  Are all the switches set correctly?
 |  |
 |  YES NO
 |  |  |
 |  |  Switch off the mainline circuit
 |  |  breaker (CB1 on the ac power
 |  |  supply) and set the switches as
 |  |  specified in steps 1, 2, and 3;
 |  |  then perform steps 5 through 7.
 |  |
 |  |  Does a single asterisk show for
 |  |  ten seconds or longer on each
 |  |  drive display?
 |  |  |
 |  |  YES NO
 |  |  |  |
 |  |  |  Note the drive addresses of
 |  |  |  the drives without a
 |  |  |  single asterisk, and which TCU
 |  |  |  those drives are attached to,
 |  |  |  and continue to the next step.
 |  |  |  |
 |  |  |  Continue to the next step.
 |  |
 |  Note the drive addresses of the
 |  drives without a single
 |  asterisk, and which TCU those drives
 |  are attached to, and continue to
 |  the next step.
 |
Continue to the next step.
```

__ 10. On each drive switch panel, set the Drive Power switch 9 to Off; then set it back to On.

Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
 |  |
 |  Note the drive addresses of the
 |  drives without a single
 |  asterisk, and which TCU those drives
 |  are attached to, and continue to the
 |  next step.
 |
Continue to the next step.
```

__ 11. On each drive switch panel, press then release the drive Reset switch 10.

Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
 |  |
 |  Note the drive addresses of the
 |  drives without a single
 |  asterisk, and which TCU those drives
 |  are attached to, and continue to the
 |  next step.
 |
Continue to the next step.
```


__ 12. On each drive switch panel, set the Online/Offline switch 11 to Offline.

Do special box-shaped symbols show in the first and last positions of the message display?

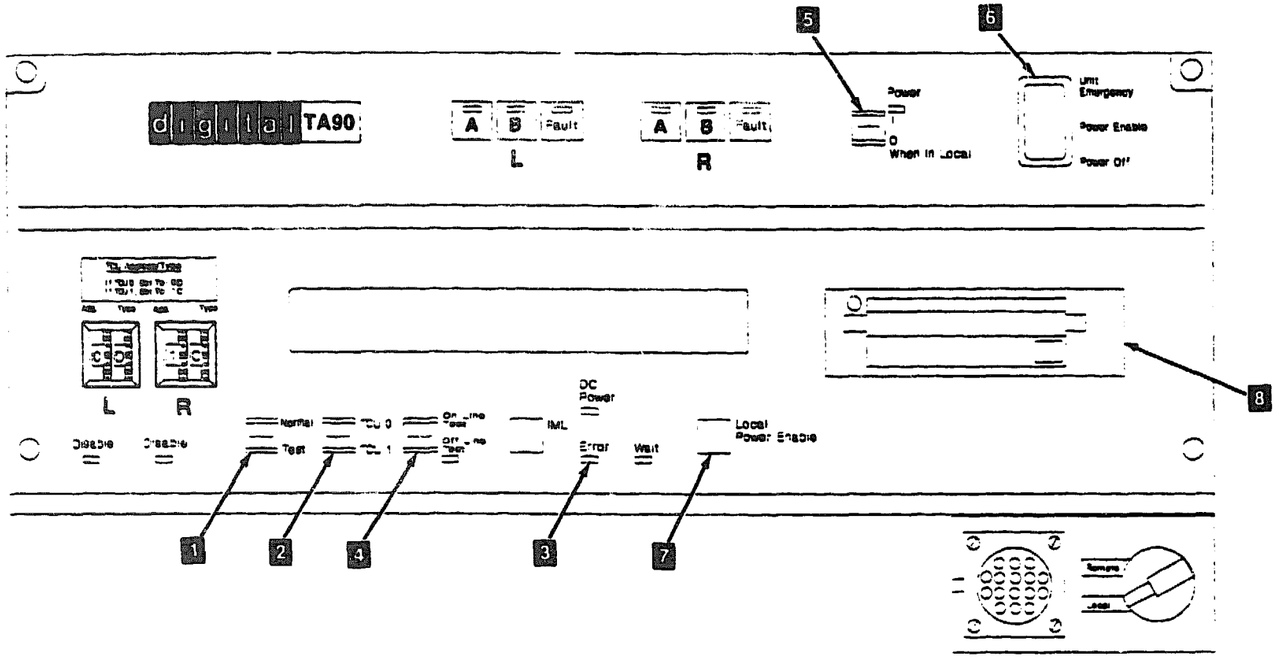
```
YES NO
 |  |
 |  Note the drive addresses of the drives
 |  without the special box-shaped
 |  symbols and which TCU those drives are
 |  attached to, and continue to the next
 |  step.
 |
Continue to the next step.
```

__ 13. On each drive switch panel, set the Online/Offline switch 11 to Online and verify that the special box-shaped symbols go away.

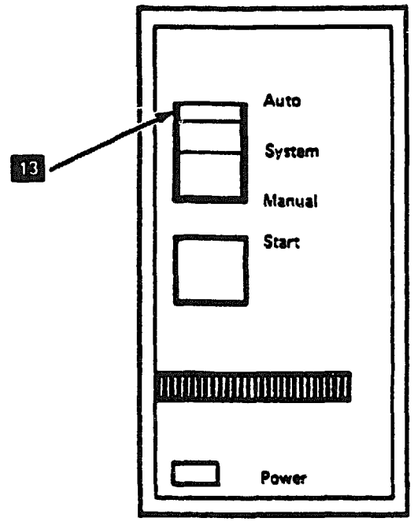
Do the special box-shaped symbols go away?

```
YES NO
 |  |
 |  Note the drive addresses of the drives
 |  where the special box-shaped symbols
 |  do not go away, and which TCU those
 |  drives are attached to; then continue
 |  to the next step.
 |
Continue with the next step.
```

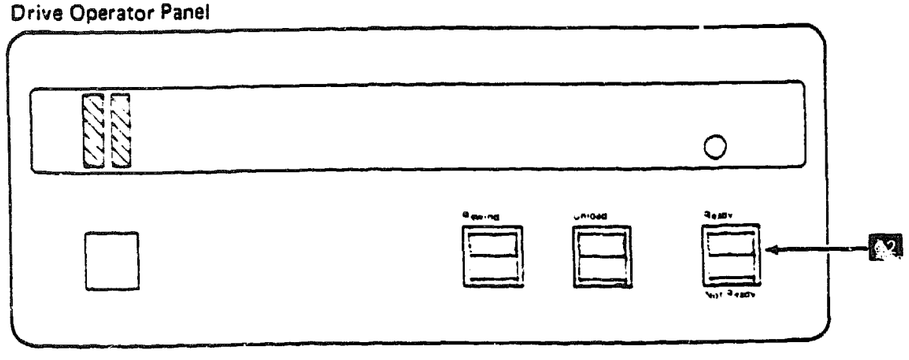
__ 14. Go to INST 78 to continue the offline checkout.



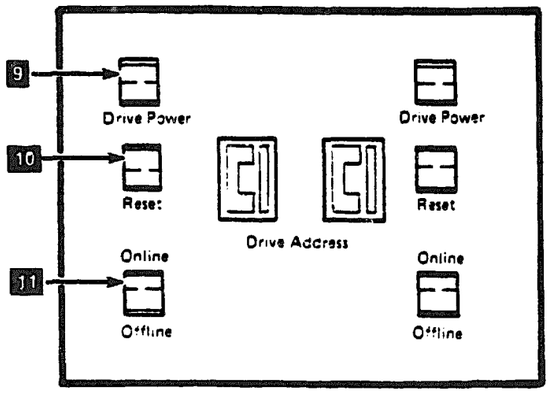
Automatic Cartridge Loader Operator Panel



Drive Operator Panel



Drive Switch Panel



Running Offline Checkout for a Dual Tape Control Unit Subsystem (Continued)

Note: See INST 79 for the following locations.

Checking the Addresses, Tape Control Unit 0

__ 15 On the TCU0 operator setup panel, set the Online Test/Offline Test switch 2 to Online Test.

After a short delay (2 1/2 seconds or less) does "L=x P=x" (x being any number between 0 and F) appear on any drive display?

```
YES NO
|   |
|   Power off the tape control unit with the Power
|   On/Off switch 3 and verify that the
|   switches are set correctly on the tape control
|   unit and tape transport unit panels. See "Setting Up
|   for the Checkout" steps 1, 2, and 3 on INST
|   70 for the correct switch settings. Correct
|   any switch settings that are wrong. Power
|   up and repeat the actions you performed in
|   step 14.
|
|   Does "L=x P=x" appear on any tape drive
|   display?
|
|   YES NO
|   |   |
|   |   The TCU will not load the microprogram
|   |   and must be fixed to continue. Set the
|   |   Normal/Test switch 1 to Normal and
|   |   press the IML switch 3.
|   |   Run GMP/TA90 Support Diagnostics to isolate the
|   |   problem and return here when the problem
|   |   is fixed.
|   |
|   |   Set the Normal/Test switch to Test and
|   |   check the TCU and tape transport unit switch
|   |   settings again. See "Setting up for
|   |   the Checkout" steps 1, 2, and 3 on
|   |   INST 70 for the correct switch
|   |   settings. Correct any switch settings
|   |   that are wrong. Power up and repeat
|   |   the actions you performed in step 15.
|   |
|   |   Does "L=x P=x" appear on any tape
|   |   drive display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Go to EAD 1, Drive Interconnect
|   |   |   Problems, then return to step 15.
|   |   |
|   |   Note the addresses of any drives that do
|   |   show correct display, then continue with
|   |   the next step.
A   B
```

```
A   B
|   |
|   Note the addresses of any drives that
|   do not show the correct display, then
|   continue with the next step.
|
Note the addresses of any drives that do
not show the correct display, then continue
with the next step.
```

__ 16 Compare the "L=x" (logical address) portion of each drive display to the address label 6 on each display.

Does each drive display match the label?

```
YES NO
|   |
|   Ensure that all the drive logical
|   addresses are set correctly. See
|   "Setting the Drive Logical and
|   Physical Addresses" on INST 50.
|
|   Leaving the tape control unit online, power
|   it off then back on again. Note the
|   addresses of any drives whose display
|   labels 6 still do not match the "L=x"
|   portion of the display, then continue
|   to the next step.
|
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive in the subsystem?

```
YES NO
|   |
|   Ensure that all of the drive physical
|   addresses are set correctly. See
|   "Setting the Drive Logical and
|   Physical Addresses" on INST 50.
|
|   Leaving the tape control unit online, power
|   it off then on again. Note any drive
|   physical addresses that are still
|   incorrect and continue to the next step.
|
Continue with the next step.
```

Checking Read/Write, Tape Control Unit 0

__ 17. On the tape control unit (TCU0) operator setup panel, set the Online Test/Offline Test switch 2 to Offline Test.

After a delay of 1 1/2 minutes or less, does TEST show with the indicator bars 5 flashing on the message display of any drive?

Note: If an Action message appears on any display, go to INST 5 and perform the action described. Return here, set the Power On/Off switch 3 to Off then On and go to step 15 on this page.

```
YES NO
|   |
|   The TCU will not load the microprogram
|   and must be fixed to continue. Set the
|   Normal/Test switch 1 to Normal and
|   press the IML switch 3.
|   Run GMP/TA90 Support Diagnostics to isolate the
|   problem and return here when the problem
|   is fixed.
|
|   Set the Normal/Test switch 1 to Test
|   and the Online/Offline switch 2 to
|   Online. Wait until addresses appear on
|   the drive displays, then repeat step 17
|   on this page.
|
Continue to the next step.
```

__ 18. Set a blank cartridge 7 to not file protect.

__ 19. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 20. Insert the cartridge into the drive that is nearest the tape control unit and displaying TEST. Close the cartridge latch and skip the next TWO steps.

__ 21. Put a cartridge in the top position of the loader on the drive that is nearest the tape control unit and displaying TEST.

__ 22. Ensure that the Loader mode switch 8 is set to Auto mode and press the Start switch 9.

__ 23. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 5 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 24. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 25. While the first drive is being tested, set another blank cartridge 7 to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 26. When the first drive UNLOADs, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

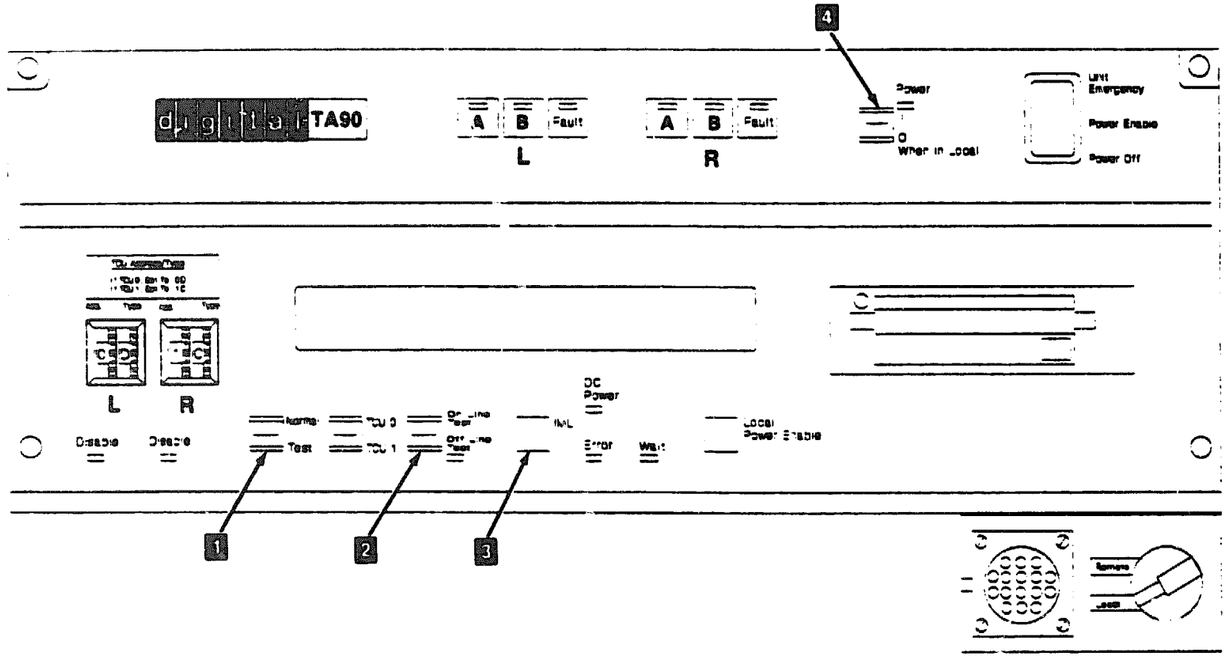
__ 27. Repeat this procedure for all drives in the subsystem showing TEST.

__ 28. If failures occur on multiple drives in a string, there may be a cable or terminator connection problem. Check the seating of the device data and read bus cables, and the dual tape control unit communication cables (for dual control unit subsystems). See LOC 1 for the tape control unit and tape transport unit cable locations.

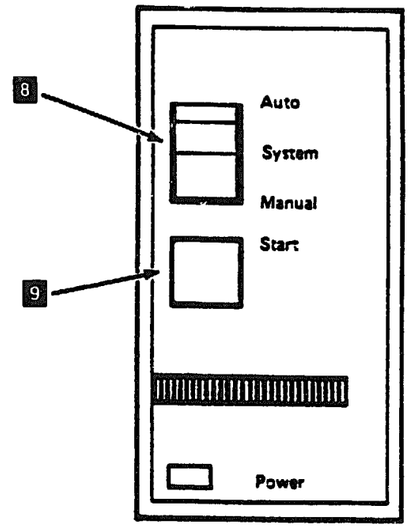
When you have finished checking the cables, insert a cartridge into those drives that were failing and rerun the tests.

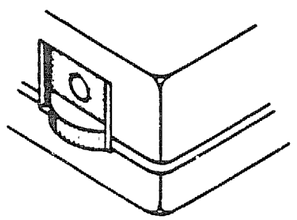
__ 29. If any drives will not run the tests to completion, note the failing drive addresses and that TCU0 was running the test. This will be used later in INST 90 when the GMP diagnostics are run.

__ 30. Go to the next step on INST 81.

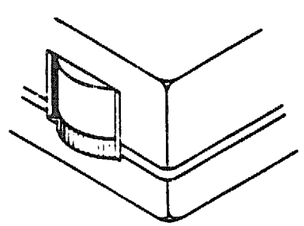


Automatic Cartridge Loader Operator Panel

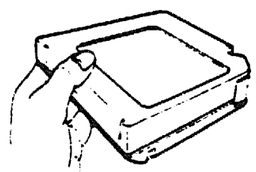




File Protect Position

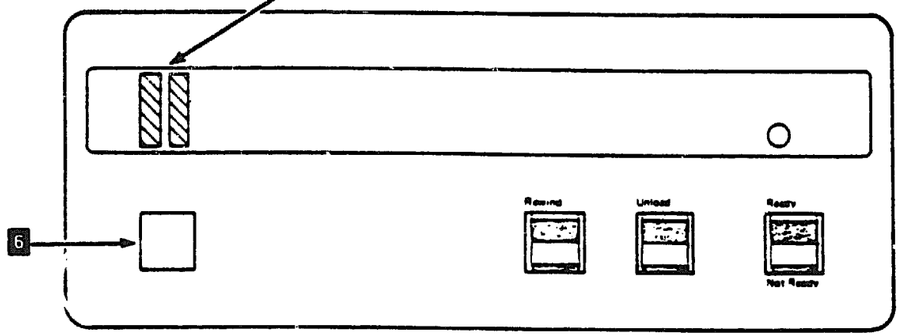


Not File Protect Position



Blank Cartridge 7

Drive Operator Panel 5



Running Offline Checkout for a Dual Tape Control Unit Subsystem (Continued)

Note: See INST 82 for the following locations.

Final Checkout of Tape Control Unit 0

__ 31 On the TCU0 operator setup panel, set the Normal/Test switch [1] to Normal

Do eight asterisks ("********) show on all drive displays not showing TEST?

```
YES NO
|   |
|   Is the Normal/Test switch [1] set to Normal?
|
|   YES NO
|   |   |
|   |   Set the switch to Normal and repeat step 31.
|   |
|   |   Do eight asterisks show on all drive displays
|   |   not showing TEST?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses that do not show
|   |   |   eight asterisks or TEST and continue to
|   |   |   the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that do not show eight
|   asterisks or TEST and continue to the next step.
|
Continue to the next step.
```

You have completed the checkout of TCU0 and the drives attached to both tape control units. If the tests worked correctly, you know that TCU0 can communicate with all the drives.

You must now check out TCU1 and all the drives again to be sure that TCU1 can communicate with all the drives.

Go to the next step to test TCU1.

Note: Do not change the switch settings or power off TCU0 during the following checkout of TCU1.

Checking the Addresses, Tape Control Unit 1

__ 32 On the TCU1 operator setup panel, set the Online Test/Offline Test switch [2] to Online Test.

After a short delay (2 1/2 minutes or less) does "L=x P=x" (x being any number between 0 and F) appear on any drive display?

```
YES NO
|   |
|   Power off the tape control unit and verify that
|   the tape control unit and tape transport unit switches (for
|   TCU1 and the drives physically attached to
|   TCU1) are set correctly.  See "Setting Up for
|   the Checkout" steps 1, 2, and 3 on INST 76
|   for the correct switch settings.  Correct
|   any switch settings that are wrong.  Power
|   up and repeat the actions you performed in
|   step 32.
|
|   Does "L=x P=x" appear on any tape drive
|   display?
|
|   YES NO
|   |   |
|   |   The TCU will not load the microprogram
|   |   and must be fixed to continue.  Set the
|   |   Normal Test switch [1] to Normal and
|   |   press the IML switch [3].
|   |   Run GMP/TA90 Support Diagnostics to isolate the
|   |   problem and return here when the problem
|   |   is fixed.
|   |
|   |   Set the Normal/Test switch to Test and
|   |   check the TCU and tape transport unit switch
|   |   settings again.  See "Setting Up for the
|   |   Checkout" steps 1, 2, and 3 on INST 76
|   |   for the correct switch settings.  Correct
|   |   any switch settings that are wrong. Power
|   |   up and repeat the actions you performed
|   |   in step 32.
|   |
|   |   Does "L=x P=x" appear on any tape
|   |   drive display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Go to EAD 1, Drive Interconnect
|   |   |   Problems, then return to step 32.
|   |   |
|   |   Note the addresses of any drives that
|   |   do not show the correct display, then
|   |   continue with the next step.
|   |
|   Note the addresses of any drives that do not
|   show the correct display, then continue with
|   the next step.
|
Note the addresses of any drives that do not
show the correct display, then continue with
the next step.
```

__ 33. Compare the "L=x" (logical address) portion of each drive display to the address label [1] on each display.

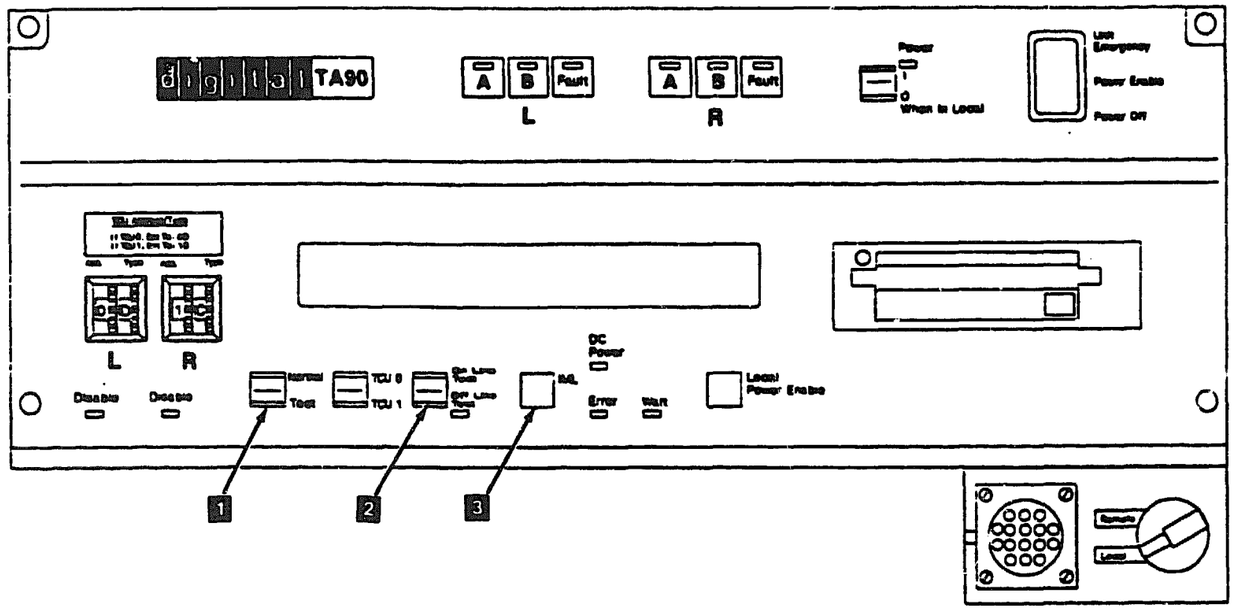
Does each drive display match the label?

```
YES NO
|   |
|   There is a cable connection problem.
|   Power off TCU1 and check the seating
|   of the device data and read bus
|   cables and the dual tape control unit
|   communication cables.  See LOC 1 for
|   the tape control unit and tape transport unit cable
|   locations.
|
|     NOTE:  Do not change any of the TCU
|     switch settings while checking out
|     the cable connection problem except
|     for the Power On/Off switch.
|
|   When you have finished checking the
|   cables, power on the tape control unit.
|   After a delay of 2 1/2 minutes or less,
|   compare the "L=x" portion of each drive
|   display to the address label [1] on the
|   drive.
|
|   Does each drive display match the label?
|
|   YES NO
|   |   |
|   |   Go to EAD 1, Drive Interconnect
|   |   Problems, then return to step 33.
|   |
|   Ensure that the "P=x" (physical address)
|   portion of each display does not match
|   the "P=x" portion of any other drive
|   display in the subsystem.
|
|   Does each drive display have a "P=x"
|   number not shared by any other drive?
|
|   YES NO
|   |   |
|   |   There is a cable connection problem.
|   |   Power off TCU1 and check the seating
|   |   of the device data and read bus cables,
|   |   and the dual tape control unit communication
|   |   cables.  See LOC 1 for the tape control unit
|   |   and tape transport unit cable locations.
|   |
|   |    NOTE:  Do not change any of the TCU
|   |    switch settings while checking the
|   |    cable connection problem, except
|   |    for the Power On/Off switch.
|   |
|   |   When you have finished checking the
|   |   cables, power on the TCU.  After a
|   |   delay of 2 1/2 minutes or less,
|   |   compare the "P=x" portion of each
|   |   drive display to the "P=x" portion
|   |   of all the other drive displays.
|   |
|   |   Does each drive have a "P=x" number
|   |   not shared by any other drive?
|   |
|   |   YES NO
|   |   |   |
A   B   C   D
```

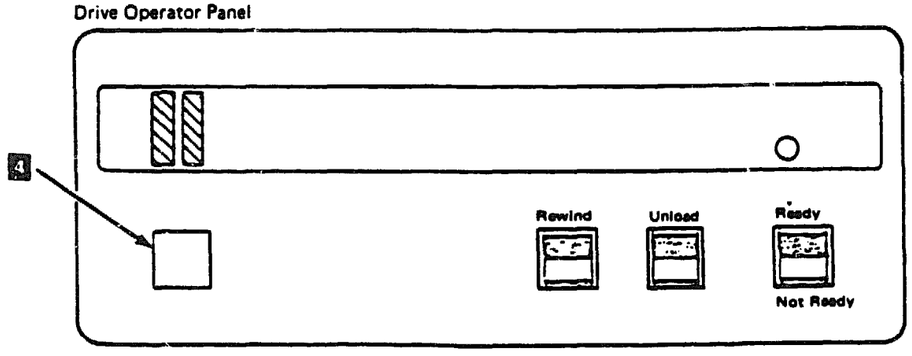
```
A   B   C   D
|   |   |   |
|   |   |   Go to EAD 1, Drive Interconnect
|   |   |   Problems, then return to step 33.
|   |   |
|   |   Go to the next step on INST 83.
|   |
|   Go to the next step on INST 83.
|
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive?

```
YES NO
|   |
|   If this drive failed during the check-
|   out of TCU0, note that it also failed on
|   on TCU1 and go to the next step on INST 83.
|   If it did not fail during the checkout of
|   TCU0, continue with this step.
|
|   There is a cable connection problem.
|   Power off TCU1 and check the seating of
|   the device data and read bus cables
|   and the dual tape control unit communication
|   cables.  See LOC 1 for the tape control unit
|   and tape transport unit cable locations.
|
|     NOTE:  Do not change any of the TCU
|     switch settings while checking out
|     the cable connection problem, except
|     for the Power On/Off switch.
|
|   When you have finished checking the
|   cables, power on the TCU.  After a
|   delay of 2 1/2 minutes or less, compare
|   the "P=x" portion of each drive display
|   to the "P=x" portion of all the other
|   drive displays.
|
|   Does each drive have a "P=x" number
|   not shared hy any other drive?
|
|   YES NO
|   |   |
|   |   Call the next level of support.
|   |
|   Go to the next step on INST 83.
|
Go to the next step on INST 83.
```



Drive Operator Panel



Running Offline Checkout for a Dual Tape Control Unit Subsystem (Continued)

Note: See INST 84 for the following locations.

Checking Read/Write, Tape Control Unit 1

__ 34. On the tape control unit (TCU1) operator setup panel, set the Online Test/Offline Test switch 3 to Offline Test.

Does TEST show with the indicator bars 8 flashing on the message display of any drive?

Note: If an Action message appears on any display, go to INST 5 and perform the action described. Return here and set the Power On/Off switch 6 to Off then On; then go to INST 81, step 32, and continue.

```
YES NO
|   |
|   The TCU will not load the microprogram
|   and must be fixed to continue.  Set
|   the Normal/Test switch 1 to Normal
|   and press the IML switch 5.
|   Run GMP/TA90 Support Diagnostics to
|   isolate the problem and return here
|   when the problem is fixed.
|
|   Set the Normal/Test switch 1 to Test
|   and the Online Test/Offline Test
|   switch 3 to online Test.
|   Wait until addresses appear on
|   the drive displays, then repeat step 34
|   on this page.
|
Continue to the next step.
```

__ 35. Set a blank cartridge 7 to not file protect.

__ 36. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 37. Insert the cartridge into the drive that is nearest the tape control unit and displaying TEST. Close the cartridge latch and skip the next TWO steps.

__ 38. Put a cartridge in the top position of the loader on the drive that is nearest the tape control unit and displaying TEST.

__ 39. Ensure that the Loader mode switch 9 is set to Auto mode and press the Start switch 10.

__ 40 If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 5 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 41 The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 42. While the first drive is being tested, set another blank cartridge 7 to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 43. When the first drive UNLOADs, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

__ 44. Repeat this procedure for all drives in the subsystem showing TEST.

__ 45. If failures occur on multiple drives in a string, there may be a cable connection problem. Check the seating of the device data and read bus cables, and the dual tape control unit communication cables (for dual control unit subsystems). See LOC 1 for the tape control unit and tape transport unit cable locations.

When you have finished checking the cables, insert a cartridge into those drives that were failing and rerun the tests.

__ 46. If any drives will not run the tests to completion, note the failing drive addresses and that TCU1 was running the test. This will be used later on in INST 90 when GMP is run.

__ 47. Go to the next step and continue.

Final Checkout of Tape Control Unit 1

__ 48. Set the Normal/Test switch 1 to Normal on the TCU1 tape control unit operator setup panel.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
|   |
|   Is the Normal/Test switch 1 set
|   to Normal?
|
|   YES NO
|   |   |
|   |   Repeat step 39.
|   |
|   |   Do eight asterisks show on all
|   |   drive displays not showing TEST?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses
|   |   |   that do not show eight
|   |   |   asterisks or TEST and
|   |   |   continue to the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that do
|   not show eight asterisks or TEST
|   and continue to the next step.
|
Continue to the next step.
```

__ 49. Set the Online Test/Offline Test switch to Online Test.

Checking the Initial Microprogram Load (IML)

__ 50. Ensure that the IML diskettes in TCU0 and TCU1 are at the same, or equivalent, microcode level; and that the diskette is not write-protected (the window is closed). If not, you will get an error light when you attempt an IML.

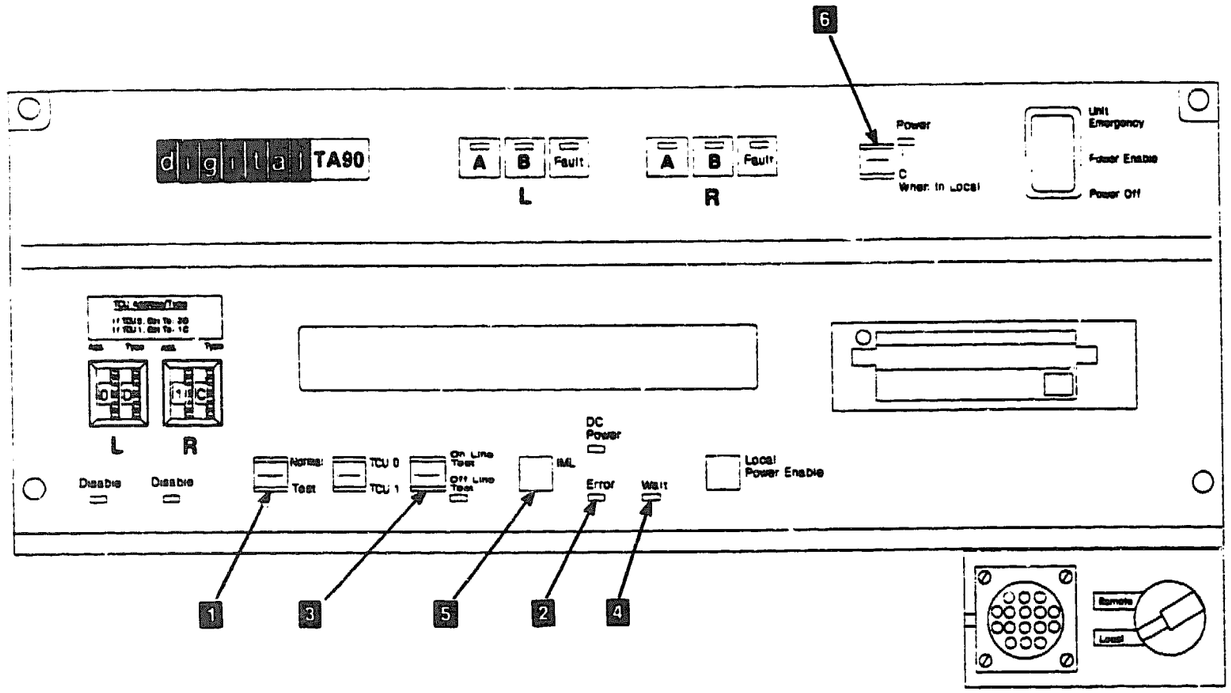
Note: See the labels on the IML diskettes.

On both TCU0 and TCU1, set the Power On/Off switch 6 to Off, then On.

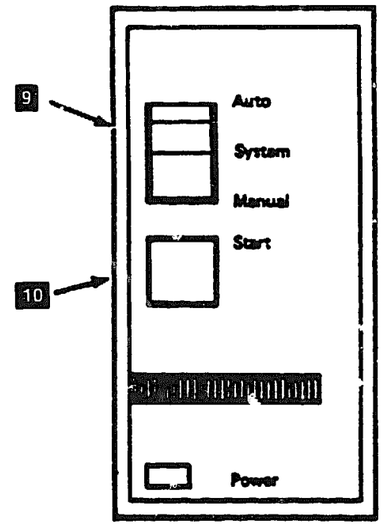
After approximately 2 minutes the Wait light 4 on the tape control unit operator setup panel should be on solidly, and the Error light 2 should be off.

Are all the lights correct?

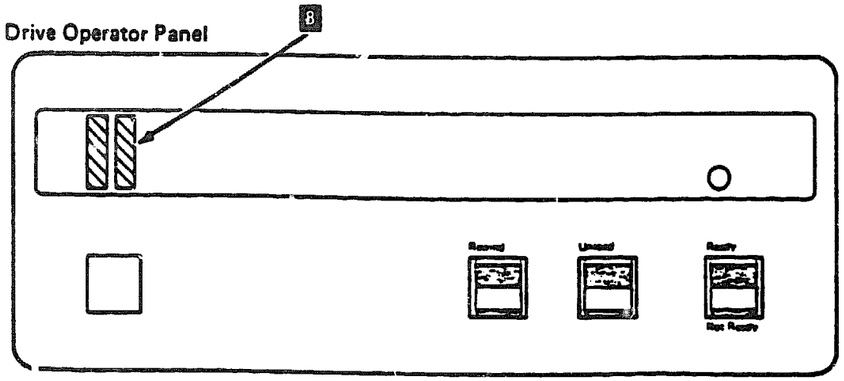
```
YES NO
|   |
|   The tape control unit will not load the micro-
|   program and must be fixed to continue.
|   Ensure the Normal Test switch 1 is set
|   to Normal and the Online Test/Offline Test
|   switch 3 is set to Online Test.
|   Run GMP/TA90 Support Diagnostics to isolate
|   the problem, and return to this page and
|   repeat step 40 when the problem is fixed.
|
Go to INST 90; the Offline checkout is
complete.
```

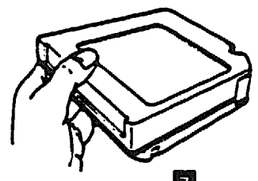


Automatic Cartridge Loader Operator Panel



Drive Operator Panel





Blank Cartridge

Failing Drives

Run GMP (see CE/HSC) on any drives that failed during this installation.

Setting Drive Base Address

__ 1. From the customer, find out what the drive base address should be.

Note: No two drives in a cluster can have the same address. On a dual TCU configuration the base address should be a minimum of eight units apart. This will inhibit the overlapping of drive addresses when using the TA90 support diskette.

__ 2. Set the STI drive base address of the subsystem (see CE/HSC).

Note: Requestors for the TA90 must be in the highest priority slots of the HSC.

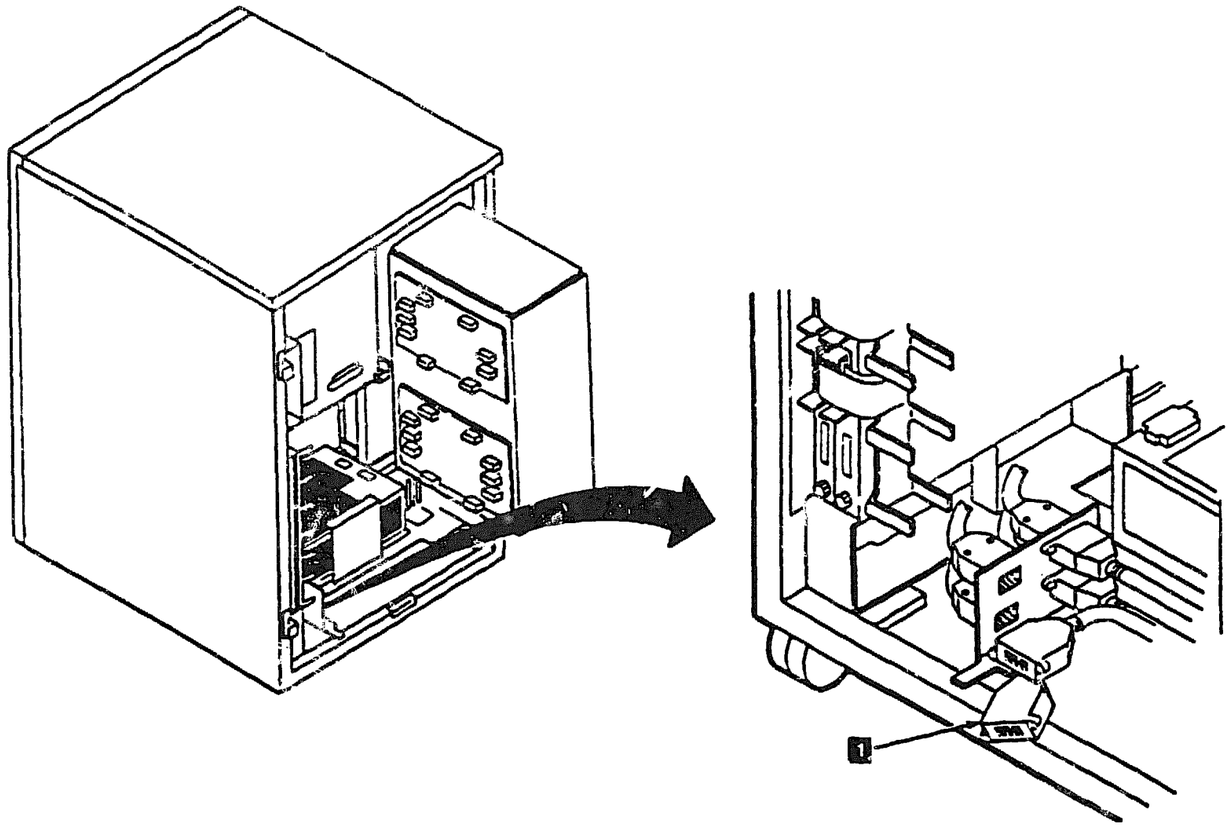
Installing STI Cables

Install the STI cables 1.

Running GMP on the Last Drive

Run GMP on the last drive of each string in this installation.

Go to INST 120 to continue.



TA90 Subsystem Interconnections

The following diagram shows some of the availability features of the TA90 subsystem. It illustrates at each level where dynamic and static failover and load balancing occur.

In a 2X configuration, the TCUs perform load balancing. If a fault occurs that indicates a data path or cache problem, sense byte 2, bit 4 must be checked to see which TCU detected the fault. The combination of the sense byte information and the fault code describe which paths were in use when the fault occurred.

Notes:

1. "Statically" dual ported

   In the event of an HSC or path failure, the subsystem will automatically failover to the other path. In the example shown, assume that STI port A is active; HSC "A" is using units 0, 2, 4, 6 and HSC "B" is using units 1, 3, 5, and 7. If there is a failure of either HSC, the non-failing HSC will continue operating all eight drive units.

2. "Dynamically" dual ported

   Each TCU is "dynamically" shared by the adapters. In the event of an STI-FIPS adapter or TCU Channel Adapter processor failure, the drive unit number switches can be changed by the operator, allowing operations to continue with up to four drives (12 drives if 2X).

3. Dual communications option

   An optional Dual TCU communications coupler allows the channel adapter processor to use the other TCU to do the requested operation. This cross coupling of the TCUs provides resource sharing (load balancing) and failover for most TCU errors.

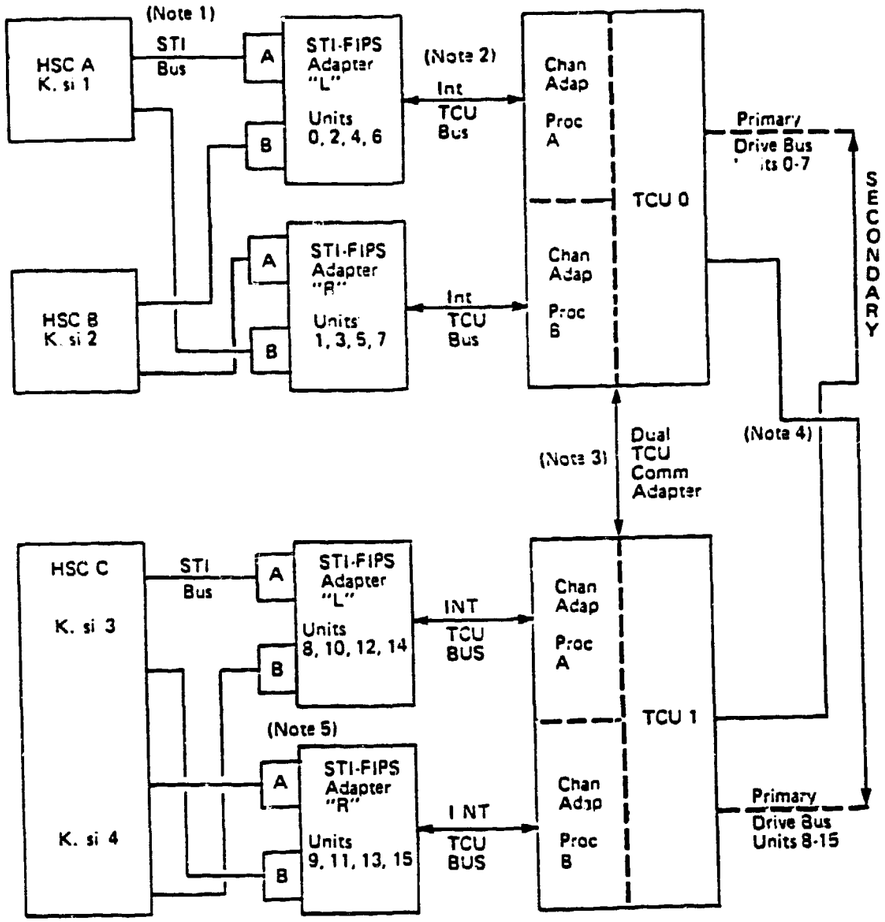
4.

   Secondary drive busses provide each TCU with a path to the other TCU's drives for use with dynamic dual porting and dual communications.

5.

   When four cables connect to one HSC, you must disable one of the ports from each adapter. For example, if you disable the left B and right B ports, and the TA90 is cabled correctly, it will come online and the connection to one of the K.si (HSC5X) interfaces will be lost. To establish a connection if a K.si requestor is lost, you must disable the port connected to the questionable K.si and enable the port on the other adapter.

TA90 Subsystem Interconnections



Installing the Unit Emergency Power Off (UEPO) Cable

Perform the following steps to install the Unit Emergency Power Off (UEPO) cable:

__ 1. Determine if UEPO cables are to be installed.

If no UEPO cables are to be installed, go to INST 130, "Installation Checks."

Note: The TA90 subsystem does not require UEPO jumpers if the Local/Remote switch is set to the Local mode.

__ 2. Pass the UEPO cables to be installed up through the opening in the bottom of the tape control unit.

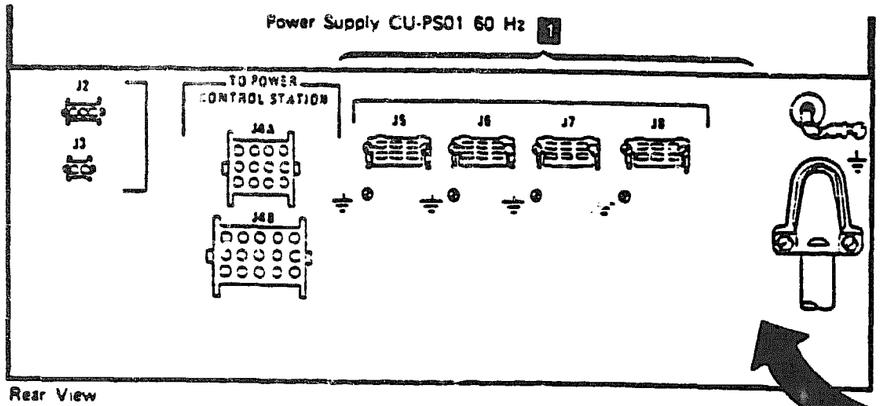
__ 3. Find the four UEPO cable sockets located at the rear of the control unit ac power supply.

Insert the UEPO cable connectors into any UEPO socket (J5 through J8) 1.

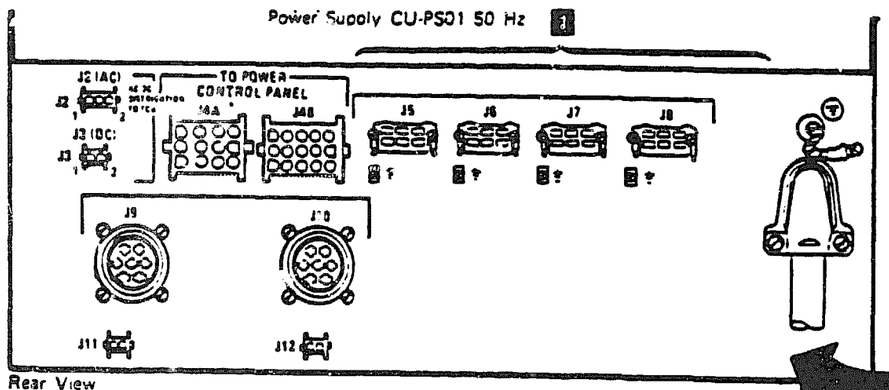
__ 4. Complete the cable installation:

__ a. Connect the UEPO cables to the host system.

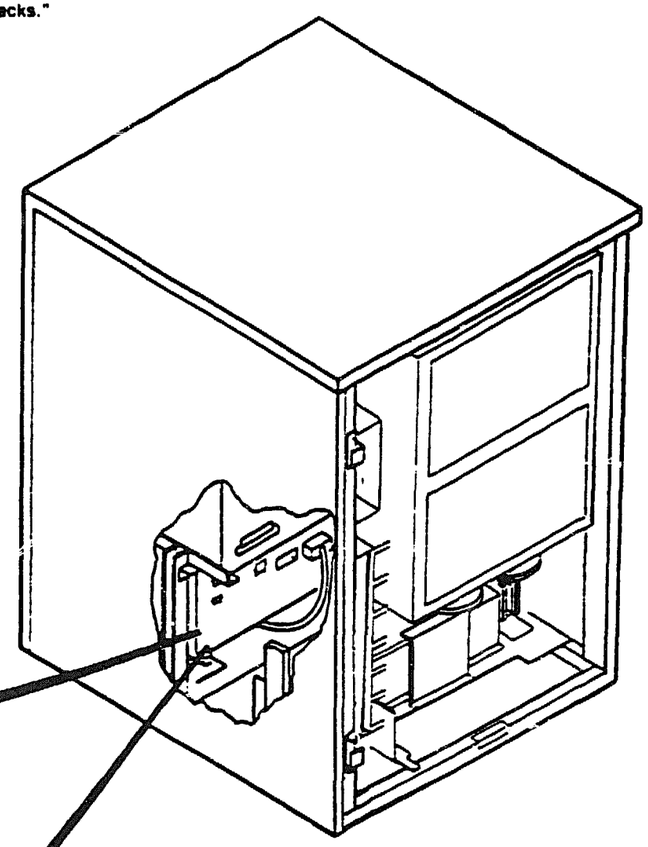
__ b. Continue the installation on INST 130, "Installation Checks."



Rear View



Rear View



Installation Checks

These procedures complete the checkout of the installation:

1. Installing the radio frequency interference (RFI) frame pans and end plates.
2. Replacing all the subcovers and covers.
3. Running the HSC subsystem diagnostics to verify correct subsystem operation.

Installing the Radio Frequency Interference (RFI) Frame Pans and End Plates.

The RFI frame pans and end plates are part of the ship group. There are two frame pans for each tape transport unit, one frame pan (of a different size) for each tape control unit, and two end plates (one for the side of the tape control unit, and one for the side of the last drive attached to that tape control unit).

Note: When you are adding a tape transport unit(s) to an installed subsystem, ensure that you move the tape transport unit end plate (described in step 7) to the last tape transport unit attached to the tape control unit.

__ 1. Place one tape transport unit frame pan under the front of the first tape transport unit attached to TCU0 [3]. Attach the frame pan to the lower front frame of the tape transport unit with two screws.

__ 2. Repeat step 1 for each tape transport unit attached to TCU0.

__ 3. Place one tape transport unit frame pan under the rear of the first tape transport unit attached to TCU0 [5]. Attach the frame pan to the lower rear frame of the tape transport unit with two screws.

__ 4. Repeat step three for each tape transport unit attached to TCU0.

__ 5. Place one tape control unit frame pan under the front of TCU0 [2], and attach it to the lower front frame of the tape control unit with two screws.

__ 6. Place one end plate under the left side of the tape control unit (as you face the front of the tape control unit) [1], and attach it to the lower tape control unit frame with three screws.

__ 7. Place one end plate under the right side of the last tape transport unit attached to TCU0 (as you face the front of the tape transport unit) [4], and attach it to the lower tape transport unit frame with three screws.

__ 8. Repeat steps 1 through 7 for TCU1 if you have a dual tape control unit subsystem.

Note: If there are no tape transport units attached to TCU1, there will be an extra end plate [4] to store for later use.

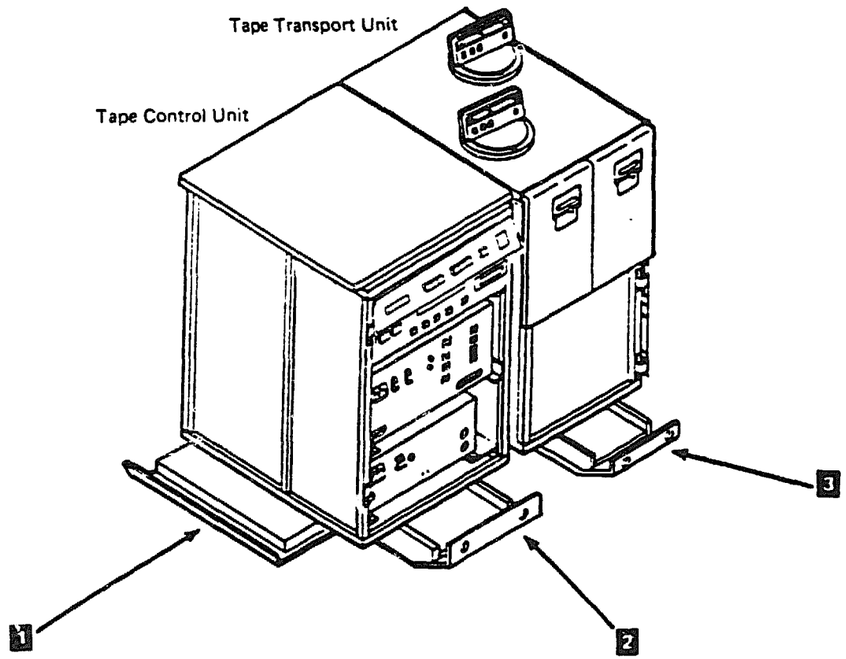
Reinstalling Subcovers and Covers

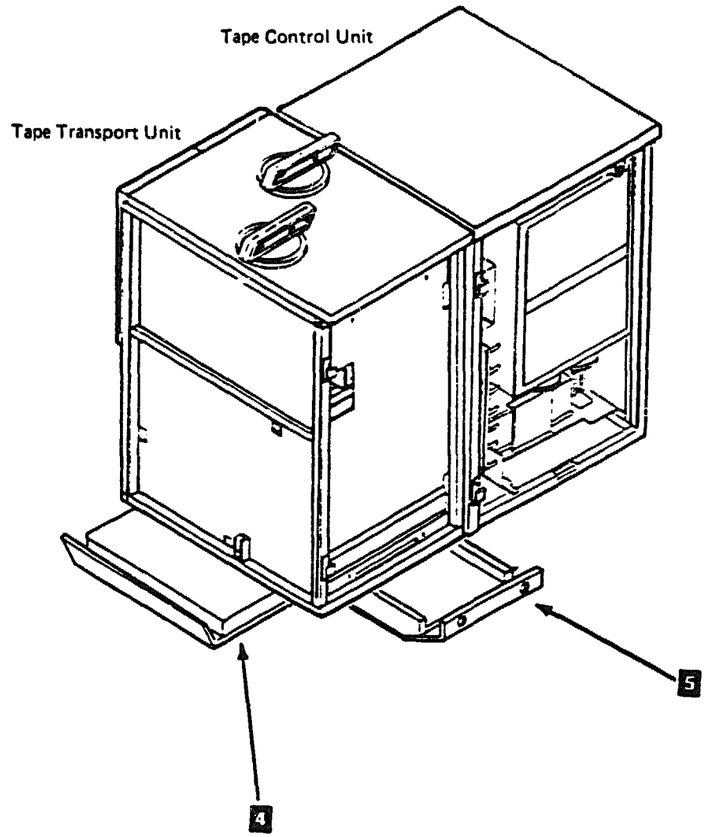
When the installation checks have been completed, all the subcovers and covers that were removed must be reinstalled.

__ 1. Take the cover that was on the right side of the tape control unit, and install it on the right side of the last tape transport unit attached to that tape control unit.

__ 2. Go to CARR-TCU 2-2, and CARR-DR 2-2 for procedures to adjust (if necessary) and reinstall the covers and subcovers on the tape control unit(s) and tape transport units.

__ 3. Go to INST 131 to continue the installation checks.





Installation Checks (Continued)

Running ILEXER and ILTAPE

ILTAPE and ILEXER are run from the HSC. Refer to CE/HSC 1 to the appropriate HSC user documentation for more information.

Perform the following procedure to test the TA90

1. Run ILTAPE (diagnostics and canned sequence) for three passes. No errors are allowed. If both STI ports are used, run ILTAPE through the second port for one pass.
2. Run ILEXER. Use the GCR worst case data pattern (22) for 15 minutes. If both STI ports are used, run ILEXER through the second port for 15 minutes.

Before You're Through...

__ 1. Put the support diskette and the blank cartridge in the pocket in the front cover of the tape control unit.

__ 2. Check and repair any drive that did not operate correctly.

__ 3. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 4. Close all the tape drive cartridge latches.

Note: The cartridge latch should be kept closed when the tape drive is not being used. (A cartridge need not be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.

Post-Installation

Installation Reporting

After the subsystem is installed and tested:

- Write the subsystem serial number on the spine tab of all volumes of the TA90 Maintenance Guide.
- Update the Site Management Guide.
- Report the installation complete using the existing LARS procedure.

Adding Tape Transport Units

The following procedures are used to add more tape transport units to an already installed subsystem:

__ 1. Have the customer deallocate all jobs and paths to the tape control unit and tape transport units that will be receiving the additional tape unit(s).

__ 2. Power off the tape control unit and tape transport units that will be affected.

__ 3. Remove the side cover from the end tape transport unit installed on the subsystem.

__ 4. Remove the radio frequency interference (RFI) endplate from the end tape transport unit installed on the subsystem.

__ 5. Place the the new tape transport unit into position.

__ 6. Open the front and rear covers.

Warning: Ensure that the power cable is not pinched between the machine frames.

__ 7. If the safety cover has the retainer tightened over it, loosen the screw holding the retainer to the ac power cap, rotate the retainer and retighten the screw.

__ 8. Connect the next tape transport unit ac power cable 5 to the preceding tape transport unit's power cable socket 8 after removing the socket safety cover (if not already removed).

Ensure that the ac power cable is routed away from the compressor motor and is fastened to the back of the frame 10 to prevent pinching the cable when the units are moved together.

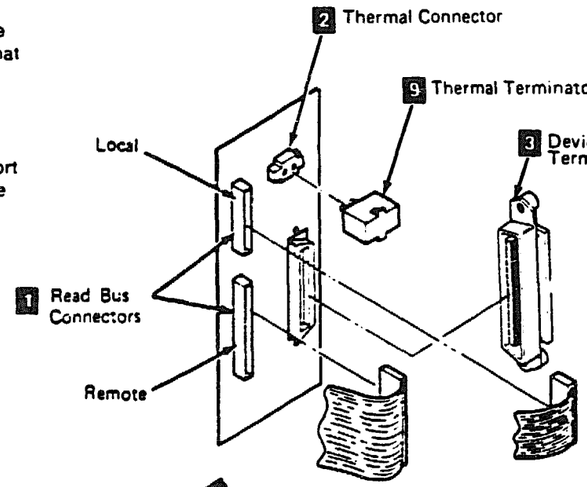
__ 9. Remove the device data bus terminator card, P/N 29-27173-01 3, and thermal terminator 9 from the preceding tape transport unit.

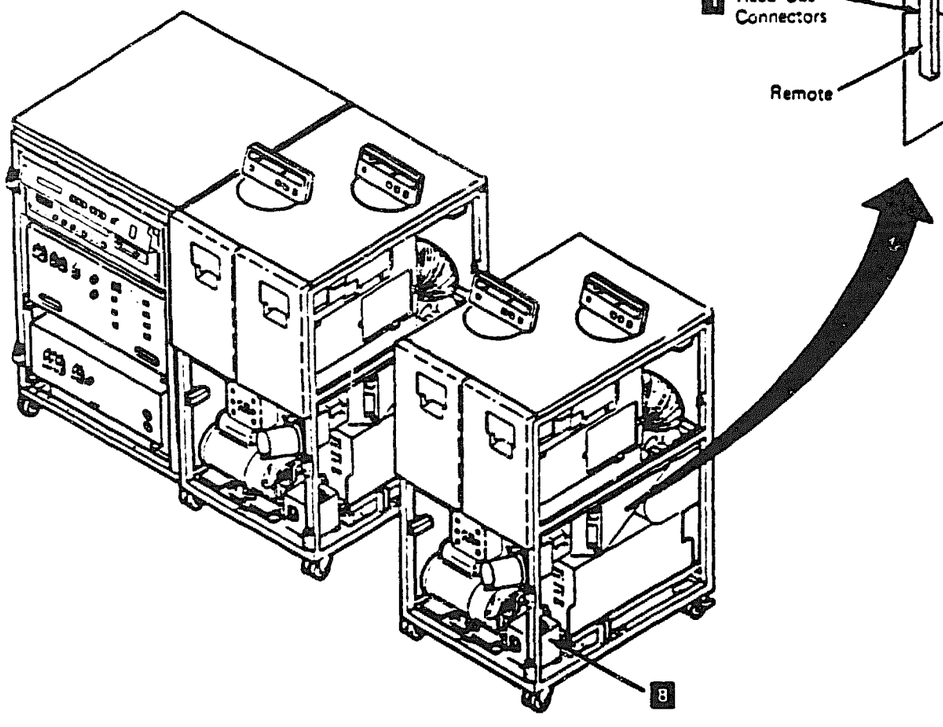
__ 10. Plug the device data bus cable 7 from the new tape transport unit into the preceding tape unit's device data bus connector, and fasten the cable in place with the retaining screws.

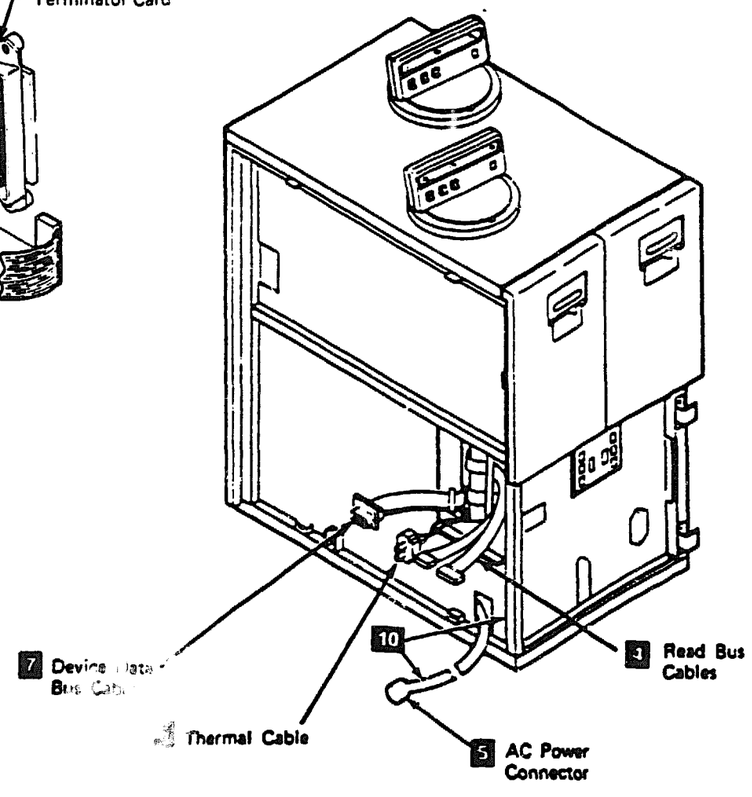
__ 11. Connect the two read bus cables 4 from the new tape transport unit to the preceding tape unit 1. Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape transport unit, making sure they are not crossed.

__ 12. Connect the thermal cable 6 on the new tape transport unit to the thermal connector 2 on the preceding tape transport unit.

__ 13. Continue with the next step on INST 136.







Adding Tape Transport Units (Continued)

__ 13. Place the next tape transport unit against the preceding tape unit.

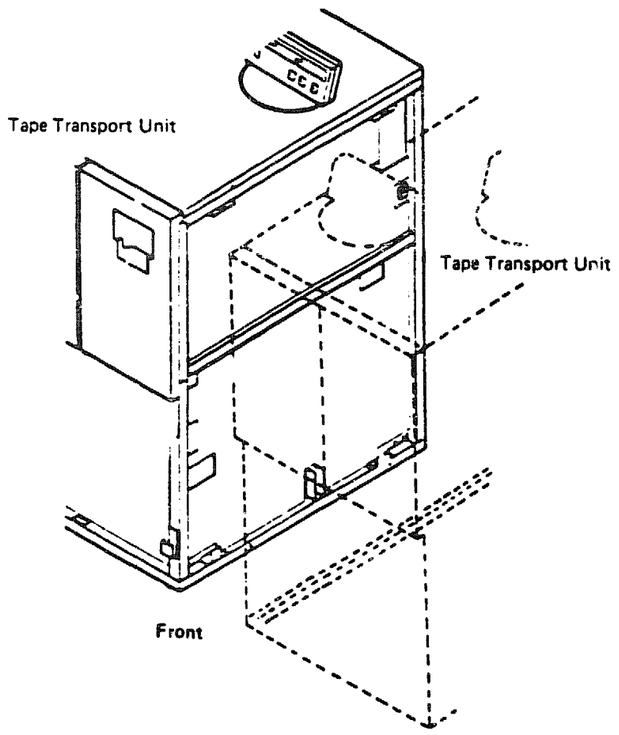
Warning: When installing a tape transport unit to a tape transport unit with the automatic cartridge loader feature installed on any drive, the drive must be opened approximately 5 cm (2 in.) to prevent the conductive seal from being pinched between the tape transport unit frames.

Note: Be sure the position of the casters does not prevent the tape transport units from fitting snugly together.

__ 14. Fasten the new tape transport unit to the preceding tape unit by installing a hex bolt and washer at the rear of the tape transport unit 1, and at the front of the tape transport unit 2. It may be necessary to remove the Tape Transport Unit Front Safety cover to install hex bolt 2. See CARR-DR 2-1 if the cover needs to be removed.

Note: If the tape transport units are not correctly aligned, the covers may bind. Ensure that the covers are not binding.

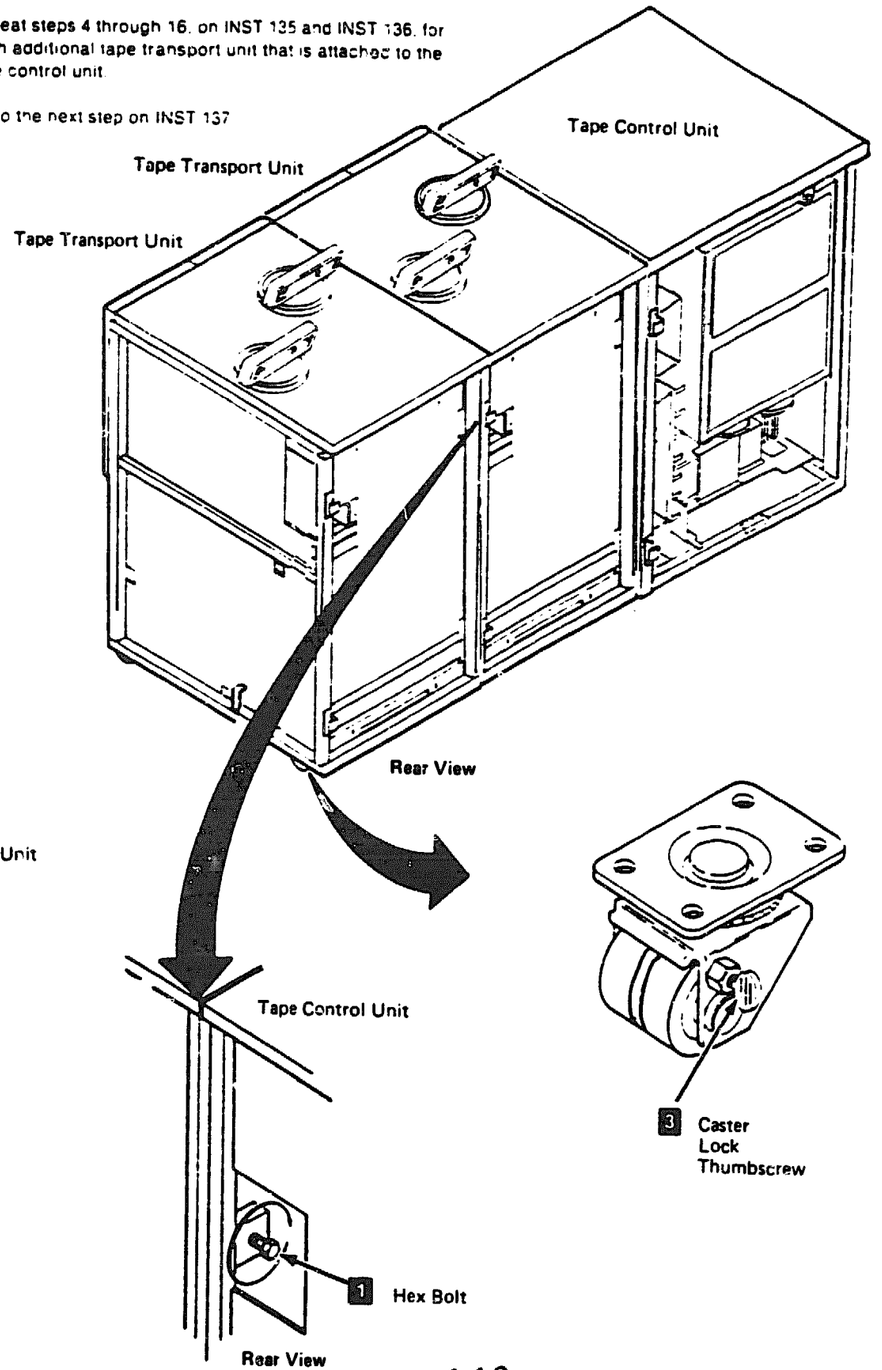
__ 15. Place the rear casters on the new tape transport unit so the caster lock thumbscrews 3 are accessible.

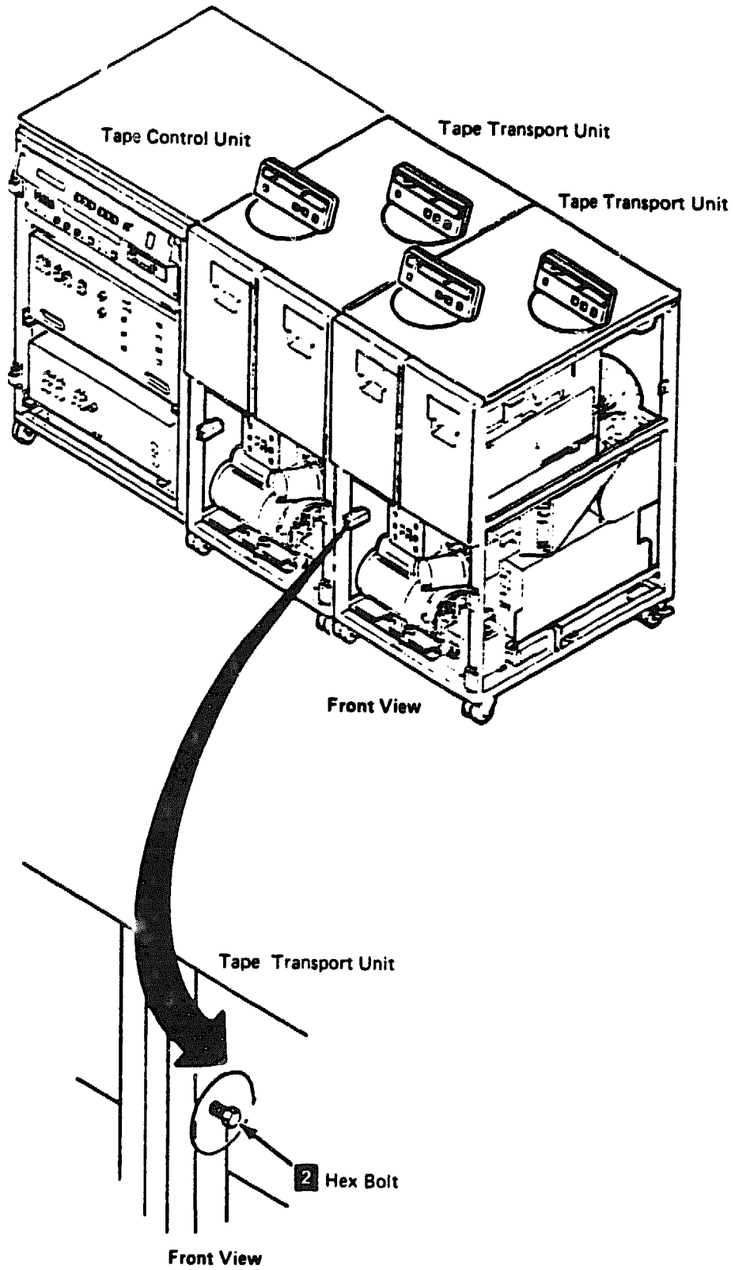


__ 16. Lock the rear casters on the new tape transport unit by turning the caster lock thumbscrews clockwise until they are tight.

__ 17. Repeat steps 4 through 16, on INST 135 and INST 136, for each additional tape transport unit that is attached to the tape control unit.

__ 18. Go to the next step on INST 137





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Adding Tape Transport Units (Continued)

On the last tape transport unit attached to the tape control unit:

__ 19. Place the device data bus terminator card P/N 29-27173-01 [4] removed from the last tape unit installed in the new tape transport unit's device data bus connector [5].

__ 20. Plug the thermal terminator [3] into the thermal connector [2]. The thermal terminator was removed in a prior step from the preceding tape transport unit.

__ 21. Screw the safety cover [1] onto the ac power cable socket.

DANGER

Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

__ 22. After the safety cover [1] is installed, loosen the screw holding the retainer [6] to the ac power box. Rotate the retainer and tighten the screw with the retainer positioned to prevent the safety cover from being removed.

__ 23. Go to INST 50 for instructions on setting the drive logical and physical addresses, return here when finished.

__ 24. Go to INST 56 for instructions on checking tape transport unit power supply jumpers, return here when finished.

__ 25. Go to INST 70 if the tape transport unit is attached to a single tape control unit subsystem, return here when finished.

__ 26. Go to INST 76 if the tape transport unit is attached to a dual tape control unit subsystem, return here when finished.

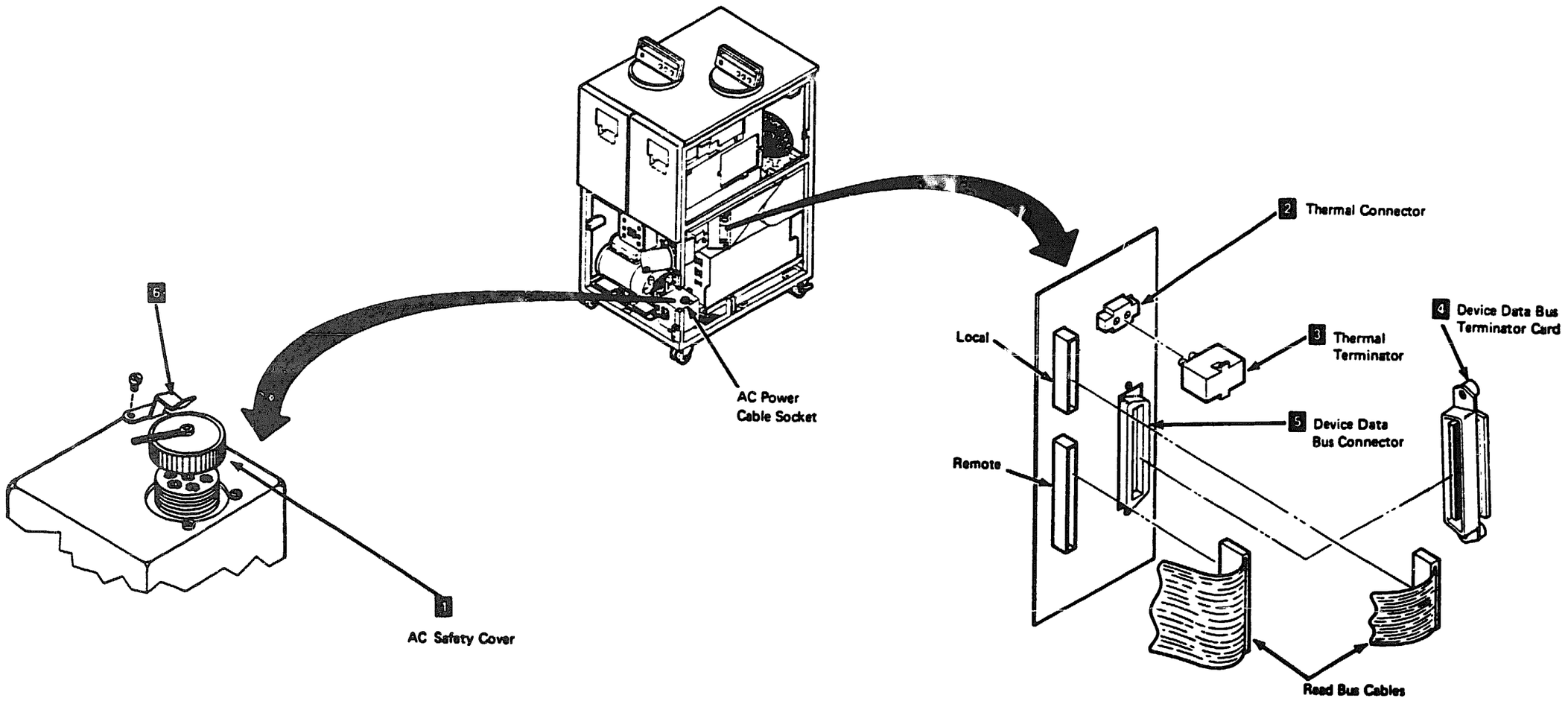
Before You're Through...

__ 1. Run the GMP on the drives added to the affected tape control units (see CE/HSC).

__ 2. Go to INST 130 and install the RFI frame pans and end plates, and reinstall all covers and subcovers that were removed.

__ 3. Go to INST 131 and run ILEXER/ILTAPE.

__ 4. This completes the installation of additional drives to an existing subsystem. Return the subsystem to the customer.



Getting Started

To remove or relocate a TA90 subsystem, perform the following steps:

__ 1. Before proceeding, check the following:

__ a. Make sure that all drives are unloaded and that the tape cartridges have been removed.

__ b. Make sure that the TA90 subsystem is offline to all host systems.

__ c. Make sure that any ports to be disabled from the tape control unit have been deallocated from the operating system.

__ 2. Remove the front, rear, and left side covers from the tape control unit. See CARR-TCU 2-1 for cover removal procedures.

Removing Power

__ 3. Remove the tape control unit rear safety cover.

__ 4. Set the Online Test/Offline Test switch [1] to Offline Test.

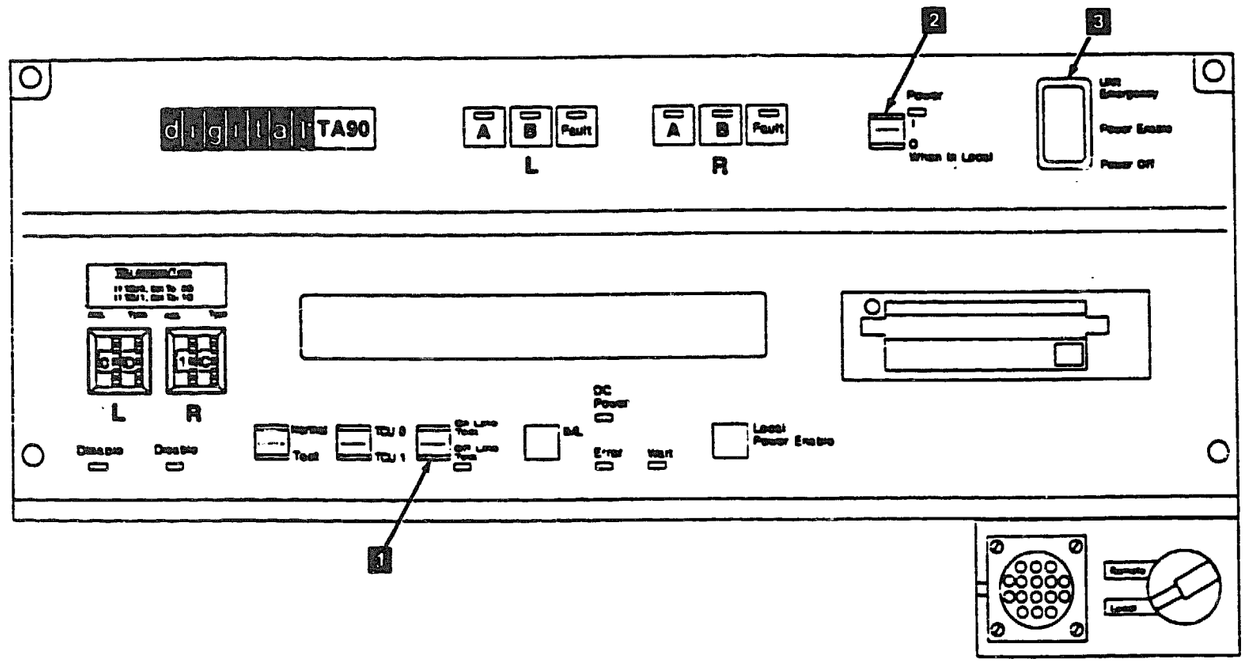
__ 5. Set the tape control unit Power On/Off switch [2] to Off.

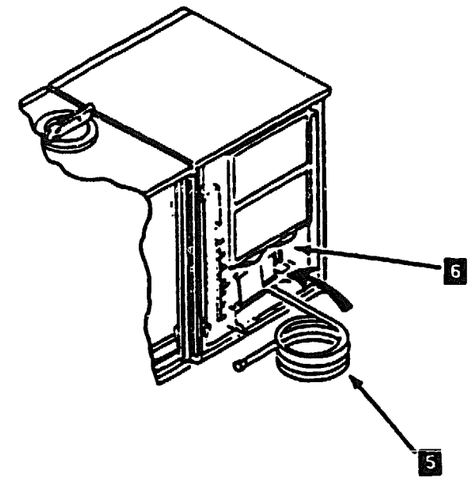
__ 6. Set the tape control unit Unit Emergency Power switch [3] to Power Off.

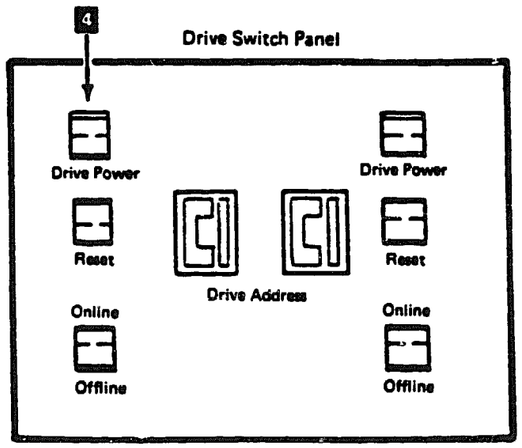
__ 7. Set the Drive Power switch [4] to Off on each drive.

__ 8. Have the customer remove power from the outlet.

__ 9. Remove the power cable [5] from the customer's outlet and tape the coiled cable behind the I/O cable connectors [6].





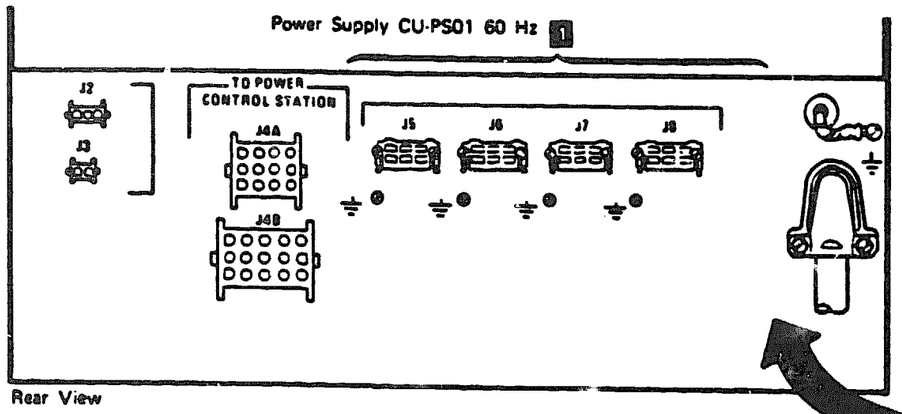


Removing Unit Emergency Power Off (UEPO) Cables

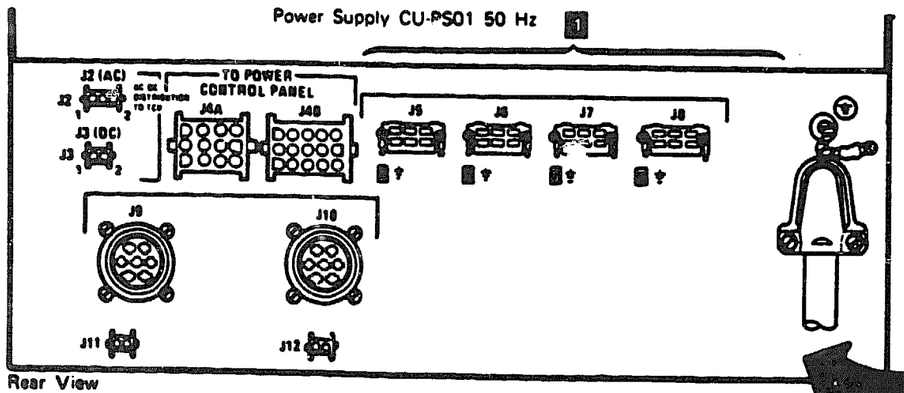
__ 14. Disconnect the UEPO cables from the controlling computer.

__ 15. Remove the four UEPO cables from connectors J5 through J8.

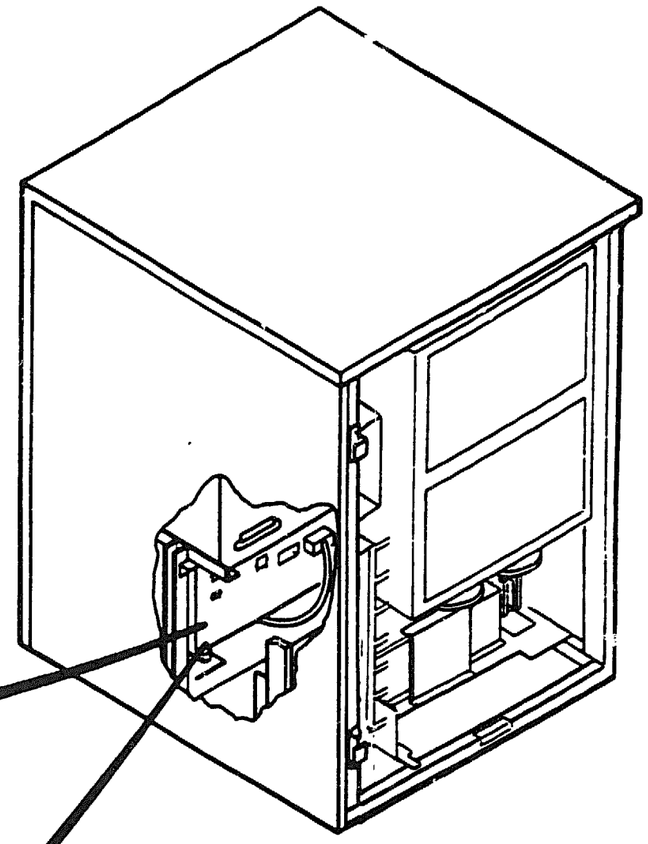
__ 16. Pass the UEPO cables down through the opening in the bottom of the tape control unit.



Rear View



Rear View



Removing Dual Tape Control Unit Communication Feature Cables

__ 17. Disconnect both ends 1 of the 3-connector cable (A3, A4, and A5), one end at each tape control unit.

__ 18. Disconnect both ends of the 2-connector feature cable (A1 and A2) 2 at the tape control units.

__ 19. Loosen the wingnuts 4 on the cable retaining brackets 5 and open the brackets.

__ 20. Slide the cables from between the guide posts.

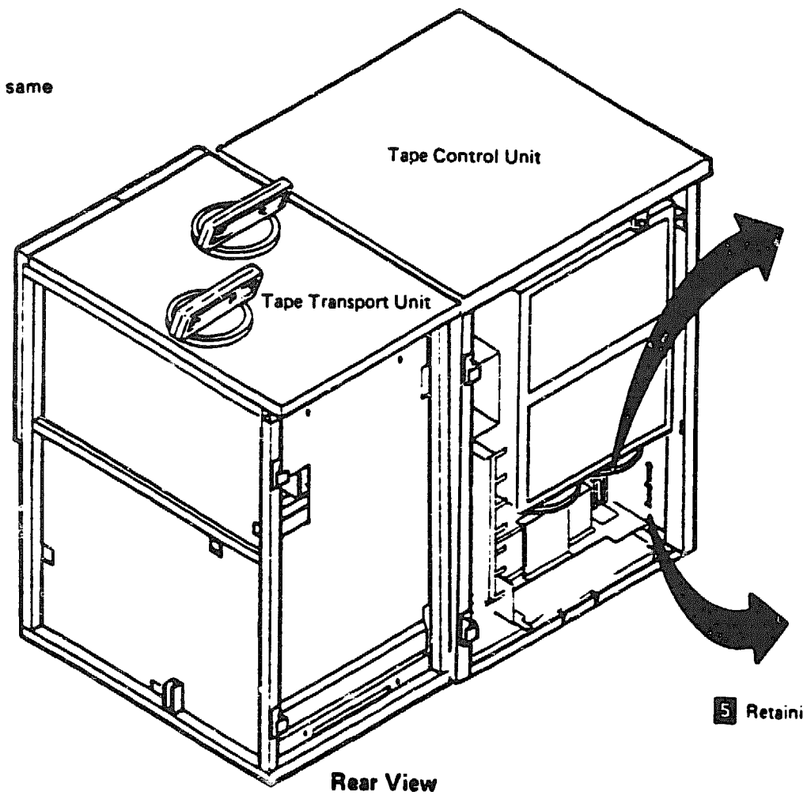
__ 21. Swing the retaining brackets closed and tighten all the wingnuts.

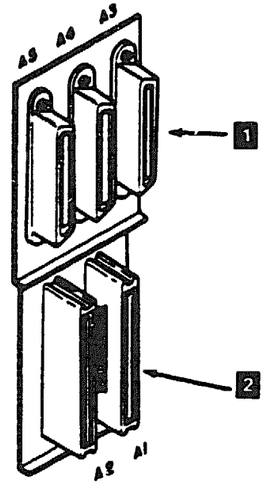
__ 22. Disconnect the cable ground straps 3 from each tape control unit.

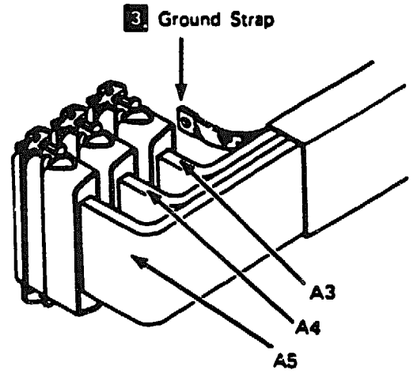
__ 23. Place protective covers over the connectors at both ends of the feature cable.

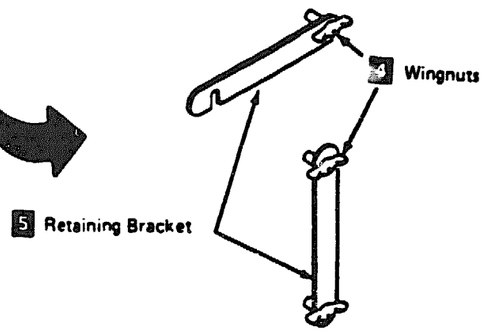
__ 24. Place the cables in the shipping carton.

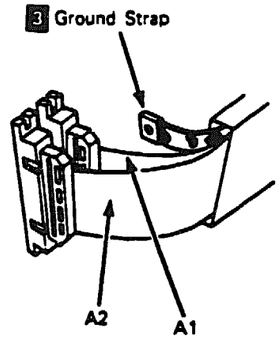
Note: If you are relocating the machines within the same building, you don't have to pack them.











Disconnecting the Tape Transport Units and the Tape Control Unit

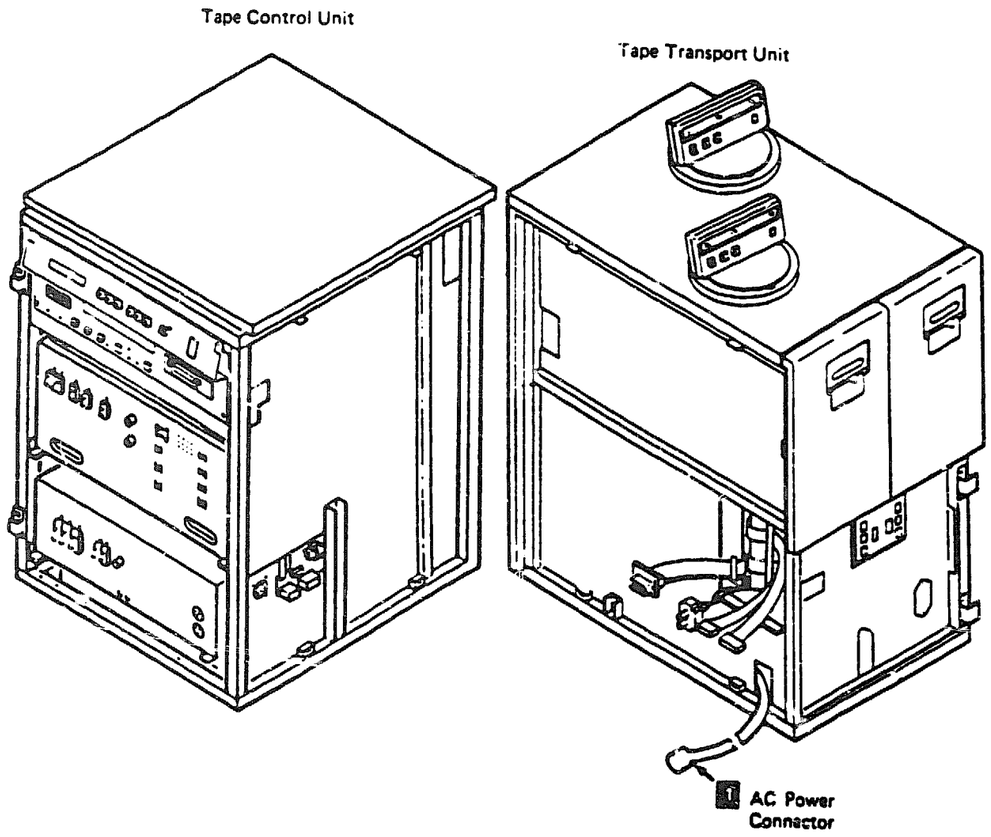
__ 25. Unlock the rear casters 3 of the tape control unit and tape transport units.

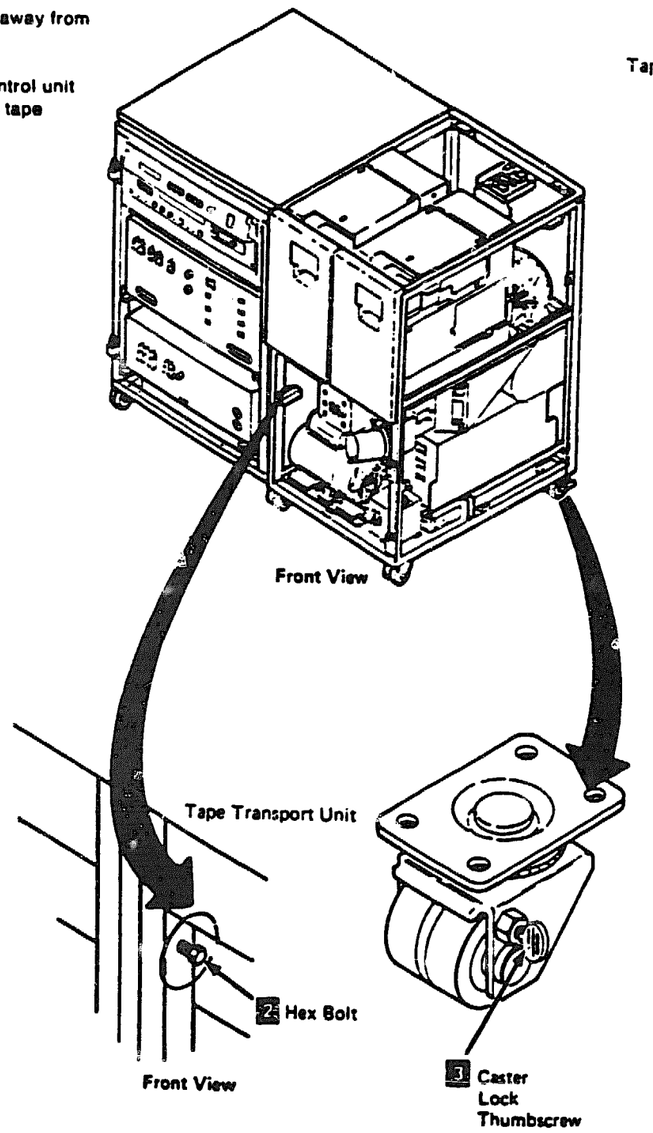
CAUTION:
TILT HAZARD. Do NOT open both drives of a tape transport unit that is not bolted to another tape transport unit or tape control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

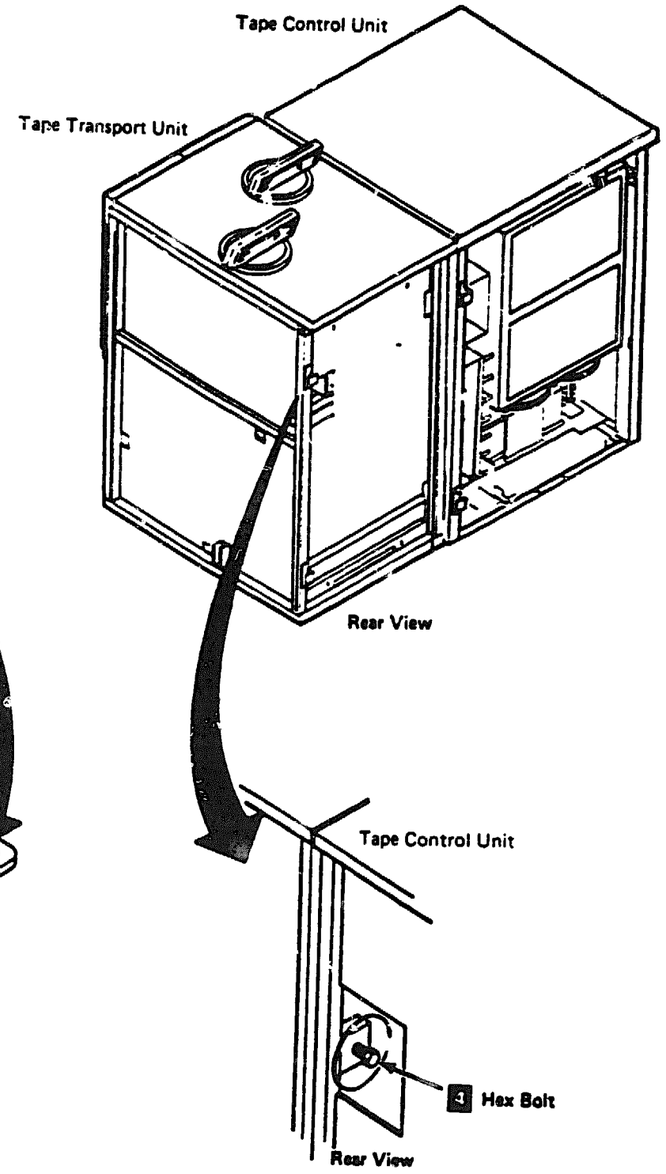
__ 26. Remove the hex bolts and washers 4 2 from the front and rear of each unit. It may be necessary to remove the Tape Transport Unit Front Safety cover to remove hex bolt 2. See CARR-DR-2-1 if the cover needs to be removed.

__ 27. Push the tape control unit about 20 cm (8 in) away from the first tape transport unit.

__ 28. Disconnect the tape transport unit to tape control unit power cable 1 and tape it to the side of the tape transport unit.







Disconnecting the Tape Transport Units and the Tape Control Unit (Continued)

__ 29. On the last tape transport unit attached to the tape control unit

- __ a. Remove the side cover
- __ b. Remove the device data terminator card P/N 29-27173-01 2
- __ c. Remove the thermal terminator 1.
- __ d. Be sure the terminators are included with the tape control unit shipping group.

__ 30. Disconnect the device data and read bus cables 3 5 and tape them to the side of the tape transport unit.

__ 31. Disconnect the thermal cable 4.

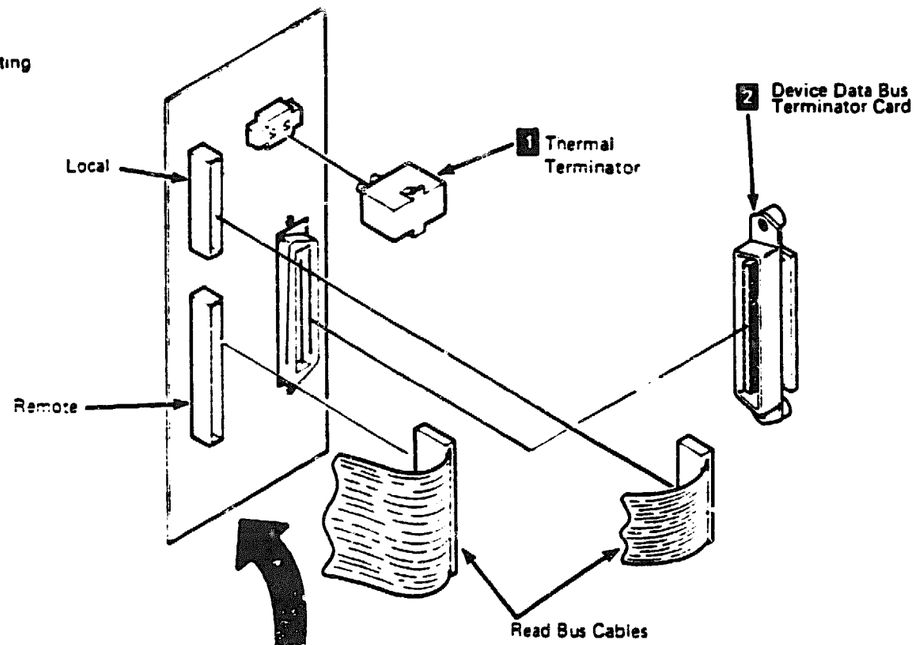
__ 32. Repeat steps 30 and 31 for each additional tape transport unit.

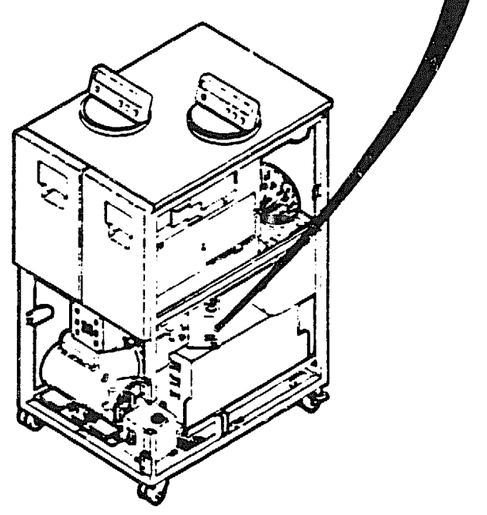
To complete the removal/replacement:

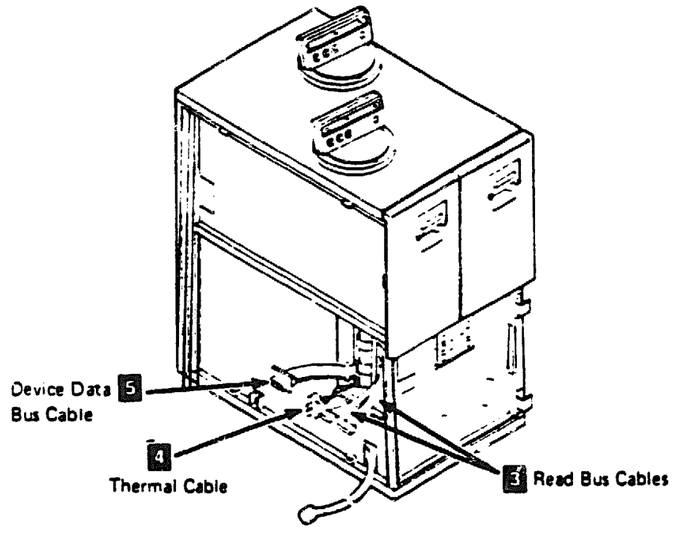
__ 33. Install the side cover you removed from the tape transport unit on the right side of the tape control unit (as you face the front of the tape control unit)

__ 34. Reinstall any covers that were removed.

__ 35. Report the activities performed, using the existing Branch Office procedures.







Install Automatic Cartridge Loader INST 900

Installation Instructions

Preparation

Read and understand the purpose and details of this installation instruction.

Check all items and count parts listed on the BOM to be installed to determine that all parts have been received.

Purpose and Description

Purpose

To Install Automatic Cartridge Loader.

Description

Replace the manual latch assembly and deck front cover with the loader assembly and Automatic Cartridge Loader Mechanical Assembly.

Special Tools and/or Materials Required

NAME	DEC P/N
ESD Grounding Kit	
Electrical Plastic Tape	
Pin Removal Tool	
TA90 Scratch Cartridges (one cartridge is required for diagnostic tests)	

Safety

CAUTION:
Do not open both drive drawers at the same time if the automatic cartridge loader feature is installed and the tape transport unit is not bolted to the tape control unit or to another tape transport unit. A stand alone tape transport unit with the automatic cartridge loader feature installed can tip over if both drive drawers are opened to the full extended position and additional downward force is applied to the drive drawer(s).

CAUTION:
Observe standard safety practices. For further information refer to PREF, page SAFETY 10.

TA90 Subsystem Power

The subsystem power need not be turned off. However, each drive must be powered off when the Automatic Cartridge Loader is being installed on that drive.

Installation Instructions (continued)

Details Of Installation

__ 1. Dismount the drive to be updated.

__ 2. Open the drive front cover 3.

__ 3. Set the drive(s) Online/Offline switch(es) to Offline for all drives to be updated. (See LOC 1 for drive switch locations.)

__ 4. If there are cartridges in any of the drives, remove them using instructions in CART 1.

CAUTION:
When powering off both drives in a TA90 you must turn off the AC breaker to prevent possible circuit damage (See CARR-DR8 for power off procedures).

__ 5. Set the Drive Power switch to Off if you are removing power from one drive (See LOC 1).

Remove Drive Drawer Clear Plastic Cover

CAUTION:
Do not open both drive drawers at the same time if the automatic cartridge loader feature is installed and the tape transport unit is not bolted to the tape control unit or to another tape transport unit. A stand alone tape transport unit with the automatic cartridge loader feature installed can tip over if both drive drawers are opened to the full extended position and additional downward force is applied to the drive drawer(s).

__ 1. Release the drive latch 5, and pull out the drive drawer you want to work on, to the full extended lock position.

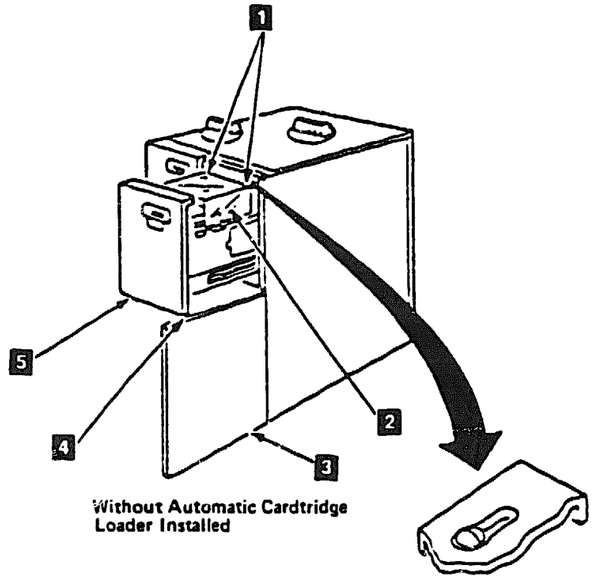
__ 2. Remove the two pins 1 holding the clear plastic cover 2 and remove the cover. Set the cover aside for later use.

Remove Drive Drawer Plastic Cover

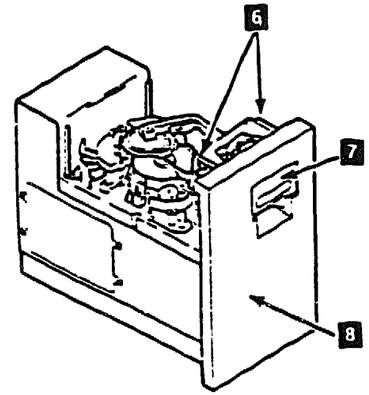
__ 1. Ensure that the cartridge latch door 7 is closed. Remove the two drawer cover bracket screws 6 from the cartridge latch assembly. Do not remove the bracket from the cover.

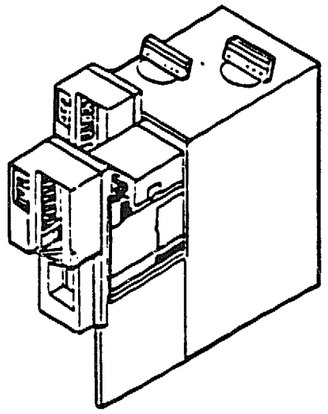
__ 2. Lift up on the cover 7 and at the same time pull the cover away from the drive, then push the cover down to clear the bottom cover pins.

__ 3. Set the cover 8 and cover bracket screws 6 aside. The cover and screws will not be used with the automatic cartridge loader feature.



Without Automatic Cardtridge Loader Installed





With Automatic Cartridge Loader Installed

Installation Instructions (continued)

Remove the Cartridge Latch Assembly

__ 1. Disconnect the file protect switch cable connector 7 from J3 8.

__ 2. Loosen the set screw 1 and unplug the cartridge present cable connector 2. Remove the connector from the cartridge latch assembly.

Note: The cartridge present sensor 3 remains in the cartridge latch assembly 14.

__ 3. Remove the screw and cable clamp 6. Disconnect the cartridge latched sensor cable connector 5 from the cartridge latched sensor 4. Set the cable clamp and mounting screw aside. Parts will not be re-used.

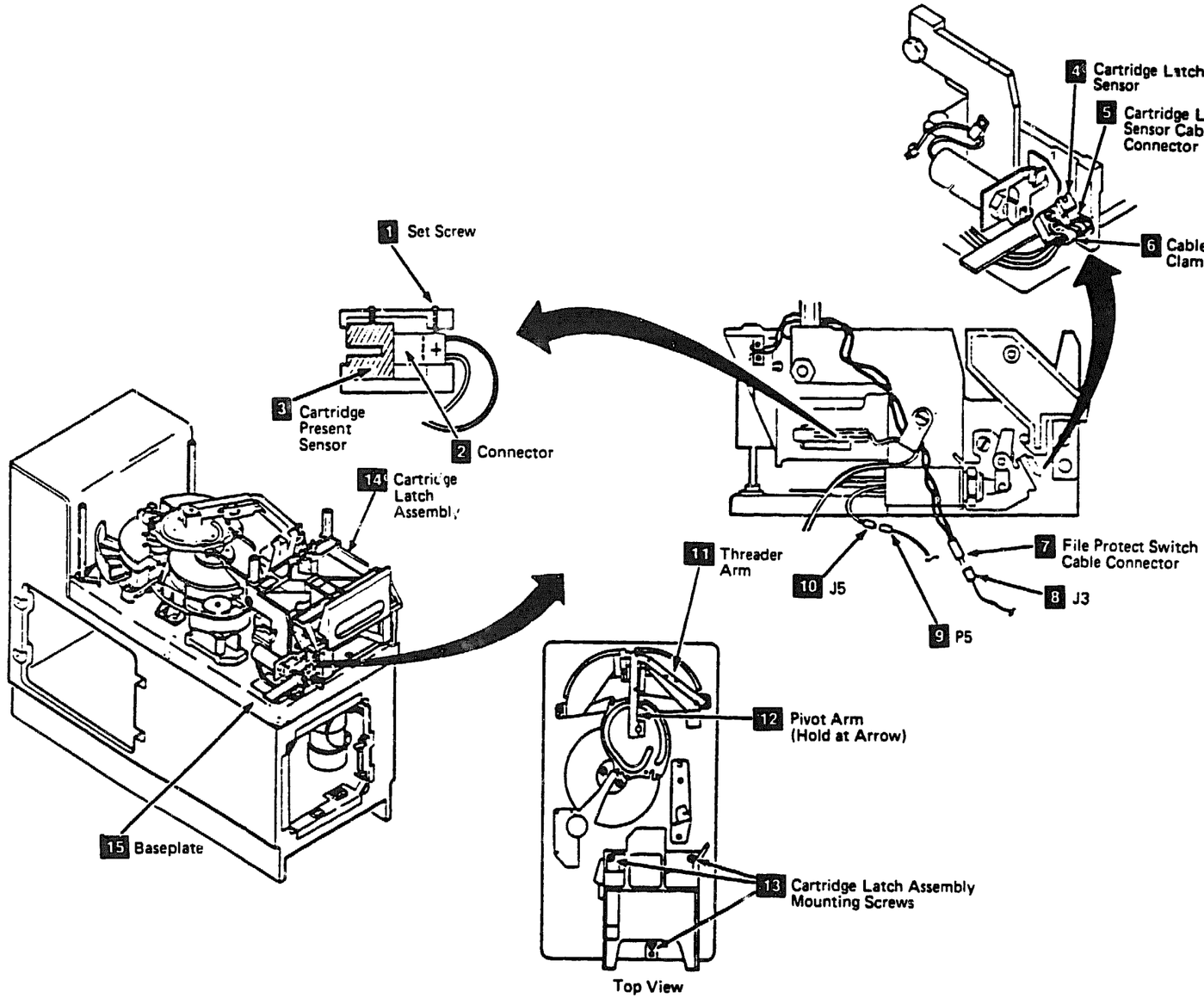
__ 4. Disconnect the cartridge latch solenoid cable connector 10 J5 from P5 9, by pinching on the end of the connector retainer.

__ 5. Turn the pivot arm 12, by holding at the indicated area, counter-clockwise to move the threader arm 11 to the position shown (the 12 o'clock position). This moves the threader arm out of the way and will prevent the arm from being broken.

Note: In the next step, route cables next to the latch assembly as required, to enable the removal of the latch assembly.

__ 6. Remove the three cartridge latch assembly mounting screws 13 and lift the latch assembly 14 off the baseplate 15. Save the screws for later use.

__ 7. Set the cartridge latch assembly 14 aside, it will not be reused.



Installation Instructions (continued)

Install the Loader Assembly

Note: In the next step there are two styles of retaining clips. Refer to 3 to determine which style you have

__ 1. Remove the cartridge present sensor 8 from the new load assembly, by unlatching the retaining clip 3. Retain the sensor for later use.

Note: In the next step, route cables to ensure that the cables will not be pinched during the installation of the load assembly.

__ 2. Place the load assembly 10 over the locating pins on the baseplate.

__ 3. Install the three mounting screws 1 removed in INST 930 step 6, to mount the load assembly to the baseplate.

__ 4. Connect the cartridge present cable connector 7 to the cartridge present sensor 8 removed in step 1. The + label on the connector and the E + mark on the sensor must be located as shown.

__ 5. Replace the cartridge present sensor 8 and cable connector 7 into the load assembly. The + label on the connector must be visible. Close the sensor retaining clip 3 to hold the sensor and cable connector in position.

__ 6. Connect the cartridge latched sensor connector to the cartridge latched sensor 16. The + label on the connector must be visible.

__ 7. Connect the file protect switch cable connector 5 to J3 4.

Note: In the next step, do not over torque the motor in the fully up or down position. The tray is fully up or down when the cam arm is in the vertical position 15. Do not rotate the motor with the connecting rod cam assembly.

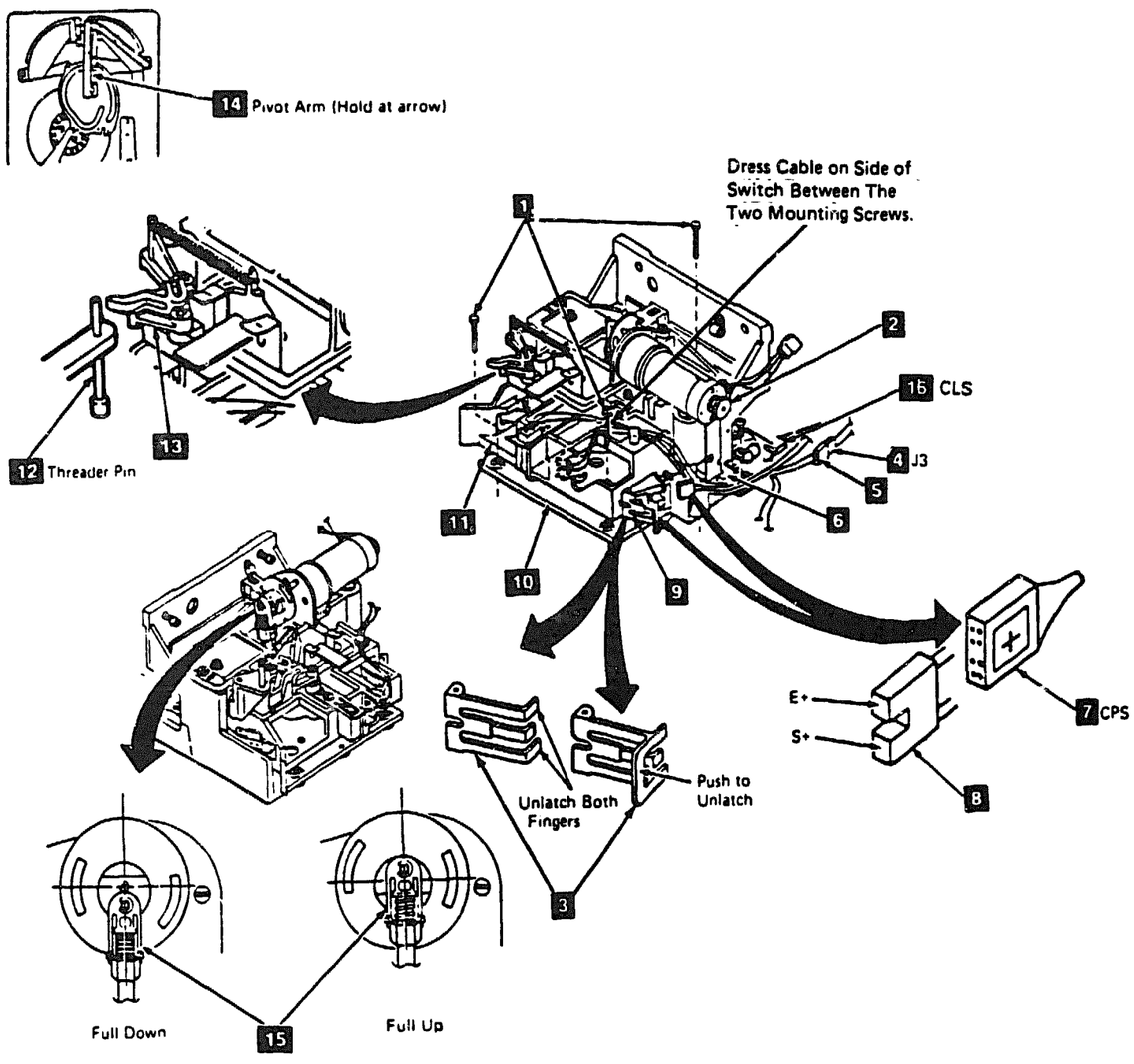
__ 8. Lower the tray to the full down position by turning the hand knob located on the load motor 2 counterclockwise, when viewed from knob end. Ensure cables are not damaged.

__ 9. Move the receiver 13 in position to receive the threader.

__ 10. Turn the pivot arm 14, by holding at the indicated area, clockwise to move the threader pin 12 into the receiver 13.

Note: In the next step, if the tray is not in the full up position an error will occur at diagnostic check.

__ 11. Raise the tray to the full up position by turning the hand knob 2 located on the load motor clockwise, when viewed from knob end. This will engage the threader pin.



Installation Instructions (continued)

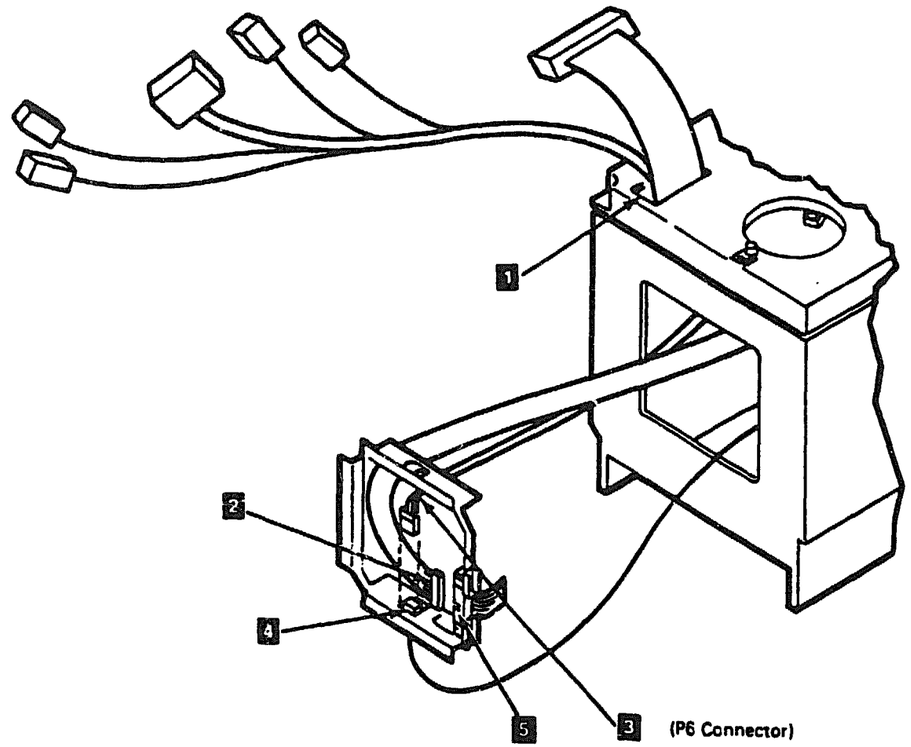
Install the Power and Signal Cables

__ 1. Thread the signal cable 2 (TU-P1 connector end) through the baseplate opening 1

__ 2. Connect the signal cable connector (TU-P1) 2 to connector (TU-J1) 5 located on the right side of the opening in front of drive. Ensure retention springs are latched on housing.

__ 3. Thread the power cable 3 (P6 connector end) through the baseplate opening 1 and in front of the signal cable 2.

__ 4. Connect the power cable connector (P6) 3 to connector (J6) 3 located on the bottom of the opening in front of drive.



Power Adapter Cable

Installation Instructions (continued)

Install the Automatic Cartridge Loader

CAUTION:
Do not remove tape and/or wire ties from cables that are fastened to the rear side of the automatic cartridge loader assembly until the automatic cartridge loader mechanical assembly is fastened to the loader assembly. The tape and/or wire ties hold the cables so they will not be damaged during installation.

When installing the automatic cartridge loader mechanical assembly, carefully position the assembly to prevent damage to the cover seals.

CAUTION:
Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions for working with ESD-SENSITIVE PARTS"

CAUTION:
Before doing Step 1, verify that the two isolating bushings 1 are installed on the front of the loader assembly 2, and the three isolating bushings 5, are installed on the rear of the automatic cartridge loader assembly 4. ESD and RFI problems will occur after installation if the bushings are not in place or have been damaged.

While installing the automatic cartridge loader mechanical assembly in the next step, carefully position it to prevent damage to the cover seals.

__ 1. Carefully lift the automatic cartridge loader, 4 shipped with this BOM, on the loader assembly, 8, ensuring that the isolating bushings 1, and 5 are in place and not damaged.

__ 2. Place the support bracket 6 so it is located over the front top surface of the loader assembly 8. The bracket provides support for the automatic cartridge loader mechanical assembly during installation.

Note: In the next step, the bottom of the automatic cartridge loader mechanical assembly is similar to the drive drawer cover and can be held by either two screws, or by two pins. If the drive has pins, go to Step 3. If the drive has screws, go to Step 5.

__ 3. From the front of the loader assembly, guide the bottom cover pins into the holes of the bottom cover 16, while at the same time lifting from the bottom and guiding the automatic cartridge loader mechanical assembly on to the locating pins 3 on the front of the loader assembly.

__ 4. Go to Step 6.

__ 5 From the front of the loader assembly, and holding at the bottom, guide the automatic cartridge loader mechanical assembly on to the locating pins 3

__ 6 Assemble three screws 10, lockwasher 9, flat washer 11, and isolating washer 12 Put assembled screws in a place where they can be easily accessed for use in the following steps. See the figure for assembly sequence order.

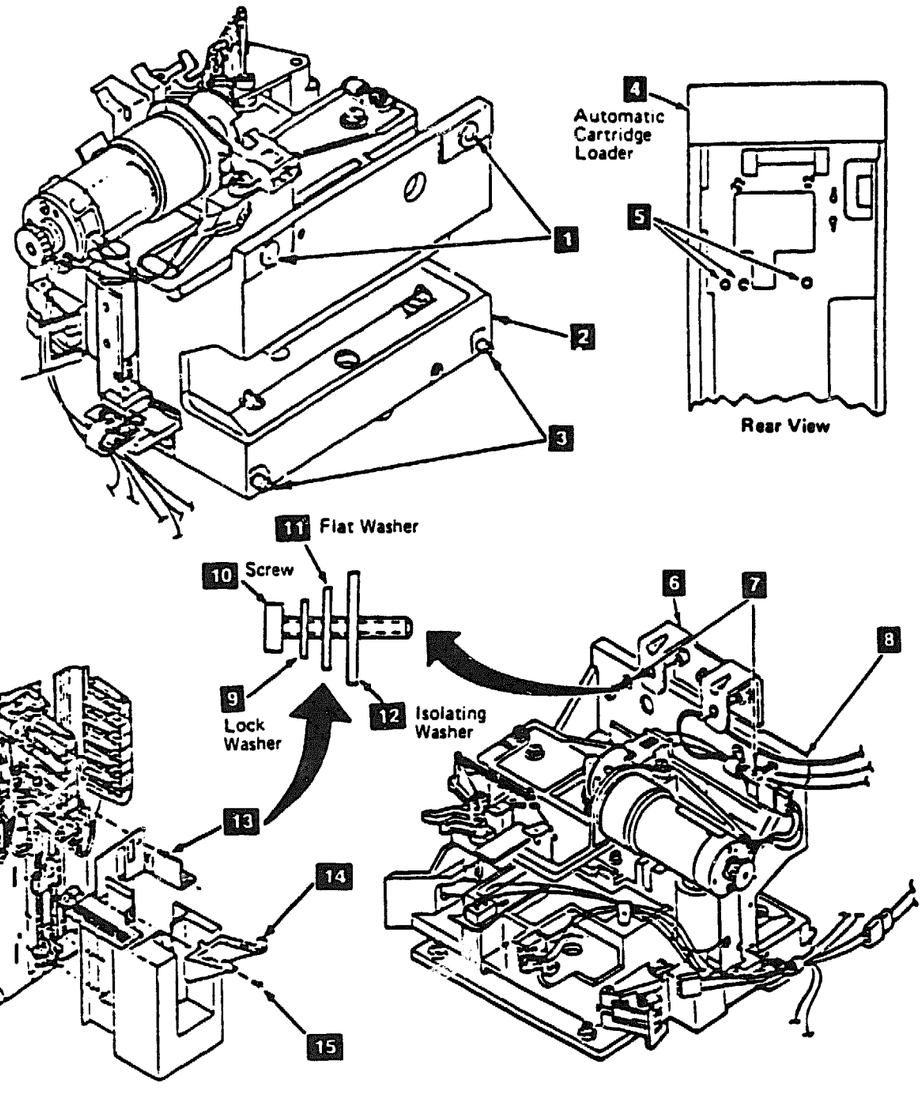
CAUTION:
Do not over tighten the screws in Steps 7 or 9 while installing the automatic cartridge loader mechanical assembly. Over tightening the screws will crack the isolating washer.

__ 7. From the rear, while holding the automatic cartridge loader mechanical assembly in place, fasten it to the loader assembly 8, at location 7 using two screws 10 (screws were assembled in Step 6).

__ 8. Remove the two screws and lock washers 15 that secure the tray 13. Set the tray, mounting screws and lock washers to the side for later installation.

__ 9. From the front of the drive, install one screw 10 at location 11. (Screw was assembled in Step 3).

__ 10. Continue on the next page.



Installation Instructions (continued)

11. Connect "P" 6 connector to the loader assembly motor connector 5.

12. Connect "B" 2 connector (B label side down) to the loader assembly motor complete sensor connector 1.

13. Remove cable clamp 3 and route loader assembly motor drive cable 4 and motor complete sensor cable 2 through the cable clamp.

14. Route excess loader assembly motor drive cable 4 behind the support bracket then install the cable clamp 3 (See the Figure for correct cable routing.)

15. Connect "A" 13 connector to the loader assembly feed complete sensor 12.

16. Remove the file protect switch cable clamp 10 then route the loader assembly feed complete cable 11 through the cable clamp and reinstall the cable clamp

17. Verify the cables are properly routed to ensure the cables will not be damaged by the loader assembly mechanism, automatic cartridge loader mechanism or covers.

18. Remove cable clamp 8 from the cartridge latched sensor then route the file protect switch cable 7, feed complete sensor cable 11, and cartridge latched sensor cable 9 through the cable clamp and reinstall the cable clamp.

    Note: There is only one wire used in the in the "P5/J5" connector. Plug as keyed in the following step. The second wire is used on tape transport units without the automatic cartridge loader feature.

19. Connect "P5" 26 connector to the cartridge latch solenoid connector "J5" 25.

20. Connect the power cable connector "P3" 29 to the card connector "J3" 24.

21. Open the front cover 14 by loosening the two fasteners 15 one-fourth turn, then swing the cover up.

22. Open the card gate 21 by loosening the one-fourth turn fastener 20 and swing the card gate outward to allow access to the rear of the card.

23. Route the signal cable 27 installed on INST 950, through the top rear of the automatic cartridge loader mechanical assembly 22 to card connector "J1" 31.

24. Connect the signal connector "AL-P1" 23 to the card connector "J1" 31.

25. Close card gate 21 and tighten the one-fourth turn fastener 20.

DANGER

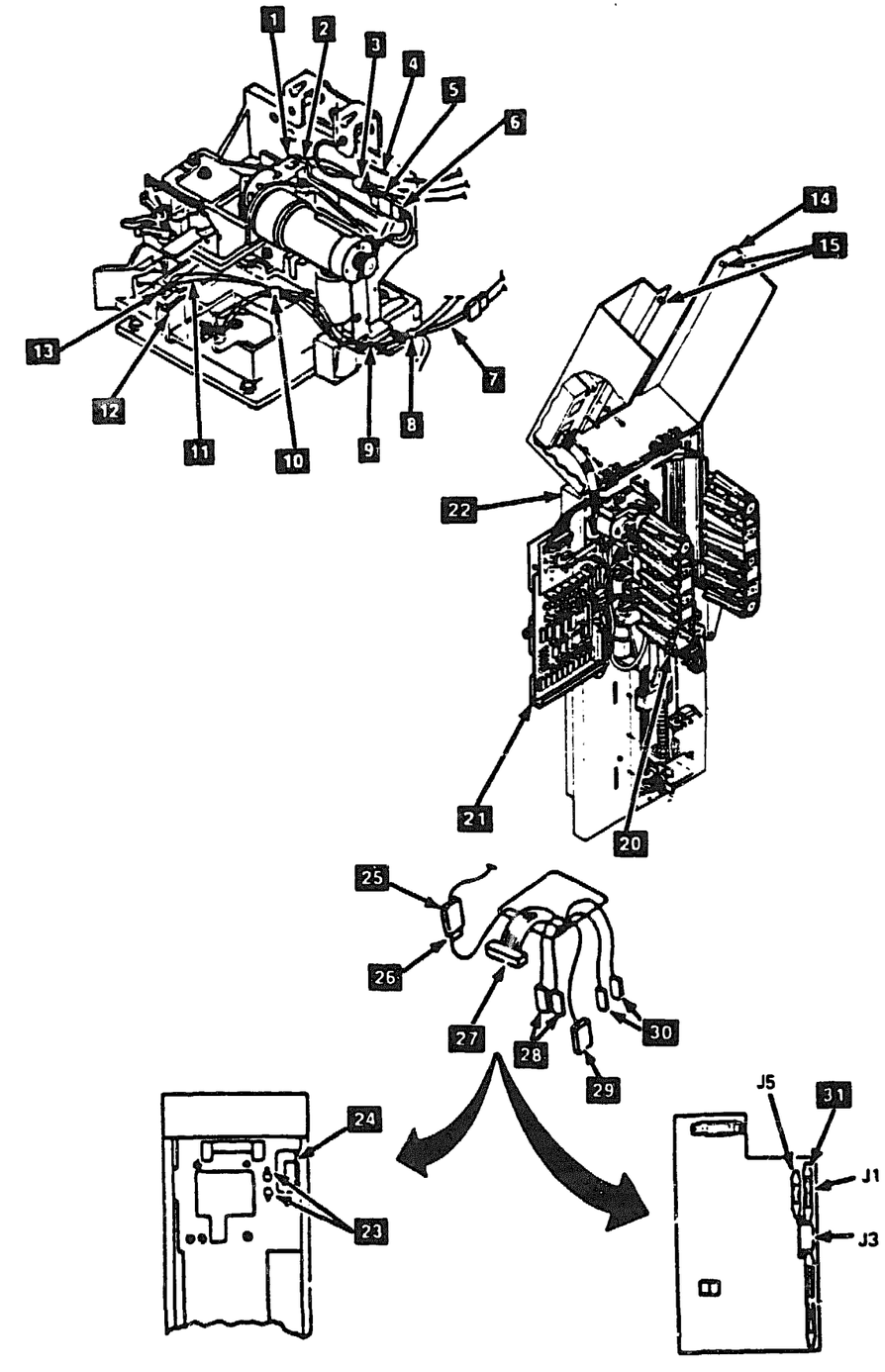
Check the connectors and terminals to ensure they are matched. You could injure yourself and damage the machine when powering up the tape unit if the connectors and terminals are not matched when doing the next step.

26. Connect the power cable connectors 28 and 30, (numbered 1,2,3,4) to the matching numbered fuse connectors 33. Ensure that the power cable connectors (numbered 1,2,3,4) are connected to the matching numbered fuse connectors.

    Note: Verify the cables are properly routed to ensure the cables will not be pinched by the load assembly mechanism, automatic cartridge loader mechanism or covers.

27. Close the front cover 14 and latch it by tightening the fasteners 15.

28. Replace the tray removed in Step 8, INST 960.



Installation Instructions (continued)

Install the Drive Clear Plastic Cover

__ 1. Replace the clear plastic cover . (See CARR-DR 2-5.)

__ 2. Close the drive drawer.

__ 3. Set the Drive Power switch to On.

__ 4. Set Online/Offline switch to Online.

__ 5. Return to Section "Details Of Installation," on INST 910 Step 2, if this is the first automatic cartridge loader installed and install the automatic cartridge loader on the other drive.

__ 6. Go to "Test Procedure".

Test Procedure

Note: Both drives in this tape transport unit should be updated prior to testing. Ensure that you test both drives.

__ 1. Set the loader switch to Auto.

__ 2. Insert six cartridges and press Start. The first cartridge should load. After the load completes.

__ 3. Unload the drive. The first cartridge should unload, drop down, and the second cartridge should load.

__ 4. Repeat for all six cartridges.

If error code E701 occurs, go to "Check Latch Solenoid Cable," otherwise, go to step 5.

__ 5. Close the front cover.

__ 6. Return the drives just tested to the customer.

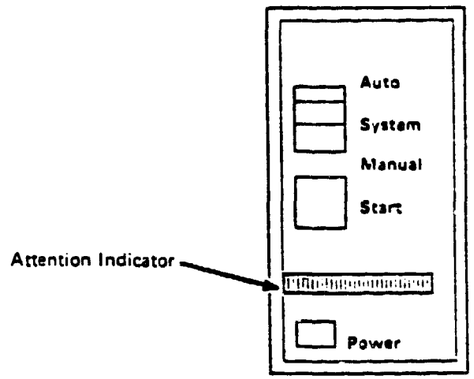
Check Latch Solenoid Cable

You are here due to error code E701 occurring during final test procedure. Wires one and two in the "P4" connector are not correctly installed. Do the following steps to correct:

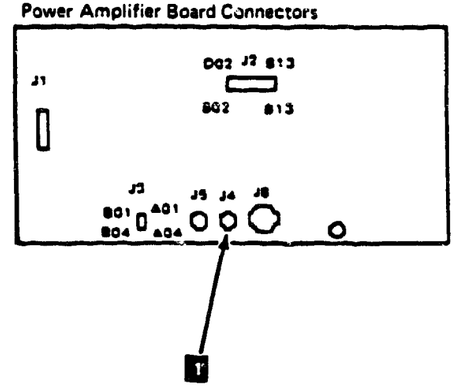
__ 1. Reverse wire 1 (one) and 2 (two) in the power amplifier board connector P4 using pin removal tool to extract pins from the connector.

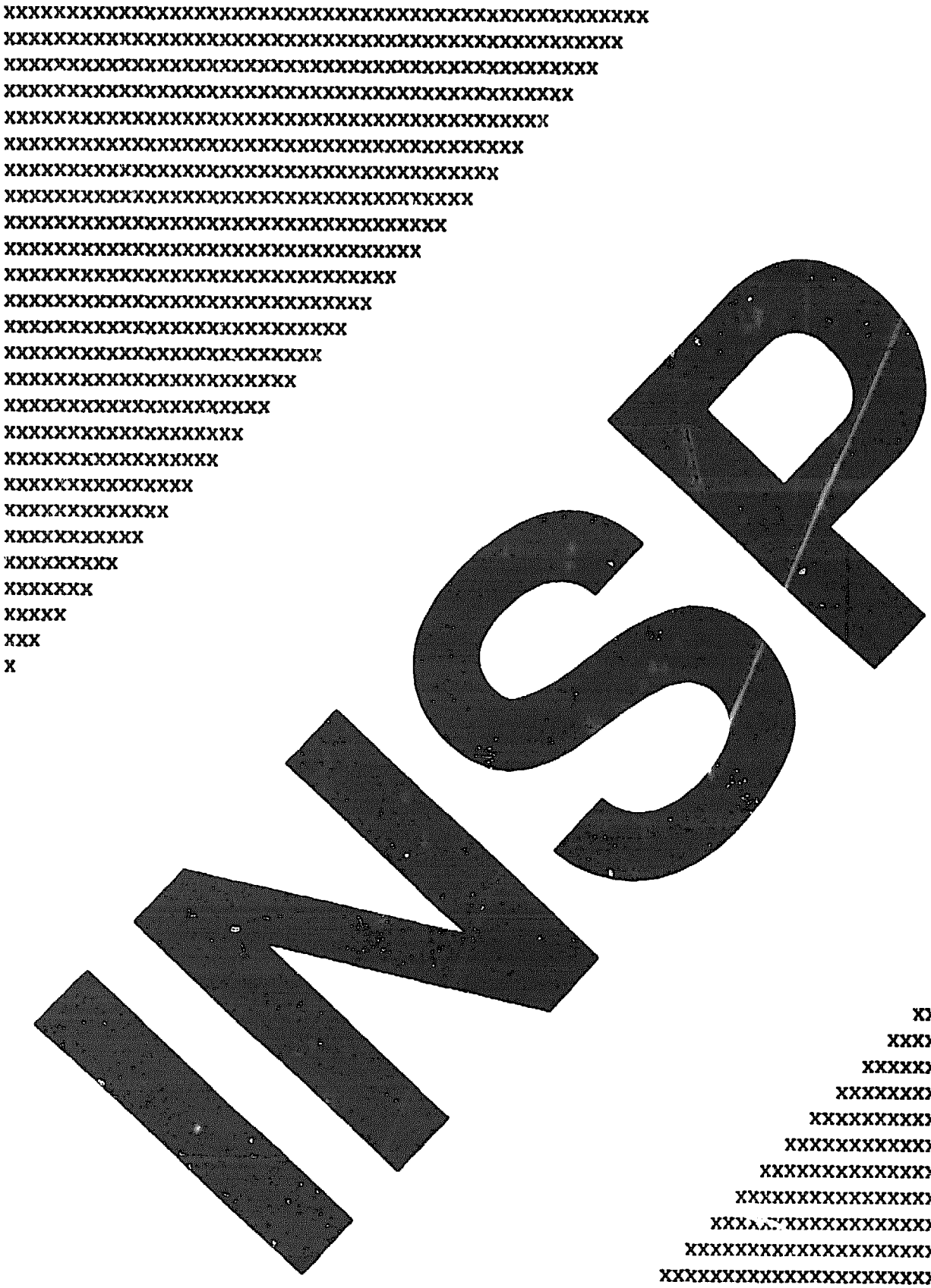
__ 2. Ensure that pin latches (tabs on side of pin) are reformed to approximately 30 degree angle to ensure that pins will be securely latched when reinstalled into the connector.

__ 3. Return to "Test Procedure"



Automatic Cartridge Loader Operator Panel




INSP

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General Instructions

This safety checklist is to ensure that a machine that has not been under a service contract has the necessary safety items installed and that no other changes were made that would make it unsafe. Each machine, as it was designed and assembled, had needed safety items installed to protect the owners, operators, and service personnel from injury. This checklist verifies only those items.

This checklist should be performed before the normal inspection for a service contract. **The machine should be suspected to be unsafe and you should think it unsafe until you verify that it is safe.** If any unsafe conditions are present, you must decide how serious the hazard could be and whether you can continue without first correcting the problem.

Think about these conditions and the safety hazards they present:

- Electrical, especially primary power, for example: an electrically charged frame can cause serious or lethal electrical shock.
- Explosive, for example: damaged or expanding capacitors can cause serious injury.
- Mechanical hazards, such as a cartridge latch assembly cover missing, can cause injury to the body.

Some of the pages are for features and need not be checked if the features are not installed on the machine.

Needed Materials

The following items are needed or will be useful during the inspection.

- Logic/wiring diagrams
- Parts catalog
- Machine history

Note: See INSP 15 and INSP 16 for the following locations.

Preparation

CAUTION: TILT HAZARD

Do NOT open both drives of a tape transport unit that is not bolted on to another tape transport unit or tape control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape transport unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

Start the checklist with the machine powered off and with all electrical power removed from the machine.

1. Power off the subsystem.
2. Have the customer open the CB/CP (circuit breaker/circuit panel) to the outlet supplying power to the subsystem.
3. Check the customer's plug housing to building ground.
   - There should be no voltage present.
   - Resistance should be less than 0.1 ohm.
4. Unplug the power cable.
5. Unplug the STI cables from the tape control unit. See LOC 1.
6. Disconnect the read/write bus connectors and the thermal connector 1, and the ac power connector 2, between the Tape Control Unit and the first tape transport unit and between all the tape transport units.
7. Check that there is no equipment plugged into any of the convenience outlets in the tape control unit. They are located on the left front of the ac power supply CU-PS-01.
8. Obtain the items that are needed or will be useful before starting the inspection.

Tape Transport Unit and Tape Control Unit Outside

Powered off with power cable and system attach cables disconnected.

On the Tape Transport Unit:

Check and Correct As Needed

1. That the machine is stable, that there are no defective casters or pedestals.
2. That the caster lock thumbscrews are in the two rear casters 7.
3. That all hinges and latches are in acceptable operating condition, not broken or corroded.
4. That the tape transport unit displays rotate without binding and the mechanical stops are not broken 8.

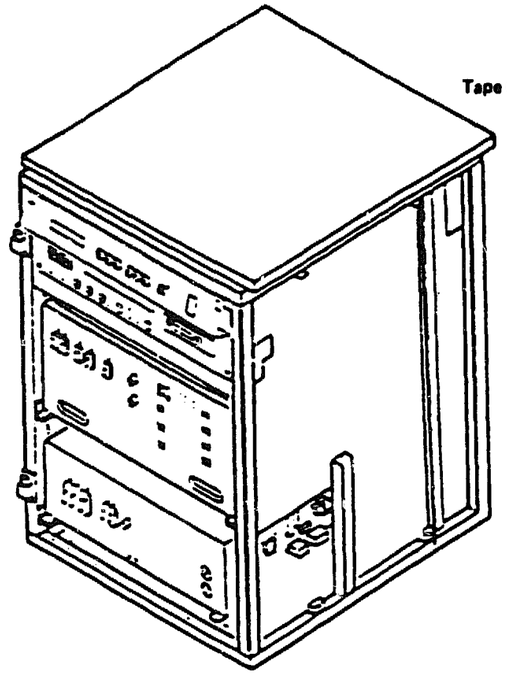
   Note: The displays have detented stop positions

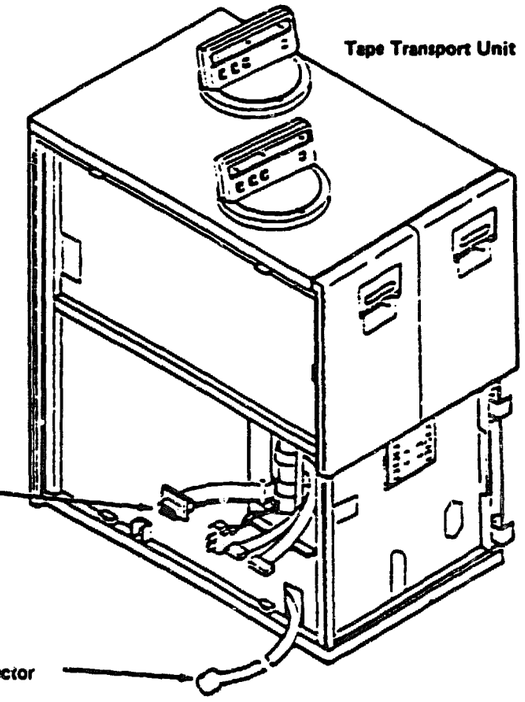
On the Tape Control Unit

Check and Correct As Needed

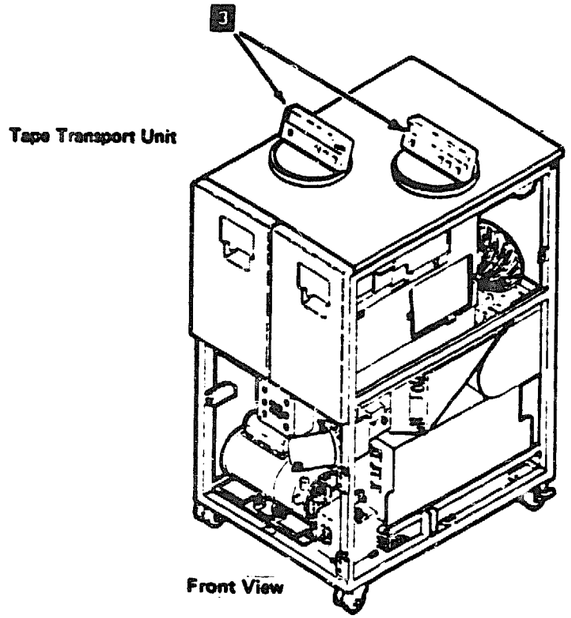
1. That the machine is stable, that there are no defective casters or pedestals.
2. That the caster lock thumbscrews are in the two rear casters 3.
3. That all hinges and latches are in acceptable operating condition, not broken or corroded.
4. That the ac mainline cord does not have frayed or damaged wiring at the plug end 6.
5. That the power cable is 10 gauge, 4 wire for 60 Hz and 50 Hz Japan, or 10 gauge 5 wire for other 50 Hz machines.
   - If the power cable is not marked, measure the diameter of a wire in the cord with the insulation removed. The diameter of a 10-gauge wire is 2.588 millimeters (0.102 inches).
6. That the power plug type is R&S* 3760 6 (60 Hz only). This plug will mate with the R&S 3754 receptacle
7. That the power plug type is Hubbell connector 532P6W (Digital P/N 12-14379-06) (50 Hz only). This plug will mate with the Hubbell receptacle 532R6W (Digital P/N 12-14378-06)

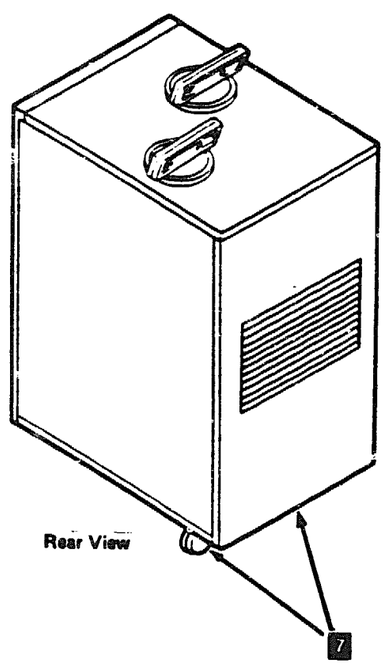
* R&S is Trademark of Russell & Stoll

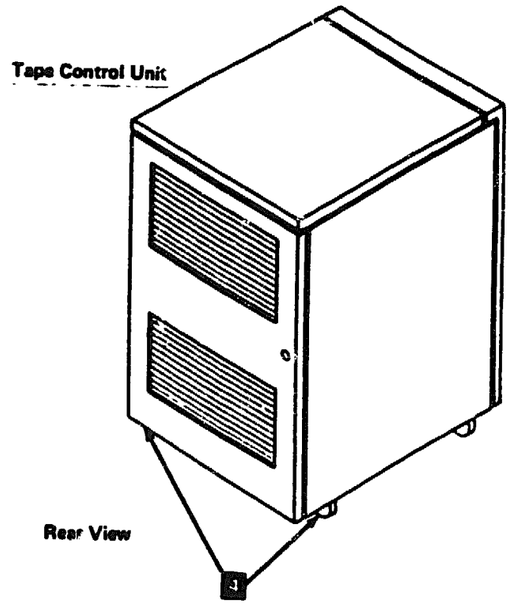


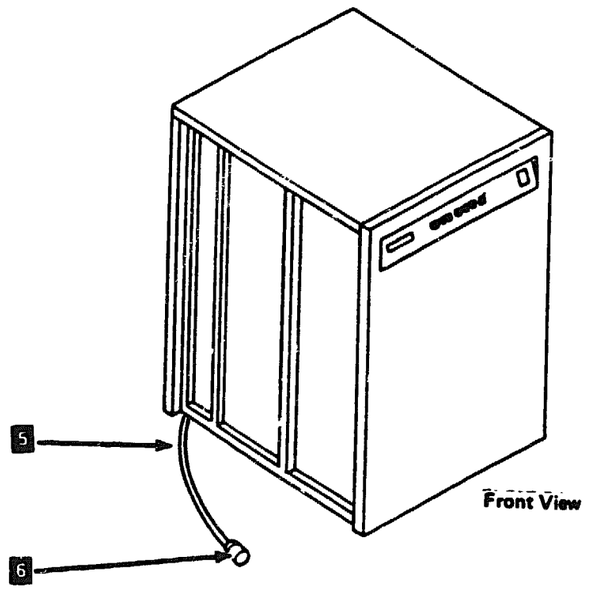


Inspection Procedures (Continued)









Note: See INSP 21 for the following locations.

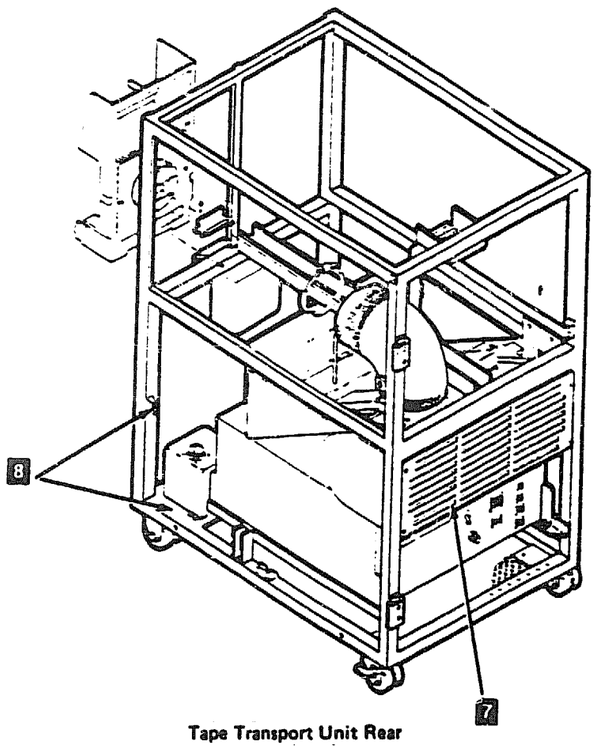
Tape Transport Unit Inside

Powered Off with Power Cable Disconnected

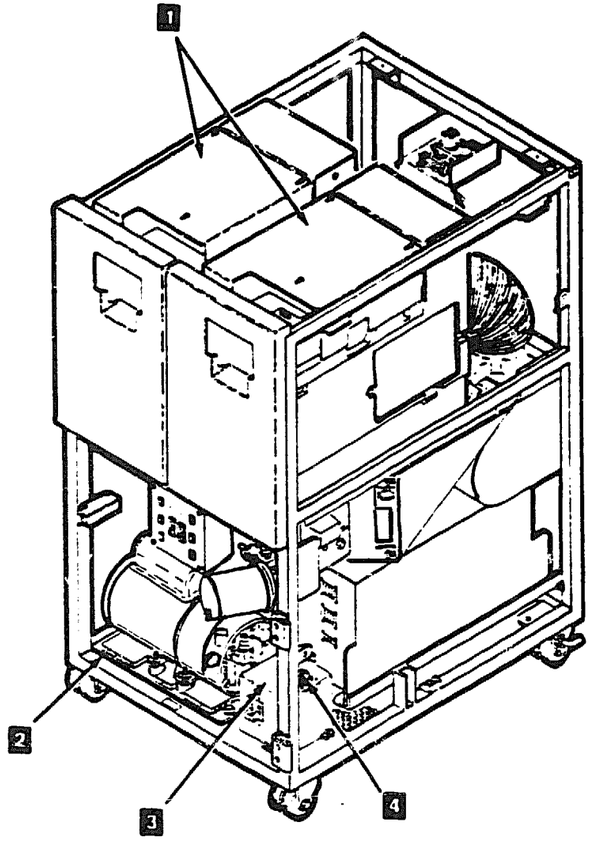
Check and Correct As Needed

1. That all ground jumpers (normally green/yellow) are tightly attached by frame ground screws 8.
2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
3. That all hinges and latches are in acceptable operating condition - not broken or corroded.
4. That all normal safety covers (operator and service areas) are in place including those protecting mechanical devices and hot surfaces - no sharp corners or edges should be unprotected.
   a. The ac CB1 safety cover is correctly in place 3.
   b. The ac power cap is present for each tape transport unit and securely attached to the safety cover 4.
   c. The logic board 02A-A1 covers (pin and card side) are in place 6.
   d. The drive and tape path safety cover is in place 1.
   e. The blower safety cover is in place 7.
   f. The ac terminal block cover is in place 2.
   g. The limited customer access covers are in place 5.

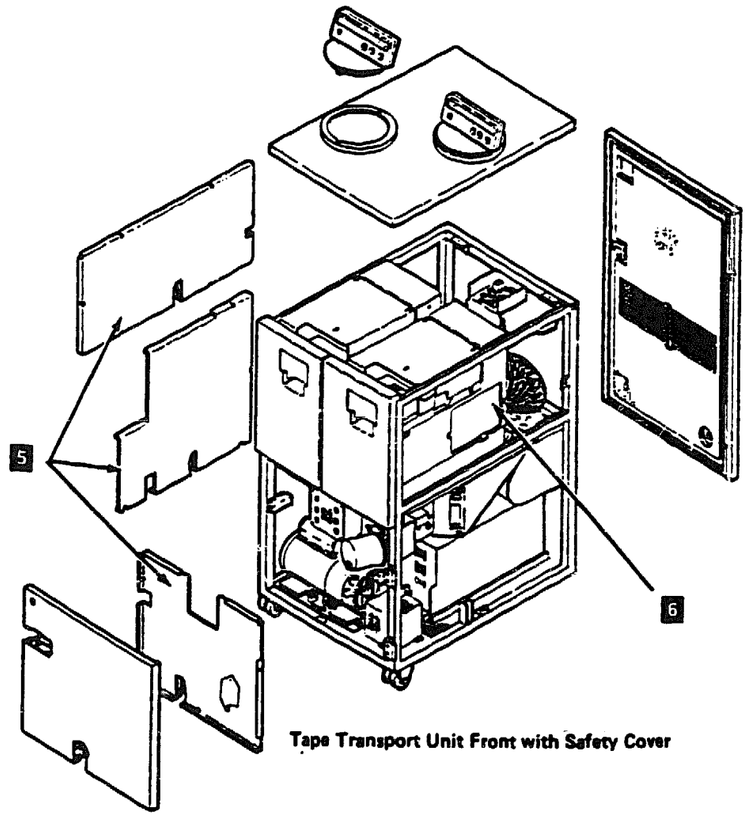
Inspection Procedures (Continued)



Tape Transport Unit Rear



Tape Transport Unit Front



Tape Transport Unit Front with Safety Cover

Tape Transport Unit Inside (Continued)

Check and Correct As Needed

1. That all safety labels are located where indicated:

   a. That all labels reading "LINE VOLTAGE PRESENT WITH POWER OFF" are attached in the following locations:

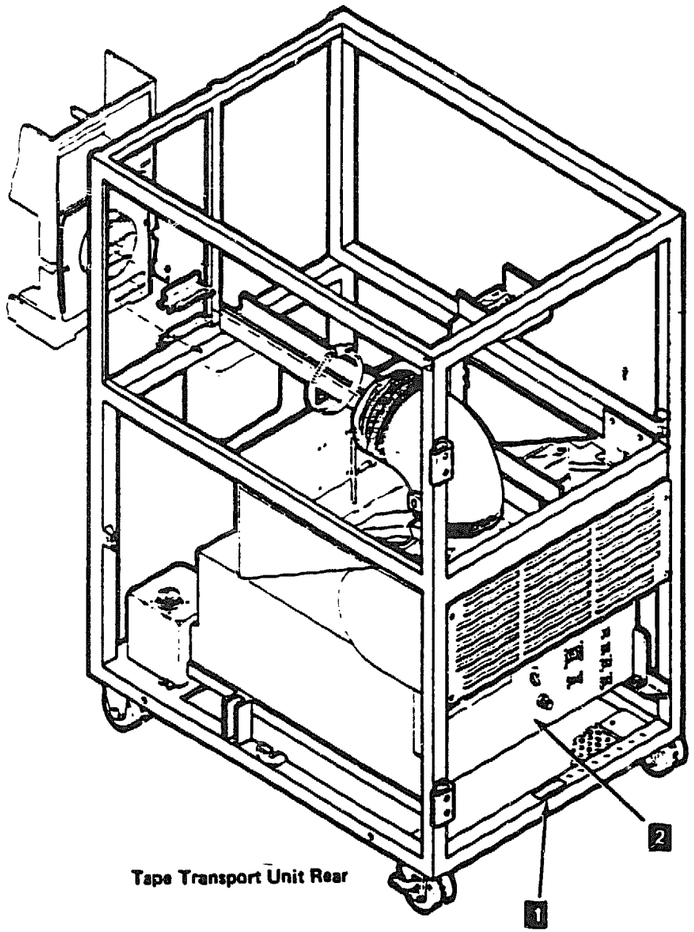
      - Terminal strip at lower rear 1.
      - Main tape transport unit circuit breaker 3.

   b. That a label reading "Unit Weight 101 LB (46 KG)" is located on the dc power supply TU-PS-01 2.

2. That the thermal switches are not bypassed. See CARR-DR 1100 and CARR-DR 820 for a procedure to get access to the thermal switches.

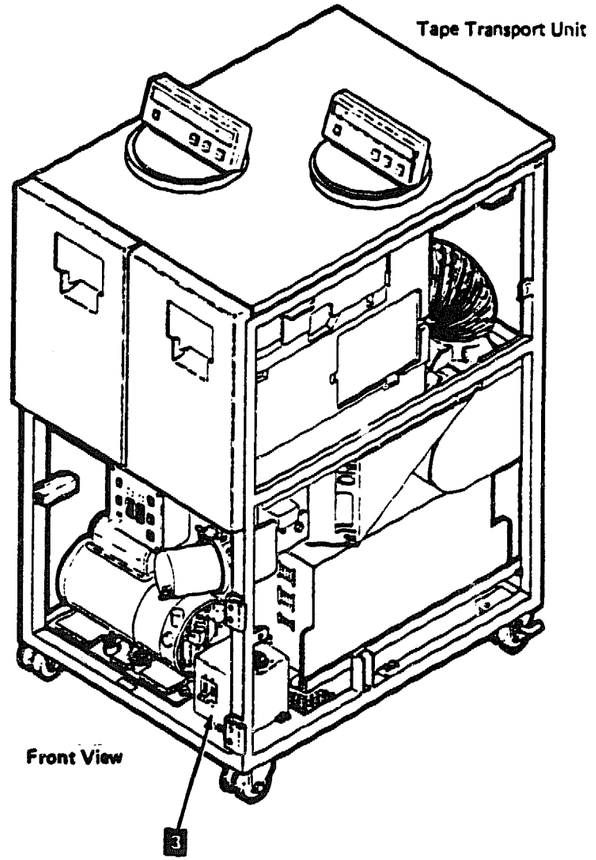
3. No metal filings, dirt or contaminants, water or other fluids, or marks of earlier smoke or burning are present.

   If there are any marks of earlier smoke or burning, ensure the cause has been corrected before applying power to the unit.



Tape Transport Unit Rear

Tape Transport Unit



Front View

Tape Transport Unit-DC Power Supplies

Powered Off with Power Cable Disconnected

Check and Correct As Needed

1. That all power supplies are attached tightly. The dc power supply TU-PS-01 has two screws [1].
2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
3. The power wiring for frayed or damaged wiring.
4. That the following ac/dc CBs and fuses are the correct size:

CB1	AC	Drive frame	10 A	
F1/2		Drive 0/1	12 A	Medium blow
F3/4		Drive 0/1	5 A	Long blow
F5/6		Drive 0/1	1 A	Long blow
F7/8		Drive 0/1	3 A	Long blow
F9/10		Drive 0/1	8 A	Medium blow
F11/12		Drive 0/1	.75 A	Immediate blow
F13/14		Drive 0/1	15 A	Medium blow
F15			2 A	Long blow

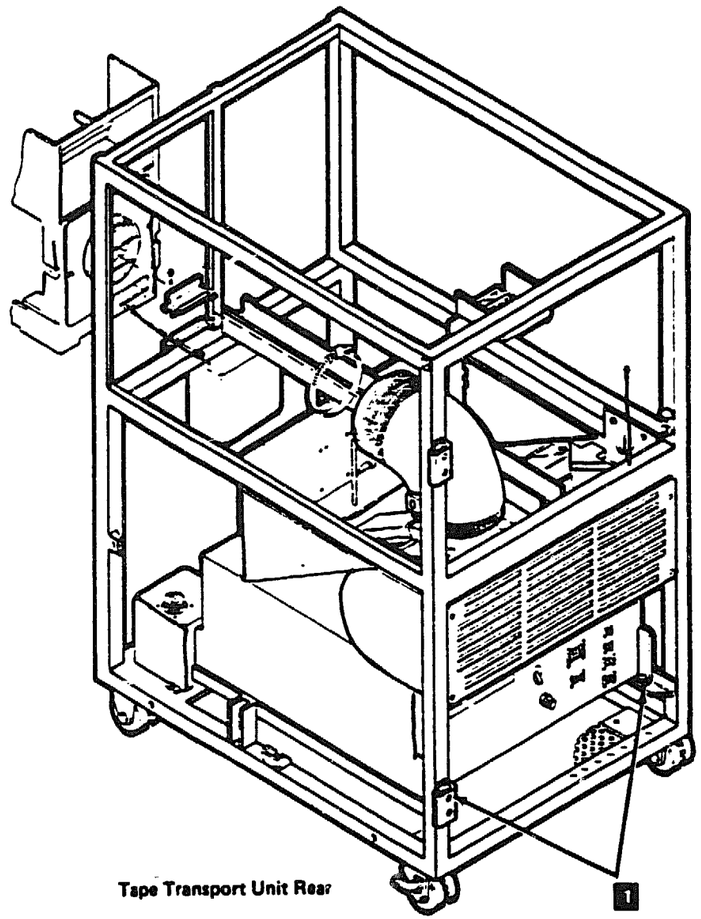
These values can be EC sensitive, so check the fuses and CBs against the machine logic.

Tape Transport Unit Inside-Miscellaneous

Powered Off with Power Cable Disconnected

Check and Correct As Needed

1. All cables, connections, plugs, and so on for frayed or damaged wiring.
2. All connections, plugs and so on for damaged latches and/or clamps.



Tape Transport Unit Rear

Tape Control Unit Inside

Powered Off with Power Cable Disconnected

Check and Correct As Needed

1. That all ground jumpers (normally green/yellow) are tightly attached by frame ground screws 6. See INSP 65 for the AC grounding diagram.

2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.

3. That all hinges and latches are in acceptable operating condition - not broken or corroded.

4. That all normal safety covers (operator and service areas) are in place including those protecting mechanical devices and hot surfaces - no sharp corners or edges should be unprotected.

   - The logic gate card covers (A1, A2) are in place 8.
   - All three gate DC voltage strip (TB) covers are in place 1.
   - The AC safety cover is in place 9.
   - Both limited customer access covers are in place 5.

5. That all safety labels are located where indicated.

   - Labels reading, "Hazardous Area, etc..." must be located on the frame members at 3 and 9.

6. Mark the customer's circuit breaker/circuit panel (CB/CP) number for the circuit controlling AC power to subsystem at CB1 (main line CB) 2 and on the main line power cable plug.

7. That the thermal switches are not bypassed. These are located at the top and the bottom of 01-A gate and on the STI (01B) gate. See CARR-TCU 1430 for a procedure to get access to the 01-A gate thermal switch, and CARR-TCU 9050 for the 01-B (STI) gate switch.

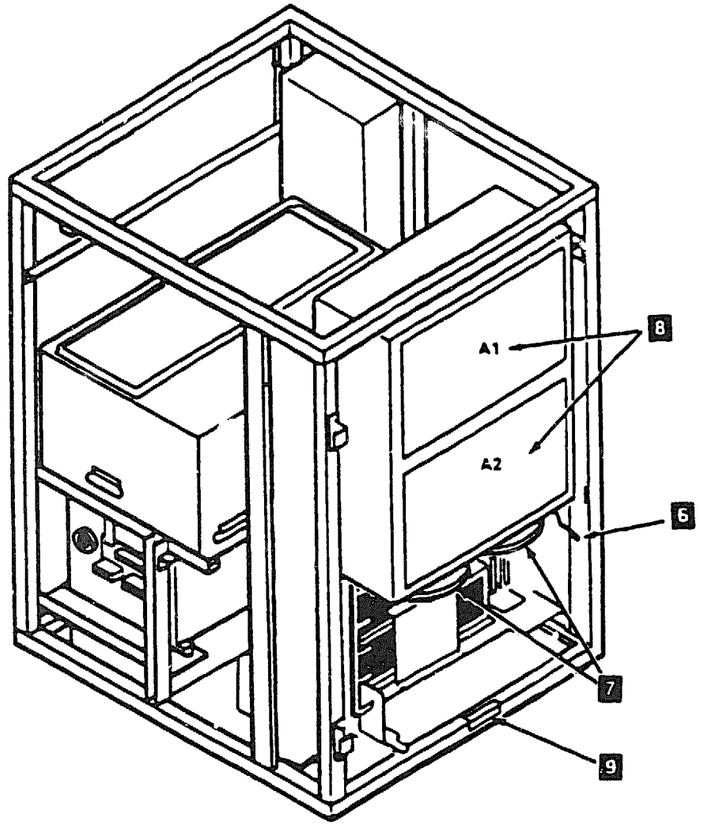
8. That no obvious non-Digital ECO changes have been made.

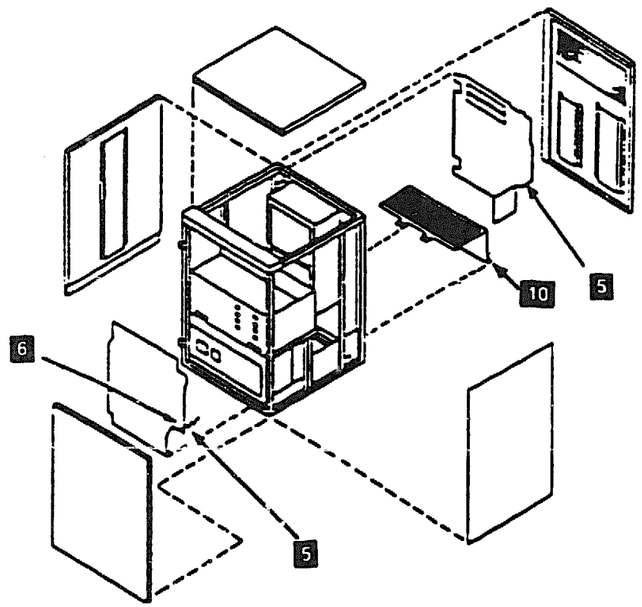
9. That the fan safety screens on the fans on the bottom of the A1 gate are in place 7.

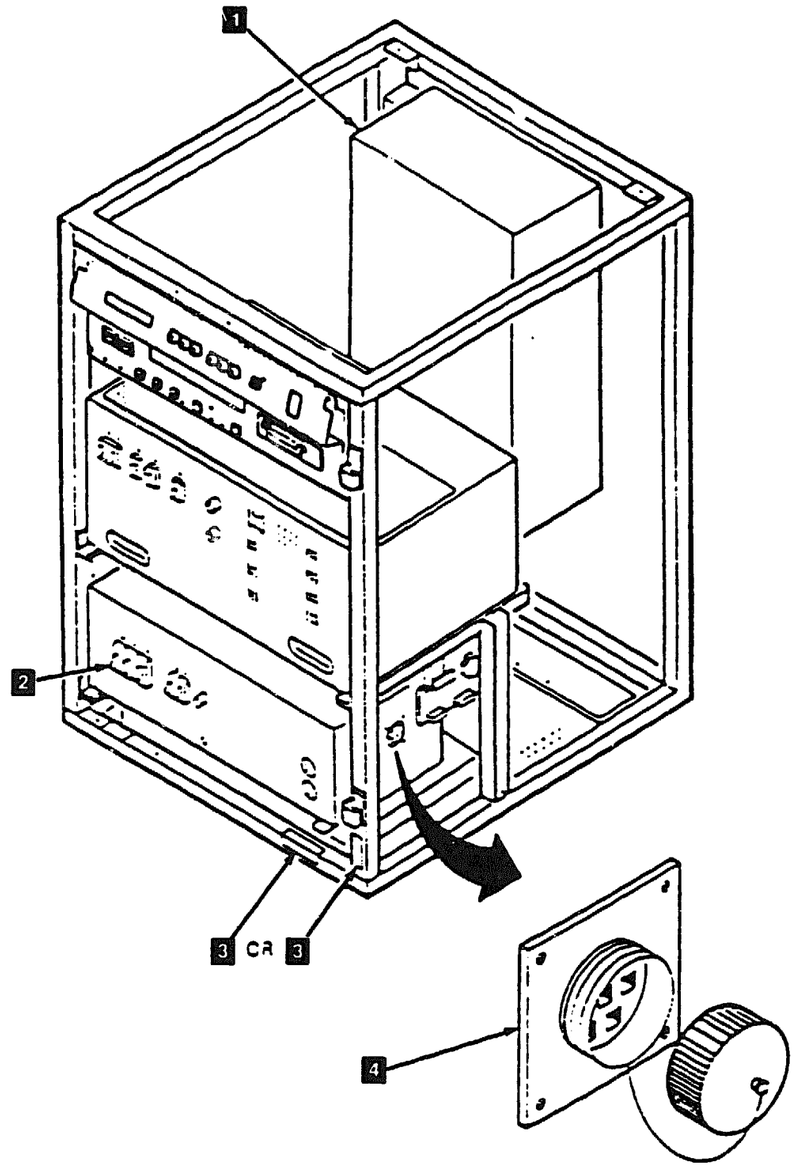
10. That drip screen-guard 10 is in place.

11. That no metal filings, dirt or contaminants, water or other fluids, or marks of earlier smoke or burning are present.

12. If there are marks of earlier smoke or burning, ensure the cause has been corrected before applying power to the unit.







Note: See INSP 40 and INSP 41 for the following locations.

Tape Control Unit – AC Primary Power

Powered Off with Power Cable Disconnected

Check and Correct As Needed

1. That the ac power supply is attached in place tightly. The power supply has two mounting screws 1.
2. That all ground jumpers (normally green/yellow) are strongly attached by frame ground screws 3. The system attach ground wires are not present if feature is not installed.

   To check the shield ground of the power cable, you must remove the left side safety cover 4 and the ac input filter cover on the power supply 5. Leave these covers off, you will need to return to this area later.
3. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
4. That the ac mainline cord has no frayed or damaged wiring at the ac power supply CU-PS-01 6.
5. That all ac service outlets are safe 2. Measure from ground pin to frame. The resistance should not be more than 0.1 ohm.

   Note: That the service outlets are for temporary use of service equipment only.
6. The resistance from the line cord ground pin and housing to all frames and to all power assembly grounds as follows:
   - Line cord ground pin to frame ground.
   - Line cord housing to frame ground.

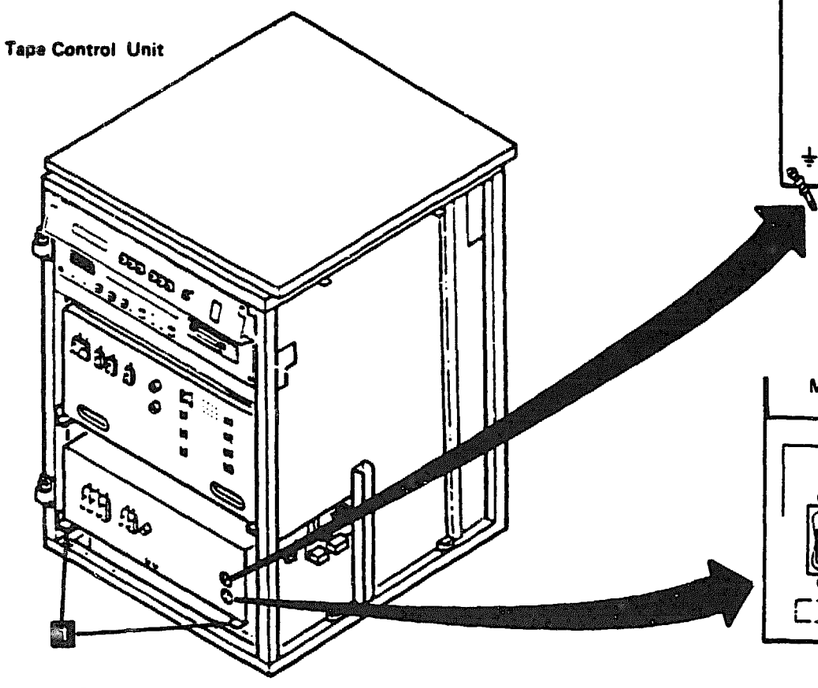
   The resistance should not be more than 0.1 ohm.
7. The resistance from the frame ground to DC ground at:
   - TB1-5
   - TB1-6
   - TB1-7
   - TB1-8
   - TB2-5
   - TB2-6
   - TB2-7
   - TB2-8

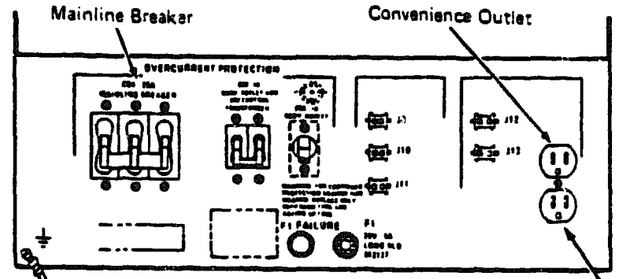
   and to the ground pin on:
   - Logic board 01A-A1D2D08
   - Logic board 01A-A2D2D08

   The resistance should not be more than 0.1 ohm.
8. That all ac/dc CBs and fuses are the correct size:

50 Hz	CB1	AC	Main Line	25 A
	CB2	AC	Conv.	5 A
	CB3	AC	24 V	1 A
	F1	DC	24 V	5 A Long Blow
60 Hz	CB1	AC	Main Line	25 A
	CB2	AC	Conv./24 V	5 A
	CB3	AC	Conv.	7 A
	F1	DC	24 V	5 A Long Blow

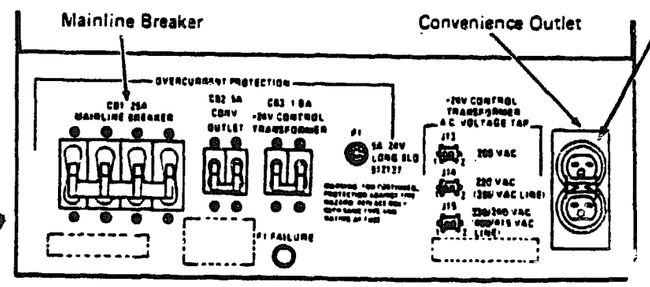
These values can be EC sensitive, so check the fuses and CBs against the machine logic.



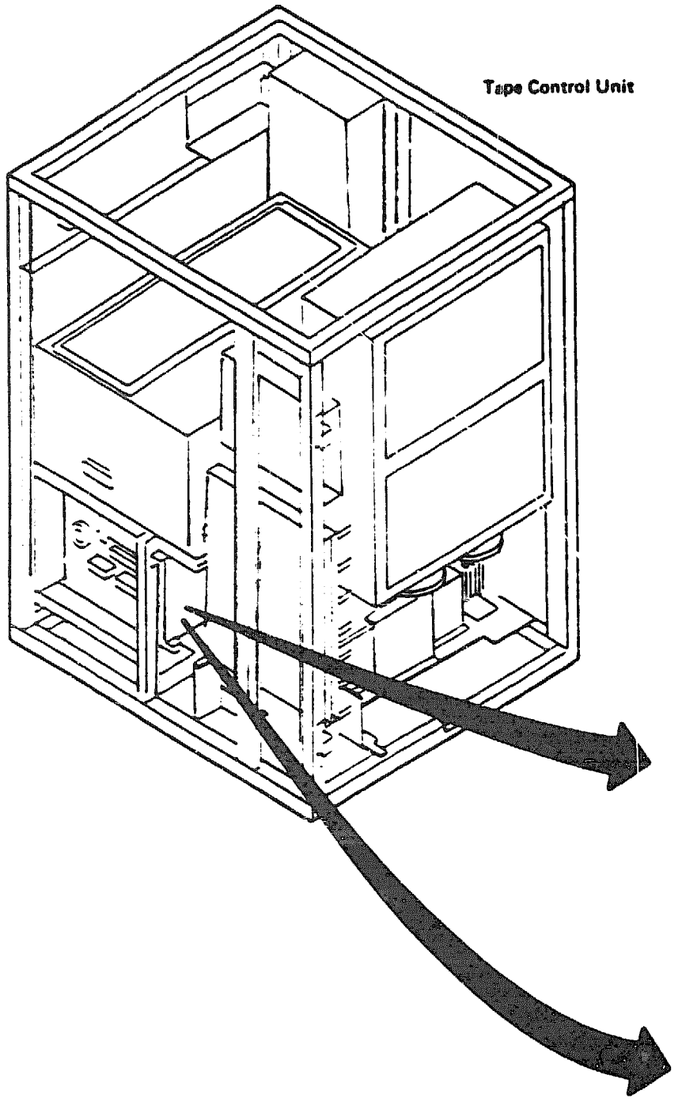


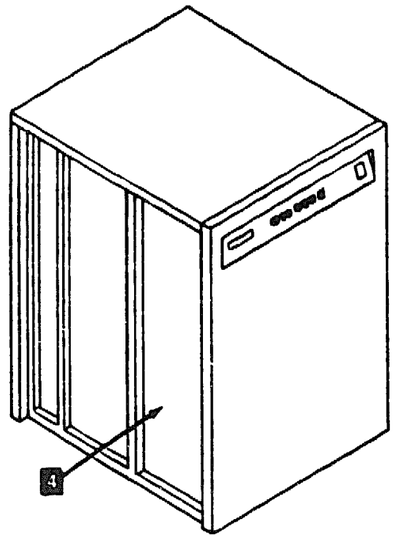
AC Power Supply 60 Hz and 50 Hz Japan

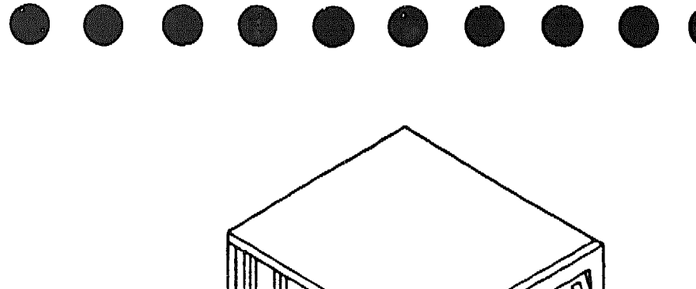
2



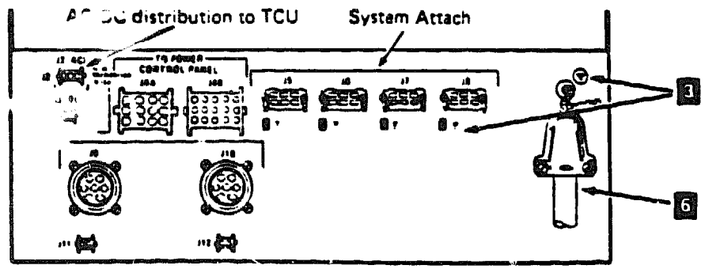
AC Power Supply 50 Hz (Except Japan)



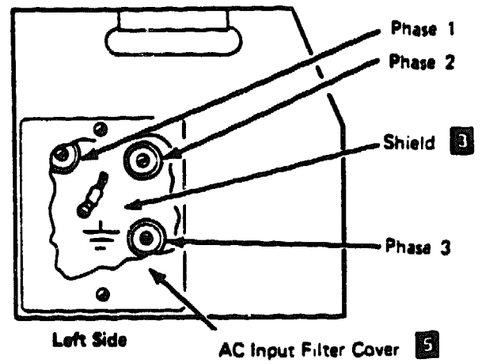




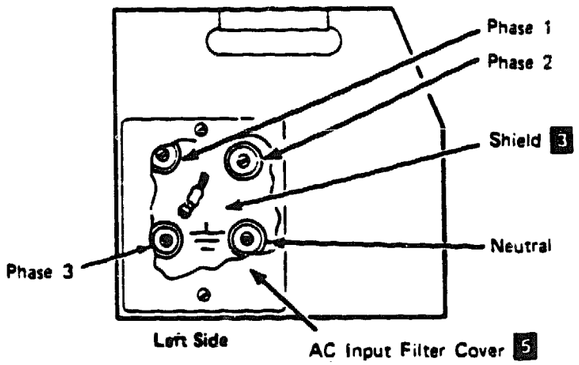
AC Power Supply 60 Hz and 50 Hz Japan



AC Power Supply 50 Hz (Except Japan)



60 Hz, and 50 Hz Japan
Tape Control Unit Left Front with
Access to AC Power Supply Left Side



50 Hz, Except Japan
Tape Control Unit Left Front with
Access to AC Power Supply Left Side

Tape Control Unit – DC Power Supplies

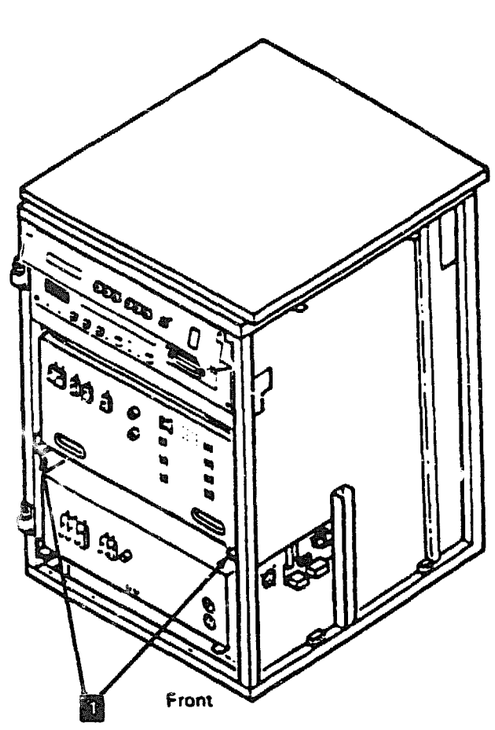
Powered Off with Power Cable Disconnected

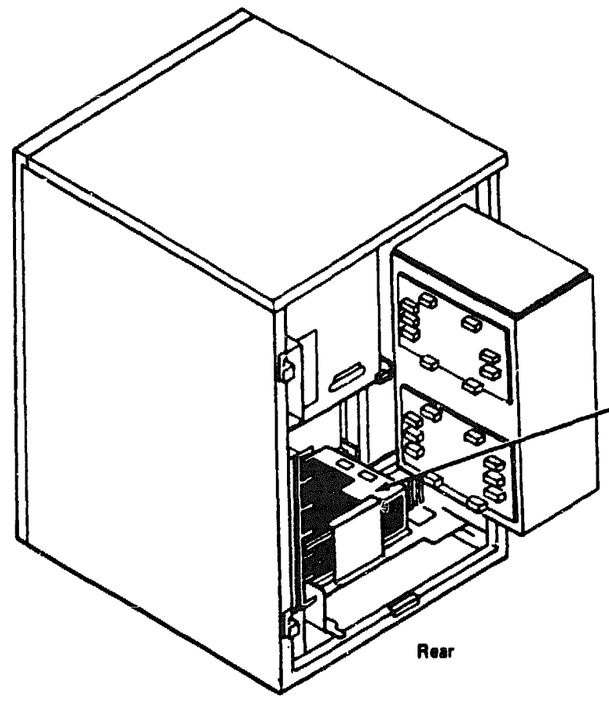
Check and Correct As Needed

1. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
2. All power wiring for frayed or damaged wires.
3. That the dc power supply is attached in place tightly. The power supply has two mounting screws 1.
4. That the STI dc power supply (PS03) 2 is attached in place tightly.
5. That all ac/dc CBs and fuses are the correct size:

CB1	AC	10	A
CB2	DC +5 v	65	A
CB3	DC +5 v	45	A
CB4	DC -5 v	12	A
F1	+8.5 v	5	A medium blow
F2	+ 24 v	2	A long blow

These values can be EC sensitive, so check the fuses and CBs against the machine logic.





Tape Control Unit Inside – Miscellaneous

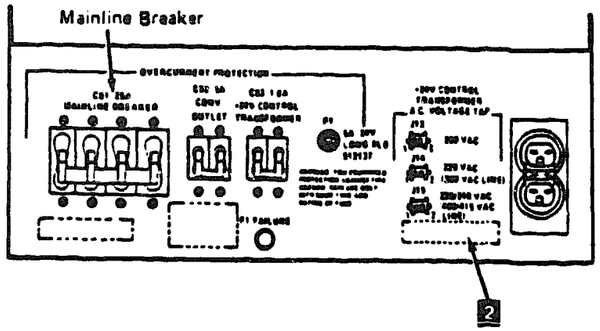
Powered Off with Power Cable Disconnected

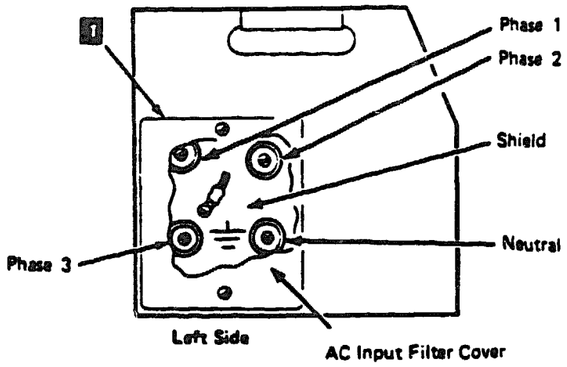
Check and Correct As Needed

1. All cables, connections, plugs, and so on for frayed or damaged wiring.
2. All connections, plugs, and so on for damaged latches and/or clamps.

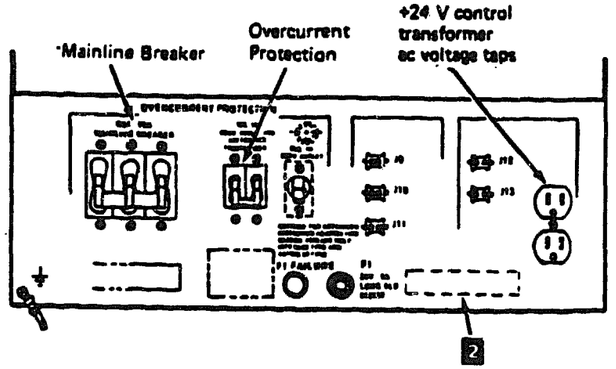
Power Off and On

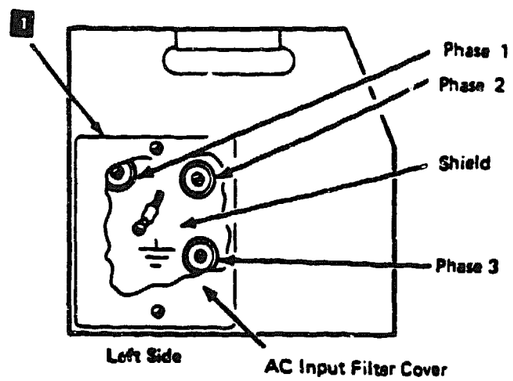
1. Check the customer plug housing to the ground pin. There should be no voltage present and the resistance should be less than 0.1 ohm.
2. Set CB1 off and plug in the power cable.
3. Have the customer close the CB/CP (circuit breaker/circuit panel) that supplies the outlet to which the subsystem is attached.
4. Does machine power label [2] match customer power? Measure with the volt/ohm meter at the ac input filter [1].
5. Have the customer open the CB/CP that supplies the outlet to which the subsystem is attached and unplug the power cable.
6. Reinstall the covers over the ac input filter.
7. Reinstall all covers and set CB1 off and plug in the power cable.
8. Have the customer close the CB/CP to the outlet that supplies the subsystem.
9. Turn ac CB1 and the Unit Emergency Power Off switch on, and put the Local/Remote switch in the Local position. Depress Local Power Enable to restore power.
10. With power up, ensure that the machine will power down with the Unit Emergency switch.
11. Reset the Unit Emergency switch. Depress Local Power Enable to restore power.





Tape Control Unit AC Power Supply 50 Hz (Except Japan)





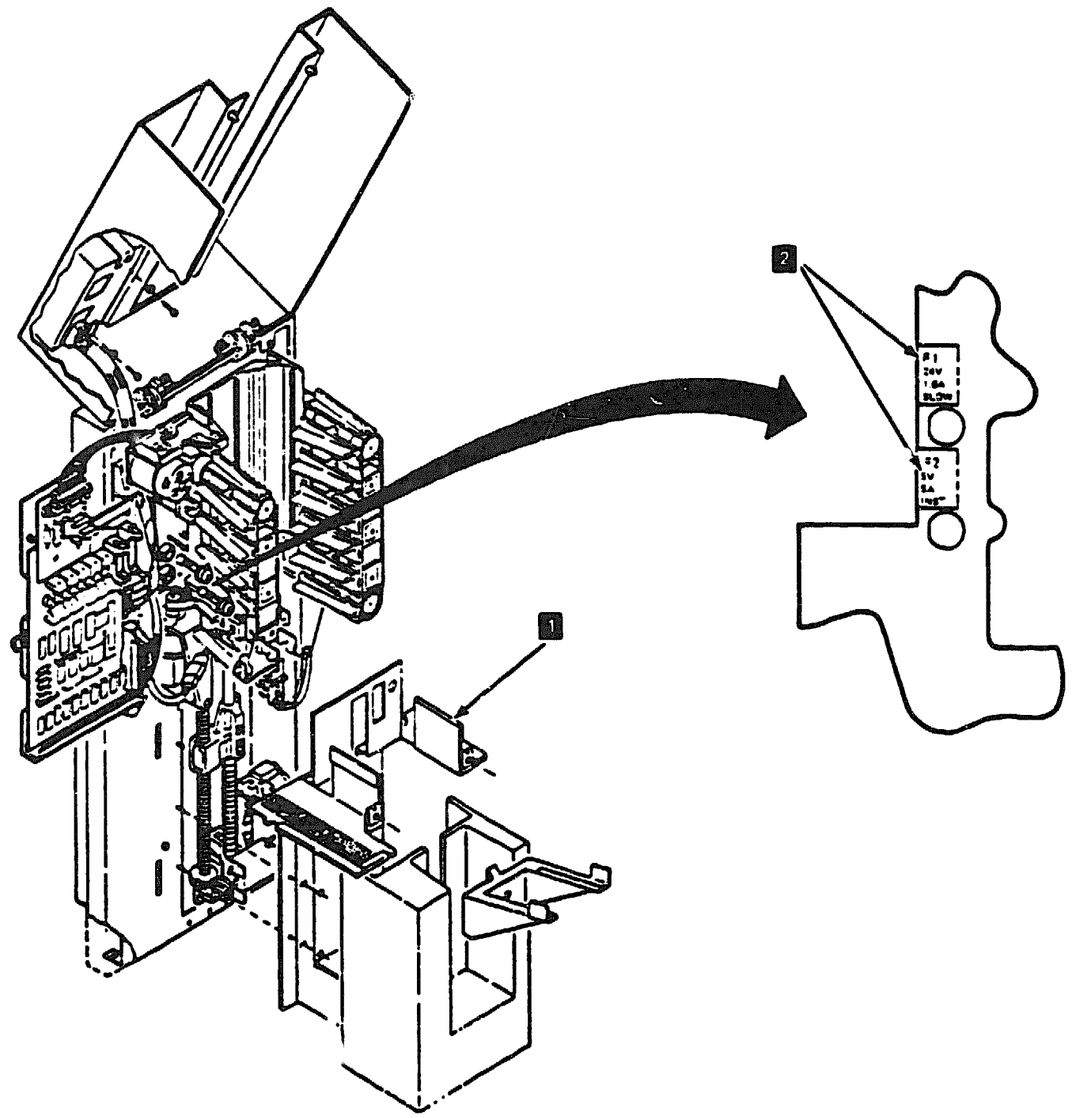
Tape Control Unit AC Power Supply 60 Hz, and 50 Hz Japan

Inspection Procedures (Continued)

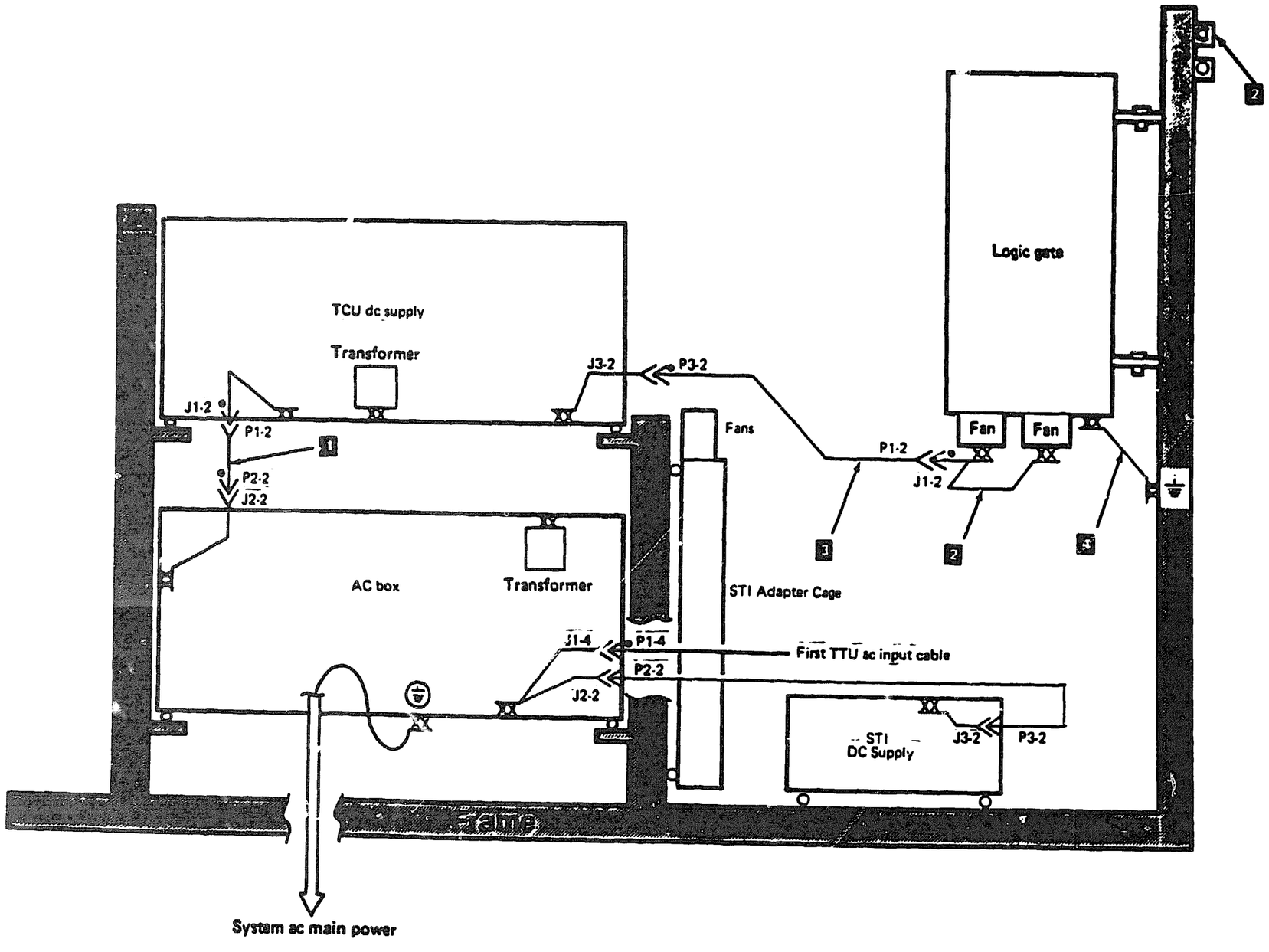
Automatic Cartridge Loaders

Check and Correct As Needed

- That the lower automatic cartridge loader safety cover is in place [ ].
- That all components are mounted correctly and all cable clamps are installed.
- Inspect all cables, connectors, and plugs for frayed or damaged wiring.
- Inspect all connections and plugs for damaged latches and/or clamps.
- Inspect the automatic cartridge loader base plate for correct installation of the fuse labels [ ].
- That the two fuses are the correct value as shown on the labels [ ] on the automatic cartridge loader base plate.
  - F1 +24 V dc 1.6A Slow Blow
  - F2 +5 V dc 5A Instantaneous Blow.



AC Grounding Diagram (60 Hz Tape Control Unit) INSP 65



Notes:

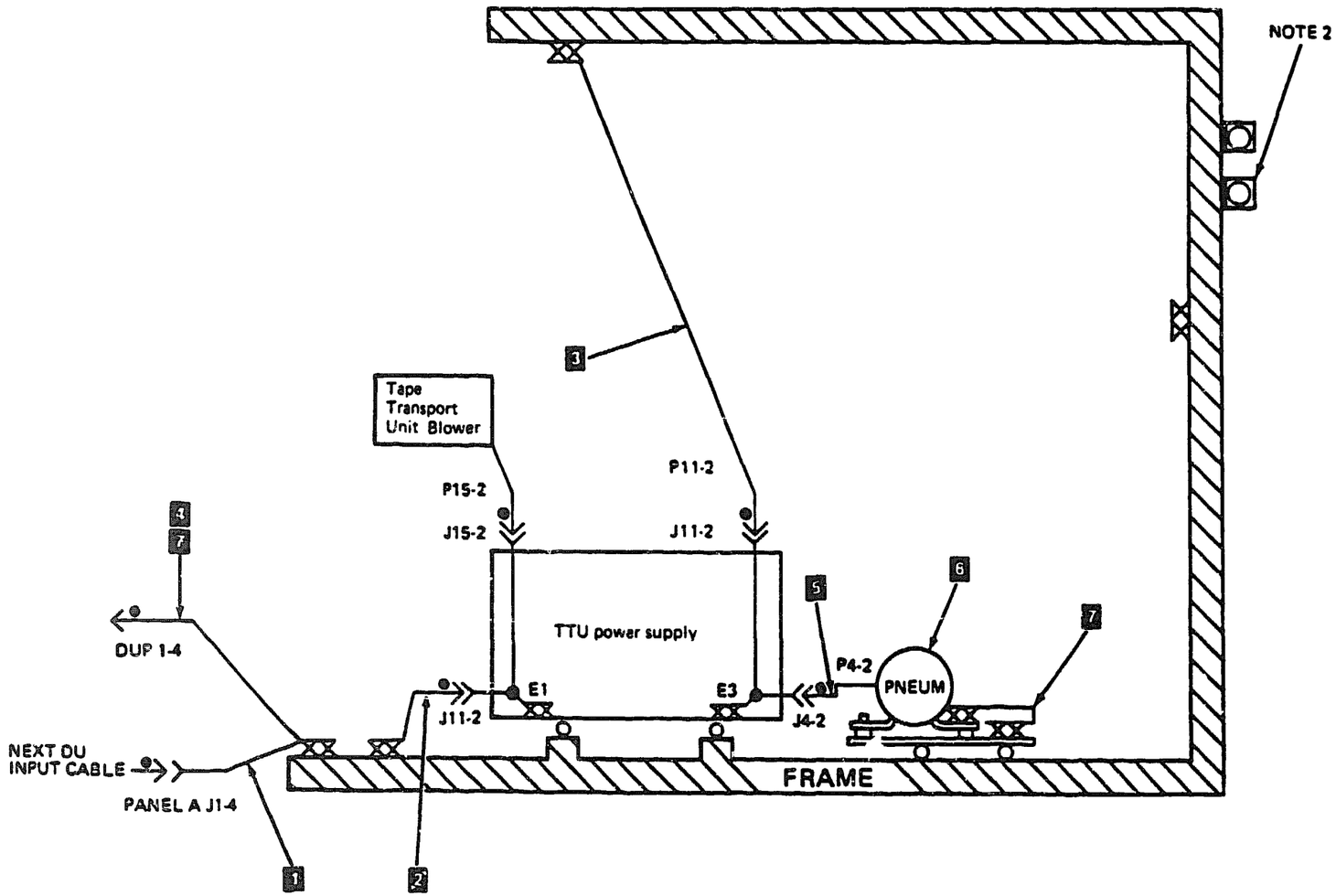
1. All wires shown are green/yellow.
2. Blocks are for adjacent frame attachment. They are used for frame ground and stability.

ITEM	DESCRIPTION	AWG
1	AC-24V DC C/A	14
2	Cont. gate fan C/A	18
3	Cont. AC fan C/A	18
4	Jumper	18

Legend

- External tooth lockwasher/starwasher
- Metal to metal with self tapping screws
- Welded connection
- Connector with grounding pin
- Tapped holes for screw attachment
- Double crimp
- JX-X Ground pin in connector

AC Grounding Diagram (50 Hz Tape Transport Unit and Drive)



Notes:

1. All wires shown are green/yellow.
2. Threaded block for adjacent frame attachment, frame ground and stability.

ITEM	DESCRIPTION	AWG
1	A/C Input cable Asm 60 and 50 Hz Japan	12
1	A/C Input cable Asm 50 Hz WTC	12
2	Power supply A/C input cable assembly	14
3	A/C box assembly, 60 and 50 Hz Japan	N/A
3	A/C box assembly, 50 Hz WTC	N/A
4	Ground Jumper Asm	16
5	Cable Asm compressor	16
6	Pneumatic supply	N/A
7	Ground jumper Asm	16

Legend

XX	External tooth lockwasher/starwasher
C	Tapped holes for screws attachment
	Metal to metal self tapping screws
—	Weld
←	Connector with ground pin
⋋	Double crimp
JX-X	Ground pin in connector


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VOLUME
A02


COLLATING LIST
OF PAGES

Collating List of Pages

This reference drawing contains the collating sequence, page side, and EC level of pages for *Digital TA90 Magnetic Tape Subsystem Maintenance Guide (MG) Volume A02*.

The part number of the divider tab list is 13F5763.

This reference drawing is to be placed at the front of the manual.

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Blank	Back	
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13F5765

PUBLICATIONS REFERENCE DRAWING

MACHINE TYPE/MODEL NO. TA90

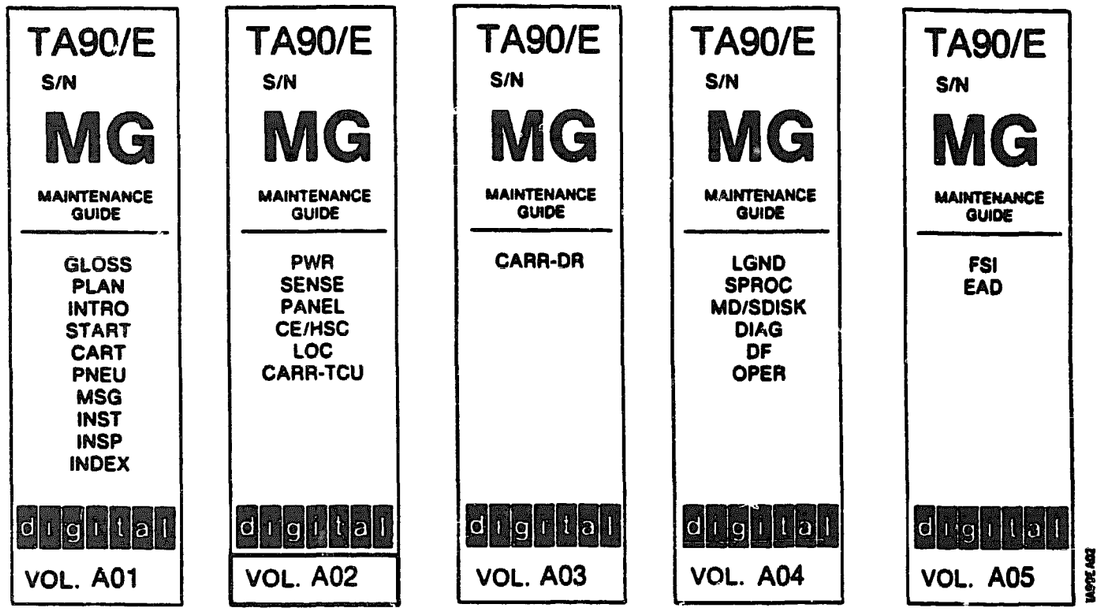
MACHINE NAME - Magnetic Tape Subsystem

E C NO.	DESCRIPTION / COMMENTS
C04824	VOL. A02 - Maintenance Guide
C13764	VOL. A02 - Maintenance Guide

digital										
NAME. PUB REF DWG (PRD)					DATE	CHANGE NO		DATE	CHANGE NO	13F5765
				REL	4/28/89	C04824				
					3/15/90	C13764				
DESIGN			SHT OF							
DETAIL										
CHECK			CLASSIFICATION	MUST CONFORM TO ENG SPEC		DEVELOPMENT NO		LOGIC PG NO		
APPRO								RD002		B

TA90/E Magnetic Tape Subsystem

digital **Maintenance Guide**



Maintenance Library

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Logic Diagrams	**Vols. C01 and D01**

EK-PTA90-MG-002

Preface

This manual contains maintenance information about the Digital TA90 Magnetic Tape Subsystem and is intended for customer engineers responsible for servicing the TA90 tape subsystem.

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Prerequisite Knowledge

It is assumed that you have a background in data processing concepts and that you are familiar with the hexadecimal numbering system, stored program concepts, and have a basic understanding of tape subsystems and their relationship within a system/cluster.

Related Documents

TA90 Operator's Manual EK-OTA90-OM

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DECwriter	Professional	STI	VT
DIBOL			Work Processor

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CART	Cartridge Analysis
PNEU	Pneumatic Analysis
MSG	Errorlog messages
INST	Installation/Removal
INSP	Safety Check Procedures
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PWR	Power Maps
SENSE	Sense/Status
PANEL	Panel
CE/HSC	Customer Engineering Panel/HSC Diagnostics
LOC	Locations
CARR-TCU	Tape Control Unit Checks/Adjustments/Removal/Replacement

Volume A03

CARR-DR	Drive Checks/Adjustments/Removal/Replacement

Volume A04

LGND	Legend
SPROC	Support Procedures
MD/SDISK	Maintenance Device/MD Support Diskette Procedures
DIAG	Support Diagnostic Descriptions
DF	Data Fields and Registers
OPER	Theory of Operation

Volume A05

FSI	Fault Symptom Index
EAD	Error Analysis Diagrams


PWR

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Introduction

PWR Purpose

This section contains the maps and procedures that will enable you to repair power related problems in the TA90 tape subsystem. A description of the DC test card and how it is used in both the control unit and tape transport unit is presented.

You will be sent into the PWR maps from either the START page or from the CE Panel.

How to Use the DC Test Tool with the Tape Control Unit

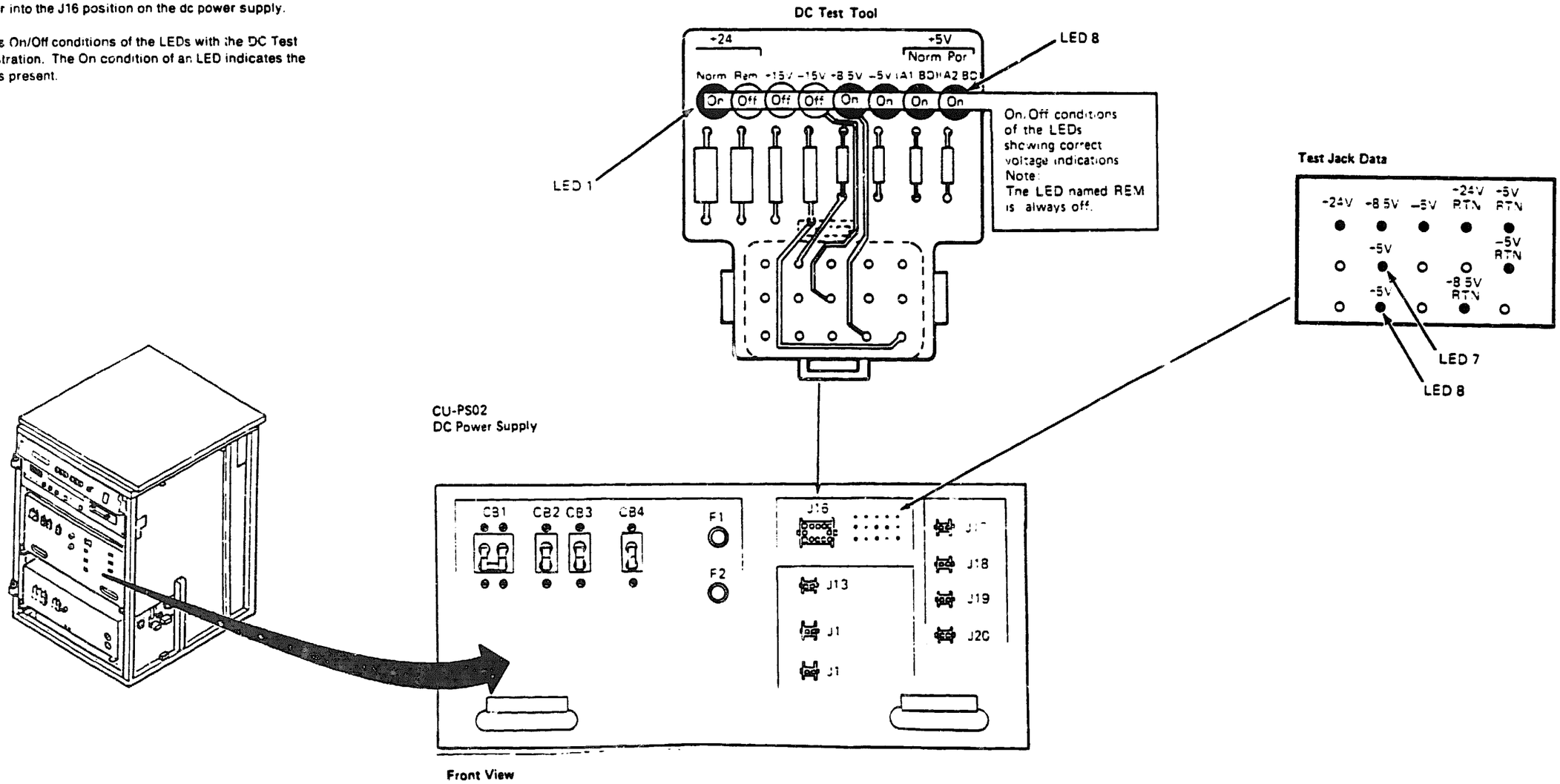
The dc test tool is used to determine if all of the dc voltages are present at the output of the dc power supply. However, the tool only determines that a voltage is present or absent. It does not determine whether or not the voltages are in specifications.

Perform the following steps to determine if all the voltages are present:

1. Open the front cover of the tape control unit and remove the safety cover (see CARR-TCU 2-1).
2. With the tape control unit power on, plug the test tool connector into the J16 position on the dc power supply.
3. Match the On/Off conditions of the LEDs with the DC Test Tool illustration. The On condition of an LED indicates the voltage is present.

Verification Procedure (Optional)

Should an LED fail to light, determine if the DC Test Tool is at fault or if the voltage is missing. Using a voltmeter, measure the voltage at the test jack J16. Measure between the voltage pin and the voltage return pin (RTN) using the Test Jack Data illustration as a reference. If the voltage is present at the test jack pins, the dc test tool is defective. If the voltage is not present, the dc supply is missing a voltage. Return to the procedure that sent you here.



How to Use the DC Test Tool with the Tape Transport Unit

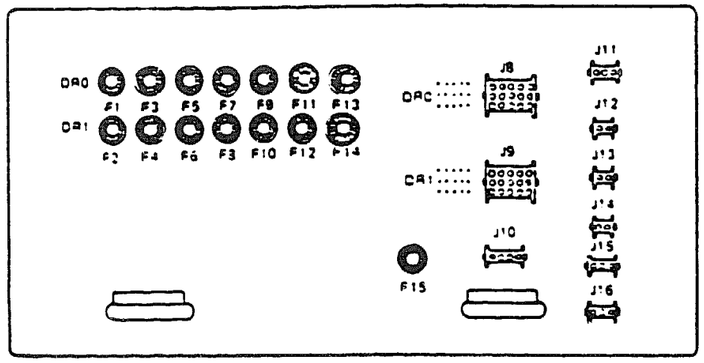
The dc test tool is used to determine if all of the dc voltages are present at the output of the dc power supply. However, the tool only determines that a voltage is present or absent. It does not determine whether or not the voltages are within specifications.

Perform the following steps to determine if all the voltages are present:

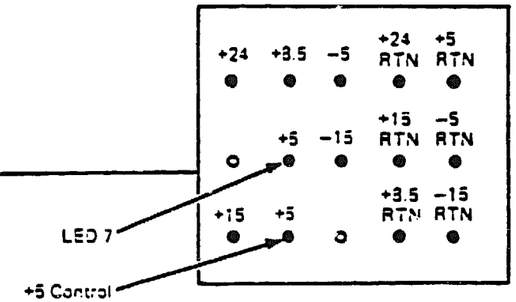
1. Open the front cover and remove the front safety cover (see CARR-TCU 2-1 or CARR-DR 2-5).
2. With the tape transport unit power on, plug the test tool into the J8 (drive 0) or J9 (drive 1) position on the dc power supply.
3. Match the On/Off conditions of the LEDs with the DC Test Tool illustration. The On condition of a LED indicates the voltage is present.

Verification Procedure (Optional)

Should a LED fail to light, determine if the dc test tool is at fault or if the voltage is missing. Using a voltmeter, measure the voltage at test jack J8 (drive 0) or J9 (drive 1). Measure between the voltage pin and the voltage return pin (RTN) using the Test Jack Data illustration as a reference. If the voltage is present at the test jack pins, the dc test tool is defective. If the voltage is not present, the dc supply is missing a voltage. Return to the procedure that sent you here.



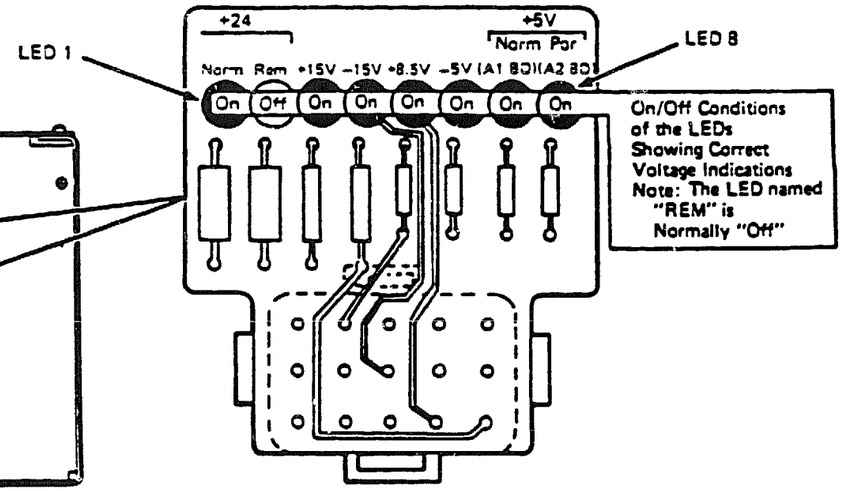
Test Jack Data



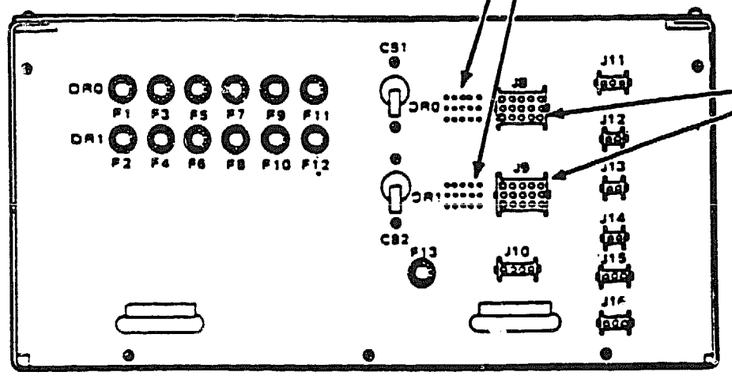
LED 7

+5 Control LED 8

DC Test Tool



Tape Transport DC Power Supply



Tape Control Unit Power Supply Jumpers

Use one of the following two tables to check the voltage settings. Ensure the jumpers are installed correctly for the voltage being used.

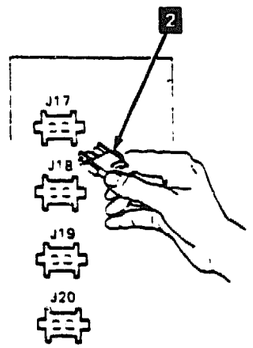
Note: For 50 Hz (except Japan) machines, if the Delta/Wye jumper has to be changed (J09 and J10 on CU-PS01), ensure that the cap is reinstalled on the empty socket.

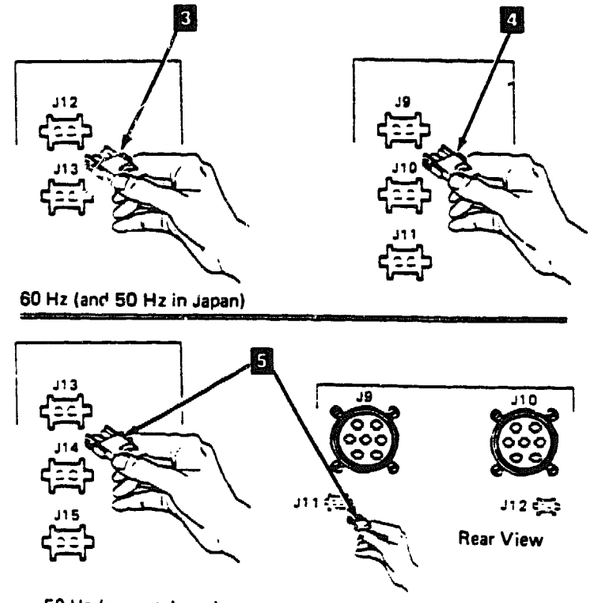
TAPE CONTROL UNIT VOLTAGE JUMPERS – 60 HZ AND 50 HZ JAPAN				
TCU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPER	REF	POSITION OF DC (PS02) JUMPER	REF
200/208 V ac	J09	4	J13	1
220 V ac	J10	4	J14	1
230/240 V ac	J11	4	J15	1
CONVENIENCE OUTLET				
100 V ac	J12	3		
120 V ac	J13	3		

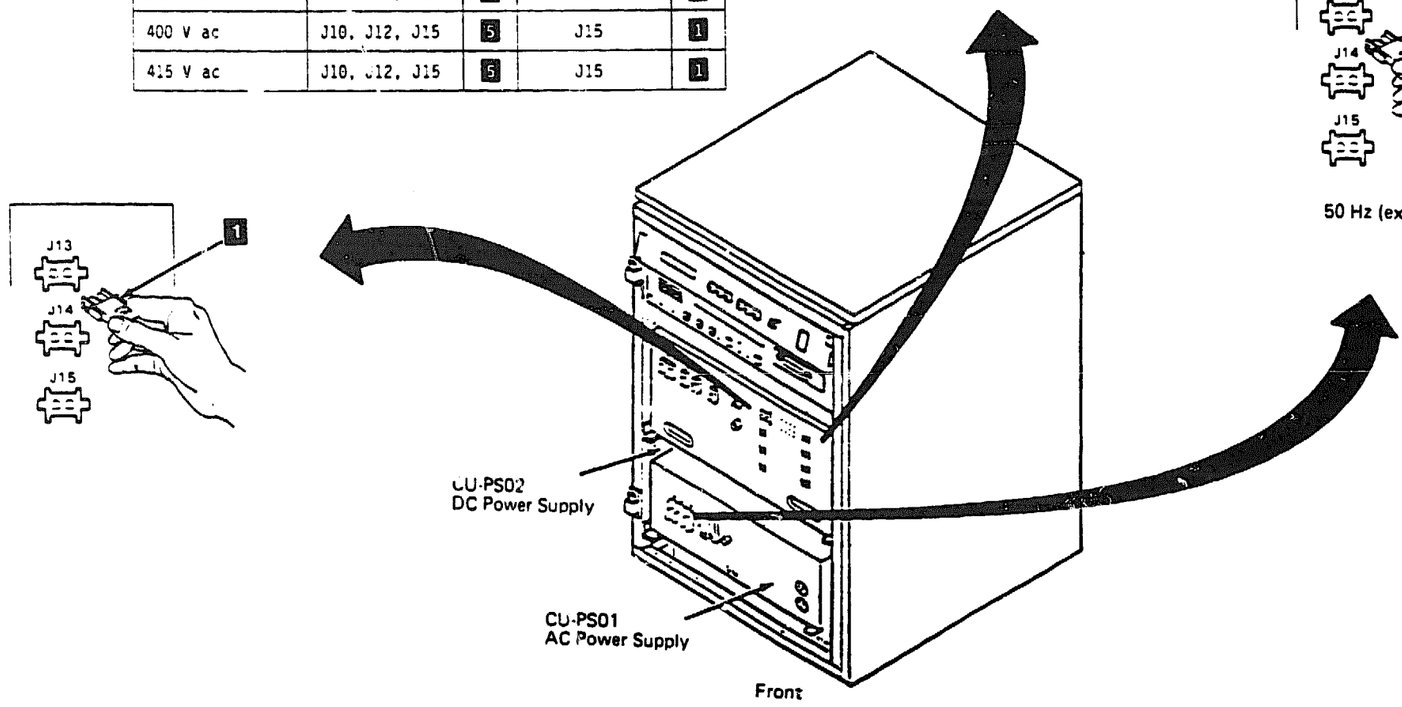
TAPE CONTROL UNIT VOLTAGE JUMPERS – 50 HZ (EXCEPT JAPAN)				
TCU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPERS	REF	POSITION OF DC (PS02) JUMPER	REF
200/208 V ac	J09, J11, J13	5	J13	1
220 V ac	J09, J11, J14	5	J14	1
230/240 V ac	J09, J11, J15	5	J15	1
380 V ac	J10, J12, J14	5	J14	1
400 V ac	J10, J12, J15	5	J15	1
415 V ac	J10, J12, J15	5	J15	1

A tape control unit has two channel adapters. Use the following table to ensure that the tape control unit is jumpered for the correct number of channel adapters.

TAPE CONTROL UNIT CHANNEL JUMPERS		
NUMBER OF CHANNEL ADAPTERS	POSITION OF DC (PS02) JUMPER	REF
2	J18	2







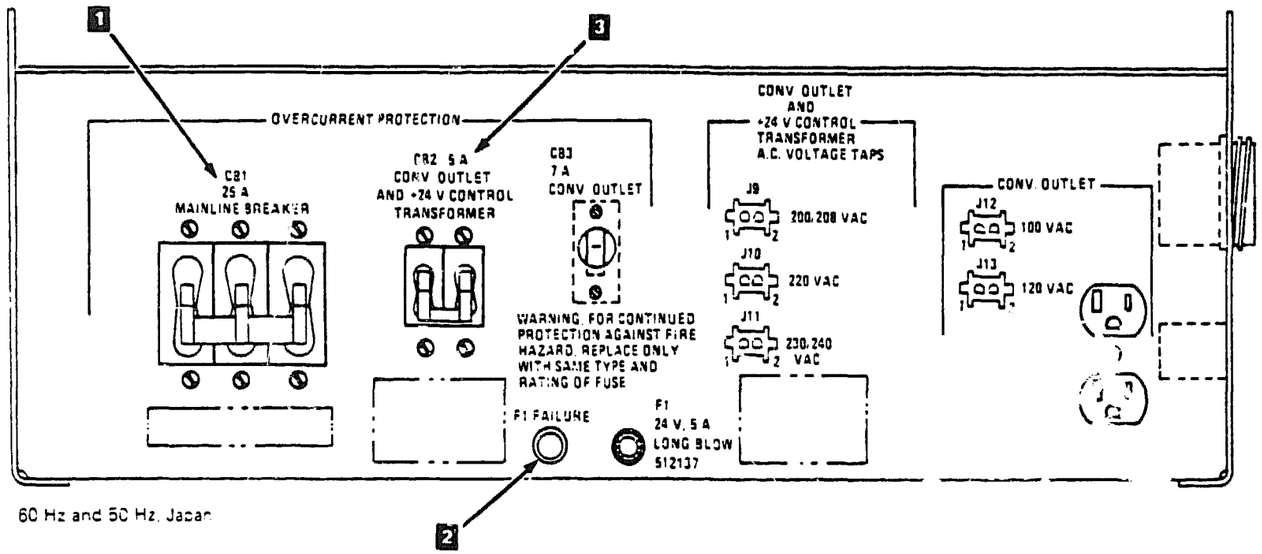
Tape Control Unit AC Power Supply Panel

In addition to supplying ac power to the tape control unit, the control unit ac power supply distributes ac power to all the tape transport units attached to it. The figure shows the control panel for the tape control unit ac power supply. Note that this control panel is behind a safety shield

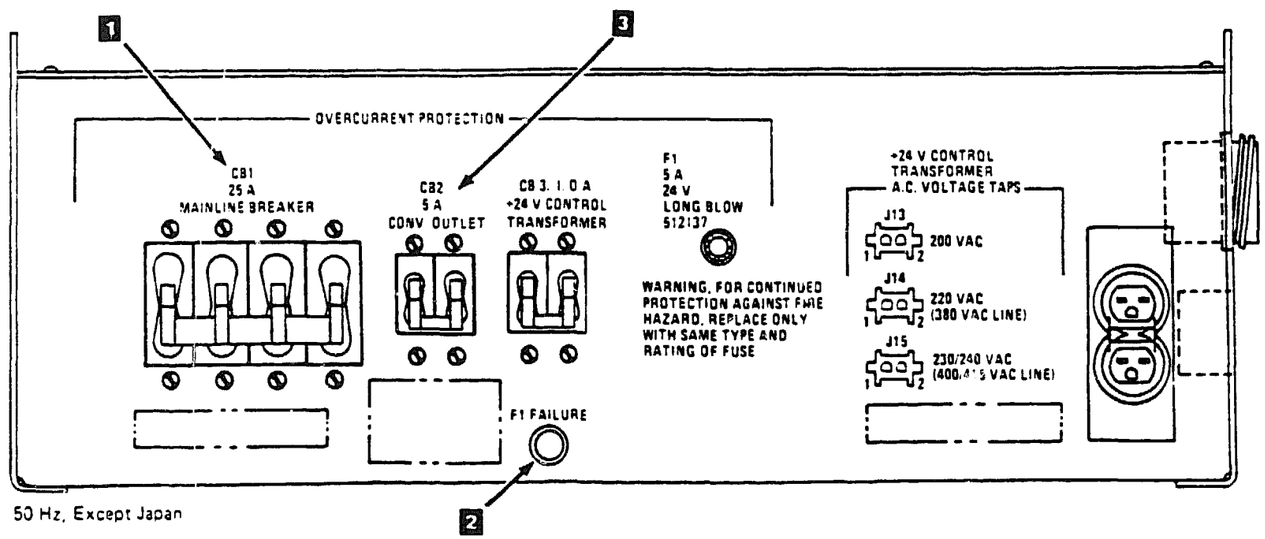
1 Mainline Circuit Breaker
- CB1 is the ac power mainline circuit breaker in the tape control unit. This switch trips automatically if the circuit is overloaded. CB1 can also be tripped by hand to remove ac power from the tape control unit and from all the tape transport units physically connected to that tape control unit.

2 F1 Failure
- This LED shows that fuse 1 on the ac power supply has blown. Fuse 1 controls the 24 V control voltage for activating the power supplies sequentially.

3 Convenience Outlet CB
- The convenience outlet circuit breaker removes power from the convenience outlet when it is tripped.



60 Hz and 50 Hz, Japan



50 Hz, Except Japan

Voltage Tolerance Tables

AC Power 60 Hz and 50 Hz Japan

Voltage	Maximum	Minimum
200/208	220	180
220	238	193
230/240	259	202

AC Power 50 Hz Except Japan

Voltage	Maximum	Minimum
200	220	180
220	238	193
230/240	259	202
380	410	333
400	432	350
415	448	363

Note. See tape control unit or tape transport unit field wire net list and voltage distribution list for actual measuring points at each FRU for the voltages.

Tape Control Unit DC Voltages 50 Hz and 60 Hz

Measured at Power Supply

Voltage	Maximum	Minimum
−5.0	−5.50	−4.70
+5.0	+5.60	+4.90
+8.5	+9.20	+7.80
+24	+32	+19

Measured at Logic Board

Voltage	Maximum	Minimum
−5.0	−5.45	−4.55
+1.70	+1.75	+1.65
+5.0	+5.45	+4.55
+8.5	+9.27	+7.74
+12.0	+12.36	+11.64
+24	+30.0	+18.0

Measuring Points

Voltage	From	To
−5	A1E2M06 A2R2B06	A1K2J08 A2K2J08
+1.7	A1T2B03	A1K2J08
+5	A1L2U03 A2R2U03	A1K2J08 A2K2J08
+8.5	A1E2M11 A2R2B11	A1K2J08 A2K2J08
+12	A1T2B11	A1K2J08
+24	A1T2S06	A1K2J08

Power Supply Ripple Check (Tape Control Unit Only)

1. Using a voltmeter, measure the DC voltage at the desired point and record the reading.
2. Using an oscilloscope, measure the peak to peak AC ripple at the same voltage point selected in step 1.
3. Divide the peak to peak reading taken in step 2 by 2.
4. Add the DC voltage reading taken in step 1 to the result of step 3.
5. The result of step 4 must fall within the mini/max voltage range.

Tape Transport Unit DC Voltages 50 Hz and 60 Hz

Measured at Power Supply

Voltage	Maximum	Minimum	Maximum Ripple (Peak-to-Peak)
−15.0	−16.5	−13.52	.300v
−5.0	−5.51	−4.55	.250v
+5.0	+5.51	+4.59	.250v
+8.5	+9.35	+7.67	.250v
+15.0	+16.50	+13.75	.300v
+24.0	+30.01	+22.88	2.4v

Note: If the drives are operating, there will be additional ripple generated by the starting and stopping of the drive motors. Therefore, this check should be done with the drives not moving tape.

Measured at Logic Board (or Load)

Voltage	Maximum	Minimum
−15.0	−16.50	−13.5
−5.0	−5.5	−4.5
+5.0	+5.5	+4.5
+8.5	+9.35	+7.65
+15.0	+16.5	+13.5
+24.0	+30.0	+22.0

Measuring Points

Voltage	See ALD
−15	PA00/001
−5	RP000
+5	RP000
+8.5	RP000
+15	VP000
+24	PA00/001

Note: The +15 volts are present only when the file protect switch is transferred.

Tape Transport Unit Fuses Continue to Blow

If an exchanged fuse continues to blow or a circuit breaker continues to trip, disconnect the cable(s) associated with the fuse or circuit breaker to isolate the problem. If the fuse or circuit breaker continues to fail with the load removed, the power supply is suspect. If the fuse or circuit breaker no longer fails (with the load removed), reconnect the cable(s) associated with the fuse or circuit breaker

Disconnect the loader cable J3 and power up. If there are no problems exchange the loader control card and/or the loader power cable. If the problem still exists then exchange the FRUs in the following table

Reconnect the cables previously removed

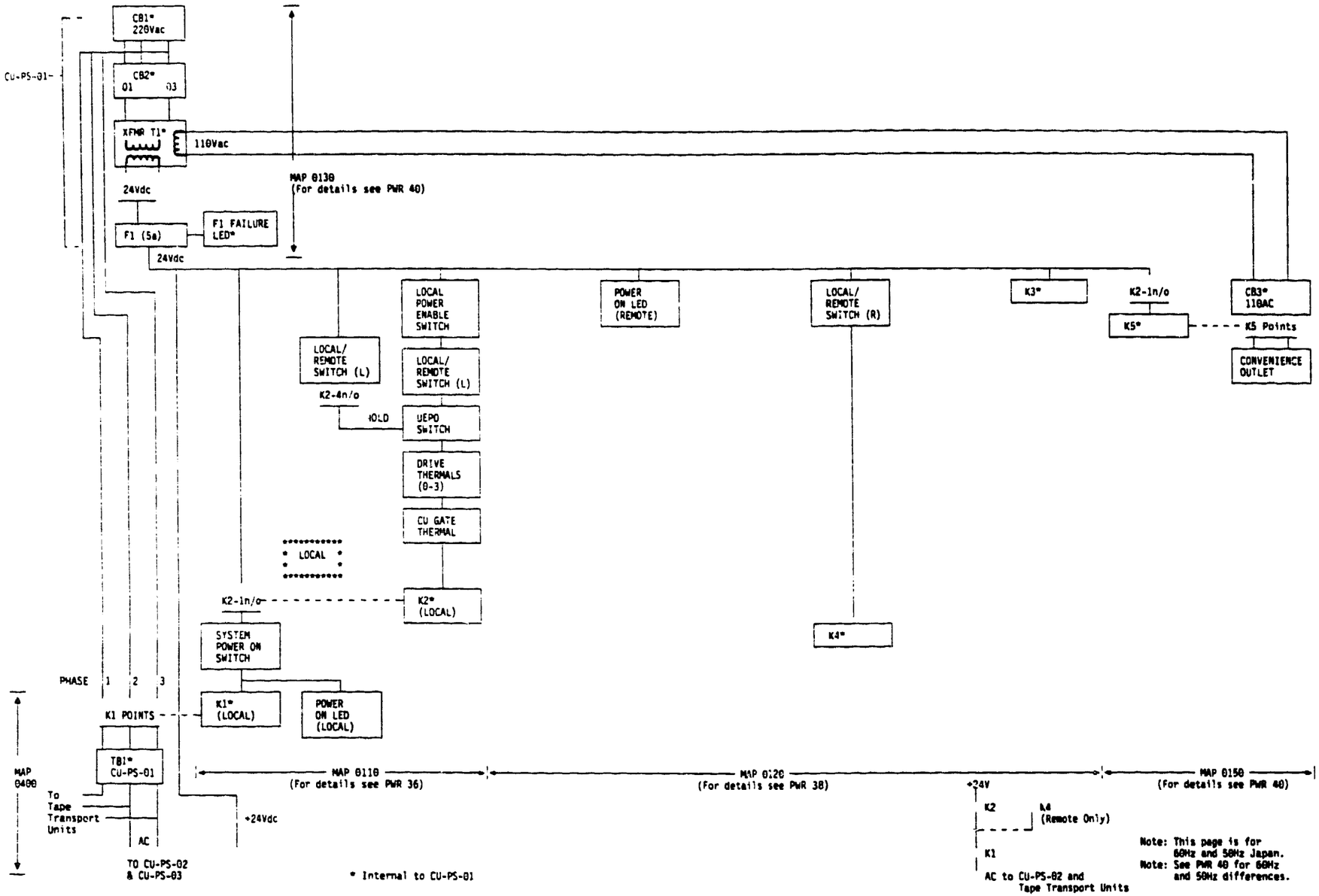
If the repair is successful, set the drive Online/Offline switch to Online (see LOC 1). Refer to the CE/HSC section and run GMP.

If the repair is not successful, request the assistance of your next level of support.

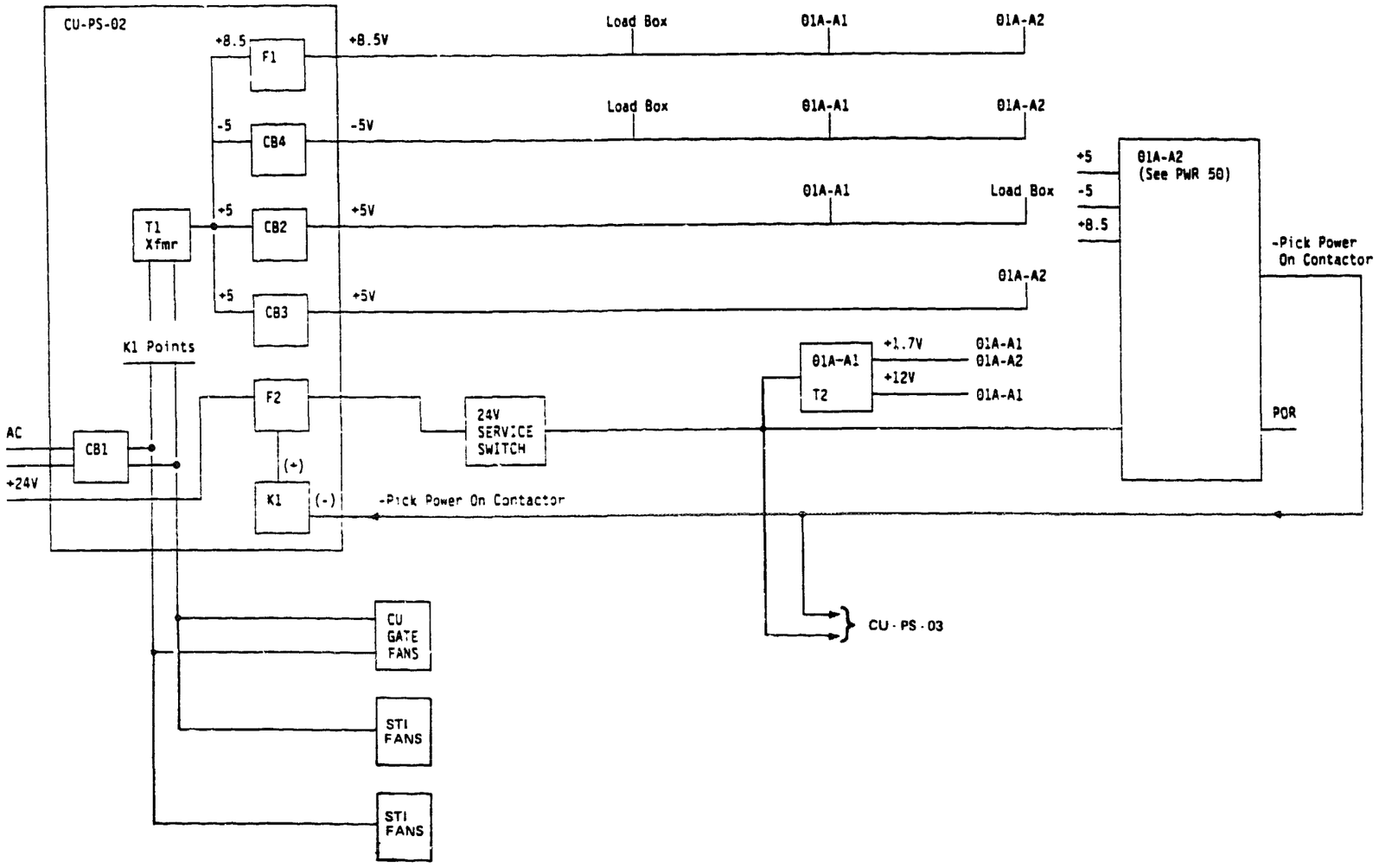
Cable locations are described on LOC 1

Fuse or CB	Drive	Associated Cables	FRU
F1 (+ 24 V dc)	0	J5	059 – Power amplifier board
F2 (+ 24 V dc)	1	J1	059 – Power amplifier board
F3 (+ 15 V dc)	0	J5	064 – Write power card 059 – Power amplifier board 058 – Logic board (02A-A1)
F4 (+ 15 V dc)	1	J1	064 – Write power card 059 – Power amplifier board 058 – Logic board (02A-A1)
F5 (–15 V dc)	0	J5	059 – Power amplifier board
F6 (–15 V dc)	1	J1	059 – Power amplifier board
F7 (+ 8.5 V dc)	0	J5, J7	060 – Message display board 085 – Drive control card 058 – Logic board (02A-A1)
F8 (+ 8.5 V dc)	1	J1, J3	060 – Message display board 085 – Drive control card 058 – Logic board (2A-A1)
F9 (–5 V dc)	0	J5, J7	059 – Power amplifier board 058 – Logic board (02A-A1)
F10 (–5 V dc)	1	J1, J3	059 – Power amplifier board 058 – Logic board (02A-A1)
F11 (+ 5 V dc ctrl)	0	J5	059 – Power amplifier board 060 – Message display board 079 – DC distribution cable
F12 (+ 5 V dc ctrl)	1	J2	059 – Power amplifier board 060 – Message display board 079 – DC distribution cable
CB1 (+ 5 V dc) F13 (+ 5 V dc)	0	J6, J7	059 – Power amplifier board 060 – Message display board 079 – DC pwr distribution cable 080 – DC pwr distribution cable 058 – Logic board (02A-A1) 281 – Loader control card 287 – Loader power cable
CB2 (+ 5 V dc) F14 (+ 5 V dc)	1	J2, J3	059 – Power amplifier board 060 – Message display board 079 – DC pwr distribution cable 080 – DC pwr distribution cable 058 – Logic board (02A-A1) 281 – Loader control card 287 – Loader power cable
Tape transport unit power ac CB	0, 1	J4, J15, J16	020 – Drive 0 blower 020 – Drive 1 blower 030 – Pneumatic pump/motor
Auto loader fuse (+ 5 V dc)	0, 1	J2, J6	281 – Loader control card
Auto loader fuse (+ 24 V dc)	0, 1	J2, J6	281 – Loader control card

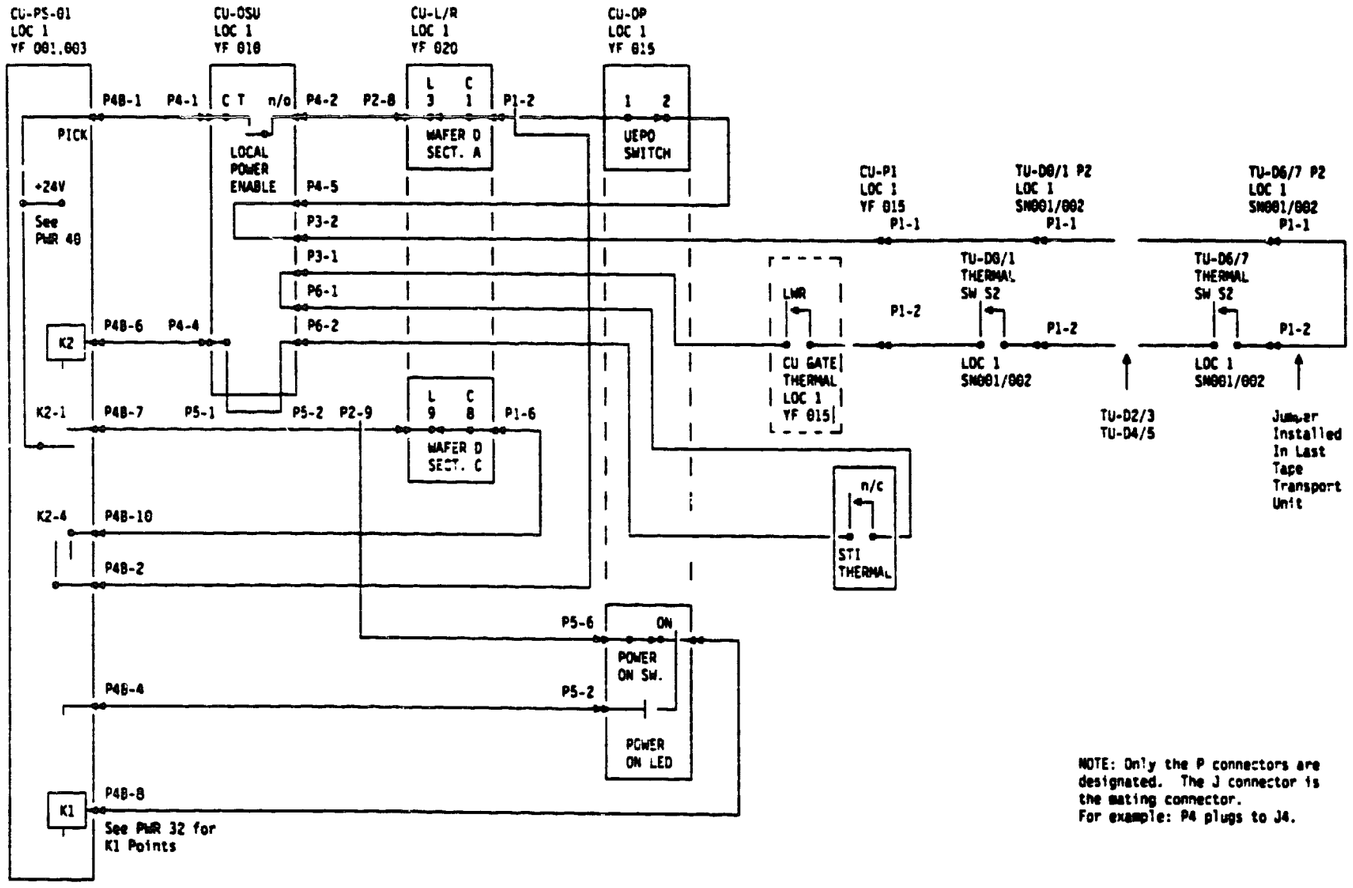
Tape Control Unit AC Power Distribution Diagram PWR 32



Tape Control Unit DC Power Distribution Diagram PWR 34



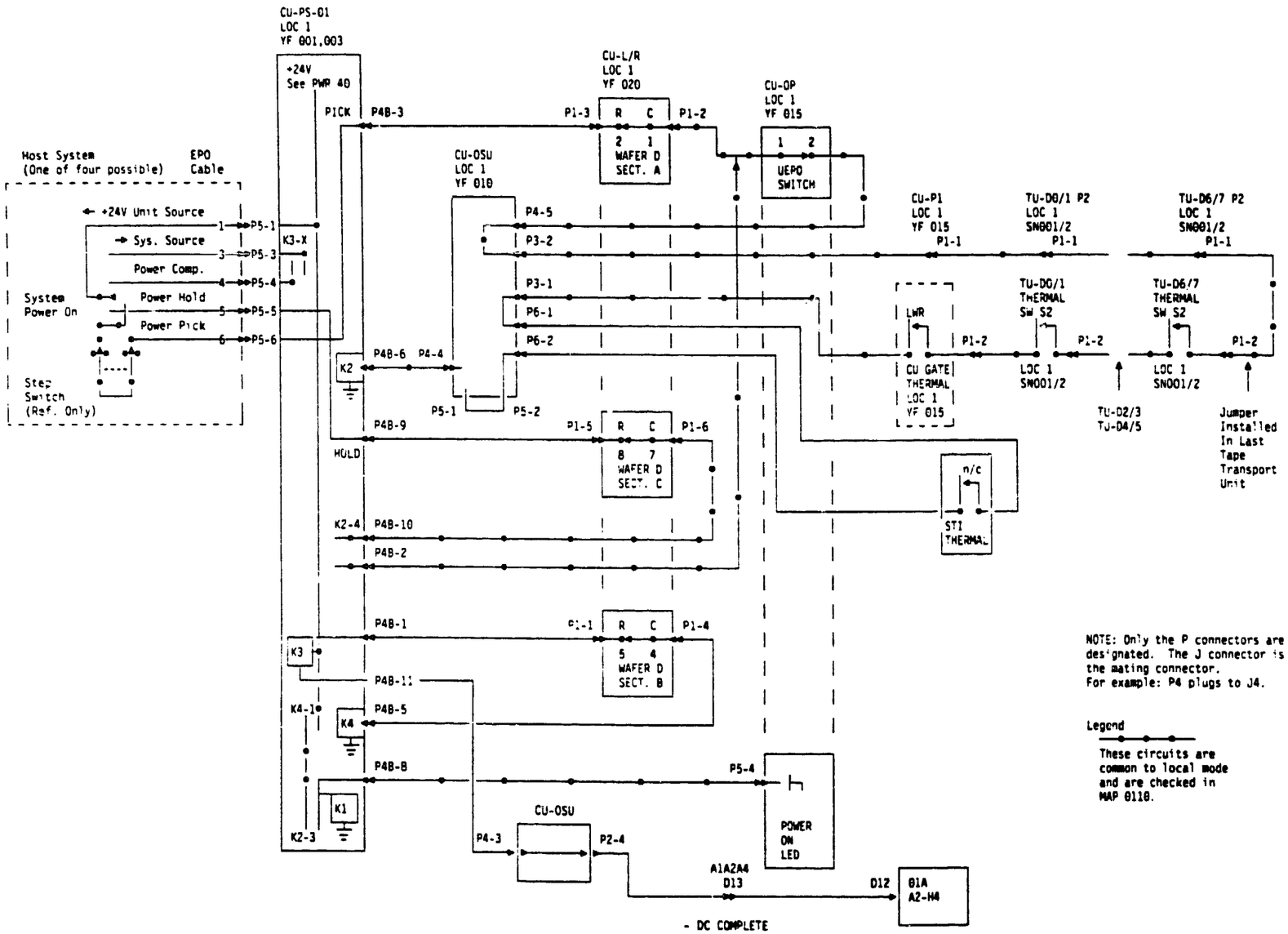
Tape Control Unit AC Power On (Local Mode) Diagram



NOTE: Only the P connectors are designated. The J connector is the mating connector.
For example: P4 plugs to J4.

Tape Control Unit AC Power On (Local Mode) Diagram

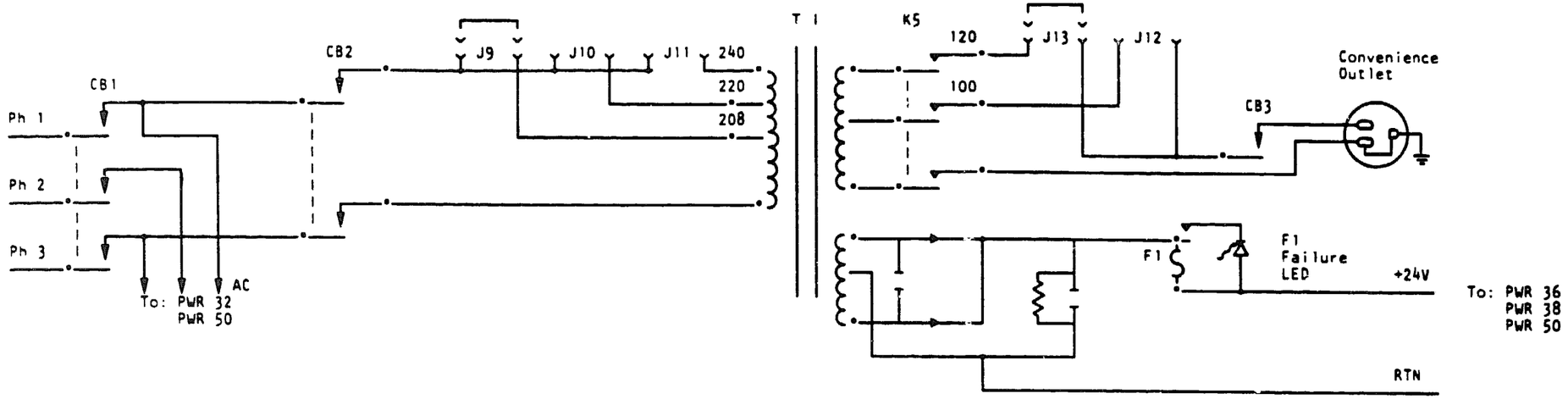
Tape Control Unit AC Power On (Remote Mode) Diagram

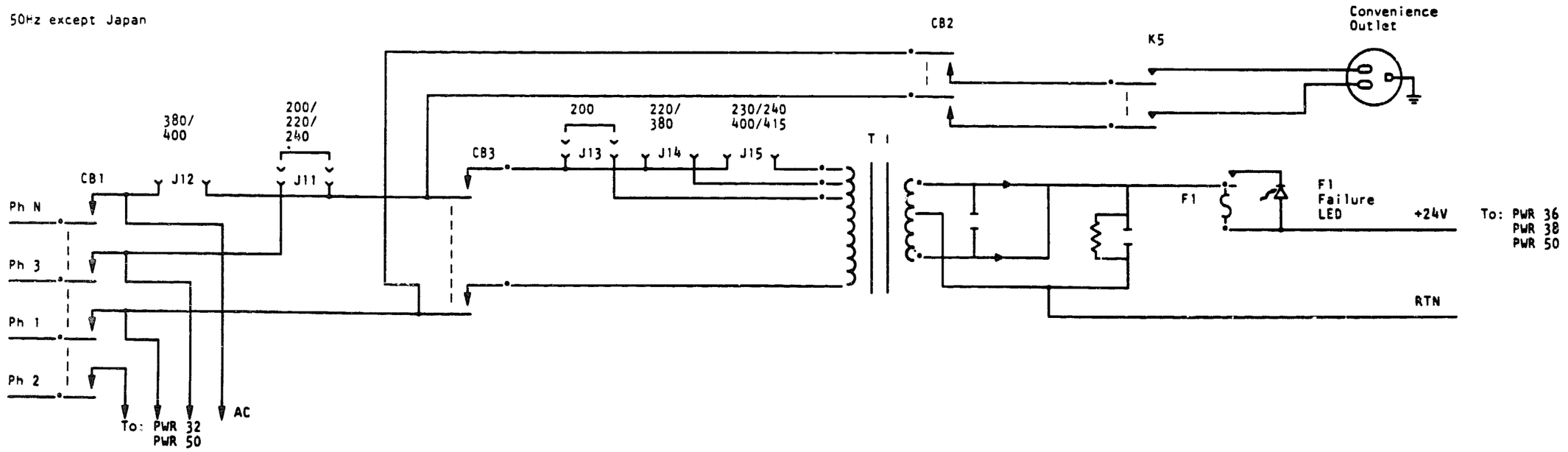


NOTE: Only the P connectors are designated. The J connector is the mating connector. For example: P4 plugs to J4.

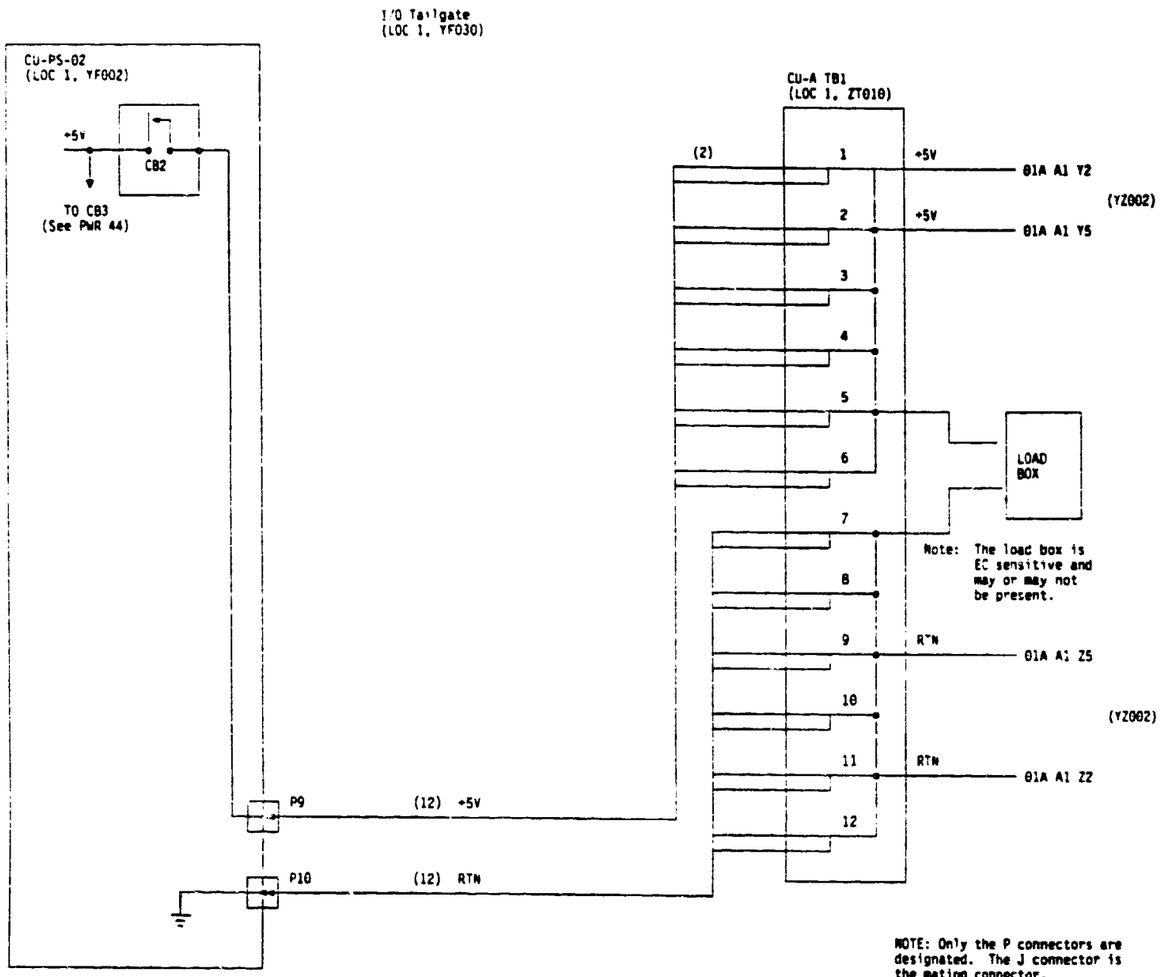
Legend

These circuits are common to local mode and are checked in MAP 0110.


CB1
CB2
J9
J10
J11
240
220
208
Ph 1
Ph 2
Ph 3
AC
To: PWR 32
PWR 50
T 1
K5
120
100
J13
J12
Convenience
Outlet
CB3
F1
F1
Failure
LED
+24V
To: PWR 36
PWR 38
PWR 50
RTN

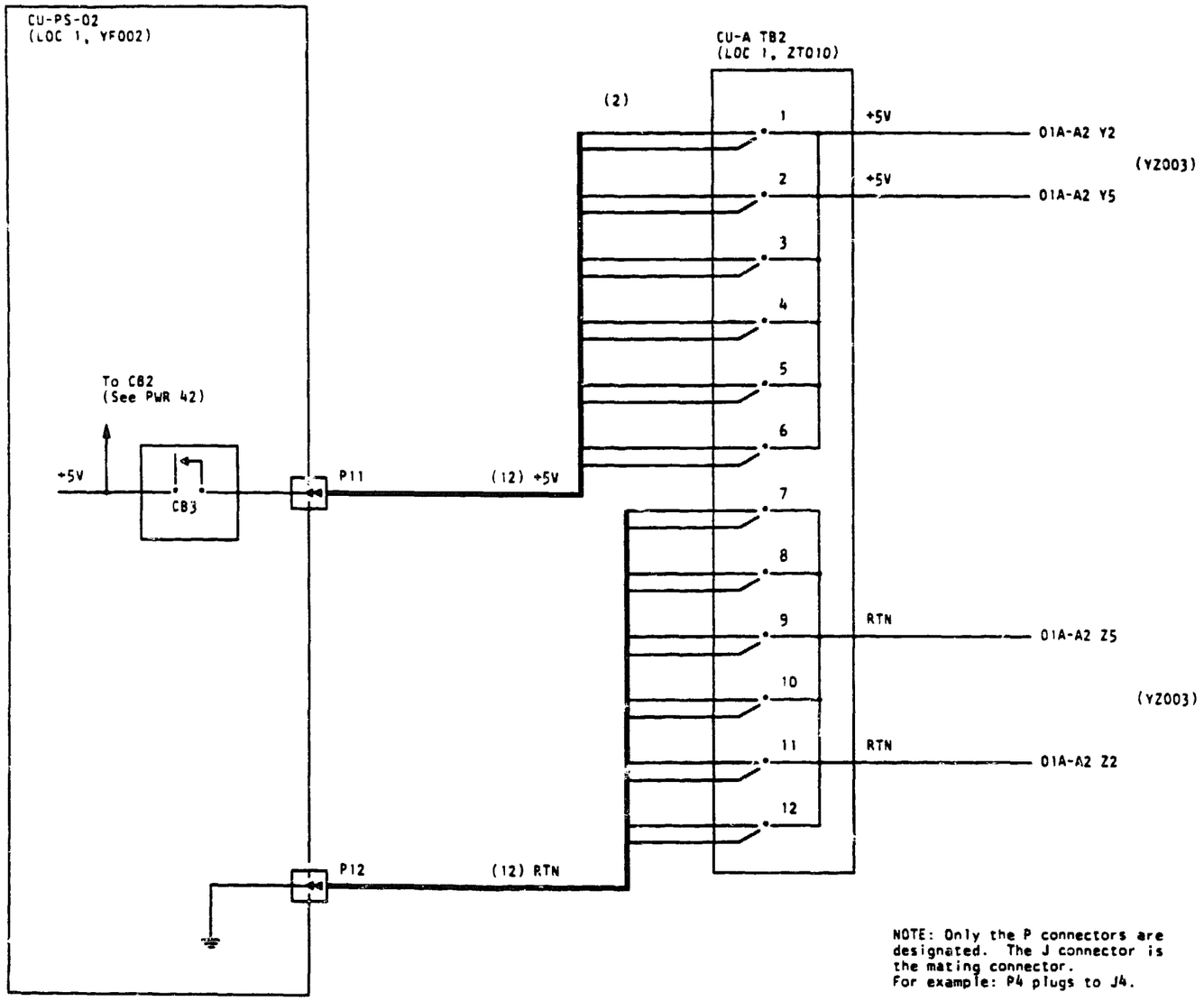

50Hz except Japan
CB2
Convenience
Outlet
K5
380/
400
200/
220/
240
200
220/
380
230/240
400/415
CB3
J13
J14
J15
T 1
CB1
J12
J11
Ph N
Ph 3
Ph 1
Ph 2
AC
To: PWR 32
PWR 50
F1
F1
Failure
LED
+24V
To: PWR 36
PWR 38
PWR 50
RTN

Tape Control Unit +5 V dc Distribution Diagram PWR 42



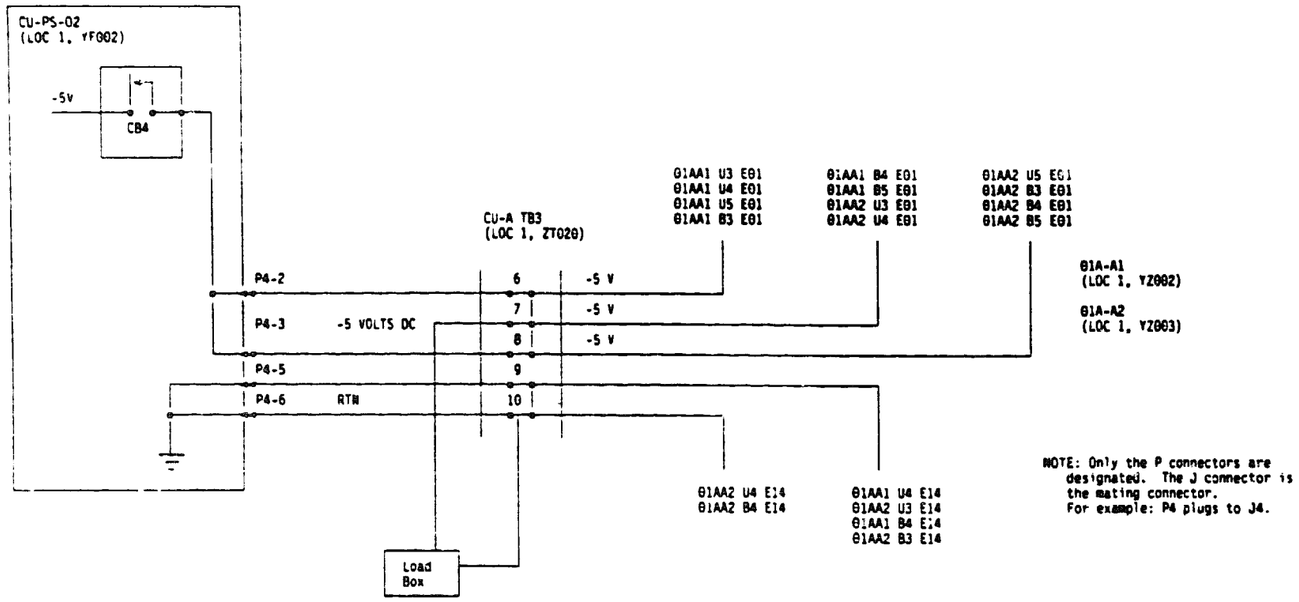
NOTE: Only the P connectors are designated. The J connector is the mating connector.
For example: P4 plugs to J4.

Tape Control Unit +5 V dc Distribution Diagram (Continued) PWR 44

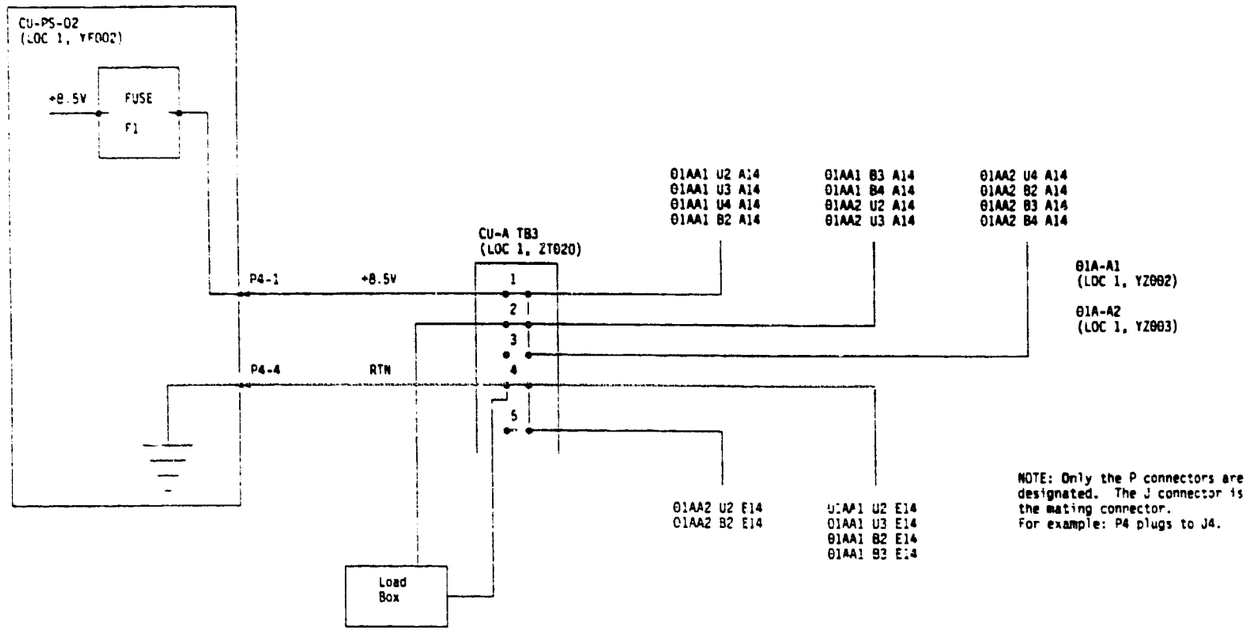


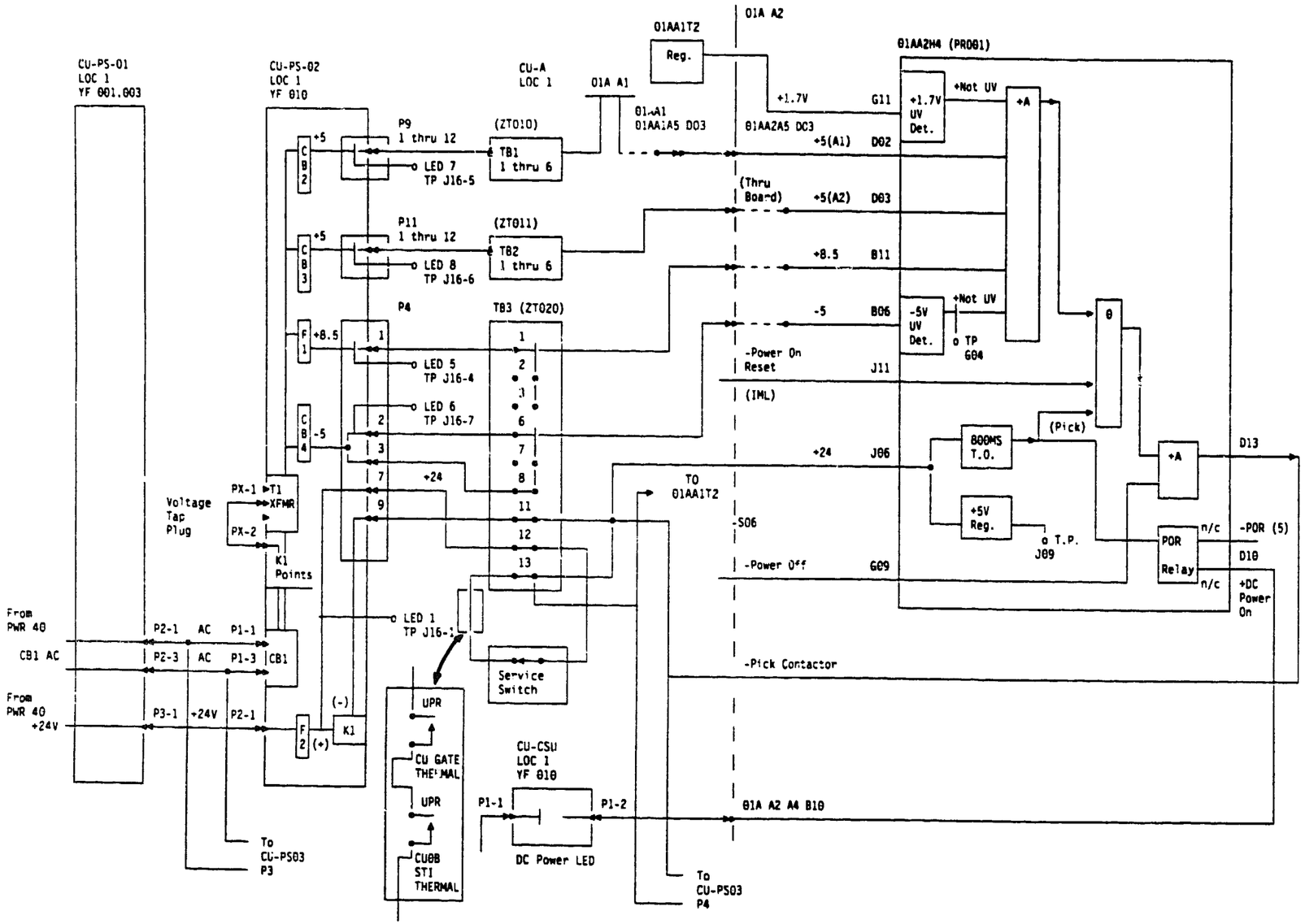
NOTE: Only the P connectors are designated. The J connector is the mating connector.
For example: P4 plugs to J4.

Tape Control Unit –5 V dc Distribution Diagram PWR 46



NOTE: Only the P connectors are designated. The J connector is the mating connector. For example: P4 plugs to J4.


CU-PS-02
(LOC 1, YF002)
+8.5V
FUSE
F1
P4-1
+8.5V
P4-4
RTN
CU-A TB3
(LOC 1, ZT020)
1
2
3
4
5
01AA1 U2 A14
01AA1 U3 A14
01AA1 U4 A14
01AA1 B2 A14
01AA1 B3 A14
01AA1 B4 A14
01AA2 U2 A14
01AA2 U3 A14
01AA2 U4 A14
01AA2 B2 A14
01AA2 B3 A14
01AA2 B4 A14
01A-A1
(LOC 1, YZ002)
01A-A2
(LOC 1, YZ003)
01AA2 U2 E14
01AA2 B2 E14
01AA1 U2 E14
01AA1 U3 E14
01AA1 B2 E14
01AA1 B3 E14
Load
Box
NOTE: Only the P connectors are designated. The J connector is the mating connector.
For example: P4 plugs to J4.


CU-PS-01
LOC 1
YF 001.003
CU-PS-02
LOC 1
YF 010
CU-A
LOC 1
01A A1
01A A2
01AA1T2
Reg.
01AA2H4 (PR001)
+1.7V
G11
+1.7V UV Det.
+Not UV
+A
01AA2A5 DC3
+5(A1)
D02
P9
1 thru 12
(ZT010)
TB1
1 thru 6
LED 7
TP J16-5
(Thru Board)
+5(A2)
D03
P11
1 thru 12
(ZT011)
TB2
1 thru 6
LED 8
TP J16-6
+8.5
B11
P4
TB3 (ZT020)
-5
B06
-5V UV Det.
TP G04
-Power On Reset
J11
(IML)
LED 5
TP J16-4
LED 6
TP J16-7
+24
J06
800MS T.O.
(Pick)
θ
D13
+5V Reg.
T.P. J09
POR Relay
n/c
-POR (5)
D10
+DC Power On
-S06
-Power Off
G09
TO 01AA1T2
Voltage Tap Plug
PX-1
PX-2
T1 XFMR
K1 Points
LED 1
TP J16-1
Service Switch
-Pick Contactor
From PWR 40
CB1 AC
From PWR 40 +24V
P2-1 AC P1-1
P2-3 AC P1-3 CB1
P3-1 +24V P2-1
F 2
(+)
(-)
K1
UPR
CU GATE THERMAL
CU0B STI THERMAL
To CU-PS03 P3
CU-CSU
LOC 1
YF 010
P1-1
P1-2
DC Power LED
01A A2 A4 B10
To CU-PS03 P4

MAP 0100—Power Start PWR 100-1

POWER START

PAGE 1 OF 12

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	A	1	001
0101	B	3	009
0101	C	9	055
0101	D	10	062
0101	E	6	038

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
6	041	0110	A
6	043	0110	D
8	052	0120	A
9	058	0120	A
7	050	0120	B
9	056	0120	D
6	040	0130	A
3	010	0130	B
3	016	0130	C
4	023	0130	D
5	030	0130	E
5	037	0150	A
5	035	0200	A
12	075	0200	A
5	036	0210	A
12	075	0210	A
10	066	0300	A
10	064	0400	A
11	068	0410	A
11	070	0410	B
12	077	190	A

001
(ENTRY POINT A)

DANGER

LETHAL VOLTAGES ARE PRESENT IN THE POWER SERVICE AREA.
SAFETY IS MOST IMPORTANT. TREAT ALL CIRCUITS AS LIVE UNTIL MEASURED.

CAPACITORS ARE POSSIBLE EXPLODING DEVICES. WEAR SAFETY GLASSES WHEN WORKING IN THE POWER AREA.

ALWAYS REINSTALL ALL SAFETY COVERS BEFORE POWERING ON THE MACHINE.

ARE YOU HERE BECAUSE YOU HAVE A CONVIENIENCE OUTLET ONLY PROBLEM?
Y N

002

ARE YOU HERE FOR DRIVE POWER PROBLEMS?
Y N

003

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

5 5 5 2
A B C D

MAP DESCRIPTION: THIS MAP IS USED TO DETERMINE THE GENERAL AREA OF POWER PROBLEMS.

START CONDITIONS: YOU WERE DIRECTED TO THIS MAP BECAUSE OF SUSPECTED POWER PROBLEMS.

ADDITIONAL SERVICE AIDS:
-TAPE CONTROL UNIT AC POWER DISTRIBUTION DIAGRAM ON PWR 32.
-TAPE CONTROL UNIT DC POWER DISTRIBUTION DIAGRAM ON PWR 34.

D
1

PAGE 2 OF 12

004

OBSERVE THE TAPE CONTROL UNIT DC POWER LED (LOC 1).

NO INDICATION OF AC POWER

IS THE TAPE CONTROL UNIT DC POWER LED ON?
Y N

005

PERFORM THE TAPE CONTROL UNIT DISMOUNT PROCEDURE ON CARR-TCU 5.

OBSERVE THE POSITION OF THE UNIT EMERGENCY POWER SWITCH (LOC 1).

SEE IF UEPO HAS BEEN ACTIVATED

IS THE UNIT EMERGENCY POWER SWITCH SET TO THE POWER ENABLE POSITION?
Y N

006

CAUTION

FIND OUT WHY THE UNIT EMERGENCY POWER SWITCH WAS SET TO THE POWER OFF POSITION.

CAUTION

SET THE UNIT EMERGENCY POWER SWITCH TO THE POWER ENABLE POSITION.
(Step 006 continues)

RECOVER FROM UEPO

5 3
E F

(Step 006 continued)

POWER ON (LOC 1).
-SET THE LOCAL REMOTE SWITCH TO LOCAL.
-SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO ON.
-PRESS THE LOCAL POWER ENABLE SWITCH.

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

007
PERFORM THE TAPE CONTROL UNIT DISMOUNT PROCEDURE ON CARR-TCU 5.

STILL NO POWER AFTER RESETTING UEPO

GO TO PAGE 3, STEP 009, ENTRY POINT B.

008

THE UNIT EMERGENCY POWER SWITCH WAS SET TO THE POWER OFF POSITION.

REFER TO THE CE/HSC SECTION AND RUN GMP.

MAP 0100——Power Start PWR 100-3

F POWER START
2

PAGE 3 OF 12

009
(ENTRY POINT B)

OPEN THE FRONT DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

OBSERVE THE F1 FAILURE LED (LOC 1).

IS THE F1 FAILURE LED OFF?
Y N

010

GO TO MAP 0130, ENTRY POINT B. — THE CU-PS-01 +24 V DC FUSE F1 IS BLOWN.

011

OBSERVE THE POSITION OF THE CU-PS-01 CB1 (LOC 1).

IS CU-PS-01 CB1 SET TO THE ON POSITION?
Y N

012

SET CU-PS-01 CB1 TO THE ON POSITION. — RECOVER FROM TRIPPED CB-1.

POWER ON (LOC 1).
-SET THE LOCAL REMOTE SWITCH TO LOCAL.
-SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO ON.
-PRESS THE LOCAL POWER ENABLE SWITCH.

WAIT 20 SECONDS.
(Step 012 continues)

G

G

(Step 012 continued)

DID CU-PS-01 CB1 TRIP?
Y N

013

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1). — RECHECK AFTER RESETTING CB-1.

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

014

GO TO STEP 009, ENTRY POINT B. — CU-PS-01 CB1 WAS TRIPPED. THERE SEEMS TO BE A SECOND PROBLEM.

015

THE CU-PS-01 CB1 WAS TURNED OFF.

REFER TO THE CE/HSC SECTION AND RUN GMP.

016

GO TO MAP 0130, ENTRY POINT C. — CU-PS-01 CB1 IS TRIPPING.

017

IS THIS A 50HZ MACHINE (EXCEPT JAPAN)?
Y N

4 4
H J

J
J

POWER START

PAGE 4 OF 12

018

OBSERVE THE POSITION OF THE
CU-PS-01 CB2 (LOC 1).

IS CU-PS-01 CB2 SET TO THE ON
POSITION?
Y N

019

SET CU-PS-01 CB2 TO THE ON
POSITION.

RECOVER FROM TRIPPED CB-2.

POWER ON (LOC 1).
-SET THE LOCAL REMOTE
SWITCH TO LOCAL.
-SET THE TAPE CONTROL UNIT POWER
ON/OFF SWITCH TO ON.
-PRESS THE LOCAL
POWER ENABLE SWITCH.

WAIT 20 SECONDS.

DID CU-PS-01 CB2 TRIP?
Y N

020

OBSERVE THE TAPE CONTROL UNIT
POWER ON LED (LOC 1).

RECHECK AFTER RESETTING CB-2.

IS THE TAPE CONTROL UNIT
POWER ON LED ON?
Y N

021

GO TO PAGE 3, STEP 009,
ENTRY POINT B.

CU-PS-01 CB2 WAS TRIPPED. THERE
SEEMS TO BE A SECOND PROBLEM.

K L M

H K L M
J

022

THE CU-PS-01 CB2 WAS TURNED
OFF.

REFER TO THE CE/HSC SECTION
AND RUN GMP.

023

GO TO MAP 0130, ENTRY POINT D.

CU-PS-01 CB2 IS TRIPPING.

024

GO TO PAGE 6, STEP 038,
ENTRY POINT C.

025

OBSERVE THE POSITION OF THE
CU-PS-01 CB3 (LOC 1).

IS CU-PS-01 CB3 SET TO THE ON
POSITION?
Y N

026

SET CU-PS-01 CB3 TO THE ON
POSITION.

RECOVER FROM TRIPPED CB-3.

POWER ON (LOC 1).
-SET THE LOCAL REMOTE
SWITCH TO LOCAL.
-SET THE TAPE CONTROL UNIT POWER
ON/OFF SWITCH TO ON.
-PRESS THE LOCAL
POWER ENABLE SWITCH.

WAIT 20 SECONDS.
(Step 026 continues)

S
N

MAP 0100—Power Start PWR 100-5

E N
2 4

POWER START

PAGE 5 OF 12

(Step 026 continued)

DID CU-PS-01 CB3 TRIP?
Y N

027

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

028

GO TO PAGE 3, STEP 009, ENTRY POINT B.

CU-PS-01 CB3 WAS TRIPPED. THERE SEEMS TO BE A SECOND PROBLEM.

029

THE CU-PS-01 CB3 WAS TURNED OFF.

REFER TO THE CE/HSC SECTION AND RUN GMP.

030

GO TO MAP 0130, ENTRY POINT E.

CU-PS-01 CB3 IS TRIPPING.

031

GO TO PAGE 6, STEP 038, ENTRY POINT E.

032
THE OP PANEL (FRU142) IS FAILING, EXCHANGE FRU142.
REFER TO THE CE/HSC SECTION AND RUN GMP.

THE AC POWER ON LED IS BAD
SEE CARR-TCU 1-1

A B C
1 1 1

033
AC POWER IS ON
GO TO PAGE 10, STEP 002, ENTRY POINT D.

034

ARE BOTH DRIVES OF ONE TAPE TRANSPORT UNIT FAILING?
(DR0 AND DR1, OR DR2 AND DR3, ETC.)
Y N

035
SINGLE DRIVE POWER PROBLEM
GO TO MAP 0200, ENTRY POINT A.

036
TWO DRIVE POWER PROBLEM
GO TO MAP 0210, ENTRY POINT A.

037
CONVENIENCE OUTLET PROBLEM
PERFORM THE TAPE CONTROL UNIT DISMOUNT PROCEDURE ON CARR-TCU 5.
GO TO MAP 0150, ENTRY POINT A.

POWER START

PAGE 6 OF 12

038
(ENTRY POINT E)

RECORD THE POSITION OF THE LOCAL REMOTE SWITCH (LOC 1).

SET THE LOCAL REMOTE SWITCH TO THE LOCAL POSITION (LOC 1).

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH (LOC 1) UNTIL DIRECTED TO RELEASE IT

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?

CU-PS-01 CB1, CB2, FUSE F1, AND THE UNIT EMERGENCY POWER SWITCH APPEAR TO BE OK, BUT THE TAPE CONTROL UNIT IS NOT POWERED ON. THIS SECTION ATTEMPTS TO POWER ON IN LOCAL MODE.

Y N

039

RELEASE THE LOCAL POWER ENABLE SWITCH.

REMOVE CU-PS-01 FUSE F1 (LOC 1).

OBSERVE THE F1 FAILURE LED (LOC 1).

IS THE F1 FAILURE LED NOW ON?

IF THE F1 FAILURE LED IS ON, +24 V DC IS AVAILABLE.

Y N

P Q R

P Q R

040

REINSTALL FUSE F1.

GO TO MAP 0130, ENTRY POINT A.

THE +24 V DC CONTROL VOLTAGE IS MISSING.

041

REINSTALL FUSE F1.

GO TO MAP 0110, ENTRY POINT A.

THE +24 V DC CONTROL VOLTAGE IS OK, BUT THE TAPE CONTROL UNIT DID NOT POWER ON.

042

RELEASE THE LOCAL POWER ENABLE SWITCH.

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?

THE LOCAL PICK CIRCUIT IS OK. THIS SECTION CHECKS THE HOLD CIRCUIT.

Y N

043

GO TO MAP 0110, ENTRY POINT D.

THE LOCAL HOLD CIRCUIT IS FAILING.

044

WAS THE ORIGINAL POSITION OF THE LOCAL REMOTE SWITCH, AS RECORDED, SET TO THE REMOTE POSITION?

THE TAPE CONTROL UNIT POWERS UP OK IN LOCAL MODE.

Y N

7 7
S T

S T POWER START
6 6

PAGE 7 OF 12

045

THE ORIGINAL FAILURE (POWER ON LED WAS OFF) HAS DISAPPEARED.

POSSIBLE CAUSES FOR INTERMITTENT OR UNEXPLAINED POWER DROP ARE:
AC POWER SUPPLY (FRU144)
TCU GATE LOWER THERMAL SWITCHES
STI GATE LOWER THERMAL SWITCHES
TTU THERMAL SWITCH (FRU882)

REFER TO PWR 36 FOR AN OVERVIEW OF THE LOCAL PICK/HOLD CIRCUITS.

REFER TO THE CE/HSC SECTION AND RUN GMP.

046

TO USE THE REMOTE MODE, THE TAPE CONTROL UNIT MUST BE ATTACHED TO A HOST SYSTEM WITH AN EPO CABLE AND THE HOST SYSTEM MUST BE POWERED ON.

IS AN EPO CABLE INSTALLED AND THE SYSTEM POWERED ON?
Y N

047

DO YOU WANT TO TEST THE REMOTE MODE?
Y N

8
U V W

V W

048

THE TAPE CONTROL UNIT WAS SET TO REMOTE AND THE HOST SYSTEM WAS NOT POWERED ON, OR AN EPO CABLE WAS NOT INSTALLED.

INFORM THE SYSTEM FE.

REFER TO THE CE/HSC SECTION AND RUN GMP.

049

CAUTION

+24 V DC IS PRESENT.

INSTALL A JUMPER FROM CU-PS-01 J5-1 TO J5-5 (LOC 1).

THE TAPE CONTROL UNIT POWERS UP OK IN LOCAL MODE. THIS SECTION WILL CHECK THE REMOTE HOLD CIRCUIT BY USING A JUMPER TO SIMULATE AN EPO CABLE.

SET THE LOCAL REMOTE SWITCH TO THE REMOTE POSITION (LOC 1).

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

050

GO TO MAP 0120, ENTRY POINT B.

THE REMOTE HOLD CIRCUIT IS FAILING.

8
X

X
7

POWER START

PAGE 8 OF 12

851

REMOVE THE JUMPER.

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS 01 CB1 TO THE OFF POSITION (LOC 1).

THE REMOTE HOLD IS OK. THE PROBLEM MAY BE A FAILURE IN THE REMOTE PICK CIRCUIT.

INSTALL THE JUMPER FROM CU-PS-01 J5-1 TO J5-6 (LOC 1).

CAUTION

THE TAPE CONTROL UNIT IS EXPECTED TO POWER ON DURING THE NEXT STEP.

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE ON POSITION (LOC 1).

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

852

GO TO MAP 0120, ENTRY POINT A.

THE REMOTE PICK CIRCUIT IS FAILING.

Y

U Y
7

853

THE TAPE CONTROL UNIT REMOTE CIRCUITS ARE OK.
THE TAPE CONTROL UNIT LOCAL REMOTE SWITCH WAS SET TO REMOTE AND THE HOST SYSTEM WAS NOT POWERED ON OR AN EPO CABLE WAS NOT INSTALLED.

INFORM THE SYSTEM FE.

REFER TO THE CE/HSC SECTION AND RUN GMP.

SEE OVERVIEW DIAGRAM ON PWR 32.

854

GO TO PAGE 9, STEP 855, ENTRY POINT C.

MAP 0100—Power Start PWR 100-8

POWER START

PAGE 9 OF 12

055
(ENTRY POINT C)

SET THE LOCAL REMOTE SWITCH TO THE REMOTE POSITION (LOC 1).

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

056

GO TO MAP 0120, ENTRY POINT D.

057

THE REMOTE HOLD IS OK. THE PROBLEM MAY BE A FAILURE TO POWER ON FROM THE SYSTEM (REMOTE POWER PICK). A JUMPER WILL BE USED TO SIMULATE THE EPO CABLE.

SET THE LOCAL REMOTE SWITCH TO THE LOCAL POSITION (LOC 1).

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

DISCONNECT THE CABLE
CU-PS-01 P5, IF INSTALLED (LOC 1).

INSTALL A JUMPER FROM CU-PS-01 J5-1 TO J5-6 (LOC 1).
(Step 057 continues)

THIS SECTION CHECKS THE REMOTE HOLD CIRCUIT.

THE REMOTE HOLD CIRCUIT IS FAILING.

(Step 057 continued)

CAUTION

THE TAPE CONTROL UNIT IS EXPECTED TO POWER ON DURING THE NEXT STEP.

SET THE LOCAL REMOTE SWITCH TO THE REMOTE POSITION (LOC 1).

OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

058

GO TO MAP 0120, ENTRY POINT A.

THE REMOTE PICK CIRCUIT IS FAILING.

059
ALL CIRCUITS APPEAR TO BE FUNCTIONING NORMALLY. THE POWER COMPLETE RELAY K3 MAY BE STUCK OR ITS PICK CIRCUIT MAY BE MALFUNCTIONING. THIS WOULD CAUSE A PREMATURE POWER COMPLETE TO BE SENT TO THE HOST ADVANCING THE STEPPER BEFORE THE TA90 ACTUALLY COMPLETED ITS POWER ON SEQUENCE.

SEE PWR30,YF001 AND YF020.

SET THE SERVICE SWITCH TO OFF

CONTINUITY CHECK
CU PS01 P5-3 TO CU PS01 P5-4

DID YOU READ CONTINUITY ?
Y N

1
1 0
0 A

MAP 0100—Power Start

Z A
Z A POWER START
9 A
9

PAGE 10 OF 12

060

RECONNECT THE CABLE
CU-PS-01 P5 (IF IT WAS PREVIOUSLY INSTALLED).

THE TAPE CONTROL UNIT POWER ON CIRCUITS APPEAR TO BE OK.

POSSIBLE CAUSES FOR INTERMITTENT OR UNEXPLAINED POWER DROP ARE:
AC POWER SUPPLY (FRU144)
TCU GATE LOWER THERMAL SWITCHES
STI GATE LOWER THERMAL SWITCHES
TTU THERMAL SWITCH (FRU002).

REFER TO PWR 30 FOR AN OVERVIEW OF THE REMOTE PICK/HOLD CIRCUITS.

REFER TO THE CE/HSC SECTION AND RUN GMP.

061
POWER COMPLETE IS STUCK ACTIVE!

ISOLATE PROBLEM AND REPAIR USING PWR 30 AND LOGIC YF001 AND YF020.
AFTER REPAIR
REFER TO THE CE/HSC SECTION AND RUN GMP.

062
(ENTRY POINT D)
THE TAPE CONTROL UNIT POWER ON LED IS LIT
ARE YOU HERE FOR A UEPO CHECK?
Y N

063

OBSERVE THE TAPE CONTROL UNIT DC POWER LED (LOC 1).

IS THE TAPE CONTROL UNIT DC POWER LED ON?
Y N

064

GO TO MAP 0400, ENTRY POINT A.

THERE IS A CU-PS-02 DC VOLTAGE FAILURE.

065

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

CHECK CHANNEL ATTACHMENT DC POWER.

OBSERVE THE LEDS ON BOTH STI CARDS

SEE LOC-1 FOR LOCATION OF THE LEDS.

ARE ANY OF THE LEDS (6) ON OR BLINKING?
Y N

066
THERE MAY BE A FAILURE OF CU-PS03
OR THE CABLING TO THE STI GATE
GO TO MAP 0300, ENTRY POINT A.

1 1
2 1
A A
B C

A
C
1
0

POWER START

PAGE 11 OF 12

067

OBSERVE THE LEDS ON THE TAPE
CONTROL UNIT REGULATOR CARD, 01A-A1T2
(LOC 1).

ARE ALL THE LEDS (4) OFF?
Y N

068

GO TO MAP 0410, ENTRY POINT A.

THERE IS A REGULATOR VOLTAGE FAILURE.

069

SET THE MULTIMETER TO MEASURE
+1.7 V DC.

MEASURE THE +1.7 V DC REGULATOR
OUTPUT FROM 01A-A1T2-B03(+) TO
01A-A1T2-D08(-).

DOES THE METER INDICATE
GREATER THAN 1.65 V DC?
Y N

070

GO TO MAP 0410, ENTRY POINT B.

THE 1.7 V DC REGULATED VOLTAGE IS FAILING.

A
D

A
D

071

CONNECT METER TO MEASURE +12 V DC

MEASURE THE +12 V DC REGULATOR OUTPUT
FROM 01A-A1T2-B11(+) TO 01A-A1T2-D08(-).

IS THE VOLTAGE BETWEEN +11 AND +13
V DC?
Y N

072
THE +12 V DC REGULATOR IS FAILING.
EXCHANGE FRU138

REFER TO THE CE/HSC SECTION AND
RUN GMP.

SEE CARR-TCU 1-1.

073

MEASURE THE AC RIPPLE ON THE DC
VOLTAGES.

SEE PWR 20.

IS THE RIPPLE VOLTAGE IN TOLERANCE?
Y N

074
TOO MUCH RIPPLE ON THE DC
VOLTAGE.
EXCHANGE FRU145.

REFER TO THE CE/HSC SECTION AND
RUN GMP.

SEE CARR-TCU 1-1.

1
2
A
E

A A POWER START
B E
1 1
0 1
PAGE 12 OF 12

075

THE TAPE CONTROL UNIT POWER SEEMS TO BE OK.

SEE OVERVIEW DIAGRAM ON PWR 32.

FOR SINGLE DRIVE POWER PROBLEMS, GO TO MAP 0200, ENTRY POINT A.

FOR MULTIPLE DRIVE POWER PROBLEMS, GO TO MAP 0210, ENTRY POINT A.

IF YOU ENTERED THIS MAP FROM THE START SECTION OF THE MG, REFER BACK TO THE CE/HSC SECTION AND RUN GMP.

IF YOU ENTERED THIS MAP FROM ANY OTHER SECTION OF THE MG, RETURN TO THAT SECTION AND CONTINUE WITH THE NEXT STEP.

076
SET THE UEPO SWITCH TO "OFF".
OBSERVE THE TAPE CONTROL UNIT POWER ON LED (LOC 1).
IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

UEPO FUNCTION CHECK.

077
UEPO CIRCUITS CHECK OKAY

SET THE UEPO SWITCH TO "ON"
GO TO MAP 190, ENTRY POINT A.

A
F

A
F

078
ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).
REMOVE WIRES FROM THE UEPO SWITCH.

AC POWER SUPPLY OR UEPO SWITCH FAILURE.

SET UEPO SWITCH TO "OFF" POSITION

CONTINUITY CHECK UEPO SWITCH.
DO YOU READ CONTINUITY ACROSS THE SWITCH?
Y N

079
THE AC PS (FRU144) IS FAILING
EXCHANGE FRU144

SEE CARR-TCU 1-1.

REFER TO THE CE/HSC SECTION AND RUN GMP.

080
THE UEPO SWITCH (FRU198) IS FAILING
EXCHANGE FRU198

SEE CARR-TCU 1-1.

REFER TO THE CE/HSC SECTION AND RUN GMP.

POWER ON, LOCAL MODE

PAGE 1 OF 13

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	D	11	064
0111	B	12	071
0111	C	13	072
0111	E	4	020
0111	F	5	025
0111	G	9	052
0111	H	10	057

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
13	073	0100	A
13	075	0100	A
4	022	0190	A
5	024	0190	A
2	003	190	A
6	032	190	A
7	038	190	A
7	041	190	A
8	046	190	A
8	050	190	A
9	056	190	A
11	062	190	A
4	016	190	A
2	006	190	A

001
(ENTRY POINT A)

(THE LOCAL POWER PICK CIRCUIT IS FAILING.)

(Step 001 continues)

MAP DESCRIPTION: MAP 0100 SENT YOU HERE WHEN THE TAPE CONTROL UNIT CANNOT POWER UP IN LOCAL MODE.

START CONDITIONS:
-POWER ON LED IS OFF
-LOCAL REMOTE SW SET TO LOCAL
-POWER ON SW SET TO ON
-UNIT EMERGENCY POWER SW SET TO ON.

FRUS DIAGNOSED:
-TAPE CONTROL UNIT AC SUPPLY CU-PS-01
-UNIT EMERGENCY POWER SW
-LOCAL REMOTE SW
-LOCAL POWER ENABLE SW
-TAPE CONTROL UNIT LOWER THERMAL
(Step 001 continues)

(Step 001 continued)

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC-1).

DISCONNECT THE CABLE CU-PS-01 P48 (LOC-1).

CONNECT THE MULTIMETER TO P48-1 AND P48-6.
(THE P CONNECTOR IS ON THE CABLE).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH WHILE MAKING THE FOLLOWING MEASUREMENT (LOC-1).

CHECK FOR CONTINUITY FROM P48-1 TO P48-6.

DOES THE METER INDICATE CONTINUITY?
Y N
| |

3 2
A B

(Step 001 continued)
-STI LOWER THERMAL
-TAPE TRANSPORT UNIT THERMALS S2
-CU-OSU PANEL
-CU GATE FANS
-STI GATE FANS.

ADDITIONAL SERVICE AIDS:
-TAPE CONTROL UNIT AC POWER DISTRIBUTION DIAGRAM ON PWR 32.
-TAPE CONTROL UNIT AC POWER ON-LOCAL MODE DIAGRAM ON PWR 36.

STANDARD RELAY PROBES ARE USEFUL IN PROBING CONNECTORS.

B 'POWER ON, LOCAL MODE
1

PAGE 2 OF 13

002

A JUMPER PLUG SHOULD BE INSTALLED IN THE THERMAL CIRCUIT OF THE LAST DRIVE.

THE +24V PICK CIRCUIT (K2 PICK) IS OPEN.

SEE DETAILED DIAGRAM ON PWR 36.

IS THE JUMPER INSTALLED IN CONNECTOR TU-DX/X-P2 J1 (LOC-1)?
Y N

003

INSTALL THE JUMPER.

SEE DETAILED DIAGRAM ON PWR 36.

RECONNECT THE CABLE CU-PS-01 P4B.
GO TO MAP 190, ENTRY POINT A.

004

PROBLEM MAY BE IN THE HOLD CIRCUITS WHICH PASS THROUGH EACH TAPE TRANSPORT UNIT.
GO TO THE TAPE TRANSPORT UNIT IMMEDIATELY ADJACENT TO THE TAPE CONTROL UNIT. OPEN THE LOWER COVERS TO GAIN ACCESS TO THE THERMAL CONNECTOR P1.

DISCONNECT THERMAL CONNECTOR P1.

CONTINUITY CHECK THERMAL CONNECTOR P1-1 TO P1-2.

THIS CHECKS THE INTERLOCK THROUGH ALL TAPE TRANSPORT UNITS.

DOES THE METER INDICATE CONTINUITY?
Y N

3
C D

D

005

OPEN SOMEWHERE IN THE STRING.

REFERENCE LOC 1 AND PWR 36.

IN EACH OF THE ATTACHED TAPE TRANSPORT UNIT S, MEASURE FOR CONTINUITY ACROSS THE TTU THERMAL CONNECTOR P1-1 TO P1-2.

DO YOU READ CONTINUITY ACROSS P1?
Y N

006

MOVE METER TO NEXT TAPE TRANSPORT UNIT AND REPEAT

THE CONTINUITY CHECK ACROSS P1.

(IF YOU ARE ON THE LAST TAPE TRANSPORT UNIT, THERE IS AN OPEN IN THE CABLE OR THE JUMPER PLUG.)

REPAIR OPEN IN THE CABLE.
GO TO MAP 190, ENTRY POINT A.

007

GO TO PAGE 4, STEP 020, ENTRY POINT E.

C
2

POWER ON, LOCAL MODE

PAGE 3 OF 13

008

OPEN SOMEWHERE IN THE TAPE CONTROL UNIT.

REFERENCE LOC 1 AND PWR 36.

MEASURE FOR CONTINUITY BETWEEN CU-PS01 P48-6 AND CU-P1J1-2 (THERMAL CONNECTOR BETWEEN TCU AND TAPE TRANSPORT UNIT)

DOES THE METER INDICATE CONTINUITY?
Y N

009
LEAVE METER CONNECTED
GO TO PAGE 5, STEP 025,
ENTRY POINT F.

010

MEASURE FOR CONTINUITY BETWEEN CU-PS01 P48-2 AND CU-P1J1-1 (THERMAL CONNECTOR BETWEEN TCU AND TAPE TRANSPORT UNIT)

REFERENCE LOC 1 AND PWR 36.

DOES THE METER INDICATE CONTINUITY?
Y N

011

GO TO PAGE 9, STEP 052,
ENTRY POINT G.

012

GO TO PAGE 10, STEP 057,
ENTRY POINT H.

A
1

013

CHECK FOR CONTINUITY FROM CU-PS-01 P48-7 TO P48-8 (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

014

THE TAPE CONTROL UNIT POWER ON SWITCH (FR142) IS FAILING (LOC-1).

---OR---

THERE IS AN OPEN WIRE FROM CU-PS-01 P48-7 TO CU-L/R P2-9 (LOC-1).

---OR---

THERE IS AN OPEN WIRE FROM CU-L/R P2-9 TO CU-OP P5-6 (LOC 1).

---OR---

THERE IS AN OPEN WIRE FROM CU-OP P5-4 TO CU-PS-01 P48-8 (LOC-1).

DISCONNECT CABLE FROM CU-OP J5

CONTINUITY CHECK FROM CU-OP J5-6 TO J5-4.

DOES THE METER INDICATE CONTINUITY?
Y N

4 4 4
E F G

MAP 0110 – Power On (Local Mode)

E F G
3 3 3

POWER ON, LOCAL MODE

PAGE 4 OF 13

015

EXCHANGE CU-OP PANEL FRU142. SEE CARR-TCU 1420.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

016

REPAIR OPEN IN THE CABLE.
GO TO MAP 190, ENTRY POINT A.

017

OBSERVE THE CORRECT POLARITY IN THE
FOLLOWING MEASUREMENT.

CHECK FOR CONTINUITY FROM
CU-PS-01 P48-4 (-) TO P48-8 (+).

DOES THE METER INDICATE CONTINUITY?
Y N

018

THE POWER ON LED IS FAILING.

----OR----

THERE IS AN OPEN WIRE FROM
CU-PS-01 P48-4 TO CU-OP P5-2.

019

THE TAPE CONTROL UNIT AC SUPPLY,
CU-PS-01,IS FAILING (LOC-1).

THE 24V PICK CIRCUIT IS OK BUT THE
POWER ON LED WILL NOT TURN ON.
THIS MUST BE A FAILURE INTERNAL TO
THE AC SUPPLY.

SEE DETAILED DIAGRAM ON PWR 36.

020
(ENTRY POINT E)
THE FAILURE IS IN THE TAPE
TRANSPORT UNIT.

CONTINUITY CHECK ACROSS THE THERMAL
SWITCH AT THE SWITCH.

DO YOU READ CONTINUITY ACROSS THE
THERMAL SWITCH?
Y N

021

RESET THE OPEN THERMAL SWITCH.

DOES THE THERMAL SWITCH NOW
INDICATE CONTINUITY?
Y N

022

THE THERMAL SWITCH S2 (FRU082)
IS FAILING (LOC-1).

EXCHANGE THE THERMAL SWITCH .
GO TO MAP 0190, ENTRY POINT A.

023

RECONNECT THE CABLE THE THERMAL WAS TRIPPED.
CU-PS-01 P48.

SET CU-PS-01 CB1 TO THE ON
POSITION (LOC-1).

PRESS AND HOLD THE LOCAL POWER
ENABLE SWITCH FOR SEVERAL SECONDS
(LOC-1).
(Step 023 continues)

5
H

MAP 0110 – Power On (Local Mode)

H POWER ON, LOCAL MODE
4

PAGE 5 OF 13

(Step 023 continued)

THE TAPE CONTROL UNIT POWER ON
LED SHOULD NOW BE ON.
IF IT IS NOT ON, GO TO MAP 0100
E.P.A.

CHECK FOR ANY OBSTRUCTION TO THE
AIR FLOW.
REFER TO THE CE/HSC SECTION OF
THE MG AND RUN GMP.

024

REPAIR THE CABLE BETWEEN THERMAL
CONNECTOR J1 AND P1.
GO TO MAP 0190, ENTRY POINT A.

025
(ENTRY POINT F)
CHECK FOR POPPED THERMALS
ON THE TCU GATE AND THE STI GATE.

RESET THE TAPE CONTROL UNIT GATE
LOWER THERMAL (LOC-1).

THE THERMALS HAVE A RESET PLUNGER
LOCATED IN THE CENTER OF THE
SWITCH.

DOES THE METER INDICATE CONTINUITY?
Y N

026
RESET THE STI GATE LOWER THERMAL.

DOES THE METER INDICATE
CONTINUITY?
Y N

027

CHECK CIRCUIT FROM PS THRU OSU
BOARD.

DISCONNECT THE CABLE CU-OSU P6
(LOC-1).

CHECK FOR CONTINUITY FROM
CU-OSU J6-2 TO PS01 P4B-6.

DOES THE METER INDICATE
CONTINUITY?
Y N

8 7 6 6
J K L M

MAP 0110 – Power On (Local Mode)

M POWER ON, LOCAL MODE
5

PAGE 6 OF 13

028

ISOLATE TO CABLE OR BOARD.

DISCONNECT THE CABLE CU-OSU P4
(LOC-1).

CHECK FOR CONTINUITY FROM
CU-OSU J6-2 TO J4-4 (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

029

THERE IS AN OPEN LAND
PATTERN ON THE CU-OSU
OR IN P5 JUMPER PLUG.
IS THE P5 JUMPER PLUG ON THE OSU
BOARD OPEN OR MISSING?
Y N

030

EXCHANGE FRU141. SEE CARR-TCU 1-1.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

031

INSTALL OR REPAIR P5 JUMPER PLUG.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

N

L N
5

032

THERE IS AN OPEN WIRE FROM
CU-P5-01 P48-6 TO CU-OSU P4-4
(LOC-1).

REPAIR OPEN IN CABLE.
GO TO MAP 190, ENTRY POINT A.

033

DISCONNECT THE CABLE CU-OSU P3
(LOC-1).

CHECK FOR CONTINUITY FROM
CU-OSU J6-1 TO J3-1 (LOC-1), AND
CU-OSU J3-2 TO J4-5 (LOC-1).

DOES METER INDICATE CONTINUITY FOR
BOTH CIRCUITS?
Y N

034

EXCHANGE FRU141. SEE CARR-TCU 1-1.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

035

CHECK FOR CONTINUITY FROM
CU-OSU P6-1 TO P6-2 (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

7 7
P Q

MAP 0110 – Power On (Local Mode) PWR 110-7

```
Q          POWER ON, LOCAL MODE
6

|
|          PAGE   7 OF  13
|
036

THERE IS AN OPEN WIRE FROM              SEE PWR 36
CU-OSU J6-1 TO STI GATE LOWER
THERMAL.

---OR---

THE STI GATE LOWER THERMAL IS
FAILING.

CONTINUITY CHECK THE LOWER STI GATE
THERMAL SWITCH.

DOES THE METER INDICATE CONTINUITY?
Y N
| 037
|
| EXCHANGE THE STI GATE LOWER
| THERMAL SWITCH.
| GO TO PAGE 13, STEP 072,
| ENTRY POINT C.
|
038

REPAIR OPEN IN CABLE
GO TO MAP 190, ENTRY POINT A.
```

```
K P
5 6

| |
| |
| |
039

THERE IS AN OPEN WIRE FROM              SEE PWR 36.
CU-OSU P3-1 TO TAPE CONTROL UNIT
GATE LOWER THERMAL (LOC-1)

---OR---

A TAPE CONTROL UNIT GATE THERMAL
(FRU143) IS FAILING (LOC-1).

CONTINUITY CHECK THE LOWER GATE
THERMAL SWITCH.

DOES THE METER INDICATE
CONTINUITY?
Y N
| 040
|
| EXCHANGE FRU143.                      SEE CARR-TCU 1.
| GO TO PAGE 13, STEP 072,
| ENTRY POINT C.
|
041

REPAIR OPEN IN CABLE.
GO TO MAP 190, ENTRY POINT A.

042
RESETTING THERMAL CLEARED PROBLEM
RECONNECT ALL CABLES ON THE CU-OSU
BOARD.
GO TO PAGE 8, STEP 043,
ENTRY POINT J.
```

J POWER ON, LOCAL MODE
5

PAGE 8 OF 13

043
(ENTRY POINT J)
RECONNECT THE CABLE
CU-PS-01 P48.

PRESS AND HOLD THE LOCAL POWER
ENABLE SWITCH UNTIL POWER IS ON
(LOC-1).

CHECK THE TAPE CONTROL UNIT GATE
AND STI GATE FANS FOR PROPER
OPERATION (LOC-1).

ARE THE CU GATE FANS OPERATING
CORRECTLY?
Y N

044

ARE BOTH FANS FAILING?
Y N

045

THE TAPE CONTROL UNIT GATE FAN
IS FAILING.

EXCHANGE FRU150 SEE CARR-TCU 1-1.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

R S

R S

046

SET THE TAPE CONTROL UNIT POWER
ON/OFF SWITCH TO THE OFF POSITION
(LOC-1).

ON THE AC SUPPLY, SET CIRCUIT
BREAKER CU-PS-01 CB1 TO THE OFF
POSITION (LOC-1).

THERE IS AN OPEN WIRE FROM
CU1A P1-1 TO CU-PS-02 P3-1
(YF005)(LOC-1).

---OR---

THERE IS AN OPEN WIRE FROM
CU1A P1-3 TO CU-PS-02 P3-3
(LOC-1).

REPAIR OPEN IN CABLE.
GO TO MAP 190, ENTRY POINT A.

047

ARE THE STI GATE FANS OPERATING
CORRECTLY?
Y N

048

ARE BOTH FANS FAILING?
Y N

T U V

T U V

049

STI GATE FAN IS FAILING.

EXCHANGE DEFECTIVE FAN.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

050

REPAIR OPEN IN CABLE.
GO TO MAP 190, ENTRY POINT A.

051

CHECK FOR ANY OBSTRUCTION
TO THE AIR FLOW.

REFER TO THE CE/HSC SECTION OF THE
MG AND RUN GMP.

POWER ON, LOCAL MODE

PAGE 9 OF 13

052
(ENTRY POINT G)
CHECK THE UNIT EMERGENCY POWER
SWITCH FOR CONTINUITY (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

053

THE UNIT EMERGENCY POWER SWITCH (FRU198) IS FAILING.

EXCHANGE FRU198)
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

SEE DETAILED DIAGRAM ON PWR 36.

SEE CARR-TCU 1-1.

054

DISCONNECT THE CABLE
CU-OSU P4 (LOC-1).

DISCONNECT THE CABLE
CU-OSU P3 (LOC-1).

CHECK FOR CONTINUITY FROM
CU-OSU J4-5 TO CU-OSU J3-2 (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

W X

055

THERE IS AN OPEN LAND PATTERN ON THE CU-OSU BETWEEN J4-5 AND J3-2.

EXCHANGE FRU141.
GO TO PAGE 13, STEP 072,
ENTRY POINT C.

SEE DETAILED DIAGRAM ON PWR 36.

SEE CARR-TCU 1-1.

056

THERE IS AN OPEN WIRE FROM THE UNIT EMERGENCY POWER SWITCH TAB 2 TO CU-OSU P4-5 (LOC-1).

---OR---

THERE IS AN OPEN WIRE FROM CU-OSU P3-2 TO CU-P1 J1-1 (LOC-1).

REPAIR OPEN IN THE CABLE.
GO TO MAP 198, ENTRY POINT A.

SEE DETAILED DIAGRAM ON PWR 36.

POWER ON, LOCAL MODE

PAGE 10 OF 13

057
(ENTRY POINT H)
PRESS AND HOLD THE LOCAL POWER
ENABLE SWITCH WHILE MAKING THE
FOLLOWING MEASUREMENT (LOC-1).

CHECK FOR CONTINUITY FROM
CU-PS-01 P4B-1 TO THE UNIT
EMERGENCY POWER SWITCH TAB 1
(LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

058

DISCONNECT THE CABLE
CU-OSU P4 (LOC-1).

PRESS AND HOLD THE LOCAL POWER
ENABLE SWITCH WHILE MAKING THE
FOLLOWING MEASUREMENT (LOC-1).

CHECK FOR CONTINUITY FROM
CU-OSU J4-1 TO J4-2 (LOC-1).

DOES THE METER INDICATE
CONTINUITY?
Y N

059

THE LOCAL POWER ENABLE SWITCH — SEE DETAILED DIAGRAM ON PWR 36.
IS FAILING (LOC-1).

EXCHANGE FRU141. — SEE CARR-TCU 1-1.
GO TO PAGE 12, STEP 071,
ENTRY POINT B.

1
1
Y Z

Z

060

RECONNECT THE CABLE
CU-OSU P4 (LOC-1).

DISCONNECT THE CABLE
CU-L/R P1 (LOC-1).

DISCONNECT THE CABLE
CU-L/R P2 (LOC-1).

CHECK FOR CONTINUITY FROM
CU-L/R J2-8 TO CU-L/R J1-2 (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

061

THE LOCAL REMOTE SWITCH (FRU084) — SEE DETAILED DIAGRAM ON PWR 36.
IS FAILING (LOC-1).

EXCHANGE FRU084 — SEE CARR-TCU 1-1.
GO TO PAGE 12, STEP 071,
ENTRY POINT B.

062

THERE IS AN OPEN WIRE FROM — SEE DETAILED DIAGRAM ON PWR 36.
CU-PS-01 P4B-1 TO CU-OSU P4-1
(LOC-1)

---OR---

THERE IS AN OPEN WIRE FROM
CU-OSU P4-2 TO CU-L/R P2-8 (LOC-1).

---OR---

THERE IS AN OPEN WIRE FROM
(Step 062 continues)

MAP 0110 – Power On (Local Mode)

Y POWER ON, LOCAL MODE
1
0

PAGE 11 OF 13

(Step 062 continued)
CU-L/R P1-2 TO THE
UNIT EMERGENCY POWER SWITCH TAB 1
(LOC-1).

REPAIR OPEN IN THE CABLE.
GO TO MAP 190, ENTRY POINT A.

063

THE PROBLEM HAS DISAPPEARED.

REFER TO THE CE/HSC SECTION OF THE
MG AND RUN GMP.

---OR---

IF AN INTERMITTENT PROBLEM IS
SUSPECTED, SEE DETAILED DIAGRAM ON
PWR 36.

064
(ENTRY POINT D)

(THE +24V HOLD CIRCUIT IS FAILING
IN LOCAL MODE.)

ON THE AC SUPPLY, SET CIRCUIT
BREAKER CU-PS-01 CB1 TO THE OFF
POSITION (LOC-1).

DISCONNECT THE CABLE
CU-PS-01 P48 (LOC-1).

CHECK FOR CONTINUITY FROM
CU-PS-01 P48-7 TO P48-10.
(THE P CONNECTOR IS ON THE CABLE).

DOES THE METER INDICATE CONTINUITY?
Y N

065

DISCONNECT THE CABLE
CU-L/R P2 (LOC-1).

DISCONNECT THE CABLE
CU-L/R P1 (LOC-1).

CHECK FOR CONTINUITY FROM
CU-L/R J2-9 TO J1-6 (LOC-1).

DOES THE METER INDICATE
CONTINUITY?
Y N

066

THE LOCAL REMOTE SWITCH IS
FAILING (LOC-1).

THE K2 HOLD CIRCUIT IS OPEN.

SEE DETAILED DIAGRAM ON PWR 36.

1 1
2 2
A A
A B

MAP 0110 – Power On (Local Mode)

A A POWER ON, LOCAL MODE
A B
1 1
1 1

PAGE 12 OF 13

067

THERE IS AN OPEN WIRE FROM CU-L/R P1-6 TO CU-PS-01 P48-10 (LOC-1).

THE K2 HOLD CIRCUIT IS OPEN.

SEE DETAILED DIAGRAM ON PWR 36.

058

CHECK FOR CONTINUITY FROM CU-PS-01 P48-2 TO UNIT EMERGENCY POWER SWITCH TAB 1 (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

069

THERE IS AN OPEN WIRE FROM CU-PS-01 P48-2 TO UNIT EMERGENCY POWER SWITCH TAB 1 (LOC-1).

THE K2 HOLD CIRCUIT IS OPEN.

SEE DETAILED DIAGRAM ON PWR 36.

070

THE TAPE CONTROL UNIT AC SUPPLY,CU-PS-01,IS FAILING (LOC-1).

THE +24V LOCAL HOLD CIRCUIT (K2 HOLD) IS OK, BUT THE POWER ON LED WILL NOT STAY ON. THIS MUST BE A FAILURE INTERNAL TO THE AC SUPPLY.

SEE DETAILED DIAGRAM ON PWR 36.

071
(ENTRY POINT B)
SET THE DRIVE ONLINE/OFFLINE SWITCH TO ONLINE.

REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

MAP 0110 – Power On (Local Mode)

POWER ON, LOCAL MODE

PAGE 13 OF 13

072
(ENTRY POINT C)
PREPARE TO EXIT AFTER FRU EXCHANGE.
OBSERVE THE TAPE CONTROL UNIT POWER ON LED.
IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

SEE LOC 1.

073
TAPE CONTROL UNIT AC POWER NOT ON.
GO TO MAP 0100, ENTRY POINT A.

074
OBSERVE THE TAPE CONTROL UNIT DC POWER LED.
IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

SEE LOC 1.

075
TAPE CONTROL UNIT DC POWER NOT ON.
GO TO MAP 0100, ENTRY POINT A.

076

REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

POWER ON, REMOTE MODE

PAGE 1 OF 3

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	B	2	004
0100	D	3	009

001
(ENTRY POINT A)

(THE REMOTE POWER PICK CIRCUIT IS FAILING.)

MAP DESCRIPTION: MAP 0100 SENT YOU HERE WHEN THE TAPE CONTROL UNIT CANNOT POWER UP IN REMOTE MODE.

START CONDITIONS:
-POWER ON LED IS OFF
-LOCAL REMOTE SW SET TO REMOTE
-UNIT EMERGENCY POWER SW SET TO ON
-TAPE CONTROL UNIT POWERS ON OK IN LOCAL.

FRUS DIAGNOSED:
-TAPE CONTROL UNIT AC SUPPLY CU-PS-01
-UNIT EMERGENCY POWER SW
-LOCAL REMOTE SW.

ADDITIONAL SERVICE AIDS:
-TAPE CONTROL UNIT AC POWER DISTRIBUTION DIAGRAM ON PWR 32
-TAPE CONTROL UNIT AC POWER ON-REMOTE MODE DIAGRAM ON PWR 38.

(Step 001 continues)

(Step 001 continued)

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC-1).

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

DISCONNECT THE CABLE CU-PS01-P4B. — SEE LOC 1

CHECK FOR CONTINUITY FROM P4B-3 TO P4B-2. — THE P CONNECTOR IS ON THE CABLE.

DOES THE METER INDICATE CONTINUITY?
Y N

Y → 002

THE LOCAL REMOTE SWITCH IS FAILING.

--------OR--------

THERE IS AN OPEN WIRE FROM CU-PS01-P4B-3 TO P4B-2.

N → 003

THE TAPE CONTROL UNIT AC POWER SUPPLY (PS01) IS FAILING.

THE K2 PICK CIRCUIT WHICH IS UNIQUE TO THE REMOTE MODE IS OK. SINCE THE LOCAL PICK AND HOLD AND THE REMOTE HOLD CHECKED OUT OK, THE FAILURE MUST BE INTERNAL TO THE AC POWER SUPPLY.

SEE DETAILED DIAGRAM ON PWR38.

MAP 0120 – Power On (Remote Mode) PWR 120-2

POWER ON, REMOTE MODE

PAGE 2 OF 3

004
(ENTRY POINT 8)
THE REMOTE HOLD CIRCUIT FAILED
USING A JUMPER.

ON THE AC POWER SUPPLY, SET CIRCUIT BREAKER CU-PS01-CB1 TO THE OFF POSITION.

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

DISCONNECT CABLE CU-PS01-P48.

CHECK FOR CONTINUITY FROM CU-PS01-P48-1 TO CU-PS01-P48-5.

THE P CONNECTOR IS ON THE CABLE.

DOES THE METER INDICATE CONTINUITY?
Y N

005

THE LOCAL REMOTE SWITCH IS FAILING.

---OR---

THERE IS AN OPEN WIRE FROM CU-PS01-P48-1 TO CU-L/R P1-1.
--------OR--------
THERE IS AN OPEN WIRE FROM CU-L/R P1-4 TO CU-PS01-P48-5.

THE K2 REMOTE HOLD CIRCUIT IS OPEN.

SEE DETAILED DIAGRAM ON PWR 38.

A

A

006

CHECK FOR CONTINUITY FROM CU-PS01-P48-9 TO CU-PS01-P48-10.

DOES THE METER INDICATE CONTINUITY?
Y N

007

THE LOCAL REMOTE SWITCH IS FAILING.

--------OR--------

THERE IS AN OPEN WIRE FROM CU-PS01-P48-9 TO CU-L/R P1-5.

THE K2 REMOTE HOLD CIRCUIT IS OPEN.

SEE DETAILED DIAGRAM ON PWR 38.

008

THE TAPE CONTROL UNIT AC POWER SUPPLY (PS01) IS FAILING.

THE K2 PICK CIRCUIT WHICH IS UNIQUE TO THE REMOTE MODE IS OK. SINCE THE LOCAL PICK AND HOLD AND THE REMOTE HOLD CHECKED OUT OK, THE FAILURE MUST BE INTERNAL TO THE AC POWER SUPPLY.

SEE DETAILED DIAGRAM ON PWR38.

POWER ON, REMOTE MODE

PAGE 3 OF 3

009
(ENTRY POINT D)
THE REMOTE HOLD CIRCUIT FAILED WITH THE EPO CABLE INSTALLED.

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

DISCONNECT CABLE CU-PS01-P5 (IF INSTALLED). — SEE LOC-1.

CAUTION

+24 V DC IS PRESENT.

INSTALL A JUMPER FROM CU-PS01-J5-1 TO CU-PS01-J5-5. — JUMPERS 24 V DC TO THE REMOTE HOLD CIRCUIT.

SET THE TAPE CONTROL UNIT POWER ON SWITCH TO THE ON POSITION. — POWER ON AGAIN IN THE LOCAL MODE.

SET THE LOCAL-REMOTE SWITCH TO THE LOCAL POSITION.

PRESS THE LOCAL POWER ENABLE SWITCH UNTIL POWER IS ON.

NOW SET THE LOCAL-REMOTE SWITCH TO REMOTE. — NOW CHECK THE REMOTE HOLD CIRCUITS.

OBSERVE THE TAPE CONTROL UNIT POWER ON LED.

IS THE TAPE CONTROL UNIT POWER ON LED ON?
Y N

B C

8 C

010
THE EPO CABLE IS FAILING

--------OR--------

THERE IS A SYSTEM PROBLEM.

CONTACT THE SYSTEM FE.

THE REMOTE HOLD CIRCUITS CHECK OK WHEN +24 V DC IS JUMPERED TO THE CIRCUIT.

011
THE REMOTE HOLD CIRCUIT FAILS WITH +24 V DC JUMPERED TO IT.
GO TO PAGE 2, STEP 004,
ENTRY POINT B.

+24 V DC CONTROL VOLTAGE

PAGE 1 OF 9

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	B	5	021
0100	C	3	012
0100	D	4	015
0100	E	4	018
9999	F	9	046

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
1	002	0190	A
3	013	0190	A
4	016	0190	A
4	019	0190	A
2	009	0190	A
5	022	0190	A
9	046	0190	A

001

(ENTRY POINT A)

(THE +24 V DC CONTROL VOLTAGE IS MISSING).

DANGER

LETHAL VOLTAGES ARE PRESENT IN THE POWER SERVICING AREA.
SAFETY IS MOST IMPORTANT. TREAT ALL CIRCUITS AS LIVE UNTIL MEASURED.

CAPACITORS ARE POSSIBLE EXPLODING DEVICES. WEAR SAFETY GLASSES WHEN WORKING IN THE POWER AREA.

ALWAYS REINSTALL ALL SAFETY COVERS BEFORE POWERING ON THE MACHINE.
(Step 001 continues)

MAP DESCRIPTION: MAP 0100 DIRECTED YOU HERE BECAUSE OF PROBLEMS IN THE +24 V DC CONTROL VOLTAGE CIRCUIT.

START CONDITIONS:
-POWER ON LED IS OFF.

FRUS DIAGNOSED:
-AC POWER SUPPLY, CU-PS-01
-DC POWER SUPPLY, CU-PS-02
-AC POWER SUPPLY VOLTAGE TAP PLUG
-AC POWER SUPPLY FUSE F1
-AC LINE CORD.

ADDITIONAL SERVICE AIDS:
-TAPE CONTROL UNIT AC POWER DISTRIBUTION DIAGRAM ON PWR 32
-+24 V CONTROL VOLTAGE DIAGRAM ON PWR 40.

(Step 001 continued)

IS THE LINE CORD CONNECTED TO CUSTOMER AC POWER?
Y N

002

DANGER

PERFORM FE POWER SAFETY CHECK FOUND ON INST 6 BEFORE CONNECTING LINE CORD.

CONNECT THE LINE CORD TO CUSTOMER AC POWER.
GO TO MAP 0190, ENTRY POINT A.

003

A VOLTAGE TAP PLUG MUST BE USED TO SELECT THE PROPER OUTPUT BASED ON THE INPUT AC VOLTAGE.
SEE CHART ON RIGHT.---->

TCU INPUT AC	PLUG LOCATION ON CU-PS-01 (USE 60HZ FOR JAPAN	
	60HZ	50HZ
200/200 V AC	J9	J11 AND J13
220 V AC	J10	J11 AND J14
230/240 V AC	J11	J11 AND J15
380 V AC		J12 AND J14
400/415 V AC		J12 AND J15

IS THE VOLTAGE TAP PLUG MISSING?
Y N

3 2
A B

B
1

+24 V DC CONTROL VOLTAGE

PAGE 2 OF 9

004

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

REMOVE THE VOLTAGE TAP PLUG FROM THE TAPE CONTROL UNIT AC POWER SUPPLY.

CONTINUITY CHECK THE VOLTAGE TAP PLUG.

CONTINUITY GOOD TO ALL POINTS?
Y N

005

REPAIR THE OPEN IN THE VOLTAGE TAP PLUG.

WHEN THE PROBLEM IS CORRECTED GO TO PAGE 9, STEP 046, ENTRY POINT F.

006

DANGER

180 TO 450 V AC IS PRESENT.

REMOVE THE AC INPUT FILTER COVER FROM THE TAPE CONTROL UNIT AC POWER SUPPLY (LOC-1). — SEE CARR-TCU 1440.

METER THE AC VOLTAGE AT THE INPUT FILTERS OF THE TAPE CONTROL UNIT AC POWER SUPPLY. — SEE VOLTAGE TOLERANCE TABLES ON PWR20.
(Step 006 continues)

(Step 006 continued)

IS CORRECT AC VOLTAGE PRESENT AT ALL POINTS?
Y N

007

DANGER

METER AC VOLTAGE AT THE CUSTOMER OUTLET.

IS CORRECT AC VOLTAGE PRESENT AT ALL POINTS?
Y N

008

INFORM CUSTOMER THAT AC POWER IS NOT AVAILABLE

009

DANGER

THE AC LINE CORD IS FAILING.

PERFORM FE SAFETY CHECK FOUND ON INSP 15 BEFORE REMOVING THE AC LINE CORD.

EXCHANGE LINECORD (FRU149) — SEE CARR-TCU 1490.
GO TO MAP 0150, ENTRY POINT A.

3
C

A C
1 2

+24 V DC CONTROL VOLTAGE

PAGE 3 OF 9

010

THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE THE AC POWER SUPPLY FRU144.

SEE CARR-TCU 1440.

011

INSTALL THE VOLTAGE TAP PLUG AT PROPER LOCATION.
SEE CHART ON RIGHT.----->

TCU INPUT AC	PLUG LOCATION ON CU-PS-01 (USE 60HZ FOR JAPAN	
	60HZ	50HZ
200/208 V AC	J9	J11 AND J13
220 V AC	J10	J11 AND J14
230/240 V AC	J11	J11 AND J15
380 V AC		J12 AND J14
400/415 V AC		J12 AND J15

WHEN THE PROBLEM IS CORRECTED
GO TO PAGE 9, STEP 040,
ENTRY POINT F.

012

(ENTRY POINT C)

RESET CU-PS-01 CB1 (LOC 1).

DID CB1 TRIP AGAIN?
Y N

013

GO TO MAP 0190, ENTRY POINT A.

014

THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE THE AC POWER SUPPLY FRU144.
GO TO PAGE 9, STEP 040,
ENTRY POINT F.

SEE CARR-TCU 1440.

+24 V DC CONTROL VOLTAGE

PAGE 4 OF 9

015

(ENTRY POINT D)

(CB2 ON A 60HZ OR 50HZ JAPAN
MACHINE IS TRIPPING).

RESET CU-PS-01 CB2.

DID CB2 TRIP AGAIN?
Y N
| 016
| GO TO MAP 0190, ENTRY POINT A.
017

THE TAPE CONTROL UNIT AC POWER
SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE THE AC POWER SUPPLY FRU144.
GO TO PAGE 9, STEP 046,
ENTRY POINT F.

SEE CARR-TCU 1440.

MAP 0130——+24 Volt Control Voltage

018

(ENTRY POINT E)

(CB3 ON A 50HZ MACHINE, EXCEPT
JAPAN, IS TRIPPING).

RESET CU-PS-01 CB3.

DID CB3 TRIP AGAIN?
Y N
| 019
| GO TO MAP 0190, ENTRY POINT A.
020

THE TAPE CONTROL UNIT AC POWER
SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE THE AC POWER SUPPLY FRU144.
GO TO PAGE 9, STEP 046,
ENTRY POINT F.

SEE CARR-TCU 1440.

MAP 0130——+24 Volt Control Voltage

+24 V DC CONTROL VOLTAGE

PAGE 5 OF 9

021

(ENTRY POINT B)

CU-PS-01 FUSE F1 IS BLC .

REPLACE CU-PS-01 FUSE F1. SEE LOC 1.

OBSERVE THE F1 FAILURE LED (LOC 1).

IS THE F1 FAILURE LED ON?
Y N

022

GO TO MAP 0190, ENTRY POINT A.

023

SET THE LOCAL REMOTE SWITCH TO THE LOCAL POSITION (LOC 1). FUSE F1 BLOWS AFTER BEING REPLACED.

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE ON POSITION (LOC 1).

DISCONNECT THE CABLE CU-PS-01 P48 (LOC-1).

CHECK FOR CONTINUITY FROM P48-1 TO FRAME GROUND (LOC-1).

DOES THE METER INDICATE CONTINUITY?
Y N

9
D E

E

024
CONNECT THE METER TO P48-2 AND FRAME GROUND.

CHECK FOR CONTINUITY FROM P48-2 TO FRAME GROUND.

DOES THE METER INDICATE CONTINUITY?
Y N

025

CHECK FOR CONTINUITY FROM P48-3 TO FRAME GROUND.

DOES THE METER INDICATE CONTINUITY?
Y N

026

CHECK FOR CONTINUITY FROM P48-5 TO FRAME GROUND.

DOES THE METER INDICATE CONTINUITY?
Y N

027

CHECK FOR CONTINUITY FROM P48-7 TO FRAME GROUND.

DOES THE METER INDICATE CONTINUITY?
Y N

7 7 7 7 6
F G H J K

K
5

+24 V DC CONTROL VOLTAGE

PAGE 6 OF 9

028

CHECK FOR CONTINUITY FROM
P48-9 TO FRAME GROUND.

DOES THE METER INDICATE CONTINUITY?
Y N

029

RECONNECT THE CABLE
CU-PS-01 P48.

DISCONNECT THE SYSTEM EPO CABLES (LOC-1).
SEE CHART ON RIGHT.---->

J5 FOR CPU 1.
J6 FOR CPU 2.
J7 FOR CPU 3.
J8 FOR CPU 4.

REPLACE CU-PS-01 FUSE F1.

IS THE F1 FAILURE LED ON?
Y N

030

PROBLEM IS IN THE SYSTEM EPO CIRCUITRY.

CALL THE SYSTEM FE TO ISOLATE THE PROBLEM.

WHEN THE PROBLEM IS CORRECTED
GO TO PAGE 9, STEP 046,
ENTRY POINT F.

7
L M

M

031

DISCONNECT THE CABLE
CU-PS-01 P3 (LOC-1).

EXCHANGE FUSE F1.

IS THE F1 FAILURE LED ON?
Y N

032

REMOVE CABLE CU-PS-02 P2 FOM THE DC POWER SUPPLY.

CHECK THE CABLE FOR PIN TO PIN SHORT CIRCUITS.

WERE ANY SHORT CIRCUITS FOUND IN THE CABLE?
Y N

033

THE DC POWER SUPPLY, CU-PS-02, IS FAILING.

EXCHANGE THE DC POWER SUPPLY FRU145.
GO TO PAGE 9, STEP 046,
ENTRY POINT F.

SEE CARR-TCU 1450.

034

REPAIR THE SHORT CIRCUIT IN THE CABLE.

WHEN THE PROBLEM IS CORRECTED
GO TO PAGE 9, STEP 046,
ENTRY POINT F.

7
N

J L N
5 6 6

+24 V DC CONTROL VOLTAGE

PAGE 7 OF 9

835

THE AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE THE AC POWER SUPPLY FRU144.
GO TO PAGE 9, STEP 846, ENTRY POINT F.

SEE CARR-TCU 1448.

835

THERE IS A SHORT CIRCUIT TO GROUND ON THE +24V NET.

ISOLATE THE SHORT CIRCUIT ON THE +24V NET.

NET:
-CU-PS-01 P48-9 TO
-CU-L/R P1-5.

SEE DETAILED DIAGRAM ON PWR 38.

837

THERE IS A SHORT CIRCUIT TO GROUND ON THE +24V NET.

ISOLATE THE SHORT CIRCUIT ON THE +24V NET.

NET:
-CU-PS-01 P48-7 TO
-CU-L/R P2-9 TO
-CU-OP P5-6.
OR
-CU-OP P5-4 TO
-CU-PS-01 P48-8.
OR
-CU-L/R P1-6 TO
-CU-PS-01 P48-10.

SEE DETAILED DIAGRAM ON PWR 36.

F G H
5 5 5

838

THERE IS A SHORT CIRCUIT TO GROUND ON THE +24V NET.

ISOLATE THE SHORT CIRCUIT ON THE +24V NET.

NET:
-CU-PS-01 P48-5 TO
-CU-L/R P1-4.

SEE DETAILED DIAGRAM ON PWR 38.

839

THERE IS A SHORT CIRCUIT TO GROUND ON THE +24V NET.

ISOLATE THE SHORT CIRCUIT ON THE +24V NET.

NET:
-CU-PS-01 P48-3 TO
-CU-L/R P1-3.

SEE DETAILED DIAGRAM ON PWR 38.

846

LEAVE THE METER CONNECTED TO P48-2 AND GROUND.

SET THE UNIT EMERGENCY POWER SWITCH TO OFF.

DOES THE METER INDICATE CONTINUITY?
Y N

8 8
P Q

MAP 0130——+24 Volt Control Voltage PWR 130-7

Q +24 V DC CONTROL VOLTAGE
7

PAGE 8 OF 9

041

LEAVE THE METER CONNECTED TO P48-2 AND GROUND.

IN THE LAST ATTACHED TAPE TRANSPORT UNIT, REMOVE THE JUMPER PLUG FROM TU-DX/X-P2 P1 (LOC-1).

SET THE UNIT EMERGENCY POWER SWITCH TO ON.

DOES THE METER INDICATE CONTINUITY?
Y N

042

CONNECT THE METER TO P48-6 AND FRAME GROUND WHILE ISOLATING THE SHORT CIRCUIT.

SEE DETAILED DIAGRAM ON PWR 36.

THE METER SHOULD BE INDICATING CONTINUITY.
(P48-6 IS THE OTHER END OF THE SHORTED NET).

ISOLATE THE SHORT CIRCUIT ON THE +24 V NET.

NET:
-CU-PS-01 P48-6 TO
-CU-CSU P4-4.
OR
-CU-CSU P3-1 TO
-CU GATE THERMAL LOWER TO
-CU-P1 P1-2 TO
-TU-D0/1 THERMAL SW S2 TO
-TU-D0/1-P2 P1-2 TO
-NEXT TAPE TRANSPORT UNIT, ETC.

CHECK PARTICULARLY FOR PINCHED
(Step 042 continues)

R

P R
7

(Step 042 continued)
THERMAL SW S2 CABLES BETWEEN THE TAPE TRANSPORT UNITS.

043

THERE IS A SHORT CIRCUIT TO GROUND ON THE +24 V NET.

SEE DETAILED DIAGRAM ON PWR 36.

ISOLATE THE SHORT CIRCUIT ON THE +24 V NET.

NET:
-UNIT EMERGENCY POWER SW TAB 2 TO
-CU-CSU P4-12.
OR
-CU-CSU P3-2 TO
-CU-P1 P1-1 TO
-TU-D0/1-P2 P1-1 TO
-NEXT TAPE TRANSPORT UNIT, ETC.

CHECK PARTICULARLY FOR PINCHED THERMAL SW S2 CABLES BETWEEN THE TAPE TRANSPORT UNITS.

044

THERE IS A SHORT CIRCUIT TO GROUND ON THE +24 V NET.

SEE DETAILED DIAGRAM ON PWR 36.

ISOLATE THE SHORT CIRCUIT ON THE +24 V NET.

NET:
-CU-CSU P4-2 TO
-CU-L/R P2-8.
OR
-CU-L/R P1-2 TO
-UNIT EMERGENCY POWER SW TAB 1 AND
-CU-PS-01 P48-2.

MAP 0130——+24 Volt Control Voltage

D
5 +24 V DC CONTROL VOLTAGE

PAGE 9 OF 9

045

THERE IS A SHORT CIRCUIT TO GROUND
ON THE +24 V NET.

SEE DETAILED DIAGRAM ON PWR 36.

ISOLATE THE SHORT CIRCUIT ON THE
+24 V NET.

NET:
-P48-1 TO
-CU-CSU P4-1.

046
(ENTRY POINT F)

CLEANUP AFTER REPAIR.

SET THE TAPE CONTROL UNIT POWER
ON/OFF SWITCH TO THE OFF POSITION
(LOC 1).

RECONNECT ANY CABLES REMOVED FOR
TROUBLESHOOTING.

REMOVE ANY JUMPERS USED FOR
TROUBLESHOOTING.
GO TO MAP 0190, ENTRY POINT A.

MAP 0150 – Convenience Outlet PWR 150-1

CONVENIENCE OUTLET

PAGE 1 OF 5

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	A	1	001
0100	A	1	001
0151	B	5	044

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
4	030	0100	A
1	005	0190	A
2	011	0190	A
2	017	0190	A

001
(ENTRY POINT A)

IMPORTANT! READ NOTE!

NOTE: 50-HZ MACHINES IN JAPAN USE THE SAME POWER SUPPLIES AS 60-HZ MACHINES. TAKE THE YES LEG BELOW.

MAP DESCRIPTION: THIS MAP IS USED TO ISOLATE FAILURES IN THE CONVENIENCE OUTLET CIRCUIT.

START CONDITIONS: THE TAPE CONTROL UNIT POWERS ON OK.

FRUS DIAGNOSED:
- AC POWER SUPPLY, CU-PS-01
- AC POWER SUPPLY VOLTAGE PLUG, P12.

ADDITIONAL SERVICE AIDS:
- TAPE CONTROL UNIT AC POWER DISTRIBUTION DIAGRAM ON PWR 32.
- +24 V CONTROL VOLTAGE DIAGRAM ON PWR 40.

IS THIS A 60-HZ TAPE CONTROL UNIT?
Y N

3
A B

B

002
OBSERVE CU-PS-01 CB2 (LOC 1). 50 HZ MACHINE (EXCEPT JAPAN)

IS CU-PS-01 CB2 TRIPPED?
Y N

003
MEASURE THE VOLTAGE AT THE CONVENIENCE OUTLET. 50 HZ MACHINE (EXCEPT JAPAN)

WAS APPROXIMATELY 210/240 VAC MEASURED AT THE OUTLET?
Y N

004
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO PAGE 5, STEP 044, ENTRY POINT B.

005
THE CONVENIENCE OUTLET IS OK.
GO TO MAP 0190, ENTRY POINT A.

006

IS ANYTHING PLUGGED INTO THE CONVENIENCE OUTLET?
Y N

007
RESET CB2

DID CB2 RESET WITHOUT TRIPPING AGAIN?
Y N

2 2 2
C D E

MAP 0150 – Convenience Outlet PWR 150-2

C D E
1 1 1

CONVENIENCE OUTLET

PAGE 2 OF 5

008
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

SEE CARR-TCU 1440.

009
MEASURE THE VOLTAGE AT THE CONVENIENCE OUTLET.

WAS APPROXIMATELY 220/240 VAC MEASURED AT THE OUTLET?
Y N

50 HZ MACHINE (EXCEPT JAPAN)

010
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

SEE CARR-TCU 1440.

011
RESETTING CB2 RESOLVED THE PROBLEM.
GO TO MAP 0190, ENTRY POINT A.

012
REMOVE ALL PLUGS CONNECTED TO THE OUTLETS.

RESET CB2.

DID CB2 RESET WITHOUT TRIPPING AGAIN?
Y N

F G

F G

013
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

SEE CARR-TCU 1440.

014
MEASURE THE VOLTAGE AT THE CONVENIENCE OUTLET.

WAS APPROXIMATELY 229/240 VAC MEASURED AT THE OUTLET?
Y N

50-HZ MACHINE (EXCEPT JAPAN)

015
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EACHANGE FRU144.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

SEE CARR-TCU 1440.

016
THE DEVICE(S) THAT WERE PLUGGED INTO THE OUTLET MAY HAVE BEEN THE CAUSE OF THE OVERLOAD CONDITION.

PLUG THE DEVICE(S) PREVIOUSLY CONNECTED BACK INTO THE OUTLET.

DID CB2 TRIP AGAIN?
Y N

017
RESETTING CB2 RESOLVED THE PROBLEM
GO TO MAP 0190, ENTRY POINT A.

3
H

MAP 0150 – Convenience Outlet PWR 150-3

A H CONVENIENCE OUTLET
1 2

PAGE 3 OF 5

018
THE OVERLOAD CONDITION IS BEING CAUSED BY ONE OF THE DEVICES THAT WAS PLUGGED INTO THE CONVENIENCE OUTLET.
GO TO PAGE 5, STEP 044, ENTRY POINT B.

019
60 HZ OR 50HZ JAPAN MACHINES
OBSERVE CU-PS-01 CB3 (LOC 1).

IS CU-PS-01 CB3 TRIPPED?
Y N

020
A VOLTAGE TAP PLUG MUST BE USED TO SELECT THE PROPER CONVENIENCE OUTLET VOLTAGE.
SEE CHART AT RIGHT.---->

AC OUTPUT *	PLUG LOCATION
100 VAC	PS1-J12
120 VAC	PS1-J13

IS THE VOLTAGE TAP PLUG INSTALLED AND IN THE PROPER POSITION?
Y N

021
SET CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

INSTALL THE VOLTAGE TAP PLUG ON THE TAPE CONTROL UNIT AC POWER SUPPLY (PS1).
SEE CHART AT RIGHT.---->

AC OUTPUT *	PLUG LOCATION
100 VAC	PS1-J12
120 VAC	PS1-J13

SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE ON POSITION (LOC 1)

MEASURE THE VOLTAGE AT THE CONVENIENCE OUTLET.
(Step 021 continues)

4 4
J K

(Step 021 continued)

DID THE OUTPUT OF THE CONVENIENCE OUTLET EQUAL THE DESIRED VOLTAGE? (APPROXIMATELY)
Y N

022
SET CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

REMOVE THE VOLTAGE TAP PLUG FROM THE TAPE CONTROL UNIT AC POWER SUPPLY (PS1).
SEE CHART AT RIGHT.---->

AC OUTPUT *	PLUG LOCATION
100 VAC	PS1-J12
120 VAC	PS1-J13

CONTINUITY CHECK THE VOLTAGE TAP PLUG.

CONTINUITY GOOD?
Y N

023
REPAIR THE OPEN ON THE PLUG.
GO TO PAGE 5, STEP 044, ENTRY POINT B.

024
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO PAGE 5, STEP 044, ENTRY POINT B.

025
PLUGGING THE VOLTAGE TAP PLUG FIXED THE PROBLEM.
GO TO PAGE 5, STEP 044, ENTRY POINT B.

K CONVENIENCE OUTLET
3

PAGE 4 OF 5

026

MEASURE THE VOLTAGE AT THE
CONVENIENCE OUTLET.

DID THE OUTPUT OF THE CONVENIENCE
OUTLET EQUAL THE DESIRED VOLTAGE?
(APPROXIMATELY)
Y N

027

SET CU-PS-01 CB1 TO THE OFF
POSITION (LOC 1).

REMOVE THE VOLTAGE TAP PLUG FROM
THE TAPE CONTROL UNIT AC POWER
SUPPLY (PS1).
SEE CHART AT RIGHT.---->

AC OUTPUT	PLUG LOCATION
100 VAC	PS1-J12
120 VAC	PS1-J13

CONTINUITY CHECK THE VOLTAGE TAP
PLUG.

CONTINUITY GOOD?
Y N

028
REPAIR THE OPEN ON THE PLUG.
WHEN THE PROBLEM IS CORRECTED,
GO TO THE CLEANUP MAP.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

029
THE TAPE CONTROL UNIT AC POWER
SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

L

J L
3

030
THE CONVENIENCE OUTLET IS OK.
GO TO MAP 0100, ENTRY POINT A.

031

IS ANYTHING PLUGGED INTO THE
CONVENIENCE OUTLET?
Y N

032
RESET CB3

DID CB3 RESET WITHOUT TRIPPING
AGAIN?
Y N

033
THE TAPE CONTROL UNIT AC POWER
SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

034
MEASURE THE VOLTAGE AT THE
CONVENIENCE OUTLET.

WAS APPROXIMATELY 120 VAC
MEASURED AT THE OUTLET?
Y N

035
THE TAPE CONTROL UNIT AC POWER
SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO PAGE 5, STEP 044,
ENTRY POINT B.

5 5
M N

MAP 0150 – Convenience Outlet PWR 150-5

N N
4 4 CONVENIENCE OUTLET

PAGE 5 OF 5

036
RESETTING CB3 RESOLVED THE PROBLEM
GO TO STEP 044,
ENTRY POINT B.

037
REMOVE ALL PLUGS CONNECTED TO THE OUTLETS.

RESET CB3.

DID CB3 RESET WITHOUT TRIPPING AGAIN?
Y N

038
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO STEP 044,
ENTRY POINT B.

039
MEASURE THE VOLTAGE AT THE CONVENIENCE OUTLET.

WAS APPROXIMATELY 120 VAC MEASURED AT THE OUTLET?
Y N

040
THE TAPE CONTROL UNIT AC POWER SUPPLY, CU-PS-01, IS FAILING.

EXCHANGE FRU144 SEE CARR-TCU 1440.
GO TO STEP 044,
ENTRY POINT B.

P

P

041
THE DEVICE(S) THAT WERE PLUGGED INTO THE OUTLET MAY HAVE BEEN THE CAUSE OF THE OVERLOAD CONDITION.

PLUG THE DEVICE(S) PREVIOUSLY CONNECTED BACK INTO THE OUTLET.

DID CB3 TRIP AGAIN?
Y N

042
RESETTING CB3 RESOLVED THE PROBLEM
GO TO STEP 044,
ENTRY POINT B.

043
THE OVERLOAD CONDITION IS BEING CAUSED BY ONE OF THE DEVICES THAT WAS PLUGGED INTO THE CONVENIENCE OUTLET.
GO TO STEP 044,
ENTRY POINT B.

044
(ENTRY POINT B)
CONVENIENCE OUTLET PROBLEM RESOLVED.

REPLACE ALL COVERS REMOVED

PERFORM END OF CALL DUTIES.

POWER RESTART

PAGE 1 OF 1

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0120	A	1	001
0400	A	1	001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
1	006	0100	A
1	007	0100	A
1	004	0400	A

001
(ENTRY POINT A)
SET THE LOCAL-REMOTE SWITCH TO THE LOCAL POSITION.

SEE LOC-1

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE ON POSITION.

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH.

IS THE TAPE CONTROL UNIT POWER ON LED OFF?
Y N

002

RELEASE THE LOCAL POWER ENABLE SWITCH.

OBSERVE THE TAPE CONTROL UNIT POWER ON LED.
IS THE TAPE CONTROL UNIT POWER ON LED OFF?
Y N

A B C

A B C

003

OBSERVE THE TAPE CONTROL UNIT DC POWER ON LED.
IS THE TAPE CONTROL UNIT DC POWER ON LED ON?
Y N

004
CHECK TAPE CONTROL UNIT DC POWER.
GO TO MAP 0400, ENTRY POINT A.

005
THE TAPE CONTROL UNIT POWER SEEMS TO BE GOOD.
GO TO THE CE/HSC SECTION OF THE MG AND RUN GMP

006
LOCAL HOLD PROBLEM.
GO TO MAP 0100, ENTRY POINT A.

007
LOCAL PICK PROBLEM.
GO TO MAP 0100, ENTRY POINT A.

MAP 0190 – Power Restart PWR 190-1

SINGLE DRIVE POWER ANALYSIS

PAGE 1 OF 5

ENTRY POINTS

FROM MAP NUMBER	ENTER THIS MAP: ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0201	B	2	016
0202	C	4	032
0203	D	5	033

001
(ENTRY POINT A)
THE PROBLEM HAS BEEN ISOLATED TO A SINGLE DRIVE FAILURE. EITHER THE DRIVE WILL NOT POWER DOWN WITH THE DRIVE POWER SWITCH SET TO OFF, OR ONE OR MORE VOLTAGES ARE MISSING AS VERIFIED BY METERING AT THE POWER SUPPLY TEST TOOL JACK.

ASSISTANCE MAY BE REQUIRED TO PERFORM SOME OF THE PROCEDURES FOUND IN THIS MAP.

DANGER
LETHAL VOLTAGES ARE PRESENT IN THE POWER SERVICE AREA. SAFETY IS MOST IMPORTANT. TREAT ALL CIRCUITS AS LIVE UNTIL MEASURED.
BECAUSE THIS FAILURE HAS BEEN IDENTIFIED AS A SINGLE DRIVE PROBLEM (THE OTHER DRIVE IN THE TAPE TRANSPORT UNIT IS OPERATIONAL), NO ANALYSIS OF AC INPUT VOLTAGES WILL BE MADE.

ANALYSIS PROCEDURE

ON THE FAILING DRIVE,SET THE ONLINE/OFFLINE SWITCH TO OFFLINE.
(Step 001 continues)

SEE LOC 1.

(Step 001 continued)

ARE YOU HERE BECAUSE THE DRIVE WILL NOT POWER DOWN WHEN THE DRIVE POWER OFF SWITCH IS SET TO OFF?
Y N

002

IF YOU HAVE NOT ALREADY DONE SO, PLUG THE DC POWER TEST TOOL INTO THE FAILING DRIVE TEST JACK (J8 IF PROBLEM IS ON DRIVE 0, OR J9 IF PROBLEM IS ON DRIVE 1).

SEE PWR 12 FOR INFORMATION ABOUT THE DC POWER TEST TOOL.

IGNORE THE STATUS OF LED 2 WHEN ANSWERING QUESTIONS ABOUT LEDS THROUGHOUT THIS MAP.

ARE ANY LEDS ON?
Y N

003

SET THE DRIVE POWER SWITCH ON THE FAILING DRIVE TO OFF.
CONTINUITY CHECK FUSE 11 (DRIVE 0) OR FUSE 12 (DRIVE 1).

NO LEDS ON. +5 V CONTROL VOLTAGE MISSING.

SEE CARR-OR 1-1.

DOES THE FUSE CHECK O.K.?
Y N

004
EXCHANGE THE FUSE; SET THE DRIVE POWER SWITCH TO ON.

NOTE: IF FUSE CONTINUES TO BLOW, GO TO PWR 30.

GO TO PAGE 4, STEP 032, ENTRY POINT C.

5 2 2
A B C

B C PWR 200
1 1

PAGE 2 OF 5

005
EXCHANGE THE DC POWER SUPPLY (FRU095).
GO TO PAGE 4, STEP 032, ENTRY POINT C.

SEE CARR-OR 1-1.

006
DISREGARD STATUS OF LED 2.
ARE ALL LEDS ON?
Y N

007
IS LED 8 THE ONLY LED ON?

CHECKING FOR +5 VOLTS.

Y N

008
IS LED 5 ON?

CHECKING FOR +8.5 VOLTS.

Y N

009

GO TO STEP 016, ENTRY POINT B.

010
IS LED 7 ON?

CHECKING FOR +5 VOLTS.

Y N

011

GO TO STEP 016, ENTRY POINT B.

012
REQUEST YOUR NEXT LEVEL OF SUPPORT.

5
D E

E

013
PRESS AND HOLD THE BLUE RESET BUTTON AND OBSERVE THE DC TEST TOOL.
RELEASE THE BLUE RESET BUTTON.

SEE LOC 1.

WAS LED 8 THE ONLY LED THAT WAS ON?
Y N

014

DID YOU OBSERVE ANY LEDS OFF OTHER THAN LED 2?
Y N

015
EXCHANGE THE POWER AMP BOARD (FRU059).
GO TO PAGE 4, STEP 032, ENTRY POINT C.

VOLTAGE DETECTOR CIRCUIT FAILURE.

016
(ENTRY POINT B)
REFER TO TABLE ONE AND CHECK OR EXCHANGE THE FUSE, OR RESET THE CB IN THE FAILING CIRCUIT. PRESS THE BLUE RESET BUTTON.

(THE LEDS ON THE DC TEST TOOL ARE NUMBERED LEFT TO RIGHT.)

TABLE 1

LED	VOLTS	FUSE	CB
1	+24	1,2	
3	+15	3,4	
4	-15	5,6	
5	+8.5	7,8	
6	-5	9,10	
7	+5	13,14 OR 1,2	
8	+5	11,12	

NOTES:
1) IGNORE LED 2.
2) F13 AND F14 USED ON POWER SUPPLY PART NUMBERS 6177166 OR 6177167.

ARE ALL LEDS ON?
Y N

3 3 3
F G H

G H PWR 200
2 2

PAGE 3 OF 5

017
IS THE FUSE BLOWN OR CB TRIPPED AGAIN?
Y N

018

GO TO PAGE 5, STEP 033,
ENTRY POINT D.

019
GO TO PWR 30.

020

ATTEMPT SEVERAL LOAD/UNLOAD CARTRIDGE OPERATIONS.
DID A FUSE BLOW DURING THE LOAD/UNLOAD OPERATION?
Y N

021
NOTE: FOR INTERMITTENT PROBLEMS, REFER TO PWR 30 FRU LIST FOR POSSIBLE CAUSES.
GO TO PAGE 4, STEP 032,
ENTRY POINT C.

022

EXCHANGE THE POWER AMP BOARD (FRU059).
GO TO PAGE 4, STEP 032,
ENTRY POINT C.

SEE CARR-DR 1-1.

SEE CARR-DR 1-1.

F
2

023
IF DRIVE 0 IS THE FAILING DRIVE, DISCONNECT J5 AND J6 FROM THE POWER SUPPLY. JUMPER J5-11 TO J5-7. IF DRIVE 1 IS THE FAILING DRIVE, DISCONNECT J1 AND J2. JUMPER J1-11 to J1-7.

IS LED 0 THE ONLY LED ON?
Y N

024
PROBLEM MAY BE IN THE "-PICK" LINE.

REMOVE THE JUMPER FROM PS J1 OR J5.

CONTINUITY CHECK THE "-PICK" LINE.
DR0 PS01-J5-11 TO TUD0 PAJ8-7.
DR1 PS01-J1-11 TO TUD1 PAJ8-7.

CONTINUITY OKAY?
Y N

025

REPAIR OPEN IN "-PICK" LINE.

RECONNECT ALL CABLES DISCONNECTED WHILE TROUBLESHOOTING.
GO TO PAGE 4, STEP 032,
ENTRY POINT C.

SEE LOC 1.
FORCE POWER ON USING A JUMPER.

FORCING POWER ON WITH JUMPER WAS SUCCESSFUL.

SEE LOC 1.

USE THE FOLLOWING REFERENCE DRAWINGS:
YF100, ZZ20 OR ZZ220, AND PA 000/001

5 4
J K

K PWR 200
J

PAGE 4 OF 5

026
EXCHANGE THE POWER AMPLIFIER BOARD (FRU059). SET THE DRIVE POWER SWITCH TO ON. — SEE CARR-DR 1-1.

ARE ALL LEDS ON?
Y N

027
PREPARE TO REMOVE THE OPERATIONAL DRIVE FROM SERVICE.

HAVE THE CUSTOMER VARY THE DRIVE OFFLINE. SET THE DRIVE ONLINE/OFFLINE SWITCH TO OFFLINE. SET THE TAPE TRANSPORT UNIT AC POWER CB TO OFF. — SEE LOC 1.

USING AN OHMMETER, VERIFY THE PROPER OPERATION OF THE DRIVE POWER SWITCH (FRU104).

DOES THE DRIVE POWER SWITCH (FRU104) FUNCTION PROPERLY?
Y N

028

EXCHANGE THE DRIVE POWER SWITCH (FRU104). — SEE CARR-DR 1-1.
GO TO STEP 032,
ENTRY POINT C.

L M

L M

029
CONTINUITY CHECK THE FOLLOWING CABLES:
ADDRESS SWITCH CABLE TO J4 (FRU106)
DC POWER DISTRIBUTION CABLE (FRU088)
DC DISTRIBUTION (FRU079)
TACHOMETER SENSOR (FRU081)
POWER AMPLIFIER J2 (FRU049).

REPAIR ANY OPENS FOUND IN THE CABLES.

WERE ANY OPENS FOUND IN THE CABLES?
Y N

030
REQUEST YOUR NEXT LEVEL OF SUPPORT.

031

GO TO STEP 032,
ENTRY POINT C.

032
(ENTRY POINT C)
SET THE DRIVE ONLINE/OFFLINE SWITCH TO ONLINE.
REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

D J PWR 200
2 3

PAGE 5 OF 5

033
(ENTRY POINT D)
PREPARE TO REMOVE THE OPERATIONAL DRIVE FROM SERVICE.

SEE LOC 1.

HAVE THE CUSTOMER VARY THE DRIVE OFFLINE. SET THE DRIVE ONLINE/OFFLINE SWITCH TO OFFLINE. SET THE TAPE TRANSPORT UNIT AC POWER CB TO OFF.

EXCHANGE THE DC POWER SUPPLY FRU(095).

SEE CARR-DR 1-1.

ARE ALL LEDS ON?
Y N

034
REQUEST YOUR NEXT LEVEL OF SUPPORT.

035

GO TO PAGE 4, STEP 032,
ENTRY POINT C.

036
NOTE: IF YOU HAVE MADE NO REPAIRS PERFORM THE POWER SUPPLY RIPPLE CHECK FOUND ON PWR 20.

SET THE DRIVE ONLINE/OFFLINE SWITCH TO ONLINE.
REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

NOTE: FOR INTERMITTENT PROBLEMS, REFER TO PWR 30 FRU LIST FOR POSSIBLE CAUSES.

A
1

037
EXCHANGE THE FOLLOWING FRU'S:
POWER AMPLIFIER BOARD (FRU059)
DRIVE POWER SWITCH (FRU104)
DC POWER DISTRIBUTION CABLE (FRU079)
DC POWER DISTRIBUTION CABLE (FRU080).

SEE CARR-DR 1-1.

DOES THE DRIVE POWER OFF NOW?
Y N

038
REQUEST YOUR NEXT LEVEL OF SUPPORT.

039

GO TO PAGE 4, STEP 032,
ENTRY POINT C.

2-DRIVE POWER ANALYSIS PROCEDURE

PAGE 1 OF 4

ENTRY POINTS

FROM MAP NUMBER	ENTER THIS MAP ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	C	4	026
3000	D	2	010
0100	A	1	001

001
(ENTRY POINT A) SEE LOC 1.
A POWER PROBLEM HAS BEEN IDENTIFIED AFFECTING BOTH DRIVES WITHIN THE TAPE TRANSPORT UNIT.

DANGER
LETHAL VOLTAGES ARE PRESENT IN THE POWER SERVICE AREA. SAFETY IS MOST IMPORTANT. TREAT ALL CIRCUITS AS LIVE UNTIL MEASURED.

ANALYSIS PROCEDURE

PLUG THE DC TEST TOOL INTO J8 (DRIVE 0) AND FOLLOW THIS PROCEDURE:
SEE LOC 1.

SET THE DRIVE ONLINE/OFFLINE SWITCH TO OFFLINE.

ARE ALL THE LEDS OFF?
Y N

A B

A B

002
EXCHANGE THE DC POWER SUPPLY (FRU895).
SEE CARR-DR 1-1.

GO TO PAGE 4, STEP 025, ENTRY POINT C.

003
IS THE AC POWER CB TRIPPED? (SEE LOC 1).
Y N

004
MEASURE THE VOLTAGE BETWEEN PS P16-1 AND P16-3. IT SHOULD MEASURE BETWEEN 180 AND 259 VOLTS AC.
SEE LOC 1.
DID VOLTAGES MEASURE OK?
TOLERANCES ARE FOUND ON PWR 20.
Y N

005
SET THE AC POWER CB TO OFF.

DISCONNECT P11 FROM THE DC POWER SUPPLY.

SET THE AC POWER CB TO ON.

MEASURE THE AC VOLTAGE BETWEEN P11-1 AND P11-3.

IS 180 TO 259 VAC MEASURED AT P11?
Y N

006
INPUT AC POWER MAY BE MISSING.
IS THE PRECEEDING UNIT ANOTHER TAPE TRANSPORT UNIT?
Y N

3 3 3 2 2
C D E F G

F G
1 1

PWR 210

PAGE 2 OF 4

007

GO TO STEP 010,
ENTRY POINT D.

008
IS THE PUMP MOTOR OR BLOWER MOTOR
RUNNING IN THE PRECEEDING TAPE
TRANSPORT UNIT?
Y N

009
POWER MAY BE MISSING IN
PRECEEDING TAPE TRANSPORT UNIT.
RESTART THIS MAP IN PRECEEDING
UNIT.

010
(ENTRY POINT D)
VERIFY THAT ALL DRIVES THAT ARE
ATTACHED, AND RECEIVE POWER FROM
THIS TAPE CONTROL UNIT ARE
DISMOUNTED.

SET THE TAPE CONTROL UNIT SUPPLYING
AC POWER TO THIS STRING OF DRIVES
TO OFFLINE TEST.

SET THE TAPE CONTROL UNIT POWER
SWITCH TO OFF.

REMOVE CABLE FROM AC CONNECTOR J1.

SET THE TAPE CONTROL UNIT POWER
SWITCH TO ON.

SEE LOC 1.

MEASURE THE VOLTAGES AT TAPE
TRANSPORT UNIT AC CONNECTOR J1.
THEY SHOULD MEASURE BETWEEN 180 AND
259 VOLTS AC.
(Step 010 continues)

(Step 010 continued)

50 HZ EXCEPT JAPAN	60 HZ OR 50HZ JAPAN
J1-1 TO J1-6 J1-2 TO J1-7 J1-3 TO J1-5	J1-1 TO J1-2 J1-1 TO J1-3 J1-2 TO J1-3

DO ALL VOLTAGES MEASURE OK?
Y N

011

SET THE TAPE CONTROL UNIT
SUPPLYING AC POWER TO THIS STRING
OF DRIVES TO OFFLINE/TEST.
SET THE TAPE CONTROL UNIT POWER
SWITCH TO OFF.
CONTINUITY CHECK THE INPUT AC
CABLE . EXCHANGE FRU075 IF OPEN.

REFER TO YF060 FOR 60 HZ
AND 50 HZ JAPAN MACHINES.
REFER TO YF050 FOR ALL
OTHER 50 HZ MACHINES.
SEE CARR-DR 1-1

IF NO PROBLEM IS FOUND WITH THE
CABLE THE PROBLEM IS MOST LIKELY
LOCATED IN A PRIOR TAPE TRANSPORT
UNIT IN THE STRING OR IN THE TAPE
CONTROL UNIT.

AFTER LOCATING AND CORRECTING THE
PROBLEM IN THE AC DISTRIBUTION
NET, SET THE TAPE CONTROL UNIT
POWER ON SWITCH TO ON.
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

3
H

MAP 0210 – Drive DC Power (Same Symptom Both Drives)

D E H PWR 210
1 1 2

PAGE 3 OF 4

012
PROBLEM IS WITH CB1 OR THE
CABLE FROM
CB1 TO PS P11.
SET THE TAPE CONTROL UNIT POWER
SWITCH TO OFF.
EXCHANGE FRU218.
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

013
EXCHANGE THE DC POWER SUPPLY
(FRU095).
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

014
PROBLEM MAY BE DUE TO OPEN OR
MISSING.
JUMPER PLUG ON J12,J13 OR J14.
IS A JUMPER PLUG INSTALLED ON
J12,J13 OR J14?
Y N

015
INSTALL JUMPER AT PROPER
LOCATION.
INSTALL FRU095, REFER TO
CARR-OR 1.
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

016
CONTINUITY CHECK THE JUMPER.
CONTINUITY OF THE JUMPER OK?
Y N

017
REPAIR JUMPER
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

J

C J
1

018
EXCHANGE THE DC POWER SUPPLY
(FRU095).
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

019
RESET THE CB.

DOES THE CB TRIP AGAIN?
Y N

020
RESETTING THE AC CB HAS CLEARED
THE ORIGINAL PROBLEM.

FOR INTERMITTENT AC CB TRIPPING
SUSPECT:

AC CB (FRU218)
POWER SUPPLY (FRU095)
BLOWER ASSEMBLY (FRU020)
PUMP MOTOR (FRU030)
GO TO PAGE 4, STEP 026,
ENTRY POINT C.

021
THE AC POWER CB TRIPS AFTER BEING
RESET.

DISCONNECT P15 FROM THE DC POWER SUPPLY. SEE LOC 1.

RESET THE AC POWER CB.

DOES THE AC POWER CB STILL TRIP?
Y N

4 4
K L

MAP 0210 – Drive DC Power (Same Symptom Both Drives)

K L PWR 210
3 3

PAGE 4 OF 4

022
REPLACE BLOWER ASSEMBLY (FRU020).
GO TO STEP 026,
ENTRY POINT C.

023

RECONNECT P15 TO THE DC POWER SUPPLY.

DISCONNECT P4 FROM THE DC POWER SUPPLY.

RESET THE AC POWER CB.

DOES THE AC POWER CB STILL TRIP?
Y N

024
EXCHANGE THE PUMP MOTOR (FRU030).

SEE CARR-OR 1-1.

GO TO STEP 026,
ENTRY POINT C.

025
EXCHANGE THE DC POWER SUPPLY (FRU095).
GO TO STEP 026,
ENTRY POINT C.

026
(ENTRY POINT C)
IF NOT ALREADY ON, SET THE AC POWER CB TO ON.

SET THE THE DRIVE POWER ON SWITCHES TO ON.

IF NECESSARY, PLUG THE DC POWER TEST TOOL INTO THE TEST JACK (J8 ON DRIVE 0 OR J9 ON DRIVE 1).
OBSERVE THE LEDS ON THE DC TEST TOOL.
IGNORE LED 2 WHEN RESPONDING TO QUESTIONS.
ARE ALL THE LEDS ON?
Y N

027
REQUEST YOUR NEXT LEVEL OF SUPPORT.

028
SET THE DRIVE ONLINE/OFFLINE SWITCH TO ONLINE.

REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

T PWR 210
4

PAGE 5 OF 7

034
INPUT AC POWER MAY BE MISSING.
IS THE PRECEDING UNIT ANOTHER TAPE TRANSPORT UNIT?
Y N

035

Go to Step 038, Entry Point D.

036
IS THE PUMP MOTOR OR BLOWER MOTOR RUNNING IN THE PRECEDING TAPE TRANSPORT UNIT?
Y N

037
POWER MAY BE MISSING IN PRECEDING TAPE TRANSPORT UNIT.
RESTART THIS MAP IN PRECEDING UNIT.

038
(Entry Point D)
VERIFY THAT ALL DRIVES THAT ARE ATTACHED, AND RECEIVE POWER FROM THIS TAPE CONTROL UNIT ARE DISMOUNTED.

SET THE TAPE CONTROL UNIT SUPPLYING AC POWER TO THIS STRING OF DRIVES TO OFFLINE/TEST.

SET THE TAPE CONTROL UNIT POWER SWITCH TO OFF.

REMOVE CABLE FROM AC CONNECTOR J1.

SET THE TAPE CONTROL UNIT POWER SWITCH TO ON.
(Step 038 continues)

(Step 038 continues)

MEASURE THE VOLTAGES AT TAPE TRANSPORT UNIT AC CONNECTOR J1. THEY SHOULD MEASURE BETWEEN 188 AND 259 VOLTS AC.

50 HZ EXCEPT JAPAN	60 HZ OR 50 HZ JAPAN
J1-1 TO J1-6 J1-2 TO J1-7 J1-3 TO J1-5	J1-1 TO J1-2 J1-1 TO J1-3 J1-2 TO J1-3

DO ALL VOLTAGES MEASURE OK?
Y N

039

SET THE TAPE CONTROL UNIT SUPPLYING AC POWER TO THIS STRING OF DRIVES TO OFFLINE/TEST.
SET THE TAPE CONTROL UNIT POWER SWITCH TO OFF.
CONTINUITY CHECK THE INPUT AC CABLE.
EXCHANGE FRU218 IF OPEN.

REFER TO YF060 FOR 60 HZ AND 50HZ JAPAN MACHINES.
REFER TO YF050 FOR ALL OTHER 50HZ MACHINES.
SEE CARA-OR 1-1.

IF NO PROBLEM IS FOUND WITH THE CABLE THE PROBLEM IS MOST LIKELY LOCATED IN A PRIOR TAPE TRANSPORT UNIT IN THE STRING OR IN THE TAPE CONTROL UNIT.

AFTER LOCATING AND CORRECTING THE PROBLEM IN THE AC DISTRIBUTION NET, SET THE TAPE CONTROL UNIT POWER SWITCH TO ON.
Go to Page 7, Step 054, Entry Point C.

040
PROBLEM IS WITH CB1 OR THE CABLE FROM CB1 TO PS P11.
SET THE TAPE CONTROL UNIT POWER SWITCH TO OFF.
EXCHANGE FRU 218.
Go to Page 7, Step 054, Entry Point C.

MAP 0210 – Drive DC Power (Same Symptom Both Drives) PWR 210-6

Q R S PWR 210

4 4 4

PAGE 6 OF 7

041
EXCHANGE THE DC POWER SUPPLY (FRU095)
Go to Page 7, Step 054, Entry Point C.

042
PROBLEM MAY BE DUE TO OPEN OR MISSING JUMPER PLUG ON J12, J13 OR J14.
IS A JUMPER PLUG INSTALLED ON J12, J13 OR J14?
Y N

043
INSTALL JUMPER AT PROPER LOCATION.
REFER TO CARR-DR 1 FOR FRU095 INSTALL.
Go to Page 7, Step 054, Entry Point C.

044
CONTINUITY CHECK THE JUMPER.
CONTINUITY OF THE JUMPER OK?
Y N

045
REPAIR JUMPER
Go to Page 7, Step 054, Entry Point C.

046
EXCHANGE THE DC POWER SUPPLY (FRU095).
Go to Page 7, Step 054, Entry Point C.

047
RESET THE CB.

DOES THE CB TRIP AGAIN?
Y N

U V

U V

048
RESETTING THE AC CB HAS CLEARED THE ORIGINAL PROBLEM.

FOR INTERMITTENT AC CB TRIPPING SUSPECT:

AC CB (FRU218)
POWER SUPPLY (FRU095)
BLOWER ASSEMBLY (FRU020)
PUMP MOTOR (FRU030)
Go to Page 7, Step 054, Entry Point C.

049
THE AC POWER CB TRIPS AFTER BEING RESET.

DISCONNECT P15 FROM THE DC POWER SUPPLY.

RESET THE AC POWER CB.

DOES THE AC POWER CB STILL TRIP?
Y N

050
REPLACE BLOWER ASSEMBLY (FRU020).
Go to Page 7, Step 054, Entry Point C.

051

RECONNECT P15 TO THE DC POWER SUPPLY.

DISCONNECT P4 FROM THE DC POWER SUPPLY.

RESET THE AC POWER CB.

DOES THE AC POWER CB STILL TRIP?
Y N

052
EXCHANGE THE PUMP MOTOR (FRU030).

Go to Page 7, Step 054, Entry Point C.

W

SEE LOC 1.

SEE CARR-DR 1-1.

W

053
EXCHANGE THE DC POWER SUPPLY (FRU095)
Go to Page 7, Step 054, Entry Point C.

MAP 0210 – Drive DC Power (Same Symptom Both Drives) PWR 210-7

PWR 210

PAGE 7 OF 7

054
(Entry Point C)
IF NOT ALREADY ON, SET THE AC POWER CB TO ON.

SET THE DRIVE POWER ON SWITCHES TO ON.

IF NECESSARY, PLUG THE DC POWER TEST TOOL INTO
THE TEST JACK (J8 ON DRIVE 0 OR J9 ON DRIVE 1).
OBSERVE THE LEDS ON THE DC TEST TOOL.
IGNORE LED 2 WHEN RESPONDING TO QUESTIONS.
ARE ALL LEDS ON?
Y N
| |
| 055
| REQUEST YOUR NEXT LEVEL OF SUPPORT.
|
056
SET THE DRIVE ONLINE/OFFLINE SWITCH TO ONLINE.

REFER TO THE START SECTION OF
THE MG, AND RUN GMP.

STI POWER CHECK

PAGE 1 OF 2

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001

001
(ENTRY POINT A)

(NONE OF THE STI LEDS ARE ON OR BLINKING.)

MAP DESCRIPTION: MAP 0100 SENT YOU HERE WHEN YOU OBSERVED THAT THE STI LEDS WERE NOT ON.
START CONDITIONS:
- POWER ON LED IS ON

FRUS DIAGNOSED:
- CU STI DC SUPPLY CU-PS-03

ADDITIONAL SERVICE AIDS:
- TAPE CONTROL UNIT LOGIC YF004

THIS STEP REQUIRES YOU TO MEASURE EACH VOLTAGE AT BOTH STI BOARD CONNECTORS. A SINGLE VOLTAGE MISSING AT 1 BOARD ONLY INDICATES A CABLING PROBLEM. A SINGLE VOLTAGE MISSING AT BOTH BOARDS INDICATES A POWER SUPPLY PROBLEM WHILE ALL VOLTAGES MISSING MAY BE CAUSED BY THE POWER SUPPLY OR THE AC INPUT TO THE SUPPLY.
(Step 001 continues)

(Step 001 continued)

MEASURE DC VOLTAGES AT THE STI BOARD CONNECTORS.

REFERENCE LOG.C ST001 AND ST002

P/J3

10	20	+5	-5.2
9	19	+5	+5
8	18		+5
7	17	-12	
6	16	+12	
5	15		
4	14		
3	13	GND	GND
2	12	GND	GND
1	11	GND	GND

VOLTAGE(S) MISSING AT ONLY 1 BOARD?
Y N

002

VOLTAGE(S) MISSING AT BOTH BOARDS?
Y N

003

DC VOLTAGES TO THE STI CARDS ARE OKAY. LED PROBLEM PROBABLY DUE TO CARD FAILURE.

004
VOLTAGE(S) MISSING AT 2 BOARDS.

ARE ALL OF THE VOLTAGES MISSING?
Y N

005

EXCHANGE POWER SUPPLY CU-PS-03.

2 2
A B

MAP 0300—STI Power Check PWR 300-2

A B STI POWER CHECK
1 1

PAGE 2 OF 2

006

ALL VOLTAGES MISSING MAY BE DUE TO MISSING AC INPUT CAUSED BY DEFECTIVE CABLE FROM CU-PS-01 TO CU-PS-03.

SEE LOGIC YF004.

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE OFF POSITION.

SEE LOC 1.

CONTINUITY CHECK THE AC INPUT CABLE BETWEEN CU-PS-01 AND CU-PS-03.

DOES THE METER INDICATE CONTINUITY?
Y N

007

REPLACE OR REPAIR OPEN IN THE CABLE.

008

EXCHANGE POWER SUPPLY CU-PS-03.

009

VOLTAGES MISSING AT 1 BOARD PROBABLY DUE TO CABLING PROBLEMS BUT COULD BE DUE TO INTERNAL POWER SUPPLY PROBLEMS.

REFER TO LOGIC YF004.

TURN THE SERVICE SWITCH TO THE SERVICE POSITION.
CONTINUITY CHECK THE CABLE FROM CU-PS-03 TO THE STI BOARD CONNECTOR.
(Step 009 continues)

SEE LOC 1.

(Step 009 continued)

CONTINUITY CHECK OKAY?
Y N

010

REPLACE OR REPAIR OPEN IN THE CABLE.

011

EXCHANGE POWER SUPPLY CU-PS-03.

TAPE CONTROL UNIT DC POWER MAP

PAGE 1 OF 19

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	001	
0190	A	001	
0401	B 7	100	
0401	C 9	135	
0401	E 3	077	

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
7	040	0[illegible]	A
2	007	0100	B
3	012	0100	B
19	135	0190	[illegible]
13	076	410	B
18	124	420	A
18	119	420	B
19	129	430	A
19	134	440	A

001
(ENTRY POINT A)

DANGER

LETHAL VOLTAGES ARE PRESENT IN THE POWER SERVICE AREA.
SAFETY IS MOST IMPORTANT. TREAT ALL CIRCUITS AS LIVE UNTIL MEASURED.

CAPACITORS ARE POSSIBLE EXPLODING DEVICES. WEAR SAFETY GLASSES WHEN WORKING IN THE POWER AREA.

ALWAYS REINSTALL ALL SAFETY COVERS BEFORE POWERING ON THE MACHINE.

THE DC TEST TOOL IS NEEDED FOR THIS MAP. SEE PWR 10 FOR INFORMATION REGARDING USE, LAYOUT AND FUNCTION OF THE TOOL.

CAUTION

THE TAPE CONTROL UNIT SHOULD BE OFFLINE AND THE TAPE TRANSPORT UNIT DISMOUNTED AND
(Step 001 continues)

MAP DESCRIPTION: MAP 0100 DIRECTED YOU TO THIS MAP BECAUSE THE DC POWER LED IS OFF.

START CONDITIONS:
-DC POWER LED OFF
-POWER ON LED IS ON.

FRUS DIAGNOSED:
-AC POWER SUPPLY,CU-PS-01
-DC POWER SUPPLY,CU-PS-02
-DC POWER SUPPLY FUSE F1
-DC POWER SUPPLY FUSE F2
-CU-CSU PANEL
-POR CARD, 01A-A2H4
-DC VOLTAGE DISTRIBUTION CABLES
-CU-PS-01 TO TCU-PS-02 CABLES
-AC VOLTAGE TAP PLUG
-CU GATE FANS
-CU GATE
UPPER THERMAL

ADDITIONAL SERVICE AIDS:
(Step 001 continues)

(Step 001 continued)
UNLOADED.

OPEN THE FRONT DOOR OF THE CU AND REMOVE THE SUB COVER

CONNECT THE DC TEST TOOL TO THE CU DC SUPPLY TCU-PS-02 J16 (LOC 1).

COMPARE THE LEDS ON THE DC TEST TOOL TO THE CHART ON THE RIGHT.
(THE LEDS ON THE DC TEST TOOL ARE NUMBERED LEFT TO RIGHT).

DOES THE CHART AND DC TEST TOOL AGREE?
Y N

002
IS LED 1 ON?
Y N

1
5 5 2
A B C

(Step 001 continued)
-CU AC POWER
DISTRIBUTION DIAGRAM
ON PWR 32.
-CU DC POWER
DISTRIBUTION DIAGRAM
ON PWR 34.
-CU DC
DISTRIBUTION DIAGRAMS:
PWR 42 (+5 V DC, CB2),
PWR 44 (+5 V DC, CB3),
PWR 46 (-5 V DC),
PWR 48 (+8.5 V DC)
-CU DC POWER
DC CONTROL DIAGRAM ON PWR 50.

LED	ON/OFF	V DC	FUSE/CB
1	ON	24CTL	F2
2	OFF		N/A
3	OFF		N/A
4	OFF		N/A
5	ON	+8.5	F1
6	ON	-5	CB4
7	ON	+5	CB2
8	ON	+5	CB3

MAP 0400—Tape Control Unit DC Power PWR 400-2

C
1

DC POWER MAP

PAGE 2 OF 19

003

SET THE LOCAL REMOTE SWITCH TO THE LOCAL POSITION (LOC 1).

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

REMOVE CU-PS-02 FUSE F2 AND CONTINUITY CHECK THE FUSE (LOC 1).

IS FUSE F2 BLOWN?
Y N

004

REINSTALL FUSE F2

OPEN THE REAR DOOR OF THE CU AND REMOVE THE SUBCOVER

ON THE DC POWER SUPPLY, DISCONNECT THE CABLE CU-PS-02 P2 (LOC 1).

ON THE AC POWER SUPPLY, DISCONNECT THE CABLE CU-PS-01 P3 (LOC 1).

CHECK FOR CONTINUITY FROM CU-PS-01 P3-1 TO CU-PS-02 P2-1 AND FROM CU-PS-01 P3-2 TO CU-PS-02 P2-2

DOES THE METER INDICATE CONTINUITY?
Y N

3
D E F

THE +24 V DC IS MISSING. IT IS DEVELOPED IN CU-PS-01.

E F

005

THERE IS AN OPEN WIRE FROM CU-PS-01 P3-1 TO CU-PS-02 P2-1

OR
CU-PS-01 P3-2 TO CU-PS-02 P2-2 (YF001)(YF002).

REPAIR THE OPEN CIRCUIT.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

24 V DC MISSING AT DC POWER SUPPLY.
SEE DETAILED DIAGRAM ON PWR 50.

006

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE ON POSITION (LOC 1).

SET THE CU POWER ON/OFF SWITCH TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH FOR SEVERAL SECONDS AND THEN RELEASE IT.

OBSERVE THE CU POWER ON LED (LOC 1).

IS THE CU POWER ON LED ON?
Y N

007
AC POWER FAILED TO COME UP.
GO TO MAP 0100, ENTRY POINT B.

3
G

D G 2 2 DC POWER MAP

PAGE 3 OF 19

008

SET THE MULTIMETER TO MEASURE +24 V DC.

MEASURE THE VOLTAGE BETWEEN CU-PS-01 J3-1(+) AND CU-PS-01 J3-2(-) (LOC 1).

SEE PWR20 FOR VOLTAGE TOLERANCES

DOES THE MULTIMETER INDICATE GREATER THAN +19 V DC?

Y

009

THE AC POWER SUPPLY, CU-PS-01, IS FAILING (LOC 1).
EXCHANGE FRU144.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

THE +24 V DC IS MISSING.
SEE DETAILED DIAGRAM ON PWR 50.

N

010

THE DC POWER SUPPLY, CU-PS-02, IS FAILING (LOC 1).
RECONNECT CABLE CU-PS-01-P3
EXCHANGE FRU145.
GO TO PAGE 19, STEP 135, ENTRY POINT C.

THE +24 V DC IS OK FROM CU-PS-01.
SEE DETAILED DIAGRAM ON PWR 50.

011

EXCHANGE FUSE F2.

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE ON POSITION (LOC 1).

SET THE CU POWER ON/OFF SWITCH TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH FOR SEVERAL SECONDS AND THEN RELEASE IT.
(Step 011 continues)

(Step 011 continued)

OBSERVE THE CU POWER ON LED (LOC 1).

IS THE CU POWER ON LED ON?

Y

012

AC POWER FAILED TO COME UP.

GO TO MAP 0100, ENTRY POINT B.

N

013

IS LED 1 ON?

Y

014

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

OVERLOAD CONDITION MAY BE CAUSED BY FRU126 OR FRU138.

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

ON THE DC SUPPLY, REMOVE CU-PS-02 FUSE F2 AND CONTINUITY CHECK IT. INSTALL A GOOD FUSE F2.

OPEN THE REAR DOOR OF THE CU AND REMOVE THE SUBCOVER.

DISCONNECT THE CABLE CU-PS-02 P4.
(Step 014 continues)

THIS ISOLATES THE LOAD FROM THE 24 V DC SOURCE.

5 H

DC POWER MAP

PAGE 4 OF 19

(Step 014 continued)

ON THE AC SUPPLY, SET CIRCUIT BREAKER
CU-PS-01 CB1 TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH
FOR SEVERAL SECONDS AND THEN RELEASE IT.

OBSERVE THE LEDS ON THE DC TEST TOOL.

IS LED 1 ON ?
Y N

015

THE CU DC POWER SUPPLY, TCU-PS-02, IS FAILING.

LED 1 STILL OFF AFTER THE LOAD WAS REMOVED.
SEE DETAILED DIAGRAM ON PWR 50.

EXCHANGE FRU145
GO TO PAGE 19, STEP 135,
ENTRY POINT C.

015

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

SEE IF OVERLOAD IS CAUSED BY FRU126.

ON THE AC SUPPLY, SET CIRCUIT BREAKER
CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

RECONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

REMOVE THE POR CARD, 01A-A2H4 (LOC 1).

ON THE AC SUPPLY, SET CIRCUIT BREAKER
CU-PS-01 CB1 TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH
FOR SEVERAL SECONDS AND THEN RELEASE IT.
OBSERVE THE LEDS ON THE DC TEST TOOL.
(Step 015 continues)

(Step 016 continued)

IS LED 1 ON?
Y N

017

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

SEE IF OVERLOAD IS CAUSED BY FRU138.

ON THE AC SUPPLY, SET CIRCUIT BREAKER
CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

RECONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

REMOVE THE REG CARD, 01A-A1T2 (LOC 1).

ON THE AC SUPPLY, SET CIRCUIT BREAKER
CU-PS-01 CB1 TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE
SWITCH FOR SEVERAL SECONDS AND THEN RELEASE
IT.
OBSERVE THE LEDS ON THE DC TEST TOOL.

IS LED 1 ON?
Y N

018

ON THE AC SUPPLY, SET CIRCUIT BREAKER
CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

EXCHANGE FUSE F2.

REPAIR CABLE BETWEEN LOGIC GATE T83 AND 01A-A2H4 OR 01A-A1T2.

SEE DETAILED DIAGRAM ON PWR 50.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

5 5
J K

MAP 0400—Tape Control Unit DC Power PWR 400-5

H J K
3 4 4

DC POWER MAP

PAGE 5 OF 19

019

THE REG CARD, 01A-A1T2, IS FAILING.

SET THE SERVICE SWITCH TO OFF (LOC 1).

EXCHANGE FRU138 SEE CARR-TCU 1-1

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

020

THE POR CARD, 01A-A2H4, IS FAILING.

SET THE SERVICE SWITCH TO OFF (LOC 1).

EXCHANGE FRU126 SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

021
IS LED 1 THE ONLY LED ON?
Y N

022
FUSE FIXED THE PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

023

GO TO STEP 024, ENTRY POINT G.

B
1

024
(ENTRY POINT G)
PRESS AND HOLD THE IML SWITCH (LOC 1).

THE ONLINE TEST/OFFLINE TEST SWITCH MUST BE SET TO OFFLINE TEST TO ENABLE IML.

OBSERVE THE LEDS ON THE DC TEST TOOL.

LED	ON/OFF	V DC	FUSE/CB
1	ON	24CTL	F2
2	OFF		N/A
3	OFF		N/A
4	OFF		N/A
5	ON	+8.5	F1
6	ON	-5	CB4
7	ON	+5	CB2
8	ON	+5	CB3

DUE TO BACK CIRCUITS,LED 5 MAY GLOW WHEN FUSE 1 IS BLOWN. COMPARE INTENSITY WITH LED 1.

DOES THE CHART AND DC TEST TOOL AGREE?
Y N

025
IS LED 1 THE ONLY LED ON?
Y N

026

GO TO PAGE 17, STEP 108,
ENTRY POINT G.

027

RELEASE THE IML SWITCH.

+24 V DC IS AVAILABLE, BUT ONE OR MORE OF THE OTHER DC VOLTAGES ARE NOT ON.

CHECK THE POSITION OF THE SERVICE SWITCH (LOC 1).

IS THE SERVICE SWITCH IN THE ON POSITION?
Y N

1
2 6 6
L M N

M N
5 5

PAGE 6 OF 19

028

SERVICE SWITCH LEFT IN THE OFF POSITION

SET SERVICE SWITCH TO THE ON POSITION.

REFER TO THE CE/HSC SECTION AND RUN GMP.

029

CAUTION — ONLY VOLTAGE UP IS +24 V DC CONTROL.

IF THE CU GATE UPPER THERMAL IS TRIPPED, RESETTING IT WILL CAUSE DC POWER TO TURN ON.

RESET THE CU GATE UPPER THERMAL (LOC 1).

IS THE CU DC POWER LED ON?
Y N

030

CAUTION — ONLY VOLTAGE UP IS +24 V DC CONTROL.

IF THE STI GATE THERMAL IS TRIPPED, RESETTING IT WILL CAUSE DC POWER TO TURN ON.

RESET THE STI GATE THERMAL.

IS THE CU DC POWER LED ON?
Y N

1 1
2 1
P Q R

R

031

CHECK THE VOLTAGE TAP PLUG(S) FOR PROPER INSTALLATION (LOC 1).

SEE THE CHART ON PAGE PWR 14.

IS THE VOLTAGE TAP PLUG(S) PROPERLY CONNECTED?
Y N

032

SET CU PS-02 CB1 TO THE OFF POSITION (LOC 1).

CONNECT THE VOLTAGE TAP PLUG(S) AS SHOWN IN THE CHART ON PAGE PWR 14.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

033
OBSERVE THE CU GATE FANS (LOC 1).

ARE THE FANS RUNNING?
Y N

034
OBSERVE CU-PS-02 CB1 (LOC 1). — THE AC CIRCUIT IS FAILING.

IS CB1 TRIPPED?
Y N

9 8 7
S T U

U DC POWER MAP
6

PAGE 7 OF 19

035
SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

DISCONNECT THE VOLTAGE TAP PLUG(S) AS SHOWN IN THE CHART ON PAGE PWR 14.

CONTINUITY CHECK THE JUMPER PLUG(S).

DOES THE METER INDICATE CONTINUITY?
Y N

036
REPAIR THE VOLTAGE TAP PLUG.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

037

ON THE AC SUPPLY,
DISCONNECT THE CABLE
CU-PS-01 P2 (LOC 1).

ON THE DC SUPPLY,
DISCONNECT THE CABLE
CU-PS-02 P1 (LOC 1).

CHECK FOR CONTINUITY FROM
CU-PS-01 P2-1 TO TCU-PS-02 P1-1 AND FROM
CU-PS-01 P2-3 TO TCU-PS-02 P1-3.

DOES THE METER INDICATE CONTINUITY?
Y N

V W

CHECK AC CABLE BETWEEN AC PS AND DC PS

V W

038

THERE IS AN OPEN WIRE FROM
CU-PS-01 P2-1 TO TCU-PS-02 P1-1
(YF001)(YF002)

OR

CU-PS-01 P2-3 TO TCU-PS-02 P1-3.

REPAIR OPEN IN CABLE.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

SEE DETAILED DIAGRAM ON PWR 50.

039

SET THE CU POWER ON/OFF SWITCH TO THE ON POSITION (LOC 1).

PRESS AND HOLD THE LOCAL POWER ENABLE SWITCH FOR SEVERAL SECONDS AND THEN RELEASE IT.

OBSERVE THE CU POWER ON LED (LOC 1).

IS THE CU
POWER ON LED ON?
Y N

040
AC POWER FAILED TO COME UP.
GO TO MAP 0100, ENTRY POINT A.

8
X

MAP 0400—Tape Control Unit DC Power PWR 400-8

T X
6 7

DC POWER MAP

PAGE 8 OF 19

841
SET THE MULTIMETER TO MEASURE 220VAC.

MEASURE OUTPUT OF THE AC PS.

DANGER
HIGH VOLTAGE IS PRESENT.

MEASURE THE VOLTAGE BETWEEN CU-PS-01 J2-1 AND J2-3.

IS THE VOLTAGE BETWEEN 180V AC AND 240 V AC?
Y N

842

THE CU AC POWER SUPPLY, TCU-PS-01, IS FAILING.

EXCHANGE FRU144.

SEE CARR-TCU 1440.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

843
THE CU DC POWER SUPPLY, TCU-PS-02, IS FAILING.

SEE CARR-TCU 1450.

EXCHANGE FRU145.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

844
RESET CB1.

PRESS AND HOLD THE IML SWITCH (LOC 1).
RELEASE THE IML SWITCH.

DID CB1 TRIP AGAIN?
Y N

Y Z

Y Z

845
RESETTING CB1 CORRECTED THE PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

846

DISCONNECT THE CU GATE FAN 1 (LOC 1).

SEE CARR-TCU 1500.

RESET CB1.

THE AC FOR THE GATE FANS GO THROUGH CU-PS-02 CB1.
SEE OVERVIEW DIAGRAM ON PWR 34.

DID CB1 TRIP ?
Y N

847

THE CU GATE FAN 1 IS FAILING.

EXCHANGE FRU150.

SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

848

DISCONNECT THE CU GATE FAN 2 (LOC 1).

SEE CARR-TCU 1500.

RESET CB1.

DID CB1 TRIP ?
Y N

9 9
A A
A B

MAP 0400—Tape Control Unit DC Power PWR 400-9

5 A A DC POWER MAP
6 A B
8 8

PAGE 9 OF 19

849

THE CU GATE FAN 2 IS FAILING.

EXCHANGE FRU150. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

850
THE CU DC POWER SUPPLY, TCU-PS-02, IS
FAILING.

EXCHANGE FRU145 SEE CARR-TCU 1-1

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

851

CONNECT METER TO MEASURE
+24 V DC BETWEEN 01A-A2H4 J06(+)
AND 01A-A2H4 D08(-) (LOC 1).

+24 V DC AND AC IS AVAILABLE TO THE DC SUPPLY,
BUT THE DC VOLTAGES ARE NOT ON.
THIS SECTION CHECKS THE DC TURN ON CIRCUITS.

SEE DETAILED DIAGRAM ON PWR 50.

THE +24 V DC CHECKS THAT FOLLOW ARE
NOT INTENDED TO BE TOLERANCE CHECKS
BUT AS CHECKPOINTS FOR PROBLEM
ANALYSIS. YOU WILL FIND TOLERANCE
TABLES ON PWR20.

DID THE METER READ GREATER THAN +18 V DC ?
Y N

1
0
A A
C D

A
D

852

ON THE CU GATE, METER TB3-12 (+) TO TB3-10
(-) FOR +24 V DC (LOC 1).

THE +24 V DC IS MISSING AT THE POR CARD.

DID THE METER READ GREATER THAN +19 V DC ?
Y N

853
SET THE CU POWER ON/OFF SWITCH TO THE OFF
POSITION (LOC 1).

DISCONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

CHECK FOR CONTINUITY FROM
CU-PS-02 P4-7 TO 01A-TB3-12 AND FROM
CU-PS-02 P4-8 TO 01A-TB3-10

DOES THE METER INDICATE CONTINUITY?
Y N

854
REPAIR CABLE FROM CU-PS-02 P4 TO 01A-TB3 THE +24 V DC IS MISSING AT TB3.

SEE DETAILED DIAGRAM ON PWR 50.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

855
THE CU DC POWER SUPPLY, TCU-PS-02, IS
FAILING.

EXCHANGE FRU145. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

1
0
A
E

A
E
9

DC POWER MAP

PAGE 18 OF 19

056

ON THE CU GATE, METER TB3-13 (+) TO TB3-10 (-) FOR 24 V DC (LOC 1).

DID THE METER READ GREATER THAN +19 V DC ?
Y N

057

THE CU GATE UPPER THERMAL IS FAILING.

OR

THE STI GATE THERMAL IS FAILING.

OR

THE SERVICE SWITCH IS FAILING.

USING THE DIAGRAM ON PWR 50, ISOLATE TO THE FAILING COMPONENT. THEN.....

EXCHANGE FAILING COMPONENT.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

058

THERE IS AN OPEN WIRE FROM 01A-TB3-13 TO 01A-A2H4 J06. — SEE ALD ZT020.

REPAIR OPEN IN CABLE.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

A
C
9

059

ON THE DC POWER SUPPLY, SET CU-PS-02 CB1 TO OFF.

DISCONNECT THE CABLE CU-PS-02 P4 (LOC 1).

INSTALL A JUMPER FROM CU-PS-02 J4-8 TO J4-9 (LOC 1). — THIS JUMPER BYPASSES THE TURN ON CIRCUITRY.

SET CU-PS-02 CB1 TO ON.

OBSERVE THE LEDS ON THE DC TEST TOOL.

IS LED 1 ONLY LED ON?
Y N

060

REMOVE JUMPER FROM CU-PS-02 J4-8 TO J4-9 (LOC 1).

CHECK FOR CONTINUITY FROM CU-PS-02 P4-9 TO 01A-A2H4 D13.

DOES THE METER INDICATE CONTINUITY?
Y N

061

THERE IS AN OPEN WIRE FROM CU-PS-02 P4-9 TO 01A-TB3-11. — SEE ALD ZT020.

-----OR-----

THERE IS AN OPEN WIRE FROM 01A-TB3-11 TO 01A-A2H4 D13.

REPAIR OPEN IN CABLE.

(Step 061 continues)

1 1
1 1
A A
F G

THE 24 V DC IS OK TO THE POR CARD.

Q A A
6 F G
1 1
0 0

DC POWER MAP

PAGE 11 OF 19

(Step 861 continued)
GO TO PAGE 19, STEP 135,
ENTRY POINT C.

862

THE POR CARD, 01A-AZH4, IS FAILING.

THE DC SUPPLY TURNS ON OK WITH THE BYPASS JUMPER. THE 24 V DC TO THE POR CARD AND THE 'PICK POWER ON CONTACTOR' NET FROM THE POR CARD ARE OK.

EXCHANGE FRU126.

SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

863
THE CU DC POWER SUPPLY, TCU-PS-02, IS FAILING.

SEE CARR-TCU 1-1.

EXCHANGE FRU145.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

864

CHECK THE STI GATE FANS FOR PROPER OPERATION.

ARE THE FANS OPERATING CORRECTLY?
Y N

865

ARE BOTH FANS FAILING?
Y N

A A A
H J K

A A A
H J K

866

THE STI GATE FAN IS FAILING.

EXCHANGE THE FAILING GATE FAN (FRU984)

SEE CARR-TCU 1-1

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

867

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

THERE IS AN OPEN WIRE FROM
CU1A P1-1 TO TCU-PS-02 P3-1 (YF005)(LOC 1)

---OR---

THERE IS AN OPEN WIRE FROM
CU1A P1-3 TO TCU-PS-02 P3-3 (LOC19)

REPAIR THE OPEN CIRCUIT.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

868

CHECK FOR ANY OBSTRUCTION
TO THE AIR FLOW.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

P 6

DC POWER MAP

PAGE 12 OF 19

869

CHECK THE CU GATE FANS FOR PROPER OPERATION (LOC 1).

ARE THE FANS OPERATING CORRECTLY?
Y N

870

ARE BOTH FANS FAILING?
Y N

871

THE CU GATE FAN IS FAILING.

EXCHANGE THE FAILING GATE FAN (FRU150) SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

872

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

ON THE AC SUPPLY, SET CIRCUIT BREAKER CU-PS-01 CB1 TO THE OFF POSITION (LOC 1).

THERE IS AN OPEN WIRE FROM CU1A P1-1 TO TCU-PS-02 P3-1 (YF005)(LOC 1)

---OR---

THERE IS AN OPEN WIRE FROM CU1A P1-3 TO TCU-PS-02 P3-3 (LOC19)

REPAIR THE OPEN CIRCUIT.

(Step 872 continues)

A L

L A 5 L

(Step 872 continued)
GO TO PAGE 19, STEP 135, ENTRY POINT C.

873

CHECK FOR ANY OBSTRUCTION TO THE AIR FLOW.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

874

RELEASE THE IML SWITCH.

OBSERVE THE LEDS ON THE DC TEST TOOL.

LED	ON/OFF	V DC	FUSE/CB
1	ON	24CTL	F2
2	OFF		N/A
3	OFF		N/A
4	OFF		N/A
5	ON	+8.5	F1
6	ON	-5	CB4
7	ON	+5	CB2
8	ON	+5	CB3

DOES THE CHART AND DC TEST TOOL AGREE?
Y N

875

CONNECT METER TO MEASURE +1.7 V DC BETWEEN 01A-A1T2 B03(+) AND 01A-A1T2 D08(-).

OBSERVE THE METER WHILE PRESSING THE IML SWITCH.

DID THE METER READ ABOVE +1.6 V DC?
Y N

CHECK FOR MISSING VOLTAGE AT THE REGULATOR CARD.

1 1 1
5 3 3
A A A
M N P

MAP 0400—Tape Control Unit DC Power PWR 400-13

A A
N P
1 1
2 2

DC POWER MAP

PAGE 13 OF 19

076

MISSING 1.7 V DC AT THE POR CARD.
GO TO MAP 410, ENTRY POINT B.

077

(ENTRY POINT E)

CONNECT METER TO MEASURE
+1.7 V DC BETWEEN 01A-A2H4 G11(+)
AND 01A-A2H4 D08(-).

CHECK FOR MISSING VOLTAGE AT POR CARD.

OBSERVE THE METER WHILE PRESSING THE IML SWITCH.

DID THE METER READ ABOVE +1.6 V DC?
Y N

078

THE 1.7 V DC NET IS OPEN.

LOCATE AND REPAIR THE OPEN.

REFERENCE LOGIC PAGE RG001.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

A
Q

A
Q

079

CONNECT METER TO MEASURE
-5 V DC BETWEEN 01A-A2H4 D08(+)
AND 01A-A2H4 B06(-).

MISSING VOLTAGE AT POR CARD OR DEFECTIVE CARD.

OBSERVE THE METER WHILE PRESSING THE IML SWITCH.

DID THE METER READ BETWEEN -4.5 V DC AND -5.5 V DC?
Y N

080

DID THE METER READ GREATER THAN 0 V?
Y N

081

THE -5 V DC NET IS OPEN.

REFERENCE ALDS YF002 AND ZT020.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR OPEN IN THE -5 V DC NET

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

082

THE DC POWER SUPPLY, CU-PS-02, IS FAILING.

EXCHANGE FRU145.

SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

1
4
A
R

MAP 0400—Tape Control Unit DC Power

A DC POWER MAP
R
1
3

PAGE 14 OF 19

083

CONNECT METER TO MEASURE
+5 V DC BETWEEN 01A-A2H4 D02(+)
AND 01A-A2H4 D08(-).

OBSERVE METER WHILE PRESSING THE IML SWITCH.

DID THE METER READ +5 V DC?
Y N

084

THE 01A-A1 +5 V NET IS OPEN. REFERENCE ALDS YF002 AND ZT010.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR OPEN IN THE +5 V DC NET

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

085

CONNECT METER TO MEASURE
+5 V DC BETWEEN 01A-A2H4 D03(+)
AND 01A-A2H4 D08(-).

OBSERVE THE METER WHILE PRESSING THE IML SWITCH.

DID THE METER READ +5 V DC?
Y N

A A
S T

A
S T

086

THE 01A-A2 +5 V NET IS OPEN. REFERENCE ALDS YF002 AND ZT011.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR OPEN IN THE +5 V DC NET

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

087

CONNECT METER TO MEASURE
+8.5 V DC BETWEEN 01A-A2H4 B11(+)
AND 01A-A2H4 D08(-).

OBSERVE THE METER WHILE PRESSING THE IML SWITCH.

DID THE METER READ +8.5 V DC?
Y N

088

THE +8.5 V DC NET IS OPEN. REFERENCE ALDS YF002 AND ZT020.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR OPEN IN THE +8.5 V DC NET

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

1
5
A
U

A A
M U
1 1
2 4

DC POWER MAP

PAGE 15 OF 19

089

CONNECT METER TO MEASURE
+24 V DC BETWEEN 01A-A2H4 J06(+)
AND 01A-A2H4 D08(-).

OBSERVE THE METER WHILE PRESSING THE IML
SWITCH.

DID THE METER READ +24 V DC?
Y N

090

THE +24 V DC NET IS OPEN. REFERENCE ALDS YF002 AND ZT020.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR OPEN IN +24 V DC NET.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

091

SET THE SERVICE SWITCH TO OFF (LOC 1).

THE POR CARD, 01A-A2H4, IS FAILING.

EXCHANGE FRU126 SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

092
SUSPECT INTERMITTENT PROBLEM ON THE POR CARD.

EXCHANGE FRU126 SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

A
1

093

CONNECT METER TO MEASURE
+5 V DC BETWEEN 01A-A2H4 J11(+)
AND 01A-A2H4 D08(-).

THE DC LED IS OFF BUT ALL THE VOLTAGES APPEAR TO BE OK. THE LED OR THE POR CARD IS FAILING OR GROUNDED.

DID THE METER READ BETWEEN +4 V DC AND +5 V DC ?
Y N

094
SET THE CU POWER ON/OFF SWITCH TO THE OFF
POSITION (LOC 1).

CHECK FOR CONTINUITY FROM
01A-A2H4 J11 TO 01A-A2 H4 D08.

DOES THE METER INDICATE CONTINUITY?
Y N

095

SET THE SERVICE SWITCH TO OFF (LOC 1).

THE POR CARD, 01A-A2H4, IS FAILING.
EXCHANGE FRU126. SEE CARR-TCU 1 FOR.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

096

SET THE SERVICE SWITCH TO OFF (LOC 1).

REMOVE THE POR CARD AT 01A-A2H4.

CHECK FOR CONTINUITY FROM
01A-A2H4 J11 TO 01A-A2 H4 D08.

DOES THE METER INDICATE CONTINUITY?
Y N

1 1 1
6 6 6
A A A
V W X

A A
W X
1 1
5 5

DC POWER MAP

PAGE 16 OF 19

697

THE POR CARD, 01A-A2H4, IS FAILING.

EXCHANGE FRU126. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

698

DISCONNECT THE CABLE
CU-OSU P1 (LOC 1).

CHECK FOR CONTINUITY FROM
01A-A2H4 J11 TO 01A-A2 H4 D08.

DOES THE METER INDICATE CONTINUITY?
Y N

699

THE CU-OSU BOARD IS FAILING.

EXCHANGE FRU141. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

100
THE '+DC POWER ON' NET IS SHORT CIRCUITED TO
GROUND.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR SHORT TO GROUND.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

A
V
1
5

101

CONNECT METER TO MEASURE
+8.5 V DC BETWEEN 01A-A2H4 B04(+)
AND 01A-A2H4 D08(-).

DID THE METER READ BETWEEN +5 V DC AND +10 V DC ?
Y N

102

CONNECT METER TO MEASURE
+5 V DC BETWEEN 01A-A2H4 D10(+)
AND 01A-A2H4 D08(-).

DID THE METER READ BETWEEN +1 V DC AND +5 V DC
?
Y N

103

THE POR CARD, 01A-A2H4, IS FAILING.

EXCHANGE FRU126. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

104

SET THE CU POWER ON/OFF SWITCH TO THE OFF
POSITION (LOC 1).

DISCONNECT THE CABLE
CU-OSU P1 (LOC 1).

CHECK FOR CONTINUITY FROM
01A-A2H4 D10 TO CU-OSU P1-2.
(Step 104 continues)

1
7
A
Y

A
Y
1
6

DC POWER MAP

PAGE 17 OF 19

(Step 104 continued)

DOES THE METER INDICATE CONTINUITY?
Y N

105

THE '+DC POWER ON' NET IS OPEN.

SEE DETAILED DIAGRAM ON PWR 50.

REPAIR OPEN IN NET.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

106
(THE DC POWER LED IS FAILING.)

EXCHANGE FRU141. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

107

SET THE SERVICE SWITCH TO OFF (LOC 1).

THE POR CARD, 01A-A2H4, IS FAILING.

EXCHANGE FRU126. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135, ENTRY POINT C.

108
(ENTRY POINT B)
IS LED 5 OFF OR DIM?
Y N

DUE TO BACK CIRCUITS,LED 5 MAY
GLOW WHEN FUSE 1 IS BLOWN.
COMPARE INTENSITY WITH LED 1.

109
IS LED 6 OFF?
Y N

110
IS LED 7 OFF?
Y N

111
IS LED 8 OFF?
Y N

112
RELEASE THE IML SWITCH.

IS LED 1 THE ONLY LED ON?
Y N

113

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

114

SET THE SERVICE SWITCH TO OFF (LOC 1).

THE POR CARD, 01A-A2H4, IS FAILING.

EXCHANGE FRU126. SEE CARR-TCU 1-1.

GO TO PAGE 19, STEP 135,
ENTRY POINT C.

1 1 1 1
9 0 0 0
A B B B
Z A B C

DC POWER MAP

PAGE 18 OF 19

115
IS CB3 TRIPPED?
Y N

116

EXCHANGE FRU145. SEE CARR-TCU 1-1.
GO TO PAGE 19, STEP 135,
ENTRY POINT C.

117

RESET CB3.

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB3 TRIP AGAIN?
Y N

118
RESETTING CB3 CORRECTED THE PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

119

ISOLATE CAUSE FOR CB3 TRIPPING.

GO TO MAP 420, ENTRY POINT B.

120
IS CB2 TRIPPED?
Y N

121

EXCHANGE FRU145. SEE CARR-TCU 1-1.
GO TO PAGE 19, STEP 135,
ENTRY POINT C.

122

RESET CB2.

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB2 TRIP AGAIN?
Y N

123
RESETTING CB2 CORRECTED THE PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

124

ISOLATE CAUSE OF CB2 TRIPPING.

GO TO MAP 420, ENTRY POINT A.

125
IS CB4 TRIPPED?
Y N

126

EXCHANGE FRU145. SEE CARR-TCU 1-1.
GO TO PAGE 19, STEP 135,
ENTRY POINT C.

MAP 0400—Tape Control Unit DC Power PWR 400-19

A B
Z E
1 1
7 8

DC POWER MAP

PAGE 19 OF 19

127

RESET C84.

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID C84 TRIP AGAIN?
Y N

128
RESETTING C84 CORRECTED THE PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

129

ISOLATE CAUSE FOR C84 TRIPPING.

GO TO MAP 430, ENTRY POINT A.

130

CHECK CU-PS-02 FUSE F1.

'S FUSE F1 BLOWN?
Y N

131

THE 8.5 LED IS OFF AND FUSE F1 IS OK.

EXCHANGE FRU145. SEE CARR-TCU 1-1.

GO TO STEP 135,
ENTRY POINT C.

B
F

B
F

132

EXCHANGE FUSE F1.

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID FUSE F1 BLOW AGAIN.
Y N

133
EXCHANGING FUSE F1 CORRECTED PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

134

ISOLATE CAUSE OF F1 BLOWING.

GO TO MAP 440, ENTRY POINT A.

(ENTRY POINT C)
CLEANUP AFTER REPAIR.

SET THE CU POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

RECONNECT ANY CABLES REMOVED FOR TROUBLESHOOTING.

REPLACE ANY FUSES REMOVED FOR TROUBLESHOOTING.

RESET ANY CB TRIPPED FOR TROUBLESHOOTING.

REMOVE ANY JUMPERS USED FOR TROUBLESHOOTING.

GO TO MAP 0190, ENTRY POINT A.

+1.7 V DC REGULATOR

PAGE 1 OF 4

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	B	3	010
0411	C	4	017

001
(ENTRY POINT A)

MAP DESCRIPTION: MAP 0100 DIRECTED YOU TO THIS MAP TO ISOLATE A FAILURE OF THE ON BOARD REGULATOR CARD, 01A-A1T2 .

START CONDITIONS:
-POWER ON LED ON
-AN 01A-A1T2 LED ON OR MISSING VOTAGE.

FRUS DIAGNOSED:
-REGULATOR CARD, 01A-A1T2
-REGULATOR CARD, 01A-A1T2 FUSES.

ADDITIONAL SERVICE AIDS:
-TAPE CONTROL UNIT DC POWER DISTRIBUTION DIAGRAM ON PWR 34.

SEE LOC 1.

RESET THE VOLTAGE REGULATOR BY SETTING THE TAPE CONTROL UNIT SERVICE SWITCH TO OFF FOR FIVE SECONDS AND THEN BY SETTING THE TAPE CONTROL UNIT SERVICE SWITCH TO ON.

OBSERVE THE LEDS LOCATED ON THE CU REGULATOR CARD, 01A-A1T2.
(Step 001 continues)

(Step 001 continued)

ARE ANY LEDS ON?
Y N

002
RECYCLING POWER CORRECTED THE PROBLEM.

SUSPECT AN INTERMITTENT REGULATOR CARD.
GO TO PAGE 4, STEP 017, ENTRY POINT C.

003

MEASURE +24 V DC BETWEEN 01A-A1T2 S06(+) AND 01A-A1T2 D08 (-).

USE ALD RG001 AS A REFERENCE.

+24 V DC GOOD?
Y N

004

OPEN CIRCUIT BETWEEN 01A-A1T2 S06 AND 01A TB3-13.

REPAIR OPEN CKT.

USE ALD RG001 AS A REFERENCE.

REFER TO THE CE/HSC SECTION AND RUN GMP.

2
A

A +1.7 V DC REGULATOR
1

PAGE 2 OF 4

005

SET THE SERVICE SWITCH TO OFF (LOC 1).

REMOVE CARD 01A-A1T2 FROM THE GATE.

CHECK THE +24 V DC FUSE ON THE REGULATOR CARD.

24 V DC FUSE IS THE LOWER FUSE (F1).

NOTE: SOME MODELS OF THE REGULATOR CARD DO NOT HAVE AN F1 FUSE. IF FUSE F1 IS NOT PRESENT ON THE CARD YOU JUST REMOVED, ANSWER "YES" TO THE FOLLOWING QUESTION.

IS THE FUSE GOOD?
Y N

006
EXCHANGE +24 V DC FUSE ON CARD 01A-A1T2.

REINSTALL CARD 01A-A1T2.

SET THE SERVICE SWITCH TO ON (LOC 1).

OBSERVE THE LEDS ON THE REGULATOR CARD.

ARE THE LEDS OFF?
Y N

007

GO TO PAGE 4, STEP 017, ENTRY POINT C.

B C

B C

008
EXCHANGING FUSE CORRECTED PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

009

GO TO PAGE 4, STEP 017, ENTRY POINT C.

+1.7 V DC REGULATOR

PAGE 3 OF 4

010
(ENTRY POINT B)
CHECK +5 V DC INPUT TO THE REGULATOR CARD.

CONNECT METER TO MEASURE +5 V DC BETWEEN 01A-A1T2 D03(+) AND 01A-A1T2 D08(-).

OBSERVE THE METER WHILE PRESSING THE IML SWITCH.

IS +5 V DC INPUT VOLTAGE MISSING?
Y N

011

SET THE SERVICE SWITCH TO OFF (LOC 1).

REMOVE CARD 01A-A1T2 FROM THE GATE.

CHECK THE +5 V DC FUSE.

+5 V DC FUSE IS THE UPPER FUSE (F2).

NOTE: SOME MODELS OF THE REGULATOR CARD DO NOT HAVE AN F2 FUSE. IF FUSE F2 IS NOT PRESENT ON THE CARD YOU JUST REMOVED, ANSWER "YES" TO THE FOLLOWING QUESTION.

IS THE FUSE OKAY?
Y N

4
D E F

E F

012
EXCHANGE FUSE ON CARD 01A-A1T2.

REINSTALL CARD 01A-A1T2.

SET THE SERVICE SWITCH TO ON (LOC 1).

MEASURE REGULATOR +1.7 V DC OUTPUT. 01A-A1T2 B03(+) TO 01A-A1T2 D08(-).

IS THE 1.7 V DC MISSING?
Y N

013
EXCHANGING FUSE CORRECTED PROBLEM.

REFER TO THE CE/HSC SECTION AND RUN GMP.

014

GO TO PAGE 4, STEP 017, ENTRY POINT C.

015

GO TO PAGE 4, STEP 017, ENTRY POINT C.

0
3 +1.7 V DC REGULATOR

PAGE 4 OF 4

016

SET THE SERVICE SWITCH TO OFF (LOC 1).

EXCHANGE BOARD 01A-A1 (FRU139). SEE CARR-TCU 1-1.

REFER TO THE CE/HSC SECTION AND RUN GMP.

017
(ENTRY POINT C)
REGULATOR CARD FAILURE.
EXCHANGE 01A-A1T2 (FRU138). SEE CARR-TCU 1-1.

REFER TO THE CE/HSC SECTION AND RUN GMP.

MAP 0420—+5 Volt CB Tripped PWR 420-1

TCU +5 VOLT CB TRIPPED

PAGE 1 OF 6

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0400	A	1	001
0400	B	4	012
0421	D	6	020
0421	E	6	019

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
6	019	0190	A

001
(ENTRY POINT A)

MAP DESCRIPTION: MAP 0400 DIRECTED YOU TO THIS MAP BECAUSE CB2 WILL NOT STAY RESET.

THERE IS AN OVERLOAD ON THE +5 V CIRCUIT TO THE 01A-A1 LOGIC BOARD

THIS SECTION ISOLATES THE SHORT CIRCUIT.

SEE DETAILED DIAGRAM ON PWR 42.

REMOVE THE +8.5 V DC FUSE, CU-PS-02 F1.

REMOVING THE FUSE PREVENTS THE DC POWER FROM HOLDING DURING THIS SECTION.

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

DISCONNECT THE CABLE CU-PS-02 P9 (LOC 1).

ISOLATES THE POWER SUPPLY FROM ALL LOADS.

RESET CB2.

PRESS AND HOLD THE IML SWITCH (LOC 1).
(Step 001 continues)

(Step 001 continued)

RELEASE THE IML SWITCH.

DID CB2 TRIP?
Y N

002

RECONNECT THE CABLE CU-PS-02 P9 (LOC 1).

OVERLOAD MAY BE DUE TO A1 BOARD, ITS CARDS OR THE RESISTIVE PRELOAD DEVICE.

SET THE SERVICE SWITCH TO OFF (LOC 1).

DISCONNECT THE 01A-A1 +5 V BUSS CABLES FROM 01A-A1 Y2 AND Y5 (LOC 1).
(SEE ALD PAGE YZ002).

REMOVES BOARD A1 AND ITS CARDS FROM LOAD.

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB2 TRIP?
Y N

3 2 2
A B C

C
1

+5 VOLT CB TRIPPED

PAGE 2 OF 6

003

SET THE SERVICE SWITCH TO OFF (LOC 1).

THIS REMOVES THE +24 V DC FROM THE LOGIC BOARDS.

RECONNECT 01A-A1 Y2 AND Y5 (YZ002) (LOC 1).

REMOVE ALL CARDS FROM THE 01A-A1 BOARD (LOC 1).
(SEE ALD PAGE AA000).

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB2 TRIP?
Y N

004

SET THE SERVICE SWITCH TO OFF (LOC 1).
REINSTALL THE CARDS, ONE AT A TIME. DO NOT INSTALL THE TOP CARD CONNECTORS (TCC).

A LOGIC CARD IS CAUSING THE CB TO TRIP.

EACH TIME A CARD IS INSTALLED;
-SET THE SERVICE SWITCH TO ON.
-PRESS AND HOLD THE IML SWITCH FOR SEVERAL SECONDS.
-SET THE SERVICE SWITCH TO OFF.
-CHECK IF CB2 IS TRIPPED.

REPEAT THIS STEP UNTIL THE FAILING CARD IS LOCATED.
THEN.....
(Step 004 continues)

D
8 D

1

(Step 004 continued)

REINSTALL FUSE F1.

EXCHANGE THE FAILING CARD.

GO TO PAGE 6, STEP 020, ENTRY POINT D.

005

THE 01A-A1 BOARD IS FAILING.

REINSTALL FUSE F1.

EXCHANGE FRU139.

SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 020, ENTRY POINT D.

006

POWER SUPPLY REGULATION IS MAINTAINED BY USING A RESISTIVE PRELOAD. THE RESISTIVE PRELOAD MAY BE LOCATED IN CARD SLOT A2P2 OR IN A LOAD BOX MOUNTED TO THE FRAME.

IS THERE A CARD LOCATED IN THE A2P2 SLOT?
Y N

3 3
E F

MAP 0420—+5 Volt CB Tripped PWR 420-3

F
2

+5 VOLT CB TRIPPED

PAGE 3 OF 6

007

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT 01A-A1 Y2 AND Y5 (YZ01-2)
(LOC 1).

DISCONNECT THE LOAD BOX +5 V CABLE
FROM TB1-5
(SEE ALD PAGE ZT010).

RESET CB2.

SET THE SERVICE SWITCH TO ON
(LOC 1).

PRESS AND HOLD THE IML SWITCH
(LOC 1).

RELEASE THE IML SWITCH.

DID CB2 TRIP?
Y N

008

THE LOAD BOX IS FAILING.

REINSTALL FUSE F1.

EXCHANGE FRU279. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 020,
ENTRY POINT D.

G

A E G
1 2

009

THERE IS A SHORT CIRCUIT FROM
CU-PS-02 P9-1 TO FRAME GROUND.

LOCATE AND REPAIR THE SHORT
CIRCUIT USING PWR 42 AS A
TROUBLESHOOTING AID.

GO TO PAGE 6, STEP 019,
ENTRY POINT E.

010

THERE IS A SHORT CIRCUIT FROM
CU-PS-02 P9-1 TO FRAME GROUND.

LOCATE AND REPAIR THE SHORT
CIRCUIT USING PWR 42 AS A
TROUBLESHOOTING AID.

GO TO PAGE 6, STEP 019,
ENTRY POINT E.

011

THE TAPE CONTROL UNIT DC SUPPLY,
CU-PS-02, IS FAILING (LOC 1).

EXCHANGE FRU145. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 020,
ENTRY POINT D.

+5 VOLT CB TRIPPED

PAGE 4 OF 6

012
(ENTRY POINT B)

MAP DESCRIPTION: MAP 0400 DIRECTED YOU TO THIS MAP BECAUSE CB3 WILL NOT STAY RESET.

THERE IS AN OVERLOAD ON THE +5 V CIRCUIT TO THE 01A-A2 LOGIC BOARD.

THIS SECTION ISOLATES THE SHORT CIRCUIT.

SEE DETAILED DIAGRAM ON PWR 42.

REMOVE THE +8.5 V DC FUSE, CU-PS-02 F1.

REMOVING THE FUSE PREVENTS THE DC POWER FROM HOLDING DURING THIS SECTION.

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

DISCONNECT THE CABLE CU-PS-02 P11 (LOC 1).

ISOLATES THE POWER SUPPLY FROM ALL LOADS.

RESET CB3 (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.
(THE DC POWER WILL GO OFF SINCE F1 FUSE IS REMOVED.)

DID CB3 TRIP?
Y N

5
H J

J

013

RECONNECT THE CABLE CU-PS-02 P11 (LOC 1).

OVERLOAD MAY BE DUE TO A2 BOARD OR ITS CARDS.

DISCONNECT THE 01A-A2 +5V BUSS CABLES FROM 01A-A2 Y2 AND Y5 (LOC 1).
(SEE ALD PAGE YZ003).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB3 TRIP?
Y N

014

RECONNECT 01A-A2 Y2 AND Y5 (YZ003) (LOC 1).

SET THE SERVICE SWITCH TO OFF (LOC 1).

THIS REMOVES THE +24 V DC FROM THE LOGIC BOARDS.

REMOVE ALL CARDS FROM THE 01A-A2 BOARD (LOC 1)
(SEE ALD PAGE AA001).

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB3 TRIP?
Y N

5 5 5
K L M

MAP 0420—+5 Volt CB Tripped

L M
4 4

+5 VOLT CB TRIPPED

PAGE 5 OF 6

015

SET THE SERVICE SWITCH TO OFF (LOC 1).
REINSTALL THE CARDS, ONE AT A TIME. DO NOT INSTALL THE TOP CARD CONNECTORS (TCC).

EACH TIME A CARD IS INSTALLED;
-SET THE SERVICE SWITCH TO ON.
-PRESS AND HOLD THE IML SWITCH FOR SEVERAL SECONDS.
-SET THE SERVICE SWITCH TO OFF.
-CHECK IF CB3 IS TRIPPED.

REPEAT THIS STEP UNTIL THE FAILING CARD IS LOCATED.
THEN.....

REINSTALL FUSE F1.

EXCHANGE THE FAILING CARD.

GO TO PAGE 6, STEP 020,
ENTRY POINT D.

A LOGIC CARD IS CAUSING THE CB TO TRIP.

016

THE 01A-A2 BOARD IS FAILING.

REINSTALL FUSE F1.

EXCHANGE FRU140. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 020,
ENTRY POINT D.

M K
4 4

017

THERE IS A SHORT CIRCUIT FROM CU-PS-02 P11-1 TO FRAME GROUND.

LOCATE AND REPAIR THE SHORT CIRCUIT USING PWR 42 AS A TROUBLESHOOTING AID.

GO TO PAGE 6, STEP 019,
ENTRY POINT E.

018

THE TAPE CONTROL UNIT DC SUPPLY, CU-PS-02, IS FAILING (LOC 1).

EXCHANGE FRU145. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 020,
ENTRY POINT D.

MAP 0420—+5 Volt CB Tripped PWR 420-6

+5 VOLT CB TRIPPED

PAGE

019
(ENTRY POINT E)
CLEANUP AFTER REPAIR.

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

REMOVE ANY JUMPERS USED FOR TROUBLESHOOTING.

RECONNECT ANY CABLES REMOVED FOR TROUBLESHOOTING.

RE-INSTALL ANY FUSES REMOVED FOR TROUBLESHOOTING.

RESET ANY CB TRIPPED FOR TROUBLESHOOTING.

GO TO MAP 0190, ENTRY POINT A

020
(ENTRY POINT D)
RETURN AFTER REPAIR.

REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

TCU -5 VOLT CB TRIPPED

PAGE 1 OF 6

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0400	A	1	001
0431	D	6	021
0431	E	6	020

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
6	020	0190	A

001
(ENTRY POINT A)

MAP DESCRIPTION: MAP 0400 DIRECTED YOU TO THIS MAP BECAUSE CB4 WILL NOT STAY RESET.

THERE IS AN OVERLOAD ON THE -5 V DC CIRCUIT.

THIS SECTION ISOLATES THE SHORT CIRCUIT.

SEE DETAILED DIAGRAM ON PWR 46.

REMOVING THE FUSE PREVENTS THE DC POWER FROM HOLDING DURING THIS SECTION.

REMOVE THE +8.5 V DC FUSE, CU-PS-02 F1.

RESET CB4 (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.
(THE DC POWER WILL GO OFF SINCE F1 FUSE IS REMOVED.)

DID CB4 TRIP?
Y N

A B

A B

002

THE TROUBLE HAS DISAPPEARED.

REINSTALL FUSE F1.
GO TO PAGE 6, STEP 020,
ENTRY POINT E.

003

SET THE SERVICE SWITCH TO OFF (LOC 1).

DISCONNECT THE 01A-A1 VOLTAGE CROSSOVERS (6):
B3 E01, B4 E01, B5 E01
U3 E01, U4 E01, U5 E01
(SEE ALD PAGE YZ002).

SET THE SERVICE SWITCH TO ON (LOC 1).
RESET CB4.

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

DID CB4 TRIP?
Y N

2 2
C D

D -5 VOLT CB TRIPPED
1

PAGE 2 OF 6

004

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT THE 01A-A1 VOLTAGE
CROSSOVERS (6).
B3 E01, B4 E01, B5 E01
U3 E01, U4 E01, U5 E01
(SEE ALD PAGE YZ002).

REMOVE ALL CARDS FROM THE 01A-A1
BOARD (LOC 1)
(SEE ALD PAGE AA000).

SET THE SERVICE SWITCH TO ON
(LOC 1).

PRESS AND HOLD THE IML SWITCH
(LOC 1).

RELEASE THE IML SWITCH.

DID CB4 TRIP?
Y N

005

SET THE SERVICE SWITCH TO OFF
(LOC 1).

REINSTALL THE CARDS, ONE AT A
TIME. DO NOT INSTALL THE TOP
CARD CONNECTORS (TCC).

EACH TIME A CARD IS IN ALLED;
-SET THE SERVICE SWITCH TO ON.
-PRESS AND HOLD THE IML
SWITCH FOR SEVERAL SECONDS.
-SET THE SERVICE SWITCH TO OFF.
-CHECK IF CB4 IS TRIPPED.
(Step 005 continues)

A LOGIC CARD IS CAUSING THE CB TO
TRIP.

E

C E
1

(Step 005 continued)

REPEAT THIS STEP UNTIL THE
FAILING CARD IS LOCATED.
THEN.....

REINSTALL FUSE F1.

EXCHANGE THE FAILING CARD.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

006

THE 01A-A1 BOARD IS FAILING.

REINSTALL FUSE F1.

EXCHANGE FRU139. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

007

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT THE 01A-A1 VOLTAGE
CROSSOVERS (6).
B3 E01, B4 E01, B5 E01
U3 E01, U4 E01, U5 E01
(SEE ALD PAGE YZ002).

DISCONNECT THE 01A-A2 VOLTAGE
CROSSOVERS (6):
B3 E01, B4 E01, B5 E01
U3 E01, U4 E01, U5 E01
(SEE ALD PAGE YZ003).
(Step 007 continues)

MAP 0430—Tape Control Unit -5 Volt CB Tripped PWR 430-2

-5 VOLT CB TRIPPED

PAGE 3 OF 6

(Step 007 continued)

RESET CB2.

SET THE SERVICE SWITCH TO ON
(LOC 1).

PRESS AND HOLD THE IML SWITCH
(LOC 1).

RELEASE THE IML SWITCH.

DID CB4 TRIP?
Y N

008

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT 01A-A2 VOLTAGE
CROSSOVERS.
B3 E01, B4 E01, B5 E01
U3 E01, U4 E01, U5 E01
(SEE ALD PAGE YZ003).

REMOVE ALL CARDS FROM THE 01A-A2
BOARD (LOC 1)
(SEE ALD PAGE AA002).

SET THE SERVICE SWITCH TO ON
(LOC 1).

PRESS AND HOLD THE IML SWITCH
(LOC 1).

RELEASE THE IML SWITCH.

DID CB4 TRIP?
Y N

4
F G H

G H

009

SET THE SERVICE SWITCH TO OFF
(LOC 1).

REINSTALL THE CARDS, ONE AT A
TIME. DO NOT INSTALL THE TOP
CARD CONNECTORS (TCC).

EACH TIME A CARD IS INSTALLED;
-SET THE SERVICE SWITCH TO ON.
-PRESS AND HOLD THE IML
SWITCH FOR SEVERAL SECONDS.
-SET THE SERVICE SWITCH TO OFF.
-CHECK IF CB4 IS TRIPPED.

REPEAT THIS STEP UNTIL THE
FAILING CARD IS LOCATED.
THEN.....

REINSTALL FUSE F1.

EXCHANGE THE FAILING CARD.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

A LOGIC CARD IS CAUSING THE CB TO
TRIP.

010

THE 01A-A2 BOARD IS FAILING.

REINSTALL FUSE F1.

EXCHANGE FRU140.

SEE CARR-TCJ 1-1.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

F
3

-5 VOLT CB TRIPPED

PAGE 4 OF 6

011

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT 01A-A2 VOLTAGE
CROSSOVERS.
B3 E01, B4 E01, B5 E01
U3 E01, U4 E01, U5 E01
(SEE ALD PAGE YZ003).

POWER SUPPLY REGULATION IS
MAINTAINED BY USING A RESISTIVE
PRELOAD. THE RESISTIVE PRELOAD MAY
BE LOCATED IN CARD SLOT A2P2 OR IN
A LOAD BOX MOUNTED TO THE FRAME.

IS THERE A CARD LOCATED IN THE A2P2
SLOT?
Y N

012

DISCONNECT THE LOAD BOX -5 V CABLE
FROM TB3-7
(SEE ALD PAGE ZT020).

CHECK FOR A DEFECTIVE LOAD BOX.

RESET CB4.

SET THE SERVICE SWITCH TO ON
(LOC 1).

PRESS AND HOLD THE IML SWITCH
(LOC 1).

RELEASE THE IML SWITCH.

DID CB4 TRIP?
Y N

5
J K L

K L

013

THE LOAD BOX IS FAILING.

EXCHANGE FRU279.

SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

014

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT THE LOAD BOX -5 V CABLE.

DISCONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

CHECK FOR CONTINUITY FROM CU-PS-02
P4-2 TO FRAME GROUND. THE METER
SHOULD INDICATE AN OPEN CIRCUIT.

DOES THE METER INDICATE AN OPEN
CIRCUIT?
Y N

015

THERE IS A SHORT CIRCUIT FROM
CU-PS-02 P4-2 TO FRAME GROUND.

LOCATE AND REPAIR THE SHORT
CIRCUIT USING PWR 46 AS A
TROUBLESHOOTING AID.

GO TO PAGE 6, STEP 020,
ENTRY POINT E.

5
M

MAP 0430—Tape Control Unit -5 Volt CB Tripped PWR 430-4

J M
4 4

-5 VOLT CB TRIPPED

PAGE 5 OF 6

016

THE TAPE CONTROL UNIT DC SUPPLY,
CU-PS-02, IS FAILING (LOC 1).

EXCHANGE FRU145. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

017

DISCONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

CHECK FOR CONTINUITY FROM CU-PS-02
P4-2 TO FRAME GROUND. THE METER
SHOULD INDICATE AN OPEN CIRCUIT.

DOES THE METER INDICATE AN OPEN
CIRCUIT?
Y N

018

THERE IS A SHORT CIRCUIT FROM
CU-PS-02 P4-2 TO FRAME GROUND.

LOCATE AND REPAIR THE SHORT
CIRCUIT USING PWR 46 AS A
TROUBLESHOOTING AID.

GO TO PAGE 6, STEP 020,
ENTRY POINT E.

N

N

019

THE TAPE CONTROL UNIT DC SUPPLY,
CU-PS-02, IS FAILING (LOC 1).

EXCHANGE FRU145. SEE CARR-TCU 1-1.

GO TO PAGE 6, STEP 021,
ENTRY POINT D.

-5 VOLT CB TRIPPED

PAGE 6 OF 6

020
(ENTRY POINT E)
CLEANUP AFTER REPAIR.

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

REMOVE ANY JUMPERS USED FOR TROUBLESHOOTING.

RECONNECT ANY CABLES REMOVED FOR TROUBLESHOOTING.

RE-INSTALL ANY FUSES REMOVED FOR TROUBLESHOOTING.

RESET ANY CB TRIPPED FOR TROUBLESHOOTING.

GO TO MAP 0190, ENTRY POINT A.

021
(ENTRY POINT D)
RETURN AFTER REPAIR.

REFER TO THE CE/HSC SECTION OF THE MG AND RUN GMP.

TCU +8.5 VOLT FUSE BLOWS

PAGE 1 OF 5

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0400	A	1	001
0401	C	5	020
0401	D	5	021

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
5	020	0190	A

001
(ENTRY POINT A)

MAP DESCRIPTION: MAP 0400 DIRECTED YOU TO THIS MAP BECAUSE FUSE F1 BLOWS REPEATEDLY

THERE IS AN OVERLOAD ON THE +8.5 V CIRCUIT.

THIS SECTION ISOLATES THE SHORT CIRCUIT.

SEE DETAILED DIAGRAM ON PWR 48.

TRIPPING THE CB PREVENTS THE DC POWER FROM HOLDING DURING THIS SECTION.

SET CU-PS-02 CB4 TO THE OFF POSITION (LOC 1).

OPEN THE REAR DOOR OF THE TAPE CONTROL UNIT AND REMOVE THE SUB COVER.

EXCHANGE FUSE F1.
(SEVERAL FUSES MAY BE NEEDED).

PRESS AND HOLD THE IML SWITCH (LOC 1).
(Step 001 continues)

(Step 001 continued)

RELEASE THE IML SWITCH.
(THE DC POWER WILL GO OFF SINCE CB4 IS TRIPPED.)

IS FUSE F1 BLOWN?
Y N

Y:
002

THE TROUBLE HAS DISAPPEARED.

RESET CB4
GO TO PAGE 5, STEP 020,
ENTRY POINT C.

003

SET THE SERVICE SWITCH TO OFF (LOC 1).

DISCONNECT THE 01A-A1 VOLTAGE CROSSOVERS (6):
02 A14, B3 A14, B4 A14
U2 A14, U3 A14, U4 A14
(SEE ALD PAGE YZ002).

EXCHANGE FUSE F1.

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH FOR SEVERAL SECONDS.

RELEASE THE IML SWITCH.

IS FUSE F1 BLOWN?
Y N

2 2
A B

B
1 +8.5 VOLT FUSE BLOWS

PAGE 2 OF 5

004

SET THE SERVICE SWITCH TO OFF
(LOC 1).

RECONNECT THE 01A-A1 VOLTAGE
CROSSOVERS (6).
B2 A14, B3 A14, B4 A14
U2 A14, U3 A14, U4 A14
(SEE ALD PAGE YZ002).

REMOVE ALL CARDS FROM THE 01A-A1
BOARD (LOC 7) (LOC 1).
(SEE ALD PAGE AA000).

SET THE SERVICE SWITCH TO ON
(LOC 1).

PRESS AND HOLD THE IML SWITCH FOR
SEVERAL SECONDS.

RELEASE THE IML SWITCH.

IS FUSE F1 BLOWN?
Y N

005

SET THE SERVICE SWITCH TO OFF
(LOC 1).

REINSTALL THE CARDS, ONE AT A
TIME. DO NOT INSTALL THE TOP
CARD CONNECTORS (TCC).

EACH TIME A CARD IS INSTALLED;
-SET THE SERVICE SWITCH TO ON.
-PRESS AND HOLD THE IML
SWITCH FOR SEVERAL SECONDS.
-SET THE SERVICE SWITCH TO OFF.
-CHECK IF F1 IS BLOWN.
(Step 005 continues)

A LOGIC CARD IS CAUSING THE CB TO
TRIP.

C

A C
1

(Step 005 continued)

REPEAT THIS STEP UNTIL THE
FAILING CARD IS LOCATED.
THEN.....

RESET C84.

EXCHANGE THE FAILING CARD.

GO TO PAGE 5, STEP 021,
ENTRY POINT D.

006

THE 01A-A1 BOARD IS FAILING.

EXCHANGE FRU139. SEE CARR-TCU 1-1.

GO TO PAGE 5, STEP 021,
ENTRY POINT D.

007

SET THE SERVICE SWITCH TO OFF
(LOC 1).

DISCONNECT THE 01A-A2 VOLTAGE
CROSSOVERS (6):
B2 A14, B3 A14, B4 A14
U2 A14, U3 A14, U4 A14
(SEE ALD PAGE YZ003).

EXCHANGE FUSE F1.

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).
(Step 007 continues)

+8.5 VOLT FUSE BLOWS

PAGE 3 OF 5

(Step 007 continued)

RELEASE THE IML SWITCH.

IS FUSE F1 BLOWN?

Y N

008

SET THE SERVICE SWITCH TO OFF (LOC 1).

RECONNECT 01A-A2 VOLTAGE CROSSOVERS (6).
B2 A14, B3 A14, B4 A14
U2 A14, U3 A14, U4 A14
(SEE ALD PAGE YZ003).

REMOVE ALL CARDS FROM THE 01A-A2 BOARD (LOC 7) (LOC 1).
(SEE ALD PAGE AA002).

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH FOR SEVERAL SECONDS.

RELEASE THE IML SWITCH.

IS FUSE F1 BLOWN?

Y N

D E F

E F

009

SET THE SERVICE SWITCH TO OFF (LOC 1).

REINSTALL THE CARDS, ONE AT A TIME. DO NOT INSTALL THE TOP CARD CONNECTORS (TCC).

EACH TIME A CARD IS INSTALLED;
-SET THE SERVICE SWITCH TO ON.
-PRESS AND HOLD THE IML SWITCH FOR SEVERAL SECONDS.
-SET THE SERVICE SWITCH TO OFF.
-CHECK IF F1 IS BLOWN.

REPEAT THIS STEP UNTIL THE FAILING CARD IS LOCATED.
THEN.....

RESET CB4.

EXCHANGE THE FAILING CARD.

GO TO PAGE 5, STEP 021, ENTRY POINT D.

A LOGIC CARD IS CAUSING THE FUSE TO BLOW.

010

THE 01A-A2 BOARD IS FAILING.

EXCHANGE FRU140

GO TO PAGE 5, STEP 021, ENTRY POINT D.

011

POWER SUPPLY REGULATION IS MAINTAINED BY USING A RESISTIVE PRELOAD. THE RESISTIVE PRELOAD MAY BE LOCATED IN CARD SLOT A2P2 OR IN A LOAD BOX MOUNTED TO THE FRAME.

IS THERE A CARD LOCATED IN THE A2P2 SLOT?

Y N

012

SET THE SERVICE SWITCH TO OFF (LOC 1).

DISCONNECT THE LOAD BOX +8.5 V CABLE FROM TB3-2 (SEE ALD PAGE ZT020).

EXCHANGE FUSE F1.

SET THE SERVICE SWITCH TO ON (LOC 1).

PRESS AND HOLD THE IML SWITCH (LOC 1).

RELEASE THE IML SWITCH.

IS FUSE F1 BLOWN?

Y N

4 4 4
G H J

H J
3 3

+8.5 VOLT FUSE BLOWS

PAGE 4 OF 5

013

THE LOAD BOX IS FAILING.

EXCHANGE FRU279

SEE CARR-TCU 1-1

GO TO PAGE 5, STEP 021,
ENTRY POINT D.

014

DISCONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

CHECK FOR CONTINUITY FROM CU-PS-02
P4-1 TO FRAME GROUND. THE METER
SHOULD INDICATE AN OPEN CIRCUIT.

DOES THE METER INDICATE AN OPEN
CIRCUIT?
Y N

015

THERE IS A SHORT CIRCUIT FROM
CU-PS-02 P4-1 TO FRAME GROUND.

SEE PWR 48 TO HELP ISOLATE THE
SHORT CIRCUIT.

WHEN THE PROBLEM IS CORRECTED,
RECONNECT THE VOLTAGE CROSSOVERS
TO THE 01A-A1 AND 01A-A2 BOARDS
(YZ002) (YZ003).

GO TO PAGE 5, STEP 020,
ENTRY POINT C.

K

G K
3

016

THE TAPE CONTROL UNIT DC SUPPLY,
CU-PS-02, IS FAILING (LOC 1).

EXCHANGE FRU145

SEE CARR-TCU 1-1

GO TO PAGE 5, STEP 021,
ENTRY POINT D.

017

DISCONNECT THE CABLE
CU-PS-02 P4 (LOC 1).

CHECK FOR CONTINUITY FROM CU-PS-02
P4-1 TO FRAME GROUND. THE METER
SHOULD INDICATE AN OPEN CIRCUIT.

DOES THE METER INDICATE AN OPEN
CIRCUIT?
Y N

018

THERE IS A SHORT CIRCUIT FROM
CU-PS-02 P4-1 TO FRAME GROUND.

SEE PWR 48 TO HELP ISOLATE THE
SHORT CIRCUIT.

WHEN THE PROBLEM IS CORRECTED,
RECONNECT THE VOLTAGE CROSSOVERS
TO THE 01A-A1 AND 01A-A2 BOARDS
(YZ002) (YZ003).

GO TO PAGE 5, STEP 020,
ENTRY POINT C.

5
L

L
4

+8.5 VOLT FUSE BLOWS

PAGE 5 OF 5

019

THE TAPE CONTROL UNIT DC SUPPLY,
CU-PS-02, IS FAILING (LOC 1).

SEE CARR-TCU 1-1

EXCHANGE FRU145

GO TO STEP 021,
ENTRY POINT D

020
(ENTRY POINT C)
CLEANUP AFTER REPAIR.

SET THE TAPE CONTROL UNIT POWER ON/OFF SWITCH TO THE OFF POSITION (LOC 1).

REMOVE ANY JUMPERS USED FOR TROUBLESHOOTING.

RECONNECT ANY CABLES REMOVED FOR TROUBLESHOOTING.

RE-INSTALL ANY FUSES USED FOR TROUBLESHOOTING.

RESET ANY CB'S TRIPPED FOR TROUBLESHOOTING.

GO TO MAP 0190, ENTRY POINT A.

021
(ENTRY POINT D)
RETURN AFTER REPAIR.

REFER TO THE CE/MSC SECTION OF THE MG AND RUN GMP.

AUTOMATIC CARTRIDGE LOADER PROCEDURE

PAGE 1 OF 6

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	A	1	001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
3	024	0200	A
4	030	0200	A

001
(ENTRY POINT A)

YOU ARE HERE BECAUSE THE POWER-ON LED AT THE OPERATOR PANEL OF THE AUTOMATIC CARTRIDGE LOADER IS NOT ON.

DANGER

LETHAL VOLTAGES ARE PRESENT IN THE POWER SERVICE AREA. SAFETY IS MOST IMPORTANT. TREAT ALL CIRCUITS AS LIVE UNTIL MEASURED.

BECAUSE THIS FAILURE HAS BEEN IDENTIFIED AS A SINGLE DRIVE PROBLEM (THE OTHER DRIVE IN THE TAPE TRANSPORT UNIT IS OPERATIONAL) NO ANALYSIS OF AC INPUT VOLTAGES WILL BE MADE.

ON THE FAILING DRIVE, SET THE ONLINE/OFFLINE SWITCH TO OFFLINE.
POWER OFF THE FAILING DRIVE.

CONTINUITY CHECK THE +5 V LOADER FUSE.

+5 V FUSE IS THE LOWER FUSE ON THE LOADER.
REFER TO MG LOC 1 FOR LOCATION.

(Step 001 continues)

(Step 001 continued)

IS THE FUSE OK?
Y N

002

HAS THE FUSE BEEN EXCHANGED BEFORE?
Y N

003

EXCHANGE THE +5 V LOADER FUSE.

POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

004
GO TO STEP 001,
ENTRY POINT A.

005
GO TO PAGE 5, STEP 038,
ENTRY POINT C.

006

EXCHANGE THE LOADER CONTROL CARD.

SEE CARR-DR 1-1.
FRU 281, ALD AL001

EXCHANGE THE +5 V LOADER FUSE.
POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

2 2 2
A B C

MAP 0900 – Automatic Cartridge Loader Procedure PWR 900-2

A B C PWR 0900
1 1 1

PAGE 2 OF 6

007

EXCHANGE THE LOADER OPERATOR PANEL. SEE CARR-DR 1-1.
FRU 298, ALD AL002

EXCHANGE THE +5 V LOADER FUSE.
POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

008

GO TO POWER 30.

009
GO TO PAGE 5, STEP 030,
ENTRY POINT C.

010
GO TO PAGE 5, STEP 030,
ENTRY POINT C.

011

CONTINUITY CHECK THE +24 V LOADER FUSE. +24 V FUSE IS THE UPPER FUSE ON THE LOADER.
REFER TO MG LOC 1 FOR LOCATION.

IS THE FUSE OK?
Y N

012

HAS THE FUSE BEEN EXCHANGED BEFORE?
Y N

3
D E F

E F

013

EXCHANGE THE +24 V LOADER FUSE.
POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

014
GO TO PAGE 1, STEP 001,
ENTRY POINT A.

015
GO TO PAGE 5, STEP 030,
ENTRY POINT C.

016

EXCHANGE THE LOADER CONTROL CARD. SEE CARR-DR 1-1.
FRU 281, ALD AL001

EXCHANGE THE +24 V LOADER FUSE.
POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

017

EXCHANGE THE LOADER OPERATOR PANEL. SEE CARR-DR 1-1.
FRU 298, ALD AL002

EXCHANGE THE +24 V LOADER FUSE.
POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

018

GO TO POWER 30.

3 3
G H

D G H
2 2 2

PWR 0900

PAGE 3 OF 6

019
GO TO PAGE 5, STEP 038,
ENTRY POINT C.

020
GO TO PAGE 5, STEP 038,
ENTRY POINT C.

021
VERIFY THAT THE CONNECTIONS FROM THE LOADER POWER CABLE TO THE FUSE HOLDERS ARE GOOD.
POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

022

DISCONNECT LOADER POWER CABLE (CONNECTOR J3) FROM LOADER CONTROL CARD.

REFER TO MG LOC 1 FOR CONNECTOR DIAGRAM.

POWER ON THE DRIVE AND MEASURE VOLTAGE ACROSS AL-D0/1-CC-P3-4 (+5V) AND AL-D0/1-CC-P3-3 (COM) WITH A VOLTMETER.

IS VOLTAGE WITHIN LIMIT +4.5 AND +5.5 V DC?
Y N

6 5
J K L

L

023

POWER OFF THE DRIVE AND DISCONNECT THE INTERPOSER CABLE AND CONNECTOR FROM THE POWER DISTRIBUTION CABLE CONNECTOR.

REFER TO MG LOC 1 FOR CONNECTOR DIAGRAM.

POWER ON THE DRIVE AND MEASURE VOLTAGE ACROSS TU-D0/1-P1-P1-3 (+5 V) AND TU-D0/1-P1-P1-9 (COM) WITH A VOLTMETER.

SEE ALD ZZ020 OR ALD ZZ120

IS VOLTAGE WITHIN LIMIT +4.5 AND +5.5 V DC?
Y N

024

GO TO MAP 0200, ENTRY POINT A.

025

POWER OFF THE DRIVE.
RE-CONNECT THE INTERPOSER CABLE AND CONNECTOR TO THE POWER DISTRIBUTION CABLE CONNECTOR.

REMOVE THE LOADER MECHANICAL ASSEMBLY.

SEE CARR-OR 1-1, FRU 285.

POWER ON THE DRIVE AND MEASURE THE VOLTAGE ACROSS TU-D0/1-P1-J6-1 (+5 V) AND TU-D0/1-P1-J6-2 (COM).

IS VOLTAGE WITHIN LIMIT +4.5 AND +5.5 V DC?
Y N

4 4
M N

MAP 0900 — Automatic Cartridge Loader Procedure PWR 900-4

K M N PWR 0900
3 3 3

PAGE 4 OF 6

826

THE INTERPOSER CABLE AND CONNECTOR IS DEFECTIVE.

EXCHANGE THE INTERPOSER CABLE AND CONNECTOR.
GO TO PAGE 5, STEP 038, ENTRY POINT C.

SEE CARR-DR 1-1.
FRU 269, ALD ZZ020/120.

827

THE LOADER POWER CABLE IS DEFECTIVE.

EXCHANGE THE LOADER POWER CABLE.

GO TO PAGE 5, STEP 038, ENTRY POINT C.

SEE CARR-DR 1-1.
FRU 287, ALD ZZ020/120.

828

MEASURE VOLTAGE ACROSS CC-P3- (+24 V) AND CC-P3-1 (COM) WITH A VOLTMETER.

REFER TO MG LOC 1 FOR CONNECTOR DIAGRAM.

IS VOLTAGE WITHIN LIMIT +21.6 AND +26.4 V DC?
Y N

5
P Q

Q

829

POWER OFF THE DRIVE AND DISCONNECT THE INTERPOSER CABLE AND CONNECTOR FROM THE POWER DISTRIBUTION CABLE CONNECTOR.

REFER TO MG LOC 1 FOR CONNECTOR DIAGRAM.

POWER ON THE DRIVE AND MEASURE VOLTAGE ACROSS TU-D0/1-P1-P2-1 (+24 V) AND TU-D0/1-P1-P2-7 (COM) WITH A VOLTMETER.

ALD ZZ020 OR ALD ZZ120.

IS VOLTAGE WITHIN LIMIT +21.6 AND +26.4 V DC?
Y N

830

GO TO MAP 0200, ENTRY POINT A.

831

POWER OFF THE DRIVE.
RE-CONNECT THE INTERPOSER CABLE AND CONNECTOR TO THE POWER DISTRIBUTION CABLE CONNECTOR.

REMOVE THE LOADER MECHANICAL ASSEMBLY.

SEE CARR-DR 1-1, FRU 285.

POWER ON THE DRIVE AND MEASURE THE VOLTAGE ACROSS TU-D0/1-P1-J6-3 (+24 V) AND TU-D0/1-P1-J6-2 (COM).

IS VOLTAGE WITHIN LIMIT +21.6 AND +26.4 V DC?
Y N

5
R S

P R S PWR 0900
4 4 4

PAGE 5 OF 6

032

THE INTERPOSER CABLE AND CONNECTOR IS DEFECTIVE.

EXCHANGE THE INTERPOSER CABLE AND CONNECTOR.
GO TO STEP 038,
ENTRY POINT C.

SEE CARR-DR 1-1.
FRU 269, ALD ZZ020/120.

033

THE LOADER POWER CABLE IS DEFECTIVE.

EXCHANGE THE LOADER POWER CABLE.

GO TO STEP 038,
ENTRY POINT C.

SEE CARR-DR 1-1.
FRU 287, ALD ZZ020/120.

034

POWER OFF THE DRIVE.

RE-CONNECT CONNECTOR J3 AND MAKE CERTAIN THAT THE CONNECTION IS GOOD.

POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

T U

T U

033

EXCHANGE THE LOADER OPERATOR PANEL.

SEE CARR-DR 1-1.
FRU 298, ALD AL902.

POWER ON THE DRIVE.

IS THE LOADER POWER-ON LED ON?
Y N

036

EXCHANGE THE LOADER CONTROL CARD.

GO TO STEP 038,
ENTRY POINT C.

SEE CARR-DR 1-1.
FRU 281, ALD AL001.

037

GO TO STEP 038,
ENTRY POINT C.

038

(ENTRY POINT C)

RECONNECT ANY CABLES REMOVED FOR TROUBLESHOOTING.
REPLACE ANY FUSES REMOVED FOR TROUBLESHOOTING.
REPLACE ANY FRUS REMOVED FOR TROUBLESHOOTING.

SET THE ONLINE/OFFLINE SWITCH TO ONLINE.

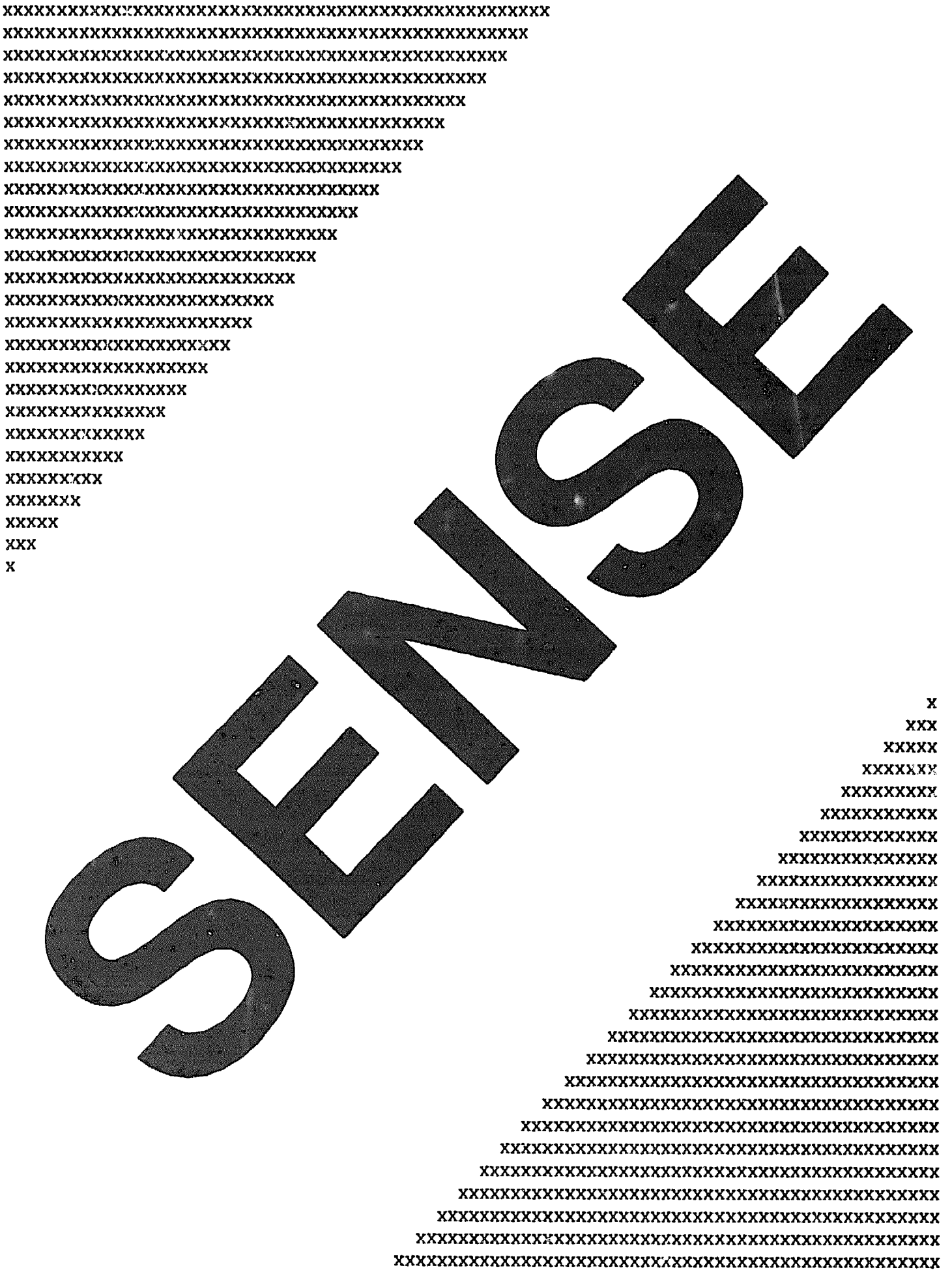
REFER TO THE CE/HSC SECTION AND RUN GMP.

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J PWR 0900
3

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039
GO TO PAGE 5, STEP 038,
ENTRY POINT C.


SENSE

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Byte 27 - Hardware Tape Control Unit Information 190
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Byte 9 - Device Write Forward Data Checks 220
Byte 10 - Device Read Backward Data Checks 220
Byte 11 - Reserved 220
Byte 12 - Device Read Criteria Data Checks 220
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Byte 18 - Device Read Blocks Corrected 230
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Sense Description

The TA90 subsystem tape control unit and tape drive microprocessors repeatedly check all subsystem operations for errors. Some errors can be corrected by the subsystem microcode and error correction circuits. These errors are recorded for later analysis if necessary. Other errors that cannot be corrected cause an interruption in subsystem operation. All available information about the error is recorded as sense data to aid in finding the subsystem problem that caused the error.

Sense data is recorded in four formats—19, 20, 21, and 30. Each tape drive has sense data stored in the tape control unit. Each tape drive has 32 bytes of sense data in each format stored in the TA90 Model AD2 tape control unit. A Sense command causes Formats 19 and 20 data to be transferred to the STI-FIPS Adapter. A Read Buffered Log command causes Format 21 or 30 to be sent to the STI-FIPS adapter.

How to Determine the Sense Data Format

Sense bytes 0 through 7 are common to the five sense formats. See SENSE 105 through SENSE 130 for a detailed description of these eight bytes. The format of bytes 8 through 31 is indicated in sense byte 7.

Note: The bits in the sense bytes are numbered 0 through 7, starting on the left.

- Sense byte 7 = hexadecimal 19 or 20 (format 19 or 20).

  Bytes 8 to 31 of both formats contain drive and tape control unit error information. However, when Format 19 is indicated, the Force Error Logging bit has been set by the system and the sense data is also logged in an Error Log Report.

  Note: Format 19 data is only present when forced logging has been enabled by the CE panel. Forced logging is used by field service as a troubleshooting tool.

- Sense byte 7 = hexadecimal 21 (format 21).

  Bytes 8 to 31 contain statistical information about subsystem operations.

- Sense byte 7 = hexadecimal 30 (format 30).

  Bytes 8 to 63 contain statistical information about subsystem operations.

Formats 19 and 20

Formats 19 and 20 consist of drive and tape control unit error information. The formats are given when a Sense command is received by the selected drive.

Sense data in formats 19 and 20 are not valid for a drive after the following operations:

- System reset
- Selective reset
- Power on reset
- Any I/O command other than Test I/O or NOP after a contingent connection
- A temporary error that has been recovered.

See SENSE 135 through SENSE 160 for a detailed description of the formats 19 and 20 sense bytes.

Format 21

Format 21 consists of 32 bytes of command when the Improved Data Recording Capability feature is not installed or allowed. Format 21 is also given when:

- A Sense command is received and one or more of the statistical error counters has an overflow.

Buffered log (format 21) data is reset to zero after a:

- Read Buffered Log command
- System reset
- Selective reset
- Power on reset.

If a unit check occurs, the tape control unit keeps a contingent connection to the selected drive on the same channel path as the original unit check was received. This contingent connection is kept until a command other than Test I/O or NOP is received by that drive. The STI-FIPS Adapter usually sends a Sense command to get the failure information.

See SENSE 165 through SENSE 190 for a detailed description of the format 21 sense bytes.

Note: The bits in the sense bytes are numbered 0 through 7, starting on the left.

Format 30

Format 30 consists of 64 bytes of buffered log data and is obtained by a Read Buffered Log command when the Improved Data Recording Capability feature is installed and allowed.

See SENSE 215 through 275 for a detailed description of Format 30 sense bytes.

BYTE/BIT (Formats 19, 20, 21, and 30) (COMMON)	MEANING	PAGE
Byte 0		
Bit 0	Command reject	110
Bit 1	Intervention required	110
Bit 2	Bus out check	110
Bit 3	Equipment check	110
Bit 4	Data check	110
Bit 5	Overrun	110
Bit 6	Deferred Unit Check	110
Bit 7	Assigned elsewhere	110
Byte 1		
Bit 0	Locate failure	110
Bit 1	Drive online to tape control unit	110
Bit 2	Reserved	
Bit 3	Record sequence error	110
Bit 4	Beginning of tape (BOT)	110
Bit 5	Write mode	110
Bit 6	Write protect	110
Bit 7	Not capable	110
Byte 2		
Bits 0-3	Reporting channel path	110
Bit 4	Reporting tape control unit	110
Bit 4	Tape control unit ID	110
Bit 5	Automatic cartridge loader active	110
Bit 6	Tape synchronous mode	110
Bit 7	Tape positioning	110
Byte 3	Error Recovery Action (ERA) code	115
Byte 4		
Bits 0-1	Format indication 00 = Standard TA90 format 01 = Reserved 10 = TA90 Improved Data Recording Capability 11 = Special Marks	130
Bits 2-7	High-order channel logical block number	130
Bytes 5 and 6	Low-order channel logical block number	130
Byte 7	Format of bytes 8-31	130

BYTE/BIT (FORMATS 19 AND 20)	MEANING	PAGE
Byte 8	Drive Error Recovery Action (ERA) code	140
Byte 9	First TCU microcode error flags	140
Bytes 10 and 11	First TCU microcode error code	140
Bytes 12 and 13	Second TCU microcode error code	140
Bytes 14 and 15	Last TCU microcode error code	140
Bytes 16 and 17	TCU hardware error code	150
Byte 18	Drive flag 1	150
Byte 19		150
Bits 0-5	Reserved	
Bit 6	Drive Model BDX	
Bit 7	Reserved	
Byte 20	Drive command code 1	150
Byte 21	Drive error code 1	150
Byte 22	Drive command code 2	150
Byte 23	Drive error code 2	150
Byte 24		
Bits 0-3	Channel adapters installed	160
Bits 4-7	Data transfer mode	160
Byte 24	Tape control unit channel adapters installed	160
Byte 25	Tape control unit feature	160
Bit 0	Two tape control units feature	160
Bit 1-3	Reserved	160
Bit 4	Improved Data Recording Capability Allowed	160
Bit 5	Improved Data Recording Capability Installed	160
Bit 6	Upgraded buffer	160
Bit 7	Automatic cartridge loader installed	160
Byte 26	Tape control unit microcode EC level	160

BYTE/BIT (FORMATS 19 AND 20)	MEANING	PAGE
Byte 27	Hardware tape control unit information	160
Bit 0	Tape control unit EC switch 0	160
Bit 1	Tape control unit EC switch 1	160
Bits 0 and 1	Tape control unit hardware flags	160
Bit 2	1 = Tape control unit has only Model BDX tape transport units	160
Bit 3	Tape Control unit EC switch 2	160
Bits 4-7	Tape control unit serial number (high-order digit)	160
Bytes 28 and 29	Tape control unit serial number (low-order digit)	160
Byte 30	Drive address	160
Bits 0-3	Logical drive address	160
Bits 4-7	Physical drive address	160
Byte 31	Buffered data bytes	160

BYTE/BIT (FORMAT 21)	MEANING	PAGE
Byte 8	Read forward data checks	170
Byte 9	Read backward data checks	170
Byte 10	Write data checks	170
Byte 11	Read blocks corrected	170
Byte 12	Write blocks corrected	170
Byte 13	Tape control unit equipment checks	170
Bytes 14 and 15	Read bytes processed	170
Bytes 16 and 17	Write bytes processed	180
Byte 18	Read blocks processed	180
Byte 19	Write blocks processed	180
Byte 20	Write transient conditions	180
Byte 21	Read transient conditions	180
Byte 22	Criteria write data checks	180
Byte 23	Criteria read data checks	180
Byte 24	Write recovery erase gap count	190
Byte 25	Drive detected errors	190
Byte 26	Low order of read or write blocks processed	190

Byte 27	Hardware tape control unit information	190
Bit 0	Not defined	
Bit 1	0 = Digital model TA90	
Bit 2	0 = Reserved	190
	1 = Tape control unit has only Model BDX tape transport units	190
Bit 3	Tape control unit hardware flag	190
Bits 4-7	Tape control unit serial number (high-order digit)	190
Bytes 28 and 29	Tape control unit serial number (low-order digit)	190
Byte 30	Read recovery retry count	190
Byte 31	Drive address	190
Bits 0-3	Logical drive address	190
Bits 4-7	Physical drive address	190

Sense Byte Summary (Continued) SENSE 103

BYTE/BIT (Format 30) (COMMON)	MEANING	PAGE
Byte 8	Device read forward data checks	220
Byte 9	Device write forward data data checks	220
Byte 10	Device read backward data checks	220
Byte 11	Reserved	220
Byte 12	Device read criteria data checks	220
Byte 13	Device write criteria data checks	220
Byte 14	Device read recovery retries	220
Byte 15	Device write recovery erase gaps	220
Byte 16	Device read transient conditions	230
Byte 17	Device write transient conditions	230
Byte 18	Device read blocks corrected	230
Byte 19	Device write blocks corrected	230
Bytes 20-21	Reserved	230
Byte 22	Channel read data request timeouts	230
Byte 23	Channel write data request timeouts	230
Byte 24	Channel transfer equipment checks	240
Byte 25	Drive detected errors	240
Byte 26	Device and/or Cartridge Action	240
Byte 27	Hardware tape control unit information	240
Bit 0	Tape control unit EC switch 0	240
Bit 1	Tape control unit EC switch 1	240
Bit 2	0 = Reserved 1 = Tape Control unit has only Model BDX tape transport units	
Bit 3	Tape control unit EC switch 2	240
Bits 4-7	Tape control unit serial number (high order digit)	240
Bytes 28-29	Tape control unit serial number (low order digit)	240
Byte 30		
Bits 0-3	Logical drive address	240
Bits 4-7	Physical drive address	240
Byte 31	Reserved	240

BYTE/BIT (Format 30) (COMMON)	MEANING	PAGE
Bytes 32-34	Channel read bytes processed	250
Bytes 35-37	Channel write bytes processed	250
Bytes 38-40	Device read bytes processed	250
Bytes 41-43	Device write bytes processed	260
Bytes 44-46	Channel read blocks processed	260
Bytes 47-49	Channel write blocks processed	260
Bytes 50-52	Device read block processed	270
Bytes 53-55	Device write blocks processed	270
Bytes 56-63	Reserved	270

Formats 19, 20, 21, and 30 Sense Bytes 0-2 Table

FORMATS 19, 20, 21, and 30 BYTES 0-2								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
0	Command Reject	Intervention Required	Bus Out Check	Equipment Check	Data Check	Overrun	Deferred Unit Check	Assigned Elsewhere
1	Locate Failure	Device Online to TCU	Reserved	Record Sequence Error	Beginning-of-Tape (BOT)	Write Mode	Write Protect	Not Capable
2	Channel Adapter Code			Channel Assignment	Tape Control Unit ID	Automatic Cartridge Loader Active	Drive In Synchronous Data Transfer	Block ID Position Indicator

Formats 19, 20, 21, and 30 Sense Bytes 0-2 Description

Sense bytes 0-7 are common to all formats. Bytes 0-2 have the following meaning:

Byte 0

Bit 0 - Command Reject: Bit 0 is set when:

- A Write, Write Tape Mark, Erase Gap, or Data Security Erase command is sent to a tape that is file protected.
- The tape control unit receives a not valid command.
- A Data Security Erase command is sent that is not command-chained to an Erase Gap command.
- The subsystem received an inhibited supervisor channel command.
- The subsystem senses a not valid channel program sequence.
- A not valid argument is specified in a command.

Bit 1 - Intervention Required: Bit 1 is set when the addressed drive is not ready or does not exist.

Bit 2 - Bus Out Check: Bit 2 is set when the channel bus out has wrong parity during a command or flag byte movement.

Bit 3 - Equipment Check: Bit 3 is set when:

- An error is sensed during a read operation in read buffered mode.
- No other bit is set in sense bytes 0 and 1 and there is an error for the drive.

Bit 4 - Data Check: Bit 4 is set when an error is sensed during an operation in which data is being written on or read from the tape.

Bit 5 - Overrun: Bit 5 is set when a data movement in tape synchronous mode finds the tape control unit buffer full during a read operation or finds the tape control unit buffer empty during a write operation. The subsystem attempts error recovery procedures before this bit is set. Data overrun is the only type of overrun from which the subsystem attempts to recover, and the data overrun condition is not sent to the STI-FIPS Adapter.

Bit 6 - Unit Check Timing: Bit 6 is set to 1 when a preceding unit check, to which this sense data is connected, is a deferred unit check or a postponed unit check. This bit is set to 0 when the unit check is connected to the channel command that the Channel Status Word indicates. If the STI-FIPS Adapter sent a Sense command and no waiting contingent connection is in effect, the content of the bit can not be relied on.

Bit 7 - Assigned Elsewhere: This bit is set to 1 if the data is associated with unit check status which is generated because the device is disabled by dynamic partitioning on the selected channel path.

Byte 1

Bit 0 - Locate Failure: This bit is set to 1 if the data is associated with unit check status which is generated because the block requested by a Locate command could not be found.

Bit 1 - Device Online to Control Unit: This bit is set to 1 if the device state in the control unit is "online".

Bit 2 - Reserved: Bit 2 is always 0.

Bit 3 - Record Sequence Error: Bit 3 is set if an out-of-sequence record is detected while reading the block ID.

Bit 4 - Beginning-of-Tape (BOT): Bit 4 is set when the tape is at the beginning-of-tape (BOT) position.

Bit 5 - Write Mode: Bit 5 is set when the latest command sent to the drive was a write-type command.

Bit 6 - Write Protect: Bit 6 is set when the cartridge in the selected drive is protected against write operations. This bit is valid only when byte 1 bit 1, device online is also set to 1.

Bit 7 - Not Capable: Bit 7 is set when the data on the cartridge cannot be read because the format is not correct.

Byte 2

Bits 0, 1, 2, and 3 - Channel Adapter Code: Bits 0, 1, 2, and 3 identify the channel adapter that reported this sense record.

BIT 0 1 2 3	MEANING
0 0 0 0	No Channel Command Received
0 0 1 0	TCU0 Channel Interface A
0 1 0 0	TCU0 Channel Interface B
0 0 1 1	TCU1 Channel Interface A
0 1 0 1	TCU1 Channel Interface B

Bit 4 - Reporting Tape Control Unit: Bit 4 indicates the tape control unit that detected and generated the sense data. If bit 4 equals 0, the sense data was assembled in tape control unit 0. If bit 4 equals 1, the sense data was assembled in tape control unit 1. In a single tape control unit configuration, this bit is always 0.

Bit 5: The automatic cartridge loader is in system or automatic mode; there are more cartridges in the input stack and the automatic cartridge loader is capable of indexing at least one cartridge into the drive.

Bit 6 - Tape Synchronous Mode: This bit is set when the tape control unit places the drive in tape synchronous mode.

Bit 7 - Tape Positioning: This bit is active if channel block ID needs to be adjusted to obtain the channel block ID associated with the failing block.

Formats 19, 20, 21, and 30 Sense Byte 3 Table

FORMATS 19, 20, 21, and 30 BYTE 3								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
3	Subsystem Error Recovery Action (ERA) Code							

Formats 19, 20, 21, and 30 Sense Byte 3 Description

Byte 3

Byte 3 contains the subsystem Error Recovery Action (ERA) code. It describes the action that the STI-FIPS Adapter should take to recover from an error in the subsystem.

Note: See SENSE 120 for a description of the recovery action.

ERA CODE (HEX)	DESCRIPTION OF ERROR	ACTION
00	Unsolicited sense	If in response to unit check status logs permanent errors, else no action.
01-20	Reserved	
21	Data streaming not operational	Retry
22	Path equipment check	
23	Read data check	
24	Load display command to prior CHK message	Resume
25	Write data check	
26	Read data check *	Retry
27	Command reject	Permanent error
28	Write ID mark check	
29	Reserved	
2A	Unsolicited environmental data (error cc inter overflow)	Retry
2B	Environmental data present after a rewind unload command	Resume
2C	Permanent equipment check	Permanent error
2D	Data security erase failure	Permanent error
2E	Not capable (BOT error)	
2F	Reserved	
30	Write protected	Operator intervention
31	Tape void	
32	Lost tape tension	Permanent error
33	Load failure	Operator intervention
34	Unload failure	Operator intervention
35	Drive equipment check	Permanent error
36	Reserved	

ERA CODE (HEX)	DESCRIPTION OF ERROR	ACTION
37	Tape length check error	Permanent error
38	Physical end of tape	Permanent error
39	Backward at Beginning-of-Tape	Permanent error if block ID not = 0, else job terminated
3A	Drive switched not ready	Operator intervention
3B	Manual Rewind or Unload	
3C-3F	Reserved	
40	Overrun	
41	Record sequence error	Permanent error
42	Degraded mode errors	Retry
43	Drive not ready	Operator intervention
44	Locate block unsuccessful	Permanent error
45	Drive assigned elsewhere	Permanent error
46	Drive not online	Permanent error
47	Volume fenced	Permanent error
48	Unsolicited informational data	Retry
49	Bus Out check	Permanent error
4C	Recovered CK1 failure	Retry
50	Read buffered log (overflow)	Resume
51	Read buffered log (EOV)	Resume
52	End of volume complete	Resume

Note: * Same error as ERA 23 but the error occurred again when reading in the opposite direction

Permanent Error

The STI-FIPS Adapter should send a permanent error signal to the access method or user program.

Operator Intervention

The operator must perform some manual action, such as moving a tape, to continue processing on the subsystem.

Resume

The channel program continues processing at the point of interruption after the system control program has performed any needed action. No error signal is sent to the user.

Formats 19, 20, 21, and 30 Sense Bytes 4-7 Table

FORMATS 19, 20, 21, AND 30 BYTES 4-7								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
4	Format Mode			High-order channel logical block number				
5	Mid-Order channel logical block number							
6	Low-Order channel logical block number							
7	Sense Byte Format							

Formats 19, 20, 21, and 30 Sense Bytes 4-7 Description

Byte 4

Bits 0-1 - Format Mode:

These two bits indicate the format mode at the time the error occurred. A TA90 Improved Data Recording Capability indicates that the data was processed with Improved Data Recording Capability enabled by the tape control unit.

00 = TA90 Format
01 = Reserved
10 = TA90 Improved Data Recording Capability
11 = Special Marks

Bits 2-7 - High-Order Channel Logical Block Number:

These bits contain the high-order bits of the channel logical block number which would be accessed in the forward direction from the control program's perspective.

Bytes 5 and 6

These bytes contain the low-order bits of the channel logical block number which would be accessed in the forward direction from the control program's perspective.

Byte 7

The contents of byte 7 determine the format of bytes 8 through 31. If byte 7 contains 19 or 20 (hexadecimal), the format represents subsystem error sense data. If byte 7 contains 21 or 30 (hexadecimal), the format represents operating condition data (media statistics). Only 19, 20, 21, or 30 is valid in sense byte 7.

Formats 19 and 20 Sense Bytes 8-15 Table

FORMAT 19 and 20 BYTES 8-15								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
8	Drive Error Recovery Action (ERA) Code							
9	First TCU Microcode Error Flags Byte							
10	First TCU Microcode Error Code							
11	First TCU Microcode Error Code							
12	Second TCU Microcode Error Code							
13	Second TCU Microcode Error Code							
14	Last TCU Microcode Error Code							
15	Last TCU Microcode Error Code							

Formats 19 and 20 Sense Bytes 8-15 Description

Byte 8 - Drive Error Recovery Action (ERA) Code

Byte 8 contains the ERA code when a drive has asked for action from the error recovery procedures. The ERA codes and tape control unit actions are described in the following table.

ERA CODE (HEX)	TAPE CONTROL UNIT ACTION
40 or C0	Backspace and write block again
4F or CF	If a write operation, reposition tape and issue the failing command again. If a read operation, do nothing unless it is a tape control unit failure.
5B or DB	Give the last (failing) command again. The drive has automatically returned the tape to the preceding position after a failure.
5F or DF	Give the preceding serial command. The serial command was not processed.
61 or E1	Give a RESETA command and continue.
63 or E3	If the BLKID=0, this is a permanent error. If not, give a Locate command and attempt again.
66 or E6	Load the drive patch area.
69 or E9	Manual action needed. Operator can remove any slack in the tape by pressing the Rewind switch to reload the tape.
6B or EB	Give a RESETB command, find block where error occurred, and continue operation.
6C or EC	Manual action needed. Equipment check bit is set.
6D or ED	If a data path transfer error occurred, return the tape to its preceding position and attempt the command again.
6E or EE	Give a Locate command to Segment 55, followed by a rewind operation to the BOT.
70 or F0	Manual action needed. Operator must unload the tape, change the position of the file protect switch on the cartridge, and load the cartridge again. A write command was given to a file-protected tape.
71 or F1	Forward command at PEOT, stop-lock, on moving forward into PEOT during a read operation, or moving forward into PEOT during a write operation.
72 or F2	Sends an equipment check message to the console. DSE failed (write RAS not valid)
73 or F3	Manual action needed. The equipment check bit is set. The operator must load or unload the tape.
75 or F5	Sends an equipment check message to the console. Send a Load Display command to the failing drive.
76 or F6	Give a Rewind Unload command from the host. If the tape does not unload, tape damage can result.
78 or F8	Manual Rewind command has been initiated. The operator pressed the Not Ready and Rewind switches.
79 or F9	Request tape control unit issue a Rewind Unload command.
7D or FD	Log temporary error to host.
8F	Read one block to identify a tape position reference, then continue.
EF	If a data path transfer error occurred, inhibit autospace operations on this block. If not, no tape control unit is needed.

Byte 9 - Tape Control Unit Flags

Byte 9 contains more information about the first tape control unit microcode error code (bytes 10 and 11), if available. See the error code in the FSI section for byte 9's meaning.

Bytes 10 and 11 - First TCU Microcode Error Code

Bytes 10 and 11 contain the tape control unit microcode detected error code for the first error of the tape control unit or drive. See the FSI section for the meaning of the error codes.

Bytes 12 and 13 - Second TCU Microcode Error Code

Bytes 12 and 13 contain the tape control unit microcode detected error code for the second error of the tape control unit or drive. See the FSI section for the meaning of the error codes.

Bytes 14 and 15 - Last TCU Microcode Error Code

Bytes 14 and 15 contain the tape control unit microcode detected error code for the last error of the tape control unit or drive. See the FSI section for the meaning of the error codes.

FORMATS 19 AND 20 BYTES 16-23								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
16	TCU Hardware Error Code							
17	TCU Hardware Error Code							
18	Drive Flag - 1							
19	Reserved						Reserved	Drive Model Number BOX
20	Drive Command Code - 1							
21	Drive Error Code - 1							
22	Drive Command Code - 2							
23	Drive Error Code - 2							

Bytes 16 and 17 - TCU Hardware Error Code

Bytes 16 and 17 contain the Tape Control Unit Hardware Detected Error Code. For a specific error code, see the EAD section for the meaning of that code.

Byte 18 - Drive Flag 1

Byte 18 contains engineering information. See the specific error code in the FSI section for the meaning of byte 18, if available.

Byte 19 - Drive Model Number

0-5	Reserved
6	Model BDX
7	Reserved

Byte 20 - Drive Command Code 1

The command active or last given at the time that drive error code 1 occurred. See the "Drive Command Codes" list on this page.

Byte 21 - Drive Error Code 1

Byte 21 contains the first error detected since the last device sense command. For a specific error code, see the FSI section for the meaning of that code. The error code number is the same as the CHK number.

Byte 22 - Drive Command Code 2

The command active or last given at the time that drive error code 2 was detected. See the "Drive Command Codes" list on this page.

Byte 23 - Drive Error Code 2

Byte 23 contains the last error that occurred, whether or not more than two errors occurred since the last drive sense command was sent. For a specific error code, see the FSI section for the meaning of that code. The error code number is the same as the CHK number.

Drive Command Codes

Command Code	Description
00	Test I/O
02	Read Forward
03	Read Backward
04	Sense
05	Patch Load
06	Clamp
07	Unclamp
08	Reset A
09	Reset B
0A	Write or Erase Gap
0C	Set Diagnostic
0D	Load Display
10	Read Control Store
11	Write Control Store
12	Data Security Erase
15	Autospace Backward
16	Autospace Forward
18	Rewind
19	Rewind/Unload
1A	Locate
1B	Read LSRs
1C	Read X-Regs
1D	Write X-Regs
1E	Load Automatic Cartridge Loader code
EE*	Bus Parity error when loading commands
FF*	Load/Unload and unloaded drive

* Not actual command codes. These codes are used when no command is being executed.

FORMATS 19 AND 20 BYTES 24-31								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
24	Channel adapter installed		Reserved	Reserved	Data transfer mode			
25	Two Tape Control Unit Communication Feature		Reserved		Extended Data Record-ing Format Allowed	Extended Data Record-ing Format Installed	Upgraded Buffer	Automatic Cartridge Loader Installed
26	Tape Control Unit Microcode EC Level							
27	Tape Control Unit EC Switch 0	Tape Control Unit EC Switch 1 0=TA90	Tape Control Unit Model 1=ADX	Tape Control Unit EC Switch 2	Tape Control Unit Serial Number (High Order)			
28	Tape Control Unit Serial Number (Mid Order)							
29	Tape Control Unit Serial Number (Low Order)							
30	Logical Drive Address				Physical Drive Address			
31	Buffered Data Bytes							

Byte 24 - Tape Control Unit Channel Adapters Installed

Byte 24 indicates the channel adapters that are installed on the tape control unit and the mode to which the active channel adapter is set on the tape control unit panel. Bits 0 through 3 are relative to the subsystem path described in sense byte 2.

Bit 0 - Channel Adapter A

Bit 1 - Channel Adapter B

Bit 2 - Reserved

Bit 3 - Reserved

Bits 4 5 6 7

Bits 0 0 0 0 Reserved

Bits 0 0 0 1 Reserved

Bits 0 1 0 1 Reserved

Bits 0 1 1 0 3 Megabyte Streaming

Byte 25 - Tape Control Unit/Drive Features

Bit 0 - Two Tape Control Unit Feature: This bit indicates that a two Tape Control Unit communication feature is installed.

Bits 1 through 3 - Reserved: Bits 1 through 3 are reserved and are always 0.

Bit 4 - Improved Data Recording Capability Allowed: This bit on indicates that data can be processed with Improved Data Recording Capability enabled as it is received from the channel adapter.

Bit 5 - Improved Data Recording Capability Installed: This bit on indicates that the Improved Data Recording Capability feature is installed.

Bit 6 - Upgraded Buffer

Bit 7 - Automatic Cartridge Loader Installed

Byte 26 - Tape Control Unit Microcode EC Level

The bits in byte 26 vary when new versions of microcode are used on the subsystem.

Byte 27 - Hardware Tape Control Unit Information

The bits in byte 27 are set by the switches under the covers of the tape control unit. Usually, they are changed only by maintenance personnel during service or by plant personnel during manufacture.

Bit 0 - Tape Control Unit EC Switch 0:

0 = Two board tape control unit
1 = Reserved

Bit 1 = Tape Control Unit EC Switch 1: Reserved

Bit 2 = Tape Control Unit Model:

0 = Model Reserved
1 = Model A0X

Bit 3 = Tape Control Unit EC Switch 2: Reserved

Bits 4 through 7 - Tape Control Unit Serial Number (High-Order Digit)

Bytes 28 and 29 - Tape Control Unit Serial Number (Low Order)

Bytes 28 and 29 contain the low-order digits of the tape control unit serial number. Usually, they are changed only by maintenance personnel during service or by plant personnel during assembly.

Byte 30 - Drive Address

Bits 0 through 3 - Logical Drive Address: Bits 0 through 3 are the low-order bits of the external drive address. This field contains the value that the drive responds to upon receipt of a command from the host.

Bits 4 through 7 - Physical Drive Address: Bits 4 through 7 contain a number that cannot be modified by the operator. It is set at installation of the drive by the Service Representative. (No duplicate numbers should be set on any drives in this subsystem.)

Byte 31 - Data Byte Count

Byte 31 contains a count of the blocks of data in the buffer. The count is specified in 4K blocks. For example, a 3,456-byte block of data is given as a count of '01', and a 5,678-byte block of data is given as a count of '02'.

FORMAT 21 BYTES 8-15								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
8	Read Forward Data Checks							
9	Read Backward Data Checks							
10	Write Data Checks							
11	Read Blocks Corrected							
12	Write Blocks Corrected							
13	Tape Control Unit Equipment Checks							
14	Read Bytes Processed							
15	Read Bytes Processed							

Format 21 Sense Bytes 8-15 Description

Byte 8 - Read Forward Data Checks

Byte 8 contains a count of the temporary read errors that needed ERP action.

Byte 9 - Read Backward Data Checks

Byte 9 contains a count of the temporary read backward errors that needed ERP action.

Byte 10 - Write Data Checks

Byte 10 contains a count of the temporary write errors that needed ERP action.

Byte 11 - Read Blocks Corrected

Byte 11 contains a count of the read errors corrected without needing ERP action.

Byte 12 - Write Blocks Corrected

Byte 12 contains a count of the write errors corrected without needing ERP action.

Byte 13 - Tape Control Unit Equipment Checks

Byte 13 contains a count of the recoverable errors that were found during uses of the external registers.

Bytes 14 and 15 - Read Bytes Processed

Bytes 14 and 15 contain a count of the bytes read from the drive to the channel. Each count has a value of 4K bytes.

FORMAT 21 BYTES 16-23								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
16	Write Bytes Processed							
17	Write Bytes Processed							
18	Read Blocks Processed							
19	Write Blocks Processed							
20	Write Transient Conditions							
21	Read Transient Conditions							
22	Criteria Write Data Checks							
23	Criteria Read Data Checks							

Bytes 16 and 17 - Write Bytes Processed

Bytes 16 and 17 contain a count of the bytes written from the channel to the drive. Each count is equal to 4K bytes

Byte 18 - Read Blocks Processed

Byte 18 contains a count of the blocks read forward and backward for this volume. Each count has a value of 256 read blocks.

Byte 19 - Write Blocks Processed

Byte 19 contains a count of the blocks written on this volume. Each count is equal to 256 write blocks, and a maximum value of 65,536 write blocks can be counted.

Byte 20 - Write Transient Conditions

Cartridge stress conditions such as exposure to extreme heat or cold can cause short-term velocity changes to occur while writing the tape. This condition is detected and the event is recorded in this sense byte as a temporary, recoverable event.

Byte 21 - Read Transient Conditions

Cartridge stress conditions such as exposure to extreme heat or cold can cause short-term velocity changes to occur while reading the tape. This condition is detected and the event is recorded in this sense byte as a temporary, recoverable event.

Bytes 22 - Criteria Write Data Checks

A count of temporary data checks that occurred with no hardware FRU indicators. These counts are a subset of the count contained in sense byte 10 and are included in sense byte 10

Bytes 23 - Criteria Read Data Checks

A count of temporary read data checks that occurred with no hardware FRU indicators. These counts are a subset of the count contained in sense bytes 8 and 9 and are included in sense bytes 8 and 9.

FORMAT 21 BYTES 24-31								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
24	Write Recovery Erase Gape Count							
25	Drive Detected Errors							
26	Low-Order Read Blocks Processed				Low-Order Write Blocks Processed			
27	Tape Control Unit EC Switch 0	Tape Control Unit EC Switch 1	Tape Control Unit Model 0 = Reserved 1 = ADX	Tape Control Unit EC Switch 2	Tape Control Unit Serial Number (High Order)			
28	Tape Control Unit Serial Number (Mid-Order 4 Digits)							
29	Tape Control Unit Serial Number (Low-Order 4 Digits)							
30	Read Recovery Retry Count							
31	Logical Drive Address				Physical Drive Address			

Byte 24 - Write Recovery Erase Gap Check

Tape Control Unit error recovery procedure was required to erase and rewrite a block or tape mark.

Byte 25 - Drive Detected Errors

Byte 25 contains a count of unit checks set by the drive.

Byte 26 - Low-Order Read or Write Blocks Processed

Bits 0 through 3 contain a low-order count of the blocks read forward and backward for this volume; see byte 18 for the high-order count. Each count has a value of 16 read blocks.

Bits 4 through 7 contain a low-order count of the blocks written on this volume; see byte 19 for the high-order count. Each count has a value of 16 write blocks.

Byte 27 - Hardware Tape Control Unit Information

The bits in byte 27 are set from switches under the covers of the tape control unit. Usually, they are changed only by maintenance personnel during service or by plant personnel during assembly.

Bit 0 - Tape Control Unit EC Switch 0

0 = Two board tape control unit
1 = Reserved

Bit 1 - Tape Control Unit EC Switch 1

0 = Digital Model TA90
1 = Reserved

Bit 2 - Tape Control Unit model

0 = Model Reserved
1 = Model ADX

Bit 3 - Tape Control Unit EC Switch 2
Reserved

Bits 4 through 7 - Tape Control Unit Serial Number (High-Order Digit)

Bytes 28 and 29 - Tape Control Unit Serial Number

Bytes 28 and 29 contain the low-order 4 digits of the tape control unit serial number. The serial number is set by switches on the drive adapter card (01A-A1Q2). The serial number must match the base casting serial number.

Byte 30 - Read Recovery Retry Count

Byte 30 contains a count of the times the tape control unit attempted consecutive read recovery actions for the same block.

Byte 31 - Drive Address

Bits 0 through 3 - Logical Drive Address: Bits 0 through 3 are the low-order bits of the external drive address. This field contains the value that the drive responds to upon receipt of a command from the host.

Bits 4 through 7 - Physical Drive Address: Bits 4 through 7 contain a number that cannot be modified by the operator. It is set at installation of the drive by the Field Engineer. (No duplicate numbers should be set on any drives in this subsystem.)

FORMAT 30 BYTES 8 - 15								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
8	Device read forward data checks							
9	Device write forward data checks							
10	Device read backward data checks							
11	Reserved							
12	Device read criteria data checks							
13	Device write criteria data checks							
14	Device read recovery retries							
15	Device write recovery erase gaps							

Format 30 Sense Bytes 8-15 Description

Byte 8 - Device Read Forward Data Checks

Byte 8 contains a count of the temporary read errors that needed ERP action.

Byte 9 - Device Write Forward Data Checks

Byte 9 contains a count of the temporary write errors that needed ERP action.

Byte 10 - Device Read Backward Data Checks

Byte 10 contains a count of the temporary read backward errors that needed ERP action.

Byte 11 - Reserved

Byte 12 - Device Read Criteria Data Checks

Byte 12 contains a count of temporary read data checks that occurred with no hardware error indications. These counts are a subset of the count contained in log bytes 8 and 10 and are included in log bytes 8 and 10.

Byte 13 - Device Write Criteria Data Checks

Byte 13 contains a count of temporary write data checks that occurred with no hardware error indications. These counts are a subset of the count contained in sense byte 9 and are included in sense byte 9.

Byte 14 - Device Read Recovery Retry Count

Byte 14 contains a count of the times the tape control unit attempted consecutive read recovery actions for the same block.

Byte 15 - Device Write Recovery Erase Gaps

Byte 15 contains a count of the times a block is erase and written again during error recovery for the addressed drive.

FORMAT 30 BYTES 16-23								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
16	Device read transient conditions							
17	Device write transient conditions							
18	Device read blocks corrected							
19	Device write blocks corrected							
20	Reserved							
21	Reserved							
22	Channel read data request timeouts							
23	Channel write data request timeouts							

Format 30 Sense Bytes 16-23 Description

Byte 16 - Device Read Transient Conditions

Cartridge stress conditions such as exposure to extreme heat or cold can cause short-term velocity changes to occur while reading the tape. This condition is detected and the event is recorded in this sense byte as a temporary, recoverable event.

Byte 17 - Device Write Transient Conditions

Cartridge stress conditions such as exposure to extreme heat or cold can cause short-term velocity changes to occur while writing to the tape. This condition is detected and the event is recorded in this sense byte as a temporary, recoverable event.

Byte 18 - Device Read Blocks Corrected

Byte 18 contains a count of the blocks that had read errors corrected without needing ERA action.

Byte 19 - Device Write Blocks Corrected

Byte 19 contains a count of the blocks that had write errors corrected without needing ERA action.

Bytes 20 and 21 - Reserved

Byte 22 - Channel Read Data Request Timeouts

Byte 22 contains a count of the data request timeouts detected during data transfers from the tape control unit buffer to the STI-FIPS adapter.

Byte 23 - Channel Write Data Request Timeouts

Byte 23 contains a count of the data request timeouts detected during data transfers from the STI-FIPS adapter to the tape control unit.

Format 30 Sense Bytes 24-31 Table

FORMAT 30 BYTES 24 - 31								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
24	Channel transfer equipment checks							
25	Drive detected errors							
26	Clean Device	Reserved					01 = Rewrite Cartridge 11 = Replace Cartridge	
27	Tape Control Unit EC Switch 0	Tape Control Unit EC Switch 1	Tape Control Unit Model 0 = Reserved 1 = AOX	Tape Control Unit EC Switch 2	Tape Control Unit Serial Number (High order)			
28	Tape Control Unit Serial Number (Mid order 4 digits)							
29	Tape Control Unit Serial Number (Low order 4 digits)							
30	Logical Drive Address				Physical Drive Address			
31	Reserved							

Format 30 Sense Bytes 24-31 Description

Byte 24 - Channel Transfer Equipment Checks

Byte 24 contains a count of the number of errors, excluding data request timeouts, detected during data transfer between the host channel and the tape control unit buffer.

Byte 25 - Drive Detected Errors

Byte 25 contains a count of unit checks set by the drive.

Byte 26 - Device and/or Cartridge Action

Bit 0 - Clean Device

Bit 1 through 5 - Reserved

Bits 6 and 7 - Cartridge Action:

01 = Rewrite Cartridge
11 = Replace Cartridge

Byte 27 - Hardware Tape Control Unit Information

Bit 0 - Tape Control Unit EC Switch 0:

0 = Two board tape control unit
1 = Reserved

Bit 1 - Tape Control Unit EC Switch 1: Reserved

Bit 2 - Tape Control Unit Model:

0 = Reserved
1 = A0X

Bit 3 - Tape Control Unit EC Switch 2: Reserved

Bits 4 through 7 - Tape Control Unit Serial Number (High order digit)

Bytes 28 and 29 - Tape Control Unit Serial Number

Bytes 28 and 29 contain the low order 4 digits of the tape control unit serial number. The serial number is set by switches on the drive adapter card (01A-A1Q2). The serial number must match the base casting serial number.

Byte 30 - Drive Address

Bits 0 through 3 - Logical Drive Address:

Bits 0 through 3 are the low order bits of the external drive address. This field contains the value that the drive responds to upon receipt of a command from the host.

Bits 4 through 7 - Physical Drive Address:

Bits 4 through 7 contain a number that cannot be modified by the operator. It is set by the Field Engineer during installation. No duplicate numbers should be set on any drives in this subsystem.

Byte 31 - Reserved

FORMAT 30 BYTES 32-40								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
32	Channel read bytes processed hi (4095)							
33	Channel read bytes processed mid (4096)							
34	Channel read bytes processed lo (4096)							
35	Channel write bytes processed hi (4096)							
36	Channel write bytes processed mid (4096)							
37	Channel write bytes processed lo (4096)							
38	Device read bytes processed hi							
39	Device read bytes processed mid							
40	Device read bytes processed lo							

Format 30 Sense Bytes 32-40 Description

Bytes 32 - 34 - Channel Bytes Processed

Bytes 32 through 34 contain a count of the nu ber of bytes read from the tape control unit buffer to the channel.

This count includes:

- Formatted data block
- Data block trailer
- Pad bytes
- Residual count
- Cyclical redundancy check (RCR).

Bytes 32, 33, and 34 are combined to form a 24 bit binary counter of write bytes processed. Each count is equal to 4096 (1000_{16}) and the counter has a maximum value of 256 gigabytes.

When each tape synchronous mode read block is processed, the true byte count is not known, therefore a number is added to the Read Bytes Processed counter equal to the current segment size.

Bytes 35 - 37 - Channel Write Bytes Processed

Bytes 35 through 37 contain a count of the number of bytes written from the channel to the tape control unit buffer.

This count includes:

- Formatted data block
- Data block trailer.

Bytes 35, 36, and 37 are combined to form a 24 bit binary counter of write bytes processed. Each count is equal to 4096 (1000_{16}) and the counter has a maximum value of 256 gigabytes.

Bytes 38 - 40 - Device Read Bytes Processed

Bytes 38 through 40 contain a count of the blocks read forward and backward for this volume from the device to the tape control unit buffer.

Bytes 38, 39, and 40 are combined to form a 24 bit binary counter of read and read backward blocks processed. Each count is equal to one block. The maximum value of the counter is 16 megablocks.

Format 30 Sense Bytes 41-49 Table

FORMAT 30 BYTES 41-49								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
41	Device write bytes processed hi							
42	Device write bytes processed mid							
43	Device write bytes processed lo							
44	Channel read blocks processed hi							
45	Channel read blocks processed mid							
46	Channel read blocks processed lo							
47	Channel write blocks processed hi							
48	Channel write blocks processed mid							
49	Channel write blocks processed lo							

Format 30 Sense Bytes 41-49 Description

Byte 41 - 43 - Device Write Bytes Processed

Bytes 41 through 43 contain a count of the blocks written on this volume from the tape control unit buffer to the device.

Bytes 41, 42, and 43 are combined to form a 24 bit binary counter of write blocks processed. Each count is equal to one block. The maximum value of the counter is 16 megablocks.

Byte 44 - 46 - Channel Read Blocks Processed

Bytes 44 through 46 contain the number of logical blocks which were successfully read by the channel.

Bytes 47 - 49 - Channel Write Blocks Processed

Bytes 47 through 49 contain the number of logical blocks which were successfully written by the channel.

Format 30 Sense Bytes 50-55 Table

FORMAT 30 BYTES 50-55								
BYTE	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
50	Device read blocks processed hi							
51	Device read blocks processed mid							
52	Device read blocks processed lo							
53	Device write blocks processed hi							
54	Device write blocks processed mid							
55	Device write blocks processed lo							

Format 30 Sense Bytes 50-63 Description

Byte 50 - 52 - Device Read Blocks Processed

Bytes 50 through 52 contain the number of physical blocks which were read from the device to the tape control unit buffer.

Byte 53 - 55 - Device Write Blocks Processed

Bytes 53 through 55 contain the number of physical blocks which were written from the tape control unit buffer to the device.

Bytes 56 - 63 - Reserved

Status Byte Description

The Status Byte

The status byte contains information about the current condition of different parts of the subsystem. When the tape control unit needs to present status for an addressed drive, the status is represented in a single byte of data. The status bits are described on SENSE 290

Status Byte							
BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
Attention	Status Modifier	Tape Control Unit End	Busy	Channel End	Device End	Unit Check	Unit Exception

Status Byte (Continued)

Status Byte Bits 0-7 Description

Bit 0 - Attention:

Bit 0 is set when the drive is changed from a not-ready to a ready condition. The change of condition is caused by loading a tape in the drive or by the operator changing the drive from offline to online status, but only if the drive has been primed. See device end (bit 5) for a description of primed. Device end (bit 5) and unit exception (bit 7) are also set when the drive is changed to the ready condition.

Bit 1 - Status Modifier:

Bit 1 in combination with busy (bit 3) indicates the tape control unit is busy. This bit in combination with channel end (bit 4) and unit check (bit 6) is used to place the channel in retry status. When an immediate retry is requested, device end is set with channel end and unit check bits. If the retry is not immediate, device end is set by a delayed interrupt when the channel is ready to retry.

Bit 2 - Tape Control Unit End:

If the tape control unit was busy during initial selection, bit 2 is set when the tape control unit is no longer busy and can perform a command. This bit is set with busy (bit 3) and status modifier (bit 1) when the tape control unit is busy for only a short time.

This bit is always set with device end (bit 5) if channel end (bit 4) was set earlier and unit check or unit exception is set with device end.

Bit 3 - Busy:

Bit 3 is set when the drive is busy on another channel path. This bit is set with status modifier (bit 1) when the tape control unit is busy. This bit is always set with status modifier and tape control unit end bits when the tape control unit is busy for only a short time.

If this bit is set during a deferred unit check, the busy status condition is associated with a preceding command. Unit check timing (sense byte 0 bit 6) is set when the status is sent as a result of a deferred unit check.

Bit 4 - Channel End:

Bit 4 is set when the data transmit part of an I/O operation is complete or when control information between the channel and the tape control unit or drive is complete and the channel is no longer needed for processing the current command.

Bit 5 - Device End:

Bit 5 is set when an I/O command has completed. It is also set with the attention and unit exception bits when a drive is changed from the not-ready to the ready condition and has been primed.

A drive is primed when an operator presses the Rewind Unload push button, when an I/O command is given while the drive is in the not-ready condition, or when the host gives an I/O request and busy (bit 3) is returned. In the last event, the tape control unit sets this bit to indicate the drive-busy condition has cleared.

Primed has a different meaning when a channel path group is operating in multipath mode. In this event, the primed status is associated with the STI-FIPS adapter ID and not with a specific channel path. So, although more than one channel is primed in a channel path group that is operating in multipath mode, any one of the channels in the channel path group is selected to receive the status. Only one device end status condition is supplied to the channel path group, regardless of the number of primed channels in that group. See "Commands" for a description of the Set Path Group ID command.

Bit 6 - Unit Check:

Bit 6 is set when one of the following conditions is sensed in the TA90 Magnetic Tape Subsystem:

- The drive is in a not-ready condition and a movement-type command is given to it.
- An error condition prevents an operation from completing successfully.
- A Read Backward, Backspace Block, or Backspace File command is given to a drive that is at the BOT position.
- The drive has received a Rewind Unload command.
- A deferred unit check status occurs.
- A not valid parity occurs on a command.
- A command or command sequence is not valid.
- Chaining occurs to or from a Set Path Group ID command or a Sense Path Group ID command.
- A write-type command is given to a file-protected tape.
- The drive is assigned to exclusive use by another channel path group.
- The buffered log has had an overflow.
- A deferred unit check occurs from an earlier I/O operation.
- A forward-movement command is given to a drive that is at the physical end-of-tape position.

  Note: The tape must be moved backward to at least the logical end of tape before any forward-movement command can be performed.

In response to a unit check status, the STI-FIPS adapter must give a Sense command to obtain the information necessary to record the error. The tape control unit maintains a contingent connection between the STI-FIPS adapter and the drive when unit check status occurs. Until the STI-FIPS adapter gives a command other than Test I/O or No Operation, the addressed drive is busy to other I/O requests to ensure that the STI-FIPS adapter can obtain the sense information.

Bit 7 - Unit Exception:

Bit 7 is set if the logical end of tape is reached during processing of a Write, Write Tape Mark, or Erase Gap command. It is also set if a tape mark is sensed during the processing of a Read, Read Backward, Forward Space Block, or Backspace Block command.

This bit is set with status modifier (bit 1) and device end (bit 5) when a drive is changed from the not-ready to the ready condition.

Note: The unit exception status condition should be processed as soon as it occurs to prevent a unit check status condition and a possible loss of data caused by a physical end-of-tape condition during write-forward operations. However, there is enough space left on the tape after the logical end of tape and before the physical end of tape for all of the contents of the buffer to be written on the tape.


PAINEL

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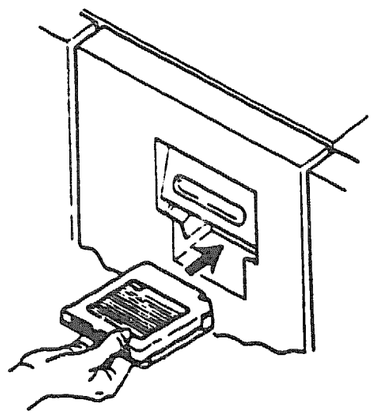
How to Operate the Drive

How to Prepare the Drive for Operation

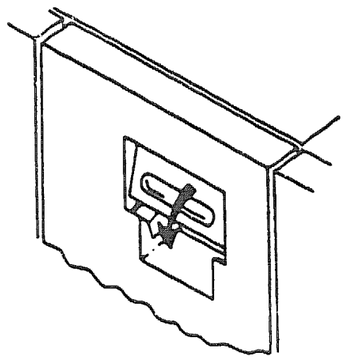
To prepare the drive for operation, perform the following steps

1 If the tape drive cartridge latch is closed, press the Unload switch 3

Hold the cartridge as shown and slide the cartridge into the opening in the front cover



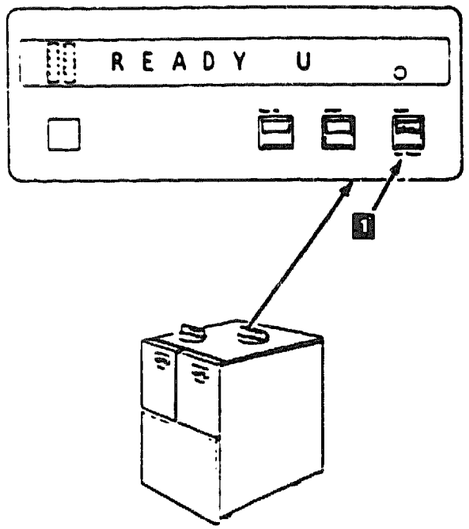
2 Move the latch cover down until it stops



3 Move the Ready/Not Ready switch 1 to the Ready position.

The Operator Panel message display will show READY F or READY U condition If the tape is at BOT, the message display will show B O T F or B O T U.

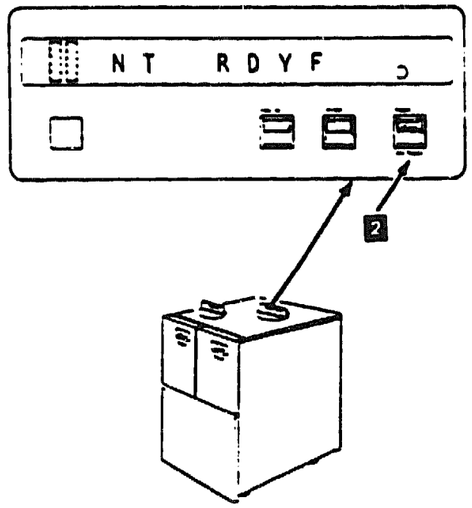
If any other message or indicator is displayed, go to START 10



How to End Drive Operation

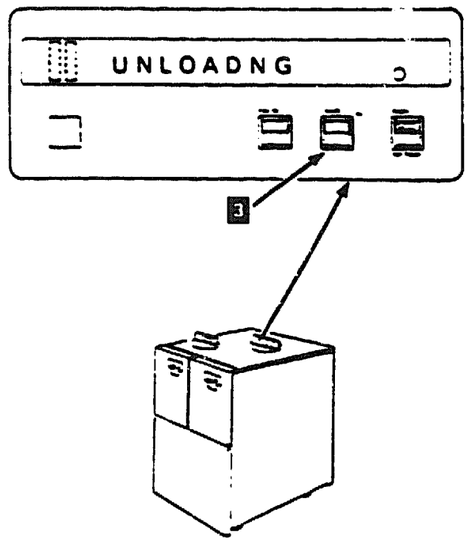
To end drive operation, perform the following steps:

1 Move the Ready/Not Ready switch 2 to the Not Ready position



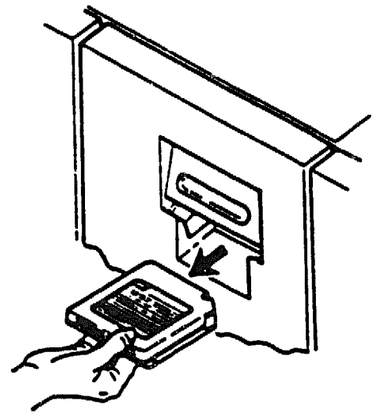
2 Press the Unload switch 3.

Note: Pressing the Unload switch rewinds the tape, opens the latch door, and locates the cartridge for removal.



3 Remove the cartridge from the tape unit. If the latch door does not open, go to START 10.

Note: The cartridge latch should be closed when the tape drive is not being used. (A cartridge need not be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.



IML Procedure

To IML the tape control unit perform the following:

1. Ensure that the subsystem power is on.
2. Place the tape control unit Online test/Offline test switch in the Offline position.
3. Place the tape control unit Normal/Test switch in the Normal position.
4. Insert the IML diskette into the IML device.
   a. Push the release button on the IML diskette drive and remove the head protector.
   b. Insert the IML diskette (label up and toward you) and push until the drive closes.
5. Press the tape control unit IML switch to the IML position.
6. Whe the IML completes successfully, the "wait" LED comes on.
7. Place the tape control unitOnline test/Offline test switch in the Online Test position. The Offline indicator turns off.
8. If the IML is not successful, remove the functional diskette from the tape control unit and IML the support diskette.

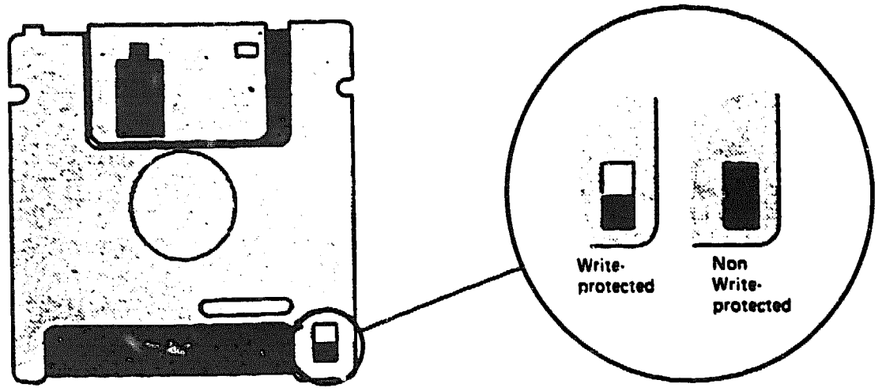
IML Fail Indication

An IML Failure is indicated by the "error" LED on the tape control unit switch panel.

WRITE-PROTECTED DISKETTES

IML Diskettes used in the TA90 Tape Control Unit should not be write-protected. Diskettes that are write-protected will cause an error during Power On and IML.

- On the reverse side of a 3 5 inch diskette, in the lower corner, there is a write-protect window. When you slide the plastic tab so that the window is open, the diskette is write-protected. When the window is closed, data can be written on the diskette.



Tape Control Unit Switches and Indicators

The tape control unit has switches that permit the customer and the CE to control specific subsystem functions. The switches are located on the tape control unit panel. The front cover must be open to get access to the tape control unit switches except for the Unit Emergency Power and Power On/Off switches.

Port Select A/B Fault **1**: When set to the enable (in) position, the Port Select A and B switches allow the HSC to access ports A and B. Under microprogrammed control, the HSC can then cause port A or B to go online. (Until the port goes online, access is limited to very few commands such as retrieving status.)

Placing the Port Select switch in the disabled (out) position with the port online causes the formatter to alert the HSC. After completing the current operation, the HSC disconnects the port from the online state.

Note: When Port Select A and B are enabled, the formatter samples each port until one receives a command to go online.

The Port Select light comes on if the port is online or if an error has been detected and Fault has been pressed. The Fault light comes on when a potentially fatal error has been detected in the formatter. (Even though an error has occurred, the formatter still attempts to communicate with the HSC.)

When a fatal error occurs, use Fault to retrieve an error code and try to clear the error. If you press Fault when no fatal error has occurred:

1. All three control panel lights will come on.
2. The Operator Panel will display a message identifying the drives associated with each formatter.

Power On/Off **2**: The Power On/Off switch is a two-position switch. The Local/Remote switch **17** is set to Local and the Power On/Off switch is placed in the On position to supply ac power to the tape control unit and all attached TTUs. When ac power is supplied, the dc power supplies are started and a Power On Reset is generated. Placing this switch in the Off position removes the ac power from the subsystem.

Power On Indicator **3**: This is a green LED that lights when the tape control unit Power On switch is placed in the On position to indicate that the tape control unit ac power is on.

Unit Emergency Power **4**: The Unit Emergency Power switch supplies an emergency disconnect from the ac power source. When the emergency switch is pushed, the ac power is immediately removed from the subsystem without the delay that occurs when the Power On/Off switch is placed in the Off position. The Unit Emergency Power switch must be placed in the Power Enable position and the Local Power Enable pushbutton **6** must be activated to restore power to the subsystem.

Diskette Drive **5**: The diskette drive contains the Functional diskette and is used in conjunction with the IML switch.

Local Power Enable **6**: This pushbutton switch resets the ac power supply to allow power in the tape control unit when the Unit Emergency Power switch **4** is in the Power Enable position.

Wait Indicator **7**: The Wait Indicator blinks or stays on when the microcode is executing. It is off when the microcode is not loaded or not executing correctly.

Error Indicator **8**: The Error Indicator either blinks or stays on when an error is detected.

DC Power Indicator **9**: This is an LED that lights when dc power is available to the tape control unit.

IML **10**: The IML switch is a momentary switch. When the switch is pressed, the tape control unit performs an IML operation.

TCU Online Test/Offline Test **11**: This switch is placed in the Online position to permit tape control unit communication with the STI-FIPS Adapter. When this switch is placed in the Offline position, the drives are not available to the STI-FIPS Adapter.

TCU0/TCU1 **12**: This switch must be set at the time of installation to a specific value, 0 or 1, to match the subsystem cable configuration. In a single tape control unit subsystem, this switch must be set to 0. In a dual tape control unit subsystem this switch must be set to 0 on the primary tape control unit and set to 1 on the secondary tape control unit.

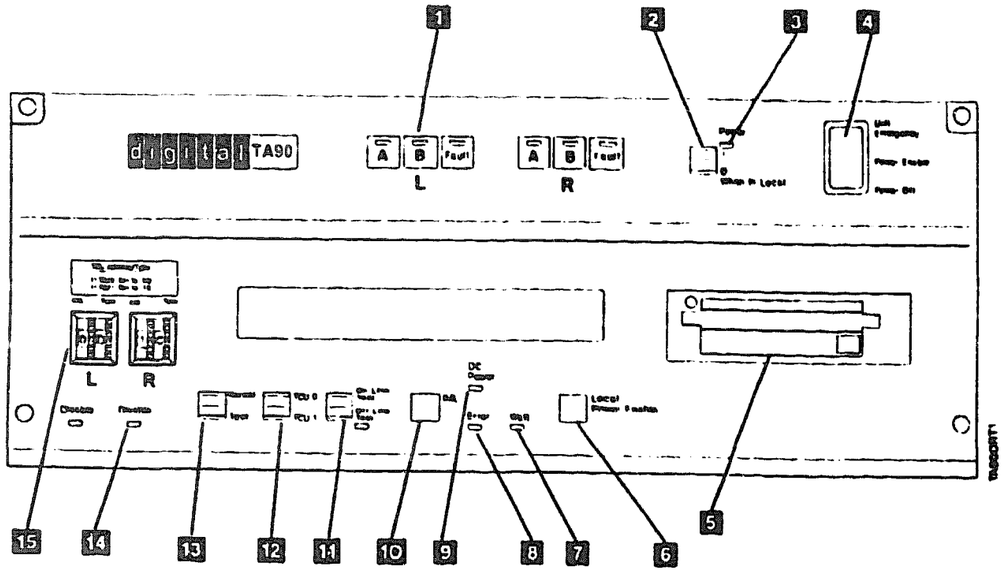
Normal/Test **13**: This switch is placed in the Normal position for usual tape control unit operations. When the switch is placed in the Test position, the IML switch is placed in the IML position, and the Functional diskette is in the IML device, the tape control unit performs the needed tests to verify subsystem operation.

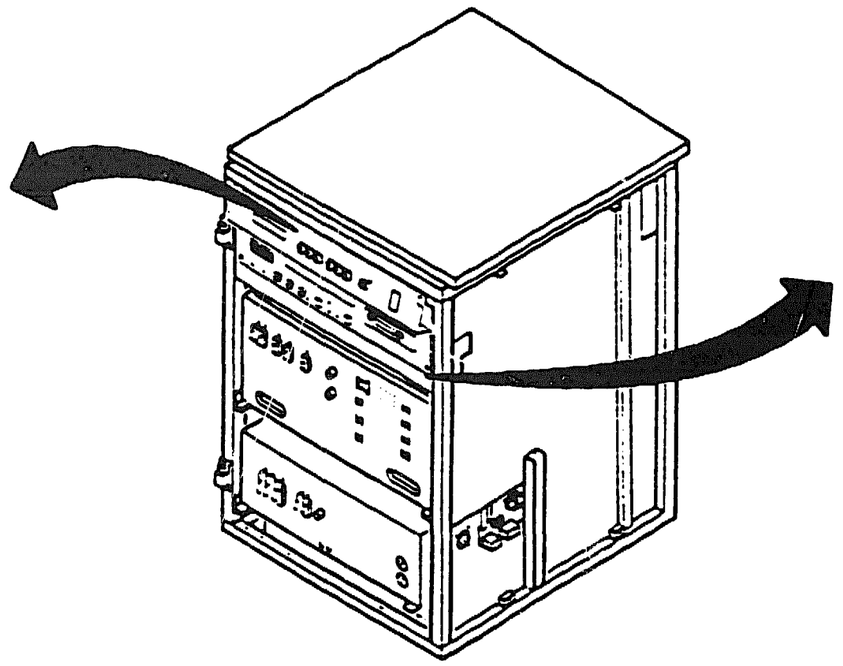
Disable **14**: This indicator stays on during power-up and IML, and turns off after a successful power-up and IML. An error in the associated Channel Adapter causes the Disable indicator to come on.

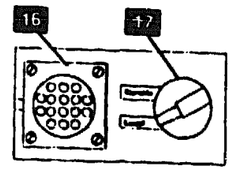
TCU Address **15**: These four thumbwheel switches represent (in groups of two) the two STI-FIPS Adapters that are installed. The first switch in each group has the hexadecimal value of 0 or 1, and is set to the tape control unit address corresponding to TCU switch **12**. The second switch in each group is set to a mode value that relates to the address. See PANEL 12 for the correct setting of these thumbwheel switches.

MD Connector **16**: This 28 pin connector is used to attach the maintenance device to the tape control unit. (This is only required for the support level utilities described in the MD/SDISK section.)

Local/Remote **17**: This switch is placed in the Remote position to enable the subsystem to power up when the host system power is switched on and to power down when the host system power is switched off. When this switch is placed in the Local position, subsystem power is controlled by the Power On/Off switch.







Setting Address Switches

The following procedure is used to set the tape control unit addresses. Each TCU has two pairs of thumbwheel switches. The left switch of each pair is the TCU Address. The right switch is set to a value to be determined by the TCU base address.

These switches should not be changed unless the correct procedure is followed.

CAUTION:
If the TCU0/TCU1 switch is set to TCU0, both left and right thumbwheel switches must be set to 0D. If both thumbwheel switches are not set to 0D, the HSC will not recognize all the drives.

The same condition holds true when the TCU0/TCU1 switch is in the TCU1 position. Both thumbwheel settings must be at 1C.

Setting the Tape Control Unit Addresses

1. For a single tape control unit subsystem, set the TCU0/TCU1 switch for tape control unit 0 to TCU0. For a dual tape control unit subsystem, set the TCU0/TCU1 switch for tape control unit 0 to TCU0, and set the TCU0/TCU1 switch for tape control unit 1 to TCU1.

   Note: TCU0 has drive string containing addresses 0-7 physically attached.

2. Start with the switches for channel adapter A (left). Set the left thumbwheel switch to the tape control unit address. If the TCU0/TCU1 switch is in the TCU0 position, set the address to zero. If it is in the TCU1 position, set the address to one.

3. Set the right thumbwheel switch to the value indicated on the panel.

4. Repeat steps 1 through 3 for channel adapter B (right).

Setting Drive Addresses

On the drives attached to TCU0, set the address switches in the range of 0 through 7. No two drives can have the same address.

On the drives attached to TCU1, set the address switches in the range of 8 through F. No two drives can have the same address.

To set the address switches for drives 10 through 15 use the following table.

Unit Address	Switch Setting
10	A
11	B
12	C
13	D
14	E
15	F

Changing the Tape Control Unit Address Switch Settings

Use this procedure to change the tape control unit address (STI-FIPS adapter address) after installation:

1. Have the customer dismount all affected devices for that tape transport unit.

2. Set the Enable/Disable switch to Disable.

3. Change the thumbwheel switches to the desired valid settings.

4. Set the Enable/Disable switch to Enable.

5. Have the customer mount all affected devices using the new unit numbers.

Tape Transport Unit Switches and Indicators

The tape transport unit operator panel switches [1] permit the customer and the service representative to control specific drive functions.

The tape transport unit ac power CB [10] is located at the front of the tape transport unit at the bottom right. The tape transport unit front cover must be open and the safety cover must be removed to get access to this switch. Push the door to open or close.

Switches are also located on a drive switch panel [9] located at the front center of the tape transport unit below the drives. The four switches at the left are used with drive 0, and the four switches at the right are used with drive 1. The tape transport unit front cover must be open for access to the drive switch panel.

Drive Operator Panel

The drive operator panel switches and indicators are:

Bar LEDs: When lighted, the bar LEDs [1] indicate that operator action is needed before the drive can continue operations.

Message Display: This is a red eight-character dot matrix LED display [2] that supplies error, service representative information, drive status, and host response messages. (See PANEL 30 for a description of these messages.)

Selected Indicator: The selected indicator [3], when on, indicates that the drive is selected by a tape control unit.

Ready/Not Ready: When the Ready/Not Ready switch [13] is placed in the Ready position and tape tension is correct, the drive is placed in a ready condition and READY F or B.O.T. F is displayed on the operator panel if the tape is file protected. If the tape is not file protected, READY U or B.O.T. U is displayed.

When the Ready/Not Ready switch is placed in the Not Ready position, the drive ready condition is removed and NT RDY F or NT RDY U is displayed. This permits the operator to perform a rewind or unload operation.

Unload: When the Unload switch [12] is pressed, and the drive is in a not ready condition (Ready indicator off), the drive rewinds the tape and performs an unload operation.

Rewind: When the Rewind switch [11] is pressed, and the drive is in a not ready condition (Ready indicator off), the drive rewinds the tape to the beginning-of-tape (BOT). In addition, if tape tension is lost and the Rewind switch is pressed, the drive performs a midtape load operation and rewinds the tape to the BOT.

Tape Transport Unit AC Power CB

The tape transport unit ac power circuit breaker [10] supplies ac voltage to the pump/motor, the blower assemblies, and the dc power supply. Before ac power is removed, both drives in the tape transport unit should be offline.

Drive Switch Panel

The drive switch panel switches are:

Drive Power On/Off: The Drive Power On/Off switch [5] is placed in the On position to supply ac voltage to the fans, and to supply dc voltage to pick the contactors in the power supply. When the switch is placed in the Off position, the ac and dc power is removed from the corresponding drive. The drive should be offline before power is removed.

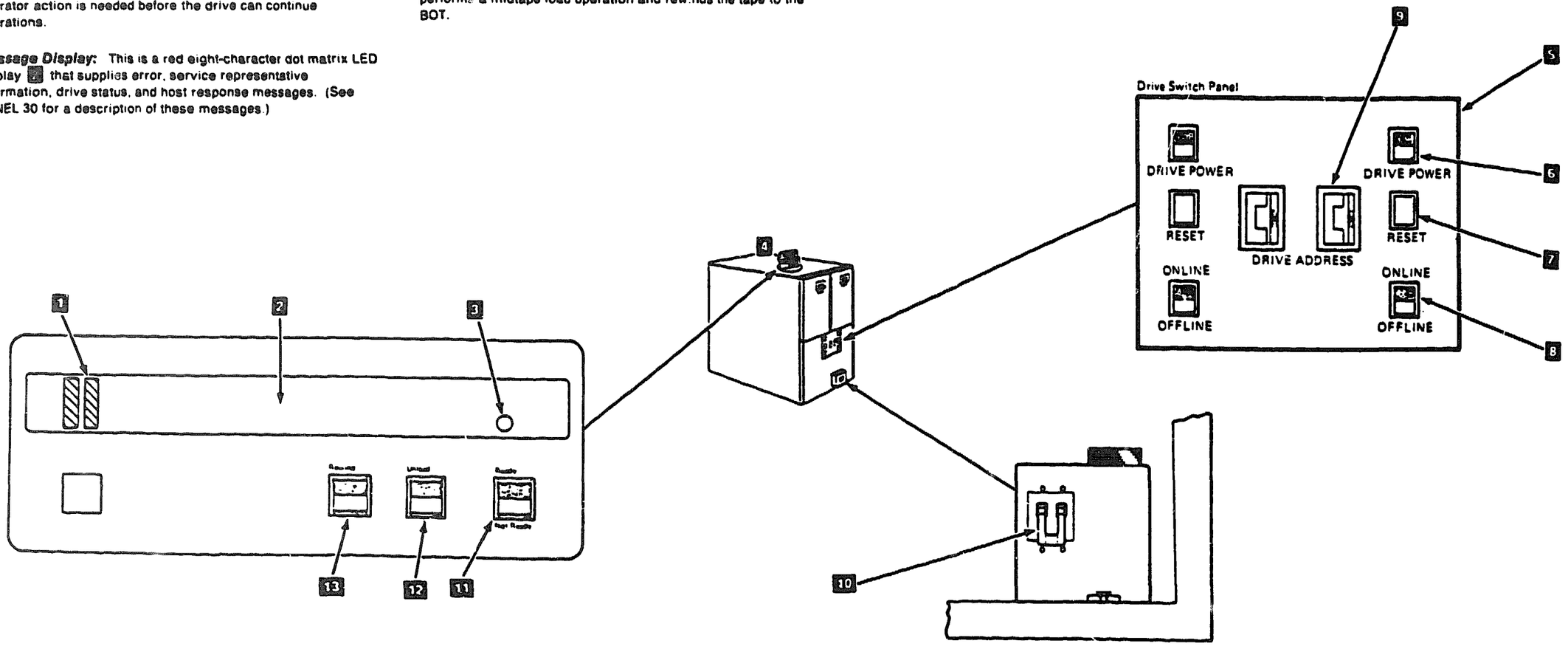
Reset: When the Reset switch [7] is pressed, the drive performs a Power-On Reset.

Online/Offline: The Online/Offline switch [8] is placed in the Online position to permit drive communication with the tape control unit. When this switch is placed in the Offline position, the drive is not permitted to communicate with the tape control unit.

Drive Address: The Drive Address thumbwheel switch [6] can have the hexadecimal value of 0-F, and is set to the drive address. Drives physically attached to the tape control unit with the TCU0/TCU1 switch set to zero must be addressed in the range of 0-7. Drives physically attached to the tape control unit with the TCU0/TCU1 switch set to one must be addressed in the range of 8-F.

Notes:

1. No two drives on the same tape control unit can have the same drive address set in their thumbwheel switches.
2. System-wide unit numbers can be established outside the drive address range by changing the basic address through the CE panel.



Message Display Messages

The following types of messages can be displayed on the message display:

- Error Message
- Customer Engineer Information
- Drive Status
- Drive Status When the Drive Is Offline
- Host Response

Message Display Characters

In addition to alphabetic characters, the message display can show two other symbols:

x. 'rectangle' (all the LEDs that make up a character in one position are lighted)

* 'asterisk'

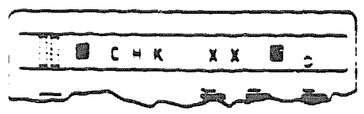
LED Positions on the Message Display



1 2 3 4 5 6 7 8 position number

Error Messages

An error message is displayed when a failure is detected in the drive whether it is on-line or off-line. This message has priority over all other types of messages and remains displayed until the failure is corrected.



This is an error code message.

XX = Hexadecimal error code

Service Representative Information

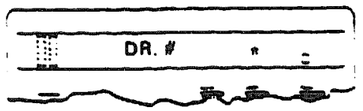
Information messages are diagnostic aids for the service representative who is performing FRU isolation on the TA90. These are not error messages.



This drive is being tested

Drive Status When the Drive Is On-line

The drive status messages are generated by the TA90 drive to indicate the status of the drive or the operation that is being performed.



When no cartridge loaded, or both A/B switches are out.



Loaded, not ready, file protected.



Loaded, not ready, not file protected.



Indicates that the cleaning cartridge should be inserted to clean the read/write head.



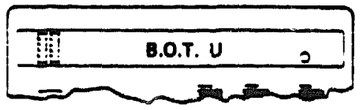
Loaded, ready, file protected.



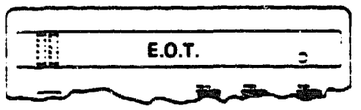
Loaded, ready, not file protected.



Loaded, ready, file protected, beginning-of-tape



Loaded, ready, not file protected, beginning-of-tape



Logical End-Of-Tape reached.



High-speed locate in operation.



Data security erase in operation.



Rewind in operation.



Unload in operation.

Drive Status When the Drive Is Offline

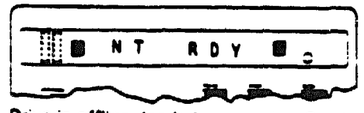
When the drive is off-line, LED positions 1 and 8 are rectangles. For drive status messages, any characters normally in positions 1 and number 8 are not visible. Any drive status message may be displayed with the drive off-line.

Example:



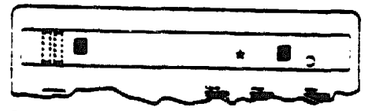
Drive is offline; loaded, ready. Can be file protected or not file protected.

Example:



Drive is offline; loaded, not ready. Can be file protected or not file protected.

Example:



Drive is offline; no cartridge loaded.

Host Response

The host response messages are customer programmed messages sent to the drive from the host system by using the Load Display command.



Customer programmed messages.

Mode Selection Switch

The mode selection switch [1] is a three position rocker switch.

- Auto
- System
- Manual

You can change the position of the switch at any time. Generally the device switches to the new mode automatically without any action by you. The one exception is when switching to Auto mode. The Start switch must be pressed to activate the new mode.

Auto Mode:

In this mode cartridges in the input stack are sequentially loaded into the drive, and upon completion of use by the drive, will be unloaded and positioned in the output stack.

Manual Mode:

In this mode you must manually insert the cartridges into the drive, one at a time.

System Mode:

System mode is not currently supported by VMS. This switch position should not be used.

Start Switch

The Start switch [2] is used by the operator to initialize Auto mode after a Power-On Reset, IML, or switching from Manual to Auto mode.

Reinitialize Auto mode after an input stack empty or output stack full condition. Cartridges must be added to the input stack or removed from the output stack before pressing the Start switch.

Activate each manual cartridge load cycle in Manual mode.

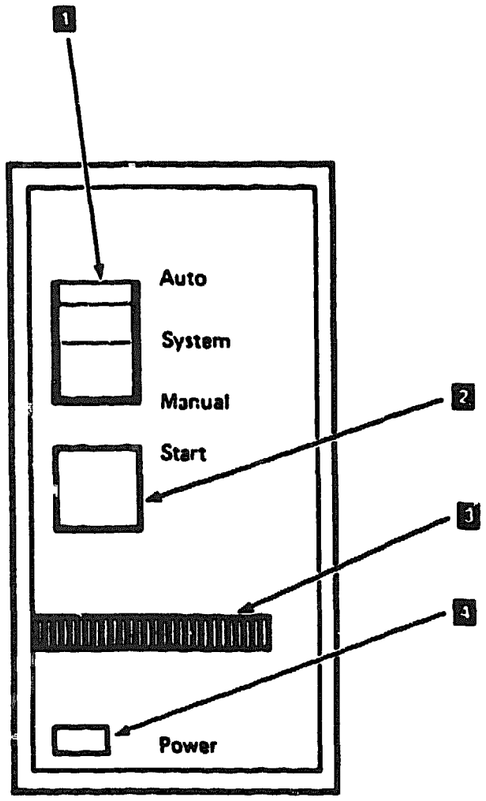
Attention Indicator

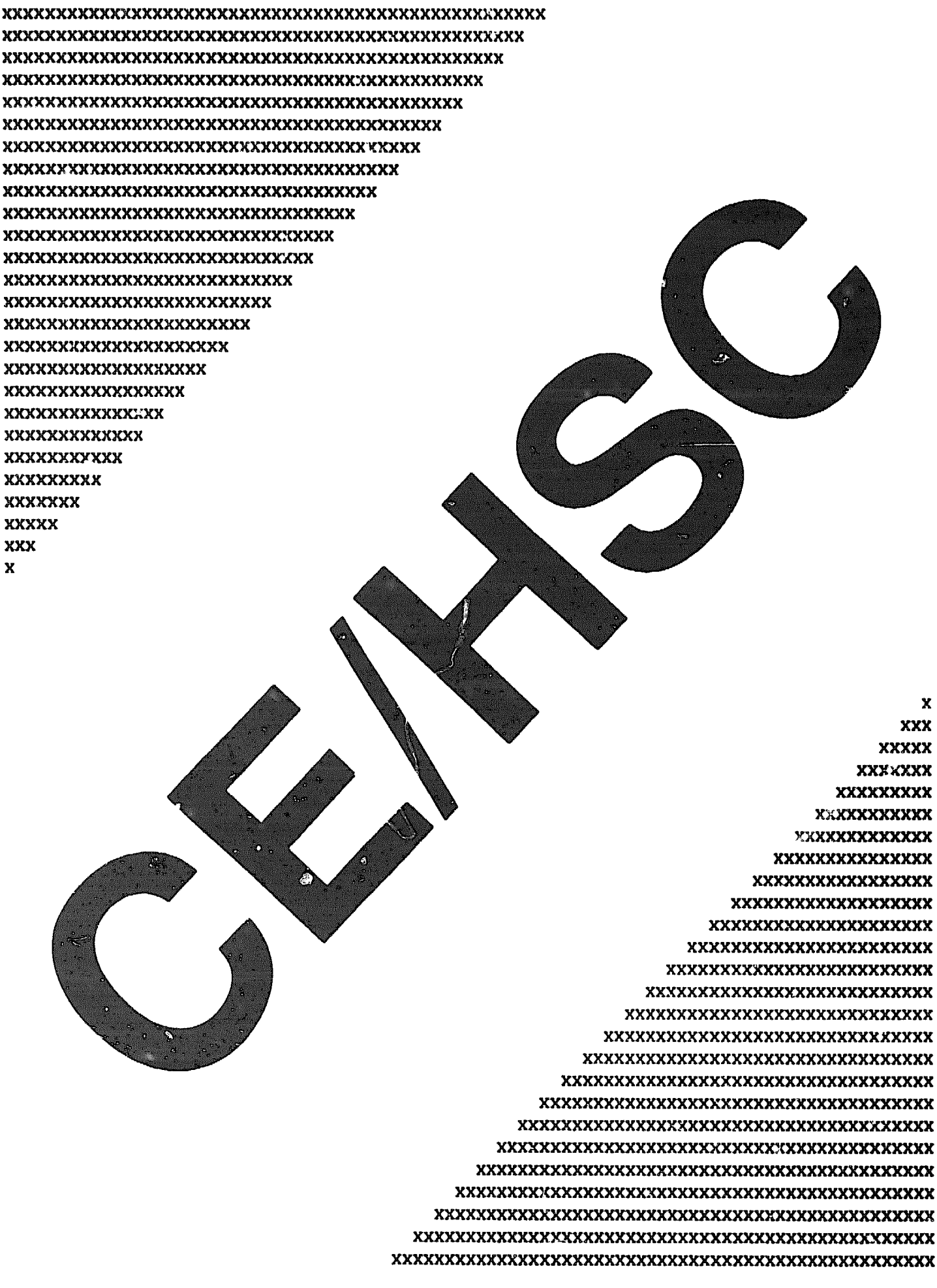
When the Attention indicator [3] LED is flashing, it indicates to the operator that action is needed before the automatic cartridge loader can continue operation.

When the LED is on solid, indicates an error condition. The indication remains on until a power off or a manual reset/IML of the drive, or the error condition has been cleared by pressing the drive Unload switch.

Power On Indicator

The Power On indicator [4] is on when the dc voltages supplied by the drive power supply are on and are regulated.




CE/HSC

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Customer Engineering Panel

Customer Engineering Panel Description

The Customer Engineer (CE) Panel is the primary maintenance tool for the TA90 Magnetic Tape Subsystem. It is used to set the subsystem base address and to run diagnostics.

Location of controls and indicators

The Customer Engineer Panel contains the following:

Panel Ribbon Cable: The CE ribbon cable is connected to the TA90 tape control unit to supply the communication path between the CE panel and the TA90. The CE connector is located in the back of the TA90 tape control unit.

Keyboard/Display: The keyboard/display permits communication with the maintenance procedures.

Display

The display has one row of 20 characters, and messages appear as either fullscreen or halfscreen messages. Messages may originate from either adapter. For halfscreen messages, the left 10 characters are reserved for the left adapter and the right 10 characters are reserved for the right adapter.

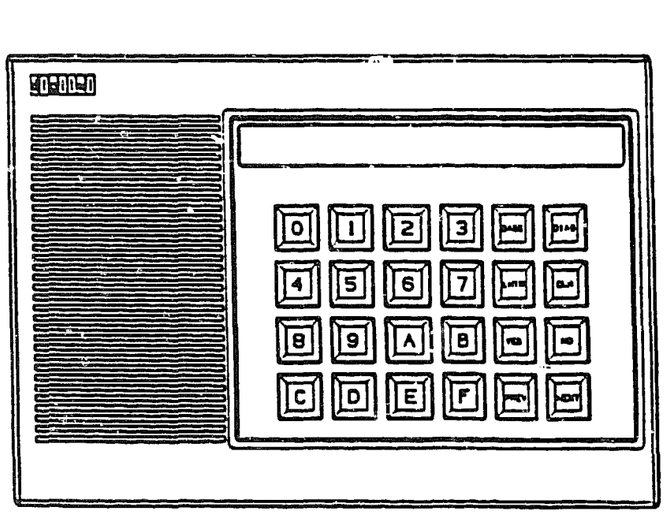
Keypad

The keypad consists of a hexadecimal entry pad (0–F), and eight special function keys. The special function keys are: BASE, DIAG, ENTR, CLR, YES, NO, PREV, and NEXT.

Special function key operations

This section describes the operations that occur when the CE keyboard pushbuttons are pressed.

BASE	The BASE key is used for setting the base address of the subsystem. It should not be used during diagnostics.
DIAG	The DIAG key is used to place the subsystem in diagnostic mode and to exit from diagnostic mode.
ENTR	When pressed, this pushbutton signals the CE to read the data that is displayed on the CE display. The ENTR pushbutton may also be used to advance to the next operation.
CLR	CLR is used to clear the display should a data entry error be made. You must re-enter all the data, as CLR clears the entire display.
YES NO	When pressed, these pushbuttons enter an alphabetic Y or N character to supply answers to questions in the current display to guide the CE through setting the base address and running diagnostics.
NEXT PREV	NEXT and PREV are used to scroll through information that exceeds the 20 character display capacity.
Data entry keys (0–F)	The data entry keys are used to input diagnostic test numbers and the base address.



CE MESSAGES

Information and direction messages are displayed on the keyboard/ display when the CE is used with the TA90. The following information and examples describe the types of messages that are displayed.

CE Message Types

The TA90 message types are:

- Information
- Question
- Request

Information message

The information messages are used to inform you that the CE is performing a function that takes time and is not idle.

Example of an Information message

EXECUTING

Question message

The question message asks a question that must be given a YES or a NO answer, and ends with a question mark (?).

Example of a Question message

USE LEFT ADAPTER ?

Request message

When input is needed, you are instructed to enter the data. To respond, enter the requested data and press the ENTR key.

Example of a Request message

NEW BASE ADDRESS?

Power-up/Timeout

The CE panel is powered directly by the TCU power supply. The panel ribbon cable should always be connected to the back of the pocket such that when the TCU (and consequently the adapters) are powered up, the panel should also be powered up.

When power-up diagnostics are completed on the CE panel, the hardware and software versions will be displayed. When the adapter diagnostics are complete, the message "PWRUP OK" should appear on both halves of the panel display. If this message does not appear on both halves of the display, the adapter corresponding to the absent message is either not present, or present and not able to communicate with the CE panel.

NOTE:

Any of the following messages indicate that an error has been detected by CE panel diagnostics: "DUART FAILURE", "RAM TEST FAILURE," "ROM TEST FAILURE."

If the panel is not used within one hour of power-up, there is a timeout and the display will show the present base address of the subsystem as follows:

BASE ADDRESS: ####

Setting the Base Address

Enter the base address mode by pressing the BASE key. When the BASE key is pressed, "BA IS ####: CHANGE?" appears on the display. (#### is the existing base address). At this prompt, respond with a YES or NO.

If the response is YES, "NEW BASE ADDRESS?" is displayed. Enter a decimal number (0–65520) and press the ENTR key. If a hexadecimal number or a number greater than 65520 is entered, an error message will appear, and the original message "BASE ADDRESS: <#>" will return to the display after 5 seconds. When a legitimate number is entered, the new base address will be displayed with "BASE ADDRESS: <#>".

If the response is NO, the original base address message will appear.

Running Diagnostics

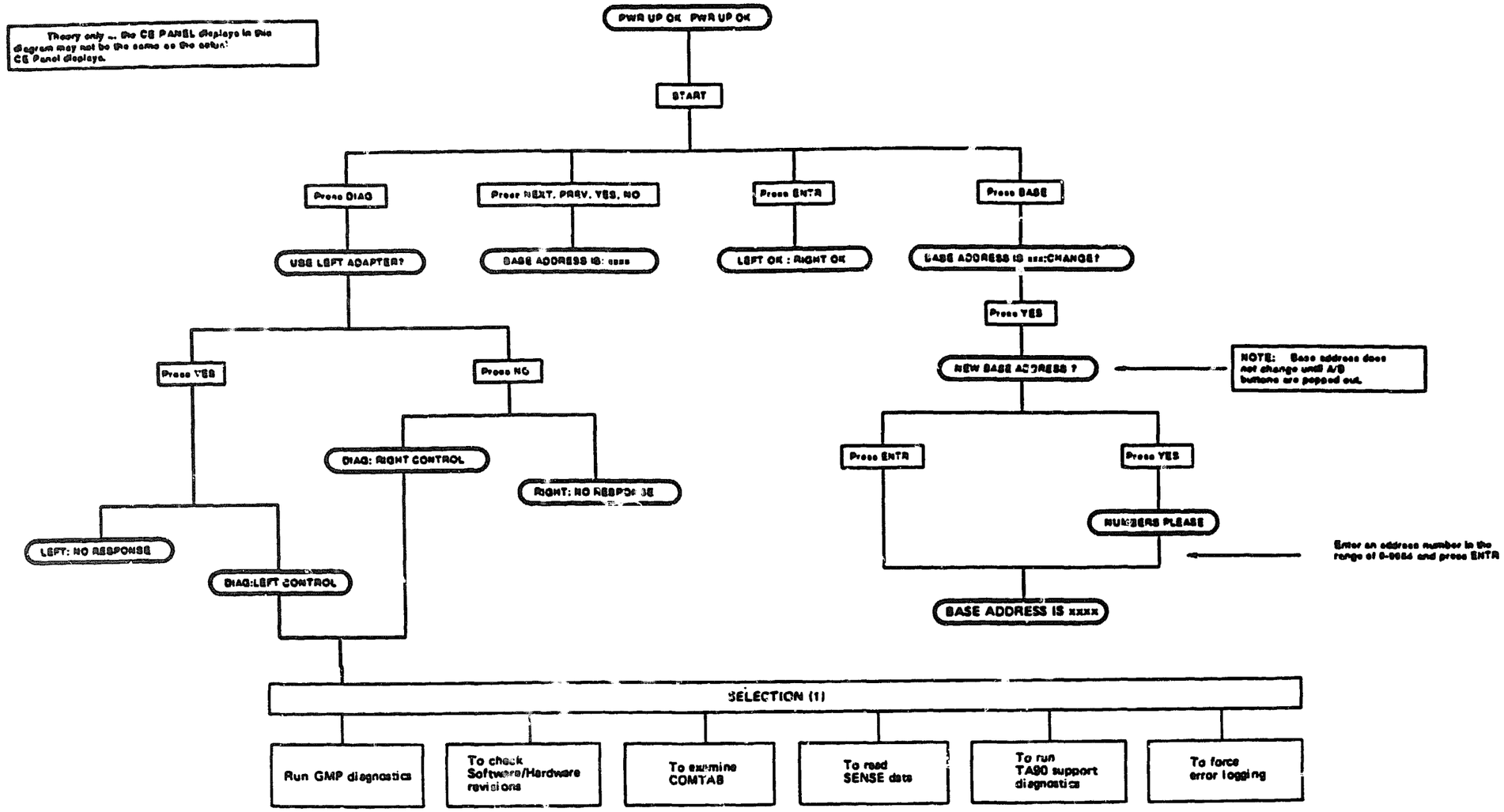
See the CE Panel functional flow diagram (CE/HSC 8).

Exiting Diagnostics

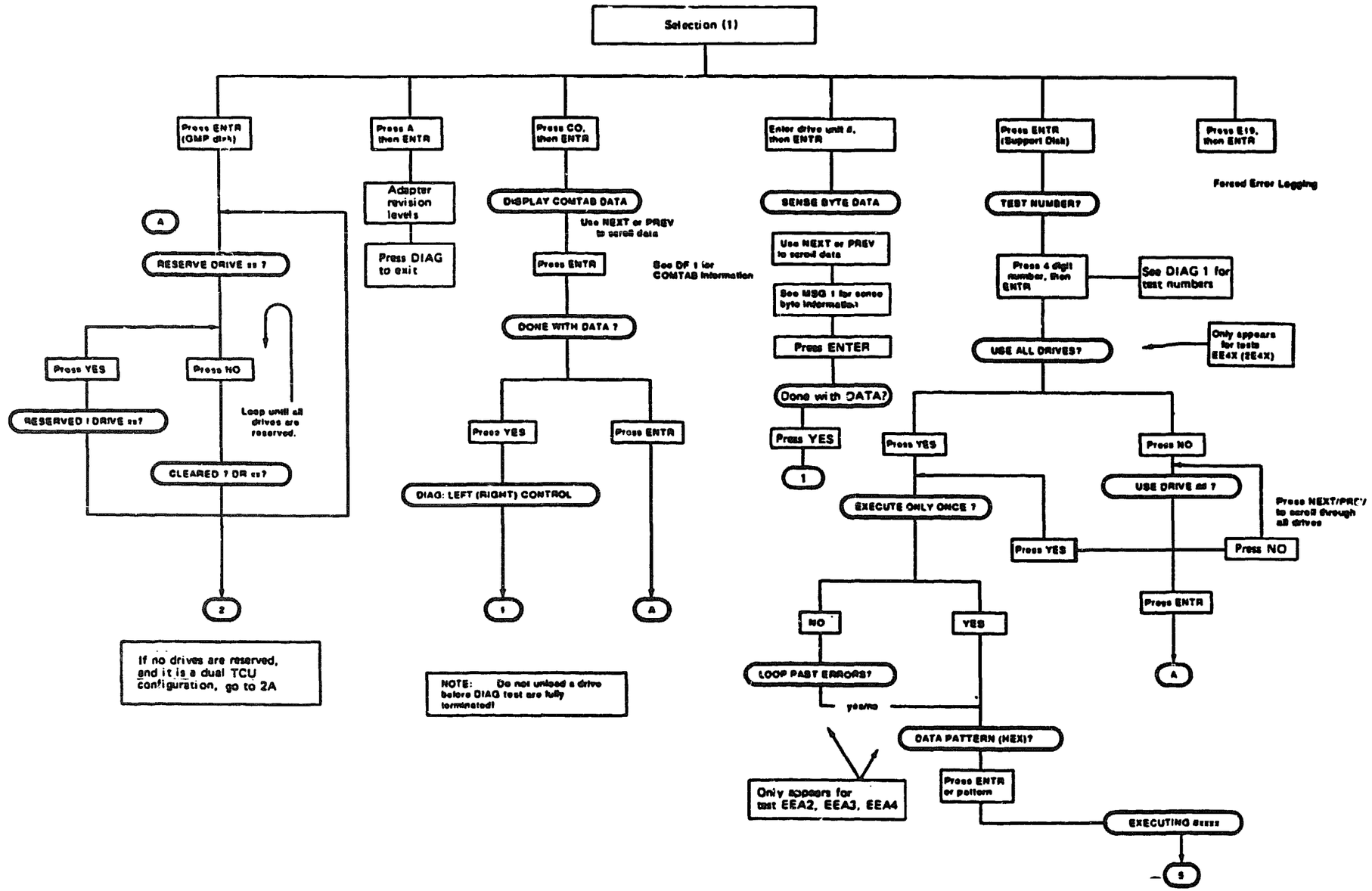
The diagnostic mode can be exited in three ways:

1. DIAG is pressed twice (once to enter, the second to exit.)
2. The one hour timeout has expired.
3. The adapters are reset.

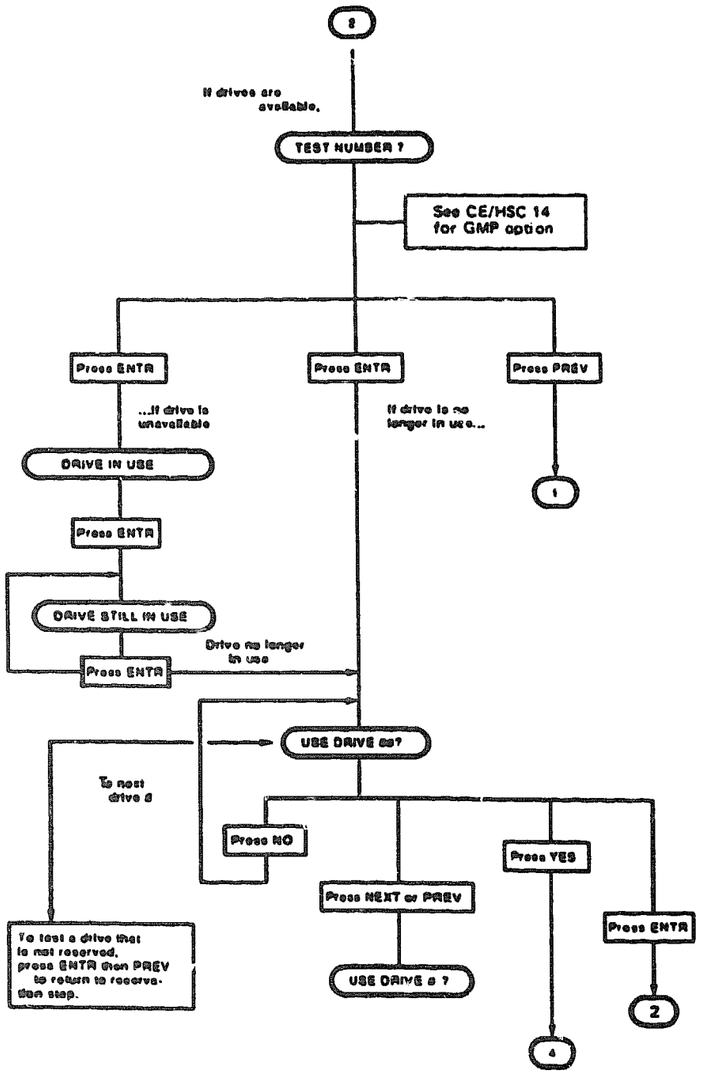
CE Panel Flow Diagrams CE/HSC 8

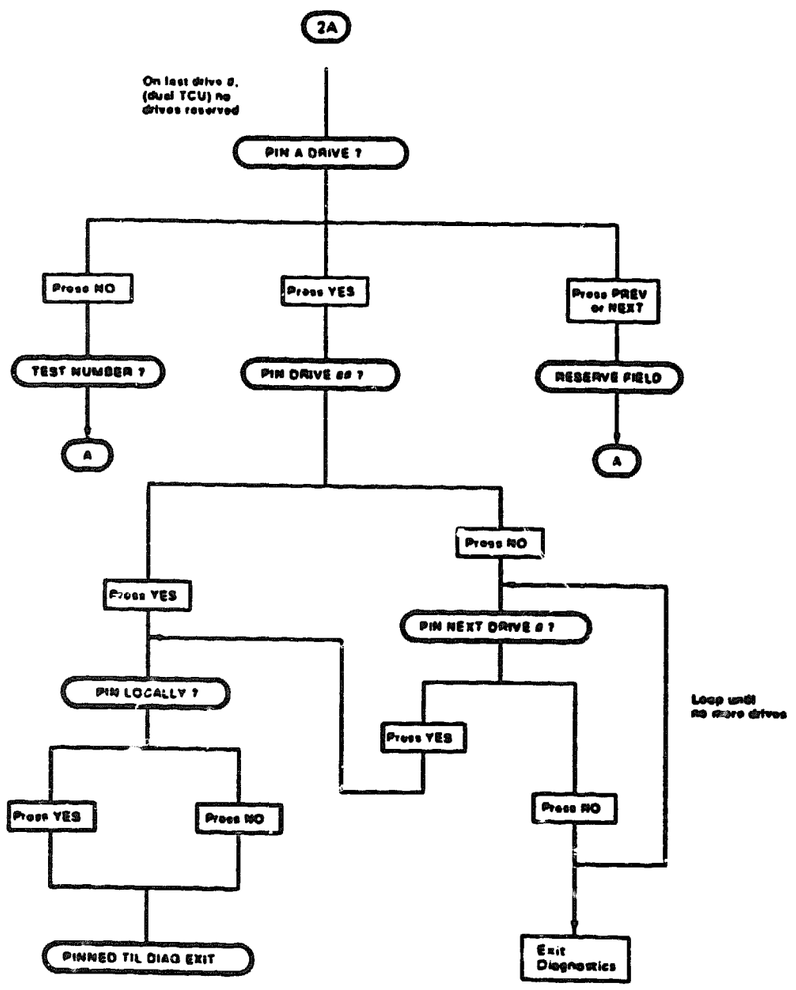


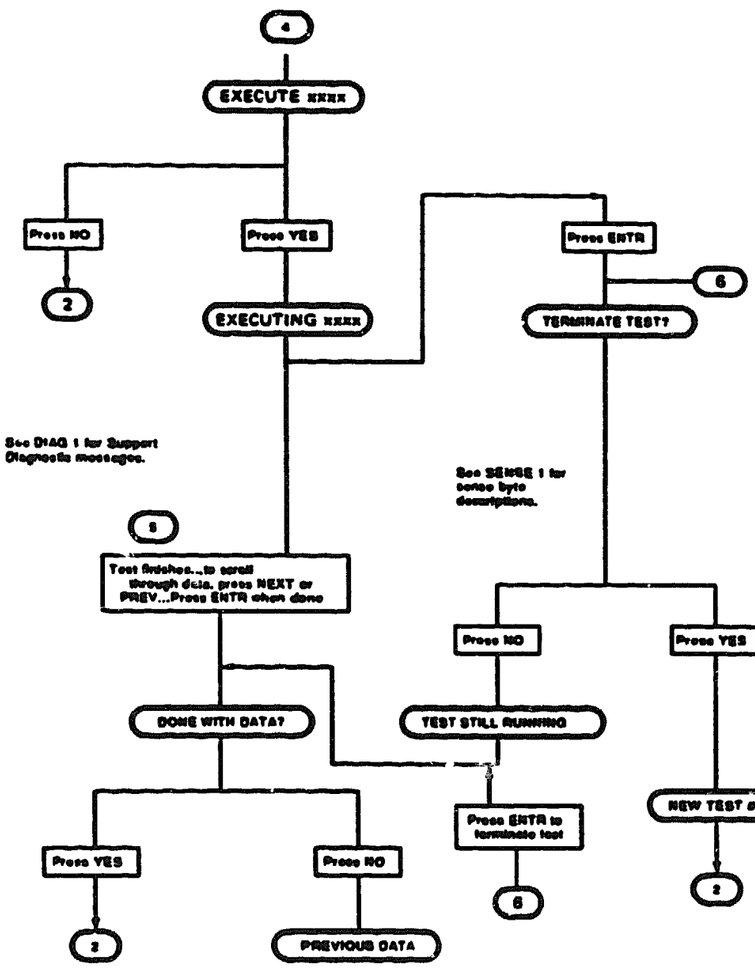
CE Panel Flow Diagrams (Continued) CE/HSC 10



CE Panel Flow Diagrams (Continued) CE/HSC 12







GMP Diagnostics

The Good Machine Path (GMP) diagnostics use a building block approach to testing the TA90 subsystem. GMP resides on the functional diskette, and can be used for problem determination and fix verification.

The GMP diagnostics provide the ability to:

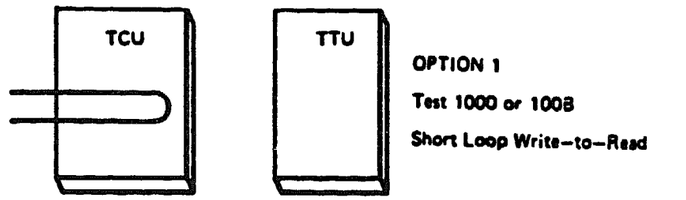
- Concurrently exercise the tape control unit for hardware failures
- Concurrently exercise the tape control unit and a single drive for hardware failures
- Concurrently exercise the tape control unit and a single drive with media for hardware failures
- Force the operation of a given device to a specified tape control unit (Pin and Unpin device).

GMP always runs for a specific drive.

GMP (Good Machine Path) Test Options

GMP Option	Basic Test Local	Buffer Override[1]	Test Remote	Test Description[2]
1	1000	1008	1018	Short Loop Write-to-Read
2	1001	1009	1019	Short Loop Write-to-Read and Long Loop Write-to-Read and ACL Device Interface functions
3	1002	100A	101A	Short Loop Write-to-Read and Long Loop Write-to-Read and ACL and Tape Motion Automatic Cartridge Loader and Tape Motion
4[3]	1003	100B	101B	ACL and Tape Motion

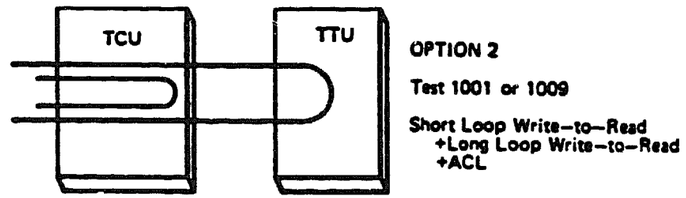
[1]Buffer override is recommend in each option.
[2]Options 1 and 2 are run with no tape loaded.
[3]Options 1 and 2 must be run before option 4.



OPTION 1

Test 1000 or 1008

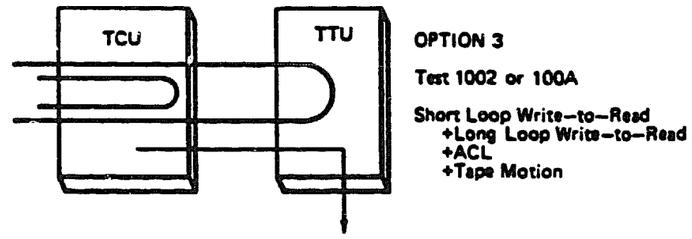
Short Loop Write–to–Read



OPTION 2

Test 1001 or 1009

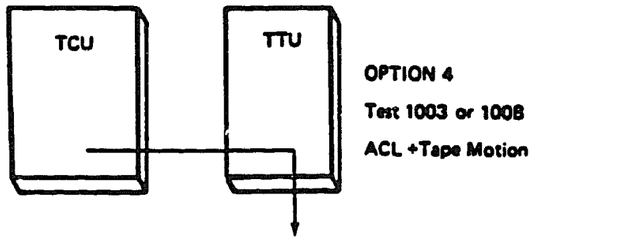
Short Loop Write–to–Read
+Long Loop Write–to–Read
+ACL



OPTION 3

Test 1002 or 100A

Short Loop Write–to–Read
+Long Loop Write–to–Read
+ACL
+Tape Motion



OPTION 4

Test 1003 or 1008

ACL +Tape Motion

Pinning a Drive

Pinning a Drive

There are some TA90 Subsystem functions that can be tested only by pinning a drive to a TCU. The data buffer and status store lines, along with the dual communicator cable is tested by pinning. Normally, drives 0-7 belong to TCU0 while the high bank of drives (8-15) belong to TCU1. When jobs are in process, the information may be processed through either TCU, regardless of which drive is being used.

"Pinning" a drive assigns a drive to a TCU and only that TCU may process data and communicate with the drive. Pinning, therefore ,may force a TCU error to surface if the TCU was running in a degraded mode. Without pinning, the other TCU would automatically take control and the problem with the degraded TCU would not be seen.

Pinning a Locally/Remotely

"Pin Locally" pins a drive to its local TCU. For example, pinning drive 0 locally would pin it to TCU0, while pinning drive 9 locally would pin it to TCU1.

"Pin Remotely" pins a drive to the remote TCU. For example, pinning drive 0 remotely would force TCU1 to process information to and from that drive. If ILEXER is run on drive 0, the HSC would send the command to TCU0, where the buffer and status store lines would be used to send commands and data between TCU1 and TCU0. TCU1 would actually be handling the job.

Use the CE Panel to pin drives. See the CE/HSC section.

Subsystem Level Diagnostics

Three subsystem level diagnostics, ILTAPE, ILTCOM, and ILEXER, verify proper TA90 operation.

- Inline Tape Test (ILTAPE)

  ILTAPE initiates tape formatter resident diagnostics or a functional test of the tape transport. In addition, the test permits selection of a full test of the K.Si interface.

- Inline Tape Compatibility Test (ILTCOM)

  ILTCOM tests the compatibility of tapes which may have been written on different systems and different drives, with STI-FIPS compatible (TA90) drives connected to an HSC via the STI bus. ILTCOM may generate, modify, read, or list a compatibility tape.

  ILTCOM is not diagnostic in nature, therefore, all of the necessary subsystem hardware is assumed to be working. Errors are detected and reported but fault isolation is not a goal of ILTCOM.

- Inline Multidrive Exerciser (ILEXER)

  The Inline Multidrive Exerciser exercises the various disk and tape drives attached to the HSC subsystem. The exerciser is initiated upon demand. Drives to be tested are selected by the operator. The exerciser will issue random READ, WRITE and COMPARE commands to exercise the drives. The reports given by ILEXER do not provide any analysis of the errors reported nor explicitly call out a specific FRU. This is strictly an exerciser.

Operating Instructions

The following steps outline the procedure for running ILTAPE, ILTCOM, and ILEXER. The tests assume an HSC70 is configured with a terminal and STI interface. If the HSC70 is not booted, start with Step 1. If the HSC70 is already booted, proceed to Step 2 (See diagram).

How to Run ILEXER

When the ILEXER program is successfully loaded, the following message is displayed:

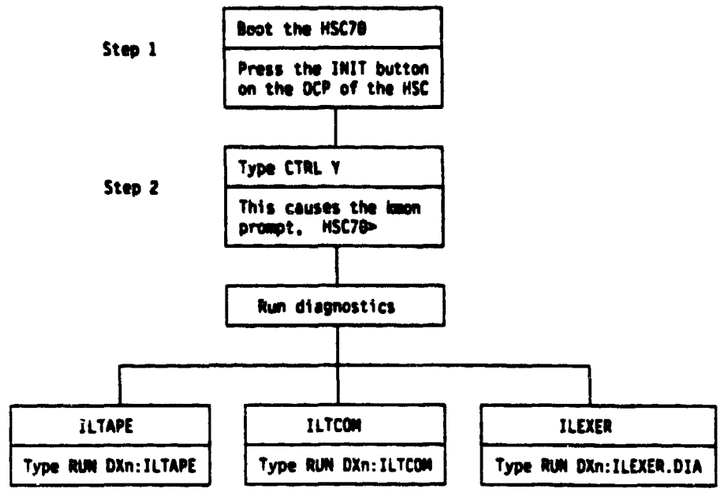
```
ILEXER>D>hh:mm  Execution Starting
```

where 'hh:mm' is the current time.

ILEXER then prompts for parameters. After all prompts are answered, the execution of the diagnostic proceeds. Error reports and performance summaries are returned from ILEXER.

When ILEXER has run for the specified time interval, reported any errors found, and generated a final performance summary, the exerciser concludes with the following message:

```
ILEXER>D>hh:mm  Execution Complete
```

ILEXER output translation

ILEXER	ACTUAL (TA90)	VALUE
Data checks	Write data checks	Contents of sense byte 10 ÷ 8
Other A	Read blocks corrected	Contents of sense byte 11 ÷ 8
Other B	Write blocks corrected	Contents of sense byte 12 ÷ 8
Other C	Read recoveries	Contents of sense byte 30 ÷ 8

ILEXER Test Parameter Entry

The parameters in ILEXER follow the format:

```
PROMPT DESCRIPTION (DATATYPE) [DEFAULT]?
```

- The PROMPT DESCRIPTION explains the type of information ILEXER needs from the operator.
- The DATATYPE is the form ILEXER expects and can be one of the following:

```
Y/N - Yes/No response
D - Decimal number
U - Unit number (see from below)
H - Hexadecimal number
```

- The DEFAULT is the value used if a carriage return is entered for that particular value. If a default value is not allowed, it appears as [ ].

The next prompt is:

```
DRIVE UNIT NUMBER (U) [ ]?
```

Enter the unit number of the drive to be tested. This prompt has no default. Unit numbers are in the form Tnnnn, where nnnn is a decimal number between 0 and 4095, corresponding to the number on the drive's display. Terminate the unit number with a carriage return. ILEXER attempts to acquire the specified unit via the HSC Diagnostic Interface. If the unit is acquired successfully, ILEXER continues with the next prompt. If the unit acquire fails, one of the following conditions was encountered:

1. The specified drive is unavailable. This indicates the drive is connected to the HSC but is currently online to a Host CPU of the HSC utility. ONLINE drives cannot be diagnosed. ILEXER repeats the prompt for the unit number.

2. The specified drive is unknown to the HSC Tape functional software. Drives are unknown for one of the following reasons:

   - The drive and/or K.SI port is broken and cannot communicate with the disk functional software.
   - The drive was previously communicating with the HSC when a serious error occurred and the HSC ceased communicating with the drive.

   In either case, ILEXER asks the operator if another drive will be selected. If so, it asks for the unit number. If not, ILEXER begins to exercise the drives selected. ILEXER terminates if no drives are selected.

After a drive is selected and ILEXER has both acquired the drive and brought it online, the following prompts appear. A CTRL Z at any time during parameter input selects the default values for the remaining parameters. If a nondefaultable parameter is encountered, the following message appears and the test prompts for new parameters:

```
ILEXER>D>hh:mm Nondefaultable Parameter
```

Select up to 12 drives to be exercised.

```
IS A SCRATCH TAPE MOUNTED (Y/N) [N]?
```

An N response results in a reprompt for the drive unit number. A Y response displays the next prompt.

```
ARE YOU SURE (Y/N) [N]?
```

If the answer is N the operator is reprompted for the drive unit number. If answered with a Y, the following prompts are displayed.

```
DATA PATTERN NUMBER (16-22) (D) [21]?
```

Seven data patterns are available for tape. These data patterns are defined in the HSC70 Service Manual.

```
RECORD LENGTH IN BYTES (1 to 12288) (D) [8192]?
```

Response to this prompt specifies the size in bytes of a tape record. Maximum size is 12K bytes. The default value is 8192, the standard record length size for 32 bit systems. Constraints on the HSC diagnostic interface prohibit selection of the maximum allowable record length of 64K bytes.

```
DATA COMPARE (Y/N) [N]?
```

A Y response selects data compares to be performed on every tape read operation. An N response causes data compares to be performed on 15 percent of the tape reads.

```
ANOTHER DRIVE (Y/N) [ ]?
```

Answering Y, the prompts beginning with the prompt for DRIVE UNIT NUMBER, are repeated. If answered NO, the following global prompts are presented. This prompt has no default, allowing the operator to default all other prompts and be able to select parameters for another drive for this pass of ILEXER.

ILEXER Global User Prompts

The following prompts are presented to the operator when no more drives or drive-specific parameters are to be entered into the testing sequence. These prompts are global in the sense they pertain to all the drives.

```
RUN TIME IN MINUTES (1 to 32767) [10]?
```

The minimum time is 1 minute, and the default is 10. After the exerciser has executed for that period of time, all testing terminates and a final performance summary is displayed.

```
HARD ERROR LIMIT (D) [20]?
```

You are allowed to specify the number of hard errors allowable for the drives being exercised. When a drive reaches this limit, it is removed from any further exercising on this pass of ILEXER. Hard errors include the following types of errors:

- Tape drive BOT encountered unexpectedly
- Invalid MSCP response received from functional code
- UNKNOWN MSCP status code returned from functional code
- Write on write-protected drive
- Tape formatter returned error
- Read compare error
- Read data EDC error
- Unrecoverable read or write error
- Drive reported error
- Tape mark error (ILEXER does not write tape marks)
- Tape drive truncated data read error
- Tape drive position lost
- Tape drive short transfer occurred on read operation
- Retry limit exceeded for a tape read, write, or read reverse operation
- Drive went OFFLINE or AVAILABLE unexpectedly.

```
NARROW REPORT (Y/N) [N]?
```

Answering Y presents a narrow report which displays the performance summaries in 32 columns. The default display, selected by answering N, or carriage return, is 80 columns.

```
ENABLE SOFT ERROR REPORTS (Y/N) [N]?
```

This prompt enables soft error reports by answering Y. By default, the operator does not see any soft error reports specific to the number of retries required on a tape I/O operation. A N response results in no soft error report. Soft errors are classified as those errors that eventually complete successfully after retry operations. They include read, write, and read-reverse requested retries.

How to Run ILTAPE

The following steps outline the procedure for running ILTAPE.

```
Type R DXn:ILTAPE
```

This invokes the inline tape diagnostic program, ILTAPE. The DX is the RX33 device name. The n refers to the unit number of the specific RX33 drive. For example, DX1: refers to RX33 drive number one. The following message should appear at the terminal:

```
ILTAPE>D>hh:mm  Execution Starting
```

ILTAPE/User Dialogue

The following paragraphs describe ILTAPE/user dialogue during execution of ILTAPE. Examples in this section refer to using ILTAPE to invoke GMP or support diagnostics. Refer to the HSC Service Manual (EK-HSC70-SV) to use ILTAPE for other testing.

```
DRIVE UNIT NUMBER (U) [ ]?
```

Enter Tnnn, where nnn is the MSCP unit number (such as T316).

```
EXECUTE FORMATTER DEVICE INTEGRITY TEST?
```

Enter Y (for yes) to execute formatter diagnostics. This is the default.

```
MEMORY REGION NUMBER (H) [0]?
```

This prompt appears only if the response to the previous prompt was Y. For TA90, the memory region number is the diagnostic test number for either GMP or support diagnostics. For example, a GMP response to this question would be 1008. See CE/HSC for a complete description of GMP tests. For support, numbers should be of the form 2EXX. See DIAG and MD/SDISK for a description of support diagnostics. EEXX are translated to 2EXX for ILTAPE.

```
DO YOU WANT TO ENTER PARAMETERS? (Y/N) [N]
```

For TA90, you must answer Y (yes) to this question. At least one parameter, the unit number, must be given. The three parameters are as follows:

```
BYTE 00:  Tnn          where nn is the drive unit number
BYTE 01:  ll           where ll is the looping option
                             0 - no loop
                             1 - loop till error
                             2 - loop indefinitely
BYTE 02:  dd           for test numbers that support tests
                       on all drives, non-zero indicates
                       "all drives".  For tests that take
                       a data pattern, this byte is the
                       data pattern.
```

LOC

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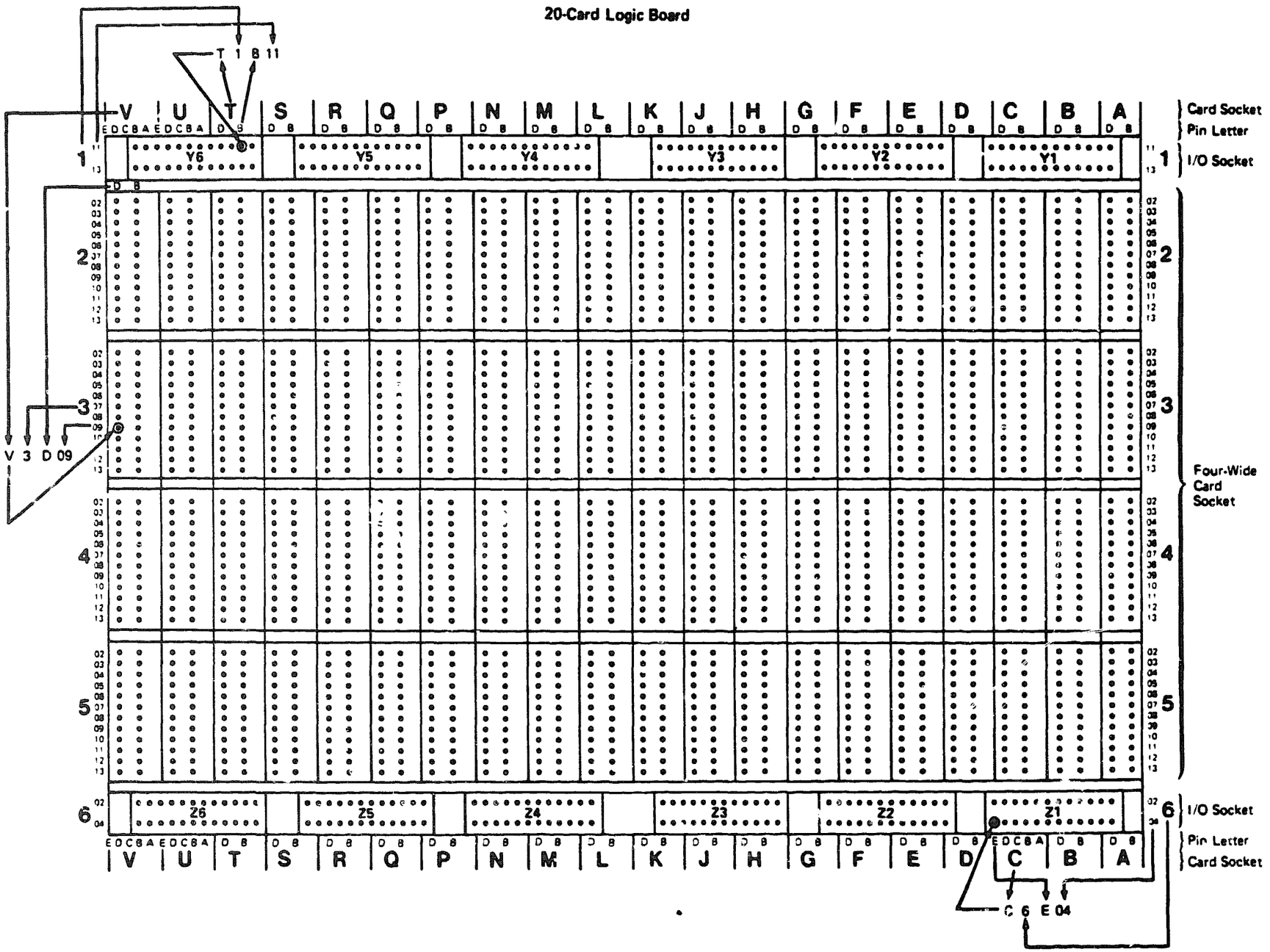
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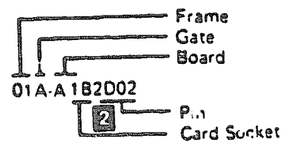
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Cartridge Latch Solenoid 100
Cartridge Present Sensor 100
Cleaner Block Assembly 100
Decoupler Assembly 100
Head and Guide Assembly 100
Latch Sensor 100
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Plenum Assembly and Pressure Sensor 100
Tape Lifter Solenoid 100
Tension Transducer 100
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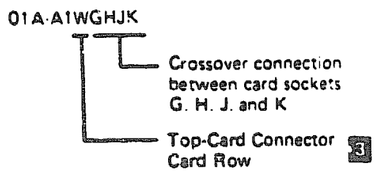
20-Card Logic Board



Card Identification

Location Identification Example:



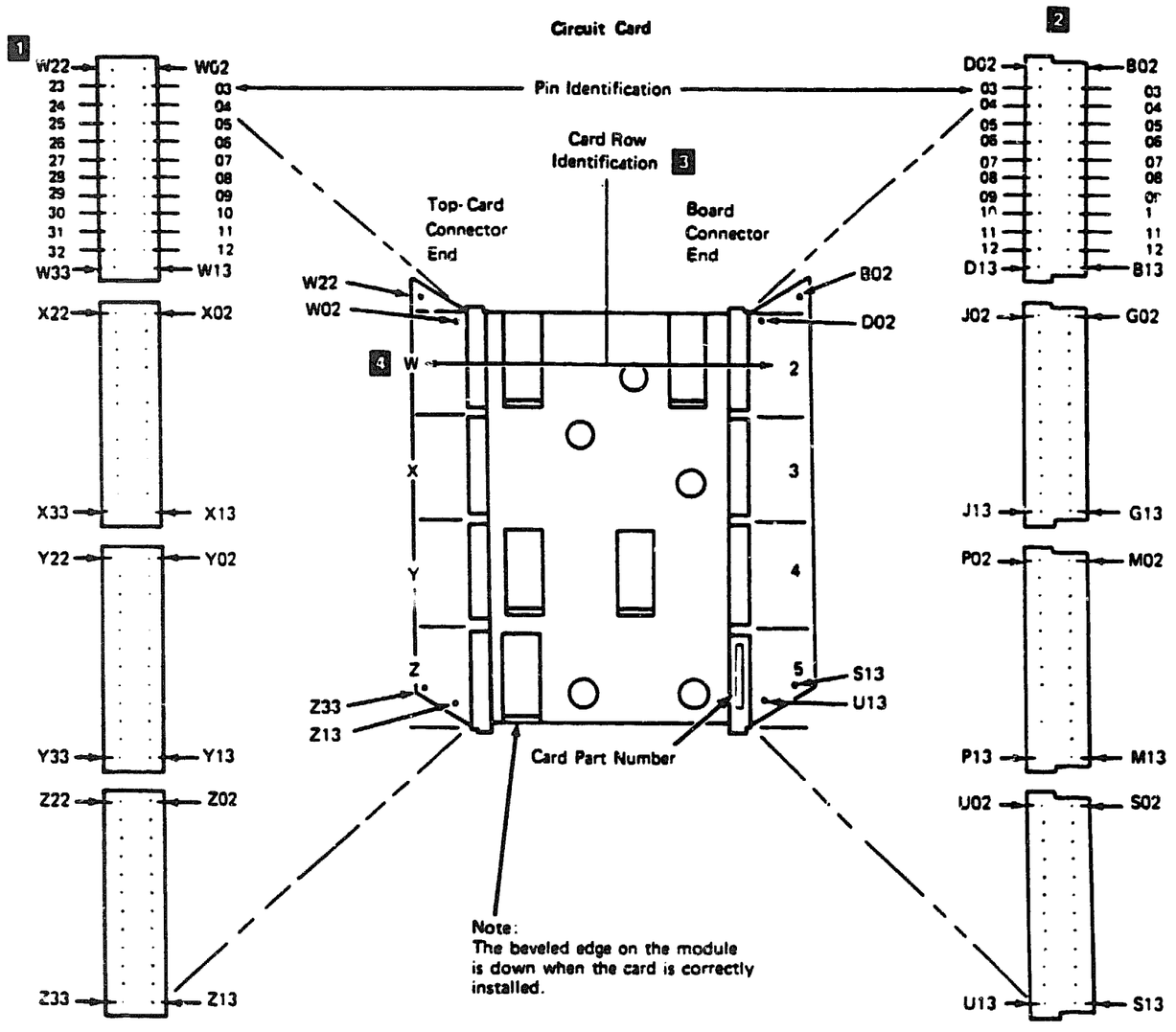






Ground Pins

W24	W06
W29	W11
X24	X06
X29	X11
Y24	Y06
Y29	Y11
Z24	Z06
Z29	Z11

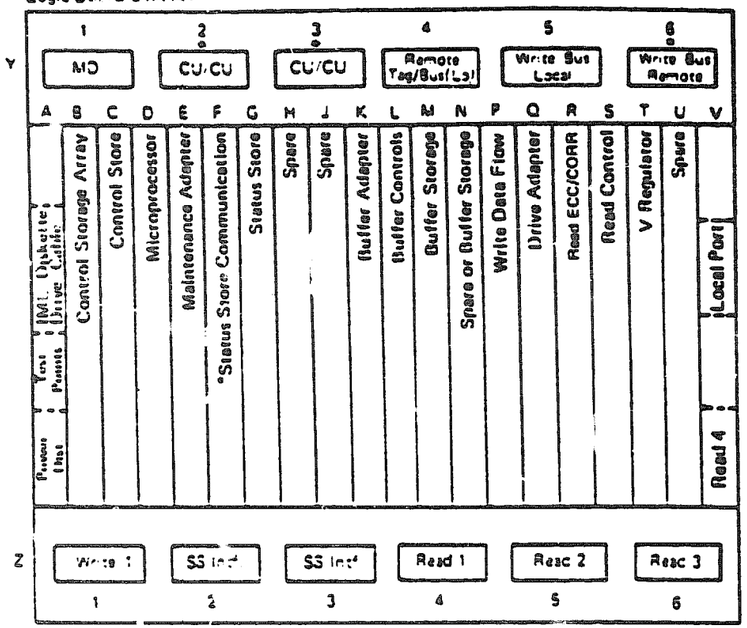


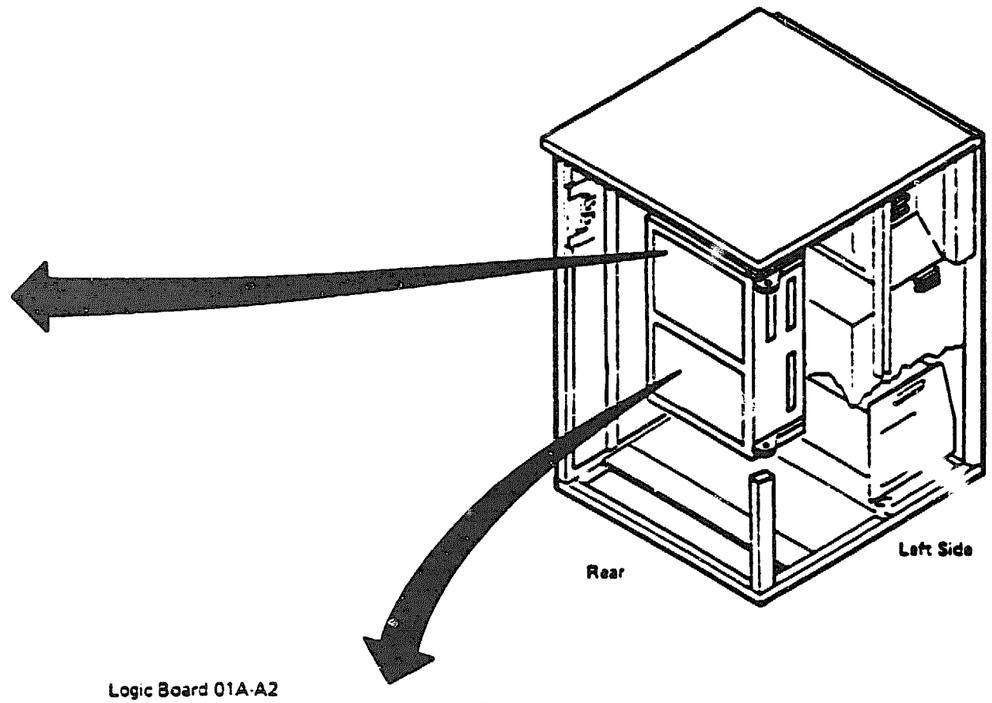
Tape Control Unit Locations (Continued)

Logic Boards (Card Side)

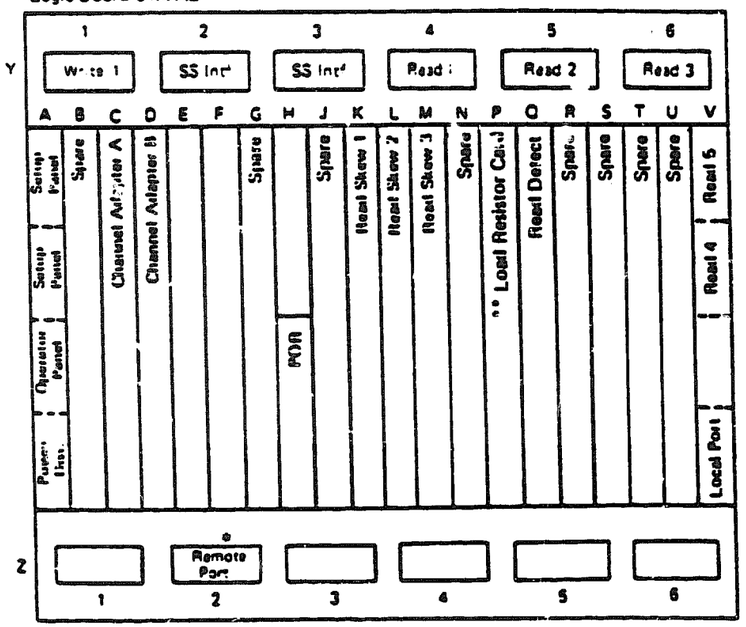
Top-Card Connectors and Cables (see LOC 20)

Logic Board 01A-A1





Logic Board 01A-A2



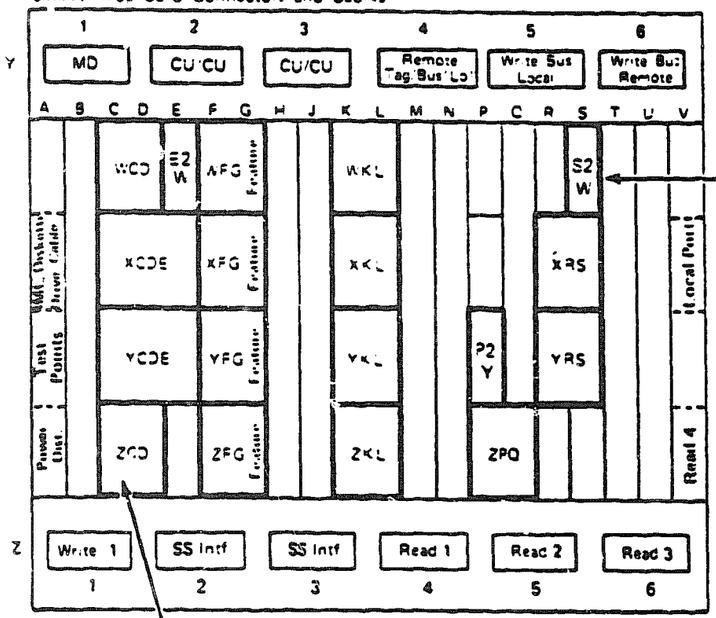
Top-Card Connectors and Cables

Notes:

1 The documentation may refer to the same connector in more than one way. For example, 01A-A1S2W may also be referred to as CU-A1S2W

2 Labeling is different for top-card connectors that mount on a single card, such as 01A-A1S2W, and top-card connectors that mount on multiple cards, such as 01A-A1ZCD. The single-card connectors are labeled with the card given first (S2), then the position of the connector on that card (W). The multiple-card connectors are labeled with the position of the connector given first (Z), then the cards (CD).

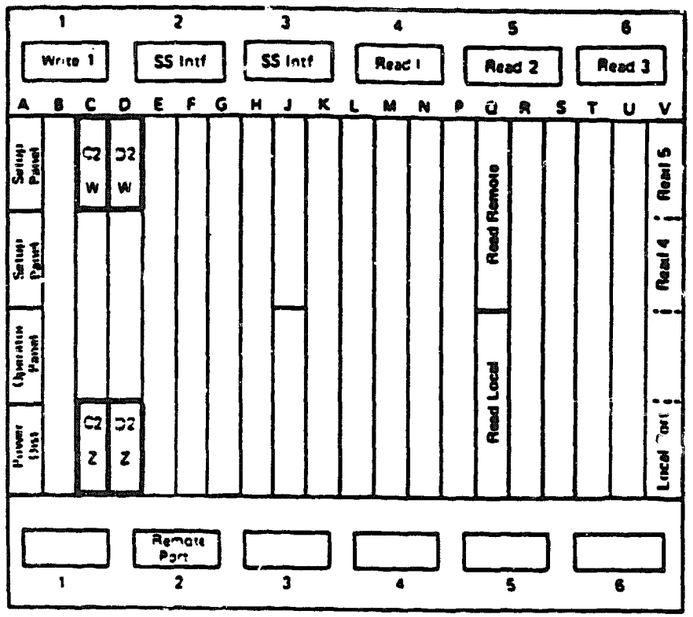
01A-A1 Top Card Connectors and Cables



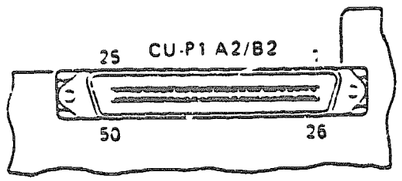
Top-Card Connector Cable 01A-A1S2W (CU-A1S2W)

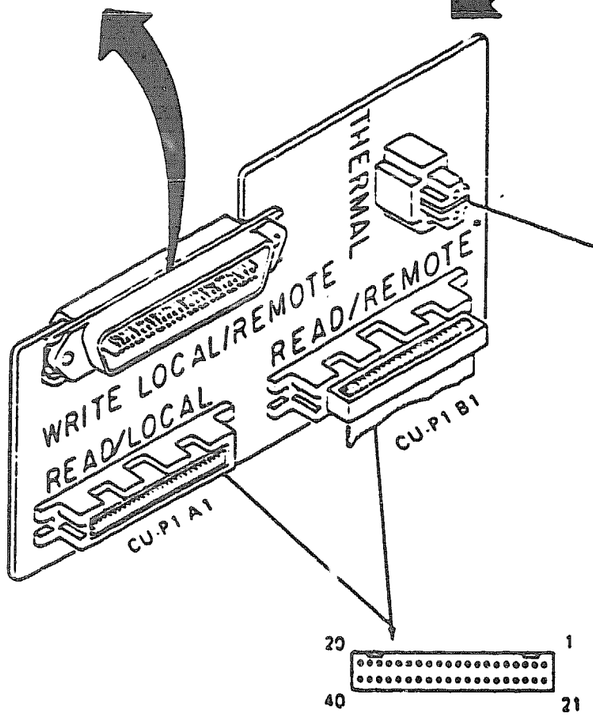
01A-A1ZCD Connector (CU-A1ZCD)

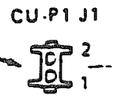
01A-A2 Top Card Connectors and Cables

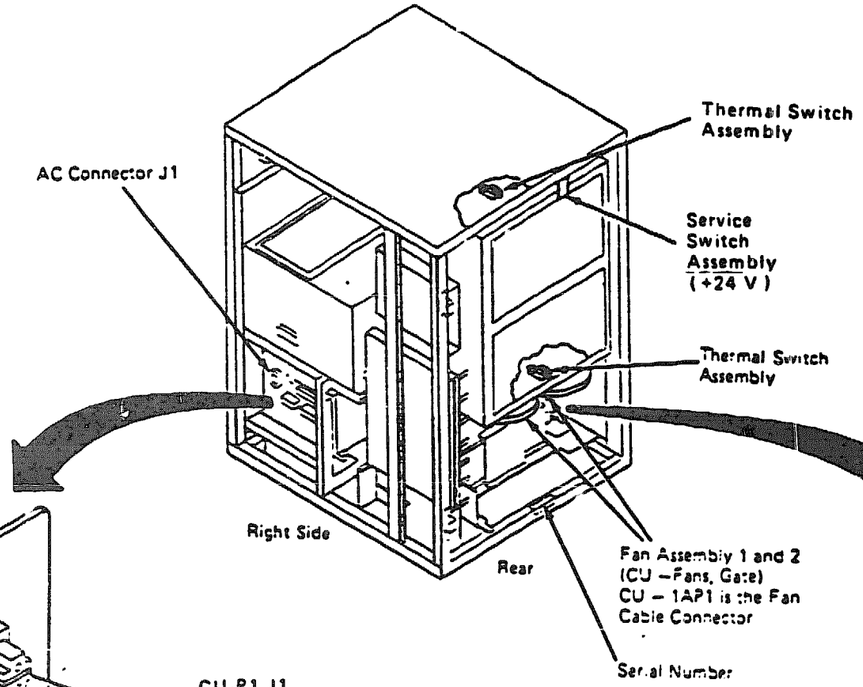


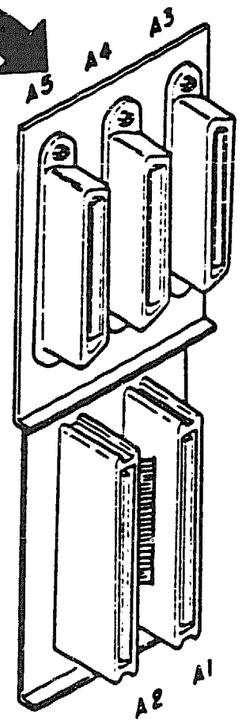
Tape Control Unit Locations (Continued)



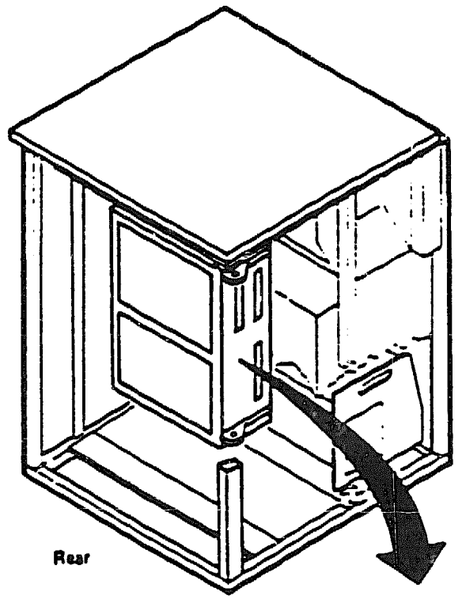




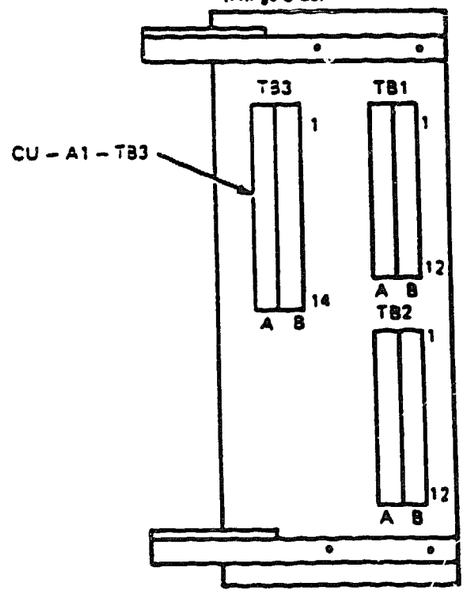




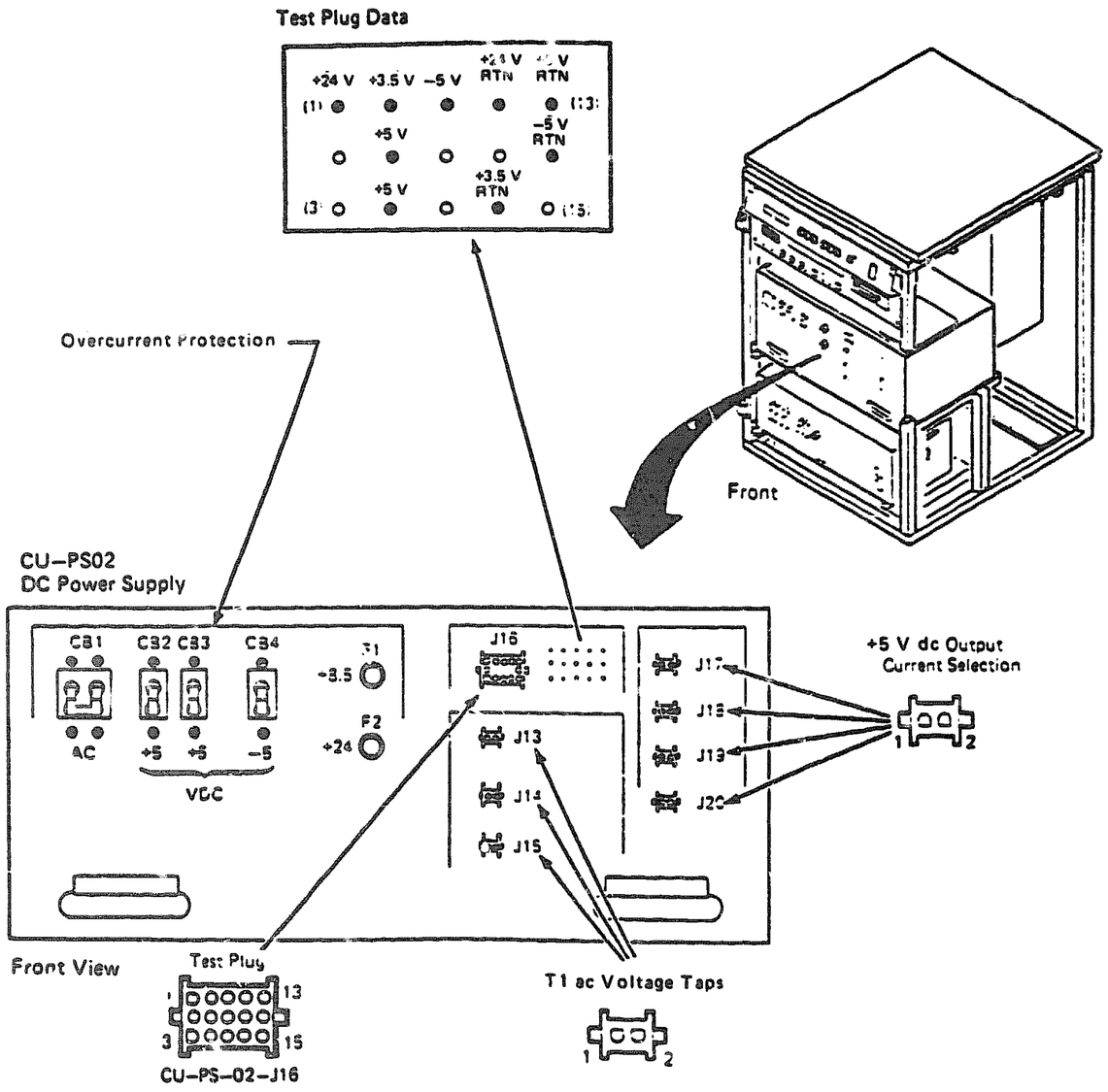
CU-P2
Cable Connectors
(Dual Tape Control Unit Communication Feature)

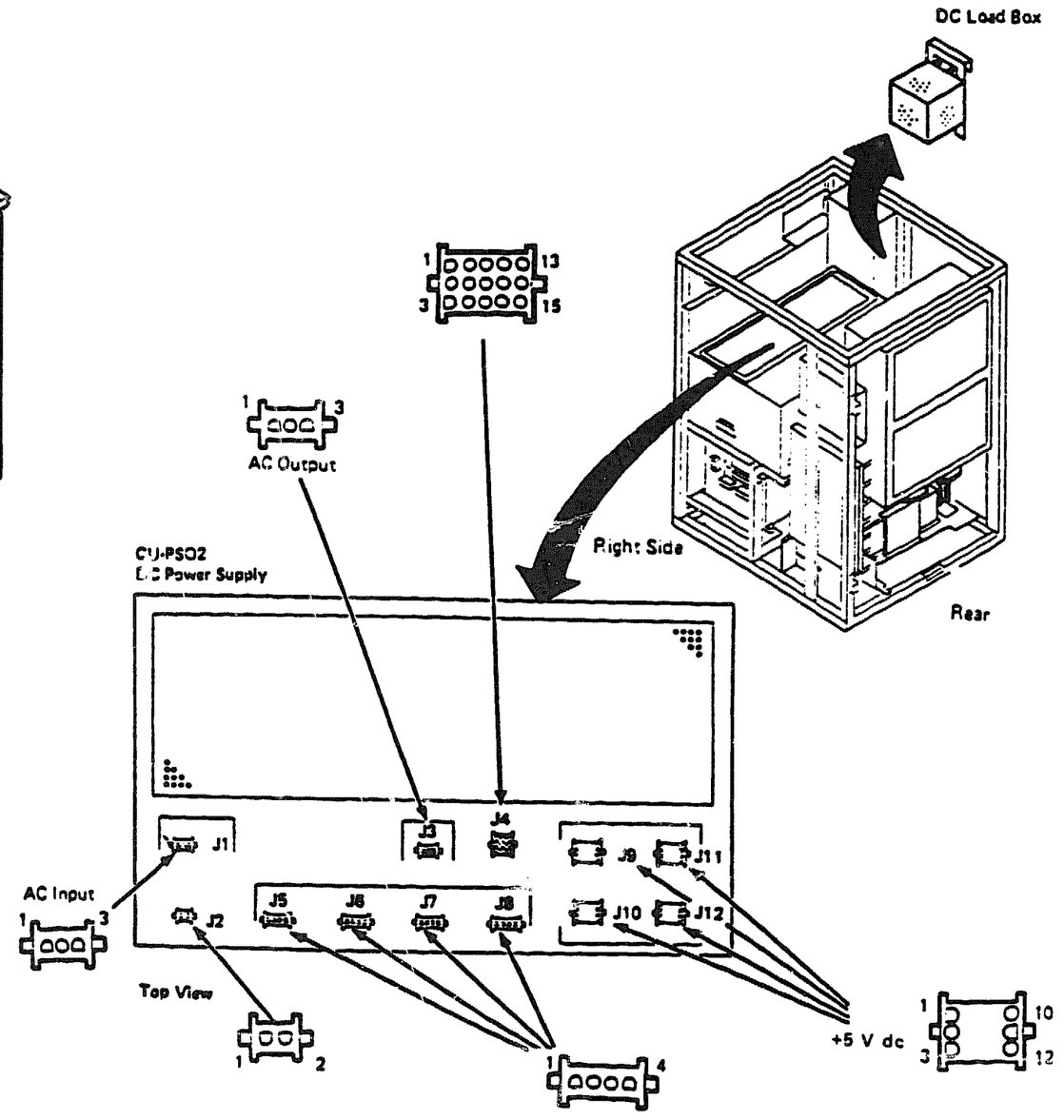


CU-A
Logic Gate
(Hinge Side)



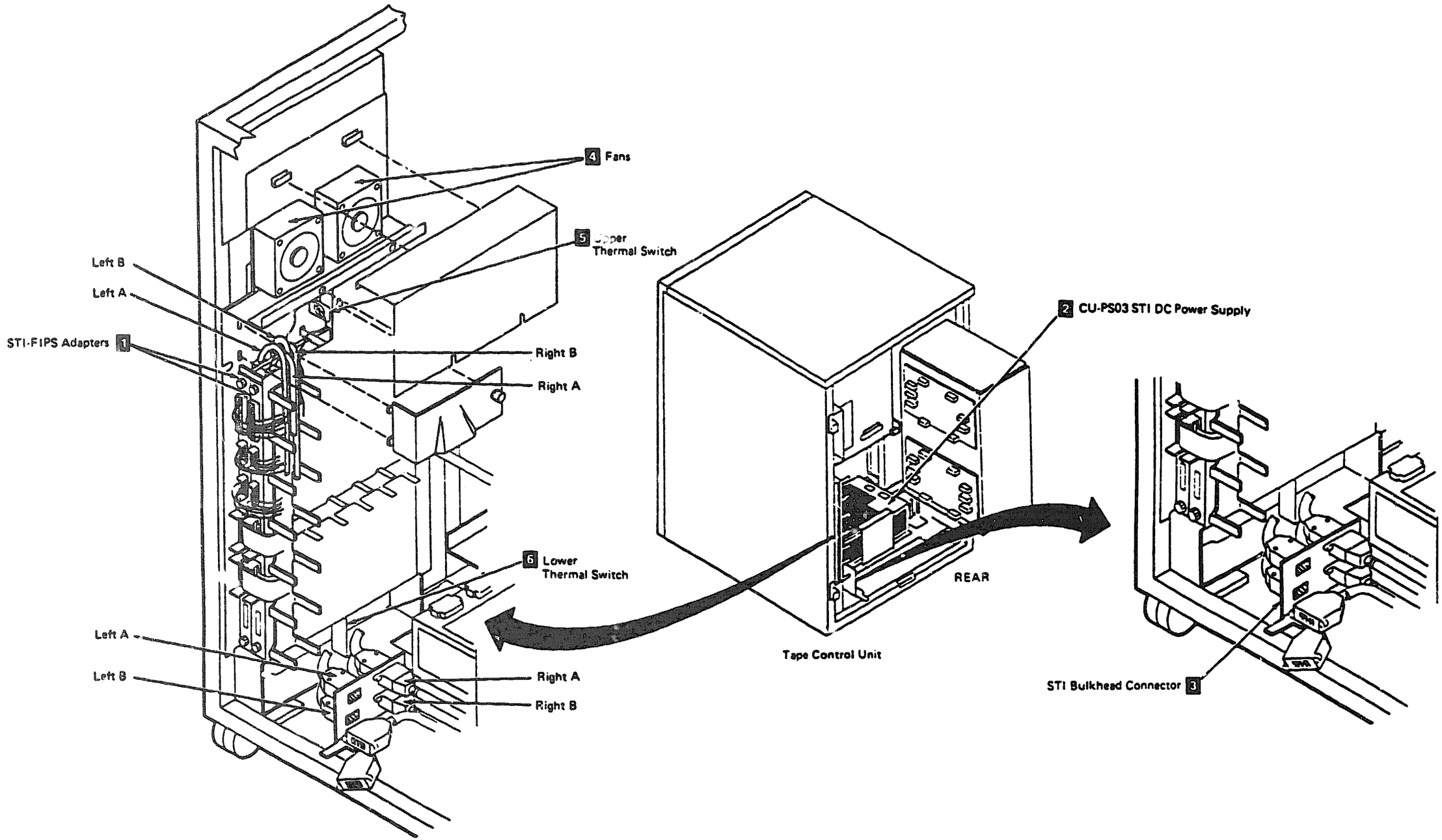
CU-PS02 Tape Control Unit dc Power Supply



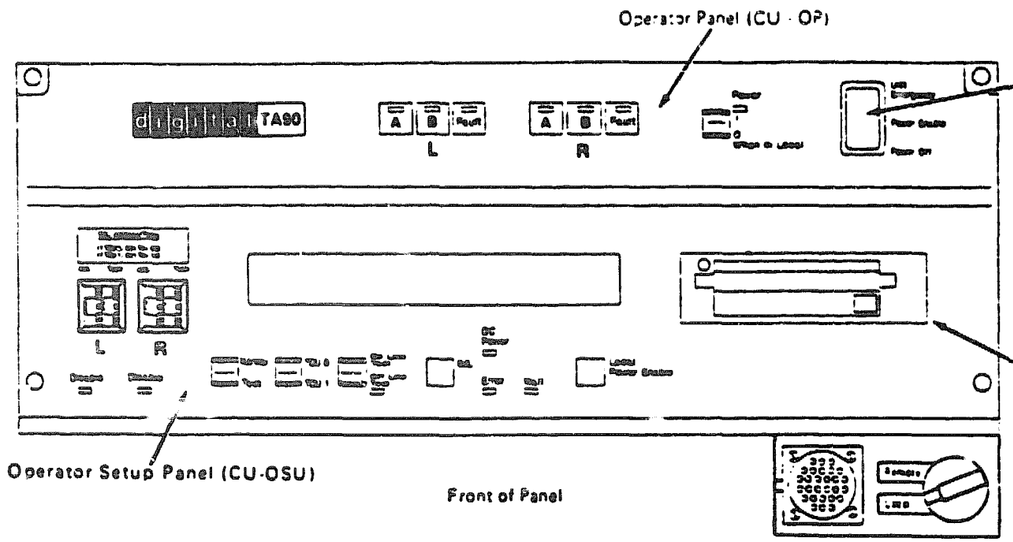


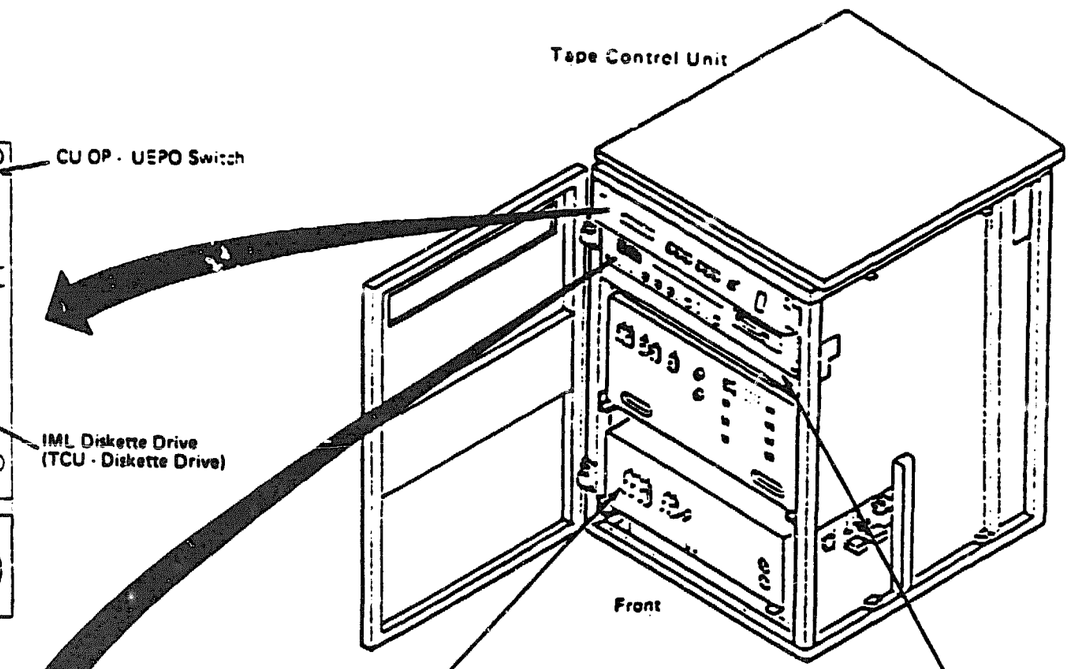
Tape Control Unit Locations (Continued) **LOC 45**

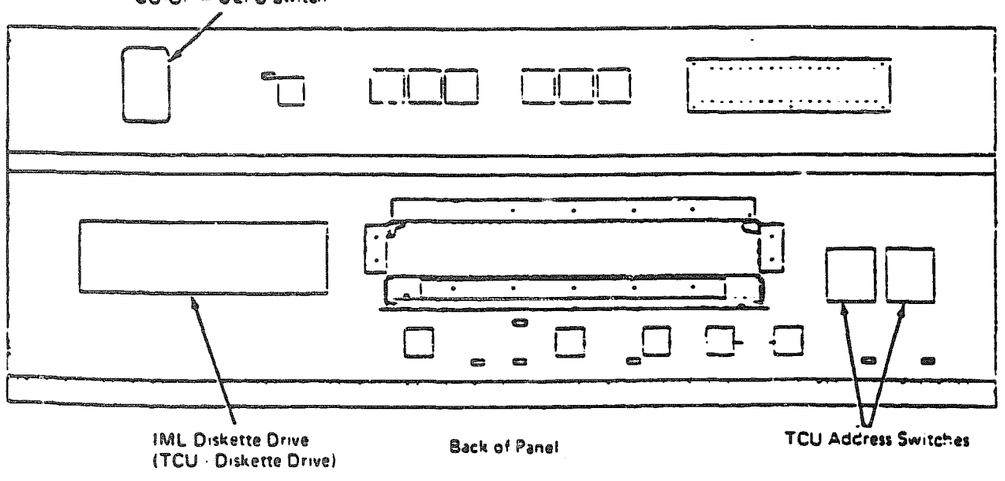
STI-FIPS Adapter Chassis



Tape Control Unit Locations (Continued) **LOC 50**

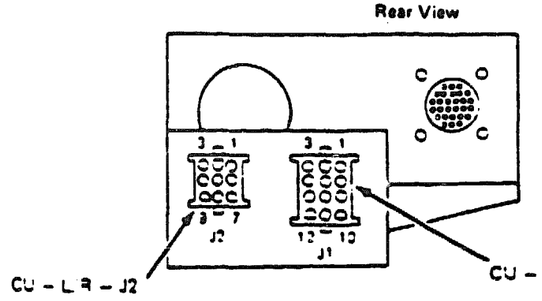


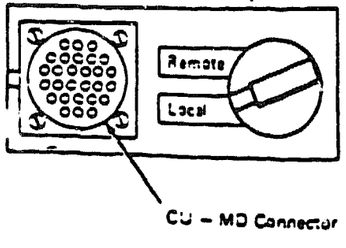




AC Power Supply, 60 Hz and 50 Hz Japan (see LOC 55)

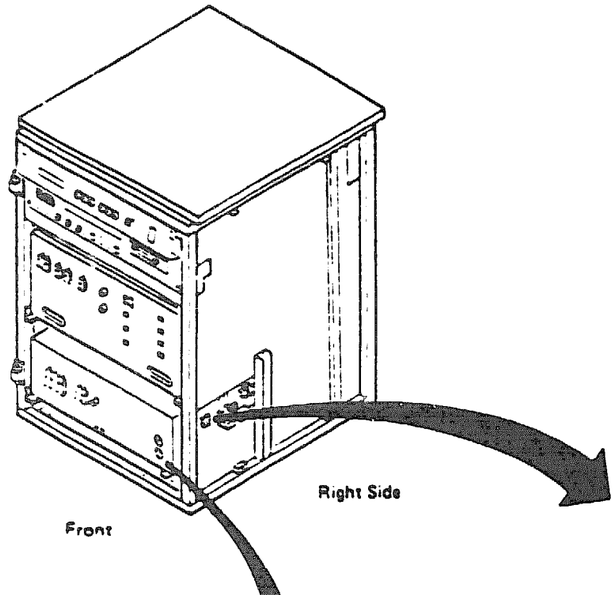
AC Power Supply, 50 Hz, except Japan (see LOC 60)





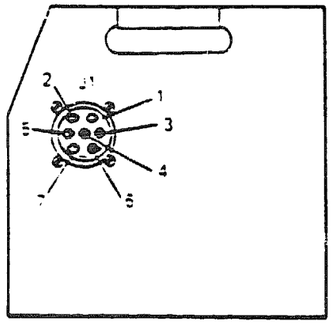
TA90 MG EC C13764

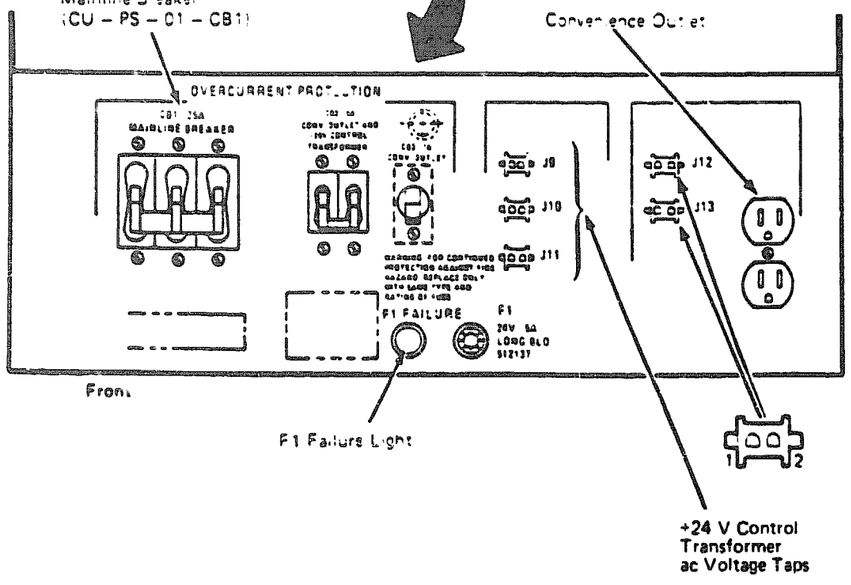
CU-PS01 Tape Control Unit ac Power Supply, 60 Hz and 50 Hz Japan

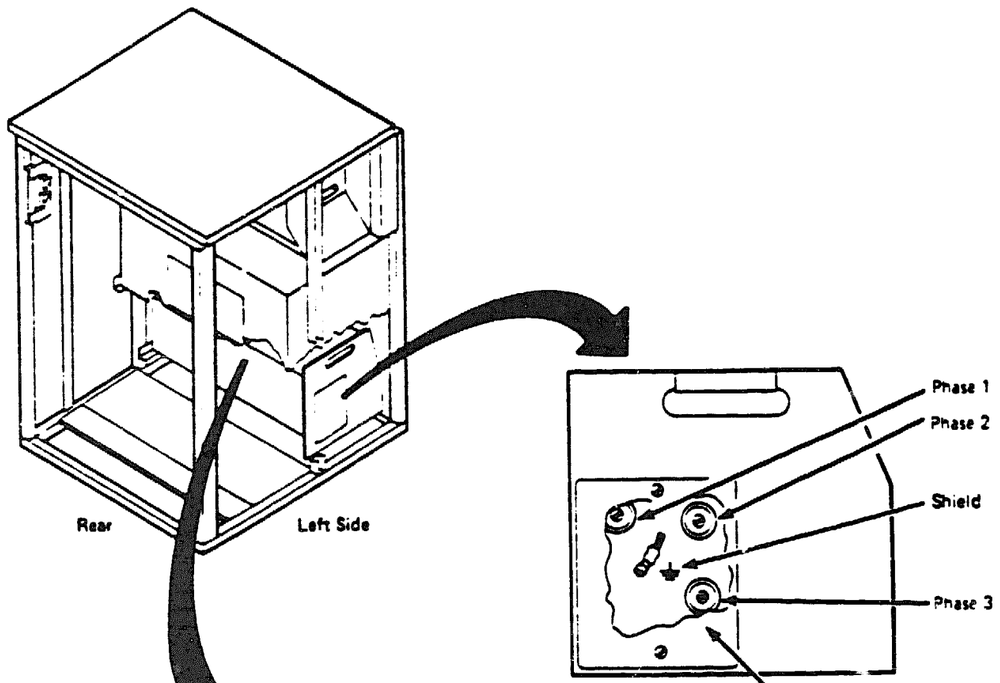


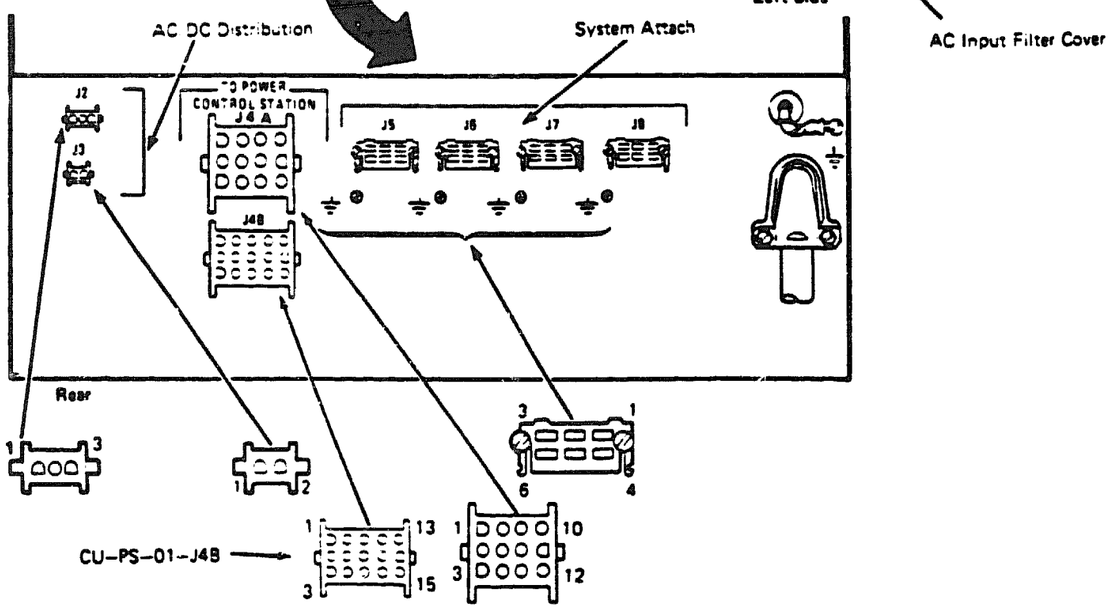
The resistance between the machine frame and the ground pin (pin 4) on the ac output socket of the tape control unit should be 0.1 ohm (see diagram A below).

Diagram A
AC Output Socket (TCU)

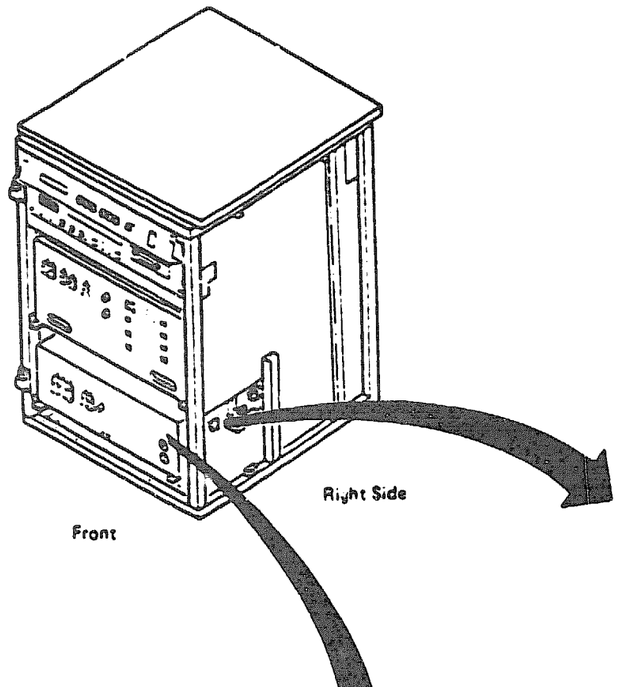






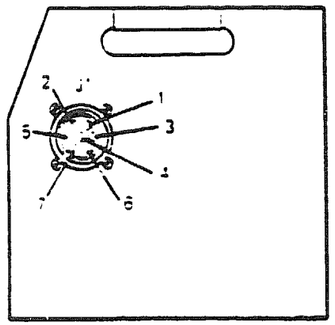


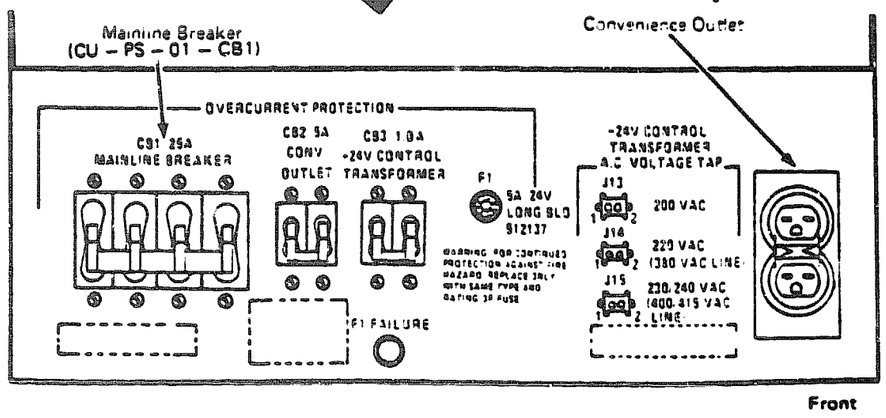
CU-PS01 Tape Control Unit ac Power Supply, 50 Hz, except Japan

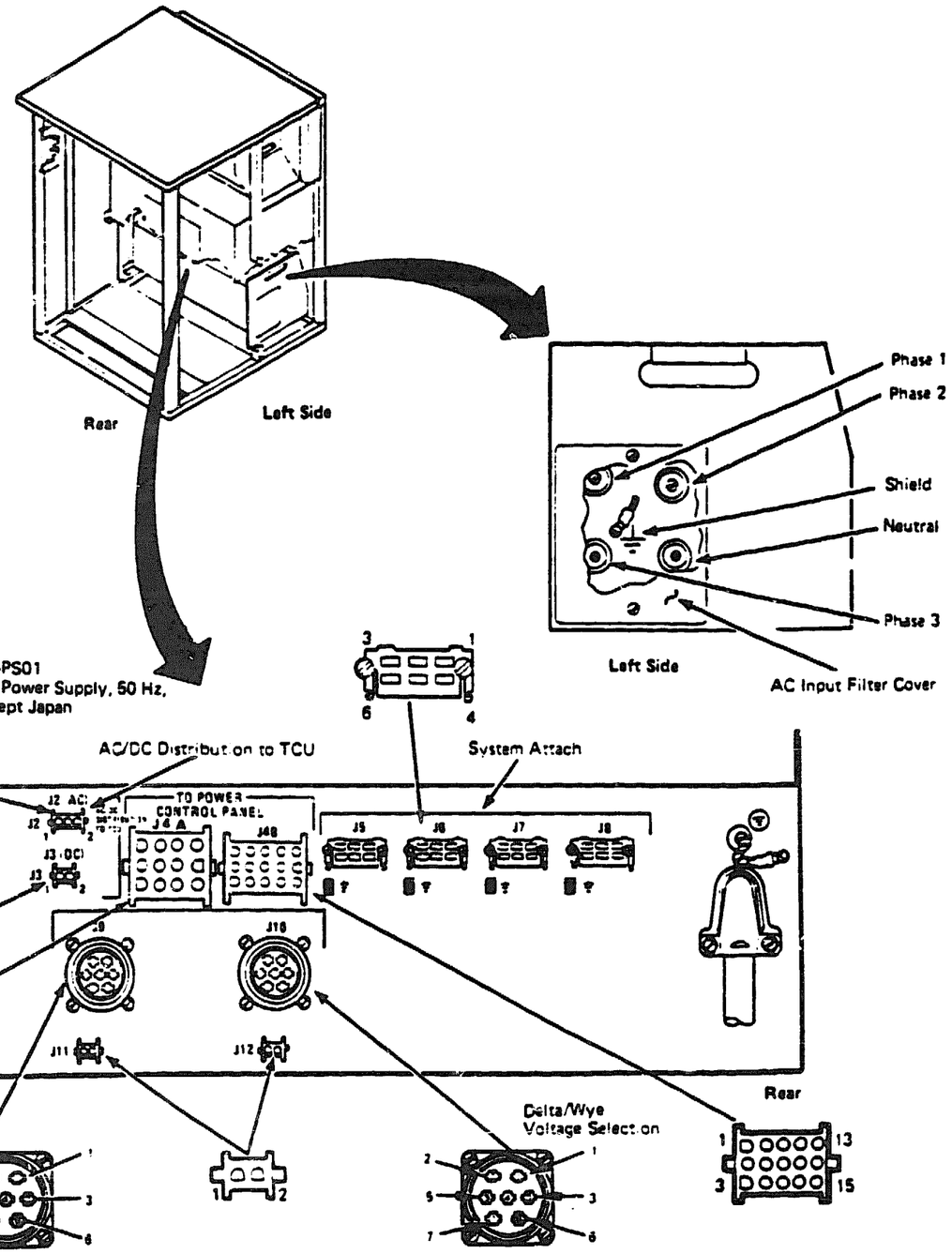


The resistance between the machine frame and the ground pin (pin 4) on the ac output socket of the tape control unit should be 0.1 ohm (see diagram A below).

Diagram A
AC Output Socket (TCU)

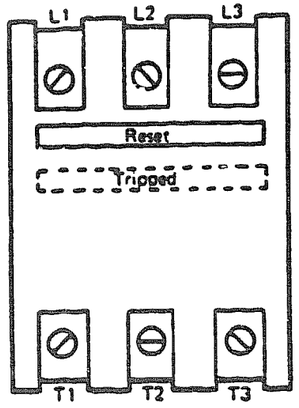




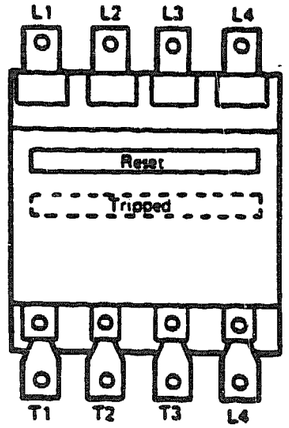


Circuit Breaker Terminals

CB1, All 60 Hz and 50 Hz Japan



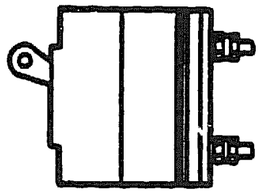
CB1, 50 Hz, except Japan



Tape Control Unit CBs

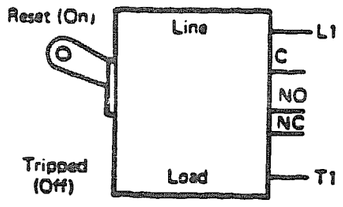
CB2, 60 Hz

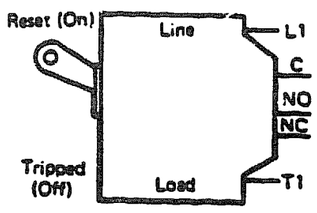
CB2 and CB3, 50 Hz

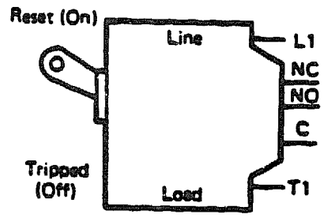


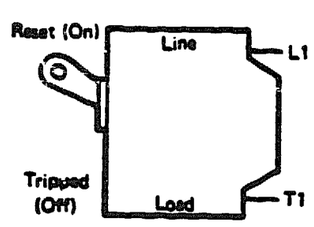
Subsystem Circuit Breakers

The circuit breakers shown represent typical breakers as found in both the tape control unit and the tape transport unit. The Auxiliary contacts, even if present, are not used.

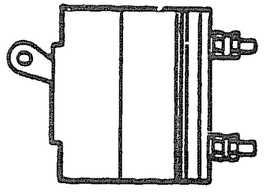






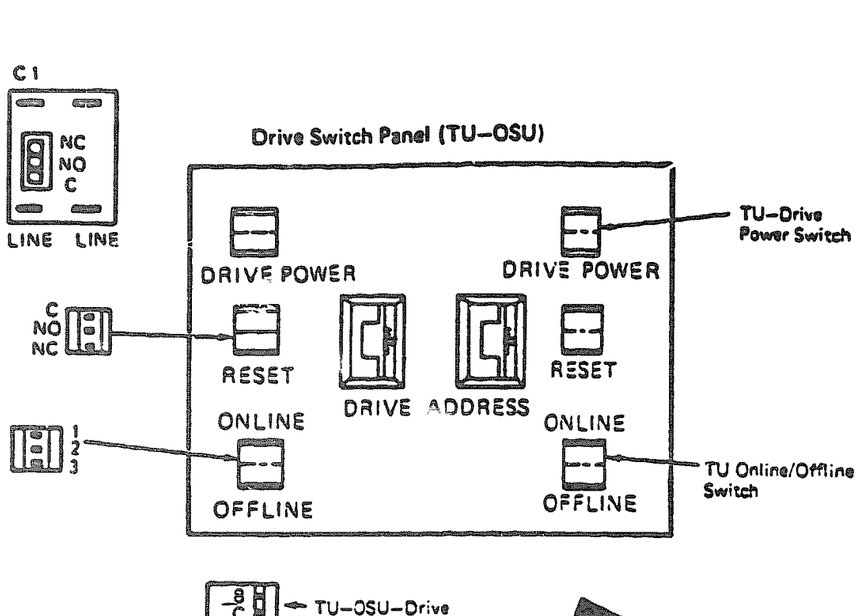


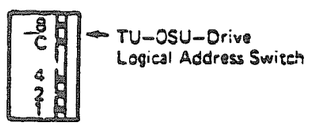
Tape Transport Unit ac Power Circuit Breaker, 60 Hz and 50 Hz Japan

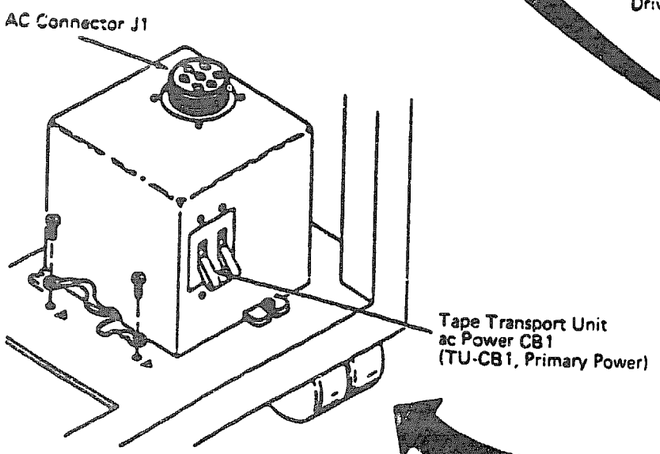


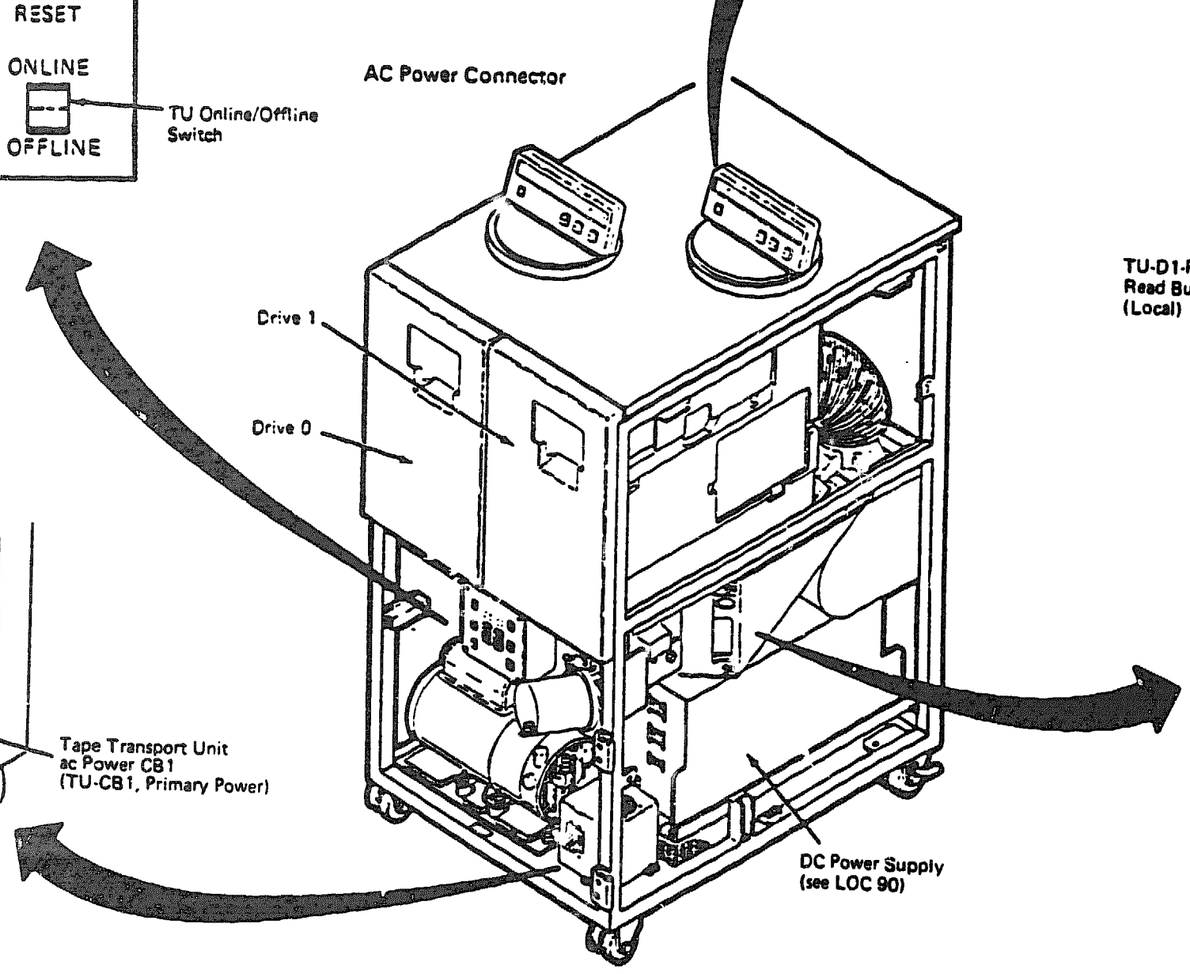
TA90 MG EC C04824

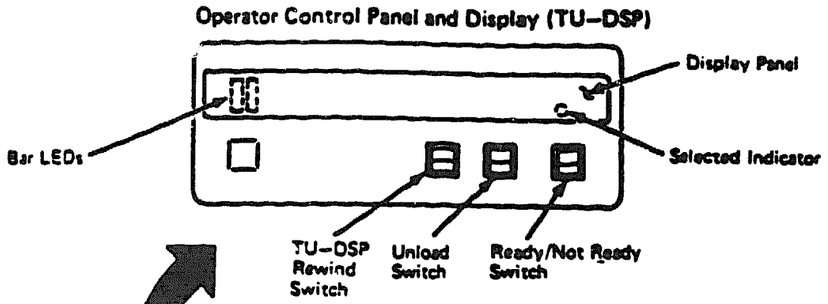
Tape Transport Unit Locations LOC 75

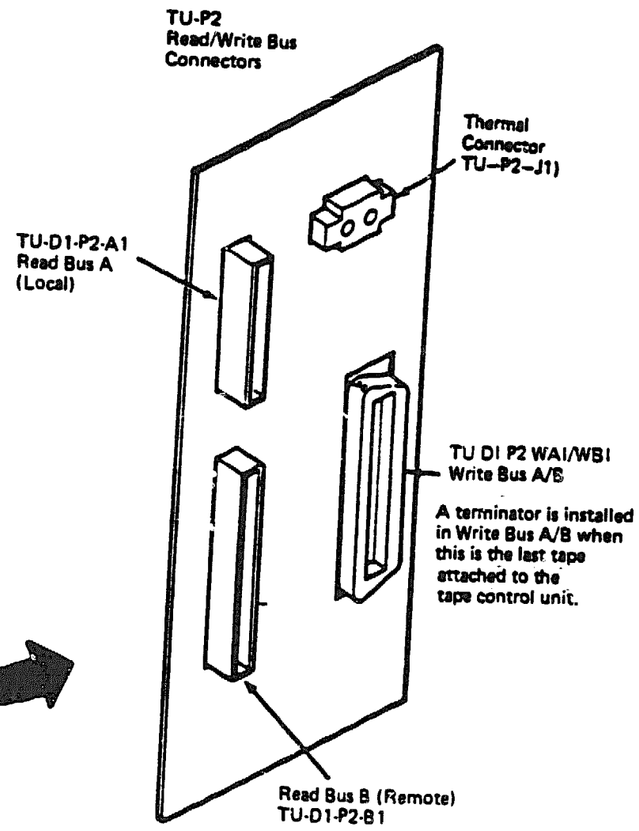




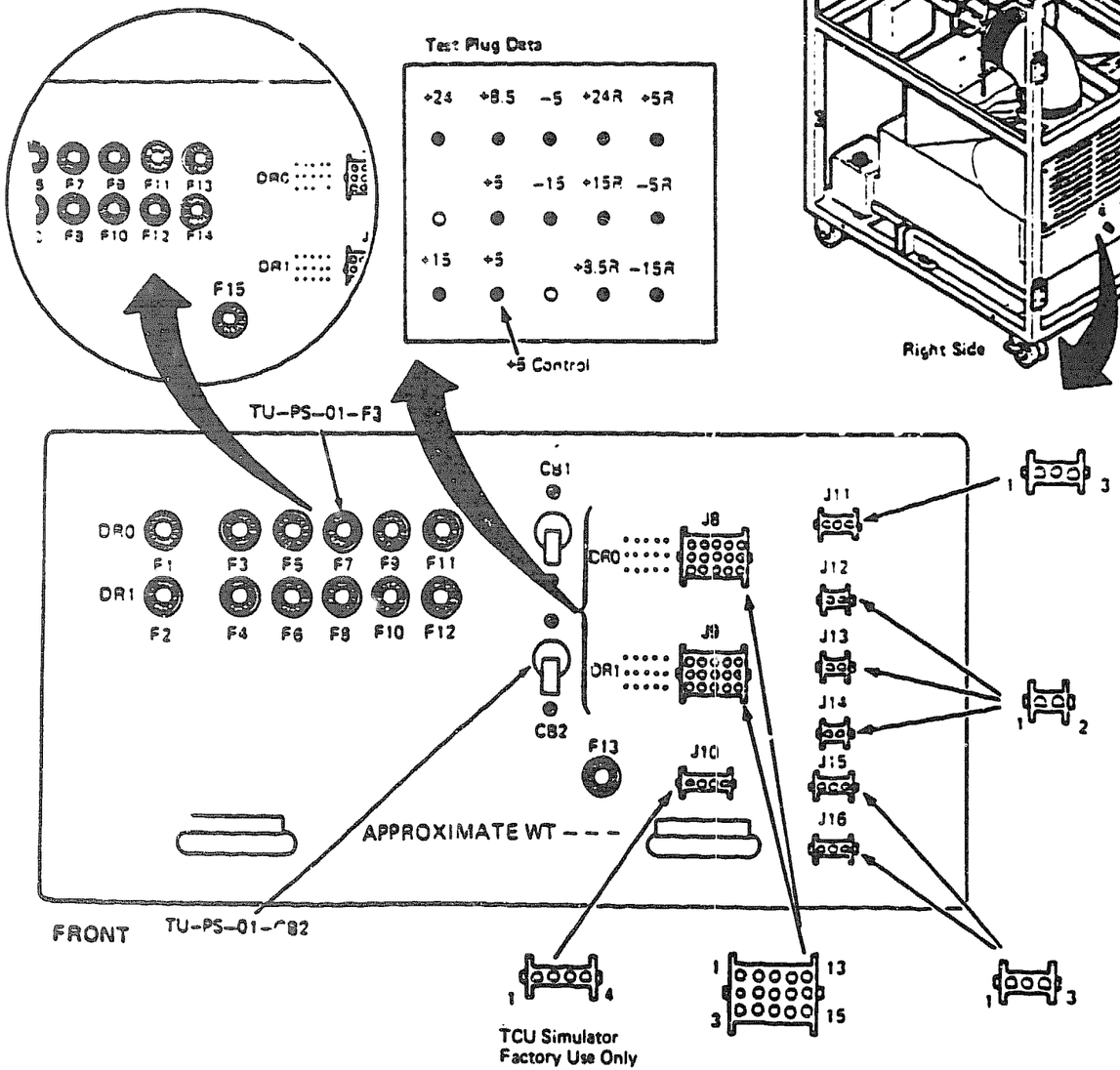


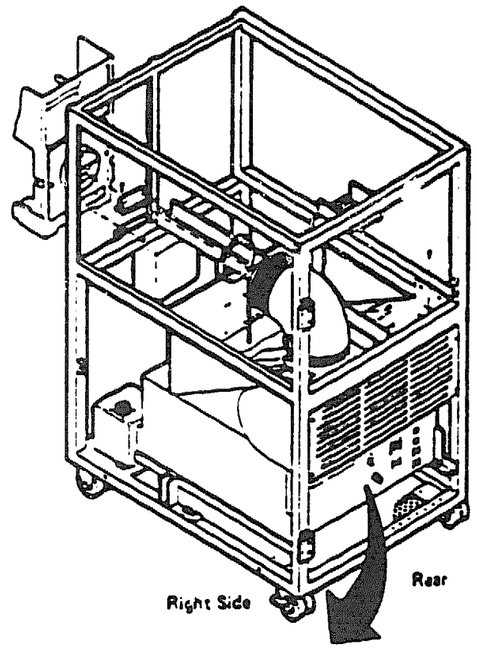


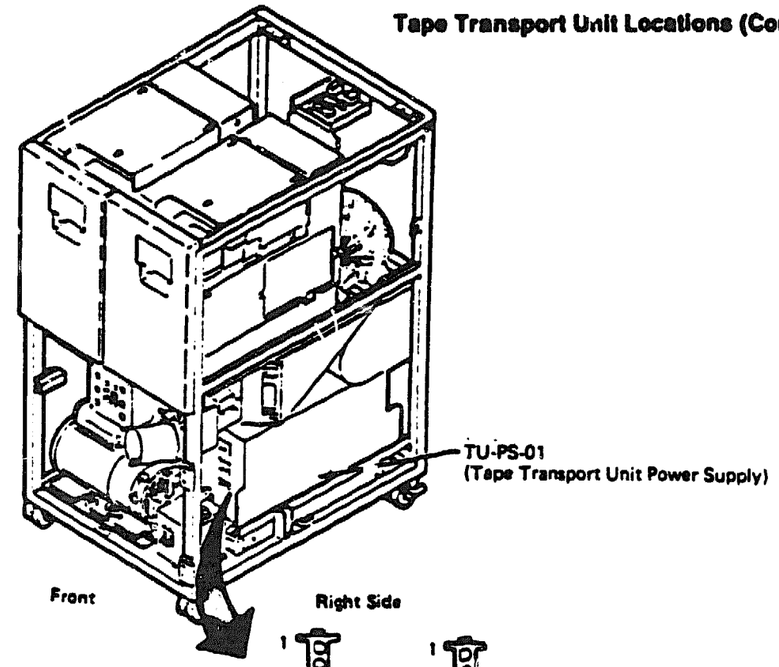


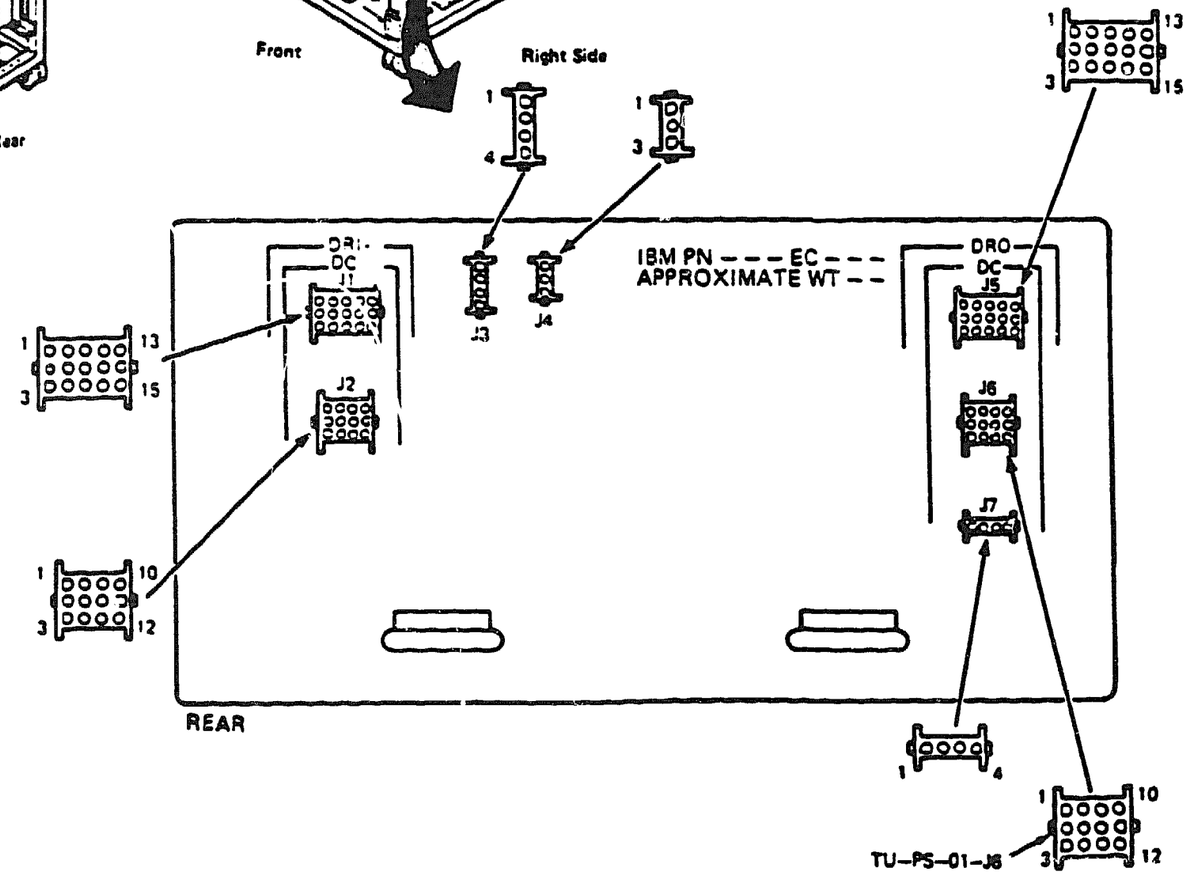


DR 0/1 PS01 Tape Transport Unit dc Power Supply

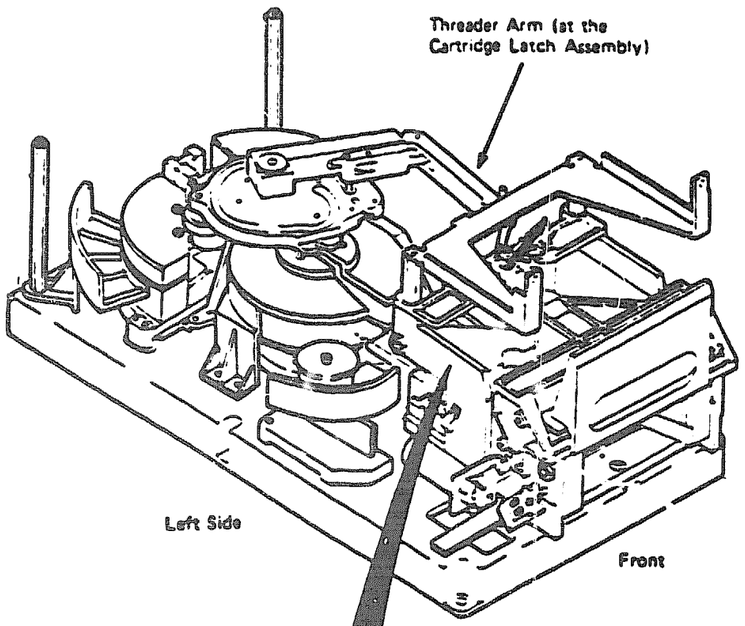


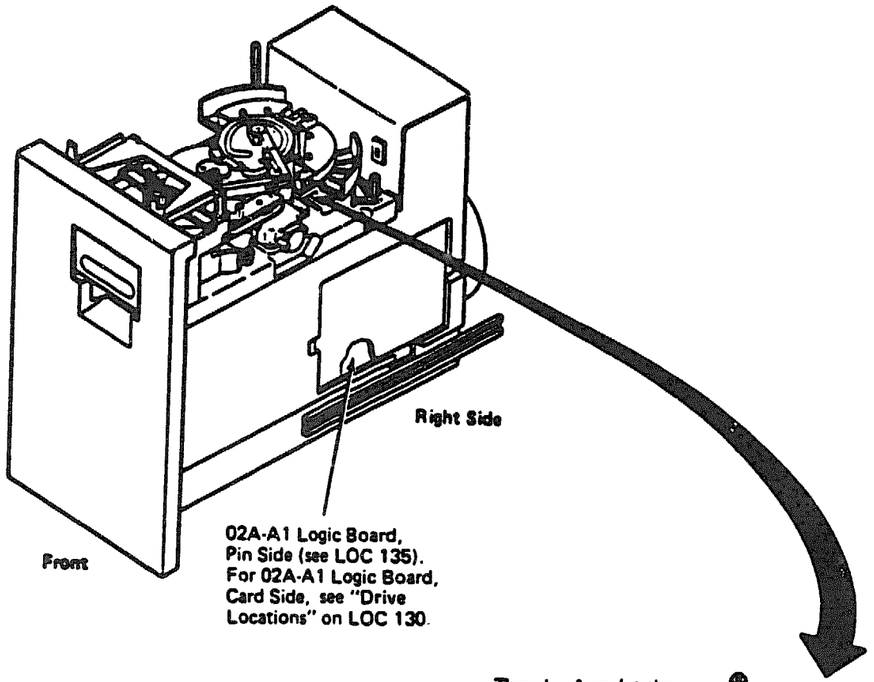


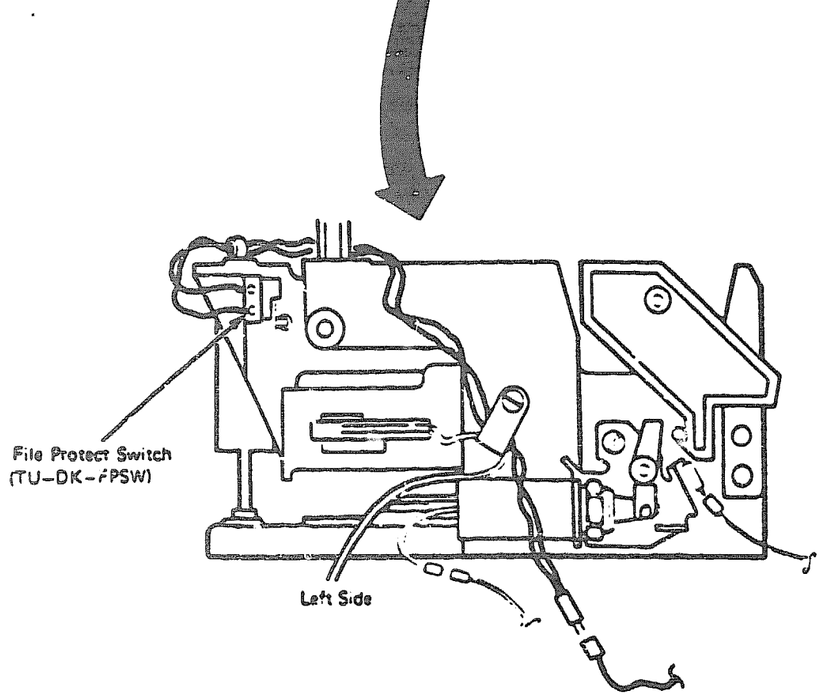


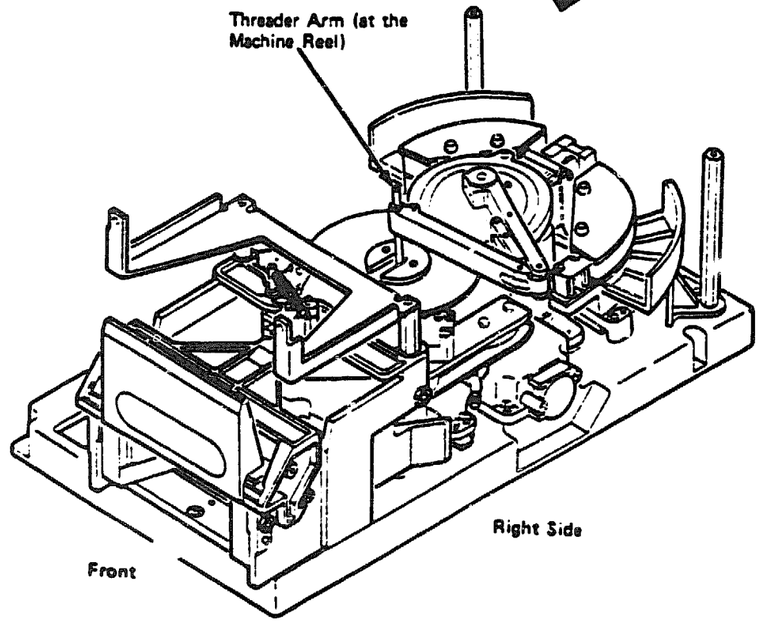


TU-DK, Tape Transport Unit Deck Assembly

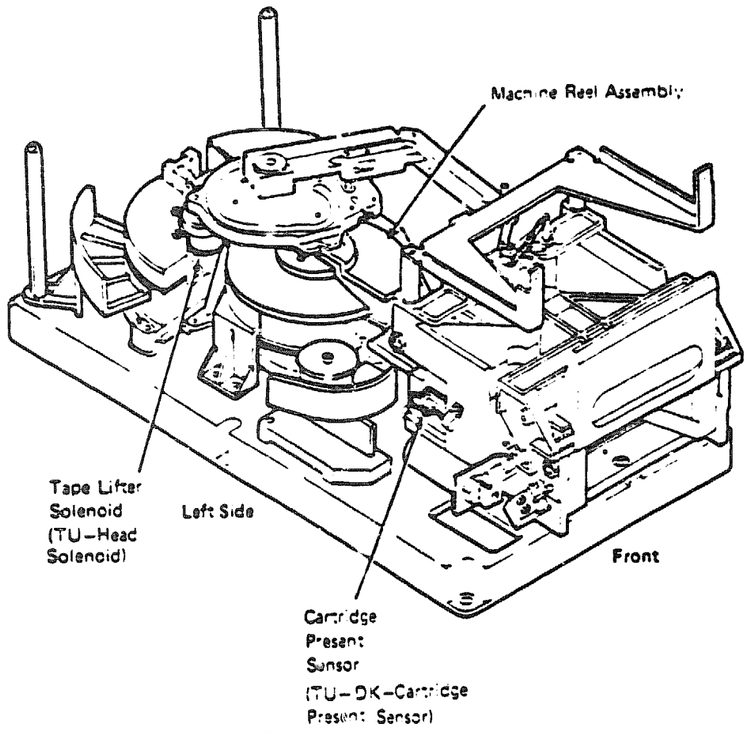


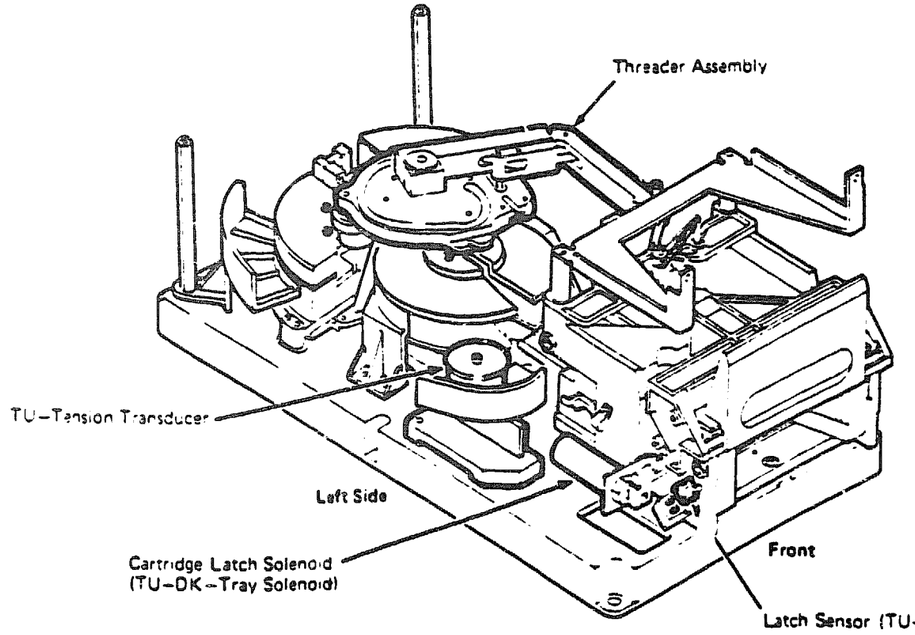


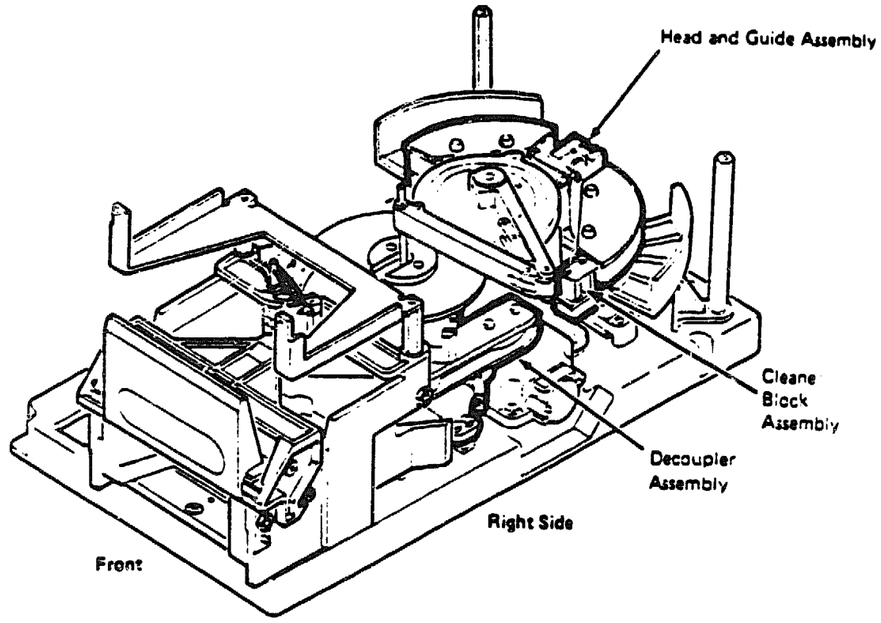


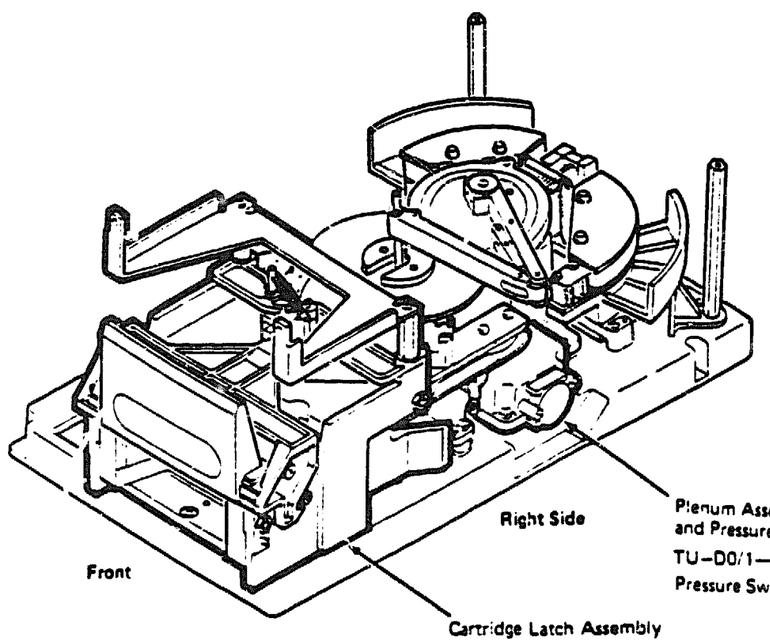


TU-DK, Tape Transport Unit Deck Assembly (Continued)

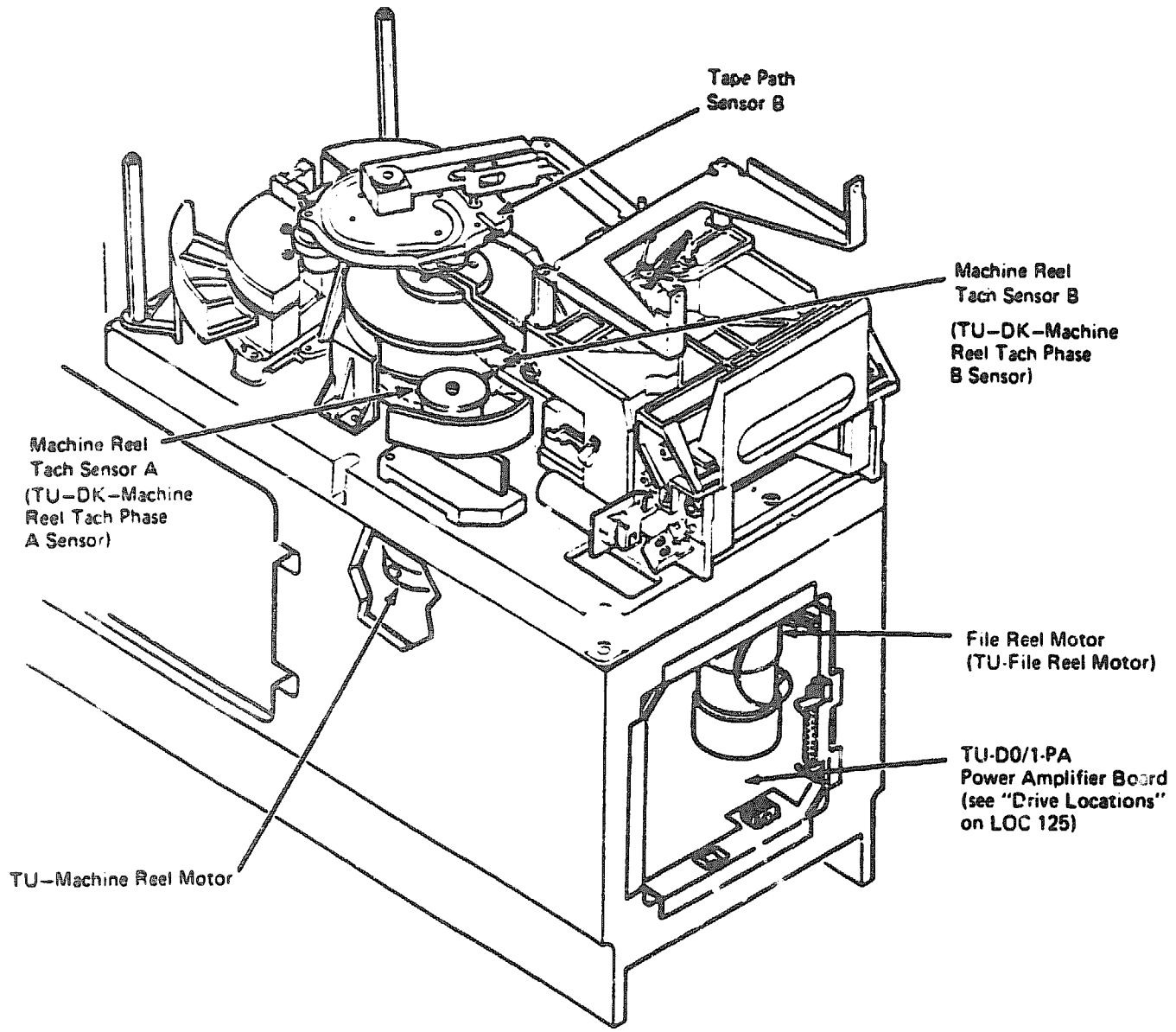


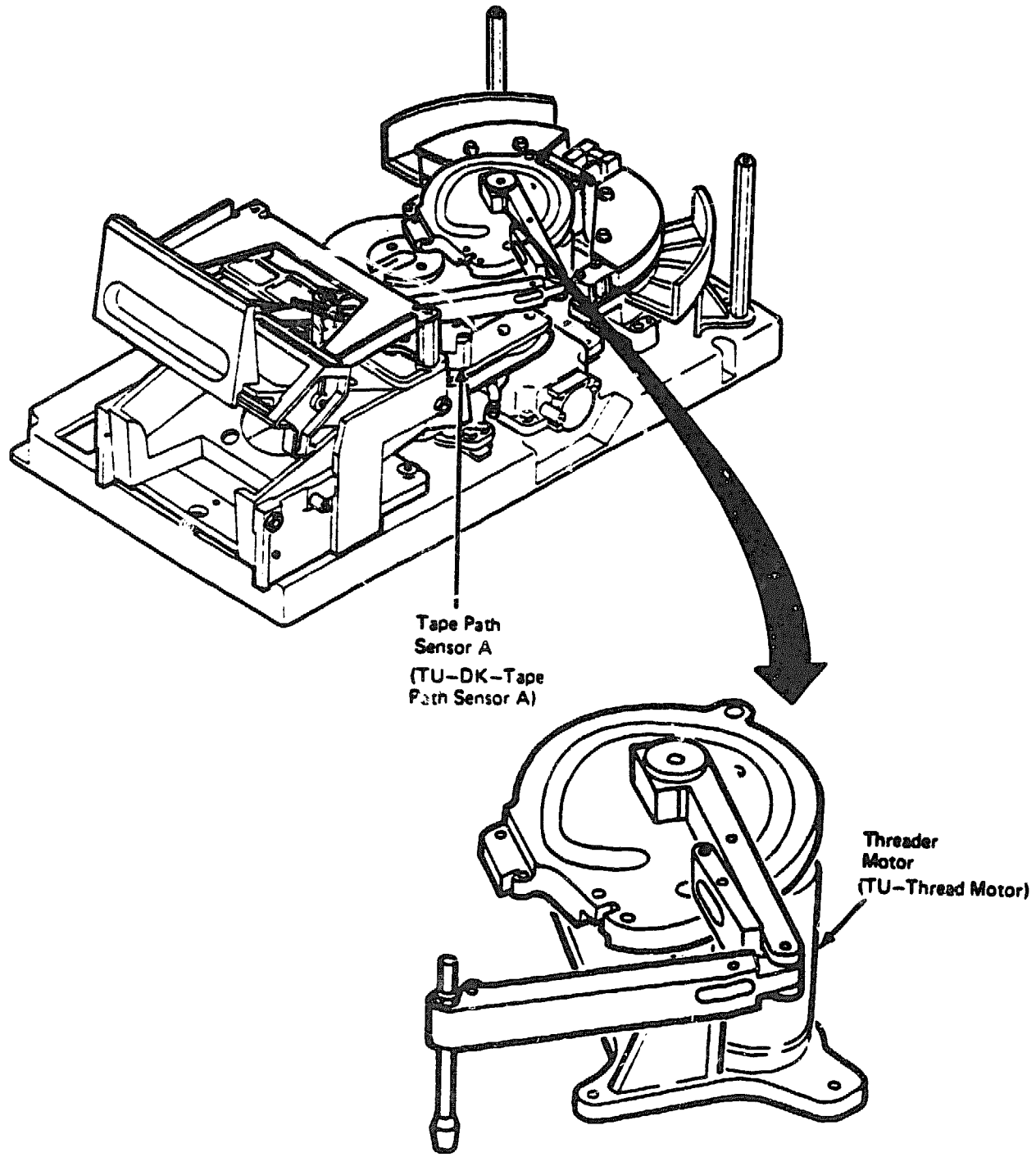




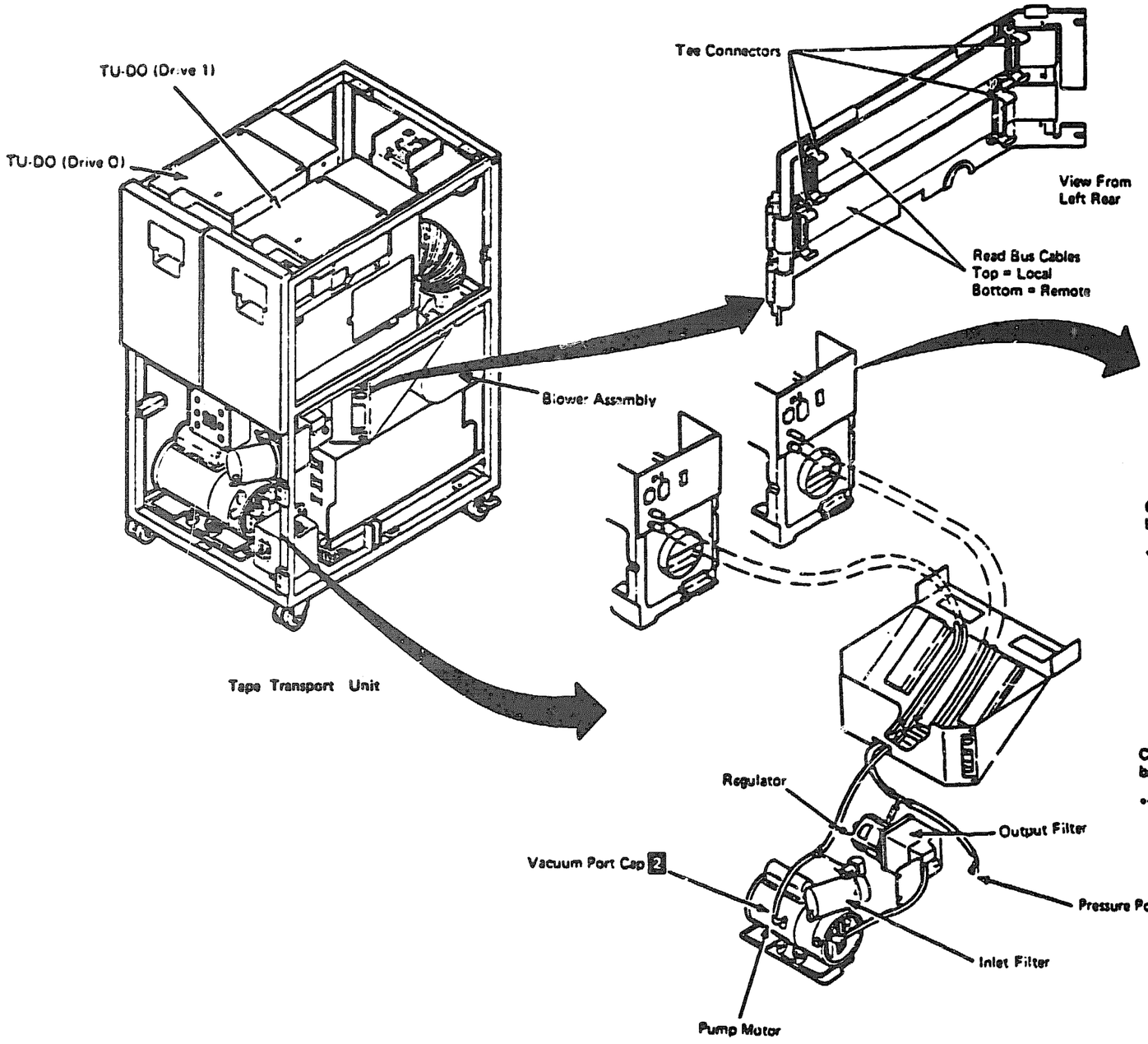


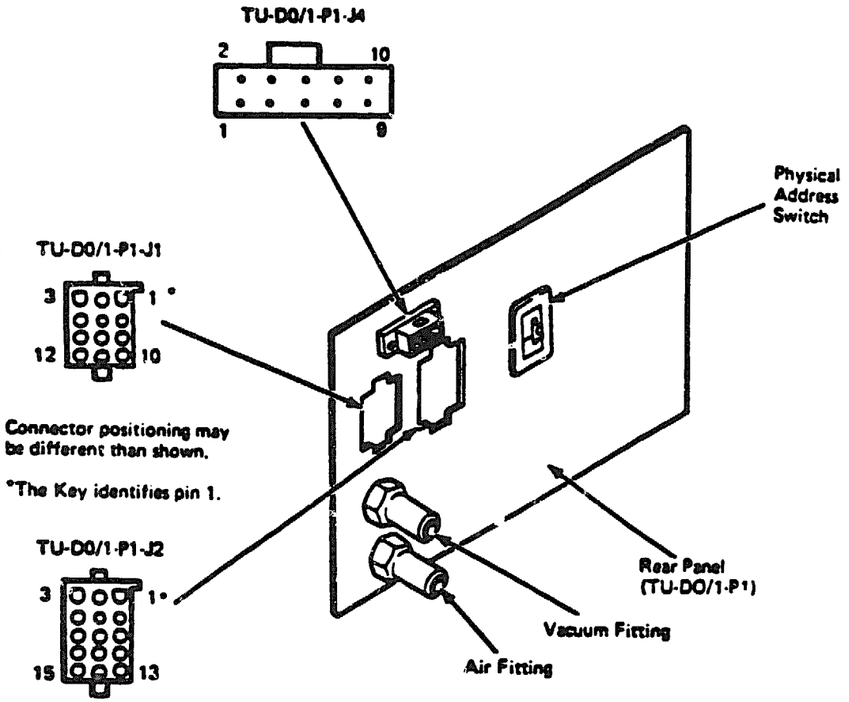
TU-DK, Tape Transport Unit Deck Assembly (Continued)



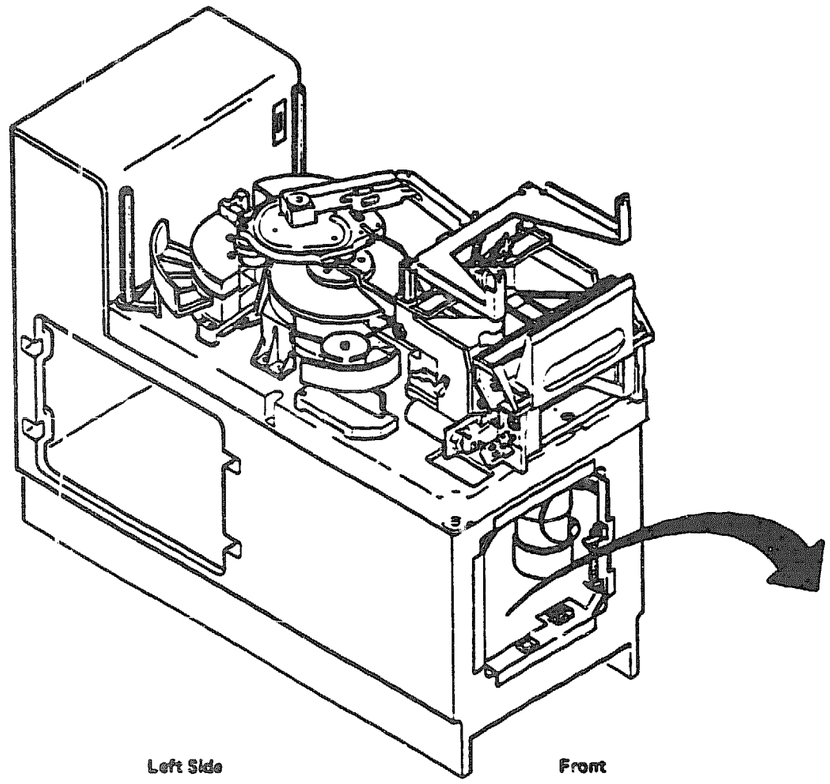


Tape Transport Unit Locations (Continued) **LOC 120**



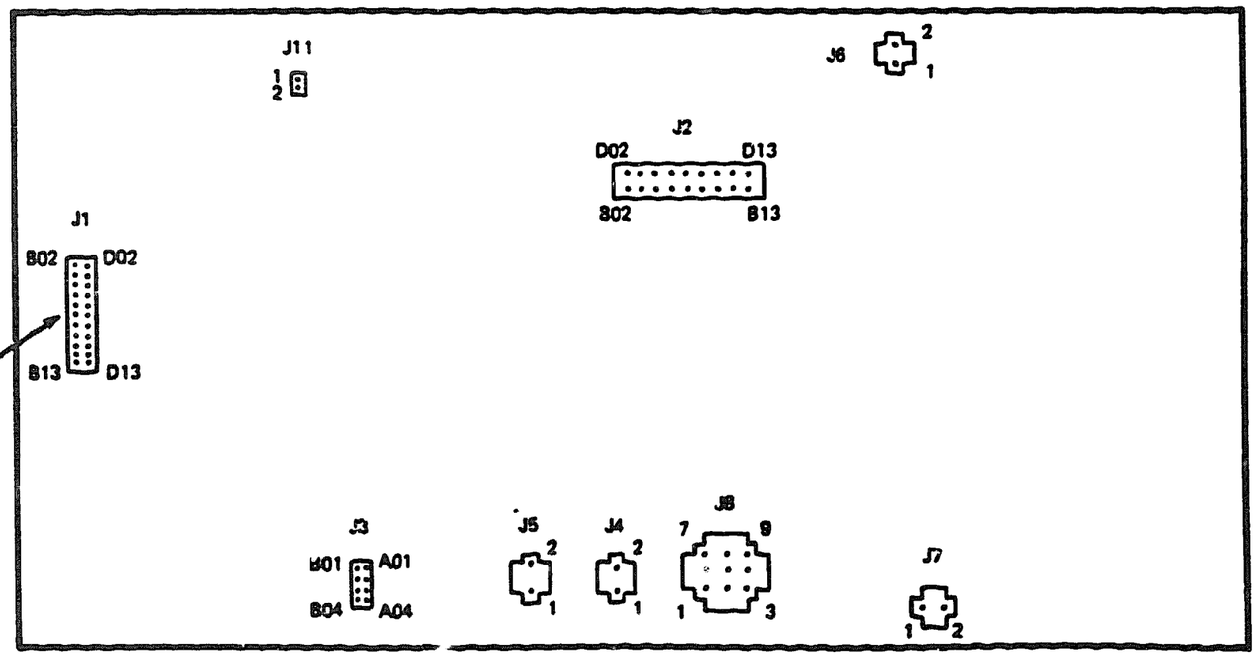


Drive Locations (Continued)

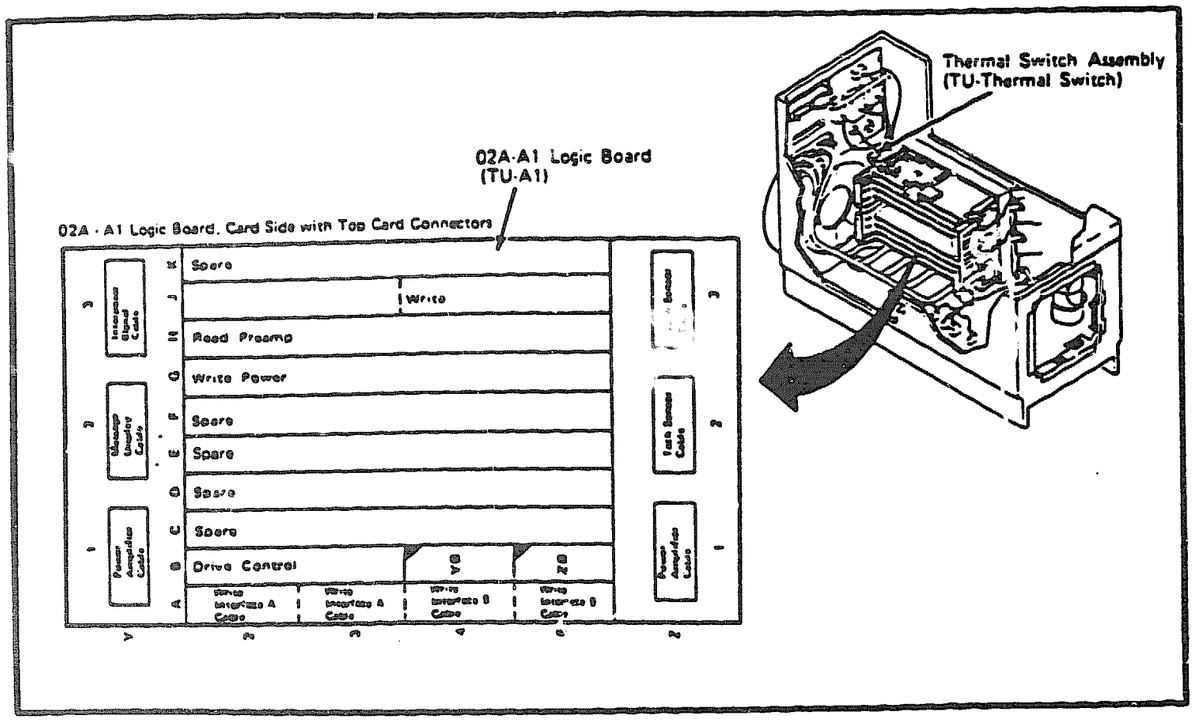


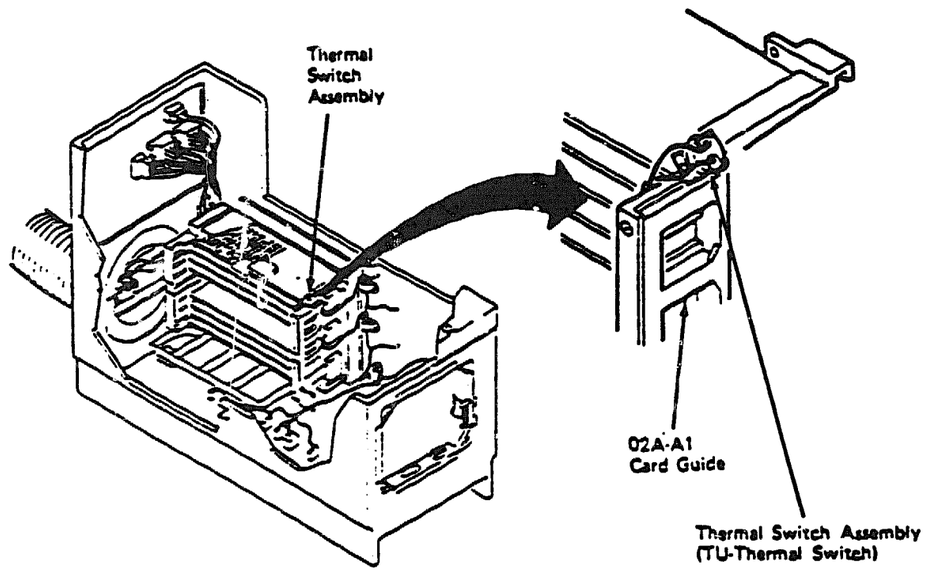
TU-DO/1-PA
Power Amplifier
Board

TU-DO/1-PA
Power Amplifier Board Connectors



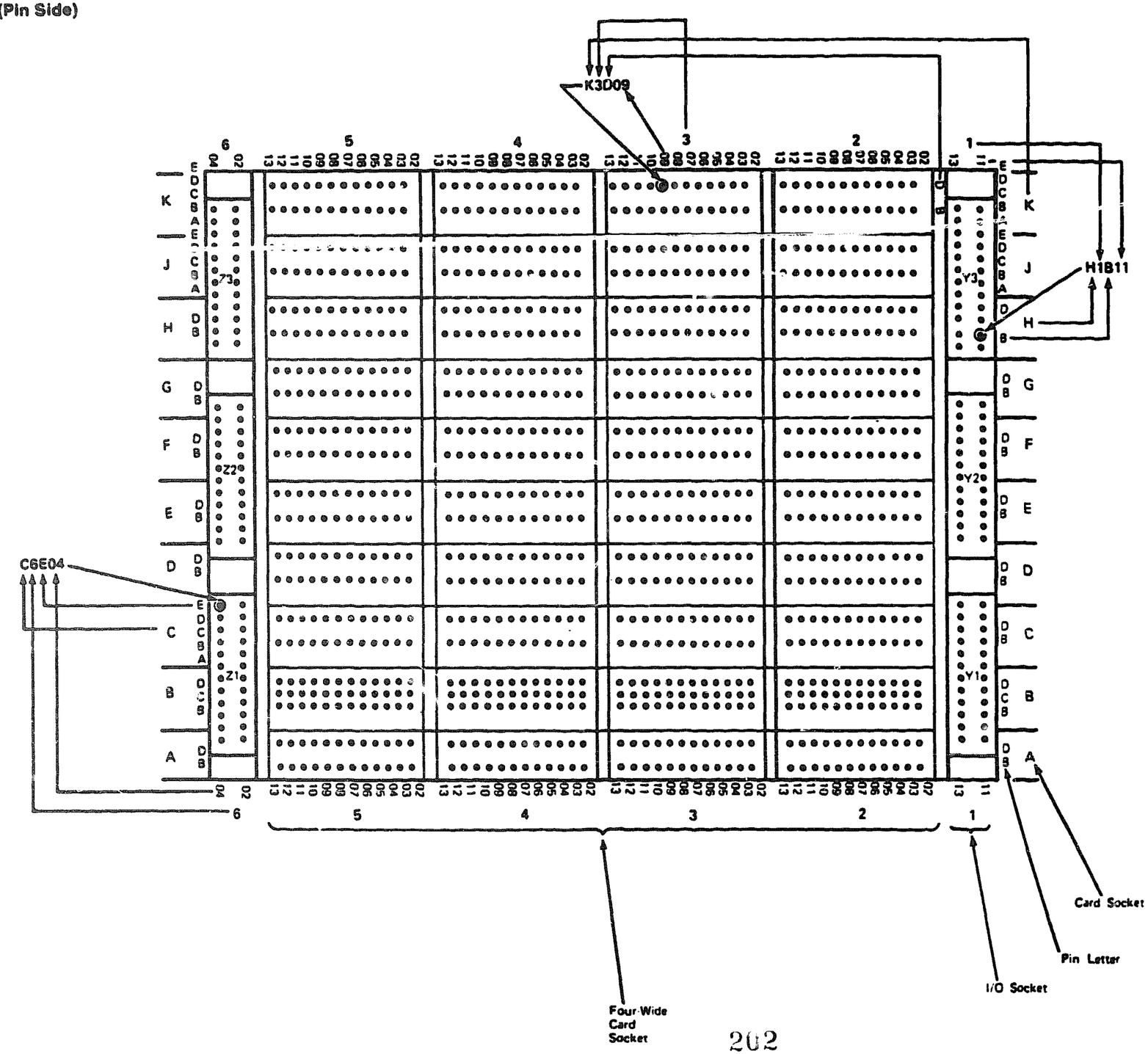
Drive Locations (Continued)



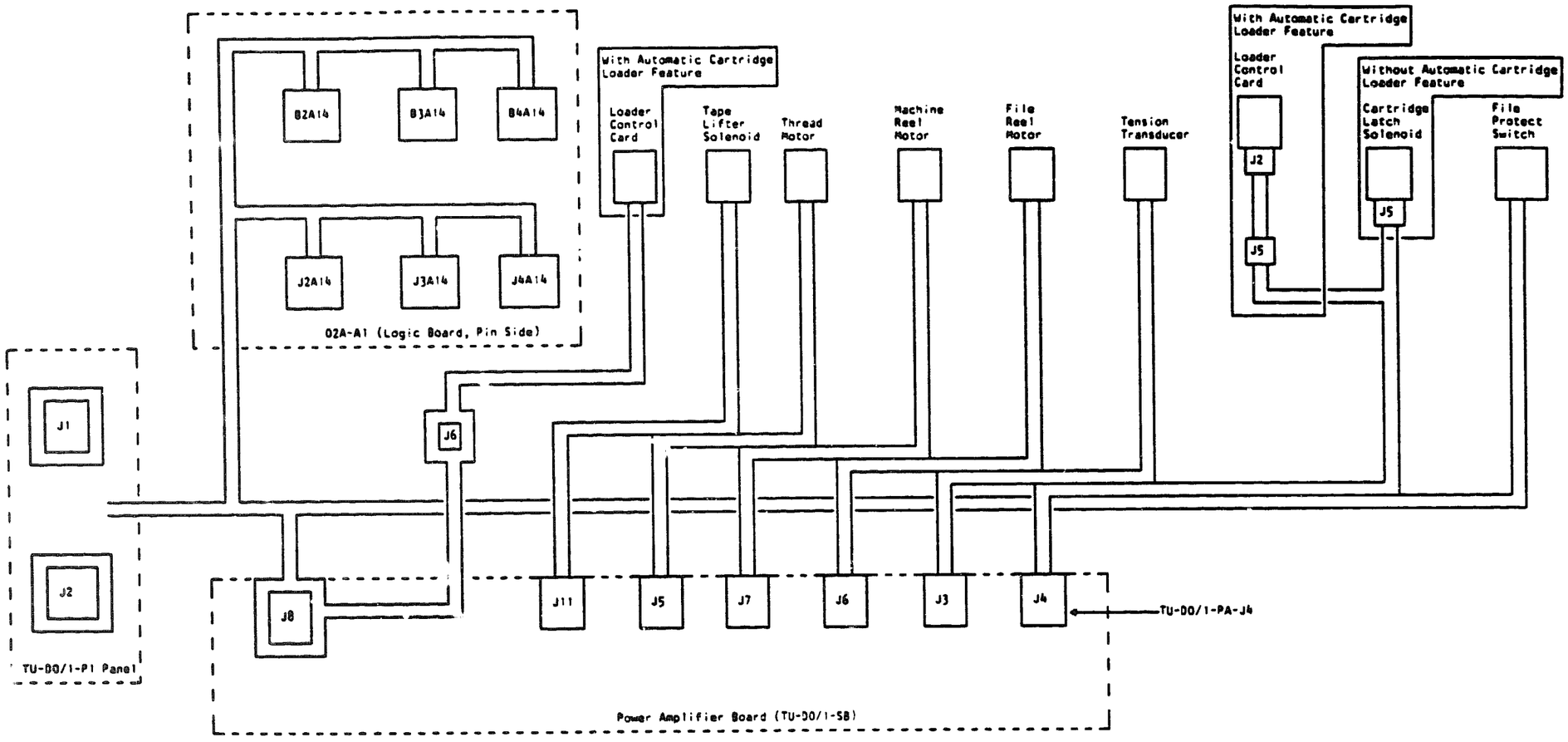


Drive Locations (Continued) LOC 135

Logic Board Layout (Pin Side)

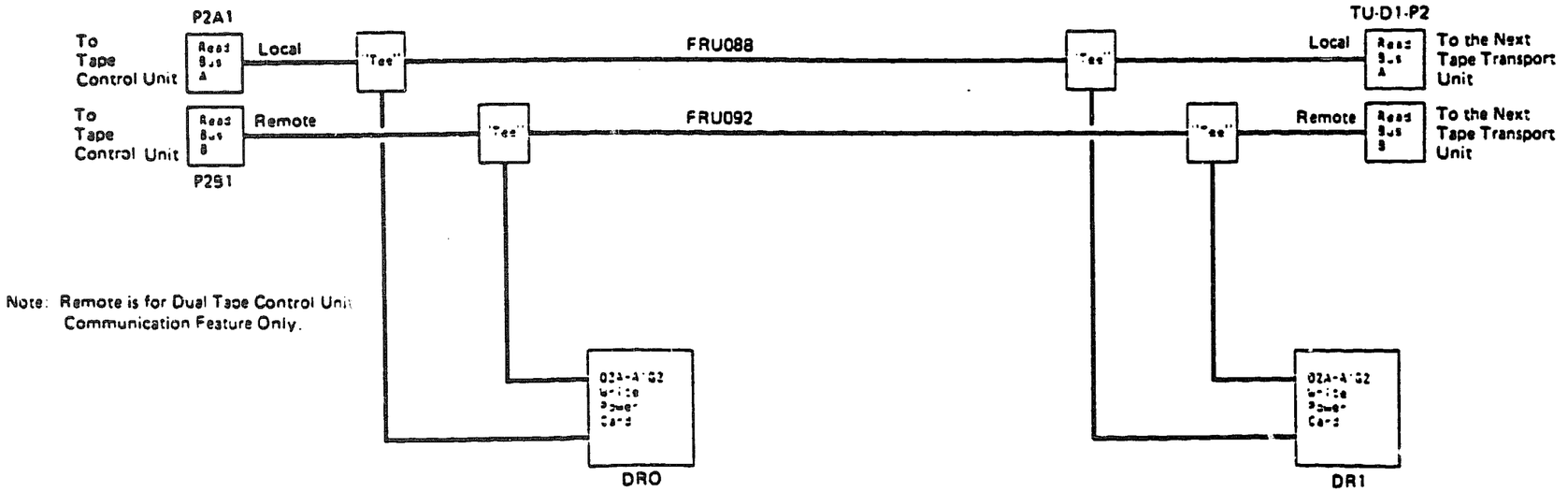


Drive Locations (Continued) LOC 140

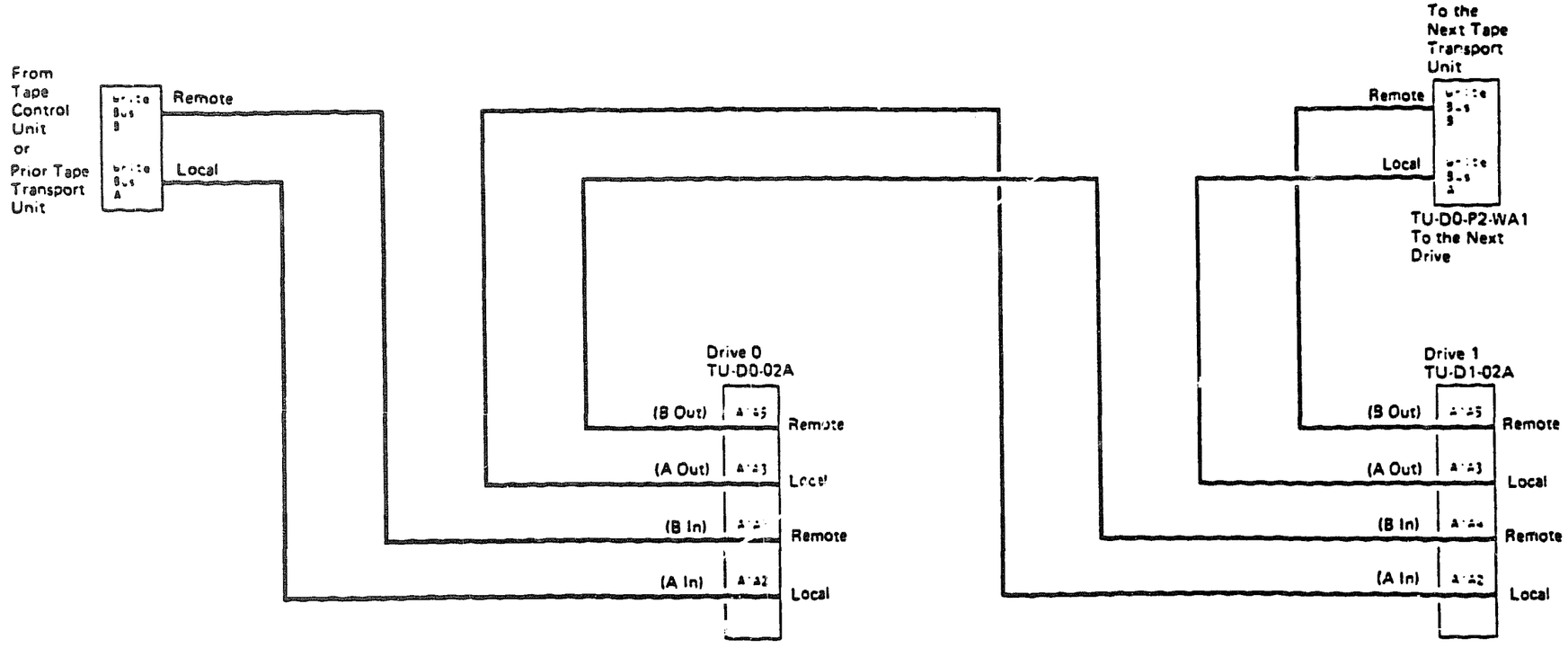


Read Adapter Cables

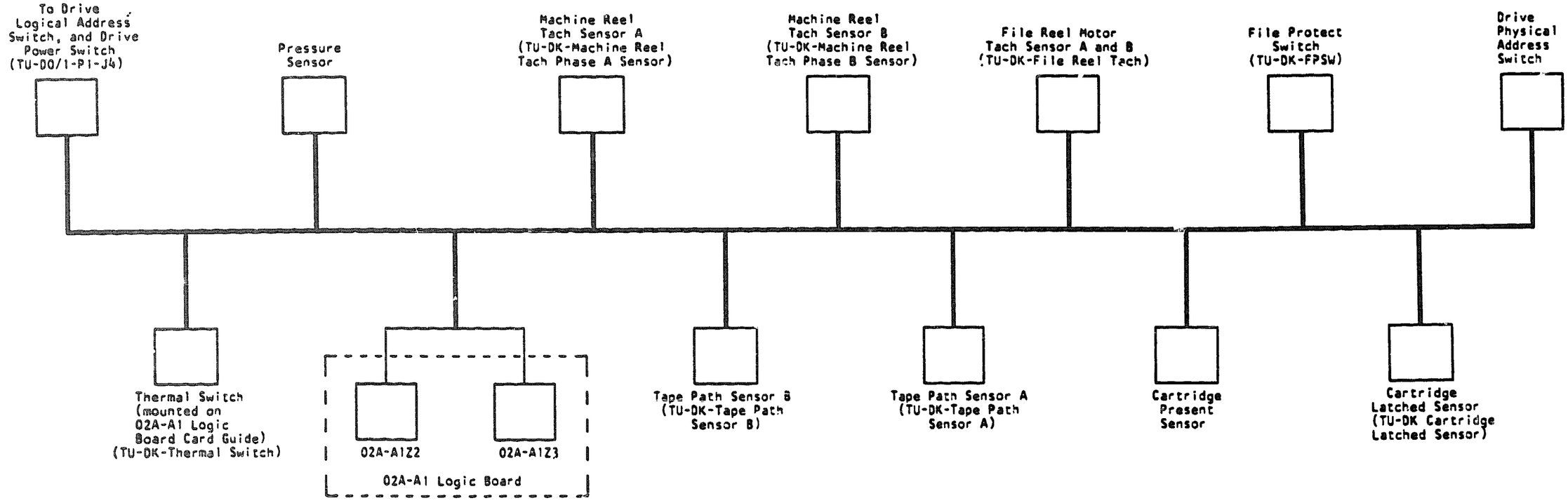
Drive Locations (Continued) LOC 145



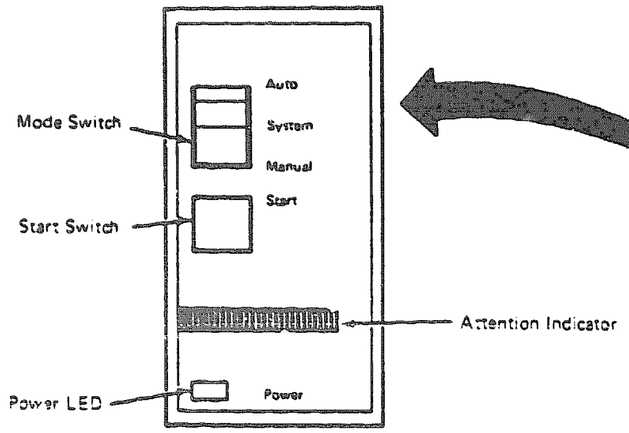
Write Adapter Cables



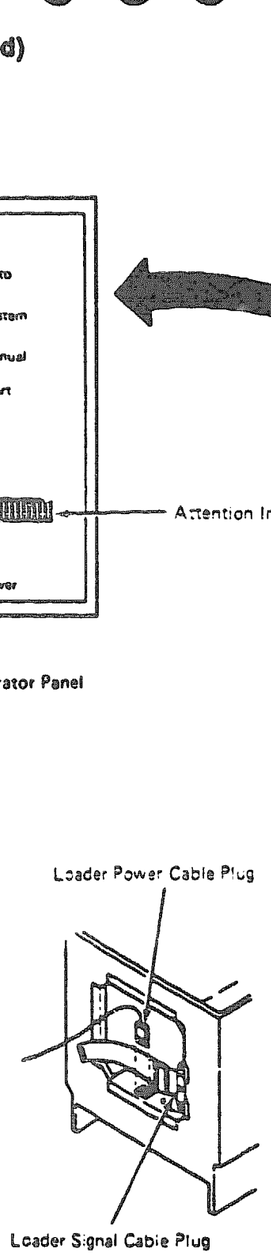
Tach Sensor Cable

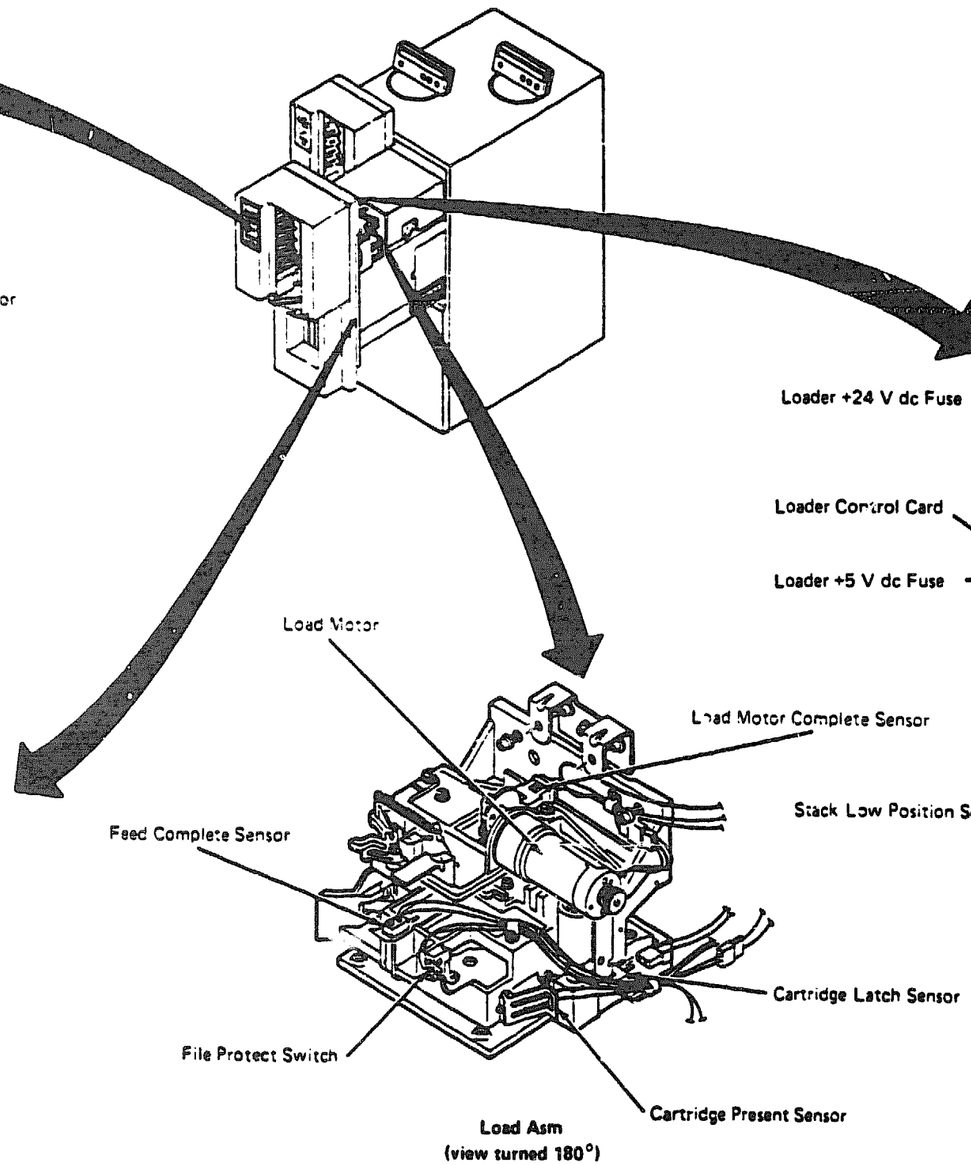


Drive Locations (Continued)

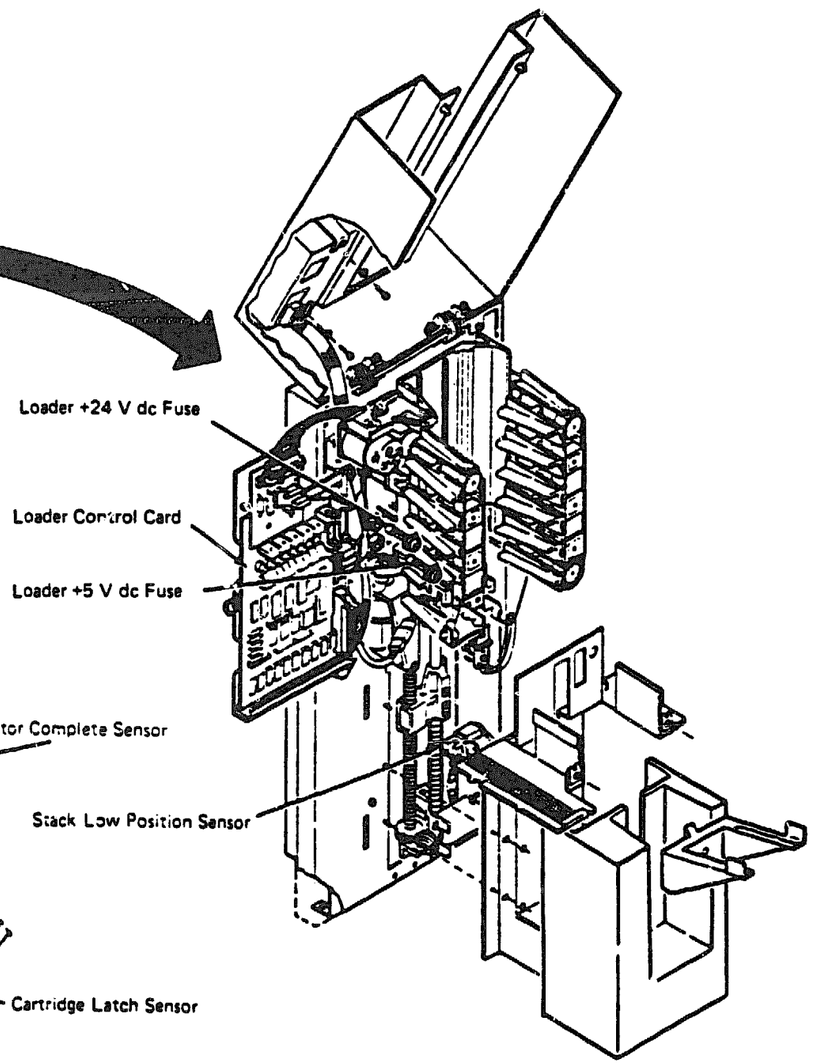


Loader Operator Panel

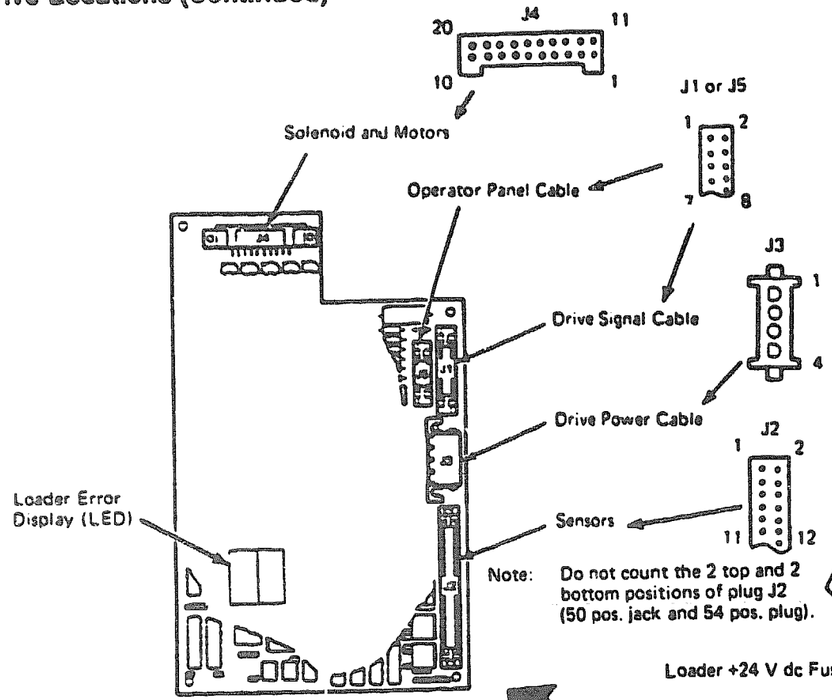




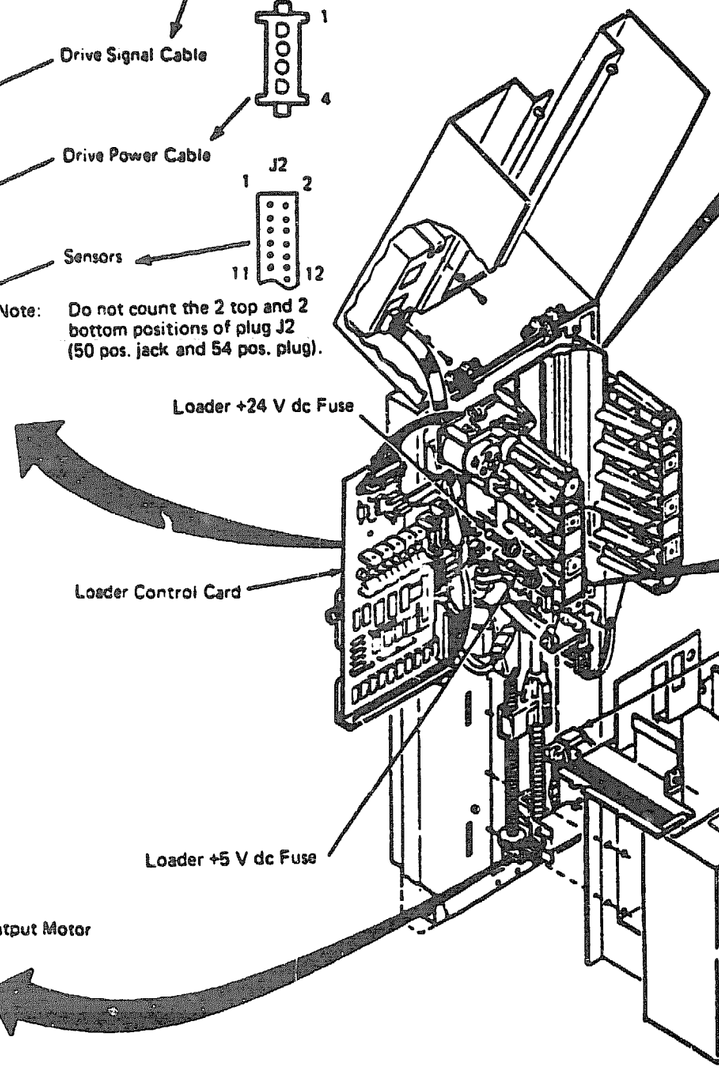
Load Asm
(view turned 180°)



Loader Mechanical Asm
with Control Card
(view turned 90°)

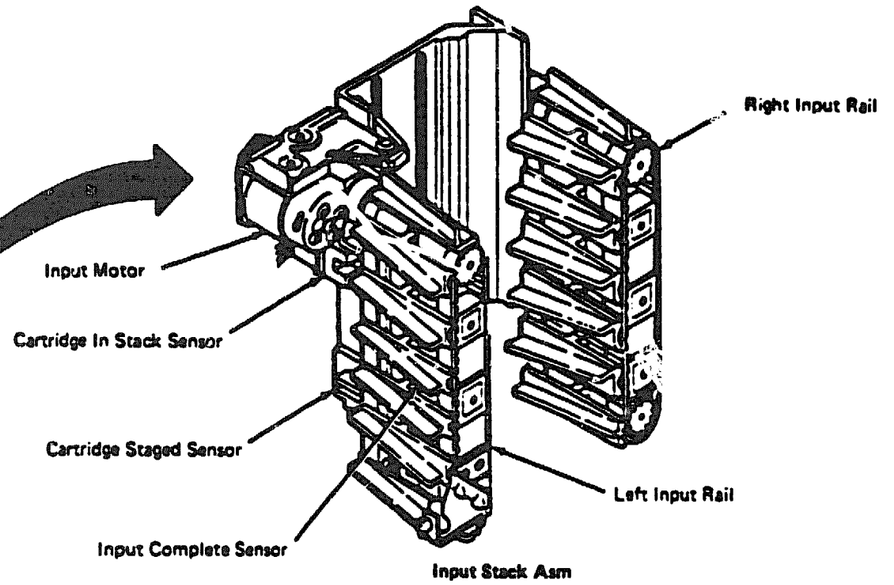


Loader Control Card

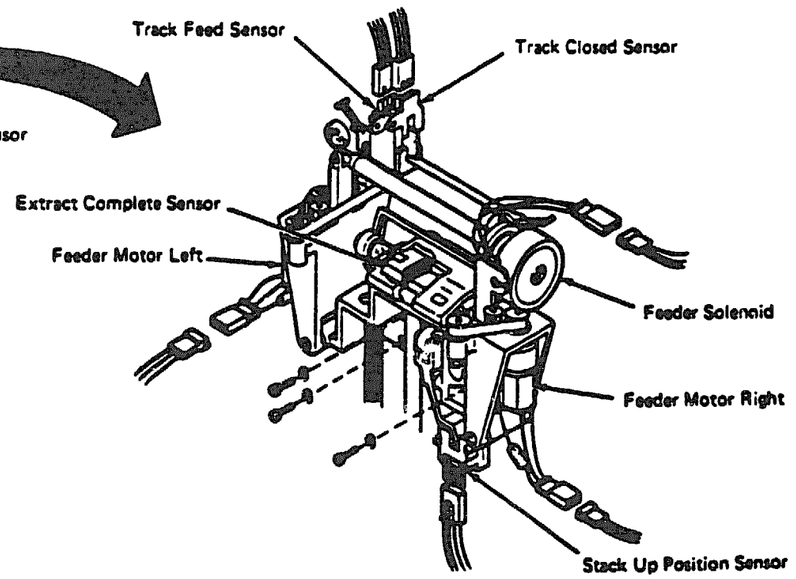


Loader Mechanical Asm with Control Card (view turned 90°)

Output Stack Asm



Input Stack Asm



Feed Asm (view turned 90°)


CARR-
TCU

This directory lists all field-replaceable units (FRUs) for the TA90 Tape Subsystem, and includes all tape control unit and drive assembly FRUs.

To locate a specific FRU removal or replacement procedure, perform the following:

1. Locate the FRU number in the FRU NUMBER column.
2. The VOLUME column indicates where the information for the FRU is located. Volume A02 contains the information for the tape control unit. Volume A03 contains the information for the drive. The name of the FRU is listed in the FRU NAME column. The FRU name corresponds to a part number in the TA90 IPB (EK-UTA90-IP-001).
3. Go to the page listed in the REMOVE column to perform the removal procedure.
4. Go to the page listed in the REPLACE column to perform the replacement procedure.

Tape Control Unit cover removals and replacements are described on CARR-TCU 2-1 through 2-2.

Drive cover removals and replacements are described on CARR-DR 2-1 through 2-9.

Plenum supply hose clamping procedures are described on CARR-DR 3-1.

Tape lifter solenoid response time checking procedures are described on MD/SDISK 302.

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU001	A03	Threader Assembly	10	29-27056-01
FRU002	A03	Latch Solenoid	20	29-27101-01
FRU003	A03	File Reel Motor	30	29-27170-01
FRU004	A03	Machine Reel Motor and Hub Mount	40	29-27169-01
FRU005	A03	Lower Flange	50	29-27089-01
FRU006	A03	Tape Path Sensor A	60	29-27079-01
FRU007	A03	Tape Path Sensor B	70	29-27079-01
FRU008	A03	Cartridge Latch Assembly	80	29-27108-01
FRU009	A03	File Protect Switch	90	29-27078-01
FRU010	A03	Cartridge Present Sensor	100	29-27079-01
FRU011	A03	Cartridge Latched Sensor	110	29-27083-01
FRU012	A03	Decoupler Assembly	120	29-27071-01
FRU013	A03	Head and Guide Assembly	130	29-27110-01
FRU014	A03	Tension Transducer	140	29-27100-01
FRU015	A02	A1V5-A2V3 Cable	150	
FRU016	A03	Latch Spring	160	29-27102-01
FRU017	A03	Plunger Spring	170	29-27107-01
FRU018	A03	Compression Spring	180	29-27080-01
FRU019	A03	Interlock Spring	190	29-27084-01
FRU020	A03	Blower Assembly	200	29-27139-01 (60 HZ) 29-27138-01 (50 HZ)
FRU022	A02	Read Bus Cable - Local	150	
FRU024	A02	Read Bus Cable - Remote	150	
FRU025	A02	Read Bus Cable - Remote	150	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU026	A02	Device Data Bus Cable - Remote	150	
FRU027	A02	Device Data Bus Cable - Remote	150	
FRU029	A02	Device Data Bus Cable - Local	150	
FRU030	A03	Pump Motor	300	29-27105-01
FRU031	A03	Regulator (60 Hz)	310	29-27069-01
	A03	Regulator (50 Hz)	310	
FRU032	A03	Output Filter (60 Hz)	320	29-27082-01
	A03	Output Filter (50 Hz)	320	
FRU033	A03	Inlet Filter	330	29-27057-01
FRU034	A03	Pressure Hose Assembly (60 Hz)	340	29-27142-01
	A03	Pressure Hose Assembly (50 Hz)	340	
FRU035	A03	Vacuum Hose Assembly (60 Hz)	350	29-27143-01
	A03	Vacuum Hose Assembly (50 Hz)	350	
FRU036	A03	-5V dc Resistor Panel (60 Hz)	360	
	A03	-5V dc Resistor Panel (50 Hz)	360	
FRU037	A03	Manifold-In Pressure Hose (60 Hz)		
FRU039	A03	Plenum Supply Hose	390	29-27155-01
FRU040	A03	Pressure Sensor	400	29-27068-01
FRU041	A03	Plenum Assembly, includes Pressure Sensor	410	29-27087-01
FRU042	A03	Decoupler Pressure Hose	420	29-27154-01
FRU043	A03	Decoupler Vacuum Hose	430	29-27154-01
FRU044	A03	Right Guide Bearing Hose	440	29-27141-01
FRU045	A03	Left Guide Bearing Hose	450	29-27481-01
FRU046	A03	Tension Transducer Hose	460	29-27225-01
FRU047	A03	Cleaner Supply Hose	470	29-27153-01
FRU048	A02	Power Bus Cable	150	
FRU049	A03	Logic Board to Power Amplifier J2 Cable	490	
FRU054	A03	Upper Flange	540	29-27140-01
FRU056	A02	Status Store Communication Cable - Dual TCU	150	
FRU058	A03	Logic Board (02A-A1)	580	29-27116-01
FRU059	A03	Power Amplifier Board	590	29-27157-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU060	A03	Message Display Board	600	29-27104-01
FRU061	A03	Machine Reel Hub	610	29-27088-01
FRU062	A03	Read Preamp 02A-A1H2	640	29-27135-01
FRU063	A03	Write 02A-A1J4	640	29-27134-01
FRU064	A03	Write Power 02A-A1G2	640	29-27115-01
FRU065	A03	Pump to Output Filter Hose	650	
FRU072	A03	AC CB to Power Supply Blower Cable	490	
FRU073	A03	Logic Board to Power Amplifier J1 Cable	490	
FRU074	A03	Tape Transport Unit AC Power CB Cable	490	
FRU077	A03	Blower Assembly AC Power Cable (Tape Unit to both Drives)	490	
FRU078	A03	Blower Assembly AC Power Cable	490	
FRU079	A03	DC Power Distribution Cable (Drive Internal)	790	
	A03	DC Power Distribution Cable (Drive External)	796	
FRU080	A03	DC Power Distribution Cable	800	
FRU081	A03	Tachometer Sensor Cable	810	
FRU082	A03	Thermal Switch	820	29-27483-01
FRU083	A03	Thermal Switch Cable	830	
FRU084	A02	Local/Remote Power Panel	840	29-27151-01
FRU085	A03	Drive Control Card	850	29-27162-01
FRU086	A02	IML Diskette Drive	860	29-27160-01
FRU087	A03	Read Data Local Cable (02A-A1G2 to TU-D0/1-P1RA1) Internal	490	
FRU088	A03	Read Bus Local Adapter Cable to TU-D1-P2A1	880	
FRU089	A03	Read Adapter Local Cable from Tee to P1RA1	190	
FRU090	A03	Message Display DC Power Cable	900	
FRU091	A02	Power Bus Cable	150	
FRU092	A03	Read Bus Remote Adapter to TU-D1-P2B1 Cable	880	
FRU093	A03	Read Adapter Remote Cable from Tee to P1RB1	490	
FRU094	A03	Read Data Remote Cable (02A-A1G2 to TU-D0/1-P1B1)	490	
FRU095	A03	DC Power Supply	950	29-27099-01 (60 HZ) 29-27098-01 (50 HZ)
FRU096	A03	Fuse F1 +24V Drive 0 Fuse F2 +24V Drive 1	960	
FRU097	A02	Power Bus Cable	150	
FRU098	A03	Fuse F3 +15V Drive 0 Fuse F4 +15V Drive 1	960	
FRU099	A03	Fuse F5 -15V Drive 0 Fuse F6 -15V Drive 1	960	
FRU100	A03	Fuse F7 +8.5V Drive 0 Fuse F8 +8.5V Drive 1	960	
FRU101	A03	Fuse F9 -5V Drive 0 Fuse F10 -5V Drive 1	960	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU102	A03	Fuse F11 +5V Drive 0 Fuse F12 +5V Drive 1	960	
FRU103	A02	Power Bus Cable	150	
FRU104	A03	Drive Power Switch	1040	29-27175-01
FRU105	A03	Online/Offline Switch (Drive)	1040	29-27075-01
FRU106	A03	Address Switch Cable to J4 (rear of deck)	490	
FRU107	A03	Reset Switch	1040	29-27074-01
FRU108	A03	Drive Address Switch	1040	29-27062-01
FRU109	A03	Operator Panel Switch Board (contains Rewind Switch Unload Switch, and Ready/Not Ready Switch)	1090	29-27094-01
FRU110	A03	Drive Thermal Switch	1100	29-27483-01
FRU111	A02	Read ECC/CORR Card 01A-A1R2	1110	29-27095-01
FRU113	A02	Buffer Storage Card 01A-A1M2	1110	29-27159-01
FRU114	A02	Buffer Control Card 01A-A1L2	1110	29-27137-01
FRU115	A02	Maintenance Adapter Card 01A-A1E2	1110	29-27148-01
FRU116	A02	Write Data Flow Card 01A-A1P2	1110	29-27133-01
FRU117	A02	Microprocessor Card 01A-A1D2	1110	29-27136-01
FRU118	A02	Drive Adapter Card 01A-A1Q2	1180	29-27163-01
FRU119	A02	Read Clock and Format Card 01A-A1S2	1110	29-27112-01
FRU120	A02	Buffer Adapter Card 01A-A1K2	1200	29-27150-01
FRU121	A02	Status Store Basic Card 01A-A1G2	1110	29-27164-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N
FRU122	A02	Status Store Communication Card 01A-A1F2	1110	29-27147-01
FRU123	A02	Read Skew Buffer Card 1 01A-A2K2	1110	29-27093-01
FRU124	A02	Read Skew Buffer Card 2 01A-A2L2	1110	29-27093-01
FRU125	A02	Read Skew Buffer Card 3 01A-A2M2	1110	29-27093-01
FRU126	A02	Power/POR Card 01A-A2H4	1260	29-27174-01
FRU127	A03	Latch Interlock	1270	29-27081-01
FRU129	A03	Physical Address Switch	1290	29-27062-01
FRU133	A02	Channel Adapter Card (Channel A) 01A-A2C2	1110	29-27166-01
FRU134	A02	Control Store Card 01A-A1C2	1110	29-27165-01
FRU135	A02	Control Storage Array Card 01A-A1B2	1110	29-27168-01
FRU138	A02	V Regulator Card 01A-A1T2	1260	29-27171-01
FRU139	A02	Logic Board A1	1390	29-27113-01
FRU140	A02	Logic Board A2	1400	29-27114-01
FRU141	A02	Tape Control Unit Switch Panel Card (includes Offline Indicator, IML Switch, Normal/Test Switch, TCU0/TCU1 Switch, Tape Control Unit Online /Offline Switch)	1410	29-27472-01
FRU142	A02	Tape Control Unit Operator Panel Printed Circuit Board (includes Power On/Off Switch, and Power Indicator)	1420	29-27482-01
FRU143	A02	Thermal Switch (TCU Gate) Lower	1430	29-27076-01
FRU144	A02	AC Power Supply	1440	29-27086-0 (60 HZ / 50 HZ J) 29-27087-01 (50 HZ)
FRU145	A02	DC Power Supply	1450	29-27072-01 (50 HZ) 29-27073-01 (60 HZ) (50 HZ JAPAN)
FRU146	A	AC Fuse F1 +24V	1460	
FRU147	A02	DC Fuse F1 +8.5V	1470	
FRU148	A02	DC Fuse F2 +24V	1470	
FRU149	A02	AC Line Cord	1490	
FRU150	A02	Blower Assembly 1	1500	29-27060-01
FRU151	A02	Blower Assembly 2	1500	29-27060-01
FRU152	A02	Channel Adapter Card (Channel B) 01A-A2D2	1110	29-27166-01
FRU155	A02	Thermal Switch Cable	150	
FRU156	A02	Power Bus Cable	150	
FRU157	A02	Top Card Connector WKL	1570	
FRU158	A02	Top Card Connector XKL	1570	
FRU159	A02	Top Card Connector YKL	1570	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU160	A02	DC Power Supply to Gate TB Cable	1600	
FRU161	A03	Cleaner Block	1610	29-27061-01
FRU162	A02	Service Switch	1620	29-27103-01
FRU164	A02	GTE DC Distribution Cable Assembly	150	
FRU165	A02	Gate Fan Cable	1650	
FRU166	A02	AC Power Supply to DC Power Supply Cable	150	
FRU167	A02	Power Bus Cable	150	
FRU168	A02	Tape Control Unit Switch Panel to Gate Cable	150	
FRU169	A02	A1Y1 to MD Connector Cable	150	
FRU170	A02	STI-FIPS I/O Tag Cable (Channel A)	150	
FRU171	A02	STI-FIPS I/O Bus Cable	150	
FRU173	A02	Channel A,B Address Cable	150	
FRU175	A02	Read Bus Cable - Single TCU	150	
FRU176	A02	TCU AC Control Switch Panel Cable	150	
FRU177	A02	AC Power to Gate Cable	1770	
FRU178	A02	A1S2W to A2V2 Cable	150	
FRU179	A02	Power Bus Cable	150	
FRU180	A02	Top Card Connector ZCD	1570	
FRU181	A02	Top Card Connector P2Y	1570	
FRU182	A02	Top Card Connector WE	1570	
FRU183	A02	Top Card Connector WCD	1570	
FRU184	A02	Top Card Connector ZPO	1570	
FRU185	A02	Top Card Connector XRS	1570	
FRU186	A02	Top Card Connector YRS	1570	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU187	A02	Top Card Connector ZFG	1570	
FRU188	A02	Top Card Connector ZKL	1570	
FRU189	A02	Top Card Connector WFG	1570	
FRU190	A02	Top Card Connector XFG	1570	
FRU191	A02	Top Card Connector YFG	1570	
FRU192	A02	Top Card Connector XCDE	1570	
FRU193	A02	Top Card Connector YCDE	1570	
FRU194	A02	IML Diskette Drive Cable (Drive to 01A-A1A3)	150	29-27160-01
FRU197	A02	Channel Address Switch (Channel A, Channel B)	1970	29-27063-01
FRU198	A02	UEPO Switch	1980	29-27064-01
FRU199	A02	Write Bus Terminator	1995	29-27173-01
FRU200	A03	Write Adapter A Cable (TCU to Drive 0 P1WB1)	490	
FRU201	A03	Write Adapter A Cable (Drive 0 P1WB2 to Drive 1 P1WB1)	490	
FRU202	A03	Write Adapter B Cable (TU-D1-P1WB2 to TU-D1-P2B2)	490	
FRU203	A03	Write Adapter B Cable (A1A4 to P1WB1)	490	
FRU204	A03	Write Adapter A Cable (A1A5 to P1WB2)	490	
FRU205	A03	Write Adapter A Cable (TCU to Drive 0 P1WA1)	490	
FRU206	A03	Write Adapter A Cable (Drive 0 P1WA2 to Drive 1 P1WA1)	490	
FRU207	A03	Write Adapter A Cable (TU-D1-P1WA2 to TU-D1-P2A2)	490	
FRU208	A03	Write Adapter A Cable (A1A2 to P1WA1)	490	
FRU209	A03	Write Adapter A Cable (A1A3 to P1WA2)	490	
FRU210	A03	Message Display Cable	490	
FRU211	A03	Message Display Cable	2110	
FRU212	A03	Vacuum Supply Hose	2120	29-27156-01
FRU213	A03	Message Display Board to Message Display Switch Board Cable	2130	
FRU214	A02	STI-FIPS I/O Tag Cable (Channel B)	150	
FRU215	A03	Tape Lifter Solenoid Input Hose	2150	29-27097-01
FRU216	A03	Tape Lifter Solenoid	2160	29-27111-01
FRU217	A02	A2Z2 to Gate TB2 Cable	150	
FRU218	A03	AC Power Circuit Breaker	2180	29-27176-01 (60 HZ / 50 HZ J) 29-27178-01 (50 HZ)
FRU219	A03	Vacuum Distribution Tee	2190	29-27065-01
FRU223	A03	Convoluted Bellows	2230	29-27177-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU224	A02	Thermal Switch (TCU Gate) Upper	2240	29-27076-01
FRU225	A03	Machine Reel Tach Sensor A	2250	
FRU226	A03	Machine Reel Tach Sensor B	2260	29-27096-01
FRU227	A03	Machine Reel Tape Guide	2270	29-27478-01
FRU228	A03	Head Tape Guide (Left)	2280	29-27479-01
FRU229	A03	Head Tape Guide (Right)	2290	29-27477-01
FRU230	A03	Tension Transducer Tape Guide	2300	29-27100-01
FRU231	A03	Center Tape Guide	2310	29-27478-01
FRU232	A03	Cartridge	2320	
FRU242	A02	STI-FIPS I/O Bus Cable (Channel B)	150	
FRU249	A02	A1Z1-A2Y1 Cable	158	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU250	A02	A1Z2-A2Y2 Cable	158	
FRU251	A02	A1Z3-A2Y3 Cable	158	
FRU252	A02	A1Z4-A2Y4 Cable	158	
FRU253	A02	A1Z5-A2Y5 Cable	158	
FRU254	A02	A1Z6-A2Y6 Cable	158	
FRU255	A02	A1A5-A2A5 Cable	158	
FRU256	A02	A1V3-A2V5 Cable	158	
FRU258	A02	IML Diskette	2580	
FRU260	A02	TCU to TCU Read Cable - Remote	150	
FRU261	A02	TCU to TCU Write Cable - Remote	150	
FRU262	A03	Air Pressure Test Port Hose Assembly	2620	29-27146-01
FRU263	A03	Vacuum Test Port Hose Assembly	2630	29-27144-01
FRU267	A03	Top Card Connector (TCC) B2X	660	
FRU268	A03	Top Card Connector (TCC) B2Y	660	
FRU270	A03	Interposer Signal Cable 02A-A1Y3 to P1-J2	490	
FRU272	A02	Load Resistor Card 01A-A2P2	1110	29-27471-01
FRU277	A03	Head Compliant Guide	2770	29-27109-01
FRU278	A02	Read Detect Card 01A-A2Q2	1110	29-27149-01
FRU279	A02	Load Box	2790	
FRU280	A03	Fuse 13 +5V dc Drive 0, Fuse 14 +5V dc Drive 1	960	
FRU281	A03	Loader Control Card	2810	29-27161-01
FRU282	A03	Load Assembly	2820	29-27172-01
FRU283	A03	Load Motor	2830	29-27091-01
FRU284	A03	Load Motor Complete Sensor	2840	29-27122-01
FRU285	A03	Loader Mechanical Assembly	2850	29-27473-01
FRU286	A03	Loader Signal Cable	2860	
FRU287	A03	Loader Power Cable	2860	
FRU288	A03	Loader Fuse +24V dc	2880	
FRU289	A03	Stack Low Position Sensor	2890	29-27130-01
FRU290	A03	Input Stack Assembly	2900	29-27092-01
FRU291	A03	Cartridge In Stack Sensor	2910	29-27122-01
FRU292	A03	Cartridge Staged Sensor	2920	29-27132-01
FRU293	A03	Left Input Rail Assembly	2930	29-27128-01
FRU294	A03	Right Input Rail Assembly	2940	29-27129-01
FRU295	A03	Feed Assembly	2950	29-27123-01
FRU296	A03	Stack Up Position Sensor	2960	29-27122-01
FRU297	A03	Output Stack Assembly	2970	29-27125-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU298	A03	Loader Operator Panel	2980	29-27126-01
FRU299	A03	Loader Fuse +5V dc	2880	
FRU300	A03	Feed Assembly Motor	3000	
FRU900	A02	STI-FIPS Adapter (L)	9000	
FRU901	A02	STI-FIPS Adapter (R)	9000	
FRU903	A02	Power Supply STI	9030	29-27409-01
FRU904	A02	STI Gate Fans	9040	29-27474-01
FRU905	A02	STI AC Interlock Thermal	9050	29-27059-01
FRU906	A02	STI DC Interlock Thermal	9060	29-27070-01

FRU Name	FRU No.	Page
AC		
Fuse 1 - 24 V ac	146	1460
Line Cord	149	1490
Power Supply	144	1440
BOARD		
Tape Control Unit Switch Panel	141	1410
Printed Circuit		
Logic A1	139	1390
Logic A2	140	1400
Op Panel Printed Circuit	142	1420
CABLE		
AC Line Cord	149	1490
AC Power to Gate	177	1770
AC Power Supply to DC Power Supply	166	150
A1A5 to A2 A5	255	150
A1S2W to A2V2	178	150
A1V3 to A2V5	256	150
A1V5 to A2V3	015	150
A1Y1 to MD Connector	169	150
A1Z1 to A2Y1	249	150
A1Z2 to A2Y2	250	150
A1Z3 to A2Y3	251	150
A1Z4 to A2Y4	252	150
A1Z5 to A2Y5	253	150
A1Z6 to A2Y6	254	150
CAF Feature	273	150
Channel A/B Address	173	150
Tape Control Unit Switch Panel Voltage	176	150
Tape Control Unit Switch Panel to Gate	168	150
Tape Control Unit to Tape Control Unit Read - Remote	260	150
Tape Control Unit to Tape Control Unit Write - Remote	261	150
DC Distribution	164	150
DC Power to Gate TB	160	1600
Device Data Bus - Local	029	150
Device Data Bus - Remote	026	150
Device Data Bus - Remote	027	150
Gate Fan	165	1650
STI-FIPS I/O Bus (Channel A)	171	150
STI-FIPS I/O Bus (Channel B)	242	150
STI-FIPS I/O Tag (Channel A)	170	150
STI-FIPS I/O Tag (Channel B)	214	150
IML Diskette Drive	194	150
Power Bus	048	150
Power Bus	091	150
Power Bus	097	150
Power Bus	103	150
Power Bus	167	150
Power Bus	179	150
Power Bus (UEPO Switch)	156	150
Read Bus - Local	175	150
Read Bus - Remote	022	150
Read Bus - Remote	024	150
Read Bus - Remote	025	150
Remote Exit - 2 TCU	217	150
Status Store - 2 TCU	056	150
Thermal Switch	155	150
CARD		
Buffer Adapter (A1K2)	120	1200
Buffer Control (A1L2)	114	1110
Buffer Memory Reference	276	1110
Buffer Memory Card (A1M2)	113	1110
Channel A Adapter (A2C2)	133	1110
Channel B Adapter (A2D2)	152	1110
Control Storage Array Card (A1B2)	135	1110
Control Storage (A1C2)	134	1110
Drive-Adapter (A1Q2)	118	1180
Load Resistor Card (A2P2)	272	1110
Maintenance Adapter (A1E2)	115	1110
Microprocessor (A1D2)	117	1110
POR (Power On Reset) (A2H4)	126	1260
Read Clock and Format (A1S2)	119	1110
Read Detect Card (A2Q2)	278	1110
Read ECC/Correction (A1R2)	111	1110
Read Skew Buffer 1 (A2K2)	123	1110
Read Skew Buffer 2 (A2L2)	124	1110
Read Skew Buffer 3 (A2M2)	125	1110
Regulator (A1T2)	138	1260
Status Store (A1G2)	121	1110
STI-FIPS Adapter (L)	900	9000
STI-FIPS Adapter (R)	901	9000
Store Status Communicator (A1F2)	122	1110
Voltage Regulator (A1T2), POR (A2H2)	138	1260
Write Data Flow (A1P2)	116	1110
TCU Address Switch	197	1970
TCU Switch Panel Printed Circuit Board	141	1410
DC		
Load Box	279	2790
Fuse F1 - 8.4 V dc	147	1470
Fuse F2 - 24 V dc	148	1470
Power Supply	145	1450
Diskette Drive - IML	086	860
Diskette	258	2580
IML Diskette Drive	086	860
Local/Remote Power Panel	084	840
Logic Board A1	139	1390
Logic Board A2	140	1400
Op Panel Printed Circuit Board	142	1420
Power Panel - Local/Remote	084	840
Power Supply - AC	144	1440
Power Supply - DC	145	1450
Power Supply - STI	903	9030
SWITCH		
TCU Address	197	1970
Local/Remote (Power Panel)	084	840
Service Assembly	162	1620
Thermal (TCU Gate) Lower	143	1430
Thermal (TCU Gate) Upper	224	2240
UEPO (Unit Emergency Power Off)	198	1980
Terminator Write Bus TCU0 (Local)	199	1995
Terminator Write Bus TCU0 (Remote)	248	1995
Terminator Write Bus TCU1 (Local)	264	1995
Terminator Write Bus TCU1 (Remote)	265	1995
TOP CARD		
Connector A1WCD	183	1570
Connector A1E2W	182	1570
Connector A1WFG	189	1570
Connector A1WKL	157	1570
Connector A1XCDE	192	1570
Connector A1XFG	190	1570
Connector A1XKL	158	1570
Connector A1XRS	185	1570
Connector A1YCDE	193	1570
Connector A1YFG	191	1570
Connector A1YKL	159	1570
Connector A1P2Y	181	1570
Connector A1YRS	186	1570
Connector A1ZCD	180	1570
Connector A1ZFG	187	1570
Connector A1ZKL	188	1570
Connector A1ZPQ	184	1570
UEPO (Unit Emergency Power Off) Switch	198	1980
Write Bus Terminator TCU0 (Local)	199	1995
Write Bus Terminator TCU0 (Remote)	248	1995
Write Bus Terminator TCU1 (Local)	264	1995
Write Bus Terminator TCU1 (Remote)	265	1995

FRU Listing by Alphabetical Sequence - Tape Control Unit

Introduction

This section contains the removal and replacement procedures for all field-replaceable units (FRUs) in the TA90 Tape Subsystem. Checks and adjustment procedures are also included

CARR Layout

CARR-TCU 1-1 through 1-5 contain a complete FRU list for the tape control unit and tape transport unit. An error code or FRU number that is displayed on the CE panel will refer to this FRU list. The corresponding procedure should be performed. The FRU removal procedure is given first and the FRU replacement procedure immediately follows for the same FRU. All procedures are shown in a step-by-step method with keyed reference to views

Common Procedures

Procedures for cover removal and replacement are described on CARR-TCU 2-1 and 2-2. You will be sent to these common procedures by the FRU removal and replacement procedures.

Read through the complete procedure before performing it, and give attention to caution and danger notes.

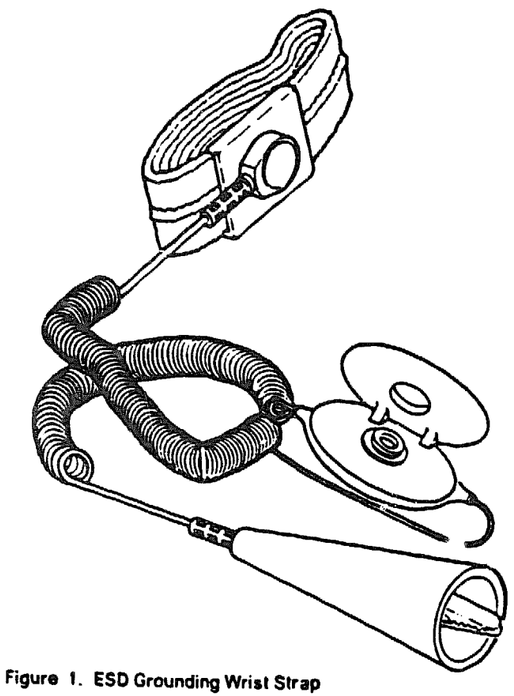


Figure 1. ESD Grounding Wrist Strap

Instructions for Working with ESD-Sensitive Parts

To prevent damage when you work with electrostatic discharge (ESD) sensitive parts, observe the following instructions. These instructions are in addition to all the usual precautions:

- ESD-sensitive parts that are shipped in a special ESD bag should be left in this bag until you are ready to immediately install them into the machine.
- Before touching the ESD-sensitive part, put on the ESD Grounding Wrist Strap on either wrist. This strap has a high resistance (1 megohm) resistor in series with the grounding clip, so there is no danger to you. It discharges the static electricity from your body. Connect the clip to the flex ground strap of the gate to the frame. Keep the strap on while you are inserting or removing a logic card or handling any ESD-sensitive part.
- Do not place the ESD-sensitive part on the machine cover or on a metal table. If you need to put down the ESD-sensitive part for any reason, first put it into its special bag. (Large metal objects can be discharge paths without being grounded.)
- Prevent ESD-sensitive parts from being touched by other personnel, such as service representatives or customers. Reinstall all covers when you are not working on the machine.
- If possible, keep all ESD-sensitive parts in a grounded metal cabinet (case).
- Be extra careful in working with ESD-sensitive parts when cold-weather heating is used. Heating of cold air lowers the relative humidity, which increases the static electricity.

CAUTION:
When wearing the ESD Grounding Wrist Strap, ensure that the flex ground strap remains connected. Failure to do this creates a safety exposure in the same manner as wearing jewelry while working on live exposed electrical circuits.

Use the most current Digital part number available for the ESD Grounding Wrist Strap.

The following is a list of the ESD-sensitive parts in the TA90 subsystem:

- All of the logic cards in the tape control unit and the drives
- Message display card in the drives
- Transducer FRU in the drives.

Tape Control Unit Cover and Safety Cover Removal

This page contains the steps needed for removing any of the tape control unit covers.

Tape Control Unit Front or Rear Cover Removal

The tape control unit front and rear covers are held closed by a latch assembly.

To open the front cover, push on the left center to release the latch. To open the rear cover, insert a small screw driver into the slot in the right center of the cover and push to the left to release the latch.

1. Press in on the cover in the area shown [1].
2. Remove the grounding strap from the cover.
3. Open the cover far enough to get access to the hinge pins [5].
4. Lift the hinge pins out of the hinges and remove the cover from the tape control unit.
5. Return to the procedure that sent you here.

Tape Control Unit Top Cover Removal

1. Open the rear cover.
2. Release the two rear latch screws [6] (these are captive screws).
3. Pivot the top cover on its front locating tabs and brackets [7] by lifting the cover from the rear of the tape control unit.
4. Lift the front locating tabs from the brackets and remove the top cover from the tape control unit.
5. Return to the procedure that sent you here.

Tape Control Unit Side Cover Removal

The tape control unit side covers are held at the top by two tabs [2] which slide into slots in the tape control unit frame. The bottom is held in place by a latch assembly.

1. To open the side cover, insert a small screw driver into the slot in the bottom center of the cover and push upward to release the latch.
2. Pull the bottom of the cover away from the tape transport unit, then lift the cover straight up and out of the brackets attached to the tape transport unit frame.
3. Return to the procedure that sent you here.

Tape Control Unit Front Safety Cover Removal

The front safety cover is held in the tape control unit frame with four sliding brackets [3]. It is not necessary to loosen all of them to remove the cover.

1. Loosen the left and right side brackets and slide them toward the inside of the safety cover.
2. Remove the grounding strap from the cover.
3. Lift the safety cover up and out of the tape control unit.
4. Return to the procedure that sent you here.

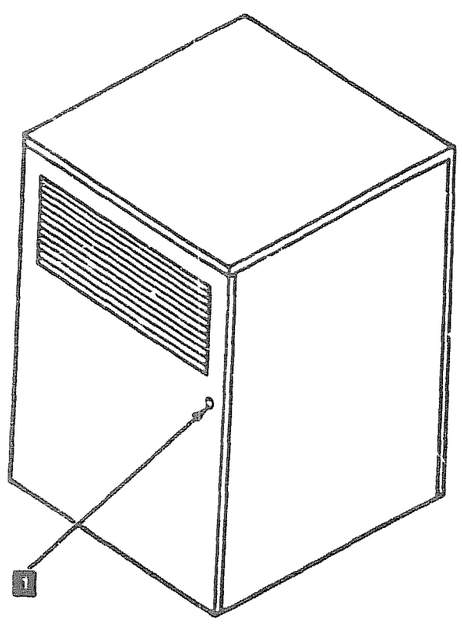
Tape Control Unit Rear Safety Cover Removal

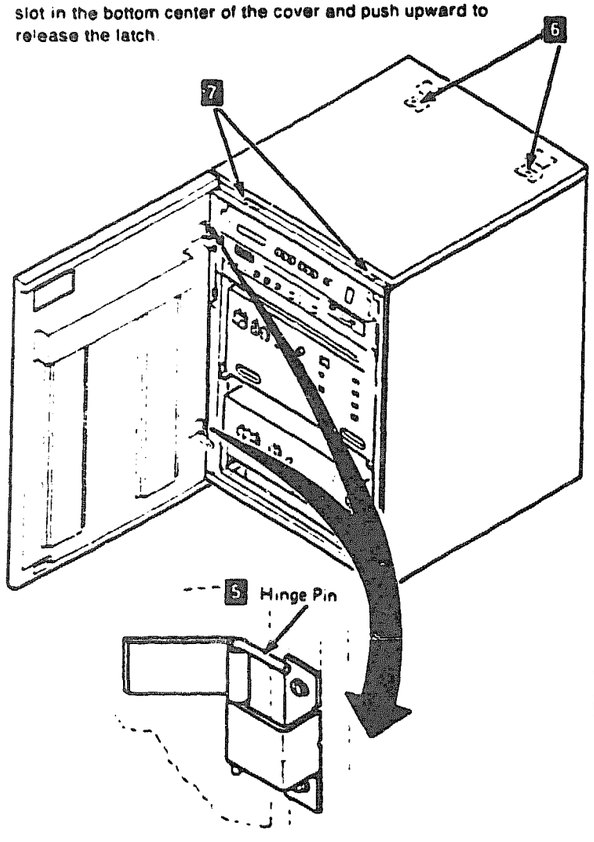
The rear safety cover is held in the tape control unit frame with three sliding brackets [4]. It is not necessary to loosen all of them to remove the cover.

1. Remove the grounding strap from the cover.
2. Loosen the left bracket bolt, slide the bracket in, and at the same time pull the left side of the safety cover out and away from the tape control unit.
3. Return to the procedure that sent you here.

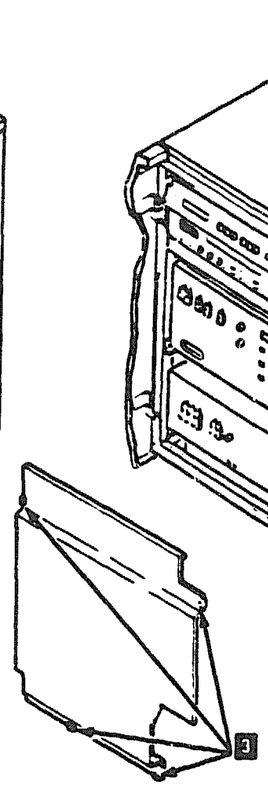
Drip-Screen Guard Removal

1. Loosen the two screws that attach the guard to the I/O tailgate. Slide the guard to the left and lift off the rear frame member.
2. Return to the procedure that sent you here.

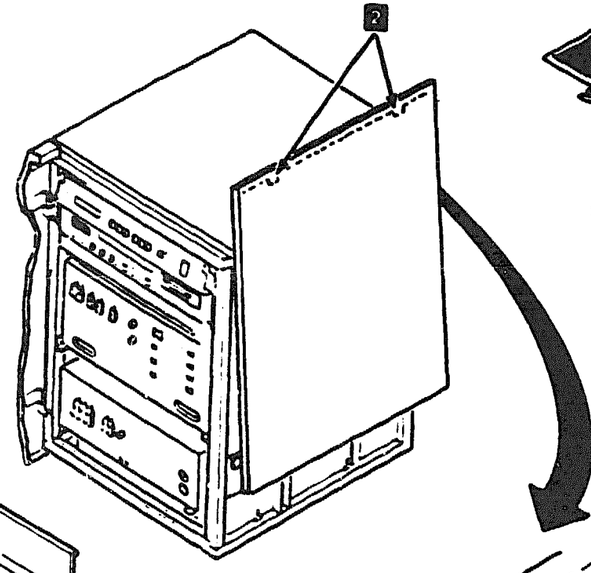


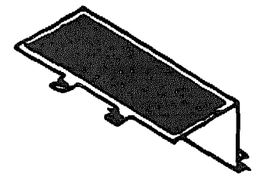


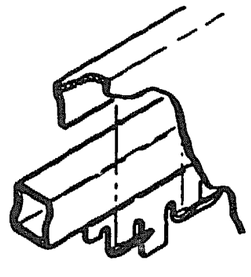
Hinge

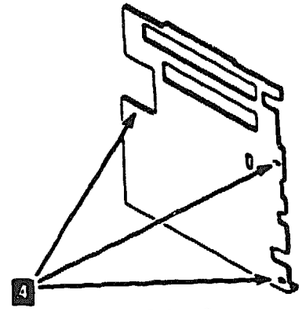


Front Safety Cover




Drip-Screen Guard





Rear Safety Cover

Tape Control Unit Cover and Safety Cover Installation

This page contains the steps needed to reinstall any of the tape control unit covers.

Tape Control Unit Front or Rear Cover Replacement

1. Move the cover into position near the hinges. Align the hinges of the door and the tape control unit 1 and insert the pins one at a time.
2. Reconnect the grounding strap to the cover.
3. Close the cover until it is held by the latch.
4. Return to the procedure that sent you here.

Tape Control Unit Front Cover Adjustment

Note: The tape control unit front cover must be adjusted so that it does not open to the casual or incidental touch. The cover should only open by the use of an intentional force in the proper area.

When the tape control unit front cover is adjusted correctly, the IML diskette drive should be parallel to the front cover and extend through the front cover approximately 2 mm (5/64 inch) (check the parallel adjustment with your six-inch straight edge).

1. As a starting point, loosen the two latch assembly holding screws and position the front of the latch assembly 7 to extend approximately 2 mm (5/64 inch) beyond the front of the side-frame.
2. Partially close the front cover and ensure that the catch mechanism 8 aligns with the latch assembly.
3. Close the front cover to ensure that it will stay closed with the latch assembly in this position (2 mm beyond the front side-frame).
4. Continue the adjustment by changing the 2 mm adjustment (distance from the front side-frame to the latch assembly) until the IML diskette drive is parallel (approximately) to the front cover and extends through the front cover approximately 2 mm (5/64 inch) (check the parallel adjustment with your six-inch straight edge).
5. Tighten the two latch assembly holding screws.
6. Return to the procedure that sent you here.

Drip-Screen Guard Replacement

1. Slide the guard over the rear frame member and to the right under the two screws on the I/O tailgate. Tighten the two screws.
2. Return to the procedure that sent you here.

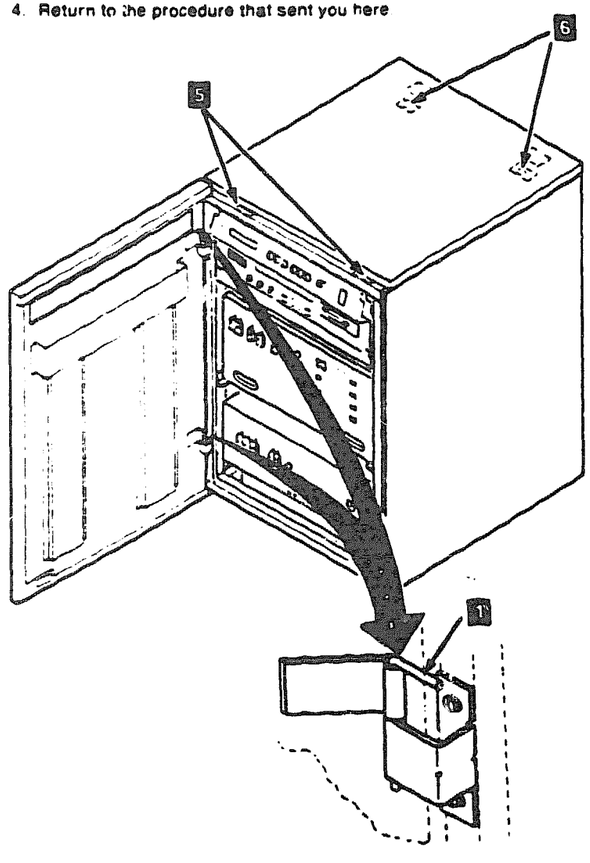
Tape Control Unit Top Cover Replacement

1. Replace the top cover by inserting the front locating tabs into the brackets 5.
2. Pivot the rear of the cover down and latch into position with the two captive screws 6.
3. Return to the procedure that sent you here.

Tape Control Unit Side Cover Replacement

The side covers are held by two tabs 2 at the top that fit into slots in the tape control unit frame, and by a latch assembly at the bottom.

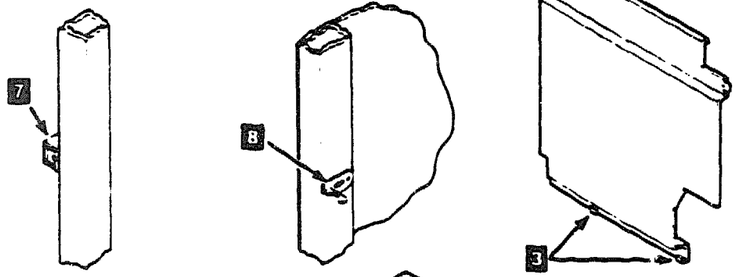
1. Lower the cover onto the tape control unit frame so the two tabs on the cover move into the slots in the tape control unit frame.
2. Reconnect the grounding strap to the cover, if present.
3. Continue to lower the cover, and at the same time move the cover bottom toward the tape control unit until it is held by the latch.
4. Return to the procedure that sent you here.



Tape Control Unit Front Safety Cover Replacement

It will be easier to install the safety cover if the bottom brackets are extended.

1. Check to see if the bottom brackets 3 are extended as far as possible. If not, loosen the bolts and move the brackets out as far as you can, then tighten the bolts.
2. Lift the cover into the tape control unit, setting the two bottom brackets into the holes in the tape control unit frame.
3. Continue to push the cover into the tape control unit until the left and right brackets are aligned with the holes in the tape control unit.
4. Reconnect the grounding strap to the cover.
5. Loosen the bracket bolts, slide the brackets into the tape control unit frame, and tighten the bracket bolts.
6. Return to the procedure that sent you here.

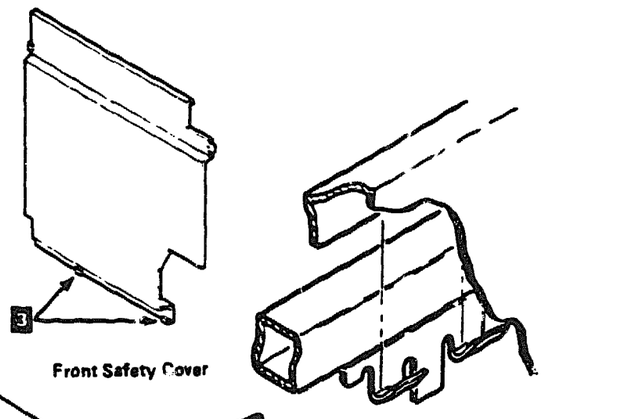


Front Safety Cover

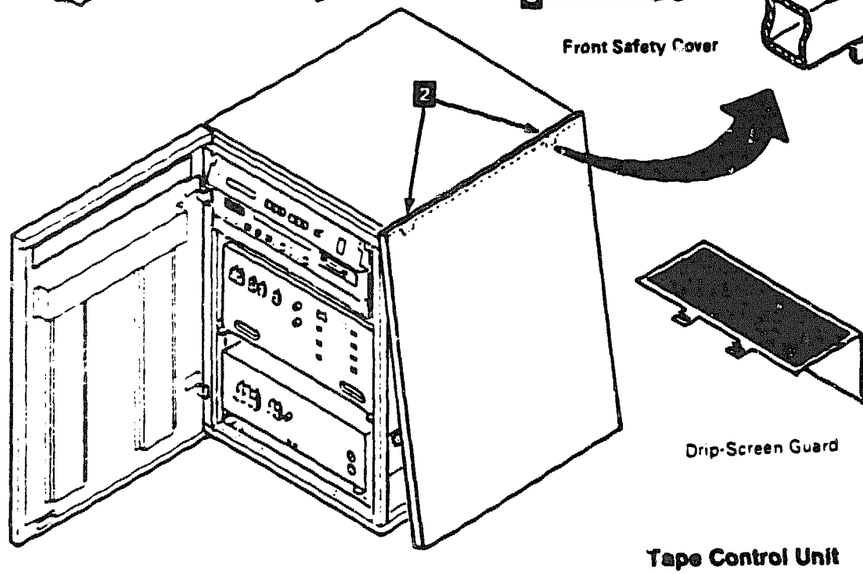
Tape Control Unit Rear Safety Cover Replacement

It will be easier to install the safety cover if the right side brackets 3 are extended.

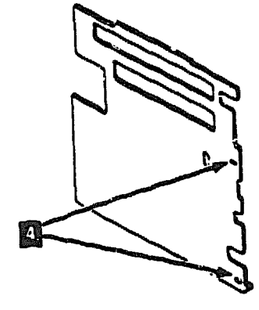
1. Check to see if the two right side brackets are extended out as far as possible. If not, loosen the bracket bolts and slide the brackets out as far as you can, then tighten the bolts.
2. Lift the cover into the tape control unit, inserting the two right side brackets into the holes of the tape control unit frame.
3. Continue pushing the cover in until the left side bracket is aligned with the hole in the tape control unit frame.
4. Reconnect the grounding strap to the cover.
5. Loosen the bracket bolt, slide the bracket into the hole in the tape control unit frame, then tighten the bolt.
6. Return to the procedure that sent you here.



Front Safety Cover



Drip-Screen Guard



Rear Safety Cover

Tape Control Unit Offline Verification Procedure

This page contains the steps needed to verify, and if necessary to dismount and deallocate all tape control units.

Getting Started

1 First, if you haven't already done so, try to take the tape control unit offline using the following procedure:

   a Set the tape control unit Online Test/Offline Test switch to Offline (see LOC 1)

   b Wait (up to a minute) for the tape control unit Offline light to come on (see LOC 1)

   If the tape control unit Offline light comes on, return to the procedure that sent you here.

2 If the tape control unit Offline light fails to come on within a minute, proceed as follows:

   - Ensure that none of the adapters are stopped. (The middle LED on both adapters should be blinking.)

   If the tape control unit Offline light comes on, return to the procedure that sent you here.

   If an adapter has stopped, IML the TCU.

3 If the tape control unit Offline light fails to come on within a minute, and neither adapter has stopped, proceed as follows:

   With the meter set on the 10 volt scale, meter the offline light (from - at 01A-A2B2D08 to + at 01A-A2A4D09).

   Is the meter reading greater that 1 volt?

```
YES NO
 |   |
 |   With the meter set on the 10 volt
 |   scale, meter the TCU Offline Test
 |   switch (from - at 01A-A2B2D08 to +
 |   at 01A-A2A4D07).
 |
 |   Does the meter read 5 volts
 |   +/- .5 volt?
 |   YES NO
 |    |   |
 |    |   The TCU Offline Test switch is
 |    |   shorted in the Online position.
 |    |   Proceed to step 4 to put the
 |    |   tape control unit
 |    |   into a serviceable condition.
 |    |
 |   The TCU Offline switch and light
 |   are alright.  Proceed to step 4.
 |
This tape control unit is actually offline.
The Offline light is open.  Power off the
tape control unit and replace FRU 141, Control
Unit Operator Setup Panel (see CARR-TCU 1-1).
Return to the procedure that sent you here
and continue with the next step of that
procedure.
```

4 Inform the customer that you will need the entire subsystem to complete the repair action.

5 When you have been given the subsystem, verify with the customer that all paths to the subsystem are offline to the host processors.

6 Ignore the status of the Offline light. There is no host activity to this subsystem.

7 If the Offline switch was indicated shorted in step 3 above, power off the tape control unit (see CARR-TCU 6) and replace FRU 141, Tape Control Unit Operator Setup Panel (see CARR-TCU 1-1).

8 Return to the procedure that sent you here and continue with the next step of that procedure.

Tape Control Unit Power Off and Power On Procedures

This page contains the steps needed to remove and restore power to the tape control unit of the TA90 Tape Subsystem.

To power Off first complete the "Power Off Procedure" on this page, then go to the desired section.

- AC Power Off
- DC Power Off

To power On go to the desired section.

- AC Power On
- DC Power On

Power Off Procedure

1. Verify that all paths to the failing tape control unit are deallocated from the operating systems.
2. Verify that all paths from any other tape control unit to drives on the failing tape control unit are deallocated from the operating systems.
3. Set the failing tape control unit Online Test/Offline Test switch to Offline Test (see LOC 1).
4. Wait (up to a minute) for the tape control unit Offline Test light to come on (see LOC 1). If the light comes on, continue with this procedure.

   If the tape control unit Offline Test light fails to come on within a minute, go to CARR-TCU 5 and do the procedure for tape control unit offline verification, return here when finished.

AC Power Off

Note: When the ac power is removed from the tape control unit, the ac power is also removed from all attached drives.

1. Verify that all paths from any other tape control unit to drives on the failing tape control unit are deallocated from the operating system.
2. If there is a cartridge in any drive, remove it using the following three steps:
   a. Set the drive Ready/Not Ready switch to Not Ready (see LOC 1).
   b. Press the drive Unload switch (see LOC 1).
   c. Remove the cartridge from the drive. If the cartridge cannot be removed, go to "Cartridge Removal By Hand" on CART 10, return here after the cartridge has been removed.
3. Disable the ports to the HSC.
4. If the subsystem power is normally controlled by an emergency power off (EPO) cable, set the tape control unit Local/Remote switch (see LOC 1) to the Local position.
5. Set the tape control unit Power On/Off switch (see LOC 1) to the Off position.
6. Open the tape control unit front cover and remove the front safety cover and ground connector, if present (see CARR-TCU 2-1).
7. The next step will remove power from the convenience outlet.

   DANGER

   Electric shock. When setting the tape control unit AC Power circuit breaker Off, hazardous voltages are still present on the AC Power circuit breaker and on the AC Power line cord.

8. Set CB1 on the tape control unit ac power supply to Off (see LOC 1). There are two CB1s in the tape control unit, so do not confuse CB1 on the ac supply with CB1 on the dc supply.
9. Return to the procedure that sent you here.

AC Power On

1. Set CB1 on the tape control unit ac power supply (see LOC 1) to On.
2. Press the Local Power switch (see LOC 1).
3. Set the Power On/Off switch (see LOC 1) to the On position.
4. Press the unit emergency power reset switch (see LOC 1).
5. Press the tape control unit IML switch (see LOC 1) to IML and initiate a Power On Reset (POR).
6. If the subsystem power is normally controlled by an emergency power off (EPO) cable, set the Local/Remote switch (see LOC 1) to the remote position.
7. Replace the front safety cover and ground connector, if present (see CARR-TCU 2-2).
8. Close the tape control unit front cover (see CARR-TCU 2-2).
9. Continue by selecting one of the following:
   - If you were sent to this procedure by the CE panel, run GMP.
   - If you were sent to this procedure by the Maintenance Guide, return to the MAP or procedure that sent you here.

DC Power Off

1. Disable the ports to the HSC.
2. Open the tape control unit rear cover (see CARR-TCU 2-1).

   Note: The service switch is a three position switch.

   Top = ON

   Middle = POR (Power On Reset)

   Down = OFF.
3. Set the tape control unit service switch to Off (see LOC 1).
4. Return to the procedure that sent you here.

DC Power On

Note: The service switch is a three position switch.

UP = ON

MID = POR (Power On Reset)

DOWN = OFF.

1. Set the tape control unit service switch (see LOC 1) to the MID position for one second, then to the On position.
2. Close the tape control unit rear cover (see CARR-TCU 2-1).
3. Continue by selecting one of the following:
   - If you were sent to this procedure by the CE panel, run GMP.
   - If you were sent to this procedure by the Maintenance Guide return to the MAP or procedure that sent you here.

FRU015 Tape Control Unit Cables Removal and Replacement Procedure

This page is meant only to provide general instructions for removing and replacing tape control unit cables. Any of the cables that are in the tables starting on CARR-TCU 157 can be removed and replaced using these procedures

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Since this procedure requires the ac power to be removed from the tape control unit, it is necessary to have all the drives attached to the tape control unit available.

Removing Tape Control Unit Cables

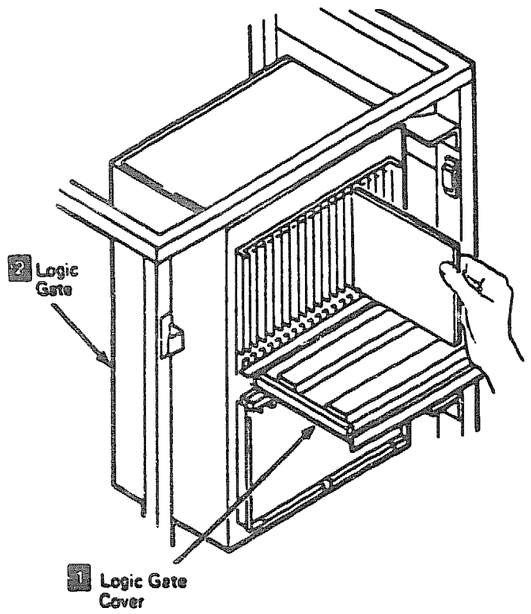
1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the tape control unit rear cover.
3. Remove the tape control unit rear safety cover 6 (see CARR-TCU 2-1).
4. Open the logic gate 2
5. Find the cable "from" and "to" locations using the table beginning on CARR-TCU 157.
6. To remove the cables from the tape control unit, it is necessary to remove some, or all of the following:
   - Logic gate covers 1
   - Logic card retainers 5
   - Top card connectors (TCC) 3
   - Top card cable connectors 4
   - Logic cards
   - Drip screen guard 7 .
7. Disconnect both ends of the cable to be removed.
8. Remove any cable retention hardware as needed to remove the cable.
9. Remove the cable from the tape control unit.

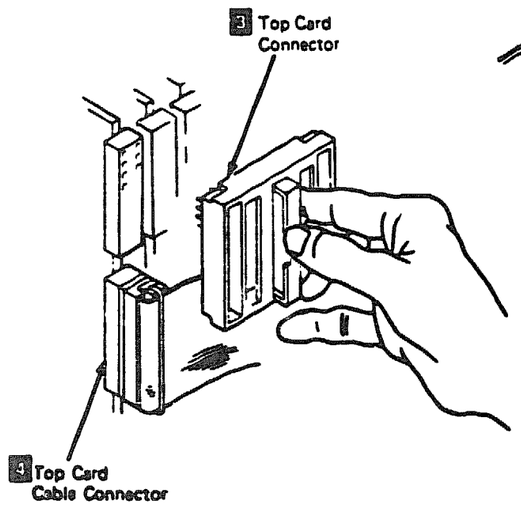
Replacing Tape Control Unit Cables

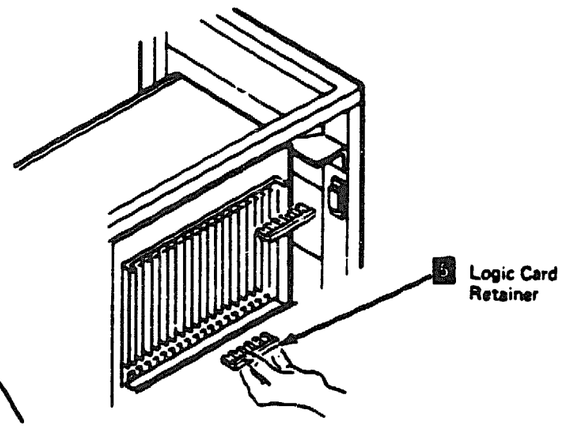
1. Find the cable "from" and "to" locations in the tables starting on CARR-TCU 157.
2. Place the cable in the tape control unit following the same path as the removed cable.

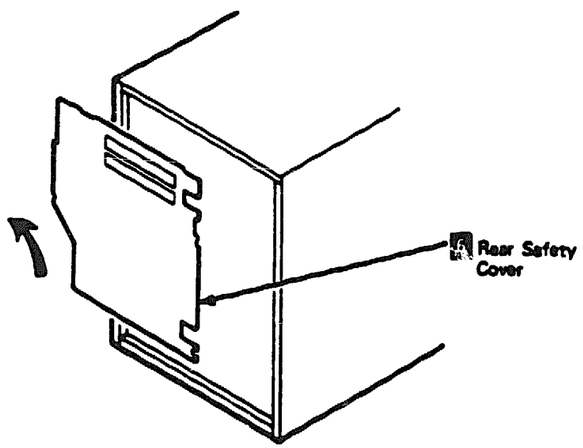
   Install the cable retention (if any) as you install the cable.

   Connect both ends of the cable.
3. Install any of the following items that have been removed:
   - Logic gate covers 1
   - Logic card retainers 5
   - Top card connectors (TCC) 3
   - Top card cable connectors 4
   - Logic cards
   - Drip screen guard 7 .
4. Close the logic gate 2 .
5. Install the rear safety cover 6 (see CARR-TCU 2-2).
6. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.









Tape Control Unit Cable Location Listing

This table shows the FROM and TO locations for each cable listed.

FRU	FRU NAME	FROM	LOC PAGE	TO	LOC PAGE
FRU015	A1V5 to A2V3 Cable	01A-A1V5	15	01A-A2V3	15
FRU022	Read Bus Cable - Local	01A-A2U2	15	CU-P1-A1	25
FRU024	Read Bus Cable - Remote	01A-A2U4	15	CU-P2-A2	25
FRU025*	Read Bus Cable - Remote	CU-P2-A1	25	CU-P1-B1	25
FRU026*	Write Adapter Cable - TCU to Remote Drives	CU-P2-A5	25	01A-A1Y6 01A-A2Z2	15
FRU027	Data Bus Cable - Remote	CU-P2-A3	25	01A-A1Y4 01A-A1Y5	15
FRU028	Write Adapter Cable - TCU Local/Remote	CU-P1-A/B2	25	01A-A1Y5 01A-P2A3	15
FRU029	Data Bus Cable - Local	CU-P1-A2	25	01A-A1Y5	15
FRU048	Power Bus Cable	01A-A1Y2	15	CU-GTE-TB1	25
FRU053	Write Adapter A/B Cable	TU-D1-A1A3 TU-D1-A1A5	15	TU-D1-P2-A/B2	25
FRU056*	Status Store Communication Cable - Dual TCU	01A-A1Y3 01A-A1Y2	25	CU-P2-A4	25
FRU091	Power Bus Cable	01A-A1Y5	15	CU-GTE-TB1	25
FRU097	Power Bus Cable	01A-A1Z5	15	CU-GTE-TB1	25
FRU103	Power Bus Cable	01A-A1Z2	15	CU-GTE-TB1	25
FRU155	Thermal Switch Cable	Gate Thermal	25	CU-CSU-J3	50
FRU156	Power Bus Cable	01A-A2Y5	15	CU-GTE-TB2	25
FRU164	GTE DC Distribution Cable Assembly				
FRU165	Gate Fan Cable	Gate Connector		Gate Fan	30
FRU166	AC Power Supply to DC Power Supply Cable	CU-PS-01-J3	55 or 60	CU-PS-02-J2	35
FRU167	Power Bus Cable	01A-A2Y2	20	CU-GTE-TB2	25
FRU168	Tape Control Unit Switch Panel to Gate Cable	01A-A2A4	20	CU-OSU-J2 CU-OSU-J1	50
FRU169	A1Y1 to MD Connector Cable	01A-A1Y1	20	MD Connector	50
FRU173	Channel A, B Address Cable	01A-A2A2	20	CU-OSU-J8 CU-OSU-J9 CU-OSU-J10 CU-OSU-J11	50
FRU175	Read Bus Cable - Single TCU	01A-A2U2	15	CU-P1-A1	25
FRU176	Tape Control Unit Switch Panel Voltage Cable	CU-PS-01-J4 (J4A and J4B)	55 or 60	CU-OSU-J4, Local/Remote Switch Connectors J1 and J2, TCU OP Panel J5, and TCU UEPO Switch	50
FRU177	AC Power to Gate Cable	CU-PS-02-J3 (J4A and J4B)	35	Gate Connector	
FRU178	A1S2W to A2V2 Cable	01A-A1S2W	20	01A-A2V2	15
FRU179	Power Bus Cable	01A-A2Z5	15	CU-GTE-TB2	25
FRU194	IML Diskette Drive Cable	01A-A1A3	20	IML Diskette Drive	25
FRU217	A2Z2 to Gate TB2 Cable	01A-A2Z2	15	01A-GTE-TB2	25

* This FRU is a part of the communicator feature.

Tape Control Unit Cable Location Listing (Continued)

This table shows the FROM and TO locations for each cable listed.

FRU	FRU NAME	FROM	LOC PAGE	TO	LOC PAGE
FRU249	A1Z1 to A2Y1 Cable	01A-A1Z1	15	01A-A2Y1	15
FRU250	A1Z2 to A2Y2 Cable	01A-A1Z2	15	01A-A2Y2	15
FRU251	A1Z3 to A2Y3 Cable	01A-A1Z3	15	01A-A2Y3	15
FRU252	A1Z4 to A2Y4 Cable	01A-A1Z4	15	01A-A2Y4	15
FRU253	A1Z5 to A2Y5 Cable	01A-A1Z5	15	01A-A2Y5	15
FRU254	A1Z6 to A2Y6 Cable	01A-A1Z6	15	01A-A2Y6	15
FRU255	A1A5 to A2A5 Cable	01A-A1A5	15	01A-A2A5	15
FRU256	A1V3 to A2V5 Cable	01A-A1V3	15	01A-A2V5	15
FRU260	TCU to TCU Read Cable - Remote	CU0-P2A2 CU1-P2A2	25 or 30	CU1-P2A1 CU0-P2A1	25 or 30
FRU261	TCU to TCU Write Cable - Remote	CU0-P2A3 CU0-P2A4 CU0-P2A5	25 or 30	CU1-P2A5 CU1-P2A4 CU1-P2A3	25 or 30
FRU271	Bus Tag Interposer Cable	CU-T1A1P CU-T1B1P CU-T1C1P CU-T1D1P	45	CU-T1A3P CU-T1B3P CU-T1C3P CU-T1D3P	45

FRU084 Local/Remote Power Panel Removal and Replacement Procedure

This page contains the steps needed to remove and replace the Local/Remote power panel in the tape control unit.

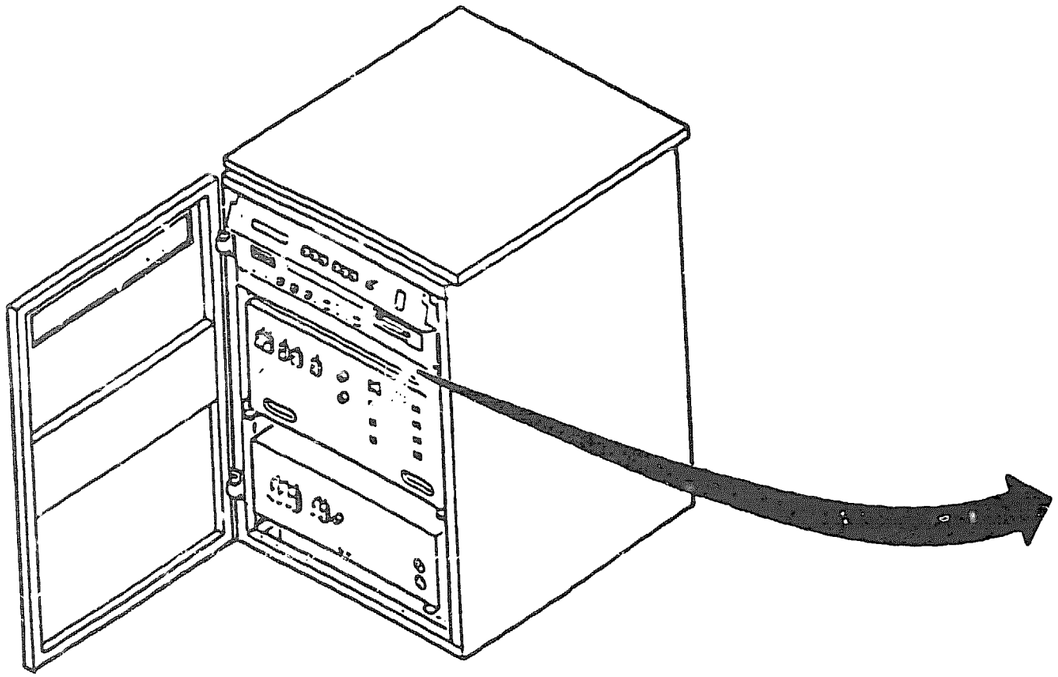
Since this procedure requires the ac voltage to be switched off, it is necessary to have all tape drives attached to the tape control unit available for service.

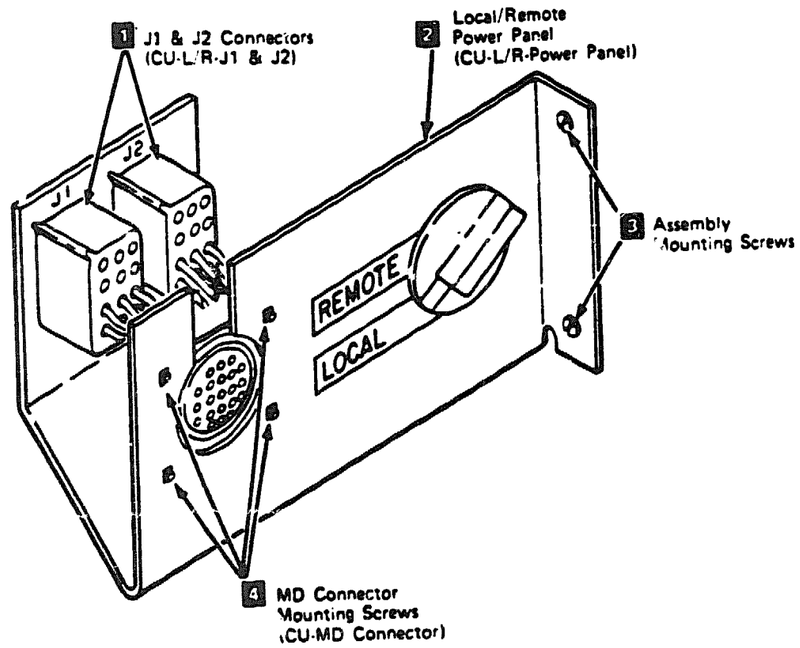
Local/Remote Power Panel Removal Procedure

1. Go to CARR-TCU 6 for the procedure to remove the ac power from the tape control unit.
2. Remove the tape control unit front safety cover (see CARR-TCU 2-1).
3. Remove the four mounting screws 3 holding the maintenance device (MD) connector to the Local/Remote power panel 2. Then remove the connector from the Local/Remote power panel.
4. While holding the Local/Remote power panel, remove the two mounting screws 3 securing the panel to the tape control unit frame.
5. Lower the Local/Remote power panel 2 and remove cable plugs P1 and P2 from the J1 and J2 connectors 1.
6. Remove the Local/Remote power panel 2 from the tape control unit.
7. Save the mounting screws for the replacement procedure.

Local/Remote Power Panel Replacement

1. Install cable plugs P1 and P2 into the J1 and J2 connectors 1 on the Local/Remote power panel 2.
2. Hold the Local/Remote power panel in position and install the two mounting screws 3 securing the Local/Remote power panel 2 to the tape control unit frame.
3. Install the maintenance device (MD) connector on the Local/Remote power panel 2 with the four mounting screws 4.
4. Install the tape control unit front safety cover (see CARR-TCU 2-2).
5. Go to CARR-TCU 6 for the procedure to restore ac power to the tape control unit.





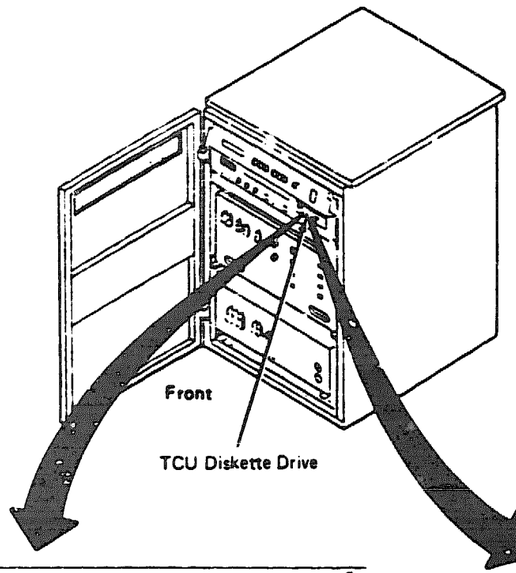
FRU086 IML Diskette Drive Removal and Replacement Procedure

This page contains the steps needed to remove and replace the IML diskette drive in the tape control unit.

Note: This FRU can be removed and replaced without affecting the attached tape transport units by removing dc power from the tape control unit with the service switch.

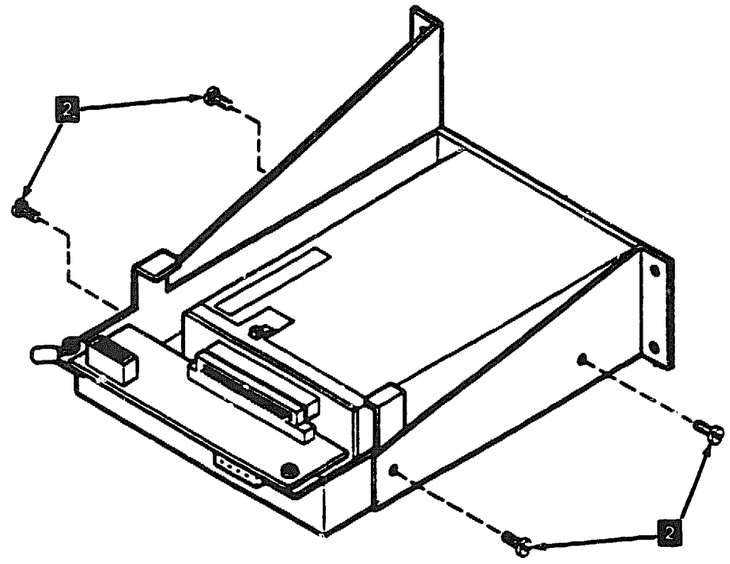
Removing the IML Diskette Drive

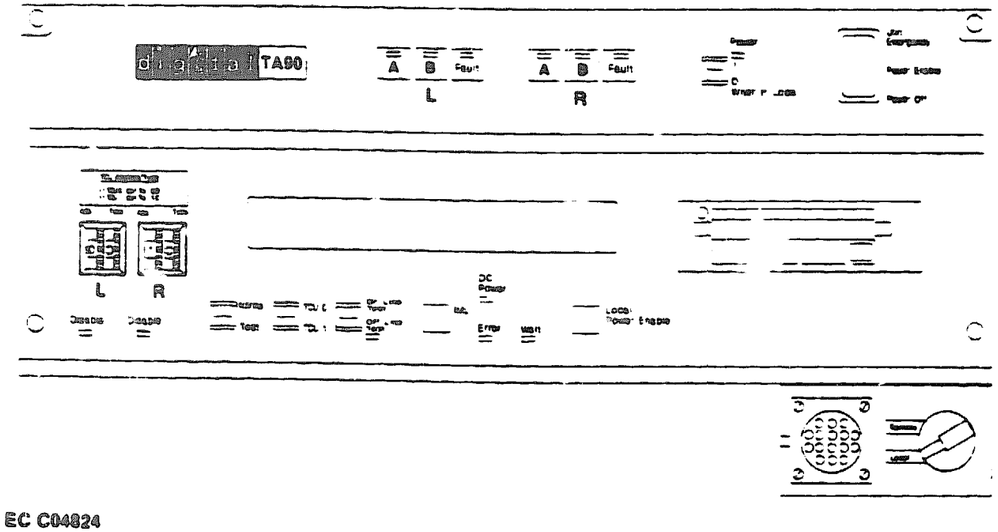
1. Go to CARR-TCU 6 for the procedure to remove ***dc power*** from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover (see CARR-TCU 2-1).
3. Remove the tape control unit top cover (see CARR-TCU 2-1)
4. Remove cable plugs P1 and P2 [4] from the J1 and J2 connectors (TCU-Diskette Drive J1 and J2) on the rear of the diskette drive [1]
5. Remove the ground wire [3] attached to the rear of the diskette drive.
6. Remove the four screws that hold the IML diskette drive on the mounting brackets [2]
7. Remove the diskette drive from the front of the tape control unit switch panel.
8. Save the screws for the replacement procedure

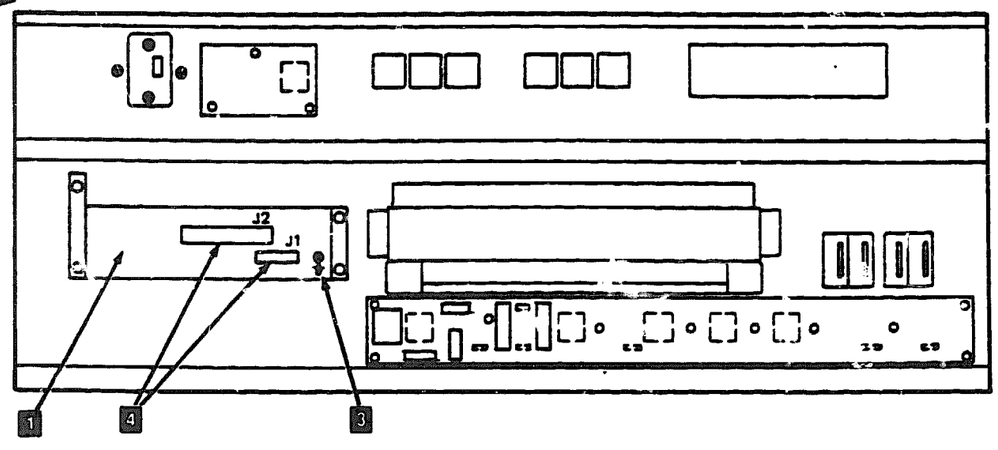


Replacing the IML Diskette Drive

1. Place the diskette drive in the opening in the tape control unit switch panel from the front of the tape control unit.
2. Install the four screws [2] that hold the diskette drive to the mounting brackets.
3. Replace cable plugs P1 and P2 [4] in the J1 and J2 connectors (TCU-Diskette Drive J1 and J2) on the rear of the diskette drive [1].
4. Replace the ground wire [3] attached to the rear of the diskette drive.
5. Replace the tape control unit top cover (see CARR-TCU 2-2).
6. Replace the tape control unit rear safety cover (see CARR-TCU 2-2) and close the rear cover.
7. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.







FRU111 Tape Control Unit Logic Card Removal and Replacement Procedure

The page contains the steps needed to remove and replace any of the logic cards in the tape control unit. It is not necessary to power off the tape control unit, however, the dc voltage must be removed from the tape control unit.

See LOC 1 for the card locations.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Warning: FRU 126 Power/POR card (01A-A2H4) or FRU 138 Voltage Regulator card (01A-A1T2) cannot be removed by this procedure without circuit damage. Go to CARR-TCU 1260 for removal of Power/POR card or Voltage Regulator card.

Removing the Logic Cards

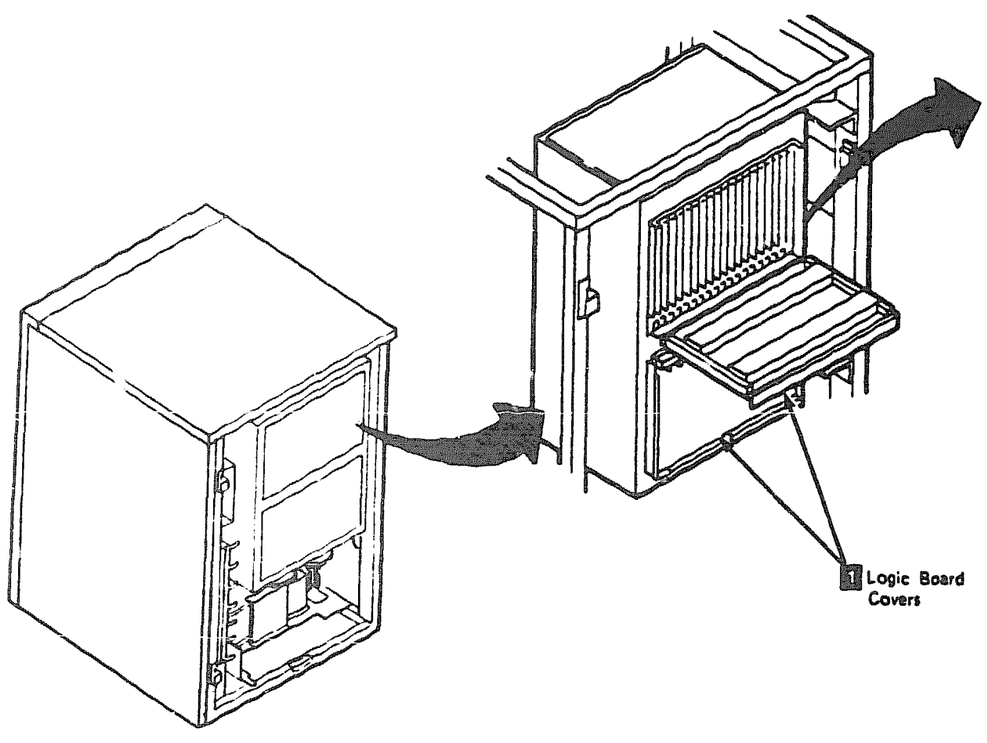
1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover (see CARR-TCU 2-1).
3. Open the logic board cover 1.
4. Remove the top card connectors (TCC) 2 as needed to remove the logic card.
5. Remove the top card cables 3 as needed to remove the logic card.
6. Remove the logic card retainers 4 to remove the logic card.
   a. Remove the two mounting screws 5 holding each retainer.
   b. Pull the retainer out of the logic gate.
7. Remove the logic card by pulling it straight out from the logic board.
8. Remove the logic card from the card holder.

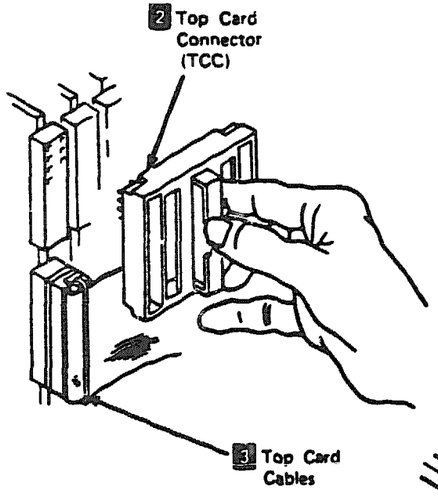
Replacing the Logic Cards

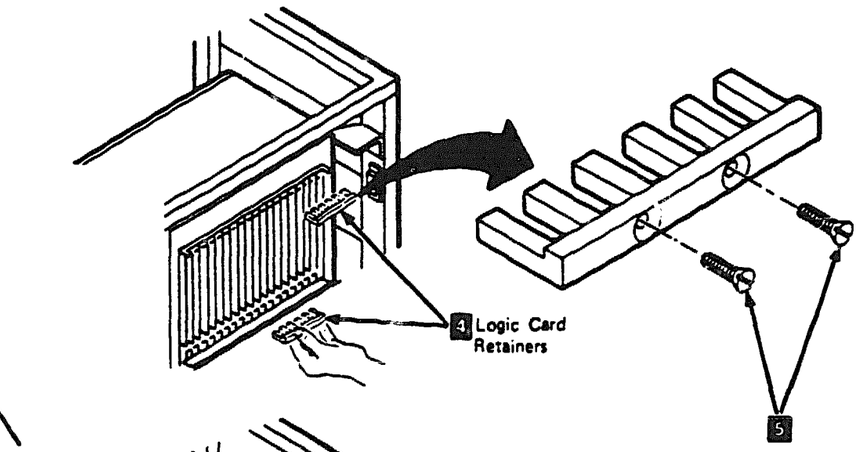
Warning: Before installing the tape control unit logic cards, check the logic board for any damaged or bent pins.

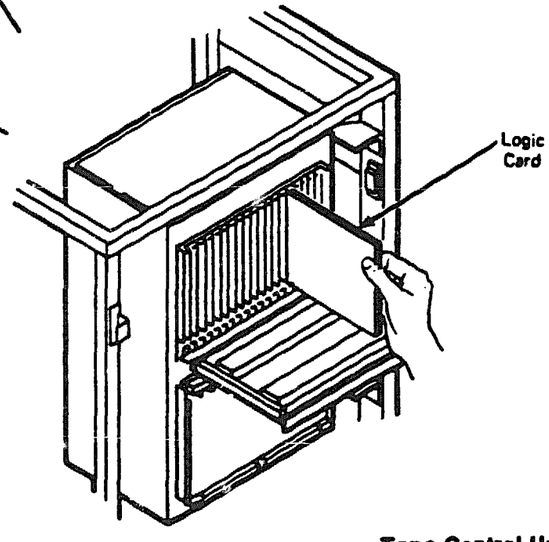
Note: If you are replacing logic card 01A-A1S2, check the setting of DLR switch position four (see CARR-TCU 1189).

1. Install the logic card in the card holder.
2. Install the logic card on the board being careful not to damage pins or connections. See LOC 1 for card locations.
3. Install the top and bottom logic card retainers 4.
   a. Slide the card retainers into the logic gate.
   b. Install the two mounting screws 5 into each retainer.
4. Install the top card connections (TCC) 2. See LOC 1 for TCC locations.
5. Install the top card cables 3. See LOC 1 for top card cable locations.
6. Close the logic board cover 1.
7. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).
8. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.









TA99 MG EC C04824

FRU118 Drive-Adapter Card (01A-A1Q2) Removal and Replacement Procedure

This page contains the steps needed to remove and replace the drive- adapter card in the tape control unit. It is not necessary to power off the tape control unit; however, the dc voltage must be removed from the tape control unit.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

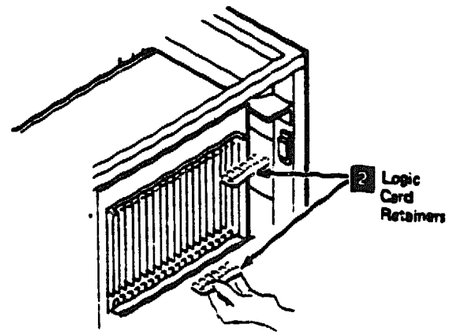
Removing the Drive-Adapter Card

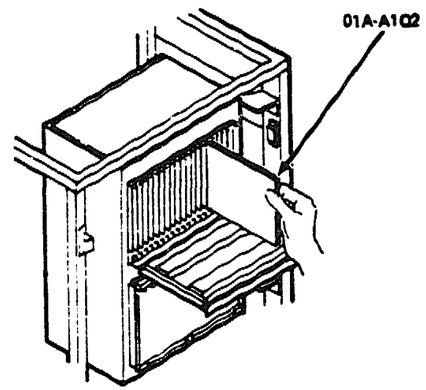
1. Go to CARR-TCU 6 for the procedure to remove dc power from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover (see CARR-TCU 2-1).
3. Open the A1 logic board cover 1.
4. Remove the card retainers 2.
   a. There are two mounting screws in each card retainer.
   b. Pull the retainer out of the logic gate.
5. Remove the top card connectors on 01A-A1P5 and 01A-A1Q5 (see LOC 1).
6. Remove the drive-adapter card by pulling it straight out from the logic board. The drive-adapter card is in location 01A-A1Q2.
7. Remove the drive-adapter card from the card holder.
8. Place the drive-adapter card so that the switches 3 are positioned as shown. Write down the switch settings for later reference.
9. Save the card holder for the replacement procedure.

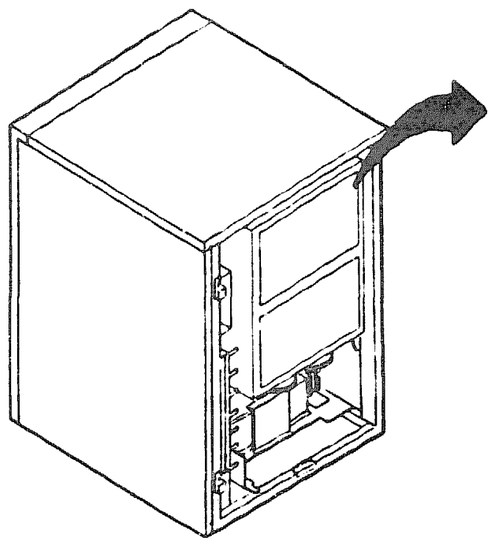
Replacing the Drive-Adapter Card

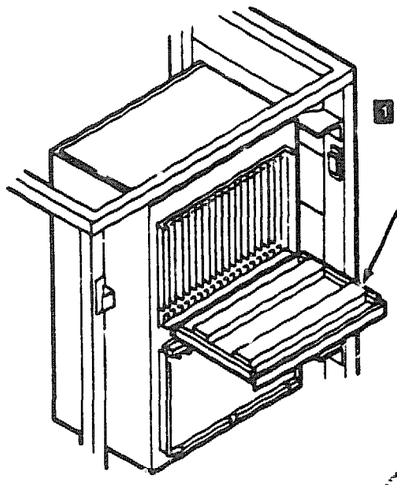
Warning: Before installing the drive-adapter card, check the logic board for any bent or damaged pins.

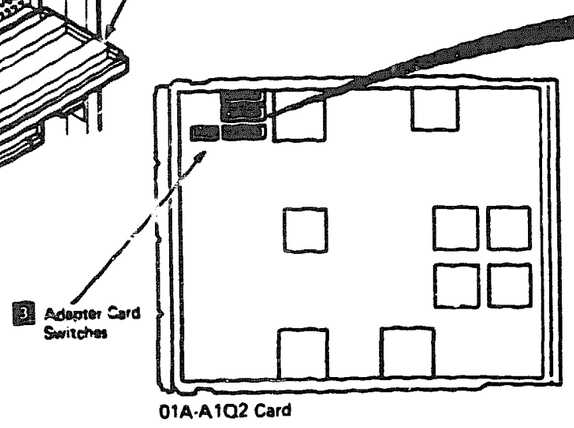
1. Verify that the drive-adapter card switches 3 are set correctly. Use the information saved from the removal (CARR-TCU 1180) and the information on CARR-TCU 1188 and CARR-TCU 1189 to verify the switch settings.
2. Install the drive-adapter card in the card holder.
3. Install the drive-adapter card in location 01A-A1Q2.
4. Install the top card connectors on 01A-A1P5 and 01A-A1Q5 (see LOC 1).
5. Install the top and bottom logic card retainers.
   a. Slide the retainers 2 into the logic gate.
   b. Install the two retaining screws into each retainer.
6. Close the logic board cover 1.
7. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).
8. Go to CARR-TCU 6 for the procedure to restore dc power to the tape control unit.

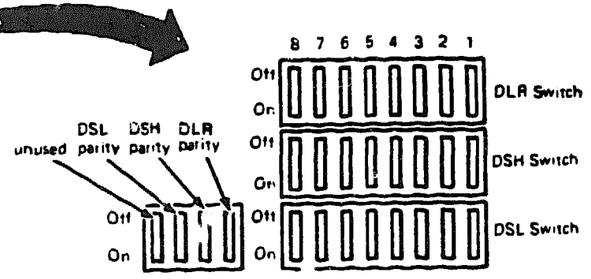












Note: Press the rocker arm switch "On" side, down for On. Press the rocker arm switch "Off" side, down for Off. Ignore any dots on the switches.

FRU118 Drive-Adapter Card Replacement Procedure

When replacing the drive-adapter card, or at installation time it may be necessary to set the switches on the drive adapter card These switches contain the tape control unit serial number, the model designation, the language feature setting, the EC level, and the parity bits.

Switch Setting Procedures

1. Convert the decimal serial number of the tape control unit to hexadecimal as follows:

   a. Write down the decimal serial number.

   b. Locate the largest decimal value in Table 1 that will fit into the decimal number to be converted (the tape control unit serial number).

   c. Write the hex equivalent of this number in the 'Hexadecimal Equivalent' position labeled the same as the column in Table 1 (where you found the hex number).

   For Example: If your largest decimal value in Table 1 was 1536; you would write a '6' (the hex equivalent) in the 'Hexadecimal Equivalent' position labeled '2' (from Hexadecimal Column labeled '2').

   Note: Ensure that the hex equivalent digits from Table 1 are put into positions labeled the same as the columns they came from.

   d. Find the decimal remainder.

   e. Repeat this process to this and subsequent remainders to find any remaining hex digits.

   See the example: The example shows that the decimal serial number of 10133 converts to the hexadecimal number of 2795.

   Note: As four digits are required, add leading zero.

   For Example: If your Hexadecimal Equivalent number is 4A5, add a leading zero to make the number 04A5.

2. Convert the hexadecimal serial number to its binary equivalent.

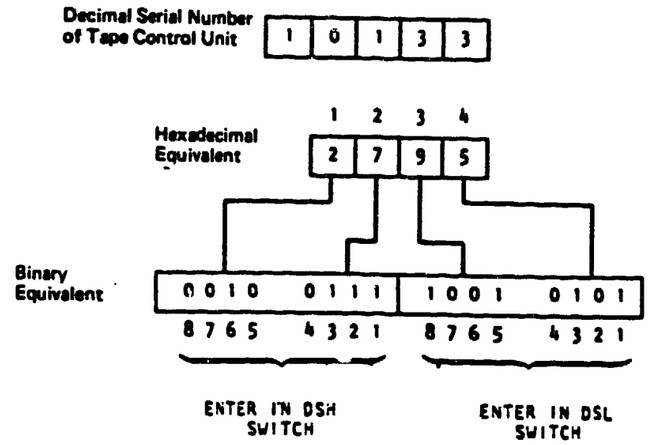
   a. Convert each number to its binary equivalent and enter this information in the box below each digit.

See the example: The example shows that the hexadecimal number of 2795 converts to the binary number of 0010 0111 1001 0101.

3. Now that you have the binary equivalent of the tape control unit serial number, see CARR-TCU 1189 for instructions on how to set the Device Serial High (DSH), Device Serial Low (DSL), and Device Level Register (DLR) switches to match this number

HEXADECIMAL COLUMNS							
1		2		3		4	
Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec
0	0	0	0	0	0	0	0
1	4,096	1	256	1	16	1	1
2	8,192	2	512	2	32	2	2
3	12,288	3	768	3	48	3	3
4	16,384	4	1,024	4	64	4	4
5	20,480	5	1,280	5	80	5	5
6	24,576	6	1,536	6	96	6	6
7	28,672	7	1,792	7	112	7	7
8	32,768	8	2,048	8	128	8	8
9	36,864	9	2,304	9	144	9	9
A	40,960	A	2,560	A	160	A	10
B	45,056	B	2,816	B	176	B	11
C	49,152	C	3,072	C	192	C	12
D	53,248	D	3,328	D	208	D	13
E	57,344	E	3,584	E	224	E	14
F	61,440	F	3,840	F	240	F	15

TABLE 1



Example of Decimal to Binary

FRU118 Drive-Adapter Card Replacement Procedure

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-3 for "Instructions For Working With ESD-Sensitive Parts."

When replacing the drive-adapter card, or at installation time, it may be necessary to set the switches on the drive-adapter card. These switches contain the tape control unit serial number, the model designation, the language feature setting, the EC level, and the parity bits.

Switch Setting Procedures

The following procedures are used to set all of the switches on the drive-adapter card.

1. Convert the decimal serial number to hexadecimal serial number (see CARR-TCU 1188).
2. Convert the hexadecimal number to binary serial number (see CARR-TCU 1188).
3. Position the drive-adapter card (01A-A1Q2) with the switches in the upper left corner (see illustration).

   Note: The numbers and lettering on the card will now be upside down.
4. Set the Device Serial High (DSH) and Device Serial Low (DSL) switches to match the binary serial number (see CARR-TCU 1188).
5. Set switch Device Level Register (DLR), positions 1-3, for the desired language (see 'Message Language Setting' chart).
6. Set DLR switch position 4 On.
7. Set DLR switch position 5 On.
8. See the DLR switch position assignments for setting switch position 6.
9. See the DLR switch position assignments for setting switch position 7.
10. Set DLR switch position 8 Off.

   Note: When setting 'odd' parity, there should be an 'odd' number of switches set to the 'On' position for each group (DLR, DSH, and DSL). If not, set the parity switch to 'On' to create 'odd' parity.
11. Use the DLR parity switch to produce odd parity of the DLR switches. Odd parity is an odd number of switches set On.
12. Use the DSH parity switch to produce odd parity of the DSH switches. Odd parity is an odd number of switches set On.
13. Use the DSL parity switch to produce odd parity of the DSL switches. Odd parity is an odd number of switches set On.

Switch Position Assignments

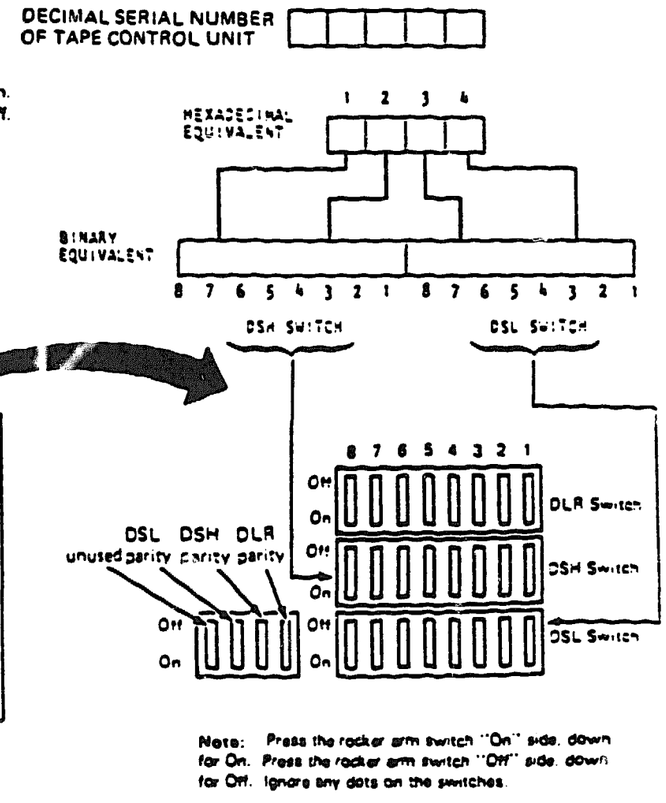
Position assignments of the drive-adapter card switches are as follows:

1. DLR
   - Switch position 8 (Reserved). Set switch position 8 to 0 (Off).
   - **Switch position 7 (TA90 Designator). Set switch position 7 to 0 (Off).**
   - Switch position 6 (Model Designator). If this is a TCU with BDx drives attached, set switch position 6 to 1 (On).
   - Switch position 5 (Reserved). Set switch position 5 to 1 (On).
   - Switch position 4 (Reserved). Set switch position 4 to 1 (On).
   - Switch position 1 – 3 (Message Language Setting). Set by using the message language setting table on this page.
2. DSH
   - Switch positions 5-8 - Digit 1 of the machine serial number (in binary form).
   - Switch positions 1-4 - Digit 2 of the machine serial number (in binary form).
3. DSL
   - Switch positions 5-8 - Digit 3 of the machine serial number (in binary form).
   - Switch positions 1-4 - Digit 4 of the machine serial number (in binary form).

Message Language Setting

Language Desired	DLR Switch Positions			Binary Value
	3	2	1	
English	Off	Off	Off	000
French	Off	Off	On	001
German	Off	On	Off	010
Spanish	Off	On	On	011
Italian	On	Off	On	101

Note: Press the rocker arm switch "On" side, down for On. Press the rocker arm switch "Off" side, down for Off. Ignore any dots on the switches.



Note: Press the rocker arm switch "On" side, down for On. Press the rocker arm switch "Off" side, down for Off. Ignore any dots on the switches.

FRU120 Buffer Adapter Card (01A-A1K2) Replacement Procedure

This page contains the steps needed to remove and replace the buffer adapter card in the tape control unit. It is not necessary to power off the tape control unit, however, the dc voltage must be removed from the tape control unit.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Removing the Buffer Adapter Card

1. Go to CARR-TCU 6 for the procedure to remove dc power.
2. Open the tape control unit rear cover and remove the rear safety cover. See CARR-TCU 2-1.
3. Open the A1 logic board cover [1].
4. Remove the card retainers [2].
   a. There are two mounting screws in each card retainer.
   b. Pull the retainer out of the logic gate.
5. Remove the top card connectors from 01A-A1K2 through K5, and 01A-A1L2 through L5 (see LOC 1).
6. Remove the buffer adapter card by pulling straight out from the logic board. The buffer adapter card is in location 01A-A1K2.
7. Remove the buffer adapter card from the card holder. Save the card holder for use in the Replacement procedure.
8. Place the buffer adapter card so that the switches [3] are positioned at the bottom of the card as shown. Write down the switch settings for later reference

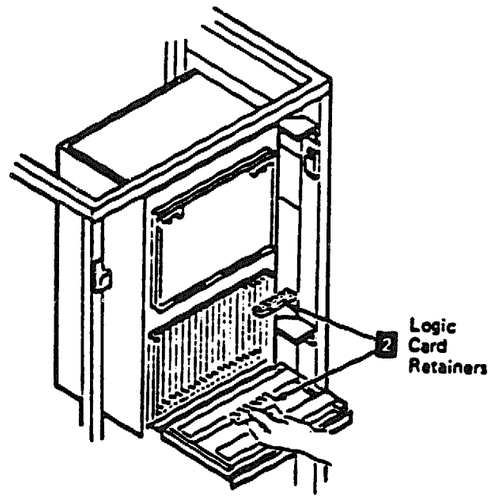
Replacing the Buffer Adapter Card

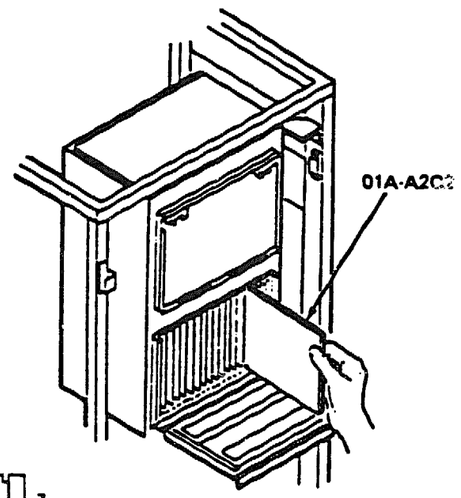
Warning: Before installing the buffer adapter card, check the logic board for any bent or damaged pins.

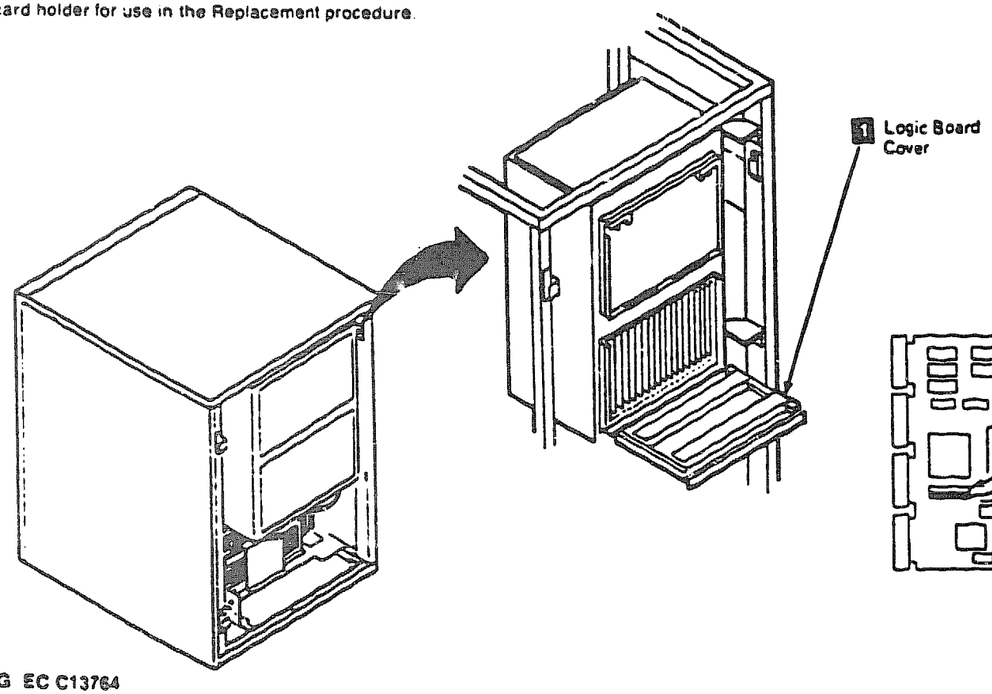
1. Verify that the switches on the buffer adapter card are set correctly. Use the information saved from the removal procedure, and the information in the switch position assignments to verify the switch settings. If no switches are present, continue with step 2.
2. Install the buffer adapter card in the card holder.
3. Install the buffer adapter card in location 01A-A1K2.
4. Install four top card connectors on 01A-A1K2 to L2, 01A-A1K3 to L3, 01A-A1K4 to L4, and 01A-A1K5 to L5.
5. Install the top and bottom logic card retainers.
   a. Slide the retainers [2] into the logic gate.
   b. Install the two retaining screws into each retainer.
6. Close the logic board cover [1].
7. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2 or 2-4).
8. Go to CARR-TCU 6 for the procedure to restore dc power to the tape control unit.

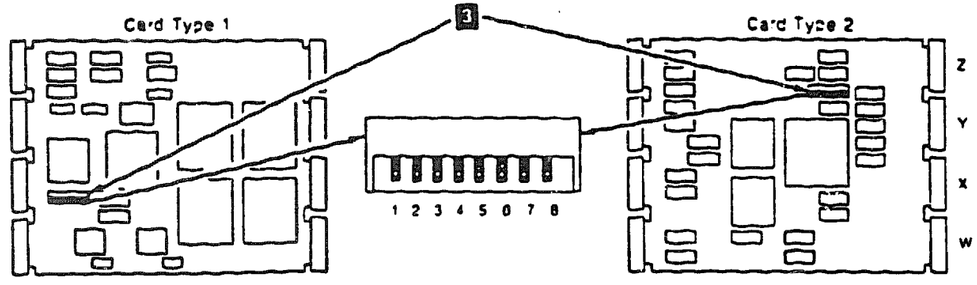
Switch Position Assignments

1. Switch Position 1. If you have card type 1 [3], set this switch off. If you have card type 2 [3], set this switch on.
2. Switch Position 2. If you have card type 1 [3], set this switch off. If you have card type 2 [3], set this switch on.
3. Switch Position 3. – Improved Data Recording Capability Allowed - If you have card type 1 [3] and data compaction is allowed, set this switch on. On all others, turn this switch off. Compaction must be allowed on both control units of a dual tape control unit subsystem.
4. Switch Position 4 (Reserved). Turn this switch off.
5. Switch Position 5 (Reserved). Turn this switch off.
6. Switch Position 6 (Reserved). Turn this switch off.
7. Switch Position 7 (Reserved). Turn this switch off.
8. Switch Position 8 - Parity - Use this switch to produce odd parity. Odd parity is an odd number of switches set on.









NOTE: Lift the switch up for OFF.
Press the switch down for ON.

TA90 MG EC C13764

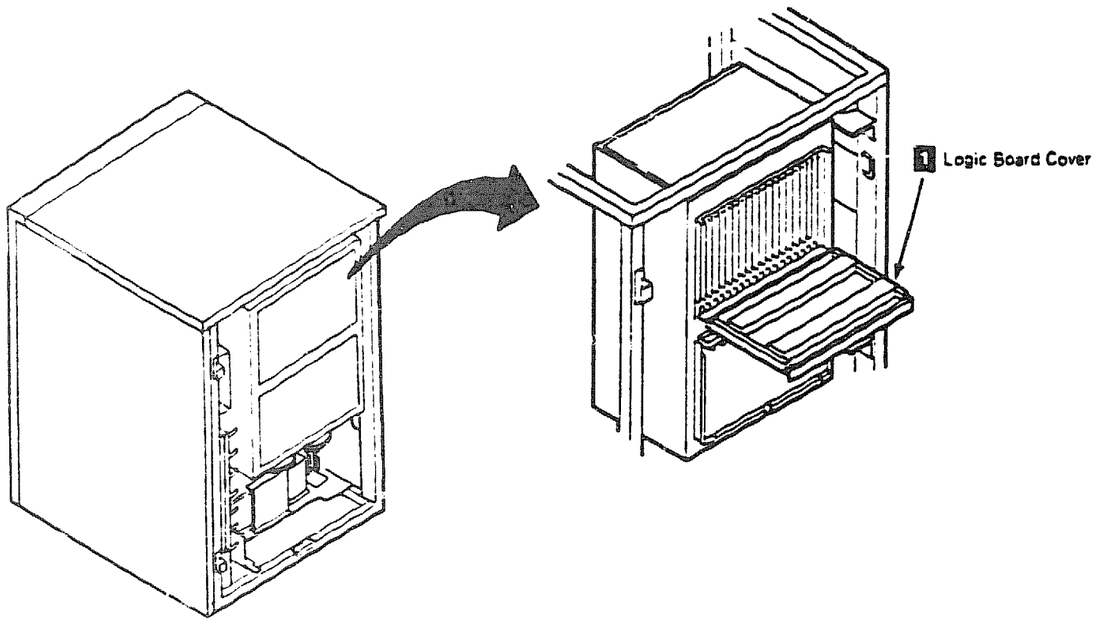
FRU126 or 138 - Power/POR (01A-A2H4) or Voltage Regulator (01A-A1T2) Card Removal and Replacement Procedure

This page contains the steps needed to remove and replace either the Power/POR card (01A-A2H4) or the Voltage Regulator card (01A-A1T2) in the tape control unit.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Removing the Power/POR or Voltage Regulator Card

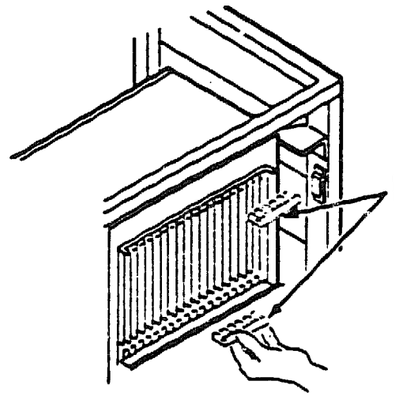
1. Go to CARR-TCU 6 for the procedure to remove ***ac power*** from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector (see CARR-TCU 2-1).
3. Open the logic board cover 1.
4. Remove the logic card retainers 2.
   a. Remove the two screws holding each retainer.
   b. Pull the retainer out of the logic gate.
5. Remove the Power/POR card or the Voltage Regulator card by pulling the card straight out from the logic board. The Power/POR card is in location 01A-A2H4. The Voltage Regulator Card is in location 01A-A1T2.
6. Remove the Power/POR card or the Voltage Regulator card from the card holder.
7. Save the card holder for the replacement procedure.



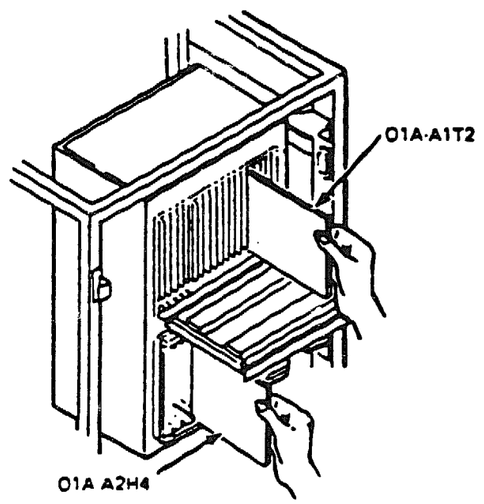
Replacing the Power/POR or Voltage Regulator Card

Warning: Before installing the Power/POR card or the Voltage Regulator card, check the logic board for any bent or damaged pins.

1. Install the Power/POR card or the Voltage Regulator card into the card holder saved from the removal procedure.
2. Install the Power/POR card in location 01A-A2H4. Install the Voltage Regulator card in location 01A-A1T2.
3. Install the top and bottom card retainers.
   a. Slide the logic card retainers 2 into the logic gate.
   b. Install the two retaining screws into each retainer.



4. Close the logic board cover 1.
5. Install the rear safety cover and ground connector and close the rear cover (see CARR-TCU 2-2).
6. Go to CARR-TCU 6 for the procedure to restore ***ac power*** to the tape control unit.



FRU139 Tape Control Unit Logic Board (01A-A1) Removal and Replacement Procedure

The page contains the steps needed to remove and replace the A1 logic board in the tape control unit. It is not necessary to power off the subsystem to remove the logic board, however, the dc voltage must be removed from the tape control unit.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Removing the A1 Logic Board

1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the A1 logic card cover.
4. Remove the top card connectors (TCC) 3 by pulling them straight off the logic cards.
5. Remove the top card cable connectors 2.
6. Remove all of the logic card retainers 8. There are two mounting screws in each card retainer.
7. Remove the cable retention hardware 7.
8. Remove the logic cards from the logic board.
9. Disconnect the cables from the Y and Z rows.
10. Disconnect the cables from the A and V columns.
11. Open the logic gate, and remove from the pin side of the logic board the laminar bus connectors 4 from locations Y5, Y2, Z5 and Z2.
12. Disconnect the voltage connections from locations 01A-A1T2G06, M06, and S06.
13. Disconnect the six dc voltage minibus connectors 5 from locations 01A-A1U2E14, U3E14, U4E14, B2A14, B3A14, and B4A14.
14. Remove the twelve logic board mounting screws and board retainers 6, then remove the logic board 1 from the tape control unit.

    Note: *Be sure to save the mounting hardware for the logic board replacement procedure.*

Replacing the A1 Logic Board

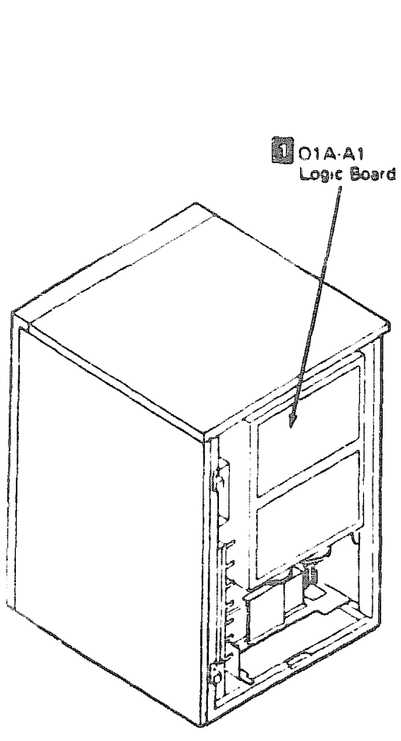
1. Open the logic gate.
2. From the pin side of the logic gate, turn the logic board 1 so the letters on the board can be read correctly, then place the board into position against the logic gate.
3. Install the twelve logic board retainers 6 and mounting screws.
4. Connect the six dc voltage minibus connectors 5 to locations 01A-A1U2E14, U3E14, U4E14, B2A14, B3A14, and B4A14.
5. Connect the three dc voltage connectors to locations 01A-A1T1G06, M06, and S06.
6. Connect the laminar bus connectors 4 to locations 01A-A1Y2, Y5, Z2, and Z5.
7. Close the logic gate.
8. On the card side of the logic board, connect the cables to the Y and Z rows.
9. On the card side of the logic board, connect the cables to the A and V columns.
10. Install the cable retention hardware 7.
11. Inspect the logic pins for damage, then install the logic cards.

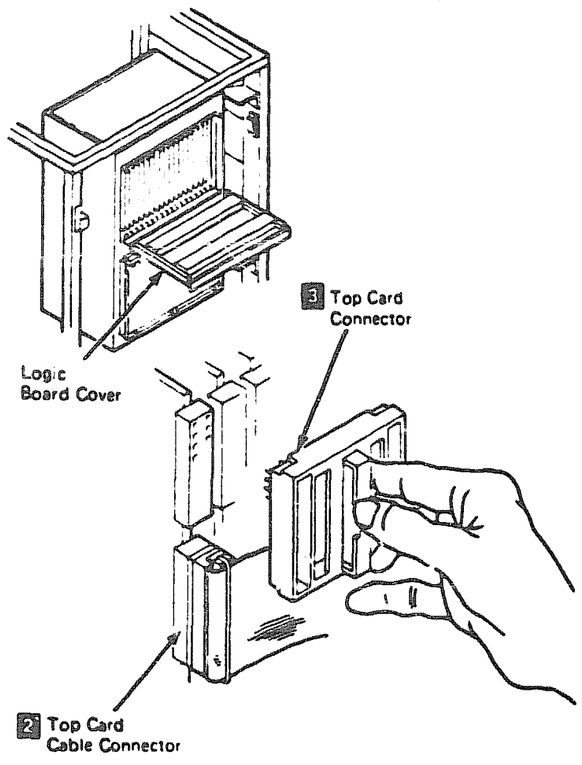
    Note: The card locations are shown on LOC 1.

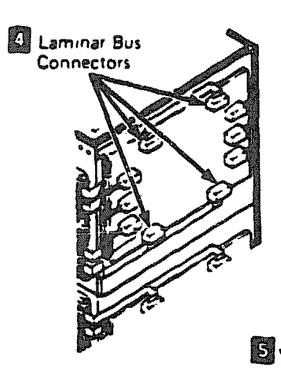
12. Install the logic card retainers 8.

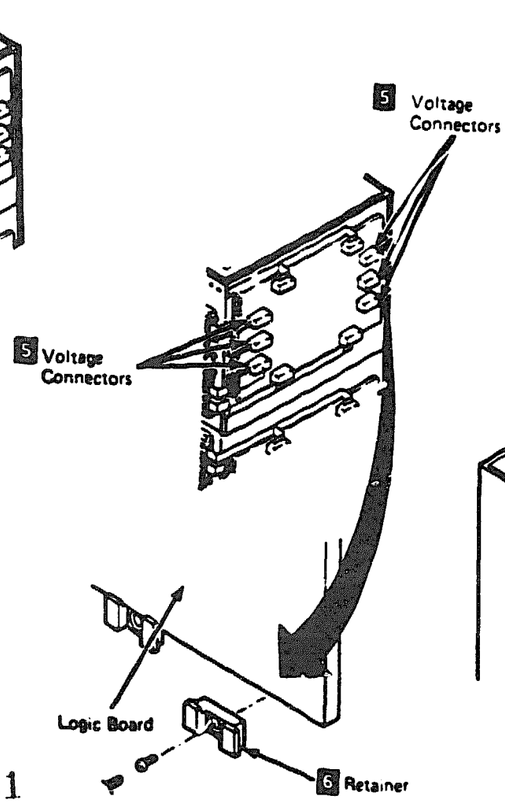
    Note: The top card connectors and the top card cable locations are shown on LOC 1.

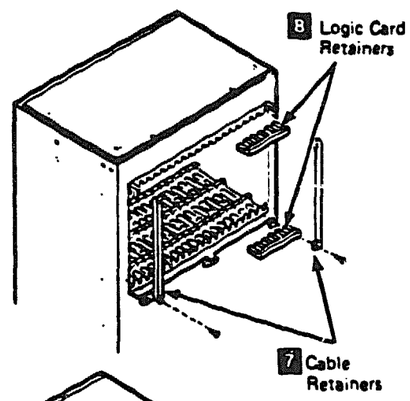
13. Install the top card connectors (TCC) 3.
14. Install the top card cable connectors 2.
15. Close the logic card cover.
16. Install the tape control unit rear safety cover and ground connector (if present) and close the tape control unit rear cover (see CARR-TCU 2-2).
17. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.

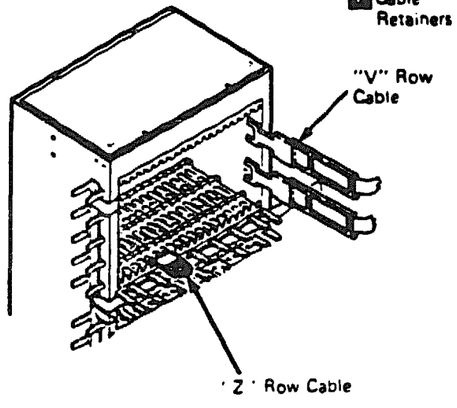












FRU140 Tape Control Unit Logic Board (01A-A2) Removal and Replacement Procedure

The page contains the steps needed to remove and replace the A2 logic board in the tape control unit. It is not necessary to power off the subsystem to remove the logic board, however, the dc voltage must be removed from the tape control unit.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Removing the A2 Logic Board

1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the A2 logic board cover.
4. Remove the top card connectors (TCC) 3 by pulling them straight off the logic cards.
5. Remove the top card cable connectors 2.
6. Remove all of the logic card retainers 8. There are two mounting screws in each card retainer.
7. Remove the cable retention hardware 7.
8. Remove the logic cards from the logic board.
9. Disconnect the cables from the Y and Z rows.
10. Disconnect the cables from the A and V columns.
11. Open the logic gate, and remove from the pin side of the logic board the laminar bus connectors 4 from locations Y5, Y2, Z5 and Z2.
12. Disconnect the voltage connections from locations 01A-A2T2G06, M06, and S06.
13. Disconnect the six dc voltage minibus connectors 5 from locations 01A-A2U2E14, U3E14, U4E14, B2A24, B3A24, and B4A24.
14. Remove the twelve logic board mounting screws and board retainers 6, then remove the logic board 1 from the tape control unit.

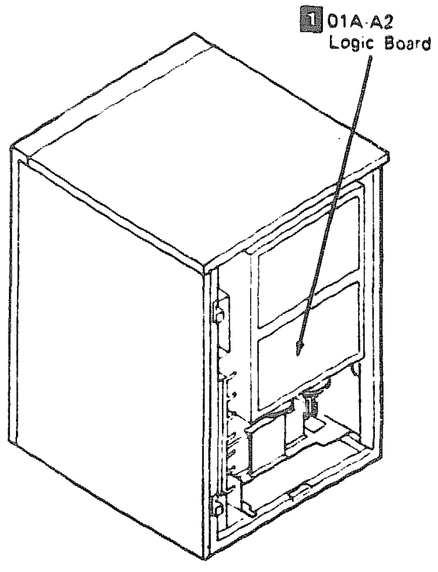
    Note: Be sure to save the mounting hardware for the logic board replacement procedure.

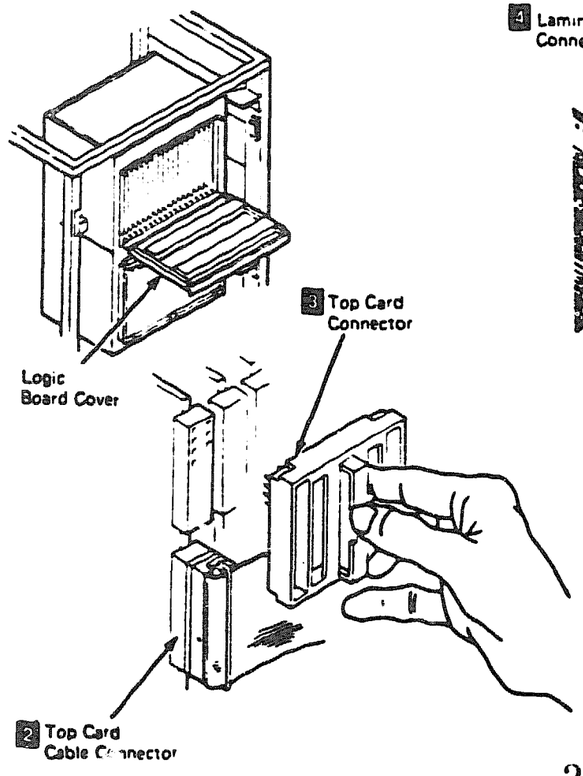
Replacing the A2 Logic Board

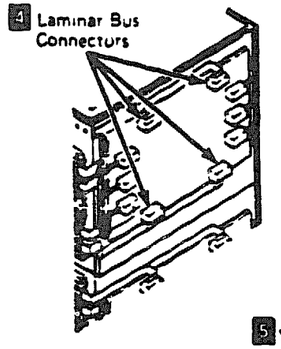
1. Open the logic gate.
2. From the pin side of the logic gate, turn the logic board so the letters on the board can be read correctly, then place the board into position against the logic gate.
3. Install the twelve logic board retainers 6 and mounting screws.
4. Connect the six dc voltage minibus connectors 5 to locations 01A-A2U2E14, U3E14, U4E14, B2A24, B3A24, and B4A24.
5. Connect the three dc voltage connectors to locations 01A-A2T1G06, M06, and S06.
6. Connect the laminar bus connectors 4 to locations 01A-A2Y2, Y5, Z2, and Z5.
7. Close the logic gate.
8. On the card side of the logic board, connect the cables to Y and Z rows.
9. On the card side of the logic board, connect the cables to the A and V columns.
10. Install the cable retention hardware 7.
11. Inspect the logic pins for damage, then install the logic cards.

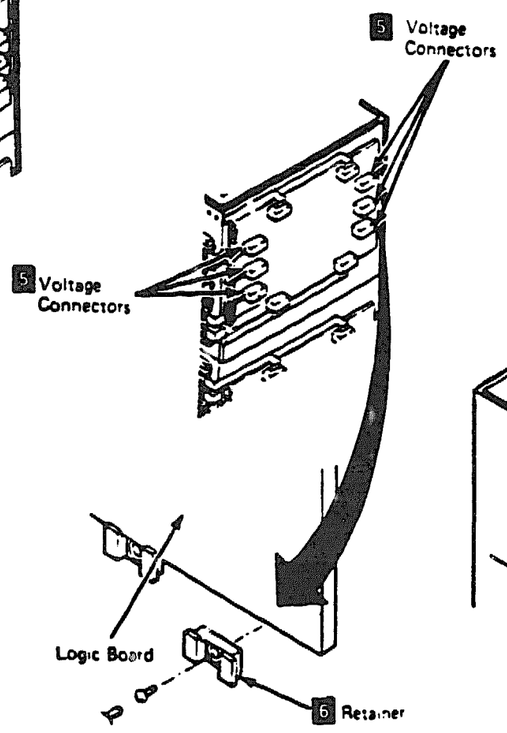
    Note: The card locations are shown on LOC 1.
12. Install the logic card retainers 8.

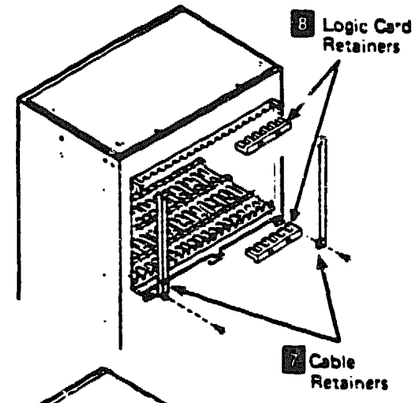
    Note: The top card connectors and the top card cable locations are shown on LOC 1.
13. Install the top card connectors (TCC) 3.
14. Install the top card cable connectors 2.
15. Close the logic board cover.
16. Install the tape control unit rear safety cover and ground connector and close the tape control unit rear cover (see CARR-TCU 2-2).
17. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.

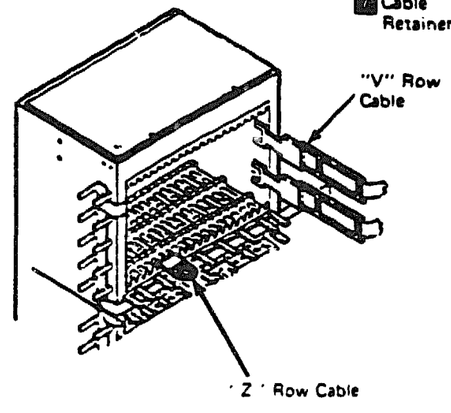












FRU141 Tape Control Unit Switch Panel Printed Circuit Board Removal and Replacement Procedure

This page contains the steps needed to remove and replace the control unit switch panel circuit board.

All drives attached to the tape control unit must be available for service.

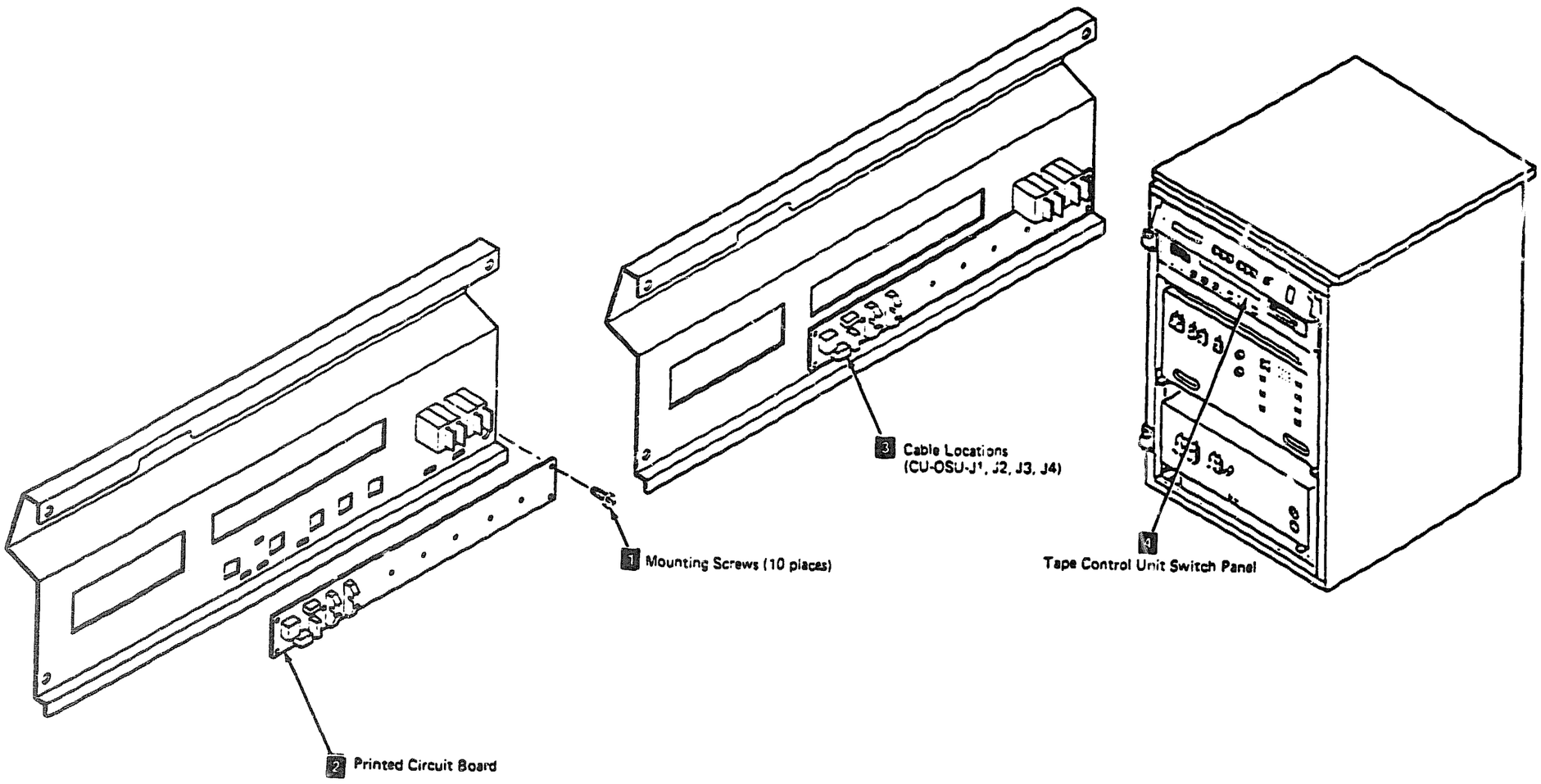
Note: This FRU can be removed and replaced in the tape control unit without affecting the attached drives by removing dc power from the control unit with the dc service switch.

Removing the Tape Control Unit Switch Panel Printed Circuit Board

1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the top cover (see CARR-TCU 2-1).
3. Remove the four cables 3 (CU-OSU-J1, J2, J3, and J4) from the rear of the printed circuit board 2.
4. Remove the ten mounting screws 1 from the rear of the tape control unit switch panel 4 and remove the printed circuit board 2 from the switch panel.
5. Save all mounting screws for the replacement procedure.

Replacing the Tape Control Unit Switch Panel Printed Circuit Board

1. Place the printed circuit board 2 on the tape control unit switch panel 4 and install the ten mounting screws 1.
2. Connect the four cables 3 (CU-OSU-J1, J2, J3, and J4) to the rear of the printed circuit board 2.
3. Replace the tape control unit top cover (see CARR-TCU 2-2) and close the rear cover.
4. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.



FRU142 Operator Panel Printed Circuit Board Removal and Replacement Procedure

This page contains the steps needed to remove and replace the printed circuit board on the operator panel. All drives must be available for service

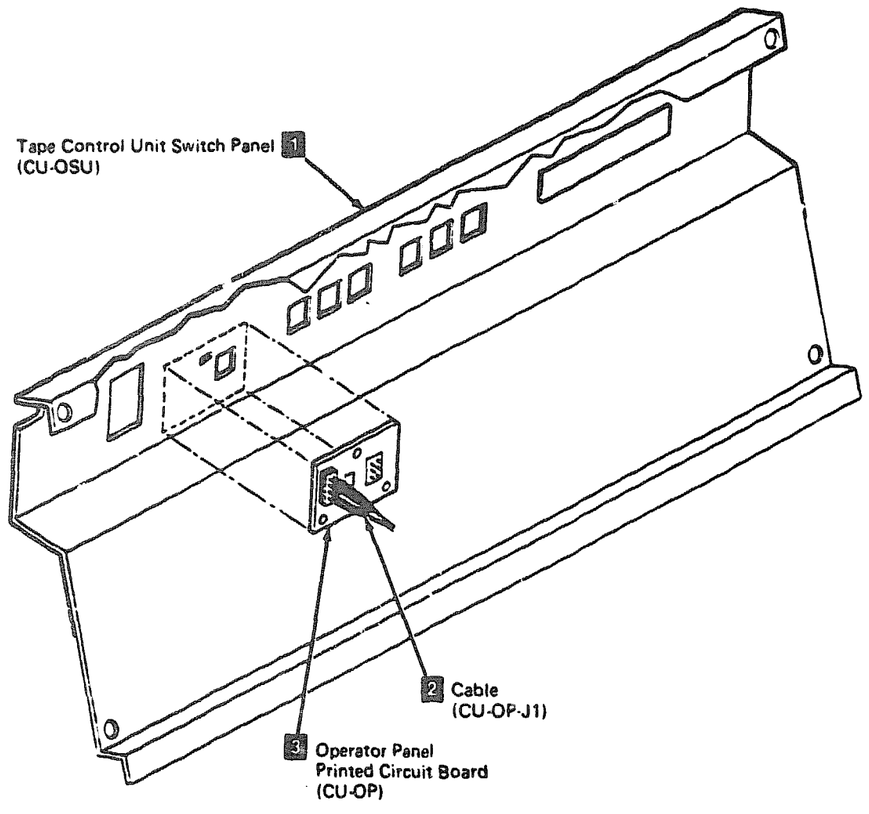
Note: This FRU can be removed and replaced in the tape control unit without affecting the attached tape units by removing dc power from the control unit with the service switch.

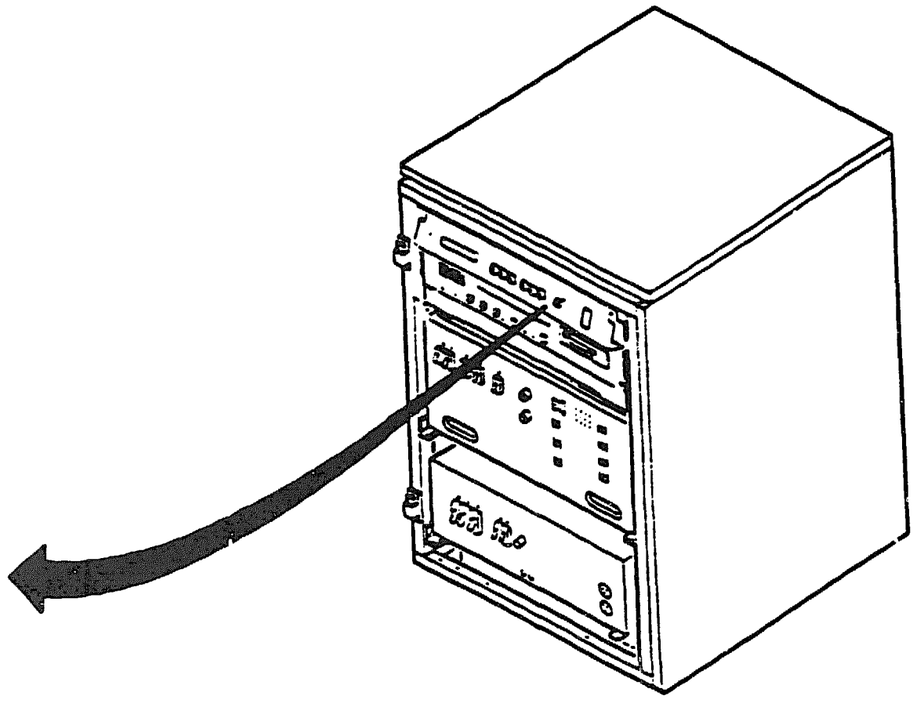
Removing the Operator Panel Printed Circuit Board

1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the top cover (see CARR-TCU 2-1)
3. Disconnect the cable 2 (CU-OP-J1) from the operator panel printed circuit board.
4. Remove the three mounting screws that hold the operator panel printed circuit board (CU-OP) 3 to the control unit switch panel (CU-OSU) 1.
5. Remove the operator panel printed circuit board 3 from the tape control unit.

Replacing the Operator Panel Printed Circuit Board

1. Place the operator panel printed circuit board 3 on the tape control unit switch panel 1 and install the three mounting screws.
2. Connect the cable 2 (CU-OP-J1) to the rear of the operator panel printed circuit board.
3. Install the tape control unit top cover and close the rear cover (see CARR-TCU 2-2).
4. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.





FRU143 Tape Control Unit Lower Thermal Switch Removal and Replacement Procedure

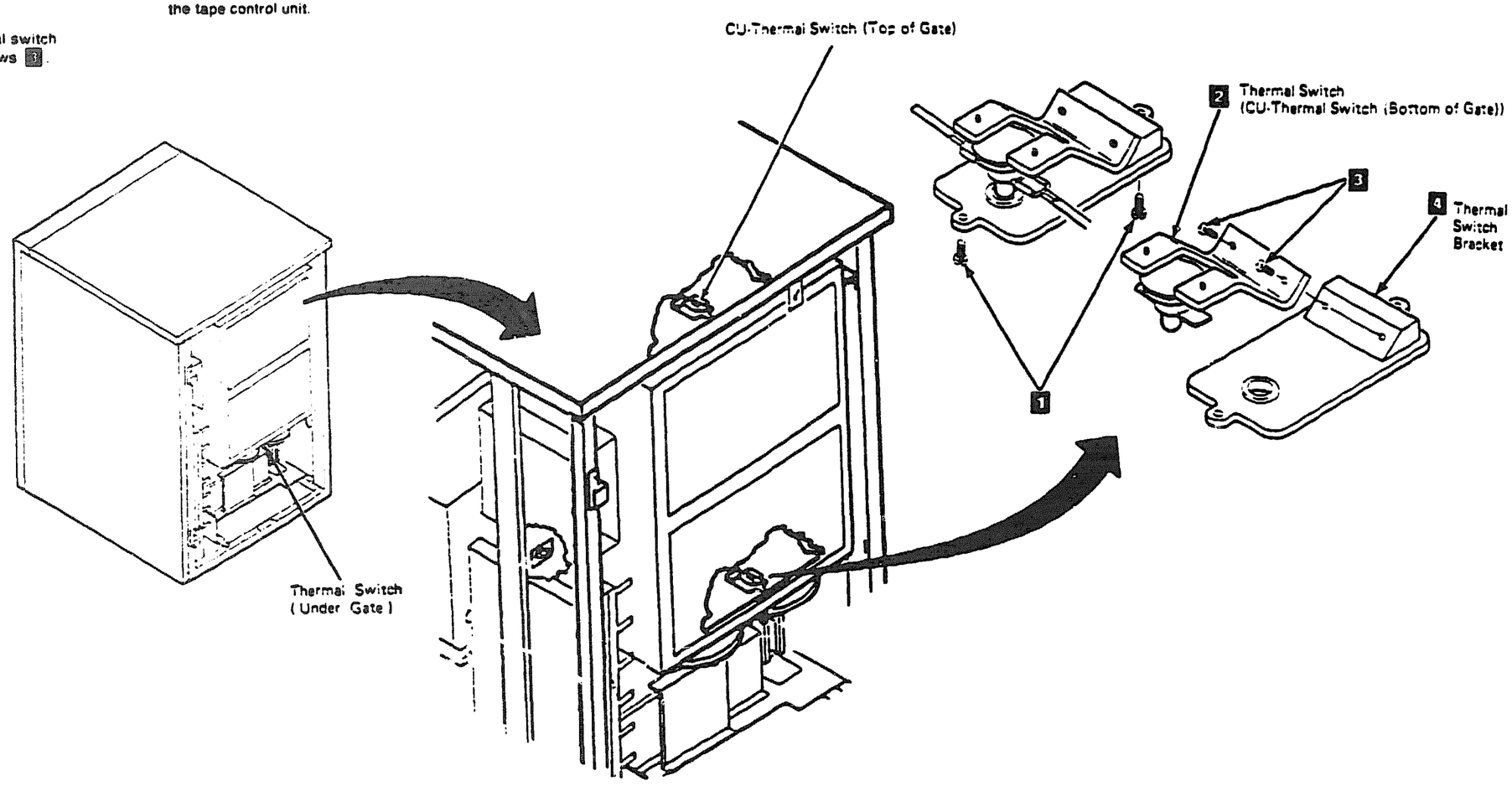
This page contains the steps needed to remove and replace the lower thermal switch in the tape control unit logic gate

Removing the Tape Control Unit Thermal Switch

1. Open the rear cover and remove the rear safety cover (see CARR-TCU 2-1).
2. Remove the two mounting screws 1 holding the thermal switch assembly to the logic gate.
3. Disconnect the two wires from the thermal switch.
4. Remove the thermal switch assembly from the tape control unit.
5. Remove the thermal switch 2 from the thermal switch bracket 4 by removing the two mounting screws 3.

Replacing the Tape Control Unit Thermal Switch

1. Place the thermal switch 2 on the thermal switch bracket 4 and install the two mounting screws 3.
2. Place the thermal switch in position on the logic gate and install the two wires to the thermal switch.
3. Install the two mounting screws 1, holding the thermal switch assembly to the logic gate.
4. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).
5. Go to CARR-TCU 6 for the procedure to restore ac *power* to the tape control unit.



FRU144 AC Power Supply Removal and Replacement Procedure

This page contains the steps needed to remove and replace the ac power supply in the tape control unit. Since ac power is being removed from the tape control unit, all drives attached to the tape control unit must be available for service.

Removing the AC Power Supply

Note: Have the customer turn off the circuit breaker for the tape control unit ac power source.

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Disconnect the ac line cord from the power source.
3. Remove the tape control unit front cover (see CARR-TCU 2-1).
4. Remove connector J1 (CU-PS01-J1) from the right side of the ac power supply.
5. Open the tape control unit rear cover and remove the tape control unit rear safety cover, if present (see CARR TCU 2-1).
6. Disconnect all of the cables from the rear of the ac power supply.
7. Remove the cable clamp that holds the ac input cable to the tape control unit frame.
8. Remove the mounting bolts 1 from the front of the ac power supply.
9. Slide the ac power supply (CU-PS01) forward to get access to the input filter cover screws.
10. Remove the cover screws 8 from the input filter cover plate 7 and remove the plate.
11. Disconnect the wires from the three filter capacitors in the input filter 4.

    Note: If you are removing a 50 Hz (except Japan) ac power supply; remove the wire from the neutral filter capacitor 6.
12. Remove the braided ground wire 5 from inside the input filter.
13. Remove the green/yellow ground wire 2 from the rear of the ac power supply.
14. Loosen and remove the mounting ring 3 from the line cord stress clamp. Be sure to save the mounting ring for later use.
15. Remove the two screws holding the line cord stress clamp. Remove the stress clamp and the line cord.

CAUTION:
The ac power supply weighs about 21 kilograms (45 pounds). Two service representatives should lift the tape control unit ac power supply.

16. Slide the ac power supply forward to remove it from the tape control unit.

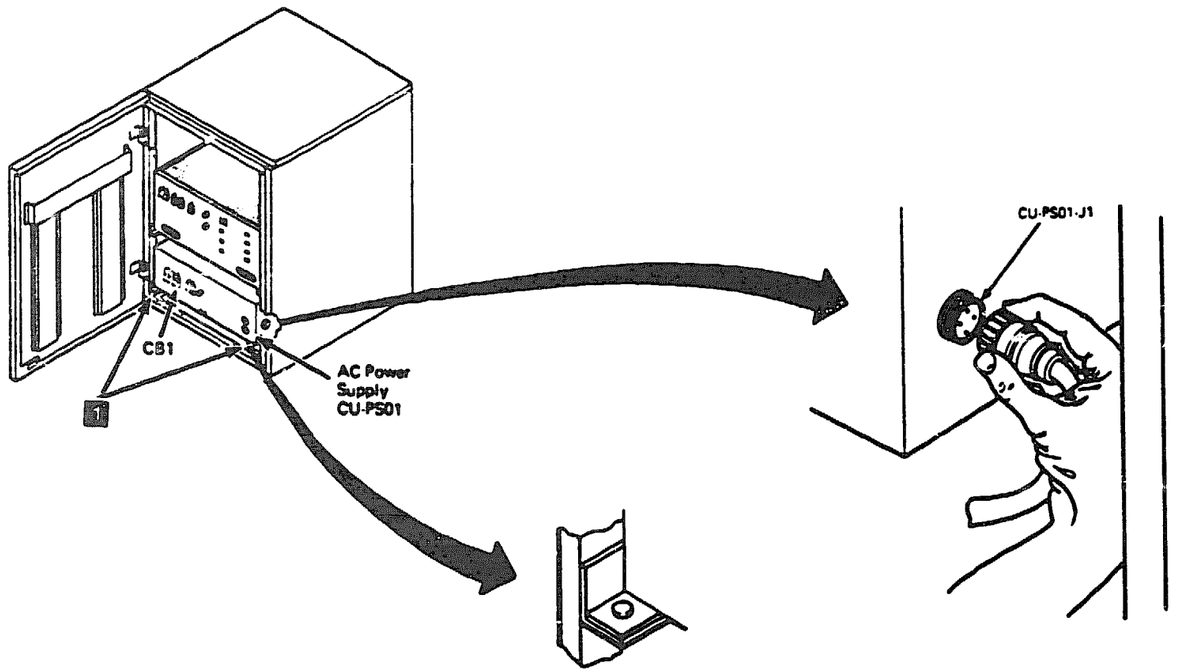
Replacing the AC Power Supply

1. Slide the tape control unit ac power supply (CU-PS01) into the front of the tape control unit. It will be necessary to get access to the input filter by removing the cover plate 7.
2. Install the line cord and stress clamp and install the mounting ring 3. Use the mounting ring removed from the old power supply.
3. Connect the yellow/green ground wire 2 to the outside rear of the power supply. Be sure to use a star washer between the lug on the wire and the power supply.
4. Connect the braided wire 5 to the ground point inside the input filter. Be sure to use a star washer between the lug on the wire and the input filter.
5. Connect one wire to each of the filter capacitors 4 in the input filter.
6. If you are installing a 50 Hz (except Japan) ac power supply connect the neutral wire to the neutral capacitor 6.
7. If you are installing a 50 Hz (except Japan) ac power supply, install the Delta/Wye jumper. See "Voltage Jumper Installation" for 50 Hz (except Japan) on this page.
8. Install the input filter cover plate 7 and replace the cover screws 8.
9. Slide the ac power supply to the rear of the tape control unit as far as it will go and install and tighten the two mounting bolts 1.
10. Install the cable clamp that holds the ac input cable to the tape control unit frame.
11. Connect all of the cables to the rear of the ac power supply.
12. Connect the J1 cable (CU-PS01-J1) to the right side of the ac power supply.

DANGER

Electric shock. Hazardous voltages can be present in the ac line cord connectors.

13. Connect the ac line cord to the power source.
14. Have the customer turn on the circuit breaker for the tape control unit ac power source.



Voltage Jumper Installation

60 Hz (and 50 Hz Japan)

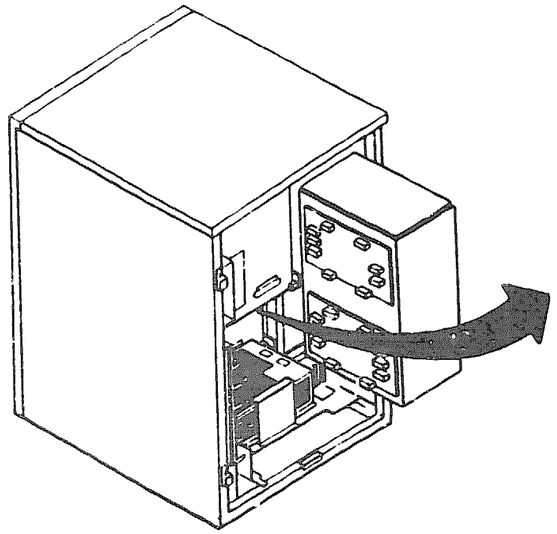
1. Set the convenience outlet voltage.
   - To set the convenience outlet voltage to 100 V ac, insert the jumper plug 10 in CU-PS01-J12.
   - To set the convenience outlet voltage to 120 V ac, insert the jumper plug 10 in CU-PS01-J13.
2. Set the input voltage.
   - If the ac input voltage is 200 or 208 V ac, plug the voltage jumper 11 in CU-PS01-J9.
   - If the ac input voltage is 220 V ac, plug the voltage jumper 11 in CU-PS01-J10.
   - If the ac input voltage is 230 or 240 V ac, plug the voltage jumper 11 in CU-PS01-J11.

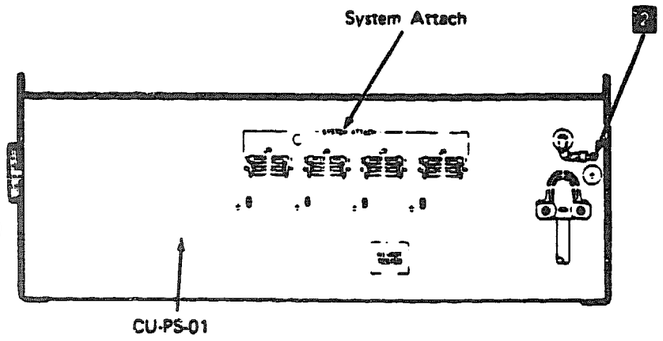
50 Hz (except Japan)

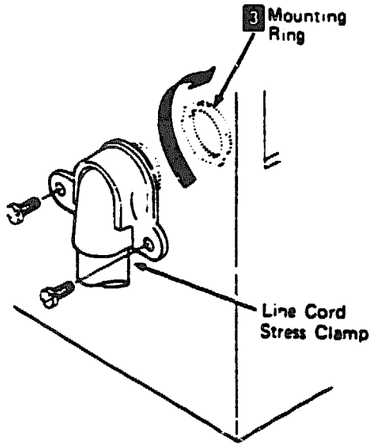
- If the ac input voltage is 200 V ac, plug the Delta/Wye jumper in CU-PS01-J9 and the voltage jumpers 9 in CU-PS01-J11 and J13.
- If the ac input voltage is 220 V ac, plug the Delta/Wye jumper in CU-PS01-J9 and the voltage jumpers 9 in CU-PS01-J11 and J14.
- If the ac input voltage is 230 or 240 V ac, plug the Delta/Wye jumper in CU-PS01-J9 and the voltage jumpers 9 in CU-PS01-J11 and J15.
- If the ac input voltage is 380 V ac, plug the Delta/Wye jumper in CU-PS01-J10 and the voltage jumpers 9 in CU-PS01-J12 and J14.
- If the ac input voltage is 400 or 415 V ac, plug the Delta/Wye jumper in CU-PS01-J10 and the voltage jumpers 9 in CU-PS01-J12 and J15.

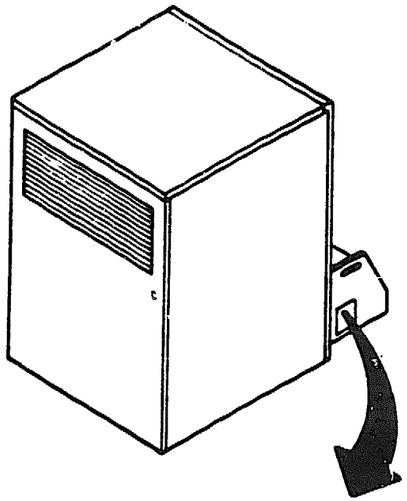
Note: Should the Delta/Wye jumper (J9-J10) have to be changed, replug the cap in the empty socket.

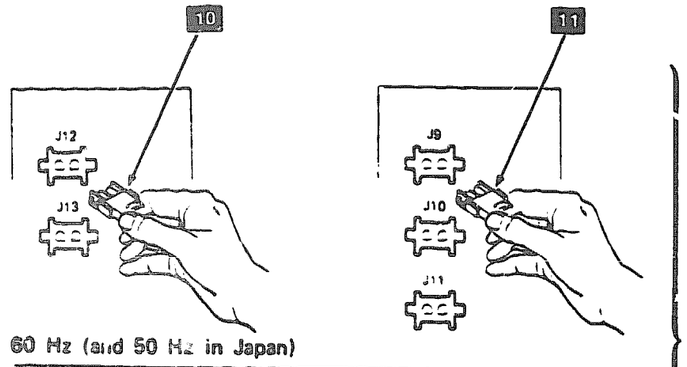
3. Install the tape control unit rear safety cover and ground connector, if present and close the tape control unit rear cover (see CARR-TCU 2-2).
4. Install the tape control unit front cover (see CARR-TCU 2-1).
5. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.

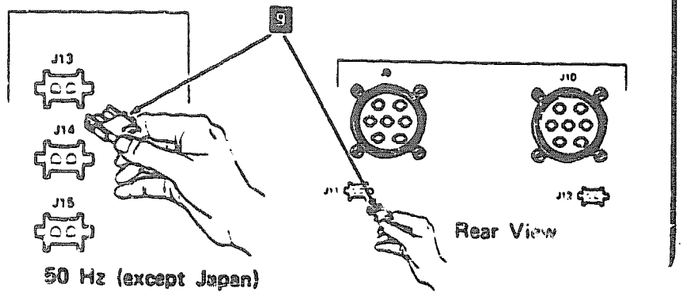


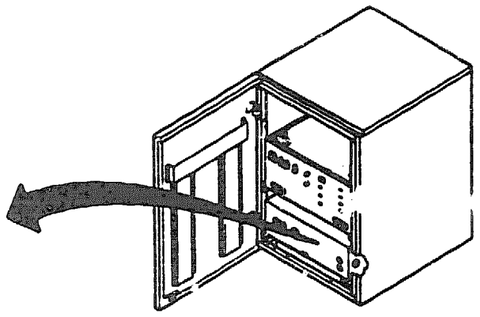

System Attach
2
CU-PS-01

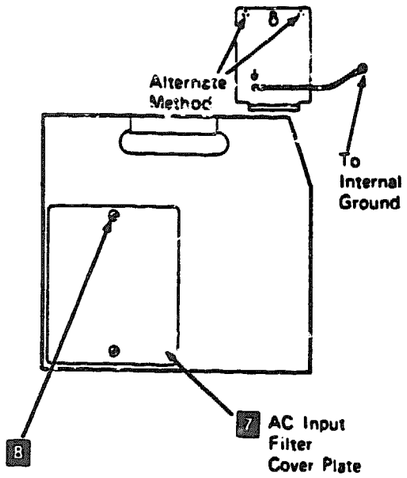

3 Mounting Ring
Line Cord Stress Clamp

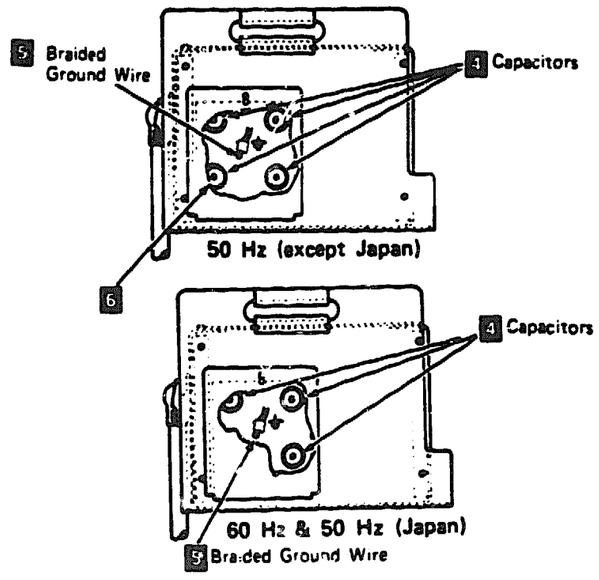



10
11
J12
J13
J9
J10
J11
60 Hz (and 50 Hz in Japan)


9
J13
J14
J15
J10
J11
J12
Rear View
50 Hz (except Japan)




Alternate Method
To Internal Ground
8
7 AC Input Filter Cover Plate


5 Braided Ground Wire
4 Capacitors
6
50 Hz (except Japan)
4 Capacitors
60 Hz & 50 Hz (Japan)
5 Braided Ground Wire

FRU145 Tape Control Unit DC Power Supply Removal and Replacement Procedure

This page contains the steps needed to remove and replace the dc power supply in the tape control unit. Because ac power must be turned off, all of the drives attached to the tape control unit must be available for service.

Removing the Tape Control Unit DC Power Supply

1. Go to CARR-TCU 6 for the procedure to remove ***ac power*** from the tape control unit.
2. Open the tape control unit rear and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic gate.
4. Disconnect all of the cables from the top rear of the dc power supply 1 (CU-PS02).
5. Remove the tape control unit front cover (see CARR-TCU 2-1).
6. Remove the two mounting bolts 2 from the tape control unit dc power supply.

   CAUTION:
   The dc power supply weighs about 50 kilograms (110 pounds). Two service representatives should lift the tape control unit dc power supply.
7. Remove the tape control unit dc power supply by sliding it out the front of the tape control unit.

Replacing the Tape Control Unit DC Power Supply

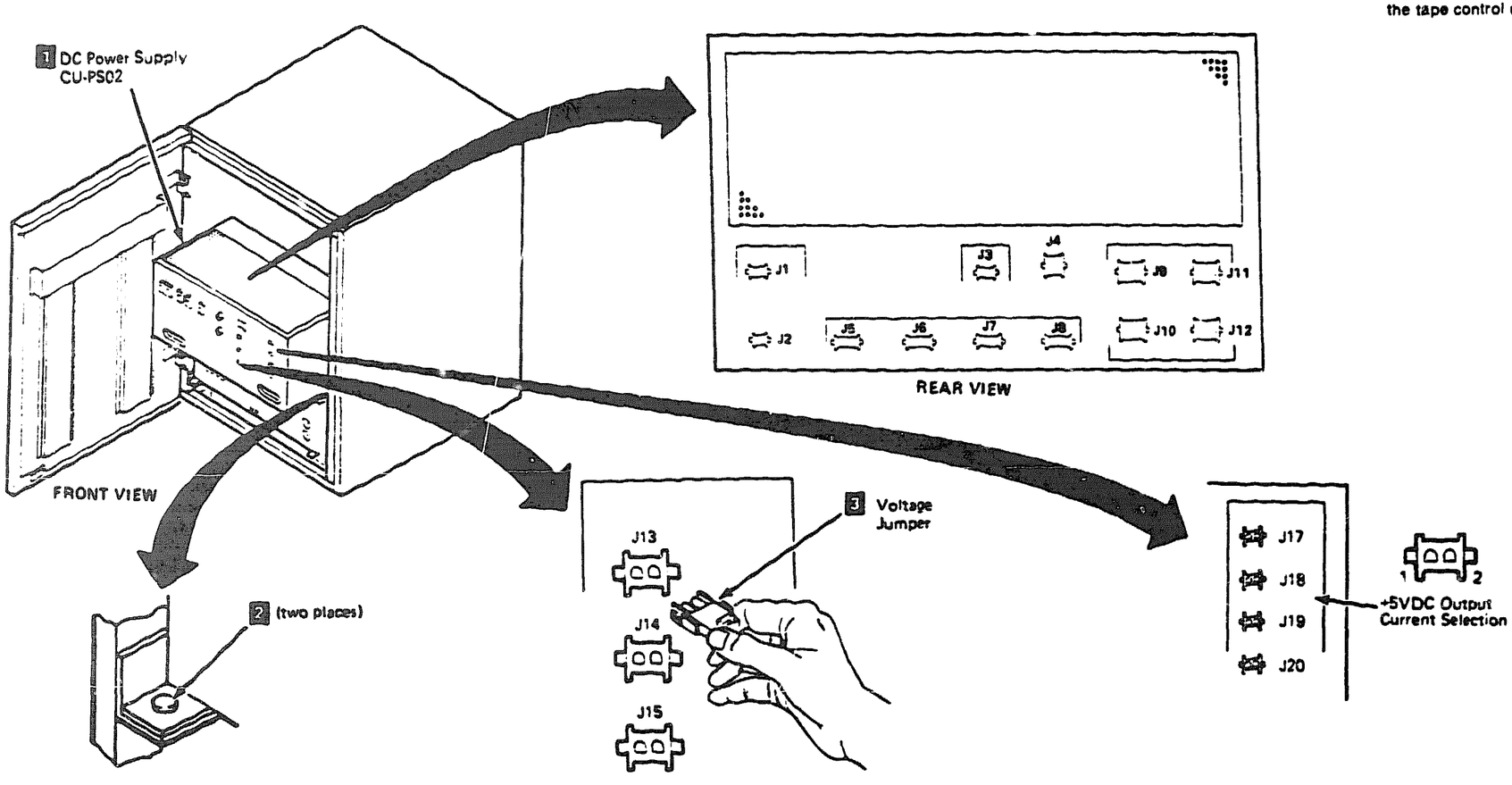
1. Slide the tape control unit dc power supply (CU-PS02) into the front of the tape control unit as far as it will go.
2. Align the two screw holes in the front on each side and install the two mounting bolts 2.
3. Install the cables into the top rear of the power supply 1.
4. Close the logic gate.
5. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).

Installing the Power Supply Jumpers

- If the input voltage is 200 or 208 V ac, plug the voltage jumper 3 in CU-PS02-J13.
- If the input voltage is 220 V ac, plug the voltage jumper 3 in CU-PS02-J14.
- If the input voltage is 230 V ac, plug the voltage jumper 3 in CU-PS02-J15.
- If the input voltage is 380 V ac (50 Hz only), plug the voltage jumper 3 in CU-PS02-J14.
- If the input voltage is 400 or 415 V ac (50 Hz only), plug the voltage jumper 3 in CU-PS02-J15.

Channel Adapters Installed

- Plug the +5 V dc jumper in CU-PS02-J17.
- Install the tape control unit front cover (see CARR-TCU 2-2).
- Go to CARR-TCU 1 for the procedure to restore ***ac power*** to the tape control unit.



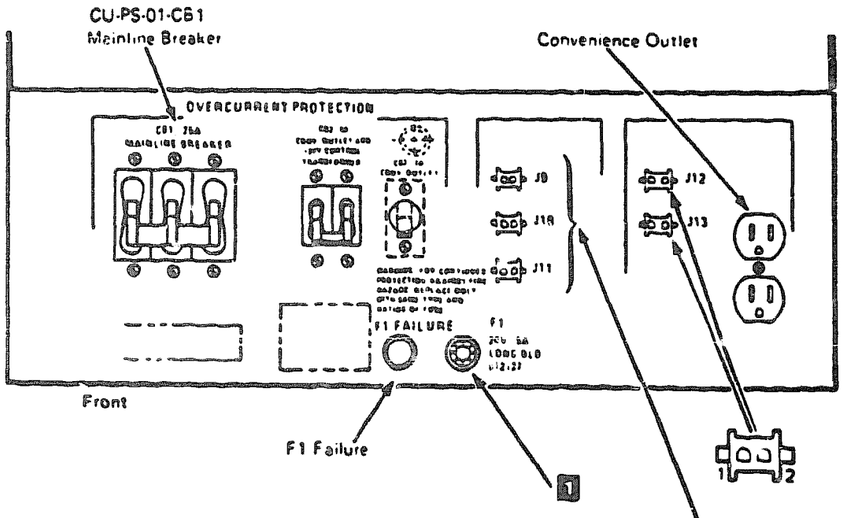
FRU146 AC Fuse Removal and Replacement Procedure

This page contains the steps needed to remove and replace the ac fuses in the tape control unit ac power supply (CU-PS01)

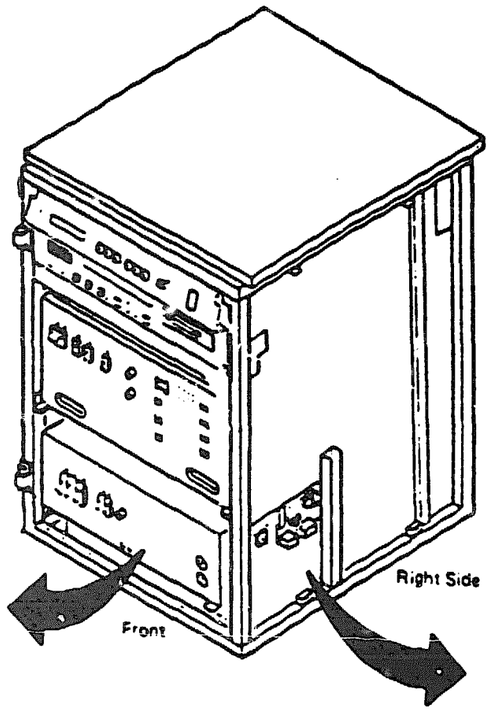
Since ac power is being removed from the tape control unit, all of the drives attached to the tape control unit must be available for service.

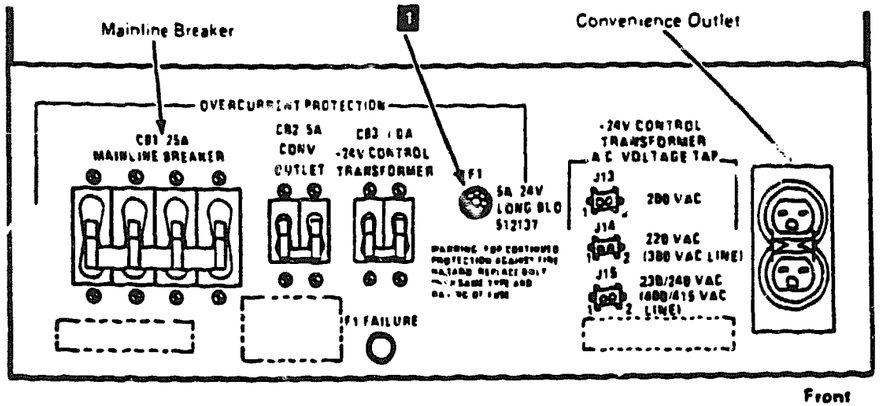
Fuse Removal and Replacement - AC Power Supply

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Remove fuse F1 [1] by turning the fuse holder cap counterclockwise.
3. Place a good fuse in the fuse holder cap and insert the fuse and cap into the power supply by turning the fuse holder cap clockwise.
4. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.



CU-PS01 Tape Control Unit AC Power Supply, 60 Hz, and 50 Hz Japan





CU-PS01 Control Unit AC Power Supply 50 Hz, Except Japan

FRU147, 148 DC Fuse Removal and Replacement Procedure

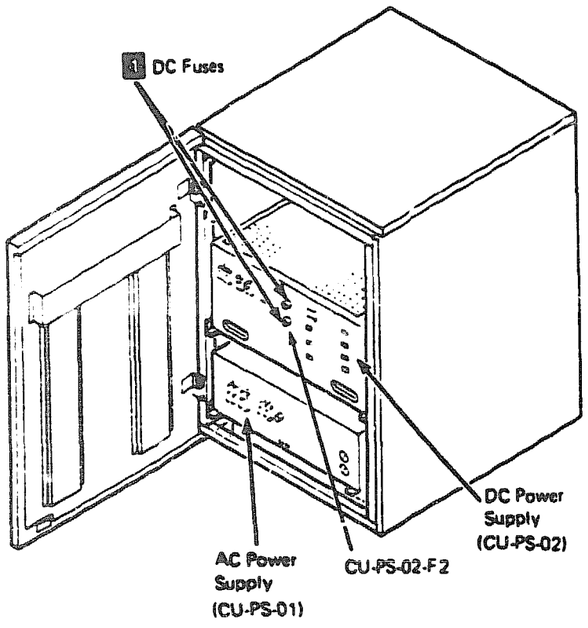
This page contains the steps needed to remove and replace either of the dc fuses [1] in the tape control unit dc power supply (CU-PS02). Removing either of the fuses will not cause the power to be removed from the drives attached to the tape control unit.

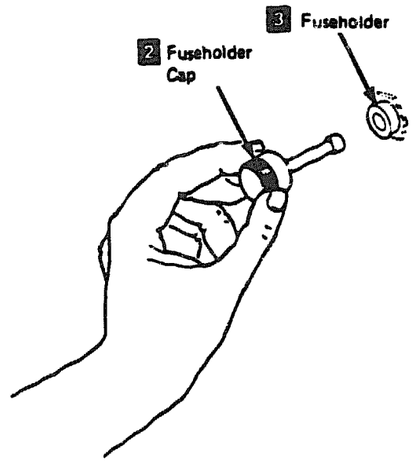
Removing the DC Fuses

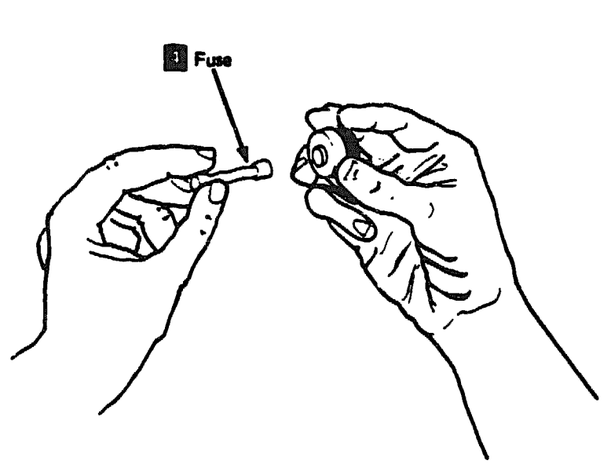
1. Go to CARR-TCU 6 for the procedure to remove ***dc power*** from the tape control unit.
2. Remove the fuse holder cap [2] from the fuse holder [3] by pushing in and turning counterclockwise until it stops. Pull the fuse holder cap and the fuse out of the fuse holder.
3. Remove the defective fuse [1] from the fuse holder cap.

Replacing the DC Fuses

1. Insert the replacement fuse [1] into the fuse holder cap [2].
2. Insert the fuse holder cap and fuse into the fuse holder [3].
3. Push in on the fuse holder cap and at the same time turn clockwise until it stops.
4. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.







FRU149 AC Line Cord Removal and Replacement Procedure

This page contains the steps needed to remove and replace the ac line cord in the tape control unit. Since ac power is being removed from the tape control unit, all drives attached to the tape control unit must be available for service.

Removing the AC Line Cord

Note: Have the customer turn off the circuit breaker for the tape control unit ac power source.

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Disconnect the ac line cord from the power source.
3. Remove the tape control unit front cover (see CARR-TCU 2-1).
4. Remove connector J1 (CU-PS01-J1) from the right side of the ac power supply (CU-PS01).
5. Open the tape control unit rear cover and remove the tape control unit rear safety cover and ground connector, if present (see CARR-TCU 2-1).
6. Remove the cable clamp which holds the ac input cable to the tape control unit frame.
7. Disconnect all of the cables from the rear of the ac power supply.
8. Remove the mounting bolts [2] from the front of the ac power supply.
9. Slide the ac power supply [1] forward to gain access to the input filter cover screw.
10. Remove the screw [9] from the input filter cover plate [8] and remove the plate.
11. Disconnect the wires from the three filter capacitors [5] in the input filter.

    Note: If you are removing a 50 Hz, except Japan, ac line cord; remove the wire from the filter capacitor [7].
12. Remove the braided ground wire [6] from inside the input filter.
13. Remove the green/yellow ground wire [3] from the rear of the ac power supply.
14. Loosen and remove the mounting ring [4] from the line cord stress clamp. Be sure to save the mounting ring for later use.
15. Remove the two screws and remove the line cord stress clamp [10] from the line cord.
16. Remove the ac line cord.

Replacing the AC Line Cord

Use the stress clamp removed from the previous line cord for the next step.

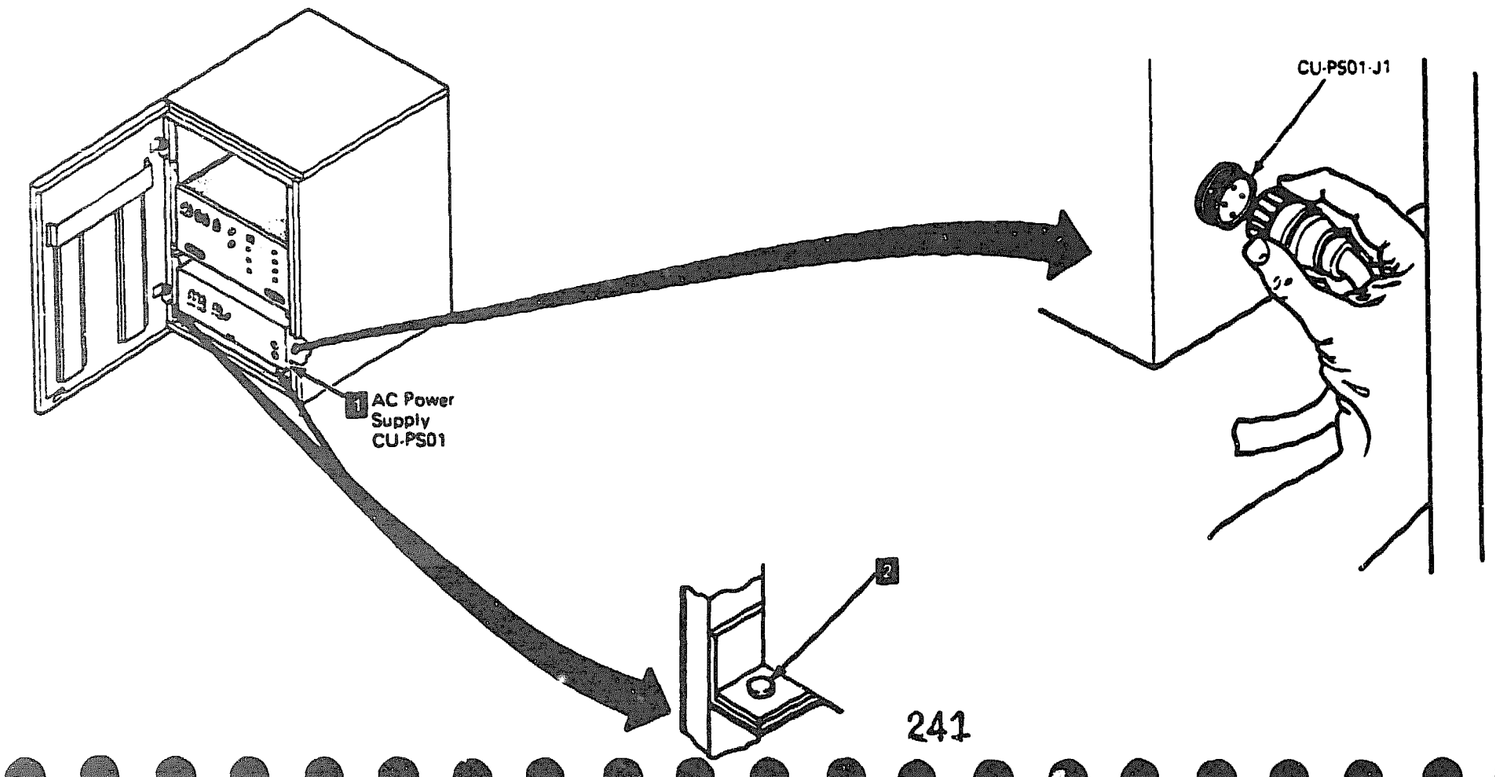
1. Install the line cord stress clamp [10]. Tighten the two stress clamp screws.
2. Install the line cord and stress clamp into the input filter and install the mounting ring [4]. Use the the mounting ring removed from the old line cord.
3. Connect the green/yellow ground wire [3] to the outside rear of the power supply. Be sure to use a star washer between the lug on the wire and the power supply.
4. Connect the braided ground wire [6] to the ground point inside the input filter. Be sure to use a star washer between the lug on the wire and the input filter.
5. Connect the one wire to each of the filter capacitors [5] in the input filter.

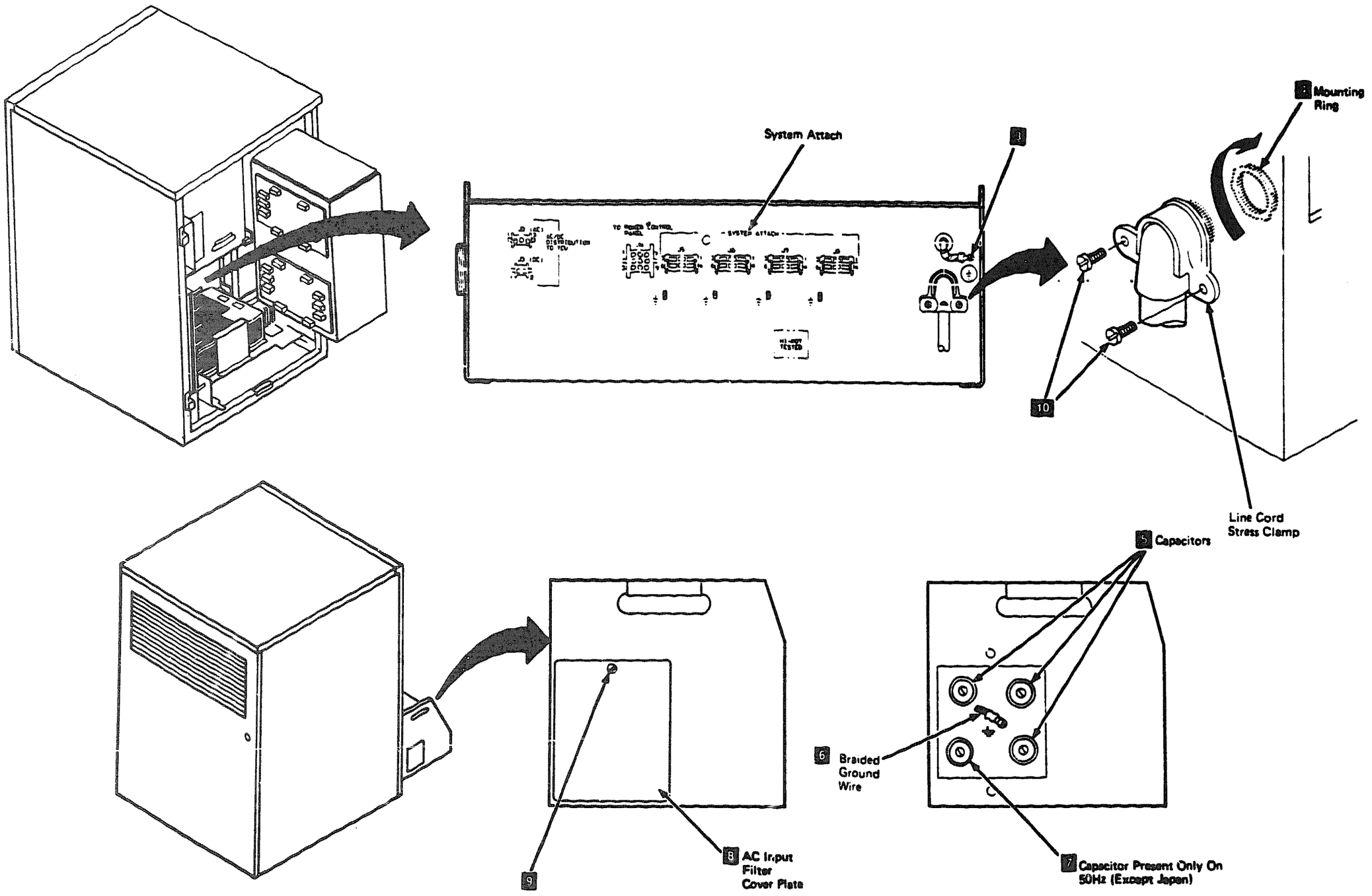
    Note: If you are installing a 50 Hz (except Japan) ac line cord, connect the wire to the filter capacitor [7].
6. Install the input filter cover plate [8] and screw [9].
7. Slide the ac power supply to the rear of the tape control unit as far as it will go and install the two mounting bolts [2].

    Note: There may not be any system cables to attach in the next step.
8. Install the cable clamp that holds the ac input cable to the tape control unit frame.
9. Connect all of the cables to the rear of the ac power supply [1].
10. Connect the J1 (CU-PS01-J1) cable on the right side of the ac power supply.

    DANGER

    Electrical shock. Hazardous voltages can be present in the ac line cord connectors.
11. Connect the ac line cord to the power source.
12. Have the customer turn on the circuit breaker for the tape control unit ac power source.
13. Install the tape control unit rear safety cover and ground connector, if present and close the tape control unit rear cover (see CARR-TCU 2-2).
14. Install the tape control unit front cover (see CARR-TCU 2-1).
15. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.




System Attach
1
Mounting Ring
10
Line Cord Stress Clamp
5 Capacitors
6 Braided Ground Wire
7 Capacitor Present Only On 50Hz (Except Japan)
8 AC Input Filter Cover Plate
9

FRU150 and 151 Blower Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace either of the blower assemblies in the tape control unit logic gate. It is not necessary to remove the ac power from the tape control unit to remove either of the blower assemblies.

Removing the Blower Assembly

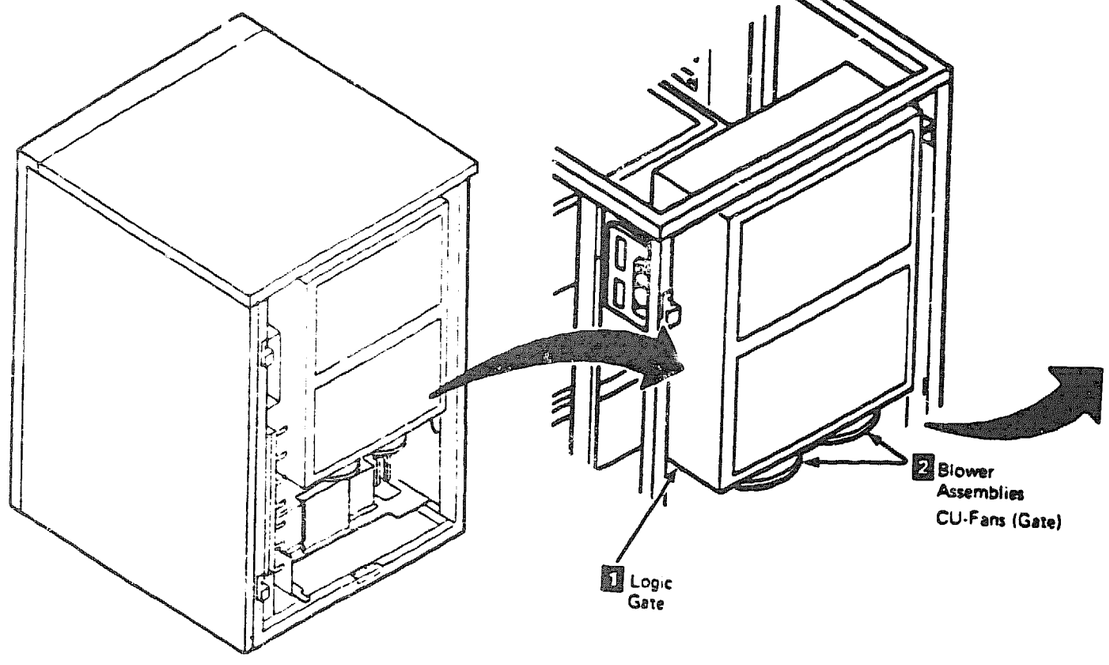
1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the tape control unit logic gate [1] and find which of the two blowers [2] you want to replace.
4. Unplug the ac power plug [7] from the blower assembly [8].
5. Remove the green/yellow ground connector [4] wire by removing the screw [5] and lockwasher [6].
6. Remove the blower mounting screws [9] and at the same time, support the blower to keep it from falling.
7. Lift the blower assembly [8] away from the tape control unit.
8. Remove the finger guard mounting screw [9] from the blower assembly. Be careful not to lose the lockwashers [11] and nuts [12]. Remove the finger guard [10].

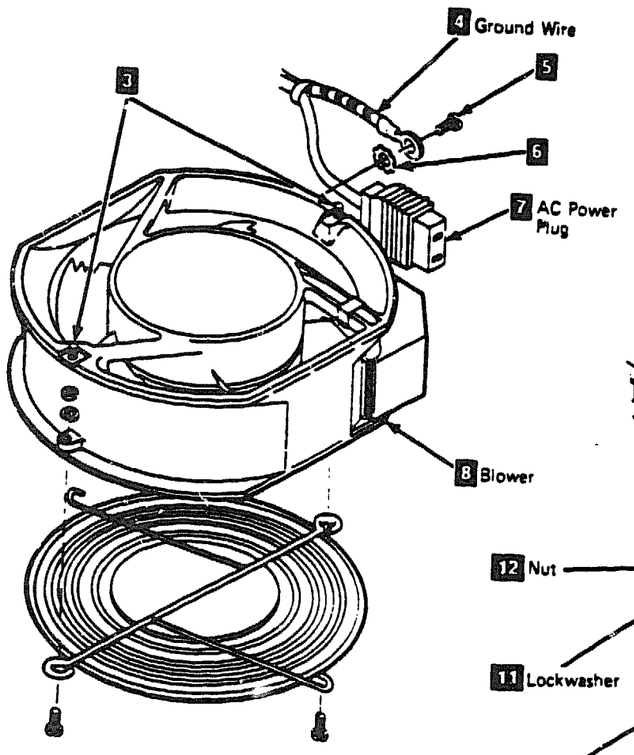
   Save the finger guard for use with the replacement blower.

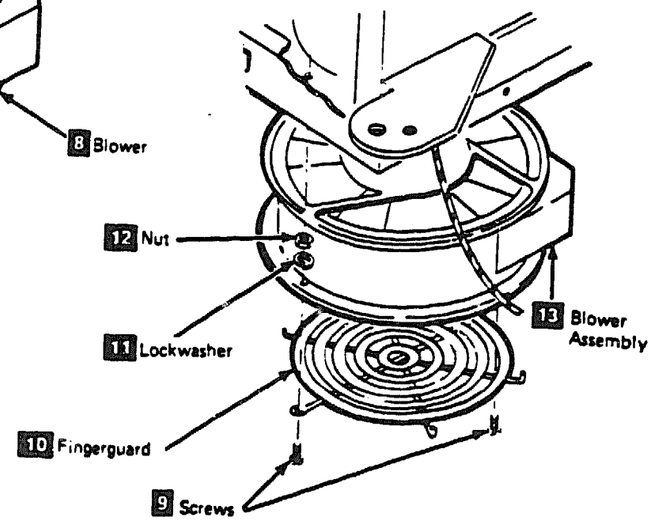
Replacing the Blower Assembly

1. Place the finger guard [10] on the blower assembly [8] and install the mounting screws [9], lockwashers [11] and nuts [12].
2. Place the blower assembly [8] in position against the tape control unit logic gate [1] and install the mounting screws [9].
3. Install the green/yellow ground connector [4], the lockwasher [6] and the mounting screw [5] to the blower assembly [8].
4. Connect the blower ac power plug [7] to the blower assembly.

   Make sure the blower plug is seated correctly on the blower.
5. Install the rear safety cover and ground connector, if present and close the rear cover (see CARR-TCU 2-2).
6. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.







FRU157 Top Card Connector Removal and Replacement Procedure

This page contains the steps needed to remove and replace any of the top card connectors (TCC) in the tape control unit.

It is not necessary to power off the tape control unit, however, dc voltage must be removed from the tape control unit.

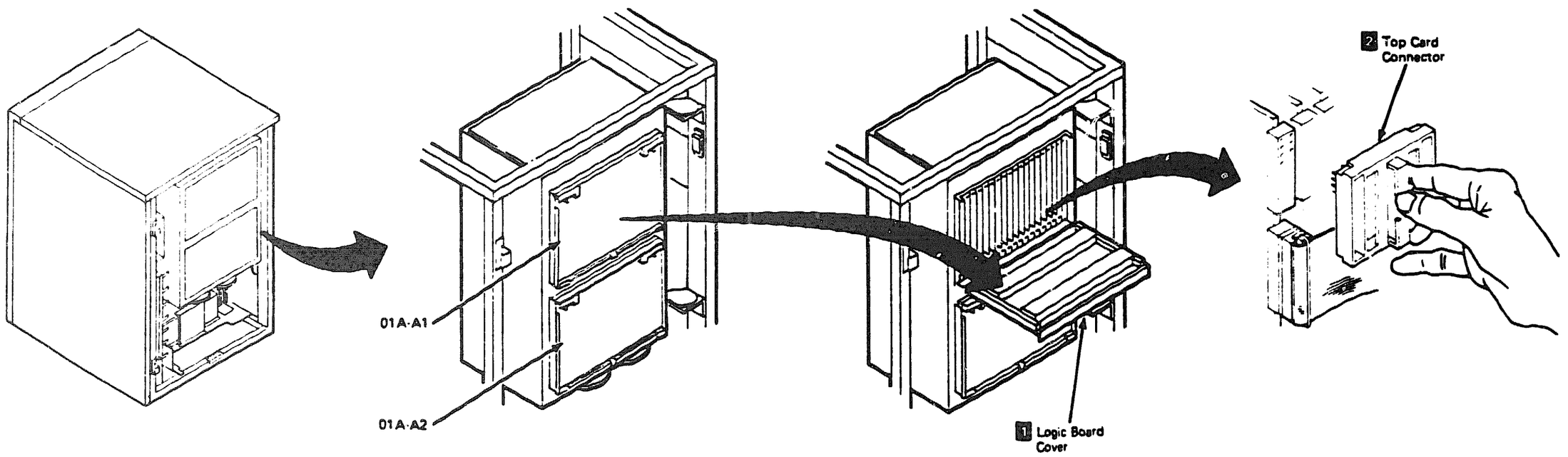
Removing the Top Card Connectors (TCC)

1. Go to CARR-TCU 6 for the procedure to remove ***dc power*** from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic board cover 1 needed to remove the TCC.
4. Remove the TCC 2 from the logic card by pulling it straight away from the card

Replacing the Top Card Connectors (TCC)

Note: For the logic card locations see LOC 1. For the top card connector and top card cable locations see LOC 1.

1. Insert the TCC 2 onto the logic card. Push the top card connector straight toward the logic card.
2. Close the logic board cover 1.
3. Install the rear safety cover and ground connector, if present and close the rear cover (see CARR-TCU 2-2).
4. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.



FRU160 Power Supply to Gate TB Cable Removal and Replacement Procedure

This page contains the steps needed to remove and replace the dc power supply to gate TB cable in the tape control unit. Since it is necessary to remove the ac power, all of the drives attached to the tape control unit should be available for service.

Removing the DC Power Supply to Gate TB Cable

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic gate 1.
4. Unplug connectors CU-PS02-P4, P9, P11, P10 and P12 6.
5. Remove the cable retention hardware as you remove the cable to the logic gate.
6. Remove the plastic safety covers 2 from the three terminal blocks (TBs), setting the covers to the side.

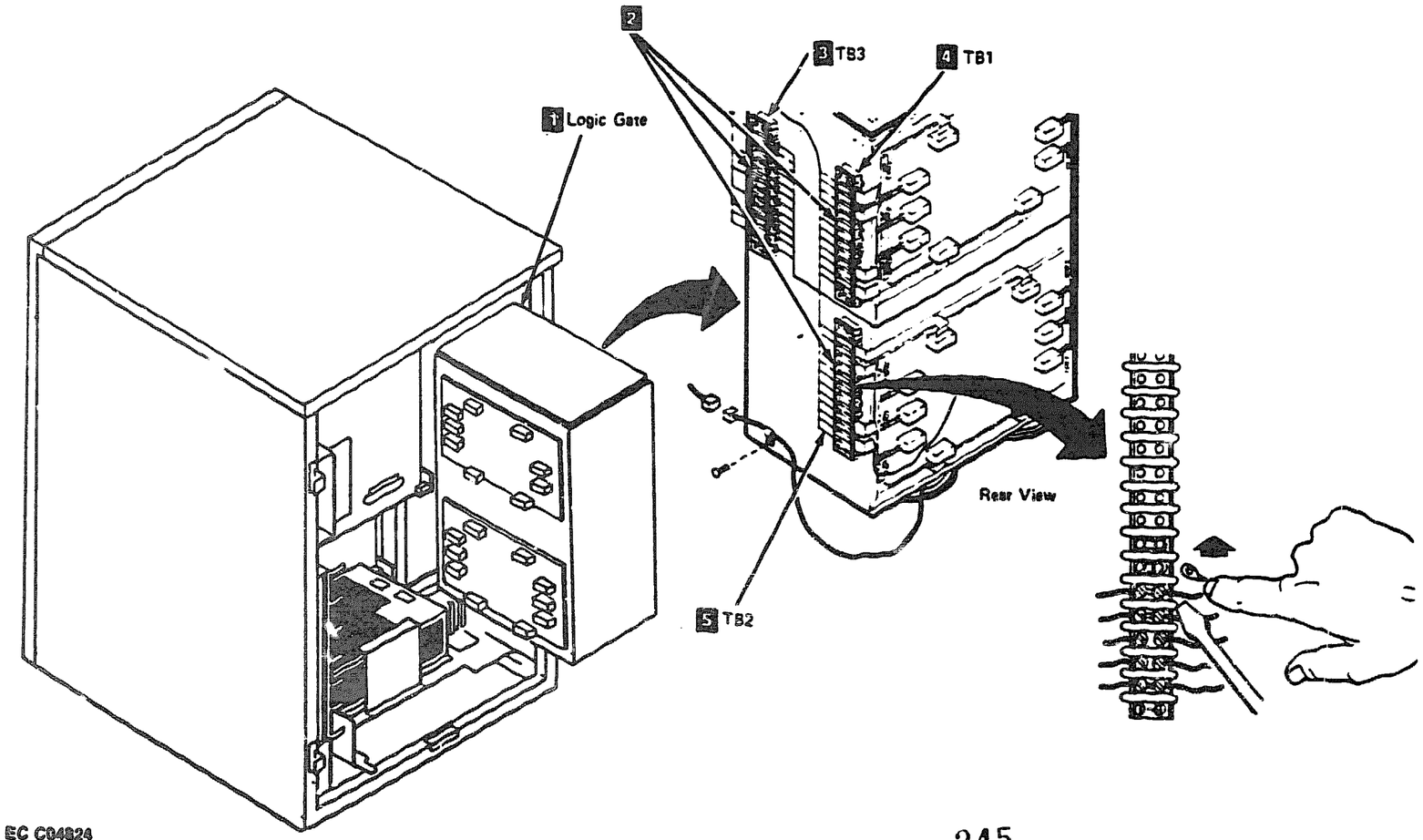
   Note: It is not necessary to label each wire before removal because the wires on the new cable are laced to line up with the TB screws.

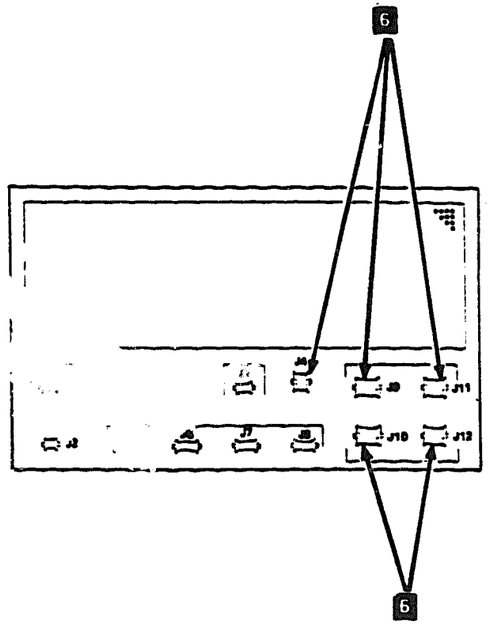
7. Remove the wires from TB2 5 (CU-A1-TB2) and set the screws to the side for later use.
8. Remove the wires from TB1 4 (CU-A1-TB1) and set the screws to the side for later use.
9. Remove the wires from TB3 3 (CU-A1-TB3) and set the screws to the side for later use.
10. Remove the cable from the tape control unit.

Replacing the DC Power Supply to Gate TB Cable

Note: The cable is laced so that the wires line up with the TB screws.

1. Install the wires and screws to TB3 3 (CU-A1-TB3). There are no wires connected to TB3-2, TB3-3, TB3-7, and TB3-14.
2. Install the wires and screws to TB1 4 (CU-A1-TB1).
3. Install the wires and screws to TB2 5 (CU-A1-TB2).
4. Place the cable in the same position as the cable removed and install the cable retention hardware.
5. Install the connectors at the top rear of the dc power supply. The connectors are installed at CU-PS02-J12, J10, J11, J9 and J4 6.
6. Install the three plastic safety covers 2 onto the three TBs.
7. Close the logic gate 1.
8. Install the rear safety cover and ground connector, if present and close the rear cover (see CARR-TCU 2-2).
9. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.





TA90 MG EC C04824

FRU162 Service Switch Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the service switch assembly from the tape control unit. It is necessary to remove the ac voltage from the tape control unit. All drives attached to the tape control unit must be available for service.

Removing the Service Switch Assembly

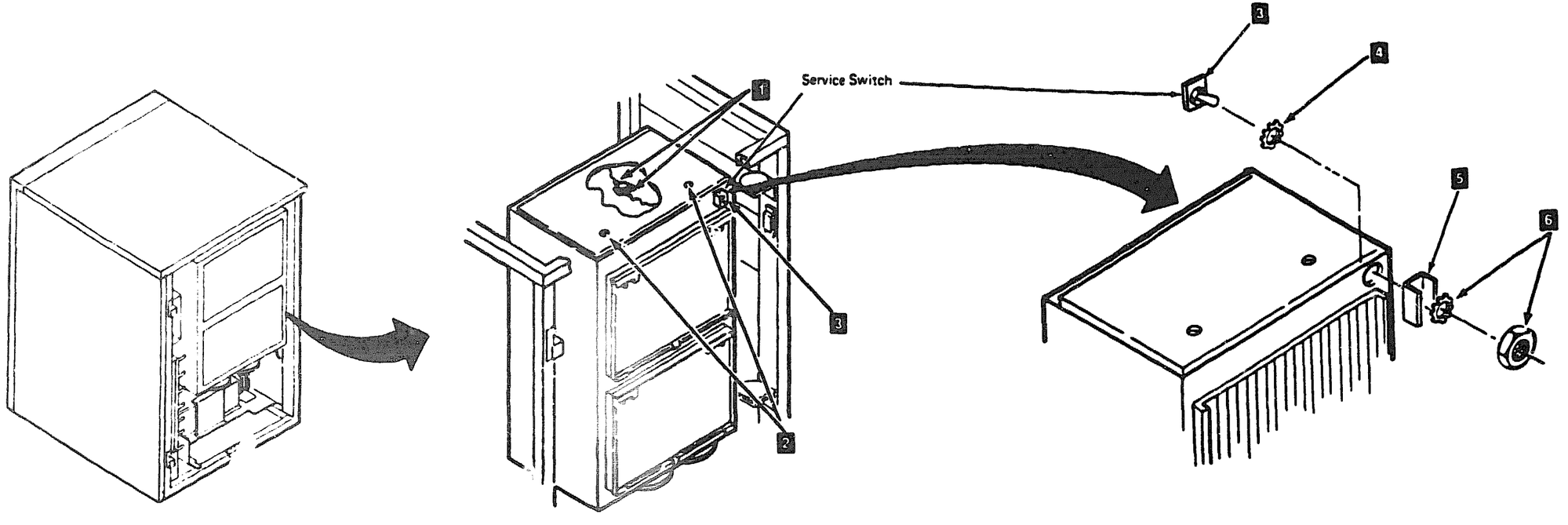
1. Go to CARR-TCU 6 for the procedure to remove ac power from the tape control unit.
2. Open the rear cover of the tape control unit and remove the safety cover and ground connector, if present (see CARR-TCU 2-1 or 2-3).
3. Swing out the logic gate and locate TB3 (see LOC 1).
4. Remove the plastic cover from TB3.
5. Open the 01A logic board cover and remove the bottom screw from the right cable retention bar. Loosen the top screw from the right cable retention bar. (This step is necessary to provide space to remove the switch assembly wires.)
6. Disconnect the wires from TB3 positions 5A, 12A, 13A, and 14A.
7. Note the wire routing, then remove the wires from any retention hardware.
8. Loosen the two screws [2] that hold the top cover on the gate by turning the fasteners one-quarter turn counterclockwise.
9. If the thermal switch is mounted on the top cover, lift the cover up far enough to disconnect the two thermal wires [1].
10. Lift the cover off.
11. While holding onto the service switch assembly [3], remove the mounting nut, lock washer [6] and the guard bracket [5], if it is removable, from the outside of the logic gate. Remove the switch assembly from inside the gate, being careful not to lose the lock washer [4].
12. Save the mounting nut and washers for the service switch assembly replacement procedure.

Replacing the Service Switch and Cable Assembly

1. Route the four-lead branch of the switch assembly along the same path as the old switch assembly and out the card side of the gate to TB3. Ensure the cable is routed under the 01A board right cable retention bar. This will prevent the cable being pinched when the board cover is closed.
2. Place a lock-washer [4] on the front of the service switch assembly, and with the key-way up mount it on the rear of the logic gate with the operating toggle through the gate mounting hole.
3. If removed previously, install the guard bracket [5] (with the ON label up), lock-washer, and nut [6] on the outside of the logic gate.
4. Tighten the nut to hold the assembly in place.
5. Connect the four wires to TB3 positions 5A, 12A, 13A, and 14A.
6. Place the logic gate top cover into position.
7. If you removed them previously, connect the two slip-on connectors [1] to the thermal switch.
8. Close the top logic gate cover and then tighten by turning the fasteners [2] one-quarter turn clockwise.
9. Replace the plastic cover on TB3.
10. Replace the bottom screw for the right cable retention bar for 01A logic board.

    Note: Ensure all cable retentions are under the cable retention bar before doing the next step.

11. Tighten the top screw for the right cable retention bar, then close the 01A logic board cover.
12. Ensure that the service switch is in the On position, then close the logic gate.
13. Replace the rear safety cover and ground connector, if present, and close the rear tape control unit cover (see CARR-TCU 2-2 or 2-4).
14. Go to CARR-TCU 6 for the procedure to restore ac power to the tape control unit.



FRU165 Gate Fan Cable Removal and Replacement Procedure

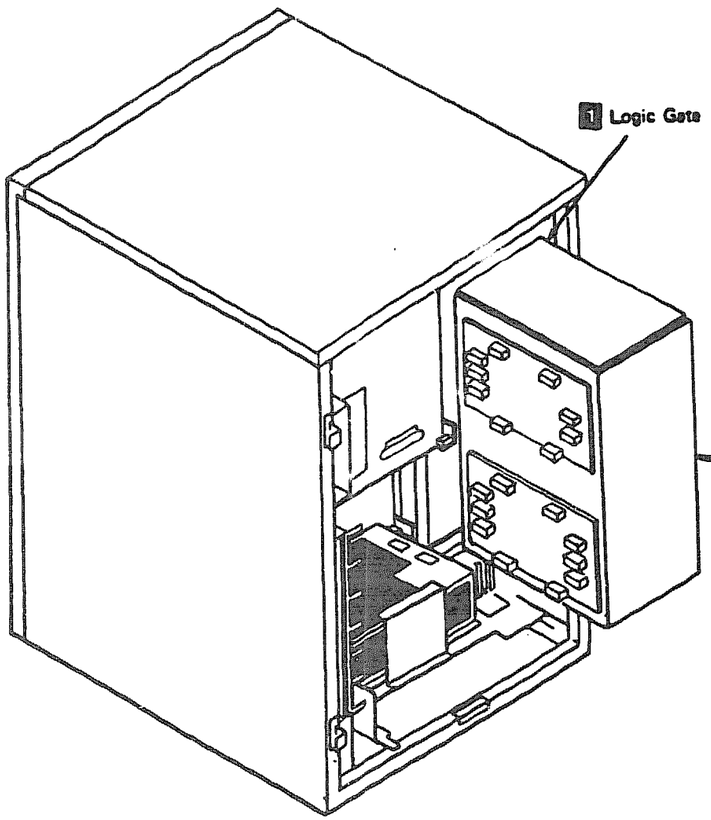
This page contains the steps needed to remove and replace the gate fan cable from the tape control unit logic gate. It is not necessary to remove ac power to remove this cable.

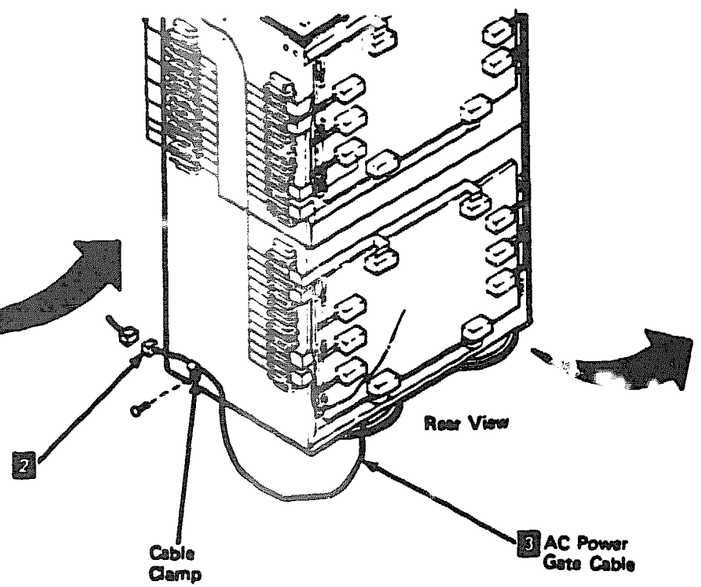
Removing the Gate Fan Cable

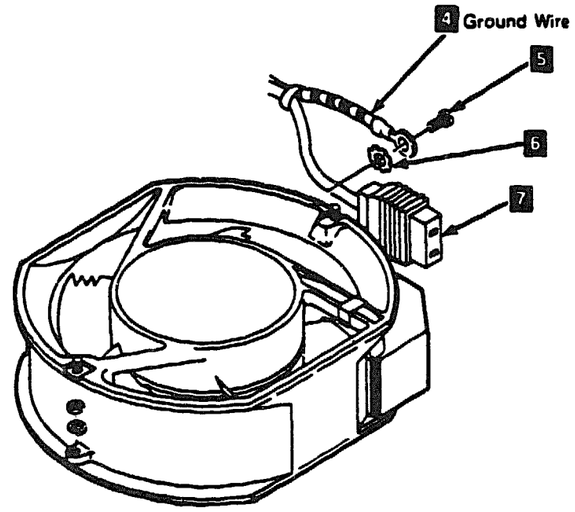
1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector (see CARR-TCU 2-1).
3. Open the tape control unit logic gate 1 and find the gate fan cable 3 at the bottom of the logic gate.
4. Unplug the connector 2 (CU-A1-P1) near the bottom hinge.
5. Unplug the connectors 7 from each of the blowers.
6. Remove the green/yellow ground wire 4, the star washer 6 and the mounting screw 5 from each of the blowers.
7. Remove the cable clamp and remove the cable from the logic gate.

Replacing the Gate Fan Cable

1. Place the gate fan cable 3 in position on the bottom of the logic gate and plug each connector 7 onto the blower assemblies.
2. Install the green/yellow ground wire 4 and mounting screw 5 to each of the blowers. Be sure to use the star washer 6 on each blower.
3. Install the cable clamp to the logic gate.
4. Plug the connector 2 (CU-A1-P1) into the cable near the bottom hinge of the logic gate.
5. Close the logic gate 1.
6. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).
7. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.







FRU177 AC Power to Gate Cable Removal and Replacement Procedure

This page contains the steps needed to remove and replace the ac power to gate cable from the tape control unit. The ac power does not need to be removed from the tape control unit to remove the gate fan cable

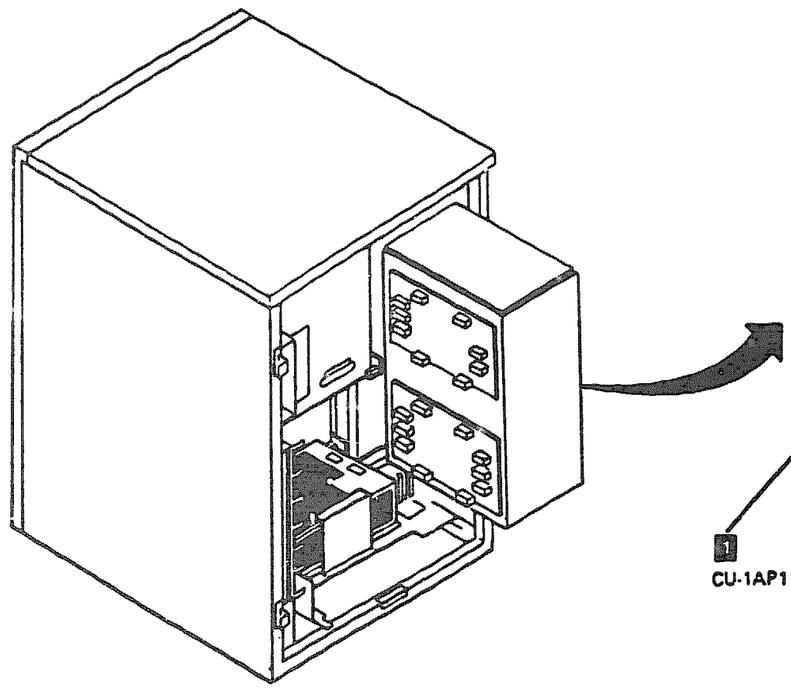
Removing the AC Power to Gate Cable

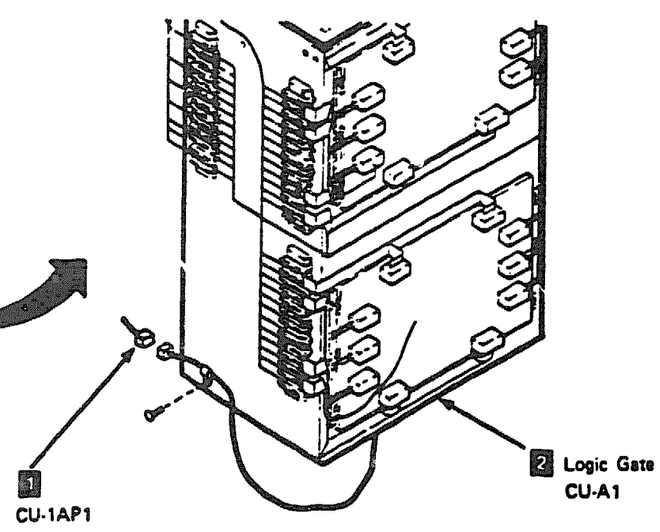
1. Go to CARR-TCU 6 for the procedure to remove ***dc power*** from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic gate.

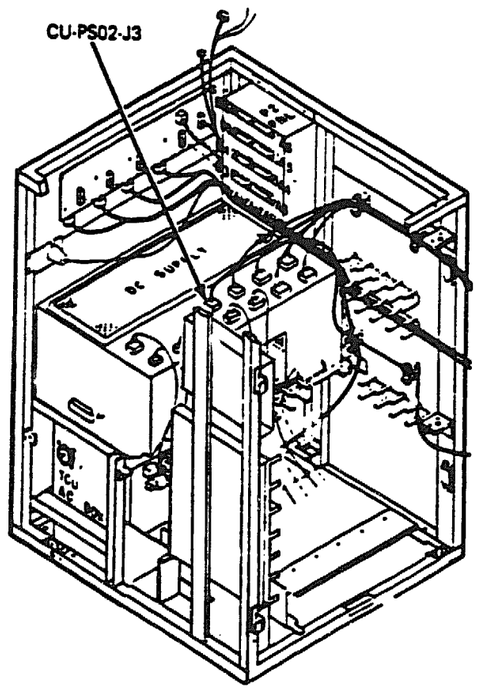
   The ac power to gate cable is located near the bottom hinge of the logic gate and travels to the top rear of the dc power supply.
4. Unplug the connector from CU-PS02-J3.
5. Remove the cable retainers as you remove the cable from the tape control unit.
6. Disconnect the cable plug at the connector 1 (CU-A1-P1) near the bottom hinge of the logic gate 2.
7. Remove the cable from the tape control unit.

Replacing the AC Power to Gate Cable

1. Connect the cable plug to the connector 1 (CU-A1-P1) located near the bottom hinge of the logic gate 2.
2. Place the cable in the path shown and install the cable retention hardware as you install the cable.
3. Connect the cable to CU-PS02-J3.
4. Close the logic gate
5. Install the rear safety cover and ground connector, if present and close the rear cover (see CARR-TCU 2-2)
6. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.







FRU197 TCU Address Switch Removal and Replacement Procedure

This page contains the steps needed to remove and replace either of the TCU address switches [1] from the tape control unit operator setup panel [2]

All of the drives attached to the tape control unit must be available for service.

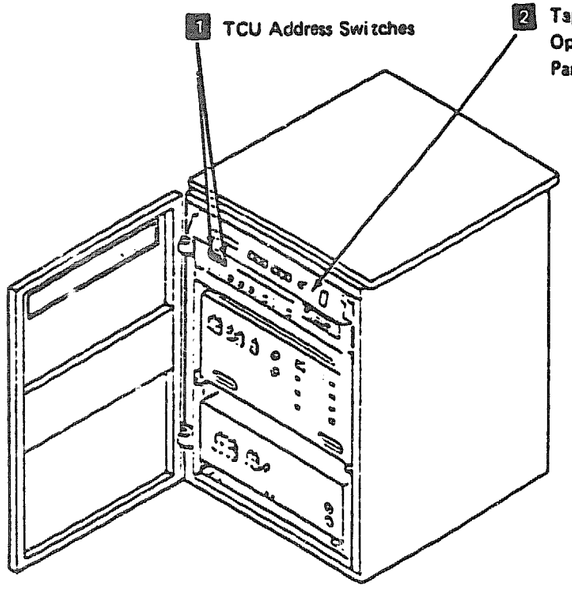
Note: This FRU can be removed and replaced without affecting the attached tape transport units by removing dc power from the tape control unit with the service switch.

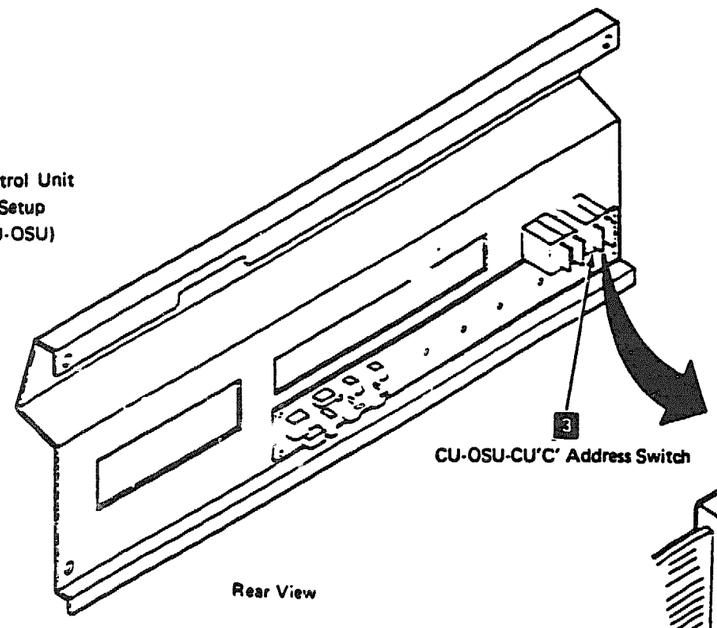
Removing the TCU Address Switch

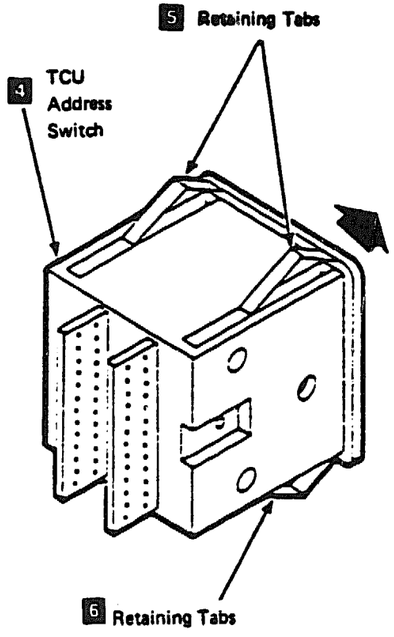
1. Go to CARR-TCU 6 for the procedure to remove ***dc power*** from the tape control unit.
2. Open the tape control unit rear cover and remove the top cover (see CARR-TCU 2-1).
3. Remove the two cables [4] (CU-OSU-J12 and J13) from the rear of the TCU address switch you are replacing.
4. Push the TCU address switch [1], [4] out from the rear of the tape control unit operator setup panel [2] by squeezing the retaining tabs [5] and [6] together, and at the same time pushing the switch toward the front of the tape control unit.

Replacing the TCU Address Switch

1. Place the TCU address switch [1], [4] in the proper position so the numbers can be read correctly. Push the switch into the tape control unit operator setup panel [2] as far as it will go.
2. Connect the two cables [3] (CU-OSU-J12 and J13) to the switch.
3. Replace the tape control unit top cover and close the rear cover (see CARR-TCU 2-2).
4. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.







FRU198 UEPO Switch Removal and Replacement Procedure

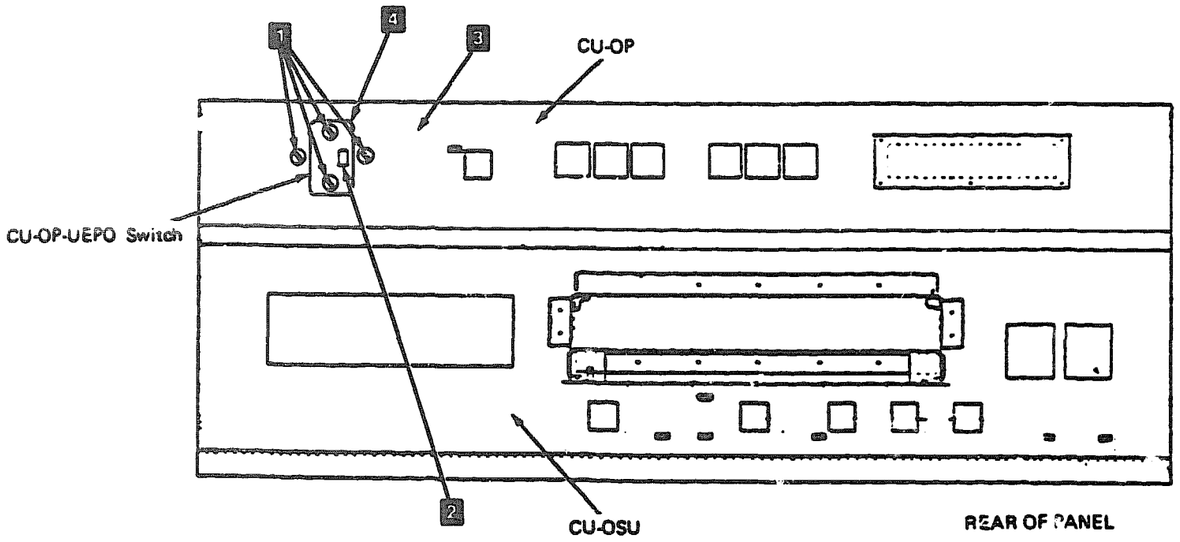
This page contains the steps needed to remove and replace the UEPO switch from the tape control unit operator panel. Because ac power must be switched off, it is necessary to have all drives attached to the tape control unit available for service.

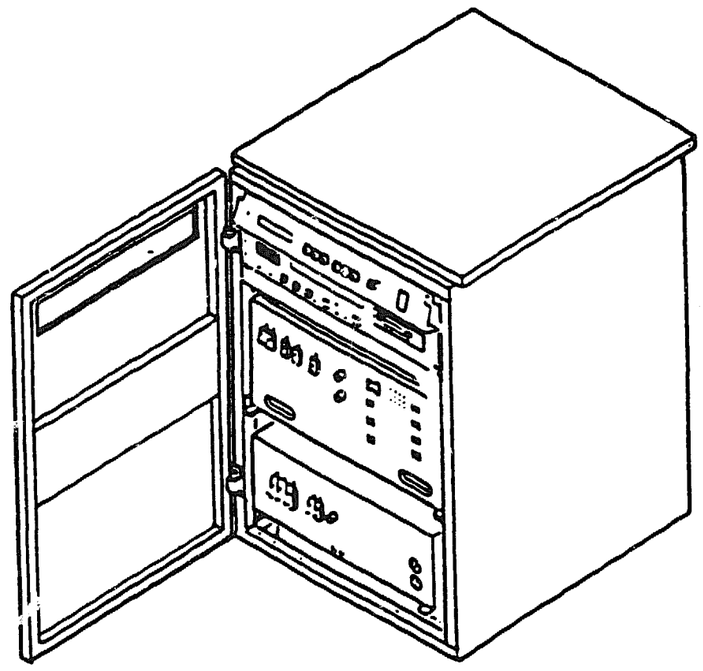
Removing the UEPO Switch

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the tape control unit rear cover and remove the top cover (see CARR-TCU 2-1 or 2-3).
3. Remove the EPO switch cable 2
4. Remove the four mounting screws 1 holding UEPO switch 4 and remove the switch from the tape control unit switch panel 3 (CU-OP)

Replacing the UEPO Switch

1. Place the UEPO switch 4 into position on the tape control unit switch panel 3 (CU-OP), and install the four mounting screws 1.
2. Attach the UEPO switch cable 2 to the connector on the rear of the UEPO switch.
3. Replace the tape control unit top cover and close the rear cover (see CARR-TCU 2-2 or 2-4).
4. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.





FRU 199 Write Terminator Removal and Replacement Procedure

This page contains the steps needed to remove and replace the write bus terminator. Depending on the subsystem configuration, the terminator can be in the tape control unit, or in the end drive attached to the tape control unit. The terminator will be in the tape control unit only when there are no drives physically attached to the tape control unit. It is not necessary to remove the ac or dc power from the tape control unit to exchange the terminator; however, it is necessary to have all the drives attached to the tape control unit available for service.

Removing the Write Bus Terminator

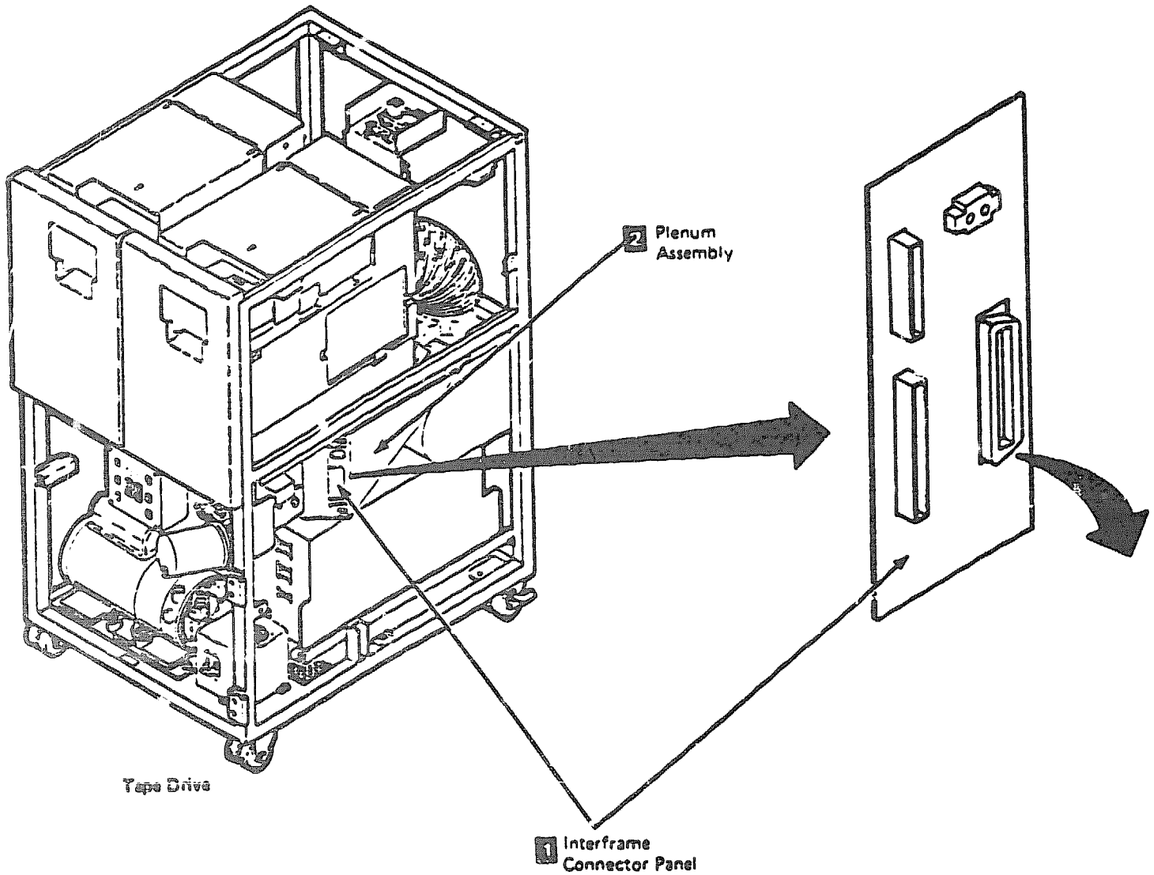
1. Find the terminator to be removed.

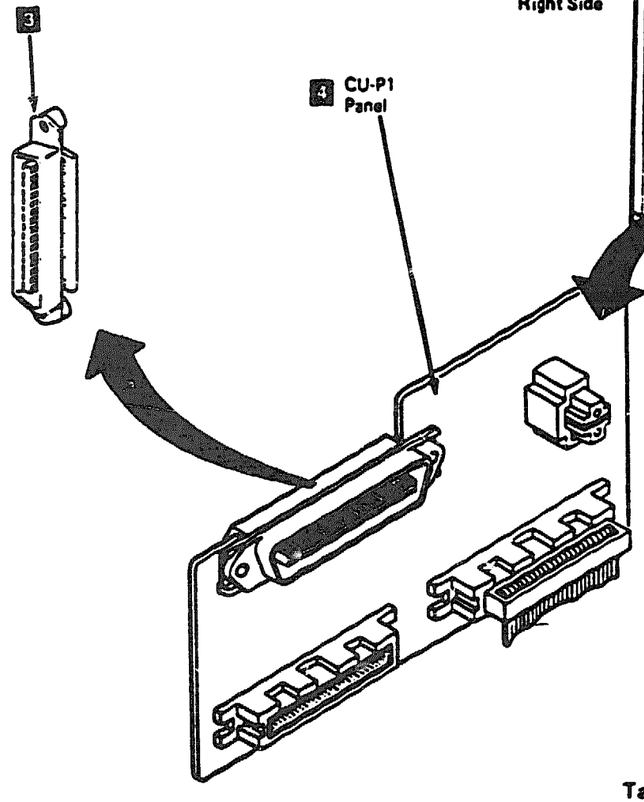
   There is one write bus terminator 3 for each tape control unit. This terminator will be either in the tape control unit or the end tape transport unit attached to the tape control unit, depending on your subsystem configuration.

   If the terminator is in the end tape unit, open the right cover (see CARR-DR 2-1) on the end tape unit. The terminator is located in the interframe connector panel 1 (attached to the right-front of the plenum assembly 2).

2. If the terminator is in the tape control unit, open the right cover (see CARR-TCU 2-1). The terminator is located in the CU-P1 panel 4.

3. Remove the terminator by removing the two mounting screws and pulling the terminator straight out of the connector.

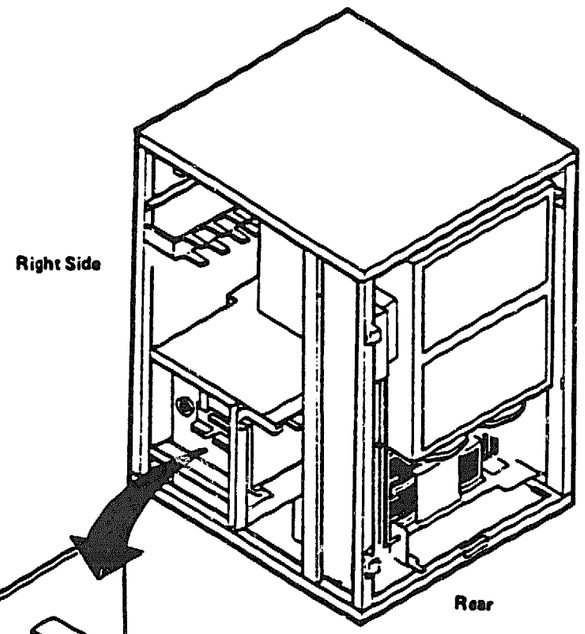




Replacing the Write Bus Terminator

1. Replace the write bus terminator 3 by pushing it straight into the connector (in the tape control unit or tape transport unit, depending on your subsystem configuration) and then replace the two mounting screws.

2. Close all covers on the tape control unit (see CARR-TCU 2-2) and tape transport units (see CARR-DR 2-2).



TA90 MG EC C13764

FRU224 Tape Control Unit Gate Upper Thermal Switch Removal and Replacement Procedure

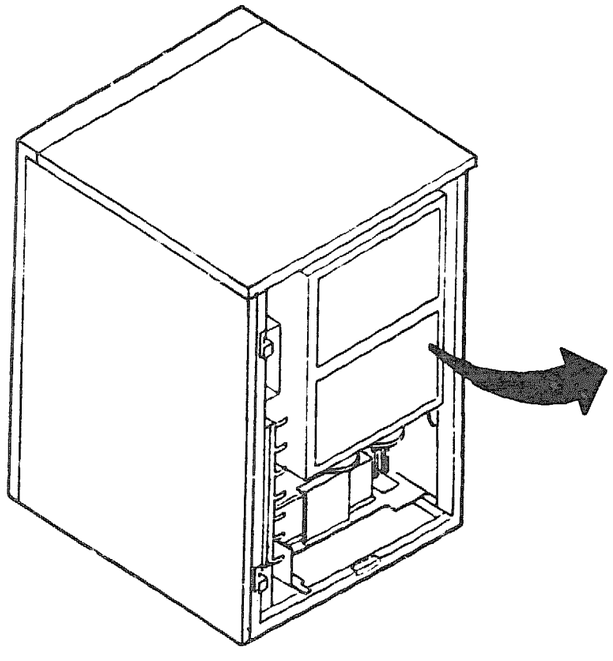
The page contains the steps needed to remove and replace the upper thermal switch in the tape control unit logic gate. It is necessary to remove the ac voltage from the tape control unit All drives attached to the tape control unit must be available for service

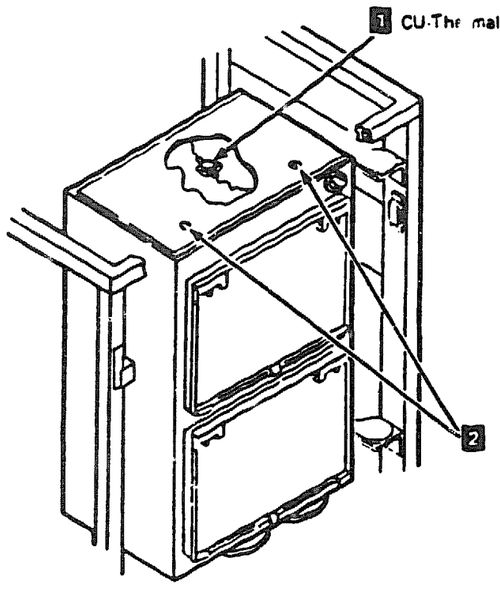
Removing the Tape Control Unit Gate Upper Thermal Switch

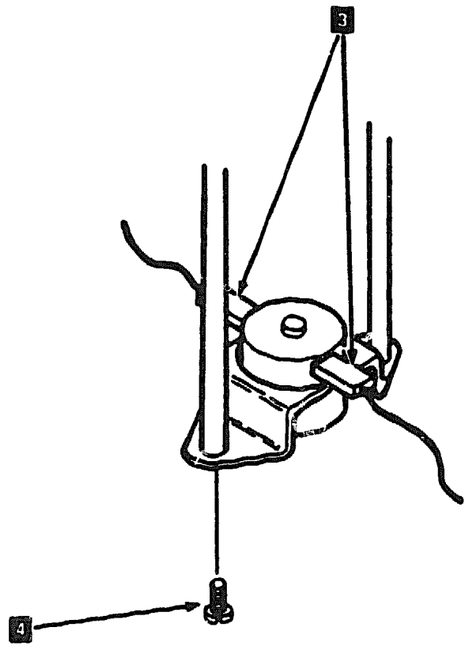
1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the rear cover of the tape control unit and remove the safety cover (see CARR-TCU 2-1).
3. Swing out the logic gate and locate the two top cover mounting screws 2, loosen the screws.
4. Raise the cover and disconnect the two wires 3 on the thermal switch, then remove the cover
5. Remove the two thermal switch mounting bracket screws 2 and remove the thermal switch 1. Save the mounting bracket hardware for the replacement procedure.

Replacing the Tape Control Unit Gate Upper Thermal Switch

1. Place the thermal switch 1 in the mounting bracket and attach it to the gate top cover with the two mounting screws 2.
2. Connect the two wires 3 to the thermal switch.
3. Place the cover on top of the logic gate, and tighten the two mounting screws 2.
4. Close the gate, replace the rear safety cover, and close the rear tape control unit door (see CARR-TCU 2-2).
5. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.







FRU258 IML Diskette

About the Initial Program Load (IML Functional Diskette)

The functional diskette is a 3.5" diskette that is used to load the microcode into the control unit for the TA90 subsystem.

Note: The functional diskette has a serial number written on it and on it's label.

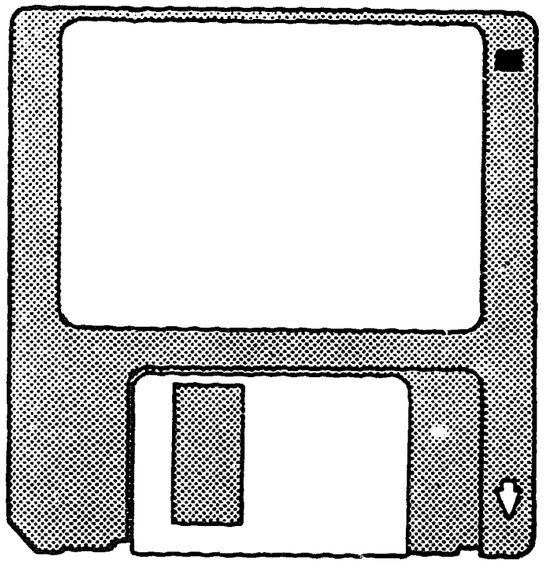
If a functional diskette problem is suspected, use the backup functional diskette for that tape control unit.

A defective functional diskette cannot be repaired. If the functional backup diskette is used, a new one at the correct EC level must be ordered to replace it.

When the new functional diskette is received, it must be IML'ed in the tape control unit that does not have a backup functional diskette. See PANEL 7 for IML'ing the TA90. Using the functional diskette causes the tape control unit serial number to be written on the diskette.

Once the serial number is written on the functional diskette:

1. Remove it from the tape control unit.
2. Write the tape control unit's serial number on the new functional diskette label using a felt-tip pen.
3. Save the new functional diskette to use as a backup for that tape control unit.



FRU279 DC Load Box Removal and Replacement Procedure

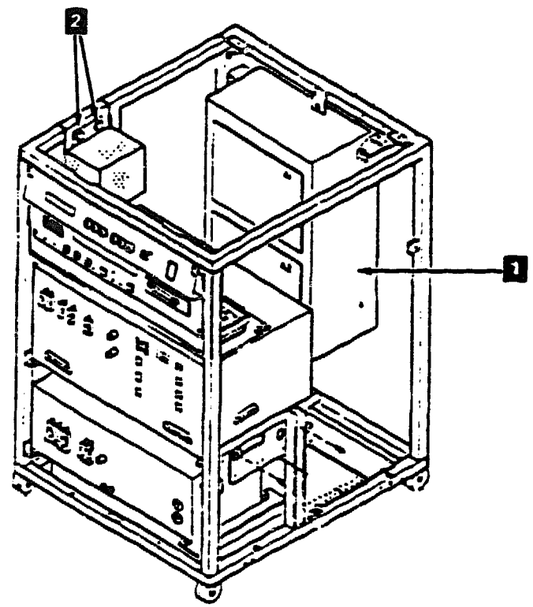
This page contains the steps needed to remove and replace the Load Box in the tape control unit. It is not necessary to power off the subsystem to remove the load box; however, the dc voltage must be removed from the tape control unit.

Removing the Load Box

1. Go to CARR-TCU 6 for the procedure to remove dc power from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Remove the tape control unit top cover (see CARR-TCU 2-1).
4. Open the logic gate 1.
5. Disconnect the load box cable from TB1 and TB3 (see ZT010 and ZT020 in Volume C01).
6. Remove the two screws 2 from the load box.
7. Lift the load box up and out of the tape control unit.

Replacing the Load Box

1. Set the load box over the top side rail on the tape control unit.
2. Install the two screws 2.
3. Install the load box cable on TB1 and TB3 (see ZT010 and ZT020 in Volume C01).
4. Close the logic gate.
5. Install the tape control unit top cover (see CARR-TCU 2-2).
6. Install the rear safety cover and ground connector, if present and close the tape control unit rear cover (see CARR-TCU 2-2).
7. Go to CARR-TCU 6 for the procedure to restore dc power to the tape control unit.



FRU900 Tape Control Unit STI-FIPS Adapter Removal and Replacement Procedure

The page contains the steps needed to remove and replace the STI-FIPS Adapters in the tape control unit. It is not necessary to power off the tape control unit; however, the dc voltage must be removed from the tape control unit.

See LOC 1 for the location of the STI-FIPS adapter chassis.

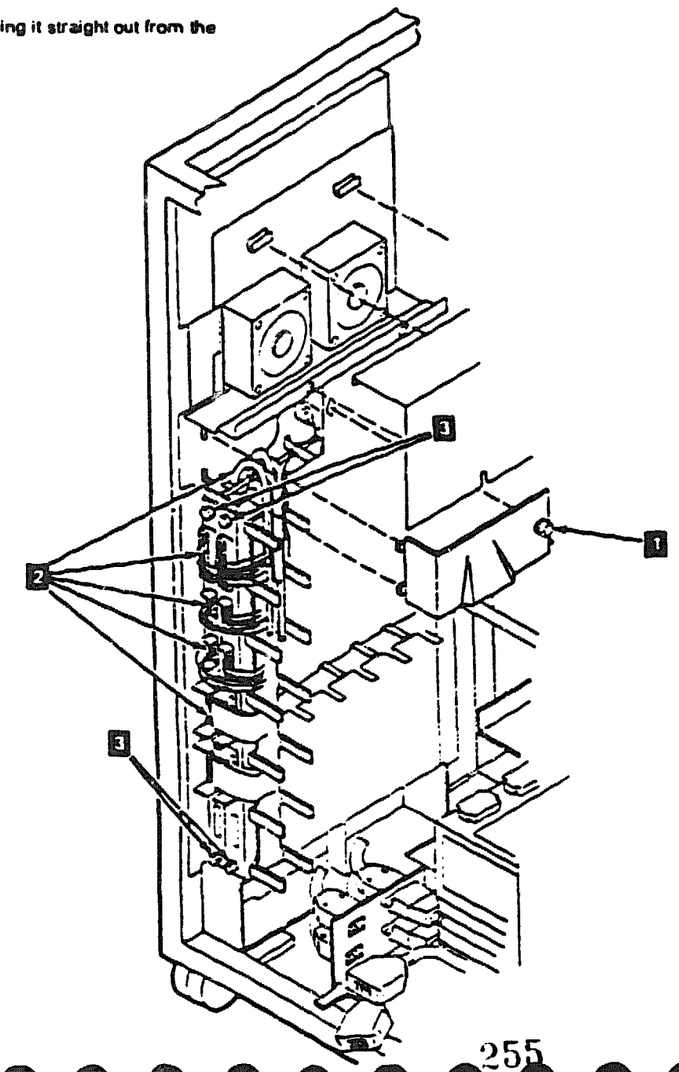
Warning: Parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-TCU 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Removing the STI-FIPS Adapter

1. Go to CARR-TCU 6 for the procedure to remove *dc power* from the tape control unit.
2. Open the tape control unit rear cover door and remove the rear safety cover 1 (see CARR-TCU 2-1). Remove the STI-FIPS cable cover by removing the retainer thumbnut 1.
3. Remove the card cables 2 as needed to remove the logic card.
4. Loosen the STI-FIPS adapter logic card retainer hexbolts 3 to remove the logic card. **CAUTION: Before removing either STI-FIPS adapter card, ensure that the card cables 2 are removed.**
5. Remove the logic card by pulling it straight out from the gate.

Replacing the STI-FIPS Adapter

1. Install the STI-FIPS adapter in the gate.
2. Tighten the STI-FIPS adapter card retainer hexbolts 3.
3. Install the card cables 2.
4. Install the STI-FIPS cable cover and tighten the retainer thumbnut 1 finger tight.
5. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).
6. Go to CARR-TCU 6 for the procedure to restore *dc power* to the tape control unit.



FRU903 STI DC Power Supply Removal and Replacement Procedure

If the replacement power supply is a different P/N than the one being replaced see CARR-TCU 9035

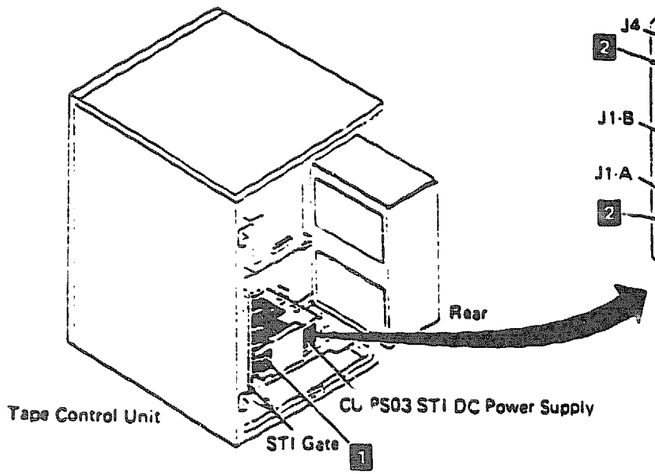
This page contains the steps needed to remove and replace the dc power supply in the tape control unit. Because ac power must be turned off, all of the drives attached to the tape control unit must be available for service.

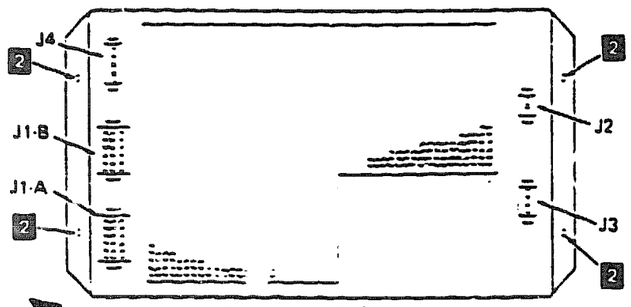
Removing the STI DC Power Supply

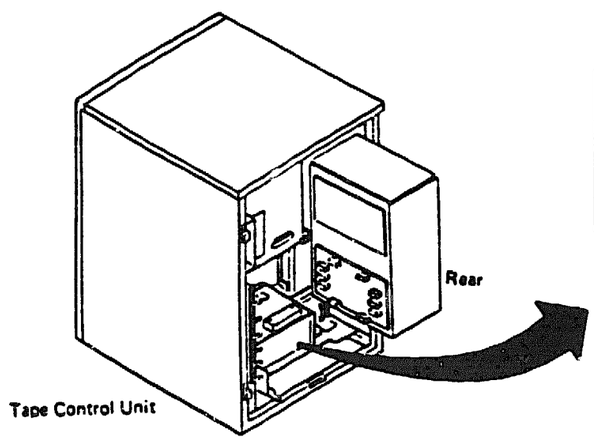
1. Go to CARR-TCU 6 for the procedure to remove ac power from the tape control unit.
2. Open the tape control unit rear and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic gate.
4. Remove the drip screen (see CARR-TCU 2-1)
5. Disconnect all of the cables from the top of the dc power supply 1 (CU-PS03).
6. Remove the four mounting bolts 2 from the STI dc power supply
7. Remove the STI dc power supply by lifting it out the rear of the tape control unit.

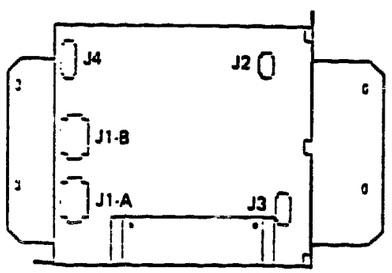
Replacing the STI DC Power Supply

1. Place the STI dc power supply (CU-PS03) into position in the rear of the tape control unit.
2. Align the four screw holes in the flange base of the STI supply and install the four mounting screws 2.
3. Install the cables into the top of the power supply 1
4. Close the logic gate.
5. Install the drip screen (see CARR-TCU 2-2).
6. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).









FRU903 STI DC Power Supply Removal and Replacement Procedure

From P/N 82X5091 to P/N 1037700

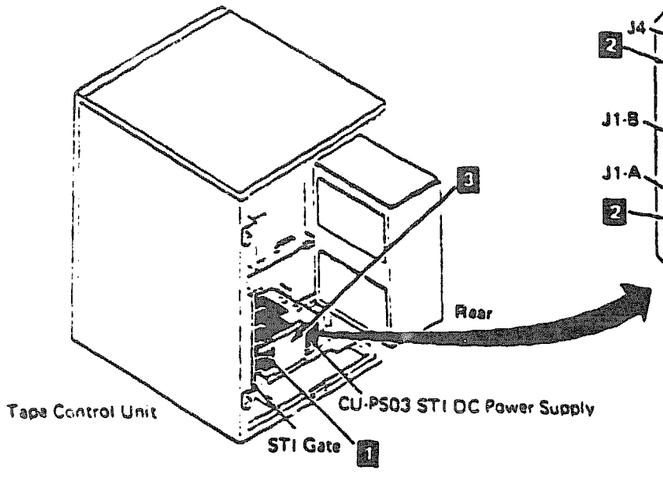
This page contains the steps needed to remove and replace the dc power supply in the tape control unit. Because ac power must be turned off, all of the drives attached to the tape control unit must be available for service.

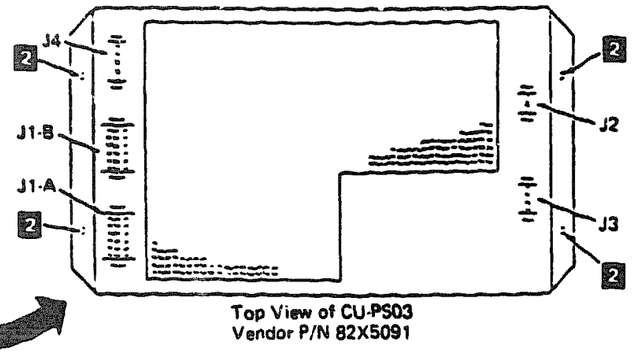
Removing the STI DC Power Supply - P/N 82X5091

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the tape control unit rear and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic gate.
4. Remove the drip screen (see CARR-TCU 2-1).
5. Remove the drip screen mounting bracket 3 and discard, save the screws and tighten to the baseplate.
6. Disconnect all of the cables from the top of the dc power supply 1 (CU-PS03).
7. Remove the four mounting bolts 2 from the STI dc power supply.
8. Remove the STI dc power supply by lifting it out the rear of the tape control unit.

Replacing the STI DC Power Supply - P/N 1037700

1. Place the STI dc power supply (CU-PS03) into position in the rear of the tape control unit.
2. Align the four screw holes in the flange base of the STI supply and install the four mounting screws 2.
3. Install the cables into the top of the power supply 1.
4. Close the logic gate.
5. Install the drip screen (see CARR-TCU 2-2).
6. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).





Top View of CU-PS03
Vendor P/N 82X5091

From P/N 1037700 to P/N 82X5091

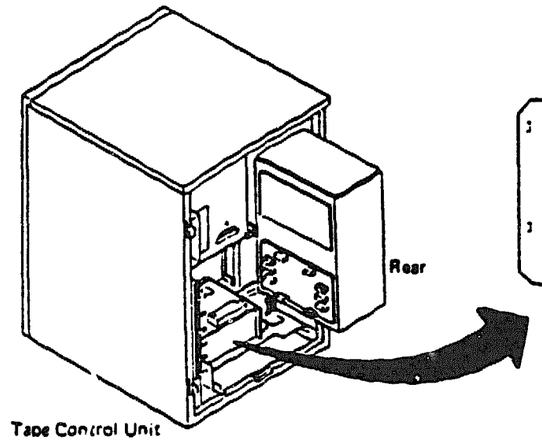
This page contains the steps needed to remove and replace the dc power supply in the tape control unit. Because ac power must be turned off, all of the drives attached to the tape control unit must be available for service.

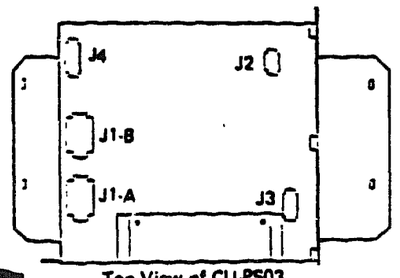
Removing the STI DC Power Supply - P/N 1037700

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the tape control unit rear and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the logic gate.
4. Disconnect all of the cables from the top of the dc power supply 1 (CU-PS03).
5. Remove the drip screen (see CARR-TCU 2-1).
6. Remove the four mounting bolts 2 from the STI dc power supply.
7. Remove the STI dc power supply by lifting it out the rear of the tape control unit.

Replacing the STI DC Power Supply - P/N 82X5091

1. Place the STI dc power supply (CU-PS03) into position in the rear of the tape control unit.
2. Align the four screw holes in the flange base of the STI supply and install the four mounting screws 2.
3. Install the cables into the top of the power supply 1.
4. Close the logic gate.
5. Install the drip screen mounting bracket 3 supplied with this power supply to the baseplate with the screws supplied with the bracket.
6. Install the drip screen (see CARR-TCU 2-2).
7. Install the rear safety cover and close the rear cover (see CARR-TCU 2-2).





Top View of CU-PS03
Vendor P/N 1037700

FRU904 STI Gate Fans Removal and Replacement Procedure

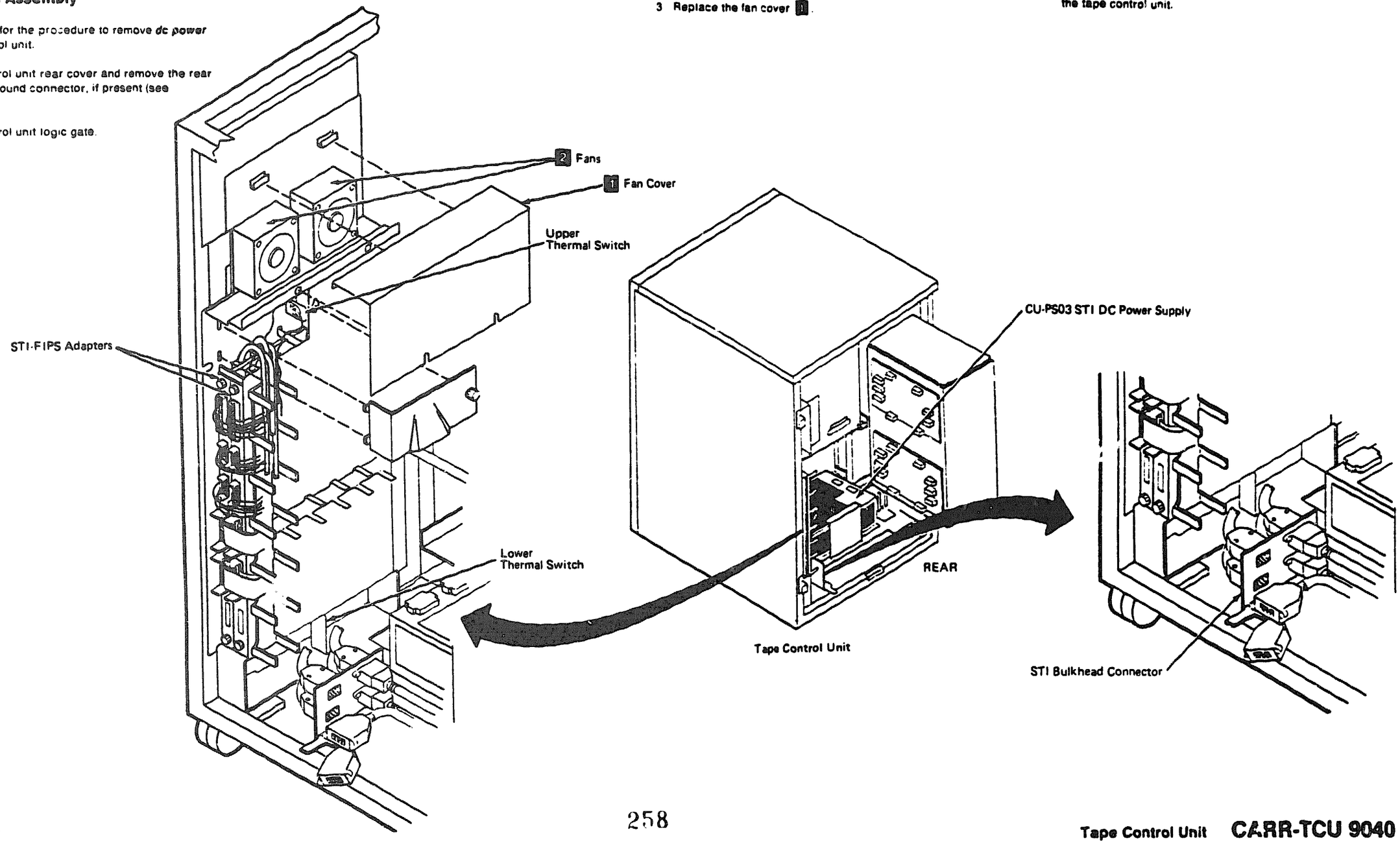
This page contains the steps needed to remove and replace either of the fan assemblies in the tape control unit STI logic gate. It is not necessary to remove the ac power from the tape control unit to remove either of the fan assemblies.

Removing the Fan Assembly

1. Go to CARR-TCU 6 for the procedure to remove ***dc power*** from the tape control unit.
2. Open the tape control unit rear cover and remove the rear safety cover and ground connector, if present (see CARR-TCU 2-1).
3. Open the tape control unit logic gate.
4. Remove the fan cover 1.
5. Remove the fan cables.
6. Loosen the screws holding the fan 2 in place and remove the fan.

Replacing the Fan Assembly

1. Mount the fan 2 with the screws previously removed.
2. Install the fan cables.
3. Replace the fan cover 1.
4. Close the tape control unit logic gate.
5. Install the rear safety cover and ground connector, if present, and close the rear cover (see CARR-TCU 2-2).
6. Go to CARR-TCU 6 for the procedure to restore ***dc power*** to the tape control unit.



FRU905 Tape Control Unit STI Gate Upper Thermal Switch Removal and Replacement Procedure

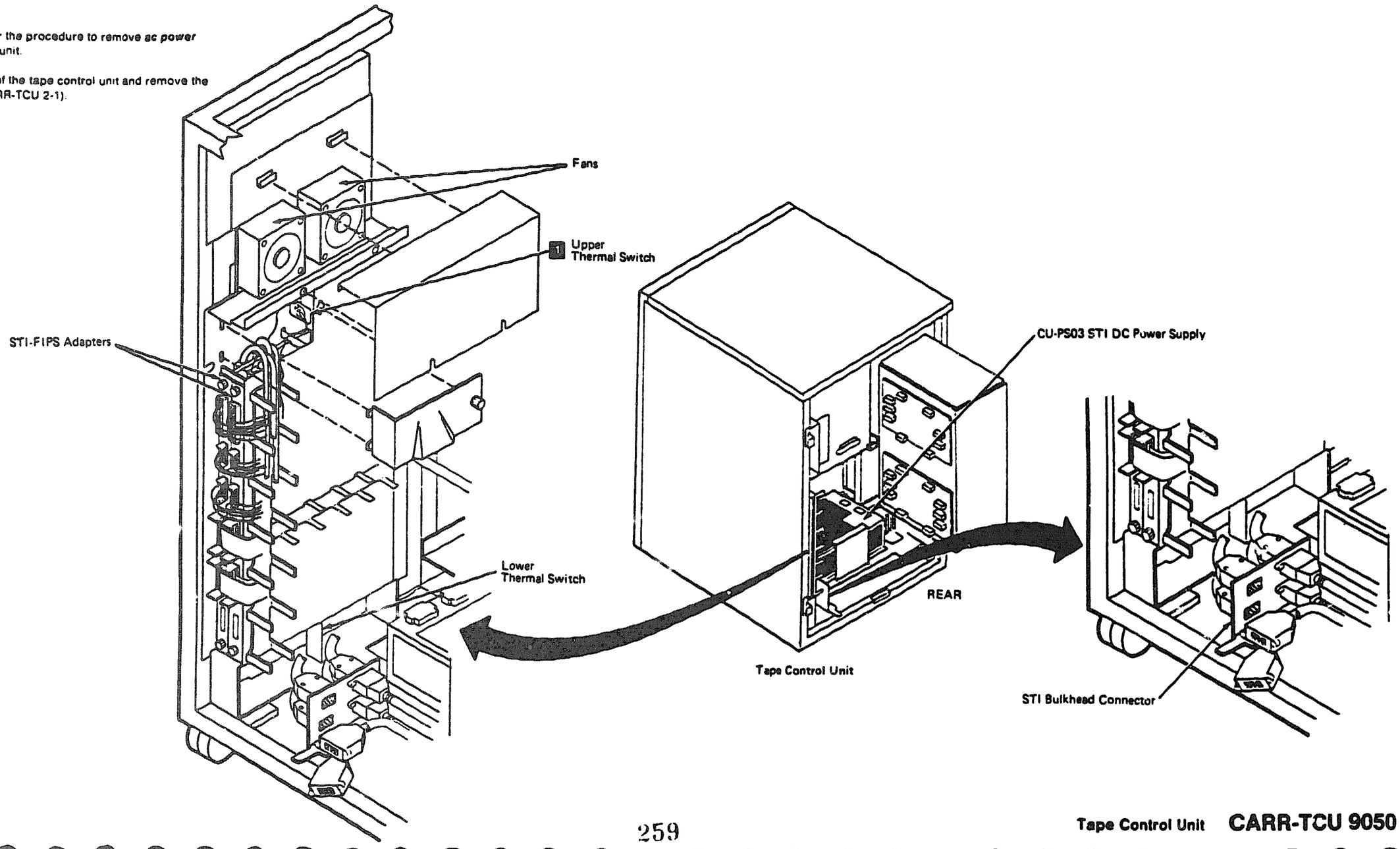
The page contains the steps needed to remove and replace the upper thermal switch in the tape control unit STI logic gate. It is necessary to remove the ac voltage from the tape control unit. All drives attached to the tape control unit must be available for service.

Removing the Tape Control Unit STI Gate Upper Thermal Switch

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the rear cover of the tape control unit and remove the safety cover (see CARR-TCU 2-1).
3. Swing out the logic gate.
4. Remove the two wires from the upper thermal switch 1.
5. Remove the thermal switch from the mounting bracket.

Replacing the Tape Control Unit STI Gate Upper Thermal Switch

1. Place the thermal switch 1 in the mounting bracket and attach it to the gate.
2. Connect the two wires to the thermal switch.
3. Close the gate, replace the rear safety cover, and close the rear tape control unit door (see CARR-TCU 2-2).
4. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.



FRU906 Tape Control Unit STI Gate Lower Thermal Switch Removal and Replacement Procedure

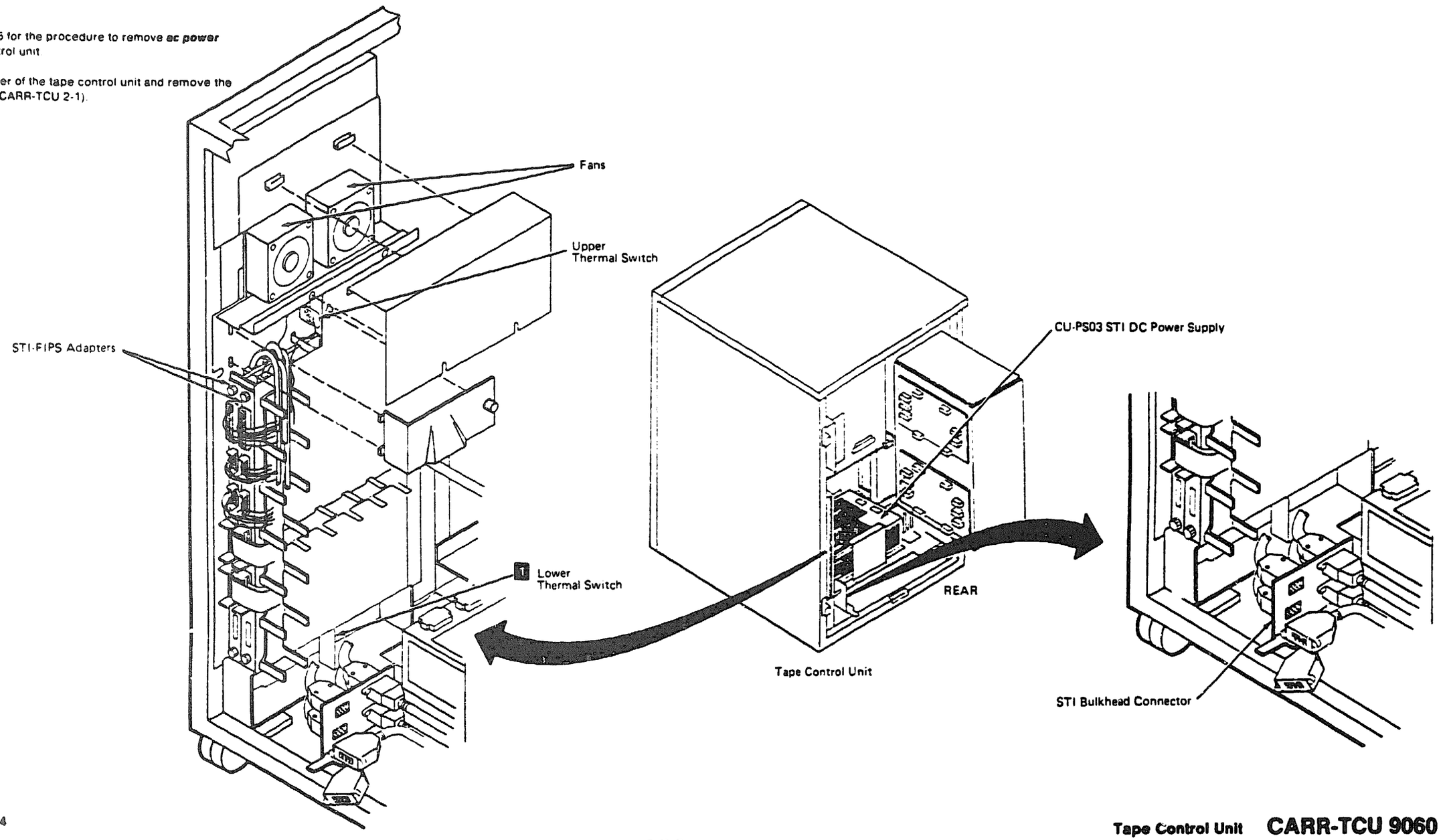
The page contains the steps needed to remove and replace the lower thermal switch in the tape control unit STI logic gate. It is necessary to remove the ac voltage from the tape control unit. All drives attached to the tape control unit must be available for service.

Removing the Tape Control Unit STI Gate Lower Thermal Switch

1. Go to CARR-TCU 6 for the procedure to remove *ac power* from the tape control unit.
2. Open the rear cover of the tape control unit and remove the safety cover (see CARR-TCU 2-1).
3. Swing out the logic gate.
4. Remove the two wires from the lower thermal switch 1.
5. Remove the thermal switch from the mounting bracket.

Replacing the Tape Control Unit STI Gate Lower Thermal Switch

1. Place the thermal switch 1 in the mounting bracket and attach it to the gate.
2. Connect the two wires to the thermal switch.
3. Close the gate, replace the rear safety cover, and close the rear tape control unit door (see CARR-TCU 2-2).
4. Go to CARR-TCU 6 for the procedure to restore *ac power* to the tape control unit.



TA90 MG EC C04824


VOLUME
A03


COLLATING LIST
OF PAGES

Collating List of Pages

This reference drawing contains the collating sequence, page side, and EC level of pages for *Digital TA90 Magnetic Tape Subsystem Maintenance Guide (MG) Volume A03*.

The part number of the divider tab list is 8673745

This reference drawing is to be placed at the front of the manual.

PAGE	SIDE	LEVEL
FRONT COVER	Front	EC C13764
PREF 1	Back	EC C13764
TAB 1	Front	EC C04824
TAB 2	Back	EC C04824
CARR-DP Tab		
CARR-DR 1-1	Front	EC C13764
CARR-DR 1-2	Back	EC C13764
CARR-DR 1-3	Front	EC C13764
CARR-DR 1-4	Back	EC C13764
CARR-DR 1-5	Front	EC C13764
CARR-DR 1-7	Back	EC C13764
CARR-DR 1-9	Front	EC C13764
CARR-DR 2-1	Back	EC C13764
CARR-DR 2-3	Front	EC C13764
CARR-DR 2-5	Back	EC C04824
CARR-DR 2-6	Front	EC C04824
CARR-DR 2-8	Back	EC C04824
CARR-DR 2-9	Front	EC C04824
CARR-DR 3-1	Back	EC C04824
Blank	Front	
CARR-DR 3-3	Back	EC C13764
CARR-DR 8	Front	EC C13764
CARR-DR 10	Back	EC C13764
CARR-DR 11	Front	EC C04824
CARR-DR 20	Back	EC C04824
CARR-DR 30	Front	EC C04824
CARR-DR 40	Back	EC C04824
CARR-DR 41	Front	EC C04824
CARR-DR 50	Back	EC C04824
CARR-DR 60	Front	EC C04824
CARR-DR 70	Back	EC C04824
CARR-DR 80	Front	EC C13764
CARR-DR 90	Back	EC C13764
CARR-DR 91	Front	EC C13764
CARR-DR 100	Back	EC C13764
CARR-DR 110	Front	EC C04824
CARR-DR 120	Back	EC C04824
CARR-DR 125	Front	EC C04824
CARR-DR 130	Back	EC C13764
CARR-DR 131	Front	EC C04824
CARR-DR 140	Back	EC C04824
CARR-DR 160	Front	EC C04824
CARR-DR 170	Back	EC C04824
CARR-DR 180	Front	EC C04824
CARR-DR 190	Back	EC C04824
CARR-DR 200	Front	EC C04824
CARR-DR 210	Back	EC C13764
CARR-DR 300	Front	EC C04824
CARR-DR 310	Back	EC C13764
CARR-DR 320	Front	EC C13764
CARR-DR 330	Back	EC C04824
CARR-DR 340	Front	EC C04824
CARR-DR 350	Back	EC C04824
CARR-DR 360	Front	EC C04824
CARR-DR 390	Back	EC C04824
CARR-DR 400	Front	EC C04824
CARR-DR 410	Back	EC C13764
CARR-DR 420	Front	EC C13764
CARR-DR 430	Back	EC C04824
CARR-DR 440	Front	EC C04824
CARR-DR 450	Back	EC C04824
CARR-DR 460	Front	EC C04824
CARR-DR 470	Back	EC C13764
CARR-DR 490	Front	EC C13764
CARR-DR 491	Back	EC C04824
CARR-DR 540	Front	EC C13764
CARR-DR 545	Back	EC C04824
CARR-DR 580	Front	EC C04824
CARR-DR 581	Back	EC C04824
CARR-DR 590	Front	EC C04824
CARR-DR 600	Back	EC C13764
CARR-DR 610	Front	EC C04824
CARR-DR 640	Back	EC C04824
CARR-DR 650	Front	EC C04824
CARR-DR 660	Back	EC C04824
CARR-DR 790	Front	EC C04824
CARR-DR 791	Back	EC C04824
CARR-DR 796	Front	EC C04824
CARR-DR 800	Back	EC C04824
CARR-DR 810	Front	EC C04824
CARR-DR 820	Back	EC C04824
CARR-DR 830	Front	EC C04824
CARR-DR 850	Back	EC C04824
CARR-DR 880	Front	EC C04824
CARR-DR 900	Back	EC C04824
CARR-DR 950	Front	EC C04824
CARR-DR 960	Back	EC C04824
CARR-DR 1040	Front	EC C13764
CARR-DR 1090	Back	EC C04824
CARR-DR 1100	Front	EC C13764
CARR-DR 1270	Back	EC C04824
CARR-DR 1290	Front	EC C04824
CARR-DR 1510	Back	EC C04824
CARR-DR 2110	Front	EC C13764
CARR-DR 2113	Back	EC C04824
CARR-DR 2120	Front	EC C04824
CARR-DR 2130	Back	EC C04824
CARR-DR 2150	Front	EC C04824
CARR-DR 2160	Back	EC C04824
CARR-DR 2180	Front	EC C04824
CARR-DR 2190	Back	EC C04824
CARR-DR 2230	Front	EC C04824
CARR-DR 2250	Back	EC C04824
CARR-DR 2260	Front	EC C04824
CARR-DR 2270	Back	EC C04824
CARR-DR 2280	Front	EC C04824
CARR-DR 2290	Back	EC C04824
CARR-DR 2300	Front	EC C04824
CARR-DR 2310	Back	EC C04824
CARR-DR 2320	Front	EC C04824
CARR-DR 2620	Back	EC C04824
CARR-DR 2630	Front	EC C04824
CARR-DR 2770	Back	EC C04824
CARR-DR 2810	Front	EC C04824
CARR-DR 2820	Back	EC C04824
CARR-DR 2830	Front	EC C04824
CARR-DR 2840	Back	EC C04824
CARR-DR 2850	Front	EC C04824
CARR-DR 2851	Back	EC C04824
CARR-DR 2860	Front	EC C04824
CARR-DR 2880	Back	EC C04824
CARR-DR 2890	Front	EC C04824
CARR-DR 2900	Back	EC C04824
CARR-DR 2910	Front	EC C04824
CARR-DR 2920	Back	EC C04824
CARR-DR 2930	Front	EC C04824
CARR-DR 2940	Back	EC C04824
CARR-DR 2950	Front	EC C04824
CARR-DR 2960	Back	EC C13764
CARR-DR 2970	Front	EC C13764
Blank	Back	
CARR-DR 2980	Front	EC C04824
CARR-DR 2990	Back	EC C04824
CARR-DR 3000	Front	EC C13764
Blank	Back	

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PUBLICATIONS REFERENCE DRAWING

MACHINE TYPE/MODEL NO. TA90

MACHINE NAME - Magnetic Tape Subsystem

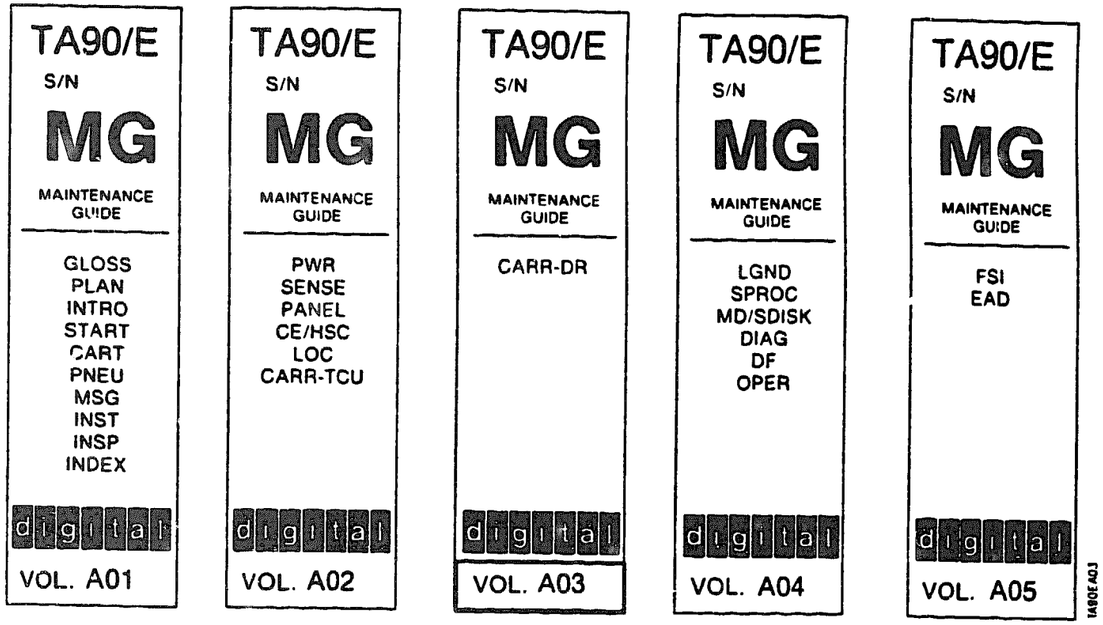
E C NO.	DESCRIPTION / COMMENTS
C04824	VOL. A03 - Maintenance Guide
C13764	VOL. A03 - Maintenance Guide

digital			DATE	CHANGE NO		DATE	CHANGE NO
NAME PUB REF DWG (PRD)		REL	4/28/89	C04824			
			3/15/90	C13764			
DESIGN	SHT OF						
DETAIL							
CHECK	CLASSIFICATION	MUST CONFORM TO ENG SPEC		DEVELOPMENT NO		LOGIC PG NO	
APPRO						RD003	

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B

TA90/E Magnetic Tape Subsystem

digital **Maintenance Guide**



Maintenance Library

Maintenance Guide	**Vols. A01 to A05**
Logic Diagrams	**Vols. C01 and D01**

EK-PTA90-MG-002

Preface

This manual contains maintenance information about the Digital TA90 Magnetic Tape Subsystem and is intended for customer engineers responsible for servicing the TA90 tape subsystem.

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Prerequisite Knowledge

It is assumed that you have a background in data processing concepts and that you are familiar with the hexadecimal numbering system, stored program concepts, and have a basic understanding of tape subsystems and their relationship within a system/cluster.

Related Documents

TA90 Operator's Manual EK-OTA90-OM

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DECwriter	Professional	STI	VT
DIBOL			Work Processor

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TAB
LIST

Tab List

Volume A01

GLOSS	Glossary
PLAN	Maintenance Plan
INTRO	TA90 Introduction
START	Start Maintenance
CART	Cartridge Analysis
PNEU	Pneumatic Analysis
MSG	Errorlog messages
INST	Installation/Removal
INSP	Safety Check Procedures
INDEX	Index

Volume A02

PWR	Power Maps
SENSE	Sense/Status
PANEL	Panel
CE/HSC	Customer Engineering Panel/HSC Diagnostics
LOC	Locations
CARR-TCU	Tape Control Unit Checks/Adjustments/Removal/Replacement

Volume A03

CARR-DR	Drive Checks Adjustments/Removal Replacement

Volume A04

LGND	Legend
SPROC	Support Procedures
MD/SDISK	Maintenance Device/MD Support Diskette Procedures
DIAG	Support Diagnostic Descriptions
DF	Data Fields and Registers
OPER	Theory of Operation

Volume A05

FSI	Fault Symptom Index
EAD	Error Analysis Diagrams


CARR-
DR

Remove/Replace Procedures by FRU Number

This directory lists all field-replaceable units (FRUs) for the TA90 Tape Subsystem, and includes all tape control unit and drive assembly FRUs

To locate a specific FRU removal or replacement procedure, perform the following:

1 Locate the FRU number in the FRU NUMBER column.

2 The VOLUME column indicates where the information for the FRU is located. Volume A02 contains the information for the tape control unit. Volume A03 contains the information for the drive. The name of the FRU is listed in the FRU NAME column. The FRU name corresponds to a part number in the TA90 IPB (EK-UTA90-IP-001).

3 Go to the page listed in the REMOVE column to perform the removal procedure.

4 Go to the page listed in the REPLACE column to perform the replacement procedure.

Tape Control Unit cover removals and replacements are described on CARR-TCU 2-1 through 2-2

Drive cover removals and replacements are described on CARR-DR 2-1 through 2-9.

Plenum supply hose clamping procedures are described on CARR-DR 3-1.

Tape lifter solenoid response time checking procedures are described on MD/SDISK 302.

Device interconnections checks are described on CARR-DR 3-3.

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU001	A03	Threader Assembly	10	29-27056-01
FRU002	A03	Latch Solenoid	20	29-27101-01
FRU003	A03	File Reel Motor	30	29-27170-01
FRU004	A03	Machine Reel Motor and Hub Mount	40	29-27169-01
FRU005	A03	Lower Flange	50	29-27089-01
FRU006	A03	Tape Path Sensor A	60	29-27079-01
FRU007	A03	Tape Path Sensor B	70	29-27079-01
FRU008	A03	Cartridge Latch Assembly	80	29-27108-01
FRU009	A03	File Protect Switch	90	29-27078-01
FRU010	A03	Cartridge Present Sensor	100	29-27079-01
FRU011	A03	Cartridge Latched Sensor	110	29-27083-01
FRU012	A03	Decoupler Assembly	120	29-27071-01
FRU013	A03	Head and Guide Assembly	130	29-27110-01
FRU014	A03	Tension Transducer	140	29-27100-01
FRU015	A02	A1V5-A2V3 Cable	150	
FRU016	A03	Latch Spring	160	29-27102-01
FRU017	A03	Plunger Spring	170	29-27107-01
FRU018	A03	Compression Spring	180	29-27080-01
FRU019	A03	Interlock Spring	190	29-27084-01
FRU020	A03	Blower Assembly	200	29-27139-01 (60 HZ) 29-27138-01 (50 HZ)
FRU022	A02	Read Bus Cable - Local	150	
FRU024	A02	Read Bus Cable - Remote	150	
FRU025	A02	Read Bus Cable - Remote	150	
FRU026	A02	Device Data Bus Cable - Remote	150	
FRU027	A02	Device Data Bus Cable - Remote	150	
FRU029	A02	Device Data Bus Cable - Local	150	
FRU030	A03	Pump Motor	300	29-27105-01
FRU031	A03	Regulator (60 Hz)	310	29-27069-01
	A03	Regulator (50 Hz)	310	
FRU032	A03	Output Filter (60 Hz)	320	29-27082-01
	A03	Output Filter (50 Hz)	320	
FRU033	A03	Inlet Filter	330	29-27057-01
FRU034	A03	Pressure Hose Assembly (60 Hz)	340	29-27142-01
	A03	Pressure Hose Assembly (50 Hz)	340	
FRU035	A03	Vacuum Hose Assembly (60 Hz)	350	29-27143-01
	A03	Vacuum Hose Assembly (50 Hz)	350	
FRU036	A03	-5V dc Resistor Panel (60 Hz)	360	
	A03	-5V dc Resistor Panel (50 Hz)	360	
FRU037	A03	Manifold-In Pressure Hose (60 Hz)		
FRU039	A03	Plenum Supply Hose	390	29-27155-01
FRU040	A03	Pressure Sensor	400	29-27068-01
FRU041	A03	Plenum Assembly, includes Pressure Sensor	410	29-27067-01
FRU042	A03	Decoupler Pressure Hose	420	29-27154-01
FRU043	A03	Decoupler Vacuum Hose	430	29-27154-01
FRU044	A03	Right Guide Bearing Hose	440	29-27141-01
FRU045	A03	Left Guide Bearing Hose	450	29-27481-01
FRU046	A03	Tension Transducer Hose	460	29-27225-01
FRU047	A03	Cleaner Supply Hose	470	29-27153-01
FRU048	A02	Power Bus Cable	150	
FRU049	A03	Logic Board to Power Amplifier J2 Cable	490	
FRU054	A03	Upper Flange	540	29-27140-01
FRU056	A02	Status Store Communication Cable - Dual TCU	150	
FRU058	A03	Logic Board (02A-A1)	580	29-27116-01
FRU059	A03	Power Amplifier Board	590	29-27157-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU060	A03	Message Display Board	600	29-27104-01
FRU061	A03	Machine Reel Hub	610	29-27088-01
FRU062	A03	Read Preamp 02A-A1H2	640	29-27135-01
FRU063	A03	Write 02A-A1J1	640	29-27134-01
FRU064	A03	Write Power 02A-A1G2	640	29-27115-01
FRU065	A03	Pump to Output Filter Hose	650	
FRU07[illegible]	A03	AC CB to Power Supply Blower Cable	490	
FRU073	A03	Logic Board to Power Amplifier J1 Cable	490	
FRU074	A03	Tape Transport Unit AC Power CB Cable	490	
FRU077	A03	Blower Assembly AC Power Cable (Tape Unit to both Drives)	490	
FRU078	A03	Blower Assembly AC Power Cable	490	
FRU079	A03	DC Power Distribution Cable (Drive Internal)	790	
	A03	DC Power Distribution Cable (Drive External)	796	
FRU080	A03	DC Power Distribution Cable	800	
FRU081	A03	Tachometer Sensor Cable	810	
FRU082	A03	Thermal Switch	820	29-27483-01
FRU083	A03	Thermal Switch Cable	830	
FRU084	A02	Local/Remote Power Panel	840	29-27151-01
FRU085	A03	Drive Control Card	850	29-27162-01
FRU086	A02	IML Diskette Drive	860	29-27160-01
FRU087	A03	Read Data Local Cable (02A-A1G2 to TU-D0/1-P1RA1) Internal	490	
FRU088	A03	Read Bus Local Adapter Cable to TU-D1-P2A1	880	
FRU089	A03	Read Adapter Local Cable from Tee to P1RA1	490	
FRU090	A03	Message Display DC Power Cable	900	
FRU091	A02	Power Bus Cable	150	
FRU092	A03	Read Bus Remote Adapter to TU-D1-P2B1 Cable	880	
FRU093	A03	Read Adapter Remote Cable from Tee to P1RB1	490	
FRU094	A03	Read Data Remote Cable (02A-A1G2 to TU-D0/1-P1B1)	490	
FRU095	A03	DC Power Supply	950	29-27099-01 (60 HZ) 29-27098-01 (50 HZ)
FRU096	A03	Fuse F1 +24V Drive 0 Fuse F2 +24V Drive 1	960	
FRU097	A02	Power Bus Cable	150	
FRU098	A03	Fuse F3 +15V Drive 0 Fuse F4 +15V Drive 1	960	
FRU099	A03	Fuse F5 -15V Drive 0 Fuse F6 -15V Drive 1	960	
FRU100	A03	Fuse F7 +8.5V Drive 0 Fuse F8 +8.5V Drive 1	960	
FRU101	A03	Fuse F9 -5V Drive 0 Fuse F10 -5V Drive 1	960	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU102	A03	Fuse F11 +5V Drive 0 Fuse F12 +5V Drive 1	960	
FRU103	A02	Power Bus Cable	150	
FRU104	A03	Drive Power Switch	1040	29-27175-01
FRU105	A03	Online/Offline Switch (Drive)	1040	29-27075-01
FRU106	A03	Address Switch Cable to J4 (rear of deck)	490	
FRU107	A03	Reset Switch	1040	29-27074-01
FRU108	A03	Drive Address Switch	1040	29-27062-01
FRU109	A03	Operator Panel Switch Board (contains Rewind Switch Unload Switch, and Ready/Not Ready Switch)	1090	29-27094-01
FRU110	A03	Drive Thermal Switch	1100	29-27483-01
FRU111	A02	Read ECC/CORR Card 01A-A1R2	1110	29-27095-01
FRU113	A02	Buffer Storage Card 01A-A1M2	1110	29-27159-01
FRU114	A02	Buffer Control Card 01A-A1L2	1110	29-27137-01
FRU115	A02	Maintenance Adapter Card 01A-A1E2	1110	29-27148-01
FRU116	A02	Write Data Flow Card 01A-A1P2	1110	29-27133-01
FRU117	A02	Microprocessor Card 01A-A1D2	1110	29-27136-01
FRU118	A02	Drive Adapter Card 01A-A1Q2	1180	29-27163-01
FRU119	A02	Read Clock and Format Card 01A-A1S2	1110	29-27112-01
FRU120	A02	Buffer Adapter Card 01A-A1K2	1200	29-27150-01
FRU121	A02	Status Store Basic Card 01A-A1G2	1110	29-27164-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU122	A02	Status Store Communication Card 01A-A1F2	1110	29-27147-01
FRU123	A02	Read Skew Buffer Card 1 01A-A2K2	1110	29-27093-01
FRU124	A02	Read Skew Buffer Card 2 01A-A2L2	1110	29-27093-01
FRU125	A02	Read Skew Buffer Card 3 01A-A2M2	1110	29-27093-01
FRU126	A02	Power/POR Card 01A-A2H4	1260	29-27174-01
FRU127	A03	Latch Interlock	1270	29-27081-01
FRU129	A03	Physical Address Switch	1290	29-27062-01
FRU133	A02	Channel Adapter Card (Channel A) 01A-A2C2	1110	29-27166-01
FRU134	A02	Control Store Card 01A-A1C2	1110	29-27165-01
FRU135	A02	Control Storage Array Card 01A-A1B2	1110	29-27168-01
FRU138	A02	V Regulator Card 01A-A1T2	1260	29-27171-01
FRU139	A02	Logic Board A1	1390	29-27113-01
FRU140	A02	Logic Board A2	1400	29-27114-01
FRU141	A02	Tape Control Unit Switch Panel Card (includes Offline Indicator, IML Switch, Normal/Test Switch, TCU0/TCU1 Switch, Tape Control Unit Online /Offline Switch)	1410	29-27472-01
FRU142	A02	Tape Control Unit Operator Panel Printed Circuit Board (includes Power On/Off Switch, and Power Indicator)	1420	29-27482-01
FRU143	A02	Thermal Switch (TCU Gate) Lower	1430	29-27076-01
FRU144	A02	AC Power Supply	1440	29-27086-01 (60 HZ / 50 HZ J) 29-27087-01 (50 HZ)
FRU145	A02	DC Power Supply	1450	29-27072-01 (50 HZ) 29-27073-01 (60 HZ) (50 HZ JAPAN)
FRU146	A02	AC Fuse F1 +24V	1460	
FRU147	A02	DC Fuse F1 +8.5V	1470	
FRU148	A02	DC Fuse F2 +24V	1470	
FRU149	A02	AC Line Cord	1490	
FRU150	A02	Blower Assembly 1	1500	29-27060-01
FRU151	A02	Blower Assembly 2	1500	29-27060-01
FRU152	A02	Channel Adapter Card (Channel B) 01A-A2D2	1110	29-27166-01
FRU155	A02	Thermal Switch Cable	150	
FRU156	A02	Power Bus Cable	150	
FRU157	A02	Top Card Connector WKL	1570	
FRU158	A02	Top Card Connector XKL	1570	
FRU159	A02	Top Card Connector YKL	1570	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU160	A02	DC Power Supply to Gate TB Cable	1600	
FRU161	A03	Cleaner Block	1610	29-27061-01
FRU162	A02	Service Switch	1620	29-27103-01
FRU164	A02	GTE DC Distribution Cable Assembly	150	
FRU165	A02	Gate Fan Cable	1650	
FRU166	A02	AC Power Supply to DC Power Supply Cable	150	
FRU167	A02	Power Bus Cable	150	
FRU168	A02	Tape Control Unit Switch Panel to Gate Cable	150	
FRU169	A02	A1Y1 to MD Connector Cable	150	
FRU170	A02	STI-FIPS I/O Tag Cable (Channel A)	150	
FRU171	A02	STI-FIPS I/O Bus Cable	150	
FRU173	A02	Channel A,B Address Cable	150	
FRU175	A02	Read Bus Cable - Single TCU	150	
FRU176	A02	TCU AC Control Switch Panel Cable	150	
FRU177	A02	AC Power to Gate Cable	1770	
FRU178	A02	A1S2W to A2V2 Cable	150	
FRU179	A02	Power Bus Cable	150	
FRU180	A02	Top Card Connector ZCD	1570	
FRU181	A02	Top Card Connector P2Y	1570	
FRU182	A02	Top Card Connector WE	1570	
FRU183	A02	Top Card Connector WCD	1570	
FRU184	A02	Top Card Connector ZPQ	1570	
FRU185	A02	Top Card Connector XRS	1570	
FRU186	A02	Top Card Connector YRS	1570	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU187	A02	Top Card Connector ZFG	1570	
FRU188	A02	Top Card Connector ZKL	1570	
FRU189	A02	Top Card Connector WFG	1570	
FRU190	A02	Top Card Connector XFG	1570	
FRU191	A02	Top Card Connector YFG	1570	
FRU192	A02	Top Card Connector XCDE	1570	
FRU193	A02	Top Card Connector YCDE	1570	
FRU194	A02	IML Diskette Drive Cable (Drive to 01A-A1A3)	150	29-27160-01
FRU197	A02	Channel Address Switch (Channel A, Channel B)	1970	29-27063-01
FRU198	A02	UEPO Switch	1980	29-27064-01
FRU199	A02	Write Bus Terminator	1995	29-27173-01
FRU200	A03	Write Adapter A Cable (TCU to Drive 0 P1WB1)	490	
FRU201	A03	Write Adapter A Cable (Drive 0 P1WB2 to Drive 1 P1WB1)	490	
FRU202	A03	Write Adapter B Cable (TU-D1-P1WB2 to TU-D1-P2B2)	490	
FRU203	A03	Write Adapter B Cable (A1A4 to P1WB1)	490	
FRU204	A03	Write Adapter A Cable (A1A5 to P1WB2)	490	
FRU205	A03	Write Adapter A Cable (TCU to Drive 0 P1WA1)	490	
FRU206	A03	Write Adapter A Cable (Drive 0 P1WA2 to Drive 1 P1WA1)	490	
FRU207	A03	Write Adapter A Cable (TU-D1-P1WA2 to TU-D1-P2A2)	490	
FRU208	A03	Write Adapter A Cable (A1A2 to P1WA1)	490	
FRU209	A03	Write Adapter A Cable (A1A3 to P1WA2)	490	
FRU210	A03	Message Display Cable	490	
FRU211	A03	Message Display Cable	2110	
FRU212	A03	Vacuum Supply Hose	2120	29-27156-01
FRU213	A03	Message Display Board to Message Display Switch Board Cable	2130	
FRU214	A02	STI-FIPS I/O Bus Cable (Channel B)	150	
FRU215	A03	Tape Lifter Solenoid Inout Hose	2150	29-27097-01
FRU216	A03	Tape Lifter Solenoid	2160	29-27111-01
FRU217	A02	A2Z2 to Gate TB2 Cable	150	
FRU218	A03	AC Power Circuit Breaker	2180	29-27176-01 (60 HZ / 50 HZ J) 29-27176-01 (50 HZ)
FRU219	A03	Vacuum Distribution Tee	2190	29-27065-01
FRU223	A03	Convoluted Bellows	2230	29-27177-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU224	A02	Thermal Switch (TCU Gate) Upper	2240	29-27076-01
FRU225	A03	Machine Reel Tach Sensor A	2250	
FRU226	A03	Machine Reel Tach Sensor B	2260	29-27096-01
FRU227	A03	Machine Reel Tape Guide	2270	29-27476-01
FRU228	A03	Head Tape Guide (Left)	2280	29-27479-01
FRU229	A03	Head Tape Guide (Right)	2290	29-27477-01
FRU230	A03	Tension Transducer Tape Guide	2300	29-27100-01
FRU231	A03	Center Tape Guide	2310	29-27478-01
FRU232	A03	Cartridge	2320	
FRU242	A02	STI-FIPS I/O Bus Cable (Channel B)	150	
FRU249	A02	A1Z1-A2Y1 Cable	158	

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU250	A02	A1Z2-A2Y2 Cable	158	
FRU251	A02	A1Z3-A2Y3 Cable	158	
FRU252	A02	A1Z4-A2Y4 Cable	158	
FRU253	A02	A1Z5-A2Y5 Cable	158	
FRU254	A02	A1Z6-A2Y6 Cable	158	
FRU255	A02	A1A5-A2A5 Cable	158	
FRU256	A02	A1V3-A2V5 Cable	158	
FRU258	A02	IML Diskette	2580	
FRU260	A02	TCU to TCU Read Cable - Remote	150	
FRU261	A02	TCU to TCU Write Cable - Remote	150	
FRU262	A03	Air Pressure Test Port Hose Assembly	2620	29-27146-01
FRU263	A03	Vacuum Test Port Hose Assembly	2630	29-27144-01
FRU267	A03	Top Card Connector (TCC) B2X	660	
FRU268	A03	Top Card Connector (TCC) B2Y	660	
FRU270	A03	Interposer Signal Cable 02A-A1Y3 to P1-J2	490	
FRU272	A02	Load Resistor Card 01A-A2P2	1110	29-27471-01
FRU277	A03	Head Compliant Guide	2770	29-27109-01
FRU278	A02	Read Detect Card 01A-A2O2	1110	29-27149-01
FRU279	A02	Load Box	2790	
FRU280	A03	Fuse 13 +5V dc Drive 0, Fuse 14 +5V dc Drive 1	960	
FRU281	A03	Loader Control Card	2810	29-27161-01
FRU282	A03	Load Assembly	2820	29-27172-01
FRU283	A03	Load Motor	2830	29-27091-01
FRU284	A03	Load Motor Complete Sensor	2840	29-27122-01
FRU285	A03	Loader Mechanical Assembly	2850	29-27473-01
FRU286	A03	Loader Signal Cable	2860	
FRU287	A03	Loader Power Cable	2860	
FRU288	A03	Loader Fuse +24V dc	2880	
FRU289	A03	Stack Low Position Sensor	2890	29-27130-01
FRU290	A03	Input Stack Assembly	2900	29-27092-01
FRU291	A03	Cartridge In Stack Sensor	2910	29-27122-01
FRU292	A03	Cartridge Staged Sensor	2920	29-27132-01
FRU293	A03	Left Input Rail Assembly	2930	29-27128-01
FRU294	A03	Right Input Rail Assembly	2940	29-27129-01
FRU295	A03	Feed Assembly	2950	29-27123-01
FRU296	A03	Stack Up Position Sensor	2960	29-27122-01
FRU297	A03	Output Stack Assembly	2970	29-27125-01

FRU NUMBER	VOLUME	FRU NAME	REMOVE/REPLACE PAGE	Digital P.N.
FRU298	A03	Loader Operator Panel	2980	29-27126-01
FRU299	A03	Loader Fuse +5V dc	2880	
FRU300	A03	Feed Assembly Motor	3000	
FRU900	A02	STI-FIPS Adapter (L)	9000	
FRU901	A02	STI-FIPS Adapter (R)	9000	
FRU903	A02	Power Supply STI	9030	29-27409-01
FRU904	A02	STI Gate Fans	9040	29-27474-01
FRU905	A02	STI AC Interlock Thermal	9050	29-27059-01
FRU906	A02	STI DC Interlock Thermal	9060	29-27070-01

FRU Listing by Alphabetical Sequence **CARR-DR 1-7**

FRU Name	FRU No.	Page
AC		
Circuit Breaker	218	2180
Air Pressure Test Port Assembly	262	2620
Blower - Tape Transport Unit	020	200
BOARD		
Drive Op Panel Switch	109	1090
Drive Logic	058	580
Message Display	060	600
Power Amplifier	059	590
CABLE		
AC Power Circuit Breaker	074	490
AC Power to Blower Asm	077	490
Address Switch	106	490
Blower Assembly AC Power	078	490
DC Distribution (Drive, External)	079	790
DC Power Distribution	080	800
Interposer Signal Cable 02A-A1Y3 to P1 J2	270	490
Loader Signal	286	2860
Loader Power	287	2860
Logic Board to Pwr Amp J1 Connector	073	490
Logic Board to Pwr Amp J2 Connector	049	490
Message Display	211	2110
Message Display Power	090	900
Msg Display Bd to Msg Sw Bd	213	2130
Read Adapter A	089	490
Read Adapter B	093	490
Read Bus A Adapter	088	800
Read Bus B Adapter	092	800
Read Data A (Internal)	087	490
Read Data B (Internal)	094	490
Tachometer Sensor	081	810
Thermal Switch - Tape Transport Unit	083	830
Write Adapter A	207	490
Write Adapter A	208	490
Write Adapter A	209	490
Write Adapter A (TCU to DR 0)	205	490
Write Adapter A (DR 0 to DR1)	206	490
Write Adapter B	202	490
Write Adapter B	203	490
Write Adapter A	204	490
Write Adapter A (TCU to DR 0)	200	490
Write Adapter A (DR 0 to DR 1)	201	490
CARD		
Loader Control	281	2810
Write Power (A1G2)	064	640
CARTRIDGE		
Cartridge	232	2320
Latch Assembly	008	80
Latch Sensor	011	110
Latch Solenoid	002	20
Latch Spring	016	160
Present Sensor	010	100
Convoluted Bellows	223	2230
Circuit Breaker - AC	218	2180
Cleaner Block Assembly	161	1610
Cleaner Vacuum Hose	047	470
DC		
Power Supply	095	950
Dist Cable (Drive External)	079	790
Distribution Cable (Drive Internal)	079	790
Fuses, Power Supply	096	960
Power Distribution Cable	080	490
DECOUPLER		
Assembly	012	120
Pressure Hose	042	420
Vacuum Hose	043	430
DRIVE		
DC Power Supply	095	950
Fuse F1 and F2 + 24V dc	096	960
Fuse F3 and F4 + 15V dc	098	960
Fuse F5 and F6 -15V dc	099	960
Fuse F7 and F8 + 8.5V dc	100	960
Fuse F9 and F10 -5V dc	101	960
Fuse F11 and F12 +5V dc	102	960
Loader Fuse + 24V dc	288	2880
Power On/Off Switch	104	1040
External Load Resistor Panel (-5 V DC)	036	360
Feed Assembly	295	2950
File Protect Switch	009	90
File Reel Motor	003	30
Filter, Drive Inlet	033	330
Filter, Drive Outlet	032	320
Flange, Machine Reel - Lower	005	50
Flange, Machine Reel - Upper	054	540
FUSE		
Loader Fuse + 24V dc	288	2880
Loader Fuse + 5V dc	299	2880
F1 and F2 + 24 V dc - Tape Transport Unit	096	960
F3 and F4 + 15 V dc - Tape Transport Unit	098	960
F5 and F6 -15 V dc - Tape Transport Unit	099	960
F7 and F8 + 8.5 V dc - Tape Transport Unit	100	960
F9 and F10 -5 V dc - Tape Transport Unit	101	960
F11 and F12 + 5 V dc - Tape Transport Unit	102	960
F13 and F14 + 5V dc - Tape Transport Unit	280	960
HEAD		
Compliant Guide	277	2770
Guide Assembly	013	130
Tape Guide - Left	228	2280
Tape Guide - Right	229	2290
HOSE		
Air Pressure Test Port Assembly	262	2620
Cleaner Vacuum	047	470
Decoupler Pressure	042	420
Decoupler Vacuum	043	430
Head Guide Left Bearing	045	450
Head Guide Right Bearing	044	440
Plenum Supply	039	390
Pressure Assembly	034	340
Pump to Outlet Filter	065	650
Tension Transducer	048	460
Vacuum Assembly	035	350
Vacuum Test Port Assembly	263	2630
Vacuum Supply	212	2120
Tape Lifter Solenoid Input	215	2150
Hub - Machine Reel	061	610
Inlet Filter - Tape Transport Unit	033	330
Input Rail Assembly, Left	293	2930
Input Rail Assembly, Right	294	2940
Input Stack Assembly	290	2900
LATCH		
Assembly - Cartridge	008	80
Interlock	127	1270
Interlock Spring	019	190
Plunger Spring	017	170
Sensor - Cartridge	011	110
Solenoid - Cartridge	002	20
Spring - Cartridge	016	160
Load Assembly	282	2820
Load Motor Complete Sensor	284	2840
Loader Mechanical Assembly	285	2850
Cartridge Staged Sensor	292	2920
Loader Operator Panel	298	2980
Logic Board - Drive	058	580
Lower Flange - Machine Reel	005	50
MACHINE REEL		
Flange, Lower	005	50
Flange, Upper	054	540
Hub	061	610
Motor and Hub Mount	004	40
Tachometer Sensor A	225	2250
Tachometer Sensor B	226	2260
Tape Guide	227	2270
Message Display Board	060	600
Message Display LEDs	021	210
MOTOR		
Load	283	2830
File Reel	003	30
Machine Reel and Hub Mount	004	40
Tape Transport Unit Pump	030	300
Operator Panel Switch Board - Drive	109	1090
Output Stack Assembly	297	2970
Outlet Filter - Tape Transport Unit	032	320
Plenum Assembly	041	410
POWER		
Amplifier Board	059	590
Supply - DC - Tape Transport Unit	095	950
Pressure Sensor	040	400
Regulator - Tape Transport Unit	031	310
Resistor Panel, External Load (-5 V DC)	036	360
SENSOR		
Cartridge In Stack	291	2910
Cartridge Latch	011	110
Cartridge Present	010	100
Cartridge Staged	292	2920
Load Motor Complete	284	2840
Pressure	040	400
A - Machine Reel Tachometer	225	2250
A - Tape Path	006	60
B - Machine Reel Tachometer	226	2260
B - Tape Path	007	70
Stack Low Position	289	2890
Stack Up Position	296	2960
Solenoid Assembly - Tape Lifter	216	2160
SPRING		
Cartridge Latch	016	160
Compression	018	180
Latch Interlock	019	190
Latch Plunger	017	170
SWITCH		
Drive Address	108	1040
Drive Online/Offline	105	1040
Drive Reset	107	1040
File Protect	009	90
Physical Address	129	1290
Power ON/OFF - Drive	104	1040
Thermal - Tape Transport Unit	082	820
TAPE		
Guide - Center	231	2310
Guide - Head Left	228	2280
Guide - Head Right	229	2290
Guide - Machine Reel	227	2270
Guide - Tension Transducer	230	2300
Lifter Solenoid Assembly	216	2160
Path - Sensor A	006	60
Path - Sensor B	007	70
Tape Transport Unit		
Blower Assembly	020	200
DC Power Supply	095	950
Inlet Filter	033	330
Outlet Filter	032	320
Pump Motor Assembly	030	300
Regulator	031	310
Thermal Switch	082	820
Tension Transducer	014	140
Tension Transducer - Tape Guide	230	2300
Thermal Switch - Drive	110	1100
Thermal Switch - Tape Transport Unit	082	820
Threader Assembly	001	10
Upper Flange - Machine Reel	054	540
Vacuum Distribution Tee	219	2190
Vacuum Test Port Hose Assembly	263	2630

Introduction

This section contains the removal and replacement procedures for all Field Replaceable Units (FRUs) in the TA90 Tape Subsystem. Checks and adjustment procedures are also included.

Carr Layout

CARR-DR pages 1-1 through 1-5 contain a complete FRU list for the tape control unit and tape transport unit. An error code or FRU number that is displayed on the CE panel will make reference to this FRU list. The corresponding procedure should be performed. The FRU removal procedure is given first and the FRU replacement procedure immediately follows for the same FRU. All procedures are shown in a step by step method with keyed reference to views.

Common Procedures

Procedures for cover removal and replacement, are given on CARR-DR 2-1 through CARR-DR 2-6. You will be sent to these common procedures by the FRU removal and replacement procedures.

Read through the complete procedure before performing it and give attention to caution and danger notes.

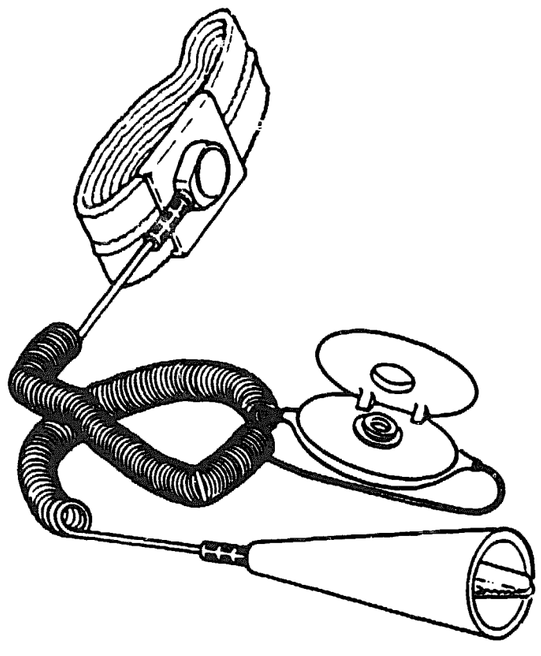


Figure 1. ESD Grounding Wrist Strap

Instructions for Working With ESD-Sensitive Parts

To prevent damage when you work with electrostatic discharge (ESD) sensitive parts, observe the following instructions. These instructions are in addition to all the usual precautions.

- ESD-sensitive parts that are shipped in a special ESD bag should be left in this bag until you are ready to immediately install them into the machine.
- Before touching the ESD-sensitive part, put on the ESD Grounding Wrist Strap on either wrist. This strap has a high resistance (1 megohm) resistor in series with the grounding clip, so there is no danger to you. It discharges the static electricity from your body. Connect the clip to the flex ground strap of the gate to the frame. Keep the strap on while you are inserting or removing a logic card or handling any ESD-sensitive part.
- Do not place the ESD-sensitive part on the machine cover or on a metal table. If you need to put down the ESD-sensitive part for any reason, first put it into its special bag. (Large metal objects can be discharge paths without being grounded.)
- Prevent ESD-sensitive parts from being touched by other personnel, such as service representatives or customers. Reinstall all covers when you are not working on the machine.
- If possible, keep all ESD-sensitive parts in a grounded metal cabinet (case).
- Be extra careful in working with ESD-sensitive parts when cold-weather heating is used. Heating of cold air lowers the relative humidity which increases the static electricity.

CAUTION:
When wearing the ESD grounding wrist strap, ensure that the flex ground strap remains connected. Failure to do this creates a safety exposure in the same manner as wearing jewelry while working on live exposed electrical circuits.

Use the most current Digital part number available for the ESD Grounding Wrist Strap.

- The following is a list of the ESD-sensitive parts in the TA90 subsystem:
  - All of the logic cards in the tape control unit and the drives
  - Message display card in the drives
  - Transducer FRU in the drives.
  - Loader Control Card
  - Loader Mechanical Assembly
  - Load Assembly

Tape Transport Unit Cover Removal Procedure

This page contains the steps needed to remove any of the tape transport unit covers. The drive drawer safety cover is not included on this page, but can be found on CARR-DR 2-5.

Tape Transport Unit Front and Rear Cover Removal

The tape transport unit front and rear covers are held on by two hinges. The front cover hinges are on the right side, the rear cover hinges are on the left. Latches hold both covers closed.

To open the front cover, push on the left center to release the latch. To open the rear cover, insert a small screw driver into the slot in the right center of the cover and push to the left to release the latch.

1. Pull the cover open until the hinge pins [2] are accessible.
2. Remove the ground strap from the cover.
3. While holding the cover, remove the hinge pins and then remove the cover.
4. Return to the procedure that sent you here.

Tape Transport Unit Side Cover Removal

The last tape transport unit in a string of drives will have a cover on the right side. The other tape transport units do not have side covers. The tape transport unit side cover is held at the top by two cradle-like brackets [3] attached to the tape transport unit frame. The bottom of the cover is held in place by a latch assembly [4].

1. To open the side cover, insert a small screw driver into the slot in the bottom center of the cover and push upward to release the latch.
2. Pull the bottom of the cover away from the tape transport unit, then lift the cover straight up and out of the brackets attached to the tape transport unit frame.
3. Return to the procedure that sent you here.

Tape Transport Unit Front Safety Cover Removal

1. Loosen the three cover mounting screws [7] (one on each side and one on the bottom of the safety cover).
2. Remove the grounding strap.
3. Remove the front safety cover from the tape transport unit.
4. Return to the procedure that sent you here.

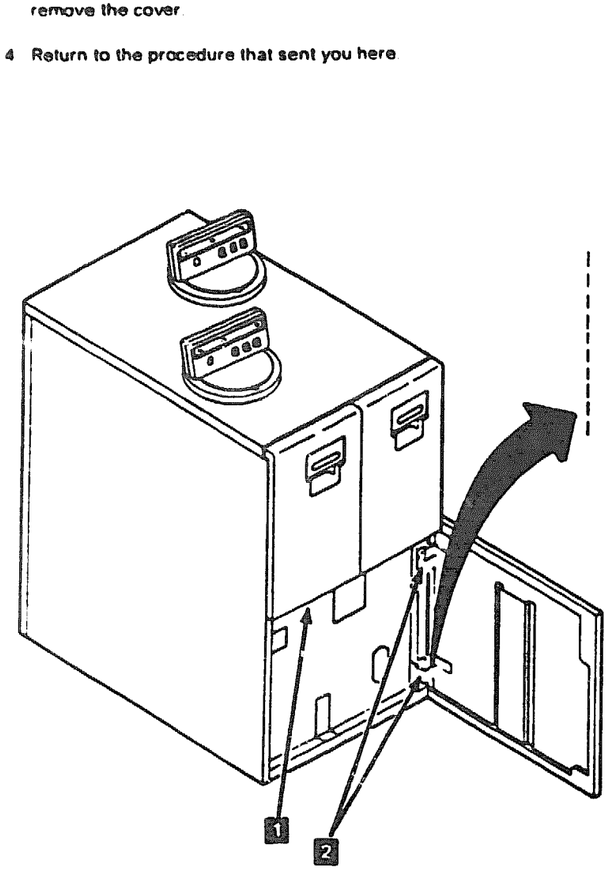
Drive Drawer Cover Removal

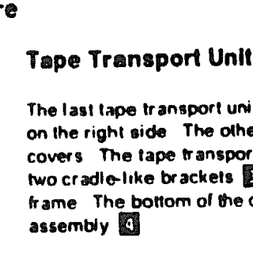
Warning: The drive 0 safety cover may contact the left side vertical member of the frame when being opened or closed. When opening drive 0, pull the drawer slowly to prevent damage to the safety cover.

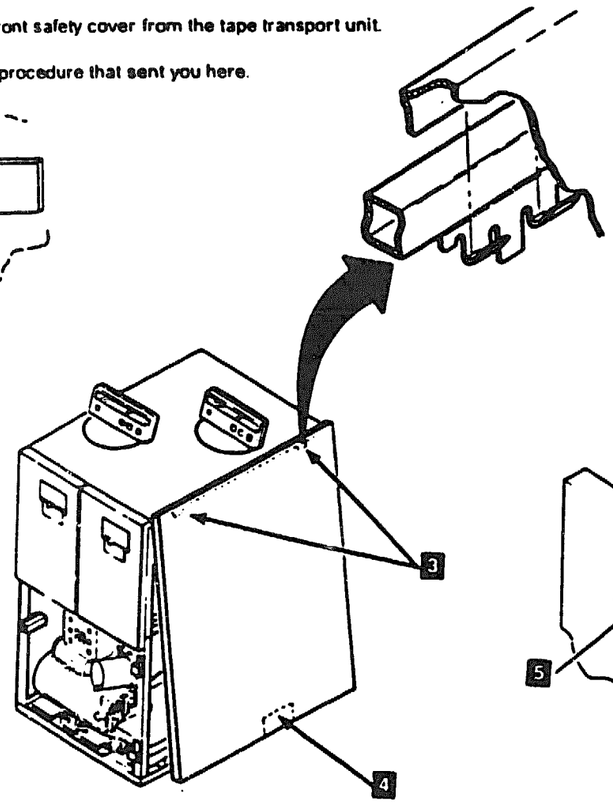
The drawer is held at the top by two screws [6] which are near the cartridge latch assembly. Do not remove the cover support bracket [8] from the top cover.

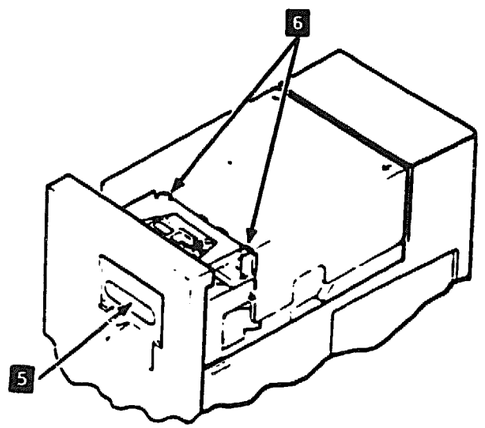
The bottom of the drive drawer can be held by either two screws, or by two pins. If held by the pins it will not be necessary to remove the pins.

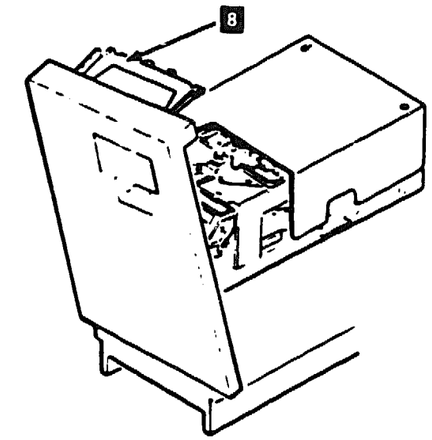
1. Open the front cover. The drive drawer has a latch located in the center-bottom of the drive drawer [1]. Push up on the latch and at the same time pull out on the drawer until you can access the two cover screws.
2. Check the bottom of the drawer cover. If you have two screws holding the bottom of the cover, remove them at this time.
3. Ensure that the cartridge latch door [5] is closed. Remove the two drawer cover bracket screws [6] from the cartridge latch assembly. Do not remove the bracket [8] from the cover.
4. Lift up on the cover and at the same time lift the cover away from the drive.
5. Return to the procedure that sent you here.

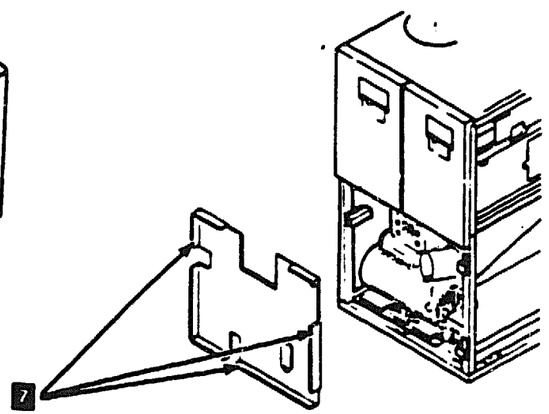










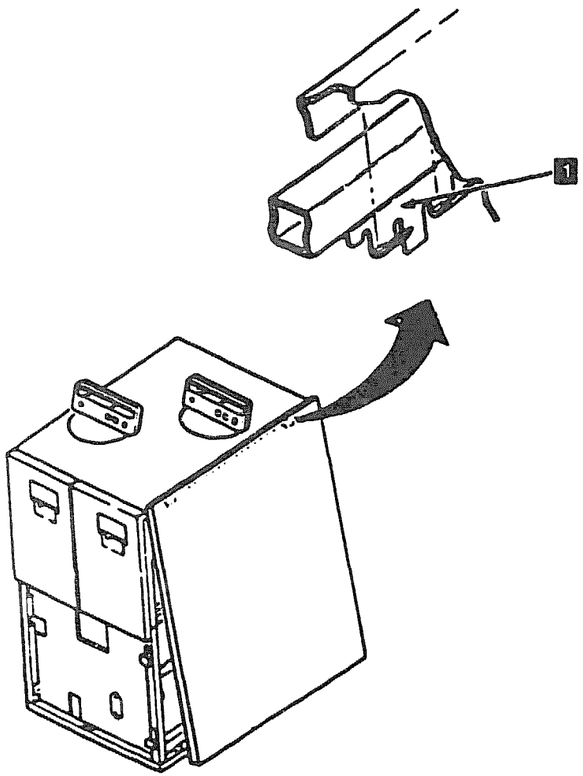


Tape Transport Unit Cover Replacement Procedure

This page contains the steps needed to replace any of the tape transport unit covers. The drive drawer safety cover is not included on this page, but can be found on CARR-DR 2-5

Tape Transport Unit Front and Rear Cover Replacement

1. Move the cover into position on the tape transport unit until the cover hinges and the tape transport unit hinges are aligned. Insert the hinge pins into the top and bottom hinges.
2. Reconnect the ground connector to the cover.
3. Close each the cover until it is held by the latch assembly.
4. Return to the procedure that sent you here.

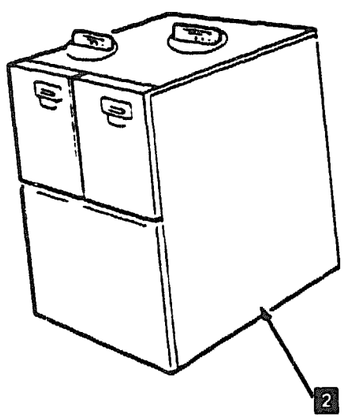


Tape Transport Unit Front Cover Adjustment

Note: The tape transport unit front cover must be adjusted so that it does not open to the casual or incidental touch. The cover should only open by the use of an intentional force in the proper area.

When the tape transport unit front cover is adjusted correctly, the upper right corner should be in alignment (approximately) with the bottom of the drive 0 front cover (check the alignment with your six-inch straight edge).

1. As a starting point, loosen the two latch assembly holding screws and position the front of the latch assembly 7 to extend approximately 2 mm (5/64 inch) beyond the front of the side-frame.
2. Partially close the front cover and ensure that the catch mechanism 8 aligns with the latch assembly.
3. Close the front cover to ensure that it will stay closed with the latch assembly in this position (2 mm beyond the front side-frame).
4. Continue the adjustment by changing the 2 mm adjustment (distance from the front side-frame to the latch assembly) until the upper right corner of the front cover is in alignment (approximately) with the bottom of the drive 0 front cover (check the alignment with your six-inch straight edge).
5. Tighten the two latch assembly holding screws.
6. Return to the procedure that sent you here.



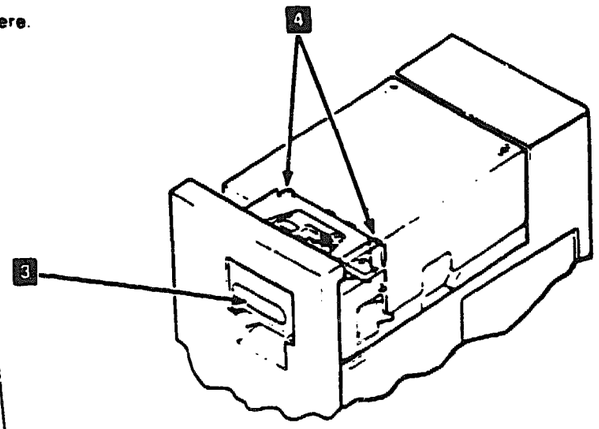
Tape Transport Unit Side Cover Replacement

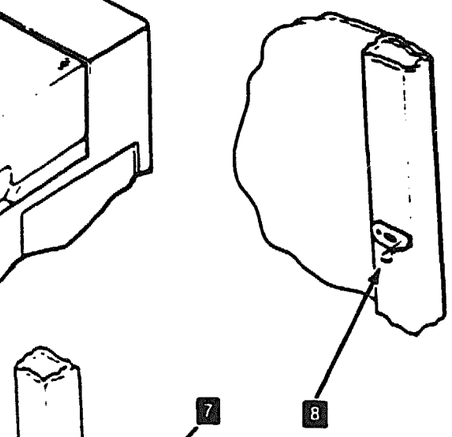
The last tape transport unit in a string of drives will have a cover on the right side. The other tape transport units do not have side covers. The tape transport unit side cover is held at the top by two cradle-like brackets attached to the tape transport unit frame. The bottom of the cover is held by a latch assembly.

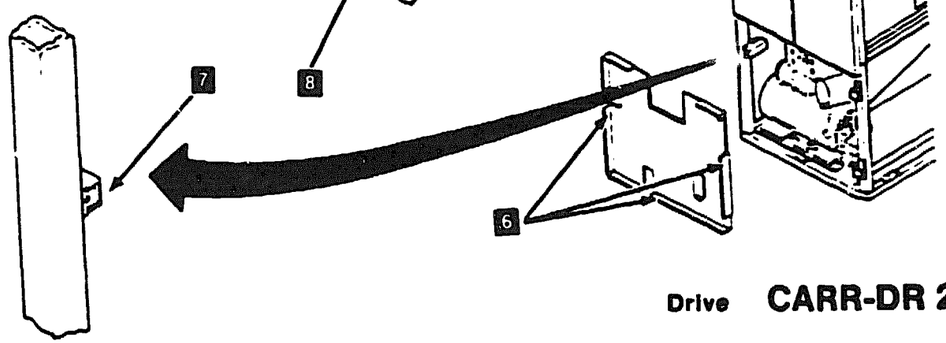
1. Lower the cover onto the tape transport unit until the top of the cover moves into the two brackets attached to the tape transport unit frame 1.
2. Reconnect the ground connector to the cover.
3. Move the bottom of the cover toward the tape transport unit until it is held by the latch assembly 2.
4. Return to the procedure that sent you here.

Tape Transport Unit Front Safety Cover Replacement

1. Position the safety cover in the tape transport unit and tighten the three mounting screws 6 (one on each side and one at the bottom of the safety cover).
2. Connect the grounding strap to the cover.
3. Return to the procedure that sent you here.



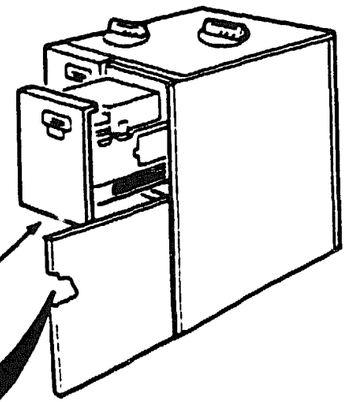




Drive Drawer Cover Replacement

The bottom of the drawer cover can be held by either two screws, or by two pins.

1. Close the cartridge latch door 3 and lift the cover onto the drive drawer. If your cover has pins, guide the pins into the holes of the cover at the same time you lift the cover onto the drive drawer.
2. Install the two cover bracket screws 4 at the top of the cover.
3. If your cover has two screws at the bottom, install the two screws 5.
4. Return to the procedure that sent you here.



Drive Drawer Safety Cover Removal or Replacement Procedure

This page contains the steps needed to remove or replace the drive drawer safety cover

Drive Drawer Safety Cover Removal

Warning: The drive 0 safety cover may contact the left side vertical member of the frame when being opened or closed When opening drive 0 pull the drawer slowly to prevent damage to the safety cover

Warning: Do not slide the drawer into the latched position with the cover screws 2 loosened The screws may contact the bottom of the message display pan

1 Open the front cover The drive drawer has a latch located in the center of the drive drawer 1 Push up on the latch and at the same time pull out on the drawer until you can get to the two cover screws

2 The safety cover is held by two screws 2 Loosen the two screws

3 Slide the safety cover toward the rear of the drive drawer until the screws will pass through the opening in the cover

4 Lift the end of the cover near the rear panel up and away from the drive drawer until it is free of the drawer

5 Set the cover to the side

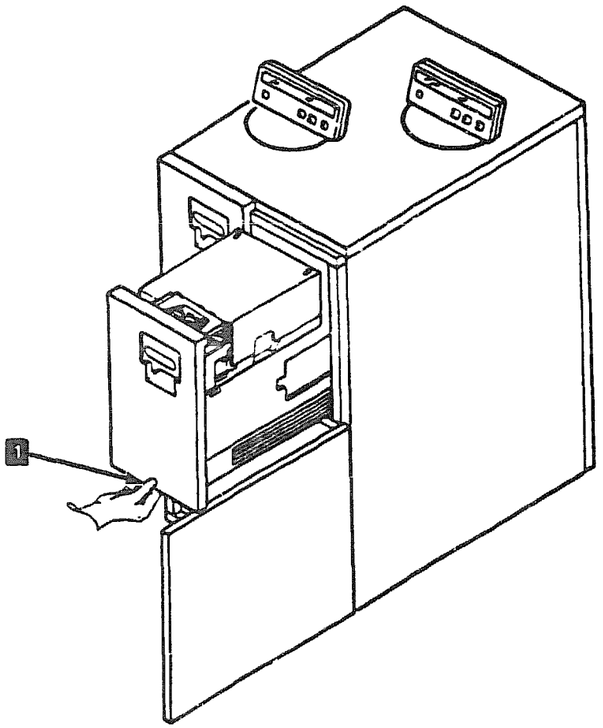
6 Return to the procedure that sent you here

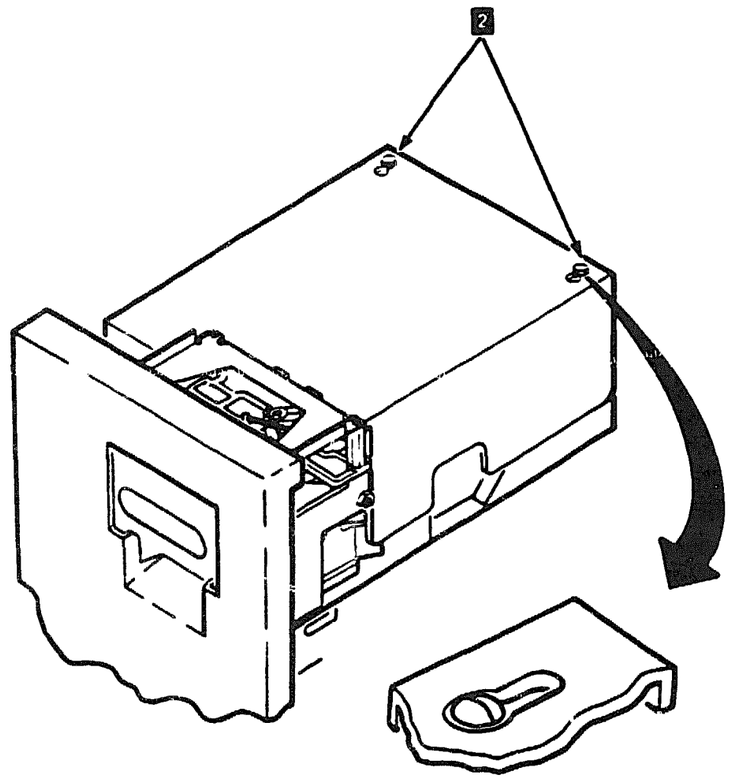
Drive Drawer Safety Cover Replacement

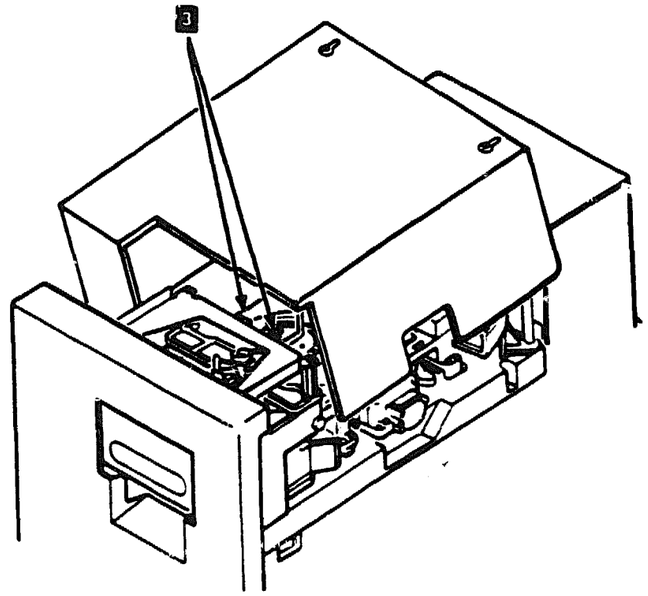
1 Lower the drawer safety cover onto the drive drawer, guiding the forward end into the front cover brackets 3 At the same time, guide the cover so the two mounting screws 2 enter the slotted openings on the rear of the cover

2 Tighten the screws

3 Return to the procedure that sent you here







Drive Operator Panel Removal and Replacement Procedure

This page contains the steps needed to remove or replace the drive operator panel 1

Drive Operator Panel Removal

1 There are two tabs 3 on the base of the drive operator panel. These two tabs insert into slots in the top cover opening.

Turn the operator panel 2 to the position shown (clockwise to its stop)

2 There are "ball bearing" type retainers in the top cover opening that hold the operator panel, and provide detents.

Remove the operator panel by lifting straight up and out of the top cover opening.

Note: It may be necessary to turn the operator panel a few degrees right or left to free the assembly from the top cover.

3 If it is necessary to disconnect the cables from the display panel, see CARR-DR 600 "Message Display Board Removal and Replacement Procedure."

4 Return to the procedure that sent you here.

Drive Operator Panel Replacement

1 If the cables from the display panel have been removed, see CARR-DR 600 "Message Display Board Removal and Replacement Procedure."

2 Place the operator panel in position over the top cover opening.

3 Align the tabs 3 on the operator panel with the slots in the top cover opening.

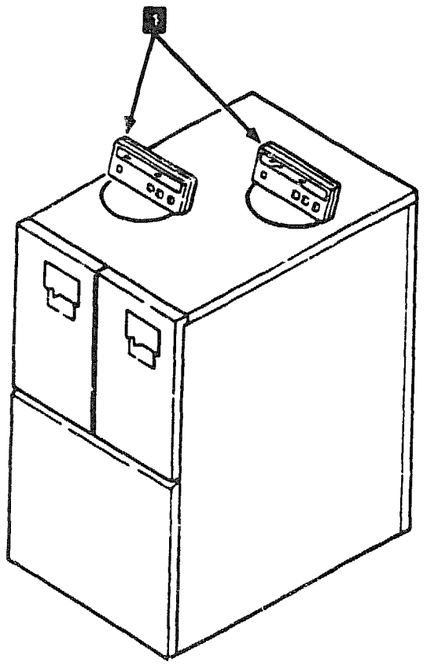
4 Push the operator panel into the opening until it seats.

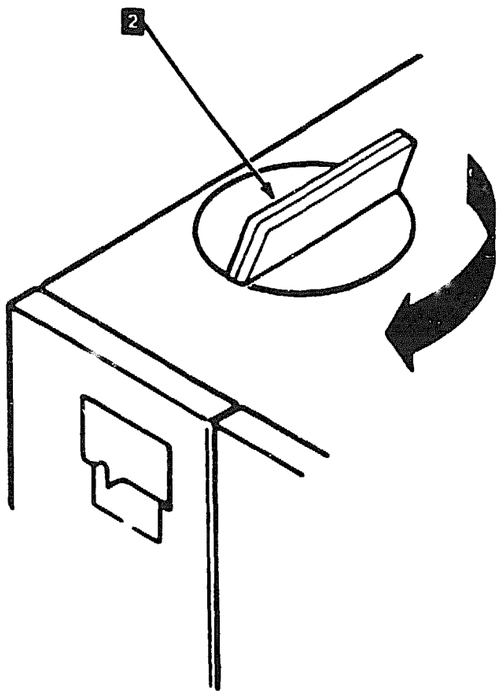
5 Turn the operator panel in a counterclockwise direction.

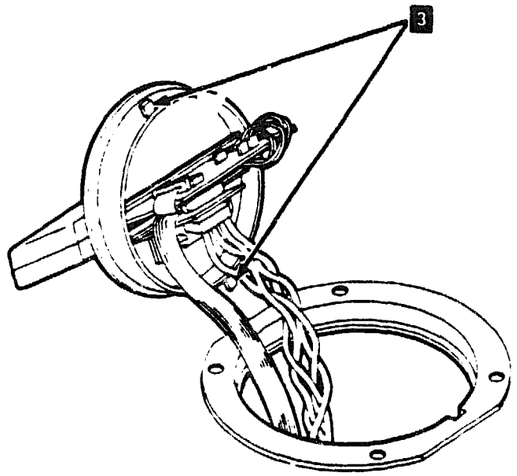
This ensures seating of the operator panel.

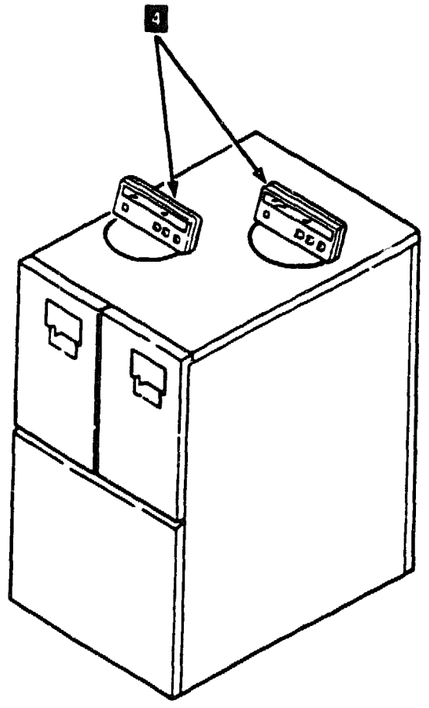
6 Position the operator panel 4 so it may easily be read by the operator.

7 Return to the procedure that sent you here.









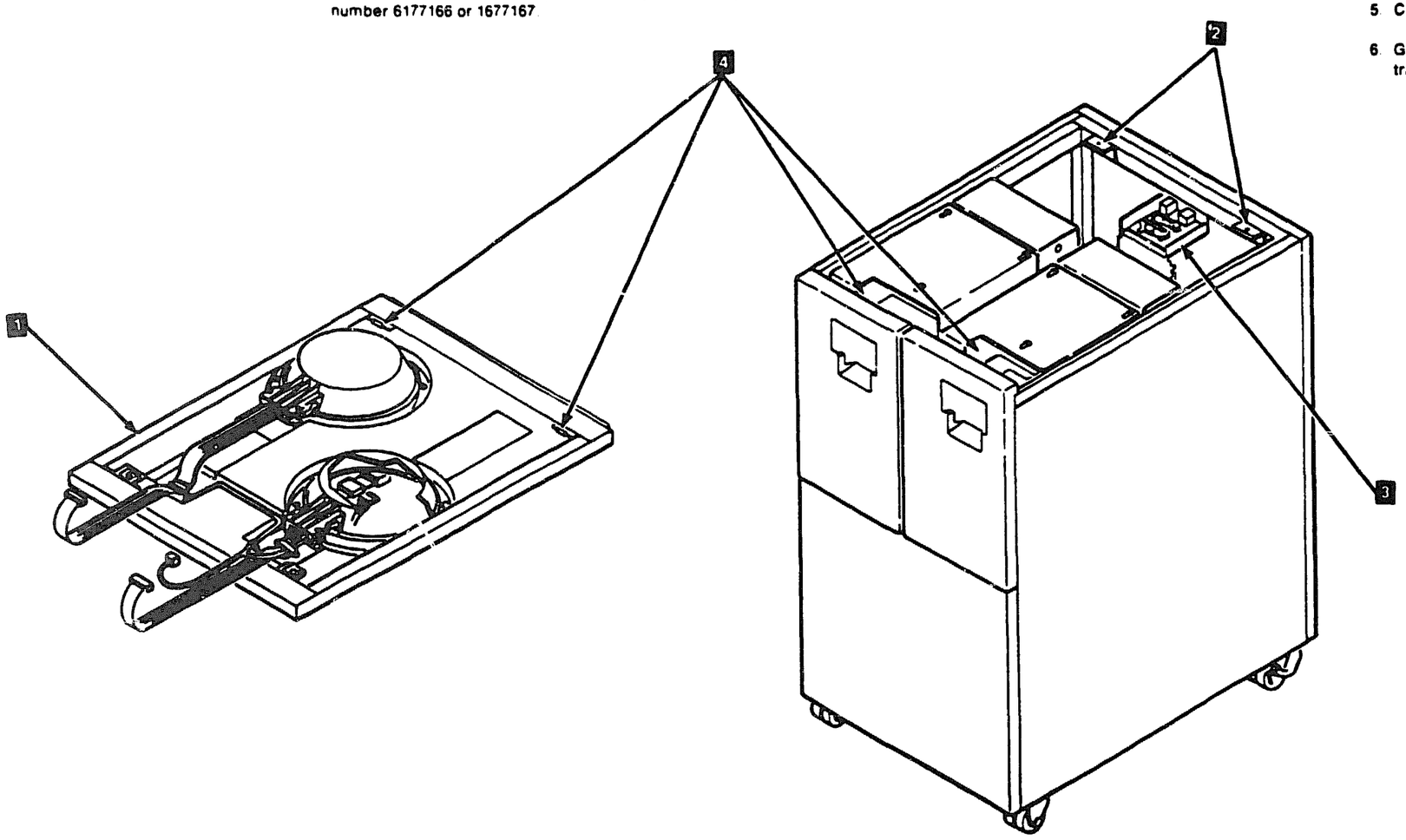
Tape Transport Unit Top Cover Removal and Replacement Procedure

This page contains the steps needed to remove and replace the top cover assembly 1 from the tape transport unit. Since both operator display panels will be disconnected, it will be necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the tape transport unit ac power circuit breaker.

Removing the Top Drive Cover

1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.
2. Open the rear drive cover (see CARR-DR 2-1).
3. Release the two rear latch screws 2. (These are captive screws.)
4. Remove cable plug P11 from connector J11 located on the bottom of the external load resistor panel 3 (cable support bracket, if tape transport unit has power supply part number 6177166 or 1677167).
5. Unplug the two SLT cables from the operator display panels to the SLT connector panel which is attached to the bottom of the external load resistor panel, and remove the cable support bracket, if tape transport unit has power supply part number 6177166 or 1677167.
6. Open both drive drawers. (This will make space for the operator panel when the top cover is turned upside down.)
7. Pivot the top cover on its front locating tabs and brackets 4 by lifting from the rear of the tape transport unit.
8. Lift the top cover off the front locating tabs and brackets 4.
9. Place the top cover upside down on top of the tape drive for easy access to the message display cables, ferrites, and RFI pans.



Replacing the Top Drive Cover

1. Replace the top cover 1 by inserting the front locating tabs into the brackets 4.
2. Pivot the rear of the cover down and latch the two rear captive screws 2.
3. Install cable plug P11 into connector J11 located on the bottom of the external load resistor panel 3 (cable support bracket, if tape transport unit has power supply part number 6177166 or 1677167).
4. Plug the two SLT cables from the operator display panels to the SLT connector panel which is attached to the bottom of the external load resistor panel, and remove cable support bracket, if tape transport unit has power supply part number 6177166 or 1677167.
5. Close both drive drawers.
6. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.

Automatic Cartridge Loader and Decorative Cover Removal and Replacement

Decorative Cover Removal When Drive is Not in Use

1 Set the automatic cartridge loader mode switch 1 to MANUAL. This prevents the tray from lowering when cartridges are unloaded.

2 Check to see if there are any cartridges in the loader or drive. If there are, remove the cartridges.

3 Make sure the cartridge loader output tray is in the up position. The decorative cover cannot be removed if the tray is not in the up position.

a If the tray is in the up position, go to step 5.

b If the tray is not in the up position, place a cartridge into the top position of the input station. Press the automatic cartridge loader STAFIT switch and remove the cartridge from the input station even if the cartridge is moving downward. The tray will move to the up position.

The tray is now in the up position.

4 Remove the lower decorative cover 3 by pushing in on the sides and pulling the cover straight out. The cover is held by tabs 2.

The automatic cartridge loader must be operated in the manual mode until the decorative cover is placed back on the cartridge loader.

Decorative Cover Removal When Drive is in Use

The following procedure can be used to remove the lower decorative cover from an automatic cartridge loader on a drive that is being used by a customer.

1 Note the setting of the automatic cartridge loader mode switch for use when the cover is installed.

2 Set the automatic cartridge mode loader switch 1 to MANUAL. This prevents the tray from lowering when cartridges are unloaded.

3 Check to see if there are any cartridges in the loader. If there are, remove the cartridges.

4 Make sure the cartridge loader output tray is in the up position. The decorative cover cannot be removed if the tray is not in the up position.

a If the tray is in the up position, go to step 4.

b If the tray is not in the up position, wait for the cartridge that is loaded to be unloaded by either the system or the operator. When the cartridge is unloaded, the tray will rise.

5 Remove the lower decorative cover 3 by pushing in on the sides and pulling the cover straight out. The cover is held by tabs 2.

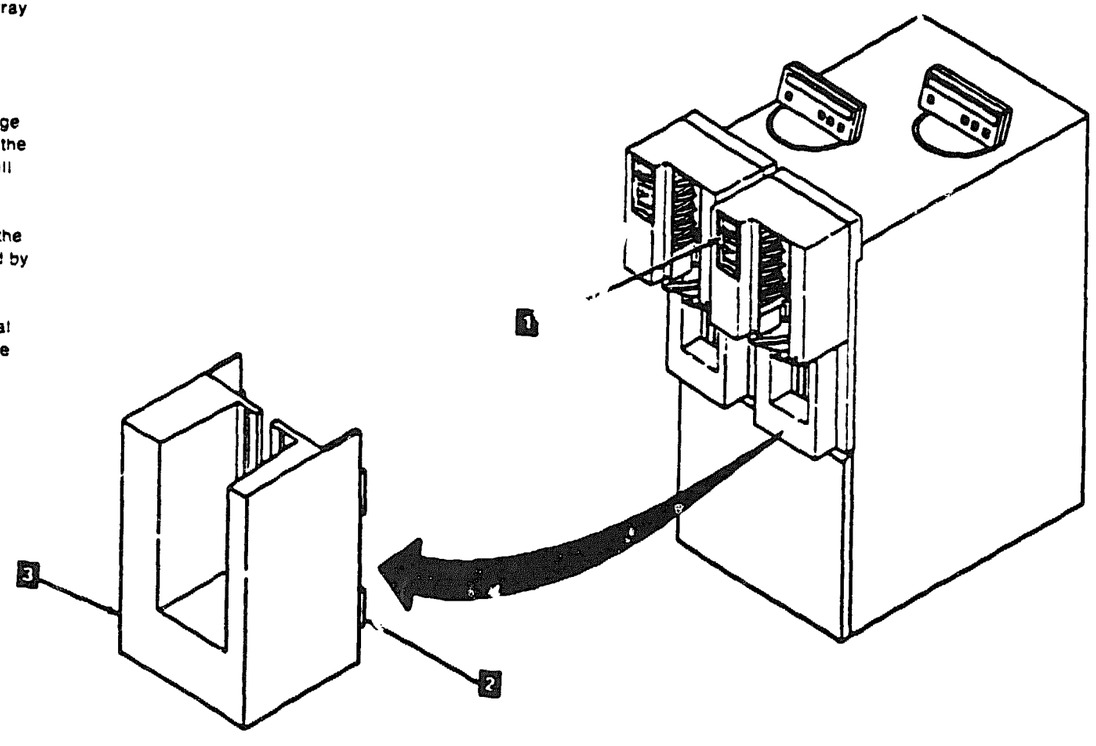
The automatic cartridge loader must be operated in the manual mode until the decorative cover is placed back on the cartridge loader.

Decorative Cover Replacement

1 Align the tabs 2 of the decorative cover with the slots in the automatic cartridge loader cover.

2 Press in on the decorative cover 3 until the cover snaps into place.

3 Set the automatic cartridge loader mode switch 1 to either the previous setting or the required setting.



Plenum Supply Hose Clamping Procedure

Several Remove/Replace procedures require clamping the plenum supply hose to prevent air pressure loss in the adjacent drive (in the same tape transport unit) during concurrent maintenance. Clamping this hose also aids in field replacement unit (FRU) isolation when both drives within a tape transport unit are having an air pressure loss problem.

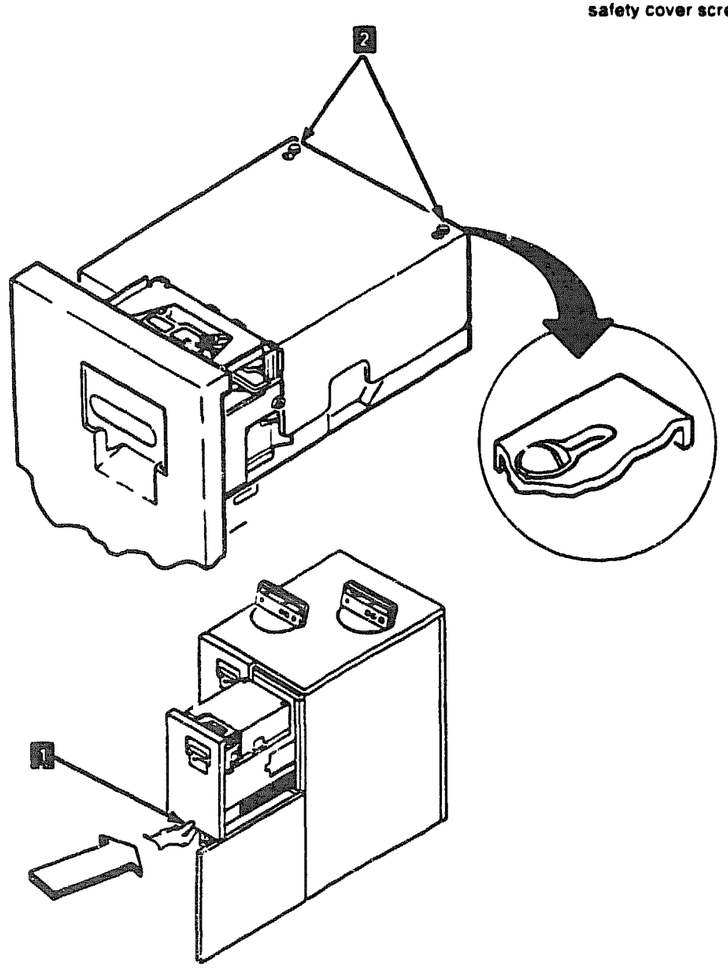
Getting Started

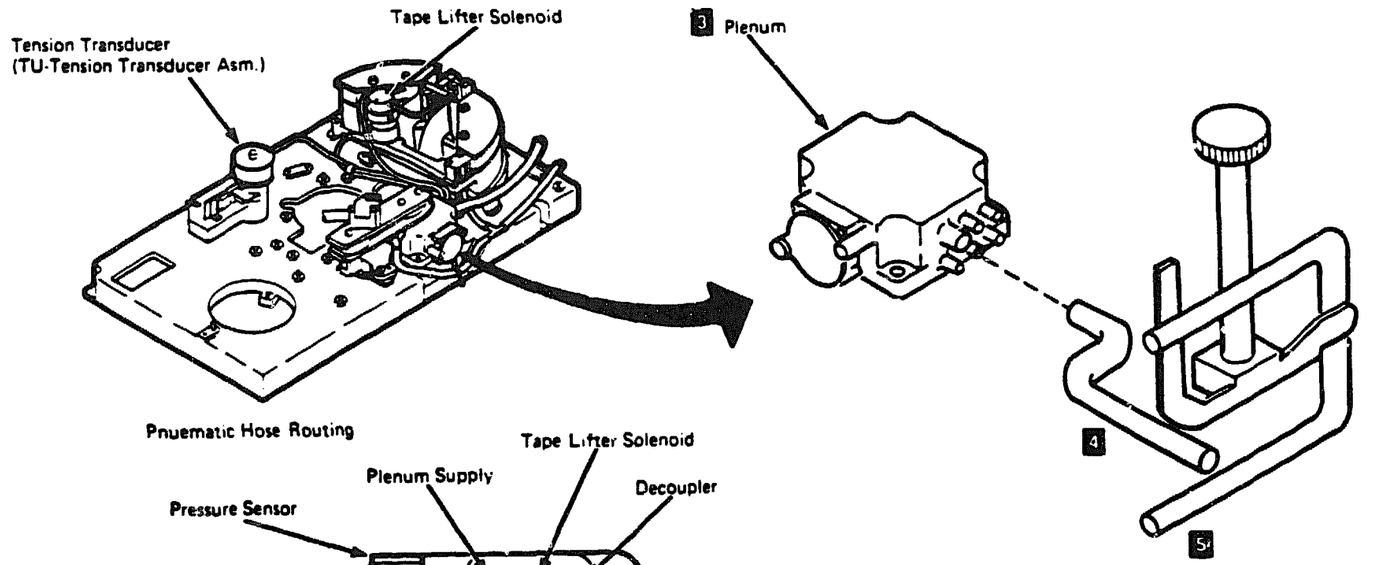
1. Open the front cover.
2. Open the drive drawer.
   a. Push up on the latch located in the center of the drive drawer 1.
   b. While pushing up on the latch, pull out on the drive drawer.
   c. Pull the drive drawer out far enough to get access to the safety cover screws.
3. The drive drawer safety cover is held by two screws 2. Loosen the two screws.
4. Slide the safety cover toward the rear of the drive drawer until the mounting screws pass through the openings in the safety cover.
5. Lift the rear of the safety cover up and away from the drive drawer.
6. Set the safety cover to the side.

Clamping the Plenum Supply Hose

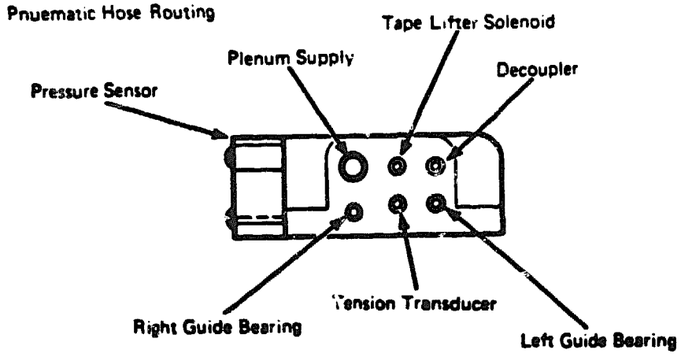
1. Locate the plenum 3 and identify the plenum supply hose. The plenum supply hose 4 is the hose with the largest diameter connected to the plenum (top hose, closest to the pressure sensor).
2. Using the hose clamp tool (part 29-27469-01) 5, clamp the hose as it leaves the plenum. Ensure that the plenum supply hose does not separate from the plenum before it is clamped.

   Warning: Remove the clamp from the plenum supply hose slowly so you do not affect the air pressure in the adjacent drive in the tape transport unit. Rapidly removing the plenum supply hose clamp can cause pressure to drop in the adjacent drive, causing a 'Check 46' error.
3. Return to the procedure that sent you here.





Pnuematic Hose Routing



Hose Connections
To The Plenum

Device Interconnection Checks

Error Description

An error was detected on the device interconnection bus

Error Condition Theory

A malfunction at any drive or at the tape control unit may appear as a single drive or multiple drive problem. (Check code 82 is a prime example of this symptom.) In this instance the functional microcode cannot perform stand-alone problem determination and requires assistance from the service representative

Problem Determination

When routed to the MAP for problem determination by an error code pointing to device data bus problems, use the CE panel to communicate with each drive attached to the tape control unit.

Problem determination is accomplished by the process of elimination. The service representative should analyze the reported errors to determine the error code and what drives are presenting the error. For instance, an error code of 8007 implies that the drive will not communicate with the TTU. If the FSC shows that drives 0 through 3 are not in the 8007 error code list but that drives 4 through 7 are, this indicates a break between drives 3 and 4. The service representative should concentrate on locating the break (loose cable or broken wire).

If the FSC error code is other than 8007, there may be hot bits or an open on the bus. By breaking the bus apart, that error code will go away when the faulty drive is disconnected. However, note that the drives beyond the break will assume an error code of 8007.

Bus identification is as follows:

- If you are using tape control unit 0, drives 0-7 are on the local bus and drives 8-F are on the remote bus.
- If you are using tape control unit 1, drives 0-7 are on the remote bus and drives 8-F are on the local bus.

Supplemental Data

```
DEVICE INTERCONNECTION BUS FUNCTIONS

  a) Send and receive device addresses
  b) Receive alerts from devices
  c) Send and receive device tags
  d) Receive device status
  e) Send write data to the devices

The bus is divided into two categories:

 A) Device Tags
    1) Select Out
    2) Status In
    3) Address In
    4) Address Out
    5) Gap In/Out (Bi-directional)
    6) Clock A Out
    7) Clock B In/Out (Bi-directional)
    8) Command Out
    9) Repositioning In

 B) Device Data (Bi-directional)
    1) Status data
    2) Write data
    3) Address data
```

Tape Transport Unit and Drive Power Off and Power On Procedures

This page contains the steps needed to remove and replace power for the tape transport unit and drive of the TA90 Tape Subsystem.

To power Off first complete the "Power Off Procedure" on this page, then go to the desired section.

- Tape Transport Unit Power Off
- Drive Power Off

To power On go to the desired section.

- Tape Transport Unit Power On
- Drive Power On

With an automatic cartridge loader installed and a cartridge at the feed station, the cartridge is loaded into the feed station and the Attention bar LEDs on the automatic cartridge loader blink when the drive is powered on.

To clear the cartridge press the Start button. The cartridge is returned to the feed station and the Attention LEDs will stop blinking.

Power Off Procedure

1. Verify that all paths to the failing tape transport unit or drive are offline to the operating systems through the local tape control unit.
2. Verify that all paths to the failing tape transport unit or drive are offline to the operating systems through the remote tape control unit.

Tape Transport Unit Power Off

1. Open the tape transport unit front cover (see CARR-DR 2-1).
2. Set both drive Online/Offline switches to Offline (see LOC 1).
3. If there is a cartridge in any drive, remove it using the following three steps:
   a. Set the drive Ready/Not Ready switch to Not Ready (see LOC 1).
   b. Press the drive Unload switch (see LOC 1).
   c. If you were sent here by CART, go to step 4.
   d. Remove the cartridge from the drive. If the cartridge cannot be removed, go to "Cartridge Removal By Hand" on CART 10; return here after the cartridge has been removed.

DANGER

Electric shock. Hazardous voltages are present on the AC Power circuit breaker and on the AC Power cord.

4. Loosen the screws in the circuit breaker access cover and pivot the cover clockwise to get access to the circuit breaker (see CARR-DR 960).
5. Set the tape transport unit ac power circuit breaker to Off (see LOC 1).
6. Return to the procedure that sent you here.

Drive Power Off

1. Open the tape transport unit front cover (see CARR-DR 2-1).
2. Set the drive Online/Offline switch to Offline (see LOC 1).
3. If there is a cartridge in the drive, remove it using the following three steps:
   a. Set the drive Ready/Not Ready switch to Not Ready (see LOC 1).
   b. Press the drive Unload switch (see LOC 1).
   c. If you were sent here by CART, go to step 4.
   d. Remove the cartridge from the drive. If the cartridge cannot be removed, go to "Cartridge Removal By Hand" on CART 10; return here after the cartridge has been removed.

DANGER

Electric shock. The Drive Power switch removes dc voltages to that drive only and does not affect the other drive in the tape transport unit.

4. Set the Drive Power switch to Off (see LOC 1).
5. Return to the procedure that sent you here.

Tape Transport Unit Power On

1. Set the tape transport unit ac power circuit breaker to On (see LOC 1).
2. Pivot the circuit breaker access cover counterclockwise to close the cover and tighten the access cover screw (see CARR-DR 960).
3. Return to the procedure that sent you here.
4. Set each Drive Power switch to On (see LOC 1).
5. Set each drive Online/Offline switch to Online (see LOC 1).
6. Close the tape transport unit front cover (see CARR-DR 2-2).
7. Continue by returning to the MAP or procedure that sent you here.

Drive Power On

1. Set the Drive Power switch to On (see LOC 1).
2. Set the drive Online/Offline switch to Online (see LOC 1).
3. Close the tape transport unit front cover (see CARR-DR 2-2).
4. Continue by returning to the MAP or procedure that sent you here.

FRU001 Threader Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the threader assembly [15] in the drive. It is necessary to remove some of the parts in the machine reel area.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Threader Assembly

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. So that we do not affect the other drive, you must clamp the plenum supply hose of the drive requiring maintenance.

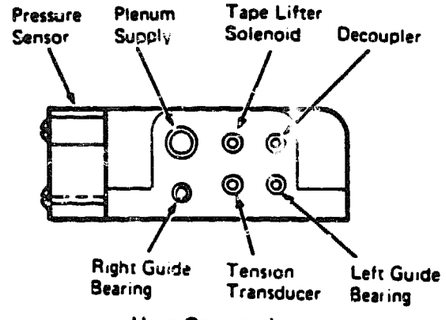
   Clamp the plenum supply hose (see CARR-DR 3-1).
4. Close the cartridge latch [19]. On drives with automatic cartridge loaders turn the knurled knob [1], on the load assembly, clockwise until it stops. This releases the threader pin [3] from the interlock. Turn the threader arm [2] until it is in the position shown (at the 12 o'clock position). This moves the arm out of the way to prevent the arm from being broken.
5. Disconnect the two threader motor wires [9].

   Note: Label the wires to aid in their replacement. Later production drives have a red dot marking the terminal for connecting the white wire.
6. Tape path sensor B [10] is located on the threader assembly and needs to be removed. Loosen the two screws holding the sensor in position, then slide the cable and sensor away from the threader assembly, toward the front of the drive.
7. Remove the cable connector from the sensor and set the sensor to the side. Push the cable back through the sensor B mounting bracket.
8. Because the tension transducer hose [7] and the left bearing guide hose pass through the threader, they must be removed. Disconnect the hoses from the tension transducer and the left bearing guide. Push the hoses through the threader assembly and disconnect their other ends from the plenum [18].
9. Remove the two machine reel tape guide mounting screws [13], then release the machine reel tape guide pin from the center tape guide by pulling it straight up. Slide the machine reel tape guide [6] out of the drive.
10. The tape lifter solenoid [5] is installed on the threader assembly. Disconnect the two hoses from the solenoid and move them out of the way. Remove the single screw holding the solenoid to the threader and move the solenoid out of the way.
11. The threader is fastened to the baseplate with three screws [11]. All three screws are partially out of view and must be accessed at an angle. Ensure that the screwdriver does not slip and cause personal injury or damage the screw. The first screw to be removed is near the plenum. It is easier to remove the screw if you first remove the hoses that cover it. Remove the hoses from the plenum and move them out of the way. Remove the screw and set it to the side.

    The other two screws can be seen by turning the machine reel. Turn the reel and remove the two screws. Do not remove the threader assembly at this time; it is necessary to remove the machine reel first.

    The lower flange [14] must be removed to remove the threader. The machine reel is between the cartridge latch assembly and the threader assembly.

    Note: To remove the machine reel, the threader assembly must be lifted off the baseplate approximately one inch. Loosen the threader from the locating pins and lift the threader and remove the machine reel.
12. The lower flange [14] is held on by the machine reel hub [16] and upper flange [17], which in turn, is held by two screws. Remove the two screws and upper flange. The machine reel hub and machine reel can be easily damaged; do not use any tools to remove the hub. Use your thumbs and use pressure as shown and at the same time lift the hub off the hub mount.
13. Lift the threader assembly [15] off the baseplate.



Hose Connections to the Plenums

Replacing the Threader Assembly.

1. Prepare the replacement threader assembly [15] for installation by turning the threader arm [2] to the position shown (to the 12 o'clock position).

   To turn the arm, hold the base of the threader assembly in one hand and turn the arm with the other.
2. Temporarily place the threader assembly on the baseplate. Do not attach the screws at this time.
3. To install the machine reel flange (lower) on the machine reel hub, lift the edge of the threader assembly nearest the machine reel.

Place the machine reel flange (lower) [14], the machine reel hub [16] and the machine reel flange (upper) [17] on the mounting hub and install but do not tighten the two screws. Be careful not to scratch the hub or reel.

Inspect the alignment of the hub opening to the flange openings [12] and if necessary, adjust the flanges so that the hub opening is centered over the flange openings [12]. Tighten the two screws holding the upper machine reel flange and the machine reel hub.

Warning: The installation of the machine reel tape guide (FRU227) and the tape center guide (FRU 231) is sequence sensitive, and they must be installed in the correct order for correct adjustment.

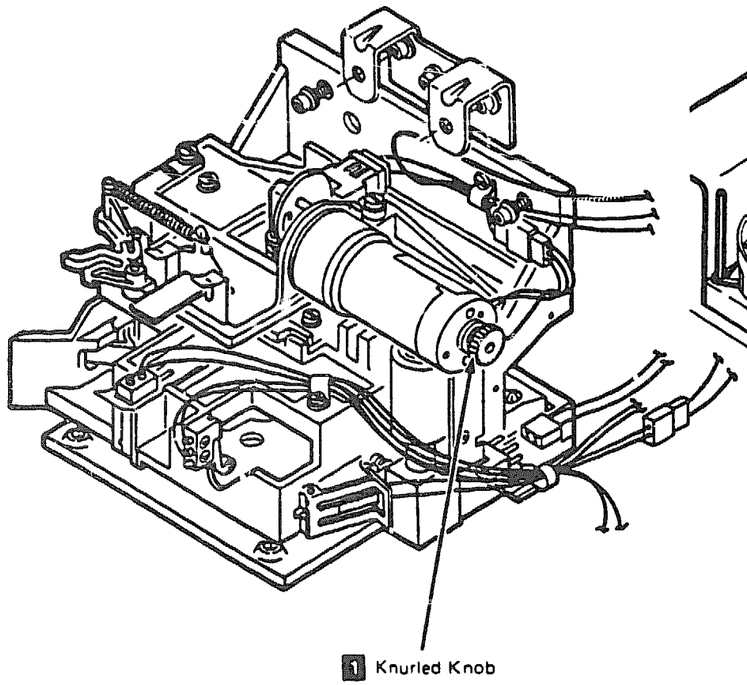
4. Go to CARR-DR 2270 and do the procedure for installing the machine reel tape guide [6] and the mounting screws [13], return here when finished.
5. Install the three threader mounting screws [11], turning the machine reel as needed to get to the screws. Use caution when installing the screws to avoid cross-threading. Also use care when tightening to ensure that the screwdriver does not slip, causing personal injury or damage to the screws.
6. Place the tape lifter solenoid [5] on the threader assembly (with the 'out' port of the solenoid toward the rear of the drive) and install the mounting screw. (If the threader assembly has two holes, use the one on the left side.)
7. Connect the two hoses to the tape lifter solenoid.
8. Connect the tension transducer hose [7] to the tension transducer [8] and the left bearing guide hose to the left bearing guide. Insert the hoses through the threader assembly base toward the plenum, then reconnect the hoses to the plenum [18].
9. If any other hoses were removed for access to the threader mounting screw near the plenum, move them back to their original places and reconnect them to the plenum.
10. Install tape path sensor B [10] onto the threader assembly.

    Note: Ensure that the polarity markings on the cable connector and the sensor match.

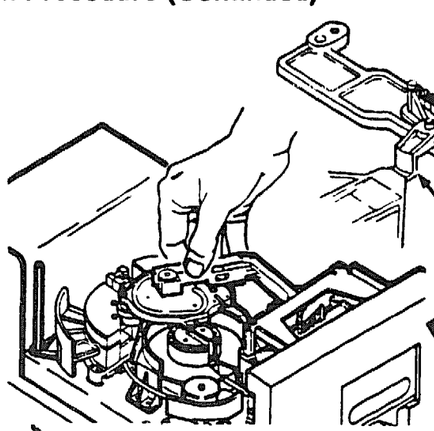
    Push the cable through the threader assembly sensor B mounting bracket toward the front of the drive. Plug the sensor onto the cable connector and slide the sensor and cable connector into the sensor B mounting bracket. Align the edges so the edges of the sensor are flush with the threader assembly, then tighten the screws to hold the sensor in place.
11. Connect the two wires to the threader assembly motor [9]. The white wire goes to the terminal labeled '1', and the black wire goes to the terminal labeled '2'.
12. Move the interlock and receiver into the position shown [3].
13. Turn the threader arm clockwise to move the threader pin [3] into the receiver.

    On drives with the automatic cartridge loaders turn the knurled knob [18], on the load assembly, counterclockwise until the knob stops. This opens the cartridge latch and interlocks the threader pin [3].

    On drives without the automatic cartridge loaders check by opening and closing the cartridge latch [19]. The latch can be opened only if the threader pin has released the interlock and is in the correct location.
14. Remove the clamp from the plenum supply hose.
15. Install the drive safety cover and close the drive drawer (see CARR-DR 2-5).
16. Go to CARR-DR 8 for the procedure to *power on* the drive.



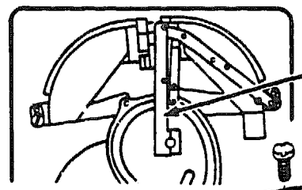
1 Knurled Knob



3 Receiver

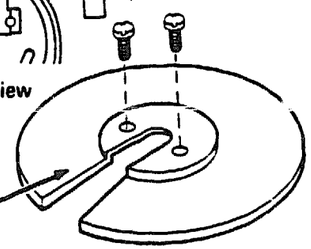
4 Threader Pin

Interlock

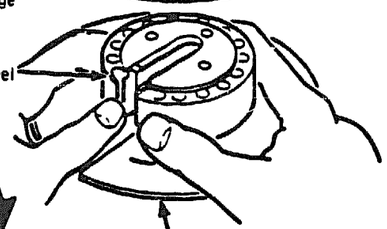


2 Threader Arm

Top View



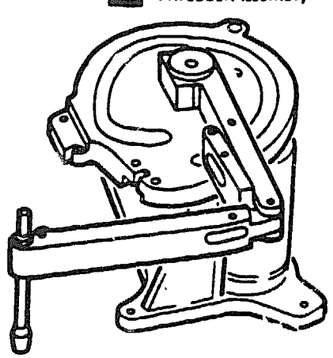
17 Machine Reel Upper Flange

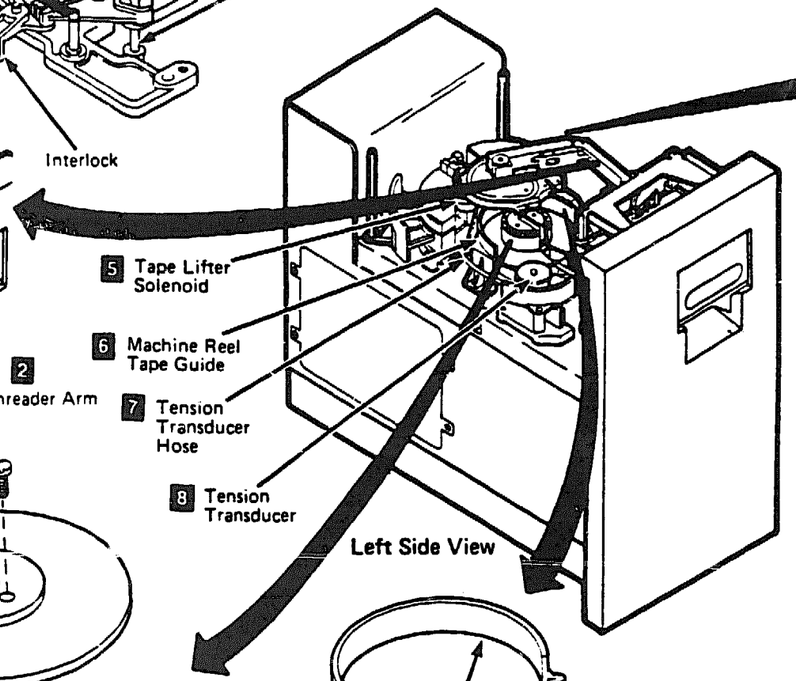


16 Machine Reel Hub

14 Machine Reel Lower Flange

15 ThreaderAssembly





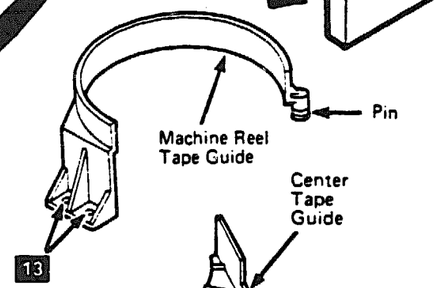
5 Tape Lifter Solenoid

6 Machine Reel Tape Guide

7 Tension Transducer Hose

8 Tension Transducer

Left Side View

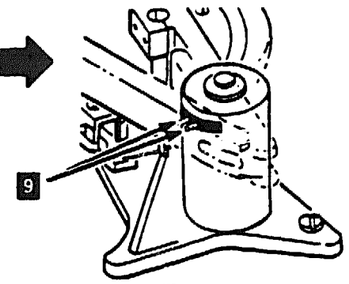


Pin

Machine Reel Tape Guide

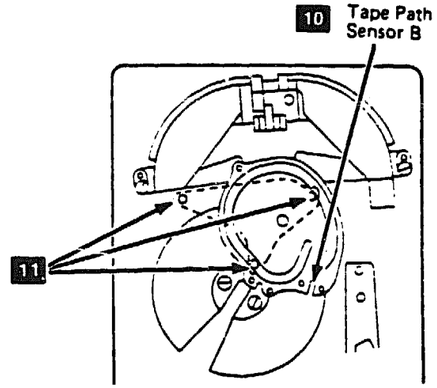
13

Center Tape Guide



9

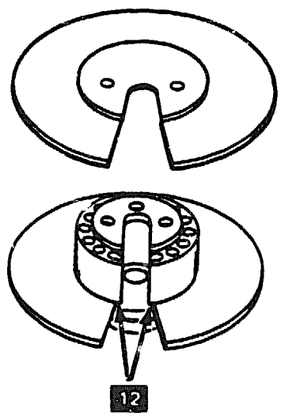
Threader Motor



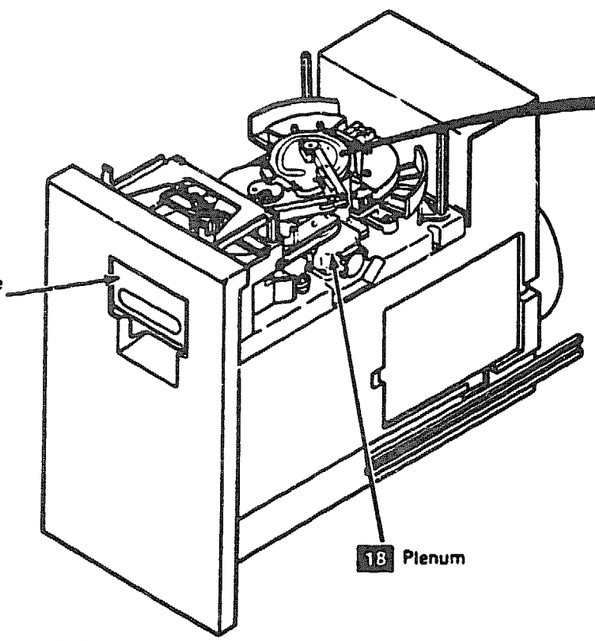
10 Tape Path Sensor B

11

Top View



12



19 Cartridge Latch

18 Plenum

TA90 MG EC C04824

FRU002 Cartridge Latch Solenoid Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cartridge latch solenoid 4 (TU-D01-DK-Tray Solenoid) from the cartridge latch assembly.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Cartridge Latch Solenoid

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive.

2 Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).

The latch solenoid is found at the left side of the cartridge latch assembly. It is not necessary to remove the drive drawer cover to change the solenoid.

3 Remove the screw from the cable clamp 2, remove the wires from the clamp and set the clamp and screw to the side.

4 Disconnect the latch solenoid cable connector 1.

5 Loosen the solenoid nut 3, then remove the cartridge latch solenoid 4 and the lockwasher from the mounting bracket.

6. Move the solenoid plunger forward and remove the solenoid plunger from the release link 5. Be careful that the solenoid nut does not fall into the drive.

7. Remove the solenoid nut from the plunger.

Replacing the Cartridge Latch Solenoid

1. Place the solenoid nut 3 in position on the bracket.

2. Slide the solenoid plunger through the bracket and nut and onto the release link 5. The slot in the spring pin should be facing down.

3. Slide the cartridge latch solenoid 4 and lockwasher onto the latch assembly rod.

4. Attach the solenoid to the bracket using the solenoid nut 3. Tighten the solenoid nut.

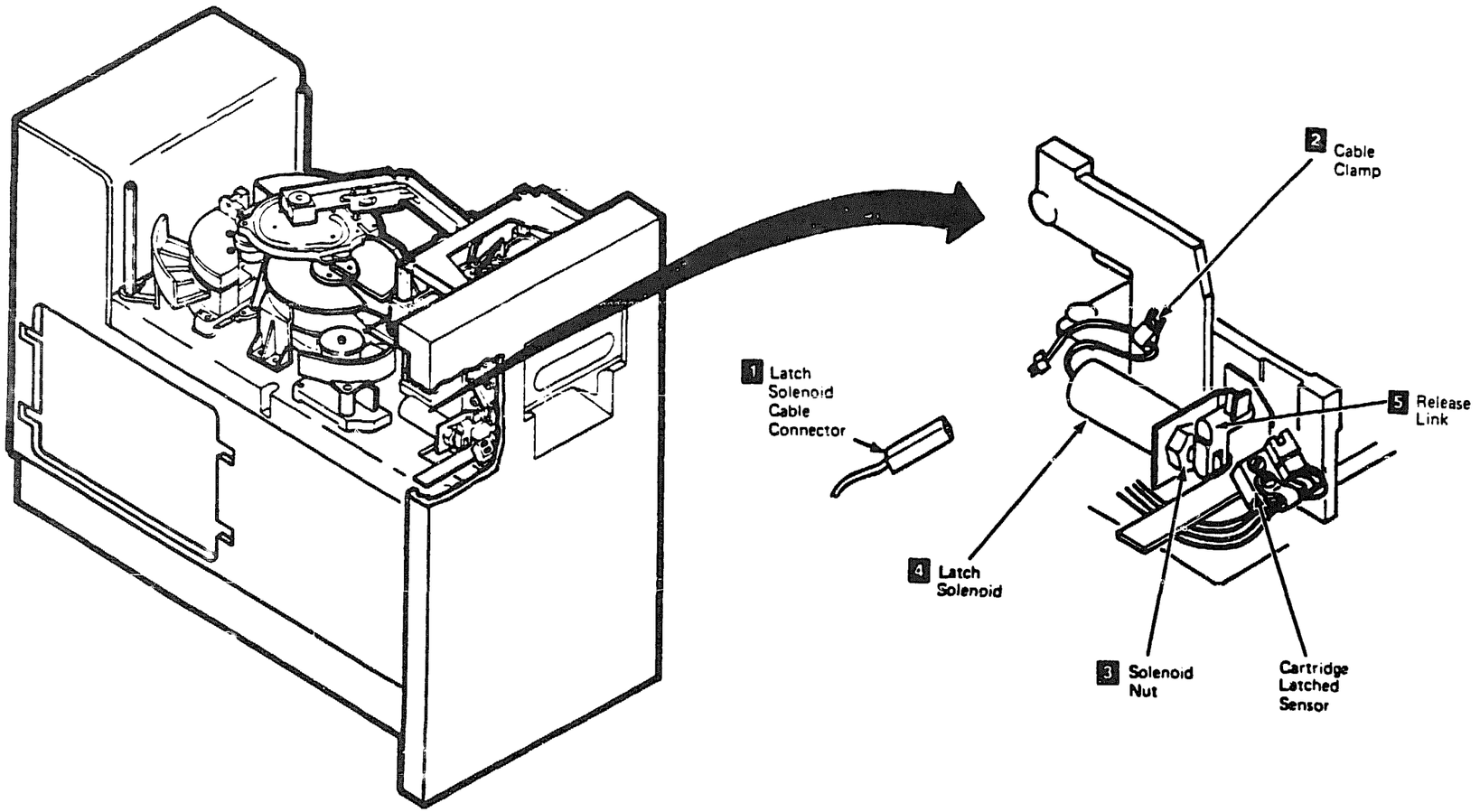
5. Insert the cable into the cable clamp 2.

6 Place the cable clamp and retaining screw in position and tighten the screw.

7. Connect the cartridge latch solenoid cable connector 1.

8 Install the drive drawer safety cover (see CARR-DR 2-5) and ***close the drive drawer***.

9 Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU003 File Reel Motor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the file reel motor 1 (TU-File Reel Motor). The motor will be removed through the front of the drive drawer.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the File Reel Motor

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. On drives with automatic cartridge loaders go to CARR-DR 2850 and perform the load mechanical assembly Removal procedure, then go to CARR-DR 2820 and perform the load assembly Removal procedure. When complete return to this page, step 10.
4. On drives without the automatic cartridge loader, remove drive drawer cover (see CARR-DR 2-1).
5. Open the cartridge latch, push up on the plunger 6 and remove the "C" clip retainer 8 from the plunger shaft.
6. Slowly lower the plunger and remove it from the cartridge latch assembly 5.
7. Make sure you do not lose the plunger spring 7.
8. Close the cartridge latch to gain access to the three file reel motor screws 9.
9. Disconnect the black and white wires 4 from the file reel motor.

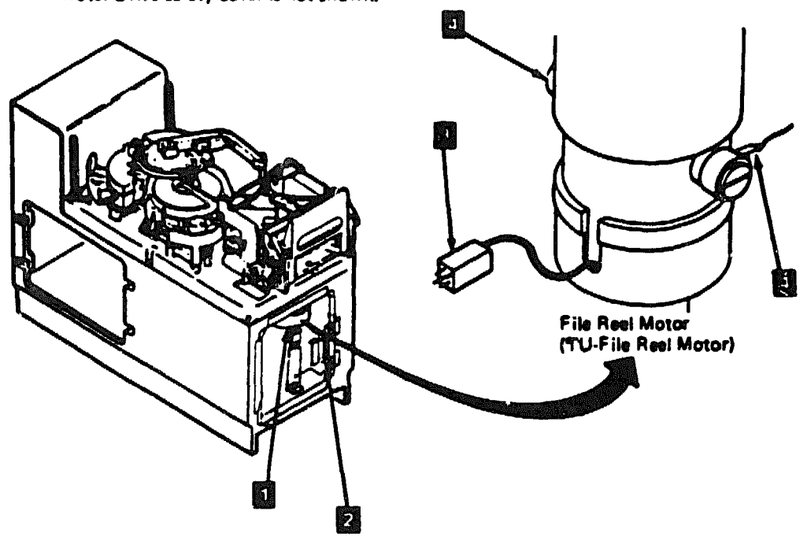
   Note: The white wire is removed from the terminal with the red marking. You cannot see the red mark until the motor is removed from the drive, therefore on replacement remember which terminal has the red mark.
10. Disconnect the tachometer sensor cable from the file reel motor at the connector 3.
11. Hold the file reel motor with one hand and at the same time loosen and remove the three file reel motor screws 9.
12. Remove the file reel motor by turning it counterclockwise approximately 1/4 of a turn and at the same time lowering and tilting the motor to remove it through the front of the drawer 2.

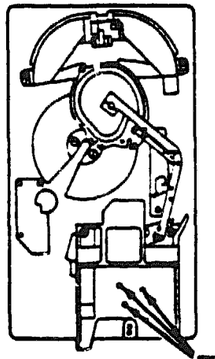
Replacing the File Reel Motor

1. On drives without the automatic cartridge loaders verify that the cartridge latch is closed. If the latch is open, the mounting screw holes will not be visible.
2. Pass the file reel motor through the opening in the front of the drive drawer 2.
3. Hold the file reel motor 1 against the baseplate and at the same time turn the file reel motor clockwise until the motor mounting holes are aligned with those in the baseplate.
4. Install the three mounting screws 9.
5. Reconnect the tachometer sensor cable to the file reel motor at the connector 3.
6. Reconnect the white and black wires 4 to the file reel motor. The white wire is installed on the terminal with the red marking.

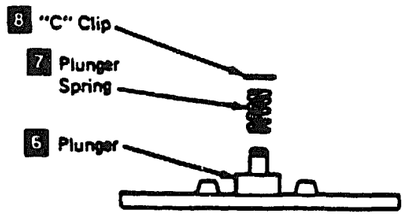
   Note: The ***white*** goes to the terminal marked with the red dot. If there is a white shrink wrap on one of the two wires, that is the ***white*** wire; otherwise the white colored wire is the ***white*** wire.
7. On drives with the automatic cartridge loaders go to CARR-DR 2820 and perform the load assembly Replacement procedure. When complete go to CARR-DR 2850 and perform the load mechanical assembly Replacement procedure. Go to step 12.
8. On drives without the automatic cartridge loaders install the plunger spring 7 on the plunger.
9. Open the cartridge latch and insert the plunger 6 into the cartridge latch assembly 5.
10. Push up on the plunger to extend the shaft above the latch tray and install the "C" clip retainer 8.
11. Install the drive drawer cover (see CARR-DR 2-2).
12. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
13. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

Note: Drive safety cover is not shown.

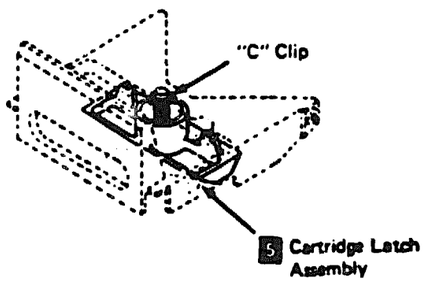




Overhead View



9 File Reel Motor Mounting Screws



FRU004 Machine Reel Motor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel motor 5 (TU-Machine Reel Motor). The threader assembly needs to be removed to permit the machine reel motor to be removed.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Machine Reel Motor

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. Close the cartridge latch 24. On drives with the automatic cartridge loaders turn the knurled knob 21, on the load assembly motor, clockwise until it stops. This releases the threader pin 19 from the interlock.
5. Turn the threader arm 1 until it is in the 12 o'clock position 13. This moves the arm out of the way and prevents the arm from being broken.
6. Disconnect the two threader motor wires 3.

   Note: Label the wires to aid in their replacement. Later production drives have a red dot marking the terminal for connecting the white wire.

7. Tape path sensor B 2 is located on the threader assembly. Loosen the two screws holding the sensor in position, then slide the cable and sensor away from the threader assembly, toward the front of the drive.
8. Remove the cable connector from the sensor and set the sensor to the side. Push the cable back through the sensor B mounting bracket.
9. Since tension transducer hose 10 and the left bearing guide hose pass through the threader, they must be removed. Remove the hoses from the tension transducer and the left bearing guide. Push the hoses through the threader assembly and disconnect their other ends from the plenum 23.
10. Remove the machine reel tape guide 11 by removing the two mounting screws, then release the center tape guide pin from the center tape guide 9 by pulling it straight up. Slide the machine reel tape guide out of the drive and set it to the side.
11. The tape lifter solenoid 12 is located on the threader assembly near the read/write head. Disconnect the two hoses from the solenoid and move them out of the way. Remove the single screw holding the solenoid to the threader and move the solenoid out of the way.
12. The threader is fastened to the baseplate with three screws 4, all are partially out of view and must be accessed at an angle. Ensure that the screwdriver does not slip and cause personal injury or damage the screw. The first screw to remove is near the plenum. It will be easier to remove the screw if you first remove the hoses that cover it. Remove the hoses from the plenum and move them out of the way; then remove the screw. The other two screws can be seen by turning the machine reel. Turn the reel and remove the two screws. Do not remove the threader assembly at this time, it is necessary to remove the machine reel first.
13. Next, remove the machine reel lower flange so the threader can be removed. The machine reel area is between the cartridge latch assembly and the threader assembly.
14. The machine reel lower flange is held on by the machine reel hub, and upper flange which, in turn, is held by two screws. Remove the two screws 7. The machine reel hub and the machine reel flange can be easily damaged; do not use any tools to remove the hub. Use your thumbs and use pressure as shown. At the same time lift the hub off the hub mount.
15. To remove the machine reel lower flange, the threader assembly must be lifted off the baseplate approximately one inch. Lift the threader and remove the flange.
16. Lift the threader assembly off the baseplate and set it to the side.
17. Remove the tension transducer tape guide 9 (see CARR-DR 2300), or the tension transducer (see CARR-DR 140).
18. Remove the center tape guide 8. It is also fastened to the baseplate with one screw.

CAUTION:
The machine reel motor may be hot.

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19. There are three screws holding the machine reel mounting bracket to the baseplate. Remove these three screws.
20. The tach sensors 6 should be removed next. There are two screws holding each sensor. Remove the screws holding the sensors.
21. Lift the sensors off the machine reel mounting bracket and disconnect the cable connectors from the sensors. If the cables are not labeled, mark them at this time.
22. Lift the machine reel motor off the baseplate far enough to push the sensor cables through the bracket. After the cables are free of the bracket, lay them on the baseplate.
23. Lift the machine reel motor off the baseplate far enough to remove the two motor wires. The machine reel motor can now be removed from the drive.

Replacing the Machine Reel Motor

1. Move the machine reel motor 5 into position, but do not lower it to the baseplate at this time.
2. Find the black and white wires that attach to the machine reel motor. Lift and attach them to the terminals on the machine reel motor.

   Note: The ***white*** wire goes to the terminal marked with the red dot. If there is white shrink wrap on one of the two wires, that is the ***white*** wire, otherwise the white colored wire is the ***white*** wire.

3. Before lowering the motor to the baseplate, push the tach sensor cables up through the openings in the machine reel motor mounting bracket.
4. Lower the machine reel motor to the baseplate and install the three mounting screws.
5. Connect the tach sensors to the cable connectors and lower the sensors to the machine reel motor mounting bracket 6.

   Note: Ensure that the polarity markings on the cable connector and the sensor match.

6. Install the four screws to hold the two sensors but do not tighten them at this time. They need to be adjusted to permit the machine reel to turn.
7. Temporarily install the machine reel lower flange 14 on the machine reel mounting hub. Do not install the machine reel hub or upper flange or the two screws at this time.
8. Adjust tach sensors A and B so the machine reel lower flange will turn and not touch the sensor 15 as it turns. Tighten the sensor mounting screws when you have the sensors adjusted correctly.
9. Remove the machine reel lower flange from the mounting hub.
10. Install the tension transducer tape guide or tension transducer 9.
11. Install the center tape guide 8. It is fastened with one screw.
12. Temporarily place the threader assembly 22 on the baseplate. Do not attach the screws at this time.
13. Place the machine reel lower flange 14, the machine reel hub 16, and upper flange on the mounting hub and install, but do not tighten, the two screws 18. Be careful not to scratch the hub or reel.

Inspect the alignment of the hub opening to the flange opening 17 and if necessary, adjust the flange so that the hub opening is centered over the flange opening 17. Tighten the two screws 18 on the machine reel upper flange.

Warning: The installation of the machine reel tape guide (FRU227) and the tape center guide (FRU231) is sequence sensitive and they must be installed in the correct order for correct adjustment.

14. Go to CARR-DR 2270 and do the procedure for installing the machine reel tape guide 11 and mounting screws, return here when finished.
15. Install the three threader mounting screws 4, turning the machine reel as needed to get access to the screws.
16. Place the tape lifter solenoid 12 on the threader assembly (with the 'out' port of the solenoid toward the rear of the drive) and install the mounting screw. (If the threader assembly has two holes, use the one on the left side.) Reconnect the two hoses removed in step 11.
17. Connect the tension transducer hose 10 to the tension transducer 9 and the left bearing guide hose to the left bearing guide. Pass the other end of the hoses through the threader assembly toward the plenum, then connect the hoses to the plenum 23.
18. If any hoses were removed to get access to the threader mounting screw, move them back and reconnect them to the plenum.
19. Install tape path sensor B 2 to the threader assembly 22.

    Note: Ensure that the polarity markings on the cable connector and the sensor match.

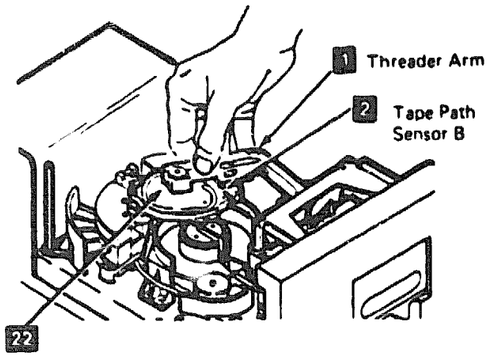
    Push the cable through the threader assembly sensor B mounting bracket toward the front of the drive. Plug the sensor onto the connector and slide the sensor and cable connector into the sensor B mounting bracket. Align the edges of the sensor with the threader assembly, then tighten the screws to hold the sensor in place.

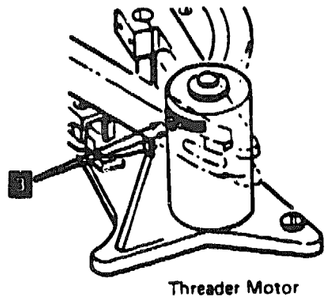
20. Connect the two wires to the threader motor 3. The white wire goes to the terminal labeled '1' and the black wire goes to the terminal labeled '2'.
21. Move the interlock and receiver 20 into the position shown.
22. Turn the threader arm clockwise to move the threader pin 19 into the receiver 20.

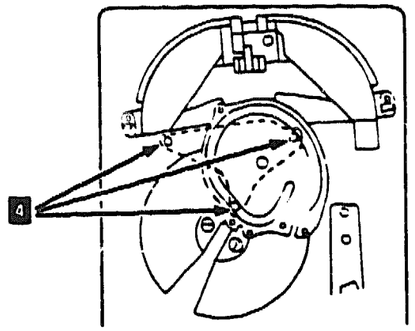
    On drives with the automatic cartridge loaders turn the knurled knob 21, on the load assembly motor, counterclockwise until it stops. This opens the cartridge latch and interlocks the threader pin 19.

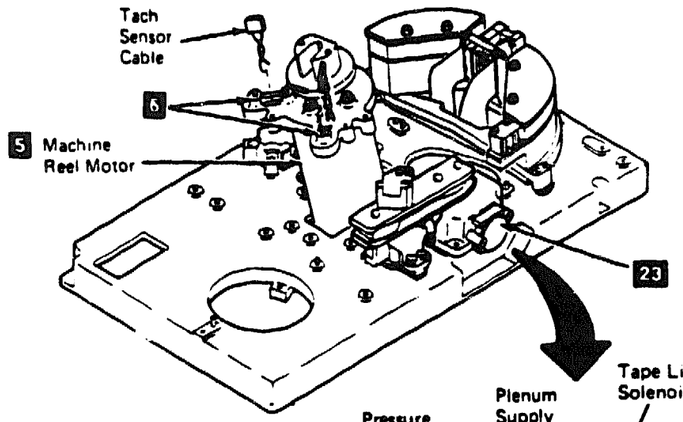
    On drives without the automatic cartridge loaders check by opening and closing the cartridge latch 24. The latch can be opened only if the threader pin has released the interlock and is in the correct location.

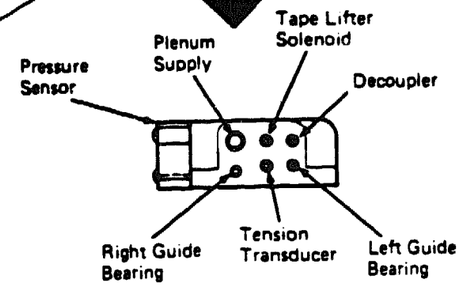
23. Remove the clamp from the plenum supply hose.
24. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
25. Go to CARR-DR 8 for the procedure to ***power on*** the drive.
26. Insert a scratch cartridge and observe the loading process. If any load failures occur, check the hoses and wiring.



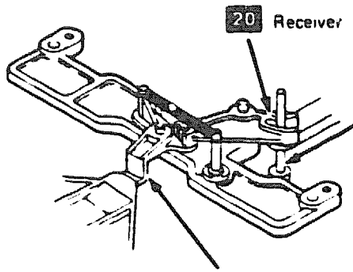


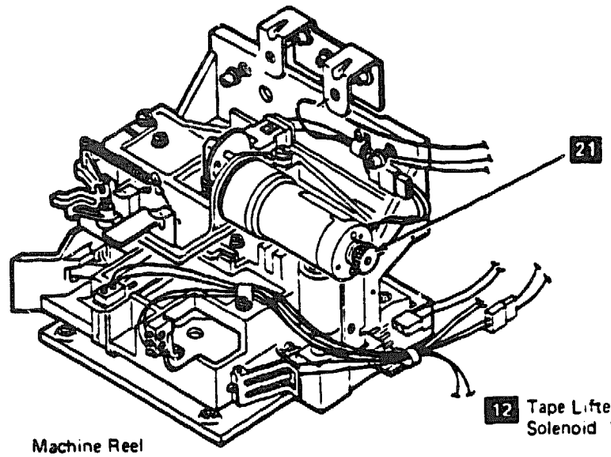


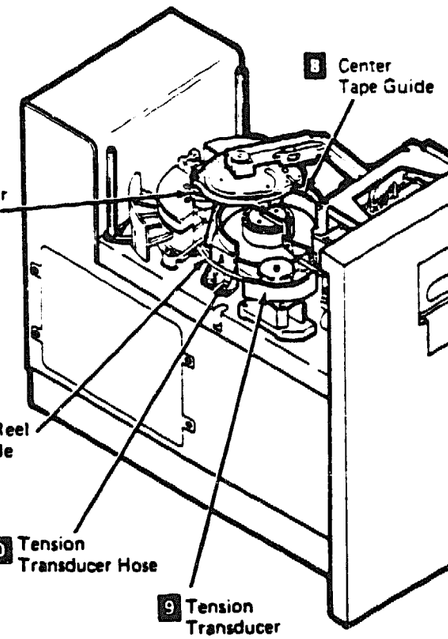


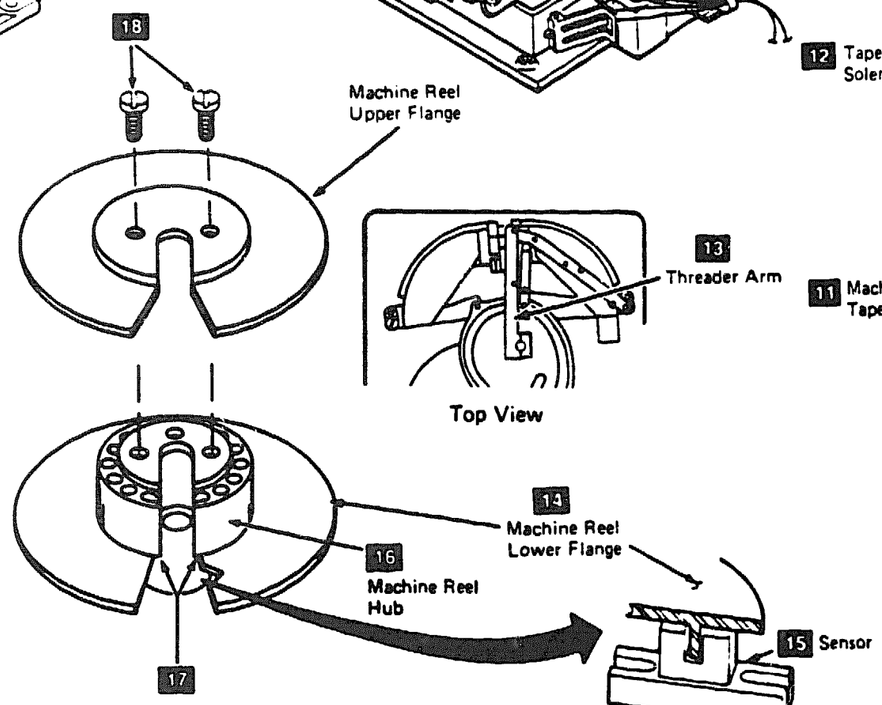


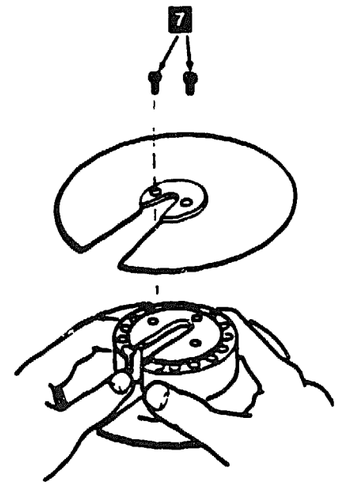
Hose Connections to the Plenum











Note: On some machines the Tension Transducer Tape Guide is part of the Tension Transducer, so the whole Tension Transducer FRU must be removed.

FRU005 Machine Reel Lower Flange Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel lower flange 10. To get the flange off the hub it is also necessary to loosen, but not remove, the threader assembly.

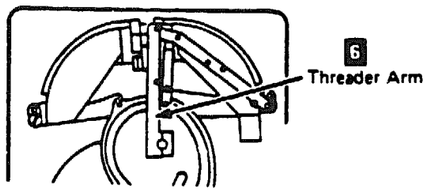
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

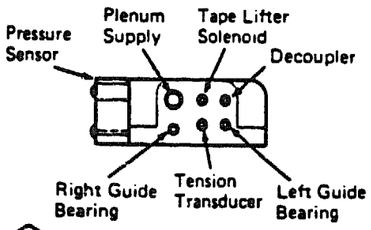
Removing the Machine Reel Flange

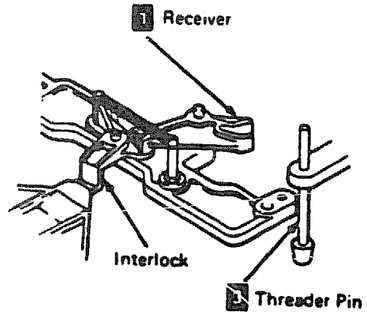
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. On drives without the automatic cartridge loaders close the cartridge latch 13.

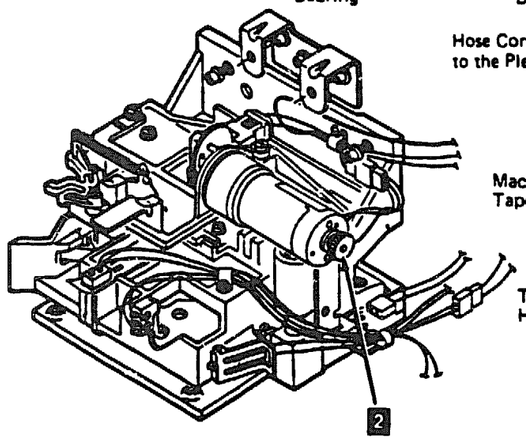
   On drives with the automatic cartridge loaders turn the knurled knob 2 clockwise until it stops. This releases the threader pin from the interlock.
5. Turn the threader arm 6 until it is in the position shown (the 12 o clock position). This moves the arm out of the way and may prevent the arm from being broken.
6. Disconnect the tension transducer hose 5 from the tension transducer. The tension transducer hose goes through the threader assembly and the threader assembly will be moved in a later step.
7. Remove the two machine reel tape guide mounting screws, then release the center tape guide pin from the center tape guide by pulling it straight up. Slide the machine reel tape guide 4 out of the drive and set it to the side.
8. The threader is fastened to the baseplate with three screws 11. All three screws are partially out of view and must be accessed at an angle. Ensure that the screwdriver does not slip and cause personal injury or damage the screw. The first screw to be removed is near the plenum 12. It will be easier to remove the screw if you first remove the hoses that cover it. Remove the hoses from the plenum and move them out of the way. Remove the screw and set it to the side.

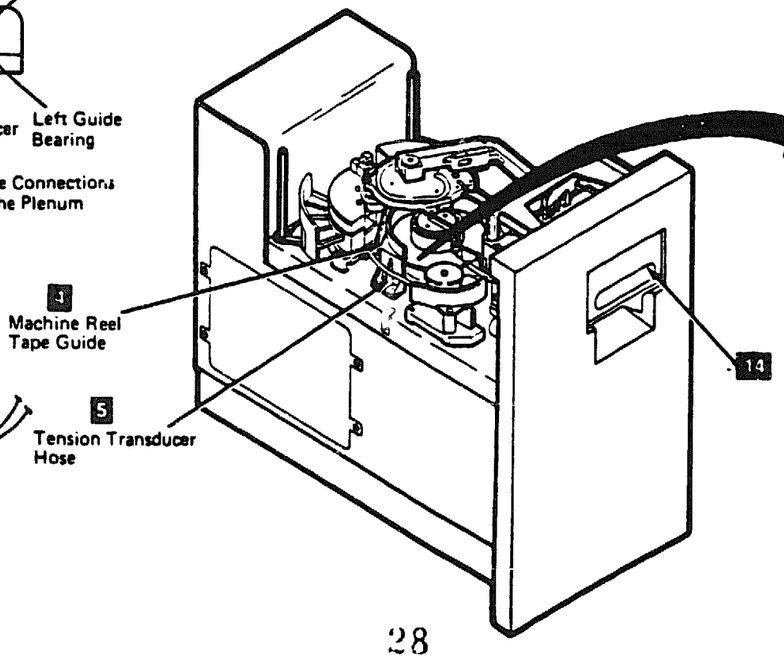
   The other two screws can be seen by turning the machine reel. Turn the reel and remove the two screws.
9. To remove the machine reel lower flange, the threader assembly must be lifted off the baseplate approximately one inch. Lift the threader and remove the machine reel.
10. The machine reel lower flange 10 is held by the machine reel hub 9 and upper flange 8, which is held by two screws 7. Remove the two screws and set them aside. The machine reel hub 9 and the machine reel can be easily damaged; do not use any tools to remove the hub. Use your thumbs and use pressure as shown and at the same time lift the hub off the hub mount.











Replacing the Machine Reel Flange

1. Lift the threader assembly off the baseplate far enough to permit the machine reel flange to be placed on the mounting hub.
2. Place the machine reel lower flange 10, machine reel hub 9 and machine reel upper flange 8 on the mounting hub and install, but do not tighten, the two screws 7. Be careful not to scratch the hub or reel.

Inspect the alignment of the hub opening to the flange opening 13 and if necessary, adjust the flange so that the hub opening is centered over the flange opening 13. Tighten the two screws 7 on the machine reel upper flange 8.

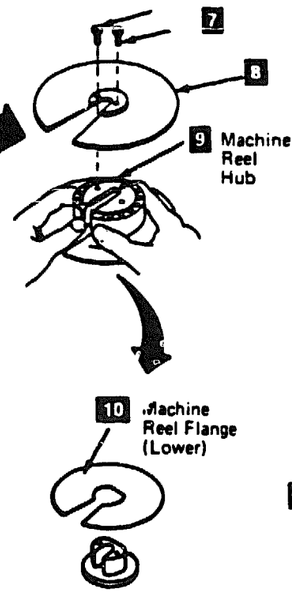
Warning: The installation of the machine reel tape guide (FRU227) and the tape center guide (FRU 231) is sequence sensitive; they must be installed in the correct order for correct adjustment.

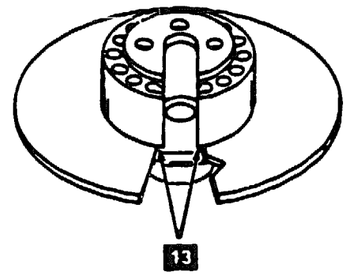
3. Go to CARR-DR 2270 and do the procedure for installing the machine reel tape guide 4 and mounting screws, return here when finished.
4. Install the three threader mounting screws 11, turning the machine reel as needed to get to the screws.
5. Connect the tension transducer hose 5 to the tension transducer bracket.
6. If any hoses were removed to get access to the threader mounting screw, move them back to their original places and connect them to the plenum 12.
7. On drives without the automatic cartridge loaders move the interlock and receiver 1 into the position shown.

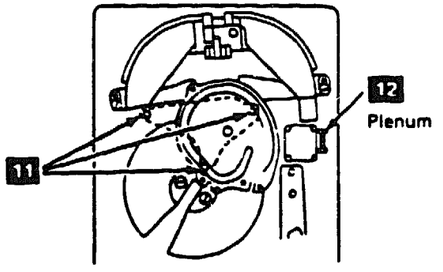
   On drives with the automatic cartridge loaders make sure that the load assembly is at the lowest point by turning the knurled knob 2 clockwise until the knob stops turning freely. This permits the threader arm to engage the interlock and receiver.
8. Turn the threader arm clockwise to move the threader pin 3 into the receiver 1.

   On drives with the automatic cartridge loaders turn the knurled knob 2 counterclockwise until the knob stops turning freely. This opens the cartridge latch and interlocks the threader pin 3.

   On drives without the automatic cartridge loaders check by opening and closing the cartridge latch 13. The latch can be opened only if the threader pin has released the interlock and is in the correct location.
9. Remove the clamp from the plenum supply hose.
10. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
11. Go to CARR-DR 8 for the procedure to ***power on*** the drive.
12. Insert a scratch cartridge and observe the loading process. If any load failures occur, check the hoses and wiring.







FRU006 Tape Path Sensor A Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape path sensor A 2 (TU-DK-Tape Path Sensor A)

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing Tape Path Sensor A

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

2 Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5)

3 On drives without the automatic cartridge loaders close the cartridge latch 9.

On drives with the automatic cartridge loaders turn the knurled knob 1, on the load assembly motor, clockwise until it stops. This releases the threader pin 4 from the receiver 3

4 Turn the threader arm 6 until it is in the position shown (the 12 o clock position). This moves the arm out of the way and may prevent the arm from being broken.

Tape path sensor A 2 is located on the decoupler 8

5 Loosen the two mounting screws and slide the sensor out of the mounting bracket 7

6 Disconnect the sensor from the cable connector 5.

Replacing Tape Path Sensor A

1 Tape path sensor A 2 is located on the decoupler 8. Find the cable and plug the sensor into the cable connector 5 Ensure the polarity markings match

2 Slide the sensor into the mounting bracket 7

3. Align the sensor with the edge of the mounting bracket 8 and tighten the screws.

4 On drives without the automatic cartridge loaders ensure that the cartridge latch is closed

On drives with the automatic cartridge loaders turn the knurled knob 1, on the load assembly motor, clockwise until it stops.

5 Move the interlock and receiver 3 into the position shown.

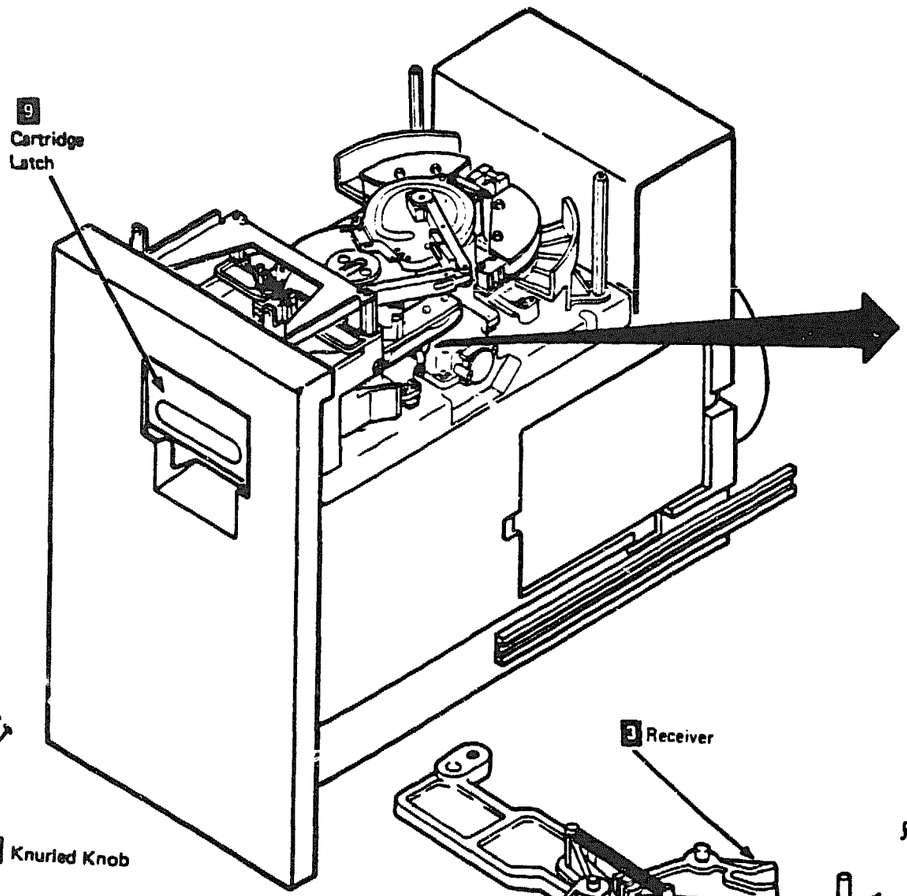
6 Turn the threader arm 6 clockwise to move the threader pin 4 into the receiver 3.

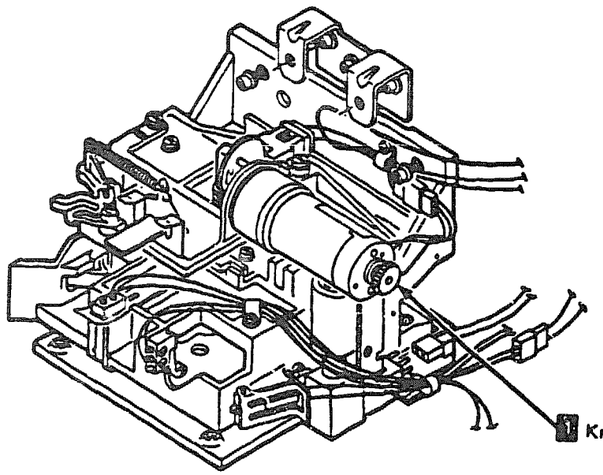
On drives with the automatic cartridge loaders turn the knurled knob 1, on the load assembly motor, counterclockwise until the knob stops. This opens the cartridge latch and interlocks the threader pin 4.

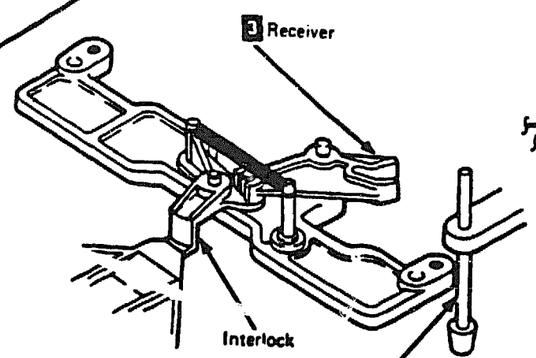
On drives without the automatic cartridge loaders check by opening and closing the cartridge latch 9. The latch can be opened only if the threader pin has released the interlock and is in the correct location

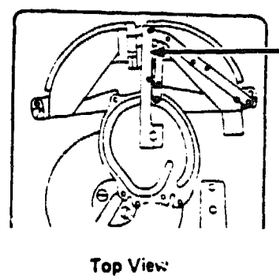
7 Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.

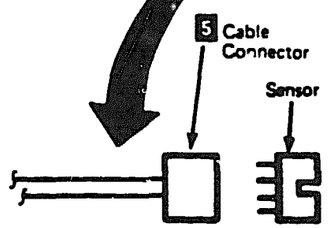
8. Go to CARR-DR 8 for the procedure to ***power on*** the drive

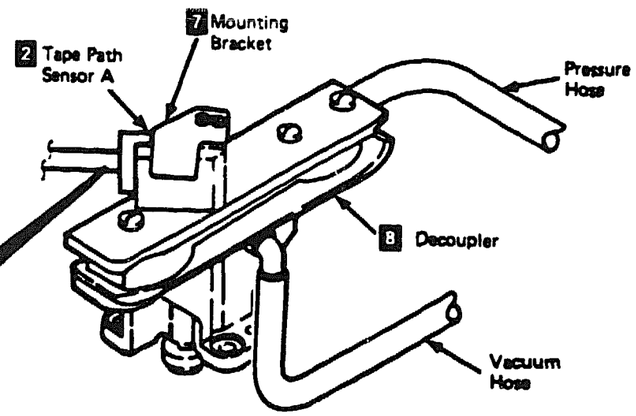












FRU007 Tape Path Sensor B Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape path sensor B 4 (TU-DK-Tape Path Sensor B)

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing Tape Path Sensor B

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive.

2 Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).

3 On drives without the automatic cartridge loaders close the cartridge latch 8.

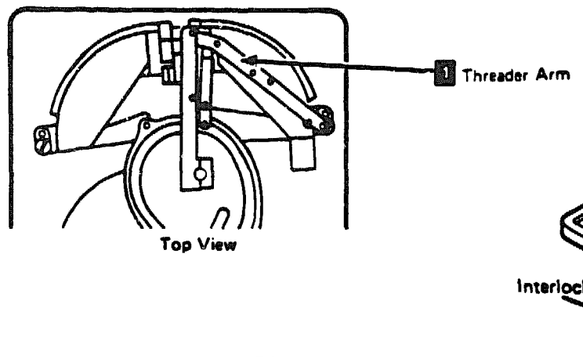
On drives with the automatic cartridge loaders turn the knurled knob 7, on the load assembly motor, clockwise until it stops. This releases the threader pin 6 from the receiver 5.

4 Turn the threader arm 1 to the position shown (the 12 o'clock position). This moves the arm out of the way and may prevent the arm from getting broken.

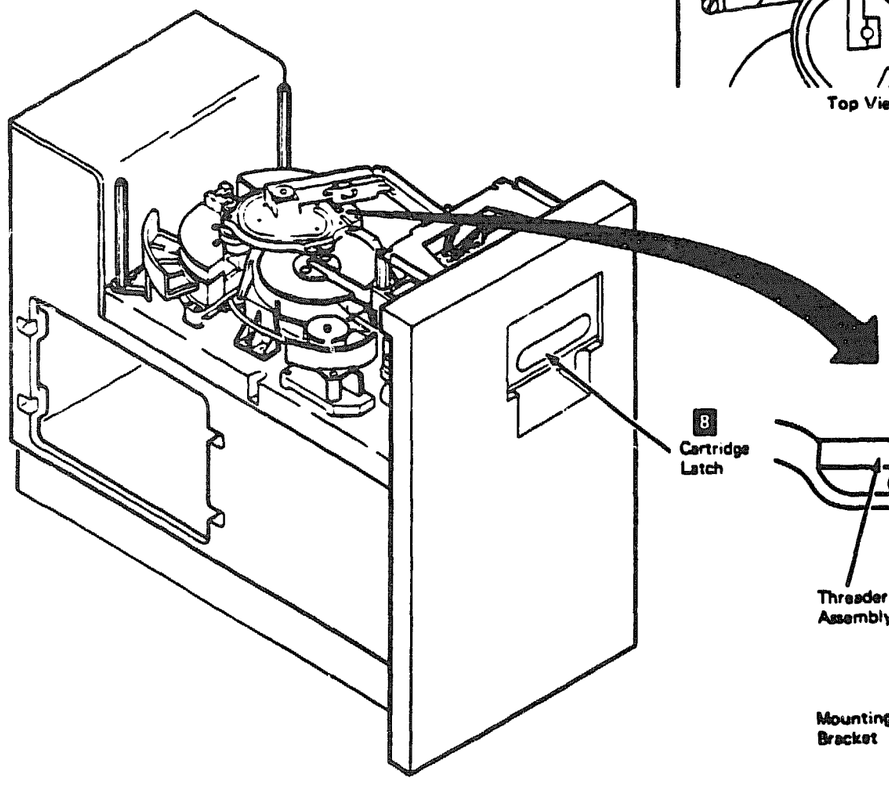
5 Loosen the two sensor bracket mounting screws 2.

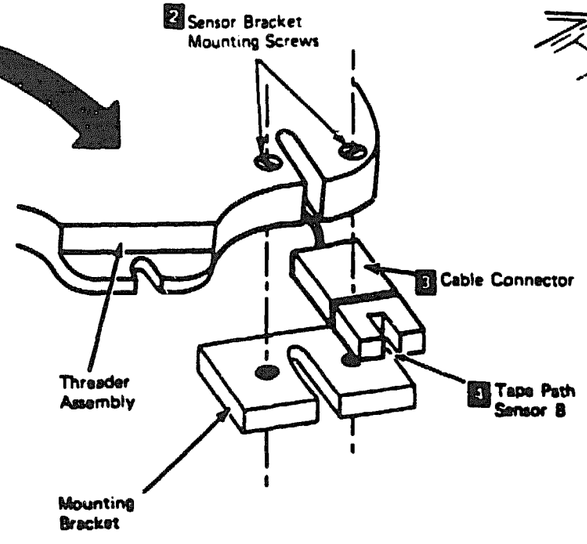
6 Push the sensor and cable through the bracket and away from the threader assembly.

7 Disconnect tape path sensor B 4 from the cable connector 3.



Top View



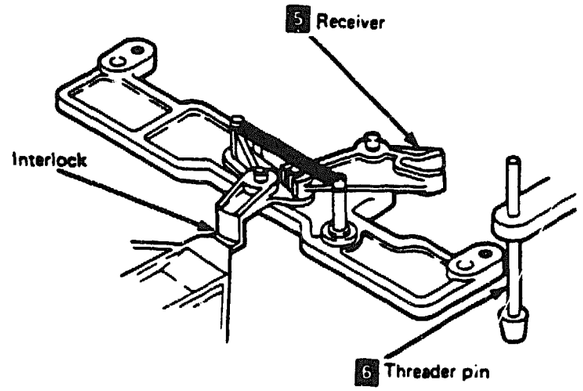


Replacing Tape Path Sensor B

1 Connect the tape path sensor B 4 the cable connector 3. Ensure that the polarity markings match.

2 Push the sensor and cable back into the mounting bracket on the threader assembly.

3 Align the edge of the sensor with the edge of the threader assembly and tighten the two mounting screws 2.



4 On drives without the automatic cartridge loaders move the interlock and receiver 5 into the position shown.

On drives with the automatic cartridge loaders ensure that the load assembly is at its lowest point by turning the knurled knob clockwise until it stops turning freely. This permits the threader arm to engage the interlock and receiver.

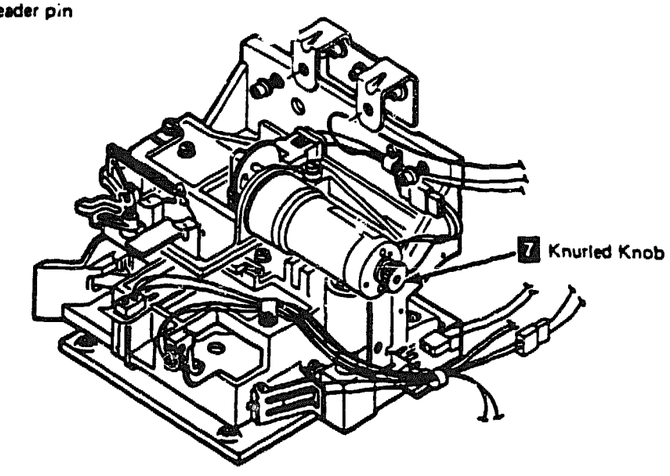
5 Turn the threader arm 1 clockwise to move the threader pin 6 into the receiver 5.

On drives with the automatic cartridge loaders turn the knurled knob 7, on the load assembly motor, counterclockwise until the it stops. This opens the cartridge latch and interlocks the threader pin 6.

On drives without the automatic cartridge loaders check by opening and closing the cartridge latch 8. The latch can be opened only if the threader pin has released the interlock and is in the correct location.

6. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.

7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU008 Cartridge Latch Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cartridge latch assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

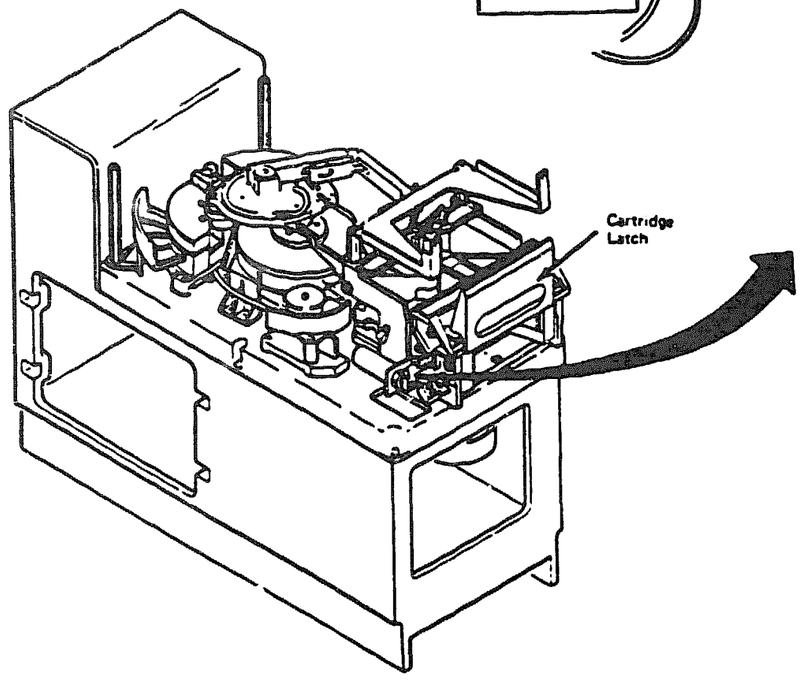
Removing the Cartridge Latch Assembly

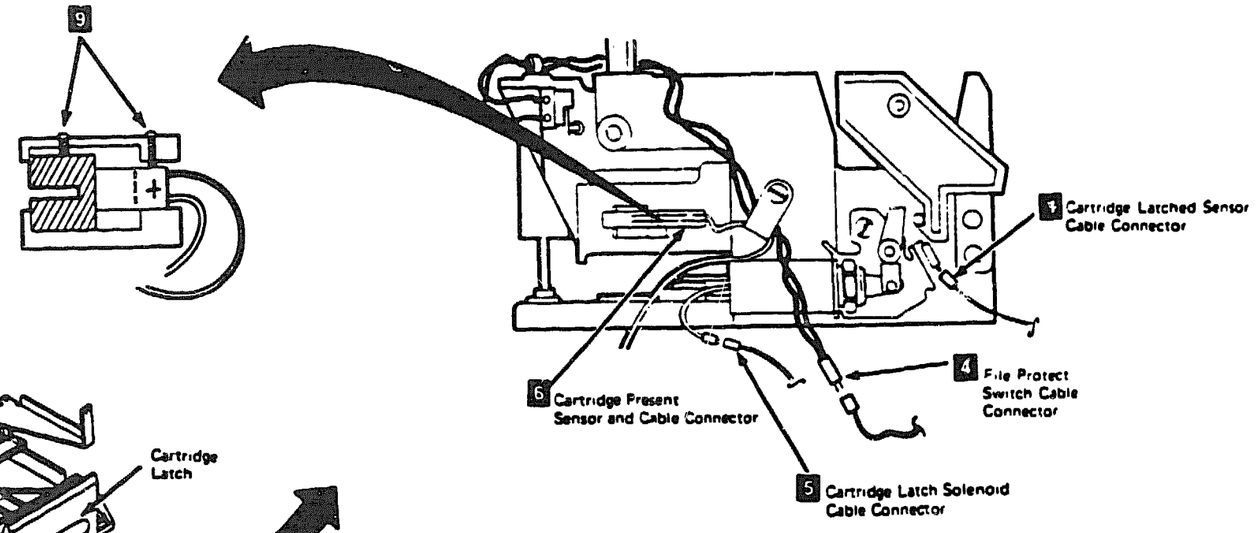
1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)
3. Disconnect the file protect switch cable connector 4.
4. Loosen the two set screws 9 holding the cartridge present sensor and cable connector 6. Remove the sensor and connector assembly from the cartridge latch assembly
5. Disconnect the cartridge latched sensor cable connector 1 by removing the screw and cable clamp.
6. Disconnect the cartridge latch solenoid cable connector 5.
7. Close the cartridge latch.
8. Turn the threader arm counter clockwise to move the threader arm 2 to the position shown (the 12 o'clock position). This moves the arm out of the way and may prevent the arm from being broken.
9. Remove the three cartridge latch assembly mounting screws 3 and lift the latch assembly off the baseplate.

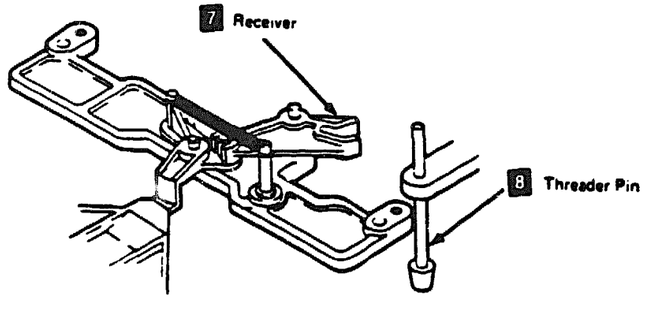
Replacing the Cartridge Latch Assembly

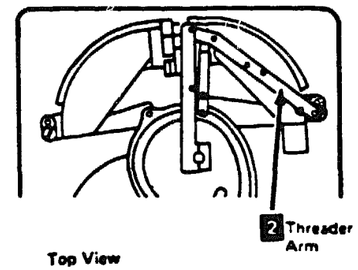
1. Place the cartridge latch assembly in position on the baseplate.
2. Install the three mounting screws 3 to mount the cartridge latch assembly to the baseplate
3. Connect the cartridge latch solenoid cable connector (J5) 5 by replacing the screw and cable clamp
4. Replace the cartridge present sensor and cable 6 into the cartridge latch assembly. ***The '+' label on the connector must be visible.*** Tighten the two set screws 9 to hold the sensor and cable connector 6 in position.
5. Connect the cartridge latched sensor cable connector 1. ***The '+' label on the connector must be visible.***
6. Replace the cartridge latched sensor cable clamp
7. Connect the file protect switch cable connector (J3) 4.
8. Move the interlock and receiver 7 into the position shown
9. Turn the threader arm 2 clockwise to move the threader pin 8 into the receiver 7.

   Check by opening and closing the cartridge latch. The latch can be opened only if the threader pin has released the interlock and is in the correct location
10. Replace the drive drawer safety cover (see CARR-DR 2-3) and close the drive drawer
11. Go to CARR-DR 8 for the procedure to *power on* the drive.

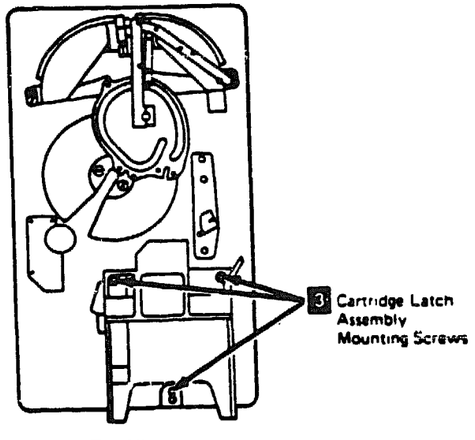








Top View



Top View

FRU009 File Protect Switch Removal and Replacement Procedure

This page contains the steps needed to remove and replace the file protect switch.

It may be difficult to install the early style file protect switch on the cartridge latch assembly with the assembly attached to the base plate. For removal of the cartridge latch assembly, see FRU008 Cartridge Latch Assembly Removal and Replacement procedure found on CARR-DR 80.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the File Protect Switch

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Disconnect the file protect switch cable connector J3 [3].
4. Remove the cable clamps holding the file protect switch cable.
5. Before removing the file protect switch, check the illustration [4] to determine if your drive has the old or new style file protect switch mounting.

   Note: The file protect switch [7] is installed on the cartridge latch assembly with two screws [9], four lockwashers [6] (two are used as spacers between the switch and the latch assembly), and a mounting plate [5].

   Loosen the two mounting screws [9] and remove the file protect switch [7] and the mounting hardware from the drive.

Replacing the File Protect Switch

1. Ensure that the new switch is good by checking it with an ohmmeter before replacing.
2. Before installing the file protect switch, check the illustration [4] to determine if your drive has the old or new style file protect switch mounting.

   Assemble the parts as shown in the illustration [4]. There are four lockwashers [6], two screws [9], a mounting plate [5], and the file protect switch [7]. Use a lockwasher under the head of each screw and another on each screw between the file protect switch and the cartridge latch assembly. The lockwasher is used as a spacer to permit the file protect switch to operator freely.

   Loosely fasten the file protect switch [7] and the mounting hardware to the cartridge latch assembly.

3. Install the cable clamps holding the file protect cable.
4. This procedure contains the steps needed to replace and adjust the file protect switch using the File Protect Gauge (part 29-27470-01).

   a. Attach a meter to the pins of the file protect cable [3] (to check continuity while adjusting the switch).

   b. On drives without automatic cartridge loaders, open the latch and insert the file protect gauge [2] so that the arrow closest to the words ***switch closed*** on the gauge points to the file protect switch. Close the latch.

      Ensure that the gauge is resting on the locating pins [1]. If there is play between the locating pins and the gauge, push the gauge toward the file protect switch.

      On drives with automatic cartridge loaders insert, the file protect gauge [2] so that the arrow closest to the words ***switch closed*** on the gauge points to the file protect switch.

      Turn the knurled knob [11] clockwise until the knob stops turning.

      Note: While turning the knurled knob, ensure that the cartridge present switch actuator arm [12] does not come in contact with the file protect gauge [2] while lowering the load assembly.

      It may be necessary to hold the actuator arm away from the gauge while turning the knurled knob.

      Ensure that the gauge is resting on the locating pins [1]. If there is play between the locating pins and the gauge, push the gauge toward the file protect switch.

   c. With the switch roller touching the gauge, slowly pivot the file protect switch back and forth to find the position where the switch closes (meter indicates continuity). While holding the switch at this position, tighten the bottom screw first and then the top screw.

   d. On drives without automatic cartridge loaders, open the latch. Remove the gauge and reinsert the gauge so that the arrow closest to the words ***switch open*** on the gauge points to the file protect switch. Ensure that the gauge is resting on the locating pins [1] as you close the latch.

      On drives with automatic loaders, turn the knurled knob [11] counterclockwise until the knob stops turning. Remove the gauge and reinsert the gauge so that the arrow closest to the words ***switch open*** on the gauge points to the file protect switch. Turn the knurled knob clockwise until the knob stops turning.

      Note: While turning the knurled knob, ensure that the cartridge present switch actuator arm [12] does not come in contact with the file protect gauge [2] while lowering the load assembly.

      It may be necessary to hold the actuator arm away from the gauge while turning the knurled knob.

      Ensure that the gauge is resting on the locating pins [1]. If there is play between the locating pins and the gauge, push the gauge toward the locating pins.

   e. Check the meter for continuity to determine if the switch is open or closed.

      If continuity is indicated, the switch is closed and the switch is not correctly adjusted. Return to step b of this procedure.

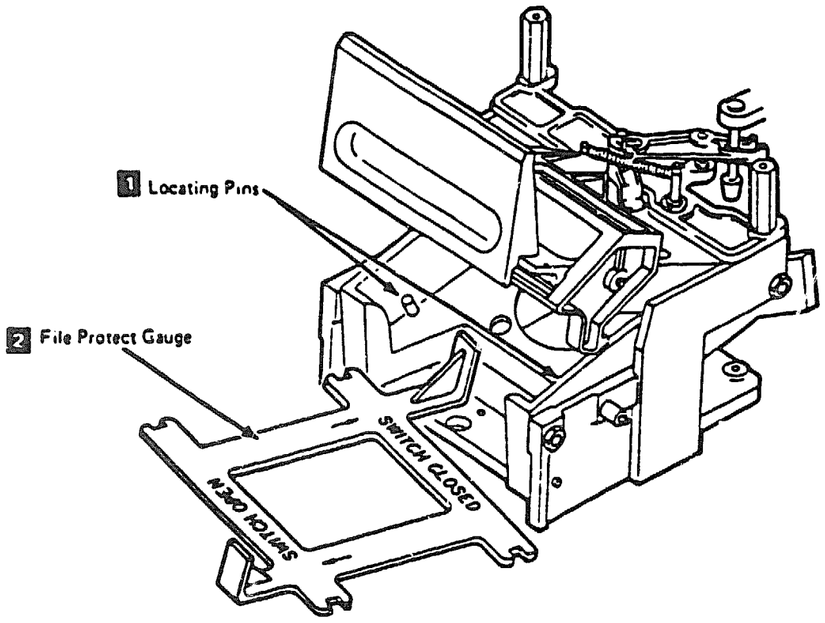
      If continuity is not indicated, the switch is open and the switch is correctly adjusted.

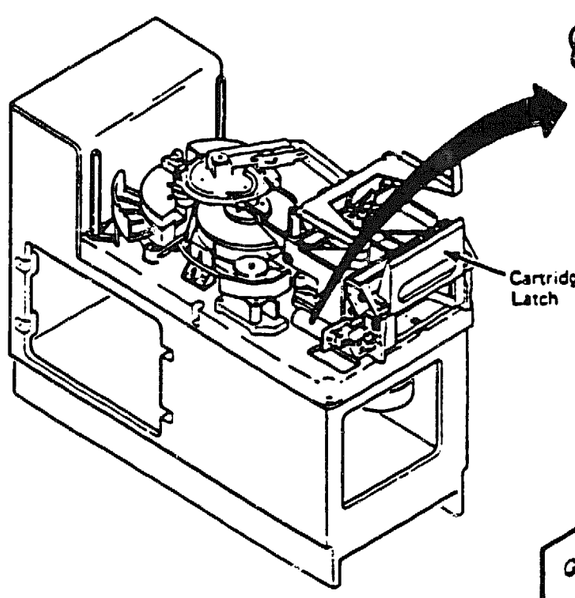
   f. On drives without automatic loaders, open the latch. Remove the file protect gauge.

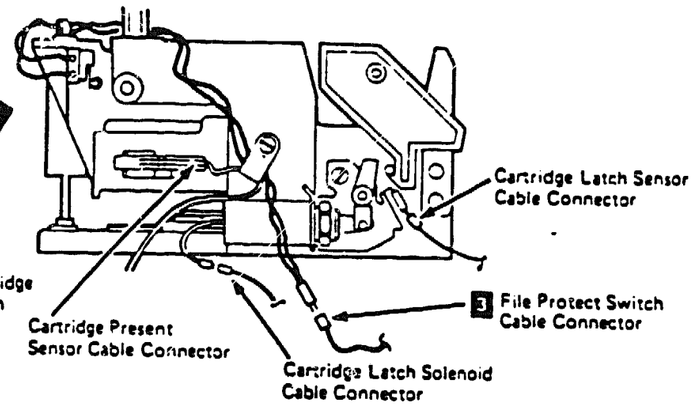
      On drives with automatic loaders turn the knurled knob [11] counterclockwise until the knob stops turning. Remove the gauge.

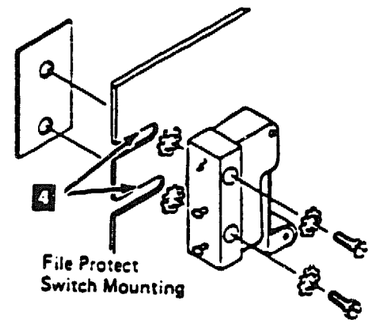
   g. Remove the meter from the file protect switch cable connector.

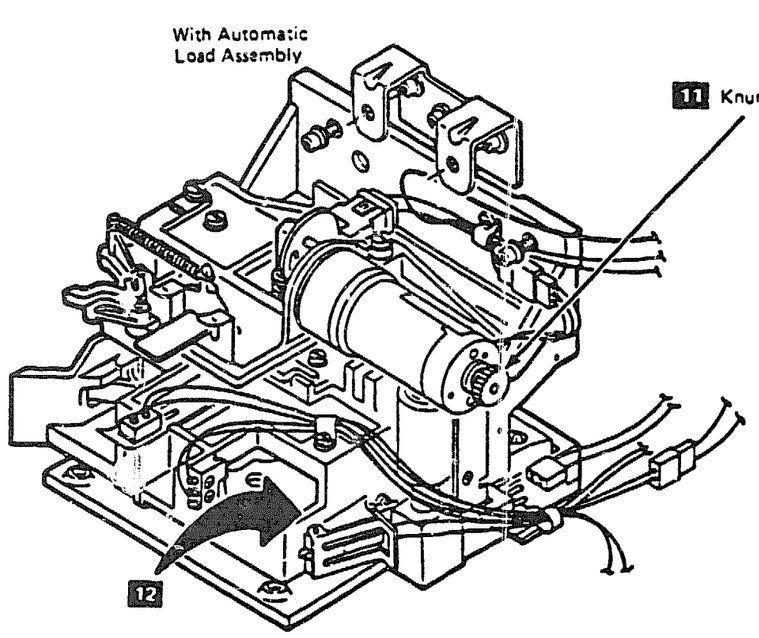
5. Connect the file protect switch cable connector J3 [3].
6. Install the drive drawer safety cover and close the drive drawer (see CARR-DR 2-5).
7. Go to CARR-DR 8 for the procedure to *power on* the drive.

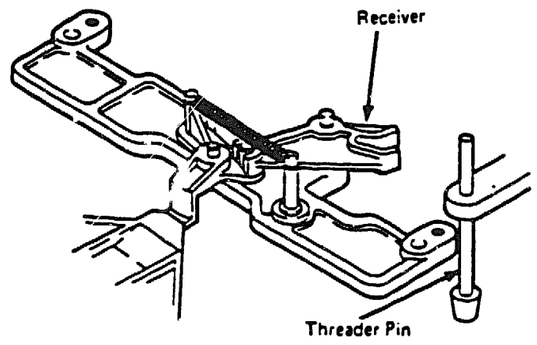

1 Locating Pins
2 File Protect Gauge
SWITCH CLOSED
SWITCH OPEN

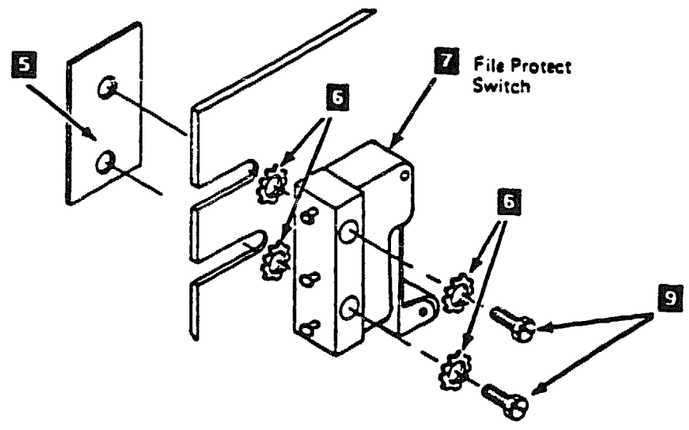

Cartridge Latch


Cartridge Latch Sensor Cable Connector
3 File Protect Switch Cable Connector
Cartridge Present Sensor Cable Connector
Cartridge Latch Solenoid Cable Connector


4
File Protect Switch Mounting


With Automatic Load Assembly
11 Knurled Knob
12


Receiver
Threader Pin


5
6
7 File Protect Switch
6
9

FRU010 Cartridge Present Sensor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cartridge present sensor 1 or 4 (TU-DK-Cartridge Present Sensor)

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Cartridge Present Sensor

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)
3. The cartridge present sensor is installed on the left side of the cartridge latch assembly, or on the left side of the load assembly (for machines with the automatic cartridge loader feature installed). If this drive has a loader installed, go to step 8.

   Note: If it is necessary to remove the tension transducer in the next step, be aware that the tension transducer FRU is an ESD-sensitive part. See CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."
4. Remove the tension transducer tape guide 7 mounting screw (or entire tension transducer if the tape guide is part of the tension transducer) and lift the tape guide off the baseplate
5. There are two small setscrews 5 holding the cartridge present sensor assembly. One holds the sensor, the other holds the connector. Close the cartridge latch 8

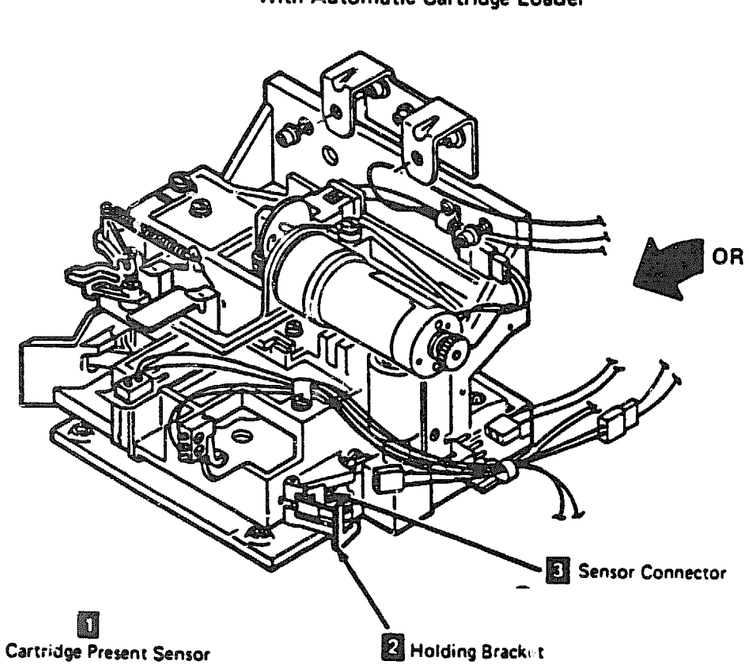
   Loosen the setscrews enough to remove the sensor and connector from the cartridge latch assembly.
6. Disconnect the cartridge present sensor cable connector 6.
7. Open the cartridge latch 8.

   End of the removal procedure for drives without the automatic cartridge loader.
8. Unlatch the sensor holding bracket 2 and remove the cartridge present sensor 1 and its cable connector 3.
9. Disconnect the cartridge present sensor cable connector 3.

Replacing the Cartridge Present Sensor

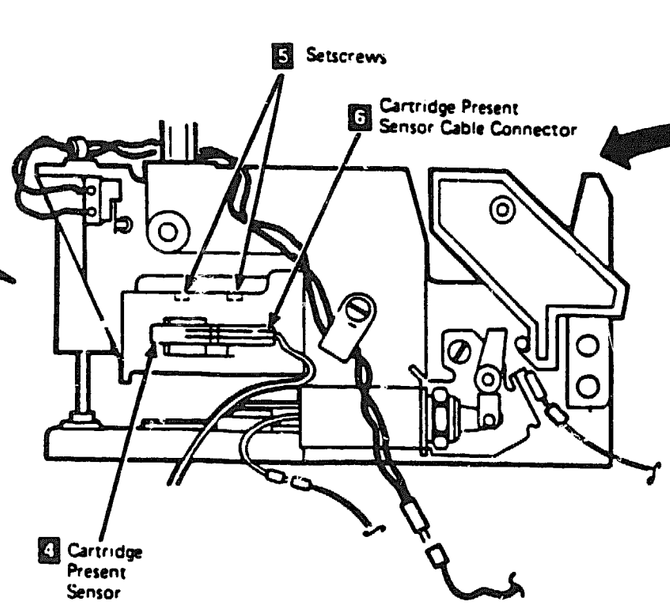
1. Reconnect the cartridge present sensor cable connector 3 or 6, observing the polarity markings.
2. If this drive has the automatic cartridge loader feature installed, go to step 6.
3. Insert the cartridge present sensor 4 and connector into the cartridge latch assembly. Close the cartridge latch 8 and tighten the setscrews 5.
4. Place the tension transducer tape guide 7 or tension transducer in position on the baseplate and install the mounting screw(s).
5. Go to step 8
6. Place the cartridge present sensor 1 and its connector 3 in the cavity of the load assembly, with the sensor slot facing in
7. Latch the sensor holding bracket 2.
8. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer
9. Go to CARR-DR 8 for the procedure to *power on* the drive.

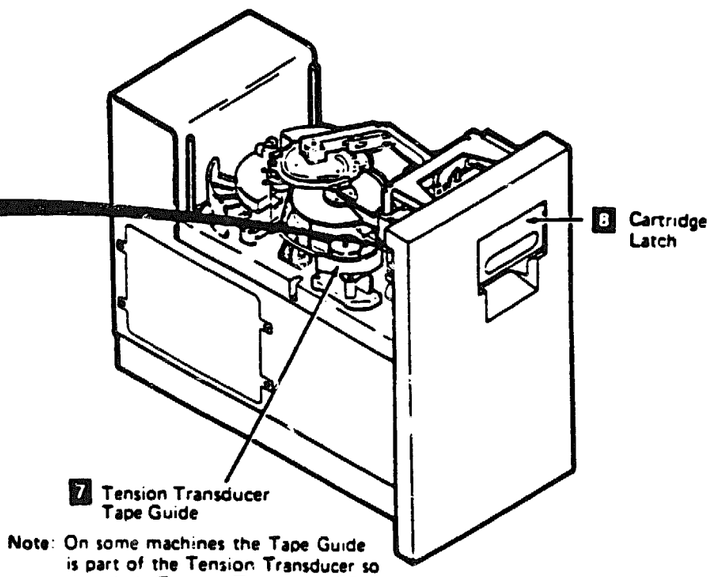
With Automatic Cartridge Loader



OR

Without Automatic Cartridge Loader





Note: On some machines the Tape Guide is part of the Tension Transducer so the whole Tension Transducer FRU must be removed.

FRU011 Cartridge Latched Sensor Removal and Replacement Procedure

This page contains the steps needed to remove the cartridge latched sensor 4 (TU-DK-Cartridge Latched Sensor) from the side of the cartridge latch assembly or load assembly.

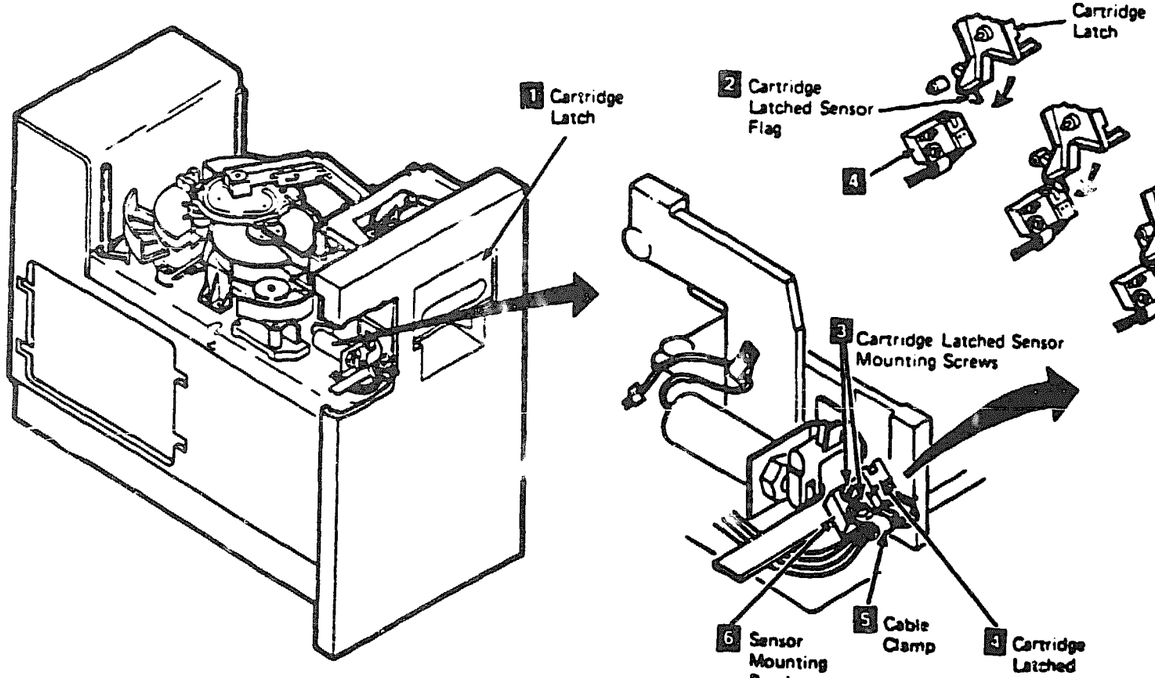
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Cartridge Latched Sensor

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. On drives without the automatic cartridge loader feature, remove the drive drawer cover (see CARR-DR 2-1).
4. Open the cartridge latch 1 or raise the cartridge latch sensor flag 2 on drives with the automatic cartridge loader feature (if it is not in the up position) by turning the knurled knob 7 on the load motor clockwise.
5. The cartridge latched sensor 4 is located on the left side of the cartridge latch assembly (held in position by two mounting screws 3).

   Remove the mounting screw holding the cable clamp 5.
6. Disconnect the cartridge latched sensor cable from the sensor 4 .
7. Remove the other cartridge latched sensor mounting screws 3 and remove the sensor from the drive.

Without Automatic Cartridge Loader



Replacing the Cartridge Latched Sensor

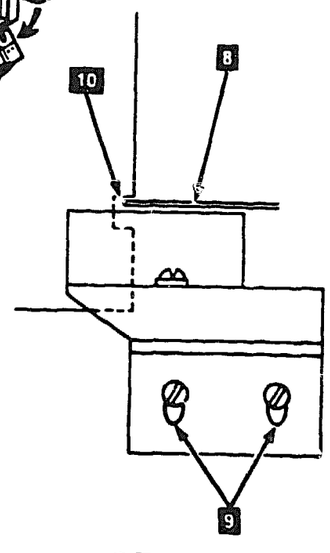
1. Place the cartridge latched sensor 4 in position on the mounting bracket 6 and install the last mounting screw 3 removed earlier, but ***do not*** tighten the mounting screw at this time.
2. Reconnect the cartridge latched sensor cable to the sensor and install the cable clamp 5 and the other mounting screw 3 . Ensure that the polarity marking is correct.
3. It is necessary to adjust the cartridge latched sensor to permit the flag 2 to move through the sensor without touching.

   Slowly close the cartridge latch 1 , or for drives with the automatic cartridge loader feature turn the knurled knob 7 clockwise until the flag is in the sensor opening. If the flag hits the sensor, move the sensor so the cartridge sensor flag can be lowered.
4. Adjust the sensor so the flag is the same distance from both sides of the sensor.
5. Tighten the sensor mounting screws 3 .

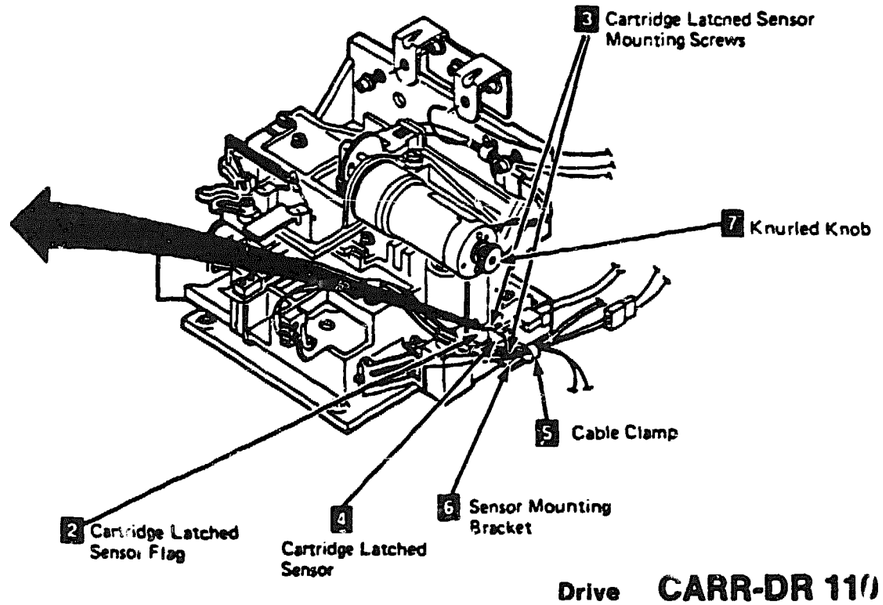
   Check the sensor adjustment by opening and closing the cartridge latch, or by raising and lowering the load assembly with the knurled knob 7 . Leave the load assembly in the up position.
6. On drives without the automatic cartridge loader feature, close the latch and install the drive drawer cover (see CARR-DR 2-1). Leave the latch in the open position. Go to step 8.
7. On drives with the automatic cartridge load feature, if the screws 9 for the cartridge latched sensor were loosened or the sensor up and down position is suspect, go to the Cartridge Latched Sensor Adjustment on this page.
8. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
9. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

Cartridge Latched Sensor Adjustment

1. Manually insert a cartridge through the feed station until it is all the way into the load assembly.
2. Turn the knurled knob 7 clockwise until the load assembly is at its lowest position or you reach the mechanical stop.
3. Loosen the two cartridge latched sensor bracket holding screws 9 .
4. Place a 0.25 mm (0.010 in.) feeler gage 8 on top of the cartridge latched sensor 4 and into the notch in the cartridge latched sensor flag 10 .
5. Position the sensor and bracket up until the feeler gage contacts the upper edge of the cartridge latched sensor flag notch 10 and tighten the two screws 9 .
6. The cartridge can be unloaded after power is restored to the drive by pressing the UNLOAD key and then the START key.
7. Return to the procedure that sent you here.



With Automatic Cartridge Loader



FRU012 Decoupler Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the decoupler assembly 5 in the drive. Since tape path sensor A 6 is installed on the decoupler, it will also be removed

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Decoupler

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

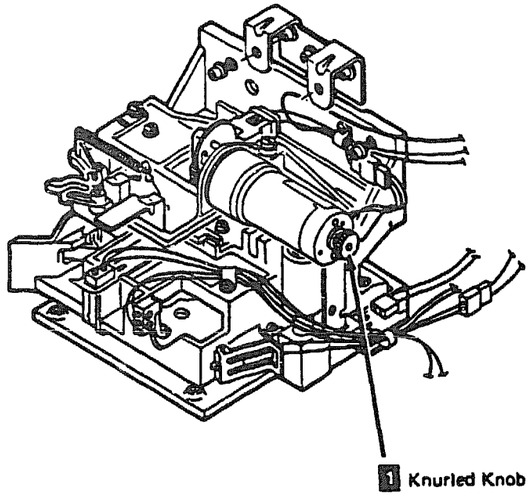
2 Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).

3 So that we don't affect the other drive, it is necessary to clamp the plenum supply hose of the drive requiring service.

Clamp the plenum supply hose (see CARR-DR 3-1).

4 On drives without the automatic cartridge loaders close the cartridge latch.

On drives with the automatic cartridge loaders turn the knurled knob 1, on the load assembly motor, clockwise until it stops. This releases the threader pin 4 from the receiver.



5 Turn the threader arm 2 until it is in the position shown (the 12 o'clock position). This moves the arm out of the way and prevents the arm from being broken.

Note: Tape path sensor A 6 is installed on top of the decoupler.

6 Disconnect the tape path sensor A cable connector.

7. Remove the two screws and remove the tape path sensor A from the decoupler.

8 Remove the vacuum hose 8 from the decoupler.

9. Use duckbill pliers to slide back the retention clip on the pressure hose 7 and remove the pressure hose from the decoupler.

10. Remove the three mounting screws 9 and lift the decoupler assembly 5 off the baseplate.

Replacing the Decoupler

1. Place the decoupler assembly 5 in position on the baseplate and install the three mounting screws 9.

2. Connect the decoupler vacuum hose 8.

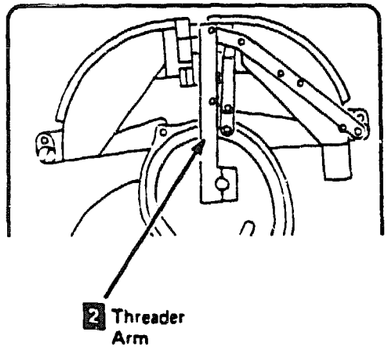
3. Connect the decoupler pressure hose 7 and use duckbill pliers to slide the retention clip back over the decoupler pressure hose connection.

4. Install the tape path sensor A on the decoupler with the two mounting screws.

5. Connect the tape path sensor A 6 to the cable connector, observing the polarity markings.

6. From the rear of the decoupler, insert the sensor into the mounting bracket.

Align the edge of the sensor with the front edge of the decoupler and tighten the two mounting screws.



Top View

7. On drives without the automatic cartridge loaders move the receiver 3 into the position shown.

On drives with the automatic cartridge loaders ensure that the load assembly is at its lowest point by turning the knurled knob 1 clockwise until it stops turning freely. This permits the threader pin 4 to engage the receiver 3.

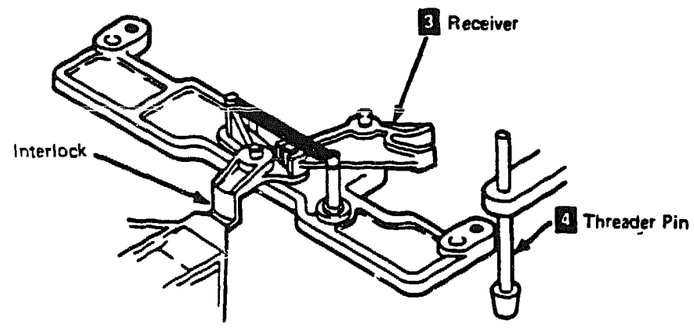
8 Turn the threader arm 2 clockwise to move the threader pin 4 into the receiver 3.

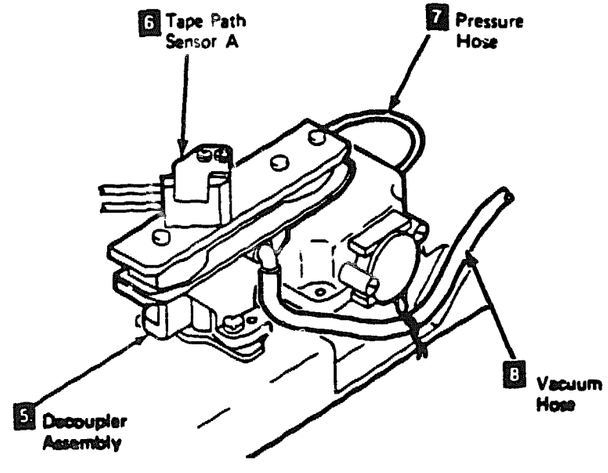
On drives with the automatic cartridge loaders turn the knurled knob 1, on the load assembly motor, counterclockwise until it stops turning freely. This opens the cartridge latch and interlocks the threader pin 4.

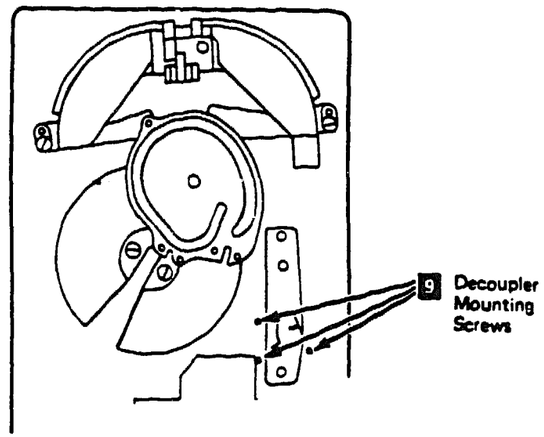
On drives without the automatic cartridge loaders check by opening and closing the cartridge latch. The latch can be opened only if the threader pin has released the interlock and is in the correct location.

9. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.

10. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







Top View

FRU013 Head and Guide Assembly Cleaning, Checking, Removal and Replacement Procedure

This page contains the steps needed to clean and remove the head and guide assembly. The head alignment is critical. Do not attempt to remove the head from the head and guide assembly.

To permit space when removing the head and guide assembly it is necessary to remove the rear panel cover 13.

Head, Decoupler, and Cleaner Block Cleaning Procedure

Warning: Do not attempt to clean the air bearings. The upper guide could be severely damaged.

If you have cleaned the head as described in this section go directly to Checking the Head Connectors.

This procedure requires use of cotton swabs and tape cleaner and lint-free cloth. The cotton swabs and the lint-free cloth are found in the Tape Cleaning Kit (part TUC01).

CAUTION:
Only Digital tape cleaner, (part TF113) or an equivalent tape cleaner should be used as a dampening agent. Prolonged skin contact with cleaner should be avoided.

1. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
2. Inspect the head with a dental mirror and a light for contaminant.
3.
   a. If contaminant is visible, dampen a clean, lint-free cloth with tape cleaner and wrap it around a cotton swab. Gently scrub the head, repeating as necessary to remove the contaminant. A brush from the cleaning kit, dampened with tape cleaner, may be used to remove any stubborn residue. Gently scrub the head. Verify residue is removed by using a light and dental mirror.
   b. If contaminant is not visible, dampen a clean, lint-free cloth with tape cleaner, wrap it around a cotton swab and gently scrub the head. Wipe dry with a clean cloth.
4. Use a cotton swab and tape cleaner to clean the decoupler, tension transducer and cleaner block. Stubborn residue may be removed with brush and tape cleaner. Wipe dry with a lint free cloth.

Checking the Head Connectors

If you have checked the head connectors as described in this section go to "Removing the Head and Guide Assembly" on this page.

A problem may be caused by a head cable that is not fully seated or by bent pins on the connector. The following procedure checks these conditions:

1. To get access to the read and write cables, first remove the card cover 9.

   The read and write cables are found on the H2 and J4 cards.
2. Lift up on the tab 10 to disconnect the read cable 11 and the write cable 12.
3. Inspect the pins on the head cable connectors and straighten any bent pins.
4. Reconnect the head cables to the H2 and J4 cards. Ensure that the cables are fully seated.
5. Replace the card cover 9 and mounting screws.
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

Removing the Head and Guide Assembly

The Head and Guide Assembly should not be removed unless it has been cleaned and the connectors checked.

Notes:

a. This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

b. The Head and Guide Assembly should ***not*** be removed unless it has been cleaned and the connectors checked as described on this page.

Continue on to page CARR-DR 131.

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Clamp the plenum supply hose (see CARR-DR 3-1).
3. Remove the mounting screws and the card cover 9.

   Warning: The cables and connectors can be easily damaged. Do not pull on the cables to disconnect them.

   The read and write cables are found on the H2 and J4 cards.
4. Lift up on the tab 10 to disconnect the read cable 11. Remove the read cable from the H2 card.
5. Lift up on the tab 10 to disconnect the write cable 12. Remove the write cable from the J4 card.

   Note: After the read and write cables have been disconnected, position a protector (such as a file card) between the logic cards and the cables. This will protect the cable pins and card components from damage.

   Warning: Do not touch the surface of the read/write head when removing or replacing the protective shield.

   To prevent damage to the read/write head, the shield that is shipped with the new head should remain on the new head until it has been installed; see the following procedure.
6. Slide the shield 6 on to the head assembly located in the drive using equal downward pressure on each side.
7. Unscrew the right safety cover support 8 and remove the head tape guide (right) 7.
8. Unscrew the left safety cover support 14 and remove the head tape guide (left) 15.
9. Remove the two screws and the rear panel cover 13.
10. Disconnect the tape lifter solenoid output hose 2 from the tape lifter solenoid.
11. Disconnect the right guide bearing hose 3 from the right guide bearing.
12. Disconnect the left guide bearing hose 1 from the left guide bearing.
13. Disconnect the cleaner hose 4 from the tape cleaner block.
14. Remove the three head and guide assembly mounting screws 5.
15. Slowly lift the assembly off the baseplate. Tilt the head away from the rear panel after clearing locating pins.

    Continue lifting the head and guide assembly, permitting the cable connectors to pass through the opening in the baseplate.
16. Set the head and guide assembly to the side taking care not to bend the cables or damage the head.

    Note: The cables on the replacement head and guide assembly must be bent using the cables on the old head and guide assembly as an example.
17. Remove the two ferrites 16 and the rubber cable protectors from the head assembly cables. These parts will be installed on the new head FRU assembly.

Replacing the Head and Guide Assembly

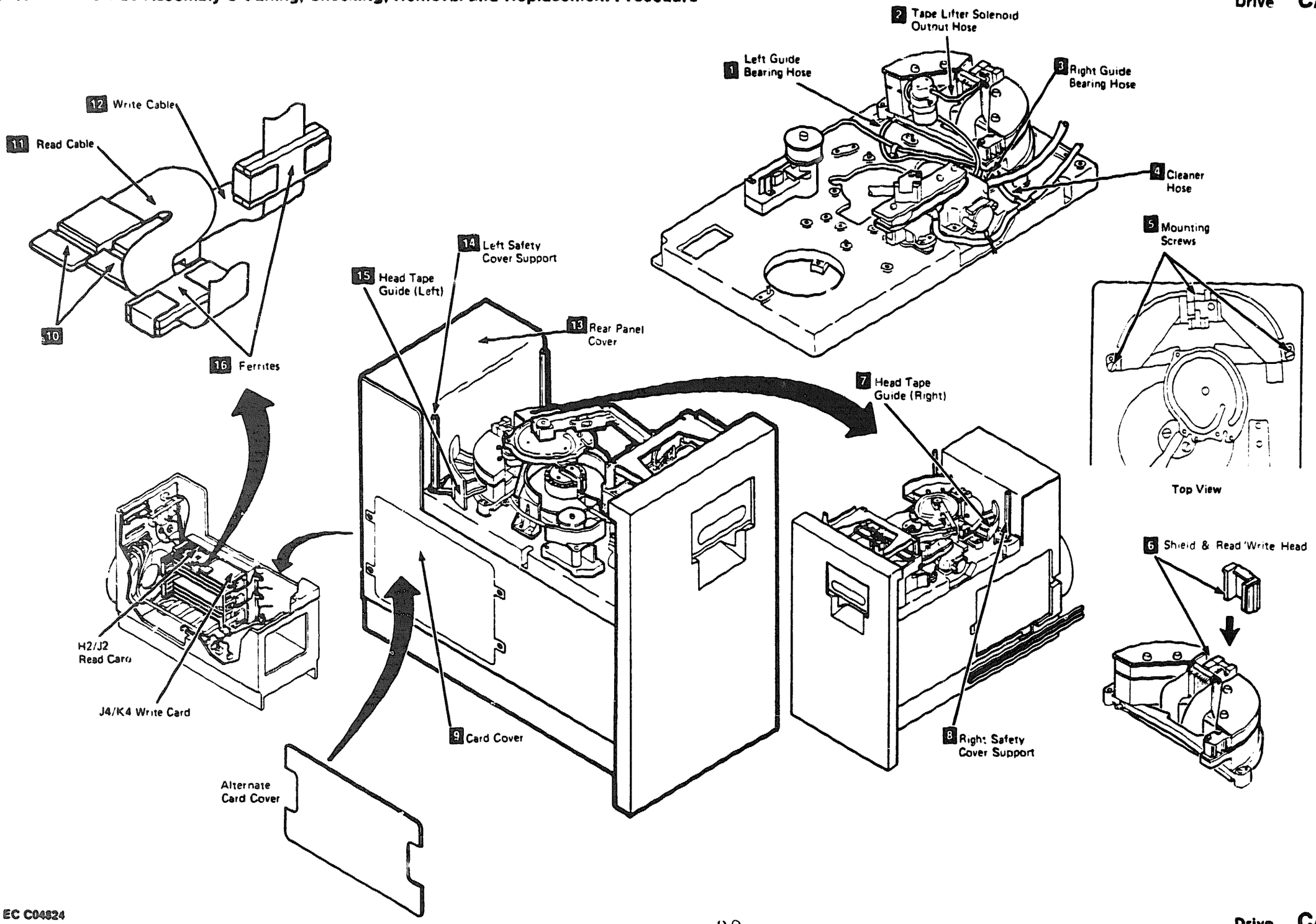
1. Remove the replacement head and guide assembly from the shipping container. Ensure that the protective shield 6 is in place on the read/write head 6.
2. Bend the read and write cables of the replacement head and guide assembly using the old head and guide assembly as an example.
3. Install the two ferrites 16 and rubber cable protectors on the replacement head and guide assembly in the same positions as they were on the old head and guide assembly.

   Warning: Ensure that the cable connector pins are not damaged during the replacement procedure.
4. Lower the head and guide assembly onto the baseplate. As you lower the head and guide assembly, guide the read and write cables through the opening in the baseplate. Ensure that the head and guide assembly installs correctly on the locating pins and is seated on the baseplate.
5. Install the three mounting screws 5. Do not over tighten the screws.
6. Reconnect the write cable 12 to the J4 write card connector.
7. Remove the protector that was used to protect the cable pins and card components from damage.
8. Reconnect the read cable 11 to the H2 read card connector.

   Note: Ensure that both the read and write cables are seated before continuing.

   If either read or write cable is not fully seated, it may have bent pins. Remove the read and/or write card(s) (see CARR-DR 640) and bend the cable connectors up to inspect for bent pins. Straighten any bent pins. Excessively bent pins may be straightened using needle nose pliers.
9. Install the card cover 9.

   Note: As you install the tape guides (in the next two steps), ensure that the guides are against the head guide assembly and do not protrude into the tape path. See CARR-DR 2280 for installing the left guide and CARR-DR 2290 for installing the right guide.
10. Install the head tape guide (left) 15 and the left safety cover support 14.
11. Install the head tape guide (right) 7 and the right safety cover support 8.
12. Reconnect the left guide bearing hose 1.
13. Reconnect the right guide bearing hose 3.
14. Reconnect the cleaner hose 4.
15. Reconnect the tape lifter solenoid output hose 2 to the tape lifter solenoid.
16. Install the rear panel cover 13 with the two mounting screws.
17. Remove the protective shield 6 from the read/write head 6. Place it on the defective head to be returned with the defective head and guide assembly.
18. Remove the clamp from the plenum supply hose (see CARR-DR 3-1).
19. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
20. Go to CARR-DR 8 for the procedure to ***power on*** the drive.


12 Write Cable
11 Read Cable
10
16 Ferrites
H2/J2
Read Card
J4/K4 Write Card
Alternate
Card Cover
14 Left Safety
Cover Support
15 Head Tape
Guide (Left)
13 Rear Panel
Cover
9 Card Cover
2 Tape Lifter Solenoid
Output Hose
1 Left Guide
Bearing Hose
3 Right Guide
Bearing Hose
4 Cleaner
Hose
7 Head Tape
Guide (Right)
8 Right Safety
Cover Support
5 Mounting
Screws
Top View
6 Shield & Read/Write Head

FRU014 Tension Transducer Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tension transducer assembly (TU-D0/1-DK-Tension Transducer)

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). see CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Tension Transducer Procedure

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).

   So that we don't affect the other drive, it is necessary to clamp the plenum supply hose of the drive requiring service.
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. The tension transducer assembly is located in the area between the cartridge latch assembly and the threader assembly.
5. Disconnect the transducer hose 3 from the tension transducer.
6. Remove the tension transducer mount screws 1, but do not remove the tension transducer at this time.

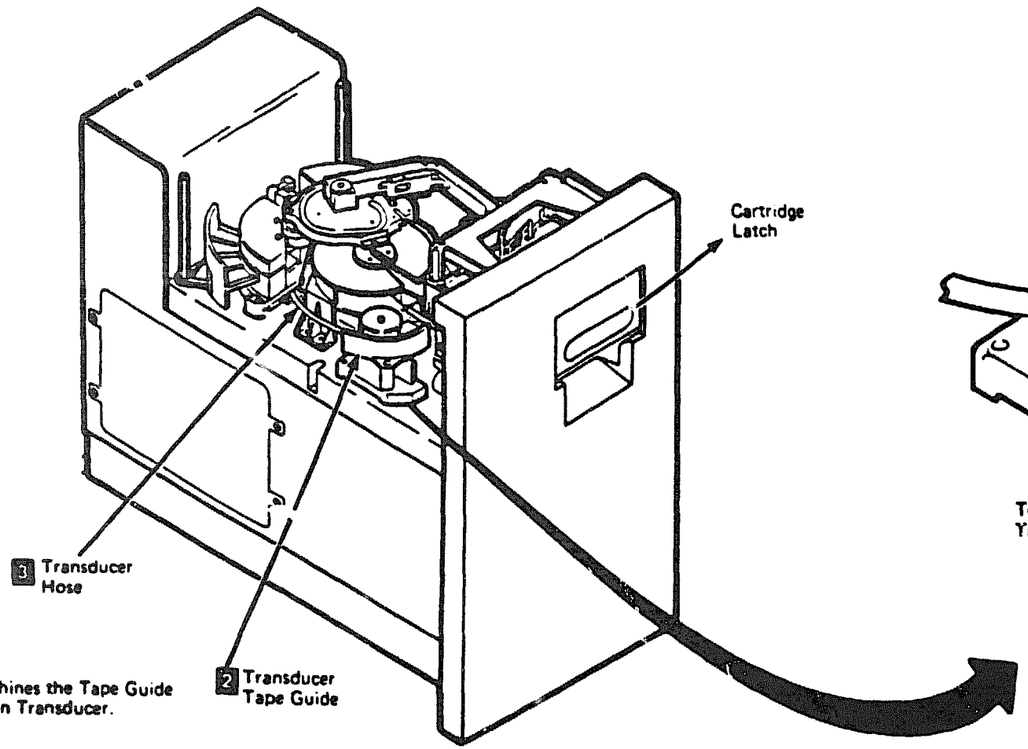
   Note: The tension transducer tape guide 2 may or may not be a part of the tension transducer assembly. If one of the tension transducer mounting screws 1 is used to secure the tension transducer tape guide, remove the mounting screw and the tension transducer tape guide.
7. Lift the tension transducer off the baseplate far enough to get access to the cable connector on the side of the assembly. Disconnect the cable connector and lay the connector on the baseplate.
8. Lift the tension transducer off the baseplate and remove from the drive.

Replacing Tension Transducer Procedure

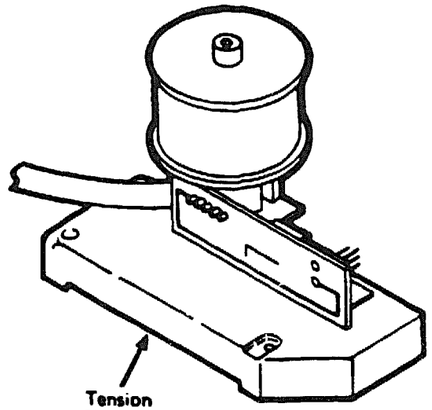
1. Place the tension transducer near its location on the baseplate and connect the cable connector to the side of the tension transducer.

   Note: Ensure that the cable to the tape lifter solenoid is routed under the tension transducer.
2. Place the tension transducer in position on the baseplate and install the three mounting screws 1.

   Note: The tension transducer tape guide 2 may or may not be a part of the tension transducer assembly. If the tension transducer tape guide is not a part of the tension transducer assembly, place the tension transducer tape guide 2 on the tension transducer and install the mounting screw.
3. Connect the transducer hose 3 to the tension transducer mounting bracket.
4. Remove the clamp from the plenum supply hose.
5. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



Note: On some machines the Tape Guide is part of the Tension Transducer.



FRU016 Latch Spring Removal and Replacement Procedure

This page contains the steps needed to remove and replace the latch spring 1 from the cartridge latch assembly. The latch spring is located inside the cartridge latch assembly.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Latch Spring

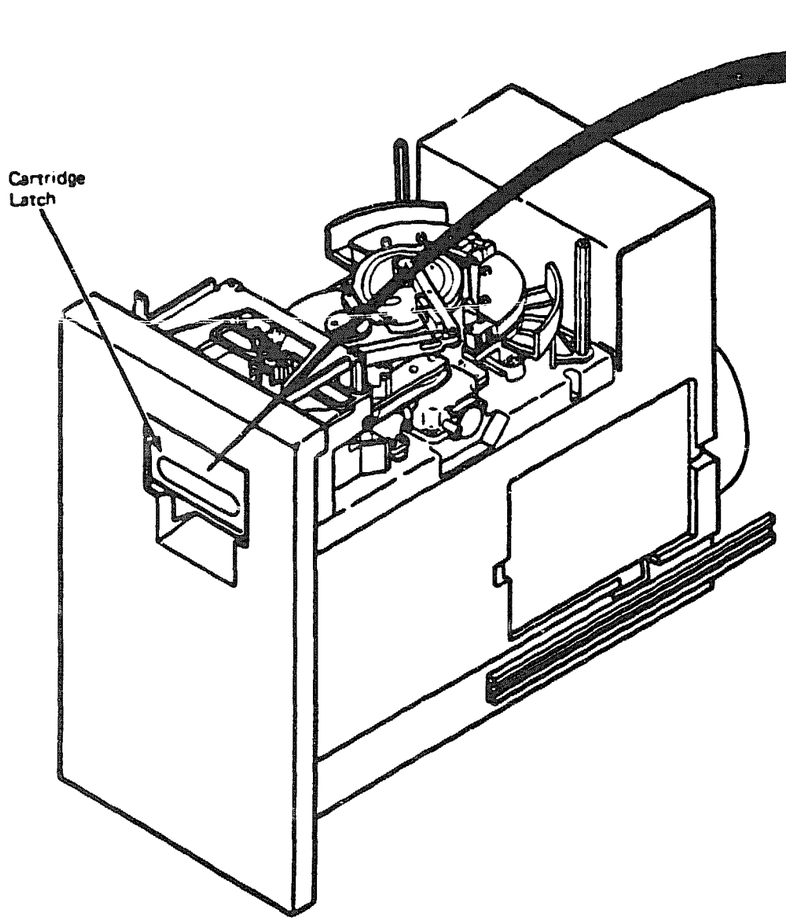
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Open the cartridge latch and find the latch spring 1.

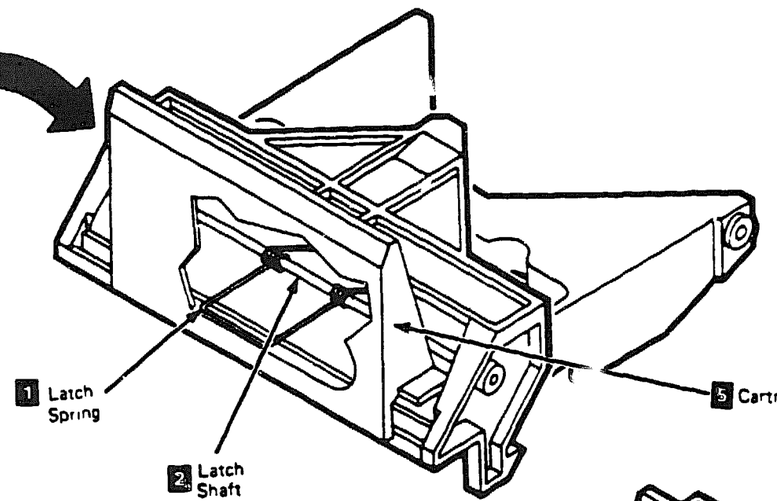
   The spring is installed on the latch shaft 2 and is located in the center of the latch opening.
4. Remove the "C" clip 3 from the left end of the latch shaft.
5. Pull the right end of the latch shaft 4 out of the latch assembly until the latch spring can be removed.
6. Remove the latch spring from the drive.

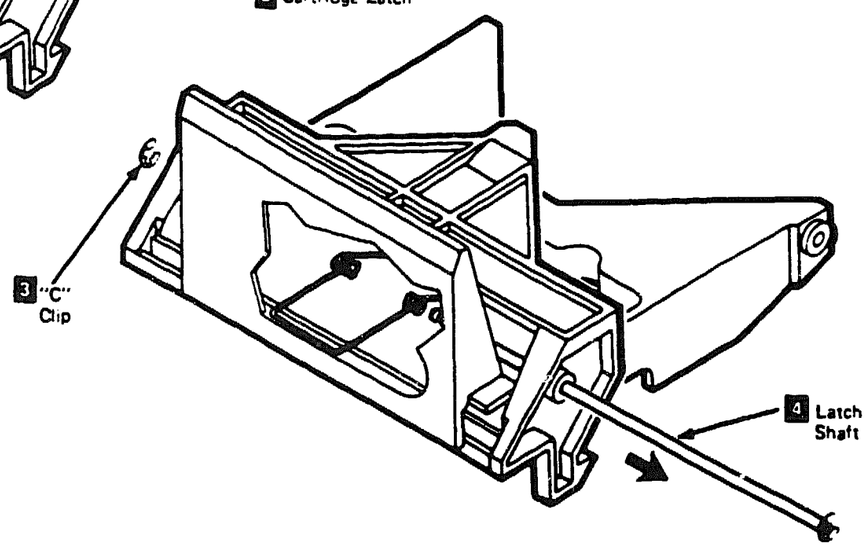
Replacing the Latch Spring

1. Slide the latch spring 1 on to the latch shaft 2.

   The "loop" end of the spring should be toward the front of the drive and the "loop" should be to the bottom of the latch shaft.
2. The "loop" must be on top of the latch 5.
3. Press down on the latch shaft and slide it to the left, through the opening on the left side of the cartridge latch assembly.
4. Install the "C" clip 3 on the end of the latch shaft.
5. Check the operation of the cartridge latch by opening and closing it.
6. Close the drive drawer.
7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







FRU017 Plunger Spring Removal and Replacement Procedure

This page contains the steps needed to remove and replace the plunger spring 2 from the cartridge latch assembly. The plunger and plunger spring are installed on the bottom of the loader cover, which is part of the cartridge latch assembly.

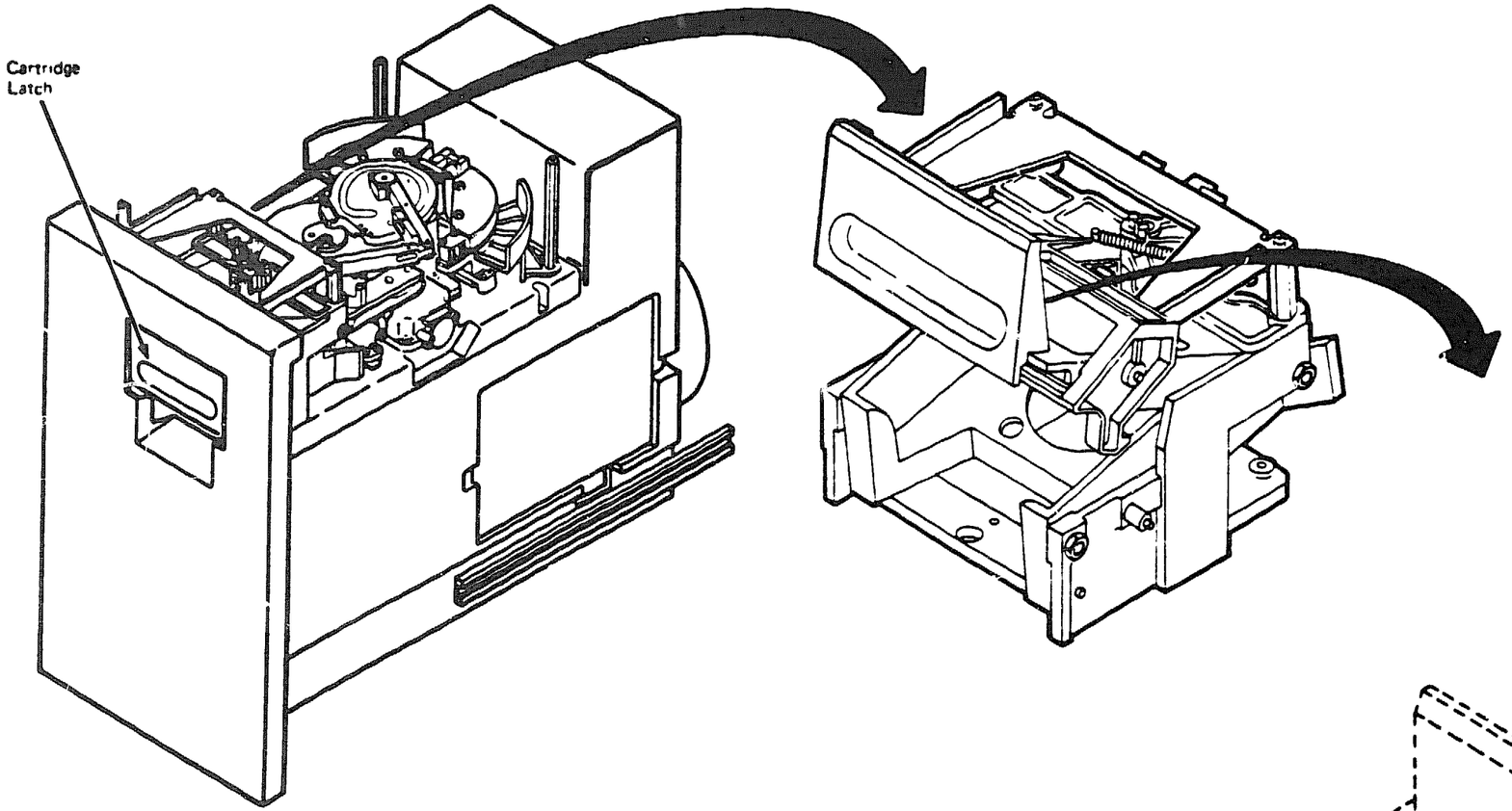
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

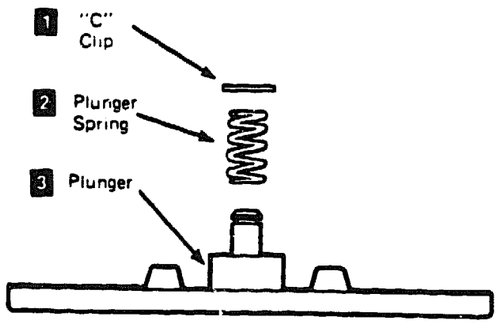
Removing the Plunger Spring

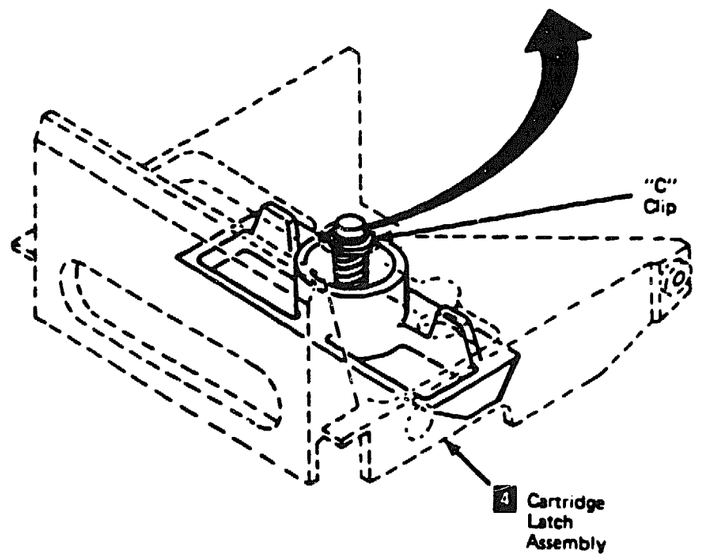
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Open the cartridge latch.
4. Push up on the plunger 3 and at the same time remove the "C" clip retainer 1 from the end of the plunger shaft.
5. Slowly lower the plunger until you can remove it from the cartridge latch assembly.
6. Remove the plunger and spring 2 from the cartridge latch assembly 4.
7. Remove the spring from the plunger.

Replacing the Plunger Spring

1. Place the plunger spring 2 on the plunger shaft 3.
2. Insert the plunger and spring into the cartridge latch assembly 4.
3. Press up on the plunger to extend the shaft above the latch tray, and reinstall the "C" clip retainer 1.
4. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







FRU018 Compression Spring Removal and Replacement Procedure

This page contains the steps needed to remove and replace the compression spring 2 in the cartridge latch assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Compression Spring

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

2 Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5)

3 Open the cartridge latch 1

4 Remove the compression spring 2 from the cartridge latch assembly

The spring can be removed by holding the top with duckbill pliers, pushing down, and pulling the spring out of the cartridge latch assembly

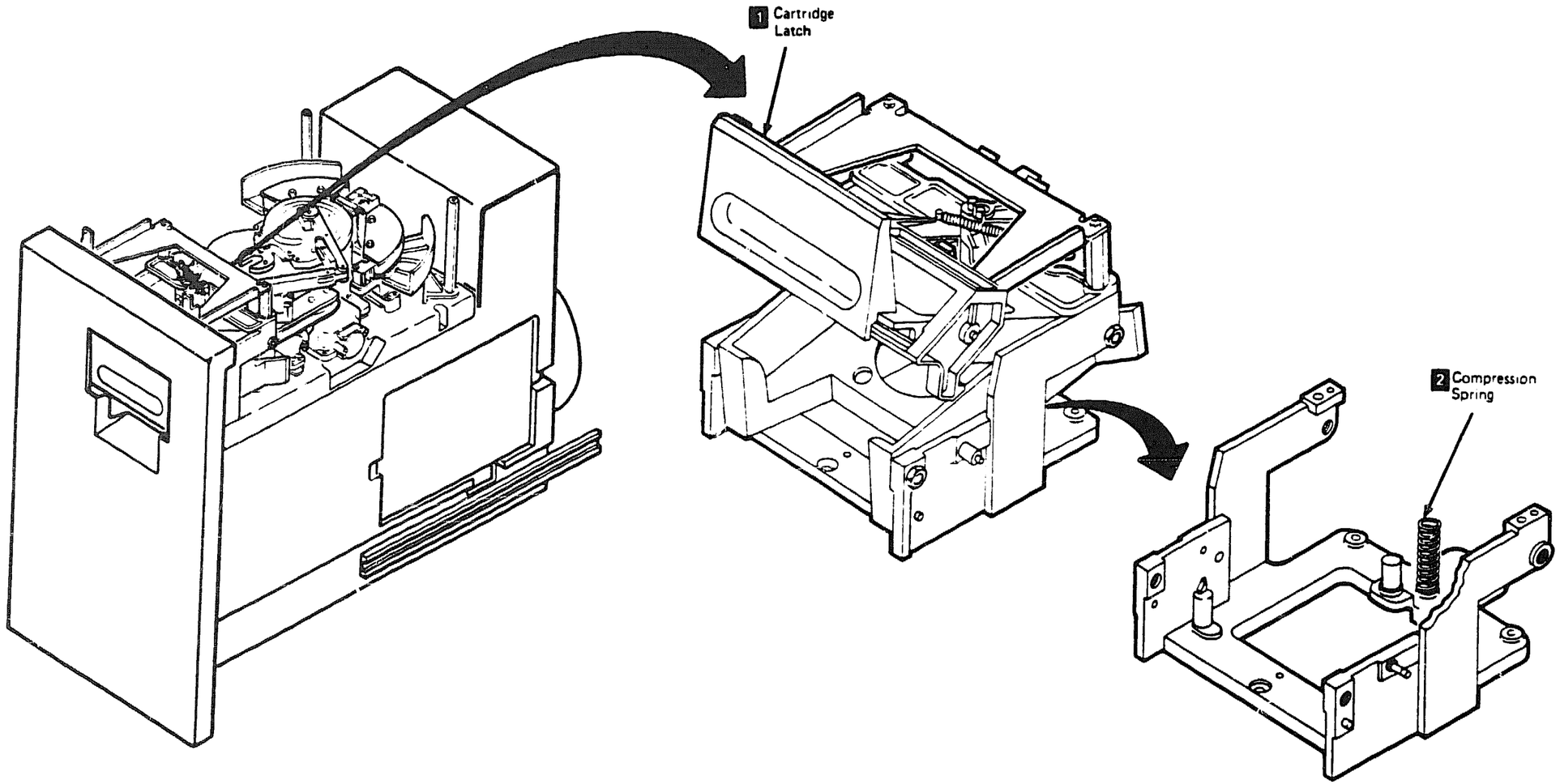
Replacing the Compression Spring

1 Using duckbill pliers, insert the compression spring 2 into the cartridge latch assembly

Ensure that the compression spring is seated correctly

2 Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.

3. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU019 Interlock Spring Removal and Replacement Procedure

This page contains the steps needed to remove and replace the interlock spring 2 in the cartridge latch assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Interlock Spring

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive.

2 Open the drive drawer.

3 Remove both ends of the interlock spring 2 and remove the spring from the cartridge latch assembly.

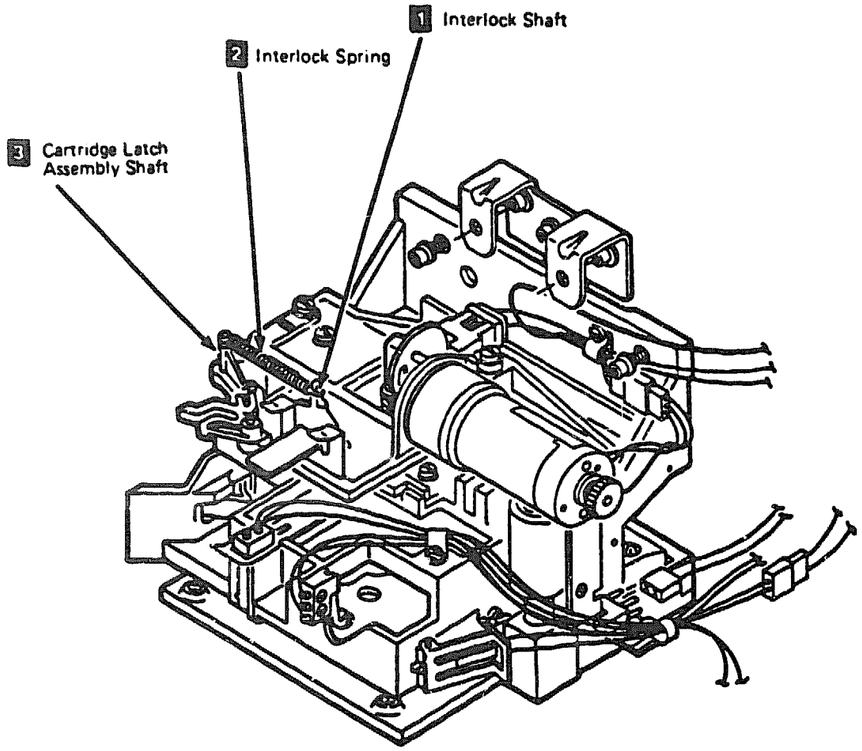
Replacing the Interlock Spring

1 Install one end of the interlock spring 2 on the interlock shaft 1.

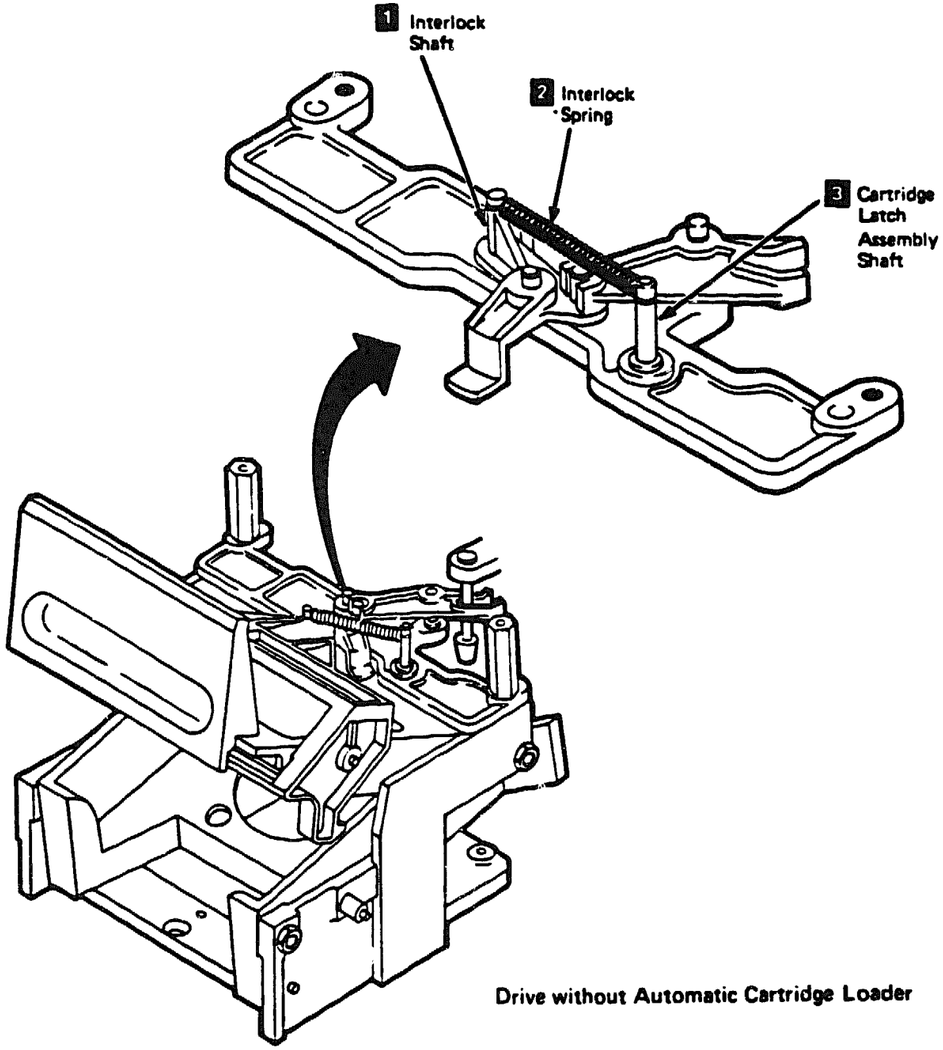
2 Install the other end of the interlock spring on the cartridge latch assembly shaft 3.

3 Close the drive drawer.

4 Go to CARR-DR 8 for the procedure to ***power on*** the drive.



Drive with Automatic Cartridge Loader



Drive without Automatic Cartridge Loader

FRU020 Blower Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape transport unit blower assembly from the tape transport unit. The removal is from the rear of the tape transport unit.

Since there is only one blower in a tape transport unit, it is necessary that both drives be available for service

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

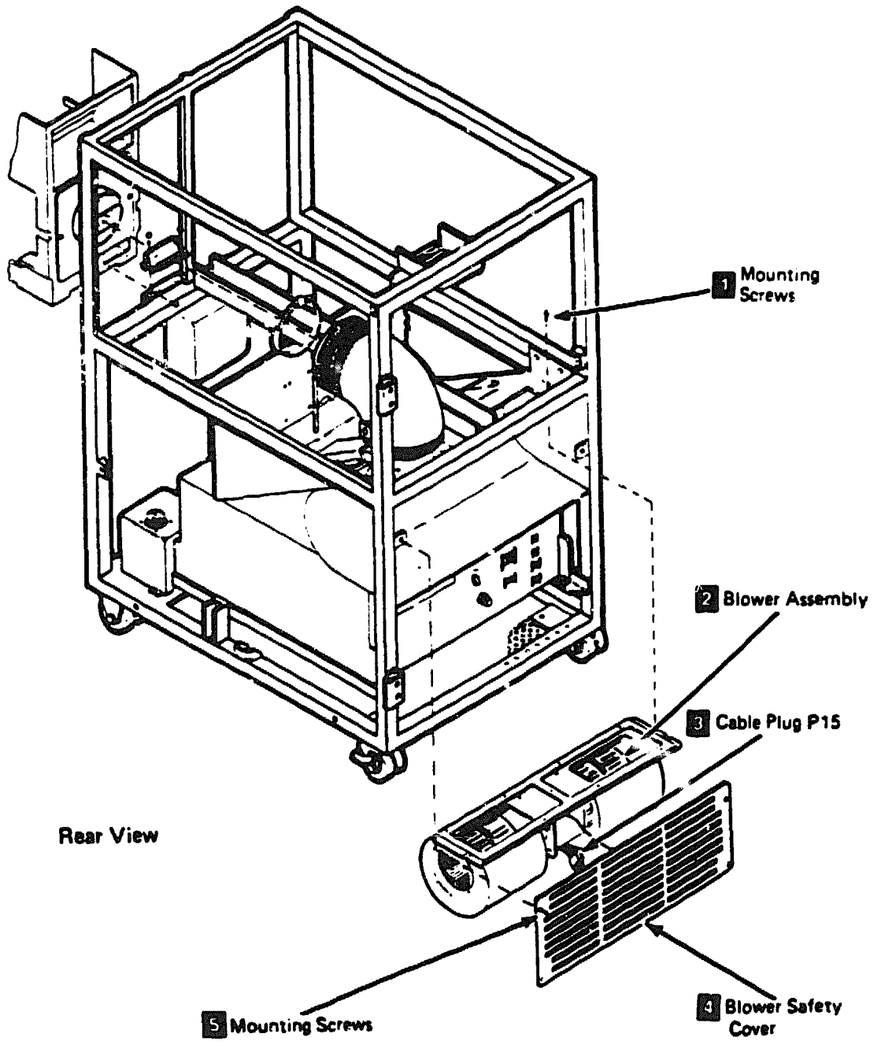
Removing the Blower Assembly

1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.
2. Open the rear cover (see CARR-DR 2-1)
3. Remove the four mounting screws 5, then remove the blower safety cover 4 from the tape transport unit.
4. Remove cable plug P15 from connector J15 3 (located on the rear of the dc power supply).
5. Support the blower and remove the three mounting screws 1
6. Remove the blower 2 from the tape transport unit.
7. Save all mounting screws for the replacement procedure.

Replacing the Blower Assembly

The replacement procedure is from the rear of the tape transport unit

1. Position the blower assembly 2 in the tape transport unit with the blower motor capacitor toward the rear of the tape transport unit.
2. Support the blower assembly and install the three blower mounting screws 1 saved from the removal procedure.
3. Install cable plug P15 3 to connector J15 (located on the rear of the dc power supply).
4. Route the cable through the slot in the bottom of the blower mounting assembly.
5. Position the blower safety cover 4, and then replace the four safety cover mounting screws 5 saved from the removal procedure
6. Close the rear cover (see CARR-DR 2-2).
7. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



FRU030 Pump Motor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the pump motor assembly in the tape transport unit. The pump motor assembly consists of the pump motor, the input filter, and the pump motor mounting plate.

The pump motor assembly is removed from the front of the tape transport unit.

Since the pump motor assembly supplies air and vacuum for both drives, it will be necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Pump Motor Assembly

1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.

CAUTION:
The pump motor may be hot.

2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
3. Disconnect the vacuum supply hose at the pump inlet (at the venturi) 3.
4. Disconnect the pressure supply hose at the pump outlet 4.
5. Remove the pump motor cable plug P4 2 from connector J4 (located on the front of the dc power supply).
6. Remove the mounting screw 5 (located near the ac circuit breaker box) for the pump motor mounting plate.
7. Loosen the mounting screw (located at the left bottom side frame of the tape drive) for the pump motor mounting plate.

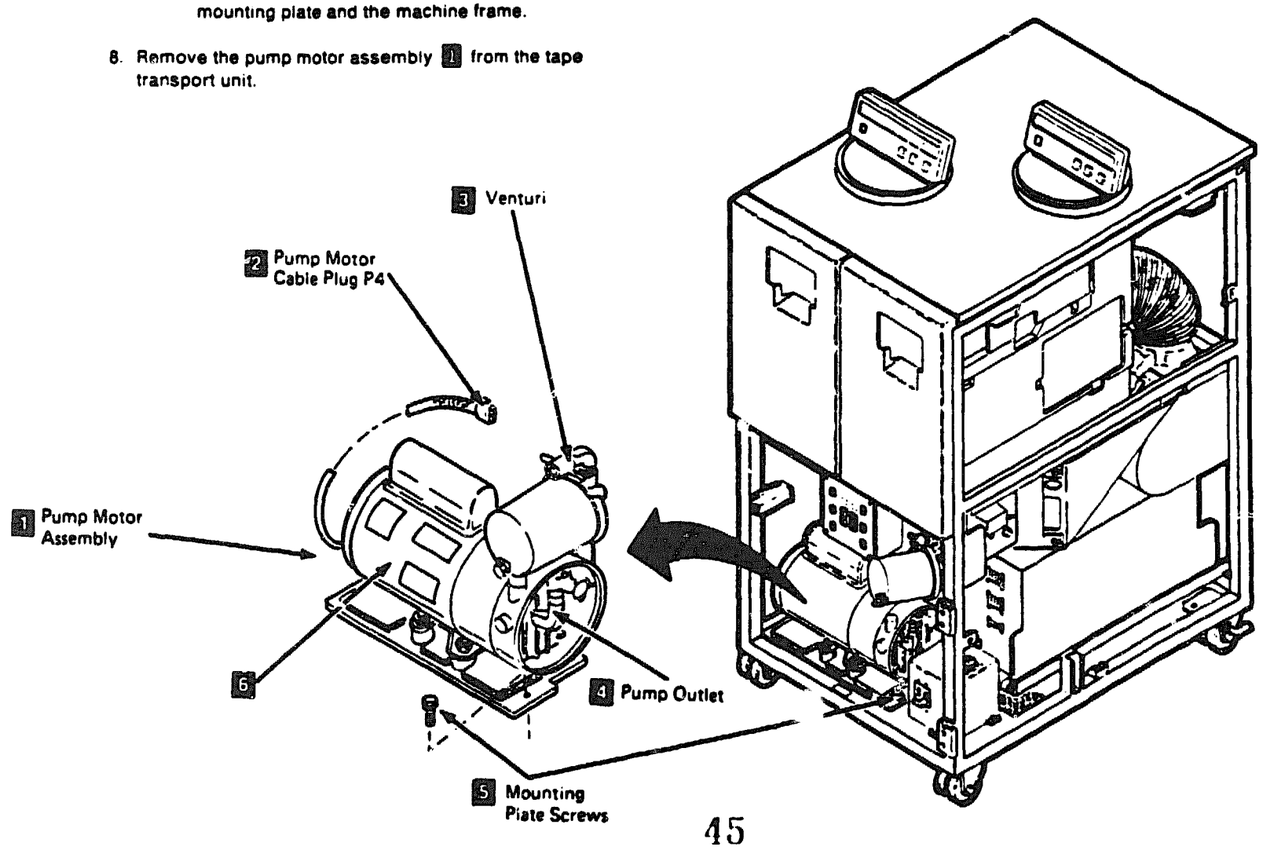
   Note: There is a grounding star washer between the mounting plate and the machine frame.

8. Remove the pump motor assembly 1 from the tape transport unit.

Replacing the Pump Motor Assembly

CAUTION:
When placing the pump motor assembly into the tape transport unit (in the next step), ensure that the ac distribution cable is placed to the rear of the pump motor assembly and is not pinched by the pump motor mounting plate.

1. Install the "Warning" and "Caution" labels 6 on the pump motor according to the instructions that come with the pump motor.
2. Place the pump motor assembly 1 into front of the tape transport unit.
   a. When positioning the left end of the pump motor mounting plate (slotted end) on its mounting screw, ensure that the grounding star-washer is between the mounting plate and the machine frame.
   b. Align the right end of the mounting plate with the screw hole near the ac circuit breaker box, then install the mounting screw 5.
   c. Tighten both mounting screws for the pump motor mounting plate.
3. Connect the vacuum supply hose to the pump inlet (at the venturi) 3.
4. Connect the pressure supply hose to the pump outlet 4.
5. Install the pump motor cable plug P4 2 to connector J4 (located on the front of the dc power supply).
5. Set the tape transport unit ac power circuit breaker to On (see LOC 1).
7. Check all hoses for leaks.
8. Install the tape transport unit front safety cover (see CARR-DR 2-2).
9. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.



FRU031 Regulator Removal and Replacement Procedure

This page contains the steps needed to remove and replace the regulator in the tape transport unit.

Since the regulator provides air pressure for both drives, it is necessary to have both drives available for service.

The regulator attaches to the output filter and the output filter mounts on a bracket attached to the front side-frame of the tape transport unit. Remove the entire assembly to access any component.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Regulator

1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.

   Warning: The threaded fitting on the regulator is the only support for the regulator and can easily be broken. Use care when removing the hose clamp and regulator output port hose.

2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).

3. Remove cable plugs P8 and P9 from connectors J8 and J9 (located on the left side of the control box 3).

4. Loosen the two control box mounting screws and remove the control box (for ease of removal of the regulator/filter assembly).

5. Remove the regulator output port hose 2 from the regulator.

6. Remove the pump to filter hose from the filter inlet port 8.

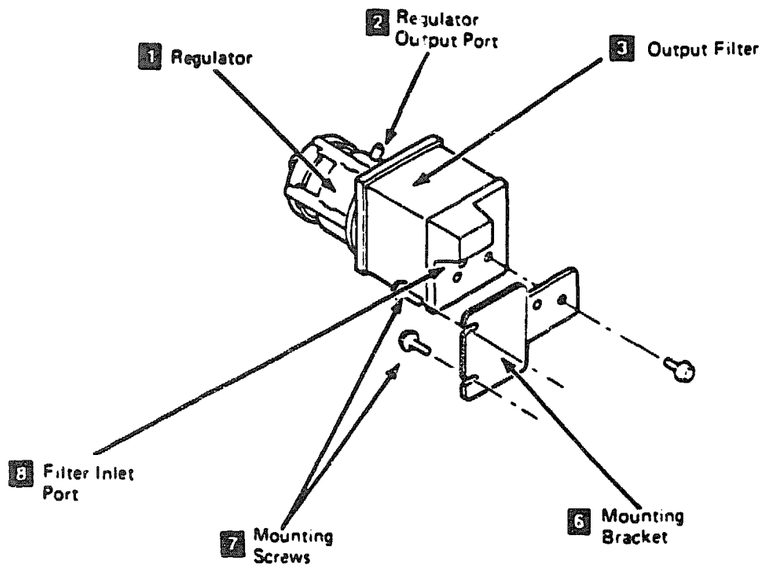
7. Loosen the two mounting screws 7 holding the assembly and bracket 6 to the side frame.

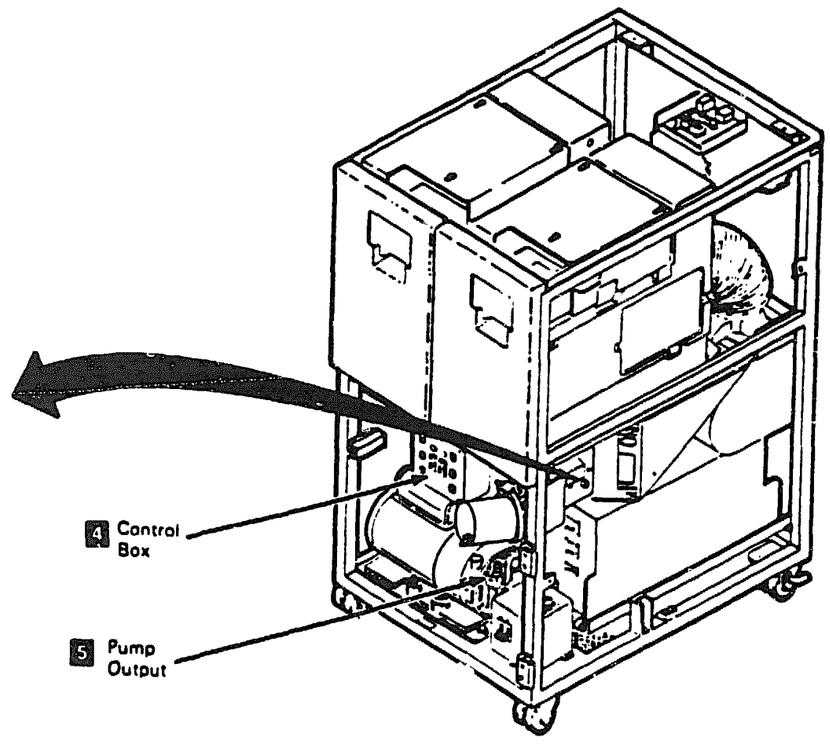
   Note: Before removing the regulator from the filter, note the position of the regulator output port.

8. Remove the regulator 1 from the output filter 3 by turning the regulator counterclockwise.

   Note: Teflon* tape will be required for the replacement procedure.

   * Trademark of Dupont, Inc.





Replacing the Regulator

1. Wrap Teflon* tape around the threaded fitting of the regulator.

2. Thread the regulator 1 onto the output filter 3 by turning the regulator clockwise. Hand tighten with caution. Position the regulator output port 2 to the same position noted during the removal procedure.

3. Replace the regulator-filter assembly and bracket 6 on the tape transport unit frame (using the two mounting screws 7).

4. Install the hose on the regulator output port 2.

5. Install the pump to filter hose on the filter inlet port 8.

6. Replace the control box 4 and tighten the two mounting screws.

7. Install cable plugs P8 and P9 into connectors J8 and J9 (located on the left side of the control box 3).

8. Go to PNEU 5 and do the procedure for checking and adjusting the pneumatic pressure and vacuum; return here when finished.

9. Replace the tape transport unit front safety cover (see CARR-DR 2-2).

10. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.

FRU032 Output Filter Removal and Replacement Procedure

This page contains the steps needed to remove and replace the output filter in the tape transport unit. Since this output filter provides air pressure for both tape drives, it is necessary to have both tape drives available for service.

The regulator is attached to the output filter and the filter is mounted on a bracket attached to the front side-frame. The entire assembly must be removed to access any component.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Output Filter

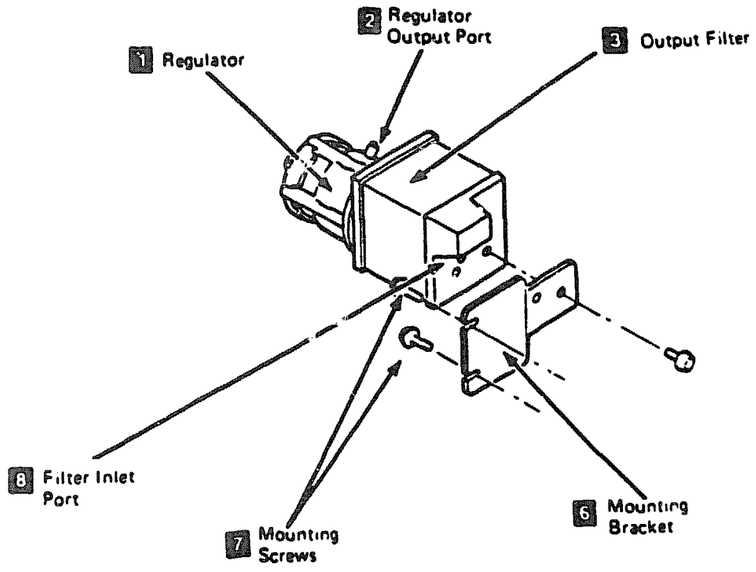
1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.
2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
3. Remove cable plugs P8 and P9 from connectors J8 and J9 (located on the left side of the control box 4).
4. Loosen the address box mounting screws and remove the tape transport unit control box (for ease of removal of the filter/regulator assembly).

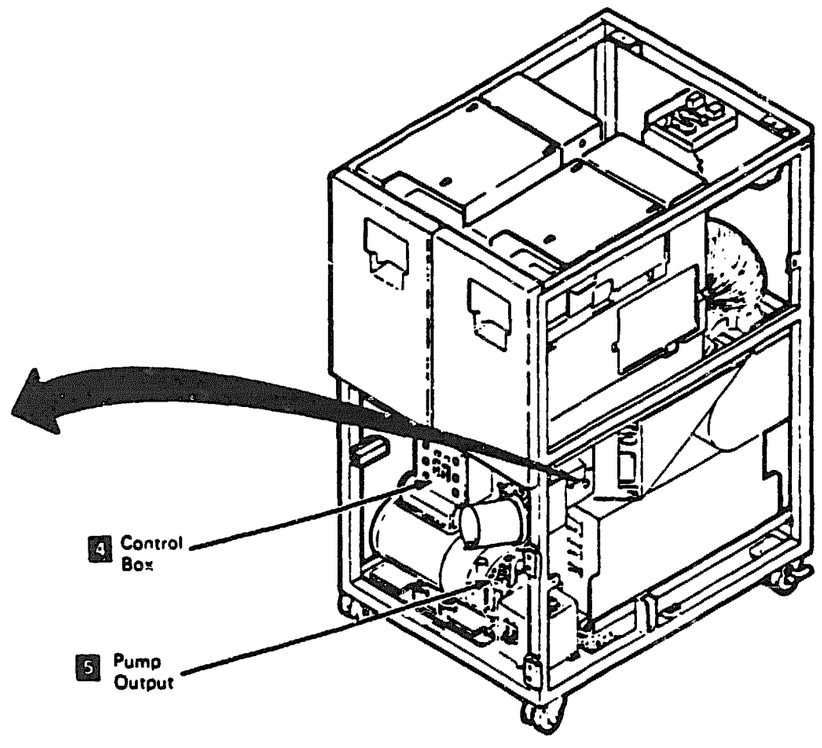
   Warning: The threaded fitting on the regulator is the only support for the regulator and can easily be broken. Use care when removing the hose clamp and regulator output port hose.
5. Disconnect the regulator output port hose 2 from the regulator output port.
6. Remove the pump to filter hose from the filter inlet port 8.
7. Loosen the two mounting screws 7 and remove the regulator/filter assembly and bracket from the tape transport unit.

   Note: Before removing the regulator from the output filter, note the position of the output port.
8. Remove the regulator 1 from the output filter 3 by turning the regulator counterclockwise. Save the regulator to be used with the replacement output filter.

   Note: Teflon* tape will be required in the replacement procedure.
9. Remove the mounting bracket 6 from the output filter 3, save the screws and mounting bracket for the replacement procedure.

   * Trademark of Dupont, Inc.





Replacing the Output Filter

1. Wind Teflon* tape around the threaded fitting of the regulator.
2. Thread the regulator 1 onto the output filter 3 by turning the regulator clockwise. Hand tighten with caution. Position the output port 2 of the regulator to the same position noted during the removal procedure.
3. Attach the mounting bracket 6 to the output filter with the screws saved from the removal procedure.
4. Install the regulator-filter assembly and bracket on the machine frame (using the two mounting screws 7).
5. Replace the pump to filter hose on the filter inlet port 8.
6. Connect the hose to the regulator output port 2.
7. Replace the tape transport unit control box (using the two mounting screws).
8. Connect cables P8 and P9 to the tape transport unit control box 4 (located on the left side of the control box).
9. Go to PNEU 5 and do the procedure for checking and adjusting the pneumatic pressure and vacuum; return here when finished.
10. Install the tape transport unit front safety cover (see CARR-DR 2-2).
11. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.

FRU033 Inlet Filter Removal and Replacement Procedure

This page contains the steps needed to remove and replace the inlet filter in the inlet filter assembly. Since this inlet filter provides air pressure for both drives, it is necessary to have both drives available for service.

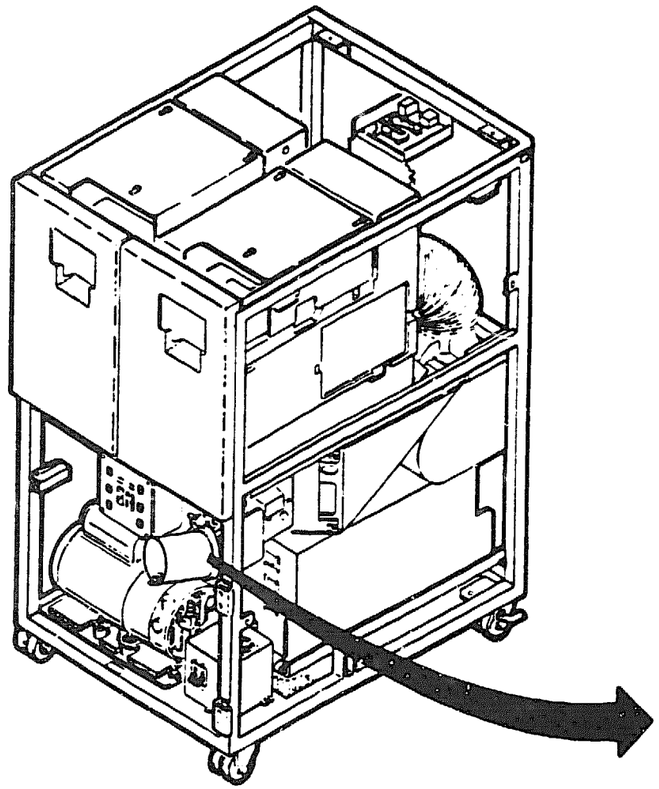
The inlet filter assembly is attached to the pump motor and is removed from the front of the tape transport unit.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Inlet Filter

1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.
2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).

CAUTION:
The inlet filter canister and pump motor may be hot.



3. Remove the retaining nut 1 from the top of the inlet filter assembly.

   Note: Do not lose the fiber washer 2 on top of the filter assembly as the canister is being removed.

4. Remove the canister 6 by pulling it away from the filter housing 3.

   Note: It may be necessary to turn the canister to free it from the inlet filter assembly.

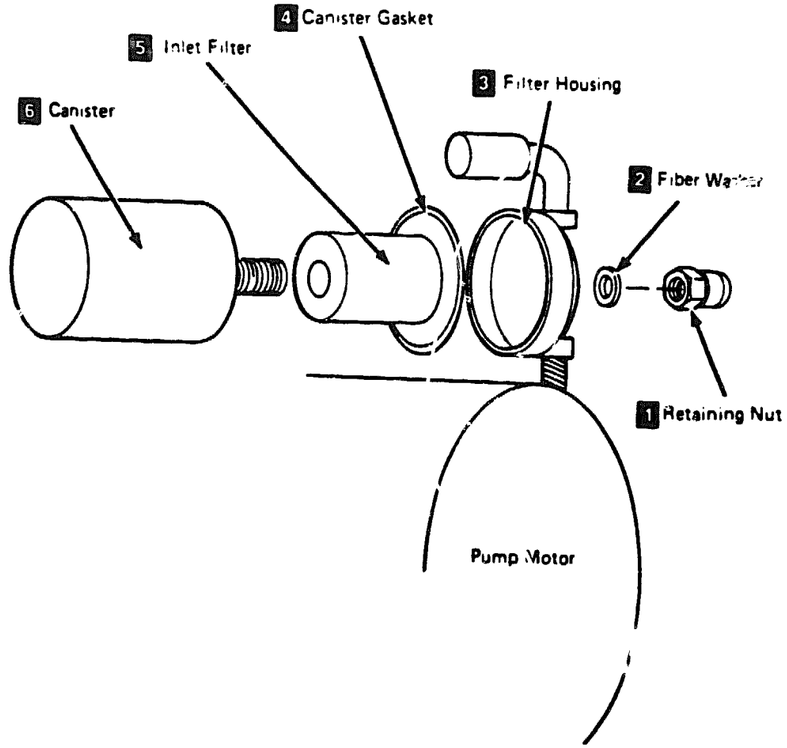
5. Remove and discard the canister gasket 4 and the inlet filter 5 from the canister.
6. Save the canister for use with the replacement inlet filter.

Replacing the Inlet Filter

1. Remove any dirt from the bottom of the canister 6.
2. Slide the inlet filter 5 into the canister.
3. Install canister gasket 4 in the filter housing 3.
4. Slide the canister and the inlet filter into the top of the filter housing 3.

   Note: Do not lose the fiber washer 2 on top of the filter assembly as the canister is being installed.

5. Install and tighten the retaining nut 1. Do not over tighten.
6. Install the tape transport unit front safety cover (see CARR-DR 2-2).
7. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



FRU034 Air Pressure Hose Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the air pressure hose assembly from either drive in the tape transport unit.

The air pressure hose assembly connects from the air pressure regulator output tee to the pressure system in each drive. Since this air pressure regulator output tee provides air pressure for both drives, it is necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Air Pressure Hose Assembly

1 Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.

From the front of the tape transport unit:

2 Remove the tape transport unit front safety cover (see CARR-DR 2-1).

3 Remove the hose clamp holding the air pressure hose assembly 2 to the air pressure regulator output tee 3.

4 Pull the air pressure hose assembly off the air pressure regulator output tee

5 Remove the clamp from the hose and save for the replacement procedure.

6 Open both drive drawers (see CARR-DR 2-1).

From the rear of the tape transport unit:

7 Open and remove the rear tape transport unit cover (see CARR-DR 2-1).

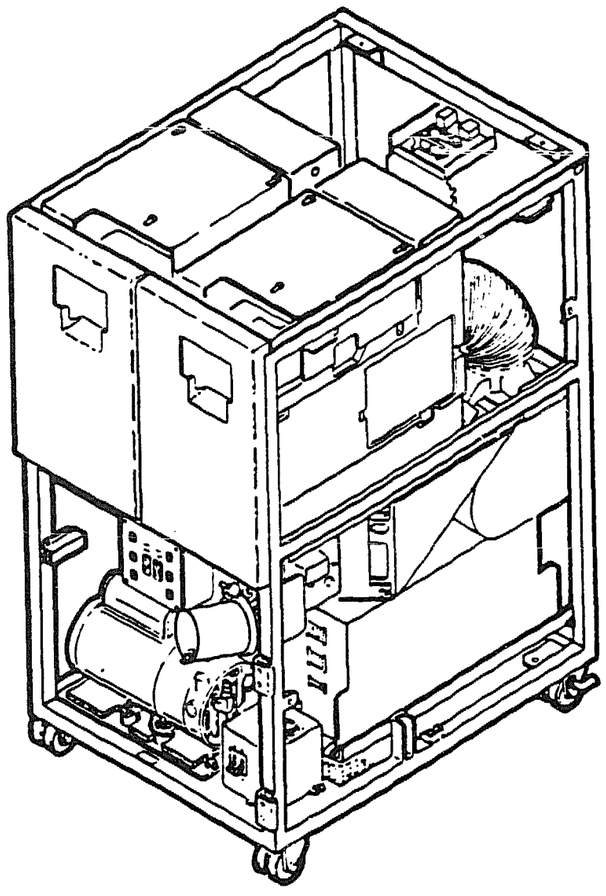
8. At the rear panel of each drive, loosen the hose clamps of the air pressure hose assembly. (At each drive drawer the assembly is connected to the fitting labeled 'Air'.)

9. Pull the air pressure hose assembly off the pressure fittings 1.

10. Carefully pull the hose through the access hose in the front of the cable plenum 4.

11. Unlace the air pressure hose assembly from the cable harness.

12. Remove the hose from the tape transport unit.



Replacing the Air Pressure Hose Assembly

1. Inspect the replacement hose for contamination or damage.

2. Open both drive drawers (see CARR-DR 2-1).

From the rear of the tape transport unit:

3. Slide the end of the air pressure hose assembly 2 through the access hole in the cable plenum 4 to the front of the tape transport unit.

4. Route the air pressure hose assembly along same path as the defective assembly to the rear panel of the drive drawers.

5. Install the ends of the air pressure hose assembly 2 onto the fittings labeled 'Air' on the rear panel of the drive drawers 1, then install the hose clamps.

6. Lace the air pressure hose assembly to the cable harness going to the rear panel of each drive drawer.

7. Install the rear cover and ground connector (see CARR-DR 2-2).

From the front of the tape transport unit:

8. Close both drive drawers (see CARR-DR 2-5).

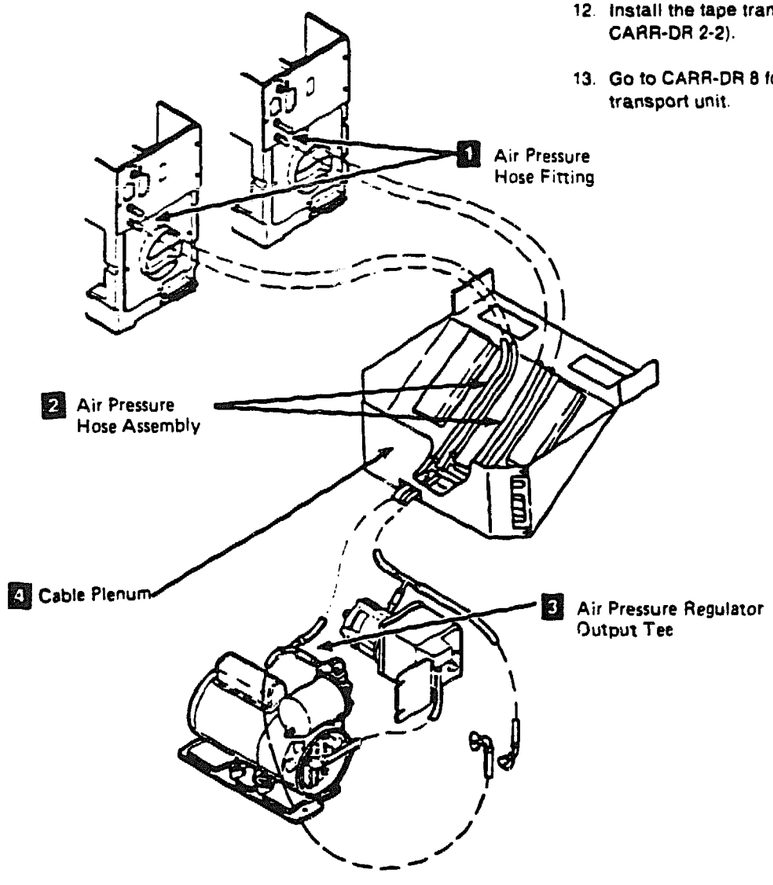
9. Install the air pressure hose assembly onto the air pressure regulator tee 3, then install the hose clamp.

10. Check for air leaks at each end of the replaced air pressure hose assembly.

11. Close both drive drawers.

12. Install the tape transport unit front safety cover (see CARR-DR 2-2).

13. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



FRU035 Vacuum Hose Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the vacuum hose assembly from the tape transport unit.

The vacuum hose assembly connects from the input filter tee to the vacuum system in each drive. Since this input filter tee provides vacuum for both drives, it is necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Vacuum Hose Assembly

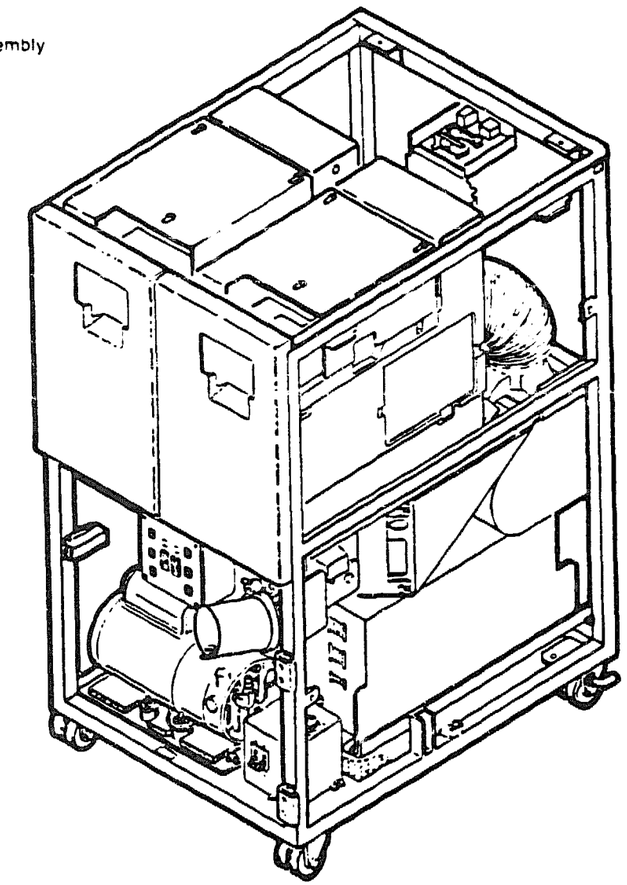
1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.

From the front of the tape transport unit:

2. Remove the tape transport unit safety cover (see CARR-DR 2-1).
3. Remove the hose clamp holding the vacuum hose assembly 2 to the input filter tee 3.
4. Pull the vacuum hose assembly off the input filter tee.
5. Remove the clamp from the hose.

From the rear of the tape transport unit:

6. Open both drive drawers (see CARR-DR 2-1).
7. Carefully pull the hose through the access hose in the front of the cable plenum 4.
8. Open and remove the rear tape transport unit cover (see CARR-DR 2-1).
9. At the rear panel of each drive, loosen the hose clamps of the vacuum hose assembly 2. (At each drive drawer the assembly is connected to the fitting labeled 'Vacuum'.)
10. Pull the vacuum hose assembly off the vacuum fittings 1.
11. Unlace the vacuum hose assembly from the cable harness.
12. Remove the vacuum hose assembly from the tape transport unit.

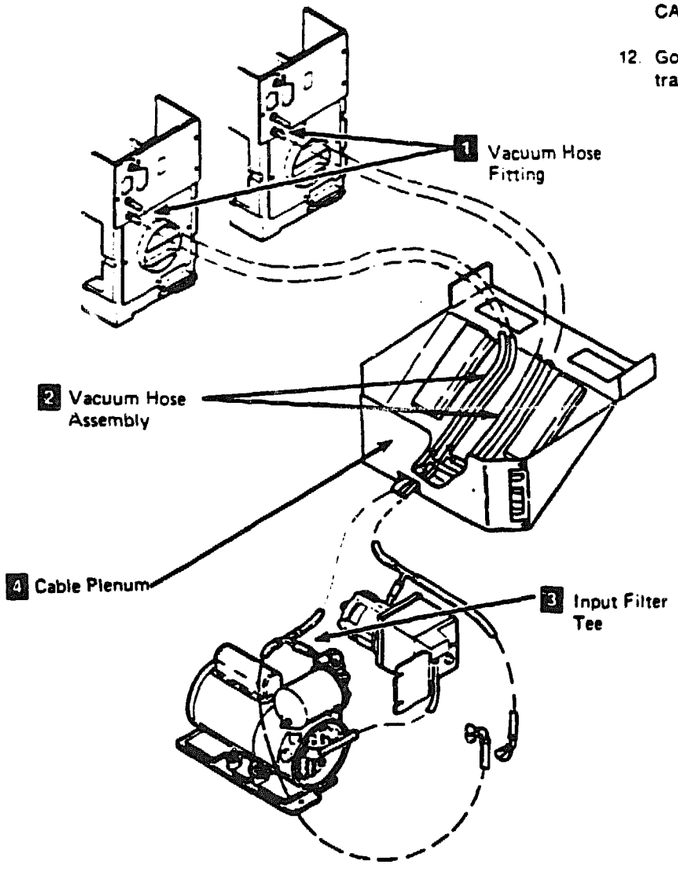


Replacing the Vacuum Hose Assembly

1. Inspect the replacement hose for contamination or damage.
2. Open both drive drawers (see CARR-DR 2-1).

From the rear of the tape transport unit:

3. Slide the end of the vacuum hose assembly 2 through the access hole in the cable plenum 4 to the front of the tape transport unit.
4. Route the vacuum hose assembly along the same path as the defective assembly to the rear panel of the drive drawers.



5. Install the ends of the vacuum hose assembly 2 onto the fittings labeled 'Vacuum' 1 on the rear panel of the drive drawers, then install the hose clamps.
6. Lace the vacuum hose assembly to the cable harness going to the rear panel of each drive drawer.
7. Replace the rear cover and ground connector (see CARR-DR 2-2).

From the front of the tape transport unit:

8. Install the vacuum hose assembly onto the input filter tee 3; then install the hose clamp.
9. Close both drive drawers.
10. Check for air leaks at each end of the replaced vacuum hose assembly.
11. Install the tape transport unit front safety cover (see CARR-DR 2-2).
12. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.

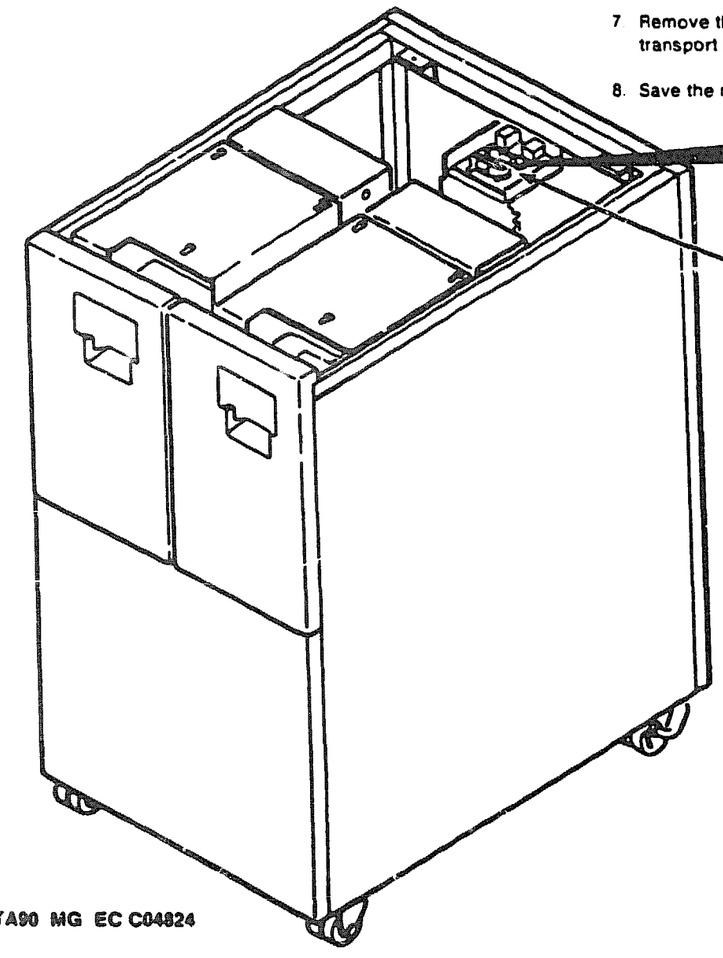
FRU036 External Load Resistor Panel Removal and Replacement Procedure

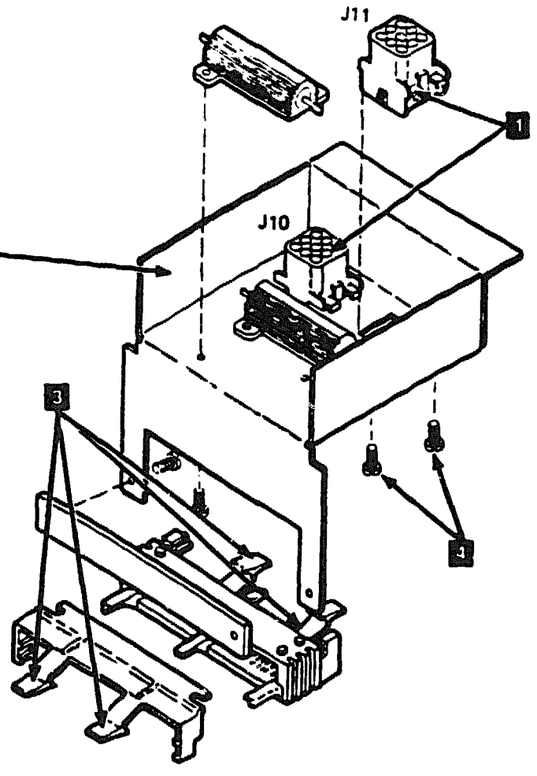
This page contains the steps needed to remove and replace the external load resistor panel (TU-EL) from the tape transport unit. The external load resistor panel is attached to the upper rear machine frame. Since this assembly provides voltage for both operator display panels, it is necessary to have both tape drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the External Load Resistor Panel

1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.
2. Open the rear cover (see CARR-DR 2-1).
3. Disconnect cable plugs P10 and P11 [1] from connectors J10 and J11 located or the bottom of external load resistor panel [2] (cable support panel, if the tape transport unit has power supply part number 6177166 or 6177167 installed).
4. Release the SLT cable retaining latch [3] and unplug the two SLT cables from the front of the SLT connector panel. (These cables go to the operator display panels.)
5. Release the SLT cable retaining latch [3] and unplug the two SLT cables from the rear of the SLT connector panel. (These cables go to the drive logic board.)
6. Hold the external load resistor panel assembly and remove the two mounting screws [4].
7. Remove the external load resistor panel from the tape transport unit.
8. Save the mounting screws for the replacement procedure.





Replacing the External Load Resistor Panel

1. Install the external load resistor panel assembly [2] (cable support panel, if tape transport unit has power supply part number 6177166 or 6177167 installed) on the tape drive frame, using the two screws [4] saved from the removal procedure.
2. Connect the two SLT cables from the operator panels to the front of the SLT connector panel and latch into place [3].
3. Connect the two SLT cables from the logic drive board to the rear of the SLT connector panel and latch into place [3].
4. Connect cables plugs P10 and P11 [1] to connectors J10 and J11 located on the bottom of external load resistor panel [2] (cable support panel, if the tape transport unit has power supply part number 6177166 or 6177167 installed).
5. Close the rear cover (see CARR-DR 2-2).
6. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.

FRU039 Plenum Supply Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the plenum supply hose 2 from the tape transport unit. Because the air pressure is used by both drives, it is necessary to clamp off the air supply going to the failing drive.

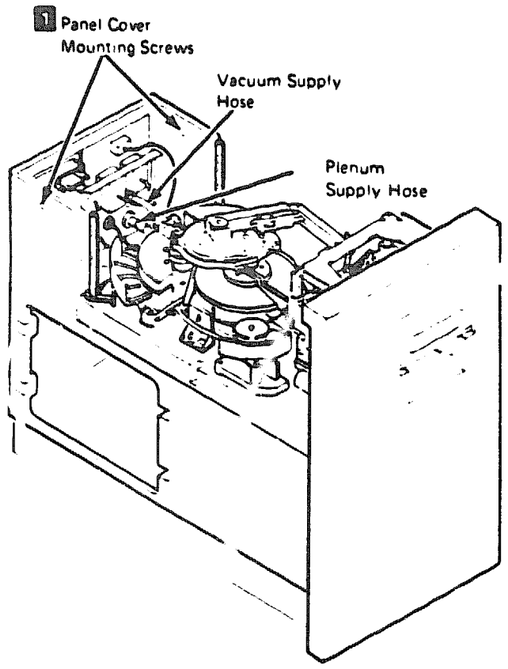
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

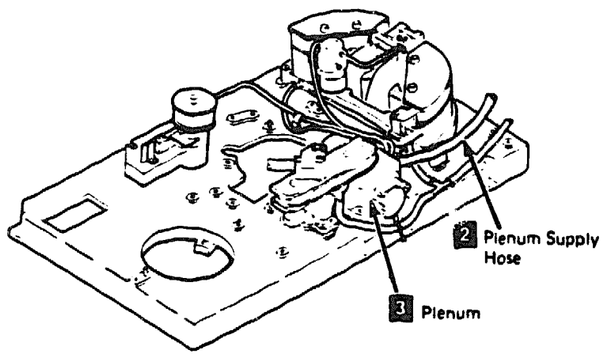
Removing the Plenum Supply Hose

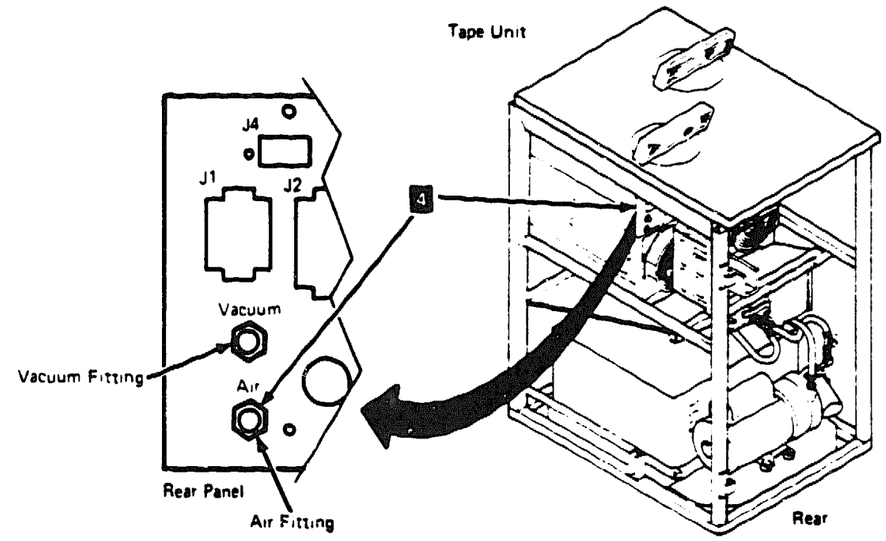
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the rear cover of the drive requiring service (see CARR-DR 2-3).
3. Locate the Air Pressure hose 4 at the point where it attaches to the rear panel of the drive drawer on the drive you are servicing.
4. Using the clamping tool 5, clamp off the air going into the failing drive. Ensure that the hose does not separate from the rear panel before it is clamped.
5. Open the drive drawer on the drive requiring service.
6. Remove the drive safety cover (see CARR-DR 2-5).
7. Remove the panel cover mounting screws 1 and the panel cover.
8. Loosen the plenum supply hose clamp and remove the plenum supply hose 2 from the pressure fitting. Save the plenum supply hose clamp to be used on the replacement hose.
9. Disconnect the other end of the plenum supply hose 2 from the plenum 3 and remove the hose from the drive.

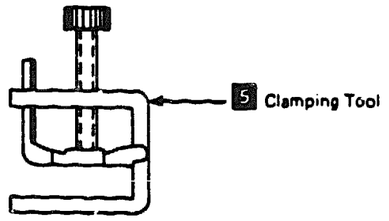
Replacing the Plenum Supply Hose

1. Connect one end of the plenum supply hose 2 to the plenum 3. Place the hose in position, going to the rear panel.
2. Slide the hose clamp on to the plenum supply hose. Slide the hose on to the pressure fitting 4 and install the hose clamp.
3. Install the panel cover and the two mounting screws 1.
4. Install the drive safety cover (see CARR-DR 2-5).
5. Ensure that the Air Pressure hose is securely attached to the rear panel of the drive, then remove clamping tool 5.
6. Close the rear cover of the tape drive (see CARR-DR 2-3).
7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.









FRU040 Pressure Sensor Removal and Replacement Procedure

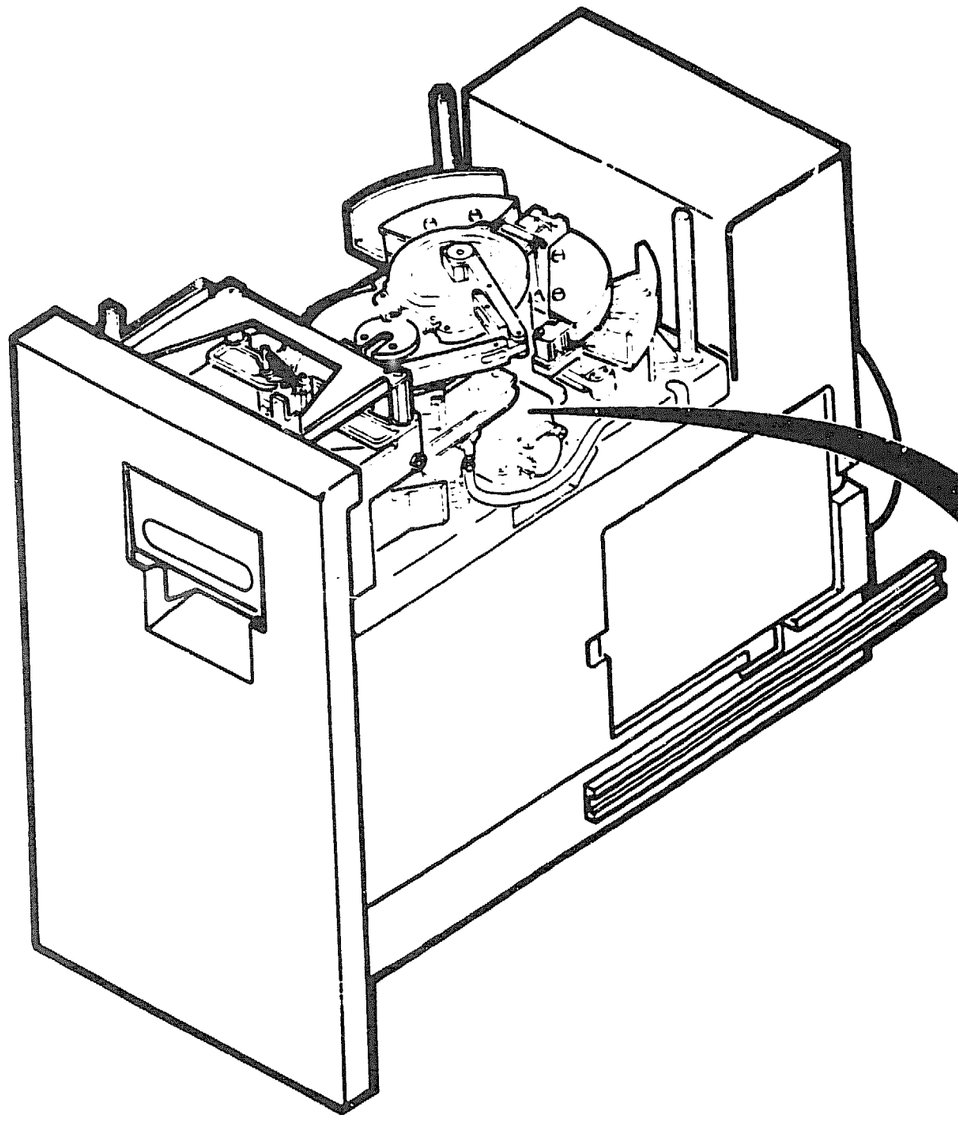
This page contains the steps needed to remove and replace the pressure sensor (TU-DK-Pressure Sensor) from the plenum assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Pressure Sensor Assembly

1. Go to CARR-DR 8 for the procedure to *power off* the drive
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1)

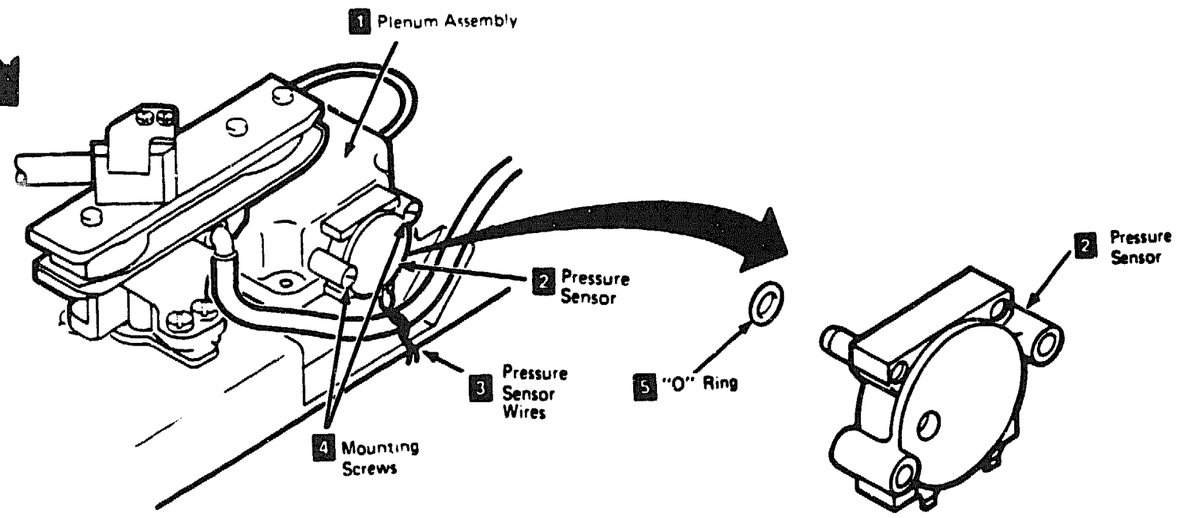
   The pressure sensor is mounted on the plenum assembly 1, which is located on the right side of the drive, in the center.



4. Disconnect the two pressure sensor wires 3 from the pressure sensor 2

   Warning: There is a small "O" ring 5 on the rear of the sensor. Be careful not to lose it.

5. Remove the two mounting screws 4 holding the sensor to the plenum 1 and remove the sensor.



Replacing the Pressure Sensor Assembly

1. Place the "O" ring 5 on the pressure sensor 2
2. Place the pressure sensor and "O" ring in position on the plenum assembly 1 and install the two mounting screws 4
3. Connect the two sensor wires 3 to the sensor terminals.
4. Remove the clamp from the plenum supply hose.
5. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
6. Go to CARR-DR 8 for the procedure to *power on* the drive

FRU041 Plenum Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the plenum assembly 7 in the drive. The replacement plenum assembly will have a new pressure sensor mounted on it, so it is not necessary to remove the pressure sensor.

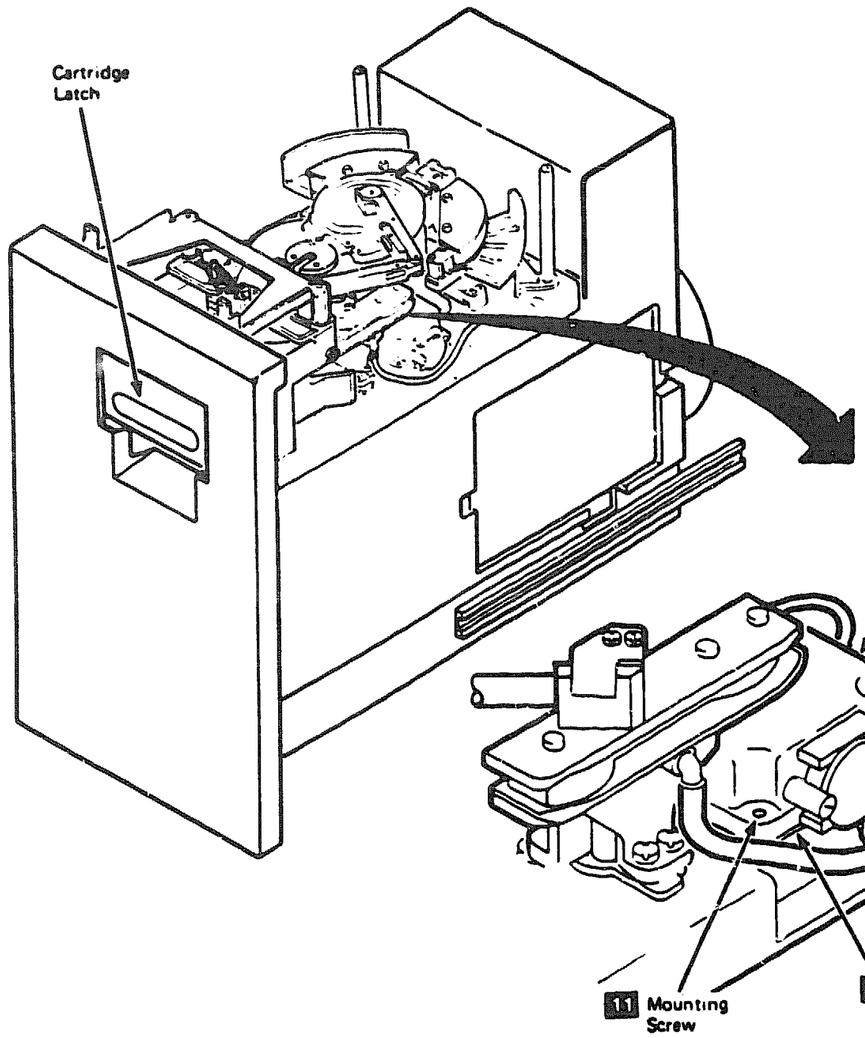
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Plenum Assembly

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).

   The plenum assembly 7 is located on the right side of the drive, in the center.
4. Disconnect the two pressure sensor wires 9 from the pressure sensor 8.
5. Disconnect all of the hoses from the plenum.

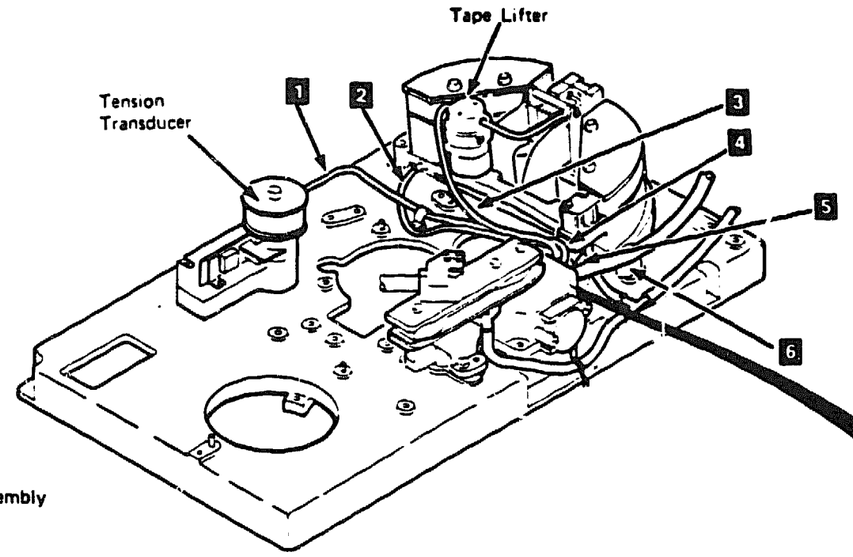
   Warning: Be careful not to damage the gasket 10 under the plenum. It is used for reinstallation of the plenum.
6. Remove the four plenum mounting screws 11. Lift the plenum assembly off the baseplate.



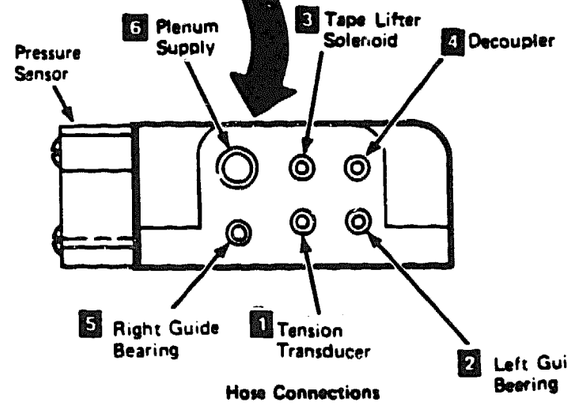
Replacing the Plenum Assembly

1. Place the plenum 7 and gasket 10 in position on the baseplate.
2. Install the four mounting screws 11.
3. Connect the two pressure sensor wires 9 to the pressure sensor 8.
4. Connect the hoses to the plenum.
   a. Connect the left guide bearing hose 2.
   b. Connect the tension transducer hose 1.
   c. Connect the right guide bearing hose 5.
   d. Connect the decoupler pressure hose 4.
   e. Connect the tape lifter solenoid input hose 3.
   f. Connect the plenum supply hose 6.

   Note: Ensure that the two wires to the threader motor have not been loosen or damaged.
5. Remove the clamp from the plenum supply hose.
6. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
7. Go to CARR-DR 8 for the procedure to *power on* the drive.



Pnuematic Hose Routing



Hose Connections to the Plenum

FRU042 Decoupler Pressure Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the decoupler pressure hose [2] from the drive

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Decoupler Pressure Hose

1 Go to CARR-DR 8 for the procedure to *power off* the drive.

2 Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)

3 Clamp the plenum supply hose (see CARR-DR 3-1)

4 Disconnect the decoupler pressure hose [2] from the plenum [1]

5 Disconnect the other end of the decoupler pressure hose from the decoupler [3] and remove it from the drive.

Replacing the Decoupler Pressure Hose

1 Connect one end of the decoupler pressure hose [2] to the decoupler [3]

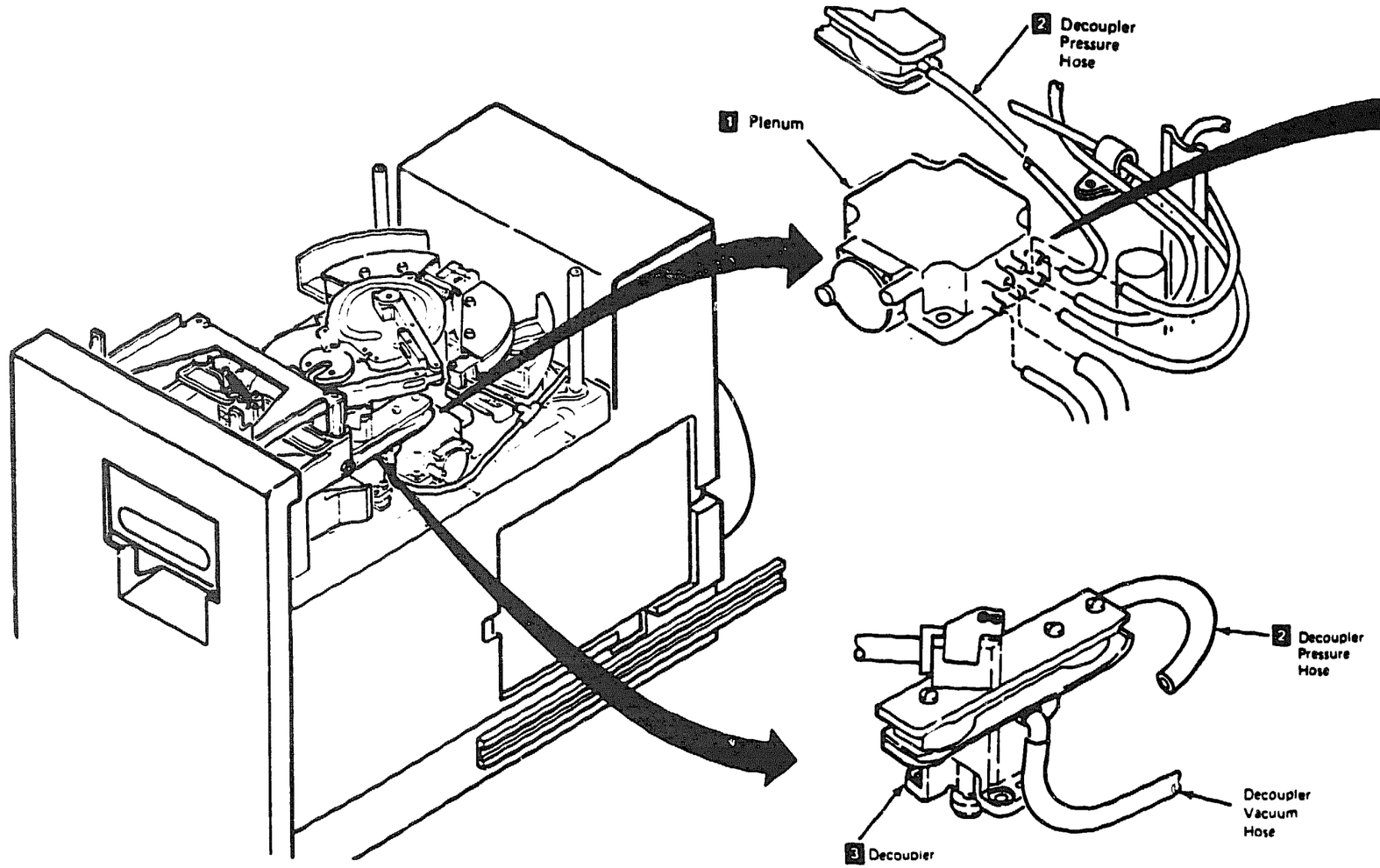
2 Connect the other end of the decoupler pressure hose to the plenum [1]

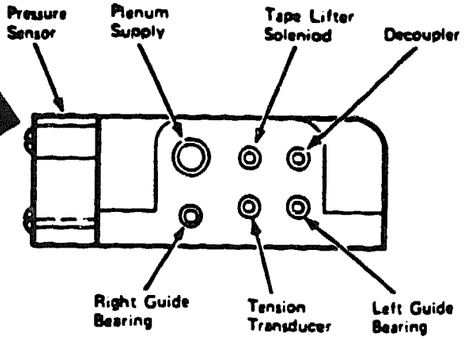
3 Remove the clamp from the plenum supply hose

Note: Ensure that the two wires to the threader motor have not been loosen or damaged

4 Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.

5. Go to CARR-DR 8 for the procedure to *power on* the drive.





Hose Connections to the Plenum

FRU043 Decoupler Vacuum Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the decoupler vacuum hose [3] from the decoupler [4].

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Decoupler Vacuum Hose

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive.

2 Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).

3 Disconnect the decoupler vacuum hose [3] from the vacuum distribution tee [2].

4 Disconnect the other end of the decoupler vacuum hose from the decoupler [4] and remove it from the drive.

Replacing the Decoupler Vacuum Hose

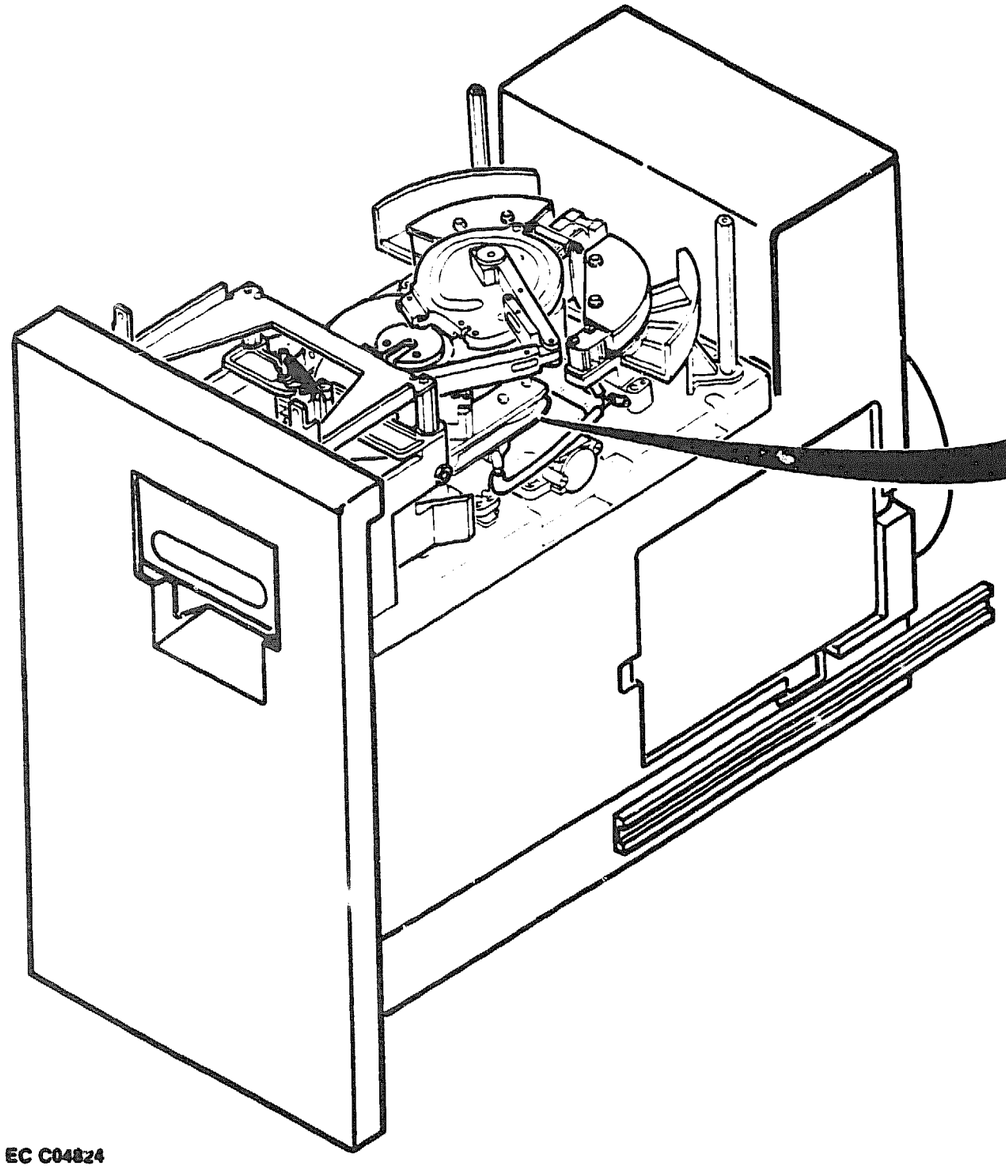
1 Connect the decoupler vacuum hose [3] to the decoupler [4].

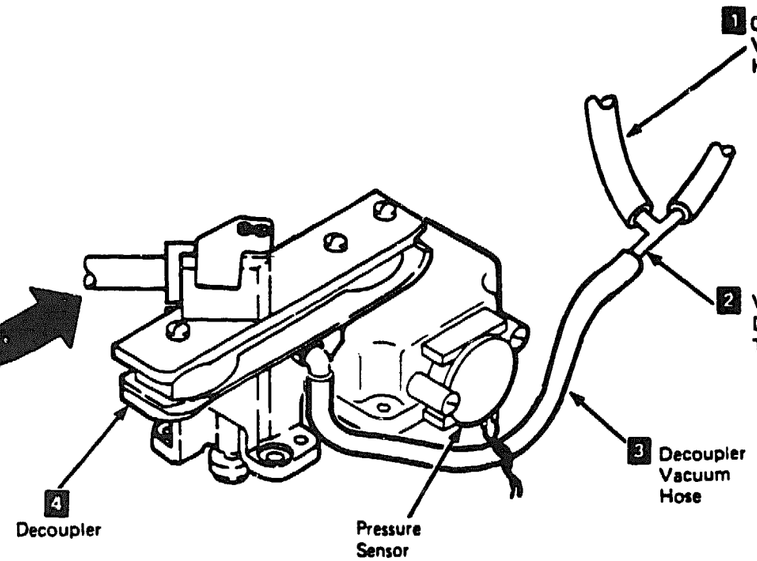
2. Connect the other end of the decoupler vacuum hose to the vacuum distribution tee [2].

   Ensure that the cleaner vacuum hose [1] is connected to the cleaner assembly.

3 Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.

4 Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU044 Right Guide Bearing Hose Removal Procedure

This page contains the steps needed to remove the right guide bearing hose 3 from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

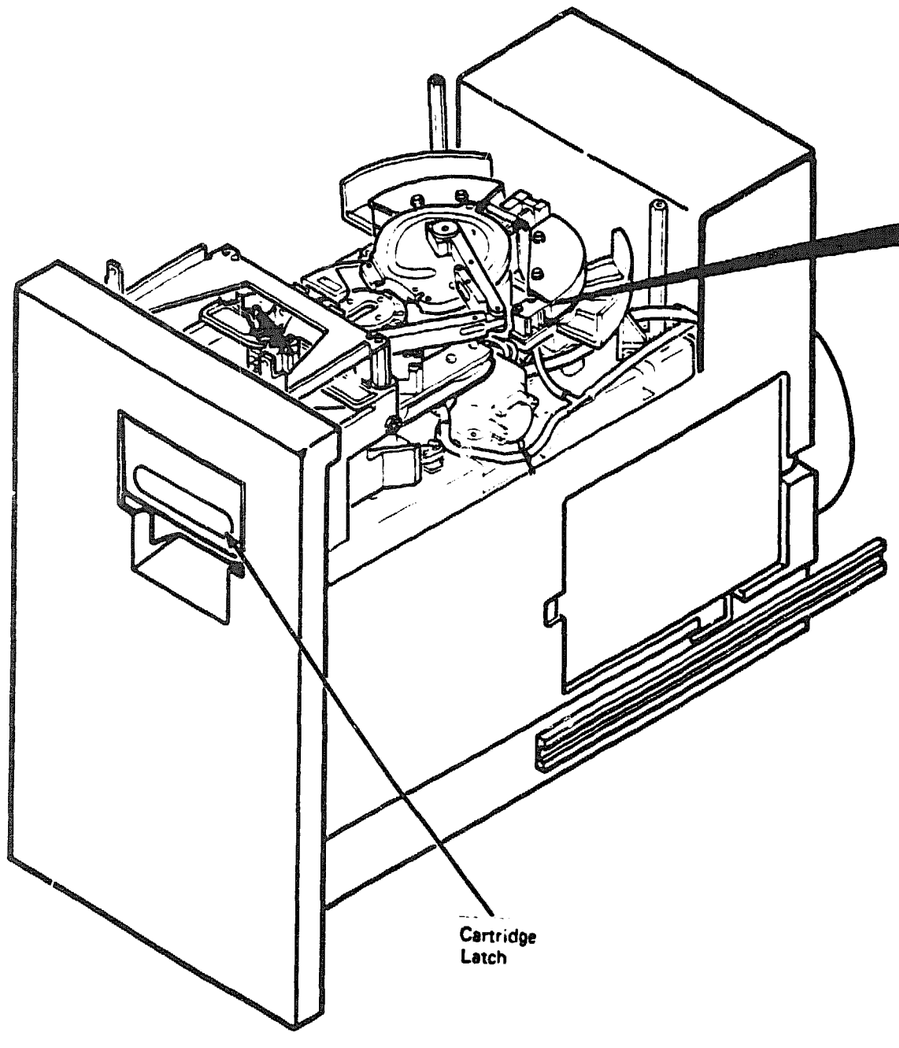
Removing the Right Guide Bearing Hose

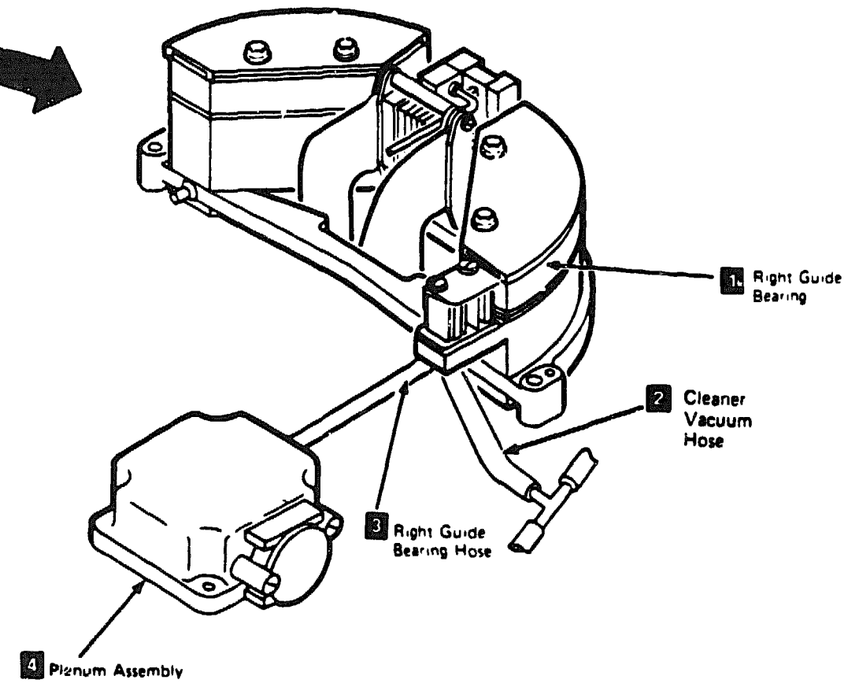
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. Disconnect the right guide bearing hose 3 from the right guide bearing 1.
5. Disconnect the other end of the right guide bearing hose from the plenum assembly 4 and remove it from the drive.

Replacing the Right Guide Bearing Hose

1. Connect the right guide bearing hose 3 to the right guide bearing 1.
2. Connect the other end of the right guide bearing hose to the plenum assembly 4.

   Ensure that the cleaner vacuum hose 2 is connected to the cleaner assembly.
3. Remove the clamp from the plenum supply hose.
4. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
5. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU045 Left Guide Bearing Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the left guide bearing hose 1 in the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Left Guide Bearing Hose

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. Disconnect the left guide bearing hose 1 from the left guide bearing 2.
5. Disconnect the other end of the left guide bearing hose 1 from the plenum assembly 3 and remove it from the drive.

Replacing the Left Guide Bearing Hose

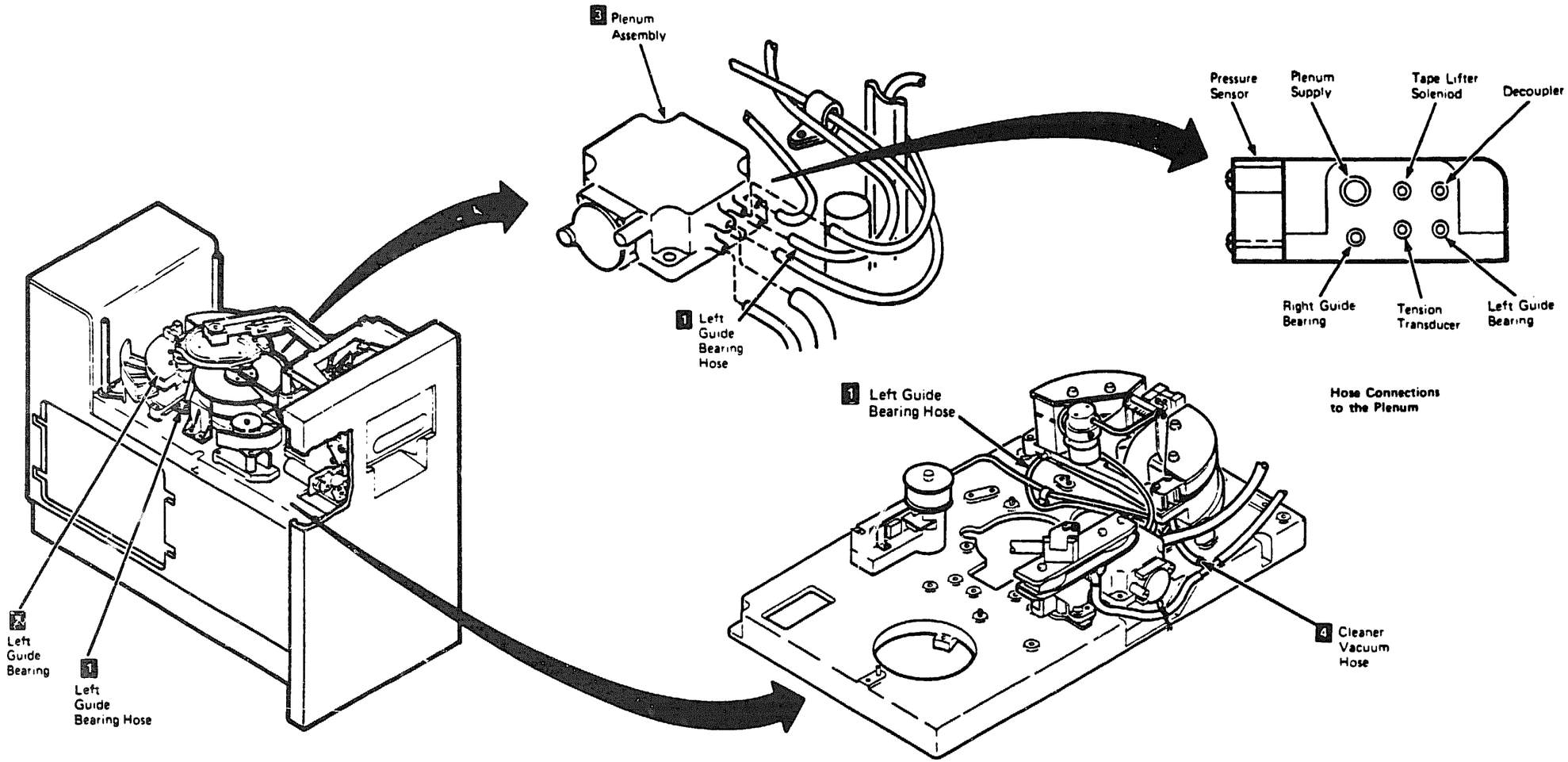
1. Connect the left guide bearing hose 1 to the left guide bearing 2.

   Place the hose through the threader assembly base to the plenum assembly 3.

2. Connect the other end of the left guide bearing hose 1 to the plenum.

   Ensure that the cleaner vacuum hose 4 is connected to the cleaner assembly.

3. Remove the clamp from the plenum supply hose.
4. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
5. Go to CARR-DR 8 for the procedure to ***power on*** the drive



FRU046 Tension Transducer Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tension transducer hose 1 in the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Tension Transducer Hose

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. Disconnect the tension transducer hose 1 from the tension transducer 4.

   For ease of removal of the tension transducer hose, you should remove the tape lifter solenoid hose and the decoupler hose.
5. Disconnect the other end of the tension transducer hose from the plenum assembly 2 and remove it from the drive.

   Note: Notice the routing of the tension transducer hose (through the threader assembly base).

Replacing the Tension Transducer Hose

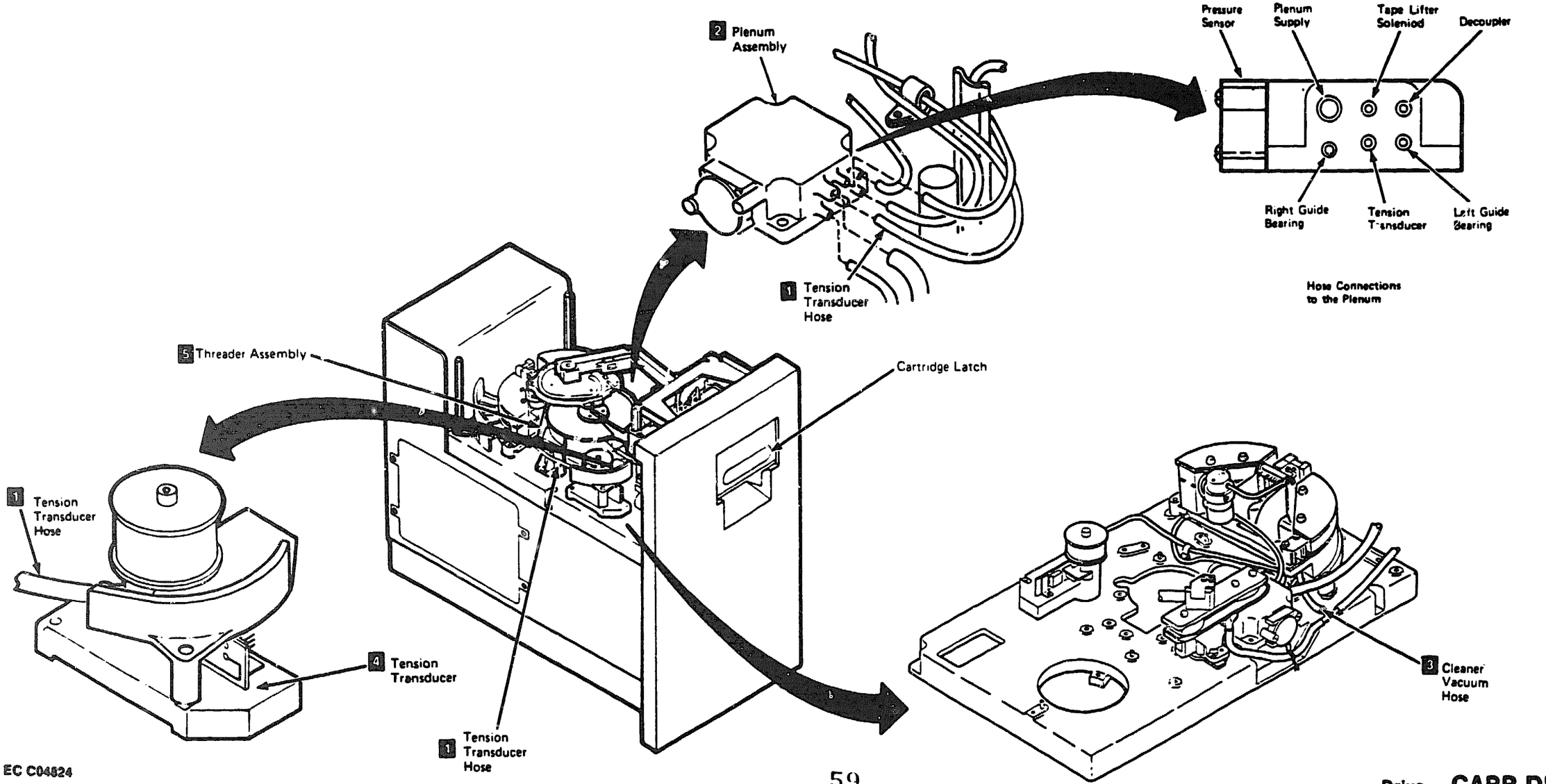
1. Connect the tension transducer hose 1 to the tension transducer 4.

   Place the hose through the threader assembly 5 base, to the plenum assembly 2.
2. Connect the other end of the tension transducer hose to the plenum assembly 2.

   Replace the tape lifter solenoid hose and the decoupler hose if they were removed during the removal procedure.

   Ensure that the cleaner vacuum hose 3 is connected to the cleaner assembly.
3. Remove the clamp from the plenum supply hose.

   Note: Ensure that the two wires to the threader motor have not been loosened or damaged.
4. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
5. Go to CARR-DR 8 for the procedure to *power on* the drive.



TA90 MG EC C04824

FRU047 Cleaner Vacuum Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cleaner vacuum hose [3] in the drive.

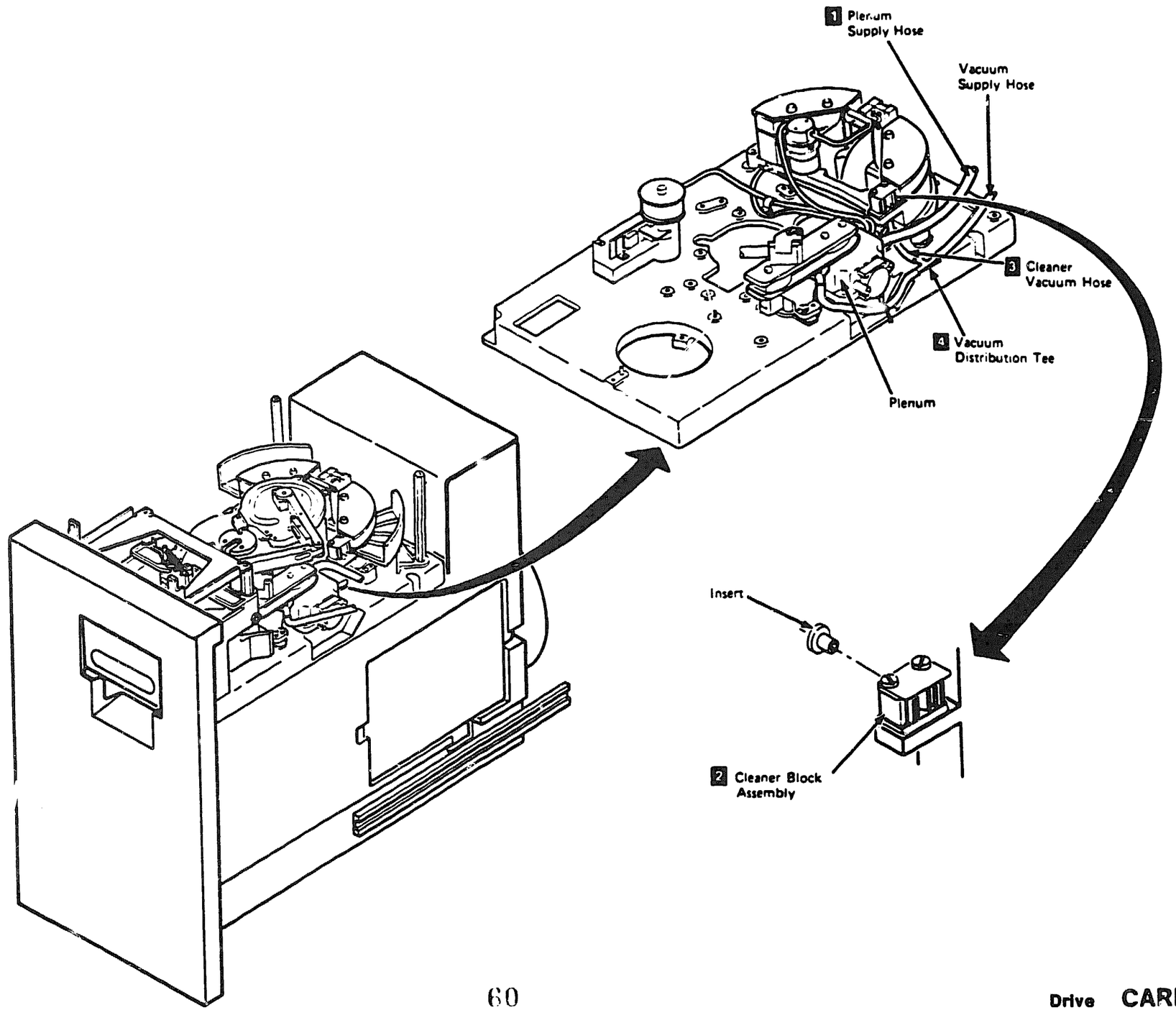
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Cleaner Vacuum Hose

1. Go to CARR-DR 8 for the procedure to *power off* the drive
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)
3. Disconnect the cleaner vacuum hose [3] at the vacuum distribution tee [4]
4. Disconnect the other end of the cleaner vacuum hose at the connector on the bottom of the cleaner block assembly [2].
5. Remove the cleaner vacuum hose [3] from the drive

Replacing the Cleaner Vacuum Hose

1. Connect one end of the cleaner vacuum hose [3] to the connector on the bottom of the cleaner block assembly [2].
2. Route the cleaner vacuum hose under the plenum supply hose [1]
3. Connect the other end of the cleaner vacuum hose to the vacuum distribution tee [4].
4. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
5. Go to CARR-DR 8 for the procedure to *power on* the drive.



Drive Cables Removal and Replacement Procedure

This page contains general guidelines for removing and replacing drive cables. Any of the cables listed on CARR-DR 491 can be removed and replaced using these procedures.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-DR 1-9 for "Instructions For Working With ESD-Sensitive Parts."

Note: The FRUs marked with an asterisk (*) on CARR-DR 491 require the ac power to be removed from the tape control unit and all attached tape transport units with the ac tape control unit circuit breaker. Removal of those FRUs requires the entire subsystem be available for service. Any FRU not marked with an asterisk (*) can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with that tape transport unit ac power circuit breaker.

Removing Tape Transport Unit Cables

1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.
2. Find the cable "from" and "to" locations using the table beginning on CARR-DR 491.
3. To remove the cables from the tape transport unit, it may be necessary to remove some, or all of the following:
   - Logic card cover 1.
   - Logic card retainers 4.
   - Top card connectors (TCC's) 3.
   - Top card cable connectors.
   - Center support bracket 2.
   - Logic cards.
4. Disconnect both ends of the cable to be removed.
5. Remove any cable retention hardware as needed to remove the cable.
6. Remove the cable from the drive.

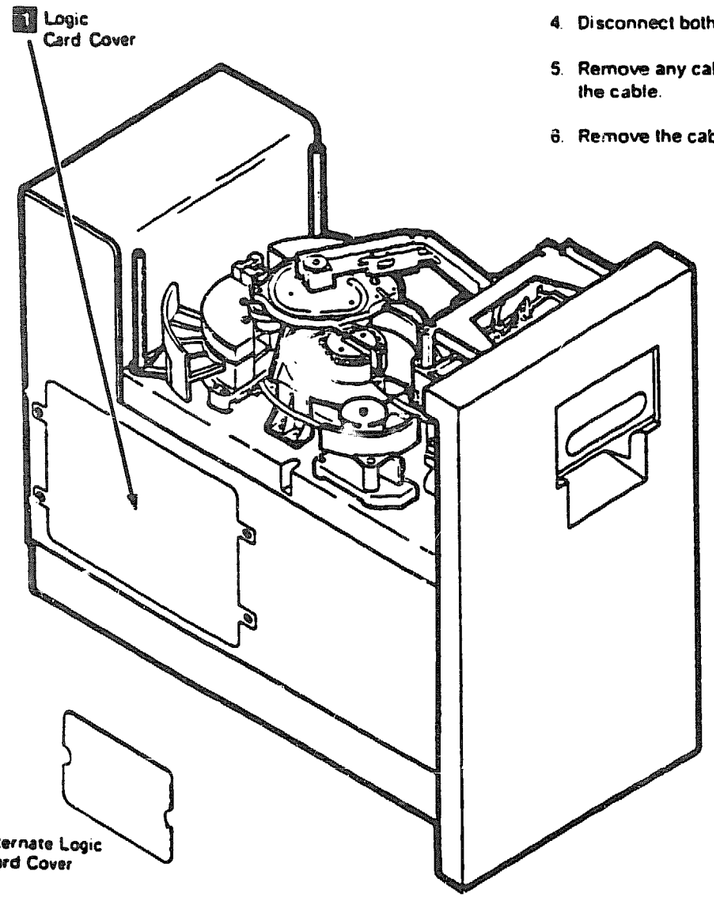
Replacing Tape Transport Unit Cables

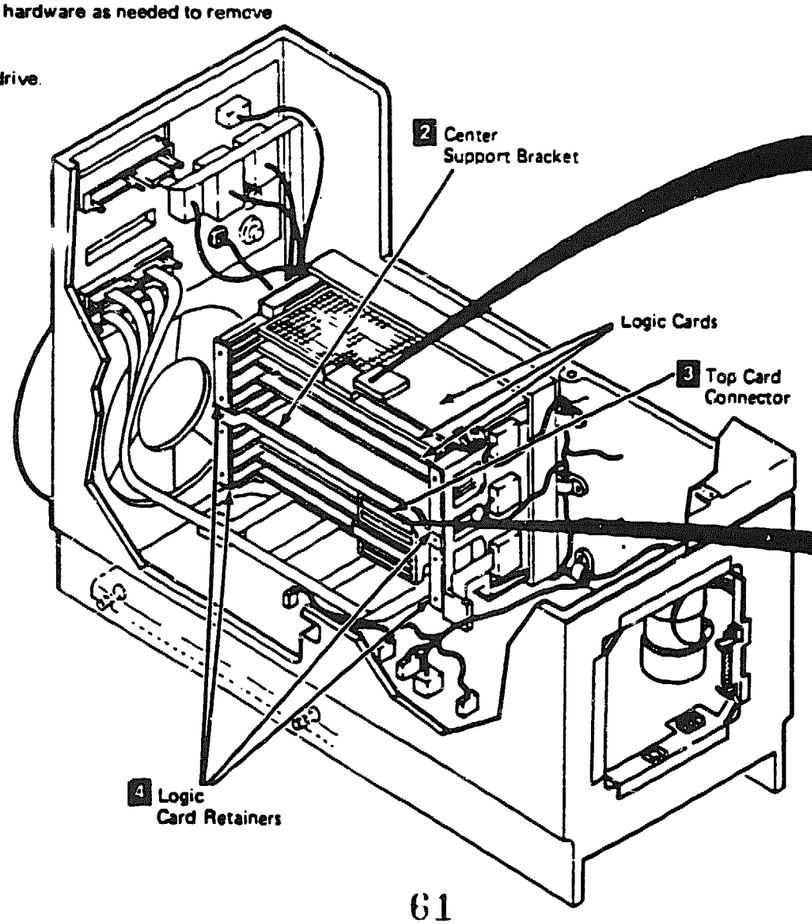
Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-DR 1-9 for "Instructions For Working With ESD-Sensitive Parts."

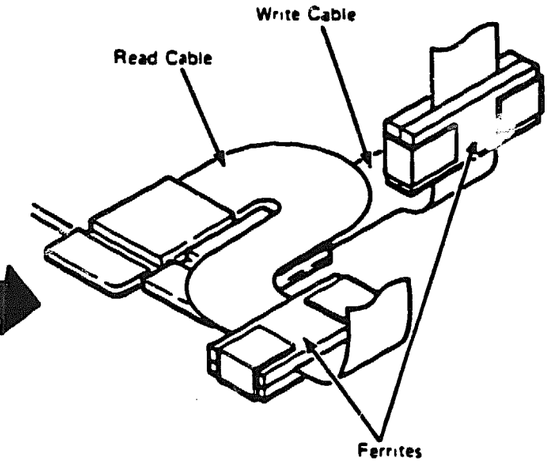
Find the cable "from" and "to" locations in the tables on CARR-DR 491.

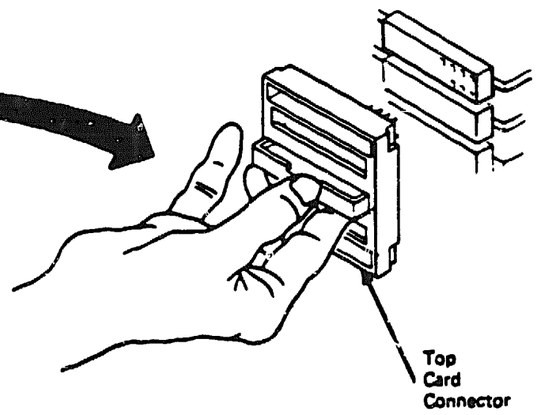
1. Place the cable in the drive following the same path as the previous cable.

   Install the cable retention hardware as you install the cable.
2. Connect both ends of the cable.
3. Install any of the following items that may have been removed:
   - Logic card cover 1
   - Logic card retainers 4
   - Top card connectors (TCC's) 3
   - Top card cable connectors.
   - Logic cards.
   - Center support bracket 2
4. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.









Drive Cables Location Chart

FRU	FRU NAME	FROM	Loc PAGE	TO	Loc PAGE
FRU023*	Write Cable Local/Remote TCU or Previous TU to Drive 0	P2WA1/WB1 in Previous TU or CU-P1-A/B2	75, 150 30, 150	TU-D0-02A-A2/A4	130, 150
FRU049	Logic Board to Power Amplifier J2 Cable	02A-A1Z1	130	TU-D0/1-PA-J2	125
FRU053*	Write Adapter Local/Remote Cable Drive 1 to P2 Panel	TU-D1-02A-A1-A3/A5	130, 150	TU-D1-P2WA1/WB1	75, 150
FRU055	Read Adapter Remote Cable from Tee 02A-A1G2 (WX)	TU-D0/1-RA(Tee)	120, 145	TU-D0/1-A1G2 (WX) (Left TCC)	130, 145
FRU057	Read Adapter Local Cable from Tee to 02A-A1G2 (YZ)	TU-D0/1-RB (Tee)	120, 145	TU-D0/1-A1G2 (YZ) (Right TCC)	130, 145
FRU073	Logic Board to Power Amplifier J1 Cable	02A-A1Y1	130	TU-D0/1-PA-J1	125
FRU174*	Write Adapter Remote Cable (Drive 0 to Drive 1)	TU-D0-02A-A1A5	130, 150	TU-D1-02A-A1A4	130, 150
FRU210	Message Display Cable (02A-A1Y2 to MD 00/01)	02A-A1Y2	130	Drive 0 - MD 00 Drive 1 - MD 01	75
FRU222*	Write Adapter Local Cable (Drive 0 to Drive 1)	TU-D0-02A-A1A3	130, 150	TU-D1-02A-A1A2	130, 150
FRU270	Interposer Signal Cable	02A-A1Y3	130	P1-J2	170

* See the Note on CARR-DR 490.

FRU054 Machine Reel Flange (Upper) Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel flange 2 (upper) from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

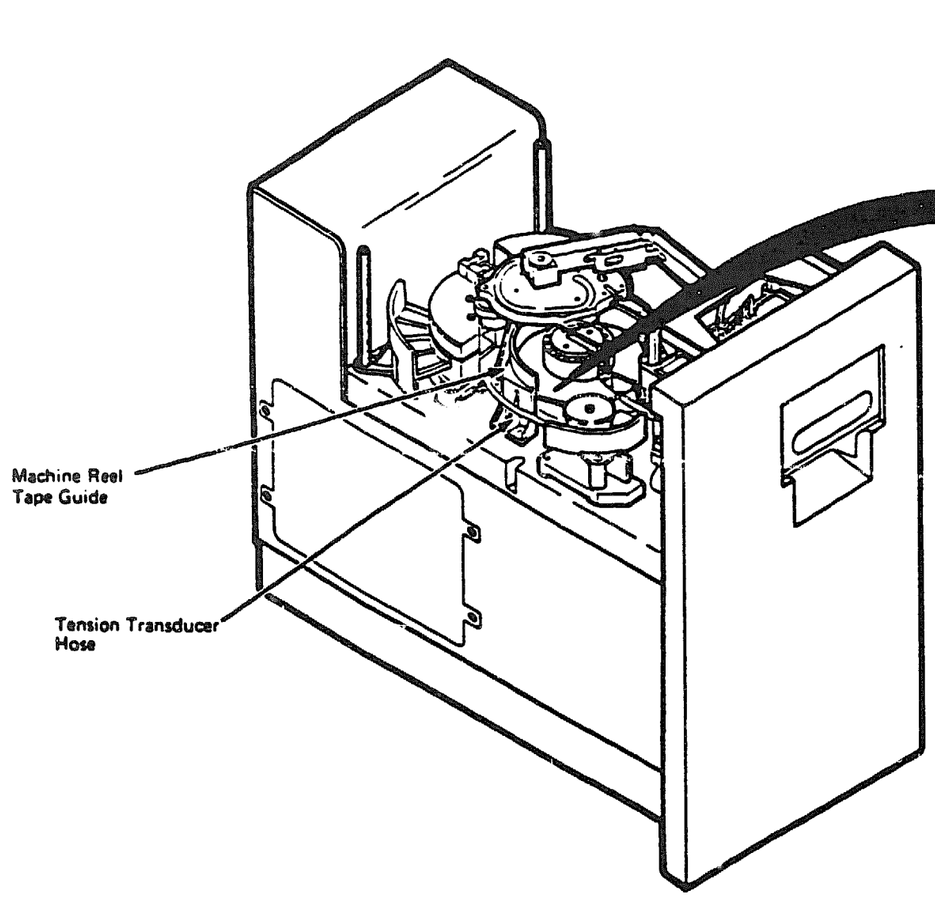
Removing the Machine Reel Flange (Upper)

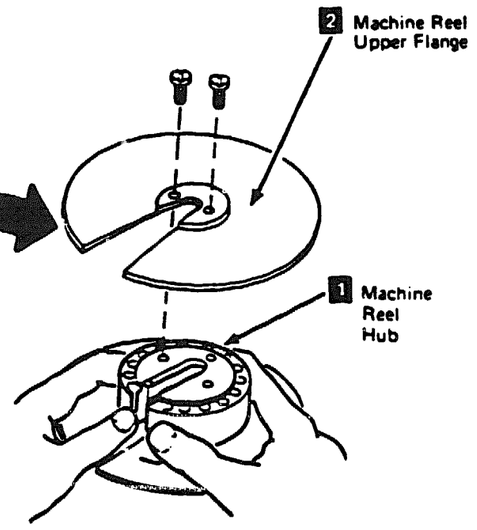
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)
3. Remove the two screws holding the machine reel upper flange 2 to the machine reel hub 1
4. Remove the machine reel flange (upper) from the drive

Replacing the Machine Reel Flange (Upper)

This page contains the steps needed to replace the machine reel upper flange in the drive.

1. Place the machine reel upper flange 2 in position on the machine reel hub 1.
2. Install the two screws holding the machine reel upper flange to the machine reel hub 1
3. Replace the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
4. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU058 Drive Logic Board (02A-A1) Removal and Replacement Procedure

This page contains the steps needed to remove and replace the logic board from the drive. The logic board is removed and replaced from the card side of the drive.

Warning: Some parts handled during this procedure are electrostatic sensitive (ESD). See CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."

Removing a drive logic board will require that the entire subsystem be available for service. The termination path of the write circuits is opened when removing a logic board.

Note: This FRU removal and replacement requires the ac power to be removed from the tape control unit and all attached tape transport units with the tape control unit ac power circuit breaker.

Removing the Drive Logic Board

Note: Although the component locations are documented (see LOC 1 for the card and TCC locations), you may want to put temporary labels on the components for your own convenience.

1. Go to CARR-TCU 6 for the procedure to remove the ***ac power*** from the tape control unit.
2. Open the drive drawer.
3. Remove the two pin side cover mounting screws 2 and the pin side cover 1.
4. Disconnect the six voltage connectors 3 from the pin side of the logic board. Also disconnect the connector for J2 P08.

   The power amplifier board is lowered in the next steps. This will give you more room to work inside the drive and make it easier to remove the logic board.
5. Support the power amplifier board 12 with one hand, and with the other, remove the two screws 8 holding the power amplifier in position.
6. Lower the power amplifier board slowly.
7. Remove the card side logic card cover 9.
8. Remove the eight screws holding the four card retainers 10 and remove the card retainers by pulling them straight out.

   Note: Some machines do not have Logic Card Retainers.
9. Remove the two screws holding the center support bracket 5 and remove the bracket.
10. Release the retainers and remove the two multi-colored read bus cables from the G2 card.

    Warning: Be careful not to bend the pins when removing the cables from the H2 and J4 cards.
11. Release the retainers, then lift up on the tabs and remove the cables 4 from the H2 and J4 cards.
12. Remove all of the top card connectors 7.
13. Remove all of the logic cards.
14. Remove the two screws holding the bottom support bracket 11 and remove the bracket.
15. Remove all of the cables from the A row of the logic board.
16. Disconnect the cables in the Y and Z rows of the logic board.
17. Remove the four screws holding the card guides 6 and the logic board.
18. Remove the screw holding the cable retaining clamp.
19. Remove the screw holding the thermal to the top of the right card guide.
20. Slide the card guides off the logic board and remove them from the drive.
21. Remove the logic board from the drive.

Replacing the Drive Logic Board

The logic board is replaced from the card side of the drive.

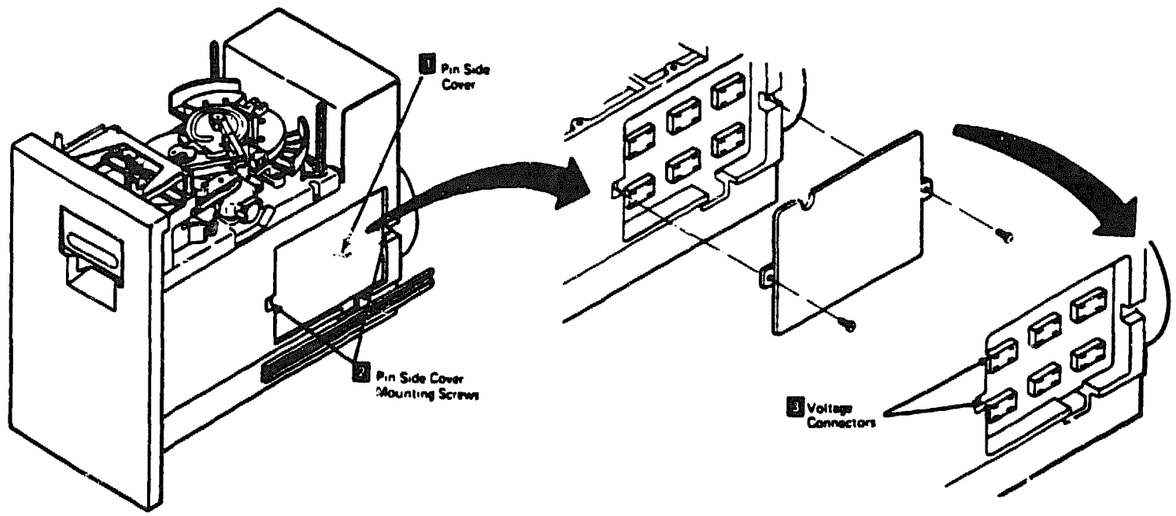
Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."

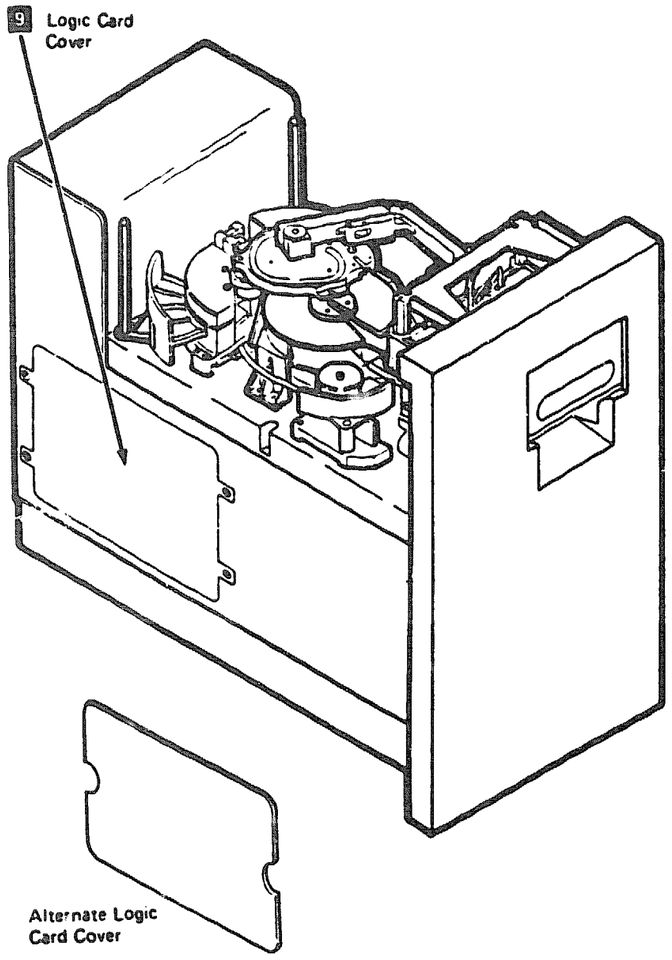
1. Place the logic board in the drive. Ensure that the board is placed with the printing facing the correct way, with the K row toward the top of the drive.
2. Slide the card guides 6 onto the logic board and install the four mounting screws.
3. Replace the screw holding the cable retaining clamp.
4. Replace the thermal and mounting screw in the upper most hole in the right card guide.
5. Connect the cables to the Y row of the logic board.
6. Connect the cables to the Z row of the logic board.
7. Connect the cables to the A row of the logic board.
8. Install the bottom support bracket 11 and the two mounting screws.
9. Install the logic cards, beginning with the J4 card.
10. Install the top card connectors 7.

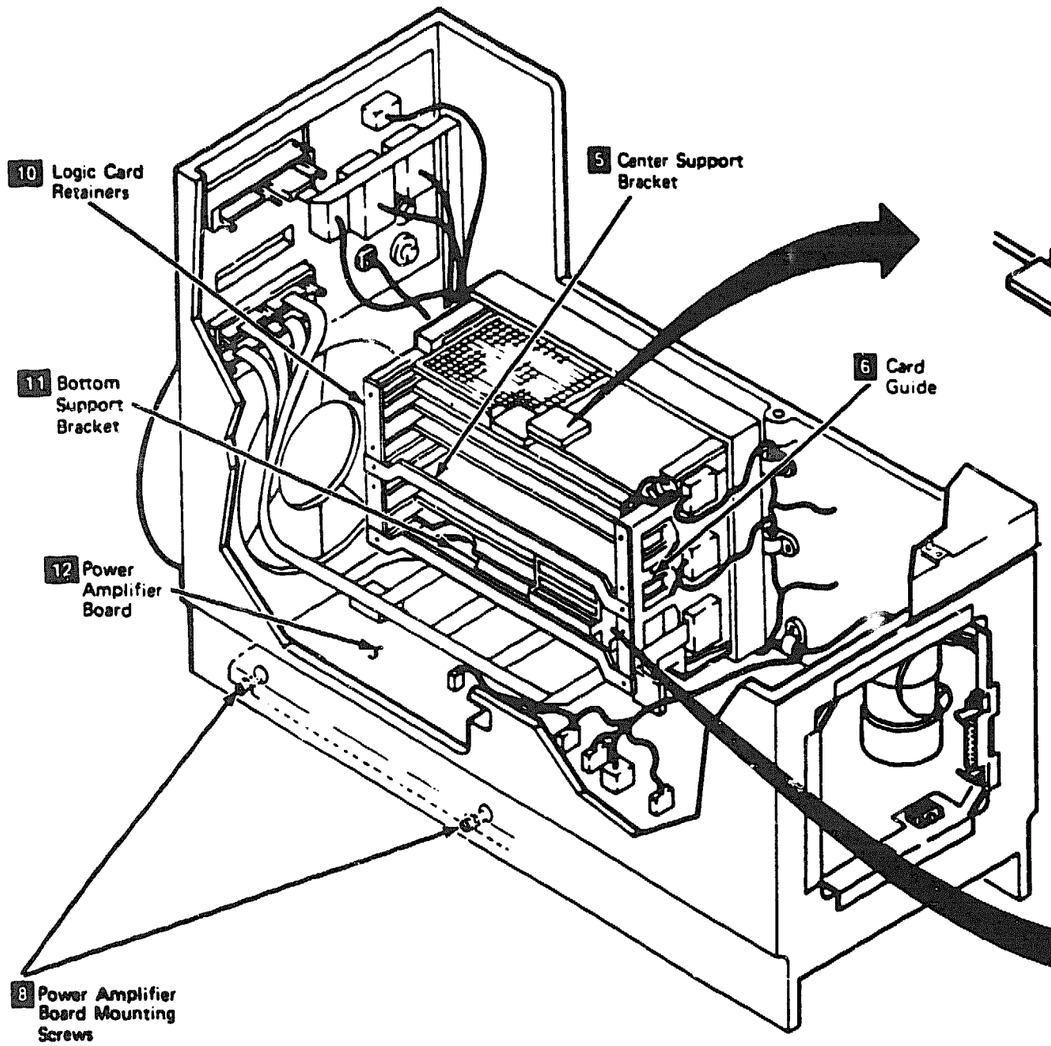
    Note: For top card connector (TCC) location see LOC 1.

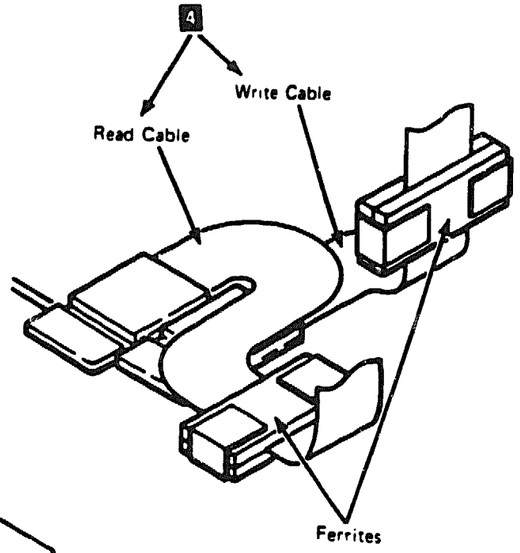
Warning: The pins on the read and write cables are small and can be easily damaged.

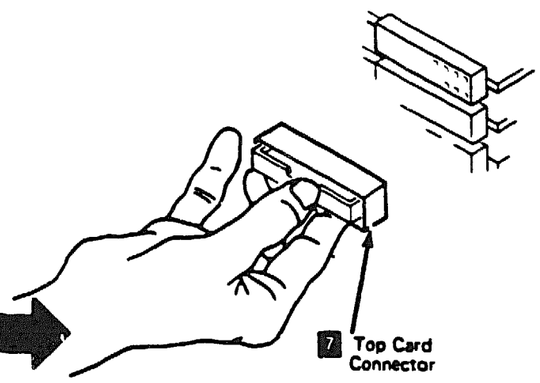
11. Install the head write cable to the J4 card 4.
12. Install the head read cable to the H2 card 4.
13. Install the multi-colored read bus cables to the G2 card.
14. Install the center support bracket 5 and the two mounting screws.
15. Slide the four card retainers 10 into position and install the eight retaining screws.
16. Place the logic card cover 9 in position and install the four mounting screws if removed previously.
17. Lift the power amplifier board 12 into position and install the two mounting screws 8.
18. Install the voltage connectors 3 on the pin side of the logic board in positions A2A14, A3A14, A4A14, J2A14, J3A14 and J4A14.
19. Install the connector on J2 P08.
20. It is possible to install the pin side cover 1 with the wrong side out. Ensure that the pin side cover is installed so that it is flush to or recessed to the side of the drive drawer. Place the pin side cover 1 in position and install the two mounting screws 2.
21. Close the drive drawer.
22. Go to CARR-TCU 6 for the procedure to restore the ***ac power*** to the tape control unit.




9 Logic Card Cover
Alternate Logic Card Cover


10 Logic Card Retainers
5 Center Support Bracket
11 Bottom Support Bracket
6 Card Guide
12 Power Amplifier Board
8 Power Amplifier Board Mounting Screws


4
Write Cable
Read Cable
Ferrites


7 Top Card Connector

FRU059 Power Amplifier Board Removal and Replacement Procedure

This page contains the steps needed to remove and replace the power amplifier board (TU-PA) [1] in the drive, and on the mounting board

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Power Amplifier Board

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive.

2 Open the drive drawer.

3. Support the power amplifier board [1] with one hand, and with the other, remove the two screws [2] holding the power amplifier in position

4. Lower the power amplifier board slowly.

5. Disconnect the nine connectors from the power amplifier board.

   It will be necessary to loosen the retaining hardware for the J1 flat cable.

6. Slide the power amplifier board to the front to remove it from the hinges [3] on the bottom of the drive.

7. Remove the four mounting screws [4] from the component side of the power amplifier board and remove the board from the cover.

Replacing the Power Amplifier Board

1. Place the power amplifier board on the cover and install the four mounting screws [4].

2. Place the power amplifier board assembly in position and slide to the rear to mount on the hinge pins [3].

3. Install the nine connectors on the power amplifier board.

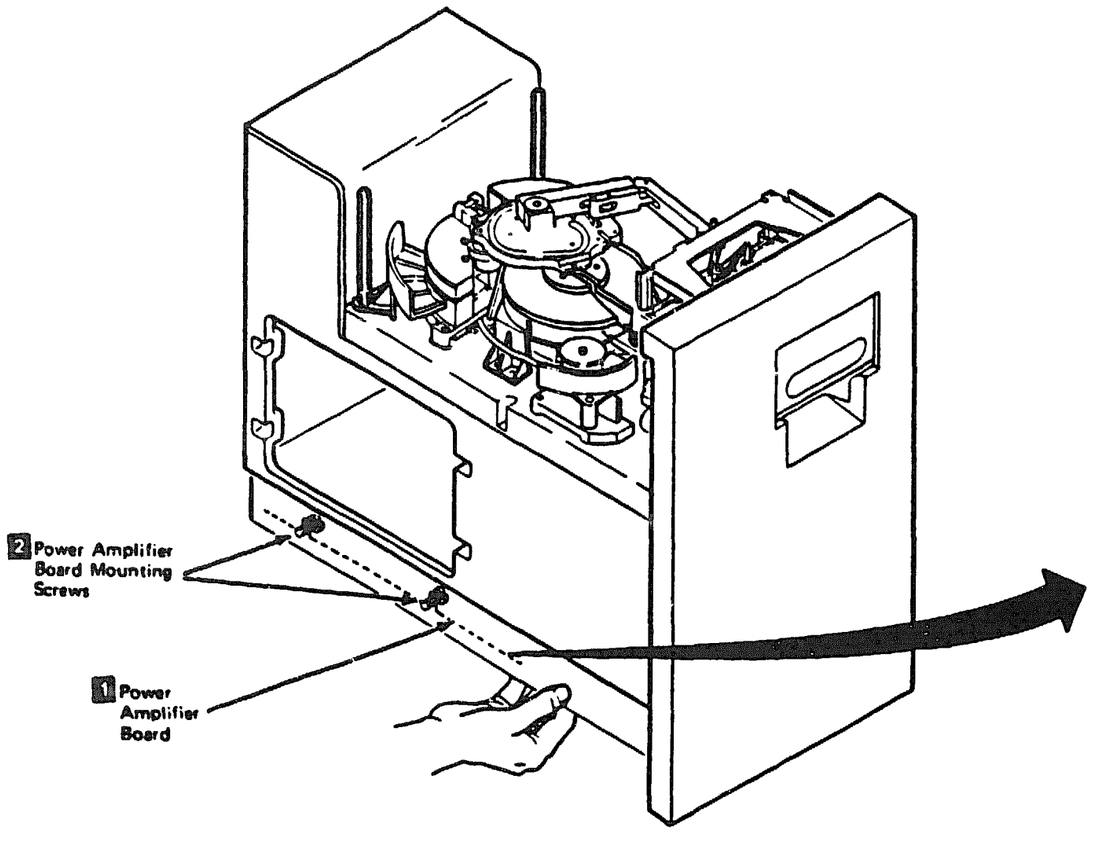
   Tighten the retaining hardware for the J1 flat cable.

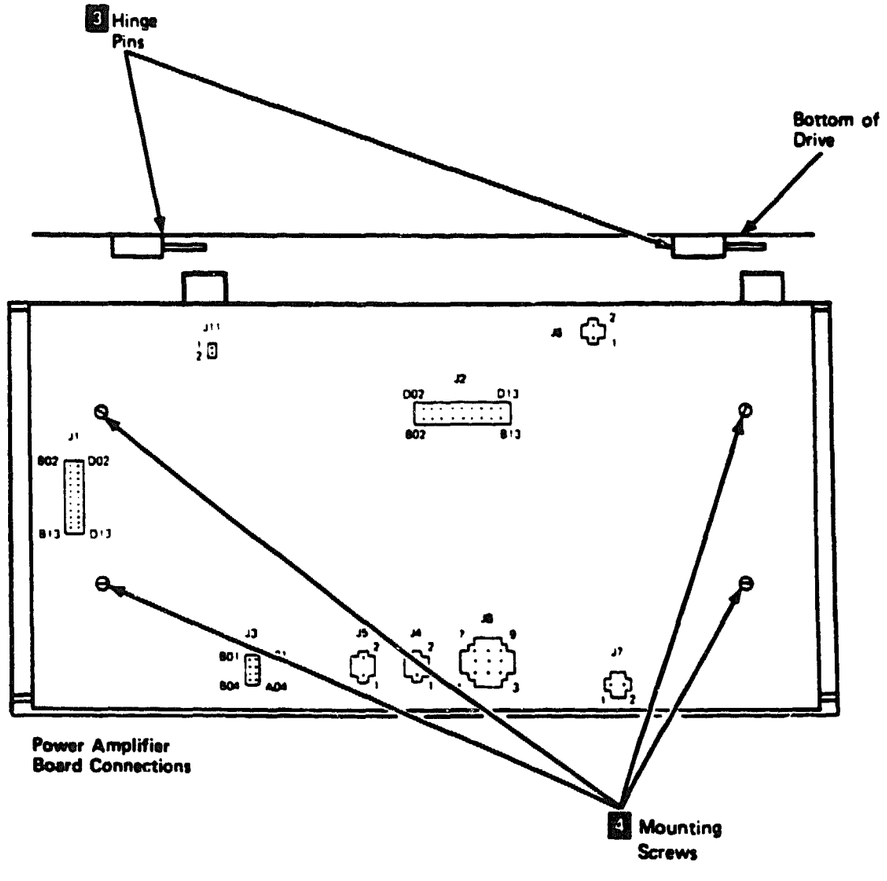
   Note: Replace the J1 cable retainer and tighten the screws. Ensure that the cable is inserted with the D02 pin connection up and away from the board.

4 Lift the power amplifier board [1] into position and install the two screws [2].

5. Close the drive drawer

6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





Power Amplifier Board Connections

FRU060 Message Display Board Removal and Replacement Procedure

This page contains the steps needed to remove and replace the message display board from the operator panel assembly.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Message Display Board

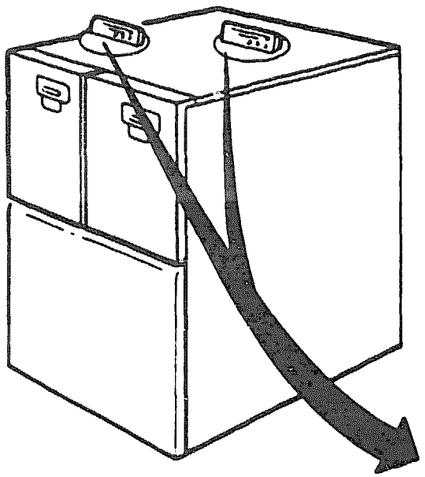
Warning: Some parts handled during this procedure are electrostatic sensitive (ESD). See CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."

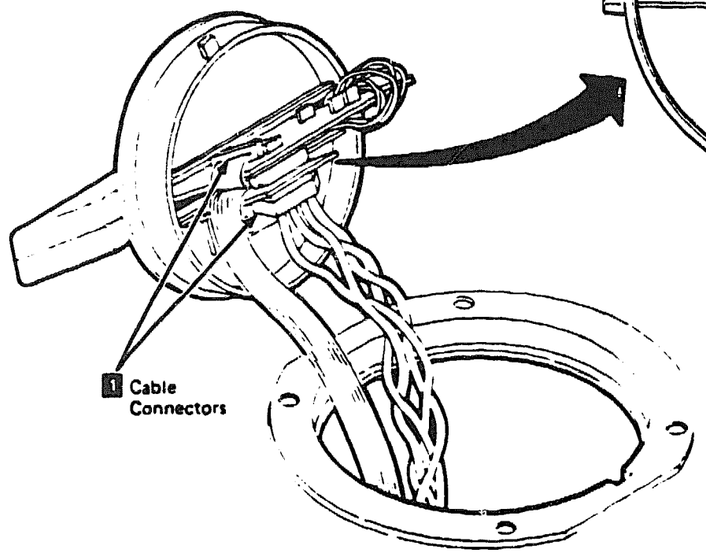
1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Remove the operator panel from the top cover (see CARR-DR 2-6).
3. Invert the operator panel and place it on the top cover to get access to the connectors and screws on the bottom.
4. Remove the two screws holding the flat cable clamp to the mounting bracket and remove any retention hardware as required.
5. Remove the two cables from the connectors 1.

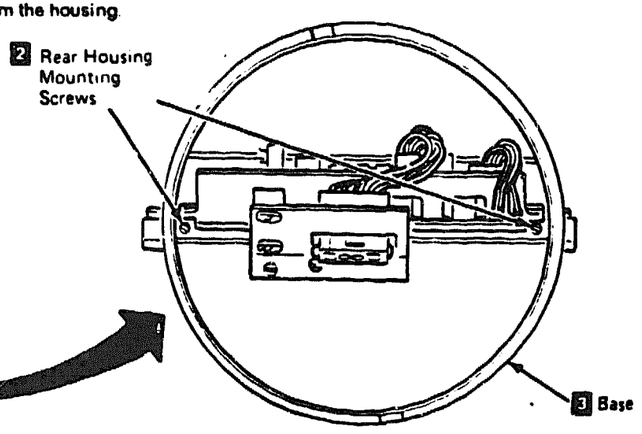
   Note: The message display should now be disconnected from the drive.
6. Remove the two screws 2 attaching the rear of the operator panel housing to the base 3.
7. Remove the housing from the operator panel assembly by pulling it forward and sliding it towards the rear at the same time. Notice the plastic tabs and lip when viewed from the bottom.

   When the tabs and lip are free from the base, remove the top housing from the base.
8. Turn the operator panel assembly upright.
9. Pull the bottom of the front housing 4 away from the rear housing 5 and at the same time lift up on the bottom of the front housing and remove it from the operator panel assembly.

   Note: There is a 'U' shaped lip on the top of the front housing.
10. Disconnect the display board to switch board cable 7 by removing the connector from the edge of the display board.
11. Remove the two mounting screws and mounting stud 6 that hold the message display board to the housing.
12. Remove the connector 9 by squeezing the tabs together and pulling the connector out of the bracket 8.
13. Remove the message display board from the housing.





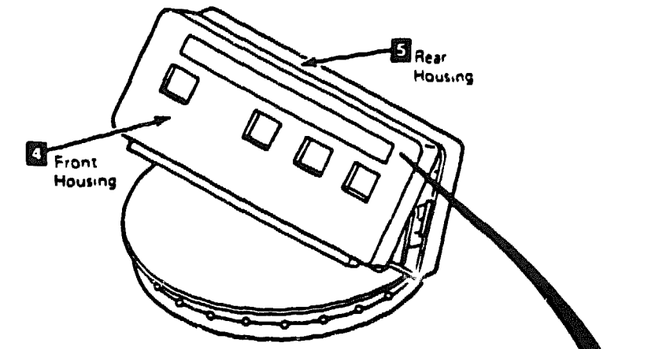


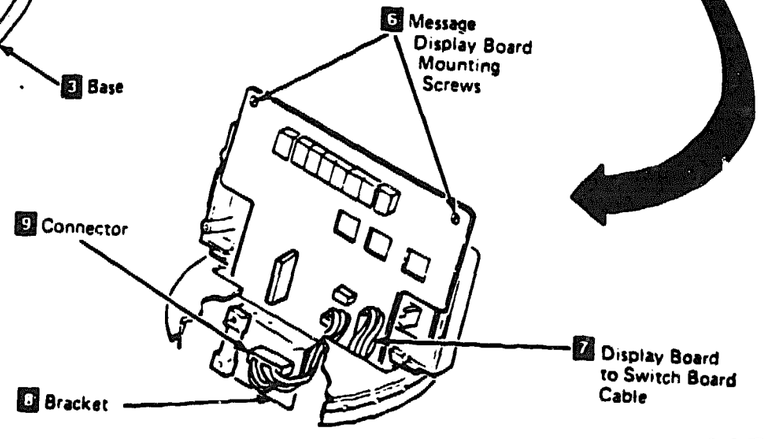
Replacing the Message Display Board

Warning: Some parts handled during this procedure are electrostatic sensitive (ESD). See CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."

1. Mount the message display board on the rear housing with the two mounting screws and the mounting stud 6.
2. Connect the display board to switch board cable 7 by inserting the connector to the edge of the display board.

   Note: There is a 'U' shaped lip on the top of the front housing.
3. Place the top of the front housing 4 on the 'U' shaped slot at the top of the rear housing 5 and pivot the front housing down into position.
4. Insert the connector 9 into the bracket 8.
5. Work the bottom of the message display board through the opening in the message display base.
6. Insert the bottom of front housing 4 into the opening in message display base and press the front housing and rear housing 5 together.
7. Align the two mounting holes in the rear housing with the holes in the base 3 and install the two mounting screws 2.
8. Connect the two cables to the connectors 1 on the bottom of the operator panel assembly and replace any retention hardware.
9. Insert the flat cable in the clamp and tighten the two clamp mounting screws.
10. Install the operator panel into the top cover (see CARR-DR 2-6).
11. Go to CARR-DR 8 for the procedure to *power on* the drive.





FRU061 Machine Reel Hub Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel hub 1 from the machine reel motor.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Machine Reel Hub

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).

   Warning: The machine reel hub and the machine reel flange can be easily scratched. Use care with tools in this area.
3. Remove the two machine reel hub and upper flange mounting screws 3.

   Note: The threader assembly must be lifted up so that the machine reel hub can be removed.
4. The threader is fastened to the baseplate with three screws. All three screws are partially out of view and must be accessed at an angle. Ensure that the screwdriver does not slip and cause personal injury or damage the screw. The first screw to be removed is near the plenum. It is easier to remove the screw if you first remove the hoses that cover it. Remove the hoses from the plenum and move them out of the way. Remove the screw and set it to the side.

   The other two screws can be seen by turning the machine reel. Turn the reel and remove the two screws.

   Warning: Do not use any tools to remove the machine reel hub.
5. Use your thumbs to apply pressure as shown and at the same time lift the machine reel hub 1 off the hub mount.

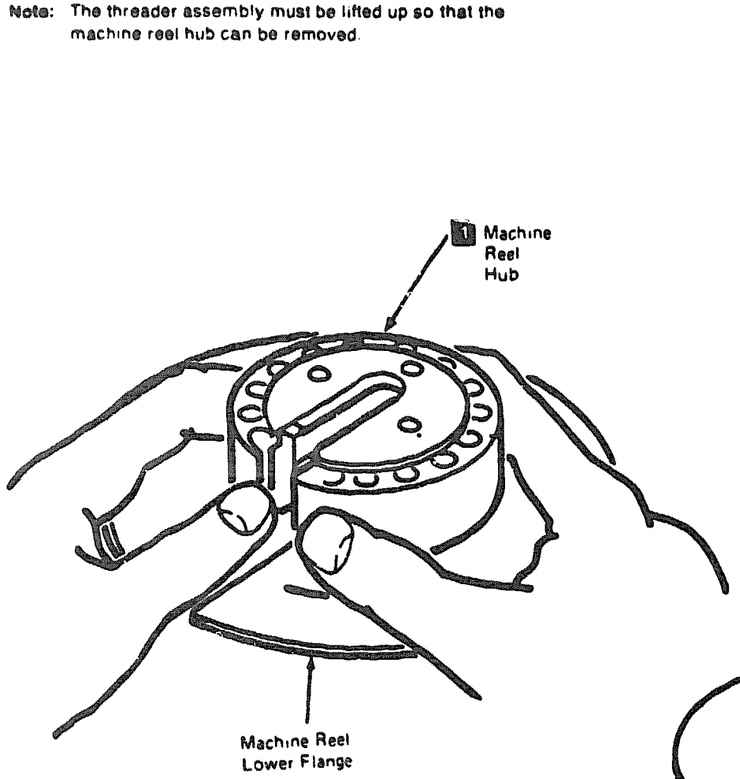
Replacing the Machine Reel Hub

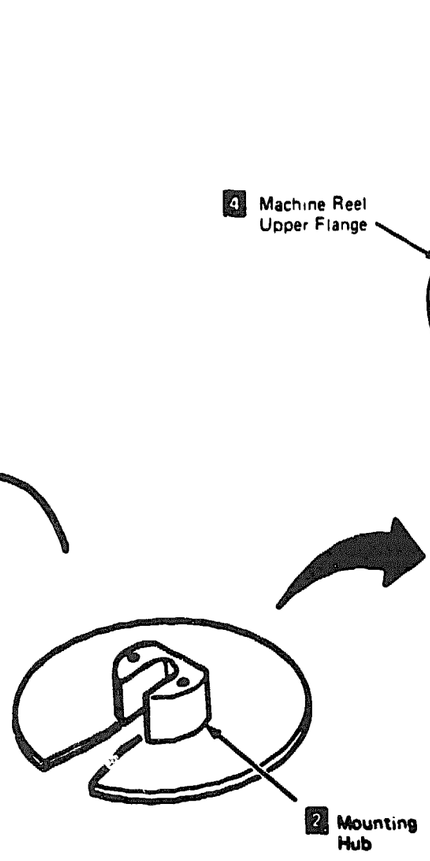
Warning: The machine reel flanges and the machine reel hub can be easily scratched. Use care with tools in this area.

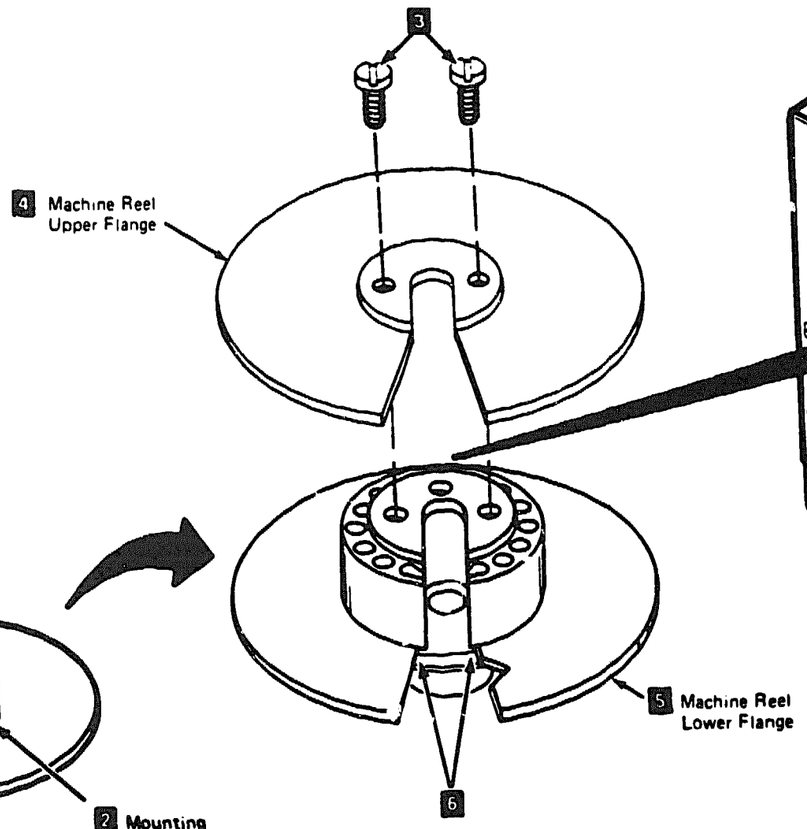
1. Place the machine reel hub 1 and upper flange 4 on the mounting hub 2 and install, but do not tighten the two screws 3. Be careful not to scratch the hub or reel.

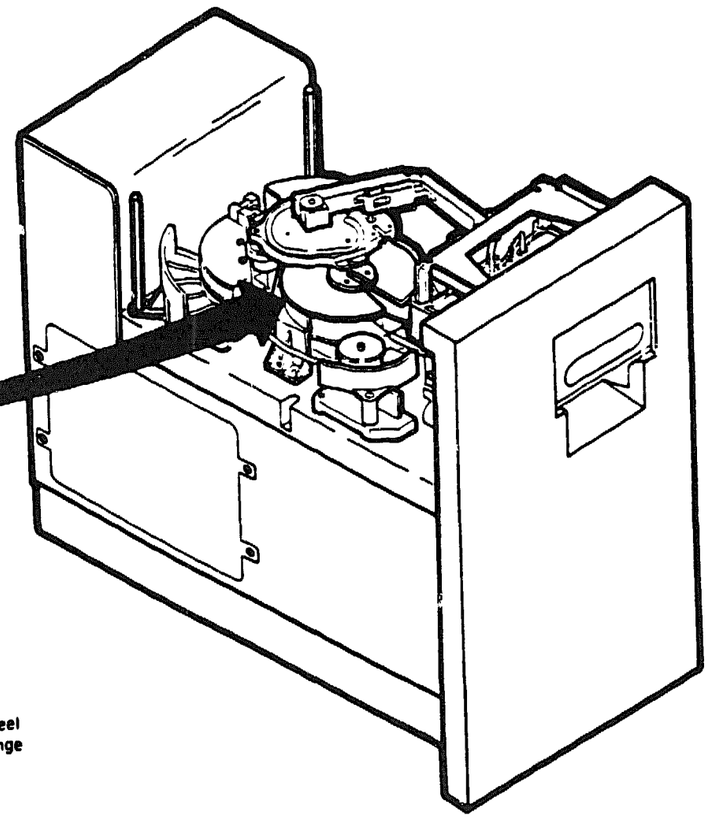
Inspect the alignment of the hub opening to the flange opening 6 and if necessary, adjust the flanges 4 and 5 so that the hub opening is centered over the flange opening 6. Tighten the two screws on the machine reel hub 3.

2. Install the three threader mounting screws, turning the machine reel as needed to get to the screw holes. Use caution when installing the screws to avoid cross-threading. Also use care when tightening to ensure that the screwdriver does not slip, causing personal injury or damage to the screws.
3. If any hoses were removed for access to the threader mounting screw near the plenum, move them back to their original places and reconnect them to the plenum.
4. Replace the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
5. Go to CARR-DR 8 for the procedure to *power on* the drive.









FRU062 – 064, 128 Drive Card Removal and Replacement Procedure

This page contains the steps needed to remove and replace a logic card from the drive. The other drive will not be affected when the logic cards are removed. For top card connector (TCC) location see LOC 1

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-DR 1-9 for "Instructions for Working With ESD-Sensitive Parts."

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing a Drive Logic Card

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Remove the card side cover 1.
4. Remove the two center support bracket mounting screws and remove the center support bracket 2 (if necessary).

   Note: Some machines do not have the Logic Card Retainers 4.
5. Remove the two screws for each card retainer 4 and remove the card retainers as needed
6. Remove any of the top card connectors 3 as needed to remove the logic card.

   Notes:

   a. If the card you are removing has a cable plugged directly into it (A1G2 or A1H2), unplug the cable before removing the card.

   b. The following steps should be used when removing the J4 logic card to prevent damage to the read/write cables and connectors and logic card components:

      1) Disconnect the cables from the H2 card and the J4 card.
      2) Position a protector (such as a file card) between the J4 card and the read/write cables. This will protect both the cable connectors and the components of the J4 card.
      3) Remove the J4 card.
7. Remove the logic card from the drive by pulling it straight out from the logic board.

Replacing a Drive Logic Card

Warning: Before inserting any logic card, visually inspect the board for any bent or damaged pins.

Warning: Before inserting any new logic card, ensure that you transferred all jumpers from the old logic card to the new logic card.

Note: The following steps should be used when replacing the J4 logic card to prevent damage to the read/write cables and connectors and logic card components:

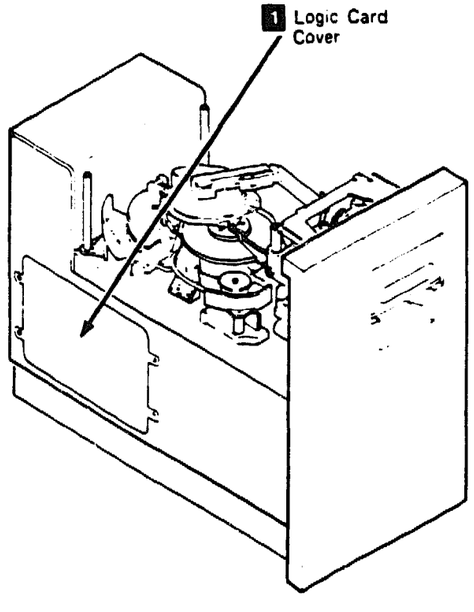
1. Position a protector (such as a file card) between the J4 card and the read/write cables. This will protect both the cable connectors and the components of the J4 card.
2. Insert the J4 logic card in the logic board by pushing it straight in until it seats.
3. Remove the protector.
4. Reconnect the cables to the H2 and J4 logic cards. See note 1.

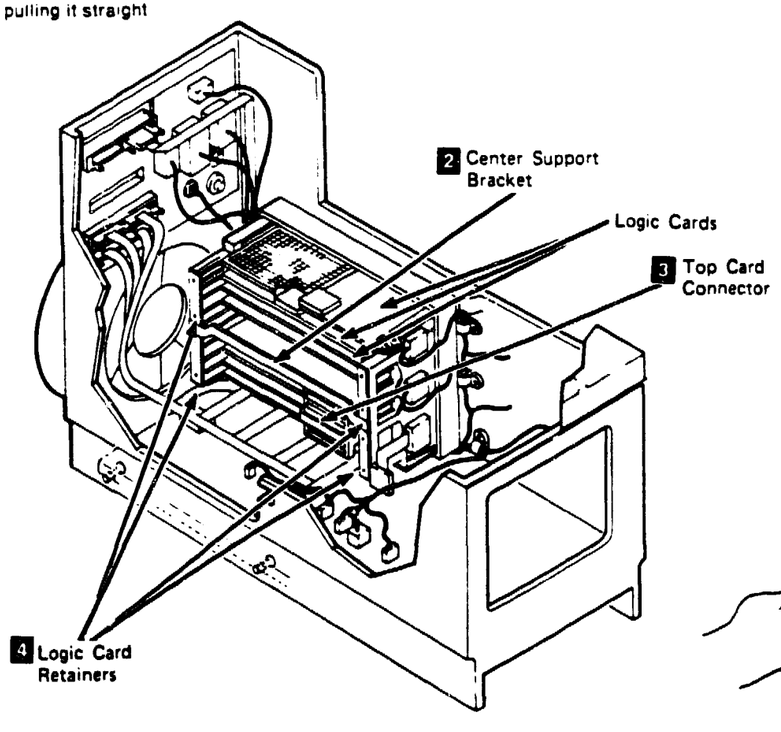
1. Insert any other logic card in the logic board by pushing it straight in until it seats. See LOC 1 for logic card and TCC locations.
2. If the logic card you are replacing has a cable plugged directly into it (A1G2 or A1H2), replace the cable after replacing the logic card. See note 1.
3. Install any TCCs 3 that may have been removed.
4. Place the card retainers 4 in position and install the two mounting screws in each retainer if removed previously.
5. Place the center support bracket 2 in position and install the two mounting screws (if removed).
6. Place the card side cover 1 in position.
7. Close the drive drawer.
8. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

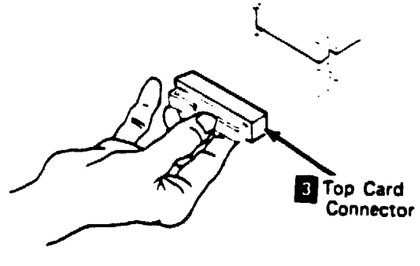
Notes:

1. If either read or write cable is not fully seated, they may have bent pins. Remove the read and/or write card(s) and bend the cable connectors up to inspect for bent pins. Straighten any bent pins. Excessively bent pins may be straightened using needle nose pliers.









FRU065 Pump to Output Filter Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the pump to output filter hose 3 in the tape transport unit. Since this pump provides air pressure for both drives, it is necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Pump to Output Filter Hose

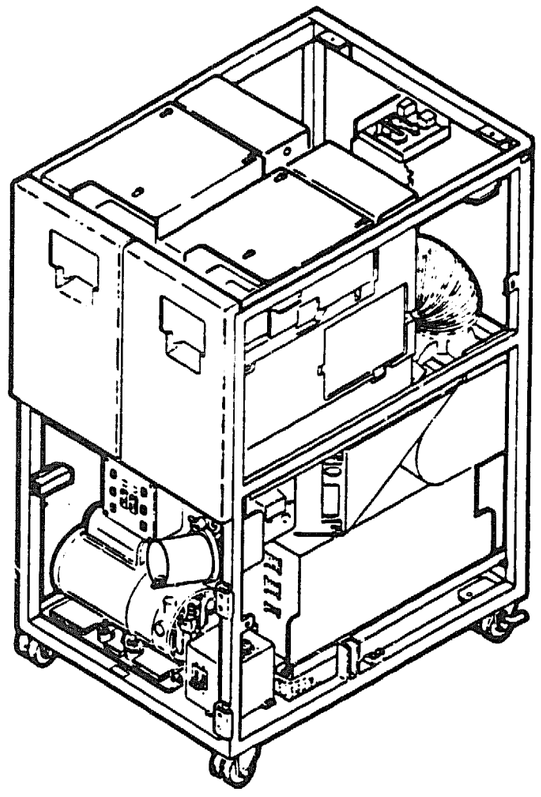
1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.
2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).

CAUTION:
The pump motor may be hot.

3. Slide the hose clamp away from the pump assembly outlet 4.
4. Pull the hose off the outlet to remove it.
5. Slide the hose clamp away from the output filter assembly inlet 1.

   Note: It may be necessary to loosen the output filter mounting bracket 2 screws and move the bracket away from the frame to get better access to the filter inlet 1.

6. Pull the hose off the inlet to remove it.
7. Save the hose clamps for use with replacement hose.

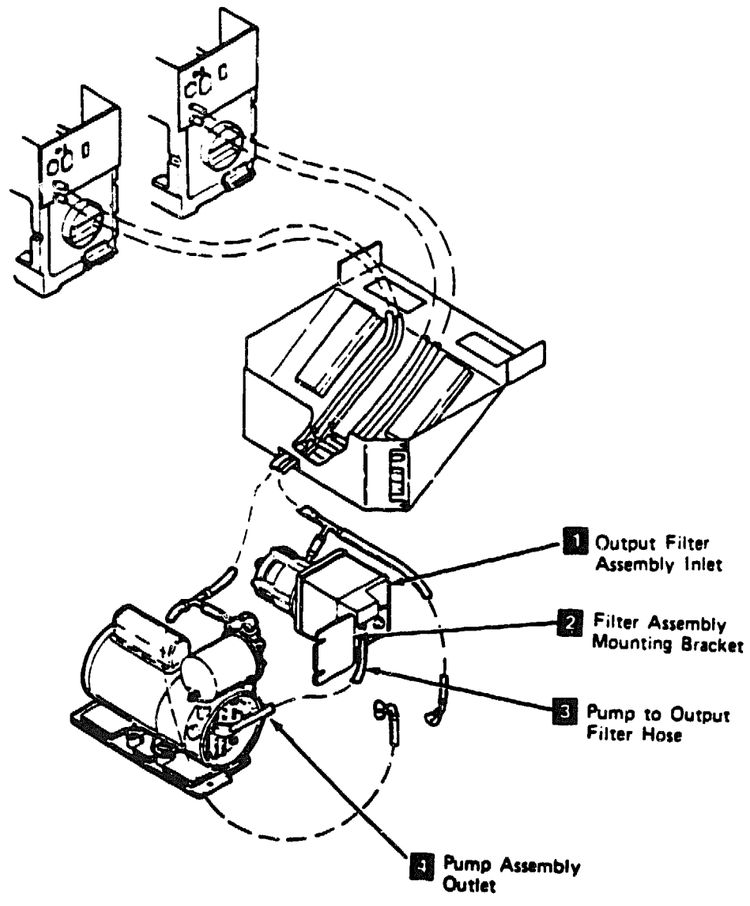


Replacing the Pump to Output Filter Hose

1. Install the hose clamps saved during the removal procedure on each end of the new hose assembly.
2. Connect one end of the pump to output filter hose 3 to the pump assembly outlet 4.
3. Connect the pump to output filter hose 3 to the output filter assembly inlet 1.
4. Slide the two hose clamps in place.

   Note: If the filter assembly mounting bracket 2 was loosened during the removal procedure, tighten the assembly now.

5. Install the tape transport unit front safety cover (see CARR-DR 2-2).
6. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.



FRU267, 268 Drive TCC Removal and Replacement Procedure

This page contains the steps needed to remove and replace a top card connector (TCC) in the drive. The other drive will not be affected when any of the TCCs are removed.

Note: See LOC 1 for TCC locations.

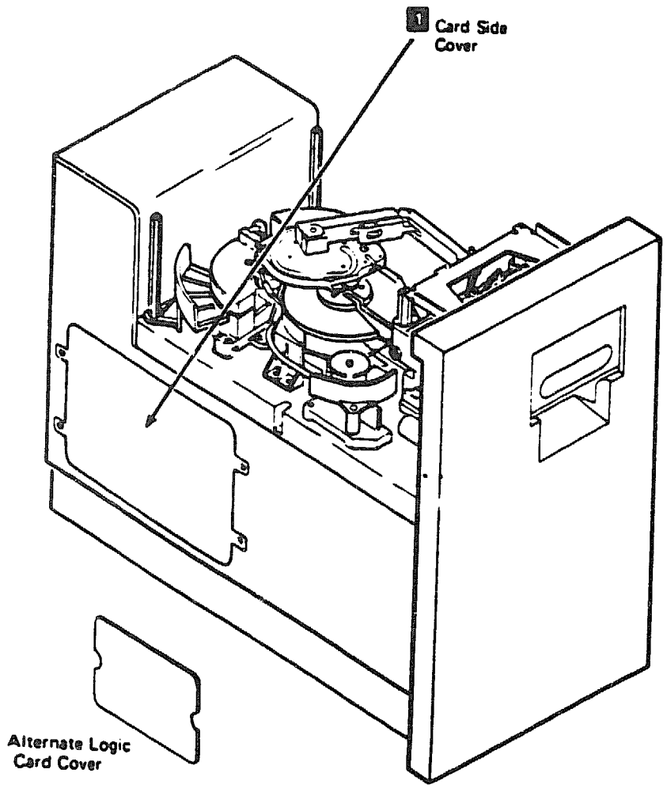
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

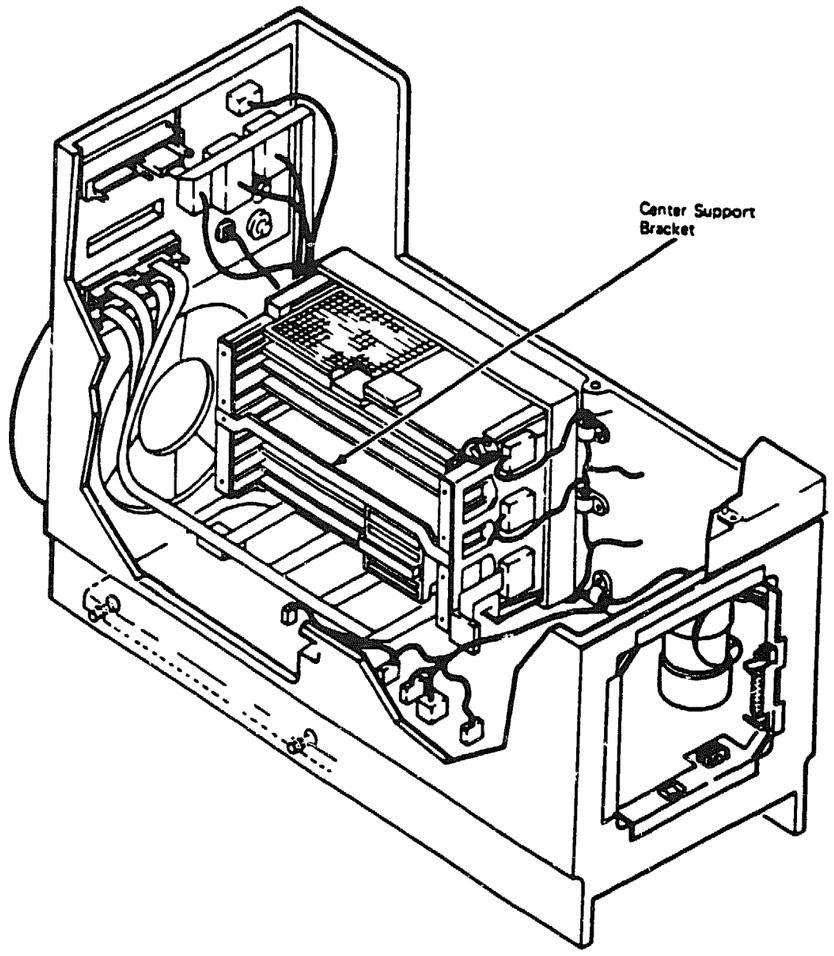
Removing a Top Card Connector

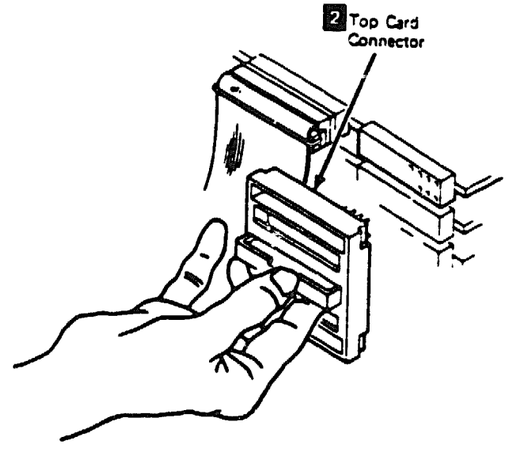
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Remove the card side cover [1].
4. Remove the desired top card connector [2].

Replacing a Top Card Connector

1. Install the top card connector (TCC) that was removed [2].
   Note: A listing of TCC locations is on LOC 1.
2. Place the card side cover [1] in position.
3. Close the drive drawer.
4. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







FRU079 DC Power Distribution Cable (Drive Internal) Removal and Replacement Procedure

This page contains the steps needed to remove and rep ace the dc power distribution cable (drive internal). This page will not cover removal of any of the deck assemblies. To find out how to remove a specific assembly, refer to index, or to the "Remove/Replace Procedures By FRU Number" beginning on CARR-DR 1-1.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the DC Power Distribution Cable (Drive Internal)

Note: Some of the drives will have a single dc power distribution cable assembly in the drive. The rest of the drives will have an interposer cable that connects J8, J9, and J6.

1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.
2. Open the tape transport unit rear cover.
3. Disconnect the cables from the rear panel connectors P1-J1, P2-J2 1 and P4-J4 2.
4. Open the drive drawer and remove the drive drawer safety cover.
5. Remove the rear panel cover screws 5 and cover.
6. Remove connectors J1 and J2 3 from inside the rear panel.
7. Remove the power amplifier board (TU-PA) 4 from the drive (see CARR-DR 590).

   On drives with an interposer cable, J8 is a double connector that joins the dc power distribution cable and the power amplifier board.
8. On drives without the automatic cartridge loaders remove the drive front cover (see CARR-DR 2-1). On drives with the automatic cartridge loaders go to CARR-DR 2850 and perform the loader mechanical assembly Removal procedure.
9. Open the tape transport unit front cover (see CARR-DR 2-1).

   Note: In the following two steps, notice that the white wire is removed from the terminal identified by the red dot on the motor housing. The leads from the new cable assembly must be connected in the same way (for correct polarity).
10. Disconnect the wires from the machine reel motor 11. Label the wires to assist in the replacement procedure.
11. Disconnect the wires from the file reel motor 9. Label the wires to assist in the replacement procedure.
12. Disconnect the cable connector from the threader motor (not shown). Label the wires to assist in the replacement procedure.
13. Disconnect the cable connector J4 (located near the access hole) from the tape lifter solenoid 6.
14. Disconnect the cable connector J5 (located near the access hole) from the latch solenoid 10.
15. Disconnect the cable plug P14 from the tension transducer 12.
16. Remove one on the leads from the file protect switch connector as follows:
    a. Disconnect the cable connector J3 from the file protect switch.
    b. Remove the J3 part of the connector from the retainer.
    c. Locate the lead (that is NOT part of the cable assembly being replaced) going through the access hole for the machine reel motor.
    d. Remove this lead from the connector block by carefully prying the retaining tab away from the pin. Label the pin (with the number of the connector position) for the replacement procedure.
17. Remove the two mounting screws and the pin side cover 8.
18. Disconnect the voltage connectors 7 from the 02A-A1 board:
    - B2A14
    - B3A14
    - B4A14
    - J2A14
    - J3A14
    - J4A14
19. Remove the air pressure and vacuum hoses from the inside of the rear panel of the drive drawer.
20. Remove any retention hardware, as needed, and remove the cable from the drive as follows:
    - ***From the top of the drive***, carefully work the J1 and J2 end of the cable around the end of the card retainers at the rear of the logic gate and out through the bottom of the drive drawer.
21. The interposer cable can be removed by disconnecting J9 and removing the retention hardware that holds the J6 connector to the front of the drive. Carefully remove the cable from the drive.
22. Save all retention hardware for the replacement procedure.

Replacing the DC Power Distribution Cable (Drive Internal)

1. Install the replacement cable in the drive drawer as follows:
   - ***From the bottom of the drive***, carefully work the J1 and J2 end of the cable around the end of the card retainers at the rear of the logic gate and out through the top of the drive drawer.
2. Place the dc distribution cable in position and install the cable retention hardware.

   If the interposer cable was removed place it in position; install the cable retention hardware and connect J8-P8 and J9-P9.
3. Connect the air pressure and vacuum hoses to the connectors on the inside rear of the drive drawer.
4. Connect the voltage connectors 7 to the 02A-A1 board:
   - B2A14
   - B3A14
   - B4A14
   - J2A14
   - J3A14
   - J4A14
5. Replace the pin side cover 8 and two mounting screws.

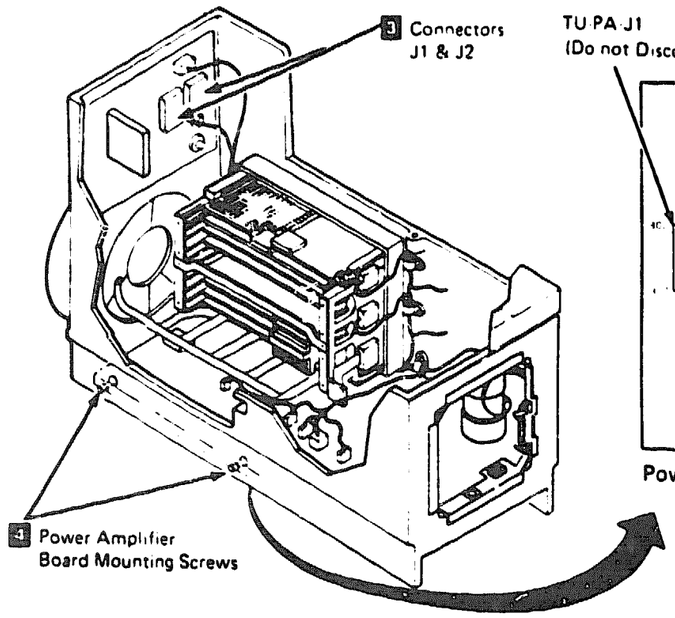
   Note: In the next step, transfer your labels from the cable you replaced.
6. Connect the leads to the machine reel motor 11.

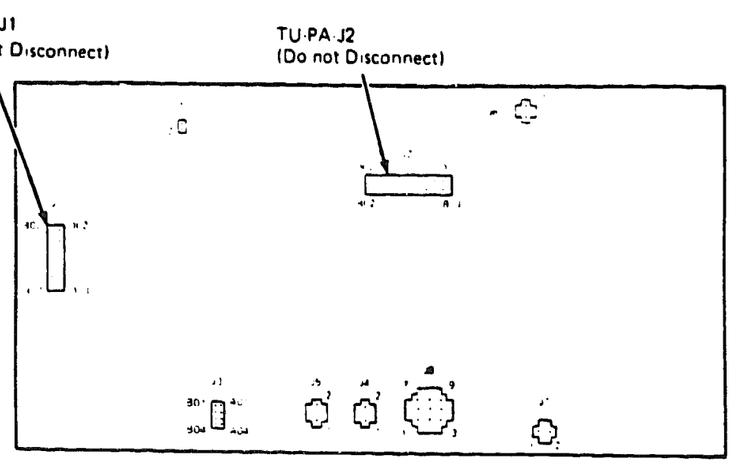
   Note: In the next step, transfer your labels from the cable you replaced.
7. Connect the leads to the file reel motor 9.

   Note: In the next step, transfer your labels from the cable you replaced.
8. Connect the leads to the threader motor (not shown).
9. Connect cable connector J4 to the tape lifter solenoid 6.
10. Connect cable connector J5 to the latch solenoid 10.
11. Connect cable plug P14 to the tension transducer 12.
12. Connect the lead coming from the access hole for the machine reel motor (noted and labeled in the removal procedure - step 16) as follows:
    a. Locate the J3 connector on the end of the new cable assembly.
    b. Insert the lead from the machine reel motor into the connector position indicated on the label.
    c. Insert the J3 Plug into the retainer
    d. Connect cable connector J3 to the file protect switch.
13. Install the power amplifier board (TU-PA) 4 (see CARR-DR 590).
14. Install connectors J1 and J2 3 on the rear panel.
15. Install the rear panel cover and mounting screws 5.
16. Connect the external dc cable plugs P1 and P2 to the rear panel connectors P1-J1 and P2-J2 1.
17. Connect the external dc cable plug P4 to the rear panel connectors P4-J4 2.
18. On drives without the automatic cartridge loaders install the front drawer cover (see CARR-DR 2-2).

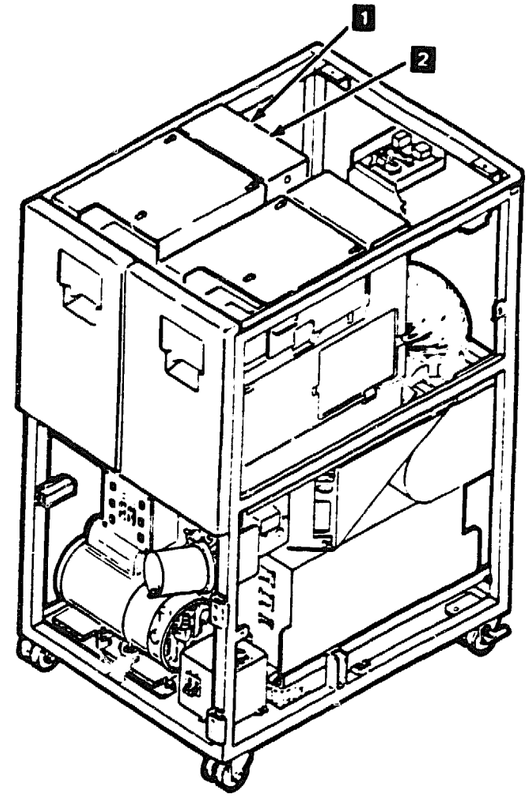
    On drives with the automatic cartridge loaders go to CARR-DR 2850 and perform the loader mechanical assembly Replacement procedure.
19. Install the drive drawer safety cover (see CARR-DR 2-5).
20. Close the drive drawer.
21. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.

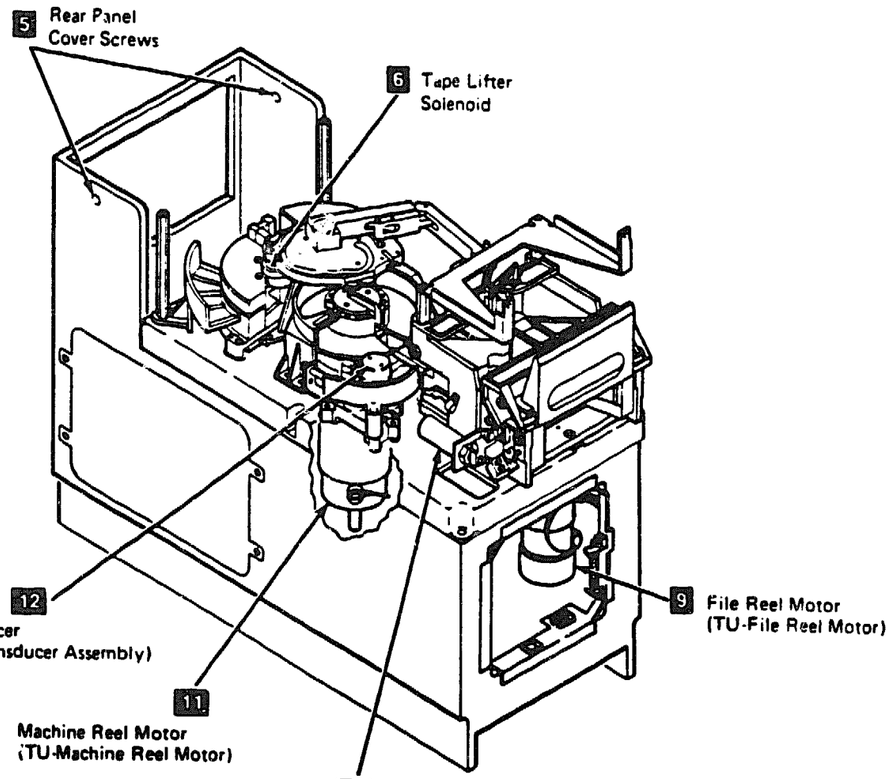
FRU079 DC Power Distribution Cable (Drive Internal) Removal and Replacement Procedure (Continued)

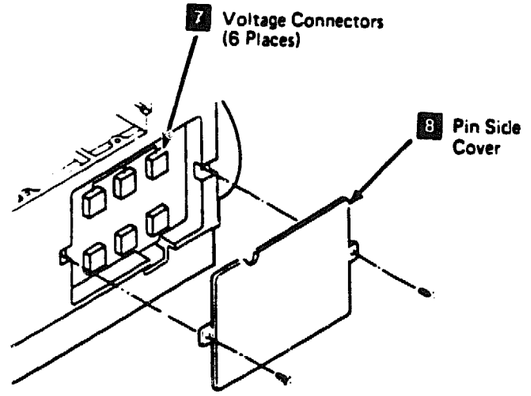




Power Amplifier Board







FRU079 DC Power Distribution Cable (Drive External) Removal and Replacement Procedure

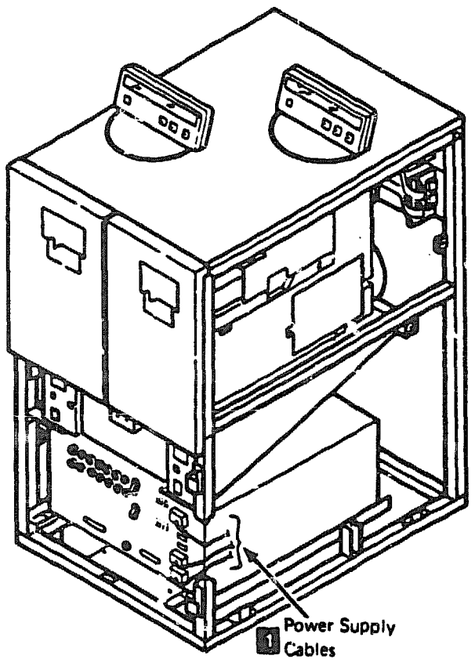
This page contains the steps needed to remove and replace the dc power distribution cable (drive external). All power will be removed from the tape transport unit except the ac power box which serves as a feedthrough for other tape transport units attached to the same tape control unit.

Since there is only one power distribution cable (drive external), it is necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the DC Power Distribution Cable (Drive External)

1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.

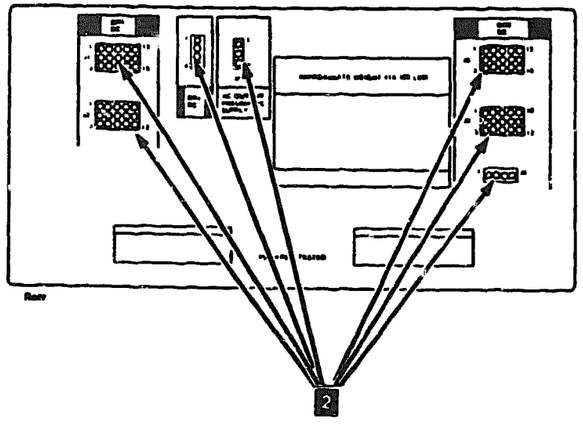


From the front of the tape transport unit:

2. Open the tape transport unit front cover and remove the safety cover and ground connector (see CARR-DR 2-1).
3. Unplug power supply cables J12, J13, and J14 1 from the front of the dc power supply (TU-PS-01).
4. Carefully remove cables J12, J13, and J14 by routing them past the right side of the dc power supply and to the rear of the tape transport unit.

From the rear of the tape transport unit:

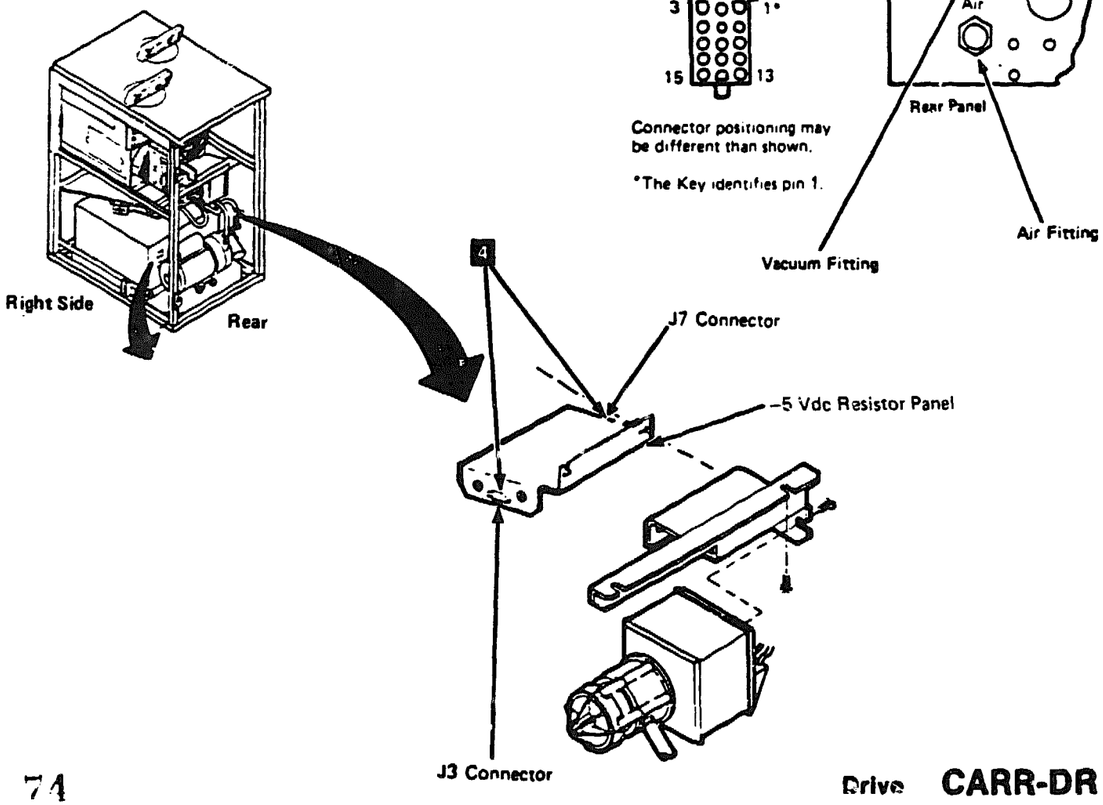
5. Open the rear cover and remove the rear safety cover and ground connector (see CARR-DR 2-1).
6. Unplug cables P1, P2, P3, P5, P6, and P7 2 from the rear of the dc power supply.
7. Carefully remove the dc cable harness and connectors from between the pump motor assembly and the rear of the dc power supply.
8. Unplug the cables from the rear of the drive panels TU-D0-P1-J1, TU-D0-P2-J2, TU-D1-P1-J1, TU-D1-P2-J2 3.
9. Unplug cables J3 and J7 4 from the external load resistor panel.
10. Remove the dc power distribution cable (drive external) from the tape transport unit by guiding the cable connectors over the pump motor assembly and out the rear of the tape transport unit.



Replacing the DC Power Distribution Cable (Drive External)

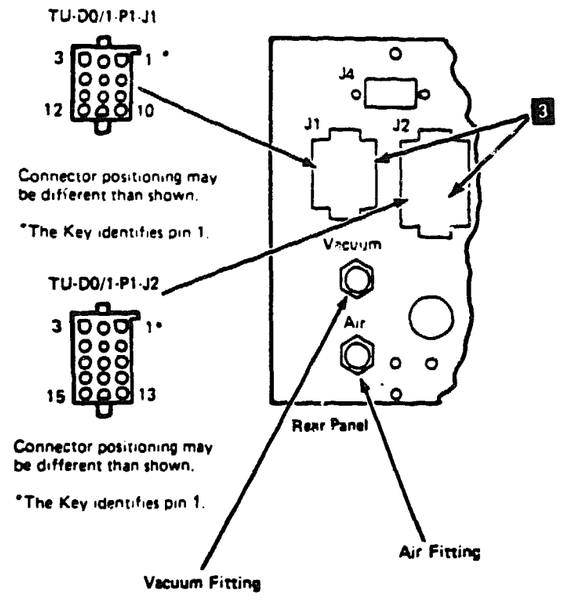
From the rear of the tape transport unit:

1. Replace the dc power distribution cable (drive external) into the tape transport unit by guiding the cable connectors over the pump motor assembly and toward the front of the tape transport unit.
2. Connect cables J3 and J7 4 into the external load resistor panel.
3. Connect the cables into the rear of the drive panels TU-P1-J1, and TU-P1-J2, TU-P2-J1, and TU-P2-J2 3.
4. Carefully route the dc cable harness and connectors between the pump motor assembly and the rear of the dc power supply.
5. Connect cables P1, P2, P3, P5, P6, and P7 2 into the rear of the dc power supply (TU-PS-01).
6. Install the rear safety cover and ground connector (see CARR-DR 2-2) and close the rear cover.



From the front of the tape transport unit:

1. Carefully route cables J12, J13 and J14 past the right side of the dc power supply and to the front of the tape transport unit.
2. Connect power supply cables J12, J13, and J14 1 to the front of the dc power supply.
3. Install the tape transport unit front safety cover and ground connector (see CARR-DR 2-2) and close the front cover.
4. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



FRU080 Tape Transport Unit DC Power Distribution Cable Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape transport unit dc power distribution cable. All power will be removed from the tape transport unit except the ac power box which serves as a feedthrough for other tape transport units attached to the same tape control unit.

Since there is only one tape transport unit dc power distribution cable, it is necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Tape Transport Unit DC Power Distribution Cable

1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.

From the front of the tape transport unit:

2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
3. Disconnect cable plugs P8 and P9 from connectors J8 and J9 (located on the left side of the tape transport unit control box).
4. Loosen the two mounting screws and remove the tape transport unit control box 5 from the tape transport unit.
5. Disconnect cable plugs P1, P2, P3, P5, P6, and P7 3 from the front of the dc power supply (TU-PS-01).
6. Loosen the two screws 1 holding the left front of the cable plenum.
7. Open the left front of the cable plenum 2 and push the cable connectors through toward the rear of the tape transport unit. Ensure that the R/W cables and the thermal cable (attached to the inside of the cable plenum) are not disconnected or damaged.

From the rear of the tape transport unit:

8. Open and remove the rear cover and ground connector (see CARR-DR 2-1).
9. Remove the convoluted bellows for drive 0 (see CARR-DR 2230) for easier access to the cable assemblies.
10. Disconnect cable plug P10 from connector J10 located on the bottom of the external load resistor panel 6 (cable support bracket, if the tape transport unit has power supply part number 6177166 or 6177167 installed).
11. Disconnect cable plugs P1, P2, and P4 (located on the rear panels of drive 0 and drive 1 4).
12. Unlace the cables from the pneumatic hoses (to the drives) and remove the cable clamps.
13. Remove the dc power distribution cable from the tape transport unit by guiding the front cable connectors over the cable plenum and out the rear of the tape transport unit.

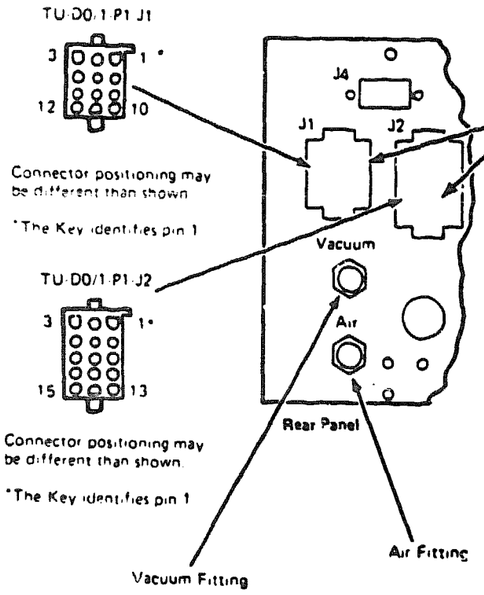
Replacing the Tape Transport Unit DC Power Distribution Cable

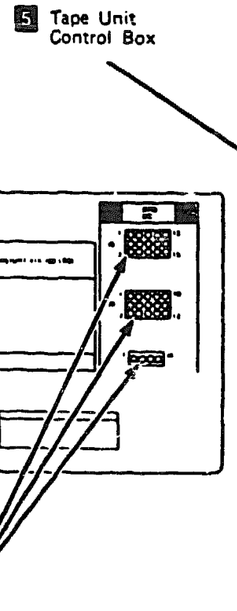
From the rear of the drive unit:

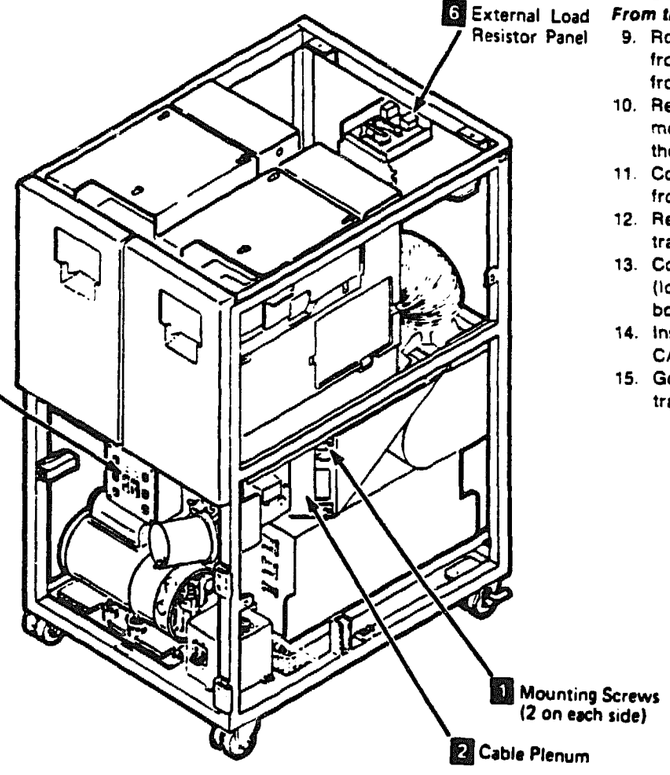
1. Place the dc power distribution cable in the tape transport unit by routing the front cable connectors (cable plugs P1, P2, P3, P5, P6 and P7) over the cable plenum to the front of the power supply (TU-PS-01).
2. Connect cable plug P10 into connector J10 located on the bottom of the external load resistor panel 6 (cable support bracket, if the tape transport unit has power supply part number 6177166 or 6177167 installed).
3. Connect the cable clamps.
4. Connect the cable plugs 0P1, 0P2 and 0P4 into the rear panel of drive 0 4.
5. Connect the cable plugs 1P1, 1P2, and 1P4 into the rear panel of drive 1 4.
6. Lace the cables to the pneumatic hoses for each drive.
7. Replace the convoluted bellows in drive 0 (see CARR-DR 2230).
8. Replace the rear cover and ground connector (see CARR-DR 2-2). Close the rear cover.

From the front of the tape transport unit:

9. Route the front cable connectors around the left end of the front cable plenum. Place the cable in the access hole in the front of the cable plenum 2.
10. Replace the front of the cable plenum and tighten the two mounting screws 1. Ensure that the R/W cables and the thermal cable are correctly positioned.
11. Connect cable plugs P1, P2, P3, P5, P6, and P7 3 into the front of the dc power supply.
12. Replace the tape transport unit control box 5 in the tape transport unit.
13. Connect cable plugs P8 and P9 into connectors J8 and J9 (located on the left side of the tape transport unit control box).
14. Install the tape transport unit front safety cover (see CARR-DR 2-2).
15. Go to CARR-DR 8 for the procedure to **power on** the tape transport unit.







FRU081 Tachometer Sensor Cable Removal and Replacement Procedure

This page contains the steps needed to remove the drive tachometer sensor cable from the drive. Refer to LOC 1 for a diagram of the tachometer sensor cable.

This page will not cover removal of any of the deck assembly. To find out how to remove a specific assembly, refer to the index, or to the "Removal/Replacement Procedures by FRU Number" beginning on CARR-DR 1-1.

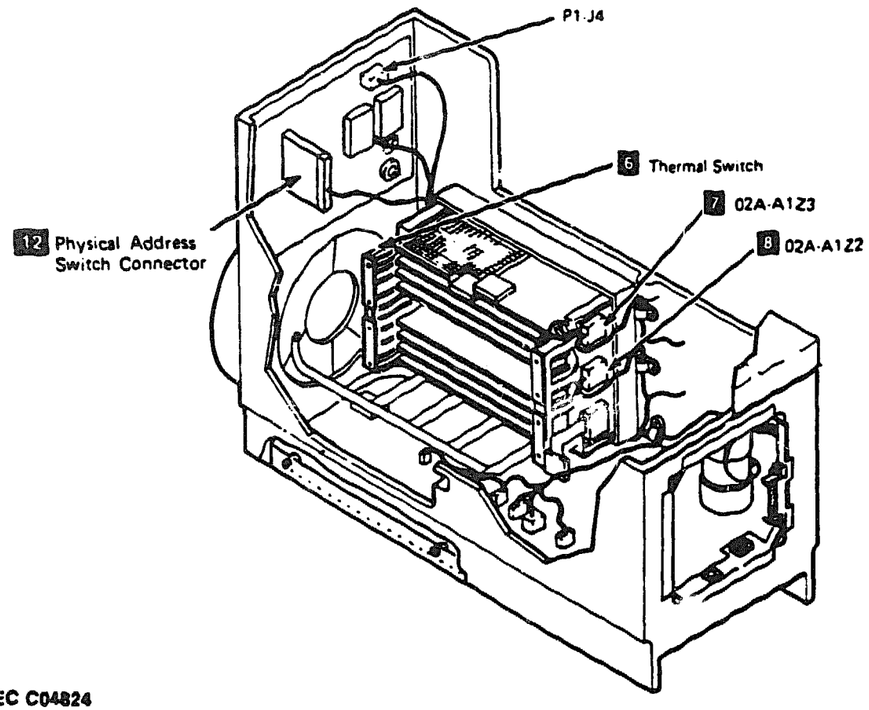
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Tachometer Sensor Cable

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer 1 for the drive being serviced.
3. Remove the drive safety cover (see CARR-DR 2-5).
4. Remove the two rear panel screws 2 and the rear panel cover.
5. Remove the drive drawer front cover (see CARR-DR 2-1).
6. Remove cable connector J4 from the inside of the rear panel.
7. Remove the drive physical address switch connector 12 from the inside of the rear panel.
8. Disconnect the wires from the pressure sensor 5 (see CARR-DR 400).
9. Go to CARR-DR 2250 and CARR-DR 2260 and do the procedures to remove the tachometer A and B 3 sensors.
10. Disconnect the cable from the file reel motor tachometer sensor (see CARR-DR 30).
11. Disconnect the cable connector from the file protect switch (see CARR-DR 90) and remove the pin at position 1 of the J3 connector block.

    Note: This lead is part of the tachometer sensor cable being replaced. The J3 connector block and other leads are part of the internal dc distribution cable.

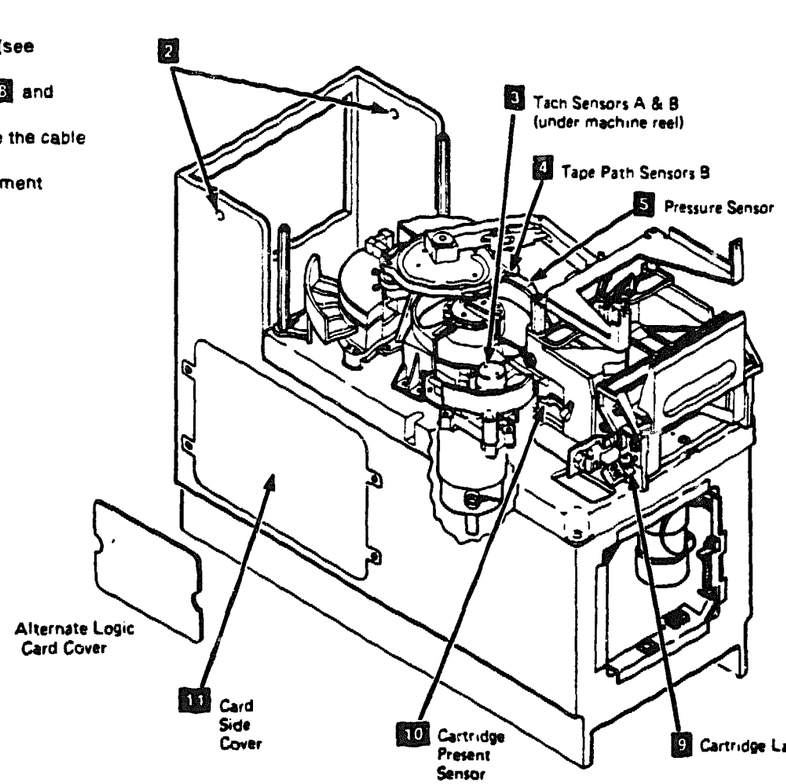
12. Disconnect the cable from tape path sensor A (see CARR-DR 60).
13. Disconnect the cable from tape path sensor B 4 (see CARR-DR 70).
14. Loosen the setscrew holding the connector and disconnect the cable from the cartridge present sensor 10 (see CARR-DR 100).
15. Loosen the screw and disconnect the cable from the cartridge latch sensor 9 (see CARR-DR 110).
16. Remove the card side cover 11.
17. Disconnect the cable from the thermal switch 6 (see CARR-DR 1100).
18. Remove the flat cables from positions 02A-A1Z2 8 and 02A-A1Z3 7.
19. Remove the cable retention hardware and remove the cable from the drive.
20. Save the cable retention hardware for the replacement procedure.

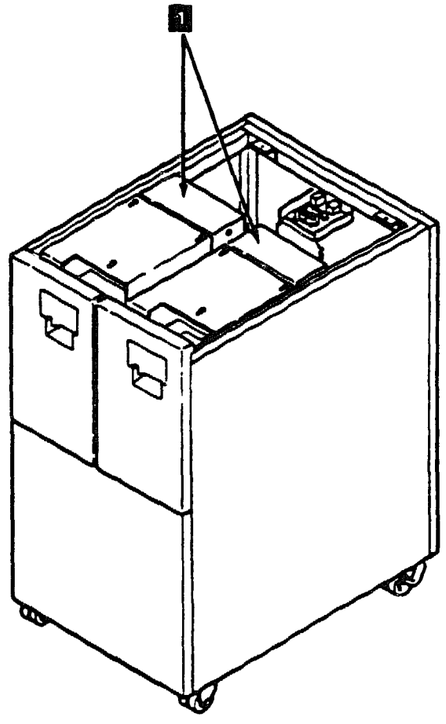


Replacing the Tachometer Sensor Cable

Refer to LOC 1 for a diagram of the tachometer sensor cable.

1. Replace the cable retention hardware as the cable is installed in the drive.
2. Connect the cable to the thermal switch 6 (see CARR-DR 1100).
3. Install the flat cables in positions 02A-A1Z2 8 and 02A-A1Z3 7.
4. Connect the wires to the pressure sensor 5 (see CARR-DR 400).
5. Connect the cables to tachometer sensor A and B 3 (see CARR-DR 2250 and CARR-DR 2260).
6. Connect the cables to the file reel motor tachometer sensor (see CARR-DR 30).
7. Insert the single lead (with connector pin) into position 1 of the J3 connector block; then connect the file protect plug (see CARR-DR 90).
8. Connect the cable to the tape path sensor A (see CARR-DR 60).
9. Connect the cable to the tape path sensor B 4 (see CARR-DR 70).
10. Connect the cable to the cartridge present sensor 10.
11. Connect the cable to the cartridge latched sensor 9.
12. Install the cable connector J4 inside the rear panel.
13. Install the drive physical address switch connector 12.
14. Install the rear panel cover and mounting screws 2.
15. Install the card side cover 11.
16. Install the drive drawer safety cover (see CARR-DR 2-5).
17. Install front drive drawer cover (see CARR-DR 2-2).
18. Close the drive drawer 1.
19. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU082 Tape Transport Unit Thermal Switch Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape tape transport unit thermal switch (TU-Thermal Switch (S-2)). Since this procedure requires the ac voltage to be off, it is necessary to have all drives attached to the tape control unit, and the tape control unit, available for service

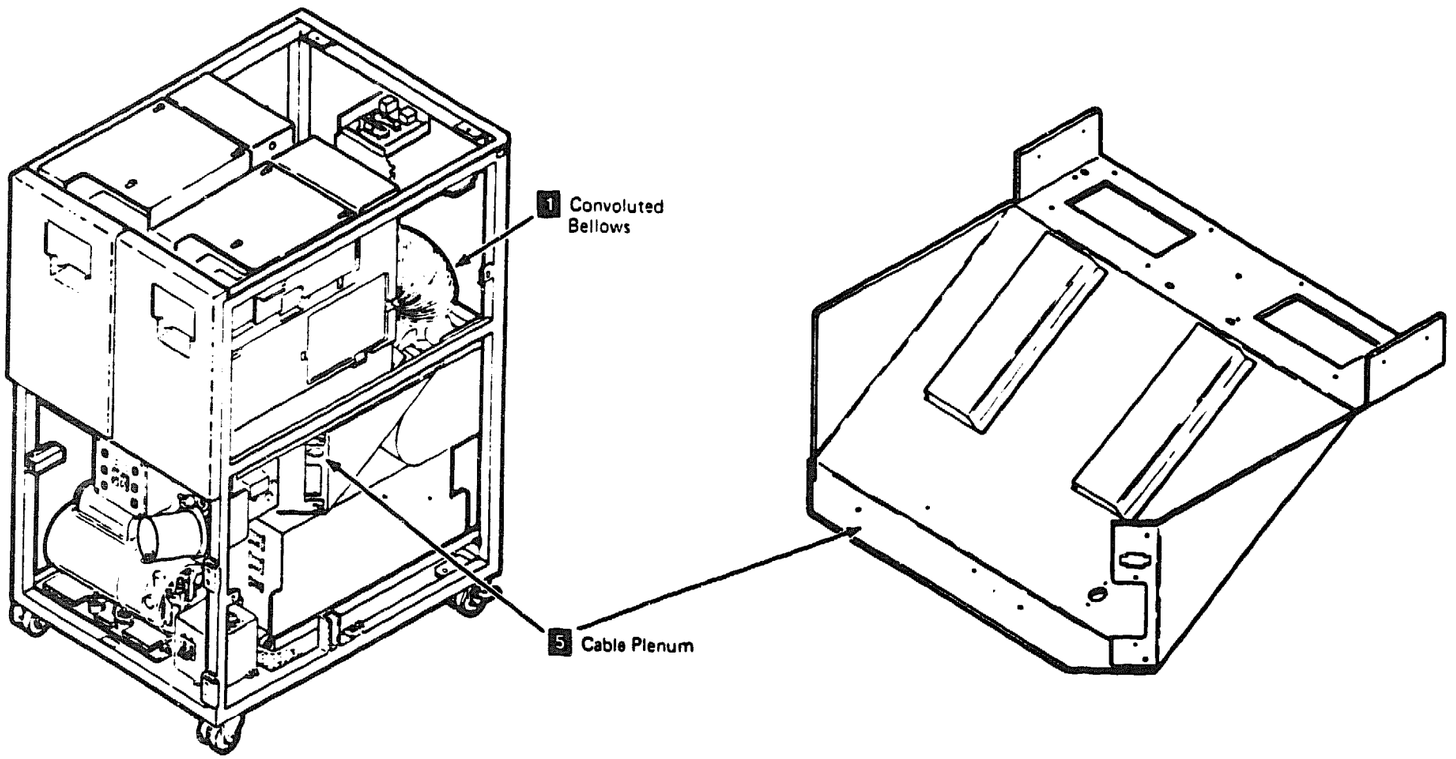
Note: This FRU removal and replacement requires the ac power to be removed from the tape control unit and all attached tape transport units with the tape control unit ac power circuit breaker

Removing the Tape Transport Unit Thermal Switch

1. Go to CARR-TCU 6 for the procedures to remove the ***ac power*** from the tape control unit

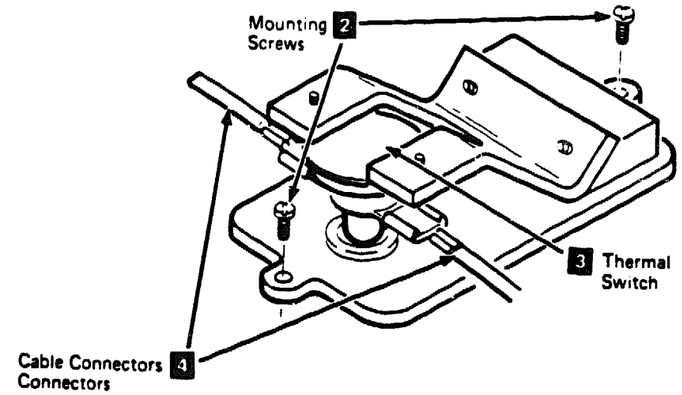
The thermal switch 3 for each tape transport unit is located on top of the cable plenum 5 under the drive 1 drawer.

2. Open and remove the rear tape transport unit cover (see CARR-DR 2-1).
3. Remove the convoluted bellows 1 from drive 1 of the affected unit (see CARR-DR 2230).
4. Open drive 1 drawer as far as possible.
5. Unplug the cable connectors 4 from the thermal switch 3
6. Remove the two mounting screws 2 and remove the thermal switch 3 from the cable plenum
7. Save the two thermal switch mounting screws 2 for the replacement procedure.



Replacing the Tape Transport Unit Thermal Switch

1. Install the tape transport unit thermal switch on the cable plenum 5 using the two screws saved from the removal procedure
2. Connect the cable to the thermal switch 3 using the two slip on connectors 4.
3. Close drive 1 drawer.
4. Replace the convoluted bellows 1 (see CARR-DR 2230).
5. Close the tape transport unit rear cover.
6. Go to CARR-TCU 6 for the procedure to restore the ***ac power*** to the tape control unit.



FRU083 Tape Transport Unit Thermal Switch Cable Harness Removal and Replacement Procedure

This page contains the steps needed to remove and replace the thermal switch cable harness in the tape transport unit.

Since this procedure requires the ac voltage to be switched off, it is necessary to have all tape transport units attached to the tape control unit, and the tape control unit, available for service.

Note: This FRU removal and replacement requires the ac power to be removed from the tape control unit and all attached tape transport units with the tape control unit ac power circuit breaker.

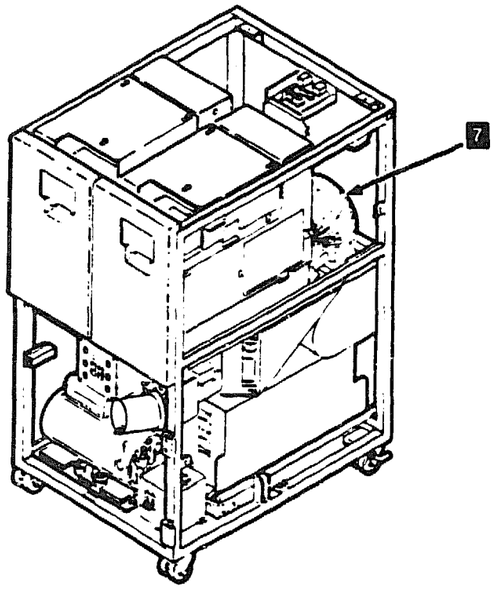
Removing the Tape Transport Unit Thermal Switch Cable Harness

After you have determined the tape transport unit containing the failing thermal switch cable harness, proceed as follows:

1. Go to CARR-TCU 6 for the procedure to remove the ***ac power*** from the tape control unit.
2. Remove the tape transport unit top cover (see CARR-DR 2-8) for easier access to cables and connectors.
3. If this is the end tape transport unit, remove the right side cover (see CARR-DR 2-1). If this is not the end tape transport unit, open the front cover and remove the front safety cover (see CARR-DR 2-1) for the tape transport unit to the right of the failing unit.
4. Remove the convoluted bellows 7 from both drives (see CARR-DR 2230).
5. Position both drive drawers all the way open (see CARR-DR 2-1).
6. Remove the tape transport unit front cover (see CARR-DR 2-1).
7. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
8. Disconnect the thermal switch cable plug P1 6 from the interframe connector panel in the tape transport unit or tape control unit to the left (as viewed from the front of the tape transport unit).
9. Loosen, but do not remove, the two screws 5 on the front of the cable plenum 1.

   This will provide an opening for the removal of the thermal cable connector.
10. Put the thermal cable and connector through the opening in the cable mounting plate and toward the rear of the tape transport unit.
11. Disconnect the thermal switch cable harness from the tape transport unit to the right of the failing tape transport unit (as viewed from the front, if present.)

    Note: This will be a jumper if the failing tape transport unit is the end unit connected to a tape control unit. Save the jumper for the replacement procedure.
12. Press the retention fingers and remove the thermal switch cable connector J1 2 from the interframe connector panel 3.
13. Remove the two cable connectors from the thermal switch 4.
14. Remove the thermal switch cable harness from the cable plenum 1 and out the rear of the tape transport unit.



Replacing the Tape Transport Unit Thermal Switch Cable Harness

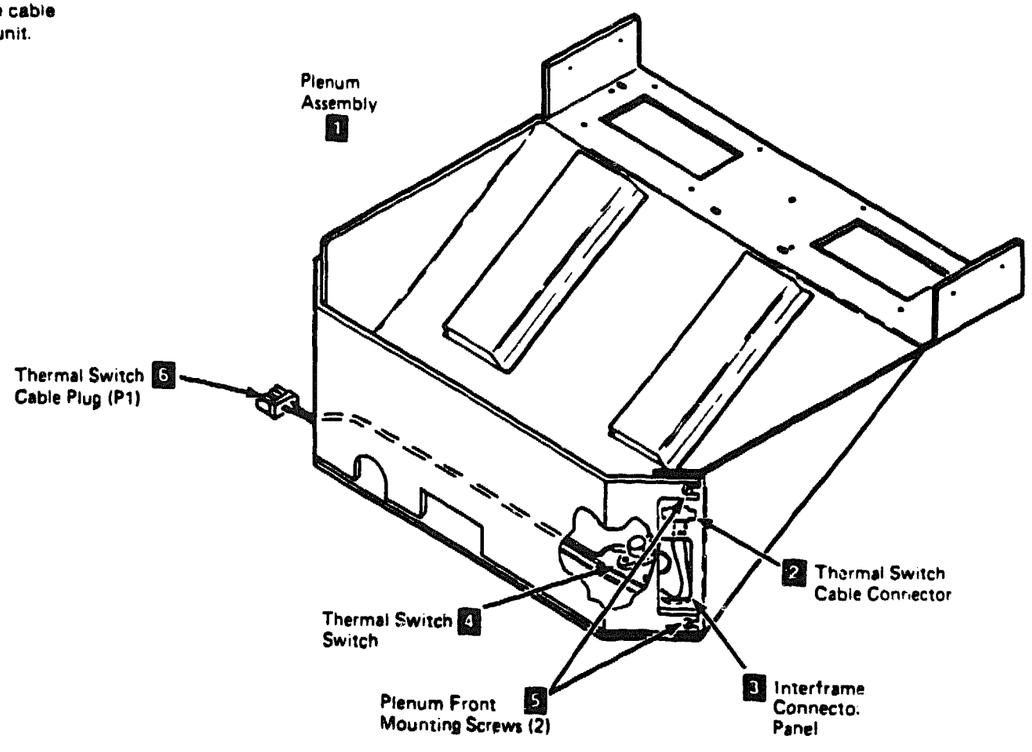
From the rear of the tape transport unit:

1. Insert the J1 connector of the cable harness into its opening in the interframe connector panel 3.
2. Connect the two cable harness connectors to the thermal switch 4.
3. Route the P1 plug 6 end of the cable harness through the opening in the cable plenum at side of the tape toward the tape control unit.

From the front of the tape transport unit:

4. Connect the P1 plug 6 of the cable harness into the J1 connector of the adjacent tape transport unit (on the left) or tape control unit.
5. Connect the P1 plug of the cable harness from the tape transport unit to the right (if present) into the J1 connector.

   Note: If this is the end tape transport unit, plug the jumper saved from the removal procedure into the thermal switch cable connector J1 2.
6. Tighten the two mounting screws 5 securing the front of the cable plenum assembly 1.
7. Close both drive drawers and replace the convoluted bellows 7 (see CARR-DR 2230).
8. Install the tape transport unit front safety cover (see CARR-DR 2-2).
9. Replace the tape transport unit rear cover (see CARR-DR 2-2).
10. If this is an end tape transport unit, install the tape transport unit right side cover (see CARR-DR 2-2). If this is not the end tape transport unit, install the tap unit front safety cover (see CARR-DR 2-2), for the tape transport unit to the right.
11. Go to CARR-TCU 6 for the procedure to restore the ***ac power*** to the tape control unit.



FRU085 Drive Control Card (02A-A1B2) Removal and Replacement Procedure

This page contains the steps needed to remove and replace the drive control card 02A-A1B2 from a drive.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-DR 1-9 for instructions for Working With ESD-Sensitive Parts.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing Logic Card A1B2

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer (see CARR-DR 2-5).
3. Remove the card side cover 1.
4. Remove the two screws for each card retainer and remove the card retainers 3 if installed.

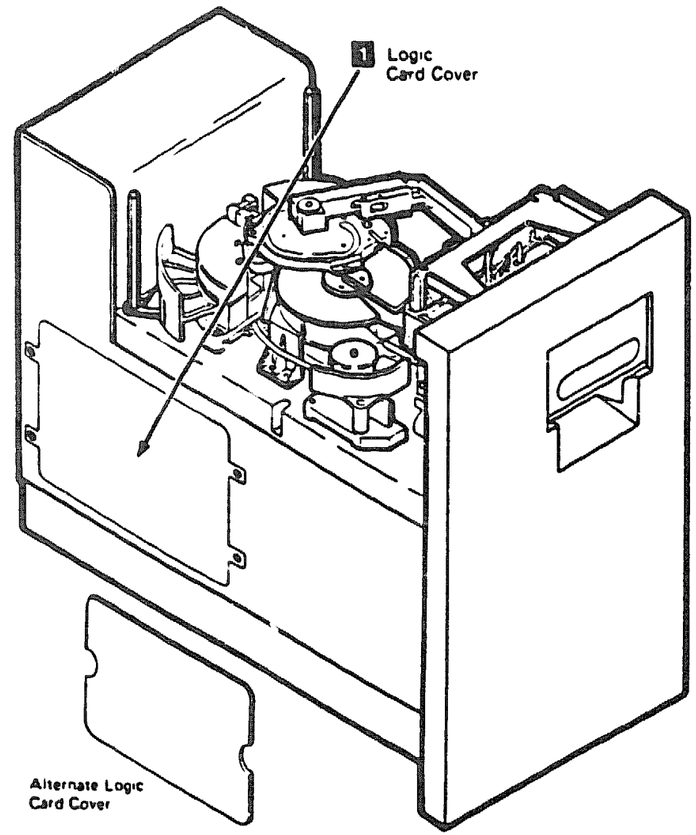
   Note: The A1B2 logic card is the bottom one plugged into the logic board.

5. Remove the TCCs 2 from positions YB and ZB.

   Note: The Drive Control card (A1B2) is a special card that plugs into three rows of pins in the logic board (A1B2-B,C,D).

   Warning: Ensure that you do not loosen or damage any of the cables in the A1 row of the logic board while removing the A1B2 logic card.

6. Remove the drive control card (02A-A1B2) from the drive by pulling the card straight out from the logic board.



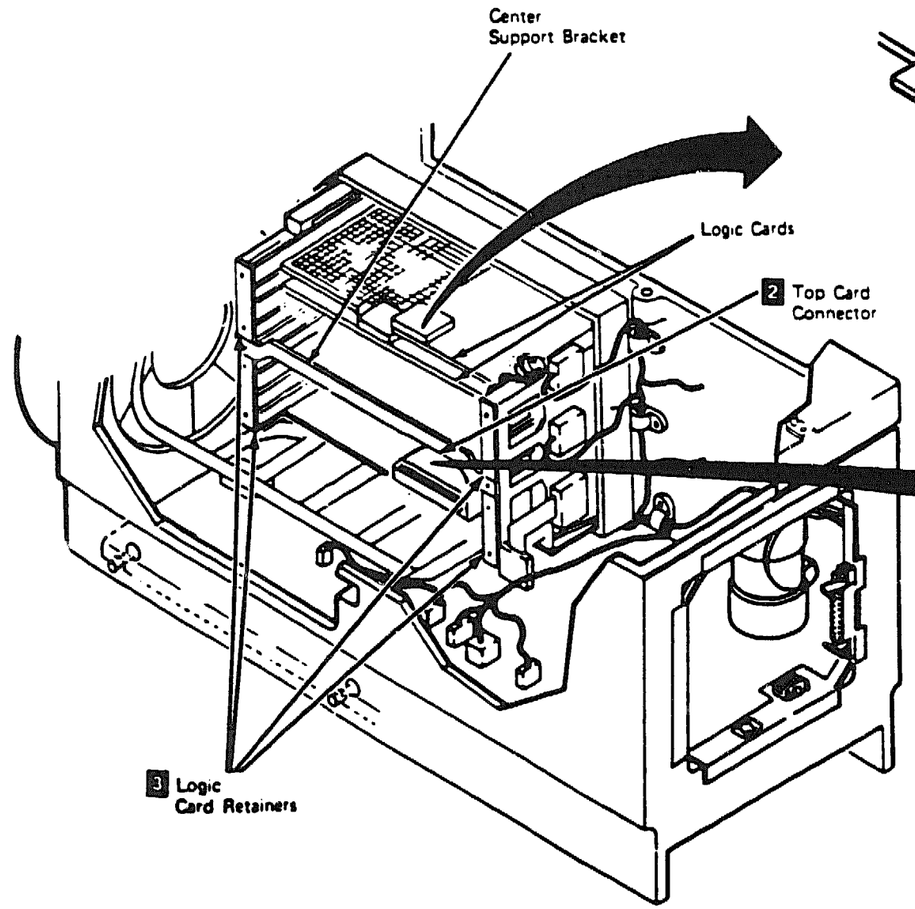
Replacing Logic Card A1B2

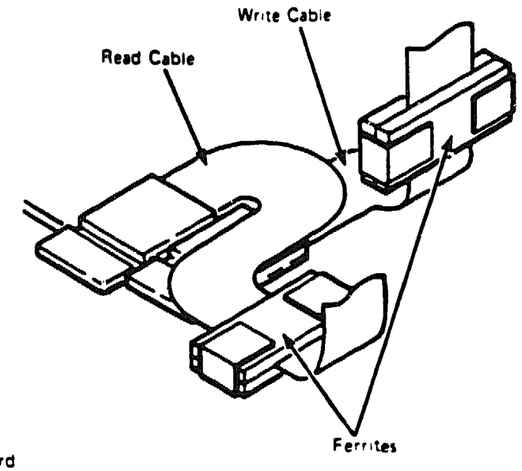
Note: Before inserting the drive control card into the logic board, inspect the board for any bent or damaged pins.

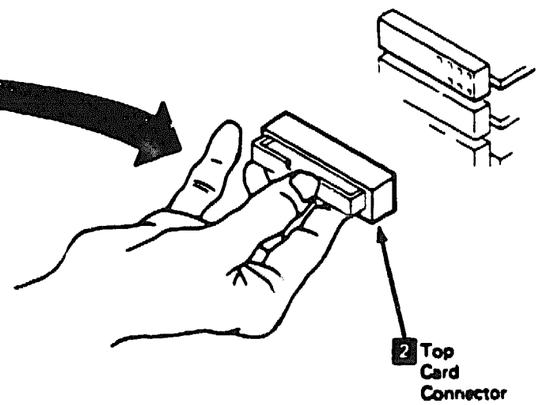
Warning: Ensure that you do not loosen any of the cables that plug into the A1 row of the logic board when you are inserting the A1B2 logic card.

Note: The A1B2 logic card is a special card that plugs into all three pins in the B2 row (A1B2-B,C,D).

1. Insert the drive control card (02A-A1B2) into the drive by pushing the card straight into the logic board.
2. Install the card retainers 3 and the two screws to secure each retainer if previously removed.
3. Install the TCCs 2 for A1B2 card at locations YB and ZB.
4. Install the card side cover 1.
5. Close the drive drawer (see CARR-DR 2-5).
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







FRU088 or 092 - Read Bus Adapter Local Cable or Read Bus Adapter Remote Cable Removal and Replacement Procedure

This page contains the steps needed to remove and replace either of the read bus cables (local or remote) in the tape transport unit. Since only one read bus will be affected, the customer may continue to use the subsystem through the other read bus if two tape control units are installed. If only one tape control unit is installed, the entire subsystem must be available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker 1.

Removing the Read Bus Cable

1. Have the customer dismount both drives in the tape transport unit with the failing read bus cable.
2. Have the customer dismount and deallocate all paths that use the failing read bus cable. (See the examples on this page.)
3. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.

From the front of the tape transport unit:

4. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
5. If this is the end tape transport unit, remove the right side cover (see CARR-DR 2-1). If this is not the end tape transport unit, open the front cover and remove the front safety cover on the tape transport unit to the right (see CARR- DR 2-1).

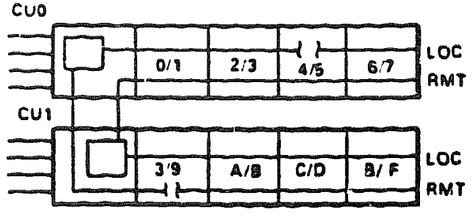
Examples

a. Tape Control Unit 0 - local read bus in drives 4/5 failing:

- Dismount drives 4 and 5.
- Deallocate paths through tape control unit 0 to drives 0-7.

b. Tape Control Unit 0 - remote read bus in drives 8/9 failing:

- Dismount drives 8 and 9.
- Deallocate paths through tape control unit 0 to drives 8-F.



Warning: Check the connector panel and cable labels to ensure that the correct read bus cable is being disconnected.

6. Disconnect the failing read bus cable from the P2 connector panel 2 in the tape transport unit to the left (or P1 connector panel in the tape control unit).
7. Disconnect the read bus cable from the P2 connector panel 2 of the failing tape transport unit to the tape transport unit to the right (if present, or else remove the terminator from the P2 connector panel in the failing drive).
8. Remove the two screws holding the cable connector to the P2 panel in the failing drive.
9. Loosen the top screw holding the front of the cable plenum 3 on each side.

From the rear of the tape transport unit:

10. Remove the top cover of the tape transport unit to get access to the cables (see CARR-DR 2-8).
11. Remove the convoluted bellows 5 from both drives (see CARR-DR 2230).
12. Open both drive drawers, completely (see CARR-DR 2-5).
13. Disconnect the drive read bus cables that plug into the tees 6 of the failing read bus cable (local 4 or remote 4).
14. Remove the top and loosen the bottom mounting screws holding the tees to the cable plenum.
15. Remove the failing read bus cable from the tape transport unit.
16. Save the mounting screws for the replacement procedure.

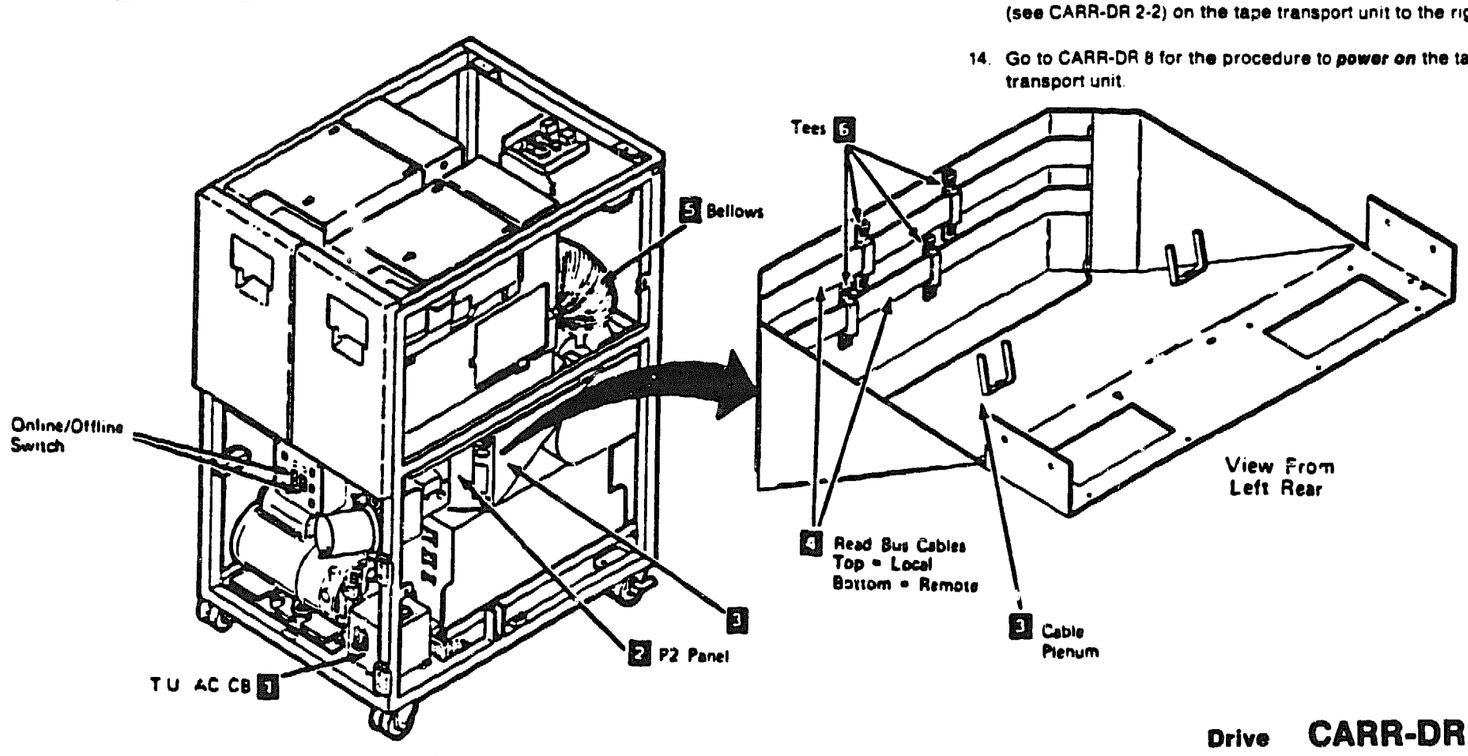
Replacing the Read Bus Cable

From the rear of the tape transport unit:

1. Position the read bus cable 4 in the cable plenum with the plug end to the right.
2. Attach the cable tees 6 to the cable plenum with the screws saved from the removal procedure.
3. Plug the drive cables into the read bus cable tees 6.
4. Route the right end of the read bus cable through the slot in the cable plenum 3.
5. Route the left end of the read bus cable through the slot at the P2 panel.
6. Close both drive drawers and replace both convoluted bellows 5 (see CARR-DR 2230).
7. Replace the tape transport unit top cover (see CARR-DR 2-8).

From the front of the tape transport unit:

8. Attach the connector on the right end of the read bus cable to the P2 panel with the screws saved from the removal procedure.
9. Install the read bus cable from the tape transport unit on the right (if present, otherwise install the terminator) in the connector just installed on the P2 panel 2.
10. Tighten the screws holding the front cable plenum 3 in position. Ensure that no cables are pinched.
11. Install the read bus cable from the drive just repaired to the tape transport unit on the left P2 panel 2 (P1 panel if this is the tape control unit).
12. Replace the tape transport unit front safety cover (see CARR-DR 2-2).
13. If this is the end tape transport unit, replace the right side cover (see CARR-DR 2-2). If this is not the end tape transport unit, replace the front safety cover and front cover (see CARR-DR 2-2) on the tape transport unit to the right.
14. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



FRU090 Message Display DC Power Cable Removal and Replacement Procedure

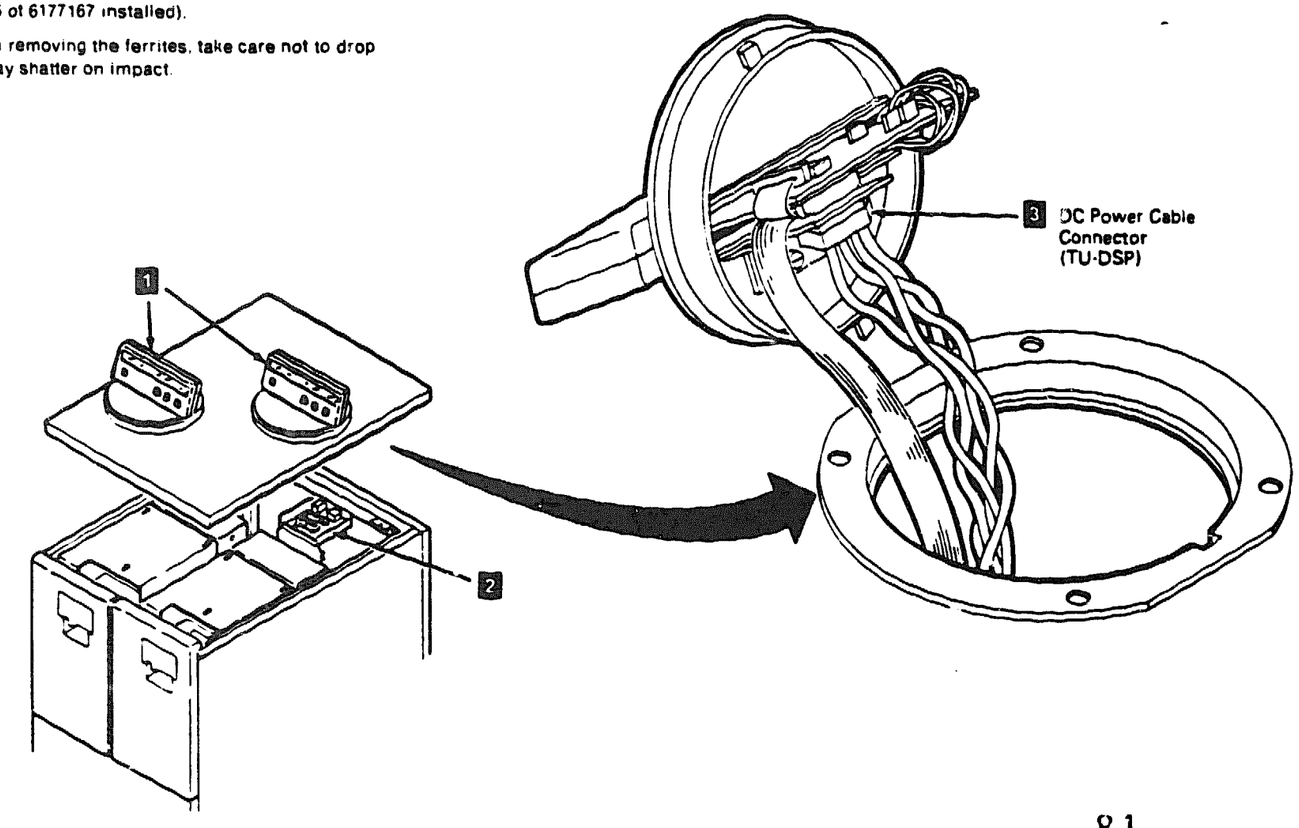
This page contains the steps needed to remove and replace the dc power cable connecting the message display of both drives to the external load resistor panel. Since dc voltage is supplied to both message displays with this cable, it will be necessary to have both drives of the tape transport unit available for service.

Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

Removing the Message Display DC Power Cable

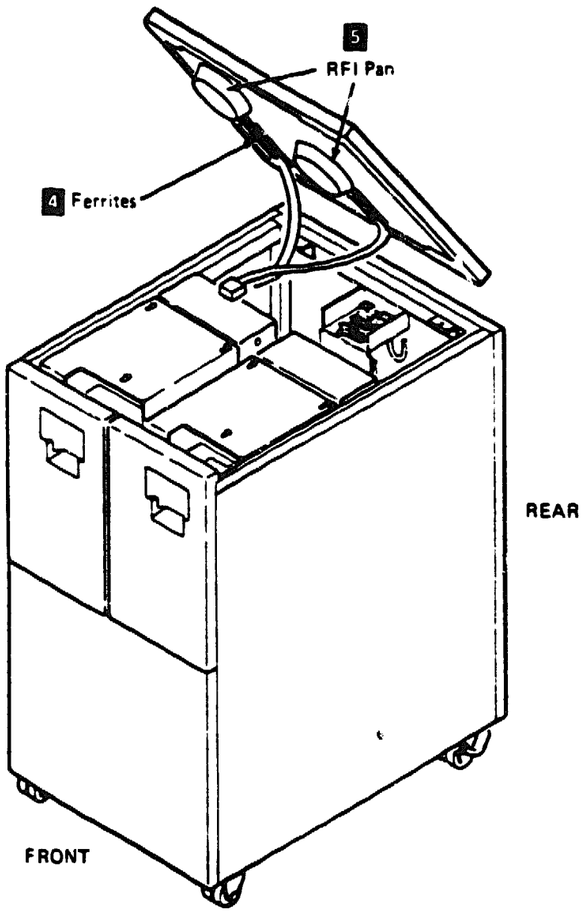
1. Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.
2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
3. Open both drive drawers (see CARR-DR 2-5).
4. Open the tape transport unit rear cover (see CARR-DR 2-1).
5. Remove cable plug P11 from connector J11 located on the bottom of the external load resistor panel 2 (cable support bracket, if the tape transport unit has power supply part number 6177166 or 6177167 installed).

   Warning: When removing the ferrites, take care not to drop them as they may shatter on impact.
6. Loosen the two screws holding the ferrites 4 to the RFI pans 5 for both message display panels and carefully remove both halves of each ferrite.
7. Remove both message display panels (TU-DSP) 1 from the top cover (see CARR-DR 2-6).
8. Turn both message display panels over and set them on the top of the cover.
9. Remove the four-conductor dc power cable plug P3 3 from each message display panel.
   - For drive 0 remove cable plug P3 from connector J3.
   - For drive 1 remove cable plug P3 from connector J3.
10. Remove the message display dc cable from the tape transport unit.
11. Save all the cable retention hardware for the installation procedure.



Replacing the Message Display DC Power Cable

1. Route the P3 3 end of the cable through the radio frequency interference (RFI) pans and to the message display panels.
   - For drive 0 - connect the cable plug P3 to connector J3.
   - For drive 1 - connect the cable plug P3 to connector J3.
2. Loosely assemble the ferrite retention and mounting plate with the ferrites and cables enclosed in the ferrites 3.
3. Tighten the ferrite mounting screws, ensuring that the cables are not pinched.
4. Replace the two screws holding the ferrites 4 to the RFI pans 5.
5. Replace the cable plug P11 in connector J11 located on the bottom of the external load resistor panel 2 (cable support bracket, if the tape transport unit has power supply part number 6177166 or 6177167 installed).
6. Replace the message display panels 1 (TU-DSP) (see CARR-DR 2-6).
7. Install and close the rear cover if removed (see CARR-DR 2-2).
8. Install the front safety cover and ground connector (see CARR-DR 2-2).
9. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



FRU095 Tape Transport Unit DC Power Supply Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape transport unit dc power supply (TU-PS-01) The removal and replacement of the dc power supply is from the rear of the tape transport unit.

Since there is only one dc power supply in the tape transport unit both drives must be available for service

Note This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker

Removing the Tape Transport Unit DC Power Supply

1 Go to CARR-DR 8 for the procedure to ***power off*** the tape transport unit.
2 Remove the tape transport unit rear cover (see CARR-DR 2-1)
3 Open the tape transport unit front cover (see CARR-DR 2-1).
4 Remove the tape transport unit front safety cover (see CARR-DR 2-1)
5 Remove cable plugs P11 and P15 (TU-PS-01-P11 and P15) 4 from the rear of the power supply 2 (see LOC 1).
6 Remove cable plugs P1, P2, P3, P4, P5, P6, and P7 (TU-PS-01-P1, P2, P3, P4, P5, and P6) 1 from the front of the power supply.
7 Remove the two mounting bolts 3

Warning: Be careful during the next step not to pinch any cables or damage any connectors as you slide the power supply from the tape transport unit frame

CAUTION:
The drive dc power supply weighs about 41 kilograms (90 pounds). Two service representatives should lift the power supply.

8. Using the handles provided, slide the power supply out the rear of the tape transport unit.
9. Save the mounting bolts for the replacement procedure.

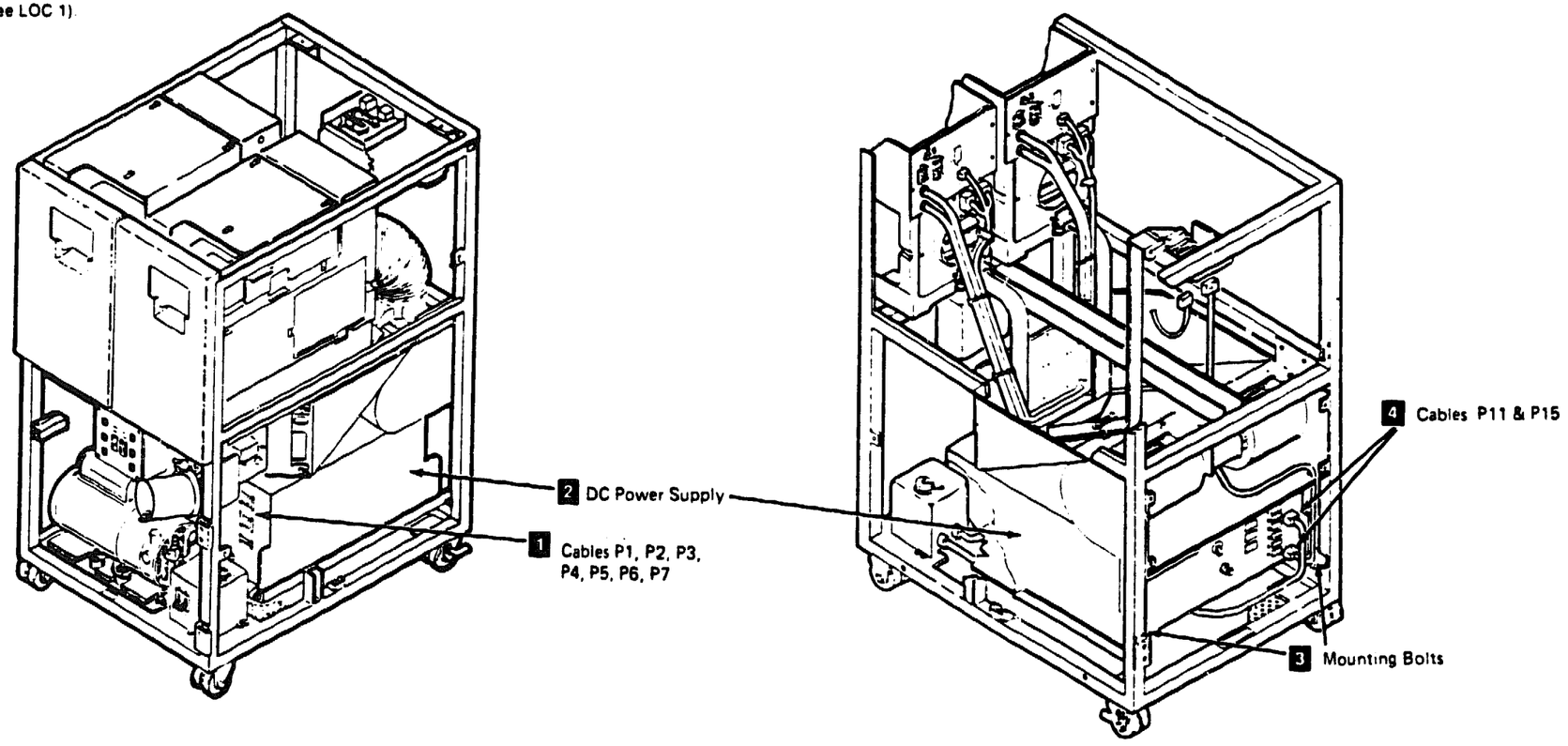
Replacing the Tape Transport Unit DC Power Supply

CAUTION:
The drive dc power supply weighs about 41 kilograms (90 pounds). Two service representatives should lift the power supply.

Warning: Be careful during the next step not to pinch any cables or damage any connectors as you slide the power supply into the tape transport unit frame

1 Place the power supply 2 on the rails and slide into position.
2. Install the two mounting bolts 3.
3. Connect the P11 and P15 cables 4 (TU-PS-01-P11 and P15) to the rear of the power supply (see LOC 1).
4. Connect cables P1, P2, P3, P4, P5, P6, and P7 1 (TU-PS-01-P1, P2, P3, P4, P5, P6, and P7) to the front of the power supply.
5 Ensure that the voltage jumper on the dc power supply is installed in the correct position.
   - If the ac supply voltage is 208/220 V ac install the voltage jumper in TU-PS-01-J12
   - If the ac supply voltage is 230 V ac install the voltage jumper in TU-PS-01-J13
   - If the ac supply voltage is 240 V ac install the voltage jumper in TU-PS-01-J14

   Note: Ensure that the setting of the ac voltage jumper is the same as listed on the power supply voltage label (input); if necessary, change the power supply voltage label.
6. Install and close the rear cover (see CARR-DR 2-2).
7. Install the tape transport unit front safety cover and close the front cover (see CARR-DR 2-2).
8. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.



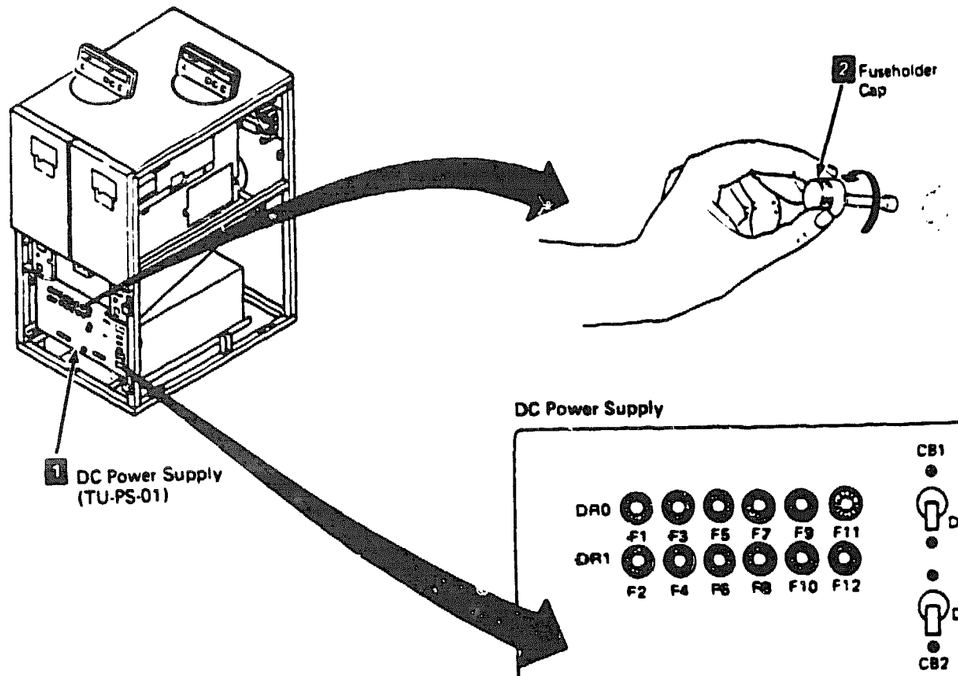
FRU096, 98-102 Fuse Removal and Replacement Procedure

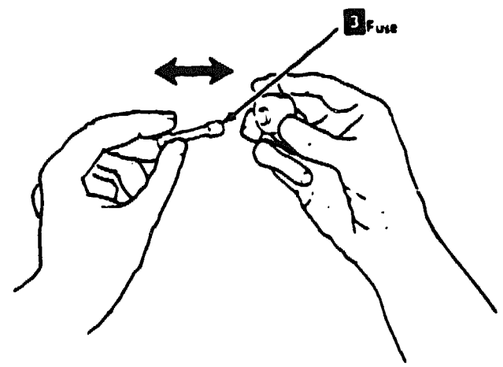
This page contains the steps needed to remove and replace any of the fuses in the tape transport unit dc power supply 1 (TU-PS-01). There are separate fuses for each drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Fuse Removal and Replacement

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive rear cover (see CARR-DR 2-1).
3. Locate the fuse to be replaced (see table on this page).
4. Turn the fuseholder cap counterclockwise 2 and remove the defective fuse from the power supply.
5. Place a fuse 3 of the correct rating in the fuseholder cap.
6. Replace the fuse in the power supply by turning the fuseholder cap clockwise.
7. Close the drive rear cover (see CARR-DR 2-2).
8. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU Number	DR. 0	DR. 1	Fuse Useage
096	F1	F2	+24v.
098	F3	F4	+15v.
099	F5	F6	-15v.
100	F7	F8	+8.5v.
101	F9	F10	-5v.
102	F11	F12	+5v.
280	F13	F14	+5v.

FRU104, 105, 107,108 Tape Transpo t Unit Control Box Switch Removal and Repalcement Pro cedure

This page contains the steps needed to remove and replace any of the switches from the tape transport unit control box assembly (TU-OSU)

Note. This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing drive with the tape transport unit ac power circuit breaker

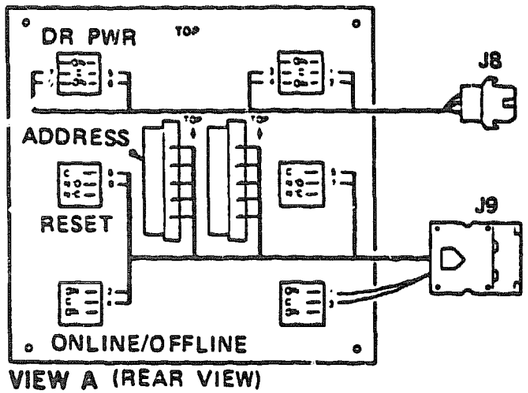
Note: Due to cable lengths and/or physical size or some connectors, you may not be able to pass the cable connectors through the front of the drive address switch panel [1]. In these cases, access the cable connectors by removing the four mounting screws and the front of the drive address switch panel.

Removing and Replacing the Control Box Switches

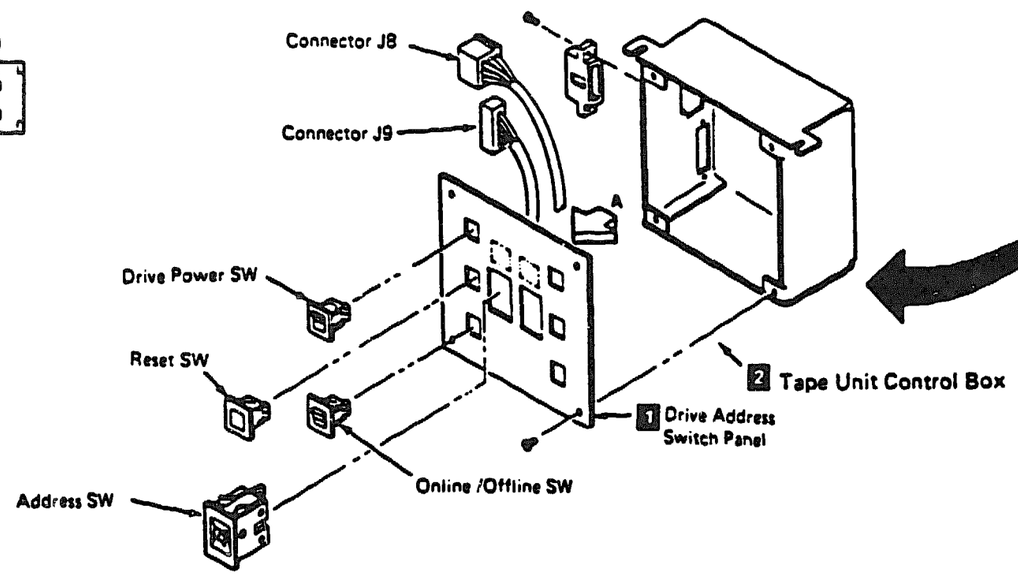
1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit
2. Remove the tape transport unit front safety cover (see CARR-DR 2-1).
3. Remove cable plugs P8 and P9 from connectors J8 and J9 located on the left side of the tape transport unit control box [2]
4. Loosen the two mounting screws and remove the control box [2] from the tape transport unit.
5. Locate the switch to be replaced.
6. Using a small screw driver or similar tool, carefully pry the switch out through the opening in the panel front [1]
7. Remove the leads (a connector block on the address switch) one at a time from the old switch and install them on the replacement switch.

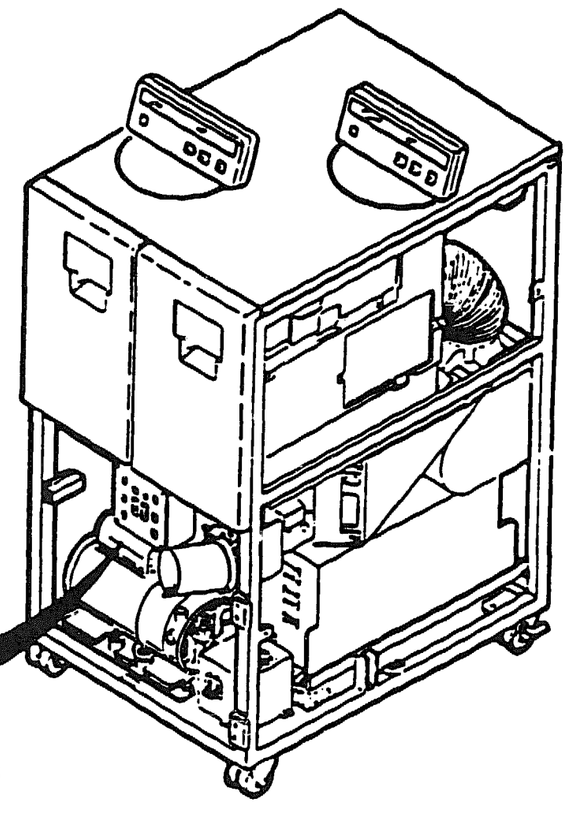
   Note: If you are uncertain about the lead connections, see the cable diagram on this page to define which lead goes to which switch connection.

8. Guide the replacement switch into the opening in the panel [1] and firmly push to seat the switch into place.
9. Install the control box [2] in the tape transport unit and tighten the mounting screws
10. Install cable plugs P8 and P9 into connectors J8 and J9 located on the left side of the control box [2]
11. Install the tape transport unit safety cover (see CARR-DR 2-2)
12. Go to CARR-DR 8 for the procedure to *power on* the drive.



VIEW A (REAR VIEW)





FRU109 Operator Panel Switch Board Removal and Replacement Procedure

This page contains the steps needed to remove and replace the switch board (TU-DSP) from the operator panel assembly. The switch board is behind the message display board in the operator panel assembly.

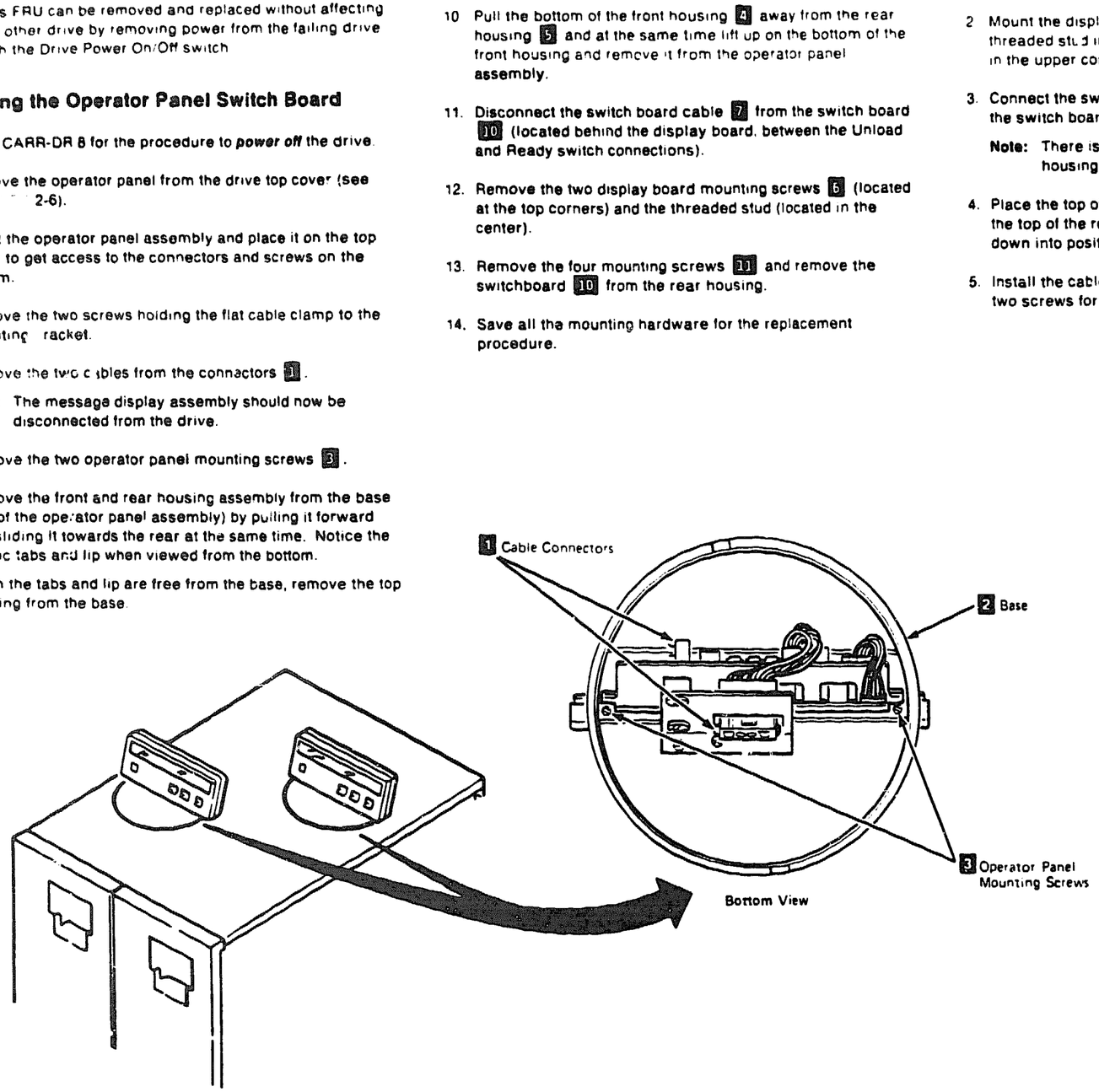
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Operator Panel Switch Board

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Remove the operator panel from the drive top cover (see CARR-DR 2-6).
3. Invert the operator panel assembly and place it on the top cover to get access to the connectors and screws on the bottom.
4. Remove the two screws holding the flat cable clamp to the mounting bracket.
5. Remove the two cables from the connectors 1.

   Note: The message display assembly should now be disconnected from the drive.
6. Remove the two operator panel mounting screws 3.
7. Remove the front and rear housing assembly from the base 2 (of the operator panel assembly) by pulling it forward and sliding it towards the rear at the same time. Notice the plastic tabs and lip when viewed from the bottom.

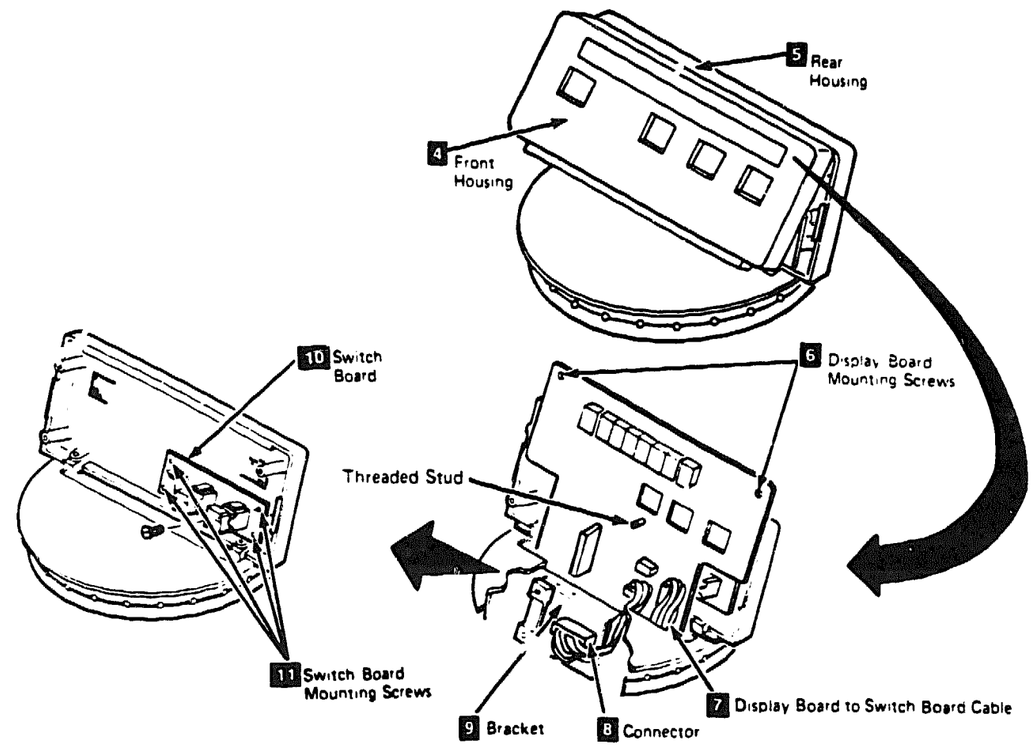
   When the tabs and lip are free from the base, remove the top housing from the base.
8. Remove the retention hardware as required and disconnect P1 8 and loosen the J1 mounting bracket 9 (two screws).
9. Turn the operator panel assembly upright.
10. Pull the bottom of the front housing 4 away from the rear housing 5 and at the same time lift up on the bottom of the front housing and remove it from the operator panel assembly.
11. Disconnect the switch board cable 7 from the switch board 10 (located behind the display board, between the Unload and Ready switch connections).
12. Remove the two display board mounting screws 6 (located at the top corners) and the threaded stud (located in the center).
13. Remove the four mounting screws 11 and remove the switchboard 10 from the rear housing.
14. Save all the mounting hardware for the replacement procedure.



Replacing the Operator Panel Switch Board

1. Place the switch board 10 on the rear housing (with the connector down) and install the four mounting screws 11.
2. Mount the display board on the rear housing 5 with the threaded stud in the center and the two mounting screws 6 in the upper corners.
3. Connect the switch board cable 7 from the display board to the switch board.

   Note: There is a 'U' shaped lip in the top of the front housing.
4. Place the top of the front housing 4 in the 'U' shaped slot at the top of the rear housing 5 and pivot the front housing down into position.
5. Install the cable plug P1 into connector 8 and tighten the two screws for the J1 mounting bracket 9.
6. Work the bottom of the message display board through the opening in the operator panel assembly base.
7. Insert the bottom of the front housing 4 into the opening in the operator panel assembly base and press the front housing and the rear housing 5 together.
8. Turn the display panel assembly over and align the two mounting holes in the rear panel housing with the two holes in the base 3.
9. Install the flat cable and the power cable into the connectors 1.
10. Insert the folded cable into the clamp and tighten with the two screws. Replace any retention hardware.
11. Install the operator display panel by inserting the panel base 2 into the top cover (see CARR-DR 2-6).
12. Position the operator display panel to the original customer orientation.
13. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU110 Thermal Switch Removal and Replacement Procedure

This page contains the steps needed to remove and replace the thermal switch (TTU-Thermal Switch) in the drive

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Drive Thermal Switch

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

2 Open the drive drawer (see CARR-DR 2-5)

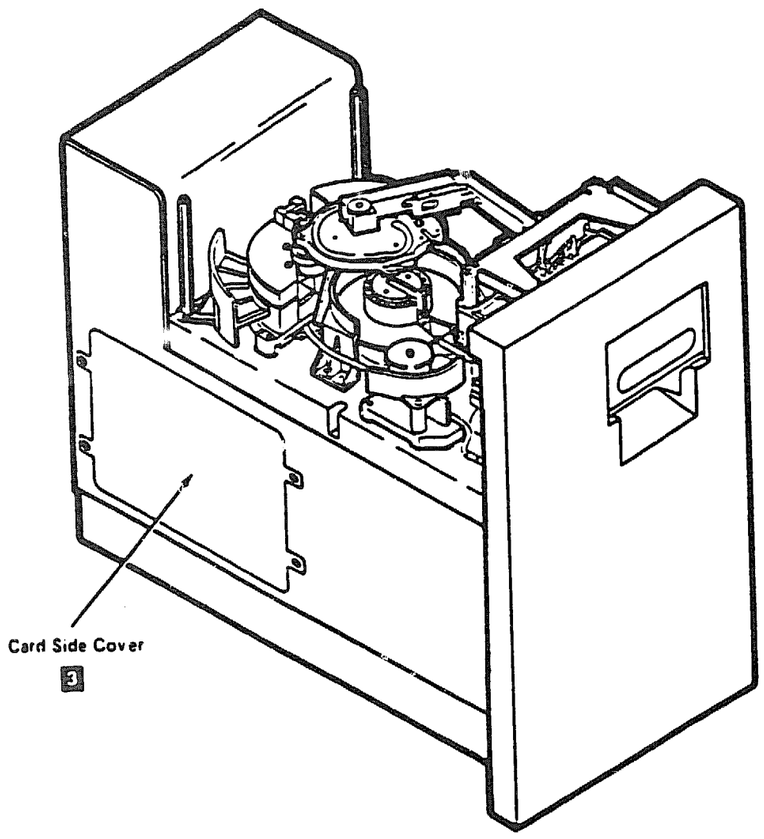
3 Remove the card side cover mounting screws and remove the card side cover 2.

Note: The thermal switch is located in one of three places:

- Mounted on the logic board ***right*** card guide.
- Mounted on the logic board ***left*** card guide.
- Mounted on the rear of the cradle assembly.

4 Remove the thermal switch mounting screw 1 and remove the thermal switch .

5 Disconnect the wires from the thermal and remove the thermal from the drive



Replacing the Drive Thermal Switch

Note: The thermal switch is installed in one of three places (depending on where the defective switch was installed)

- Mounted on the logic board ***right*** card guide
- Mounted on the logic board ***left*** card guide.
- Mounted on the rear of the cradle assembly

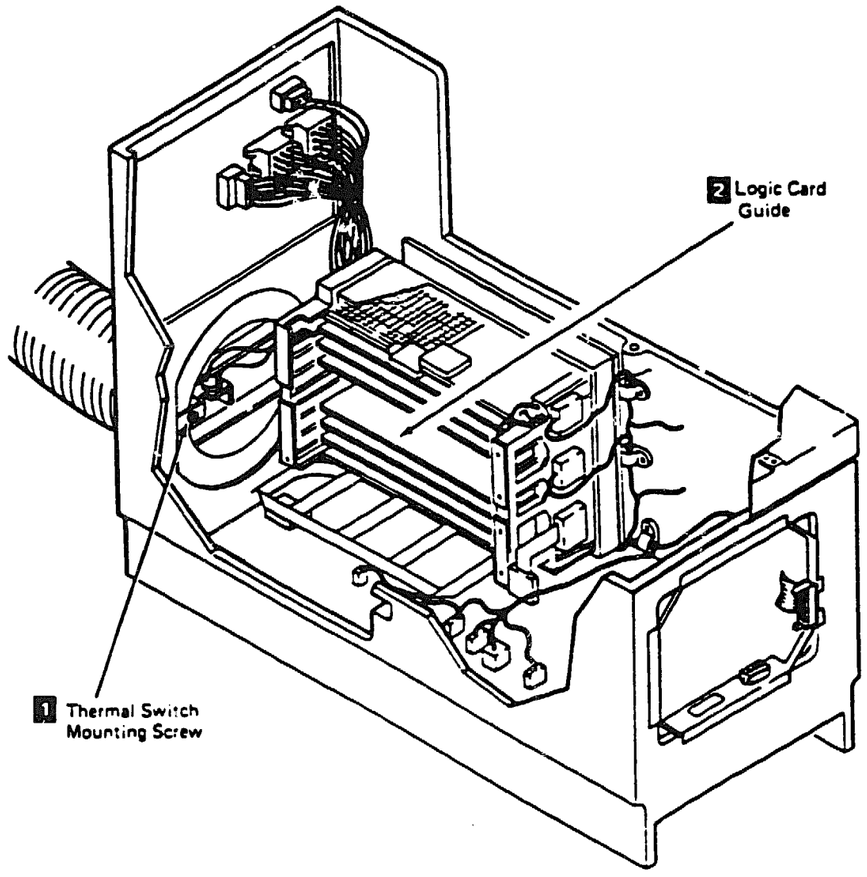
1 Connect the wires to the thermal switch.

2 Place the thermal switch in position and install the mounting screw 1

3 Place the card side cover 2 in position and install the mounting screws

4 Close the drive drawer (see CARR-DR 2-5).

5 Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU127 Latch Interlock Removal and Replacement Procedure

This page contains the steps needed to remove and replace the latch interlock in the drive. The other drive will not be affected

The latch interlock is a part of the cartridge latch assembly or the load assembly

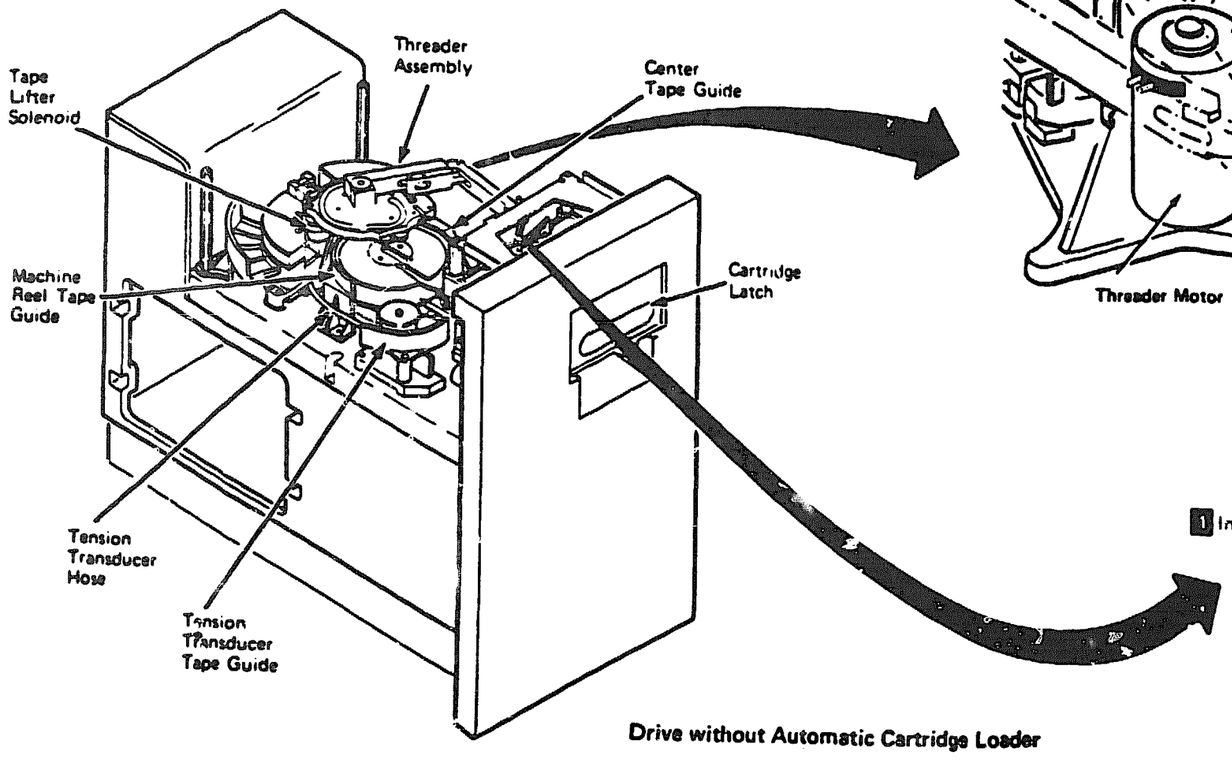
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Latch Interlock

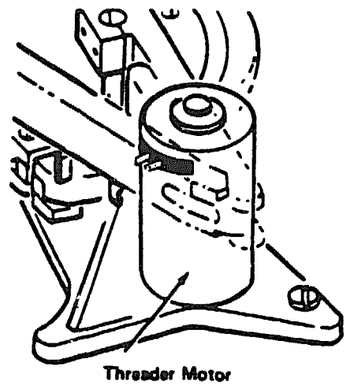
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Open the drive drawer (see CARR-DR 2-5).
3. Remove the drive drawer safety cover (see CARR-DR 2-5)
4. Remove both ends of the interlock spring 1 and remove the spring from the latch assembly.
5. Remove the 'C' clips holding the receiver 2 and the interlock 3.
6. Lift the receiver 2 so it is not engaged with the interlock
7. Remove the interlock 3 from the interlock pin.

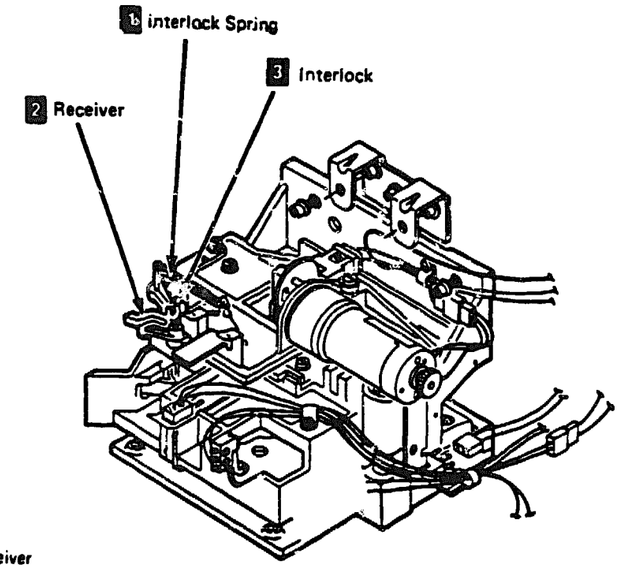
Replacing the Latch Interlock

1. Place the interlock 3 on the interlock pin.
2. Place the receiver 2 on the receiver pin.
3. Replace the 'C' clips on the interlock and receiver pins.
4. Replace the ck spring 1.
5. Replace the drive drawer safety cover (see CARR-DR 2-5).
6. Close the drive drawer (see CARR-DR 2-5).
7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

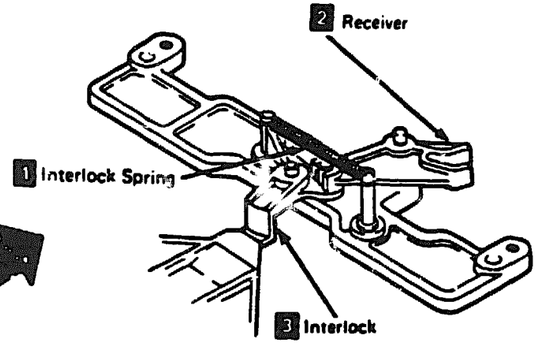


Drive without Automatic Cartridge Loader





Drive with Automatic Cartridge Loader



FRU129 Physical Address Switch Removal and Replacement Procedure

This page contains the steps needed to remove and replace the physical address switch (TU-PASW) in the drive. The other drive will not be affected.

The physical address switch is located on the rear panel of each drive drawer.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

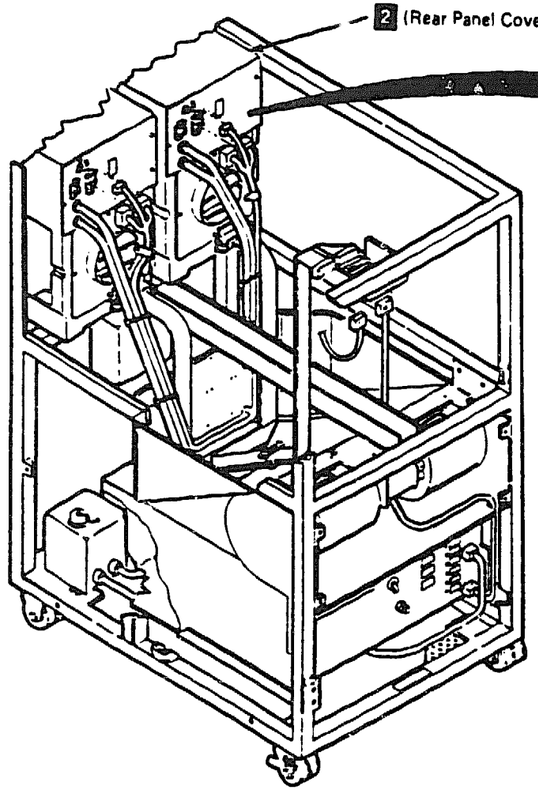
Removing the Physical Address Switch

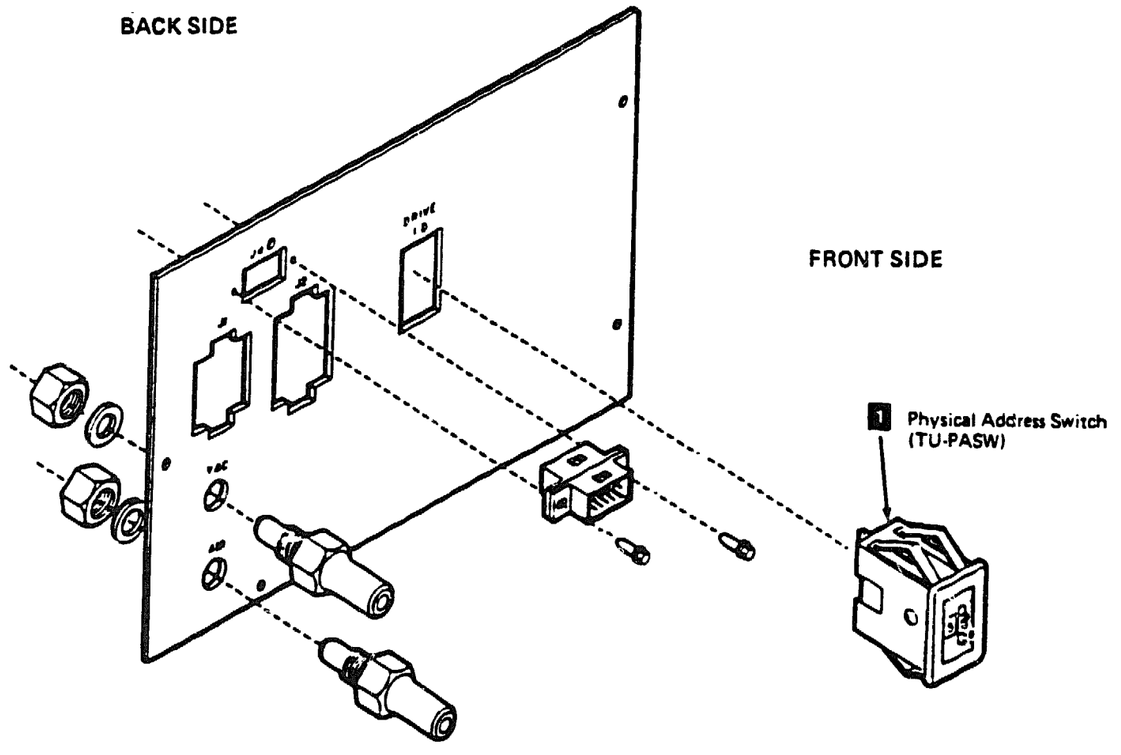
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive rear panel cover (see CARR-DR 2-5)
3. Write the address shown on the physical address switch **1** on the rear panel cover **2**. This address will be used in the replacement procedure.
4. Disconnect the cable connector to the physical address switch.
5. Compress the springs on the physical address switch and push the switch out the rear panel of the drive drawer.

Replacing the Physical Address Switch

1. Compress the springs on the physical address switch and push the switch through the rear panel of the drive drawer.

   Ensure that the switch is positioned so that the digits can be read.
2. Connect the cable connector to the physical address switch.
3. Set the physical address switch **1** to the physical address of the drive. The physical address of the drive should have been written on the rear panel cover during the removal procedure.
4. Replace the drive rear panel cover **2** (see CARR-DR 2-5).
5. Close the drive drawer.
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU161 Cleaner Block Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cleaner block assembly [3] from the drive

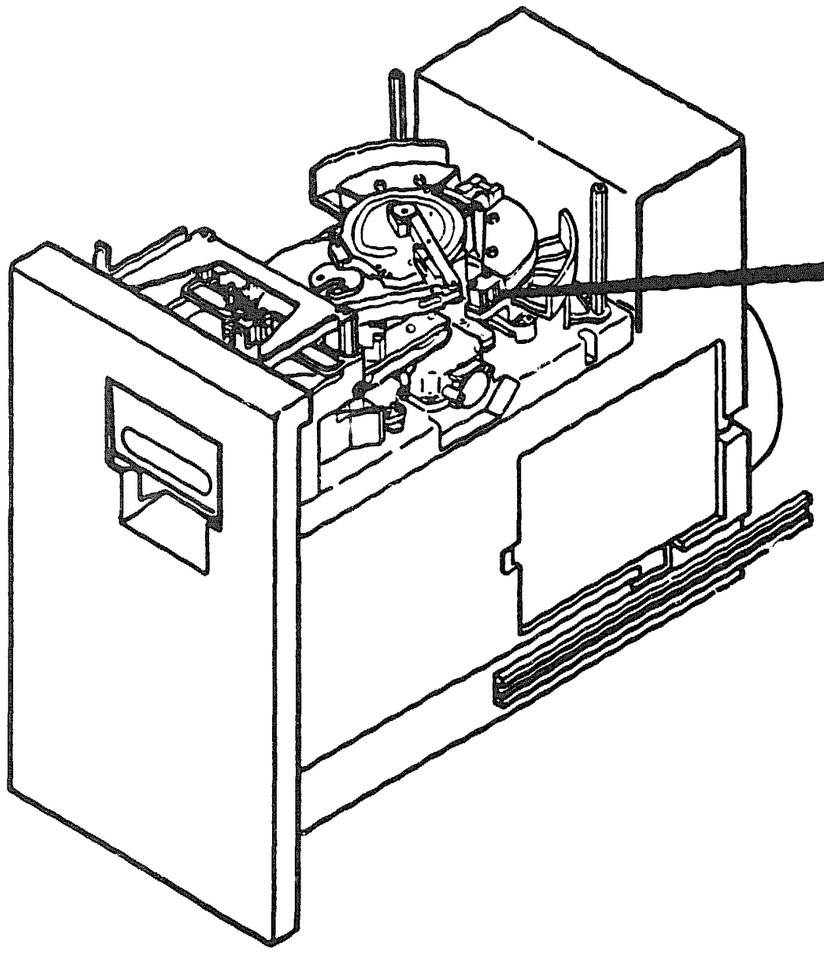
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

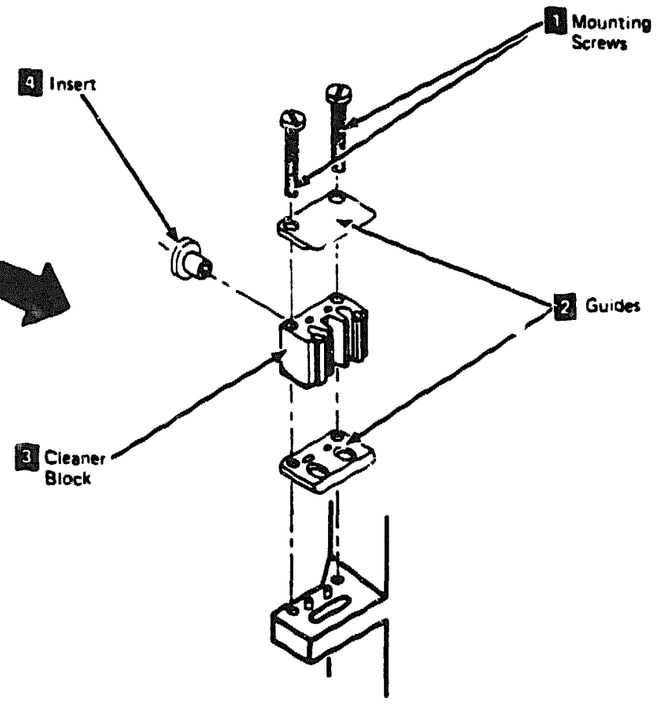
Removing the Cleaner Block Assembly

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5)
3. Remove the two cleaner block mounting screws [1] using care not to drop the upper and lower guides [2]
4. Remove the cleaner block [3] and the two guides.
5. Remove the plastic insert [4]. Save the guides and plastic insert for use on the replacement cleaner block.

Replacing the Cleaner Block Assembly

1. Install the plastic insert [4] on the new cleaner block
2. Install the cleaner block [3] using the two mounting screws [1] and the upper and lower guides [2] as shown Do not over tighten the mounting screws.
3. Install the drive drawer safety cover (see CARR 2-5).
4. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU211 Message Display Cable Removal and Replacement Procedure (Message Display to SLT Panel)

This page contains the steps needed to remove and replace the message display flat cable between the message display (TU-DSP) and the tape transport unit SLT connector panel (located on the bottom of the external load resistor panel - or cable support bracket if the tape transport unit has power supply part number 6177166 or 6177167 installed)

It is not necessary to have both drives available for service.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Message Display Cable

1 Go to CARR-DR 8 for the procedure to *power off* the drive.

2 Open the tape transport unit rear cover (see CARR-DR 2-1).

3 Disconnect the SLT cable for the failing drive from the SLT connector panel MD 00/01 1, located below the external load resistor panel (cable support bracket if the tape transport unit has power supply part number 6177166 or 6177167 installed)

Warning: When removing the ferrites, take care not to drop then as they may shatter on impact.

4 Loosen the two screws holding the ferrites 5 to the radio frequency interference (RFI) pan 6 and carefully remove both of the ferrite parts.

5 Remove the message display panel (for the failing drive) 7 from the top cover of the tape transport unit (see CARR-DR 2-6).

6 Place the message display panel on top of the tape transport unit to get access to the bottom of the panel.

7 Remove the two screws from cable clamp 3

8 Remove the message display cable from connector DPS-J1 2 (TU-D0/1-DSP-J1) on the message display board.

9 Note the position of the ferrite 4 (from the end of the cable) and then carefully remove both of the ferrite parts.

10 Remove the message display to SLT panel cable from the tape transport unit by pulling it through the opening in the RFI pan and through the opening in the top cover.

11 Save all hardware for the replacement procedure.

Replacing the Message Display Cable

1 Connect the message display cable for the failing drive to the SLT connector panel MD 00/01 1, located below the external load resistor panel (cable support bracket if the tape transport unit has power supply part number 6177166 or 6177167 installed)

2 Route the DSP-J1 connector end of the message display cable through the hole in the radio frequency interference (RFI) pan 6 to the message display panel 7

3. Loosely assemble the two ferrite parts 5 (surrounding the cables) and attach with the mounting screws to the RFI pan 6

Note:

Ensure that you do not pinch any of the cables when you tighten the mounting screws.

4 Loosely assemble the two ferrite parts 4 (surrounding the cables) and place in the position (from the cable end) noted in the removal procedure

Note:

5 Ensure that you do not pinch any of the cables with the ferrites

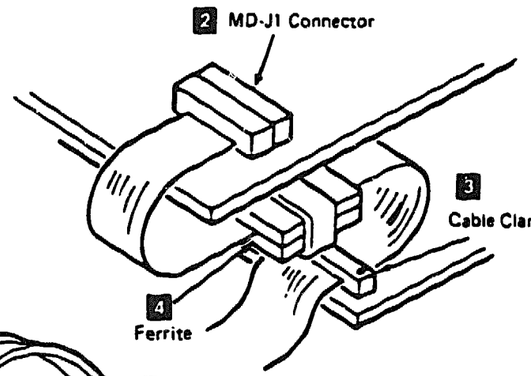
6 Install the cable clamp 3 with the two mounting screws

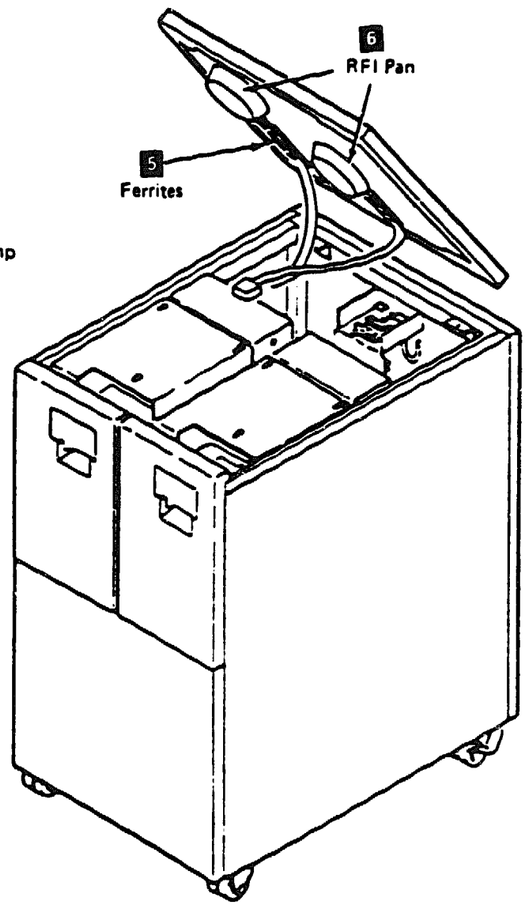
7 Plug the message display cable into connector DSP-J1 2 (TU-D0/1-DSP-J1) on the message display panel.

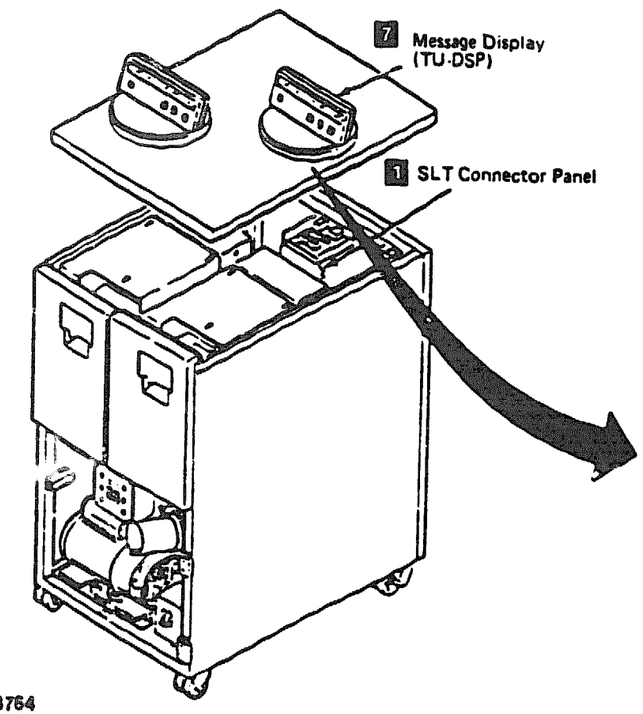
8 Install the message display panel 7 in the tape transport unit (see CARR-DR 2-6)

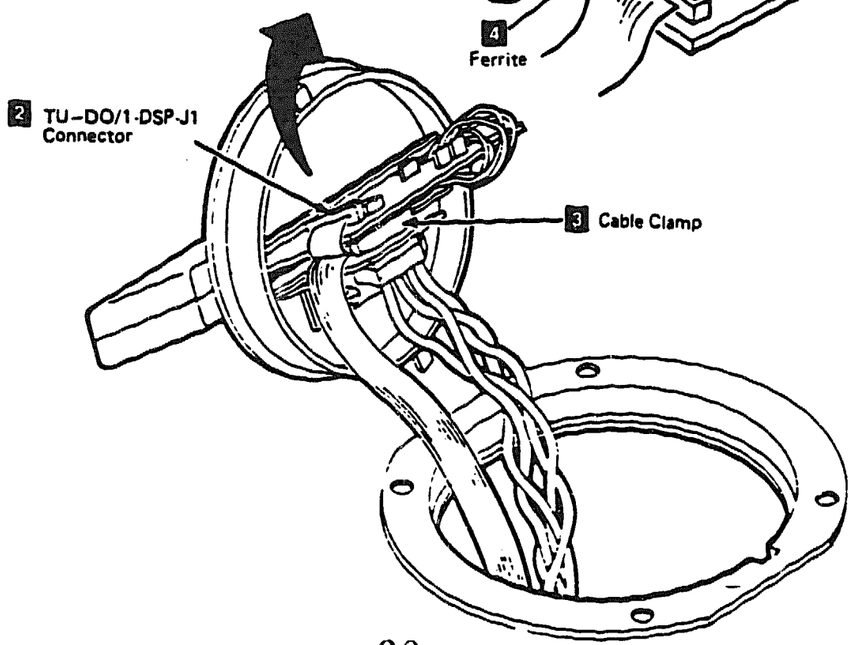
9 Close the tape transport unit rear cover (see CARR-DR 2-2).

10 Go to CARR-DR 8 for the procedure to *power on* the drive.









FRU211 Message Display Cable Removal and Replacement Procedure (SLT Panel to Logic Board)

This page contains the steps needed to remove and replace the message display flat cable between the SLT connector panel (located on the bottom of the external load resistor panel) and the logic board 02A-Y2.

It is necessary to have both drives available for service.

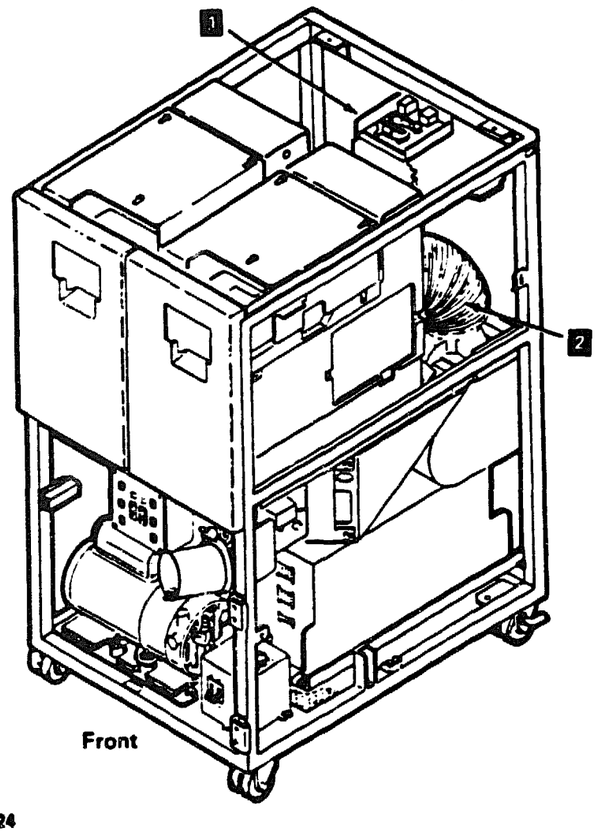
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

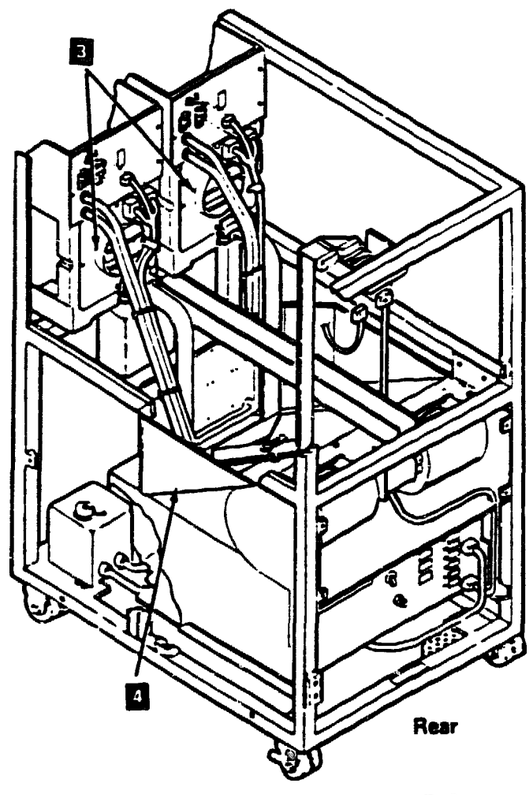
Removing the Message Display Cable

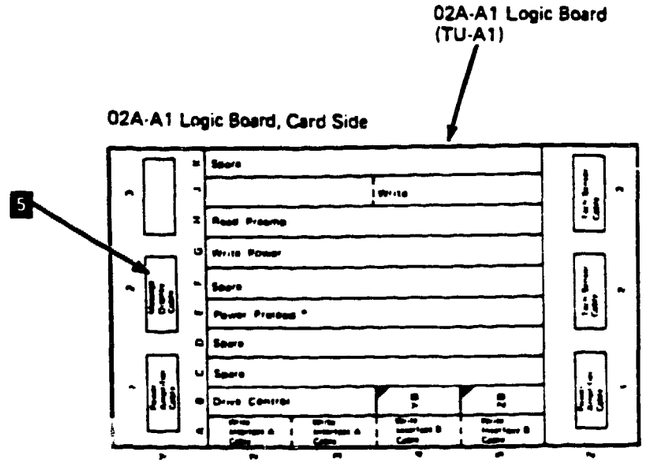
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the tape transport unit rear cover (see CARR-DR 2-1).
3. Remove the convoluted bellows 2 (see CARR-DR 2230) for drive 1 to get better access to the path the cable follows to the logic board.
4. Open both drive drawers (see CARR-DR 2-5).
5. Remove the message display signal cable (for the affected drive) from the SLT connector 1 (located on the bottom of the external load resistor panel - cable support bracket if the tape transport unit has power supply part number 6177166 or 6177167 installed).
6. Loosen the drive cable retainer clamps and remove the message display signal cable from the cable raceway on top of the cable plenum 4.
7. Remove the drive bellows housing 3 for the affected drive (held in position by four screws).
8. Reach through the opening in the rear of the drive drawer and unplug the display cable from the logic board (Y2 position) 5.
9. Loosen the cable clamp located at the rear of the drive drawers.
10. Unlace the message display signal cable from the R/W cables and remove the cable from the tape transport unit.
11. Save all the mounting hardware for the replacement procedure.

Replacing the Message Display Cable

1. Route the logic board end of the message display signal cable through the cable raceway on top of the cable plenum 4 and to the logic board.
2. Route the cable through the cable clamp at the rear of the drive drawers and replace the cable clamp.
3. Reach through the opening in the rear of the drive drawer and plug the message display signal cable into the correct position in the logic board (Y2 position) 5.
4. Replace the drive bellows housing 3 for the affected drive (held in position by four screws).
5. Replace the drive cable retaining clamps that hold the drive cables in the cable raceway on top of the cable plenum 4.
6. Replace the convoluted bellows 2 for drive 1.
7. Plug the message display signal cable into the SLT connector panel 1 (located on the bottom of the external load resistor panel - cable support bracket if the tape transport unit has power supply part number 6177166 or 6177167 installed).
8. Lace the cable to the R/W cables for the affected drive.
9. Replace the tape transport unit rear cover (and ground connector if present) (see CARR-DR 2-2).
10. Close the tape transport unit rear cover (see CARR-DR 2-2).
11. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







*Power preload card not used in machines containing power supply part number 6177166 or 6177167

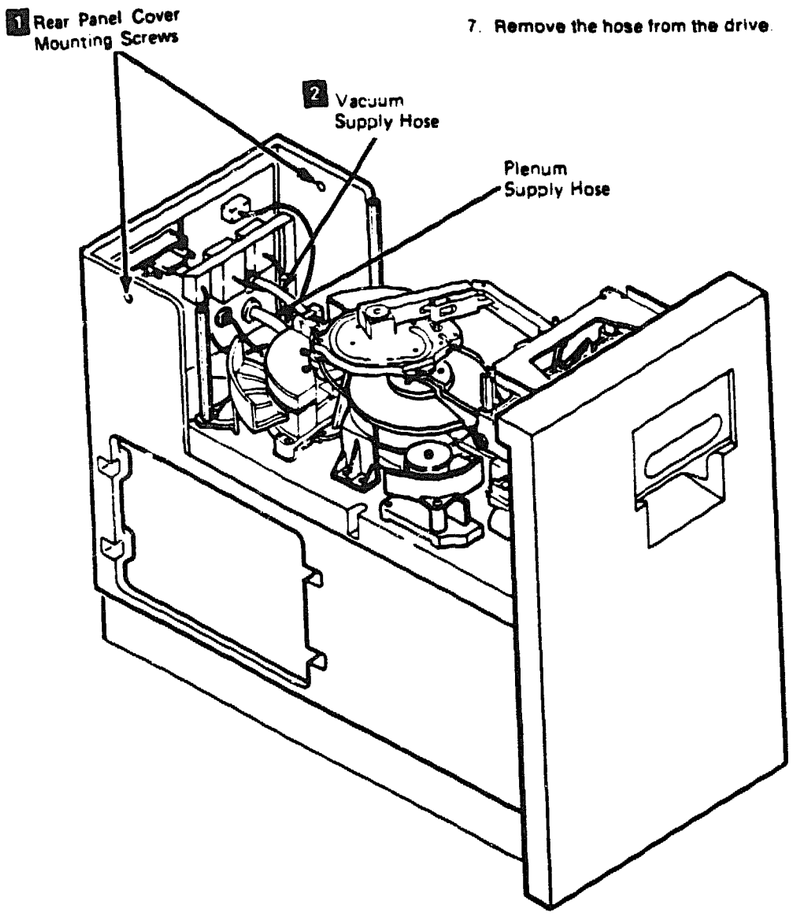
FRU212 Vacuum Supply Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the vacuum supply hose 3. The other drive will not be affected when the vacuum is disconnected during this procedure.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

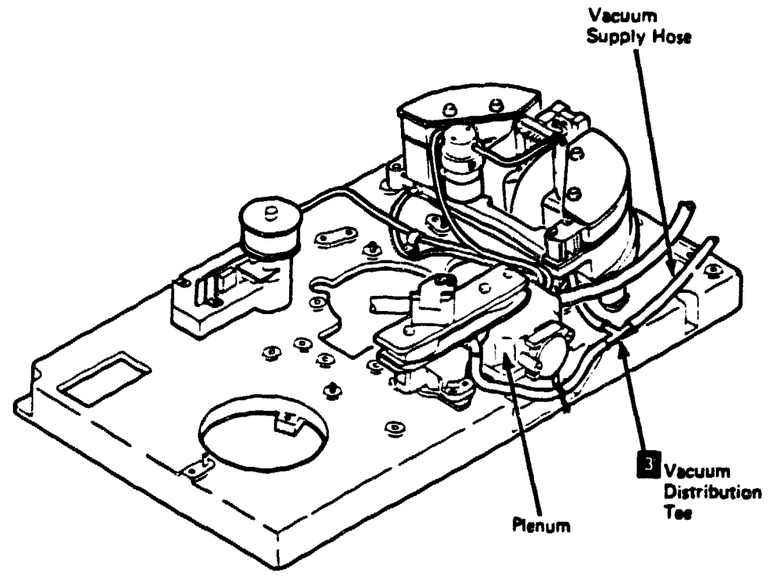
Removing the Vacuum Supply Hose

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer.
3. Remove the drive drawer safety cover (see CARR-DR 2-5).
4. Remove the two rear panel cover mounting screws 1 and remove the rear panel cover.
5. Loosen the vacuum supply hose clamp and disconnect the vacuum supply hose 2 from the vacuum fitting.
6. Disconnect the other end of the vacuum supply hose from the vacuum distribution tee 3.
7. Remove the hose from the drive.



Replacing the Vacuum Supply Hose

1. Connect one end of hose to the vacuum distribution tee 3.
2. Place the hose in position, going to the rear panel.
3. Slide the hose clamp onto the vacuum supply hose 2. Slide the hose onto the vacuum fitting and tighten the hose clamp.
4. Install the rear panel cover and the two mounting screws 1.
5. Install the drive safety cover (see CARR-DR 2-5).
6. Close the drive drawer.
7. Go to CARR-DR 8 for the procedure to *power on* the drive.



FRU213 Display Board to Switch Board Cable Removal and Replacement Procedure

This page contains the steps needed to remove and replace the display board (TU-DO/1-DSP) to switch board cable

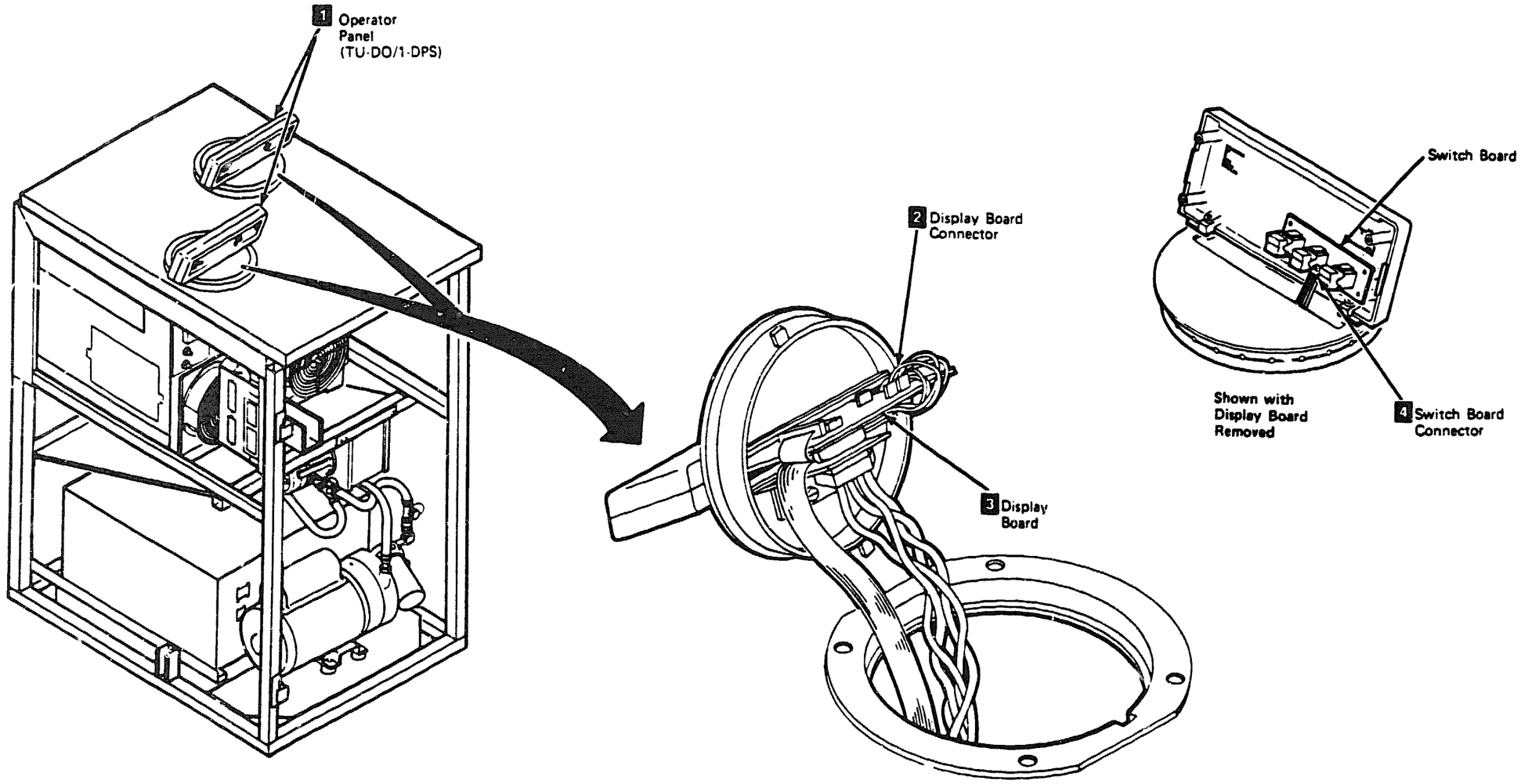
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Display Board to Switch Board Cable

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Remove the operator panel assembly 1 from the top cover (see CARR-DR 2-6)
3. Disconnect the cable from the connector 2 on the edge of the display board 3.
4. Disconnect the other end of the cable from the connector 4 on the switch board. Remove the cable from the drive.

Replacing the Display Board to Switch Board Cable

1. Connect one end of the cable to the connector 4 on the switch board
2. Connect the other end of the cable to the connector 2 on the display board 3
3. Install the operator panel assembly 1 into the top cover (see CARR-DR 2-6)
4. Go to CARR-DR 8 for the procedure to ***power on*** the drive



FRU215 Tape Lifter Solenoid Input Hose Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape lifter solenoid input hose 1 from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Note: The tape lifter solenoid 2 may be rectangular in shape, or of a different design.

Removing the Tape Lifter Solenoid Input Hose

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. Disconnect the tape lifter solenoid input hose 1 from the tape lifter solenoid 2 (TU-Tape Lifter (Head) Solenoid).
5. Disconnect the other end of the tape lifter solenoid input hose from the plenum 4 and remove it from the drive.

Replacing the Tape Lifter Solenoid Input Hose

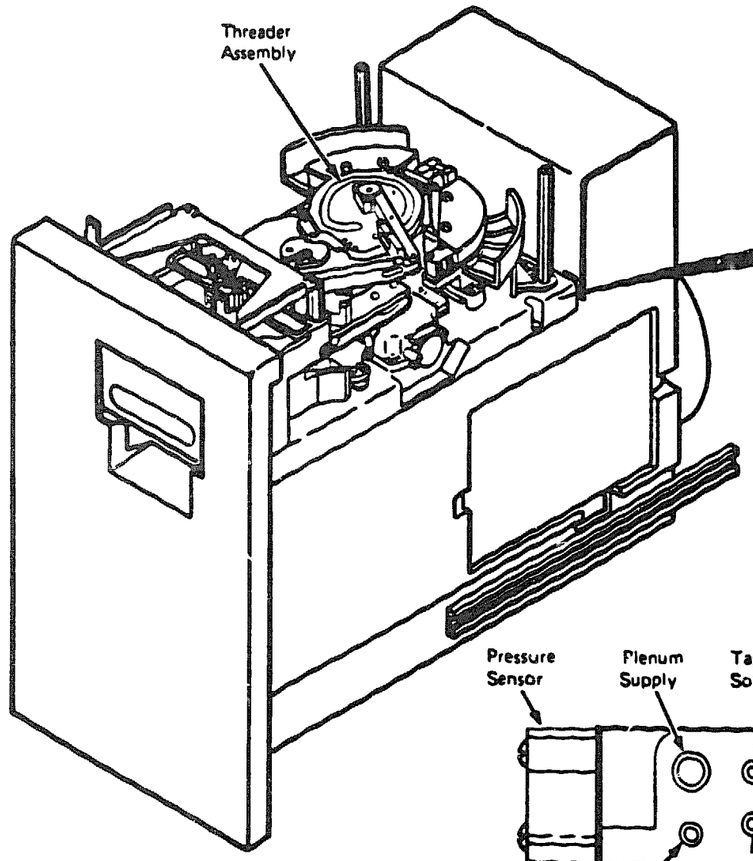
1. Connect the tape lifter solenoid input hose 1 to the tape lifter solenoid 2.

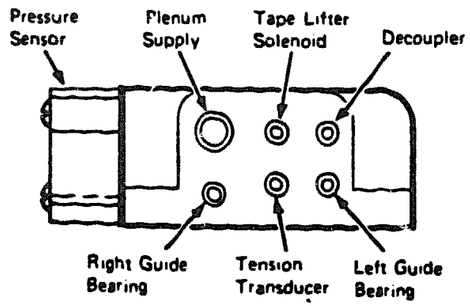
   Place the hose in the path shown, around the threader assembly base, to the plenum 4.

2. Connect the other end of the tape lifter solenoid input hose to the plenum 4.

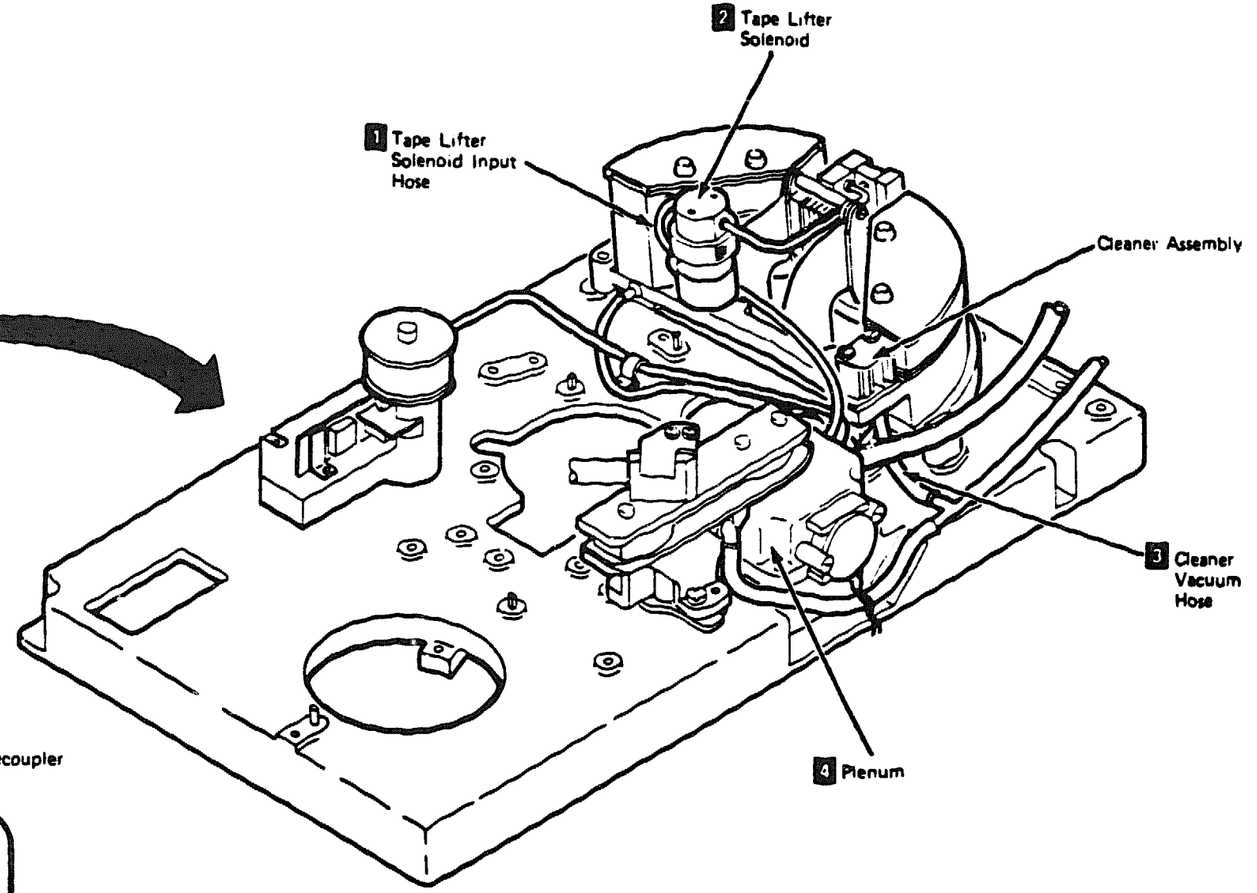
   Check that the cleaner vacuum hose 3 is still connected to the cleaner assembly.

3. Remove the clamp from the plenum supply hose.
4. Install the drive safety cover (see CARR-DR 2-5).
5. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





Hose Connections to the Plenum



Pneumatic Hose Routing

FRU216 Tape Lifter Solenoid Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape lifter solenoid 6 from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

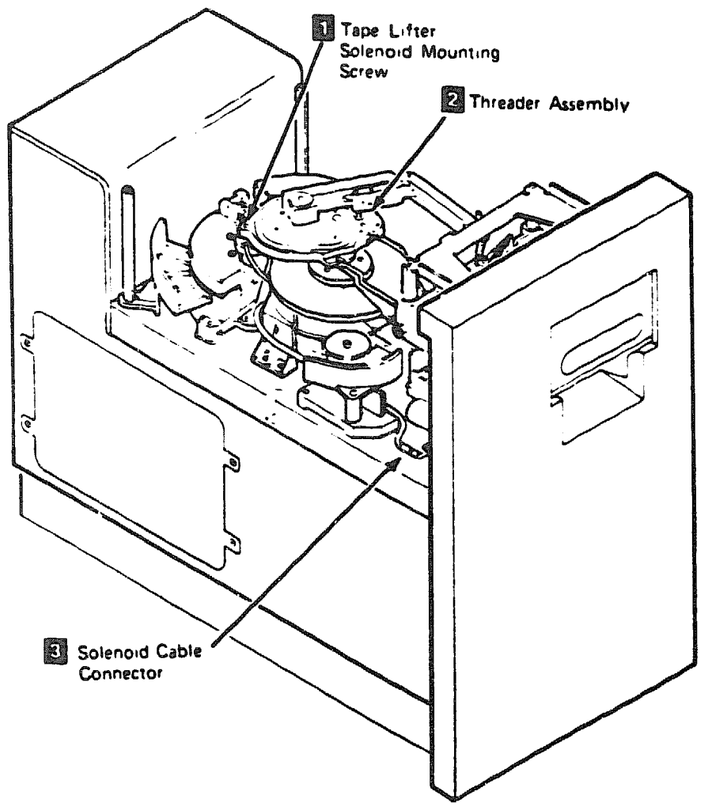
Note: The tape lifter solenoid 6 may be retangular in shape, or of a different design.

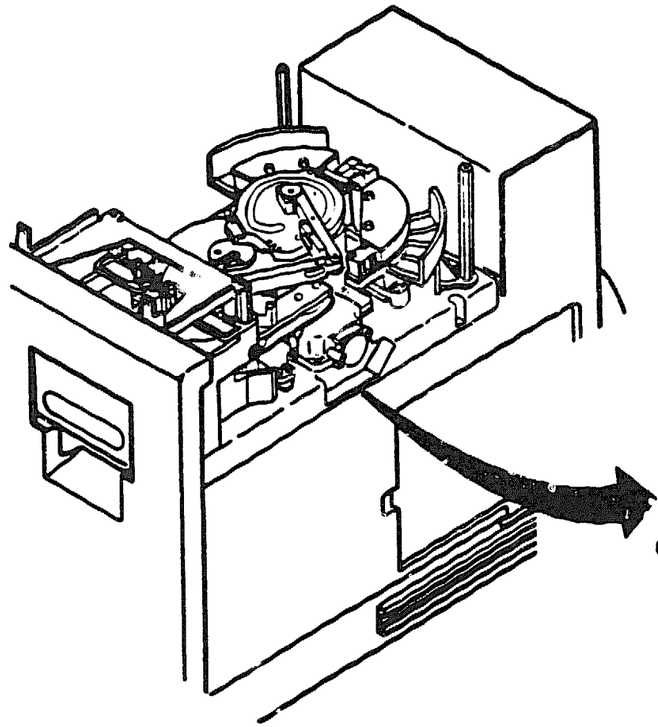
Removing the Tape Lifter Solenoid

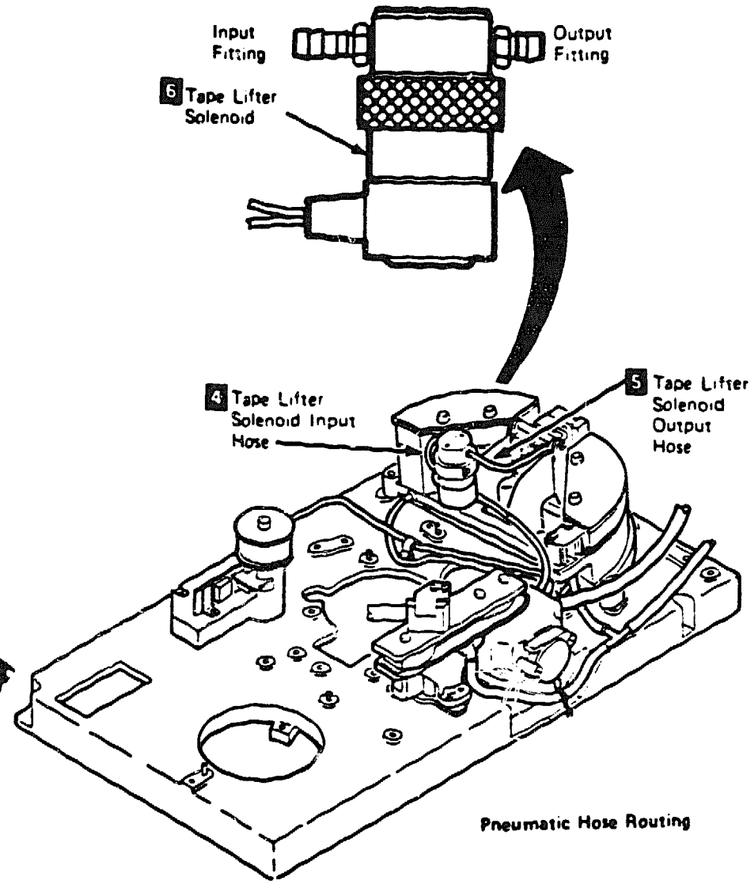
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Clamp the plenum supply hose (see CARR-DR 3-1).
4. Disconnect the tape lifter solenoid input hose 4 from the tape lifter solenoid 6.
5. Disconnect the tape lifter solenoid output hose 5 from the tape lifter solenoid.
6. Disconnect the solenoid cable connector 3.
7. Remove the tape lifter solenoid mounting screw 1 and remove the tape lifter solenoid from the threader assembly 2.

Replacing the Tape Lifter Solenoid

1. Install the tape lifter solenoid 6 and mounting screw 1 on the threader assembly 2. If your threader assembly has two mounting holes, be sure to use the hole on the left.
2. Route the cable along the bottom of the deck to the solenoid cable connector 3 and reconnect the solenoid cable.
3. Connect the tape lifter solenoid output hose 5 to the tape lifter solenoid 6.
4. Connect the tape lifter solenoid input hose 4 to the tape lifter solenoid.
5. Remove the clamp from the plenum supply hose.
6. Install the drive drawer safety cover (see CARR-DR 2-5) and close the drive drawer.
7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







Pneumatic Hose Routing

FRU218 Tape Transport Unit AC Power Circuit-Breaker/Cable Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tape transport unit ac power circuit-breaker/cable assembly.

Because ac power will be switched off and disconnected at the tape control unit, all of the tape transport units attached to the tape control unit must be available for service.

Note: This FRU removal and replacement requires the ac power to be removed from the tape control unit and all attached tape transport units with the tape control unit ac power circuit breaker.

Removing the Tape Transport Unit AC Power Circuit Breaker Assembly

1 Go to CARR-TCU 6 for the procedure to remove the ***ac power*** from the tape control unit.

At the tape control unit:

2 Remove the ac distribution cable P1 [1] from the tape control unit by turning the retaining ring counterclockwise and at the same time pulling the cable connector away from the receptacle.

At the failing tape transport unit:

3 Open the tape transport unit front cover and remove the front safety cover (see CARR-DR 2-1).

4 Remove the ac distribution cable P1 [1] from ac connector J1 [4] (TU-PS-01-J1) to the tape transport unit on the right side (if present) by turning the retaining ring counterclockwise and at the same time pulling the cable connector away from the receptacle.

Note: In the next step, if the failing tape transport unit is connected to the tape control unit the ac distribution cable has already been removed.

5 Remove the ac distribution cable P1 [1] from the ac box in the tape transport unit on the left side (if present) by turning the retaining ring counterclockwise and at the same time pulling the cable connector away from the receptacle.

6. Remove the cable clamp [2].
7. Disconnect the cable plug P11 [3] (TU-PS-01-P11) from J11 connector (at the rear of the dc power supply) and carefully route the plug to the front of the tape transport unit.
8. There are two grounding wires from the ac box:
   - Remove the mounting screw for the green ground wire [6] and starwasher.
   - Remove the mounting screw for the yellow/green ground wire [6] and starwasher.
   - Save the ground wire mounting screws and lockwashers for the replacement procedure.

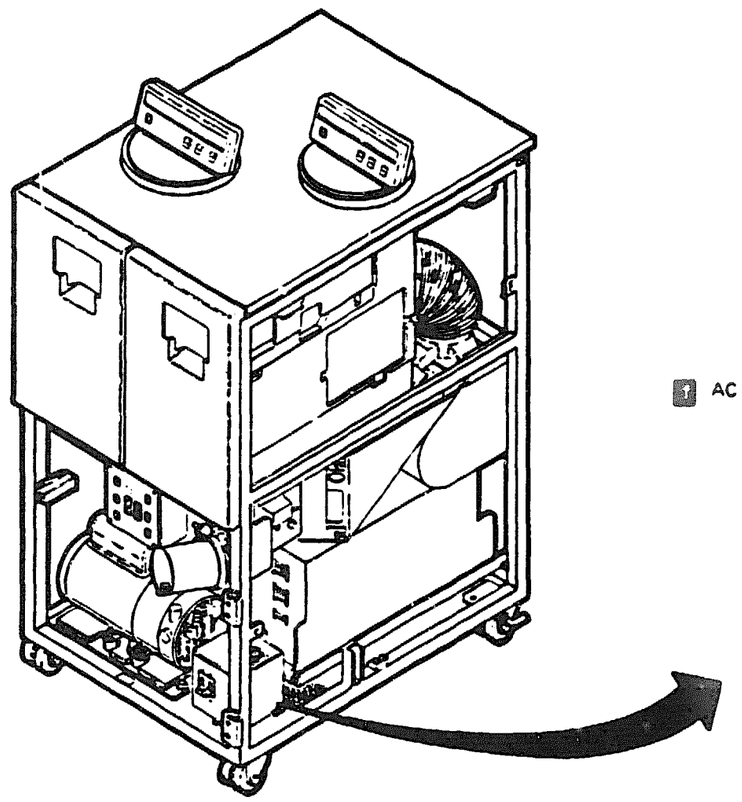
9 Remove the front mounting screw [5] from the ac box.

10 Loosen the mounting screws [7] at the right side and the left side of the ac box.

11. Open the tape transport unit rear cover (see CARR-DR 2-1).
12. Remove the two mounting bolts in the rails at the rear of the dc power supply.
13 Using the handles provided, move the dc power supply toward the rear of the tape transport unit far enough to allow the ac cable plug P1 [1] to pass between the front of the dc power supply and the rear of the motor pump.

Warning: The ac distribution cable is routed behind the pump motor assembly and in front of the dc power supply. When removing the ac distribution cable, ensure that you do not damage or disconnect any connectors on the front of the dc power supply.

14 Remove the ac box and cables through the front of the tape transport unit.

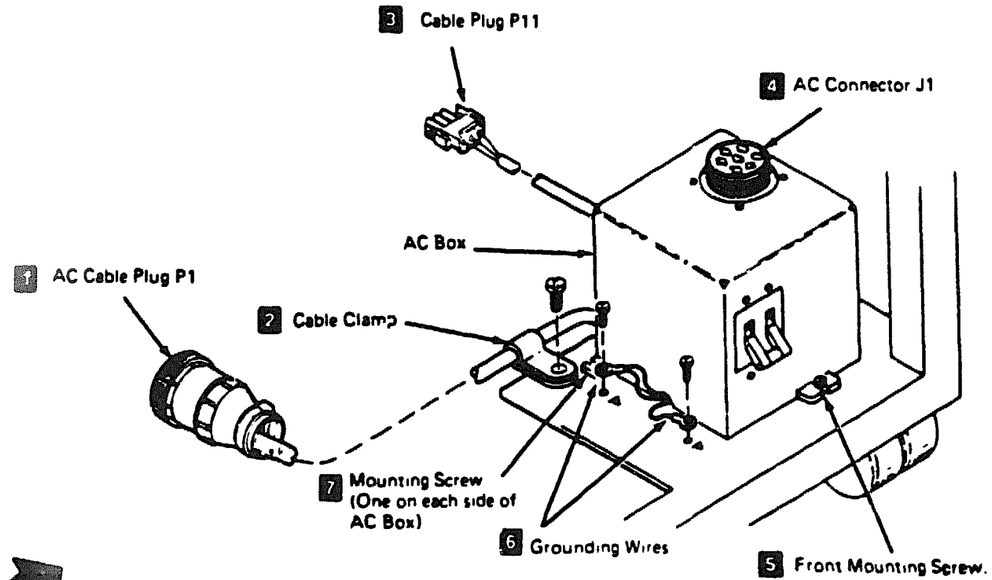


Replacing the Tape Transport Unit AC Power Circuit Breaker Assembly

1. Place the ac box and cables into position through the front of the tape transport unit.
2. Route cable plug P11 [3] (TU-PS-01-P11) along the right side of the dc power supply to the rear of the machine.
3. Connect cable plug P11 to J11 connector on the rear of the dc power supply.

Warning: When replacing the ac distribution cable, ensure that you do not damage or disconnect any connectors on the front of the dc power supply.

4. Route the ac distribution cable plug P1 [1] between the rear of the pump motor mounting frame and the front of the dc power supply to the tape transport unit or tape control unit on the left.
5. Install the cable clamp [2].
6. Move the dc power supply into position and install the two mounting bolts in the rails.
7. Close the tape transport unit rear cover (see CARR-DR 2-2).
8. Install the mounting screw [5] at the front of the ac box.
9. Tighten the mounting screws [7] at the left side and right side of the ac box.



There are two grounding wires from the ac distribution box:

- Install the mounting screw and starwasher for the green ground wire [6].
- Install the mounting screw and starwasher for the yellow/green ground wire [6].

10. Connect the ac distribution cable [1] from the tape drive on the right (if present) to the ac box by inserting the connector plug into the receptacle and turning the retaining ring clockwise.
11. Connect the ac distribution cable [1] from the ac box to the tape transport unit (or tape control unit) on the left by inserting the connector plug into the receptacle and turning the retaining ring clockwise.
12. Replace the tape transport unit front safety cover and close the front cover (see CARR-DR 2-2).

At the tape control unit:

13. Connect the ac distribution cable P1 [1] from the tape drive on the right of the tape control unit to the tape control unit ac box (see LOC 1) (if not already connected) by inserting the connector plug and turning the retaining ring clockwise.
14. Go to CARR-TCU 6 for the procedure to restore the ***ac power*** to the tape control unit.
15. Go to CARR-DR 8 for the procedure to ***power on*** the tape transport unit.

FRU219 Vacuum Distribution Tee Removal and Replacement Procedure

This page contains the steps needed to remove and replace the vacuum distribution tee [1] from the drive. The other drive will not be affected when the vacuum is disconnected.

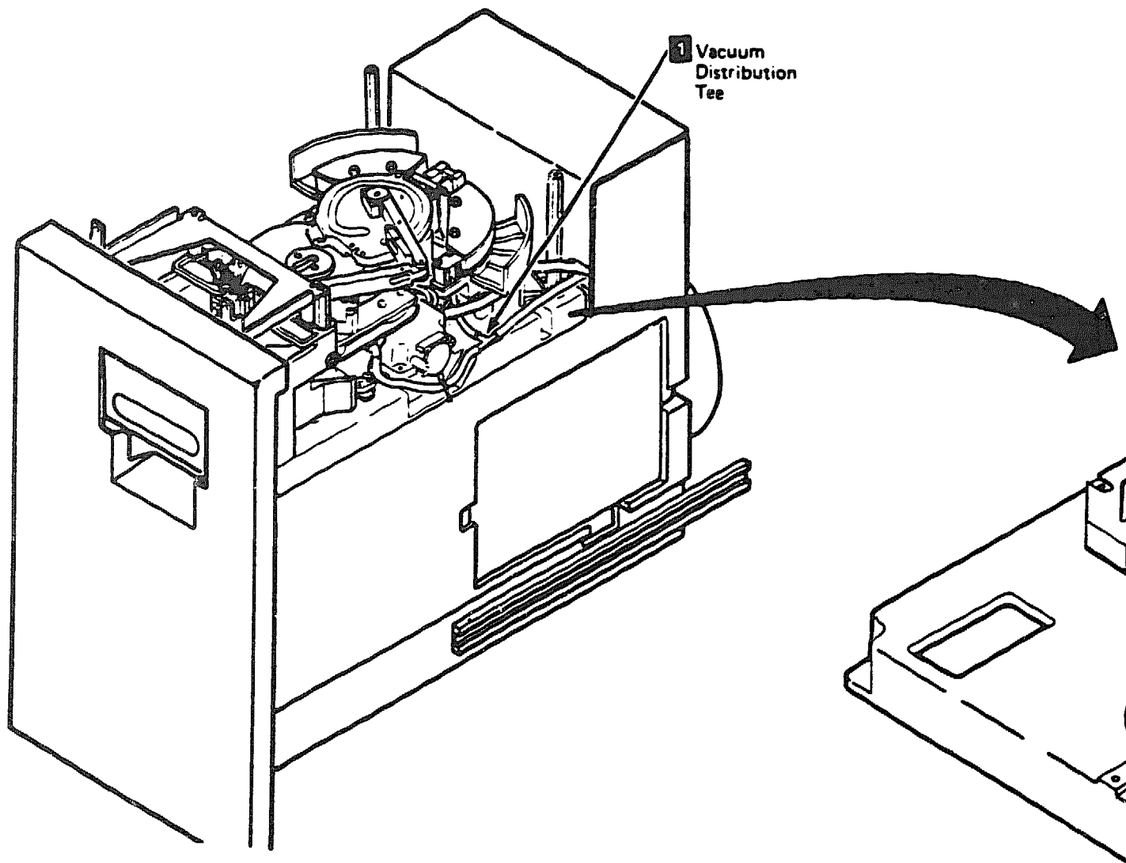
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

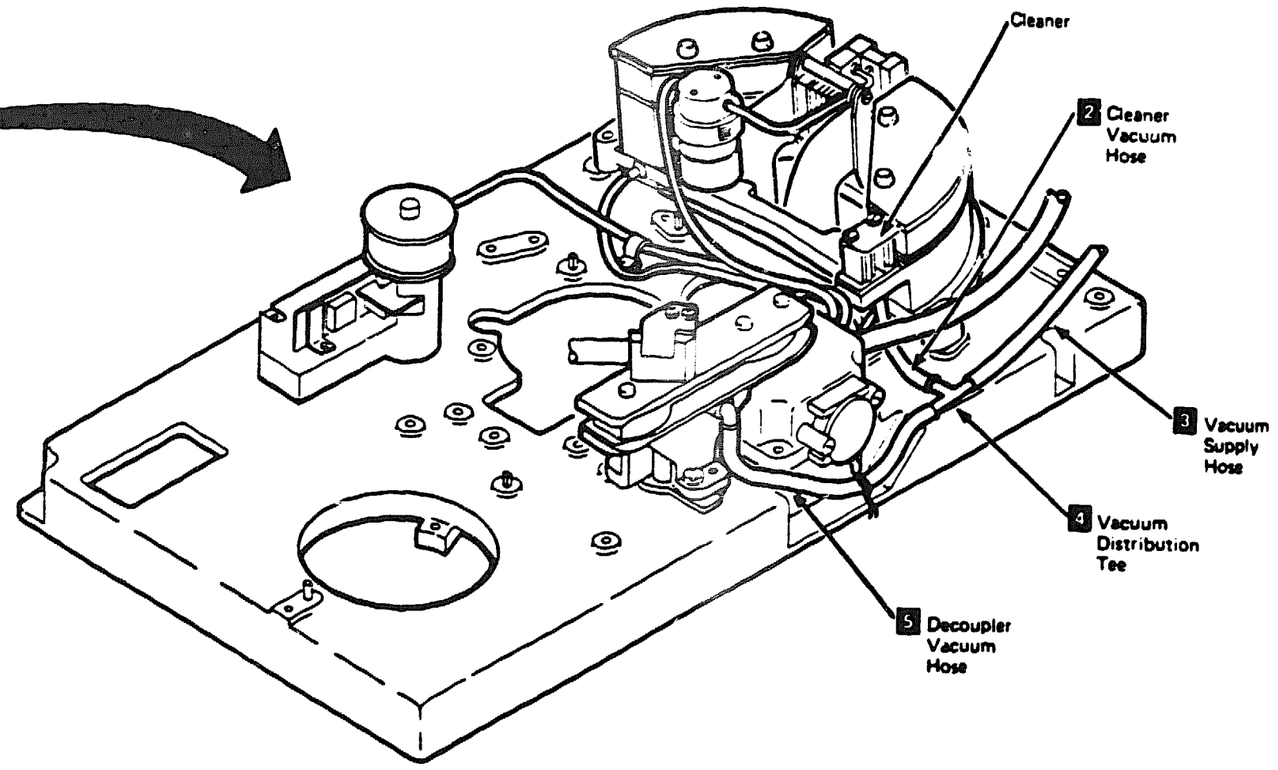
Removing the Vacuum Distribution Tee

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Disconnect the decoupler vacuum hose [5] from the vacuum distribution tee [1], [4].
4. Disconnect the cleaner vacuum hose [2] from the vacuum distribution tee.
5. Remove the vacuum distribution tee from the vacuum supply hose [3].

Replacing the Vacuum Distribution Tee

1. Insert the large end of the vacuum distribution tee [4] into the vacuum supply hose [3].
2. Connect the decoupler vacuum hose [5] to the vacuum distribution tee.
3. Connect the cleaner vacuum hose [2] to the vacuum distribution tee [1], [4]. Make sure the cleaner hose remains connected to the cleaner.
4. Install the drive safety cover and close the drive drawer (see CARR-DR 2-5).
5. Go to CARR-DR 8 for the procedure to ***power on*** the drive.





FRU223 Convoluted Bellows Removal and Replacement Procedure

This page contains the steps needed to remove and replace the convoluted bellows for either drive in the tape transport unit.

Since there is a convoluted bellows for each drive in the tape transport unit, it is not necessary to have both drives available for service when performing this procedure.

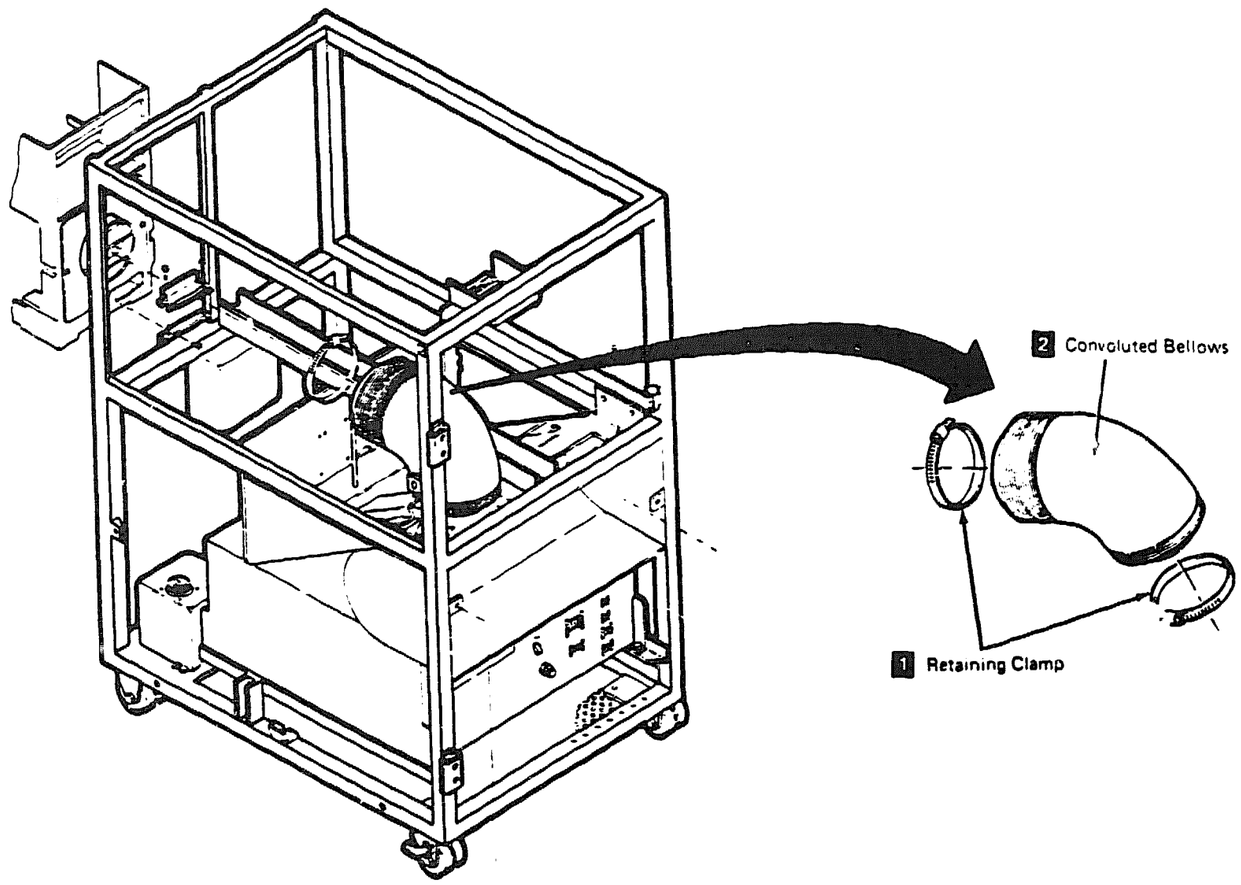
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Convoluted Bellows

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Open the rear tape transport unit cover (see CARR-DR 2-1)
3. Loosen the retaining clamp [1] on each end of the convoluted bellows [2] you are replacing.
4. Remove the convoluted bellows from the housing on the rear panel of the drive.

CAUTION:
The blower motor has not been turned Off; therefore, the blower fans are still turning. When the convoluted bellows is removed from the blower, the vanes of the blower are exposed. Ensure that all fingers, tools, and parts are kept clear of the blower opening.

5. Remove the convoluted bellows [2] from the housing on the output of the blower
6. Remove the convoluted bellows from the tape transport unit.
7. Save the retaining clamps [1] for the replacement procedure.



Replacing the Convoluted Bellows

1. Install the retaining clamps on each end of the replacement convoluted bellows [2].
2. Install the convoluted bellows on the housing on the output of the blower (of the affected drive).
3. Tighten the retaining clamp [1].
4. Install the convoluted bellows on the housing on the rear panel of the affected drive.
5. Tighten the retaining clamp [1].
6. Check for air leaks at both ends of the replaced convoluted bellows.
7. Close the tape transport unit rear cover (see CARR-DR 2-1).
8. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

FRU225 Machine Reel Tach Sensor A Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel tach sensor A [3] (TU-DO/1-DK-Machine Reel Tach Phase A Sensor) The sensor is located under the machine reel, but it is not necessary to remove the machine reel to remove the tach sensor. This tach sensor will be easier to remove if the tension transducer tape guide is removed.

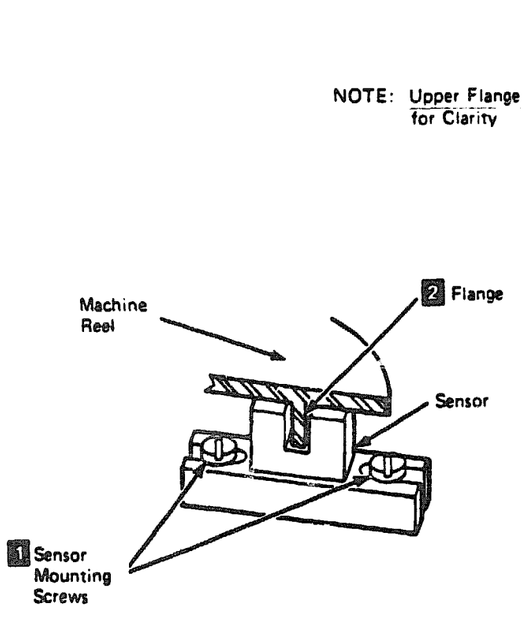
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

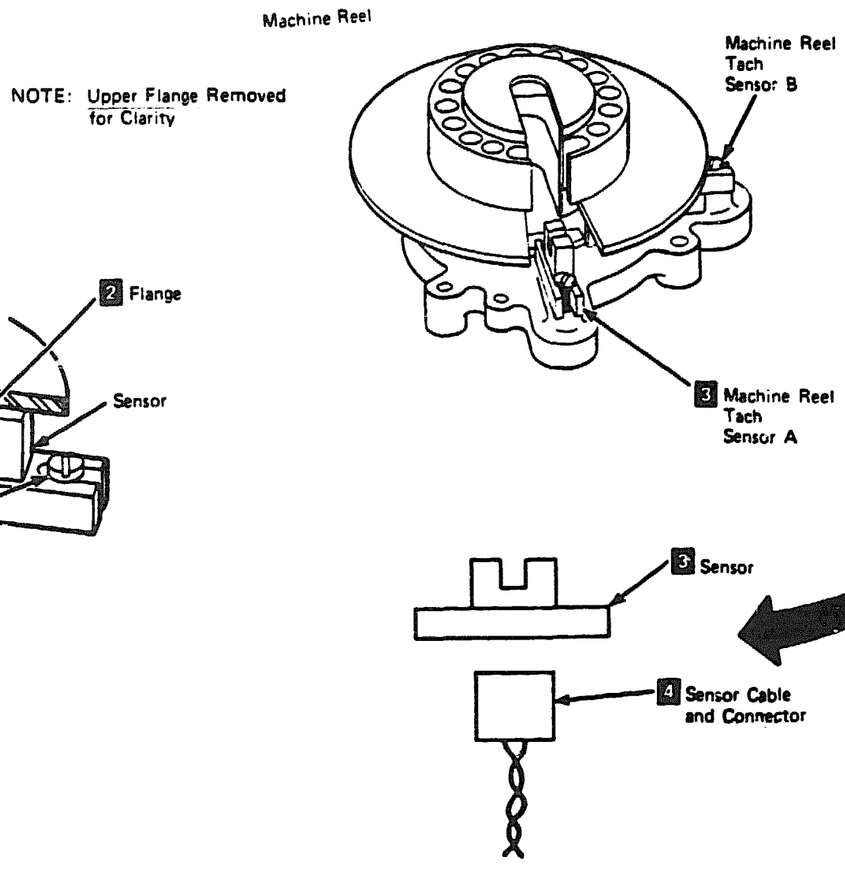
Removing the Machine Reel Tach Sensor A

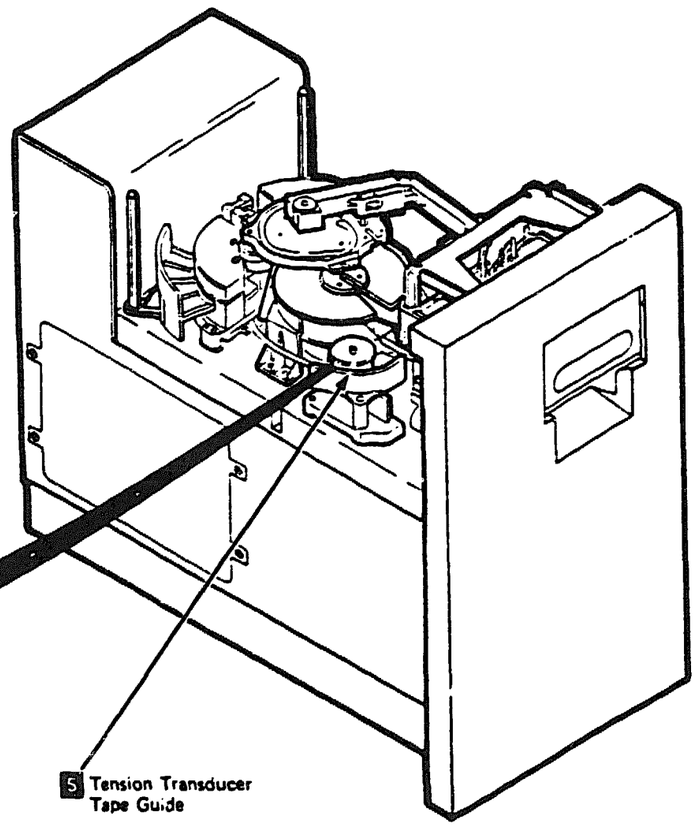
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Turn the machine reel to get access to tach sensor A [3].
4. Remove the two sensor mounting screws [1].
5. Lift the sensor and cable connector [4] from the baseplate.
6. Disconnect the cable from the sensor [3] and remove the sensor from the drive.

Replacing the Machine Reel Tach Sensor A

1. Connect the machine reel tach sensor [3] to the sensor cable and connector [4].
2. Lower the sensor and cable into the mounting block and install the two mounting screws [1]. Do not tighten the screws at this time. The sensor must be adjusted to allow the machine reel to turn.
3. Adjust machine reel tach sensor A so the machine reel flange [2] will turn without touching the sensor. Tighten the sensor mounting screws when you have the sensor adjusted correctly.
4. Install the drive safety cover and close the drive drawer (see CARR-DR 2-5).
5. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







FRU226 Machine Reel Tach Sensor B Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel tach sensor B 3 (TU-DO/1-DK-Machine Reel Tach Phase B Reel Sensor). The sensor is located under the machine reel, but it is not necessary to remove the machine reel to remove the tach sensor.

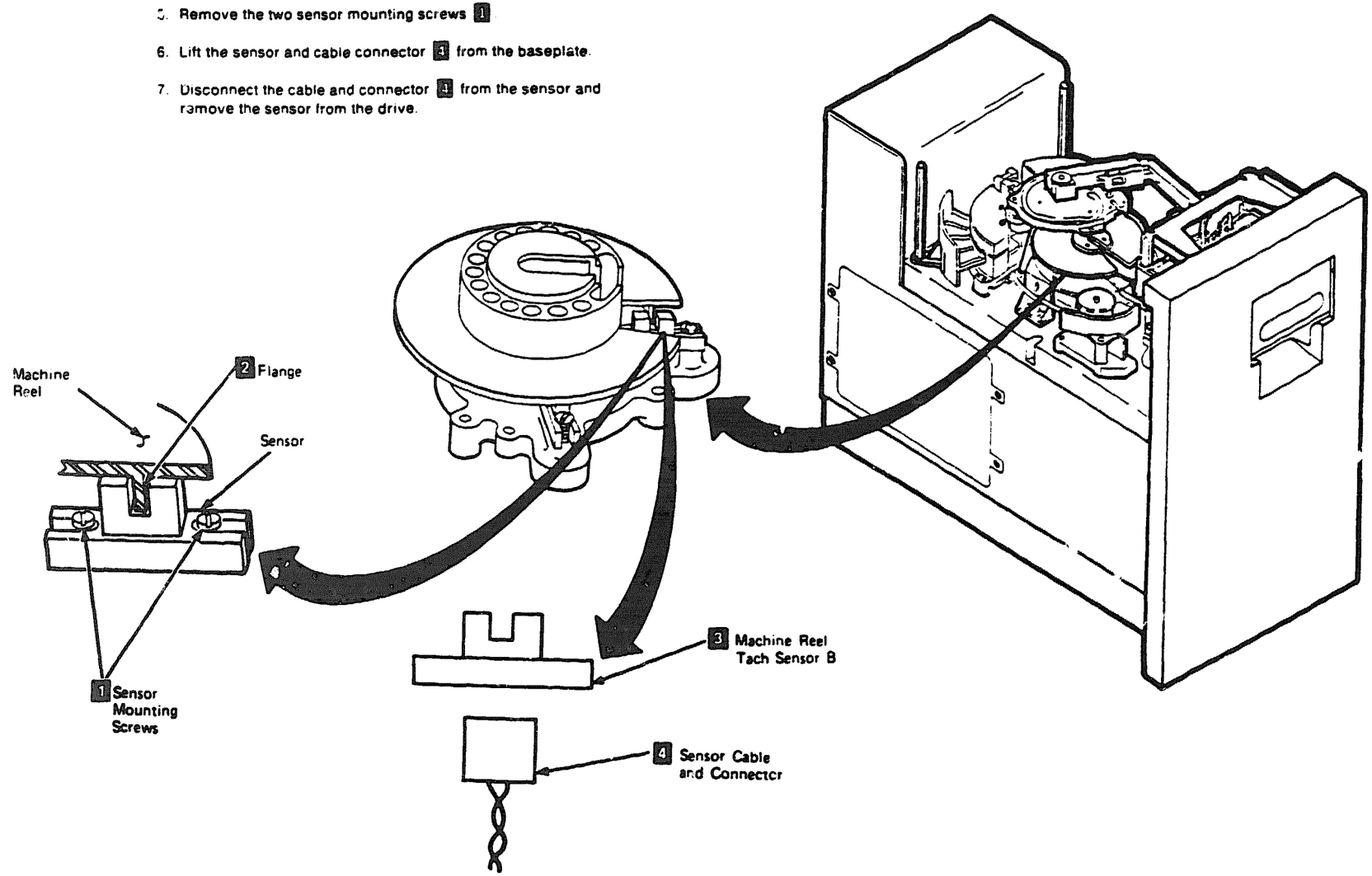
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Machine Reel Tach Sensor B

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Remove the center tape guide (see CARR-DR 2310) and the tension transducer tape guide (see CARR-DR 2300) to get access to tach sensor B.
4. Turn the machine reel to get access to tach sensor B 3.
5. Remove the two sensor mounting screws 1.
6. Lift the sensor and cable connector 4 from the baseplate.
7. Disconnect the cable and connector 4 from the sensor and remove the sensor from the drive.

Replacing the Machine Reel Tach Sensor B

1. Connect the machine reel tach sensor 3 to the sensor cable and connector 4.
2. Lower the sensor and cable into the mounting block and install the two mounting screws 1. Do not tighten the screws at this time; the sensor must be adjusted to allow the machine reel to turn.
3. Adjust machine reel tach sensor B so the machine reel flange 2 will turn without touching the sensor. Tighten the sensor mounting screws when you have the sensor adjusted correctly.
4. Replace the center tape guide (see CARR-DR 2310) and the tension transducer tape guide (see CARR-DR 2300).
5. Install the drive safety cover and close the drive drawer (see CARR-DR 2-5).
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU227 Machine Reel Tape Guide Removal and Replacement Procedure

This page contains the steps needed to remove and replace the machine reel tape guide 2 from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

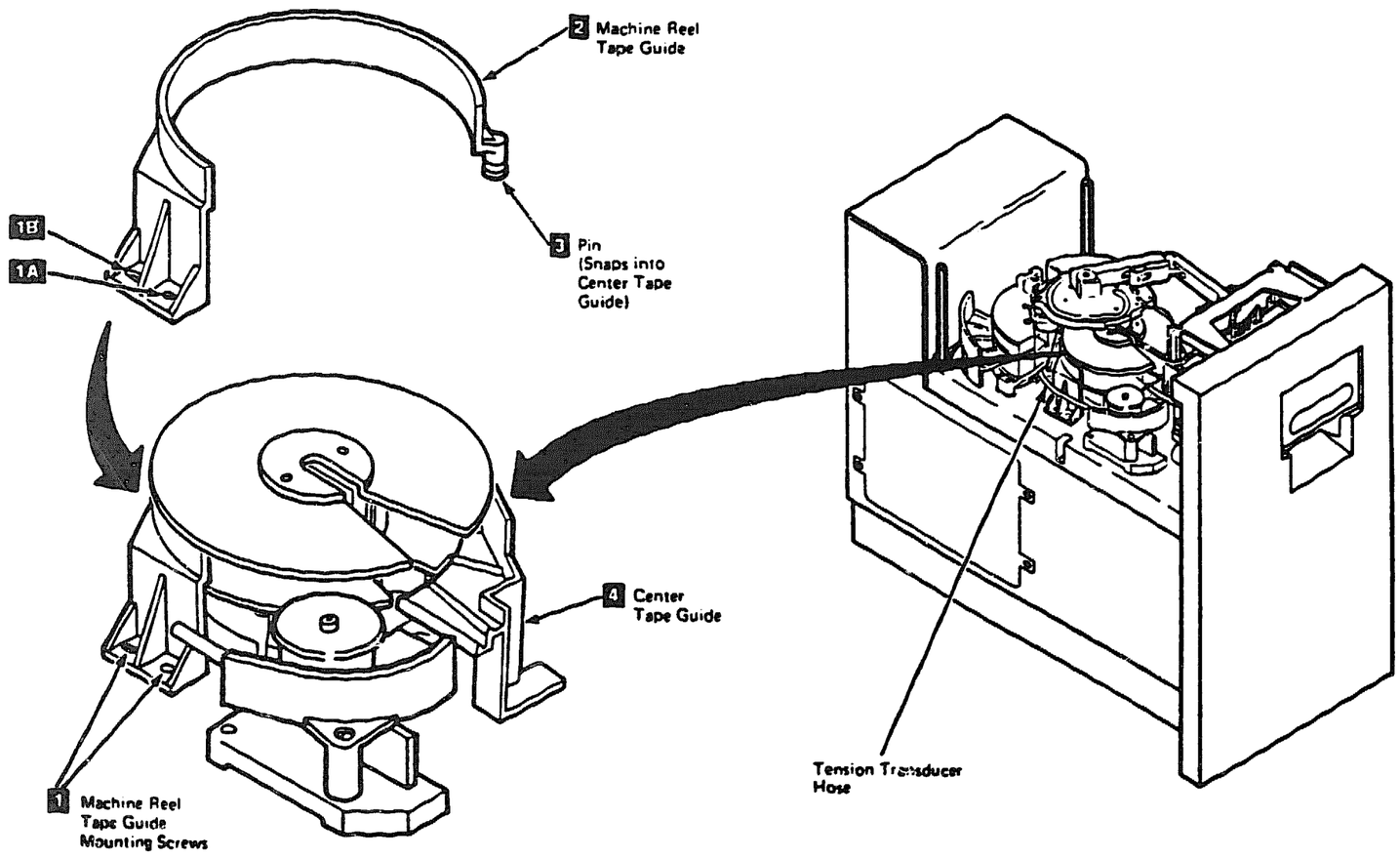
Removing the Machine Reel Tape Guide

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Remove the two machine reel guide mounting screws 1, then unsnap the center tape guide pin 3 from the center tape guide 4 by pulling it straight up.
4. To remove the machine reel tape guide 2, carefully lift the screw mount base up and over the tape tension transducer in a counterclockwise direction, being careful not to scratch the flange surface with the mounting pin.

Replacing the Machine Reel Tape Guide

Warning: The machine reel tape guide (FRU227) and the tape center guide (FRU231) are sequence sensitive and must be installed in the correct order for correct adjustment.

1. Place the machine reel tape guide 2 in position and install (but do not tighten) the two mounting screws 1.
2. Press the guide pin 3 on the machine reel tape guide into the slotted hole in the center tape guide 4.
3. Loosen the center tape guide mounting screw, and then tighten.
4. Tighten the machine reel tape guide mounting screws, first 1A and then 1B.
5. Install the drive drawer safety cover (see CARR-DR 2-5).
6. Close the drive drawer.
7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU228 Head Tape Guide (Left) Removal and Replacement Procedure

This page contains the steps needed to remove and replace the head tape guide (left) from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Head Tape Guide(Left)

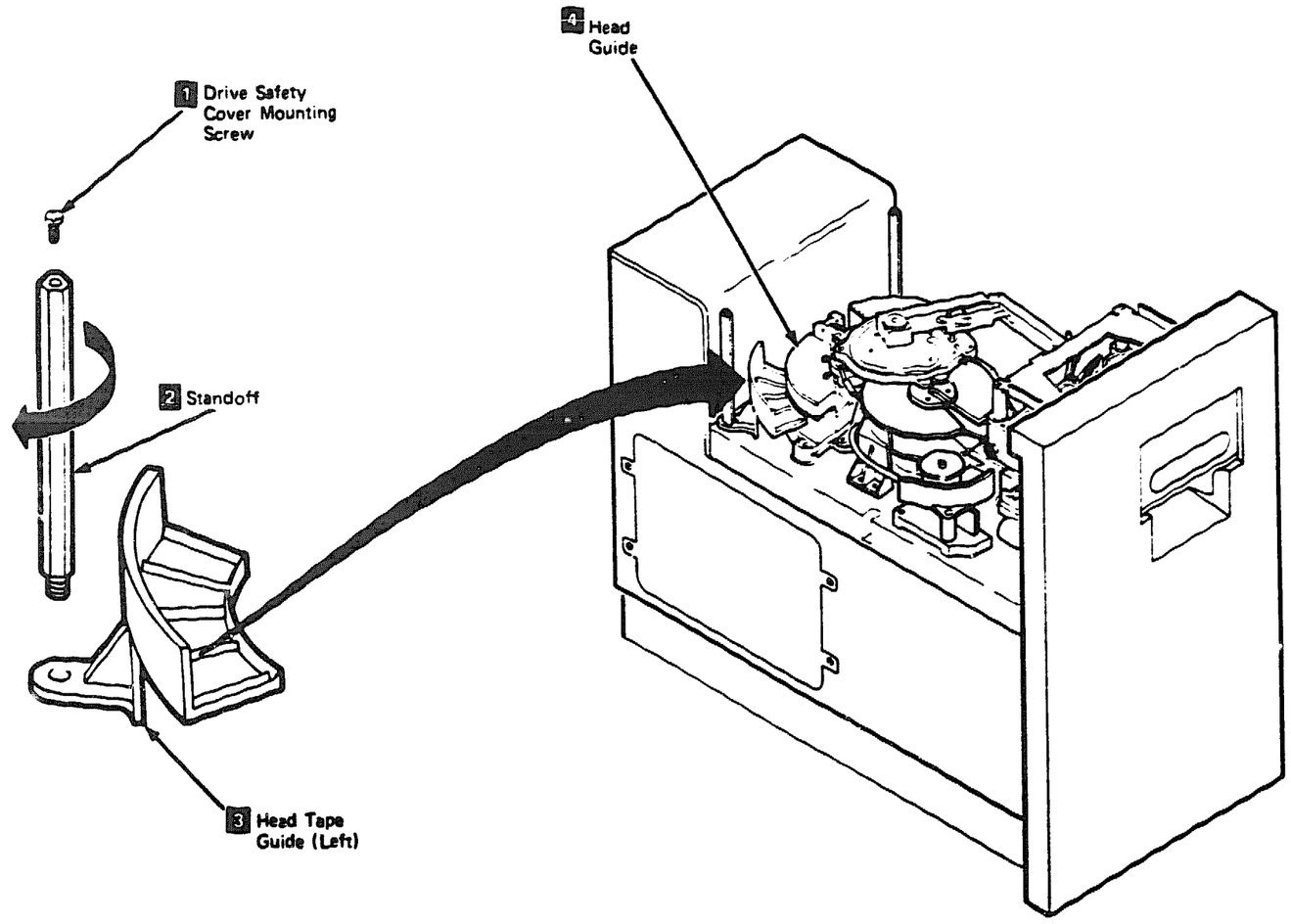
1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).

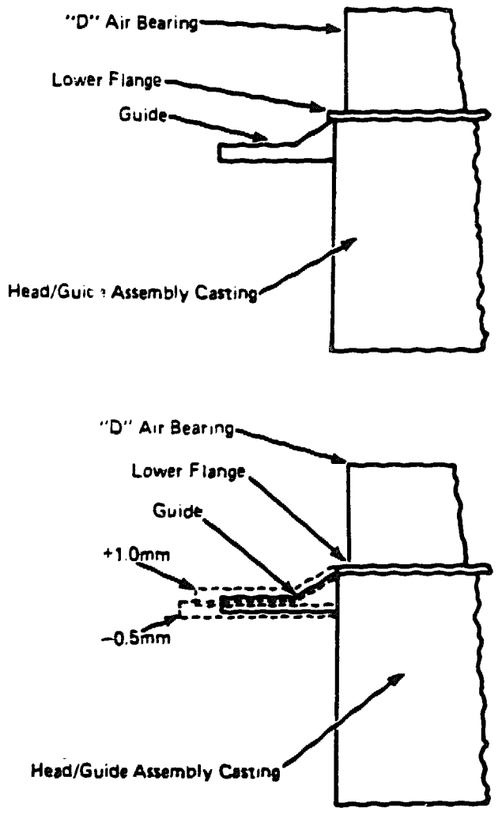
   Note: Note the position of the head guide with respect to the lower flange.
3. Remove the drive safety cover mounting screw 1 from the standoff 2.
4. Unscrew and remove the standoff 2 from the baseplate.
5. Remove the head tape guide (left) 3.

Replacing the Head Tape Guide (Left)

1. Place the tape guide (left) 3 into position next to the head guide.
2. Install the standoff 2 but do not tighten.
3. Push the tape guide (left) against the casting and tighten the standoff 2.
4. Replace the drive safety cover mounting screw 1 in the standoff 2.

   Note: The relationship of tape guide to the flange may vary. See the illustrations for the acceptable positions.
5. Install the drive safety cover using the drive safety cover mounting screw 1 and close the drive drawer (see CARR-DR 2-5).
6. Go to CARR-DR 8 for the procedure to *power on* the drive.





FRU229 Head Tape Guide (Right) Removal and Replacement Procedure

This page contains the steps needed to remove and replace the head tape guide (right) from the drive

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Head Tape Guide (Right)

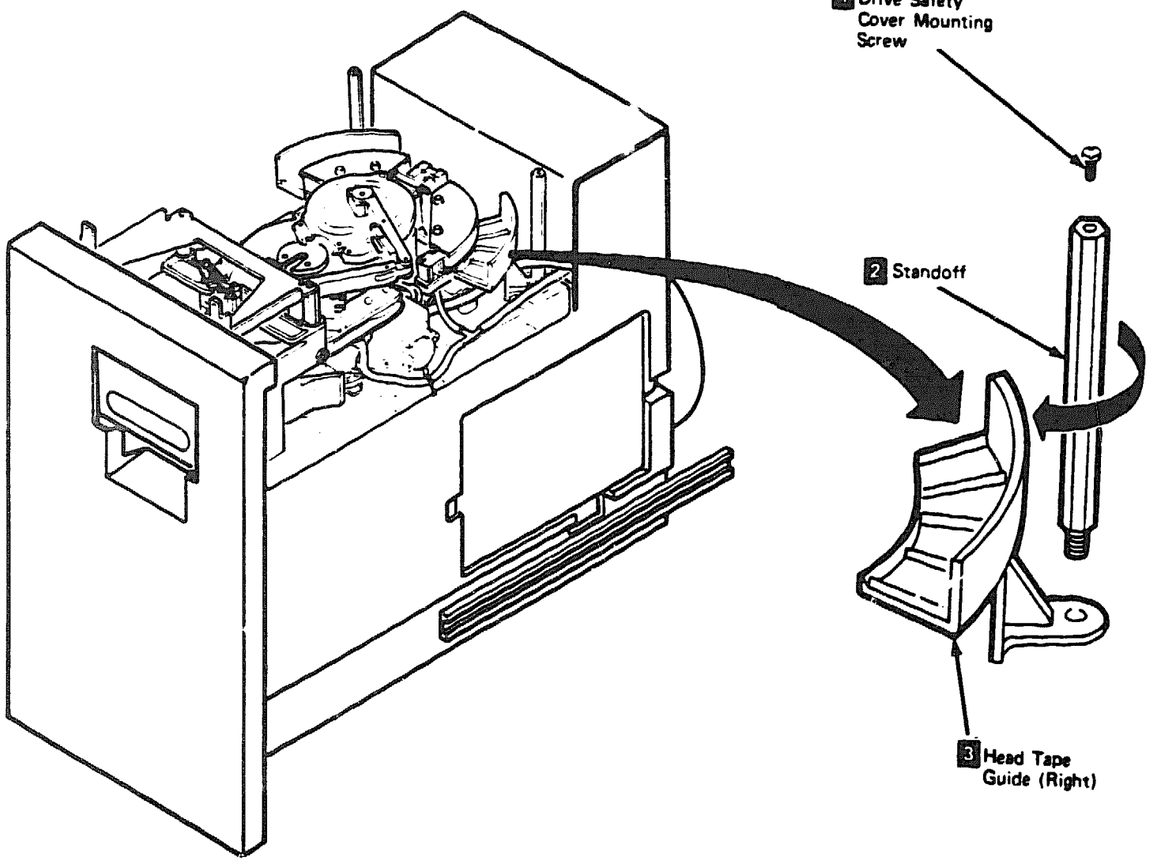
1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).

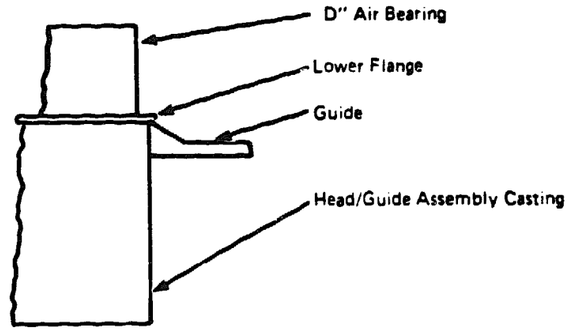
   Note: Note the position of the head guide with respect to the lower flange.
3. Unscrew and remove the standoff 2 from the baseplate.
4. Remove the head tape guide (right) 3.

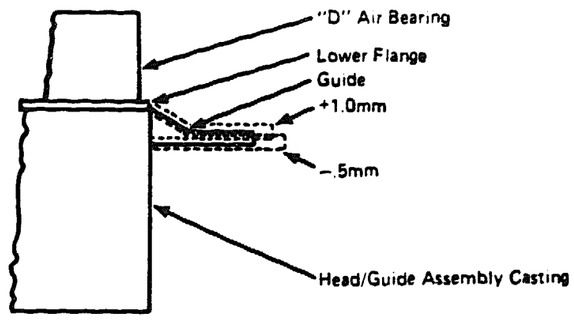
Replacing the Head Tape Guide (Right)

1. Place the tape guide (right) 3 into position next to the head guide.
2. Install the standoff 2 but do not tighten.
3. Push the tape guide (right) against the casting and tighten the standoff 2.

   Note: The relationship of the tape guide to flange may vary See the illustrations for the acceptable positions.
4. Install the drive safety cover mounting screw 1 in the standoff 2.
5. Install the drive safety cover using the drive safety mounting screws 1 and close the drive drawer (see CARR-DR 2-5).
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.







FRU230 Tension Transducer Tape Guide Removal and Replacement Procedure

This page contains the steps needed to remove and replace the tension transducer in the drive

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Tension Transducer Tape Guide

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

2 Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5)

3 Compare the tension transducer in the affected drive with the figures on this page to determine if the drive has the old style or new style tension transducer tape guide

4 If the drive has the new style tension transducer tape guide, go to CARR-DR 140 for the tension transducer removal and replacement procedure

5 If the drive has the old style tension transducer tape guide, proceed as follows.

a. Remove the tension transducer tape guide mounting screw 2.

b. Remove the tension transducer tape guide 1 from the drive.

Replacing the Tension Transducer Tape Guide

1 Compare the tension transducer in the affected drive with the figures on this page to determine if the drive has the old style or new style tension transducer tape guide.

2 If the replacement part is the new style tension transducer tape guide, go to CARR-DR 140 for the tension transducer replacement procedure.

3 If the replacement part is the old style tension transducer tape guide, proceed as follows

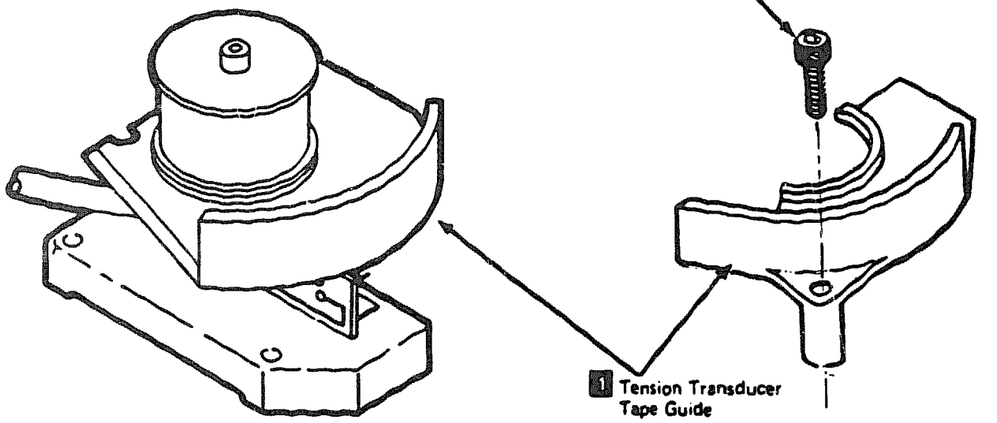
a. Position the tension transducer tape guide 1 in the drive

b. Replace the tension transducer tape guide mounting screw 2.

c. Install the drive safety cover (see CARR-DR 2-5)

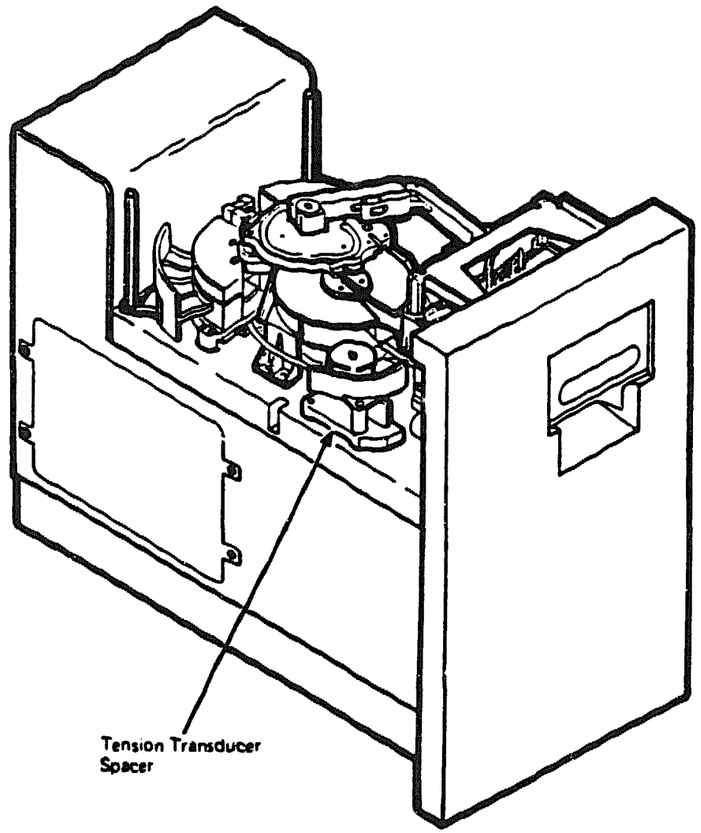
4. Close the drive drawer.

5. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



New Style Tension Transducer Tape Guide

Old Style Tension Transducer Tape Guide



FRU231 Center Tape Guide Removal and Replacement Procedure

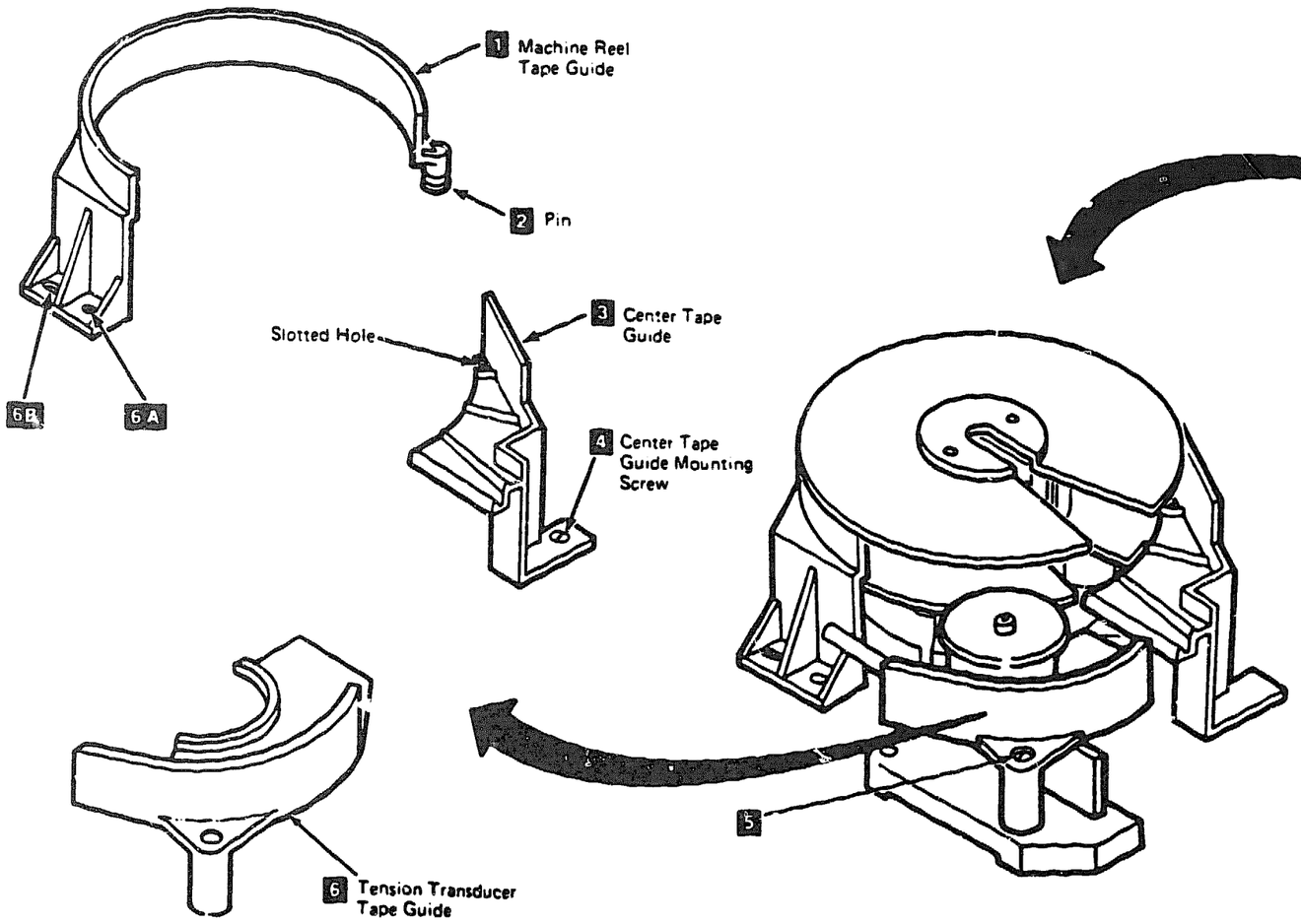
This page contains the steps needed to remove and replace the center tape guide 3. You must remove the tension transducer tape guide 6 from the drive.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Center Tape Guide

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
3. Remove the tension transducer tape guide mounting screw 5 and remove the tension transducer tape guide 6 (see CARR-DR 140 and CARR-DR 2300).

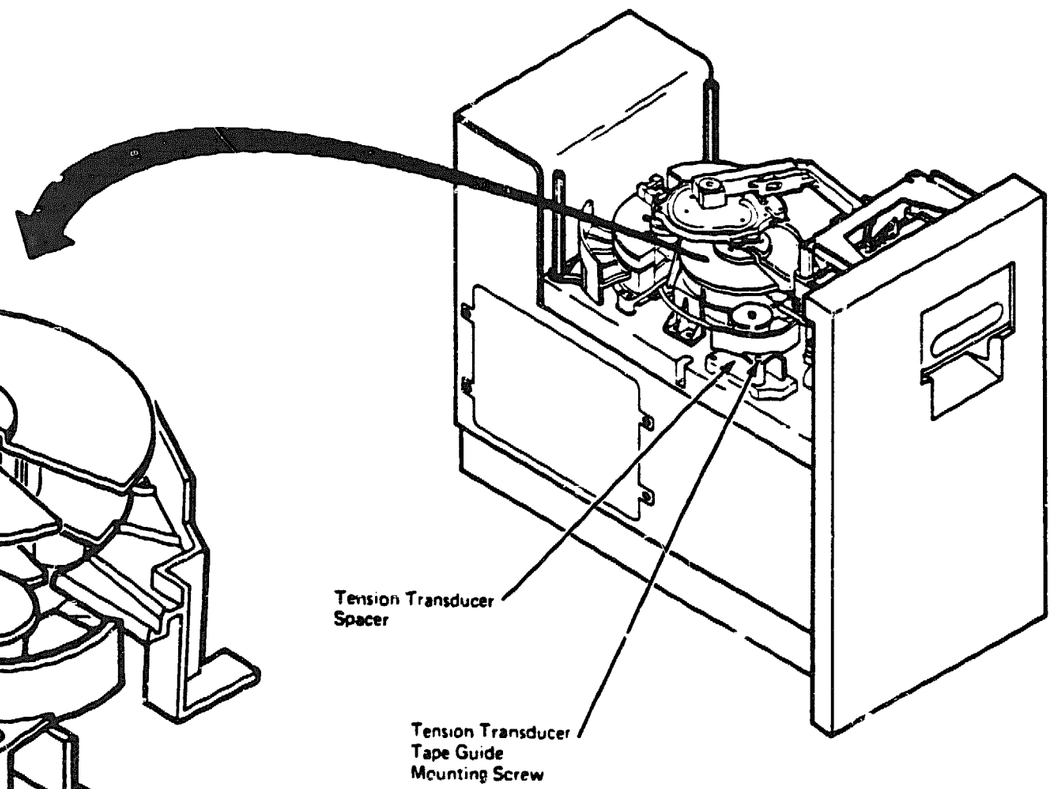
   The machine reel tape guide has a pin which is inserted into the center tape guide.
4. Separate the machine reel tape guide pin 2 from the center tape guide 3 by lifting up on the end of the machine reel tape guide 1.
5. Remove the mounting screw 4 and the center tape guide from the drive.



Replacing the Center Tape Guide

Warning: The machine reel tape guide (FRU227) and the tape center guide (FRU231) are sequence sensitive and must be installed in the correct order for correct adjustment.

1. Place the center tape guide 3 in position on the baseplate and install the mounting screw 4, loosely.
2. Press the guide pin 2 on the machine reel tape guide 1 into the slotted hole in the center tape guide 3.
3. Loosen the machine reel tape guide mounting screws.
4. Tighten the center tape guide mounting screw 4.
5. Tighten the machine reel tape guide mounting screws, first 6A and then 6B.
6. Install the tension transducer tape guide mounting screw 5 and the tension transducer tape guide 6 (see CARR-DR 140 and CARR-DR 2300).
7. Install the drive safety cover (see CARR-DR 2-5).
8. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



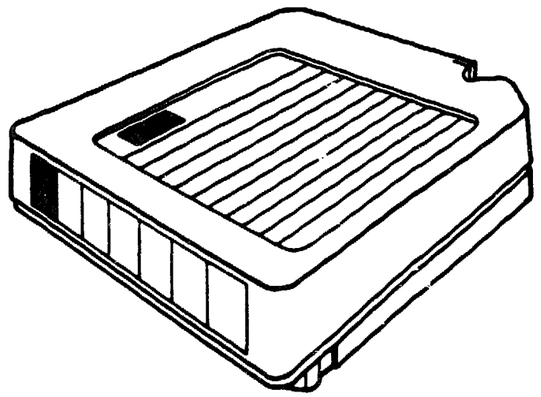
FRU232 Cartridge Removal/Replacement Information

About the Cartridge

The cartridge is a customer-owned FRU.

If the cartridge is suspected, try the cartridge on another drive, or try a known good cartridge on the failing drive.

Further cartridge repair information can be found in the CART section of the MG.



FRU262 Air Pressure Test Hose Assembly Removal and Replacement Procedure

This page contains the steps needed to remove the air pressure test hose assembly from the tape transport unit. The removal is from the front of the tape transport unit.

Since there is only one air pressure test hose assembly in a tape transport unit, it is necessary that both drives be available for service.

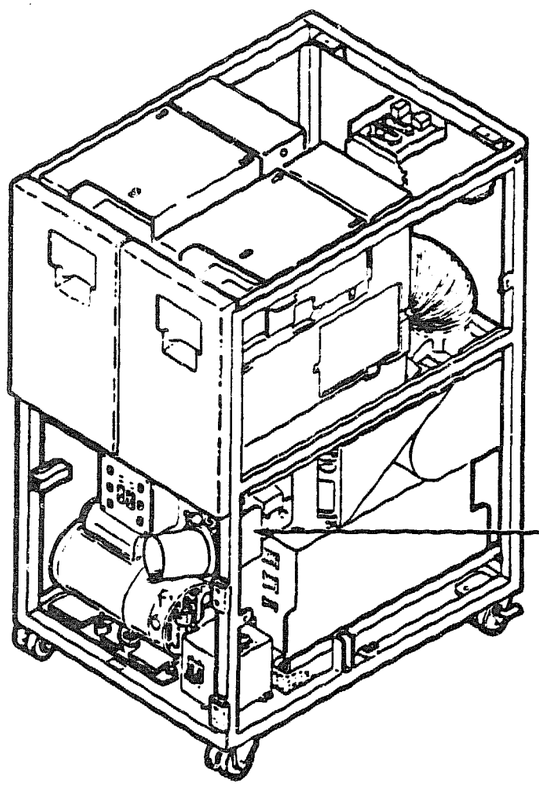
Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker.

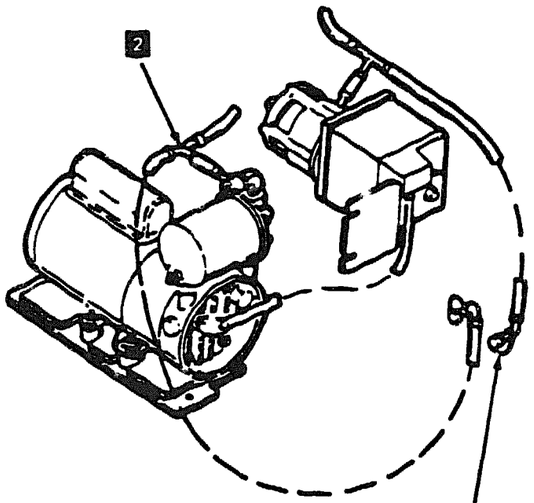
Removing the Air Pressure Test Hose Assembly

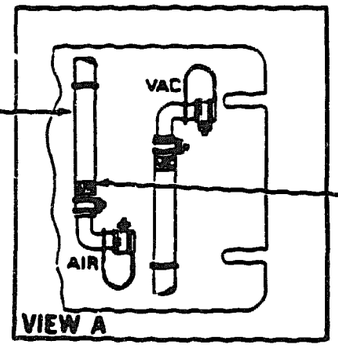
1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.
2. Remove the front safety cover (see CARR-DR 2-1).
3. Remove the test hose assembly from the mounting bracket 3.
4. Disconnect the tape transport unit air pressure hose from the tee 2.
5. Remove the air pressure test hose assembly 1 from the tape transport unit.

Replacing the Air Pressure Test Hose Assembly

1. Position the air pressure test hose assembly 1 in the tape transport unit.
2. Connect the air pressure test hose assembly 1 to the regulator output port tee 2.
3. Insert the test port end of the air pressure test hose assembly into the retainer on the mounting bracket 3.
4. Replace the tape transport unit front safety cover (see CARR-DR 2-2).
5. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.







FRU263 Vacuum Test Hose Assembly Removal and Replacement Procedure

This page contains the steps needed to remove the vacuum test hose assembly from the tape transport unit. The removal is from the front of the tape transport unit

Since there is only one vacuum test hose assembly in a tape transport unit, it is necessary that both drives be available for service

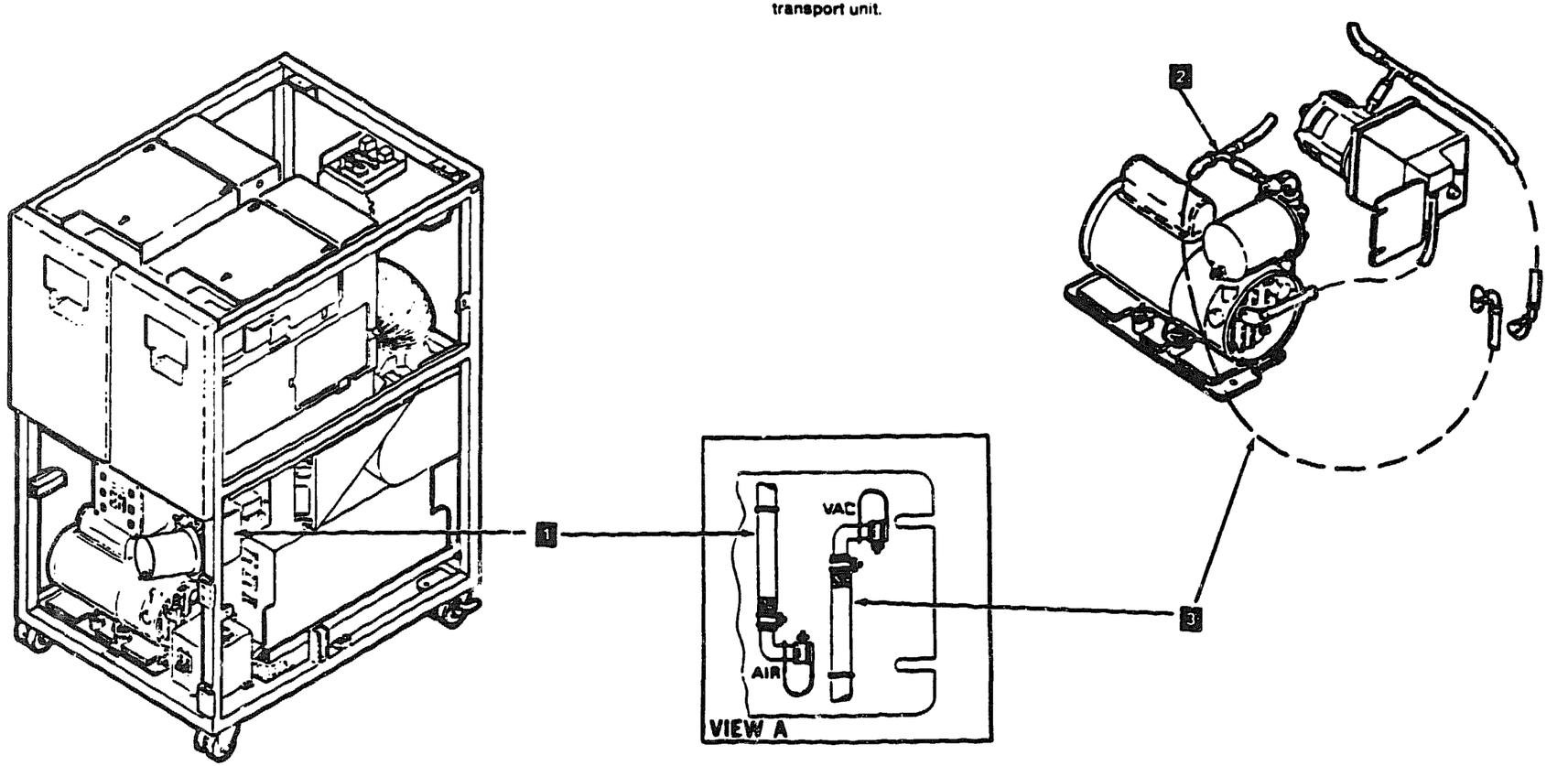
Note: This FRU can be removed and replaced without affecting the other tape transport units by removing power from the failing tape transport unit with the ac power circuit breaker

Removing the Vacuum Test Hose Assembly

1. Go to CARR-DR 8 for the procedure to *power off* the tape transport unit.
2. Remove the front safety cover (see CARR-DR 2-1)
3. Remove the test hose assembly from the mounting bracket 1.
4. Disconnect the tape transport unit vacuum test hose assembly 3 from the tee 2 at the venturi.

Replacing the Vacuum Test Hose Assembly

1. Position the vacuum test hose assembly 3 in the tape transport unit.
2. Connect the vacuum test hose assembly 3 to the tee 2 at the venturi.
3. Insert the test port end of the vacuum test hose assembly into the retainer on the mounting bracket 1.
4. Replace the tape transport unit front safety cover (see CARR-DR 2-2).
5. Go to CARR-DR 8 for the procedure to *power on* the tape transport unit.



FRU277 Read/Write Head Compliant Guide Removal and Replacement Procedure

You have been directed to this page to exchange the Read/Write Head Compliant Guides. Before starting this procedure, ensure that you have the two parts on hand for the replacement procedure.

Warning: Handle carefully, this is a delicate part.

This page contains the steps needed to exchange the drive-read/write-head compliant guides.

Note: This FRU can be exchanged without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

There are two compliant guides on the read/write head assembly, one on the left guide bearing 4, and one on the right guide bearing 2. The compliant guides are replaced as a pair.

Removing the Compliant Guide

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover (see CARR-DR 2-5).

Warning: Ensure that you do not scratch or hit the read/write head with your tools while working in the area.

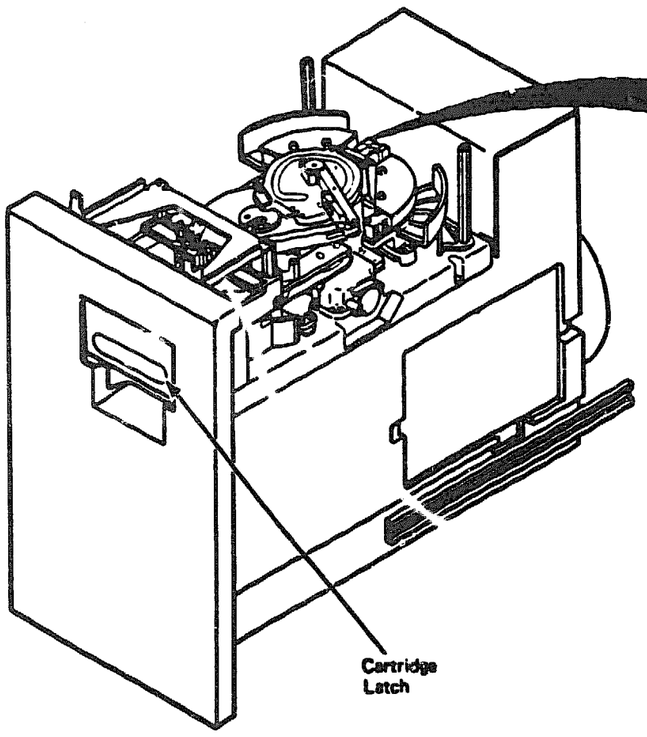
3. Start with the *left* compliant guide.
4. Remove the two mounting screws 3 from the compliant guide. Save the two mounting screws 3 for the replacement procedure.
5. Remove the compliant guide 1 from the locating pins and discard.

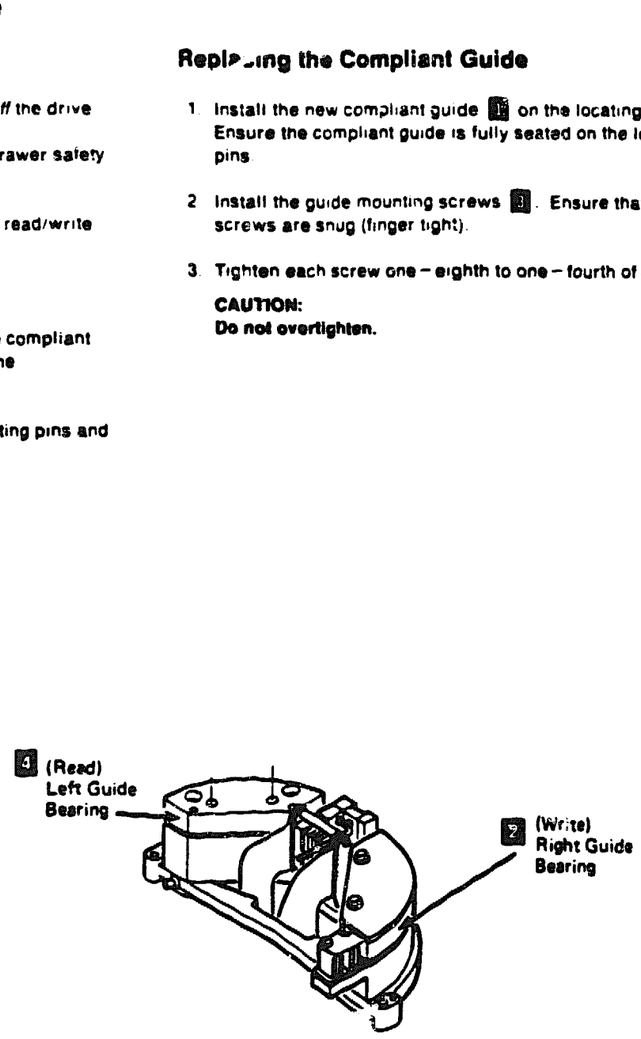
Replacing the Compliant Guide

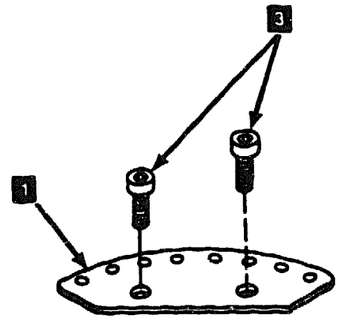
1. Install the new compliant guide 1 on the locating pins. Ensure the compliant guide is fully seated on the locating pins.
2. Install the guide mounting screws 3. Ensure that both screws are snug (finger tight).
3. Tighten each screw one – eighth to one – fourth of a turn.

   CAUTION:
   Do not overtighten.

4. Repeat this removal and replacement procedure for the *right* compliant guide 2.
5. Go to CARR-DR 130 and do the "Head, Decoupler, and Cleaner Block Cleaning Procedure"; return here when finished.
6. Install the drive drawer cover (see CARR-DR 2-5) and close the drive drawer.
7. Go to CARR-DR 8 for the procedure to *power on* the drive.







Compliant Guide

FRU281 Loader Control Card Removal and Replacement Procedure

This page contains the steps needed to remove and replace the logic card from the automatic cartridge loader. The other drive is not affected when the logic card is removed or replaced.

Warning: Some parts handled during this procedure are sensitive to electrostatic discharge (ESD). See CARR-DR 1-9 for "Instructions for Working with ESD-Sensitive Parts."

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Loader Control Card

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the front cover.
4. Raise the front cover.

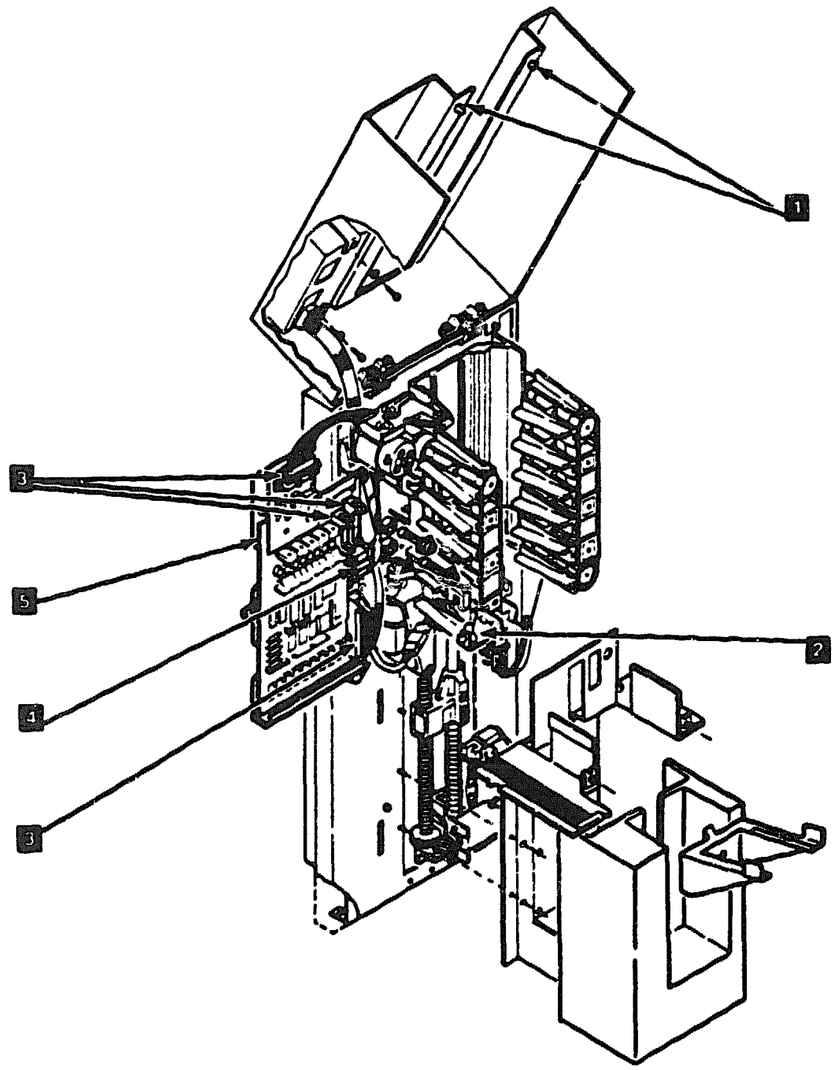
   The top part of the front cover is hinged at the top.
5. Disconnect the power cable 4 from the control card.
6. Unlock the quarter-turn fastener 2 at the front of the control card gate and swing out the gate.
7. Disconnect the signal cables 3 from the control card.
8. Gently, but firmly, grasp the control card 5 and pull it toward you and out of the upper and lower card guides.

Replacing the Loader Control Card

1. Place the control card 5 in the upper and lower card guides and gently, but firmly, push the control card into position (all the way in past the quarter-turn opening).
2. Connect the signal cables 3 to the control card.
3. Close the control card gate and lock the quarter-turn fastener 2.

   Make sure no cables are binding or pinching.
4. Connect the power cable 4 to the control card.
5. Lower the front cover and lock the two quarter-turn fasteners 1.

   Make sure there are no cables outside the cover and that none are being pinched.
6. Close the drive drawer.
7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU282 Load Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the load assembly

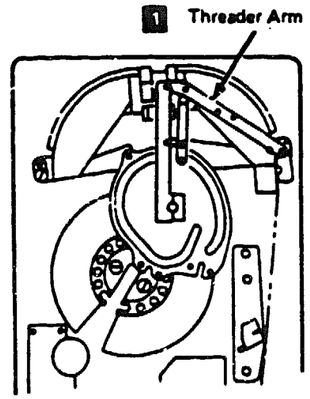
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

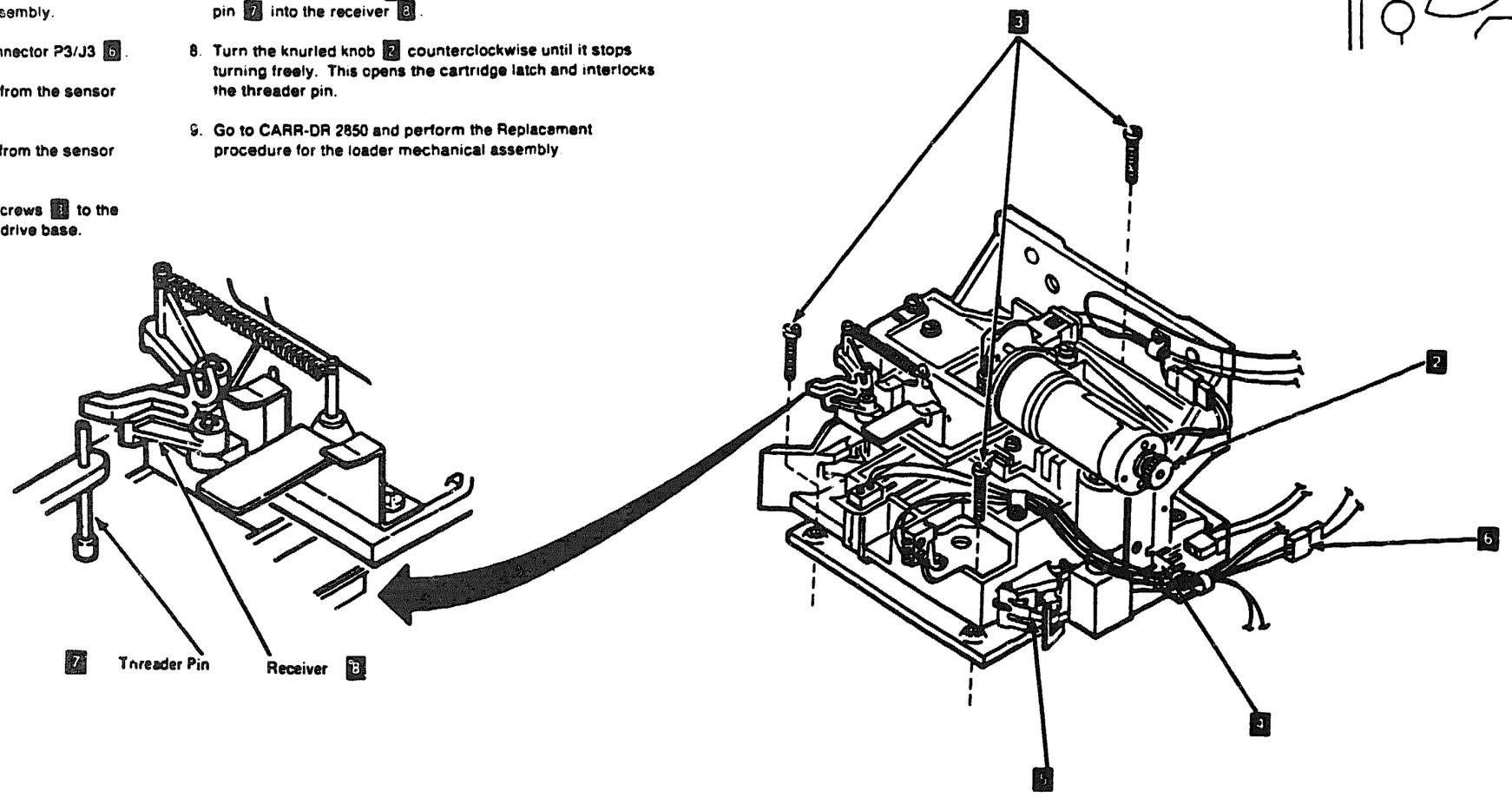
Removing the Load Assembly (From the Drive)

1. Go to CARR-DR 2850 and perform the Removal procedure of the loader mechanical assembly, and when completed, return to step 2.
2. Turn the knurled knob 2 clockwise until the knob stops. This releases the threader pin from the interlock.
3. Turn the threader arm counterclockwise to move the threader arm 1 to the position shown (the 12 o'clock position). This moves the arm out of the way and may prevent the arm from being broken.
4. Remove the cable clamps from the load assembly.
5. Disconnect the file protect switch cable connector P3/J3 6.
6. Unplug the cartridge present sensor cable from the sensor 5.
7. Unplug the cartridge latched sensor cable from the sensor 4.
8. Remove the three load assembly holding screws 3 to the drive base; lift the load assembly from the drive base.

Replacing the Load Assembly (To the Drive)

1. Place the load assembly on the drive and install the three load assembly holding screws 3.
2. Connect the cartridge latched sensor cable to the cartridge latched sensor 4.
3. Connect the cartridge present sensor cable to the cartridge present sensor 5.
4. Connect the file protect switch cable connector P3/J3 6.
5. Install the cable clamps.
6. Ensure that the load assembly is at the lowest point by turning the knurled knob clockwise until the knob stops turning freely. This permits the threader arm to engage the interlock and receiver.
7. Turn the threader arm 1 clockwise to move the threader pin 7 into the receiver 8.
8. Turn the knurled knob 2 counterclockwise until it stops turning freely. This opens the cartridge latch and interlocks the threader pin.
9. Go to CARR-DR 2850 and perform the Replacement procedure for the loader mechanical assembly.





FRU283 Load Motor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the load motor.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Load Motor

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer and remove the drive drawer safety cover. See CARR-DR 2-5.
3. Disconnect the load motor connector P 4
4. Disconnect the load complete sensor cable connector B 6 and remove the cable clamp.
5. Turn the knurled knob 10 clockwise until it stops turning freely. This permits the threader arm to be disengaged from the interlock.
6. Turn the threader arm counterclockwise to move the threader arm 2 to the position shown (the 12 o'clock position). This moves the arm out of the way and may prevent the arm from being broken.
7. Remove the "C" clip 7 from the upper end of the connecting rod.
8. Remove the two screws 3 from the load motor bridge assembly and remove the bridge assembly from its locating pins. Be careful not to break the connecting rod.

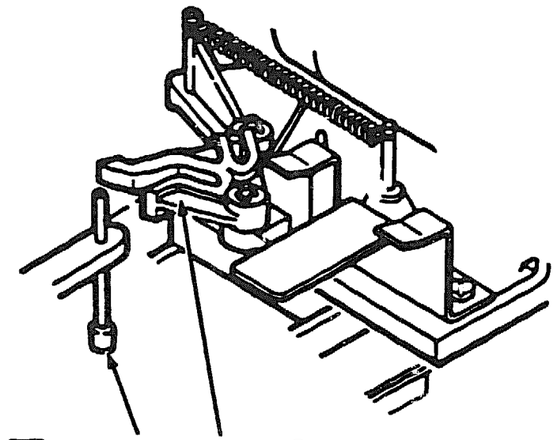
   Note: Be careful not to lose the plastic bushings under the mounting screws.
9. Remove the holding screw and remove the load complete sensor 12.
10. Loosen the crank arm set screw 8. Slide the crank arm off the motor shaft.
11. Remove the three motor holding screws 9 and remove the motor.

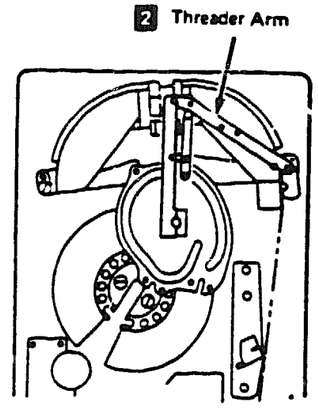
Replacing the Load Motor

1. Install the motor on the load motor bridge assembly with the voltage connector 4 positioned as shown in the drawing. Install and tighten the three mounting screws 9.
2. Install the crank arm 5 on the motor shaft and tighten the set screw 8.
3. While ensuring that the crank arm flag is centered in the load motor complete sensor 12, install the sensor and tighten the holding screw.

   Note: Make sure the connecting rod does not bind.
4. Place the bridge assembly on its locating pins and at the same time ensure the crank arm shaft is in the connecting rod. Install the bridge assembly mounting screws 3.

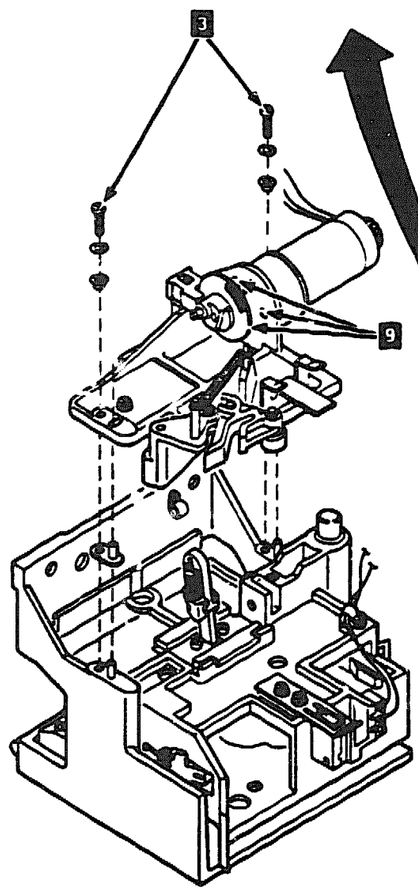
   Note: Make sure the plastic bushings are in place under the mounting screws.
5. Install the "C" clip 7 on the motor shaft.
6. Connect the load motor complete cable connector B 6 and install the cable clamp.
7. Connect the load motor connector P 4.
8. Turn the threader arm 2 clockwise to return the arm to the home position (receiver 1 and threader pin 11 engaged).
9. Turn the knurled knob 10 counterclockwise until it stops turning freely (load assembly in the up position).
10. Install the drive drawer safety cover and close the drive drawer. See CARR-DR 2-5.
11. Go to CARR-DR 8 for the procedure to *power on* the drive.

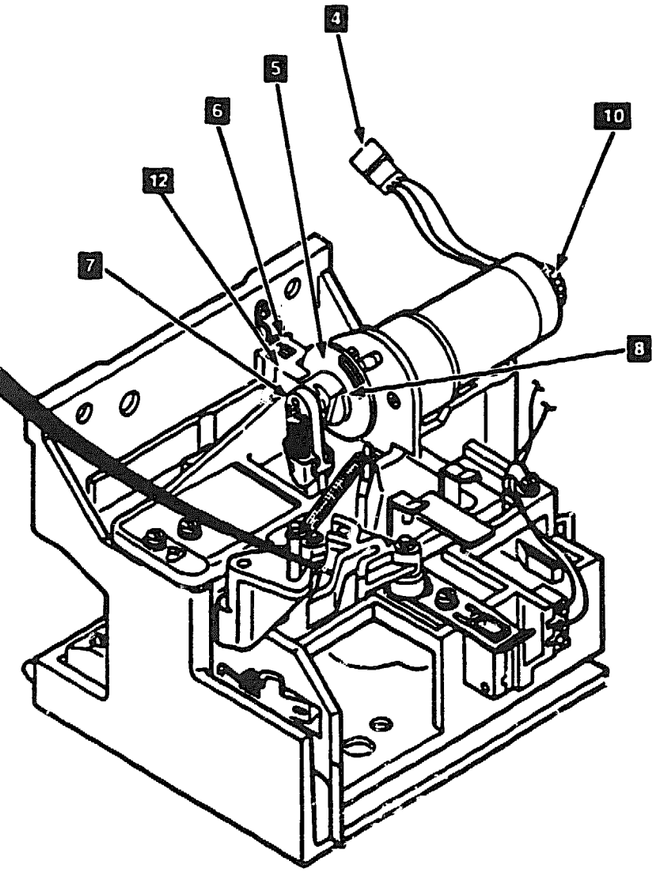




11 Threader Pin

Receiver 1





FRU284 Load Complete Sensor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the load complete sensor.

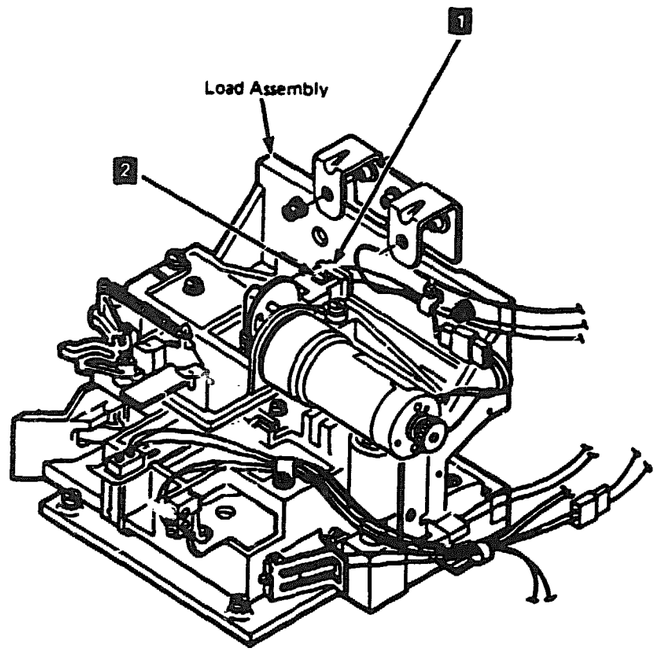
Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Load Complete Sensor

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive
2. Open the drive drawer and remove the drive drawer safety cover. See CARR-DR 2-5.
3. Disconnect the load complete sensor cable connector B [1].
4. Remove the holding screw and remove the load complete sensor [2].

Replacing the Load Complete Sensor

1. While ensuring that the crank arm flag is centered in the load motor complete sensor [2], install the sensor and tighten the holding screw.
2. Connect the load complete cable connector B [1].
3. Install the drive drawer safety cover and close the drive drawer. See CARR-DR 2-5.
4. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU285 Loader Mechanical Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the loader mechanical assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Loader Mechanical Assembly

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer and remove the drive drawer safety cover. See CARR-DR 2-5.
3. Disconnect the following from the load assembly.
   - Load motor connector P 14 and cable clamp
   - Load motor complete sensor connector B 15
   - Cartridge latched signal connector P5/J5 25
   - Cartridge feed complete sensor connector A 19 and cable clamp.
4. Unlock the two quarter-turn fasteners 8 at the bottom of the hinged part of the front cover and raise the front cover.

   The top part of the front cover is hinged.

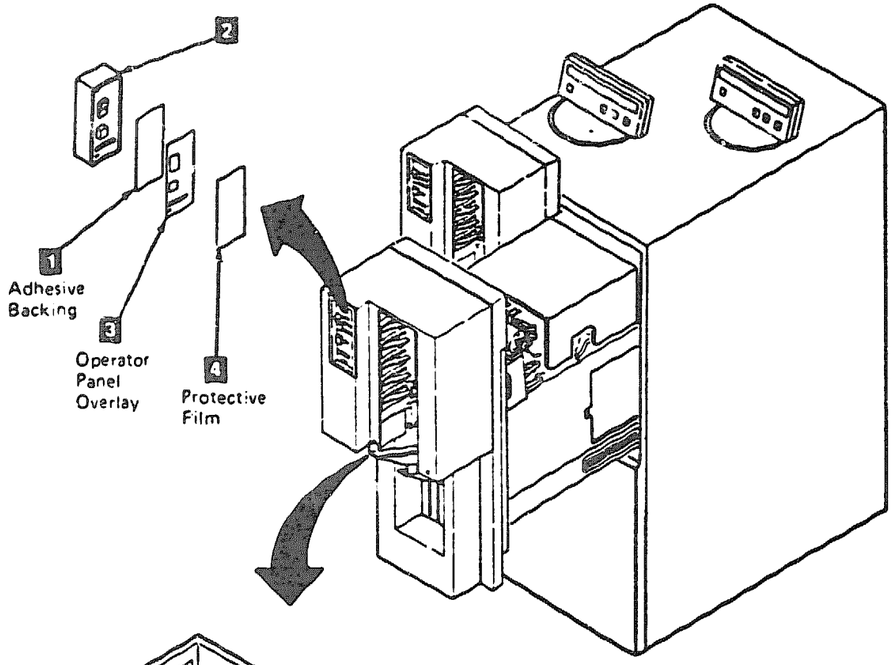
   Note: There is one mounting screw that can only be accessed from inside the loader assembly (front right). The other two mounting screws can be accessed from the load assembly side.
5. Disconnect the drive power cable at P3 6 and the two fuse holders, noting the location of the wires for installation at a later time
6. Unlock the quarter-turn fastener 10 at the front of the loader control card gate and swing out the gate.
7. Disconnect the drive signal cable P1 7.
8. Close the loader control card gate and lock the quarter-turn fastener 10.
9. Remove the two screws 12 (six flute) securing the tray 11. Retain the tray and mounting screws for later use
10. Remove the one mounting screw 9 to the bottom of the load assembly.
11. Lower the top part of the front cover and lock the two quarter-turn fasteners 8.

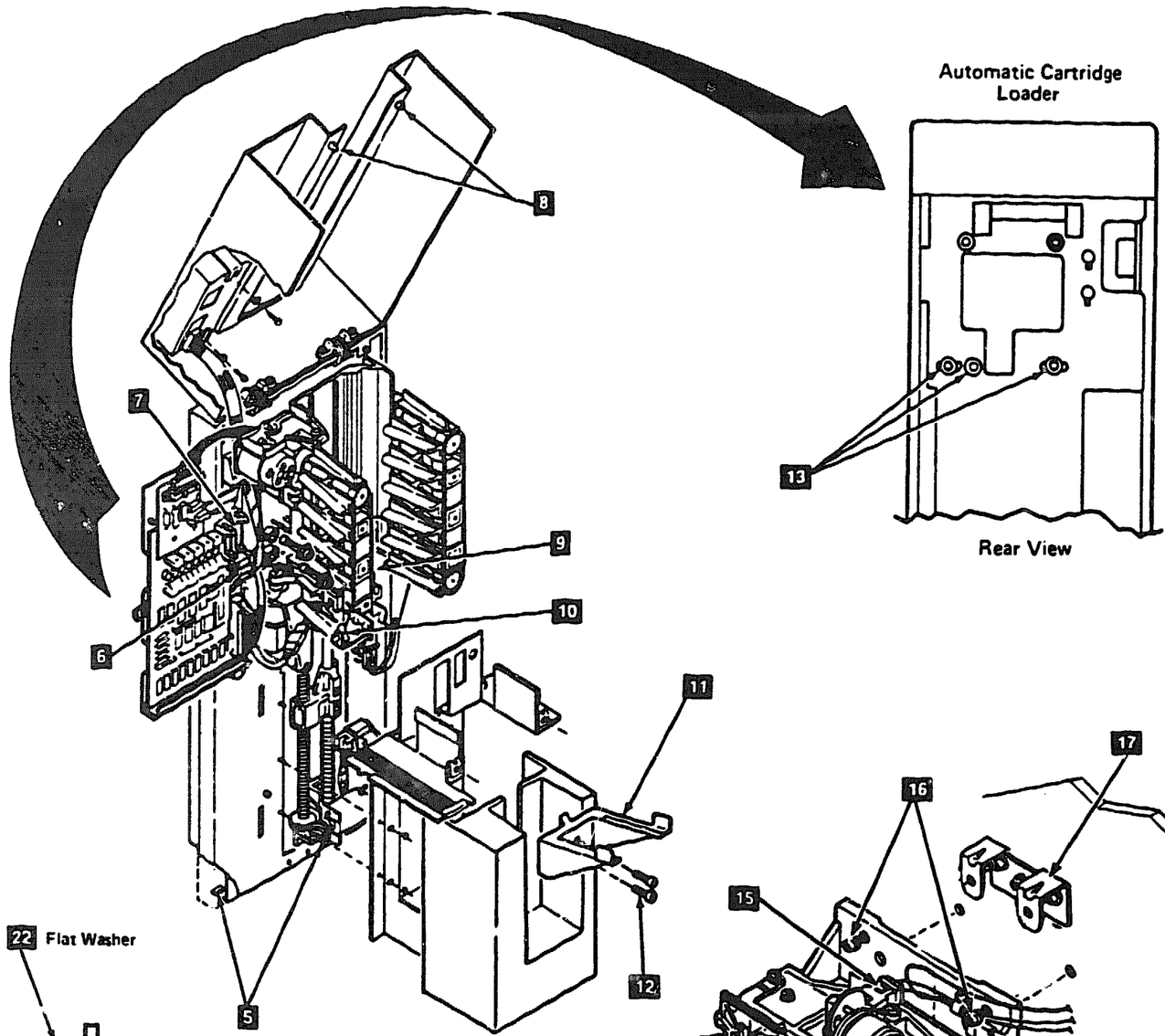
    CAUTION:
    Be sure you have a strong grip on the loader assembly before removing the two screws.
12. Remove the two mounting screws 16 at the top of the load assembly and remove the loader mechanical assembly.

Replacing the Loader Mechanical Assembly

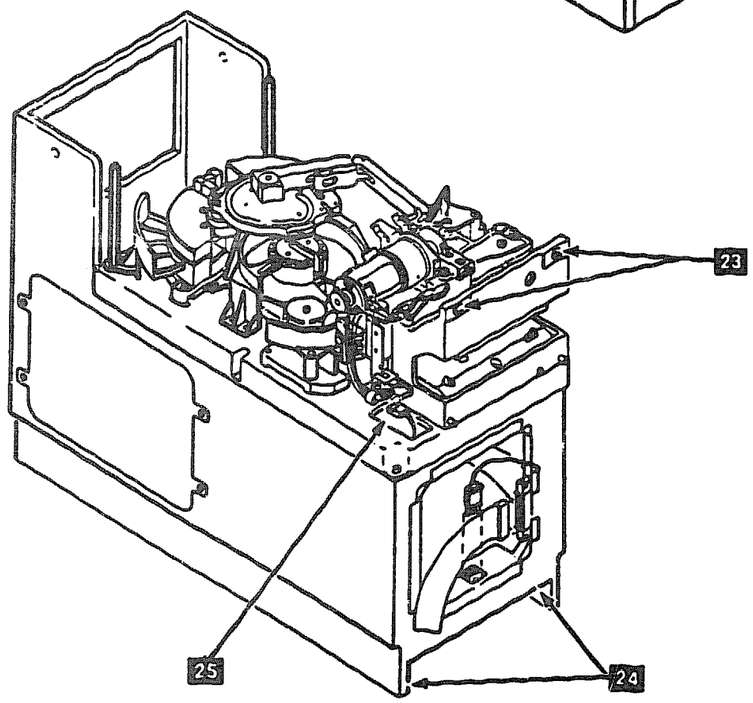
1. Verify that the two isolating bushings 23 are installed on the front of the loader assembly.
2. Verify that the three isolating bushings 13 are installed on the back of the automatic cartridge loader.
3. Route cables to ensure they will not be pinched during the installation of the automatic cartridge loader.
4. Lift the automatic cartridge loader onto the load assembly so the support bracket 17 is located over the front top surface of the load assembly. The bracket provides support for the automatic cartridge loader.
5. The bottom of the automatic cartridge loader is similar to the drive cover and can be held by either two screws or by two pins.
6. If your drive has pins 24, guide the pins into the holes 5 of the cover and at the same time, lift the automatic cartridge loader over the locating pins 18 on the load assembly.
7. Do not excessively tighten the screws securing the automatic cartridge loader. Excessive tightening of the screws will crack the isolating washer.

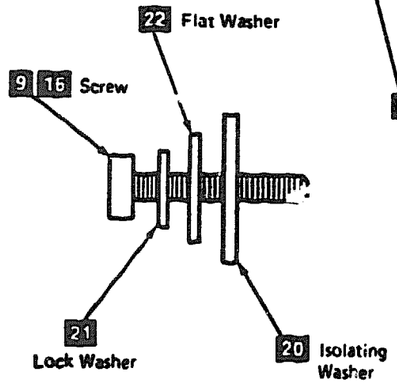
   Secure the automatic cartridge loader to the load assembly from the back, using the screws 16, isolating washer 20, flat washer 22, and lockwasher 21. The screws, isolating washer, flat washer, and lockwasher must be installed in the order shown on the following page.
8. If not already removed, remove the two screws 12 (six flute) securing the tray 11. Retain the tray and mounting screws for later use.
9. Install the screw 9, isolating washer 20, flat washer 22, and lockwasher 21 from the front and secure. The screw, isolating washer, flat washer, and lockwasher must be installed in the order shown on the following page.
10. If your drive has the two screws at the bottom, install the two screws.
11. Connect the drive power cable at P3 6 and the two fuse holders. Ensure the proper wires are installed on the correct fuse holder.
12. Unlock the quarter-turn fastener 10 at the front of the loader control card gate and swing out the gate.
13. Connect the drive signal cable P1 7.
14. Close the loader control card gate and lock the quarter-turn fastener 10.
15. Lower the front cover, being careful no cables are pinched, and lock the two quarter-turn fasteners 8.
16. Install the tray 11 removed earlier using the two screws 12.
17. Connect the following to the load assembly:
    - Load motor connector P 14 and install the cable clamp
    - Load motor complete sensor connector B 15 and install the cable clamp
    - Cartridge latched signal connector P5/J5 25
    - Cartridge feed complete sensor connector A 19 and install the cable clamp.
18. If you are replacing a loader mechanical assembly that had been previously installed, go to step 22.
19. If you are installing a new loader mechanical assembly, select the operator panel overlay 3 from the overlay group supplied. The language should be the same as the tape transport unit.
20. Peel the adhesive protective backing 1 from the overlay and install on the front face of the operator panel 2.
21. Remove the protective film 4 on the front face of the overlay after the overlay has been attached to the operator panel.
22. Install the drive drawer safety cover and close the drive drawer. See CARR-DR 2-5.
23. Go to CARR-DR 8 for the procedure to ***power on*** the drive.

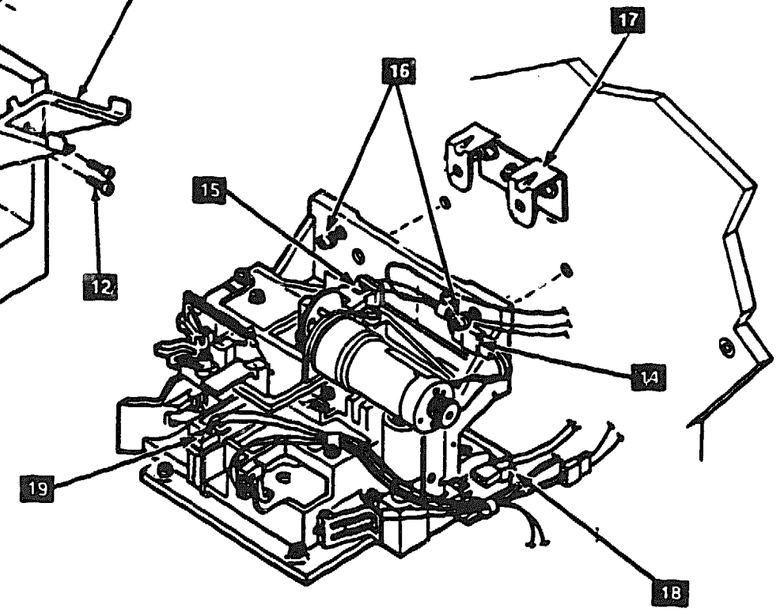

2
1
Adhesive Backing
3
Operator Panel Overlay
4
Protective Film


8
7
9
10
6
11
5
12

Automatic Cartridge Loader
13
Rear View


23
25
24


22 Flat Washer
9 16 Screw
21
Lock Washer
20 Isolating Washer


17
16
15
14
19
18

FRU286 and 287 Loader Signal and Power Cable Removal and Replacement Procedure

This page contains the steps needed to remove and replace the loader signal and power cables.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Loader Cables

1 Go to CARR-DR 2850 and perform the Removal procedure of the loader mechanical assembly

2 If you are here to remove the power cable, go to step 3
Remove the lower end of the loader signal cable 1
TU-D0/1-P1-P1 End of the removal.

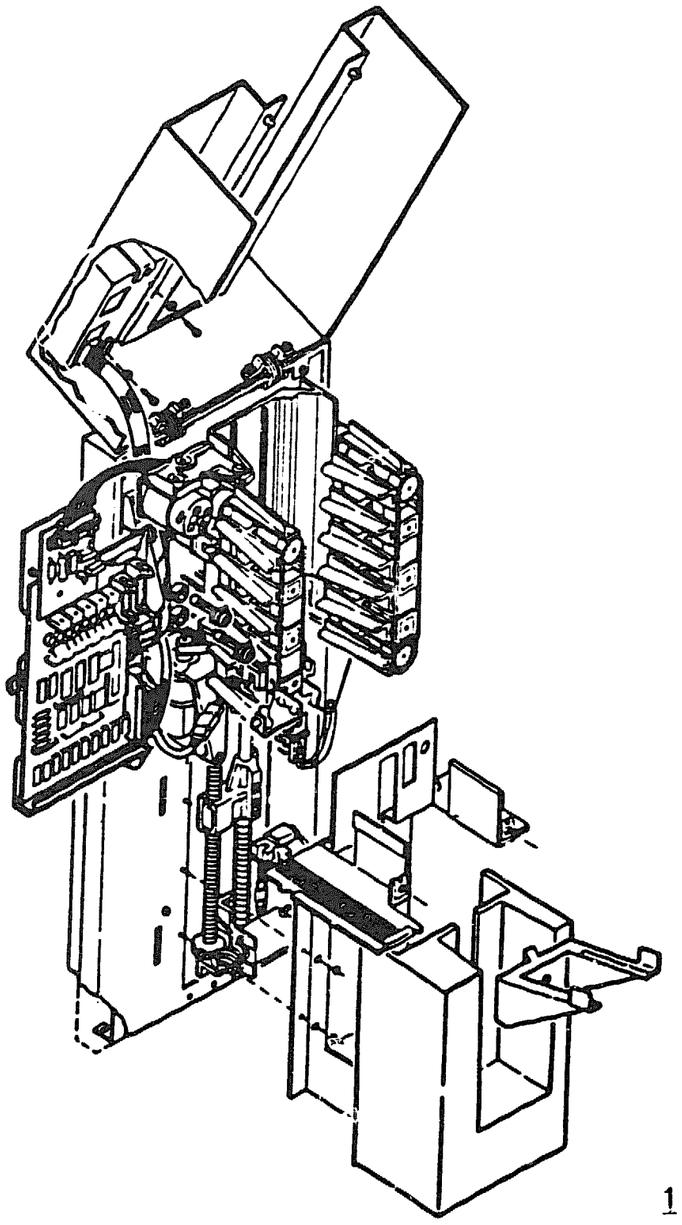
3 Remove the lower end of the loader power cable 2
TU-D0/1-P1-P6

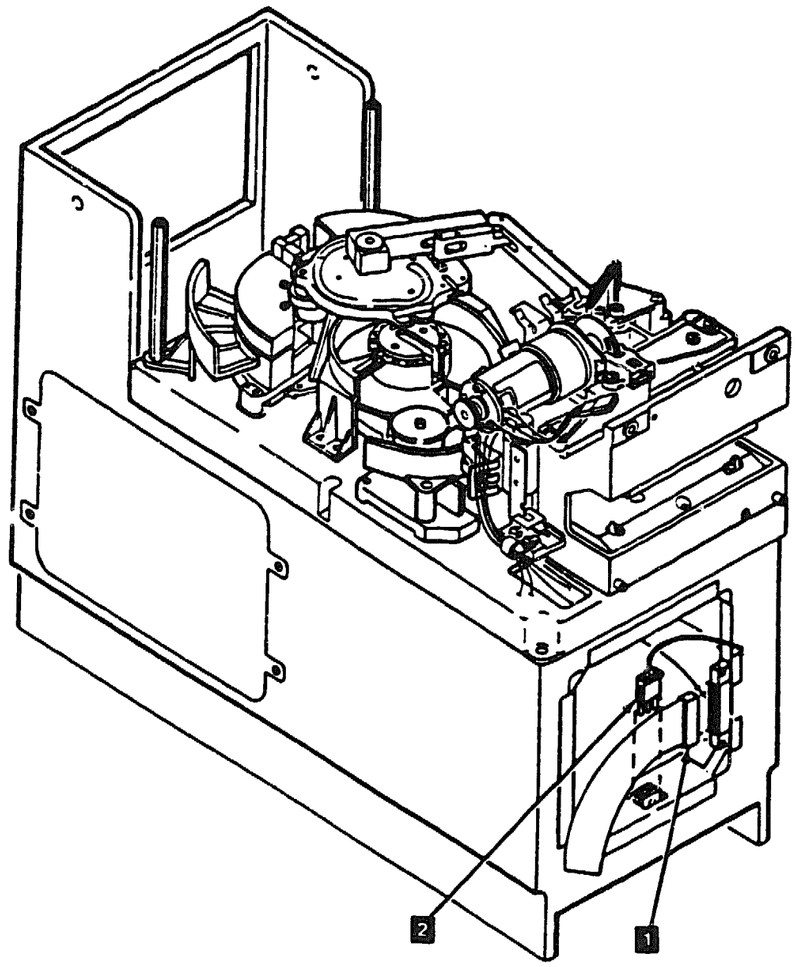
Replacing the Loader Cables

1 If you are here to install the loader power cable go to step 2
Install the drive end of the loader signal cable 1
TU-D0/1-P1-P1. Go to step 3.

2 Install the drive end of the loader power cable 2
TU-D0/1-P1-P6

3 Go to CARR-DR 2850 and perform the Replacement procedure for the loader mechanical assembly.





FRU288 and 299 Loader Fuse Removal and Replacement Procedure

This page contains the steps needed to remove and replace either loader fuse, +24V dc or +5V dc.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Loader Fuse

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer.
3. Unlock the two quarter-turn fasteners [1] at the bottom of the hinged part of the front cover.
4. Raise the front cover.

   The top part of the front cover is hinged.
5. Unlock the quarter-turn fastener [2] at the front of the control card gate and swing out the gate.
6. Locate the fuse to be exchanged [3].
7. While pressing in on the fuse holder cap rotate it one quarter-turn to the left and remove the defective fuse from the holder [3].

   Note: Observe the fuse value.

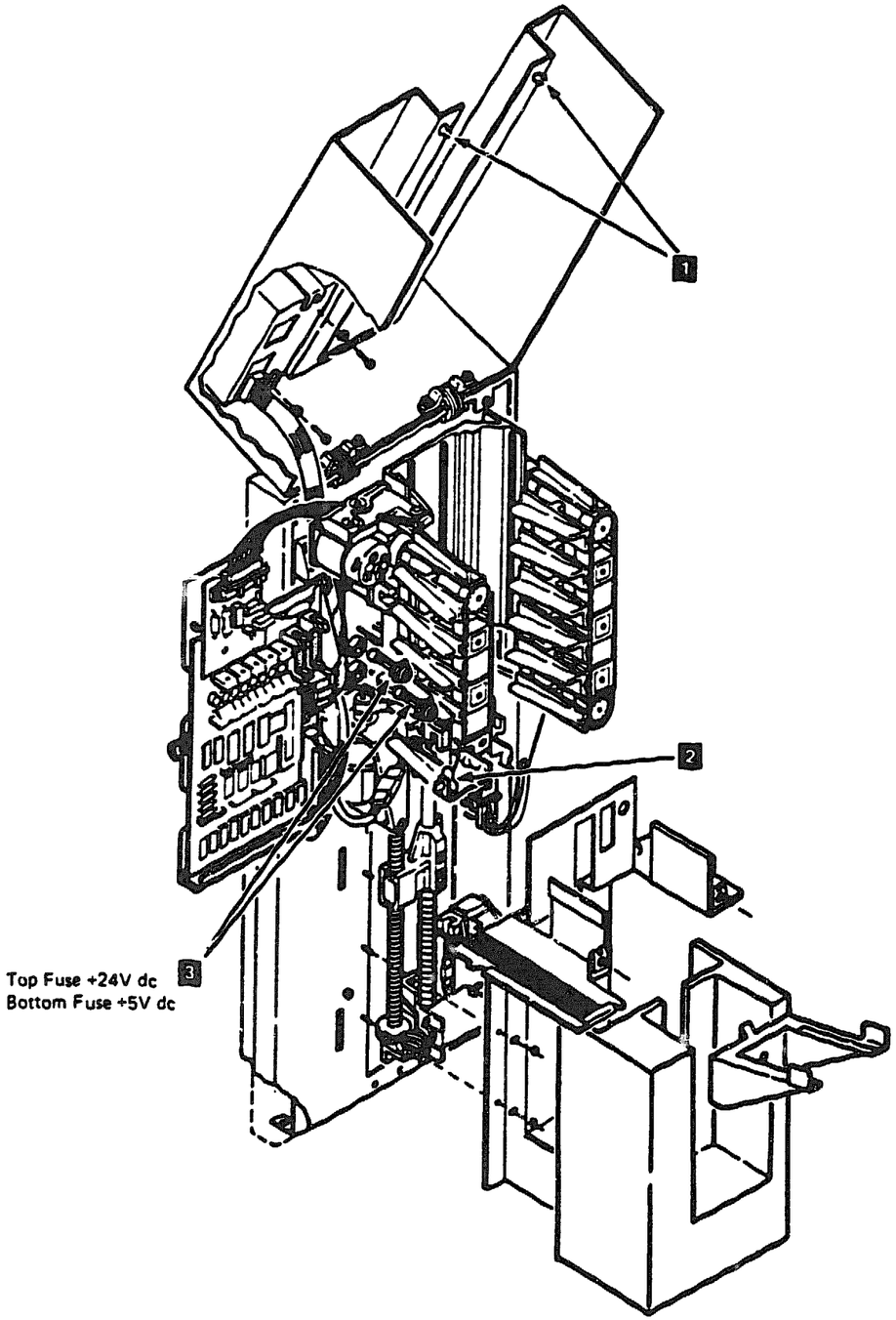
Replacing the Loader Fuse

Note: Make sure you have the correct fuse to install.

1. Install the correct fuse into the fuse holder [3].
2. Press in on the cap and rotate it one quarter-turn to the right.
3. Close the control card gate and lock the quarter-turn fastener [2].

   Make sure no cables are binding or pinching.
4. Lower the front cover and lock the two quarter-turn fasteners [1].

   Make sure there are no cables outside the cover and that none are being pinched.
5. Close the drive drawer.
6. Go to CARR-DR 8 for the procedure to *power on* the drive.



FRU289 Stack Low Position Sensor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the stack low position sensor

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Stack Low Position Sensor

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

2 Open the drive drawer

3 Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the of the front cover.

4 Raise the front cover

The top part of the front cover is hinged.

5 Remove the front tray 3 by removing the two screws

Note: Be sure you do not lose the screws and washers

6 Remove the lower decorative cover 4 by pushing in on the sides and pulling straight out. It is held by tabs only

7 Remove the output stack assembly cover holding nuts, washers, and springs 6 and remove the output stack assembly cover 5. Note the location of the two springs for replacement

8 Disconnect the output stack low position sensor connector H 2, pull out the sensor 7 and discard.

Note: A gentle rocking motion while pulling on the sensor assembly will release the split sensor posts from the metal casting

Replacing the Stack Low Position Sensor

1 Install the new sensor 7 and connect the sensor cable H 2

2. Install the output stack assembly cover 5 using the nuts, washers, and springs 6 removed earlier.

Note: Make sure when you install the two springs that the curve of the spring faces toward the decorative cover.

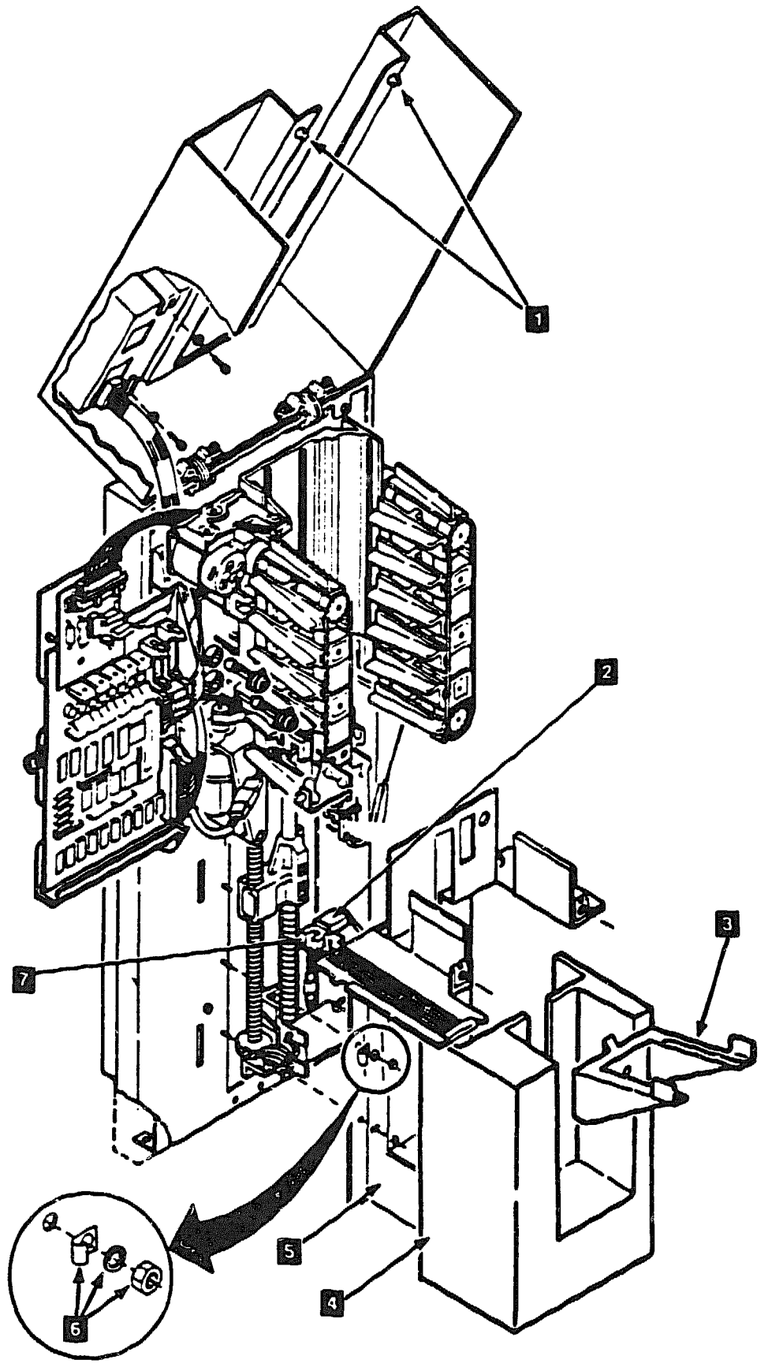
3. Install the lower decorative cover 4 by inserting the cover tabs in their respective slots and pushing on the cover.

4. Install the front tray 3.

5 Lower the front cover, being careful no cables are pinched, and lock the two quarter-turn fasteners 1

6. Close the drive drawer.

7. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU290 Input Stack Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the input stack assembly.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Input Stack Assembly

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer.
3. Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the front cover.
4. Raise the front cover.

   The top part of the front cover is hinged.
5. Unlock the quarter-turn fastener 5 at the front of the loader control card gate and swing out the gate.
6. Disconnect the cartridge staged sensor cable K 7 from the sensor.
7. Disconnect the input complete sensor jumper cable J 4 from the sensor.
8. Disconnect the cartridge in stack sensor cable C 3 from the sensor.
9. Disconnect the input drive motor cable Q 2.

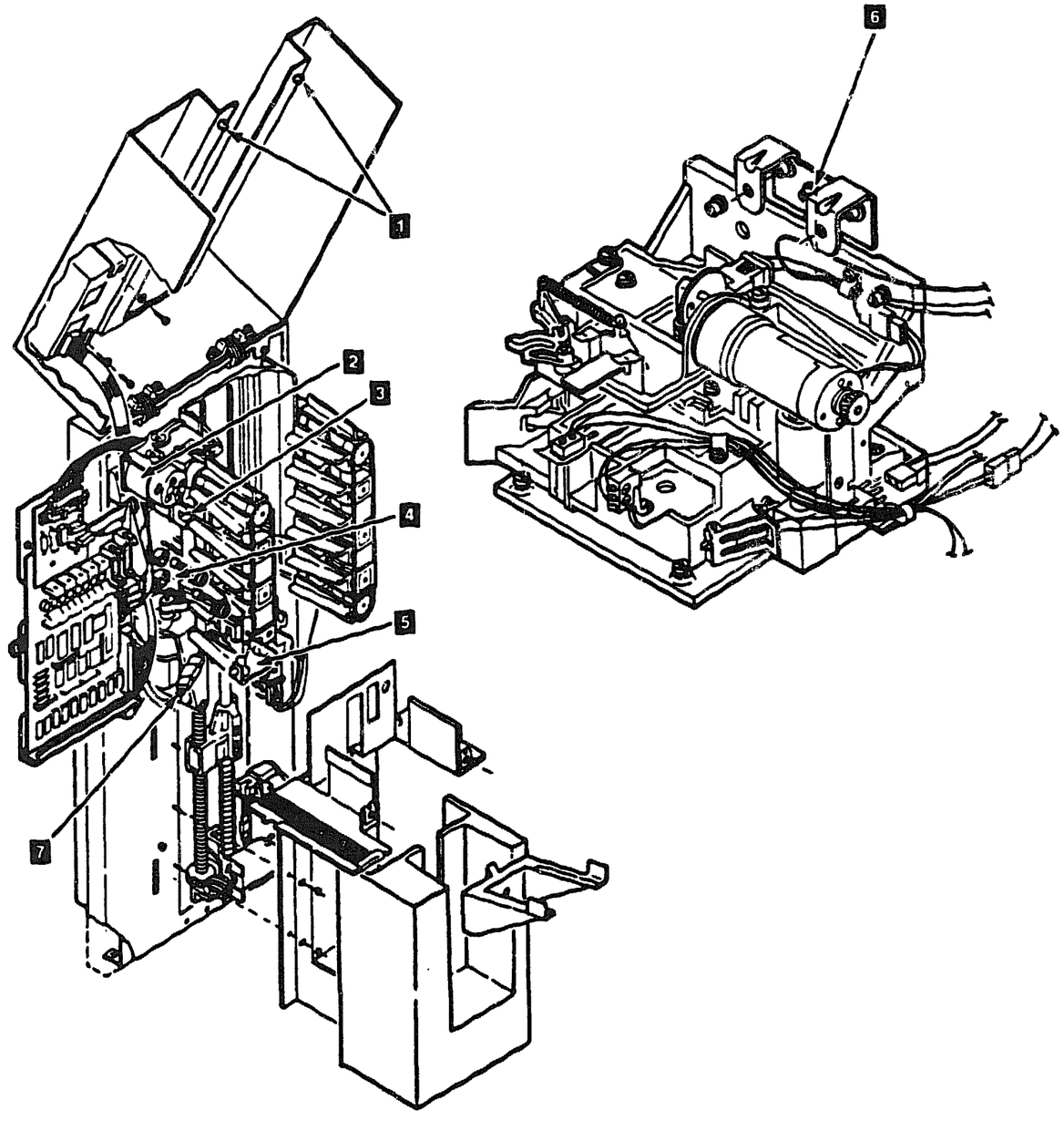
   CAUTION:
   Make sure you have a strong grip on the input stack assembly before removing the screw.
10. Remove the one holding screw 6 from the input stack assembly. Remove the input stack assembly from its two locating pins.

Replacing the Input Stack Assembly

1. Place the input stack assembly on its two locating pins, and while holding the assembly with one hand install the one holding screw 6.
2. Connect the cartridge staged sensor cable K 7 to sensor.
3. Connect the input complete sensor cable J 4 to the sensor.
4. Connect the cartridge in stack sensor cable C 3 to the sensor.
5. Connect the input drive motor cable Q 2.
6. Close the control card gate and lock the quarter-turn fastener 5.

   Make sure no cables are binding or pinching.
7. Lower the front cover and lock the two quarter-turn fasteners 1.

   Make sure there are no cables outside the cover and that none are being pinched.
8. Close the drive drawer.
9. Go to CARR-DR 8 for the procedure to *power on* the drive.



FRU291 Cartridge In Stack Sensor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cartridge in stack sensor.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Cartridge In Stack Sensor

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the front cover.
4. Raise the front cover.

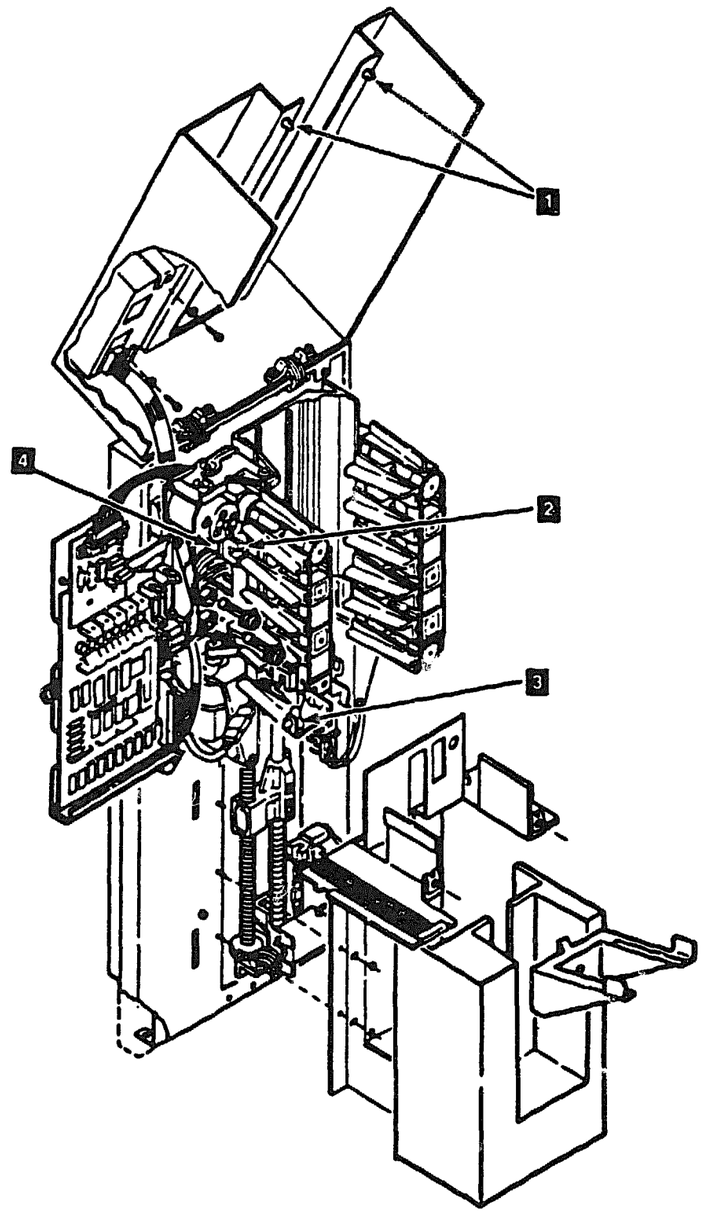
   The top part of the front cover is hinged.
5. Unlock the quarter-turn fastener 3 at the front of the control card gate and swing out the gate.
6. Remove one input sensor holding screw and remove the sensor 2 from its locating pin.
7. Disconnect the cartridge in stack sensor cable C 4.

Replacing the Cartridge In Stack Sensor

1. Connect the sensor cable C 4 to the sensor.
2. Install the sensor 2 onto its locating pin. Use the screw and washer removed earlier to fasten the sensor.
3. Close the control card gate and lock the quarter-turn fastener 3.

   Make sure no cables are binding or pinching.
4. Lower the top part of the front cover and lock the two quarter-turn fasteners 1.

   Make sure there are no cables outside the cover and that none are being pinched.
5. Close the drive drawer.
6. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU292 Cartridge Staged Sensor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the cartridge staged sensor 3.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Cartridge Staged Sensor

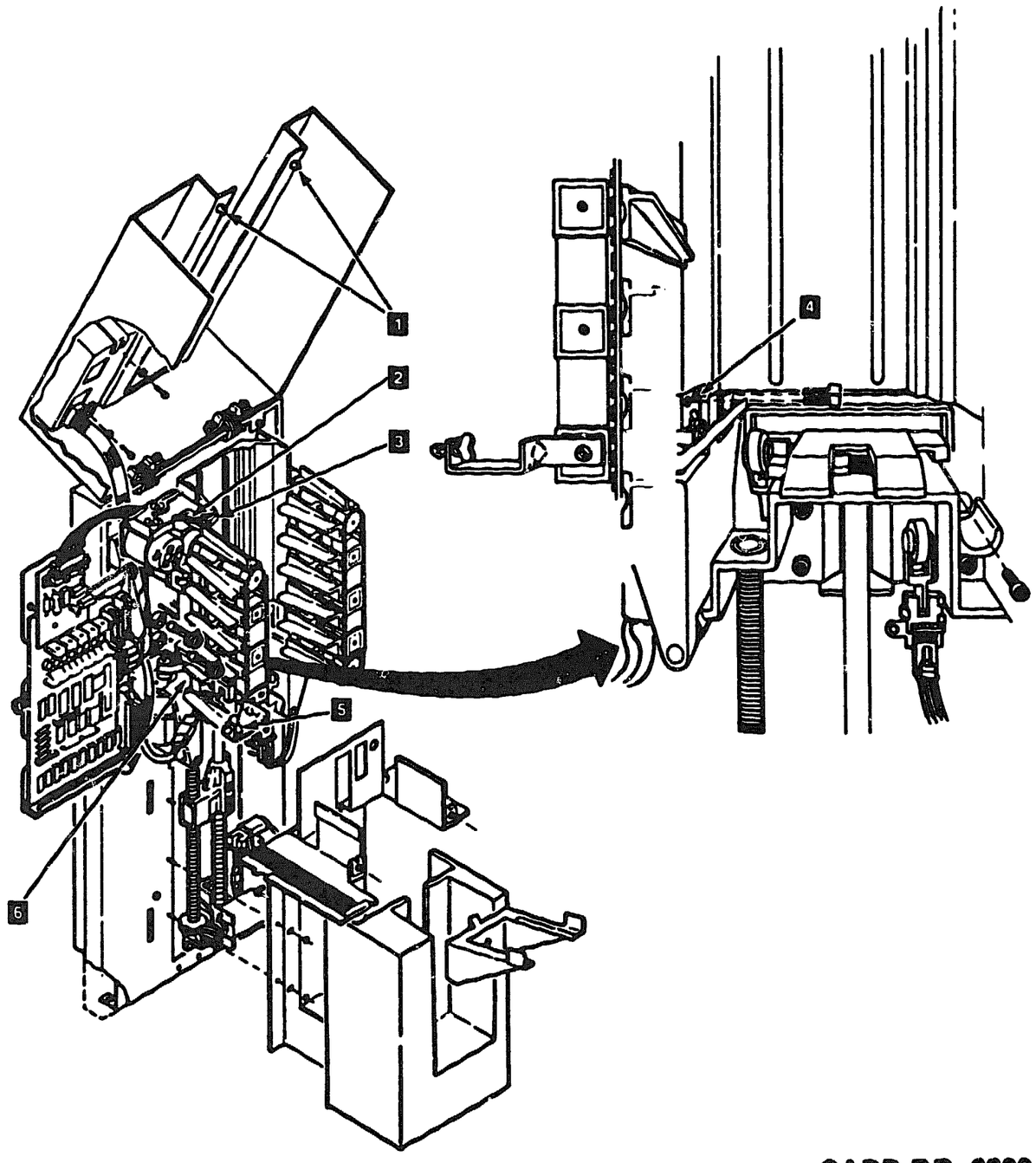
1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Open the drive drawer.
3. Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the front cover.
4. Raise the front cover.

   The top part of front cover is hinged.
5. Unlock the quarter-turn fastener 5 at the front of the loader control card gate and swing out the gate.
6. Remove the spring 2 from the arm at the top of the switch actuator 3. Leave it attached to the casting at the other end.
7. While holding the switch actuator with one hand, remove the two allen screws 4 from the bearing block at the bottom of the switch actuator.
8. Remove the bearing block, cartridge staged sensor, and switch actuator.
9. Disconnect the cartridge staged sensor cable from the sensor 6 cable connector K.
10. Remove the cartridge staged sensor 6 from the bearing block by removing the screw.

Replacing the Cartridge Staged Sensor

1. Place the new sensor so the yellow wire of the sensor is toward the front of the machine when the sensor is installed.
2. Install the new sensor on the bearing block with the screw removed earlier.
3. Install the switch actuator 3 by inserting the top pivot into the bushing on the casting.
4. While holding the switch actuator 3 with one hand, install the bearing block and sensor 6 using the allen screws 4 removed earlier.
5. Attach the switch actuator spring 2 to the switch actuator arm.
6. If the actuator arm binds, loosen the screw 4 and adjust the pivot.
7. Connect the sensor cable K to the sensor 6.
8. Close the control card gate and lock the quarter-turn fastener 5.

   Make sure no cables are binding or pinching.
9. Lower the front cover, being careful no cables are pinched, and lock the two quarter-turn fasteners 1.
10. Close the drive drawer.
11. Go to CARR-DR 8 for the procedure to *power on* the drive.



FRU293 Left Input Rail Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the left input rail assembly.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Left Input Rail Assembly

1. Go to CARR-DR 2900 and perform the Removal procedure for the input stack assembly, and when completed return to step 2.
2. Remove the three holding screws and washers 4 from the back of the left input rail assembly 2.
3. Grasp the rail assembly and pull straight out. The left input rail coupling and the stack coupling 1 slide apart.

Replacing the Left Rail Input Rail Assembly

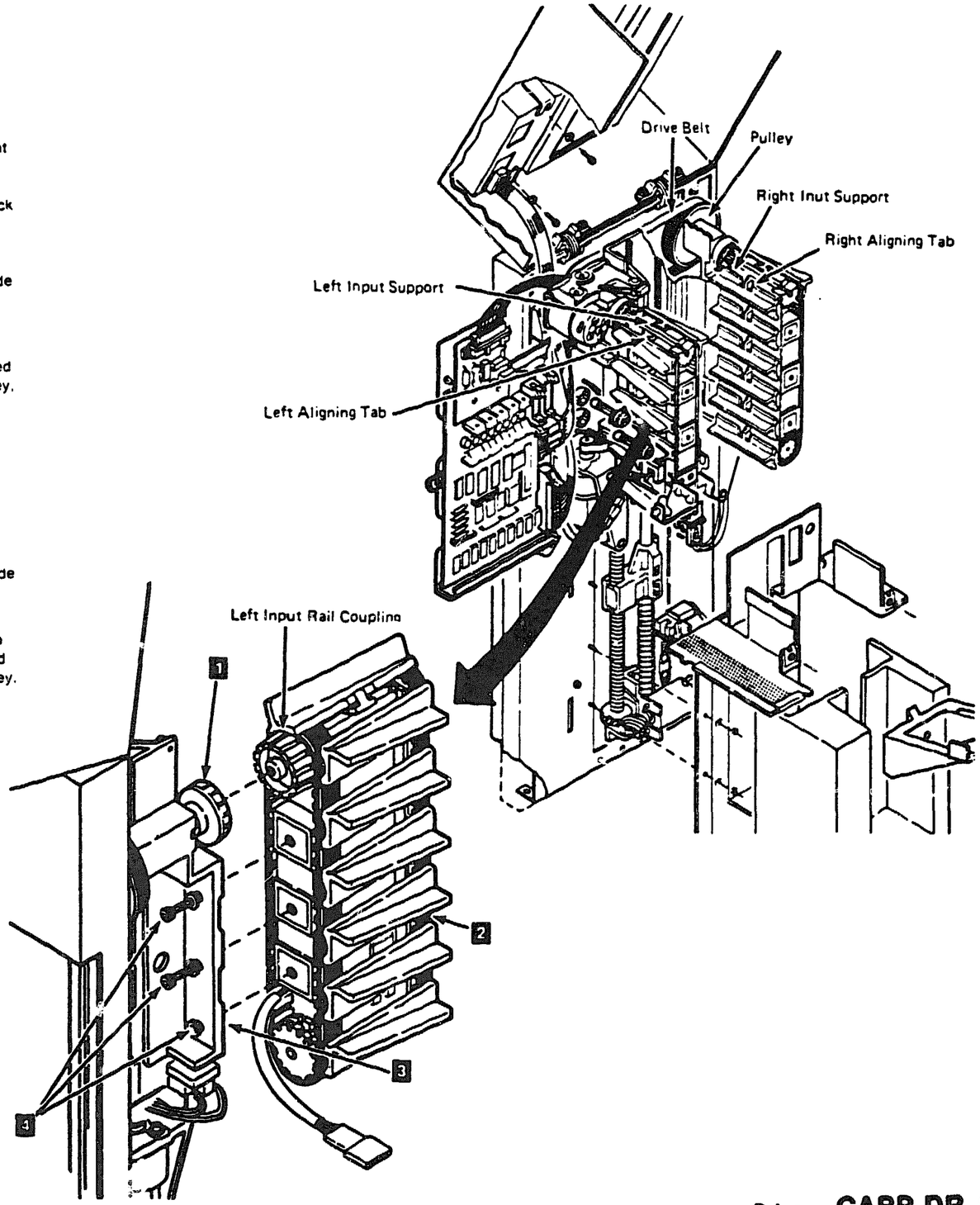
1. Place the left rail coupling into the input stack coupling 1 (it slides in with the bottom of the left input rail assembly angled to the left).
2. Swing the bottom part of the input rail assembly to the right until it is stopped by the stop pin 3.
3. Install the three holding screws and washers 4 in the back of the left input rail assembly 2 and tighten.
4. Align the left and right input supports so they are at the same height. The aligning tab in the center of the top inside input support should be even with the top of the guide on both sides.

   To align them, slip the drive belt off the pulley behind the right input rail and rotate the pulley until both tabs are lined up within 1 mm (0.04 in.). Slide the belt back onto the pulley, being careful not to change the alignment.
5. Go to CARR-DR 2900 and perform the Replacement procedure for the input stack assembly.

Aligning the Left and Right Rails

1. Align the left and right input supports so they are at the same height. The aligning tab in the center of the top inside support should be even with the top of the guide on both sides.

   To align these, slip the drive belt off the pulley (behind the right input rail) and turn the pulley until both tabs are lined up within 1mm (0.04 in.). Slide the belt back onto the pulley, being careful not to change the alignment.
2. Return to the procedure that sent you here.



FRU294 Right Input Rail Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the right input rail assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

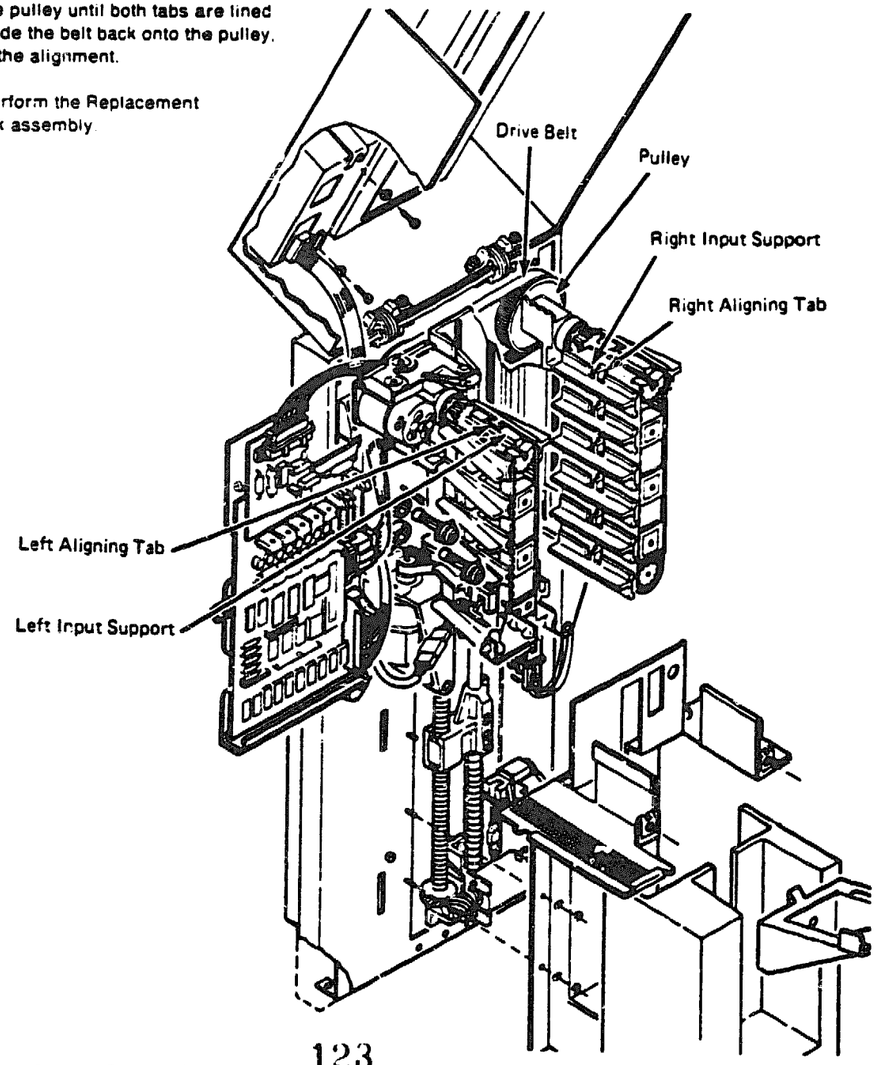
Removing the Right Input Rail Assembly

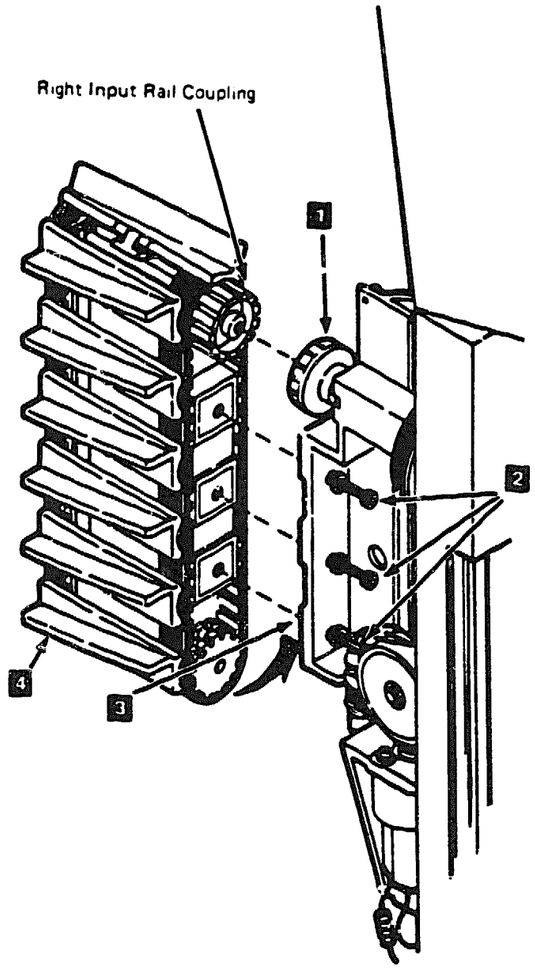
1. Go to CARR-DR 2900 and perform the Removal procedure for the input stack assembly, and when completed return to step 2
2. Remove the three holding screws and washers 2 from the back of the right input rail assembly 4
3. Grasp the rail assembly and pull straight out. The right input rail coupling and the stack coupling 1 slide apart.

Replacing the Right Rail Input Rail Assembly

1. Place the right rail coupling into the input stack coupling 1 (it slides in with the bottom of the left input rail assembly angled to the right).
2. Swing the bottom part of the input rail assembly to the left until it is stopped by the stop pin 3
3. Install the three holding screws and washers 2 in the back of the right input rail assembly 4 and tighten.
4. Align the left and right input supports so they are at the same height. The aligning tab in the center of the top inside input support should be even with the top of the guide on both sides.

   To align them, slip the drive belt off the pulley behind the right input rail and rotate the pulley until both tabs are lined up within 1 mm (0.04 in.). Slide the belt back onto the pulley, being careful not to change the alignment.
5. Go to CARR-DR 2900 and perform the Replacement procedure for the input stack assembly





FRU295 Feed Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the feed assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Feed Assembly

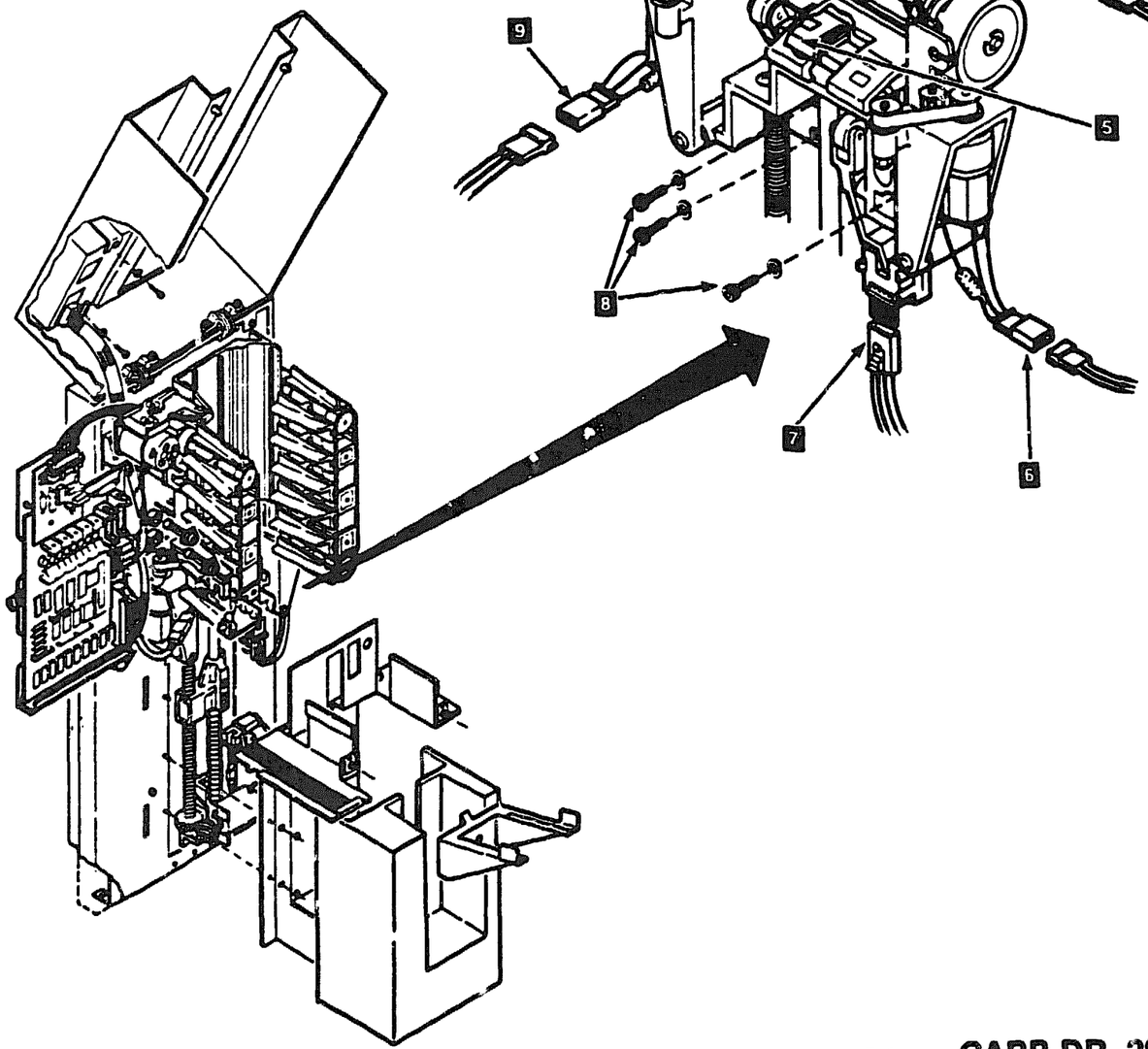
1. Go to CARR-DR 2900 and perform the Removal procedure for the input stack assembly, and when completed return to step 2
2. Go to CARR-DR 2970 and perform the Removal procedure for the output stack assembly, and when completed return to step 3
3. Disconnect the track feed sensor connector D 1
4. Disconnect the track closed sensor connector E 2
5. Disconnect the left L 9 and the right N 6 cartridge feed motor connectors
6. Disconnect the feed solenoid connector M 4
7. Disconnect the stack up position sensor connector G 7
8. Disconnect the left and right solenoid springs 3 at the pins.
9. Remove the three feed assembly holding screws 8. Carefully remove the feed assembly from the front and disconnect the extract complete sensor connector F 5.

Replacing the Feed Assembly

1. When installing a new feed assembly ensure that the left and right solenoid springs 3 from the old feed assembly have been installed on the new feed assembly
2. Connect the extract complete sensor connector F 5.
3. Install the feed assembly from the front using the three holding screws 8 removed earlier.
4. Connect the left and right solenoid springs 3
5. Connect the output stack up position sensor connector G 7
6. Connect the feed solenoid connector M 4
7. Connect the left L 9 and the right N 6 cartridge feed motor connectors.
8. Connect the track closed sensor connector E 2
9. Connect the track feed sensor connector D 1.
10. Go to CARR-DR 2970 and perform the Replacement procedure for the output stack assembly, and when completed return to step 10.

    Note: Do not power up or close the drive drawer as instructed until the following step has been performed.

11. Go to CARR-DR 2900 and perform the Replacement procedure for the input stack assembly.



FRU296 Output Stack Up Position Sensor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the output stack sensor.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Stack Up Position Sensor

1. Go to CARR-DR 8 for the procedure to *power off* the drive.
2. Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the front cover.
3. Raise the front cover.

   The top part of the front cover is hinged.
4. Remove the front tray 5 by removing the two screws.

   Note: Be sure you do not lose the screws and washers.
5. Remove the lower decorative cover 6 by pushing in on the sides and pulling straight out. It is held by tabs only.
6. Remove the output stack assembly cover holding nuts, washers, and springs 8 and remove the output stack assembly cover 7. Note the location of the two springs for replacement.

   Note: Washers and/or springs 8 may not be present.
7. Remove the stack up position sensor by springing open the retainer ears on each side of the holder 3 and lifting out the sensor 2.

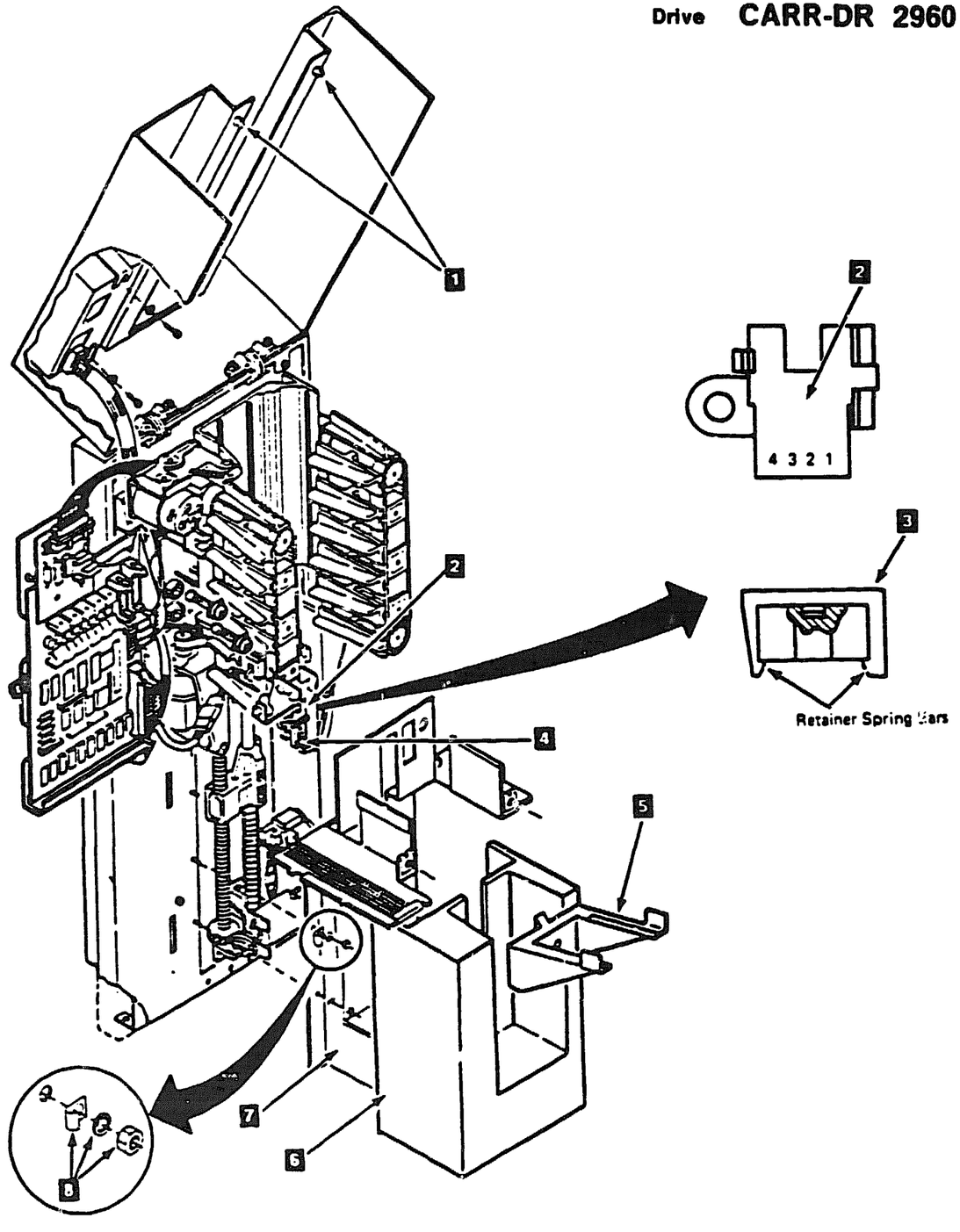
   Do not remove the lock star washers that holds the sensor holder.
8. Disconnect the stack up position sensor cable G 4.

Replacing the Output Stack Sensor

1. Install the new stack up position sensor 2 into the sensor holder 3 and connect the sensor cable G 4.
2. Install the output stack assembly cover 7 using the nuts, washers, and springs 8 removed earlier.

   Note: Make sure when you install the two springs that the curve of the spring faces toward the decorative cover.
3. Install the lower decorative cover 6 by inserting the cover tabs in their respective slots and pushing the cover on.
4. Install the front tray 5.
5. Lower the top part of the front cover and lock the two *quarter-turn fasteners* 1.

   Make sure there are no cables outside the cover and that none are being pinched.
6. Go to CARR-DR 8 for the procedure to *power on* the drive.



FRU297 Output Stack Assembly Removal and Replacement Procedure

This page contains the steps needed to remove and replace the output stack assembly

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch

Removing the Output Stack Assembly

1 Go to CARR-DR 8 for the procedure to ***power off*** the drive

2 Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the of the front cover

3 Raise the front cover

The top part of the front cover is hinged

4 Remove the front tray 4 by removing the two screws

Note: Be sure you do not lose the screws and washers

5 Remove the lower decorative cover 5 by pushing in on the sides and pulling straight out It is held by tabs only

6 Remove the output stack assembly cover holding nuts, washers, and springs 7 and remove the output stack assembly cover 6 Note the position of the two springs

Note: Washers and/or springs 7 may not be present

7 Disconnect the output stack assembly motor cable connector R 3

8 Remove the three output stack assembly holding screws 2

Note: You should be able to remove the lower part of the assembly from the two locating pins using finger pressure

9 Once the lower part of the output stack assembly is away from the locating pins pull down on the output assembly This removes the lead screw bearing and shaft from their respective cavities in the feed assembly

The output stack assembly consists of:

- The cartridge tray casting
- The lead screw, bearing, and lead screw gear
- The shaft and compression spring
- The output stack motor

Replacing the Output Stack Assembly

1 Install the new output stack assembly by inserting the lead screw bearing and shaft into their respective cavities in the feed assembly and push upward At the same time push in on the lower part of the assembly and place it on the locating pins.

2 To remove excess end play on the lead screw and shaft, push up on the output assembly while installing the three holding screws 2

Make sure that the lead screw does not bind

3 Connect the output stack assembly motor cable connector R 3

4 Install the output stack assembly cover 6 using the nuts, washers, and two springs 7 removed earlier

Note: Make sure when you install the two springs that the curve of the spring faces toward the decorative cover

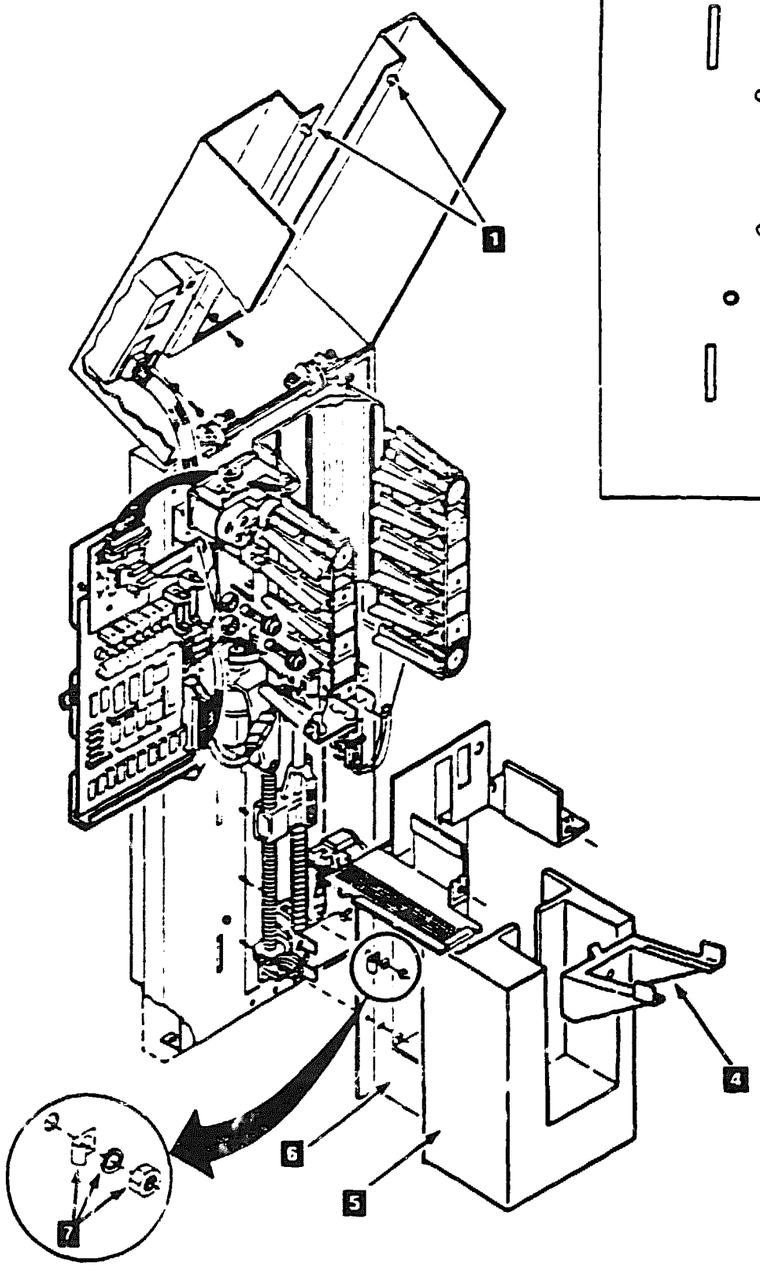
5 Install the lower decorative cover 5 by inserting the cover tabs in their respective slots and pushing on the cover

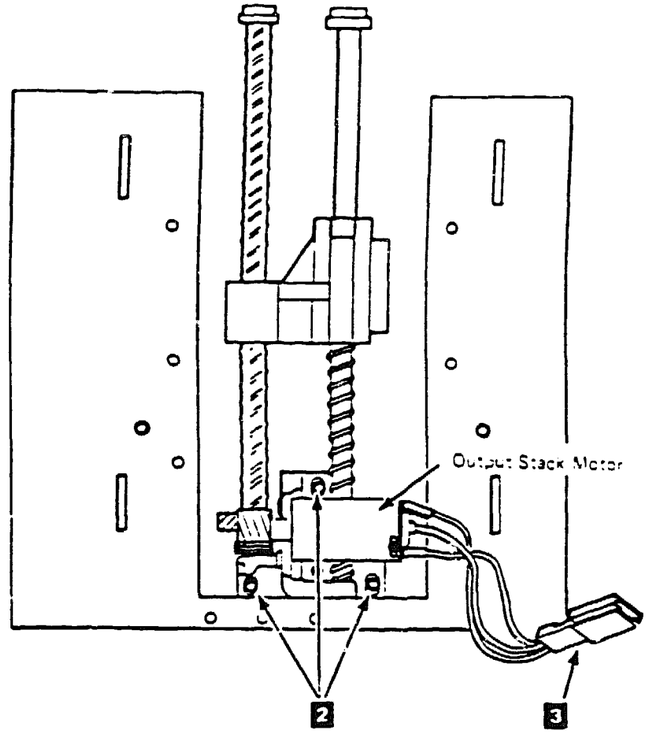
6 Install the front tray 4 using the screws and washers removed earlier

7 Lower the top part of the front cover and lock the two quarter-turn fasteners 1

Make sure there are no cables outside the cover and that none are being pinched

8 Go to CARR-DR 8 for the procedure to **power on** the drive





FRU298 Loader Operator Panel Removal and Replacement Procedure

This page contains the steps needed to remove and replace the loader operator panel.

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Loader Operator Panel

1. Go to CARR-DR 8 for the procedure to ***power off*** the drive.
2. Open the drive drawer.
3. Unlock the two quarter-turn fasteners 1 at the bottom of the hinged part of the front cover.
4. Raise the front cover.

   Note: The top part of the front cover is hinged.
5. Unlock the quarter-turn fastener 7 at the front of the loader control card gate and swing out the gate.
6. Disconnect the operator panel cable 8 from the loader control card AL-D0/1-CC-J5 and remove the cable. Note the cable routing for later replacement.

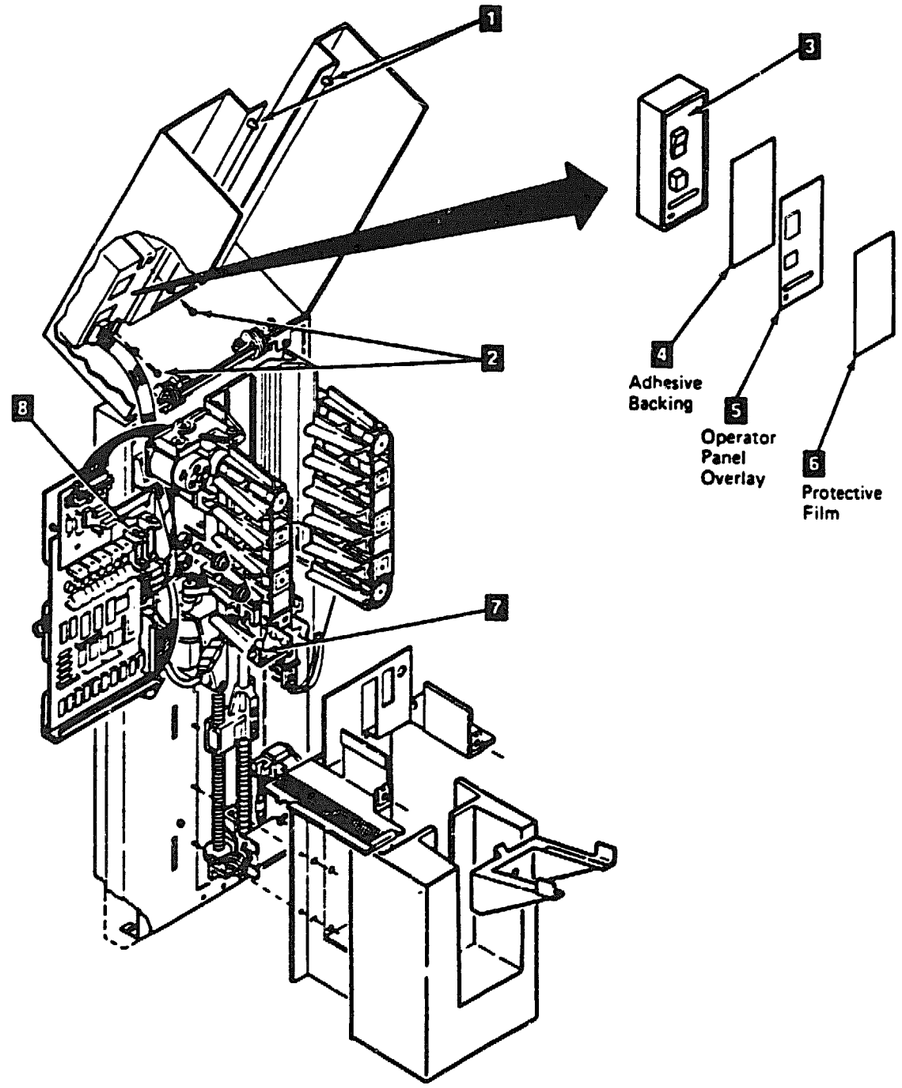
   Warning: Be careful not to damage the cable end or other components.
7. Hold the operator panel with one hand and remove the two allen head holding screws 2. Be careful not to lose the screws and washers.

   The operator panel is removed through the front of the cover.

Replacing the Loader Operator Panel

1. Place the operator panel in the front cover opening and reinstall the two allen head holding screws 2.
2. Route the cable to the loader control card behind the input station as noted earlier in the Removal procedure.
3. Connect the operator panel cable 8 to the loader control card AL-D0/1-CC-J5.
4. Close the loader control card gate and lock the quarter-turn fastener 7.
5. Lower the front cover and lock the two quarter-turn fasteners 1.

   Make sure there are no cables outside the cover and that none are being pinched.
6. Select the operator panel overlay 5 from the overlay group supplied. The language should be the same as the tape transport unit.
7. Peel the adhesive protective backing 4 from the overlay and install on the front face of the operator panel 3.
8. Remove the protective film 6 on the front face of the overlay after the overlay has been attached to the operator panel.
9. Close the drive drawer.
10. Go to CARR-DR 8 for the procedure to ***power on*** the drive.



FRU300 Feed Assembly Motor Removal and Replacement Procedure

This page contains the steps needed to remove and replace the feed assembly motors

Note: This FRU can be removed and replaced without affecting the other drive by removing power from the failing drive with the Drive Power On/Off switch.

Removing the Feed Assembly Motors

1. Go to CARR-DR 2900 and perform the Removal procedure for the input stack assembly, and when completed return to step 2.

   Note: Go to Step 6 for the left motor removal procedure.

2. Remove retainer 1 from the pivot pin. Remove the pivot pin 2 and set aside for re-installation in a later step.

3. Before removing solenoid pivot bushings, note the way they are installed. Remove solenoid pivot bushing 3 from the side of the solenoid that is away from the machine casting. The bushing must be replaced by new bushings

4. Remove the solenoid assembly by lifting the end of the tube 4 and moving it away from the machine.

5. Remove the remaining solenoid pivot bushing 5 and discard.

6. Unplug the power connector 6.

7. Remove the motor. Each motor is held in place by 2 metric cap socket head screws. The screws will be reused.

Replacing the Feed Assembly

1. When installing new motors, ensure the belts are properly engaged on the pulleys. Use the screws removed in Step 7, "Removing the Feed Assembly Motors". Ensure the motor is snug, but not tight as the motor will have to be moved to adjust belt tension. Do not connect the motor power connector at this time.

2. Open the drive unit rear cover; Plug the power jumper cord in test jack J9 if this a deck 1 or test jack J8 if this is a deck 2.

3. Plug the motor into the power jumper cable.

4. Set your amp meter to read 50 milliamps.

5. Plug the meter leads into the power jumper to complete the circuit.

6. Ensure that the motor is running in the unload direction. If necessary reverse the polarity of the motor plug connector into the power jumper.

7. Adjust the belt tension by moving the motor to obtain a reading of 50 milliamps + 5 milliamps. Tighten the motor mounting screws.

8. If this is the first motor, unplug the power jumper cable from the motor and plug the second motor connector into the power jumper cable and repeat steps 6 and 7.

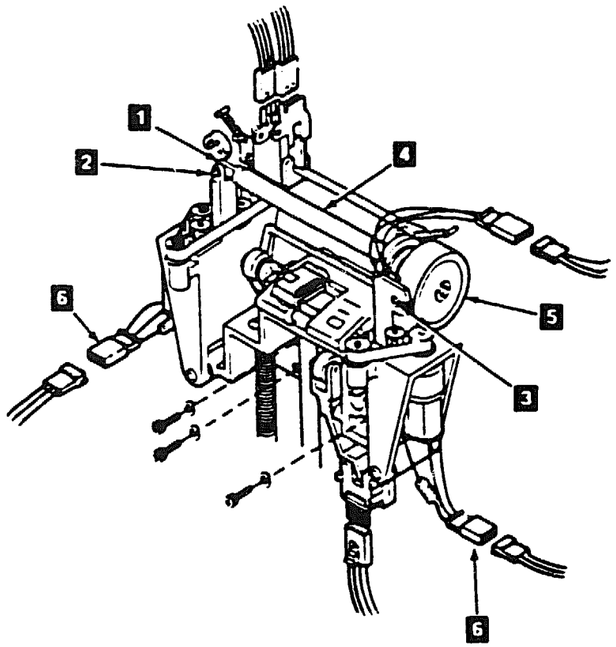
   Note: If Installing the left motor, proceed directly to step 11.

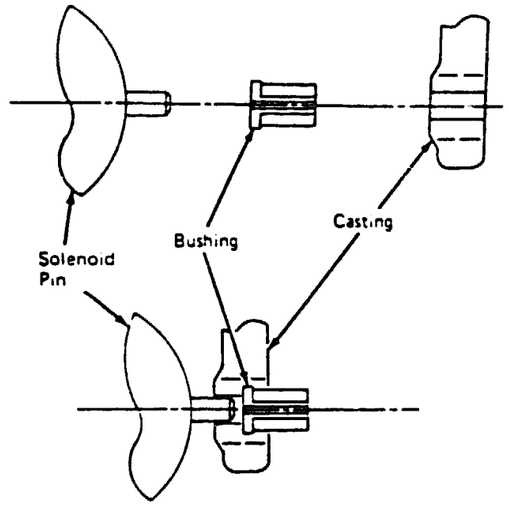
9. Partially install the rear bushing so that it extends to the back half of the casting as shown in Figure 1. Reinstall the solenoid by lifting the end of the tube and moving it toward the machine. Replace the front bushing by pinching the bushing so tat it passes thru the casting as shown in Figure 1. Insure that both of the bushings are correctly seated with the tabs locking the bushings in place. See Figure 1 for proper orientation.

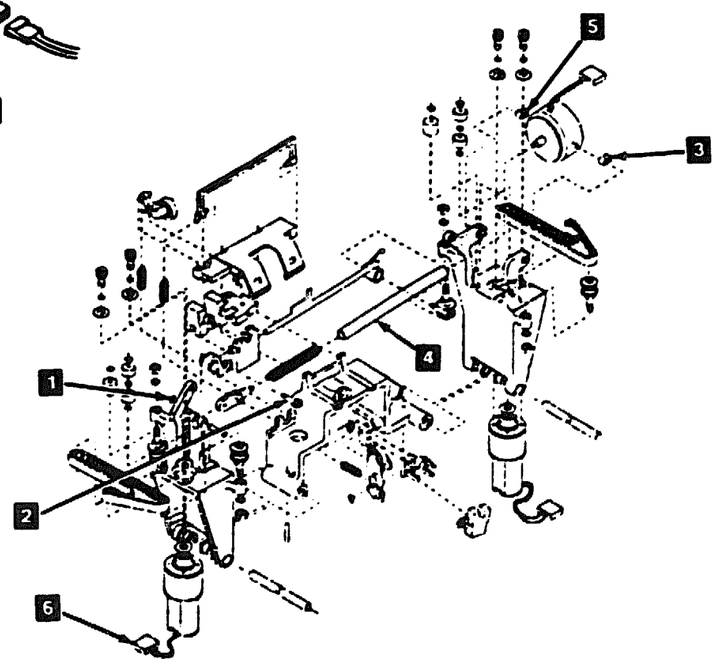
10. Replace the pivot pin which was removed earlier. Secure the pivot pin with a new retainer.

11. Remove the power jumper and connect the motors into their correct power source.

12. Go to CARR-DR 2900 and perform the replacement procedure for the input stack assembly.








VOLUME
A04


COLLATING LIST
OF PAGES

Collating List of Pages

This reference drawing contains the collating sequence, page side, and EC level of pages for *Digital TA90 Magnetic Tape Subsystem Maintenance Guide (MG) Volume A04*.

The part number of the divider tab list is 13F6816.

This reference drawing is to be placed at the front of the manual.

PAGE	SIDE	LEVEL
FRONT COVER	Front	EC C13764
PREF 1	Back	EC C13764
TAB 1	Front	EC C04824
TAB 2	Back	EC C04824
LGND Tab		
LGND 1	Front	EC C04824
LGND 5	Back	EC C04824
LGND 10	Front	EC C04824
LGND 15	Back	EC C04824
LGND 20	Front	EC C04824
LGND 25	Back	EC C04824
LGND 30	Front	EC C04824
LGND 35	Back	EC C04824
LGND 40	Front	EC C04824
LGND 45	Back	EC C04824
LGND 46	Front	EC C04824
LGND 47	Back	EC C04824
LGND 48	Front	EC C04824
LGND 50	Back	EC C04824
LGND 55	Front	EC C04824
LGND 60	Back	EC C04824
LGND 65	Front	EC C04824
LGND 70	Back	EC C04824
LGND 75	Front	EC C04824
LGND 80	Back	EC C04824
SPROC Tab		
SPROC 1	Front	EC C13764
SPROC 2	Back	EC C13764
SPROC 3	Front	EC C04824
SPROC 4	Back	EC C13764
SPROC 100	Front	EC C13764
SPROC 110	Back	EC C04824
SPROC 120	Front	EC C04824
SPROC 130	Back	EC C04824
SPROC 140	Front	EC C04824
Blank	Back	
MD/SDISK Tab		
MD/SDISK 1	Front	EC C13764
Blank	Back	
MD/SDISK 3	Front	EC C13764
MD/SDISK 4	Back	EC C13764
MD/SDISK 5	Front	EC C13764
MD/SDISK 6	Back	EC C13764
MD/SDISK 7	Front	EC C13764
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MD/SDISK 110	Back	EC C13764
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MD/SDISK 115	Back	EC C04824
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MD/SDISK 1220	Front	EC C13764
MD/SDISK 1221	Back	EC C04824
MD/SDISK 1222	Front	EC C04824
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DIAG 102	Back	EC C13764
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DIAC 402	Back	EC C04824
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DIAG 450	Front	EC C13764
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DIAG 460	Back	EC C13764
DIAG 462	Front	EC C04824
DIAG 500	Back	EC C13764
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DIAG 502	Back	EC C04824
DIAG 504	Front	EC C04824
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DIAG 508	Front	EC C04824
DIAG 509	Back	EC C04824
DIAG 510	Front	EC C13764
DIAG 511	Back	EC C04824
DIAG 512	Front	EC C04824
DiAG 514	Back	EC C04824
DIAG 516	Front	EC C04824
DIAG 518	Back	EC C04824
DIAG 520	Front	EC C04824
DIAG 522	Back	EC C04824
DIAG 524	Front	EC C04824
DIAG 526	Back	EC C04824
DIAG 528	Front	EC C04824
DIAG 530	Back	EC C04824
DIAG 532	Front	EC C04824
DIAG 534	Back	EC C04824
DIAG 536	Front	EC C04824
DIAG 538	Back	EC C04824
DIAG 540	Front	EC C04824
DIAG 542	Back	EC C13764
DIAG 544	Front	EC C04824
DIAG 550	Back	EC C13764
DIAG 551	Front	EC C04824
DIAG 552	Back	EC C04824
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Blank	Back	
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OPER 40	Back	EC C13764
OPER 45	Front	EC C04824
OPER 50	Back	EC C04824
OPER 55	Front	EC C04824
OPER 60	Back	EC C13764
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OPER 70	Back	EC C04824
OPER 75	Front	EC C04824
OPER 80	Back	EC C13764
OPER 81	Front	EC C13764
OPER 85	Back	EC C04824
OPER 90	Front	EC C13764
OPER 95	Back	EC C04824
OPER 96	Front	EC C04824
OPER 100	Back	EC C13764
OPER 105	Front	EC C13764
OPER 106	Back	EC C13764
OPER 110	Front	EC C04824
OPER 115	Back	EC C04824
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OPER 125	Back	EC C04824
OPER 130	Front	EC C04824
OPER 131	Back	EC C04824
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OPER 245	Front	EC C04824
Blank	Back	
RCF-1	Front	
RCF-2	Back	

B

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PUBLICATIONS REFERENCE DRAWING

MACHINE TYPE/MODEL NO. TA90

MACHINE NAME - Magnetic Tape Subsystem

E C NO.	DESCRIPTION / COMMENTS
C04824	VOL. A04 - Maintenance Guide
C13764	VOL. A04 - Maintenance Guide

4

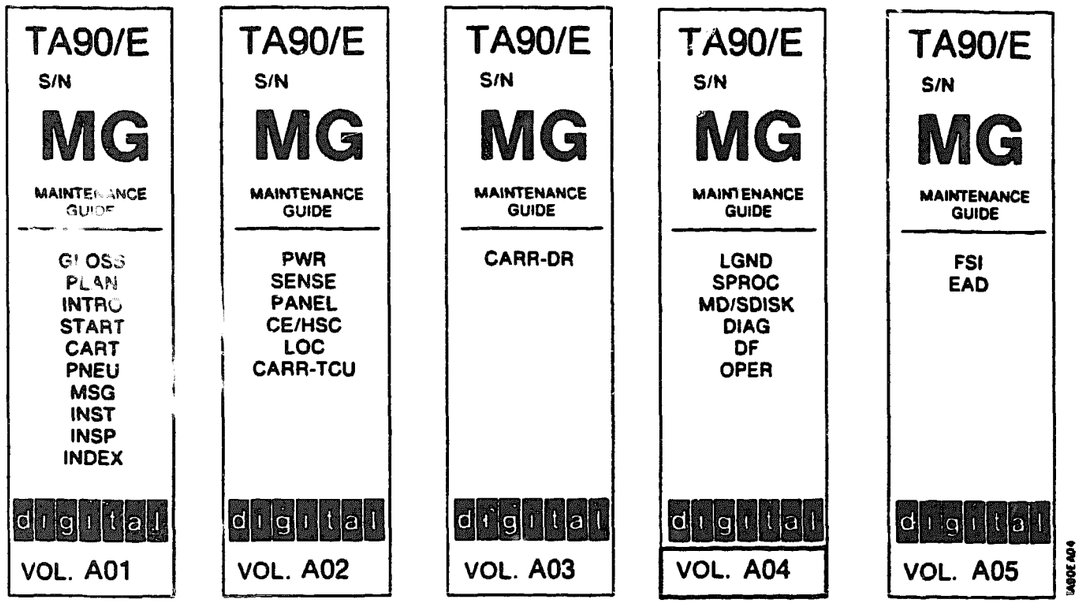
digital							
NAME. PUB REF DWG (PRD)		DATE	CHANGE NO		DATE	CHANGE NO	
	REL	4/28/89	C04824				
		3/15/90	C13764				
DESIGN	SHT OF						
DETAIL							
CHECK	CLASSIFICATION	MUST CONFORM TO ENG SPEC	DEVELOPMENT NO		LOGIC PG NO		
APPRO					RD004		

13F5767

B

TA90/E Magnetic Tape Subsystem

digital **Maintenance Guide**



Maintenance Library

Maintenance Guide	**Vols. A01 to A05**
Logic Diagrams	**Vols. C01 and D01**

EK-PTA90-MG-002

Preface

This manual contains maintenance information about the Digital TA90 Magnetic Tape Subsystem and is intended for customer engineers responsible for servicing the TA90 tape subsystem

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Prerequisite Knowledge

It is assumed that you have a background in data processing concepts and that you are familiar with the hexadecimal numbering system, stored program concepts, and have a basic understanding of tape subsystems and their relationship within a system/cluster

Related Documents

TA90 Operator's Manual EK-OTA90-OM

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DECUS	P/OS	RT	VMS
DECwriter	Professional	STI	VT
DIBOL			Work Processor

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LIST

Tab List

Volume A01

GLOSS	Glossary
PLAN	Maintenance Plan
INTRO	TA90 Introduction
START	Start Maintenance
CART	Cartridge Analysis
PNEU	Pneumatic Analysis
MSG	Errorlog messages
INST	Installation/Removal
INSP	Safety Check Procedures
INDEX	Index

Volume A02

PWR	Power Maps
SENSE	Sense/Status
PANEL	Panel
CE/HSC	Customer Engineering Panel/HSC Diagnostics
LOC	Locations
CARR-TCU	Tape Control Unit Checks/Adjustments/Removal/Replacement

Volume A03

CARR-DR	Drive Checks Adjustments/Removal/Replacement

Volume A04

LGND	Legend
SPROC	Support Procedures
MD/SDISK	Maintenance Device/MD Support Diskette Procedures
DIAG	Support Diagnostic Descriptions
DF	Data Fields and Registers
OPER	Theory of Operation

Volume A05

FSI	Fault Symptom Index
EAD	Error Analysis Diagrams


LGND

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- Bus and Control Lines 5

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- Voltage Distribution List 80

Legend

Graphic Symbols and Lines

Keys

Primary Key

Reverse number in a black square. Used in text and diagrams.

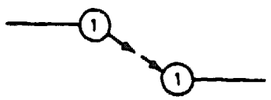
Secondary Key

Reverse letter in black circle. Used in text when keying to a test point symbol in a diagram.

Connectors

On-Page Connectors

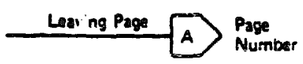
Connection between parts of the same diagram. Arrows point to remote connectors and indicate flow direction of the line.



Off-Page Connectors

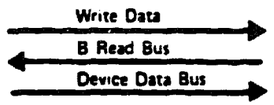
Connection between diagrams on separate pages. Letter keys are used to identify corresponding points.





Bus and Control Lines

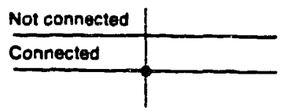
Minor Bus Lines



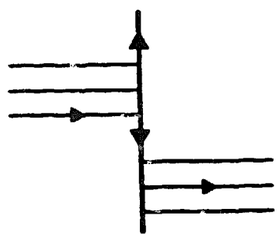
Major Bus Line



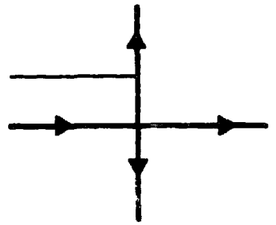
Control Lines



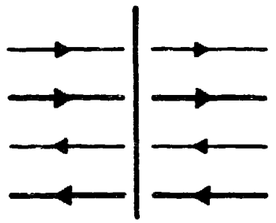
Bus or cable with multiple control lines entering and exiting.



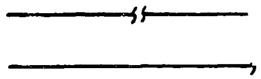
Bus and control lines that connect to a bus.



Bus and control lines that do not connect to a bus.



Standard line break, used when a line break is needed.



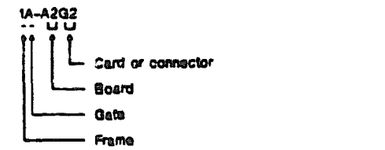
Identifying Parts

Two different formats are used in the maintenance guide (MG) and logic diagrams to represent the unit that a part is located.

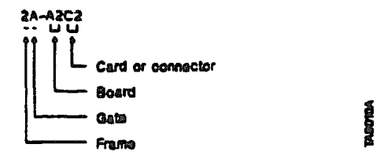
Examples of the First Format:

1A-A1H4
1A-A1D2-U06
1A-A1E2-W22
1A-A2G2
2A-A1C2

Tape Control Unit Logic Part Definitions

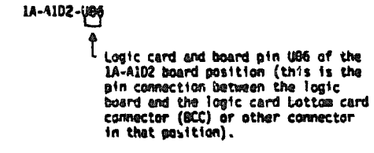


Tape Transport Unit Logic Part Definitions

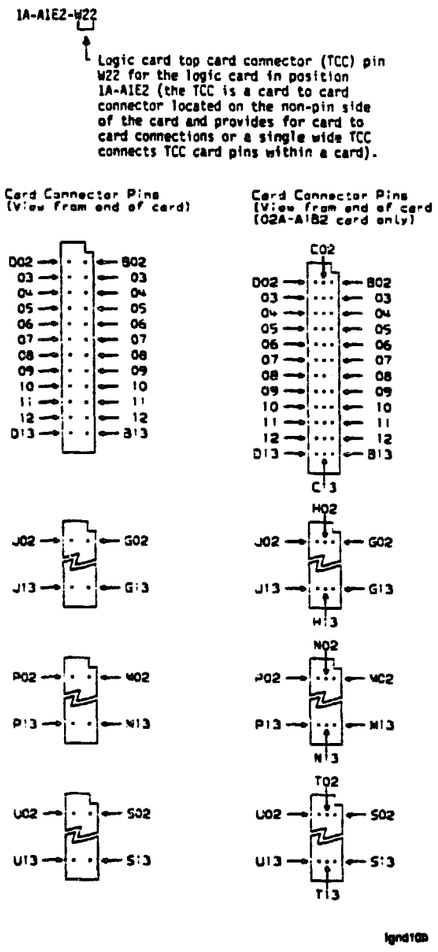


TA90MGA

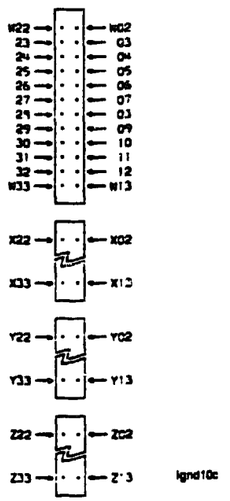
Logic Board Card Pin Position Identifiers



Logic Board Card Pin Position Identifiers



Top card connector (TCC) pins (View from the top of the card)



Examples of the Second Format:

1A-T1A1	TU-D1-PA-J1-D12
1A-T1A3Y	TU-D0/D1-A1-C1B11
2A-A1Z2	TU-D0/D1-P1-3
1A-A2Y2	TU-D0/D1-DK-P7-4
CU-P2A4	TU-D0-EL-J7-1
CU-PS-01-J1-3	TU-D1-DSP-P1-D11
CU-L/R-P2-2	TU-PS-01-P11-3
CU-A1-TB3-6	TU-PS1-J2-9
CU1AP1-3	TU-D0-P1-WA2-D05
TU-D0-PA-J1-D12	TU-D1-A1-A2-B12

Subsystem Unit Identifiers

1A-....	Tape Control Unit
CU-....	Tape Control Unit
2A-....	Tape Transport Unit
TU-....	Tape Transport Unit

Tape Transport Unit Identifiers

For subsystems unit with identifiers of TU or 2A only.

TU-D0....
—
TU-D1....
—
TU-D0/D1
—
2A-D0/D1
—
2A-... (when no D0 or D1)
—
or
TU-... The next numbers are the functional area within the tape unit, not the individual drives within the tape unit.
—
TU-D0-.. Drive 0 - the remaining numbers pertain to FRUs or parts in drive 0.
—
TU-D1-.. Drive 1 - the remaining numbers pertain to FRUs or parts in drive 1.
—
TU-D0/D1-.. Drive 0/1 - the remaining numbers pertain to FRUs or parts in both drive 0 and drive 1.
—

Logic Location Area Identifiers

1A-T1A1...	TU-D0/D1-A1...
----	--
CU-P2A4...	TU-D0/D1-P1-P1...
----	-----
CU-PS-01...	TU-D0/D1-DK...
-----	--
CU-L/R-P2...	TU-D1-DSP...
------	---
CU-A1-TB3...	TU-PS-01...
-----	-----
TU-D0-MSG...	TU-D0-P1-WA2...
---	------

Note: For descriptions, locations, and remove/replace procedures for the location area identifiers, see the following for:

- Tape Control Unit –, LGND 15, Figure 1, "Tape Control Unit Location Area Definitions"
- Tape Transport Unit and Tape Drives –, LGND 35, Figure 2, "Tape Transport Unit and Drives Location Area Definitions"

Part Location Identifiers

CU-PS-01-J1-3	(pin 3 of connector J1)
----	--
CU-L/R-P2-2	(pin 2 of connector P2)
----	-----
TU-D0/D1-A1-C1B11	(pin B11 of position C1)
-----	--
TU-PS-01-P11-3	(pin 3 of connector P11)
------	---
TU-PS1-J2-9	(pin 9 of connector J2)
-----	-----
TU-D0-P1-WA2-D05	(pin D05 of connector WA2)
---	------

Legend

The following figures show how to locate parts in the TA90 documentation, using the identifying numbers that are shown in "Examples of the Second Format" on LGND 10.

For the part location area that is used in the logics, the figures show where they are located in the TA90 subsystem by referencing the "Table of Contents" entry in the LOC and CARR sections of the Maintenance Guide. The LOC and CARR sections "Table of Contents" may not be the exact name or FRU number of the part referenced in the logic, however, the page referenced by the "Table of Contents" will relate to the part you are looking for.

These figures also show where a part can be found in the logics. For example, if the power is suspected to be a problem, you can look for power parts (CBs, Power Supplies, and so forth) and find the logic pages that show these areas.

Tape Control Unit Location Area Definitions (Figure 1)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
1AP1	Connectors for gate fans	YF005	Fan Assemblies 1 and 2	FRU165
+24v Service Switch	Service switch	ZT020	CU-A1 Logic Gate (Hinge Side)	FRU162
A1	Logic board	AA000 AA100	01A-A1 Logic Board	FRU139
A1A2	Logic board position A2	AA000	01A-A1 Logic Board	FRU139
A1Y2	Logic board connector Y2 at top of board	AA000	01A-A1 Logic Board	FRU139
A1Z2	Logic board connector at bottom of board	AA000	01A-A1 Logic Board	FRU139
A1P2*	Single wide TCC board position P2 row y	AA001	01A-A1 Top Card Connectors and Cables	FRU181
A1*CDE	TCC row Y across board positions C-E	AA000	01A-A1 Top Card Connectors and Cables	FRU193
A1ZFG	TCC row Z across board positions F-G	AA000	01A-A1 Top Card Connectors and Cables	FRU187
A2	Logic board	AA001 AA200	01A-A2 Logic Board	FRU140
A2A2	Logic board position a2	AA001	01A-A2 Logic Board	FRU140
A2C2W	Single wide TCC board position C2 row W	AA001 CA002 WA005/006	01A-A2 Top Card Cables	FRU170
A2C2WZ2	Single wide TCC board position C2 row W, pin 22	AA001 CA002 WA005/006	01A-A2 Top Card Cables	FRU170
A2Y2	Logic board connector Y2 at top of board	AA001	01A-A2 Top Card Cables	FRU140
A2Z2	Logic board connector Z2 at bottom of board	AA001	01A-A2 Top Card Cables	FRU140
Diskette Drive	Diskette drive	WZ301/002	Operator Set Up Panel	FRU086
Fans (Gate)	Gate fans	YF005	Fan Assembly 1 Fan Assembly 2	FRU158 FRU151
L/R	Local/remote power panel	YF029	Operator Set Up Panel	FRU084
-J1	Connector	YF029	Operator Set Up Panel	
-J2	Connector	YF029	Operator Set Up Panel	
Local Power Enable	Local power enable	YF029	Operator Set Up Panel	
MD Connector	TCU connector for MD attachment	WX001	MD Connector	FRU169
OP	Operator panel		Operator Set Up Panel	FRU142
-J1/J2	Connector	WZ106		
-J2/P2	Connector	WZ106		
-J5	Connector	YF015 WZ106	Operator Set Up Panel	FRU142
-Power On-Indicator	Power on indicator	YF015	Operator Set Up Panel	FRU142
-(Sub) System Power Switch	(Sub) system power switch	YF015	Operator Set Up Panel	FRU142
-UEPO Switch	UEPO switch	YF015	Operator Set Up Panel	FRU198

Tape Control Unit Location Area Definitions (Continued)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
OSU	Operator (controller) setup panel		Operator Set Up Panel	FRU141
-"A" Channel Type (Mode) Switch	TCU (L) (mode) switch	WZ102	Operator Set Up Panel	FRU141
-"B" Channel Type (Mode) Switch	TCU (R) (mode) switch	WZ102	Operator Set Up Panel	FRU141
-Channel A Disable Indicator	Channel disable indicator (TCU Address L)	YF010 (Sheet 1)	Operator Set Up Panel	FRU141
-Channel B Disable Indicator	Channel disable indicator (TCU Address R)	YF010 (Sheet 1)	Operator Set Up Panel	FRU141
-CU0/CU1 Switch	TCU0/TCU1 switch	YF010	Operator Set Up Panel	FRU197
-CU "A" Address Switch	TCU address (L) switch	WZ102	Operator Set Up Panel	FRU197
-CU "B" Address Switch	TCU address (R) switch	WZ102	Operator Set Up Panel	FRU197
-CU Error Indicator	TCU error indicator	YF010	Operator Set Up Panel	FRU141
-CU Online Switch	TCU online test/ offline test switch	YF010	Operator Set Up Panel	FRU141
-CU Waiting Indicator	TCU wait indicator	YF010	Operator Set Up Panel	FRU141
-DC Power On Indicator	DC power on indicator	YF010	Operator Set Up Panel	FRU141
-IML/Power On Reset Switch	IML/power on reset switch	YF010	Operator Set Up Panel	FRU141
-J1/P1	Connector	WZ106 YF010 (Sheets 1 and 2)	Operator Set Up Panel	FRU141
-J2/P2	Connector	WZ106 YF010 (Sheets 1 and 2)	Operator Set Up Panel	FRU141
-J3/P3	Connector	YF010 (Sheet 2)	Operator Set Up Panel	FRU141
-J4/P4	Connector	YF010 (Sheet 2)	Operator Set Up Panel	FRU141
-J5/P5	Connector for thermal jumper	YF010 (Sheet 2)	Operator Set Up Panel	FRU141

Tape Control Unit Location Area Definitions (Continued)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
-Local Power Enable Switch	Local power enable switch	YF010	Operator Set Up Panel	FRU141
-Offline Indicator	Offline indicator	YF010	Operator Set Up Panel	FRU141
-Test/ Normal Switch	Test/Normal switch	YF010	Operator Set Up Panel	FRU141
P1	Cable panel		CU-P1 Read/Write Bus Connectors	FRU150
-A1	Connector	WT004 WT006 WW020	CU-P1 Read/Write Bus Connectors	FRU150
-A2	Connector	WT001 WW010	CU-P1 Read/Write Bus Connectors	FRU150
-B1	Connector	WW020	CU-P1 Read/Write Bus Connectors	FRU150
-B2	Connector	WW010	CU-P1 Read/Write Bus Connectors	FRU150
-J1	Thermal connector	YF015	CU-P1 Read/Write Bus Connectors	FRU150
P2	Cable panel		CU-P2 Cable Connectors (Dual Tape Control Unit Communication Connectors)	FRU150
-A1	Connector	WW020	CU-P2 Cable Connectors (Dual Tape Control Unit Communication Connectors)	FRU150
-A2	Connector	WT008 WT010 WW020	CU-P2 Cable Connectors (Dual Tape Control Unit Communication Connectors)	FRU150
-A3	Connector	WK005 WW010	CU-P2 Cable Connectors (Dual Tape Control Unit Communication Connectors)	FRU150
-A4	Connector	WK001 WK003 WK005 WW010	CU-P2 Cable Connectors (Dual Tape Control Unit Communication Connectors)	FRU150
-A5	Connector	WK006 WT003 WW010	CU-P2 Cable Connectors (Dual Tape Control Unit Communication Connectors)	FRU150
PS-01	Power supply	YF001 YF003	CU-PS01 (two different types)	FRU144
-CB1	Circuit breaker	YF001 YF003	CU-PS01 (two different types)	FRU144
-CB2	Circuit breaker	YF001 YF003	CU-PS01 (two different types)	FRU144
-CB3	Circuit breaker	YF001 YF003	CU-PS01 (two different types)	FRU144
-F1	Fuse	YF001 YF003	CU-PS01 (two different types)	FRU144
-J1-J4B	Connectors	YF001 YF003	CU-PS01 (two different types)	FRU144
-J9-J10	Connectors	YF001 YF003	CU-PS01 (two different types)	FRU144
-J11	Connector	YF001	CU-PS01 (two different types)	FRU144
-J13-J15	Connectors	YF003	CU-PS01 (two different types)	FRU144
PS-02	Power supply	YF002	CU-PS02	FRU145
-CB1	Circuit breaker	YF002	CU-PS02	FRU145
-CB2	Circuit breaker	YF002	CU-PS02	FRU145
-CB3	Circuit breaker	YF002	CU-PS02	FRU145
-F1	Fuse		CU-PS02	FRU147
-F2	Fuse	YF002	CU-PS02	FRU148
-J1-J29	Connectors	YF002	CU-PS02	FRU145
-K1	Relay	YF002	CU-PS02	FRU145
PS-03	Power Supply	YF004	CU-PS03	FRU 903
STI-FIPS (Left)	STI-FIPS Adapter	ST001	STI-FIPS Adapter	FRU 900
STI-FIPS (Right)	STI-FIPS Adapter	ST002	STI-FIPS Adapter	FRU 901
018 Fans	Fans	YF005	018 Fans	FRU 904

Tape Control Unit Location Area Definitions (Continued)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
TB1	Terminal block	ZT010	CU-A1 Logic Gate (hinge side)	FRU160
TB2	Terminal block	ZT011	CU-A1 Logic Gate (hinge side)	FRU160
TB3	Terminal block	ZT011	CU-A1 Logic Gate (hinge side)	FRU160
Thermal Switch (Top of gate)	Thermal switch	ZT020	Thermal Switch Assembly	FRU224
Thermal Switch (Bottom of gate)	Thermal switch	YF015	Thermal Switch Assembly	FRU143
Thermal Switch (Top of STI gate)	Thermal switch	YF015	01-B Gate Upper Thermal Switch Assembly	FRU905
Thermal Switch (Bottom of STI gate)	Thermal switch	YF015	01-B Gate Lower Thermal Switch Assembly	FRU906

Tape Transport Unit and Drive Location Area Definitions (Figure 2)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
A1	Logic board in each drive in the tape transport unit	AA000 AA100	02A-A1 Logic Board Pin and Card Side	FRU058
CB1	Circuit breaker (primary power)	YF050 YF060	Tape Transport Unit AC Power CB	FRU218
Compressor	Compressor	YF050 YF060	Major FRU Locations 50/60 Hz	FRU030
OC Switch	OC switch (these are additional contacts on the drive fan and power switch)	SN001/002 (Sheet 2)	Tape Transport Unit Locations	FRU104
-P1	Plug	SN001/002 (Sheet 2)		FRU104
DE	Deck assembly		Drive Locations	
-Cartridge Latched Sensor and LED	Cartridge latched sensor and LED	SN001/002 (Sheet 1)	Cartridge Latch Assembly	FRU011
-Cartridge Present Sensor and LED	Cartridge present sensor and LED	SN001/002 (Sheet 1)	Cartridge Present Sensor	FRU010
-File Reel Tach	File reel tachometer	SN001/002 (Sheet 2)	File Reel Motor	FRU003
-FPSw	Deck assembly file protect switch	SN001/002 (Sheet 2)	File Protect Switch	FRU009
-J14	Connector for tension transducer	PA000/001 (Sheet 2)	Tension Transducer	FRU014
-Machine Reel Tach Phase A Sensor and LED	Machine reel tachometer phase A sensor and LED	SN001/002 (Sheet 1)	Machine Reel Tach Sensor A	FRU225
-Machine Reel Phase B Sensor and LED	Machine reel tachometer phase B sensor and LED	SN001/001 (Sheet 1)	Machine Reel Tach Sensor B	FRU225
-P1	Connector for tape path sensor A	SN001/002 (Sheet 1)	Tape Path Sensor A	FRU006
-P2	Connector for tape path sensor B	SN001/002 (Sheet 1)	Tape Path Sensor B	FRU007
-P3	Connector for cartridge present sensor and file protect switch	SN001/002 (Sheet 1 and 2)	Cartridge Present Sensor and File Protect Switch	FRU010
-P4	Connector for cartridge latched sensor	SN001/002 (Sheet 1)	Cartridge Latch Assembly	FRU011
-P5	Connector for machine reel tach phase B sensor	SN001/002 (Sheet 1)	Machine Reel Tach Sensor B	FRU226
-P6	Connector for machine reel tach phase A sensor	SN001/002 (Sheet 1)	Machine Reel Tach Sensor A	FRU225
-P7	Connector for file reel tach	SN001/002 (Sheet 2)	File Reel Motor	FRU003
-Plenum Press Sw	Plenum pressure sensor switch	SN001/002 (Sheet 2)	Plenum Assembly and Pressure Switch	FRU040
-Tape Path Sensor A and LED	Tape path sensor A and LED	SN001/002 (Sheet 1)	Tape Path Sensor A	FRU006
-Tape Path Sensor B And LED	Tape path sensor B and LED	SN001/002 (Sheet 1)	Tape Path Sensor B	FRU007
-Tray Solenoid	Cartridge latch solenoid	YG010 YG110	Latch Sensor	FRU002
Drive Fan and Power Switch	Drive fan and power switch	YF029	Tape Transport Unit Locations	FRU104
DSP	Message display		Operator Control and Display	FRU021
-J1	Connector	WD000 WD001		
-J2	Connector	WD000 WC001		
-J3	Connector	WD000 WD001		
-J4	Connector	WD000 WD001		
-Ready Switch	Switch	WD000 WD001	Ready/Not Ready Switch	FRU109

Tape Transport Unit and Drive Location Area Definitions (Continued)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
-Rewind Switch	Switch	WD000 WD001	Rewind Switch	FRU109
-Unload Switch	Switch	WD000 WD001	Unload Switch	FRU109
EL	External load register panel	WD000 WD901	Major FRU Locations 50/60 Hz (-5 V dc Resister panel)	FRU036
Fan	Fan (located near the compressor in the tape unit for 50 Hz)(fan is located at the bottom of the tape unit frame for 60 Hz)	YF050 YF060	Major FRU Locations 50/60 Hz	FRU071
Fan	Fan for drive gate	YG010 (drive 0) YG110 (drive 1)	50/60 Hz Blower Assembly	FRU029
File Reel Motor	File reel motor	YG010 (drive 0) YG110 (drive 1)	File Reel Motor	FRU003
Head (Tape Lifter) Solenoid	Solenoid at the head to move tape away from the head during high-speed tape movement (tape lifter)	YG010 (drive 0) YG110 (drive 1)	Tape Lifter Solenoid	FRU216
Local	Local read/write and control DDB cabling TCU/TTU TCU0 local drive address 0-7 TCU1 local drive address 8-F	YP001 WW010 WW020 ZW101 ZW102 ZW103	Read Adapter Cables and Write Adapter Cables	FRU087-089 FRU091-093
Machine Reel Motor	Machine reel motor	YG010 (drive 0) YG110 (drive 1)	Machine Reel Motor	FRU004
Online Test/ Offline Test Switch	Online Test/ Offline Test switch	SW001/002 (Sheet 2)	Tape Transport Unit Locations	FRU105
OSU	Operator set up panel for drive address switches	SW001/002 (Sheet 2)	Tape Transport Unit Locations	FRU108
-Drive Logical Address Switch	Drive logical address switch	SW001/002 (Sheet 2)	Tape Transport Unit Locations	FRU108
-J1	Connector for drive logical address switch	SW001/002 (Sheet 2)	Tape Transport Unit Locations	FRU108
P1	Cable panel		50/60 Hz TU-D0/1-P1	
-J/P1	Connector for PS1 voltage distribution	ZZ010 ZZ020 ZZ110 ZZ120	50/60 Hz TU-D0/1-P1	
-J/P2	Connector for PS1 voltage distribution	ZZ010 ZZ020 ZZ110 ZZ120	50/60 Hz TU-D0/1-P1	
-J3	Connector for drive fan and power switch	YF020	50/60 Hz TU-D0/1-P1	
-J4	Connector to drive logical address switch connector OSU-J1	SW001/002 (Sheet 2)	50/60 Hz TU-D0/1-P1	
-P1	Plug to message display card	WD000	50/60 Hz TU-D0/1-P1	
-RA1	Connector for read bus local	YP001 WW020	50/60 Hz TU-D0/1-P1	FRU087-089
-RB1	Connector for read bus remote	YP002 WW029	50/60 Hz TU-D0/1-P1	FRU091-093
-WA1	Connector for write bus local	WW010 ZW101 ZW102	50/60 Hz TU-D0/1-P1	FRU087-089
-WA2	Connector for write bus local	WW010 ZW102 ZW102	50/60 Hz TU-D0/1-P1	FRU087-089
-WB1	Connector for write bus remote	WW010 ZW202	50/60 Hz TU-D0/1-P1	FRU091-093
-WB2	Connector for write bus remote	WW010 ZW201 ZW202 ZW203	50/60 Hz TU-D0/1-P1	FRU091-093

Tape Transport Unit and Drive Location Area Definitions (Continued)

LOGIC LOCATION AREA IDENTIFIER	DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
P2	Read/write 008 cable connector panel between tape units		TU-P2 Read/Write Bus Connectors	FRU199, 248, 264, 265
-J1	Thermal connector	SN001/002 (Sheet 2)	Tape Transport Unit Locations	
-A1	Connector for read bus local	WW020	TU-P2 Read/Write Bus Connectors	FRU087-089
-B1	Connector for read bus remote	WW020	TU-P2 Read/Write Bus Connectors	FRU087-089
-WA1	Connector for write bus local	WW010 ZW103	TU-P2 Read/Write Bus Connectors	FRU087-089
-WB1	Connector for write bus remote	WW010 ZW203	TU-P2 Read/Write Bus Connectors	FRU087-089
PA	Power amplifier	PA000/001	TU-D0/1-PA Power Amplifier Board	FRU059
-J1	Connector	PA000/001 (Sheet 1)	TU-D0/1-PA Power Amplifier Board	
-J2, J3	Connectors	PA000/001 (Sheet 2)	TU-D0/1-PA Power Amplifier Board	
-J4-J8, J11	Connectors	PA000/001 (Sheet 3)	TU-D0/1-PA Power Amplifier Board	
PASW	Physical address switch	SN001/002 (Sheet 1)	Physical Address Switch	FRU129
Power On Reset Switch	Power on reset switch	SN001/002 (Sheet 2)	Tape Transport Unit Locations	FRU107
PS	Tape transport unit power supply 1	YF100	Tape Transport Unit DC Power Supply (two different types)	FRU095
PS1	Tape transport unit power supply 1	YF106	Tape Transport Unit DC Power Supply (two different types)	FRU095
PS-01	Tape transport unit power supply 1	YF100	Tape Transport Unit DC Power Supply (two different types)	FRU095
-CB1	Circuit breaker	YF100	Tape Transport Unit DC Power Supply (two different types)	FRU095
-CB2	Circuit breaker	YF100	Tape Transport Unit DC Power Supply (two different types)	FRU095
-F1-F13	Fuses	YF100	Tape Transport Unit DC Power Supply (two different types)	FRU095
-P/J1 to P/J16	Connectors	YF100	Tape Transport Unit DC Power Supply (two different types)	FRU095
Remote	Remote read, write, and control 008 cables TCU/TTU TCU0 remote drive address 8-F TCU1 remote drive address 0-7	YP002 WW010 WW020 ZW201 ZW202 ZW203	Read Adapter Cables and Write Adapter Cables	FRU087-089 FRU091-093
Tape Lifter Solenoid (Head)	Solenoid at the head to move tape away from the head during high-speed tape movement (tape lifter)	YG010 YG110	Tape Lifter Solenoid	FRU216
TB1	Terminal block	YF050 YF060	TB1	FRU075, 076
Tension Transducer Assembly	Tension transducer assembly	ZT030	Tension Transducer	FRU014
Terminator (See note 1 on WW020)	Write bus terminator	WW010	TU-P2 Read/Write Bus Connectors	FRU199, 248, 264, 265
Thermal Switch	Thermal switch in D0/1 logic gates	SN001/002 (Sheet 2,	Thermal Switch Assembly	FRU110
Thermal Switch S-2	Thermal switch	SN001/002 (Sheet 2)	Tape Transport Unit Locations	FRU082
Thread Motor	Thread motor	YG010 (drive 0) YG110 (drive 1)	Threader Motor	FRU081

Tape Transport Unit and Drive Location Area Definitions

Automatic Cartridge Loaders

DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
Load Assembly		Load Locations	
Cartridge Latched Sensor and LED	SN001/002 (Sheet 1)	Cartridge Latch Assembly	FRU011
Cartridge Present Sensor and LED	SN001/002 (Sheet 1)	Cartridge Present Sensor	FRU010
Feed Complete Sensor (Hall Effect Switch)	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU282
Load Assembly File Protect Switch	SN001/002 (Sheet 2)	File Protect Switch	FRU009
Connector for Cartridge Present Sensor	SN001/002 (Sheet 1)	Cartridge Present Sensor	FRU010
Connector for File Protect Switch	SN001/002 (Sheet 2)	File Protect Switch	FRU009
Connector for Load Motor Complete Sensor	SN003 (Sheet 2)	Automatic Cartridge Loader Feature	FRU284
Connector for Cartridge Latched	SN001/002 (Sheet 1)	Cartridge Latch Assembly	FRU011
Connector for Feed Complete Sensor	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU282
Load Motor	YG129	Automatic Cartridge Loader Feature	FRU283
Load Motor Complete Sensor and LED	SN003 (Sheet 2)	Automatic Cartridge Loader Feature	FRU284
Load Motor	YG129	Automatic Cartridge Loader Feature	FRU283

DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
Loader Control Card	AL001, 002, 003	Automatic Cartridge Loader Feature	FRU281
Loader Control Card Connectors		Automatic Cartridge Loader Feature	FRU281
Connector to Signal Cable from Drive	AL001, 002, 003	Automatic Cartridge Loader Feature	FRU281
Connector to Loader Sensors	AL001, 002, 003	Automatic Cartridge Loader Feature	FRU281
Connector to Voltage Cable from Drive	AL001, 002, 003	Automatic Cartridge Loader Feature	FRU281
Connector to Loader Motors and Solenoid	AL001, 002, 003	Automatic Cartridge Loader Feature	FRU281
Connector to Loader Operator Panel	AL001, 002, 003	Automatic Cartridge Loader Feature	FRU281
Loader Mechanical Assembly		Loader Mechanical Locations	FRU285
Loader +5 V.DC	ZZ020/129	Automatic Cartridge Loader Feature	FRU299
Loader +24 V.DC	ZZ020/120	Automatic Cartridge Loader Feature	FRU286
Signal Cable Connector to Drive	ZX004	Automatic Cartridge Loader Feature	FRU286
Power Cable Connector to Drive	ZZ020/120	Automatic Cartridge Loader Feature	FRU287

Tape Transport Unit and Drive Location Area Definitions

Automatic Cartridge Loaders

DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
Loader Operator Panel-Attention and Power LED, Mode and Start Switches	AL002	Automatic Cartridge Loader Feature	FRU298
Loader Operator Panel	AL002	Automatic Cartridge Loader Feature	FRU298
Attention LED on Operator Panel	AL002	Automatic Cartridge Loader Feature	FRU298
Power LED on Operator Panel	AL002	Automatic Cartridge Loader Feature	FRU298
Start Switch on Operator Panel	AL002	Automatic Cartridge Loader Feature	FRU298
Input Stack Assembly		Automatic Cartridge Loader Feature	FRU290
Cartridge in Stick Sensor and LED	SN003 (Sheet 2)	Automatic Cartridge Loader Feature	FRU291
Cartridge Staged Sensor and LED	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU292
Input Complete Sensor and LED	SN003 (Sheet 2)	Automatic Cartridge Loader Feature	FRU293
Input Motor	YG120	Automatic Cartridge Loader Feature	FRU290
Connector for Cartridge in Stack Sensor	SN003 (Sheet 2)	Automatic Cartridge Loader Feature	FRU291
Connector for Input Motor	YG120	Automatic Cartridge Loader Feature	FRU290
Connector for Input Complete Sensor	SN003 (Sheet 2)	Automatic Cartridge Loader Feature	FRU293
Connector for Cartridge Staged Sensor	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU292
Left Input Rail Assembly		Automatic Cartridge Loader Feature	FRU293
Right Input Rail Assembly		Automatic Cartridge Loader Feature	FRU294
Feed Assembly		Automatic Cartridge Loader Feature	FRU295
Extract Complete Sensor and LED	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU295
Feeder Motor Left	YG120	Automatic Cartridge Loader Feature	FRU295
Feeder Motor Right	YG120	Automatic Cartridge Loader Feature	FRU295
Feeder Solenoid	YG120	Automatic Cartridge Loader Feature	FRU295
Connector for Feeder Motor Left	YG120	Automatic Cartridge Loader Feature	FRU295
Connector for Feeder Solenoid	YG120	Automatic Cartridge Loader Feature	FRU295
Connector for Feeder Motor Right	YG120	Automatic Cartridge Loader Feature	FRU295
Connector for Tracks Feed Sensor	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU295
Connector for Tracks Closed Sensor	SN003	Automatic Cartridge Loader Feature	FRU295

Tape Transport Unit and Drive Location Area Definitions

Automatic Cartridge Loaders

DESCRIPTION	LOGIC PAGE	LOC 1 TABLE OF CONTENTS REFERENCE	CARR 1 TABLE OF CONTENTS REFERENCE
Connector for Extract Complete Sensor	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU295
Track Closed Sensor and LED	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU295
Track Feed Sensor and LED	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU295
Output Stack Assembly		Automatic Cartridge Loader Feature	FRU297
Output Motor	YG120	Automatic Cartridge Loader Feature	FRU297
Connector for Output Motor	YG120	Automatic Cartridge Loader Feature	FRU297
Stack Up Position Sensor and LED	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU296
Connector for Stack Up Position Sensor	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU296
Stack Low Position Sensor and LED	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU289
Connector for Stack Low Position Sensor	SN003 (Sheet 1)	Automatic Cartridge Loader Feature	FRU289

Error Analysis Diagram (EAD) Logic Blocks

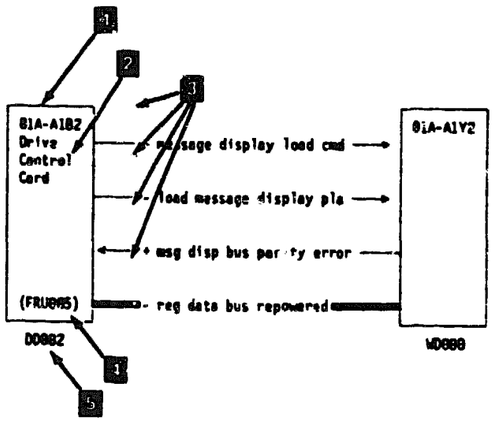
EAL) are block diagrams which show the logical functions relating to the error code.

The error analysis logic blocks contain the following information:

- Physical card location 1
- Card name 2
- Test points 3
- FRU number 4
- Logic diagram 5

  Note: The actual logic diagram references must be used when performing scoping or probing procedures.

- Signal lines and buses that pertain to the error condition.



Legend

Logic Diagrams

Logic diagrams show the input and output connectors of each card.

Card Location Chart

Card Location Charts for each board are included at the start of the logic diagrams. The charts identify the cards and cables that plug into the board, their names, and the location of plug information and reference pages (input and output connector logic diagrams). Crossover connectors and their part numbers are also shown.

Card Plug List

Card Plug Lists 3 are provided for each card in the subsystem. They contain information such as the card function, location, and logic diagram page numbers. Part, EC, and REA numbers for the primary and alternate cards are also listed. The comments area provides information about an alternate card.

For example, an EAD indicates that inputs and outputs from the Write Data Flow card 01A-A1P2 had to be scoped. The 'P' card position 1 on the chart shows that the card input and output connectors can be found on logic pages DF001 and DF002 2. This information can also be found on the Card Plug List.

To expand on the example, suppose the EAD also indicates that the card output to be scoped was the MUX WRITE DATA and the inputs were the BF/WD CLOCK S2-S3 and WDF DATA.

The "Sample Logic Diagrams" on LGND 65 show that the 'MUX WRITE DAT' line 8 is found on logic page DF002 9 and that it can be scoped at the Top Card Connector pins (identified by TCC 7 following the card label). The inputs ('BF/WD CLOCK' line 5 and 'WDF DATA' line 6 are found on logic page DF001 11 and can be scoped at the Bottom Card Connector pins (BCC) on the same card 10 and 12. The connector is identified by the (BCC) 4 following the card label.

Note: BCC pins are the same as the pins on the back of the board.

Multiple Logic Diagrams for One Card

Logic pages are not true functional representations of logic cards. They only represent the input and output connectors to the cards.

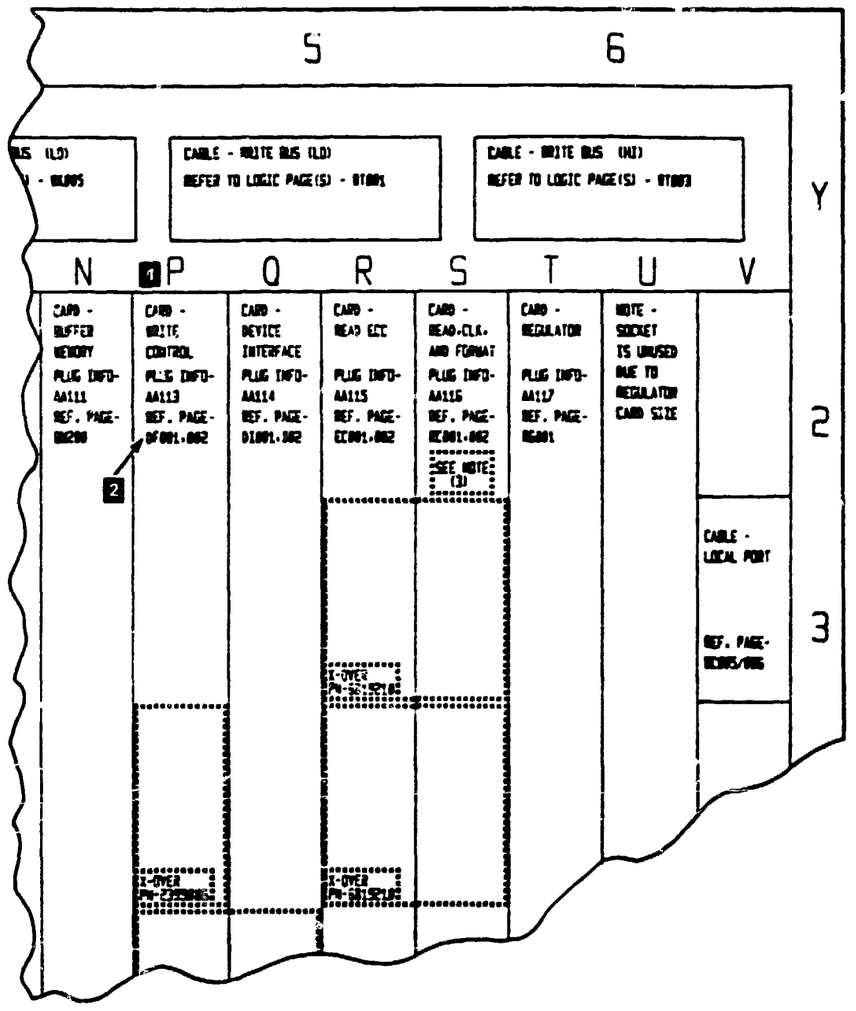
A card can have three types of connectors:

- Bottom Card Connector (BCC)
- Middle Card Connector (MCC)
- Top Card Connector (TCC)

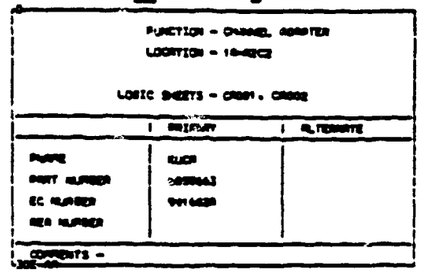
Only one type of connector is shown on each logic diagram; therefore, one card may be shown on up to three separate diagrams. To determine the number of logic diagrams for a card, see the card plug list.

Note: The relationship between the input and output card connector pins cannot be determined from the logic diagrams. When required, these relationships are defined in the Error Analysis Diagram (EAD) section by error code.

Card Location Chart

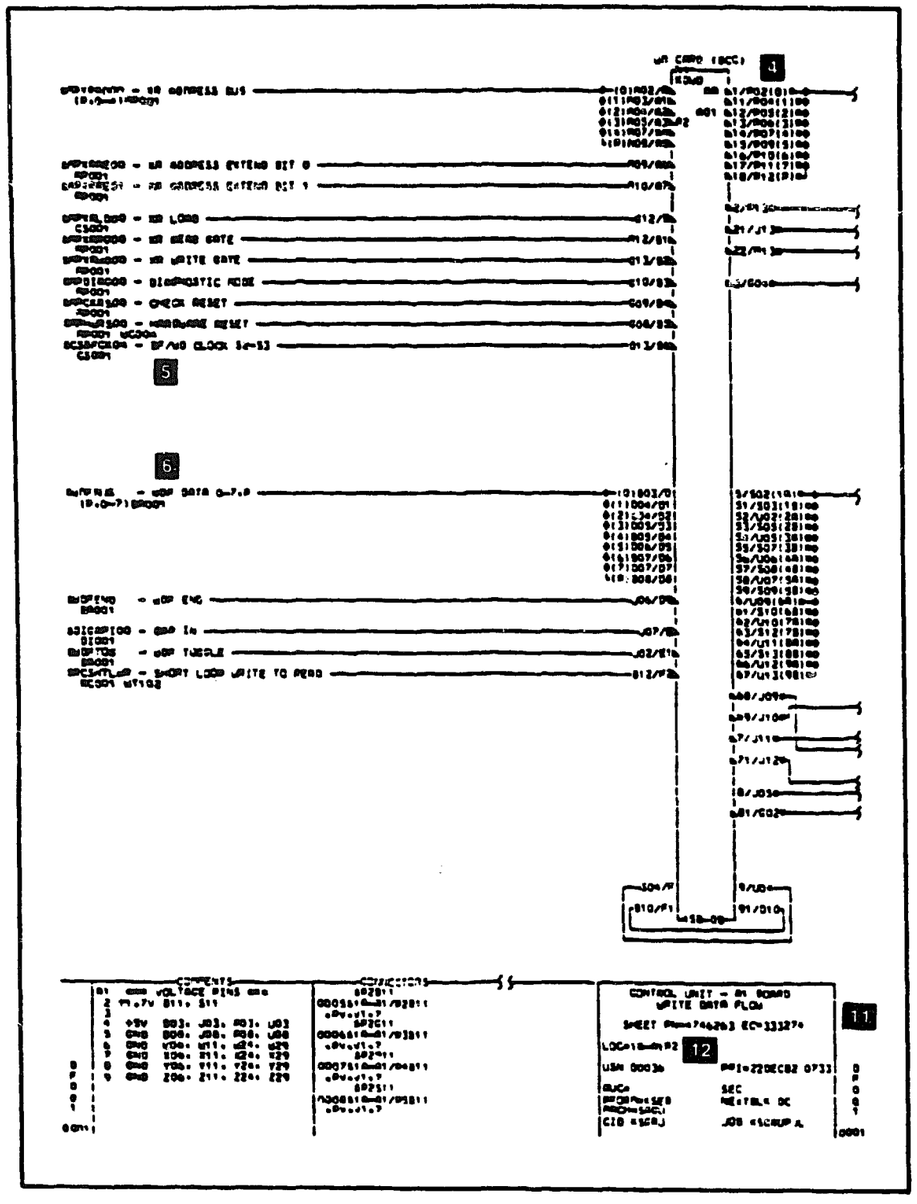


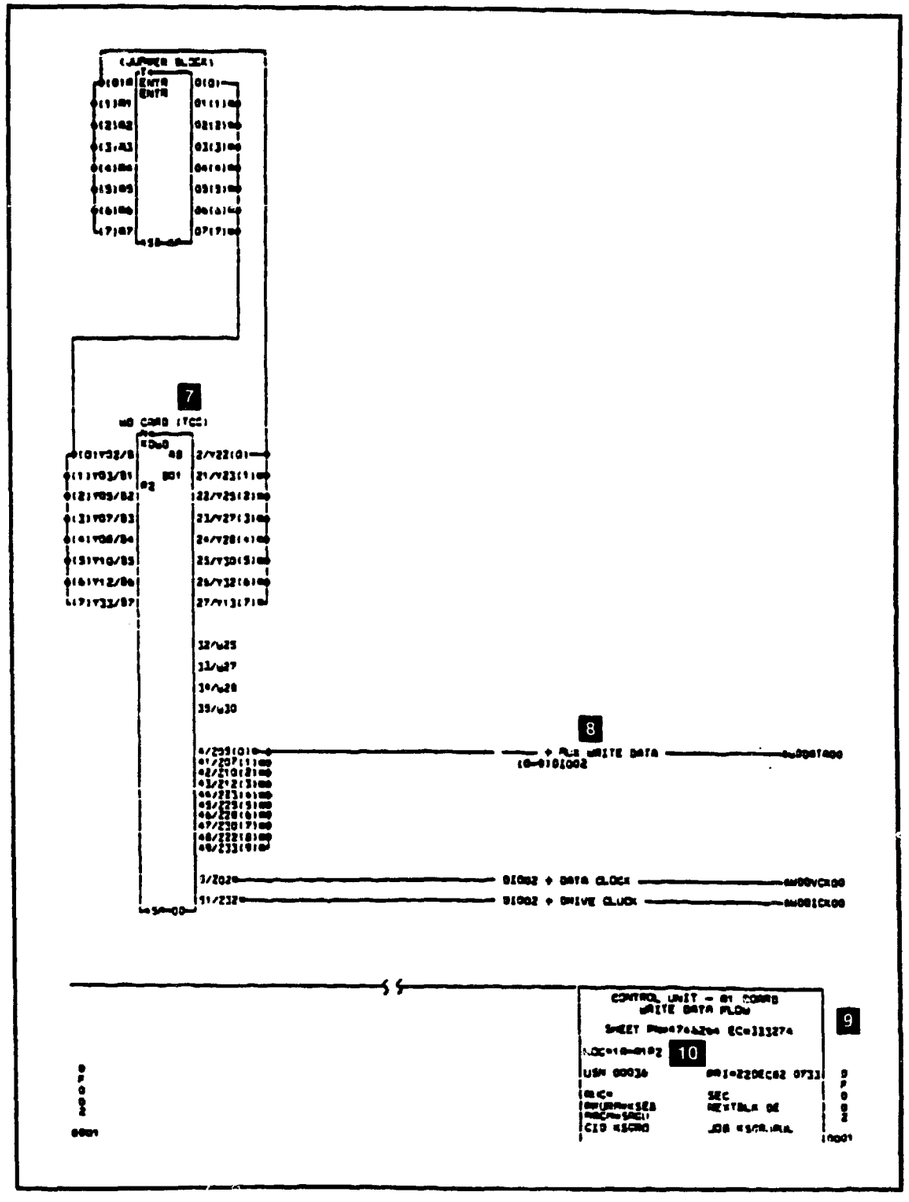
3 Card Plug List



Logic Diagrams (Continued)

Sample Logic Diagrams





Logic Diagrams (Continued)

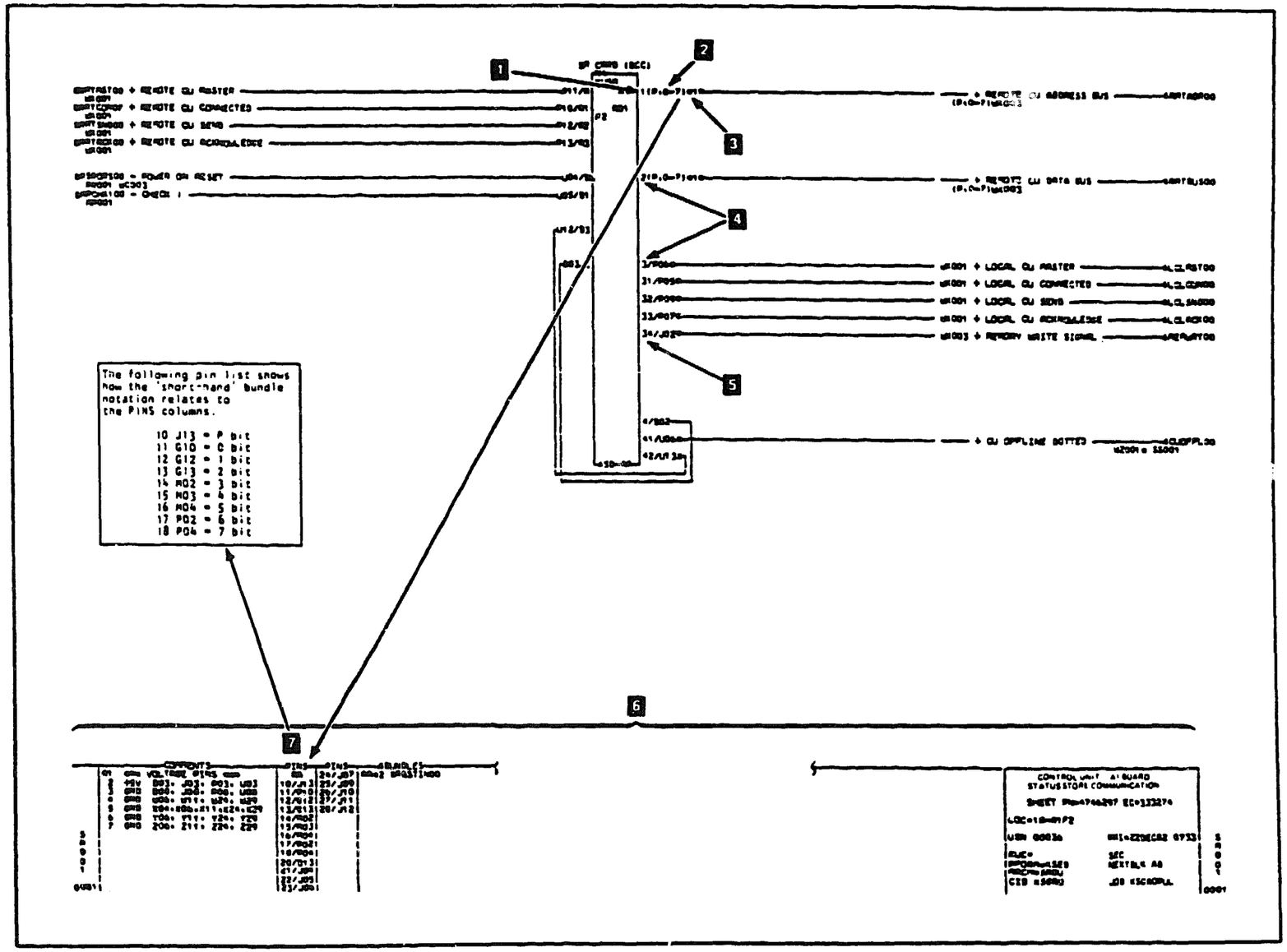
Bundled Lines

Bundled lines combine the bit lines in a bus and represent the bus as a single line. The bit lines in the bundle are identified by a 'short-hand' notation. The (P,0-7) 2 indicates that a parity bit and bits 0 through 7 are included in the REMOTE TCU ADDRESS BUS. An asterisk (*) 3 following the 'short-hand' notation (P,0-7) indicates that the bit lines are defined in the information area 6 at the bottom of the logic diagram.

The PINS columns 7 in the information area define the pins for each bundle on the diagram. Pins 10/J13 through 18/P04 represent the pins contained in the REMOTE TCU ADDRESS BUS bundle 2. The parity bit is on pin 10/J13 (low order zeros do not appear on the diagram for logical pins 1 and 0) and the 7 bit is on pin 18/P04.

Logical/Physical Pins

Pins are identified by logical pin notation and pin number 5. J02 is the physical pin. The 34 is a logical pin notation and is used for engineering purposes only. Low order zeros are not used for logical pin notation. For example, logical pin 10 = 1, 20 = 2 1 and 0, and so on.



Logic Diagrams (Continued)

Logic diagrams show the input and output pins of each card.

Dot OR's of Output Lines

The '- LOCAL BUFFER SERVICE OUT' lines on logic diagram pages CA001 [redacted] and CA101 [redacted] appear to be output lines exiting the logic page and going to another page. However, instead of being inputs to other logic pages, the lines are all outputs that are "Dot-OR'ed" together.

To differentiate between a driver (source) and receiver (sink) for non-directional (BI-DI) lines on the right side of a logic diagram:

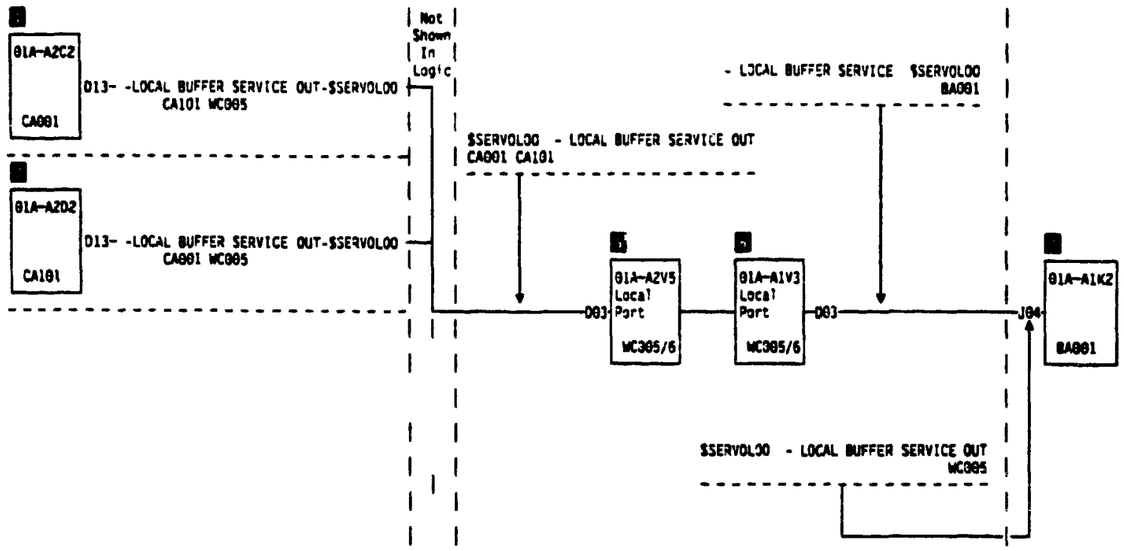
1. All logic diagram page references, except those beginning with "W" (WA001, WC006), that are followed by an asterisk (*) are other driver logic diagram pages for the receiver.

2. All logic diagram page references, except those beginning with a "W" that are not followed by an asterisk are the receiver logic diagram pages from the driver.

In this diagram the logic represents a wire-or-wire path, not a logical flow path. The only output from the two CA cards is to logic page BA001 [redacted]. The drive logics are on CA pages [redacted] – [redacted], WC005/6 [redacted] [redacted], and the receiver card on BA001 [redacted].

Test Points

Some logic card outputs are test points and connect only as far as indicated in the logics. These lines are represented by having a "TP" or "T.P." in the line name.



Legend

Field Wire Net Lists

The Field Wire Nets Lists, show the following for the 01A-A1 and 01A-A2 boards:

- Pin to Net List
- Net to Pin List
- Voltage Distribution List

Pin to Net List

To determine which net contains a specific pin:

1. Find the pin number in the PIN column 1.
2. The column to the right of the pin number is the NET column 2 that lists the net the pin is included in.
3. A 'V' to the left of the pin number 3 indicates that the pin is a voltage pin. Such a pin will also be referenced in the Voltage Distribution List.

Net to Pin List

To determine which pins are included in a net:

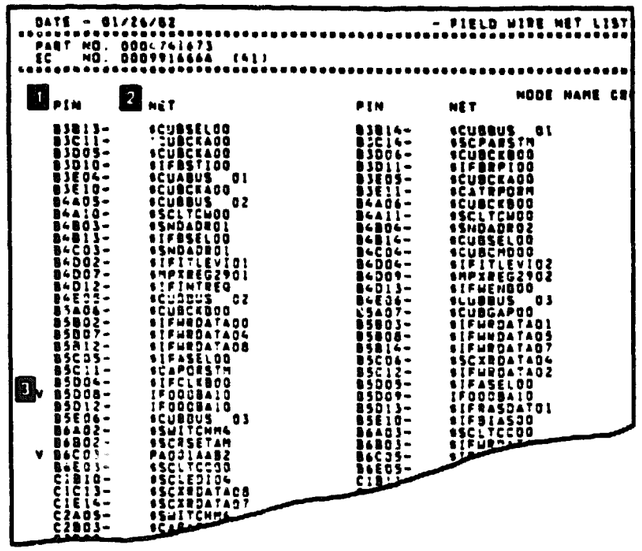
1. Find the net number in the ENG. NET NO. column 4.
2. The two columns to the right of the net number, the FROM and TO columns 5, contain a listing of the pins included in the net. They also indicate the order in which the pins are connected.

Voltage Distribution List

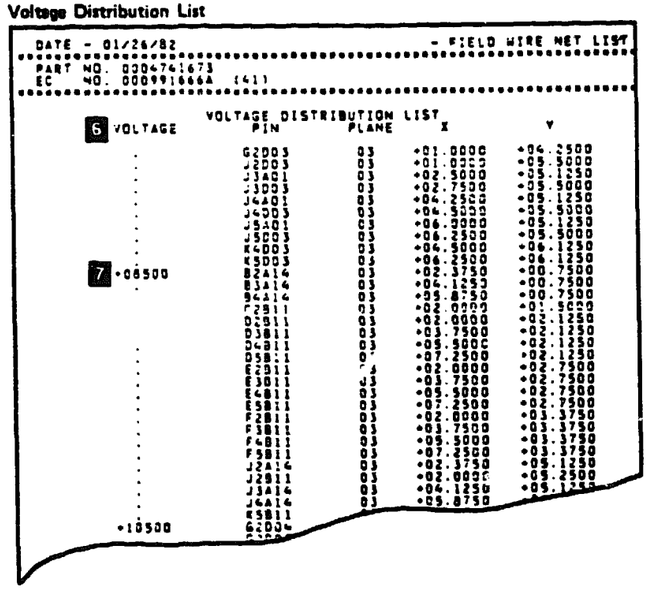
The Voltage Distribution List, references the voltage levels and the pins that are supplied by that specific voltage level. See the "Voltage Tolerance Tables" in the PWR section for the specific voltage level tolerance.

Note: The VOLTAGE column 6 shows the different voltages that are supplied to the boards. +08500 7 means +8.5 Vdc, and so on.

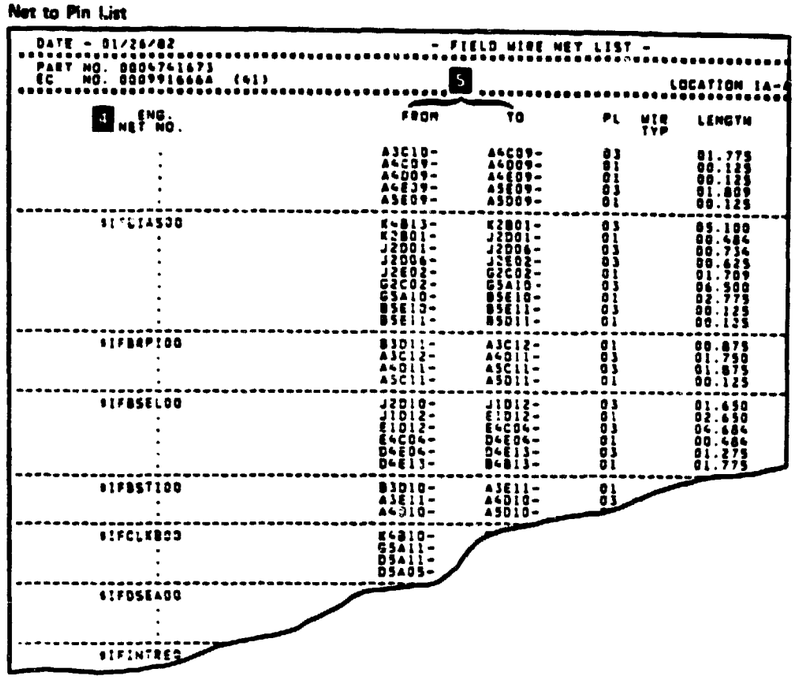
Pin to Net List



Voltage Distribution List



Net to Pin List



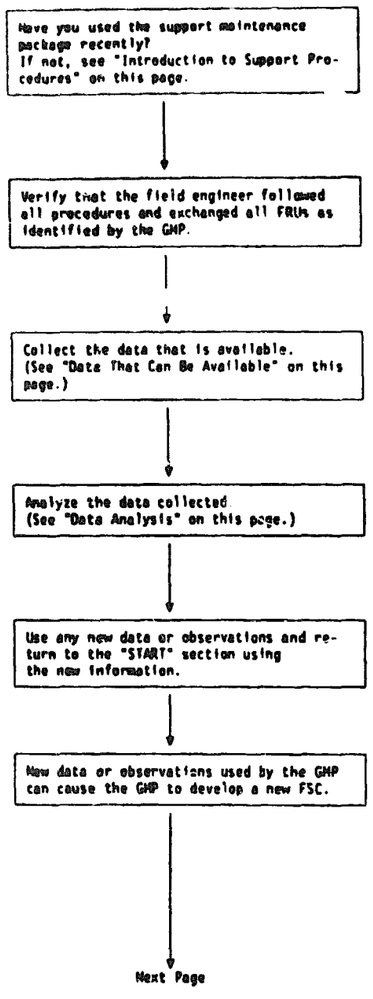

SPROC

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Support Procedures

Start



Introduction to Support Procedures

The information in Volumes A04 and A05 of this maintenance guide make up the support material for the TA90 Magnetic Tape Subsystem. Each of the tabs within these volumes represents a section of information that aids the field engineer in problem determination and repair at the support level.

The field engineer should already be thoroughly familiar with the information in Volumes A04 and A05. In addition, the field engineer can, with aid, use this information in troubleshooting when the GMP fails to isolate a subsystem problem.

Support Maintenance Package

The support maintenance package supplies the field engineer with a TCU support diskette and documentation that can be used to isolate difficult subsystem problems. The support diskette gives the field engineer the ability to select and run specific diagnostics. The support documentation supplies maintenance information beyond the scope of MAPs and procedures used by the Level 1 field engineer.

There is a second support package available at area support. This package contains a maintenance device (MD), and an MD Support Diskette. The MD Support Diskette contains diagnostics, subsystem display and alter controls, support utility programs, and microcode patch programs.

When to Use the Support Maintenance Package

Use the support maintenance package to correct failures that were not repaired using the GMP. The following kinds of failures may require use of the support maintenance package.

- The FRUs identified by the GMP were not exchanged, or procedures were not followed as directed by the maintenance guide.
- Power is missing or out of tolerance at the point of failure.
- Connections between FRUs (cables, connectors, top card connectors, or board wiring) have short circuits or open circuits.
- A FRU exchanged by the product field engineer is defective.
- A design problem exists in the hardware, the microcode, or the maintenance package.
- No trouble was found.
- Failures occur during installation or after EC rework.

Transition From the Product Maintenance Package to the Support Maintenance Package

The support maintenance package is intended to be used when the GMP fails to repair a problem. You should enter the package at the block marked 'Start' on this page and follow the steps as they continue to other pages.

This Support Procedures section of the maintenance information contains the information about how to proceed to gather appropriate information, how to analyze that information, and how to use the action-oriented fault symptom index (FSI), EAD, and DIAG sections.

Data That Can Be Available

- Fault symptom codes (FSCs) that are supplied by the GMP. See PLAN 1 for "TA90 Maintenance Package Summary."
- Drive message displays. See PANEL 1 for "Message Display Messages."
- System Error Log See MSG 1 for "Analyze/Error Outputs."
- Audio-visual indications of the subsystem or media.

Data Analysis

- Is it consistent?
- Does it indicate multiple problems?
- Is the problem (or one of the problems) obvious?
- Does the problem indicate system, programming, operator, or other errors?

If the problem analysis indicates some obvious errors, correct the obvious errors before you continue. If correcting the obvious errors shows that wrong data was used in the initial attempt to correct the problem, return to the GMP with the new data and start again.

Some items to check in the data analysis are:

- System error log report
  - Look for multiple records.
  - Are there earlier sense records for the failing address with different sense data? (It is possible that after the original failing sense data, later sense data can indicate the effect of the problem, not the cause.)
  - Do multiple FSCs relate to a common problem?
  - Are FSCs common or similar for the drives on the same subsystem?
  - Check for possible common tape control unit problems.
- For two tape control unit configuration

From Preceding Page

Use the FSC developed by the CE panel. If you want to verify this FSC, use the data gathered in the preceding steps to develop a fault symptom code (see "Determining a Fault Symptom Code" on START 300). Use the fault symptom code to find the error as listed in the Fault Symptom Code Index (FSI) section. Return here after you find the fault symptom code in the FSI and continue with other verification actions first, before doing any troubleshooting actions in the FSI (see Note).

If you want to verify that the FRUs were exchanged in the correct tape control unit, see START 400 for "Error Path Isolation".

Next Page

ATTENTION

Take care in using the FSI. The FRU list generated by SPEAR or VAXsimPLUS contains the "highest probability" FRUs as the cause of the problem. The FSI may list additional FRUs that could also cause the problem.

Note: The SPROC section procedures are used to verify that you are in the correct functional area before doing any more troubleshooting or corrective actions. These actions are, for example, re-running the GMP package if the newly developed FSC differs from the original FSC . If you are sure that the earlier actions were correct and the existing information still points to the same area, continue with the actions specified in the FSI "Additional Action/Comments" column instead of returning to the SPROC block that sent you to this note. However, after completing all the actions specified in the FSI, you must return to SPROC 4 and follow "General Problem Definition Diagnostics."

From Preceding Page

Use the information from the FSI to recheck the actions that were taken by the product CE.
(See "Rechecking Actions" on this page)

If the FSI explanation and your analysis are different, some of the data may have been interpreted incorrectly earlier. Return to the CE panel using the new data.

If the problem information is consistent and the FRUs have been exchanged, check the cables and boards identified by the FSI.

Perform the actions defined in the "Additional Actions/Comments" column in the FSI for the FSC, before continuing any other actions in this SPROC section. Use the information referenced in the FSI (EADs, diagnostics or others) to analyze the problem. Sometimes, a diagnostic or an EAD can lead you to a new error code. Use the new error code for the entry to the FSI for more fault isolation. Return here after all other defined actions have been done, whether the problem was fixed or not.

There are additional diagnostics available to test major functional areas of the TA90 subsystem. If you did not have enough data, you can run any or all of these programs to assist in defining the problem.

If you want to select these diagnostics, see "General Problem Definition Diagnostics", on this page.

Complete the call.
(See "End of Call Actions", on this page.)

Rechecking Actions

- Compare the FSI explanation of the problem being analyzed with what is known from the data collection and analysis done in the preceding steps. If the FSI explanation and your analysis vary widely, some misinterpretation of data may have occurred using the new data from the FSI. Return to the GMP using the new data from the FSI.
- Compare the FRU list from the FSI with the FRU list developed by the GMP. If the FRU lists do not match, or the field engineer did not exchange all the FRUs, exchange those FRUs that have not been exchanged.
- If the GMP was not used, exchange the FRUs identified by the FSI.

General Problem Definition Diagnostics

The following are some general diagnostics that can be used to test the functional areas of the subsystem when there is not enough data to fully define a problem.

- Basic tape control unit tests within the subsystem
  - See "Basic TCU Tests" on DIAG 1
- Basic drive tests within the subsystem
  - See "ILEXER" and "GMP" on CE/HSC 1.
- Tape control unit commands: non-motion and motion including write and read commands from the host system
  - See "ILEXER" on CE/HSC 1.
- Subsystem pathing assignment tests from the host system
  - See "Error Path Isolation" on START 400.
- Subsystem write and read reliability tests with extended run times from the host system
  - See "ILEXER" on CE/HSC 1.
- Tape interchange tests with forced error logging for sense definition of temporary errors, from the host system
  - Ask the customer to back up some files, and verify them on another drive.

End of Call Actions

Failure Has Not Been Repaired

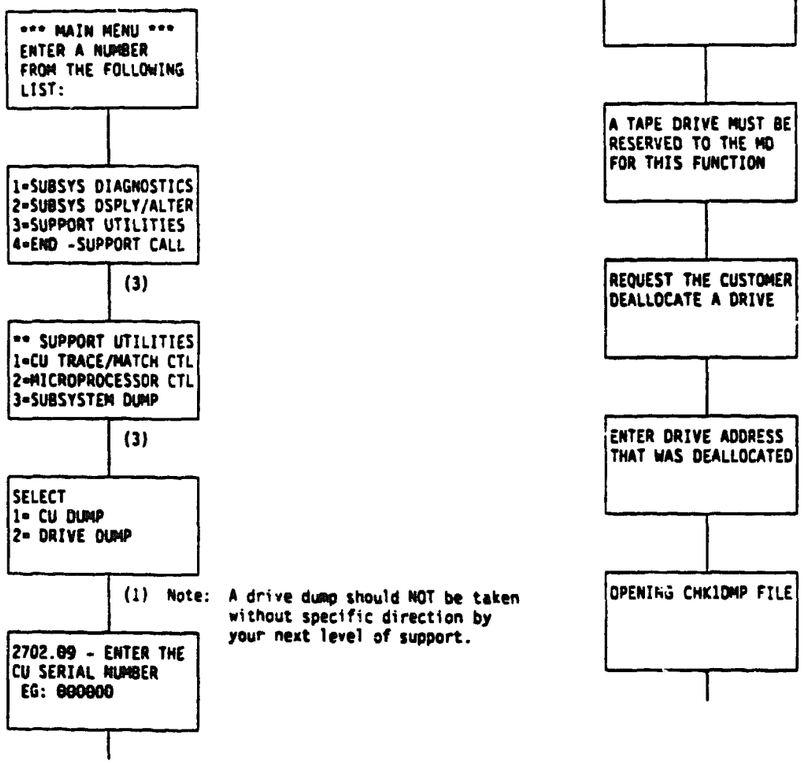
If the failure has not been repaired, or is intermittent without a repair by either the GMP or the support maintenance package, call your next level of support, then use the "No Trouble Found Procedures" EAD. Have a record of actions taken, FRUs exchanged, error codes observed, and any data collected during the analysis of the failure available when you call. If you leave the call, leave the record for follow-on effort.

Failure Has Been Repaired

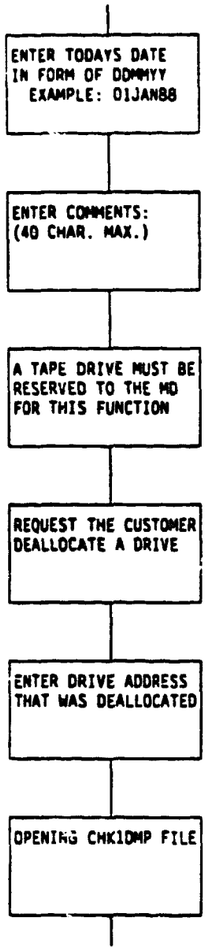
If the failure has been found, verify the repair by retesting using the program or diagnostic test that originally failed.

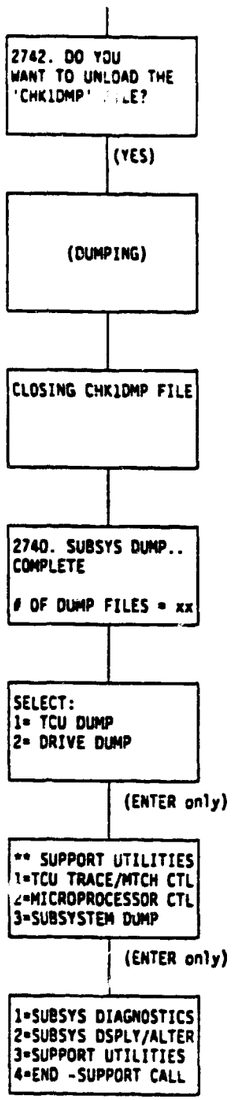
Taking a CHK1 dump

CHK1 dumps are recorded on the functional microcode diskette when errors are detected that are considered to be microcode related. CHK1 dumps are not recorded for errors deemed to be hardware related because hardware controls may not be functional. The MD Support diskette dump procedures will always interrogate the CHK1 dump area to determine if any valid data has been stored.



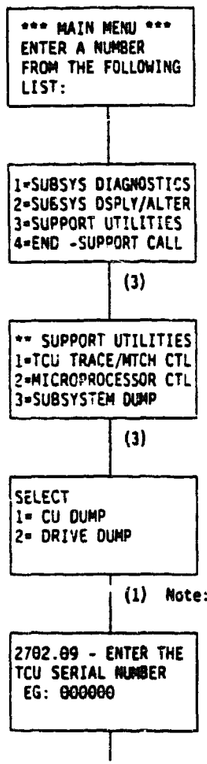
(1) Note: A drive dump should NOT be taken without specific direction by your next level of support.

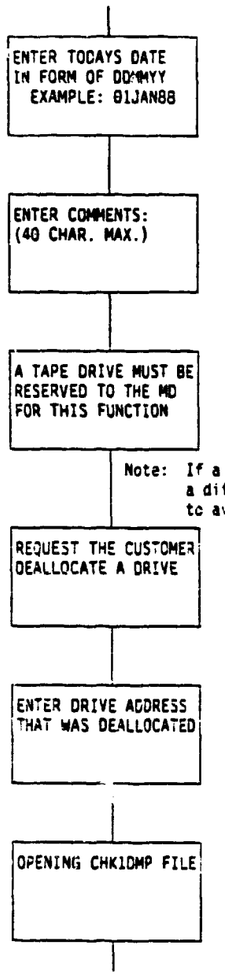


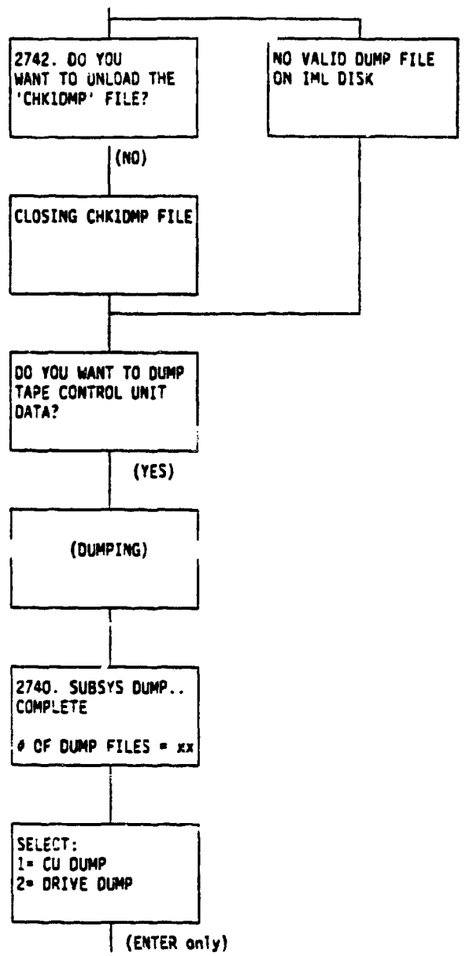


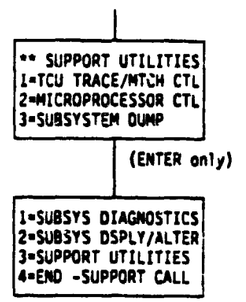
Taking a Concurrent Dump

Concurrent tape control unit dumps are 'snapshots' of running tape control units that are taken without impact to the customer. These dumps are usually taken to determine the status of the tape control unit with respect to the host or the attached drives. For example, does a particular interface have access to a particular drive? Or, what was the last operation performed with a particular drive? This function is sometimes used if the problem can be recreated, but requires that the dump be obtained as soon as possible following an error. The depth of the trace tables is limited and other activity can cause pertinent data to be overwritten.





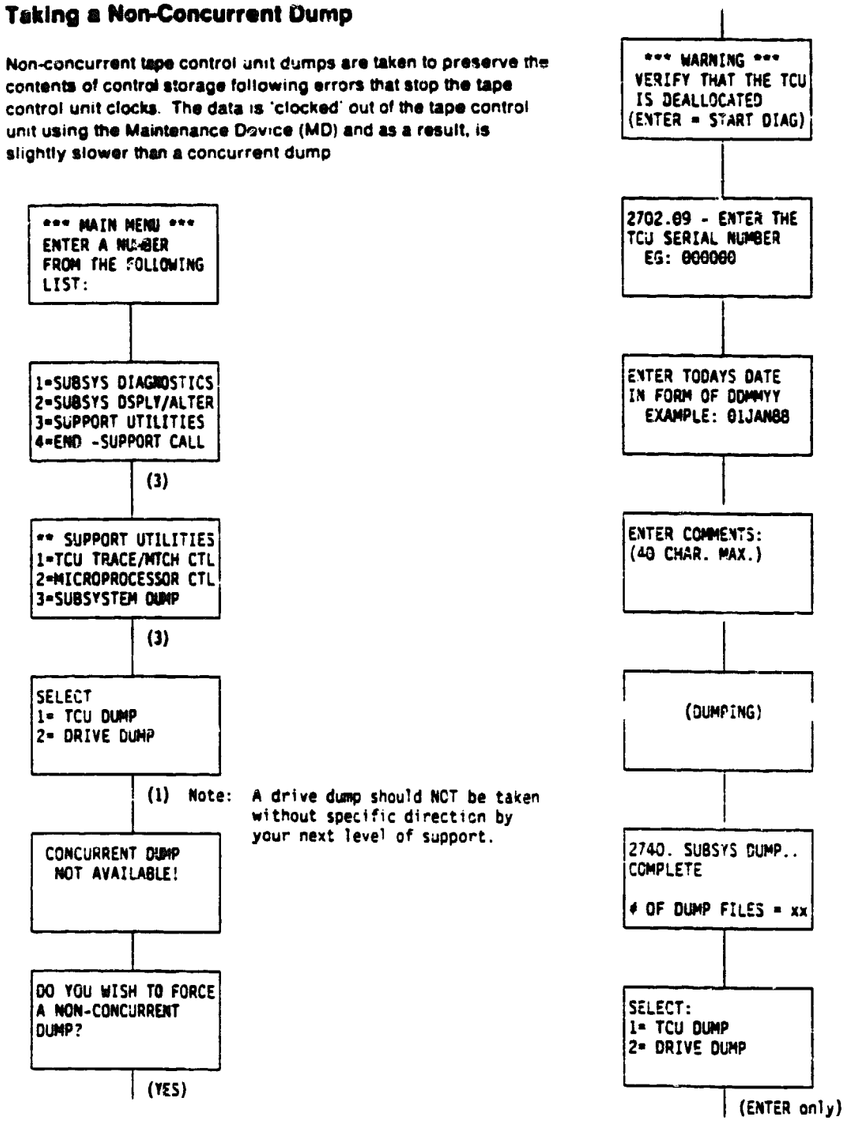


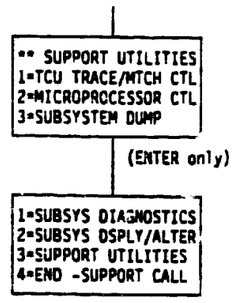


Support Procedure C SPROC 120

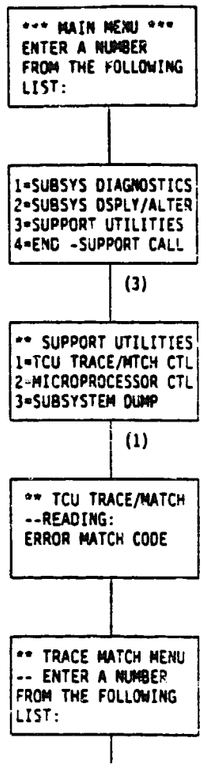
Taking a Non-Concurrent Dump

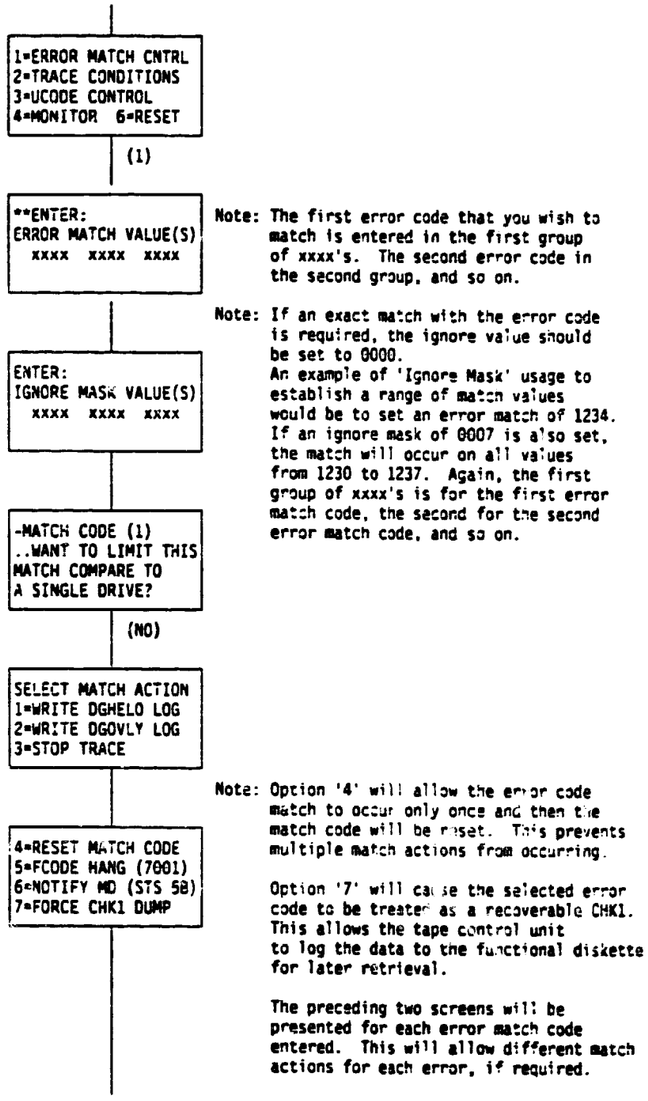
Non-concurrent tape control unit dumps are taken to preserve the contents of control storage following errors that stop the tape control unit clocks. The data is 'clocked' out of the tape control unit using the Maintenance Device (MD) and as a result, is slightly slower than a concurrent dump





Setting Error Match Codes and Trace Conditions





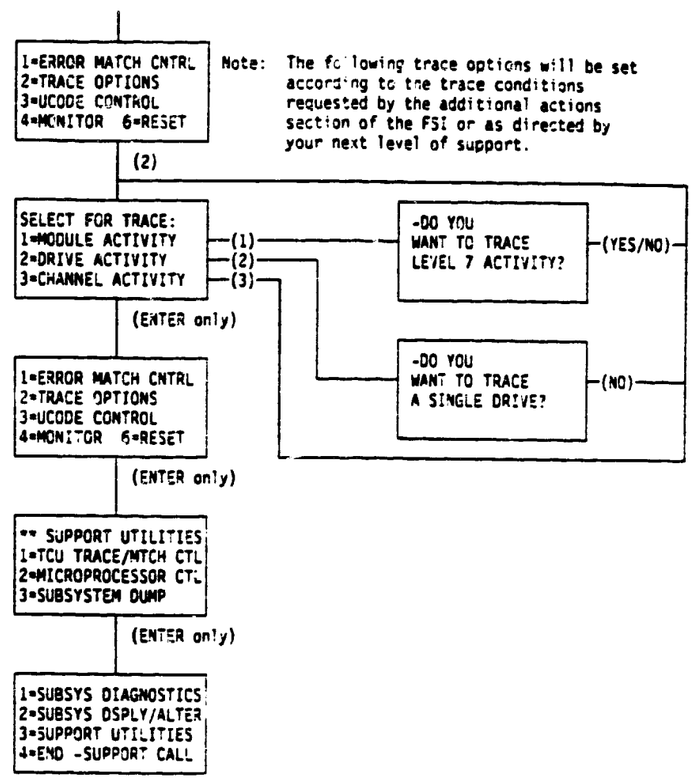
Note: The first error code that you wish to match is entered in the first group of xxxx's. The second error code in the second group, and so on.

Note: If an exact match with the error code is required, the ignore value should be set to 0000.
An example of 'Ignore Mask' usage to establish a range of match values would be to set an error match of 1234. If an ignore mask of 0007 is also set, the match will occur on all values from 1230 to 1237. Again, the first group of xxxx's is for the first error match code, the second for the second error match code, and so on.

Note: Option '4' will allow the error code match to occur only once and then the match code will be reset. This prevents multiple match actions from occurring.

Option '7' will cause the selected error code to be treated as a recoverable CHK1. This allows the tape control unit to log the data to the functional diskette for later retrieval.

The preceding two screens will be presented for each error match code entered. This will allow different match actions for each error, if required.



Note: The following trace options will be set according to the trace conditions requested by the additional actions section of the FSI or as directed by your next level of support.

Support Procedure E

Microcode Error Problem Determination

This procedure is used whenever an error in the MD microcode is suspected. The procedure causes a unique label to be entered in the MD trace table (PELOG) and the table is then written to the MD diskette. After performing the procedure, the next level of support should be contacted to determine the next course of action. The diskette may need to be forwarded to engineering for further analysis of the trace table.

Note: The error code can only be generated when running the MD and may not relate to any customer problems.

Procedure E

1. Press the RESET button on the MD.
2. When the MAIN MENU appears on the MD keyboard/display, remove the diskette from the MD.
3. Call your next level of support for further instructions.


MD/SDISK

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Diagnostic Identification Code Table

ID Code *	Page	Type (See Note)	Purpose	Load and Run Times (Approximate)	Failure ID Example	Prerequisite Diagnostics	MG Section
(MD/MA)	MD/SDISK	1	Maintenance Device/Maintenance Adapter Diagnostic (MD/MA)	10 seconds	MA10xx	None	MD/SDISK
(BCU)	MD/SDISK 530	1	Basic tape control unit test. Also runs E010 (BCU)	2 minutes	CB10xx	None	MD/SDISK
E010	MD/SDISK 530	1	TCU functions test, diagnostic section. Runs diagnostic routines EE12, EE13, EE14, EE32, EE33, EE52, EE53, EE64, EE85, EE92, and EE93. See "E010-TCU functions test."	2 minutes		BCU	MD/SDISK
EE10		1	Processor basic tests, diagnostic section. Runs routines EE12, EE13, EE14, and EE85.	1 minute and 5 seconds		BCU	MD/SDISK
EE12	MD/SDISK 550	1	Processor function test.	18 seconds	HC20xx	BCU	MD/SDISK
EE13	MD/SDISK 555	1	Interrupt level test.	18 seconds	HC30xx	BCU, EE12	MD/SDISK
EE14	MD/SDISK 565	1	Processor external register test.	18 seconds	HC40xx	BCU, EE12, EE13	MD/SDISK
EE20			Reserved.				N/A
EE30		1	Data buffer tests, diagnostic section. Runs routines EE32 and EE33.	42 seconds		BCU, EE10	DIAG
EE32	DIAG 100	1	Data buffer data path test.	34 seconds	BU20xx	BCU, EE10	DIAG
EE33	DIAG 110	1	Data buffer controls test.	24 seconds	BU30xx	BCU, EE10, EE32	DIAG
EE40		2	Tape Control Unit to drive tests, diagnostic section. Runs routines EE42, EE43, and EE44.	2 minutes (15 drives)		BCU	DIAG
EE42	DIAG 150	2	Tape Control Unit to drive bus out and driver wrap test	18 seconds	DI20xx	BCU	DIAG
EE43	DIAG 160	2	Tape Contol Unit to drive bus and tag test.	19 seconds	DI30xx	BCU, EE42	DIAG
EE44	DIAG 170	2	Tape Control Unit to drive serial test.	1 minute and 23 seconds (16 drives)	DI40xx	BCU, EE42, EE43	DIAG
EE50		2	Data path tests, diagnostic section. Runs routines EE52, EE53, and EE54.	54 seconds		EE10, BCU, EE30, EE40	DIAG
EE52	DIAG 200	1	Short loop write to read pattern test.	18 seconds	LW20xx	BCU, EE10, EE30	DIAG
EE53	DIAG 218	1	Short loop write to read timing test.	18 seconds	LW30xx	BCU, EE10, EE30, EE52	DIAG
EE54	DIAG 220	2	Long loop write to read test.	18 seconds	LW40xx	BCU, EE10, EE30, EE52, EE53, EE40	DIAG
EE60			Channel adapter function test. Runs routine EE64.			BCU, EE10, EE30	DIAG
EE64	MD/SDISK 820	1	Channel adapter function test. Runs routine EE64	51 seconds	CI40xx	BCU, EE10, EE30	MD/SDISK
EE70			Reserved.				N/A

ID Code *	Page	Type (See Note)	Purpose	Load and Run Times (Approximate)	Failure ID Example	Prerequisite Diagnostics	MG Section
EE72			Reserved				N/A
EE85	DIAG 400	1	External register bus addressing and data pattern test	19 seconds	XB50xx	BCU, EE12, EE13, EE14	DIAG
EE90		1	Status store tests, diagnostic section. Runs routines EE92 and EE93.	36 seconds		BCU, EE10	DIAG
EE92	DIAG 450	1	Status store wrt/rd RAM storage test.	18 seconds	SS20xx	BCU, EE10	DIAG
EE93	DIAG 460	1	Status store order test.	18 seconds	SS30xx	BCU, EE10, EE92	DIAG
EEA0		2	Tape movement tests, diagnostic section. Runs routines EEA2, EEA3, and EEA4	7 minutes and 30 seconds		BCU, EE40, EE10	DIAG
EEA2	DIAG 500	2	Basic tape motion test.	18 seconds	TM20xx	BCU, EE40, EE10	DIAG
EEA3	DIAG 510	2	Write/Read Exerciser.	3 minutes and 47 seconds	TM30xx	BCU, EE40, EE10, EEA2	DIAG
EEA4	DIAG 550	2	Write/Read Exerciser.	4 minutes and 30 seconds	TM60xx	BCU, EE40, EE10, EEA2	DIAG
EEF0	MD/SDISK 1100	2	Scope loop utility.	Continuous		None	MD/SDISK
(EEF1)	MD/SDISK 1120	N/A	Drive Patch Load Utility.	Not Applicable	None	None	MD/SDISK

Note: Single Tape Control Unit Subsystems

- Type 1 and 2 Diagnostics
  - Type 1 Diagnostics are required only when running the MD.
  - The subsystem must be deallocated and made unavailable for customer use.

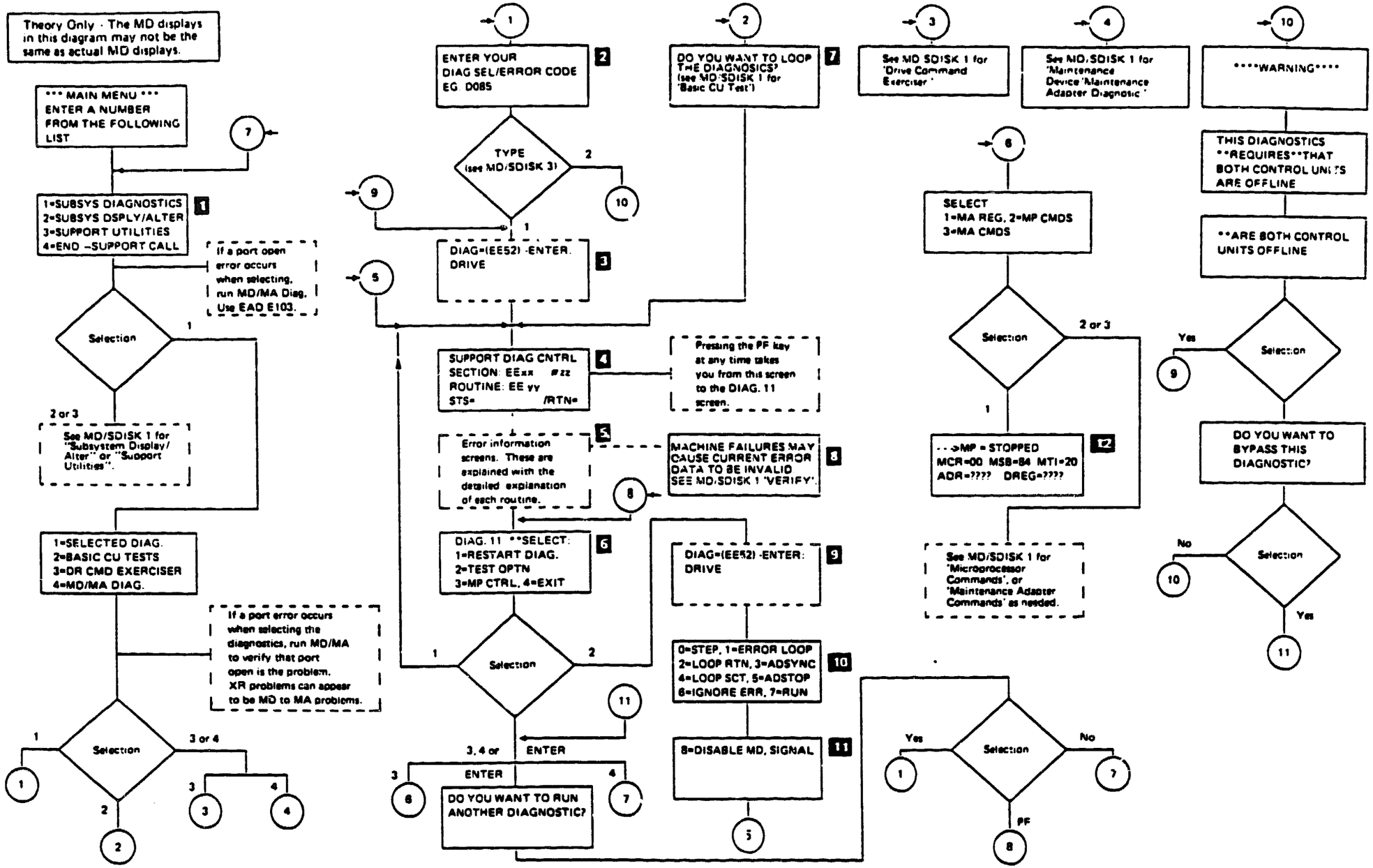
Dual Tape Control Unit Subsystems

- Type 1 Diagnostics
  - Type 1 Diagnostics are required when running the MD.
  - The complete subsystem must be deallocated and made unavailable for customer use. Due to drive interface interaction, run diagnostics from only one MD at a time.

* ID codes within parentheses cannot be used for diagnostic selection.

** The prerequisite diagnostics for a routine must be run, in the correct order, and error free. These routines are only required when running the MD.

How to Use the MD Support Diagnostics MD/SDISK 4



MD Support Diagnostic Flow

The flowchart on MD/SDISK 4 shows the order of proceeding through the support diagnostics. It does not show all the menus because many of the menus are self-explanatory. The flowchart is keyed to the text on this and the next two pages. The text explains what the screens mean and gives some suggestions about how to interpret them.

To use the support diagnostics, you must know:

- How the diagnostic programs are controlled.
- How to run the diagnostics for single-tape control-unit subsystems and for dual-tape control-unit subsystems.
- What information the diagnostics will supply to you, and how to use it.
- How to verify error data that may not be valid.
- What options you have for controlling the diagnostics.
- How to end use of the diagnostics.

Control of the MD Support Diagnostics

The diagnostic control program in the TCU controls the running of the support diagnostics. To permit you to control the way the TCU runs the diagnostics, the MD presents screens on the keyboard/display and reacts to your entries from the keyboard.

After you have made your selections, the diagnostic control program selects the diagnostic routines and controls the order in which they run. You can control which routines are run and the order in which they run by entering:

- A diagnostic section identification code.
- A diagnostic routine identification code.

Because the diagnostic routine microcode replaces the functional microcode, you cannot perform concurrent maintenance using the support diagnostics.

Note: Once the diagnostic microcode has been loaded, you must perform an IML of the Functional Microcode on that tape control unit before normal operation can be started again.

Running MD Support Diagnostics

Note: When you are through running the diagnostics:

- Put the Normal/Test switch in the Normal position.
- Follow the instructions in "How to End Use of the Diagnostics," located on MD/SDISK 7, before putting the Offline Test/Online Test switch in the Online Test position.

Single-Tape Control Unit Subsystem

Use this procedure when you run the diagnostics on a single-tape control unit subsystem or when you run the basic control unit tests (E010) on a dual-tape control unit subsystem.

1 Set the Offline Test/Online Test switch to Offline Test.

2 Insert the MD support diskette and press IML.

3 Now you are ready to run the support diagnostics.

Dual-Tape Control Unit Subsystem

Use this procedure when you run any support diagnostic other than those included in the basic tape control unit tests (E010) on a dual-tape control unit subsystem.

1. Set the Offline Test/Online Test switch to Offline Test on both tape control units.
2. On the tape control unit not being tested, set the Normal/Test switch to Test and press the IML switch. (This causes the tape control unit to stop and avoids interference with the drives while the diagnostics run from the other tape control unit.)
3. On the tape control unit being tested, set the Normal/Test switch to Normal.
4. Insert the MD support diskette and press IML.
5. Now you are ready to run the support diagnostics.

Getting the Diagnostics Running

Connect the MD to the tape control unit that is to be tested, and begin using the support diskette as explained in the MD/SDISK section of this maintenance guide. Select the option of using diagnostics by selecting option 1 from the main menu 1.

When the diagnostic is in the process of loading from the diskette and storing into control storage, problems can interfere with the communications between the tape control unit and the MD, causing 'Fast Load' to stop. The control program then displays a screen asking 'PMA FORCE LOAD IT'.

Controlling the Diagnostics

The diagnostics supply two controls at the start of the diagnostics.

Controls at the Start of the Diagnostics

When you start running the Basic TCU tests, the diagnostic control program lets you select whether to loop the diagnostics 7. If you choose to loop the diagnostics, the diagnostics loop until an error occurs.

When you choose to run selected diagnostics, the diagnostic control program lets you specify the diagnostics to be run. You can enter the identification code for a diagnostic section or a diagnostic routine. Following the selection of certain diagnostic sections or diagnostic routines, you can select the drive, channel, and test pattern that you want to use 3, 5.

Controls at the End of the First Pass

When the diagnostic stops, either because of an error or because it ran without errors, you can select from a number of options. The first menu 6 permits you to select changes in the way the diagnostic is running or to look at certain information. If you want to change the control options for the diagnostic (selection 2), you can get the drive, channel, and pattern selection menu 3, 9, and you get the test options menu 10, 11. The selections from the test options menu cause the following results.

The last routine (of a section), will be the first routine run when an option, drive address, TCU address, or test pattern is changed.

Option	Result
ERROR LOOP	Causes the diagnostic routine to run to the point of error and then restart the test. The routine loops until the PF key on the MD keyboard/display is pressed. Error loop causes the routine to loop if no errors are detected.
LOOP RTN	Loop routine. Causes the last routine run to restart and loop until the MD keyboard/display PF key is pressed. If an error is detected, the loop ends and an error screen is displayed.
LOOP SCT	Loop section. Permits looping a section of one or more diagnostic routines. Looping continues until an error is detected or the PF key on the MD keyboard/display is pressed.
ADSTOP	Address stop. Causes the microprogram in progress to stop when the storage address you have entered is reached.
IGNORE ERR	Ignore error. Disables the check 1 error stop. If this option is used at the same time as the loop routine option, the routine restarts when an error occurs.
DISABLE MD SIGNAL	Ends diagnostic to MD signalling. This option can be used with the ADSYNC and LOOP RTN options to increase the oscilloscope triggering rate.
RUN	This option starts the diagnostic operating under the conditions that you have established with your other option selections. This option must be entered as the last option selected. The last routine (of a section), will be the first routine run when an option, drive address, TCU address, or test pattern is changed.

Information Supplied by the MD Support Diagnostics

The MD support diagnostics supply three kinds of information

- A status screen
- Error screens
- Common stop addresses

Status Screen

When a diagnostic routine is running or ends, with or without an error, the status screen 4 (see MD/SDISK 4) displays. If the routine did not have an error and more than one routine is to run, the screen displays only momentarily, then it is replaced with the loading screen from the next routine. If an error occurred or no more screens are to run, the diagnostic stops with the status screen displayed. The status screen displays:

- SECTION = The name of the diagnostic section
- ROUTINE = The name of the diagnostic routine
- # = Control options

  ZZ No options

  EL Error loop

  LR Loop routine

  IE Ignore errors

  EI Error loop and ignore errors

  LI Loop routine and ignore errors

  AD Address sync

  EA Error loop and address sync

  LA Loop routine and address sync

  AI Address sync and ignore errors

  EX Error loop and address sync and ignore errors

  LX Loop routine and address sync and ignore errors.

- STS = Status of diagnostics

  RUNNING Diagnostics running

  STOPPED Diagnostics stopped

  CK1STOP Check 1 error, stopped

  LOOPING Diagnostic looping

  ERROR Error has occurred (see note 1)

  GOOD Diagnostic complete with no errors

  DATA(XX) Expected data, actual data is shown in the /RTN field

  PGMFLAG Program flag

  MTIERR Maintenance-tags-in error (see note 1)

  LOOPREQ Error loop request

  CHECK1 Check 1 error, not stopped (see note 1)

- /RET = Return code

  40 Good return

  03 Error

  ... Press ENTER for message from the diagnostic.

Note 1:
- If STS = DATA(XX), /RTN = actual byte received.
- If STS = CK1STOP or CHECK1, /RTN = maintenance status byte (MSB) (see note 2).
- If STS = MTIERR, /RTN = maintenance tags in (MTI) (see note 2).
- If STS = PGMFLAG, /RTN =
  - 80 = Loop routine (diagnostic)
  - 40 = Loop on error
  - 20 = Ignore error

Note 2:
- See "Error Screens" if no screens are available.
- See EAD 1 for E100 or Fnnn.

Error Screens

In addition to the status screen, each diagnostic can supply you with error screens 5 (see MD/SDISK 4). The error screens follow the status screen only if an error occurred. The error screens are made for the particular diagnostic, so they are explained in the description of each diagnostic.

Common Stop Addresses

When a diagnostic routine completes its run, it branches to a stop address. The stop addresses supply diagnostic test result indications.

To obtain the stop address at which a diagnostic routine has stopped, you must select 3 from the DIAG.11 screen 6 (see MD/SDISK 4) and display the MA REGS. The address shown on the MP = STOPPED screen 12 is the stop address.

The following stop addresses are common to all diagnostic routines except EEA4 (where Y = 6), and EEF0 (where Y = 0). The y represents the second hexadecimal digit following the EE in the name of the diagnostic routine as shown on the status screen 4 (see MD/SDISK 4).

Address	Meaning
y011	The branch operation did not work. The microprocessor has failed. See the FSI section for "Error Code E100."
y012	A test failed in this routine.
y013	A get pointer error occurred. Indicates a microprogram error.
y014	The routine ended successfully (Normal end).
y015	Reserved
y016	A command that was not valid was received from the MD. Rerun the routine. If the routine runs successfully, ignore the error. If the routine fails repeatedly, see FSI section for "Error Code E100."
y017	The MD connection is broken.
y018	The maintenance adapter card detected an error during microprocessor to MD communications.

How to Use the Information Supplied by the MD Support Diagnostics

When an error occurs while running the diagnostics, the diagnostic stops with the status screen displayed. When the status is ERROR, use the information from the error screens as follows:

1. Press the enter key to advance to the first error screen.
2. Write down the information from the error screen.
3. Press ENTER to advance to any following error screens and write down the information from those screens.
4. Look at the first six characters from the first error screen. These constitute a failure ID code.
5. Look up the failure ID code in the chart that is part of the description of the routine in this section of the maintenance information. The chart tells you what failure occurred and sends you to the error analysis diagram (EAD) that guides you in troubleshooting that error. The other information recorded from the error screens is used to analyze the error using the EAD.
6. When the failure has been repaired, load functional microcode into the tape control unit, insert the product diskette into the MD, and select the Unit Test option to verify that the subsystem operates correctly.

For example, if you were running EE32 and the diagnostic stopped with ERROR displayed as the status on the status display:

1. Press the ENTER key to display the first error screen.
2. Assume the first six characters on the first error screen are BU2021.
3. Look in the chart in the description of EE32 and find BU2021.
4. The chart explains that a buffer channel status error occurred and that the FSI section for error code D5nn should be used.

Verify

Some error screens can send you to the following reference screen.

```
MACHINE FAILURES MAY
CAUSE CURRENT ERROR
DATA TO BE INVALID.
SEE DIAG 1 "VERIFY".
```

This message is referred to by routines EE12, EE13, EE14, and EE85. The message tells you to make sure that the data displayed by the error displays is correct.

Either XR address bus or XR data bus errors can occur that can cause the data that is read by the microprocessor to be invalid. The microprocessor then displays this invalid data as the data on the error screen. To make sure that you know that you have the correct data, you must verify the error screen display.

1. Write down the error display data as explained under "How to Use the Information Supplied by the Diagnostics."
2. Display the tape control unit scan rings. Note that the XRA register information is formatted differently on the scan ring display than it is on the diagnostic display. See MD/SDISK 1 for "Tape Control Unit Scan Rings." and DF 1 for "XRA Register."
3. Write down the data in ERA, ERB, and the XRA registers. Also write down the value of the XR error bit (PSR bit 0).
4. Compare the data from the scan rings with the data from the error display.
5. If the data is different, use the data from the scan rings.
6. If the data from the error display is valid, you do not need to verify the data again while diagnosing the failure.

How to Use the Diagnostic Test Options

The test options for the MD support diagnostics are very versatile, but you must understand some features of the programs to use the options most effectively. The control program in the MD interacts with the diagnostic programs to control the way the options function. The options perform somewhat differently for running a diagnostic section than they do for running a diagnostic routine.

In running a diagnostic section or running from an error code entry, the MD selects a group of routines to be run. The MD then gives you the opportunity to select step mode or to loop the section. Selecting either of these options at this time (before the routines have started running) affects all of the routines. Selections made after the routines are running can affect a single routine or all the routines.

In running a diagnostic routine, you cannot select run options until after the first pass of the routine. Any option selected applies only to the one routine because only one routine is running.

Each routine contains indicators called flags that the MD sets and tests to determine what control options are effective for each run of a routine. If step mode or loop section options are selected at the beginning of the run, the MD sets the corresponding flags on in *each* routine in the section. During the run, other options can be selected that affect single routines in the section. Selecting run with no other options selected clears all the options for that routine.

Some Examples of Using the Diagnostic Test Options

The following discussion does not give all the possible combinations for use of test options. It illustrates two ways in which the options can be used so that you can see how to devise other uses for them.

Using Step Mode, Loop Routine, and Error Loop

Refer to the figure on this page. Let us assume that we selected a diagnostic section and answered yes to the questions "Do you want to loop the section?" and "Do you want to run in step mode?"

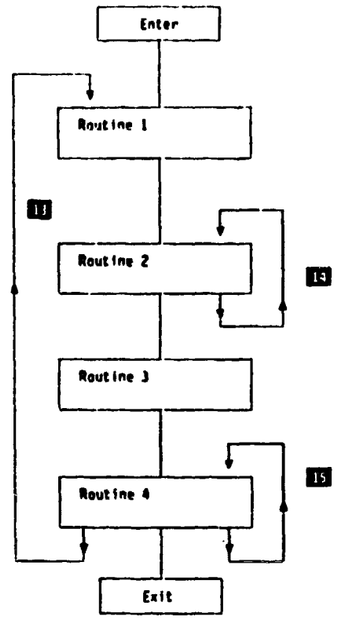
When the section starts, routine 1 runs and stops. When you press the ENTER key, routine 2 runs and stops. Presuming that we have no errors on the first pass, routines 3 and 4 run in the same way as routines 1 and 2. When you press ENTER after routine 4 stops, routine 1 starts again as shown by loop 13.

Now, on the second pass, let us say that an error occurs in routine 2, so routine 2 stops with the error indication. You can modify the run options at this time by using selection 2 from the DIAG.11 screen (6 on MD/SDISK 4).

Let us say that you select ERROR LOOP. The routine enters loop 14, and you can analyze the failure. After you analyze the failure, you can get to the DIAG.11 screen again by pressing the PF key. Let us say that you select RUN with no other options. This selection clears step mode and loop routine from the flags in routine 2. Now, routines 3 and 4 continue in step mode and we return to loop 13 where routine 1 runs in step mode. However, routine 2 does not stop to permit you to press enter before routine 3 starts. (Remember, you cleared step mode in routine 2.)

Using Loop Routine

See the figure on this page again. This time let us say that we selected a diagnostic section and will loop the section but not in step mode. When the section begins, routine 1 runs, followed by routines 2, 3, and 4, then loop 13 starts the operation again. Let us say that on one of the passes an error occurs in routine 4. The diagnostics stop in routine 4 and you select LOOP RTN as a test option. This selection starts us in loop 15. Let us say that you cannot get a failure while running in the LOOP RTN options, so you press the PF key to get to the DIAG.11 screen to select another option. To return to loop 15, you must select LOOP-SCT for the test option. (Remember, if you just select RUN, you clear all the control options for that routine.)



How to End Use of the Diagnostics

When you are through running diagnostics, go to DIAG 11 either by pressing the PF key on the MD keyboard/display or by pressing the ENTER key if you are stopped with GOOD displayed on the status screen 4 (see MD/SDISK 4). Selection 4 on the DIAG 11 screen 6 (see MD/SDISK 4) takes you to the MD support diskette main menu 1 (see MD/SDISK 4). You can then choose to use some other facility from the support diskette or you can end the call (selection 4 on the main menu).

To end the call:

1. If you have repaired the failure:
   a. Remove the support diskette from the MD.
   b. IML the functional microcode into the tape control unit.
   c. Insert the product diskette into the MD.
   d. Select the unit test option to verify that the subsystem operates correctly.
   e. Return the Offline Test/Online Test switch to the Online Test position.
   f. Return the subsystem to the customer.
2. If you have not repaired the failure, follow the defer call procedure or other procedure to continue with the analysis of the failure.

MD Support Plan

The support plan provides FEs with an MD support diskette and documentation that can be used to isolate difficult or intermittent subsystem problems.

The MD and its MD support diskette is an engineering support level tool that may be required to execute MA/MD diagnostics, and scope loop utilities, to deposit/examine registers/control store, and to load microcode patches.

Note: The MD displays in the following diagrams may not be the same as the actual MD displays.

MD Support Diskette

The MD support diskette supplies the following facilities:

- Subsystem diagnostics
- Subsystem display and alter programs
- Support utility programs.

The subsystem diagnostics are explained in the MD/SDISK and DIAG sections of the maintenance guide. This MD/SDISK section explains the subsystem display and alter programs and the support utility programs.

You can perform two classes of maintenance with the MD support diskette:

- Concurrent maintenance. This class of maintenance lets a customer run jobs on all of the subsystem except on the drive you are troubleshooting. Subsystem performance may be slightly degraded.
- Non-concurrent maintenance. The subsystem is not available for customer use.

Subsystem Display and Alter Programs

The subsystem display and alter programs perform as a service panel. They permit you to:

- Display the subsystem configuration.
- Display and alter various storages in the subsystem.
- Display and alter various registers in the subsystem.
- The PF key causes the current program to stop running and returns to the 'MAIN MENU'.
- Null (pressing the enter key only) causes the current operation to stop and returns to the preceding menu, or to what is defined on the MD screen.

Support Utilities Programs

The support utilities programs permit you to

- Perform a microcode trace
- Operate the microprocessor in the tape control unit
- Dump data from the tape control unit and the drives.

Loading the MD Support Diskette

To load the support programs, insert the MD support diskette into the maintenance device and press the IPL key. The MD then performs an initial program load (IPL) to load the support programs. When the initial program load (IPL) is complete, the following screen displays:

```
TA90  SUPPORT DSKT
DISKETTE PN= 4770121
DISKETTE EC= xxxxxxx
CUO= xxxxx CU1=xxxxx
```

This screen provides the part number and EC level of the diskette and the serial numbers of the subsystem tape control units.

Press ENTER: The following screen displays:

```
*WARNING*
YOU MAY DESTROY NEW
DISKETTES IF THEY ARE
INSERTED          ...
```

This warning indicates that when a diskette is IPL'ed and being used, you cannot remove this diskette and insert another diskette and continue without IPLing the MD.

Press ENTER:

```
ALWAYS IPL THE MD
WHEN CHANGING TA90
MD DISKETTES
```

This screen is a reminder to IPL the last diskette inserted into the MD.

Press ENTER: The following screen displays:

```
*** MAIN MENU ***
ENTER A NUMBER
FROM THE FOLLOWING
LIST :            ...
```

This is the Main Menu title screen. If you know the menu selection, you can enter it via this screen. If you do not know the selection,

Press ENTER: The following selection screen displays:

```
1=SUBSYS DIAGNOSTICS
2=SUBSYS DSPLY/ALTER
3=SUPPORT UTILITIES
4=END -SUPPORT CALL
```

You can select the major MD support programs from this screen.

Some MD support diagnostic routines are non-concurrent. If possible, all other troubleshooting procedures should be performed before taking the subsystem away from the customer.

The diagnostics are defined in the Diagnostic Procedures (MD/SDISK) section of the MG. Support utilities and subsystem display/alter selections are explained in this section. Registers displayed by the support programs and diagnostic routines, which are useful for isolating hardware failures, are explained in the Data Fields (DF) section of the MG.

MD Support Diskette Procedures Description

- An overview flow chart is provided for the Main Menu selection.
- The flow for each procedure begins at the selection screen that displays after the Main Menu selection has been entered.
- Blocks represent MD display output.
- All charts start at 'MAIN MENU'.
- MD display information screens are included only if they contain information needed to use the procedure.
- Pressing the PF key causes the current operation to stop and returns to the 'MAIN MENU'.

Display Subsystem Configuration

The following procedure is used to display the subsystem configuration:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 2 (SUBSYS DSPLY/ALTER).
4. Enter a 1 (SUBS CONFIG DSPLY) from the Display/Alter menu screen.

Subsystem Component Descriptions

Tape Control Unit and drive description display 1:

TA90 MODEL = Tape Control Unit model number - Defined by switches on the device adapter card (01A-A1Q2).

SN = Tape Control Unit unit serial number.

EC = Current Tape Control Unit hardware EC level - Defined by switches on the device adapter card (01A-A1Q2).

ID = Setting of the TCU0/TCU1 switch on the tape control unit operator panel.

DRIVE MODEL = Drive model number - Defined by switches on the device adapter card (01A-A1Q2).

CUS = Defines the number of tape control units in the subsystem.

CHAN = Defines the number of channel adapters and their locations (A, B).

Microcode description display 2:

UCODE PN = Identifies the part number of the functional microcode currently loaded in the tape control unit.

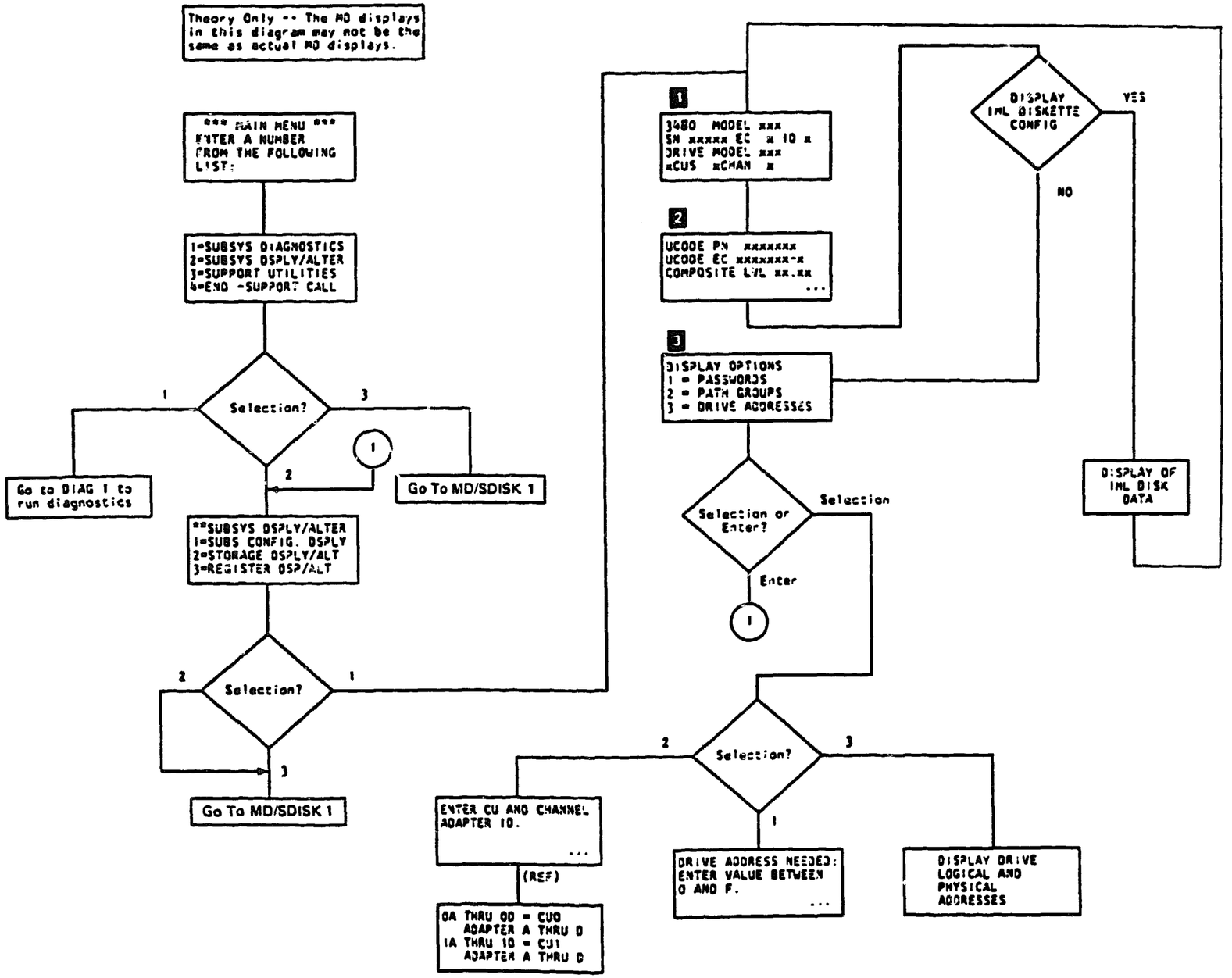
UCODE EC = Identifies the EC level of the functional microcode currently loaded in the tape control unit.

COMPOSITE LVL = Defines the linked composite of the functional microcode currently loaded in the tape control unit.

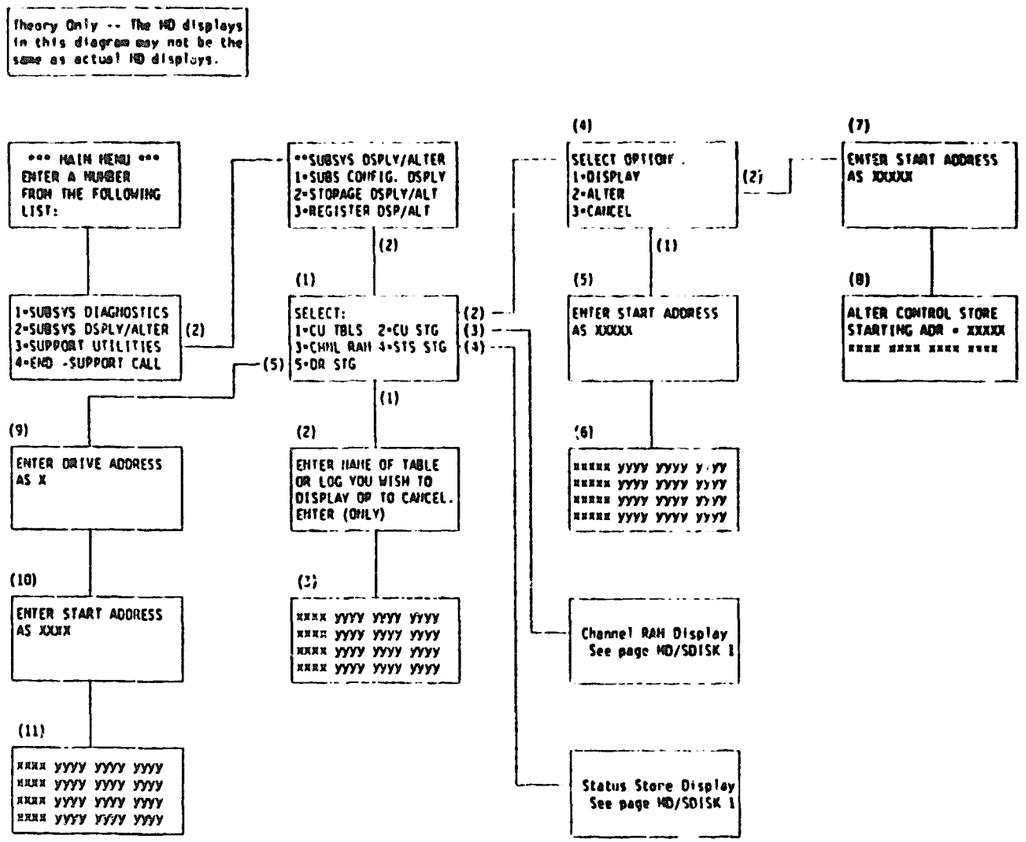
Display options display 3:

PASSWORDS = Unique passwords assigned by the host system for specified drives.

PATH GROUPS = Unique path IDs assigned by the host system for specified channel adapters.



Storage Display/Alter Diagram



Storage Display/Alter

The following procedure is used to display or alter subsystem storage, tables, and logs with the maintenance device:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 2 (SUBSYS DSPLY/ALTER).
4. Enter a 2 (STORAGE DSPLY/ALT) from the Display/Alter menu screen.
5. SELECT one of the following:

   1 = CU TBLS - Tape Control unit tables
   2 = CU STG - Tape Control unit storage (Control Storage)
   3 = CHNL RAM - Channel buffer
   4 = STS STG - Status storage
   5 = DR STG - Drive storage

Note: Display functions can be performed concurrently with customer operations. Alter functions are non-concurrent and are allowed only if the tape control unit microprocessor is stopped. You must vary all channel paths offline in the controlling computer operating system and take the tape control unit offline before performing any alter function.

Tape Control Unit Tables

To display tape control unit tables:

1. Enter a 1 (CU TBLS) when the selection screen 1 displays.
2. Enter the acronym for the table you want to display 2. For example, enter CST to display the Control Status Table. The table displays 3 in the following format:

   a. The x's represent the address of the data.

   b. The y's represent the data beginning at the xxxx address.

   Note: Refer to the Data Fields (DF) registers section of the MG for a description of the table data.

3. Press ENTER to display the next four address locations.

To exit from a table display, press the maintenance device RET (Return) key. The ENTER NAME OF TABLE 2 screen displays.

Tape Control Unit Control Storage

The subsystem display/alter function allows you to display and alter control storage for trouble analysis. This function is particularly helpful when trying to isolate intermittent problems or problems that are difficult to define.

Display Control Storage

To display control storage:

1. Enter a 2 (CU STG) when the selection screen 1 displays.
2. Enter a 1 (DISPLAY) when the select option screen 4 displays.
3. Enter the address of the first storage location (START ADDRESS) that you want to display 5. Control storage displays 6 in the following format:

   a. The x's represent the address of the data.

   b. The y's represent the data beginning at the xxxx address.

To exit from display mode, press the maintenance device RET (Return) key. The SELECT OPTION screen displays.

Alter Control Storage

Warning: Altering control storage overlays subsystem microcode. The subsystem must be offline before using the ALTER function and an IPL must be performed again before it is returned to the customer.

To alter control storage:

1. Enter a 2 (CU STG) when the selection screen 1 displays.
2. Enter a 2 (ALTER) when the select option screen 7 displays.
3. Enter the address of the first storage location (START ADDRESS) that you want to change 7.
4. When the ALTER CONTROL STORE screen 8 displays, use the MD space key to move the cursor under the byte to be altered. Input new data.

   Note: Do not press the ENTER key until all data for the screen has been entered.

To exit from alter mode, press the maintenance device RET (Return) key. The SELECT OPTION screen displays.

Drive Control Storage

The subsystem display/alter function allows you to display drive control storage for trouble analysis.

Display Control Storage

To display control storage:

1. Enter a 5 (DR STG) when the selection screen 1 displays.
2. Enter a drive address when screen 9 displays.
3. Enter the address of the first storage location (START ADDRESS) that you want to display 10. Control storage displays 11 in the following format:

   a. The x's represent the address of the data.

   b. The y's represent the data beginning at the xxxx address.

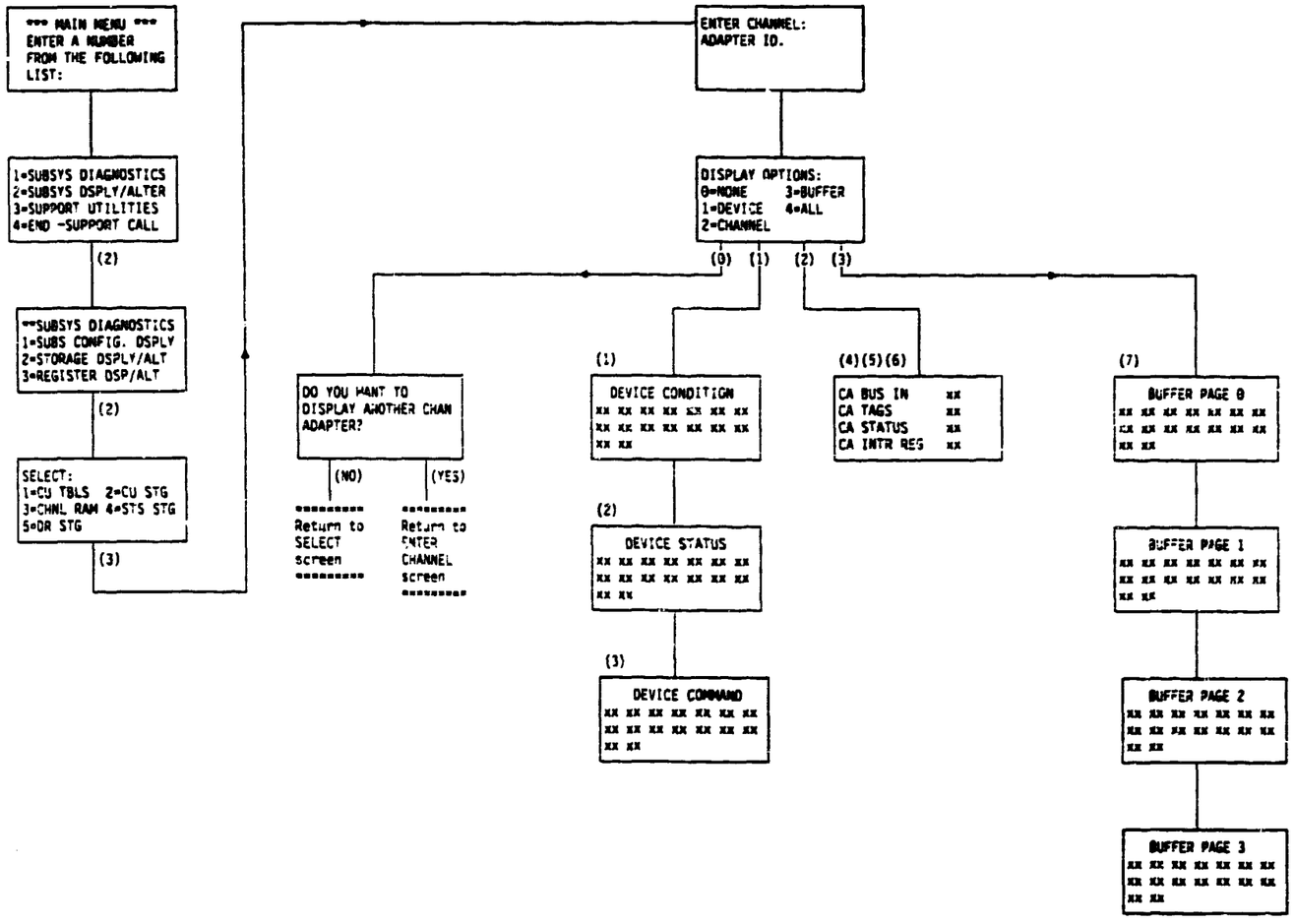
To exit from display mode, press the maintenance device RET (Return) key. The SELECT OPTION screen displays.

Note: You cannot alter drive control storage.

Subsystem Display/Alter (Continued) MD/SDISK 115

Channel RAM Display Diagram

Theory Only — The MD displays in this diagram may not be the same as actual MD displays.



Channel RAM Display

The following procedure is used to display channel buffer data:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 2 (SUBSYS DSPLY/ALTER).
4. Enter a 2 (STORAGE DSFLY/ALT) from the Display/Alter menu screen.
5. Enter a 3 (CHNL RAM).
6. Enter the channel adapter ID (A or B).
7. Select one of the following DISPLAY OPTIONS:

0 = NONE
1 = DEVICE
2 = CHANNEL
3 = BUFFER
4 = ALL

Note: One entry is used for each device starting with device 0 [1], [2], [3].

Channel RAM is initialized with:

Device Condition = X'00'
Device Status = X'20'
Device Command = X'00'

Device Condition

Device Condition bit definitions [1]:

Bits: 0, 1, and 2

000 = None
001 = CCR path 0
010 = CCR path 1
011 = Busy prime
100 = Ready prime
101 = Reserved
110 = Reserved
111 = Busy prime and ready prime

Bits: 3, 4, and 5

000 = None
001 = Contingent connection
010 = Device End, Chained
011 = Channel End, Busy, Stacked
100 = Nonsuppressible status generated
101 = Suppressible status in RAM
110 = Channel End, Not Chained, Device End not generated
111 = Channel End, Chained, Device End not generated

Device Status

Device Status bit definitions [2]:

Bit 0 - Attention
Bit 1 - Status Modifier
Bit 2 - Tape Control Unit End (CUE)
Bit 3 - Busy
Bit 4 - Channel End (CE)
Bit 5 - Device End (DE)
Bit 6 - Unit Check (UC)
Bit 7 - Unit Exception (UE)

Device Command

The eight bit device commands on the data bus from the channel [3]:

00 = Unused mode sets
08 = Read block ID
10 = Sense
18 = Sense I/O
20 = Sense path group ID
28 = Read buffered log
40 = Control Access
48 = Set path group ID
50 = Suspend multipath reconnect
58 = Read data buffer
60 = TA90 mode sets
68 = Load display
70 = Assign device
78 = Unassign device
80 = No operation
88 = Locate block
90 = Synchronize buffer
98 = Write
A0 = Read forward
A8 = Read backward
B0 = Test I/O (TIO)
B8 = Data Security Erase (DSE)
C0 = Rewind (REW)
C8 = Rewind/Unload (REWUN)
D0 = Erase Gap (ERG)
D8 = Write Tape Mark (WTM)
E0 = Forward Space Block (FSB)
E8 = Backward Space Block (BSB)
F0 = Forward Space File (FSF)
F8 = Backward Space File (BSF)

Channel Adapter Tags

Channel adapter tag bit definitions [4]:

Bit 0 - Operational In
Bit 1 - Address In
Bit 2 - Select In
Bit 3 - Request In
Bit 4 - Status In
Bit 5 - Service In
Bit 6 - Data In
Bit 7 - Disconnect In

Channel Adapter Status

Channel adapter status bit definitions [5]:

Bit 0 - Channel Adapter Offline
Bit 1 - Offline switch
Bits 2, 3, and 4

000 - Reserved
001 - Reserved
010 - Reserved
011 - Reserved
100 - Reserved
101 - Reserved
110 - 3 MB streaming

Bit 5 - Address switch parity bad
Bit 6 - Reserved
Bit 7 - Reserved

Channel Adapter Interrupt Register

Channel adapter interrupt definitions [6]:

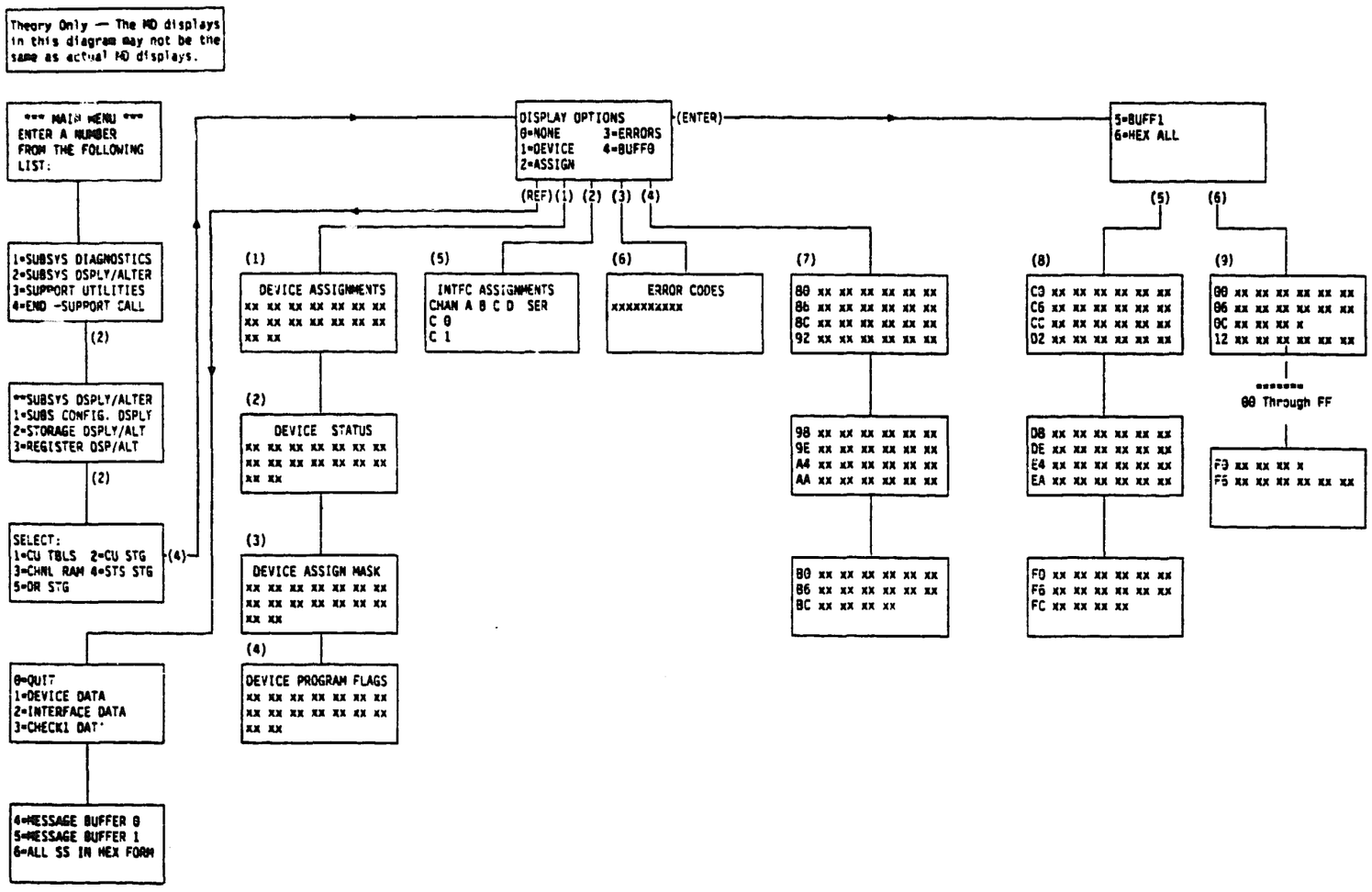
X = Drive address
00 = CCW accepted
10 = Free device
20 = Interface disconnect
30 = Selective reset
40 = System reset
41 = Put/Get command end
42 = Put/Get command out
43 = Put/Get buffer out parity error
5x = CCR - No path
6x = CCR - Buffer conditions
7x = CCR - Interrupt
8x = UC - Subsystem error
9x = UC - Command sequence
Ax = UC - Reserved other
Bx = UC - Command reject
Cx = UC - Buffer out parity error
Dx = UC - Deferred unit check
Ex = UC - Device not ready
Fx = UC - Device not file protected

Buffer Page 0, 1, 2, and 3

Buffer Page blocks contain data going to the host [7].

Subsystem Display/Alter (Continued) **MD/SDISK 120**

Status Store Display Diagram



Subsystem Display/Alter (Continued)

Status Store Display

The Status Store selection is used to display the status of the subsystem

The following procedure is used to display status storage data:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 2 (SUBSYS DSPLY/ALTER).
4. Enter a 2 (STORAGE DSPLY/ALT) from the Display/Alter menu screen.
5. Enter a 4 (STS STG).
6. Select one of the following DISPLAY OPTIONS:

   0 = NONE
   1 = DEVICE
   2 = ASSIGN
   3 = ERRORS
   4 = BUFF0

Note: Status Store is initialized to:

Device Assignment	= X'00'
Device Status	= X'0E'
Device Assignment Mask	= X'FF'
Device Program Flags	= X'00'

Device Assignments

One device assignment entry for each device starting with device 0 [1]:

80 = Tape Control Unit 0, Adapter A
40 = Tape Control Unit 0, Adapter B
08 = Tape Control Unit 1, Adapter A
04 = Tape Control Unit 1, Adapter B

Device Status

One device status entry for each device starting with device 0 [2]:

Bit 0 = Deferred unit check
Bit 1 = Not file protect
Bit 2 = Buffer assigned to tape control unit 0
Bit 3 = Buffer assigned to tape control unit 1
Bit 4 = Buffer write
Bit 5 = Buffer full/backward
Bit 6 = Buffer empty
Bit 7 = Device ready

Device Assignment Mask

One device assignment mask entry for each device starting with device 0 [3]:

80 = Tape Control Unit 0, Adapter A
40 = Tape Control Unit 0, Adapter B
08 = Tape Control Unit 1, Adapter A
04 = Tape Control Unit 1, Adapter B

Device Program Flags

One device program flag entry for each device starting with device 0 [4]:

80 = Local system reset
40 = Remote system reset
30 = CMP device deadlock state
20 = TCU0 CMP device interlock
10 = TCU1 CMP device interlock
08 = All channel paths assigned
04 = Device at BOT
02 = Initial extended contingent connection
01 = Give busy for extended contingent connection

Interface Assignments

An 'X' identifies which channel the tape control unit is using and whether it is assigned the serial bus [5].

Error Codes

This is the error code of the last recovered Check 1 error [6].

Buffer 0

This display contains tape control unit to tape control unit messages. Tape Control Unit 1 in write mode and tape control unit 0 in read mode [7]

Buffer 1

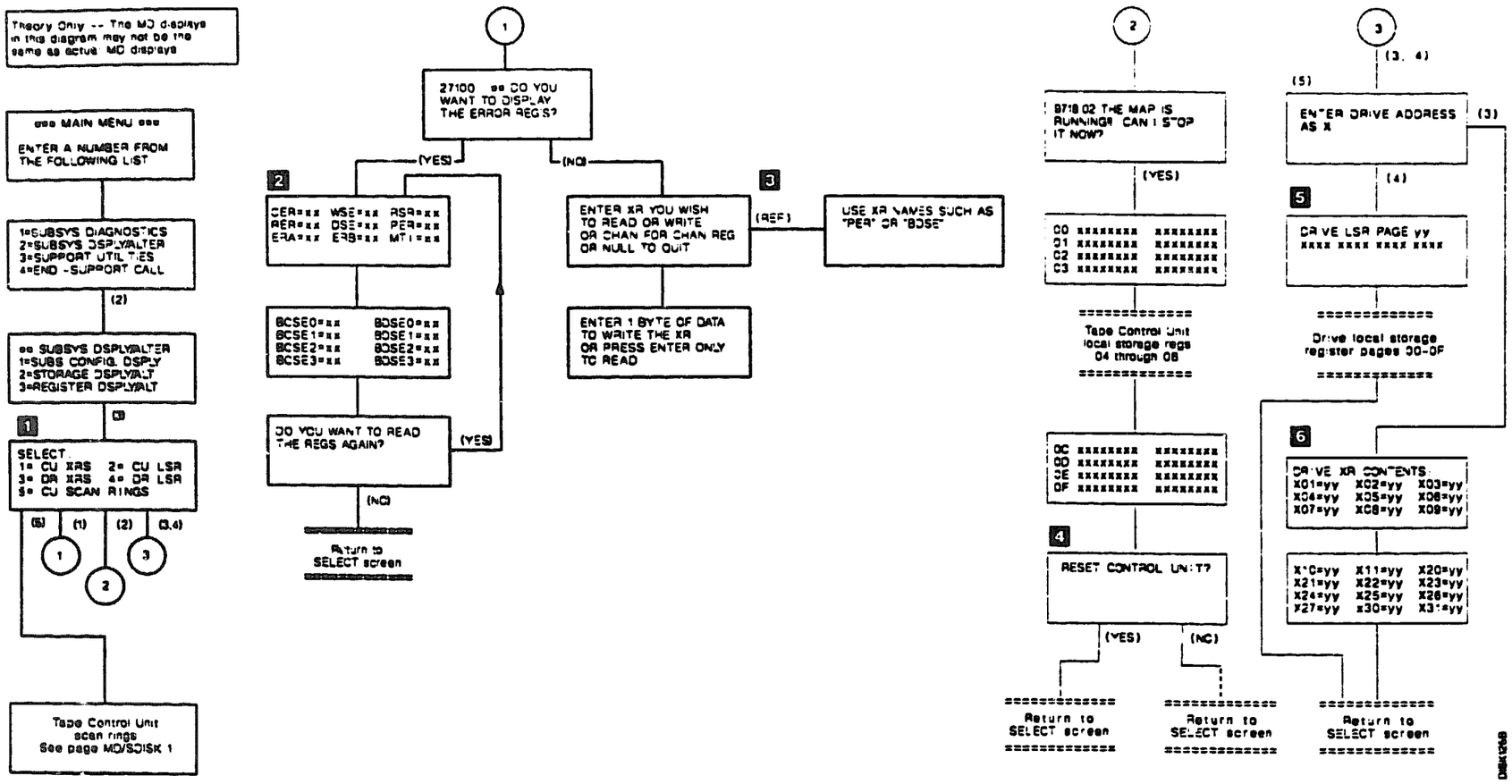
This display contains tape control unit to tape control unit messages. tape control unit 0 in write mode and tape control unit 1 in read mode [8].

Hex All

This selection provides a dump of all Status Store information (address 00 through FF) [9].

Subsystem Display/Alter (Continued)

Register Display/Alter Diagram



Subsystem Display/Alter (Continued) MD/SDISK 126

Register Display/Alter

The register display/alter routine lets you display or alter selected subsystem registers and to display the tape control unit scan rings

Note: When the alter external register function is used, a subsystem reset is needed before the subsystem can be returned to the customer.

The following procedure is used to display tape control unit external registers:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 2 (SUBSYS DSPLY/ALTER).
4. Enter a 3 (REGISTER DSP/ALT) from the Display/Alter menu screen.
5. Select one of the following [1]:

   1 = CU XRS - Tape Control Unit External Registers
   2 = CU LSR - Tape Control Unit Local Storage Registers
   3 = DR XRS - Drive External Registers
   4 = DR LSR - Drive Local Storage Registers
   5 = CU SCAN RINGS - Tape Control Unit Scan Register

The DF (Data Fields and Registers) section of the MG defines the registers that are useful when troubleshooting subsystem failures.

Error Registers

Error register definitions [ ]:

CER = Channel Error Register
RER = Read Error Register
ERA = Error Register A
WSE = Write Status Error
DSE = Device Status Error
ERB = Error Register B
RSR = Read Status Register
PER = Processor Error Register
MTI = Maintenance Tag In
BCSE = Buffer Channel Status Error Register
BDSE = Buffer Device Status Error Register

Register data fields are defined in the Data Fields (DF) register section of the MG.

Reference Screen

The reference screen [3] is obtained by pressing the MD keyboard/display REF key. The screen is used for prompting and to ensure that correctly formatted data is entered.

Note: See the DF section of the MG for XR names, pages, and addresses.

Reset Tape Control Unit

The tape control unit can be reset by answering yes to the question displayed on this screen [3]:

YES - Resets the tape control unit and forces a return to the SELECT screen.

NO - Forces a return to the SELECT screen.

Display Drive LSRs and XRs

Before you can display drive XRs [2] or LSRs [3], the functional microcode must be running and the drive must be available to the MD (not assigned to a host processor).

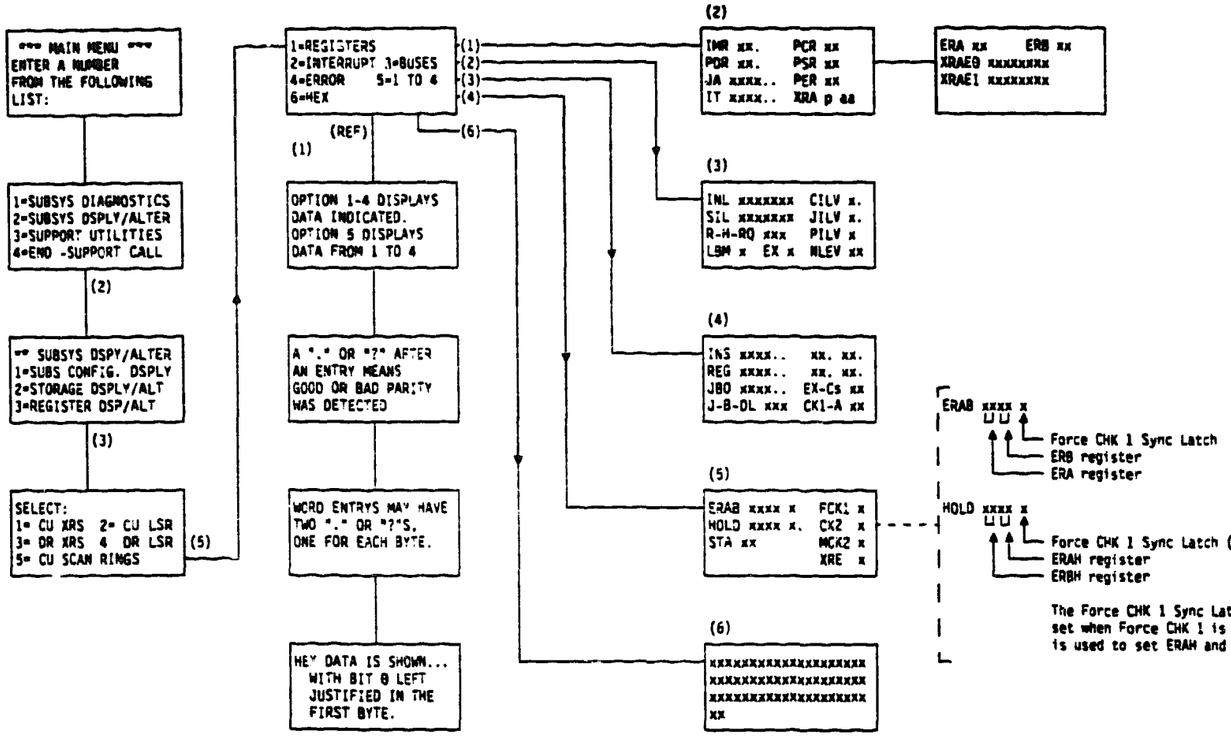
Notes:

1. See the DF section for definitions of pertinent drive XR bits.
2. Unless indicated in a specific diagnostic, the contents of the external registers may be different from the original diagnostic display.

Subsystem Display/Alter (Continued)

Tape Control Unit Scan Rings Diagram

Theory Only -- The MD displays in this diagram may not be the same as actual MD displays.



Tape Control Unit Scan Rings

The Tape Control Unit Scan Ring routine allows you to display registers, interrupts, buses and error information when a Check 1 error condition exists.

The following procedure is used to display tape control unit scan rings:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 2 (SUBSYS DSPLY/ALTER).
4. Enter a 3 (REGISTER DSP/ALT) from the Display/Alter menu screen.
5. Enter a 5 (CU SCAN RINGS).
6. Select one of the following:

   1 = REGISTERS
   2 = INTERRUPT
   3 = BUSES
   4 = ERROR
   5 = 1 TO 4
   6 = HEX

Note: Scan ring data will not be valid unless a Check 1 condition exists.

Registers

The following registers are displayed 5 when the REGISTERS option is selected:

IMR = Interrupt Mask Register
PDR = Processor Diagnostic Register
JA = Processor Address high and low
IT = Interval Timers A and B
PCR = Processor Control Register
PSR = Processor Status Register
PER = Processor Error Register
XRA = External Register Address
p = page
aa = address
ERA = Error Register A (Ck 1)
ERB = Error Register B (Ck 1)
XRAE = External Register Address Extended

Note: The Data Fields (DF) section of the MG defines the registers that are useful when troubleshooting subsystem failures.

Interrupt

The following interrupt information is displayed 1 when the INTERRUPT option is selected:

INL = Interrupt Latches
SIL = Sample Interrupt Latches
R-H-RQ = Return, Hold, and Request Latches
LBM = Level Before Master Mask
EX = Extended Operation
CILV = Current Interrupt Level
JILV = Pending Processor Interrupt Le
PILE = Previous Interrupt Level
NLEV = New Interrupt Level

Buses

The following bus information is displayed 2 when the BUSES option is selected:

INS = Instruction register and source high/low. xx xx equals the location of the register (CS CS).
REG = Fetch Register. xx xx equals the location of the register (XR XR).
JBO = Processor Bus Out
J-B-DL = Jump, Blowout, and Disable LSR
Ex-CS = Extended Operations and Cycle Steal delayed latches
CK1-A = First bit on indicates that a Check 1 error latch is on. Second bit on indicates that multiple error latches are on.

Error

The following error information is displayed 3 when the ERROR option is selected:

ERAB = Error Registers A and B
HOLD = Holding registers for ERA and ERB (ERAH and ERBH). Indicates the condition that caused the first check 1 error.
STA = Scan only register; used to load CRR and ERR registers.
FCK1 = Force Check 1 on
CK2 = Check 2 on
MCK2 = Microprocessor Check 2
XRE = External Register Error

Hex Display

A Hex display of the scan rings is provided 6 when the HEX option is selected.

MD Reference Key

Provides prompting and information 7 about the option screen selections.

MD Support Utilities MD/SDISK 140

Introduction

The following support utilities are selected from an MD support diskette utilities menu:

- Trace/Match control
- Microprocessor control
- Subsystem dump.

Trace/Match Control

The TCU Trace/Match Control program gives you the ability to perform a microcode trace. It lets you stop or record specific error conditions and microcode data fields. The utility provides MG-defined data that aids you when isolating machine malfunctions. Trace/match control will run in concurrent and non-concurrent maintenance modes; however, running this option in concurrent mode may affect system operation. Cautions that must be observed when running in concurrent mode are noted in the Trace/Match Control Procedure Details.

Microcode control options affect subsystem performance. All options except 1, 2 and 9 are reset when exiting from the utility.

Microprocessor Control

Note: The microprocessor control functions may cause errors at the host system.

The MD support diskette contains programs that provide field engineer panel-like functions. The following functions may be selected to supply microprocessor control from the MD keyboard/display:

- Microprocessor reset
- Microprocessor start
- Microprocessor stop
- Microprocessor instruction step
- Address compare/stop
- Force branch
- Set/reset ignore error
- Set/reset check stop
- Set/reset check 2 = check 1
- Reset maintenance control register.

Subsystem Dump

The Subsystem Dump program dumps tape control unit or drive data fields and registers from the subsystem onto the support diskette dump area. The dumped data will be analyzed by your next level of support.

Sources of data for the tape control unit dump are the functional diskette and control store.

Selecting TCU dump will cause the MD to automatically search for dump files, posting information to the keyboard display.

All dump activity is attempted in the concurrent mode (functional microcode running). If the functional microcode is not running, the MD will default to the non-concurrent mode, posting informational messages on the keyboard display.

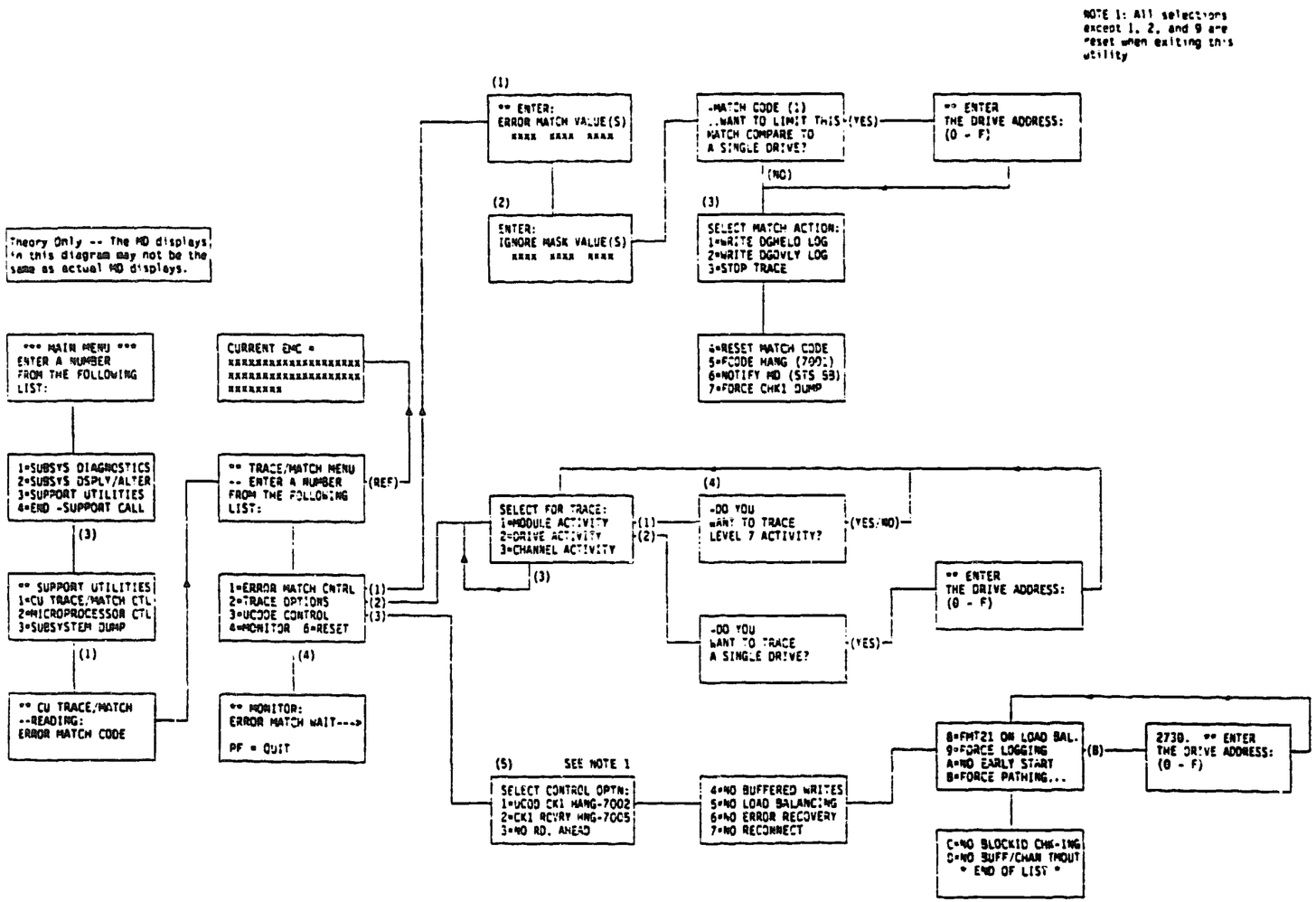
The functional diskette dump file contains information relative to microcode generated or recovered check 1 conditions. Generally speaking, it is historical data.

Dump files taken from tape control unit storage are files representing current conditions (at time of dump).

MD Support Utilities (Continued)

Trace/Match Control Diagram

Note: See the warnings and notes on the facing page to review what effects this program has on the tape subsystem and host system before using trace/match control.



Trace/Match Control

The Trace/Match Control Utility Program provides prompting for setup data that is used to specify actions to be taken when selected hardware or microprogram errors occur. The match values can be specified for all drives connected to a control unit or limited to a single drive.

After the match values and options have been specified, the MD monitor function can be given control. Its purpose is to wait for a signal from the subsystem that indicates that an error match has occurred. The monitor wait function can be terminated by pressing the PF key on the MD keyboard/display.

A Display Error Match Code command is periodically sent to the functional microcode's diagnostic monitor to detect stops, hangs, or Check 1 errors. If one of these conditions occur, an error message is displayed on the MD keyboard/display.

When a match action, control option, or trace option is asked for, more than one selection can be specified. The selection process is ended by pressing the ENTER key.

Note: When a selection is entered on the trace/match menu, select for trace, select match action, or select control option screens, an asterisk (*) replaces the equal (=) sign on the item line to indicate that the item has been selected.

The following procedure is used to run the trace/match control utility:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 3 (SUPPORT UTILITIES).
4. Enter a 1 (CU TRACE/MATCH CTL) from the support utilities menu screen.
5. Press ENTER after the CU TRACE/MATCH READINGS screen displays.
6. Select one of the following from the trace/match menu screen:

   1 = ERROR MATCH CNTRL
   2 = TRACE OPTIONS
   3 = UCODE CONTROL
   4 = MONITOR
   8 = RESET.

Note: The Error Match codes are reset when the tape control unit is IML'ed. Switching a tape control unit online in a dual tape control unit subsystem will cause its options to be replaced with the options of the online tape control unit.

Error Match Control

Error Match Value

The error match value [1] is compared to the current microcode error code (current EMC)

Ignore Mask Value

The Trace/Match Control Program ORs this ignore mask value [2] with the error code from the subsystem and the error match value [1]. As a result, any bit that is on in the ignore mask is treated as a don't care bit because the OR operation sets the bit on. If the ignore mask value is hexadecimal FFFF, a match is found for any error code.

An example of the way the ignore mask value works is:

Error Match Value	0800	Error Code Value	08nn
Ignore Mask Value	00FF		00FF
ORed Value	08FF		08FF

In the example, the two ORed values match because the OR function forces the low order bytes to match. Of course, you can set the ignore mask to any value necessary to select the group of error codes you want.

Select Match Action

The Select Match Action screens [3] provide the following selections:

WRITE DGHELO LOG: External registers will be stored when an error code is matched.

WRITE DGOVLY LOG: The sense error history log data will be stored when an error code is matched.

STOP TRACE: All tracing stops when a matching error code is found.

RESET MATCH CODE: The matching "Error Match Code" entry will be reset after a match is found.

FCODE HANG: The microprocessor will hang at 7001 when an error is matched. See Note 1.

NOTIFY MD: The microcode alerts the MD via a present status order when the error code is matched.

FORCE CHK1 DUMP: When the error code is matched, a CHK1 dump will be written in the logging area of the functional diskette.

Trace Options

Trace options are provided to permit tracing of the microcode activity if microcode problems are suspected.

Ucode Control

Select Control Options

The Select Control Option screens permit selecting the following options [5]:

Note: Select Control Options affect tape control unit operations; therefore, all drives will also be affected.

- UCOD CK1 HANG-7002: Will not force a Check 1 error. If a Check 1 error occurs, it will hang at 7002. See Note 1.
- CK1 RCVRY HANG-7005: Forces a Check 1 error and will hang at 7005 before error recovery starts. See Note 2.
- NO RD. AHEAD: No read ahead operations will be done by the tape control unit. See Note 3.
- NO BUFFERED WRITES: All write commands are interpreted as tape writes. See Note 3.
- NO LOAD BALANCING: This tape control unit will not initiate a Load Balance, but may receive Load Balance jobs from the other tape control unit. See Note 3.
- NO ERROR RECOVERY: Error recovery operations will not be activated if an error is detected. See Note 4.
- NO RECONNECT: Use of the reconnect timer (IT0) is inhibited. See Note 3.
- FMT21 ON LOAD BAL: When the FMT21 bit is sent, the buffered log will be off-loaded when a drive is load balanced to the other tape control unit.
- FORCE LOGGING: Sense data is sent to the host when an error occurs. (See CE/HSC 1 for turn on/off instructions.)
- NO EARLY START: Use of the early start timer (ITD) and device selection over the serial interconnection is inhibited. See Note 3.
- FORCE PATHING: This function forces the subsystem to use this tape control unit's buffer for the transfer of data to and from a selected drive. The MD prompts the user for the drive address. After the function is active, a flashing message appears on the MD screen.
- NO BLOCKID CHK-ING: Unit checks caused by invalid block IDs detected during read operations are inhibited.

  Warning: This option must never be used in concurrent maintenance mode because data integrity of the subsystem can be affected.
- NO BUFF/CHAN TMOUT: Disables the eight second buffer-channel no activity microcode timer.

Monitor

This function monitors error match conditions that were previously defined in "Error Match Control."

Reset

This function CLEARS/RESETS all Trace Match functions that were previously selected.

Notes:

1. When an error occurs, this option will hang the entire subsystem (non-concurrent maintenance) and can hang the host system waiting for a response from the subsystem.
2. An error will cause the subsystem to hang (non-concurrent maintenance). However, the host system will receive a disconnect and will continue its processing without this subsystem.
3. This option can be used in concurrent maintenance mode, but subsystem performance for drives not under test will be affected.
4. In concurrent maintenance mode, errors normally recovered by the subsystem will be logged by the host as permanent errors. Subsystem performance will not be affected, but host throughput will, because the host will be performing its own error recovery actions more frequently for errors that are normally handled by the subsystem.

MD Support Utilities (Continued)

Microprocessor Control

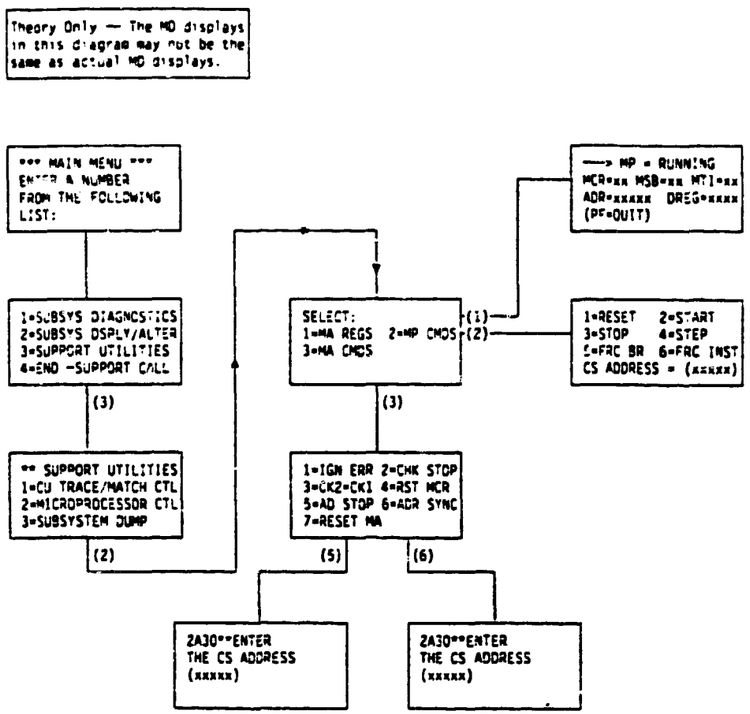
- This utility permits controlling
  - Maintenance Control Register (MCR)
  - Microprocessor commands
  - Control storage commands
  - Maintenance Adapter commands.
- Host or channel errors may occur if the utility is run during concurrent maintenance mode.

Note: See the warnings on the following page to review what effects this program has on the tape subsystem and host system before using microprocessor control.

The following procedure is used to run the microprocessor control utility:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 3 (SUPPORT UTILITIES).
4. Enter a 2 (MICROPROCESSOR CTL) from the support utilities menu screen.
5. Select one of the following:

   1 = MA REGS - Maintenance Adapter Registers
   2 = MP CMDS - Microprocessor Commands
   3 = MA CMDS - Maintenance Adapter Commands.



The following procedures describe the flow and MD display screen content for each selectable path of the microprocessor control utility. Each path starts at the utility's selection screen.

Display Maintenance Adapter Registers

```
SELECT:
1=MA REGS  2=MP CMDS
3=MA CMDS
```

- Selections:
  - 1 = Product Maintenance Adapter Registers
  - 2 = Microprocessor Commands
  - 3 = Maintenance Adapter Commands

Enter a 1: The following screen displays current MA register status:

```
---> MP = RUNNING
MCR=xx MSB=xx MTI=xx
ADR=xxxx   DREG=xxxx
(PF=QUIT)
```

- ---> MP
  - RUNNING = Microprocessor is executing instructions
  - STOPPED = Microprocessor is stopped

  Note: This display flashes and register content is updated if the microprocessor is running and no error bits are on in the maintenance status byte (MSB) register (bits 4, 5, or 7).
- MCR (Maintenance Control Register)
  - Bit 0: Ignore errors
  - Bit 1: Address compare stop
  - Bit 2: Check Stop
  - Bit 3: Check 2 = Check 1
  - Bit 4: Address compare sync
- MSB (Maintenance Status Byte)
  - Bit 0: Spare
  - Bit 1: Status modifier - Always inactive
  - Bit 2: Extended Op in progress - MP executing in extended Op.
  - Bit 3: Address compare equal - Match between the address entered from the MD and the control storage address.
  - Bit 4: Check 1/Processor error - Hard error that affects the integrity of the tape control unit.
  - Bit 5: MP stopped - MP has been stopped by a Check 1 condition or by a Stop MP command from the MD.
  - Bit 6: Instruction executed - MP read an instruction from control storage during the last microprocessor cycle.
  - Bit 7: Error, MTI data stored - Error data is stored in the MTI register and is available to the MD.
- MTI (Maintenance Tag In)
  - Bit 0: MA Request/MA response - Indicates that another byte of information is available to the MP, or that the MA is ready to receive another byte. Also used to acknowledge "MP Status Out" or "Data" received from the MP.
  - Bit 1: Data transfer - Active during data transfer to and from the MP.
  - Bit 2: MD enabled - MD is on-line and enabled
  - Bit 3: FRU 1 - Microprocessor card
  - Bit 4: FRU 2 - External register user card
  - Bit 5: FRU 3 - Maintenance adapter card
  - Bit 6: FRU 4 - Maintenance device
  - Bit 7: Check 1 error recovery - Code currently executing is the result of a Check 1 error.
- ADR: Control program instruction address
- DREG: Control program data register

Microprocessor Commands

```
SELECT:
1=MA REGS  2=MP CMDS
3=MA CMDS
```

Enter a 2: The following screen displays microprocessor command controls.

Warning: The following selections should be used in non-concurrent maintenance mode only.

```
1=RESET   2=START
3=STOP    4=STEP
5=FRC BR  6=FRC INST
CS ADDRESS = (xxxx)
```

- RESET: Resets the MP and forces a level 0 interrupt.
- START: Starts the MP at the next logical instruction.
- STOP: Stops the MP. Must be done before force branch, force instruction, step, control storage, reset, or MA commands can be used.
- STEP: Allows MP to run in a single instruction mode.
- FRC BR (Force Branch): Transfers control to the address loaded in the MA data register.
- FRC INST (Force Instruction): Puts the instruction loaded in the data register on the data bus. MP may be stepped to execute the instruction.
- CS ADDRESS: Displays the control storage address that was current at the time the menu displayed.

Maintenance Adapter Commands

```
SELECT:
1=MA REGS  2=MP CMDS
3=MA CMDS
```

Enter a 3: The following screen displays MA command controls:

Warning: The following selections should be used in non-concurrent maintenance mode only (except ADR SYNC and RESET MA).

```
1=IGN ERR 2=CHK STOP
3=CK2=CK1 4=RST MCR
5=AD STOP 6=ADR SYNC
7=RESET MA
```

- IGN ERR: Ignore error
  - Prevents the microprocessor from stopping when a hard (Check 1) error is detected
  - Turns MCR bit 0 on
- CHK STOP: Check stop
  - Prevents the microprocessor from restarting after a Check 1 error
  - Turns MCR bit 2 on
- CHK2=CHK1: Check 2 = Check 1
  - Allows a Check 2 error to be handled as a Check 1 error
  - Turns MCR bit 3 on
- RST MCR: Reset Maintenance Control Register
  - Resets all MCR bits
- AD STOP: Address Stop
  - Causes the microprocessor to stop when the address compare equal latch comes on
  - Turns MCR bit 1 on
- ADR SYNC: Address Synchronize
  - Turns MSB bit 3 on when the address compare equal latch comes on when the address selected is executed.
  - Causes a sync pulse to be generated on the '+ Address Compare Signal' line (MA003, 01A A1E2 Z12) when the address selected is executed.
  - Microprocessor does not stop.
- RESET MA: Reset Maintenance Adapter
  - Resets the ignore error, check 2 equals check 1, and check stop bits in the maintenance control register (MCR)
  - Resets the maintenance tag in (MTI) register
  - Resets the force-branch function
  - Resets the maintenance adapter level 0 interrupt request

MD Support Utilities (Continued)

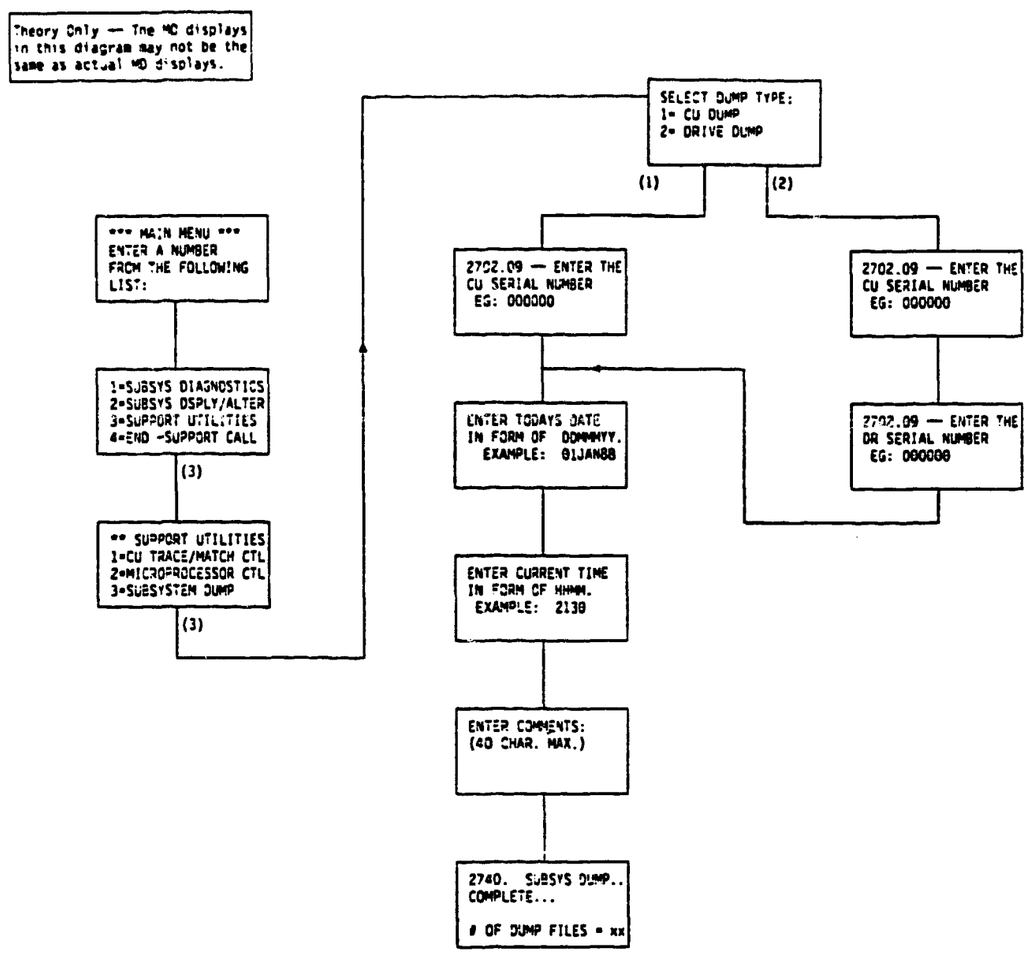
Subsystem Dump

Dump files may be created for the tape control unit, the drive or from the CHK1DMP file on the functional diskette. This interactive utility will assemble the data from the selected area and move it to the MD support diskette. Dump functions are available in the concurrent (microcode operational and running) or non-concurrent modes (microcode stopped or hung). The CHK1DMP file from the diskette is only available in the concurrent mode. The MD will automatically try the concurrent mode first as this mode is faster and then default to the non-concurrent mode.

Multiple dump files may be taken and stored on the MD diskette. An error message will display if the dump area is full. The user may then choose to overwrite (destroy) existing dump files. The MD creates a dump header file which defines the actual location of the dump data on the diskette.

The following procedure is used to run the subsystem dump utility:

1. Insert and IPL the MD support diskette.
2. Press ENTER until the main menu selection screen displays.
3. Enter a 3 (SUPPORT UTILITIES).
4. Enter a 3 (SUBSYSTEM DUMP) from the support utilities menu.
5. Select the type of dump needed.
   1 = Tape Control Unit storage dump
   2 = Drive storage dump
6. Follow instructions provided by the MD.



Tape Lifter Solenoid Response Checking Procedure

This procedure is used to check the response time of the tape lifter solenoid. A dual trace oscilloscope is needed for this checking procedure

The dropout response time of the tape lifter solenoid is measured from the time the tape lifter solenoid is electrically turned off (the dropping of '+ lifter on'), until the start of read signal. This dropout response time must be longer than 2.5 milliseconds but not longer than 14 milliseconds.

CE Panel connected to TCU0		CE Panel Connected to TCU1	
Drive Addr 0 7	Drive Addr 8 F	Drive Addr 0 7	Drive Addr 8 F
Probe #2 on H2D07	Probe #2 on H2B07	Probe #2 on H2B07	Probe #2 on H2D07

Response Checking Procedure:

1. Oscilloscope setup:
   - chop
   - sync minus (-) on probe #1
   - 2 msec/div
   - trigger minus (-).
2. Place probe #1 on logic board 02A-A1C1E11 ('+ lifter on' signal). Sync the oscilloscope minus on this signal.
3. Place probe #2 on the logic board pin you select from the chart on this page.
4. Observe the time (labeled 'A' in the scope figure on this page) from the start of the trace ('+ lifter on' signal going minus), until the start of read signal on the read bus.

This time must be longer than 2.5 milliseconds but not longer than 14 milliseconds.

5. If the time (A) is longer than 14 milliseconds, the solenoid is dropping too slowly (suspect a defective solenoid).
6. If the time (A) is shorter than 2.5 milliseconds, the solenoid is dropping too rapidly (suspect loss of air to the lifter or a defective solenoid).
7. Correct operation of this check can be verified by pinching the air hose between the solenoid and lifter while observing the oscilloscope trace. (This will shorten the time required for the read signal to stabilize on the read bus.)
8. Observe that the read signal amplitude does not vary after the point of data stabilization. The time between start of read signal and the point of data stabilization may vary from drive to drive.

Maintenance Device/Maintenance Adapter Diagnostic

This diagnostic tests the communication path between the maintenance device and the maintenance adapter card in the tape control unit. The diagnostic tests the cables and the part of the maintenance adapter card that communicates with and responds to the MD.

When the maintenance device/maintenance adapter diagnostic is selected (selection 4 on the subsystem diagnostics screen), all tests are automatically run. When the diagnostic stops, one of the following screens will be displayed:

- Test complete screen
- Tag active screen (failure ID = MD1020)
- Function error screen (failure ID = MD2025).

Pressing Enter from any of these screens takes you to a selection screen.

Selection Screen

```
** SELECT: 1.RESTART
2.PUT TEST 3.GET TST
4.OPEN TEST
5.STATUS OUT TEST
```

This screen permits you to select the tests you want to run. Selection 1 restarts the complete maintenance device/maintenance adapter diagnostic. The other selections run the tests identified. PF1 stops the tests and returns you to the main menu.

Open Test

This test shifts a data byte of hexadecimal 5A from the maintenance device through the maintenance adapter shift register.

Put Test

This Test sends a hexadecimal 55 (Load Data Reg 1) command to the maintenance adapter with a data byte of hexadecimal 5A.

Get Test

This test sends a hexadecimal 5E (Unload The MTI Reg) command to the maintenance adapter and receives a data byte of hexadecimal 20.

Status Out Test

This test sends a data byte with bad parity to the maintenance adapter and checks that the maintenance adapter signals that the byte is wrong.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
MD1020	MD display lines 2-4 indicate that one or more inbound signal lines are active (zero volts). This error message will vary depending on the state of each signal line named.	An active level (zero volts) on 'status in' will force 'read' active. 'Status in' is controlled by the MD. Test this line at the maintenance adapter card if 'read' is active. These signal lines may be held active (zero volts) by the microcode in the TCU. To eliminate this as the cause of the problem, do a power on reset (POR) to the tape control unit by removing the functional diskette, and pressing the IML switch. The test may be restarted by pressing enter on the MD keyboard and responding "YES" to the "RETRY" message.	FRU115 FRU117 FRU135 FRU169	MD1020 ** ERROR MD 'WRITE' ACTIVE MD 'READ' ACTIVE MD 'STS OUT' ACTIVE
MD1035	The program detected that an internal MD failure has occurred.	Replace the MD.	MD	MD1035 ** ERROR THE MD IS FAILING
MD1025	The Port function indicated by the 'xxxx' OPEN, PUT, GET, and STAT. The error Status Byte (aa) definition is: 48 = Timed out waiting for the function to complete. (Caused by a missing signal.) 81 = If the 'xxxx' field = OPEN, this status byte means the serial data path has failed. If the 'xxxx' field = PUT, GET, or STAT, this sense byte means an error condition occurred. (Caused by an unexpected active signal.)	1. Execute the MD diagnostic tests. 2. See EAD 1 for E103 errors. 3. See OPER 1, "Maintenance Device to TA90 Maintenance Adapter Communication Path," for the signal lines used during the OPEN, PUT, GET, AND STAT tests. Use this information to find the failing line, and use the status byte (aa) to show what type of failure occurred on that line.	FRU115 FRU117 FRU134 FRU135 FRU169	PORT 'xxxx' FAILED.. STAT= aa (ENTER = LOOP) xxxx = OPEN PUT GET STAT aa = Status Byte

Basic Tape Control Unit Test

The purpose of the basic tape control unit test is to ensure that the maintenance adapter, processor, and control storage functional areas operate correctly.

This test consists of two major sections. The first section uses the maintenance adapter to MD interconnection to test:

- The MA data and address registers
- The tape control unit control storage data bus
- All control storage address bus
- The tape control unit microprocessor's ability to execute the resident IML microcode.

The IML microcode will detect errors in the microprocessor, external registers, and control storage areas.

The second section of the test loads and executes all the basic support micro-diagnostics that are defined in E010 - TCU Functions Test (see MD/SDISK 1).

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3 and 1-4 for the names and locations of the FRUs.

```
*** MAIN MENU***
ENTER A NUMBER
FROM THE FOLLOWING
LIST:
```

```
1=SUBSYS DIAGNOSTICS
2=SUBSYS DSPLY/ALTER
3=SUPPORT UTILITIES
   *END OF LIST*
```

```
 1=SELECTED DIAG.
 2=BASIC TCU TESTS
 3=DR CMD EXERCISER
 4=MD/MA DIAG
```

```
27100  ** DO YOU
WANT TO LOOP THE
DIAGNOSTICS
```

If 'no' is the answer, the TCU Basic and E010 linked tests run one pass.

If 'yes' is the answer, the TCU Basic and E010 tests will run on the first pass, and on the second and succeeding passes only E010 will run.

If no failures are detected, the following message is displayed after the diagnostics have completed: 'BASIC TCU DIAG RAN ERROR FREE'.

Basic TCU Test Messages

```
****
TESTING THE MA REGS

TEST DATA=xx
```

xx Test data is:

00
FE
AA
55
B2
C4

```
****
TESTING CONTROL
STORAGE . .
PATTERN=xxxx
```

xxxx Test data pattern is:

0000
FEFE
AAAA
5555
B2B2
C4C4

```
****
RUNNING THE IML

DIAGNOSTICS
```

```
** TCU BASIC TEST
RAN ERROR FREE
```

Basic Tape Control Unit Test (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see the EAL 1 for error code Fnnn.		
CB1023	MD display line 1 can also show: CB1023 **DATA COMPARE. Data is written to and read back from four maintenance adapter card registers (rrrrr). If the EXPECTED data equals the ACTUAL data, the parity bit (which is not shown) is causing the error.	1. Remove the functional diskette from the tape control unit, press the IML switch to cause a power on reset. 2. Respond YES to the RETRY message on the MD display to restart the test.	FRU115 FRU169 FRU139	CB1023 **DATA PARITY ERROR.. (rrrrr) EXPECTED DATA = (xx) ACTUAL DATA = (xx) rrrrr = DREG1 DREG2 AREG1 AREG2
CB1025	MD display line 1 can also show: CB1025 **ADDR PARITY CB1025 **DATA PARITY CF1025 **CS DATA BUS Data is written to and read back from control store, and the EXPECTED and ACTUAL values are displayed if an error occurs. If the EXPECTED data equals the ACTUAL data, the parity bit (which is not shown) is causing the error.	See the FSI section for error code E100.	FRU134 FRU135 FRU115 FRU117 FRU139	CB1025 **ADDRESS BUS ERROR.. EXPECTED = (xxxx) ACTUAL = (xxxx)
CB1026	The extended operation bit in the maintenance status byte (MSB) register did not reset after a 'Stepmp' operation.	1. Remove the functional diskette, then press the IML switch to cause a power-on reset. 2. Select and run the "Basic TCU Test" option again. 3. Check the top card connectors on the logic card FRUs listed for this error.	FRU117 FRU115 FRU139	CB1026 ** MP FAILURE . . .
CB1027	The instruction executed bit in the maintenance status byte (MSB) register did not activate after a Force Instruction and 'Stepmp' command operation.	1. Remove the functional diskette, then press the IML switch to cause a power-on reset. 2. Select and run the "Basic TCU Test" option again. 3. Check the top card connectors on the logic card FRUs listed for this error.	FRU117 FRU115 FRU139	CB1027 ** MP FAILURE . . .
CB1028	MD display line 2 can also show: ERROR..**ADDR PARITY A reset is issued to the MP followed by two 'Step' commands. This results in a hardware forced branch to address 0000 and the execution of the first PROM instruction. If the EXPECTED data equals the ACTUAL data, the parity bit (which is not shown) is causing the error.	Go to the PWR section, "MAP 0100--Power Start," entry point A, and follow the power MAPs. Run diagnostic 'E010'. Check the top card connectors on the logic card FRUs listed for this error.	FRU117 FRU115 FRU139	CB1028 ** MP RESET ERROR..**INVALID ADR EXPECTED = (xxxx) ACTUAL = (xxxx)

Basic Tape Control Unit Test (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see the EAD 1 for error code Fnnn.		
CB1036	This error is generated by the PROM diagnostic program that tests TCU Control Storage. MD display line 2 will contain a "#CK1" if a check 1 condition occurred. Register data is defined in the maintenance guide DF section.	Run diagnostic E010.	FRU135 FRU134 FRU115 FRU117 FRU139	CB1036 ** CS FAILURE ERA=aa) ERB=bb) #CK1 DATA ADDRESS= (xxxx) DATA PATTERN= (xxxx)

CB1037	This error is generated by the PROM diagnostic program while testing basic TCU functions.
	
	MD display line 2 will contain a "#CK1" if a check 1 condition occurred.
	
	Register data is defined in the maintenance guide DF section.
		Run diagnostic E010.	FRU117
			FRU115
			FRU121
			FRU085
			FRU114
			FRU120
			FRU116
			FRU119
			FRU188
			FRU139
				CB1037 ** MP FAILURE
				ERA=aa) ERB=bb) #CK1
				XRA=xx) MTI=tt)
				PSR=pp PCR=cc PER=ee

CB1038	This error is generated by the PROM diagnostic program while testing basic TCU functions.
	
	MD display line 2 will contain a "#CK1" if a check 1 condition occurred.
	
	Register data is defined in the maintenance guide DF section.
		See EAD 1 for error code Fnnn.
		
		XR errors can cause ERA and ERB errors. Use routine EE85 to check the ERA and ERB registers.
		
		Run diagnostic E010.
			FRU121
			FRU118
			FRU117
			FRU115
			FRU114
			FRU120
			FRU119
			FRU116
			FRU124
			FRU135
			FRU157
			FRU158
			FRU159
			FRU139
				CB1038 ** XR FAILURE
				ERA=aa) ERB=bb) #CK1
				XRA=xx) MTI=tt)
				PSR=pp PCR=cc PER=ee

CB1041	An error occurred while trying to read error data from the tape control unit.	1. Remove the functional diskette from the tape control unit; press the IML switch to cause a power on reset. 2. Respond YES to the RETRY message on the MD display to restart the test. See DIAG 1 for "Maintenance Device/Maintenance Adapter Diagnostic."	FRU115 FRU117 FRU169 FRU139	CB1041 MA CONNECTION ERROR.. -RESET THE CU. (ENTER = RETRY)
CB1045	The PROM diagnostic failed to complete successfully, and the error code is invalid.	1. Remove the functional diskette from the tape control unit; press the IML switch to cause a power on reset. 2. Press the enter key on the MD. 3. Select and run the "Basic TCU Tests" option again.	FRU115 FRU117 FRU169 FRU139	CB1045 **INVALID IML ERROR CODE = (xxxx) . .

Processor Function Test - Routine EE12

Prerequisite diagnostics must run without failure before this diagnostic is run. See MD/SDISK 3, "PREREQUISITE DIAGNOSTICS."

This routine provides a general check of the microprocessor data flow, including:

- Branching
- Local storage access and storage capabilities
- Paths to external registers
- Control storage access and storage capabilities.

Routine Start Address: 2010

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Error Displays

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the keyboard/display.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
HC2021	Failure occurred when testing branch conditions for active and reset conditions.	1. Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE12 again. 2. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. Also see action number 4 of this Additional Actions column. 3. If PSR bit 0 = 1, see EAD 1 for error code Fnnn. 4. If a diagnostic failure occurs and no errors are detected by the hardware, see the FSI section for error code E100 and perform the procedures for the microprocessor and control storage. 5. XR errors (PSR bit 0 = 1) can cause ERA and ERB errors. Use diagnostic EE85 to check the ERA and ERB registers.	FRU121 FRU118 FRU117 FRU115 FRU114 FRU120 FRU119 FRU116 FRU134 FRU135 FRU157 FRU158 FRU159 FRU139	nnnnnn ERA ACT = xx,EXP= yy ERB ACT = xx,EXP= yy PSR ACT = xx,EXP= yy PER ACT = xx,EXP= yy MTI ACT = xx,EXP= yy XRA ACT = xx,EXP= yy MDI= md,WR= dw,RD=dr MACHINE FAILURES MAY CAUSE CURRENT ERROR DATA TO BE INVALID. SEE DIAG 1 "VERIFY". This screen is explained on MD/SDISK 6. nnnnnn = Failure ID xx = The actual contents of the external register yy = The expected contents of the external register md = Contents of the maintenance data in register dw = Data written dr = Data read
HC2022	Failure occurred during local storage paging or addressing operations.			
HC2023	Local storage register failed when tested with AA, 55, and 01 patterns.			
HC2024	External register immediate operation failed.			
HC2025	Failure occurred during a register to register operation.			
HC2026	Local storage register immediate operation failed.			
HC2027	Failure occurred during a processor to control storage operation.			

Interrupt Level Test - Routine EE13

Prerequisite diagnostics must run without failure before this diagnostic is run. See MD/SDISK 3, "PREREQUISITE DIAGNOSTICS."

This routine tests the microprocessor interrupt handling for interrupt levels 0 through 7.

Routine Start Address: 3010

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Error Displays

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the keyboard/display.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
HC3021	Failure occurred when testing if interrupts can be suspended.	1. Remove the functional diskette then press the IML switch to cause a power-on reset. Run routine EE13 again. 2. If the value of ERA or ERB is other than 0, see the FSI section for error code E190. Also see step 4 of this Additional Actions column. 3. If PSR bit 0 = 1, see EAD 1 for error code Fnnn. 4. If a diagnostic failure occurs and no errors are detected by the hardware, see the FSI section for error code E108 and perform the procedures for the microprocessor and control storage. 5. XR errors (PSR bit 0 = 1) can cause ERA and ERB errors. Use routine EE85 to check the ERA and ERB registers.	FRU121 FRU118 FRU117 FRU115 FRU114 FRU120 FRU119 FRU116 FRU134 FRU135 FRU157 FRU158 FRU159 FRU139	mmmmm ERA ACT = xx,EXP= yy ERB ACT = xx,EXP= yy PSR ACT = xx,EXP= yy PER ACT = xx,EXP= yy MTI ACT = xx,EXP= yy XRA ACT = xx,EXP= yy MDI= wd,WR= dw,RD=dr MACHINE FAILURES MAY CAUSE CURRENT ERROR DATA TO BE INVALID. SEE DIAG 1 "VERIFY". This screen is explained on MD/SDISK 6. mmmmm = Failure ID xx = The actual contents of the external register yy = The expected contents of the external register wd = Contents of the maintenance data in register dw = Data written dr = Data read
HC3022	Invalid subroutine return code.			
HC3023	The interrupt mask register (IMR) has bits that won't change. They are fixed in either an ON or an OFF position.			
HC3024	While using the interrupt mask register (IMR) an XR error is detected.			
HC3025	The local store page was not saved correctly or a PSW swap occurred to the wrong interrupt level.			
HC3026	An XR error occurred while exercising the processor external registers.			
HC3027	The interrupts occurred in the wrong sequence. The PSR current and/or previous values are wrong.			
HC3028	Extend bits for external register addressing were not saved and set/reset correctly.			
HC3029	Extend bits for external register addressing were not saved and set/reset correctly.			
HC302A	The local store page was not saved correctly or a PSW swap occurred to the wrong interrupt level.			
HC302B	An XR error occurred while exercising the processor external registers.			
HC302C	The interrupts occurred in the wrong sequence. The PSR current and/or previous values are wrong.			
HC302D	Extend bits for external register addressing were not saved and set/reset correctly.			
HC302E	The condition code is not set correctly in the PSW.			
HC302F	The local store page was not saved correctly or a PSW swap occurred to the wrong interrupt level.			

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Interrupt Level Test - Routine EE13 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
MC3030	Extend bits for external register addressing were not saved and set/reset correctly.	1. Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE13 again. 2. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. Also see step 4 of this Additional Actions column. 3. If PSR bit 0 = 1, see EAD I for error code Fnnn. 4. If a diagnostic failure occurs and no errors are detected by the hardware, see the FSI section for error code E100 and perform the procedures for the microprocessor and control storage. 5. XR errors (PSR bit 0 = 1) can cause ERA and ERB errors. Use routine EE85 to check the ERA and ERB registers.	FRU121 FRU118 FRU117 FRU115 FRU114 FRU120 FRU119 FRU116 FRU134 FRU135 FRU157 FRU158 FRU159 FRU139	See the "Error Displays" column on MD/SDISK 555.
MC3031	The interrupts occurred in the wrong sequence. The PSR current and/or previous values are wrong.			
MC3032	The interval timer failed during interrupt handling.			
MC3033	The interval timer failed during interrupt handling.			
MC3034	The interval timer failed during interrupt handling.			
MC3035	An XR error occurred while exercising the processor external registers.			
MC3036	Check 1 error occurred during the interrupt test.			
MC3037	Check 1 error occurred during the interrupt test.			
MC3038	An XR error occurred while exercising the processor external registers.			

Processor External Register Test - Routine EE14

Prerequisite diagnostics must run without failure before this diagnostic is run. See MD/SDISK 3, "PREREQUISITE DIAGNOSTICS."

This routine provides a check of the microprocessor external registers function and error handling.

Routine Start Address: 4010

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Error Displays

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the keyboard/display.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
HC4021	Jump address high register failed.	1. Remove the functional diskette, the press IML switch to cause a power-on-reset. Run routine EE14 again. 2. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. Also see action number 4 of this Additional Actions column. 3. If PSR bit 0 = 1, see EAD 1 for error code Fnnn. 4. If a diagnostic failure occurs and no errors are detected by the hardware, see the FSI section for error code E100 and perform the procedures for the microprocessor and control storage. 5. XR errors (PSR bit 0 = 1) can cause ERA and ERB errors. Use diagnostic EE85 to check the ERA and ERB registers.	FRU121 FRU118 FRU117 FRU115 FRU114 FRU120 FRU119 FRU116 FRU134 FRU135 FRU157 FRU158 FRU159 FRU139	nnnnnn ERA ACT = xx,EXP= yy ERB ACT = xx,EXP= yy PSR ACT = xx,EXP= yy PER ACT = xx,EXP= yy MTI ACT = xx,EXP= yy XRA ACT = xx,EXP= yy MDI= md,WR= dw,RD=dr MACHINE FAILURES MAY CAUSE CURRENT ERROR DATA TO BE INVALID. SEE DIAG 1 "VERIFY". This screen is explained on MD/SUISK 6. nnnnnn = Failure ID xx = The actual contents of the external register yy = The expected contents of the external register md = Contents of the maintenance data in register dw = Data written dr = Data read
HC4022	Force jump operation failed.			
HC4023	Jump address low register failed.			
HC4024	Interval timer registers A and/or B failed.			
HC4025	Interval timer A and/or B timings wrong.			
HC4026	Processor control register (PCR) failed.			
HC4027	Interrupt mask register (IMR) failed.			
HC4028	Processor diagnostic register (PDR) failed.			
HC4029	Local storage page register (LSP) failed.			
HC402A	ERA or ERB is incorrect, or the ERA or ERB could not be reset, or the PSW error indication is incorrect. See step 1 under the Additional Actions column of this chart.			
HC4029	Level 1 interrupt problem.			

Channel Adapter Function Test - Routine EE64

Prerequisite diagnostics must run without failure before this diagnostic is run. See MD/SDISK 3, "PREREQUISITE DIAGNOSTICS."

This routine tests the functional operation of the channel adapter as follows:

- The channel adapter is tested to ensure that it is installed
- Determines tape control unit addressability
- Verifies level 6 interrupt generation
- Validates the channel adapter RAM
- Validates all valid channel commands
- Forces all channel command retry functions
- Forces and verifies unit checks
- Forces and verifies busy conditions
- Forces and verifies 'selective reset'.

Routine Start Address: 4010

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Addressing: Select and run the channel adapter function test. The following screen is used to select a channel address:

```
CHN ADDR
  (A)
```

(A) Channel Address (valid parameters are A and B)

If channel adapter A is to be tested, press the ENTER key. If a different channel adapter is to be tested, enter that channel adapter address and press the enter key

Enter an 'F' if all channels are to be tested. When the first error is detected, the test stops and the error is displayed.

Error Displays

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the keyboard/display.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance information.

External Registers Used

BCC	CAE	MDI	WSE
BCPC	CCA	MDO	
BCPL	CCC	MTI	
BCPH	CDR	MTO	
BCSE	CER	PCR	
BCSL	CMR	PCR	
BCSH	CRR	PDR	
BCSS	DLR	PER	
BCR	DSE	PRR	
BDC	IMR	PSR	
BDSE	LSP	RER	
BMR		RSR	

Channel Tags Bit Meaning

Channel Tags In (TGI) (not an external register)

80	Operational In
40	Address In
20	Select In
10	Request In
08	Status In
04	Service In
02	Data In
01	Disconnect In

Channel Tags Out (TGO) (not an external register)

80	Operational Out
40	Address Out
20	Select Out
10	Hold Out
08	Command Out
04	Service Out
02	Data Out
01	Suppress Out

Channel Adapter Interrupt Description

Note: The x equals the device address (0-F)

Channel Tags In (TGI) (not an external register)

0x	Definition
1x	CCW accepted
2x	Interface disconnect
3x	Selective reset
4x	System reset complete
41	PUT/GET - completed
42	PUT/GET - truncated
43	GET - bus out parity error
44-4E	Reserved
4F	Power on reset complete
5x	CCR - No path
6x	CCR - Buffer conditions
7x	CCR-Reject
8x	UC - Status store error or channel adapter error
9x	UC - Command sequence error
Ax	UC - Device assigned to other path group
Bx	UC - Command reject
Cx	UC - Command parity error
Dx	UC - Deferred UC
Ex	UC - Device not ready
Fx	UC - Device file protected

FRUs

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Error Analysis

```
CCC=ra    CRR=rb        MTI=rj     MDI=rk
PSR=rc    PER=rd        BCSE=abcde XRA=rl
DSE=re    WSE=rf        BDSE=fghkj
RER=rg    RSR=rh        ERA=rm     ERB=rn

          BOPE= Oxx
          BIPE= Oyy
          CHAN ERR=ch  CER=cc
          STS=ww  ,CODE=zzzz
```

```
ra = Contents of the channel control card
     register
rb = Contents of the request register
rc = Contents of the processor control register
rd = Contents of the processor error register
re = Contents of the drive status error register
rf = Contents of the write status error register
rg = Contents of the read error register
rh = Contents of the read status register
rj = Contents of the maintenance tap-in register
rk = Contents of the maintenance data-in
     register
rl = Contents of the buffer channel status error
     register
rm = Contents of the buffer drive status error
     register
rn = Contents of the external register address
     register
abcde = Contents external register A
     check 1 errors
fghjk = Contents external register B
     check 1 errors
  Oxx = On - There is a channel bus-out parity
            error detected in the channel adapter
            hardware
      Off - No error detected
  Oyy = On - There is a channel bus-in parity
            error detected in the channel adapter
            hardware
      Off - No error detected
   cc = contents of the channel error register
   ch = Bit 0 - Status store busy
      Bit 1 - Status store data out parity error
      Bit 2 - Status Store Response out parity
              error
      Bit 3 - Bus out error during a buffer
              write command, Service In
      Bit 4 - Bus out error during a buffer
              write command, Data In
      Bit 5 - Processor detected error
      Bit 6 - External register address or
              write error
      Bit 7 - Hardware detected status store
              error
   ww = Ignore all codes except:
      74 - Error free internal channel adapter
           diagnostics
      78 - An error is detected by the internal
           channel adapter hardware diagnostics
 zzzz = Indicates the sequence of testing by the
      internal channel adapter diagnostics.
      They are in ascending sequence from 1zzz
      through Fzzz.
```

Error Analysis

Analyze the errors for Routine EE64 as follows:

1. Record all information on the error screens.

2. If ERA and ERB are not 0, record the contents (if the screen is displayed) of ERA and ERB. See the FSI section for error code E100 and the following FRU list:

   FRU NAME

   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   118 Drive-adapter card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card
   134 Control store card
   135 Control storage array card

3. If PSR bit 0 = 1, record the contents (if the screen is displayed) of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn and the following FRU list:

   FRU NAME

   118 Drive-adapter card
   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card

4. If BCSE channel error groups 0-3 indicate any errors, record the contents of BCSE. See the FSI section for error code D5nn and the following FRU list:

   FRU NAME

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   133 Channel Adapter card (A)
   152 Channel Adapter card (B)
   119 Read clock and format card
   118 Drive-adapter card
   116 Write data card
   126 Power/POR card
   134 Control store card
   121 Status store basic card
   122 Status store communication card

5. If BDSE channel error groups 0-3 indicate any errors, record the contents of BDSE. See the FSI section for error code D6nn and the following FRU list:

   FRU NAME

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   111 Read ECC/CORR card
   119 Read clock and format card
   118 Drive-adapter card
   116 Write data card
   134 Control store card
   117 Microprocessor card

6. If DSE bits 0, 1, or 2 = 1, record the contents of DCB, DCR, DSE, DIR, and DTR. See the FSI section for error code D4nn and the following FRU list:

   FRU NAME

   118 Drive-adapter card
   116 Write data card
   134 Control store card
   085 Drive control card

7. If any RER bits = 1, or if RSR bits 5, 6, 7 = 1, record the contents of RCR, RRC, RER, RSR, and RDC. See the FSI section for error code D8nn and the following FRU list:

   FRU NAME

   064 Write power card
   062 Read preamplifier card
   085 Drive control card
   278 Read detect card
   123 Read skew buffer card 1
   124 Read skew buffer card 2
   125 Read skew buffer card 3
   119 Read clock and format card
   111 Read ECC/CORR card

8. If WSE bits 4, 5, or 6 = 1, record the contents of WCR and WSE. See the FSI section for error code D7nn and the following FRU list:

   FRU NAME

   116 Write data card
   120 Buffer adapter card
   114 Buffer control card
   117 Microprocessor card
   118 Drive-adapter card
   139 Logic board A1

9. If BOPE is ON, BIPE is ON, CHAN ERR is not 0, or CER bits 0, 1, or 2 = 1, record the contents of CER. See the FSI section for error code 54nn and the following FRU list:

   FRU NAME

   133 Channel Adapter card (A)
   152 Channel Adapter card (B)
   117 Microprocessor card
   121 Status store basic card
   122 Status store communication card
   197 TCU address switch

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI4021	The field engineer (FE) entered an invalid channel adapter address. The address received by the microcode is shown in the ADDRESS RCVD field. This could be an MD communication error.	Ensure that the maintenance device (MD) is working correctly. See REF screen or Error Displays.	The MD FRU169	CI4021 INVALID CA ADDRESS VALID = A B C D F ADDRESS RCVD = xx xx Data received by the microcode
CI4022	A channel adapter was selected that is not installed, or the status store to channel adapter communication data path is bad. The microcode did not receive the correct response from status store for channel adapter reset.	Run routine EE64 once on each channel adapter. Remove the functional diskette, the press the IML switch to cause a power-on-reset. Run routine EE64 again. See the FSI section for error code 2060.	FRU133 FRU152 FRU121 FRU250 FRU251	CI4022 CHANNEL ADAPTER NOT PLUGGED. DOES NOT ACKNOWLEDGE
CI4023	The microcode attempted to force the channel adapter offline but was not successful.	Run routine EE64 once for each channel. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU250 FRU251	CI4023 CANNOT TAKE CHANNEL ADAPTER OFF-LINE
CI4024	The status store did not acknowledge an order from the channel adapter card.	Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE64 again. See the FSI section for error code 5310.	FRU171	CI4024 CHANNEL ADAPTER DID NOT ACKNOWLEDGE LAST ORDER CHNL CMD=cc CA ADDR=ca CA CMD= co CA DATA=cd ca The failing channel adapter cc The failing channel command cd Channel adapter order co Channel adapter data

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI4025	The microcode detected a check 2 error condition and stopped the test.	FRUs are listed on error analysis on page 320. 1. a. Remove the functional diskette, then press the IML switch to cause a power-on-reset. b. Rerun either routine EE62 or routine EE64.		CI4025 A CHECK-2 ERROR CONDITION WAS DETECTED CER=cc CAE=bb PSR=rr PER=pp DSE=ds WSE=ww RER=re RSR=rs MTI=mm BCSE=abcde BDSE=fg ERA=ra ERB= rb a Buffer channel status and error register bits 0-3 b Channel error group 0 c Channel error group 1 d Channel error group 2 e Channel error group 3 f Buffer device status and error register bits 0-3 g Buffer device error group 0 bb Channel adapter errors for channels A-B cc Contents of the channel error register ds Contents of the device status/error register mm Contents of the maintenance tag in register pp Contents of the processor error register ra External register A check 1 errors rb External register B check 1 errors re Contents of the read error register rr Contents of the processor status register rs Contents of the read status register ww Contents of the write/status error register
CI4026	The microcode attempted to force a diagnostic interrupt ('F8') and was not successful. Channel Adapter Addresses from the channel control card external register: 80 = channel adapter A 40 = channel adapter B	Run routine EE64 once for each channel. Remove the IML functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE64 again. See the FSI section for error code 54nn.	FRU133 FRU152 FRU250 FRU251	CI4026 LEVEL 6 INTERRUPT DID NOT OCCUR CCC=aa CRR=bb aa Contents of the channel card control register bb Contents of the channel request register
CI4027	The microcode detected a read back miss compare after writing channel adapter RAM addresses.	See the FSI section for error code 3302.	FRU133 FRU152 FRU121 FRU250 FRU251	CI4027 DATA MSCMPR DURING CA RAM READ TESTING EXP=ee RCVD=ff ee Expected channel adapter RAM data ff Received channel adapter RAM data

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI4028	More than one tape control unit address responded to initial selection.	Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE64 again. Ensure the tape control unit address switch is set correctly. See the FSI section for error code 2705.	FRU133 FRU152 FRU173 FRU153 FRU197	CI4028 MULTI CU ADDRESS RESPONDED TO SELECT ADDR1=gg ADDR2=hh gg The first tape control unit address that responded. hh The second tape control unit address that responded.
CI4029	The received 'tag in' did not match the expected 'tag in' during a channel command execution.	Compare the actual tags in (TGI) to the TGI EXPECTED tags in, to determine the failing tag. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU114 FRU120 FRU126 FRU250 FRU251 FRU256	CI4029 CHANNEL IN TAGS ARE WRONG CA=ca CHNL CMD=cc TGO=jj TGI=kk TGI EXPECTED=mm ca The failing channel adapter cc The failing channel address jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. kk Actual 'tag in' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected 'tag in' data
CI402A	The received address ('bus in') did not match the address ('bus out') from the microcode.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU250 FRU251	CI402A DEV ADDR ON BUS IN DOES NOT MATCH EXPECTED BUS IN CA=ca CHNL CMD=cc TGO=jj BUSO=bo BUSI=bi BUSI EXPECTED=mm ca The failing channel command cc The failing channel command jj Current 'tag out' data See "Error Displays" on DIAG MD/SDISK 829 for bit meanings. bo 'Bus out' data bi Actual address on 'bus in' mm Expected address on 'bus in'
CI4023	The microcode received no response from any tape control unit address (0-F) when attempting an initial selection sequence.	Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE64 again. See the FSI section for error code 2060.	FRU133 FRU152 FRU173 FRU153 FRU197	CI4023 CU DID NOT RESPOND TO ADDRESS 0-F CK CU ADDR SWITCH

Channel Adapter Function Test - Routine EE64 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
C1402C	The received interrupting channel adapter address does not match the current channel adapter.	Run routine EE64 once for each channel. See the FSI section for error code 5350.	FRU133 FRU152	C1402C WRONG CA ADDRESS CAUSED INTERRUPT CA=ca C=hL CMD=cc TGO=jj INTRPT=ai EXP INTRPT=ei ca The failing channel adapter cc The failing channel command ai Actual interrupt received. See "Error Displays" on MD/SDISK 820 for interrupt descriptions. ei Expected interrupt jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings.
C1402D	The channel adapter decodes a unique 5-bit code for each channel command.	See the FSI section for error code 52nn.	FRU133 FRU152	C1402D CHNL CMD DID NOT DECODE TO PROPER 5 BIT DECODE CA=ca CHNL=cc TGO=jj EXP 5 BIT DECODE=ed RCVD 5 BIT DECODE=rd ca The failing channel adapter cc The failing channel command ed Expected 5 bit decode from channel command rd Received 5 bit decode from channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings.
C1402E	The 'bus in' data did not match the expected data on a read forward channel command. A previous Write command could be the fault.	Run routine EE64 once for each channel. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU121 FRU114 FRU120 FRU113 FRU255	C1402E READ DATA MISCOMPARE DATA WAS: EXP=ee RCVD=ff ee Bits expected on inbound bus lines ff Bits received on inbound bus lines
C1402F	The channel adapter failed to reserve the selected device.	Run routine EE64 once for each channel. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	C1402F ASSIGNMENT PATH FAILED FOR INITIAL SELECTION

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
C14030	The BCSE register did not indicate stop after the microcode raised 'command out' through the channel adapter.	See the FSI section for error code A131.	FRU114 FRU120 FRU113 FRU133 FRU152 FRU256	C14030 BCSE CHNL STOP NOT DETECTED FOLLOWING A WRITE COMMAND CA=ca CHNL CMD=cc BYTE CNT=by BCSE=abcde a Buffer channel status and error register bits 0-3 b Channel error group 0 c Channel error group 1 d Channel error group 2 e Channel error group 3 by Byte count of the data transferred ca The failing channel adapter cc The failing channel command
C14031	The channel adapter failed to release the selected device.	Run routine EE64 once for each channel. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	C14031 DEVICE WAS NOT RELEASED AFTER FALL OF HOLD OUT
C14032	'Service in' or 'data in' was detected after the expected end of read data.	See the FSI section for error code A131.	FRU133 FRU152	C14032 TOO MANY SERVICE OR DATA IN OR READ COMMAND
C14033	Programming error.	Call your next level of support.		C14033 PROGRAMMING ERROR NO INPUT FOR COMMAND TYPE
C14034	The channel adapter RAM data was incorrect following a GET type channel command. The data in RAM should be in a first-in, last-out sequence.	Run routine EE64 once for each channel. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU121	C14034 RAM DATA MISCOMPARE AFTER GET COMMAND EXP=ee ACT=ff ee Bits expected from channel adapter RAM ff Bits received from channel adapter RAM
C14035	The read data ('bus in') was in error during a PUT type command. The expected data is pre-loaded by the microcode and checked duri ; the data transfer (such as a Sense command).	Run routine EE64 once for each channel. See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU121	C14035 BUS IN DATA MISCOMP ON PUT COMMAND EXP=ee RCVD=ff ee Bits expected on bus lines ff Bits received on bus lines

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI4036	The microcode did not determine that a channel adapter is present. The channel adapter is not tested.	Ensure that the channel adapter card is plugged. If it is plugged, this is an error. If it is not plugged, ignore this message. When running the Basic CU Test or EO10, this message is not displayed unless an error occurs. See the FSI section for error code 53AD.	FRU133 FRU152 FRU121	CI4036 THE FOLLOWING ADAPS WERE NOT TESTED 00 Bits 0-1 correspond to channels L and R respectively. Bits 2-3 are reserved. If the bit is on, the channel was not tested. Bits 4-7 are not used.
CI4037	The microcode sent a channel adapter order and status store did not indicate that it was completed (CRR bit 7).	Remove the functional diskette, then press the IML switch to cause a power-on reset. Run routine EE64 again. See the FSI section for error code 5311.	FRU133 FRU152 FRU121 FRU250 FRU251	CI4037 CHANNEL ADAPTER DID NOT COMPLETE LAST ORDER CHNL CMD=cc CA ADDR=ca CA CMD=co CA DATA=cd ca The failing channel adapter cc The failing channel command cd Channel adapter data co Channel adapter order
CI4038	The device address was bypassed during a select attempt.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	CI4038 RECEIVED SELECT-IN DURING INITIAL SELECTION CA=ca CHNL CMD=cc TGO=jj TGI=kk TGI EXPECTED=mm ca The failing channel adapter cc The failing channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. kk Actual 'tag in' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected 'tag in' data
CI4039	The channel adapter did not respond with 'service in' to a read type channel command.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152 FRU256	CI4039 SERVICE-IN NOT DETECTED DURING DATA TRANSFER CA=ca CHNL CMD=cc TGO=jj TGI=kk TGI EXPECTED=mm ca The failing channel adapter cc The read type channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. kk Actual 'tag in' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected 'tag in' data

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
C1403A	The channel adapter did not respond with 'service in' to a write type channel command.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	C1403A SERVICE-IN NOT DETECTED DURING DATA TRANSFER CA=ca CHNL CMD=cc TGO=jj TGI=kk TGI EXPECTED=mm ca The failing channel adapter cc The failing write type channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. kk Actual 'tag in' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected 'tag in' data
C1403B	The received 'status in' (bus in) did not match the expected 'status in'.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	C1403B CHAN STATUS ON BUS IN DOES NOT MATCH EXPECTED BUS IN CA=ca CHNL CMD=cc TGO=jj BUSO=bo BUSI=bi BUSI EXPECTED =mm bi Actual status on 'bus in' bo 'Bus out' data ca The failing channel adapter cc The failing channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected status on 'bus in'
C1403C	An unexpected channel command retry was requested by the channel adapter microcode.	See the FSI section for error code 38C0.	FRU133 FRU152	C1403C UNEXP CCR ON LAS CHANNEL COMMAND MARK-IN IS ACTIVE CA=ca CHNL CMD=cc TGO=jj BUSO=bo BUSI=bi BUSI EXPECTED =mm bi Actual status on 'bus in' bo 'Bus out' data ca The failing channel adapter cc The failing channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected status on 'bus in'

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI403D	The microcode forced a busy condition and the received status did not match the expected status.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	CI403D FORCED BUSY STATUS NOT AS EXPECTED CA=ca CHNL CMD=cc TGO=jj BuSO=bo BUSI=bi BUSI EXPECTED =mm bi Actual status on 'bus in' bo 'Bus out' data ca The failing channel adapter cc The failing channel command jj Current 'tag out' data. See "Error Displays" on MD/SDISK 820 for bit meanings. mm Expected status on 'bus in'
CI403E	A channel adapter generated interrupt did not match the expected interrupt.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	CI403E INTERRUPT RECEIVED NOT EXPECTED DURING INITIAL SELECTION CA=ca CHNL CMD=cc TGO=jj INTRPT=ai EXP INTRPT=ei ai Actual interrupt received. See "Error Displays" on MD/SDISK 820 for interrupt descriptions. ca The failing channel adapter cc The failing channel command ei Expected interrupt
CI403F	The channel adapter did not respond with an expected interrupt.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	CI403F FREE DEV INTERRUPT DID NOT OCCUR CA=ca CHNL CMD=cc TGO=jj INTRPT=ai EXP INTRPT=ei ai Actual interrupt received. See "Error Displays" on MD/SDISK 820 for interrupt descriptions. ca The failing channel adapter cc The failing channel command ei Expected interrupt
CI4040	A PUT type channel command did not generate an interrupt at the expected end of data.	See EAD 1, "Status Store/Channel Adapter."	FRU133 FRU152	CI4040 PUT INTERRUPT NOT DETECTED ON LAST DATA BYTE CA=ca CHNL CMD=cc TGO=jj INTRPT=ai EXP INTRPT=ei ai Actual interrupt received. See "Error Displays" on MD/SDISK 820 for interrupt descriptions. ca The failing channel adapter cc The failing channel command ei Expected interrupt

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI4045	Any buffer error was detected in the BCSE register.	See the FSI section for error code A170.	FRU133 FRU152 FRU114 FRU120 FRU113 FRU256	CI4045 BUFFER ERROR DETECTED FOLLOWING READ OR WRITE CMD. CA=ca CHNL CMD=cc BYTE CNT=by BCSE=abcde a Buffer channel status and error register bits 0-3 b Channel error group 0 c Channel error group 1 d Channel error group 2 e Channel error group 3 ca The failing channel adapter cc The failing channel command by 01 for Write command or 02 for Read command
CI4046	Programming error. Command data taken from a control table was not a Read command.	Call your next level of support.		CI4046 READ CMD DOES NOT XLATE TO EITHER FORWARD OR BACKWARD
CI4047	Programming error. Byte count taken from a control table was greater than 32.	Call your next level of support.		CI4047 ILLEGAL BYTE COUNT FOR PUT COMMAND CNT=bc bc Byte count
CI4048	The field engineer (FE) entered an invalid channel adapter address. The address received by the microcode is shown in the ADDRESS RCVD field. This could be an MD communication error.	Ensure that the Maintenance device (MD) is working correctly. See REF screen or Error Displays.	The MD FRU169	CI4048 INVALID CA ADDRESS VALID = A 9 C D F ADDRESS RCVD = xx xx Data received by the microcode
CI4049	The status store did not acknowledge an order from the channel adapter card.	Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE64 again. See the FSI section for error code 5319.	FRU121	CI4049 CHANNEL ADAPTER DID NOT ACKNOWLEDGE LAST ORDER CA ADDR=ca CA CMD= cd CA DATA=cd ca The failing channel adapter cd Channel adapter order cb Channel adapter data

Channel Adapter Function Test - Routine EE64 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
C1404A	The microcode sent a channel adapter order and status store did not indicate that it was completed (CRR bit 7).	Remove the functional diskette, then press the IML switch to cause a power-on-reset. Run routine EE64 again. See the FSI section for error code 5311.	FRU133 FRU152 FRU121 FRU250 FRU251	C1404A CHANNEL ADAPTER DID NOT COMPLETE LAST ORDER CA ADDR=ca CA CMD=co CA DATA=cd ca The failing channel adapter cd Channel adapter data co Channel adapter order
C1404B	Unexpected errors have occurred which are either check 1, check 2, or internal channel adapter errors.	See MD/SDISK 820, "Error Analysis."		C1404B A "CU" or "CA" ERROR CONDITION WAS DETECTED.
C1404C	The microcode detected a read back miss compare after writing Channel adapter RAM addresses.	See the FSI section for error code 3302. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU121 FRU250 FRU251	C1404C READ DATA MISCOMPARE DATA is: EXP=ee RCVD=ff ee Expected channel adapter RAM data ff Received channel adapter RAM data
C1404D	The received tag-in did not match the expected tag-in during the data transfer of write data to the buffer, or read data from the buffer.	Compare the received tag-in to the expected tag-in to determine the failing tag.	FRU133 FRU152 FRU114 FRU120 FRU126 FRU250 FRU251 FRU256	C1404D CHANNEL IN TAGS ARE WRONG. CA ADDR=ca TAGS OUT=to TAGS IN=aa EXP TAGS IN= bb ca Failing channel adapter address to Last tag-out, Service Out or Data Out. aa Tags-in received. See "Error Displays" on MD/SDISK 820 for bit meanings. bb Tags-in expected. See "Error Displays" on MD/SDISK 820 for bit meanings.
C1404E	The received interrupting channel adapter address does not match the current channel adapter.	Run routine EE64 once for each channel. See the FSI section for error code 5350. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152	C1404E WRONG CA ADDRESS CAUSED INTERRUPT
C1404F	The microcode detected a read back miss compare after writing channel adapter data to the data buffer.	See the FSI section for error code 3302. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU121 FRU250 FRU251	C1404F READ DATA MISCOMPARE DATA is: EXP=ee RCVD=ff ee Expected buffer data ff Received buffer data

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI4050	The BCSE register did not indicate stop after the microcode raised 'command out' through the channel adapter.	See the FSI section for error code A131. See MD/SDISK 820, "Error Analysis."	FRU114 FRU120 FRU113 FRU133 FRU152 FRU256	CI4050 BCSE CHNL STOP NOT DETECTED FOLLOWING A WRITE COMMAND
CI4051	'Service in' or 'data in' was detected after the expected end of read data.	See the FSI section for error code A131. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152	CI4051 TOO MANY SERVICE-IN OR DATA-IN ON READ COMMAND
CI4052	Programming error.	Call your next level of support. See MD/SDISK 820, "Error Analysis."		CI4052 PROGRAMMING ERROR
CI4053	The channel adapter did not acknowledge a channel adapter reset. The channel adapter is not tested.	Ensure that the channel adapter card is plugged. If it is plugged, this is an error. If it is not plugged, ignore this message. When running the Basic TCU Test or E010, this message is not displayed unless an error occurs. See CARR-TCU 1189 for the correct DLR switch settings. See the FSI section for error code 53A0. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU121	CI4053 THE FOLLOWING ADAPS WERE NOT TESTED: 00 DLR= YY Bits 0-1 correspond to channels A & B respectively. If the bit is on, the channel was not tested. Bits 2-7 are not used. yy = Contents of the DLR external register
CI4054	The BCSE register did not indicate complete on a Write CRC operation from the channel buffer.	See the FSI section for error code A140. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU114 FRU120 FRU113 FRU256	CI4054 MP WRITE COMP NOT DETECTED FOLLOWING A WRITE CRC
CI4055	The BCSE register did not indicate channel pointer stop after reading all the data from the data buffer.	See the FSI section for error code A131. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU114 FRU120 FRU113 FRU256	CI4055 CHNL PNTR STOP NOT DETECTED FOLLOWING A READ COMMAND

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
C14056	Any buffer error was detected in the BCSE register.	See the FSI section for error code A170. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU114 FRU120 FRU113 FRU256	C14056 BUFFER ERROR DETECTED FOLLOWING READ OR WRITE CMD.
C14057	The microcode detected and unexpected level 6 interrupt. Channel Adapter Addresses from the CCC external register: 80 = Channel adapter A 40 = Channel adapter B	Compare the contents of the CCC register with the CRR register, they should be the same. If not, a channel adapter has failed and either no interrupt is set or multiple interrupts are set. See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU121 FRU250 FRU251	C14057 HOT LEVEL 6 INTRPT. FOLLOWING A RESET CCC=aa CRR=bb aa Contents of the channel card control register bb Contents of the channel request register
C14058	At this time the processor should be in the correct level indicated by the expected data.	Compare the actual contents of the PSR register to the expected contents, they should be the same. See MD/SDISK 820, "Error Analysis."	FRU117 FRU133 FRU152	C14058 PSR IS NOT CORRECT INTERRUPT TEST EXP=aa ACT=bb aa Expected contents of the PSR external register bb Actual contents of the PSR external register
C14059	Channel adapter internal diagnostics did not complete. Correct completion is indicated by the ending status being set, along with a level 6 interrupt.	See MD/SDISK 820, "Error Analysis."	FRU133 FRU152	C14059 LEVEL 6 INTERRUPT DID NOT OCCUR
C1405A	Channel adapter internal diagnostics detected an error during execution.	See MD/SDISK 820, "Error Analysis."		C1405B CHANNEL ADAPTER DIAGNOSTICS FAILED
C1405B	Unexpected errors have occurred, either check 1, check 2, or internal channel adapter errors.	See MD/SDISK 820, "Error Analysis."		C1405B A "CU" or "CA" ERROR CONDITION WAS DETECTED

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
CI405C	The internal channel adapter parameter data should be 'FF'. An error may have been detected before the parameter was set.	See MD/SDISK 820, "Error Analysis."		CI405C CACI DATA ERROR FIRST LVL 6 INTRPT. EXP=ee ACT=ff ee Data expected ff Data received
CI405D	The internal channel adapter diagnostic has forced a level 6 interrupt; however, it is not detected by the control unit microcode.	See MD/SDISK 820, "Error Analysis."		CI405D MID TEST CA INTRPT. DID NOT OCCUR.
CI405E	The internal channel adapter diagnostic forced an error; however, when the CER was checked it did not have the correct channel error set.	See MD/SDISK 820, "Error Analysis."	FRU133 FRU152 FRU250 FRU251	CI405E EXPECTED CER ERROR DID NOT OCCUR. EXP=ee ACT=ff ee Data expected ff Data received
CI405F	The TCU address-switch test detected a parity error while reading the TCU address switch (the thumbwheel switch).	See MD/SDISK 820, "Error Analysis." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	FRU197 FRU133 FRU152	CI405F CHANNEL ADAPTER ADDR THUMB WHEEL SWITCH PARITY ERROR.
CI4060	The TCU address-switch test detected an undefined mode while reading the TCU address switch (the thumbwheel switch).	See MD/SDISK 820, "Error Analysis." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	FRU197 FRU133 FRU152	CI4060 CHANNEL ADAPTER ADDR THUMB WHEEL SWITCH INVALID MODE.

Scope Loop Utility - Routine EEF0

This routine permits the field engineer (FE) to select and loop a register in any of the eight control or adapter cards. Addresses, data, clock lines, and so on, can also be scoped in the external register area of the tape control unit using this scoping utility.

Use the "XR Bus and Control Clocks" timing chart (see EAD 1) as a guide when using this scope procedure.

Error Loop: All errors are ignored when this routine is running

Test Selection

The following screen displays after routine EEF0 has been selected.

```
DIAG*(EEF0)-ENTER:
            PATTERN
            TTII
```

TT Address for register selection
II Data field (enter 00)

Four characters must be entered for the data pattern to be valid. Valid TT patterns are listed under ENTRY ADDRESS in the table below. If an odd-numbered address is selected, the parity bit is inhibited and the data field will be the default listed in the Address and Register Selection chart in Figure 1.

Parity errors can be forced by selecting the odd number address for the register being tested.

ENTRY ADDRESS	REGISTER TESTED	PARITY INHIBIT	DEFAULT DATA	FUNCTIONAL AREA	CARD LOCATION
21	CCC	Yes	00	Status Store	01A-A1G2
22	CCC	No	FF	Status Store	01A-A1G2
23	WCR	Yes	00	Write Control	01A-A1P2
24	WCR	No	FF	Write Control	01A-A1P2
25	RCR	Yes	00	Read Data	01A-A1S2
26	RCR	No	FF	Read Data	01A-A1S2
27	DCB	Yes	00	Drive-Adapter	01A-A1Q2
28	DCB	No	FF	Drive-Adapter	01A-A1Q2
29	MDO	Yes	00	Maintenance Adapter	01A-A1E2
2A	MDO	No	FF	Maintenance Adapter	01A-A1E2
2B	BMR	Yes	00	Buffer Adapter	01A-A1K2
2C	BMR	No	FF	Buffer Adapter	01A-A1K2
2D	LSP	Yes	00	Microprocessor	01A-A1D2
2E	LSP	No	FF	Microprocessor	01A-A1D2
2F	BCSL	Yes	00	Buffer Control	01A-A1L2
30	BCSL	No	FF	Buffer Control	01A-A1L2

Figure 1. Address and Register Selection Chart

This chart shows which diagnostic is used to test the external registers

DIAGNOSTIC	REGISTER	LOCATION	FUNCTIONAL AREA
EE12 EE13 EE14	ERA LSP ERB PCR IMR PER ITA PDR ITB PSR JAM XRA JAL PRR*	01A-A1D2	Processor
EE85	MDI MTI MDO MTO PRR*	01A-A1E2	Maintenance
	CCA CER CCC CMR CDR CAR PRR*	01A-A1G2	Status Store
	BCC BDC BCR BCR BCPC BDPH BCPH BDPL BCPL BDSE BCSE BDSH BCSH BDSL BCSL BDSS BCSS BWRP PRR*	01A-A1L2	Buffer
	BDGO BDG1 BDAT BMR CMM** CMGT** CMH** CMS**	01A-A1K2	Buffer-Adapter
	DCB DSC DCR DSH DLR DSL DIR DSR DTR ITC DSE PRR*	01A-A1Q2	Drive-Adapter
	RCR RPR RDC RRC RER RSR PRR*	01A-A1S2	Read Data
	WCR WSE PRR*	01A-A1P2	Write Data

* This register is used to send a check reset to any or all functional areas. When the register is written the 'check reset' line is activated, and if bit 3 is inactive, all functional areas whose assigned bit is active perform a check reset.
** These Buffer Adapter registers will be tested in place of the unmarked Buffer Adapter registers if the tape control unit has the Improved Data Recording Capability feature.

Figure 2. Diagnostic and External Register Chart

Scope Loop Sync Address

The scope loop routine consists of the following sync address.

SYNC ADDRESS	DESCRIPTION
003A	Set the PCR extend bits on
003C	Write the specified external register
003D	Read the specified external register
003E	Read, 'OR' the data and write it back
0040	Set the extend bits off
0042	Set user reset into the PRR register

Figure 3. Scope Loop Sync Addresses

Scope Loop Utility - Routine EEF0 (Continued)

Scope Loop Sync Address (Continued)

The scope loop sync address provides a positive going sync pulse, when the microprocessor fetches an instruction from the selected address. The negative going part of this pulse should be used to sync the oscilloscope when scoping the XR timings for a specific part of the EEF0 routine. The first Subsystem Clock S0 time (after the negative transition of the sync pulse) starts that part of the XR timing sequence (see MD/SDISK 1110).

This scope loop routine contains the following sync addresses. See MD/SDISK 1110 for the following reference key locations.

SYNC ADDRESS	DESCRIPTION
0038 [1]	Turns on both XR page selection XR address extend bits. Sets PCR bits 6 and 7 to one (equals XR page D). They may already be on.
003A [2]	Turns off both XR page selection XR address extend bits. Sets PCR bits 6 and 7 to zero (equals XR page A).
003C [3]	Sets the XR page to the page selected by the service representative. PCR bits 6 and 7, and XR extend bits 0 and 1, respectively, are set to the XR page of the selected XR. See Figure 2 on this page.
0040 [4]	Writes the XR that was selected in the "Test Selection". During address selection, the XR address bus contains the address of the selected XR. During write time the XR data bus contains the data specified in the "Data Used" in "Test Selection". See Figure 1 on MD/SDISK 1100.
0042 [5]	Reads the XR selected in "Test Selection". During address selection the XR address bus contains the address of the selected XR. During read time, the XR data bus contains the data specified in the "Data Used" (see Figure 1 on MD/SDISK 1109) in "Test Selection" that was written into the selected XR during sync address 0040.
0044 [6]	Reads, then writes the XR selected during "Test Selection". During address selection, the XR address bus contains the address of the selected XR. During read time, the XR data bus contains the data specified in the "Data Used" (see Figure 1 on MD/SDISK 1100) "Test Selection" that was written into the selected XR during sync address 0040. During write time, the XR data bus contains the data that was read during the read part of this sync address.

Figure 1. Scope Loop Sync Address Descriptions

Set the sync address by performing the following:

1. Start routine EEF0 running (see "Test Selection" on MD/SDISK 11 00)
2. Press the PF key on the MD
3. Enter a 2 (alter parameters).
4. The screen displays, WANT TO ALTER TEST PARM? Press Yes
5. Enter sync address (xxxx). See Figure 1 on this page.
6. On next display enter a 7 (run).
7. IS THIS CORRECT? Press Yes.
8. Attach the scope lead (on this control unit) to 01A-A1E2Z12.

If the following screen is displayed after setting up the scope loop and sync address, you can ignore it because the loop routine is still running.

```
SUPPORT DIAG CNTRL
SECTION:  EExx   #zz
ROUTIN:   EEyy
STS=            /RTN=
```

The following chart indicates which bits are active for any one of the eight registers that can be selected with routine EEF0.

XR REGISTER	EXTEND BITS 0 1	XR ADDRESS BUS BITS 0 1 2 3 4 P	XR ADDRESS BUS BITS 2 3 4 5 6 7	FUNCTIONAL AREA	CARD LOCATION
CCC	0 0	0 0 0 0 0 0	0 0 0 0 0 0	Status Store	01A-A1G2
WCR	0 1	0 0 0 0 0 0	0 0 0 0 0 0	Write Data Flow	01A-A1P2
RCR	0 1	0 0 0 1 0 1	0 0 0 1 0 1	Read Clock/Format	01A-A1S2
DCB	0 1	1 1 0 0 0 0	0 0 0 0 0 0	Drive-Adapter	01A-A1Q2
MDD	1 0	1 0 0 1 1 1	0 0 0 0 0 0	Maint. Adapter	01A-A1E2
BMR	1 1	1 0 1 1 1 0	0 0 0 0 0 0	Buffer Adapter	01A-A1K2
LSP	1 1	1 1 1 1 1 1	0 0 0 0 0 0	Microprocessor	01A-A1D2
BCSL	1 1	0 0 1 0 1 0	0 0 0 0 0 0	Buffer Adapter	01A-A1L2

Figure 2. Extend Bit and XR Register Chart

The notes on this page refer to to the diagram on MD/SDISK 1115.

Notes:

1. The logic card that contains the XR that is selected turns on its line to the MA card Each line name identifies the card that it came from. For example, selecting the CCC register's XR turns on '-SS addressed' line to the MA card The MA card checks the lines from all cards to ensure that only one XR is selected at a time. It also checks that one line is on during all XR operations.

   The logic pages used are: BA001, DF001, DI001, MP003, RC001, SS001, MA001, and MA002.

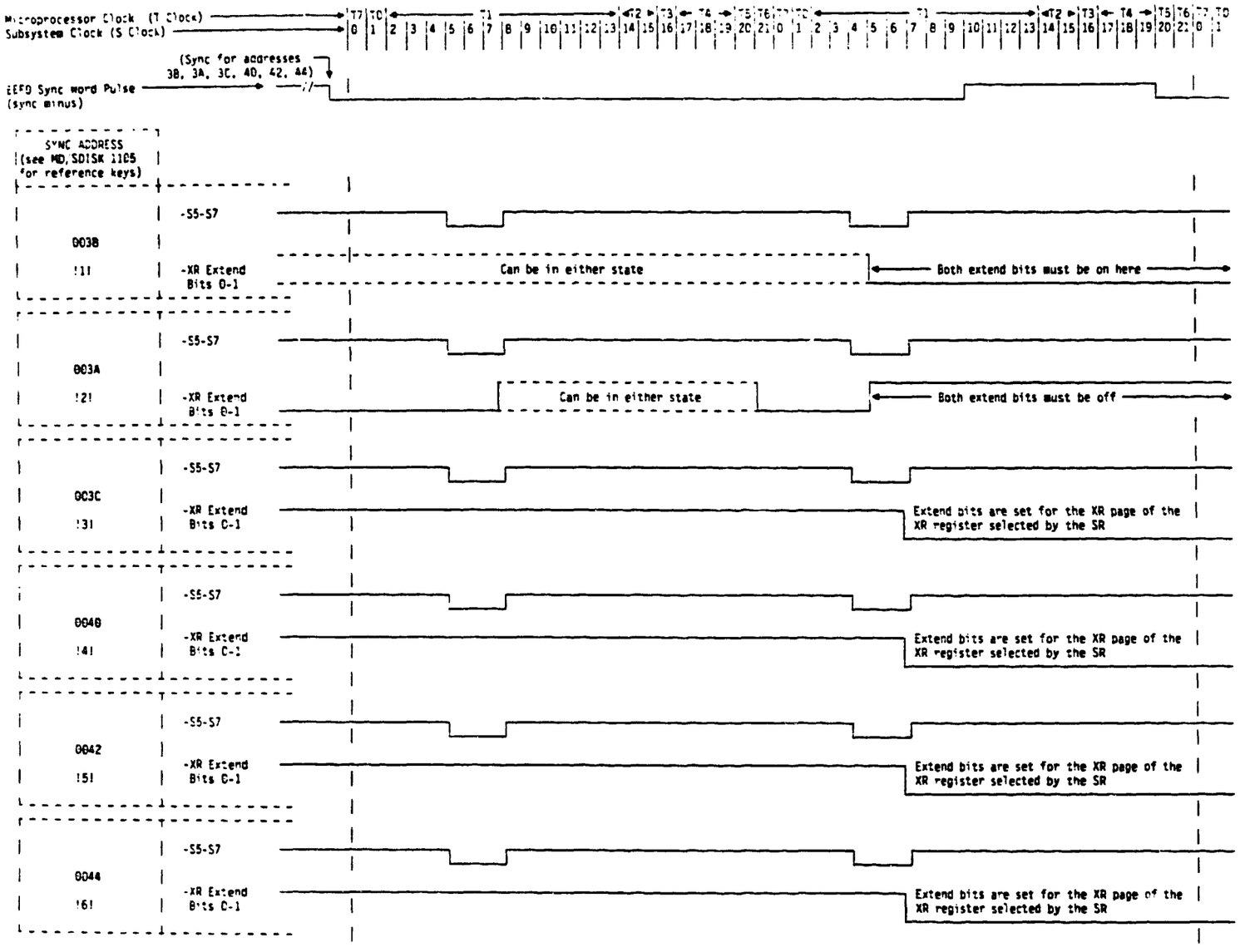
2. To read the XR selected by the XR address and XR extended bits 0 and 1 at S18-S21 time. However, the XR data read from the selected XR is actually latched in the microprocessor card at S18-S19 time.
3. To all microprocessors cards with XR registers. If active during 'XR addressed clock' time, a check 2 and 'XR error latched' are set.
4. The microprocessor card samples 'XR error ungated' during S9-S10 time for XR write, and S20-S21 time for XR read.
5. When the MP instruction decodes as an XR write, data is put on the XR data bus and write gate is turned on.

   0038 - PCR bits 6,7 = 1,1
   003A - PCR bits 6,7 0,0
   003C - PCR bits 6,7 = XR page of selected XR (see Figure 2 on this page)
   0040 - From EEF0's, data used in the write data test selection parameter
   0042 - SR selected XR read data that was written in address sync word 0040 cycle

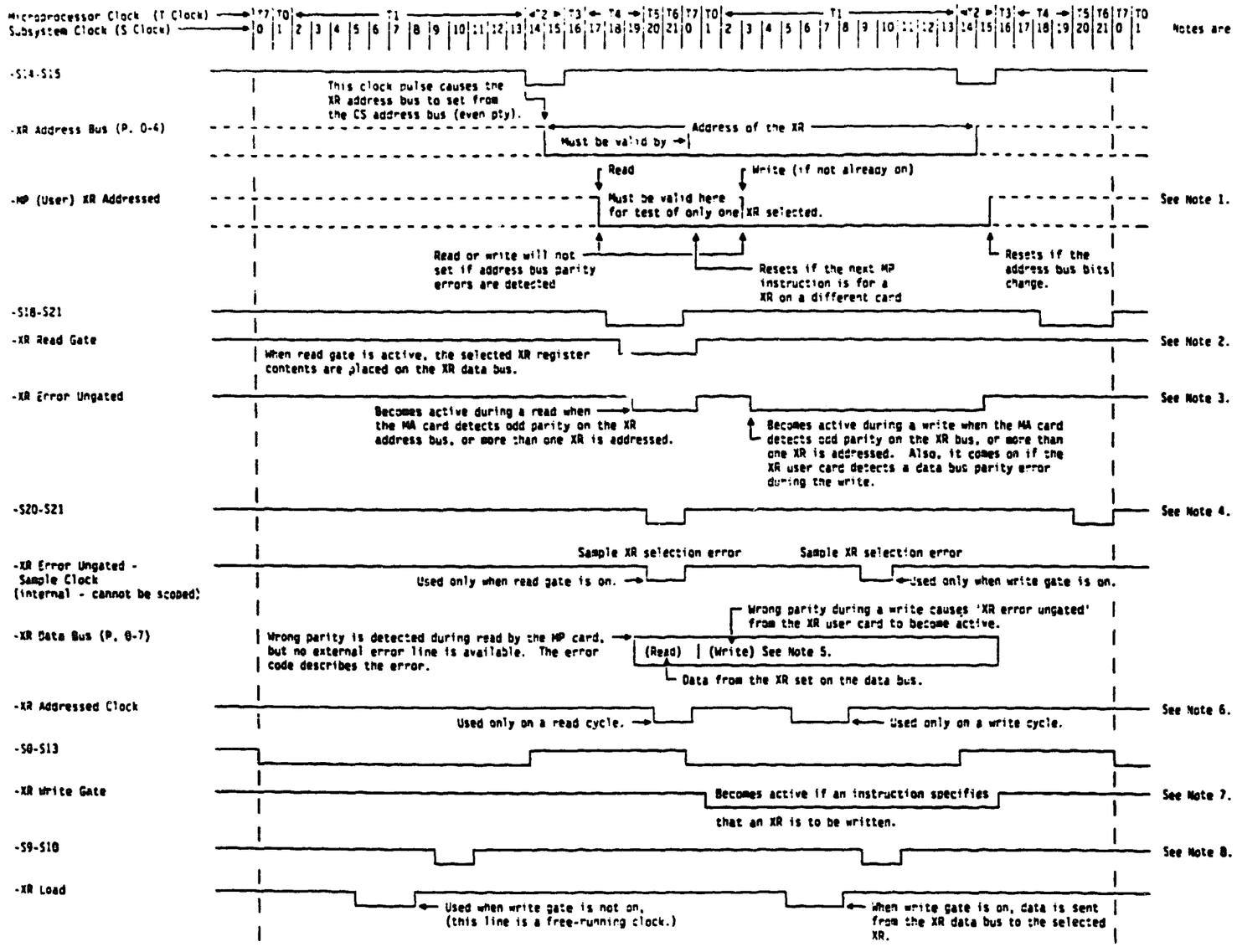
   The bidirectional XR data bus can have write data on it from S0-S14 time, but the selected XR writes at S5-S7 'XR load' time The XR data bus can have read data on it at S18-S21 time, however, it is set into the microprocessor card's read data register (RDR) at S18-S19 time.
6. Used by the MA to validate its 'one and only one' check.
7. To write the XR selected by the XR address and XR extend bits 0 and 1 at S0-S13 time. The XR write data is set on the XR data bus at S0-S13 time, but the selected XR sets at S5-S7 'XR load' time.

   The logic pages used are: BA001, DF001, DI001, MA001, RC001, SS001.
8. To all XR cards on logics pages BA001, DF001, DI001, MA001, RC001, SS001 and to BA003 from BA002 as '-XR load clock'.

Scope Loop Utility – Routine EEF0 (Continued)



Scope Loop Utility – Routine EEF0 (Continued)



Drive Patch Load Utility - Routine EEF1

This routine is used to automatically read microcode from the IML diskette and then send it to the drive

Error Loop does not apply to this routine

Test Selection

This routine cannot be selected directly from the maintenance device (MD).

When any routine is loaded that requires drive microcode patches from the functional diskette, this routine is automatically loaded.

Drive Command Exerciser

The drive command exerciser is a group of programs, on the support diskette, which permits you to test a suspect drive for failures. The support diskette is loaded on a maintenance device (MD), which is connected to a tape control unit. The drive command exerciser issues commands to the suspect drive in a concurrent maintenance mode. The exerciser can be used to isolate drive motion problems or failures caused by a specific command sequence.

You must select one channel adapter and one drive to run the commands on. The maintenance device (MD) will display the channel adapters you are allowed to select from. Only those channel adapters that the tape control unit microcode is able to communicate with, will be displayed. If you select a channel adapter that is not on the MD display, an error is caused.

You can run a predefined group of commands to the drive by selecting routine 1 or 2, or you can run a group of commands of your own selection, up to a maximum of eight commands.

Note: Routine 2 cannot be looped because the last command of that routine is a Rewind Unload. Any group of commands that contains a Rewind Unload (RUN) command should not be looped, because it can cause errors.

Any motion command issued to a drive after a Rewind Unload (RUN) command will cause an error.

A command is entered by keying in the command acronym and pressing the ENTER key. When all the commands in the chain are entered, a null entry (the ENTER key is pressed again) signals the program that all the command entries have been made. A run mode option selection screen is then displayed.

Once a command chain is entered and the run mode is selected, the MD sends the commands to the tape control unit. Each command is executed in turn. Status from the tape control unit is sent to the MD and is analyzed by the exerciser microprogram. Depending on the status returned from the tape control unit, one of the following actions are taken:

- If the command sent receives a good beginning and ending status from the device, the next command is issued.
- If the status returned is a channel command retry, the same command is reissued.
- If the status returned is a unit check, the program gets sense data from the tape control unit and displays an error message followed by the sense data.

Note: The tape control unit error light can blink on and off under certain normal operating conditions. Real errors will be reported on the error display.

Commands

Commands are entered as acronyms by way of the maintenance device keyboard/display. If additional data such as record number, data length, and number of blocks is required, the exerciser microprogram will request the information.

The following commands are supported by the drive command exerciser:

- BSB - Backspace block
- BSF - Backspace file
- DSE - Data security erase
- ERG - Erase gap
- FSB - Forward space block
- FSF - Forward space file
- LDD - Load display
- LOC - Locate block
- MDS - Mode set
- NOP - No operation
- RBI - Read block ID
- RBK - Read backward
- RBL - Read buffered log
- RDF - Read forward
- REW - Rewind
- RUN - Rewind unload
- SID - Sense path/group ID
- SIO - Sense I/O
- SNS - Sense
- TIO - Test I/O
- WRT - Write to tape with synchronize buffer command
- WTM - Write tapemark
- RES - Reserve device
- REL - Release device

For write data commands that execute in tape write immediate mode (SYN - Synchronize buffer), block size (1K increments to 32K) and block count (1 to 256) must be defined.

Run Mode Options

Execution run mode options are:

- **Once:** The command or command chain executes once.
- **Continuous Loop:** The loop continues until an MD function key is pressed, or an error is detected. If an error is detected, the loop ends and an error message is displayed on the MD keyboard/display. The error message is followed by 32 bytes of sense information.

  Note: The loop option should not be selected if you are using the Rewind Unload (RUN) command. If loop is used with a group of commands containing Rewind Unload, an error will occur.
- **Loop 255 Times:** The command or command chain loops 255 times, or until an error is detected. If an error is detected, the loop ends and an error message is displayed on the MD keyboard/display. The error message is followed by 32 bytes of sense information.

Status and error data sent to the MD keyboard/display contains the same information as would normally be sent to the host system.

Error Display

If an error is detected while the drive command exerciser is executing, the following error screen is displayed:

```
(Error
 Message)
ON THE COMMAND:
(Command)
```

The first and second lines are used to display an error message that describes the error. The last line is used to indicate the command that was executing when the error occurred.

Error Messages

The following error messages are displayed on lines 1 and 2 of the MD keyboard/display when an error is detected while the drive command exerciser is executing:

LOOK AT SENSE FOR PROBLEM

INCORRECT NUMBER OF DATA BYTES SNT

DEVICE IS IN USE

INVALID DATA WITH COMMAND

CANNOT RELEASE, NOT RESERVED

NEED RES TO EXECUTE COMMAND

INVALID DIAGNOSTIC OP-CODE

INVALID CHANNEL OP-CODE

CANNOT SCHEDULE OPERATION

SENSE HAS ERROR DATA

TIMEOUT ALLOC BUFF SW

ERR DUR. WRTCARR WCA ORDER

ERR DUR. WRTCACC WCA ORDER

ERR DUR. DIAGINT WCA ORDER

TIMEOUT DURING PMA RESP.

FOUND DEVICE XFER ACTIVE

THE TAPE IS FILE PROTECTED

DEVICE IS NOT READY

CHANNEL COMMAND RETRY

NO BUFFER RECORDS PRESENT

BUFFER IS IN USE

NO ROOM IN BRT TO CREATE REC

DEVICE IS NOT ONLINE

BUFFER DATA NOT CORRECT

XR ERROR

DEFERRED UNIT CHECK

CHANNEL TRANSFER ACTIVE

SNS ERROR MATCH CODE MATC

ERROR PROCESSING RBSSSS ORDER

ERR DUR. DIAG MODEWCA ORDER

UNIT CK END STAT FROM DV

ERR DURING SWB SSS ORDER

ERR DURING RBE SSS ORDER

ERR DUR. RDCADS RCA ORDER

ERR DUR. WTCADS WCA ORDER

DIDNT SEE IBG DUR LWR CMND

BCSE NOT COMP OR FRU ACTIVE

BDSE FRUS ACTIVE

ATTEMPTING TO RD INVAL CS

RD BUFF POINTERS FOR TM

SET OF DIAG MODE FAILED

ERR DUR DEV SEL SEQUENCE

ERR DUR DEV CMND SEQUENCE

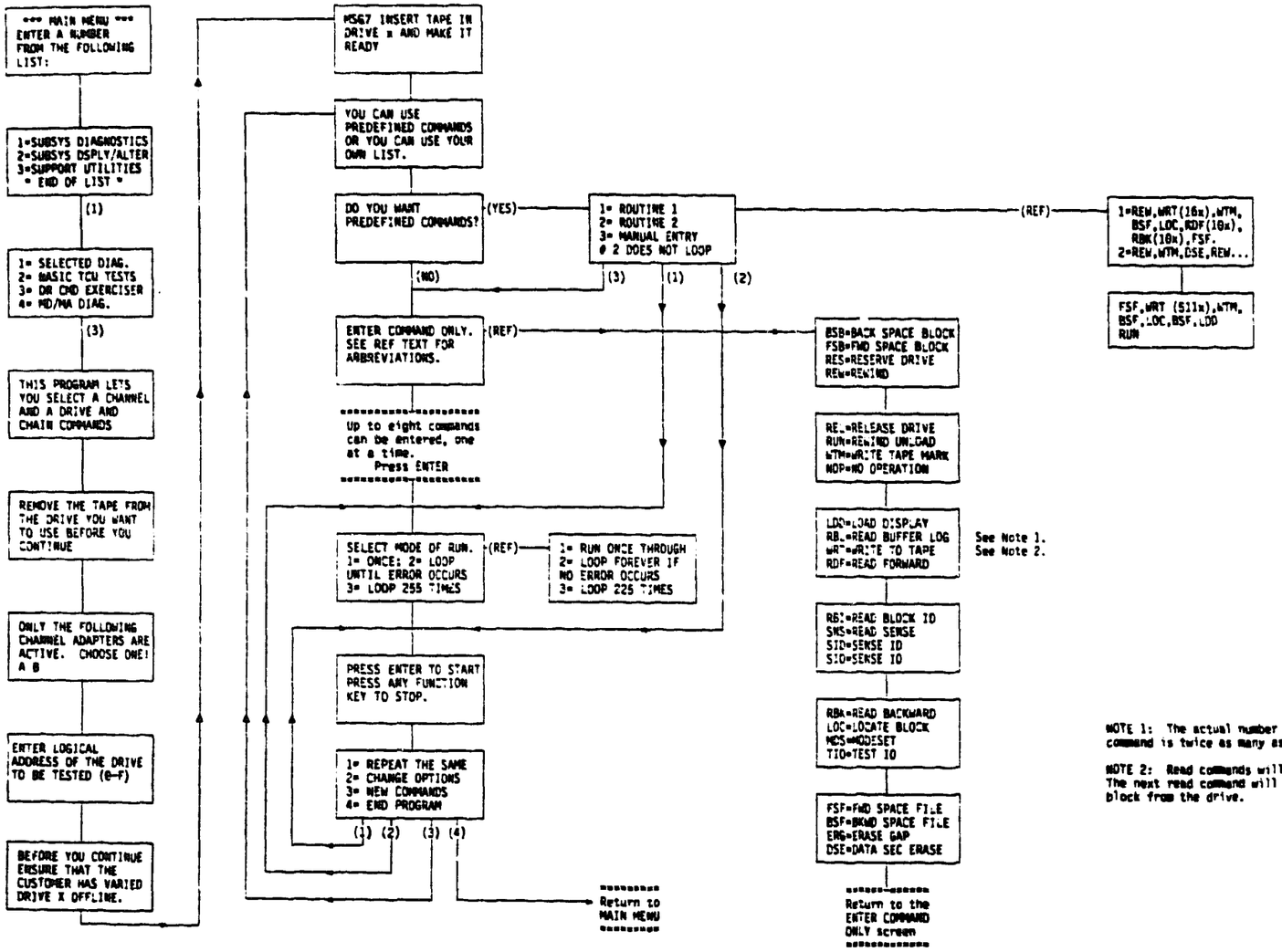
RESET OF DIAG MODE FAILED

DO RBP CMND B4 DEL REC

TIMEOUT ENDING LWR OP

Drive Command Exerciser (Continued) MD/SDISK 1221

Drive Command Exerciser Diagram



NOTE 1: The actual number of blocks written to tape using the write command is twice as many as entered on the MD keyboard.

NOTE 2: Read commands will read multiple blocks from the drive. The next read command will purge the buffer and read the following block from the drive.

Drive Command Exerciser Details

The Drive Command Exerciser programs are written on the support diskette. Once the support diskette has been placed in the maintenance device and the control program has been loaded, the MD display screen indicates the tape control unit serial number and the EC level and part number of the support diskette.

Press ENTER: The following screen displays.

```
 *** MAIN MENU ***
ENTER A NUMBER
FROM THE FOLLOWING
LIST.
```

Press ENTER: The following screen displays.

```
1=SUBSYS DIAGNOSTICS
2=SUBSYS DSPLY/ALTER
3=SUPPORT UTILITIES
 * END OF LIST *
```

Enter a 1: The following screen displays.

```
1= SELECTED DIAG.
2= BASIC TCU TESTS
3= DR CMD EXERCISER
4= MD/MA DIAG.
```

Enter a 3: The following information screen displays.

```
THIS PROGRAM LETS
YOU SELECT A CHANNEL
AND A DRIVE AND
CHAIN COMMANDS.
```

Press ENTER: The following screen displays.

```
REMOVE THE TAPE FROM
THE DRIVE YOU WANT
TO USE BEFORE YOU
CONTINUE
```

- Remove the cartridge completely from the drive

Press ENTER: The following screen displays

```
ONLY THE FOLLOWING
CHANNEL ADAPTERS ARE
ACTIVE.  CHOOSE ONE!
A B
```

- The channel adapter that is to be tested is selected from this display.
- Any adapter not shown is either not working correctly or not present.

Enter an A or B : The following screen displays.

```
ENTER UNIT ADDRESS
OF THE DRIVE TO BE
TESTED. (0-F)
```

- This entry identifies the tape drive that will be tested.

Note: In a dual tape control unit configuration the MD can be attached to either tape control unit; therefore, any drive can be tested.

Enter the drive address: The following screen displays.

```
BEFORE YOU CONTINUE
ENSURE THAT THE
CUSTOMER HAS VARIED
DRIVE X OFFLINE.
```

- X = Current drive being tested.

Press ENTER: The following screen displays.

```
MSG7 INSERT TAPE IN
DRIVE X AND MAKE IT
READY
```

- This entry prepares the drive you want to use so the MD can exercise it.

  After the drive is ready, **press ENTER**. The following screen displays.

```
DO YOU WANT
PREDEFINED COMMANDS?
```

- A YES response to "Do you want predefined commands?" causes the following screen to display

```
1 = ROUTINE1
2 = ROUTINE2
3 = MANUAL ENTRY
# 2 DOES NOT LOOP
```

If you press the ref key while the above display is active, you will be shown the contents of routine 1:

- REW, WRT(16x), WTM, BSF, LOC, RDF(10x), RBK(10x) and FSF commands.

And the contents of routine 2:

- REW, WTM, DSE, REW, FSF, WRT(511x), WTM BSF, LOC, BSF, LDD, and RUN commands.

If one of the routines is selected, each command executes in the sequence noted above.

- A NO response to "Do you want predefined commands?" causes the following screen to display:

```
ENTER COMMAND ONLY.
SEE REF TEXT FOR
ABBREVIATIONS.
```

- Commands can be entered from this screen only.
- Up to eight commands can be entered, one at a time.
- If the command abbreviations are not known, pressing the REF key will cause prompting screens to display. See the Drive Command Exerciser Diagram for the content of the screens (MD/SDISK 1221).
  - Pressing REF causes the next prompting screen to display.
  - Pressing RET causes the 'ENTER COMMAND ONLY' screen to return.
- Press ENTER after each command abbreviation is keyed in.

  Note: If the LDD, WRT, LOC, or MDS commands are entered, additional prompting screens will display. See Prompting Screens on MD/SDISK 1225 for the content of the screens.

Press ENTER: The following screen displays

```
SELECT MODE OF RUN
1= ONCE; 2= LOOP
UNTIL ERROR OCCURS
3= LOOP 255 TIMES
```

- Pressing the REF key causes a prompting screen to display that defines the selections.
  - ONCE - The commands run one time.
  - CONTINUOUS LOOP - The loop continues until an MD function key is pressed, or an error occurs. If an error is detected, the loop ends and an error message is displayed on the MD keyboard/display. The error message is followed by 32 bytes of sense information.
  - LOOP 255 TIMES - The command or command chain loops 255 times. If an error is detected, the loop ends and an error message is displayed. The error screen is followed by another screen that contains 32 bytes of sense information.

Note: The loop option should not be selected if you are using the Rewind Unload (RUN) command. If loop is used with a group of commands containing Rewind Unload, an error will occur. **Select the run mode and press ENTER:** The following screen displays.

```
PRESS ENTER TO START
PRESS ANY FUNCTION
KEY TO STOP.
```

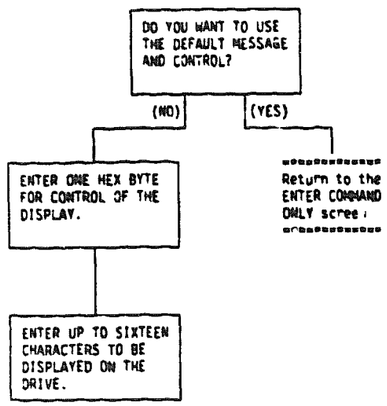
Press ENTER: The following screen displays.

```
1= REPEAT THE SAME
2= CHANGE OPTIONS
3= NEW COMMANDS
4= END PROGRAM
```

- See the Drive Command Exerciser Diagram (MD/SDISK 1221) for the paths taken for each selection.
- If routine 2 is being used, you cannot change options. If you select option 2 it will default to option 1.

Prompting Screens

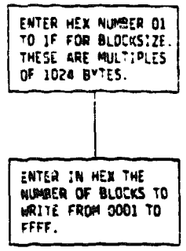
Load Display (LDD)



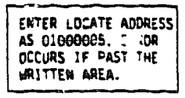
The bits used to control the load display option are defined as follows:

- Bits 0, 1, and 2
  - 000 - Permit drive message to overlay message
  - 001 - No overlay unless tape is removed
  - 010 - No overlay until drive is ready
  - 111 - Display both messages until cartridge is removed, then display 9 - 16 until the drive is ready
- Bit 3
  - 0 - Display message specified by bit 5
  - 1 - Display both messages
- Bit 4
  - 1 - Flash message specified by bit 5
- Bit 5
  - 0 - Display bytes 1 through 8
  - 1 - Display bytes 9 through 16
- Bits 6 and 7.
  - Reserved

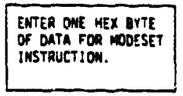
Write To Tape (WRT)



Locate Block (LOC)



Modeset (MDS)



The bits used to enter one byte of data for a modeset instruction are defined as follows:

- Bits 0 and 1 - Tape Format
  - 00 - Write 18 track format
  - 01 - Reserved
  - 10 - Reserved
  - 11 - Reserved
- Bit 2 - Write Mode
  - 0 - Buffered write
  - 1 - Tape write mode
- Bit 3 - Inhibit Supervisor Commands
  - 0 - Execute supervisor commands
  - 1 - Inhibit supervisor commands
- Bits 4, 5, and 6 - Reserved
- Bit 7 - Inhibit Tape Control Unit Error Recovery
  - 0 - Automatic error recovery takes place
  - 1 - Temporary read and write errors reported as permanent errors


DIAG

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Subsystem Diagnostics

You can be directed to run particular subsystem diagnostics by some other part of this Maintenance Guide, for example, from the EAD section or the FSI section. Or you can select diagnostics from what is known about the problem.

Support Diagnostics

The support diagnostics are microprograms that can operate the different parts of the subsystem independently of the subsystem command operation. That is, the diagnostics:

- Consist of microcode
- Replace the functional microcode
- Test the parts of the subsystem.

Because they replace the functional microcode, the support diagnostics cannot be used for concurrent maintenance. You can use the support diagnostics when:

- The error analysis diagram or FSI section calls for the diagnostic
- The GMP does not isolate a problem
- You finish installation
- Unless indicated in a specific diagnostic, the contents of external registers may differ from the original diagnostic display.

Additional diagnostic and support utilities which require the use of an MD are described in MD/SDISK.

How the Support Diagnostics Are Organized

The support diagnostics test many parts of the subsystem. Because you may not need to test everything in the subsystem, the support diagnostics are divided into sections and routines. The sections and routines can be selected to test only those parts of the subsystem that are suspected of failing.

Diagnostic routines and diagnostic sections are identified by an identification code of EE plus a hexadecimal number. An E010 is also assigned that runs a basic set of diagnostics.

Diagnostic Sections

Diagnostic sections consist of a group of diagnostic routines that run in sequence. The sequences test particular areas of the subsystem, such as the tape control unit data flow, the tape control unit to magnetic tape drive interconnections, or the tape control unit buffer. The diagnostic sections are useful when a general area is suspected, but the specific function that may be failing within that area is not known.

Note: Loop until error is the only available option for this section.

Diagnostic Routines

Diagnostic routines are the actual sets of microcode instructions that perform tests on the parts of the subsystem. Some, but not all, diagnostic routines can be called by diagnostic sections.

Note: Loop until error, and loop and bypass error are the only available options for this routine.

Diagnostic Identification Code

The table on DIAG 3 lists the identification code, the page on which detailed explanations of the diagnostic sections and routines begin, and the purpose of each diagnostic section or routine. Also listed are the approximate run times, failure ID examples for each routine, and prerequisite diagnostics. Use this table to select the identification code you want to use if you were not sent to a particular diagnostic by another part of the maintenance package.

E010 — TCU Functions Test

This identification code causes the diagnostic control program to run the diagnostic routines that test the internal circuits of the control units. It does not test the tape units themselves and does not test those circuits that can interfere with operations of a dual tape control unit subsystem. This identification code can be used on one tape control unit of a dual tape control unit subsystem while the other tape control unit operates with the host processor.

E010 runs tape control unit and tape unit data path diagnostic routines in the following order: EE32, EE33, EE52, EE53, EE85, EE92, and EE93.

When E010 runs, the diagnostic routines included in E010 use their built in defaults. Parameter entries such as channel and drive addresses and pattern numbers are neither required nor allowed.

EE30 — Data Buffer and Buffer Adapter Tests

For control options, see the individual routines listed under this diagnostic section on DIAG 3. The Improved Data Recording Capability tests run automatically if the Improved Data Recording Capability feature is installed.

EE40 — Tape Control Unit to Drive Test

For control options, see the individual routines listed under this diagnostic section on DIAG 3.

EE50 — Data Path Tests

For control options, see the individual routines listed under this diagnostic section on DIAG 3.

EE90 — Status Store Tests

For control options, see the individual routines listed under this diagnostic section on DIAG 3.

EEA0 — Tape Movement Tests

For control options, see the individual routines listed under this diagnostic section on DIAG 3.

Subsystem Diagnostics (Continued)

POR Codes to Support Diagnostic Error Code Conversions

Error Codes Generated For the Jib Diagnostics (See MD/SDISK)

POR Error Code	Support Error Code
EC01	HC2021
EC02	HC2022
EC03	HC2023
EC04	HC2024
EC05	HC2025
EC06	HC2026
EC07	HC2027
EC08	HC3021
EC09	HC3022
EC0A	HC3023
EC0B	HC3024
EC0C	HC3025
EC0D	HC3026
EC0E	HC3027
EC0F	HC3028
EC10	HC3029
EC11	HC302A
EC12	HC302B
EC13	HC302C
EC14	HC302D
EC15	HC302E
EC16	HC302F
EC17	HC3030
EC18	HC3035
EC19	HC3032
EC1A	HC3036
EC1B	HC3037
EC1C	HC3038
EC1D	HC3031
EC1E	HC3033
EC21	HC4021
EC22	HC4022
EC23	HC4023
EC24	HC4024
EC25	HC4025
EC26	HC4026
EC27	HC4027
EC28	HC4028
EC29	HC4029

Error Codes Generated For the External Register Diagnostics (See DIAG)

POR Error Code	Support Error Code
EC31	XB5021
EC32	XB5022
EC33	XB5023
EC34	XB5024
EC35	XB5025
EC36	XB5026
EC37	XB5027
EC38	XB5028
EC39	XB5029
EC3A	XB502A
EC3B	XB502B
EC3C	XB502C
EC3D	XB502D
EC3E	XB502E

Error Codes Generated For the Buffer Diagnostics (See DIAG)

POR Error Code	Support Error Code
EC51	BU2021
EC52	BU2022
EC53	BU2023
EC54	BU2024
EC55	BU2025
EC56	BU2026
EC57	BU2027
EC58	BU2028
EC59	BU2029
EC5A	BU202A
EC5B	BU202B
EC5C	BU202C
EC5D	BU202D
EC5E	BU202E
EC5F	BU202F
EC60	BU2030
EC61	BU2031
EC62	BU2032
EC63	BU2033
EC64	BU2034
EC65	BU2035
EC66	BU2036
EC67	BU2037
EC68	BU2038
EC69	BU2039
EC6A	BU203A
EC6B	BU203D
EC6C	BU203E
EC6D	BU203F
EC6E	BU2040
EC6F	BU2041
EC70	BU2042
EC71	BU2043
EC72	BU2044
EC73	BU2045
EC74	BU2046
EC75	BU2047
EC76	BU2048
EC77	BU2049
EC78	BU204A
EC79	BU204B
EC7A	BU204C
EC7D	BU203B, BU203C
EC82	BU4055
EC83	BU4056
EC84	BU405A,BU405B
EC85	BU404A, BU404B, BU404C, BU404D, BU404E
EC86	BU404F
EC87	BU4050
EC88	BU4051
EC89	BU4052
EC8A	BU4053
EC8B	BU4057, BU4058, BU4059, BU405A, BU405B
EC8C	BU4055
EC8D	BU402E
EC8E	BU4021, BU4024
EC8F	BU4022, BU4023
EC90	BU402F, BU4030
EC91	BU4025
EC92	BU4026
EC93	BU4027
EC94	BU4028
EC95	BU4029
EC96	BU402A
EC97	BU402B
EC98	BU402C
EC99	BU402D
EC9A	BU4031
EC9B	BU4032
EC9C	BU4033
EC9D	BU4034
EC9E	BU4035
EC9F	BU4036
ECA0	BU4037
ECA1	BU4039
ECA2	BU403A
ECA3	BU403B
ECA4	BU403C
ECA5	BU403D
ECA6	BU403E
ECA7	BU403F
ECA8	BU4040
ECA9	BU4041
ECAA	BU4042

POR Error Code	Support Error Code
ECAB	BU4043
ECAC	BU4044
ECAD	BU4045
ECAE	BU4046
ECAF	BU4047
ECB0	BU4048
ECB1	BU4049
ECB3	BU405F, BU4060
ECB4	BU4061
ECB5	BU4066,BU4067
ECB6	BU4054, BU406D
ECB7	BU406E

Error Codes Generated For the Loop Write To Read Diagnostics (See DIAG)

POR Error Code	Support Error Code
ECC2	LW2022
ECC3	LW2023
ECC4	LW2024
ECC5	LW2025
ECC6	LW2026
ECC7	LW2027
ECC8	LW2028
ECC9	LW2029
ECCA	LW202A
ECCB	LW202B
ECCC	LW202C
ECCD	LW202D
ECCE	LW202E
ECCF	LW202F
ECD0	LW2030
ECD1	LW2031
ECD2	LW2032
ECD3	LW2033
ECD4	LW2034
ECD5	LW2035
ECD6	LW2036

POR Error Code	Support Error Code
ECDF	LW3041
ECE0	LW3044
ECE1	LW3045
ECE2	LW3042
ECE3	LW3043
ECE5	LW302B
ECE6	LW3029
ECE7	LW302A
ECE8	LW302B
ECE9	LW302C
ECEA	LW302D
ECEB	LW302E
ECEC	LW302F
ECED	LW3030
ECEE	LW303A
ECEF	LW303B
ECF0	LW303C
ECF1	LW303D
ECF2	LW303E
ECF3	LW303F
ECF4	LW3040
ECF5	LW3021, LW3022, LW3023, LW3024, LW3025
ECF6	LW3026
ECF7	LW3027
ECF8	LW3031
ECF9	LW3033
ECFA	LW3034
ECFB	LW3035
ECFC	LW3037
ECFD	LW3036
ECFE	LW3038
ECFF	LW3039

Error Codes Generated For the Status Store Diagnostics (See DIAG)

POR Error Code	Support Error Code
ED00	SS2021
ED01	SS2022
ED02	SS2023
ED03	SS2024
ED04	SS2025
ED05	SS2026
ED06	SS2027
ED10	SS3021
ED11	SS3022
ED12	SS3023
ED13	SS3024
ED14	SS3025
ED15	SS3026
ED16	SS3027
ED17	SS3028
ED18	SS3029
ED19	SS302A

Error Codes Generated For the Channel Diagnostics (See MD/SDISK)

POR Error Code	Support Error Code
ED22	CI4049
ED23	CI404A
ED24	CI404B
ED25	CI404C
ED26	CI404D
ED27	CI404E
ED28	CI404F
ED2A	CI4050
ED2B	CI4051
ED2D	CI4054
ED2E	CI4055
ED2F	CI4056
ED30	CI4057
ED31	CI4058

POR Error Code	Support Error Code
ED32	CI4059
ED33	CI405A
ED34	CI405B
ED35	CI405C
ED36	CI405D
ED37	CI405E
ED38	CI405F
ED39	CI4060
ED3A	CI404D
ED3B	CI404D
ED3C	CI4061
ED3D	CI404D
ED3E	CI404D
ED3F	CI404D
ED40	CI4061

Error Codes Generated For the Hardware Checkers Diagnostics

Note: There are no equivalent support diagnostics.

POR Error Code	Action/Comment
ED41	BCSE group 0 error
ED42	BCSE group 1 error
ED43	BCSE group 2 error
ED44	BCSE group 3 error
ED45	Channel CRC checker failed
ED46	BDSE group 0 error
ED47	BDSE group 1 error
ED48	BDSE group 2 error
ED49	BDSE group 3 error
ED4A	Device CRC checker failed
ED4C	Buffer XR check 2 error
ED4D	Timed out while waiting for service in after setting channel read forward command.
ED4E	Device CRC checker failed (WSE errors)
ED4F	Device parity checker failed (buf toggle write)

Subsystem Diagnostics (Continued)

POR Error Code	Action/Comment
ED50	Buffer XR check 2 error (write data flow)
ED51	Device parity checker failed (buf toggle read)
ED52	Timed out while waiting for beginning sync
ED53	Timed out while waiting for BOB
ED54	Timed out while waiting for IBG
ED55	The DLR switch (see CARR-TCU 1189) is not set to TA90 mode.

Error Codes Generated For the IML Functional

Diskette Loader Error Detection

POR Error Code	Action/Comment
ED80	IML successful.
ED81	Requested file not found.
ED82	Incorrect file password.
ED83	Requested number of blocks too large.
ED84	Directory not open.
ED85	Illegal file I/O request.
ED86	Duplicate file name.
ED87	Requested directory not found.
ED88	Insufficient disk space.
ED89	Directory full.
ED8A	File not open.
ED8B	File not closed.
ED8C	Attempting to write a read only file.
ED8D	File not a directory.
ED8E	File I/O busy.
ED90	Diskette read error. The diskette controller status registers 0,1,2 & the cylinder number are posted in the next two words.
ED91	Diskette write error. The diskette controller status registers 0,1,2 & the cylinder number are posted in the next two words.
ED92	Diskette read back compare error. The diskette controller status registers 0,1,2 & the cylinder number are posted in the next two words.
ED93	Diskette seek error. The diskette controller status registers 0,1,2 & the cylinder number are posted in the next two words.

POR Error Code	Action/Comment
ED94	Diskette recalibrate error. The diskette controller status registers 0,1,2 & the cylinder number are posted in the next two words.
ED95	Invalid sector number.
ED96	Timeout while trying to read diskette controller data register.
ED97	Timeout while trying to write diskette controller data register.
ED98	Timeout while trying to do a diskette operation (read, write, readback, seek, recalibrate). Probably due to no diskette or the diskette not being loaded in correctly.
EDB1	Swap to level 0 failed.
EDB2	Control store read/write failure. The failing control store address and the pattern are posted in the next two words.
EDB3	Check 1 during control store R/W check. The control store address and ERA & ERB are posted in the next two words.
EDB4	Second boot not loaded. The diskette controller status registers 0,1,2 & 3 are posted in the next two words.
EDB5	Invalid second boot, or blank diskette.
EDB6	Microprocessor not reset to level 7.
EDB7	Diskette controller write timeout.
EDB8	Diskette controller read timeout.
EDB9	Diskette data transfer timeout.
EDBA	External register error.
EDBB	Unidentified level 0 interrupt.
EDBC	Checksum error.
EDBD	Collision detect error during IML.
EDBE	Hardware Check 1 Error followed by diskette I/O error loading 2nd bootstrap.
EDBF	Hardware Check 1 Error.
EDC1	Invalid Parameter specified on CS Dump/Load command (hexadecimal 8C).
EDC2	POR Diagnostics detected a hardware error during IML.
EDD0	This IML disk has been configured for some other tape control unit. Configuration is performed at initial IML time. IML of this tape control unit with the wrong disk is not allowed.
EDD1	When reading in the tape control unit patch table, the check sum did not compare. No patching was done and the IML of this tape control unit will not continue.
EDD2	When reading in the actual patch from the disk, the check sum did not compare. The patch was not applied. The IML of this tape control unit will not continue

Diagnostic Identification Code Table

ID Code *	Page	Type (See Note)	Purpose	Load and Run Times (Approximate)	Failure ID Example	Prerequisite Diagnostics
E010		1	TCU functions test, diagnostic section. Runs diagnostic routines EE32, EE33, EE52, EE53, EE64, EE85, EE92, and EE93. See "E010 – TCU Functions Test."	2 minutes		GMP
(BCU)	DIAG 30	1	Basic tape control unit test. TCU functions test, diagnostic section. Runs diagnostic routines EE12, EE13, EE14, EE32, EE33, EE52, EE53, EE64, EE85, EE92, and EE93.	5 minutes	CB10xx	None
EE10		1	Processor basic tests, diagnostic section. Runs routines EE12, EE13, EE14, and EE85.	1 minute and 5 seconds		BCU
EE12	DIAG 50	1	Processor function test.	18 seconds	HC20xx	BCU
EE13	DIAG 55	1	Interrupt level test.	18 seconds	HC30xx	BCU, EE12
EE14	DIAG 65	1	Processor external register test.	18 seconds	HC40xx	BCU, EE12, EE13
EE20			Reserved.			
EE30		1	Data buffer tests, diagnostic section. Runs routines EE32 and EE33.	3 minutes		GMP, EE10
EE32	DIAG 100	1	Data buffer data path test.	2 minutes 30 seconds	BU20xx	GMP, EE10
EE33	DIAG 110	1	Data buffer controls.	24 seconds	BU30xx	GMP, EE10, EE32
EE40		2	Tape Control Unit to drive tests, diagnostic section. Runs routines EE42, EE43, and EE44.	2 minutes (16 drives)		GMP
EE42	DIAG 150	3	Tape Control Unit to drive bus out and driver wrap test.	18 seconds	DI20xx	GMP
EE43	DIAG 160	2	Tape Control Unit to drive bus and tag test.	19 seconds	DI30xx	GMP, EE42
EE44	DIAG 170	2	Tape Control Unit to drive serial test.	1 minute and 23 seconds (16 drives)	DI40xx	GMP, EE42, EE43
EE50		2	Data path tests, diagnostic section. Runs routines EE52, EE53, and EE54.	54 seconds		EE10, GMP, EE30, EE40
EE52	DIAG 200	1	Short loop write to read pattern test.	18 seconds	LW20xx	GMP, EE10, EE30
EE53	DIAG 210	1	Short loop write to read timing test.	18 seconds	LW30xx	GMP, EE10, EE30, EE52
EE54	DIAG 220	2	Long loop write to read test.	18 seconds	LW40xx	GMP, EE10, EE30, EE52, EE53, EE40
EE70			Reserved.			
EE72			Reserved.			
EE85	DIAG 400	1	External register bus addressing and data pattern test.	19 seconds	XB50xx	GMP, EE12, EE13, EE14

ID Code *	Page	Type (See Note)	Purpose	Load and Run Times (Approximate)	Failure ID Example	Prerequisite Diagnostics
EE90		1	Status store tests, diagnostic section. Runs routines EE92 and EE93.	36 seconds		GMP, EE10
EE92	DIAG 450	1	Status store wrt/rd RAM storage test.	18 seconds	SS20xx	GMP, EE10
EE93	DIAG 460	1	Status store order test.	18 seconds	SS30xx	GMP, EE10, EE92
EEA0		2	Tape movement tests, diagnostic section. Runs routines EEA2, EEA3, and EEA4.	7 minutes and 30 seconds		GMP, EE40, EE10
EEA2	DIAG 500	2	Basic tape motion test.	18 seconds	TM20xx	GMP, EE40, EE10
EEA3	DIAG 510	2	Write/Read Exerciser.	3 minutes and 47 seconds	TM30xx	GMP, EE40, EE10, EEA2
EEA4	DIAG 550	2	Write/Read Exerciser.	4 minutes and 30 seconds	TM80xx	GMP, EE40, EE10, EEA2

Notes:

1. For operating instructions refer to CE/HSC.
2. To run the TCU support diagnostics, or IML the TCU support diskette, the entire subsystem (including both TCUs and all drives) must be deallocated and unavailable for customer use.

Data Buffer Data Path Test - Routine EE32

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine contains three modules that test the data buffer operation. The modules test the data paths into and out of the buffer, the buffer CRC character generation, and the ability to address all locations in the buffer.

Routine Start Address: 2010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Data Buffer Data Path Test

This module consists of four tests that check each of the four data paths into the data buffer.

- Test 1 uses the Channel Adapter write data path to write data into the buffer and the drive read data path to read data from the buffer.
- Test 2 uses the drive write data path to write data into the buffer and the channel adapter read data path to read data from the buffer.
- Test 3 writes 256 bytes of ripple data using the channel adapter write data path and reads the data back using the drive read data path.
- Test 4 writes 256 bytes of ripple data using the drive write data path and reads the data back using the channel adapter read data path.

A 256 byte data pattern of each hexadecimal character from hexadecimal 00 to hexadecimal FF is written into one data buffer data path and read through another data path. The expected data (written) is then compared to the actual data (read).

Data Buffer Check Character Test

This module tests the CRC character generation. A record is written and the CRC character is stored. The same record is then read and the calculated CRC character is compared with the stored CRC character.

Data Buffer Memory Test

This module tests the addressability of the data buffer by writing into and reading out of every buffer location. It also tests the segment looping function of the data buffer.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette, you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the next key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Data Buffer Data Path Test

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ERB is not 00 go to FSI for err code E100 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU:14 FRU:26 FRU:13
8U2021	A buffer channel status error occurred during a write operation through the channel write data path.	See the FSI section for error code D5nn.	
8U2022	A buffer device status error occurred during a read operation through the drive read data path.	See the FSI section for error code D6nn.	
8U2023	A buffer device status error occurred on the last pass during a read operation through the drive read data path.	See the FSI section for error code D6nn.	
8U2024	Data read from the buffer did not equal the data written into the buffer.	If any errors are set, ignore the data compare error and troubleshoot the errors set by the hardware. See the FSI section for error code D5nn.	
8U2025	The BCSE status bit 0 (device pointer stop) was not active after a read operation through the drive read data path.	See the FSI section for error code D5nn.	
8U2026	Channel - pointer = Stop was not on after an MP read.	See the FSI section for error code D5nn.	
8U2027	A buffer device status error occurred during a write operation through the drive write data path.	See the FSI section for error code D6nn.	
8U2028	A buffer channel status error occurred during a write operation through the channel write data path.	See the FSI section for error code D5nn.	
8U2029	A buffer channel status error occurred on the last pass during a read operation through the channel read data path.	See the FSI section for error code D5nn.	
8U202A	Data read from the buffer did not equal the data written into the buffer.	If any errors are set, ignore the data compare error and troubleshoot the errors set by the hardware. See the FSI section for error code D5nn.	
8U202B	'Service in' did not become active or 'data in' is active on a channel operation.	See the FSI section for error code D5nn.	
8U202C	'Data in' did not become active or 'service in' is active on a channel operation.	See the FSI section for error code D5nn.	
8U202D	Channel 1 stop bit was not active after a channel operation.	See the FSI section for error code D5nn.	
8U202E	'Microprocessor write complete' did not become active on a channel write operation.	See the FSI section for error code D5nn.	
8U202F	Buffer channel status error occurred during a channel write operation.	See the FSI section for error code D5nn.	

ERROR DISPLAYS

```
nnnnnn
ERA=ra,          ERB=rb
PSR=sa, PER=pp, XRA=aa
MTI=mm, MDI=md
```

nnnnnn Failure ID

**	No errors were set
ra	Contents of error register A
rb	Contents of error register B
sa	Contents of the processor status register
pp	Contents of the processor error register
aa	Contents of the external address register
mm	Contents of the maintenance tag in register
md	Contents of the maintenance data in register

```
BCSE = abcde
BDSE = fghij
BWRP = cc
```

*	No errors were set
a	Buffer channel status and error register bits 0 - 3
b	BCSE channel error group 0
c	BCSE channel error group 1
d	BCSE channel error group 2
e	BCSE channel error group 3
f	BCSE device status and error register bits 0 - 3
g	BDSE device error group 0
h	BDSE device error group 1
i	BDSE device error group 2
j	BDSE device error group 3
cc	Contents of the buffer wrap register

```
DATA EXP/WRT=aaaa
DATA READ   =bbbb
BUFFER adr  =cccc
```

aaaa	Data written into the buffer
bbbb	Data read from the buffer
cccc	Current buffer address

NOTE: You will see the following error displays only if the Data Compaction Feature is installed.

```
CMS = aa,  CTXE = ee
CMM = bb,  CMDD = ff
CMM = cc,  CMD1 = gg
CTEJ = dd, CMFL = hh
```

aa	Contents of the COMP status register
bb	Contents of the COMP mode register
cc	Contents of the Channel mode register
dd	Contents of the C3PO error register
ee	Contents of the C3PO XR error register
ff	Contents of the COMP diagnostic 0 register
gg	Contents of the COMP diagnostic 1 register
hh	Contents of the COMP feature level register

```
CPOED = aa, CP2ED = ee
CP0E1 = bb, CP2E1 = ff
CP1E0 = cc, CP3E0 = gg
CP1E1 = dd, CP3E1 = hh
```

aa	Contents of the Comp 0 error 0 register
bb	Contents of the Comp 0 error 1 register
cc	Contents of the Comp 1 error 0 register
dd	Contents of the Comp 1 error 1 register
ee	Contents of the Comp 2 error 0 register
ff	Contents of the Comp 2 error 1 register
gg	Contents of the Comp 3 error 0 register
hh	Contents of the Comp 3 error 1 register

```
CP0C = aa,  CP2D = ee
CP1C = bb,  CP1D = ff
CP2C = cc,  CP2D = gg
CP3C = dd,  CP3D = hh
```

aa	Contents of the Comp0 configuration register
bb	Contents of the Comp1 configuration register
cc	Contents of the Comp2 configuration register
dd	Contents of the Comp3 configuration register
ee	Contents of the Comp0 diagnostic register
ff	Contents of the Comp1 diagnostic register
gg	Contents of the Comp2 diagnostic register
hh	Contents of the Comp3 diagnostic register

```
CBC CH0 = aaaaaaaa
CBC CH1 = bbbbbbbb
CBC CH2 = cccccccc
CBC CH3 = dddddddd
```

aaaaaaaa = Channel byte count for Comp 0
bbbbbbbb = Channel byte count for Comp 1
cccccccc = Channel byte count for Comp 2
dddddddd = Channel byte count for Comp 3

Data Buffer Data Path Test (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. 2. If PSR bit 0 = 1 see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU113	See the "Error Displays" column on DIAG 102.
8U2030	Buffer channel status error occurred after a Store CRC command.	See the FSI section for error code D5nn.		
8U2031	Data read from the buffer did not equal the data written into the buffer.	If any errors are set, ignore the data compare error and troubleshoot the errors set by the hardware. See the FSI section for error code D6nn.		
8U2032	'Device pointer stop' or 'device complete' was not active after a read operation through the drive read data path.	See the FSI section for error code D6nn.		
8U2033	Buffer device status error occurred during a read operation through the drive read data path.	See the FSI section for error code D6nn.		
8U2034	Buffer device status error occurred during a write operation through the drive write data path.	See the FSI section for error code D6nn.		
8U2035	'Device read end' and 'device data transfer complete' bits were not on after a write operation through the drive write data path.	See the FSI section for error code D6nn.		
8U2036	'Service in' did not become active or 'data in' is active on a channel operation.	See the FSI section for error code D5nn.		
8U2037	'Data in' did not become active or 'service in' is active on a channel operation.	See the FSI section for error code D5nn.		
8U2038	Data read from the buffer did not equal the data written into the buffer.	If any errors are set, ignore the data compare error and troubleshoot the errors set by the hardware. See the FSI section for error code D5nn.		
8U2039	Buffer channel status error occurred during a write operation through the channel write data path.	See the FSI section for error code D5nn.		
8U203A	Channel pointer equals stop was not on in the buffer channel status and error (BCSE) register after a channel operation.	See the FSI section for error code D5nn.		

Data Buffer Data Path Test - Routine EE32 (Continued)

Check Character Test

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. 2. If PSR bit 0 = 1 see EAD 1 for error code Fnnn.	FRU114 FRU120	See the "Error Displays" column on DIAG 102.
8U2038	Ending sequence error after a channel write operation.	See the FSI section for error code D5nn.		
8U203C	Ending sequence error after a channel read operation.	See the FSI section for error code D5nn.	FRU113	
8U203D	A failure was detected by the buffer channel status and error (BCSE) or the buffer device status and error (BDSE) after an MP channel write operation.	See the FSI section for error code D5nn or D6nn.		
8U203E	Buffer channel remainder value is incorrect.	See the FSI section for error code D5nn.		
8U203F	The CRC character generated by the data transfer hardware and the expected CRC character are not equal. Errors are not checked.	See the FSI section for error code D5nn.		
8U2040	A failure was detected by the buffer channel status and error (BCSE) or the buffer device status and error (BDSE) after an MP channel write operation.	See the FSI section for error code D5nn or D6nn.		
8U2041	Buffer channel remainder value is incorrect.	See the FSI section for error code D6nn.		
8U2042	The CRC character generated by the data transfer hardware and the expected CRC character are not equal. Errors are not checked.	See the FSI section for error code D6nn.		

Data Buffer Data Path Test - Routine EE32 (Continued)

Memory Test

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 0, see the FSI section for error code E10E. 2. If PSR bit 0 = 1 see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU113	See the "Error Displays" column on DIAG 102.
8U2043	A buffer channel status error was received after a write of modulo 32 addresses into the buffer.	See the FSI section for error code D5nn.		
8U2044	A buffer device status error was received after a read of the modulo 32 addresses just written into the buffer.	See the FSI section for error code D6nn.		
8U2045	The address read out of the buffer does not equal the expected address.	See the FSI section for error code D5nn.		
8U2046	Buffer channel status error was received after a specified data pattern was written into the buffer.	See the FSI section for error code D5nn.		
8U2047	A buffer device status error was received after a specified data pattern was read from the buffer.	See the FSI section for error code D6nn.		
8U2048	The data read out of the buffer does not equal the expected data.	See the FSI section for error code D5nn.		
8U2049	A buffer channel status error was received after a channel wrap write test.	See the FSI section for error code D5nn.		
8U204A	The buffer channel pointer and the actual buffer address are not equal after a buffer wrap write test.	Check the DLR switch setting (see CARR-TCU 1189). See the FSI section for error code D5nn.	FRU114 FRU120	
8U2048	A buffer device status error was received after a buffer wrap read test.	See the FSI section for error code D6nn.	FRU114 FRU120 FRU113	
8U204C	The buffer device pointer and the actual buffer address are not equal after a buffer wrap read test.	See the FSI section for error code D6nn.		

Data Buffer Controls Test - Routine EE33

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine consists of nine tests that check various control features of the data buffer.

Routine Start Address: 3010

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics, follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 11).

Error Looping: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Tests

'Suppress Out' and 'Data Stop' (Read Forward) Test

This test checks the response of the buffer to the 'suppress out' and 'data stop' signals. The diagnostic writes 135 data bytes to the buffer through the channel write data path. The diagnostic then reads the data back (with a read forward command) through the channel read data path. When the diagnostic has read one third of the data, it activates the 'suppress out' signal to the buffer and checks to ensure that the data transfer has stopped. The diagnostic then deactivates 'suppress out' and reads data again. After reading another one third of the data, the diagnostic activates 'data stop' and checks to ensure that the buffer has stopped transferring data. When the data transfer is complete, the diagnostic checks for any errors in the buffer channel status and error (BCSE) register and checks that the buffer is addressing the correct storage location.

'Suppress Out' and 'Data Stop' (Read Backward) Test

This test checks the response of the buffer to the 'suppress out' and 'data stop' signals. The diagnostic writes 135 data bytes to the buffer through the channel write data path. The diagnostic then reads the data back (with a read backward command) through the channel read data path. When the diagnostic has read one third of the data, it activates the 'suppress out' signal to the buffer and checks to ensure that the data transfer has stopped. The diagnostic then deactivates 'suppress out' and reads data again. After reading another one third of the data, the diagnostic activates 'data stop' and checks to ensure that the buffer has stopped transferring data. When the data transfer is complete, the diagnostic checks for any errors in the buffer channel status and error (BCSE) register and checks that the buffer is addressing the correct storage location.

Read Overrun Test

This test checks the circuits that recognize an overrun condition during a read operation. The diagnostic performs a read forward operation through the channel read data path, of 257 bytes. The address pointer is reset to address 6. The diagnostic then performs a read operation through the drive data path, of 257 bytes, which is placed in the buffer at address 6. After the read operation through the drive data path is completed, the diagnostic checks to ensure that the needed errors are set, and that the address pointers for the channel data path and the drive data path are correct.

Write Overrun Test

This test checks the circuits that detect overrun conditions during write operations. The diagnostic program performs a write operation of 257 bytes through the channel data path. The diagnostic then sets the buffer address pointer for the drive data path to address 6, and performs a write operation of 257 bytes through the buffer to the drive data path. The diagnostic then checks to ensure the needed errors are set and that the buffer address pointers are correct for the channel data path and the drive data path.

Separation Test

This test checks that the channel does not take data from the buffer before the drive has transferred the data to the buffer. The diagnostic program reads 262 bytes into the buffer through the drive to buffer data path. With the drive to buffer data path still active, the diagnostic performs a read forward operation for 256 bytes using the buffer to channel data path. With the channel data path still active, the diagnostic performs two consecutive 128-byte read forward operations and checks to ensure no errors have occurred. The diagnostic then performs another 256-byte read forward operation and checks for errors and to ensure that the address pointers are correct for both the channel and drive data paths. The diagnostic then performs a complete reset of the buffer.

Improved Data Recording Capability Tests

Note: The Improved Data Recording Capability tests will run automatically if the Improved Data Recording Capability feature is installed.

Buffer Adapter Improved Data Recording Capability XR Reset Test

This test verifies that each register on the buffer adapter Improved Data Recording Capability card can be reset properly. This is accomplished by first writing to the register, issuing the reset and then verifying the register is reset.

Buffer Adapter Improved Data Recording Capability RAM Tests

This test verifies that the data RAM's (random access memory) functions properly. This is accomplished by writing special data patterns into each RAM address then reading back and comparing the data written to the data read. Finally a unique address is written to each RAM and is then read back to verify their addressability.

Buffer Adapter Improved Data Recording Capability Checkers Test

This text section forces errors and checks all the error detecting circuitry on the buffer adapter card.

Buffer Adapter Improved Data Recording Capability Tests

The Improved Data Recording Capability function is verified by writing incremental, fixed and random data patterns with the Improved Data Recording Capability enabled. Then the data is read back, and compared to the original write data. The channel byte count registers are also verified during this test.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette, you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

Routine EE33 displays different combinations of the screens shown under ERROR DISPLAY in the following charts. The different failures and the different tests determine which screens are displayed. You can step through the screens you receive on your maintenance device, and locate the matching screen and its explanation in the chart. If the Improved Data Recording Capability feature is installed and an error occurs, additional error displays show the actual and expected contents of the buffer adapter card external registers.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Error Displays

ERROR DISPLAYS

Note: This error display is only present if you have the data compaction feature.

```
CMS  = AA, CMXE = EE
CMM  = BB, CMD0 = FF
CMM  = CC, CMD1 = GG
CMED = DD, CMFL = HH
```

AA	Contents of the COMP Status Register	EE	Contents of the C3PO Error Register
BB	Contents of the COMP Mode Register	FF	Contents of the COMP Diagnostic 0 Register
CC	Contents of the Channel Mode Register	GG	Contents of the COMP Diagnostic 1 Register
DD	Contents of the C3PO Error 0 Register	HH	Contents of the COMP Feature Level Register

Note: This error display is only present if you have the data compaction feature.

```
CP0E0 = AA, CP2E0 = EE
CP0E1 = BB, CP2E1 = FF
CP1E0 = CC, CP3E0 = GG
CP1E1 = DD, CP3E1 = HH
```

AA	Contents of the Comp0 Error 0 Register	EE	Contents of the Comp2 Error 0 Register
BB	Contents of the Comp0 Error 1 Register	FF	Contents of the Comp2 Error 1 Register
CC	Contents of the Comp1 Error 0 Register	GG	Contents of the Comp3 Error 0 Register
DD	Contents of the Comp1 Error 1 Register	HH	Contents of the Comp3 Error 1 Register

Note: This error display is only present if you have the data compaction feature.

```
CP0C = AA, CP0D = EE
CP1C = BB, CP1D = FF
CP2C = CC, CP2D = GG
CP3C = DD, CP3D = HH
```

AA	Contents of the Comp0 Configuration Register	EE	Contents of the Comp0 Diagnostic Register
BB	Contents of the Comp1 Configuration Register	FF	Contents of the Comp1 Diagnostic Register
CC	Contents of the Comp2 Configuration Register	GG	Contents of the Comp2 Diagnostic Register
DD	Contents of the Comp3 Configuration Register	HH	Contents of the Comp3 Diagnostic Register

Note: This error display is only present if you have the data compaction feature.

```
CP0BC-3 = AAAAAAAA
CP1BC-3 = BBBBBBBB
CP2BC-3 = CCCCCCCC
CP3BC-3 = DDDDDDDD
```

AAAAAAAA = Channel Byte Count for Comp 0
BBBBBBBB = Channel Byte Count for Comp 1
CCCCCCCC = Channel Byte Count for Comp 2
DDDDDDDD = Channel Byte Count for Comp 3

ERROR DISPLAYS

```
nnnnnn
ERA=ra, ERB=rb
PSR=xx, PER=pp, XRA=qq
MTI=md, MDI=me
```

nnnnnn = Failure ID
** = no error set

aa = Contents of XRA reg ra = Contents of ERA reg
md = Contents of MDI reg rb = COntents of ERB reg
me = Contents of MTI reg pp = Contents of PER reg
                          xx = Contents of PSR reg

```
DATA
DATA READ   = bbbb
BUFFER ADR  = cccc
```

```
DATA EXP/WRT= aaaa
DATA READ   = bbbb
BUFFER ADR  = cccc
REM = gg, EXP = hh
```

```
DATA EXP/WRT= aaaa
DATA READ   = bbbb
BUFFER ADR  = cccc
BDG1 = dd
```

```
DATA EXP/WRT= aaaa
DATA READ   = bbbb
BUFFER ADR  = cccc
BCSS = ee EXP = ff
```

aaaa = Expected write data
bbbb = Data that was read
cccc = Buffer address of data in error
dd = Contents of the BDG1 register
ee = Contents of the BCSS register
ff = Expected contents of the BCSS register
gg = Remainder register count
hh = Expected remainder register count

```
nnnnnn
    BCP  BCP
EXP kkll  oopp
ACT iijj  mmnn
```

nnnnnn = Failure ID

ii = Actual buffer channel pointer high
jj = Actual buffer channel pointer low
kk = Expected buffer channel pointer low value
mmnn = Actual buffer device pointer contents
oopp = Expected buffer device pointer contents

```
BCSE = abcde
BCSE = fghij
BuRP = cc
```

```
nnnnnn
    BCSE   BCSE
EXP klmno pqrst
ACT abcde fghij
```

nnnnnn = Failure ID
 * = No errors were set
 a = Buffer channel status and error register bits 0-3
 b = BCSE channel error group 0
 c = BCSE channel error group 1
cc = Contents of the buffer wrap register
 d = BCSE channel error group 2
 e = BCSE channel error group 3
 f = Buffer device status and error register bits 0-3
 g = BDSE channel error group 0
 h = BDSE channel error group 1
 i = BDSE channel error group 2
 j = BDSE channel error group 3
 k = Expected buffer channel status
     and error register bits 0-3
 l = Expected BCSE channel error group 0
 m = Expected BCSE channel error group 1
 n = Expected BCSE channel error group 2
 o = Expected BCSE channel error group 3
 p = Expected buffer device status and error
 q = Expected BCSE channel error group 0
 r = Expected BCSE channel error group 1
 s = Expected BCSE channel error group 2
 t = Expected BCSE channel error group 3

```
BDG1 = dd
BCSS = ee
EXP  = ff
```

dd = Contents of the BDG1 register
ee = Contents of the BCSS register
ff = Expected contents of the BCSS register

Note: See the error displays on DIAG 112

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ERB is not 00 go to FSI for err code E100 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU113	See error display on DIAG 112
8U4021	This error is set when either the CMS or CMFL installed bits are not on when expected.	See steps 1 and 2 at the top of this column.		
8U4022	This error is set when the CMS reg compbusy bit does not come on after a reset.	See steps 1 and 2 at the top of this column.		
8U4023	This error is set when the CMS reg compbuny bit does not go off within 30 usec of a reset.	See steps 1 and 2 at the top of this column.		
8U4024	This error is set when either the CMS or CMFL installed bits are on when not expected.	See steps 1 and 2 at the top of this column.		
EU4025	After writing 255 data bytes through the channel write data path, the hardware detected errors.	See the FSI section for error code D5nn.		
8U4026	The hardware detected a data compare error. The data written did not compare with the data read.	See the FSI section for error code D6nn.		
8U4027	The hardware detected an error after reading 255 bytes of data to initialize intermediate storage.	See the FSI section for error code D6nn.		
8U4028	The hardware detected an error after a 135 byte write of X'07' through X'01' followed by a channel store crc.	See the FSI section for error code D5nn.		
8U4029	'Service in' or 'Data in' did not become active within 520 microseconds during a read operation.	See the FSI section for error code D5nn.		
8U402A	After the first 45 bytes of data have been read, suppress out is activated and data in or service became active before 61 microseconds expired.	See the FSI section for error code D5nn.		
8U402B	The buffer channel is stopped and a ck 1, xr, or buffer device error was detected by hardware.	See the FSI section for error code D6nn.		
8U402C	The BCSE contains an unexpected value. The actual value is displayed. The expected value is either X'C0000' or X'20000'.	See the FSI section for error code D5nn.		
8U402D	The buffer channel pointer does not = X'0005' indicating data transfer did not end correctly	See the FSI section for error code D5nn.		
8U402E	The status bits are not correct during the ending sequence of a channel read operation.	See steps 1 and 2 at the top of this column.		
8U402F	Reserved			
8U4030	The Improved Data Recording Capability allowed bit is on in the CMS External Register when not expected.	See steps 1 and 2 at the top of this column.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ERB is not 00 go to FSI for err code E100 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FUR113	See error display on DIAG 112
8U4031	The hardware detected errors after a 135 byte write of X'07' through X'01' followed by a channel store crc.	See FSI section for error code D5nn.		
8U4032	'Service in' or 'data in' did not become active within 520 microseconds while reading backward	See FSI section for error code D5nn.		
8U4033	The first 45 bytes have been read, and 'suppress out' is activated. Either 'data in' or 'service in' was active before a 61 microseconds period ended.	See FSI section for error code D5nn.		
8U4034	The buffer channel operation is stopped and the hardware has detected check 1, XR, or a device buffer error.	See steps 1 and 2 at the top of this chart. or see the FSI section for error code D6nn.		
8U4035	The BCSE contains an unexpected value. The actual value is displayed. The expected value is X'C0000'.	See the FSI section for error code D5nn.		
8U4036	The buffer channel pointer is not X'0005' after stop out is activated, which indicates that the data transfer did not end correctly.	See the FSI section for error code D5nn.		
8U4037	The pad counter value in the BCSS register is incorrect on a Read Backward command.	See the FSI section for error code D5nn.		
8U4038	The status bits are not correct during the ending sequence of a channel read backwards operation.	See steps 1 and 2 at the top of this chart.		

Data Buffer Controls Test - Routine EE33 (Continued)

Read Overrun Test

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU113	
8U4039	An XR error or a Check 1 was detected.	See steps 1 and 2 at the top of this column.		
8U403A	The content of the BCSE does not equal the expected content. The content is displayed. The expected content is 1400, any channel error, channel overrun error, and STI-FIPS adapter error.	See the FSI section for error code D5nn.		
8U403B	The buffer channel pointer is expected to contain 0008 after an overrun is detected. The content of the buffer channel pointer is displayed.	See the FSI section for error code D5nn.		
8U403C	The content of the BCSE does not equal the expected content. The content is displayed. The expected content is 5C800, any device error, device overrun error, and read data flow error.	See the FSI section for error code D6nn.		
8U403D	The buffer device pointer is expected to contain 0008 after an overrun is detected. The content of the buffer device pointer is displayed.	See the FSI section for error code D6nn.		

```
CMS = AA, CTXE = EE
CMM = BB, CMD0 = FF
CMM = CC, CMD1 = GG
CTE0= DD, CMFL = HH
```

AA Contents of the CCMP Status Regist
BB Contents of the CCMP Mode Register
CC Contents of the Channel Mode Register
DD Contents of the C2P0 Error 0 Register
EE Contents of the C2P0 XR Error Register
FF Contents of the CCMP Diagnostic 0 Register
GG Contents of the CCMP Diagnostic 1 Register
HH Contents of the CCMP Feature Level Register

```
nnnnnn
ERA=ra, ERB=rb
PSR=xx, PER=pp,XRA=aa
MTI=mm,MDI=md
```

nnnnnn = Failure ID
** = No errors were set
aa = Contents of the external register address
md = Contents of the maintenance data in register
mm = Contents of the maintenance tag in register
ra = Contents of error register A
rb = Contents of error register B
pp = Contents of processor error register bits 0-3
xx = Contents of the processor status register register

```
nnnnnn
     BCP    BDP
EXP kkll    oopp
ACT iijj    mmnn
```

nnnnnn = Failure ID
ii = Contents of buffer channel pointer low
jj = Contents of buffer channel pointer high
kk = Expected contents of buffer channel pointer high
ll = Expected contents of buffer channel pointer low
mmnn = Contents of buffer device pointer
oopp = Expected contents of buffer device pointer

```
nnnnnn
     BCSE    BDSE
EXP klmno    pqrst
ACT abcde    fghij
```

nnnnnn = Failure ID
** = No errors were set
a = Buffer channel status and error register bits 0-3
b = BCSE channel error group 0
c = BCSE channel error group 1
d = BCSE channel error group 2
e = BCSE channel error group 3
f = Buffer device status and error register bits 0-3
g = BDSE device error group 0
h = BDSE device error group 1
i = BDSE device error group 2
j = BDSE device error group 3
k = Expected buffer channel status and error register bits 0-3
l = Expected BCSE channel error group 0
m = Expected BCSE channel error group 1
n = Expected BCSE channel error group 2
o = Expected BCSE channel error group 3
p = Expected buffer device status and error
q = Expected BDSE device error group 0
r = Expected BDSE device error group 1
s = Expected BDSE device error group 2
t = Expected BDSE device error group 3

Data Buffer Controls Test - Routine EE33 (Continued)

Write Overrun Test

Note: See the error displays on DIAG 112.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERR is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU113	See error display on DIAG 112
BU4039	An XR error or a Check 1 was detected.	See steps 1 and 2 at the top of this column.		
BU403A	The content of the BCSE does not equal the expected content. The content is displayed. The expected content is 1400, any channel error, channel overrun error, and host channel adapter error.	See the FSI section for error code D5nn.		
BU403B	The buffer channel pointer is expected to contain 0000 after an overrun is detected. The content of the buffer channel pointer is displayed.	See the FSI section for error code D5nn.		
BU403C	The content of the BDSE does not equal the expected content. The content is displayed. The expected content is 5C800, any device error, device overrun error, and read data flow error.	See the FSI section for error code D6nn.		
BU403D	The buffer device pointer is expected to contain 0000 after an overrun is detected. The content of the buffer device pointer is displayed.	See the FSI section for error code D6nn.		
BU403E	An XR error or a Check 1 was detected.	See steps 1 and 2 at the top of this column.		
BU403F	The content of the BCSE does not equal the expected content. The content is displayed. The expected content is 1C100, any channel error, channel overrun error, and host channel adapter error.	See the FSI section for error code D5nn.		
BU4040	The buffer channel pointer is expected to contain 0000 after an overrun is detected. The content of the buffer channel pointer is displayed.	See the FSI section for error code D5nn.		
BU4041	The content of the BDSE does not equal the expected content. The content is displayed. The expected content is 1C800, any device error, device overrun error, and read data flow error.	See the FSI section for error code D6nn.		
BU4042	The buffer device pointer is expected to contain 0000 after an overrun is detected. The content of the buffer device pointer is displayed.	See the FSI section for error code D6nn.		

Separation Test

Note: See the error displays on DIAG 112.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ER8 is not 00 go to FSI for err code E100 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU113	See error display on DIAG 112
8U4043	'Service in' or 'data in' did not become active in 703 microseconds.	See the FSI section for error code 05nn.		
8U4044	The channel read more than 128 bytes, which indicates the channel is overrunning the drive.	See the FSI section for error code 05nn.		
8U4045	An XR error or check 1 was detected.	See steps 1 and 2 at the top of this chart.		
8U4046	The content of the BDSE does not = the expected content. The expected content is 70000. The content of the BCSR does not = the expected content. The expected content is 90000.	See the FSI section for error code 06nn.		
8U4047	The buffer device remainder register does not = 05 after the last read of six bytes.	See the FSI section for error code 06nn.		
8U4048	The buffer device pointer expected content is 0000. The buffer channel pointer expected content is 0009.	See the FSI section for error code 06nn.		
8U4049	The BCSS content doe not = the expected content. The expected content is 07.	See the FSI section for error code 05nn.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ER8 is not 00 go to FSI for err code E100 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU129 FRU113	See error display on DIAG 112
8U404A	A channel control reset failed during an external register reset test.	See steps 1 and 2 at the top of this chart.		
8U404B	A check 4 reset failed during an external register reset test.	See steps 1 and 2 at the top of this chart.		
8U404C	A check 5 reset failed during an external register reset test.	See steps 1 and 2 at the top of this chart.		
8U404D	A hardware reset failed during an external register reset test	See steps 1 and 2 at the top of this chart.		
8U404E	A buffer register that can be reset by a POR reset only is found in a reset state and no POR reset was issued.	See steps 1 and 2 at the top of this chart.		
8U404F	The 300NS clock ring error indicator (CTE0 Reg bit 2) is not turned on when forced.	See steps 1 and 2 at the top of this chart.		
8U4050	The any error bit indicator (CMS Reg Bit 7) is not turned on by one of the other errors.	See steps 1 and 2 at the top of this chart.		
8U4051	The feature level parity error indicator (CTE0 Reg bit 6) is not turned on when forced.	See steps 1 and 2 at the top of this chart		
8U4052	The channel overrun error indicator (CTE0 Reg Bit 0) is not working correctly.	See steps 1 and 2 at the top of this chart		
8U4053	The transferr complete/overrun error indicator (CMS Reg Bit 3) is not working correctly.	See steps 1 and 2 at the top of this chart		
8U4054	The check 5 reset does not work correctly during a channel operation.	See steps 1 and 2 at the top of this chart		
8U4055	Service in or data in is not working correctly during a channel operation.	See steps 1 and 2 at the top of this chart		
8U4056	The bc toggle error indicator (CTE0 Reg Bit 4) is not on when forced.	See steps 1 and 2 at the top of this chart		
8U4057	Either the C3P0 data parity error or the BC channel parity error indicators (Comp Error 1 Reg Bits 0 or 3) are not on when forced.	See steps 1 and 2 at the top of this chart		
8U4058	Either the BC data parity error or the channel data parity error indicators (CTE0 Reg Bits 3 and 5) are not on when forced.	See steps 1 and 2 at the top of this chart		

Buffer Adapter Tests

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ERB is not 00 go to FSI for err code E100 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU116 FRU120 FRU113
BU404A	A channel control reset failed during an external register reset test.	See steps 1 and 2 at the top of this chart	
BU404B	A check 4 reset failed during an external register reset test.	See steps 1 and 2 at the top of this chart	
BU404C	A check 5 reset failed during an external register reset test.	See steps 1 and 2 at the top of this chart	
BU404D	A hardware reset failed during an external register reset test	See steps 1 and 2 at the top of this chart	
BU404E	A buffer register that can be reset by a POR reset only is found in a reset state and no POR reset was issued.	See steps 1 and 2 at the top of this chart	
BU404F	The 100MS clock ring error indicator (CTEO Reg bit 2) is not turned on when forced.	See steps 1 and 2 at the top of this chart	
BU4050	The any error bit indicator (CMS Reg Bit 7) is not turned on by one of the other errors.	See steps 1 and 2 at the top of this chart	
BU4051	The feature level parity error indicator (CTEO Reg bit 6) is not turned on when forced.	See steps 1 and 2 at the top of this chart	
BU4052	The channel overrun error indicator (CTEO Reg Bit 0) is not working correctly.	See steps 1 and 2 at the top of this chart	
BU4053	The transfer complete/overrun error indicator (CMS Reg Bit 3) is not working correctly.	See steps 1 and 2 at the top of this chart	
BU4054	The check 5 reset does not work correctly during a channel operation.	See steps 1 and 2 at the top of this chart	
BU4055	Service in or data in is not working correctly during a channel operation.	See steps 1 and 2 at the top of this chart	
BU4056	The bc toggle error indicator (CTEO Reg Bit 4) is not on when forced.	See steps 1 and 2 at the top of this chart	
BU4057	Either the C3PO data parity error or the BC channel parity error indicators (Comp Error 1 Reg Bits 0 or 3) are not on when forced.	See steps 1 and 2 at the top of this chart	
BU4058	Either the BC data parity error or the channel data parity error indicators (CTEO Reg Bits 3 and 5) are not on when forced.	See steps 1 and 2 at the top of this chart	

ERROR DISPLAYS

```
CMS = AA, CTXE = EE
CMM = BB, CM00 = FF
CMM = CC, CM01 = GG
CTEO= DD, CMFL = HH
```

AA Contents of the CCMP Status Register
BB Contents of the CCMP Mode Register
CC Contents of the Channel Mode Register
DD Contents of the C2PO Error 0 Register
EE Contents of the C2PO XR Error Register
FF Contents of the CCMP Diagnostic 0 Register
GG Contents of the CCMP Diagnostic 1 Register
HH Contents of the CCMP Feature Level Register

```
nnnnnn
ERA=ra,ERB=rb
PSR=xx,PER=pp,XRA=aa
MTI=mm,MDI=md
```

nnnnnn = Failure ID
** = no error set

aa = Contents of XRA reg ra = Contents of ERA reg
md = Contents of MDI reg rb = Contents of ERB reg
mm = Contents of MTI reg pp = Bits 0-3 of PER reg
                          xx = Contents of PSR reg

```
DATA EXP/WRT= aaaa
DATA READ   = bbbb
BUFFER ADR  = cccc
```

```
DATA EXP/WRT= aaaa
DATA READ   = bbbb
BUFFER ADR  = cccc
BDG1 = dd
```

aaaa = Expected write data bbbb = Data that was read
cccc = Buffer address of the data in error
dd = Contents of the BDG1 register

```
nnnnnn
    BCP   BDP
EXP kkll  oopp
ACT iijj  mmnn
```

nnnnnn = Failure ID

ii = Actual buffer channel pointer high
jj = Actual buffer channel pointer low
kk = Expected buffer channel pointer high value
ll = Expected buffer channel pointer low value
mmnn = Actual buffer device pointer contents
oopp = Expected buffer device pointer contents

```
BCSE=abcde
BDSE=fghij
BWRP=cc
```

```
nnnnnn
     BCSE   BDSE
EXP klmno   pqrst
ACT abcde   fghij
```

nnnnnn = Failure ID
* = No errors were set
a = Buffer channel status and error register bits 0-3
b = BCSE channel error group 0
c = BCSE channel error group 1
cc = Contents of the buffer wrap register
d = BCSE channel error group 2
e = BCSE channel error group 3
f = Buffer device status and error register bits 0-3
g = BDSE device error group 0
h = BDSE device error group 1
i = BDSE device error group 2
j = BDSE device error group 3
k = Expected buffer channel status and error register bits 0-3
l = Expected BCSE channel error group 0
m = Expected BCSE channel error group 1
n = Expected BCSE channel error group 2
o = Expected BCSE channel error group 3
p = Expected buffer device status and error
q = Expected BDSE device error group 0
r = Expected BDSE device error group 1
s = Expected BDSE device error group 2
t = Expected BDSE device error group 3

Note: See the error displays on DIAG 112

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING OTHER ACTIONS:	1. If ERA or ERB is not 00 go to FSI for error code E100 2. If PSR bit 0 = 1, see EAD 1 for error code code Fnnn.	FRU114 FRU120 FRU113	See error display on DIAG 112
8U4059	The comp xr error (CTXE Bit 0) is not on when forced	See steps 1 and 2 at the top of this chart.		
8U405A	The write data parity error indicator (CTXE Bit 1) is not on when forced.	See steps 1 and 2 at the top of this chart.		
8U405B	Either the read data parity error or the xr output parity error indicators (CTXE Bits 2 & 3) are not on when forced.	See steps 1 and 2 at the top of this chart.		
8U405C	CMS Register bit 0 (Comp busy) cannot be reset.	See FSI section for error code DAnn.		
8U405D	An error was detected in the data in or service in tag lines during a read or write operation in Improved Data Recording Capability mode.	See FSI section for error code DAnn.		
8U405E	An coding sequence error was detected during a channel write or a channel read operation.	See FSI section for error code D5nn.		
8U405F	The actual channel byte count does not equal the expected channel byte count.	See FSI section for error code D5nn.		
8U4060	The channel byte count registers in each module do not compare.	See FSI section for error code DAnn.		
8U4061	The Improved Data Recording Capability record trailer does not equal the calculated value.	See FSI section for error code DAnn.		
8U4062	The data read does not equal the data written in Improved Data Recording Capability mode.	See FSI section for error code D6nn.		
8U4063	An error was detected in the service in or data in tag lines.	See FSI section for error code DAnn.		
8U4064	A data compare error was detected in the RAM diagnostic tests.	See FSI section for error code DAnn.		
8U4065	The any error bit (CMS bit 7) was on after running the RAM diagnostic tests.	See FSI section for error code DAnn.		
8U4066	Cannot force the encode does not equal decode error (Comp Error 0 bit 7).	See FSI section for error code DAnn.		
8U4067	Cannot force the initialization error (Comp error 0 bit 6).	See FSI section for error code DAnn.		
8U4068	The any error bit (CMS Bit 7) was not turned on by another Improved Data Recording Capability error.	See FSI section for error code DAnn.		
8U4069	Cannot force the channel adapter interface overflow error (Comp error 1 bit 7).	See FSI section for error code DAnn.		
8U406A	Cannot force the channel byte count overflow error (Comp error 1 bit 6).	See FSI section for error code DAnn.		
8U406B	Cannot force a ca or bc master transfer error (Comp error 1 bits 1 or 4).	See FSI section for error code DAnn.		
8U406C	Cannot force a crc error (Comp error 0 bits 1 through 5).	See FSI section for error code DAnn.		
8U4060	A check 5 reset did not work properly during a channel operation.	See FSI section for error code DAnn.		

Tape Control Unit to Drive Bus Out Driver Wrap Test - Routine EE42

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine tests the tape control unit/drive interconnection as follows:

1. Activates 'select out' to degate all 'bus in' lines from the drives attached to the tape control unit and tests the 'bus in' lines to make sure that none are active. If any 'bus in' lines are active, the routine issues a clamp command to each drive, one at a time, to isolate the drive with the active 'bus in' lines.
2. Tests the tag-in lines to make sure that none are active. If any tag-in lines are active, the routine issues a clamp command to each drive, one at a time, to isolate the drive with the active tag-in lines.
3. Ripples 'bus out' through all possible bit patterns. The data is then read through the tape control unit device interrupt register and compared.

Routine Start Address: 2010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Addressing: If a drive address is entered, only that drive is tested. If no drive address is entered, the routine tests all drives in the subsystem. The following screen is used to enter a drive address.

```
DIAG=(EE42)-ENTER:
DRIVE
(xx)
```

Valid Parameters:

xx Drive address (0-F, or 00-0F).
    Enter FF to run all drives.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CAPR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
DI2021	When 'select out' was presented to the drive, bits were still active on the device data bus 'bus in'. A clamp command was sent to all drives, but the active bit condition was not removed from the bus.	See the FSI section for error code 8005. See EAD 1, "Drive Interconnections."	FRU085 FRU139 FRU248 FRU118	DI2021 BUS IN = vv INTF x SEL OUT ACTIVE AND ALL DRIVES 'CLAMPED' vv Value of 'bus in' active bits x L for drives 0 through 7, H for drives 8 through F
DI2022	The active device data bus 'bus in' bits were removed from the bus following a clamp command to the drive that was causing the active bits.	See the FSI section for error code 8005. See EAD 1, "Drive Interconnections."	FRU085 FRU139 FRU248 FRU118	DI2022 (DR a) ON INTF x HAS BUS IN BITS vv ACTIVE WITH SEL OUT a Drive address x L for drives 0 through 7, H for drives 8 through F vv Value of 'bus in' active bits
DI2023	During the "electronic wrap" of the control unit/drive BI-OI bus, the data returned to the device interrupt register (DIR) did not equal the data sent to the device control bus (DCB) register.	See the FSI section for error code 800A. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU124 FRU115	DI2023 BUS IN DID NOT EQUAL BUS OUT ON INTF x BUS O =vv BUS I =yyy x L for drives 0 through 7, H for drives 8 through F vv Value of 'bus out' bits yy Value of 'bus in' bits
DI2024	A parity error was detected in the device status/error (DSE) register.	See the FSI section for error code 80nn. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134	DI2024 PARITY ERROR OCCURRED ON INTF x DATA = vv 'DSE' REG = yy x L for drives 0 through 7, H for drives 8 through F vv Value of 'bus out'/'bus in' yy Value in the DSE register
DI2025	While trying to determine if the subsystem is configured with a dual or single tape control unit, a status store time-out occurred.	See the FSI section for error code 5360.	FRU121 FRU122 FRU133 FRU152 FRU134	DI2025 TIMEOUT OCCURRED WHILE TRYING TO READ STATUS STORE

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
DI2026	Active tag lines were found after setting the device tag register (DTR) to zero. A clamp command was sent to all drives on the serial interconnection, but the active bit condition was not cleared from the DTR register.	See the FSI section for error code 800A. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU134 FRU115	DI2026 DTR = vv INTF =x WITH ALL DRIVES 'CLAMPED' vv Value of bits in the device tag register x L for drives 0 through 7, H for drives 8 through F
DI2027	The active 'gap in' bit was removed from the device data bus following a clamp command to the drive.	See the FSI section for error code 7507. See EAD 1, "Drive Interconnections."	FRU085 FRU118	DI2027 (DR a) ON INTF x GAP IN TAG IS ACTIVE x L for drives 0 through 7, H for drives 8 through F a Drive address
DI2029	The active 'address in' tag was removed from the device data bus following a clamp command to the drive.	See the FSI section for error code 8009. See EAD 1, "Drive Interconnections."	FRU085 FRU199 FRU248 FRU118	DI2029 (DR a) ON INTF x ADDRESS IN TAG IS ACTIVE x L for drives 0 through 7, H for drives 8 through F. a Drive address
DI2029	The active 'status in' tag was removed from the device data bus following a clamp command to the drive.	See the FSI section for error code 8007. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134	DI2029 (DR a) ON INTF x STATUS IN TAG IS ACTIVE x L for drives 0 through 7, H for drives 8 through F a Drive address
DI202A	The active 'clock B in' tag was removed from the device data bus following a clamp command to the drive.	See the FSI section for error code 840C. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU199 FRU248	DI202A (DR a) ON INTF x CLOCKB IN TAG IS ACTIVE x L for drives 0 through 7, H for drives 8 through F a Drive address

Tape Control Unit to Drive Bus and Tag Test - Routine EE43

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine checks all tags to and from the drives during initial selection to ensure correct response.

Following selection, 17 bytes of data are transferred to the drive display with the message '********'. (This test does not remove the message on the drive display.) The routine then de-selects the drive and checks all tags to and from the drive during an ending sequence to ensure correct response.

All bits on the BI-DI and tag buses, except device tag register (DTR) bit 4 ('gap in', 'gap out') are tested.

Routine Start Address: 3010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Addressing: If a drive address is entered, only that drive is tested. If no drive address is entered, the routine tests all drives in the subsystem. The following screen is used to enter a drive address.

```
DIAG=(EE43)-ENTER:
DRIVE
(xx)
```

Valid Parameters:

xx Drive address (0-F, or 00-0F).
Enter FF to run all drives.

Diagnostic Aid

The following sequence should be used when isolating difficult tape control unit to drive interconnection problems.

1. Let the default run the routine on all drives; if you are using the CE panel, answer yes to "USE ALL DRIVES ?."
2. Check the drive displays and record the address of any drive that does not display the message '********'.
3. Select the routine again and enter the drive address that did not have the correct display. The routine will identify which lines are not responding correctly.

Note: A valid address table is generated by selecting all drives on the subsystem and checking for 'address in'. If any drive in the subsystem does not respond, the drive will not be in the valid address table and it will not be tested when the "running all drives" default is used.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4, for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
DI3021	The drive did not return an 'address in' response to the tape control unit, after the tape control unit sent an 'address out' tag along with the drive address on the device data bus 'bus out'.	See the FSI section for error code 8807. See EAD 1, "Drive Interconnections."	FRU085 FRU059 FRU049 FRU108 FRU107 FRU105	DI3021 (DR a) ADDRESS IN WAS NOT RETURNED DURING SELECTION a Drive address
DI3022	The one's complement address sent from the drive on the device data bus 'bus in' on did not match the expected address. The expected address was generated from the address sent to the drive on the device data bus 'bus out'.	See the FSI section for error code 880C. See EAD 1, "Drive Interconnections."	FRU085 FRU118	DI3022 (DR a) ADDR ON BUS IN IS NOT CORRECT BUS IN=vv EXPECT=xx a Drive address vv Address on device data bus 'bus in' xx Expected address device data bus 'bus out'
DI3023	The device data bus 'address in' from the drive did not drop when the control unit dropped device data bus 'address out.'	See the FSI section for error code 8809. See EAD 1, "Drive Interconnections."	FRU085 FRU199 FRU248 FRU118	DI3023 (DR a) ADDR IN STILL ACTIVE AFTER ADDR OUT WAS REMOVED a Drive address

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS		ERROR DISPLAYS
DI3024	The one's complement address sent from the drive on device data bus 'bus in' remained on the bus after the drive dropped device data bus 'address in'.	See the FSI section for error code 8809. See EAD 1, "Drive Interconnections."	FRU085 FRU199 FRU248 FRU118	DI3024 (DR a) AFTER ADDR IN BECAME INACTIVE, BUS IN=vv EXPECT=xx a Drive address vv Address on 'bus in' xx Expected address on 'bus out'
DI3025	The drive did not return status when the tape control unit set device data bus 'command out'.	See the FSI section for error code 8E05. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134	DI3025 (DR a) STATUS IN DID NOT BECOME ACTIVE WITH COMMAND OUT a Drive address
DI3026	The drive returned 'unit check' in the status byte at initial selection time.	See the FSI section for error code 8E06. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134	DI3026 (DR a) UNIT CHECK WAS ACTIVE DURING INITIAL SELECTION a Drive address
DI3027	The drive did not return 'clock B in' when the tape control unit set device data bus 'clock A out'.	See the FSI section for error code 840A. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU199 FRU248	DI3027 (DR a) CLOCKB IN WAS NOT RETURNED FOR CLOCKA OUT a Drive addr
DI3029	'Clock B in' did not drop after the tape control unit dropped device data bus 'clock A out'.	See the FSI section for error code 8309. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU199 FRU248	DI3029 (DR a) CLOCKB IN WAS STILL ACTIVE AFTER CLOCKA OUT DROPPED a Drive address
DI3029	'Clock B in' did not set during the data transfer of the control byte (byte 8) to the drive.	See the FSI section for error code 840A. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU199 FRU248	DI3029 (DR a) CLOCKB DIDN'T RESPOND AS EXPECTED FOR CONTROL BYTE XFR a Drive address

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS		ERROR DISPLAYS
DI302A	'Clock B in' did not set during the transfer of 16 bytes of display information to the drive on the device data bus.	See the FSI section for error code 8300. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU199 FRU248	DI302A (DR a) CLOCKB DIDN'T RESPOND AS EXPECTED FOR THE 16 BYTE XFR a Drive address
DI302B	The drive hardware detected an error. Device data bus 'bus in' contains failure information from the drive.	See the FSI section for error code 89nn. See EAD 1, "Drive Interconnections."	FRU085 FRU199 FRU248 FRU118 FRU116 FRU134	DI302B (DR a) DR HARDWARE DETECTED CHECK 1 BUS IN = xx a Drive address xx Failure data on 'bus in'
DI302C	The drive did not set device data bus 'status in' during the de-selection sequence.	See the FSI section for error code 8C00. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134	DI302C (DR a) STATUS IN DID NOT BECOME ACTIVE DURING ENDING SEQ. a Drive address
DI302D	The drive did not set 'clock B in during the ending sequence on the device data bus.	See the FSI section for error code 840A. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU199 FRU248	DI302D (DR a) CLOCKB DID NOT BECOME ACTIVE DURING ENDING SEQ. a Drive address
DI302E	'Clock B in' did not drop during the ending sequence on the device data bus.	See the FSI section for error code 840C. See EAD 1, "Drive Interconnections."	FRU685 FRU118 FRU199 FRU248	DI302E (DR a) CLOCKB DID NOT FALL DURING THE ENDING SEQUENCE a Drive address

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
DI302F	Device data bus 'status in' did not drop during the ending sequence.	See the FSI section for error code 8C07. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134	DI302F (DR a) STATUS IN DID NOT FALL DURING THE ENDING SEQUENCE a Drive address
DI3030	The drive microcode detected an error. Device data bus 'bus in' contains failure information from the drive.	See the FSI section for error code 8Fnn. See EAD 1, "Drive Interconnections."	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	DI30230 (DR a) DRIVE MICRO CODE DETECTED ERROR BUS IN = xx a Drive address xx Error information from the drive
DI3031	'Unit check' was active in the ending status from the drive.	See the FSI section for error code 8C01.	FRU085 FRU118 FRU116 FRU134	DI3031 (DR a) UNIT CHECK WAS ACTIVE DURING ENDING SEQUENCE a Drive address
DI3032	When defaulting to all available drives, the table build module did not find any drive available. (No drive returned 'address in' during the selection sequence.)			DI3032 ADDRESS DEFAULT NOT SUCCESSFUL, RESTART WITH VALID DR ADDR
DI3033	The user entered a drive address that is not a valid drive address for this subsystem.			DI3033 ADDRESS ENTERED WAS NOT VALID, ADDRESSES MUST BE '00' - 'xx' xx 0-7 for a single tape control unit subsystem, or 0-F for a dual tape control unit subsystem
DI3034	A timeout occurred while reading status store to determine if this is a dual, or single tape control unit subsystem.	See the FSI section for error code 5360.	FRU121 FRU122 FRU133 FRU152 FRU134	DI3034 TIMEOUT OCCURRED WHILE TRYING TO READ STATUS STORE

Tape Control Unit to Drive Serial Test - Routine EE44

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine tests the serial interconnection as follows

1. The drive is selected to ensure that it can communicate with the tape control unit.
2. The serial interconnection is used to issue a Clamp command to the drive. CLAMP is displayed on the drive message display
3. The microcode attempts to re-select the drive using the BI-DI parallel interconnection. If the preceding Clamp command was recognized, the drive will not be available
4. The serial interconnection is again used to issue an Unclamp command.
5. The drive is again selected using the BI-DI parallel interconnection. This time the drive should be available. UNCLAMP is displayed on the drive message display
6. At the end of the routine, the drive display is returned to its normal unloaded display. '

Routine Start Address: 4010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Addressing: If a drive address is entered, only that drive will be tested. If no drive address is entered, the routine will run against all drives in the subsystem. The following screen is used to enter a drive address.

```
DIAG-(EE44)-ENTER:
DRIVE
(xx)
```

Valid Parameters:

xx Drive address (0-F, or 00-FF).
Enter FF to run all drives.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER on the MD keyboard/display or the NEXT key on the CE panel.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
DI4021	Selection of the drive was not successful.	1. Run the tape control unit to drive bus and tag test routine, EE43. 2. See the FSI section for error code 8E06.	FRU085 FRU118 FRU116 FRU134	DI4021 (DR a) INITIAL SELECTION WAS NOT SUCCESSFUL a = drive address
DI4022	Following a Clamp command sent over the serial interface to the drive, the next selection sequence was successful. This indicates that the Serial Clamp command did not operate correctly.	See the FSI section for error code 8803.	FRU085 FRU118	DI4022 (DR a) SELECTION WAS SUCCESSFUL AFTER 'CLAMPING' THE DR. a = drive address
DI4023	The selection sequence following the Unclamp command was unsuccessful, indicating that the Unclamp command did not operate correctly. This could be a drive problem rather than a serial interconnection problem if the preceding Clamp command operated correctly.	See the FSI section for error code 8803.	FRU085 FRU118	DI4023 (DR a) SELECTION WAS NOT SUCCESSFUL AFTER 'UNCLAMPING' THE DR. a = drive address
DI4024	When defaulting to all drives, the table build module did not find any drives available. (No drive returned 'address in' during selection.)	See the FSI section for error code 8807.		DI4024 ADDRESS DEFAULT NOT SUCCESSFUL, RESTART WITH VALID DR ADDR
DI4025	The user entered a drive address that is not a valid drive address for this subsystem.	Run diagnostic EE40 on all drive addresses to determine the pattern of the failure. Run Drive Command exercises (see DIAG 1).		DI4025 ADDRESS ENTERED WAS NOT VALID. ADDRESSES MUST BE '08' - 'xx' xx = 07 for a single tape control unit subsystem or 0F for a dual tape control unit subsystem
DI4026	A timeout occurred while reading status store to determine if this is a dual- or single-tape-control-unit subsystem.	See the FSI section for error code 5360.	FRU121 FRU122 FRU133 FRU152 FRU134	DI4026 TIMEOUT OCCURRED WHILE TRYING TO READ STATUS STORE
DIAG.07	This screen is displayed several times (about every 8 seconds during normal diagnostic execution). If the total execution time is more than the normal run time (see "Diagnostic Identification Code Table" run times) see E103 in the FSI section.	None.	FRU117 FRU115 FRU121 FRU122	DIAG.07 WAITING FOR DIAG COMPLETION

Short Loop Write to Read Pattern Test - Routine EE52

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine tests the short loop write, in the tape control unit, from the write data flow to the read data flow. Microcode generated patterns test the data path and the response from the read detection circuits.

The routine consists of four tests:

- Test 1 performs initialization to set up the data path and registers for tests 2, 3, and 4.
- Test 2 operates in read forward mode using the short loop write to read controls.
- Test 3 operates in read backward mode using the short loop write to read controls.
- Test 4 operates in write mode using the short loop write to read controls.

Tests 2, 3, and 4 execute as follows:

- The data pattern is stored in the buffer with the buffer control set for Loop Write to Read.
- Write and read data flow controls are set.
- An IBG is written and followed by a microcode generated pattern.
- The read data flow is tested for the correct response.
- Hardware error registers BCSE, WSE, RER, and RSR are tested for error indications.

This sequence of operations is followed for each generated pattern. If an error or unexpected condition is detected, an error message displays on the maintenance device keyboard/display.

Routine Start Address: 2010

Error Loop:

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

Test 1 Error Display

```
LW2021
PARM ENTERED= xxxx,
IS NOT VALID. EX:
0202, 0302, OR 0402
```

nnnnnn Failure ID
xxxx Parameter entered

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Test 2

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW2021	The routine or pattern number is not valid.			
LW2022	An external register error occurred.	If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU117 FRU115 FRU118 FRU121 FRU119 FRU116 FRU122	
LW2023	A check 1 error occurred.	See the FSI section for error code E100.	FRU117 FRU115 FRU114 FRU118 FRU121 FRU119 FRU116 FRU120 FRU122 FRU134 FRU135 FRU192	

```
nnnnnn
ERA=ra, ERB=rb
PSR=xx, PER=pp XRA=aa
MTI=mm, MDI=md
```

nnnnnn = failure ID
** = no errors were set
ra = contents of error register A
rb = contents of error register B
xx = contents of processor status register
pp = contents of processor error register
aa = contents of external register address register
mc = contents of maintenance tag in register
md = contents of the user's active register

```
BCSE=abcde
BDSE=fghij
RER=rr, RSR=rs
WSE EXP=xw, ACT=aw
```

* = no errors were set
** = no errors were set
a = buffer channel status and error register bits 0-3
b = BCSE channel error group 0
c = BCSE channel error group 1
d = BCSE channel error group 2
e = BCSE channel error group 3
f = buffer device and error register bits 0-3
g = BCSE channel error group 0
h = BCSE channel error group 1
i = BCSE channel error group 2
j = BCSE channel error group 3
rr = contents of read error register
rs = contents of the read status register
xw = expected data in the write status/error register
aw = actual data in the write status/error register

```
FAILING PATTERNS
xx, xx, xx, xx, xx
xx, xx, xx, xx, xx
xx, xx
```

xx = failing patterns
Note: This screen always displays at least one pattern; however, if the number of failing patterns is more than can be displayed on a single screen, they will be listed on following screens.

```
PATTERN = ttii
RPRT DATA FOLLOWS:
EXP=mx, dx, vx, tx
ACT=ma, da va, ta
```

ttii = test ID (tt) and pattern ID (ii) of the test recording the error
tt = 01 not valid
02 loop write to read test 2
03 loop write to read test 3
04 loop write to read test 4
05-FF not valid

mx or ma
bit 0 IBG sensed
1 tapemark sensed
2 erase gap sensed
3 reserved
4 beginning of block sensed
5 VOID sensed
6 none of the above sensed
7 reserved

dx or da
bit 0 density mark sensed
1 reserved
2 reserved
3 reserved
4 beginning of block sensed
5 VOID sensed
6 none of the above sensed
7 reserved

vx or va
bit 0 VOID zone A
1 VOID zone B
2 VOID zone C
3 VOID zone D
4 VOID zone E
5 VOID zone F
6 reserved
7 reserved

tx or ta
bit 0 tone zone A
1 tone zone B
2 tone zone C
3 tone zone D
4 tone zone E
5 tone zone F
6 reserved
7 reserved

Test 2 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW2024	A WSE register error occurred.	Do an Exclusive OR using the WSE register's expected and actual data. Test the bits of the results in the following order: 1. Bits 4, 5, and 7 - See the FSI section for error code D7nn and use these bits for nn (bit 6 is ignored and used as zero to build nn). See the FRUs under #1 in the 'FRUS' column. 2. Bit 0 - See the FSI section for error code 7141. See the FRUs under #2 in the 'FRUS' column. 3. Bit 1 - See the FSI section for error code 70E5. See the FRUs under #3 in the 'FRUS' column. 4. Bit 6 - (Normally a 1) forced on by this diagnostic if one frame of data has been processed. If no data has been processed by the write data flow, this bit is set to a zero. See the FSI section for error code D780. See the FRUs under #1 in the 'FRUS' column.	#1 FRU116 FRU118 FRU120 FRU114 FRU139 #2 FRUC64 FRU062 FRU085 FRU130 FRU116 FRU216 FRU059 FRU117 FRU131 FRU132 FRU118 FRU119 FRU063 FRU058 FRU013 #3 FRU085 FRU062 FRU064 FRU116 FRU118 FRU114 FRU120	See the "Error Displays" column on DIAG 202.
LW2025	Buffer status is incorrect or the buffer detected an error.	1. If BCSE errors are set, see the FSI section for error code D5nn. See the FRUs under #1 in the 'FRUS' column. 2. If BDSE errors are set, see the FSI section for error code D6nn. See the FRUs under #2 in the 'FRUS' column. 3. If WSE register bits 4, 5, and 7 are in error, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. 4. If BCSE status bit 2 is not 1, the channel microprocessor write is not complete. See the FSI section for error code D5nn. See the FRUs under #1 in the 'FRUS' column. 5. If WSE register bit 0 and 1 are not set, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. 6. If BDSE bits 0 and 2 are not set to 1, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. Note. This failure can occur when the DLR external register is not correctly set. Verify CARR-TCU 1189 DLR external register switch position 6 is set on.	#1 FRU114 FRU120 FRU113 FRU133 FRU136 FRU119 FRU118 FRU116 FRU126 FRU134 FRU152 FRU233 FRU235 FRU237 FRU121 FRU122 #2 FRU114 FRU120 FRU113 FRU111 FRU119 FRU118 FRU116 FRU134 FRU117 #3 FRU116 FRU118 FRU120 FRU114 FRU278 FRU139	
LW2026	A read data flow error occurred during a loop write to read operation.	1. Determine the failing zone. 2. See the FSI section for error code D8nn.	FRU064 FRU062 FRU085 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111	

Short Loop Write To Read Pattern Test - Routine EE52 (Continued)

Test 2 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW202*	A read data flow error occurred during a loop write to read operation.	1. Determine the failing zone. 2. See the FSI section for error code D8nn. This failure can occur when the DLR external register is not correctly set. The RPRT expected = 08 08 00 00 actual = 04 04 A8 00 Verify that CARR-TCU DLR external register switch postion 6 is set per CARR-TCU page 1189.	FRU064 FRU062 FRU085 FRU278 FRU123 FRU124 FRU125 FRU119 FRU125 FRU111 FRU116 FRU249 FRU252 FRU253 FRU254	See the "Error Displays" column on DIAG 202.
LW2028	The return code was not valid after an error occurred during a loop write to read operation. This is an EE52 program error.	Call your next level of support.		

Test 3

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW2029	An external register error occurred.	If PSR bit 0 = 1, see EAD 1 for error code Fnnn.	FRU114 FRU120 FRU117 FRU115 FRU118 FRU121 FRU119 FRU116 FRU122	See the "Error Displays" column on DIAG 202.
LW202A	A check 1 error occurred.	See the FSI section for error code E1C0.	FRU117 FRU115 FRU114 FRU118 FRU121 FRU119 FRU116 FRU120 FRU122 FRU134 FRU135 FRU192	

Test 3 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW2029	A WSE register error occurred.	Do an Exclusive OR using the WSE register's expected and actual data. Test the bits of the results in the following order: 1. Bits 4, 5, and 7 - See the FSI section for error code D7nn and use these bits for nn (bit 6 is ignored and used as zero to build nn). See FRUs under #1 in the 'FRUS' column. 2. Bit 0 - See the FSI section for error code 7141. See FRUs under #2 in the 'FRUS' column. 3. Bit 1 - See the FSI section for error code 70E5. See FRUs under #3 in the 'FRUS' column. 4. Bit 6 - (Normally a 1) forced on by this diagnostic if one frame of data has been processed. If no data has been processed by the write data flow, this bit is set to a zero. See the FSI section for error code D780. See the FRUs under #1 in the 'FRUS' column.	#1 FRU116 FRU118 FRU120 FRU114 FRU139 #2 FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013 #3 FRU085 FRU062 FRU064 FRU116 FRU118 FRU114 FRU120	See the "Error Displays" column on DIAG 202.
LW202C	Buffer status is incorrect or the buffer detected an error.	1. If BCSE errors are set, see the FSI section for error code D5nn. See the FRUs under #1 in the 'FRUS' column. 2. If BDSE errors are set, see the FSI section for error code D6nn. See the FRUs under #2 in the 'FRUS' column. 3. If WSE register bits 4, 5, and 7 are in error, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. 4. If BCSE status bit 2 is not 1, the channel microprocessor write is not complete. See the FSI section for error code D5nn. See the FRUs under #1 in the 'FRUS' column. 5. If WSE register bit 0 and 1 are not set, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. 6. If BDSE bits 0 and 2 are not set to 1, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column.	#1 FRU114 FRU120 FRU113 FRU133 FRU136 FRU119 FRU118 FRU116 FRU126 FRU134 FRU152 FRU121 FRU122 #2 FRU114 FRU120 FRU113 FRU111 FRU119 FRU118 FRU116 FRU134 FRU117 #3 FRU116 FRU118 FRU120 FRU114 FRU139	
LW202D	A read data flow error occurred during a loop write to read operation.	1. Determine the failing zone. 2. See the FSI section for error code D8nn.	FRU064 FRU062 FRU085 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111 FRU116	

Test 3 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW202E	A read data flow error occurred during a loop write to read operation.	1. Determine the failing zone. 2. See the FSI section for error code D8nn.	FRU064 FRU062 FRU085 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111 FRU116	See the "Error Displays" column on DIAG 202.
LW202F	The return code was not valid after an error occurred during a loop write to read operation. This is an EE52 program error.	Call your next level of support.		

Test 4

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW2030	An external register error occurred.	If PSR bit 0 = 1, see EAC 1 for error code Fnnn.	FRU114 FRU120 FRU117 FRU115 FRU118 FRU121 FRU119 FRU116 FRU122	See the "Error Displays" column on DIAG 202.
LW2031	A check 1 error occurred.	See the FSI section for error code E:00.	FRU117 FRU115 FRU114 FRU118 FRU121 FRU119 FRU116 FRU120 FRU122 FRU134 FRU135 FRU192	

Test 4 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW2032	A WSE register error occurred.	Do an Exclusive OR using the WSE register's expected and actual data. Test the bits of the results in the following order: 1. Bits 4, 5, and 7 - See the FSI section for error code D7nn and use these bits for nn (bit 6 is ignored and used as zero to build nn). See FRUs under #1 in the 'FRUS' column. 2. Bit 0 - See the FSI section for error code 7141. See FRUs under #2 in the 'FRUS' column. 3. Bit 1 - See the FSI section for error code 70E5. See FRUs under #3 in the 'FRUS' column. 4. Bit 6 - (Normally a 1) forced on by this diagnostic if one frame of data has been processed. If no data has been processed by the write data flow, this bit is set to a zero. See the FSI section for error code D780. See the FRUs under #1 in the 'FRUS' column.	#1 FRU116 FRU118 FRU120 FRU114 FRU139 #2 FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013 #3 FRU085 FRU062 FRU064 FRU116 FRU118 FRU114 FRU120	See the "Error Displays" column on DIAG 202.
LW2033	Buffer status is incorrect or the buffer detected an error.	1. If BCSE errors are set, see the FSI section for error code D5nn. See the FRUs under #1 in the 'FRUS' column. 2. If BDSE errors are set, see the FSI section for error code D6nn. See the FRUs under #2 in the 'FRUS' column. 3. If WSE register bits 4, 5, and 7 are in error, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. 4. If BCSE status bit 2 is not 1, the channel microprocessor write is not complete. See the FSI section for error code D5nn. See the FRUs under #1 in the 'FRUS' column. 5. If WSE register bit 0 and 1 are not set, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column. 6. If BDSE bits 0 and 2 are not set to 1, see the FSI section for error code D7nn. See the FRUs under #3 in the 'FRUS' column.	#1 FRU114 FRU120 FRU113 FRU133 FRU136 FRU119 FRU118 FRU116 FRU126 FRU134 FRU152 FRU121 FRU122 #2 FRU114 FRU120 FRU113 FRU111 FRU119 FRU118 FRU116 FRU134 FRU117 #3 FRU116 FRU118 FRU120 FRU114 FRU139	
LW2034	A read data flow error occurred during a loop write to read operation.	1. Determine the failing zone. 2. See the FSI section for error code D8nn.	FRU064 FRU062 FRU085 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111 FRU116	

Test 4 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
L42035	A read data flow error occurred during a loop write to read operation.	1. Determine the failing zone. 2. See the FSI section for error code 09nn.	FRU064 FRU062 FRU085 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111 FRU116	See the "Error Displays" column on DIAG 202.
L42036	The return code was not valid after an error occurred during a loop write to read operation. This is an EE52 program error.	Call your next level of support.		

Short Loop Write to Read Timing Test - Routine EE53

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine checks the read and write data flow in the tape control unit. A record consisting of 28 bytes is placed in the data buffer by the microprocessor and then sent to the write data flow card.

The write data flow card sends an IBG, preamble, 28 bytes of data, and a postamble to the read detection card using 18 special loop write to read signal lines.

This routine checks that the following events occur at the proper time:

- Beginning of Block
- Beginning Sync
- Ending Sync
- Generate Gap Out
- The next IBG

A failure during this diagnostic indicates the problem is in the tape control unit being exercised and not in the tape transport units attached to this tape control unit.

Refer to the OPER section of the MG for more details on the loop write to read data flow.

Routine Start Address: 3010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop on diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette, you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW3021	An error was detected in the PER, PSR, or MTI register.	See the FSI section for error codes 01nn and 0900.	FRU129 FRU114 FRU113 FRU116 FRU111 FRU119 FRU123 FRU124 FRU125 FRU279	nnnnnn ERA=aa ERB=bb MTI=cc MDI=dd PSR=ee PER=ff XRA=gg WSE=hh WER=ii RSR=jj BCSE= a b c d e BOSE= f g h i j RCR=kk MCR=ll RPR=mm nnnnnn = failure ID * = No error is set aa = Contents of the ERA register bb = Contents of the ERB register cc = Contents of the MTI register dd = Contents of the MDI register ee = Contents of the PSR register ff = Contents of the PER register gg = Contents of the XRA register hh = Contents of the WSE register ii = Contents of the WER register jj = Contents of the RSR register kk = Contents of the RCR register ll = Contents of the MCR register mm = Contents of the RPR register a = Bits 0-3 of the BCSE status register b = BCSE register error group 0 c = BCSE register error group 1 d = BCSE register error group 2 e = BCSE register error group 3 f = Bits 0-3 of the BOSE status register g = BOSE register error group 0 h = BOSE register error group 1 i = BOSE register error group 2 j = BOSE register error group 3
LW3022	An error was detected in the ERA or ERB register.	See the FSI section for error code E100		
LW3023	An error was detected in the WSE register.	See the FSI section for error code 7076.		
LW3024	An error was detected in the BCSE or BOSE register.	See the FSI section for error codes 05nn and 06nn.		
LW3025	An error was detected in the WER or RSR register.	See the FSI section for error codes 08nn and 09nn.		
LW3026	An error was detected in the WSE register prior to starting the write data flow.	See the FSI section for error code 7076.		
LW3027	An error was detected in the RSR register prior to starting the write data flow.	See the FSI section for error code 00nn.		
LW3028	An error was detected in the WER register prior to starting the write data flow.	See the FSI section for error code 00nn.		
LW3029	Beginning of block was not detected.	See the FSI section for error code 7142.		
LW302A	Beginning of block was detected too soon.	See the FSI section for error code 7142.		
LW302B	Beginning sync was not detected.	See the FSI section for error code 7971.		
LW302C	Beginning sync was detected too soon.	See the FSI section for error code 7071.		
LW302D	Ending sync was not detected.	See the FSI section for error code 7071.		
LW302E	Ending sync was detected too soon.	See the FSI section for error code 7071.		
LW302F	Generate gap out was not detected.	See the FSI section for error code 7163.		
LW3030	Generate gap out was detected too soon.	See the FSI section for error code 7163.		
LW3031	The next IBG was not detected.	See the FSI section for error code 7503.		
LW3032	The diagnostic produced an invalid error code.	This is a diagnostic program error.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS
LW3033	An error was detected in the WSE register prior to starting the write data flow.	See the FSI section for error code 7076.
LW3034	An error was detected in the RSR register prior to starting the write data flow.	See the FSI section for error code D0nn.
LW3035	An error was detected in the RER register prior to starting the write data flow.	See the FSI section for error code D8nn.
LW3036	Beginning of block was not detected.	See the FSI section for error code 7142.
LW3037	Beginning of block was detected too soon.	See the FSI section for error code 7142.
LW3038	Read condition was set too soon.	
LW3039	Read condition was set too late.	
LW303A	Begi sync was not detected.	See the FSI section for error code 7071.
LW303B	Beginning sync was detected too soon.	See the FSI section for error code 7071.
LW303C	Ending sync was not detected.	See the FSI section for error code 7071.
LW303D	Ending sync was detected too soon.	See the FSI section for error code 7071.
LW303E	Generate gap out was not detected.	See the FSI section for error code 7163.
LW303F	Generate gap out was detected too soon.	See the FSI section for error code 7163.
LW3040	The next IBG was not detected.	See the FSI section for error code 7503.
LW3041	Beginning of block was not set during the read condition test.	This failure can occur when the DLR external register is not correctly set. Verify CARR-TCU DLR external register switch position 6 is off.
LW3042	Read condition is set when a block is shorter than 15 microseconds.	
LW3043	Read condition is not set when a block is longer than 15 microseconds.	
LW3044	Read condition is set when a block is shorter than 15 microseconds.	This failure can occur when the DLR external register is not correctly set. Verify CARR-TCU DLR external register switch position 6 is set.
LW3045	Read condition is set, but not enabled.	

FRUS

FRU129
FRU114
FRU113
FRU116
FRU111
FRU119
FRU123
FRU124
FRU125
FRU278

ERROR DISPLAYS

```
nnnnnn
ERA=aa    ERB=bb
MTI=cc    MDI=dd
PSR=ee    PER=ff
```

```
XRA=gg    WSE=hh
RER=ii    RSR=jj
 BCSE= a b c d e
 BDSE= f g h i j
```

```
RCR=kk    WCR=ll
RPR=mm
```

nnnnnn = failure ID
 * = No error is set
aa = Contents of the ERA register
bb = Contents of the ERB register
cc = Contents of the MTI register
dd = Contents of the MDI register
ee = Contents of the PSR register
ff = Contents of the PER register
gg = Contents of the XRA register
hh = Contents of the WSE register
ii = Contents of the RER register
jj = Contents of the RSR register
kk = Contents of the RCR register
ll = Contents of the WCR register
mm = Contents of the RPR register
 a = Bits 0-3 of the BCSE status register
 b = BCSE register error group 0
 c = BCSE register error group 1
 d = BCSE register error group 2
 e = BCSE register error group 3
 f = Bits 0-3 of the BDSE status register
 g = BDSE register error group 0
 h = BDSE register error group 1
 i = BDSE register error group 2
 j = BDSE register error group 3

Long Loop Write to Read Test - Routine EE54

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine checks the read and write data flow from the tape control unit to a tape transport unit and back to the tape control unit.

The write data flow card sends an IBG to the drive, the write bus, and the drive-adapter card. The drive-adapter card loops the data from write bus lines 0 and 1 to the read pre-amplifier card. The read pre-amplifier card sends the data over the read bus to the read detection card. The read detection card checks for the proper zones that indicate an IBG is present. An error is indicated if an IBG is not detected.

This routine also tests the tape control unit to tape transport unit interconnections because a drive must be selected and conditioned for the long loop write to read test by sending it the diagnose command. Errors are indicated if the drive responds incorrectly to the control unit.

A failure during this diagnostic indicates the problem may be in the tape control unit being tested or in the tape transport units attached to this tape control unit. This test may be run using the same tape control unit and a different drive to further isolate the problem. If you have a dual tape control unit configuration, this test may be run using the second tape control unit to exercise the failing drive.

Refer to the OPER section of the MG for more details on the loop write to read data flow.

Routine Start Address: 4010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Test Selection

The following screen displays after routine number EE54 has been entered to start the routine.

```
DIAG=(EE54)-ENTER:
DRI=E
(xx)
```

Valid parameters.

xx Drive address (0-F, or 00-0F)

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS
LW4021	An error was detected in the PER, PSR, or MTI register.	See the FSI section for error codes D0nn, and D1nn. See EAD 1 for error code Fnnn.	FRU120 FRU114
LW4022	An error was detected in the ERA or ERB register.	See the FSI section for error code E100.	FRU113
LW4023	An error was detected in the WSE register.	See the FSI section for error code D7nn.	FRU116
LW4024	An error was detected in the BCSE or BDSE register.	See the FSI section for error codes D5nn and D6nn.	FRU118 FRU111
LW4025	An error was detected in the RER or RSR register.	See the FSI section for error codes D0nn and D8nn.	FRU119
LW4026	An error was detected in the WSE register prior to write data flow starting.	See the FSI section for error code D7nn.	FRU123
LW4027	An error was detected in the RSR register prior to write data flow starting.	See the FSI section for error code D0nn.	FRU124
LW4028	An error was detected in the RER register prior to write data flow starting.	See the FSI section for error code D8nn.	FRU125
LW4029	An invalid address has been specified.	Valid drive addresses are 00 to 0F.	FRU278
LW402A	The IBG was not detected.	See the FSI section for error codes 7093 and 7142.	FRU064
LW4029	A timeout occurred while waiting for the drive to raise device data bus 'clock B in', indicating that the drive is ready to accept the diagnose command data.	See the FSI section for error codes 840A and 8300. See EAD 1, "Drive Interconnections."	
LW402C	A timeout occurred while waiting for the drive to drop device data bus 'clock B in' indicating that the drive has accepted the diagnose command.	See the FSI section for error codes 8600 and 8601. See EAD 1, "Drive Interconnections."	
LW402D	A timeout occurred while waiting for the drive to clear the device data bus of all interrupts.	See the FSI section for error code 8005. See EAD 1, "Drive Interconnections."	
LW402E	A timeout occurred while waiting for the drive to raise device data bus 'address in', indicating that the drive has recognized its address on the bus.	See the FSI section for error code 8007. See EAD 1, "Drive Interconnections."	
LW402F	The drive address returned in the device data bus DCB does not match the one's complement address.	See the FSI section for error code 800C. See EAD 1, "Drive Interconnections."	

ERROR DISPLAYS

```
nnnnnn
ERA=aa    ERB=bb
MTI=cc    MDI=dd
PSR=ee    PER=ff
```

```
XRA=gg    WSE=hh
RER=ii    RSR=jj
 BCSE= a b c d e
 BDSE= f g h i j
```

```
RCR=kk    WCR=ll
RPR=mm
```

nnnnnn = failure
- * = No error is set
- aa = Contents of the ERA register
- bb = Contents of the ERB register
- cc = Contents of the MTI register
- dd = Contents of the MDI register
- ee = Contents of the PSR register
- ff = Contents of the PER register
- gg = Contents of the XRA register
- hh = Contents of the WSE register
- ii = Contents of the RER register
- jj = Contents of the RSR register
- kk = Contents of the RCR register
- ll = Contents of the WCR register
- mm = Contents of the RPR register
- a = Bits 0-3 of the BCSE status register
- b = BCSE register error group 0
- c = BCSE register error group 1
- d = BCSE register error group 2
- e = BCSE register error group 3
- f = Bits 0-3 of the BDSE status register
- g = BDSE register error group 0
- h = BDSE register error group 1
- i = BDSE register error group 2
- j = BDSE register error group 3

The following two frames are displayed only when a drive unit check is detected.

```
DRV=dv    DSE=de
DCR=dr        DTR=dt
DCB=db    DIR=di
STS=gggg hhhh
```

- * No error is set
- db Contents of the DCB register
- de Contents of the DSE register
- di Contents of the DIR register
- dr Contents of the DCR register
- dt Contents of the DTR register
- dv Is the drive address
- gggg Drive status byte
- hhhh Drive status bytes for a sense command

```
DRSNS-  S0=b0,S19=b1
S18= b2, S2021= b4b5
         S2223= b6b7
S30= 21,    EC= 2223
```

NOTE: When no sense data is received from the drive, these bytes all contain FF.

The following sense data is described in the SENSE section (see formats 19 and 20).

- b0 Contents of the drive error recovery byte (see sense byte 8).
- b1 The contents of the drive features byte (see sense byte 19).
- b2 Flags modifier to b4b5 (see sense byte 18).
- b4b5 The first error the drive detected. B4 contains the drive command associated with this error, an EE to indicate a bus out parity error while loading a command or an F to indicate that the error occurred when the drive was not performing a command. B5 contains the drive error code identifying this error (see sense bytes 20 and 21).
- b6b7 The last error the drive detected. B6 contains the drive command associated with this error, an EE to indicate bus out parity error while loading a command, or an FF to indicate that the error occurred when the drive was not performing a command. B7 contains the drive error code identifying this error (see sense bytes 22 and 23).
- 21 Logical drive address and physical drive address (contents of the thumbwheel switches). See sense byte 30.
- 2223 The drive EC level (contains the last four digits of the drive RDS module EC level).

The following frame is displayed only when a data compare error is detected. Each symbol (1A, 2A) indicates a compare error has occurred on that track.

```
ERR TRK:1A, 2A, 3A,
4A, 5A, 6A, 7A, 8A,
9A, 1B, 2B, 3B, 4B,
5B, 6B, 7B, 8B, 9B.
```

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW4030	An error has been detected in the DSE register during selection.	See the FSI section for error codes 800A and 80nn. See EAD 1, "Drive Interconnections."	FRU120 FRU114	See the "Error Displays" column on DIAG 222.
LW4031	A timeout occurred waiting for the drive to drop device data bus 'address in', indicating that the drive recognized that device data bus 'address out' dropped.	See the FSI section for error code 8009. See EAD 1, "Drive Interconnections."	FRU113 FRU116	
LW4032	The drive has raised device data bus 'address in' during a command, indicating that it has detected a hardware error.	See the FSI section for error codes 86F0, 86F1, and 89nn. See EAD 1, "Drive Interconnections."	FRU118	
LW4033	An error has been detected in the DSE register during a command.	See the FSI section for error code 800A. See EAD 1, "Drive Interconnections."	FRU111 FRU119	
LW4034	A timeout occurred while waiting for the drive to drop device data bus 'status in', in response to the control unit dropping 'select out'.	See the FSI section for error code 8C07. See EAD 1, "Drive Interconnections."	FRU123 FRU124	
LW4035	The drive has raised device data bus 'address in' during device data bus 'status in', indicating that it has detected a hardware error.	See the FSI section for error codes 86F0, 86F1, and 89nn. See EAD 1, "Drive Interconnections."	FRU125 FRU278	
LW4036	A timeout occurred while waiting for the drive to raise device data bus 'status in', indicating that the first status byte is available on the DCB.	See the FSI section for error code 8E05. See EAD 1, "Drive Interconnections."	FRU085 FRU064	
LW4037	A timeout occurred while waiting for the drive to raise device data bus 'clock B in', indicating that the second status byte is available on the DCB.	See the FSI section for error code 840A. See EAD 1, "Drive Interconnections."		
LW4038	A timeout occurred while waiting for the drive to drop device data bus 'clock B in' in response to the control unit dropping 'clock A out'.	See the FSI section for error code 840C. See EAD 1, "Drive Interconnections."		
LW4039	Status indicates a different address (HI or LO) than the one the control unit used. See DFI, "Drive Status Bits 0–15," and read the definition of bit 8.	See the FSI section for error code 86C0.		
LW403A	The drive external register cartridge present sensor is set using a read drive external register order.	1. Remove the cartridge and rerun this diagnostic. 2. Press the reset switch on the drive. 3. See the FSI section for CHK 02.		
LW403B	Status indicates a drive unit check.	Check the sense bytes for the cause of the check.		
LW403C	A timeout occurred while waiting for the drive to raise device data bus 'clock B in', indicating that a sense byte is available on the DCB.	See the FSI section for error codes 840A, 8600, and 8601. See EAD 1, "Drive Interconnections."		
LW403D	A timeout occurred while waiting for the drive to drop device data bus 'clock B in', in response to the control unit raising device data bus 'clock A out during a sense operation.	See the FSI section for error codes 8600 and 8601. See EAD 1, "Drive Interconnections."		
LW403E	A timeout occurred while waiting for the drive to raise device data bus 'clock B in' indicating that a sense byte is available on the DCB.	See the FSI section for error code 8600. See EAD 1, "Drive Interconnections."		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
LW403F	A timeout occurred while waiting for the drive to drop device data bus 'clock B in', in response to the control unit raising device data bus 'clock A out' during a sense operation.	See the FSI section for error code 8600. See EAD 1, "Drive Interconnections."	FRU120 FRU114 FRU113 FRU116 FRU118 FRU111 FRU119 FRU123 FRU124 FRU125 FRU279 FRU085 FRU064	See the "Error Displays" column on DIAG 222.
LW4040	The diagnostic program has produced an invalid error code.	This is a diagnostic program error.		
LW4041	A timeout occurred while waiting for the drive to raise device data bus 'clock B in', indicating that a data byte is available on the DCB.	See the FSI section for error codes 840A, 8600, and 8601. See EAD 1, "Drive Interconnections."		
LW4042	A timeout occurred while waiting for the drive to drop device data bus 'clock B in', in response to the control unit raising device data bus 'clock A out' during a read drive external register command.	See the FSI section for error codes 8600 and 8601. See EAD 1, "Drive Interconnections."		
LW4043	A timeout occurred while waiting for the drive to raise device data bus 'clock B in', indicating that a data byte is available on the DCB.	See the FSI section for error code 8600. See EAD 1, "Drive Interconnections."		
LW4044	A timeout occurred while waiting for the drive to drop device data bus 'clock B in', in response to the control unit raising 'clock A out' during a read drive external register command.	See the FSI section for error code 8601. See EAD 1, "Drive Interconnections."		
LW4045	A drive unit check occurred during a sense command.	See the FSI section for error code 86A0.		
LW4046	The sense data from the drive contained an ERP code that is not permitted. Permitted errors are ERP = 66, ERP = 6C with error code 75, or ERP = 78 with error code 76.	Go to the FSI section with the error code listed for b5 or b7 of the DRSNS error display (see the Error Display Column).		
LW4047	A Read External Register command was sent twice and a drive unit check was received both times.	Go to the FSI section with the error code listed for b5 or b7 of the DRSNS error display (see the Error Display Column).		
LW4048	A Drive Set Diagnose command was sent twice and a drive unit check was received both times.	Go to the FSI section with the error code listed for b5 or b7 of the DRSNS error display (see the Error Display Column).		
LW4049	A Write command was sent and drive unit check was received.	Go to the FSI section with the error code listed for b5 or b7 of the DRSNS error display (see the Error Display Column).		
LW404A	A Drive Set Diagnose command was sent twice and a drive unit check was received both times.	Go to the FSI section with the error code listed for b5 or b7 of the DRSNS error display (see the Error Display Column).		
LW404B	The control unit hardware did not complete the execution of a device data bus 'Serial Reset A' command.	See the FSI section for error code 8803. See EAD 1, "Drive Interconnections."		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRU LISTINGS		ERROR DISPLAYS
			LIST	FRU NUMBERS	
LW404C	The first IBG is too long.	See the FSI section for error code 7152. See FRU list A			See the error page DIAG 222. page DIAG 222.
LW404D	The first IBG is too short.	See the FSI section for error code 7151. See FRU list A	A	FRU120, FRU114, FRU113, FRU116 FRU118, FRU111, FRU119, FRU123 FRU124, FRU125, FRU278, FRU085 FRU064	
LW404E	The preamble is too long.	See the FSI section for error code 7071. See FRU list A			
LW404F	The preamble is too short.	See the FSI section for error code 7071. See FRU list A			
LW4050	Ending synch did not occur during the time allowed.	See the FSI section for error code 7155. See FRU list A	B	FRU278, FRU125	
LW4051	Ending synch occurred too soon.	See the FSI section for error code 7155. See FRU list A	C	FRU278, FRU124	
LW4052	Gapout did not occur during the time allowed.	See the FSI section for error code 7502. See FRU list A	D	FRU123	
LW4053	Gapout occurred too soon.	See the FSI section for error code 7502. See FRU list A	E	FRU124, FRU278, FRU125	
LW4054	The second IBG did not occur during the time allowed.	See the FSI section for error code 7152. See FRU list A	F	FRU123, FRU278, FRU125	
LW4055	An error occurred in BDSE during long loop write to read.	See the FSI section for error code 7077. See FRU list A	G	FRU123, FRU278, FRU124	
LW4C56	An error occurred in the DSE register during long loop write to read.	See the FSI section for error code D4nn. See FRU list A	H	FRU123, FRU124, FRU125, FRU278	
LW4057	BDSE status is incorrect at the end of long loop write to read.	See the FSI section for error code 7078. See FRU list A	I	FRU085, FRU062, FRU064, FRU013, FRU088 or FRU092, FRU089 or FRU092, FRU087 or FRU094	
LW4058	BCSE status is incorrect at the end of long loop write to read.	See the FSI section for error code D5nn. See FRU list A			
LW4059	A data error occurred in group 3.	See the FSI section for error code E304. See FRU lists B and I See Note	Note: This problem can be caused by a problem on any drive attached to this interface (Local 'A') or (Remote 'B'). Pull drive TEE cables to isolate to a single failing drive. See LOC 1 and 2 for 'Read Adapter Cables'		
LW405A	A data error occurred in group 2.	See the FSI section for error code E302. See FRU lists C and I See Note			
LW405B	A data error occurred in group 1.	See the FSI section for error code E301. See FRU lists D and I See Note			
LW405C	Data errors occurred in groups 2 and 3.	See the FSI section for error code E306. See FRU lists E and I See Note			
LW405D	Data errors occurred in groups 1 and 3.	See the FSI section for error code E305. See FRU lists F and I See Note			
LW405E	Data errors occurred in groups 1 and 2.	See the FSI section for error code E303. See FRU lists G and I See Note			
LW405F	Data errors occurred in groups 1, 2, and 3.	See the FSI section for error code E307. See FRU lists H and I See Note			
LW4060	Incorrect byte count of (loop write to read) read data.	See the FSI section for error code 74nn. See FRU list A			
LW4061	WSE status did not contain complete.	See the FSI section for error code D7nn. See FRU list A			
LW4062	A level 2 interrupt did not occur on the density separator.	See the FSI section for error code 7142. See FRU list A			
LW4063	The second IBG was not detected.	See the FSI section for error code 7052. See FRU list A			
LW4064	At the completion of the loop-write-to-read the RSR must contain 'ED' (hexadecimal) and the RER must contain '00' (hexadecimal).	See the FSI section for error code 7081. See FRU list A			
LW4065	The DLR external register and drive sense do not agree.	See CARR-TCU 1189 for correct DLR external register switch setting.	FRU118		

Long Loop Write to Read Test-Routine EE54 (Continued)

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs	ERROR DISPLAYS
LW4066 LW4067	A timeout error occurred during a TIO command to the drive. A drive status error occurred while sending code to the drive.	1. This program has minimum diagnostic capability during the drive patching procedure. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit on-line. Press unload switch of drive being tested, reload diagnostic EE54 and run it. 4. If this error persists, run EE40.		See the "Error Displays" on DIAG 222.
LW4068 LW4069 LW406A	The correct level of code patches is not found on the functional diskette. The correct level of code patches is not found on the functional diskette. Unable to read the functional diskette due to an error.	1. Make sure the diskette in the diskette reader is the correct level. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit on-line. Press unload switch of drive being tested, reload diagnostic EE54 and run it. Ensure that the tape control unit successfully loads code from the diskette. 4. If this error persists, run EE40.		

External Register Bus Addressing and Data Pattern Test - Routine EE85

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine consists of five tests

Routine Start Address: 5010

Note: The following looping information, applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop diagnostics (see CE/HSC 1).

Test 1

- Tests the external register address extend bits (bits 6 and 7) and the path from the process control register as it is used for external register addressing.
- Tests external address error detection.

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Test 2

- Ensures that an external register error causes a level 0 interrupt
- Tests the path from the processor control register as it is used for external register addressing.

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Test 3

- Tests that writable external registers can be written to and that readable external registers can be read. The data written is ripple data 00 through FF. After each write, the data is read and the read data is compared to the written data.

Error Loop - XR Register Write: Loop on the same XR address writing the same data.

Error Loop - XR Register Read: Loop on the same XR address reading the same data.

Test 3 External Register Test Sequence

START

REG NAME	WRT REG	RD REG
CCC	X	X
MDO	X	
CDR	X	
CMR	X	
ITC	X	
DCB	X	
CER	X	
CRR	X	
DLR	X	
DSH	X	
DSL	X	
DIR	X	
DSE	X	
MDI	X	

REG NAME	WRT REG	RD REG
RCR	X	X
RDC	X	X
BCPL	X	X
BDPH	X	X
BDPL	X	X
BCSH	X	X
BCSL	X	X
BDSH	X	X
BDSL	X	X
BWRP	X	X
BCC	X	
BCSE	X	X
BCR	X	X
BCSS	X	X

REG NAME	WRT REG	RD REG
BDC	X	X
BDSE	X	
BDR	X	X
BDSS	X	X
BDPH	X	X
BCPC	X	
WSE	X	
RSR	X	
RER	X	
RRC	X	
RPR	X	
* BDG0	X	X
* BDAT	X	
* BMR	X	

END

NOTE: If the Improved Data Recording Capability feature is installed, the feature registers are tested in place of the registers preceded by an *.

FEATURE REGS

REG NAME	WRT REG	RD REG
CMRS	X	X
CMM	X	X
CIM	X	X
CMDT	X	X
CMS	X	

Test 4

- Tests that external register errors can be set when bad parity data is written to writable registers
- Does not test processor external registers.

Error Loop - XR Register Write: Loop on the same XR address writing 00.

Test 4 External Register Test Sequence

(1) CCC	(17) BCSH
(2) CCA	(18) BCSL
(3) CDR	(19) BWRP
(4) ITC	(20) BCC
(5) DCB	(21) BCSE
(6) DTR	(22) BCR
(7) DSC	(23) BCSS
(8) DSR	(24) BDC
(9) MDO	(25) BDSE
(10) WCR	(26) BDR
(11) RCR	(27) BDSS
(12) RDC	(28) BCPC
(13) BCPH	*(29) BDAT
(14) BCPL	*(30) BDG0
(15) BDPH	*(31) BDG1
(16) BDPL	*(32) BMR

Test 5

- Ensures that external register address errors are set when addresses that are not valid are written to or read from the external register bus.

Error Loop - XR Write: Loop on the same XR address writing 00 and inhibit parity.

Error Loop - XR Read: Loop on the same XR address reading.

Test 5 Address Test Sequence For Addresses That Are Not Valid

- Write and Read Addresses:
  - A04 through A0F
  - A13 through A17
  - B08 through B0F
  - C00 through C0F
  - C14 through C17
  - D13 and D14 (Valid if the Improved Data Recording Capability feature is installed).
- Write Only Addresses:
  - A07
  - A10 through A12
  - B01
  - B03 through B06
  - B10
  - B13
  - C12
  - C19
  - D19
- Read Only Addresses:
  - A18
  - B18
  - D0D

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette, you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

External Register Table (XRT)

Word 0

Note: The bits in the following table are contained in the first byte of word 0 of the XRT.

Bit	Label	Area	Description/Detail
Bit 0	HIT2A	XR A Bus Flags	Two or more external registers failed while testing the registers on bus A.
Bit 1	HIT1A	XR A Bus Flags	One external register failed while testing the registers on bus A.
Bit 2	WRAF	XR A Bus Flags	A failure was detected while writing a register on bus A.
Bit 3	RDAF	XR A Bus Flags	A failure was detected while reading a register on bus A.
Bit 4	HIT2B	XR B Bus Flags	Two or more external registers failed while testing the registers on bus B.
Bit 5	HIT1B	XR B Bus Flags	One external register failed while testing the registers on bus B.
Bit 6	WRBF	XR B Bus Flags	A failure was detected while writing a register on bus B.
Bit 7	RDBF	XR B Bus Flags	A failure was detected while reading a register on bus B.

Tests 1 and 2 Error Displays

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
X85021	XR error is on after the hardware, check 1, and user reset at the start of the first test in routine EE85.	To help in problem isolation, also run diagnostics EE10, EE30, EE40, EE50, EE90, and EEA0. 1. Install the support diskette, then press the IML switch to cause a power-on-reset. Run routine EE85 again. 2. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. Also see action number 4 of this Additional Actions column. 3. If PSR bit 0 = 1, see EA0 1 for error code Fnnn. 4. If a diagnostic failure occurs and no errors are detected by the hardware, see the FSI section for error code E100 and perform the procedures for the microprocessor and control storage. 5. XR errors (PSR bit 0 = 1) can cause ERA and ERB errors. Use diagnostic EE10 to check the ERA and ERB registers. 6. If ERA and ERB are not 0, record the contents (if the screen is displayed) of ERA and ERB and see the FSI section for error code E100. 7. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. 8. If BCSE channel error groups 0-3 indicate any errors, record the contents of BCSE. See the FSI section for error code D5nn. 9. If BDSE channel error groups 0-3 indicate any errors, record the contents of BDSE. See the FSI section for error code D6nn. 10. If DSE bits 0, 1, or 2 = 1, record the contents of DC9, DCR, DSE, DIR, and DTR. See the FSI section for error code D4nn. 11. See EAD 1, "Drive Interconnections." If any RER bits = 1, or if RSR bits 5, 6, or 7 = 1, record the contents of RCR, RRC, RER, RSR, and RDC. See the FSI section for error code D8nn. 12. If WSE bits 4, 5, or 6 = 1, record the contents of WCR and WSE. See the FSI section for error code D7nn. 13. If CER bits 0, 1, or 2 = 1, record the contents of CER and AER. See the FSE section for error code 55nn.	FRU121 FRU118 FRU117 FRU115 FRU114 FRU120 FRU119 FRU134 FRU135 FRU157 FRU158 FRU159 FRU140	nnnnnn ERA = ra, ERB = rb PSR = rr, PER = pp MTI = mm, MDI = md HOT BITS XR BUS = aa XRA EXP = ex, ACT=ac (This screen is exp'ained on DIAG 4). MACHINE FAILURES MAY CAUSE CURRENT ERROR DATA TO BE INVALID. SEE DIAG 1 "VERIFY". nnnnnn Failure ID ** No errors were set ra Contents of error register A rb Contents of error register B rr Contents of the processor status register pp Contents of the processor error register mm Contents of the maintenance tag in register md Contents of the users active register aa Result of ANDing data from registers on the XR bus ac Actual data in external register address register ex Expected data in external register address register
X85022	The XRA did not match the data compare table during the test of all possible combinations of data into the XRA.			
X85023	An XR error occurred while using procedure registers during the testing of XRA.			
X85024	An error occurred while using the diagnostic mode to force an error while writing to the JAM register (data equal 00), and using extend bits for addressing external registers A or B. An XR error is expected along with specific data in XRA.			
X85025	An XR or check 2 error is on unexpectedly during test of XRA following a user test.			
X85026	1. An XR error is forced causing a level 0 interrupt. These results are expected: XR error, check 2, and user write error. 2. An XR interrupt occurred; however, the XR error or check 2 are not set. 3. An XR error is forced with interrupts disabled, with XR errors and check 2 in the processor error register (PER). 4. Current or preceding interrupt levels are not correct.			
X85027	1. A level 0 interrupt occurred; however, the current and preceding interrupt levels do not match. Current = 0 and previous = 7. 2. After returning from level 0, the PSR is not correct.			
X85028	1. Processor problems. 2. A level 0 interrupt occurred and the XRA did not have the correct value in it. 3. The return from a level 0 interrupt did not occur or the level 0 interrupt occurred too soon. 4. The JAM register did not activate 'users active' when an error was forced on the data bus. (Address is correct.) 5. XR error interrupt did not occur. 6. Check reset is activated and check 2 and/or XR error did not reset. 7. The preceding interrupt level changed when the reset is given and XR error is not reset in the PER.			nnnnnn PSR = rr, PER = pp MTI = mm, DSE = ds RER = re, RSR = rs BCSE=bc, BDSE = bd WSE = ww, CER = ce A CAE = aa,B CAE= bb C CAE = cc,D CAE= dd nnnnnn Failure ID ** No errors were set rr Contents of the processor status register pp Contents of the processor error register mm Contents of the maintenance tag in register ds Contents of the device status/error register re Contents of the read error register rs Contents of the read status register bc Contents of the buffer channel status and error register bd Contents of the buffer device status and error register ww Contents of the write status/error register ce Contents of the channel error register aa Channel adapter A errors if CER bit 4 = 1 bb Channel adapter B errors if CER bit 5 = 1
X85029	Both read and write operations are performed while forcing an addressing error on the XR address. The following failures can occur: • XR error or check 2 did not occur • PER XR errors were not set or reset correctly • IMR responded to an address with bad parity.			
X8502A	While testing to ensure that A and B bus does not affect the processor bus, an XR or check 1 error occurred.			
X8502B	An XR address parity error was forced, but the MTI did not contain MTI FRU 1, indicating that the error was not detected.			

Tests 3, 4, and 5 Error Displays

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
X8502C	An error occurred while testing register zzzz.	To help in problem isolation, also run diagnostics E010, EE30, EE40, EE50, EE60 EE90, and EEA0. 1. Install the support diskette then press the IML switch to cause a power-on reset. Run routine EE85 again. 2. If the value of ERA or ERB is other than 0, see the FSI section for error code E100. Also see action number 4 of this Additional Actions column. 3. If PSR bit 0 = 1, see EAD 1 for error code Fnnn. 4. If a diagnostic failure occurs and no errors are detected by the hardware, see the FSI section for error code E100 and perform the procedures for the microprocessor and control storage. 5. XR errors (PSR bit 0 = 1) can cause ERA and ERB errors. Use diagnostic EE85 to check the ERA and ERB registers.	FRU121 FRU118 FRU117 FRU115 FRU114 FRU120 FRU119 FRU116 FRU134 FRU135 FRU157 FRU158 FRU159 FRU139	nnnnnn REG = zzzz XRT = ff WR=yy. RD = aa ERA = ra, ERB = rb PSR = xx, EXP = xy PER = pp, EXP = py XRA = za, EXP = zy MTI = ti, EXP = ty MDI = di, EXP = dy MACHINE FAILURES MAY CAUSE CURRENT ERROR DATA TO BE INVALID. SEE DIAG 1 "VERIFY". (This screen is explained on MD/SDISK 6.)
X8502D	An error occurred while testing register zzzz.			
X8502E	A failure occurred while using an invalid address. An error is expected; see PSR, PER, and XRA registers. If the actual and expected values are the same for those registers, the error is indicated.			

nnnnnn	Failure ID
zzzz	Mnemonic of the failing external register
ff	External register table at first error (program flags)
yy	Data written to the register
aa	Data read from the register
ra	Contents of error register A ** = No errors were set
rb	Contents of error register B
xx	Actual contents of the processor status register
xy	Expected contents of the processor status register
pp	Actual contents of the processor error register
py	Expected contents of the processor error register
za	Actual contents of the external register address register
zy	Expected contents of the external register address register
ti	Actual contents of the maintenance tag in register
ty	Expected contents of the maintenance tag in register
di	Actual contents of the users active register
dy	Expected contents of the users active register

Status Store Write/Read RAM Storage Test - Routine EE92

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine writes each of the sixteen offset bytes in the sixteen status store pages. The routine tests the status store RAM as follows:

1. It issues a command to write a status store page with a data pattern and increments the offset in the page until all sixteen offset bytes have been written.
2. It issues a command to read the page of storage that was just written. The read data and write data is then compared.
3. When all sixteen pages have been written, the data pattern is changed and steps 1 and 2 are repeated.

   Note: The default data patterns are Hex AA, 55, FF, and 00.

Routine Start Address: 2010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Pattern Entry Display

The data pattern written into status store can be altered by entering the pattern when the following screen displays.

```
DIAG=(EE92)-ENTER:
              PATTERN
               ttii
```

ttii Test data

Press the MD ENTER key to run the default data patterns.

or

Enter a pattern. Two bytes can be entered; the first byte (tt) must be FF to alert the routine that the default patterns are not being used. The second byte (ii) is the data pattern that will be written. Valid patterns are FF00-FFFF.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			
SS2021	A timeout occurred while trying to write in status store. No hardware errors were detected for this error.	See the FSI section for error code 53B2.	FRU121 FRU122 FRU133 FRU152 FRU134	SS2021 SS TIMEOUT OCCURRED DURING THE WRITE FOR PAGE x OFFSET y x = Status store page y = Offset of the storage location
SS2022	A timeout occurred while trying to read a location in status store. No hardware errors were detected for this error.	See the FSI section for error code 53B0.	FRU121 FRU122 FRU133 FRU152 FRU134	SS2022 SS TIMEOUT OCCURRED DURING THE READ FOR PAGE x OFFSET y x = Status store page y = Offset of the storage location
SS2023	The data read from the status store RAM did not match the data written. No hardware errors were detected for this error.	See the FSI section for error code 53B3.	FRU121 FRU122 FRU133 FRU152 FRU195 FRU196 FRU134	SS2023 DATA NOT AS EXPECTED PAGE x OFFSET y WRITE = zz READ = ww x = Status store page y = Offset of the storage location zz = Write data ww = Read data
SS2024	The status store write/read was completed successfully; however, a hardware error was detected. The registers that were checked for errors are displayed.	See the FSI section for error code 5900. If ERA and ERB are not 0, record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn.	FRU121 FRU122 FRU134	SS2024 ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md cc = Contents of channel error register rr = Contents of the processor status register pp = Contents of the processor error register ra = Contents of error register A rb = Contents of error register B xx = Contents of the external register address register mm = Contents of the maintenance 'tag in' register md = Contents of the users active register

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		
SS2025	The data read from status store RAM did not match the data written. A hardware error was detected and the contents of the registers that were checked are displayed.	See the FSI section for error code 53B3. If ERA and ERB are not 0 record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn.	FRU121 FRU122 FRU133 FRU152 FRU134	SS2025 DATA NOT AS EXPECTED PAGE x OFFSET y WRITE = zz READ = ww HARDWARE REGISTERS ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md x Status store page y Offset of the storage location zz Write data ww Read data cc Contents of the channel error register rr Contents of the processor status register pp Contents of the processor error register ra Contents of error register A rb Contents of error register B xx Contents of the external register address register mm Contents of the maintenance 'tag in' register md Contents of the user's active register
SS2026	A timeout occurred while trying to write in status store. A hardware error was detected and the contents of the registers that were checked are displayed on an additional error screen.	If ERA and ERB are not 0, record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn. See the FSI section for error code 53B2.	FRU121 FRU122 FRU133 FRU152 FRU134	SS2026 SS TIMEOUT OCCURRED DURING THE WRITE FOR PAGE x OFFSET y HARDWARE REGISTERS ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md x Status store page y Offset of the storage location cc Contents of the channel error register rr Contents of the processor status register pp Contents of the processor error register ra Contents of error register A rb Contents of error register B xx Contents of the external register address register mm Contents of the maintenance 'tag in' register md Contents of the user's active register
SS2027	A timeout occurred while trying to read from status store. A hardware error was detected and the contents of the registers checked are displayed on an additional error screen.	If ERA and ERB are not 0, record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn. See the FSI section for error code 53B0.	FRU121 FRU122 FRU133 FRU152 FRU134	SS2027 SS TIMEOUT OCCURRED DURING THE READ FOR PAGE x OFFSET y HARDWARE REGISTERS ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md x Status store page y Offset of the storage location cc Contents of the channel error register rr Contents of the processor status register pp Contents of the processor error register ra Contents of error register A rb Contents of error register B xx Contents of the external register address register mm Contents of the maintenance 'tag in' register md Contents of the user's active register

Status Store Order Test - Routine EE93

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine tests to see if the subsystem is in a dual tape control unit configuration. If it is, the routine issues a Reset Dual Tape Control Unit Connection before starting the orders test. The orders test consists of the following

1. The routine issues status store orders that are valid for a single tape control unit and tests a correct response from status store.

2. The routine tests to see if this is a dual tape control unit configuration, and if it is, the routine issues status store orders that are valid for a dual tape control unit and checks the response from status store.

Note: Dual tape control unit order '4A' (Set Dual Controller Connect) is not issued by this routine.

Routine Start Address: 3010

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			
SS3021	A timeout occurred while trying to determine the type of subsystem being tested; single or dual tape control unit.	See the FSI section for error code 5360.	FRU121 FRU117	SS3021 SS TIMEOUT OCCURRED WHILE TRYING TO READ FEATURE INFORMATION
SS3022	A timeout occurred while trying to get status store to disconnect from the second tape control unit before running the status store orders test.	See the FSI section for error code 5360.	FRU121 FRU117	SS3022 SS TIMEOUT OCCURRED WHILE DISCONNECTING THE 2ND CONTROL UNIT
SS3023	A timeout occurred while trying to issue a status store order for a single tape control unit status store. No hardware errors were detected for this error.	See the FSI section for error code 5310.	FRU121 FRU117	SS3023 A TIMEOUT OCCURRED FOR STATUS STORE ORDER = xx xx Status store order that was issued
SS3024	A timeout occurred while trying to issue a status store order for a dual tape control unit status store. No hardware errors were detected for this error.	See the FSI section for error code 5310.	FRU121 FRU117	SS3024 A TIMEOUT OCCURRED FOR STATUS STORE ORDER = xx xx Status store order that was issued
SS3025	The channel request register bit 5 was not reset as expected when issuing the Reset Message Buffer order. No hardware errors were detected for this error.	See the FSI section for error code 5311.	FRU121 FRU117	SS3025 THE RECEIVED BIT(5) NOT RESET FOR ORDER RESET READ MSG BUFF
SS3026	The response returned from status store when issuing a Read Message Buffer order indicates that the Reset Message Buffer order was not successful. No hardware errors were detected for this error.	See the FSI section for error code 5341.	FRU121 FRU117	SS3026 RESPONSE TO ACCESS READ MSG BUFF SHOWS RESET READ NOT GOOD
SS3027	The response returned from status store when issuing the acknowledge message indicated that the tape control units are still connected. No hardware errors were detected for this error.	See the FSI section for error code 5342.	FRU121 FRU117	SS3027 THE ACKNOWLEDGE MSG. RESPONSE INDICATES CU'S ARE CONNECTED

FAILURE ID	DESCRIPTION	ADDITIGNAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see the EAD 1 for error code Fnnn.		
SS3028	The status store order completed successfully, but a hardware error was detected.	If ERA and ERB are not 0, record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn. See the FSI section for error code 5310.	FRU121 FRU117	SS3028 ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md cc Contents of the channel error register rr Contents of the processor status register pp Contents of the processor error register ra Contents of error register A rb Contents of error register B xx Contents of the external register address register mm Contents of the maintenance 'tag in' register md Contents of the user's active register
SS3029	A timeout occurred while trying to issue a status store order for a single tape control unit status store. A hardware error was detected and the contents of the registers checked are displayed on an additional error screen.	If ERA and ERB are not 0, record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn. See the FSI section for error code 5310.	FRU121 FRU117 FRU122 FRU118 FRU115 FRU114 FRU120 FRU119 FRU116 FRU134 FRU135 FRU157 FRU158 FRU159 FRU139	SS3029 A TIMEOUT OCCURRED FOR STATUS STORE ORDER = yy HARDWARE REGISTERS ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md yy Status store order issued cc Contents of the channel error register rr Contents of the processor status register pp Contents of the processor error register ra Contents of error register A rb Contents of error register B xx Contents of the external register address register mm Contents of the maintenance 'tag in' register md Contents of the user's active register
SS302A	A timeout occurred while trying to issue a status store order for a dual tape control unit status store. A hardware error was detected and the contents of the registers checked are displayed on an additional error screen.	If ERA and ERB are not 0, record the contents of ERA and ERB and see the FSI section for error code E100. If PSR bit 0 = 1, record the contents of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn. If CER bits 0, 1, 2, or 3 = 1, record the contents of CER. See the FSI section for error code 55nn. See the FSI section for error code 5310.	FRU121 FRU117	SS302A TIMEOUT OCCURRED FOR DUAL STATUS STORE ORDER = yy HARDWARE REGISTERS ERROR: CER=cc PSR=rr PER=pp ERA=ra ERB=rb XRA=xx MTI=mm MDI=md yy Status store order issued cc Contents of the channel error register rr Contents of the processor status register pp Contents of the processor error register ra Contents of error register A rb Contents of error register B xx Contents of the external register address register mm Contents of the maintenance 'tag in' register md Contents of the user's active register

Basic Tape Motion Test - Routine EEA2

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine contains two tests that exercise a single drive. The serial and parallel drive interconnections are used to verify correct operation of the Test I/O and Read Forward commands. There is no data transfer when the Read Forward command is tested.

Routine Start Address: 2010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Tests

Test 1

This test initializes the routine and checks for active level 3 through level 6 interrupts.

Test 2

This test checks to ensure that the correct drive address has been entered. Once the address has been verified as correct, a Sense command is issued to test correct execution of the command. Finally, Serial Test I/O and Serial Read commands are issued to test drive repositioning and drive interrupt operations.

Test Selection

The following screen displays after routine number EEA2 has been entered to invoke the tape motion diagnostic routine.

```
DIAG-(EEA2)-ENTER:
DRIVE       PATTERN
(xx)        tttt
```

xx Drive address
tttt Test data

To run the tests:

1. Insert a scratch tape that is not file protected.
2. Enter the drive address (valid parameters are 0-F, or 00-0F).
3. Enter the pattern. Valid parameters are 0200, or 0000. Entering 0200 causes tests 1 and 2 to loop until you press the PF key. Entering 0000 causes tests 1 and 2 to run one time.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Error Analysis

Analyze errors for routine EEA2 as follows:

1. From the first error information screen record the key number, the drive address, and the serial and parallel commands.
2. Read the error message on the first error information screen and perform any action indicated.
3. Take the actual drive status (tttt) and the expected drive status (ssss) and convert them to binary. Example:

```
8621 = 1000 0110 0010 0001
```

The bits are numbered 0-15, left to right. Compare the actual to expected drive status, and analyze bits that do not match.

Bit 0 This bit indicates that a serial command was issued since the last parallel command. This bit will only be on in the next status received by the tape control unit. If this is one of the error bits, see the FSI section for error code 9602.

Bit 1 This bit indicates that the drive is repositioning after a previous serial or parallel command. Repositioning can be indicated over either the serial or the parallel interconnections, and should always indicate the real-time operation of the drive, so both indicators should always indicate the same condition. If this is one of the error bits, see the FSI section for error code 8804.

Bit 2 This bit indicates the drive just changed from not ready to ready. This is usually a normal condition. If this is one of the error bits, see the FSI section for error code 33E8.

Bit 3 This bit indicates that the drive has moved a predetermined amount of tape and is notifying the tape control unit. This is usually a normal condition. This bit is not checked by routine EEA2.

Bit 4 This bit indicates that the drive just completed a disconnected command. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 5 This bit indicates that the drive just completed a connected command. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 6 This bit indicates the drive set drive unit check and sense data is present in the drive. Normally, the sense data is valid and is displayed in a later error information screen. Analyze this bit last.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 7 This bit indicates that the tape installed in the drive has been manually unloaded using the Rewind/Unload switch. If this is one of the error bits, see the FSI section for error code 8202.

Bit 8 This bit indicates that the drive address is one with an address in the range 8 – F. If this is one of the error bits, see the FSI section for error code 86C0.

Bit 9 This bit indicates that the drive has completed a tape volume mount and is ready. If the drive is not really ready, you must make it ready. If this is one of the error bits, see the FSI section for error code 33E8.

Bit 10 This bit indicates that the drive has received patches from the tape control unit. Normally during this diagnostic, this bit is not active; however, if the functional microcode has previously sent patches and the drive has not been powered off or a reset has not been issued, this bit may be on. This bit is not checked.

Bit 11 This bit indicates that the drive is positioned at the beginning of tape. See EAD 1, "Drive Interconnections" for failure isolation.

Bit 12 This bit indicates that the drive tape volume is file protected. If this is one of the error bits, see the FSI section for error code CK07.

Bit 13 This bit indicates that the drive is positioned at or following the logical end of tape. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 14 This bit indicates that the drive is positioned at the physical end of tape. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 15 Reserved

Error Analysis (Continued)

Analyze the errors for routine EEA2 as follows:

1. Record all information on the error screens.

2. If ERA and ERB are not 0, record the contents (if the screen is displayed) of ERA and ERB. See the FSI section for error code E100 and the following FRU list:

   FRU Name

   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   118 Drive-adapter card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card
   134 Control store card
   135 Control storage array card

3. If PSR bit 0 = 1, record the contents (if the screen is displayed) of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn and the following FRU list:

   FRU Name

   118 Drive-adapter card
   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card

4. If BCSE channel error groups 0-3 indicate any errors, record the contents of BCSE. See the FSI section for error code D5nn and the following FRU list:

   FRU Name

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   133 Channel adapter card (A)
   152 Channel adapter card (B)
   119 Read clock and format card
   118 Drive-adapter card
   116 Write data card
   126 Power/POR card
   134 Control store card
   121 Status store basic card
   122 Status store communication card

5. If BDSE channel error groups 0-3 indicate any errors, record the contents of BDSE. See the FSI section for error code D6nn and the following FRU list:

   FRU Name

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   111 Read ECC/CORR card
   119 Read clock and format card
   118 Drive-adapter card
   116 Write data card
   134 Control store card
   117 Microprocessor card

6. If DSE bits 0, 1, or 2 = 1, record the contents of DCB, DCR, DSE, DIR, and DTR. See the FSI section for error code D4nn and the following FRU list:

   FRU Name

   118 Drive-adapter card
   116 Write data card
   134 Control store card
   085 Drive control card

7. If any RER bits = 1, or if RSR bits 5, 6, 7 = 1, record the contents of RCR, RRC, RER, RSR, and RDC. See the FSI section for error code D8nn and the following FRU list:

   FRU Name

   064 Write power card
   052 Read preamplifier card
   085 Drive control card
   278 Read detect card
   123 Read skew buffer card 1
   124 Read skew buffer card 2
   125 Read skew buffer card 3
   119 Read clock and format card
   111 Read ECC/CORR card

8. If WSE bits 4, 5, or 6 = 1, record the contents of WCR and WSE. See the FSI section for error code D7nn and the following FRU list:

   FRU Name

   116 Write data card
   120 Buffer adapter card
   114 Buffer control card
   117 Microprocessor card
   118 Drive-adapter card
   139 Logic board A1

9. Record the contents of drive sense. See the last display screen under Error Displays for this routine for an explanation of the drive sense bytes.

ERROR DISPLAYS FOR ROUTINE EEA2

```
nnnnnn
KEY = xxxx,DR = xx
CMD=SER-x,PARALL- yy
***Error messages***
```

* Data is not Valid
nnnnnn Failure ID
xxxx Sequence code for the error.
Sequence codes are:
0000 Initialization and active interrupt test.
0002 Issue an initial sense to ensure that drive is in a known state.
0003 Verify that there are no pending drive alerts for the drive being tested.
0005 The drive is at end of tape (EOT). A rewind is issued to the drive.
0006 Issue a serial read forward command.
0008 During Key 0006 the drive is not repositioning, which indicates that the drive is accelerating towards 95 percent velocity in preparation for setting 'gap in'. Repeatedly issue a serial Test I/O command until the drive sets repositioning. Repositioning occurs when the drive reaches the 'gap in' point.
0009 During Key 0006 the drive is not repositioning. Key 0008 is completed with repositioning set. Verify that the drive does not set an alert.
0010 During Key 0006 the drive is not repositioning. Key 0008 is completed with repositioning set. Key 0009 is completed successfully. The drive should set an alert, which indicates that it is back in read forward stoplock.
0011 During Key 0006 the drive is not repositioning, which indicates that the drive is not at read forward stoplock but is moving towards read forward stoplock. The drive should set an alert when it reaches read forward stoplock.
0012 During Key 0006 the drive is not repositioning. Key 0011 either received an alert or timed out. Invoke a serial Test I/O command and check for errors.
0013 During Key 0006 the drive is not repositioning. Key 0011 either received an alert or timed out. Key 12 did not find any errors. Issue a serial Read Forward command, and if repositioning is not on, go to Key 0006.
0014 Key 10 has completed successfully. Perform parallel test I/O and check the drive status.
xx Drive address
x Last serial command issued
yy Last parallel command issued

ERROR MESSAGES:
MAKE THE DRIVE READY = Load the drive with a write enabled tape.
DR STS FILE PROT = The drive should be set to write enable (not file protect).

```
DRSTS=tttt,EXP=ssss
ERA=ra, ERB=rb
PSR=rr,PER=pp,XRA=aa
MTI=mm,MDI=md,
```

* No error is stored
tttt Actual drive status
ssss Expected drive status
ra Contents of error register A
rb Contents of error register B
rr Contents of the processor status register
pp Contents of the processor error register
aa Contents of the external register address register
mm Contents of the maintenance tag in register
md Contents of the user's active register

```
BCSE= abcde
BDSE= fghij,DCB= cb
DCR = dc,  DSE = ds
DIR = di   DTR = dt
```

* No error is set
a Buffer channel status and error register bits 0-3
b BCSE channel error group 0
c BCSE channel error group 1
d BCSE channel error group 2
e BCSE channel error group 3
f Buffer device status and error register bits 0-3
g BDSE device error group 0
h BDSE device error group 1
i BDSE device error group 2
j BDSE device error group 3
cb Contents of the device control bus register
dc Contents of the device control register
ds Contents of the device status/error register
di Contents of the device interrupt register
dt Contents of the device tag register

```
RCR = rc,  RRC = cr
RER = re,  RSR = rs
RDC = rd,
WCR = wc,  WSE = ws
```

* No error is set
rc Contents of the read control register
cr Contents of the read residual count register
re Contents of the read error register
rs Contents of the read status register
rd Contents of the read diagnostic control register
wc Contents of the write control register
ws Contents of the write status/error register

```
DRSNS-  S8=b0,S19=b1
S18= b2, S2021= b4b5
         S2223= b6b7
S30= 21,    EC= 2223
```

The following sense data is described in the SENSE section (see formats 19 and 20).

b0 Contents of the drive error recovery byte (see sense byte 8).
b1 The contents of the drive features byte (see sense byte 19).
b2 Flags modifier to b4b5 (see sense byte 18).
b4b5 The first error the drive detected. B4 contains the drive command associated with this error, an EE to indicate a bus out parity error while loading a command, or an FF to indicate that the error occurred when the drive was not performing a command. B5 contains the drive error code identifying this error (see sense bytes 20 and 21).
b6b7 The last error the drive detected. B6 contains the drive command associated with this error, an EE to indicate a bus out parity error while loading a command, or an FF to indicate that the error occurred when the drive was not performing a command. B7 contains the drive error code identifying this error (see sense bytes 22 and 23).
21 Logical drive address and physical drive address (contents of the thumbwheel switches). See sense byte 30.
2223 The drive EC level (contains the last four digits of the drive ROS module EC level).

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 502.
TM2021	LVL 3 INTRPT ACTIVE Level 3 interrupt is active following a reset.	See "Error Analysis" on DIAG 500. See the FSI section for error code 1103.	FRU119 FRU117	
TM2022	LVL 4 INTRPT ACTIVE Level 4 interrupt is active following a reset.	See "Error Analysis" on DIAG 500. See the FSI section for error code 1104.	FRU120 FRU117	
TM2023	LVL 5 INTRPT ACTIVE Level 5 interrupt is active following a reset.	See "Error Analysis" on DIAG 500. See the FSI section for error code 1105.	FRU120 FRU117	
TM2024	During execution of a drive diagnose command, an error occurred.	See "Error Analysis" on DIAG 500.		
TM2025	DR ADDR NOT VALID The drive address is not valid. Valid addresses are 0 through F. Re-enter the drive address from the test selection option screen.	See "Test Selection" on DIAG 500. See EAD 1, "Drive Interconnections."		
TM2026	SNS CMD TIMED OUT Sense time out. A Sense command issued to the drive did not complete.	See "Error Analysis" on DIAG 500. See EAD 1, "Drive Interconnections."		
TM2027	TIO CMD TIMED OUT Test I/O time out. A Test I/O command issued to the drive did not complete.	See "Error Analysis" on DIAG 500. See EAD 1, "Drive Interconnections."		
TM2028	SERIAL TIME OUT 8803 Serial time out. A serial command has been issued but the tape control unit did not complete the operation.	See "Error Analysis" on DIAG 500. See the FSI section for error code 8803. See EAD 1, "Drive Interconnections."	FRU085 FRU118	
TM2029	DR REPO ERROR 8804 While preparing to issue a serial command, repositioning response was active. The error could be caused by the drive being tested, another drive, or an invalid response from the tape control unit.	See "Error Analysis" on DIAG 500. See the FSI section for error code 8804. See EAD 1, "Drive Interconnections."	FRU085 FRU118	
TM202A	DR ALERT ON Drive alert error. A Sense command has just completed successfully, which should have reset any alert present. However, a drive alert was detected.	See "Error Analysis" on DIAG 500. 1. Perform a Rewind/Unload operation on the drive. 2. Press POR on the drive. 3. Rerun routine EEA2. See EAD 1, "Drive Interconnections."	FRU085	
TM202B	REW TO - NO ALERT Rewind timed out. Ending alert was not received from the drive.	See "Error Analysis" on DIAG 500. See EAD 1, "Drive Interconnections."	FRU085	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAK'NG ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSP bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 502.
TM202C	REW ALERT TOO SOON The following sequence occurred: 1. A serial Read Forward command was issued with the drive at read forward stoplock. 2. Repositioning was checked to ensure it was set, which indicates that the drive was going back to read stoplock. 3. A drive alert was detected too soon.	See "Error Analysis" on DIAG 500. See EAD 1, "Drive Interconnections."	FRU085	
TM202D	INVALID PATTERN RECD An invalid pattern was entered. Valid patterns are 0200 and 0000.	See "Test Selection" on DIAG 500, and enter 0000 to run the test once or 0200 to loop the test continuously.		
TM202E	REW SELECT TIMED OUT Rewind command time out. A Rewind command issued to the drive did not complete.	See "Error Analysis" on DIAG 500. See the FSI section for error codes 89nn and 8Fnn.	FRU085 FRU199 FRU248 FRU118 FRU116 FRU134	
TM202F	RDF DR S/B STOPPED Serial Read Forward command is issued. The drive should be at read stoplock and repositioning should be off. Repositioning is still on.	See "Error Analysis" on DIAG 500.	FRU085	
TM2030	SER RD, NO SEL, NOREPO The following sequence occurred: 1. A serial Read Forward command was issued with the drive at read forward stoplock. 2. Repositioning was not set after sufficient time for the drive to have reached 95 percent velocity.	See "Error Analysis" on DIAG 500.	FRU085	
TM2031	REW CMD NOT ACCEPTED The internal status for a Rewind command was not correct, which indicates that the drive did not accept the command.	See "Error Analysis" on DIAG 500.		
TM2032	An external register error occurred during the operation.	See "Error Analysis" on DIAG 500. See steps 1 and 2 at the top of this chart.		
TM2033	A tape control unit Check 1 error occurred.	See "Error Analysis" on DIAG 500. See steps 1 and 2 at the top of this chart.		
TM2034	Either the BCSE or BDSE register contains an error. Buffer status is not checked for incorrect bits.	See "Error Analysis" on DIAG 500.		
TM2035	Errors are set in the write, read, or drive error registers.	See "Error Analysis" on DIAG 500.		
TM2036	The BCSE or BDSE registers did not contain the correct status.	See "Error Analysis" on DIAG 500.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAY
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 502.
TM2037	The WSE register did not contain the correct status.	See "Error Analysis" on DIAG 500. See the FSI section for error code D7nn.	FRU116 FRU118 FRU120 FRU114 FRU139	
TM2038	A drive Check 1 error occurred during the last I/O operation.	See "Error Analysis" on DIAG 500. See the DCB for nn bits and see the FSI section for error code 8Fnn.	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	
TM2039	The drive status is incorrect excluding drive unit check.	See "Error Analysis" on DIAG 500.		
TM203A	The drive sense contains an error that is unrecoverable.	See "Error Analysis" on DIAG 500.		
TM203B	NO ALERT READ A Serial Read command was issued to the drive and no alert occurred after repositionin	See "Error Analysis" on DIAG 500. See EAD 1, "Drive Interconnections."	FRU085	
TM203C	DIAGNOSE CMD TIMED OUT A diagnose command issued to the drive did not complete.	See "Error Analysis" on DIAG 500. See EAD 1, "Drive Interconnections."		
TM203D	After an error, as part of error recovery, the tape control unit issued a 'Serial Reset A' command followed by a 'Set Diagnose', which causes a midtape load. During this recovery routine, an error occurred.	See "Error Analysis" on DIAG 500.		
TM203E	After an error, as part of error recovery, the tape control unit issued a 'Serial Reset A' command followed by a 'Set Diagnose', which causes a midtape load. When the routine had not completed after three minutes, a timeout occurred.	See "Error Analysis" on DIAG 500.		
TM203F	The DLR external register and drive sense do not agree.	See CARR-TCU 1189 for correct DLR external register switch setting.	FRU118	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs	ERROR DISPLAYS
TM2040 TM2041	A timeout error occurred during a TIO command to the drive. A drive status error occurred while sending code to the drive.	1. This program has minimum diagnostic capability during the drive patching procedure. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit on-line. Press unload switch of the drive to be tested, reload diagnostic EE54 and run it. 4. If this error persists, run EE40.		See the "Error Displays" on DIAG 502.
TM2042 TM2043 TM2044	The correct level of code patches is not found on the functional diskette. The correct level of code patches is not found on the functional diskette. Unable to read the functional diskette due to an error.	1. Make sure the diskette in the diskette reader is the correct level. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit on-line. Press unload switch of the drive to be tested, reload diagnostic EE54 and run it. Ensure that the tape control unit successfully loads code from the diskette. 4. If this error persists, run EE40.		

Write/Read Exerciser - Routine EEA3

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine verifies that the write, read backward, and read operations of the drive operate correctly. Routine EEA3 tests are performed at the beginning-of-tape (BOT).

This test checks the drive's data flow and buffer with the following sequence of operations:

1. Checks for interrupts that are on all of the time.
2. Ensures that a single drive address is entered.
3. Sends a sense command to reset any unit checks or sense data.
4. Sends a rewind command to start the test at BOT.
5. Writes and reads 16 blocks of varying length data.

Routine Start Address: 3010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Test Selection

The following screen displays after routine number EEA3 has been entered to start the tape motion diagnostic routine.

```
DIAG=(EEA3)-ENTER:
DRIVE
(xx)
```

Valid parameters:

xx Drive address (0-F, or 00-0F).

To run the tests:

1. Insert a write enabled scratch cartridge in the drive and make it ready.
2. Enter the drive address.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette, you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

The format of the display's first line is the same for all detected errors. The remaining three lines contain additional information about the failure.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

Note: If the diagnostic is not permitted to complete normally, (for example, if the program function or enter key is used to stop the diagnostic) you must wait until the drive motion has stopped before restarting the diagnostic or an error will occur.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Error Analysis

Analyze the errors for routine EEA3 as follows.

1. From the first error information screen record the key number, the drive address, and the drive status.
2. Read the error message on the first error information screen and perform any action indicated.
3. Take the actual drive status (tttt) and the expected drive status (ssss) and convert them to binary. Example:

```
8621 = 1000 0110 0010 0001
```

The bits are numbered 0-15, left to right. Compare the actual to expected drive status, and analyze bits that do not match.

Bit 0 This bit indicates that a Serial command was issued since the last parallel command. This bit will only be on in the next status received by the tape control unit. If this is one of the error bits, see FSI section for error code 9602.

Bit 1 This bit indicates that the drive is repositioning after a previous Serial or Parallel command. Repositioning can be indicated over either the serial or the parallel interconnections and should always indicate the real-time operation of the drive, so both indicators should always indicate the same condition. If this is one of the error bits, see FSI section for error code 8804.

Bit 2 This bit indicates the drive just changed from Not Ready to Ready. This is usually a normal condition. If this is one of the error bits, see FSI section for error code 33E8.

Bit 3 This bit indicates that the drive has moved a predetermined amount of tape and is notifying the tape control unit. This is usually a normal condition. This bit is not checked by routine EEA3.

Bit 4 This bit indicates that the drive just completed a Disconnected command. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 5 This bit indicates that the drive just completed a Connected command. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 6 This bit indicates the drive set drive unit check and sense data is present in the drive. Normally, the sense data is valid and is displayed in a later error information screen. Analyze this bit last.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 7 This bit indicates that the tape loaded in the drive has been manually unloaded using the Rewind/Unload switch. If this is one of the error bits, see FSI section for error code 8202.

Bit 8 This bit indicates that the drive address is one with an address in the range of 8 – F. If this is one of the error bits, see FSI section for error code 86C0.

Bit 9 This bit indicates that the drive has completed a tape volume mount and is ready. If this is one of the error bits, see FSI section for error code 33E8.

Bit 10 This bit indicates that the drive has received patches from the tape control unit. Normally during this diagnostic, this bit is not active; however, if the functional microcode has previously sent patches and the drive has not been powered off or reset has not been issued, this bit may be on. This bit is not checked.

Bit 11 This bit indicates the drive is positioned at the beginning of tape. See EAD 1, "Drive Interconnections" for failure isolation.

Bit 12 This bit indicates that the drive tape volume is file protected. If this is one of the error bits, see FSI section for error code CK07.

Bit 13 This bit indicates that the drive is positioned at or following the logical end of tape. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 14 This bit indicates that the drive is positioned at the physical end of tape. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 15 Reserved

Error Analysis (Continued)

Analyze the errors for routine EEA3 as follows:

1. Record all information on the error screens.

2. If ERA and ERB are not 0, record the contents (if the screen is displayed) of ERA and ERB. See the FSI section for error code E100 and the following FRU list:

   FRU Name

   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   118 Drive adapter card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card
   134 Control store card
   135 Control storage array card

3. If PSR bit 0 = 1 , record the contents (if the screen is displayed) of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn and the following FRU list:

   FRU Name

   118 Drive adapter card
   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card

4. If BCSE channel error groups 0-3 indicate any errors, record the contents of BCSE. See the FSI section for error code D5nn and the following FRU list:

   FRU Name

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   133 STI-FIPS Adapter card (channel A)
   152 STI-FIPS Adapter card (channel B)
   119 Read clock and format card
   118 Drive adapter card
   116 Write data card
   126 Power/POR card
   134 Control store card
   121 Status store basic card
   122 Status store communication card

5. If BDSE channel error groups 0-3 indicate any errors, record the contents of BDSE. See the FSI section for error code D6nn and the following FRU list:

   FRU Name

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   111 Read ECC/CORR card
   119 Read clock and format card
   118 Drive adapter card
   116 Write data card
   134 Control store card
   117 Microprocessor card

6. If DSE bits 0, 1, or 2 = 1, record the contents of DCB, DCR, DSE, DIR, and DTR. See the FSI section for error code D4nn and the following FRU list:

   FRU Name

   118 Drive adapter card
   116 Write data card
   134 Control store card
   085 Drive control card

7. If any RER bits = 1, or if RSR bits 5, 6, 7 = 1, record the contents of RCR, RRC, RER, RSR, and RDC. See the FSI section for error code D8nn and the following FRU list:

   FRU Name

   064 Write power card
   062 Read preamplifier card
   085 Drive control card
   278 Read detect card
   123 Read skew buffer card 1
   124 Read skew buffer card 2
   125 Read skew buffer card 3
   119 Read clock and format card
   111 Read ECC/CORR card

8. If WSE bits 4, 5, or 6 = 1, record the contents of WCR and WSE. See the FSI section for error code D7nn and the following FRU list:

   FRU Name

   116 Write data card
   120 Buffer adapter card
   114 Buffer control card
   117 Microprocessor card
   118 Drive adapter card
   139 Logic board A1

9. Record the contents of drive sense. See the last display screen under Error Displays for this routine for an explanation of the drive sense bytes.

Error Counts

The "BLKS CORR EEA3 EEA4" screen contains a count of the number of blocks written or read forward (fwd) or backward (bkd) upon which ECC correction was performed. It is normal for some error counts to occur. You must use the following information, and any past experience with this machine type, to determine if the error count is normal, or if a problem exists.

Total blocks written are hex '20B'
Total blocks read fwd are hex '200'
Total blocks read bkd are hex '200'

"Correctable errors" are errors that are corrected while processing data between the control unit and the drive. No error recovery actions are required. These errors are sometimes called ECC errors.

A correctable "write" error would be a single track in either or both of the two groups (fwd and bkd). The error is detected in the control unit detection logic as the data from the read head is processed during the writing process. The data itself is not actually corrected because it is not used except for the read-back check.

A correctable "read" error would be a single or double track error in either or both of the two groups (fwd and bkd). The data is corrected as it is processed through the detection and deskewing logic. CRC checking is performed on the corrected data.

Because this diagnostic does not retry errors, it is possible for a worn or bad place on the media to cause write or readback check errors. If this is the cause of an error, do one or more of the following:

- Use another drive (same cartridge)
- Use another cartridge (same drive)
- Run diagnostic routine EEA4 to see if the error occurs at the opposite end of the tape.
- If available, use another tape control unit.

ERROR DISPLAYS FOR ROUTINE EEA3

```
nnnnnn
KEY = kk   DR = xx
DRSTS=tttt,EXP=ssss
***Error messages***
```

* Data is not valid
nnnnnn Failure ID
kk Key that error occurred in.

Key codes are:

00 Set up write buffer
01 Ensure that a single drive address is entered
02 The microcode performs the following:
1. Generates a sense command to the drive to clear any units checks or sense data.
2. Generates a sense command to the drive to check for any errors.
3. Generates a parallel test I/O command.
03 Send command to drive to set display language.
04 Sends a rewind command to the drive to start the test at beginning-of-tape (BOT).
05 The microcode sets up the control tables.
06 Executes the following block sequence queues (BSQ):

BSQ Number	Description
01	Write a density and a tapemark
02	Write an erase gap
03	Write a tapemark
04	Write an erase gap
05	Write a density mark and a one-byte block
07	In a one drive selection, write an erase gap, tapemark, one-byte block, a 53-byte block, tapemark and a 140-byte block.
08-1C	Write 16 blocks, varying in length from one-byte to 65536 bytes, then stop and repeat writing the same 16 blocks fifteen more times for a total of 256 blocks. All data blocks are written with ripple data, hex 00-FF. The blocks sizes are:

Block ID	Byte Size	Block ID	Byte Size
0000 0001	1	0000 000A	4906
0000 0002	53	0000 0008	32768
0000 0003	54	0000 000C	5607
0000 0004	140	0000 000C	7009
0000 0005	2102	0000 000E	7710
0000 0006	16384	0000 000F	9813
0000 0007	2803	0000 0010	65536
0000 0008	3504	0000 EEEE	Tapemark
0000 0009	4205	0000 AAAA	Erasegap

During the write operation, the drive buffer, and the write and read data flow are checked to ensure that no errors are detected.

20-4F Write one block, then read backward for two blocks and then read forward two blocks, and repeat for 255 times, using the same block size sequence shown above.

11 Sends rewind command to drive.
tttt Actual drive status.
ssss Expected drive status.

ERROR MESSAGES:
MAKE THE DRIVE READY = Load the drive with a write enabled tape.
DR STS FILE PROT = The drive should be set to write enable.

```
ERA=ra     ERB=rb
PSR=xx,    PER=pp
MTI=mm     MDI=md
XRA=aa
```

This screen is displayed only if a check 1 or an XR error occurs.

* No errors are set
aa Contents of the external register
md Contents of the maintenance data in register
mm Contents of the maintenance tag in register
pp Contents of the processor error register
ra Contents of error register A
rb Contents of error register B
xx Contents of the processor status register

```
SCMD=xxx   PCMD=yyy
 BSQ=qq    DTR=dr
WRITE ID=wwwwwwww
R/RBC ID=rrrrrrrr
```

* Data is not valid
dr Contents of the device tag register
qq For BSQ number, see the Key Code 06 (BSQ descriptions) under the first error display on this page.
rrrrrrrr Block ID of the block currently being read or read back checked.
wwwwwwww Block ID of the block currently being written.
xxx Last serial command
yyy Last parallel command sent

```
BLKS CORR EEA3 EEA4
WRITE  =  bb   ee
READ FWD=  cc   ff
READ BKD=  dd   gg
```

* Data is not valid
bb Write ECC errors counted during the EEA3 test
cc Read forward ECC errors counted during the EEA3 test
dd Read backward ECC errors counted during the EEA3 test
ee Write ECC errors counted during the EEA4 test
ff Read forward ECC errors counted during the EEA4 test
gg Read backward ECC errors counted during the EEA4 test

```
BCSE= abcde  DSE= ds
BDSE= fghij  RCR= rc
WCR = wc     RSR= rs
WSE = ws     RER= re
```

* No errors are set
a Buffer channel status and error register bits 0-3
b BCSE channel error group 0
c BCSE channel error group 1
d BCSE channel error group 2
e BCSE channel error group 3
f Buffer device status and error register bits 0-3
g BDSE device error group 0
h BDSE device error group 1
i BDSE device error group 2
j BDSE device error group 3
ds Contents of the device status error register
rc Contents of the read control register
re Contents of the read error register
rs Contents of the read status register
wc Contents of the write control register
ws Contents of the write status error register

```
DRSNS-  S8=b0,S19=b1
S18= b2, S2021= b4b5
         S2223= b6b7
S30= 21,    EC= 2223
```

The following sense data is described in the SENSE section (see formats 19 and 20).

b0 Contents of the drive error recovery byte (see sense byte 8).
b1 The contents of the drive features byte (see sense byte 19).
b2 Flags modifier to b4b5 (see sense byte 18).
b4b5 The first error the drive detected. B4 contains the drive command associated with this error; an EE indicates a bus out parity error occurred while loading a command, or an FF indicates that the error occurred when the drive was not performing a command. B5 contains the drive error code identifying this error (see sense bytes 20 and 21).
b6b7 The last error the drive detected. B6 contains the drive command associated with this error; an EE indicates a bus out parity error occurred while loading a command, or an FF indicates that the error occurred when the drive was not performing a command. B7 contains the drive error code identifying this error (see sense bytes 22 and 23).
21 Logical drive address and physical drive address (contents of the thumbwheel switches). See sense byte 30.
2223 The drive EC level (contains the last four digits of the drive ROS module EC level).

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM3021	LVL 0 INTRPT ACTIVE Level 0 interrupt was active following a reset.	See "Error Analysis" on DIAG 510. See the FSI section for error code 1100.	FRU119 FRU117	
TM3022	LVL 3 INTRPT ACTIVE Level 3 interrupt was active following a reset.	See "Error Analysis" on DIAG 510. See the FSI section for error code 1103.	FRU120 FRU117	
TM3023	LVL 4 INTRPT ACTIVE Level 4 interrupt was active following a reset.	See "Error Analysis" on DIAG 510. See the FSI section for error code 1104.	FRU120 FRU117	
TM3024	LVL 5 INTRPT ACTIVE Level 5 interrupt was active following a reset.	See "Error Analysis" on DIAG 510. See the FSI section for error code 1105.	FRU120 FRU117	
TM3025	DR ADDR NOT VALID The drive address is not valid. Valid addresses are 0 through F.	Enter the drive address from the test selection option screen, again. See "Test Selection" on DIAG 510.		
TM3026	UNIT CK ON SNS CMD Unit Check (UC) was on in the initial status from the Sense command. A UC is acceptable only in the first Sense command, but was still on in the second Sense command.	See "Error Analysis" on DIAG 510.	FRU120 FRU117	
TM3027	SNS CMD TIMED OUT A Sense command timed out. A Sense command issued to the drive did not complete.	See "Error Analysis" on DIAG 510.		
TM3028	TIO CMD TIMED OU A Test I/O command timed out. A Test I/O command issued to the drive did not complete, and timed out after approximately 33 milliseconds on the device data bus.	See "Error Analysis" on DIAG 510.		
TM3029	SERIAL TIME OUT 8803 A Serial command timed out. A serial command has been issued but the tape control unit did not complete the operation on the device data bus.	See "Error Analysis" on DIAG 510. See the FSI section for error code 8803.	FRU085 FRU118	
TM302A	DR REPO ERROR 8804 While preparing to issue a serial command, repositioning response was active. This error could be caused by the drive being tested, by another drive, or by an invalid response from the tape control unit on the device data bus.	See "Error Analysis" on DIAG 510. See the FSI section for error code 8804.	FRU085 FRU118	
TM302B	REW TO - NO ALERT A Rewind command timed out. Ending alert was not received from the drive.	See "Error Analysis" on DIAG 510.	FRU085	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM302C	REW SELECT TIMED OUT A Rewind command timed out. A Rewind command issued to the drive did not complete.	See "Error Analysis" on DIAG 510. See the FSI section for error codes 89nn and 8Fnn.	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	
TM302D	REW CMD NOT ACCEPTED The initial status for a Rewind command issued to the drive was not correct, which indicates that the drive did not accept the command.	See "Error Analysis" on DIAG 510.		
TM302E	An external register error occurred during the operation.	See "Error Analysis" on DIAG 510. See steps 1 and 2 at the top of this chart.		
TM302F	A control unit check 1 error occurred.	See "Error Analysis" on DIAG 510. See steps 1 and 2 at the top of this chart.		
TM3030	Either the BCSE or BDSE register contains an error. Buffer status is not checked for incorrect bits.	See "Error Analysis" on DIAG 510.		
TM3031	Errors are set in the write, read, or drive error registers.	See "Error Analysis" on DIAG 510.		
TM3032	The BCSE or BDSE registers did not contain the correct status.	See "Error Analysis" on DIAG 510.		
TM3033	The WSE register did not contain the correct status.	See "Error Analysis" on DIAG 510. See the FSI section for error code D7nn.	FRU116 FRU118 FRU120 FRU114 FRU139	
TM3034	A drive Check 1 error occurred during the last I/O operation.	See "Error Analysis" on DIAG 510. See the DCB for nn bits and see the FSI section for error code BFnn.	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	
TM3035	The drive status is incorrect.	See "Error Analysis" on DIAG 510.		
TM3036	The drive sense contains an error that is unrecoverable.	See "Error Analysis" on DIAG 510.		
TM3037	NO ALERT A serial command was issued to the drive, and no alert occurred after repositioning.	See "Error Analysis" on DIAG 510.	FRU085	
TM3038	This is a microcode program error.	Call your next level of support.		
TM3039	This is a microcode program error.	Call your next level of support.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code fnnn.			See the "Error Displays" on DIAG 512.
TM303A	This is a microcode program error.	Call your next level of support.		
TM303B	This is a microcode program error.	Call your next level of support.		
TM303C	An error occurred while writing the buffer to initialized the channel buffer storage.	See "Error Analysis" on DIAG 510. See the FSI section for error code A141.	FRU120 FRU114	
TM303D	A buffer error occurred while writing the write operation data into the buffer. The BCSE register value should be X'20'.	See "Error Analysis" on DIAG 510.		
TM303E	A buffer error was detected while writing this record.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70E4.	FRU114 FRU120 FRU113 FRU111 FRU116	
TM303F	'Device xfer complete' (BDSE register) did not set.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70E6.	FRU085 FRU062 FRU064 FRU116 FRU118 FRU114 FRU120	
TM3040	A write data flow error was detected while writing this record. Error bits were on in the WSE register, or 'end write' did not set in the maximum allowable time.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70E5.		
TM3041	A write sequence error occurred. This is a microcode program error.	Call your next level of support.		
TM3042	A write sequence error occurred. This is a microcode program error.	Call your next level of support.		
TM3043	A time out occurred waiting for the 'status in' response to 'gap out' on the device data bus.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70E3.	FRU085 FRU118	
TM3044	A drive check 1 occurred.	See "Error Analysis" on DIAG 510. See the FSI section for error code 89nn.	FRU085 FRU199 FRU248 FRU118 FRU116 FRU134	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM3045	A time out occurred waiting for the device data bus 'status in' line to come active.	See "Error Analysis" on DIAG 510. See the FSI section for error code 8C03.	FRU085 FRU118 FRU116 FRU134	
TM3046	The hardware detected a device adapter error.	See "Error Analysis" on DIAG 510. See the FSI section for error code 88nn.	FRU085 FRU118 FRU116 FRU134	
TM3047	Drive sense data contains an error, and while ending the tag sequence to the drive, device data bus 'status in' did not drop.	See "Error Analysis" on DIAG 510. See the FSI section for error code 8C07.	FRU085 FRU118 FRU116 FRU134	
TM3048	A pattern sequence table error occurred during the read back check. The read data flow detected an IBG that was not expected.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7861.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3049	This is a microcode program error.	Call your next level of support.		
TM304A	IBG was not detected after 'gap in' on the device data bus.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7093.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 512.
TM304B	A device buffer overrun occurred once while writing the same record.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7181.	FRU114 FRU120 FRU117	
TM304C	256 ERGs were read without detecting a Block or TM.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7702.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM304D	A read error occurred on the last record.	See "Error Analysis" on DIAG 510. See the FSI section for error code 76nn.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU120 FRU114 FRU111	
TM304E	A timeout occurred waiting for the device data bus 'status in' response to device data bus 'gap out'.	See "Error Analysis" on DIAG 510.	FRU085 FRU118	
TM304F	During a read back check, a level 3 interrupt occurred that was caused by 'end sync'.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7503.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM3050	A read back check error occurred on the last record.	See "Error Analysis" on DIAG 510. See the FSI section for error code 74nn.	FRU064 FRU062 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111 FRU114 FRU120 FRU264 FRU265	
TM3051	The value of bits 0 and 1 of the RRC register do not match the value of bits 6 and 7 (word 1) of the LDT table.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7501.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU050 FRU013	
TM3052	A timeout occurred while waiting for device data bus 'status in' in response to device data bus 'gap out'.	See "Error Analysis" on DIAG 510. See the FSI section, error code 7502.	FRU085 FRU118	
TM3053	Device data bus 'gap out' did not occur for the last block of data read.	See "Error Analysis" on DIAG 510. See the FSI section, error code 7502.	FRU085 FRU118	
TM3054	After a Read ID operation, an error was indicated in the BDSE register.	See "Error Analysis" on DIAG 510. See the FSI section, error code 70C1.	FRU114 FRU120 FRU113 FRU111 FRU116	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM3055	A block ID format error occurred. Bits 0 and 8-11 of the four-byte block ID are always zero. The block just read from the tape contains a block ID with at least one of these bits on.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70C4.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3056	A block ID error occurred on a Read Forward operation. The block just read from the tape does not have the expected block ID sequence number.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70C2.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3057	A block ID error occurred on a Read Backward operation. The block just read from the tape does not have the expected block ID sequence number.	See "Error Analysis" on DIAG 510. See the FSI section for error code 70C3.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3058	The expected buffer CRC data did not compare to the actual data read from the buffer. This could be the wrong block read. No hardware errors were detected.	See "Error Analysis" on DIAG 510.		
TM3059	The expected buffer CRC data did not compare to the actual data read from the buffer. This could be the wrong block read. No hardware errors were detected.	See "Error Analysis" on DIAG 510.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 512.
TM305A	A level 0 interrupt occurred that was caused by an external register error.	See "Error Analysis" on DIAG 510. See steps 1 and 2 at the top of this chart. See the FSI section for error code 7061.		
TM305B	A level 0 interrupt occurred that was not caused by an external register error or 'collision detect'.	See "Error Analysis" on DIAG 510. See the FSI section for error code 1100.	FRU119 FRU117	
TM305C	A level 0 interrupt occurred that was caused by 'collision detect'.	See "Error Analysis" on DIAG 510. FRUs are to be changed in both control units. See the FSI section for error code 1100.	FRU117 FRU121 FRU122 FRU134	
TM305D	A time out occurred waiting for 'beg sync' during a read back check operation.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7071.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM305E	A write data flow error was detected while writing this record. FRU bits were on in WSE register, or 'end write' did not set in the maximum allowable time (50 microseconds).	See "Error Analysis" on DIAG 510. See the FSI section for error code 7076.	FRU085 FRU062 FRU964 FRU116 FRU118 FRU114 FRU128	
TM305F	The BDSE register detected an buffer error while writing this record.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7077.	FRU114 FRU128 FRU113 FRU111 FRU116	
TM3060	'Device xfer complete' (BDSE register) was not on, at the end of a Buffer to WDF Transfer operation.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7078.	FRU128 FRU114	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 8 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM3061	A pattern sequence table error occurred during a read back check operation.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7074.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3062	'Gap in' and 'generate gap out' (RSR register) were on, causing a level 3 interrupt to occur.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7081.	FRU118 FRU119 FRU176 FRU116	
TM3063	A device buffer overrun condition occurred once while writing the same record.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7081.	FRU114 FRU120 FRU117	
TM3064	A device buffer overrun condition occurred while reading a record operation.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7173.	FRU114 FRU120	
TM3065	'Density separator' was not detected before 45 sets of samples were taken.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7161.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3066	A pattern sequence table error occurred during a read back check operation. The read data flow detected a tapemark (TM) that was not expected.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7041.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 80, see the FSI section for error code E180. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM3067	A tapemark (TM) was read during read back check that did not meet the minimum length specifications.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7042.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3068	The write control register (WCR) did not set at the correct time.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7192.	FRU064 FRU116 FRU063 FRU118	
TM3069	This is a microcode program error.	Call your next level of support.		
TM306A	The read back check started incorrectly. It came up when reading the IBG, and did not find the block before the first IBG.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7051. See the FSI section for error code D0nn. See the FSI section for error code D8nn.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM306B	The read back check started incorrectly and timed out waiting for the IBG preceding the first block written.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7052.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 512.
TM306C	The IBG read during the read back check was too short.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7151.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM306D	The IBG read during the read back check was too long.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7152.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM306E	A read back check occurred waiting for the IBG.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7159.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 512.
TM306F	VOID was detected during a read operation. A valid block, TM, or ERG was not detected within 67 milliseconds after 'gap in'.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7153.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	
TM3070	A data transfer timeout was detected during a read operation. No valid IBG was read within 67 milliseconds after 'beg sync'.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7154.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU112 FRU113	
TM3071	A data transfer timeout was detected during a RBC operation. No valid IBG was read within 67 milliseconds after 'beg sync'.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7155.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL A[illegible]	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other t[illegible], see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error co[illegible]			See the "Error Displays" on DIAG 512.
TM3072	A read back check of a tapemark determined that the tapemark's length was too long.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7156.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3073	No beginning of block or tapemark was detected in the maximum allowed time during a read operation.	See "Error Analysis" on DIAG 510. See the FSI section error code 7154.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3074	A Write Erase Gap operation was not ended by a buffer interrupt.	See "Error Analysis" on DIAG 510. See the FSI section for error code 715A.	FRU114 FRU120	
TM3075	A write data flow error occurred.	See "Error Analysis" on DIAG 510.		
TM3076	A valid density pattern was not read after five retries.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7141.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113 FRU264 FRU265	
TM3077	A timeout occurred waiting for 'write end' when writing a write density separator.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7144.	FRU116	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 512.
TM3078	A timeout occurred waiting for the density separator.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7142.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM3079	A timeout occurred while waiting for the IBG after the density separator.	See "Error Analysis" on DIAG 510. See the FSI section for error code 7143.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM307A	This is a microcode program error.	See "Error Analysis" on DIAG 510. See the FSI section for error code 9600.		
TM3078	A timeout occurred waiting for 'gap in' from the drive.	See "Error Analysis" on DIAG 510. See the FSI section for error code 9601.	FRU085 FRU118 FRU117 FRU134 FRU115	
TM307C	A time out occurred while waiting for the drive to be selected on a read or write command.	See "Error Analysis" on DIAG 510. See the FSI section for error code 8005. See the FSI section for error code 8007. See the FSI section for error code 8009.	FRU085 FRU199 FRU248 FRU118 FRU059 FRU049 FRU188 FRU187 FRU185	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 512.
TM307D	This is a microcode program error.	Call your next level of support.		
TM307E	This is a microcode program error.	Call your next level of support.		
TM307F	This is a microcode program error.	Call your next level of support.		
TM3080	Set Diagnose command was sent to the drive and did not complete correctly.	See "Error Analysis" on DIAG 510.	FRU085 FRU199	
TM3081	A Set Diagnose command, sent to the drive, did not complete.	See "Error Analysis" on DIAG 510. See the FSI section for error code 8005. See the FSI section for error code 8007. See the FSI section for error code 8009.	FRU085 FRU199 FRU248 FRU118 FRU059 FRU049 FRU108 FRU107 FRU105	
TM3082	Test EEA3 has completed, and there are one or more errors in the counters. The counters are displayed on the screen with the following first line: BLKS CORR EEA3 EEA4. (See ERROR DISPLAYS on DIAG 512.)	1. See "Error Counts" on DIAG 510. 2. a. Test another drive using the same cartridge. b. Test the the same 2 drives using another cartridge. c. Test both drives using both cartridges. d. Run the test using the other TCU (if present). 3. Clean the read/write head. See CARR-DR 1-1, for FRU013. 4. Run GMP.	DR FRU062 FRU064 FRU063 FRU085 FRU216 FRU059 FRU013 CU FRU278 FRU125 FRU124 FRU123 FRU119 FRU111 FRU199 FRU248 FRU264 FRU265	
TM3083	The DLR external register and drive sense do not agree.	See CARR-TCU 1189 for correct DLR external register switch setting.	FRU118	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs	ERROR DISPLAYS
TM30F4 TM3085	A timeout error occurred during a TIO command to the drive. A drive status error occurred while sending code to the drive.	1. This program has minimum diagnostic capability during the drive patching procedure. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit on-line. Press unload switch of the drive to be tested, reload diagnostic EE54 and run it. 4. If this error persists, run EE40.		See the "Error Displays" on DIAG 512.
TM3086 TM3087 TM3088	The correct level of code patches is not found on the functional diskette. The correct level of code patches is not found on the functional diskette. Unable to read the functional diskette due to an error.	1. Make sure the diskette in the diskette reader is the correct level. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit on-line. Press unload switch of the drive to be tested, reload diagnostic EE54 and run it. Ensure that the tape control unit successfully loads code from the diskette. 4. If this error persists, run EE40.		

Write/Read Exerciser - Routine EEA4

Prerequisite diagnostics must run without failure before this diagnostic is run. See DIAG 3, "PREREQUISITE DIAGNOSTICS."

This routine verifies that the write, read backward, and read operations of the drive operate correctly. Routine EEA4 tests are performed at the end of tape (EOT).

This test checks the drive's data flow and buffer with the following sequence of operations:

1. Checks for interrupts that are on all of the time.
2. Ensures that a single drive address is entered.
3. Sends a sense command to reset any units checks or sense data.
4. Sends DSE and Locate commands to start the test at EOT.
5. Writes and reads 16 blocks of data varying in length from 1 byte to 65,536 bytes. This is repeated fifteen times for a total of 256 blocks. All data blocks are written using a ripple data pattern of X'00' to X'FF'.

Routine Start Address: 6010

Error Loop

Note: The following looping information applies if you were sent here by MD/SDISK 3 and are using a Maintenance Device (MD). If you are using the TA90 support diskette, use the CE panel to run diagnostics; follow the CE panel flow diagram to loop the diagnostics (see CE/HSC 1).

Error Loop: If no error occurs, the routine loops as if "LOOP ROUTINE" is set. When an error is detected, the routine saves the error information and displays the error on the MD. After the error is displayed, the routine continues to loop on that error. However, if a different error occurs, that new error is displayed on the MD, and the routine will loop on the new error.

Test Selection

The following screen displays after routine number EEA4 has been entered to start the tape motion diagnostic routine.

```
DIAG=(EEA4)-ENTER:
DRIVE
(xx)
```

Valid parameters:

xx Drive address (0-F, or 00-0F).

To run the tests:

1. Insert a write enabled scratch cartridge in the drive and make it ready.
2. Enter the drive address.

Error Displays

Note: The following error display information applies to the MD if you were sent here by MD/SDISK 3. If you are using the TA90 support diskette you are using the CE Panel and the displays are presented one line at a time.

When an error is detected by the diagnostic program, the maintenance device or CE panel displays error information on its keyboard/display. The first screen displays automatically. You can see the second and following screens by pressing the ENTER key on the MD keyboard/display or the NEXT key on the CE panel.

External registers are defined in the DF (Data Fields) section of this maintenance guide.

Note: If the diagnostic is not permitted to complete normally, you must wait until drive motion has stopped before restarting the diagnostic, or an error will occur.

FRUS

See CARR-TCU or CARR-DR, pages 1-1, 1-2, 1-3, and 1-4 for the names and locations of the FRUs.

Error Analysis

Analyze the errors for routine EEA4 as follows:

1. From the first error information screen record the key number, the drive address, and drive status.
2. Read the error message on the first error information screen and perform any action indicated.
3. Take the actual drive status (tttt) and the expected drive status (ssss) and convert them to binary. Example:

8621 • 1000 0110 0010 0001

The bits are numbered 0-15, left to right. Compare the actual to expected drive status, and analyze bits that do not match.

Bit 0 This bit indicates that a Serial command was issued since the last parallel command. This bit will only be on in the next status received by the tape control unit. If this is one of the error bits, see the FSI section for error code 9802.

Bit 1 This bit indicates that the drive is repositioning after a previous Serial or Parallel command. Repositioning can be indicated over either the serial or the parallel interconnections, and should always indicate the real-time operation of the drive, so both indicators should always indicate the same condition. If this is one of the error bits, see the FSI section for error code 8804.

Bit 2 This bit indicates the drive just changed from Not Ready to Ready. This is usually a normal condition. If this is one of the error bits, see the FSI section for error code 33E8.

Bit 3 This bit indicates that the drive has moved a predetermined amount of tape and is notifying the tape control unit. This is usually a normal condition. This bit is not checked by routine EEA4.

Bit 4 This bit indicates that the drive just completed a Disconnected command. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 5 This bit indicates that the drive just completed a Connected command. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 6 This bit indicates the drive set drive unit check and sense data is present in the drive. Normally, the sense data is valid and is displayed in a later error information screen. Analyze this bit last. See EAD 1, "Drive Interconnections" for failure isolation.

Bit 7 This bit indicates that the tape loaded in the drive has been manually unloaded using the Rewind/Unload switch. If this is one of the error bits, see the FSI section for error code 8202.

Bit 8 This bit indicates that the drive address is one with an address in the range of 8 – F. If this is one of the error bits, see the FSI section for error code 86C0.

Bit 9 This bit indicates that the drive has completed a tape volume mount and is ready. If this is one of the error bits, see the FSI section for error code 33E8.

Bit 10 This bit indicates that the drive has received patches from the tape control unit. Normally during this diagnostic, this bit is not active; however, if the functional microcode has previously sent patches and the drive has not been powered off or reset has not been issued, this bit may be on. This bit is not checked.

Bit 11 This bit indicates the drive is positioned at the beginning of tape. See EAD 1, "Drive Interconnections" for failure isolation.

Bit 12 This bit indicates that the drive tape volume is file protected. If this is one of the error bits, see the FSI section for error code CK07.

Bit 13 This bit indicates that the drive is positioned at or following the logical end of tape. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 14 This bit indicates that the drive is positioned at the physical end of tape. If this is one of the error bits, replace FRU085.

See EAD 1, "Drive Interconnections" for failure isolation.

Bit 15 Reserved

Error Analysis (Continued)

Analyze the errors for routine EEA4 as follows:

4. Record all information on the error screens.

5. If ERA and ERB are not 0, record the contents (if the screen is displayed) of ERA and ERB. See the FSI section for error code E100 and the following FRU list:

   FRU Name

   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   118 Drive adapter card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card
   134 Control store card
   135 Control storage array card

6. If PSR bit 0 = 1, record the contents (if the screen is displayed) of PSR, PER, XRA, MTI, and MDI. See EAD 1 for error code Fnnn and the following FRU list:

   FRU Name

   118 Drive adapter card
   117 Microprocessor card
   115 Maintenance adapter card
   114 Buffer control card
   121 Status store basic card
   119 Read clock and format card
   116 Write data card
   120 Buffer adapter card
   122 Status store communication card

7. If BCSE channel error groups 0-3 indicate any errors, record the contents of BCSE. See the FSI section for error code D5nn and the following FRU list:

   FRU Name

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   133 Channel adapter (A)
   152 Channel adapter (B)
   119 Read clock and format card
   118 Drive adapter card
   116 Write data card
   126 Power/POR card
   134 Control store card
   121 Status store basic card
   122 Status store communication card

8. If BDSE channel error groups 0-3 indicate any errors, record the contents of BDSE. See the FSI section for error code D6nn and the following FRU list:

   FRU Name

   114 Buffer control card
   120 Buffer adapter card
   113 Buffer storage card
   111 Read ECC/CORR card
   119 Read clock and format card
   118 Drive adapter card
   116 Write data card
   134 Control store card
   117 Microprocessor card

9. If DSE bits 0, 1, or 2 = 1, record the contents of DCB, DCR, DSE, DIR, and DTR. See the FSI section for error code D4nn and the following FRU list:

   FRU Name

   118 Drive adapter card
   116 Write data card
   134 Control store card
   085 Drive control card

10. If any RER bits = 1, or if RSR bits 5, 6, 7 = 1, record the contents of RCR, RRC, RER, RSR, and RDC. See the FSI section for error code D8nn and the following FRU list:

    FRU Name

    064 Write power card
    062 Read preamplifier card
    085 Drive control card
    278 Read detect card
    123 Read skew buffer card 1
    124 Read skew buffer card 2
    125 Read skew buffer card 3
    119 Read clock and format card
    111 Read ECC/CORR card

11. If WSE bits 4, 5, or 6 = 1, record the contents of WCR and WSE. See the FSI section for error code D7nn and the following FRU list:

    FRU Name

    116 Write data card
    120 Buffer adapter card
    114 Buffer control card
    117 Microprocessor card
    118 Drive adapter card
    139 Logic board A1

12. Record the contents of drive sense. See the last display screen under Error Displays for this routine for an explanation of the drive sense bytes.

Error Counts

The "BLKS CORR EEA3 EEA4" screen contains a count of the number of blocks written or read forward (fwd) or backward (bkd) upon which ECC correction was performed. It is normal for some error counts to occur. You must use the following information, and any past experience with this machine type, to determine if the error count is normal, or if a problem exists.

Total blocks written are hex '20B'
Total blocks read fwd are hex '200'
Total blocks read bkd are hex '200'

"Correctable errors" are errors that are corrected while processing data between the tape control unit and the drive. No error recovery actions are required. These errors are sometimes called ECC errors.

A correctable "write" error would be a single track in either or both of the two groups (fwd and bkd). The error is detected in the tape control unit detection logic as the data from the read head is processed during the writing process. The data itself is not actually corrected because it is not used except for the read-back check.

A correctable "read" error would be a single or double track error in either or both of the two groups (fwd and bkd). The data is corrected as it is processed through the detection and deskewing logic. CRC checking is performed on the corrected data.

Because this diagnostic does not retry errors, it is possible for a worn or bad place on the media to cause write or readback check errors. If this is the cause of an error, do one or more of the following:

- Use another drive (same cartridge)
- Use another cartridge (same drive)
- Run diagnostic routine EEA4 to see if the error occurs at the opposite end of the tape.
- If available, use another tape control unit.

ERROR DISPLAYS FOR ROUTINE EEA4

```
nnnnnn
KEY = kk   DR = xx
DRSTS=tttt,EXP=ssss
***Error messages***
```

* Data is not valid
nnnnnn Failure ID
kk Key that error occurred in.

Key codes are:

00 Set up write buffer
01 Ensure that a single drive address is entered
02 The microcode performs the following:
    1. Generates a sense command to the drive to clear any units checks or sense data.
    2. Generates a sense command to the drive to check for any errors.
    3. Generates a parallel test I/O command.
03 Send command to drive to set display language.
04 Sends a rewind command to the drive to start the test at beginning-of-tape (BOT).
05 The microcode sets up the control tables.
06 Executes the following block sequence queues (BSQ):

BSQ Number	Description
01	Write a density and a tapemark
02	Write an erase gap
03	Write a tapemark
04	Write an erase gap
05	Write a density mark and a one-byte block
07	In a one drive selection, write an erase gap, tapemark, one-byte block, a 53-byte block, tapemark and a 140-byte block.
0D-1C	Write 16 blocks, varying in length from one-byte to 65536 bytes, then stop and repeat writing the same 16 blocks fifteen more times for a total of 256 blocks. All data blocks are written with ripple data, hex 00-FF. The blocks sizes are:

Block ID	Byte Size	Block ID	Byte Size
0000 0001	1	0000 000A	4906
0000 0002	53	0000 0008	32768
0000 0003	54	0000 000C	5607
0000 0004	140	0000 0000	7009
0000 0005	2182	0000 000E	7710
0000 0006	16384	0000 000F	9813
0000 0007	2803	0000 0010	65536
0000 0008	3504	0000 EEEE	Tapemark
0000 0009	4205	0000 AAAA	Erasegap

During the write operation, the drive buffer, and the write and read data flow are checked to ensure that no errors are detected.

20-4F Write one block, then read backward for two blocks and then read forward two blocks, and repeat for 255 times, using the same block size sequence shown above.

11 Sends rewind command to drive.
tttt Actual drive status.
ssss Expected drive status.

ERROR MESSAGES:

MAKE THE DRIVE READY = Load the drive with a write enabled tape.

DR STS FILE PROT = The drive should be set to write enable.

```
ERA=ra     ERB=rb
PSR=xx,    PER=pp
MTI=mm     MDI=md
XRA=aa
```

This screen is displayed only if a check 1 or an XR error occurs.

* No errors are set
aa Contents of the external register
md Contents of the maintenance data in register
mm Contents of the maintenance tag in register
pp Contents of the processor error register
ra Contents of error register A
rb Contents of error register B
xx Contents of the processor status register

```
SCMD=xxx   PCMD=yyy
 BSQ=qq    DTR=dr
WRITE ID=wwwwwwww
R/RBC ID=rrrrrrrr
```

* Data is not valid
dr Contents of the device tag register
qq For BSQ number, see the Key Code 06 (BSQ descriptions) under the first error display on this page.
rrrrrrrr Block ID of the block currently being read or read back checked.
wwwwwwww Block ID of the block currently being written.
xxx Last serial command
yyy Last parallel command sent

```
BLKS CORR EEA3 EEA4
WRITE   =  bb   ee
READ FWD=  cc   ff
READ BKD=  dd   gg
```

* Data is not valid
bb Write ECC errors counted during the EEA3 test
cc Read forward ECC errors counted during the EEA3 test
dd Read backward ECC errors counted during the EEA3 test
ee Write ECC errors counted during the EEA4 test
ff Read forward ECC errors counted during the EEA4 test
gg Read backward ECC errors counted during the EEA4 test

```
BCSE= abcde  DSE= ds
BDSE= fghij  RCR= rc
WCR = wc     RSR= rs
WSE = ws     RER= re
```

* No errors are set
a Buffer channel status and error register bits 0-3
b BCSE channel error group 0
c BCSE channel error group 1
d BCSE channel error group 2
e BCSE channel error group 3
f Buffer device status and error register bits 0-3
g BDSE device error group 0
h BDSE device error group 1
i BDSE device error group 2
j BDSE device error group 3
ds Contents of the device status error register
rc Contents of the read control register
re Contents of the read error register
rs Contents of the read status register
wc Contents of the write control register
ws Contents of the write status error register

```
DRSNS-  S8=b0,S19=b1
S18= b2, S2021= b4b5
         S2223= b6b7
S30= 21,    EC= 2223
```

The following sense data is described in the SENSE section (see formats 19 and 20).

b0 Contents of the drive error recovery byte (see sense byte 8).
b1 The contents of the drive features byte (see sense byte 19).
b2 Flags modifier to b4b5 (see sense byte 18).
b4b5 The first error the drive detected. B4 contains the drive command associated with this error; an EE indicates a bus out parity error occurred while loading a command, or an FF indicates that the error occurred when the drive was not performing a command. B5 contains the drive error code identifying this error (see sense bytes 20 and 21).
b6b7 The last error the drive detected. B6 contains the drive command associated with this error; an EE indicates a bus out parity error occurred while loading a command, or an FF indicates that the error occurred when the drive was not performing a command. B7 contains the drive error code identifying this error (see sense bytes 22 and 23).
21 Logical drive address and physical drive address (contents of the thumbwheel switches). See sense byte 38.
2223 The drive EC level (contains the last four digits of the drive ROS module EC level).

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6021	LVL 0 INTRPT ACTIVE Level 0 interrupt was active following a reset.	See "Error Analysis" on DIAG 550. See the FSI section for error code 1100.	FRU119 FRU117	
TM6022	LVL 3 INTRPT ACTIVE Level 3 interrupt was active following a reset.	See "Error Analysis" on DIAG 550. See the FSI section for error code 1103.	FRU120 FRU117	
TM6023	LVL 4 INTRPT ACTIVE Level 4 interrupt was active following a reset.	See "Error Analysis" on DIAG 550. See the FSI section for error code 1104.	FRU120 FRU117	
TM6024	LVL 5 INTRPT ACTIVE Level 5 interrupt was active following a reset.	See "Error Analysis" on DIAG 550. See the FSI section for error code 1105.	FRU120 FRU117	
TM6025	DR ADDR NOT VALID The drive address is not valid. Valid addresses are 0 through F.	Enter the drive address from the test selection option screen, again. See "Test Selection" on DIAG 550.		
TM6026	UNIT CK ON SNS CMD Unit check (UC) was on in the initial status from the Sense command. A UC is acceptable only in the first Sense command, but was still on in the second Sense command.	See "Error Analysis" on DIAG 550.	FRU120 FRU117	
TM6027	SNS CMD TIMED OUT A Sense command timed out. A Sense command issued to the drive did not complete.	See "Error Analysis" on DIAG 550.		
TM6028	TIO CMD TIMED OUT A Test I/O command timed out. A Test I/O command issued to the drive on the device data bus did not complete, and timed out after approximately 33 milliseconds.	See "Error Analysis" on DIAG 550.		
TM6029	SERIAL TIME OUT 8803 A Serial command timed out. A serial command has been issued but the tape control unit did not complete the operation on the device data bus.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8803.	FRU085 FRU118	
TM602A	DR REPO ERROR 8804 While preparing to issue a serial command, repositioning response was active. This error could be caused by the drive being tested, another drive, or by an invalid response from the tape control unit on the device data bus.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8804.	FRU085 FRU118	
TM602B	DSE SELECT TIMED OUT A DSE command timed out. A DSE command issued to the drive did not complete.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8005. See the FSI section for error code 8067. See the FSI section for error code 8069.	FRU085 FRU199 FRU248 FRU118 FRU059 FRU049 FRU108 FRU107 FRU105	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM602C	DSE COMMAND NOT ACCEPTED The initial status for a DSE command issued to the drive was not correct, which indicates that the drive did not accept the command.	See "Error Analysis" on DIAG 550. See the FSI section for error code 89nn. See the FSI section for error code 8Fnn.	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	
TM602D	DSE TO - NO ALERT A DSE command timed out. Ending alert was not received from the drive.	See "Error Analysis" on DIAG 550. See the FSI section for error code 89nn. See the FSI section for error code 8Fnn.	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	
TM602E	LOCATE SELECT TIMED OUT A Locate command timed out. A Locate command issued to the drive did not complete.	See "Error Analysis" on DIAG 550. See the FSI section for error code 89nn. See the FSI section for error code 8Fnn.	FRU085 FRU199 FRU248 FRU118 FRU116 FRU134	
TM602F	LOC COMMAND NOT ACCEPTED The initial status for a LOC command issued to the drive was not correct, which indicates that the drive did not accept the command.	See "Error Analysis" on DIAG 550.		
TM6030	LOC TO - NO ALERT A LOC command timed out. Ending alert was not received from the drive.	See "Error Analysis" on DIAG 550. See the FSI section for error code 89nn. See the FSI section for error code 8Fnn.	FRU085 FRU118 FRU116 FRU134 FRU199 FRU248	
TM6031	An external register error occurred during the operation.	See "Error Analysis" on DIAG 550. See steps 1 and 2 at the top of this chart.		
TM6032	A tape control unit check 1 error occurred.	See "Error Analysis" on DIAG 550. See steps 1 and 2 at the top of this chart.		
TM6033	Either the BCSE or BDSE register contains an error. Buffer status is not checked for incorrect bits.	See "Error Analysis" on DIAG 550.		
TM6034	Errors are set in the write, read, or drive error registers.	See "Error Analysis" on DIAG 550.		

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6035	The BCSE or BDSE registers did not contain the correct status.	See "Error Analysis" on DIAG 558.		
TM6036	The WSE register did not contain the correct status.	See "Error Analysis" on DIAG 558. See the FSI section for error code D7nn.	FRU116 FRU118 FRU120 FRU114 FRU139	
TM6037 TM603A	A drive Check 1 error occurred during the last I/O operation. NO ALERT A serial command was issued to the drive, and no alert occurred after repositioning.	See "Error Analysis" on DIAG 558. See "Error Analysis" on DIAG 558.	FRU085 FRU985	
TM6038	This is a microcode program error.	Call your next level of support.		
TM603C	This is a microcode program error.	Call your next level of support.		
TM603D	This is a microcode program error.	Call your next level of support.		
TM603E	This is a microcode program error.	Call your next level of support.		
TM603F	An error occurred while writing to the buffer to initialize the channel buffer storage.	See "Error Analysis" on DIAG 558. See the FSI section for error code A141.	FRU120 FRU114	
TM6040	A buffer error occurred while writing the write operation data into the buffer. The BCSE register value should be X'20'.	See "Error Analysis" on DIAG 558.		
TM6041	A buffer error was detected while writing this record.	See "Error Analysis" on DIAG 558. See the FSI section for error code 70E4.	FRU114 FRU120 FRU113 FRU111 FRU116	
TM6042	'Device xfer complete' (BDSE register) did not set.	See "Error Analysis" on DIAG 558. See the FSI section for error code 70E6.	FRU085 FRU062 FRU064 FRU116 FRU118 FRU114 FRU120	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6043	A write data flow error was detected while writing this record. Error bits were on in the WSE register, or 'end write' did not set in the maximum allowable time.	See "Error Analysis" on DIAG 550. See the FSI section for error code 70E5.		
TM6044	A write sequence error occurred. This is a microcode program error.	Call your next level of support.		
TM6045	A write sequence error occurred. This is a microcode program error.	Call your next level of support.		
TM6046	A time out occurred waiting for the 'status in' response to 'gap out'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 70E3.	FRU085 FRU118	
TM6047	A drive check 1 occurred.	See "Error Analysis" on DIAG 550. See the FSI section for error code 6nnn.	FRU085 FRU199 FRU248 FRU118 FRU116 FRU134	
TM6048	A time out occurred waiting for the device data bus 'status in' line to become active.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8C03.	FRU085 FRU118 FRU116 FRU134	
TM6049	The hardware detected a device adapter error.	See "Error Analysis" on DIAG 550. See the FSI section for error code 88nn.	FRU085 FRU118 FRU116 FRU134	
TM604A	Drive sense data contains an error, and while ending the tag sequence to the drive, device data bus 'status in' did not drop.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8C07.	FRU085 FRU118 FRU116 FRU134	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6048	A pattern sequence table error occurred during the read back check. The read data flow detected an IBG that was not expected.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7061.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM604C	This is a microcode program error.	Call your next level of support.		
TM604D	IBG was not detected after device data bus 'gap in'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7093.	FRU064 FRU062 FRU065 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	
TM604E	A device buffer overrun occurred once while writing the same record.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7181.	FRU114 FRU120 FRU117	
TM604F	256 ERGs were read without detecting a Block or TM.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7702.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6050	A read error occurred on the last record.	See "Error Analysis" on DIAG 550. See the FSI section for error code 76nn.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU120 FRU114 FRU111	
TM6051	A timeout occurred waiting for the device data bus 'status in' response to 'gap out'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7701.	FRU085 FRU118	
TM6052	During a read back check, a level 3 interrupt occurred that was caused by 'end sync'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7503.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	
TM6053	A read back check error occurred on the last record.	See "Error Analysis" on DIAG 550. See the FSI section for error code 74nn.	FRU064 FRU062 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU111 FRU114 FRU120 FRU264 FRU265	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6054	The value of bits 0 and 1 of the RRC register do not match the value of bits 6 and 7 (word 1) of the LDT table.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7501.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	
TM6055	A timeout occurred while waiting for the device data bus 'status in' response to 'gap out'.	See "Error Analysis" on DIAG 550. See the FSI section, error code 7502.	FRU085 FRU118	
TM6056	Device data bus 'gap out' did not occur for the last block of data read.	See "Error Analysis" on DIAG 550. See the FSI section, error code 7502.	FRU085 FRU118	
TM6057	After a Read ID operation, an error was indicated in the BDSE register.	See "Error Analysis" on DIAG 550. See the FSI section, error code 70C1.	FRU114 FRU120 FRU113 FRU111 FRU116	
TM6058	A block ID format error occurred. Bits 0 and 8-11 of the four-byte block ID are always zero. The block just read from the tape contains a block ID with at least one of these bits on.	See "Error Analysis" on DIAG 550. See the FSI section for error code 70C4.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6059	A block ID error occurred on a Read Forward operation. The block just read from the tape does not have the expected block ID sequence number.	See "Error Analysis" on DIAG 550. See the FSI section for error code 70C2.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU112 FRU113	
TM605A	A block ID error occurred on a Read Backward operation. The block just read from the tape does not have the expected block ID sequence number.	See "Error Analysis" on DIAG 550. See the FSI section for error code 70C3.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM605B	The expected buffer CRC data did not compare to the actual data read from the buffer. This could be the wrong block read. No hardware errors were detected.	See "Error Analysis" on DIAG 550.		
TM605C	The expected buffer CRC data did not compare to the actual data read from the buffer. This could be the wrong block read. No hardware errors were detected.	See "Error Analysis" on DIAG 550.		
TM605D	A level 0 interrupt occurred that was caused by an external register error.	See "Error Analysis" on DIAG 550. See steps 1 and 2 at the top of this chart. See the FSI section for error code 7061.		
TM605E	A level 0 interrupt occurred that was not caused by an external register error or 'collision detect'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 1100.	FRU119 FRU117	
TM605F	A level 0 interrupt occurred that was caused by 'collision detect'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 1100.	FRU119 FRU117	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6060	A time out occurred waiting for 'beg sync' during a read back check operation.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7071.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6061	A write data flow error was detected while writing this record. FRU bits were on in MSE register, or 'end write' did not set in the maximum allowable time (50 microseconds).	See "Error Analysis" on DIAG 550. See the FSI section for error code 7076.	FRU085 FRU062 FRU064 FRU116 FRU118 FRU114 FRU120	
TM6062	The BDSE register detected an buffer error while writing this record.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7077.	FRU114 FRU120 FRU113 FRU111 FRU116	
TM6063	'Device xfer complete' (BDSE register) was not on, at the end of a Buffer to WDF Transfer operation.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7078.	FRU120 FRU114	
TM6064	A pattern sequence table error occurred during a read back check operation.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7074.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6065	'Gap in' and 'generate gap out' (RSR register) were on, causing a level 3 interrupt to occur.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7081.	FRU118 FRU119 FRU176 FRU116	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6066	A device buffer overrun condition occurred once while writing the same record.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7081.	FRU114 FRU120 FRU117	
TM6067	A device buffer overrun condition occurred while reading a record operation.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7173.	FRU114 FRU120	
TM6068	'Density separator' was not detected before 45 sets of samples were taken.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7161.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6069	A pattern sequence table error occurred during a read back check operation. The read data flow detected a tapemark (TM) that was not expected.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7041.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM606A	A tapemark (TM) was read during read back check that did not meet the minimum length specifications.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7042.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM606B	The write control register (WCR) did not set at the correct time.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7182.	FRU064 FRU116 FRU063 FRU118	
TM606C	This is a microcode program error.	Call your next level of support.		
TM606D	The read back check started incorrectly. It came up when reading the IBG, and did not find the block before the first IBG.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7051. See the FSI section for error code D0nn. See the FSI section for error code D8nn.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM606E	The read back check started incorrectly and timed out waiting for the IBG preceding the first block written.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7052.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM606F	The IBG read during the read back check was too short.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7151.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6870	The IBG read during the read back check was too long.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7152.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6871	A read back check occurred waiting for the IBG.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7159.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	
TM6872	VOID was detected during a read operation. A valid block, TM, or ERG was not detected within 67 milliseconds after 'gap in'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7153.	FRU064 FRU062 FRU085 FRU278 FRU116 FRU216 FRU059 FRU117 FRU118 FRU119 FRU063 FRU058 FRU013	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6073	A data transfer timeout was detected during a read operation. No valid IBG was read within 67 milliseconds after 'beg sync'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7154.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6074	A data transfer timeout was detected during a RBC operation. No valid IBG was read within 67 milliseconds after 'beg sync'.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7155.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6075	A read back check of a tapemark determined that the tapemark's length was too long.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7156.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6076	No beginning of block or tapemark was detected in the maximum allowed time during a read operation.	See "Error Analysis" on DIAG 550. See the FSI section error code 7154.	FRUB62 FRUB64 FRU116 FRU118 FRUZ78 FRU123 FRU124 FRU125 FRU119 FRU113	
TM6077	A Write Erase Gap operation was not ended by a buffer interrupt.	See "Error Analysis" on DIAG 550. See the FSI section for error code 715A.	FRU114 FRU120	
TM6078	A write data flow error occurred.	See "Error Analysis" on DIAG 550.		
TM6079	A valid density pattern was not read after five retries.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7141.	FRUB62 FRUB64 FRU116 FRU118 FRUZ78 FRU123 FRU124 FRU125 FRU119 FRU113 FRU264 FRU265	
TM607A	A timeout occurred waiting for 'write end' when writing a write density separator.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7144.	FRU116	
TM607B	A timeout occurred waiting for the density separator.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7142.	FRUB62 FRUB64 FRU116 FRU118 FRUZ78 FRU123 FRU124 FRU125 FRU119 FRU113	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS:	1. If the value of ERA or ERB is other than 00, see the FSI section for error code E100. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.		See the "Error Displays" on DIAG 552.
TM607C	A timeout occurred while waiting for the IBG after the density separator.	See "Error Analysis" on DIAG 550. See the FSI section for error code 7143.	FRU062 FRU064 FRU116 FRU118 FRU278 FRU123 FRU124 FRU125 FRU119 FRU113	
TM607D	This is a microcode program error.	Call your next level of support.		
TM607E	A timeout occurred waiting for 'gap in' from the drive.	See "Error Analysis" on DIAG 550. See the FSI section for error code 9601.	FRU085 FRU118 FRU117 FRU134 FRU115	
TM607F	A time out occurred waiting for the drive to be selected on a read or write command.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8005. See the FSI section for error code 8007. See the FSI section for error code 8009.	FRU085 FRU199 FRU248 FRU118 FRU059 FRU049 FRU108 FRU107 FRU105	
TM6080	This is a microcode program error.	Call your next level of support.		
TM6081	This is a microcode program error.	Call your next level of support.		
TM6082	This is a microcode program error.	Call your next level of support.		
TM6083	A Set Diagnose command was sent to the drive and it did not complete correctly.	See "Error Analysis" on DIAG 550.	FRU085 FRU199	
TM6084	A Set Diagnose command, sent to the drive, did not complete.	See "Error Analysis" on DIAG 550. See the FSI section for error code 8005. See the FSI section for error code 8007. See the FSI section for error code 8009.	FRU085 FRU199 FRU248 FRU118 FRU059 FRU049 FRU108 FRU107 FRU105	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUS	ERROR DISPLAYS
	FOLLOW STEPS 1 AND 2 BEFORE TAKING ANY OTHER ACTIONS: 1. If the value of ERA or ERB is other than 00, see the FSI section for error code E108. 2. If PSR bit 0 = 1, see EAD 1 for error code Fnnn.			See the "Error Displays" on DIAG 552.
TM6085	Test EEA4 has completed, and there are one or more errors in the counters. The counters are displayed on the screen with the following first line: BLKS CORR EEA3 EEA4. (See ERROR DISPLAYS on DIAG 552.)	1. See "Error Counts" on DIAG 550. 2. a. Test another drive using the same cartridge. b. Test the the same 2 drives using another cartridge. c. Test both drives using both cartridges. d. Run the test using the other TCU (if present). 3. Clean the read/write head. See CARR-DR 1-1, for FRU013. 4. Run GMP.	DR FRU062 FRU064 FRU063 FRU085 FRU216 FRU059 FRU013 TCU FRU278 FRU125 FRU124 FRU123 FRU119 FRU111 FRU199 FRU248 FRU264 FRU265	
TM6086	The DLR external register and drive sense do not agree.	See CARR-TCU 1189 for correct DLR external register switch setting.	FRU118	

FAILURE ID	DESCRIPTION	ADDITIONAL ACTIONS	FRUs	ERROR DISPLAYS
TM4087 TM4088	A timeout error occurred during a TIO command to the drive. A drive status error occurred while sending code to the drive.	1. This program has minimum diagnostic capability during the drive patching procedure. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit online. Press unload switch of the drive to be tested, reload diagnostic EE54 and run it. 4. If this error persists, run EE40.		See the "Error Displays" on DIAG 552.
TM4089 TM408A TM408B	The correct level of code patches is not found on the functional diskette. The correct level of code patches is not found on the functional diskette. Unable to read the functional diskette due to an error.	1. Make sure the diskette in the diskette reader is the correct level. 2. This error occurs when a cartridge loader is installed and a cartridge is present in the drive to be tested. 3. This error can be bypassed by loading the functional code into the tape control unit and setting the tape control unit online. Press unload switch of the drive to be tested, reload diagnostic EE54 and run it. Ensure that the tape control unit successfully loads code from the diskette. 4. If this error persists, run EE40.		





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Note: Registers marked with a * may or may not be present depending upon the EC level and installed features.

Data Fields

Functional Areas

The microprocessor communicates data that can be used for problem analysis via external registers. These one byte wide registers are distributed throughout the tape control unit and are attached to the processor by the External Register Interface. The registers may be read only, write only, or read/write.

Functional areas serviced by the registers are the following:

- Buffer area and control
- Drive adapter interface
- Maintenance adapter
- Microprocessor
- Read data flow
- Status store
- Write data flow

Note: The location of bit definitions for individual registers can be found in the table of contents. Storage fields that are loaded by the microcode with subsystem error and status information are also defined.

External Register Address Cross-Reference Tables

The external register cross-reference tables contain the following information:

- **REGISTER NAME:**

  Formal name of the register.

- **REGISTER MNEM/TYPE:**

  MNEM - Mnemonic name of the register.

  TYPE - Type of register.

  - R = Read
  - W = Write
  - R/W = Read and Write

- **XR PAGE:**

  XR page select address.

  The XR page defines groups of external registers that have the same address. That is, two external registers may have the address hexadecimal 02, but they are defined as different locations by the XR page. The pages are controlled by the XR address extend bits 0 and 1, shown on logic page MP001, as follows:

XR Address Extend Bits 0 1	Page
0 0	A
0 1	B
1 0	C
1 1	D

- **ADDRESS:**

  The actual register address in the buffer page. Both hexadecimal and decimal values are provided.

- **XRA VALUE:**

  The external register address value as it appears on the Maintenance Device (MD) display.

External Register Addressing

Addresses for the XR registers are generated from the XR address bus and the XR address extend bits 0 and 1. The extend bits become bits 0 and 1 of the XRA register. Bits 0, 1, 2, 3, 4, and P of the XR address bus become XRA register address bits 2, 3, 4, 5, 6, and 7.

XR register address bits 2, 3, 4, 5, 6, and 7 are used to address multiple XR registers and the extend bits control which register (page) will be selected. The XR address extend bits do not have any parity bits associated with them. The parity of the XR address bus is even.

XR Address Extend Bits	XR Address Bus Bits
0 1	0 1 2 3 4 P

↓ ↓

XRA Register	
Extend Bits	Address Bits
0 1	2 3 4 5 6 7

Examples of Address Bus/XRA Translation

- **XR Page/Address Bus to XRA**

EXAMPLE 1

```
XR Page=D

XR Address Bus = Hex 00

  XR          XR
  Address     Address
  Extend      Bus
  Bits        Bits

   0  0        0
   |  |  ______|_____
  0 1  0 1 2 3 4 P
  1 1  0 0 0 0 0 0 <-- Add 0 to maintain even
                       parity for address bus
                       bits 0-4

  1 1  0 0 0 0 0 0
  |___|  |_____|
    C      0     = XRA value
```

EXAMPLE 2

```
XR Page=8

XR Address Bus = Hex 13

  XR          XR
  Address     Address
  Extend      Bus
  Bits        Bits

   0  0        0
   |  |  ______|_____
  0 1  0 1 2 3 4 P
  0 1  1 0 0 1 1 1 <-- Add 1 to maintain even
                       parity for address bus
                       bits 0-4

  0 1  1 0 0 1 1 1
  |___|  |_____|
    6      7     = XRA value
```

- **XR to XR Page/Address Bus Examples**

EXAMPLE 1

```
XRA value = E2
      XRA
      Value
      Bits

    E       2
    |       |
  0 1 2 3 4 5 6 7
  1 1 1 0 0 0 1 0
  |___|   |_____|
    |       |
   XR      XR
   Extend  Address
   Address Bus
   Bits    Bits

  0 1      0 1 2 3 4 P
  1 1                  = XR page D
           1 0 0 0 1 0 = XR address bus
           1 0 0 0 1 X
           |_____|
              |
           1  1        = XR address
                         Hex 11 (17 decimal)
```

EXAMPLE 2

```
XRA value = A1
      XRA
      Value
      Bits

    A       1
    |       |
  0 1 2 3 4 5 6 7
  1 0 1 0 0 0 0 1
  |___|   |_____|
    |       |
   XR      XR
   Extend  Address
   Address Bus
   Bits    Bits

  0 1      0 1 2 3 4 P
  1 0                  = XR page C
           1 0 0 0 0 1 = XR address bus
           1 0 0 0 0 X
           |_____|
              |
           1  0        = XR address
                         Hex 10 (16 decimal)
```

Cross Reference Tables

Note: Not all the registers are defined in this section. Only those registers that are useful for troubleshooting are defined.

Buffer Control Card (01A-A1L2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
BCPH	R/W	Buffer Channel Pointer High	D	00	0	C0
BCPL	R/W	Buffer Channel Pointer Low	D	01	1	C3
BDPH	R/W	Buffer Device Pointer High	D	02	02	C5
BDPL	R/W	Buffer Device Pointer Low	D	03	3	C8
BCSH	R/W	Buffer Channel Stop High	D	04	4	C9
BCSL	R/W	Buffer Channel Stop Low	D	05	5	CA
BDSH	R/W	Buffer Device Stop High	D	06	6	CC
BDSL	R/W	Buffer Device Stop Low	D	07	7	CF
BWRP	R/W	Buffer Wrap	D	08	8	D1
BCC	R/W	Buffer Channel Command	D	09	9	D2
BCSE	R/W	Buffer Channel Status/Error	D	0A	10	D4
BCR	R/W	Buffer Channel Remainder	D	0B	11	D7
BCSS	R/W	Buffer Channel SARS	D	0C	12	D8
BCPC	W	Buffer Channel Pad Counter	D	0D	13	DB
BDC	R/W	Buffer Device Command	D	0E	14	DD
BDSE	R/W	Buffer Device Status/Error	D	0F	15	DE
BDR	R/W	Buffer Device Remainder	D	10	16	E1
BDSS	R/W	Buffer Device SARS	D	11	17	E2

Buffer Adapter Card (01A-A1K2) with Improved Data Recording Capability

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
CMDT	R/W	Diagnostic Data	D	12	18	E4
CMRS	R/W	Register Select	D	13	19	E7
CMRP	R/W	Register Page	D	14	20	E8
CMS	R	Status	D	15	21	EB
CMM	R/W	Mode	D	16	22	ED
CHM	R/W	Channel Mode	D	17	23	EE

Drive Adapter Card (01A-A1Q2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
DLR	R	Device Level Register	A	10	16	21
DSH	R	Tape Control Unit Serial High	A	11	17	22
DSL	R	Tape Control Unit Serial Low	A	12	18	24
DIR	R	Device Interrupt Register	B	10	16	61
ITC	R/W	Interval Timer C	B	11	17	62
DCR	R/W	Device Control Register	B	12	18	64
DSE	R	Device Status/Error	B	13	19	67
DCB	R/W	Device Control Bus	B	14	20	68
DTR	R/W	Device Tag Register	B	15	21	6B
DSC	R/W	Device Secondary Clock	B	16	22	6D
DSR	R/W	Device Secondary Register	B	17	23	6E

Maintenance Adapter Card (01A-A1E2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
MTI	R/W	Maintenance Tag In	C	10	16	A1
MTO	R/W	Maintenance Tag Out	C	11	17	A2
MDI	R	Maintenance Data In	C	12	18	A4
MDO	R/W	Maintenance Data Out	C	13	19	A7
MSB	R	Maintenance Status Byte	*	*	*	*

Note: * These registers are not directly addressable, but can be displayed by using the MD Support Diskette.

Cross-Reference Tables (Continued)

Microprocessor Card (01A-A1D2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
ITB	W	Interval Timer B	A/B	18	4	30/70
ERA	R	Error Register A	C	18	4	B0
ERB	R	Error Register B	D	18	4	F0
ITA	R/W	Interval Timer A	A/B	19	5	33/73
XRA	R	External Register Address	C/D	19	5	B3/F3
PER	R	Processor Error Register	A/B/C/D	1A	6	35/75/ B5/F5
JAL	W	Jump Address Low	A/B/C/D	1A	6	35/75/ B5/F5
PSR	R	Processor Status Register	A/B/C/D	1B	7	36/76/ B6/F6
JAH	W	Jump Address High	A/B/C/D	1B	7	36/76/ B6/F6
PDR	R/W	Processor Diagnostic Register	A/B/C/D	1C	8	39/79/ B9/F9
PCR	R/W	Processor Control Register	A/B/C/D	1D	9	3A/7A/ BA/FA
IMR	R/W	Interrupt Mask Register	A/B/C/D	1E	0	3C/7C/ BC/FC
LSP	R/W	Local Storage Page	A/B/C/D	1F	1	3F/7F/ BF/FF

Read Data Flow and Read Control Card (01A-A1S2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
RCR	R/W	Read Control Register	B	02	2	45
RSR	R	Read Status Register	B	03	3	46
RER	R	Read Error Register	B	04	4	49
RRC	R	Read Residual Count	B	05	5	4A
RPR	R	Read Pattern Register	B	06	6	4C
RDC	R/W	Read Diagnostic Control	B	07	7	4F

Status Store Card (01A-A1G2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
CCC	R/W	Channel Card Control	A	00	0	00
CCA	R/W	Channel Card Address	A	01	1	03
CDR	R/W	Channel Data Register	A	02	2	05
CER	R	Channel Error Register	A	03	3	06
CMR	W	Channel Modifier Register	A	03	3	06
CRR	R	Channel Request Register	A	07	7	0F
CAE	R	Channel Adapter Error				
CAS	R	Channel Adapter Status	*	*	*	*

Note: * These registers are not directly addressable, but can be displayed by using the MD Support Diskette.

Write Data Flow Card (01A-A1P2)

MNEM	Register Type	Register Name	XR Page	Addr Hex	Addr Dec	XRA Value
WCR	R/W	Write Control Register	B	00	0	40
WSE	R	Write Status/Error	B	01	1	43

External Registers (Continued)

Cross-Reference Tables (Continued)

XRA Value to Register Name Cross-Reference Table

XRA Value	Register Name
C0	Channel Card Control
03	Channel Card Address
05	Channel Data Register
06 (R)	Channel Error Register
06 (W)	Channel Modifier Register
0F	Channel Request Register
21	Device Level Register
22	Tape Control Unit Serial High
24	Tape Control Unit Serial Low
30	Interval Timer B
33	Interval Timer A
35	Processor Error Log
35	Jump Address Low
36 (R)	Processor Status Register
36 (W)	Jump Address High
39	Processor Diagnostic Register
3A	Processor Control Register
3C	Interrupt Mask Register
3F	Local Storage Page
40	Write Control Register
43	Write Status/Error
45	Read Control Register
46	Read Status Register
49	Read Error Register
4A	Read Residual Count
4C	Read Pattern Register
4F	Read Diagnostic Control
61	Device Interrupt Register
62	Interval Timer C
64	Device Control Register
67	Device Status/Error
68	Device Control Bus
6B	Device Tag Register
6D	Device Secondary Clock
6E	Device Secondary Register
70	Interval Timer B
73	Interval Timer A
75	Processor Error Register
75	Jump Address Low
76 (R)	Processor Status Register
76 (W)	Jump Address High
79	Processor Diagnostic Register
7A	Processor Control Register
7C	Interrupt Mask Register
7F	Local Storage Page
A1	Maintenance Tag In
A2	Maintenance Tag Out
A4	Maintenance Data In
A7	Maintenance Data Out
B0	Error Register A
B3	External Register Address
B5 (R)	Processor Error Register
B5 (W)	Jump Address Low
B6 (R)	Processor Status Register
B6 (W)	Jump Address High
BA	Processor Control Register
BC	Interrupt Mask Register
BF	Local Storage Page
C0	Buffer Channel Pointer High
C3	Buffer Channel Pointer Low
C5	Buffer Device Pointer High
C6	Buffer Device Pointer Low
C9	Buffer Channel Stop High
CA	Buffer Channel Stop Low
CC	Buffer Device Stop High
CF	Buffer Device Stop Low
D1	Buffer Wrap
D2	Buffer Channel Command
D4	Buffer Channel Status/Error
D7	Buffer Channel Remainder
D8	Buffer Channel SARS
DB	Buffer Channel Pad Counter
DD	Buffer Device Command
DE	Buffer Device Status/Error
E1	Buffer Device Remainder
E2	Buffer Device SARS
F0	Error Register B
F3	External Register Address
F5 (R)	Processor Error Register
F5 (W)	Jump Address Low
F6 (R)	Processor Status Register
F6 (W)	Jump Address High
FA	Processor Control Register
FC	Interrupt Mask Register
FF	Local Storage Page

Buffer Adapter Registers with Improved Data Recording Capability

XRA Value	Register Name
E4	Diagnostic Data
E7	Register Select
E8	Register Page
EB	Status
ED	Mode
EE	Channel Mode

BCPH Register

- Type = Read/Write
- Card = 01A-A1L2
- XRA Value = C0

The Buffer Channel Pointer High (BCPH) register provides the high order half of the address used for channel storage cycles. It is incremented at the end of each channel storage cycle, except the last channel storage cycle, at the completion of Store CRC and Loop Write to Read operations. It is initialized before starting a Buffer Channel Side operation. The BCPH register is reset by Power-On-Reset (POR).

BCPL Register

- Type = Read/Write
- Card = 01A-A1L2
- XRA Value = C3

The Buffer Channel Pointer Low (BCPL) register provides the low order half of the address used for channel storage cycles. It is incremented at the end of each channel storage cycle, except the last channel storage cycle, at the completion of Store CRC and Loop Write to Read operation. It is initialized before starting a Buffer Channel Side operation. The BCPL register is reset by POR.

BCSE Register

- Type = Read/Write
- Card = 01A-A1K2
- XRA Value = D4

The Buffer Channel Status and Error (BCSE) register is used to indicate channel status and error conditions.

Note: All cards referenced by this table are on the 01A gate. To display the BCSE register, see "Register Display/Alter" on MD/SDISK 1

Bits 0-3 have the same meaning for all four channel groups.
Bits 4-7 (BCSE0) = Channel Error Group 0
Bits 4-7 (BCSE1) = Channel Error Group 1
Bits 4-7 (BCSE2) = Channel Error Group 2
Bits 4-7 (BCSE3) = Channel Error Group 3

Bit	Label	Description/Detail
0	Channel Pointer Equals Stop	A status condition set during a channel store cycle when buffer control detects that the last byte in the buffer has transferred for this channel data transfer operation.
1	Channel Stop	A status condition set after a Channel Stop condition is received from the buffer adapter card during channel read or write operations. Set after a Device Read End condition is received from the read data flow during a Loop to Read operation.
2	Microprocessor Write Complete	A status condition set after the data in the channel RAM containing the two CRC bytes has been stored.
3	Sample Channel Errors (This is a status condition.)	When set, enables the Channel Error Group pointer so that following each read of the BCSE register, the contents of the BCSE register are updated to the next error group. The first read of the BCSE register shows the errors for Error Group 0, the second read for Error Group 1, the third read for Error Group 2, and the fourth read for Error Group 3. The operation then is repeated.
4-7	Channel Errors	Bits 4 through 7 represent errors in each of the four error groups and change meaning for each group. Bits 4-7 of the BCSE register comes from Bits 0-3 of the CEG0, CEG1, CEG2, and CEG3 register respectively. Error groups are identified by the Channel Error Group Pointer. Channel Error Group 0 (CEG0): Bit 4 = Any channel error Bit 5 = Channel overrun Bit 6 = Channel Adapter to Buffer Adapter Parity Error Bit 7 = Buffer Control to Channel Adapter Parity Error Channel Error Group 1 (CEG1): Bit 4 = Buffer Control - FRU114 (A1L2), FRU120 (A1K2) Bit 5 = Buffer Adapter - FRU120 (A1K2), FRU114 (A1L2) Bit 6 = Buffer Memory - FRU113 (A1N2) Bit 7 = STI-FIPS/Channel Adapter Channel Error Group 2 (CEG2): Bit 4 = Channel Buffer Memory Address Parity Error Bit 5 = Buffer Memory Address Pointer Parity Error Bit 6 = Channel Buffer Memory Data Correctable Error Bit 7 = Channel Buffer Memory Data Uncorrectable Error Channel Error Group 3 (CEG3): Bit 4 = Buffer Adapter to Buffer Control Channel Data Bus Parity Error Bit 5 = Buffer Control Channel RAM Data Parity Error Bit 6 = Channel CRC Error Bit 7 = Not used

BCSS Register

- Type = Read/Write
- Card = 01A-A1L2
- XRA Value = D8

The Buffer Channel SARS (BCSS) register provides the addressing for the intermediate channel storage, for any data transfers between the channel storage and the buffer channel side interfaces . It is incremented each time a byte of data is read from, or written into the channel storage via one of the buffer channel side interfaces. The BCSS register is reset with a hardware or channel control reset.

BDSE Register

- Type = Read/Write
- Card = 01A-A1K2
- XRA Value = DE

The Buffer Device Status and Error (BDSE) register shows drive status and error conditions

Note: All cards referenced by this table are on the 01A gate. To display the BDSE register, see "Register Display/Alter" in MD/SDISK 1.

Bits 0-3 have the same meaning for all four device groups.
Bits 4-7 (BDSE0) = Device Error Group 0
Bits 4-7 (BDSE1) = Device Error Group 1
Bits 4-7 (BDSE2) = Device Error Group 2
Bits 4-7 (BDSE3) = Device Error Group 3

Bit	Label	Description/Detail
0	Device Pointer Equals Stop	A status condition set during a device store cycle when buffer control detects that the last data byte has been transferred for this device data transfer.
1	Device Read End	A status condition set after a Device Read End is received from the Read Data Flow.
2	Device Data Transfer Complete	A status condition set after the CRC bytes have been processed through the Device CRC Checker during a write operation. Is also set after the data in the device RAM, containing the two CRC bytes, has been stored during a Read and Store CRC operation.
3	Sample Device Errors (This is a status condition.)	When set, enables the Device Error Group pointer, so that following each read of the BDSE register, the contents of the BDSE register are updated to the next error group. The first read of the BDSE register shows the errors for Error Group 0, the second read for Error Group 1, the third read for Error Group 2, and the third read for Error Group 3. The operation then is repeated.
4-7	Device Errors	Bits 4 through 7 represent errors in each of the four error groups and change meaning for each group. Bits 4-7 of the BDSE register comes from Bits 0-3 of the CEG0, CEG1, CEG2, and CEG3 register respectively. Error groups are identified by the Device Error Group Pointer. Device Error Group 0 (DEG0): Bit 4 = Any device error Bit 5 = Device Data Overrun Bit 6 = Read Data Flow to Buffer Adapter Parity Error Bit 7 = Buffer Control to Buffer Adapter Device Data Bus Parity Error Device Error Group 1 (DEG1): Bit 4 = Buffer Control - FRU114 (A1L2) Bit 5 = Buffer Adapter - FRU120 (A1K2) Bit 6 = Buffer Memory - FRU113 (A1N2) Bit 7 = Read Data Flow Device Error Group 2 (DEG2): Bit 4 = Device Buffer Memory Address Parity Error Bit 5 = Device Buffer Memory Address Pointer Parity Error Bit 6 = Device Buffer Memory Data Correctable Error Bit 7 = Device Buffer Memory Data Uncorrectable Error Device Error Group 3 (DEG3): Bit 4 = Buffer Adapter to Buffer Control Data Bus Parity Error Bit 5 = Buffer Control Device RAM Data Parity Error Bit 6 = Device CRC Error Bit 7 = Not used

BDG0 Register

- Type = Read/Write
- Card = 01A-A1K2
- XRA Value = EB

Buffer Diagnostic 0 (BDG0) register is used for diagnostic purposes.

Bit	Label	Description/Detail
0	Shift Gate Select 0	Used to select one of eight scan paths on the BC card when the Shift Gate Enable bit equals a one, or one of two paths on the BA card when the Shift Gate Enable bit equal zero.
1	Shift Gate Select 1	See Bit 0.
2	Shift Gate Select 2	See Bit 0.
3	Shift Gate Enable	Used to start a scan operation on the BC card when the bit is set to a one.
4	Enable Correctable Error Status	When set to a one, enables the correctable error status to be put into the BCSE register.
5	Read End	When set to a one, issues a Read End Tag in diagnostic mode
6	Device Side Diagnostic	When set to a one, causes a drive operation in diagnostic mode.
7	Channel Side Diagnostic	When set to a one, causes a channel operation in diagnostic mode.

BDG1 Register

- Type = Read/Write
- Card = 01A-A1K2
- XRA Value = ED

The Buffer Diagnostic 1 (BDG1) register is used with diagnostic mode.

Bit	Label	Description/Detail
0	Scan Out Data (Read Only)	Used to sample the Scan Out Data from the BC card.
0	Scan In Data (Write Only)	Used for diagnostic scans of the BC card.
1	Service In (Read Only)	Samples the Service In tag. A value of one indicates that the Service In tag is active.
1	Scan Clock A (Write Only)	When set to a one, permits 'LSSD scan A clock' line to scan data for the BC card.
2	Data In (Read Only)	When set to a one, indicates that the Data In tag is active.
2	Scan Clock B (Write Only)	When set to a zero, permits 'LSSD scan B clock' line to scan data for the BC card.
3	Write End (Read Only)	When set to a one, indicates that the Write Data Flow End tag is active.
3	Disable ECC (Write Only)	When set to a one, disables buffer storage error correction.
4	Service Out	When set to a one, causes a Service Out tag in diagnostic mode to be sent.
5	Data Out	When set to a one, causes a Data Out tag in diagnostic mode to be sent.
6	Stop Out	When set to a one, causes a Stop Out tag in diagnostic mode to be sent.
7	Suppress Out	When set to a one, causes a Suppress Out tag in diagnostic mode to be sent.

BDPH Register

- Type = Read/Write
- Card = 01A-A1L2
- XRA Value = C5

The Buffer Device Pointer High (BDPH) register provides the high order half of the address used for drive channel storage cycles. It is incremented at the end of each drive storage cycle, except the last drive storage cycle, at the completion of a Read Data Flow operation. It is initialized before starting a Buffer Device Side operation. The BDPH register is reset by Power-on-Reset (POR).

Bit	Label	Description/Detail
0	Select Channel Adapter A	Specifies which of the channel adapters is to be selected.
1	Select Channel Adapter B	See Bit 0.
2	Reserved	
3	Reserved	
4	Device Address 8	Specifies which device address is to be used, or a displacement into a page of RAM.
5	Device Address 4	See Bit 4
6	Device Address 2	See Bit 4.
7	Device Address 1	See Bit 4.

BDPL Register

- Type = Read/Write
- Card = 01A-A1L2
- XRA Value = C6

The Buffer Device Pointer Low (BDPL) register provides the low order half of the address used for drive channel storage cycles. It is incremented at the end of each drive storage cycle, except the last drive storage cycle, at the completion of a Read Data Flow operation. It is initialized before starting a Buffer Device Side operation. The BCPL register is reset by a Power-on-Reset.

BWRP Register

- Type = Read/Write
- Card = 01A-A1L2
- XRA Value = D1

Bits 0-3 of the Buffer Wrap (BWRP) register control the setting of fixed 16, 32, 64, or 128K byte storage segments for Buffer Channel Side operations. Bits 4-7 control the setting of fixed 16, 32, 64, or 128K byte storage segments for Buffer Device Side operations. This register is reset by a Power-On-Reset.

Bit	Label	Description/Detail
0	Channel 128 K-byte Segment	Buffer Channel Side Operation
1	Channel 64 K-byte Segment	Buffer Channel Side Operation
2	Channel 32 K-byte Segment	Buffer Channel Side Operation
3	Channel 16 K-byte Segment	Buffer Channel Side Operation
4	Device 128 K-byte Segment	Buffer Device Side Operation
5	Device 64 K-byte Segment	Buffer Device Side Operation
6	Device 32 K-byte Segment	Buffer Device Side Operation
7	Device 16 K-byte Segment	Buffer Device Side Operation

External Register Bit Definitions (Continued)

CAE Register

The Channel Adapter Error (CAE) register is not a channel external register in the sense that it cannot be read directly. To get the data from the adapter error register you must transfer the data to an external register that can be read directly.

For the procedures, do the following steps (see "Register Display/Alter" on MD/SDISK 1).

To read the CAE:

1. Set the channel card control (CCC) register to hexadecimal:

   85 for channel adapter A
   45 for channel adapter B

2. Set the channel card address (CCA) register to hexadecimal D3 to write the CAE into the STI-FIPS adapter RAM.

3. Set the channel card address register to hexadecimal C3 to write the CAE into the channel data register (CDR).

4. Read the channel data register to get the contents of the CAE.

Bit	Definition
0	Multi-tag error
1	Channel Adapter RAM write parity error
2	Channel Adapter RAM read parity error
3	Buffer-data-in parity error
4	Channel Adapter to status store data parity error
5	Channel Adapter to status store response parity error
6	Status store to channel adapter data parity error
7	Status store to channel adapter response parity error

Note: There is one CAE register in each channel adapter. When an error occurs on channel adapter A, bit 4 of the CER register is set. Channel adapter B errors sets bit 5, and so on (see "CER Register" on DF 35).

CAS Register

The Channel Adapter Status (CAS) is a read only register. It is displayed by channel orders using the MD support diskette (see "Channel RAM Display" on MD/SDISK 1). The CAS register is located on the channel adapter card for the channel adapter that is selected.

01A-A2C2 for channel adapter A
01A-A2D2 for channel adapter B

The Channel Adapter Status (CAS) register has the following bit definitions.

Bit	Label	Description/Detail
0	Reserved	
1	Reserved	
2-4	TCU Mode/Type	The TCU Mode/Type Switch bits are set to the value of the three high order bits of the low order hex digit of the address switch (bits 4-6) on the operator panel. The bits are used by the microcode to control the operation mode of tape control unit buffer during data transfer mode.
5	Address Switch Parity Bad	Bit 5 is active when even parity is detected on the control unit address switches (high order hex digit and low order bit of the low order hex digit (bits 0-3, 7).
6	Collision Detected	Bit 6 is set if both tape control units in a two tape control unit subsystem have activated the collision detection hardware circuits. When Collision Detected is on, the 'adapters failure' to status store. This causes the failing channel adapter's bit to be set in the Channel Error Register (CER). Check 2 error and a level 6 interrupt then become active.
7	Reserved	

CCA Register

- Type = Read/Write
- Card = 01A-A1G2
- XRA Value = 03

The Channel Card Address Register (CCA) is used to present orders to the status store or channel adapter areas.

CCC Register

- Type = Read/Write
- Card = 01A-A1G2
- XRA Value = 00

The Channel Card Control (CCC) register is used by the microcode to control the selection of the channel adapters and specify the address that is to be used. It is also used with the CCA register.

Bit 0 selects channel adapter A
Bit 1 selects channel adapter B
Bit 2 reserved
Bit 3 reserved
Bits 4-7 specify the channel adapter RAM page.

CER Register

- Type = Read
- Card = 01A-A1G2
- XRA Value = 06

The Channel Error Register (CER) contains pointers to errors detected by the status store or channel adapter areas.

Notes:

1. Any active channel error register bit sets a Check 2 error.
2. All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	Status Store Basic Card Parity Error	Basic register parity check (internally checked). Status store basic (SSB) card - FRU121 (A1G2)
1	Status Store Communication Card Parity Error	Status store communication parity check (data from status store communication register to status store communication card checked). Status store communication (SCC) card - FRU122 (A1F2)
2	SSC Card to SSB Card Transfer Error	Remote tape control unit control transfer error (status store communication card to status store basic card).
3	XR Data Bus Parity Error	XR data parity error. XR data from the microprocessor card had bad parity. Microprocessor - FRU117 (A1D2)
4	Channel Adapter A Detected Error	Register parity check transfer error. Data from the channel adapter register to the status store card (A1G2) had bad parity. Channel Adapter A - FRU133 (A2C2)
5	Channel Adapter B Detected Error	Register parity check transfer error. Data from the channel adapter register to the status store card (A1G2) had bad parity. Channel Adapter B - FRU152 (A2D2)
6	Reserved	
7	Reserved	

Note: After the failing channel has been identified by the CER register bits 4-7, see "CAE Register" on DF 33 for more details.

CHM Register

- Type = Read/Write
- Card = 01A-A1K2 (with Improved Data Recording Capability feature)
- XRA Value = EE

The CHM register is used to set the channel mode. Only microcode can change the contents of this XR through an XR write operation. This register is reset by a hardware reset.

Bit	Label	Description/Detail
0	Bytes in Flight 0	See Bit 1
1	Bytes in Flight	These two bits determine the maximum number of outstanding in tag requests that are permitted. Bits 0-1 In Tag Bits Count 00 15 01 31 10 63 11 127
2	Channel Timer 0	See Bit 3
3	Channel Timer 1	These two bits determine the maximum amount of time the buffer adapter waits for an out tag before setting a channel overrun error. If the timer is disabled, a channel overrun error cannot be set. Channel Timer 0-1 Time Selected 00 Disabled 01 16 us 10 64 us 11 256 us
4	Channel Group	This bit determines the group of channel adapters (local or remote) through which a channel data transfer takes place. Bit On = Remote Bit Off = Local
5	Channel Mode 1	See bit 7
6	Channel Mode 2	See bit 7
7	Channel Mode 3	These three bits determine the channel data transfer rate and mode. Channel Mode 0-2 Channel Mode 000 1.5 Mb/s Interlock (Service in first) 001 1.5 Mb/s Interlock (Data in first) 010 1.5 Mb/s Streaming 011 2.0 Mb/s Streaming 100 3.0 Mb/s Streaming 101 Reserved 110 Reserved 111 Reserved

CMDT Register

- Type = Read/Write
- Card = 01A-A1K2 (with the Improved Data Recording Capability feature)
- XRA Value = E4

The CMDT register is used for diagnostic data transfers between the microprocessor and the buffer adapter, or buffer controller. The CMDT is reset to X'00' by a channel control reset.

CMM Register

- Type = Read/Write
- Card = 01A-A1K2 (with Improved Data Recording Capability feature)
- XRA Value = ED

The CMM register is used to set the operation mode for the Buffer Adapter Card.

Bit	Label	Description/Detail
0	Improved Data Recording Capability	This bit turns on Improved Data Recording Capability Format.
1	Ram Write/Read	When set to 1, this bit specifies that the RAM selected for the Comp Ram Diagnostic is to be written. When set to 0, the selected RAM is read.
2	Diagnostic Mode 0	Bits 2 and 3 set the diagnostic mode
3	Diagnostic Mode 1	00 = No Diagnostics 01 = Buffer RAM Diagnostic 10 = Buffer Channel Diagnostics 11 = Buffer Device Diagnostics
4	Maintain Separation	This bit is set for the Maintain Separation command.
5	Force 300 ns Clock Ring Error	When this bit is set it causes the 300 ns clock ring to go out of synchronization causing the 300 ns clock ring error to be set.
6	Force Toggle Feature Parity Error	When this bit is set the feature switch parity is defined as even and forces a feature switch parity error. When this bit is off the feature switch parity is defined as odd.
7	Pseudo Buffer End	This bit is set after receiving a buffer control interrupt at the end of a data transfer.

CMRP Register

- Type = Read/Write
- Card = 01A-A1K2 (with Improved Data Recording Capability feature)
- XRA Value = E8

The CMRP register is the microcode interface for reading and writing the channel adapter internal registers. These registers are addressable by the page and register number in the CMRS register. The CMRP register holds the data of the register addressed by the CMRS register.

Buffer Adapter Register Pages

Page #	CMRS Bits 1 - 3	# Regs Per Page	Type	Description
0	000	16	R	Comp 0 through Comp 3 Channel Byte Count Registers
1	001	0	NA	Reserved
2	010	3	R	C3P0 Error and Feature Level Registers
3	011	8	NA	Comp 0 through Comp 3 Error Registers
4	100	0	NA	Reserved
5	101	2	R/W	Buffer Adapter Diagnostic Registers
6	110	4	NA	Comp 0 through Comp 3 Diagnostic Registers
7	111	4	NA	Comp 0 through Comp 3 Configuration Registers

The above figure lists the buffer adapter register pages with their respective page addresses (CMRS XR bits 1-3). The desired register address within the page must be specified by writing CMRS XR, bits 4-7.

CMRS Register

- Type = Read/Write
- Card = 01A-A1K2 (with Improved Data Recording Capability feature)
- XRA Value = E7

The CMRS register is the microcode interface for selecting and accessing registers on the Improved Data Recording Capability buffer adapter card. These registers are organized into eight pages, and each page can contain up to 16 registers.

Bit	Label	Description/Detail
0	Auto increment CMRP register address	Setting this bit causes the CMRP register address to increment after each XR read of the CMRP XR.
1	CMRP page address 0	See bit 3.
2	CMRP page address 1	See bit 3.
3	CMRP page address 2	These bits select the CMRP register page to be accessed by either an XR read or write to the CMRP XR. There is a total of 8 CMRP register pages with a varying number of registers in each.
4	CMRP register address 0	See bit 7.
5	CMRP register address 1	See bit 7.
6	CMRP register address 2	See bit 7.
7	CMRP register address 3	These bits select the CMRP register to be accessed within a selected CMRP register page.

CMS Register

- Type = Read
- Card = 01A-A1K2 (with Improved Data Recording Capability feature)
- XRA Value = EB

The CMS register is used to post status information and is synchronized to the MP interface so that it may be read by microcode at any time.

Bit	Label	Description/Detail
0	Comp Busy	Set when the Comps are busy initializing their respective Encoders and Decoders. Also set when Improved Data Recording Capability is on during a channel read or write.
1	Channel End	Set when the end data is detected during a channel read or a channel write.
2	Buffer Control End	Set when the buffer transfers the last byte of data to the buffer control.
3	Xfer Complete/Overrun	Set when stop out or end indications and out tags corresponding to all generated in tags have been received.
4	Channel Op Complete	Set when a channel operation is complete. Not set for a zero byte transfer.
5	Improved Data Recording Capability installed	This bit is set to 1 when the Improved Data Recording Capability card is installed.
6	Improved Data Recording Capability allowed	Improved Data Recording Capability is allowed when this bit is set to 1. In a dual control unit subsystem both control units must have the Improved Data Recording Capability feature installed before Improved Data Recording Capability can be allowed.
7	Any Error	Set by any of the error bits on CMRP register page 2.

CRR Register

- Type = Read
- Card = 01A-A1G2
- XRA Value = 0F

The Channel Request Register (CRR) is used by status store to present status information about the channel adapter, status store, or message handling between the tape control units in a dual tape control unit subsystem.

Bit	Label	Description/Detail
0	Channel Adapter A Request	These bits indicate that their respective channel adapter has met one of the following conditions: • The adapter is at the end of initial selection and status has been accepted by the channel. • The adapter has received a Halt I/O, Selective Reset, or System Reset from the channel.
1	Channel; Adapter B Request	See Bit 0.
2	Reserved	
3	Reserved	
4	Acknowledge	Indicates that the other tape control unit has acknowledged receipt of a message. This bit is reset when the microcode sends a Write Message Buffer order.
5	Received	Indicates that this tape control uni, has received a message from the other tape control unit. This bit is reset when the microcode sends a Write Message Buffer order.
6	SS Order Ack	Indicates that the status store or the channel adapter has processed the order in the CCA register (A01). It is reset when register A01 is written into.
7	SS Response	Indicates that the status store or channel adapter has successfully processed the order that is in CCA register A01. This bit is valid only if bit 6 of this register is on.

DCB Register

- Type = Read/Write
- Card = 01A-A1Q2
- XRA Value = 68

The Device Control Bus (DCB) register is used to transfer information from the tape control unit microcode to the drive through 'bus out' using the Device Data Bus (DDB). It is also used to transfer information to the tape control unit microcode from the drive through 'bus in' using the DDB.

DCR Register

- Type = Read/Write
- Card = 01A-A1Q2
- XRA Value = 64

The Device Control Register (DCR) is used by the microcode to select and control the correct device lines.

Bit	Label	Description/Detail
0	Select Hi/Lo	When set to a zero, bit 0 gates the lines between the drive-adapter card and the drive (see Note), drivers and receivers. When set to a one, the (see Note) lines are gated to the drivers and receivers. The DCB and DTR registers are controlled by this bit. This bit is used also with bits 2 and 4.
1	Interrupt/ Secondary Select Hi/Lo	When set to a zero, permits the microcode to sense interrupts that are present (see Note). When set to a one, the interrupts (see Note) are sensed. The DIR register is controlled by this bit. When used as a secondary, and this bit is set to a zero, the serial data and clock are sent from the DSR and DSC register to the drives on the (see Note) interface. When set to a one, it is sent selected tape control unit (see Note). The DSR and DSC registers are controlled by this bit.
2	Enable Bus	When set to a one, permits the DCB register or write data flow, access to the device control bus. When set to a zero, the bus drivers are unconditionally disabled. The tape control unit that is enabled is controlled by DCR register bit 0.
3	ITD Enable	When set to a one, permits the DSC register, linked with the DSR register, to be used as an internal timer. It also degates the serial command and clock lines to the devices. When set to zero, the DSC and DSR registers operate as a serial interconnection.
4	Enable Write	When set to a one, with bit 2 also set to a one, permits the data from the write data flow, access to the drive control bus. When set to a zero, the write data flow does not have access to the drive control bus. DCR register bit 0 controls the tape control unit that is enabled.
5	ITC Time Out	When ITC equals zero. This bit will reset when a non- zero is set into the ITC.
6	ITD/Serial Command Complete	Set when the ITD or DSC contents equal zero. This occurs a the time of the timeout or after the secondary command has been sent to the drive. The bit resets when a non-zero value is set into the ITD register or a new secondary command is loaded into the DSR register.
7	Reset Repos	Sets the 'repositioning in'latch. **Note:** **Single Tape Control Unit Subsystem** Local = Tape Control Unit 0 - Addr 0-7 **Dual Tape Control Unit Subsystem** Local = Tape Control Unit 0 - Addr 0-7 Remote = Tape Control Unit 0 - Addr 8-F Local = Tape Control Unit 1- Addr 8-F Remote = Tape Control Unit 1- Addr 0-7

DIR Register

- Type = Read
- Card = 01A-A1Q2
- XRA Value = 61

The Device Interrupt Register (DIR) is used to present interrupts from any drive to the microcode. An interrupting device causes its corresponding bit and the P bit to be set in the DIR register. The hardware sets an error if only the P bit is on.

Bit	Description
0	Interrupt from drive 0
1	Interrupt from drive 1
2	Interrupt from drive 2
3	Interrupt from drive 3
4	Interrupt from drive 4
5	Interrupt from drive 5
6	Interrupt from drive 6
7	Interrupt from drive 7

DLR Register

- Type = Read
- Card = 01A-A1Q2
- XRA Value = 21

The Device Level Register (DLR) contains miscellaneous information.

Bit	Description
0	Reserved
1	01A-A1F2 logic card level, 0 = TA90
2	1 = TA90 ADx designator
3	Reserved
4	Reserved
5-7	Message language group: 000 - English 001 - French 010 - German 011 - Spanish 100 - English 101 - Italian 110 - English 111 - English

DSE Register

- Type = Read
- Card = 01A-A1Q2
- XRA Value = 67

The Device Status/Error (DSE) register shows device status and error conditions.

Note: All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	Drive Adapter-Card Parity Error	Bit 0 indicates that bad parity was detected by the drive adapter-card (A1Q2) on the device data bus (DDB). It is also used to permit interrupts from the drives to be signalled if the drive bus parity bit is on and no other drives bus lines are on.
1	Write Data Parity Error card	Bit 1 indicates that bad parity was detected on the MUX data path when the data was gated from the write data flow to the drive control bus. FRU116 (A1P2)
2	Drive Adapter-Card Parity Error	Bit 2 indicates that the device adapter-card had bad internal parity or there was an interrupt error. FRU118 (A1Q2)
3	Reserved	
4	Repositioning	Repositioning is used as a response to any serial sequence command that causes tape motion. It indicates that the drive is either repositioning or it is not at the command stoplock position.
5	Repositioning	Same as bit 4.
6	Reserved	
7	Reserved	

DTR Register

- Type = Read/Write
- Card = 01A-A1Q2
- XRA Value = 6B

The Device Tag Register (DTR) is used by the microcode to transfer control tags to and from the drive.

Bit	Label	Description/Detail
0	Select Out	Select Out is used to start the Initial Sequence to the drive and requires no response from the drive. Select Out must stay active during the complete connected part of the operation.
1	Address Out	Address Out is used to signal all the drives to decode the address that is on the bus. When the drive recognizes its address, its responds by placing its complement address on the bus and raising Address In.
2	Command Out	Command Out is a response to Address In during Initial sequence and indicates to the selected drive that the command on the bus is valid. Command Out stays active until Status In is received.
3	Clock A Out	Clock A Out is used during data transfer sequences and it is the odd parity of the nine data bits being transferred. During sense or control transfer sequences, Clock Out A is used as a response to Clock B In/Out. Clock A Out indicates to the selected drive that the tape control unit has accepted or provided the information on the bus that was requested by the drive generated Clock B In/Out line.
4	Gap In/Out	Gap In and Gap Out share a common bi-directional line. The microcode raises 'Gap Out' by writing in to the DTR register. The DTR register monitors the Gap In/Out line and raises Gap In for read operations.
5	Address In	Address In is used as a response to Address Out to indicate to the tape control unit that the address of the selected drive is valid. Address In is also used to indicate any error or unusual condition that is detected during a data transfer sequence.
6	Status In	Status In is used to indicate that the status information on the bus is valid. Status In is the response to Command Out during a Initial Sequence or a tape control unit ending sequence.
7	Clock B In	Clock B In/Out is a bi-directional line between the tape control unit and all attached drives. Its function is the same as Clock A Out.

ERA Register and ERAH (Holding)

ERA XR only

- Type = Read
- Card = 01A-A1D2
- XRA Value = B0

The ERAH is not a XR register, but it can be displayed using "TCU Scan Rings - Error" (see MD/SDISK 1).

Error register A (ERA) and error register B (ERB) are used to indicate check 1 error conditions. Normally, the processor is stopped before it reads the error registers. However, they can be read out using the MD Support Diskette Alter/Display program "TCU Scan Rings" (see MD/SDISK 1). The registers are also used to verify that the check 1 error detection circuits are working correctly.

ERAH is the holding register for the ERA register. If the check 1 error recovers on the retry operation, the ERAH or ERBH registers indicates the cause of the recovered check 1 error. If any bit is on in the ERA or ERB register, it means that the check 1 condition is a solid error and the ERA or ERB register(s) have meanings that are useful for troubleshooting.

Notes:

1. The ERA register does not include Check 1 errors that are caused by Forced Microcode Check 1 (PCR register, bit 5) errors.
2. All cards referenced by this table are on the 01A gate.
3. MD displays can indicate ERA and ERB as a single hex character field named 'ERAB'.
4. MD displays can indicate ERAH and ERBH as a single hex character field named 'HOLD'.

Bit	Label	Description/Detail
0	CS Data Parity Funnel Error	This bit is set when bad parity is detected in the micro- processor card (A1D2) on a word fetched from the control storage data bus or when the control storage source register indicates an invalid source.
1	Reg Source Funnel Error	This bit is set when the register source indicates an invalid source (valid sources are CS, LSR, JUMP, and XR registers). The error is inhibited until Initial Diagnostic Complete (PCR register bit 4) so that the microcode can initialize local storage. This is an internal error of the microprocessor card.
2	Microprocessor, Internal Data, or Clock Error	This bit is set when an error is detected by one of the three check latches in the microprocessor. 1. Control Storage Data Parity Error - Data transferred from the CS Data Bus to the Microprocessor or Data Bus. 2. Local Storage or External Register Data Parity Error - Data transferred from LS or XR Bus in to Microprocessor Data Bus In. 3. Registers internal to the microprocessor card have bad parity (even) or an invalid clock state (system clocks) was detected.
3	Current Interrupt Parity Error	This bit indicates that bad parity was detected in the 'current interrupt level' latches in the microprocessor card.
4	Processor Interrupt Level Parity Error	This bit indicates that bad parity was detected on the 'processor interrupt level' bus during an interrupt swap, in the microprocessor card.
5	LSR Address Parity Error	This bit indicates that bad parity was detected on the 'LSR selects and address' bus in the microprocessor card.
6	XR Address Parity Error	This bit indicates that bad parity was detected on the 'XR select and processor XR address' bus in the microprocessor card.
7	Processor Bus Out Parity Error	This bit indicates that bad parity was detected on 'processor bus out' during a register write operation. The error was detected in the microprocessor card.

ERB Register and ERBH (Holding)

ERB XR only

- Type = Read
- Card = 01A-A1D2
- XRA Value = F0

The ERBH is not a XR register, but it can be displayed using "TCU Scan Rings - Error" (see MD/SDISK 1).

Error register B (ERB) and error register A (ERA) are used to indicate check 1 error conditions. Normally, the processor is stopped before it reads the error registers. However, they can be read out using the MD Support Diskette Alter/Display program "TCU Scan Rings" (see MD/SDISK 1). The registers are also used to verify that the check 1 error detection circuits are working correctly.

ERBH is the holding register for the ERB register. If the check 1 error recovers on the retry operation, the ERBH or ERAH registers indicates the cause of the recovered check 1 error. If any bit is on in the ERB or ERA register, it means that the check 1 condition is a solid error and the ERB or ERA register(s) have meanings that are useful for troubleshooting.

Notes:

1. The ERA register does not include Check 1 errors that are caused by Forced Microcode Check 1 (PCR register, bit 5) errors.
2. All cards referenced by this table are on the 01A gate.
3. MD displays can indicate ERA and ERB as a single hex character field named 'ERAB'.
4. MD displays can indicate ERAH and ERBH as a single hex character field named 'HOLD'.

Bit	Label	Description/Detail
0	XR Address Compare Error	Set when the Processor XR Address bus bits 0-4 do not match the XR Address bus bits 0-4 (internal in the microprocessor card).
1	MP Register Error	Bad parity is detected in the IMR or PDR registers (internal in the microprocessor card).
2	Uncorrectable CS Read Error	The control storage error correction hardware detected an uncorrectable data word on a control storage fetch operation (error was detected by the CS card).
3	CS Address Parity Error	This bit indicates that bad parity was detected on the control storage address bus (error was detected by the CS card).
4	CS Refresh Error	This bit indicates that one of the three refresh error is in error (error was detected by the CS card).
5	Selection Check	This bit indicates that Multiple Card Selects was active (error was detected by the CS card).
6	Key Bit Check	The Key Bit Check bit indicates an error was detected from the control storage address bus parity bit (error was detected by the CS card).
7	CS Write Data Parity Error	This bit indicates that the data being written had bad parity (error was detected by the CS card).

MCR Register

The Maintenance Control Register (MCR) is not a readable register. The following description is for information only.

The four bits of the MCR register are set by individual MD commands. All bits are reset with a Reset MCR command.

The MCR is controlled by the "Microprocessor Control Utility," see MD/SDISK 1.

Bit	Description
0	Ignore Errors
1	Address Compare Stop
2	Check Stop
3	Check 2 = Check 1
4	Address Compare Sync
5	Program Flag

MDI Register

- Type = Read
- Card = 01A-A1E2
- XRA Value = A4

The Maintenance Data In (MDI) register has two functions:

1. When Maintenance Tag Out (MTO) register bit 2 (Read XR Active) and Maintenance Tag In (MTI) register bit 4 (XR Address Error) both equal 1, this register defines the logic card that contains the external register at the time of an external register error.
2. When MTO bit 2 or MTI bit 4 does not equal 1, this register contains commands or data transferred between the functional microcode and the maintenance device; however, this data does not provide valid pointers to external register logic cards.

Diagnostic routines only display the MDI register when the register can define the logic card that contains the external register that was addressed at the time of the external register error.

Use the following procedure to read the contents of the MDI register.

1. Display the MTI register to verify that bit 4 equals 1. If Bit 4 does not equal 1, no further troubleshooting information can be read, even if the bit is turned on.
2. Display the MTO register to verify that bit 2 equals 1. If bit 2 does not equal 1, write hexadecimal 20 into the register to turn on bit 2.
3. Display the contents of the MDI register to determine the logic card that contains the external register that was addressed at the time of the external register error.

   To display the MDI register, see "Register Display/Alter" on MD/SDISK 1.

Note: All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	Buffer Adaptar	One of the following external registers was addressed during an external register error: BCPH, BCPL, BDPH, BDPL, BCSH, BCSL, BDSH, BDSL, BWRP, BCC, BCSE, BCR, BCSS, BCPC, BDC, BDSE, BDR, BDSS, BDAT, BDG0, BDG1, BMR, or BDAT. FRU114 (A1L2) FRU120 (A1K2)
1	Status Store	One of the following external registers was addressed during an external register error: CCC, CCA, CDR, CER, CMR, or CCR. FRU121 (A1G2)
2	Device Adapter	One of the following external registers was addressed during an external register error: DSH, DSL, DIR, DLR, ITC, DCR, DSE, DCB, DTR, DSC, or DSR. FRU118 (A1Q2)
3	Read Data Flow	One of the following external registers was addressed during an external register error: RCR, RSR, RER, RRC, RPR, or RDC. FRU119 (A1S2)
4	Microprocessor	One of the following external registers was addressed during an external register error: ITB, ERA, ERB, ITA, XRA, PER, JAL, PSR, JAH, PDR, PCR, IMR, or LSP. FRU117 (A1D2)
5	Write Data Flow	One of the following external registers was addressed during an external register error: WSE or WCR. FRU116 (A1P2)
6	Maintenance Adapter	One of the following external registers was addressed during an external register error: MTI, MTO, MDI, or MDO. FRU115 (A1E2)
7	Reserved	

MDO Register

- Type = Read/Write
- Card = 01A-A1E2
- XRA Value = A7

The Maintenance Data Out (MDO) register is used to transfer information between the microcode and the maintenance device.

MSB Register

- Type = Read
- Card = 01A-A1E2
- To display the MSB register, see "Microprocessor Control" on MD/SDISK 1.

The Maintenance Status Byte (MSB) register contains the Maintenance Adapter and Microprocessor status.

Bit	Label	Description/Detail
0	Spare	
1	Status Modifier	This bit will always be off.
2	Extended Op in Progress	This bit indicates that the microprocessor is executing an Extended Op instruction (an instruction that requires more than one control storage fetch.
3	Address Compare Equal	This bit indicates a match between the compare address set by the Maintenance Device microcode and the control storage address that is referenced by the microprocessor.
4	Check 1 Hardware Error	This bit indicates a hard error in the microprocessor or other hardware circuits of this tape control unit.
5	MP Stopped	This bit is on if the microprocessor is stopped. The microprocessor may be stopped with a Stop MP command from the Maintenance Device, a Check 1 error condition, or by processor control.
6	Instruction Executed	This bit indicates to the microprocessor microcode that the microprocessor read an instruction from the control storage for execution during the last microprocessor cycle. This bit is used during a Force MP Instruction sequence to confirm the execution of the instruction before resetting force mode.
7	Error - MTI Status Stored	This bit indicates that error data is stored in the MTI register.

MTI Register

- Type = Read/Write
- Card = 01A-A1E2
- XRA Value = A1

The Maintenance Tag In (MTI) register controls the operation of the maintenance adapter (MA) and provides status and error conditions for the adapter and the subsystem.

To display the MTI register, see "Register Display/Alter" on MD/SDISK 1.

Note: All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	Maintenance Adapter Request/Response	A status condition that indicates to the microprocessor that another byte of information is ready to be taken by the microprocessor, or that another byte of information can be received by the maintenance adapter. This bit also acknowledges microprocessor Status Out.
1	Data Transfer or MD Connection Busy	Bit 1 indicates a status condition that is active during all data transfers to and from the microprocessor or indicates that the MD byte transfer is in process.
2	Maintenance Device Enabled	A status condition that indicates that the maintenance device is on-line and enabled.
3	XR Address Bus Parity Error	The maintenance adapter card A1E2 has detected bad parity on the XR address bus from the microprocessor card. FRU117 (A1D2)
4	XR Addressed Line Error	Either none or more than one XR addressed lines are active during an XR read or write cycle. External Register cards - FRU117 (A1D2); FRU115 (A1E2); FRU121 (A1G2); FRU120 (A1K2); FRU114 (A1L2); FRU116 (A1P2); FRU118 (A1Q2); FRU119 (A1S2)
5	MA Internal Card Error	The maintenance adapter card A1E2 detected an error internal to the card. This can be caused by the MA card, bad clock lines to the MA card from the control store (CS) card (A1H2), or voltages to either card. FRU115 (A1E2); FRU134 (A1C2)
6	MD Parity Error	The maintenance adapter card detected bad parity on serial data in line from the maintenance device. FRU = Maintenance Device
7	Check 1	Indicates that a Check 1 occurred that has not been reset by a check or hardware reset.

External Register Bit Definitions (Continued)

MTO Register

- Type = Read/Write
- Card = 01A-A1E2
- XRA Value = A2

The Maintenance Tag Out (MTO) register is used by the microcode to control the operation of the maintenance adapter and report status and other information about the subsystem.

To display the MTO register, see "Register Display/Alter" on MD/SDISK 1.

Bit	Label	Description/Detail
0	Not Used	
1	Wait Light	This bit is used by the microcode to indicate the amount of subsystem activity. Wait light blinks - Normal subsystem activity Wait light on continuous - No drive activity Wait light never on - subsystem in a loop or wait light circuitry problem (this is not a normal condition)
2	RD X/R Active	This bit gates the XR active latch to the MP.
3	Data Ready	This bit indicates that the data in the MDO register is ready to be transferred to the MD. For information only. Displaying the MTO register will change the values of bits 3-6.
4	MD Status Out	This bit indicates that the microcode needs the attention of the MD. For information only. Displaying the MTO register will change the values of bits 3-6.
5	Data Demand	This bit indicates that the microcode wants to send data to or receive data from the MA. For information only. Displaying the MTO register will change the values of bits 3-6.
6	Command/Data Received	This bit indicates to the MA that the MP has successfully received the command or data byte. For information only. Displaying the MTO register will change the values of bits 3-6.
7	Reserved	

PCR Register

- Type = Read/Write
- Card = 01A-A1D2
- XRA Value = BA

The microcode uses the Processor Control Register (PCR) to cause events or conditions to occur within the subsystem.

Bit	Label	Description/Detail
0	Force Interrupt	Forces an interrupt at levels 0 through 6, whichever is enabled. This directs the microcode to handle interrupts with more priority if they are not masked off. Interrupt priorities, high to low: Level 0 - Microprocessor of subsystem maintenance adapter Level 1 - Microprocessor (Timer) Level 2 and 3 - Read control Level 4 and 5 - Buffer control Level 6 - Status store Level 7 - All others Reset by the hardware automatically and will always read as a zero.
1	Return From Interrupt	Causes a PSW swap from the current level to the highest remaining level that has an interrupt pending. Reset by the hardware automatically and will always read as a zero.
2	Diagnostic Mode	When set, activates the 'diagnostic mode' line. Enables data with incorrect parity to be written to an external register. Prevents the MA from alerting the channel interface to disconnect during a check 1 condition.
3	Hardware Reset	When set, activates the hardware reset line. Causes all functional areas except the micro processor to initialize to a power-on condition. It is also forced active while power-on reset is active. Remains set for at least ten processor cycles.
4	Initial Diagnostic Complete	This bit is set by the microcode after the initial power-on diagnostics have successfully completed. Remains set until next power on sequence. Enables Reg Funnel Parity checker after all LSR locations have been initialized to good parity.
5	Forced Microcode Check 1	Activates the 'check 1' line when the microcode detects a non-recoverable error condition.
6	XR Address Extend 0	See Bit 7.
7	XR Address Extend 1	These two bits extend the XR addressing to 128 Read/Write registers. See 'External Register Addressing' on DF 3.

PER Register

- Type = Read
- Card = 01A-A1D2
- XRA Value = F5

The Processor Error Register (PER) contains status and error condition indicators.

Note: All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	MP Check 2	Set when a parity error is detected in the ITA/ITB timer registers (card A1D2). Reset by a check reset to the microprocessor, if the error no longer exists.
1	ITA/B = 0	Active if the ITA/ITB counter equals zero. When active, a level 1 (timer) interrupt is generated. Timer ITA/B is used by the microcode to time the different operations.
2	Collision Detect	Bit 2 on, indicates a problem in the dual control unit communication area. When one tape control unit attempts to communicate with the other tape control unit and does not receive a response, the tape control unit expecting the response causes bit 2 of the PER register in the tape control unit that did not respond to be set on. A microcode forced check 1 error is caused in the tape control unit that has PER register bit 2 on.
3	On-Line	Indicates the state of the online switch (one equals online).

Bit	Label	Description/Detail
4	XR Read Parity Error	Set if a read parity error is detected by the microprocessor card (A1D2) during an XR read operation. Reset by a Check Reset to the MA/MP. When active, causes XR Error and Check 2 to be set.
5	XR User Read Error	Set if the 'XR error ungated' line is active during an XR read operation. Reset by Check Reset to the MA/MP.
6	XR User Write Error	Set if the 'XR error ungated' line is active during an XR write operation. Reset by Check Reset to the MA/MP.
7	Normal Mode	Indicates the state of the Test/Normal switch. (1) for normal mode; (0) for test mode. See PANEL 1 for "Tape Control Unit Switches and Indicators" for the function of the switch.

PRR Register

The Processor Reset Register (PRR) is used to send a check reset to any or all functional areas. Each functional area is assigned a particular bit in the register. When the register is written, the check reset line is activated and, if bit 3 is not active, all functional areas whose bit is active performs a check reset. This register is a virtual register (no hardware) and does not store what was written. It is always reset after the write is complete.

Bit	Label	Description/Detail
0	Drive-adapter	
1	Maintenance adapter/processor	
2	Status store/channel adapter	
3	Must be a zero for check reset	
4	Buffer (drive side)	
5	Buffer (channel side)	
6	Write data flow	
7	Read data flow	

PROCESSOR STATUS REGISTER

- Type = Read
- Card = 01A-A1D2
- XRA Value = 36, 76, B6, and F6

The Processor Status Register (PSR) contains status indicators pertinent to error conditions.

Bit	Label	Description/Detail
0	XR Error	This bit continuously samples the condition of the 'XR error latched' line and is set whenever any of the three XR Error bits (PER register bits 4, 5 or 6) are set. Once set, the bit remains set until a check reset is issued to the MA/MP functional area.
4	Check 2	This bit continuously samples the status of the 'Check 2 error' line. When a Check 2 condition exists, this bit will be active. See "External Registers Data Flow/Error Detection" in the OPER section for more information.

READ CONTROL REGISTER

- Type = Read/Write
- Card = 01A-A1S2
- XRA Value = 45

The Read Control Register (RCR) is used by the microcode to control the operation of the read data flow and condition it to do the needed read function.

Bit	Label	Description/Detail
0	Read Gate	This bit is used by the read detection circuits to gate the VFC from the write clock onto the read data. It becomes active when Gap In is sensed and reset at the end of the device operation.
1	Read LWR	This bit conditions the read detection circuits to perform a Loop-Write-to-Read LWR operation. It is used on a short LWR operation.
2	Read Condition	This bit is used to activate the read data flow. It becomes active at the time the read data flow should start detecting beginning sync and is reset at the end of the operation.
3	Inhibit External Pointers	This bit, when active, inhibits the ECC from processing any pointers other than ECC pointers.
4	Read/Write	This bit specifies the type of operation; one equals read and zero equals write. Bit 4 is set before the rise of read gate and must not change until the end of the operation.
5	Fwd/Bkwd	This bit is active for the same duration for read or write operations. It is on for a forward direction and off for a backward direction.
6	Gap Out Enable Command Complete	This bit permits 'Gap Out' to be set under the control of the microprocessor. 'Gap Out' is set with a fixed delay after 'End Sync' is sensed, or after BOB (without sensing the ending sync), ERG, or TM when IBG is sensed.
7	Density Enable	This bit permits the display of the density pattern being read. See bits 0-3 of the "RDR" on DF 80.

RDC Register

- Type = Read/Write
- Card = 01A-A1S2
- XRA Value = 4F

The Read Diagnostic Control (RDC) register controls the diagnostic status and functions of the read logic.

Bit	Label	Description/Detail
0 (See Note)	Select Tone	This bit, when a one, permits the microprocessor to read the tone zones in the Read Pattern Register (RPR). Zones A through F will appear in bit positions 0 through 5 respectively.
1 (See Note)	Select Amp Sense	This bit, when a one, permits the microprocessor to read the amp sense zones in the Read Pattern Register (RPR). Zones A through F will appear in bit positions 0 through 5 respectively.
2	Disable ECC	This bit, when a one, disables the error correction from being performed. This permits the data record to be read into the buffer uncorrected.
3	Check Character Read	This bit, when a one, causes all the characters read from the tape (including the four ECC check characters) to be sent to the buffer during data frames.
4	Disable Dead Track Threshold	This bit, when a one, disables dead-tracking that is due to persistent pointers.
5	Enable BOB Processing	This bit is set by the microcode when the read head is still in the IBG to enable the hardware part of BOB processing.
6	Inhibit Dropping Pointers	This bit, when a one, will not let the ECC drop the pointers.
7	ECC Diagnostic	This bit, when a one, passes ECC diagnostic information instead of data.

Note: When the state of bits 0 or 1 changes, the RPR must be reset before its new value can be used.

READ ERROR REGISTER

- Type = Read
- Card = 01A-A1S2
- XRA Value = 49

The microcode uses the Read Error Register (RER) to get the FRU information detected by the read data flow. All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	FRU0	Skew Buffer Zones A and B: This bit indicates that one of the following conditions has occurred: 1. Skew Buffer Hardware Error (card A2K2) - The error is determined by the demodulator module on the ECC card (A1R2). RER bit 5 is also activated. 2. The 'gate read cycle' lines from this card (A2K2) are not equal to the 'gate read cycle' lines from the other two Skew Buffer Hardware Error cards (A2L2 and A2M2). RER bit 7 is also activated. 3. The 'ROC equals zero' lines from this card (A2K2) are not equal to the 'ROC equals zero' lines from the other two Skew Buffer Hardware Error cards (A2L2 and A2M2). RER bit 7 is also activated. FRUs for condition 1: FRU123 (A2K2); FRU111 (A1R2); FRU119 (A1S2) FRUs for conditions 2 and 3: FRU123 (A2K2); FRU119 (A1S2)
1	FRU1	Skew Buffer Zones C and D: This bit indicates that one of the following conditions has occurred: 1. Skew Buffer Hardware Error (card A2L2) - The error is determined by the demodulator module on the ECC card (A1R2). RER bit 5 is also activated. 2. The 'gate read cycle' lines from this card (A2L2) are not equal to the 'gate read cycle' lines from the other two Skew Buffer Hardware Error cards (A2K2 and A2M2). RER bit 7 is also activated. 3. The 'ROC equals zero' lines from this card (A2L2) are not equal to the 'ROC equals zero' lines from the other two Skew Buffer Hardware Error cards (A2K2 and A2M2). RER bit 7 is also activated. FRUs for condition 1: FRU124 (A2L2); FRU111 (A1R2); FRU119 (A1S2) FRUs for conditions 2 and 3: FRU124 (A2L2); FRU119 (A1S2)
2	FRU2	Skew Buffer Zones E and F: This bit indicates that one of the following conditions has occurred: 1. Skew Buffer Hardware Error (card A2M2) - The error is determined by the demodulator module on the ECC card (A1R2). RER bit 5 is also activated. 2. The 'gate read cycle' lines from this card (A2M2) are not equal to the 'gate read cycle' lines from the other two Skew Buffer Hardware Error cards (A2K2 and A2L2). RER bit 7 is also activated. 3. The 'ROC equals zero' lines from this card (A2M2) are not equal to the 'ROC equals zero' lines from the other two Skew Buffer Hardware Error cards (A2K2 and A2M2). RER bit 7 is also activated. FPUs for condition 1: FRU125 (A2M2); FRU111 (A1R2); FRU119 (A1S2) FRUs for conditions 2 and 3: FRU125 (A2M2); FRU119 (A1S2)

Bit	Label	Description/Detail
3	Acceleration Check	This can be a normal condition. For some write conditions, the drive can have limited instantaneous speed variations (ISV), and when the speed is more than the limits, write errors can occur. The ISV can cause changes in the write data density. Based on a pre-determined limit of ISV, the acceleration check is turned on and the microcode repeats the write before a write error occurs. If this bit is on and write errors are occurring, troubleshoot the write errors. If this bit frequently occurs without any other write error conditions, it can be an indication of wear of the tape media, mechanical tape path parts or the read/write head.
4	CRC Hardware Failure	This bit indicates that the CRC checker on the ECC card has failed and activates a Check 2 condition. FRU111 (A1R2); FRU119 (A1S2)
5	FRU5	This bit indicates that one of the following conditions has occurred: 1. Skew Buffer Hardware Errors 1, 2 and 3 as determined by the demodulator module on the ECC card (A1R2). 2. ARP registers parity error during a sample period. 3. Correction registers parity error during a sample period. 4. Decode parity error during a sample period. 5. Incorrect parity on the corrected data bus during the residual byte. Possible FRUs. Condition 1: FRU123 (A2K2); FRU124 (A2L2); FRU125 (A2M2) Conditions 2-5: FRU111 (A1R2); FRU119 (A1S2)
6	FRU6	This bit indicates that one of the following conditions has occurred: 1. The data buffer did not respond correctly following the 'read data ready' signal. 2. The read clock and format did not respond correctly following the 'read data ready' signal. This bit also sets RER bit 7. Possible FRUs. FRU120 (A1K2); FRU119 (A1S2)
7	FRU7	This bit indicates that one of the following conditions has occurred: 1. Skew Buffer Hardware Errors 1, 2 and 3 as determined by the 'gate read cycle' and 'ROC equals zero' signals. Also sets the respective skew buffer hardware error bits (RER bits 0, 1 and 2). 2. The clock module on A1S2 is not cycling correctly. 3. The module 18 and module 8 counters are not in sequence. (Write/Read data flow counters are used to control data transfer.) 4. The read clock and FMT card detected bad parity on the corrected data bus during the residual byte. RER bit 3 will be set if this error occurs. 5. The data buffer did not respond correctly following the 'read data ready' signal. This condition also sets RER bit 6. 6. The read clock and FMT did not respond correctly following the 'read data ready' signal. This condition also sets RER bit 6. Possible FRUs. Condition 1: FRUs are indicated by bits 0-2. FRU123 (A2K2); FRU124 (A2L2); FRU125 (A2M2) Conditions 2 and 3: FRU119 (A1S2) Condition 4: FRU111 (A1R2); FRU119 (A1S2) Conditions 5 and 6: FRU120 (A1K2); FRU119 (A1S2)

RPR Register

- Type = Read
- Card = 01A-A1S2
- XRA Value = 4C

The Read Pattern Register (RPR) is a selectable register for pattern, tones, or amp sense. It is selected by the Read Diagnostic Control (RDC) register. In Normal mode, it is used by the microcode to determine the type of information being detected by the read logic. See the RDC register for more information.

Bit	Label	Description/Detail
0	IBG/ID18	The meaning of bits 0, 1, 2, and 3 depends on the setting of the Density Enable bit (RCR register bit 7). When Density Enable is not on, these bits indicate when an IBG, TM, ERG, or SPR pattern is being sensed. A TM indication will cause an interrupt level 2. This interrupt level is active when the RPR register bit 1 is set and RCR register bit 7 is not set. When Density Enable is on and a density pattern is being detected, bits 0, 1, 2, and 3 are an indication of the actual density being read.
1	TM/SID1	See Bit 0.
2	ERG/SID2	See Bit 0.
3	SPR/SID3	See Bit 0.
4	BOB	This bit indicates that a data block is being sensed by the read logic. It will be active when one or less zones are active and a no data condition does not exists. This bit causes a interrupt level 2. This level will be active when the RPR register bit 4 is present.
5	VOID	This bit indicates that a no data condition is being sensed.
6	NOA	This bit indicates that none of the other defined patterns exist.
7	Reserved	

Note: See "RCR Register" bit 7 and "RDC Register" bits 0 and 1 for more details.

RRC Register

- Type = Read
- Card = 01A-A1S2
- XRA Value = 4A

The Read Residual Count (RRC) register stores the residual byte count that is read from the tape. The count is equal to the number of pad bytes that were written and are in a number range of 0 to 13. The microprocessor uses the count to determine the location and number of pad bytes in the buffer so that the count is not sent to the channel.

Bit	Label	Description/Detail
0	Block IDA	Bits 0 and 1 form the encoded modulo 4 count of the block ID.
1	Block IDB	See Bit 0.
2	Reserved	
3	Reserved	
4-7		Contains the encoded residual byte count read from the drive.

RSR Register

- Type = Read/Write
- Card = 01A-A1S2
- XRA Value = 46

The Read Status Register (RSR) contains the status of the read or write operation as it progresses. It also contains the status of the error correction attempts.

Bit	Label	Description/Detail
0	Beginning Sync	This bit indicates that the beginning sync pattern was recognized by the read data flow card. When this bit is active, interrupt level 3 is signaled.
1	Ending Sync	This bit indicates that the ending sync pattern was recognized by the read data card. When this bit is active, interrupt level 3 is signaled.
2	Gap Out Timing	This bit is active when the IBG and TM or ERG or BOB are active in the Read Pattern Register (RPR). If bit 6 of the Read Control Register (RCR) is also active, interrupt level 3 is signaled, which causes 'gap out' to be sent to the drive. The drive must receive 'gap out' within a specified time in order to control the gap size.
3	Gap In	This bit is set when 'gap in' is sent by the drive during tape repositioning. It indicates that the end of the last record read or written was sensed at the read/write head.
4	Data Corrected	This bit is set when ECC corrections to the record just read are made. Bits 5-7 of this register indicate whether the corrections were successful.
5	Data Check	This bit indicates that the ECC could not correct this data block and it must be repositioned for a retry. A check 2 interrupt is signaled when this occurs.
6	Multitrack Indicator	This bit indicates that more ECC pointers were detected then the operating threshold permits. A check 2 interrupt is signaled when this occurs during write operations.
7	CRC Check	This bit indicates that a data check was detected. A check 2 interrupt is signaled when this occurs.

WCR Register

- Type = Read/Write
- Card = 01A-A1P2
- XRA Value = 40

The Write Control Register (WCR) controls the operation of the write data flow and conditions the appropriate write function.

Bit	Label	Description/Detail
0	Block IDA	Bits 0 and 1 form the modulo 4 count of the 2 bit ID. They are set to the starting ID (before Gap In) for the first record. On following write operations, the microcode must set the ID somewhere in the IBG before the record which they are to be used. They should not change again until the next IBG.
1	Block IDB	See Bit 0.
2	LWR	This bit conditions the write logic to execute a Loop-Write- to-Read operation.
3	DIAG	This bit conditions the modulation encoder to handle the diagnostic data supplied to the write data flow functional area.
4	Reserved	
5	Write Data Flow Op Enable	When this bit equals a one, bits 6 and 7 have the meaning indicated.
6	Write Mode A	Bits 5, 6, and 7 cause the Write Data Flow to write the following command information: BIT 5 6 7 COMMAND 1 0 0 Write Data 1 0 1 Write TM 1 1 0 Write ERG 1 1 1 Write Density These bits must be valid before the write head is one third of the way through the preceding IBG, when writing a record. They cannot change again until Device Data Transfer Complete (Bit 0 of the BDS register) is detected. This indicates that a full record has been transferred to the drive. To continue writing to this drive, these bits must be valid before the write head is two thirds of the way through the IBG.
7	Write Mode Bits	See Bit 6.

WSE Register

- Type = Read
- Card = 01A-A1P2
- XRA Value = 43

The Write Status/Error (WSE) register contains the status of the write circuits and the write operation currently in progress

Bit	Label	Description/Detail
0	Write Operation	This bit is active when 'gap in' is received from the drive. It is reset during a write operation if bit 5 of the Write Control register (WCR) does not become active during the IBG mark. When this bit is not active, there is no writing of data. Also, this bit is not affected by any resets to the write circuits.
1	End Write	This bit indicates that the last byte of the postamble has been written. The IBG mark must be still written.
2	Reserved	
3	Reserved	
4	Error 2	This bit indicates a write control error.
5	Error 3	This bit indicates a write data flow error.
6	Error 4	This bit indicates a multiplexed data parity error.
7	Reserved	

XRA Register

- Type = Read
- Card = 01A-A1D2
- XRA Value = F3

The External Register Address (XRA) register saves the value of the external register address during execution cycles of instructions that address XR registers. When an XR error is detected, this register is latched and it contains the address of the XR register being addressed. The XRA register is reset by MP Reset or Power-On-Reset (POR).

Note: All cards referenced by this table are on the 01A gate.

Bit	Label	Description/Detail
0	XR Address Extend Bit 0	Set from processor control register bit 6. See Bit 1.
1	XR Address Extend Bit 1	Set from processor control register bit 7. Bits 0 and 1 indicate which XR page to access. Bit 0 Bit 1 XR Page 0 0 A 0 1 B 1 0 C 1 1 D
2	XR Address Bus Bit 0	Bit 7 of current instruction. See Bit 5.
3	XR Address Bus Bit 1	Bit 8 of current instruction. See Bit 6.
4	XR Address Bus Bit 2	Bit 9 of current instruction. See Bit 6.
5	XR Address Bus Bit 3	Bit 10 of current instruction. See Bit 6.
6	XR Address Bus Bit 4	Bit 11 of current instruction. Bits 2 through 6 are set from CS Data Bus Hi/Lo bits 7 through 11 for instructions that address XR registers.
7	XR Address Bus Parity	Set for even parity for XR (external register) bus address bits 0 through 4. This bit is generated by the microprocessor card (A1D2) for even parity on the XR Address Bus (bits 0-4, and P).

Buffer Adapter Internal Registers

Note: All of the internal buffer adapter registers are present if the buffer adapter card supports the Improved Data Recording Capability feature. None of the registers are present if the Improved Data Recording Capability feature is not installed.

These are internal registers and cannot be accessed directly. These registers can only be accessed by putting the page and register numbers into the CMRS register and reading or writing the CMRP register. See MG page DF 10 and 07 for more information.

Page 0 Registers

Type = Read Only

This page contains four sets of channel byte count registers from COMP0-3. The four channel byte count registers in each COMP count the total number of bytes transferred to or from the channel. Channel byte count 0 is the most significant byte of the count field. The registers can be reset by Channel control.

REG	MNEMONIC	NAME
0	CP0B0	COMP0 Channel Byte Count 0
1	CP0B1	COMP0 Channel Byte Count 1
2	CP0B2	COMP0 Channel Byte Count 2
3	CP0B3	COMP0 Channel Byte Count 3
4	CP1B0	COMP1 Channel Byte Count 0
5	CP1B1	COMP1 Channel Byte Count 1
6	CP1B2	COMP1 Channel Byte Count 2
7	CP1B3	COMP1 Channel Byte Count 3
8	CP2B0	COMP2 Channel Byte Count 0
9	CP2B1	COMP2 Channel Byte Count 1
A	CP2B2	COMP2 Channel Byte Count 2
B	CP2B3	COMP2 Channel Byte Count 3
C	CP3B0	COMP3 Channel Byte Count 0
D	CP3B1	COMP3 Channel Byte Count 1
E	CP3B2	COMP3 Channel Byte Count 2
F	CP3B3	COMP3 Channel Byte Count 3

Page 2 Registers

Type = Read Only

This page contains three registers used to report errors detected by the C3PO or display the buffer adapter feature level.

REG	MNEMONIC	NAME	RESET
0	CTE0	C3PO Error 0	Check 5
1	CTXE	C3PO XR Error	Check 5
2	CMFL	Buffer Adapter feature level	None

	CTE0 Register	CTXE Register	CMFL Register
Bit	*Name/Description*	*Name/Description*	*Name/Description*
0	Channel Overrun Error	Comp XR Error	Improved Data Recording Capability Installed
1	100 ns Clock Ring Error	XR Write Data Parity Error	EC Level 0
2	300 ns Clock Ring Error	XR Read Data Parity Error	Comp EC Level 1
3	Comp Control Parity Error	XR Output Parity Error	Improved Data Recording Capability allowed
4	Channel Toggle Error	Reserved	Reserved
5	Channel Data Parity Error	Reserved	Reserved
6	Feature Level Parity Error	Reserved	Reserved
7	CRC Error	Reserved	Reserved

Page 3 Registers

Type = Read Only

This Improved Data Recording Capability page consists of four sets of two error registers found in COMP0-3. Each COMP has two error registers, COMP Error 0 and COMP Error 1. The bit organization is the same for each COMP register.

REG	MNEMONIC	NAME	RESET
0	CP0E0	COMP0 Error 0	Check 5
1	CP0E1	COMP0 Error 1	Check 5
2	CP1E0	COMP0 Error 0	Check 5
3	CP1E1	COMP0 Error 1	Check 5
4	CP2E0	COMP0 Error 0	Check 5
5	CP2E1	COMP0 Error 1	Check 5
6	CP3E0	COMP0 Error 0	Check 5
7	CP3E1	COMP0 Error 1	Check 5

	COMP0-3 Error 0	COMP0-3 Error 1
Bit	*Name/Description*	*Name/Description*
0	Upper CRC Error 0 (UCRC0)	Channel Adapter Data Parity Error
1	Upper CRC Error 1 (UCRC1)	Channel Adapter Master Transfer Error
2	Lower CRC Error 0 (LCRC0)	C3PO to Channel Adapter Interface Error
3	Lower CRC Error 1 (LCRC1)	Buffer Control Channel Interface Error
4	Lower CRC Error 2 (LCRC2)	Buffer Control Master Transfer Error
5	Lower CRC Error 3 (LCRC3)	C3PO 100 ns Clock Ring Error
6	Initialization Error	Channel Byte Count Overflow
7	Encode Not Equal to Decode	C3PO to Channel Adapter Overflow Error

Page 5 Registers

Type = Read/Write

This page contains two registers that provide the microcode interface for the diagnostic operations on the buffer adapter card.

REG	MNEMONIC	NAME	RESET
0	CMD0	Buffer Adapter	Channel Control
1	CMD1	Diagnostic Register 1	Buffer Adapter

	CMD0 Register	CMD1 Register
Bit	*Name/Description*	*Name/Description*
0	Shift Gate Select 0	Scan Out Data (Read) or Scan In Data (Write)
1	Shift Gate Select 1	Service In (Read) or Scan A Clock (Write)
2	Shift Gate Select 2	Data In (Read) or Scan B Clock (Write)
3	Shift Gate Enable	Write End (Read) or Read End (Write)
4	Gate BC	Service Out
5	Disable ECC	Data Out
6	Reserved	Stop Out
7	Reserved	Suppress out

Page 6 Registers

Type = Read/Write

This page contains four registers in COMP0-3 that are used to select internal diagnostic functions. The organization of these COMP Diagnostic Registers is the same for each COMP.

REG	MNEMONIC	NAME	RESET
0	CP0D	COMP0 Diagnostic	Channel Control
1	CP1D	COMP1 Diagnostic	Channel Control
2	CP2D	COMP2 Diagnostic	Channel Control
3	CP3D	COMP3 Diagnostic	Channel Control

	CMP0-3 Diagnostic Registers
Bit	*Name/Description*
0	RAM Select 0
1	RAM Select 1
2	RAM Select 2
3	Disable Encoder and Decoder
4	Force Bad Parity
5	Force Busy
6	Force Encode Statistic RAM Initialization Error
7	Force Decode Statistic RAM Initialization Error

Page 7 Registers

Type = Read/Write

This page consists of four registers in COMP0-3 that are used to establish operation parameters at power on time. The organization of the COMP configuration registers is the same for each COMP.

REG	MNEMONIC	NAME	RESET
0	CP0C	COMP0 Configuration	POR
1	CP1C	COMP1 Configuration	POR
2	CP2C	COMP2 Configuration	POR
3	CP3C	COMP3 Configuration	POR

	CMP0-3 Configuration Registers
Bit	*Name/Description*
0	COMP Online/Offline (1 = online)
1	COMP ID 0
2	COMP ID 1
3	COMP ID 2
4	COMP Count 0
5	COMP Count 1
6	1 or 2 Statistics RAMs (1 = Stat RAM 2)
7	Global CRC

Reading COMTAB

Follow the flow diagram in the CE/HSC section to use the panel to access COMTAB. The contents of COMTAB are interpreted as follows:

The first display will read: "COMTAB: XX"

"XX" is byte 8 of the COMTAB. This value will be nonzero if an error has been detected. Bytes 8 and 9 of COMTAB indicate which are of the machine has failed. Use the chart on this page to determine the failed area.

The next screens of COMTAB have the following meaning:

```
Bytes 0-6      same as sense byte data
Byte  7        92, indicating COMTAB
Bytes 8,9      which area of the machine is failed
Bytes 10,11    configuration data
```

After byte 11, scroll through the COMTAB until the first 4 nonzero data bytes are displayed. The first two bytes will be the error code (FSC) and the second two bytes will be the support diagnostic ID.

Notes:

1. If the IML diskette is the source of the failure, there will be no diagnostic ID, only 2 bytes of error code.
2. COMTAB is available from the CE Panel and from the system error log (see MSG), when a POR failure occurs, and the TCU is able to report it.

When COMTAB data is in the system error log, all spare bytes are eliminated.

COMTAB Table

The COMTAB word 0 defines the area of the machine which failed during IML or during POR. It may also contain other engineering information.

Byte	Bit	Label	Description/Detail
8	0	CSU Flag	Used to indicate installation tests still running.
8	1 - 3	POR Return Code	0 = Successful 1 = Check 1 2 = Check 2
8	4	JIBFAIL	JIB Failure during POR
8	5	EXTREG	External register failure during POR
8	6	BUFFER	Buffer failure during POR
8	7	LOOPWR	Loop-write-to-read failure during POR
9	8	STATSTOR	Status store failure during POR
9	9	HDWCHKR	Hardware checker failure during POR
9	10	Spare	
9	11	CHANNELA	Channel adapter A failure during POR
9	12	CHANNELB	Channel adapter B failure during POR
9	13	Spare	
9	14	Spare	
9	15	IMLDISK	IML diskette failure during POR

CST Table

The Command Status Table (CST) contains information about the command currently executing with a drive. The fields in the CST are set by microcode. This table is accessed by the drive address using the MD support diskette Subsystem Display/Alter program.

Word 0

Bits	Field	Function	Detail
0-3	ADSTAT	Provides initial status and interrupt condition indications generated by the STI-FIPS adapter.	0 = CCW accepted 1 = End of command chain 2 = Interface disconnect 3 = Selective reset 5 = Data path not available 6 = Invalid buffer conditions 7 = CCR interrupt - CCR stacked, refused, or channel did not chain from the device end after a CCR. 8 = Subsystem error 9 = Command sequence invalid A = Reserved different group B = Command reject C = Bus out parity error D = Deferred unit check E = Device not ready F = Device file protected
4-7	DRIVE	Provides the drive address for which a channel command was received.	
8-12	CMD	Indicates which 5-bit channel command code is to be executed.	The 5-bit channel command codes accepted by the tape control unit are: **SENSE COMMANDS:** '00' - Modesets other than TA90 '08' - Read block ID '10' - Sense '18' - Sense I/O device '20' - Sense path group ID '28' - Read buffered log **READ/WRITE COMMANDS:** '80' - No operation '88' - Locate block '90' - Synchronize buffer '98' - Write 'A0' - Read 'A8' - Read backward 'B0' - Test I/O 'B8' - Data security erase **CONTROL COMMANDS:** 'C0' - Rewind 'C8' - Rewind unload 'D0' - Erase gap 'D8' - Write tape mark 'E0' - Forward space block 'E8' - Backspace block 'F0' - Forward space file 'F8' - Backspace file **MISCELLANEOUS COMMANDS:** '40' - Control access '48' - Set path group ID '50' - Suspend multipath reconnection '58' - Read data buffer '60' - TA90 mode set '68' - Load display '70' - Assign '78' - Unassign
13	SPVRINH	Indicates that supervisor operations are inhibited.	
14-15		Reserved	

CST Table (Continued)

Word 1

Bits	Field	Function	Detail
0-3	CHANNEL	Identifies which of this tape control unit's channel adapters received the command.	1 0 0 0 = Channel Adapter L 0 1 0 0 = Channel Adapter R
4	RECCU	Receiving TCU's bit indicates which tape control unit received the command.	0 = Tape Control Unit 0 1 = Tape Control Unit 1
5	PENDING	Command Pending bit indicates that a command is in progress for a drive.	
6	FIRST	1st pass complete bit indicates that the first part of a given command is complete.	
7	RETRY	Command Retry bit indicates that the channel command retry status for the addressed drive has been accepted.	
8	RECERR	Record-In Error bit indicates that the read command has a permanent error, but must transfer any available read data to the channel before performing a unit check on the command.	
9	NODATA	Indicates that a read operation had to be performed (because no data was in the buffer for this drive) when a read command was sent from the channel.	

Bits	Field	Function	Detail
10	WRTMODE	Write Mode bit indicates whether the drive is operating in tape write or buffer write mode.	0 = Buffer write mode 1 = Tape write mode
11	NOTIFY	Indicates that Continue Command execution is to be notified by scan when a drive operation has been marked complete.	
12-15	CCPARM	The Continue Command execution parameter is used by Continue Command execution when it has been notified by scan that a device operation has been marked complete.	**DEVICE PREPARATION CODES:** 0 0 0 1 = Read ahead stopped 0 0 1 1 = Buffer write operation complete 0 0 1 0 = Repositioning complete 0 1 0 0 = Spare code 0 1 0 1 = Spare code 0 1 1 0 = Spare code **BUFFER MANAGEMENT CODES:** 0 1 1 1 = Buffer deallocation pending 1 0 0 0 = Device sending in progress 1 0 0 1 = Spare code 1 0 1 0 = Spare code 1 0 1 1 = Spare code **SPECIAL EXECUTION CODES:** 1 1 0 0 = Sector location complete 1 1 0 1 = Selective reset buffer write complete 1 1 1 0 = Repositioning because of off-line sequence 1 1 1 1 = Spare code

CST Table (Continued)

Word 2

Bits	Field	Function	Detail
0	LOCDIR	Indicates the search direction by the microprocessor for the Locate Block command.	0 = Forward search in progress 1 = Backward search in progress
1	CHANGE	Indicates whether a change in search direction for the Locate Block command has occurred. Also indicates if the read direction has been changed to determine when to set the Inhibit ERPS in the Logical Device Table (LDT) and the Suppress Read Ahead bit 4 in the CST.	
2	NERP	Permanent Inhibit TCU ERPS bit indicates that the Inhibit ERPS bit in the Logical Device Table (LDT) for this device should not be reset at the end of the command chain.	
3	INTDIS	Indicates that a interface disconnect has been detected and the channel adapter has not responded with device freed. This bit is set by OCSSPMOS and reset by OCSMDFOS when the device freed has occurred.	
4	SUPRDA	Suppress Read Ahead bit is set whenever a write type command has been received or whenever the read commands that have been received have changed direction twice. When set, this bit causes read ahead operations to be inhibited until a tape mark has been read or written, or that a Locate Block, Rewind Unload Device operation has been initiated.	
5	CONCONN	Contingent Connection bit indicates that the drive is connected to the channel that issued the command (which has unit checked) until the next SIO has been accepted by the tape control unit.	
6	DISCON	Indicates that an interface disconnect has been detected by the channel adapter and has been acknowledged by the microcode.	

Bits	Field	Function	Detail
7	SELRST	Indicates that a 'Selective Reset' has been detected by the channel adapter and that the reset is in progress.	
8	CHEND	Indicates that a 'Channel End' status byte has been accepted by the channel and that a Device End has not been received from the addressed drive.	
9	PERROR	Indicates that a 'Permanent Error' has occurred with write data in the drive's buffer segment. All existing write data will be deleted from the buffer segment if a tape motion command is received.	
10	CCRINT	Indicates that the channel adapter has generated a Channel Command Retry Interrupt (CCR Interrupt) because a CCR was either stacked or refused by the channel.	
11	ADUCK	Indicates that the channel adapter generated a unit check during initial status and presented the status to the channel.	
12	PTRANS	Indicates that a 'Permanent Parameter Data Transfer Error' occurred and that the current command must be unit checked.	
13	SYSRES	Indicates that a 'System Reset' was detected by the channel adapter.	
14	LBBIT	The 'Load Balanced Requested Bit' indicates that the balancing algorithm has determined that the addressed drive can be connected to the remote tape control unit when conditions are appropriate.	
15	SENDEV	Indicates that a drive whose buffer is assigned to the local tape control unit will operate better with the remote tape control unit and should be connected to it when conditions are appropriate.	

CUT Table

The Tape Control Unit Operations Table (CUT) contains information that only pertains to the tape control unit. It also contains flags that control the operation of the tape control unit.

Word 0

Bits	Field	Function	Detail
0	INRDAHD	Inhibits read ahead operations on any drive connected to this tape control unit (Set by MD only). See Note 1.	
1	INBUFWR	Inhibits buffered write operations for any device connected to this tape control unit (Set by MD only). See Note 1.	
2	INLDBAL	Inhibits this tape control unit from load balancing a drive to the other tape control unit (Set by MD only). See Note 1.	
3	INERPS	Inhibits this tape control unit from performing any internal ERPS (Set by MD only). See Note 1.	
4	INRCNCT	Inhibits this tape control unit from using the reconnect algorithm and Reconnect Timer (ITC), (Set by MD only). See Note 1.	
5	OFFLBUFL	Indicates to the sending device to set Device Error. Causes the buffered log to be transferred to the host (Set by MD only). See Note 1.	
6	FORCELOG	Causes this tape control unit to be in forced logging mode. Sense data is logged at the host for all errors (Set by MD only). See Note 2.	
7	INELYST	Inhibits this tape control unit from using the early start algorithm and Early Start Timer (ITD), (Set by MD only). See Note 1.	
8	DEFERUC	Indicates a deferred unit check. Unit check will be presented to the next CCW processed by this tape control unit.	

Notes:

1. These functions can be reset by:
   a. Disconnecting the MD from the tape control unit.
   b. Using the trace/match control reset function on the MD Support Diskette. See "Trace/Match Control-Select Control Options" on MD/SDISK 1.
2. Forced logging mode can be reset by:
   a. An IML.
   b. Using the trace/match control reset function on the MD Support Diskette. See "Trace/Match Control-Select Control Options" on MD/SDISK 1.

Bits	Field	Function	Detail
9	DIAGREAD	Indicates that this tape control unit is in LWR with ECC disabled. This bit is set at the same time that Bit 3 in the Read Diagnostic Control (RDC) register is set.	Setting this bit causes: All 18 tracks of data are read into the buffer from tape. No Block ID Errors will be flagged. All data read into the buffer will be transferred to the channel.
10	INITTIO	Indicates that Test I/O's are scheduled for all drives and are executing.	
11	INHSEL	Inhibits this tape control unit from selecting any drive.	
12	DISKIML	Indicates that this tape control unit has just been IML'ed from diskette device. This bit is only valid during initialization and resets later.	
13	NOPAIRS	Indicates that no buffer segments are available to join two segments to double the size of the buffer for a drive.	
14	INCRC	Indicates that Cyclic Redundancy Check (CRC) errors, from the read data flow, will not be flagged during read operations.	
15	INBLKID	Indicates that Block ID errors will not be flagged during read operations.	

CUT Table (Continued)

Word 1

Bits	Field	Function	Detail
0	NUMOCU	Indicates that two TCUs can communicate with each other.	0 = One TCU on status store communication is not active 1 = Two TCUs and status store communication is active.
1-5	NUMDEV	Indicates the number of drives in the subsystem.	0 0001 = 1 drive 1 0000 = 16 drives
6	OCUADDR	Indicates the setting of the TCU0/TCU1 toggle switch.	0 = Tape Control Unit 0 1 = Tape Control Unit 1
7	SSFEAT	Indicates that this tape control unit has the communicating status store installed.	
8-15	NUMSEG	Indicates the number of 32K byte buffer segments that are installed on this tape control unit.	

Word 2

Bits	Field	Function	Detail
0-3	CAATCH	Bit mask that indicates which channel adapters are attached to this tape control unit.	1 0 0 0 = Channel Adapter A 0 1 0 0 = Channel Adapter B 0 0 1 0 = Reserved 0 0 0 1 = Reserved 1 1 1 1 = Both channel adapters
4	MBINUSE	Indicates that the message buffer in the status store is in use.	
5	FIRSTMSG	Flag that is set after the first message has been sent to the other tape control unit.	
6	UNEXP6	Indicates that an attempt has been made to clear an unexpected level 6 interrupt by having the other tape control unit disconnect.	
7	CK1ERR	Indicates that a Check 1 error has occurred.	
8	NOSIX	Indicates that level 6 interrupts should not be re-enabled.	
9	CUOFF	Indicates that this tape control unit has completed offline processing.	
10	LPROOFF	Indicates that an offline request for the local tape control unit is being processed.	
11	RPROOFF	Indicates that an offline request for the remote tape control unit is being processed.	
12-15	OFFCNT	Contains the counter that indicates the number of drives that must be processed before offline processing will be completed.	

CUT Table (Continued)

Word 3

Bits	Field	Function	Detail
0	MBBUSY	Indicates that the Message Buffer In Use bit should be set on.	
1	CMPCTL	Indicates that Coordinate MP Assignments is in the process of buffer switch assignment and status should be stacked.	
2	OCUCONNT	Indicates that the other control unit has reconnected and asked for either a copy of control storage or all PGM and PGT tables.	
3	RMTCK1	Indicates that the other control unit is recovering from a check 1 error.	
4	MDCONNT	Indicates that the other control unit has reconnected for Maintenance Device purposes.	
5	CK1RECOV	Indicates that this tape control unit has successfully executed a remote check 1 recovery procedure.	
6	OFFMSGRS	Indicates that this tape control unit has either received or sent a 2 Tape Control Unit Offline message.	
7	LDBLINIT	Indicates that load balance is in process and waiting for Fault Count from the other tape control unit.	
8-15	LDBALTH	Contains the threshold value for the load balance algorithm. If the difference between the total Fault Counts of the two control units is not greater than this threshold, the load balance algorithm will not be performed.	

Word 4

Bits	Field	Function	Detail
0-15	FLTLIM	Contains the Fault Count for this tape control unit. If the Total Fault Count reaches the limit, the load balance algorithm is performed.	
16-31	TOTFLT	Contain the number of faults in this tape control unit.	
32-39	CUBL15	Contains the Tape Control Unit Equipment Checks. It is put into Format 21 sense by any drive, then reset.	
40-47	CUBL16	Contains the count of the number of 16K byte buffer segments that have been de-marked.	

Control Storage Tables and Logs (Continued)

DGHELO Log

The Diagnostic Hardware Error Log (DGHELO) contains data stored when a hardware error occurs. This data is the microcode error code, the hardware error code, and all readable error registers.

Table updates are under the control of the maintenance device. When the diagnostic overlay is enabled the table is updated each time the sense builder is called, unless the error is a read or write data flow error and the tape control unit ERP is doing recovery when the error occurs.

DGHELO entries are twelve words long and are separated by the contents of word zero (CDEF). The log is 560 words long and wraps to ensure that the last 18 words are saved.

DGHELO can be displayed by the MD support diskette function "Storage Display/Alter-Control/Unit Tables" (see MD/SDISK 1). When DGHELO is entered, the latest error is shown in the top line of the MD display. Since DGHELO is a wrap log, the next entry on the MD display will be the oldest entry in the log. If you scroll the display forward or backward to see additional entries, record the microcode table address, so you will know when you have returned to the latest entry.

Word	Bits	Definition
0	0-15	A four-character constant ('CDEF') to identify each entry.
1	0-15	The microcode error code. This error code is the same as the tape control unit error code stored in sense bytes 10 and 11, or 12 and 13, or 14 and 15 of Format 20 sense.
2	0-7 8-15	Drive address TCU flag byte
3	0-15	The hardware error code. This is the same as the tape control unit error code stored in bytes 16 and 17 of Format 20 sense.
4 (See Note)	0-7 8-15	Error register CER Error register PER
5 (See Note)	0-7 8-15	Error register WSE Error register RSR
6 (See Note)	0-7 8-15	Error register RER Error register DSE
7 (See Note)	0-7 8-15	Error register RPR Error register MTI
8 (See Note)	0-7 8-15	BCSE Group 0 BCSE Group 1
9 (See Note)	0-7 8-15	BCSE Group 2 BCSE Group 3
10 (See Note)	0-7 8-15	BDSE Group 0 BDSE Group 1
11 (See Note)	0-7 8-15	BDSE Group 2 BDSE Group 3

Note: See the DF section Table of Contents to find the location of external register detailed descriptions.

DOT Table

The Device Operation Table (DOT) contains information about scheduled, active (selected), and completed drive operations. There is one entry for each drive. The table is accessed by the drive address.

Word 0

Bits	Field	Function	Detail
0-15	CHAIN	Contains a pointer to the next 'DOT' entry.	

Word 1

Bits	Field	Function	Detail
0-7	DVADRDOT	The device address of this entry.	
8-15		Used by ERP to control ECC.	

Word 2

Bits	Field	Function	Detail
0-3		Not used.	
4	ERPSR	Indicates that ERP is active for this drive operation.	
5	VALID	When on, this bit indicates the service is waiting to execute an operation. When off, the other DOT fields are not valid.	
6	STARTED	Indicates that the drive operation has started.	
7	COMPLETE	Indicates that the drive operation has completed.	
8	INFOSEQ	Indicates information sequence operation (See Note).	Tape Control Unit to drive commands. For example: Drive test I/O, drive sense, read control storage, read LSRs, and read drive external registers.
9	CNTLSEQ	Indicates control sequence operation (See Note).	Operations that do not involve data transfer.
10	BUFRXFR	Indicates that data transferred is to be held in the buffer (Read only, See Note).	
11-15	DEVCMD	Drive command code to be issued (See Note).	Command codes are described in the OPER section.

Note: Operational Modes:

Bits:	8	9	10	11-15	
	1	1	1	X	Synchronous Command Mode
	0	0	0	0	Diagnostic Monitor
	0	0	X	X	Data Transfer
	0	0	1	X	Read Operation
	0	0	0	X	Space Operation

LDT Table

The Logical Device Table (LDT) contains current information about each drive which is not directly related to a particular buffer segment.

Word 0

Bits	Field	Function
0-7	DEVFLT	Contains the fault count for this drive since the last reset of 'Fault Count'.
8	INHAUSP	Inhibits this tape control unit from issuing a forward or backward 'Auto Space' command to this drive.
9	INHRDAH	Inhibits performing read ahead operations.
10	INHREC	Inhibits using the Reconnect Timer (ITC).
11	INHSERST	Inhibits using the serial interconnection to start this drive.
12	INHERP	Inhibits performing internal ERPS.
13	MDDEV	Indicates that this drive is reserved to the MD.
14	ERPDEV	Indicates that this drive is reserved to the ERP.
15	CALLERP	Indicates to call the ERP after Gap Out processing, even if the record was read with no errors.

Word 1

Bits	Field	Function
0	INHWROP	Inhibits this tape control unit from starting a Write operation, from the buffer to this drive.
1	IBGTOUT	Indicates that during Gap Out processing an IBG Time Out occurred on the last IBG.
2	ENDSYC	Indicates the 'Ending Sync' was detected during the read of the last record.
3	STRBC	Indicates that writing has started but the read-to-write head timer did not time out.
4	WR1REC	Indicates that the first record of a Write operation is ready to be written.
5	RD1REC	Indicates that writing has started but the first record has not been 'read back checked'.
6-7	TWOBITID	Is the modulo 4 count used to identify a Write operation with its 'read back check'.
8	BUFPIN	Indicates that this drive's buffer is pinned to this control unit.
9	PCUDA	Permits the tape control unit's deallocation of this drive.
10	TPMARK	Indicates that the last record was a tape mark.
11	SYNCMODE	Indicates that this drive is in Synchronous Data Transfer mode (blocksize is more than 64K).
12	RDAHOP	Indicates that the current Read operation is not scheduled (Read Ahead).
13	TINHWROP	Indicates that a Read Data Buffer operation is in progress and Write operations are not to be scheduled.
14	DISERP	Indicates to disable the ERP flag for errors during channel data transfers.

Control Storage Tables and Logs (Continued) DF 130

LDT Table (Continued)

Word 2

Bits	Field	Function
0-15	CHID1	Contains the high order channel block ID

Word 3

Bits	Field	Function
0-15	CHID2	Contains the low order channel block ID.

Word 4

Bits	Field	Function
0-15	DEVID1	Contains the high order device block ID.

Word 5

Bits	Field	Function
0-15	DEVID2	Contains the low order device block ID.

Word 6

Bits	Field	Function
0-15	BLCKSIZ	Contains the blocksize/16 of the largest block in this file.

Word 7

Bits	Field	Function
0-15	BSTPTR	Contains the buffer status table PTR under normal conditions.

Word 8

Bits	Field	Function
0-15	ERPBST	Contains the buffer status table PTR under ERP conditions.

Word 9

Bits	Field	Function
0	SCNALGOR	Indicates that Scan is needed to compute the reconnect time for this device.
1	SCNALGOE	Indicates that Scan is needed to compute the early start time for this device.
2	SCNREC	Indicates that when the ITC times out, Scan should call Reconnect for this device.
3	SCNFOREC	Indicates that Reconnect should be called in despite the ITC timer.
4-15	SCNRSVD	Reserved

Word 10

Bits	Field	Function
0-7	IBGTOCNT	Contains the counter for the number of erase gaps (IBGOUTS) that occurred during a write operation.
8	GLOC	Indicates that this is the first Gap-In after a Disconnected Locate operation.
9	NOBID	Indicates that not to check Bids for correct during Space Ops.
10	DBSDEV	Indicates that this device is assigned to the MP by buffer management for buffer deallocation purposes.
11	ALLNOREP	
12-15	FIROVRN	Contains the number of Device- Buffer Overruns that have occurred while writing a record from the buffer to tape.

Word 11

Bits	Field	Function
0-15	LOXNT	Contains the local transfer count.

Word 12

Bits	Field	Function
0-15	REXNT	Contains the remote transfer count.

PGM Table

The Path Group Map (PGM) consists of seven data words for each entry (Each drive has a separate seven-word entry) The table is accessed by the drive address.

Word 0

Bits	Field	Function	Detail
0-7	MAP	The first byte is the path group mask that has a bit set for each channel adapter interface that is a member of the path.	Bits 0-3 represent tape control unit 0 channel adapters A and B Bits 4-7 represent tape control unit 1 channel adapters A and B Bit format: 1 0 0 0 = A 0 1 0 0 = B 0 0 1 0 = Reserved 0 0 0 1 = Reserved
8-13		Not used.	
14	ALLASND	Indicates that both channel paths have drives assigned. This allows the tape control unit to differentiate between the All Assigned and None Assigned conditions of the channel assignment in status store.	
15	PSWDREC	Indicates that a valid password has been set by a control access command.	

Word 1

Bits	Field	Function	Detail
0-7		Not used.	
8-15	PASSWRD1	Contains the password (if any) set by the control access command.	Passwords are generated by the host system.

Word 2

Bits	Field	Function	Detail
0-7	PASSWRD2	Contains the password (if any) set by the control access command.	Passwords are generated by the host system.
8-15	PASSWRD3	Contains the password (if any) set by the control access command.	

Word 3

Bits	Field	Function	Detail
0-7	PASSWRD4	Contains the password (if any) set by the control access command.	Passwords are generated by the host system.
8-15	PASSWRD5	Contains the password (if any) set by the control access command.	

Word 4

Bits	Field	Function	Detail
0-7	PASSWRD6	Contains the password (if any) set by the control access command.	Passwords are generated by the host system.
8-15	PASSWRD7	Contains the password (if any) set by the control access command.	

Word 5

Bits	Field	Function	Detail
0-7	PASSWRD8	Contains the password (if any) set by the control access command.	Passwords are generated by the host system.
8-15	PASSWRD9	Contains the password (if any) set by the control access command.	

Word 6

Bits	Field	Function	Detail
0-7	PASSWRDA	Contains the password (if any) set by the control access command.	Passwords are generated by the host system.
8-15	PASSWRDB	Contains the password (if any) set by the control access command.	

PGT Table

The Path Group ID Table (PGT) contains the path group identification of each channel adapter interface for both tape control units. It also contains the Path Group Management byte that includes information about the path mode of the interface (single or multipath). There is one PGT for each channel.

The Path Group ID Table is affected by Set Path Group ID commands addressed to drives connected to both local and remote tape control units in a two tape control unit subsystem. This ensures that both tape control units will contain the same path group ID information after the execution of any Set Path Group ID commands.

There is an entry in this table for each tape control unit and adapter combination. The table is accessed by specifying the tape control unit number and channel adapter.

Byte 0

Bits	Field	Function	Detail
0	SYSERR	A system reset is being processed within the tape control unit. The reset may have been caused by the channel or tape control unit.	
1-2	Reserved		
3	IDREC	The ID Received bit is set if a path group ID has been received for the channel interface since the last Power-On or system reset.	
4	PATHMODE	Set for channel interfaces in multipath mode. Reset for interfaces in single path mode.	0 = Single path
5-7	GROUP	Identifies a path group ID that has been received by the tape control unit over this channel. These three bits are a shorthand identifier of the 11 byte Path Sweep GROUP ID.	0 0 0 = Path group 0 0 0 1 = Path group 1 0 1 0 = Path group 2 0 1 1 = Path group 3 1 0 0 = Path group 4 1 0 1 = Path group 5 1 1 0 = Path group 6 1 1 1 = Path group 7

Bytes 13 and 14

Bits	Field	Function	Detail
0	CADIS	Indicates that this channel adapter is disabled.	
1	PRODIS	Indicates that this channel adapter is processing a channel adapter disable sequence.	Disable sequence is initiated by moving the Offline Test/Online Test switch to Offline Test.
2	Reserved		
3	Reserved		
4-7	Reserved		
8	PROSYS	Indicates that the system reset for this channel is in progress.	
9-15	Reserved		

SNERRH Table

The Sense Error History Table (SNEHRH) contains the sense builder call entry parameters and the first four words of drive sense that result from a drive unit check. The table is updated each time the sense builder is called. It is 256 words long and wraps when filled so that the last 20 to 40 errors are saved.

SNERRH can be displayed by using the "Storage Display/Alter - Tape Control Unit Tables" function (see MD/SDISK 1.) When SNERRH is entered, the latest error record is shown in the top line of the MD display. Since SNERRH is a wrap log, the next entry on the MD display will be the oldest entry in the log. If you scroll the display forward or backward to see additional entries, record the microcode table address so you know when you have returned to the latest entry.

- ABCD indicates that a tape control unit or channel error has occurred and is four words long (see Figure 1).
- EFAB indicates that a drive error has occurred and is five words long (see Figure 3).

Table 1. Tape Control Unit or Channel Errors Table

Word	Bits	Definition
0	0-15	A four-character constant ('ABCD') to identify each entry.
1	0-15	Microcode error code - (Control unit sense bytes 10 and 11)
2	0-3 4-7 8-15	Log Request Code Indicates the drive address Contains sense byte 9 - (Control unit flag byte)
3	0-7 8-15	Microcode error recovery action code Reserved

SENSE BUILDER REQUEST LABELS

BUFLOG	Present buffered log (format 21). Counter overflow or unload.
CHECK 1	Check 1 recovery started at this time.
CUERR	Tape Control Unit error not attributable to a particular drive.
PERM	Recovery unsuccessful, present unit check with the data now in the sense table.
POST	Enter and error code and ERA code into the sense table.
POSTERA	Enter and ERA code only into the sense table.
POSTPERM	Single invocation yielding both POST and PERM.
RECOVER	Recovery successful, clear the sense table.
SNSRESET	Unequivocal clear (RESET) the sense tables.
SNSTRACE	Entry only in SNERRH, not in sense tables.

These are microcode operations and will be used to report errors to your next level of support.

Table 2. Tape Control Unit or Channel Errors Words

Word 0	Word 1	Word 2	Word 3	Description
ABCD	vvvv	1xyy	zz--	Device side POSTPERM
ABCD	vvvv	2xyy	zz--	Device side POST
ABCD	0000	2xyy	zz--	Device side POSTERA
ABCD	0000	3x00	zz--	Device side RECOVER
ABCD	0000	4x00	zz--	Device side PERM
ABCD	0000	5x00	zz--	BUFLOG
ABCD	vvvv	6xyy	zz--	Device side SNSTRACE
ABCD	0000	7x00	00--	Device side SNSRESET
ABCD	vvvv	8xyy	zz--	CHECK1 trace entry
ABCD	vvvv	9xyy	zz--	Channel side POSTPERM
ABCD	0000	Axyy	zz--	Channel side POSTERA
ABCD	0000	Bx00	00--	Channel side RECOVER
ABCD	0000	Cx00	zz--	Channel side PERM
ABCD	vvvv	D0yy	zz--	CUERR
ABCD	vvvv	Exyy	zz--	Channel side SNSTRACE
ABCD	0000	Fx00	00--	Channel side SNSRESET

vvvv Bits 0-15 of WORD 1 (see Figure 1).

x Bits 4-7 of WORD 2 (see Figure 1).

yy Bits 8-15 of WORD 2 (see Figure 1).

zz Bits 0-7 of WORD 3 (see Figure 1).

Table 3. Drive Errors

Word	Bits	Definition
0	0-15	A four-character constant ('EFAB') to identify each entry.
1	0-7 8-15	Indicates the drive ERP code. Indicates drive address.
2	0-7 8-15	Device flag 1. The device flag is associated with the first error that was detected for the current command. Device flag 2. The device flag is associated with the last error that was detected.
3	0-7 8-15	Device Command Code 1. Indicates that the command was active or last issued at the time of the first error that is defined in Word 3 bits 8 through 15. Device error code 1. This code is associated with the first error detected for the current command.
4	0-7 8-15	Device Command Code 2. Indicates that the command was active or last issued at the time of the second or last error that is defined in Word 4 bits 8 through 15. Device error code 2. This code is associated with the second or last error detected.

Drive Status Bits 0-15

When Status In is active, the information on the bus from the drive is status bits 0-7 or 8-15 for the selected drive.

The status bits are sent to the tape control unit for the following conditions

- At the end of any Initial Sequence
- During the Ending Sequence, of a Transfer Sequence

A status bit that is the result of a tape control unit initiated operation is sent only to that tape control unit. Status that is not associated with a tape control unit operation is sent to both tape control units.

Bit	Label	Description/Detail
0	Prep Move Executed	This bit is set when a Serial command execution begins. If the command cannot be completed, a Unit Check (UC) is set. The bit is reset after status is sent by the Parallel command. If the Parallel is a motion command, it must be the same command as the Serial command or UC is set, and no motion occurs.
1	Repositioning	This bit is set at the end of a motion command as the drive begins the repositioning operation. It stays set until the drive enters Stoplock. If a new command is received and the drive is at the wrong Stoplock position to execute the command, this bit is set and is in the initial status for that command. This bit is reset when the correct Stoplock is reached, or at Gap In time if the command stays connected and the command is in the opposite direction to the last command.
2	Not-Ready-To-Ready	Bit 2 is set when the drive goes into Stoplock after establishing tension and a radius during a load operation. If the drive Ready switch is active, or when placed in the active position, a TCU Alert is sent to the tape control unit. Moving the Online Test/Offline Test switch to the online test position on a loaded and ready drive will also set this bit. This bit is reset after status is sent during normal interface sequences by the first tape control unit to select the drive.
3	New Sector	Bit 3 is set when a Write command is in progress and a new sector number is detected from the drive table, as the command is executing. It is reset the next time status is sent to the tape control unit. The drive may find a new sector number after the tape control unit ends a Write operation. The ending status will not show the sector status but the initial status for the next command will.
4	Device End for Disconnected Command	This bit is set at the end of any disconnected command. A tape control unit Alert is sent on the interface that issued the command. UC may be active when this status is set. Bit 4 is reset after status is sent during normal interface operations. Enables Reg Funnel Parity checker after all LSR locations have been initialized to good parity before this bit is set. Microcode can change active conditions.
5	Device End	Bit 5 is set when the drive has completed any connected command. It is reset after status is sent during the ending sequence.
6	Unit Check	Bit 6 is set when the drive has detected an error condition that it can not recover from by itself. If a command was in process, it is sent with Device End. If no command was in process, UC will be in the initial status of the next command. The bit is reset after status is sent.
7	Manual Rewind/Unload	Bit 7 is set when tape tension is up, the Ready/Not Ready switch is in the inactive position and the rewind/unload switch is pressed.
8	Address High	This bit is active during status presentation when the drive address switch is set to hexadecimal address 8-F. It is reset after status is presented.
9	Ready	This bit is set after a Load-Op operation when tension is set, the machine reel has rotated at least one revolution, and BOT status is detected (except a mid-tape-load). It is reset by a Rewind-Unload operation or any drive error condition that causes a loss of tension or requires the motor stopping. Bit 1 is also set when the drive Ready switch activated if it had been inactive during the load operation.
10	Patched	This bit is set after a successful Patch load to a drive. It stays on until a power down condition, power on reset, or a Reset command.
11	Load Point	This bit is set when the drive motion is backward and the BOT is sensed. Drive motion is stopped and no backwards commands are accepted until BOT is reset with the next forward operation. If a data error is received while moving the tape forward from BOT, and a backward command is executed for ERP, BOT will not be detected.
12	File Protected Cartridge	This bit is set when a cartridge is loaded if the tape is file protected. It stays active until the current cartridge is unloaded and reset during an unload operation.
13	Tape Indicate (EOT) or Logical End of Tape	This bit is set when the drive motion is forward and EOT is sensed. Drive motion is not stopped and the EOT status stays active until a backward operation moves the tape backward and passes EOT.
14	Physical End of Tape (PEOT)	This bit is set when the microcode senses the physical end of tape. Tape motion is stopped and UC is set.
15	Reserved	

Drive External Registers

The following registers are drive external registers that can be accessed using the MD Support Diskette, "Register Display/Alter" option (see MD/SDISK 1).

Note: Bit positions marked 'x' may be on or off. Only the important drive external registers and bits are defined.

	BIT							
REGISTER	0	1	2	3	4	5	6	7
X01	x	x	High Addr Bit	x	Rewind Switch	x	x	x
X02	x	x	Offline Switch	x	x	x	x	x
X03	Air Loss Switch	x	Over Temp Sw	x	x	Cartridge Present Sensor	x	R/Unload Switch
X07	x	x	LED Open Error	Message Display Error	Timer Error 1	Timer Error 2	Intf A Error	Intf B Error
X08	File Protect Sensor	Loader Extract Sensor	Tape Path SNSR-A	Tape Path SNSR-B	Cartridge Latched Sensor	x	x	x
X09	Rdy/Not Rdy Switch	x	Module Parity Error	Counter Parity Error	Module Parity Error	Gap CNT Parity Error	Timer Parity Error	x
X10	Serial Command Error	x	x	x	x	x	x	x
X11	Analog Cnvrter Error	File Motor Error	Machine Motor Error	x	Power Amp Error	Tension Loss	x	24V dc Failure
X20	x	x	x	x	x	Tag/Bus Parity Error	x	x
X25	Drive Address 0/8	1/9	2/A	3/B	4/C	5/D	6/E	7/F
X26	Drive ID (8)	(4)	(2)	(1)	x	Logical Address (4)	(2)	(1)
X27	x	x	x	x	x	x	INTFC A Selected	INTFC B Selected


OPER

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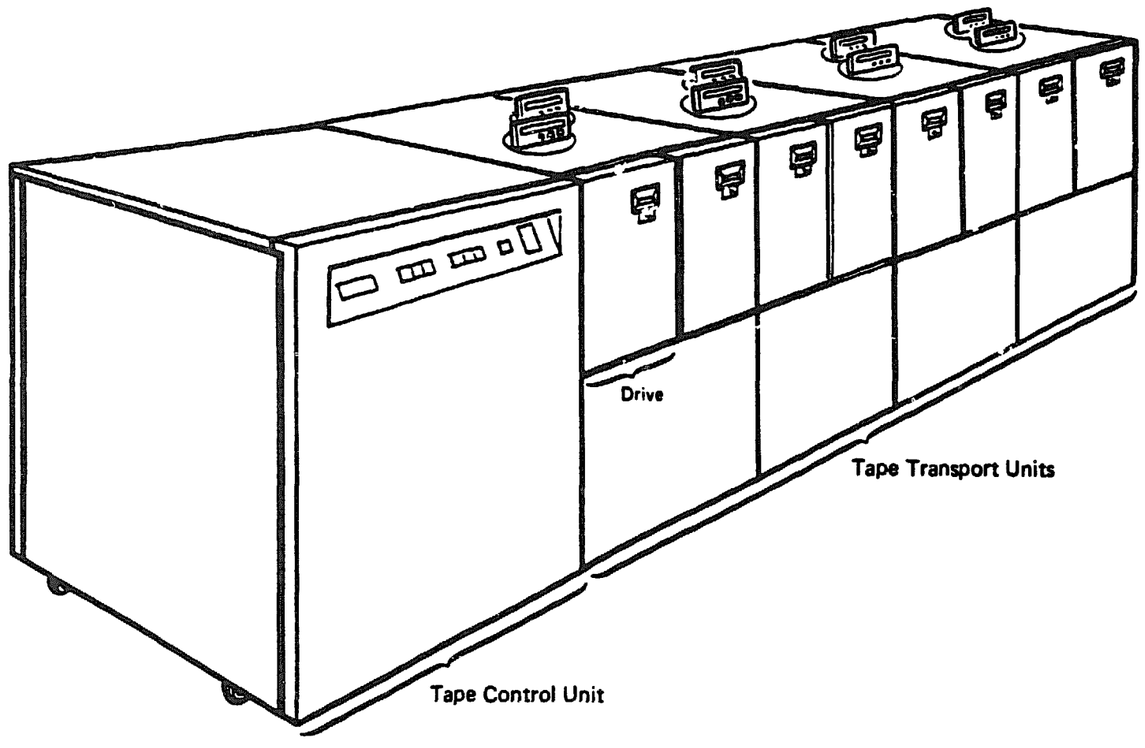
Introduction

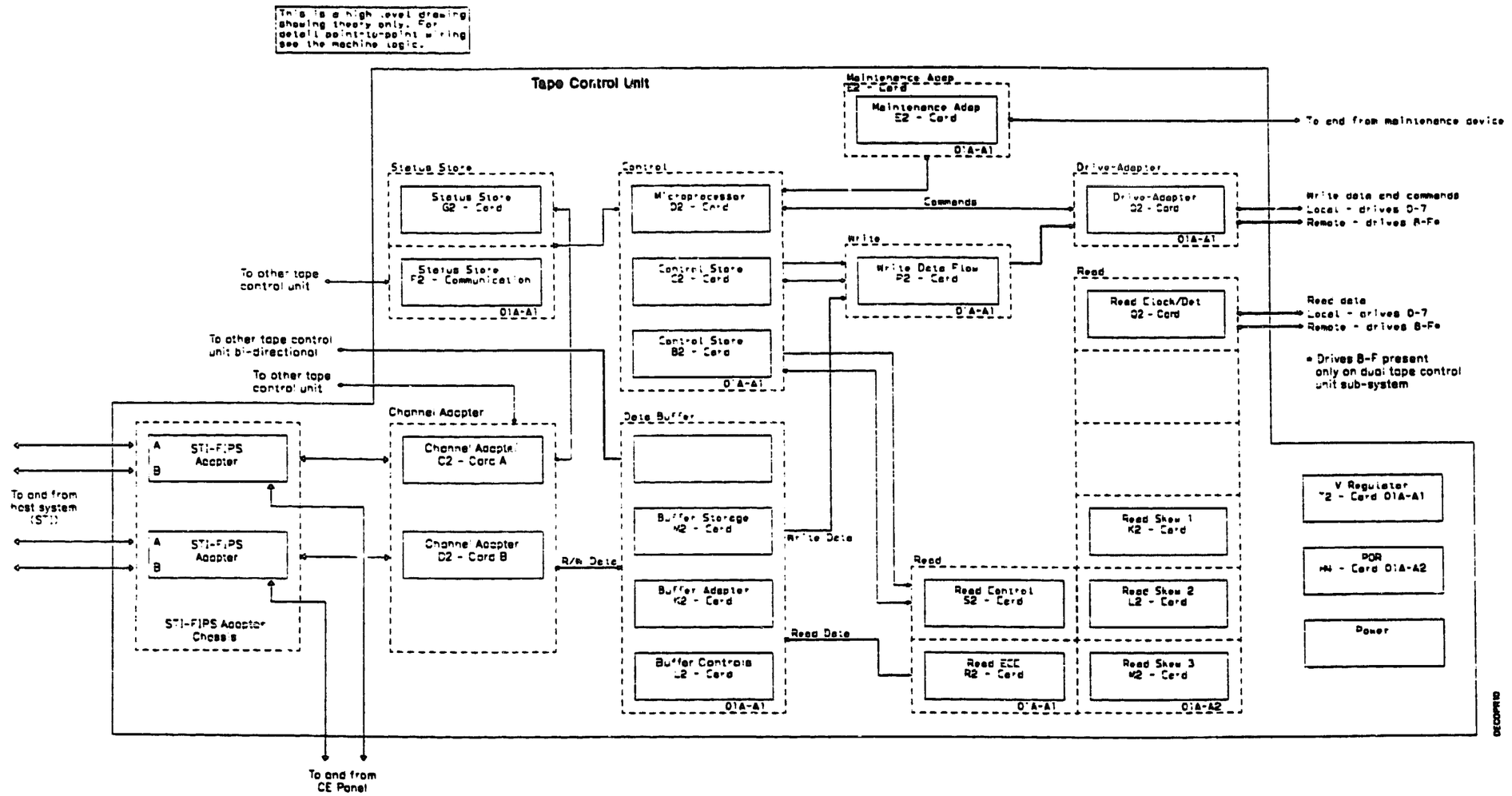
This section explains the theory of operation for the TA 90 tape subsystem. Topics included in this section are:

- **STI-FIPS Adapter**, which describes the operation of the interface protocol translator modules
- **Tape Control Unit**, which describes the functional areas of the tape control unit.
- **Tape Transport Unit**, which describes the functional areas of the tape transport unit.
- **Drive**, which describes the functional areas of the drive (two in each tape unit).
- **Data Flow**, which describes the major data paths through the subsystem.
- **Subsystem Initialization**, which describes power on sequencing, and initial microprogram load.
- **Subsystem Configuration**, which describes single and dual tape control unit configurations.
- **IML Diskette Drive**, which describes the IML diskette drive operation.

The flow of information in each topic is from general to detailed. An overview at the start of the topic introduces the topic and describes its content.

Diagrams and illustrations are used to supplement the theory text. The diagrams and illustrations show subsystem operations and data flow concepts; therefore, they may not duplicate actual machine circuits or total operations.




This is a high level drawing showing theory only. For detail point-to-point wiring see the machine logic.
Tape Control Unit
Maintenance Adap
E2 - Card
Maintenance Adap
E2 - Card
01A-A1
To end from maintenance device
Status Store
Status Store
G2 - Card
Status Store
F2 - Communication
01A-A1
Control
Microprocessor
D2 - Card
Commands
Control Store
C2 - Card
Control Store
B2 - Card
01A-A1
Drive-Adapter
Drive-Adapter
D2 - Card
01A-A1
Write data and commands
Local - drives 0-7
Remote - drives 8-Fe
Write
Write Data Flow
P2 - Card
01A-A1
Read
Read Clock/Det
Q2 - Card
Read data
Local - drives 0-7
Remote - drives 8-Fe
* Drives 8-F present only on dual tape control unit sub-system
To other tape control unit
To other tape control unit bi-directional
To other tape control unit
Channel Adapter
Channel Adapter
C2 - Card A
Channel Adapter
D2 - Card B
Data Buffer
Buffer Storage
M2 - Card
Buffer Adapter
K2 - Card
Buffer Controls
L2 - Card
01A-A1
R/W Data
Write Data
Read Data
A
B
STI-FIPS
Adapter
A
B
STI-FIPS
Adapter
STI-FIPS Adapter
Chassis
To and from host system (STI)
To and from CE Panel
Read
Read Control
S2 - Card
Read ECC
R2 - Card
01A-A1
Read Skew 1
K2 - Card
Read Skew 2
L2 - Card
Read Skew 3
M2 - Card
01A-A2
V Regulator
T2 - Card 01A-A1
POR
MM - Card 01A-A2
Power
DECDPR10

Tape Control Unit

STI-FIPS Adapter

The STI-FIPS adapter provides protocol translation and data movement between the STI (Standard Tape Interconnect) interface used by DIGITAL computer systems and the FIPS (Federal Information Processing Standard) interface used by the tape control unit. For the purpose of this discussion, the term FIPS will be used to indicate the FIPS 60 interface, which describes a government standard hardware and software connection protocol between computer systems and peripherals.

On its STI side, the STI-FIPS adapter makes the TA90 tape subsystem appear to a DIGITAL host computer system as an STI-compliant tape subsystem.

On its FIPS side, the STI-FIPS adapter makes the DIGITAL host computer system appear to the remainder of the tape subsystem as a FIPS-compliant host computer system. In this manner, the STI-FIPS adapter allows the FIPS tape subsystem to operate in a DIGITAL environment.

The peripheral control concepts of the STI and FIPS interfaces are similar. Each interface provides basic commands such as: READ DATA; WRITE DATA; GET STATUS; REWIND; and UNLOAD. The STI-FIPS adapter translates the command codes, status bytes, and handshake protocols between its STI and FIPS sides so that the required action occurs. Each interface also supports high speed data transfers for both read and write operations. The STI-FIPS adapter is designed to transfer data using the required handshake protocol.

Each STI-FIPS adapter is capable of processing commands, status, and data associated with up to four tape transports. Since there may be up to eight tape transports connected to a single tape control unit, two STI-FIPS adapters are supplied in each TA90 subsystem. Multiple paths from the host system into the tape subsystem also ensure that the full throughput capability of the tape subsystem may be utilized, and provide the possibility of increased availability for subsystems without a full load of tape transports.

To avoid the possibility of the two STI-FIPS adapters trying to access the same tape transport unit, one of the STI-FIPS adapters communicates with tape transports having even addresses while the other communicates with tape transports having odd addresses. In order to balance the work load between the two STI-FIPS adapters, there should be an equal number of even and odd addressed tape transport units in the tape subsystem.

To transfer multiple blocks of data efficiently, each STI-FIPS adapter contains a data buffer memory large enough to hold two blocks of data for each of the four tape transports. The STI-FIPS adapter is designed to permit simultaneous data transfer on each of its interfaces. In this manner, the DIGITAL host computer can be writing a block of data into the STI-FIPS adapter's data buffer at the same time that the STI-FIPS adapter is writing a different block of data from its data buffer across the FIPS interface to the tape subsystem. Similarly, simultaneous transfers on both the STI and FIPS interfaces occur during data reads from the tape subsystem to the DIGITAL host system.

Each STI-FIPS adapter contains two STI ports, known as the A port and B port. The dual STI ports provide multiple paths to the tape subsystem, thus increasing subsystem availability. The adapter can communicate over one STI port at a time.

There are two sets of A/B/Fault switches on the operator panel of the TA90 tape control unit. Each set is wired to one of the two STI-FIPS adapters. The STI-FIPS adapter communicates with the DIGITAL host system over one of the two STI ports, when the corresponding port select button is depressed. The Fault button is used to display error codes and to reset error conditions which may arise during subsystem operation.

Each of the STI-FIPS adapters is in communication with the CE Panel. Upon command from the CE Panel, the subsystem base address can be modified, diagnostics can be run, and internal STI-FIPS adapter registers can be examined.

Tape Control Unit (Continued)

The diagram on Oper 10 shows the functional areas of the TA90 tape control unit and the location of the STI-FIPS adapters in the subsystem. This topic explains the purpose of the functional areas. A brief description of the tape control unit power components is also included.

The tape control unit functional areas can be separated into two categories: data handling and control.

The data handling functional areas provide the data paths to transfer data between the STI-FIPS adapters and the drives for read and write operations. The bold lines in the diagram identify the read and write data paths. The data handling areas include:

- Channel Adapter
- Data Buffer
- Write
- Read
- Drive Adapter

The control functional areas control the movement of data and information within the subsystem. The control areas include:

- Control
- Status Store
- Maintenance Adapter
- STI-FIPS Adapter

Data Movement

The microprocessor, within the control functional area, controls data movement between the tape subsystem and STI-FIPS adapter, and the data flow within the subsystem.

The data buffer area contains user-programmed information. Components of the tape control unit operate asynchronously to process data in and out of the data buffer, schedule I/O operations with the STI-FIPS adapter, and control drive operations and data flow.

When a buffered write operation occurs, data is transferred to the buffer. The controller signals the STI-FIPS adapter that the data has been written on tape; although, in reality, the data is still in the buffer. When the tape control unit's workload permits scheduling work for the drive that the data was intended for, the data is transferred to the drive and written on tape.

During read operations the tape control unit pre-reads data from the drive into the data buffer. When the STI-FIPS adapter requests the data from the subsystem, the tape control unit responds immediately and transfers the data.

Data Handling Functional Areas

Data handling functional areas provide the data paths to transfer data between the STI-FIPS adapter and the drives for read and write operations. The data handling area formats data to be sent to the drives. This area also processes data received from the drives to put it in a form that can be accepted by the STI-FIPS adapter. Error checking is also performed by the data handling functional areas.

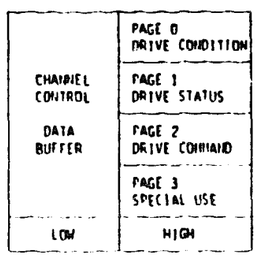
Channel Adapter

The channel adapter connects the tape control unit to the STI-FIPS adapter.

There are two channel adapters, A and B, installed in a tape control unit, one for each STI-FIPS adapter. The adapters are the same, and each adapter is on one logic card.

Channel Adapter RAM: The channel RAM keeps track of various tape control unit conditions, about which the channel adapter needs information to make decisions quickly. The RAM also monitors the status for each drive controlled by the associated STI-FIPS adapter.

The channel adapter RAM can be thought of as being divided into two halves, a low half and a high half. The low half of the RAM is used as a buffer for control data to or from the STI-FIPS adapter. The high half of the RAM is divided into four pages. Page 0 is for storing drive conditions. Page 1 is for the status for each drive. Page 2 is used for the last command given to each drive. Page 3 is for special use. There is a channel adapter 'RAM' in each channel adapter.



PAGE size = 16 bytes
RAM size = 128 bytes

Channel Adapter Orders: The microprogram gives the channel adapter an order by writing an address into the channel adapter address register and then writing the order into the channel adapter order register.

In addition to orders from the microprocessor sent to the status store, there is a small set of orders from the channel adapter to the status store.

Malfunction Reset: Malfunction reset is microprogram controlled. If the microprogram determines that a specific channel adapter is causing nonrecoverable errors, the bit corresponding to the channel adapter is set in the channel modifier register on the status store card. This causes the 'malfunction reset' line to that channel adapter to become active. When this occurs, the channel adapter is reset. As long as the 'malfunction reset' line is active, the channel adapter is not active.

Channel Interface

The channel adapter recognizes the following channel sequences or conditions:

- Initial Selection
- Polling Sequence
- Ending Sequence
- Interface Disconnect
- Selective/System Reset
- Buffer Data Send/Receive
- Control Information Data Send/Receive
- Go Online
- Go Offline
- Check Reset

These sequences comprise the FIPS protocol used by the STI-FIPS adapter to communicate with the channel adapter.

The standard FIPS 60 interface, modified to run at low power levels, is the interface between the channel adapter and the STI-FIPS adapter. Two cables, a tag, and a bus cable, run between each channel adapter and its associated STI-FIPS adapter. All levels on these cables are actively low.

Channel Adapter to Status Store Communication

The status store/channel adapter bus has two uses. First, it is the communication path between the microprogram and the channel adapter. Second, the status store supplies information to the channel adapter to determine initial status to be sent to the STI-FIPS adapter.

Microprogram-to-channel adapter communication is done by external registers. The contents of these registers are gated to the status store/channel adapter bus. Gating is controlled by status store.

The status store/channel adapter bus consists of nine bidirectional data bus lines, five response lines, and 10 control lines. All active status store/channel adapter communication lines are minus.

Channel Adapter to Data Buffer Communication

The channel adapter/buffer bus is the path for transferring customer data. There are two buses: one for the buffer, and one for the remote buffer. The microprogram controls which communication bus the channel adapter card uses at a given time. The microprogram assigns a buffer in the status store, and the channel adapter makes the correct connection to send/receive data.

The bi-directional data bus has nine data lines (eight lines for data and one for parity) and seven control lines. All active line levels except the "data OK to parity check" line are minus.

Data Buffer

The data buffer contains a buffer control card, a buffer adapter card, and one or two buffer storage cards. The data buffer is temporary storage for data being transferred between the tape control unit and the STI-FIPS adapter. The buffer permits data transfer between the STI-FIPS adapter and the tape control unit at high speed without the mechanical speed restrictions of the drives.

The buffer has data input and output buses. A write operation consists of sending data from the channel to the buffer, followed by sending data from the buffer to the write data flow path. A read operation consists of sending data from the read data flow path to the buffer, followed by sending data from the buffer to the channel. The microprocessor can read and write the buffer at the same time.

Buffer Data Write/Read: Data is written into the buffer from the read data flow path or channel through a CRC generator. Then it is moved to an input/output register and becomes two bytes wide. Next the data is sent through two single byte multiplexors to a random access memory (RAM). Data is sent from the RAM to storage through the multiplexers in 2-byte blocks of 16 bytes.

Data read from the buffer by the write data flow or channel follows a similar data path. Blocks of 16 bytes are sent from memory to the RAM through the multiplexors. From there it is sent to the two input/output registers through the multiplexers. The data is then sent through a CRC checker one byte at a time to either the write data flow or the channel.

The data transfer is started when the microprocessor sets a Read or Write command in either the buffer channel or device command registers. When the transfer is complete, the buffer sets the status in the buffer channel or device status registers, and sends an interrupt to the microprocessor, which then reads the status.

Buffer Control Card

The buffer control card contains external registers that monitor and record subsystem conditions and status. It also includes the channel buffer FRU and device buffer FRU registers. The buffer control card controls the data buffer, decodes commands and generates controls to the buffer address, buffer lines, and storage cards. When an error is detected, error registers are collected and read by the microprocessor over the external register bus. These registers become part of an error code that points to a possible FRU. All clock and reset signals needed by the buffer are received on this card and sent to the other buffer cards.

Error Checking: All bus, CRC, and parity errors are monitored by two error assembly circuits that set bits in the two buffer error registers. These registers are used to build an error code that can be read by the microprocessor. Parity checking is done on the external register data bus and errors are reported by way of the 'XR error' and 'XR active' lines. A hardware error causes a Check 2 error to occur.

Buffer Adapter Card

The Buffer Adapter card contains:

- Synchronization registers that communicate with the channel adapter and the read/write data bus
- CRC generators and checkers to check for storage bit failures
- Device and channel pointers
- Device and channel stop registers
- Improved Data Recording Capability feature.

The buffer adapter card compares the current and stop addresses of the devices and channel and sends the result to the buffer control card. Parity is checked for all data going in and out of storage, the read and write data paths, and the channel adapter.

Error Checking: Two error assembly circuits monitor all bus, CRC, and parity errors and set bits in two buffer error registers. These registers are used to build an error code that can be read by the microprocessor that points to a possible FRU. Parity checking is done on the XR data bus and errors are reported through the 'XR error' and 'XR active' lines. A hardware error is a Check 2 error.

Buffer Storage Cards

The buffer storage contains one logic card.

Single card buffers have sizes of 512K bytes, 1024K bytes, or 2048K bytes of storage in an 18 by 256K bits or 1024K bits matrix. Write and read operations are done in 16 byte blocks.

Error Checking: Error checking is supplied by two signals leaving the buffer adapter card. Address parity is generated on the buffer adapter card and is then checked externally. The 'address valid' signal indicates that the address selected is valid and is assigned to the card.

Write

The write functional area contains the write data flow card that processes and controls the data that is to be recorded on tape. The microprocessor specifies the operation sequence, controls command execution in the drive, and checks the operation sequence. The data buffer stores the data until it is processed. The drive starts by responding with 'gap in' as a synchronizing start point. The processed data and one clock timing are sent to the device adapter, and the device adapter sends the data to the drive.

Initial processing is done in byte parallel form. ECC and CRC bytes are generated and combined with the data into a formatted sequence. A bit pattern of all ones is generated for preamble, postamble, and sync/resync symbols, and is inserted into the data format.

The combined data is serialized longitudinally by encoded byte and diagonally by bit. Nine 'write data' lines, one 'write data parity' line, and one 'clock' line are sent to the selected drive through the drive adapter.

Control lines and clock lines to the data flow section come from the control section of the write data flow card. Control lines and clock lines are used to control switching, modes of operation, and generation of special marks. Errors are detected and returned to the write data flow card for error reporting and sampling.

Tape Control Unit (Continued)

Read

The read area of the tape control unit consists of:

- One read clock/detect card
- Three read deskew cards
- A read ECC correction card
- A read clock and format card.

The read area receives the read data from the drive, detects the encoded data, and detects the sync pattern. When the read area detects a sync pattern, the data is deserialized to byte format, deskewed, and the pointers are stored. The deskewed data is demodulated and placed in an ECC buffer. Then the data is transferred to the data buffer.

Read Clock/Detect Cards

The read data is sent from the drive to the read/clock detect cards. This card detects the data and conditions, and recover the timing and signaling information read from the eighteen tracks of the tape.

Read Skew Cards

The read data is sent from the read/clock detect cards to the read deskew cards. The read deskew cards are used to deserialize and deskew data from the tape. Each card has six separate data paths; however, the three cards (18 data tracks) must communicate with each other to deskew the data.

Read ECC/CORR Card

The read ECC/CORR card receives its control and timing from the read clock/format card. Data and detection pointers are received from the read deskew cards. The output-corrected data is sent to the data buffer. The read ECC/CORR card:

- Demodulates the data
- Generates error syndromes, error patterns, and pointers
- Performs error correction
- Conducts CRC checking.

The syndrome generator receives 18 demodulated read data bytes one at a time, and generates four syndromes per data frame. Two syndromes are vertical syndrome bytes, and two are diagonal syndrome bytes.

The pointer system receives pointers to erroneous tracks from the read detection, deskew, demodulation, and error pattern generators. The pointer values are stored in registers, and sent to the error pattern generators in the correct format. The ECC/CORR card also signals the skew buffer to dead track any tracks with continuous errors.

The error pattern generation system consists of two error pattern generators, one generator for each group of nine tracks. The generation system uses syndromes from the syndrome generator and the pointers from the pointer system to generate error patterns.

The correction system deserializes the error patterns from the error pattern generators. The corrected data byte is then stored in the correction register, and sent to the data buffer and the read clock and format card.

A 16-bit cyclic redundancy check (CRC) character is generated by the write data flow card when the data record is written on tape. The check characters are generated for all data bytes and resynchronization data patterns. During a read operation, the same CRC character should be generated. After reading the check character, the CRC register should equal zero. If the CRC register does not equal zero, a read error is indicated.

Read Clock and Format Card

The read clock and format card supplies clock timings and control for the read data flow, and communicates with the microprocessor. The read clock and format card controls when the deskew will read out, and identifies synchronization and resynchronization bytes. This card also supplies the control lines and clock timings for the read ECC card.

Drive Adapter

The drive adapter supplies the communication link between the control unit and its attached drives. With a two tape control unit subsystem configuration, dual tape control unit communication compatibility provides a second communication path for up to eight additional drives for each tape control unit. Therefore, any tape control unit can communicate with up to 16 drives in the maximum configuration. See the write-up on Dual Tape Control Unit subsystems in this section.

The drive adapter card is controlled by the microprocessor. The microprocessor writes in external registers on the drive adapter card to set up the communication paths.

Control Functional Areas

The control functional areas control the movement of data within the subsystem. In addition, these areas provide for communication between functional areas and between tape control units in a dual tape control unit subsystem configuration. The control areas also provide for error logging and status information transfer to the STI-FIPS adapter.

Control

The microprocessor card in the control functional area contains a microprocessor, local storage register, and associated logic for control and communications with the other areas of the tape control unit. This card also contains all processor external registers, the external interrupt hardware, and most of the processor error detection and reporting logic. The processor controls and keeps track of tape control unit operations through external registers by way of the external register bus.

Control storage consists of tables accessible by the microprogram and the microprocessor. Control storage also contains the initial microprogram load (IML) data after it has been loaded. Any time the microprocessor needs the microprogram to perform a function, it communicates with control storage to obtain the instructions. Control storage uses additional storage contained on the array card.

Status Store

The status store functional area provides a common area in the tape control unit to store status information. Status information is used by the microprocessor and channel adapter areas for allocation of common resources. The status store area also provides a communication path between the microprocessor and channel adapter. The status store communication card contains the logic that provides a communication path between two tape control units when two tape control units are connected as a single subsystem.

All machines are shipped with both the status store and the status store communication card, but the status store communication card is not used in a single tape control unit configuration. A status store card and status store communication card are required for a dual tape control unit configuration. The status store card contains the microprocessor bus, the channel adapter bus, the controlling logic, and the status store storage.

Status Store/Channel Adapter Communications

Status store communicates with the channel adapters by polling. Status store polls the two channel adapters alternately.

The status store/channel adapter bus has two uses. First, it is the path by which the microcode communicates with the channel adapter. Second, it supplies information to the channel adapter that determines the initial status to be sent to the channel.

Microprogram-to-channel adapter communication is done through external registers. The content of these registers is gated to the status store/channel adapter bus. Gating is controlled by status store.

Maintenance Adapter

The maintenance adapter provides a way for the maintenance device (MD) to monitor and change the tape control unit's status. The maintenance adapter card enables the MD to read or write data stored in control storage and to control the microprocessor. The maintenance adapter card performs the basic communication function on the MD bus, and provides a bus for command and data transfer between the MD microprogram and external registers. The maintenance adapter card processes these Check 1 error conditions:

- Stopping the microprocessor
- Disconnecting the channels from the subsystem
- Starting the microprocessor under specific conditions.

The maintenance adapter card receives and decodes commands from an MD to:

- Perform the microprocessor control function
- Read and write control storage
- Detect and trap error conditions
- Send and receive commands and data to and from the MD microprogram for maintenance purposes.

Maintenance Adapter Registers

The following registers are contained in the maintenance adapter card logic:

- Maintenance control
- Maintenance status byte
- Maintenance data out
- Maintenance data in
- Maintenance tag out.

The registers are for temporary storage of control and status information, and data used by the maintenance device for trouble analysis.

MD Serializer/Deserializer

The MD serializer/deserializer is a shift register on the maintenance adapter card that converts serial data from the maintenance device to a parallel format for command decoding or for the microprocessor. When data and commands are to be sent to the MD, the data is converted from parallel to serial data.

Error Checking

The maintenance adapter monitors Check 1 errors. A Check 1 error is a hard microprocessor error in which the integrity of the subsystem is suspect.

A Check 2 error is a hardware-detected error. Any of the tape control unit cards may recognize parity errors or other errors. These errors activate the Check 2 error line to the maintenance adapter and microprocessor. The microprocessor searches for Check 2 errors during normal operation.

Power

The power area of the tape control unit contains an ac power supply and two dc power supplies. The ac power supply provides power for the dc power supplies, fans, and ac power for the tape units. One dc power supply furnishes power to the tape control unit. The other dc power supply provides power for the CE Panel and the two STI-FIPS adapters. Tape unit dc power is developed in each tape transport unit dc power supply.

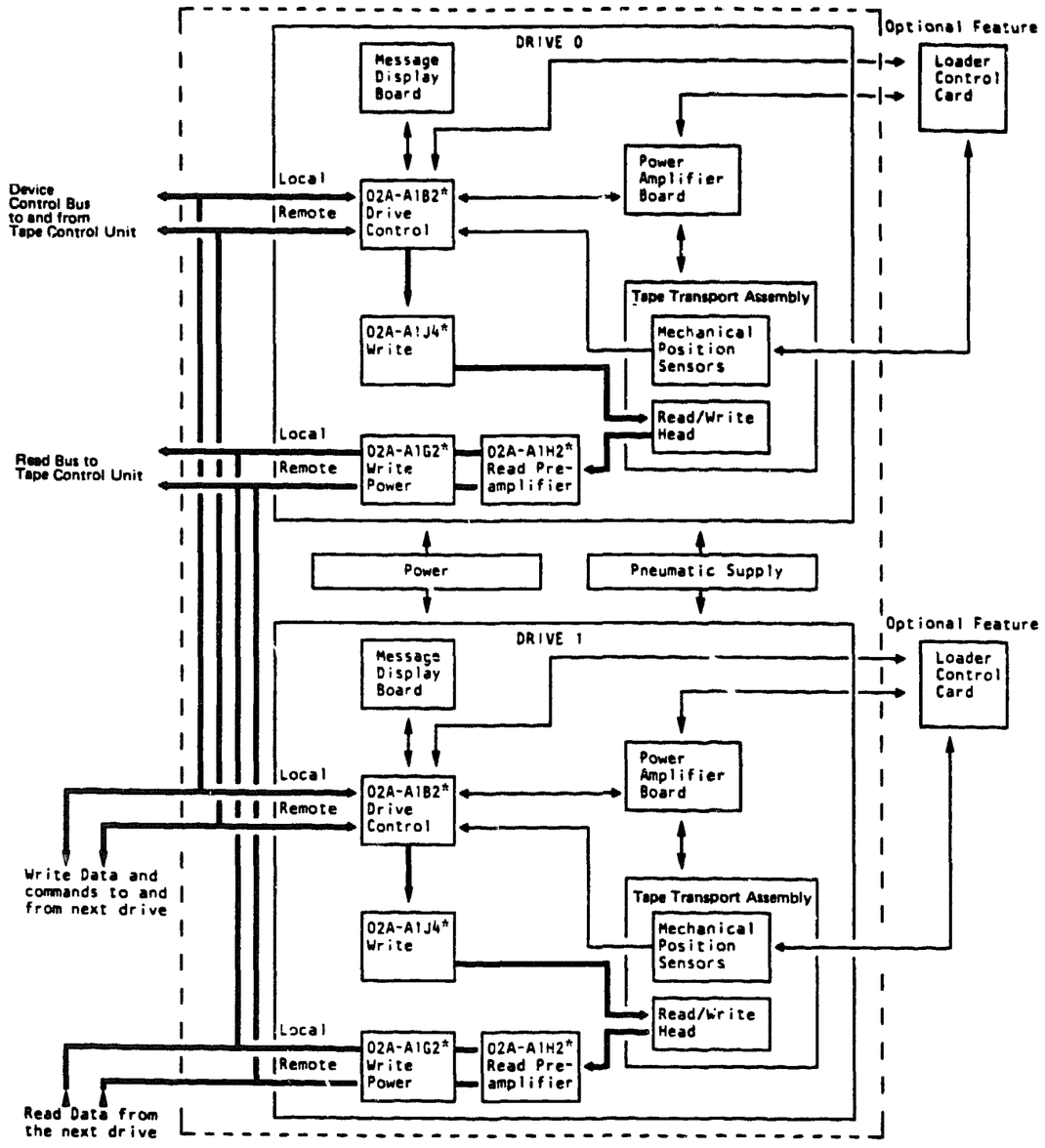
Voltage Regulator

The voltage regulator card controls the voltages needed for the storage cards in the tape control unit.

Power-on Reset/UV Detector

The power-on reset (POR) card contains the POR circuits and the under voltage (UV) circuits. In addition to resetting the tape control unit circuits during a power on, the POR and UV pulses are used to supply POR to the STI-FIPS adapters.

Tape Transport Unit Diagram



Tape Transport Unit (Continued)

Logical Components

Each tape transport unit contains two drives and two groups of logical components that control tape movement and data transfer within the tape transport unit. Each drive and its associated logical and mechanical components operates independently; however, the power and pneumatic supplies are shared by both drives.

The diagram on OPER 35 shows the components needed to load, move, and unload tape, and to write on and read from tape. This topic explains the purpose of these components along with a description of the tape transport unit power supply and pneumatic supply is also included in this topic. The drive's mechanical components, sensors, and tape movement operations are also described.

Processor Card

The processor card controls all functions within the drive. Write data and commands are received by the adapter card and are passed, under control of the processor, to the digital servo card and write card. Read data is read from the tape by the read head and sent to the read card, under control of the digital servo card, as directed by the processor. All motion controls are controlled by the digital card, power amplifier card, and the processor.

Digital Servo Card

Because the drive is a microprocessor based system operating in a real time mode, and because of the tight control that is needed to maintain proper tape tension and tape velocity, high speed control processing is required. The digital servo card is designed to relieve the processor of simple housekeeping work, which increases its availability to perform processing tasks.

The digital servo card serves as a buffer and the interconnections between the processor and the rest of the drive. It also gathers information from the various drive sensors, mechanical switches, and error lines from other cards and presents them to the processor.

Adapter Card

The drives can be logically attached to one or two tape control units. The adapter card contains two buses and the controls that permit communications between the drives and one or both tape control units.

In a dual tape control unit configuration, only one tape control unit at a time is permitted to communicate with a specific drive. The other tape control unit cannot access the drive until the first tape control unit has finished using the drive.

Drive Control Card

The drive control card controls all functions within the drive. Write data and commands are received by the adapter section and are passed, under control of the microprocessor section, to the digital servo section and the write card. Read data is read from the tape by the read head and sent to the read preamplifier card, under control of the digital servo section, as directed by the microprocessor section. All motion control is controlled by the digital servo section, power amplifier card, and the microprocessor card

Microprocessor

The microprocessor section of the drive control card contains the microprocessor, storage for the local storage register, and associated logic for control and interconnections to the tape control unit.

Some external registers (XRs), the external interrupt hardware, and most of the microprocessor error detection and reporting logic are located in this part of the card.

The microprocessor performs microcode to control and monitor tape control unit activity through the external registers, which are accessed by way of the external register interconnections.

Digital Servo

The digital servo section of the drive control card serves as a buffer and provides the connections to and from the microprocessor and the rest of the drive. The digital section of the card gathers information from the sensors, mechanical switches, and error lines from other cards in the drive and presents them to the drive microprocessor.

Because the drive is a microprocessor based operating system in a real time mode and because correct control is needed to maintain the correct tape tension and tape velocity, high speed control processing is needed. The digital servo section is designed to relieve the microprocessor of having to do certain simple housekeeping routines.

Adapter

The adapter section of the drive control card contains two buses and the controls that permit communication between the drive and one or both of the tape control units. A drive can attach to one or two tape control units.

In the two tape control unit environment, only one tape control unit is permitted to communicate with a specific drive at any one time. The other tape control unit cannot access the drive until the first tape control unit has finished its operation

Write Card

The write card contains the 18 write drivers, the head connector, parity checking circuits, and error checking circuits that check for an open head or head cable, shorted write drivers, and various other write problems.

Read Preamplifier Card

The read card amplifies the 18 read signals generated at the read/write head. The read preamplifier card sends the read data to the tape control unit by way of read bus local or remote. The bus is selected by the tape control unit.

Power Amplifier Board

The power amplifier board accepts digital current inputs from the processor through the digital servo section of the digital servo card, converts them to analog signals and applies necessary gain and phase shifting to drive the reel motors.

The power amplifier board uses the input from the tension transducer to keep correct tension on the tape. The power amplifier board also controls power on, power off, and power on reset.

Message Display

The message display provides a means for the host and the tape subsystem to communicate with the operator. The message display is a logic board with eight LEDs and two bar LEDs that displays messages that are sent from the processor through the digital servo card.

Power

The tape transport unit ac power is provided by the tape control unit ac supply. AC power is cabled from the tape control unit to the first tape transport unit then cabled from that tape transport unit to the next tape transport unit, and so on.

The dc power for the tape transport unit is developed in each tape transport units dc power supply. The dc power supply furnishes the power for both drives in that tape transport unit.

Loader Control Card

The automatic cartridge loader - loader control card has its own microprocessor and storage. The storage is loaded from the tape control unit functional diskette using the "Patching Path" each time the drive patches are loaded. This code is used by the loader control card to control the functions within the automatic cartridge loader. The loader control card uses the information from sensors, mechanical switches, and cards in the drive to control the loading and unloading of the tape cartridge.

Pneumatic Supply

The tape transport unit contains one pneumatic supply that is shared by both drives. The pressure side of the pneumatic supply consists of a pump, regulator, and an output filter. The vacuum side of the supply uses the same pump and an inlet filter.

Air under regulated pressure is distributed to the drive components through a plenum [3], which acts as a buffer to ensure a constant supply to the components. A pressure sensor attached to the plenum monitors the air pressure and causes a Check 46 to occur if pressure is reduced because of a leak in a hose or a loss of air from the supply.

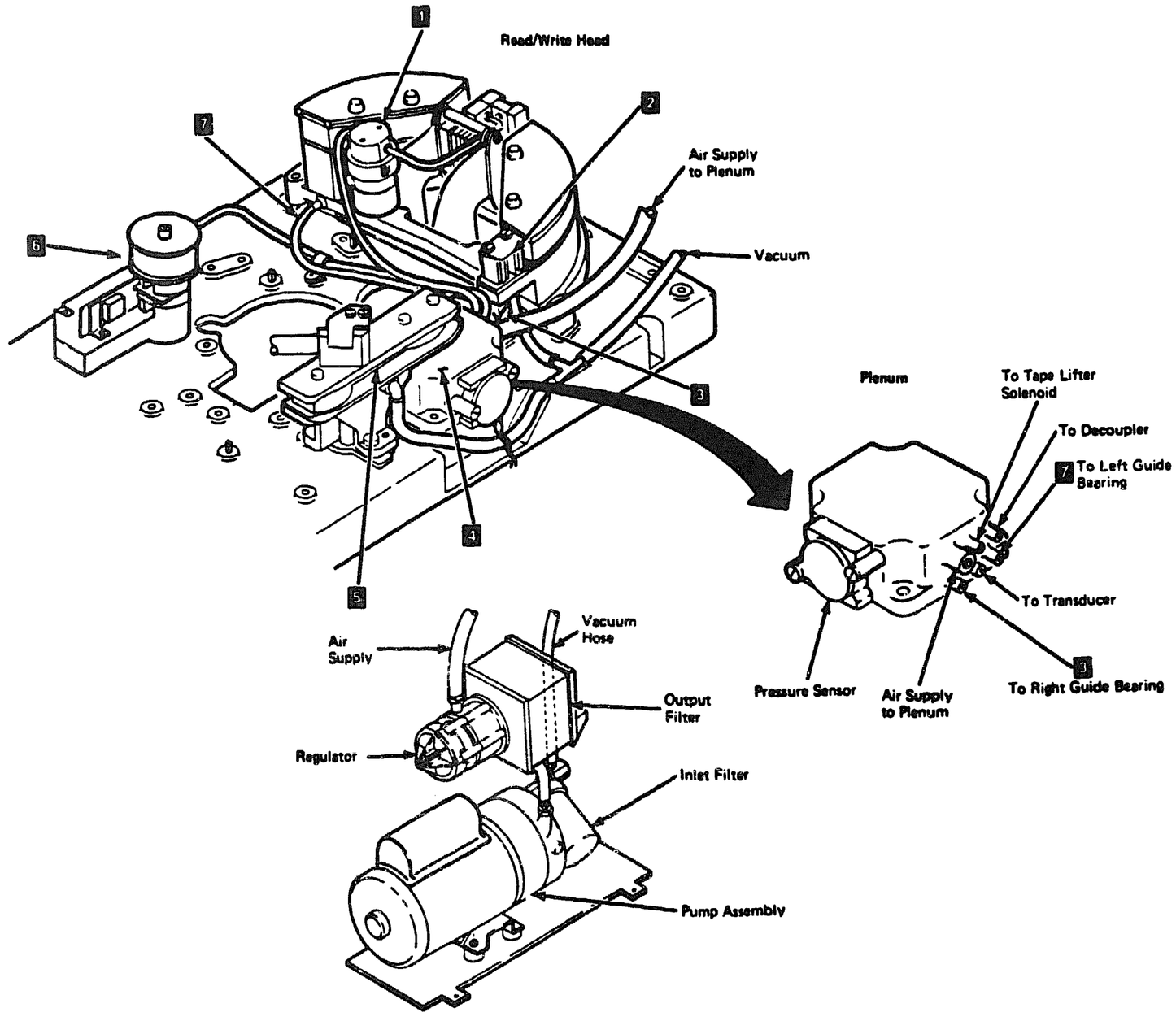
Air is supplied to the following bearing surfaces in the tape path to reduce friction and tape wear.

- Right Guide Bearing [3] (supply hose shown)
- Left Guide Bearing [7] (supply hose shown)
- Decoupler [5]
- Tension Transducer [6]

Air is also supplied to the tape lifter solenoid [1]. The solenoid is energized whenever tape is not moving. When the solenoid is energized, air blows through a slot in the read/write head and pushes the tape away from the head. If the solenoid fails to operate when tape motion is stopped, intermittent read/write errors can occur.

Note: A solenoid failure does not always cause an error check condition.

The vacuum side of the pneumatic supply applies vacuum to the tape cleaner [2] and to the decoupler [5]. The tape cleaner removes particulate matter from the tape before it passes over the read/write head. The vacuum applied to the decoupler pulls the tape into the decoupler. The decoupler provides a cushion that prevents the tape from stretching during start and stop operations. No error checking is directly associated with the vacuum side of the pneumatic supply. However, vacuum failures can cause intermittent read/write errors.



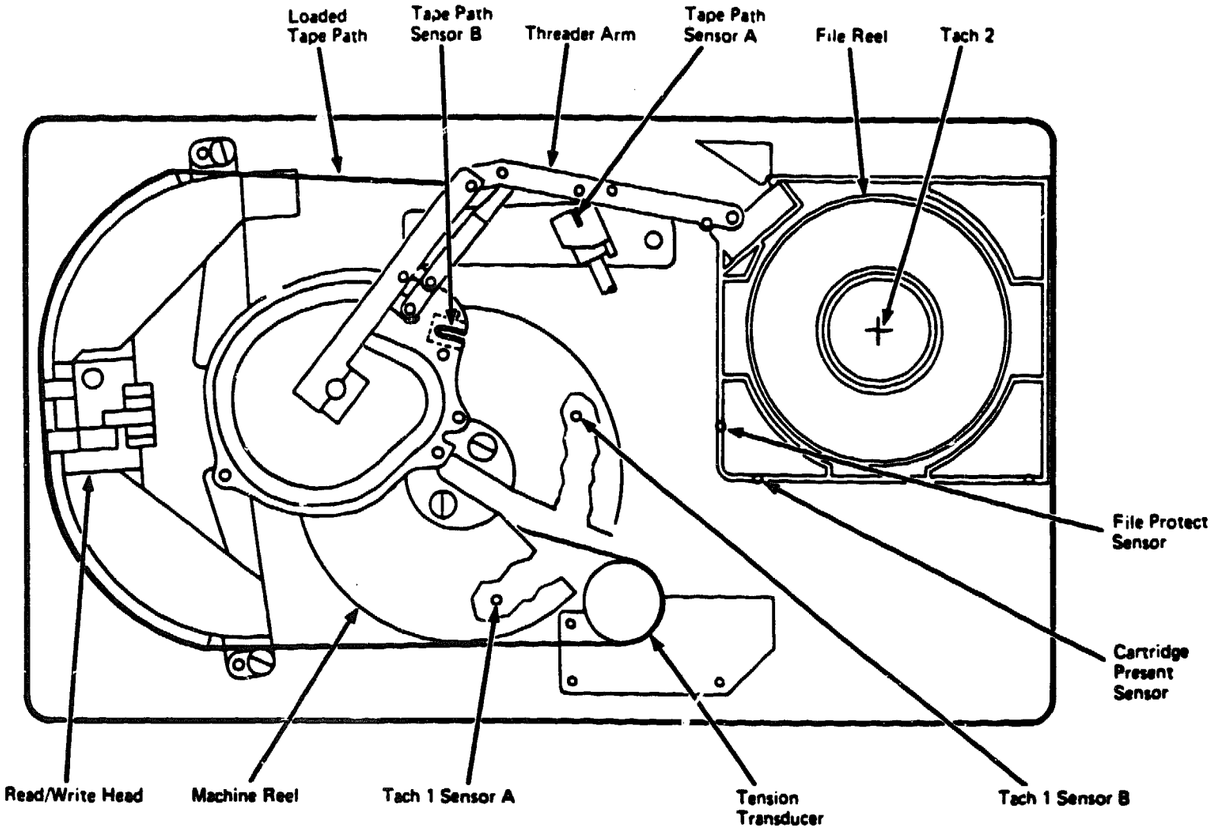
Tape Transport Unit (Continued)

Drive

The drive contains the read/write head to read and write data, and the mechanical components, sensors, and motors to thread tape and move tape forward and backward. The processor controls all mechanical operations in the drive. The processor uses the digital servo and power amplifier to change digital signals used by the control logic to analog signals used by the drive motors.

Drive sensors feed back information to the digital servo to indicate motion errors and tape position so that the digital servo can modify the speed, velocity, or direction of tape motion. The following sensors monitor the drive:

- Cartridge Present Sensor - indicates that the tape cartridge has been inserted into the drive.
- Cartridge Latched Sensor - indicates that the cartridge is latched in place.
- Tape Path Sensor A - indicates that the tape leader block is at the file reel.
- Tape Path Sensor B - indicates that the tape leader block is at the machine reel.
- Machine Reel Tach Sensor A - senses the position of the machine reel. It is used in conjunction with Tach 1 Sensor B to generate the 'tach 1' pulse.
- Machine Reel Tach Sensor B - senses the position of the machine reel. It is used in conjunction with Tach 1 Sensor A.
- Tension Transducer - senses tape tension. Its output is used by the microprocessor to control the reel motor power amplifiers.
- File Reel Tachometer (Tach 2) - monitors the speed and direction of the file reel motor.



Tape Transport Unit (Continued)

Tape Threading-Loading

Tape threading-loading is an automatic microprogram controlled operation that starts after a tape cartridge has been inserted and latched in the drive. The operation consists of:

- Sensor Test - Tests sensors and associated detection circuitry.
- ILS Test - Tests for interlayer slip.
- Thread-Load - Threading, loading, and positioning the tape at BOT.

Sensor Test

The sensor test is a diagnostic routine that tests the threading path sensors and the tension error detection circuits. The test is limited to sensors that are in a "light" (not covered) state at the time the cartridge is inserted. In addition, the test sets appropriate flags if a midtape load is required or if a cleaner cartridge has been inserted.

ILS Test

This test is performed to determine if an ILS condition exists in the cartridge before the processing of data. If this condition is detected, the tape control unit is instructed to issue a Locate command to a sector near EOT, followed by a Rewind command. This operation reestablishes correct tape tension on the reel.

- A start/reposition/stop loop starts.
- The acceleration rate for the start is 150 meters/sec (492.13 feet/sec).
- At 100% velocity, velocity deviation is checked at each of 32 tach-2's.
- If at any of the 32 tests made, the velocity is greater than 3.5% of nominal, an ILS condition exists.
- The above sequence is repeated ten times.
- An alert is issued to the tape control unit signaling load complete.
- If an ILS condition was detected, unit check and the appropriate ERP code will be sent to the tape control unit.

Thread-Load

The thread-load operation starts by driving the thread motor in a forward direction in a pulsed mode. Pulsed mode supplies velocity control for the threading mechanism. Backward bias is applied to the file reel motor to maintain tension on the tape during threading.

To thread tape, the carrier pin is extracted from the file reel by the threader mechanism 1. At the same time that the threading mechanism starts to move, the machine reel is positioned (nulled) to permit proper entry of the tape carrier pin. The carrier pin, leader block, and tape are then pulled around the periphery of the tape path by the threader mechanism 2. Finally, the carrier pin and leader block are housed in the machine reel 3. Proper engagement of the carrier pin in the machine reel is ensured by a sensor at the machine reel home position.

When the threading operation is complete, the threader motor is stopped and the tape is moved forward, under microprogram control, to BOT. A Stoplock condition is activated at BOT and a 'not-ready to ready' alert is presented if the Ready/Not Ready switch is in the Ready position.

Tape Unloading

The tape unloading-rewinding operation starts when the Unload switch is pressed, and the Ready/Not Ready switch in the Not Ready position. Tape is rewound onto the file reel at high speed until BOT is detected.

Unload

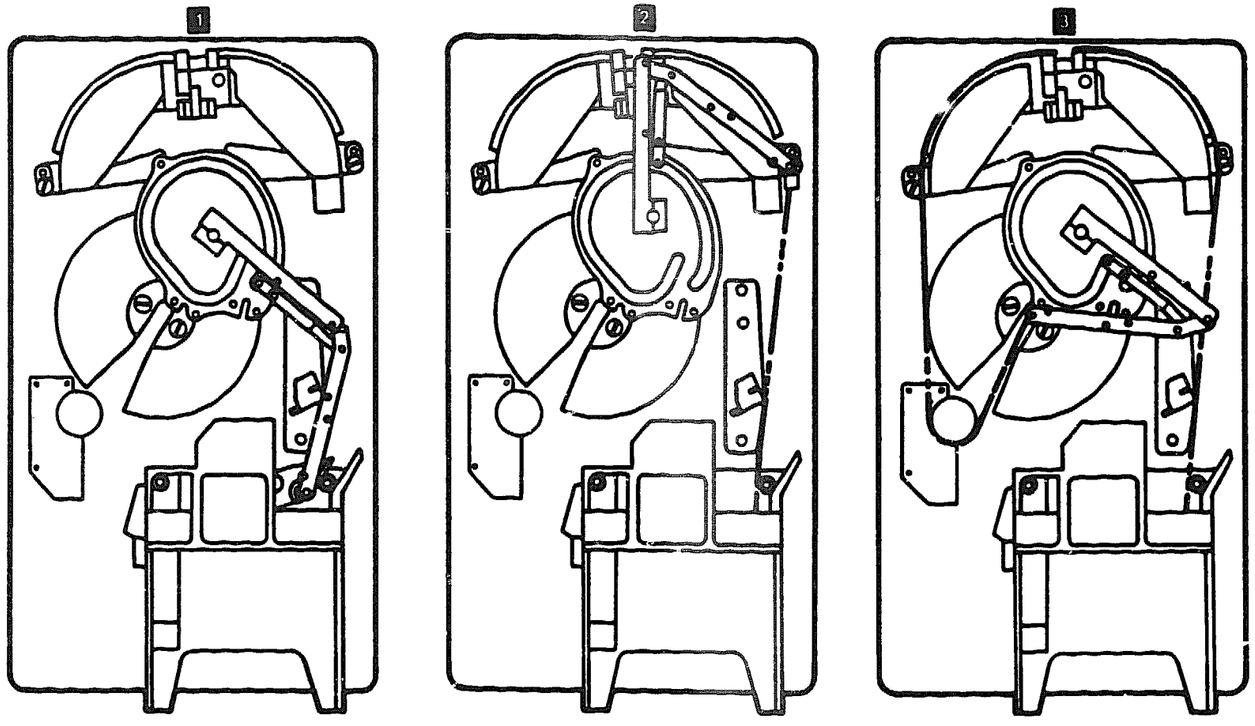
The unload (last wrap detect) sequence starts with the tape under tension, at BOT, and with 'rewind unload status' signal active. Stoplock and tension control are deactivated, and the tape is moved at low speed (less than one meter/second (3.28 feet/second)) to the last wrap null point. The last wrap null point is where the machine reel is positioned for the exit of the leader block and carrier pin.

When the tape reaches the last wrap null point, the leader block is withdrawn from the machine reel sufficiently to change the state of tape path sensor 'B'.

The machine reel is nulled to ensure proper exit of the leader block and carrier pin and a small backward bias is applied to the file reel motor to remove any slack in the tape. The thread motor is driven backward in pulsed mode. Increased bias is also applied to the file reel motor to maintain tape tension.

When the leader block is sensed at the cartridge home position, power is dropped from the file reel and threader motors, and the cartridge tray solenoid is energized. When the cartridge tray solenoid energizes, the tray cover is raised, which permits the cartridge to be removed from the drive.

Note: The cartridge latch should be closed when the tape drive is not being used. (A cartridge need not be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.



Subsystem Initialization

This topic describes the power sequencing, and initial microprogram load (IML).

Power Sequencing

Power sequencing for the tape subsystem is activated from the tape control unit. When power is applied, internal diagnostic tests check voltages. After the voltages have been checked, a general reset of the tape control unit and drive logic is performed. Finally, a basic function test of the tape control unit and drive logic is performed. Errors detected during the power on sequence are reported to the tape control unit.

When all tests have been made and the results have been reported to the tape control unit, the tape control unit IMLs itself from the functional diskette.

Initial Microprogram Load (IML)

After every power-on reset, or when the IML button is pushed on an offline tape control unit, the tape control unit will IML itself from the functional diskette. The functional diskette is kept in the IML device at all times, and must be write enabled.

The tape control unit has a permanent microprogram that detects and reads the functional diskette information into the control storage area of the tape control unit logic. A read operation is performed from the diskette device and the data is sent to control storage.

If the diskette device cannot read the functional diskette, or read errors occur, the tape control unit error light turns on.

If no read errors occur, the tape control unit performs diagnostic tests to ensure that the microprogram has loaded without any errors and is executing correctly. If errors occur during the diagnostic tests, an FSC is generated and stored in COMTAB.

If the IML and diagnostics complete successfully, the tape control unit wait light is on and the tape control unit error light is off. Pressing the tape control unit Online Test/Offline Test switch to Online Test , causes the IML device to run again and load any necessary tape control unit or drive microcode patches. The tape control unit offline light then goes off.

In a dual tape control unit configuration, each tape control unit is independent of the other tape control unit. Each tape control unit must be separately IML'ed. Any IML or IML diagnostic errors that occur are reported only in the failing tape control unit. The version of microcode in each tape control unit's functional diskette must be identical.

External Registers Data Flow/Error Detection

The external registers (XRs) are used by the microprocessor that has a 16 bit (one word) instruction to communicate, through the channel adapter to the STI-FIPS adapter, and through the device adapter to the drive.

The XRs are used to control various operations in the functional areas and also for error retention. The XRs are eight bits, plus parity, in size and are used in read-only, write-only, or read/write operations. All XR errors are reported to either the maintenance adapter (MA) or the microprocessor (MP) card.

There are seven functional areas in the tape control unit that use the XRs. The buffer adapter and the buffer control card are in the same functional area.

- Status Store
- Buffer
- Microprocessor
- Write Data Flow
- Device Interconnections
- Read Data Flow
- Maintenance adapter

The XRs are addressed by using an XR address bus (a six bit bus) which uses bits 0-4 and a P bit for even parity together with two 'extend' bits (0-1). Extend bits 0 and 1 are in fact the PCR register bits 6 and 7. See Figure 1. These bits are sent to each functional area from the MP card. They are not parity checked.

External Register Addressing

There is a five bit address in all microprocessor XR instructions permitting up to 32 XRs to be addressed (hexadecimal 0-1F).

Addresses are 'extended' by using processor control register (PCR) bits 6 and 7 (extend bits 0 and 1) 128 addresses can be selected by addressing one of four register pages Each page contains 32 addresses (see Figure 2).

The 'extend' bits are not part of the address bus and are not parity checked, but are sent to each functional area from the MP card.

PCR Register Bits 6 and 7	
'Extend Bits 0 and 1'	
0	0 Page A
0	1 Page B
1	0 Page C
1	1 Page D

Figure 1. Page Selection

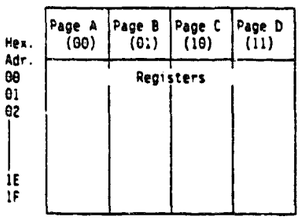


Figure 2. Register Addressing

The XR address is common to all cards containing XRs, except the buffer control card. The buffer control card receives only the P-bit from the XR address bus. XR address bits 0-4 are received from the buffer adapter card through a top card connector.

Moving Data

Data is moved using three data buses:

- XR Data Bus A
- XR Data Bus B
- XR MP Bus

The XR MP Bus is internal to the MP card. Each data bus is eight bits plus a parity bit for odd parity. The XR Data Bus A moves data between the MA, DI, SS, and the MP card. The XR Data Bus B moves data between the MP, BA, DF, and the RC cards.

Clocking for the XRs is provided by the CS card. There are 22 sub cycles (S0-S21), each sub cycle is 23.1667 ns.

Note: There is an XR timing chart on EAD 8 and a drawing on EAD 2696 that may help in understanding the following sequence.

External Register Operation

The following sequence addresses, reads, and writes into a selected external register.

1. The address is placed on the XR address bus by the MP card.
   a. The bus contains bits 0-4, P with even parity.
   b. The 'extend' bits (0-1) are also sent to each functional area to select the page that the addressed register is on.
   c. Each functional area decodes the data on the XR address bus, together with the 'extend' bits, to determine if one of its registers is being addressed.
   d. An 'XR addressed' line is activated when an XR in a functional area is selected.

      'XR addressed' is not generated if the XR address bus has bad parity.
   e. The XR addressed lines go to the MA card where they are checked for only one active line.
2. If the instruction specified that an XR was to be read, an XR gate is generated permitting the addressed area to gate the data on the XR data bus.
   a. If an XR read is occurring, 'XR addressed clock' line is generated and 'XR error ungated' line is sampled at S20-S21 time. The MA card uses 'XR addressed clock' line to set the XR functional area error latch (MTI bit 4) and to latch the functional area (MP) 'XR addressed' lines if only one functional area is not detected.
   b. The latched XR addressed lines are read through the MDI register when the read XR addressed bits latch (MTO bit 2) is on.
   c. The MA card also uses the 'XR addressed clock' line to set the MP error latch (MTI bit 3) and MA error latch (MTI bit 5) if the XR address bus has bad parity.
   d. If 'XR error ungated' line is active, the processor sets the XR error functional area read error latch (PER bit 5). 'XR error ungated' line must not be active during S20-S21 time to avoid an error.
3. If the instruction specified that an XR was to be written, 'XR write gate' line is activated at S0-S13 time and the processor places the write data on all three XR data buses. The functional area's gate the 'XR data bus' lines on their internal buses.
4. If the XR address bus and the XR address extend bits have addressed a write XR (XR write gate is on), the functional area register activates its XR addressed line (MP). An 'XR addressed' line is not generated if the XR address bus has bad parity.
5. The MA card checks the XR addressed line for only one line being active. An 'XR error ungated' line is activated if the addressed area detects that the write data had bad parity. An 'error ungated' line is activated if the MA card detects bad parity on the XR address bus, or if more than one XR addressed line is active.

At S5-S7 time the 'XR load' line is activated by the control store card. The XRA register is loaded with XR address extend bits 0 and 1, and the five bits plus parity of the XR address bus. If an XR was read during the first half of the cycle and the data latched in the scan path had bad parity, the XR read parity latch (PER bit 4) is set. The XR functional area write error latch (PER bit 6) is set if XR write is occurring and 'XR error ungated' line is active at S9-S10 time.

The three XR errors indicated by PER bits 4, 5, and 6 causes the 'XR error latched' line to be active. XR error latched being active causes the 'check 2' line to be active and also activates the 'MP external interrupt 0' line and stops the XRA register from being updated. The XRA register contains the address of the register that was used when the error occurred.

Check 2 is used by the functional areas to indicate to the microcode that some error has occurred internal to their area.

XR Detected Errors

CHK 1 Errors

ERB Bit 0 is set:

If there is an XR address compare error. An address error is address bus does not equal the address that the instruction called for.

ERB Bit 1 is set:

If the MP card (registers IMR or PDR) has bad parity.

ERA Bit 6 is set:

If MP internal XR address bus has bad parity.

CHK 2 Errors

MTI Bit 3 is set:

If the MP XR was found to have a parity error.

MTI Bit 4 is set:

If no XR or more than one XR addressed line is active.

MTI Bit 5 is set:

If the XR address bus has bad parity.

PER Bit 4 is set:

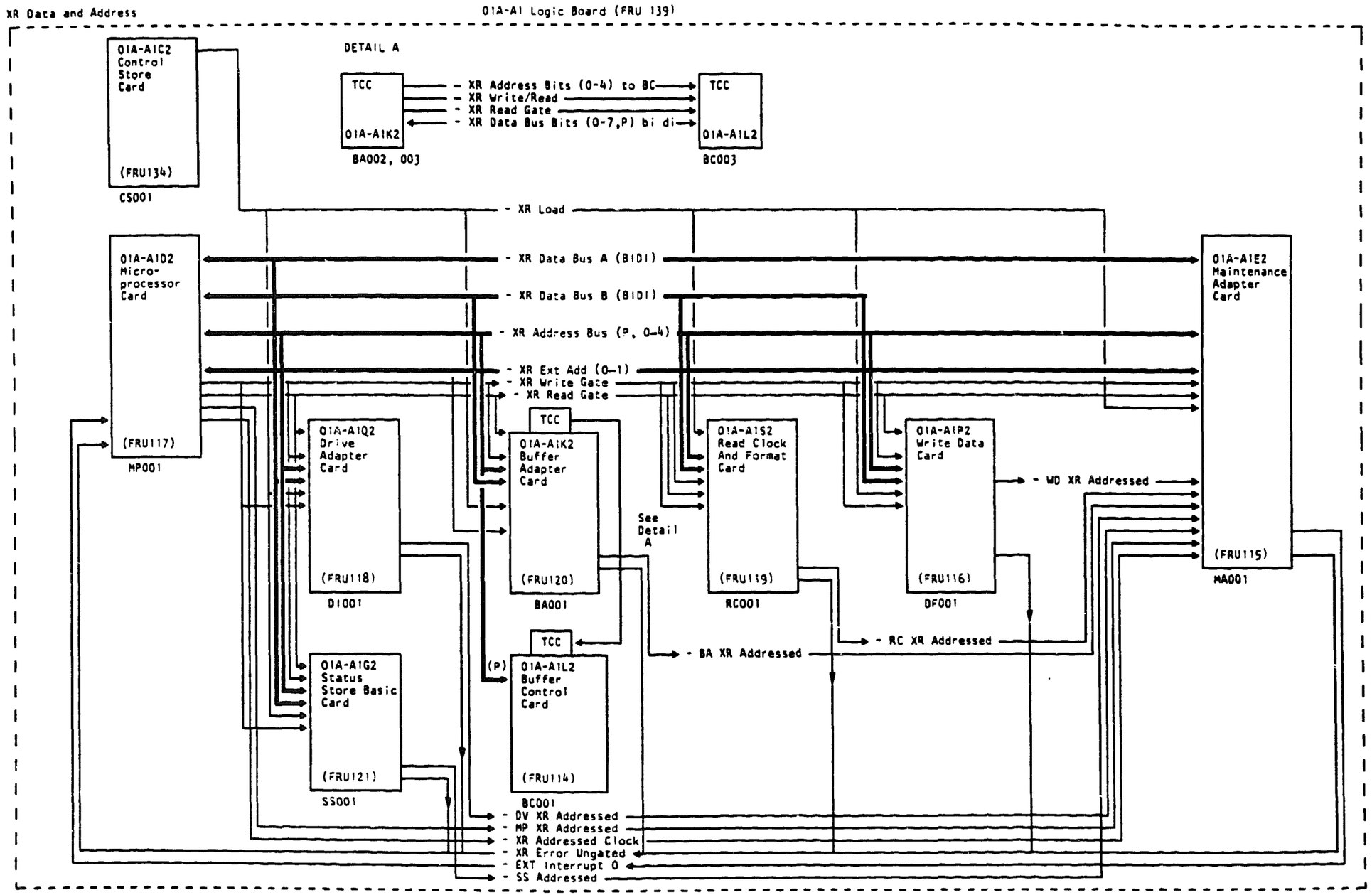
If a read data parity error is detected by the MP card during an XR read (sets PSR bit 0).

PER Bit 5 is set:

If the functional area containing the XR that was addressed detects bad parity on a read (sets PSR bit 0).

PER Bit 6 is set:

If the functional area containing the XR that was addressed detects bad parity during an XR write.



Point-to-point wiring on a board is shown on the Tape Control Unit and/or Drive net wire lists.

Maintenance Device to TA90 Maintenance Adapter Communication Path

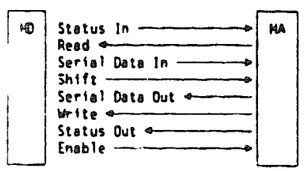
The maintenance device (MD) can be used to service the TA90 subsystem. It executes maintenance analysis programs contained on a diskette and has a communication path to the TA90 subsystems maintenance adapter (MA) card. This communication path is used to send commands to the MA from the MD where they are recognized as control or data transfer functions. The MD cannot diagnose problems in the STI-FIPS adapters.

The direction of the data movement is determined by the type of function specified by the MA (read/write) and by the type of function specified by the MD program (get/put). The communication path signal lines used for control of data byte movement differs for MD 'get' or MD 'put' type functions.

Command and data bytes are sent serially-by-bit from the MD to the MA. Data and status bytes are received by the MD on a separate serial data line.

The purpose of this description is to explain the function of each signal line and its use for specific operations. The signal lines are named from the Product Maintenance Adapter Perspective (such as, 'serial data in'). The signal levels used are + 5 V dc to 0 V dc with + 5 V dc being the inactive level.

MD to/from MA Communication Path Signal Lines



Status In

This line is activated at the start of an operation by the MD to signal the MA to respond with 'read' and to receive a command. It is also activated when all data bytes have been sent or received by the MD to signal the end of the operation. The command byte sent for the second 'status in' sequence is end-of-message (EOM) 40 (hexadecimal). This line is deactivated when the 'read' signal goes inactive.

Read

This line is activated by the MA in response to 'status in' and is used to request data bytes during an MD 'put' operation. It is a signal to the MD to start sending shift pulses. It must go inactive at the center (+ edge) of the 9th shift pulse. This line goes active then inactive for each byte that is sent by the MD.

Serial Data In

This line is used to send serial data bits from the MD serializer/deserializer (SERDES) register to the MA SERDES register. It changes on the leading (-) edge of the 'shift' pulse and it is valid for the MA to sample it on the trailing (+) edge. The bit order is 0-7, then the 'P' bit is last. See Figure 1.

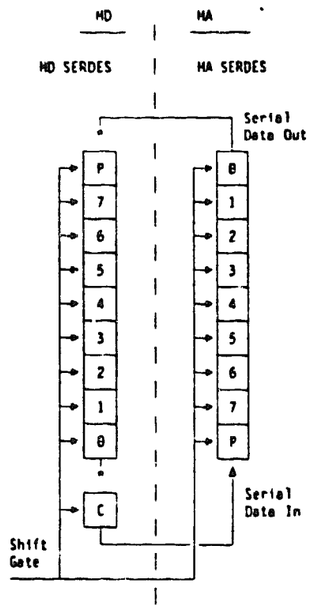


Figure 1. Shifting Bits Through SERDES

Shift

9600 bits per second (bps) pulses (104 microseconds) are placed on this line by the MD in response to the 'read' or 'write' signals from the MA. These pulses control the movement of SERDES register bits to and from the MD and the MA. Shift pulses also appear during the 'diagnostic wrap' part of an MD port 'open' operation. See Figure 1 on OPER 81.

Serial Data Out

This line is used to send serial data bits from the MA SERDES register to the MD SERDES register. It changes on the trailing (+) edge of the shift pulse and it is valid for the MD to sample it on the leading (-) edge. The bit order is 0-7, then the 'P' bit is last. Since the MD samples for bit 0 on the leading edge (-) of the first shift pulse, the data in the MA SERDES must be valid before the 'write' line is activated.

Write

This line is activated by the MA to send data to the MD when a 'write' type command is received in an MD 'get' operation. It is a signal to the MD to start sending shift pulses. It must go inactive at the center (+) edge of the 9th shift pulse. This line goes active then inactive for each byte that is received by the MD. It is also used in combination with 'status out' to end an MD 'put' operation in progress or asynchronously to send a status byte from the MA to the MD.

Status Out

This line is used together with the 'write' line to end an MD 'put' operation if the MA detects bad parity on an incoming data or command byte. 'Write' and 'status out' may be activated when there is no other activity and the MD will send shift pulses to move a single byte of status information from the MA to the MD. This asynchronous operation occurs following all commands that are executed by the TA90 microcode. See Figure 4 on OPER 81.

Enable

This line is activated by the MD during an MD port 'open' operation. It is monitored by the MA card indicating that the MD is connected. It must be active during all communication path operations.

MD to MA Communication Path Error Checking

Parity Error Detection

Data received by the MD in a 'get' operation from the MA is tested for an odd number of bits (vertical redundancy). If an even number of bits are detected, the operation is ended with a 'status in' command sequence and an error condition sent to the MD program.

The MA card also checks the parity of the data it receives from the MD. If an even number of bits are detected, the MA ends the operation by activating 'status out' and 'write' at the end of the 9th bit period. This error condition also indicates a bit in the MA cards MTI register, and the 'status out' sequence sets error bits in the MD for detection by its program.

Communication Path Signal Sequence Error Detection

The MD checks for the correct signal during 'get' and 'put' operations. If 'read' is the expected signal, and 'write' appears without 'status out', an error is reported by the MD program.

MD Internal Adapter Error Detection

The MD checks for the correct internal interrupt sequence during all port operations and errors are reported by the MD program.

MD to MA Communication Path Operations

- Open with Diagnostic External Wrap
- Put from the MD to the MA
- Get from the MA to the MD

1. **Open:** This function is executed in the MD and it resets the MD hardware adapter, activates the 'enable' line, and tests the data path between the MD and the MA. This test is accomplished by shifting a data byte 5A (hexadecimal) from the MD SERDES through the 'serial data in' path to the MA SERDES, and returns the data to the MD SERDES through the 'serial data out' path. This test requires 18 shift pulses. See Figure 1.

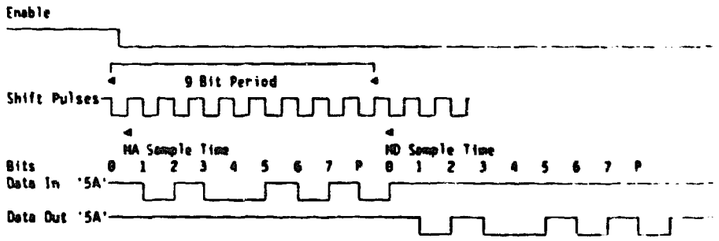


Figure 1. MD 'Open' Operation

2. **Put:** In this function both command and data bytes are sent across the 'serial data in' path using the 'read' and 'status in' lines for control. The MA command byte is sent first followed by the data bytes. The EOM command byte is sent to end the operation. Command bytes are indicated with the 'status in' signal line.

   The MD initiates the operation by activating the 'status in' line and the MA responds by activating 'read'. When the active 'read' signal line is detected by the MD, it starts sending 'shift' pulses that moves data or command bytes. There is a form of 'put' function with no data transfer that is used to send a command byte only for control type functions that have no data associated with them. See Figure 2.

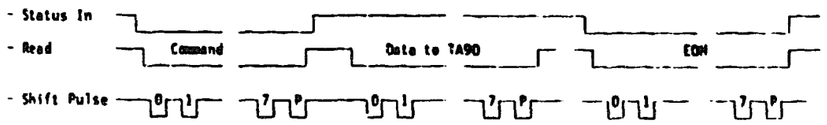


Figure 2. 'Put' Operation from MD to MA

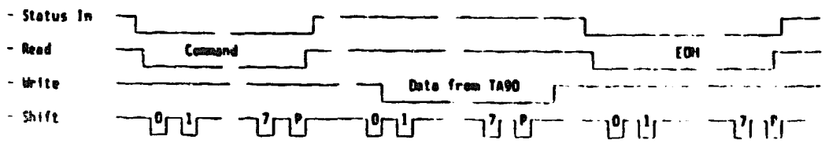


Figure 3. 'Get' Operation from the MA to MD

3. **Get:** In this function, the command bytes are sent to the MA by way of the 'serial data in' path, but the data bytes are controlled by the 'write' signal line and are received by the MD on the 'serial data out' path.

   You will notice that this operation is similar to the 'put' function except the 'write' line is used to move data and it is active before 'status in' and 'read' becomes active to send the EOM command at the end of the data transfer part of the operation. See Figure 3.

   Note: See the Maintenance Device/Maintenance Adapter Diagnostic on MD/SDISK 1. This diagnostic permits you to repetitively execute (loop) any of the above operations.

Enable Communication Path

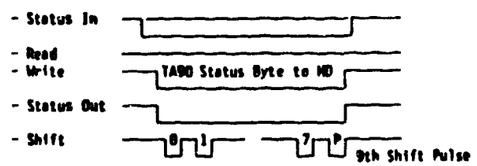
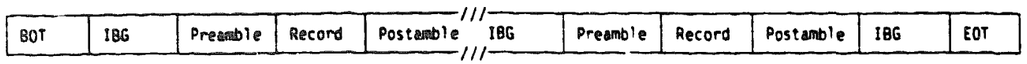


Figure 4. Status Out Sequence

Tape Record Format

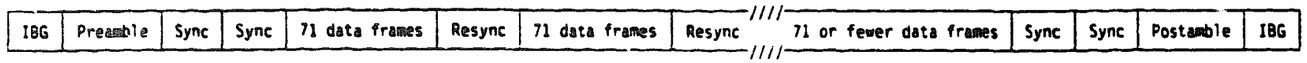
Tape Format

This diagram represents the general format of the tape.



Tape Data Record Format

This diagram represents the general format of data records on tape.



Read Data Flow

This topic describes the major data flow paths within the subsystem that are used to transfer data during read and write operations and that control tape motion. In addition, data flow for the loop write to read diagnostic routine is also described.

Read Operation

The diagram on the OPER 95 page shows the read data flow path within the TA90 tape subsystem.

Buffered Read

A buffered read operation moves the data three times:

- From the drive to the tape control unit's data buffer
- From the tape control unit's data buffer to the STI-FIPS adapter's data buffer
- From the STI-FIPS adapter's data buffer to the host system using the STI interface

The move from the drive to the TCU buffer is performed at the drive data rate.

If multiple read commands have been sent to the same drive, the TCU might cause the drive to read the next data block in the file before the STI-FIPS adapter asks for it. Therefore, the requested block may already be in the TCU data buffer. If it is, the tape control unit sends it to the STI-FIPS adapter as soon as the FIPS READ command is received. It does not require data transfer from the drive and does not include the drive start up time. Once the requested data has been transferred from the TCU data buffer to the STI-FIPS adapter data buffer, it is then sent to the host system over the STI interface. The operation is complete when all the requested data has been transferred from the tape to the host system.

If the data is not in the TCU data buffer when the STI-FIPS adapter sends the FIPS READ command, the TCU informs the STI-FIPS adapter that the data will be available later. The tape control unit then selects and starts the addressed drive. As soon as the drive is up to speed, the TCU checks for read data from the drive. If a tape mark is found, the STI-FIPS adapter is informed of the end-of-file condition. The STI-FIPS then passes this information to the host system, and the read operation ends. If no tape mark is found, the TCU checks the inter-block gap, synchronization, and preamble characters for correct patterns and timing.

As the data block is read from the tape, it is loaded into TCU's data buffer. At the same time, the tape control unit signals the STI-FIPS adapter that the data is available. The STI-FIPS adapter reissues the FIPS READ command. When the TCU receives the READ command, it starts sending the data block, one byte at a time, from the TCU data buffer to the STI-FIPS adapter's data buffer. (It is possible for the drive to still be sending data to the TCU's data buffer at the same time.)

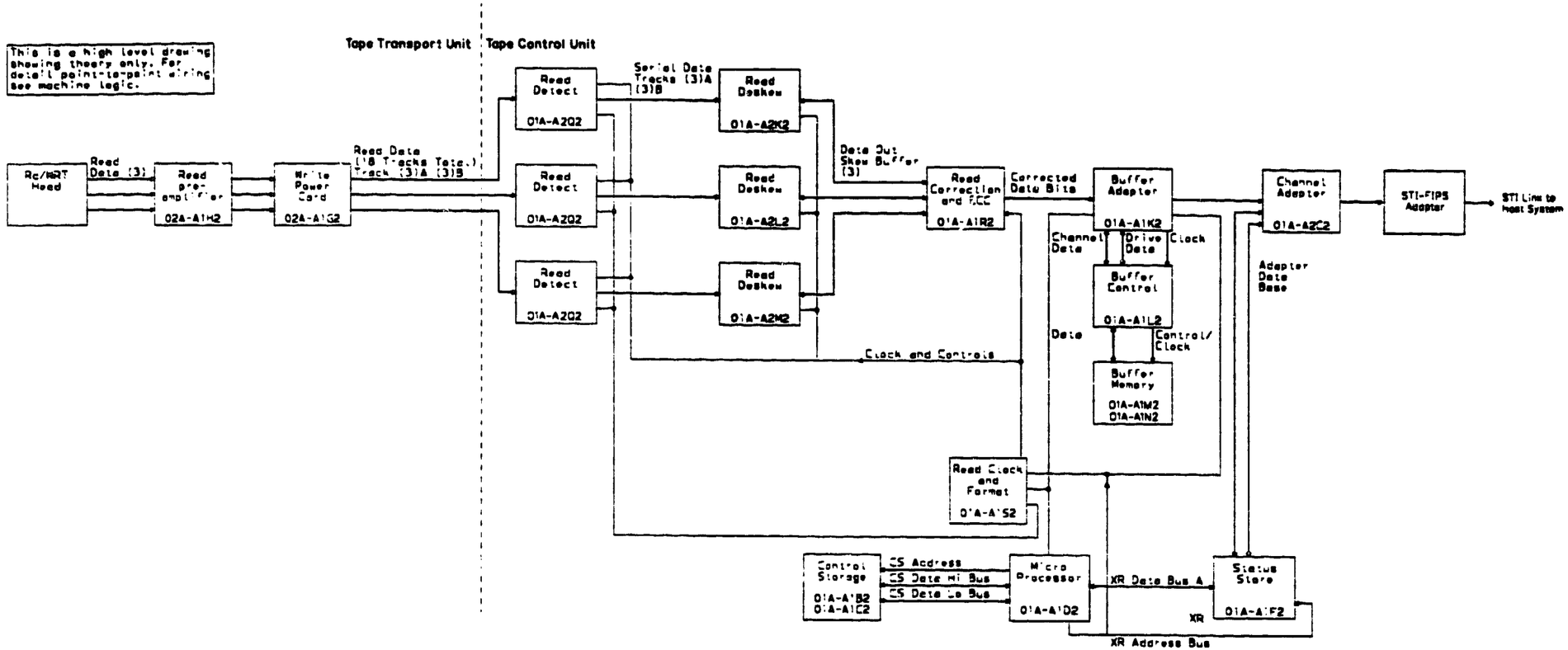
When all the data has been transferred by the TCU from the buffer, or the buffer and the drive, the TCU signals the STI-FIPS adapter that the read operation is complete. The STI-FIPS adapter is then able to begin the transfer to the host subsystem. While the transfer to the host subsystem is occurring, the STI-FIPS adapter might be transferring data between its buffer and the TCU's data buffer for the next READ or WRITE command.

If any nonrecoverable errors occur during any part of the operation, an error indication is sent to the host system, which then may issue status requests to determine the nature of the error.

If the end-of-tape (EOT) is detected during the read operation, or if the beginning-of-tape (BOT) is detected during a read backward operation, this condition is reported by the TCU to the STI-FIPS adapter, which then informs the host system.

Improved Data Recording Capability is not supported during a Read Backward operation.

Read Data Flow (Continued) OPER 95



Read Data Flow (Continued)

A Read command sent to the selected drive starts a read operation. When the drive is up to correct speed, and the interblock gap (IBG) preceding the record to be read has reached the read head, the drive signals the tape control unit by activating the 'gap in' line.

Read Operation

Use the following explanation with Figure 1.

'Gap in' sets the read status register (RSR) bit 3, causing a Level 3 interrupt. The microprocessor activates the 'read gate', (read control register (RCR) bit 0), and also checks that the read head is in the IBG (read pattern register bit 0 is set).

When the beginning of the record reaches the read head the beginning-of-block (BOB) sets read pattern register (RPR) bit 4 on, which causes a Level 2 interrupt.

The microprocessor activates the 'read condition' line (read control register (RCR) bit 2) which activates the read data flow, and sets the interval timer to check the preamble. When the sync byte reaches the read head 'begin sync' (RSR bit 0) is set, which causes a Level 3 interrupt and at the same time starts the read data flow transfer to the TCU data buffer. The microprocessor checks that the beginning sync occurred within 100 microseconds (usec.) of the BOB. When the ending sync bytes pass the read head 'end sync' (RSR bit 1) is set, which causes a Level 3 interrupt. The microprocessor sets 'gap out enable' (RCR bit 6) and sets the interval timer to check the postamble.

The read data flow sends a 'read end' signal to the buffer adapter and 'device read end' (buffer device status and error register bit 1) is set. A Level 4 interrupt occurs and the microprocessor checks that no device buffer overrun occurred. When the last byte of the postamble has passed the read head, 'generate gap out' (RSR bit 2) is set. This causes a Level 3 interrupt. The microprocessor then checks that 'generate gap out' has occurred within 100 usec. of 'end sync', also verifies that the read head is in the IBG (RPR bit 0 is set) area, sends the 'gap out' signal to the drive, checks for any buffer or read data flow errors, checks the block ID for the correct sequence, and determines whether to continue or end the operation. If the operation continues, the buffer and read data flow controls are activated to send the next record. If the operation ends, the buffer and read data flow controls are reset and the drive is released.

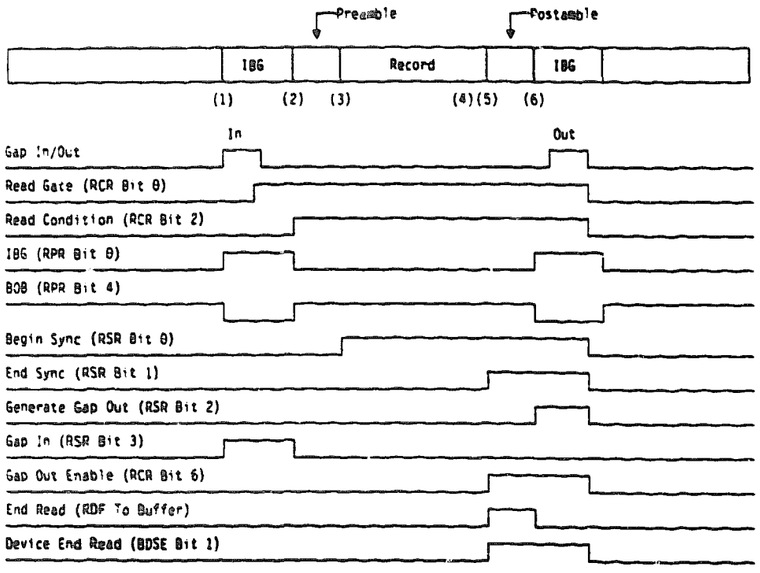


Figure 1. Read Operation Timing Chart

Write Data Flow

Write Operation

The heavy lines in the diagram on the following page show the data flow path within the subsystem for a write operation.

A write operation accepts data from the host system and records it on tape. The subsystem can accommodate two modes of writing.

- Buffered Write
- Tape Write Immediate

The Write command prepares the subsystem to record data on tape with the selected drive. The drive must be ready and the cartridge that is loaded must not be file-protected.

Under VMS, the use of the /CACHE qualifier in combination with the MOUNT command determines whether buffered, or immediate write mode, is selected. If the /CACHE qualifier is used with the MOUNT command, the buffered write mode is selected. If the /CACHE qualifier is not used, or if the /NOCACHE qualifier is used, the tape immediate write mode is selected. Obtaining high performance operation from the TA90 subsystem requires using the buffered write mode. Data compaction is not supported during the tape immediate write mode.

Buffered Write Mode

The host system issues the STI write command to the STI-FIPS adapter and informs the adapter of the length of the block that will be written. The STI-FIPS adapter allocates room for the data block in its data buffers and then signals the host system to begin the data transfer. The data is transferred in a series of 512 byte packets, each packet including error detecting check bits. If a transmission error is detected, the host system and the STI-FIPS adapter are able to re-try any 512 byte packet transmission. The STI-FIPS adapter informs the host system of the successful completion of the WRITE command when the entire block has been received.

The STI-FIPS adapter then sends the FIPS WRITE command to the TCU. The TCU allocates space for the block in its data buffer, and enters the starting address of the data block being written in a buffer record table. When the data is loaded into the buffer, an ending address is written in the buffer record table. The ending address enables the tape control unit to do the operation again if an error is detected during the write or the read-back check. The TCU receives the write data block, one byte at a time, from the STI-FIPS adapter and loads it into the data buffer. The TCU writes the ending buffer address in the buffer record table and informs the STI-FIPS adapter that the write operation is successfully completed when the STI-FIPS adapter indicates that no more data is to be written.

Errors detected while the data is being transferred from the STI-FIPS adapter to the TCU data buffer are detected by the TCU and reported to the STI-FIPS adapter, which in turn, reports the problem to the host system.

If another WRITE command immediately follows the first, the TCU places the new data in the data buffer at the address immediately following the first data block. (The first data block does not need to be completely written to tape for this to occur.) The TCU takes the responsibility for placing the correct pad, CRC, and ID bytes in the correct locations in its data buffer while the data is being stored.

It is common for many WRITE commands to occur in sequence. The transfer of one block may be taking place from the TCU's data buffer to the tape transport, while another block is being transferred from the STI-FIPS adapter's data buffer to the TCU's data buffer, while a third block is being transferred from the host system to the STI-FIPS adapter's data buffer.

If data is supplied to the subsystem fast enough, it is not necessary for tape motion to stop between data blocks' processing. When the tape passes the interblock gap and arrives at the point where writing another block may begin, the data for the next block may be available, and the writing process can begin without delays. (Delays such as stopping, repositioning, and restarting the tape.) The TA90 delivers its maximum performance when the tape is kept in motion. This constant tape motion is called "streaming."

To send the data block from the buffer to the drive, the microprogram sends the data, one byte at a time, to the drive. When the drive signals that it is ready, the next data byte is sent. The drive processor sends the data bytes through the drive write circuits to the tape. The drive logic writes the preamble, postamble, IBG, and all pattern characters on the tape. If no errors occur, the next data block can be processed. If recoverable errors occur, the drive processor interrupts the tape control unit microprogram so that the error can be logged by the tape control unit in the buffered log. Nonrecoverable errors cause sense information to be stored by the tape control unit for future action.

As the data is written, a read-back check is performed to determine that writing is taking place, that the data can be read, and that the error condition code (ECC) checks without error. The read-back checks all data on the tape from the preamble to the next IBG. If no errors are detected, the microprogram generates 'gap out'.

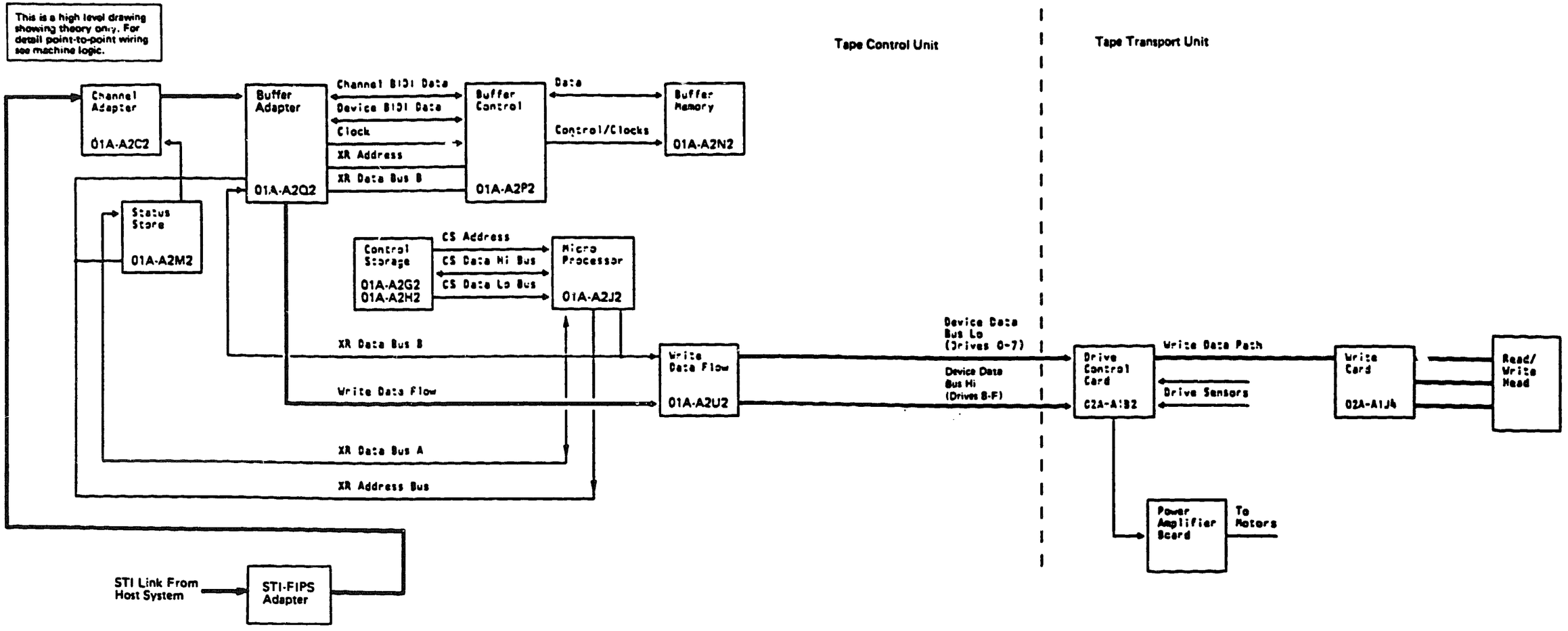
Various error recovery procedures are performed if errors occur while data is being written over the FIPS interface from the STI-FIPS adapter to the TCU, or if the TCU determines that data in its buffer cannot be written on the tape. The STI-FIPS adapter informs the host system that buffered data has been lost if the error recovery procedures do not correct the problem. The job which has been generating the WRITE command on the host system completes unsuccessfully.

Tape Write Immediate Mode

This mode is identical to the buffered write mode except that various successful completion messages do not occur until the TCU has determined that the data block has been properly recorded on the tape. The host system transfers a single block to the STI-FIPS adapter, the STI-FIPS adapter transfers that same block to the TCU, and the TCU writes the block on tape. After the block has been verified, the TCU informs the STI-FIPS adapter of successful completion and the STI-FIPS adapter passes this message on to the host. Only after this process has taken place may the next block be transferred from the host system.

Simultaneous data transfer over the STI interface, FIPS interface, and drive interface occurs only when the buffered write mode is used. For this reason, subsystem performance using the tape write immediate mode suffers when compared to performance using the buffered write mode. Furthermore, tape motion always stops between blocks during the tape write immediate mode, thus ensuring that the drive's mechanical motion delays are added to the time required to process each block.

Write Data Flow (Continued) **OPER 105**



Write Data Flow (Continued)

The microprocessor sends a Write command to the drive, and when the drive is up to the correct speed and the interblock gap (IBG) is at the write head, the drive generates a 'gap in' line to the tape control unit.

Write Operation

'Gap in' sets the write status error (WSE bit 0) register ('write op') and also sets the read status register bit 3 ('gap in') which causes a Level 3 Interrupt 1. The microprocessor sets up the data flow controls in the write control register (WCR) and sets the timer for read back checking.

The write data flow (WDF) completes a write of the preceding IBG, and then writes the preamble and the beginning sync bytes. The WDF encodes the binary data from the buffer and writes the data part of the record.

When all the data bytes have been sent from the buffer to the WDF, the buffer adapter sends a WDF 'end' signal to the WDF, and sets device transfer complete. The WDF 'end' signals the WDF to write the ending sync bytes, postamble, and activates the WSE register bit 1. The WDF writes the greater part of the next IBG and deactivates the WSE bit 0, Device Transfer Complete, causing a Level 4 Interrupt 2. A check is made for any buffer and WDF errors and it is then determined whether to continue or end the operation.

Read Back Checking

When timeout (set in the write sequence) occurs, a Level 1 Interrupt 3 occurs. The microprocessor activates read control register (RCR) bit 0 and checks to ensure that the read head is in the preceding record, tape mark, or the end of record gap (ERG).

When the last byte of the postamble, tape mark, or the ERG goes past the read head, read status register (RSR bit 2) ('generate gap out') is set and a Level 3 Interrupt 4 occurs. The microprocessor checks that the IBG is active and that the timer is set to check for short IBGs. When the timer has timed out a Level 1 Interrupt 5 occurs. The microprocessor checks to ensure that the IBG is active, and then resets the RSR.

When the first byte of the preamble has been read by the read head, the beginning-of-bob (BOB) read pattern register (RPR bit 4) is set and a Level 2 Interrupt 6 occurs. The microprocessor activates a read condition to enable the read data flow for read back checking. The timer is set for the checking of the preamble.

When the beginning sync bytes are read at the read head, RSR bit 0 is set and a Level 3 Interrupt 7 occurs. The microprocessor then checks that the beginning sync occurred within 100 microseconds of the BOB. When the ending sync is read at the read head, RSR bit 1 is set which causes a Level 3 Interrupt 8 occurs.

The microprocessor sets the timer for a postamble check and when the last byte of the postamble has been read at the read head, RSR bit 2 ('generate gap out') is set which causes a Level 3 Interrupt 9. The microprocessor then checks that 'generate gap out' occurred within 100 microseconds of the ending sync. The microprocessor then verifies that the read head is in an IBG, and also checks for any errors. If these two conditions have been met, the tape control unit sends 'gap out' to the drive and resets the buffer and the data flow controls. The microprocessor then releases the drive.

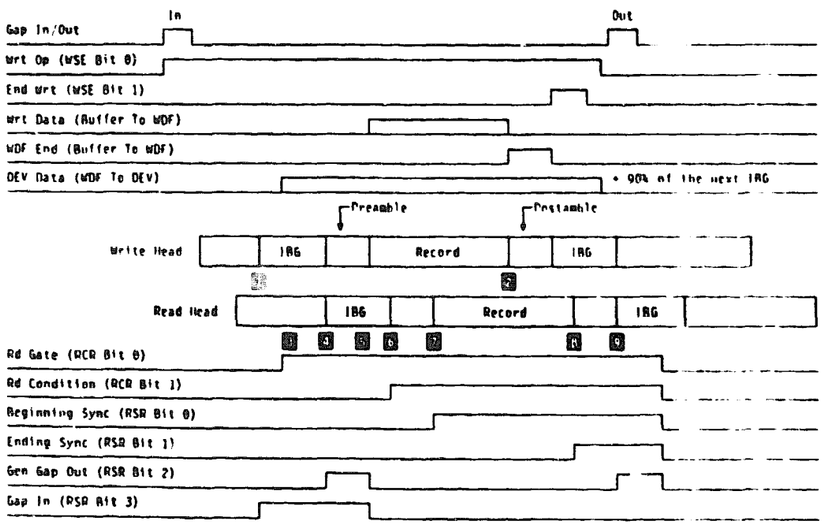


Figure 1 Write Operation Timing Chart

Loop-Write-to-Read Data Flow

This topic describes the long and short loop-write-to-read modules in the loop-write-to-read diagnostic routine.

Loop-write-to-read diagnostic modules are used to check out the write and read data paths within the subsystem and to isolate problems to either the tape control unit or to a tape transport unit.

The diagram on the OPER 106 page shows the data paths within the subsystem for the long and short loop-write-to-read diagnostic modules. The long dashed lines show the long loop-write-to-read data path and the short dashed lines show the short loop-write-to-read data path. The heavy solid lines show the common data path used by both modules.

Note that none of the loop-write-to-read tests check the data paths in the channel adapters or the STI-FIPS adapters.

Short Loop-Write-to-Read

The short loop-write-to-read diagnostic module checks the write to read data path within the tape control unit. A data pattern, is sent along a data path that includes the buffer adapter card, write data flow card, read detect and read deskew cards, and finally to the read correction and ECC card where the tape control unit microprocessor checks for any hardware detected errors.

This is test 1008 from the CE Panel and can also be initiated by the MD.

Long Loop-Write-to-Read

The long loop-write-to-read diagnostic module checks the write to read data path from the tape control unit to a tape transport unit and back to the tape control unit. A data pattern, is sent along a data path that includes the buffer adapter card, write data flow card, drive control card, the write bus, and the drive adapter card.

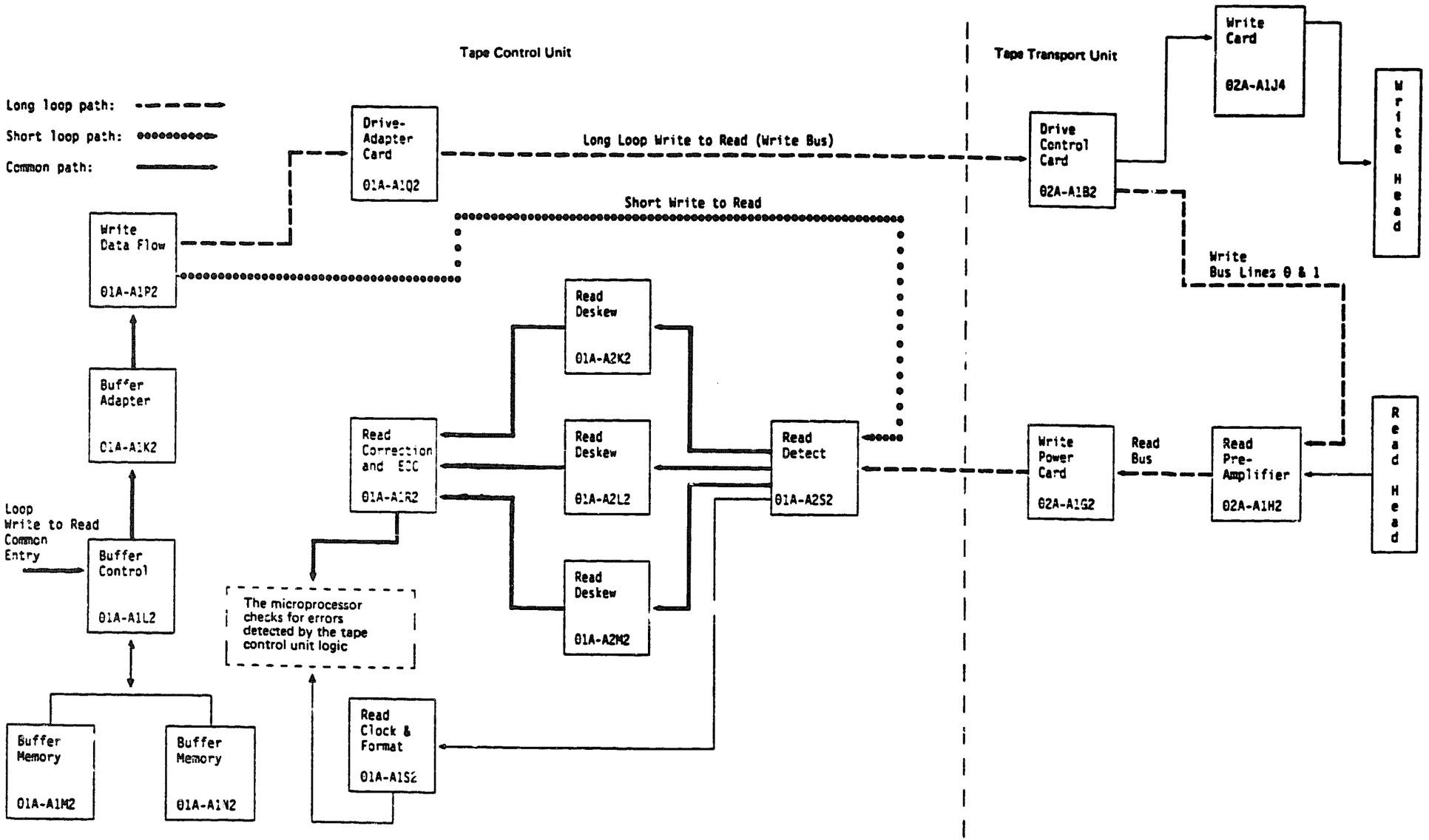
The drive adapter card transfers data over 'write bus' lines 0 and 1 to the read preamp card. At the read preamp card, the data from 'write bus' line 0 is gated to the read inputs for tracks 1A, 2B, 3B, 4A, 5B, 6B, 7B, 8B and 9B. The data from 'write bus' line 1 is gated to the read inputs for inputs for tracks 1B, 2A, 3A, 4B, 5A, 6A, 7B, 8A and 9A.

This is test 1009 from the CE Panel and can also be initiated by the MD.

From the read preamp card, data is returned to the tape control unit over a read path that includes: the read bus, write power card, read detect and read deskew cards, and finally to the read correction and ECC card where the tape control unit microprocessor checks for any hardware detected errors. The write card and write head are not part of this path and are not tested in a long loop-write-to-read operation.

The subsystem will refuse to run this test if a cartridge is present.

Loop-Write-to-Read Data Flow (Continued) OPER 115



Drive Data Flow

This topic describes the read and write data flow within the tape transport unit.

Read

The differential signal output from each read track is directly connected to the read preamp by way of the read head cable. The read preamp amplifies these signals, and sends them to the selected read bus cable (either A or B) and to the read detect cards in the tape control unit. The read bus is determined by the tape control unit that requested the data; bus A is for tape control unit 0, and bus B is for tape control unit 1. The write power card is used as a signal feed-through from the logic board to the A and B read bus connectors.

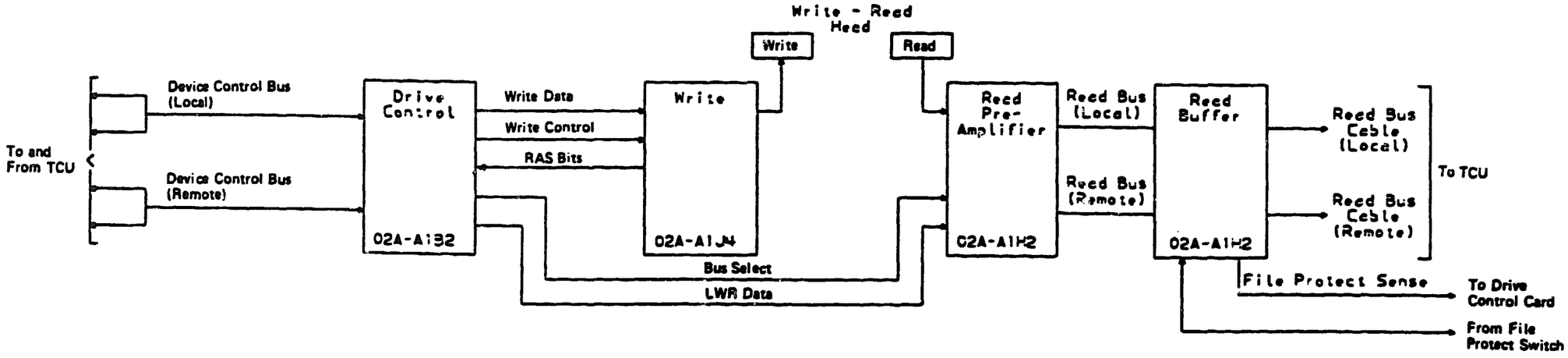
Write

Write data is sent from a tape control unit to the selected drive by way of a serial connected device control bus. Either bus A or B is used. The bus used depends on the tape control unit that selects the device: bus A is for tape control unit 0, and bus B is for tape control unit 1. For single tape control unit subsystem, bus 'A' is always used. The adapter card receives the non-return-to-zero (NRZI) data, and sends it to the correct analog read bus on the read preamp card.

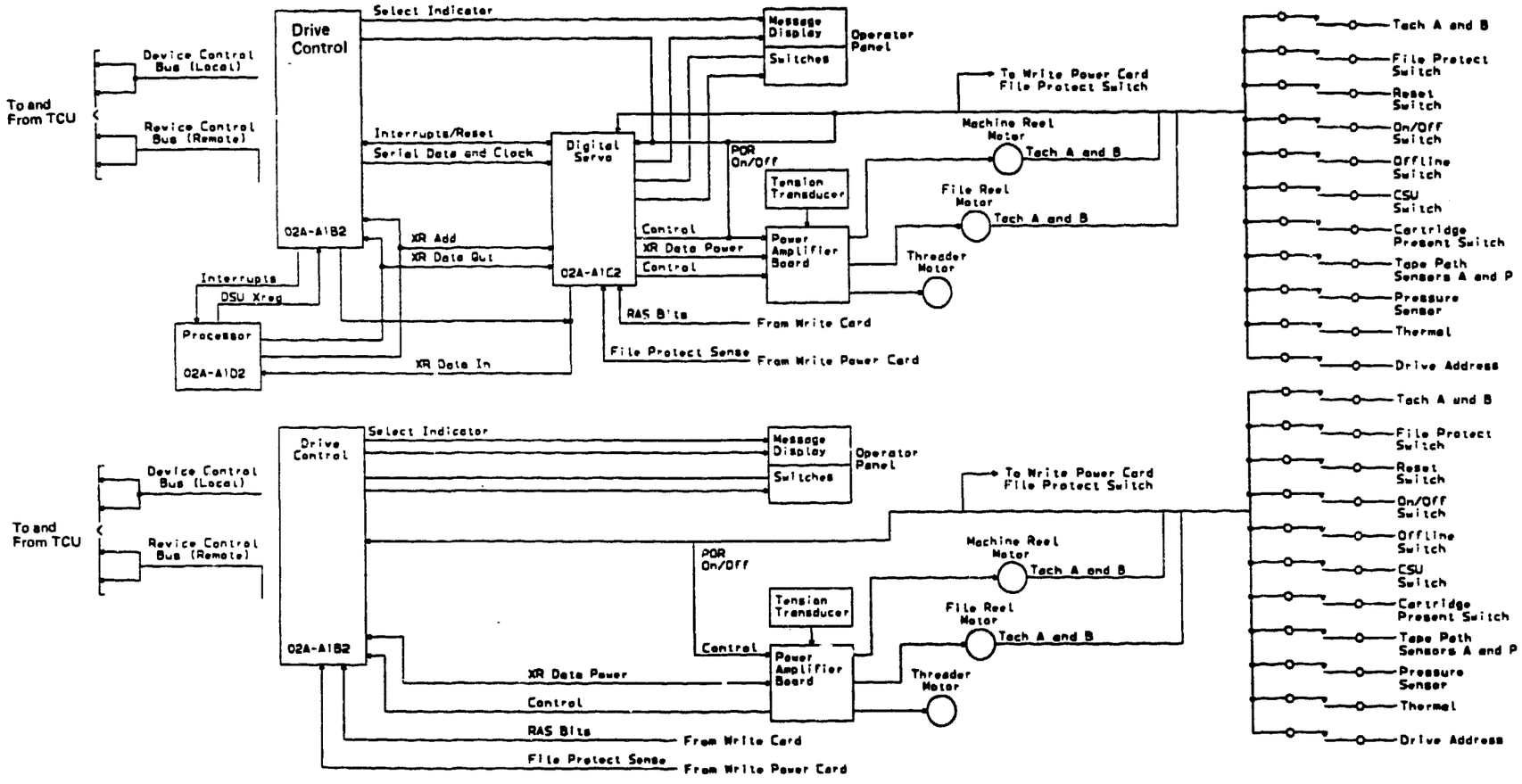
The write card converts the NRZI data to a chain of current pulses that are sent directly to the write tracks by way of the write head cable.

Read/Write Operations Diagram

This is a high level drawing showing theory only. For detail point-to-point wiring see the machine logic.



Drive Data Flow (Continued) OPER 125



Drive Data Flow (Continued)

This topic describes operations within the drive that control tape motion. Parallel and serial interconnections are also described

Motion Control

The drive motion control logic is used for

- Tape tension control
- Velocity control
- Backhitch (reposition) control
- Stoplock (position) control

The **tension control** function provides constant tape tension, essential for motion control.

The **velocity control** provides controlled acceleration up to recording speed or rewind speed, precise control of recording speed regardless of tape distribution on the reels, and controlled deceleration.

Following read or write operations, the tape is repositioned so that the read/write head is located just before the interblock gap (IBG) that was just written or read. Repositioning is handled automatically by the motion control logic and is termed **backhitch**. The drive control logic causes the IBG to be written or read by the head while the tape is moving at normal recording velocity. Once the IBG has been written or read from the tape following a block, the head is deactivated, and the drive decelerates. By the time the tape has stopped, the head is past the IBG. The drive then backs up the tape immediately in front of the IBG that was just written or read, so that when the drive starts to accelerate for the next read or write operation it is be moving the tape at full speed when the IBG is encountered.

The **Stoplock** (position-hold) mode is used when the tape is in a stopped position and under tension. When in Stoplock mode, the tape lifter solenoid is energized to prevent the tape from sticking to the head.

The drive can independently reposition the tape from one location to the preceding Stoplock location, under direction from the tape control unit. Thus, the drive can independently revert to the preceding data block position for fast error recovery. Once loaded, the drive maintains one of three Stoplock positions, in anticipation of the next command.

- Read Forward Stoplock, ready for a read forward
- Read Backward Stoplock, ready for a read backward
- Write Stoplock, ready for a write.

Stoplock positions are achieved automatically by the drive, and are based on the command just executed. At the end of a particular command where no similar command is immediately following, the drive always assumes that some time in the future the next command executed will be the same as the last one. The drive repositions the tape to the Stoplock position that accommodates the next (similar) command. The exception to this is a Backspace Block command. After a Backspace Block command, the drive assumes a Read Forward Stoplock in anticipation of a subsequent Read command.

Message Display

The digital servo also communicates with the message display by way of the 'XR repowered data' bus that also connects to the power amplifier, additional display control signals, and switch signals from the operator panel.

Motor Control

The digital servo card functions as a buffer and bus between the microprocessor and the other areas of the device. Like the adapter card, the processor communicates with the digital servo external registers using the XR data and address buses. The digital servo sends the data and control signals to the power amplifier board. The power amplifier converts this digital information to motor current. The digital servo then collects information in its external registers from the motor tachometers and tape sensors. This information is used by the processor to control the speed of the drive motors.

Parallel/Serial Interconnector

Commands are sent to the device on the device control bus (DCB). For a dual tape control unit subsystem, cables DCB local and remote are used. For a single tape control unit subsystem, only the DCB local cable should be connected. The adapter card has two separate parallel paths (local/remote) and a single serial path. (The serial buses are connected together on the adapter card.)

Parallel Interconnector

Commands received on one of the parallel interconnection are controlled by the device microprogram once the 'command out' tag becomes active. (Adapter hardware logic processes the device selection.) The command is controlled by the processor, which communicates with the adapter using the external registers on the adapter and the XR data and address buses.

Serial Interconnector

The serial interconnection permits limited communication to the device while the parallel interconnection is busy or has failed. Only non-data transmission commands are sent over the serial interconnection.

The adapter card synchronizes and gates the serial clock and data to the digital servo card, where it is decoded. The data path runs from the DCB cable, through the adapter, to the digital servo. Once decoded, the motion commands are controlled by device microprogram just as if they had come on the parallel interconnection; hardware-only commands are executed independent of microprogram.

Subsystem Configurations

The TA90 tape subsystem can be configured as either a single or dual tape control unit subsystem. In a single tape control unit subsystem, the tape control unit sends data to and receives data from its attached drives. In a dual (two) tape control unit configuration, either tape control unit can transfer data to or receive data from its own drives or the drives attached to the other tape control unit. This topic describes the operation of both configurations.

Single Tape Control Unit Configuration

A single tape control unit configuration consists of one tape control unit with up to eight attached drives. The tape control unit receives commands and data from the host and transfers data and subsystem status by way of the channel adapters and STI-FIPS adapters.

The diagram at right shows the data paths between the host, tape control unit and drives.

SS Status Store

Loc Local

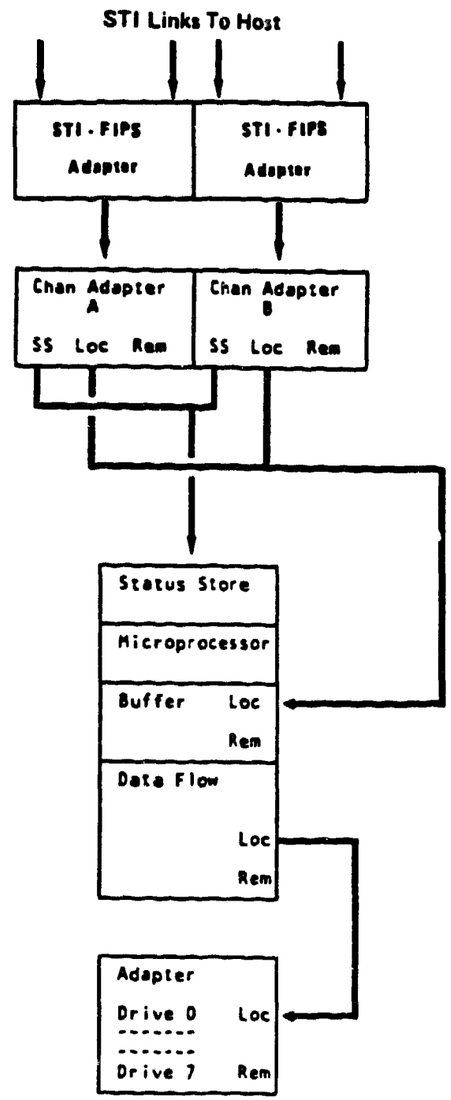
Rem Remote

Single Tape Control Unit Command Sequence

An example of a typical single tape control unit command sequence is:

1. The host issues an STI command to the STI-FIPS adapter.
2. The STI-FIPS adapter translates the command to its FIPS equivalent and issues the translated command to the TCU's channel adapter.
3. The channel adapter waits to be polled by status store.
4. The channel adapter requests a device assignment and the device status byte from status store.
5. Status store tests the device assignment byte, and if not assigned elsewhere, sets the channel adapter bit and responds with the device status bit.
6. The channel adapter uses the device status bit to generate initial status.
7. The channel adapter passes the initial status to the STI-FIPS adapter.
8. The channel adapter stores the command, device condition byte, and interrupt request code, sets tape control unit busy, and activates a level 6 interrupt.
9. When the interrupt is detected by the microprogram, it examines the channel response register (CRR) in status store to identify the reason for the interrupt and to find out which channel adapter bit is set.
10. The microprogram interrogates the channel RAM to find the reasons for the interrupt and the command byte.
11. The microprogram resets the interrupt to free the channel adapter, which in turn, resets tape control unit busy in the channel adapter and permits the processing of a new command.
12. The microprogram initiates the command, sets up the buffer, starts the selected drive, and controls the data flow to or from the drive.
13. When the operation is complete, the microprogram stores an ending status byte in the channel adapter RAM and directs the adapter to present the status to the STI-FIPS adapter.
14. The STI-FIPS adapter translates the status from the TCU into STI format and returns the translated status to the host system.

Single Tape Control Unit Configuration Diagram



Subsystem Configurations (Continued)

Dual Tape Control Unit Configuration

The dual tape control unit configuration interconnects two tape control units. This dual tape control unit configuration permits operations in the subsystem to be balanced between the tape control units for most efficient use of subsystem resources. This mode of subsystem operation is transparent to the host, because subsystem operations are automatically handled by the subsystem hardware and microprogram.

Note: If when using a dual tape control unit subsystem one of the tape control units is not able to detect a response from the other tape control unit, it indicates this in the other tape control unit by setting PER register bit 2 (collision detect), in that tape control unit. See PER bit 2 in the MG DF section.

In a dual tape control unit configuration the following four communication paths are used:

- Status store to status store 1.
- Channel adapter to status store 2.
- Channel adapter to local buffer 3.
- Channel adapter to remote buffer 4.

Figure 1 on page OPER 141 shows the data paths between the host, tape control unit, and drives.

SS Status Store
Loc Local
Rem Remote

Load Balancing in a Dual Tape Control Unit Subsystem

At varying times each drive attached to the subsystem is assigned to one of the two tape control units. All commands to a drive are executed by the assigned tape control unit and all buffered data to the drive is stored in that assigned tape control unit.

Both tape control units monitor their workloads and periodically balance their work by reassigning drives from the more active tape control unit to the less active tape control unit. Reassignment may occur at any time during the processing of a drives tape.

When a drive is assigned to a tape control unit for use by the field engineer (FE), reassignment of the drive is not permitted until the FE releases the drive.

Status Store to Status Store Interconnection

The status store to status store 1 communication path is used to give the two tape control units the ability to synchronize their individual operations and to provide a communications path between the two microprocessors using a 'master/slave' mode of operation. When either tape control unit is in the 'slave' status, status store does not execute orders.

Part of the status store communication path between tape control units is the RAM address bus, RAM data bus, and 'memory write' signal. When a memory write operation is performed the RAM address bus contains the address of the status store RAM; the RAM data bus contains the data being written to the RAM, and the memory write signal is used to gate the data into the RAM. When either tape control unit is written into, the RAM in the other tape control unit is also written into with the same data.

The remainder of the status store to status store communication path control signals are:

- Local Tape Control Unit Master – indicates this tape control unit is the current master tape control unit.
- Remote Tape Control Unit Master – indicates that the other tape control unit is the current master.
- Local Tape Control Unit Connected – the local tape control unit is enabled for a dual tape control unit mode of operation.
- Remote Tape Control Unit Connected – the remote tape control unit is enabled for a dual tape control unit mode of operation.

  Note: Local and remote tape control unit connected lines become inactive when the corresponding tape control unit is offline.
- Local Tape Control Unit Send – indicates that the microcode has assembled a message in the message buffer.

  Note: This signal is named 'received' at the receiving tape control unit.
- Local Tape Control Unit Acknowledge – this line is used to acknowledge the receiving of a message. This causes a reset of the 'send' signal at the other tape control unit.

Channel Adapter to Status Store Interconnection

The channel adapter to status store 2 interconnection supplies the communication path for data and status information between the channel adapters and status store.

The status store communicates with the channel adapters by polling each adapter alternately.

The communication path contains the following lines:

- A nine bit bi-directional data bus used to transfer orders and data between the status store and the channel adapter.
- A five bit bi-directional response used to transfer an address or response data to the channel adapter, or response data to the status store.
- Two system clocks (C1 and C2).
- Two condition bits that define the current PLA condition.
- An adapter select line to each adapter.
- An adapter reset line to each adapter.
- An adapter interrupt line from each adapter to the status store.
- An adapter failure line from each adapter to the status store.

Channel Adapter to Buffer (Local/Remote) Interconnection

All channel adapters in a tape control unit share the same local 3 and remote 4 buses to the buffer. Only one is permitted use of the bus at any one time.

The interconnection contains the following lines:

- Service Out (Remote/Local) – this is the channel service out tag.
- Data Out (Remote/Local) – this is the channel data out tag.
- Service In (Remote/Local) – this is the tape control unit service in tag.
- Data In (Remote/Local) – this is the tape control unit data in tag.
- Stop (Remote/Local) – this is the channel adapter signal used to inform the buffer that the data transfer has ended.
- Data Valid (Remote/Local) – this line is used as a gate for data that is sent to the channel for parity checking.
- Buffer Data Bus (Remote/Local) – this a 9-bit bi-directional data bus used to send and receive data from the buffer.
- Suppress Out (Remote/Local) – this is the channel suppress out tag.

Dual Tape Control Unit Command Sequence

An example of a typical dual tape control unit command sequence is

1. The host issues an STI command to the STI-FIPS adapter.
2. The STI-FIPS adapter translates the command to its FIPS equivalent and issues the translated command to the TCU's channel adapter.
3. The channel adapter waits to be polled by status store.
4. The channel adapter requests a device assignment and the device status byte from status store.
5. Status store requests master status before it can begin order execution.
6. When master status is granted, status store tests the device assignment, and if not assigned elsewhere, sets the channel adapter bit and responds with the device status byte from status store RAM.
7. The channel adapter uses the device status byte to generate initial status and sends this to the STI-FIPS adapter.
8. The channel adapter stores the command, device condition byte, and interrupt request code in the channel adapter RAM, sets tape control unit busy, and activates a request interrupt to the status store. Status store activates an interrupt level 6 to the microprogram.
9. When the interrupt is detected by the microprogram, it examines the channel response register (CRR) in status store to identify the reason for the interrupt and to find which channel adapter bits are set.
10. The microprogram reads the channel adapter RAM to find the reason for the interrupt and the command byte.
11. The microprogram resets the interrupt to free the channel adapter. The channel adapter resets the tape control unit busy condition.
12. The microprogram determines which tape control unit the drive is assigned to.

    Local: Perform the command action as required - set up the buffer, start the drive.

    Remote: Send the command to the other tape control unit by way of status store. Wait for the remote tape control unit to finish the command. The remote tape control unit sends the ending status in a message when the command is complete.
13. When the command has completed, the microprogram stores the ending status byte in the channel adapter RAM and directs the adapter to send the status to the STI-FIPS adapter.
14. The STI-FIPS adapter translates the status from the TCU into STI format and returns the translated status to the host system.

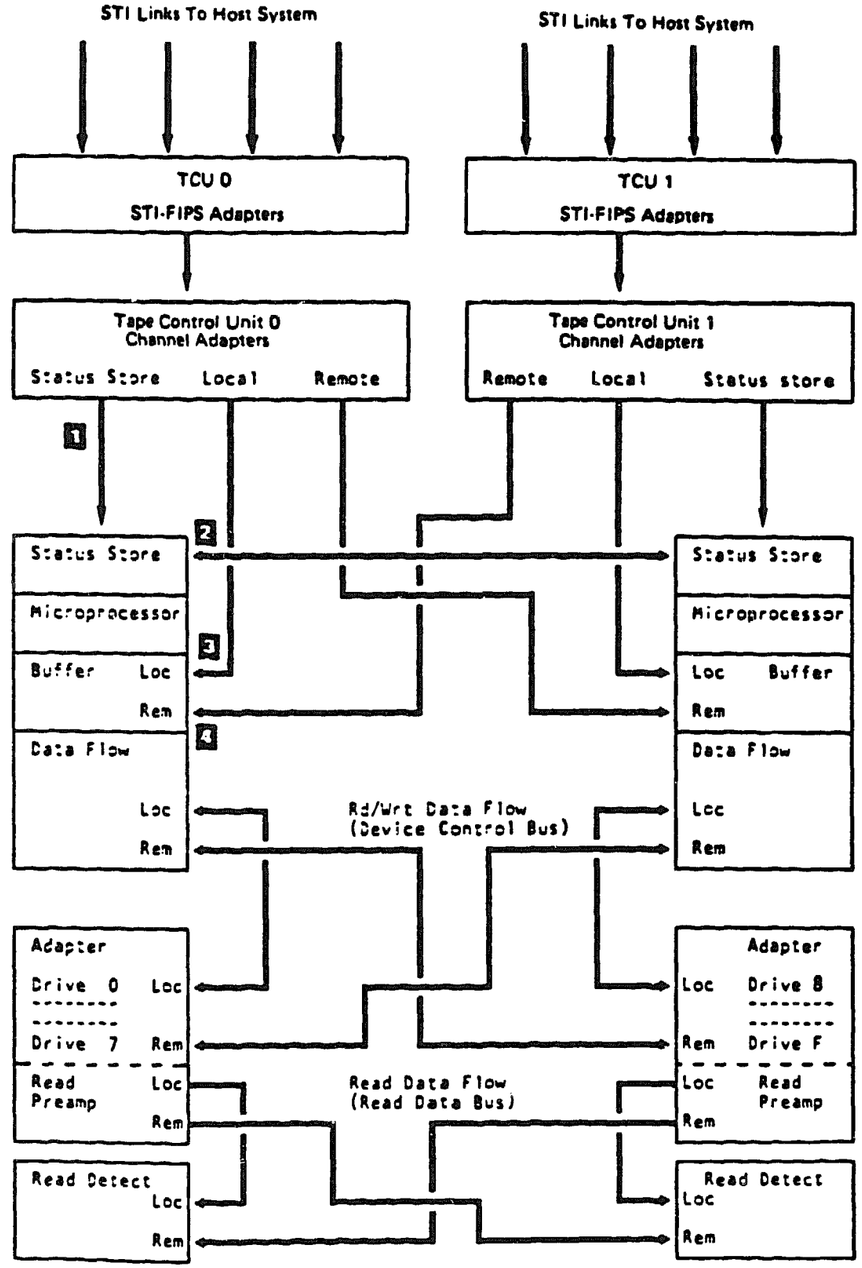


Figure 1. Dual Tape Control Unit Configuration

Dual Control Updating Status Store 'RAM'

At installation time the customer assigns the tape control units as 0 and 1. During a normal dual control operation, tape control unit 0 assumes control of the 'master/slave' logic.

At every status store condition 3 cycle, tape control unit 0 deactivates the 'local master' line for one cycle to permit tape control unit 1 to reach the master condition if it needs to.

The importance of being in the master condition is that the status store in each tape control unit can not execute any orders while in the 'slave' condition. If tape control unit 1 is in the 'slave' condition, a request for 'master' condition is generated by activating its 'local master' line.

Part of the status store communication path between tape control units is the RAM address bus, RAM data bus, and a 'memory write' signal line. When a memory write operation is performed, the RAM address bus contains the address of the status store RAM, the RAM data bus contains the data being written to the RAM, and the 'memory write' signal is used to gate the data into the RAM. When either tape control unit is written into, the RAM in the other tape control unit is written into with the same data.

Figure 1 shows an example of a message being written into address 80 and 83, and the updating of the RAM status.

Note: This is to remind you that each tape control units status store lines going to the other tape control unit are labeled local, and are labeled remote coming from the other tape control unit. Figure 1 shows the tape control unit 0 side. See OPER 1, Subsystem Configurations, "Status Store to Status Store Communication Path Diagram."

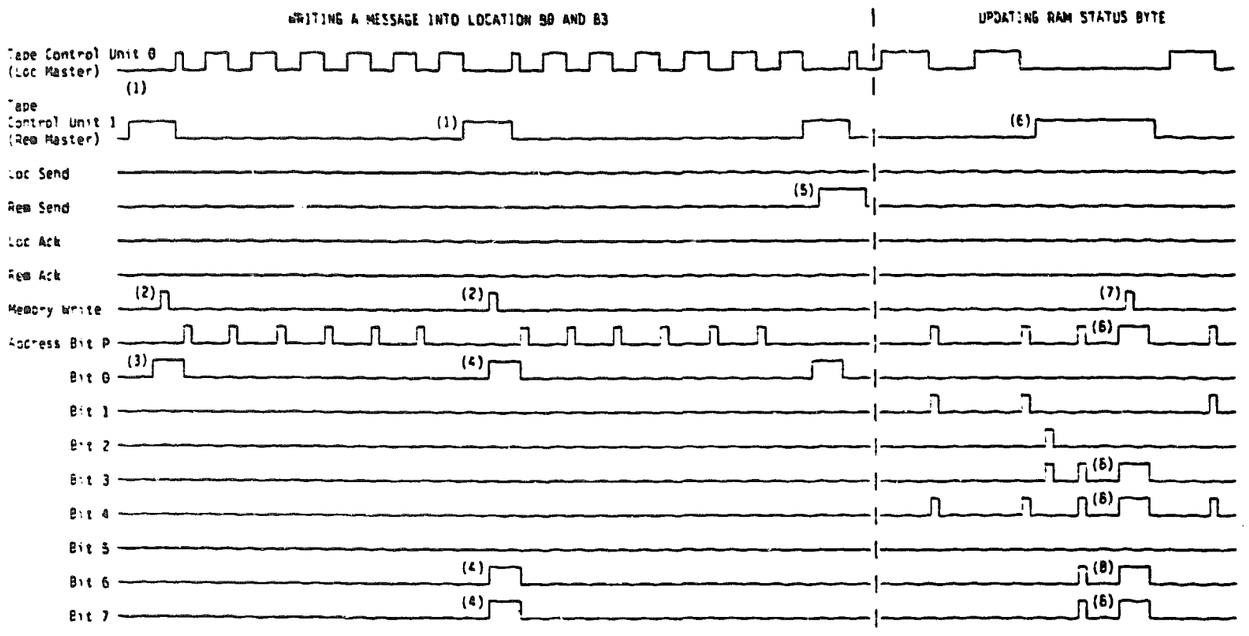


Figure 1. Status Store Communication Path Timing Chart

Writing a Message into Address 80 and 83

Tape control unit 1 requests an initial microcode load (IML) from tape control unit 0 by writing a message into address 80 and 83. The first part of Figure 1 shows that tape control unit 1 must activate its 'local master' 1 line, assemble the data and address to be written, then activates its 'memory write' 2 line to gate the information into address 80 3 and 83 4 of both RAMs.

When both addresses have been written into, tape control unit 1 activates its 'send' 5 line to indicate to tape control unit 0 that a message has been written. No other action takes place until tape control unit 0 acknowledges the 'remote send' line.

Note: The 'send' line is only active when a message has been sent to the RAMs. Updating the device status byte needs no 'send' line.

Updating the RAM Status Byte

The second half of Figure 1 shows tape control unit 1 updating the device status byte in address 1B of the RAMs. tape control unit 1 activates its 'local master' 6 line, assembles the data and the address to be written into, then activates its 'memory write' 7 line to gate the information into address 1B 8. Because this is not a message, tape control unit 1 does not activate its 'send' line.

Tape Control Unit to Tape Control Unit Communication

The tape control units, in a dual tape control unit configured subsystem, communicate over the Status Store to Status Store Interconnection. The status store communication card supplies the logic for this communication.

In order for the microprograms in the two tape control units to communicate, status store gives orders, which are used by the microprogram. In addition to the orders, a portion of status store RAM is set aside as message buffers. Two message buffers are defined, one for sending and one for receiving messages. Two buffers also permit the tape control unit to send and receive messages at the same time.

The diagram at right shows the lines that are used to transfer data and information between the tape control units.

Send Message Operation

To send a message to the other tape control unit, the following sequence of operations is followed:

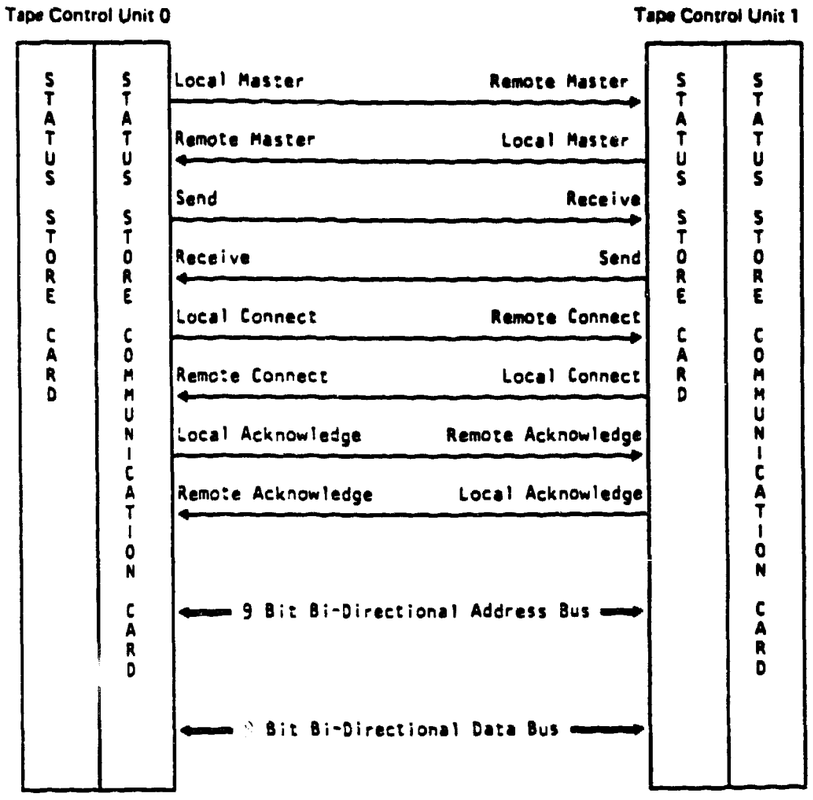
1. Test if the Acknowledge bit is on. If it is not on, the other tape control unit has not responded to the last message sent. A message can not be sent until the Acknowledge response is received.
2. Issue a Reset Write Message Pointer order to status store to initialize the buffer pointer.
3. Set a byte of data into the channel data register (CDR).
4. Issue an Access Write Message Buffer order to store the data from the CDR into the message buffer (and into the read message buffer of the remote tape control unit).
5. Repeat the last two steps until all the data bytes have been sent.
6. Issue a Send order. This causes a received indication at the remote tape control unit.

Receive Message Operation

To receive a message from the other tape control unit, the following sequence of operations is followed:

1. Issue a Reset Read Message Pointer order to initialize the read buffer pointer.
2. Issue an Access Read Message Buffer order to set the data byte into the channel data register (CDR).
3. Read the CDR to obtain the data byte.
4. Repeat the previous two steps until the entire message is read.
5. Issue an Acknowledge order to inform the other tape control unit that the message was received.

Status Store to Status Store Interconnection Diagram



Channel Command Summary

The TA90 executes the channel commands listed below (and described on OPER 160 through OPER 180) The channel command summary table provides a brief description of each command as it appears on the FIPS channel that connects the STI-FIPS adapter to the tape control unit.

Channel Command	Hex Code	Description
Assign	B7	Reserves the addressed drive to a specified channel path
Backspace Block	27	Causes the drive to move the tape backward to the last block ID
Backspace Block	2F	Causes the drive to move the tape backward to the last tape mark
Control Access	E3	Permits a specified drive to be used by an STI-FIPS adapter to which it is not assigned.
Data Security Erase	97	Causes the drive to erase the tape to the end of the tape
Erase Gap	17	Causes the drive to write an erase gap pattern
Forward Space Block	37	Causes the drive to move the tape forward to the next block ID
Forward Space File	3F	Causes the drive to move the tape forward to the next tape mark
Load Display	9F	Causes a message to be displayed on the message display panel
Locate Block	4F	Causes the drive to move the tape to the specified location of data.
Mode Set	DB	Causes a drive to be set to a specified operating mode.
No Operation	03	No operation is performed
Read Backward	0C	Causes the drive to read in a backward direction.
Read Block ID	22	Causes the tape block ID to be sent to the STI-FIPS adapter.
Read Buffer	12	Causes the buffer data to be sent to the STI-FIPS adapter.
Read Buffered Log	24	Causes the stored buffered log data to be sent to the STI-FIPS adapter.
Read Forward	02	Causes the drive to read in a forward direction
Rewind	07	Causes the drive to rewind the tape to the load point
Rewind Unload	0F	Causes the drive to rewind the tape and unload the cartridge
Sense	04	Causes the TCU to send 32 bytes of sense data to the STI-FIPS adapter
Sense I/O	E4	Causes the TCU to send 7 bytes of subsystem ID information to the STI-FIPS adapter.
Sense Path Group ID	34	Causes the TCU to send the path state byte and the 11 bytes of path group ID information to the STI-FIPS adapter
Set Path Group ID	AF	Sends the function control byte and 11 path group ID bytes to the tape control unit.
Suspend Multipath Reconnection	5B	Causes a temporary connection between the addressed drive and the STI-FIPS adapter that issued the command
Synchronize	43	Causes the TCU to write any data that is cached to tape
Test I/O	00	Causes the TCU to send the status byte to the STI-FIPS adapter
Unassign	C7	Releases the addressed drive from the STI-FIPS adapter group to which it had been reserved.
Write	01	Causes the drive to write data on the tape
Write Tape Mark	1F	Causes the drive to write a tape mark pattern on the tape

Channel Command Descriptions

Assign (X'B7')

The Assign command assigns the addressed drive to a specific STI-FIPS adapter. This command takes the place of the physical partitioning switches that are present on tape subsystems of earlier design. The Assign command is performed even if the addressed drive is not ready or if it is not installed in the subsystem. Once assigned, a drive can be used by the STI-FIPS adapters only. If a command other than the four shown below as exceptions is sent to the drive by a different STI-FIPS adapter to which the drive is not assigned, a unit check (status bit 6) is set in the initial status for the command and assigned (sense byte 0 bit 7) is set.

However, the following four commands can be sent to a drive over any channel path:

- Control Access
- Sense
- Sense Path Group ID
- Set Path Group ID.

The Assign command is a supervisor command. Therefore, if a Mode Set command that inhibits execution of supervisor commands precedes the Assign command, the Assign command fails, and unit check (status bit 6) and command reject (sense byte 0 bit 0) are set.

The Assign command sends 11 bytes of information (named an argument) to the subsystem. These 11 bytes can contain all zeros, which assign the addressed drive to the single channel path over which the command was received. If the channel path is not grouped by a Set Path Group ID command, the tape control unit assumes that the group consists of a specific group of one channel path. If the 11 bytes contain non-zeros, they are interpreted as a path group ID, as determined by the Set Path Group ID command (described later in this section). The contents of the 11-byte argument are compared, and if they match a group of channel paths that have the same group ID, the addressed drive is assigned to all those channel paths. However, if no channel-path groups have the same path group ID, unit check (status bit 6) and command reject (sense byte 0 bit 0) are set. The 11-byte argument does not have to match the path group ID of the channel path over which the Assign command is sent. A drive can be assigned to several channel path groups by several Assign commands. The assign is active immediately after each Assign command completes processing.

The assign can be removed in several ways:

- Power-On Reset in the tape control unit
- System Reset on all assigned channel paths
- Control Access command with 40 (hexadecimal) specified
- Unassign command.

Backspace Block (X'27')

The Backspace Block command causes the addressed drive to move the tape one data block in the backward direction.

Backspace File (X'2F')

The Backspace File command causes the addressed drive to move the tape one tape file in the backward direction. A tape file is the data written in an area of tape between two tape marks.

Control Access (X'E3')

The Control Access command permits an STI-FIPS adapter to have special use of a drive even if the drive is assigned to a different STI-FIPS adapter. This command executes even if the addressed drive is not ready or is not online in the subsystem.

12 bytes of argument information must be sent from the STI-FIPS adapter to the tape control unit when the Control Access command is sent. If fewer than 12 bytes are sent, the unit check status bit and command reject sense bit are set to one. If more than 12 bytes are specified, only the first 12 bytes are sent as the argument, and the incorrect length bit is set by the channel unless the suppress length indication bit in the channel command word (CCW) is set to one.

The 12-byte argument has two parts. Byte 0 contains the mode-of-use code and must contain the values of 00, 40, or 80 (hexadecimal). The remaining 11 bytes contain a password and should not contain all zeros, except when mode-of-use code 40 (hexadecimal) is specified. Mode-of-use code 40 (hexadecimal) ignores the contents of bytes 1 through 11. If byte 0 contains any value other than 00, 40, or 80 (hexadecimal), or if the remaining 11 bytes of the argument contain all zeros and the mode-of-use code is 00 or 80 (hexadecimal), the command is rejected, and unit check status bit and the command reject sense bit are set to one. The mode-of-use codes are used as follows:

- **Set Password - 00 (hexadecimal):** Mode-of-use code 00 (hexadecimal) can be used only by a STI-FIPS adapter that already has assignment of the addressed drive. The Control Access command sets up a password for the addressed drive. Then, another &STI-FIPS adaptersys. can access the drive by specifying the correct password in a Control Access command. Once a password has been set up, it remains associated with the drive until all assignments of that drive are cleared.
- **Generalized Unassign - 40 (hexadecimal):** Mode-of-use code 40 (hexadecimal) clears the assignment of the addressed drive from all channel paths.

  If a password was set up by another Command Access command, the password in bytes 1 through 11 must match the password set up. If the passwords do not match, the command is rejected, and the unit check status bit and the command reject sense bit are set to one.

  If the Control Access command is sent on a channel path that does not have assignment of the addressed drive, the command fails, and the unit check status bit and the command reject sense bit are set to one.

- **Request Temporary Unassignment - 80 (hexadecimal):** Mode-of-use code 80 (hexadecimal) causes the assign protection to be stopped for a specific channel program. The password in bytes 1 through 11 are compared to the password that was set up by an earlier Control Access command using mode-of-use code 00 (hexadecimal). If the passwords match, the channel program can be executed.

Channel Commands (Continued)

Data Security Erase (X'97')

The Data Security Erase command erases the data from the tape. The data is erased from that point of the tape when the command is sent to the physical end-of-tape.

Erase Gap (X'17')

The Erase Gap command writes a special pattern on 7.8 mm (0.3 inch) of tape.

Forward Space Block (X'37')

The Forward Space Block command causes the addressed drive to move the tape one data block in the forward direction.

Forward Space File (X'3F')

The Forward Space File command causes the addressed drive to move the tape one tape file in the forward direction. A tape file is the data that is written in an area of tape between two tape marks.

Load Display (X'9F')

The Load Display command sends 17 bytes of data from the channel to the tape control unit. This data controls the message display (and the automatic cartridge loader feature) on the addressed drive. If the channel sends fewer than 17 bytes of data, the command fails, and unit check (status bit 6) and command reject (sense byte 0 bit 0) are set. If more than 17 bytes of data are specified, the channel sends only the first 17 bytes.

The Load Display command is a supervisor command. If a Mode Set command, which inhibits supervisor commands, precedes a Load Display command in a command chain, the Load Display command fails, with unit check (status bit 6) and command reject (sense byte 0 bit 0) set.

Format Control Byte

The format control byte is the first byte of the 17 bytes that were sent from the channel to the addressed drive. This byte controls the way the drive displays the remaining 16 bytes.

Bits 0 - 2 New Message Overlay

- When lit the messages in bytes 1-8 and 9-16 are overlayed with a drive message when the drive next starts tape motion.
- Bit 1 overlays the messages in bytes 1-8 and 9-16 with a drive message only when the tape cartridge is physically removed from the drive.
- Bit 2 overlays the messages in bytes 1-8 and 9-16 with a drive message only when the drive becomes ready.
- Bits 0, 1, and 2 displays the messages in bytes 1-8 and 9-16 until a tape cartridge has been physically removed from the drive. Then, display only the message in bytes 9-16 until the drive becomes ready.

Bit 3, Alternate Messages

When bit 3 is set to 0, the drive displays only the message that is specified in bit 5.

When bit 3 is set to 1, the drive displays both messages specified in bytes 1-8 and 9-16, respectively, alternating them on the message display. When bit 3 is set to 1, bits 4 and 5 are ignored.

Bit 4, Blink Message

When bit 4 is set to 0, the message specified by the setting of bit 5 is not blinked.

When bit 4 is set to 1, the message specified by the setting of bit 5 is displayed repeatedly for about 2 seconds with an interval of about 0.5 seconds between each display. Bit 4 is ignored when bit 3 is set to one.

Bit 5, Display Low/High Message

When bit 5 is set to 0, the message specified in bytes 1-8 is displayed.

When bit 5 is set to 1, the message specified in bytes 9-16 is displayed.

Bits 6, Reserved

Bit 7, Load Type

Bit 7 is valid only with an automatic cartridge loader feature installed on the drive, and the automatic cartridge loader mode switch on its operator panel set to System.

Note: System mode is not used on the TA90.

1. If these conditions are not met the setting of bit 7 is ignored.
2. With the above conditions set, bit 7 set to 1 inhibits the message from appearing on the drive message display if the automatic cartridge loader is capable of performing the automatic load (a cartridge is available in the input stack and space is available in the output stack). The cartridge is loaded.

   If the automatic cartridge loader is not capable, the message appears on the drive message display.
3. With the above conditions set, bit 7 set to 0 permits the message to appear on the drive message display.

Locate Block (X'4F')

The Locate Block command positions the tape on the addressed drive to permit the STI-FIPS adapter to write or read a specific block on the tape.

Four bytes of data must be supplied to the tape control unit as an argument to the Locate Block command. These four bytes usually are the first four bytes of the block identifier, which were returned as a result of a Read Block ID command that was sent before. If fewer than four bytes are supplied, the unit check status bit and the command reject bit are set to 1, and the command fails. If more than four bytes are supplied, only the first four bytes are used. When a locate operation starts, the tape control unit disconnects from the channel and the drive. The drive then searches at high speed for the location specified. When the drive reaches the approximate location of the block, the tape control unit reconnects to the drive, and the drive searches at recording speed for the specific data block or file mark that was requested.

The tape control unit sends channel end status to the STI-FIPS adapter after the Locate Block command argument is received. The device end status is sent to the STI-FIPS adapter when the command completes the operation. A unit check status is sent along with the device end status if the specified block cannot be found.

If the specific data block or file mark cannot be found, the tape control unit assumes that the user is moving the tape for a write operation. In this case, the drive searches for the data block or file mark that precedes the one specified in the Locate Block command argument. The drive moves the tape after the preceding block or file mark so that the STI-FIPS adapter can write the data block or file mark that is being located. However, if the tape control unit is not correct because a non-write operation is requested, the non-write command fails, and the unit check status bit and the locate block function failed sense bit are set to one.

If the Locate Block command does not find the data block, the tape location is not known.

Mode Set (X'DB')

The Mode Set command sends one byte of mode control information from main storage to the tape control unit. All controls specified by the Mode Set command (except tape format, bits 0 and 1) are only in effect for the commands in the chain following the Mode Set command. If the subsystem does not receive a Mode Set command before the current executing command, the default values are assumed. The Mode Set command is a supervisor command. If another Mode Set command inhibits supervisor commands in a command chain in which a second Mode Set command appears, the second Mode Set command fails, and the unit check status bit and the command reject sense bit are set to one.

This command is performed even though the addressed drive is not ready or is not online in the subsystem.

The format of the byte of mode control information that is sent from main storage to the tape control unit is as follows:

Bits 0 and 1 - Tape Format: These bits must contain X'00', which is the default value. If a combination other than X'00' is specified, the command fails, and the unit check status bit and the command reject sense bit are set to one.

These bits have meaning only if the tape is located at the beginning-of-tape (BOT). The first command that causes the tape to move must be a write-type command.

Bit 2 - Write Mode: Bit 2 is set to zero to cause execution in buffered write mode, and set to one to cause execution in tape write mode. The default value is zero.

Bit 3 - Inhibit Supervisor Commands: When a zero is specified in this bit, any supervisor command can execute after this Mode Set command appears in a command chain. When a one is specified in this bit, any supervisor command that appears after this Mode Set command fails, and the unit check status bit and command reject sense bit are set to one.

Bits 4 - Extended Data Format Mode: Bit 4 is set to one to cause data compaction during a write operation.

Bits 5 through 7 - Reserved: The values in these bits should be set to 0.

No-Operation (NOP) (X'03')

The No-Operation (NOP) command causes no operations to be performed in the drive.

Perform Subsystem Function (X'77')

The perform subsystem function command is used to pass control information from the control program to the subsystem. The command passes a variable amount of data depending on the order being executed. If the channel transfers more bytes than the the order requires, only the number of bytes required by the order are accepted. If the channel transfers less bytes than required for the order of if the command contains an undefined or invalid order, unit check status is presented with sense data indicating ERA 27 (command reject). A minimum of two bytes must be transferred for every order.

BYTE	ORDER
BYTE 0	80 (hexadecimal) - Active forced error logging 81 (hexadecimal) - Deactivate forced error logging 82 (hexadecimal) - Activate logical write protect 83 (hexadecimal) - Deactivate forced write protect 90 (hexadecimal) - Test device
BYTE 1	Flag reserved - must be 0
BYTE 2	Parameters if any. See order definition.

Activate Forced Error Logging Order

This order requires one parameter byte in addition to the flag byte passed with the command.

BYTE 2	ACTIVATION MODE 01 (hexadecimal) - Implicit activation (all devices) 02 (hexadecimal) - Explicit activation (addressed device)

Deactivate Forced Error Logging Order

This order requires one order parameter byte n addition to the flag byte passed with the command.

BYTE 2	DEACTIVATION MODE 01 (hexadecimal) - Implicit deactivation (all implicitly activated devices) 02 (hexadecimal) - Explicit deactivation (addressed device)

Activate Logical Write Protect

This order activates the logical write protect facility and does not require a parameter byte.

Deactivate Logical Write Protect

This order deactivates the logical write protect facility and does not require a parameter byte.

Test Device

This order is equivalent to the No-operation function of the load display command. It can be issued at anytime to verify the state of the device and does not require a parameter byte.

Read Backward (X'0C')

A Read Backward command is similar to the Read Forward command, except that the tape moves in a backward direction. The data is passed to the STI-FIPS adapter in a backward sequence.

The tape control unit will pre-read data in the backward direction in the same way as in the forward direction. See "Read Forward" in this section.

Read Block ID (X'22')

The Read Block ID command sends two 4 byte block identifiers to the STI-FIPS adapter system. If the STI-FIPS adapter requests fewer than eight bytes, only the requested number of bytes are sent. If the STI-FIPS adapter requests more than eight bytes, the tape control unit sends only eight bytes.

The Read Block ID command is performed even though the addressed drive is not ready, or if it is not on-line in the subsystem.

The bits in each 4-byte block identifier are identified from high order to low order, with the higher-order bits having lower bit position values.

BIT POSITION	DESCRIPTION
0	Reserved,always 0
1-7	Physical reference value
8-9	Format mode 00 = TA90 format 01 = Reserved 10 = TA90 Improved Data Recording Capability 11 = Reserved
10-31	Local block number

The physical reference value (bits 1 through 7) identifies the approximate physical location of a data block or file mark on a tape. The physical reference value of the block IDs for the next two data blocks or file marks may or may not be the same. The first data block or file mark after the tape cartridge is loaded has a physical reference value of 01 (hexadecimal).

The last 22 bits (bits 10 through 31) of a block ID contain the sequential count of the data block or file mark on the active tape. The first data block or file mark after the load point is sequential count zero. A block ID identifies a data block or file mark from the STI-FIPS adapter, and does not see the buffer action of the tape control unit.

The block ID at any point of processing is the next data block or file mark that appears to the STI-FIPS adapter to be on the tape between the current data block or file mark and the physical end of tape. The first block ID describes the data block that is about to be passed between the STI-FIPS adapter and the subsystem in either read or write mode. In read backward mode, the first block ID describes the latest data block sent to the STI-FIPS adapter.

The second block ID describes to the STI-FIPS adapter:

- The next data block that is to be written to the tape from the tape control unit buffer for write mode.
- The next data block that is to be read from the tape to the tape control unit for read mode.
- The latest data block that was read from the tape to the tape control unit buffer for read backward mode.

If the tape control unit is not performing any pre-buffer operations, the first and second block IDs are the same.

The value of the difference between the logical block position part of the two block IDs indicates the number of data blocks in the tape control unit buffer when the Read Block ID command is executed. The result of subtracting the logical block position part of the second block ID from the logical block position of the first block ID indicates the direction of tape movement before the Read Block ID command was sent. If the result is negative, the tape control unit buffer is in read mode. If the result is positive, the tape control unit buffer is in write or read-backward mode. If the logical block position parts of both block IDs are the same, the tape control unit is not performing any pre-buffer operations.

Examples:

Write Commands Precede the Read Block ID Command:

The first block ID identifies the next block that the STI-FIPS adapter will write. The second block ID identifies the next block that the tape control unit buffer will write to the tape. The result is positive, which indicates that four blocks of data are in the buffer and the direction is forward.

Read Commands Precede the Read Block ID Command:

The first block ID identifies the next block that the STI-FIPS adapter will read. The second block ID identifies the next block that is to be read from the tape to the tape control unit buffer. The result is negative, which indicates that four blocks of data are in the buffer and the direction is forward.

Read-Backward Commands Precede the Read Block ID Command:

The first block ID identifies the next block that the STI-FIPS adapter will read in the forward direction. The second block ID identifies the latest block that was read from the tape to the tape control unit buffer. Because the result is positive, there are four blocks in the buffer and the tape movement is in the backward direction.

The tape control unit assumes that the Read, Write, or Read Backward commands will continue. The next operation that is not a command that the tape control unit expects, causes pre-buffered write data to be written on tape, or causes pre-buffered read data to be erased. The tape is then located at the point necessary to execute the unexpected command. The unexpected command is held in the subchannel by a channel command retry until the tape control unit completes the operations necessary to execute it. When the tape control unit receives a command that is not the expected command, no pre-buffering of read data is performed until the beginning-of-tape (BOT) is indicated, a Locate command is performed, or a tape mark is read or written.

Read Buffer (X'12')

The Read Buffer command causes the STI-FIPS adapter to get the buffered write-type data that the tape control unit has not yet written to tape. For each Read Buffer command, the STI-FIPS adapter receives one block of data in a first in/first out (FIFO) sequence until the buffer for the addressed drive is empty. This command is usually sent by the STI-FIPS adapter when the drive or subsystem has an error, and cannot write data from the buffer to the tape.

The Read Buffer command is performed even though the drive is not ready, or is not on-line in the subsystem.

Read Device Characteristics - (X'64')

A read device characteristics command causes up to 64 bytes if data to be transferred to the channel.

BYTE	CHARACTERISTICS
0 - 1	N/A
2	Tape control unit model - 92 (hexadecimal) = ADX
3 - 4	N/A
5	Drive model = 92 (hexadecimal) = BDX
6 - 7	Binary 0's
8	Buffered log format - 30 (hexadecimal)
9	Drive and Tape control unit features - Bit 0 = Automatic cartridge loader Bit 1 = Reserved Bit 2 = PSF base support Bit 3 through 7 reserved
10	Device class code (80 (hexadecimal))
11	Device type code (80 (hexadecimal))
12-39	Binary 0's
40	Reserved
41	Reserved
42-63	Binary 0's

Read Buffered Log (X'24')

The Read Buffered Log command sends 32 bytes of buffered log data (sense information, format 21) to the STI-FIPS adapter from the tape control unit for the addressed drive, if the Improved Data Recording Capability is not installed or is disabled. If the Improved Data Recording Capability is installed and enabled 64 bytes of data (sense information, format 30) are sent to the STI-FIPS adapter from the tape control unit.

The Read Buffered Log command is performed even though the addressed drive is not ready or is not online in the subsystem.

Read Forward (X'02')

The Read Forward command causes the drive to read a block of data into the tape control unit data buffer. Then the tape control unit sends the data over the STI-FIPS adapter one byte at a time at the channel data rate. The byte count in the channel command word (CCW) may not equal the length of the data block. When the channel stops requesting data bytes, the tape control unit may discard any data remaining in the data buffer.

If a tape mark is read instead of a data block, a unit exception is sent by the tape control unit and no data is read.

After the first Read command to a drive, the tape control unit pre-reads data blocks from the tape and holds them in the data buffer.

Rewind (X'07')

The Rewind command rewinds the tape to BOT. The tape control unit sets channel end (status bit 4) in initial status and disconnects itself from the channel during the rewind operation. When the rewind operation has completed, the tape control unit sends device end (status bit 5) and error status information, if any, to the STI-FIPS adapter.

Rewind Unload (X'0F')

The Rewind Unload command rewinds the tape into the cartridge, which permits the cartridge to be removed from the drive.

Sense (X'04')

The Sense command sends 32 bytes of sense information (format 20) to the STI-FIPS adapter. The STI-FIPS adapter should send the Sense command when the tape control unit sets the unit check status bit.

Note: Until the STI-FIPS adapter that received the unit check status bit sends this sense, a contingent connection is maintained from the tape control unit for the addressed drive to that STI-FIPS adapter. Until the contingent connection is cleared, the addressed drive appears to be busy to any other STI-FIPS adapter that attempts to address the drive.

Sense I/D (X'E4')

The Sense I/D command sends seven bytes of identification information to the STI-FIPS adapter. This information identifies the subsystem by drive and model number.

This command executes even if:

- Intervention required (sense byte 0 bit 1) is on
- The addressed drive is not ready (no tape cartridge is loaded)
- The addressed drive is not installed in the subsystem.

The format of the seven bytes is as follows:

BYTE	DESCRIPTION OF CONTENTS
0	X'FF'
1-2	Tape Control Unit Type Number
3	Tape Control Unit Model Number
4-5	Tape Drive Type Number
6	Tape Drive Model Number

Sense Path Group ID (X'34')

The Sense Path Group ID command sends 12 bytes of channel path information from the tape control unit to the channel. The first byte is the path-state byte, and the remaining 11 bytes contain the path-group identifier. The bit assignments of the path-state byte are: bits 0 and 1 contain the grouping status, bits 2 and 3 contain the assignment status, bit 4 contains the mode status, and bits 5 through 7 are reserved and contain all zeros.

Set Path Group ID (X'AF')

The Set Path Group ID command identifies an STI-FIPS adapter specific channel path to the addressed drive. The subsystem can then determine to which STI-FIPS adapter to reconnect. The Set Path Group ID command is performed even though:

- The addressed drive is not in the ready state (no tape cartridge is loaded).
- The addressed drive is not installed in the subsystem.
- The addressed drive has not been assigned to the channel path over which the command was received.

The Set Path Group ID command sends 12 bytes of path group ID information from the STI-FIPS adapter to the addressed drive. If fewer than 12 bytes are sent to the tape control unit, the command fails, and unit check (status bit 6) and command reject (sense byte 0 bit 0) are set. If more than 12 bytes are specified in the CCW, only the first 12 bytes are sent from the STI-FIPS adapter.

Suspend Multipath Reconnection (X'5B')

The Suspend Multipath Reconnection command is a supervisor command used in a channel program. This command causes the addressed drive to have a connection with the channel path over which the command is received, but only for the length of time the channel program that it is a part of is active. Therefore, all the status information and data for the channel program are sent to and from the STI-FIPS adapter along the channel path that was used to send the Suspend Multipath Reconnection command. Any multipath dynamic path definitions are ignored.

If an earlier Mode Set command inhibited supervisor commands in the channel program in which the Suspend Multipath Reconnection command appears, the Suspend Multipath Reconnection command fails, and unit check (status bit 6) and command reject (sense byte 0 bit 0) are set.

This command is performed even though the addressed drive is not ready or is not online in the subsystem.

Channel Commands (Continued)

Synchronize (X'43')

The Synchronize command causes synchronization between the drive and the STI-FIPS adapter after buffered operations. This command ensures that, during a buffered write operation, all the buffered data is written on the tape and the tape is moved to receive the next record. The command completes only after all I/O operations for the addressed drive have completed processing and all the write data is moved from the buffer to the tape.

When write-type data has to be written from the buffer to the tape before the Synchronize command can complete, the data channel is disconnected by channel command retry.

Other commands sent by the STI-FIPS adapter that perform the same operation as a synchronize operation are:

- Write Tape Mark
- Erase Gap
- Locate Block
- Rewind
- Rewind Unload
- Any space command, such as Forward Space Block
- Any read-type command that follows a write-type command.

As a result of the Synchronize command, no data is sent on the channel path.

Test I/O (X'00')

The Test I/O command causes the status of the addressed drive to be sent to the STI-FIPS adapter. The status byte is sent to the STI-FIPS adapter during the initial selection sequence.

If earlier status is waiting or stacked, that status is given in response to the Test I/O command. If no status is stacked and the addressed drive is not ready, a unit check status bit is set along with other status, if any.

The Test I/O command does not reset any contingent connections.

Unassign (X'C7')

The Unassign command terminates an earlier assignment of the addressed drive to the exclusive use of an STI-FIPS adapter. The command must be sent over a channel path to which the addressed drive was assigned before. If the Unassign command is sent by a STI-FIPS adapter to which the addressed drive was not assigned, the Unassign command causes unit check (status bit 6) and command reject (sense byte 0 bit 0) to be set.

The Unassign command is a supervisor command. Therefore, if a Mode Set command that inhibits execution of supervisor commands precedes the Unassign command, the Unassign command fails, and unit check (status bit 6) and command reject (sense byte 0 bit 0) are set.

The Unassign command passes 11 bytes of information (named an argument) to the subsystem. These 11 bytes can contain all zeros, which releases the addressed drive from the assignment to the STI-FIPS adapter over which the command was received.

Write (X'01')

The Write command causes data to be written from the STI-FIPS adapter to the addressed drive. The tape control unit buffer makes up for the difference in data rate between the channel and the drive.

Write Tape Mark (X'1F')

The Write Tape Mark command writes a special pattern on the tape. One tape mark separates two files; two tape marks indicate the end of the tape.

Note: A block ID is assigned to a tape mark when it is read or written, but the block ID is not physically written on the tape.

Tape Control Unit to Drive Operation

To start an I/O operation to the drive an initial selection of the drive is first performed.

Note: Tape control units send commands, drive addresses, and write data across the device control bus (DCB) and receive the drive address (complemented) and status information from the drives across the DCB. Tape control units receive read data from the drives across the read data bus.

Initial Selection

To start an initial selection sequence the tape control unit activates 'select out' [1] to the drive by setting bit 0 of the device tag register (DTR). The DTR is an external register that is used by the microcode to transfer control tags to and from the drive across the DCB. Each drive removes its own 'alert' [2] by testing for the device control bus being clear.

Note: An alert is a signal given by the drive and is used to gain the attention of the tape control unit after the completion of a disconnected drive operation.

When the DCB is cleared of 'alerts' the tape control unit places the drive address on the bus and activates 'address out' [4] by setting bit 1 of the DTR.

The tape control unit sets bit 2 of the DCR [3] and switches the bi-directional bus to the send (write) mode. The drive address on the bi-directional bus is then gated to the drive.

The drive activates 'address in' [5] to the tape control unit by setting bit 5 of the DTR. The tape control unit switches the bi-directional bus to the receive (read) mode by setting the DCR bit 2 [6] to zero (read) and waits for a response from the drive. The drive responds by putting its complemented address on the bus. When the tape control unit reads the complemented drive address, 'address out' [7] is deactivated.

Note: If the address is not correct 'select out' is deactivated and the operation is ended. If the returned drive address was correct the tape control unit switches the bus to the send (write) mode and 'address in' [8] is deactivated.

With 'address out' not active the tape control unit activates 'command out' [9] to the drive by setting bit 2 of the DTR. The tape control unit decodes the command and puts it on the bus to the drive. After the command has been sent to the drive the bi-directional DCB is switched to receive (read) and the tape control unit waits for a response from the drive.

The drive places the first of two status bytes on the DCB and activates 'status in' [10] to the control unit by setting bit 6 of the DTR. The tape control unit accepts status byte 1 from the drive and requests the second status byte by activating 'clock A out' [11].

Note: The first status byte reports any error conditions that may exist (unit check) and the status of the drive (repositioning, performing a manual rewind unload and so forth).

The drive responds by placing status byte 2 on the bus to the control unit and activating 'clock B in' [12]. The tape control unit accepts the second status byte and drops 'clock A out'.

Note: The second status byte pertains to the drive and tape cartridge (ready, at beginning-of-tape, at end-of-tape, or file protected).

When both status bytes have been accepted, the tape control unit resets 'command out' [13] and the drive resets 'status in' [14].

Select out remains on if:

- The command was a burst command.
- The command was a control type with data to be transferred.

Select out is reset if:

- A control command and no data is to be transferred.
- The command was an immediate command.
- The status byte contained unusual or unexpected information.

This ends the initial selection sequence to the drive. The drive is now ready for a data transfer operation.

Alert Sequence

An 'alert' sequence is started by the drive when:

- A disconnected sequence is complete
- The drive goes from 'not ready' to 'ready'
- Repositioning is complete
- A manual rewind unload is started
- Request processor microcode patches

Whenever the drive needs to communicate with the tape control unit, it sets an 'alert' bit in the drive device alert register (DAR) and also the tape control unit device interrupt register (DIR).

The DIR bit set corresponds to the drive sending the alert. If the remote connection is used, the register bit still corresponds to the drive sending the alert.

Once an 'alert' has been set in the tape control unit DIR the tape control unit must initiate an initial selection sequence to the drive to clear the alert.

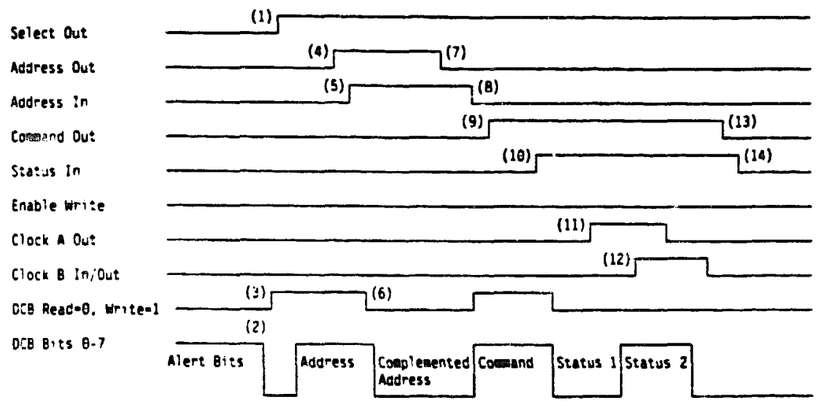


Figure 1. Tape Control Unit to Drive Initial Selection Sequence

The tape control unit sets 'select out' in the device tag register and switches to send mode. The drive address is placed on the device control bus (DCB) and 'address out' is set into the DTR. The DCB is switched to receive mode and 'address in' is activated. The tape control unit waits for a response from the drive. When the address complemented is received, 'address out' is reset followed by 'address in'. The sequence continues as for an initial selection. The status bytes sent to the tape control unit at the end of the sequence contains the alert information. The drive alert is reset in the DIR and the control unit and drive are ready for the next operation. See the 'initial selection' sequence timing chart.

Tape Control Unit To Drive Operation (Continued)

Ending Sequence (Tape Control Unit Initiated)

An "ending sequence" (device stop) is used to disconnect the drive from the tape control unit. An "ending sequence" can be started by the tape control unit or the drive, except for a "data transfer sequence," which can only be ended by the tape control unit.

Note: If 'address in' is active before the 'ending sequence," and is inactive when 'command out' becomes active, it indicates a microcode detected error. If 'address in' becomes active while 'command out' is active, a hardware error is indicated (check 1).

The "ending sequence" for a data transfer starts when either 'write enable' (write operation) 1 or 'read gate' (read operation) is reset. The tape control unit checks for 'address in' 2 from the drive. If no errors are detected, the tape control unit activates 'command out' 3 to the drive.

'Address in' 4 is again checked for an indication of an error, by the tape control unit. The drive activates 'status in' 5 and the tape control unit checks for 'address in' 6 again (any errors) The drives status byte 1 7 is sent to the tape control unit across the device control bus (DCB). 'Address in' 10 is checked again (indicating errors) by the tape control unit.

'Clock A out' 8 is activated requesting status byte 2 from the drive and 'clock B in' 9 is activated verifying that status byte 2 11 has been sent to the tape control unit across the DCB. After the tape control unit receives status byte 2 'clock A out' 12 is deactivated and 'address in' 13 is checked once again. 'Clock B in' 14 is deactivated and 'status in' 15 is then deactivated indicating no more status bytes are to be sent.

Both status bytes from the drive have been received, and at this time 'select out' 16 is deactivated. 'Command out' 17 is deactivated stopping the drive, completing the ending sequence.

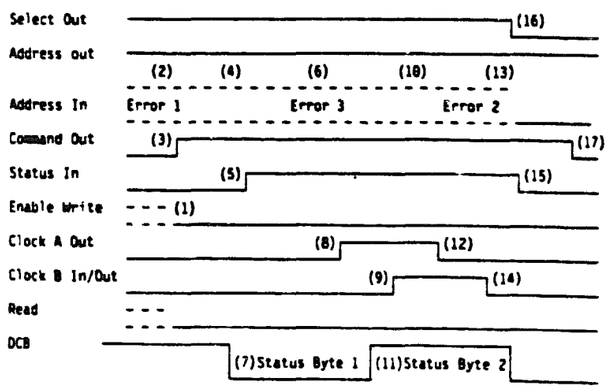


Figure 1. Ending Sequence (Device Stop)

Tape Control Unit To Drive Operation (Continued)

Write Operation

A write operation is started when the tape control unit sends a write command across the device control bus (DCB) to the drive. This starts tape motion and conditions the drive to write. After the tape has reached the correct speed and is at the correct place to start writing, the drive signals the tape control unit by activating the 'gap in' line to the tape control unit. The write status/error register (WSE) bit 0 must be on to indicate to the drive that this is a write operation.

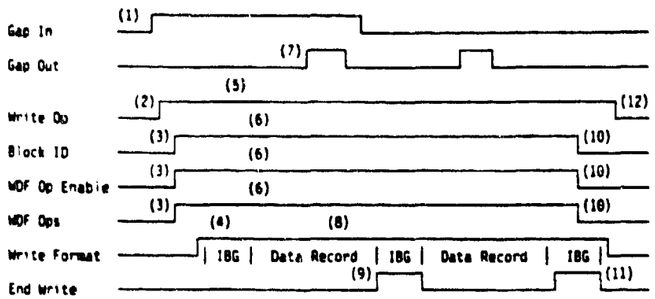


Figure 1 Write Operation

The write control register (WCR) is set with the following:

- Bits 0 and 1 - Starting Block ID Sequence '00'
- Bit 5 - Write data flow operation enabled
- Bits 6 and 7 - Write data flow operation

At this time the interblock gap (IBG), which is supplied by the tape control unit, is written. After the IBG has been written a check is made to ensure that the write operation is still being performed by testing bit 0 of the WSE register. A check is made to ensure that the correct write control register (WCR) bits were set by doing a compare. 'Gap out' is a signal from the tape control unit indicating that the IBG has been recognized. The c[illegible]l then starts sending data through the write data flow to th[illegible]. As it is written the data is converted to the TA90 tape [illegible]at.

When [illegible]ata block has been written a block ID (sequence num[illegible]) is added to the end of the data block, and a sequence cou[illegible]nto the WCR for each block written. Both of these are [illegible]de[illegible] as part of the data record.

An [illegible] 'write stop) line (bit 1 of the WSE register) signals [illegible] of each data record. This line is a result of a count of 'write request' signals from write data flow to the channel. The tape control unit can now issue a command to the write data flow that specifies either a new record is to be written or to stop writing. A new IBG is written in either case.

If a new record is to be written, set a block ID number and advance the sequence number and reset the 'end write' (write stop) line. If the command is to stop writing because of the end of data, the drive is signaled to stop by the tape control unit.

1. Reset the WCR write data flow operation enable [illegible].
2. Reset end write (write stop) [illegible].
3. The WSE register bit 0 (write operation) should be off [illegible]. If it is not, an error is indicated.

The drive slows down and comes to a stop. The tape moves backward to the write stoplock position, which is in front of the IBG. The drive assumes that the next command is another write-type operation. The drive is now in position for the next command.

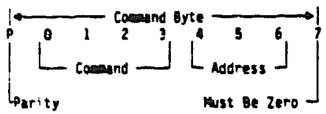
Serial Interconnection Sequence

The serial interconnection (using the device control bus) is used when the tape control unit is busy using the parallel interconnection on another drive.

The serial interconnection contains three signal lines:

- Repositioning In - is a line from all attached drives to the tape control unit. It indicates that the drive is repositioning or not at the stoplock position.
- Serial Clock Out - is a line from the tape control unit to all attached drives. It clocks the serial information to all drives. There are 18 serial clock out pulses. There is no response to this line.
- Serial Data Out - is a line from the tape control unit to all attached drives. It sends information to all nonselected drives together with 'serial clock out'. The 'serial clock out' gates the 'serial data out' line.

The serial interconnection saves time by getting another drive up to speed ('early start') while the parallel interconnection is in use with another drive using the parallel interconnection. (Only commands are sent across the serial interconnection.)



Example:

Command = 0A (Write Command) Address = 5

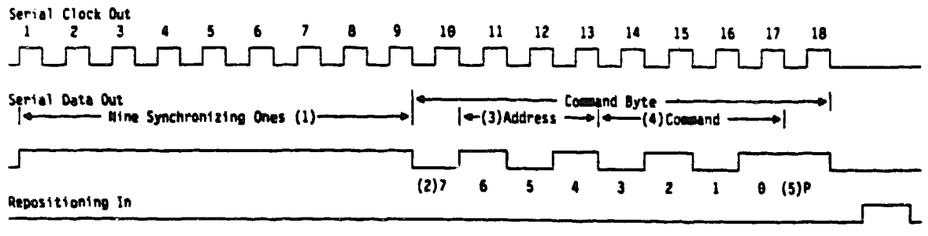


Figure 1. Serial Interconnection

Data is sent to the drive, serial by bit, as an 18 bit word that contains an address and command. No response is sent to the tape control unit from the drive unless the drive is repositioning. If the drive is repositioning, the 'repositioning in' line is activated to the tape control unit.

The serial command must be followed on the parallel interconnection with the same command before the drive is up to speed and has activated the 'gap in' line.

Note: The initial selection sequence and the command must be completed over the parallel interconnection to the drive before 'gap in' is received at the tape control unit.

The parallel command is then executed from this point. If no parallel command is received by 'gap in' time, the drive goes to the serial stoplock position and waits for a parallel command.

There are seven serial interconnection commands.

- (06) Clamp
- (07) Unclamp
- (08) Reset A
- (02) Read Forward
- (03) Read Backward
- (0A) Write
- (00) Test I/O

The Clamp, Unclamp, and Reset A commands are issued when the drive is suspected of not operating correctly. The Read Forward, Read Backward, and Write commands are issued to cause tape movement.

When the serial command is received, and the drive is not at the correct stoplock, the drive repositions to the correct stoplock for the serial command just received and then sends an 'alert' to the tape control unit.

The Test I/O command causes hardware to gate the status on the 'repositioning in' tag line.

Serial Format

The serial command is a string of 18 data bits with 18 associated clock pulses.

The format is as follows:

1. At least nine logical '1's' in a row (preamble).
2. Followed by one logical '0'.
3. The three drive address bits (low order first).
4. The four command bits (low order first).
5. One parity bit associated with steps 2, 3, and 4.

If the correct preamble is not received by the serial interconnection, no serial command is decoded.

I/O Interface

The tape control unit must communicate with both the STI-FIPS adapters and with each of the tape transport units of the subsystem. A method for this communication is supplied by two I/O connections, STI-FIPS adapter to the tape control unit and tape control unit to the drive. See the diagram on the following page

The basic timing sequence of the interface is found in: *FIPS Publication 60-2, I/O Channel Interface*.

The electrical characteristics of the interface between the STI-FIPS adapters and the tape control unit differ from the *FIPS Pub 60-2* standard in that they operate at low power levels and low logic levels.

STI-FIPS adapter to tape control unit interface

Bus Out

There are eight information lines plus one parity line on 'bus out'. Bus out is used to send a tape control unit address, device address, commands, and data to the tape control unit from the STI-FIPS adapter

Bus In

There are eight information lines plus one parity line on 'bus in'. Bus in is used to send a tape control unit address, device address, status information, sense information, and data to the STI-FIPS adapter from the tape control unit.

Operational Out

The 'operational out' tag is a line from the STI-FIPS adapter that connects the tape control unit to the STI-FIPS adapter. When 'operational out' is deactivated, the existing operation across the interface must be reset.

Address Out

'Address out' is a tag line from the STI-FIPS adapter to the tape control unit. It is used to signal the tape control unit to decode the tape control unit and device address sent on bus out. The tape control unit then must activate 'operational in' to the STI-FIPS adapter.

Hold Out

'Hold out' is a line from the STI-FIPS adapter to the attached control unit and is used with 'select out' to synchronize tape control unit selection

Select Out

'Select out' is a line from the STI-FIPS adapter to the tape control unit and, together with 'select in', supplies a loop for scanning the attached tape control unit. A tape control unit can activate 'operational in' to the channel only when 'select out' is sent to the tape control unit.

Command Out

'Command out' is a line from the STI-FIPS adapter to the attached tape control unit and is used to signal the selected device in response to 'address in', 'status in', or 'service in' from the tape control unit.

Service Out

'Service out' is a tag line from the STI-FIPS adapter to the tape control unit and is a response to 'status in' or 'service in'. It indicates to the tape control unit that the STI-FIPS adapter has received information sent on 'bus in' or has supplied (on bus out) the data requested by 'service in'.

Data Out

'Data out' is a tag line from the STI-FIPS adapter to the tape control unit and is used in response to a signal on 'data in'. A signal on 'data out' indicates the STI-FIPS adapter has received the information on 'bus in' or has supplied (on bus out) the data requested by 'data in'.

Suppress Out

'Suppress out' is a line sent from the STI-FIPS adapter to the tape control unit and is used alone or together with other out tags to supply the signal to suppress data, suppress status, do command chaining, or a selective reset.

Select In

'Select in' is a line that extends 'select out' from the STI-FIPS adapter to the tape control unit and is returned to the STI-FIPS adapter as 'select in'. 'Select in' is only returned to the STI-FIPS adapter if no device address has been decoded.

Operational In

'Operational in' is a line from the tape control unit to the STI-FIPS adapter and is used to signal the STI-FIPS adapter that the device has been selected. It must remain active for the complete time of the selection.

Address In

'Address in' is a line from the tape control unit to the STI-FIPS adapter and is used to signal the STI-FIPS adapter that the addresses of the tape control unit and the selected device have been placed on bus in.

Status In

'Status in' is a line from the tape control unit to the STI-FIPS adapter and is used to signal the STI-FIPS adapter that the selected tape control unit has placed status information on bus in.

Service In

'Service in' is a tag line from the tape control unit to the STI-FIPS adapter and is used to signal the STI-FIPS adapter when the selected device is ready to send or receive a byte of data. 'Service in' on a read operation validates data on 'bus in', and on a write operation acknowledges receipt of data on 'bus out'.

Data In

'Data in' is a tag line from the tape control unit to the STI-FIPS adapter and is used to signal the STI-FIPS adapter when the selected device is ready to send or receive a byte of data. 'Data in' on a read operation validates data on 'bus in', and on a write operation acknowledges receipt of data on 'bus out.'

Request In

'Request in' is a line from the tape control unit to the STI-FIPS adapter and indicates the tape control unit is ready to present status information or data, and is therefore requesting a selection sequence.

Disconnect In

'Disconnect in' is a line from the tape control unit and permits the tape control unit to signal the STI-FIPS adapter of a failure that could prevent the tape control unit from signaling correctly over the interface.

Mark In

Used in a command-retry sequence. If during the execution of a command, the tape control unit finds a condition that requires a retry, the tape control unit requests command retry by activating 'mark 0 in' and 'status in' to the STI-FIPS adapter.

Tape Control Unit to Drive Interconnection

Select Out

'Select out' is a line from the tape control unit to the drive. Whenever 'select out' is inactive, all lines from the drive to the tape control unit must be inactive, except for the device control bus (DCB) when sending alerts to the tape control unit. Any operation on the interconnection must be reset, except that operations at the device continue to a normal stopping point.

Address Out

'Address out' is a line from the tape control unit to all attached drives. The address of the needed drive is placed on the DCB, following the activating of 'select out', signaling all drives to decode the address. 'Address in' is deactivated after the complemented drive address has been returned to the tape control unit.

Address In

'Address in' is a line from all attached drives to the tape control unit. It is the response to 'address out' to signal the tape control unit that the complemented drive address is correct on the DCB. 'Address in' remains active until 'address out' is deactivated.

'Address in' is used after the above sequence to indicate any error or unusual condition that occurs before the ending 'status in'.

When 'address in' becomes active in response to 'command out' it means a drive hardware error.

I/O Interface (Continued) **OPER 196**

Command Out

'Command out' is a line from the tape control unit to all attached drives. The command must be correct on the DCB before 'command out' is activated. It is a response to 'address in' going inactive during initial selection and indicates to the selected drive that the command is correct on the DCB. 'Command out' remains active until 'status in' is received.

When used during a data transfer sequence, data transfer stops, and there is no information on the DCB associated with the tag. 'Status in' is activated in response.

Status In

'Status in' is a line from all attached drives to the tape control unit. It verifies the first status byte and remains active for both status byte 1 and status byte 2. Status byte 2 is requested when the tape control unit activates 'clock A out' and is verified by the drive activating 'clock B in'.

During the initial selection sequence, 'status in' is in response to 'command out' going active and goes inactive after 'command out' is deactivated.

Repositioning In

'Repositioning in' is a line from all attached drives to the tape control unit. It indicates that the drive is repositioning or not at a stoplock position. The 'repositioning in' response occurs after the command byte is received.

Gap In/Gap Out

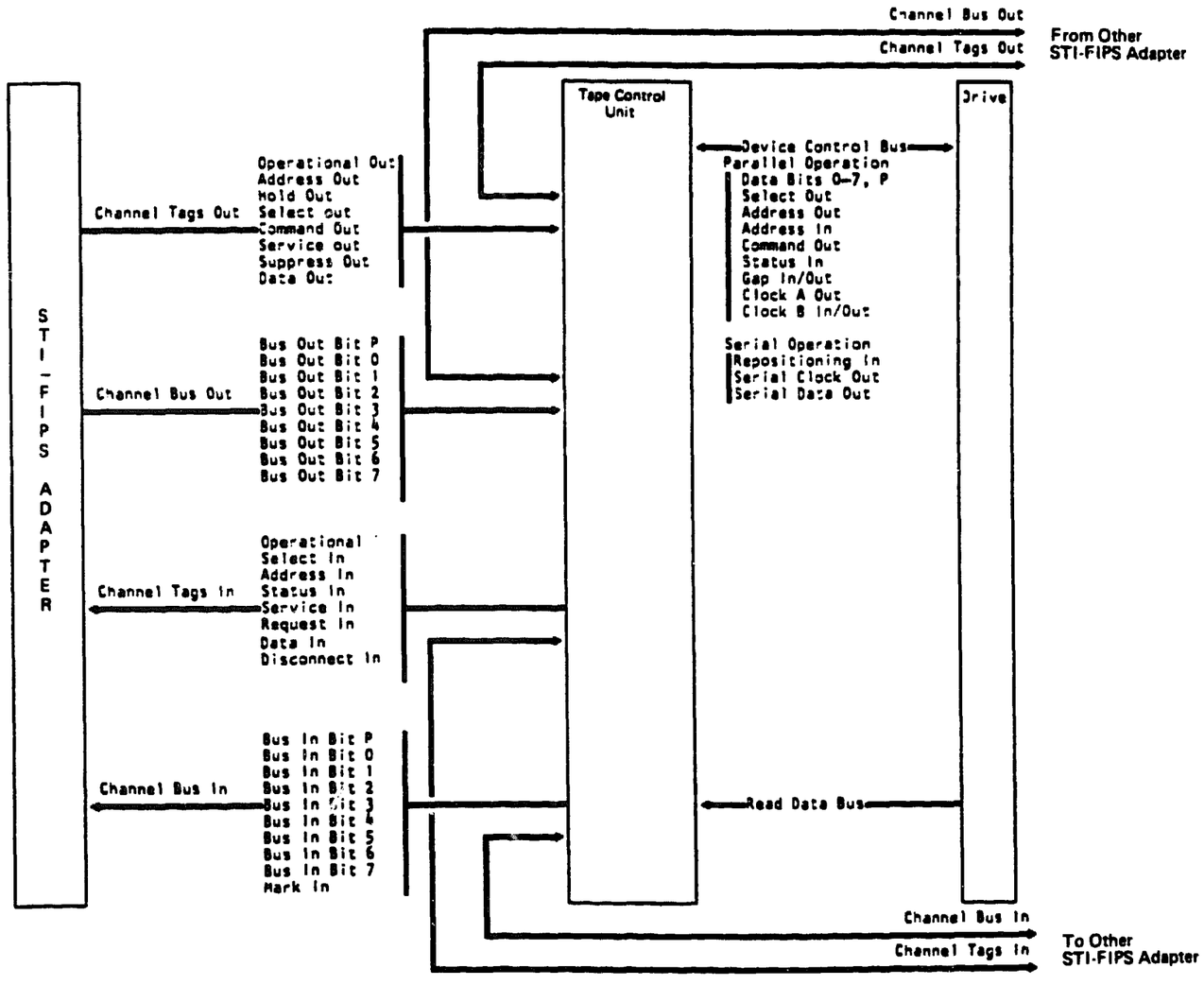
'Gap in/Gap out' is a bi-directional line between the tape control unit and all drives. The line is used by the tape control unit (gap out) and the selected device (gap in) during data transfer sequence to indicate the relative position of the tape and the read/write head.

Clock A Out

'Clock A out' is a line from the tape control unit to all attached drives and is activated when the tape control unit requests the second status byte from the drive.

Clock B In/Out

'Clock B in/out' is a bi-directional line between the tape control unit and all attached drives. These lines are used during a data transfer, control transfer, sense transfer, and a status 2 transfer sequence.



Microprocessor to Channel Adapter Operation

This is a list of acronyms that are used extensively in the explanation of the microprocessor to channel adapter operation.

```
MP - Microprocessor
SS - Status Store
CA - Channel Adapter
RAM - Random Access Memory
CCC - Channel Card Control
CDR - Channel Data Register
CCA - Channel Card Address
CRR - Channel Response Register
CER - Channel Error Register
XR - External Register
CDTI - Channel Diagnostic Tag In
Register
CTO - Channel Tag Out
```

Communication between the MP and the CA is accomplished through the SS. The MP sends orders to XRs in SS, which are sent on to the CA.

The adapter and device address, or 'RAM' offset, are sent through the CCC register. Any data sent or received is through the CDR. The actual order and RAM page number is sent through the CCA register. Writing the CCA register causes the order, address, and data to be sent to the CA. When the order is completed, the CA returns any data requested through the CDR register. Also, a response is returned and loaded into the CRR.

The MP monitors CCR bit 6 (order complete) and CCR bit 7 (order successful) to determine the results of the order sent. Errors are set in the CER.

Note: Some of the external registers in the SS are read only, write only, or both.

MP to SS Communications

The MP to SS communication is through the normal external register path.

Major functional lines include the following:

- XR ADR EXT Bits 0 and 1 - set from the processor control register bits 6 and 7.
- XR ADR Bus Bits P, 0-4 - bits 0-4 are set from the five bits on the control storage data bus that corresponds to the XR address in the instruction. The 'P' bit is generated to maintain even parity on this bus.
- XR Data Bus P, 0-7 - a bi-directional bus for read or write data.
- XR Read Gate - active at S18-S21 time for XR read.
- XR Write Gate - active at S0-S13 time for XR write.
- XR Load - active at S5-S7 time. If XR write gate is on, the addressed register is loaded with the data on the XR data bus. This signal is generated by the control store card and always occurs. No writing occurs unless the write gate is also on.

SS to CA Communications

SS to CA communications is accomplished by a polling sequence. SS polls each CA in sequence. A poll operation has four conditions, S0-S3, determined by the binary bits 1 and 2.

If SS receives an order from the MP for the CA, the order and address is sent during S0 time, also data if required, is sent or received during S2 time. If the CA has an order for SS to process, it sends the order to SS during S1 time, and SS responds during S3 time.

SS to CA path includes the following functional major lines:

- Select Bus 0-3 - bits 0 through 3 select channel adapters A and B.
- Data Bus P, 0-7 - bi-directional bus for read, write, or control data.
- Response Bus P, 0-3 - bi-directional bus for control or response data. When the response bus contains response data it is defined as follows:

  During S2 time (SS execution of a MP order)
  - Bit 0 - adapter installed
  - Bit 1 - adapter installed
  - Bit 2 - order complete
  - Bit 3 - order successful

  During S3 time (SS execution of a CA order)
  - Bit 0 - response valid
  - Bit 1 - no errors detected
  - Bit 2 - adapter permitted
  - Bit 3 - assign successful
- Order State - active when SS external register 01 (CCA) has been set with an MP order for the channel adapter.
- Binary State Bit 1 and 2 - decode of these lines determines S0-S3 times.

MP to SS to CA Communication

EXAMPLE

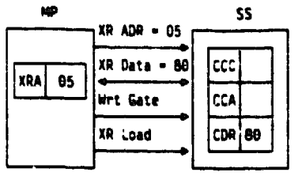
Assume that the MP is running the channel wrap test EE62, and wants to activate the 'operational in' tag line, and also check that it wraps to the 'operational out' tag line. This is accomplished by the following operation.

1. The MP sends a CA order and the required data to SS to activate the 'operational in' bit in the CDTI register.
2. On the next poll, SS sends the order and data to the CA which activates the 'operational in' bit in the CDTI. With the wrap blocks installed, 'operational in' is wrapped to 'operational out'.
3. Because the CTO register is a status register external to the RAM, the MP must first write the CTO into the RAM position assigned to this register. Later it can be read out to determine if the 'operational in' bit is on. Therefore, the MP sends a CA order to SS to write the CTO into the RAM.
4. On the next poll SS sends the order to the CA, and the CTO is written into the RAM.
5. The MP now sends the necessary order to SS to read the RAM location just written.
6. On the next poll SS sends the order on to the CA which reads the assigned RAM location and sends the data back to SS where it is loaded into the CDR.
7. The MP checks the results in the CDR with a normal XR read to SS.

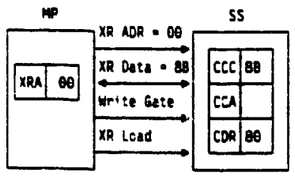
MP to SS Operation (Set CDTI Bit 0 On)

The following three diagrams relates to Step 1 of the EXAMPLE

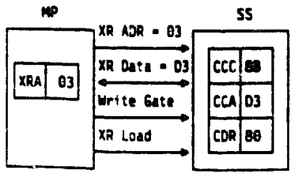
- MP sets CDR register to X'80'.
  1. Gate X'05' to the XR address bus
  2. Gate X'80' to the XR data bus.
  3. Activate the write gate and XR load.



- MP sets CCC to X'8B'.
  1. Gate X'00' to the XR address bus.
  2. Gate X'8B' to the XR data bus.
  3. Activate the write gate and XR load.



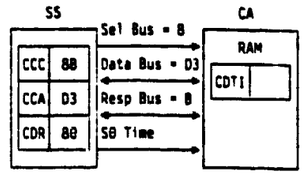
- MP sets CCA to X'03'.
  1. Gate X'03' to the XR address bus.
  2. Gate X'D3' to the XR data bus.
  3. Activate the write gate and XR load.



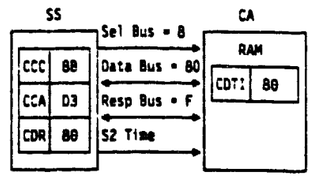
SS to CA Operation (Set CDTI Bit 0 On)

The following two diagrams relate to Step 2 of the EXAMPLE.

- Status store polls at S0 time.
  1. Gate CCA register to the data bus (MP order and RAM page number).
  2. Gate CCC register bits 0-3 to the select bus (channel adapter address).
  3. Gate CCC register bits 4-7 to the response bus (page offset).



- Status store poll at S2 time.
  1. Gate CDR register to the data bus.
  2. CA write data into RAM page 3, offset B (CDTI).
  3. CA sets response bus to X'F' (order complete and successful).



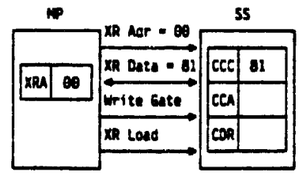
The CDTI register bits are:

Bit 0 Operational In
Bit 1 Address In
Bit 2 Select In
Bit 3 Request In
Bit 4 Status In
Bit 5 Service In
Bit 6 Data In
Bit 7 Disconnect In

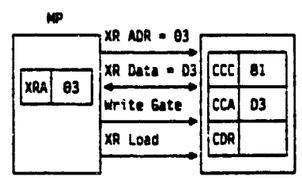
MP to SS Operation (Write CTO into RAM)

The following two diagrams relate to Step 3 of the EXAMPLE.

- MP sets CCC register to X'81'.
  1. Gate X'00' to the XR address bus.
  2. Gate X'81' to the XR data bus
  3. Activate the write gate and XR load.



- MP sets the CCA register to X'D3'.
  1. Gate X'03' to the XR address bus.
  2. Gate X'D3' to the XR data bus.
  3. Activate the write gate and the XR load.

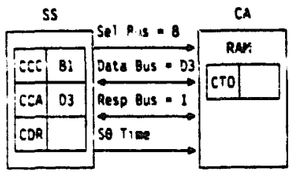


SS to CA Operation (Write CTO into RAM)

The following two diagrams relate to Step 4 of the EXAMPLE on OPER 205.

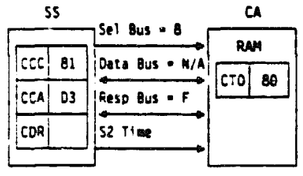
- Status store poll at S0 time.

  1. Gate the CCA register to the data bus (MP order and RAM page number).
  2. Gate the CCC register bits 0-3 to the select bus (Channel Adapter Address).
  3. Gate the CCC register bits 4-7 to the response bus (Page Offset).



- Status store poll at S2 time.

  1. CA writes CTO register into RAM page 3, offset 1 (CTO)
  2. CA sets response bus to X'F' (order complete and successful).



The CTO register bits are:

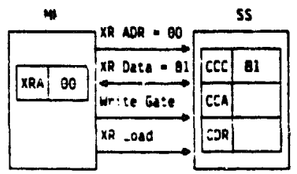
Bit 0 Operational Out
Bit 1 Address Out
Bit 2 Select Out
Bit 3 Hold Out
Bit 4 Command Out
Bit 5 Service Out
Bit 6 Data Out
Bit 7 Suppress Out

MP to SS Operation (Read RAM CTO location)

The following two diagrams relate to Step 5 of the EXAMPLE on OPER 205.

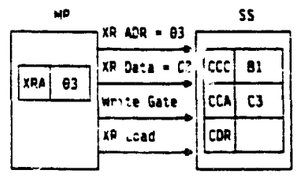
- MP sets CCC register to X'81'

  1. Gate X'00' to the XR address bus.
  2. Gate X'81' to the data bus.
  3. Activate the write gate and XR load.



- MP sets CCA to X'C3'.

  1. Gate X'03' to the XR address bus.
  2. Gate X'C3' to the XR data bus
  3. Activate the write gate and XR load.

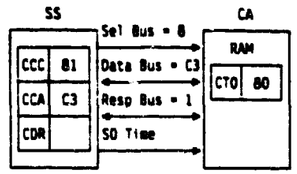


SS to MP Operation (Read RAM CTO location)

The following two diagrams relate to Step 6 of the EXAMPLE on OPER 205.

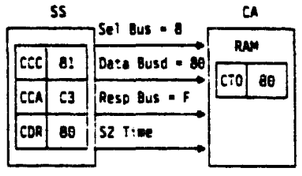
- Status store poll at S0 time

  1. Gate CCA register to the data bus (MP order and RAM page number).
  2. Gate CCC register bits 0-3 to select bus (CA address).
  3. Gate CCC register bits 4-7 to response bus (page offset).



- Status store poll at S2 time.

  1. CA gates RAM data X'80' to the data bus.
  2. SS writes data to the CDR.
  3. CA sets response bus to X'F' (operation complete and successful).

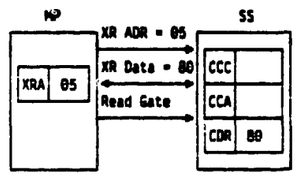


MP External Register Read (Read Data into CDR)

The following diagram relates to Step 7 of the EXAMPLE on OPER 205.

- MP reads CDR register in status store

  1. Gate X'05' to the XR address bus.
  2. Activate the read gate.
  3. SS gates the CDR register X'80' to the XR data bus.



MP to SS to CA Data Flow

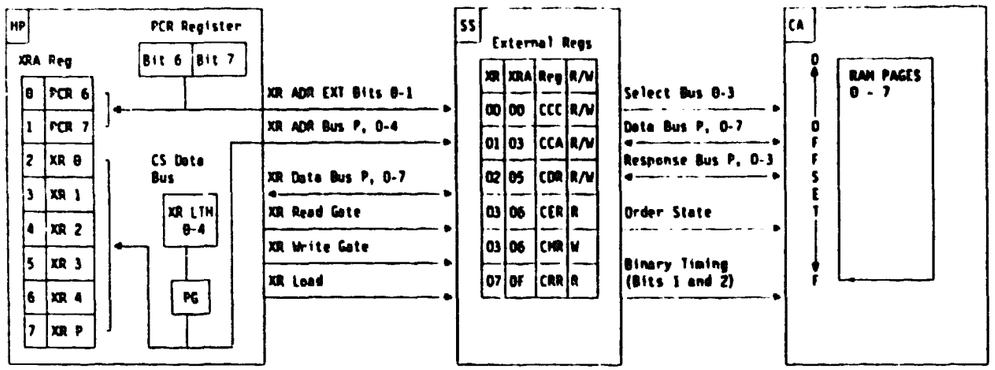


Figure 1. Microprocessor To Channel Adapter Data Flow

XRA Decode

The following is an example of XRA decoding, using status store external register 02.

0	1	2	3	4	5	6	7
EXT 0	EXT 1	ADR 0	ADR 1	ADR 2	ADR 3	ADR 4	ADR P
0	0	0	0	0	1	0	1

Status store is selected by bits 0 and 1 set to 00.

Bits 2 through 7 are set to a binary value of the external register with even parity.

The result is XRA = 05 (hexadecimal).

Channel Card Control Register

The following is the layout of the channel card control register.

CCC Register XRA Register = 00

0	1	2	3	4	5	6	7
CA A	CA B			Page Offset			

Channel Card Address Register

The following is the layout of the channel card address register.

CCA Register XRA Register = 03

0	1	2	3	4	5	6	7
MP Order				RAM Page			

Channel Data Register

The following is the layout of the channel data register.

CDR XRA Register = 05

0	1	2	3	4	5	6	7
RAM Read/Write Data							

Status registers external to the RAM. In order to inspect, write into RAM, and read the RAM.

Control Registers external to the RAM. Write to the RAM writes into the register and RAM.

Off-set	RAM PAGE 3
0	CBO-Channel Bus Out
1	CTO-Channel Tag Out
2	CBI-Channel Bus In
3	CTI-1-Channel Tag In 1
4	CTI-2-Channel Tag In 2
5	CAE-Channel Adapter Error
6	CAS-Channel Adapter Status
7	Unused
8	CDBO-Channel Diagnostic Bus Out
9	CDTO-Channel Diagnostic Tag Out
A	CDBI-Channel Diagnostic Bus In
B	CDTI-Channel Diagnostic Tag In
C	CDC-Channel Diagnostic Control
D	Unused
E	Unused
F	CIR-Channel Interrupt Request

IML Diskette Drive Operation

The initial microprogram load (IML) diskette drive is a 3 5 inch disk drive, providing 1 megabyte of unformatted storage on a double sided diskette. The purpose of the diskette drive is to IML the functional microcode for the TA90 subsystem.

The IML is accomplished during a TA90 power on, or by pressing the IML switch when the tape control unit Test/Normal switch is in the Normal position and the tape control unit Online Test/Offline Test switch is in Offline Test.

The IML sequence of operation is as follows:

1. Run the programmable read only memory (PROM) diagnostics to test the 128 kilobytes of control storage. Error information is stored in a microcode table for later use by the functional microcode and the maintenance diskette.

2. Start the IML diskette drive to load IML diagnostics into control storage and run the diagnostics. The IML diagnostics check out the tape control unit.

   Note: All errors are placed in a microcode table but, severe (CHK 1) errors cause 'disconnect in' and the tape control unit stops.

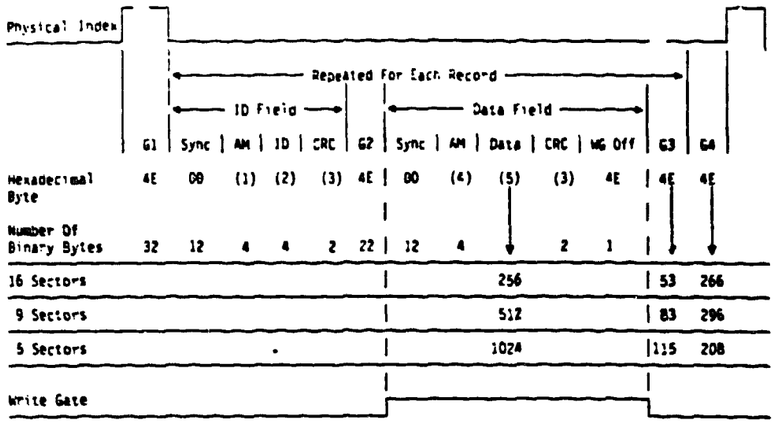
   Errors other than CHK 1 errors cause the tape control unit to respond with a unit check to the next 'Start I/O' command from the host system.

3. Load the functional microcode to start a normal operation. The maintenance diskette looks at the microcode table for any error information.

4. If you are installing a subsystem the functional diskette is used to load installation diagnostics. You must place the Test/Normal switch in the Test position to run the installation diagnostics.

   Note: When the Normal/Test switch is in the Test position the installation diagnostics are run before the start of normal operations.

Modified frequency modulation (MFM) is a function of the control units control storage card and the recording format is in the MFM format. See Figure 1. The inter-sector gaps are shown as G1, G2, G3, and G4.



Notes: (1) ID Address Mark With Missing Clock
(2) Cylinder Number, Head Number, Sector Number, and Physical Record Length
(3) Generated by CRC Generator.
(4) Data Address Mark With Missing Clock
Deleted Data Address Mark With Missing Clock
(5) Users Data

Figure 1. MFM Sectored Format

IML Diskette Drive Operation (Continued)

Control Storage To Drive Interconnections

The IML diskette drive has two connectors. Connector P1/J1 connects the digital I/O signals, and connector P2/J2 connects the + 5 V dc and the + 12 V dc. The interconnections second level diagram in Figure 1 identifies the pin assignments for these connectors.

Figure 2 is a timing chart showing the signal lines and their relationship.

Drive Select 0 To Disk

An active level on the 'drive select to disk' (DS0) line (pin E of the J1 connector) permits communication between the individual drive and the control storage card.

The drive select address is selected by a pluggable jumper. The DS0 jumper is installed at the plant and must be inserted in the DS0 position for correct operation. When the two DS0 jumper pins are shorted, the IML drive is activated by an active signal on the 'drive select to disk' line.

Motor On To Disk

An active level on pin J of the J1 connector enables the drive motor. One-half second is required after 'motor on' is activated for the spindle to come up to speed before reading or writing on the diskette is permitted. Pin J is deactivated for maximum motor life if no commands are issued to the drive within two seconds (10 media revolutions) after completion of a preceding command.

Direction Select To Disk

'Direction select' (pin K of the J1 connector) defines the direction of the read/write head. An active level on this line causes the head positioning mechanism to move the read/write head toward the center of the diskette when the 'step' line becomes active.

When the 'direction select' line is not active, the 'step' line causes the head positioning mechanism to move the read/write head away from the center of the diskette.

Step To Disk

When the 'step' line is active on pin L of the J1 connector the read/write head is moved one track. The direction is controlled by the 'direction select' line.

Write Data To Disk

The data that is written on the diskette is sent on pin M of the J1 connector. Each transition on pin M from not active to active causes the write current direction through the write head to be reversed

Write Gate To Disk

An active level on pin N of the J1 connector enables the write current, and disables the stepping (head positioning) circuits. With pin N not active, the read circuits are enabled..

Side Select To Disk

The 'side select' line (pin T of the J1 connector) defines which surface of a two-sided diskette is to be accessed for writing or reading data. An active level on pin T selects the read/write head for diskette side 1 (the side facing the printed circuit board). With pin T not active, side 0 (the diskette side facing the disk drive chassis) of the diskette is selected. When switching from side to side, a 100 microsecond delay is provided before any read or write operation can be performed.

Drive to Control Storage Interconnections

Index From Disk

This signal on pin D of the J1 connector is provided by the drive once each diskette revolution. The leading (negative going) edge of the Index pulse indicates to the tape control unit the beginning of a track.

Track 00 From Disk

When pin P of the J1 connector is active it indicates that the read/write head is positioned at track 00.

Write Protect From Disk

Note: On the reverse side of a 3.5 inch diskette, in the lower right corner, there is a write-protect window. When you slide the plastic tab so that the window is open, the diskette is write protected. When the window is closed data can be written on the diskette.

Read Data From Disk

Data on pin S of the J1 connector is read from the diskette to the host system in the same form as when it was written on the diskette.

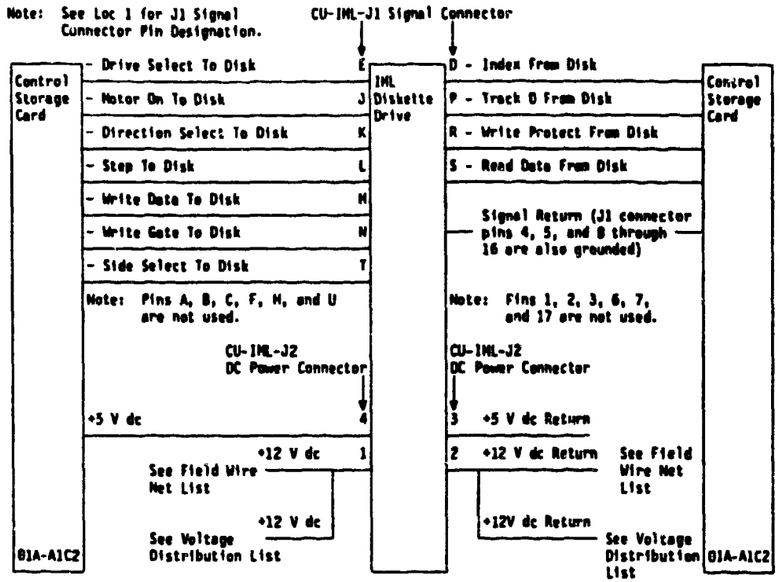


Figure 1. Control Storage To/From IML Diskette Drive

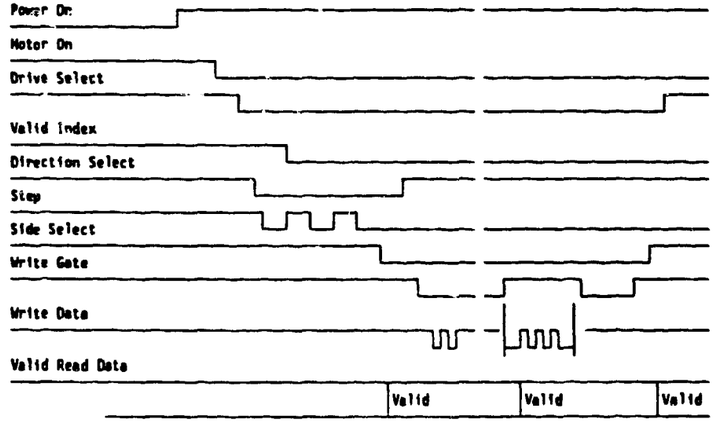


Figure 2. Controls and Data Timing Chart

Automatic Cartridge Loader

This topic explains the purpose of the functional areas. A brief description of the functional areas is included.

- Loader Operator Panel
- Loader Control Card
- Loader Mechanical Assembly
- Load Assembly.

The Loader Operator Panel consists of:

- Mode Selection Switch
- Start Switch
- Attention Indicator
- Power Indicator.

Mode Selection Switch:

The mode selection switch has three positions and can be changed at any time by the operator. Generally, the device switches to the new mode automatically, without any other operator action. The exception is switching to auto mode. The start switch must be depressed to activate the new mode.

Automatic Mode:

In this mode cartridges in the input stack are sequentially loaded into the drive, and upon completion of use by the drive, are unloaded and positioned in the output stack.

Manual Mode:

In this mode cartridges are manually inserted into any position of the input station by the operator. When the drive unloads the cartridge remains at the feed station.

System Mode:

This mode is not used on the TA90.

Start Switch:

This switch is used to initialize auto mode, reinitialize auto mode, or to activate each manual load cycle. The start switch is also used to remove a cartridge from the feed station when the attention indicator is flashing and a cartridge is in the TA90.

Attention Indicator:

When flashing, indicates an operator action is required. The operator should remove the cartridge from the input feed or the output stack or press the automatic cartridge loader start switch to clear the attention condition. When on solid, indicates an error condition exists. If in a recovery mode and the light is on solid, press the drive unload switch to clear the solid attention light on the automatic cartridge loader.

Power Indicator:

Indicates when dc power is on at the automatic cartridge loader.

Loader Control Card:

The loader control card contains the microprocessor, drivers, memory and interfaces to the sensors, motors, automatic loader operator panel and tape drive. After getting an IML load from the TCU, by way of the drive card, the drive card controls all the motions of the automatic cartridge loader.

Loader Mechanical Assembly:

The loader mechanical assembly contains all the components required to hold, load, unload and stack cartridges. The assembly consists of these major components:

- Input Stack Assembly
- Feed Assembly
- Output Stack Assembly.

Input Stack Assembly:

The input stack assembly holds the cartridges and moves them into position to be fed into the TA90.

Feed Assembly:

The feed assembly feeds the cartridge into the load assembly or removes the cartridge from the load assembly and moves it to the output stack assembly.

Output Stack Assembly:

The output stack assembly receives the cartridge from the feed assembly and stacks it for later operator removal.

Load Assembly:

The load assembly consists of all the parts required to position the tape cartridge within the drive for loading. It replaces the cartridge latch assembly on drives without automatic cartridge loaders.

Automatic Cartridge Loader Sensors and Motors

Load Motor Complete Sensor:

This senses a disk on the output shaft of the load motor and is used for positioning the motor at its up or down position.

Cartridge Latched Sensor:

This sensor indicates that the loader tray is in the down position where the drive can thread tape. This sensor initiates the thread operation. The drive also uses this to control how long the latch solenoid signal is left on.

Cartridge Present Sensor:

This indicates that a cartridge is present in the loader tray. It becomes active before the cartridge has been pushed all the way into the tray. The cleaning cartridge does not activate this sensor when it is in the tray.

File Protect Switch:

This is used to detect the file protect condition of the cartridge. It is also used to indicate that a cleaning cartridge is in the tray if the cartridge present sensor is not active.

Feed Complete Switch:

This indicates that a cartridge has been pushed all the way into the loader tray. When the tray is driven down, the cartridge seats on the alignment pins. This indicates to the feeder that the forward drive can be turned off, the tracks opened and the load motor may be driven down.

Cartridge in Stack Sensor:

This indicates that cartridges are loaded in one or more of the top five cells of the input stack.

Load Motor:

This motor is used to drive the load tray up or down to release or seat the cartridge on the aligning pins.

Input Motor:

This motor is used to drive the input rail assemblies down to position the cartridge for insertion by the feed assembly.

Cartridge Staged Sensor:

This sensor senses that a cartridge is in the feed station.

Tracks Feed Sensor:

This sensor indicates that the tracks have moved in from their open position.

Tracks Closed Sensor:

This sensor indicates that the tracks have closed past the position where they stop if a cartridge was anywhere in the feed position. This sensor is used to sense if a cartridge is in the feed position.

Extract Complete Sensor:

This sensor indicates that a cartridge has been fed completely back into the feed position in the stack. With this indication the feeder motor stops.

Stack Up Position Sensor:

This sensor is used to position the output stack.

Stack Low Position Sensor:

This sensor indicates that the output stack is full. This condition inhibits input stack operations until cartridges are removed from the output stack.

Feeder Solenoid:

This solenoid is used to force the feeder belts against the sides of the cartridge on either a load or unload operation.

Feed Motors Right and Left:

These motors turn the feed belts that drive the cartridge into or out of the load assembly

Output Motor:

This motor is used to drive the output stack assembly up or down thru a worm gear and threaded shaft.

Real Time Statistical Analysis and Reporting System OPER 245

Real Time Statistical Analysis and Reporting System is an algorithm controlled by TA90 tape control unit microcode. Real Time Statistical Analysis performs real time or near real time predictive maintenance and problem determination on TA90 subsystem hardware.

Purpose

Real Time Statistical Analysis gather performance information (statistics or counts of specified events) every time a cartridge is mounted. These statistics are then combined with the past history of the device to produce measures of level and performance and performance trends for the device.

These single cartridge mount statistics are combined with the device condensed statistical history (saved on the tape control unit diskette) to develop device dependent performance trends for generating alert messages for the device. There is one record for each device attached to a tape control unit. The device condensed statistical history is saved on the tape control unit diskette and is available for further processing when the next cartridge is mounted.

These hardware performance measures are used to identify:

- when a device requires cleaning
- when a device, string of devices, or tape control unit have degraded in performance and should be repaired.

Benefits

Real Time Statistical Analysis provides the following benefits:

- Identifies degraded hardware. This allows you to schedule maintenance before hardware causes permanent errors, high criteria error counts, and unscheduled interrupts.
- Saves rerun time by decreasing the number of ABORTS caused by degraded hardware.
- Indicates when a device should be cleaned.

Messages

Messages are provided on the TA90 device pod .

Device Messages

The CLEAN message is displayed on the TA90 device pod. This message indicates that the cleaning cartridge should be inserted in the device to clean the drive. This message will appear every time a cartridge is demounted until the device has been cleaned. This message can be overlaid by a system message.

Obtaining Maximum Real Time Statistical Analysis Benefits

The following suggestions allow you to receive the maximum benefit from the Real Time Statistical Analysis algorithm:

- Clean a drive as soon as possible after the CLEAN message appears on the display pod.
- Have the customer spread work across all devices. Do not use only the low order devices or those that are the closest.
- Take action on any Real Time Statistical Analysis error code presented by VAXsimPLUS or by ERF (ANALYZE/ERROR).


VOLUME
A05


COLLATING LIST
OF PAGES

Collating List of Pages

This reference drawing contains the collating sequence, page side, and EC level of pages for *Digital TA90 Magnetic Tape Subsystem Maintenance Guide (MG) Volume A05.*

The part number of the divider tab list is 13F5773.

This reference drawing is to be placed at the front of the manual.

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Blank	Back	
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FSI 34	Front	EC C13764
FSI 34-1	Back	EC C13764
FSI 35	Front	EC C13764
FSI 35-1	Back	EC C13764
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FSI 39	Back	EC C04824
FSI 40	Front	EC C13764
FSI 40-1	Back	EC C13764
FSI 41	Front	EC C13764
Blank	Back	
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FSI 58-2	Back	EC C13764
FSI 58-3	Front	EC C13764
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FSI 78-1	Front	EC C13764
FSI 79	Back	EC C13764
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FSI 83	Back	EC C13764
FSI 84	Front	EC C13764
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FSI 202	Front	EC C13764
FSI 203	Back	EC C13764
FSI 204	Front	EC C04824
FSI 205	Back	EC C04824
EAD Tab		
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EAD 2	Back	EC C04824
EAD 3	Front	EC C04824
EAD 5	Back	EC C04824
EAD 6	Front	EC C04824
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EAD 171	Back	EC C13764
EAD 172	Front	EC C13764
EAD 175	Back	EC C04824
EAD 176	Front	EC C04824
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PUBLICATIONS REFERENCE DRAWING

MACHINE TYPE/MODEL NO. TA90

MACHINE NAME - Magnetic Tape Subsystem

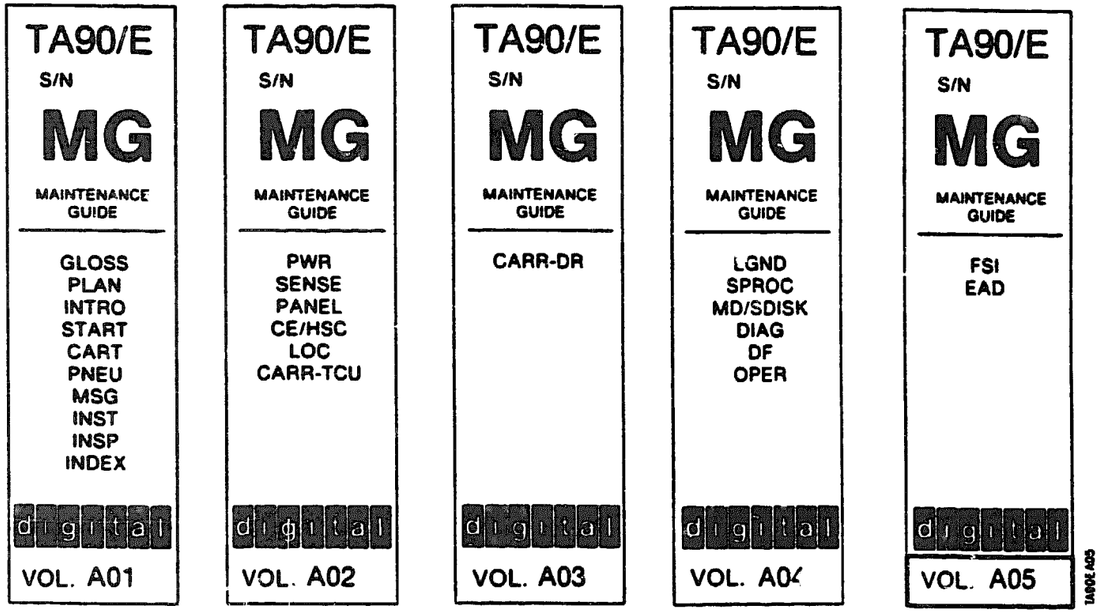
E C NO.	DESCRIPTION / COMMENTS
C04824	VOL. A05 - Maintenance Guide
C13764	VOL. A05 - Maintenance Guide

digital									
NAME PUB REF DWG (PRD)					DATE	CHANGE NO		DATE	CHANGE NO
				REL	4/28/89	C04824			
					3/15/90	C13764			
DESIGN			SHT OF						
DETAIL									
CHECK			CLASSIFICATION	MUST CONFORM TO ENG SPEC		DEVELOPMENT NO		LOGIC PG NO	
APPRC								RD005	

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TA90/E Magnetic Tape Subsystem

digital **Maintenance Guide**



Maintenance Library

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EK-PTA90-MG-002

Preface

This manual contains maintenance information about the Digital TA90 Magnetic Tape Subsystem and is intended for customer engineers responsible for servicing the TA90 tape subsystem

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Prerequisite Knowledge

It is assumed that you have a background in data processing concepts and that you are familiar with the hexadecimal numbering system, stored program concepts, and have a basic understanding of tape subsystems and their relationship within a system/cluster

Related Documents

TA90 Operator s Manual EK-OTA90-OM

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DIBOL			Work Processor

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TAB
LIST

Tab List

Volume A01

GLOSS	Glossary
PLAN	Maintenance Plan
INTRO	TA90 Introduction
START	Start Maintenance
CART	Cartridge Analysis
PNEU	Pneumatic Analysis
MSG	Errorlog messages
INST	Installation/Removal
INSP	Safety Check Procedures
INDEX	Index

Volume A02

PWR	Power Maps
SENSE	Sense/Status
PANEL	Panel
CE/HSC	Customer Engineering Panel/HSC Diagnostics
LOC	Locations
CARR-TCU	Tape Control Unit Checks/Adjustments/Removal/Replacement

Volume A03

CARR-DR	Drive Checks Adjustments/Removal/Replacement

Volume A04

LGND	Legend
SPROC	Support Procedures
MD/SDISK	Maintenance Device/MD Support Diskette Procedures
DIAG	Support Diagnostic Descriptions
DF	Data Fields and Registers
OPER	Theory of Operation

Volume A05

FSI	Fault Symptom Index
EAD	Error Analysis Diagrams

FSI

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Fault Symptom Index (FSI)

General Information

The fault symptom index is intended to prevent your using much time analyzing design problems. When the fault symptom index information has been used as much as possible without supplying a correction, you should immediately request aid from your next level of support.

Attention

The FRU list generated by SPEAR or VAXsimPLUS will contain the "highest probability" FRUs as cause of the problem. The FSI may list additional FRUs that could also cause the problem.

Contents of the Fault Symptom Index

The fault symptom index contains:

- The tape control unit error codes and the drive check codes in numeric order
- Error descriptions
- Suggested diagnostics to test the area that produced the error code
- Additional actions. This is added information and procedures that are useful for this error code, such as:
  - References to Error Analysis Diagrams (EADs) that diagnose this error
  - References to added theory information
  - A cable group list that provides all "from and to" connections for a given data path.
  - Additional sense information available, for example, "Sense byte 9 contains a value from the channel error register (CER) – see CER in 'Data Fields' (DF) section."
- A list of possible FRUs that can cause the error.

Entry into the Fault Symptom Index

The fault symptom index is entered because an error code is available. The fault symptom index is in error-code order. Use the error code to find the information that you need in the fault symptom index.

Error codes (FSCs) can be obtained from three sources:

- From the system error log
- From the FSC development procedure in the SPROC section
- From a POR or CMP detected error.

Support Troubleshooting

Before Using the Fault Symptom Index

1. Verify that all FRUs identified by GMP have been exchanged and all procedures for isolating drive/subsystem errors have been followed correctly before continuing troubleshooting using the fault symptom index.

2. Check all voltages at the inputs to each FRU identified in the fault symptom index to verify that the voltages are in tolerance.

   The voltages at the inputs to each FRU are found in the lower left corner of the first logic page for each FRU and in the net wire lists.

3. For intermittent errors, loop any named diagnostics repeatedly and scope the area in question looking for unusual or deteriorated levels and signals.

   Note: If the troubleshooting procedures in the FSI point to a failure of a FRU that has already been exchanged by the results of GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Failures detected in the functional area can be caused by defective clock lines. If clocks to the functional area are suspected, verify that the clocks to the functional area are as shown on the "Tape Control Unit Clocks" pages of the EAD section. See the entry "Tape Control Unit Clocks" in the table of contents on EAD 1 for the functional area clocks.

5. Once FRUs have been replaced by results of GMP, the remaining failures are usually caused by the connections between FRUs. These are the cables, connectors, nets, and wires. The logic page numbers for connections of all FRUs can be found in the Logic Pages column in the "Fault Symptom Index Table."

Using the Fault Symptom Index

The fault symptom index is in error code numeric order. Error description information is supplied. Some error codes have additional error information available. For this condition, use the error analysis diagram (EAD) to determine the problem for the failure.

In the error analysis diagrams (EADs), the term "up logic level" means that the line is at a logic level of +4.75 volts to +5.0 volts (except as noted). The term "down logic level" means that the line is at a logic level of 0 volts to +0.4 volts.

The fault symptom index gives you a list of the FRUs that can cause this failure, the first being the most probable cause and the last being the least probable cause.

Note: If there is no error code listed, or if the error code definition states "This error should not occur," you should call your next level of support. You probably have a microprogram problem. Suggest that a tape control unit dump be made at this time.

After Using the Fault Symptom Index

1. If the failure is isolated and a correction is performed, for tape control unit failures, IML functional microcode into the tape control unit; for drive failures, IML functional microcode into the tape control unit only if a non-concurrent maintenance diagnostic was used, or you will disrupt normal customer operation on the non-failing drives. Run GMP to verify that the subsystem is operating correctly.

2. If the failure cannot be isolated, request technical aid from your next level of support.

   After an aided correction, for tape control unit failures, IML functional microcode into the tape control unit; for drive failures, IML functional microcode into the tape control unit only if a non-concurrent maintenance diagnostic was used, or you will disrupt normal customer operation on the non-failing drives. Run GMP to verify that the subsystem is operating correctly.

Cable Groups

Many of the error codes have cable group numbers called as possible problems. Each group is a list of cables for a given data path. The cable groups are listed following the "Fault Symptom Index Table."

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0002 — CHK 02	Open LED in tape path sensor A, cartridge present sensor, or cartridge latched sensor.	Use the EAD for CHK 02 for failure isolation. See EAD 1 for "CHK 02." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	006 011 010 085 081 058	Tape path sensor A Cartridge latched sensor Cartridge present sensor Drive control card Tachometer sensor cable Logic board	Baseplate Baseplate Baseplate 02A-A1B2 Baseplate 02A-A1	SN001, 002 SN001, 002 SN001, 002 DD000, 001, 002, 003 SN001, 002 AA000, 100
0003 — CHK 03	Performing FRU isolation with a cartridge in the tray.	This error should not occur unless the cartridge is present after the message display tells you to remove it. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	010 085 081	Cartridge present sensor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
0004 — CHK 04	An under-tension error was not detected when it was tested before a load operation.	Use the EAD for CHK 04 for failure isolation. See EAD 1 for "CHK 04." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	014 059 085 099 095 073 079 080 049	Tension transducer Power amplifier board Drive control card Fuse F5 — 15 V dc for drive 0 or Fuse F6 — 15 V dc for drive 1 DC power supply Logic board to pwr amp J1 cable DC power distribution cable, drive internal — J1,J2 DC power distribution cable Logic board to pwr amp J2 cable	Baseplate Drive 02A-A1B2 Power supply Drive Drive Drive Power supply Drive	ZT030 PA000, 001 DD000, 001, 002, 003 YF100 YF100 PA000, 001 ZZ010, 020, 110, 120 YF100 PA000, 001
0005 — CHK 05	Tape path sensor B failure or no LED current was detected.	Use the EAD for CHK 05 for failure isolation. See EAD 1 for "CHK 05." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	007 085 081 058	Tape path sensor B Drive control card Tachometer sensor cable Logic board	Baseplate 02A-A1B2 Baseplate 02A-A1	SN001, 002 DD000, 001, 002, 003 SN001, 002 AA000, 100
0006 — CHK 06	A tape path sensor B detect circuit failure has occurred. An up logic level is always indicated.	Use the EAD for CHK 06 for failure isolation. See EAD 1 for "CHK 06." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
0007 — CHK 07	The file protect switch is defective or shorted.	See SN001, 002 for the wiring of the file protect switch. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	009 085 064 081 079	File protect switch Drive control card Write power card Tachometer sensor cable DC power distribution cable, drive internal — J1, J2	Baseplate 02A-A1B2 02A-A1G2 Baseplate Drive	SN001, 002 DD000, 001, 002, 003 VP000 SN001, 002 ZZ010, 020, 110, 120
000E — CHK 0E	A tape path sensor B detection module failure occurred. A down logic level is always indicated.	Use the EAD for CHK 0E for failure isolation. See EAD 1 for "CHK 0E" TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 007 081	Drive control card Tape path sensor B Tachometer sensor cable	02A-A1B2 Baseplate Baseplate	DD000, 001, 002, 003 SN001, 002 SN001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0014 — CHK 14	A time-out occurred during removal of the tape slack at the beginning of a load operation (broken tape) OR the drive sensed either cartridge present or file protect when the manual latch was closed without a cartridge being inserted.	If the CHK 14 can be caused by latching the manual latch without a cartridge, the failure is caused by either the file protect switch (FRU 009), the cartridge present sensor (FRU 010) or the write power card at 02A-A1G2 (FRU 064). Use the EAD for CHK 14 for failure isolation. See EAD 1 for "CHK 14." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z **Note:** On drives with automatic cartridge loaders use FRUs 281 and 282 in place of FRU 008. **Note:** Use CART 40 to see if the cartridge caused the failure.	059 085 003 008 095 079 081 049 073 058 282 281	Power amplifier board Drive control card File reel motor Cartridge latch assembly DC power supply DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to pwr amp J2 cable Logic board to pwr amp J1 cable Logic board Load assembly Loader control card	Drive 02A-A1B2 Baseplate Baseplate Power supply Drive Baseplate Drive Drive 02A-A1 Auto loader Auto loader	PA000, 001 DD000, 001, 002, 003 YG010, 110 Mechanical part YF100 ZZ010, 020, 110, 120 SN001, 002 PA000, 001 PA000, 001 AA000, 100 Mechanical part AL001
0015 — CHK 15	Loose wraps were detected in the cartridge.	See OPER 1 "Tape Threading/Loading—ILS - Test."	232 003 004 014 059	Cartridge File reel motor Machine reel motor Tension transducer Power amplifier board	 Baseplate Baseplate Baseplate Drive	 YG010, 110 YG010 110 YG010 110 PA000, 001
0016 — CHK 16	Servo PLA failure.	See OPER 1 "Motion Control" and "Motor Control." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
0017 — CHK 17	Timer failure. The timer is checked by hardware at load, unload, or after a power on reset.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
0018 — CHK 18	Adapter card external register failure.	1. Run drive interface tests — diagnostic section EE40 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3 for EE40. 2. See OPER 1 for "Adapter Card" and "Parallel/Serial Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 062 063 118	Drive control card Read preamplifier card Write card Drive-adapter card	02A-A1B2 02A-A1H2 02A-A1J4 01A-A1Q2	DD000, 001, 002, 003 RP000 WR000 DI001, 002
0019 — CHK 19	Drive adapter card interrupt failure.	1. Run diagnostic section EE40 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3 for EE40. 2. See OPER 1 for "Adapter Card" and "Parallel/Serial Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 058	Drive control card Drive-adapter card Logic board	02A-A1B2 01A-A1Q2 02A-A1	DD000, 001, 002, 003 DI001, 002 AA000, 100
0020 — CHK 20	A machine reel null error was sensed during a load, or a phase one tach B failure occurred.	Use the EAD for CHK 20 for failure isolation. See EAD 1 for "CHK 20." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	226 004 059 085 005 225 079 081 073 049	Machine reel tach sensor B Machine reel motor and hub Power amplifier board Drive control card Flange Machine reel tach sensor A DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to pwr amp J1 cable Logic board to pwr amp J2 cable	Baseplate Baseplate Drive 02A-A1B2 Baseplate Baseplate Drive Baseplate Drive Drive	SN001, 002 YG010, 110 PA000, 001 DD000, 001, 002, 003 Mechanical part SN001, 002 ZZ010, 020, 110, 120 SN001, 002 PA000, 001 PA000, 001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0021 — CHK 21	The threading mechanism is slow or stalled, or a tach 2 failure has occurred during a load operation	Use the EAD for CHK 21 for failure isolation. See EAD 1 for "CHK 21." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z **Note:** Use CART 40 to see if the cartridge caused the failure.	001 059 085 003 007 079 081 049 005	Threader assembly Power amplifier board Drive control card File reel motor assembly Tape path sensor B DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to pwr amp J2 cable Flange	Baseplate Drive 02A-A1B2 Baseplate Baseplate Drive Baseplate Drive Baseplate	YG010, 110 PA000, 001 DD000, 001, 002, 003 YG010, 110 SN001, 002 ZZ010, 020, 110, 120 SN001, 002 PA000, 001 Mechanical part
0022 — CHK 22	The threading mechanism was not at the home position during cartridge load.	Use the EAD for CHK 22 for failure isolation. See EAD 1 for "CHK 22." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z **Note:** On drives with automatic cartridge loaders use FRUs 281 and 282 in place of FRU 008.	001 006 059 085 127 008 079 081 049 282 281	Threader assembly Tape path sensor A Power amplifier board Drive control card Latch interlock Cartridge latch assembly DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to pwr amp J2 cable Load assembly Loader control card	Baseplate Baseplate Drive 02A-A1B2 Baseplate Baseplate Drive Baseplate Drive Auto loader Auto loader	YG010, 110 SN001, 002 PA000, 001 DD000, 001, 002, 003 Mechanical part Mechanical part ZZ010, 020 110, 120 SN001, 002 PA000, 001 Mechanical part AL001
0023 — CHK 23	A machine reel null error was sensed during a load, or a phase one tach A failure occurred.	Use the EAD for CHK 23 for failure isolation. See EAD 1 for "CHK 23." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	225 004 059 085 005 079 081 073	Machine reel tach sensor A Machine reel motor and hub Power amplifier board Drive control card Flange DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to pwr amp J1 cable	Baseplate Baseplate Drive 02A-A1B2 Baseplate Drive Baseplate Drive	SN001, 002 YG010, 110 PA000, 001 DD000, 001, 002, 003 Mechanical part ZZ010, 020, 110, 120 SN001, 002 PA000, 001
0024 — CHK 24	A machine reel null error was detected during an unload operation.	Use the EAD for CHK 24 for failure isolation. See EAD 1 for "CHK 24." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	225 004 059 085 005 079 081 073	Machine reel tach sensor A Machine reel motor and hub Power amplifier board Drive control card Flange DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to pwr amp J1 cable	Baseplate Baseplate Drive 02A-A1B2 Baseplate Drive Baseplate Drive	SN001, 002 YG010, 110 PA000, 001 DD000, 001, 002, 003 Mechanical part ZZ010, 020, 110, 120 SN001, 002 PA000, 001
0025 — CHK 25	The threading mechanism is slow or stopped during an unload operation, or the leader block was not attached to the threader pin on a load operation and the drive tried to put the leader block back during a load retry. **Note:** If the threader pin does not engage the leader block on a load operation, the drive will attempt a load retry.	Use the EAD for CHK 25 for failure isolation. See EAD 1 for "CHK 25." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z **Note:** On drives with automatic cartridge loaders use FRUs 281 and 282 in place of FRUs 008, 017, and 018. **Note:** Use CART 40 to see if the cartridge caused the failure.	001 059 085 003 017 018 019 127 008 006 049 079 081 282 281	Threader assembly Power amplifier board Drive control card File reel motor Plunger spring Compression spring Interlock spring Latch interlock Cartridge latch assembly Tape path sensor A Power amplifier J2 cable DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Load assembly Loader control card	Baseplate Drive 02A-A1B2 Baseplate Baseplate Baseplate Baseplate Baseplate Baseplate Baseplate Drive Drive Baseplate Auto loader Auto loader	YG010, 110 PA000, 001 DD000, 001, 002, 003 YG010, 110 Mechanical part Mechanical part Mechanical part Mechanical part Mechanical part SN001, 002 PA000, 001 ZZ010, 020, 110, 120 SN001, 002 Mechanical part AL001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0026 — CHK 26	The cartridge latch failed to release	Use the EAD for CHK 26 for failure isolation. See EAD 1 for "CHK 26 or CHK 31." TCC FRUs associated with this error code are 267 - 02A-A1B2Y 268 - 02A-A1B2Z This error may occur if the code has not been loaded to the automatic cartridge loader. Note: On drives with automatic cartridge loaders use FRUs 281 and 282 in place of FRUs 002 and 008.	002 008 059 085 049 079 011 006 081 282 281	Latch solenoid Cartridge latch assembly Power amplifier board Drive control card Logic board to pwr amp J2 cable DC power distribution cable drive internal — J1, J2 Cartridge latched sensor Tape path sensor A Tachometer sensor cable Load assembly Loader control card	Baseplate Baseplate Drive 02A-A1B2 Drive Drive Baseplate Baseplate Baseplate Auto loader Auto loader	YG010, 110 Mechanical part PA000, 001 DD000, 001, 002, 003 PA000, 001 ZZ010, 020, 110, 120 SN001, 002 SN001, 002 SN001, 002 Mechanical part AL001
0027 — CHK 27	An unexpected interrupt occurred at tape path sensor B during an unload operation.	Use the EAD for CHK 27 for failure isolation. See EAD 1 for "CHK 27." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	007 226 085 001 004 059 225 005 081 079 073 049	Tape path sensor B Machine reel tach sensor B Drive control card Threader assembly Machine reel motor and hub Power amplifier board Machine reel tach sensor A Flange Tachometer sensor cable DC power distribution cable, drive internal — J1, J2 Logic board to pwr amp J1 cable Logic board to pwr amp J2 cable	Baseplate Baseplate 02A-A1B2 Baseplate Baseplate Drive Baseplate Baseplate Baseplate Drive Drive Drive	SN001, 002 SN001, 002 DD000, 001, 002, 003 YG010, 110 YG010, 110 PA000, 001 SN001, 002 Mechanical part SN001, 002 ZZ010, 020, 110, 120 PA000, 001 PA000, 001
0028 — CHK 28	The tape is not attached to the leader block pin, the tape is broken, or the file reel is turning in reverse during a thread operation.	Use the EAD for CHK 28 for failure isolation. See EAD 1 for "CHK 28." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z Note: On drives with automatic cartridge loaders use FRUs 281 and 282 in place of FRU 008. Note: Use CART 40 to see if the cartridge caused the failure.	001 003 059 008 085 081 079 282 281	Threader assembly File reel motor Power amplifier board Cartridge latch assembly Drive control card Tachometer sensor cable DC power distribution cable, drive internal — J1, J2 Load assembly Loader control card	Baseplate Baseplate Drive Baseplate 02A-A1B2 Baseplate Drive Auto loader Auto loader	YG010, 110 YG010, 110 PA000, 001 Mechanical part DD000, 001, 002, 003 SN001, 002 ZZ010, 020, 110, 120 Mechanical part AL001
0029 — CHK 29	Hardware timer failure during unload operation.	See OPER 1 for "Tape Unloading—Unload." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
002A — CHK 2A	An error was detected in attempting to reach the last wrap null point.	Use the EAD for CHK 2A for failure isolation. See EAD 1 for "CHK 2A." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 059 001 085 014 007 226 010 079 081 049	File reel motor Power amplifier board Threader assembly Drive control card Tension Transducer Tape path sensor B Machine reel tach sensor B Cartridge present sensor DC power distribution cable, drive internal — J1, J2 Tachometer sensor cable Logic board to power amplifier J2 cable	Baseplate Drive Baseplate 02A-A1B2 Baseplate Baseplate Baseplate Baseplate Drive Baseplate Drive	YG010, 110 PA000, 001 YG010, 110 DD000, 001, 002, 003 ZT030 SN001, 002 SN001, 002 SN001, 002 ZZ010, 020, 110, 120 SN001, 002 PA000, 001
002B — CHK 2B	A mid-tape load failure occurred.	Run GMP option 100A for failure isolation. See CE/HSC. Note: See CART 1 for "Cartridge Removal by Hand" if needed. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	004 003 059 001 085 081 079 Cartridge	Machine reel motor and hub mount File reel motor Power amplifier board Threader assembly Drive control card Tachometer sensor cable DC power distribution cable, drive internal — J1, J2 Cartridge	Baseplate Baseplate Drive Baseplate 02A-A1B2 Baseplate Drive Baseplate	YG010, 110 YG010, 110 PA000, 001 YG010, 110 DD000, 001, 002, 003 SN001, 002 ZZ010, 020, 110, 120 Mechanical part

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
002C — CHK 2C	Excessive speed detected at the file reel motor during an unload operation.	See OPER 1 for "Tape Unloading—Unload." TCC FRUs associated with this error code are 267 - 02A-A1B2Y 268 - 02A-A1B2Z	232 001 003 059 085 081 049 073 058	Cartridge Threader assembly File reel motor Power amplifier board Drive control card Tachometer sensor cable Logic board to pwr amp J2 cable Logic board to pwr amp J1 cable Logic board	Baseplate Baseplate Baseplate Drive 02A-A1B2 Baseplate Drive Drive 02A-A1	Mechanical part YG010, 110 YG010, 110 PA000, 001 DD000, 001, 002, 003 SN001, 002 PA000, 001 PA000, 001 AA000, 100
002D — CHK 2D	Short tape in cartridge	None	232	Cartridge	Baseplate	Mechanical part
002F — CHK 2F	The drive needs to be cleaned with the cleaner cartridge.	None				
0030 — CHK 30	The drive is unable to accept patch commands during load, unload, or midtape load operations.	None				
0031 — CHK 31	On a drive with an automatic cartridge loader installed, the latch sensor did not open within 200 ms after the signal was sent to the loader. This is equivalent to a CHK 26 for a drive without the automatic cartridge loader.	Use the EAD for CHK 26 for failure isolation. See EAD 1 for "CHK 26 or CHK 31." TCC FRUs associated with this error code are: 267* - 02A-A1B2Y 268* - 02A-A1B2Z This error may occur if the code has not been loaded to the automatic cartridge loader.	281 282 059 085 049 079 011 006 081	Loader control card Load assembly Power amplifier board Drive control card Logic board to pwr amp J2 cable DC power distribution cable drive internal - J1, J2 Cartridge latched sensor Tape path sensor A Tachometer sensor cable	Loader Loader Drive 02A-A1B2 Drive Drive Baseplate Baseplate Baseplate	AL001 Mechanical part PA000, 001 DD000, 001, 002, 003 PA000, 001 ZZ10, 020, 110, 120 SN001, 002 SN001, 002 SN001, 002
0034 — CHK 34	The TCU issued a Load Automatic Cartridge Loader command, but the drive is busy with tape loading or unloading and cannot accept the command.	None	281 085	Loader control card Drive control card	Loader 02A-A1B2	AL001 DD000, 001, 002, 003
0036 — CHK 36	Automatic Cartridge Loader is not responding to commands from the drive.	None	281. 085	Loader control card Drive control card	Loader 02A-A1B2	AL001 DD000, 001, 002, 003
0040 — CHK 40	The microprocessor detected a parity error on servo data. (Tach PLA bus error.)	See OPER 1 for "Drive Control Card." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
0041 — CHK 41	The servo hardware sensed a power amplifier board failure. If sense byte 8 equals: 76 - tension established 73 - load/unload in progress	Use the EAD for CHK 41 for failure isolation. See EAD 1 for "CHK 41." TCC FRUs associated with this error code are: 267* - 02A-A1B2Y 268* - 02A-A1B2Z	059 085 014 049	Power amplifier board Drive control card Tension transducer Logic board to pwr amp J2 cable	Drive 02A-A1B2 Baseplate Drive	PA000, 001 DD000, 001, 002, 003 ZT030 PA000, 001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0042 – CHK 42	The power amplifier board detected an open in the file reel motor circuit, or the file reel motor was running with no load If sense byte 8 equals 76 - tension established 73 - load/unload in progress	Use the EAD for CHK 42 for failure isolation. See EAD 1 for "CHK 42." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 059 085 049 079 080 081 058	File reel motor Power amplifier board Drive control card Logic board to pwr amp J2 cable DC power distribution cable, drive internal – J1, J2 DC power distribution cable Tachometer sensor cable Logic board	Baseplate Drive 02A-A1B2 Drive Drive Power supply Baseplate 02A-A1	YG010, 110 PA000, 001 DD000, 001, 002, 003 PA000, 001 ZZ010, 020, 110, 120 YF100 SN001, 002 AA000, 100

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0043 — CHK 43	The power amplifier board detected an open in the machine reel motor circuit, or the machine reel motor was running with no load. If sense byte 8 equals 76 - tension established 73 - load/unload in progress	Use the EAD for CHK 43 for failure isolation. See EAD 1 for "CHK 43." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	004 225 226 059 010 085 216 014 081 079 049 073 080 232 058	Machine reel motor and hub mount Machine reel tach sensor A Machine reel tach sensor B Power amplifier board Cartridge present sensor Drive control card Tape lifter solenoid Tension transducer Tachometer sensor cable DC power distribution cable, drive internal — J1, J2 Logic board to pwr amp J2 cable Logic board to pwr amp J1 cable DC power distribution cable Cartridge Logic board	Baseplate Baseplate Baseplate Drive Baseplate 02A-A1B2 Baseplate Baseplate Drive Drive Drive Drive Power Supply Baseplate 02A-A1	YG010, 110 SN001, 002 SN001, 002 PA000, 001 SN001, 002 DD000, 001, 002, 003 YG010, 110 ZT030 SN001, 002 ZZ010, 020, 110, 120 PA000, 001 PA000, 001 YF100 Mechanical part AA000, 100
0044 — CHK 44	An over- or under-tension error has occurred.	See OPER 1 for "Motion Control." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	014 059 012 085 003 004 216 215 013	Tension transducer Power amplifier board Decoupler assembly Drive control card File reel motor Machine reel motor and hub mount Tape lifter solenoid Tape lifter solenoid input hose Head and guide assembly	Baseplate Drive Baseplate 02A-A1B2 Baseplate Baseplate Baseplate Baseplate Baseplate	ZT030 PA000, 001 Mechanical part DD000, 001, 002, 003 YG010, 110 YG010, 110 YG010, 110 Mechanical part WR000
0046 — CHK 46	Air pressure loss has occurred in one or both drives.	1. See OPER 1 for "Pneumatic Supply." 2. See PNEU 10 for "Air Pressure Loss—CHK 46 on Both Drives in Same Tape Transport Unit" and "Air Pressure Loss—CHK 46 on a Single Drive." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	030 033 031 032 034 039 095 040 216 042 044 045 046 215 041 085 081	Pump motor Inlet filter Regulator Output filter Pressure hose assembly Plenum supply hose DC power supply Pressure sensor Tape lifter solenoid Decoupler pressure hose Right guide bearing hose Left guide bearing hose Tension transducer hose Tape lifter solenoid input hose Plenum assembly Drive control card Tachometer sensor cable	See LOC 1 See LOC 1 See LOC 1 See LOC 1 Drive Baseplate See LOC 1 Baseplate Baseplate Baseplate Baseplate Baseplate Baseplate Baseplate Baseplate 02A-A1B2 Baseplate	YF050, 060 Mechanical part Mechanical part Mechanical part Mechanical part Mechanical part YF100 SN001, 002 YG010, 110 Mechanical part Mechanical part Mechanical part Mechanical part Mechanical part Mechanical part DD000, 001, 002, 003 SN001, 002
0047 — CHK 47	Air cooling has been lost.	See OPER 1 for "Motion Control Diagram" for an illustration of the thermal switch circuit. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z **CAUTION:** **The tape transport unit may be extremely hot.**	020 110 085 104 081 078 077 074	Blower assembly Thermal switch (drive) Drive control card Drive power switch Tachometer sensor cable Blower assembly ac power cable Blower assembly ac power cable (tape transport unit to both drives) Tape transport unit ac power CB cable	Drive Drive 02A-A1B2 Drive Baseplate Drive Drive Drive	YG010, 110 SN001, 002 DD000, 001, 002, 003 YF020 SN001, 002 YG010, 110 YG010, 110 YF050, 060
0048 — CHK 48	Tach 2 error.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 085 081	File reel motor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	YG010, 110 DD000, 001, 002, 003 SN001, 002
0049 — CHK 49	Period counter parity error.	See OPER 1 for "Motor Control." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
004A — CHK 4A	High speed counter parity error.	See OPER 1 for "Motor Control." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
004B — CHK 4B	3 microsecond clock parity error.	See OPER 1 for "Motor Control." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
004C — CHK 4C	Gap counter parity error.	See OPER 1 for "Drive Control Card" (contains the gap counter). TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
004D — CHK 4D	A digital to analog converter (DAC) parity error was detected.	Use the EAD for CHK 4D for failure isolation. See EAD 1 for "CHK 4D." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 059 060 073 210 211	Drive control card Power amplifier board Message display board Logic board to pwr amp J1 cable Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	02A-A1B2 Drive Drive Drive 02A-A1Y2 Drive	DD000, 001, 002, 003 PA000, 001 WD000, 001 PA000, 001 WD000, 001 WD000, 001
0050 — CHK 50	A parity error occurred on the message display. If sense byte 8 equals: 5B - load display command 7D - device initiated message	Use the EAD for CHK 50 for failure isolation. See EAD 1 for "CHK 50." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 059 060 073 210 211	Drive control card Power amplifier board Message display board Logic board to pwr amp J1 cable Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	02A-A1B2 Drive Drive Drive 02A-A1Y2 Drive	DD000, 001, 002, 003 PA000, 001 WD000, 001 PA000, 001 WD000, 001 WD000, 001
0051 — CHK 51	Timer hardware error.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0060 — CHK 60	Tach 1 phase B signal failed after a thread/load or mid-tape load operation, or the cartridge present sensor failed during a thread/load operation.	Use the EAD for CHK 60 for failure isolation. See EAD 1 for "CHK 60." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	004 226 085 059 010 005 081 079	Machine reel motor and hub mount Machine reel tach sensor B Drive control card Power amplifier board Cartridge present sensor Flange Tachometer sensor cable DC power distribution cable, drive internal — J1, J2	Baseplate Baseplate 02A-A1B2 Drive Baseplate Baseplate Baseplate Drive	YG010, 110 SN001, 002 DD000, 001, 002, 003 PA000, 001 SN001, 002 Mechanical part SN001, 002 ZZ010, 020, 110, 120
0061 — CHK 61	Invalid line count or radial pointer.	Possible problem in machine or file reel area. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 225 226 003 081 053	Drive control card Machine reel tach sensor A Machine reel tach sensor B File reel motor Tachometer sensor cable Logic board	02A-A1B2 Baseplate Baseplate Baseplate Baseplate 02A-A1	DD000, 001, 002, 003 SN001, 002 SN001, 002 YG010, 110 SN001, 002 AA000, 100
0062 — CHK 62	Direction change during unidirectional condition. Direction is determ... ed from the file reel tach.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 003 118	Drive control card File reel motor Drive-adapter card	02A-A1B2 Baseplate 01A-A1Q2	DD000, 001, 002, 003 YG010, 110 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0063 — CHK 63	Tach 1 phase A signal has failed after a thread/load or mid-tape load operation, or the cartridge present sensor failed during a thread/load operation.	Use the EAD for CHK 63 for failure isolation. See EAD 1 for "CHK 63." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	004 225 085 059 010 081 079 058	Machine reel motor and hub mount Machine reel tach sensor A Drive control card Power amplifier board Cartridge present sensor Tachometer sensor cable DC power distribution cable, drive internal — J1, J2 Logic board	Baseplate Baseplate 02A-A1B2 Drive Baseplate Baseplate Drive 02A-A1	YG010, 110 SN001, 002 DD000, 001, 002, 003 PA000, 001 SN001, 002 SN001, 002 ZZ010, 020, 110, 120 AA000, 100
0064 — CHK 64	The P counter reached its maximum count during a record. This condition is normal on the first forward operation after BOT because of the length of the ID burst. The P counter is reset at each 'gap out'. Tach 2 pulses increment the counter by 1 to a maximum of hexadecimal FF.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 063 118 059 073	Drive control card Write card Drive-adapter card Power amplifier board Logic board to pwr amp J1 cable	02A-A1B2 02A-A1J4 01A-A1Q2 Drive Drive	DD000, 001, 002, 003 WR000 DI001, 002 PA000, 001 PA000, 001
0065 — CHK 65	A tach 2 pulse was missed with no change in direction (stoplock).	Use the EAD for CHK 14 for the troubleshooting guide to check tach 2 pulses. See EAD 1 for "CHK 14." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 085 059 081	File reel motor Drive control card Power amplifier board Tachometer sensor cable	Baseplate 02A-A1B2 Drive Baseplate	YG010, 110 DD000, 001, 002, 003 PA000, 001 SN001, 002
0066 — CHK 66	A tach 2 pulse was missed during acceleration or repositioning.	Use the EAD for CHK 14 for the troubleshooting guide to check tach 2 pulses. See EAD 1 for "CHK 14." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 059 081	File reel motor Power amplifier board Tachometer sensor cable	Baseplate Drive Baseplate	YG010, 110 PA001, 002 SN001, 002
0067 — CHK 67	A tach 2 pulse was missed during data transfer.	Use the EAD for CHK 14 for the troubleshooting guide to check tach 2 pulses. See EAD 1 for "CHK 14." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 085 059 081	File reel motor Drive control card Power amplifier board Tachometer sensor cable	Baseplate 02A-A1B2 Drive Drive	YG010, 110 DD000, 001, 002, 003 PA000, 001 SN001, 002
0068 — CHK 68	A timeout interrupt occurred. Either the file reel motor did not start or it did not get up to speed.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 059 085 118 073	File reel motor Power amplifier board Drive control card Drive-adapter card Logic board to pwr amp J1 cable	Baseplate Drive 02A-A1B2 01A-A1Q2 Drive	YG010, 110 PA000, 001 DD000, 001, 002, 003 DI001, 002 PA000, 001
0069 — CHK 69	An interruption occurred in the tape path sensors on a loaded drive.	Use the EAD for CHK 69 for failure isolation. See EAD 1 for "CHK 69." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	006 007 011 001 085 081 058	Tape path sensor A Tape path sensor B Cartridge latched sensor Threader assembly Drive control card Tachometer sensor cable Logic board	Baseplate Baseplate Baseplate Baseplate 02A-A1B2 Baseplate 02A-A1	SN001, 002 SN001, 002 SN001, 002 YG010, 110 DD000, 001, 002, 003 SN001, 002 AA000, 100
006A — CHK 6A	Accelerate started in the wrong direction and missed tach 2. This is a possible phase problem in the file reel tach area.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 059 085 081 079	File reel motor Power amplifier board Drive control card Tachometer sensor cable DC power distribution cable, drive internal — J1, J2	Baseplate Drive 02A-A1B2 Baseplate Drive	YG010, 110 PA000, 001 DD000, 001, 002, 003 SN001, 002 ZZ0010, 020 110, 120
006B — CHK 6B	The position counter reached 0 before 75% velocity during a read/write operation. The counter is updated by the file reel tachometer. Velocity is measured by the machine reel tachometer.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 004 059 085 216 215 013	File reel motor Machine reel motor and hub mount Power amplifier board Drive control card Tape lifter solenoid Tape lifter solenoid input hose Head and guide assembly	Baseplate Baseplate Drive 02A-A1B2 Baseplate Baseplate Baseplate	YG010, 110 YG010, 110 PA000, 001 DD000, 001, 002, YG010, 110 Mechanical part WR000

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
006C — CHK 6C	The position counter reached 0 before 95% velocity during a read/write operation. The counter counts time between tach 2 pulses. It is located on the digital servo card.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 004 059 085 081 216 215 013	File reel motor Machine reel motor and hub mount Power amplifier board Drive control card Tachometer sensor cable Tape lifter solenoid Tape lifter solenoid input hose Head and guide assembly	Baseplate Baseplate Drive 02A-A1B2 Baseplate Baseplate Baseplate Baseplate	YG010, 110 YG010, 110 PA000, 001 DD000, 001, 002, 003 SN001, 002 YG010, 110 Mechanical part WR000
006D — CHK 6D	The period counter equals 0 after it has been loaded. The counter counts the time between tach 2 pulses.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	003 085 081	File reel motor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	YG010, 110 DD000, 001, 002, 003 SN001, 002
006F — CHK 6F	A velocity check occurred on a write command during a data transfer.	See OPER 1 for "Write Operation." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 003 004 059 216 014 215 013	Drive control card File reel motor Machine reel motor and hub mount Power amplifier board Tape lifter solenoid Tension transducer Tape lifter solenoid input hose Head and guide assembly	02A-A1B2 Baseplate Baseplate Drive Baseplate Baseplate Baseplate Baseplate	DD000, 001, 002, 003 YG010, 110 YG010, 110 PA000, 001 YG010, 110 See LOC 1 Mechanical part WR000
0070 — CHK 70	Backward command at the beginning of tape, stoplock.	Run GMP option 100A for failure isolation. See CE/HSC. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0071 — CHK 71	Forward command at physical end of tape.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0072 — CHK 72	Moving forward into physical end of tape during a read operation.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0073 — CHK 73	Moving forward into physical end of tape during a write operation.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0074 — CHK 74	Read backward into beginning of tape.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0075 — CHK 75	The Ready switch has been moved to the Not Ready position on a loaded drive.	See WD000, 001 for the Ready switch circuit. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 060 085 213 210 211	Operator panel switch board Message display board Drive control card Message display board to message display switch board cable Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive Drive 02A-A1B2 Drive Drive Drive	WD000, 001 WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001
0078 — CHK 78	The rewind switch was pressed.	This is a normal operating condition.				
0080 — CHK 80	Interconnection data bus out parity error from the tape control unit.	1. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." 2. See OPER 1 for "Adapter Card." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
0081 — CHK 81	Serial command error.	1. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." 2. See OPER 1 for "Parallel/Serial Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
0082 — CHK 82	Interconnection drive error.	1. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." 2. See OPER 1 for "Adapter Card." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 208 209	Drive control card Drive-adapter card Write adapter A cable (A1A2 to P1WA1) Write adapter A cable (A1A3 to P1WA2)	02A-A1B2 01A-A1Q2 Drive Drive	DD000, 001, 002, 003 DI001, 002 ZW101 ZW103
00A0 — CHK A0	'Select out' became inactive after address verification and before 'command out' and ending status.	1. Use the EAD for CHK A0 for failure isolation. See EAD 1 for "CHK A0." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00A2 — CHK A2	'Command out' became inactive before presenting status.	1. Use the EAD for CHK A2 for failure isolation. See EAD 1 for "CHK A2." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00A3 — CHK A3	A motion command was issued to a drive that is not ready.	Check the drive to make sure it is ready. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00A4 — CHK A4	A write or data security erase was attempted on a file-protected cartridge	1. Check the cartridge to make sure it is not file-protected. 2. Run the Drive Command Exerciser using the Data Security Erase and Rewind commands. See MD/SDISK 1 for "Drive Command Exerciser." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	009 064 085 118 081	File protect switch Write power card Drive control card Drive-adapter card Tachometer sensor cable	Baseplate 02A-A1G2 02A-A1B2 01A-A1Q2 Baseplate	SN001, 002 VP000 DD000, 001, 002, 003 DI001, 002 SN001, 002
00A5 — CHK A5	Parallel command does not match serial command.	Run diagnostic section EE40 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3 for EE40. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00A6 — CHK A6	Interface connection error.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 00, 002, 003 DI001, 002
00A7 — CHK A7	Command late (drive early start or accelerating from an aborted command).	Call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
00A8 — CHK A8	Invalid command.	1. Run GMP for failure isolation. If GMP does not isolate the fault, perform steps 2 and 3. 2. Run diagnostic section EE40 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3 for EE40. 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 264 265	Drive control card Drive-adapter card Write bus terminator Write bus terminator	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00A9 — CHK A9	'Command out' became inactive before loading the command.	1. Use the EAD for CHK A9 for failure isolation. See EAD 1 for "CHK A9." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00AA — CHK AA	Patch command reached end of RAM area.	Refer to "Possible EC Level Compatibility Problems" on Start 1.				
00AB — CHK AB	Patch command byte count does not agree.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 134	Drive control card Drive-adapter card Control store card	02A-A1B2 01A-A1Q2 01A-A1C2	DD000, 001, 002, 003 DIC01, 002 CS001, 002
00AC — CHK AC	Parallel motion command to drive with incomplete disconnect command.	See OPER 1 for "Parallel/Serial Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 116 118	Drive control card Write data card Drive-adapter card	02A-A1B2 01A-A1P2 01A-A1Q2	DD000, 001, 002, 003 DF001, 002 DI001, 002
00AD — CHK AD	The 'gap out' line is always on or late in coming on.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 203 204 208 209	Drive control card Drive-adapter card Write adapter B cable (A1A5 to P1WB1) Write adapter B cable (A1A4 to P1WB2) Write adapter A cable (A1A2 to P1WA1) Write adapter A cable (A1A3 to P1WA2)	02A-A1B2 01A-A1Q2 Drive Drive Drive Drive	DD000, 001, 002, 003 DI001, 002 ZW201 ZW203 ZW101 ZW103
00AE — CHK AE	'Gap out' failure.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 203 204 208 209	Drive control card Drive-adapter card Write adapter B cable (A1A5 to P1WB1) Write adapter B cable (A1A4 to P1WB2) Write adapter A cable (A1A2 to P1WA1) Write adapter A cable (A1A3 to P1WA2)	02A-A1B2 01A-A1Q2 Drive Drive Drive Drive	DD000, 001, 002, 003 DI001, 002 ZW201 ZW203 ZW101 ZW203
00AF — CHK AF	An Autospace Block command was attempted in the same direction as the last read or write operation.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
00B0 — CHK B0	A long-loop-write-to-read operation was attempted with a cartridge in the drive.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	080 085 081	Cartridge present sensor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
00B1 — CHK B1	Write to control store with odd byte count.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
00B2 — CHK B2	For a locate operation only so many sectors exist on a tape, and an invalid sector was requested.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00B3 — CHK B3	Incorrect number of bytes transferred from the tape control unit on a Load Message Display command, or 'Select Out' dropped.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
00B4 — CHK B4	A host message display command issued to a drive with an error message active.	This is only a symptom. This error appears only in the sense byte. The drive displays the error message that is the problem.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
00B5 — CHK B5	Invalid serial command.	1. Run GMP for failure isolation. If GMP does not isolate the fault, perform step 2. 2. Run diagnostic section EE40 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3 for EE40. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00B6 — CHK B6	Consecutive Autospace commands issued.	Refer to SPROC 1 and perform procedure B. After completing the procedure, call your next level of support.				
00B7 — CHK B7	The drive is not able to accept patches at this time.	The drive is probably in a load/unload operation.				
00B8 — CHK B8	The drive control card detected a data parity error during the patch transfer from the tape control unit.	None	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00BA — CHK BA	The drive detected a parity error during a data transfer from the tape control unit.	None	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00C0 — CHK C0	During a write operation, the write card did not go into write mode, and C0 is the default condition.	1. Use the EAD for CHK C0 for failure isolation. See EAD 1 for "CHK C0." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	063 085 064 009 116 118 265	Write card Drive control card Write power card File protect switch Write data card Drive-adapter card Write bus terminator TCU 1 (REMOTE)	02A-A1J4 02A-A1B2 02A-A1G2 Baseplate 01A-A1P2 01A-A1Q2 See CARR-TCU 1-8	WR000 DD000, 001, 002, 003 VP000 SN001, 002 DF001, 002 DI001, 002
00C2 — CHK C2	A parity error was sensed on the write card.	1. Use the EAD for CHK C2 for failure isolation. See EAD 1 for "CHK C2." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	063 085 116 118 265	Write card Drive control card Write data card Drive-adapter card Write bus terminator TCU 1 (REMOTE)	02A-A1J4 02A-A1B2 01A-A1P2 01A-A1Q2 See CARR-TCU 1-8	WR000 DD000, 001, 002, 003 DF001, 002 DI001, 002
00C3 — CHK C3	A phase locked loop is not synchronized.	Use the EAD for CHK C3 for failure isolation. See EAD 1 for "CHK C3." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 063 264 265	Drive control card Write card Write bus terminator TCU 1 (LOCAL) Write bus terminator TCU 1 (REMOTE)	02A-A1B2 02A-A1J4 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 WR000
00C4 — CHK C4	Open head or cable. At least one track or wire is open.	Run the Drive Command Exerciser using a Write command with the loop control option set. See MD/SDISK 1 for "Drive Command Exerciser." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	013 063 085	Head and guide assembly Write card Drive control card	Baseplate 02A-A1J4 02A-A1B2	WR000 DD000, 001, 002, 003
00C5 — CHK C5	If write enable is active and read bias is not active, the write operation stops with this check.	Use the EAD for CHK C5 for failure isolation. See EAD 1 for "CHK C5." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	063 085 062	Write card Drive control card Read preamplifier card	02A-A1J4 02A-A1B2 02A-A1H2	WR000 DD000, 001, 002, 003 RP000
00C6 — CHK C6	Write driver failure. At least one write pulse is missing because of an open or shorted write driver.	See OPER 1 for "Write Card." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	063 064 085 013	Write card Write power card Drive control card Head and guide assembly	02A-A1J4 02A-A1G2 02A-A1B2 Baseplate	WR000 VP000 DD000, 001, 002, 003
00C7 — CHK C7	The drive detected a +10.5 V regulator fault.	Use the EAD for CHK C7 for failure isolation. See EAD 1 for "CHK C7." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	009 063 064 085 049	File protect switch Write card Write power card Drive control card Logic board to pwr amp J2 cable	Baseplate 02A-A1J4 02A-A1G2 02A-A1B2 Drive	SN001, 002 WR000 VP000 DD000, 001, 002, 003 PA000, 001
00D0 — CHK D0	The tape control unit has the wrong level of patches for this drive ROS EC level.	Refer to "Possible EC Level Compatibility Problems" on START 1.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
00D1 — CHK D1	The tape control unit does not have patches for the automatic cartridge loader.	Refer to START 1 "Possible EC Level Compatibility Problems."	258	IML diskette		
00E0 — CHK E0	Drive cannot communicate with the automatic cartridge loader.	The cables associated with this failure are FRU286 and FRU287.	281 085	Loader control card Drive control card	Loader 02A-A1B2	AL001 DD000, 001, 002, 003
00E1 — CHK E1	The automatic cartridge loader is in the middle of cartridge movement and the tape control unit is issuing a load cartridge loader command.	This is only a temporary error. The Tape Control Unit microcode will reissue the command.				
00E2 — CHK E2	The tape control unit is issuing a load automatic cartridge loader command and no automatic cartridge loader is installed.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
00E3 — CHK E3	The tape control unit is issuing a load automatic cartridge loader command but the drive cannot accept the command because it is moving tape.	This is only a temporary error. The Tape Control Unit microcode will reissue the command.				
00E7 — CHK E7	Drive detected a parity error on the data bus during data transfer from the tape control unit.	The cables associated with this failure are FRU286 and FRU287.	085 118	Drive control card Drive adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
00E8 — CHK E8	Automatic cartridge loader failed to receive a correct IML from the tape control unit/drive.	The cables associated with this failure are FRU286 and FRU287.	281 085	Loader control card Drive control card	Loader 02A-A1B2	AL001 DD000, 001, 002, 003
00EC — CHK EC	The automatic cartridge loader has detected a failure in one of its mechanical units.	The two-position error display indicator on the motor control card displays the last error that occurred on the ACL. To determine the FSC, add E7 to the beginning of the display (nn) value.	285 282			
00ED — CHK ED	The automatic cartridge loader has detected a failure in the loader control card.	The two-position error display indicator on the motor control card displays the last error that occurred on the ACL. To determine the FSC, add E7 to the beginning of the display (nn) value.	281			
00EE — CHK EE	The automatic cartridge loader has detected a failure in itself but cannot isolate the fault.	The two-position error display indicator on the motor control card displays the last error that occurred on the ACL. To determine the FSC, add E7 to the beginning of the display (nn) value.	281 285 282			
00EF — CHK EF	The automatic cartridge loader has detected a failure, but cannot isolate between itself and the drive.	The two-position error display indicator on the motor control card displays the last error that occurred on the ACL. To determine the FSC, add E7 to the beginning of the display (nn) value.	281 085 286			
00FF — CHK FF	Drive patch load request.	None				
01nn	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
02nn	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: MODULE = LVL7.				
1000	The power-on reset diagnostics detected an error during power-on time.	Use the EAD for IML/POR failures. See EAD 1 for "IML/POR Failures."				
1001	A level 1 interrupt was never detected during initialization. Sense byte 9 contains the value in the processor status register (PSR).	A level 1 interrupt indicates a microprocessor timeout. Run GMP for failure isolation.	117	Microprocessor card	01A-A1D2	MP001, 002, 003
1100	An always-active level 0 interrupt was detected during initialization. Sense byte 9 contains the value of the processor status register (PSR).	A level 0 interrupt indicates an MD command error or an external register error. Run GMP for failure isolation.	117	Microprocessor card	01A-A1D2	MP001, 002, 003
1101	An always-active level 1 interrupt was detected during initialization. Sense byte 9 contains the value of the processor status register (PSR).	A level 1 interrupt indicates a microprocessor timeout. Run GMP for failure isolation.	115 117	Maintenance adapter card Microprocessor card	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
1103	An always-active level 3 interrupt was detected during initialization. Sense byte 9 contains the value in the processor status register (PSR).	A level 3 interrupt indicates a read or write beginning sync. Run GMP for failure isolation.	119 117	Read clock and format card Microprocessor card	01A-A1S2 01A-A1D2	RC001, 002 MP001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
1104	An always-active level 4 interrupt was detected during initialization. Sense byte 9 contains the value of the processor status register (PSR).	A level 4 interrupt indicates buffer device complete. Run GMP for failure isolation.	120 117	Buffer adapter card Microprocessor card	01A-A1K2 01A-A1D2	BA001, 002, 003 MP001, 002, 003
1105	An always-active level 5 interrupt was detected during initialization. Sense byte 9 contains the value of the processor status register (PSR).	A level 5 interrupt indicates buffer channel complete. Run GMP for failure isolation.	120 117	Buffer adapter card Microprocessor card	01A-A1K2 01A-A1D2	BA001, 002, 003 MP001, 002, 003
1106	An always-active level 6 interrupt was detected during initialization. Sense byte 9 contains the value of the processor status register (PSR).	A level 6 interrupt indicates status store or channel adapter. Run GMP for failure isolation.	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
1200	The microcode or microprocessor branched to address 0.	1. Run GMP for failure isolation. 2. If replacing the microprocessor card does not repair the failure, call your next level of support.	134 117	Control store card Microprocessor card	01A-A1C2 01A-A1D2	CS001, 002 MP001, 002, 003
1300	The hardware detected an external register (XR) error during power-on, or during internal check 1 recovery. Sense byte 9 contains the value of XRA.	1. Use EAD D1nn for failure isolation. See EAD 1 for "Error Code D1nn." 2. Use the EAD for Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	117 115 114 118 121 119 116 120 122	Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2	MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002
1301	The DLR switch for bit 0 (on the drive-adapter card at 01A-A1Q2) is set on, indicating down level channel adapter cards are installed in this tape control unit.	Ensure the proper channel cards are installed. Correct the DLR switch for bit position 0 if it is wrong.	118	Drive-adapter card	01A-A1Q2	D1001, 002
1302	The DLR switch for bit 4 (on the drive-adapter card at 01A-A1Q2) is set off, indicating a down level card at 01A-A1S2 is installed in this tape control unit.	Ensure the proper read control card is installed. Correct the DLR switch for bit position 4 if it is wrong.	118	Drive-adapter card	01A-A1Q2	D1001, 002
1304	A test of the buffer wrap register indicates that a down level buffer memory is installed.	Ensure that the proper buffer memory is installed.	113 114	Buffer storage card Buffer control card	01A-A1M2 01A-A1L2	BM100 BC001, 002, 003
1305	A test of the buffer adapter registers indicates that the switches on the buffer adapter card are not set correctly.	Ensure that the switches on the buffer adapter card are set correctly. See CARR-TCU 1200.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003
1500	A Read Channel Adapter Status Byte order could not complete successfully during initial selection. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	• Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 121 122	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NIIM	FRU Name	Location	Logic Pages
1502	A channel adapter could not execute a Go Online order. Sense byte 9 contains the channel adapter address 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 24A, 24B, 24C, and 24D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 121 122	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
1503	An external register (XR) error occurred during initialization. Sense byte 9 contains the value of XRA. 80 = Channel adapter A 40 = Channel adapter B	1. Use EAD D1nn for failure isolation. See EAD 1 for "Error Code D1nn." 2. Use EAD Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	117 115 114 118 121 119 116 120 122	Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2	MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002
1504	A channel could not execute a Write Channel Adapter Status Byte order successfully. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 121 122	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 SS001, 002 SM001, 002
1505	The channel adapter detected a bad parity on the TCU Address/Mode switch. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the setting of the TCU Address/Mode switch for the failing channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	197 133 152	TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	See LOC 1 01A-A2C2 01A-A2D2	 CA001, 002 CA101, 102
1506	The channel adapter returned an invalid response. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
1507	An error occurred when writing tape control unit end (CUE) in the device status byte in status store. Sense byte 9 contains the channel adapter/device address. 8n = Channel adapter A 4n = Channel adapter B n = Device address	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
1508	An error occurred when reading the channel adapter switch. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the seating of the TCU Address/Mode switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
1509	An error occurred when initializing status store	1 IML the tape control unit to load the functional microcode The functional microcode will initialize the status store 2 Use the EAD for Status Store/Channel Adapter for failure isolation See EAD 1 for "Status Store/Channel Adapter " TCC FRUs associated with this error code are 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature)	01A-A1G2 01A-A1F2	SS001, 002 SM001 002
1600	The two tape control units are not at the same microcode EC level	This error could result from operating condition				
1601	The two tape control units do not have the same Checksums. (The two tape control units have different levels of microcode)	This error is an operating condition.				
1603	Microcode detected error.	Refer to SPROC 1 and perform procedure A After completing procedure A, call your next level of support.				
1604	The Improved Data Recording Capability allowed bit is not set the same on the two tape control units of a dual tape control unit subsystem. This is an invalid operating condition.	1. Check the setting of the Improved Data Recording Capability allowed bit on both tape control units. See CARR-TCU 1200 for the switch setting procedure. Note: If one tape control unit of a dual tape control unit subsystem does not have the Improved Data Recording Capability feature, then the Improved Data Recording Capability allowed bit must be turned off on the other tape control unit.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003
1700	The local tape control unit received the wrong messages five times from the other tape control unit during initialization.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
1701	The local tape control unit detected a remote status store disconnection five times during initialization.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit " 2 Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
1703	An invalid return code for a received message was received.	1. Check the seating of the TCU address/mode switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
1704	The status store messages received are being repeated, or a message is missing.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52 See FSI 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 120 118 115	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Drive-adapter card Maintenance adapter card	01A-A1G2 01A-A1F2 01A-A1K2 01A-A1Q2 01A-A1E2	SS001, 002 SM001, 002 BA001, 002, 003 DI001, 002 MA001, 002, 003
1705	The remote tape control unit never responded to an Update message during IML from the other tape control unit.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See FSI 1 for "Cable Group Table." Note: Be sure to check the cables in this list for both tape control units. 2. Run diagnostic section EE90 for failure isolation. See "Diagnostic Identification Code Table " on DIAG 3. 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
18nn	An error occurred when reading the IML diskette.	None	258 086 134 138	Media IML diskette drive Control store card V Regulator Card	 See LOC 1 01A-A1C2 01A-A1T2	 CS001, 002 RG001
19nn	An error occurred when reading the IML diskette.	None	258 086 134 138	Media IML diskette drive Control store card V Regulator Card	 See LOC 1 01A-A1C2 01A-A1T2	 CS001, 002 RG001
2000	A check 1 error occurred in tape control unit 0. If the microcode forced a check 1, the actual error code is posted in sense bytes 12 and 13. If the hardware detected the check 1, no error code is posted.	1. If no error code is set in sense bytes 12 and 13, IML the functional diskette and run GMP. If GMP has already been run, continue with step 2. 2. See MD/SDISK 1 and display the ERA and ERB registers. 3. Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." See OF 1 for bit definitions of the registers. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	135 115 117	Control storage array card Maintenance adapter card Microprocessor card	01A-A1B2 01A-A1E2 01A-A1D2	MS001, 002 MA001, 002, 003 MP001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
2010	A check 1 error occurred in tape control unit 1. If microcode forced a check 1, the actual error code is in sense bytes 12 and 13. If hardware detected the check 1, no error code is posted.	1. If no error code is set in sense bytes 12 and 13, IML the functional diskette and run GMP. If GMP has already been run, continue with step 2. 2. See MD/SDISK 1 and display the ERA and ERB registers. 3. Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." See DF 1 for bit definitions of the registers. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	135 115 117	Control storage array card Maintenance adapter card Microprocessor card	01A-A1B2 01A-A1E2 01A-A1D2	MS001, 002 MA001, 002, 003 MP001, 002, 003
2020	A remote check 1 error has occurred but no microcode generated error code has been stored.	Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	117 115 134 135 121 122	Microprocessor card Maintenance adapter card Control store card Control storage array card Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1D2 01A-A1E2 01A-A1C2 01A-A1B2 01A-A1G2 01A-A1F2	MP001, 002, 003 MA001, 002, 003 CS001, 002 MS001, 002 SS001, 002 SM001, 002
2021	A hardware detected check 1 error, without another microcode error, occurred.	Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100."	117 115 134 135	Microprocessor card Maintenance adapter card Control store card Control storage array card	01A-A1D2 01A-A1E2 01A-A1C2 01A-A1B2	MP001, 002, 003 MA001, 002, 003 CS001, 002 MS001, 002
2050	The status store Enable Connection order failed after a check 1.	1. Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." The cables associated with this failure are in cable group 52. See FSI 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3.	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
2055	No message was received from the other tape control unit during a check 1 recovery. Recovery is stopped.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See FSI 1 for "Cable Group Table." Note: Be sure to check the cables in this list for both tape control units. 2. Run diagnostic section EE90 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	134 117 115	Control store card Microprocessor card Maintenance adapter card	01A-A1C2 01A-A1D2 01A-A1E2	CS001, 002 MP001, 002, 003 MA001, 002, 003
2056	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
2057	The check 1 recovery failed because the status store connection was not enabled.	1. Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." The cables associated with this failure are in cable group 52. See FSI 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
2058	An unsuccessful channel adapter operation has stopped the check 1 recovery process. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." • To determine the failing path, see "Error Path Isolation" on Start 400. The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
2063	Status store did not set acknowledge.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
2064	The local tape control unit requested information from the remote tape control unit, but no message was received. The check 1 recovery process is stopped.	The FRUs called out in this error code pertain to both tape control units. 1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable groups 30 and 52. See FSI 1 for "Cable Group Table."	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
2065	The tape control unit detected a check 1 error in the remote tape control unit. An incorrect checksum was received when getting the error code from status store.	The FRUs called out in this error code pertain to both tape control units. 1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable groups 30 and 52. See FSI 1 for "Cable Group Table."	122 121	Status store communication card (This FRU is a feature on 3480 Model A11 and standard on 3480 Model A22.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
2068	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support				
2101	The remote tape control unit detected a check 1 condition and check 1 recovery was disabled in both tape control units	1. IML the product diskette 2. Enter START REPAIR to investigate the check 1 error 3. See MD/SDISK 1 and display the ERA and ERB registers. See DF 1 for the definitions of the ERA and ERB registers. 4. Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." TCC FRUs associated with this error code are 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	135 115 117	Control storage array card Maintenance adapter card Microprocessor card	01A-A1B2 01A-A1E2 01A-A1D2	MS001, 002 MA001, 002, 003 MP001, 002, 003
2200	Channel transfer timeout on a write	1. See MD/SDISK 1 and display error register BCSE. See DF 1 for the definitions of the BCSE register. 2. Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114 133 152	Buffer adapter card Buffer control card Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1K2 01A-A1L2 01A-A2C2 01A-A2D2	BA001, 002, 003 BC001, 002, 003 CA001, 002 CA101, 102
2201	Channel transfer timeout on a read.	1. See MD/SDISK 1 and display error register BCSE. See DF 1 for the definitions of the BCSE register. 2. Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
2210	Channel transfer timeout on the write operation with the improved data recording feature enabled.	For error isolation, run the Support Diagnostics EE32 and EE33.				
2211	Channel transfer timeout on the read operation with the improved data recording feature enabled.	For error isolation, run the Support Diagnostics EE32 and EE33				
2220	Channel transfer timeout on a write after command out is received and with the improved data recording feature enabled.	For error isolation, run the Support Diagnostics EE32 and EE33. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
2500	The command is a Write Tape Mark or Erase Gap and the buffer is not in write mode and is not empty.	This is an operating condition. After a tape control unit reset, the last command will be reissued. This code logs as a temporary error.				
2501	The command is a Rewind or Rewind Unload and the buffer contains write data.	This is an operating condition. After a tape control unit reset, the last command will be reissued. This code logs as a temporary error.				
2502	The command is a Forward Space Block or Forward Space File and the buffer is not in read forward mode.	This is an operating condition. After a tape control unit reset, the last command will be reissued. This code logs as a temporary error.				
2503	The command is a Backspace Block or Backspace File and the buffer is not in read backward mode.	This is an operating condition. After a tape control unit reset, the last command will be reissued. This code logs as a temporary error.				
2504	The channel that issued the command has been removed from the extended contingent connection because of a system reset.	This is an operating condition. After a tape control unit reset, the last command will be reissued. This code logs as a temporary error.				
2505	The command is a Set Path Group ID or a Sense Path Group ID and it caused a unit check. The host must reissue the command.	This is an operating condition. After a tape control unit reset, the last command will be reissued. This code logs as a temporary error.				
2600	A System Reset was received on the last path of a path group. The device was in Extended Contingent Allegiance prior to the reset (a permanent write error had been reported) or when buffered write data was being written (as a result of the tape control unit's system reset processing) a permanent error occurred. The Extended Contingent Allegiance or the permanent error is reset and this error is presented until the tape is unloaded manually or by the system.	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. See the system error log report for the sense data. Error 2600 also means that the operator or program failed to recover from the write error. 3. Use the drive command exerciser (write operation) for failure isolation. See "Drive Command Exerciser" on MD/SDISK 1.	062 064 278 123 124 125 119 085	Read preamplifier card Write power card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Drive control card	02A-A1H2 02A-A1G2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 02A-A1B2	RP000 VP000 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 DD000, 001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
2700	A Read Channel Adapter Status Byte order could not complete successfully. The channel adapter is forced to a disabled condition. Sense byte 9 contains the channel adapter address 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
2701	Invalid TCU address/mode switch setting, broken switch, or other failure, resulted in an error detected in the tape control unit. The channel adapter is forced to a disabled condition. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the settings of the TCU address/mode switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	197 133 152	TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	See LOC 1 01A-A2C2 01A-A2D2	 CA001, 002 CA101, 102
2702	A channel adapter could not execute a Go Online order. The channel adapter is forced to a disabled condition. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 24A, 24B, 24C, and 24D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
2703	A channel adapter could not execute a "set system reset complete" order. The channel adapter is taken offline. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 24A, 24B, 24C, and 24D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG 1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. To determine the failing path. See "Error Path Isolation" on START 400.	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
2704	The TCU Address/Mode switch is set to a channel transfer rate of 4.5 megabytes per second. However, this channel adapter does not have the necessary hardware to support that data rate. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the setting of the TCU Address/Mode switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 158 - 01A-A1XKL 159 - 01A-A1YKL 187 - 01A-A1ZFG 188 - 01A-A1ZKL 189 - 01A-A1WFG 190 - 01A-A1XFG 191 - 01A-A1YFG	120 197 133 152	Buffer adapter card TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1K2 See LOC 1 01A-A2C2 01A-A2D2	BA001, 002, 003 CA001, 002 CA101, 102
2705	A channel detected bad parity on the TCU Address/Mode switch. The channel adapter is forced to a disabled condition. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the settings of the TCU Address/Mode switch for the failing channel. See PANEL 1 for "Setting Address Switches." Check the plug on the back of the address switch for the failing channel. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	197 133 152	TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	See LOC 1 01A-A2C2 01A-A2D2	 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
2708	The tape control unit sent a Go Online order to the channel adapter, but the channel adapter did not go online. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
2709	The channel adapter sent a interrupt code that is not valid in response to a power on reset. The channel adapter is taken offline. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
270A	The channel adapter did not send an interrupt in response to a power on reset. The channel adapter is taken offline. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
270B	A channel adapter error that was indicated by the CER could not be reset. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A2G2	CA001, 002 CA101, 102 SS001, 002
270C	A channel adapter error that was indicated by the CER could not be reset. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A2G2	CA001, 002 CA101, 102 SS001, 002
270E	An attempt was made to initialize a channel adapter to an incorrect configuration for this subsystem. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Check the setting of the DLR switches on the drive adapter card. See CARR-TCU 1189 for the switch setting procedure.	118	Drive adapter card	01A-A1Q2	DI001, 002
270F	The tape control unit timed out waiting for a channel adapter interrupt signaling a completion of an order to operate in OEM mode. The adapter is taken offline. Sense byte 9 = TCU channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. To determine the failing path, see "Error Path Isolation" on START 400.	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
3000	The device is allocated to both tape control units in the same device status byte. Allocation to both tape control units is invalid.	1. See MD/SDISK 1 and display the device status in status store to determine if a channel adapter is failing. This can be a microcode error. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
3001	An invalid channel connection code has been set on the TCU Address/Mode switch. 80 = Channel adapter A 40 = Channel adapter B	1. Check the setting of the TCU Address/Mode switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	197 133 152	TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	See LOC 1 01A-A2C2 01A-A2D2	 CA001, 002 CA101, 102
3030	A channel command retry was stacked or refused by the channel after a microcode channel command retry attempt. The error is logged as a temporary error. The program resumed running. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the temporary errors in the system error log for a possible failing channel adapter. This failure can be caused by a channel problem. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 001 CA101, 102
3032	The level 6 interrupt could not be reset. 80 = Channel adapter A 40 = Channel adapter B	1. To determine the failing path, see "Error Path Isolation" on START 400. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
31nn	An invalid command code was received from the channel adapter. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
3300	A channel command retry has been stacked or refused by the channel after a channel adapter channel command retry attempt, or the channel command retry could not be performed because the channel had issued an Interface Disconnect before the status could be presented. This is a temporary error and the previous command is sent again. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
3301	The channel adapter device condition byte could not be read successfully. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. To determine the failing path, see "Error Path Isolation" on START 400. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
33E2	The channel adapter detected a subsystem error during initial selection. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the system error log for messages. Check the sense data for any additional error codes. See MSG 1 and SENSE 1 to interpret the sense data. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 900 152 901 197 903 126 122 141 120 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) TCU address switch STI dc power supply Power/POR card Status store communication card (This FRU is a part of the communicator feature.) Tape control unit switch panel card Buffer adapter card Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1 01A-A2H4 01A-A1F2 See LOC 1 01A-A1K2 01A-A1G2	CA001, 002 CA101, 102 PR001 SM001, 002 BA001, 002, 003 SS001, 002
33E3	A channel command sequence error was detected by the channel adapter. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." **Note:** Possible program problem. Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 900 152 901 197 903 126 122 141 120 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) TCU address switch STI dc power supply Power/POR card Status store communication card (This FRU is a part of the communicator feature.) Tape control unit switch panel card Buffer adapter card Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1 01A-A2H4 01A-A1F2 See LOC 1 01A-A1K2 01A-A1G2	CA001, 002 CA101, 102 PR001 SM001, 002 BA001, 002, 003 SS001, 002

FSC/ Error	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
33E4	The addressed drive is currently assigned to a path group that does not contain the channel path over which the command was received. Sense byte 9 contains the allowed path: Bit 0 1 2 3 4 5 6 7 └ Reserved Reserved TCU1 Channel B (right) TCU1 Channel A (left) Reserved Reserved TCU0 Channel B (right) TCU0 Channel A (left)	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." **Note:** This error may be a program problem. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 900 152 901 197 903 126 122 141 120 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) TCU address switch STI dc power supply Power/POR card Status store communication card (This FRU is a part of the communicator feature.) Tape control unit switch panel card Buffer adapter card Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1 01A-A2H4 01A-A1F2 See LOC 1 01A-A1K2 01A-A1G2	CA001, 002 CA101, 102 PR001 SM001, 002 BA001, 002, 003 SS001, 002
33E5	Command reject occurred because of an invalid command code. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Check the system error log for the command that was rejected. See MSG 1. 3. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
33E6	A 'bus cut' parity error occurred during the channel adapter decode of the channel command and drive address. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	This can be either a STI-FIPS adapter failure or a channel cable failure. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
33E7	The drive is not online to the local tape control unit. The drive must be online and/or ready to perform the channel command. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1 This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures." before continuing the next step. 2 Check the drive Online/Offline and Ready/Not Ready switches and their connecting cables. See PANEL 1 for "Tape Transport Unit Switches and Indicators." 3 Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." Check the device data bus and drives first, if a single drive failure. 4 Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 191 - 01A-A1YFG 189 - 01A-A1WFG 267 - 02A-A1B2Y 190 - 01A-A1XFG 268 - 02A-A1B2Z	085 118 121 122 133 152	Drive control card Drive-adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	02A-A1B2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	DD000, 001, 002, 003 DI001, 002 SS001, 002 SM001, 002 CA001, 002 CA101, 102
33E8	The addressed drive is not ready and the program issued a channel command that must have the drive ready to be performed. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Check the drive Online/Offline and Ready/Not Ready switches and their connecting cables. See PANEL 1 for "Tape Transport Unit Switches and Indicators." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." Check the device data bus and drives first, if a single drive failure. 4. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 191 - 01A-A1YFG 189 - 01A-A1WFG 267 - 02A-A1B2Y 190 - 01A-A1XFG 268 - 02A-A1B2Z	085 118 121 122 133 152	Drive control card Drive-adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	02A-A1B2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	DD000, 001, 002, 003 DI001, 002 SS001, 002 SM001, 002 CA001, 002 CA101, 102
33E9	The addressed drive is file protected and the channel command is a write-type command. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Check the cartridge to ensure that it is not file protected. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	009 064 085 121 118 081	File protect switch Write power card Drive control card Status store basic card Drive-adapter card Tachometer sensor cable	Baseplate 02A-A1G2 02A-A1B2 01A-A1G2 01A-A1Q2 Baseplate	SN001, 002 VP000 DD000, 001, 002, 003 SS001, 002 DI001, 002 SN001, 002
33EA	An invalid channel adapter interrupt code was received. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
33EB	The addressed drive is logically file protected and the channel command is a write-type command. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	This error can be caused by other than TA90 hardware See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
3411	A request for TA90 Improved Data Recording Capability format failed because the tape control unit is not allowed to write in that format.	1. Check the dip switch settings on the 01A-A1K2 card. See CARR-TCU 1200 for the switch position assignment. If dip switch bit 3 is off, then the Improved Data Recording Capability is not allowed and a request for extended format should not be made. 2. If the 01A-A1K2 card does not have dip switches, then the Improved Data Recording Capability is not installed and a request for the extended data format should not be made. Note: This error may be a program problem.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003
3412	This device is changing between TA90 format and TA90 Improved Data Recording Capability format while writing a file. This unit check is given only once per file.	This is an operating condition that affects performance. It is strongly recommended that TA90 Improved Data Recording Capability format not be turned on and off while writing a file.				
3421	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
3422	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
3488	Both tape control unit allocation bits are set in page 1 of the status store RAM for this device	1 See MD:SDISK 1 and display the status store for device assignments and channel adapters 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
3749	The channel issued a selective reset during a Read Data Buffer command. The data block that was being sent has been purged from the subsystem and cannot be retrieved by the host. Sense byte 9 contains the channel address 80 = Channel adapter A 40 = Channel adapter B	1 Check the seating of the channel-type switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2 Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
3880	A channel adapter check 2, or a remote tape control unit check 1 failure has caused a system reset. The path group IDs and assignment data were reset. A tape was mounted and the next channel command to this drive was not an Assign or Set Path Group ID command. This unit check state will continue until a rewind unload channel command, or a manual rewind unload has been executed. Sense byte 9 contains the channel adapter address 80 = channel A 40 = channel B	Notes: 1. This error can be caused by an STI-FIPS adapter failure or by a channel cable failure. 2. The FRUs are located in the tape control unit that did not report the error. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
3880	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
3881	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
3883	A rewind unload command has been received. ERA 51 is presented requesting a read buffered log command.	This is a normal operating command.				
38C0	A channel command was received before ending status had been generated or accepted for the preceding command. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." Note: This error can be caused by incorrect manual intervention.	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NHM	FRU Name	Location	Logic Pages
38E2	A channel data transfer was successful to this buffer after it failed to the other buffer in a two tape control unit subsystem. The same channel paths were used for all retries. This error indicates the problem is in a buffer and not in a channel path. This drive is not permitted to use the failing buffer for the remainder of this tape mount. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A in tape control unit 0 40 = Channel adapter B in tape control unit 0 08 = Channel adapter A in tape control unit 1 04 = Channel adapter B in tape control unit 1 **Note:** Sense byte 2 indicates the buffer that had the successful data transfer.	**Note:** The FRUs are located in the tape control unit that did not report the error. Run diagnostic section EE64. See the "Diagnostic Identification Code Table" on MD/SDISK 3. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL Cables associated with the failure are in cable groups 50 and 52. See FSI 1 for "Cable Group Table."	114 120 113 133 152	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 01A-A2D2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102
38E3	This error indicates that three times during this tape mount, a 'channel overrun' occurred in data streaming mode. Sense byte 9 contains the channel address of the failing channel. 80 = Channel adapter A or STI-FIPS Adapter L in tape control unit 0 40 = Channel adapter B or STI-FIPS Adapter R in tape control unit 0 08 = Channel adapter A or STI-FIPS Adapter L in tape control unit 1 04 = Channel adapter B or STI-FIPS Adapter R in tape control unit 1	Run diagnostic section EE64. See the "Diagnostic Identification Code Table" on MD/SDISK 3.	900 133 901 152 903 197	STI-FIPS Adapter (L) Channel adapter card (channel A) STI-FIPS Adapter (R) Channel adapter card (channel B) STI dc power supply TCU address switch	02A-L 01A-A2C2 02A-R 01A-A2D2 See LOC 1	CA001, 002 CA101, 102
38E4	A channel data transfer (in Tape Write mode) was successful to this buffer, after it failed to the other buffer in a two tape control unit subsystem. The same channel path was used for all retries. This error indicates that the problem is in a buffer and not in a channel path. This drive is not permitted to use the failing buffer for the remainder of this tape mount. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A in tape control unit 0 40 = Channel adapter B in tape control unit 0 08 = Channel adapter A in tape control unit 1 04 = Channel adapter B in tape control unit 1 **Note:** Sense byte 2 indicates the buffer that had the successful data transfer.	**Note:** The FRUs are located in the tape control unit that did not report the error. Run diagnostic section EE64. See the "Diagnostic Identification Code Table" on MD/SDISK 3. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL Cables associated with the failure are in cable groups 50 and 52. See FSI 1 for "Cable Group Table."	114 120 113 133 152	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 01A-A2D2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
38E5	This error indicates that three times during this tape mount, a 'channel overrun' occurred in data streaming mode (and in Tape Write mode). Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A in tape control unit 0 40 = Channel adapter B in tape control unit 0 08 = Channel adapter A in tape control unit 1 04 = Channel adapter B in tape control unit 1	Run diagnostic section EE64. See the "Diagnostic Identification Code Table" on MD/SDISK 3.	197 133 900 152 901 903	TCU address switch Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply	See LOC 1 01A-A2C2 02A-L 01A-A2D2 02A-R	 CA001, 002 CA101, 102
3941	A channel data transfer failed on both buffers of a two tape control unit subsystem. The same channel path was used for all retries. This error indicates that the problem is in the channel path and not in a buffer. Immediately after the Sense command completes, or when the contingent allegiance is broken, this channel adapter is disabled.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 197 903 126	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) TCU address switch STI dc power supply Power/POR card	01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1 01A-A2H4	CA001, 002 CA101, 102 PR001
3990	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
39B0	Repositioning cannot be successfully concluded because the block that the channel last read, wrote, or located to cannot now be found.	This error can be caused by incorrect manual intervention. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 117 112 113	Buffer control card Buffer adapter card Microprocessor card Buffer storage card Buffer storage card	01A-A1L2 01A-A1K2 01A-A1D2 01A-A1N2 01A-A1M2	BC001, 001, 002 BA001, 001, 002 MP001, 001, 002 BM200 BM100
39B1	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
39B2	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
39D1	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
3A10	A channel command was received before the host error recovery actions were completed after a permanent write error had occurred on a different channel.	This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures."				
3A16	An ending status was generated that does not match the earlier ending status. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
3945	A channel to buffer transfer failed with the Improved Data Recording feature enabled. The transfer will be retried with the feature disabled.	This FSC is always proceeded by another FSC, therefore, use the proceeding FSC to diagnose this error code.	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
38EA and 38EB	The Improved Data Recording has been disabled for the remainder of the tape mount.	Run support diagnostics EE32 and EE33 for error isolation. TCC FRUs associated with this error code are: 157-01A-A1WKL 159-01A-A1YKL 158-01A-A1XKL 188-01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
3A19	The channel adapter command byte could not be written with zeros. Sense byte 9 contains the address of the failing channel 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152 121 122	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 SS001, 002 SM001, 002
3A1A	A channel adapter check 2 occurred during channel status presentation. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
3A1B	A channel adapter order never completed successfully during channel presentation. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152 121 122	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 SS001, 002 SM001, 002
3A20	A 'bus out' parity error was detected during channel data transmission. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. **Note:** This error can be caused by a channel failure or by a channel cable failure. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
3A30	The device condition byte cannot be read successfully. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
3A31	The device condition byte cannot be written. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
3C60	An incorrect byte count was detected during a channel to tape control unit control command. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1 This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step 2 Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
3C61	An interface disconnect was detected during the channel data transfer of a channel to tape control unit control command. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
3C63	A 'bus out' parity error occurred during channel data transfer on a channel to tape control unit control command. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
3CBA	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: MODULE = LVL 7.				
3CBB	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
3CBD	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
3D11	A read backward command has requested a record in "TA90 extended data format."	This is an operating condition. The record is in the buffer in the forward direction and a read forward must be performed to retrieve it. Data in the TA90 extended data format cannot be read in the backward direction. This check is issued once for each read backward in TA90 extended data format mode.				
3EB0	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
3F13	A permanent write error occurred and a command that may cause tape motion was issued instead of a Read Data Buffer command needed to recover the data. Write data has been deleted from the data buffer. The actions listed here try to diagnose the write error. Note: No device-type operations have occurred since the write error was reported.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures." before continuing the next step. 2. See the system error log report for the sense data. Error 3F13 also means that the operator or program failed to recover from the write error. 3. Use the drive command exerciser (write operation) for failure isolation. See "Drive Command Exerciser" on MD/SDISK 1. 4. Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	062 064 278 123 124 125 119 085	Read preamplifier card Write power card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Drive control card	02A-A1H2 02A-A1G2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 02A-A1B2	RP000 VP000 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 DD000, 001, 002, 003
3F14	There is no valid data path to the drive through either tape control unit, and the channel command received needs a drive online and/or ready. This error occurs if an attempt is made to select a drive that is not installed in the subsystem.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures." before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Device Data Bus Problems - General." The cables associated with this failure are cable groups 28, 30, and 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 191 - 01A-A1YFG 189 - 01A-A1WFG 267 - 02A-A1B2Y 190 - 01A-A1XFG 268 - 02A-A1B2Z	085 118 121 122 133 152	Drive control card Drive-adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	02A-A1B2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	DD000, 001, 002, 003 DI001, 002 SS001, 002 SM001, 002 CA001, 002 CA101, 102
3F15	A permanent read error occurred. Tape position is not certain and the cartridge must be unloaded.	This FSC is always preceded by another sense record. Use the FSC from that sense record when troubleshooting this failure.				
3F16	A permanent read error occurred. Tape position is not certain and the cartridge must be unloaded.	This FSC is always preceded by another sense record. Use the FSC from that sense record when troubleshooting this failure.				
3FEE	The drive is at the physical end of tape and a command that requires forward tape motion is received from the channel.	This is an operating condition. No forward motion is allowed at the end of tape.				
41F0	The block ID to be located by the Locate Block command could not be found. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	This error can be caused by incorrect operator action. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Device Data Bus Problems General." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 191 - 01A-A1YFG 189 - 01A-A1WFG 267 - 02A-A1B2Y 190 - 01A-A1XFG 268 - 02A-A1B2Z	085 118 121 122 133 152	Drive control card Drive-adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	02A-A1B2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	DD000, 001, 002, 003 DI001, 002 SS001, 002 SM001, 002 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4200	An invalid tape-format bit combination was detected in the TA90 Mode Set command. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4201	A permanent write error was ignored and a TA90 Mode Set command with tape write set was received. Any remaining write data in the buffer segment has been deleted. Note: No device type operations have occurred since the write error was reported.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. Note: This error code can be caused by incorrect manual intervention. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4202	Either bit 5 or bit 6 in the Mode Set command data byte is not 0. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4203	A Mode Set command with the tape write mode bit set on was received and the drive was not ready. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. Make the drive ready to offload the buffered data. 2. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step 3. Check the drive Online/Offline and Ready/Not Ready switches and their connecting cables. See PANEL 1 for "Tape Transport Unit Switches and Indicators." 4. Use the EAC for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." Check the device data bus and drives first, if a single drive failure. 5. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 191 - 01A-A1YFG 189 - 01A-A1WFG 267 - 02A-A1B2Y 190 - 01A-A1XFG 268 - 02A-A1B2Z	085 118 121 122 133 152	Drive control card Drive adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	02A-A1B2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	DD000, 001, 002, 003 DI001, 002 SS001, 002 SM001, 002 CA001, 002 CA101, 102
4204	Bit 4 of a mode set command specifying the Improved Data Recording Capability format mode was issued to a tape control unit that does not have the hardware to support the function. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The Cables associated with this failure are in cable group 30. See FSI1 for "Cable Group Table."	133 152 233 121 120	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Buffer adapter card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1K2	CA001, 002 CA101, 102 SS001, 002 BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4260	There are no channel paths in the grouped state for this drive that have a path group ID matching the path group ID received as the argument to the Assign command. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4261	The channel path that issued an Unassign command did not have assignment of this drive. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4262	The Unassign command was issued and no channel paths with path group IDs matching the Unassign command argument had assignment of the drive. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 136 152 233 121	Channel adapter card (channel A) Bus shoe card (channel A) Channel adapter card (channel B) Bus shoe card (channel B) Status store basic card	01A-A2C2 01A-T1A1 01A-A2D2 01A-T1B1 01A-A1G2	CA001, 002 IB001, 002, 003, WA013 CA101, 102 IB001, 002, 003, WA013 SS001, 002
4263	The drive is not online to the local tape control unit. The drive must be online and/or ready to perform the channel command. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Check the drive Online/Offline and Ready/Not Ready switches and their connecting cables. See PANEL 1 for "Tape Transport Unit Switches and Indicators." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." Check the device data bus and drives first, if a single drive failure. 4. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 191 - 01A-A1YFG 189 - 01A-A1WFG 267 - 02A-A1B2Y 190 - 01A-A1XFG 268 - 02A-A1B2Z	085 118 121 122 133 152	Drive control card Drive-adapter card Status store basic card Status store communication card Channel adapter card (channel A) Channel adapter card (channel B)	02A-A1B2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	DD000, 001, 002, 003 DI001, 002 SS001, 002 SM001, 002 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4280	An invalid function-control byte has been received—an invalid function was specified. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4281	A Set Path Group ID command was performed successfully in the tape control unit that received the command but not in the remote tape control unit.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
4312	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
4313	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
4314	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
4411	A read backward command has requested a record in TA90 extended data format.	This is an operating condition. A read backward has been issued for a record in "TA90 extended format." This unit check is given the first time a read backward command is issued. It is only given once per tape mount.				
4412	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
4680	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
46C0	Reserved bits 6 and 7 of byte 0 of the load display data were not zero for a drive without the automatic cartridge loader feature or for drives with the automatic cartridge loader feature bit 6 of byte 0 of the load display was not zero.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
4740	An invalid channel connection code has been set on the TCU Address/Mode switch. The path will operate in throttled DCI mode until the switch setting is corrected and the interface re-enabled. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the seating of the TCU address/mode type switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Check the cables in cable group 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 3. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	197 133 152	TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	See LOC 1 01A-A2C2 01A-A2D2	 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
47B0	The Space File operation is not making any progress down the tape. See the secondary error codes in the sense bytes.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures." before continuing to the next step 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 185 - 01A-A1XRS 184 - 01A-A1ZPO 186 - 01A-A1YRS	062 064 116 118 278 123 124 125 119 113 111	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card Read ECC/CORR card	02A-A1J2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2 01A-A1R2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100 EC001, 002
47D0	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
47D1	An invalid channel connection code has been set on the TCU Address/Mode switch. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the seating of the TCU address/mode switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Check the cables in cable group 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 3. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable groups 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	197 133 152	TCU address switch Channel adapter card (channel A) Channel adapter card (channel B)	See LOC 1 01A-A2C2 01A-A2D2	 CA001, 002 CA101, 102
47D2	Microcode detected error.	Refer to SPROC 1 and perform Procedure A. After completing procedure A, call your next level of support.				
47E0	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
4811	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
4812	A rewind unload command has been received. ERA 51 is presented requesting a read buffered log command.	This is a normal operating condition.				
4820	A Set Path Group ID command was received with an invalid function control byte in the argument—bits 3 through 7 were not 0. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures." before continuing to the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4821	The path group ID in the argument of the Set Path Group ID command is equal to 0. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4B22	The path group ID in the argument of the Set Path Group ID command does not match the path group ID received in a prior Set Path Group ID command over the same channel. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4B23	The received path mode bit in the function-control byte does not match the path mode set in a prior Set Path Group ID command addressed to a channel interface with the same path group ID as the interface that issued the current command. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4B24	The received path mode bit was on, indicating Multipath mode. Multipath mode is not supported by this machine. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4B40	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
4D70	The received password for the Control Access command is 0. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4D71	An invalid function byte has been received for the Control Access command. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4D72	The password received with the Control Access command is not identical to the password received during a prior Control Access command. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R	CA001, 002 CA101, 102 SS001, 002
4D73	A Control Access command attempted to establish a password, but the channel path that issued the command did not have assignment of the drive. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4D74	A Control Access command attempted the temporary unassignment function, but a prior command had not established a password. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4D75	A Control Access command attempted the generalized unassignment function, but the channel path that issued the command did not have assignment of the drive. Sense byte 0 contains the channel adapter address 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 121	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Status store basic card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
4D76	A Control Access command was performed successfully in the tape control unit that received the command but not in the remote tape control unit.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
4D79	Microcode detected error	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
4D7C	Microcode detected error	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
4D7D	Microcode detected error.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
4D88	An invalid order or flag byte has been received for the Perform Subsystem Function command. Sense byte 0 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 136 152 233 121	Channel adapter card (channel A) Bus shoe card (channel A) Channel adapter card (channel B) Bus shoe card (channel B) Status store basic card	01A-A2C2 01A-T1A1 01A-A2D2 01A-T1B1 01A-A1G2	CA001, 002 IB001, 002, 003, WA013 CA101, 102 IB001, 002, 003, WA013 SS001, 002
4D81	A perform subsystem function command was executed successfully in the receiving tape control unit, but unsuccessfully in the remote tape control unit.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See EAD 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
4D82	A TA90 Perform Subsystem Function command is received and the maintenance device is in use.	None				
4D83	A TA90 Perform Subsystem Function command is received, but GMP is already active in this TCU or a diagnostic is in progress in the other TCU.	None				
4D84	A Perform Subsystem Function command is received to pin the drive to this TCU, but the drive is already pinned.	None				
4D85	A Perform Subsystem Function command is received to pin a drive to the other TCU, but the drive is already pinned to this TCU or the other TCU is unavailable or nonexistent.	None				
4D86	A Perform Subsystem Function command is received to unpin a device that is not pinned.	None				
4D87	A Perform Subsystem Function command is received to run a TA90 diagnostic on the other TCU, but the drive is pinned to this TCU.	None				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
4D84	A Perform Subsystem Function command has been received to pin the drive to this TCU but the drive is already pinned	None.				
4D85	A Perform Subsystem Function command has been received to pin a drive to the other TCU, but the drive is already pinned to this CU or the other TCU is unavailable or non-existant.	None.				
4D86	A Perform Subsystem Function command has been received to unpin a device which is not pinned.	None.				
4D8A	A Perform Subsystem Function command has been received with an Access Control, pin, unpin or reset device fence and the device is assigned elsewhere.	None.				
4D8B	A Perform Subsystem Function command has been received with an Access Control, order, but the device is not ready.	None.				
4D8C	A Perform Subsystem Function command has been received with an Access Control order, but the device is not online	None.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
50nn	The channel adapter detected an error and interrupted the tape control unit with an 'nn' reason code. The actual FRU is dependent on the value of 'nn'.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121 115 197	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Maintenance adapter card TCU address switch	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1E2 See LOC 1	CA001, 002 CA101, 102 SS001, 002 MA001, 001, 003

nn	Error Description	FRUs
10	Initialization error	133, 152
20	Checksum error - hardware failure	133, 152
21	Microprocessor error - hardware failure	133, 152
22	XR error - hardware failure	133, 152
23	Status store error - hardware failure	133, 152, 121
27	Timeout on status order error	133, 152, 121
28	Timeout on status order error	133, 152, 121
29	Timeout on channel adapter to tape control unit interrupt	133, 152, 121
33	Unexpected level 3 interrupt	133, 152
34	Unexpected level 4 interrupt	133, 152
35	Unexpected level 5 interrupt	133, 152
36	Unexpected level 6 interrupt	133, 152
40	Timeout waiting for 'request in'	133, 152, 900, 901
41	Channel chained illegally	133, 152, 900, 901
43	Channel stacked '00' status	STI-FIPS adapter hardware or firmware problem
50	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
51	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
52	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
60	Microcode detected error	115, 133, 152, 900, 901
61	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
70	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
71	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
72	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options to MODULE, CHANNEL, DRIVE, no LVL 7.
81	Timeout waiting for fall of holdout for a '70' x short busy	133, 152, 900, 901
82	Timeout waiting for fall of service 'command out' prior to 'status in'	133, 152, 900, 901
83	Timeout waiting for 'service out' 'command out' interface disconnect or reset response to 'status in'	133, 152, 900, 901
84	Timeout waiting for fall of 'command out' and 'service out' before starting buffer data transfer	133, 152, 900, 901

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
50nn	The channel adapter detected an error and interrupted the tape control unit with an 'nn' reason code. The actual FRU is dependent on the value of 'nn'. nn Error Description FRUs 85 Timeout waiting for fall of 'address out' during initial selection sequence 133, 152, 900, 901 86 Timeout waiting for rise of 'command out' during initial selection sequence 133, 152, 900, 901 87 Timeout waiting for rise of 'command out' during tape control unit initiated sequence 133, 152, 900, 901 88 Timeout waiting for fall of 'Command Out' 'Service Out' and 'Suppress Out' before starting a get data transfer 133, 152, 900, 901 89 Timeout waiting for 'Command Out' or 'Service Out' in response to 'Service In' during a get data transfer 133, 152, 900, 901 8A Timeout waiting for fall of 'Command Out' 'Service Out' and 'Suppress Out' before starting a put data transfer 133, 152, 900, 901 8B Timeout waiting for 'Command Out' or 'Service Out' in response to 'Service In' a put data transfer 133, 152, 900, 901 8C Timeout waiting for fall of 'Hold Out' during interface termination 133, 152, 900, 901 8D Timeout waiting for chained reselection or chain break 133, 152, 900, 901 00 Microcode detected error 01 Microcode detected error 02 Microcode detected error E0 Bad channel adapter TCU address switch parity 197, 133, 152, 900, 901 F1 Status store error 133, 152, 121, 900, 901 F2 Status store error 133, 152, 121, 900, 901 F3 Status store error 133, 152, 121, 900, 901 F4 Status store error 133, 152, 121, 900, 901 F5 Status store error 133, 152, 121, 900, 901 F6 Status store error 133, 152, 121, 900, 901 F7 Status store error 133, 152, 121, 900, 901	Refer to SPROC 1 and perform procedure D. Set trace option to MODULE, CHANNEL, DRIVE, no LVL 7. Refer to SPROC 1 and perform procedure D. Set trace option to MODULE, CHANNEL, DRIVE, no LVL 7. Refer to SPROC 1 and perform procedure D. Set trace option to MODULE, CHANNEL, DRIVE, no LVL 7.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5100	The microcode detected a parity error during the command that was sent. The appropriate channel adapter is forced offline. Sense byte 9 contains the channel adapter address. 80 = channel adapter A 40 = channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
52nn	The channel command did not match. Sense byte 9 contains the channel adapter number and the five-bit encoded device command translated from the channel command. Bits 0 – 4 = the 5-bit encoded device command. Bits 5 – 7 = the channel adapter number. 0 = Channel adapter A 1 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. See OPER 1 for "Channel Command Descriptions." See MD/SDISK 1 for "Channel RAM Display" to find the five-bit encoded device commands. 3. Run the Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for "Channel Adapter Function Test." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch for channel A or B	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
5310	The status store did not respond to a Read Message Buffer order.	1. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for "Channel Adapter Function Test." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5311	The status store did not perform a Read Message Buffer order.	1. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for "Channel Adapter Function Test." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5320	The status store did not respond to a Write Message Buffer order. Sense byte 9 contains the channel card address.	1. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for "Channel Adapter Function Test." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5322	The retry of a failed message also failed.	TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5323	A status store error occurred on a 'rec msg' order.	Note: The FRUs are located in the tape control unit that did not report the error. 1. Check the seating of the channel-type switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this error code are in cable group 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5324	A status store order initiated in this interrupt level completed in a higher level.	Note: Replace the FRUs in both tape control units. 1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this error code are in cable group 30 and 52. See FSI 1 for "Cable Group Table."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5332	A status store error on an 'ack msg' occurred, or the remote tape control unit disconnected status store.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this error code are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 188 - 01A-A1ZKL 158 - 01A-A1XKL 189 - 01A-A1WFG 159 - 01A-A1YKL 190 - 01A-A1XFG 187 - 01A-A1ZFG 191 - 01A-A1YFG	133 152 121 122 120 114	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003
5333	The channel adapter returned an invalid byte count. Sense byte 9 contains the invalid count.	Use the EAD for Status Store/Channel Adapter failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
5334	The channel adapter returned an invalid byte count. Sense byte 9 contains the invalid count.	Use the EAD for Status Store/Channel Adapter failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5341	An Access Read Message Buffer order failed between the tape control units	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See EAD 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3 TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5342	A status store error occurred on an Acknowledge Message order, or the remote tape control unit just disconnected status store	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See EAD 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5344	The microcode expected a repeat of the last message because a checksum failure occurred the first time it was sent.	Replace the FRUs in both tape control units. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5345	The retry of a failed message also failed.	Replace the FRUs in both tape control units. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5346	Microcode detected error.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
5347	A status store order initiated in this interrupt level completed in a higher level. It did not complete successfully.	Note: Replace the FRUs in both tape control units. 1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See EAD 1 for "Cable Group Table." 2. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5350	The local microprocessor stopped and then started running again.	TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	117 115	Microprocessor card Maintenance adapter card	01A-A1D2 01A-A1E2	MP001, 002, 003 MA001, 002, 003
5356	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
5357	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
5360	Status store never responded to an order.	1. Check the cables in cable group 30. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG Note: Defective TCU 0/1 switch could cause this error.	121 122 134 118 141 197	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Control store card TCU switch panel card TCU address switch	01A-A1G2 01A-A1F2 01A-A1C2 01A-A1Q2 01A-A2C2 01A-A2D2 01A-A2E2 01A-A2F2 See LOC 1	SS001, 002 SM001, 002 CS001, 002 SI001, 002 CA001, 002 CA101, 102 CA201, 202 CA301, 302

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5382	Status store never responded to an order.	1 Use the EAD for Status Store/Channel Adapter failure isolation See EAD 1 for "Status Store/Channel Adapter " 2 Use the EAD for Dual Tape Control Unit for failure isolation See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable groups 30 and 52. See EAD 1 for "Cable Group Table " TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5389	The other tape control unit is unable to operate for some reason For example, master is set in the other tape control unit, or the code is in an endless loop.	1. Use the EAD for Dual Tape Control Unit for failure isolation See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable group 52. See FSI 1 for "Cable Group Table." 2. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for diagnostic EE64 "Channel Adapter Function Test." 3. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. See EAD 1 for "Dual Tape Control Unit." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5391	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
5392	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
53A0	Status store never responded to an order.	This error can be caused by the microcode. 1. Check the cables in cable group 30. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121 134	Status store communication card (This FRU is a part of the communicator feature) Status store basic card Control storage card	01A-A1F2 01A-A1G2 01A-A1C2	SM001, 002 SS001, 002 CS001, 002
53A1	Status store never responded to an order.	1. Check the cables in cable group 30 and 52. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5380	Status store never responded to the Read Status Store RAM order.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." 3. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for diagnostic EE64 "Channel Adapter Function Test." 4. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3.		FRUs are defined by the diagnostic failure ID that brought you here.		
5381	Status store never responded to the Read Status Store RAM order.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 3. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for diagnostic EE64 "Channel Adapter Function Test." 4. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121 133 152	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1F2 01A-A1G2 01A-A2C2 01A-A2D2	SM001, 002 SS001, 002 CA001, 002 CA101, 102
5382	Status store never responded to the Write Status Store RAM order.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 3. Run Channel Adapter Function Test for failure isolation. See MD/SDISK 1 for diagnostic EE64 "Channel Adapter Function Test." 4. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121 133 152	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1F2 01A-A1G2 01A-A2C2 01A-A2D2	SM001, 002 SS001, 002 CA001, 002 CA101, 102
5383	Used by the support diagnostics to define added actions.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Check the cables in cable group 30. See FSI 1 for "Cable Group Table."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5385	Status store did not respond to a Read or a Write RAM page four order.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
53B6	The microcode detected a channel adapter error that cannot be reset.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
53B7	A module was started with an invalid order.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
53B8	Status store never responded to an order.	Note: Replace the FRUs in both tape control units. 1. Use the EAD for Status Store/Channel Adapter failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The cables associated with this failure are in cable groups 30 and 52. See FSI 1 for "Cable Group Table."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
53C0	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
53C1	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
54nn	The channel adapter returned an invalid response. The nn is the channel adapter interrupt code. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the cables in cable group 30. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch for channel A or B	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
55[illegible]	An internal MTI error occurred in the channel adapter. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
55nn	The channel adapter detected an error. The nn is the value from the channel error register (CER). If this is a channel adapter error, the microcode will force the appropriate channel adapter offline. If this is not detected as a channel adapter error, the microcode will force a check 1 error. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. To determine the failing path, see "Error Path Isolation" on START 400. 2. Use the EAD for Status Store/Channel Adapter failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Check the cables in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197 120	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch Buffer adapter card	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1 01A-A1K2	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002 BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5602	An unexplained level 6 interrupt occurred.	1. To determine the failing path, see "Error Path Isolation" on START 400. 2. Use the EAD for Status Store/Channel Adapter failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Check the cables in cable group 30. See FSI 1 for "Cable Group Table."	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2 See LOC 1	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
5605	The channel adapter detected a parity error on a channel command. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. This error can be caused by a channel or channel cable problem. See SENSE 1 for "Format 19, 20, and 21 Sense Bytes 0 – 2 Description" to find the failing channel adapter. 3. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch for channel A or B	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
5606	The local tape control unit cannot take control of status store.	1. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." See EAD 1 for "Cable and Board Interconnection Failures." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
57nn	A channel adapter returned an invalid response. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
5820	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
5900	The local tape control unit detected a status store communication error, a microprocessor error, or a remote tape control unit status store error. Sense byte 9 contains the value from the channel error register (CER). See DF 1 for "Channel Error Register (CER)."	1. The FRUs called in this error code pertain to both tape control units. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 4. Check the cables in cable groups 30 and 52. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG Note: Defective TCU 0/1 switch could cause this error.	122 121 134 118 133 152 141 197	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card Control store card TCU switch panel card TCU address switch	01A-A1F2 01A-A1G2 01A-A1C2 01A-A1Q2 01A-A2C2 01A-A2D2 01A-A2E2 01A-A2F2 See LOC 1	SM001, 002 SS001, 002 CS001, 002 SI001, 002 CA001, 002 CA101, 102 CA201, 202 CA301, 302

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5901	The status store detected a channel adapter parity error, but the status store could not be reset. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	1. To determine the failing path, see "Error Path Isolation" on START 400 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Check the cables in cable group 30 and 52. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5904	The channel adapter detected an error, but the microcode cannot reset the error. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 133 152 122	Status store basic card Channel adapter card (channel A) Channel adapter card (channel B) Status store communication card (This FRU is a part of the communicator feature)	01A-A1G2 01A-A2C2 01A-A2D2 01A-A1F2	SS001, 002 CA001, 002 CA101, 102 SM001, 002
5905	Status store detected a parity error from the channel adapter when reading the channel adapter RAM. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. To determine the failing path, see "Error Path Isolation" on START 400. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Check the cables in cable group 30 and 52. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch for channel A or B	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002
5906	The local tape control unit detected a parity error from the remote tape control unit. If the microcode can reset the status store error indication, a tape control unit error is indicated, otherwise, a check one error is set. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5907	The local tape control unit detected a channel adapter error. Sense byte 9 contains the channel address. 80 = Channel adapter A 40 = Channel adapter B	1. Check the seating of the channel-type switch for the appropriate channel. See PANEL 1 for "Setting Address Switches." 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 3. Check the cables in cable group 23A, 23B, 23C, and 23D. See FSI 1 for "Cable Group Table."	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5908	The tape control unit microcode detected a channel adapter error that cannot be reset. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
590A	The channel adapter detected an error and has been taken offline. Sense byte 9 contains the address of the failing channel 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
590B	The status store and channel detected and error. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121 122	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 SS001, 002 SM001, 002
5A03	The remote tape control unit raised 'collision detect' to force a check 1 condition in the local tape control unit.	1. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." 2. Check the cables in cable group 52. See FSI 1 for "Cable Group Table." 3. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 0 A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
5A04	A 'collision detect' was sensed as this tape control unit was coming up. Status store is not operational and the other tape control unit has all the drives.	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. 3. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121 134 141	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card Control store card Tape control unit switch panel card	01A-A1F2 01A-A1G2 01A-A1C2 See LOC 1	SM001, 002 SS001, 002 CS001, 002 YF010
5A05	The local tape control unit failed to connect the status store interconnection to the remote tape control unit.	1. Run diagnostic section EE90 for failure isolation. See the "Diagnostic Identification Code Table" on DIAG 3. 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5A06	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
5B00	The channel adapter in the local tape control unit is broken. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Check the cables in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152 117 121 122 197	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch for channel A or B	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1G2 01A-A1F2	CA001, 002 CA101, 102 MP001, 002, 003 SS001, 002 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5B50	A timeout error has caused the channel adapter to go offline. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
5BB0	The buffer switch was made free, because of no activity on the channel path. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
5BB1	The buffer switch was made free, because of no activity on the channel path. The channel adapter has been disabled ('disconnect in'). Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
5BB2	The check in byte cannot be read successfully. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A Channel adapter card (channel B Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
5BB3	The channel adapter has not responded recently and a channel hang is probably the problem. A disconnect sequence is initiated and the channel adapter is taken offline. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
5BB4	The check in byte cannot be written successfully. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
5BB5	The channel adapter has not responded recently and is assumed to be bad. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5BBF	A buffer segment was deallocated for a device that is associated with this pass. This prevents a buffer segment from being allocated to a defective or stopped channel interface. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 900 152 901 903	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply	01A-A2C2 02A-L 01A-A2D2 02A-R	CA001, 002 CA101, 102
5CB1	The channel adapter never responded to a channel adapter read type order. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5CB2	The channel adapter never responded to a read channel adapter order.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5CB3	The channel adapter never processed an order successfully, and a Disconnect In order is then issued to the channel adapter. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 133 152 121	Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A1F2 01A-A2C2 01A-A2D2 01A-A1G2	SM001, 002 CA001, 002 CA101, 102 SS001, 002
5CB5	Status store did not respond to a previously sent order.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
5CC1	The channel adapter never responded to a channel adapter write type order. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	1. To determine the failing path, see "Error Path Isolation" on START 400. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
5CC2	The channel adapter never processed a Disconnect in order successfully. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5CC3	The channel adapter never processed an order successfully, and a Disconnect in order is then issued to the channel adapter. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
5CC5	Status store did not respond to a previously sent order.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The FRUs called in this error code pertain to both tape control units. The cables associated with this failure are in cable groups 30 and 52. See FSI 1 for "Cable Group Table."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5CD0	Status store did not respond to a previously sent order.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." The FRUs called in this error code pertain to both tape control units. The cables associated with this failure are in cable groups 30 and 52. See FSI 1 for "Cable Group Table."	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
5D00	The code attempted to issue a "Reset CA Interrupt" order when there was no interrupt active in the CRR register. Sense byte 9 contains the address of the failing channel. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 SS001, 002
5Enn	The channel adapter returned an invalid response. Sense byte 9 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
6F00	The channel adapter did not respond successfully to a Set Diagnostic Mode order. The microcode retried the order 256 times before setting the error. Sense byte 8 contains the channel adapter address. 80 = Channel adapter A 40 = Channel adapter B	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." The cables associated with this failure are in cable group 30. See FSI 1 for "Cable Group Table."	133 152	Channel adapter card (channel A) Channel adapter card (channel B)	01A-A2C2 01A-A2D2	CA001, 002 CA101, 102
6881	A drive is assigned to both tape control units in status store	1. See WD-SDISK-1 for "Device Assignments" to determine the channel adapter assignment for the drive. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121	Status store basic card	01A-A1G2	SS001, 002
6981	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6111	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6112	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6211	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6212	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6213	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6214	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6215	A buffer error occurred while trying to read the packet header	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are 157 - 01A-A1WKL 181 - 01A-A1P2Y 158 - 01A-A1XKL 188 - 01A-A1ZKL 159 - 01A-A1YKL	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM1C0
6216	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6217	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6218	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6481	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6471	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6481	The new record mode and direction do not match the previous record		133 152 121	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card	01A-A2C2 01A-A2D2 01A-A1G2	CA001, 002 CA101, 102 CA201, 202 CA301, 302 SS001, 002
6482	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
6485	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6486	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6551	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6552	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6555	A read write buffer operation failed. Sense byte 9 contains the return code. Return Codes: 1 = unable to read the packet header 2 = unable to write the packet header 3 = buffer error writing block trailer 4 = zero data bytes transferred 5 = zero length record 6 = negative free bytes	Use the EAD for error codes D5nn or D7nn for failure isolation. See EAD 1 for "Error Code D5nn or D7nn." Note: This error may be a program problem.	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM1C0
6556	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6661	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6666	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
6810	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6890	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
68F0	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
6E00	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
7041	A pattern sequence table (PST) error occurred during a read back check. The read data flow detected a tape mark, but a tape mark was not expected. Sense byte 9 contains the value from the PST.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are 181 - 01A-A1P2Y 267* - 02A-A1B2Y 184 - 01A-A1ZPQ 268* - 02A-A1B2Z	062 064 116 119 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 SI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM1C0

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7042	A read back check of the tape mark determined that it did not meet the minimum length specification (0.7 mm).	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	062 064 085 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Drive control card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 02A-A1B2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DD000, 001, 002, 003 DF001, 002 SI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7051	Failed to correctly start the read back check. Came up in interblock gap but never found the block preceding the first interblock gap	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	062 064 085 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Drive control card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 02A-A1B2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DD000, 001, 002, 003 DF001, 002 SI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7052	Failed to correctly start the read back check. Timed out waiting for the interblock gap preceding the first block written.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 063 013 216 059 116 118 278 119 111 199 248 264 265	Drive control card Write card Head and guide assembly Tape lifter solenoid Power amplifier board Write data card Drive-adapter card Read detect card Read clock and format card Read ECC/CORR card Write bus terminator TCU0 (local) Write bus terminator TCU0 (remote) Write bus terminator TCU1 (local) Write bus terminator TCU1 (remote)	02A-A1B2 02A-A1J4 Baseplate Drive Drive 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A1S2 01A-A1R2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 WR000 DF001, 002 SI001, 002 RD001 RC001, 002 EC001, 002
7061	A pattern sequence table (PST) error occurred during a read back check. The read data flow detected an interblock gap, but the interblock gap was not expected. Sense byte 9 contains the value from the PST register.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU Num	FRU Name	Location	Logic Pages
7062	A buffer record table entry is being deleted while a write operation is still in progress.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7063	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
7064	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
7071	Timed out waiting for 'Beginning Sync' during the read back check of a record. A maximum time of 100 microseconds is allowed between detection of 'beginning of block' and the 'beginning sync' indication.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7074	A pattern sequence table (PST) error occurred during read back check. The read data flow detected a record, but the record was not expected. Sense byte 9 contains the value from the PST.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7076	A write data flow error was detected while writing this record. FRU bits were on in the write status/error (WSE) register, or 'end write' did not come on in the WSE register. Sense byte 9 contains the value from the WSE register.	1. Use the EAD for error code D7nn for failure isolation. See EAD 1 For "Error Code D7nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 184 - 01A-A1ZPQ 158 - 01A-A1XKL 188 - 01A-A1ZKL 159 - 01A-A1YKL 267 - 02A-A1B2Y 181 - 01A-A1P2Y 268 - 02A-A1B2Z	085 062 064 116 118 114 120	Drive control card Read preamplifier card Write power card Write data card Drive-adapter card Buffer control card Buffer adapter card	02A-A1B2 02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A1L2 01A-A1K2	DD000, 001, 002, 003 RP000 VP000 DF001, 002 DI001, 002 BC001, 002, 003 BA001, 002, 003
7077	A buffer error was detected while writing this record. The error was indicated in the buffer device status and error (BDSE) register. BDSE error groups 0 and 1 are reported in sense byte 17. BDSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 181 - 01A-A1P2Y 158 - 01A-A1XKL 188 - 01A-A1ZKL 159 - 01A-A1YKL	114 120 113 111 116	Buffer control card Buffer adapter card Buffer storage card Read ECC/CORR card Write data card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A1R2 01A-A1P2	BC001, 002, 003 BA001, 002, 003 BM100 EC001, 002 DF001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7078	'Device xfer complete' was not on in the buffer device status and error (BDSE) register at the end of the buffer to write data flow transfer. Sense byte 9 contains the value from the BDSE.	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
7081	'Gap in' and 'generate gap out' were indicated in the read status when a level 3 interrupt was signalled. 'Gap in' and 'generate gap out' occurring simultaneously causes a level 3 interrupt. Sense byte 9 contains the value from the read status register (RSR).	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	118 119 117 116	Drive-adapter card Read clock and format card Microprocessor card Write data card	01A-A1Q2 01A-A1S2 01A-A1D2 01A-A1P2	DI001, 002 RC001, 002 MP001, 002, 003 DF001, 002
7091	Invalid condition at 'Gap In' time. It appears that another device is still selected ('Device Transfer Active' is already On).	See FSC 7081, items 1 and 2.	085 108 106 118	Drive control card Drive address switch Address switch cable Drive-adapter card	02A-A1B2 Drive Drive 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
7093	In read mode, an interblock gap was not detected within 2 mm after 'gap in.' (The timer is not set for the first read after the disconnected part of a locate.)	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013 123 124 125 111 199 248 264 265	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read ECC/CORR card Write bus terminator TCU0 (local) Write bus terminator TCU0 (remote) Write bus terminator TCU1 (local) Write bus terminator TCU1 (remote)	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Baseplate 01A-A1K2 01A-A1L2 01A-A1M2 01A-A1R2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 YG010 PA000, 001 MP001, 002, 003 DI001, 002 RC001, 002 WR000 SB001, 002 SB101, 102 SB201, 202 EC001, 002
7094	At 'gap in' time of a write operation, status from the drive does not indicate 'beginning of tape' or 'density mark successfully written.' The tape control unit ERP will be called to rewind and retry the write density mark operation.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 278 119 118	Drive control card Read detect card Read clock and format card Drive-adapter card	02A-A1B2 01A-A2Q2 01A-A1S2 01A-A1Q2	DD000, 001, 002, 003 RD001 RC001, 002 DI001, 002
70C1	After a read ID operation, an error was indicated in the buffer device status and error (BDSE) register. BDSE error groups 0 and 1 are reported in sense byte 17. BDSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 111 116	Buffer control card Buffer adapter card Buffer storage card Read ECC/CORR card Write data card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A1R2 01A-A1P2	BC001, 002, 003 BA001, 002, 003 BM100 EC001, 002 DF001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70C2	Block ID mismatch on read forward. The block just read from the tape does not have the expected block ID sequence number.	This error can be caused by operating conditions 1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 216 116 118 278 123 124 125 119 113 114 120 111 199 248 264 265	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card Buffer control card Buffer adapter card Read ECC/CORR card Write bus terminator TCU0 (local) Write bus terminator TCU0 (remote) Write bus terminator TCU1 (local) Write bus terminator TCU1 (remote)	02A-A1H2 02A-A1G2 Baseplate 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2 01A-A1L2 01A-A1K2 01A-A1R2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100 BC001, 002, 003 BA001, 002, 003 EC001, 002
70C3	Block ID mismatch on read backward. The block just read from the tape does not have the expected block ID sequence number.	This error can be caused by operating conditions. 1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 216 116 118 278 123 124 125 119 113 114 120	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card Buffer control card Buffer adapter card	02A-A1H2 02A-A1G2 Baseplate 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2 01A-A1L2 01A-A1K2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100 BC001, 002, 003 BA001, 002, 003
70C4	Block ID format error. Bit 0 and bits 8 – 11 of the 4-byte block ID are defined to always be 0. The block just read from the tape contains a block ID with at least one of these bits 1. Sense byte 9 contains the value from block ID byte 1.	This error can be caused by operating conditions. 1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113 114 120	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card Buffer control card Buffer adapter card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2 01A-A1L2 01A-A1K2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100 BC001, 002, 003 BA001, 002, 003
70C5	Either the buffer pointers or the buffer tables are wrong. This error is set when there is more data to be sent to the buffer than there is space as determined by the microcode.	Use the EAD for error codes D5nn and D6nn for failure isolation. See EAD 1 for "Error Code D5nn and D6nn." Select the correct error code depending on whether it is a channel to buffer, or buffer to device problem. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
70E1	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
70E2	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
70E3	Timed out waiting 100 microseconds for 'status in' in response to 'gap out.'	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70D1	Block ID format error. Bit 0 in byte 0 of the 4 byte block is defined to always be 0, but it was on in the block just read from the tape.	This error can be caused by operating conditions 1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70D2	Block ID mismatch on read forward in the TA90 Improved Data Recording Capability. The block just read from the tape does not have the expected block ID sequence number.	This error can be caused by operating conditions. 1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures." before continuing the next step. 2. Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70D3	Block ID mismatch on read backward in the TA90 Improved Data Recording Capability. The block just read from the tape does not have the expected block ID sequence number.	This error can be caused by operating conditions. 1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70D4	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70D5	Block ID mismatch error, the block just read from the tape is in TA90 format, and the previous block was a FCM1 (Format Change Mark 1), which indicates this block should have been in TA90 Improved Data Recording Capability	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3 Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70D6	Block ID mismatch error; the block just read from the tape is in TA90 format, and the previous block was in TA90 Improved Data Recording Capability. A Format Change Mark 1 is required to change formats. This mark was not detected.	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70D7	Block ID mismatch error; the block just read from the tape is in TA90 Improved Data Recording Capability. The tape control unit is not allowed to read blocks in this format.	This error can be caused by operating conditions. 1. Check the dip switch settings on the card at 01A-A1K2. See CARR-TCU 1200 for the switch setting procedure. If dip switch 3 is off, then the Improved Data Recording Capability is not allowed and the tape in the TA90 Improved Data Recording Capability cannot be read. 2. If the card at 01A-A1K2 does not have dip switches, then the Improved Data Recording Capability feature is not installed and the tape in the TA90 Improved Data Recording Capability cannot be read.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70D8	Block ID mismatch error; the block just read from the tape is in TA90 Improved Data Recording Capability, and the previous block was a FCM2 (Format Change Mark 2), which indicates this block should have been in TA90 format.	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70D9	Block ID mismatch error; the block just read from the tape is in TA90 Improved Data Recording Capability, and the previous block was in TA90 format. A Format Change Mark 2 is required to change formats. This mark was not detected.	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70DA	Block ID mismatch error; the block just read from the tape is a special mark (FCM 1 or FCM 2) and this tape control unit is not allowed to read blocks in this format.	This error can be caused by operating conditions. 1. Check the dip switch settings on the card at 01A-A1K2. See CARR-TCU 1200 for the switch setting procedure. If dip switch 3 is off, then the Improved Data Recording Capability is not allowed and the tape cannot be read. 2. If the card at 01A-A1K2 does not have dip switches, then the Improved Data Recording Capability feature is not installed and the tape cannot be read.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70DB	Block ID mismatch error, the block just read from the tape is an FCM 1 (Format Change Mark 1), and the previous block was neither TA90 format nor was it an FCM 2 (Format Change Mark 2).	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70DC	Block ID mismatch error; the block just read from the tape is an FCM 2 (Format Change Mark 2) and the previous block was neither TA90 Improved Data Recording Capability nor was it an FCM 1 (Format Change Mark 1).	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70DD	Block ID mismatch error; the block just read from the tape is a invalid special mark. It is not a FCM 1 (Format Change Mark 1) or an FCM 2 (Format Change Mark 2) which are the only valid special change marks.	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100

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FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70DE	Block ID mismatch error: the block just read from the tape has an invalid block ID flag field. The only valid block ID flags are TA90 format, TA90 Improved Data Recording Capability and special marks.	1. This error can indicate a compatibility problem. Check to see that the tape being read is compatible with all TA90 formats. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	062 064 216 116 118 130 131 132 123 124 125 119 113	Read preamplifier card Write power card Tape lifter solenoid Write data card Drive-adapter card Read detect card 1 Read detect card 2 Read detect card 3 Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 Base plate 01A-A1P2 01A-A1Q2 01A-A2R2 01A-A2S2 01A-A2T2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 YB010, 110 DF001, 002 DI001, 002 RD001 RD101 RD201 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
70E1	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
70E2	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
70E3	Timed out waiting 100 Microseconds for 'status in' response to 'gap out.'	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRU's associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 02A-A1Q2	DD000, 001, 002, 003 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
70E4	A buffer error was detected while writing this record. The error was indicated in the buffer device status and error (BDSE) register. BDSE error groups 0 and 1 are reported in sense byte 17. BDSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 181 - 01A-A1P2Y 158 - 01A-A1XKL 188 - 01A-A1ZKL 159 - 01A-A1YKL	114 120 113 111 116	Buffer control card Buffer adapter card Buffer storage card Read ECC/CORR card Write data card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A1R2 01A-A1P2	BC001, 002, 003 BA001, 002, 003 BM100 EC001, 002 DF001, 002
70E5	A write data flow error was detected while writing this record. FRU bits were on in the write status/error (WSE) register, or 'end write' did not come on in the WSE in the maximum time allowed. Sense byte 9 contains the value from the WSE.	1. Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 184 - 01A-A1ZPQ 158 - 01A-A1XKL 188 - 01A-A1ZKL 159 - 01A-A1ZKL 267 - 02A-A1B2Y 181 - 01A-A1P2Y 268 - 02A-A1B2Z	085 062 064 116 118 114 120	Drive control card Read preamplifier card Write power card Write data card Drive-adapter card Buffer control card Buffer adapter card	02A-A1B2 02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A1L2 01A-A1K2	DD000, 001, 002, 003 RP000 VP000 DF001, 002 DI001, 002 BC001, 002, 003 BA001, 002, 003
70E6	'Device xfer complete' was not on at the end of the buffer-to-write-data-flow transfer. Sense byte 9 contains the value from BDSE.	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114 117	Buffer adapter card Buffer control card Microprocessor card	01A-A1K2 01A-A1L2 01A-A1D2	BA001, 002, 003 BC001, 002, 003 MP001, 002, 003
7141	Density mark criterion not met after five retries. A valid density pattern must be detected in 40 out of 50 samples of the read pattern register (RPR).	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7142	An error occurred when trying to write the Density Mark. Timed out waiting (2.5 milliseconds) for density separator (BOB interrupt). Timer was set when write data flow began writing the separator.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7143	Timed out waiting (1.3 milliseconds) the interblock gap that follows the density separator.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7144	Timed out waiting for 'write end' in the write status/error (WSE) register when trying to write a density separator.	1 This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." TCC FRU associated with this error code is: 181 - 01A-A1P2Y	116	Write data card	01A-A1P2	DF001, 002
7145	Write data flow could not be successfully started for a density mark write operation. After the 'gap in,' 'write op' was not on in the write status/error (WSE) register.	1. Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7151	Read back check of an interblock gap detected that the interblock gap was too short. Minimum interblock gap length is 1.6 mm.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7152	Read back check of an interblock gap detected that the interblock gap was too long. Maximum interblock gap length is 3.0 mm.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 216 116 117 059 118 119 053 058 013	Write power card Read preamplifier card Drive control card Read detect card Tape lifter solenoid Write data card Microprocessor card Power amplifier board Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 Drive 01A-A1P2 01A-A1D2 Drive 01A-A1Q2 01A-A1S2 02A-A1K4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7153	Void was detected during a read operation. A valid block, tape mark, or erase gap was not detected within 67 ms after 'gap in.'	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 216 116 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Tape lifter solenoid Write data card Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 Drive 01A-A1P2 Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7154	Data transfer timeout was detected during a read operation. No valid interblock gap was detected within 67 ms after 'beg sync' was detected. (The timer is not set if the subsystem is in synchronous mode.)	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 216 116 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Tape lifter solenoid Write data card Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 Drive 01A-A1P2 Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7155	Data transfer timeout was detected during a read back check operation. No valid interblock gap was detected within 67 ms after 'beg sync' was detected. (The timer is not set if the subsystem is in synchronous mode.)	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 216 116 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Tape lifter solenoid Write data card Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 Drive 01A-A1P2 Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7158	Read back check of a tape mark determined that the tape mark was too long. Maximum tape-mark length is 1.3 mm	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 216 116 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Tape lifter solenoid Write data card Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 Drive 01A-A1P2 Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7159	Read back check timed out waiting for the interblock gap following an erase gap. Interblock gap must be detected within 5.9 milliseconds after the erase gap is started to be written.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 216 116 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Tape lifter solenoid Write data card Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 Drive 01A-A1P2 Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
715A	The buffer did not interrupt to end a write erase gap operation. The subsystem timed out 6.4 milliseconds after the write erase gap started.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
7161	Did not detect 'density separator' before 45 sets of samples were taken (1025 mm).	1. This error can be caused by STI-FIPS Adapter hardware or firmware. by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7163	Used by the support diagnostics to define added actions.	Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn."		FRUs are defined by the diagnostic failure ID that brought you here.		

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7171	In synchronous mode and the device transfer overran the channel transfer.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." This error could be caused by operating conditions. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
7172	The buffer indicated a device buffer overrun while doing a loop-write-to-read operation. This is an invalid condition.	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
7173	Device-buffer overrun occurred while reading and error recovery was in progress.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
7174	Maximum data buffer allocated to the MD is too small to read this record.	Record can only be read without using the MD.				
7181	Device-buffer overrun occurred twice while writing the same record.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 117	Buffer control card Buffer adapter card Microprocessor card	01A-A1L2 01A-A1K2 01A-A1D2	BC001, 002, 003 BA001, 002, 003 MP001, 002, 003
7182	Device-buffer transfer ended before the channel-buffer transfer of the same write record. Sense byte 9 contains the value from the buffer device status and error (BDSE) register.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
7191	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
7192	The write data flow could not be successfully started for a write operation that was not a beginning of tape. After 'gap in,' 'write op' was not on in the write status/error (WSE) register. Sense byte 9 contains the value from the WSE.	Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y	116	Write data card	01A-A1P2	DF001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
71A1	A tape mark was detected during a read operation with the 'ISG timeout count' equal to a one. This indicates that a block of data was not read previous to the tape mark. The error recovery program (ERP) will re-read the previous block.	Note: Suspect a possible tape media failure if only one volume is failing. 1. Run GMP option 100A for failure isolation. See CE/HSC 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	062 064 085 063 013 216 059 116 118 278 119	Read preamplifier card Write power card Drive control card Write card Head and guide assembly Tape lifter solenoid Power amplifier board Write data card Drive-adapter card Read detect card Read clock and format card	02A-A1H2 02A-A1G2 02A-A1B2 02A-A1J4 Baseplate Drive Drive 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A1S2	RP000 VP000 DD000, 001, 002, 003 WR000 DF001, 002 DI001, 002 RD001 RC001, 002
7420	This can be a normal condition. For some write conditions, the drive can have limited instantaneous speed variations (ISV), and when the speed is more than the limits, write errors can occur. The ISV can cause changes in the write data density. Based on a pre-determined limit of ISV, the acceleration check is turned on and the microcode repeats the write before a write error occurs.	If this bit is on and write errors are occurring, troubleshoot the write errors. If this bit freq ently occurs without any write error conditions, it can be an indication of wear of the tape media, mechanical tape path parts, or the read/write head. Note: Suspect a possible tape media failure if only one volume is failing. 1. Run GMP option 100A for failure isolation. See CE/HSC. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn" 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	012 277 013 014 278 119	Decoupler assembly Head compliant guides Head and guide assembly Tension transducer Read detect card Read clock and format card	Drive Drive Drive Drive 01A-A2Q2 01A-A1S2	 RD001 RC001, 002
74nn	A read back check error occurred on the last record. The nn indicates the kind of error as follows: Bits 0 – 1 = Reserved Bit 2 = See FSC/Error Code 7420 Bit 3 = No 'end sync' was detected Bit 4 = FRU bits on in the read error register (RER) Bit 5 = 'Data check' (CRC error) on in the read status register (RSR) Bit 6 = 'Data check' (uncorrected error) on in the RSR Bit 7 = 'Multi-track error' on in the RSR. Sense byte 9 contains the value from the read error register (RER).	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. To determine which EAD to use, see the bits that are on in 'nn,' in error code 74nn. Use the "No-End-Sync" (see EAD 1) first, if the corresponding bit is on. For error codes: 7401 - Use D0nn and D8nn EAD 7402 - Use D0nn and D8nn EAD 7404 - Use D0nn and D8nn EAD 7408 - Use D0nn and D8nn EAD 7410 - Use No-End-Sync EAD 7420 - See FSC/Error Code 7420 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 184 - 01A-A1ZPQ 158 - 01A-A1XKL 185 - 01A-A1XRS 159 - 01A-A1YKL 186 - 01A-A1YRS 181 - 01A-A1P2Y 188 - 01A-A1ZKL	062 064 116 118 278 123 124 125 119 111 114 120	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Read ECC/CORR card Buffer control card Buffer adapter card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1R2 01A-A1L2 01A-A1K2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 EC001, 002 BC001, 002, 003 BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7501	Two-bit ID mismatch. The value in the read residual count (RRC) register is not equal to the value in the logical device table (LDT). Sense byte 9 contains the value from the RRC.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000
7502	Timed out waiting 100 microseconds for a 'status in' response to 'gap out.'	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
7503	During read back check of a record, got an interrupt due to 'end sync', but timed out waiting for interblock gap (100 microseconds).	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	064 062 085 278 116 216 059 117 118 119 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Write data card Tape lifter solenoid Power amplifier board Microprocessor card Drive-adapter card Read clock and format card Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1P2 Drive Drive 01A-A1D2 01A-A1Q2 01A-A1S2 02A-A1J4 02A-A1 Drive	VP000 RP000 DD000, 001, 002, 003 RD001 DF001, 002 MP001, 002, 003 DI001, 002 RC001, 002 WR000

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7504	Excessive ECC errors while writing this tape	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. To determine which EAD to use, see the bits that are on in 'nn,' in error code 74nn. Use the "No-End-Sync" (see EAD 1) first, if the corresponding bit is on. For error codes: 7401 - Use D0nn and D8nn EAD 7402 - Use D0nn and D8nn EAD 7404 - Use D0nn and D8nn EAD 7408 - Use D0nn and D8nn EAD 7410 - Use No-End-Sync EAD 7420 - Use D0nn and D8nn EAD 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 184 - 01A-A1ZPQ 158 - 01A-A1XKL 185 - 01A-A1XRS 159 - 01A-A1YKL 186 - 01A-A1YRS 181 - 01A-A1P2Y 188 - 01A-A1ZKL	062 064 116 118 278 123 124 125 119 111 114 120	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Read ECC/CORR card Buffer control card Buffer adapter card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1R2 01A-A1L2 01A-A1K2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 EC001, 002 BC001, 002, 003 BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
76nn	A read error occurred on the last record. The nn indicates the cause of the error as follows: Bit 0 = Acceleration check on in read error register (RER) Bit 1 = 'Device xfr complete' not on in the buffer device status and error (BDSE) register Bit 2 = 'Data check' (CRC error) on in the read status register (RSR) Bit 3 = 'Data check' (uncorrected error) on in the RSR Bit 4 = 'Multi-track error' on in the RSR Bit 5 = FRU bits on in the read error register (RER) Bit 6 = BDSE error indicated Bit 7 = No 'end sync' was detected	The contents of sense byte 9 for the above nn bits are: Bit 0 = RER Bit 1 = BDSE group 2 and 3 Bit 2 = RER Bit 3 = RER Bit 4 = RER Bit 5 = RER Bit 6 = BDSE group 0 and 1 Bit 7 = RER 1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. The cables associated with this failure are: • Single drive failures - cable groups 66 and 67 • Multiple drive failures - cable groups 61, 62, and 65 3. To determine which EAD to use, see the bits that are on in 'nn' of error code 76nn. Use the "No-End-Sync" EAD only, if bits 1 or 7 are on. For error codes: 7601 - Use the No-End-Sync EAD 7602 - Use the D6nn EAD 7603 - Use the D0nn and D8nn EAD 7608 - Use the D0nn and D8nn EAD 7610 - Use the D0nn and D8nn EAD 7620 - Use the D0nn and D8nn EAD 7640 - Use the No-End-Sync EAD 7680- Use the D0nn and D8nn EAD 4. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 184 - 01A-A1ZPQ 158 - 01A-A1XKL 185 - 01A-A1XRS 159 - 01A-A1YKL 186 - 01A-A1YRS 181 - 01A-A1P2Y	062 064 116 118 278 123 124 125 119 120 114 111	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer adapter card Buffer control card Read ECC/CORR card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1K2 01A-A1L2 01A-A1R2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BA001, 002, 003 BC001, 002, 003 EC001, 002
7701	Timed out waiting 100 microseconds for 'status in' response to 'gap out.'	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
7702	256 erase gaps have been read without detecting a block or tape mark.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step 2. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 3. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." This error could result from operating conditions. TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	062 064 116 118 278 123 124 125 119 113	Read preamplifier card Write power card Write data card Drive-adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Buffer storage card	02A-A1H2 02A-A1G2 01A-A1P2 01A-A1Q2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1M2	RP000 VP000 DF001, 002 DI001, 002 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 BM100
7710	A buffer timeout occurred while reversing the data in the buffer.	Use the EAD for error codes D6nn and D7nn for failure isolation. See EAD 1 for error codes D6nn and D7nn.	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
7711	A buffer error occurred while reversing the data in the buffer.	Use the EAD for error codes D6nn and D7nn for failure isolation. See EAD 1 for error codes D6nn and D7nn.	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
8000	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
8003	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.	121	Status store basic card	01A-A1G2	SS001, 002
8005	The tape control unit raised 'select out' and waited for the bus to clear. The bus did not clear in 200 microseconds. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
8007	Timed out waiting 200 microseconds for 'address in' response from the drive. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 059 049 108 107 105 118 199 248 265	Drive control card Power amplifier board Logic board to pwr amp J2 cable Drive address switch Reset switch Online/Offline switch Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 Drive Drive Drive Drive Drive 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 PA000, 001 PA000, 001 DI001, 002
8009	Timed out waiting 200 microseconds for 'address in' to become not active during initial selection (tape control unit to drive). Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
800A	Hardware detected a drive adapter error. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 268 - 02A-A1B2Z 267 - 02A-A1B2Y	085 118 134 115	Drive control card Drive-adapter card Control store card Maintenance adapter card	02A-A1B2 01A-A1Q2 01A-A1C2 01A-A1E2	DD000, 001, 002, 003 DI001, 002 CS001, 002 MA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
800C	The drive did not return the same address as the tape control unit requested. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
8100	No patches available for this drive EC level.	This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures."				
8101	Hardware incompatibility.	This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures."				
8102	Hardware incompatibility.	This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures."				
8202	The Unload switch was pressed.	This is a normal operating condition.				
8204	The Rewind switch was pressed.	This is a normal operating condition.				
8208	An error occurred while servicing the alert after an Autospace command.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
8210	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, no LVL7.				
8211	An alert was received from this drive. The Sense command was not successful, and the drive has not been microcode patched. The tape control unit sends a Reset A to reset this drive.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
8218	The patched bit is not set in the drive status. The drive must be patched to continue.	1. This is possibly an interconnection problem. Look for other error codes to troubleshoot first. 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	118 085	Drive-adapter card Drive control card	01A-A1Q2 02A-A1B2	DI001, 002 DD000, 001, 002, 003
8300	Timed out waiting 750 microseconds for 'clock B' response from the drive during a drive to tape control unit data transfer. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
8301	An error occurred during a drive to tape control unit data transfer. Sense byte 9 contains the value from the device status/error register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
840A	Timed out waiting for 'clock B' to become active. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
840C	'Clock B' did not become not active after a tape control unit to drive transfer. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
840D	The drive did not take the correct number of bytes. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
84D1	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, no LVL7.				
85nn	A disk error occurred while attempting to read in drive patches.	See the FSI for FSC EDnn where the 'nn' of 85nn equals the low order byte of EDnn.	258 0R6 134 138	Media IML diskette drive Control store card V Regulator Card	 See LOC 1 01A-A1C2 01A-A1T2	 CS001, 002 RG001
8600	Timed out in the status sequance during initial selection. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
8601	Timed out in the status sequence during the ending sequence. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
86A0	Drive unit check on a Sense command. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
86C0	Bit 0 of status byte 2 from the drive did not indicate the correct tape control unit.	1. This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing to the next step. 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." 3. The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 108 118	Drive control card Drive address switch Drive-adapter card	02A-A1B2 See LOC 1 01A-A1Q2	DD000, 001, 002, 003 SN001, 002 DI001, 002
86F0	'Address in' was active during the beginning status transfer.	1. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." 2. See error code 8Fnn in this FSI. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
86F1	'Address in' was active during the ending status transfer.	1. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." 2. See error code 8Fnn in this FSI. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
8803	The tape control unit timed out during a serial sequence routine.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."				
8804	The 'repositioning in' line is active at the beginning of the serial sequence.	This error may be the result of an error on a different drive on this bus (local or remote). Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
8805	The serial interconnection is not assigned to this tape control unit.	1. See MD/SDISK 1 for "Device Status" to display the device status. 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
89nn	The tape control unit received check 1 from the drive. The 'nn' (bits 1-3) indicates the FRU code taken from the bus at the time of the error as follows: Bit 1 = Adapter card Bit 2 = Processor card Bit 3 = Digital servo card Any combination of the bits (or none) is valid. Sense byte 9 contains the value from the device/error (DSE) register. Note: The FRU code indicates which card detected the error, not necessarily the failing FRU	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-88. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118 199 248 265	Drive control card Drive-adapter card Write bus terminator TCU0 local Write bus terminator TCU0 remote Write bus terminator	02A-A1B2 01A-A1Q2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TCU 1-8	DD000, 001, 002, 003 DI001, 002
8Ann	A disk error occurred while reading in the functional microcode.	For FRU list and additional comments, use FSC EDnn. The nn is same as 8Ann.	138	V Regulator Card	01A-A1T2	RG001
8Bnn	A device status/error (DSE) occurred during the ending sequence. The nn indicates the DSE contents. Sense byte 9 contains the value from the DSE.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-88. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8C01	Unit check was detected in the drive status during the ending sequence. Sense byte 9 contains the value from the device status/error (DSE) register.	1. This error code must be accompanied by a drive error code. Use the FRU list from the drive error code (found in this FSI). 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-88. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8C03	The tape control unit timed out waiting for the 'status in' line to become active during an ending sequence. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-88. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8C07	The tape control unit timed out waiting for the 'status in' line to become not active during an ending sequence of a non class 3 operation. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-88. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8CDF	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
8Dnn	An error occurred in the device status/error (DSE) register during initial selection. The nn indicates the contents of the DSE. Sense byte 9 contains the value from the DSE.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8E05	The tape control unit timed out waiting for 'status in' from the drive. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 109 116 134	Drive control card Drive-adapter card Operator panel switchboard Write data card Control store card	02A-A1B2 01A-A1Q2 Drive 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 WD000, 001 DF001, 002 CS001, 002
8E06	A unit check was detected in the status during initial selection. Sense byte 9 contains the value from the device status/error (DSE) register.	1. This error code must be accompanied by a drive error code. Use the FRU list from the drive error code in this FSI. 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8EA7	The tape control unit has received an A7 error code from the drive for five retries. An A7 error code indicates a drive early start from an aborted command.	This is not a tape control unit hardware failure. 1. See CHK A7 in this FSI. 2. See "Diagnostic Identification Code Table" on DIAG 3, for diagnostic section EE40. TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002
8EAC	The tape control unit has received an AC error code from the drive for five retries. The AC error code indicates a parallel motion command to the drive with a not completed disconnected command.	This is not a tape control unit hardware failure. 1. See CHK AC in this FSI. 2. See "Diagnostic Identification Code Table" on DIAG 3, for diagnostic section EE40. TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 267 - 02A-A1B2Y 184 - 01A-A1ZPQ 268 - 02A-A1B2Z	085 118 116 134	Drive control card Drive-adapter card Write data card Control store card	02A-A1B2 01A-A1Q2 01A-A1P2 01A-A1C2	DD000, 001, 002, 003 DI001, 002 DF001, 002 CS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
8Fnn	The tape control unit received a check 1 from the drive. The nn (bits 1-3) indicates the FRU code taken from the bus at the time of the error as follows: Bit 1 = Adapter card Bit 2 = Processor card Bit 3 = Digital servo card Any combination of the bits (or none) is valid. Sense byte 9 contains the value from the device status/error (DSE) register. **Note:** The FRU code indicates which card detected the error, not necessarily the failing FRU.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Write data flow card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
9000	Two drives are reporting the same physical address. Sense byte 30 shows the logical and physical address of one drive, and sense byte 9 shows the logical address of the other drive.	Ensure that the drive address switches are set correctly. TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 129 118	Drive control card Physical address switch Write data flow card	02A-A1B2 See LOC 1 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
9010	The drive status byte indicates that Repositioning was on for more than 250 milliseconds. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Write data flow card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
9011	A Rew or Locate command was sent, but the alert from the drive indicated that completion was not received. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Write data flow card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
9012	There was no alert from the device 100 seconds after issuing a Data Security Erase command.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Write data flow card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
9015	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
9016	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
9017	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
9018	A tape mark is being written with records in the buffer. This error should not occur.	Call your next level of support.				
9600	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
9601	The tape control unit timed out waiting for 'gap in' from the drive. Sense byte 9 contains the value from the device status/error (DSE) register.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 267 - 02A-A1B2Y 192 - 01A-A1XCDE 268 - 02A-A1B2Z 193 - 01A-A1YCDE	085 118 117 134 115 199 248 265	Drive control card Write data flow card Microprocessor card Control store card Maintenance adapter card Write bus terminator TCU0 (local) Write bus terminator TCU0 (remote) Write bus terminator	02A-A1B2 01A-A1Q2 01A-A1D2 01A-A1C2 01A-A1E2 See CARR-TCU 1-8 See CARR-TCU 1-8 See CARR-TUC 1-8	DD000, 001, 002, 003 DI001, 002 MP001, 002, 003 CS001, 002 MA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
9602	The drive serially started, but no prep move executed bit was shown in the drive status. Prep move executed indicates that the serial command has started.	Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 80-86. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	085 118	Drive control card Drive-adapter card	02A-A1B2 01A-A1Q2	DD000, 001, 002, 003 DI001, 002
98nn	The microcode error match code was set to X'98nn' by the MD and a drive error command received a drive error code of X'nn'.	For FRU list and additional comments, use FSC 00nn. The nn is same as 98nn.				
A110	At the start of a buffer to channel transfer, a buffer error occurred while trying to read the packet header. The error is indicated in the buffer channel status and error (BCSE) register. BCSE error groups 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI for "Cable Group Table."	114 120 113	Buffer control card Buffer adapter card Buffer storage card	01A-A1L2 01A-A1K2 01A-A1M2	BC001, 002, 003 BA001, 002, 003 BM100
A111	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
A112	Packet ID sequence error; at the start of a buffer to channel transfer, the current packet does not have the expected packet ID sequence number.	This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. TCC FRU's associated with this failure are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113	Buffer control card Buffer adapter card Buffer storage card	01A-A1L2 01A-A1K2 01A-A1M2	BC001, 002, 003 BA001, 002, 003 BM100
A113	The tape control unit timed out waiting for CMS Bit 0 to be turned off following a channel control reset.	The cables associated with this failure are in cable groups 28 and 50. See FSI for "Cable Group Table."	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A119	Bit 6 in the CMS register is on during a read operation. But, because this bit should always be off, a check 1 is initiated.	Check the dip switch settings on the 01A-A1K2 card. Switch position 3 should be off. See CARR-TCU 1-2 "FRU120" for the location of the switch setting procedure.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003
A11A	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
A120	The tape control unit timed out waiting for CMS Bit 0 to be turned off following a channel control reset.	The cables associated with this failure are in cable groups 28 and 50. See FSI for "Cable Group Table."	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A129	Bit 6 in the CMS register is on during a write operation. But, because this bit should always be off, a check 1 is initiated.	Check the dip switch settings on the 01A-A1K2 card. Switch position 3 should be off. See CARR-TCU 1-2 "FRU120" for the location of the switch setting procedure.	120	Buffer adapter card	01A-A1K2	BA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
A130	A buffer-to-channel transfer caused a check 2 condition. The error is indicated in the buffer channel status and error (BCSE) register. BCSE error groups 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	114 120 113 133 900 152 901 903 197	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply TCU address switch	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102 IT001, 002, 003
A131	At the end of a buffer-to-channel transfer, channel pointer equal stop was not on in the buffer channel status and error (BCSE) register, but any channel error was not on either. BCSE error groups 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	117 114	Microprocessor card Buffer control card	01A-A1D2 01A-A1L2	MP001, 002, 003 BC001, 002, 003
A135	The channel adapter detected bad parity during data transfer from buffer-to-channel. The buffer did not detect bad parity on the same transfer.	For error isolation, run the Support Diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	133 152 120	Channel adapter card (channel A) Channel adapter card (channel B) Buffer adapter card	01A-A2C2 01A-A2D2 01A-A1K2	CA001, 002 CA101, 102 BA001, 002, 003
A13A	At the end of a buffer-to-channel transfer, a buffer error occurred when deleting the current packet. BCSE error groups 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A140	The tape control unit timed out waiting 100 microseconds for status from the buffer (write ID complete) during an MP Write operation.	For error isolation, run the Support Diagnostics EE32 and EE33. The cables associated with this failure are in cable group 50. See FSI 1 for "Cable Group Table." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A141	An error was indicated in the buffer channel status and error (BCSE) register after the MP Write operation following a channel-to-buffer transfer. BCSE error groups 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
A142	A bad return code was received from Set Record Complete at the end of a channel-to-buffer transfer. Sense byte 9 gives the error type as follows 4 = 0 bytes transferred—the block size is less than or equal to 4. This implies that the block has no data bytes. 5 = 0 length record—the block size is exactly 0. 6 = Negative free-bytes—the block size subtracted from the free-bytes caused a negative result.	For error isolation, run the Support Diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A143	MP write operation failure following a channel buffer transfer. BCR did not indicate the transfer of any bytes for the block ID.	The cables associated with this feature are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A149	At the end of a channel to buffer transfer, a Buffer timeout occurred while the tape control unit was writing the packe. trailer. BCSE error groups 0 and 1 are reported in sense byte 17 and BCSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A14A	At the end of a channel-to-buffer transfer, a buffer error occurred while writing the packet trailer. BCSE error group 0 and 1 are reported in sense byte 17. BCSE error group 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A14B	At the end of a channel-to-buffer transfer, a buffer error occurred while writing the packet header. BCSE error group 0 and 1 are reported in sense byte 17. BCSE error group 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A14C	At the end of a channel-to-buffer transfer, a buffer error occurred while trying to set the packet complete. BCSE error group 0 and 1 are reported in sense byte 17. BCSE error group 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A14D	A bad return code was received from Set Packet complete at the end of a channel-to-buffer transfer. Sense byte 9 gives the error type as follows: 4 = 0 bytes transferred—the block size is less than or equal to 4. This implies that the block has no data bytes. 5 = 0 length record—the block size is exactly 0. 6 = Negative free-bytes—the block size subtracted from the free-bytes caused a negative result.	For error isolation, run the Support Diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A14E	MP write operation failure following a channel-to- buffer transfer. The BCR did not indicate the transfer of any bytes.	For error isolation, run the Support Diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A14F	Exactly 0 bytes of data were transferred from the channel while in the enhanced data recording mode.	For error isolation, run the Support Diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM100
A170	A channel-to-buffer transfer caused a check 2 condition. The error is indicated in the buffer channel status and error (BCSE) register. BCSE error groups 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 121 122 133 126 152 197	Buffer control card Buffer adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Power/POR card Channel adapter card (channel B) TCU address switch	01A-A1L2 01A-A1K2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2H4 01A-A2D2 See LOC 1	BC001, 002, 003 BA001, 002, 003 SS001, 002 SM001, 002 CA001, 002 PR001 CA101, 102
A175	A channel adapter detected bad parity (BOPE) during a data transfer from Channel-to-Buffer.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	133 900 152 901 903	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply	01A-A2C2 02A-L 01A-A2D2 02A-R	CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
A190	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
A191	A buffer error occurred while writing an FCM (Format Change Mark) into the buffer with an MP Write Op. BCSE error group 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM200
A192	The tape control unit timed out waiting 100 microseconds for status from the buffer (Write ID complete) during an MP Write operation. BCSE error group 0 and 1 are reported in sense byte 17. BCSE error groups 2 and 3 are reported in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM200
A193	An error occurred while trying to put a FCM (Format Change Mark) in the buffer.	For error isolation, run the support diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114 113	Buffer adapter card Buffer control card Buffer storage card	01A-A1K2 01A-A1L2 01A-A1M2	BA001, 002, 003 BC001, 002, 003 BM200
A2nn	A channel-to-buffer transfer caused a check 2 condition. nn = Active error bits in the CTE0 register.	This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing with the next step. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 121 122 133 126 152 197	Buffer control card Buffer adapter card Status store basic card Status store communications card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Power/POR card Channel adapter card (channel B) TCU address switch	01A-A1L2 01A-A1K2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2H4 01A-A2D2 See LOC 1	BC001, 002, 003 BA001, 002, 003 SS001, 002 SM001, 002 CA001, 002 PR001 CA101, 102
A3nn	A buffer-to-channel transfer caused a check 2 condition. nn = Active error bits in the CTE0 register.	This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	114 120 113 133 900 152 901 903 197	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply TCU address switch	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102
A430	During a read, an attempt was made to run at a channel data rate of 4.5 megabytes per second. The hardware was not able to support this data rate. A message is sent to the host and the data transfer is attempted at a slower data rate.	This is an operating condition. Load balancing was attempted on the remote tape control unit, and that tape control unit does not support a 4.5-megabyte channel data rate.				
A431	During a read, the tape control unit timed out waiting for transfer complete and any channel error is not on in either the BCSE or the CMS registers.	For error isolation, run the support diagnostics EE32 and EE33. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A432	The tape control unit timed out waiting for the buffer control end or the channel op complete bits to be set in either the BCSE or the CMS registers.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A441	During a write, the tape control unit timed out waiting for transfer complete and any channel error is not on in the BCSE register. BCSE error group 0 and 1 *are* in sense byte 17, and BCSE error group 2 *are* in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
A432	CMS Bit 0 (Improved Data Recording Capability format busy bit) remained active following a buffer-to-channel transfer.	The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A440	During a write, an attempt was made to run at a channel data rate of 4.5 megabytes per second. The hardware was not able to support this data rate. A message is sent to the host and the data transfer is attempted at a slower rate.	This is an operating condition. Load balancing was attempted on the remote tape control unit, and that tape control unit does not support the 4.5-megaby[illegible] channel data rate.				
A441	During a write, the tape control unit timed out waiting for transfer complete and any channel error is not on in the BCSE register. BCSE error group 0 and 1 are in sense byte 17, and BCSE error group 2 are in sense byte 9.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A442	CMS Bit 0 (Improved Data Recording Capability format busy bit) remained active following a channel-to-buffer transfer.	The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	120 114	Buffer adapter card Buffer control card	01A-A1K2 01A-A1L2	BA001, 002, 003 BC001, 002, 003
A5nn	A channel-to-buffer transfer caused a check 2 condition. nn = active error bits in the CTEO register and the CPEO register contents are reported in sense bytes 16 and 17 as DCnn.	This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing with the next step. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 133 152 197	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) Channel adapter card (channel B) TCU address switch	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 01A-A2D2 See LOC 1	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102
A6nn	A channel-to-buffer transfer caused a check 2 condition. nn = active error bits in the CTEO register and the CTXE register contents are reported in sense bytes 16 and 17 as DCnn.	This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing with the next step. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 133 152 197	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) Channel adapter card (channel B) TCU address switch	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 01A-A2D2 See LOC 1	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102
A7nn	A channel-to-buffer transfer caused a check 2 condition. nn = active error bits in the CTEO register and the CPEO register contents are reported in sense bytes 16 and 17 as DCnn.	This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing with the next step. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 121 122 126 133 152 197	Buffer control card Buffer adapter card Status store basic card Status store communication card Power/POR card Channel adapter card (channel A) Channel adapter card (channel B) TCU address switch	01A-A1L2 01A-A1K2 01A-A1G2 01A-A1F2 01A-A2H2 01A-A2C2 01A-A2D2 See LOC 1	BC001, 002, 003 BA001, 002, 003 SS001, 002 SM001, 002 PR001 CA001, 002 CA101, 102
A8nn	A buffer-to-channel transfer caused a check 2 condition. nn = active error bits in the CTEO register and the CTXE register contents are reported in sense bytes 16 and 17 as DCnn.	This error can be caused by other than TA90 hardware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing with the next step. The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 121 122 126 133 152 197	Buffer control card Buffer adapter card Status store basic card Status store communication card Power/POR card Channel adapter card (channel A) Channel adapter card (channel B) TCU address switch	01A-A1L2 01A-A1K2 01A-A1G2 01A-A1F2 01A-A2H2 01A-A2C2 01A-A2D2 See LOC 1	BC001, 002, 003 BA001, 002, 003 SS001, 002 SM001, 002 PR001 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
B010	Statistical analysis of temporary hardware errors indicates a hardware malfunction in the tape control unit. If sense byte 14 = B1, then byte 15 = type of temporary errors that are unacceptable: Bit 0 = Write criteria error threshold exceeded 1 = Write criteria event threshold exceeded 2 = Write ECC threshold exceeded 3 = Reserved 4 = Read criteria error threshold exceeded 5 = Read criteria event threshold exceeded 6 = Read ECC threshold exceeded 7 = Device Excessive Cleans	Bit 7 of byte 15 (device excessive cleans) may be the result of operator not cleaning the drive OR deposits in the tape path that are not removed by the cleaning cartridge	278 123 124 125 119 111 116 118	Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Read ECC/CORR card Write data card Drive-adapter card	01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1R2 01A-A1P2 01A-A1Q2	RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 EC001, 002 DF001, 002 DI001, 002
B011	Statistical analysis of temporary hardware errors indicates a hardware malfunction in the string of drives addressed 0-7. Sense byte 12 identifies drives within the string that are failing: Bit Drive 0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 If sense byte 14 = B1, then byte 15 = type of temporary errors that are unacceptable: Bit 0 = Write criteria error threshold exceeded 1 = Write criteria event threshold exceeded 2 = Write ECC threshold exceeded 3 = Reserved 4 = Read criteria error threshold exceeded 5 = Read criteria event threshold exceeded 6 = Read ECC threshold exceeded 7 = Device Excessive Cleans	1. The drive FRU listed as possible cause of this error may be located in any drive attached to the failing string of drives. 2. Bit 7 of byte 15 (device excessive cleans) may be the result of operator not cleaning the drive OR deposits in the tape path that are not removed by the cleaning cartridge.	278 062 199	Read detect card Read preamplifier card Write bus terminator	01A-A2Q2 02A-A1H2 See LOC 1	RD001 RP000
B012	Statistical analysis of temporary hardware errors indicates a hardware malfunction in the string of drives addressed 8-F. Sense byte 13 identifies drives within the string that are failing: Bit Drive 0 8 1 9 2 A 3 B 4 C 5 D 6 E 7 F If sense byte 14 = B1, then byte 15 = type of temporary errors that are unacceptable: Bit 0 = Write criteria error threshold exceeded 1 = Write criteria event threshold exceeded 2 = Write ECC threshold exceeded 3 = Reserved 4 = Read criteria error threshold exceeded 5 = Read criteria event threshold exceeded 6 = Read ECC threshold exceeded 7 = Device Excessive Cleans	1. The drive FRU listed as possible cause of this error may be located in any drive attached to the failing string of drives. 2. Bit 7 of byte 15 (device excessive cleans) may be the result of operator not cleaning the drive OR deposits in the tape path that are not removed by the cleaning cartridge.	278 062 199	Read detect card Read preamplifier card Write bus terminator	01A-A2Q2 02A-A1H2 See LOC 1	RD001 RP000
B013	Statistical analysis of temporary hardware errors indicates a hardware malfunction in the drive unit. If sense byte 14 = B1, then byte 15 = type of temporary errors that are unacceptable. Bit 0 = Write criteria error threshold exceeded 1 = Write criteria event threshold exceeded 2 = Write ECC threshold exceeded 3 = Reserved 4 = Read criteria error threshold exceeded 5 = Read criteria event threshold exceeded 6 = Read ECC threshold exceeded 7 = Device Excessive Cleans	Bit 7 of byte 15 (device excessive cleans) may be the result of operator not cleaning the drive OR deposits in the tape path that are not removed by the cleaning cartridge.	062 063 216 013 059 064 085	Read preamplifier card Write card Tape lifter solenoid Head and guide assembly Power amplifier board Write power card Drive control card	02A-A1H2 02A-A1J4 Drive Drive Drive 02A-A1G2 02A-A1B2	RP000 WR000 VP000 DD000, 001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
DF00	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
DF10	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
DF11	Microcode detected error.	Refer to SPROC 1 and perform procedure A After completing procedure A, call your next level of support				
DF12	Microcode detected error.	Refer to SPROC 1 and perform procedure D Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7				
DF13	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
DF14	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: MODULE = LVL7				
DF16	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
DF20	Microcode detected error	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
DF21	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
DF22	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support				
DF23	Microcode detected error.	Refer to SPROC 1 and perform procedure D. Set trace options as follows: CHANNEL, DRIVE, MODULE, LVL7.				
DF50	A buffered log overflow has occurred in a Tape Control Unit supporting the extended buffer log. A read buffered log command is requested.	This is a normal operating condition.				
DF52	A rewind unload command has completed in a Tape Control Unit supporting the extended buffer log. A read buffered log command is requested.	This is a normal operating condition.				
DFF1	Microcode detected error. An unsolicited sense or read buffered log command has been received.	Call your next level of support. This code is a trace tool and never appears in the sense data. It is found only in the SNERM table.				
DFF2	Microcode detected error. A sense command has been received and sense data has been presented in response to UNIT CHECK status.	Call your next level of support. This code is a trace tool and never appears in the sense data. It is found only in the SNERM table.				
DFFD	Microcode detected error. This code is posted when an ERROR MATCH is detected and the option to force a Tape control unit dump is set.	Call your next level of support. Usually posted when SPROC procedure D has been involved. Perform SPROC procedure A and then call your next level of support.				
E040	Microcode detected error. This is a normal completion code for the diagnostic monitor.	Refer to SPROC 1 and perform procedure E. After completing procedure E, call your next level of support.				
E041	Incorrect number of data bytes in command parms.	Refer to SPROC 1 and perform procedure E.				
E042	Device requested by the MD is busy.	Refer to SPROC 1 and perform procedure E.				
E043	Invalid command data byte from the MD.	Refer to SPROC 1 and perform procedure E.				
E044	Invalid command sequence.	Refer to SPROC 1 and perform procedure E.				
E045	Drive must be reserved for this command.	Refer to SPROC 1 and perform procedure E.				
E046	Invalid command received.	Refer to SPROC 1 and perform procedure E.				
E047	Invalid channel command received.	Refer to SPROC 1 and perform procedure E.				
E048	Sense data available prior to executing this command.	Refer to SPROC 1 and perform procedure E.				
E049	Sense data available after executing last command.	Refer to SPROC 1 and perform procedure E.				
E04A	The diagnostic monitor has attempted to reserve the buffer switch (necessary for this command), but the switch was in use.	This is a normal occurrence during concurrent maintenance. Reissue the command. If the problem persists during a stand-alone operation, a faulty component may exist. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152 126	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B) Power/POR card	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2 01A-A2H4	SS001, 002 SM001, 002 CA001, 002 CA101, 102 PR001
E04B	An error occurred in processing the Write Channel Adapter Request Register order. The channel command was not performed	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 188 - 01A-A1ZKL 158 - 01A-A1XKL 189 - 01A-A1WFG 159 - 01A-A1YKL 190 - 01A-A1XFG 187 - 01A-A1ZFG 191 - 01A-A1YFG	133 152 121 122 120 114	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E04C	An error occurred in processing the Write Channel Adapter Channel Command order. The channel command was not performed	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are. 157 - 01A-A1WKL 188 - 01A-A1ZKL 158 - 01A-A1XKL 189 - 01A-A1WFG 159 - 01A-A1YKL 190 - 01A-A1XFG 187 - 01A-A1ZFG 191 - 01A-A1YFG	133 152 121 122 120 114	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003
E04D	An error occurred in processing the Diagnostic Interrupt Channel Adapter order. The channel command was not performed.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 188 - 01A-A1ZKL 158 - 01A-A1XKL 189 - 01A-A1WFG 159 - 01A-A1YKL 190 - 01A-A1XFG 187 - 01A-A1ZFG 191 - 01A-A1YFG	133 152 121 122 120 114	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003
E04E	The MA card did not respond to functional microcode.	Run MD/MA and BCU diagnostics. (See MD/SDISK 1.)	115 117	Maintenance adapter card Microprocessor card	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
E04F	The MD tried to execute a new command before the old command was complete.	Refer to SPROC 1 and perform procedure E.				
E051	Unit check-device not ready (sense data available).	Refer to SPROC 1 and perform procedure E.				
E052	Channel command retry status. The buffer does not currently contain the correct data to execute this command. Issue the RDCHST command until a device end is received, then reissue the command.	TCC FRUs associated with this error code are: 157 - 01A-A1WKL 189 - 01A-A1WFG 158 - 01A-A1XKL 190 - 01A-A1XFG 159 - 01A-A1YKL 191 - 01A-A1YFG 187 - 01A-A1ZFG 267 - 02A-A1B2Y 188 - 01A-A1ZKL 268 - 02A-A1B2Z	133 152 121 122 120 114 085	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card Drive control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2 02A-A1B2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003 DD000, 001, 002, 003
E053	A Read Buffer Pointer (RBP) command was received and there are no complete records in the buffer.	TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 133 900 152 901 903 119	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Read clock and format card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1S2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102 RC001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E054	Device reservation was attempted, but the buffer is already marked as allocated. This status may be an indication that the host has this device in use. End all host activity and retry the command	TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A A1XKL 188 - 01A-A1ZKL	114 120 113 133 900 152 901 903 119	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Read clock and format card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1S2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102 RC001, 002
E055	There was not enough buffer table area to create a buffer entry. Reissue this command.	TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 133 900 152 901 903 119	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Read clock and format card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1S2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102 RC001, 002
E056	Microcode cannot communicate with the addressed device.	Refer to SPROC 1 and perform procedure E.				
E057	The buffer is empty, or the data is not the correct type to perform this command; for example, attempting a Loop Write to Read command with no data in the buffer. Place the appropriate data in the buffer and reissue the command.	TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 133 900 152 901 903 119	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Read clock and format card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1S2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102 RC001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E058	An external register error has occurred prior to or during performance of this command	Use the EAD for error codes D1nn and Fnnn for failure isolation. See EAD 1 for "Error Code D1nn" and "Error Code Fnnn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 158 - 01A-A1XKL 159 - 01A-A1YKL 181 - 01A-A1P2Y 182 - 01A-A1E2W 184 - 01A-A1ZPQ 188 - 01A-A1ZKL 192 - 01A-A1XCDE 193 - 01A-A1YCDE	117 115 114 118 121 119 116 120	Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card	01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2	MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003
E059	Deferred unit check active for reserved device.	Refer to SPROC 1 and perform procedure E.				
E05A	TCU tried to execute a channel command while previous command was still in progress.	Refer to SPROC 1 and perform procedure E.				
E05B	An error match code was set by the MD and that error code was detected	This is an operating condition. This condition can only occur during error match code operation with the MD. If this condition occurs during customer operation, use the MD to turn off error matching. See MD/SDISK 1 for "Trace/Match Control."	121	Status store basic card	01A-A1G2	SS001, 002
E05C	Status store did not process a Reset Buffer Switch order. The channel may be unable to access the buffer because of the failure.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121	Status store basic card	01A-A1G2	SS001, 002
E05D	The channel adapter was unable to go into diagnostic mode at this time.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 903 126 122 141 121 120	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Power/POR card Status store communication card (This FRU is a part of the communicator feature.) Tape control unit switch panel card Status store basic card Buffer adapter card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A2H4 01A-A1F2 See LOC 1 01A-A1G2 01A-A1K2	CA001, 002 CA101, 102 PR001 SM001, 002 SS001, 002 BA001, 002, 003
E05E	A Reserve command was issued without first specifying a valid channel adapter.	Use the EAD for Status Store/Channel Adapter for failure isolation.	133 152 121 122 120 114	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003

Fault Symptom Index (FSI)

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E05F	A message was sent to the remote tape control unit with no response. The failure could be in the other tape control unit.	1. Run diagnostic section EE90 for failure isolation. See "Diagnostic Code Identification Table" on DIAG 3. 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
E062	Error occurred during execution of this device command.	Refer to SPROC 1 and perform procedure E.				
E063	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	Run BCU diagnostics. (See MD/SDISK 1.)	121	Status store basic card	01A-A1G2	SS001, 002
E064	Status store was unable to process a Reset Buffer Empty order.	Run BCU diagnostics. (See MD/SDISK 1.)	121	Status store basic card	01A-A1G2	SS001, 002
E065	The channel adapter was unable to process a Read Channel Adapter Device Condition order. The channel command was not performed.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 188 - 01A-A1ZKL 158 - 01A-A1XKL 189 - 01A-A1WFG 159 - 01A-A1YKL 190 - 01A-A1XFG 187 - 01A-A1ZFG 191 - 01A-A1YFG	133 152 121 122 120 114	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Buffer adapter card Buffer control card	01A-A2C2 01A-A2D2 01A-A1G2 01A-A1F2 01A-A1K2 01A-A1L2	CA001, 002 CA101, 102 SS001, 002 SM001, 002 BA001, 002, 003 BC001, 002, 003
E066	The buffer is currently in Improved Data Recording Capability Mode, and cannot be updated until this condition is reset.	This is an operating condition. Unload the tape (manually or by command) and reissue the command.				
E067	The leading interblock gap was not detected during performance of a Loop Write to Read command.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	064 062 085 278 118 119 035 043 047 212 219 063 058 013	Write power card Read preamplifier card Drive control card Read detect card Drive-adapter card Read clock and format card Vacuum hose assembly Decoupler vacuum hose Cleaner supply hose Vacuum supply hose Vacuum distribution tee Write card Logic board Head and guide assembly	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A1Q2 01A-A1S2 Drive Drive Drive Drive Drive 02A-A1J4 02A-A1 Baseplate	VP000 RP000 DD000, 001, 002, 003 RD001 DI001, 002 RC001, 002 WR000

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E068	An error was detected on the channel port of the buffer. An RDDGNST command can be issued to retrieve the channel buffer error groups (4 bytes).	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." TCC FRUs associated with this error code are 157 - 01A-A1WKL 182 - 01A-A1E2W 158 - 01A-A1XKL 184 - 01A-A1ZPQ 159 - 01A-A1YKL 188 - 01A-A1ZKL 181 - 01A-A1P2Y	114 120 113 117 116 118 115 119 121	Buffer control card Buffer adapter card Buffer storage card Microprocessor card Write data card Drive-adapter card Maintenance adapter card Read clock and format card Status store basic card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A1D2 01A-A1P2 01A-A1Q2 01A-A1E2 01A-A1S2 01A-A1G2	BC001, 002, 003 BA001, 002, 003 BM100 MP001, 002, 003 DF001, 002 DI001, 002 MA001, 002, 003 RC001, 002 SS001, 002
E069	An error was detected on the device port of the buffer. An RDDGNST command can be issued to retrieve the device buffer error groups (4 bytes).	Use the EAD for error code D6nn for failure isolation. See EAD 1 for "Error Code D6nn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120 113 133 900 152 901 903 119 118 116 134	Buffer control card Buffer adapter card Buffer storage card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) STI dc power supply Read clock and format card Drive adapter card Write data card Control store card	01A-A1L2 01A-A1K2 01A-A1M2 01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1S2 01A-A1Q2 01A-A1P2 01A-A1C2	BC001, 002, 003 BA001, 002, 003 BM100 CA001, 002 CA101, 102 RC001, 002 DI001, 002 DF001, 002 CS001, 002
E06B	A recovered CK1 has occurred in this Tape Control Unit.	Refer to SPROC 1 and perform procedure E.				
E06C	A read buffer pointer command was issued and the first record in the buffer is a tape mark.	Refer to SPROC 1 and perform procedure E.				
E06D	Status store could not process a Set Buffer Empty order.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121	Status store basic card	01A-A1G2	SS001, 002
E06E	An error occurred during the process of the set diagnose command during the long LWR.	Refer to SPROC 1 and perform procedure E.				
E06F	An error occurred during device selection sequence of the long LWR.	Refer to SPROC 1 and perform procedure E.				
E070	An error occurred during the device command sequence of the long LWR.	Refer to SPROC 1 and perform procedure E.				
E071	An error occurred during the set diagnose command taking the drive out of the long LWR.	Refer to SPROC 1 and perform procedure E.				
E072	A Read Buffer Pointer (RBP) command is required before the record can be deleted.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121	Status store basic card	01A-A1G2	SS001, 002
E073	The diagnostic monitor timed out waiting for completion of a Loop Write to Read command.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 185 - 01A-A1XRS 267 - 02A-A1B2Y 186 - 01A-A1YRS 268 - 02A-A1B2Z	064 062 085 278 123 124 125 119 111	Write power card Read preamplifier card Drive control card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Read ECC/CORR card	02A-A1G2 02A-A1H2 02A-A1B2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1R2	VP000 RP000 DD000, 001, 002, 003 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 EC001, 002
E074	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E075	An MD device reserve request was sent to the other tape control unit, but this tape control unit did not receive a response from the other tape control unit. The failure may be in the other tape control unit.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 133 152	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	SS001, 002 SM001, 002 CA001, 002 CA101, 102
E076	The channel adapter did not respond to a Diagnostic Mode order.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 121 903 126	Channel timeout card Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) Status store basic card STI dc power supply Power/POR card	01A-A2G2 01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2 01A-A2H4	CR001 CA001, 002 CA101, 102 SS001, 002 PR001
E077	Device already had an operation in progress at the time of this command.	Refer to SPROC 1 and perform procedure E.				
E078	IML complete.	Refer to SPROC 1 and perform procedure E.				
E079	Requested device is allocated to the other Tape Control Unit.	Refer to SPROC 1 and perform procedure E.				
E07A	Write data flow end not on in WSE	TCC FRUs associated with this error code are: 181 - 01A-A1P2Y	116 278	Write data flow card Read detect card	01A-A1P2 01A-A2Q2	DF001, 002 RD001
E07B	A message was sent to the remote tape control unit and no response was received. The problem may be in the other tape control unit.	TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
E07C	IML diskette failure.	See COMTABLE for further isolation.	258 086 134	IML diskette IML diskette drive Control storage card	See LOC 1 See LOC 1 01A-A1C2	CS001, 002
E07D	Drive still has active path assignment.	Information Message: Ensure that online is reset before proceeding.	121 122	Store status card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
E0FE	The maintenance package timed out waiting for a response.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	117 121 122 133 152	Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1D2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	MP001, 002, 003 SS001, 002 SM001, 002 CA001, 002 CA101, 102

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E0FF	The maintenance package timed out waiting for device end	1. Use the EAD for Status Store/Channel Adapter and Device Data Bus for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	117 121 122 133 152	Microprocessor card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Channel adapter card (channel A) Channel adapter card (channel B)	01A-A1D2 01A-A1G2 01A-A1F2 01A-A2C2 01A-A2D2	MP001, 002, 003 SS001, 002 SM001, 002 CA001, 002 CA101, 102
E100	A check 1 error was detected.	Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 188 - 01A-A ZKL 158 - 01A-A1XKL 189 - 01A-A1 NFG 159 - 01A-A1YKL 190 - 01A-A1 ZFG 181 - 01A-A1P2Y 191 - 01A-A1YFG 182 - 01A-A1E2W 192 - 01A-A1XCDE 184 - 01A-A1ZPQ 193 - 01A-A1YCDE 187 - 01A-A1ZFG	117 115 114 118 121 119 116 120 122 134 135	Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.) Control store card Control storage array card	01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2 01A-A1C2 01A-A1B2	MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002 CS001, 002 MS001, 002
E101	FRU bits are on in the maintenance tag in (MTI) register.	Use the EAD for error code D1nn for failure isolation. See EAD 1 for "Error Code D1nn." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117	Maintenance adapter card Microprocessor card.	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
E102	Maintenance tag in (MTI) register failure.	Use error code D1nn for failure isolation. See EAD 1 for "Error Code D1nn." TCC FRUs associated with this error code are: 182 - 01A-A1E2W	115	Maintenance adapter card	01A-A1E2	MA001, 002, 003
E103	Cannot communicate with the functional microcode.	Use the EAD for error code E103 for failure isolation. See EAD 1 for "Error Code E103." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 191 - 01A-A1YFG 187 - 01A-A1ZFG 192 - 01A-A1XCDE 189 - 01A-A1WFG 193 - 01A-A1YCDE 190 - 01A-A1ZFG	117 115 121 122	Microprocessor card. Maintenance adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1D2 01A-A1E2 01A-A1G2 01A-A1F2	MP001, 002, 003 MA001, 002, 003 SS001, 002 SM001, 002
E104	Timed out waiting for diagnostic monitor status.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117	Maintenance adapter card Microprocessor card	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
E105	Monitor status does not equal 40.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117	Maintenance adapter card Microprocessor card	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
E106	D register failure.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 182 - 01A-A1E2W	115	Maintenance adapter card	01A-A1E2	MA001, 002, 003

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E108	Microprocessor stopped.	Run GMP for failure isolation.	117 134 115	Microprocessor card Control store card Maintenance adapter card	01A-A1D2 01A-A1C2 01A-A1E2	MP001, 002, 003 CS001, 002 MA001, 002, 003
E109	Microprocessor will not stop.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117	Maintenance adapter card Microprocessor card	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
E110	The A register failed.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 182 - 01A-A1E2W	115	Maintenance adapter card	01A-A1E2	MA001, 002, 003
E111	Control storage data did not match.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117 169	Maintenance adapter card Microprocessor card A1Y1 to MD connector cable	01A-A1E2 01A-A1D2 01A-A1Y1	MA001, 002, 003 MP001, 002, 003 WX001
E112	The maintenance adapter will not perform a maintenance adapter command.	Run GMP for failure isolation. TCC FRUs associated with this error code are: 180 - 01A-A1ZCD 192 - 01A-A1XCDE 182 - 01A-A1E2W 193 - 01A-A1YCDE 183 - 01A-A1WCD	115 117 134 135 169	Maintenance adapter card Microprocessor card Control store card Control storage array card A1Y1 to MD connector cable	01A-A1E2 01A-A1D2 01A-A1C2 01A-A1B2 01A-A1Y1	MA001, 002, 003 MP001, 002, 003 CS001, 002 MS001, 002 WX001
E113	The local status store cannot communicate with the remote status store.	1. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." 2. Use the EAD for Dual Tape Control Unit for failure isolation. See EAD 1 for "Dual Tape Control Unit." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122	Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1G2 01A-A1F2	SS001, 002 SM001, 002
E114	The local status store failed.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	121 122 117	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Microprocessor card	01A-A1G2 01A-A1F2 01A-A1D2	SS001, 002 SM001, 002 MP001, 002, 003
E115	Maintenance adapter to microprocessor connection error.	Use the EAD for error codes Fnnn and D1nn for failure isolation. See EAD 1 for "Error Code Fnnn" and "Error Code D1nn." TCC FRUs associated with this error code are: 180 - 01A-A1ZCD 192 - 01A-A1XCDE 182 - 01A-A1E2W 193 - 01A-A1YCDE 183 - 01A-A1WCD	117 115 134 135 118	Microprocessor card Maintenance adapter card Control store card Control storage array card Drive-adapter card	01A-A1D2 01A-A1E2 01A-A1C2 01A-A1B2 01A-A1Q2	MP001, 002, 003 MA001, 002, 003 CS001, 002 MS001, 002 DI001, 002
E116	Invalid interrupt.	Use the EAD for error code D1nn for failure isolation. See EAD 1 for "Error Code D1nn." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	117 115	Microprocessor card Maintenance adapter card	01A-A1D2 01A-A1E2	MP001, 002, 003 MA001, 002, 003
E117	Control store error.	Run GMP for failure isolation.	134	Control store card	01A-A1C2	CS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E118	Check 1 is on and the microprocessor is running.	Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." Check the power supply voltages for proper dc value and ripple values. TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117 134	Maintenance adapter card Microprocessor card Control storage card	01A-A1E2 01A-A1D2 01A-A1C2	MA001, 002, 003 MP001, 002, 003 CS001, 002
E119	A recovered check 1 was detected by the hardware.	Use the EAD for error code E100 for failure isolation. See EAD 1 for "Error Code E100." TCC FRUs associated with this error code are: 180 - 01A-A1ZCD 192 - 01A-A1XCDE 182 - 01A-A1E2W 193 - 01A-A1YCDE 183 - 01A-A1WCD	117 115 134 135	Microprocessor card Maintenance adapter card Control store card Control store array card	01A-A1D2 01A-A1E2 01A-A1C2 01A-A1B2	MP001, 002, 003 MA001, 002, 003 CS001, 002 MS001, MP002
E11A	MD port failed to open.	Run GMP for failure isolation. Check the power supply voltages for proper dc values and ripple values. TCC FRUs associated with this error code are: 182 - 01A-A1E2W	115 134 135	Maintenance adapter card Control store card Control store array card	01A-A1E2 01A-A1C2 01A-A1B2	MA001, 002, 003 CS001, 002, MS001, MP002
E11F	Invalid diagnostic monitor return code.	Run diagnostic Basic TCU (BCU) Tests for failure isolation. TCC FRU's associated with this error are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 117	Maintenance adapter card Microprocessor card	01A-A1E2 01A-A1D2	MA001, 002, 003 MP001, 002, 003
E120	This error code is generated by the product maintenance package. It is a result of the ERA register equaling the ERB register in an EDB3 error. See error code EDB3 for the error definition.	TCC FRUs associated with this error code are: 157 - 01A-A1WKL 189 - 01A-A1WFG 158 - 01A-A1XKL 190 - 01A-A1ZFG 159 - 01A-A1YKL 191 - 01A-A1YFG 182 - 01A-A1E2W 192 - 01A-A1XCDE 187 - 01A-A1ZFG 193 - 01A-A1YCDE 188 - 01A-A1ZKL	135 134 117 115 114 118 121 122 119 116 120	Control storage array card Control store card Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Read clock and format card Write data card Buffer adapter card	01A-A1B2 01A-A1C2 01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1F2 01A-A1S2 01A-A1P2 01A-A1K2	MS001, 002 CS001, 002 MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 SM001, 002 RC001, 002 DF001, 002 BA001, 002, 003
E201	Bar LEDs fail to turn on or fail to turn off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	060 085 210 211	Message display board Drive control card Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1B2 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001
E202	Select indicator does not turn on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	060 085 210 211	Message display board Drive control card Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1B2 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001
E203	The display is blank.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	060 090 085 210 211	Message display board Message display dc power cable Drive control card Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive Drive 02A-A1B2 02A-A1Y2 Drive	WD000, 001 WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001
E204	The display shows eight rectangles.	None	060	Message display board	Drive	WD000, 001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E205	One LED is blank or not correct.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	021 060 085 210 211	Message display board Drive control card Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1C2 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001
E206	FE and MD actions have determined that the wrong language is displayed.	Check the switch settings on the drive adapter card for the desired language.	118	Drive-adapter card	01A-A1Q2	DI001, 002
E207	An invalid message is displayed.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	060 085 210 211	Message display board Drive control card Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1B2 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001
E210	The Rewind switch does not work.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 060 213 211 210	Operator panel switch board Drive control card Message display board Message display board to message display switch board cable Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001 WD000, 001
E211	The Unload switch does not work.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 060 213 210 211	Operator panel switch board Drive control card Message display board Message display board to message display switch board cable Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001 WD000, 001
E212	The Ready/Not Ready switch will not operate to not ready	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 060 213 210 211	Operator panel switch board Drive control card Message display board Message display board to message display switch board cable Message display cable (02A-A1Y2 to P1-DISP-P1) Message display cable (P1-DISP-P1 to MDJ1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2 Drive	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001 WD000, 001
E213	The cartridge latch assembly will not remain latched.	None	016 008	Latch spring Cartridge latch assembly	Baseplate Baseplate	Mechanical part Mechanical part
E214	The cartridge latch assembly will not release.	None	008 018	Cartridge latch assembly Compression spring	Baseplate Baseplate	Mechanical part Mechanical part
E215	The cartridge does not pop up.	None	018 008	Compression spring Cartridge latch assembly	Baseplate Baseplate	Mechanical part Mechanical part
E216	The Online/Offline switch does not cause the drive to go offline.	None	105 106	Online/Offline switch Address switch cable to J4	Drive Drive	SN001, 002 SN001, 002
E217	The Reset switch does not cause the drive to reset.	None.	107 106	Reset switch Address switch cable to J4	Drive Drive	SN001, 002 SN001, 002
E220	The tape transport unit will not power off.	None	218	AC power circuit breaker	See LOC 1	YF050, 060

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E221	The drive will not power off	None	104 059 079 080	Drive power switch Power amplifier board DC power distribution cable, drive internal – J1, J2 DC power distribution cable	Drive Drive Drive Drive	YF020 PA000, 001 ZZ010, 020, 110, 120
E230	Drive operation is noisy.	None	232 001 003 004	Cartridge Threader assembly File reel motor Machine reel motor and hub mount	Baseplate Baseplate Baseplate Baseplate	Mechanical part YG010, 110 YG010, 110 YG010, 110
E231	Air leak noise.	None	030 039 041 042 044 045	Pump motor Plenum supply hose Plenum assembly Decoupler pressure hose Right guide bearing hose Left guide bearing hose	Tape transport unit base Tape transport unit base Baseplate Baseplate Baseplate Baseplate	YF050, 060 Mechanical part Mechanical part Mechanical part Mechanical part Mechanical part
E232	The tape transport unit power supply is noisy.	None	095	DC power supply	Tape transport unit base	YF100
E233	The drive's blower motor is noisy.	None	020	Blower assembly	Drive	YG010, 110
E234	The file reel motor is noisy.	None	003	File reel motor	See LOC 1	
E235	The machine reel motor is noisy.	None	005 054 227 231 004	Flange Upper flange Machine reel tape guide Center tape guide Machine reel motor and hub	See LOC 1 See LOC 1 See LOC 1 See LOC 1 Baseplate	
E240	The tape control unit has a noisy fan.	None	150 151	Blower assembly 1 Blower assembly 2	See LOC 1 See LOC 1	
E241	The tape control unit has a noisy dc power supply.	None	145	DC power supply	See LOC 1	
E242	The tape control unit has a noisy ac power supply.	None	144	AC power supply	See LOC 1	
E243	The tape control unit is noisy.	None	145 144 151 150	DC power supply AC power supply Blower assembly 2 Blower assembly 1	See LOC 1 See LOC 1 See LOC 1 See LOC 1	
E250	The EPO switch does not cause the subsystem to power off.	None	198	UEPO switch	See LOC 1	
E251	The tape control unit Power On/Off switch does not cause the tape control unit to power off.	None	142	Tape control unit operator panel printed circuit board	See LOC 1	
E252	The TCU Address switch does not operate.	None	197	TCU address switch	See LOC 1	
E253	The Channel Enable switch will not move to the Disable position.	None	141	Tape control unit switch panel card	See LOC 1	
E254	The Normal/Test switch will not move.	None	141	Tape control unit switch panel card	See LOC 1	
E255	The TCU0/TCU1 switch will not move.	None	141	Tape control unit switch panel card	See LOC 1	
E256	The Online Test/Offline Test switch will not move to Offline Test.	None	141	Tape control unit switch panel card	See LOC 1	
E257	The IML switch will not move.	None	141	Tape control unit switch panel card	See LOC 1	
E259	The Local Power Enable switch will not move.	None	141	Tape control unit switch panel card	See LOC 1	
E25A	The Local/Remote switch will not move.	None	084	Local/remote switch	See LOC 1	
E25B	The Power On LED does not light when power is on.	None	142	Tape control unit operator panel printed circuit board	See LOC 1	
E25C	The TCU Offline LED does not light when the tape control unit is offline.	None	141	Tape control unit switch panel card	See LOC 1	
E25D	The Channel Disabled LED does not light when the channel is disabled.	None	141	Tape control unit switch panel card	See LOC 1	
E25E	The Error LED does not light for a Check 1 error.	None	141	Tape control unit switch panel card	See LOC 1	
E25F	The Wait LED does not light during a wait condition.	None	141	Tape control unit switch panel card	See LOC 1	

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E280	The DC Power LED does not light when the power sequence is complete.	None	141	Tape control unit switch panel card	Tape control unit	
E281	An IML diskette drive error occurred.	None	086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	
E301	Pointer failure in track group 1.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	278 123 111	Read detect card Read skew buffer card 1 Read ECC/CORR card	01A-A2Q2 01A-A2K2 01A-A1R2	RD001 SB001, 002 EC001, 002
E302	Pointer failure in track group 2.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	124 111	Read skew buffer card 2 Read ECC/CORR card	01A-A2L2 01A-A1R2	SB101, 102 EC001, 002
E303	Pointer failure in track groups 1 and 2.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	278 123 124 111	Read detect card Read skew buffer card 1 Read skew buffer card 2 Read ECC/CORR card	01A-A2Q2 01A-A2K2 01A-A2L2 01A-A1R2	RD001 SB001, 002 SB101, 102 EC001, 002
E304	Pointer failure in track group 3.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	125 111	Read skew buffer card 3 Read ECC/CORR card	01A-A2M2 01A-A1R2	SB201, 202 EC001, 002
E305	Pointer failure in track groups 1 and 3.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	278 123 125 111	Read detect card Read skew buffer card 1 Read skew buffer card 3 Read ECC/CORR card	01A-A2Q2 01A-A2K2 01A-A2M2 01A-A1R2	RD001 SB001, 002 SB201, 202 EC001, 002
E306	Pointer failure in track groups 2 and 3.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	124 125 111	Read skew buffer card 2 Read skew buffer card 3 Read ECC/CORR card	01A-A2L2 01A-A2M2 01A-A1R2	SB101, 102 SB201, 202 EC001, 002
E307	Pointer failure in track groups 1, 2, and 3.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections."	278 123 124 125 111	Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read ECC/CORR card	01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1R2	RD001 SB001, 002 SB101, 102 SB201, 202 EC001, 002
E308	Buffer failed to load pointer information in diagnostic mode.	TCC FRUs associated with this error code are: 185 - 01A-A1XRS 186 - 01A-A1YRS	119 111	Read clock and format card Read ECC/CORR card	01A-A1S2 01A-A1R2	RC001, 002 EC001, 002
E4E0	The Ready switch is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 213 211 210	Operator panel switch board Drive control card Message display board to message display switch board cable Message display cable (P1-DISP-P1 to MDJ1) Message display cable (02A-A1Y2 to P1-DISP-P1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E4E1	The Ready switch is always on.	TCC FRUs associated with this error code are 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 213 211 210	Operator panel switch board Drive control card Message display board to message display switch board cable Message display cable (P1-DISP-P1 to MDJ1) Message display cable (02A-A1Y2 to P1-DISP-P1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001
E4E2	The Unload switch is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 213 211 210	Operator panel switch board Drive control card Message display board to message display switch board cable Message display cable (P1-DISP-P1 to MDJ1) Message display cable (02A-A1Y2 to P1-DISP-P1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001
E4E3	The Unload switch is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 213 211 210	Operator panel switch board Drive control card Message display board to message display switch board cable Message display cable (P1-DISP-P1 to MDJ1) Message display cable (02A-A1Y2 to P1-DISP-P1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001
E4E4	The Rewind switch is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 213 211 210	Operator panel switch board Drive control card Message display board to message display switch board cable Message display cable (P1-DISP-P1 to MDJ1) Message display cable (02A-A1Y2 to P1-DISP-P1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001
E4E5	The Rewind switch is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	109 085 213 211 210	Operator panel switch board Drive control card Message display board to message display switch board cable Message display cable (P1-DISP-P1 to MDJ1) Message display cable (02A-A1Y2 to P1-DISP-P1)	Drive 02A-A1B2 Drive Drive 02A-A1Y2	WD000, 001 DD000, 001, 002, 003 WD000, 001 WD000, 001 WD000, 001
E4E6	The cartridge is not inserted or the cartridge present sensor is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z This error can be caused by the field engineer using a cleaning cartridge at the wrong time.	010 085 081	Cartridge present sensor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
E4E7	The cartridge is not removed from the tray or the cartridge present sensor is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	010 085 081	Cartridge present sensor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
E4E8	The cartridge latched sensor is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	011 085 016 008 081	Cartridge latched sensor Drive control card Latch spring Cartridge latch assembly Tachometer sensor cable	Baseplate 02A-A1B2 Drive Baseplate Baseplate	SN001, 002 DD000, 001, 002, 003 Mechanical part Mechanical part SN001, 002
E4E9	The cartridge latched sensor is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	011 085 081	Cartridge latched sensor Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E4EA	The file protect switch is always off	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	009 085 064 107 059 081 106 058	File protect switch Drive control card Write power card Reset switch Power amplifier board Tachometer sensor cable Address switch cable to J4 Logic board	Baseplate 02A-A1B2 02A-A1G2 Drive Drive Drive Drive 02A-A1	SN001, 002 DD000, 001, 002, 003 VP000 SN001, 002 PA000, 001 SN001, 002 SN001, 002 AA000, 100
E4EB	The file protect switch is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	009 085 081	File protect switch Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
E4EC	Tape path sensor A is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	006 001 007 085 081	Tape path sensor A Threader assembly Tape path sensor B Drive control card Tachometer sensor cable	Baseplate Baseplate Baseplate 02A-A1B2 Baseplate	SN001, 002 YG010, 110 SN001, 002 DD000, 001, 002, 003 SN001, 002
E4ED	Tape path sensor A is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	006 085 081	Tape path sensor A Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 Baseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
E4EE	Tape path sensor B is always off.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	007 085 081	Tape path sensor B Drive control card Tachometer sensor cable	Baseplate 02A-A1B2 eplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
E4EF	Tape path sensor B is always on.	TCC FRUs associated with this error code are: 267 - 02A-A1B2Y 268 - 02A-A1B2Z	007 085 081	Tape path sensor B Drive control card Tachometer sensor cable	aseplate 2A-A1B2 aseplate	SN001, 002 DD000, 001, 002, 003 SN001, 002
ES01	A CC3 or a path not operating condition occurred.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 900 152 901 121 122 197 903 126 141	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) Status store basic card Status store communication card (This FRU is a part of the communicator feature.) TCU address switch STI dc power supply Power/POR card Tape control unit switch panel card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1G2 01A-A1F2 See LOC 1 01A-A2H4 See LOC 1	SS001, 002 SM001, 002 PR001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E502	A CC3 or a path not operating condition occurred. The tape control unit will not go online.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	122 121	Status store communication card (This FRU is a part of the communicator feature.) Status store basic card	01A-A1F2 01A-A1G2	SM001, 002 SS001, 002
E503	A CC3 or a path not operating condition occurred. Multiple channel adapters will not enable.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	121	Status store basic card	01A-A1G2	SS001, 002
E504	A CC3 or a path not operating condition occurred and one channel adapter will not enable.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 152 121 126 197	Channel adapter card (channel A) Channel adapter card (channel B) Status store basic card Power/POR card TCU address switch	01A-A2C2 01A-A2D2 01A-A1G2 01A-A2H4 See LOC 1	CA001, 002 CA101, 102 SS001, 002 PR001
E505	A continuous CC3 or a path not operating condition occurred. The channel adapters are enabled.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter."	133 900 152 901 197 903 126	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) TCU address switch STI dc power supply Power/POR card	01A-A2C2 02A-L 01A-A2D2 02A-R See LOC 1 01A-A2H4	CA001, 002 CA101, 102 PR001
E510	A check 1 condition was reset which caused a 'disconnect in' error.	Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 180 - 01A-A1ZCD 190 - 01A-A1XFG 182 - 01A-A1E2W 191 - 01A-A1YFG 183 - 01A-A1WCD 192 - 01A-A1XCDE 187 - 01A-A1ZFG 193 - 01A-A1YCDE 189 - 01A-A1WFG	133 152 117 115 134 121 122 126	Channel adapter card (channel A) Channel adapter card (channel B) Microprocessor card Maintenance adapter card Control store card Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Power/POR card	01A-A2C2 01A-A2D2 01A-A1D2 01A-A1E2 01A-A1C2 01A-A1G2 01A-A1F2 01A-A2H4	CA001, 002 CA101, 102 MP001, 002, 003 MA001, 002, 003 CS001, 002 SS001, 002 SM001, 002 PR001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E511	An interface control check occurred.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 187 - 01A-A1ZFG 190 - 01A-A1XFG 189 - 01A-A1WFG 191 - 01A-A1YFG	133 900 152 901 120 114 197 903 126 141	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) Buffer adapter card Buffer control card TCU address switch STI dc power supply Power/POR card Tape control unit switch panel card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1K2 01A-A1L2 See LOC 1 01A-A2H4 See LOC 1	CA001, 002 CA101, 102 BA001, 002, 003 BC001, 002, 003 PR001
E513	An interface control check, or a channel data check, or a tag failure occurred.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	133 900 152 901 120 114 197 903 126 141	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) Buffer adapter card Buffer control card TCU address switch STI dc power supply Power/POR card Tape control unit switch panel card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1K2 01A-A1L2 See LOC 1 01A-A2H4 See LOC 1	CA001, 002 CA101, 102 BA001, 002, 003 BC001, 002, 003 PR001
E514	An interface control check, or a channel data check, or a bus failure occurred.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	133 900 152 901 120 114 197 903 126 141	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) Buffer adapter card Buffer control card TCU address switch STI dc power supply Power/POR card Tape control unit switch panel card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1K2 01A-A1L2 See LOC 1 01A-A2H4 See LOC 1	CA001, 002 CA101, 102 BA001, 002, 003 BC001, 002, 003 PR001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E520	A channel timeout or hang condition occurred.	1. This error can be caused by STI-FIPS Adapter hardware or firmware. See START 1 for "FSC Caused by Other Than TA90 Hardware Failures," before continuing the next step. 2. Use the EAD for Status Store/Channel Adapter for failure isolation. See EAD 1 for "Status Store/Channel Adapter." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	133 900 152 901 120 114 197 903 126 141	Channel adapter card (channel A) STI-FIPS Adapter (L) Channel adapter card (channel B) STI-FIPS Adapter (R) Buffer adapter card Buffer control card TCU address switch STI dc power supply Power/POR card Tape control unit switch panel card	01A-A2C2 02A-L 01A-A2D2 02A-R 01A-A1K2 01A-A1L2 See LOC 1 01A-A2H4 See LOC 1	CA001, 002 CA101, 102 BA001, 002, 003 BC001, 002, 003 PR001
E5FF	An external register (XR) error was detected while running the verification test.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 184 - 01A-A1ZPQ 158 - 01A-A1XKL 188 - 01A-A1ZKL 159 - 01A-A1YKL 192 - 01A-A1XCDE 181 - 01A-A1P2Y 193 - 01A-A1YCDE 182 - 01A-A1E2W	121 117 115 114 118 119 116 120	Status store basic card Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Read clock and format card Write data card Buffer adapter card	01A-A1G2 01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1S2 01A-A1P2 01A-A1K2	SS001, 002 MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 RC001, 002 DF001, 002 BA001, 002, 003
E601	The automatic cartridge loader processor is not operational.	None	281	Loader control card	Loader	AL001
E602	The automatic cartridge loader stack is full with no attention light or it is empty with the attention light on.	None	298 289 281	Leader operator panel Stack low position sensor Loader control card	Loader Loader Loader	AL002 SN003 AL001
E604	The automatic cartridge loader stack low position sensor has failed.	None	289 281	Stack low position sensor Loader control card	Loader Loader	SN003 AL001
E605	The automatic cartridge loader has an open or shorted switch on its operator panel.	None	298	Loader operator panel	Loader	AL002
E6E0	The automatic cartridge loader input sensor did not indicate a cartridge when one was inserted.	Could be caused by operator error.	298 291	Loader operator panel Cartridge in stack sensor	Loader Loader	AL002 SN003
E6E1	The cartridge present sensor did not indicate a cartridge had been loaded after the service representative had been told to load a cartridge into the TA90 with an automatic cartridge loader.	Could be caused by running the automatic cartridge loader test with cleaning cartridge(s).	010 085 281	Cartridge present sensor Drive control card Loader control card	Baseplate 02A-A1B2 Loader	SN001, 002 DD000, 001, 002, 003 AL001
E700	The service representative is here to service the automatic cartridge loader but no problem can be found using diagnostics (intermittent).	None	281 285 282 085	Loader control card Loader mechanical assembly Load assembly Drive control card	Loader Loader Loader 02A-A1B2	AL001 DD000, 001, 002, 003
E701	The automatic cartridge loader control card has detected the wrong polarity of the solenoid latch signal.	Wires in connector J5 may be reversed. To correct the problem reverse wires 1 and 2 in the Power Amplifier Board connector P4.	281	Loader control card	Loader	AL001
E702	The automatic cartridge loader control card has detected a +24V dc problem.	If the loader power on LED is off, use the PWR section of the MG to troubleshoot.	281	Loader control card	Loader	AL001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E703	The automatic cartridge loader has timed out before a "Load Request" from the drive was received.	None	281 085	Loader control card Drive control card	Loader 02A-A1B2	AL001 DD000, 001, 002, 003
E704	The automatic cartridge loader control card has detected the latch solenoid signal while loading a cartridge.	Can be caused by pressing the unload switch while the drive is loading.	281 085	Loader control card Drive control card	Loader 02A-A1B2	AL001 DD000, 001, 002, 003
E720	The automatic cartridge loader detected an unexpected condition of either the cartridge present sensor or the file protect switch.	Additional FRUs that may cause this error are: 282 Load ASM 295 Feed ASM 293 L Input Rail ASM	010 009	Cart Present SNS File Protect SW	Baseplate Baseplate	SN001, 002 SN001, 002
E721	The automatic cartridge loader detected an unexpected condition of the stack up position sensor.	Additional FRUs that may cause this error are: 282 Load ASM 295 Feed ASM 293 L Input Rail ASM	296	Stack up Pos SNS	Loader	SN003
E722	The automatic cartridge loader detected an unexpected condition of the input complete sensor.	Additional FRUs that may cause this error are: 282 Load ASM 295 Feed ASM	293	L Input Rail ASM	Loader	
E723	The automatic cartridge loader detected an unexpected condition of the load motor complete sensor.	Additional FRUs that may cause this error are: 282 Load ASM 295 Feed ASM 293 L Input Rail ASM	284	Load Mtr Com SNS	Loader	SN003
E724	The automatic cartridge loader detected an unexpected condition of the feed complete sensor.	Additional FRUs that may cause this error are: 282 Load ASM 293 L Input Rail ASM	295	Feed ASM	Loader	SN003
E725	The automatic cartridge loader detected an unexpected condition of the cartridge latched sensor.	Additional FRUs that may cause this error are: 282 Load ASM 295 Feed ASM 293 L Input Rail ASM	011	Cart Latched SNS	Baseplate	SN001, 002
E726	The automatic cartridge loader detected an unexpected condition of the tracks closed sensor.	Additional FRUs that may cause this error are: 282 Load ASM 293 L Input Rail ASM	295	Feed ASM	Loader	SN003
E727	The automatic cartridge loader detected an unexpected condition of the tracks feed sensor.	Additional FRUs that may cause this error are: 282 Load ASM 293 L Input Rail ASM	295	Feed ASM	Loader	SN003
E728	The automatic cartridge loader detected an unexpected condition of the extract complete sensor.	Additional FRUs that may cause this error are: 282 Load ASM 293 L Input Rail ASM	295	Feed ASM	Loader	SN003
E740	The automatic cartridge loader has detected a processor error.	None	281	Loader control card	Loader	AL001
E741	The automatic cartridge loader test of the LED checkers has failed.	None	281	Loader control card	Loader	AL001
E742	The automatic cartridge loader wrap bits test has failed.	None	281	Loader control card	Loader	AL001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E743	The automatic cartridge loader motor checker test has failed.	This error may be caused by missing +24V dc at the automatic cartridge loader. Additional FRUs that may cause this error are: 288 Loader Fuse +24V dc 285 Loader Mechanical Assembly 282 Load Assembly	281	Loader control card	Loader	AL001
E744	The automatic cartridge loader motor control has failed.	None	281	Loader control card	Loader	AL001
E745	The automatic cartridge loader control card single shot has failed.	None	281	Loader control card	Loader	AL001
E746	The automatic cartridge loader control card has detected a checker failure during retry.	None	281	Loader control card	Loader	AL001
E747	The automatic cartridge loader control card single shot timeout reset failed.	None	281	Loader control card	Loader	AL001
E74F	The automatic cartridge loader control card has detected a memory error.	None	281	Loader control card	Loader	AL001
E77E	A program error has been detected in the automatic cartridge loader (no spare timers).	Call your next level of support.				
E77F	A program error has been detected in the automatic cartridge loader.	Call your next level of support.				
E781	The automatic cartridge loader extract complete sensor has failed.	None	295 281	Feed assembly Loader control card	Loader Loader	AL001
E782	The automatic cartridge loader tracks feed sensor has failed.	None	295 281	Feed assembly Loader control card	Loader Loader	AL001
E783	The automatic cartridge loader tracks close sensor has failed.	None	295 281	Feed assembly Loader control card	Loader Loader	AL001
E784	The automatic cartridge loader stack up position sensor has failed.	None	296 281	Stack up position sensor Loader control card	Loader Loader	SN003 AL001
E785	The automatic cartridge loader cartridge staged sensor has failed.	None	292 281	Cartridge staged sensor Loader control card	Loader Loader	SN003 AL001
E786	The automatic cartridge loader stack low position sensor has failed.	None	289 281	Stack low position sensor Loader control card	Loader Loader	SN003 AL001
E787	The automatic cartridge loader input complete sensor has failed.	None	293 281	Left input rail Loader control card	Loader Loader	AL001
E788	The automatic cartridge loader cartridge in stack sensor has failed.	None	291 281	Cartridge in stack sensor Loader control card	Loader Loader	SN003 AL001
E789	The automatic cartridge loader load motor complete sensor has failed.	None	284 281	Load motor complete sensor Loader control card	Loader Loader	SN003 AL001
E78A	The automatic cartridge loader tracks feed, tracks closed, or load motor complete sensor has failed.	None	295 282 281	Feed assembly Load assembly Loader control card	Loader Loader Loader	AL001
E78B	The automatic cartridge loader is attempting to open the load assembly and one of the following sensors/switches is in the wrong state: Cartridge Latched, Cartridge Present, File Protect, Feed Complete, Load Motor Complete, Tracks Feed, Tracks Closed, or Extract Complete.	None	282 295	Load assembly Feed assembly	Loader Loader	
E78C	The automatic cartridge loader is beginning the cartridge staged test routine and one of the following sensors/switches is in the wrong state: Cartridge Latched, Cartridge Present, File Protect, Feed Complete, Input Complete, Tracks Feed, Tracks Closed, or Extract Complete.	None	282 295 293	Load assembly Feed assembly Left input rail assembly	Loader Loader Loader	

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E78D	The automatic cartridge loader is in the cartridge staged test routine and one of the following sensors/switches is in the wrong state: Cartridge Latched, Cartridge Present, File Protect, Feed Complete, Input Complete, Tracks Feed, or Tracks Closed.	None	282 295 293	Load assembly Feed assembly Left input rail assembly	Loader Loader Loader	
E78E	The automatic cartridge loader input stack either did not move or sense that it did move.	Inspect the left or right input rail assembly for damage. Exchange damaged FRU.	290	Input stack assembly	Loader	
E78F	The automatic cartridge loader detected the extract complete sensor in the middle of moving the input stack.	None	295	Feed assembly	Loader	
E790	The automatic cartridge loader input either stopped or did not sense the completion of the input cycle after it started moving.	Inspect the left or right input rail assembly for damage. Exchange damaged FRU.	290	Input stack assembly	Loader	
E791	The automatic cartridge loader detected the tracks feed sensor in the wrong state at the end of the test for a cartridge staged.	None	295	Feed assembly	Loader	
E792	The automatic cartridge loader is in the cartridge load (from the feed assembly to the load assembly) routine and one of the following sensors/switches is in the wrong state: Cartridge Latched, Cartridge Present, File Protect, Feed Complete, Input Complete, Tracks Feed, Tracks Closed, Extract Complete or Load Motor Complete.	None	282 295 293	Load assembly Feed assembly Left input rail assembly	Loader Loader Loader	
E793	The automatic cartridge loader detected the staged sensor but tracks closed sensor indicates no cartridge is staged.	Can be caused by not having the cartridge inserted far enough into the feed.	292 295	Cartridge staged sensor Feed assembly	Loader Loader	SN003
E794	At the end of the test for a cartridge staged, the automatic cartridge loader detected the tracks closed sensor.	None	295	Feed assembly	Loader	
E795	The automatic cartridge loader did not detect extract complete sensor after starting to feed a cartridge.	This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure.	295	Feed assembly	Loader	
E796	The automatic cartridge loader has timed out waiting for "Feed Complete" while moving the cartridge from the feed to the load assembly.	1. Can be caused by having a cartridge upside down in the feed station. 2. This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure.	282 295	Load assembly Feed assembly	Loader Loader	
E797	The automatic cartridge loader did not detect extract complete sensor open after feed complete sensor closed while feeding a cartridge.	None	295	Feed assembly	Loader	
E798	The automatic cartridge loader did not detect tracks feed sensor open after a completed feed.	None	295	Feed assembly	Loader	
E799	The automatic cartridge loader is attempting to close the load assembly and one of the following sensors/switches is in the wrong state: Cartridge Latched, Cartridge Present, File Protect, Feed Complete, Load Motor Complete, Tracks Feed, Tracks Closed, or Extract Complete.	None	282 295	Load assembly Feed assembly	Loader Loader	

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E79A	The automatic cartridge loader did not detect a change in the load motor complete sensor but the load assembly should be moving down.	None	282	Load assembly	Loader	
E79B	The automatic cartridge loader did not detect the cartridge latched sensor closed after the load assembly has closed.	None	011	Cartridge latched sensor	Baseplate	SN001, 002
E79C	The automatic cartridge loader did not detect a change in the load motor complete sensor OR after the load motor complete sensor is uncovered, the cartridge latched sensor was NOT covered. The tray should coast down far enough to activate the cartridge latched sensor.	If the tray has moved down, check the adjustment of the cartridge latched sensor (see CARR-DR 110).	282	Load assembly	Loader	
E79D	The automatic cartridge loader did not detect a change in the load motor complete sensor but the load assembly should be moving up.	None	282	Load assembly	Loader	
E79E	The automatic cartridge loader did not detect a cartridge latched sensor open after the load assembly was opened.	None	011	Cartridge latched sensor	Baseplate	SN001, 002

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FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E79F	The automatic cartridge loader is beginning the routine to move the cartridge from the load assembly to the feed assembly and one of the following sensors/switches is in the wrong state: Cartridge Latched, Input Complete, Tracks Feed, Tracks Closed, Extract Complete, or Load Motor Complete.	Can be caused if a cartridge is put into the feed station while one is in the drive.	282 295 293	Load assembly Feed assembly Left input rail assembly	Loader Loader Loader	
E7A0	The automatic cartridge loader did not detect a change in the load motor complete sensor but the load assembly should be open.	None	282	Load assembly	Loader	
E7A1	The automatic cartridge loader detected the wrong state of the tracks feed or tracks closed sensors while attempting to remove a cartridge.	None	295	Feed assembly	Loader	
E7A2	The automatic cartridge loader detected the cartridge staged sensor closed while removing the cartridge.	Can be caused if a cartridge is put into the feed station while one is in the drive.	292 295	Cartridge staged sensor Feed assembly	Loader Loader	SN003
E7A3	The automatic cartridge loader did not detect the feed complete sensor open while removing the cartridge.	This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure.	295 282	Feed assembly Load assembly	Loader Loader	
E7A4	The automatic cartridge loader detected the cartridge staged sensor closed while removing the cartridge.	1. Can be caused if a cartridge is put into the feed station while one is in the drive. 2. This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure.	292 295	Cartridge staged sensor Feed assembly	Loader Loader	SN003
E7A5	The automatic cartridge loader detected the cartridge staged sensor closed while removing the cartridge.	Can be caused if a cartridge is put into the feed station while one is in the drive.	292 295	Cartridge staged sensor Feed assembly	Loader Loader	SN003
E7A6	The automatic cartridge loader did not detect extract complete sensor closed while attempting to removing a cartridge.	1. This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure. 2. This error can be caused by having the cartridge latched down.	295	Feed assembly	Loader	
E7A7	The automatic cartridge loader did not detect extract complete sensor open while attempting to removing a cartridge.	None	295	Feed assembly	Loader	
E7A8	The automatic cartridge loader did not detect tracks feed sensor open after removing a cartridge and releasing the solenoid.	None	295	Feed assembly	Loader	
E7A9	The automatic cartridge loader did not detect stack up position sensor open while moving the output stack down.	None	297 296 289	Output stack assembly Stack up position sensor Stack low position sensor	Loader Loader Loader	SN003 SN003
E7AA	The automatic cartridge loader is in the start input moving routine and one of the following sensors/switches is in the wrong state: Input Complete, Tracks Feed, Tracks Closed, or Stack Up Position Sensor.	None	295 293	Feed assembly Left input rail assembly	Loader Loader	
E7AB	The automatic cartridge loader detected the extract complete sensor before an input stack move operation.	None	295	Feed assembly	Loader	
E7AC	The automatic cartridge loader input stack cycled 13 times without detecting a cartridge at the feed station.	Could be caused by a stuck cartridge in stack sensor or by removing cartridge from the stack while loading.	290	Input stack assembly	Loader	

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E7AD	The automatic cartridge loader did not detect stack up position sensor closed while moving the output stack up.	None	297 296	Output stack assembly Stack up position sensor	Loader Loader	SN003 SN003
E7AE	The automatic cartridge loader is in the cartridge to drive routine and one of the following sensors/switches is in the wrong state: Cartridge Latched, Cartridge Present, File Protect, Feed Complete, Input Complete, Tracks Feed, Tracks Closed, or Load Motor Complete.	None	282 295 293	Load assembly Feed assembly Left input rail assembly	Loader Loader Loader	
E7AF	The automatic cartridge loader initialization/recovery code did not detect tracks closed sensor after cartridge present was detected.	None	010 009 295	Cartridge present sensor File protect switch Feed assembly	Baseplate Baseplate Loader	SN001, 002 SN001, 002
E7B0	The automatic cartridge loader initialization/recovery code should reposition and move the input but the extract complete sensor is on.	None	295 281	Feed assembly Loader control card	Loader Loader	AL001
E7B1	The automatic cartridge loader initialization/recovery code is in the reposition code but the extract complete sensor is on.	None	295 281	Feed assembly Loader control card	Loader Loader	AL001
E7B2	The automatic cartridge loader initialization/recovery code should reposition and move the input but the extract complete sensor is on.	This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure.	295 281	Feed assembly Loader control card	Loader Loader	AL001
E7B3	The automatic cartridge loader initialization/recovery code does not see the load assembly in the up (home) position.	If the load assembly is all the way up, suspect the load motor complete sensor.	282	Load assembly	Loader	
E7B4	The automatic cartridge loader initialization/recovery code is in the reposition code but the extract complete sensor is on.	None	295 281	Feed assembly Loader control card	Loader Loader	AL001
E7B5	The automatic cartridge loader initialization/recovery code is attempting to move the input down but did not see the input complete sensor.	None	293	Left input rail assembly	Loader	
E7B6	The automatic cartridge loader initialization/recovery code has timed out attempting to feed a cartridge into the drive.	This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure.	295 282	Feed assembly Load assembly	Loader Loader	
E7B7	The automatic cartridge loader cartridge staged sensor has failed.	None	292 281	Cartridge staged sensor Loader control card	Loader Loader	SN003 AL001
E7B8	The automatic cartridge loader initialization/recovery code has timed out trying to extract a cartridge from the drive.	1. This error may be caused by the left and right input rail assemblies not being aligned correctly. See CARR-DR for FRU 293 for the alignment procedure. 2. This error can be caused by having the cartridge upside down.	295	Feed ASM	Loader	
E7B9	The automatic cartridge loader initialization/recovery code detected the feed complete sensor but before that next operation was started, the feed complete sensor was open.	The file protect switch may be out of adjustment, causing the cartridge to move when the driving force is removed from the cartridge. Check the adjustment (see CARR-DR 90).	282	Load assembly	Loader	
E7CF	The automatic cartridge loader has detected a failure it cannot isolate.	None	281	Loader control card	Loader	AL001

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E800	There were too many temporary data errors based on Format 21 sense records from the system error log information	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 184 - 01A-A1ZPQ	085	Drive control card	02A-A1B2	DD000, 001, 002, 003
			063	Write card	02A-A1J4	WR000
			064	Write power card	02A-A1G2	VP000
			062	Read preamplifier card	02A-A1H2	RP000
			120	Buffer adapter card	01A-A1K2	BA001, 002, 003
			216	Tape lifter solenoid	Drive	
			059	Power amplifier board	Drive	
			013	Head and guide assembly	Drive	
			278	Read detect card	01A-A2Q2	RD001
			123	Read skew buffer card 1	01A-A2K2	SB001, 002
			124	Read skew buffer card 2	01A-A2L2	SB101, 102
			125	Read skew buffer card 3	01A-A2M2	SB201, 202
			119	Read clock and format card	01A-A1S2	RC001, 002
			111	Read ECC/CORR card	01A-A1R2	EC001, 002
			116	Write data card	01A-A1P2	DF001, 002
			118	Drive-adapter card	01A-A1Q2	DI001, 002
			199	Write bus terminator TCU0 local	See CARR-TCU 1-8	
			248	Write bus terminator TCU0 remote	See CARR-TCU 1-8	
			264	Write bus terminator TCU1 local	See CARR-TCU 1-8	
			265	Write bus terminator TCU1 remote	See CARR-TCU 1-8	
E810	The data read during the read routine of the verification test did not match the data written during the write routine.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 186 - 01A-A1YRS 184 - 01A-A1ZPQ 267 - 02A-A1B2Y 185 - 01A-A1XRS 268 - 02A-A1B2Z	064	Write power card	02A-A1G2	VP000
			062	Read preamplifier card	02A-A1H2	RP000
			085	Drive control card	02A-A1B2	DD000, 001, 002, 003
			063	Write card	02A-A1J4	WR000
			120	Buffer adapter card	01A-A1K2	BA001, 002, 003
			216	Tape lifter solenoid	Drive	
			059	Power amplifier board	Drive	
			013	Head and guide assembly	Drive	
			278	Read detect card	01A-A2Q2	RD001
			123	Read skew buffer card 1	01A-A2K2	SB001, 002
			124	Read skew buffer card 2	01A-A2L2	SB101, 102
			125	Read skew buffer card 3	01A-A2M2	SB201, 202
			119	Read clock and format card	01A-A1S2	RC001, 002
			111	Read ECC/CORR card	01A-A1R2	EC001, 002
			116	Write data card	01A-A1P2	DF001, 002
			118	Drive-adapter card	01A-A1Q2	DI001, 002
E811	The data read during the read routine of the verification test did not match the data written during the write routine in the long-loop-write-to-read routine.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 186 - 01A-A1YRS 184 - 01A-A1ZPQ 267 - 02A-A1B2Y 185 - 01A-A1XRS 268 - 02A-A1B2Z	064	Write power card	02A-A1G2	VP000
			062	Read preamplifier card	02A-A1H2	RP000
			085	Drive control card	02A-A1B2	DD000, 001, 002, 003
			063	Write card	02A-A1J4	WR000
			120	Buffer adapter card	01A-A1K2	BA001, 002, 003
			216	Tape lifter solenoid	Drive	
			059	Power amplifier board	Drive	
			013	Head and guide assembly	Drive	
			278	Read detect card	01A-A2Q2	RD001
			123	Read skew buffer card 1	01A-A2K2	SB001, 002
			124	Read skew buffer card 2	01A-A2L2	SB101, 102
			125	Read skew buffer card 3	01A-A2M2	SB201, 202
			119	Read clock and format card	01A-A1S2	RC001, 002
			111	Read ECC/CORR card	01A-A1R2	EC001, 002
			116	Write data card	01A-A1P2	DF001, 002
			118	Drive-adapter card	01A-A1Q2	DI001, 002
E812	An ECC failure occurred during the short-loop-write-to-read routine.	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 186 - 01A-A1YRS 184 - 01A-A1ZPQ 267 - 02A-A1B2Y 185 - 01A-A1XRS 268 - 02A-A1B2Z	120	Buffer adapter card	01A-A1K2	BA001, 002, 003
			278	Read detect card	01A-A2Q2	RD001
			123	Read skew buffer card 1	01A-A2K2	SB001, 002
			124	Read skew buffer card 2	01A-A2L2	SB101, 102
			125	Read skew buffer card 3	01A-A2M2	SB201, 202
			119	Read clock and format card	01A-A1S2	RC001, 002
			111	Read ECC/CORR card	01A-A1R2	EC001, 002
			116	Write data card	01A-A1P2	DF001, 002
			118	Drive-adapter card	01A-A1Q2	DI001, 002

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FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
E813	An error occurred during the short-loop-write-to-read routine	1. Use the EAD for error codes D0nn and D8nn for failure isolation. See EAD 1 for "Error Codes D0nn and D8nn." 2. Use the EAD for Drive Interconnections for failure isolation. See EAD 1 for "Drive Interconnections." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 188 - 01A-A1YRS 184 - 01A-A1ZPQ 267 - 02A-A1B2Y 185 - 01A-A1XRS 268 - 02A-A1B2Z	120 278 123 124 125 119 111 116 118	Buffer adapter card Read detect card Read skew buffer card 1 Read skew buffer card 2 Read skew buffer card 3 Read clock and format card Read ECC/CORR card Write data card Drive-adapter card	01A-A1K2 01A-A2Q2 01A-A2K2 01A-A2L2 01A-A2M2 01A-A1S2 01A-A1R2 01A-A1P2 01A-A1Q2	BA001, 002, 003 RD001 SB001, 002 SB101, 102 SB201, 202 RC001, 002 EC001, 002 DF001, 002 DI001, 002
E815	This error should not occur.	Call your next level of support.				
E830	Problem found during Tape Lifter Solenoid tests.	None	215 216 059 085 013	Tape lifter solenoid input hose Tape lifter solenoid Power amplifier board Drive control card Head and guide assembly	Drive Drive Drive 02A-A1B2 Baseplate	 DD000, 001, 002, 003 WR000
ECnn	These errors are reserved for the power-on diagnostic check-the-checkers routine. The error code and the expected and received data are stored in 'COMTAB'.	• Use the conversion tables in DIAG 2-1 to convert the POR code to a support disk code and refer to the error for FRU information. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 181 - 01A-A1P2Y 158 - 01A-A1XKL 184 - 01A-A1ZPQ 159 - 01A-A1YKL 188 - 01A-A1ZKL				
EDnn	These errors are reserved for the power-on diagnostic check-the-checkers routine. The error code and the expected and received data are stored in 'COMTAB'.	• Use the conversion tables in DIAG 2-1 to convert the POR code to a support disk code and refer to the error for FRU information. TCC FRUs associated with this error code are: 157 - 01A-A1WKL 181 - 01A-A1P2Y 158 - 01A-A1XKL 184 - 01A-A1ZPQ 159 - 01A-A1YKL 188 - 01A-A1ZKL				

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
ED49	A BDSE group 3 error occurred.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table."	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
ED4A	A device CRC checker error occurred.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
ED4C	A buffer XR check 2 error occurred.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	115 114 117	Maintenance adapter card Buffer control card Microprocessor card	01A-A1E2 01A-A1L2 01A-A1D2	MA001, 002, 003 BC001, 002, 003 MP001, 002, 003
ED4D	A timeout occurred waiting for 'service in'.	Use the EAD for error code D5nn for failure isolation. See EAD 1 for "Error Code D5nn." The cables associated with this failure are in cable groups 28 and 50. See FSI 1 for "Cable Group Table." TCC FRUs associated with this error code are: 157 - 01A-A1WKL 159 - 01A-A1YKL 158 - 01A-A1XKL 188 - 01A-A1ZKL	114 120	Buffer control card Buffer adapter card	01A-A1L2 01A-A1K2	BC001, 002, 003 BA001, 002, 003
ED4E	A device CRC checker error occurred (WSE).	Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y	116 114 120	Write data card Buffer control card Buffer adapter card	01A-A1P2 01A-A1L2 01A-A1K2	DF001, 002 BC001, 002, 003 BA001, 002, 003
ED4F	A device parity checker error occurred.	Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y	116	Write data card	01A-A1P2	DF001, 002
ED50	A buffer XR check 2 error occurred (WDF).	Use the EAD for error code D7nn for failure isolation. See EAD 1 for "Error Code D7nn." TCC FRUs associated with this error code are: 181 - 01A-A1P2Y	116 114 120	Write data card Buffer control card Buffer adapter card	01A-A1P2 01A-A1L2 01A-A1K2	DF001, 002 BC001, 002, 003 BA001, 002, 003
ED51	A device parity checker error occurred.		119	Read clock and format card	01A-A1S2	RC001, 002
ED52	A timeout occurred waiting for beginning sync.		119	Read clock and format card	01A-A1S2	RC001, 002
ED53	A timeout occurred waiting for BOB.	Use EAD for D0nn and D8nn. See EAD 1 for error codes D0nn and D8nn.	119	Read clock and format card	01A-A1S2	RC001, 002
ED54	A timeout occurred waiting for IBG.	Use EAD for D0nn and D8nn. See EAD 1 for error codes D0nn and D8nn.	119	Read clock and format card	01A-A1S2	RC001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
ED80	The IML was successful	This is the normal operation condition				
ED81	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support	258	Media		
ED82	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support	258	Media		
ED83	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support	258	Media		
ED84	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support	258	Media		
ED85	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED86	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED87	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED88	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED89	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED8A	Microcode detected error	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED8B	Microcode detected error.	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED8C	Microcode detected error.	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED8D	Microcode detected error.	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED8E	Microcode detected error.	Bad IML diskette. Use a different diskette, save the bad diskette for analysis, then call your next level of support.	258	Media		
ED90	A diskette read error occurred. Diskette controller status registers 0, 1, 2, and the cylinder number are set in the next two words.	Use the EAD for IML or POR failure. See EAD 1.	258 086 134	Media IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED91	A diskette write error occurred. Diskette controller status registers 0, 1, 2, and the cylinder number are set in the next two words.	Use the EAD for IML or POR failure. See EAD 1.	258 086 134	Media IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED92	A diskette read back compare error occurred. Diskette controller status registers 0, 1, 2, and the cylinder number are set in the next two words.	Use the EAD for IML or POR failure. See EAD 1.	258 086 134	Media IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED93	A diskette seek error occurred. Diskette controller status registers 0, 1, 2, and the cylinder number are set in the next two words.	Use the EAD for IML or POR failure. See EAD 1.	086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED94	A diskette recalibrate error occurred. Diskette controller status registers 0, 1, 2, and the cylinder number are set in the next two words.	Use the EAD for IML or POR failure. See EAD 1.	086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED95	Microcode detected error.	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
ED96	A timeout occurred while trying to read the diskette controller data register.		086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED97	A timeout occurred while trying to write the diskette controller data register.		086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED98	A timeout occurred while trying to perform a diskette (read, write, readback, seek, or recalibrate) operation. This is possibly due to no diskette or the diskette is not being loaded correctly		086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED81	Swap to level 0 failed.	TCC FRUs associated with this error code are: 182 - 01A-A1E2W 193 - 01A-A1YCDE 192 - 01A-A1XCDE	117 115	Microprocessor card Maintenance adapter card	01A-A1D2 01A-A1E2	MP001, 002, 003 MA001, 002, 003
ED82	A control store read/write failure occurred. The failure control store address and the pattern are set in the next two words.		135 134	Control storage array card Control store card	01A-A1B2 01A-A1C2	MS001, 002 CS001, 002
ED83	A check 1 error occurred during a control store read/write check. The control store address and the ERA and ERB registers are set in the next two words.		135 134	Control storage array card Control store card	01A-A1B2 01A-A1C2	MS001, 002 CS001, 002
ED84	The second bootstrap did not load. The diskette controller status registers (0, 1, 2, and 3) are set in the next two words.		086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002
ED85	The second bootstrap is invalid.		086 134	IML diskette drive Control store card	See LOC 1 01A-A1C2	 CS001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
F00B	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support				
F00D	The microprocessor received a level 0 interrupt but was unable to determine the source. Usually a reset to the maintenance adapter card (a power on reset or an MD keyboard reset) will clear the level 0 interrupt	Use the EAD for error code F00D for failure isolation. See EAD 1 for "Error Code F00D." This error may be associated with 'collision detection' or diskette operations TCC FRUs associated with this error code are: 181 - 01A-A1P2Y 190 - 01A-A1XFG 182 - 01A-A1E2W 191 - 01A-A1YFG 184 - 01A-A1ZPQ 192 - 01A-A1XCDE 187 - 01A-A1ZFG 193 - 01A-A1YCDE 189 - 01A-A1WFG	115 117 120 116 118 119 121 122	Maintenance adapter card Microprocessor card Buffer adapter card Write data card Drive-adapter card Read clock and format card Status store basic card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1E2 01A-A1D2 01A-A1K2 01A-A1P2 01A-A1Q2 01A-A1S2 01A-A1G2 01A-A1F2	MA001, 002, 003 MP001, 002, 003 BA001, 002, 003 DF001, 002 DI001, 002 RC001, 002 SS001, 002 SM001, 002
F00E	Microcode detected error	Refer to SPROC 1 and perform procedure A. After completing procedure A, call your next level of support.				
F1nn	An external register error occurred in the channel functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	121 122 117 115 114 118 119 116 120	Status store basic card Status store communication card (This FRU is a part of the communicator feature.) Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Read clock and format card Write data card Buffer adapter card	01A-A1G2 01A-A1F2 01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1S2 01A-A1P2 01A-A1K2	SS001, 002 SM001, 002 MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 RC001, 002 DF001, 002 BA001, 002, 003
F2nn	An external register error occurred in the buffer functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	114 120 117 115 118 121 119 116 122	Buffer control card Buffer adapter card Microprocessor card Maintenance adapter card Drive-adapter card Status store basic card Read clock and format card Write data card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1L2 01A-A1K2 01A-A1D2 01A-A1E2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1F2	BC001, 002, 003 BA001, 002, 003 MP001, 002, 003 MA001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 SM001, 002
F3nn	An external register error occurred in the maintenance functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	115 117 114 118 121 119 116 120 122	Maintenance adapter card Microprocessor card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1E2 01A-A1D2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2	MA001, 002, 003 MP001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
F4nn	An external register error occurred in the device functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	118 117 115 114 121 119 116 120 122	Drive-adapter card Microprocessor card Maintenance adapter card Buffer control card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1Q2 01A-A1D2 01A-A1E2 01A-A1L2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2	DI001, 002 MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002
F5nn	An external register error occurred in the read data flow functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	119 117 115 114 118 121 116 120 122	Read clock and format card Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1S2 01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1P2 01A-A1K2 01A-A1F2	RC001, 002 MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 DF001, 002 BA001, 002, 003 SM001, 002
F6nn	An external register error occurred by accessing an invalid register address. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	117 115 114 118 121 119 116 120 122	Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2	MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002
F7nn	An external register error occurred in the microprocessor functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	117 115 114 118 121 119 116 120 122	Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Write data card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1P2 01A-A1K2 01A-A1F2	MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 DF001, 002 BA001, 002, 003 SM001, 002
F8nn	This is an error match code set by the maintenance package.	This is an operating condition. See MD/SDISK 1 for "Trace/Match Control."				
F9nn	An external register error occurred in the write data flow functional area. The nn is the value in the external register address (XRA) register at the time of the error. If bit 7 of sense byte 9 is 0, sense byte 9 contains the value from the processor error register (PER), which represents a data error. If bit 7 of sense byte 9 is not 0, sense byte 9 contains active XR users, which represents an addressing error.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn." TCC FRUs associated with this error code are: 159 - 01A-A1YKL 188 - 01A-A1ZKL	116 117 115 114 118 121 119 120 122	Write data card Microprocessor card Maintenance adapter card Buffer control card Drive-adapter card Status store basic card Read clock and format card Buffer adapter card Status store communication card (This FRU is a part of the communicator feature.)	01A-A1P2 01A-A1D2 01A-A1E2 01A-A1L2 01A-A1Q2 01A-A1G2 01A-A1S2 01A-A1K2 01A-A1F2	DF001, 002 MP001, 002, 003 MA001, 002, 003 BC001, 002, 003 DI001, 002 SS001, 002 RC001, 002 BA001, 002, 003 SM001, 002

FSC/ Error Code	Error Code Definition	Additional Actions/Comments	FRU NUM	FRU Name	Location	Logic Pages
FC80	Microcode detected error.	Refer to SPROC 1 and perform procedure B. After completing procedure B, call your next level of support.				
Fnnn	Used by the support diagnostics to define added actions.	Use the EAD for error code Fnnn for failure isolation. See EAD 1 for "Error Code Fnnn."		FRUs are defined by the diagnostic failure that brought you here.		

Cable Groups

Cables are grouped according to a common data path. Some cable groups will begin at a switch and end at a board location. Another group may begin in one tape control unit and go through two additional cables and end in another tape control unit. The continuity of the data path is kept throughout a group.

Using the Cable Group Information

If you look at the cable group list, you can see that it provides a variety of information. Each column heading is explained below.

Group Number

This number is referred to by entries in FSI error codes under the Additional Actions column. The group number can identify two or more cables.

Area or Subsystem

This column identifies that part of the machine that the cables are servicing. This includes channel, read data bus, device data bus, and other areas of the subsystem.

From/To Connectors

This column tells where both ends of the cable are located. In the channel cable area you must determine which channel number (A or B) to select the correct cables. In other groups, the correct tape control unit must be identified (TCU0 or TCU1).

FRU Number

As a reference, the FRU number is listed for each cable. Occasionally the same FRU number is listed for cables going to/from different locations. This is normal because the cables will have the same part number.

Logic Pages

These are the machine logic pages where the cables or cable plugs are found.

Location Pages

The LOC section of the MG is helpful in locating cables in the machine or locating connectors. Each cable has a page where you can find information about the cable location.

Cable Group Table

- For specified cable troubleshooting, use the "Additional Actions/Comments" column in the FSI for that FSC.
- For general cable and connection checkout, see "Cable and Board Interconnection Failure" on EAD 1.

Group Number	Area of Subsystem	From/To Connectors	FRU NUM	Logic Pages	LOC Pages
10	TCU Online Test/Offline Test switch	Offline switch to CU-CSU-J2	141	YF010, WZ106	50
		CU-CSU-J2 to 01A-A2A4	168	WZ106, WZ001-2	50, 20
		01A-A2A5 to 01A-A1A5	255	WZ001, MP001	20
	Offline Indicator	01A-A1Z3 to 01A-A2Y3	251	SS001, WC003-4	20
		01A-A2A4 to CU-CSU-J2	168	WZ106, YF010	20, 50
		CU-CSU-J2 to Offline LED	141	YF010	50
11	IML switch	IML switch (IML) to CU-CSU-J2	141	YF010, WZ106	50
		CU-CSU-J2 to 01A-A2A4	168	WZ106, PR001	20, 50
12	IML switch	IML switch to CU-CSU-J2	141	YF010, WZ106	50
		CU-CSU-J2 to 01A-A2A4	168	WZ106, WZ001-2	20, 50
		01A-A2A5 to 01A-A1A5	255	WZ001-2, MA001	20
13	TCU0/TCU1 switch	TCU0/TCU1 switch to CU-CSU-J2	141	YF010, WZ106	50
		CU-CSU-J2 to 01A-A2A4	168	WZ106, WC001-2, CA001, CA101, CA201, CA301	50, 20
		01A-A2Y2 to 01A-A1Z2	250	WC001-2, SS001	20
14	TCU Test/Normal switch	TCU Test/Normal switch to CU-CSU-J2	141	YF010, WZ106	50
		CU-CSU-J2 to 01A-A2A4	168	WZ106, WZ001-2	50, 20
		01A-A2A5 to 01A-A1A5	255	WZ001-2, MP001	20
22	TCU Address switch	CU-CSU-J8 to 01A-A2A2 (channel A)	173	WZ102, CA001	50, 20
		CU-CSU-J10 to 01A-A2A2 (channel B)	173	WZ102, CA101	50, 20
23	TCU Type (Mode) switch	CU-CSU-J9 to 01A-A2A2 (channel A)	173	WZ102, CA001	50, 20
		CU-CSU-J11 to 01A-A2A2 (channel B)	173	WZ102, CA101	50, 20

(See notes on FSI 204.)

Group Number	Area of Subsystem	From/To Connectors	FRU NUM	Logic Pages	LOC Pages
28	Channel adapter to buffer adapter local port	01A-A2V5 to 01A-A1V3	256	WC005-6	15
30	Channel adapter to status store	01A-A2Y2 to 01A-A1Z2 01A-A2Y3 to 01A-A1Z3	250 251	WC001-2 WC003-4	15 15
32	Maintenance device to maintenance adapter	01A-A1Y1 to TCU MD connector	169	WX001	15, 50
34	Miscellaneous CA, MP, MA, SS, SM lines	01A-A1A5 to 01A-A2A5	255	WZ001-2	15
50	Channel adapter in one TCU to buffer in other TCU (buffer adapter remote port) (see notes 1 and 2)	01A-A2Z2 (local TCU) to P2A5 (local TCU) (see note 3) P2A5 (local TCU) to P2A3 (remote TCU) (see note 4) P2A3 (remote TCU) to 01A-A1Y4 (remote TCU) (see note 3)	026 261 027	WK006 WW010 WK005	15, 25 25 15, 25
52	Status store communication (TCU to TCU communication and control) (see notes 1 and 6)	01A-A1Y2 and A1Y3 (local TCU) to P2A4 (local TCU) (see note 5) P2A4 (local TCU) to P2A4 (remote TCU) (see note 4) P2A4 (remote TCU) to 01A-A1Y3 and A1Y2 (remote TCU) (see note 5)	056 261	WK001,WK003 WW010	15, 25 25
61	Read bus to local tape transport units	01A-A2U2 (local TCU) to P1A1 (local TCU) P1A1 (local TCU) to tape transport units (see cable group 66)	022 088	RDxxx, WT004-6 WW020	15, 25 25
62	Read bus to remote tape transport units (see note 1)	01A-A2U4 (local TCU) to P2A2 (local TCU) P2A2 (local TCU) to P2A1 (remote TCU) P2A1 (remote TCU) to P1B1 (remote TCU) P1B1 (remote TCU) to tape transport units (see cable group 67)	024 260 025 092	RDxxx, WT008-10 WW020 WW020 WW020	15, 25 15, 25 15, 25 25, 75
65	Read bus - A2 board to A1 board	01A-0A1Z4 to 01A-A2Y4 01A-0A1Z5 to 01A-A2Y5 01A-0A1Z6 to 01A-A2Y6 01A-A1S2W to 01A-A2V2 01A-A1Z1 to 01A-A2Y1	252 253 254 178 249	WT103-4 WT105-6 WT107-8 WT111 WT101	15 15 15 20 20
66	Read bus A - tape transport unit	TU D0 RA(TEE) to TU D0 P1 RA1 TU D0 P1 RA1 to TU DO 02A-A1G2 TU D1 RA(TEE) to TU D1 P1 RA1 TU D1 P1 RA1 to TU D1 02A-A1G2	089 087 089 087	WW020, VP001 WW020, VP001 WW020, VP001 WW020, VP001	115, 120 115, 130 115, 120 115, 130
67	Read bus B - tape transport unit (see note 1)	TU D0 RB(TEE) to TU D0 P1 RB1 TU D0 P1 RB1 to TU D0 02A-A1G2 TU D1 RB(TEE) to TU D1 P1 RB1 TU D1 P1 RB1 to TU D1 02A-A1G2	093 094 093 094	WW020, VP002 VP002, WW020 WW020, VP002 VP002, WW020	115, 120 115, 130 115, 120 115, 130
80	Device data bus to local tape transport units	01A-A1Y5 to P1A2 P1A2 to tape transport units (see cable group 85)	029 205	WT001, WW010 ZW101, WW010	20, 25
82	Device data bus to remote tape transport units (see note 1)	01A-A1Y6 (local TCU) to P2A5 (local TCU) P2A5 (local TCU) to P2A3 (remote TCU) P2A3 (remote TCU) to P1B2 (remote TCU) P1B2 (remote TCU) to tape transport units (see cable group 86)	026 261 027 200	DI001, WT003 WW010 WW010 ZW201, WW010	20, 25 25 25 25

(See notes on FSI 204.)

Group Number	Area of Subsystem	From/To Connectors	FRU Num	Logic Pages	LOC Pages
85	Device data bus local	CU (P1A2) or TU (TU D1 P2A2) to TU D0 P1WA1 TU D0 P1WA1 to D0 02A-A1A2 D0 02A-A1A3 to TU D0 P1WA2 TU D0 P1WA2 to TU D1 P1WA1 TU D1 P1WA1 to D1 02A-A1A2 D1 02A-A1A3 to TU D1 P1WA2 TU D1 P1WA2 to TU D1 P2A2 To terminator or next drive	205 208 209 206 208 209 207 199	ZW101, WW010 ZW101, WW010 ZW101, WW010 ZW102, WW010 ZW102, WW010 ZW103, WW010 ZW103, WW010 ZW103	30, 70, 110 110, 130 110, 130 110, 130 110, 130 110, 130 110, 70 70
86	Device data bus remote (see note 1)	CU (P1B2) or TU (TU D1 P2B2) to TU D0 P1WB1 TU D0 P1WB1 to D0 02A-A1A4 D0 02A-A1A5 to TU D0 P1WB2 TU D0 P1WB2 to TU D1 P1WB1 TU D1 P1WB1 to D1 02A-A1A4 D1 02A-A1A5 to TU D1 P1WB2 TU D1 P1WB2 to TU D1 P2B2 To terminator or next drive	200 203 204 201 203 204 202 248	ZW201, WW010 ZW201, WW010 ZW202, WW010 ZW202, WW010 ZW202, WW010 ZW203, WW010 ZW203, WW010 ZW203	30, 75, 110 110, 130 110, 130 110, 130 110, 130 110, 130 110, 70 70
166	Read bus A - tape transport unit	CU-(P1A1) or DR(TU-D1-P2A1) to TU-D1-P2A1 TU-D0-RA(TEE) to TU-D0-A1G2 (right TCC) TU-D1-RA(TEE) to TU-D1-A1G2 (right TCC)	088 057 057	WW020 WW020, VP001 WW020, VP001	30, 70 110 110
167	Read bus B - tape transport unit (see note 1)	CU-(P1B1) or TU(TU-D1-0P2B1) to TU-D1-P2B1 TU-D0-RB(TEE) to TU-D0-A1G2 (left TCC) TU-D1-RB(TEE) to TU-D1-A1G2 (left TCC)	092 055 055	WW020 WW020, VP001 WW020, VP001	30, 70 110, 130 110, 130
180	Device data bus to local tape transport units	01A-A1Y5 to 01A-P1A/B2 (local part of cable) 01A-P1A/B2 to TU-D0-A1A2 (local part of cable)	028 023	WT001, WW010 WW010, ZW101	30
182	Device data bus to remote tape transport units	01A-A1Y6 (local TCU) to 01A-P2A5 (local TCU) 01A-P2A5 (local TCU) to 01A-P2A3 (remote TCU) 01A-P2A3 (remote TCU) to 01A-P1A/B2 (remote TCU) 01A-P1A/B2 (remote TCU) to TTUs (TU-D0-A1A4, remote part of cable)	026* 261 028 023	DI001, WT003 WW010 WW010 WW010, ZW201	15, 25 25 25 25, 130
185	Device data bus local	CU-P1A/B2 or TU-D1-P2A/B2 to TU-D0-A1A2 (local part of cable) TU-D0-A1A3 to TU-D1-A1A2 TU-D0-A1A5 to TU-D1-P2A/B2 (local part of cable) To terminator (local and remote) or next drive	023 222 053 266	WW010, ZW101 ZW102, WW010 ZW103, WW010 ZW103	25, 110 130 130, 75 75
186	Device data bus remote (see note 1)	CU-P1A/B2 or TU-D1-P2A/B2 to TU-D0-A1A4 (remote part of cable) TU-D0-A1A5 to TU-D1-A1A4 TU-D1-A1A5 to TU-D1-P2A/B2 (remote part of cable) To terminator (local and remote) or next drive	023 174 053 266	WW010, ZW201 ZW202, WW010 ZW203, WW010 ZW203	25, 110 130 130 75

* This FRU is a part of the communicator feature.
(See notes on FSI 204)

Fault Symptom Index (FSI) FSI 204

Notes:

1 For dual tape control unit configuration only.

2 From/To Connectors shown for channel adapters in local TCU to buffer in remote TCU. To obtain the opposite path, interchange words 'local' and 'remote'.

3 FRUs 026 and 027 are cable assemblies in which the cables from two different board locations are merged into a single connector at the dual TCU tailgate (P2). Only the part of the cable assembly related to the area under consideration is listed in the From/To column.

4 FRU 261 is a cable assembly having multiple cables packaged together for connecting the dual TCU configuration. Only the tailgate connections related to the area under consideration are listed in the From/To column.

5 FRU 056 is a cable assembly in which cables from two different board locations are merged into a single connector at the dual TCU tailgate (P2). Both parts of the cable are used in Status Store Communication, and both are listed in the From/To column.

6 The path described in the From/To column is for Status Store Communications in both directions.

Error Code D7nn (Continued)

Troubleshooting Information for WSE Bit 6 On

Use this troubleshooting guide first for error codes D702 and D703 only. For other D7nn error codes, see "Common Troubleshooting Guide for All D7nn Error Codes" for the correct sequence of testing multiple WSE error bits on. (WSE bits 5 and 4 should be used for troubleshooting before WSE bit 6.)

Error Description

A write data error has occurred.

Error Condition Theory

Data supplied by the buffer is checked for parity upon arrival at the WDF card. If parity later is found to be in error at the output of the WDF card, WSE Bit 6 is set.

Check characters are generated internal to the card, and are transmitted through the WDF logic with known parity. This parity is checked at the output of the WDF card. Wrong parity of these check characters will set WSE Bit 6.

The circuitry which generated the check characters is checked internally for proper operation, if a failure in this circuitry is detected WSE Bit 6 is set.

Check 2 is set with WSE Bit 7 to indicate the error to the microprocessor.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Cable group 66 (See FSI 1 for "Cable Group Table")
2. Cable group 67 (See FSI 1 for "Cable Group Table")
3. Cable group 61 (See FSI 1 for "Cable Group Table")
4. Cable group 62 (See FSI 1 for "Cable Group Table")
5. Source voltages at the input to the FRUs involved
6. Cables, connectors, and nets between FRUs called by FSI and EAD.

Troubleshooting Guide

Verify from sense information that the most frequently occurring error code is D702 or D703. You also use this error analysis diagram if troubleshooting WSE bits 5 and 4 was not successful. If an error code other than D702 or D703 is occurring more frequently, use the error analysis diagram for that error code.

If you have only the one error code, continue in this error analysis diagram. If you came to this error analysis diagram from another EAD, continue in this error analysis diagram until you are instructed to do otherwise.

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.

   Note: The net list given with the error diagram is divided into two groups.

   Net list A detects an internal diagnostic failure; that is, the internal Loop Write to Read diagnostic path is broken. This may not have any association with a hardware failure that you are analyzing.

   Net list B includes nets that will cause customer failures and diagnostic failure IDs.
3. For intermittent errors, loop the identified diagnostics repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

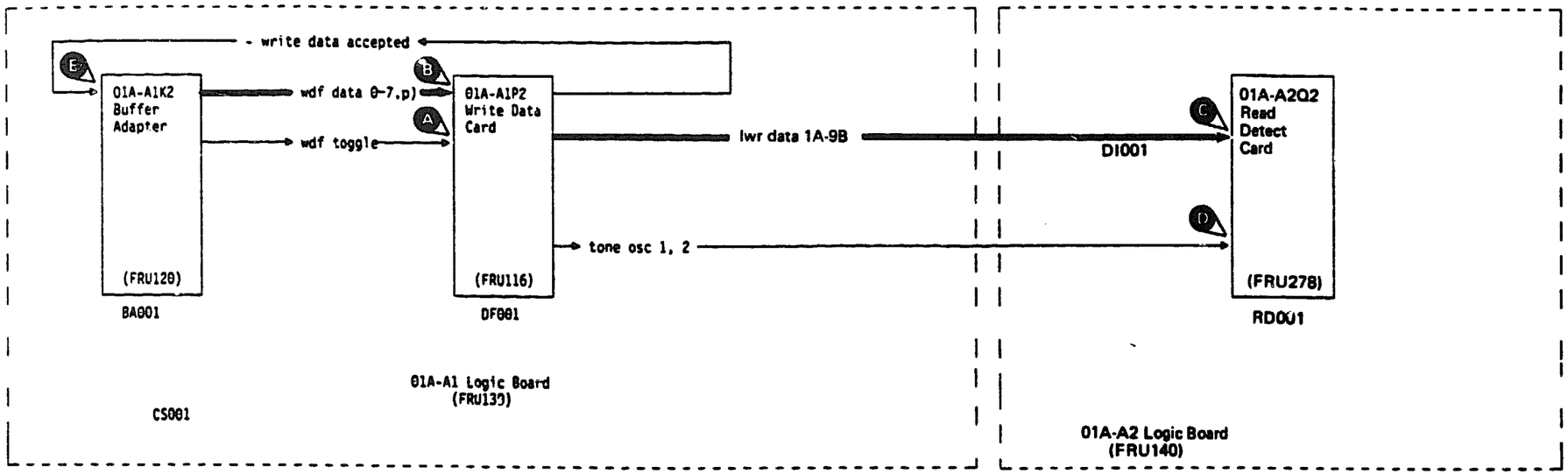
   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.
4. If a diagnostic failure ID is available, compare the failure ID with the failure IDs in WSE bit 6 net lists A and B in the error diagram. If the failure ID is included in WSE bit 6 net list B, the failure is a diagnostic failure and may not be the original user's failure. Use WSE bit 6 net list B to fix this problem first, then continue with the user's failure. Loop the failing diagnostic with the Loop on Error option. If no failure is detected, loop the Loop Write to Read diagnostic (EE52, options 1 and 7) with the Loop Routine option. Scope the nets included in "WSE Bit 6 Net List." If a diagnostic failure ID occurs and is included in "WSE Bit 6 Net List," run the EE52 diagnostic with the Loop on Error option. Scope those lines (see EAD 2341) included for the diagnostic failure ID. If any of these lines are not changing with correct up and down logic level tolerances, that is the bad net. If the diagnostic failure ID is not included in "WSE Bit 6 Net List," you may be in the wrong error analysis diagram. See the diagnostic (DIAG) section for the diagnostic failure ID. The diagnostic failure ID will send you to the correct error code in the FSI.
5. If no bad net is found, set the Loop Write to Read diagnostic (EE52, options 2 and 7) to loop on the whole routine. Scope the rest of the nets included in "WSE Bit 6 Net List." Look for a net that is not changing between two valid logic levels.
6. If all nets included in the "WSE Bit 6 Net List" look good, go to the troubleshooting guide for WSE bit 0. Then look at your original error code to see if any of the other write status/error register bits are on. If another write status/error register error bit is on, go to the EAD that describes the troubleshooting guide for that error. Be sure to follow the order described in the first EAD for error code D7nn.
7. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3	CARR-TCU 1-1	Removal and replacement procedures
4,5	DIAG 1	Diagnostic control program options. Diagnostic failure ID (with each diagnostic description)
7	CE/HSC 1	How to use the CE Panel

Error Code D7nn (Continued) **EAD 2341**

WSE Bit 6 Error Diagram



WSE Bit 6 Net List A

DIAG	NET NAME	LOGIC	ERROR STOP	WSE REG	ERROR DIAGRAM REF
EE50	+ LWR data (2A)	RD101	LW2035	C2	G
and	+ LWR data (5B)	RD101	LW2035	C2	G
EEA0	+ LWR data (1A)	RD001	LW2027	C2	G
and	+ LWR data (1B)	RD001	LW2027	C2	G
E010	+ LWR data (2B)	RD101	LW2027	C2	G
	+ LWR data (3A)	RD201	LW2027	C2	G
	+ LWR data (3B)	RD201	LW2027	C2	G
	+ LWR data (4A)	RD001	LW2027	C2	G
	+ LWR data (4B)	RD001	LW2027	C2	G
	+ LWR data (5A)	RD101	LW2027	C2	G
	+ LWR data (6A)	RD201	LW2027	C2	G
	+ LWR data (6B)	RD201	LW2027	C2	G
	+ LWR data (7A)	RD001	LW2027	C2	G
	+ LWR data (7B)	RD001	LW2027	C2	G
	+ LWR data (8A)	RD101	LW2027	C2	G
	+ LWR data (8B)	RD101	LW2027	C2	G
	+ LWR data (9A)	RD201	LW2027	C2	G
	+ LWR data (9B)	RD201	LW2027	C2	G

WSE Bit 6 Net List B

DIAG	NET NAME	LOGIC	ERROR STOP	WSE REG	ERROR DIAGRAM REF
EE52	- write data	DF001	LW2025	CA	E
and	accepted				
E010	- WDF toggle	DF001	LW2024	CA	A
and	- WDF bit 0	DF001	LW2024	CA	B
EE50	- WDF bit 1	DF001	LW2024	CA	B
and	- WDF bit 2	DF001	LW2024	CA	B
EEA0	- WDF bit 3	DF001	LW2024	CA	B
	- WDF bit 4	DF001	LW2024	CA	B
	- WDF bit 5	DF001	LW2024	CA	B
	- WDF bit 6	DF001	LW2024	CA	B
	- WDF bit 7	DF001	LW2024	CA	B
	- WDF bit P	DF001	LW2024	CA	B
	tone osc 1	DI001	LW2027	C2	D
	tone osc 2	DI001	LW2027	C2	D

Error Code D7nn (Continued)

Troubleshooting Information for WSE Bit 7 On

Use this troubleshooting guide first, only for error code D701. For other D7nn error codes, see "Common Troubleshooting Guide for All D7nn Error Codes" for the correct sequence for testing multiple WSE bits on. (WSE bits 5, 4, and 6 on should be used for troubleshooting before WSE bit 7.)

Error Description

A multiplexed data error has occurred in the write data card.

Error Condition Theory

The write data card reformats the data and adds the check characters before sending the buffer data to the drive adapter card. The format consists of 18 tracks of specially decoded write data. This data is multiplexed out on the '+ mux write data' bus 9 bits at a time plus parity. This data is parity checked on the bus in the write data card.

When a multiplex parity error is detected, write status/error (WSE) register bit 7 and check 2 are set to indicate the error condition to the microprocessor.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Source voltages at the input to the FRUs involved
2. Cables, connectors, and nets between FRUs called by FSI and EAD.

Troubleshooting Guide

Verify from sense information that the most frequently occurring error code is D701 or that analyzing WSE bits 5, 4, and 6 was not successful. If another error code is more frequent, go to the error analysis diagram for that error code. If you only have the one error code, continue with this error analysis diagram. If you came to this error analysis diagram from another EAD, continue with this error analysis diagram until you are instructed to do otherwise.

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

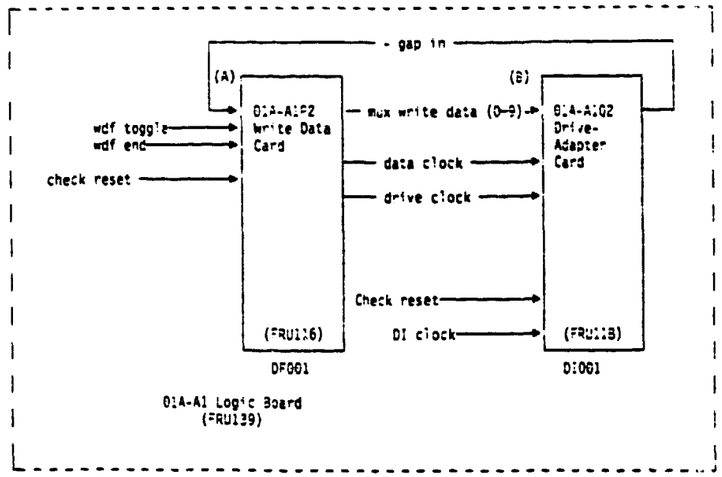
4. Loop the failing diagnostic with the Loop on Error option. If no failure is detected, run the Loop Write to Read diagnostic (EE52, options 1 and 7) with the Loop Routine option. If a diagnostic failure ID occurs and is included in "WSE Bit 7 Net List," run the Loop Write to Read diagnostic (EE52) with the Loop on Error option. Scope those lines (see EAD 2346) included for the diagnostic failure ID. If any of these lines are not changing with correct up and down logic level tolerances, that is the bad net.
5. If no bad net is found, set the short loop write to read pattern test diagnostic (EE52, options 2 and 7) to loop on the whole routine. Scope all of the nets included in "WSE Bit 7 Net List." Look for a net that is not changing between two valid logic levels.
6. Use diagnostic EE53 Short Loop Write to Read timing test to test the rest of this area. See the "WSE Bit 7 Net List."
7. Loop diagnostic EEA2 and scope the nets included as reference B in the "WSE Bit 7 Net List."
8. If all nets included in the "WSE Bit 7 Net List" look good, go to the troubleshooting guide for WSE bit 0. Look at your original error code. If another WSE register error bit is on, go to the EAD that describes the troubleshooting guide for that error. Be sure to follow the order described in the common troubleshooting guide for error code D7nn.
9. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
10. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3	CARR-TCU 1-1	Removal and replacement procedures
4,5,6,7	DIAG 1	Diagnostic control program options. Diagnostic failure ID (with each diagnostic description)
9	CE/HSC 1	How to use the CE Panel

Error Code D7nn (Continued) **EAD 2346**

Error Diagram



* Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

WSE Bit 7 Net List

DIAG	NET NAME	LOGIC	ERROR STOP	WSE REG	ERROR DIAGRAM REF
EE52 EE53	- gap in - mux write data	DF001 DI002	LW2925	85	A B

Error Code D900

Error Description

A check 2 occurred, and the microprocessor card cannot detect the card that generated the check 2.

Error Condition Theory

Some of the cards generate '- check 2' to indicate to the microprocessor that an error has occurred on the card. The - check 2' signal is bidirectional and is dot ORed by all the cards that use it. The '- check 2' signal turns on processor status register (PSR) bit 4.

When the microcode detects processor status register bit 4 active, it checks each of the cards that can activate '- check 2' to determine which card had the error.

Error code D900 is set if the microcode detects processor status register bit 4 active but cannot find a card that is indicating a failure.

Possible Causes of Failure

This failure is most likely caused by a false signal on the '- check 2' line. Because the signal is dot ORed (see the error diagram), you cannot isolate a failing card with an oscilloscope.

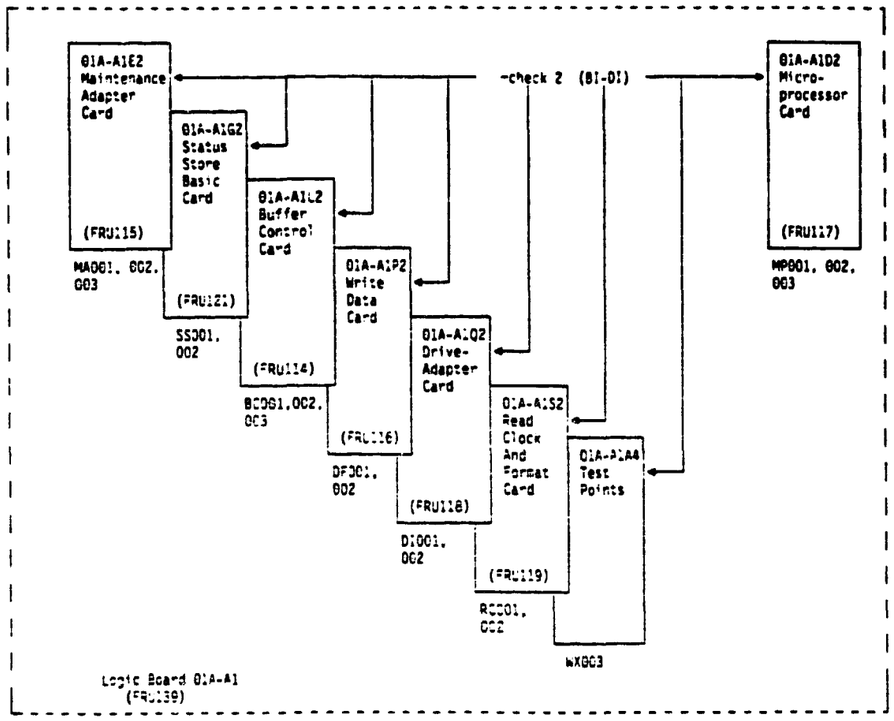
Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. If all of the cards have been replaced, replace the C1A-A1 board (FRU139).
4. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
5. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
4	CE/HSC 1	How to use the CE Panel

Error Diagram



Error Code E100

Error Description

The error bits in the ERA and ERB registers indicate the cause of the existing check 1 condition. The contents of the ERA and ERB registers are transferred to the ERAH and ERBH (holding) registers at the start of check 1 error recovery. If a check 1 error condition still exists, the error from the recovery attempt sets 1 of the bits in ERA or ERB to 1. The microprocessor detects the bits in the ERA or ERB registers and in the ERAH or ERBH registers and sets check 1 bit to 1. The microprocessor then stops.

Error Condition Theory

The check 1 indicator shows that one or more of the 17 check 1 error latches has been set. These latches are the ERA and ERB registers and the PCR Register bit 5 set by the microcode.

The ERA and ERB registers are reset by power on reset or by microprocessor reset during error recovery. If a check 1 error is solid, the ERA and ERB (described in the DF section) registers are set and the check 1 error code is set even after the reset. Latches involved in check 1 indications are:

Check	Latch
Check 1 latch A-F	ERB bits 2-7
Check 1 holding latches	ERAH/ERBH 0-7
MP internal or CS data bus high/low failure	ERA bit 0
Current interrupt level parity error latch	ERA bit 3
MP bus out parity error latch	ERA bit 7
Interrupt level parity error latch	ERA bit 4
Microprocessor error	ERA bit 2
LSR address parity error (internal MP card failure)	ERA bit 5
Internal microprocessor card register parity error	ERB bit 1
Microprocessor XR data bus input error	ERA bit 1
Internal MP card or XR address bus error latch	ERB bit 0
XR address parity error	ERA bit 6

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU139) logic board 01A
2. Source voltages at the input to the FRUs on this EAD
3. Cables, connectors, and nets between FRUs on this EAD

FRU Matrix by Error Register Bits

FRU	ERA 0123 4567	ERB 0123 4567
FRU117	XXXX XXXX	XXXX XXXX
FRU134	XX	X X
FRU135	X XX XXXX	XXXX XXXX
FRU115	X X	XX XXXX

Common Troubleshooting Guide for Error Code E100

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

2. Display the ERA, ERB, ERAH, and ERBH register contents. (The error registers can be read out using the Subsystem Display/Alter program, option 3 Register Display/Alter, selection 5 TCU Scan Rings. See MD/SDISK 1, to find "Tape Control Unit Scan Rings.")

3. Look for the first ERA or ERB bit on. Go to the troubleshooting information for that bit first.

4. If there is more than one ERA or ERB bit on and the troubleshooting information for the first bit does not solve the problem, go to the next bit in the ERA or ERB and use that troubleshooting information.

5. Use the preceding procedure starting with ERA bit 0 and ending at ERB bit 7.

6. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.

7. Failures detected in an area can be caused by defective clock lines. Load the Basic Tape Control Unit Test. When a diagnostic failure ID is detected, set the Loop on Error option. If no failure ID is detected, set the Loop on Routine option and scope the clocks in the following list looking for a clock that is at the wrong logic level or for one that is not changing logic level. The location of the clock diagrams is shown on EAD 1. The functional area clocks to be scoped are:

   - Subsystem clocks to the microprocessor
   - XR bus and control clocks
   - Maintenance adapter system clocks.

8. For intermittent errors, loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorating levels or signals.

9. Run Basic Tape Control Unit Test and EE85, record all the diagnostic failure IDs.

   Go to DIAG 1 to find the failure ID description to determine the best error analysis diagram to use to analyze the failure.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

10. Do not continue with this error analysis diagram if the diagnostic failure ID sends you to another error analysis diagram. If you have been sent back here, diagnostic EEF0 is a helpful scoping aid for the suspected area.

11. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:

    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, continue in this EAD with the next action.

12. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2,3,4	DF 1	ERA and ERB bit descriptions
6	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
7	EAD 1	Location of clock descriptions
7,9,10	DIAG 1	Diagnostic EEFO descriptions and options
11	CE/HSC 1	How to use the CE Panel

Troubleshooting Information for ERA Bits 0, 1, 2, and 6 or ERB Bit 0 On

1. ERA bit 0 = 1 Internal microprocessor or control storage data bus high/low failure

   These are failures internal to the microprocessor card except for the control storage data bus high/low. The control storage data is passed to the microprocessor card (FRU117) by way of the 'control storage data hi/lo buses' from the control storage card (FRU135).

2. ERA bit 1 = 1 Microprocessor XR data bus input error

   The microprocessor card (FRU117) has detected an error from one of the XR data buses (XR data bus a/b).

3. ERA bit 2 = 1 Microprocessor error

   This bit is set when the microprocessor detects that one or more of the following conditions exist:

   - Control storage data error. Bad parity was detected on the high/low bus during control storage transfer, or the error is internal on the MP card.
   - A local storage or external register data error occurred. Incorrect parity was detected on XR data bus A/B during register read.
   - An internal microprocessor error occurred.

4. ERA bit 6 = 1 External register address parity error internal to the MP card

   This bit is set when bad parity is detected on the microprocessor external register address bus.

5. ERB bit 0 = 1 Internal microprocessor card or XR address bus failure

   This bit is set when an internal microprocessor card failure or a failure of the XR address bus (P. 0—4) is detected.

Troubleshooting Guide for ERA Bits 0, 1, 2, and 6 or ERB Bit 0 On

1. For only ERA bit 0 on, scope the net groups in the order 3, 2, 1
2. For only ERA bit 1 on, scope the net groups in the order 2, 3, 1
3. For only ERA bit 2 on, scope the net groups in the order 1, 2, 3
4. For only ERA bit 6 on, scope the net groups in the orcer 3, 2, 1
5. For only ERB bit 0 on, scope the net groups in the order 1, 2, 3.

For multiple bits on, scope all the net groups in any order

Note: See EAD 2652 for test points

- Net Group 1

  - cs data bus high/low

    (A) from FRUs 134, 135, 115, to FRU117.

    $MPCSDE00 (P.0 – 7) CS001 to MP001

    $MPCSDO00 (P.0 – 7) CS001 to MP001

- Net Group 2

  - xr data bus a/b

    (C) input to FRU117.

    $MPXRBA00 (P.0 – 7) MP001

    $MPXRBB00 (P.0 – 7) MP001

- Net Group 3

  - xr address bus

    (B) from FRU117. Scope these nets at the output of the microprocessor card drivers looking for a net with a short circuit to the cards they are supplying.

    $MPXRAD00 (P. 0-4)

If the preceding procedure did not solve the problem and there are other ERA or ERB bits on in the diagnostic failure ID, go to troubleshooting guide for the next ERA or ERB bit on from the recorded diagnostic failure ID in the common troubleshooting guide.

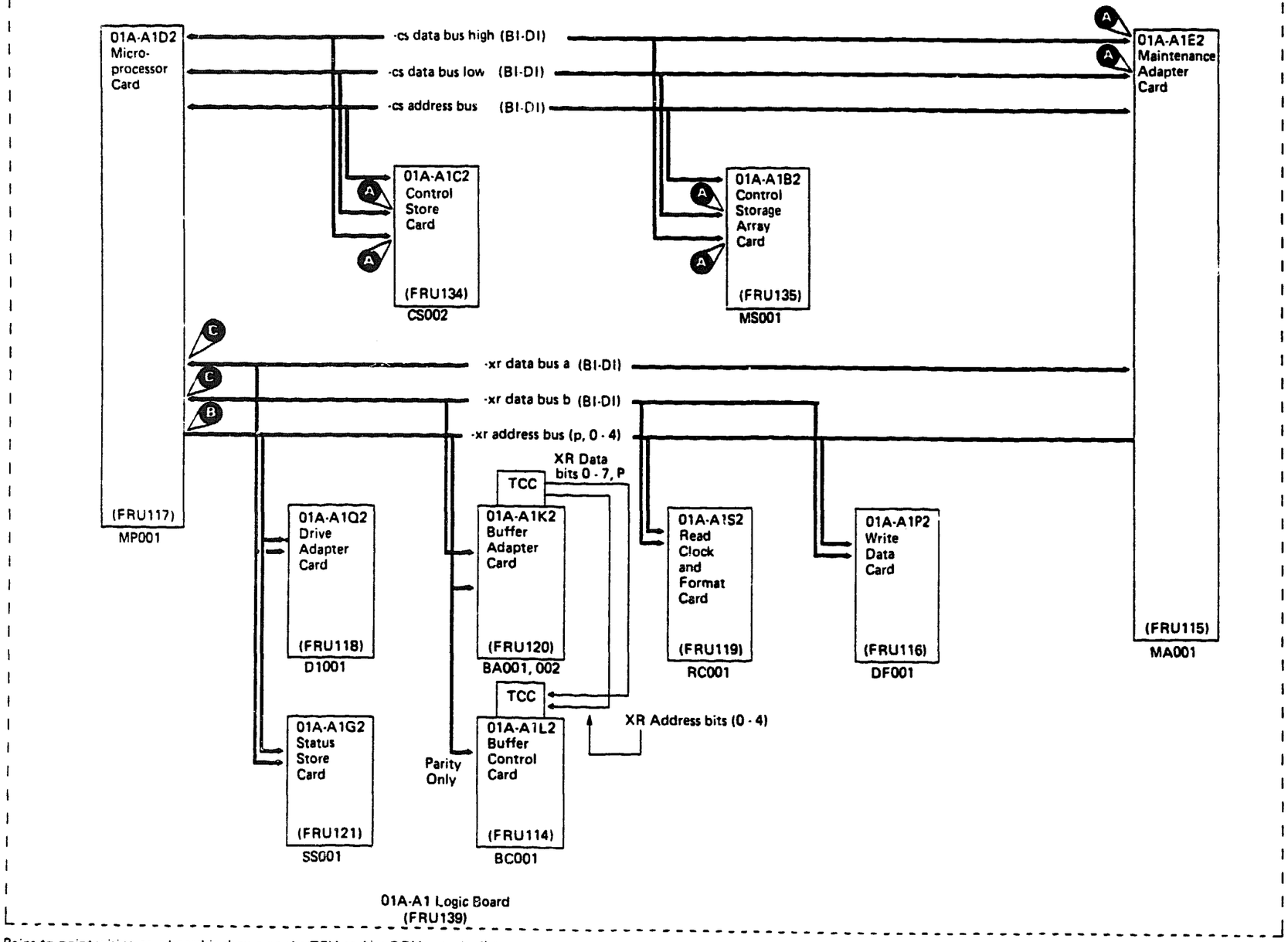
6. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.

7. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Error Code E100 (Continued) **EAD 2652**

Error Diagram for ERA Bits 0 - 2 and 6 or ERB Bit 0 On



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Troubleshooting Information for ERA Bit 3 On

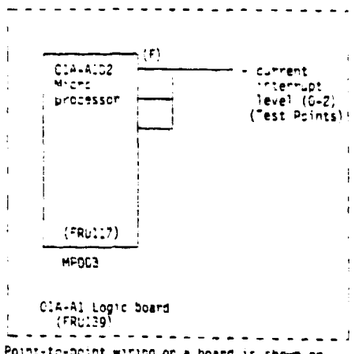
ERA bit 3 = 1 indicates that a current interrupt level parity error occurred. This bit is set when bad parity is detected on the current interrupt level latches.

This is an internal failure of the microprocessor card (FRU117) or of the external 'current interrupt level' card pins.

Troubleshooting Guide for ERA Bit 3 On

1. Scope the 'current interrupt level' output (F) (see diagram on this page). These pins are scope points only and have no board nets. If any of these pins have logic level that is not correct and the card has been exchanged, the failure can only be a short circuit to that pin.
2. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
3. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Error Diagram for ERA Bit 3 On



Point-to-point wiring on a board is shown on the TCD and or DRV net wire list.

Troubleshooting Information for ERA Bits 4, 5, and 7 or ERB Bit 1 On

1. ERA bit 4 = 1 Processor interrupt level parity error

   This bit is set when bad parity is detected on the microprocessor interrupt level latches while an interrupt request is active. The interrupt level latches are checked at S0 – S1 time for correct parity.

2. ERA bit 5 = 1 Internal microprocessor card failure of the local storage address parity

   This bit is set when bad parity is detected internally on the microprocessor local storage address bus inside the card.

3. ERA bit 7 = 1 Microprocessor bus out parity error

   This bit is set when bad parity is detected on the microprocessor data even/odd bus out during any register write operation.

4. ERB bit 1 = 1 Internal microprocessor card register parity error

   This bit is set when bad parity is detected in the microprocessor internal interrupt mask register (IMR) or in the processor diagnostic register (PDR).

5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Troubleshooting Guide for ERA Bit 4, 5, and 7 or ERB Bit 1 On

1. This is an indication of a check condition internal to the microprocessor card, which has already been exchanged. The only other causes of the problem are the voltages to the FRU and the clocks to the microprocessor card defined in the EAD for error code E100 common troubleshooting guide.
2. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
3. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Troubleshooting Information for ERB Bits 2 through 7 On

ERB bits 2 through 7 = 1

These bits indicate that an error has been detected by the control storage array card (FRU135). The error is reported to the microprocessor card (FRU117) by the control store card (FRU134).

1. ERB bit 2 = 1 Uncorrectable control storage read error

   This bit indicates that the control storage array card (FRU135) detected an ECC error that cannot be corrected (double bit) during a read operation.

2. ERB bit 3 = 1 Control storage address parity error

   This bit indicates that the control storage array card (FRU135) detected bad parity on the control storage address bus. This address is sent to the control storage array card from the storage address register (SAR) on the control store card (FRU134).

3. ERB bit 4 = 1 Control storage refresh error

   This bit indicates that the control storage array card (FRU135) detected a parity check condition in the refresh counter.

4. ERB bit 5 = 1 Selection check

   This bit indicates that the control storage array card (FRU135) detected that a 'card select' line was active at the same time as the 'refresh select' line or that more than one 'card select' line was active. The 'card select' lines select one of the four arrays in the control storage array card.

5. ERB bit 6 = 1 Key bit check

   This bit indicates that the control storage array card (FRU135) detected that the key bit does not match the key bit stored on a preceding cs write cycle.

6. ERB bit 7 = 1 Control storage write data parity error

   This bit indicates that the control storage array card (FRU135) detected that the data on the 'control storage data high/low bus' from the microprocessor card has bad parity during a cs write operation.

Error Code E100 (Continued) **EAD 2653**

7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Troubleshooting Guide for ERB Bits 2 through 7 On

Note: See EAD 2655 for test points

1. ERB bit 2 = 1 Uncorrectable control storage read error

   Scope the following nets for correct tolerances and logic levels:

   - '- uncorrectable read data check' **(M)** between FRUs 135 and 134
   - '- cs check 1 a (read data ecc)' **(M)** between FRUs 135 and 117.

2. ERB bit 3 = 1 Control storage address parity error

   Scope the following nets for correct tolerances and logic levels

   - '- wp address parity bad' **(M)** between FRUs 134 and 135
   - '- cs check 1 b (wp adr par)' **(M)** between FRUs 134 and 117.
   - '- cs address bus' **(D)** at FRU134 and bad check driver outputs on BI-DI bus at output of FRUs 135, 117, and 115

3. ERB bit 4 = 1 A control storage refresh error has occurred

   - Sync the oscilloscope on 'xr load' **(C)** at 10 microseconds/division. Display 'xr load' on channel A. Display '- refresh timer clock' **(E)** on channel B. '- refresh timer clock' should pulse once for every 27 pulses of 'xr load'. Display '- wp refresh select' **(R)** on channel B. '- wp refresh select' should pulse once for every 27 pulses of 'xr load'

4. ERB bit 5 = 1 A selection check has occurred

   Scope the following nets for correct tolerances and logic levels:

   - '- wp card selects **(J)** between FRUs 134 and 135
   - '- wp refresh select' **(R)** between FRUs 134 and 135
   - '- wp selection check' **(M)** between FRUs 135 and 134
   - '- cs check 1 d (selection)' **(M)** between FRUs 134 and 117.

5. ERB bit 6 = 1 A key bit check error has occurred

   Scope the following nets for correct tolerances and logic levels

   - '- wp key bit' **(K)** between FRUs 134 and 135
   - '- key bit check' **(M)** between FRUs 135 and 134
   - '- cs check 1 e (key bit)' **(M)** between FRUs 134 and 117.

6. ERB bit 7 = 1 A control storage write data parity error has occurred

   Scope the following nets for correct tolerances and logic levels.

   - '- wp write data parity check' **(M)** between FRUs 135 and 134
   - '- cs check 1 f (wrt data par)' **(M)** between FRUs 134 and 117.
   - '- cs data bus high/low' **(A)** between FRUs 135 and 134, 117, 115.

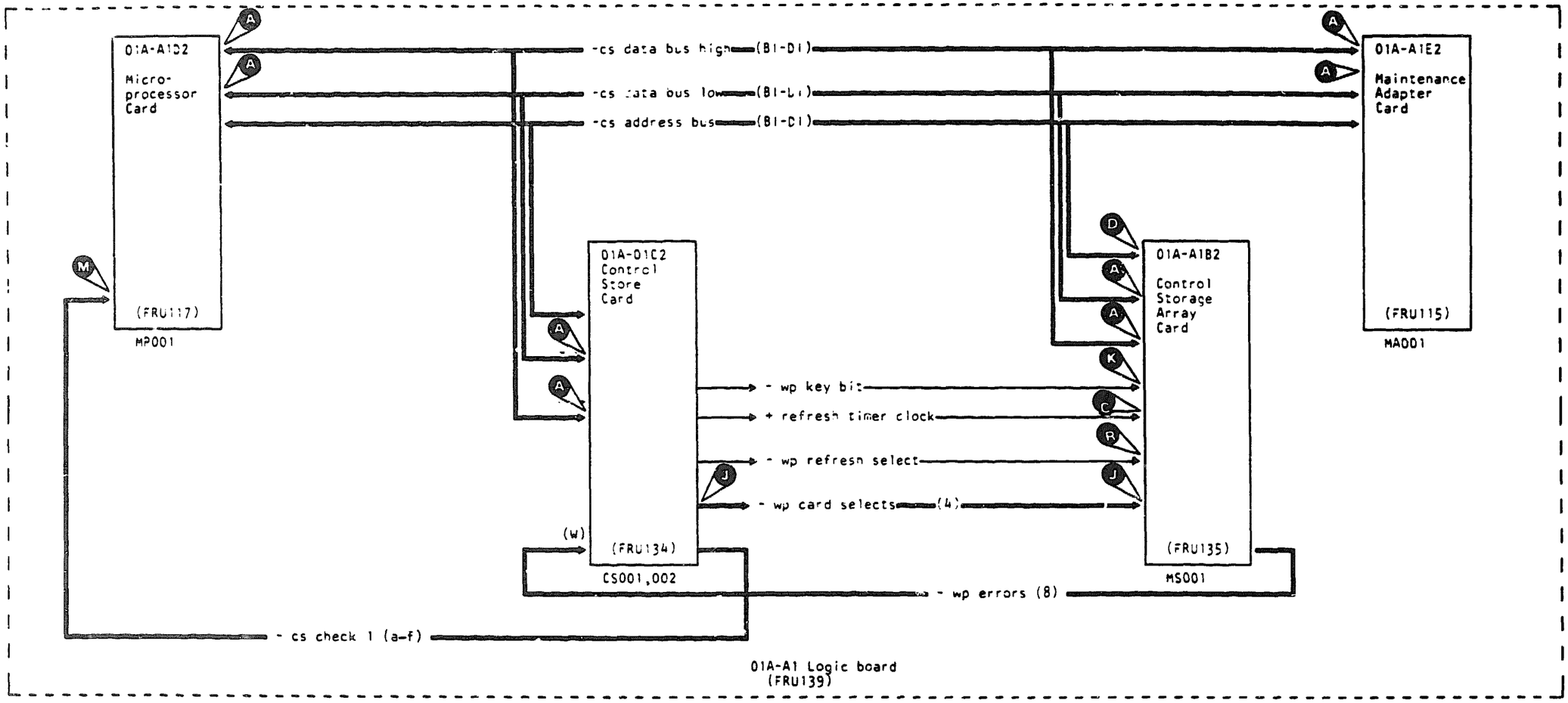
7. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Error Code E100 (Continued) **EAD 2655**

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Code E103, Port Open and MTI Bit 6 Errors

Error Description

The maintenance adapter card cannot communicate with the MD.

Error Condition Theory

Port open errors occur during operation of the Maintenance Device/Maintenance Adapter diagnostic. The port open error indicates that the maintenance device could not shift data bits from the MD through the shift register on the maintenance adapter card and back to the MD.

MTI bit 6 errors can occur during any MD-to-maintenance adapter card operation. The MTI bit 6 error indicates that the maintenance adapter card detected even parity on the data it received from the MD. MTI bit 6 being set causes the maintenance adapter card to activate '- check 2' to the microprocessor card.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU134) control store card 01A-A1C2
2. Maintenance device
3. Cable from 01A-A1Y1 to the MD connector
4. Nets from 01A-A1 to 01A-A1E2
5. (FRU139) logic board 01A-A1.

   Note: FRUs 1 and 2 are identified by the maintenance package in diagnosing a correction error.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. Check the cables and connectors between logic board 01A-A1 and the MD.
4. The MD may be failing. Use the MD test diskette to run the MD test. If another MD is available, try the other MD and another support diskette.
5. Run the Maintenance Device/Maintenance Adapter and the TCU Basic diagnostics and E010.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

6. Meter or scope the nets indicated in the net list.
7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
8. **If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3,6	Logics WX001-MA001	Cable and net checks
4	MD/SDISK 1	Maintenance Device/Maintenance Adapter and TCU Basic diagnostics
5,6	OPER 1	Theory of Operation MD/MA Interconnection
7	CE/HSC 1	How to use the CE Panel

Nets to Scope

See EAD 1 for "Clocks to and from the Maintenance Adapter" and "Maintenance Device to Maintenance Adapter Timing."

All S clocks to the maintenance adapter card

- MD serial data in
- MD shift pulse
- MD status in
- MD enable
- MA read to MD
- MA write to MD
- MA serial data out to MD
- MA status out to MD

\+ Streaker B clock

\+ Streaker MS clock

\+ KVPB L1 clock

- KVPB L2 clock

Error Description

The microprocessor uses the level 0 external interrupt for the maintenance adapter, operation external registers errors and data transfer from the IML diskette drive. Level 0 interrupt is the highest priority interrupt and cannot be masked. When the microprocessor receives a level 0 interrupt, and can find no valid reason for its occurrence it attempts to post the correct Fnnn code as determined by the external register address in use at the time of the failure.

When the microprocessor detects a level 0 interrupt, it checks the processor status register (PSR) bit 0 for an external register error. If PSR bit 0 is 0, the microprocessor checks bit 0 of the maintenance tag in (MTI) register, which is set to 1 if the maintenance device was communicating with the tape control unit. If both register bits are 0, the microprocessor checks to see if the IML diskette drive is set to transfer data. If none of the three conditions spelled out above are set, the microprocessor sets error code F00D, which indicates unknown cause of the level 0 interrupt.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU134) control storage card 01A-A1C2
2. (FRU194) cable IML diskette drive
3. (FRU086) IML diskette drive
4. (FRU139) logic board 01A-A1
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between FRUs on this EAD
7. (FRU134) control storage card 01A-A1C2 (in the other tape control unit).

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Failures detected in the functional area can be caused by defective clock lines. If clocking to the functional area is suspected, verify that the clocks to the functional area are as shown in the "Tape Control Unit Clocks" pages of this volume.
5. The scan controls and clocks to the functional areas can cause the functional area to indicate a failure and should also be checked to ensure that they are not in their active condition.

   The functional areas are the microprocessor, the control storage, and the maintenance adapter.

6. Run all diagnostics from the support diskette and use the diagnostic information in the DIAG section of the maintenance information for any failure. If no failure is detected, or a diagnostic failure ID points to this EAD, go to step 7.
7. Select and loop EE10 diagnostics from the support diskette to test these functional areas. (Selecting diagnostic EE10 runs the EE12 and EE85 diagnostics as one test.) For scoping, if there is no diagnostic failure, use the loop section option; if there is a diagnostic failure, use the loop on error option.

   Note: See EADs 2696 and 2697 for test points.

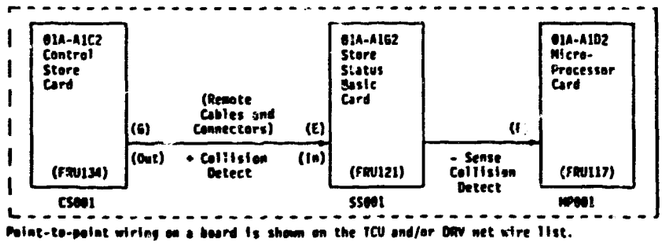
   If it becomes necessary to scope the XR data bus, (C) or the XR address bus, (D) there is a diagnostic available (EEFO) that will allow you to select one XR register in each functional area and loop the diagnostic while scoping the nets and clocks that affect selection and data movement to the XR registers in the functional area selected.
8. Scope 'mp external interrupt 0' (A) for bad levels.
9. Scope 'xr error ungated' (B) for glitches or bad levels. Any down logic level is an error and should be traced to find the cause.
10. Scope 'collision detect' (F) signal for an active state (- level).

    Scope points (E) and (G) ((G) is in the other tape control unit) to isolate the problem.
11. **If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:**
    - **If no errors are detected, go to SPROC 1 "End of Call Actions."**
    - **If the program detects an error, continue in this EAD with the next action.**
12. **If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."**

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
6,7	DIAG 1	How to operate diagnostics How to use EEFO
10,11	CE/HSC 1	How to use the CE Panel

Error Diagram

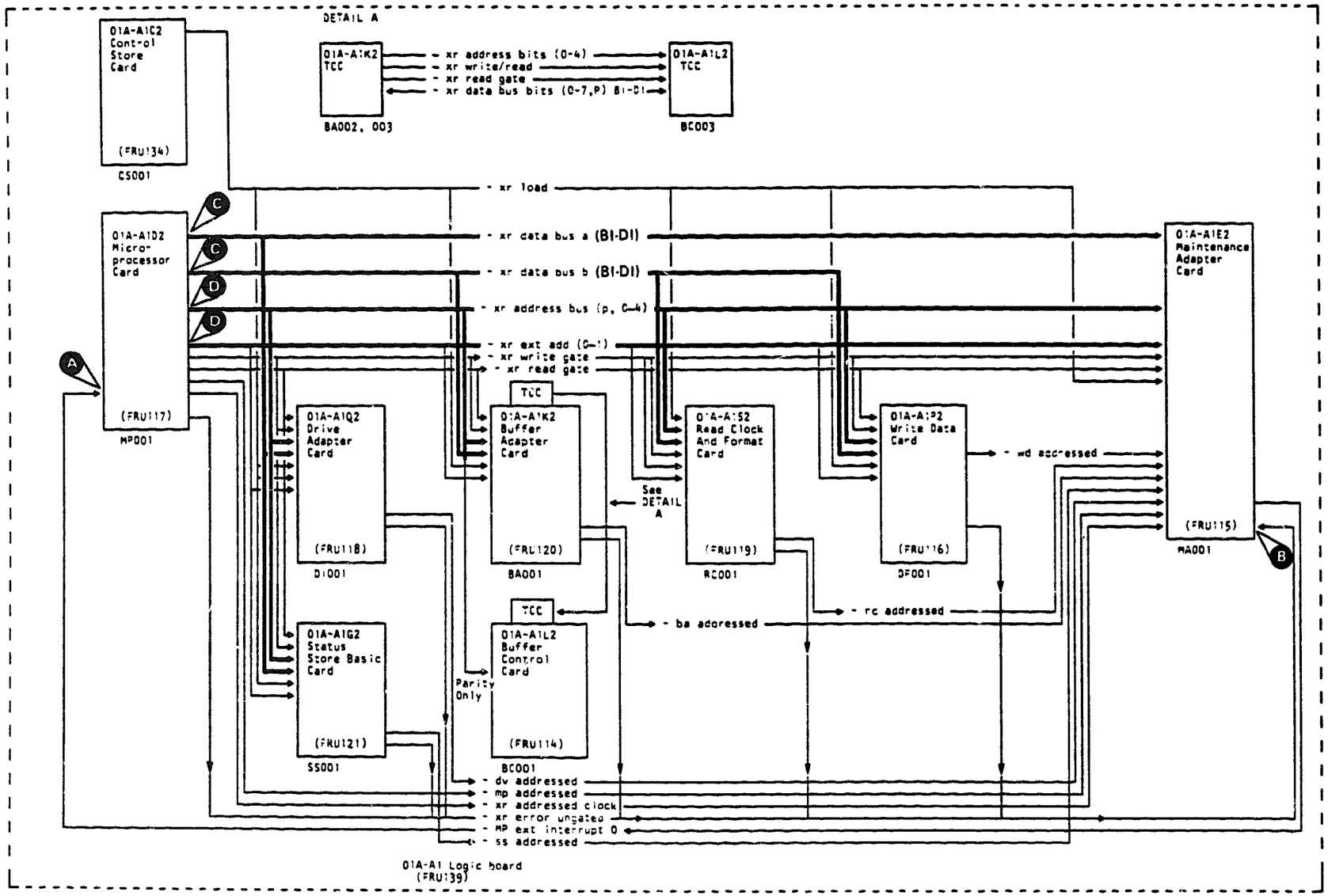


Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Code F00D (Continued) **EAD 2696**

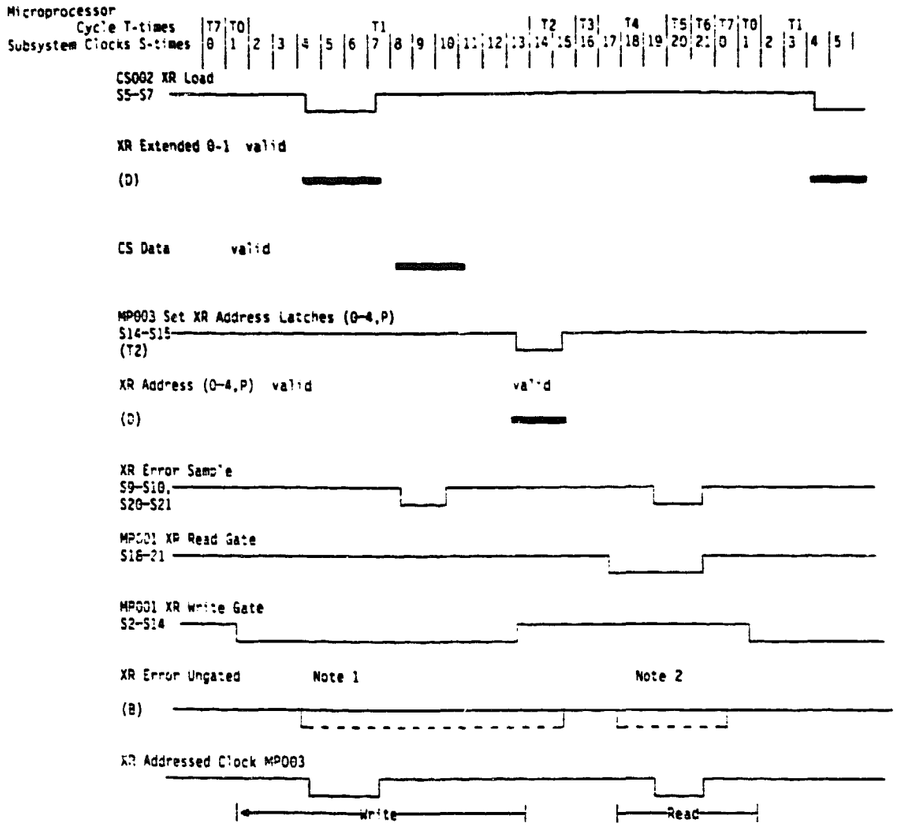
Error Diagram

XR Data and Address



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

XR Register Address/Data Transfer Timing



Note 1: The line goes down only if an error and a write is included in the instruction.
Note 2: The line goes down only if an error and a read is included in the instruction.

Error Code F00D (Continued) EAD 2697

Error Code Fnnn

If you have entered this EAD from the DIAG section, record the XRA register contents at the time of the error (displayed on the MD keyboard). Use that data along with the chart on this page to obtain the 'nnn' part of error code Fnnn.

Error Description

An external register error was detected in a functional area. The error code is F plus a character representing the functional area plus two characters representing the contents of the external register address (XRA) register.

Error Condition Theory

The microprocessor communicates with the functional areas by way of the external registers (XRs). An 'xr error ungated' from the failing functional area causes a microprocessor level 0 external interrupt.

The microprocessor analyzes the source of the level 0 interrupt by checking the processor status register (PSR) bit 0 (XR error). If PSR bit 0 = 1, the external register address (XRA0) register contains the address of the external register at the time of the failure.

The microprocessor also defines the external register error as an addressing or a data error.

External Register Data Error

Each of the functional area FRUs makes 'xr error ungated' active if an error condition is detected by the addressed FRU during a read or write operation.

- When the external registers are being read by the microprocessor ('read gate' active), a parity check is performed on the data active on the microprocessor scan path. If the microprocessor detects bad parity, it sets processor error register (PER) bit 4, XR read parity error.
- During 'xr read gate' operation, the microprocessor checks 'xr error ungated' at 'xr addressed clock' time. If 'xr error ungated' is active, the microprocessor sets processor error register (PER) bit 5, XR user read error.
- During 'xr write gate' operation, the microprocessor checks 'xr error ungated' during 'xr addressed clock' time. If 'xr error ungated' is active, the microprocessor sets processor error register (PER) bit 6, XR user write error.
- The maintenance adapter checks 'xr data bus a' during external register write operations to the maintenance adapter. If 'xr data bus a' has even parity, the maintenance adapter activates 'maintenance tag in' (MTI) bit 5, XR data parity check.

  Note: MTI bit 5 will also indicate that the MA register is in error if the processor status register (PSR) bit 0 is not 1.

External Register Addressing Error

- The maintenance adapter checks the xr user addressed lines from each of the functional areas. Each functional area activates its own user addressed line to the maintenance adapter when the address received from the microprocessor matches one of the valid addresses for the functional area.

  The maintenance adapter checks that one and not more than one of the functional areas has activated a user addressed line any time the microprocessor addresses an external register.

  If none or more than one user addressed line is active while an external register read or write operation is in process, the maintenance adapter activates 'xr error ungated' and activates 'maintenance tag in' bit 4.

  When the microprocessor detects 'maintenance tag in' bit 4, it activates 'maintenance tag out' bit 2 to gate the active xr user signals into the maintenance data in (MDI) register, which the microprocessor then sets in sense byte 9 as the sense data for this error. The bit definitions for the maintenance data in the sense byte 9 are:

Bit	*Meaning*
0	Buffer adapter addressed or contents of PER
1	Status store addressed or contents of PER
2	Device adapter addressed or contents of PER
3	Read clock and format addressed or contents of PER
4	Microprocessor addressed or contents of PER
5	Write data addressed or contents of PER
6	Maintenance adapter addressed or contents of PER
7	If 1, bits are defined as shown above; if 0, contents of PER (see EAD 2701).

  Sense byte 9 is also saved in word 2, bits 8—15 of the sense error history table (tape control unit flag byte). If bit 7 of sense byte 9 is 1, sense byte 9 contains active xr user addressed information and shows a user select error. If bit 7 is 0, sense byte 9 contains processor error register data and shows an xr data error.
- The maintenance adapter checks the 'xr address bus' for parity during external register read and write operations to ensure that the address has been sent correctly by the microprocessor. If 'xr address bus' has bad parity with 'read gate' or 'write gate' active, the maintenance adapter activates the 'maintenance tag in' (MTI) bit 3 and activates 'xr error ungated'.

How to Find the 'nnn' Value for Error Code Fnnn

1. Use the contents of the XRA register. This byte is the last two numbers (nn) of the Fnnn error code.
2. Use these numbers under 'nn' in the chart below to find the value of the first two numbers 'Fn' of the error code.

   Example 1: XRA reg = 21. Under the nn column find 21. These are the last two numbers of error code F421.

   Example 2: XRA reg = C9. Under the nn column find C9. The complete Fnnn error code is F2C9.

Note: If the XRA register value cannot be found in the following chart, the error code is F6nn where nn is the value of the XRA register.

nn	nn	nn
F100	F462	F2C0
F103	F464	F2C3
F105	F467	F2C5
F106	F468	F2C6
F109	F46B	F2C9
F10F	F460	F2CA
F416	F46E	F2CC
F421	F770	F2CF
F422	F773	F2D1
F424	F775	F2D2
F730	F776	F2D4
F733	F779	F2D7
F735	F77A	F2D8
F736	F77C	F2DB
F739	F77F	F2DD
F73A	F3A1	F2DE
F73C	F3A2	F2E1
F73F	F3A4	F2E2
F940	F3A7	F2E4
F943	F7B8	F2EB
F545	F7B3	F2ED
F546	F7B5	F2EE
F549	F7B6	F7F0
F54A	F7B9	F7F3
F54C	F7BA	F7F5
F54F	F7BC	F7F6
	F7BF	F7F9
		F7FA
		F7FC
		F7FF

Registers

The registers that are active for the Fnnn error code are:

- **Processor Error Register (PER)**

0	1	2	3	4	5	6	7
MP CK 2	ITA/B = 0	Collision detect	Online	XR read parity error	XR user read error	XR user write error	Normal mode

Bits 0, 4, 6 Set to 0 by power on reset or microprocessor reset or by microcode issued MP/MA check reset.

Bits 1, 3, 7 Set to 0 by power on reset or microprocessor reset; updated on the first execute cycle.

- **Processor Status Register (PSR)**

CK 2

0	1	2	3	4	5	6	7
XR error				Check 2			

Check 2 error line

Bits 1—3, 5—7 Set to 1 by power on reset or microprocessor reset

Bits 0,4 Set to 0 by power on reset or microprocessor reset; updated on first execute cycle

- **Maintenance Tag In (MTI)**

0	1	2	3	4	5	6	7
MA request response	Data transfer	MD enabled	XR address bus parity error	XR addressed line error	MA internal card error	MD parity error	Check 1

- **Maintenance Tag Out (MTO)**

0	1	2	3	4	5	6	7
Reserved	Mait light	Read X/R active	Data ready	MP status out	Data demand	Command data received	Reserved

Error Code Fnnn (Continued) EAD 2701

- **External Register Address (XRA)**

0	1	2	3	4	5	6	7
XR add ext 0	XR add ext 1	XR add bus 0	XR add bus 1	XR add bus 2	XR add bus 3	XR add bus 4	XR add bus P

Set to hex 00 by power on reset or microprocessor reset.

Set to the status of the xr address on the first execute cycle.

Note: See the DF section for bit meanings.

Error Code Fnnn (Continued)

Possible Causes of Failure

The Fnnn error codes are generated by functional microcode as determined by the xr/address at the time of the failure. Any or all cards that share the common XR data, address, control, and error indication nets should be considered as possible causes.

If you have entered this EAD from the DIAG section, record the XRA register contents at the time of the error (displayed on the MD keyboard). Use that data along with the chart on EAD 2700 to obtain the 'nnn' part of error code Fnnn. See the FSI for error codes F1nn, F2nn, and so on for the errors.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU139) logic board 01A-A1
2. (FRU157) top card connector WKL
3. (FRU158) top card connector XKL
4. (FRU159) top card connector YKL
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between the FRUs on this EAD.

Troubleshooting Guide

Note: See EADs 2703 and 2704 for test points.

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Failures detected in the functional area can be caused by defective clock lines. If clocking to the functional area is suspected, verify that the clocks to the functional area are as shown on the "Tape Control Unit" pages of this EAD volume.

   Note: The scan controls and clocks to the functional areas are as defined by the error code or external register address.

5. Review and record sense byte 9
6. Run the TCU basic support diagnostics E010 (also run EE85) and use the diagnostic descriptions from the DIAG section for all errors detected. If no error is detected, select the correct diagnostic for your error code from the chart on this page.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.

Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.

Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.

Do the actions specified for that failure.
```

Loop the selected diagnostic.

If it is necessary to scope the XR data bus or XR address bus, diagnostic EEFO can be used to select one XR register in each functional area. The diagnostic can be looped when scoping the nets and clocks that affect the selection and data movement to the registers.

7. If sense byte 9 bit 7 is 0, the external register error is a data parity error. Scope '- xr data bus a and b' (A) from the microprocessor card to the failing functional area for glitches or bad signal levels.

   Note: If the drive adapter card has been exchanged or it is suspected to be at fault, check the tape control unit serial number/EC level switches on the card for correct parity. The registers affected by these switches are the EC level register, the serial number high register, and the serial number low register.

8. If sense byte 9 bit 7 is 1, the external register error is an external register address parity check error or an external register user addressed error. Scope '- xr address bus (P, 0 – 4)' and '- xr extended 0 – 1' (B) from the microprocessor card to the failing functional area for glitches or bad signal levels. Scope the xr addressed lines (B) to the maintenance adapter card. One and only one should be active at any time.
9. Scope '- xr error ungated' (C) for glitches or bad levels.
10. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
11. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

Error Code	Diagnostic
F1nn	EE90, E010, EE85 Status store
F2nn	EE30, E010, EE85 Buffer
F3nn	EE10, E010, EE85 Maintenance adapter
F4nn	EE40, E010, EE85 Drive adapter
F5nn	EE50, E010, EE85 Read data flow
F6nn	EE85, E010, Invalid Address
F7nn	EE10, E010, EE85 Microprocessor
F9nn	EE50, E010, EE85 Write data flow

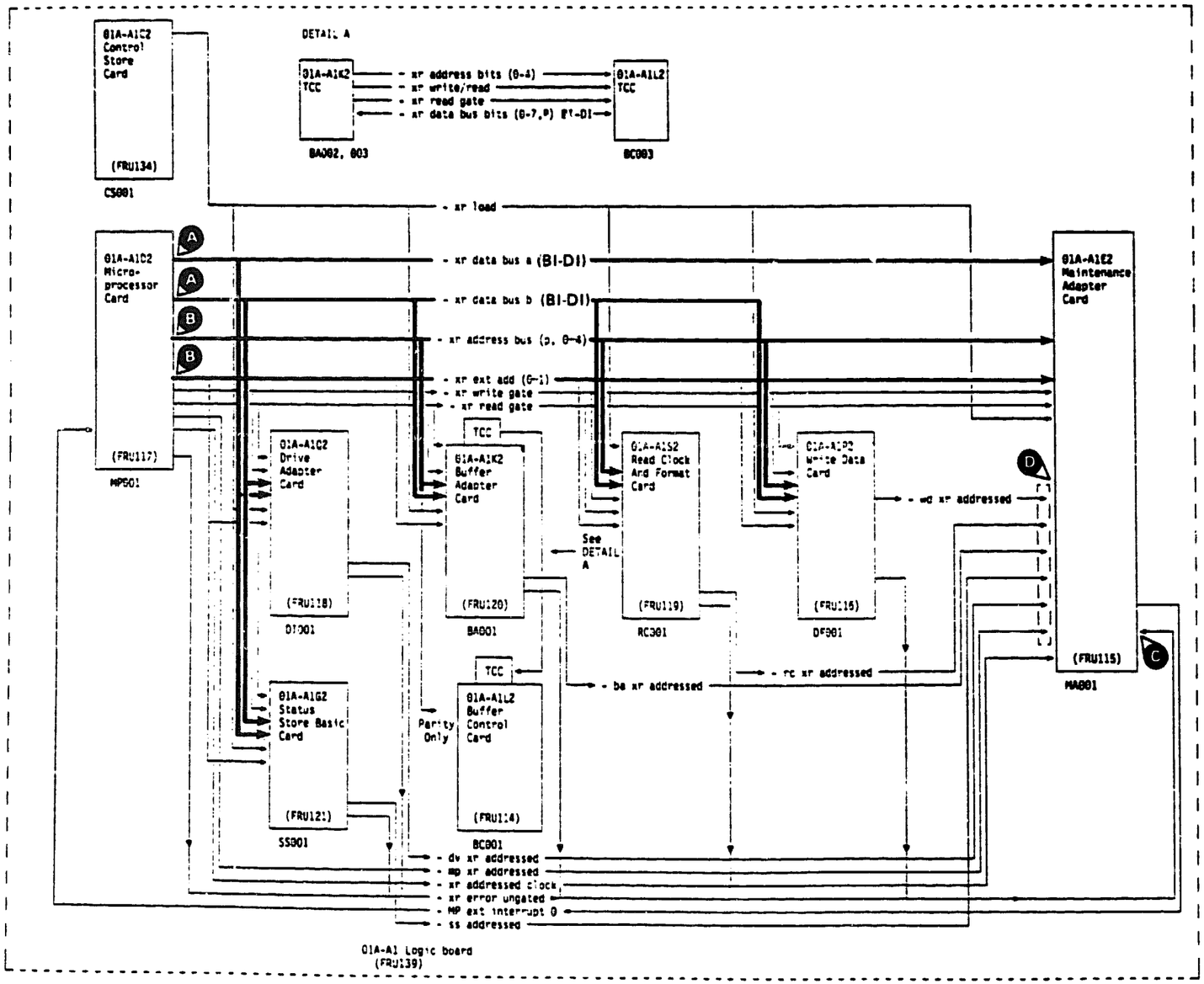
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
6	DIAG 1	How to run diagnostics How to use EEFO
5,7,8	SENSE 1	Sense byte 9
7	CARR-TCU 1-1	Tape control unit serial and EC switches
10	CE/HSC 1	How to use the CE Panel

Error Code Fnnn (Continued) **EAD 2703**

Error Diagram

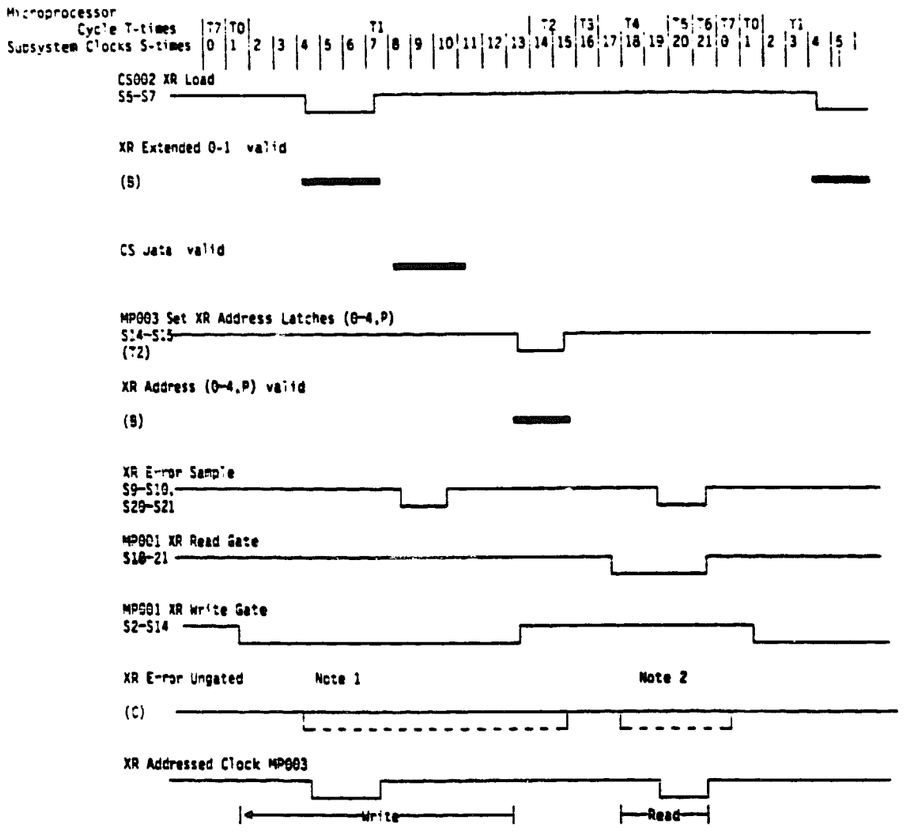
XR Data and Address



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Code Fnnn (Continued)

XR Register Address/Data Transfer Timing



Note 1: The line goes down only if an error and a write is included in the instruction.
Note 2: The line goes down only if an error and a read is included in the instruction.

Initial Microprogram Load (IML) or Power On Reset (POR) Failure

Error Description

An error was detected during the IML.

Error Condition Theory

When a power on reset (POR) occurs, the microprocessor is forced to address 0000 in the read only memory (ROM) where execution of the IML bootstrap code begins.

The IML process is divided into four phases:

1. Go/Nogo checks of the hardware.
2. Load of second bootstrap
3. Execution of POR diagnostics
4. Load functional microcode

If any errors are detected during any phase of the IML, the tape control unit error LED is turned on. When available, data relative to the error is entered in a table residing in the tape control unit control storage. The table is named "COMTAB" and is used by the maintenance package to assist in problem determination and maintenance actions.

A bit is posted in COMTAB bytes 0 and 1 to indicate the failing area of the tape control unit. Addition error information, if available, is entered in three words reserved for each functional area (words 2 through 38 or COMTAB). The information consists of an error code and identity of the diagnostic that failed. (See COMTAB description.)

COMTAB DESCRIPTION

Word 0	Compcode (failing area indicators)
Word 1	Parameters
Word 2-4	MP area fail data
Word 5-7	External register (XR) area fail data
Word 8-10	Buffer area fail data
Word 11-13	Read/write area fail data
Word 14-16	Status store area fail data
Word 17-19	Channel A area fail data
Word 20-22	Channel B area fail data
Word 29-31	Hardware checkers fail data
Word 32-34	Reserved
Word 35-38	IML fail data

COMPCODE DESCRIPTION

Word 0 (failing area indicators)

Bit 0	Install code wait
Bit 1-3	Return codes (internal mapping)
Bit 4	MP area fail indicator
Bit 5	XR area fail indicator
Bit 6	Buffer area fail indicator
Bit 7	Read/write area fail indicator
Bit 8	Status store area fail indicator
Bit 9	Hardware checker fail indicator
Bit 10	Reserved
Bit 11	Channel A area fail indicator
Bit 12	Channel B area fail indicator
Bit 15	IML area fail indicator

Common Troubleshooting Guide

1. Examine the system error log for a COMTAB entry. If there is no entry and an MD is available, display the IML failure log (COMTAB) using the tape control unit tables function of the 'Subsystem Display/Alter Facility'. (See MD/SDISK 1.)
2. This will provide a display of the contents of COMTAB. Using the COMTAB description (on this page), determine the failing area.
3. If the failure is in the IML area, go to the IML section of this EAD.
4. If the failure is in the POR area, go to the POR section of this EAD.
5. If no failure is indicated in COMTAB, the tape control unit has been powered off and on since the reported failure. No failure was detected by the POR diagnostics during the current or most recent IML sequence. Therefore, the reported failure must be considered intermittent. Information is no longer available to provide troubleshooting aid. Advise the customer to leave the tape control unit in the failure state on the next occurrence of the reported failure.
6. If there is no COMTAB entry in the system error log and no MD is available, follow the POR flowchart (on this page).

POR Failure

The power-on diagnostics have detected a problem. Display the contents of COMTAB. The failing area 'parameters' will contain a failure error code and the diagnostic which produced that failure. The first word of the failing area contains the error code generated by the diagnostic listed in the second word.

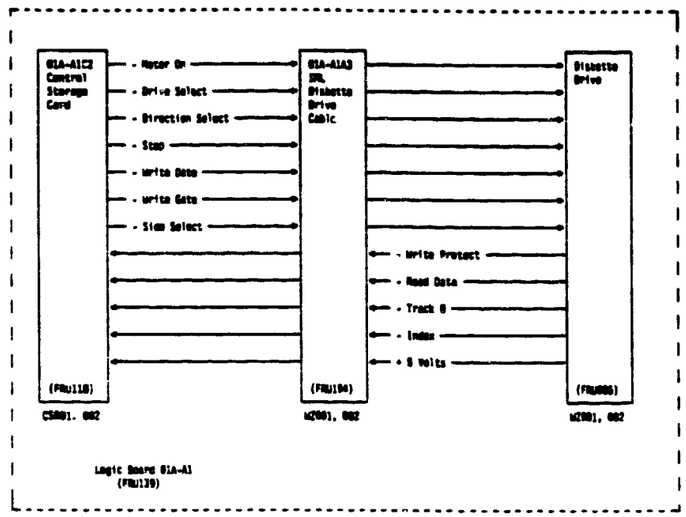
The POR diagnostics are abbreviated forms of diagnostics available on the support diskette. Proceed to the DIAG section of the maintenance package and run listed diagnostic for isolation and correction.

IML Area Failure

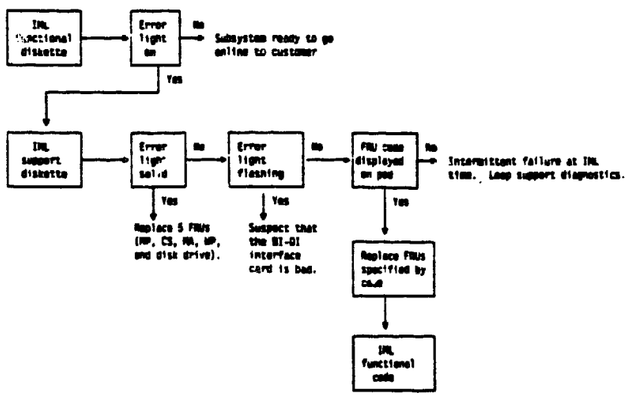
A failure has been detected while attempting an IML. Use an oscilloscope to scope the IML device control and data lines to isolate the problem.

IML control and data lines may be activated by setting the tape control unit Online Test/Offline Test switch to Offline and then pressing the IML switch.

Error Diagram



POR Flowchart



Fault Symptom Code 1000 (FSC1000)

Error Description

FSC1000 is an error code generated by the Maintenance Device (MD) under the following circumstances:

1. START REPAIR was selected.
2. No drive check code was provided when solicited by the MD.
3. No Sense Data was provided when solicited by the MD.
4. Questions about HOST/INTERFACE symptoms were answered NO.
5. Questions about Cartridge Loader problems were answered NO.
6. The maintenance package has been completed to this point without detecting an error.
7. The MD has found an entry in the COMTAB, indicating that a POR/IML failure was recorded the last time that an IML was performed.

Error Condition Theory

The TA90 Initial Microcode Load (IML) process is normally considered to be one function. It is, in reality, divided into several different steps briefly described as follows:

- IML button is depressed or Power on Reset (POR).

  Note: POR and IML are synonymous, because the IML switch actually toggles a logic line in the Control Unit called 'POR'.

- Execution of 'hard-core' diagnostics. These diagnostics check storage to ensure that data can be read and written successfully, and they also check some of the microprocessor functions.
- Execution of Power on Reset (POR) diagnostics, which consist of a modified set of microdiagnostics (buffer tests, and loop write to read tests, etc).
- IML or microcode loading (actual IML is considered to be reading from the diskette and storing the data in control storage).
- Initialize or setup routines are performed (the tape control unit sends additional microcode to channel adapters and initializes internal tape control unit cables).
- Tape Control Unit comes 'online' to the other tape control unit of the subsystem pair and is available for host access through 'enabled' and attached interface cables

When power is applied, internal diagnostic tests check voltages, perform a general reset of the control and finally, a basic function test of the tape control unit is performed. Errors detected during this sequence are reported as 'red light' error conditions and the process terminates at this point.

If the basic function test is completed successfully, the tape control unit loads what is called the '2nd bootstrap' which will load the following microdiagnostics from the diskette:

- EE10
- EE30
- EE52
- EE53
- EE84
- EE85
- EE90

These microdiagnostics are referred to as the 'POR' tests and if failures are detected during execution, the tape control unit will save the error data in a microcode table known as 'COMTAB' and stop with the Check 1 error light on. 'COMTAB' data will be used by the MD to troubleshoot the failure and will contain the error code and the failing microdiagnostic routine if applicable.

Note: If the MD is attached during execution of the POR diagnostics and failure is detected, the error will still be logged in 'COMTAB' but setting the Check 1 error light and stopping the tape control unit will be bypassed.

Channel adapter diagnostic failures can be detected during POR diagnostics and while recorded for later use, will not prevent the tape control unit from coming on-line as long as there is one functioning channel adapter.

Following the POR diagnostics, the tape control unit reads the functional microcode from the diskette, which is kept in the reader at all times. The data from this read operation is sent to control storage and each block of data is checked to ensure that it is correct. If read errors occur, the tape control unit error light turns on and the IML process is terminated. Since the tape control unit is offline, no information is sent to the host system.

If the POR microdiagnostics and the subsequent loading of functional microcode completes successfully (no read errors occur), additional microdiagnostic tests are performed to ensure that the microprogram has been loaded without errors and is executing correctly. Once complete, the tape control unit wait light will come on solid and the error light will remain off. Moving the tape control unit Online Test/Offline Test switch to the online test position, causes the diskette reader to run again and load any necessary tape control unit or drive patches, and to load the automatic cartridge loader microcode if required.

Errors that have been saved by the tape control unit under these circumstances can be accessed by the Field Engineer (FE) while attempting to perform subsequent maintenance. This information, stored in 'COMTAB', will only be accessed by the MD Product Diskette under the following conditions:

- Start Repair was selected
- no drive check code was provided
- no sense data was entered
- questions about host/interface symptoms were answered - NO
- questions about Automatic Cartridge Loader problems were also answered - NO
- the tape drive diagnostics have been completed without detecting any problems.

If ALL of the preceding conditions are met, the MD Product Diskette will interrogate 'COMTAB' and report the contents, if any, to the CE.

Troubleshooting Guide

This data may or may not be related to any current problem; as the contents of 'COMTAB' could be left over from a problem that occurred a long time ago.

Care must be exercised when using the data from 'COMTAB', especially if the tape control unit is performing properly with all other drives.

The MD will provide the Diagnostic ID which detected the error and also provide a diagnostic failure code. By referring to the displayed diagnostic data in Volume 4 of the MG, a description of the error and a suggested FRU List are provided.

Fault Symptom Code (FSC) 1000 EAD 4010

Cable and Board Interconnection Failures

Error Description

Loose or defective cables or open board nets can cause failures that are difficult to analyze. You have been sent to this error analysis diagram by the fault symptom index (FSI) or another error analysis diagram because the analysis indicates that a cable or the board may be at fault. If you enter this EAD from the FSI, do step 1 of the troubleshooting guide then return to the FSI for other additional actions. If you enter this EAD from another EAD, do steps 2, 3, and 4 then return to the EAD that sent you here.

Possible Causes of Failure

1. FRU139 Logic board 01A-A1
2. FRU1 ~ Logic board 01A-A2
3. FRU058 Logic board 02A-A1
4. Cables

   Cable groups involved with failing functional units are identified by the "Additional Actions" column in the FSI or by the EAD that sent you here. The cable groups are explained in the cable group chart that immediately follows the FSI. The cable group chart shows the FRU number and from/to locations for each cable in the cable group. See FSI 1 to find "Cable Group Table."

Troubleshooting Guide

1. Visually inspect and reseat the cables and card connectors appropriate to the error code you are working on.

   a. From the cable group list (following the FSI) identify the from and to connections of the cables affecting the error code you are working on.

   b. Examine the logic board pins and the receptacle, jack, or plug for bent or pushed-back pins or connectors.

   c. Examine the flat-cable ends for bent or broken connectors.

   d. Examine the logic board's top card connectors (TCC) and bottom card connectors (BCC) for broken or bent pins. Also check the TCC's wiring for short or open circuits.

   e. Check the TCCs for broken or bent pins. Check the TCC's wiring for short or open circuits.

      TCCs are used to jumper the same pins on the logic cards that are next to each other. For example, the TCC pin for Y02 only connects the Y02 pins between logic cards 01A-A1C2, D2, and E2. Y02 should have no connections to any other pins. See logic page AA000 for the correct part number and plugging position for the TCCs. Ensure that the cut out part of the TCC is in the upper right hand corner when the TCC is installed.

   f. If the contacts of a discrete wire cable are pushed back inside the plug, the cable can often be repaired by straightening the locking tab on the connector and reinserting the connector into the plug.

   g. Reseat connectors, plugs, and cables and retest the machine to verify that the original failure does not recur.

2. Test for open cables and nets.

   a. If you are testing a logical net remove the logic cards that are part of the net.

   b. If you are testing a discrete wire cable net, remove the plugs from the receptacles on the net.

   c. Use the multimeter to test the net from the source pin to the receiving pin. If no continuity is found, work back from the receiving pin toward the source pin until continuity is found. Use the logic pages and the field net wire lists to determine if the open is in a board net or in a cable. If the net involves two boards with a cable connecting them, the cable can be disconnected to permit checking the board nets and the cable individually.

   d. Replace defective boards or flat cables.

   e. You can test discrete wire cables in the same way. Check from a source pin to a receiving pin. Flexing a cable where it terminates at a plug can reveal poor wire crimps that can be repaired in the field.

3. Test for grounded nets.

   a. If you are testing a logical net, remove the cards that are part of the net.

   b. If you are testing a discrete wire net, remove the plugs from the receptacles on the net.

   c. Use the service meter to test for grounds. Connect one lead to the frame or to a logic ground.

      CAUTION:
      Check the logic pages or the field net wire lists for logic board ground pins. Not all D06 pins are ground.

      Probe the net with the other lead. If the net has two boards connected by a cable, remove the cable at each board and check the pieces individually. If a ground is found, replace the affected board. If no ground is found on either board, connect one end of the cable and retest the net on the board with the cable connected. If a ground is found, replace the cable. If no ground is found, disconnect the connected end of the cable and connect the other end to the other board. Test again for grounds. Use logic pages to identify the I/O connections for lines going from or to boards.

   d. Check for bent pins in the net or for bare wire ends from wire wrapping. Check for other foreign material that might ground the net. Flex the cables at tie points to find out if the ground is caused by chafing at the tie points. If a ground is caused by chafing, you may be able to reinsulate the cable and repair the problem.

   e. If the ground is in the board or cable, replace the defective part.

   f. For discrete wire cables, connect the ground lead of the meter to the frame. Remove the plugs from the receptacles and use the other meter lead to probe the failing pin. Flex the cable at tie points or other possible chafing points to find out if the ground is caused by chafing. If a ground is caused by chafing, you may be able to reinsulate the cable and repair the problem.

      Note: The remote buffer buses and control lines are terminated to ground through resistors on the 01A-A2H4 card (logic PR001). Remove the 01A-A2H4 card in addition to normal logic cards when you test these lines.

4. Test for Short Circuited Cable Nets

   a. If you suspect two or more nets, test to ensure that they are not shorted together.

   b. If you are testing a logical net, remove the cards in the net.

   c. If you are testing a discrete wire net, remove the plugs from the receptacles.

   d. Check for continuity between the suspected nets. Check for both nets shorted to ground. Look for:

      - Bent board pins
      - Bent or broken cable connector contacts
      - Bare wire ends
      - Other foreign material that could short the nets together.

      If the nets are on two boards connected by a cable, remove the cable at each board and check the individual board nets. If a short is found, replace the affected board. If no short is found on either board, connect one end of the cable and retest the nets on the board that has the cable connected. If no short is found, remove the cable from the board where it is connected and connect the other end to the other board. Test the nets on the board that has the cable connected. Use logics to identify the I/O pin connections for lines going to or from boards.

   e. If nets are shorted on a board or in a cable, replace the defective part.

Error Description

This is a general Error Analysis Diagram (EAD) that describes the hardware (D2nn error code) and microcode detected errors in the status store and channel adapter functional areas of the subsystem.

You are here because:

- The FSI section called out this EAD

  OR

- A diagnostic failure ID called out this EAD.

The prerequisites for entering this EAD are:

1. The initial FRUs called out by VAXsimPLUS or GMP diagnostics have been replaced.
2. All FRUs called out by the FSI section have been replaced.
3. All additional actions that were called out by the FSI section have been completed.

Error Condition Theory

Note: See Figure 1 for the overview diagram of this description. For additional information, see "Tape Control Unit Functional Area Diagram" on OPER 1.

The two functional areas described in this EAD are:

- Channel Adapters
- Status Store.

These two functional areas are closely integrated and are used in the balancing process of the tape control unit's workload. The channel adapter is the interconnection to the host system for commands, status, and data information. The channel adapter communicates with the status store and data buffer functional areas.

The status store functional area:

- Stores the drive status information
- Polls the installed channel adapters
- Maintains the drive path assignments
- Shares information with the remote status store
- Communicates with the microprocessor.

The microcode monitors the operation of the communication paths and sets the different error codes in sense bytes 10-15 to describe the failures detected.

The channel error register (CER) is set when the hardware checkers detect incorrect parity on the buses in the status store or channel adapter functional areas. A D2nn error code is also set in sense bytes 16-17 when any CER bits are set (nn equals the CER bits). The following is an explanation of the CER bits

Bit 0 Status store basic card error

The status store basic registers on the status store channel adapter interconnection are parity checked. CER register bit 0 is set and a check 2 condition is sent to the microprocessor when a parity error is detected.

Bit 1 Status store communication card error

Bit 2 Remote tape control unit transfer error

Bit 3 Status store external register bus parity error

The status store card parity checks the external register data bus. CER register bit 3 is set and a check 2 condition is sent to the microprocessor when a parity error is detected.

Bits 4-7 Channel adapters A-B register parity errors

The channel adapters signal the status store card when errors are detected by raising the 'adapter fail' line. Some of the errors that cause this line to rise are:

- Data parity error on a buffer to channel adapter data transfer
- An irrecoverable error within the channel adapter card
- A parity check on the 'address assign' bus (this is the bus from the tape control unit address switches).

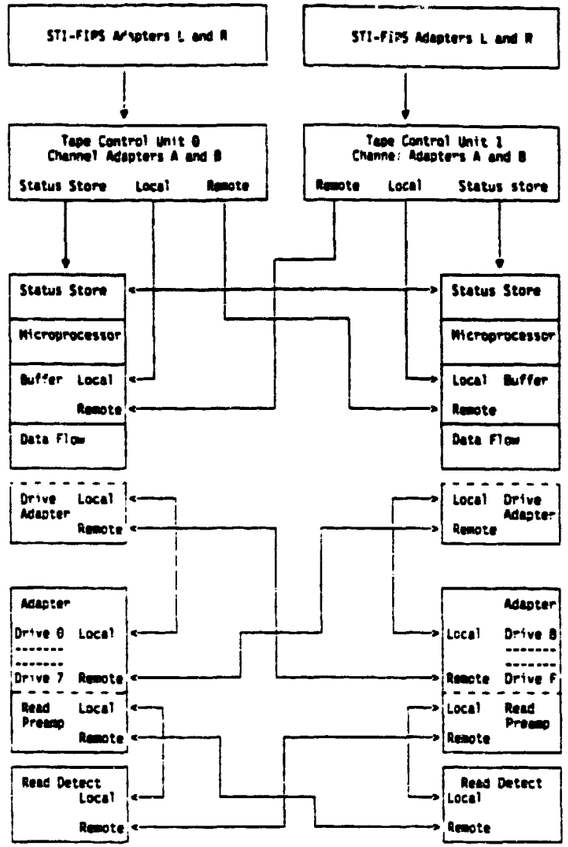


Figure 1. Status Store/Channel Adapter Overview

Troubleshooting Guide - General

Reviewing the Product Trained Service Representative Problem Analysis

Before continuing, review the work done by the product trained service representative.

1. If the problem analysis continues to indicate a FRU already replaced by the product trained service representative, replace that FRU a second time.
2. Run the GMP diagnostics. If the problem remains, continue with this EAD.

External System Problems

Determine if any hardware changes have been made. For example:

- Has any microcode change been made?
- Has any EC been installed on the subsystem?
- Check with the higher level of support for information on any problems with the changes that have been made.
- Has any drive been added or removed from the subsystem?
- Has any system cabling change been made?

If any change has been made, remove or try to bypass the change to see if the problem still exists.

Sense Data and Diagnostic Failure ID Analysis

Determine which interface and interface lines are failing.

1. Review the available sense data (from the console messages or error log). See "Error Path Isolation" on START 1 for more information.

   The drive address (in the console message or error log) and the contents of sense byte 2 must be used to determine which data path was in use at the time of the failure.

   For example:

   Channel adapter A, on tape control unit 0 (TCU0), is attached to STI-FIPS Adapter L.

   The error log reports a failure on a drive, and sense byte 2 equals

SENSE BYTE 2	CHANNEL ADAPTER LOCATION	BUFFER LOCATION	DRIVE PATH
00100000	TCU0	TCU0	Local
00110000	TCU1	TCU0	Local
00101000	TCU0	TCU1	Remote
00111000	TCU1	TCU1	Remote

Figure 1. Sense Byte 2 Path Possibilities

   The chart (see Figure 1) shows four different paths for selecting drive 7, depending on which channel adapter/tape control unit and which data buffer/tape control unit combinations are used.

2. Review the microcode and hardware detected errors shown in the sense data. These are helpful in determining what type of failure occurred and which interface failed (other than a data path). See "Formats 19 and 20 Sense Bytes 8-15 Description" on SENSE 1, for a description of the microcode detected errors. See "Formats 19 and 20 Sense Bytes 16-23 Description" on SENSE 1, for a description of the hardware errors. See the failure descriptions in the FSI section to find common areas of the failures.

   Note: The microcode detected errors in sense bytes 10-11, 12-13, and 14-15 are in a first error, second error, and last error order. It is possible that the second and last errors are the result of the error recovery procedures performed for the first error. See "Formats 19, 20, and 21 Sense Byte 3 Description" on SENSE 1, for a description of the error recovery procedures.

3. Run the "Basic Tape Control Unit Test - Routine E010" (see DIAG 1) if it has not been previously run and review the results. See "How to use the Support Diagnostics" on DIAG 1.

   Note: Both tape control units and their attached drives must be offline to the host processor before running this test.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

A diagnostic failure ID can verify the original error failure code. It may also display a failing line or net. The diagnostic failure IDs are defined in the individual diagnostic pages in the DIAG section.

4. Go to the troubleshooting guides for the channel adapter interface (status store or data buffer) that is failing.

Troubleshooting Guide - Channel Adapter to Status Store Communication Path

Single Channel Adapter Failing

1. If the failing path indicates that one channel adapter failed, remove the top card cable connectors from the failing channel adapter. This prevents any failures in the STI-FIPS adapter cards from affecting diagnostic EE64 when it is run.
2. Run "Channel Adapter Function Test - Routine EE64" (see MD/SDISK 1).

   Note: The tape control unit and its attached drives must be offline to the host processor before running this test.

3. If any errors occur, go to step 4 of the "Multiple Channel Adapters Failing" on EAD S007.
4. If no errors occur, reinstall the top card cable connectors and run "Channel Interface Wrap Test - Routine EE62" (see MD/SDISK 1).

   Note: The tape control unit and its attached drives must be offline to the host processor before running this test.

   If failures occur:

   - Check the seating of the crossover cables at the I/O connectors.
   - Check the flat cable (going from the channel adapter W2 and Z2 connectors to the STI-FIPS Adapter) for bent or broken connectors.
   - Check the STI-FIPS cable pins for bent or broken connectors.
   - Ensure that the right interposer is installed on the top card connector of the channel adapter card, and that no pins are bent or broken.

5. Check the dc power cable going to the STI-FIPS cards for broken wires or bent pins.
6. Replace the card, depending on the diagnostic failure ID. Replace the cable group, going from the STI-FIPS adapter card to the channel adapter, using the diagnostic failure ID as a guide on which set to replace.

   Exchange the following FRUs (even if they were exchanged by the GMP, exchange them a second time). Test the subsystem after each FRU is exchanged.

   FRU121 Status store card
   FRU134 Control store card
   FRU117 Microprocessor card

7. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.

8. If no repair action has been performed and no additional actions are listed in the EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

Multiple Channel Adapters Failing

If the failing path indicates that multiple channel adapters are failing, start with the step below

1. Remove the channel adapter card

   01A-A2D2 - channel B

2. Run "Channel Adapter Function Test Routine EE64" (see MD/SDISK 1).

   Note: The tape control unit and its attached drives must be offline to the host processor before running this test.

   If channel adapter A fails go to step 4.

   If channel adapter A does not fail, reinstall the other channel adapter cards, one at a time, and rerun test EE64 after each card is replaced. If one of the channel adapters fails, replace that card and rerun EE64 to verify correct operation. If channel adapter failures continue, go to step 4.

   Note: If the problem is intermittent or the diagnostics have stopped failing, do the next two steps and record these actions in the SITE log for future reference.

3. Inspect the 01A-A2C2-F2 card sockets, and 01A-A1Z2-Z3 and 01A-A2Y2-Y cable sockets for bent or broken pins. Inspect the 01A-A1 and 01A-A2 board cable connectors and card-bottom card connectors for bent or broken connectors.

4. Check the voltages on the 01A-A1 and 01A-A2 boards. See the voltage distribution lists in the logic manuals, or the comments section of the logic pages for the location of the voltage pins. See PWR 1 for the voltage tolerance table. If any voltages are incorrect, go to "Map 400 - Tape Control Unit DC Power" on PWR 1. If any voltages are missing, check the power distribution cables.

   Possible FRUs:

FRU048	DC cable 01A-A1Y2
FRU091	DC cable 01A-A1Y5
FRU097	DC cable 01A-A1Z5
FRU103	DC cable 01A-A1Z2
FRU156	DC cable 01A-A2Y5
FRU167	DC cable 01A-A2Y2
FRU179	DC cable 01A-A2Z5
FRU217	DC cable 01A-A2Z2
FRU160	Cables CU-PS-02-J4, J9, J11
FRU164	DC distribution cable
FRU145	DC power supply

5. Remove 01A-A2C2-F2 and 01A-A1G2 cards.

6. Using the multimeter and logic pages CA001, SS001, WC001, and WC002 for reference, check the interface adapter bus and interface adapter response bus for open, shorted, or grounded lines (see "Cable and Board Interconnection Failures" on EAD 1).

   Possible FRUs:

FRU250	Cable 01A-A1Z2 to 01A-A2Y2
FRU251	Cable 01A-A1Z3 to 01A-A2Y3
FRU139	Board 01A-A1
FRU140	Board 01A-A2

7. If the channel adapter to status store problem still exists, exchange the following FRUs (even if they were exchanged by the product package, exchange them a second time). Test the subsystem after each FRU is exchanged. Exchange the following FRUs:

FRU121	01A-A1G2 Status store basic card
FRU134	01A-A1C2 Control store card
FRU117	01A-A1D2 Microprocessor card

   If any line needs scoping, see "Oscilloscope Information" on EAD 5008.

8. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.

9. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

Troubleshooting Guide - Channel Adapter to Buffer Failures

Error codes described in this EAD are the data parity errors that are detected by the channel adapter.

Note: Problems in the buffer area are described by other EADs.

When the two tape control unit feature is installed, a channel adapter has a data path to the data buffer in its tape control unit or to the data buffer in the remote tape control unit. The data path is controlled by the microcode. This permits the use of unused resources to increase throughput.

Channel Adapter to Local Buffer Failures

1. If the error code and sense data indicates a problem between the channel adapters and the local data buffer, remove channel adapter cards 01A-A2D2-F2.

2. Run "Channel Adapter Function Test - Routine EE64" (see MD/SDISK 1) on channel A.

   Note: The tape control unit and its attached drives must be offline to the host processor before running this test.

3. If channel adapter A fails, go to step 5.

4. If channel adapter A does not fail, reinstall the other channel adapter cards, one at a time, and rerun EE64 after each one is replaced. If one of the channel adapters fails, replace that card and rerun routine EE64 to verify correct operation. If channel adapter failures continue, go to step 5.

5. Check the 01A-A1 and 01A-A2 boards for bent or broken pins. Check the cable from 01A-A2V5 to 01A-A1V3 for bent or broken connectors. If any channel adapter cards, buffer cards, or cables between the boards have been removed or replaced, check that the card bottom connectors and cable connectors have not been damaged. Ensure that all cards and cables are seated correctly.

   Possible FRUs:

FRU256	Cable 01A-A1V3 to 01A-A2V5
FRU139	Board 01A-A1
FRU140	Board 01A-A2

6. Check the voltages on the 01A-A1 and 01A-A2 boards. See the voltage distribution lists in the logic manual, or in the comments section of the logic pages for the location of the voltage pins on the boards. See PWR 1 for the voltage tolerance table. If any voltages are incorrect, go to "Map 400 - Tape Control Unit DC Power" on PWR 1. If any voltages are missing, check the power distribution cables.

   Possible FRUs:

FRU048	DC cable 01A-A1Y2
FRU091	DC cable 01A-A1Y5
FRU097	DC cable 01A-A1Z5
FRU103	DC cable 01A-A1Z2
FRU156	DC cable 01A-A2Y5
FRU167	DC cable 01A-A2Y2
FRU179	DC cable 01A-A2Z5
FRU217	DC cable 01A-A2Z2
FRU160	Cables CU-PS-02-J4, J9, J11
FRU164	DC distribution cable
FRU145	DC power supply

7. Remove 01A-A2C2-F2 and 01A-A1G2 cards.

8. Using the CE meter and logic pages CA001, BA001, WC005, and WC006 for reference, check the local port bus for open, shorted, or grounded lines (see "Cable and Board Interconnection Failures" on EAD 1).

   Possible FRUs:

FRU256	Cable 01A-A1V3 to 01A-A2V5
FRU139	Board 01A-A1
FRU140	Board 01A-A2

If any lines needs scoping, see "Oscilloscope Information" on EAD 5008.

If you have completed all activities for this EAD, return to the FSI section to see if any additional actions are specified. If any are, follow the FSI's direction. If the FSI does not provide any more directions, do the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If no repair action has been found, call your next level of support.

  After an assisted repair action, return to the Support Procedures section for the end of call actions.

Note: Channel adapter to remote buffer failure is on the next page.

Status Store/Channel Adapter (Continued)

Channel Adapter to Remote Buffer Failures

There is no diagnostic to exercise the remote data bus. If failures occur, perform the following steps by using ILEXER.

1. If the error code and error sense data indicates a problem between the channel adapters and the remote data buffer, remove channel adapters cards 01A-A2D2.

   Note: The tape control unit, its attached drives, and the paths to channel B must be offline to the host processor before running this test.

2. Run the diagnostic on channel adapter A (through STI-FIPS Adapter L).

3. If channel adapter A does not fail, reinstall the other channel adapter card, and rerun the diagnostic. If a channel adapter card fails, replace that card. If the failure still exists, continue with the next step.

4. In order to continue the maintenance action, the FE will need both tape control units of the subsystem. The alternative is to isolate the two tape control units and run as two, one by eight, tape control units and defer the maintenance to a later time.

   If the customer chooses to isolate the tape control units, go to "Subsystem Tape Control Unit Isolation" on EAD 5008; otherwise continue the repair action with the complete subsystem.

5. Replace the 01A-A1K2 card in the remote tape control unit (replace it again, even if it has been replaced before). Rerun the ILEXER diagnostic that indicated a failure on the failing channel adapter.

6. If the failure continues, check the 01A-A1 and 01A-A2 boards for bent or broken pins. Check the cable from 01A-A1Y4 to CU-P2-A3 and 01A-A2Z2 to CU-P2-A5 for bent or broken connectors. If any channel adapter cards, buffer cards, or the cables between the boards have been removed or replaced, check that the card-bottom connectors or cable connectors are not damaged. Ensure that all cards and cable connectors are seated correctly.

7. Check the voltages on the 01A-A1 and 01A-A2 boards. See the voltage distribution lists in the logic manual, or in the comments section of the logic pages for the location of the voltage pins on the boards. See PWR 1 for the voltage tolerance table. If any voltages are incorrect, go to "Map 400 - Tape Control Unit DC power" on PWR 1. If any voltages are missing, check the power distribution cables.

   Possible FRUs:

FRU048	DC cable 01A-A1Y2
FRU091	DC cable 01A-A1Y5
FRU097	DC cable 01A-A1Z5
FRU103	DC cable 01A-A1Z2
FRU156	DC cable 01A-A2Y5
FRU167	DC cable 01A-A2Y2
FRU179	DC cable 01A-A2Z5
FRU217	DC cable 01A-A2Z2
FRU160	Cables CU-PS-02-J4, J9, J11
FRU164	DC distribution cable
FRU145	DC power supply

8. Remove 01A-A2C2-F2, 01A-A1K2, and 01A-A2H4 (A2H4 is a terminator card for the remote bus).

9. Using a CE meter and logic pages CA001, BA001, WK005, and WK006 for reference, check the remote port bus net for open, shorted, or grounded lines (see "Cable and Board Interconnection Failures" on EAD 1).

   Possible FRUs.

FRU048	DC cable 01A-A1Y2
FRU091	DC cable 01A-A1Y5
FRU097	DC cable 01A-A1Z5
FRU103	DC cable 01A-A1Z2
FRU156	DC cable 01A-A2Y5
FRU167	DC cable 01A-A2Y2
FRU179	DC cable 01A-A2Z5
FRU217	DC cable 01A-A2Z2
FRU160	Cables CU-PS-02-J4, J9, J11
FRU164	DC distribution cable
FRU145	DC power supply

Oscilloscope Information

1. See Figure 1 for the channel adapter and status store clock timing chart. Scope the clock lines using the scope points shown below. Verify that the clock pulse timing relationship is correct and that they are available to the logic cards. If problems are found, suspect bent pins on the card side of the logic board, incorrect board nets, bad cable connectors, or bad cables. See "Cable and Board Interconnection Failure" on EAD 1, for more information, when checking board nets or cables.

2. Scope the suspected bus or control lines.

   The channel adapter to status store and channel adapter to local data buffer bus are VTL voltage levels (+5 V dc and 0 volts). The channel adapter to remote data bus and status store bus are NPL voltage levels (+3 V dc and 0 volts).

   The three functional areas operate in asynchronous mode, so scoping is generally only a search for bad levels or non-pulsing lines. BI-DI buses are validated by various tag or other control lines, so a proper sync point must be chosen to view meaningful information.

   The channel adapter/status store interface and the channel adapter/data buffer local interface are exercised by diagnostic routine EE64. Use the loop option to create a scoping loop

Subsystem Tape Control Unit Isolation

If it becomes necessary to isolate the two tape control units in a subsystem, use the following procedure:

1. For maximum safety in protecting the customers data, it is best that the customer permit all tape jobs to complete, and halt the starting of any new jobs until the isolation has taken place.

2. If this is not possible, then the customer should halt all I/O operations.

3. Remove the cable connectors at the CU-P2 connector in either tape control unit (see LOC 1 for cable locations). This opens the remote buffer to channel adapter interface, and the status store to status store interconnection.

4. IML both tape control units separately.

5. The customer may now restart the system. The system has access to both tape control units and attached drives. Dynamic 'load balancing' is eliminated.

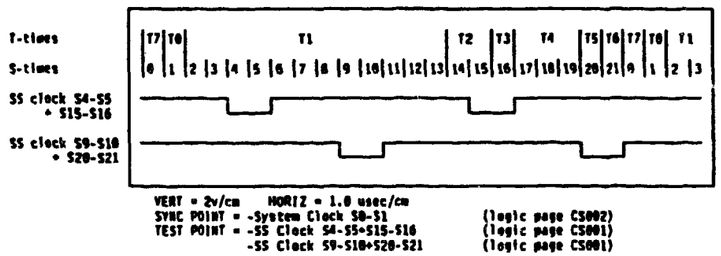


Figure 1. Control Storage to Status Store Card Timing Chart

Device Data Bus Problem Information

Procedure 2

Multiple drives failing on one or both strings on one or both device data buses (DDB).

Note: Before performing this procedure, the tape control unit, drive string, and failing data path must be deallocated to the host processor(s).

Run "Tape Control Unit to Drive Bus Out and Driver Wrap Test - Routine EE42" and "Tape Control Unit to Drive Bus and Tag Test - Routine EE43" (see DIAG 1) after each step.

1. Visually check the data bus connections and terminators. See "TCU Subsystem Cable Diagrams" on EAD 5044-5046, for reference. If any logic card or cable has been removed or replaced, check the board pins or cable contacts for being bent or broken. Replace any damaged parts.

   FRU058 02A-A1 - Drive logic board
   FRU139 01A-A1 - Tape control unit logic board
   Cable groups 80-86

2. Isolate the failure to a failing tape transport unit.

   a. Remove the back sub-cover from the tape transport unit you wish to be the last one in the string.

   b. The error path isolation that was determined in "Troubleshooting - DSE register, Bit 0" step 1, identifies which cables are related to the failing tape transport unit string.

      See LOC 1 for the location of the TU-P2 connector. See "TCU Subsystem Cable Diagram" on EAD 5044-5046.

      If multiple drives fail on a common string, select a tape control unit as a test unit and the cables to test as follows:

Failing TCU and Drive String	Test Unit	Open Cable Connector
CU8-Drives 0-7	TCU0	DDB at TU-P2-A2
CU8-Drives 8-F	TCU0	DDB at TU-P2-B2
CU1-Drives 0-7	TCU1	DDB at TU-P2-B2
CU1-Drives 8-F	TCU1	DDB at TU-P2-A2

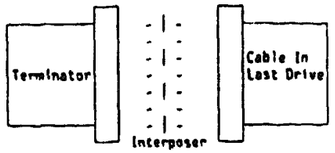
      Opening a TU-P2-A/B2 connector disconnects all tape transport units past the connector, further away from the tape control unit.

      The remaining drives, closer to the tape control unit, will be running without any termination with the TU-P2-A/B2 connector open. See the note below.

      Run "Tape Control Unit to Drive Bus Out and Drive Test - Routine EE42" and "Tape Control Unit to Drive Bus and Tag Test - Routine EE43" (see DIAG 1) to test the selected tape control unit. Repeat this step, moving up or down the device data bus, depending on the run or failure of the diagnostics.

      Note: It is not necessary to move the terminator when EE4x diagnostics are used. It is necessary to move the terminator to the last tape transport unit being tested, when any Read or Write diagnostics are used.

      To move a terminator, after removing the cable from the drive TU-P2 connector, install interposer, then install the terminator. See the diagram below.



      If a failing tape transport unit is located, isolate the failure to the failing drive by removing the device data bUnitable from the drive (see LOC 1) as follows:

      - For Local (A) at - TU-D0/1-A1A2 or TU-D0/1-P1WA1
      - For Remote (B) at - TU-D0/1-A1A4 or TU-D0/1-P1WB1

      If all drive are failing in one or both strings, the problem is in the Device Data Bus Local/Remote between the tape control unit's 01A-A1Q2 card connection (tape control unit logic DI001) and the first tape transport unit drive board connector at TU-D0-A1A2 (local) or TU-D0-A1A4 (remote) tape unit logic WW010.

      If multiple drives on both strings are failing on both device data buses, get the subsystem from the customer and troubleshoot each local device data bus independently. Test or troubleshoot the remote data buses if necessary. If a failing drive is found, use "Procedure 1" for troubleshooting.

3. If no drive fails, or if the problem is intermittent, check the device data bus as follows:

   Use "TCU Subsystem Cable Diagrams" on EAD 5044-5046 for reference. Use "Cable and Board Interconnection Failures" on EAD 1 for cable checking instructions.

   a. Remove the 01A-A1Q2 card from the failing tape control unit.

      Note: The device data bus is terminated at the 01A-A1Q2 card as well as at the terminator card.

   b. Using a multi-meter (R X 1 scale) and logic page DI001 as reference, attach one lead to a ground pin, and check the termination of the failing device data bus (on the pin side of the board). The normal termination resistance is 90 ohms. Resistance less than 90 ohms can indicate a shorted line. For example, two lines shorted together would read approximately 45 ohms on each line. Resistance that is zero ohms can indicate a ground and infinite resistance indicates open lines.

      If the resistance of a line is not correct, use logic pages ZW101-203 as a reference, move the multi-meter lead (along the failing line) closer to the terminator. When the correct termination resistance is measured, the short or open in the line has been located. Replace the affected board or defective cable.

   c. It is possible to have a defective or damaged terminator card. If the terminator is defective, the terminator on the other data bus can be used in the above test.

   Exchange the following FRUs (even if they were exchanged by the GMP, exchange them a second time). Test the subsystem after each FRU is exchanged.

   Possible FRUs:

   FRU058 02A-A1 Drive logic board
   FRU139 01A-A1 Control unit logic board
   FRU199 Terminator card local
   FRU248 Terminator card remote
   Cable groups 80-86

4. Check the tape control unit logic board voltages.

   Check the voltages at the pins listed in the lower left hand corner on logic pages DI001. See PWR 1 for the "Voltage Tolerance Tables." The "Field Wire Net List" voltage pins in the logic diagrams may also be used to determine the voltage pins. If the voltages are not correct, see "Map 400 - Tape Control Unit DC Power" on PWR 1.

   Possible FRUs:

   FRU048 DC cable 01A-A1Y2
   FRU091 DC cable 01A-A1Y5
   FRU097 DC cable 01A-A1Z5
   FRU103 DC cable 01A-A1Z2
   FRU160 Cables CU-PS-02-P4, P9, P11,
   FRU164 DC distribution cable
   FRU145 DC power supply

5. If the earlier actions have not corrected the problem, exchange the following FRUs (even if they were exchanged by the GMP, exchange them a second time). Test the subsystem after each FRU is exchanged.

   FRU117 01A-A1D2 Microprocessor card
   FRU134 01A-A1C2 Control storage card
   FRU121 01A-A1G2 Status store card
   FRU120 01A-A1K2 Buffer adapter card
   FRU119 01A-A1S2 Read clock and format card
   FRU115 01A-A1E2 Maintenance adapter card
   FRU139 01A-A1 Tape Control unit logic board

6. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.

7. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

Procedure 3

The sense data is missing or not complete. For these problems, it may be helpful to request assistance from your next level of support.

Customer programs sometimes exercise the subsystem more than the diagnostics and should be used when possible. Set up procedures with the customer to report the failures. Include in the report such items as; the time, the jobs being run, the drives being used, visual symptoms, and error log messages at the time of the failure. Review the daily Error Log printouts to see if any other system events occurred at the same time as the failure, such as adapter errors.

If a particular path or drive is suspected, deallocate the path or paths and see if the problem disappears.

See the "Status Store/Channel Adapter" EAD, for the procedure to eliminate the communications path between the two tape control units. In a two tape control unit subsystem, and see if the symptoms change.

If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If the program detects an error, continue in this EAD with the next action.

If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

Drive Interconnections

Error Description – General

This is a general Error Analysis Diagram (EAD) that describes troubleshooting of the Device Data Bus and the Read Bus. Errors relating to these functional areas can show up against the tape control unit, or one or more drives. Parts of this EAD contain procedures to isolate the failure to a failing drive or tape control unit.

Troubleshooting in this EAD is for:

- Write and Control Problems – Device Data Bus (DDB)
- Read Problems – Read Bus

Drive Interconnections - Overview

The drives and tape control units are interconnected by two physically distinct cables: the read bus and the device data bus (DDB).

- The **Read Bus** is an 18 signal, analog, differential bus used to send read data from a previously selected drive to a tape control unit.
- The **Device Data Bus** is a bi-directional (BI-DI) digital bus used to send control information, commands, addresses, and status information between the drives and tape control units. Write data from a tape control unit to a previously selected drive is also sent on this bus, and sometimes identified as the write and control bus.

  The DDB is separated into two physical connections:

  – A parallel interconnection which all functions of control, command, status, and write are sent.

  – A serial interconnection which is used to start motion operations to prepare for a read or write operation on one drive while the parallel connection is in use by another drive. However, the command must be sent again on the normal interconnection to complete any command function other than motion type operation.

  The subsystem can inhibit the use of the serial interconnection when some type of errors are detected; however, subsystem performance is affected.

Figure 1 shows the lines and functions of the drive interconnections.

NUMBER OF LINES	FUNCTION
112	56 DDB local 56 DDB remote
9	DDB data bus bits: P, 0-7 (BI-DI) (write data/read status)
8	DDB parallel control tags: Select out Address out Address in Command out Status in Gap in/out (BI-DI) Clock A out Clock B in/out (BI-DI)
3	DDB serial control tags Serial clock out Serial data out Repositioning in
36	DDB read data bus: 18 differential analog signal tracks

Figure 1. DDB Lines Definitions

Each tape control unit and each drive is provided with two sets of interconnections so that, in a dual tape control unit configuration, each drive has a unique path to each tape control unit.

Subsystem Cable diagrams on EAD 5044-5046 show the complete cabling for the interconnections.

Troubleshooting Procedures

Before continuing with this procedure, repair all drive problems

If there are are any audio or visual problems, a drive display, or drive error codes in sense byte 18-23, (except a CHK 82, or an FSC 0082), return to the GMP or the FSI section and repair these problems first. If data bus or read bus problems continue, return to this EAD.

Note: Drive check 82 is a data bus problem and is detected at the drive. For a CHK 82 or an FSC of 0082, follow "Troubleshooting Procedure 2" on EAD 5032.

The Fault Symptom Codes (FSCs) that refer you to this EAD are shown in Figure 2. The Troubleshooting Procedure Number and Page column shows the EAD page and troubleshooting procedure number to go to. If the step number in the "Additional Action/Comments" column in the FSI section that sent you here is anything other than the first step, make sure that the preceding actions have been done before proceeding. If the FSC number is not listed in Figure 2, you should not be using this EAD.

FSC	TROUBLESHOOTING PROCEDURE NUMBER and EAD PAGE	
0080	2	5032
0081	2	5032
0082	2	5032
00A0	3	5040
00A2	3	5040
00A6	2	5032
00A8	3	5040
00A9	3	5040
00AD	3	5040
00AE	3	5040
00C0	3	5040
00C2	3	5040
1700	4	5042
1701	4	5042
1705	4	5042
33E7	3	5040
33E8	3	5040
41F0	3	5040
4780	4	5042
5310	4	5042
5311	4	5042
5320	4	5042
7041	4	5042
7042	4	5042
7051	4	5042
7052	4	5042
7061	4	5042
7062	4	5042
7071	4	5042
7074	4	5042
7076	3	5040
7081	4	5042
7093	4	5042
7094	4	5042
70C2	4	5042
70C3	4	5042
70C4	4	5042
70E3	3	5040
70E5	3	5040
7141	4	5042
7142	4	5042
7143	4	5042
7145	3	5040
7151	4	5042
7152	4	5042
7153	4	5042
7154	4	5042
7155	4	5042
7156	4	5042
7159	4	5042
7161	4	5042
7174	4	5042
71A1	3	5040
74nn	4	5042
7501	4	5042
7502	3	5040
7503	4	5042
76nn	4	5042
7701	3	5040
7702	4	5042
8005	3	5040
8007	3	5040
8009	3	5040
800A	3	5040
800C	3	5040
8200	3	5040
8216	3	5040
8300	3	5040
840A	3	5040
840C	3	5040
840D	3	5040
8600	3	5040
8601	3	5040
86A0	3	5040
86C0	3	5040
86F0	3	5040
86F1	3	5040
8803	3	5040
8804	3	5040
8805	3	5040
89nn	3	5040
88nn	3	5040
8C01	3	5040
8C03	3	5040
8C07	3	5040
8Dnn	3	5040
8E05	3	5040
8E06	3	5040
8Fnn	3	5040
9601	3	5040
9602	2	5040
CF00	3	5040
D0nn	4	5042
D4nn	(see Figure 3)	
D8nn	4	5042
E067	4	5042
E073	4	5042
E0FF	3	5040
E301	4	5042
E302	4	5042
E303	4	5042
E304	4	5042
E305	4	5042
E306	4	5042
E307	4	5042
E800	4	5042
E810	4	5042
EC11	4	5042
EC12	4	5042

Figure 2. FSC Cross Reference Chart

FSC	nn BITS 8 9 10 11 12 13 14 15	TROUBLESHOOTING PROCEDURE NUMBER AND EAD PAGE
D4nn	0 0 0 x x x x x	2 5032
	x 1 x x x x x x	1 5032
	x x 1 x x x x x	1 5032
	1 x x x x x x x	2 5032

Figure 3. D4nn Bits

If multiple D4nn bits 8-10 are on, troubleshoot in the order shown in Figure 3.

Troubleshooting Procedure 1

For FSC D4nn (nn Bit 9 or 10 Equals One)

1. Check that the top card connector (TCC) at 01A-A1ZP0 is in the correct location and is seated correctly. See logic page AA000 for the location and part number of the TCC. The cut out on the TCC is always on the upper right side

   Possible FRUs:

   FRU184 Top card connector 01A-A1ZP0
   FRU139 01A-A1 Tape control unit logic board

2. Check the clocks shown in Figure 1.

3. Check the voltages at the pins listed in the lower left hand corner on logic pages DI001 and DF001. See PWR 1 for the voltage tolerance tables. The "Field Wire Net List" voltage pins may also be used to determine the voltage pins.

   Possible FRUs:

   FRU048 DC cable 01A-A1Y2
   FRU091 DC cable 01A-A1Y5
   FRU097 DC cable 01A-A1Z5
   FRU103 DC cable 01A-A1Z2
   FRU160 Cables CU-PS-02-P4, P9, P11
   FRU164 DC distribution cable
   FRU145 DC power supply

4. If the previous actions have not corrected the problem, replace the following FRUs, that were replaced by the product package, a second time.

   FRU134 Control storage card 01A-A1C2
   FRU118 Drive adapter card 01A-A1Q2
   FRU116 Write data card 01A-A1P2

5. If the FSC is D4nn, and nn bit 8 also equals 1, follow "Troubleshooting Procedure 2," on this page.

6. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

Additional Information for Troubleshooting Procedure 1

For FSC D4nn and nn Bit Equals One

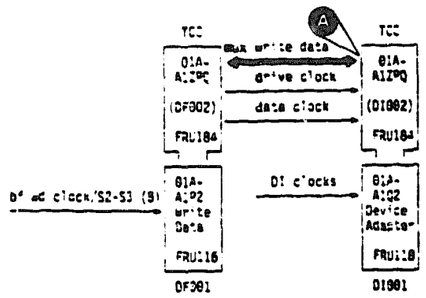
FSC D4nn bit 9 comes from the DSE external register (XR) bit 1.

The tape control unit communicates with the drive through the device adapter card when writing a record. The buffered data is sent to the write data card and:

- Formatted for writing
- Check characters added

It is then gated to the device adapter card.

The device adapter card communicates with the write data card over a multiplex write data bus ('MUX data bus'). Parity of the write data is checked as it enters the device adapter card. If even parity is detected on the 'MUX write data' bus, the DSE register bit 1, and a check 2 condition are set to indicate the error condition. See the diagram below.



Note: All the connections between A1P2 and A1Q2 are on a top card connector.

For FSC D4nn and nn Bit 10 Equals One

FSC D4nn bit 10 comes from the DSE external register (XR) bit 2.

The data is parity checked internally on the device adapter card. Parity errors can be caused by bad input data from either the write data card or from the device data bus. The device adapter card can also cause parity errors.

Troubleshooting Procedure 2

For FSCs 0080, 0081, 0082, 00A6, 0802, and D4nn Bit 8 Equals One or Bits 8-10 Equals Zero.

Note: If you are here for a D4nn FSC and nn bits 9 or 10 also equal one, follow "Troubleshooting Procedure 1" (on this page) first, before doing this procedure.

This procedure troubleshoots the device data bus (DDB) for both parallel and serial functions combined. The "Additional Information for Troubleshooting Procedure 2" on EAD 5036 gives more information pertaining to the different FSCs for the DDB.

1. Review the error codes in sense bytes 10-15 and 16-17. See the FSI section for sense byte meanings and check for common areas of failures. Use the data in sense byte 2, and "Error Path Isolation" on START 1, to determine the failing data path.

   Note: The output message of the GMP may have defined the failing tape control unit and data path.

2. Run GMP (see CE/HSC). When requested to select a drive, select the drive that has the most errors.

3. Use the diagnostic failure IDs and the sense data in the following steps:

   a. If only one drive on one data path is failing, or only one drive on both data paths is failing, go to "Troubleshooting Procedure 2 - Part 1" on EAD 5034.

   b. If multiple drives on one string fail on one or both device data buses, go to "Troubleshooting Procedure 2 - Part 2" on EAD 5034.

   c. If multiple drives on both strings fail on one or both device data buses, go to to "Troubleshooting Procedure 2 - Part 2 " on EAD 5034.

   d. If the sense data is missing or not complete, and there were no Diagnostic Failure IDs, go to "Troubleshooting Procedure 2 - Part 3" on EAD 5036.

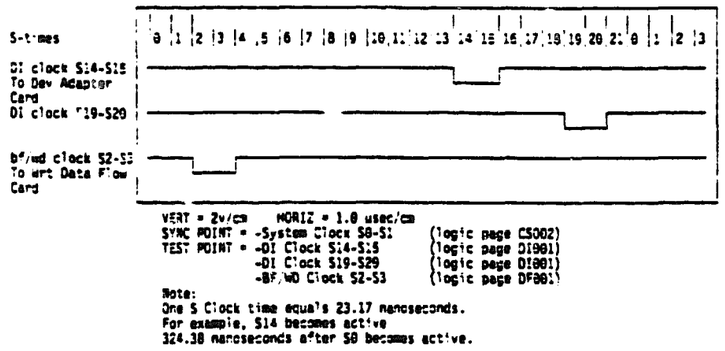


Figure 1. Control Storage Clocks to Device Adapter and Write Data Cards

Troubleshooting Procedure 2 (Continued)

Troubleshooting Procedure 2 (Part 1)

One drive failing on one or both data buses

1. Ensure that the drive is offline to all attached host systems.

2. Before replacing any FRUs, or disconnecting any cables, ensure that the tape control unit and drive string are offline to the host processor.

3. Check the voltages on the drive logic board. See "Tape Transport Unit DC Voltages 50 Hz and 60 Hz" on PWR 1. If the voltages are not correct, go to "Map 210 - Drive DC Power" on PWR 1.

   Possible FRUs:

   FRU079 DC power distribution cable drive internal
   FRU080 DC power distribution cable

4. Terminator problems may show up on only one drive, if there is a defective or damaged terminator card.

   Possible FRUs:

   FRU266 Terminator card – local and remote

   Note: FRU266 is located in the P2A/B2 connector of the last tape transport unit attached to the tape control unit.

5. If the failing drive is the last drive in the string, it is possible to have an open in the cabling in the tape transport unit (short circuits would affect more than one drive).

   Use "Tape Control Unit Subsystem Cable Diagrams" on EAD 5044-5046 for reference. Use "Cable and Board Interconnections Failures" of EAD 1 for general cable checking instructions.

   a. Remove the 01A-A1Q2 card from the failing tape control unit.

      Note: The device data bus is terminated at the 01A-A1Q2 card and the terminator card.

   b. Using a multimeter (R X 1 scale) and logic page DI001 as reference, attach one lead to a ground pin, and check the termination of the failing device data bus (on the pin side of the board). The normal termination resistance is 90 ohms. Infinite resistance indicates open lines.

      If the resistance of a line is not correct, use logic pages ZW101-203 as a reference, and move the CE meter lead (along the failing line) closer to the terminator.

      When the correct termination resistance is measured, the break in the line has been located. Replace the affected board or defective cable.

      Possible FRUs:

      Cable groups 180-186
      FRU058 02A-A1 Drive logic board

6. If the previous actions have not corrected the problem, replace the following FRUs that were replaced by the product package a second time. Run "Tape Control Unit to Drive Bus Out and Driver Wrap Test – Routine EE42" (see DIAG 1) after each FRU replacement.

   FRU085 02A-A1B2 - Drive control card

7. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

Troubleshooting Procedure 2 (Part 2)

Multiple drives failing on one or both strings on one or both device data buses (DDB)

Note: Before performing this procedure, the tape control unit, drive string, and failing data path must be offline to the host processor(s).

Run "Tape Control Unit/Drive Active Bus and Tag Test - Routine EE42" and "Tape Control Unit to Drive Bus and Tag Test - Routine EE43" (see DIAG 1) after doing each step.

1. Visually check the data bus connections and the terminator. See "Tape Control Unit Subsystem Cable Diagrams" on EAD 5044-5046, for reference. If any logic card or cable has been removed or replaced, ensure that the board pins or cable contacts are not bent or broken. Replace any damaged parts.

   FRU058 02A-A1 - Drive logic board
   FRU139 01A-A1 - Tape control unit logic board
   Cable groups 180-186

2. Isolate the failure to a failing tape transport unit.

   a. The error path isolation that was determined in "Troubleshooting Procedure 2," step 1, on EAD 5032, identifies which cables are associated with the failing local or remote tape control unit and the attached drives.

   b. If multiple drives fail on a tape control unit data path, select a tape control unit and cables to test as follows:

Failing TCU and Attached Drives	Test Unit	Open Cable Connector
TCU0-Drives 0-7	TCU0	DDB at TU-D1-A1A3
TCU0-Drives 8-F	TCU0	DDB at TU-D1-A1A5
TCU1-Drives 0-7	TCU1	DDB at TU-D1-A1A5
TCU1-Drives 8-F	TCU1	DDB at TU-D1-A1A3

   Notes:

   1) See LOC 1 for "02A-A1 Logic Board, Card Side" for the location of the TU-D1-A1A3 and A1A5 connectors. See "Tape Control Unit Subsystem Cable Diagram" on EAD 5044-5046.

   2) Opening the connectors at CU-P1-A/B2 or TU-D1-A1A3 and A5, will open both the local (A), and remote (B) lines to the attached drives from both tape control units. (For example, opening drive address 3, TU-D1-A1A3 and TU-D1-A1A5, removes drive addresses 4-7 from both tape control units.)

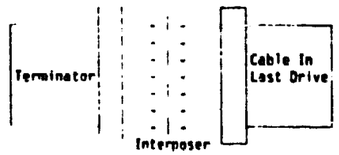
   The remaining drives will be running without any termination with the TU-D1-A1A3 or TU-D1-A1A5 connectors open. See the note below.

   c. Run GMP (see CE/HSC).

   d. Repeat the preceding step, moving up or down the device data bus, until the failing area is determined.

      Note: It is not necessary to move the terminator when EE4x diagnostics are used. It is necessary to move the terminator to the last tape transport unit being tested when any Read or Write diagnostics are used.

      To move a terminator, remove the cable from the drive TU-P2 connector, install the interposer, then install the terminator. See the diagram below.



      Note: See the earlier note in step 2b.

      If a failing tape transport unit is located, isolate the failure to the failing drive by removing the device data bus cable from the drive (see LOC 1) as follows:

      - For Local (A) at - TU-D0/1-A1A2
      - For Remote (B) at - TU-D0/1-A1A4

   e. If all drives are failing in one or both groups of the attached drives, the problem is in the Device Data Bus Local/Remote connection between the tape control unit 01A-A1Q2 card (TCU logic DI001) and the first tape transport unit drive board connector at TU-D0-A1A2 (local) and TU-D0-A1A4 (remote) (TTU logic WW010).

   f. If multiple drives on both groups of attached drives are failing on both device data buses, get the subsystem from the customer and troubleshoot each local device data bus independently. Test or troubleshoot the remote data buses if necessary. If a failing drive is found, use "Troubleshooting Procedure 2 (Part 1)" for troubleshooting.

Troubleshooting Procedure 2 (Part 2) (Continued)

3. If no drive fails, or if the problem is intermittent, check the device data bus as follows:

   Use "Tape Control Unit Subsystem Cable Diagrams" on EAD 5044-5046 for reference. Use "Cable and Board Interconnection Failures" on EAD 1 for general cable checking instructions.

   a. Remove the 01A-A1Q2 card from the failing tape control unit.

      Note: The device data bus is terminated at the 01A-A1Q2 card and the terminator card.

   b. Using a multimeter (R X 1 scale) and logic page DI001 as reference, attach one lead to a ground pin, and check the termination of the failing device data bus (on the pin side of the board). The normal termination resistance is 90 ohms. Resistance less than 90 ohms can indicate a shorted line. For example, two lines shorted together would read approximately 45 ohms on each line. Resistance that is zero ohms can indicate a ground and infinite resistance indicates open lines.

      If the resistance of a line is not correct, and using logic pages ZW101-203 for reference, move the multi-meter lead (along the failing line) closer to the terminator. When the correct termination resistance is measured, the short or open in the line has been located. Replace the affected board or defective cable.

   c. It is possible to have a defective or damaged terminator card. If the terminator is defective, the terminator on the other group of drives can be used in the above test if this is a dual tape control unit configuration.

      Possible FRUs:

FRU058	02A-A1 Drive logic board
FRU134	01A-A1 Tape control unit logic board
FRU266	Terminator card local and remote Cable groups 180-186

   Note: FRU266 (terminator card local and remote) is located in the P2A/B2 connector of the last tape transport unit attached to the tape control unit.

4. Check the tape control unit logic board voltages.

   a. Check the voltages at the pins listed in the lower left corner on logic page DI001. See PWR 1 for the voltage tolerance tables. The "Field Wire Net List" voltage pins may also be used to determine the voltage pins.

   b. If the voltages are not correct, see "Map 400 - Tape Control Unit DC Power" on PWR 1.

      Possible FRUs:

FRU048	DC cable 01A-A1Y2
FRU091	DC cable 01A-A1Y5
FRU097	DC cable 01A-A1Z5
FRU103	DC cable 01A-A1Z2
FRU160	Cables CU-PS-02-P4, P9, P11,
FRU164	DC distribution cable
FRU145	DC power supply

5. Check the clock timings shown in Figure 1.

6. If the earlier actions have not corrected the problem, exchange the following FRUs (even if they were exchanged by GMP, exchange them a second time). Test the subsystem after each FRU replacement.

FRU117	01A-A1D2 Microprocessor card
FRU134	01A-A1C2 Control storage card
FRU121	01A-A1G2 Status store card
FRU120	01A-A1K2 Buffer adapter card
FRU119	01A-A1S2 Buffer adapter card
FRU115	01A-A1E2 Maintenance adapter card
FRU139	01A-A1 Tape control unit logic board

7. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

Troubleshooting Procedure 2 (Part 3)

The sense data is missing or not complete and there are no diagnostic failure IDs.

For these problems, it may be helpful to request assistance from your next level of support.

Customer programs sometimes exercise the subsystem more than the diagnostics and should be used when possible. Set up procedures with the customer to report the failures. Include in the report such items as: the time, the jobs being run, the drives being used, visual symptoms, and console messages at the time of the failure. Review the daily error logs to see if any other system events occurred at the same time as the failure, such as adapter errors.

If a particular path or drive is suspected, deallocate the path or paths and see if the problem disappears.

See the "Status Store/Channel Adapter" EAD, for the procedure to eliminate the communications path between the two tape control units and see if the symptoms change.

If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If the program detects an error, return to the FSI and do one of the following:
  - Perform any additional actions.
  - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

Additional Information For Troubleshooting Procedure 2

General Device Data Bus Problems

Figure 1 shows the clocks that are needed for correct operation of the DDB, for both parallel and serial functions.

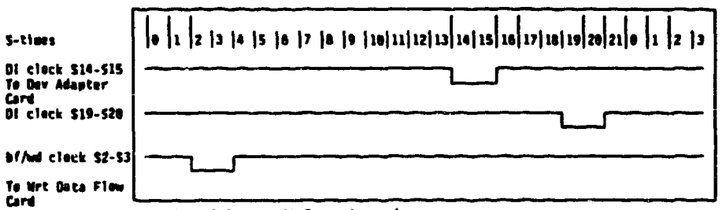
Device Data Bus (PARALLEL)

Note: See Figure 1 in EAD 5038 for the overview of this description.

Parallel write and control problems result in hardware (D4nn error codes) and microcode detected errors in the device data adapter functional area of the subsystem.

Error indicators are set when:

- The microcode detects errors on the device data bus. The error codes are set in the sense data.
- The hardware parity checkers detect parity errors on the inputs to the adapter card. Error bits are set in the device status error (DSE) register, and D4nn is set in sense bytes 16-17 (D4 nn bits 8-15 equals the contents of the DSE register bits 0-7).



VERT = 2v/cm HORIZ = 1.0 usec/cm
SYNC POINT = -System Clock S0-S1 (logic page CS002)
TEST POINT = -DI Clock S14-S15 (logic page DI001)
-DI Clock S19-S20 (logic page DI001)
-BF/WD Clock S2-S3 (logic page DF001)

Note:
One S Clock time equals 23.17 nanoseconds.
For example, S16 becomes active
324.38 nanoseconds after S0 becomes active.

Figure 1. Control Storage Clocks to Device Adapter and Write Data Cards

The following is an explanation of the DSE bits:

Bit 0	Incorrect parity from the drive on the device data bus
Bit 1	Data parity error on the write data card to the drive adapter card
Bit 2	Drive adapter internal parity error
Bit 3-7	Not used for D4nn error code

- For any Device Data Bus FSC that references the contents of the DSE register, and DSE bits 0-2 equals zero, follow Troubleshooting Procedure 2.

  If multiple bits are on in DSE bits 0-2, troubleshoot DSE bits 1 and 2 first using Troubleshooting Procedure 1, then bit 0 using Troubleshooting Procedure 2.

Troubleshooting Procedure 2 (Continued)

Additional Information for Troubleshooting Procedure 2

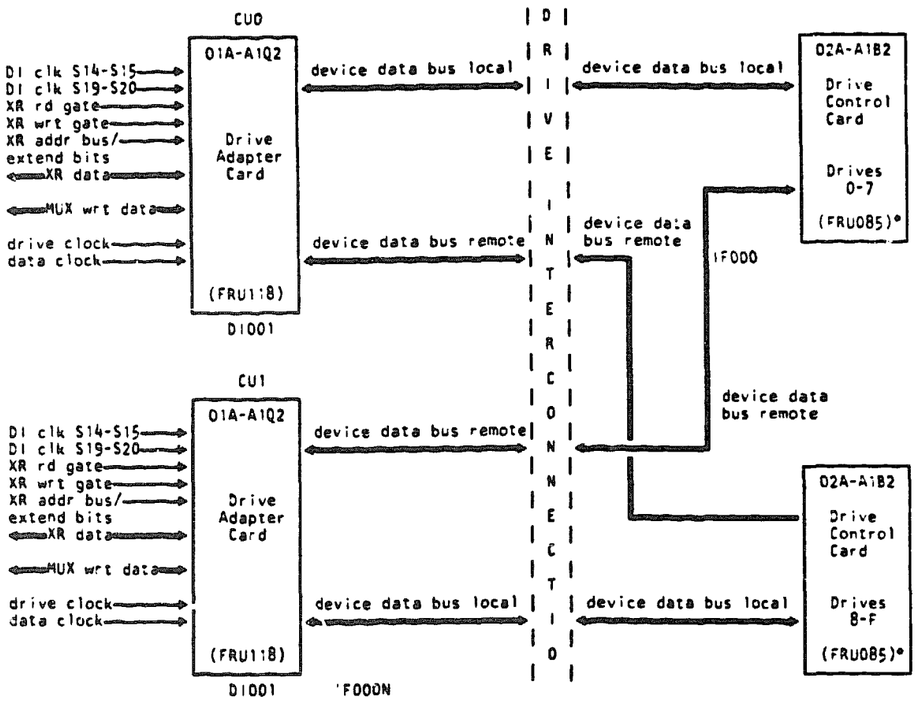


Figure 1. Device Interconnection Overview - DDB

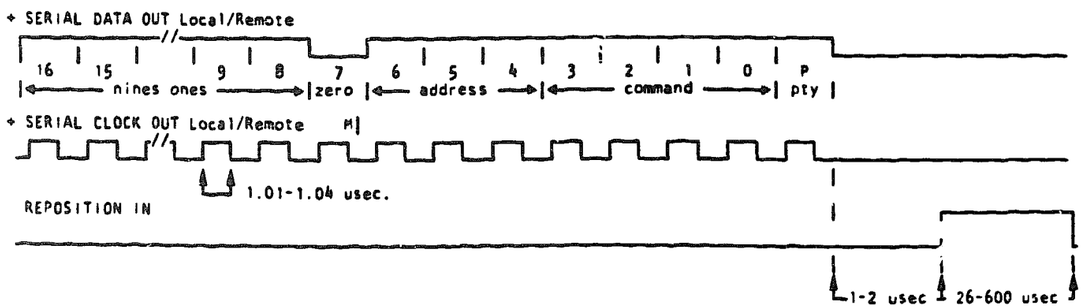


Figure 2. Serial Sequence Device Interconnections (logic page DI001)

Additional Information for FSC D4nn, nn Bit 8 Equals One

FSC D4nn bit 8 comes from the DSE external register (XR) bit 0.

Notes:

1. See Figure 1 for the overview diagram of this description.
2. If D4 nn bits 9 or 10 also equals one, follow "Troubleshooting Procedure 1" first, before following "Troubleshooting Procedure 2."

The drive adapter card in the tape control unit communicates with the tape transport units via a bi-directional (BI-DI) bus: the device data bus (DDB). This bus is connected in parallel to all tape transport units and is terminated in the last tape transport unit on the attached group of tape transport units. See "Write Data Flow" on OPER 1 for more information.

Note: All control information to and from the drives, and write data to the drives is transferred on this bus.

The drive adapter card does not correct any data errors on the data that passes through it. If it receives incorrect parity (even) from the tape control unit or drive, the drive adapter card signals a check 2 error to the microprocessor. An error is set in the DSE register and the data is sent to the receiving function. See the DSE bit definitions above.

The drive adapter monitors the DDB for odd parity, except for the three following exceptions:

- **Alerts:** Drives signalling that they need service. Any combination of drives can signal that service is needed, therefore, parity is not checked. Alerts can be signalled only when 'select out' is not on.
- **Address-out/Address-in Time:** The tape control unit puts the drive address on the bus, and the drive returns a complemented 'P' bit that causes an even parity condition.

  Note: For a period of time, the BI-DI bus will be set with all ones. The BI-DI bus will be correct when sampled by the microcode during 'address in' time, but the address is not checked for parity.
- **Address-in Response to Command Out:** Bits on the BI-DI bus indicate that drive errors exist, and can be in any combination. See error code 8Fnn in the FSI section.

Additional Information for Non-D4nn Microcode Detected Device Data Bus FSCs

The microcode also detects errors in the device data bus functional area. Each FSC is defined in the FSI section of this maintenance information. For Device Data Bus FSCs that reference this EAD, follow the Troubleshooting Procedure referenced in the table on EAD 5030.

Additional Information for 8803-8805, 9602, or CF80 (Serial Bus Errors)

The microcode detects the errors on the serial bus and sets error codes 8803, 8804, 8805, 9602, or CF80 in the sense data.

Note: An MD option is available that inhibits 'starts' on the serial bus. This can be used to defer maintenance to a later time. See "Trace Match Control" on MD/SDISK 1. However, the performance of the subsystem will be affected until the MD Trace Match Control option restores normal serial bus operation.

The "Tape Control Unit/Drive Serial Interconnection Test - Routine EE44" verifies that the serial bus can send commands.

Oscilloscope Information

The data bus uses an NPL voltage level (+3 Vdc and 0 V). It is a bi-directional bus with several inbound and outbound tags that are similar in purpose to a normal channel interface. Scoping is used to look for incorrect voltage levels or non-pulsing lines. The sync points must be carefully chosen in order to display meaningful information on the oscilloscope. The clock signals that are checked on the boards are shown in Figure 2.

Troubleshooting Hint

If the error codes indicate serial bus errors are occurring, Troubleshooting Procedure 2 should be used to determine the problem.

Drive Interconnections (Continued)

Troubleshooting Procedure 3

Multiple functions are shared on the device data bus (DDB) connections. Therefore, after an operation fails with an FSC, a different FSC can occur at an earlier time when the error condition is tested in a sequence of operations. For example, the first FSC occurred during an ending sequence operation and a different FSC occurs during the initial selection sequence part of another operation that uses and checks the same function.

In the chart on this page, the Beginning Operation FSCs shown in column one can occur more frequently since they are the first FSCs that check for the error condition in a sequence of operation.

BEGINNING OPERATION FSC	OTHER RELATED FSCs	AFFECTED DRIVE INTERCONNECTIONS
70E3 7502 7701	00AD 00AE	Status In/Gap Out
8005	00A0, 70E5, 86A0 00A8, 7145, 88nn 00C0, 71A1, 8C01 00C2, 8005, 8Dnn 3F14, 800C, 8E06 41F0, 8216, 8Fnn 7076	Data Bus/Select Out
8007 8009	86F1	Address In/Out
800A	00A0, 70E5, 86A0 00A8, 7145, 88nn 00C0, 71A1, 8C01 00C2, 8005, 8Dnn 3F14, 800C, 8E06 41F0, 8216, 8Fnn 7076	Hardware Detected DDB
8600	8300, 840C 840A, 8601	Clock B In/Clock A Out
8608	00A2, 86F1 00A9, 8C03 8601, 8C07	Status In/Command Out
86F0	86F1	Address In
8Dnn	00A0, 70E5, 8216 00A8, 7145, 86A0 00C0, 71A1, 88nn 00C2, 8005, 8C01 3F14, 800A, 8E06 41F0, 800C, 8Fnn 7076	Hardware Detected DDB
8E05	00A2, 86F1 00A9, 8C03 8601, 8C07	Status In/Command Out
8E06	00A0, 70E5, 8216 00A8, 7145, 86A0 00C0, 71A1, 88nn 00C2, 8005, 8C01 3F14, 800A, 8Dnn 41F0, 800C, 8Fnn 7076	Unit Check DDB Bit 6
8Fnn	00A0, 70E5, 86F1 00A2, 7145, 89nn 00A8, 71A1, 88nn 00A9, 8005, 8C01 00C0, 800A, 8C03 00C2, 800C, 8C07 3F14, 8216, 8Dnn 41F0, 86A0, 8E06 7076	Address In/Command Out
9601		Gap In
CF80	8803 8804	Repositioning In/ Serial Data/ Serial Clock

The FSCs listed in the chart on this page are for specific functional errors that can occur during tape control unit and drive communications. The GMP troubleshoots and replaces logic FRUs that can correct the specific failures. The remaining area to troubleshoot is the device interconnections between the already replaced FRUs. DDB interconnection problems can affect multiple drives. These problems can appear as varying symptoms because of the shared functions of selection, control, and writing of data for both parallel and serial operations.

It is possible for only one drive to fail because of an interconnection problem if it is the last drive in a group of drives.

1. Determine if any failure pattern can be found, using the VAXsimPLUS error log or customer definition of the problem. For example:

   - All drives failing past a certain drive in a group of drives
   - Drive failures common to a local or remote bus from either tape control unit
   - All drives failing from one tape control unit
   - A single drive failure that is the last drive in a group of drives.

   a. If only one drive is failing (other than the last drive in a group) you should re-check earlier actions specified in the FSI for that FSC, because it is probably not a drive interconnection problem.

   b. If the FSC occurred multiple times without causing an initial failure FSCs, you should re-check earlier actions specified in the FSI for that FSC, because it is probably not a drive interconnection problem.

   In steps a and b, if there are no further actions in the FSI, and all FRUs called out by the GMP were replaced, call your next level of support.

   c. If drive interconnection problems are suspected (multiple drives, or the last drive in a group) follow "Troubleshooting Procedure 2" (see EAD 5032).

   The lines relating to the FSCs are shown in the chart (on this page) as "Affected Drive Interconnections." The logic connection points are on DI001 for the tape control unit, and IFC00 for the tape drive.

Troubleshooting Procedure 4

Note: Make sure that you have followed the earlier FSI additional actions for the FSCs before doing this procedure.

If the FSC description in the FSI relates to the Read Back Check part of a write command, then you must also follow "Troubleshooting Procedure 2" on EAD 5032 for possible write and control line DDB problems.

Read Bus Problems Caused by the DDB Read Bus

The FSCs shown below are for specific data flow errors that can occur during tape control unit and drive communications, because of DDB read data bus problems.

READ BUS PROBLEMS - FSCs		
1700	70C2	76nn
1701	70C3	7702
1705	70C4	00nn
4780	7141	08nn
5310	7142	E067
5311	7143	E073
5320	7151	E301
7041	7152	E302
7042	7153	E303
7051	7154	E304
7052	7155	E305
7061	7156	E306
7062	7159	E307
7071	7161	E800
7074	7174	E810
7081	74nn	EC11
7093	7581	EC12
7094	7503	

The GMP troubleshoots and replaces logic FRUs that can correct the specific failures. The remaining area to troubleshoot is the device interconnections between the already replaced FRUs.

Troubleshooting Procedure 4 is for troubleshooting problems with interconnections of the DDB Read bus. DDB interconnections problems can affect multiple drives. These problems can appear as varying symptoms because of the shared functions of read back checks during write operations and for read operations.

It is possible to have only one drive failing because of an interconnection problem if it is the last drive in a group. The failure could also be a connection problem in a parallel connection that is internal to the drive and beyond the 'Tee' of the main read bus series connection to other drives.

1. Determine if any failure pattern can be found using the VAXsimPLUS or error log or customer definition of the problem:
   - All drives failing past a certain drive in a group of drives
   - Drive failures common to a local or remote bus from either tape control unit
   - All drives failing from one tape control unit
   - A single drive failure that is the last drive in a group
   - A single drive failure that has changing FSCs within the FSCs listed for Troubleshooting Procedure 4.
2. If only one drive is failing, (other than the last drive in a group) with a single FSC, you should check preceding actions specified in the FSI for that FSC; it is probably not a drive interconnection problem. If there are no further actions in the FSI, and all FRUs called out by the GMP were replaced, call your next level of support.
3. If drive interconnection problems are suspected, continue with Troubleshooting Procedure 4.

   Note: Power must be off for the complete subsystem being checked for shorted or open circuits.

   Ensure that the associated logic board pins and cable connectors are not bent or broken. Replace any damaged parts.
4. Checking for Open Circuits
   - One drive failing:
     a. Check for continuity of the read data bus pins between 02A-A1J2 (drive logic RP000) and TU-D0/D1-RA(Tee) or TU-D0/D1-RB(Tee) (drive logic WW020) for the failing drive. See "Tape Control Unit Subsystem Cable Diagrams" on EADs 5044-5046 for reference.
     b. Correct any cable problem found.
     c. If the cabling is not the problem, replace the failing drive logic board, 02A-A1.

Possible FRUs:

- **FRU057** Read adapter A cable TU Tee (TU-D0/D1-RA(Tee)) to 02A-D0/D1-A1G2 (right TCC).
- **FRU055** Read adapter B cable TU Tee (TU-D0/D1-RB(Tee)) to 02A-D0/D1-A1G2 (left TCC).
- **FRU058** 02A-A1 Drive logic board.

- Multiple drives failing:
  a. Review error log or the system console messages to define the failing drive addresses.
  b. Identify the failing drive address that is closest to the tape control unit. Check for continuity of the read data bus pins between TU-D1-P2A1 or TU-D1-P2B1 of the next non-failing tape transport unit closest to the tape control unit and the same connector TU-D1-P2A1 or TU-D1-P2B1 in the tape transport unit with the failing drive closest to the tape control unit. For example, if drives 5-7 were failing, continuity should be checked from drive 3 TU-D1-P2A1 or B1 to drive 5 TU-D1-P2A1 or B1. Use tape control unit logic pages WT004, 006, 008, and 010 pin assignments for CU-P1A1 or CU-P1B1 to identify the pin assignments of TU-D1-P2A1 or TU-D1-P2B1. (CU-P1A1 and CU-P1B1 have the same pin assignments as TU-D1-P2A1 and TU-D1-P2B1.) See "Tape Control Unit Subsystem Cable Diagrams" on EADs 5044-5046 for reference.

     Correct any cable problem found.

     Possible FRUs:

     - **FRU088** Read bus A adapter cable previous TU-D1-P2A1 to TU-D1-P2A1.
     - **FRU092** Read bus B adapter cable previous TU-D1-P2B1 to TU-D1-P2B1.

  c. If the failing drive closest to the tape control unit is in the first tape transport unit in the group, check continuity from the tape control unit at 01A-A2R2, 01A-A2S2, and 01A-A2T2, (CU logic RD001, 101, 201) for read data 1A local through read data 9B remote to the first tape transport unit at TU-D1-P2A1 or TU-D1-P2B1. Use tape control unit logic pages WT004, 006, 008, and 010 pin assignments for CU-P1A1 or CU-P1B1 to identify the pin assignments of TU-D1-P2A1 or TU-D1-P2B1. (CU-P1A1 and CU-P1B1 have the same pin assignments as TU-D1-P2A1 and TU-D1-P2B1.) See "Tape Control Unit Subsystem Cable Diagrams" on EADs 5044-5046 for reference.

     Correct any cable problem found.

  d. If the cabling is not the problem, replace the tape control unit logic board 01A-A2.

Possible FRUs:

- **FRU088** Read bus A adapter cable CU-P1A1 to TU-D1-P2A1 of first TTU (from TCU0, if the failing connection was from TCU0 to drives 0-7; from TCU1, if the failing connection was from TCU1 to drives 8-F).
- **FRU022** FRU022 connects from 01A-A2O4 to CU-P1A1. TCU read bus local cable 01A-A2U2 to CU-P1A1 (in TCU0, if the failing connection was from TCU0 to drives 0-7; in TCU1, if the failing connection was from TCU1 to drives 8-F).
- **FRU092** Read bus B adapter cable CU-P1B1 to TU-D1-P2B1 of first TTU (from TCU0, if the failing connection was from TCU1 to drives 0-7; from TCU1, if the failing connection was from TCU0 to drives 8-F).
- **FRU025** TCU read bus remote cable CU-P2A1 to CU-P1B1 (in TCU0, if the failing connection was from TCU1 to drives 0-7; in TCU1, if the failing connection was from TCU0 to drives 8-F).
- **FRU260** Read bus remote cable - read bus part of cable assembly CU-P2A2 to other CU-P2A1 (from CU0-P2A2 to CU1-P2A1 ,if the failing connection was from TCU0 to drives 8-F; from CU1-P2A2 to CU0-P2A1, if the failing connection was from TCU1 to drives 0-7).
- **FRU024** FRU024 connects from 01A-A2O2 to CU-P2A2. TCU Read bus remote cable 01A-A2U4 to CU-P2A2 (in TCU0, if the failing connection was from TCU0 to drives 8-F, in TCU1, if the failing connection was from TCU1 to drives 0-7).
- **FRU140** 01A-A2 CU logic board.

5. Checking for Short Circuits

   Short circuits can be isolated to a failing tape transport unit by looping a failing diagnostic and separating groups of tape transport units until the failure is isolated to a single tape transport unit. Make resistive measurements in the tape transport unit with the short circuit or the subsystem read bus while separating groups of tape transport units until the problem is isolated.

Troubleshooting Procedure 4 (Continued)

6 Resistive Measurements

a 100 ohms is the nominal resistance across the differential read data pins (m to p) for each track for read data 1A local through read data 9B remote, and at least 3000 ohms between adjacent read data bus track pins and from either side of a differential read data bus pin (m or p) to ground, at tape control unit logic cards 01A-A2R2, 01A-A2S2, and 01A-A2T2 (logic cards must be installed) (See RD001, RD101, and RD201 for reference.)

OR

b 100 ohms is the nominal resistance across the differential read data pins (m to p) for each track for read data 1A local through read data 9B remote, and at least 3000 ohms between adjacent read data bus track pins and from either side of a differential read data bus pin (m or p) to ground in the last tape transport unit in the string at TU-D1-P2A1, or TU-D1-P2B1. Use tape control unit logic pages WT004, 006, 008, and 010 pin assignments for CU-P1A1 or CU-P1B1 to identify the pin assignments of TU-D1-P2A1 or TU-D1-P2B1. (CU-P1A1 and CU-P1B1 have the same pin assignments as TU-D1-P2A1 and TU-D1-P2B1.) See "Tape Control Unit Subsystem Cable Diagrams" on EADs 5044-5046 for reference.

To isolate a short between the tape control unit and the tape transport units, open the connector at CU-P1A1 or CU-P1B1. Check the resistance measurements at the first tape transport unit TU-D1-P2A1 or TU-D1-P2B1 and at CU cards 01A-A2R2, 01A-A2S2, and 01A-A2T2 (logic cards must be installed).

7 Short Circuit in a Tape Transport Unit

a. Open the connectors at TU-D0-RA(Tee) and TU-D1-RA(Tee), or at TU-D0-RB(Tee) and TU-D1-RB(Tee).

b If the short circuit remains, the problem is in the area of the cable from the previous TU-D1-P2A1 (or if the first tape transport unit from CU-P1A1) to TU-D1-P2A1; or from the previous TU-D1-P2B1 (or if the first tape transport unit from CU-P1B1) to TU-D1-P2B1.

Possible FRUs

FRU088 Read bus A adapter cable from previous TU-D1-P2A1 (or if the problem is isolated to the first tape transport unit, CU-P1A1 to TU-D1-P2A1) (from TCU0, if the failing connection was from TCU0 to Drive addresses 0 or 1, from TCU1, if the failing connection was from TCU1 to Drives 8 or 9)

FRU092 Read bus B adapter cable from previous TU-D1-P2B1 (or if the problem is isolated to the first TTU, CU-P1B1) to TU-D1-P2B1 (from TCU0, if the failing connection was from TCU1 to Drive addresses 0 or 1, from TCU1, if the failing connection was from TCU0 to Drives 8 or 9)

c If the short disappeared when the TU-D0/1-RA(Tees) or TU-D0/1-RB(Tees) were opened, reconnect the Tees, one at a time, until the short circuit returns, to determine which read drive bus (D0 or D1) has the short circuit. Check the cabling from the Tee connector to the failing drive logic board. If a cabling problem is found, replace the defective cable. If no cable problem is found, replace the failing drive logic board 02A-A1.

FRU057 Read Adapter A Cable TU Tee (TU-D0/D1-RA(Tee)) to 02A-D0/D1-A1G2 (Right TCC)

FRU055 Read Adapter B Cable TU Tee (TU-D0/D1-RB(Tee)) to 02A-D0/D1-A1G2 (Left TCC)

FRU0-58 02A-A1 Drive Logic Board

8 Short Circuit in the Tape Control Unit

a. Review EREP or the system console messages to determine if the problem is in TCU0 or TCU1, and to drives 0-7 or 8-F.

b. Select a tape control unit and the cables to test as follows:

Failing TCU/ Drive Group	Check for Short Circuits At:
TCU0 DRVs 0-7	TCU0 at CU-P1-A1 Local
TCU0 DRVs 8-F	TCU0 at CU-P1-B1 Remote
TCU1 DRVs 0-7	TCU1 at CU-P1-B1 Remote
TCU1 DRVs 8-F	TCU1 at CU-P1-A1 Local

See tape control unit logic pages WT004, 006, 008, and 010 for pin assignments of CU-P1A1 or CU-P1B1. See "Tape Control Unit Subsystem Cable Diagrams" on EADs 5044-5046 for reference.

c Check for short circuits in the tape control unit back to 01A-A2R2, 01A-A2S2, and 01A-A2T2, (CU logic RD001, 101, 201) for read data 1A local through read data 9B remote. Correct any cable problem found. If cabling is not found to be the problem, replace the tape control unit logic board 01A-A2.

Possible FRUs

FRU022 FRU022 connects from 01A-A2Q4 to CU-P1A1. TCU read bus local cable 01A-A2U2 to CU-P1A1 (in TCU0, if the failing connection was from TCU0 to drives 0-7, in TCU1, if the failing connection was from TCU1 to drives 8-F)

FRU025 TCU read bus remote cable CU-P2A1 to CU-P1B1 (in TCU0, if the failing connection was from TCU1 to drives 0-7, in TCU1, if the failing connection was from TCU0 to drives 8-F)

FRU260 Read bus remote cable-Read bus part of cable assembly CU-P2A2 to other CU-P2A1 (from CU0-P2A2 to CU1-P2A1, if the failing connection was from TCU0 to drives 8-F, from CU1-P2A2 to CU0-P2A1, if the failing connection was from TCU1 to drives 0-7).

FRU024 FRU024 connects from 01A-A2Q2 to CU-P2A2. TCU read bus remote cable 01A-A2U4 to CU-P2A2 (in TCU0, if the failing connection was from TCU0 to drives 8-F, in TCU1, if the failing connection was from TCU1 to drives 0-7)

FRU140 01A-A2 CU logic board

If you have completed all activities for this EAD, return to the FSI section to see if any additional actions are specified. If any are, follow the FSI's direction. If the FSI does not provide any more directions, do the following:

- After each repair action, or if the call has to be deferred, return to the Support Procedures section for the "End of Call Actions."
- **If no repair action has been found, call your next level of support.**
- After an assisted repair action, return to the Support Procedures section for the "End of Call Actions."

Additional Information for Troubleshooting Procedure 4

Read problems are normally corrected by following troubleshooting actions in the FSI or another EAD for that specific read FSC.

This EAD assumes those actions that address the possible logic causes of a read problem have already been followed. This EAD strictly troubleshoots the related read cabling and logic boards, and isolates a problem to a Tape Transport Unit, or a Tape Control Unit out of a string of subsystem drives.

The results of read bus shorts can be errors showing up in a random manner; therefore, more effort is required to isolate the problem. An open on the read bus can effect one drive, or all drives past the open, further away from the tape control unit.

The read bus connections are shown on EADs 5044-5046. The impedance across the differential read data pins (m to p), for each track, is 100 ohms, nominal, developed by the terminators in the tape control unit read detect cards 01A-A2R2, S2, and T2 (logic pages RD001, 101, 201).

With the tape control unit read detect cards removed, at least 1 megohm is measured across the differential read data bus pins (m to p). An impedance greater than 3000 ohms between adjacent read data bus track pins and from either side of a differential read data bus pin (m or p) to ground, is considered good.

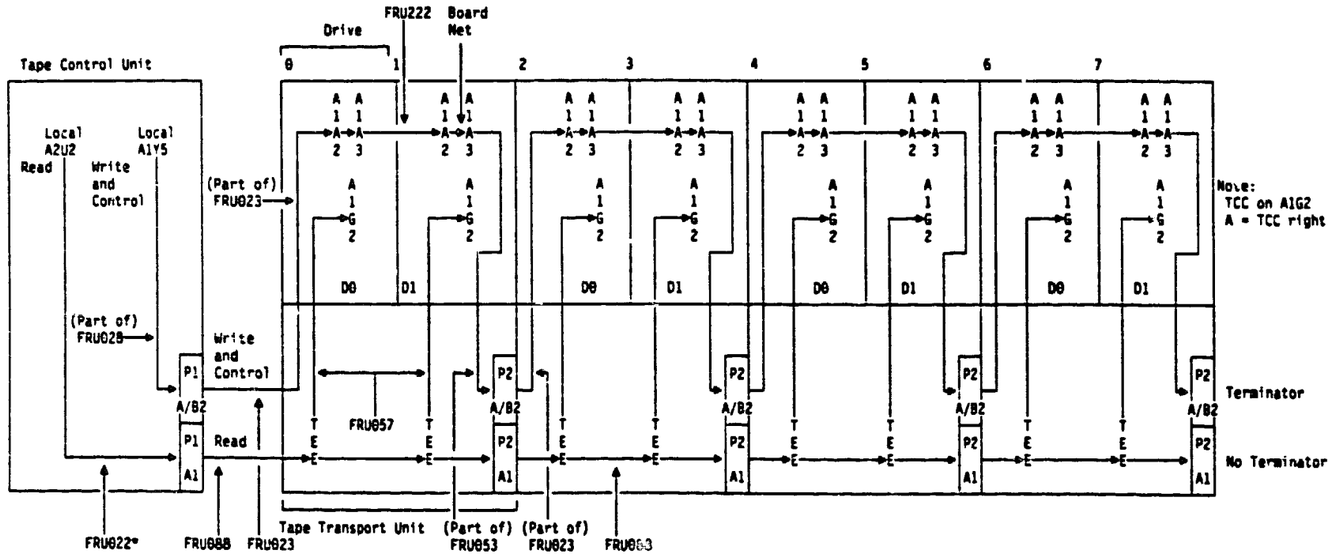
Drive Interconnections (Continued) EAD 5044

Tape Control Unit Subsystem Cable Diagrams

Single Tape Control Unit Subsystem Cable Diagram

Drive isolation requires you to disconnect cables and move terminator cards. The drawings on this error analysis diagram and the two following show drive to tape control unit interconnection cable paths.

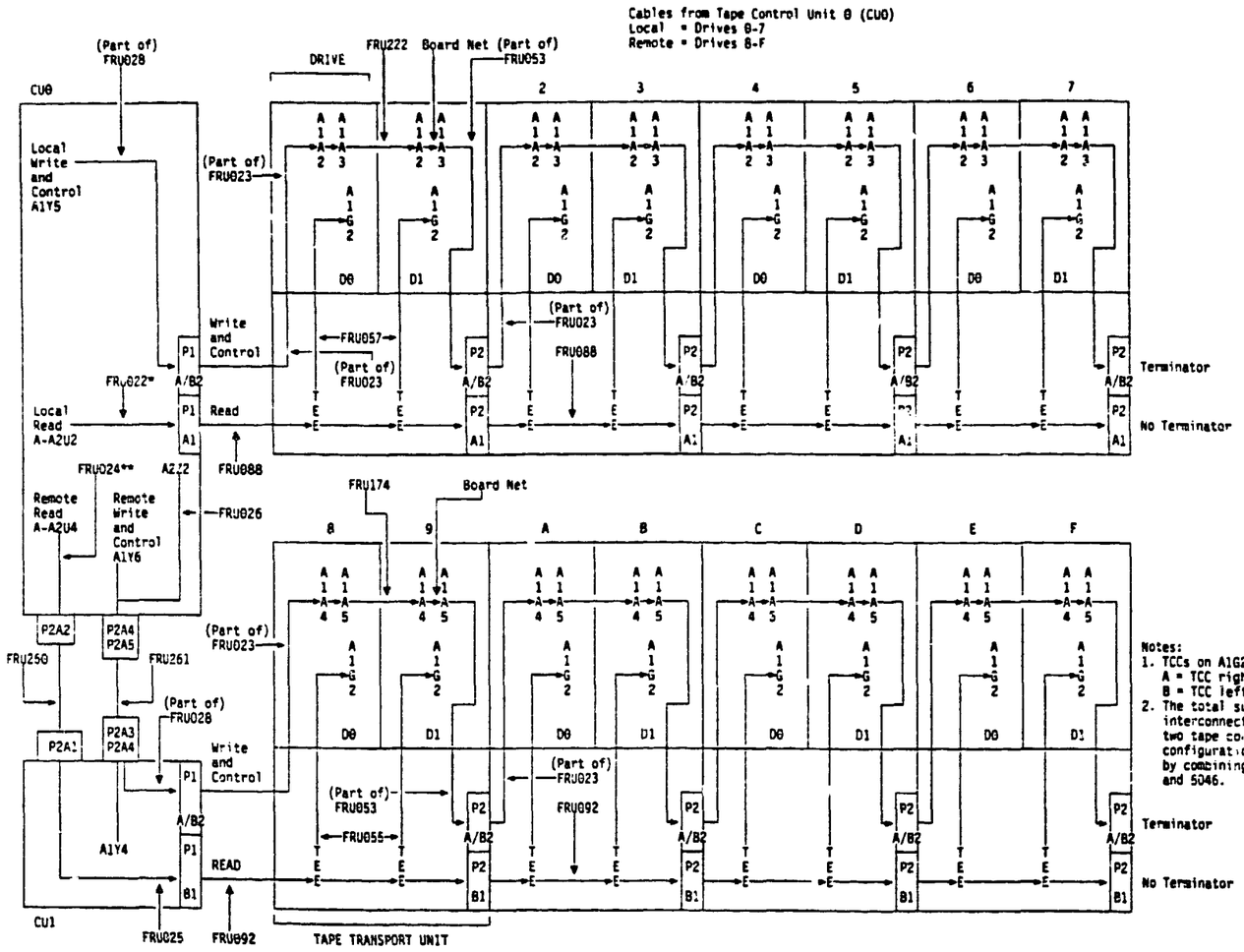
CAUTION:
Moving cables or terminators may disrupt customer operation.



* FRU822 connects from 01A-A2Q4 to CU-P1A1

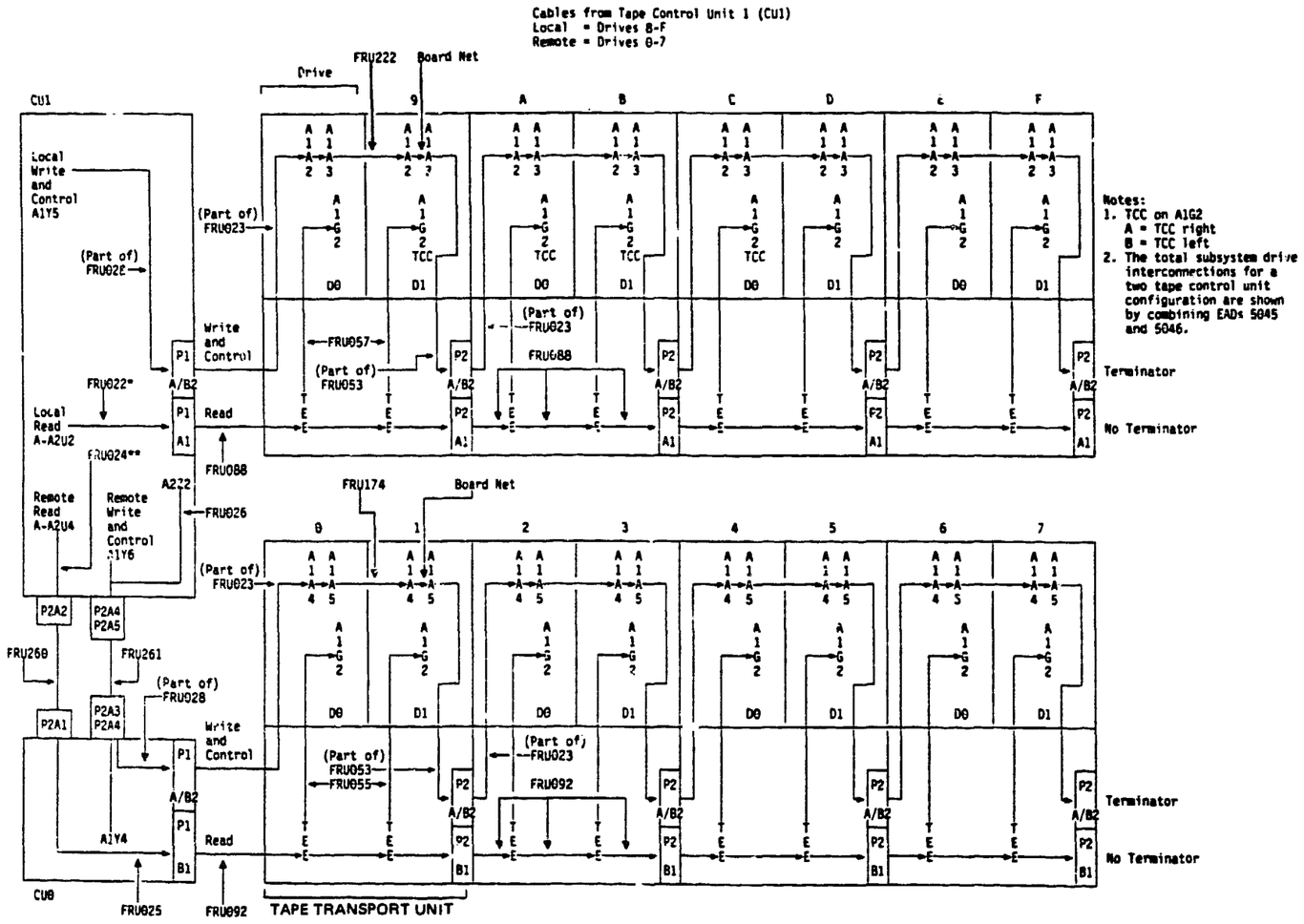
Drive Interconnections (Continued) EAD 5045

Dual Tape Control Unit Subsystem Cable Diagram (Part 1 of 2)



Drive Interconnections (Continued) EAD 5046

Dual Tape Control Unit Subsystem Cable Diagram (Part 2 of 2)



* FRU022 connects from 01A-A2O4 to CU-P1A1
** FRU024 connects from 01A-A2O2 to CU-P2A2

Error Description

This Error Analysis Diagram (EAD) describes:

1. The errors that the microprocessor detects on the dual tape control unit communication paths of the status store to status store functional areas of the subsystem.
2. The parity errors that the hardware checkers detect on the internal and external buses of the dual tape control unit status store communicator.
3. The use of error codes furnished by COMTAB after examining a check 1 error.
4. A data path error isolation procedure requiring sense analysis.

You are here because:

- The FSI section called out this EAD.

  OR

- A diagnostic failure ID called out this EAD.

Note: In a dual tape control unit configuration, there are device data buses, read buses, and remote paths between the channel adapters and buffers that are used for data transfers and communication in the subsystem. Problems in the read or device data buses are discussed in the "Drive Interconnections" EAD pages. Channel adapter to buffer paths problems are discussed in the "Status Store/Channel Adapter" EAD pages.

Error Condition Theory

When the dual tape control unit feature is installed, the status store function provides a communications path between the two tape control units (see "Tape Control Unit to Tape Control Unit Communication" on OPER 1).

The connection between the two tape control units is made under control of the orders from the microprocessor. The data that concerns the status of the subsystem is passed between the two status stores. This permits both status stores to be repeatedly updated and contain the same information about all the drives in the subsystem (see Figure 1). The connect lines 1 are active after a power-on-reset and remain active until a tape control unit is taken offline with the tape control unit offline switch, or another power-on-reset occurs.

To update a storage location in status store, the tape control unit that has the master state 2 places a byte of data on the data bus 7 and the address of that byte on the address bus 6 and raises memory write 5. The information is placed in both status stores.

The two microprocessors communicate with each other by placing bytes of data (a 'message') in specific locations in the status store RAM. When the message is complete, the sending status store raises the send 3 line. After the data has been transferred to control storage, the receiving microprocessor raises acknowledge 4.

The microcode monitors the sequence of events on the dual tape control unit bus and develops error codes that define the error detected. Because of the continuing communications between the two tape control units, a problem in one tape control unit can cause data that is in error to be sent to the other tape control unit. This can cause check conditions and microcode hangs in either or both tape control units.

There are several buses between the status store card and the status store communication card that are parity checked. See DF 1 for the bit definitions for "Channel Error Register." Results of these hardware checks are set in sense data bytes 16 and 17 as D2nn error codes. 'nn' is the contents of the channel error register.

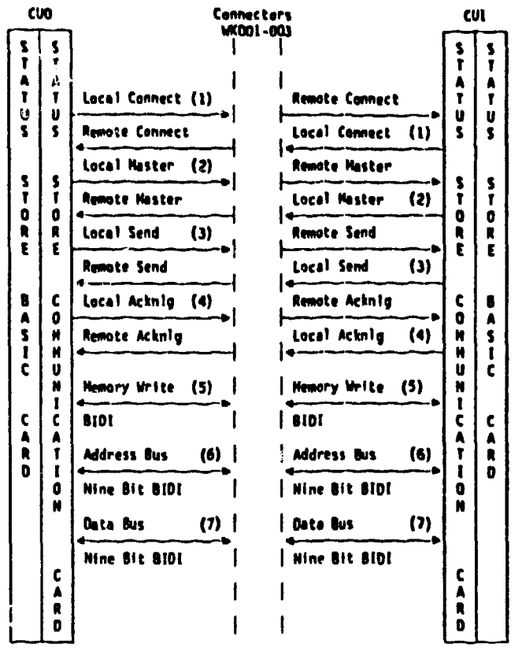


Figure 1. Status Store to Status Store Connections

Note: The voltage level of the status store to status store signal lines is NPL (0 Vdc and +3 Vdc).

Troubleshooting Guide — General

1. Before continuing, determine that all actions and FRU replacements called out by the GMP have been performed correctly
2. If the problem indicates a status store to status store error and the FRUs called out by the product package have been replaced, replace the same FRUs in the other tape control unit before continuing with this EAD.
3. After a repair action has been made, test the subsystem using the product package functional verify program, diagnostics, or customer program that caused the original failure.

External System Problems

Check with the customer or account representative and determine if any changes have been made to the operating system.

Determine if any changes or updates have been made to other parts of the subsystem.

For example:

- Has any microcode change been made?
- Has an ECO been installed on the subsystem? Check with the higher levels of support for information on any possible problems with the change that has been made.
- Has any drive been added or removed from the subsystem?
- Has any system cabling change been made?
- Has any addressing change been done?

If any changes have been made, try to bypass the change to see if the problem still exists. If the problem goes away, correct and reinstall the change.

Sense Data Analysis

1. Review the microcode and hardware detected errors in the sense data. The status store to status store communications are an asynchronous operation with respect to the other tape control unit functions.

   The error description discussed that erroneous data can cause check or hang conditions in one or both tape control units. In some of these conditions, no sense data will be available.

2. Go to "Procedure 1" on this page, if the sense data is available. Go to "Procedure 2" on EAD 5065 if either or both tape control units are in a check 1 or hang condition. Run the product package to clear the tape control unit and get the scan ring data. If the GMP provides an error code, use it with the FSI to determine the failing area of the subsystem.

Troubleshooting Guide

Procedure 1

Sense Data Available

This procedure should be used if the sense data is available to find a common failing path or common failing area of the dual tape control unit subsystem.

1. Get all the sense data that is available from the error log and review it.

   The drive address in the console message, error log, and the contents of sense byte two, may be used to determine which data path was in use at the time of the failure.

   Note: The data path in use at the time of the failure, indicated by sense byte two, may not always be the actual failing path.

   In most cases, sense byte two will indicate the correct path for maintenance. If a successful repair action cannot be made on the indicated path, then suspect the possibility of another path failing. See START 1 for "Error Path Isolation."

SENSE BYTE 2	CHANNEL ADAPTER LOCATION	BUFFER LOCATION
00100000	TCU0	TCU0
00110000	TCU1	TCU0
00101000	TCU0	TCU1
00111000	TCU1	TCU1

Figure 1. Sense Byte Two - Path Possibilities

2. Review the microcode and hardware detected error in the sense data. These will be helpful in determining what type of failure occurred and, also, what internal interconnection failed (other than a data path). See SENSE 1 "Format 19 and 20 Sense Bytes 8-15 Description" for the microcode detected errors and "Format 19 and 20 Sense Bytes 16-23 Description" for hardware errors. Read the failure descriptions in the FSI to find common areas of failure.

   Note: The microcode detected errors set in sense bytes 10-11, 12-13, and 14-15 are in a first error, second error, and last error order. It is possible that the second and last errors are an effect of the error recovery procedure taken for the first error. See "Format 19, 20, and 21 Sense Byte 3" on SENSE 1.

When a specific path is failing, the "Drive Interconnection" and "Status Store/Channel Adapter" pages (see EAD 1) can be helpful in isolating the problem and should be used when a drive path is suspected. The "Force Pathing" procedure (on the next page) can be used when isolating drive path failures.

Dual Tape Control Unit (Continued)

Troubleshooting Guide (Continued)

Pinning a Drive

Pinning a drive is a tool that can be used for problem determination in a dual tape control unit configuration when a path to a specific drive is suspected of failing. This is also useful for isolating intermittent failures on a path since it can assign a drive to a buffer and be left pinned for a reasonable test period (see CE/HSC).

Use sense byte two to assist in determining which tape control unit, channel adapter, and buffer that was in use at the time of the failure, when selecting the drive and buffer to forced pathing.

Use Figure 1 to determine which cable groups are involved when a failure occurs when using one of the listed buffer/drive paths. Check the cables and connectors in each indicated cable group (see "Cable Group Table" on FSI 1) of a failing path for pinched or broken wires, bent or damaged pins, and loose connections or crimped wires.

For each buffer/drive path possibility in Figure 1, the cable groups that are associated with a failing operation are indicated as follows:

1 cable groups that are used for read operations only.

2 cable groups that are used for all operations.

3 cable groups that are used for all operations, except read.

Suspect the 01A-A1 boards of the tape control units if the cable groups cannot be determined as the cause of the failure. See "Drive Interconnections" and "Status Store/Channel Adapter" on EAD1 for more path failure determination information. Repair any problems found and test the subsystem using the program that first detected the problem.

TCU0 or TCU1 BUFFER/DRIVE PATHS	CABLE GROUP NUMBER									
SENSE BYTE 2	60	61	62	65	66	67	80	82	85	86
Local Buffer/ Local Drive		1		2	1		3		3	
Local Buffer/ Remote Drive			1	2		1		3		3
Remote Buffer/ Local Drive	2	1		2	1		3		3	
Remote Buffer/ Remote Drive	2		1	2		1		3		3

Figure 1. Buffer/Drive Paths and Cable Groups

Dual Tape Control Unit (Continued)

Troubleshooting Guide (Continued)

Procedure 2

Tape Control Unit Check 1 or Hang Condition

Note: Troubleshooting problems on the two tape control unit communication paths requires both tape control units.

- Determine if the check 1 condition was caused by a status store to status store error, by separating the dual tape control units using the "Subsystem Tape Control Unit Isolation" procedure on this page.
- Perform the "Status Store to Status Store Cable Continuity Check" procedure on this page.

Subsystem Tape Control Unit Isolation

The subsystem tape control unit isolation procedure may be used to separate a dual tape control unit subsystem when it is necessary to defer maintenance and the customer prefers to run in a degraded mode.

If it becomes necessary to isolate the two tape control units in a subsystem, use the following procedure:

1. For maximum safety in protecting the customer's data, it is best that the customer permit all tape jobs to complete. Also, do not initiate any new tape jobs until the isolation procedure is complete.
2. At either tape control unit, remove the cables at the P2 connector (see LOC 1 "CU P2 Cable Connectors"). This opens the remote buffer to channel adapter interconnection, and the status store to status store interconnection.
3. IML both tape control units.
4. The customer may now restart the system. The system has both tape control units and access to the attached drives. Dynamic load balancing is eliminated.
5. Depending on the customer set up, some alternate paths may be eliminated by the separation of the two tape control units.

Status Store to Status Store Cable Continuity Check

Note: This check requires that both tape control units be offline and powered off.

If the dual tape control unit communication cable is suspected of causing the failure, this basic continuity check can be used.

This procedure checks the continuity of the status store to status store communication lines through the 01A-A1 boards, the A1Y2 and A1Y3 to CU P2A4 cables and connectors in both tape control units. The local CU P2A4 to remote CU P2A4 communication cable is also checked.

1. See logic pages WK001 and WK003 for the pin locations at the 01A-A1Y2 and A1Y3 board positions. The measurements will be made at these locations.
2. Switch power off in both tape control units.
3. Remove the 01A-A1F2 card from the tape control unit in which the measurements will be made. This tape control unit will be referred to as the local tape control unit.
4. Using a multimeter (R x 1 scale), connect one lead to ground. Use the other lead to measure the resistance of the signal lines.

The status store to status store BI-DI signal lines are terminated in both tape control units by the 01A-A1F2 cards. Removing the 01A-A1F2 card in the local tape control unit eliminates one termination. For the remote TCU address bus and the TCU data bus lines (bits P,0-7) an indication of good continuity is approximately 90 ohms. A reading of about zero ohms indicates a line shorted to ground. If the reading is about 45 ohms, suspect that two lines are shorted together. If a measurement is greater than 90 ohms, suspect an open cable or loose connection. The status store to status store signal lines (memory write, TCU master, TCU connected local, TCU send local, TCU acknowledge local) have the same messurement indications as the address and data bus lines.

Do the following to check the TCU connected, TCU send, and the TCU acknowledge remote signal lines:

1. Disconnect the multimeter and replace the 01A-A1F2 card that was removed from the local tape control unit.
2. Remove the 01A-A1F2 card from the remote tape control unit.
3. Use the multimeter (R x 1 scale), and measure the continuity of the TCU connected local, TCU send local, and TCU acknowledge local lines in the remote tape control unit. These local lines are the same lines that are labeled as remote lines in the local tape control unit.
4. Compare the measurements with the measurements of the TCU address and TCU data bus lines. Approximately 90 ohms is a good measurement, 45 ohms indicates that two lines are shorted together, zero ohms indicates a line shorted to ground, and greater than 90 ohms indicates an open or loose connection.
5. If a wrong indication is found, suspect the status store basic and the status store communication card TCCs (01A-A1WFG, XFG, YFG, and ZFG) and cables in cable group 52 (see "Cable Group Table" on FSI 1). Also suspect the 01A-A1 boards in both tape control units.

For each cable listed in cable group 52, check the cables and connectors for pinched or broken wires, bent or damaged pins, and loose connections or wire crimps.

When a cable cannot be determined as the cause of the failure, suspect the 01A-A1 boards in the tape control units. Use the logic pages and a multimeter to isolate the failing net to the failing logic board.

If all the activities for this EAD have been completed, see the FSI and determine if any additional actions are specified. If the FSI does not provide any continuing actions, follow the instructions below.

After each repair action, or if the call has to be deferred, return to the Support Procedures (SPROC) section for "End of Call Actions."

If no repair action has been found, call your next level of support.

After an assisted repair action, return to the Support Procedures section for the "End of Call Actions."

No Trouble Found Procedures

Introduction

This EAD is used when

- A reported problem cannot be identified or repaired.
- Repeated similar incidents have not been resolved.

Two key actions when dealing with these problems are:

- Use your next level of support and other support facilities to the fullest possible extent.
- Create and/or maintain a history: collect and record information.

Additional Subsystem Checks

1. If at this point you have not been directed to measure the voltages, do it now:

   In the tape control unit (in each tape control unit if two are involved), measure the voltages at both boards. Work back toward the power supply test jack. At TBs or other connectors, check for loose or faulty connections. Move the power distribution cabling around to expose faulty cabling or connections. If any problem is discovered, trace it to its source and repair it. Repeat these procedures in tape transport units that are suspected of contributing to the problem. In the tape transport unit, measure the voltages in each drive and work back to the common power supply test jack. See the "Voltage Distribution List" in the tape logic diagram Manual.

2. If the air pressure and vacuum have not been checked, perform the measurements on all suspected drives. See PNEU 5.

3. Use the LOC section for reference and locate the fans in the suspected drives and tape control units. Ensure that the fans are operating and moving air in the correct direction.

Documenting and Tracking

1. Run a subsystem checkout when the symptoms shown by a problem are misleading, erratic, confusing, or otherwise cause the wrong repair actions to be taken, or do not lead to a repair. Try running ILTAPE, GMP, and drive diagnostics and see if the failure occurs with different symptoms.

2. Obtain and record the error log information at the time of failure.

3. Note and record other data about the failures

   - How often is it happening?
   - When is it happening?
   - What else is happening in the same time period?
   - Who are the people involved when it happens?
   - What systems, applications, programs, are active when it happens?

4. Compare previous history with the current results to analyze repeated incidents.

5. Record any problems occurring in other parts of the system (interface control checks, processor errors, and so on).

6. Given a history of repeated incidents, you should use each entry into this EAD as a reason to attempt some action or perform some experiment designed to resolve or further isolate the problem. Record what you are attempting, what you expect might happen as a result, and what it might mean if your expected results occur or don't occur. Let the next person who might be working on the problem know what you are doing and thinking.

Get Assistance

Use whatever means of support and assistance that have been provided for you. With their help, any or all of the following can be considered and accomplished if available and appropriate:

1. Information exchange:

   - Collection and transmission of data related to the problem such as subsystem dumps.
   - Problem/Incident data base search.
   - Emergency patches.

2. Mechanically reconfigure to keep the customer running, or verify or eliminate the condition of the problem.

   - Move drives within the string or between strings.
   - Separate dual tape control units into single tape control units.
   - Substitute an unused channel adaptor position for a suspected one, or exchange channel cables between two channel adaptors.

3. Setup special operating conditions for the subsystem, with advice and assistance to see if problem is eliminated, changes, or to trap additional information.

   - Prevent load balancing.
   - Prevent tape control unit error recovery.
   - Define and setup trace/match control options.
   - Prevent ECC.
   - Force pathing.
   - Monitor key activity
     - Channel interface monitors
     - Logic analyzers.

Other Things to Check

1. System Conditions

   Check for recent changes to programs, system or channel, or TA90 subsystem, such as:

   - Engineering changes.
   - Reconfiguration activity.
   - Drive address changes.

2. Environmental Conditions

   Consider if any abnormal conditions in the following areas may be contributing to the problem:

   - Power.
   - Circuit loading.
   - Inductive or reactive loads on the same circuit as the TA90.
   - Time of day.
   - Condition of the wiring and connectors.

3. Temperature and humidity

4. Control of static and dust

5. EMC

6. Operational Conditions

   Are operating conditions contributing to the problem?

   - Tape storage, transportation, and handling.
   - Operator actions.
   - System resources in use at the time of failure.


EAD

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Error Analysis Introduction

An Error Analysis Diagram (EAD) is supplied for use as a troubleshooting tool. The support maintenance package will lead you into the EADs.

The EADs include several type of entries which are briefly explained below.

Error Description: gives the reason for the error code.

Error Condition Theory: describes the machine operation that is performed to detect an error.

Additional Possible Causes of Failure: lists additional FRUs which can cause the error code. You may also be directed to an EAD for another error code for more troubleshooting aid.

References: guide you to MG pages where additional information is found.

Error Diagrams: are block diagrams which show data flow relating to the error code. Logic boards, card locations, FRU numbers and line names are shown. Timing charts are sometimes included.

GMP Diagnostics

GMP diagnostics are concurrent diagnostics that can be run using only one drive. During GMP diagnostics, the rest of the subsystem is available to the customer.

Support Diagnostics

Support diagnostics are non-concurrent maintenance diagnostics that test areas of the subsystem. The support diagnostics have variable options for running the programs. When possible, the EAD recommends support diagnostics that can be used in problem determination for the error code. The diagnostic descriptions and control program options are explained in the DIAG section of the maintenance guide. DIAG 1 is the table of contents for the DIAG section.

MD Support Diskette

The MD Support Diskette (MD/SDISK) section supplies MD functions similar to the CE Panel and support utility programs to aid in collecting and displaying error condition and status information. Errors can be saved with the Error Trace/Match function, and registers and data fields can be displayed. Data fields and registers useful for hardware troubleshooting are described in the "Data Fields" (DF) section of the maintenance guide. Support diskette tools can be found in the "MD Support Diskette" table of contents on MD/SDISK 1.

Diagnostic Selection

For troubleshooting purposes, there is often more than one way to perform a function called for in the EAD. For example, a short loop write to read test can be performed:

- Concurrently, by selecting the short loop write to read option in GMP
- Non-concurrently, by selecting the EE52/EE53 routines from the TCU support diskette.

If the EAD requests that a tape be written, run ILTAPE from the HSC or run VMS backup (copy) from the host.

Data Fields

External register and microcode data field contents that are useful for isolating hardware failures are explained in the "Data Fields" (DF) section of the maintenance guide. See the table of contents on DF 1 for the fields and registers explained. The data field definitions are mainly used to define bit meanings in a register or field when an EAD makes reference to the register or field. Also, support diagnostics display register contents and the DF section can be used to determine the meaning of the register contents.

Sense

The SENSE section of the maintenance guide explains the 32 sense bytes supplied by the subsystem. For some error codes, sense bytes contain error register information. The contents of the error registers are described in the "Data Fields" section of the maintenance guide. See the table of contents on SENSE 1 for sense bytes, and see the table of contents on DF 1 for the locations of error register descriptions.

Clock Nets

Tape control unit error codes can be caused by bad clock signals to the failing functional area. The table of contents on EAD 1 shows pages that contain descriptions of tape control unit clocks and clock signal distribution.

Procedure for Isolating Drive Failures

If more than one drive appears to be failing, use the procedure for isolating drive failures contained in this Error Analysis Diagram section. See EAD 1 for the location of the "Drive Interconnections" EAD. Read the general error descriptions and troubleshooting guide. For write or control problems, follow the procedures for "Information for - FSC D4nn, DSE Register Bit 0 Equals 1." For read problems, follow the procedures for "Error Codes DOnn and D8nn," followed by "Drive Interconnections," and "Read Bus Problems."

Subsystem Level Diagnostics

Two subsystem level diagnostics, ILTAPE and ILEXER, can be used to troubleshoot the TA90. These two diagnostics are run from the HSC. The ILTAPE and ILEXER diagnostics are described in the CE/HSC section of the maintenance guide. See CE/HSC 1 for the table of contents of the CE/HSC section.

Subsystem Clocks and Sequences

Clocks are generated in the tape control unit and in the magnetic tape drives. Communications sequences are used between the tape control unit and the STI-FIPS Adapter and between the tape control unit and the drives.

Tape Control Unit Clocks

Clocks in the tape control unit are generated first in the control store card. Although the basic clocks are generated there, various other cards take the control store card clocks and generate other clocks and sequences to succeeding cards and to the channel and the magnetic tape drives.

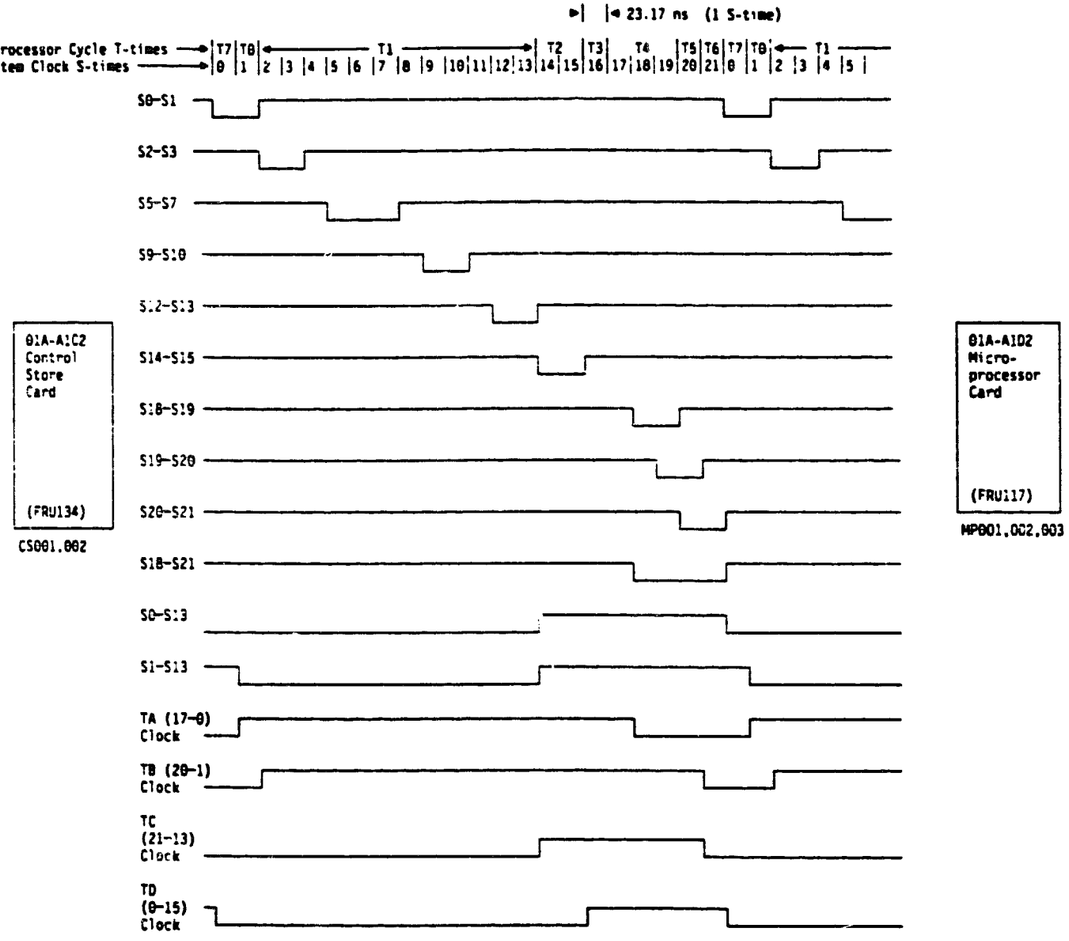
The tape control unit clocks can be divided into the following areas for discussion:

- Control storage subsystem clocks
- Channel adapter area
- Buffer area
- Write data flow area
- Drive adapter clocks
- Read data flow area
- Dual tape control unit area
- Maintenance adapter area.

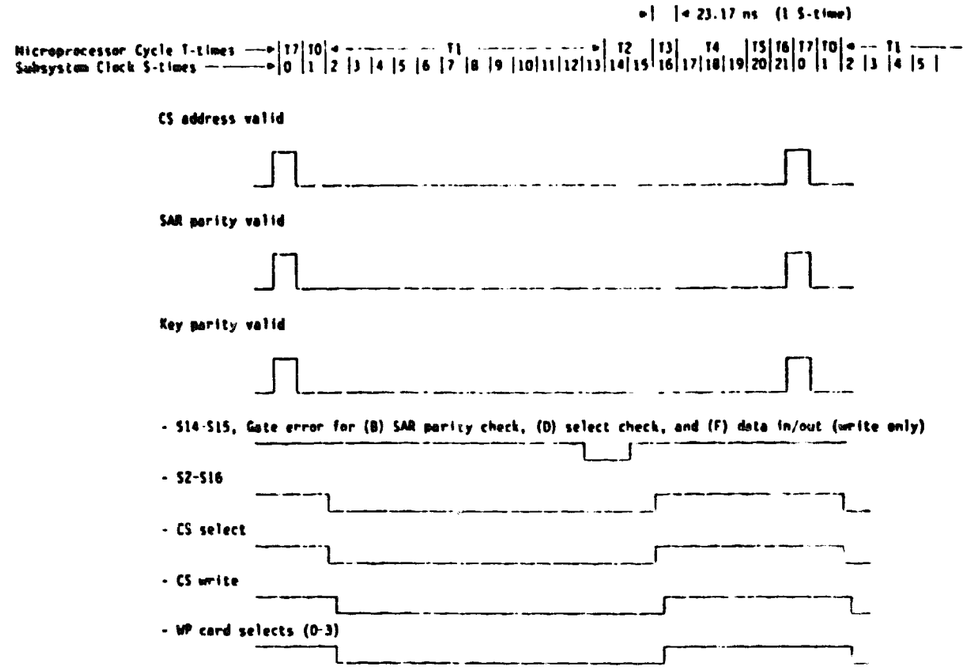
Control Storage Subsystem Clocks EAD 6

Subsystem Clocks to the Microprocessor Card

The main oscillator on the control storage card (01A-A1C2) runs a ring counter to develop s-time clock pulses. The ring counter output is decoded to make a combination of timing pulses for the functional area cards in the tape control unit. The s-times and clocks that go to the microprocessor card are shown in the timing chart.



Control Storage Clocks Timing Chart

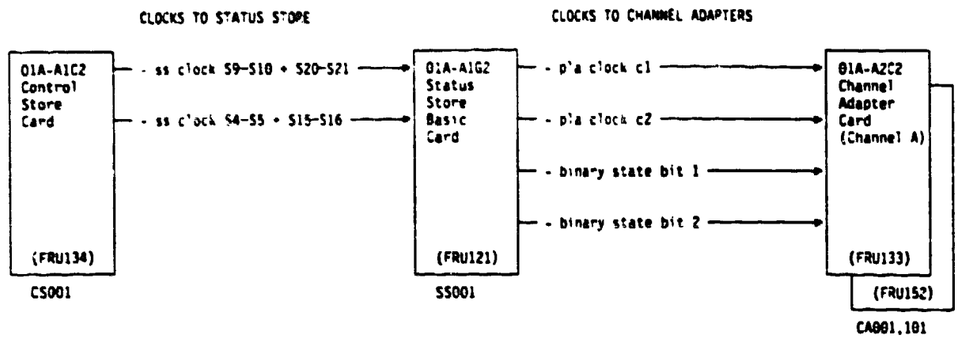


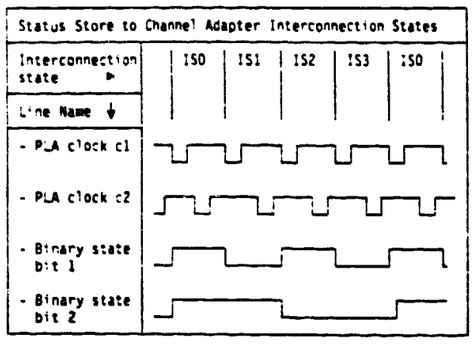
XR Bus and Control Clocks

The external register (XR) bus supplies the primary means for the microprocessor to communicate with and control the other areas in the tape control unit. Each area has been assigned specific registers that are accessible by the microprocessor through the external register bus.

Because of the large number of variables in the use of the XR bus, the timing chart and documentation and support diagnostic EEF0 are shown on MD/SDISK 1100.

Channel Adapter Area Clocks EAD 10

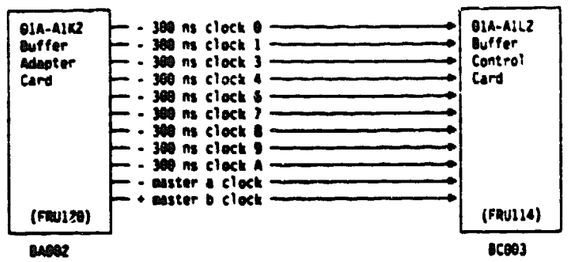




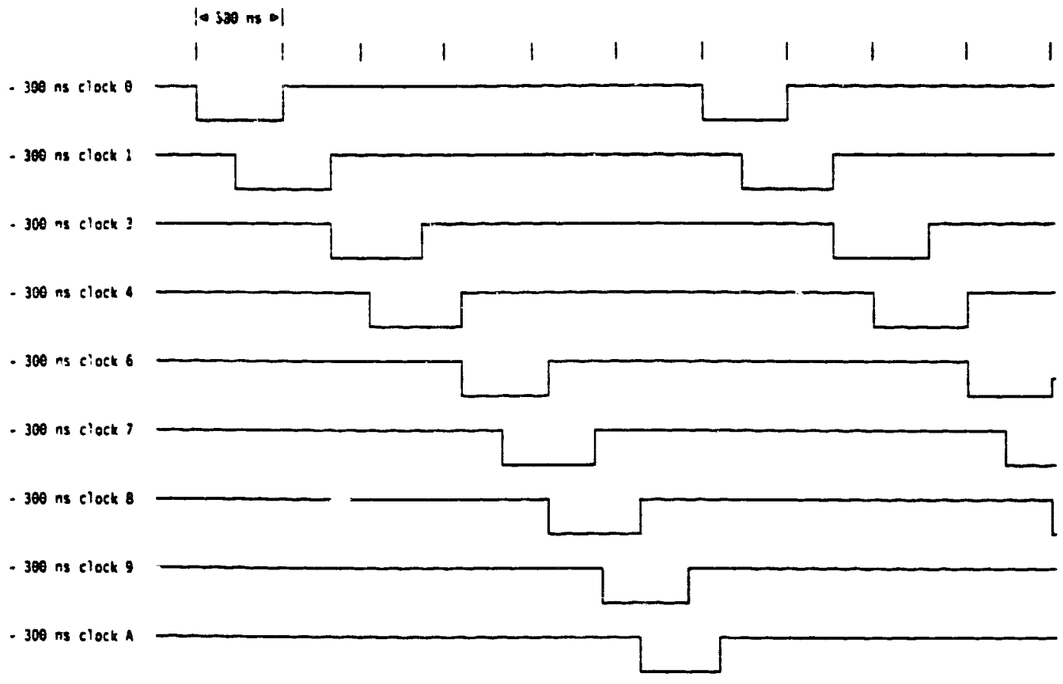
Each IS time = 255 ns
PLA clock c1 minus time = 46 ns
PLA clock c2 minus time = 46 ns
Time between c2 going not active and c1 going active = 69 ns

Buffer Area Clocks

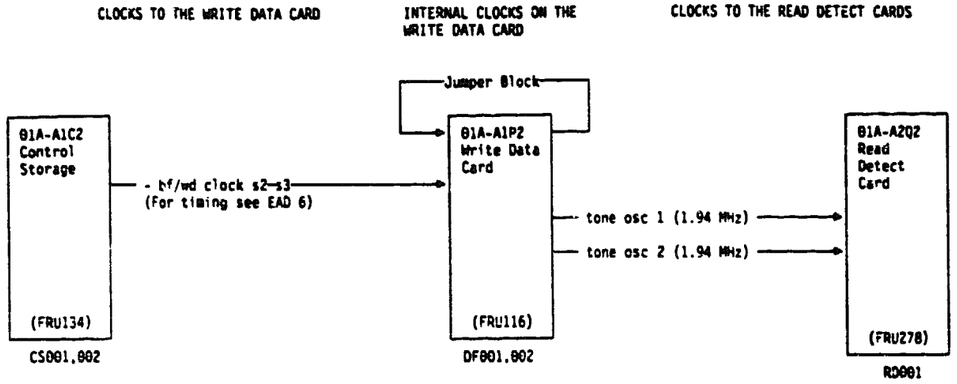
Clocks to the Buffer Control Card



300 Nanosecond Clock Timings

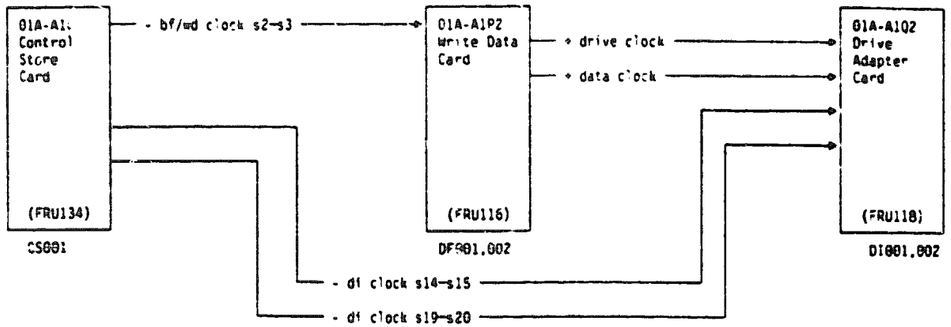


Write Data Flow Area Clocks



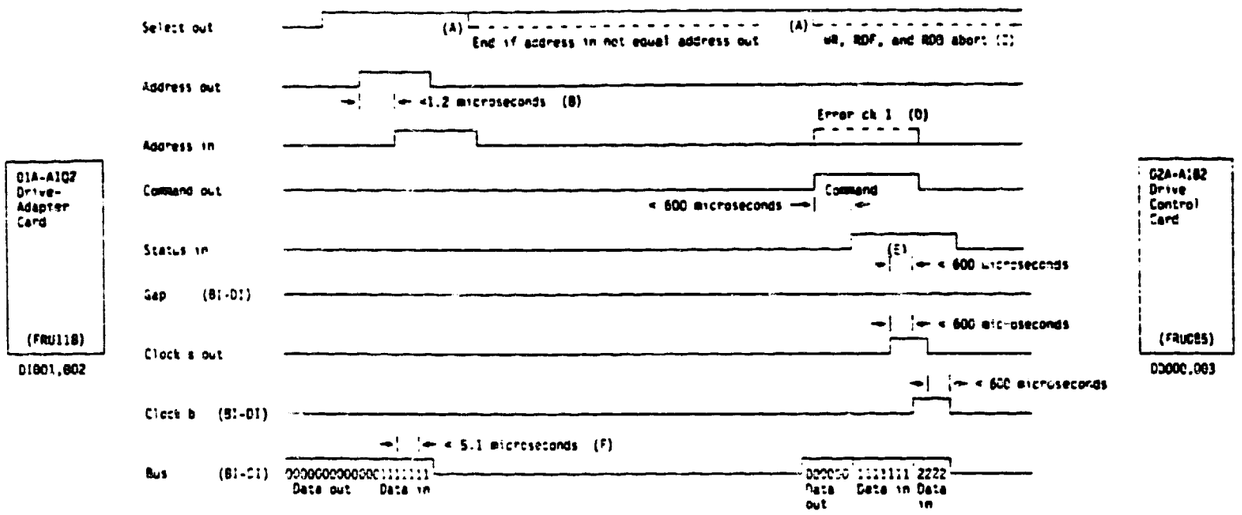
Drive Adapter Area Clocks

Clocks to the Drive Adapter Card



(For system clock timings see EAD 6.)

Initial Selection Sequence from the Tape Control Unit to the Drive



(A) 'Select out' becomes inactive if:

1. Control command and no data to be transferred
2. Command was an immediate command
3. Status byte contained unusual or unexpected data.

(B) A selected drive must respond to 'address out' in 1.2 microseconds or less by activating 'address in' and putting the complemented address on the bus. 'Select out' must remain active during the whole connected operation and must become inactive and stay inactive for 200 microseconds before another initial sequence can be started.

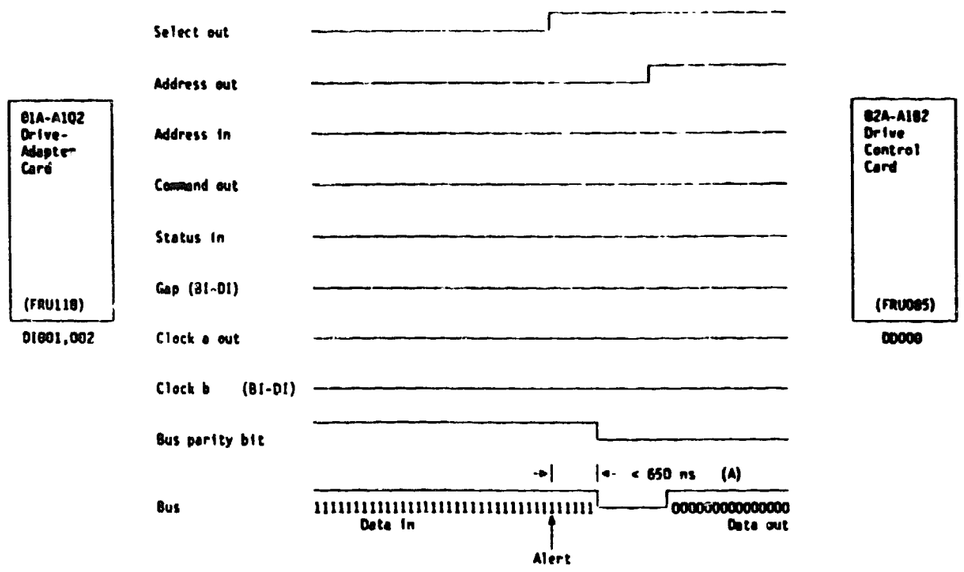
(C) Drive goes to stop lock for that command.

(D) 'Address in' active in response to 'command out' signals a drive hardware error.

(E) 'Status in' becomes active in response to the rise of 'command out' ('status in' going active can be delayed up to 600 microseconds due to microcode processing). 'Status in' becomes inactive with 'clock B' going inactive, as a result of 'command out' going inactive.

(F) 5.1 microseconds or less after 'address in' becomes active, the address bits from the tape control unit become inactive on the bus.

Alert Sequence from the Drive to the Tape Control Unit



(A) All pending alerts from the drive must be removed in 650 ns.

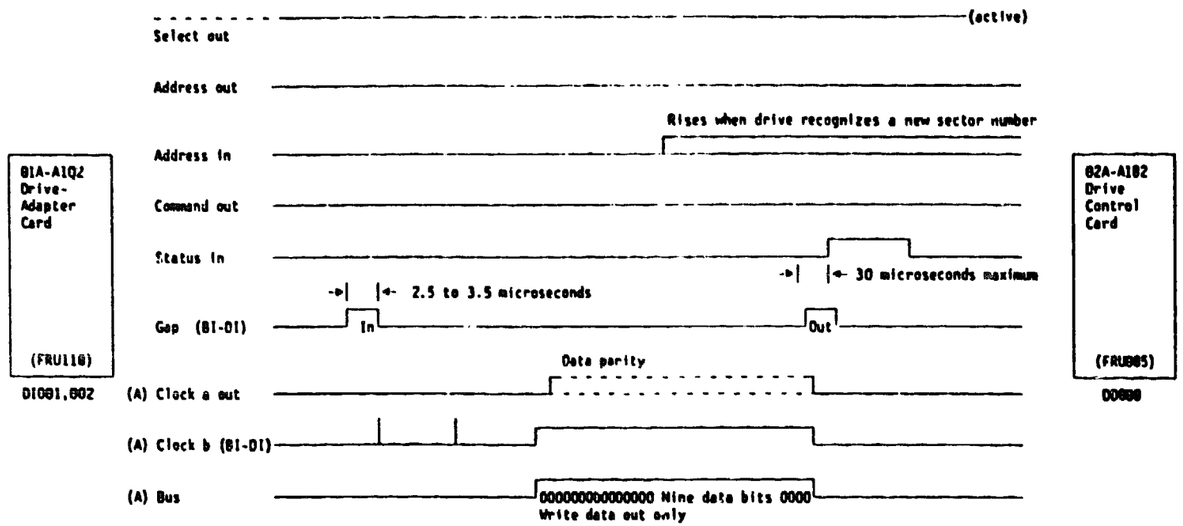
The drive uses this sequence to get the attention of the tape control unit for:

- Completion of the Disconnected operation
- Not ready to ready status changes
- Completion of repositioning
- Manual Rewind Unload switch activated
- Request patches during the power on sequence.

Drive Adapter Area Clocks (Continued) EAD 42

Drive Adapter Area Clocks (Continued) EAD 43

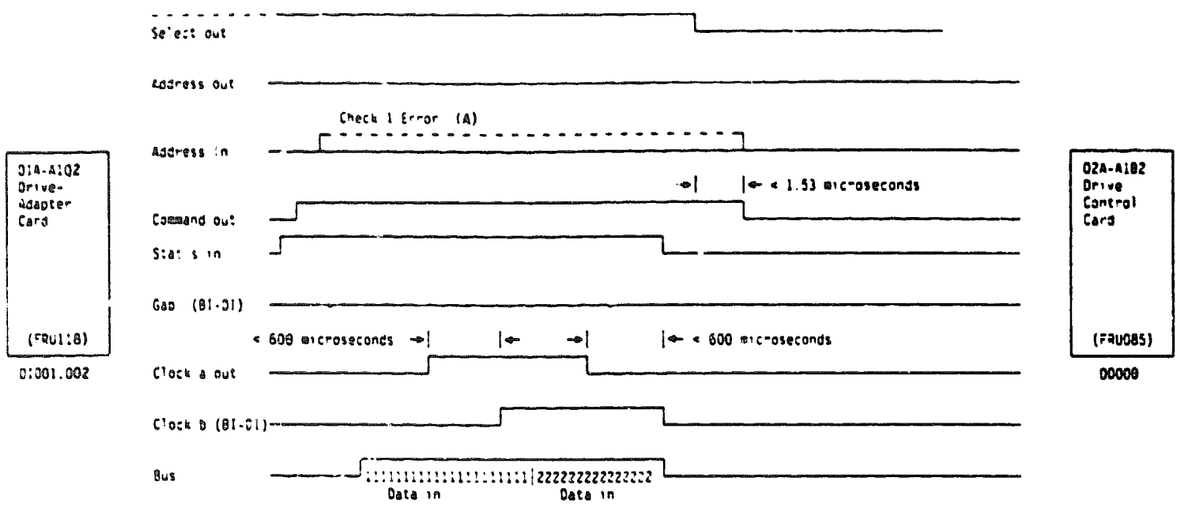
Data Transfer Sequence between the Tape Control Unit and the Drive and WTM, Write Erase Gap Sequence



(A) These lines are 'don't care' during a read data sequence.

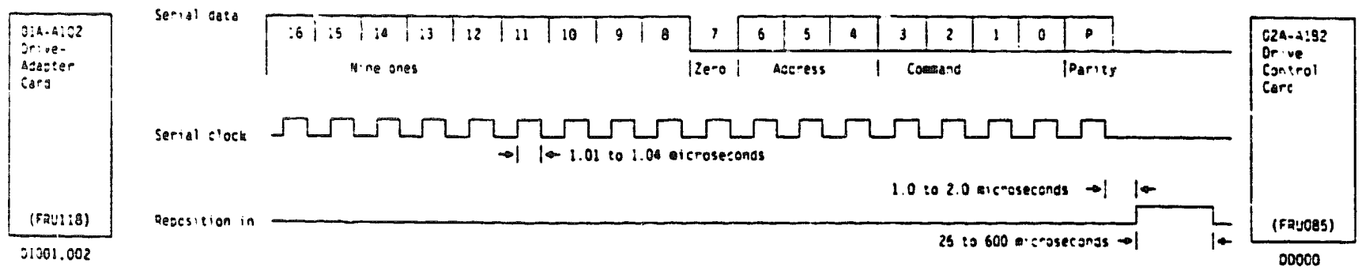
Drive Adapter Area Clocks (Continued)

Sense Control Transfer



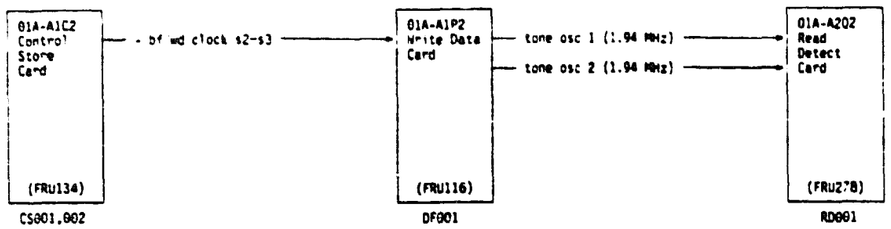
(A) If 'address in' becomes active during this time, the tape control unit indicates a check 1 was detected from the drive.

Serial Sequence Drive Interconnections

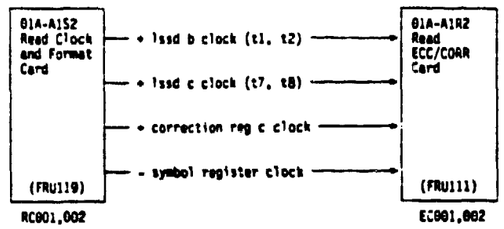


Read Data Flow Area Clocks

Clocks to the Read Detect Cards

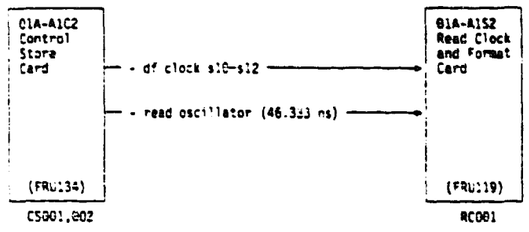


Clocks to the Read ECC/CORR Card

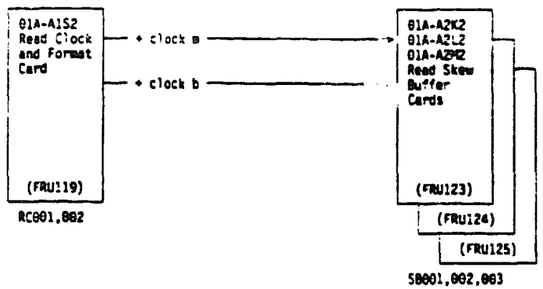


Note: For system clock timings (s and t times), see EAD 6.

Clocks to the Read Clock and Format Card

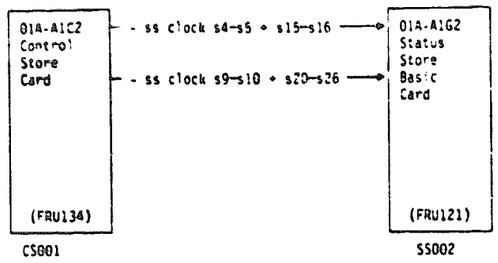


Clocks to the Read Skew Buffer Cards

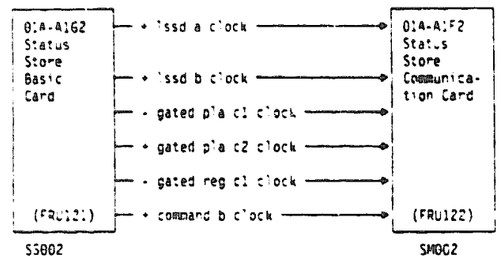


Dual Tape Control Unit Area Clocks

Clocks to the Status Store Basic Card

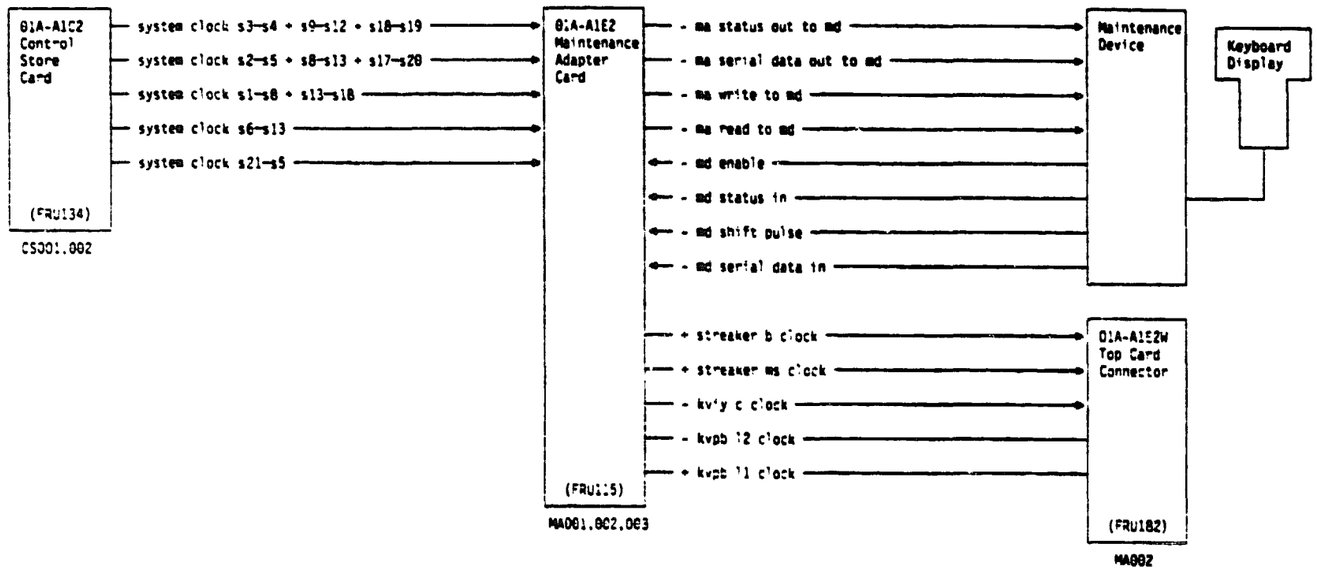


Clocks to the Status Store Communication Card



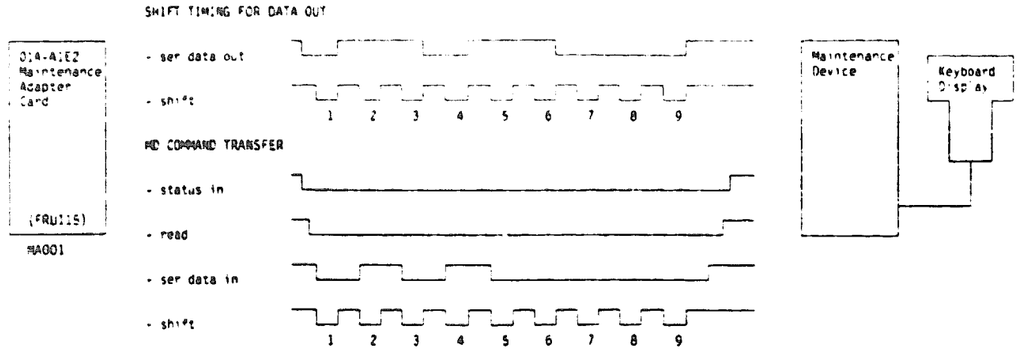
Clocks to and from the Maintenance Adapter

The control storage card and microprocessor card supply clocks to the maintenance adapter card. The maintenance adapter card supplies clocks to the maintenance device and the microprocessor card.

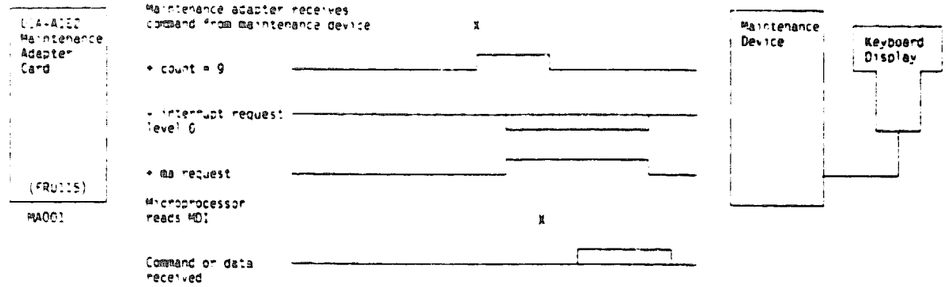


Maintenance Adapter Area Clocks (Continued)

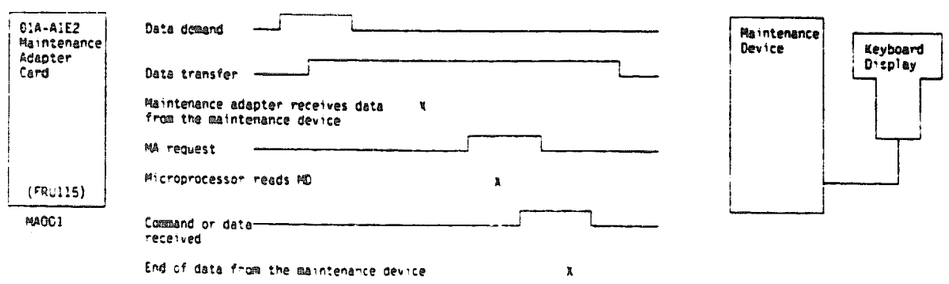
Maintenance Device to Maintenance Adapter Timing



Maintenance Device Command Byte Transfer Maintenance Adapter Card to Microprocessor Card

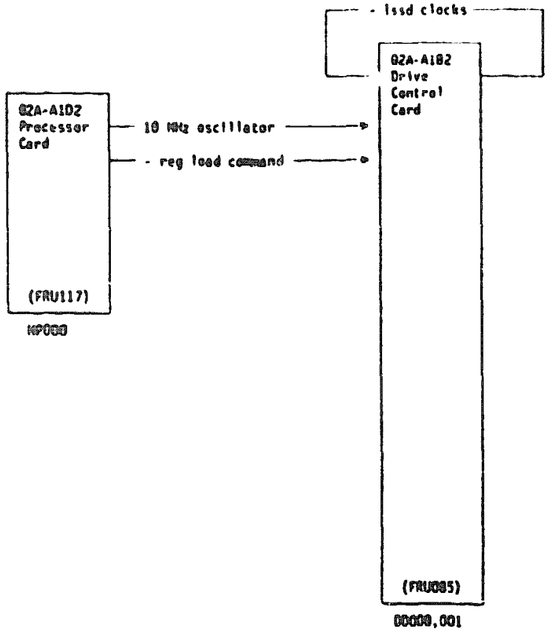


Data Byte Transfer Maintenance Adapter Card to Microprocessor Card



Magnetic Tape Drive Clocks EAD 80

Clocks to the Adapter Card



Error Description

An open was detected while checking the LED current for tape path sensor A, the cartridge present sensor, and the cartridge latched sensor.

Error Condition Theory

Note: See EAD 101 for test points.

The current to these three LEDs is checked before the thread/load operation by the digital servo card and microcode. The digital servo card performs as a 3-input OR with the LED currents used as the inputs. Normally, points (A) (see diagram) are +1.4 volts to +2.2 volts. If one of the LEDs opens, point A for that LED increases to approximately +5.0 volts, which sets a sensor error in the digital servo card. This error is then read by microcode, and CHK 02 is displayed.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. Source voltages at the input to the FRUs on this EAD
3. Cables, connectors, and nets between FRUs on this EAD
4. (FRU058) 02A-A1 logic board.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.

   Note: The measurement points with the drive control card (FRU085) and the digital servo card (FRU 050) can change because these cards are EC-sensitive.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals

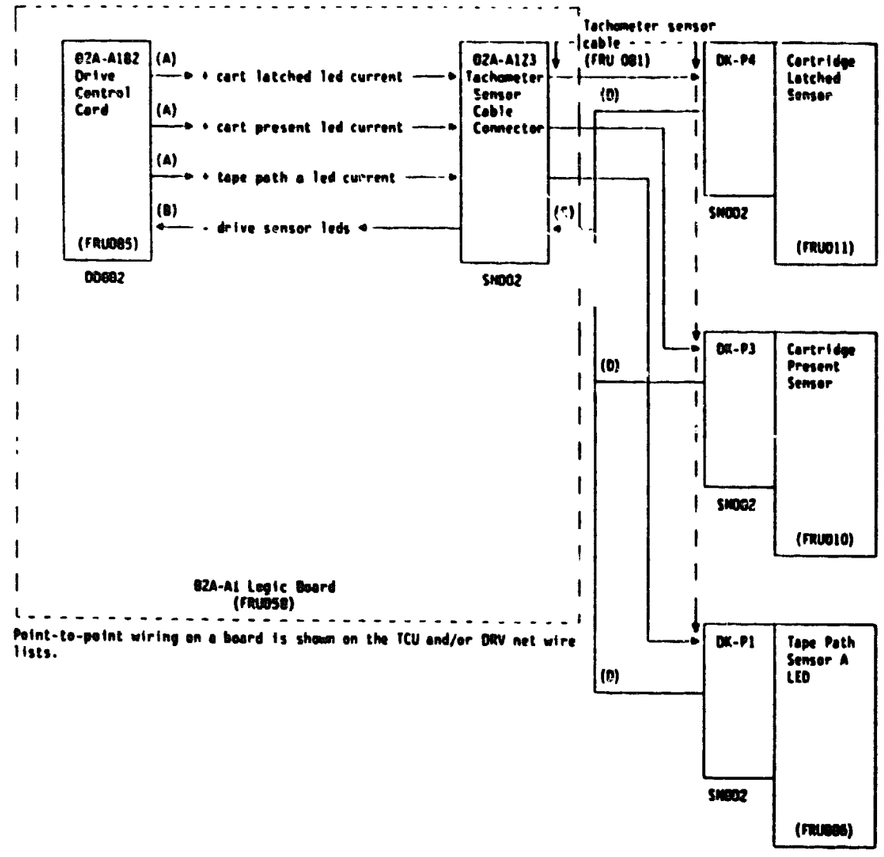
   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective
4. Check for less than +2.2 volts at the output to each LED (A). If all three are more than +2.2 volts, check for an open circuit in the return line between point (B) and any point (D). If the return line is not open, the problem is in the area of FRU058 or FRU085
5. If only one (A) is more than +2.2 volts, check that line for an open circuit between point (A) and point (C). (Note that there is a diode in the circuit. If the meter shows an open circuit, reverse the leads of the meter to verify the open circuit.) If there is continuity, the problem is in the area of FRU058 or FRU085.
6. If (A) is less than +2.2 volts at all three points, suspect FRU085.
7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   a. If no errors are detected, go to SPROC 1 "End of Call Actions."
   b. If the program detects and error, return to the FSI and do one of the following:
      1) Perform any additional actions.
      2) If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

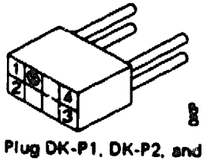
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,5,6	LOC 1	Location of FRUs. Also see SN002 for point-to-point wiring of the return bus on cable A1Z3
4,5,6	CARR-DR 1-1	Removal and replacement procedures
7	CE/HSC 1	How to use the CE Panel

CHK 02 (Continued)

Error Diagram





Plug DK-P1, DK-P2, and DK-P4 (Pin Side)

Error Description

A tension-transducer-under-tension error was not detected.

Error Condition Theory

Note: See EAD 107 for test points.

After the sensor test and before loading the tape, the drive logic checks the tension transducer to ensure that the 'tension good' signal is not active. If the 'tension good' signal is active, a CHK 04 is set and the load operation is not performed.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure.

1. (FRU073) logic board to power amplifier J1 cable
2. (FRU079) dc power distribution cable drive internal—J1, J2
3. (FRU080) dc power distribution cable
4. (FRU049) logic board to power amplifier J2 cable
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between FRUs on this EAD
7. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

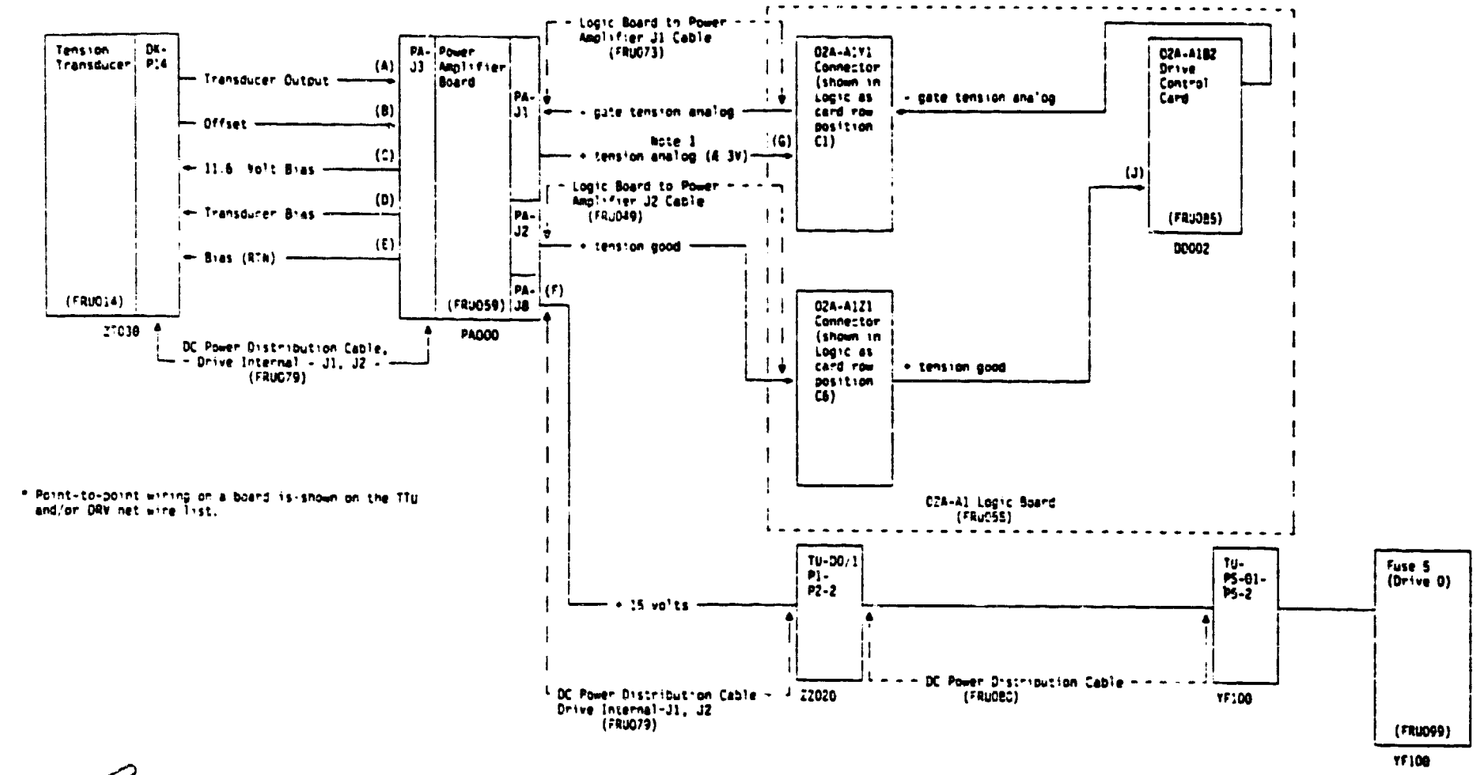
4.
   a. With the tape unloaded, connect point (H) in the error diagram to logic ground.
   b. Scope point (G) in the error diagram. Point (G) should be at -2.5 volts to -1.9 volts.
   c. Remove the connection between point (H) and logic ground.
   d. Load a tape. Point (G) should now be -0.5 volts to +0.5 volts.
   e. If both tests are correct, the problem is in the area of FRUs 059, 085, or the cables between them. Go to step 6.
   f. If either test fails, the problem is in the area of FRUs 014, 059, the cables between them, or source voltages. Go to step 5.
5.
   a. Point (F) in the error diagram should be +15 volts. If the voltage is not correct, use the logics to follow its path back to the power supply.
   b. Measure the voltage at points (C) and (D) in the error diagram. Point (C) should be not less than +11.2 volts. Point (D) should be approximately +15 volts.
   c. If all points are correct, replace FRUs 059 and 014 again. Go to step 8.
6. Point (J) in the error diagram varies from +5 volts to 0 volts. Connect the oscilloscope to (J) and attempt to load a cartridge. The logic level should go from +5 volts to 0 volts then back to +5 volts. If the logic level fails to vary correctly, the problem is in the area of FRUs 059, 049, or 085.
7. Point (H) in the error diagram varies from +3 volts to 0 volts. Scope (H) and load a cartridge. The value is +3 volts before the cartridge latch engages, on drives without the automatic cartridge loaders, or before the load motor completes its cycle on drives with the automatic cartridge loaders, goes to 0 volts momentarily, then goes back to +3 volts. If the value fails to vary, the problem is in the area of FRUs 059, 073, or 085.
8. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
9. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

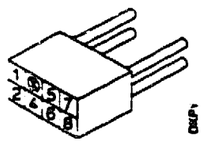
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,5,6,7	LOC 1	Location of cables and connectors
4,5,6,7	CARR-DR 1-1	Location of cables and connectors
8	CE/HSC 1	How to use the CE Panel

CHK 04 (Continued) **EAD 107**

Error Diagram



* Point-to-point wiring on a board is shown on the TTu and/or DRV net wire list.



DK-P14 (Pin Side)

Note 1. This is a test point.

Error Description

Tape path sensor B failure or no LED current was detected

Error Condition Theory

Note: See EAD 109 for test point.

After a cartridge is inserted and the latch is closed on drives without the automatic cartridge loaders or the Start button is pressed on drives with the automatic cartridge loaders, a three step sensor test is run to check tape path sensor B.

Step one checks that '+ tape path sensor B' (B) is at a down logic level (lighted status). If step one is correct, step two turns off the LED and checks that '+ tape path sensor B' is now at an up logic level (dark status).

If step two is correct, the thread/load operation starts. If step one fails, step three pulls down the '+ tape path sensor B' signal on the digital servo card and checks for a down logic level. If a down logic level is detected, the checking circuit is good, and CHK 05 is set.

(If a down logic level is not detected, CHK 06 is set. If step two failed, CHK 0E is set. For more information on CHK 06 and CHK 0E, see the EADs for those check codes.)

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. Voltages at the input to the FRUs on this EAD
3. Cables, connectors, and nets between FRUs on this EAD
4. (FRU058) 02A-A1 logic board.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and that all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly (or loop on the identified diagnostics) and scope the specified test points looking for unusual or deteriorated levels or signals.

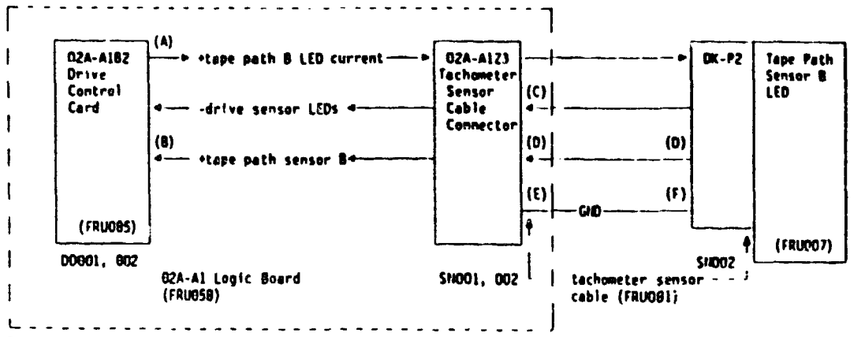
   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Check for +1.4 volts to +2.2 volts at (A). If the voltage at (A) is correct, the LED current supply and return lines are good. If the voltage is more than +2.2 volts, check for an open circuit between points (A) and (C). (Note that there is a diode in the circuit. If the meter shows an open circuit, switch the meter leads to verify that the circuit is really open.) If the voltage is less than +1.4 volts, the problem is in the area of FRU085 or there is a short circuit between (A) and ground on FRU081 or FRU058.
5. Check for a down logic level at point (B). If point (B) is at an up logic level, check for an open circuit between points (B) and (D) or (E) and (F). If point (B) is at a down logic level or if no open circuit can be found, the failure is in the area of FRU058 or FRU085.
6. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
7. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

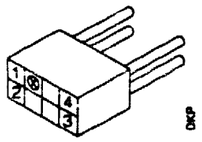
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4.5	LOC 1	Location of FRUs
4.5	CARR-DR 1-1	Removal and replacement procedures
6	CE/HSC 1	How to use the CE Panel

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Note: Point A Norm: +1.4 V to +2.2 V
Fail: +5.0 V
Point B Light: +0.4 V
Dark: +5.0 V



Plug DK-P2 (Pin Side)

Error Description

A tape path sensor B detect circuit failure h : occurred (always an up logic level).

Error Condition Theory

Note: See this page for test points.

After a cartridge is inserted and the latch is closed on drives without the automatic cartridge loaders or the Start button is pressed on drives with the automatic cartridge loaders, a three-step sensor test is run to check tape path sensor B.

Step one checks that '+ tape path sensor B' (A) is at a down logic level (lighted status). If step one is correct, step two turns off the LED and checks that '+ tape path sensor B' is now at an up logic level (dark status).

If step two is correct, the thread/load operation is started. If step one fails, step three pulls down the '+ tape path sensor B' signal on the digital servo card and checks for a down logic level. If a down logic level signal is not detected, the detection circuit is failing and CHK 06 is set.

(If a down logic level is detected, CHK 05 is set. If step two failed, CHK 0E is set. For more information on CHK 05 and CHK 0E, see the EADs for those check codes.)

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. Voltages at the input to the FRUs on this EAD
3. Cables, connectors, and nets between FRUs on this EAD
4. (FRU058) 02A-A1 logic board.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and that all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Check for a down logic level at (A). If point (A) is at a down logic level, the failure is in the area of FRU058 or FRU085.
5. If point (A) is at an up logic level, connect a jumper between (A) and 01A-A1B2D08 (ground). Reset the drive and load a scratch cartridge. If the same error returns, the failure is in the area of FRU085.
6. If CHK 0E is displayed, turn power off and check for a short circuit between '+ tape path sensor B' and +5.0 volts in FRU058 or FRU081.

   a. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

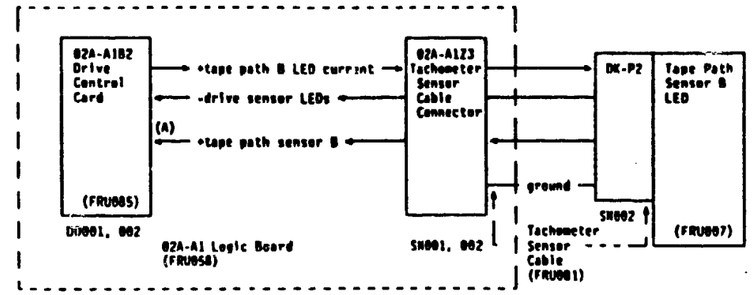
      - If no errors are detected, go to SPROC 1 "End of Call Actions."
      - If the program detects an error, return to the FSI and do one of the following:
        - Perform any additional actions.
        - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

   b. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

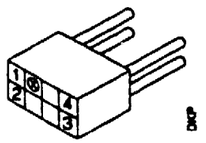
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,5,6	LOC 1	Location of FRUs
4,5,6	CARR-DR 1-1	Removal and replacement procedures
7,8	CE/HSC 1	How to use the CE Panel

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Note: Point A Light: +0.4 V
Dark: +5.0 V



Plug DK-P2 (Pin Side)

Error Description

A tape path sensor B failure has occurred (always a down logic level)

Error Condition Theory

Note: See the diagram on this page for test points.

After a cartridge is inserted and the latch is closed on drives without the automatic cartridge loaders or the Start button is pressed on drives with the automatic cartridge loaders, a three-step sensor test is run to check tape path sensor B.

Step one checks that '+ tape path sensor B' (A) is at a down logic level (lighted status). If step one is correct, step two turns off the LED and checks that '+ tape path sensor B' is now at an up logic level (dark status)

If step two is correct, the thread/load operation is started. If step two fails, CHK 0E is set. (If step one failed, step three sets either CHK 05 or CHK 06. For more information on CHK 05 and CHK 06, see the EADs for those check codes.)

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. Voltages at the input to the FRUs on this EAD
3. Cables, connectors, and nets between FRUs on this EAD
4. (FRU058) 02A-A1 logic board.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and that all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

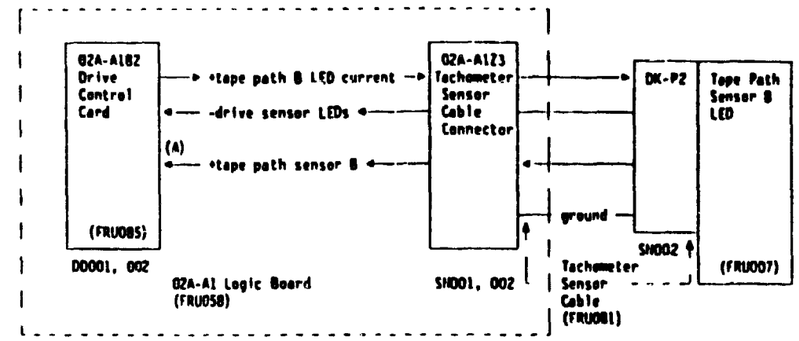
4. Connect an oscilloscope to '+ tape path sensor B' at point (A). Insert a scratch cartridge and close the latch on drives without the automatic cartridge loaders, or press the Start button on drives with the automatic cartridge loaders. Check for a 50 ms pulse to +5.0 volts after the latch is closed on drives without the automatic cartridge loaders, or the Start button is pressed on drives with the automatic cartridge loaders
5. If no pulse is present, the failure is in the area of FRU085, or there is a short circuit between '+ tape path sensor B' and ground in FRU007, FRU081, FRU085, or FRU058.
6. If the pulse occurred, the failure is in the area of FRU085 or FRU058
   a. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
      - If no errors are detected, go to SPROC 1 "End of Call Actions."
      - If the program detects an error, return to the FSI and do one of the following:
        - Perform any additional actions.
        - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

   b. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

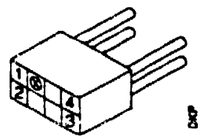
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,5	LOC 1	Location of FRUs
4,5	CARR-DR 1-1	Removal and replacement procedures
7	CE/HSC 1	How to use the CE Panel

ERROR DIAGRAM



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Note: Point A Light: +0.4 V
Dark: +5.0 V



Plug DK-P2 (Pin Side)

Error Description

The file reel motor tachometer sensed an error before the threading operation.

Error Condition Theory

Note: See EAD 121 for test points.

After a cartridge is inserted and the latch is closed on drives without the automatic cartridge loaders (on drives with the automatic cartridge loaders insert the cartridge then press the Start button) a test is performed to remove the slack in the cartridge. A timer is set to a predetermined value and the file reel motor is driven backwards under velocity control of the DAC on the digital servo card. The DAC is incremented until there are no file reel tach pulses. If the DAC did not reach a certain threshold before the timer timed out, a CHK 14 is set. (This condition can also be caused by a broken tape.)

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU079) dc power distribution cable, drive internal, J1, J2
2. (FRU081) tachometer sensor cable
3. (FRU049) power amplifier cable PA-J2 to 02A-A1Z1
4. (FRU073) power amplifier cable PA-J1 to 02A-A1Y1
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between the FRUs on this EAD
7. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Connect an oscilloscope with channel 1 on point **(A)** and channel 2 on point **(B)**. Reach through the front of the latch, on drives without the automatic cartridge loaders, and slowly turn the file reel motor by hand.

   On drives with the automatic cartridge loaders use the tape removal tool (see PLAN 1) on the socket wrench handle. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft. Slowly turn the file reel motor.

   Check to ensure that both lines are changing between 0.4 volts and 5 volts. If either line fails to change to a down logic level, check for an open circuit between points **(A)** and **(C)** or between points **(B)** and **(D)** for that sensor.

   If both lines fail to change to a down logic level, check for an open circuit in **(E)**. If either line fails to change to an up logic level, check that line for a short circuit to ground. If both phases are working, go to step 5.

5. Connect channel 1 to point **(G)** and sync minus internal. Insert a scratch cartridge (on drives without the automatic cartridge loaders close the latch, on drives with the automatic cartridge loaders insert the cartridge and press the Start button).

   Check for a down logic level pulse in a few seconds after you close the latch. If the pulse is correct, check for a down logic level signal at **(J)**.

   If **(J)** is correct (on drives without the automatic cartridge loaders open the latch; on drives with the automatic cartridge loaders press the Unload button) and remove the cartridge. Now, connect channel 1 to **(H)** with the sync still on minus internal.

   Insert the scratch cartridge (on drives without the automatic cartridge loaders close the latch; on drives with the automatic cartridge loaders press the Start button). Check for a down logic level pulse within a few seconds after you close the latch. If the pulse is correct, check for a down logic level signal at **(K)**. If any of the test points is not correct, check for an open circuit in FRU058 or FRU073 for the failing line.

   If all the checks were correct, go to step 6.

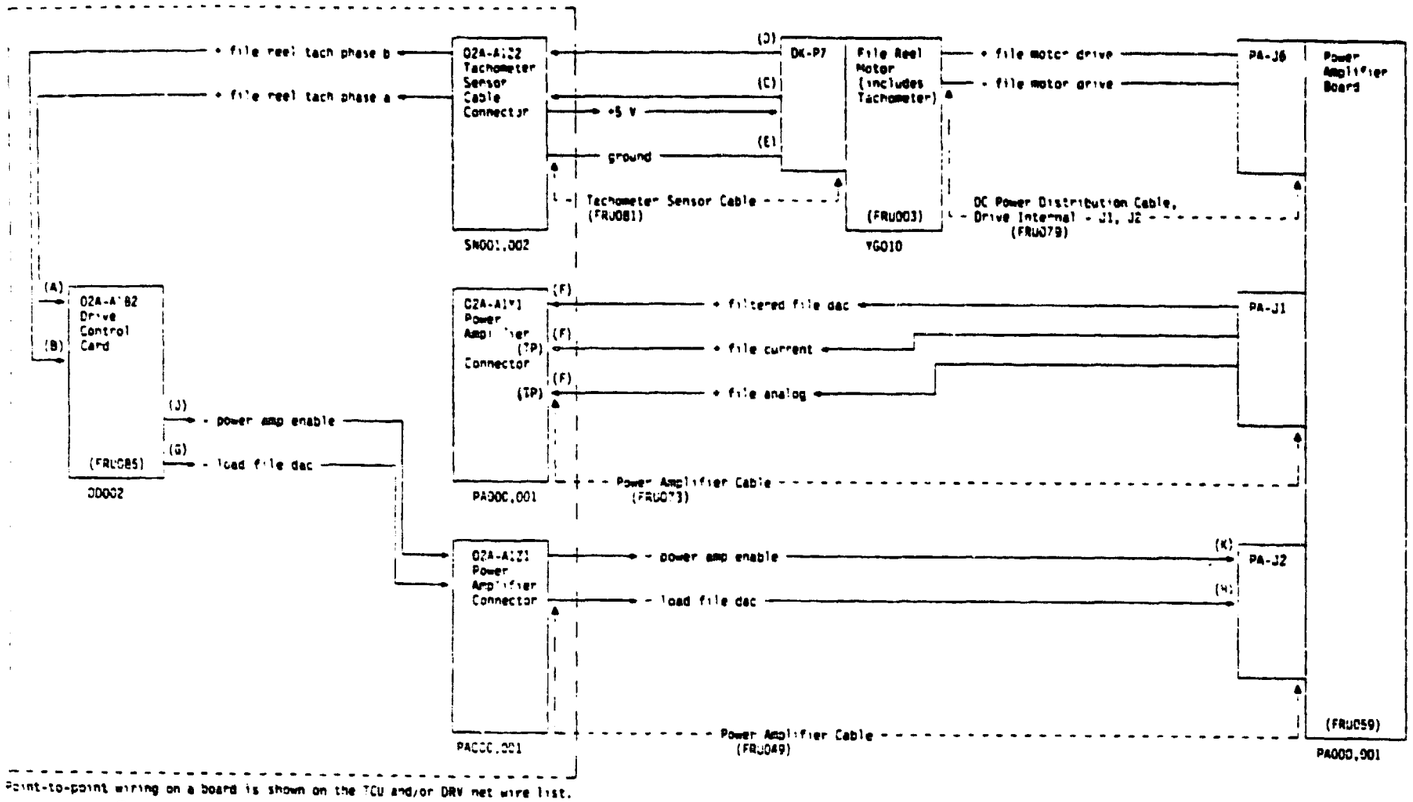
6. Check for a short circuit between **(F)** and ground for all three test points.
7. Lower the power amplifier board and disconnect J6. Check for approximately 4 ohms between J6-1 and J6-2. If the resistance is not correct, suspect FRU003 or FRU079.
8. Check the +24 volts and the +15 volts with an oscilloscope to verify that the voltages and ac ripple are in tolerance. If they are out of tolerance, exchange FRU095.
9. Physically check that the cartridge latch assembly (the load assembly on drives with the automatic cartridge loaders) holds the cartridge on the file reel motor without binding. The cartridge should be free to move a small amount.
10. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
11. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

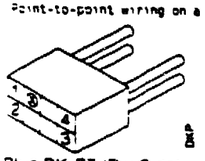
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,5,7,9	LOC 1	Location of FRUs
4,5,7	CARR-DR 1-1	Removal and replacement procedures
5	PANEL 1	How to operate the tape transport unit
8	YF100	DC power supply voltage pins
8	ZZ200	Voltage net wire list
10	CE/HSC 1	How to use the CE Panel

CHK 14 (Continued) **EAD 121**

Error Diagram





Plug DK-P7 (Pin Side)

Note: TP = test point.

Error Description

- A machine reel null completed, or because of an intermittent machine reel tach phase A signal, the drive microcode signals a null complete, and machine reel tach phase B was on (CHK 20)
- A machine reel null error was sensed during a load, or a machine reel tach phase A failure occurred (CHK 23).

Error Condition Theory

Note: See EAD 146 for test points.

After the thread/load operation starts, the microprocessor attempts to move the machine reel to a null position to receive the leader block. The movement to the null position is done by sending current to the machine reel motor until the machine reel tach A signal changes from a down logic level to an up logic level or from an up logic level to a down logic level. If the movement to the null position fails to cause the tach A signal to change in a specified time, the microprocessor stops the loading process and signals CHK 20 or CHK 23.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure.

1. (FRU081) tachometer sensor cable
2. (FRU073) logic board to power amplifier J1 cable
3. (FRU049) drive cable logic to the power amplifier board J2 (CHK 20)
4. Source voltages at the input to the FRUs on this EAD
5. Cables, connectors, and nets between the FRUs on this EAD
6. (FRU058) drive logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostic and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

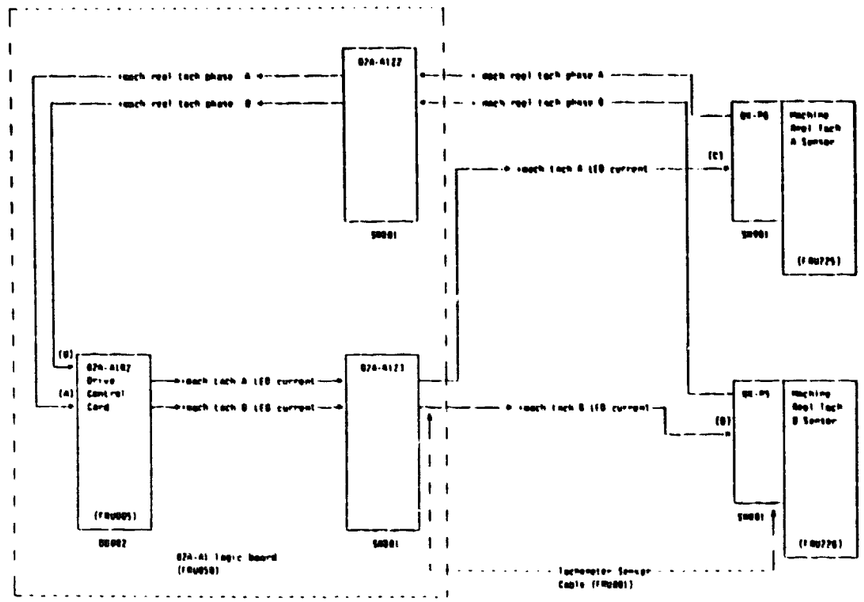
4. For a continuous error do steps 5 and 6. For intermittent errors, start at step 7.
5. Measure `+ machine reel tach phase A' at point **(A)** looking for a change from 0 volts to 5 volts as you manually turn the machine reel hub. If the voltages are not correct at point **(A)**, trace the voltage back to the machine reel tach A sensor (FRU225) to correct the problem.
6. Check for 1.5 volts at points **(C)** and **(D)**. If the voltage is not correct at point **(C)** or **(D)**, trace the voltage back to the drive control card (FRU085) to correct the problem.
7. Run ILTAPE and sequentially select the DSE (Data Security Erase) and REW (Rewind) commands.
8. Sync the oscilloscope plus internal with 5 volts/division vertical deflection and 10 milliseconds/division horizontal deflection. Display **(A)** on channel 1 and **(B)** on channel 2. Look for phase A to differ from phase B by 90 degrees. (See the timing charts in the Error Diagram.) The change from lighted to dark should be from 0 volts to 5 volts.
9. Physically check the machine reel flange for cracks or other damage.
10. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
11. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

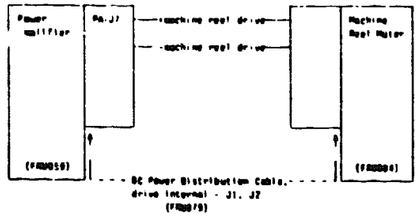
References

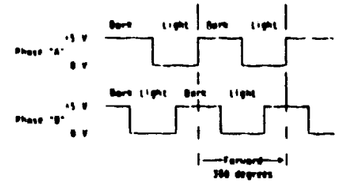
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
3	CARR-DR 1-1	FRU removal and replacement
5,9	LOC 1	Location of machine reel and flange
7	CE/HSC 1	How to run ILTAPE from the HSC
7	CE/HSC 1	How to use the CE Panel

CHK 20 or CHK 23 (Continued) **EAD 146**

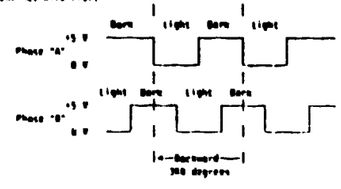
Error Diagram

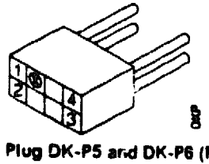






Point-to-point wiring on a board is shown on the TCO and/or WDV net wire list.





Plug DK-P5 and DK-P6 (Pin Side)

Error Description

The thread mechanism is slow or stalled during load.

Error Condition Theory

Note: See EAD 151 for test points.

When the threader assembly pulls the tape from the cartridge, the digital servo card monitors the '+ file reel tach phase A' and '+ file reel tach phase B' lines until tape path sensor B goes dark (tape leader block is at the machine reel). The power amplifier board applies a small reverse bias to the file reel motor through the '+ file motor drive' and '- file motor drive' lines to maintain tension on the tape. If the file reel tach pulses do not occur at the correct intervals:

- The thread operation stops.
- The file reel motor winds the tape into the cartridge (unload operation)
- The thread operation restarts.

If the file reel tach pulses still do not occur at the correct intervals during the first retry, the operation stops and the drive displays CHK 21.

Note: If the file reel tach phase pulses do not occur at the correct intervals during the unload operation for the retry, the operation stops and the drive displays CHK 25.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Source voltages at the input to the FRUs on this EAD
2. Cables, connectors, and nets between FRUs on this EAD
3. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

3. Turn the file reel motor by hand and check for binds.
4. Remove the cartridge and close the cartridge latch assembly on drives without the automatic cartridge loaders or remove the cartridge and then turn the knurled knob on the load assembly motor counterclockwise until the knob stops. This releases the threader pin from the interlock. Move the threader by hand and check for binds.

   Move the threader arm clockwise to move the threader pin into the receiver, then turn the knurled knob clockwise until it stops turning freely. This opens the cartridge loader assembly and interlocks the threader pin.

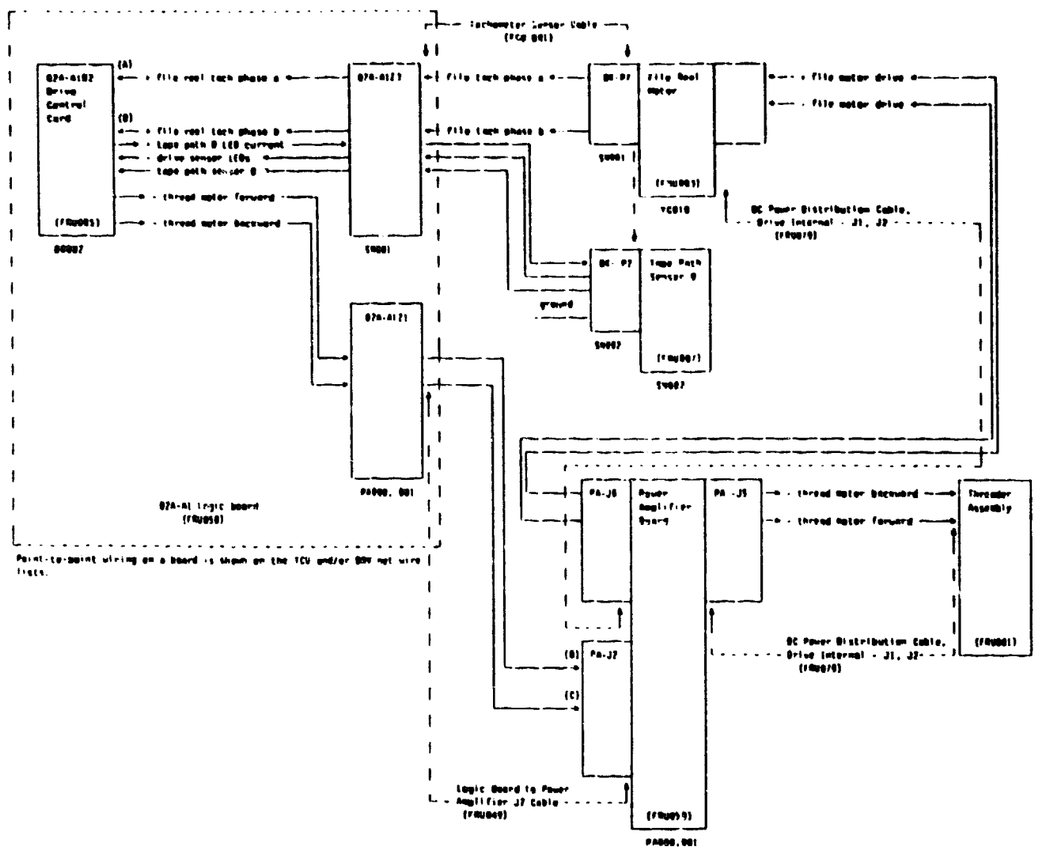
5. Check the tape path for any contamination that can cause excessive tape drag.
6. Connect the oscilloscope with channel 1 on point **(D)** and channel 2 on point **(C)**. Perform a load operation and check that point **(D)** ('- thread motor forward') goes to 0 volts and point **(C)** ('- thread motor backward') remains at +5 volts while the tape is threading. If a retry occurs, check that point **(C)** goes to 0 volts and point **(D)** goes to −5 volts when the tape is winding back into the tape cartridge.
7. Connect the oscilloscope to points **(A)** and **(B)** and turn the file reel motor by hand. Both points should change between +5 volts and 0 volts as the file reel motor is turned.
8. Check the file reel motor (FRU003) and threader assembly (FRU001) circuitry for short circuits or open circuits from the power amplifier board (FRU059).
9. Check for loose connections and pins pushed back at all connectors referred to by the error diagram.
10. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
11. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

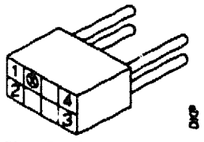
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
3,4	LOC 1	Location of file reel motor and of threader assembly
10	CE/HSC 1	How to use the CE Panel

CHK 21 (Continued) **EAD 151**

Error Diagram





Plug DK-P2 and DK-P7 (Pin Side)

Error Description

The threading mechanism was not at the cartridge home position during cartridge load.

Error Condition Theory

Note: See EAD 156 for test points.

After the cartridge latch is closed, on drives without the automatic cartridge loaders, or on drives with the automatic cartridge loaders the load assembly moves down to the latched position, and before the tape is loaded, the drive checks the threading mechanism to verify that it is at the home position. This check verifies that '+ tape path sensor A' (A) is at an up logic level (dark status). If (A) is at a down logic level (lighted status) during a cartridge load attempt, CHK 22 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU079) dc power distribution cable, drive internal - J1, J2
2. (FRU081) tachometer sensor cable
3. (FRU049) logic board to power amplifier J2 cable
4. Source voltages at the input to the FRUs on this EAD
5. Cables, connectors, and nets between FRUs on this EAD
6. (FRU058) 02A-A1 logic board.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Check visually to see if the threading mechanism is at the cartridge home position (flag on threader arm is located in tape path sensor A). If the threading mechanism is in the home position, go to step 5. If the threading mechanism *is not* in the home position:

   a. Manually move the threader arm to the home position.

   b. Reset the drive.

   c. Insert and load a scratch cartridge.

   If the same check code returns, continue with step 5. If a different check code appears, go to the EAD for that check code.

5. Check the adjustment of FRU006. The open end of the LED should be even with the mounting bracket. Also check the flag on the threader arm to ensure that it is not bent or broken and that it is fully seated in FRU006.
6. Check for an up logic level at point (A). If (A) is at an up logic level, the problem is in the area of FRU058 or FRU085
7. If (A) is at a down logic level, check for a short circuit between '+ tape path sensor A' and ground in FRU006, FRU081, or FRU058.
8. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:

   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

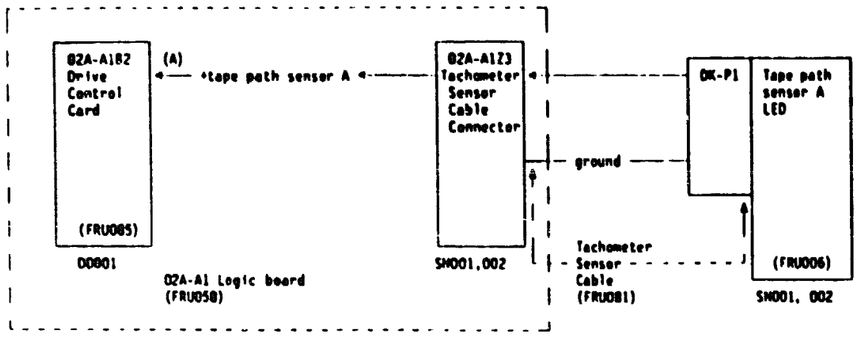
9. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	CART 13	Step 5 for moving the arm to the home position
5,6,7	CARR-DR 1-1	Removals, replacements, and adjustments
8	CE/HSC 1	How to use the CE Panel

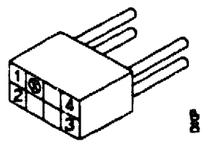
CHK 22 (Continued) **EAD 156**

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Note: Point A Light: +0.4 V
Dark: +5.0 V



Plug DK-P1 (Pin Side)

CHK 24

Error Description

A machine reel null error was sensed during an unload operation.

Error Condition Theory

Note: See EAD 166 for test points.

During an unload sequence after beginning of tape (BOT) is detected, the microcode attempts to null the machine reel. This is done by applying current to the machine reel motor and detecting a change in machine reel tach sensor A. Then the current is reversed and tach sensor A is monitored for a change back. This is done five times. A timer is set for a timeout condition which will cause a CHK 24 to occur.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU079) dc power distribution cable, drive internal - J1, J2
2. (FRU081) tachometer sensor cable
3. (FRU073) drive cable logic to power amplifier J1
4. Source voltages at the input to the FRUs on this EAD
5. Cables, connectors, and nets between FRUs on this EAD
6. (FRU058) drive logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostic and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

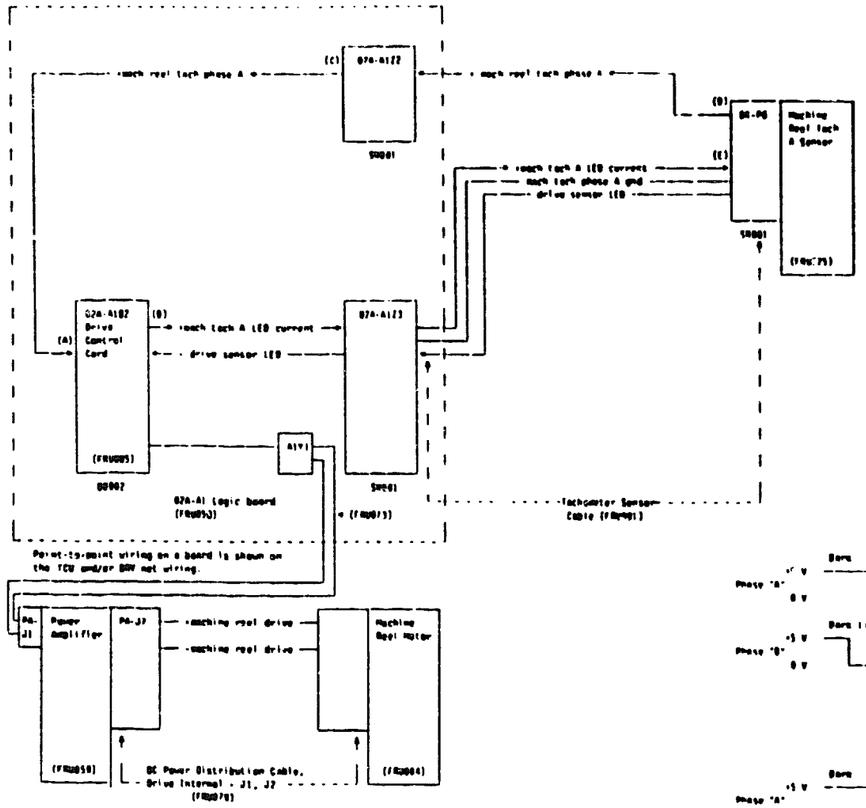
4. Scope lines **(A)** **(C)** and **(D)** looking for 0 to 5 volt changes as you turn the machine reel hub by hand.
5. Check for 1.5 volts at **(B)** and **(E)**.
6. Physically check the machine reel flange for cracks or other damage.
7. Check the machine reel motor circuitry (FRU004) and the cables (FRUs 079 and 073) for short circuits or open circuits from the power amplifier board (FRU059).
8. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
9. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

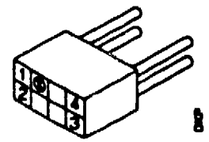
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
6,7	CARR-DR 1-1	Removal and replacement procedures
4,7	LOC 1	Location of machine reel
8	CE/HSC 1	How to use the CE Panel

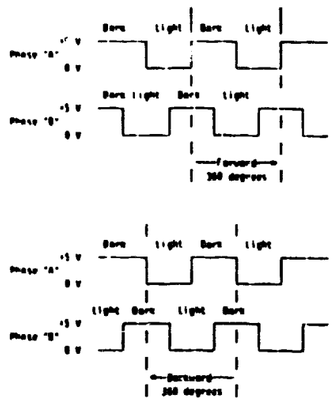
CHK 24 (Continued) **EAD 166**

Error Diagram





Plug DK-P6 (Pin Side)



Error Description

The threading mechanism is slow or stopped during an unload operation, or the leader block was not attached to the threader pin on a load operation and the drive tried to put the leader block back during a load retry.

Error Condition Theory

Note: See EADs 171 and 172 for test points.

The unload sequence starts with the tape under tension, at the beginning of tape, and with the rewind-unload status active. When the tape reaches the last-wrap null point, the tape leader block and the threader assembly threader pin are pulled out from the machine reel enough to cause tape path sensor B to become lighted. This causes control to pass to the unthread routine.

When the null position is reached, the thread motor is driven in the backward direction with an increased bias on the file reel motor. The threading assembly movement is checked by timing the tach 2 rate until tape path sensor A is blocked. If the threading assembly is slow or stopped, a time-out occurs and CHK 25 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU049) drive logic cable to power amplifier J2
2. (FRU079) dc power distribution cable, drive internal - J1, J2
3. (FRU068) tachometer sensor cable
4. Source voltages at the input to the FRUs on this EAD
5. Cables, connectors, and nets between FRUs on this EAD
6. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostic and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. For a solid error, start at step 5, for an intermittent error, start at step 6.

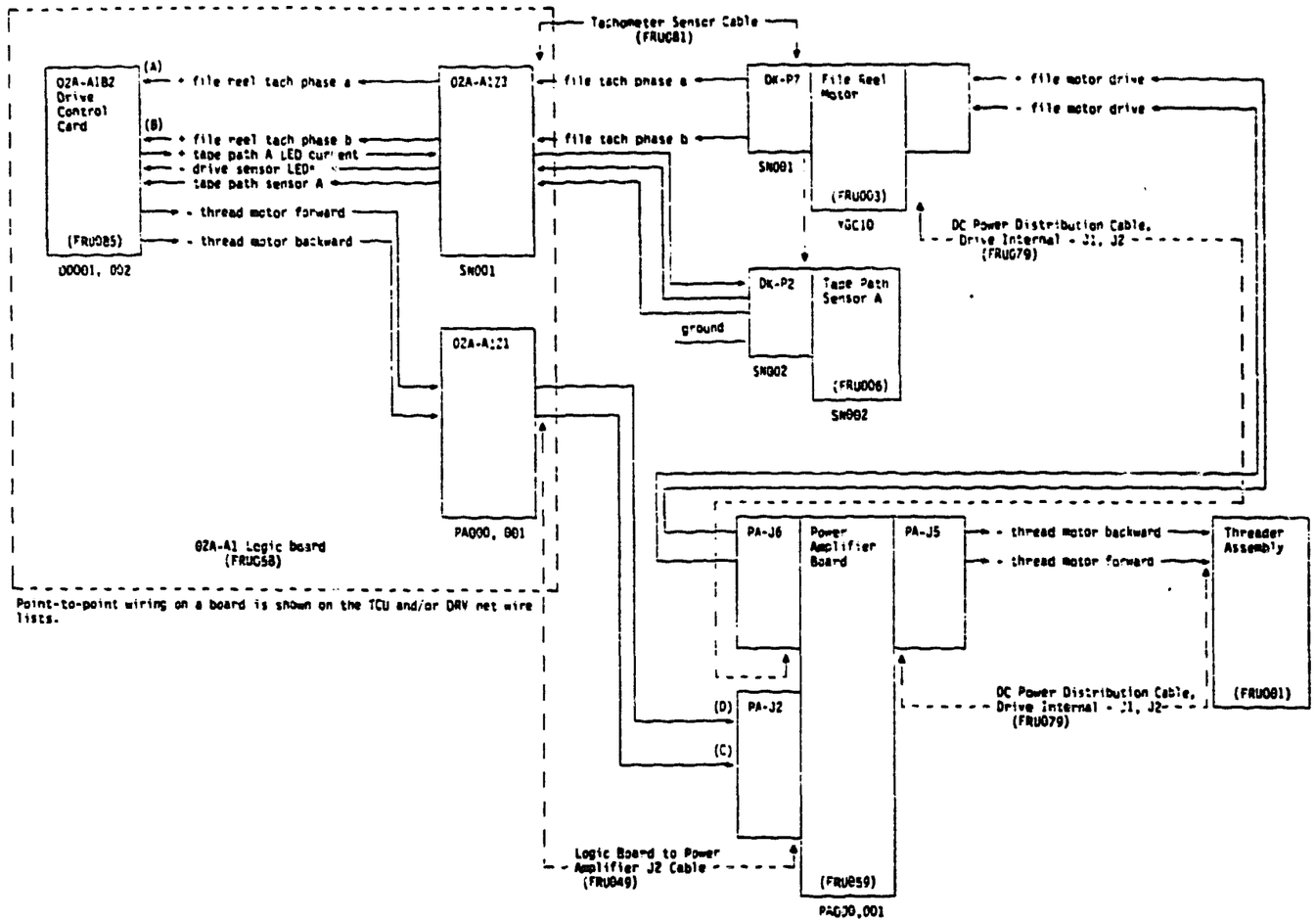
   Note: Scope points for steps 5-8 are on EAD 171.

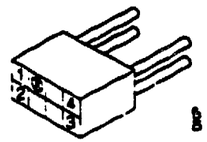
5. Scope line **(B)** looking for a change from 0 volts to +5 volts while you manually turn the file reel motor.
6. Scope points **(C)** and **(D)** while an unload operation is running. Look for point **(C)** to pulse from +5 volts to 0 volts and for point **(D)** to remain at +5 volts.
7. Run ILTAPE to write one record (WRT) and rewind (REW).
8. Sync the oscilloscope plus internal with the settings at 5 volts/division vertical and 0.1 millisecond/division horizontal. Display point **(A)** on channel 1 and point **(B)** on channel 2. Look for phase A to differ from phase B by 90 degrees. (See the Phase Diagram of the error diagram.) The change from lighted to dark should be from 0 volts to +5 volts.
9. Check the file reel motor (FRU003) and the threader assembly (FRU001) circuits for short circuits or open circuits from the power amplifier board (FRU059).
10. Check for loose connections at all connectors shown in the error diagram.
11. Check for binds in the threader assembly mechanism (FRU001).
12. Connect the oscilloscope to point **(E)** and point **(F)** (diagram 3 on EAD 172). Observe both lines while an unload operation runs. **(E)** should remain at +1.6 volts to +2.2 volts at all times. **(F)** should be at 0 volts until the flange enters tape path sensor A, then it should change to +5 volts.
13. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
14. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
3	CARR-DR 1-1	Removal and replacement procedures
5,10	LOC 1	File reel and threader location
7	CE/HSC 1	How to run ILTAPE from the HSC
7,13	CE/HSC 1	How to use the CE Panel

Error Diagram





Plug DK-P2 and DK-P7 (Pin Side)

CHK 25 (Continued) EAD 172

Error Diagram

Diagram 2

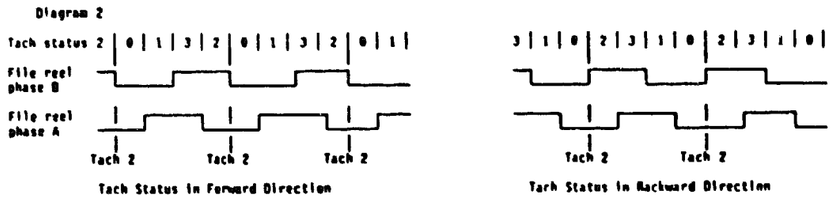
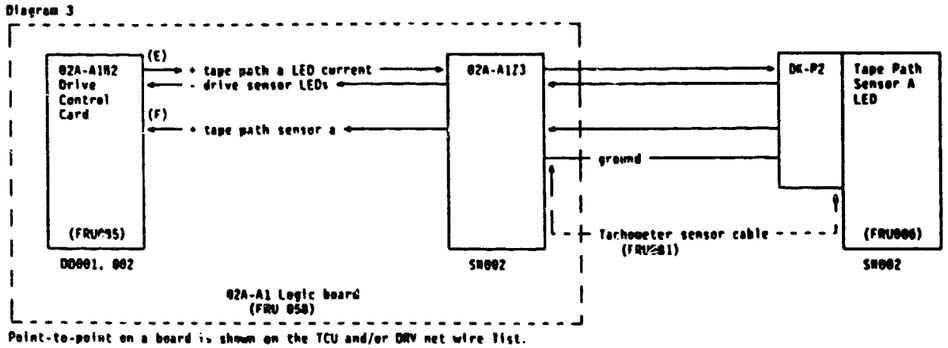
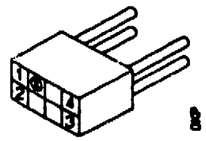


Diagram 3



Point-to-point on a board is shown on the TCU and/or DRV net wire list.



Plug DK-P2 (Pin Side)

Error Description

The cartridge tray latch failed to release

Error Condition Theory

Note: See EAD 176 for test points

When the threader arm reaches tape path sensor A during a rewind and unload operation (signaling the cartridge home position), the digital servo card releases the cartridge latch assembly on drives without the automatic cartridge loaders, or signals the automatic cartridge loader to move the load assembly to the up position by activating '- cartridge latched' to the latch assembly on drives without the automatic cartridge loaders, or to the loader control card on drives with the automatic cartridge loaders

When the latch opens, or the load assembly moves to the up position, the flag is removed from the cartridge latched sensor, and '+ cartridge latched' changes to a down logic level, signaling that the tray has released (the load assembly has moved to its up position). If the tray fails to release (the load assembly does not move to the upper position on drives with the automatic cartridge loaders), or if the sensor fails to detect the movement of the flag, CHK 26 or CHK 31 is set.

CHK 26 is set if the drive has no automatic cartridge loader feature or does not know the feature is installed (early in the power-on cycle). If the drive knows the automatic cartridge loader feature is installed, CHK 31 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI) these items are possible causes of the failure

1. Source voltages at the input to the FRUs on this EAD.
2. Cables, connectors, and nets between FRUs on this EAD.
3. (FRU058) logic board 02A-A1.

   In addition to the previously called FRUs, if an automatic cartridge loader is present the following items are also possible causes of the failure:

4. (FRU283) load motor.
5. Automatic cartridge loader cables and connectors.

Note: FRU011 and FRU081 are possible FRUs. When a false error condition occurs, the latch releases with a check 26 on the display

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. If the cartridge tray latch is failing to release on drives without the automatic cartridge loaders or the load assembly fails to move to the up position on drives with the automatic cartridge loaders, go to step 7.

   If the cartridge tray latch releases on drives with the automatic cartridge loaders, or the load assembly does move to the up position on drives with the automatic cartridge loaders, go to step 5

5. Check point (A) for +1.4 volts to +2.2 volts. If the voltage is correct, go to step 6. If the voltage is more than +2.2 volts, check for an open circuit between points (A) and (B). (Note that there is a diode in the circuit. If the meter shows an open circuit, reverse the meter leads to verify that the circuit is really open.) If the voltage at (A) is less than +1.4 volts, check for a short circuit between (A) and ground. If no problem can be found, the failure is in the area of FRUs 058 or 085.
6. With the cartridge unlatched on drives without the automatic cartridge loaders, or the load assembly in the up position on drives with the automatic cartridge loaders, check point (C) for a down logic level. If (C) is at an up logic level, check for an open circuit between points (C) and (D) or points (E) and (F). If there is no open circuit, the failing area is FRU058 or FRU085.
7. On drives with the automatic cartridge loaders go to step 8. On drives without the automatic cartridge loaders follow this procedure only if the cartridge latch assembly failed to release the cartridge tray.

   Connect an oscilloscope to point (G). Reset the drive and load a scratch cartridge. Press the Unload switch.

   After the cartridge unthreads, check for a down logic level pulse. If no pulse occurs, the problem is in the area of FRU058 or FRU085. If the pulse occurs, check for an open circuit in the solenoid circuit by:

   a. Disconnect PA-P4 from FRU059.

   b. Measure the resistance from P4-1 to P4-2.

   If the circuit is not open, the failure is in the area of FRUs 059, 049, or 058.

8. On drives with the automatic cartridge loaders check to see if the loader assembly moved up to the unlocked position. If the loader assembly did move up, then the problem is in the cartridge latch sensor assembly FRU011, loader control card FRU281, or the loader mechanical assembly FRU285.

   If the loader assembly did not move up to the unlocked position, then the problem is in the load assembly FRU282 (motor and mechanical parts), the loader control card FRU281, or in the loader mechanical assembly FRU285 (for cables and connectors to the load assembly).

9. If the threader is still near the machine reel, the tape path sensor A (H) should be light (0 volts). If it is dark (+5 volts), the problem is in the area of FRUs 006, 085, and 081.
10. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:

    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

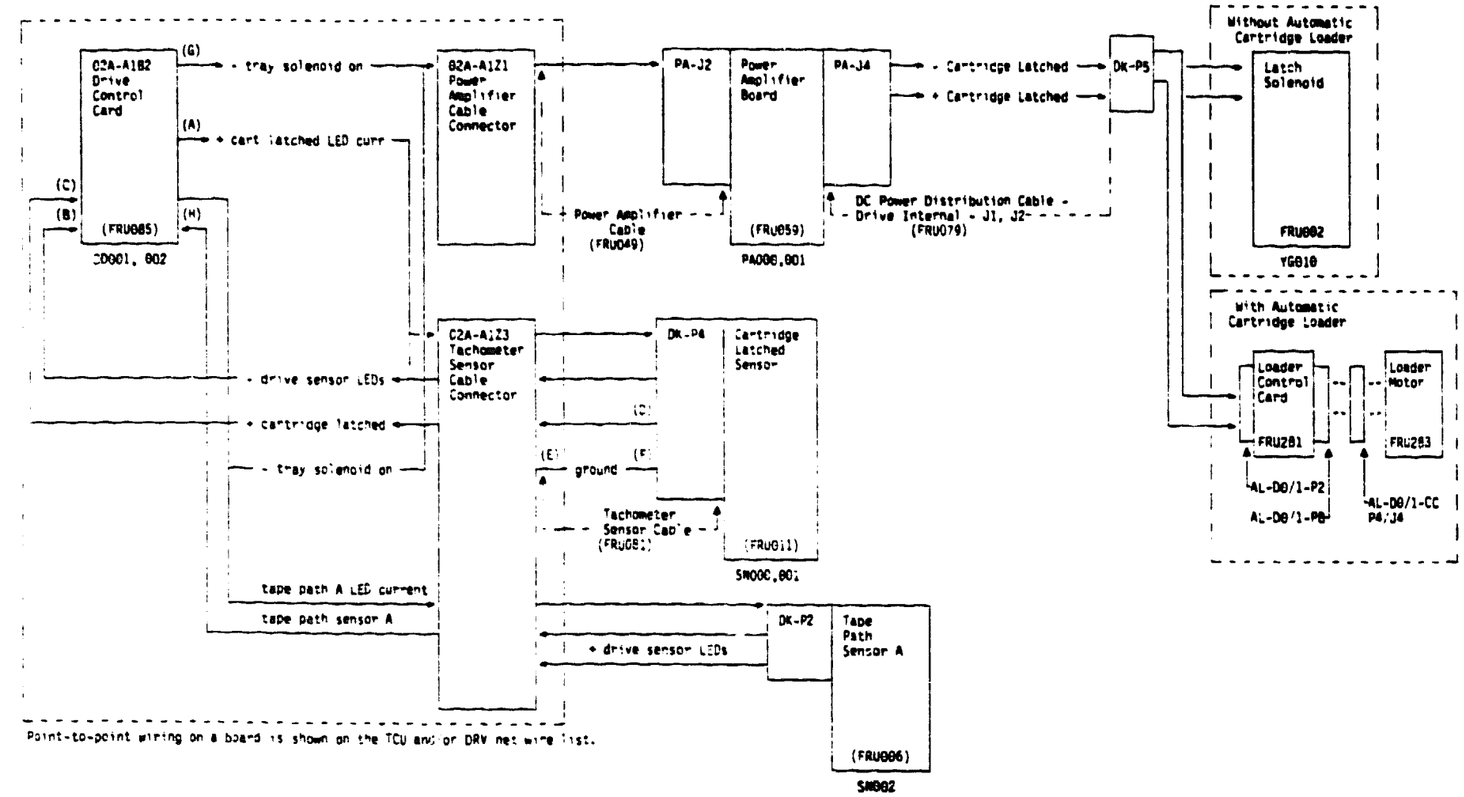
11. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

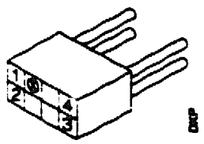
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5,6,7,8,9	CARR-DR 1-1	Removal and replacement procedures
7	PANEL 1	How to operate the tape transport unit
7	LOC 1	Location of FRU059
7	CARR-DR 1-1	How to lower FRU059 to service position
10	CE/HSC 1	How to use the CE Panel

CHK 26 or CHK 31 (Continued) **EAD 176**

Error Diagram





Plug DK-P2 and DK-P4 (Pin Side)

Error Description

An unexpected interrupt occurred at tape path sensor B (FRU007) during an unload operation or the machine reel sensor B (FRU226) is on unexpectedly during an unload operation.

Error Condition Theory

Note: See EAD 181 for test points.

During a rewind and unload operation, the tape reaches the last wrap null point and the tape leader block and the threader assembly tape carrier pin are withdrawn from the machine reel enough to cause an interrupt to tape path sensor B. The interrupt causes control to be passed to the unthread routine. An interrupt from tape path sensor B before this time sets CHK 27.

When the machine reel reaches the last-wrap null point, sensor B is checked. If it is on, a CHK 27 is set. A CHK 27 cannot be repeated, because of the unique timing considerations. The failing FRU or FRUs should cause other CHK Codes and these codes should be pursued (CHK 20 or 0E for example).

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU079) dc power distribution cable, drive internal - J1, J2
2. (FRU081) tach sensor cable
3. (FRU073) drive cable logic to power amp J1
4. (FRU049) drive cable logic to power amp J2
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between FRUs on this EAD.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Check machine reel tach sensor B (FRU226) output **(B)**. rotate the machine reel by hand; the signal should switch from +5 volts to 0 volts.
5. While the tape drive is unloading and prior to unthread, check the voltages at FRU007 output point **(A)**. With the sensor covered the output should be at approximately +5.0 volts, if uncovered the output will be approximately +0.5 volts.
6. Check the adjustments of machine reel sensors B (FRU226) and A (FRU225). For this check code, sensor A is suspected intermittent.
7. Check the adjustment of tape path sensor B (FRU007).
8. Check the flag on the threader assembly to see if it is bent or broken. Check the flange on the machine reel hub.
9. Check FRU001 for a bent threader assembly tape carrier pin. A bent pin could cause the flag to move out of tape path sensor B while unloading.
10. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:

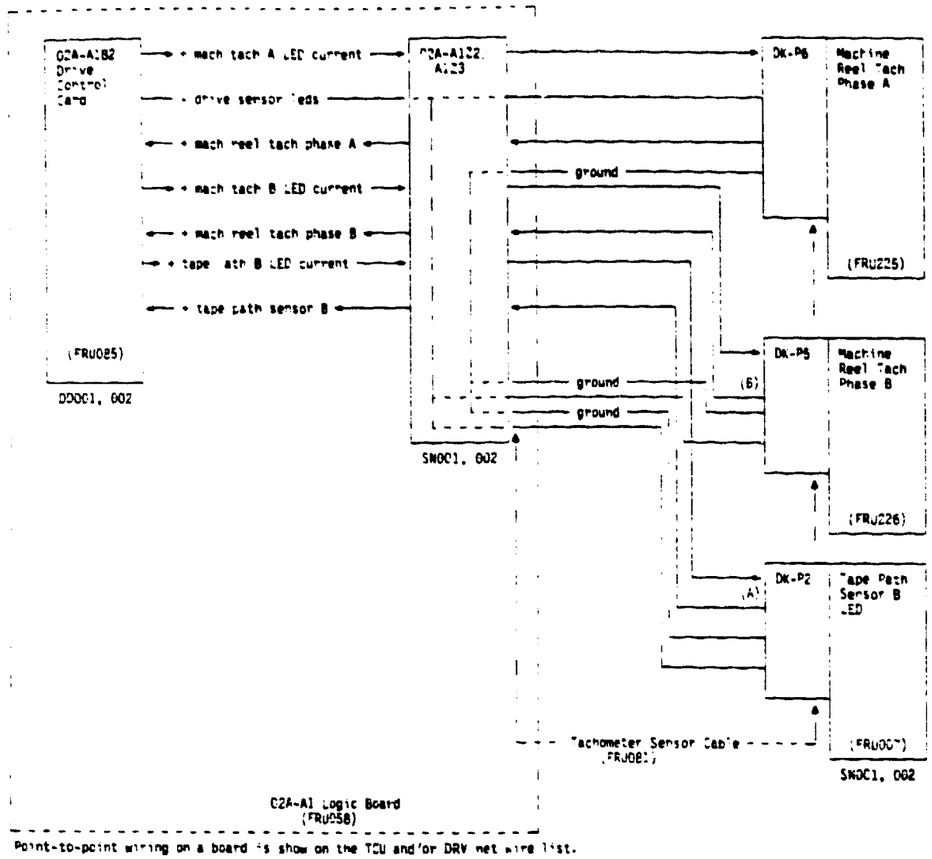
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

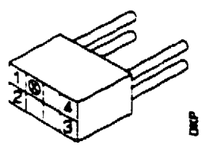
11. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,6,9	LOC 1	Location of FRUs
7,8	CARR-DR 1-1	Tape path sensor B and machine reel A and B sensor adjustments
10	CE HSC 1	How to use the CE Panel

Error Diagram





Plug DK-P2, DK-P5, and DK-P6 (Pin Side)

Error Description

The tape leader block is not attached to the carrier pin, or the tape is broken, which causes the file reel to turn in reverse during a thread operation.

Error Condition Theory

Note: See EAD 186 for test points.

A thread operation is started by driving the thread motor in the forward direction. The tape carrier pin engages the leader block on the tape, and the tape starts through the tape path. At the same time, a reverse bias is supplied to the file reel motor to keep tension on the tape during the thread operation. If the tape is broken or the carrier pin does not engage the leader block, the reverse bias causes the file reel motor to turn in reverse. The backward movement causes CHK 28 to be set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure.

1. (FRU081) tachometer sensor cable
2. (FRU079) dc power distribution cable, drive internal - J1, J2
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Connect an oscilloscope with channel 1 on point **(A)** and channel 2 on point **(B)**.
5. On drives without the automatic cartridge loaders reach through the front of the latch and slowly turn the file reel motor while doing the check in step 7.
6. On drives with the automatic cartridge loaders use the tape removal tool (see PLAN 1) on the socket wrench handle. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft. Slowly turn the file reel motor while doing the check in step 7.
7. Check to ensure that both lines are changing between +0.4 volts and +5.0 volts. If either line fails to change to +0.4 volts, check for an open circuit between points **(A)** and **(C)** or points **(B)** and **(D)** for that sensor.

   If both lines fail to change to +0.4 volts, check for an open circuit in **(E)**. If either line fails to change to +5 volts, check that line for a short circuit to ground. If both phases are working, go to step 8.

8. This failure can be caused by the gear on the cartridge not engaging the gear on the file reel motor correctly. Poor engaging is caused by the height of either the latch assembly (on drives without the automatic cartridge loaders), the load assembly (on drives with the automatic cartridge loaders), or the file reel motor not being correct.

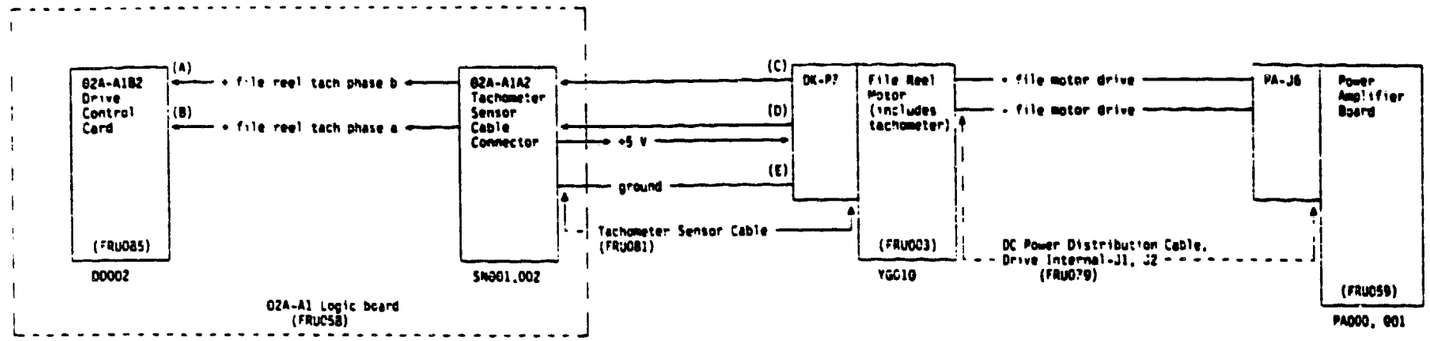
   Compare the distance between the file reel motor gear and the latch assembly (on drives without the automatic cartridge loaders), or the file reel motor gear and the latch assembly (on drives with the automatic cartridge loaders), to the same distance on a drive that is working correctly. If the distance is not correct, exchange the FRUs as needed to obtain the correct distance.
9. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
10. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

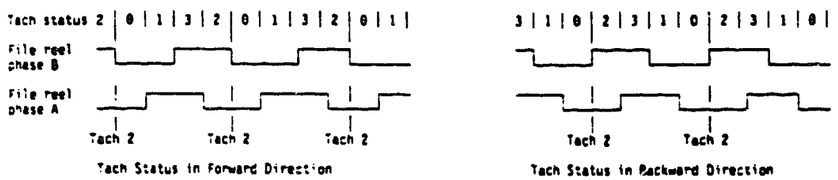
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,5	LOC 1	Location of FRUs
4,5	CARR-DR 1-1	Removal and replacement procedures
6	CE/HSC 1	How to use the CE Panel

CHK 28 (Continued) **EAD 186**

Error Diagram

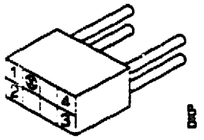


Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.



Tach Status in Forward Direction

Tach Status in Backward Direction



Plug DK-P7 (Pin Side)

Error Description

An error was detected in attempting to reach the last wrap null point during unload.

Error Condition Theory

Note: See EAD 196 for test points.

When the tape is at the beginning of tape position and a rewind and unload sequence is started, the tape is moved backward toward the machine reel position for the leader block to leave the reel. The position for the leader block to leave the reel is known as the last wrap null point.

If too much tape drag causes the file reel digital-to-analog converter (DAC) to contain a value larger than an already determined value, CHK 2A is set.

The machine reel is tested for rotation in the correct direction during the rewind and unload sequence. If the machine reel turns in the wrong direction (forward), CHK 2A is set. The machine reel tach sensor B being on (dark) can cause this.

Tape path sensor B should go to an up level (lighted status) when the last wrap null point is reached. If tape path sensor B does not go up (+5.0 V), CHK 2A is set.

CHK 2A causes the drive to remove power from all motors and to display CHK 2A on the message display. CHK 2A is also stored in the sense bytes.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure.

1. (FRU079) dc power distribution cable, drive internal - J1, J2
2. (FRU081) tachometer sensor cable
3. (FRU049) logic board to power amplifier J2 cable
4. (FRU058) logic board 02A-A1
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between the FRUs on this EAD.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. Check tape path sensor B (FRU007) for dust or dirt that might be blocking the sensor.
4. Check the tape path for dirt or something else that might cause too much friction on the tape.
5. Check J5, J6, and J7 for loose connections to the power amplifier board.
6. Check that the machine reel, file reel, and threader assembly are not binding by moving them by hand. (If another drive is available, compare the amount of friction in a failing drive to the amount of friction in a drive that is operating correctly.)
7. Check the pressure and vacuum hoses for leaks.
8. Ensure that the pressure and vacuum measurements are correct.
9. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

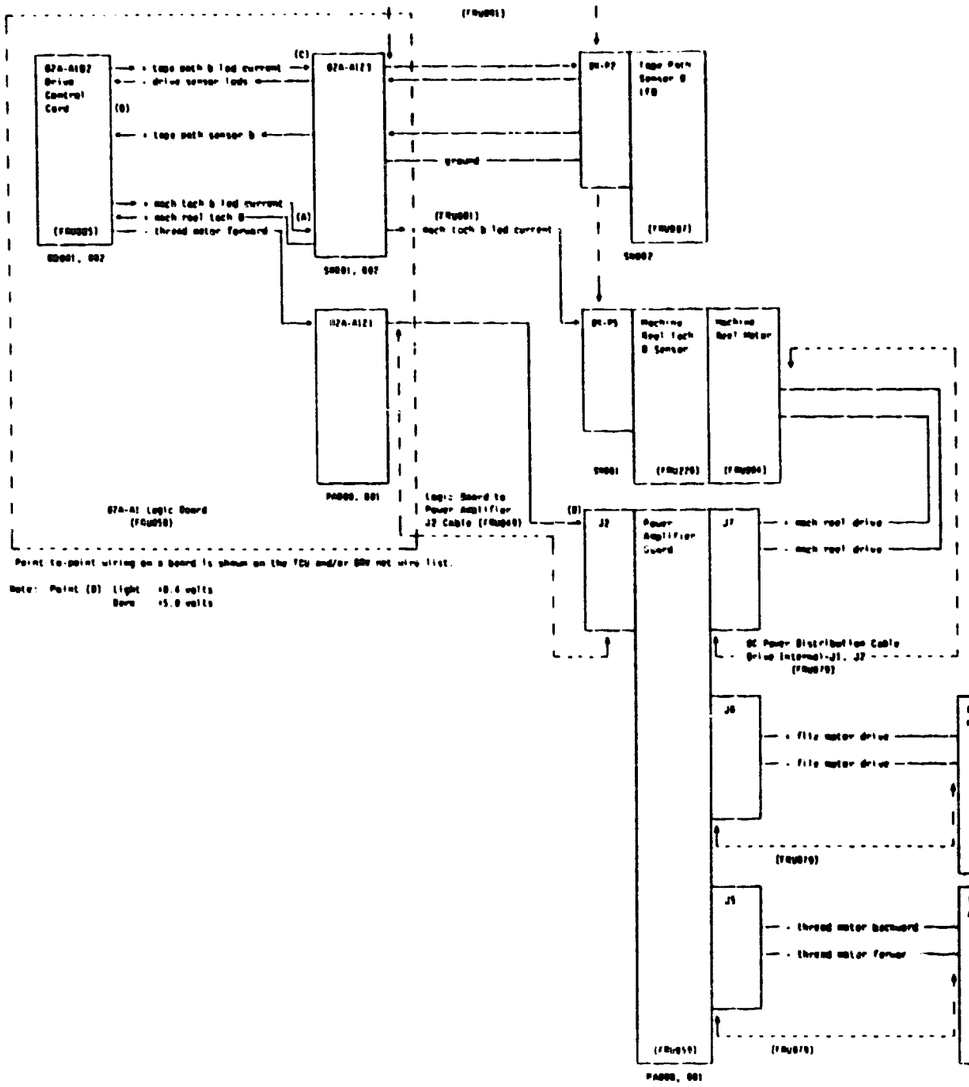
10. Scope point **(A)** during an unload operation. Ensure the cartridge that you use is in good mechanical condition; a cartridge that is jamming can cause a CHK 2A. **(A)** should remain between +1.4 V and +2.2 V at all times.
11. Scope point **(B)** during an unload operation. **(B)** should remain at +5 V. If **(B)** pulses to ground (0 V), it will drive the thread motor forward and cause too much friction.
12. Connect the oscilloscope to points **(C)** and **(D)**. Observe both lines during an unload operation. **(C)** should remain at +1.4 V to +2.2 V at all times. **(D)** should remain at +5 V until the flange leaves the tape path sensor B, then it should change to +0. V.
13. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
14. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

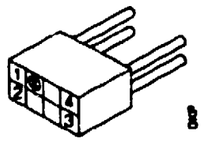
References

Step	Ref Page	Description/Comments
1	CARR-DR 1-1	Removal and replacement procedures
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,6,9	LOC 1	Location of cables and connectors
8	PNEU 1	Pressure and vacuum measurements
13	CE/HSC 1	How to use the CE Panel

CHK 2A (Continued) **EAD 196**

Error Diagram





Plug DK-P2 and DK-P5 (Pin Side)

CHK 41

Error Description

The servo hardware sensed a power amplifier failure

Error Condition Theory

Note: See this page for test points.

The power amplifier board contains two driver/amplifier circuits to drive the reel motors (one for the file reel motor and one for the machine reel motor). The output current of each driver, along with being sent to the motors, is sent back to a checking circuit and compared to the control signal. If the current and the control signal do not match for either power driver/amplifier circuit, CHK 41 is set.

Additional Possible Causes of Failure

A tension transducer failure can cause CHK 41. A tension transducer failure or short in the cable can provide a -10 volt reference input to the power amp card. This causes the power amp to correct a severe tension condition, which will be detected by the power amp error line and a CHK 41 occurs.

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Source voltages at the input to the FRUs on this EAD
2. Cables, connectors, and nets between FRUs on this EAD
3. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

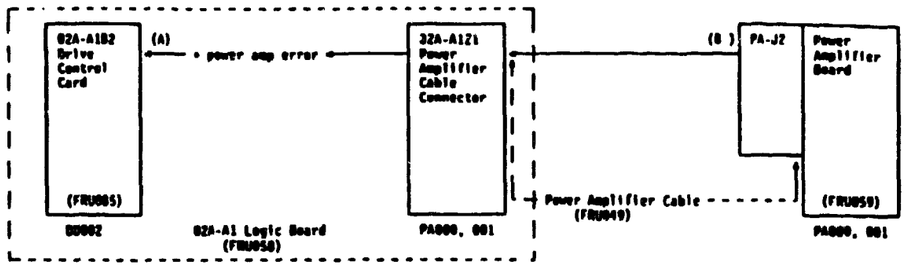
   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Check point (A) for a down logic level. If (A) is at a down logic level, the failure is in the area of FRU058 or FRU085. If (A) is at an up logic level, check for an open circuit in FRU058 or FRU049 between points (A) and (B)
5. If the failure still is not found, obtain the sense data and check for any associated error. Go to the EAD for that error.
6. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
7. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	CARR-DR 1-1	Removal and replacement procedures
5	SENSE 1	Location of format 20 sense bytes 16-23 description
6	CE/HSC 1	How to use the CE Panel

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Description

The power amplifier board detected an open circuit in the file reel motor circuit, or the file reel motor was running with no load.

Error Condition Theory

Note: See EAD 216 for test points.

The power amplifier board contains a circuit that checks the output current of the power amplifier for the file reel motor. If the file reel motor circuit opens or the motor runs with no load, the power amplifier saturates and causes '+ file motor problem' to go active to the digital servo card. '+ file motor problem' causes CHK 42 to be set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU049) power amplifier cable PA-J2 to 02A-A1Z1
2. (FRU079) dc power distribution cable drive internal— J1, J2
3. (FRU080) dc power distribution cable—external to drive (inside tape unit)
4. (FRU081) tachometer sensor cable
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between FRUs on this EAD
7. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

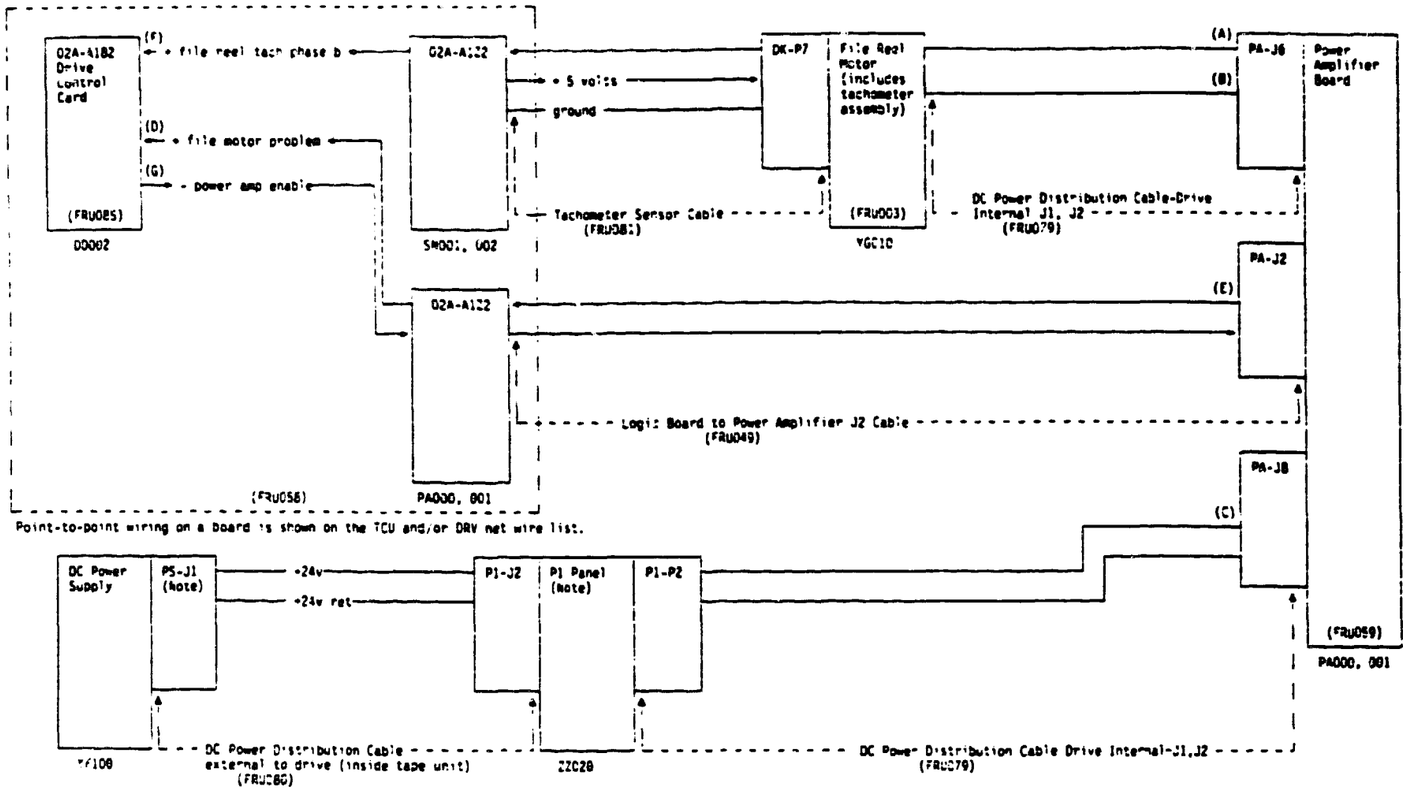
4. If this error occurs on an unload operation only, go to step 8. Otherwise, continue with step 5.
5. Lower the power amplifier board and disconnect J6. Check for approximately 4 ohms from J6-1 **(A)** to J6-2 **(B)**. If the resistance is not correct, the failure is in the area between FRU003 and FRU079.
6. Check for +24 volts at point **(C)**. If +24 volts is not present, the failure is in the area of FRU079 and FRU080.
7. Load a scratch cartridge. Check point **(D)** for a logic level that is down. If the logic level is down, the failure is in the area of FRU085 and its 02A-A1 logic board nets. If the logic level is up, check for an open circuit between points **(D)** and **(E)** or the problem is in the area of FRU059.
8. Load a scratch cartridge. Check point **(D)** for a logic level that is down. If the logic level is down, the failure is in the area of FRU085 and its 02A-A1 logic board nets. If the logic level is up, check for an open circuit between points **(D)** and **(E)** or the problem is in the area of FRU059.
9. (Note: Perform steps 8 and 9 if the drive is failing on an unload operation only). Load a scratch cartridge and then press the Unload switch. Check that '- power amp enable' **(G)** changes to an up logic level after the unload operation is complete. If **(G)** does not go to an up logic level, the failure is in the area of FRU085 or check for a short circuit between point **(G)** and ground. If point **(G)** does go to an up logic level, go to step 9.
10. An intermittent short circuit between '+ file reel tach phase b' and ground can cause a CHK 27. Scope point **(F)** and verify that the signal does not intermittently go to 0 volts. The signal should switch between +0.4 volts and +5 volts as the file reel motor turns. If the signal is going to 0 volts, check for a short circuit to ground between **(F)** and FRU003.
11. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
12. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

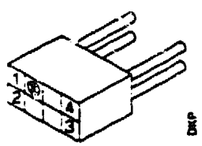
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5,6,7,9	LOC 1	Location of cables and connectors
5,6,7,9	CARR-DR 1-1	Removal and replacement procedures
8	PANEL 1	How to operate the tape transport unit
10	CE/HSC 1	How to use the CE Panel

CHK 42 (Continued) **EAD 216**

Error Diagram





Plug DK-P7 (Pin Side)

Note: The logic reference shown in the power area is for drive 0. Use the correct lines for a drive 1 failure.

Error Description

The power amplifier board detected an open circuit in the machine reel motor circuit, or the machine reel motor was running with no load.

Error Condition Theory

Note: See EADs 221 and 222 for test points.

The power amplifier board contains a circuit that checks the output current of the power amplifier for the machine reel motor. If the machine reel motor circuit opens or the motor runs with no load, the power amplifier saturates and causes '+ machine motor problem' (J) to go active to the digital servo card. '+ machine motor problem' causes CHK 43 to be set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. (FRU049) power amplifier cable PA-J2 to 02A-A1Z1
3. (FRU073) power amplifier cable PA-J1 to 02A-A1Y1
4. (FRU079) dc power distribution cable drive internal—J1,J2
5. (FRU080) dc power distribution cable—external to the drive (inside the tape unit)
6. (FRU005) flange
7. Source voltages at the input to the FRUs on this EAD
8. Cables, connectors, and nets between FRUs on this EAD
9. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Lower the power amplifier board and disconnect J7. Check for approximately 4 ohms from J7-1 (A) to J7-2 (B). If the resistance is not correct, the failure is in the area of the machine reel motor cable or FRU004.
5. With a cartridge inserted, check for +5 volts at point (C). If (C) is correct, go to step 6. If (C) is at 0 volts to +0.4 volts, check to ensure that the flag is engaging the LED assembly correctly. If the flag and sensor are correct, check for a short circuit between point (C) and ground.
6. Check the voltage at (D) for each tach sensor. The voltage should be +1.4 volts to +2.2 volts. If (D) is more than +2.2 volts, check for an open circuit in the tachometer sensor cable between points (D) and (E). (Note that there is a diode in the circuit. If the meter shows an open circuit, reverse the meter leads to verify that there really is an open circuit.) If (D) is less than +1.4 volts, the problem is in FRU085, or there is a short circuit between (D) and ground at the 02A-A1 logic board, in the tachometer sensor cable, or in FRUs 225 or 226.

   If (D) is correct, go to step 7.
7. Manually rotate the machine reel motor and scope point (F) for each sensor (A and B). Check for a change from +0.4 volts to +5 volts when the LED changes from the lighted condition to the dark condition. If either fails to change to −5 volts, check for a short circuit between point (F) for that sensor and ground. If either fails to change to +0.4 volts, check for an open circuit between point (F) and point (G) for that sensor.

   If no short or open circuits can be found and the voltage does not change correctly, the failure is in the area of FRU085 or the 02A-A1 logic board. If the sensors operate correctly, go to step 8.
8. Check test points (H) for a short circuit to ground. If either has a short circuit, the failure is in the area of power amplifier cable PA-J1 to 02A-A1, FRU059, or logic board 02A-A1. If there is no short circuit, go to step 10.
9. Check point (L) for an up logic level with the drive unloaded. If (L) is at a down logic level, the failure is in the area of FRU085 or logic board 02A-A1, or check for a short circuit to ground.

   If (L) is correct, load a scratch cartridge. Check to see that (L) changes to a down logic level.

   If (L) does not go to a down logic level, the failure is in the area of FRU085 or logic board 02A-A1.

   If (L) operates correctly, go to step 10.
10. With the cartridge still loaded, check point (J) for a down logic level.

    If (J) is at a down logic level, the failure is in the area of FRU085 or logic board 02A-A1. If (J) is at an up logic level, check for an open circuit between points (J) and (K) or the failure is in the area of FRU059.
11. Follow these procedures only for an intermittent failure.

    Load a scratch cartridge and run ILTAPE to write a record (WRT) and rewind (REW). This procedure permits you to scope the sensors while the tape is moving.
12. Sync the oscilloscope plus internal with the settings 5 volts/division vertical and 10 milliseconds/division horizontal. Display phase A (F) on channel 1 and phase B (F) (see diagram 2) on channel 2. Look for phase A to differ from Phase B by 90 degrees (see diagram 3).

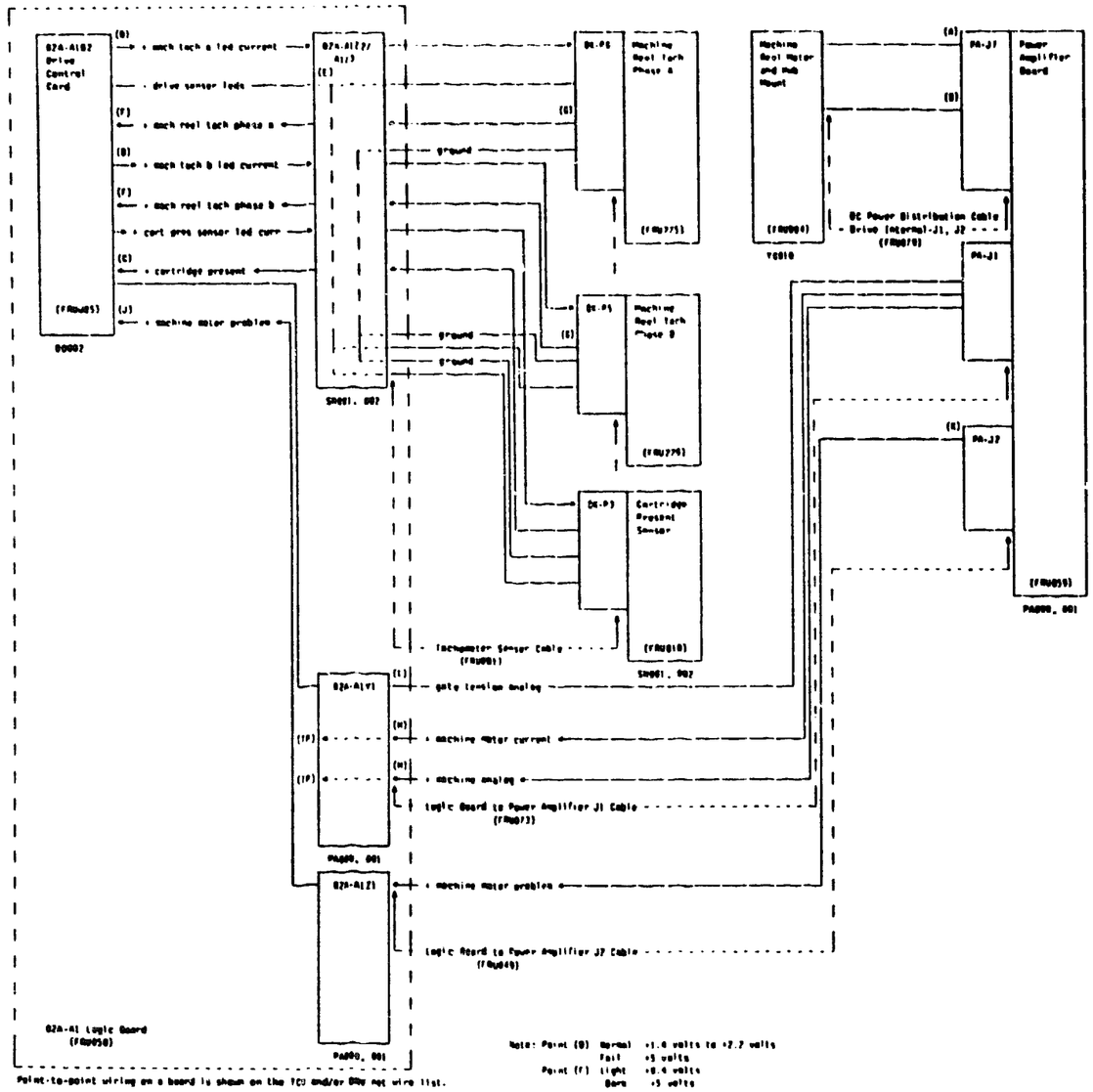
    Also check for signals that are not regular on either phase. If either pulse is not regular, check for a broken or cracked flange (FRU005) or for the tachometer sensor cable not being seated correctly.
13. Verify that +24 volts is in tolerance at point (M) (see EAD 222). If +24 volts is out of tolerance, the failure is in the area of the dc distribution cables internal and external (inside the tape unit) to the drive.
14. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
15. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

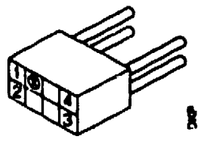
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4-10	LOC 1	Location of FRUs
4-10	CARR-DR 1-1	Removal and replacement procedures
9	PANEL 1	How to operate the tape transport unit
11	CE/HSC 1	How to run ILTAPE from the HSC
12	CARR-DR 1-1	Removal and replacement procedures
13	PWR 1	Voltage tolerance page
11,14	CE/HSC 1	How to use the CE Panel

CHK 43 (Continued) **EAD 221**

Error Diagram 1

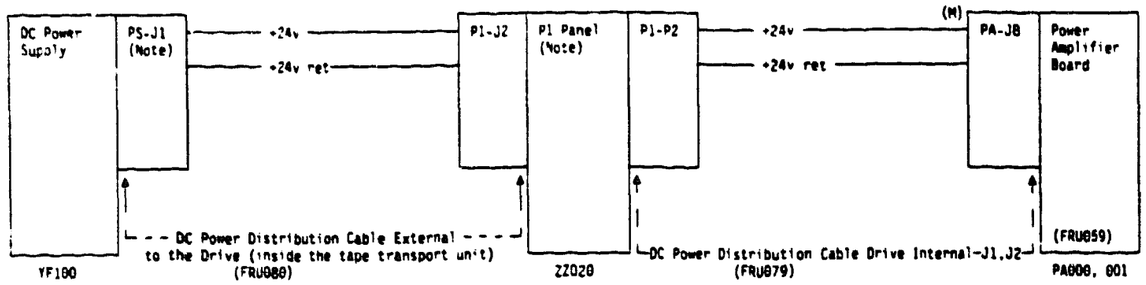




Plug DK-P3, DK-P5, and DK-P6 (Pin Side)

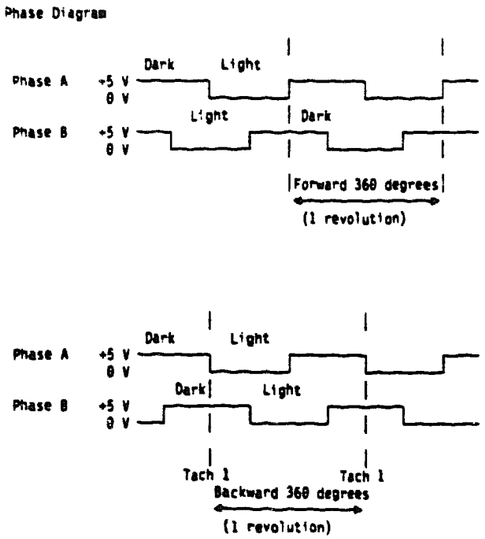
CHK 43 (Continued) **EAD 222**

Error Diagram 2



Note: The logic reference shown is for drive 0. Use the correct lines for a drive 1 failure.

Error Diagram 3



Error Description

A digital to analog converter (DAC) parity error was sensed

Error Condition Theory

Note: See EAD 266 for test points.

The power amplifier board contains two digital to analog converters (DAC), one for each reel motor. The DACs convert the digital signals supplied by the digital servo card into analog current for use by the motors. Digital data is loaded into two 8-bit registers on the power amplifier board and gated into the correct digital to analog converter by 'load file dac' or 'load machine dac'. Logic on the power amplifier board checks for odd parity on the input to the registers. If even parity is detected, '+ dac parity error' changes to an up logic level, and CHK 4D is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU073) power amplifier cable PA-J1 to 02A-A1Y1
2. (FRU210) message display cable 02A-A1Y2 to P1-DISP-P1
3. (FRU211) message display cable P1-DISP-P1 to MDJ1
4. (FRU060) message display board
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between FRUs on this EAD
7. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective

4. If the "4D" is displayed on the drive message display, start at step 6. If the drive message display is blank and the "4D" was found in SENSE, start at step 5.
5. Set up an oscilloscope at 2.0 volts/division and 0.5 microseconds/division. Sync plus on channel 1. Connect channel 1 to each point **(A)**, one by one, and check for a down logic level pulse approximately every 0.5 microseconds.

   If any line remains at a down logic level, check for a short circuit between that line and ground or suspect FRU085. If any line remains at an up logic level, the problem is in the area of FRU058 or FRU085. If all lines pulse correctly, repeat this procedure and check the signals at points **(D)** and **(G)** respectively. If any line remains at an up logic level at **(D)**, the failure is in FRU058. If the signals are correct at **(D)** and remain at an up logic level at **(G)**, the failure is in the area of FRU073 or FRU058.
6. With the oscilloscope set as in step 5, connect channel 1 to point **(B)**. Load a scratch cartridge. Check for a down logic level pulse early in the load operation. If the signal is correct at **(B)**, perform the same steps for point **(C)**. If either pulse is missing, the failure is in the area of FRU058 or FRU085. If either line is at the down logic level all the time, check for a short circuit between that line and ground.

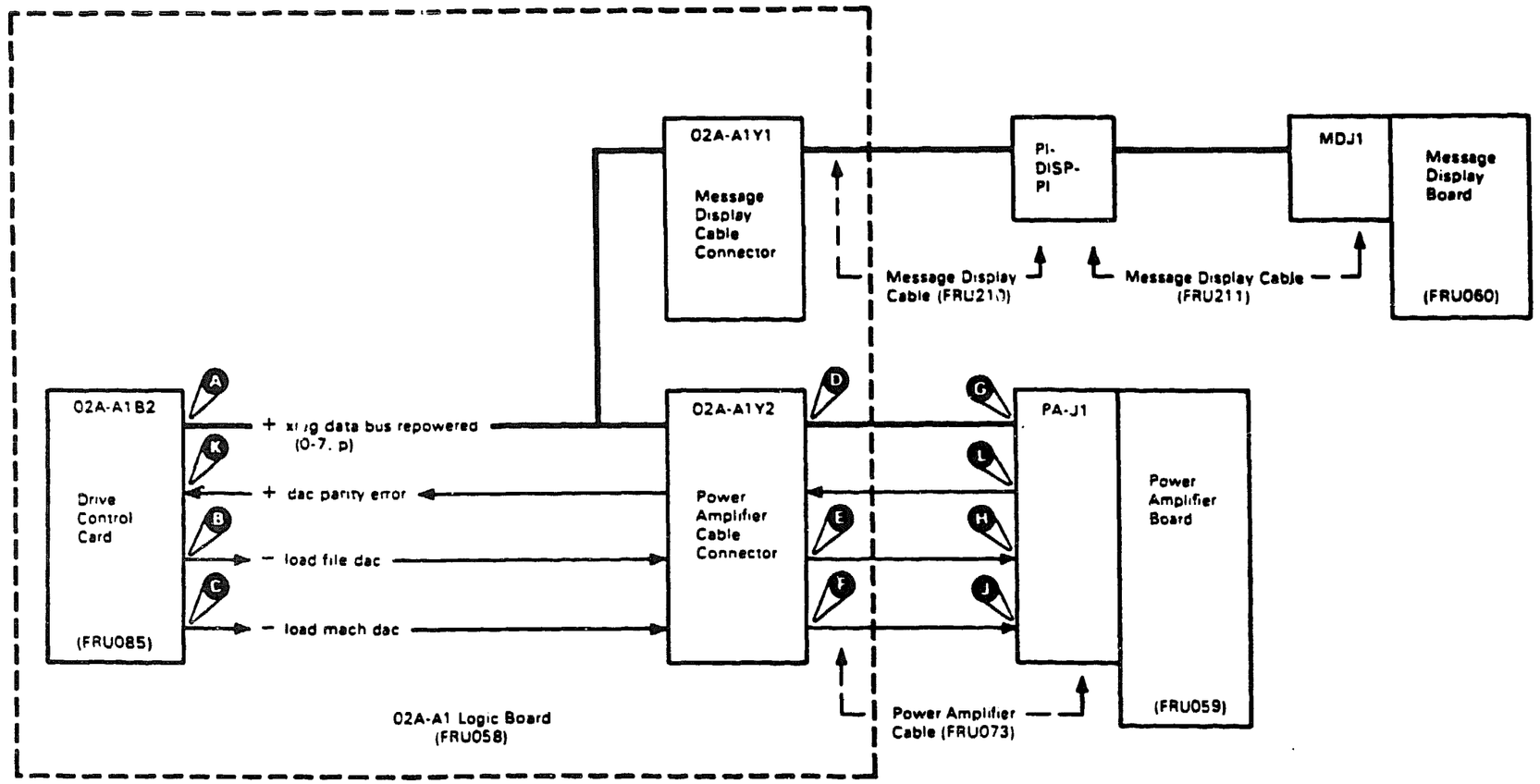
   If the signals are correct here, repeat the procedure checking the pulses at **(E)**, **(F)**, **(H)**, and **(J)**. If the signals are still correct, go to step 7.
7. Check point **(K)** for a down logic level. If **(K)** is at a continuous up logic level, check for an open circuit between **(K)** and **(L)**. If **(K)** is at a down logic level and all other troubleshooting has been attempted, suspect FRU058 or FRU085.
8. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
9. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5,6,7	LOC 1	Location of FRUs
5,6,7	CARR-DR 1-1	Removal and replacement procedures
8	CE/HSC 1	How to use the CE Panel

CHK 4D (Continued) **EAD 266**

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Code 50

Error Description

A parity error occurred on the message display.

Error Condition Theory

Note: See EAD 271 for test points.

Sixteen bytes of message data is loaded into RAM on the message display board from 'xreg data bus repowered'. The PLA on the message display board checks for odd parity on the input to the RAM. If even parity is detected, the '+ msg disp bus parity error' line is activated to the digital servo card, the message is not displayed, and error code 50 is set in the sense bytes.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU073) power amplifier cable 02A-A1Y1 to PA-J1
2. (FRU059) power amplifier board
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Set up an oscilloscope at 2 volts/division vertical deflection and 0.5 microseconds/division horizontal deflection. Sync plus on channel 1. Connect channel 1 to each point **(A)**, one by one, and check for a down logic level pulse approximately every 0.5 microseconds. If any line stays at a down logic level, check for a short circuit between that line and ground or suspect FRU085. If any line stays at an up logic level, the failure is in the area of FRU058 or FRU085. If all lines are pulsing correctly, repeat this procedure and check the signals at point **(B)**. If any line stays at an up logic level at **(B)**, the failure is in the area of FRUs 211, 210, or 058.
5. Press the fault button for the adapter that controls this drive. This will cause the adapter to repeatedly write the drive number in its display.
6. Set up an oscilloscope at 10 microseconds/division horizontal deflection and 5 volts/division vertical deflection and sync minus internal. Connect channel 1 to point **(C)**. Check for an up logic level with a down logic level pulse approximately every 25 microseconds. If **(C)** is at an up logic level with no pulsing, the failure is in the area of FRU085 or there is an open circuit in FRU058 between FRU085 and point **(C)**. If **(C)** is at a continuous down logic level, check for a short circuit between net '$SCMDLODM' and ground. If **(C)** is operating correctly, repeat this step using point **(D)** and net '$SCLDMSGM'.
7. If the logic levels are correct at points **(C)** and **(D)**, check them at points **(E)** and **(F)** respectively. If either is a continuous up logic level, check for an open circuit in the associated net. If **(E)** and **(F)** are correct, go to step 8.
8. Check point **(G)** for a down logic level. If **(G)** is at an up logic level, check for an open circuit in net '$MDERRORP' between FRU085 and FRU060.
9. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
10. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

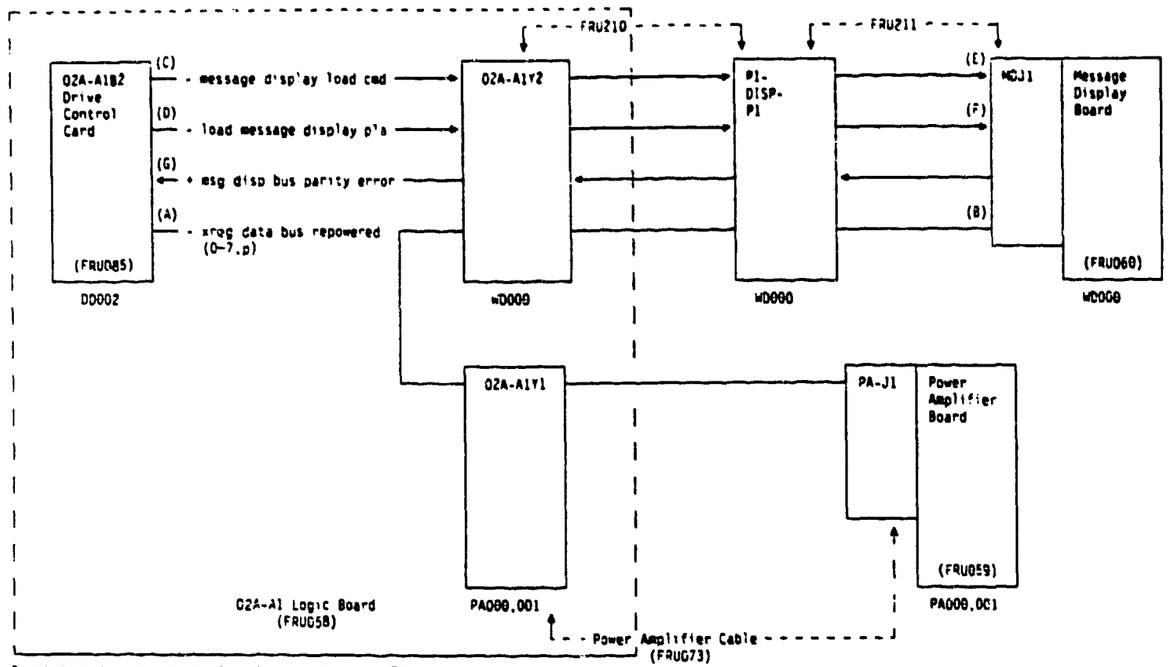
Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4,6	LOC 1	Location of cables and connectors
4,6	CARR-DR 1-1	Removal and replacement procedures
5	PANEL 1	How to operate the drive
6,7,8	FEALDS	Net wire list for point-to-point wiring
9	CE/HSC 1	How to use the CE Panel

Net Name to Line Name Cross Reference

Net Name	Line Name	FRUs	Level
$SCXRDATA	- xreg data bus repowered	085,210,211, 060,073,059, 058	Pulsing
$SCMDLODM	- message display load command	085,210,211, 060,058	Up level at rest, pulsing down when loading display
$SCLDMSGM	- load message display pla	085,210,211, 060,058	Up level at rest, pulsing down when loading display
$MDERRORP	+ msg disp bus parity error	085,210,211, 060,058	Normal = down level; fail = up level

Error Code 50 (Continued)

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Description

CHK 60 specifies that machine reel tach 1 phase B signal has failed after a thread/load or mid-tape load operation or that the cartridge present sensor failed during a thread/load operation.

Error Condition Theory

Note: See EAD 281 for test points.

A counter is loaded initially and at each machine reel tach 1 phase B occurrence. Tach 2 pulses decrement this counter. If the counter reaches 0 before the next tach 1 phase B occurs, a CHK 60 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. (FRU079) dc power distribution cable, drive internal-J1, J2
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostic and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. For a continuous failure, go to step 5; for an intermittent failure, go to step 9.
5. With a cartridge inserted, check for +5.0 volts at point (G). If the voltage is correct, go to step 6. If the voltage is at a down logic level, check to make sure the flag is engaging the LED assembly correctly. If the sensor is working correctly, check for a short circuit between point (G) and ground (E).
6. Check the voltage at (A) for the sensor that is failing. The voltage should be between +1.4 volts and +2.2 volts. If the voltage is more than +2.2 volts, check for an open circuit in FRU081 between points (A) and (B). (Note that there is a diode in the circuit. If the meter shows an open circuit, reverse the meter leads to verify that the circuit is really open.) If the voltage is less than +1.4 volts, the failure is in FRU085, or there is a short circuit between (A) and ground (F) in FRUs 058, 081, 225, or 226. If the voltage is correct, go to step 7.
7. Connect the oscilloscope to point (C) for each tach phase A and B. Manually rotate the machine reel motor and check for a change from +0.4 volts to +5 volts as the sensors go from light to dark. If either sensor fails to change to an up logic level, check for a short circuit between point (C) for that sensor and ground. If either sensor fails to change to a down logic level, check for an open circuit between point (C) and point (D) for that sensor. If no short circuits or open circuits can be found, the failure is in the area of FRU058 or FRU085.
8. Lower the power amplifier board and disconnect J7. Check for approximately 4 ohms between J7-1 and J7-2. If the resistance is not correct, suspect FRU004 or FRU079.
9. Follow these procedures only for an intermittent failure.

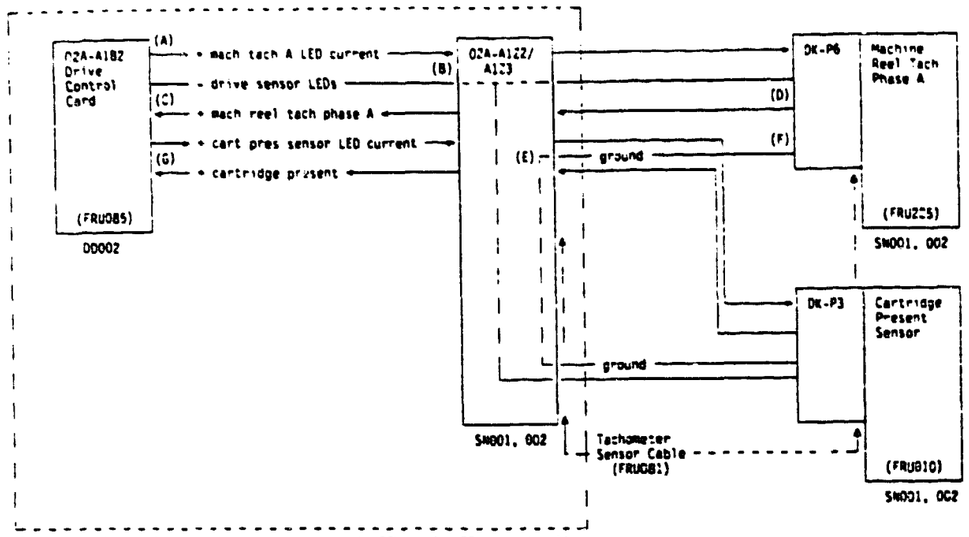
   Load a scratch cartridge and move the Ready/Not Ready switch to the Ready position. Run ILTAPE to write a record (WRT) and rewind (REW). This procedure permits you to scope the sensors while the tape is moving.
10. Sync the oscilloscope plus internal with the settings at 5 volts/division vertical and 10 milliseconds/division horizontal. Display phase A (C) on channel 1 and phase B (C) on channel 2. Look for phase A to differ from phase B by 90 degrees. (See the phase diagram of the error diagram.) Also check for any irregular signals on either phase. If either pulse is irregular, check for a broken or cracked flange or the seating of FRU081.
11. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
12. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5	LOC 1	Location of FRUs
6	CARR-DR 1-1	Removal and replacement procedures
9	CE/HSC 1	How to run ILTAPE from the HSC
11	CE/HSC 1	How to use the CE Panel

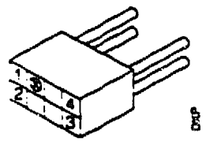
CHK 60 (Continued)

Error Diagram



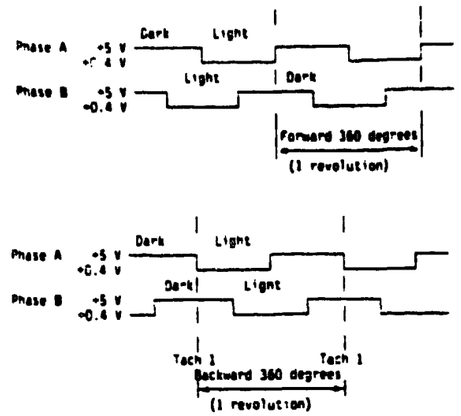
Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

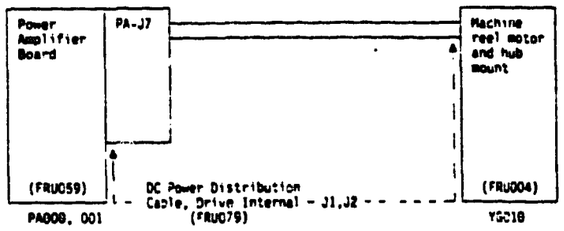
Note: Point (A) Norm +1.4 volts to +2.2 volts
Fail +5.0 volts
Point (C) Light +0.4 volts
Dark +5.0 volts



Plug DK-P3 and and DK-P6 (Pin Side)

Phase Diagram





CHK 63

Error Description

CHK 63 specifies that machine reel tach phase A signal has failed after a thread/load or midtape load operation or that the cartridge present sensor failed during a thread/load operation.

Error Condition Theory

Note: See EAD 296 for test points.

A counter is loaded initially and at each machine reel tach phase A pulse. Tach 2 pulses decrement the counter. If the counter reaches 0 before the next machine reel tach phase A pulse, a CHK 63 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU081) tachometer sensor cable
2. (FRU079) dc power distribution cable, drive internal-J1, J2
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostic and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. For a continuous failure, go to step 5; for an intermittent failure, go to step 9.
5. With a cartridge inserted, check for +5.0 volts at point **(G)**. If the voltage is correct, go to step 6. If the voltage is at a down logic level, check to make sure the flag is engaging the LED assembly correctly. If the sensor is working correctly, check for a short circuit between point **(G)** and ground **(E)**.
6. Check the voltage at **(A)** for the sensor that is failing. The voltage should be between +1.4 volts and +2.2 volts. If the voltage is more than +2.2 volts, check for an open circuit in FRU081 between points **(A)** and **(B)**. (Note that there is a diode in the circuit. If the meter shows an open circuit, reverse the meter leads to verify that the circuit is really open.) If the voltage is less than +1.4 volts, the failure is in FRU085, or there is a short circuit between **(A)** and ground **(F)** in FRUs 058, 081, or 225. If the voltage is correct, go to step 7.
7. Connect the oscilloscope to point **(C)** for each tach phase A and B. Manually rotate the machine reel motor and check for a change from +0.4 volts to +5 volts as the sensors go from light to dark. If either sensor fails to change to an up logic level, check for a short circuit between point **(C)** for that sensor and ground. If either sensor fails to change to a down logic level, check for an open circuit between point **(C)** and point **(D)** for that sensor. If no short circuits or open circuits can be found, the failure is in the area of FRU058 or FRU085.
8. Lower the power amplifier board and disconnect J7. Check for approximately 4 ohms between J7-1 and J7-2. If the resistance is not correct, suspect FRU004 or FRU079.
9. Follow these procedures only for an intermittent failure.

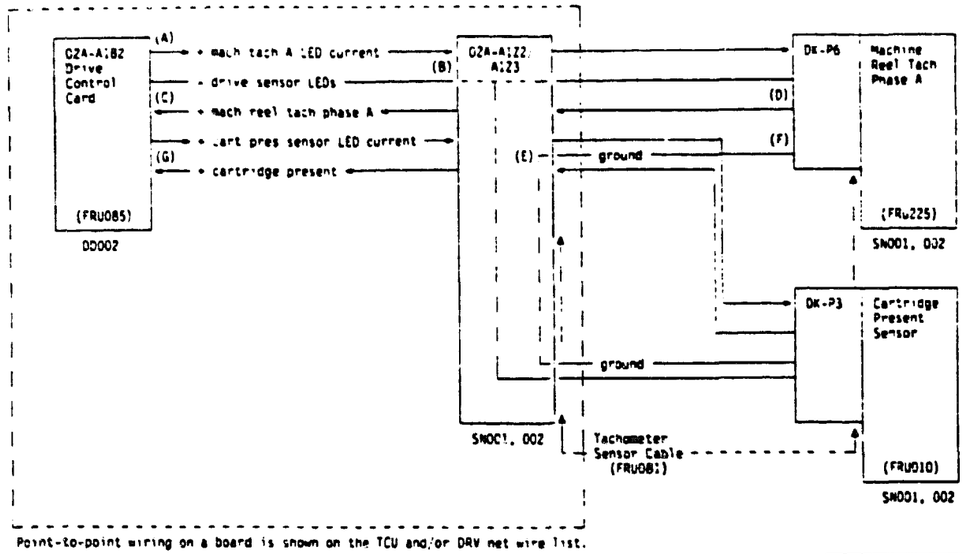
   Load a scratch cartridge and move the Ready/Not Ready switch to the Ready position. Run ILTAPE to write a record (WRT) and rewind (REW). This procedure permits you to scope the sensors while the tape is moving.
10. Sync the oscilloscope plus internal with the settings at 5 volts/division vertical and 10 milliseconds/division horizontal. Display phase A **(C)** on channel 1 and phase B **(C)** on channel 2. Look for phase A to differ from phase B by 90 degrees. (See the phase diagram of the error diagram.) Also check for any irregular signals on either phase. If either pulse is irregular, check for a broken or cracked flange or the seating of FRU081.
11. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
12. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5	LOC 1	Location of FRUs
6	CARR-DR 1-1	Removal and replacement procedures
9	CE/HSC 1	How to run ILTAPE from the HSC
11	CE/HSC 1	How to use the CE Panel

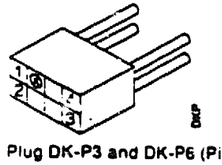
CHK 63 (Continued) **EAD 296**

Error Diagram



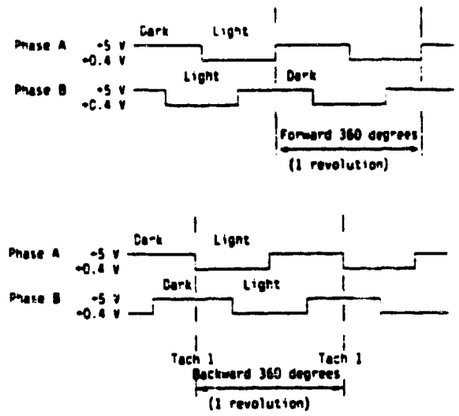
Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

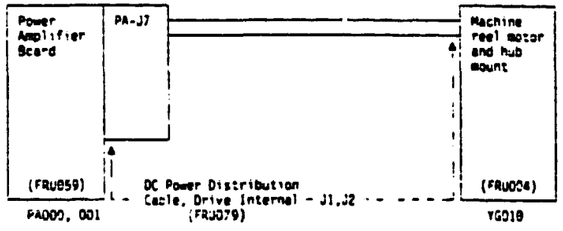
Note: Point (A) Norm +1.4 volts to +2.2 volts
Fail +5.0 volts
Point (C) Light +0.4 volts
Dark +5.0 volts



Plug DK-P3 and DK-P6 (Pin Side)

Phase Diagram





Error Description

An interruption occurred on tape path sensor A, tape path sensor B, or the cartridge latched sensor on a loaded drive.

Error Condition Theory

Note: See this page for test points.

One of the functions of the tape path sensors (FRUs 008 and 007) and the cartridge latched sensor (FRU 011) is to check the loaded status of the drive. When the drive is loaded and a sensor changes from its normal status (sensor A lighted, sensor B dark, and cartridge latched sensor dark), the drive sets a CHK 69. CHK 69 also occurs if the voltage path of sensor A becomes open at the cable, the logic board, or the digital servo card (causing a sensor A dark).

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU011) cartridge latched sensor
2. (FRU001) threader assembly
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

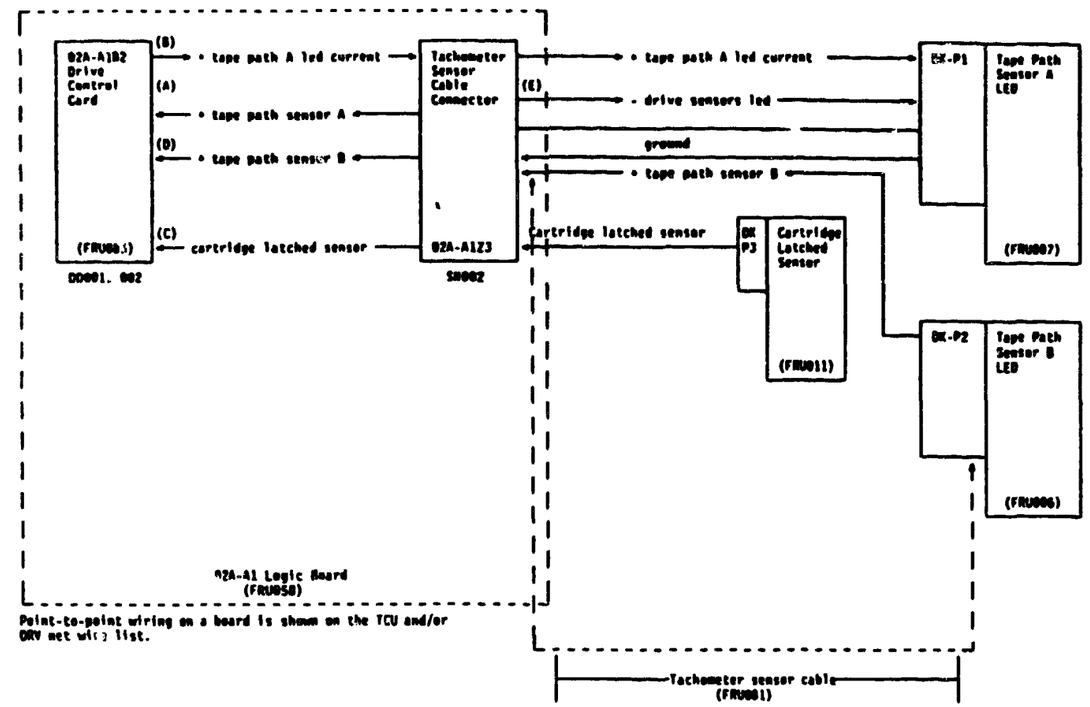
   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

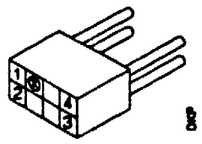
4. Check the threader assembly (FRU001) for a bent carrier pin. This could cause a wobble while running, further causing the flag to move out of tape path sensor B (FRU007)
5. With the drive loaded, check for +0.5 volts at (A) and +1.5 volts at (B). If (B) is less than 1.4 volts check for a short to ground in FRUs 081, 007, and 058. If (B) is over +2.2 volts, check for an open circuit between (B) and (E) (Note that there is a diode in the circuit; reverse your ohm meter leads).
6. With the drive still loaded, check for +5.0 volts at (C) and (D).
7. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
8. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	LOC 1	Location of cables and connectors
4	CARR-DR 1-1	Location of cables and connectors
7	CE/HSC 1	How to use the CE Panel

Error Diagram





Plug DK-P1, DK-P2, and DK-P3 (Pin Side)

Error Code A0

Error Description

'Select out' became not active after address verification and before 'command out' or 'ending status'.

Error Condition Theory

Note: See this page for test points.

Whenever 'select out' is not active, all inbound lines except the bus presenting alerts must become inactive. Any operation currently in process over the interface must be reset. Operations at the drive continue to a normal stopping point.

When 'select out' becomes inactive and is not interlocked with other tags, it must remain not active for a minimum of 200 microseconds. The 200 microsecond delay permits the drive to respond to a servo interrupt, which may occur at the completion of an ending sequence, without missing the changing of 'select out' from active to not active and back to active. Any serial sequence is exempt because it can operate when 'select out' is either active or not active.

'Select out' becoming active signals the start of the initial sequence. 'Select out' requires all drives to remove all waiting alerts from the bus in 200 microseconds or less. 'Select out' must remain active during all of the connected portion of the operation. 'Select out' must become not active and remain not active for at least 200 microseconds before another initial sequence can be started.

'Select out' is reset if:

- The command was a control command with no data to be transferred.
- The command was an immediate command.
- The status byte contained unusual or unexpected information.

'Select out' remains set if:

- The command was a burst command.
- The command was a control command with data to be transferred.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure.

1. Drive I/O cables
2. Tape control unit to drive interconnection cables
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1

Troubleshooting Guide

1. Verify that all FPUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

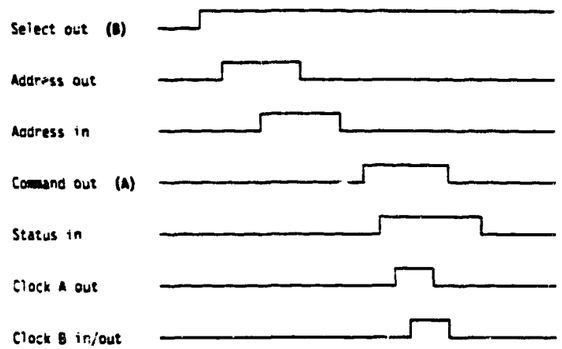
4. Run ILTAPE to repeatedly write a record, then rewind. Scope the 'command out' line **(A)** and 'select out' line **(B)** to determine when 'select out' is becoming not active before 'status in'.
5. Continue scoping while checking the connecting cables between the tape control unit and the drive, looking for unusual or deteriorating logic levels or signals.
6. Check the I/O cables A2, A3, A4, and A5 on the drive logic board for loose or bad connections.
7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	CE/HSC 1	How to run ILTAPE from the HSC
5,6	LOC 1	Location of cables and connectors
7	CE/HSC 1	How to use the CE Panel

Error Diagram

See the tape control unit to drive cabling diagrams in the ALD volume of the maintenance guide.



Error Code A2

Error Description

A2 – 'Command out' became not active before presenting status.

Error Condition Theory

Note: See this page for test points.

'Command out' is a line from the tape control unit to all attached drives. The command must be valid on the bus before 'command out' becomes active. 'Command out' is a response to 'address in' becoming not active during the initial sequence and indicates to the selected drive that the command is valid on the bus. 'Command out' remains active until 'status in' is received from the drive. When 'status in' is received, the tape control unit removes the command from the bus, reads the status bytes, and makes 'command out' not active.

When 'command out' becomes active during the data transfer sequence, it stops the transfer operation in progress, and there is no information on the bus associated with the tag. 'Status in' becomes active in response to this 'command out'. After 'status in' becomes active, the signals on the interconnections operate the same as in the initial sequence.

'Command out' used as a response to 'clock B in' during the sense-control-transfer sequence indicates stop. 'Clock B in' becomes not active in response to 'command out' becoming active.

'Command out' active, as a response to 'status in' during an ending sequence, indicates to the selected drive that the status on the bus has been accepted and the bus is not required to be valid. 'Command out' becomes not active after 'status in' becomes not active.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Drive I/O cable (01A-A2, A3, A4, A5)
2. Tape control unit to drive interconnection cables
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

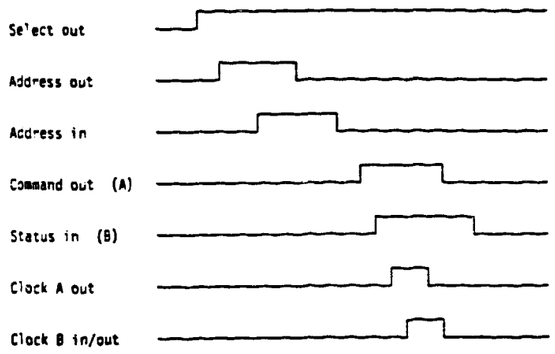
4. Run ILTAPE to repeatedly write a record and then rewind. Scope the 'command out' line **(A)** and 'status in' line **(B)** to determine where 'command out' is becoming not active before 'status in'.
5. Continue scoping while checking the connecting cables between the tape control unit and the drive, looking for unusual or deteriorating logic levels or signals.
6. Check the I/O cables A2, A3, A4, and A5 on the drive logic board for loose or bad connections.
7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	CE/HSC 1	How to run ILTAPE from the HSC
5,6	LOC 1	Location of cables and connectors
7	CE/HSC 1	How to use the CE Panel

Error Diagram

See the tape control unit to drive cabling diagrams in the ALD volume of the maintenance guide.



Error Code A9

Error Description

A9 – 'Command out' or 'select out' became not active before loading the command.

Error Condition Theory

Note: See this page for test points.

'Command out' is a line from the tape control unit to all attached drives. The command must be valid on the bus before 'command out' becomes active. 'Command out' is a response to 'address in' becoming not active during the initial sequence and indicates to the selected drive that the command is valid on the bus. 'Command out' remains active until 'status in' is received from the drive. When 'status in' is received, the tape control unit removes the command from the bus, reads the status bytes, and makes 'command out' not active.

When 'command out' becomes active during the data transfer sequence, it stops the transfer operation in progress, and there is no information on the bus associated with the tag. 'Status in' becomes active in response to this 'command out'. After 'status in' becomes active, the signals on the interconnections operate the same as in the initial sequence.

'Command out' used as a response to 'clock B in' during the sense-control-transfer sequence indicates stop. 'Clock B in' becomes not active in response to 'command out' becoming active.

'Command out' active as a response to 'status in' during an ending sequence indicates to the selected drive that the status on the bus has been accepted and the bus is not required to be valid. 'Command out' becomes not active after 'status in' becomes not active.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Drive I/O cable (01A-A2, A3, A4, A5)
2. Tape control unit to drive interconnection cables
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD
5. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

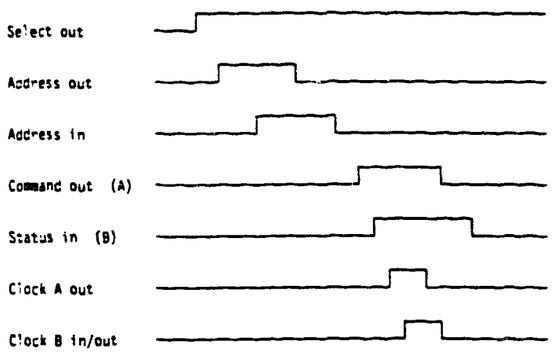
4. Run ILTAPE to repeatedly write a record and then rewind. Scope the 'command out' line (A) and 'status in' line (B) to determine where 'command out' is becoming not active before 'status in'.
5. Continue scoping while checking the connecting cables between the tape control unit and the drive, looking for unusual or deteriorating logic levels or signals.
6. Check the I/O cables A2, A3, A4, and A5 on the drive logic board for loose or bad connections.
7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	CE/HSC 1	How to run ILTAPE from the HSC
5,6	LOC 1	Location of cables and connectors
7	CE/HSC 1	How to use the CE Panel

Error Diagram

See the tape control unit to drive cabling diagrams in the ALD volume of the maintenance guide.



Error Code C0

Error Description

A default condition occurred on a w. ' operation

Error Condition Theory

Note: See EAD 456 for test points.

Three encoded RAS lines are supplied to indicate 1 of 7 possible error conditions. These lines are sent from the write card to the digital servo card, where the tape control unit checks them for the correct status.

After a power on, all three RAS lines (bits) are set to the default status (000). The tape control unit then checks to verify that the lines are set to the default status. If the lines are correct, 'write enable' changes to a down logic level, and the write operation can start. At the end of each write operation, the tape control unit checks the RAS lines again. If the write operation was successful, the write-valid bit is on (001). If the RAS lines are still in the default status, CHK C0 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU184) top card connector ZPQ
2. (FRU058) logic board 02A-A1
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

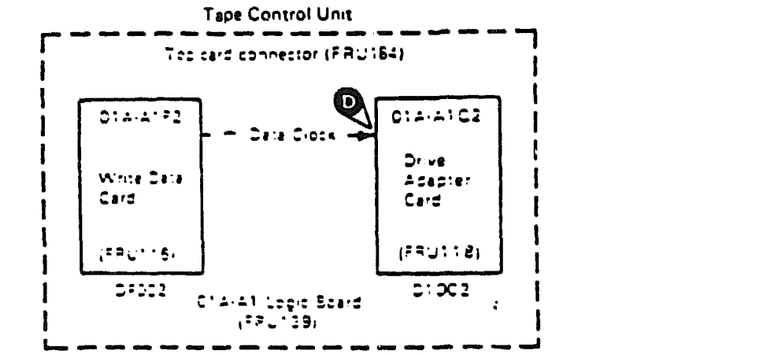
4. Run ILEXER. If the diagnostic detects failures, it reports them directly.
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

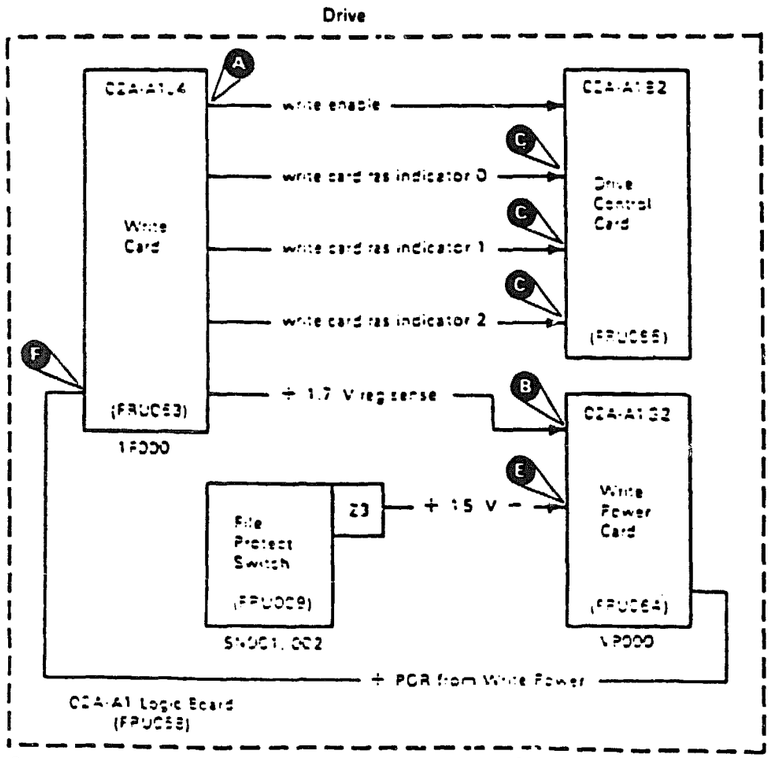
References

Step	Ref Page	Description/Comments
1	CARR-DR 1-1	Removal and replacement procedures
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	CE/HSC 1	How to run ILEXER from the HSC

Error Code C0 (Continued)

Error Diagram





Point-to-point wiring on a board is show on the TCU and/or DRV net wire list.

WRITE CARD RAS INDICATOR	
BITS: 0,1,2	MEANING
000	Default
001	Write Valid
010	Parity Error
011	Phase Lock Loop Error
100	Open (Head/Cable) Fault
101	Interconnection Fault
110	Card Fault
111	Regulator Fault

CHK C2

Error Description

A parity error was sensed on the write card (FRU063).

Error Condition Theory

Note: See EAD 461 for test points.

Nine data lines multiplex data out of the tape control unit write data card to become write data to the drive. These lines are active only during a normal write operation. Lines zero through eight contain the NRZI data to be recorded on tape. Line nine is an odd parity bit line.

The data sent from the tape control unit to the drive is checked for parity. The write card checks for odd parity on the data received from the tape control unit and sets CHK C2 when it detects even parity.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU058) logic board 02A-A1
2. (FRU139) logic board 01A-A1
3. (FRU184) top card connector ZPQ
4. Interconnecting cables between the tape control unit and the drive
5. Source voltages at the input to the FRUs on this EAD
6. Cables, connectors, and nets between FRUs on this EAD.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

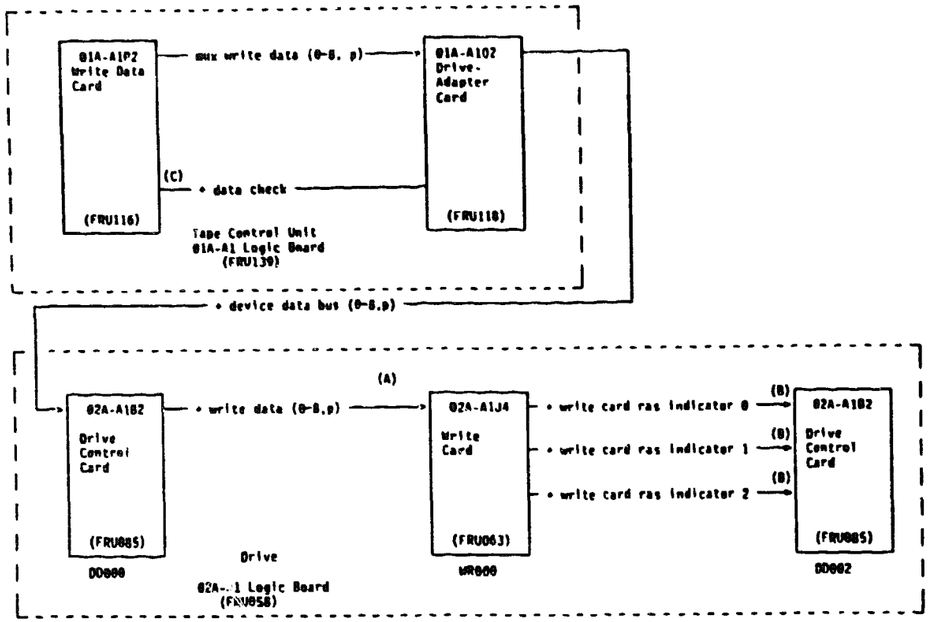
4. Look at sense bytes 10, 11, 16 and 17. If they contain D1nn, D2nn, D5nn, D6nn, or D7nn, go to the error analysis diagram for that error code for repair information. If they contain D4nn (where nn = 0–7) with bits 1 or 2 on, go to the EAD for that error code. The EADs for the Dnnn error codes talk about both tape control unit and drive failures. Review the error log to determine if these failures are occurring on more than one drive. Failures on more than one drive indicate that the failure is in the tape control unit. If no correction is made by the EADs for the Dnnn error codes, return here to analyze the problem in the drive that has the most failures.
5. Run ILEXER. If the diagnostic detects failures, it reports them directly.
6. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
7. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
4	MSG 1	Drive detected error log information
4	CE/HSC 1	How to run ILEXER from the HSC
5	CE/HSC 1	How to use the CE Panel

CHK C2 (Continued)

Error Diagram



Point-to-point wiring on a boar.· is shown on the TCU and/or DRV net wire list.

WRITE CARD RAS INDICATOR	
BIT: 0,1,2	MEANING
000	Default
001	Write Valid
010	Parity Error
011	Phase Lock Loop Error
100	Open (Head/Cable) Fault
101	Interconnection Fault
110	Card Fault
111	Regulator Fault

Error Description

The phase locked loop is not synchronized

Error Condition Theory

Note: See this page for test points

This error indicates that the 'clock sync' line (A) is not locked in phase and frequency with the phase locked loop (PLL) reference clock signal on the write card (FRU063) during a write operation. This causes a 'write card ras indicator' bit (B) combination to be set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU058) logic board 02A-A1
2. Source voltages at the input to the FRUs on this EAD
3. Cables, connectors, and nets between FRUs on this EAD.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

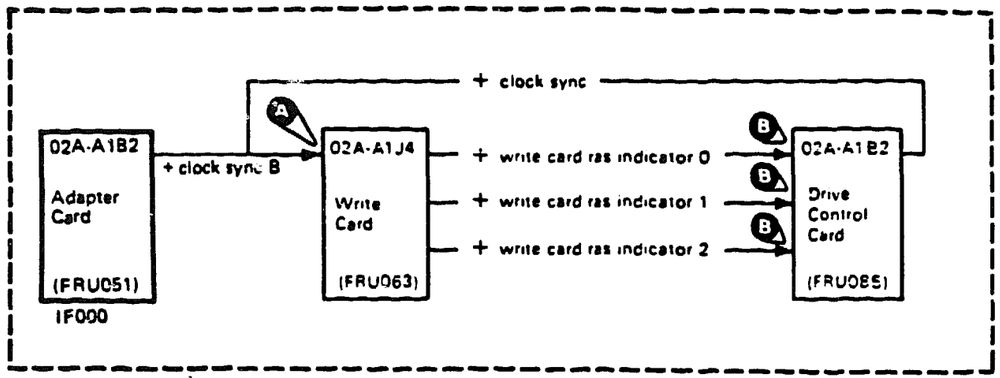
4. Run ILEXER. If the diagnostic detects failures, it reports them directly.
5. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
6. See EAD 2 for "Drive Interconnections EAD."
7. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5	LOC 1	Location of cables and connectors
4	CE/HSC 1	How to run ILEXER from the HSC
6	CE/HSC 1	How to use the CE Panel

Write Card RAS Indicator	
Bits: 0,1,2	Meaning
000	Default
001	Write Valid
010	Parity Error
011	Phase Lock Loop Error
100	Open (Head/Cable) Fault
101	Interconnection Fault
110	Card Fault
111	Regulator Fault

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

CHK C5

Error Description

A RAS interconnection fault was detected.

Error Condition Theory

Note: See EAD 476 for test points.

Normal write operation is sensed when '- write enable' (B) changes to a down logic level. From this time, a continuous check is made by the write card (FRU063) to ensure that '+ read bias' (A) does not change to a down logic level when 'write enable' is at a down logic level. If 'write enable' and 'read bias' are at a down logic level at the same time, the write operation is stopped and CHK C5 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Source voltages at the input to the FRUs on this EAD
2. Cables, connectors, and nets between FRUs on this EAD
3. (FRU058) logic board 02A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

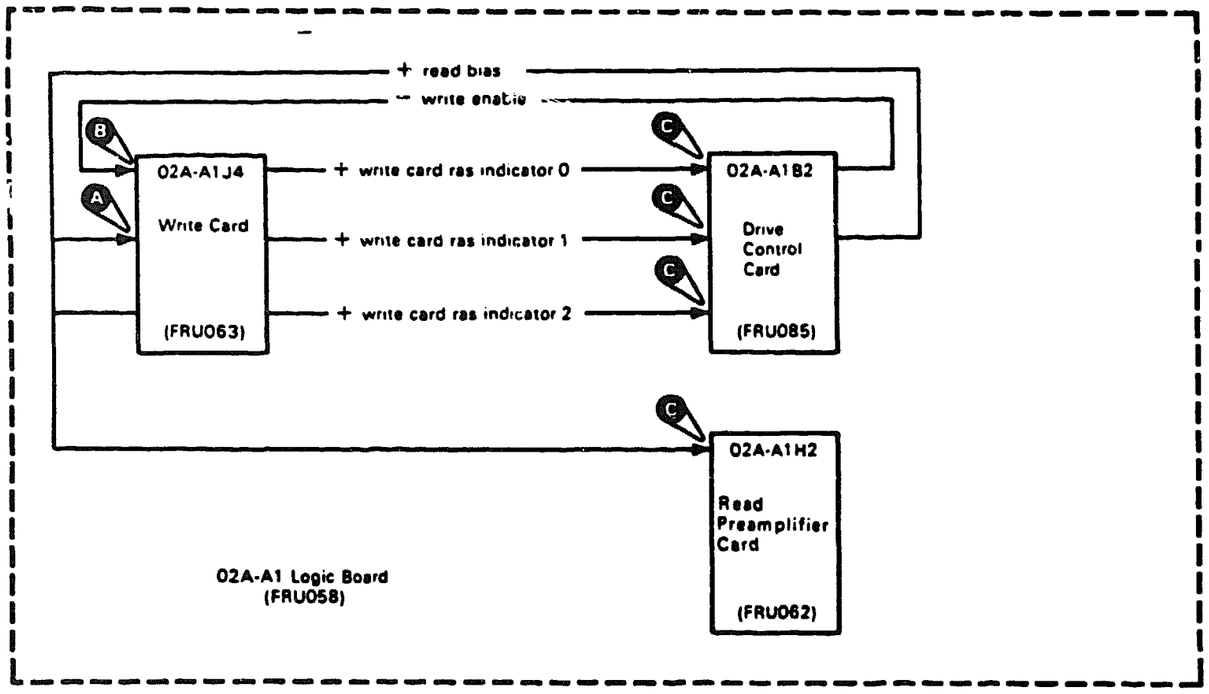
4. Insert a scratch tape in the tape transport unit, run ILTAPE, and select the commands DSE (date security erase) and REW (rewind).
5. Scope point (A) for a continuous +3.4 volts during an erase and rewind.
6. Scope point (B) for a down logic level (+0.2 volts) during an erase and +4 volts during a rewind command. Check for a deteriorated condition of either line (A) or (B).
7. Perform a reset on the drive and scope (C), the 'write card ras indicator' lines, for any bits being active. All of the (C) lines should be at a down logic level (0 volts).
8. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
9. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
4	CE/HSC 1	How to run ILTAPE from the HSC
7	CE/HSC 1	How to use the CE Panel

CHK C5 (Continued) **EAD 476**

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

WRITE CARD RAS INDICATOR	
BITS: 0,1,7	MEANING
000	Default
001	Write Valid
010	Parity Error
011	Phase Lock Loop Error
100	Open (Head/Cable) Fault
101	Interconnection Fault
110	Card Fault
111	Regulator Fault

Error Description

The drive detected a + 10.5 regulator fault.

Error Condition Theory

Note: See EAD 486 for test points.

This status indicates that a regulator failure has occurred. Regulators on the write power card supply the write drivers with + 10.5 volts. The '- turn on + 10.5v' line is used to turn on the + 10.5 volt regulators. The file protect switch supplies the '- turn on + 10.5v' to the voltage regulators.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU049) logic board to power amplifier J2 cable
2. (FRU058) logic board 02A-A1
3. Source voltages at the input to the FRUs on this EAD
4. Cables, connectors, and nets between FRUs on this EAD.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

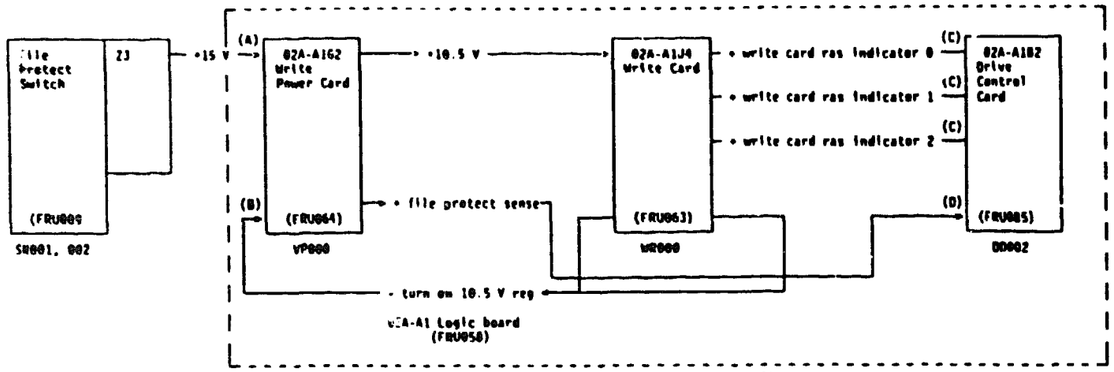
4. Insert a cartridge that is not file protected and check the display panel for READY U. If the U does not appear, check the area of FRU009 for an open condition.
5. Check for a logical down level (+ 0.1 to + 0.7 volts) on the '+ file protect sense' line (D).
6. Measure point (A). It should be + 15 volts with a tape cartridge that is not file protected inserted. (See the comments on logic page VP000.)
7. Connect '- turn on + 10.5v reg' to ground at point (C) to turn on the + 10.5v regulator voltage.
8. Measure the + 10.5 volts at FRU063 and FRU064. It should be + 10.2 volts to + 10.8 volts. Disconnect (B) from ground. (See the comments for voltage pin locations on logic pages VP000 and WR000.)
9. Run ILEXER. If the diagnostic detects failures, it reports them directly.
10. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, return to the FSI and do one of the following:
      - Perform any additional actions.
      - If there are no additional actions, **call your next level of support** and then go to SPROC 1 "End of Call Actions."
11. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
4	LOC 1	Location of FRU009
9	CE/HSC 1	How to run ILTAPE and ILEXER from the HSC
9	CE/HSC 1	How to use the CE Panel

CHK C7 (Continued)

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

WRITE CARD RAS INDICATOR	
BITS: 0,1,2	MEANING
000	Default
001	Write Valid
010	Parity Error
011	Phase Lock Loop Error
100	Open (Head/Cable) Fault
101	Interconnection Fault
110	Card Fault
111	Regulator Fault

Error Description - 74nn

During writing of the last record, a read back check error was detected in the read error register (RER) or the read status register (RSR).

Note: If sense bytes 10, 11, 16, or 17 contain D0nn, D6nn, or D8nn, use the FSI entry for the error code in sense bytes 16 and 17. This EAD should be used only for error code 741n (missing end sync). If any other bits are on, use this EAD first.

```
74 n  n
   0123 4567
            Multitrack error (bit 6) on in RSR
             (see D0nn/D8nnEAD)
           Data check (uncorr error, bit 5) on
            in RSR (see D0nn/D8nn EAD)
          Data check (CRC error, bit 4) on in
           RSR (see D0nn/D8nn EAD)
         FRU bits on in RER (see D0nn/D8nn EAD)
        No END SYNC was detected
       See FSC/Error Code 7420
      Reserved
     Reserved
```

At the end of a write data record operation, the write data flow logic writes pad characters (if needed) to complete the 71 data frames and then writes two sync characters (end sync). The postamble is then written.

The read data flow cards detect the end sync pattern as an indication of the end of a data record. The read data flow is the same for detecting begin sync, resync, and end sync. A failure to detect end sync is most likely an indication that end sync was not written.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. 01A-A1N2 Buffer storage card
2. 01A-A1M2 Buffer storage card
3. Tape and cartridge
4. 01A-A1 Logic board
5. 01A-A2 Logic board
6. 02A-A1 Logic board
7. The source voltages at the input to the FRUs in this EAD
8. The cables, connectors, and nets between FRUS in this EAD
9. Media.

Error Description - 76nn

During writing of the last record, a read error was detected.

Note: This EAD should be used in cases where bits 1 or 7 are on in the nn part of the error code. If any other bits are also on, use the EAD for those bits first.

```
76 n  n
   0123 4567
            No 'end sync' was detected
           BDSE error indicated (see D6nn EAD)
          FRU bits on in RER (see D0nn/D8nn EAD)
         Multitrack error indicator on in RER
          (see D0nn/D8nn EAD)
        Data check (uncorr error) on in RSR
         (see D0nn/D8nn EAD)
       Data check (CRC error) on in RSR
        (see D0nn/D8nn EAD)
      Device transfer complete not on in BDSE
     Acceleration Check on in RER
```

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. 01A-A1S2 Read clock and format card
2. 01A-A1K2 Buffer adapter card
3. 01A-A1 Logic board
4. 01A-A2 Logic board
5. 02A-A1 Logic board
6. The source voltages at the input to the FRUs in this EAD
7. The cables, connectors, and nets between FRUs in this EAD
8. Media.

No End Sync (Continued)

Troubleshooting Guide

Note: See this page for test points.

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. Failures can be caused by defective scan controls and clock lines. Verify the clocks going to the areas as shown on the clock pages of this MG.
4. For intermittent errors, perform the following procedures repeatedly or loop the identified diagnostics and scope the EAD test points.

   Note: If the troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time.

5. See the "Diagnostic Identification Code Table" on DIAG 3, and run the short loop write to read test or run ILTAPE using the commands that were failing on the user's job and scope the following signals for correct logic levels and tolerances.

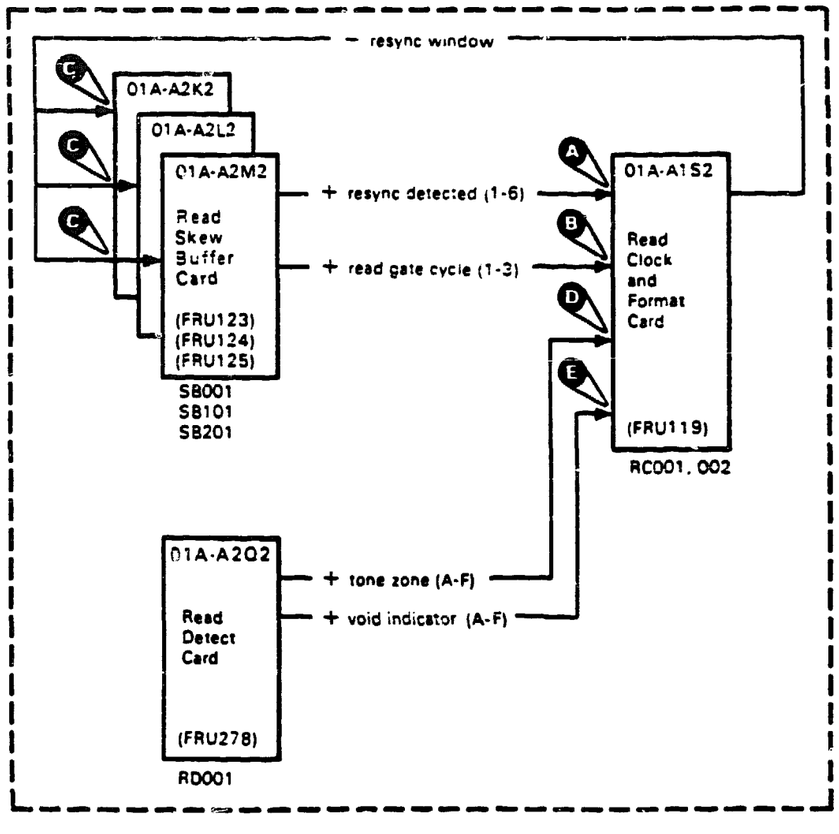
LOGIC NAME	TEST POINT
+resync detected (0-6)	A
+read gate cycle (1-3)	B
-resync window	C
+tone zone (A-F)	D
+VOID ind (A-F)	E

6. **If you have performed a repair action**, verify the correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, return to the FSI and do one of the following:
     - Perform any additional actions.
     - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."
7. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Maintenance Reference Table - No End Sync

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
5	CE/HSC 1	How to run GMP
5	CE/HSC 1	How to run ILTAPE from the HSC

Error Diagram



Error Codes D0nn and D8nn

Error Description

This EAD contains information about the Read Error Register (RER) and Read Status Register (RSR) that pertains to errors in the read data path.

- The RSR register contains the error information that is caused by one or more of the drives, defective media, or the data path between the tape control units and the drives.
- Error bits that are on in the RER register normally indicate a tape control unit problem that is internal to the tape control unit.
- It is possible that errors that cause bits to be set on in both RSR and RER registers may affect each other.
- If error bits are on in both the RER and RSR registers, use the error bits that are on in RER register first, to try to fix the problem.
  - Error bits that are on in the RSR register are D0nn error codes
  - Error bits that are on in the RER register are D8nn error codes.

The following is the list of diagnostics that will detect failures in the read data flow path:

GMP TCU Test	- Basic TCU check out - Data path tests - Basic tape motion test - Write/Read exerciser
ILTAPE	- HSC initiated commands

If you entered this EAD with other than a D0nn or D8nn error code and the RER and RSR register bits are not known, run the diagnostics first to obtain the error information needed to continue this EAD.

Note: Read errors may be caused by a problem on any drive attached to an interface (Local A or Remote B). Use GMP to run several drives, one at a time. If it fails on more than one drive, remove "Tee" connector from drive next to TCU and rerun EE54. If errors persist, remove "Tee" connector from next sequential drive and continue this procedure until EE54 runs error free. Trouble is in last drive that "Tee" connector was removed. Be sure to reconnect "Tee" connectors in drives that didn't fail. If the RER and RSR registers are zero, diagnostic EEA0 may need to be run for additional troubleshooting information.

Read problems can show up in many ways. Each specific FSC will have troubleshooting action for the logic in the FSI or EAD for that error code. If those actions have already been followed, use the "Drive Interconnections" to isolate the problem to a tape transport unit or tape control unit. See EAD 1 for "Drive Interconnections."

RER Register

Bit Description

0 Error detected in read skew buffer zone A and B

1 Error detected in read skew buffer zone C and D.

2 Error detected in read skew buffer zone E and F.

3 Acceleration Check.

4 CRC hardware error.

5 Parity error detected in the error correction circuitry.

6 Buffer data bus error.

7 Read clock and format card circuitry error. Read skew buffer error bits 0, 1, or 2 are set. Buffer data bus error bit 6 is set.

RSR Register

Bit Description

0 Indicates that the read data flow recognized the beginning sync of a record (activates interrupt level 3).

1 Indicates that the read data flow recognized the ending sync and sent the last byte of data to the buffer.

2 Indicates that a transition from BOB, tape mark, or erase gap to the IBG has occurred. This bit is set only if RCR register bit 6 is active.

3 Gap In - indicates that the end of the last record (read or write) was detected at the drive's read/write head.

4 Indicates that the ECC has determined that the read data needs correction. This bit is activated during ECC Enable or Disable.

5 Activated by one of the following conditions:

- ECC uncorrectable error
- Resync sequence error (resync did not occur or occurred when it should not have occurred). This indicates that the media may have been the failing FRU.

Check 2 is activated.

6 This bit is active when the ECC detects more pointers than are permitted by the ECC threshold. Check 2 is activated.

7 This bit indicates that the CRC was not zero at the end of a record. It also indicates that the media may have been the failing FRU. Check 2 is activated.

Common Troubleshooting Guide for D0nn and D8nn Errors

1. Run the ILTAPE fixed canned sequence and the ITLCOM write and read exerciser to isolate the failure.

2. See DF 1 for the RER and RSR and examine the information in the RER and RSR registers (from the diagnostic failure or from the nn byte of the D0nn or D8nn error code). To determine which troubleshooting guide to start with, use the first bit that is on in the RER register. Go to that troubleshooting information first and troubleshoot that bit, except for bit 3, and troubleshoot that bit last.

3. If troubleshooting that bit did not resolve the failure and other bits are on in the RER or RSR registers, use those bits and continue troubleshooting. If no other bits are on in the RER or RSR registers, start with bit 0 and follow all the troubleshooting information until the failure is resolved or "RER Bit 7 Troubleshooting Guide" has been completed without determining the failure.

4. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.

5. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.

6. When troubleshooting intermittent errors, loop the referenced diagnostics and scope the EAD test points. Look for unusual or deteriorating signal levels and troubleshoot accordingly.

7. Determine if the error occurs while reading a previously written good tape or only when writing new tapes. Run ITLCOM or system job to check.

8. Use GMP to run the 'Short Loop Write to Read' test. If this test fails, the problem is in the tape control unit.

9. If the error occurs only when using a tape drive, use ILTCOM to read from that drive.

10. Run the Drive Diagnostic and use the "Drive Interconnections" (see EAD 1) "Read Bus Problem Information" EAD to isolate the problem to a failing drive. If multiple drives are failing, but the short loop write to read does not fail, it is probably a data path problem. If the Dual Tape Control Unit feature is installed, see if the problem occurs on both local and remote tape control units and on both local and remote tape transport unit strings.

11. Try to determine which tracks are failing, and whether or not the 'loop write to read' fails. If some tracks are always in error, scope the lines in the data path corresponding to the tracks always in error while the diagnostic is running. If the returned data is X'55', it indicates that the track is always dead tracked.

12. If the tape control unit fails, scope the error bits that are indicated, using the reference diagram error points, while looping the 'Short Loop Write to Read'.

13. Scope the read clocks, using the EAD for reference, for correct levels. Read clock errors can result in 'hang conditions'.

14. If the above troubleshooting procedures indicate a failing FRU that has already been replaced by the product package, replace the FRU a second time (even if the FRU has been replaced before).

15. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, continue in this EAD with the next action.

16. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Maintenance Guide Reference Table for Common Troubleshooting Guide for D0nn and D8nn errors

Step	Ref Page	Description/Comments
5	PWR 1	Power
12	DIAG 1	Diagnostic options
13	EAD 1	Clocks
7	CE/HSC 1	How to run ILTCOM from the HSC
8	CE/HSC 1	GMP short LWR option
9,10	CE/HSC 1	How to run GMP
10	EAD 1	Drive interconnections

Error Codes D0nn and D8nn (Continued)

TCU Hardware Detected Error Code – Sense Bytes 16 and 17 Equals D0nn

Error Description

An error was detected in the read data path.

Error Condition Theory

Note: See EAD 2005 for test points.

An error detected in the read data path sets a check 2 error condition on a Read, Read Backward, or Read Back Check operation. Bits 5, 6, or 7 of the RSR register (read clock and format card) are set to indicate the error that was detected. Error code D0nn is set (nn equals bits 5, 6, and 7 in the RSR register.)

The ECC corrects most of the read data errors that are detected in the read data flow. These errors are reported in the status information as 'correction required'. A count of the records needing correction is maintained as Format 21 in the EREP data.

Uncorrectable data checks are indicated when Read ECC and Correction ECC card detects an uncorrectable data error or the Read Clock and Format card detects a resync error.

The ECC circuitry can detect up to three tracks in error as long as not all the tracks are in the same group of nine tracks. Four tracks in error can be corrected as long as not all of the tracks are in the same group. Correction of the fourth track in error depends on the hardware pointers from the read detection cards. If an error is detected in a track and corrected, a non-zero bit in the syndrome is set. If, after correction, a non-zero bit exists, the error was not corrected and an uncorrectable error (A) is signaled to the read clock and format card. Bit 5 is set in the RSR register.

The Resync sequence is also checked. The data format consists of two beginning sync frames followed by 71 frames of data. When the second sync frame in the beginning sync is recognized (or dead tracked) in all six tracks on a skew buffer card, the 'gate read cycle' line (C) is activated for that skew buffer and is sent to the Read Clock and Format card. The recognition of two or three 'gate read cycle' lines starts a read frame sequence. The 'modulo 18' counter is stepped to gate bytes into the Read ECC Correction card.

When the Read Skew Buffer sends the frame to the ECC card, the first six tracks that are read are analyzed. When at least three of the six tracks are active, a resync frame is recognized, and the 'resync detected' (8) line to the Read Clock and Format card is set. The sequence is checked to ensure that a resync frame occurs only at 72 frame intervals. If there are too many or too few data frames between the resync frames, bit 5 is set in the RSR register.

In a write operation, more than one track in error in a subset (a group of nine tracks) causes a Multi Track Error (bit 6) to be set. In a read operation, if more than three tracks in a subset or a total of four tracks have pointers, the Multi Track Error (bit 6) is set. The Multi Track Error set by itself on a read operation is not an error.

The write data flow generates the correct data format, which includes the two cyclic redundancy check (CRC) characters. These 16 bits are generated from the data and residual frames. The read data flow receives the data from the tape drive and generates another CRC character in the Read ECC and Correction card. The check character that is received and generated should be equal, resulting in a zero output and setting the 'CRC equals zero' line (D) to the Read Clock and Format card. If the check characters do not compare equal, it indicates that part of the data record was read wrong and the ECC circuitry did not correct the failure. A CRC error is signaled and bit 7 is set in the RSR register.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Tape media
2. FRU139 - 01A-A1 board
3. FRU140 - 01A-A2 Board
4. The source voltages at the input to the boards listed in this EAD
5. The cables, connectors, or nets between the FRUs listed in this EAD.

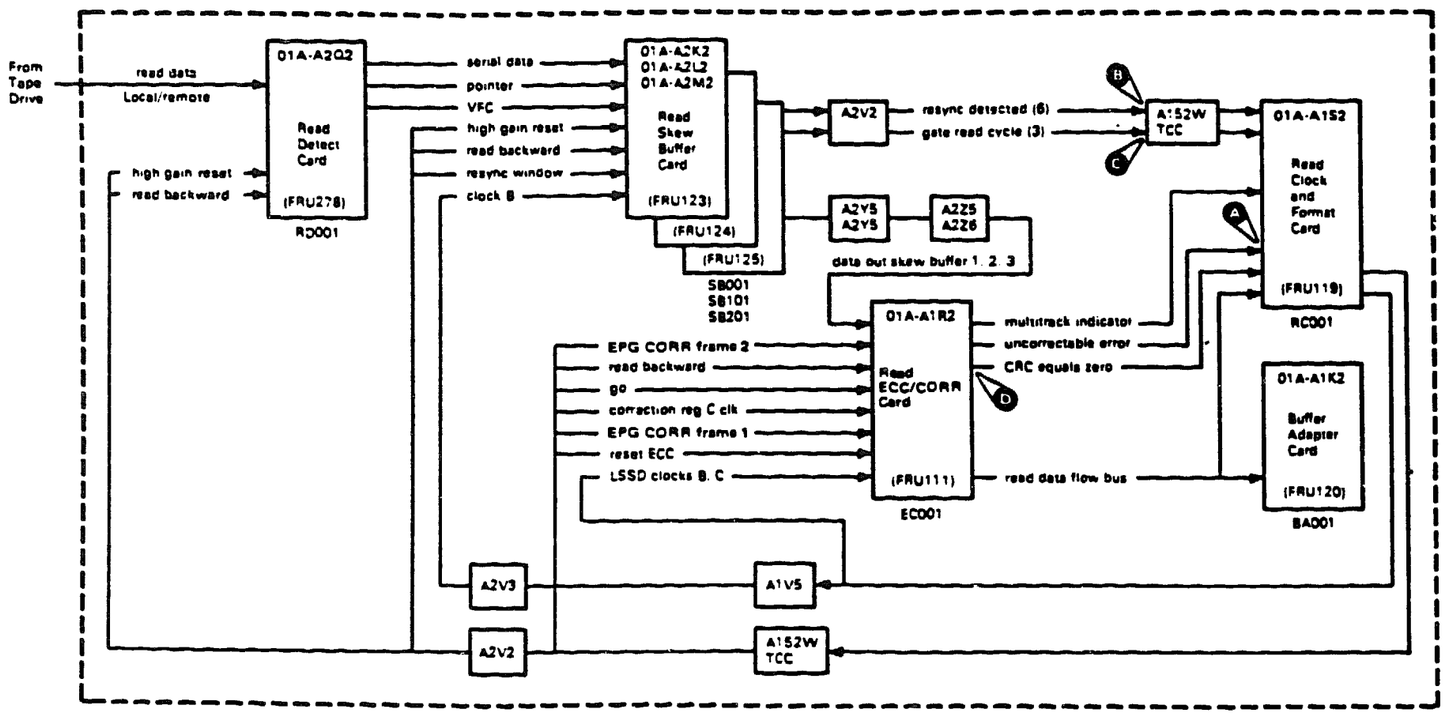
Error Diagram for Error Code D0nn

Error Codes D0nn and D8nn (Continued) EAD 2005

Net List for RSR Bits 5, 6, and 7

NET	LINE NAME	ERROR CODE
$ECRDFBUS (0-9,P)	+Read Data Flow Bus	D001
$RBUS1AL-9B	+/-Read Data Local/Remote	D005
$RDVFCTB1-T1B	+VFC Trk 1A-9B	D001
$RDSDATB1-T1B	-Serial Data TRK 1A-9B	D001
$RDPNTRB1-1B	-Pointer Trk 1A-9B	D001
$CLK01TP-1BTP	-Clock Test Point	D001
$VC001TP-1BTP	+Memory Voltage Test Point	D001
$SS01TP-1BTP	+Single Shot Test Point	D001
$RCRSTECC	+Reset ECC	D007
$RCCRREGCK	+Correction Reg C Clock	D001
$RC60	+60	D001
$ECCRCZRO	+CRC Equals Zero	D001
$RCEP6CF1	+EPG Completion Frame 1	D004
$RCEP6CF2	+EPG Completion Frame 2	D004
$RCBCCC00	+Backward Clock Control	D005
$RCRCKD00	-Read Backward	D007
$RCCLKEC00	-Demodulator Gate C	D003
$ECUNCERR	-Uncorrectable Error	D004
$ECMULTRK	-Multitrack Indicator	D002
$RCRSYW00	-Resync Window	D004

See the tape control unit logic for pin numbering and detail net information.
These error codes are found in SENSE/FSI for operating errors,
or in GMP output for GMP detected errors.



TCU Hardware Detected Error Code — Sense Bytes 16 and 17 Equals D8nn

Error Description

The read data flow path receives data from the drive and prepares the data for sending to the host system. The data is reformatted and any recoverable data errors are corrected before loading into the data buffer. The data path is parity checked to ensure data integrity. The correction hardware is checked to ensure correct operation.

FRU pointer bits are set in the Read Error Register (RER) for any errors that are detected. Any hardware errors set the check 2 signal, which is sent to the microprocessor.

Error Condition Theory

Note: See EAD 2015 for test points.

The following functional areas are part of the read data flow circuitry and failures are detected as D8nn error codes.

- Read detect cards
  1. Converts the 18 tracks of analog data from the drive to 18 tracks of digital data.
  2. Detects tones, zones, and voids that are used by the read clock format card.
  3. Only a small amount of error detection is done by these cards. Pointers to probable failing tracks are set when the analog signal amplitude goes below the threshold.
- Read skew buffer cards
  1. Provides the skew correction of the 18 tracks of digital data received from the read detect cards.
  2. Provides some error detection to the read ECC and correction card.
- Read ECC and correction card
  1. Converts the 18 tracks of deskewed digital data into two 8-bit bytes of data that is sent to the buffer adapter card.
  2. Provides error correction to the data bits.
  3. Provides error detection to the read clock and format card.
- Read clock and format card
  1. Provides the clocking to all the cards listed above.
  2. Provides all the control lines for presenting data to the buffer adapter card.
  3. Contains the RER and RPR external registers used for error detection and FRU isolation.
  4. Presents the detected error information about the read data flow to the microprocessor using the 'check 2' line and the RER external register contents.

Troubleshooting Information for RER Bits 0, 1, and 2

Error Description

RER, bits 0, 1, and 2, indicate possible error conditions associated with the read skew buffers.

Error Condition Theory

The read skew buffer detected errors are set by three different conditions:

- Condition 1 (see (A) on "Error Diagram for RER Bits 0, 1, and 2")

  The data format that is read consists of two sync symbols followed by the read data. When the second sync symbol is recognized, the '+gate read cycle' line is sent to the read clock and format card. When the read clock and format card receives the '+ gate read cycle' lines from two or three read skew buffer cards, it starts a read frame sequence. An error condition is indicated if the '+ gate read cycle' line from one card is not equal to the other two cards.

  For example, the '+ gate read cycle' line for read skew buffer 1 is active at the same time as the other two are inactive. Therefore, bits 0 and 7 (X'81') would be set in the RER register indicating that the read skew card 1 in failing.

  + gate read cycle (read skew buffer 1) equals +.
  + gate read cycle (read skew buffer 2) equals ±.
  + gate read cycle (read skew buffer 3) equals −.

  The hardware detected error code will be D881, D841, or D821.

- Condition 2 (see (B) on "Error Diagram for RER Bits 0, 1, and 2")

  Each read skew buffer card develops a '-ROC equal zero' line when a data frame has been read from the read skew buffer and the readout counter equals zero. An error is detected in the read clock and format card if the '-ROC equals zero' lines from each read skew buffer card do not compare equal. A comparison process is used to determine which read skew buffer card is in error. The card that is not like the other two is considered the failing card and the appropriate RER bit is set. RER bit 7 is also set to indicate the read clock and format card is a possible FRU.

  In the example, the '- ROC equals zero' line for read skew buffer 2 is inactive at the same time that the other lines are active. Therefore, bits 1 and 7 (X'41') are set in the RER indicating read skew buffer 2 is failing.

  + ROC equals zero'(read skew buffer 1) equals -.
  -ROC equals zero'(read skew buffer 2) equals +.
  + ROC equals zero'(read skew buffer 2) equals -.

  The detected hardware error code will be D881, D841, or D821.

- Condition 3 (see (C) on "Error Diagram for RER Bits 0, 1, and 2")

  RER bits 0, 1, and 2 can also be set by the read ECC and correction card. When the serial data enters the read skew buffer card, a 'check bit' is developed from the serial data parity, pointer, and the check bit generated from the internal register parity. After the deskew buffer's 'read in' and 'read out' operation, another bit is generated from the sequence checking circuitry, named 'address parity'. The 'check bit' and 'address parity' bits are compared in the read ECC and correction card. If one of the read skew buffers does not compare equal, a '+skew buffer error latched' line is sent to the read clock and format card and the appropriate RER bit is set. The error is detected in the read ECC and correction card, therefore, bit 5 of the RER is also set indicating it is a possible FRU.

The hardware detected error code will be D884, D844, or D824.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. FRU139 A1 board
2. FRU140 A2 board
3. The source voltages at the input to the boards in this EAD
4. The cables, connectors, or nets between the FRUs in this EAD.

Troubleshooting Guide

1. See the "Common Troubleshooting Guide" for error codes D0nn and D8nn.
2. Use GMP to isolate the failure.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

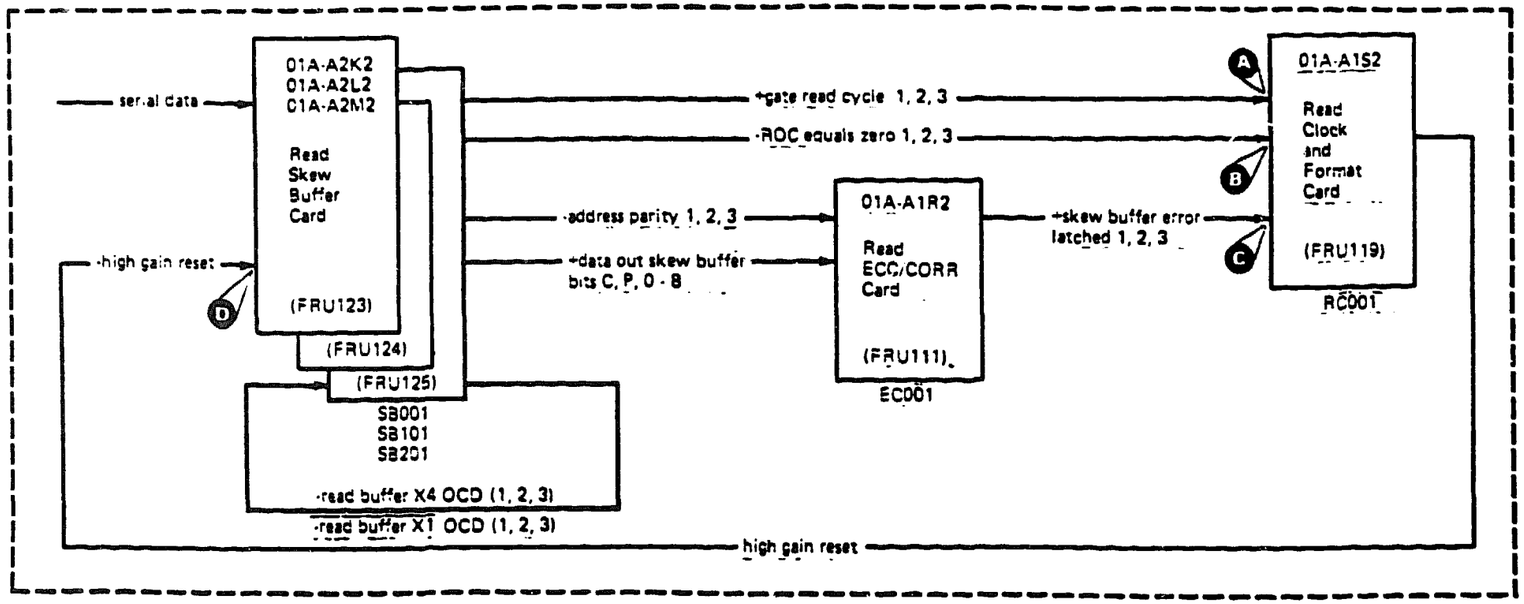
3. Scope the read clocks, using the EAD for correct voltage levels.
4. If the read skew buffer FRU pointer bits are not always the same, scope the 'reset' line. A bad 'reset' line will cause errors at the different read skew buffers (see (D)). It may also result in other error codes.

Maintenance Guide Reference Table for RER Bits 0, 1, and 2

Step	Ref Page	Description/Comments
2	CE/HSC 1	GMP options
3	EAD 1	Clocks

Error Codes D0nn and D8nn (Continued) **EAD 2015**

Error Diagram for Error Code D8nn



Net List for RER Bits 0, 1, and 2

NET	LINE NAME	ERROR CODE
$ECSBERR (1)	+Skew Buffer Err LTH 1	D884
$ECSBERR (2)	+Skew Buffer Err LTH 2	D844
$ECSBERR (3)	+Skew Buffer Err LTH 3	D824
$SBGRDC01	+Gate Read Cycle 1	D881
$SBGRDC02	+Gate Read Cycle 2	D841
$SBGRDC03	+Gate Read Cycle 3	D821
$SBROCE01	-ROC Equals Zero 1	D881
$SBROCE02	-ROC Equals Zero 2	D841
$SBROCE03	-ROC Equals Zero 3	D821
$SBADRP01	-Address Parity 1	D884
$SBADRP02	-Address Parity 2	D844
$SBADRP03	-Address Parity 3	D824
$SBDAT000	+Data Out Skew Buffer 1 (C, P, 0-8)	D884
$SBDAT020	+Data Out Skew Buffer 2 (C, P, 0-8)	D844
$SBDAT040	+Data Out Skew Buffer 3 (C, P, 0-8)	D824
	-Read Buffer X4 OCD 1,2,3	D824
	-Read Buffer X1 OCD 1,2,3	D824
$RCCRST00	-Hi Gain/Reset	D8xx

See the tape control unit logic for pin numbering and detail net information.
These error codes are found in SENSE/FSI for operating errors,
or in GMP output for GMP detected errors.

Troubleshooting Information for RER Bit 3 Acceleration Check

Error Description

While a block of data is being read or is readback checked, the read detect cards are testing the rate that the data is received from the drive.

If the data rate varies rapidly over a short period of time and a similar change is sensed in a track in each of the three zones at the same time, the error is set into the RER external register. This can be a normal condition due to the variations of media and the tape path.

During a read operation (either read or readback check of write) the read detect cards use '+ HI gain inactive' and '+ read condition' to change the meaning of three void lines: Void A, Void C, and Void E to ISV card 1, ISV card 2, and ISV card 3 respectively.

Acceleration check is one of the errors that is counted in the read transient counter and the write transient counter in format 21 sense data bytes 20 and 21 respectively.

The error recovery procedure (ERP) action for write operations is:

When the first error occurs rewrite the block in place. If an error occurs again perform an erase gap followed by another retry. Repeat until error recovery or the error becomes permanent.

Additional Possible Causes of Failure

Ensure that the drive tape path is clean. See CARR-DR 130
Change the media used

FRU NUMBER	FRU NAME
012	Decoupler assembly
277	Head compliant guides
013	Head and guide assembly
014	Tension transducer
278	Read detect card
119	Read clock and format card

Troubleshooting Guide

1. Run GMP.
2. Run the TCU Support Diagnostics.

Maintenance Guide Reference Table for Read Error Register Bit 3

Step	Ref Page	Description/Comments
2	CE/HSC 1	GMP options

Error Codes D0nn and D8nn (Continued) EAD 2020

Troubleshooting Information for RER Bit 4

Error Description

The read error register (RER) bit 4, indicated a read clock and format card detected CRC hardware error.

Error Condition Theory

This bit indicates that the CRC checker on the ECC card has failed. The ECC card sends the 'CRC equal zero' line to the read clock and format card. When this line is active, the read clock and format card is able to detect an error on the CRC hardware located on the ECC card. If the line is active at the wrong time (other than the normal end of a record) RER bit 4 is set. If the tag line is at a low voltage level during the end of a record, RSR bit 7 is set.

RER bit 4 sets 'check 2', which notifies the microprocessor that an error has occurred. The hardware detected error code is D808.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. FRU139 A1 board
2. FRU140 A2 board
3. The source voltages at the input to the boards in this EAD
4. The cables, connectors, or nets between the FRUs in this EAD.

Troubleshooting Guide

1. See the "Common Troubleshooting Guide" for D0nn and D8nn.
2. Run ILTAPE or GMP to isolate the failure.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

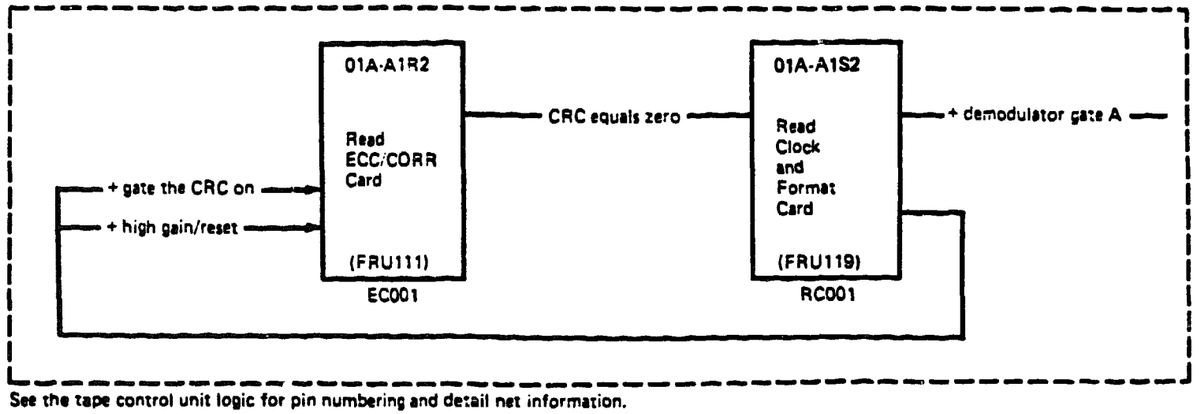
YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

3. For intermittent errors, loop the referenced diagnostic(s) and scope the EAD test points. Look for unusual or deteriorating signal levels and troubleshoot accordingly.

Maintenance Guide Reference Table for RER Bit 4

Step	Ref Page	Description/Comments
2.3	CE/HSC 1	GMP options
2	CE/HSC 1	ILTAPE

Error Diagram for RER Bit 4



See the tape control unit logic for pin numbering and detail net information.

Net List for RER Bit 4

NET	LINE NAME	ERROR CODE
$RCGATCRC	+Gate The CRC on	D808
$RCCRSTOO	+Hi Gain/Reset	D808
$RCCLKADO	+Demodulator Gate A	D808

These error codes are found in SENSE/FSI for operating errors, or in GMP output for GMP detected errors.

Troubleshooting Information for RER Bit 5

Error Description

The read error register (RER) bit 5 indicated a read correction and ECC detected error.

Error Condition Theory

Note: See EAD 2030 for test points.

The read ECC and correction card receives data from the read skew buffers, reformats it into byte data for storing into the data buffer, and makes any error corrections that are necessary. The read ECC and correction card circuitry is internally parity checked during the complete data handling process to ensure data integrity. Bit 5 is set by five different conditions. Four conditions are detected in the read ECC and correction card and the last condition is detected in the read clock and format card.

- Condition 1

  The 'AXP parity error group' line (A) signals internal hardware parity error conditions. The hardware detected error code is D804.

- Condition 2

  The 'corr reg parity check' line (B) indicates a parity check of the corrected data in the correction register before the data is passed to the data buffer. The hardware detected error code is D804.

- Condition 3

  The 'decode parity error' line (C) is a parity check of the read data after it enters the read correction and ECC card. It is checked internally on the card. The hardware detected error code is D804.

- Condition 4

  The 'skew buffer error latched' line (D) is a check of the skew buffer data. Troubleshoot any read skew buffer error bits first. See "Troubleshooting Information for RER Bits 0, 1, and 2" on EAD 2010 for the procedure. The hardware detected error codes are D884, D844, and D824.

- Condition 5

  The 'read data flow data bus parity error' line (E) is a parity check detected during the residual byte. This error also sets the read clock and format bit (RER bit 7). The hardware detected error code is D805.

Any condition that sets bit 5 of the RER register, also sets check 2, which notifies the microprocessor that an error has occurred.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. FRU139 A1 board
2. FRU140 A2 board
3. The source voltages at the input to the boards in this EAD
4. The cables, connectors, or nets between the FRUs on this EAD.

Troubleshooting Guide

1. See the "Common Troubleshooting Guide" for D0nn and D8nn.
2. Run ILTAPE to isolate the failure.

```
Did this diagnostic fail?

YES NO
 |   |
 |   Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |   |
 |   Go to the place that the diagnostic
 |   sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |   |
 |   Loop the diagnostics and do any other
 |   actions specified in the EADs.
 |
Do the actions specified for that failure.
```

3. For intermittent errors, loop the referenced diagnostic(s) and scope the EAD test points. Look for unusual or deteriorating signal levels and troubleshoot accordingly.

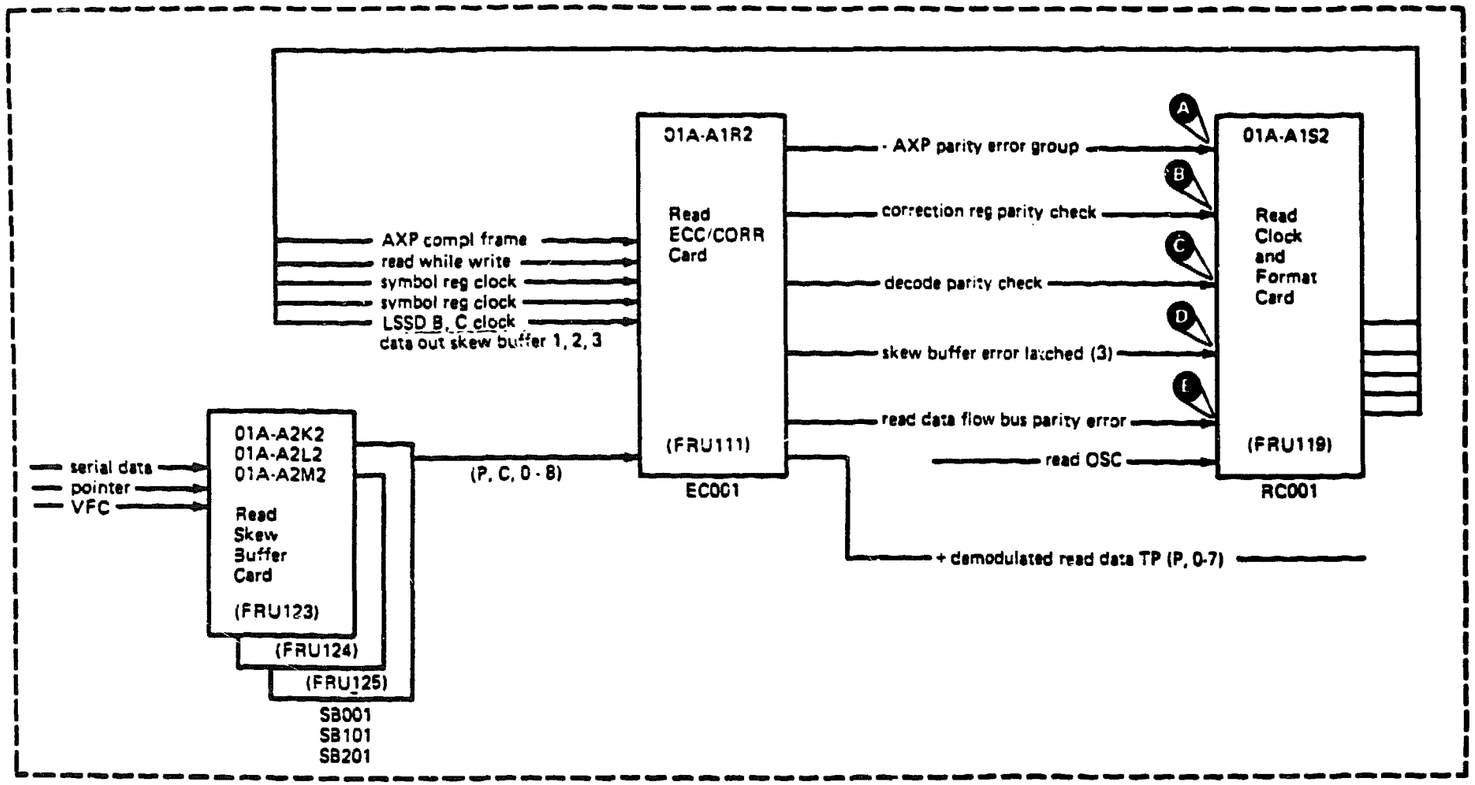
Maintenance Guide Reference Table for RER Bit 5

Step	Ref Page	Description/Comments
2	CE/HSC 1	ILTAPE

Error Codes D0nn and D8nn (Continued)

Troubleshooting Information for RER Bit 5 (Continued)

Error Diagram for RER Bit 5



See the tape control unit logic for pin numbering and detail net information.

Net List for RER Bit 5

NET	LINE NAME	ERROR CODE
$ECAXPERC	-AXP Parity Error Group	D884
$RCSYMC00	-Symbol Register Clock	D884
$ECDCDPER	+Decode Parity Error	D884
$RCECCLKB	+LSSD B Clock (T1T2)	D884
$RCECCLKC	+LSSD C Clock (T7T8)	D884
$ECDATBIT	+Demodulated Read Data TP (P,0-7)	D884

These error codes are found in SENSE/FSI for operating errors, or in GMP output for GMP detected errors.

Troubleshooting Information for RER Bit 6

Error Description

The read error register (RER) bit 6, indicated a buffer data bus error occurred.

Error Condition Theory

RER register bit 6 is set if an error is detected in the data that is transferred to the data buffer. The buffer adapter card keeps track of the bytes received and sends the '-RDF toggle' line to the read clock and format card. Its value is compared to an internal latch which is toggled by 'read data ready'.

This error also sets RER register bit 7, because the error is detected in the read clock and format card. It is also a possible failing FRU. Check 2 is sent to the microprocessor to signal that an error has occurred. The hardware detected error code is D803.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. FRU120 01A-A1K2
2. FRU139 A1 board
3. FRU140 A2 board
4. The source voltages at the input to the boards in this EAD
5. The cables, connectors, or nets between the FRUs on this EAD.

Troubleshooting Guide

1. See the "Common Troubleshooting Guide" for D0nn and D8nn.
2. Run ILTAPE to isolate the failure.

```
Did this diagnostic fail?

YES NO
|   |
|   Continue with the actions in the EAD.
|
Did the failure direct you back to the
same EAD?

YES NO
|   |
|   Go to the place that the diagnostic
|   sends you and do the actions.
|
Do the EADs have specific actions for the
diagnostic failure?

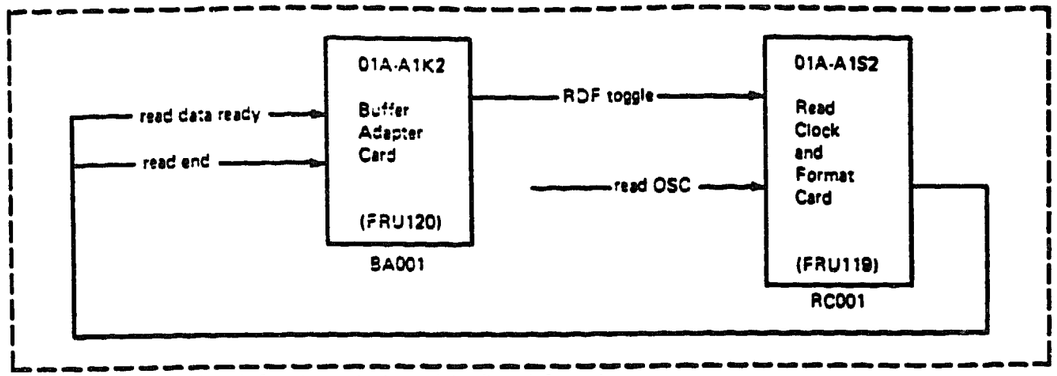
YES NO
|   |
|   Loop the diagnostics and do any other
|   actions specified in the EADs.
|
Do the actions specified for that failure.
```

3. For intermittent errors, loop the referenced diagnostic(s) and scope the EAD test points. Look for unusual or deteriorating signal levels and troubleshoot accordingly.

Maintenance Guide Reference Table for RER Bit 6

Step	Ref Page	Description/Comments
2	CE/HSC 1	ILTAPE

Error Diagram for RER Bit 6



See the tape control unit logic for pin numbering and detail net information.

Net List for RER Bit 6

NET	LINE NAME	ERROR CODE
$RDFTOG	-RDF Toggle	D803
$RCDTARDY	-Read Data Ready	D803
$RCRDEND	-Read End	D803

These error codes are found in SENSE/FSI for operating errors, or in GMP output for GMP detected errors.

Troubleshooting Information for RER Bit 7

Error Description

The read error register (RER) bit 7, indicated a read clock and format error occurred.

Error Condition Theory

The read clock and format card provides read clock checking and read data flow control (under control of the microprocessor). This function is accomplished by receiving control information, and sending pattern, status and error information to the microprocessor.

RER bit 7 is set if an error is detected in the read clock and format card. If bit 7 is on by itself, either a 'clock sequence error', 'count', or 'format sequence error' has occurred. Bit 7 is also set if RER bits 0, 1, 2, 5, or 6 are set. Troubleshoot these bits first if they occur with bit 7. The hardware detected error codes are D801, D803, D805, D821, D841, D881.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. FRU139 A1 board
2. FRU140 A2 board
3. The source voltages at the input to the boards in this EAD
4. The cables, connectors, or nets between the FRUs on this EAD.

Troubleshooting Guide

1. See the "Common Troubleshooting Guide" for D0nn and D8nn.
2. Run ILTAPE to isolate the failure.

```
Did this diagnostic fail?

YES NO
|   |
|   Continue with the actions in the EAD.
|
Did the failure direct you back to the
same EAD?

YES NO
|   |
|   Go to the place that the diagnostic
|   sends you and do the actions.
|
Do the EADs have specific actions for the
diagnostic failure?

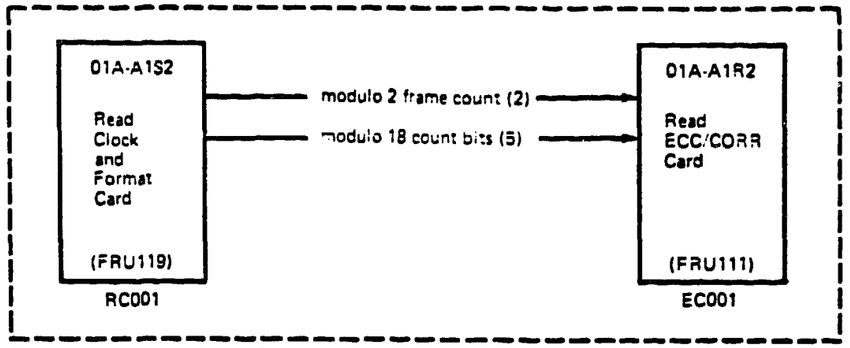
YES NO
|   |
|   Loop the diagnostics and do any other
|   actions specified in the EADs.
|
Do the actions specified for that failure.
```

3. For intermittent errors, loop the referenced diagnostic(s) and scope the EAD test points. Look for unusual or deteriorating signal levels and troubleshoot accordingly.

Maintenance Guide Reference Table for RER Bit 7

Step	Ref Page	Description/Comments
2	CE/HSC 1	ILTAPE

Error Diagram for RER Bit 7



See the tape control unit logic for pin numbering and detail net information.

Net List for RER Bit 7

EAD test points for hardware detected error code D801

NET	LINE NAME	ERROR CODE
$RCFRMONT (0)	+Modulo 2 Frame Count 0	D801
$RCFRMONT (1)	+Modulo 2 Frame Count 1	D801
$PCMCOUNT (1)	+Modulo 18 Cnt Bit 1	D801
$PCMCOUNT (2)	-Modulo 18 Cnt Bit 2	D801
$PCMCOUNT (3)	-Modulo 18 Cnt Bit 3	D801
$PCMCOUNT (4)	-Modulo 18 Cnt Bit 4	D801
$PCMCOUNT (5)	-Modulo 18 Cnt Bit 5	D801

These error codes are found in SENSE/FSI for operating errors, or in GMP output for GMP detected errors.

Error Code D1nn

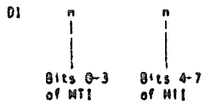
Error Description

The maintenance adapter card detected an error

Error Condition Theory

The maintenance adapter card detects errors in itself and in addressing the external registers on other cards. These errors set bits in the maintenance-tag-in (MTI) register on the maintenance adapter card. When a maintenance-tag-in register bit is set, the maintenance adapter card activates '- check 2' to the microprocessor card.

When the microprocessor card detects '- check 2', it reads the registers on the cards that can activate '- check 2'. When the microprocessor reads bits on in the maintenance-tag-in register, it uses the bits in the MTI to set the D1nn error code as follows:



Bit *Meaning*

0-2 Masked off for D1nn FSC

3 An XR address parity error occurred on one of the cards on the XR address and extend buses.

4 None or more than one of the cards responded when an XR was addressed by the microprocessor card.

5 Either the maintenance adapter had a parity check in a register, or it detected a parity check on the XR address and extend lines.

6 The maintenance adapter card detected a parity error while it was communicating with the MD.

7 Check 1 - indicates a check 1 condition occurred and was not reset by a check or hardware reset.

The troubleshooting procedure to be followed is controlled by the MTI bits that are on. If MTI bit 6 is on, always troubleshoot that problem first. The cause of the inability to communicate with the MD must be solved before the other problems, even though the communication problem may be unrelated to the customer's problem.

Note: Bit 6 should never turn on for a customer problem because the customer's operation should never try to communicate with the MD.

MTI Bit 6, Maintenance Adapter to MD Communication Failure

The maintenance adapter card checks the parity of serial data transferred from the MD to the maintenance adapter. If the maintenance adapter card detects a parity error, it turns on bit 6 in the maintenance-tag-in register and activates '- check 2' to the microprocessor card.

Note: This error will most likely be detected when the MD is first connected and is unable to communicate with the maintenance adapter. This error may be indicated as a port-open error.

To troubleshoot this failure, see EAD 1 for "Error Code E103, Port Open and MTI Bit 6 Errors."

MTI Bit 3, XR Addressing Parity Error

Note: See EAD 2103 for the test points.

This error occurs when one of the cards detects a parity error on the 'xr address bus' (A) lines. The card that detects the error activates '- xr error ingated' (G) to the maintenance adapter card. The maintenance adapter card turns on MTI bit 3 and activates '- check 2' to the microprocessor card.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU121) status store card 01A-A1G2
2. (FRU118) write data flow card 01A-A1Q2
3. (FRU114) buffer control card 01A-A1L2
4. (FRU120) buffer adapter card 01A-A1K2
5. (FRU116) write data card 01A-A1P2
6. (FRU119) read clock and format card 01A-A1S2
7. Top card connectors
8. Source voltages at the inputs to the FRUs on this EAD
9. Cables, connectors, and nets between the FRUs on this EAD
10. (FRU139) logic board 01A-A1.

Troubleshooting Procedure

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.

2. Check the source voltages at the input to each FRU identified in the FSI to verify that the voltages are in tolerance.

3. After obtaining the complete subsystem, IML the TCU with the support diskette. Repeatedly run the support diagnostics and scope the EAD test points. Look for unusual or deteriorating levels or signals. If a failure occurs, use the information provided with the diagnostic failure to determine the troubleshooting path to follow.

4. If the TCU support diskette fails to isolate the problem, the MD must be used. Perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

5. Run the Maintenance Device/Maintenance Adapter, the TCU Basic, and the EE85 diagnostic tests. If a failure occurs, use the information provided with the diagnostic failure information to determine the troubleshooting path to follow. (The diagnostic might send you back to this EAD.)

```
Did this diagnostic fail?

YES NO
 |   |
 |   Continue with the actions in the EAD.

Did the failure direct you back to the
same EAD?

YES NO
 |   |
 |   Go to the place that the diagnostic
 |   sends you and do the actions.

Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |   |
 |   Loop the diagnostics and do any other
 |   actions specified in the EADs.

Do the actions specified for that failure.
```

6. If the Maintenance Device/Maintenance Adapter diagnostic detects an error, use the MTI bit 6 procedure in this EAD to troubleshoot the error.

7. Use the register alter/display routine in MD/SDISK to select a microprocessor read/write type external register such as the LSP register. If the register you selected displays on the MD, the address bus is operable to the microprocessor.

8. Load the selected register with FF. Display the register again. If the data displayed is FF, the register can be written correctly.

9. Load the selected register with 00. Display the register again. If the register contains 00, the register can be both set and reset.

10. Repeat steps 7, 8, and 9 for each card until you find the card that indicates the addressing parity error.

11. Set up an oscilloscope with a X10 probe for 2 volts/division. Sync on 01A-A2K2Z12.

12. Scope the following nets while running diagnostic EEF0:

Net	Name	Diagram Ref
$MPXRAD00	XR address bus	(A)
$MPXRAE00	Extend bit 0	(B)
$MPXRAE01	Extend bit 1	(B)
$BAXRADDR	XR address bits to buffer control card	(D)
	Clocks	See EAD 1 for "Clocks to and from the Maintenance Adapter."

13. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, continue in this EAD with the next action.

14. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3	CE/HSC 1	How to use the TCU support diskette
4	MD/SDISK 1	How to use the MD
5,12	DIAG 1	How to run diagnostics TCU Basic, MD/MA, EE85, EEF0
7,8,9	MD/SDISK 1	How to alter and display external registers
7,8,9	DF 1	External register addresses and locations

MTI Bit 4, External Register Response Error

The maintenance adapter card monitors the XR addressed lines (E) when the microprocessor card addresses an external register. If none of the lines or more than one of the lines become active, the maintenance adapter card turns on bit 4 in the MTI and activates '- check 2' to the microprocessor card.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU117) microprocessor card 01A-A1D2
2. (FRU121) status store card 01A-A1G2
3. (FRU114) buffer control card 01A-A1L2
4. (FRU120) buffer adapter card 01A-A1K2
5. (FRU116) write data card 01A-A1P2
6. (FRU118) drive adapter card 01A-A1Q2
7. (FRU119) read clock and format card 01A-A1S2
8. Top card connectors
9. Source voltages at the inputs to the FRUs on this EAD
10. Cables, connectors, and nets between the FRUs on this EAD
11. (FRU139) logic board 01A-A1.

Troubleshooting Guide

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. After obtaining the complete subsystem, IML the TCU with the support diskette. Repeatedly run the support diagnostics and scope the EAD test points. Look for unusual or deteriorating levels or signals. If a failure occurs, use the information provided with the diagnostic failure to determine the troubleshooting path to follow.
4. If the TCU support diskette fails to isolate the problem, the MD must be used. Perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

5. Run the Maintenance Device/Maintenance Adapter, the TCU Basic, and the EE85 diagnostics. If an error is detected by one of the diagnostics, use the information supplied with the failure ID to select the debug path.

```
Did this diagnostic fail?

YES NO
 |   |
 |   Continue with the actions in the EAD.

Did the failure direct you back to the
same EAD?

YES NO
 |   |
 |   Go to the place that the diagnostic
 |   sends you and do the actions.

Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |   |
 |   Loop the diagnostics and do any other
 |   actions specified in the EADs.

Do the actions specified for that failure.
```

6. Set up an oscilloscope with a X10 probe for 2 volts/division. Sync on '- xr read gate' or '- xr write gate', as appropriate for the operation you choose in the next step.
7. Select one external register from each card and loop diagnostic EEF0 on the registers (one at a time). Scope the 'xr addressed' lines (E) (see EAD 2103). The card that contains the register you are operating with the EEF0 diagnostic should have its 'xr addressed' line active. All other 'xr addressed' lines should be not active.
8. XR data bus and XR address bus errors are also detected as Fnnn error codes. If you are getting multiple error codes, use the EAD for error code Fnnn for further aid.
9. Probe or scope the signals shown in "XR Bus and Control Clocks" while running diagnostic EEF0. Look for bad line levels and shifting pulse times.
10. Run diagnostic EEF0 and scope the following nets.

Net	Name	Diagram Ref
$WDXRAC00	WD XR addressed	(E)
$RCXRAC00	RC XR addressed	(E)
$DIXRAC00	DI XR addressed	(E)
$SSXRAC00	SS XR addressed	(E)
$BAXRAC00	BA XR addressed	(E)
$MPXADR00	MP XR addressed	(E)
$MPXRAD00	XR address bus	(A)
$MPXRAE00	Extend bit 0	(B)
$MPXRAE01	Extend bit 1	(B)
$MPXRBA00	XR data bus A	(C)
$MPXRBB00	XR data bus B	(C)
$BAXRRDWT	XR write/read	(F)
$BAXRADDR	XR address bits to buffer control card	(D)
	Clocks	See EAD 1 for "Clocks to and from the Maintenance Adapter"

11. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, continue in this EAD with the next action.
12. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams
3	CE/HSC 1	How to use the TCU support diskette
4	MD/SDISK 1	How to use the MD
5,7,9,10	DIAG 1	How to run diagnostics TCU Basic, MD/MA, EE85,EEF0
7	DF 1	External register addresses and locations
9	EAD 1	Location of "XR Bus and Control Clocks"
11	CE/HSC 1	How to use the CE Panel

MTI Bit 5, Maintenance Adapter Error

The maintenance adapter card checks parity on external registers that it contains and on the XR address bus. If the maintenance adapter card detects bad parity in one of the registers or on the XR address bus, it sets MTI bit 5 and activates '- check 2' to the microprocessor card.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU117) microprocessor card 01A-A1D2
2. Source voltages to the FRUs on this EAD
3. Cables, connectors, and nets between the FRUs on this EAD
4. (FRU139) logic board 01A-A1.

Troubleshooting Procedure

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. After obtaining the complete subsystem, IML the TCU with the support diskette. Repeatedly run the support diagnostics and scope the EAD test points. Look for unusual or deteriorating levels or signals. If a failure occurs, use the information provided with the diagnostic failure to determine the troubleshooting path to follow.
4. If the TCU support diskette fails to isolate the problem, the MD must be used. Perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

5. Run the Maintenance Device/Maintenance Adapter, the EE85, and the TCU Basic diagnostic tests in that order. If a failure occurs, use the information provided with the diagnostic failure information to determine the debug path to follow. (The diagnostic might send you back to this EAD.)

```
Did this diagnostic fail?

YES NO
 |
 |  Continue with the actions in the EAD.

Did the failure direct you back to the
same EAD?

YES NO
 |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.

Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.

Do the actions specified for that failure.
```

6. If the Maintenance Device/Maintenance Adapter diagnostic detects an error, use the MTI bit 6 procedure in this EAD to troubleshoot the error.
7. Use the register alter/display routine in MD/SDISK to select a maintenance adapter read/write type external register such as the MDO register. If the register you selected displays on the MD, the address bus is operable to the microprocessor.
8. Load the selected register with FF. Display the register again. If the data displayed is FF, the register can be written correctly.
9. Load the selected register with 00. Display the register again. If the register contains 00, the register can be both set and reset.
10. Repeat steps 7, 8, and 9 for each register until you find the register that indicates the parity error.

    Note: The MDI register can be read but not written to because it is a read-only register.

11. Set up an oscilloscope with a X10 probe for 2 volts/division. Sync on 01A-A1E2Z12.
12. Scope the following nets while running diagnostic EEF0:

Net	Name	Diagram Ref
$MPXRAD00	XR address bus	(A)
$MPXRAE00	Extend bit 0	(B)
$MPXRAE01	Extend bit 1	(B)
	Clocks	See EAD 1 for "XR Bus and Control Clocks"
	Clocks	See EAD 1 for "Clocks to and from the Maintenance Adapter"

13. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, continue in this EAD with the next action.
14. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

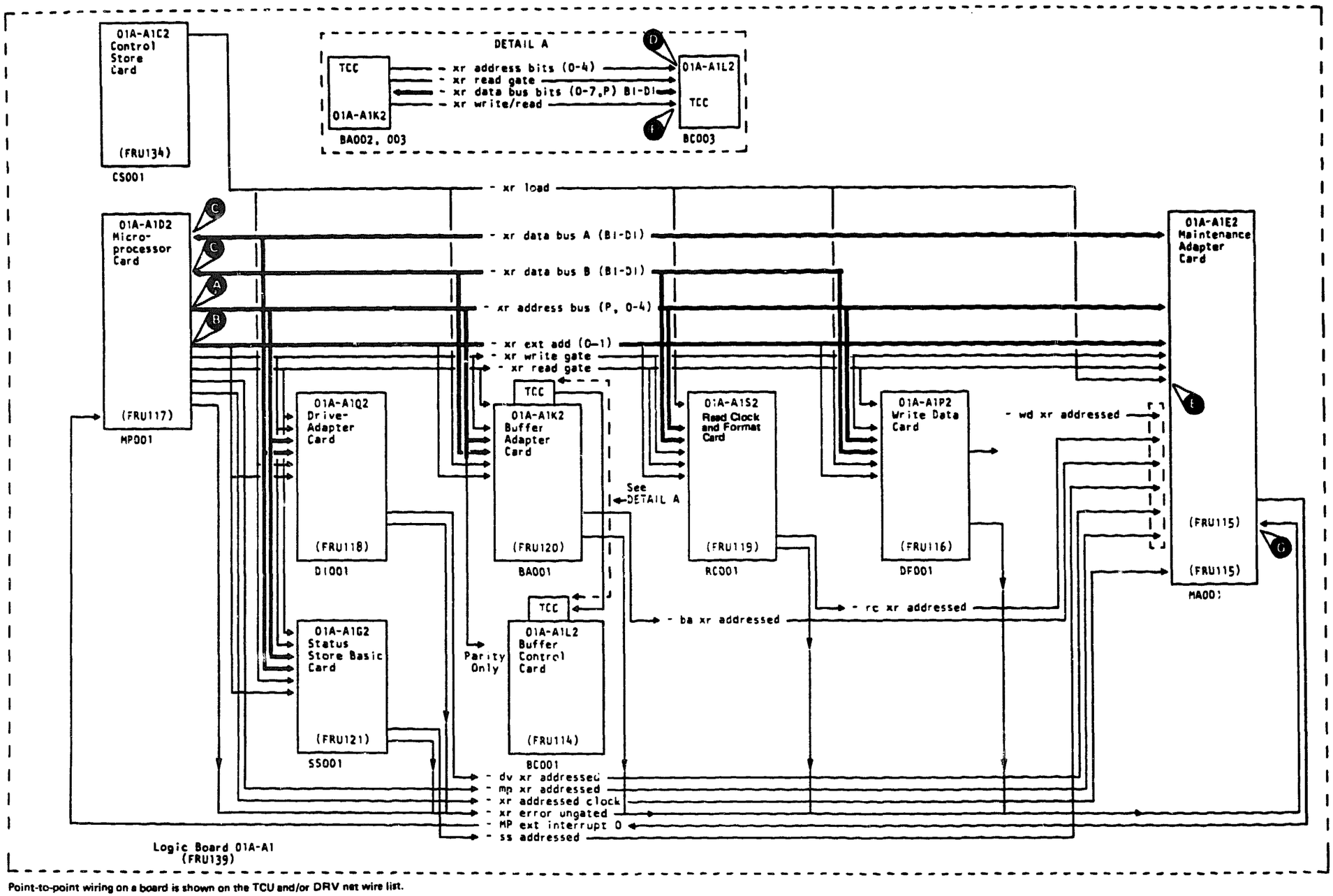
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3	CE/HSC 1	How to use the TCU support diskette
4	MD/SDISK 1	How to use the MD
5,12	DIAG 1	How to run diagnostics TCU Basic, MD/MA, EE85, EEF0
7,8,9	MD/SDISK 1	How to alter and display external registers
7,8,9	DF 1	External register addresses and locations
13	CE/HSC 1	How to use the CE Panel

Error Code D1nn (Continued) **EAD 2103**

Error Diagram

XR Data and Address



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Description

The buffer-channel functional area detected a hardware error during a data transfer between the host system and the TA90 TCU data buffer. The errors detected are data parity errors and data transfer control failures

Error Condition Theory

The buffer-channel functional area includes all the hardware that is used to transfer data between the STI-FIPS adapter and the TCU data buffer. When this hardware detects an error, it sets bits in channel error group registers 0, 1, 2, and 3 (CEG0, CEG1, CEG2, and CEG3). The channel error group registers are four bit registers that cannot be read directly. They are read by transferring their data to bits 4-7 of the buffer channel status and error (BCSE) register.

When an error is detected, the microcode reads the BCSE register which includes CEG0 in bits 4-7. Then the microcode sets bit 3 of the BCSE to signal that the other CEG registers must be read. When BCSE bit 3 is on, each read of the BCSE advances a pointer to cause the next CEG to be read out. If bit 3 of the BCSE is not on, the CEG pointer does not advance, and CEG0 is read for each read of the BCSE. The data read out of the CEG registers is stored, and the microcode uses it to build sense data and the D5nn error code. CEG2 and CEG3 are stored in sense byte 9, and CEG0 and CEG1 are used to build the error code as follows:

```
                    CEG0              CEG1
                     |                 |
BCSE bits        4567 (first read)  4567(second read)
                     |                 |
Error code  D5   n                 n
```

CEG0 and CEG1 are also stored in sense byte 17.

Any error except channel buffer storage data correctable error (CEG2 bit 2) causes the 'check 2' line to the microprocessor to become active and the CEGs to be read. When an error is detected, the start bit in the buffer channel control (BCC) register becomes active and remains active while the microcode reads out the CEGs. If for some reason the start bit becomes not active before all the CEGs are read, BCSE bits 4–7 contain the contents of the CEG that was loaded after the last XR read of the BCSE before the start bit became not active. Also, resetting the start bit causes some error latches in the CEGs to be reset.

Sense byte 2 points to the tape control unit that contains the buffer that detected the failure. Sense byte 2 also indicates the channel adapter card and power/POR card involved in the failure.

Buffer Channel Status and Error Register

The contents of the BCSE are:

Bit	Meaning	Condition
Bit 0	Channel pointer = stop	Set when BCP = BCS
Bit 1	Channel stop	Channel ended the data transfer to or from the buffer
Bit 2	MP write complete	Set when data and CRC are stored in the buffer storage (BM)
Bit 3	Sample channel errors	Set to read out CEGs
Bit 4	Channel error 0	Contains the channel error group bit 0
Bit 5	Channel error 1	Contains the channel error group bit 1
Bit 6	Channel error 2	Contains the channel error group bit 2
Bit 7	Channel error 3	Contains the channel error group bit 3

Channel Error Groups

The channel error group bits have meanings as follows:

Channel Error Group 0 (CEG0)

Bit Description

0 Any channel error. This bit is set by any other CEG bit being on except for CEG2 bit 2.

1 Channel overrun

2 Channel adapter to buffer adapter parity error

3 Buffer control to buffer adapter channel data bus parity error.

Channel Error Group 1 (CEG1)

Note: The bits of CEG1 points to FRUs and are not used for error isolation. Use the channel error group registers 0, 2, and 3 for error isolation.

Bit Description

0 The buffer control card caused the failure

1 The buffer adapter card caused the failure

2 A buffer storage card caused the failure

3 A channel adapter card, power/POR card, or STI-FIPS adapter caused the failure.

Channel Error Group 2 (CEG2)

Bit Description

0 Channel buffer storage address parity error

1 Channel buffer storage address pointer parity error

2 Channel buffer storage data correctable error

3 Channel buffer storage data uncorrectable error.

Channel Error Group 3 (CEG3)

Bit Description

0 Buffer adapter to buffer control channel data bus parity error

1 Buffer control channel RAM data parity error

2 Channel CRC error

3 Not used.

Sense Byte 2

Sense byte 2 has the following format.

Bits 0 1 2	Description
0 0 0	No channel interface is selected
0 0 1	Channel interface A is being used
0 1 0	Channel interface B is being used.
Bit 3	0 = Channel adapter card, power/POR card, and STI-FIPS adapter are in tape control unit 0. 1 = Channel adapter card, power/POR card, and STI-FIPS adapter are in tape control unit 1.
Bit 4	0 = Microprocessor, buffer, and data flow are in tape control unit 0. 1 = Microprocessor, buffer, and data flow are in tape control unit 1.
Bit 5	Reserved
Bit 6	Reserved
Bit 7	Not used for this EAD

Use the bits from sense byte 2 to determine which tape control unit to work on.

Error Code D5nn (Continued)

Troubleshooting Guide

This is a common troubleshooting guide for all D5nn error codes. This troubleshooting guide helps you determine the order in which you should analyze the symptoms of the error code.

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Failures detected in a functional area can be caused by defective clock lines. All clocks for the buffer are generated by the buffer adapter card. The clock lines are listed in the individual net lists for each CEG bit and should be scoped as part of the individual troubleshooting guide.
5. After obtaining the complete subsystem, IML the TCU with the support diskette. Repeatedly run the support diagnostics and scope the EAD test points. Look for unusual or deteriorating levels or signals. If a failure occurs, use the information provided with the diagnostic failure to determine the troubleshooting path to follow.
6. Run diagnostics E010, EE30, and EE53. If a failure is detected, see the failure Diagnostic Identification Code listed in the Diagnostic Identification Table on DIAG 3. Record the BCSE and BDSE error information from the diagnostic screen. Return to this EAD and compare any common FRUs or troubleshooting tips.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

7. If diagnostic EE30 (buffer test) does not give any valid information in the BCSE, suspect an external line between the buffer adapter and the channel adapter.
8. If diagnostic EE30 does not give any valid information in the BCSE and diagnostic EE53 fails, suspect an external line between the buffer adapter and the read data flow.
9. If the BCSE has no error indicated and the BDSE has an error indicated, go to the EAD for error code D6nn to continue troubleshooting.
10. If the BCSE has error bits on, continue in this EAD and analyze the CEG bits.

    Note: You can obtain the CEG bits in either of two ways.

    a. If you are analyzing a failure from a diagnostic, the CEGs are displayed as the last four hexadecimal characters of the BCSE in the diagnostic error message on the MD screen. (See the error screen descriptions for the diagnostic you are running.)

    b. If you are analyzing the sense data from the system error log, CEG0 and CEG1 are the nn characters from the D5nn error code in sense bytes 16 and 17. CEG2 and CEG3 are in sense byte 9.

    As an example, assume that we have CEG values 8C0C. The CEG bit values are:

```
CEG0 CEG1 CEG2 CEG3
1000 1100 0000 1100
|||| |||| |||| ||||
|||| |||| |||| ||||
|||| |||| |||| |||+-- Buffer control channel RAM
|||| |||| |||| |||     data error
|||| |||| |||| ||+--- Buffer adapter to buffer
|||| |||| |||| ||      control channel data bus
|||| |||| |||| ||      parity error
|||| |||| |||| |+---- Buffer adapter card pointer
|||| |||| |||| +----- Buffer control card pointer
|||| |||| ||||
|||| |||| |||+------- Any channel error
```

    Select the correct bit to be used for troubleshooting using the troubleshooting procedures on the EAD pages that follow by:

    a. Start with bit 1 of CEG0. (Bit 0 of CEG0 should always be on. If it isn't, go to the troubleshooting procedure for CEG0 bit 0.)

    b. Take the bits in CEG0 in order from bit 1 to bit 3. Troubleshoot for the first bit that is a 1.

    c. If no bits (other than bit 0) in CEG0 are 1 or if troubleshooting the bits in CEG0 did not locate the trouble, go to CEG2. (CEG1 is a FRU pointer. Use the bits from CEG1 to determine which FRU to suspect.)

    d. If no bits are on in CEG2 or if troubleshooting the bits in CEG2 did not locate the trouble, go to CEG3.

    For this example, you would suspect the buffer control card and buffer adapter card because their FRU pointer bits are on in CEG1. If those cards had been replaced, you would begin your troubleshooting with CEG3 bit 0. You would find "CEG3 Bit 0, Buffer Adapter to Buffer Control Channel Data Bus Parity Error" on EAD 1 and go to the page for the troubleshooting guide for that error. If troubleshooting with CEG3 bit 0 was not effective, you would try using CEG3 bit 1.

11. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
    - If no errors are detected, go to SPROC 1 "End of Call Actions."
    - If the program detects an error, continue in this EAD with the next action.
12. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
5,9	DIAG 1	How to run and interpret diagnostics
8	CE/HSC 1	How to use the CE Panel
9	MSG 1	How to find and interpret information in the system error log

CEG0 Bit 0, Any Error Detected

Error Condition Theory

Bit 0 should always be on in the D5nn error code. It is set by any other channel error group bit being on. If it is not on and any other CEG bit is on, bit 0 failed to be set by internal circuitry. D500 should never occur. A check-2 error with no FRU-pointing bits should result in a D900 error code. Bit 0 should not be on by itself (D580). If bit 0 is on and no other CEG bits are on:

- A false error occurred.
- The error was reset or failed to be latched on when the channel error groups were read out by the microprocessor.
- Something inhibited reading out the CEGs.

If bit 0 is on as it should be, go to the next CEG bit for troubleshooting. If bit 0 is on incorrectly, look for a valid error indicated in the sense information.

If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If the program detects an error, return to the FSI and do one of the following:
  - Perform any additional actions.
  - If there are no additional actions, call your next level of support and then go to SPROC 1 "End of Call Actions."

If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

CEG0 Bit 1, Channel Overrun

Error Condition Theory

Note: See EAD 2240 for test points.

The buffer adapter checks the number of 'service in'/'data in' tags (C) against the number of 'service out'/'data out' (B) tags to ensure that they are equal. It also checks that a response is received from the channel within 8 microseconds after 'service in' or 'data in' is activated to the channel. If the tags do not match or the response is not received within 8 microseconds, the buffer adapter card activates '-channel overrun' (A) to the buffer control card.

The buffer channel command (BCC) register in the buffer control card holds the buffer channel side command that the buffer is to perform. The buffer mode register (BMR) in the buffer adapter card holds the channel group (local or remote) and the mode of the channel data transfer.

Buffer Channel Command Register

Bit	Description
0	Buffer channel command 0
1	Buffer channel command 1
2	Buffer channel command 2
3	Buffer channel command 3
4	Start channel
5–7	Not used

Buffer Channel Commands

BCC Bits 0 1 2 3 4	Command
0 0 0 0 1	Store CRC
0 0 0 1 1	Channel write
0 0 1 0 1	Loop write to read
0 1 0 0 1	Microprocessor write
1 0 0 0 1	Channel read forward
1 0 0 1 1	Channel read forward with separation
1 0 1 0 1	Channel read backward
1 0 1 1 1	Channel read backward with separation
1 1 0 0 1	Microprocessor read
1 1 1 1 0	Hold buffer channel control reset
0 0 0 0 0	No buffer channel operation

Buffer Mode Register

Bit	Description
0	Maintain channel separation
1–3	Not used
4	0 = Local channel group 1 = Remote channel group
5	Channel mode A
6	Channel mode B
7	Channel mode C

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU133) channel adapter card (channel A) 01A-A2C2
2. (FRU152) channel adapter card (channel B) 01A-A2D2
3. (FRU900) STI-FIPS adapter (L)
4. (FRU901) STI-FIPS adapter (R)
5. HSC 50/70
6. (FRU114) buffer control card 01A-A1L2
7. (FRU126) power/POR card 01A-A2H4 (as associated with the channel adapter in use, local or remote)
8. Remote port path between the remote and local tape control units if the remote channel adapter was used
9. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used
10. (FRU140) logic board 01A-A2 in the tape control unit that contains the channel adapter that was used
11. Cable groups 28 and 50 (see cable group list in the FSI section).

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG0 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1–3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, call your next level of support and then go to SPROC 1 "End of Call Actions."

References

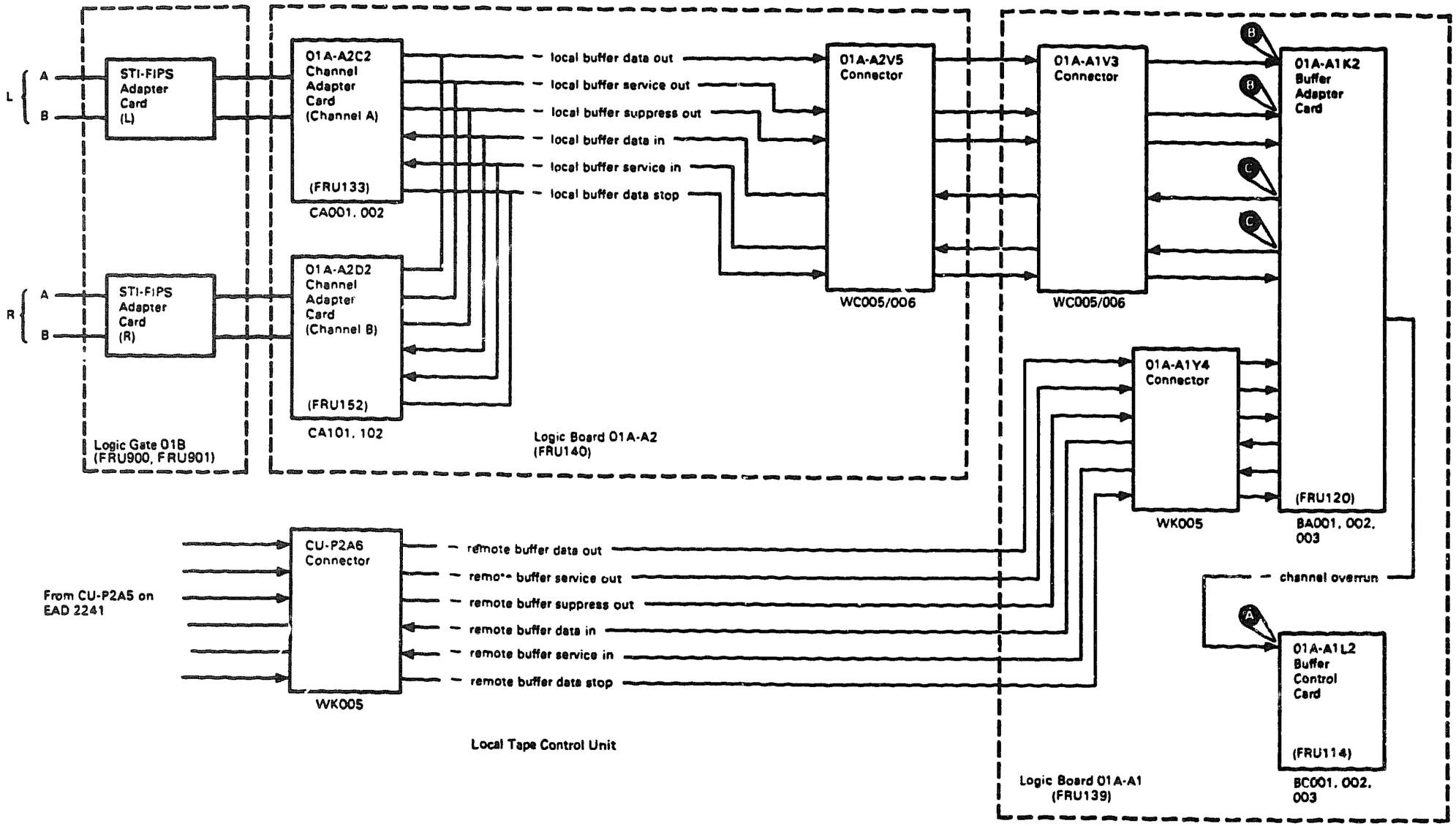
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

CEG0 Bit 1, Channel Overrun (Continued)

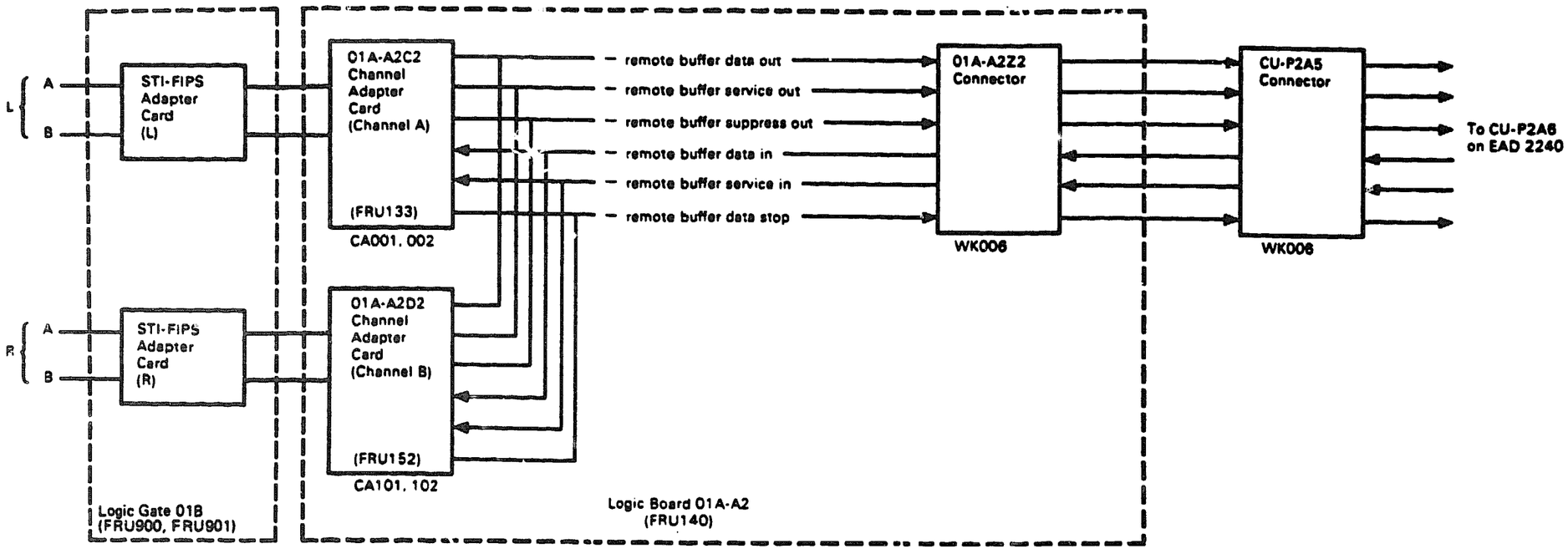
CEG0 Bit 1 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- Channel overrun	BU3021	3C100	70000
EE33, E010	- Enable channel tags	BU3025	9D900	90000
EE33, E010	- Channel MP operation	BU3025	9C100	90000
EE33, E010	- 300 ns clock 0 – A	BU3024	9C800	30000

Error Diagram



Error Diagram



CEG0 Bit 2, Channel Adapter to Buffer Adapter Parity Error

Error Condition Theory

This bit indicates that the buffer adapter card received data with even parity from a channel adapter during a Channel Write operation. This error can also be set during a Loop Write to Read operation, indicating bad data parity from the read data flow circuits and can be set during a microprocessor write. Setting this bit also sets CEG 1 bit 3 to indicate that the host system channel and the channel adapters are the probable failing FRUs. Sense byte 2 points to the tape control unit that contains the buffer that detected the failure and to the channel adapter and tag and shoe cards that are involved in the failure.

Additional Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure. Use sense byte 2 to determine which tape control unit contains the FRU in the following list:

1. HSC 50/70
2. (FRU133) channel adapter card (channel A) 01A-A2C2
3. (FRU152) channel adapter card (channel B) 01A-A2D2
4. (FRU900) STI-FIPS adapter (L)
5. (FRU901) STI-FIPS adapter (R)
6. (FRU120) buffer adapter card 01A-A1K2
7. (FRU114) buffer control card 01A-A1L2
8. (FRU126) power/POR card 01A-A2H4 (as associated with the channel adapter in use, local or remote)
9. (FRU117) microprocessor card 01A-A1D2
10. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used
11. (FRU140) logic board 01A-A2 in the tape control unit that contains the channel adapter that was used
12. Remote port path between the remote and local tape control units if the remote channel adapter was used
13. Cable, connectors, and nets between all FRUs identified by the FSI and this EAD.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG0 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1–3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

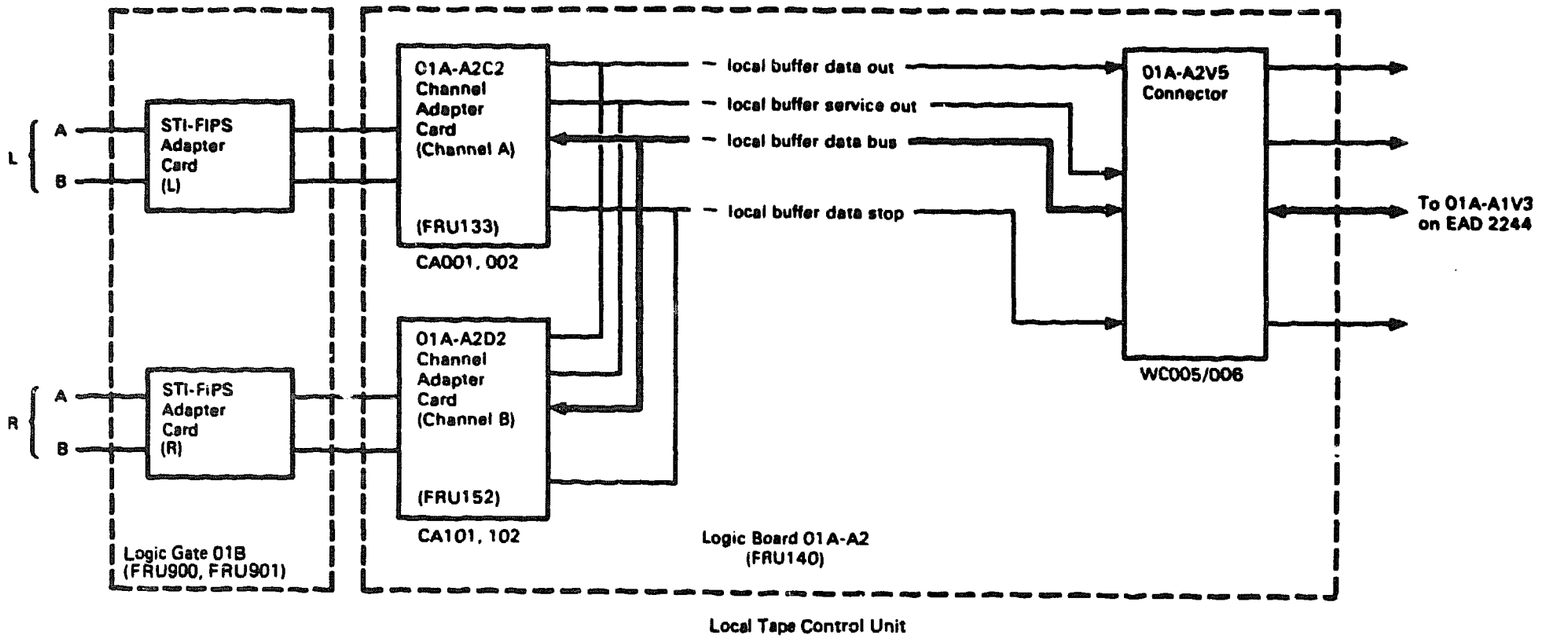
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

CEG0 Bit 2 Net List

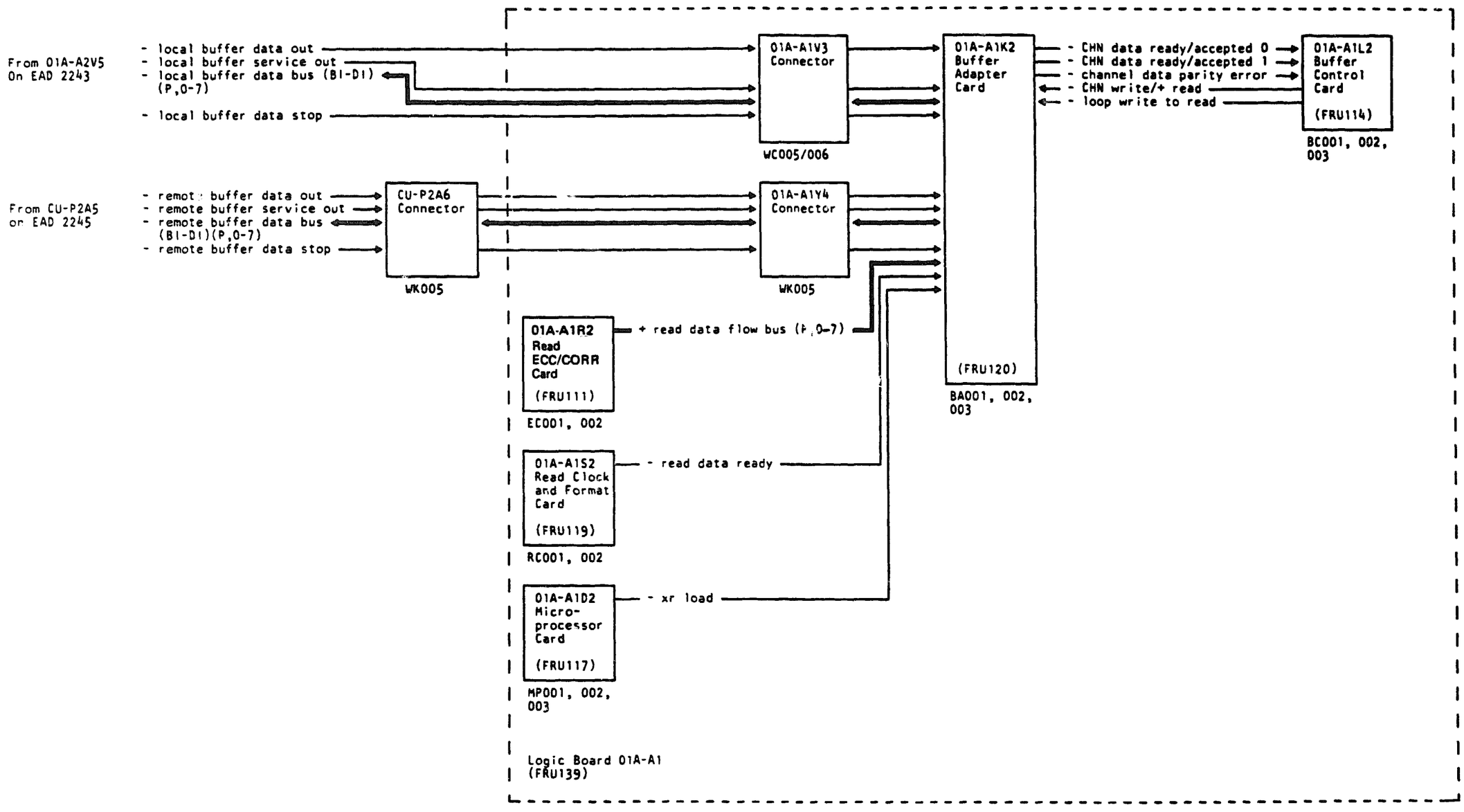
Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33	- CHN data read/accepted 0	BU3021	3AD0C	70000
EE33	- Loop write to read	BU3021	3A904	90000
EE33	- Channel data parity error	BU3021	3A100	70000
EE33	- Local buffer service out	BU3021	3A100	10000
EE33	- Local buffer data out	BU3021	3A100	10000
EE33	- XR load			
EE53	- Read data flow bus (P, 0–7)	LW3024	DADOC	B0000
EE53	- Read data ready			

CEG0 Bit 2, Channel Adapter to Buffer Adapter Parity Error (Continued)

Error Diagram

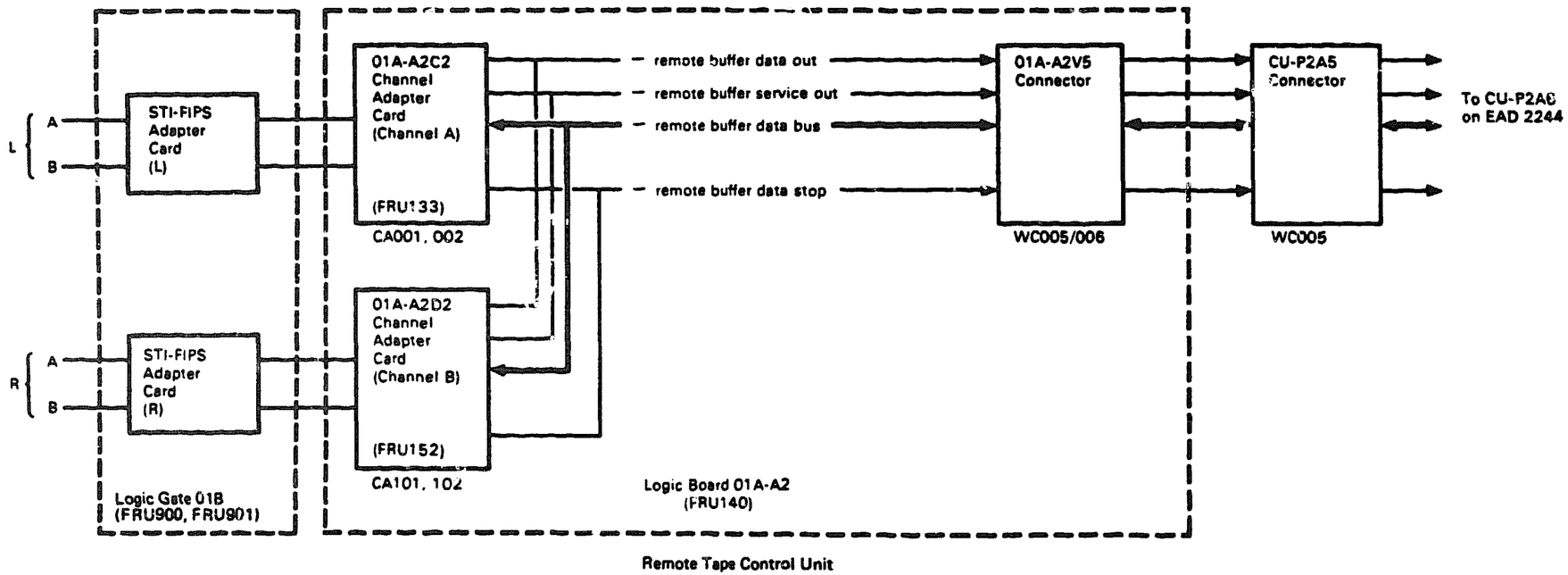


Error Diagram



CEG0 Bit 2, Channel Adapter to Buffer Adapter Parity Error (Continued)

Error Diagram



Remote Tape Control Unit

CEG0 Bit 3, Buffer Control to Buffer Adapter Channel Data Bus Parity Error

Error Condition Theory

This bit indicates that the buffer adapter card received data with even parity from the buffer control card during Channel Read or Microprocessor Read operations.

Note: The bits of CEG1 are FRU pointers and are not used for error isolation. Use channel error group registers 0, 2, and 3 for error isolation.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU120) buffer adapter card 01A-A1K2
2. (FRU114) buffer control card 01A-A1L2
3. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG0 Bit 3 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

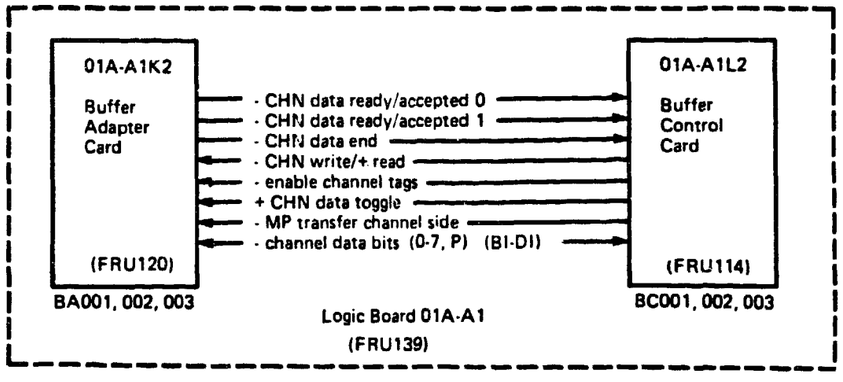
References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

CEG0 Bit 3 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- Enable channel tags	BU3025	D9800	90000
EE33, E010	- CHN date end	BU3025	DD900	90000
EE33, E010	- CHN write/+ read	BU3027	D9A02	90000
EE33, E010	- MP transfer channel side			
EE33, E010	+ CHN data toggle			
EE33, E010	- CHN data ready/accepted 0			
EE33, E010	- CHN data ready/accepted 1			
EE33, E010	- Channel data bits (0 – 7, P)			

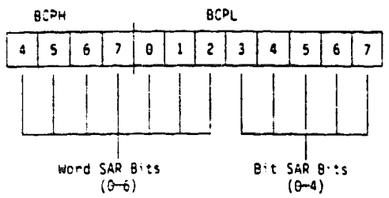
Error Diagram



CEG2 Bit 0, Channel Buffer Storage Address Parity Error

Error Condition Theory

This bit indicates that a miss-compare occurred between the buffer storage address parity generated by the buffer control card and the address parity received by the buffer storage cards during a channel storage cycle. The parity of the buffer storage address received by the buffer storage cards is sent back to the buffer control card and compared there. Address parity is checked for channel storage data access cycles only. Address parity is generated from bits 4 – 7 of the buffer channel pointer high (BCPH) external register and bits 0 – 7 of the buffer channel pointer low (BCPL) external register as follows:



Word-SAR bits and bit-SAR bits are combined and parity is generated to give the address parity.

CEG1 bits 0 and 2 are set to point to the buffer control card and buffer storage cards as the probable failing FRUs. Sense byte 2 bit 5 indicates the buffer storage card that was being accessed when the error occurred.

If the channel buffer storage address pointer parity error (CEG2 bit 1) is also set, go to the EAD for that bit. (See EAD 1.) The channel buffer storage address pointer parity error is most likely to be the primary error. This channel buffer storage address parity error is likely to be the result of the channel buffer storage address pointer parity error.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG2 Bit 0 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

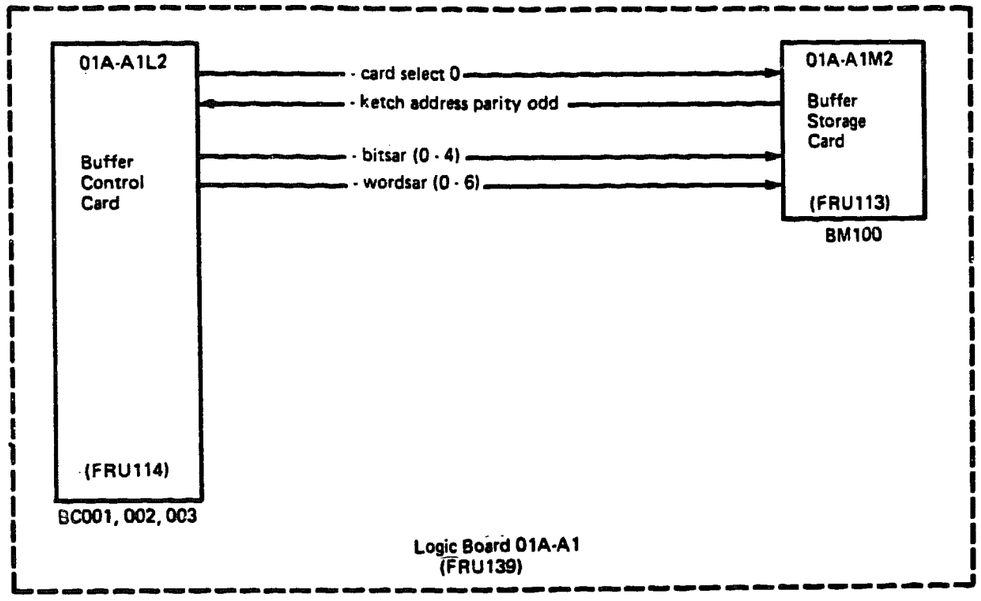
References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

CEG2 Bit 0 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	-Bitsar (0-4)	BU3021	18A80	10000
EE33, E010	-Wordsar (0-6)	BU3021	18A80	70000
EE33, E010	-Ketch address parity odd	BU3021	18A80	90000
EE33, E010	-Card select 0	BU2021	18A80	70000
EE33, E010	-Card select 1	BU2021	18A80	30000

Error Diagram



CEG2 Bit 1, Channel Buffer Storage Address Pointer Parity Error

Error Condition Theory

This bit indicates that a parity error was detected in the buffer channel pointer high (BCPH) external register or buffer channel pointer low (BCPL) external register in the buffer control card during a channel storage cycle. These registers act as one counter and step each channel-buffer-storage cycle to provide the buffer storage addressing. A buffer wrap (BWRP) external register is used to determine the segment size buffer boundary. The BCPH and BCPL step up to the boundary set by the BWRP and go back to the beginning of the segment for the next storage cycle.

BCPH				BCPL							
4	5	6	7	0	1	2	3	4	5	6	7

For example, for a 32K wrap, BCPL steps up to hexadecimal FF and BCPH bits 6 and 7 step to hexadecimal 11. After completing the storage cycle at this address, the pointer bits are reset to zero.

The parity of the BCPH and BCPL is predicted, taking into account the wrap bits. This predicted parity is compared with the actual parity, and a miscompare results in a channel buffer storage address pointer parity error.

CEG1 bit 0 is set to point to the buffer control card as the probable failing FRU.

Buffer Wrap Register (BWRP)

Bit Meaning

0 Channel port segment size 128K

1 Channel port segment size 64K

2 Channel port segment size 32K

3 Channel port segment size 16K

4 – 7 Not used by this EAD.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU120) buffer adapter card 01A-A1K2
3. (FRU117) microprocessor card 01A-A1D2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG2 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

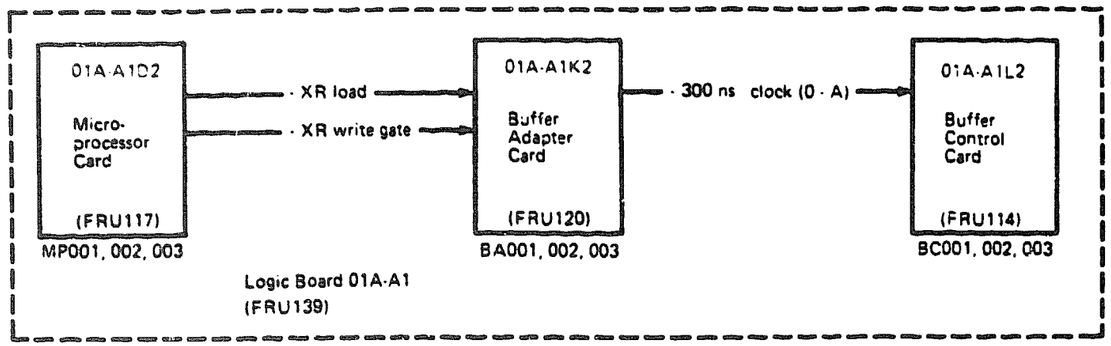
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options.
5	PANEL 1	How to IML functional microcode into the tape control unit.
5	CE/HSC 1	How to use the CE Panel

CEG2 Bit 1 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- XR load			
EE33, E010	- XR write gate			
EE33, E010	- 300 ns clock 0 – A			

CEG2 Bit 1, Channel Buffer Storage Address Pointer Parity Error (Continued)

Error Diagram



CEG2 Bit 2, Channel Buffer Storage Data Correctable Error

Error Condition Theory

This bit indicates a single-bit error was detected in the data received by the buffer control card from the buffer storage card during a channel-to-storage cycle. The error was corrected by the ECC circuits on the buffer control card.

CEG1 bits 0 and 2 are set to point to the buffer control card and buffer storage cards as the probable failing FRUs.

This error does not cause a check 2 error and does not set the any-channel-error bit in CEG0. This error bit cannot be set unless bit 4 of the buffer diagnostic 0 (BDG0) external register has been set. BDG0 bit 4 is the enable-correctable-error-status bit. The channel error BDG0 bit 4 is never set by functional microcode.

Operations continue uninterrupted after CEG2 bit 2 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

CEG2 Bit 3, Channel Buffer Storage Data Uncorrectable Error

Error Condition Theory

This bit indicates that a multiple-bit error was detected in the data received by the buffer control card from the buffer storage card during a storage-to-channel cycle. The error could not be corrected by the ECC circuits on the buffer control card.

CEG1 bits 0 and 2 are set to point to the buffer control card and buffer storage cards as the probable failing FRUs. Sense byte 2 bit 5 indicates the buffer storage card that was being accessed when the error occurred.

Multiple bit errors give various indications. For example:

- 3-bit errors give wrong correctable error indications and send the wrong data.
- 4-bit errors give no indications and send the wrong data.

The buffer control card uses a cyclic redundancy check (CRC) to detect the multiple-bit errors not detected by the ECC circuits.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG2 Bit 3 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

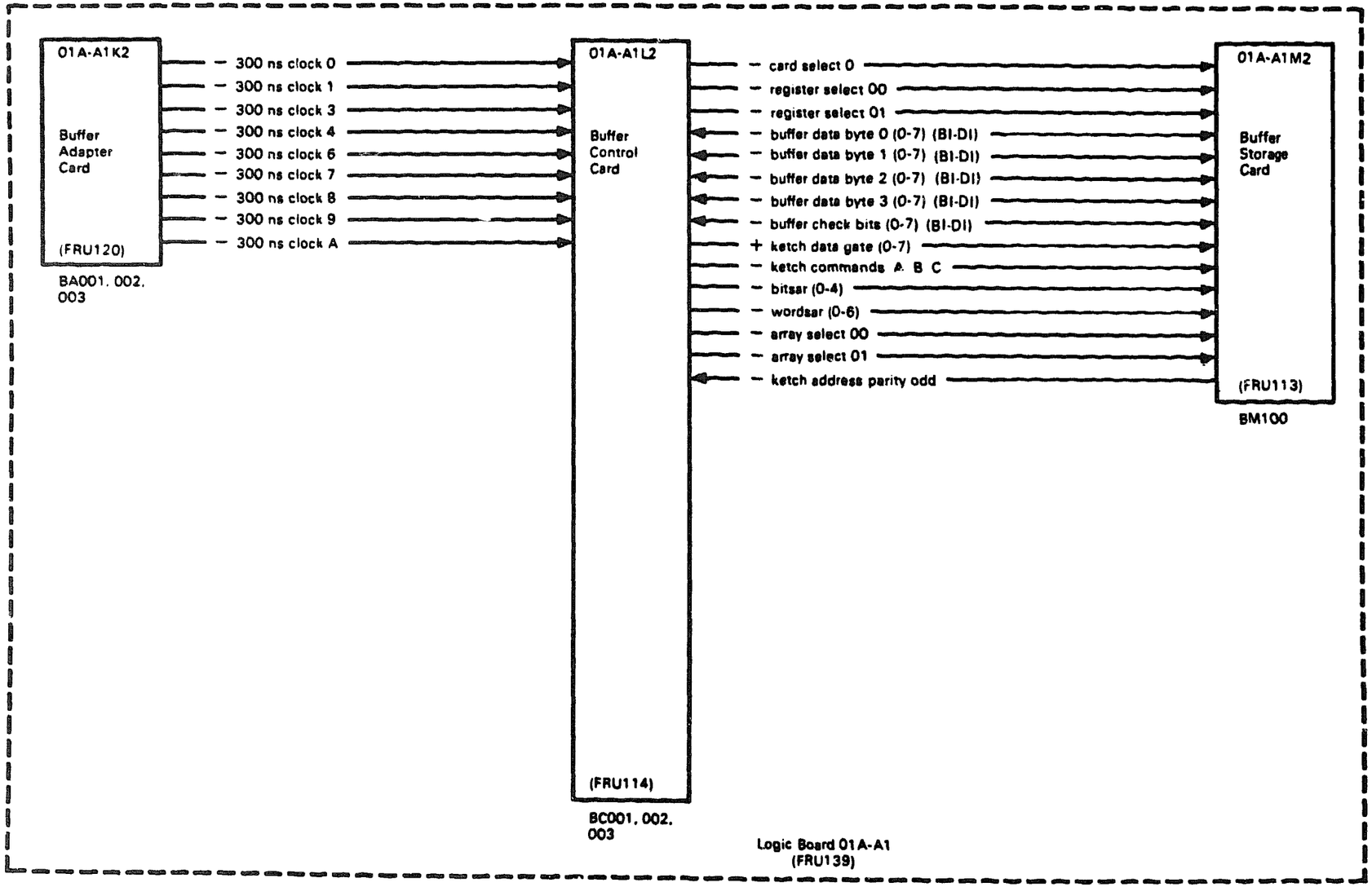
References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options.
5	PANEL 1	How to IML functional microcode into the tape control unit.
5	CE/HSC 1	How to use the CE Panel

CEG2 Bit 3 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- Buffer data byte 0 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer data byte 1 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer data byte 2 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer data byte 3 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer check bits 0 – 7			
EE33, E010	+ Ketch data gate (0 – 7)			
EE33, E010	- Card select 0			
EE33, E010	- Card select 1			
EE33, E010	- Register select 00			
EE33, E010	- Register select 01			
EE33, E010	- Register select 10			
EE33, E010	- Register select 11			
EE33, E010	- Ketch commands A B C			
EE33, E010	- Array select 00			
EE33, E010	- Array select 01			
EE33, E010	- Wordsar 0 – 6			
EE33, E010	- Bitsar 0 – 4			
EE33, E010	- 300 ns clock 0 – A			

Error Diagram



CEG3 Bit 0, Buffer Adapter to Buffer Control Channel Data Bus Parity Error

Error Condition Theory

This bit indicates that the buffer control card received data with even parity from the buffer adapter card during a Channel Write, Loop Write to Read, or Microprocessor Write operation. CEG1 bit 1 is set to point to the buffer adapter card as the probable failing FRU.

If CEG0 bit 2 (channel adapter to buffer parity error) is also set, ignore this data bus parity error because CEG3 bit 0 is a result of the bad parity being sent to the buffer adapter card and propagated to the buffer control card. Return to the error detection theory and troubleshooting guide for CEG0 bit 2.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure. Use sense byte 2 to determine which tape control unit contains the FRUs in the following list:

1. (FRU120) buffer adapter card 01A-A1K2
2. (FRU114) buffer control card 01A-A1L2
3. HSC 50/70
4. (FRU133) channel adapter card (channel A) 01A-A2C2
5. (FRU152) channel adapter card (channel B) 01A-A2D2
6. (FRU900) STI-FIPS adapter (L)
7. (FRU901) STI-FIPS adapter (R)
8. (FRU126) power/POR card 01A-A2H4 (as associated with the channel adapter in use, local or remote)
9. (FRU117) microprocessor card 01A-A1D2
10. Remote port path between the remote and local tape control units if the remote channel adapter was used
11. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used
12. (FRU140) logic board 01A-A2 in the tape control unit that contains the channel adapter that was used
13. Cables, connectors, and nets between all FRUs identified by the FSI and this EAD.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG3 Bit 0 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

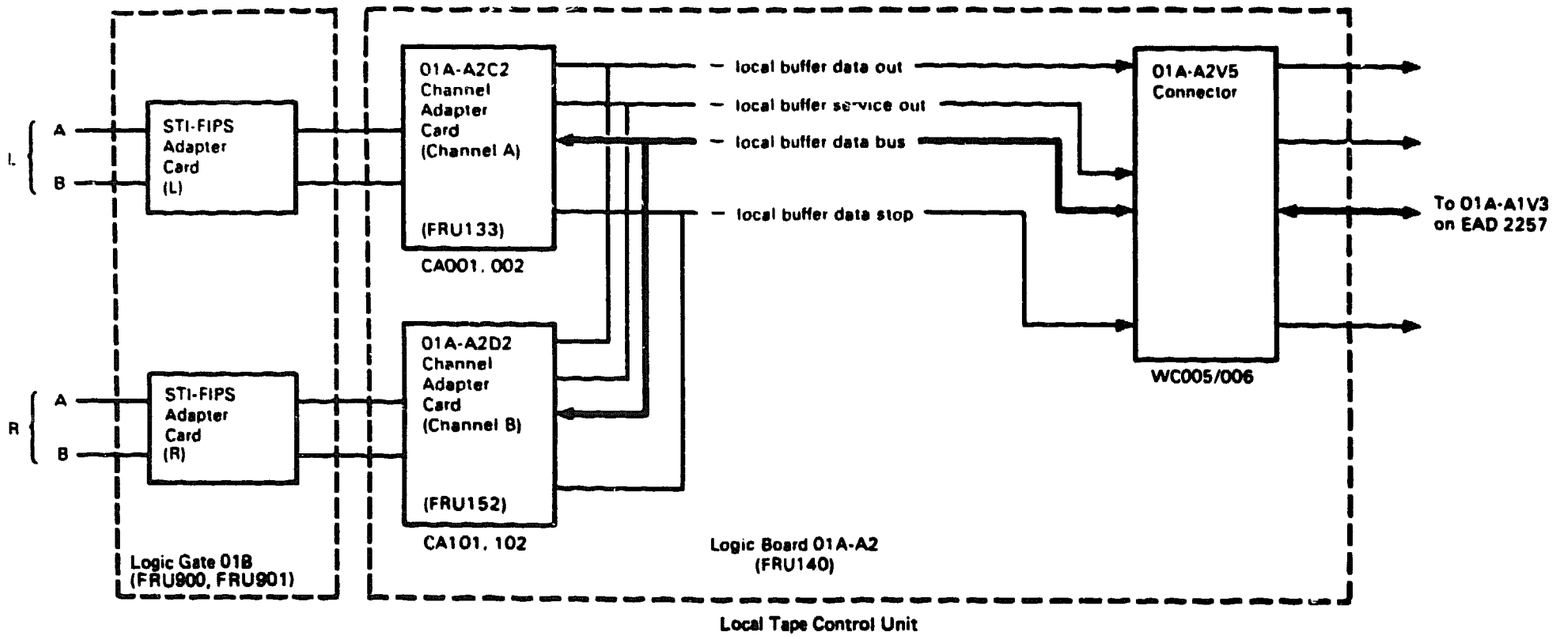
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

CEG3 Bit 0 Net List

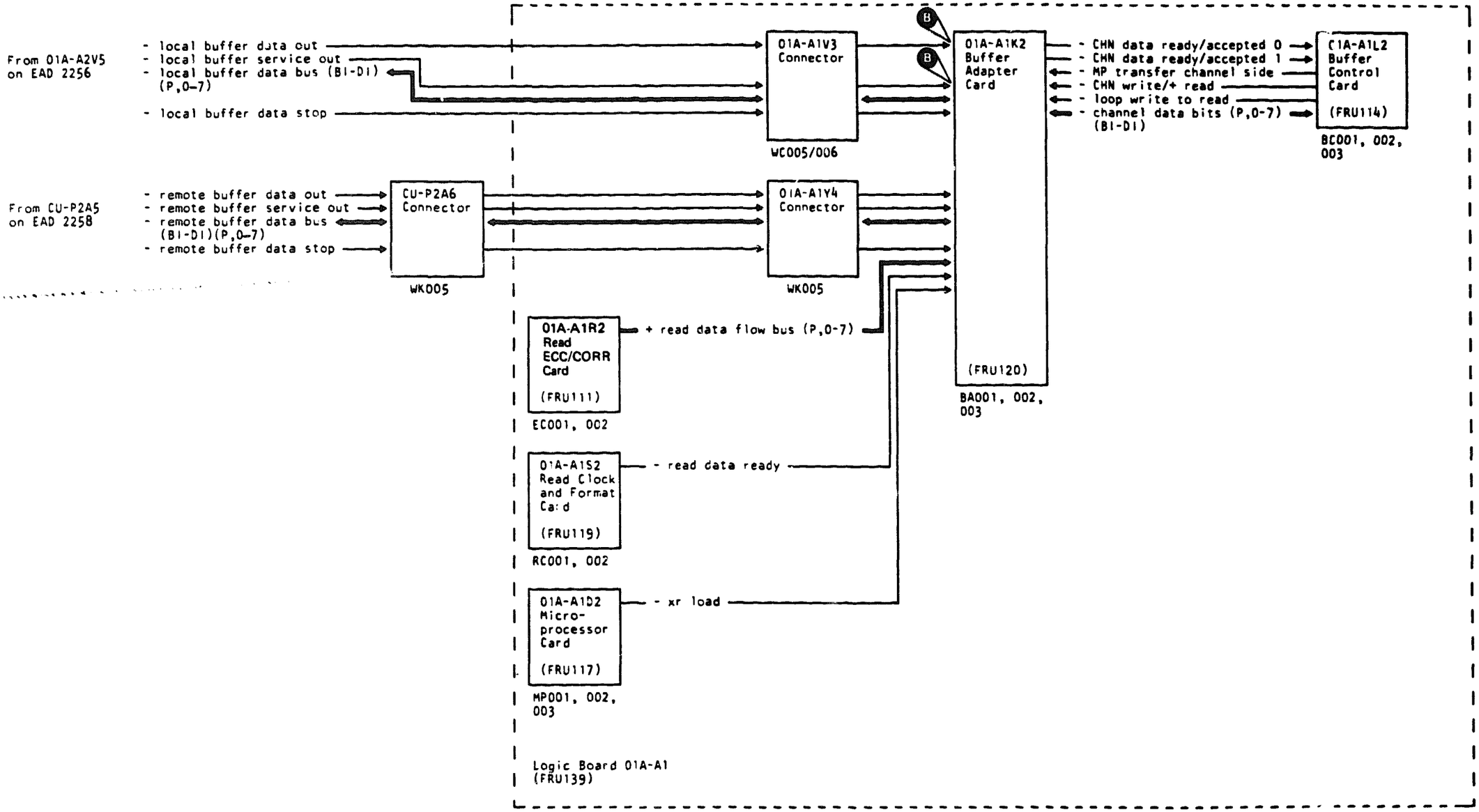
Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- CHN data read/accepted 0	BU3021	3AD0C	70000
EE33, E010	- Channel data bits (0 – 7) BI-DI	BU3021	38804	90000
EE33, E010	- Channel write/ + read	BU2021	38804	70000
EE33, E010	+ Read data flow bus (P,0 – 7)	LW3024	DAD0C	B0000
EE33, E010	- Loop write to read			
E010	- Local buffer service out			
E010	- Local buffer data out			
E010	- Local buffer data stop			
E010	- Local buffer data bus BI-DI (P,0 – 7)			
EE33, E010	- XR load			
EE53, E010	- Read data ready			
E010	- MP transfer channel side			

CEG3 Bit 0, Buffer Adapter to Buffer Control Channel Data Bus Parity Error (Continued)

Error Diagram

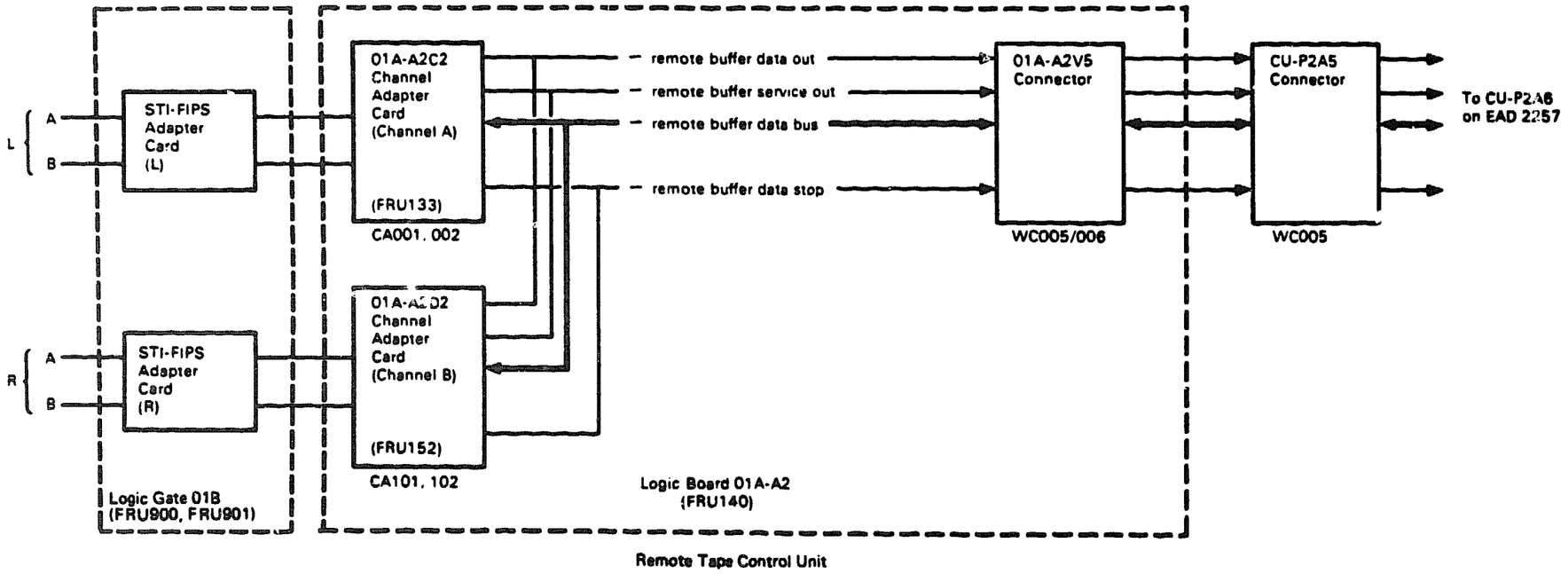


Error Diagram



CEG3 Bit 0, Buffer Adapter to Buffer Control Channel Data Bus Parity Error (Continued)

Error Diagram



CEG3 Bit 1, Buffer Control Channel RAM Data Parity Error

Error Condition Theory

This bit indicates that a parity error was detected on the output of the buffer control channel RAM on the buffer control card during a buffer-storage-channel-store cycle while performing a Write operation. This is an internal parity check of data stored temporarily in the channel RAMs before it is sent to the buffer storage card. All data written to or read from the buffer storage cards must pass through the buffer control channel RAM on the buffer control card.

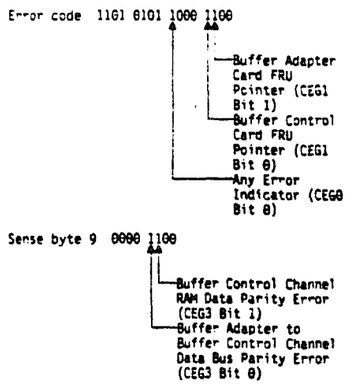
After checking the output of the buffer control channel RAM, the buffer control card strips the parity and generates an error correction code (ECC) across groups of four data bytes as the data is taken from the RAM and stored in the buffer storage cards. By parity checking the data as it is read from the RAM, the buffer control card knows that each group of four bytes is correct before the ECC is concatenated to the group.

CEG1 bit 0 is set to point to the buffer control card as the probable failing FRU.

If CEG0 bit 2 (channel adapter to buffer adapter parity error) or CEG3 bit 0 (buffer adapter to buffer control channel data bus parity error) is set, the buffer control channel RAM failure is a result of the earlier error. The following examples show you how to select the correct error bit if multiple error bits are on.

Example 1

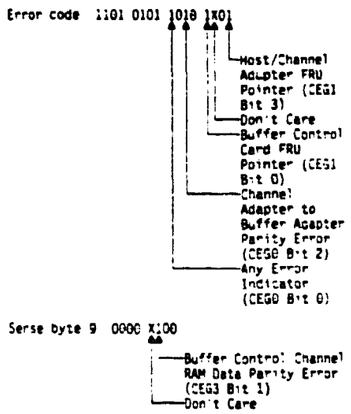
Assume that the error code is D58C and sense byte 9 is 0C



This indicates that the buffer control card received data with bad parity from the buffer adapter card over the channel data bus. The incorrect data propagated through the buffer control card logic and was loaded into the RAM. The failure is either in the buffer adapter card, the channel data bus, the control lines from the buffer adapter card to the buffer control card, or the logic on the control card that precedes the checker for the buffer adapter to buffer control channel data bus parity error. Return to the error detection theory and troubleshooting guide for "CEG3 bit 0, Buffer Adapter to Buffer Control Channel Data Bus Parity Error."

Example 2

Assume an error code of D5A9 or D5AD and sense byte 9 of 04 or 0C.



This indicates that the buffer adapter card received data with bad parity from the channel adapter over either the local or remote buffer data bus. The error data propagated through the buffer adapter card and the buffer control card logic and was loaded into the RAM. Return to the error detection theory and troubleshooting guide for "CEG0 Bit 2, Channel Adapter to Buffer Adapter Parity Error."

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure. Use sense byte 2 to determine which tape control unit contains the FRUs in the following list:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU117) microprocessor card 01A-A1D2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU126) power/POR card 01A-A2H4 (as associated with the channel adapter)
5. Host system channel
6. (FRU133) channel adapter card (channel A) 01A-A2C2
7. (FRU152) channel adapter card (channel B) 01A-A2D2
8. (FRU900) STI-FIPS adapter (L)
9. (FRU901) STI-FIPS adapter (R)
10. Remote port path between the remote and local tape control units if the remote channel adapter was used
11. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used
12. (FRU140) logic board 01A-A2 in the tape control unit that contains the channel adapter that was used
13. Cables, connectors, and nets between all FRUs identified by the FSI and this EAD.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG3 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

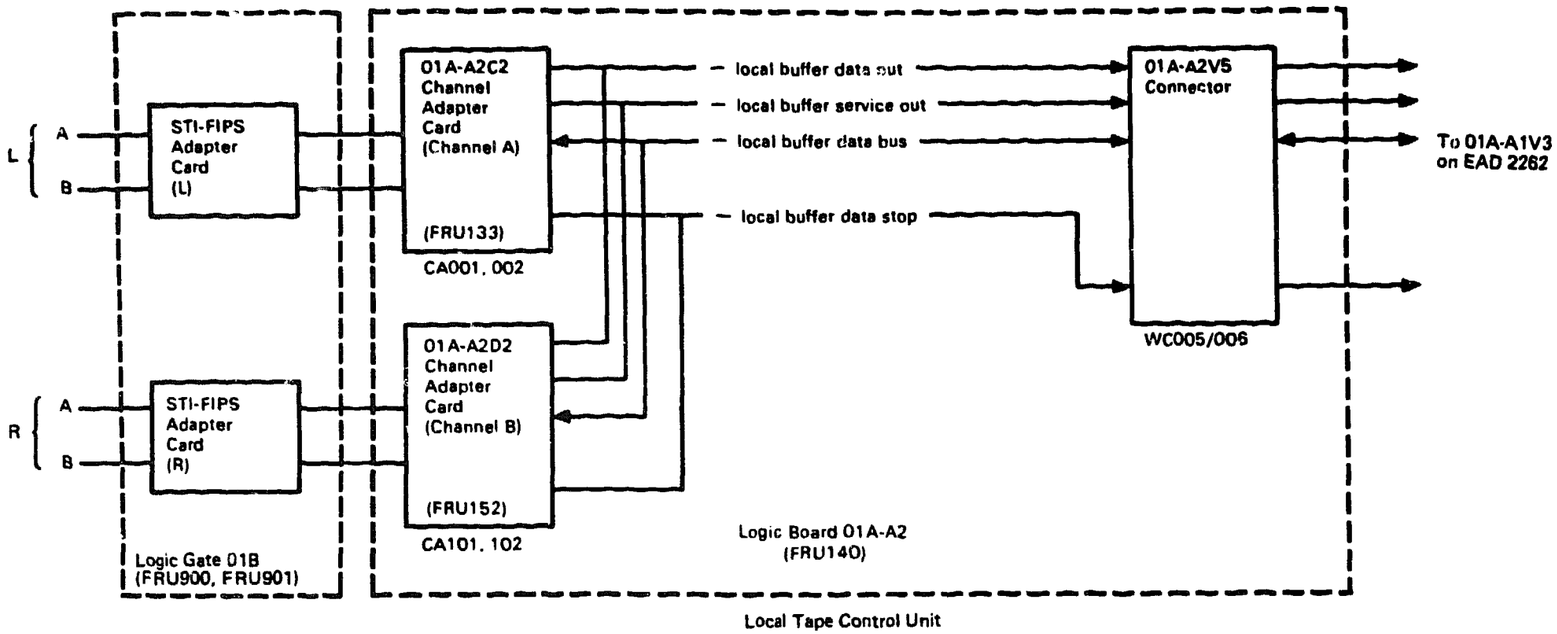
CEG3 Bit 1, Buffer Control Channel RAM Data Parity Error (Continued)

CEG3 Bit 1 Net List

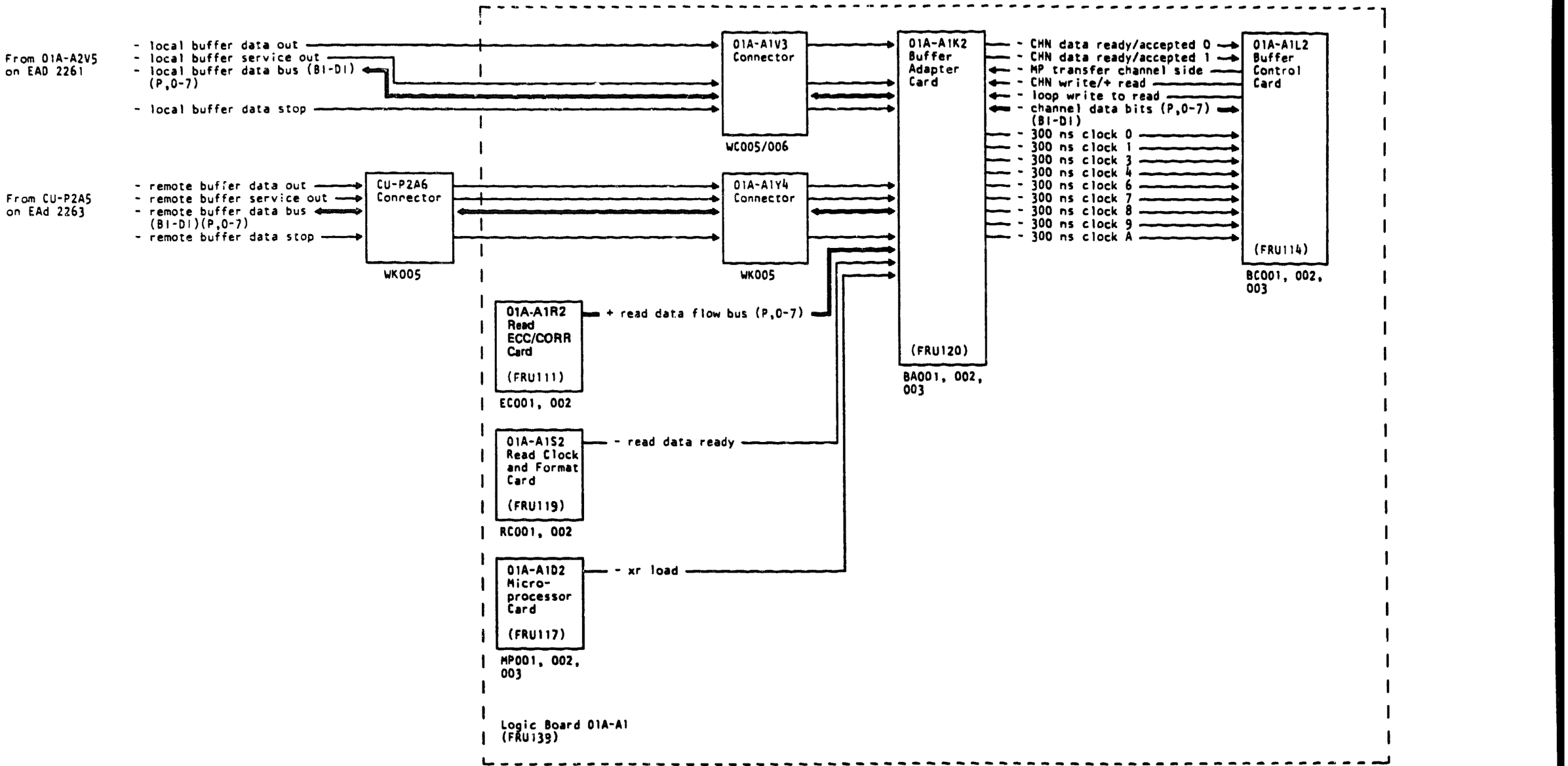
Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- CHN data ready/accepted 0	BU3021	3AD0C	70000
EE33, E010	- CHN data ready/accepted 1	BU3021	38804	70000
EE33, E010	- Channel data bits ,0 – 7) BI-DI	BU3021	38804	10000
EE33, E010	- Channel write/ + read	BU2021	38804	70000
EE53, E010	+ Read data flow bus (P,0 – 7)	LW3024	DAD0C	B0000
EE33, E010	- Loop write to read	BU3021	3A904	90000
EE53, E010	- 300 ns clock 0 – A	LW3024	18804	10000
EE33, E010	- XR load			
EE53, E010	- Read data ready			

CEG3 Bit 1, Buffer Control Channel RAM Data Parity Error (Continued)

Error Diagram

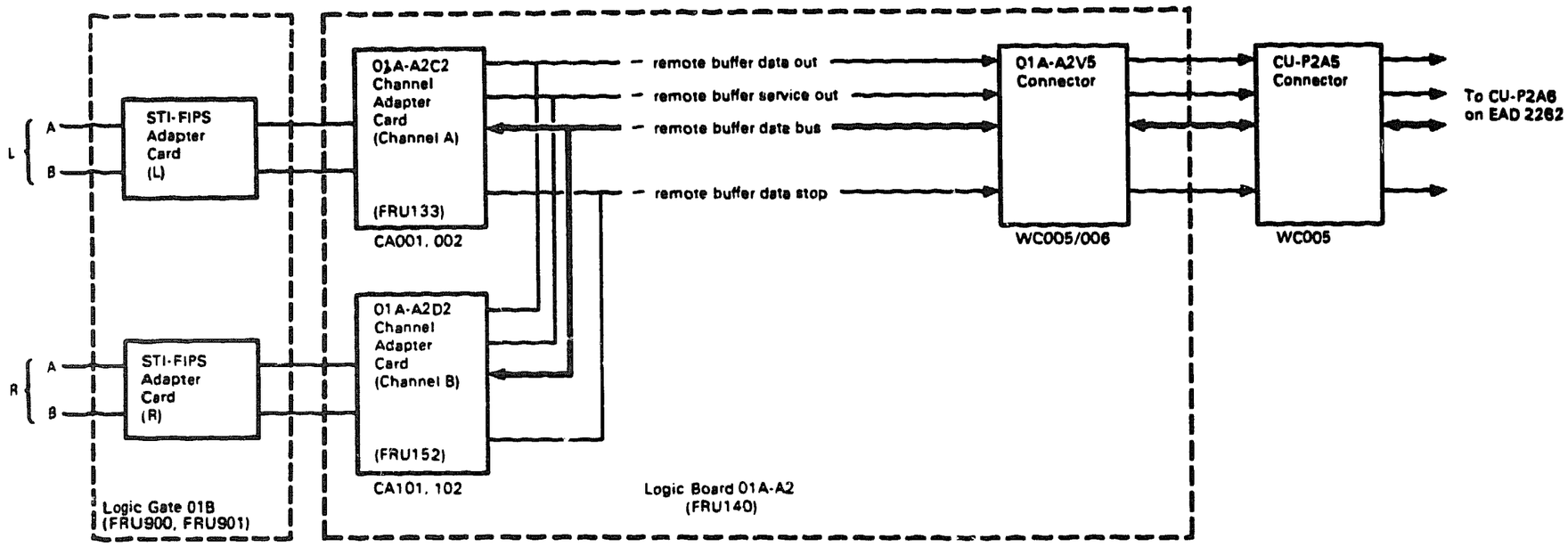


Error Diagram



CEG3 Bit 1, Buffer Control Channel RAM Data Parity Error (Continued)

Error Diagram



CEG3 Bit 2, Channel Cyclic Redundancy Check (CRC) Error

Error Condition Theory

This bit indicates that the contents of the buffer channel CRC register was not zero at the completion of a Channel Read operation. The read data flow circuits read data from the tape and send the data to the buffer storage cards through the device-side circuits one byte at a time. As each byte is received, it is clocked through a CRC generator register in the device-side circuits of the buffer control card. Thus, a CRC is generated for the entire record that is read from tape. The buffer control card stores the CRC behind the last characters of the record.

When the channel reads the record, the record is taken from the buffer storage cards by the channel-side circuits of the buffer control card. As each byte is sent to the channel, the channel-side circuits of the buffer control card clock the byte through a CRC generator. After the last byte has been sent to the channel, the CRC that was stored behind the record is clocked through the CRC generator. The CRC generated by the device-side circuits should cause the channel-side CRC generator to go to zero. If the channel-side CRC does not go to zero, channel CRC error is detected. This CRC check ensures data integrity from the tape through the buffer storage cards to the buffer control card output to the buffer adapter card.

CEG1 bits 0 and 2 are set to point to the buffer control card and the buffer storage cards as the probable failing FRUs.

If this error is set at the same time as any of the following errors, channel CRC error is likely to be a result of the primary error. The primary errors are:

- Channel buffer storage data uncorrectable error (CEG2 bit 3)
- Channel buffer storage address parity error (CEG2 bit 0)
- Channel buffer storage address pointer parity error (CEG2 bit 1)
- Buffer control to buffer adapter data bus parity error (CEG0 bit 3).

Go to the error detection theory and troubleshooting guide for the primary error.

Additional Possible Cruses of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure. Use sense byte 2 to determine which tape control unit contains the FRUs in the following list:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. HSC 50/70
4. (FRU133) channel adapter card (channel A) 01A-A2C2
5. (FRU152) channel adapter card (channel B) 01A-A2D2
6. (FRU900) STI-FIPS adapter (L)
7. (FRU901) STI-FIPS adapter (R)
8. (FRU120) buffer adapter card 01A-A1K2
9. (FRU126) power/POR card 01A-A2H4 (as associated with the channel adapter in use, local or remote)
10. (FRU 17) microprocessor card 01A-A1D2
11. Remote port path between the remote and local tape control units if the remote channel adapter was used
12. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used
13. (FRU140) logic board 01A-A2 in the tape control unit that contains the channel adapter that was used
14. Cables, connectors, and nets between all FRUs identified by the FSI and this EAD.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "CEG3 Bit 2 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BCSE from the diagnostic failure for the next CEG bit on.
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

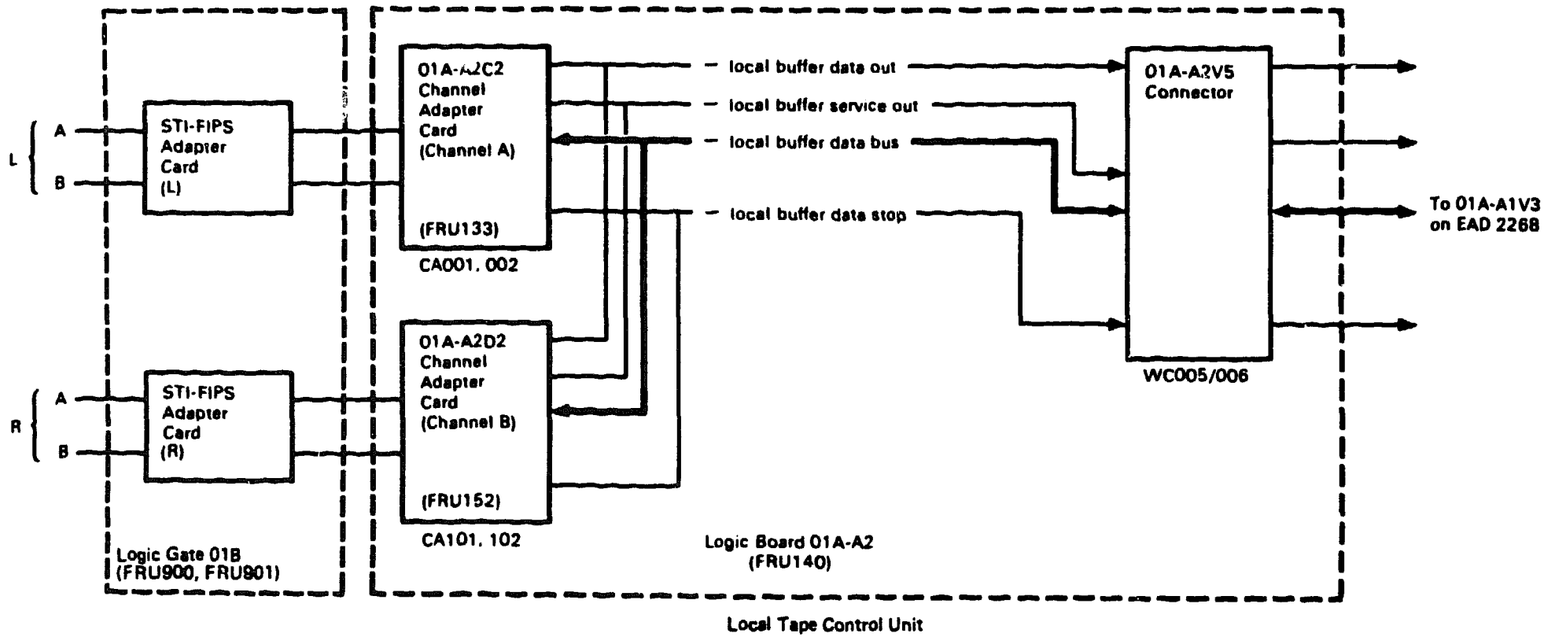
CEG3 Bit 2, Channel Cyclic Redundancy Check (CRC) Error (Continued)

CEG3 Bit 2 Net List

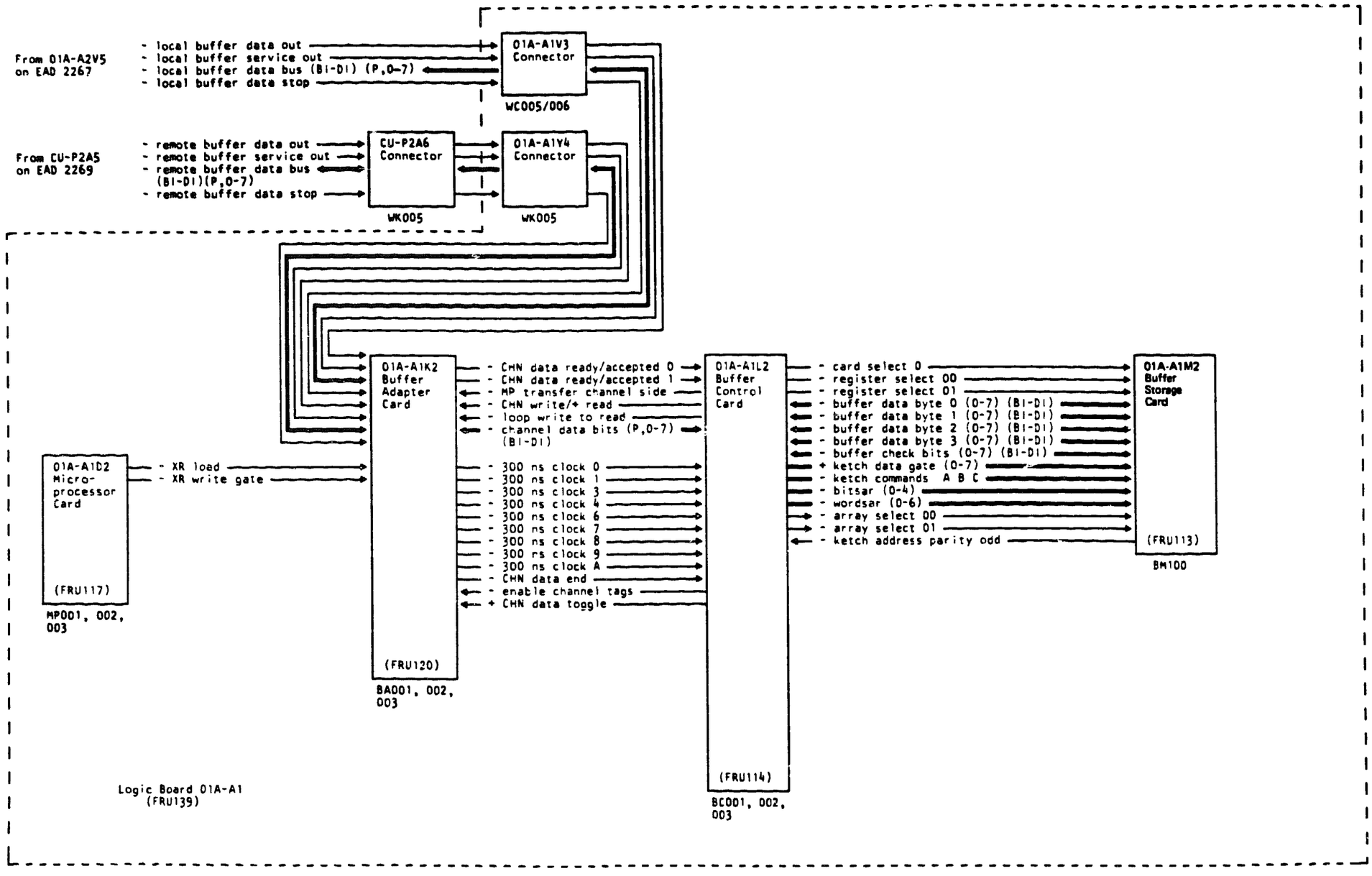
Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE33, E010	- Ketch command C	BU3025	D8A02	XXXXX
EE33, E010	- Local buffer data stop	BU3025	D8A02	90000
EE33, E010	- CHN write/+ read	BU2027	D9A02	90000
EE33, E010	- Ketch command B	BU3028	D8A02	XXXXX
EE33, E010	- Buffer data byte 0 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer data byte 1 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer data byte 2 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer data byte 3 bits 0 – 7	BU3028	D8A12	XXXXX
EE33, E010	- Buffer check bits 0 – 7			
EE33, E010	+ Ketch data gate (0 – 7)			
EE33, E010	- Card select 0			
EE33, E010	- Card select 1			
EE33, E010	- Register select 00			
EE33, E010	- Register select 01			
EE33, E010	- Register select 10			
EE33, E010	- Register select 11			
EE33, E010	- Ketch commands A B C			
EE33, E010	- Array select 00			
EE33, E010	- Array select 01			
EE33, E010	- Wordsar 0 – 6			
EE33, E010	- Bitsar 0 – 4			
EE33, E010	- 300 ns clock 0 – A			
EE33, E010	- XR load			
EE33, E010	- XR write gate			
EE33, E010	- Ketch address parity odd	BU3021	18A80	90000
EE33, E010	- Enable channel tags	BU3025	D98000	90000
EE33, E010	- CHN data end	BU3025	DD900	90000
EE33, E010	- MP transfer channel side			
EE33, E010	- CHN data ready/accepted 0	BU3021	3AD0C	70000
EE33, E010	- CHN data ready/accepted 1	BU3021	38804	70000
EE33, E010	- Channel data bits (0 – 7) BI-DI	BU3021	38804	10000
EE33, E010	+ CHN data toggle			

CEG3 Bit 2, Channel Cyclic Redundancy Check (CRC) Error (Continued)

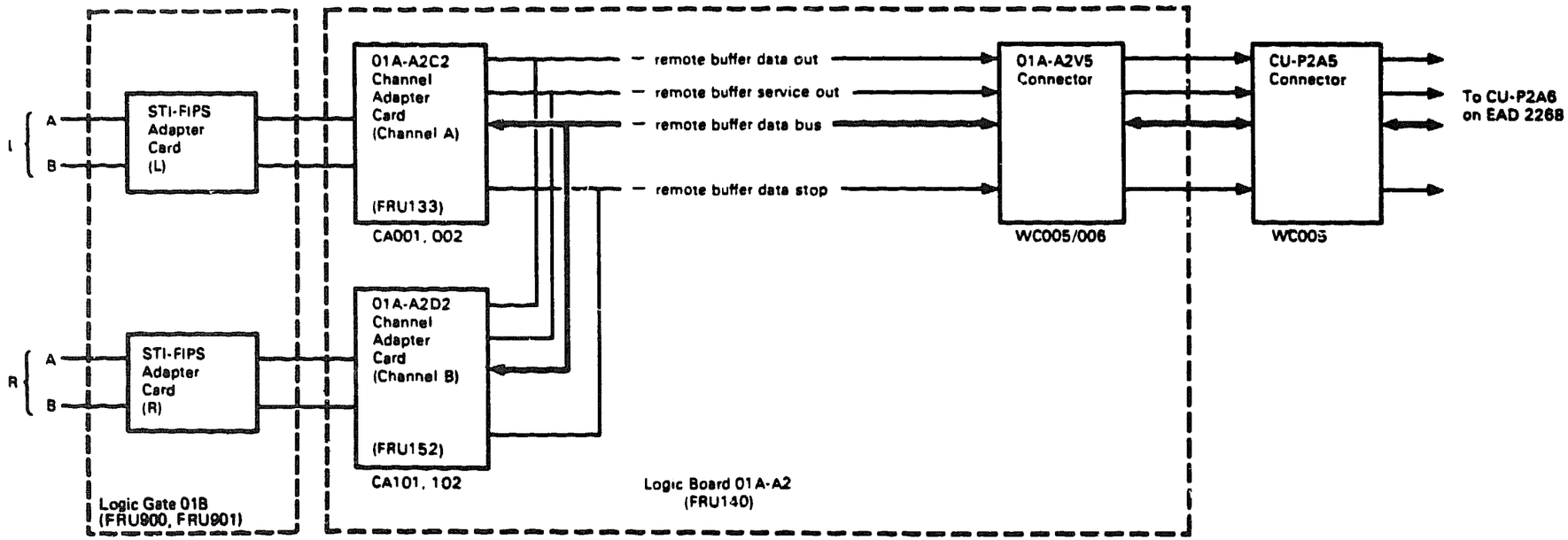
Error Diagram



Error Diagram



Error Diagram



Error Code D6nn

Error Description

The buffer-device functional area detected a hardware error during a data transfer between the tape drive and the TA90 subsystem buffer. The errors detected are data parity errors and data transfer control failures.

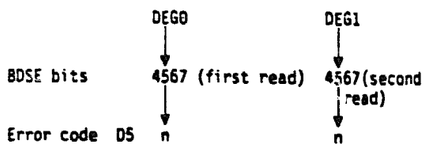
For the case where nn = 8A, the channel cables between the STI-FIPS adapter and the tape control unit are also suspect, as well as the buffer-device interface in the tape control unit.

Error Condition Theory

The buffer-device functional area includes all the hardware that is used to transfer data between the tape drives and the subsystem buffer. When this hardware detects an error, it sets bits in device error group registers 0, 1, 2, and 3 (DEG0, DEG1, DEG2, and DEG3).

The device error group registers are four-bit register that cannot be read directly. They are read by transferring their data to bits 4 through 7 of the buffer device status and error register (BDSE).

When an error is detected, the microcode reads the BDSE register which includes DEG0 in bits 4 through 7. Then the microcode sets bit 3 of the BDSE register to signal that the other DEG registers must be read. When BDSE bit 3 is on, each read of the BDSE advances a pointer to cause the next DEG to be read out. If bit 3 of the BDSE is not on, the DEG pointer does not advance, and DEG0 is read for each read of the BDSE. The data read out of the DEG registers is stored, and the microcode uses it to build sense data and the D6nn error code. DEG2 and DEG3 are stored in sense byte 9, and DEG0 and DEG1 are used to build the error code as follows.



DEG0 and DEG1 are also stored in sense byte 17.

Any error except device buffer storage data correctable error (DEG2 bit 2) causes the 'check 2' line to the microprocessor to become active and the DEGs to be read.

When an error is detected, the start bit in the buffer device control (BDC) register becomes active and remains active while the microcode reads out the DEGs. If for some reason the start bit becomes not active before all the DEGs are read, BDSE bits 4–7 contain the contents of the DEG that was loaded after the last XR read of the BDSE before the start bit became not active. Also, resetting the start bit causes some error latches in the DEGs to be reset.

Sense byte 2 points to the tape control unit that contains the buffer that detected the failure.

Buffer Device Status and Error Register

The contents of the BDSE are:

Bit	Meaning	Condition
0	Device pointer = stop	Set when BDP = BDS
1	Device read end	Read data flow circuits ended the data transfer to or from the buffer
2	Device data transfer complete	Set when the data transfer has been completed between the buffer and the read data flow or write data flow circuits
3	Sample device errors	Set to read out DEGs
4	Device error 0	Contains the device error group bit 0
5	Device error 1	Contains the device error group bit 1
6	Device error 2	Contains the device error group bit 2
7	Device error 3	Contains the device error group bit 3

Device Error Groups

The device error group bits have meanings as follows.

Device Error Group 0 (DEG0)

Bit	Description
0	Any device error. This bit is set by any other DEG bit being on except DEG2 bit 2.
1	Device data overrun.
2	Read data flow to buffer adapter parity error.
3	Buffer control to buffer adapter device data bus parity error.

Device Error Group 1 (DEG1)

Note: The bits of DEG1 are FRU pointers and are not used for error isolation. Use the device error group registers 0, 2, and 3 for error isolation.

Bit	Description
0	The buffer control card caused the failure.
1	The buffer adapter card caused the failure.
2	A buffer storage card caused the failure.
3	The read ECC/CORR card or the read clock and format card caused the failure.

Device Error Group 2 (DEG2)

Bit	Description
0	Device buffer storage address parity error.
1	Device buffer storage address pointer parity error.
2	Device buffer storage data correctable error.
3	Device buffer storage data uncorrectable error.

Device Error Group 3 (DEG3)

Bit	Description
0	Buffer adapter to buffer control device data bus parity error.
1	Buffer control device RAM data parity error.
2	Device CRC error.
3	Not used.

Sense Byte 2

Sense byte 2 has the following format:

Bits	Description
0–3	Not used for this EAD.
4	0 = Microprocessor, buffer, and data flow are in tape control unit 0. 1 = Microprocessor, buffer, and data flow are in tape control unit 1.
5	Reserved
6	Reserved
7	Not used for this EAD.

Use the bits from sense byte 2 to determine which tape control unit to work on.

Error Code D6nn (Continued)

Troubleshooting Guide

This is a common troubleshooting guide for all D6nn error codes. This troubleshooting guide helps you determine the order in which you should analyze the symptoms of the error code

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.

2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD

3. For intermittent errors, perform the following procedures repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Failures detected in a functional area can be caused by defective clock lines. All clocks for the buffer are generated by the buffer adapter card. The clock lines are listed in the individual net lists for each DEG bit and should be scoped as part of the individual troubleshooting guide.

5. Run diagnostics EE30 and EE52 (see DIAG 1). If a failure is detected, see the failure ID table. Record the BCSE and BDSE error information from the diagnostic screen. Return to this EAD and compare any common FRUs or troubleshooting tips.

```
Did this diagnostic fail?

YES NO
 |  |
 |  Continue with the actions in the EAD.
 |
Did the failure direct you back to the
same EAD?

YES NO
 |  |
 |  Go to the place that the diagnostic
 |  sends you and do the actions.
 |
Do the EADs have specific actions for the
diagnostic failure?

YES NO
 |  |
 |  Loop the diagnostics and do any other
 |  actions specified in the EADs.
 |
Do the actions specified for that failure.
```

6. If diagnostic EE30 (buffer test) does not give any valid information in the BDSE and diagnostic EE52 fails, suspect an external line between the buffer adapter and the read data flow or write data flow first and suspect an internal net second.

7. If the BDSE has no error indicated and the BCSE has an error indicated, go to the EAD for error code D5nn to continue troubleshooting

8. If the BDSE has error bits on, continue in this EAD and analyze the DEG bits.

   Note: You can obtain the DEG bits in either of two ways.

   a. If you are analyzing a failure from a diagnostic, the DEGs are displayed as the last four hexadecimal characters in the BDSE in the error display on the CE Panel screen. (See the error screen descriptions for the diagnostic you are running.)

   b. If you are analyzing the sense data from the error log, DEG0 and DEG1 are the nn characters from the D5nn error code in sense bytes 16 and 17. DEG2 and DEG3 are in sense byte 9

   As an example, assume that we have DEG values 8C0C. The DEG bit values are:

```
DEG0 DEG1 DEG2 DEG3
1000 1100 0000 1100
 |    |              |
 |    |              |
 |    |              |
```

DEG0 Bit 0, Any Device Error Detected

Error Condition Theory

Bit 0 should always be on in the D6nn error code. It is set by any other device error group bit being on. If it is not on and any other DEG bit is on, bit 0 failed to be set by internal circuitry. D600 should never occur. A check-2 error with no FRU-pointing bits should result in a D900 error code. Bit 0 should not be on by itself (D680). If bit 0 is on and no other DEG bits are on:

- A false error occurred.
- The error was reset or failed to be latched on when the device error groups were read out by the microprocessor.
- Something inhibited reading out the DEGs.

If bit 0 is on as it should be, go to the next DEG bit for troubleshooting. If bit 0 is on incorrectly, look for a valid error indicated in the sense information.

If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If the program detects an error, continue in this EAD with the next action.

If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

DEG0 Bit 1, Device Overrun

Error Condition Theory

The data buffer provides the speed matching necessary to handle the difference between channel and drive data rates. The buffer also allows the channel to write a record to a drive address before the tape transport has accelerated to recording speed. In Channel Read operations, records can be pre-read sequentially from the drive and stored into the data buffer before the channel has issued a Read command for that drive (after the initial Read command). When the next Read command is issued, the record is available in the buffer for immediate transfer to the channel. All of these buffer operations serve to increase channel performance. The channel and the drive can both be reading from or writing to the buffer at the same time.

During a channel write operation, the channel is writing to the buffer while the drive is reading from the buffer and writing the data on tape. When the Channel Write operation is initiated, the tape transport mechanism in the drive is stopped. The Channel Write operation signals for the drive to start the tape transport mechanism and starts transferring data to the buffer storage cards through the channel-side circuits of the buffer adapter and buffer control cards. When the drive has the tape transport mechanism moving at the correct speed, data is transferred from the buffer storage cards through the device-side circuits of the buffer adapter and buffer control cards to the write data flow circuits. The write data flow circuits format the data and send it to the drive to be written on the tape. Meanwhile, the channel can still be transferring data to the buffer through the channel-side circuits. If the buffer control circuits detect that the drive is trying to transfer data from storage positions that the channel has not yet written, they set the device-overrun error.

During Channel Read operations, data transfers from the drive through the device-side circuits to the buffer storage cards. The channel-side circuits transfer data from the buffer storage cards to the host system channel. If the buffer adapter and buffer control circuits detect that the host system channel is trying to transfer data from storage positions that the drive has not yet written, they set the device-overrun error.

DEG1 bit 0 is set to point to the buffer control card as the probable failing FRU.

If either DEG2 bit 0 (device buffer storage address parity error) or DEG2 bit 1 (device buffer storage address pointer parity error) is set, go the error detection and troubleshooting guide for the addressing error. Either of the addressing errors causes a device overrun because they inhibit storing of data in the buffer storage cards.

Buffer Device Command Register

Bit Description

0 Buffer device command 0

1 Buffer device command 1

2 Buffer device command 2

3 Buffer device command 3

4 Start tape drive

5 Degate BCP = BDP

6 Disable device fetch cycle

7 Not used

Buffer Device Commands

BDC (Hexa-Decimal)	Description
08	Store CRC
18	Read data flow to buffer storage
48	Microprocessor write
88	Buffer storage to write data flow
8C	Erase gap (Pseudo store data flow)
CC	Microprocessor read operation
CE	Microprocessor read buffer control device RAM only
F0	Hold buffer device control reset
00	No buffer device operation

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU120) buffer adapter card 01A-A1K2
3. (FRU119) read clock and format card 01A-A1S2
4. (FRU116) write data card 01A-A1P2
5. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG0 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

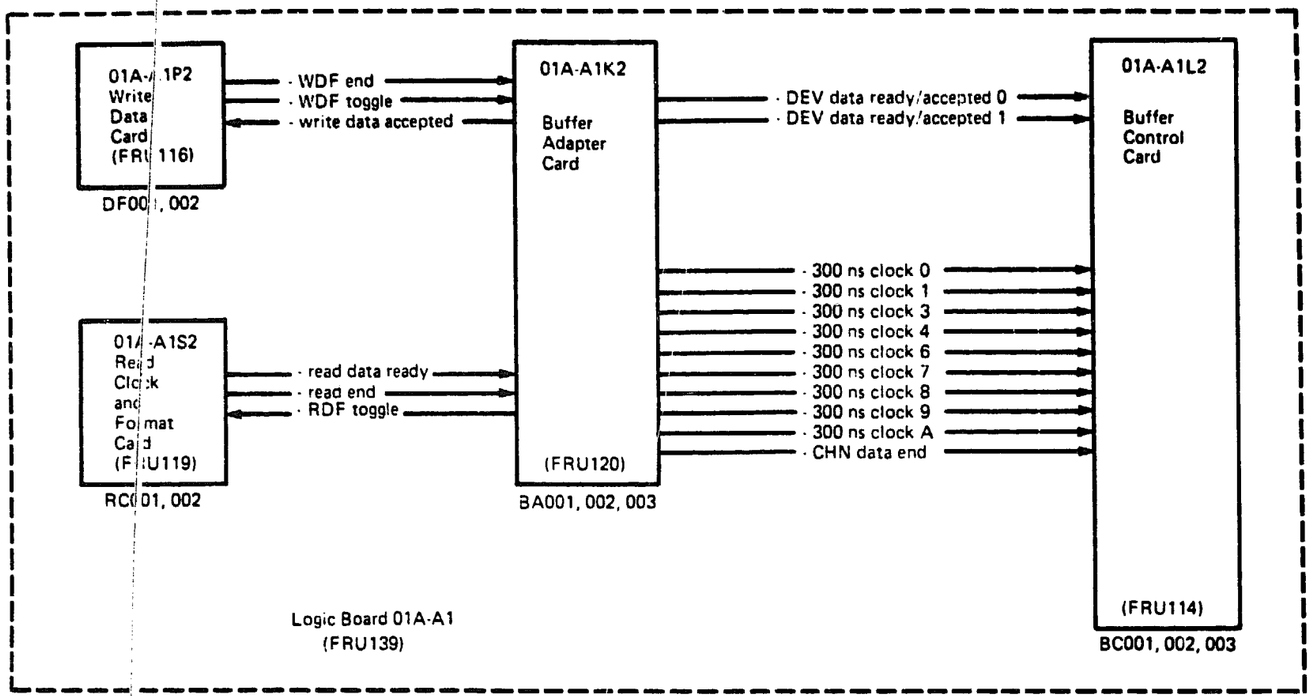
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

DEG0 Bit 1, Device Overrun (Continued)

DEG0 Bit 1 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- DEV data ready/accepted 0	BU2022	30000	1C800
EE32, E010	- 300 ns clock A	BU2024	10000	1CA10
EE32, E010	- 300 ns clock 0, 3, 4, 8, and 9	BU2024	10000	1C800
EE32, E010	- 300 ns clock 6	BU2024	30000	9C800
EE33, E010	- 300 ns clock 1	BU3022	30000	9CA10
EE33, E010	- 300 ns clock 7	BU3022	30000	9C800
EE33, E010	- DEV data ready/accepted 0			
EE33, E010	- Write data accepted			
EE33, E010	- Read data ready			
EE33, E010	- WDF end			
EE33, E010	- WDF toggle			
EE33, E010	- RDF end			
EE33, E010	- RDF toggle			

Error Diagram



DEG0 Bit 2, Read Data Flow to Buffer Adapter Parity Error

Error Condition Theory

This bit indicates that the buffer adapter card received data with even parity from the read EEC/CORR card during a read-data-flow-to-buffer data transfer operation. Setting this bit also sets DE 31 bit 3 to indicate that the read ECC/CORR and read clock and format cards as the probable failing FRUs. Sense byte 2 points to the tape control unit that contains the buffer that detected the failure.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure. Use sense byte 2 to determine which tape control unit contains the FRUs in the following list:

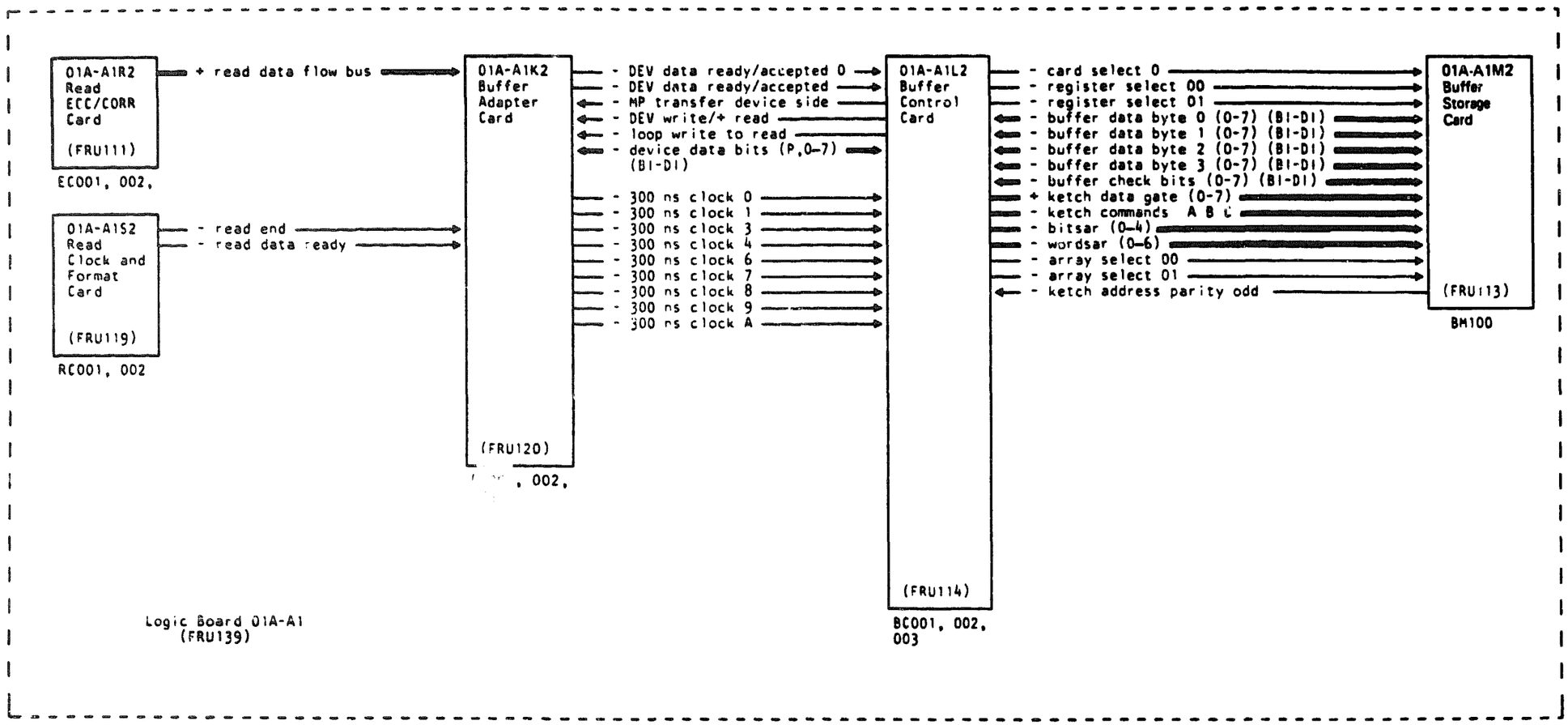
1. (FRU119) read clock and format card 01A-A1S2
2. (FRU111) read ECC/CORR card 01A-A1R2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU114) buffer control card 01A-A1L2
5. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If the program detects an error, continue in this EAD with the next action.

If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

Error Diagram



DEG0 Bit 3, Buffer Control to Buffer Adapter Device Data Bus Parity Error

Error Condition Theory

This bit indicates that the buffer adapter card received data with even parity from the buffer control card during buffer-to-write-data-flow Microprocessor Read operations

Note: The bits of DEG1 are FRU pointers and are not used for error isolation. Use the device error group registers 0, 2, and 3 for error isolation.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU120) buffer adapter card 01A-A1K2
2. (FRU114) buffer control card 01A-A1L2
3. (FRU117) microprocessor card 01A-A1D2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG0 Bit 3 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action,** verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

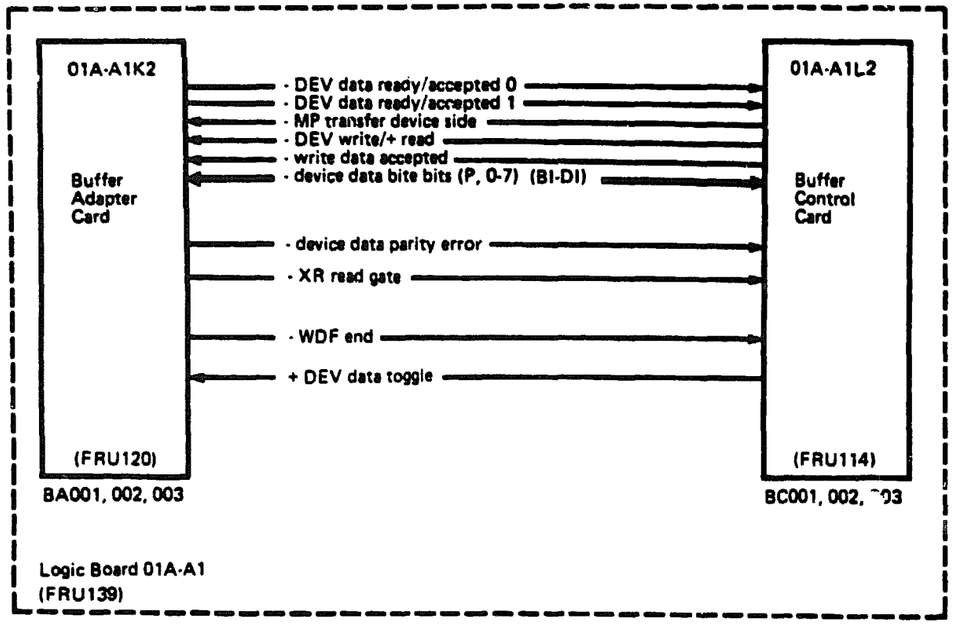
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

DEG0 Bit 3 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- Write data accepted	BU2022	30000	B9800
EE32, E010	- DEV write/ + read	BU2022	30000	99800
EE32, E010	- Device data parity error	BU2022	30000	99800
EE32, E010	- DEV data ready/accepted 0	BU2022	30000	19800
EE52, E010	- device data bits (P,0 – 7)	LW2025	30000	B9800
EE32, E010	- WDF end			
EE32, E010	- MP transfer device side			
EE32, E010	+ device data toggle			
EE32, E010	- DEV data ready/accepted 1			
EE32, E010	+- XR read gate			

DEG0 Bit 3, Buffer Control to Buffer Adapter Device Data Bus Parity Error (Continued)

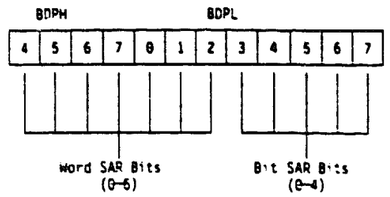
Error Diagram



DEG2 Bit 0, Device Buffer Storage Address Parity Error

Error Condition Theory

This bit indicates that a miscompare occurred between the buffer storage address parity generated by the buffer control card and the address parity received by the buffer storage cards during a device storage cycle. The parity of the buffer storage address received by the buffer storage cards is sent back to the buffer control card and compared there. Address parity is checked for device memory data access cycles only. Address parity is generated from bits 4 – 7 of the buffer device pointer high (BDPH) external register and bits 0 – 7 of the buffer device pointer low (BDPL) external register as follows.



Word SAR bits and bit SAR bits are combined and parity is generated to give the address parity.

DEG1 bits 0 and 2 are set to point to the buffer control card and buffer storage cards as the probable failing FRUs. Sense byte 2 bit 5 indicates the buffer storage card that was being accessed when the error occurred.

If the device buffer storage address pointer parity error (DEG2 bit 1) is also set, go to the EAD for that bit. (See EAD 1.) The device buffer storage address pointer parity error is most likely to be the primary error. This device buffer storage address parity error is likely to be the result of the device buffer storage address pointer parity error.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG2 Bit 0 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

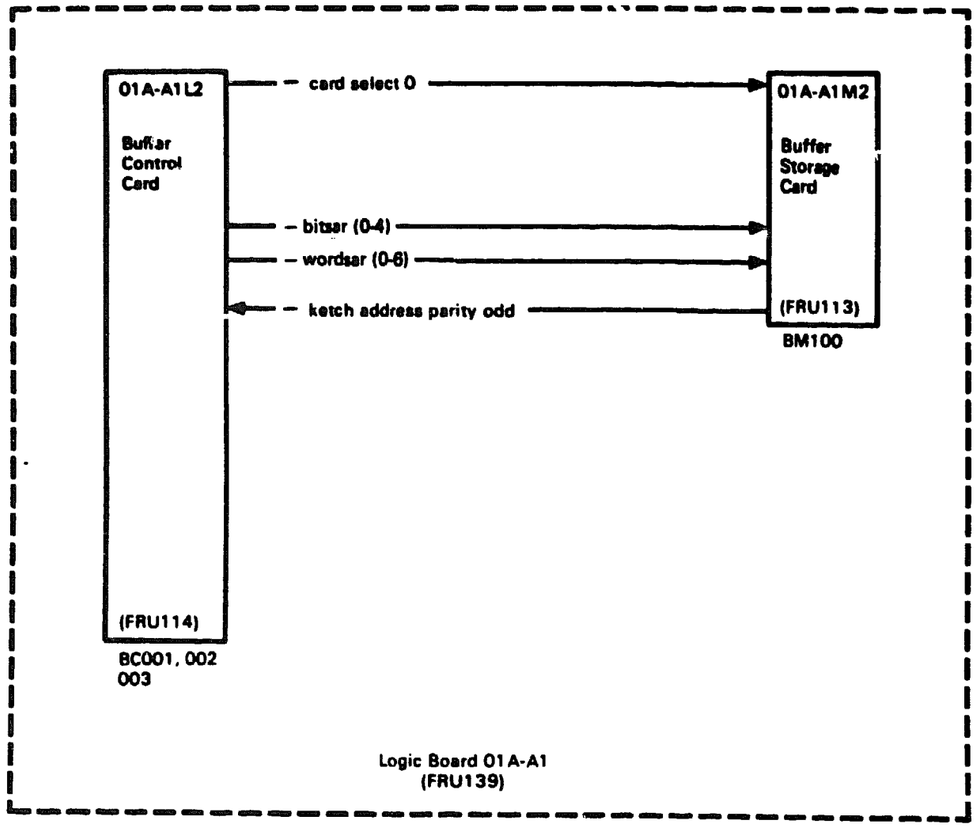
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

DEG2 Bit 0 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- Bitsar (0 – 4)			
EE32, E010	- Wordsar (0 – 6)			
EE32, E010	- Ketch address parity odd			
EE32, E010	- Card select 0			
EE32, E010	- Card select 1			

DEG2 Bit 0, Device Buffer Storage Address Parity Error (Continued)

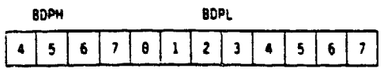
Error Diagram



DEG2 Bit 1, Device Buffer Storage Address Pointer Parity Error

Error Condition Theory

This bit indicates that a parity error was detected in the buffer device pointer high (BDPH) external register or buffer device pointer low (BDPL) external register in the buffer control card during a device storage cycle. These registers act as one counter and step each device storage cycle to provide the buffer storage addressing. A buffer wrap (BWRP) external register is used to determine the segment size buffer boundary. The BDPH and BDPL step up to the boundary set by the BWRP and go back to the beginning of the segment for the next storage cycle.



For example, for a 32K wrap, BDPL steps up to hexadecimal FF and BDPH bits 6 and 7 step to hexadecimal 11. After completing the storage cycle at this address, the pointer bits are reset to zero.

The parity of the BDPH and BDPL is predicted, taking into account the wrap bits. This predicted parity is compared with the actual parity, and a miscompare results in a device buffer storage address pointer parity error.

DEG1 bit 0 is set to point to the buffer control card as the probable failing FRU.

Buffer Wrap Register (BWRP)

Bit	Meaning
0 – 3	Not used by this EAD
4	Device port segment size 128K
5	Device port segment size 64K
6	Device port segment size 32K
7	Device port segment size 16K

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU120) buffer adapter card 01A-A1K2
3. (FRU117) microprocessor card 01A-A1D2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG2 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

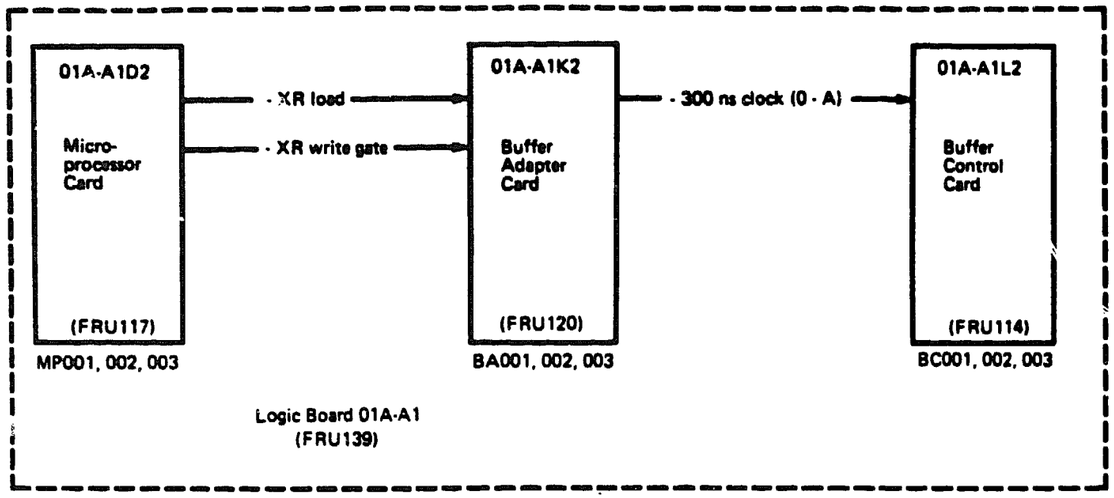
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

DEG2 Bit 1 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- XR load			
EE32, E010	- XR write gate			
EE32, E010	- 300 ns clock 0 – A			

DEG2 Bit 1, Device Buffer Storage Address Pointer Parity Error (Continued)

Error Diagram



DEG2 Bit 2, Device Buffer Storage Data Correctable Error

Error Condition Theory

This bit indicates a single-bit error was detected in the data received by the buffer control card from the buffer storage card during a device read cycle. The error was corrected by the ECC circuits on the buffer control card.

DEG1 bits 0 and 2 are set to point to the buffer control card and buffer storage card as the probable failing FRUs.

This error does not cause a check 2 error and does not set the any-device-error bit in DEG0. This error bit cannot be set unless bit 4 of the buffer diagnostic 0 (BDG0) external register has been set. BDG0 bit 4 is the enable-correctable-error-status bit. BDG0 bit 4 is never set by functional microcode.

Operations continue uninterrupted after DEG2 bit 2 is set.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

If you have performed a repair action, verify correct operation by running the program that detected the failure and select one of the following:

- If no errors are detected, go to SPROC 1 "End of Call Actions."
- If the program detects an error, continue in this EAD with the next action.

If no repair action has been performed and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

DEG2 Bit 3, Device Buffer Storage Data Uncorrectable Error

Error Condition Theory

This bit indicates that a multiple-bit error was detected in the data received by the buffer control card from the buffer storage card during a device read cycle. The error could not be corrected by the ECC circuits on the buffer control card.

DEG1 bits 0 and 2 are set to point to the buffer control card and buffer storage cards as the probable failing FRUs. Sense byte 2 bit 5 indicates the buffer storage card that was being accessed when the error occurred.

Multiple bit errors give various indications. For example:

- 3-bit errors give wrong correctable-error indications and send the wrong data.
- 4-bit errors give no indications and send the wrong data.

The buffer control card uses a cyclic redundancy check (CRC) to detect the multiple-bit errors not detected by the ECC circuits.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG2 Bit 3 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1–3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD *).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

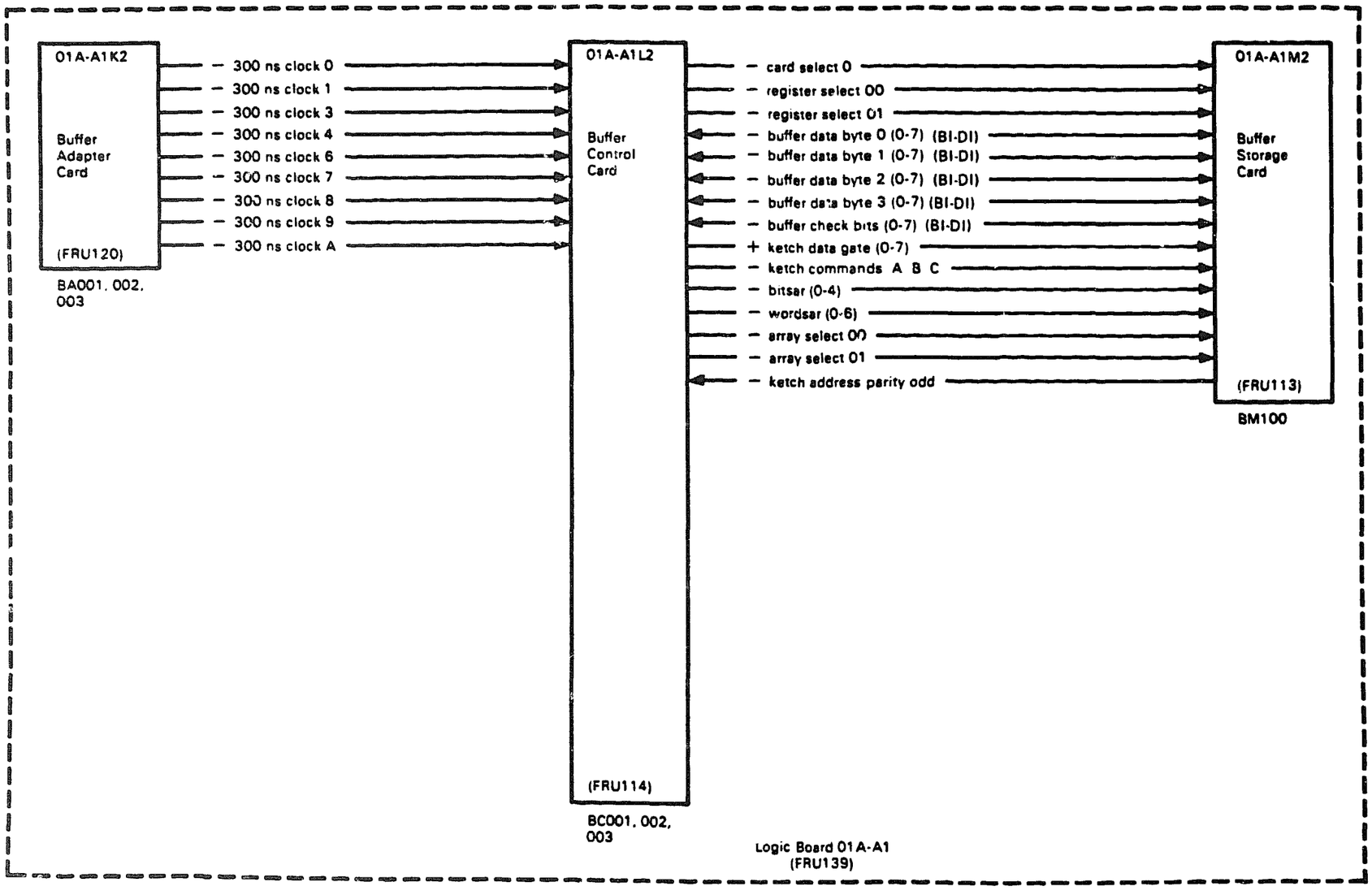
References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

DEG2 Bit 3 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- Buffer check bits 0–7	BU2022	30000	98A10
EE33, E010	- 300 ns clock B	BU2024	30000	98A10
EE32, E010	- 300 ns clock A	BU2024	10000	1CA10
EE32, E010	- Buffer data byte 0 bits 0–7	BU2024	30000	98A10
EE32, E010	- Buffer data byte 1 bits 0–7	BU2024	30000	98A10
EE32, E010	- Buffer data byte 2 bits 0–7	BU2024	30000	98A10
EE32, E010	- Buffer data byte 3 bits 0–7	BU2024	30000	98A10
EE33, E010	+ Ketch data gate (0–7)	BU2024	30000	18A10
EE32, E010	- Ketch command C	BU2024	30000	18A10
EE32, E010	- Ketch command A	BU2024	30000	18A10
EE32, E010	- Register select 10	BU2024	30000	18A10
EE32, E010	- Register select 11	BU2024	30000	18A10
EE32, E010	- Array select 00	BU2024	30000	18A10
EE32, E010	- Register select 00	BU2049	10000	98A10
EE32, E010	- Array select 01	BU2049	10000	98A10
EE32, E010	- Register select 01	BU2049	10000	98A10
EE33, E010	- 300 ns clock 0	BU3022	10000	98A10
EE33, E010	- 300 ns clock 1	BU3022	30000	9CA10
EE33, E010	- Card select 0			
EE33, E010	- Card select 1			
EE33, E010	- Ketch command B			
EE33, E010	- Wordsar 0–6			
EE33, E010	- Bitsar 0–4			
EE33, E010	- 300 ns clock 3, 4, 6, 7, and 9			

Error Diagram



DEG3 Bit 0, Buffer Adapter to Buffer Control Device Data Bus Parity Error

Error Condition Theory

This bit indicates that the buffer control card received data with even parity from the buffer adapter card during a read-data-flow-to-buffer data transfer. DEG1 bit 1 is set to point to the buffer adapter card as the probable failing FRU.

If DEG0 bit 2 (read data flow to buffer parity error) is also set, ignore this error because DEG3 bit 0 is a result of the bad parity being sent to the buffer adapter card and propagated to the buffer control card. Return to the error detection theory and troubleshooting guide for DEG0 bit 2.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU120) buffer adapter card 01A-A1K2
3. (FRU119) read clock and format card 01A-A1S2
4. (FRU111) read ECC/CORR card 01A-A1R2
5. (FRU117) microprocessor card 01A-A1D2
6. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG3 Bit 0 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following.
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

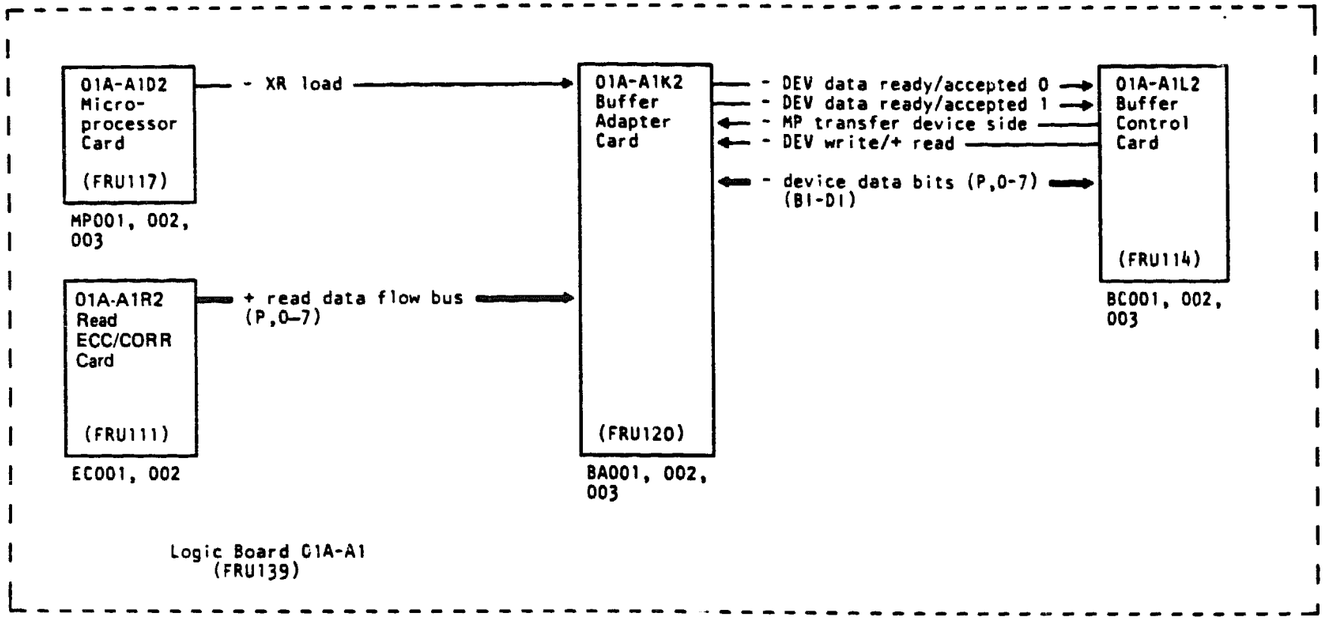
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE:HSC 1	How to use the CE Panel

DEG3 Bit 0 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- DEV data read/accepted 0			
EE32, E010	+ Read data flow bus (0 – 7)			
EE32, E010	- DEV write/ + read			
EE32, E010	- XR load			
EE32, E010	- MP transfer device side			
EE32, E010	- Device data bits (P,0 – 7)			

DEG3 Bit 0, Buffer Adapter to Buffer Control Device Data Bus Parity Error (Continued)

Error Diagram



DEG3 Bit 1, Buffer Control Device RAM Data Parity Error

Error Condition Theory

This bit indicates that a parity error was detected on the output of the buffer control device RAM on the buffer control card during a buffer-memory-device-store cycle while performing a read-data-flow-to-buffer data transfer. This is an internal parity check of data stored temporarily in the device RAMs before it is sent to the buffer storage card. All data written or read from the buffer storage cards must pass through the buffer control device RAM on the buffer control card.

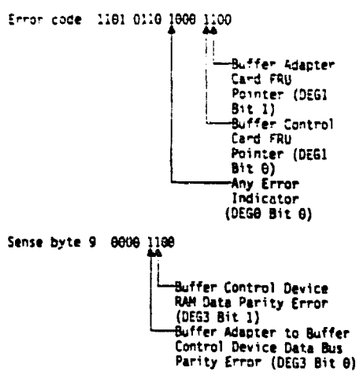
After checking the output of the buffer control device RAM, the buffer control card strips the parity and generates an error correction code (ECC) across groups of four data bytes as the data is taken from the RAM and stored in the buffer storage cards. By parity checking the data as it is read from the RAM, the buffer control card knows that each group of four bytes is correct before the ECC is concatenated to the group.

DEG1 bit 0 is set to point to the buffer control card as the probable failing FRU.

If DEG0 bit 2 (read data flow to buffer adapter parity error) or DEG3 bit 0 (buffer adapter to buffer control device data bus parity error) is set, the buffer control device RAM failure is a result of the earlier error. The following examples show you how to select the correct error bit if multiple error bits are on.

Example 1

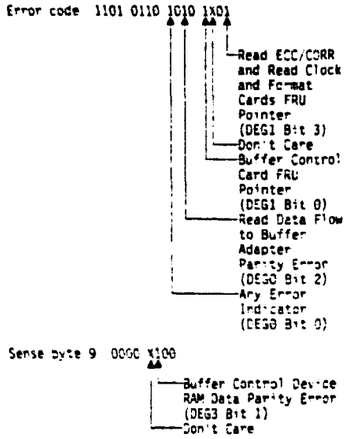
Assume that the error code is D68C and sense byte 9 is 0C



This indicates that the buffer control card received data with bad parity from the buffer adapter card over the device data bus. The incorrect data propagated through the buffer control card logic and was loaded into the RAM. The failure is either in the buffer adapter card, the device data bus, the control lines from the buffer adapter card to the buffer control card, or the logic on the control card that precedes the checker for the buffer adapter to buffer control device data bus parity error. Return to the error detection theory and troubleshooting guide for "DEG3 bit 0, Buffer Adapter to Buffer Control Device Data Bus Parity Error."

Example 2

Assume an error code of D6A9 or D6AD and sense byte 9 of 04 or 0C.



This indicates that the buffer adapter card received data with bad parity from the read data flow over the read data flow bus. The error data propagated through the buffer adapter card and the buffer control card logic and was loaded into the RAM. Return to the error detection theory and troubleshooting guide for "DEG0 Bit 2, Read Data Flow to Buffer Adapter Parity Error."

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU120) buffer adapter card 01A-A1K2
3. (FRU119) read clock and format card 01A-A1S2
4. (FRU111) read ECC/CORR card 01A-A1R2
5. (FRU117) microprocessor card 01A-A1D2
6. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG3 Bit 1 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

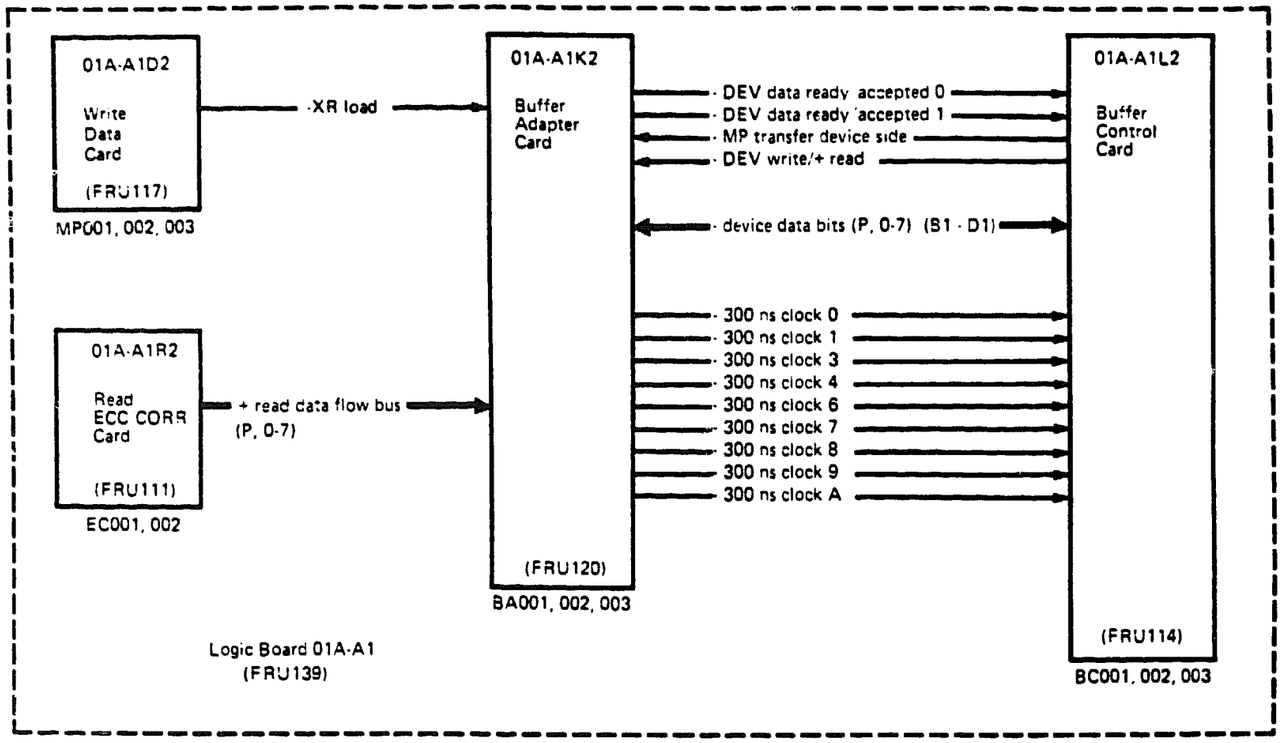
DEG3 Bit 1, Buffer Control Device RAM Data Parity Error (Continued)

DEG3 Bit 1 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- 300 ns clock 0 – A			
EE32, E010	- DEV data read/accepted 0			
EE32, E010	- DEV data ready/accepted 1			
EE32, E010	+ Read data flow bus (0 – 7)			
EE32, E010	- DEV write/+ read			
EE32, E010	- XR load			
EE32, E010	- MP transfer device side			
EE32, E010	- Device data bits (P,0 – 7)			

DEG3 Bit 1, Buffer Control Device RAM Data Parity Error (Continued)

Error Diagram



DEG3 Bit 2, Device Cyclic Redundancy Check (CRC) Error

Error Condition Theory

This bit indicates that the contents of the buffer device CRC register were not zero at the completion of a device-to-write-data-flow data transfer. The channel circuits write data from the channel and send the data to the buffer storage cards through the channel-side circuits one byte at a time. As each byte is written, it is clocked through a CRC generator register in the channel-side circuits of the buffer control card. Thus, a CRC is generated for the entire record that is written from the channel. The buffer control card stores the CRC behind the last characters of the record.

When the device reads the record, the record is read from the buffer storage cards by the device-side circuits of the buffer control card. As each byte is sent to the device, the device-side circuits of the buffer control card clock the byte through a CRC generator. After the last byte has been sent to the device, the CRC that was stored behind the record is clocked through the CRC generator. The CRC generated by the channel-side circuits should cause the device-side CRC generator to go to zero. If the device-side CRC does not go to zero, device CRC error is detected. This CRC check ensures data integrity from the channel through the buffer storage cards to the buffer control card output to the buffer adapter card.

DEG1 bits 0 and 2 are set to point to the buffer control card and the buffer storage cards as the probable failing FRUs.

If this error is set at the same time as any of the following errors, channel CRC error is likely to be a result of the primary error. The primary errors are:

- Device buffer storage data uncorrectable error (DEG2 bit 3)
- Device buffer storage address parity error (DEG2 bit 0)
- Device buffer storage address pointer parity error (DEG2 bit 1)
- Buffer control to buffer adapter device data bus parity error (DEG0 bit 3).

Go to the error detection theory and troubleshooting guide for the primary error.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU114) buffer control card 01A-A1L2
2. (FRU113) buffer storage card 01A-A1M2
3. (FRU120) buffer adapter card 01A-A1K2
4. (FRU116) write data card 01A-A1P2
5. (FRU117) microprocessor card 01A-A1D2
6. (FRU139) logic board 01A-A1 in the tape control unit that contains the buffer that was used.

Troubleshooting Guide

1. Use the loop-on-error diagnostic option to loop the diagnostic routine that failed during the common troubleshooting procedure. Compare the failure ID from the diagnostic with the failure IDs shown in "DEG3 Bit 2 Net List."
2. Scope the nets indicated by the failure ID first. Look for a net with a bad level. If you do not find a failing net, scope the rest of the nets in the list.
3. For intermittent errors, use the loop-routine option with the diagnostic routine that failed during the common troubleshooting procedure and scope all the nets in the list. Look for a net that is not changing or is at an invalid level.
4. If steps 1 – 3 did not correct the problem, examine the BDSE from the diagnostic failure for the next DEG bit on. If another bit is on, go to the EAD for that bit (see EAD 1).
5. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
6. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

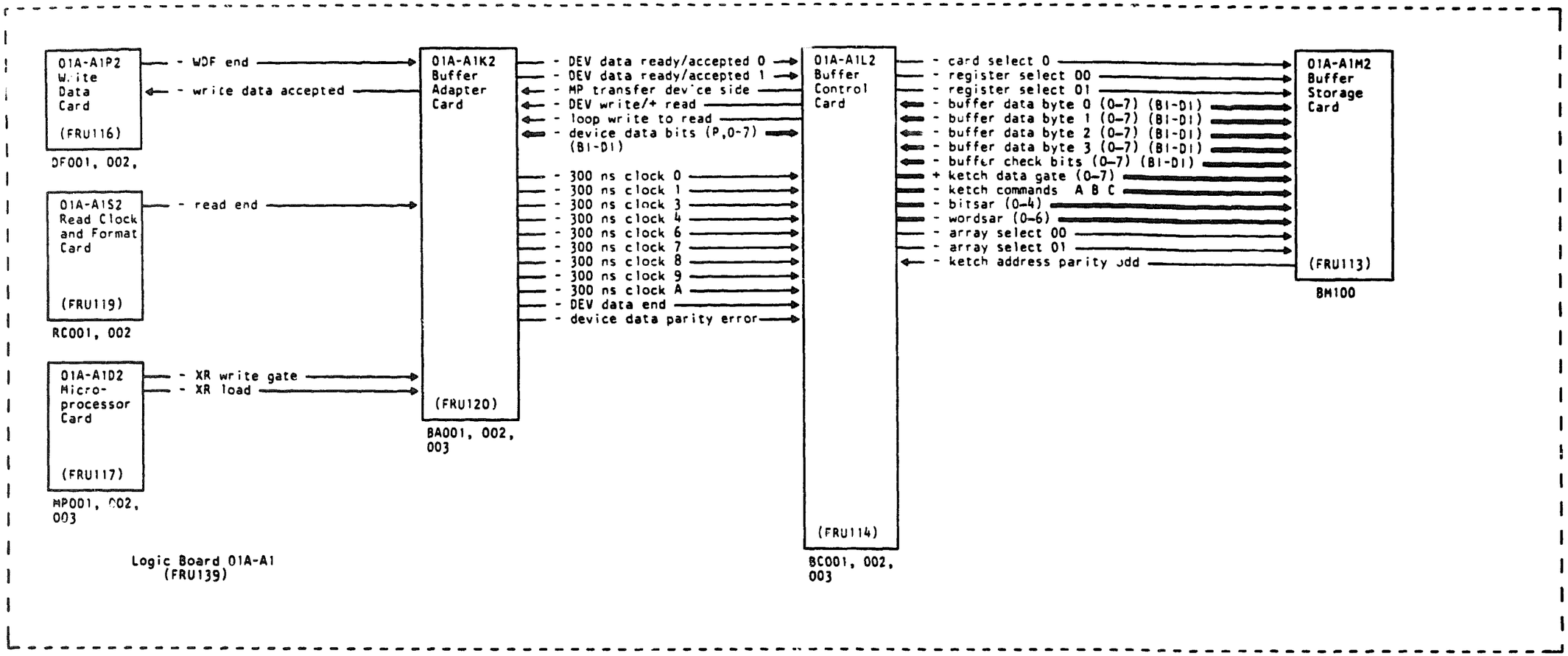
Step	Ref Page	Description/Comments
1	DIAG 1	How to use the diagnostic test options
5	PANEL 1	How to IML functional microcode into the tape control unit
5	CE/HSC 1	How to use the CE Panel

DEG3 Bit 2, Device Cyclic Redundancy Check (CRC) Error (Continued)

DEG3 Bit 2 Net List

Diagnostic	Net Name	Failure ID	BCSE	BDSE
EE32, E010	- Read end	BU2031	30000	38A02
EE32, E010	- Device data end	BU2031	30000	38A02
EE53, E010	- Ketch commands A and C	LW3024	D0000	B8A12
EE53, E010	- Register select 10	LW3024	D0000	B8A12
EE53, E010	- Register select 11	LW3024	D0000	B8A12
EE53, E010	- Array select 00	LW3024	D0000	B8A12
EE53, E010	+ Ketch data gate (0 – 7)	LW2033	30000	B8A12
EE32, E010	- DEV write/ + read	BU2022	30000	99800
EE32, E010	- Write data accepted	BU2022	30000	B9800
EE33, E010	- Ketch command B	BU3028	D8A02	xxxxx
EE32, E010	- Buffer data byte 0 bits 0 – 7	BU2024	30000	98A10
EE32, E010	- Buffer data byte 1 bits 0 – 7	BU2024	30000	98A10
EE32, E010	- Buffer data byte 2 bits 0 – 7	BU2024	30000	98A10
EE32, E010	- Buffer data byte 3 bits 0 – 7	BU2024	30000	98A10
EE32, E010	- Buffer check bits 0 – 7	BU2022	30000	98A10
EE33, E010	- Card select 0			
EE33, E010	- Card select 1			
EE32, E010	- Register select 00	BU2049	10000	98A10
EE32, E010	- Register select 01	BU2049	10000	98A10
EE32, E010	- Device data parity error	BU2022	30000	99800
EE32, E010	- Array select 01	BU2049	10000	98A10
EE33, E010	- Wordsar 0 – 6			
EE33, E010	- Bitsar 0 – 4			
EE32, E010	- 300 ns clock 0 – A			
EE32, E010	- XR load			
EE32, E010	- XR write gate			
EE32, E010	- Ketch address parity odd	BU3021	18A80	90000
EE32, E010	- Device data bit (P,0 – 7)	LW2025	30000	B9800
EE32, E010	- WDF end			
EE32, E010	- MP transfer channel side			
EE32, E010	- DEV data ready/accepted 0	BU2022	30000	19800
EE32, E010	- DEV data ready/accepted 1			
EE32, E010	- XR read gate			
EE33, E010	+ DEV data toggle			

Error Diagram



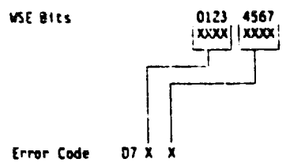
Error Code D7nn

Error Description

D7nn error codes result from errors detected in the write status/error (WSE) external register

Error Condition Theory

The Write Status/error register is contained in the Write Data Card. The Write Data Flow Card is used to communicate between the Buffer Functional Area and the drive Adapter Functional Area. The Write Data Card changes the 8 bit Write Data Flow Bus coming from the Buffer Adapter Card to the Multiplexed Data Bus going to the drive adapter Card. The Multiplexed data is a mixture of data and check bits. During the process of handling the write data and inserting the check bits, various checks are made and detected errors are recorded in the WSE register.



Common Troubleshooting Guide for All D7nn Error Codes

The bits in the write status/error (WSE) register determine the last two digits of the error code as explained above. The bits of the WSE register are: (See DF1 to find a detailed bit description.)

WSE Bit	Bit Description
0	Write operation.
1	End write. This bit indicates that the last bit of the postamble is being written.
2	Reserved.
3	Reserved.
4	Buffer interconnection error.
5	Write control error.
6	Write data flow error.
7	Multiplexed data error.

1 Gather all recent sense information for D7nn errors to determine the error codes that occur most frequently. Analyze the most frequently occurring error. For error codes that indicate more than one bit is on in the write status/error register, analyze the error in the following order:

A	WSE bit 5
B	WSE bit 4
C	WSE bit 6
C	WSE bit 7
D	WSE bit 0

Note: D780 is pointed to only by diagnostics. Always analyze for WSE bit 0 if the failure is not found by analyzing any other write status/error register bit.

For example, if the error code is D70F:

a. Follow the troubleshooting guide for WSE bit 5 on.

b. If bit 5 is not successful, follow the troubleshooting guide for WSE bit 4, except do not repeat any procedure performed while analyzing WSE bit 5.

c. If bit 4 is not successful, follow the troubleshooting guide for WSE bit 6.

d. Continue with WSE bit 7, and finally with the troubleshooting guide for WSE bit 0.

e. If none of the troubleshooting guides finds the failure, request aid from your next level of support.

Note: The specific troubleshooting guides assume that only one bit is on, and each contains procedures found in the other troubleshooting guides.

2. Go to the correct troubleshooting guide for the WSE bit selected from the diagnostic failure ID or, if the diagnostic did not fail from the D7nn error code WSE bit selected in step 1.

3 See CE/HSC 1 and run the TCU support diskette. If a diagnostic fails, go to the diagnostic (DIAG) section of the maintenance guide for the diagnostic failure ID. If the failure ID specifies another error code in the FSI, obtain the additional information from the FSI entry (such as Explanation, FRUs and so on) and return here.

References

Step	Ref Page	Description/Comments
2	DIAG 1	Diagnostic failure IDs
3	CE/HSC 1	Diagnostic control options Basic TCU test

Troubleshooting Information for WSE Bits 0 and 1 On or Off

Use this error analysis diagram when the diagnostic generates an error code of D78X or when the procedure for any other D7nn error code does not find the failure.

Error Description

The write data card detected an error but could not generate good error information.

Error Condition Theory

This is a diagnostic-detected error. This error is not generated by the functional microcode that the customer uses in the tape control unit.

This error usually occurs when the top card connector in the Y position is missing, is in the wrong position, or is defective.

The troubleshooting guide for this error should also be followed when use of the troubleshooting guide for a D7nn error code (not only D780) did not find the failure.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. Top card connector A1P2 Y position
2. Source voltages at the input to the FRUs involved
3. Cables, connectors, and nets between FRUs called by FSI and EAD

Troubleshooting Guide for WSE Bits 0 and 1

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, loop the identified diagnostic and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

4. Failures detected in the functional area can be caused by defective clock lines. This EAD covers the internal clocks that can cause this error.
5. See DF002 and scope the clock lines listed in "WSE Bit 0 Net List" at test point **(B)**.
6. If no other write status/error register error bit is on, use the diagnostic option E010. If another diagnostic failure ID is received before the D7nn failure ID, see the diagnostic section of the maintenance information for the EAD for the earlier failure ID.
7. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
8. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

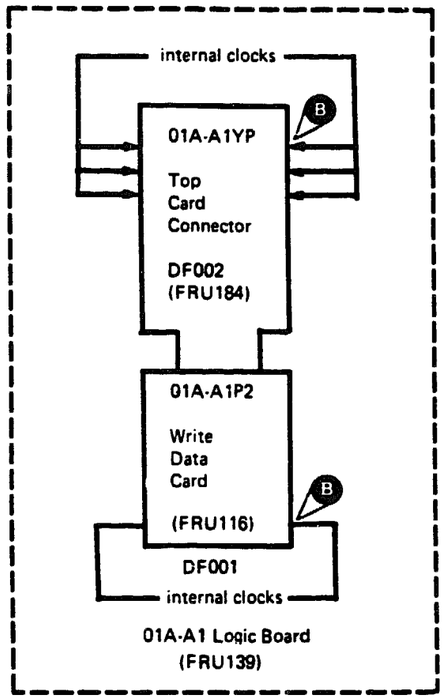
References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3	CARR-TCU 1-1	Removal and replacement procedures
6	DIAG 1	Diagnostic control program options E010 diagnostic description Diagnostic failure ID (with each diagnostic description)
7	CE HSC 1	How to use the CE Panel

WSE Bit 0 Net List

Diagnostic	Net Name	Logic	Error Stop	WSE Reg	Error Diag Ref
EE52 EE53 EEA0 E010	No name in logic	DF002	LW2025	00	B
EE5C EEA0 E010	No name in logic		LW2025	00	B
EE50 EEA0 E010	No name in logic		LW2025	CC	B
EE5C EEA0 E010	No name in logic	DF001	LW2025	84	B
EE50, EEA0 E010			LW2025	85	B

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

Error Code D7nn (Continued)

Troubleshooting Information for WSE Bit 4 On

Use this information for first analysis of error codes D708, D709, D70A, and D70B only. For other D7nn error codes, see the "Common Troubleshooting for All D7nn Error Codes" for the correct sequence of testing multiple WSE error bits. (WSE bit 5 should be used for troubleshooting before WSE bit 4.)

Error Description

The write data card detected a buffer adapter error.

Error Condition Theory

The data coming from the Data Buffer to the WDF is checked for parity and number of bytes transferred. Write Data is gated from the Buffer Adapter card to the Write Data card. The Write Data card checks Data parity on the Write Data to ensure that the data was received correctly. Not odd parity sets WSE Bit 4 and generates and error.

The number of bytes transferred is checked, not by actual count, but by an odd/even counter. For each byte sent by the Buffer, the counter is complemented indicating an even [0] or odd [1] number sent. This signal is provided to the WDF by 'WDF Toggle'. The WDF counts received data bytes by the same method, and compares its count with that supplied by the Buffer Adapter card. Both counts should be the same even or odd. If not, WSE Bit 4 is set and generates an error.

Check 2 is set with WSE Bit 4 to indicate the error to the microprocessor.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure.

1. Source voltages at the input to the FRUs involved.
2. Cables, connectors, and nets between the FRUs called by FSI and EAD.

Troubleshooting Guide for WSE Bit 4

Verify from sense information that the error code that occurs most often is D708, D709, D70A, or D70B. You also use this error analysis diagram if analyzing WSE bit 5 was not successful. If another error code occurs more often, go to the EAD for that error code. If you have only the one error code, continue with this troubleshooting guide.

1 Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.

Check that all voltages are within tolerance at the input to the boards referenced in this EAD.

2 For intermittent errors, loop the identified diagnostics repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

3 Loop the failing diagnostic with the Loop on Error option. If no failure occurs, loop the Loop Write to Read diagnostic (EE52, options 1 and 7) with the Loop Routine option. Scope the lines in the WSE bit 4 net list. See "WSE Bit 4 Net List" on the next page. If a diagnostic failure ID occurs and is included in this net list, run the Loop Write to Read diagnostic with the Loop on Error option. Scope those lines (see EAD 2331) identified for the diagnostic failure ID. If any of these lines are not changing with the correct up and down logic level tolerances, that is the bad net.

4 If no bad net is found, set the Loop Write to Read diagnostic (EE52, options 2 and 7) to loop on the whole routine. Scope the rest of the nets included in the "WSE Bit 4 Net List." Look for a net that is not changing between valid levels.

5 If all nets included in the "WSE Bit 4 Net List" look good, go to the troubleshooting guide for WSE bit 0. Then look at your original error code to see if any of the other write status/error register bits are on. If another write status/error register error bit is on, go to the troubleshooting guide for that error. Be sure to follow the order described in the common Troubleshooting Guide for error code D7nn.

6. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:

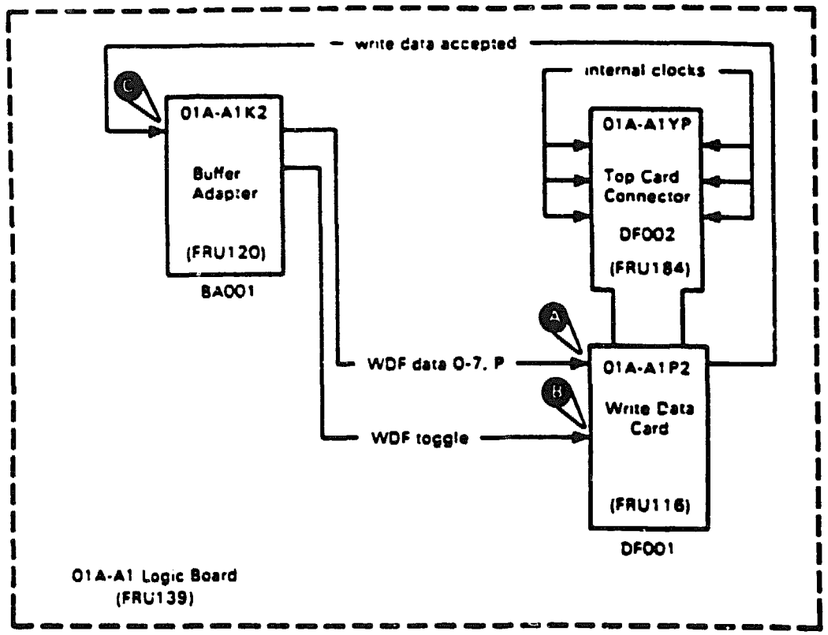
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.

7 **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
1	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
2	CARR-TCU 1-1	Removal and replacement procedures
3,4,5	DIAG 1	Diagnostic control program options. Diagnostic failure ID (with each diagnostic description)
6	CE/HSC 1	How to use the CE Panel

Error Diagram for WSE Bit 4 On



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

WSE Bit 4 Net List

DIAGNOSTIC	NET NAME	LOGIC	ERROR STOP	WSE REG	ERROR DIAGRAM REF
EE50, EEA0, E010	- write data accepted	BA001	LW2025	CA	C
EE50, EEA8, E010	- WDF toggle	DF001	LW2024	CA	B
EE50, EEA0, E010	- WDF bit 0	DF001	LW2024	CA	A
EE50, EEA0, E010	- WDF bit 1	DF001	LW2024	CA	A
EE50, EEA8, E010	- WDF bit 2	DF001	LW2024	CA	A
EE50, EEA8, E010	- WDF bit 3	DF001	LW2024	CA	A
EE50, EEA0, E010	- WDF bit 4	DF001	LW2024	CA	A
EE50, EEA8, E010	- WDF bit 5	DF001	LW2024	CA	A
EE50, EEA0, E010	- WDF bit 6	DF001	LW2024	CA	A
EE50, EEA8, E010	- WDF bit 7	DF001	LW2024	CA	A
EE50, EEA8, E010	- WDF bit P	DF001	LW2024	CA	A

Error Code D7nn (Continued)

Troubleshooting Information for WSE Bit 5 On

Use this troubleshooting guide first for analysis of error codes D704 through D707 and D70C through D70F.

Error Description

The write data card detected a write control error.

Error Condition Theory

The write data card formats and adds the check characters to the data before it is sent to the drive adapter card.

The conditions that are checked include parity and sequencing errors that are internal to the card. When an error is detected, bit 5 of the write status/error register and check 2 are set to indicate the error.

Additional Possible Causes of Failure

In addition to the previously called FRUs (as listed in the FSI), these items are possible causes of the failure:

1. (FRU139) logic board 01A-A1
2. Source voltages at the input to the FRUs involved
3. Cables, connectors, and nets between the FRUs called by FSI and EAD.

Troubleshooting Guide

Verify from sense information that the most frequently occurring error code is D704 through D707 or D70C through D70F. If another error code occurs more frequently, go to the error analysis diagram for that error code.

If you came to this error analysis diagram from another error analysis diagram, continue in this EAD until you are instructed to do otherwise.

1. Verify that all FRUs identified by GMP have been exchanged and all procedures have been followed correctly before continuing troubleshooting using this EAD.
2. Check that all voltages are within tolerance at the input to the boards referenced in this EAD.
3. For intermittent errors, loop the identified diagnostics repeatedly and scope the EAD test points looking for unusual or deteriorated levels or signals.

   Note: If the following troubleshooting procedures point to the failure of a FRU that has already been exchanged by GMP, exchange the FRU a second time. The exchanged FRU may have been defective.

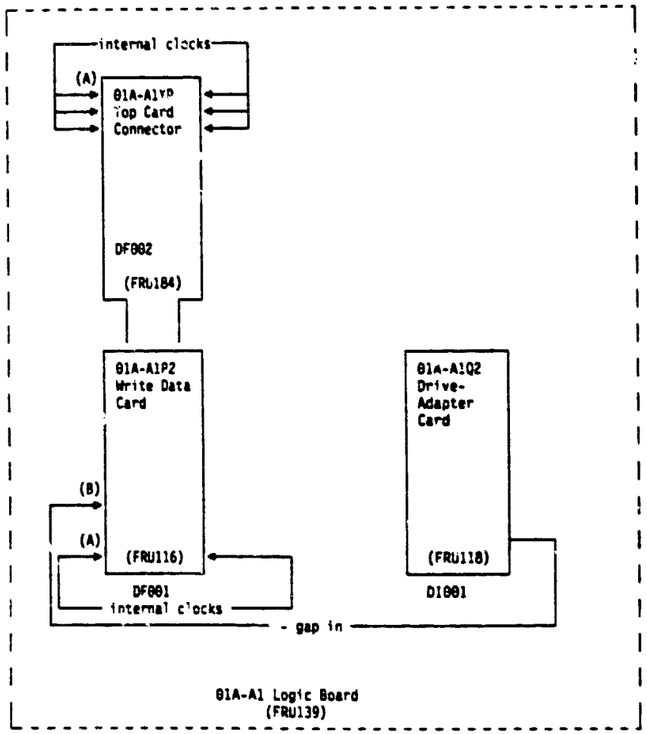
4. Failures detected in an area can be caused by defective clock lines. This error analysis diagram analyzes the clocks that can cause this error.
5. Loop the failing diagnostic with the Loop on Error option. If no failure is detected, loop the Loop Write to Read diagnostic (EE52, options 1 and 7) with the Loop Routine option. Scope the nets identified in the "WSE Bit 5 Net List." If a diagnostic failure ID occurs and is listed in "WSE Bit 5 Net List," run the Loop Write to Read diagnostic Loop on Error option. Scope those lines (see EAD 2336) included for the diagnostic failure ID. If any of these lines are not changing with correct up and down logic level tolerances, that is the bad net.
6. If no bad net is found, set the Loop Write to Read diagnostic (EE52, options 2 and 7) to loop on the whole routine. Scope the rest of the nets included in the "WSE Bit 5 Net List." Look for a net that is not changing between two valid levels.
7. If all nets included in the "WSE Bit 5 Net List" look good, go to the troubleshooting guide for WSE bit 0. Then look at your original error code to see if any of the other write status/error register bits are on. If another write status/error register error bit is on, go to the EAD that describes the troubleshooting guide for that error. Be sure to follow the order described in the common Troubleshooting guide for error code D7nn.
8. **If you have performed a repair action**, verify correct operation by running the program that detected the failure and select one of the following:
   - If no errors are detected, go to SPROC 1 "End of Call Actions."
   - If the program detects an error, continue in this EAD with the next action.
9. **If no repair action has been performed** and no additional actions are listed in this EAD or in the FSI, **call your next level of support** and then go to SPROC 1 "End of Call Actions."

References

Step	Ref Page	Description/Comments
2	PWR 1	"Voltage Tolerance Tables." For voltage pin positions, see the "Voltage Distribution List" in the Field Wire Net list in the Logic Diagrams.
3	CARR-TCU 1-1	Removal and replacement procedures
5,6	DIAG 1	Diagnostic control program options. Diagnostic failure ID (with each diagnostic description)
8	CE/HSC 1	How to use the CE Panel

Error Code D7nn (Continued) **EAD 2336**

Error Diagram



Point-to-point wiring on a board is shown on the TCU and/or DRV net wire list.

WSE Bit 5 Net List

DIAG	NET NAME	LOGIC	ERROR STOP	WSE REG	ERROR DIAGRAM REF
EE52 and EE59 and EEA0	No name in logic (card pins for internal clocks shorted back to the card at TCC and BCC)	DF001 DF002	LW2025 LW2025	84 84	A A
	- gap in	DF001	LW2025	85	B