SERVICE GUIDE

applicationDEC 433MP EISA

Service Guide

Order Number: EK-PS110-SV.001

This document provides the information a service technician needs to diagnose and repair the applicationDEC 433MP EISA system. It includes an overview of the features and capabilities of the system.

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, January 1992

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MA-0347-90-CPG.DG

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Preface

Intended Audience

The procedures in this guide are for service technicians trained by Digital Equipment Corporation.

Purpose

This service guide is designed to help diagnose and repair the applicationDEC 433MP EISA system. It contains the following chapters:

- **Chapter 1, System Overview** — Provides a brief overview of the applicationDEC 433MP system hardware, several typical configurations, diagnostics, physical hardware, FRUs, and special diagnostics tools.
- **Chapter 2, System Components** — Describes the main applicationDEC 433MP system parts.
- **Chapter 3, Troubleshooting the System** — Describes a procedure for troubleshooting the applicationDEC 433MP system.
- **Chapter 4, Boot Sequence** — Describes the boot sequence.
- **Chapter 5, Power-On Self-Test (POST)** — Describes the POST, which verifies nonvolatile RAM, DMA controllers, diskette drives, and the real-time clock.
- **Chapter 6, ROM Resident Diagnostics** — Describes firmware diagnostics that can be run whether the system has an operating system installed or not.
- **Chapter 7, EISA Configuration Utility** — Describes a standalone, diskette-based utility that is used to configure the applicationDEC 433MP system.
- **Chapter 8, System Exerciser** — Describes a standalone, diskette-based diagnostic that detects and isolates hardware problems to the FRU level.

- **Chapter 9, Removal and Replacement** — Describes how to remove and replace system FRUs.
- **Chapter 10, Other Diagnostics** — Describes additional diagnostics capabilities that are available for the applicationDEC 433MP system.
- **Appendix A, Description of RRD Numbered Tests** — Describes the 60 RRD tests.

applicationDEC 433MP EISA Documentation Set

A four-manual documentation set is shipped with each applicationDEC 433MP system. The manuals in this set are listed in Table 1.

Table 1 applicationDEC 433MP EISA Documentation Set

Manual	Part Number	Purpose
System Installation Guide	EK-PS110-IG	Installation of hardware components; meant to be used once at initial installation.
Using the System	EK-PS110-RC	User information; this manual shows, in easily referenced format, how to operate the system hardware.
System Overview	EK-PS110-OV	User information; this manual provides a short overview description of the system. Methods of adding users, storage space, processing power, and memory are all briefly described. Technical details such as switch settings and installation instructions are omitted.
Technical Configuration and Option Installation Guide	EK-PS110-CG	System administrator information; describes how to configure all hardware items in the system; provides installation and configuration information for all option modules and optional media devices that can be installed in an applicationDEC 433MP system.

Table 2 lists related documentation.

Table 2 Related Digital Equipment Corporation Documentation

Manual	Part Number	Purpose
Upgrade Installation Instructions	EK-PS1XX-IG	Provided with the PS11K-DA Upgrade Kit; describes how to upgrade a PS10*x*-*xx* applicationDEC 433MP system to the PS11*x*-*xx* applicationDEC 433MP system level.
Terminal Multiplexer Intelligent I/O Subsystem Installation Guide	ER-PCTMC-IG	Installation of the terminal multiplexer host adapter, installation of the multiplexer software driver, installation of terminal concentrators, configuration of terminal and printer devices, description of using intelligent transparent printing, explanation of the terminal multiplexer extension power kit.
VRC16 Color Multisync Monitor Installation and User Manual	ER-VRC16-IG	Installation and use of the VRC16 monitor.
PS1XG-AA High Resolution Graphics Adapter Installation and User's Manual	ER-PS1XG-IG	Installation of the VGA module, use of the bootable diskette utility for configuration of adapter and bus mouse, description of DOS driver diskettes, description of all monitor modes supported.
ISA 16-Bit SCSI Host Adapter Installation and User's Manual	ER-PS1XR-IG	Installation of the ISA SCSI adapter, configuration of jumpers and terminator resistor packs.

Conventions

The following conventions are used in this manual:

Enter	A key name, such as Enter, is shown enclosed to indicate that you press a key on the keyboard.
Ctrl/X	A two key sequence, such as Ctrl/X, is shown enclosed to indicate that you must hold down the key labeled Ctrl while you simultaneously press another key.
Ctrl/Alt/S	A multiple key sequence, such as Ctrl/Alt/S, is shown enclosed to indicate that you must hold down the keys labeled Ctrl and Alt while you simultaneously press another key.
boldface text	Boldface text is used to represent the name of a command.
italic text	Italic text is used to indicate SCO UNIX file names.

CHAP 1

1

System Overview

This chapter provides a brief overview of the applicationDEC 433MP system hardware, typical configurations, and diagnostics.

1.1 System Hardware

This section describes the following hardware components of the applicationDEC 433MP system:

- Processors
- System memory
- Storage devices
- Media devices
- Dual bus design
- ISA modules

Figures 1–1 and 1–2 show where the storage and media devices are located in the system. Figure 1–3 shows the system back panel for a typical configuration.

Figure 1–1 applicationDEC 433MP Internal Components, Right Side

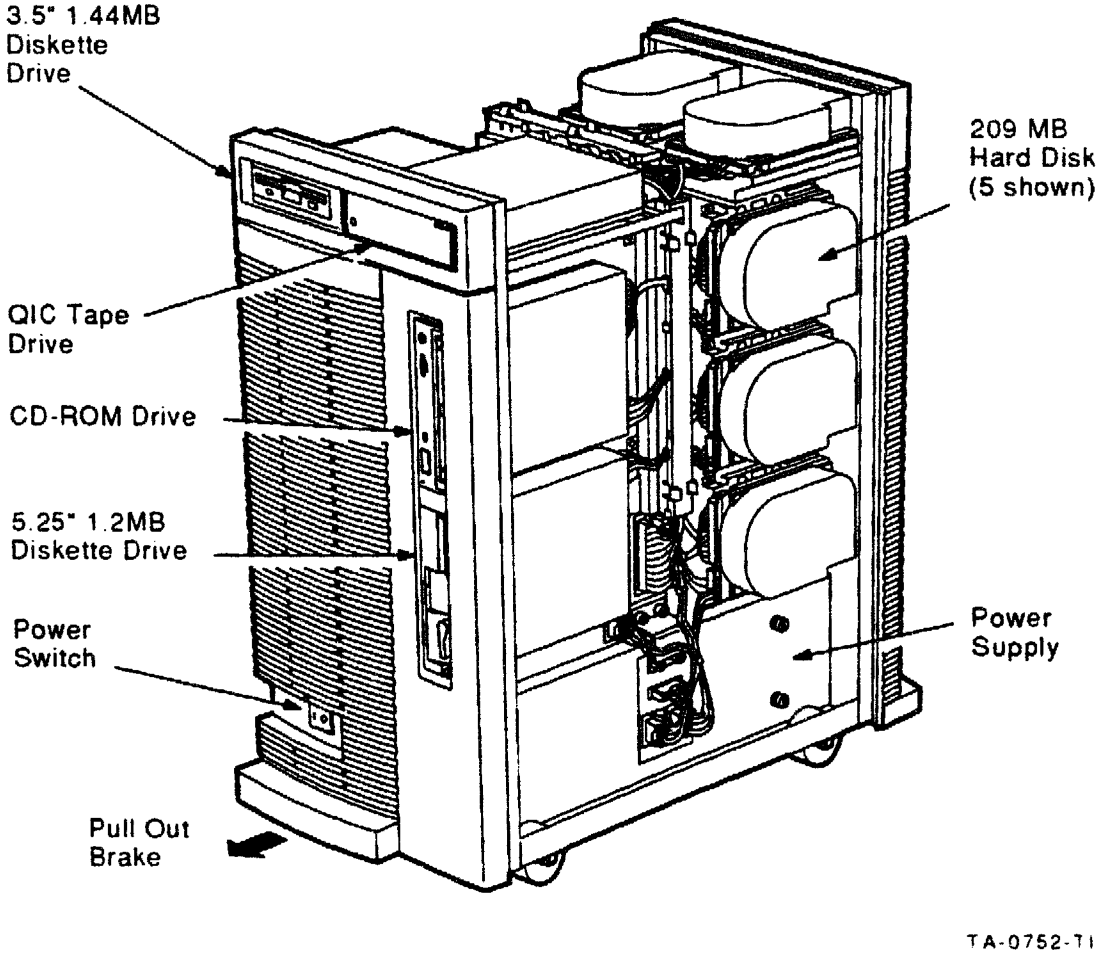


Figure 1–2 applicationDEC 433MP Internal Components, Left Side

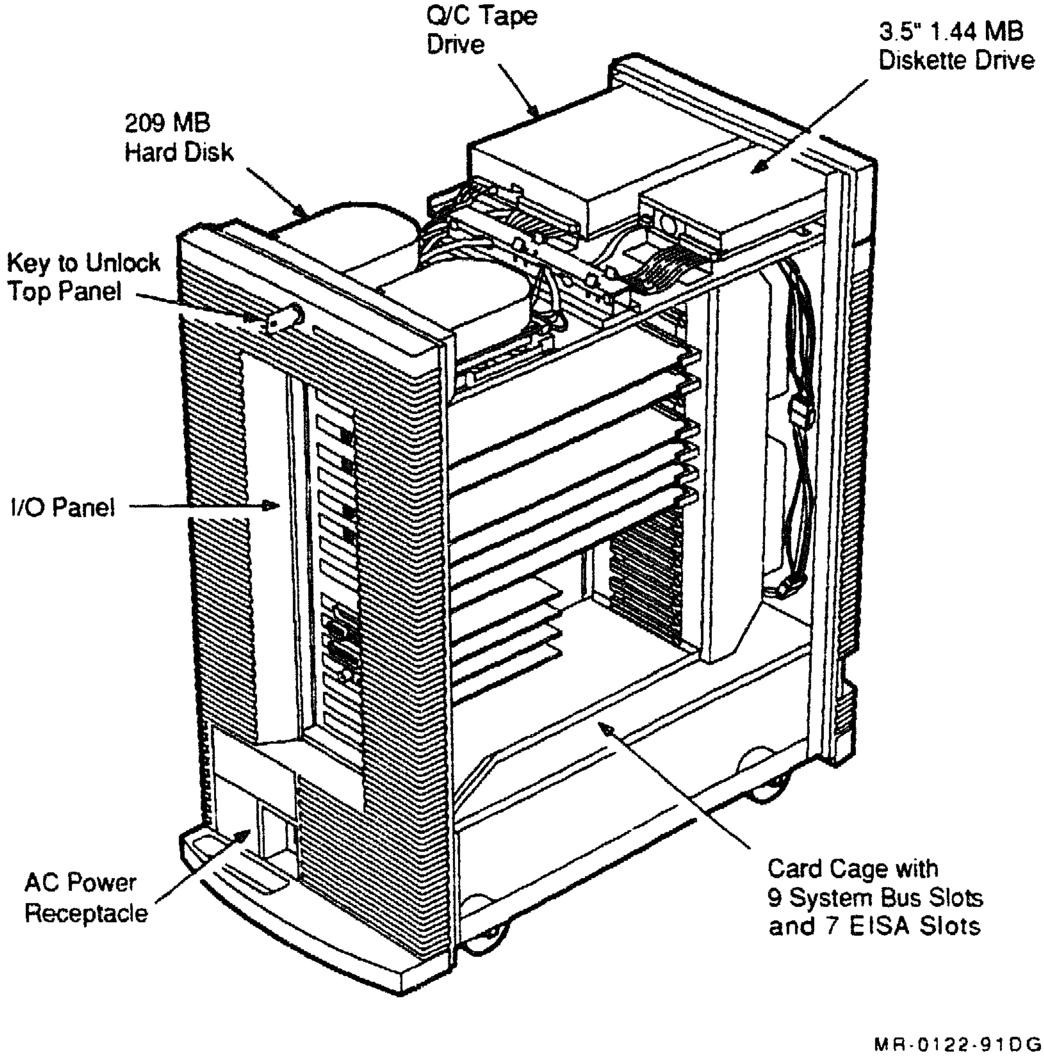
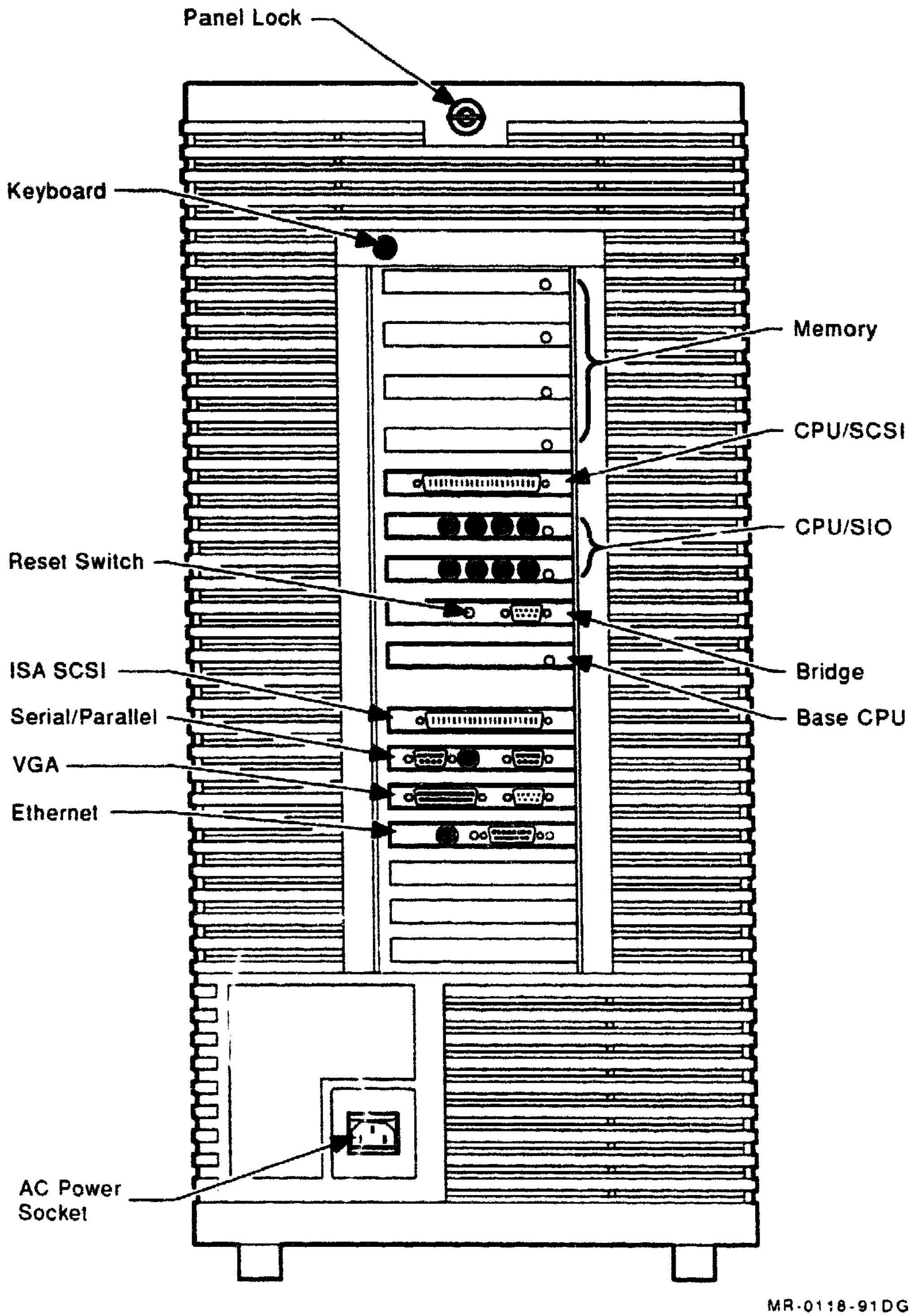


Figure 1–3 applicationDEC 433MP Back Panel, Typical Configuration



1.1.1 Processors

The applicationDEC 433MP system is a symmetric multiprocessing computer. Symmetric multiprocessing is an architecture that shares system resources across all of the CPUs in the system.

All systems include one base processor module and a bridge module for communication with the EISA bus. Optional processor modules can be added.

The applicationDEC 433MP system allows up to four Intel 80486 processor modules to be installed in the system. The base processor module is standard in every system. Optional processor modules are the CPU/SIO module and the CPU/SCSI module.

1.1.2 System Memory

The applicationDEC 433MP system comes with 8 MB of memory. Single inline memory modules (SIMMs) are used for easy upgrading of system memory. SIMMs can be added to a memory module in units of 4 MB. Each memory module can contain up to 16 MB of memory, and up to four memory modules can be installed. This provides a total system memory of 64 MB.

1.1.3 Storage Devices

The applicationDEC 433MP system comes with a single 209 MB hard disk drive. Mounting spaces within the system box allow up to five additional hard disk drives to be installed. If the five additional hard disk drives are 426 MB Digital Equipment Corporation drives, this provides a total of 2.3 GB within the system. Replacing the 209 MB hard disk drive with a 426 MB hard disk drive increases the total storage to 2.6 GB. For more storage, external storage expansion boxes are available. These storage expansion boxes can provide up to 19.2 GB of storage.

All hard disk storage devices are SCSI compliant.

1.1.4 Media Devices

The applicationDEC 433MP system supports the following media devices:

- 3.5-inch diskettes
- 5.25-inch diskettes
- CD-ROM
- QIC tape
- EXABYTE 8200 8-mm cartridge tape subsystem

The 3.5-inch 1.44 MB diskette drive reads and writes high-density and double-density diskettes. The 5.25-inch 1.2 MB diskette drive reads and writes high-density, and reads double-density diskettes. The CD-ROM is a High Sierra compatible compact disk, ROM drive. The QIC 320/525 MB tape is compatible with the QIC-320 format. For convenient backup of a large amount of data, the EXABYTE 8200 8-mm 2.5 GB tape drive is recommended.

The applicationDEC 433MP system comes with a single 3.5-inch diskette drive. The other media devices are all optional equipment.

1.1.5 Dual Bus Design

For increased system performance, the applicationDEC 433MP system uses a dual bus design. This design provides a system bus for processor and memory interaction and a separate I/O bus for communications and option modules.

The system bus in an applicationDEC 433MP system operates at 64 MB per second. This high speed means that processor requests for system memory data are filled quickly. The processors spend as little time idle as possible. CPUs and memory are installed in the system bus slots.

The applicationDEC 433MP system uses an EISA I/O bus for complete system openness. Up to seven ISA or EISA modules can be installed in an applicationDEC system.

1.1.6 ISA Modules

The applicationDEC 433MP system comes with the following ISA modules:

- ISA SCSI adapter (installed in backplane slot 10)
- Serial/parallel module (installed in backplane slot 11)
- Video graphics adapter (installed in backplane slot 12)

These ISA modules are all supported under SCO UNIX.

Your applicationDEC 433MP system may be configured with additional factory-installed ISA modules, including:

- PC4XD-DA terminal multiplexer host adapter
- EtherWORKS Turbo Ethernet adapter

1.2 Typical System Configurations

The applicationDEC 433MP system can be configured with software for a variety of system purposes. These include:

- Use as a multiuser, multiprocessor, timesharing system
- Use as a network file server
- Use as an X-windows host system

The applicationDEC 433MP system can be used as a multiuser, symmetric multiprocessing computer with as many as 128 users. In this timesharing configuration, users communicate with the system through dumb terminals over serial communications lines. This configuration generally provides a system with the lowest cost per seat. SCO UNIX is designed for multiuser systems; with SCO MPX multiprocessor extensions, the applicationDEC 433MP system provides a very efficient timesharing system. Figure 1–4 illustrates a typical multiuser timesharing configuration.

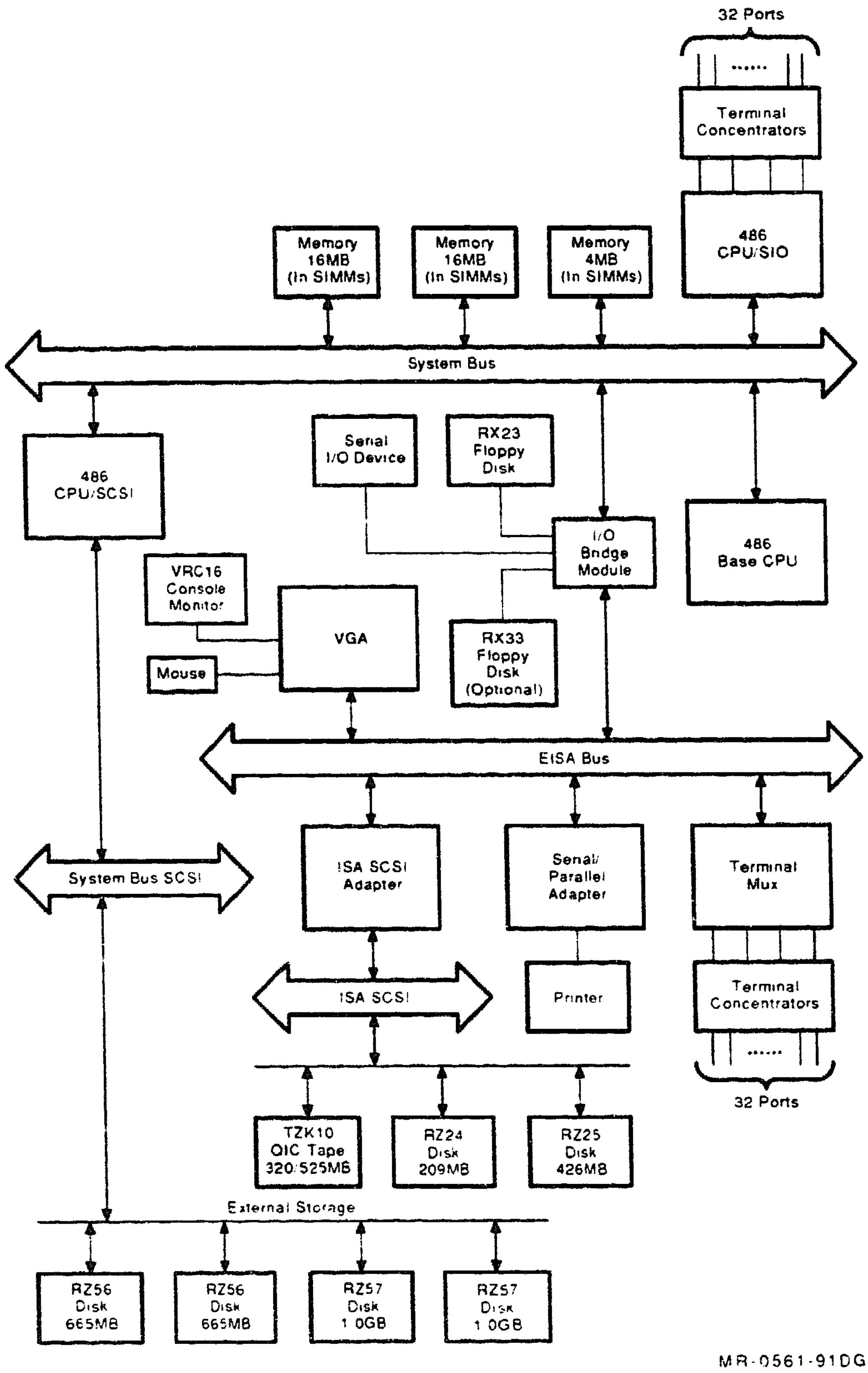
In a network file server configuration, other systems connected to the network share a filesystem that resides on the applicationDEC 433MP system. The software support for this configuration is industry standard SCO NFS on SCO UNIX and Open Desktop. Other systems on the local and wide area network running SUN compatible NFS can access remote files as if they were local files.

The applicationDEC 433MP system can also be a file server for a network of MS–DOS computers. PC-Interface from Locus Computing Corporation converts the applicationDEC 433MP system into a PC LAN server, providing extensive network services for MS–DOS computers.

For Ethernet network environments, the applicationDEC 433MP system can use either the TCP/IP protocol or the DECnet protocol. SCO TCP/IP is a layered product for SCO UNIX and is included with the Open Desktop product. DECnet for SCO is a Digital Equipment Corporation product qualified for use on the applicationDEC 433MP system. Both products can be used at the same time and can share a single Ethernet network module.

When running SCO Open Desktop, the applicationDEC 433MP system can serve as an X-windows host system. In this configuration, other systems running X-server software can access applications on the host system. Open Desktop provides full X-windows support. The SCO Server Upgrade provides X-server support software for other systems to be connected to the network.

Figure 1–4 Typical Multiuser Timesharing Configuration



1.3 Diagnostics

Three diagnostic programs are included with the applicationDEC 433MP system:

- Power-on self-test (POST)
- ROM resident diagnostics (RRD)
- System exerciser

The power-on self-test (POST) determines if the system hardware is operational. The hardware check includes nonvolatile RAM, DMA controllers, diskette drives, and the real-time clock. Finally, the POST calls the RRD to initialize system bus memory modules and slave CPUs. See Chapter 5 for more information about the power-on self-test.

The ROM resident diagnostics (RRD) consist of numbered tests that check memory, bus cycles, and multiprocessor capability. These tests can be run individually or as a "runall" package to verify all system bus CPUs. The RRD tests isolate the system problem to a single module. See Chapter 6 for more information about the RRD tests and commands.

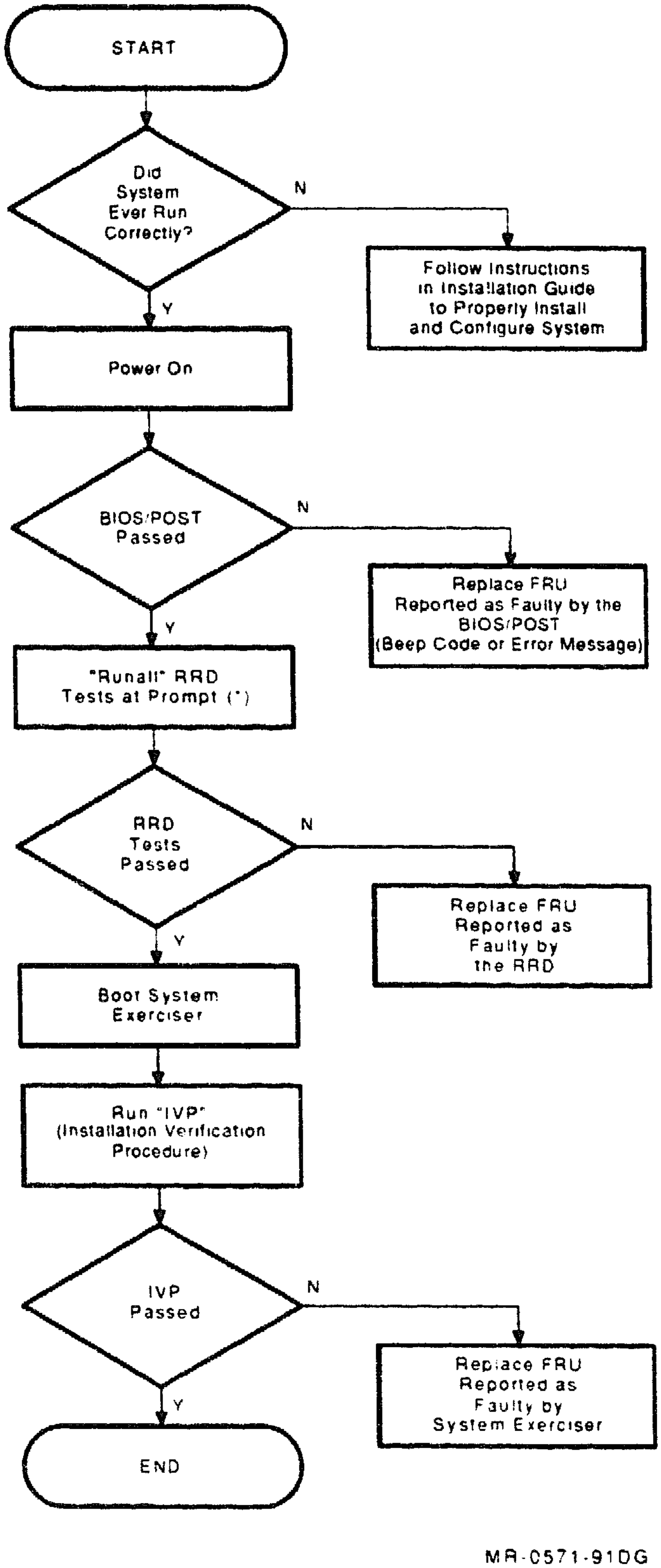
Like the RRD, the system exerciser tests the CPUs and memory. However, it also checks storage devices, performs all tests concurrently rather than serially, and can isolate a system problem to a single module or device (such as an individual SIMM module on one of four memory modules). See Chapter 8 for more information about the system exerciser.

Note

Incorrect system configuration can crash the system exerciser. See the *applicationDEC 433MP EISA Technical Configuration and Option Installation Guide* (EK-PS110-CG) and Chapter 7 of this guide for system configuration information.

The diagnostic strategy is shown in Figure 1–5.

Figure 1–5 Diagnostic Strategy



CHAP 2

2
System Components

2.1 Overview

This chapter describes the following applicationDEC 433MP system parts:

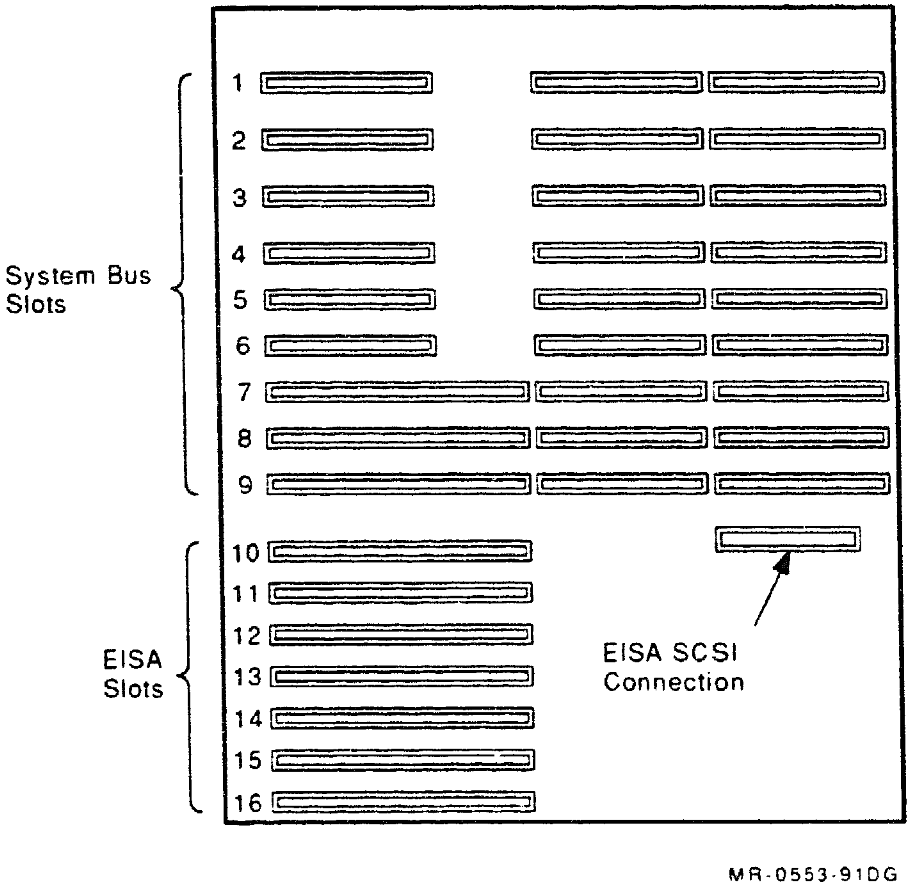
- Backplane
- Base Processor Module
- Bridge Module
- Memory Modules and SIMMs
- CPU/SIO
- CPU/SCSI
- ISA SCSI Host SCSI Adapter
- Serial/Parallel Adapter
- Video Graphics Adapter (VGA)
- Terminal Multiplexer Host Adapter
- SCSI Hard Disk Drives
- 320/525 MB QIC Tape Drive
- CD-ROM Drive
- 3.5-Inch 1.44 MB Diskette Drive
- 5.25-Inch 1.2 MB Diskette Drive

The applicationDEC 433MP system is an open system. ISA modules, EISA modules, storage devices, and media devices from other vendors can be used in the system.

2.2 Backplane

The applicationDEC 433MP backplane (Figure 2–1) contains two separate buses. The system bus provides a high speed private interconnect for CPU and memory interactions. The extended industry standard architecture bus, or EISA bus, provides an open bus for installation of industry standard I/O modules and other optional modules.

Figure 2–1 Backplane



The top nine slots (slots 1 through 9) in the backplane are system bus slots. The bottom seven slots (slots 10 through 16) are EISA slots. Any industry standard ISA or EISA option module may be placed in any of the bottom seven slots. The top nine slots are for Digital Equipment Corporation system bus modules only. Table 2–1 lists configuration possibilities for each backplane slot.

Table 2–1 applicationDEC 433MP Backplane Slot Configuration Options

Slot	Bus	Use
1	System bus	Memory
2	System bus	Memory
3	System bus	Memory
4	System bus	Memory
5	System bus	CPU/SIO or CPU/SCSI[1]
6	System bus	CPU/SIO or CPU/SCSI[2]
7	System bus	CPU/SIO
8	System bus	Bridge module
9	System bus	Base CPU
10	EISA	ISA SCSI adapter[3]
11	EISA	Serial/parallel module[4]
12	EISA	VGA module[4]
13	EISA	Terminal multiplexer[4]
14	EISA	ISA or EISA option
15	EISA	ISA or EISA option
16	EISA	ISA or EISA option

[1]A CPU/SCSI in slot 5 can be used to control internal or external devices.

[2]A CPU/SCSI in slot 6 can be used to control external devices only.

[3]Factory default slot.

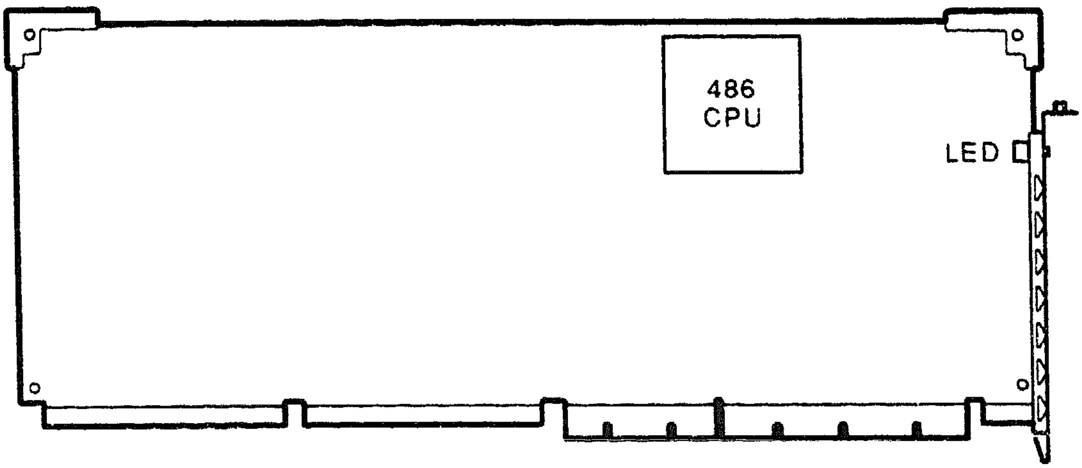
[4]Factory default slot; can be installed in any EISA slot.

There are no restrictions on EISA backplane slots for ISA or EISA modules. However, the ISA SCSI adapter should always be installed in slot 10 to simplify internal cabling.

2.3 Base Processor Module

The applicationDEC 433MP base processor module, shown in Figure 2–2, includes an Intel 80486 processing chip for system and user code execution. It also contains logic for communication with the bridge module through the EISA bus. Only one base processor can be installed.

Figure 2–2 Base CPU Module



MR-0188-91DG

The base CPU module has the following features:

- Intel 80486 processor: provides execution of system code and user code
- LED: indicates power and processor activity
- EISA compliant: EISA bus data transfers occur at 33 MB/second, allowing faster I/O transactions

The base processor module is standard with every applicationDEC 433MP system and is the only processor in single-processor versions of the system. Although the applicationDEC 433MP system is designed for multiprocessor expansion, the system is fully functional with only the base processor installed. In a single-processor configuration, the SCO MPX multiprocessor extensions are not required.

Expansion CPUs such as the CPU/SIO and CPU/SCSI cannot be used as single processors. Both of these modules require that the base processor module be already installed.

2.4 Bridge Module

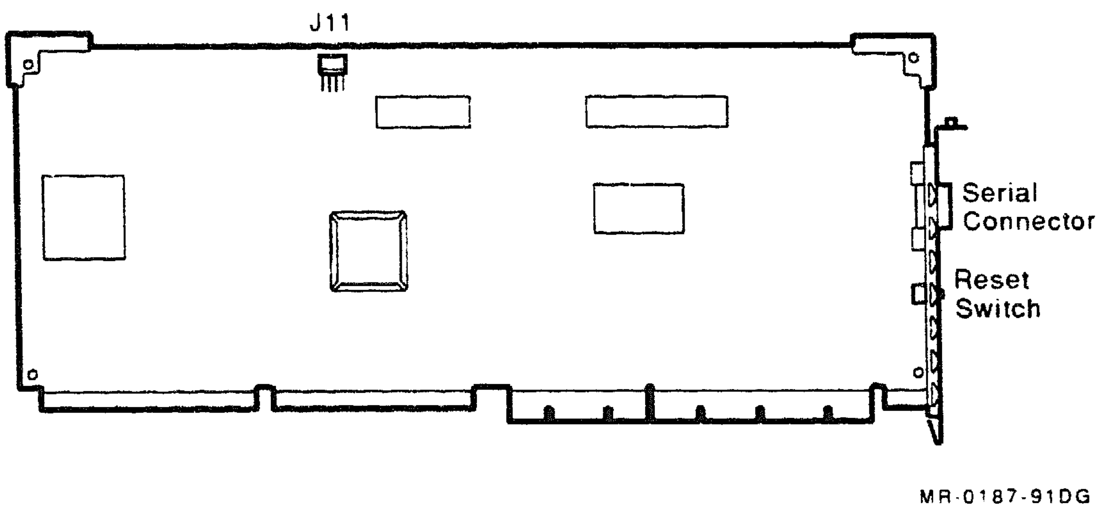
The bridge module, shown in Figure 2–3, is a standard feature of all applicationDEC 433MP systems. The bridge module provides the data link between the system bus and the EISA bus. It also provides a general purpose serial connector (configured as COM1:) for use with a serial printer or other serial device. Additional logic on the module provides control for the 3.5-inch, 1.44 MB diskette drive and the optional 5.25-inch, 1.2 MB diskette drive.

The bridge module has the following features:

- General purpose serial connector
- Reset switch (S1)
- Clock for system time
- On-board battery for RAM data retention in the event of power loss
- Jumpers for selection of default boot diskette drive (J11)
- Connector to base processor module through the EISA bus

Only one bridge module can be installed.

Figure 2–3 Bridge Module



2.4.1 Serial Connector

The serial connector is a 9-pin D connector that has COM1: as its address. This connector allows for direct connection of serial printers or other serial devices. If your device has a modified modular jack (MMJ) connector, use the H8571-J adapter provided with the applicationDEC 433MP system. Connect the adapter directly to the bridge module serial connection and connect the MMJ cable to the adapter.

2.4.2 Reset Switch

The reset switch provides an external means of resetting the system in the event that the system hangs or has a software failure. The reset switch restores all components of the system to their initial power-up states.

If the operating system is installed, pushing reset causes the system to reboot.

2.4.3 Bridge Module Jumper Settings

Jumper pack J11 on the bridge module controls the designation of the boot diskette drive. Jumper pack J11 controls whether the 3.5-inch or the optional 5.25-inch diskette drive is designated as the boot drive (drive A). The boot diskette drive is the drive from which the system attempts to boot when it goes through its power-on sequence.

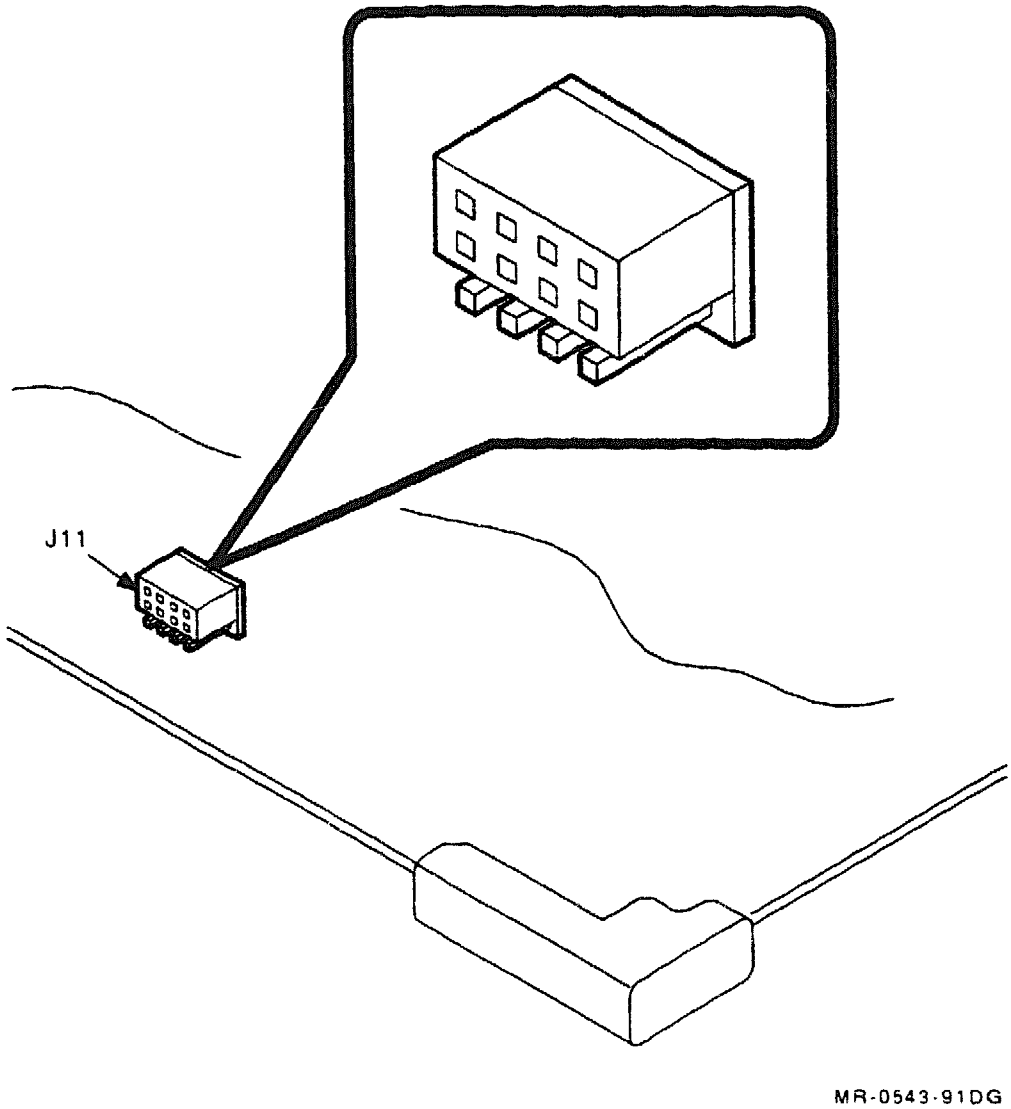
Note

Do not leave nonbootable diskettes in drive A during the boot sequence. If nonbootable diskettes are in drive A during the boot sequence, the system attempts to boot from the diskette and will hang.

To designate the 3.5-inch diskette drive as the boot drive, place a four-pin jumper on the upper pin pairs in J11. The factory configuration is for the 3.5-inch diskette drive to be the boot drive. Figure 2–4 shows jumper pack J11 in the factory configuration.

To designate the 5.25-inch diskette drive as the boot drive, place the four-pin jumper on the lower pin pairs.

Figure 2–4 Bridge Module J11 Factory Configuration



2.5 Memory Modules and SIMMs

The applicationDEC 433MP system accommodates a maximum of 64 MB of system memory. Each memory module provides 16 MB of memory; four memory modules can be installed.

Single inline memory modules (SIMMs) are used for memory capacity. The SIMMs contain 1 MB of memory each and are inserted in slots on the memory module. Memory must be added in increments of 4 MB. SIMMs are available in packages of five SIMM modules each; four are used for memory and one is used for error checking. There are 20 slots for SIMMs on the memory module, allowing 16 MB of total memory per memory module.

Each applicationDEC 433MP system has at least one factory-installed memory module with at least 8 MB of memory. Additional PS1XM-AA memory modules are sold with no SIMMs installed. SIMMs are available in packages of 4 MB (5 SIMMs) or 100 MB (25 sets of 4 MB SIMMs). These packages have part numbers PS1XM-BA and PS1XM-BB, respectively.

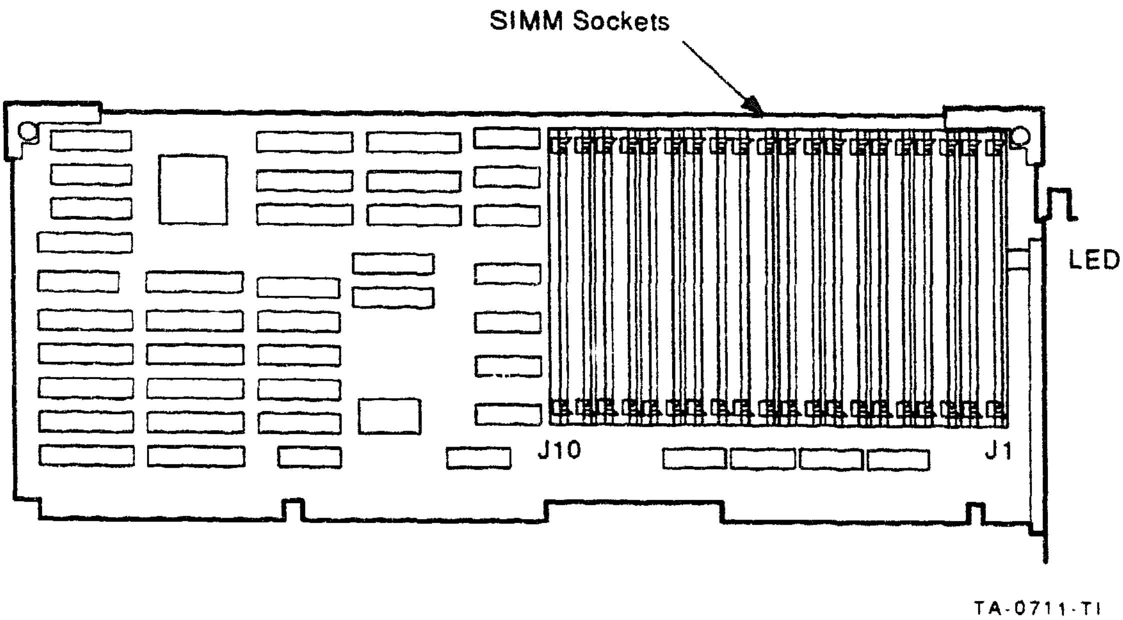
SCO MPX includes an error correction code (ECC) daemon program which uses the fifth SIMM for error detection and correction.

2.5.1 Features

The memory module, shown in Figure 2–5, has the following features:

- SIMM sockets for increasing memory
- LED for ECC error detection. The ECC daemon software detects and corrects single-bit errors.

Figure 2–5 Memory Module



2.5.2 Software Support

Additional memory modules are recognized by the system. No additional software installation is required.

2.5.3 ECC Daemon

The ECC daemon is a software feature of SCO MPX. This program executes in the background at a frequency you select. Each time the program runs, it scans all memory locations and runs error correction code, or ECC. This code uses the fifth SIMM in every package of four SIMMs to perform cross-check computations on every bit in the memory.

The program is capable of detecting and correcting single-bit errors. A single-bit error occurs when one bit in the array is set incorrectly. The ECC software can detect single bits and reverses the state of the incorrect bit to its proper setting. When a single-bit error is detected, the memory module's LED is illuminated.

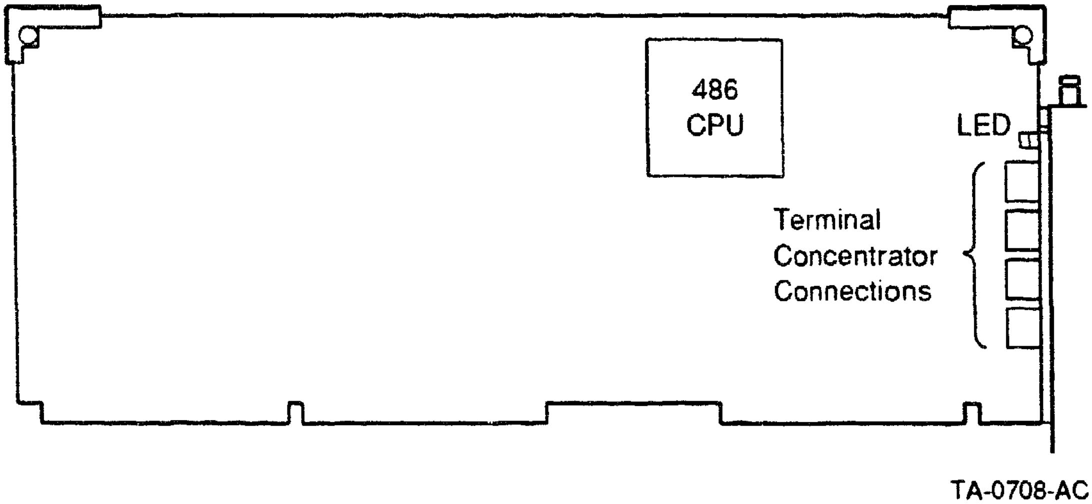
A double-bit error occurs when the ECC daemon discovers that at least two bits in the array are incorrectly set. The ECC daemon issues a *panic* error message and shuts down the system.

The ECC daemon software logs all error messages to the console monitor and to the file */usr/adm/messages*.

2.6 CPU/SIO

The CPU/SIO module, shown in Figure 2–6, provides symmetrical multiprocessing capability for the applicationDEC 433MP system. The CPU/SIO module contains complete terminal multiplexer logic for support of up to four terminal concentrators, each of which supports eight terminals.

Figure 2–6 CPU/SIO Module



Features of the CPU/SIO module include:

- Intel 80486 CPU for additional processing power
- Four terminal concentrator ports
- LED for indicating CPU activity

The Intel 80486 processor provides additional processing power for symmetrical multiprocessing. SCO MPX provides support for the CPU/SIO module's processor. One copy of SCO MPX must be installed for each CPU/SIO module installed on your system.

At the I/O distribution panel, four mini-DIN connectors are available for connection of up to four terminal concentrators.

PC4XD-DB terminal concentrators are used to make connection to the ports on the CPU/SIO module. Terminal concentrators are not included with the CPU/SIO module and are ordered separately. Up to four terminal concentrators can be connected to each CPU/SIO module. Up to eight terminals can be connected to each of the terminal concentrators. This provides a total of 32 serial lines for each CPU/SIO module.

Each terminal multiplexer port on the CPU/SIO module is identified by a letter (A through D). The port names are used to identify the **tty** device under SCO UNIX. The device naming convention used by SCO MPX allows you to define a device as a terminal, printer, modem, or intelligent transparent printer. Refer to the *SCO MPX Release Notes and Installation Guide* for information on how to define the terminal devices used on the CPU/SIO module.

2.7 CPU/SCSI

The CPU/SCSI module, shown in Figure 2–7, has the following features:

- Intel 80486 processor for increased processing capability
- SCSI adapter logic
- External SCSI connector

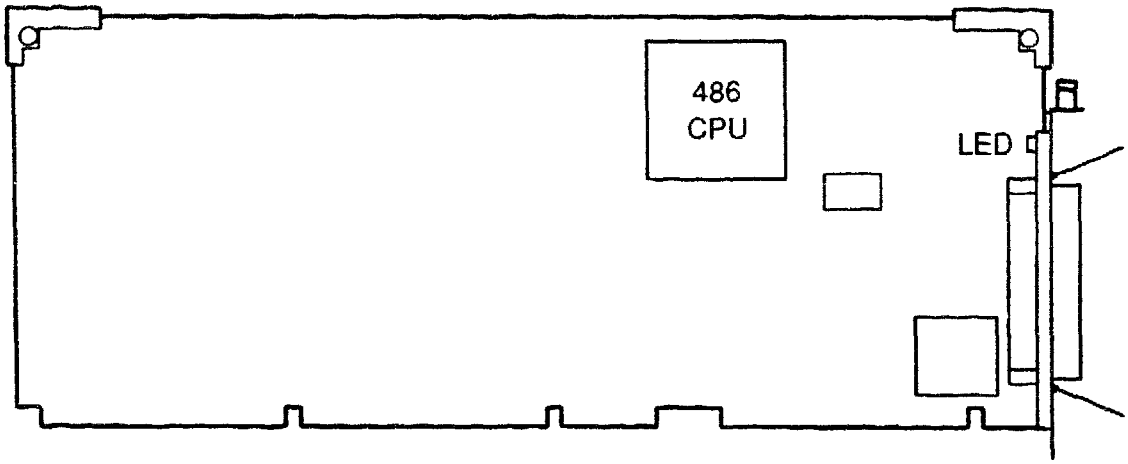
The Intel 80486 processor provides additional processing power for symmetric multiprocessing. The SCO MPX multiprocessor extensions provide support for the CPU/SCSI module's processor. Install one copy of SCO MPX for each CPU/SCSI installed on your system.

The CPU/SCSI module provides logic for an additional SCSI adapter. The CPU/SCSI adapter provides higher performance SCSI transactions than the ISA SCSI adapter. Since the CPU/SCSI module resides in the system bus, SCSI transactions can occur without data transfer through the slower EISA bus.

The CPU/SCSI module always uses SCSI ID 7 as its address. There are no SCSI ID jumpers on the module.

The CPU/SCSI module also provides an external SCSI connector. This connector can be used to provide a complete external SCSI bus, or to extend the internal SCSI bus to external devices.

Figure 2–7 CPU/SCSI Module



For systems with only one CPU/SCSI, Digital Equipment Corporation recommends that you install this CPU/SCSI in slot 5. This ensures an easy upgrade path should you ever install a second CPU/SCSI.

SCO MPX recognizes as device *ciha0* the first CPU/SCSI seen in the backplane (by searching the backplane slots in ascending numerical order: slot 1 through 9). When you have two CPU/SCSIs installed, the CPU/SCSI in slot 5 is *ciha0* and the CPU/SCSI in slot 6 is *ciha1*. When you have one CPU/SCSI installed, it is *always* recognized as *ciha0*, regardless of slot.

Note

If you have only one CPU/SCSI installed, future upgrades will be easier if you install the single CPU/SCSI in slot 5. It will be configured now as *ciha0* and will remain *ciha0* when the second CPU/SCSI is installed.

If you install the first CPU/SCSI in slot 6, it will be configured as *ciha0*. At the later addition of a CPU/SCSI in slot 5, the slot 5 CPU/SCSI becomes *ciha0*, and an entire reconfiguration of your filesystem is necessary. This is avoided if you place your first CPU/SCSI in slot 5.

Devices on the SCSI bus controlled by the CPU/SCSI module are defined using the **mkdev corollary** command. Refer to the *SCO MPX Release Notes and Installation Guide* for details.

2.8 ISA SCSI Host SCSI Adapter

The ISA SCSI host adapter is factory installed in backplane slot 10. It is functionally equivalent to an Adaptec 1540B SCSI adapter and is fully supported by the SCO UNIX drivers for an Adaptec 1540B.

See Section 2.7 for additional information on the SCSI bus schemes available in the applicationDEC 433MP system.

2.8.1 Configuration Jumpers

Table 2–2 shows the configurable features of an ISA SCSI adapter.

Table 2–2 ISA SCSI Adapter Configurable Features and Defaults

Feature	Default Setting
Address	330H
IRQ and interrupt channel	IRQ11
Synchronous negotiation	Disabled
SCSI parity	Enabled
SCSI ID	ID7
DMA channel	Channel 5
DMA request/acknowledge levels	5
DMA transfer speed	5.7 MB/second
BIOS	Enabled
BIOS address	C8000
BIOS wait states	Zero wait states

Figure 2–8 shows the ISA SCSI adapter and the location of jumpers J5, J6, J7, and J9. All of the selectable features are chosen using these jumpers. The factory default jumper configurations are shown.

Figures 2–9 through 2–12 show the different jumper configurations.

Descriptions of the selectable features follow.

Figure 2–8 ISA SCSI Adapter

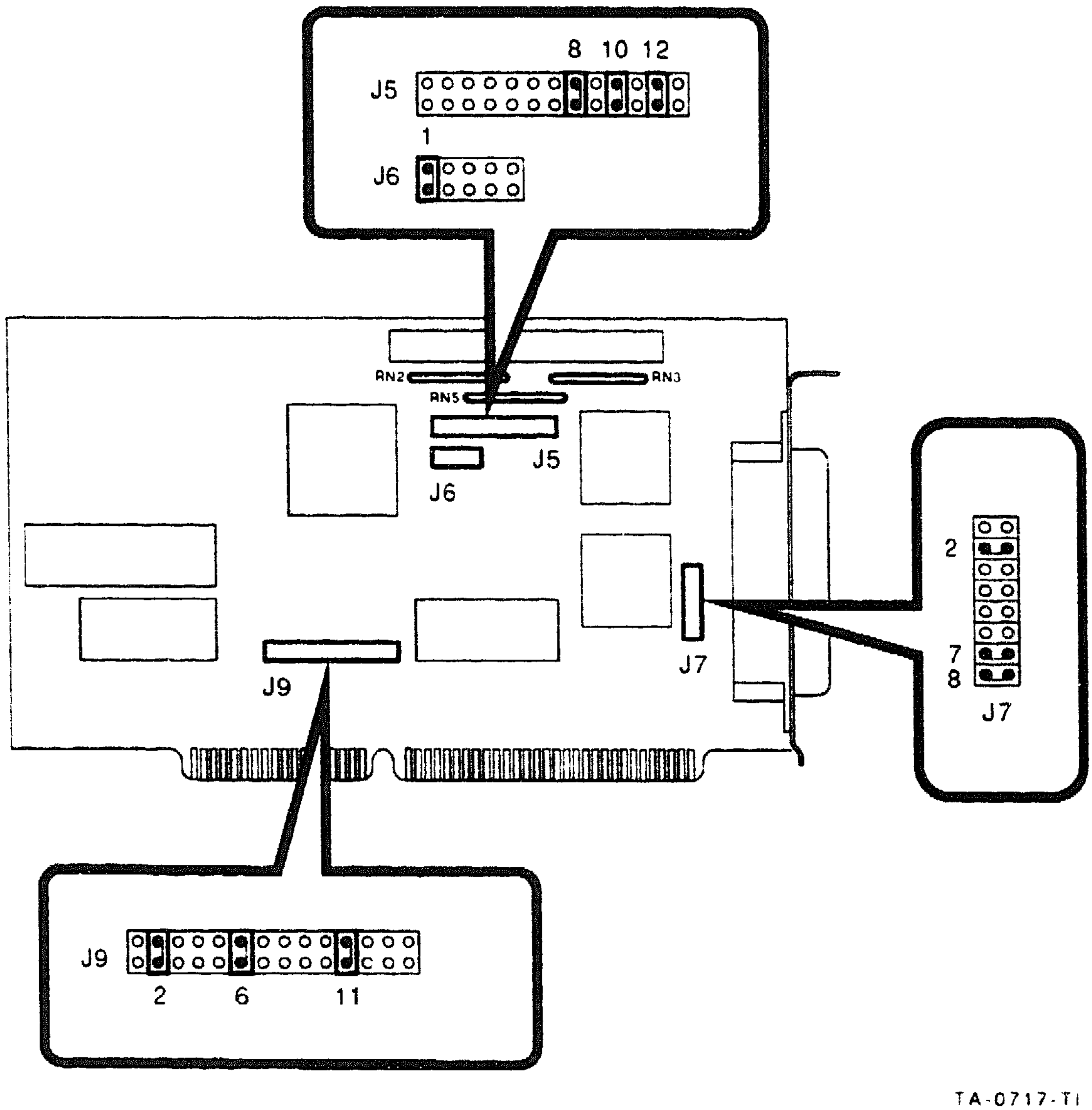


Figure 2–9 SCSI Adapter: Factory Configuration J5

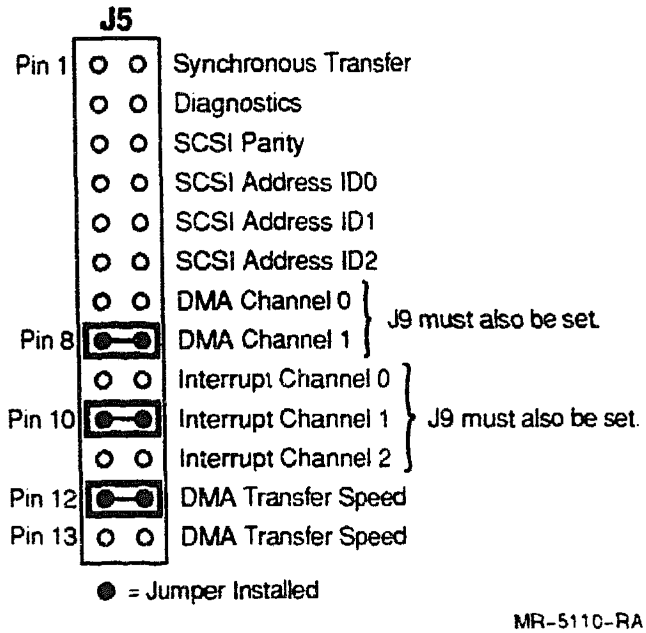


Figure 2–10 SCSI Adapter: Factory Configuration J6

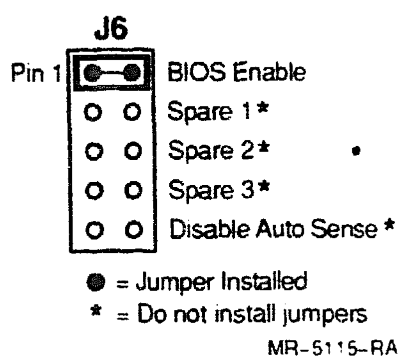


Figure 2–11 SCSI Adapter: Factory Configuration J7

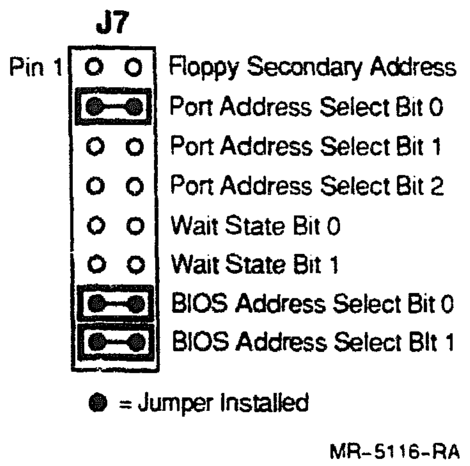
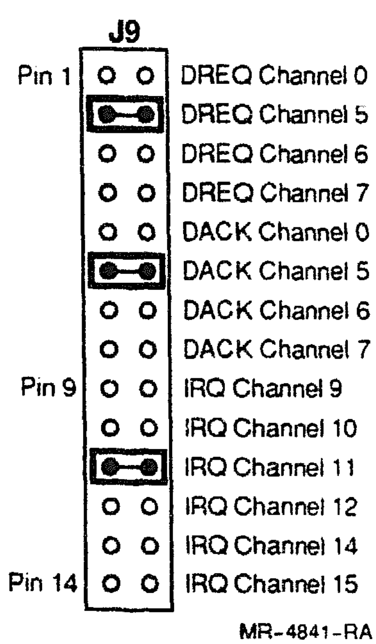


Figure 2–12 SCSI Adapter: Factory Configuration J9



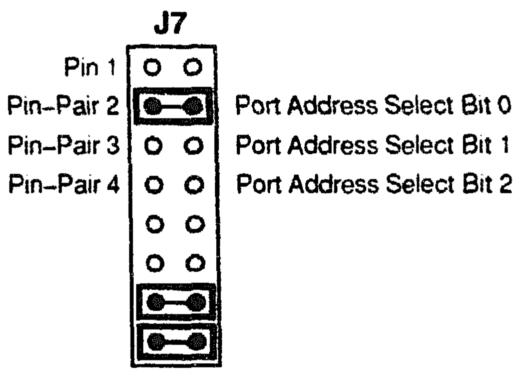
2.8.2 ISA Address

The ISA port address of the SCSI adapter can be set to one of the following addresses:

- 330 (default)
- 334
- 234
- 230
- 134
- 130

Pin pairs 2, 3, and 4 on jumper pack J7 control which address is selected, as shown in Figure 2–13.

Figure 2–13 ISA Address Jumper Settings



ISA Port Address			
Bit 2 A9 4	Bit 1 A8 3	Bit 0 A2 2	Select Bit 1 Address Pin–Pair
○	○	○	334H
○	○	●	330H*
○	●	○	234H
○	●	●	230H
●	○	○	134H
●	○	●	130H
●	●	○	Not Used
●	●	●	Not Used

● = Jumper Installed
* = Default

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2.8.3 IRQ and Interrupt Channel

The IRQ and interrupt channel must be set to identical values. The IRQ and interrupt channel can be set to 9, 10, 11, 12, 14, or 15.

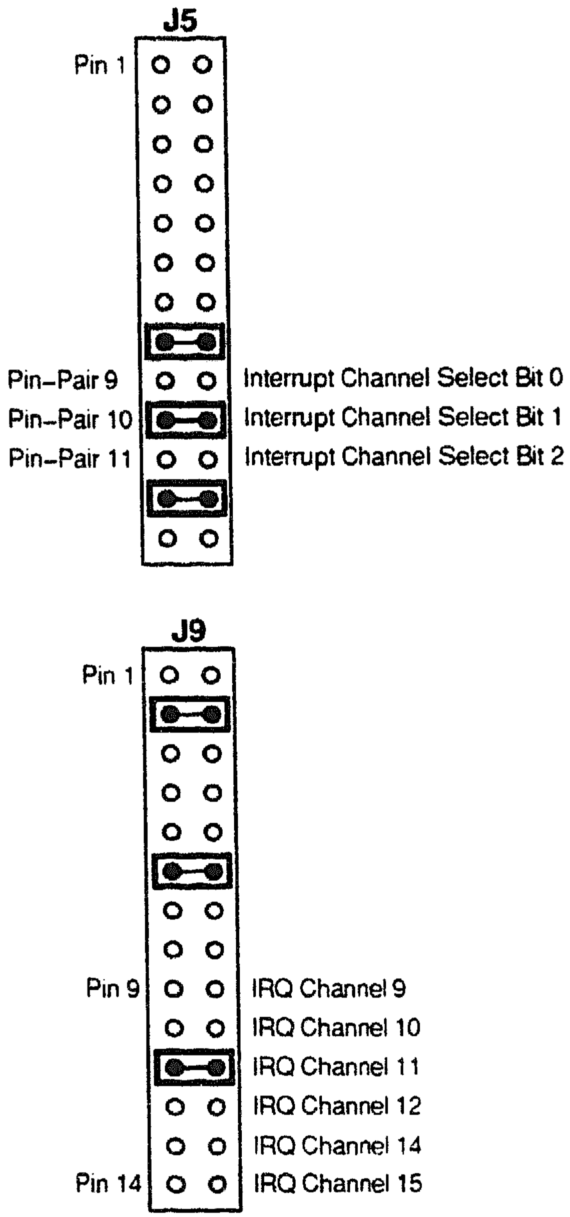
Pin pairs 9, 10, and 11 on jumper pack J5 control the interrupt channel assigned to the SCSI adapter. Pin pairs 9 through 14 on jumper pack J9 control the IRQ channel. Both jumper packs must be set to the same value. Figure 2–14 shows how values are selected in these jumper packs.

2.8.4 DMA Channel

The DMA channel can be set to 0, 5, 6, or 7. The default setting is DMA channel 5. The DREQ and DACK channels must be set to match the DMA channel selected.

Pins 7 and 8 on J5 and pins 1 through 8 on J9 control the DMA channel and DREQ and DACK channel settings. Figure 2–15 shows how the DMA channel is specified.

Figure 2–14 IRQ and Interrupt Channel Jumper Settings



J5 Interrupt Channels

Pin–Pair 9	Pin–Pair 10	Pin–Pair 11	Interrupt Channel
○	○	○	9
●	○	○	10
○	●	○	11*
●	●	○	12
○	○	●	14
●	○	●	15

● = Jumper Installed
* = Default

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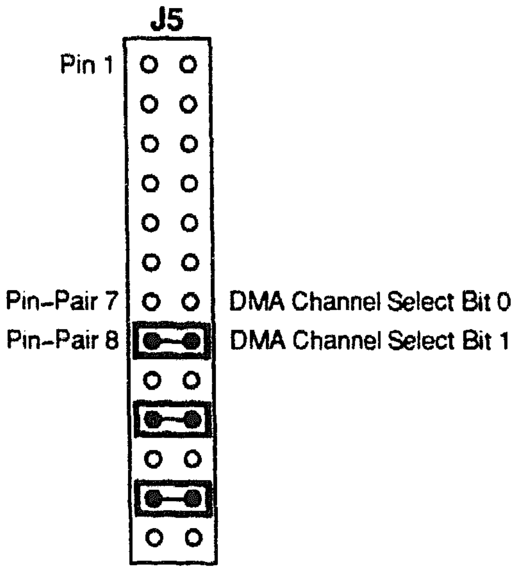
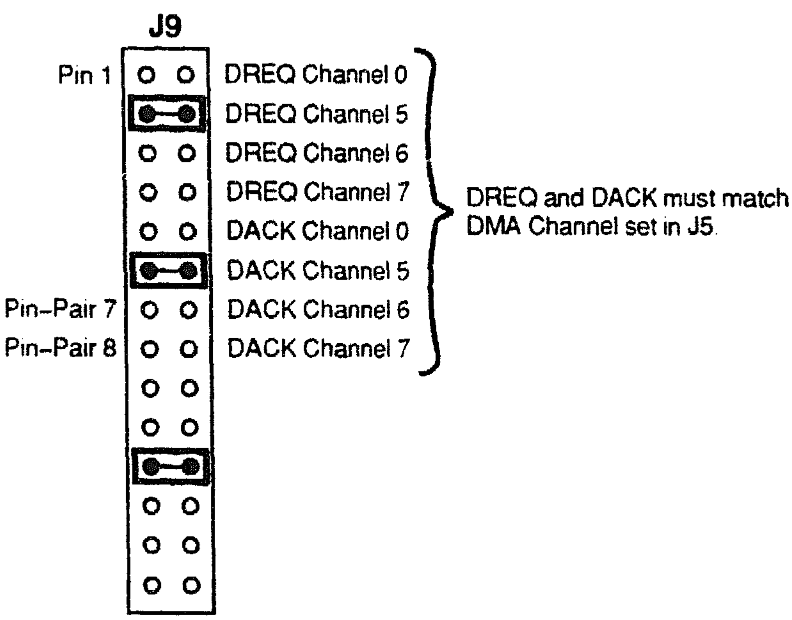
Figure 2–15 DMA Channel Jumper Settings



J5 DMA Channel Jumpers

Pin–Pair 7	Pin–Pair 8	DMA Channel
○	○	7
●	○	6
○	●	5*
●	●	0

● = Jumper Installed
* = Default



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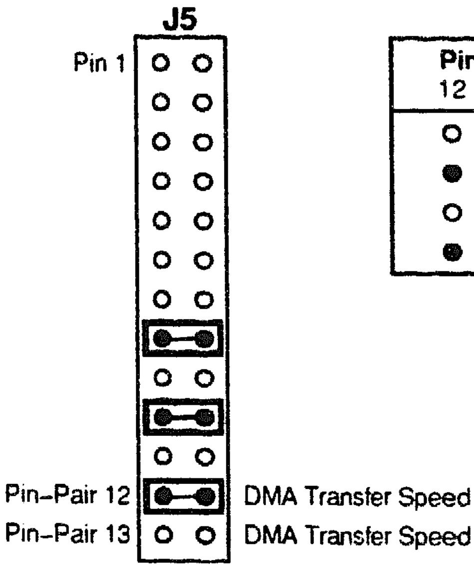
2.8.5 DMA Transfer Rate

The DMA transfer rate can be set to 5.0, 5.7, 6.7, or 8.0 MB/second. The default setting is 5.7 MB/second.

Pins 12 and 13 control the setting of the DMA transfer rate, as shown in Figure 2–16.

Figure 2–16 DMA Transfer Rate Jumper Settings



Pin–Pair 12	Pin–Pair 13	DMA Speed
○	○	5.0 MB/s
●	○	5.7 MB/s*
○	●	6.7 MB/s
●	●	8.0 MB/s

● = Jumper Installed
* = Default

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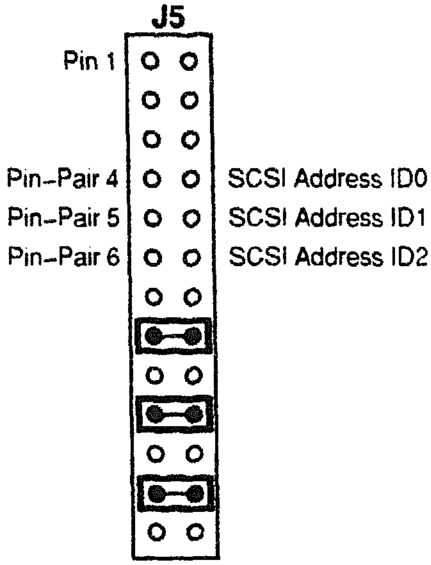
2.8.6 SCSI ID Address

The SCSI ID address of the adapter can be set between 0 and 7. The default setting is 7.

Pins 4, 5, and 6 control the SCSI ID address, as shown in Figure 2–17.

Figure 2–17 SCSI ID Jumper Settings



Pin–Pair 4	Pin–Pair 5	Pin–Pair 6	SCSI Address
O	O	O	7*
●	O	O	6
O	●	O	5
●	●	O	4
O	O	●	3
●	O	●	2
O	●	●	1
●	●	●	0
0	1	2	SCSI Address Bit Number

Jumper installed sets a zero in the SCSI Address.

● = Jumper Installed
* = Default

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2.8.7 SCSI Parity

SCSI parity checking can be enabled or disabled. The default is parity checking enabled. Pin 3 of jumper pack J5 controls this setting. If the pin is installed, parity checking is disabled. If the pin is removed, parity checking is enabled.

2.8.8 SCSI Synchronous Transfer

SCSI synchronous negotiation transfers can be enabled or disabled. The default is disabled synchronous transfers. This means that the adapter supports synchronous transfers if initiated by another device.

2.8.9 BIOS Memory, Enable, and Wait State Selections

The BIOS PROM can be enabled with a jumper on pin 1 on jumper pack 6 (J6). This jumper must always be installed, as shown in Figure 2–10.

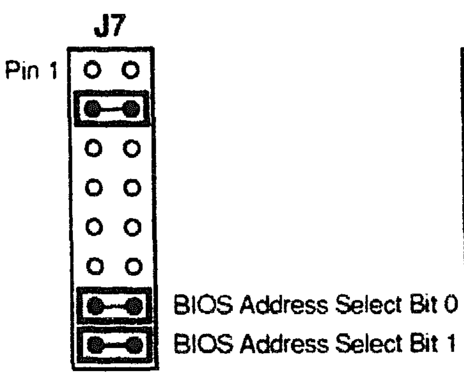
The starting address of memory space for the on-board BIOS can be set to the following values:

- DC000
- CC000
- D8000
- C8000

The default setting is C8000.

Pins 7 and 8 on jumper pack J7 control the BIOS memory address space, as shown in Figure 2–18.

Figure 2–18 BIOS Memory Jumper Settings



BIOS SEL 0	BIOS SEL 1	Address
–	–	DC000
●	–	CC000
·	●	DB000
●	●	C8000*

● = Jumper Installed
– = Jumper Not Installed
* = Default

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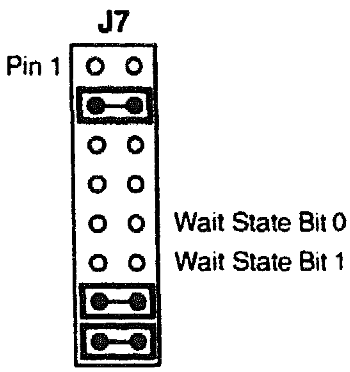
BIOS wait states can be set to values of 0, 100, 200, or 300 nanoseconds. The default setting is zero wait states. Pins 5 and 6 on jumper pack J7 control the BIOS wait state selection, as shown in Figure 2–19.

Figure 2–19 BIOS Wait State Jumper Settings



WS 0	WS 1	Delay (ns)
–	–	0 (IOCHRDY Not Driven)*
●	–	100
–	●	200
●	●	300

● = Jumper Installed
– = Jumper Not Installed
* = Default

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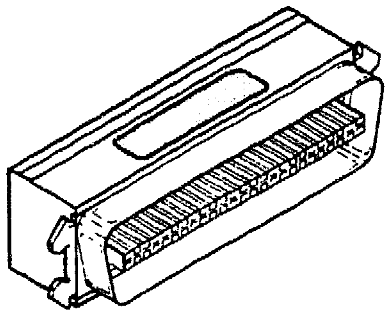
2.8.10 Terminator Resistor Packs

Each end of a SCSI bus must be terminated. Terminator resistor packs are used on a module to terminate the SCSI bus when only one end of the SCSI bus terminates with a cable terminator. The terminator resistor packs are RN2, RN3, and RN5, as shown in Figure 2–8.

Factory-installed ISA SCSI adapters have terminator resistor packs removed. The internal end of the SCSI bus is terminated with a cable terminator. The external end of the SCSI bus is terminated with the H8574-A 50-pin SCSI terminator. Figure 2–20 shows the terminator.

When installing a PS1XR-AA ISA SCSI adapter, the terminator resistor packs are present on the module and should be left in place. The resistor packs serve to terminate the internal end of the SCSI bus. The external end is terminated with the 50-pin SCSI terminator.

Figure 2–20 SCSI Terminator



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2.8.11 ISA CFG File

The ISA CFG file for use with the ISA SCSI host adapter is the file for an Adaptec 1540B ISA SCSI adapter. This file is on the system configuration diskette and is labeled "ADP0100.CFG Adaptec AHA-1540/1542 ISA SCSI Host Adapter." This file should have been installed during the initial system installation. (Instructions for installation are contained in the *applicationDEC 433MP EISA System Installation Guide*, EK-PS110-IG.)

The instructions below summarize how to install the ISA CFG file for the ISA SCSI host adapter.

1. Boot the ECU from the 3.5-inch diskette drive.
2. From the main menu, select "Configure computer."
3. Select step 2, "Add or remove boards."
4. Use the arrow keys to highlight EISA slot 10 (the factory default slot for the ISA SCSI adapter).
5. Press [Enter] to list the available ISA CFG files.
6. Use the arrow keys to select the ISA CFG file, "ADP0100.CFG Adaptec AHA-1540/1542 ISA SCSI Host Adapter."
7. Press [F10] to return to the "Configure computer" menu.
8. Select "View or edit details."
9. Use the arrow keys to highlight the ISA SCSI adapter.
10. All of the default settings for the Adaptec 1540B can be used except for the following: DMA transfer speed; and BIOS memory address.
11. Use the arrow keys to highlight the BIOS memory address. Press [Enter] and use the arrow keys to select C8000 as the memory address. This reflects the default jumper settings of the applicationDEC 433MP system ISA SCSI adapter.
12. Use the arrow keys to highlight the DMA transfer speed. Press [Enter] and use the arrow keys to change the DMA transfer rate to 5.7 MB/second. This reflects the default jumper settings of the applicationDEC 433MP system ISA SCSI adapter.
13. Press [F10] to return to the "Configure computer" menu.
14. Select "Save and exit" to write the system configuration file to your system and to the ECU diskette.

2.8.12 Second ISA SCSI Adapter

A second ISA SCSI adapter can be installed for additional SCSI device support. SCO UNIX System V Release 3.2 Version 2.0 allows a maximum of four hard disks on ISA SCSI adapters per system. The four hard disks can be installed internally or externally and can be split between the two adapters in any configuration desired. The second ISA SCSI adapter can be used for external storage expansion only.

If a second ISA SCSI adapter is installed, the configurable features should be changed from the defaults as listed in Table 2–3.

Table 2–3 Jumper Settings for Second ISA SCSI Adapter

Feature	Setting	Jumper Changes
Base address	230	Add a jumper on J7 pin 3
IRQ	14	Move jumper on J5 from pin 10 to pin 11 Move jumper on J9 from pin 11 to pin 13
DMA channel	6	Move jumper on J5 from pin 8 to pin 7 Move jumper on J9 from pin 2 to pin 3 Move jumper on J9 from pin 6 to pin 7
BIOS	Disabled	Remove jumper on J6 pin 1

In addition, the terminator resistor packs must remain installed on the adapter. The PS1XR-AA ISA SCSI adapter, when ordered separately, is shipped with the terminator resistor packs installed. The ISA SCSI adapter which is factory installed in an applicationDEC 433MP system has the terminator resistor packs removed.

After installation of the second ISA SCSI adapter, the device must be configured. This involves editing of kernel link files as described below.

1. Boot the system in Maintenance mode and log in as *root*.
2. Set directory to the kernel link area using the command:

   `cd /etc/conf/cf.d` [Enter]

3. Use an editor to edit the file *mdevice*. Search for the line *ad*.

   ```
   ad      iI      iHroCc  aha     34      34      1       2       5
   ```

4. Remove the "o" in the third field to make the line read:

   ```
   ad      iI      iHrCc   aha     34      34      1       2       5
   ```

5. Change your directory using the command below.

   `cd /etc/conf/sdevice.d` [Enter]

6. Edit the file *ad* using any editor. Add the following line:

```
ad      Y       1       6       1       14      230     232     0       0
```

   The new file *ad* will look as follows:

```
ad      Y       1       5       1       11      330     332     0       0
ad      Y       1       6       1       14      230     232     0       0
```

   The **sdevice(F)** manpage can provide additional information.

7. Use the **mkdev hd** command to configure the devices on the second ISA SCSI adapter. The **mkdev hd** command must be run twice. The first execution updates the internal kernel configuration tables, followed by a kernel relink and a reboot. The second execution, with same **mkdev hd** parameters, establishes a partition table. Refer to the **fdisk(ADM)** documentation and **divvy(ADM)** documentation for more information.

   For example, to configure disk ID 3 on the second ISA SCSI adapter, use the following command:

   `mkdev hd 3 SCSI-1 0` [Enter]

2.8.12.1 ISA CFG File

The ISA CFG file for use with the second ISA SCSI host adapter is the file for an Adaptec 1540B ISA SCSI adapter. This file is on the system configuration diskette and is labeled "ADP0100.CFG Adaptec AHA-1540/1542 ISA SCSI Host Adapter."

The instructions below summarize how to install the ISA CFG file for the second ISA SCSI host adapter.

1. Boot the ECU from the 3.5-inch diskette drive.
2. From the main menu, select "Configure computer."
3. Select step 2, "Add or remove boards."
4. Use the arrow keys to highlight the EISA slot in which you installed the second ISA SCSI adapter.
5. Press [Enter] to list the available ISA CFG files.
6. Use the arrow keys to select the ISA CFG file, "ADP0100.CFG Adaptec AHA-1540/1542 ISA SCSI Host Adapter."
7. Press [F10] to return to the "Configure computer" menu.
8. Select "View or edit details."

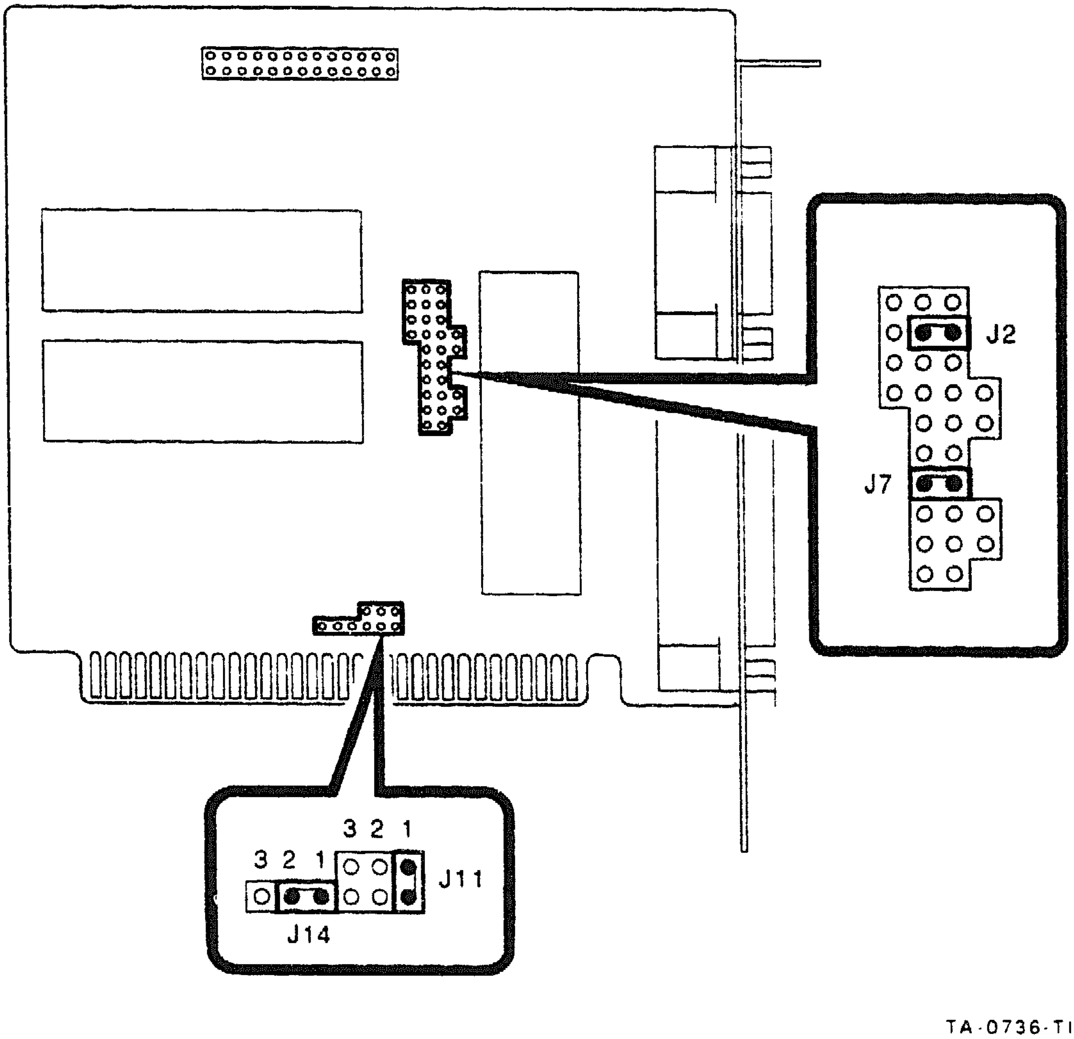
9. Use the arrow keys to highlight the ISA SCSI adapter.
10. The settings in the ISA CFG file must be altered to match the settings of the board you have just installed. These include: base address of 230; IRQ of 14; DMA channel of 6; and BIOS disabled.
11. Use the arrow keys to highlight the address setting. Press [Enter] to display the choices available, and select 230. Press [Enter] to select 230.
12. Use the arrow keys to highlight the BIOS memory address. Press [Enter] and use the arrow keys to select "Disabled" for the BIOS memory. Press [Enter].
13. Use the arrow keys to highlight the DMA transfer speed. Press [Enter] and use the arrow keys to change the DMA transfer rate to 5.7 MB/second. This reflects the default jumper settings of the PS1XR-AA ISA SCSI adapter.
14. Use the arrow keys to highlight the DMA channel selection. Press [Enter] and choose Channel 6.
15. Use the arrow keys to highlight the IRQ setting and select 14 for the IRQ. These settings now reflect the true jumper configuration of the module as set in Table 2–3.
16. Press [F10] to return to the "Configure computer" menu.
17. Select "Save and exit" to write the system configuration file to your system and to the ECU diskette.

2.9 Serial/Parallel Adapter

The serial/parallel adapter, shown in Figure 2–21, is factory installed in backplane slot 11. It provides one serial port and one parallel port.

The serial port is factory configured to have COM2: as its address. The parallel port is factory configured to have 387H (LPT1:) as its address.

Figure 2–21 Serial/Parallel Adapter

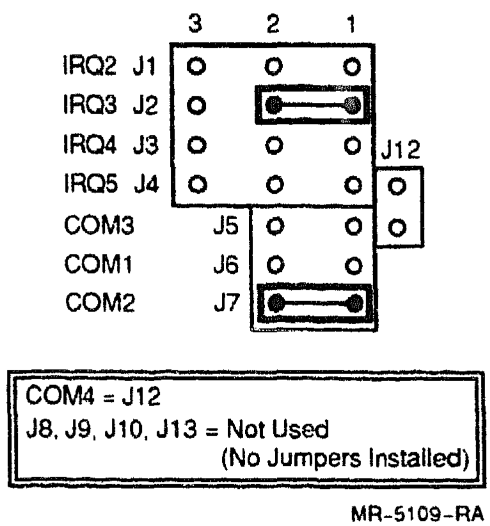


2.9.1 Serial Port Address and IRQ Line

The serial port address is controlled by jumpers, as shown in Figure 2–22. The address can be set to COM1:, COM2:, COM3:, or COM4:. The default setting is COM2:.

The IRQ line for the serial port can be set to IRQ2, IRQ3, IRQ4, or IRQ5. The default setting is IRQ3.

Figure 2–22 Serial Port Jumpers



Note

The address of the serial port on the serial/parallel module should not be set to COM1:. During system configuration, the ECU automatically assigns the COM1: address to the serial port on the bridge module.

Table 2–4 lists the addresses possible for the serial port. Table 2–5 lists the IRQ settings possible for the serial port.

Table 2–4 Serial Port Addresses

Address Name	Address	Jumper Installed
COM1:	3F8–3FF	J6
COM2:	2F8–2FF	J7 (factory default)
COM3:	3E8–3EF	J5
COM4:	2E8–2EF	J12
Disabled	NA	None

Table 2–5 Serial Port IRQ Settings

IRQ Setting	Jumper Installed
IRQ2	J1 pins 1–2
IRQ3	J2 pins 1–2 (factory default)
IRQ4	J3 pins 1–2
IRQ5	J4 pins 1–2

Pin pairs 2–3 in J1 through J4 should be left open (no jumper installed).

2.9.2 Parallel Port Address and IRQ Line

The parallel port address is controlled by jumpers. The address can be set to 378H (LPT1:), 278H, or 3BCH. The default setting is for 378H (LPT1:). Figure 2–23 illustrates how to install jumpers for the different address settings.

The IRQ line for the parallel port can be set to IRQ5 or IRQ7. The default setting is IRQ7.

Figure 2–23 Parallel Port Jumpers

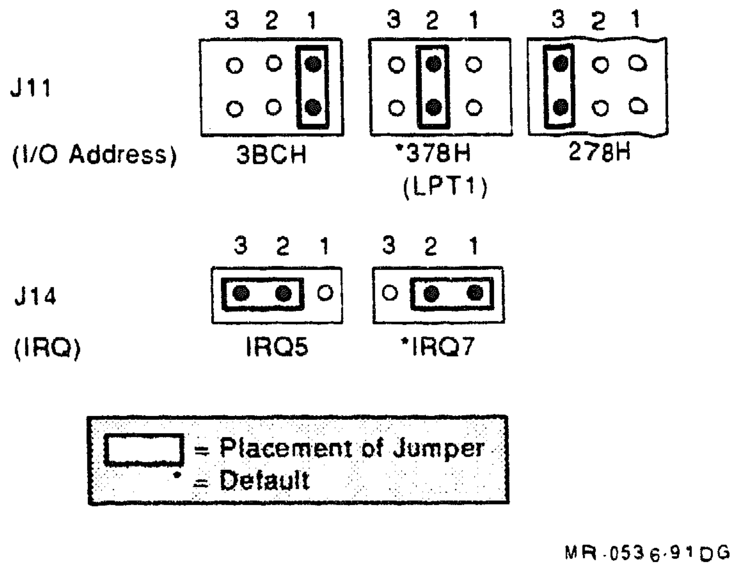


Table 2–6 lists the addresses available for the parallel port. Table 2–7 lists the IRQ settings available for the parallel port.

Table 2–6 Parallel Port Addresses

Address	Jumper Installed
3BC	J11 pin 1
378 (LPT1:)	J11 pin 2 (factory default)
278	J11 pin 3

Table 2–7 Parallel Port IRQ Settings

IRQ	Jumper Installed
IRQ5	J14 pins 2–3
IRQ7	J14 pins 1–2 (factory default)

2.9.3 Signal Pinouts

Figure 2–24 shows the signals presented on the serial port connector.

Figure 2–24 Serial Port Pinout

I/O Card Serial Port A (CN3)	Signal Name	25–Pin End of RS–232 Cable
1	DCD (Data Carrier Detect)	8
2	RX (Receiving Data)	3
3	TX (Transmit Data)	2
4	DTR (Data Terminal Ready)	20
5	GND (Signal Ground)	7
6	DSR (Data Set Ready)	6
7	RTS (Request to Send)	4
8	CTS (Clear to Send)	5
9	RI (Ring Indicator)	22

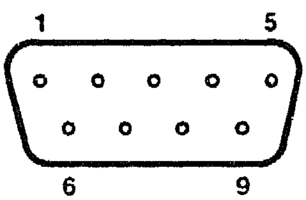


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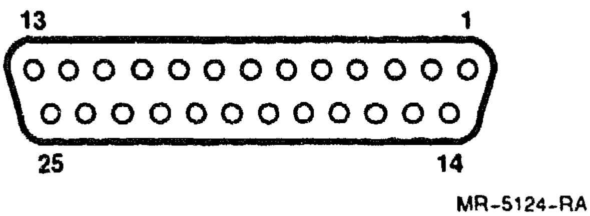
Figure 2–25 shows the signals presented on the parallel port connector.

Figure 2–25 Parallel Port Pinout

Pin	Signal	In/Out
1	-STROBE	Out
2	Data Bit 0	Out
3	Data Bit 1	Out
4	Data Bit 2	Out
5	Data Bit 3	Out
6	Data Bit 4	Out
7	Data Bit 5	Out
8	Data Bit 6	Out
9	Data Bit 7	Out
10	-ACK	In
11	BUSY	In
12	PE	In
13	SLCT	In
14	-AUTO FEED XT	Out
15	-ERROR	In
16	-INIT	In
17	-SLCT IN	Out
18–25	GND	-



2.10 Video Graphics Adapter (VGA)

The video graphics adapter (VGA), part number PS1XG-AA, provides graphics capabilities for the console monitor. One graphics monitor can be connected to a VGA. This high resolution graphics adapter includes the following features:

- High resolution up to 1024 x 768 and Super VGA 800 x 600 on multisync monitors
- High 72 Hz refresh rate
- Compatibility with VGA, EGA, CGA, MDA, and Hercules graphics modes
- Bus mouse support

The VGA contains automatic monitor detection circuitry, which allows it to configure itself for the attached monitor. If the adapter is unable to determine the monitor type and resolution, utility software is provided with the adapter to configure it for the monitor attached.

The Digital Equipment Corporation VRC16 Color Multisync monitor is the recommended monitor for use with the applicationDEC 433MP system. However, the VGA supports many monitors from various vendors. For more information, see the *PS1XG-AA High Resolution Graphics Adapter Installation and User Manual*, ER-PS1XG-IG.

2.10.1 Bootable Utility Diskette

The VGA is shipped with a bootable utility diskette, which can be used to configure the adapter for your monitor (if the VGA is unable to automatically detect the monitor). The utility diskette contains a program called VGASETUP, which allows you to configure the VGA and specify an IRQ level and address for the bus mouse. In addition, the diskette contains a diagnostic test program that verifies proper operation of the VGA.

2.10.2 Preinstallation Configuration

There are no jumpers or switches on the VGA. All address and IRQ selections are either software configurable or fixed.

2.10.3 ISA Address and IRQ Selection

The VGA address port and memory port are not selectable. The VGA address is configured for 3B0–3DF. The memory port is configured for A0000–BFFFF.

An IRQ line must be selected for the bus mouse. This IRQ line must be unique and not conflict with any IRQ already assigned to an option in the ISA bus. The IRQ line is set with the utility software and can be any IRQ between 2 and 5, inclusive, or disabled. The factory configuration is for the mouse IRQ to be disabled. Use the bootable utility diskette supplied with the VGA to configure the mouse for an IRQ setting and a primary or secondary address.

Select IRQ5 for the bus mouse.

The bus mouse address is selectable between the primary address (23C–23F) and the secondary address (238–23B). The bus mouse should be configured for the primary address in an applicationDEC 433MP system.

2.10.4 ISA CFG File

The ISA CFG file for use with the VGA is the file for an ATI VGA Wonder+. This file is contained on your system configuration diskette and is labeled "ATI0060.CFG VGA Wonder+." This file should have been installed during the initial system installation. (Instructions for installation are contained in the *applicationDEC 433MP EISA System Installation Guide*, EK-PS110-IG.)

The instructions below summarize how to install the ISA CFG file for the VGA.

1. Boot the ECU from the 3.5-inch diskette drive.
2. From the main menu, select "Configure computer."
3. Select step 2, "Add or remove boards."
4. Use the arrow keys to highlight EISA slot 12 (the factory default slot for the VGA).
5. Press [Enter] to list the available ISA CFG files.

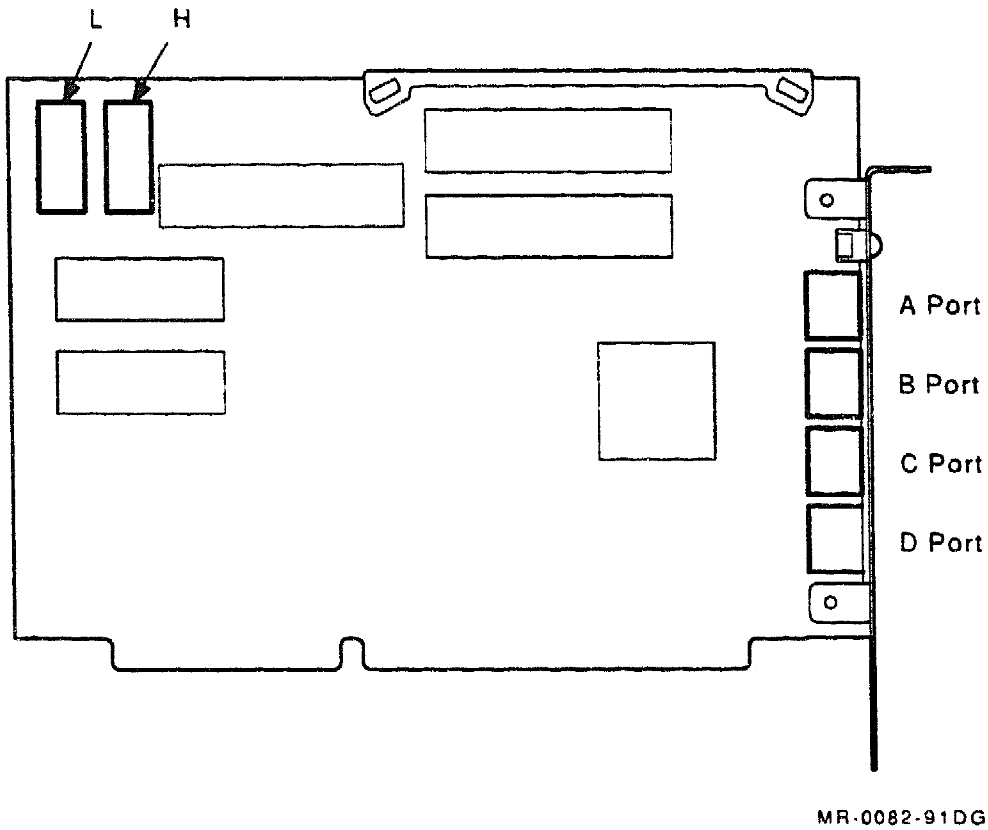
6. Use the arrow keys to select the ISA CFG file, "ATI0060.CFG VGA Wonder+."
7. Press F10 to return to the "Configure computer" menu.
8. Select "View or edit details."
9. Use the arrow keys to highlight the VGA.
10. Select the "Primary/secondary" address for the mouse.
11. Press F6 and check that the IRQ is set to 5 for the mouse. Note that this does not enable the mouse; VSETUP on the bootable utility diskette sets these features for the mouse.
12. Ensure that the "16-bit ROM" is selected.
13. Press F10 to return to the "Configure computer" menu.
14. Select "Save and exit" to write the system configuration file to your system and to the ECU diskette.

2.11 Terminal Multiplexer Host Adapter

The terminal multiplexer host adapter, shown in Figure 2–26, is an ISA module that allows connection of up to 32 serial terminals. Each terminal multiplexer adapter has four connectors for installation of a terminal concentrator. Each terminal concentrator allows up to eight terminals to be connected.

The terminal concentrator is connected to the terminal multiplexer or the CPU/SIO. See Chapter 10 for information on terminal multiplexer diagnostics.

Figure 2–26 Terminal Multiplexer Host Adapter

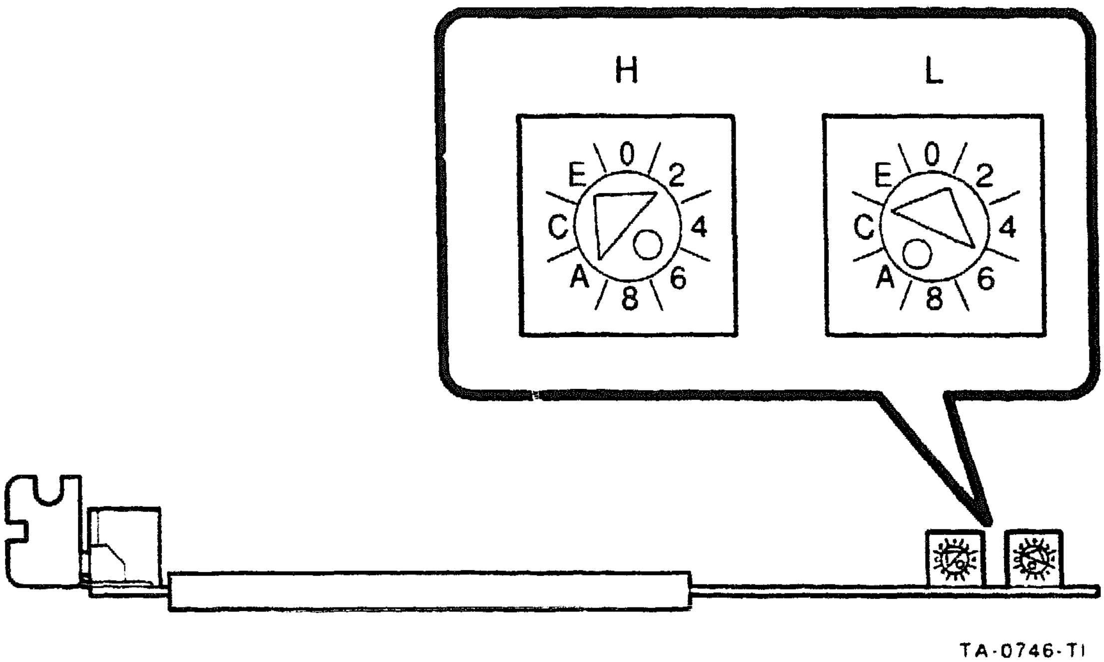


The memory address of the terminal multiplexer must be set before it is installed. The memory address should be set as shown in Table 2–8. Figure 2–27 shows the rotary switches (H and L) that set the module address. Make sure these switches are set correctly.

Table 2–8 Terminal Multiplexer Memory Address Settings

Terminal Multiplexer	Memory Address	H Switch	L Switch
First installed	E10000–E1FFFF	E	1
Second installed	E20000–E2FFFF	E	2

Figure 2–27 Terminal Multiplexer Rotary Switch Settings



Select an IRQ line for the terminal multiplexer. During installation of the software driver, you will be asked to specify the IRQ line. Select the line as shown in Table 2–9.

Install the terminal multiplexer host adapter in the system as described in Section 9.19.

Table 2–9 Terminal Multiplexer IRQ Settings

Terminal Multiplexer	IRQ
First installed	12
Second installed	12

2.11.1 Update System Configuration with ECU

After you install the terminal multiplexer host adapter, you must also update the system configuration file by running the ECU.

Note

The terminal multiplexer host adapter uses memory locations reserved for system memory. Therefore, you must run the ECU and update the system configuration file to specify that the terminal multiplexer uses the 14 MB memory space. This sets the 14 MB memory space as noncacheable.

Use the following instructions to update the file with the ECU.

1. Boot the ECU from the 3.5-inch diskette drive.
2. From the main menu, select "Configure computer."
3. Select step 2, "Add or remove boards."
4. Use the arrow keys to highlight the EISA slot in which you installed the terminal multiplexer host adapter.
5. Press [Enter] to list the available ISA CFG files.

6. Use the arrow keys to select the ISA CFG file, "ISAC001.CFG Corollary 8x4 MUX."
7. Press F10 to return to the "Configure computer" menu.
8. Select "View or edit details."
9. Use the arrow keys to highlight the terminal multiplexer.
10. Select the memory range, 14 MB, for the terminal multiplexer.
11. Press F6 and ensure that the IRQ is set to 12.
12. Press F10 to return to the "Configure computer" menu.
13. Select "Save and exit" to write the system configuration file to your system and to the ECU diskette.

2.12 SCSI Hard Disk Drives

Table 2–10 lists Digital-supplied SCSI hard disk drives that can be installed in the applicationDEC 433MP system.

Table 2–10 Hard Disk Drives

Formatted Capacity	Model Number	Order Number	Size
209 MB	RZ24-S	RZ24-S	Half-height (3.5-inch)
426 MB	RZ25-S	RZ25-S	Half-height

Note

The -S extension in the RZ24 and RZ25 model numbers indicates that the drives are factory set to spin up when power is applied.

Half-height (3.5-inch) SCSI hard disk drives supplied by other vendors can also be installed in an applicationDEC 433MP system.

One 209 MB disk drive is standard with every applicationDEC 433MP system.

2.12.1 Preinstallation Configuration

Before you install a hard disk drive, check/set its SCSI ID with the jumpers located on the drive. Table 2–11 shows you how to set the jumpers. Figures 2–28 and 2–29 show the location of the SCSI ID jumpers on the 209 MB and 426 MB drives.

When you set the ID jumpers to define the SCSI ID, remember:

- Each drive on a SCSI bus must have a unique ID number.
- The applicationDEC 433MP system supports dual SCSI buses.
- ID addresses for one SCSI bus have no bearing on ID addresses for another SCSI bus.

Therefore, each drive connected to a SCSI bus must have a unique SCSI ID from 0 to 6, and each drive connected to the second SCSI bus must have a unique SCSI ID from 0 to 6. For each bus, SCSI ID 7 is generally reserved for the SCSI adapter.

Table 2–11 SCSI ID Jumper Settings

SCSI ID	E1 (0)	E2 (1)	E3 (2)
0	Out	Out	Out
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In

Before you install a 426 MB drive in the applicationDEC 433MP system, verify that configuration jumpers A through H are installed as shown in Figure 2–29. Table 2–12 describes the jumpers.

Table 2–12 426 MB Drive Configuration

Jumper	Operating Position	Description
A	Out	Factory use only.
B	Out	Spin-up on power up when removed. Spin-up on command when installed.
C	Out	Spin-up delay (valid only if jumper B is removed). Drive spins up after n-second delay when installed (n = 16 x SCSI ID setting). Drive spins up immediately when removed.
D	Out	Write-protect. Drive is write protected when installed.
E	In	Parity checking. Parity checking is enabled when installed.
F	Out	Reserved. Do not install jumper.
G	In	Terminator power source. The drive supplies power to SCSI bus, pin 26.
H	In	Terminator power source. The drive supplies power to its own terminators. Jumpers G and H should both be installed.

The factory-installed devices are configured as shown in Figure 2–30. The ID address scheme is designed to avoid changing SCSI addresses when upgrading a system to include the second CPU/SCSI bus. If you use these addresses, you do not need to change the SCSI ID of any existing devices.

Figure 2–28 209 MB Disk Drive Jumpers

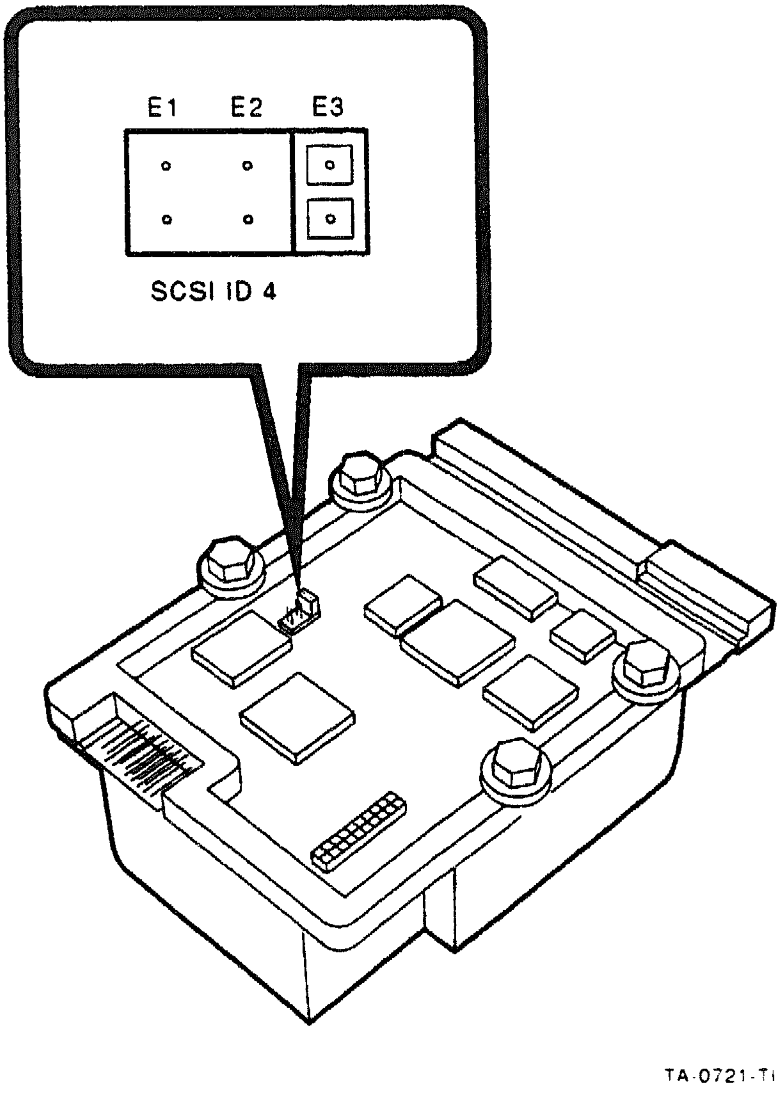


Figure 2–29 426 MB Disk Drive Jumpers

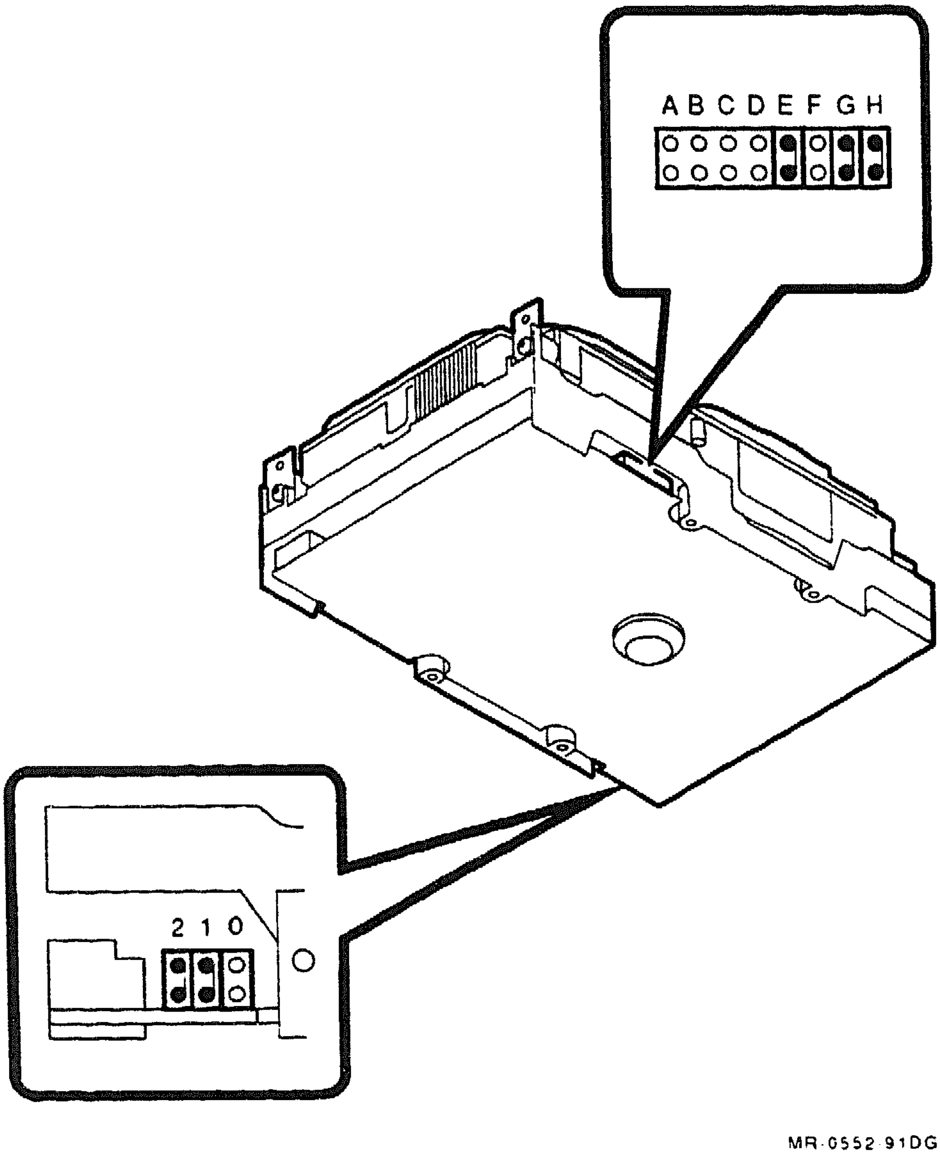
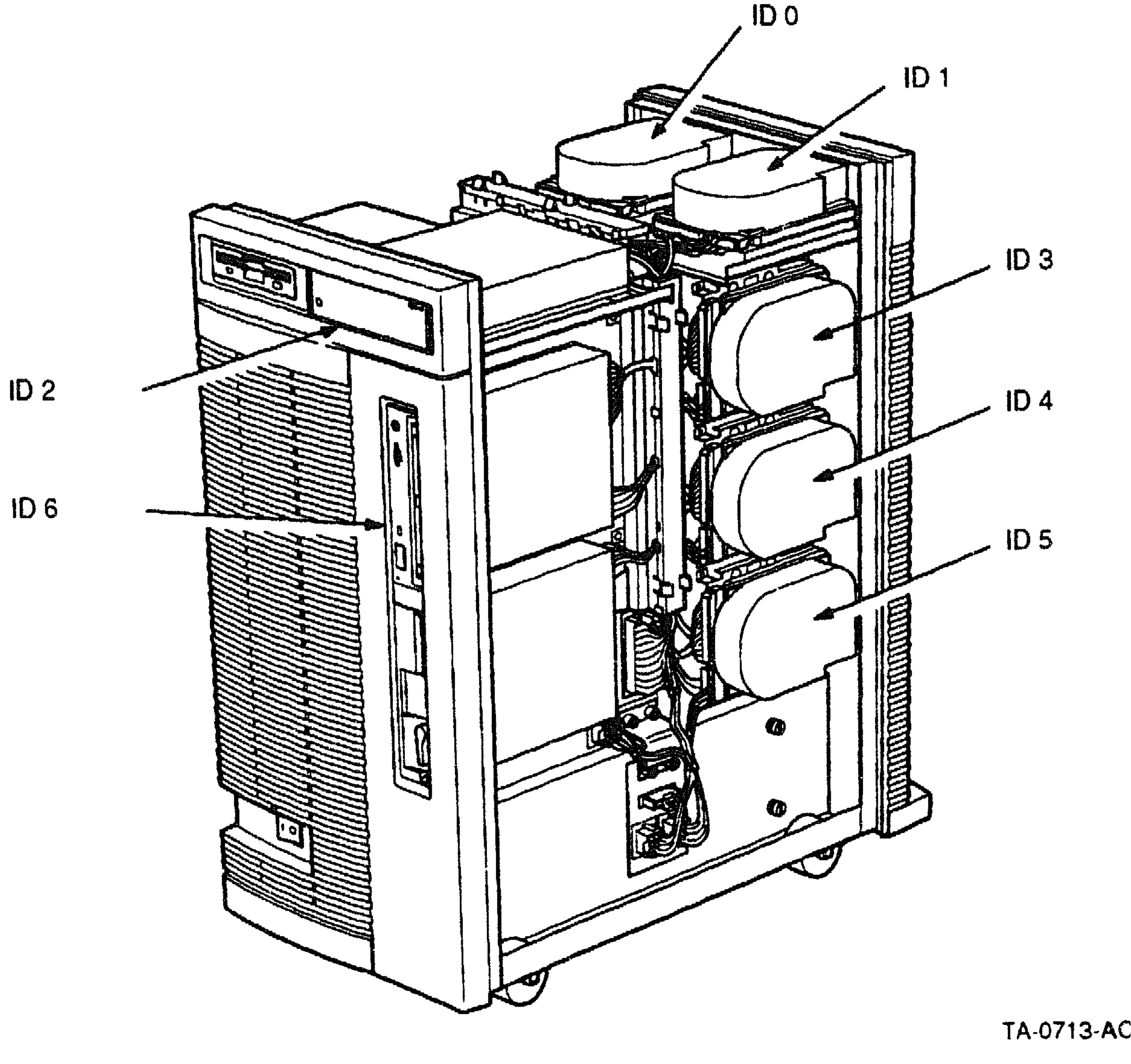


Figure 2–30 Recommended SCSI Addresses



2.12.2 Software Support

Each hard disk drive must be defined as a device. If this is a uniprocessor system, use the **mkdev hd** command. Refer to the *SCO UNIX System Administrator's Guide* for information on how to define each hard disk drive. If this is a multiprocessor system, use the **mkdev corollary** command for all hard disk drives, including drives controlled by the ISA SCSI adapter. Refer to the *SCO MPX Release Notes and Installation Guide* for information on this command.

2.13 320/525 MB QIC Tape Drive

The 320/525 MB quarter-inch cartridge (QIC) tape drive, model number TZK10-E, provides the following features:

- Ability to read and write in formats from 320 MB to 525 MB
- Standard quarter-inch tape cartridge size

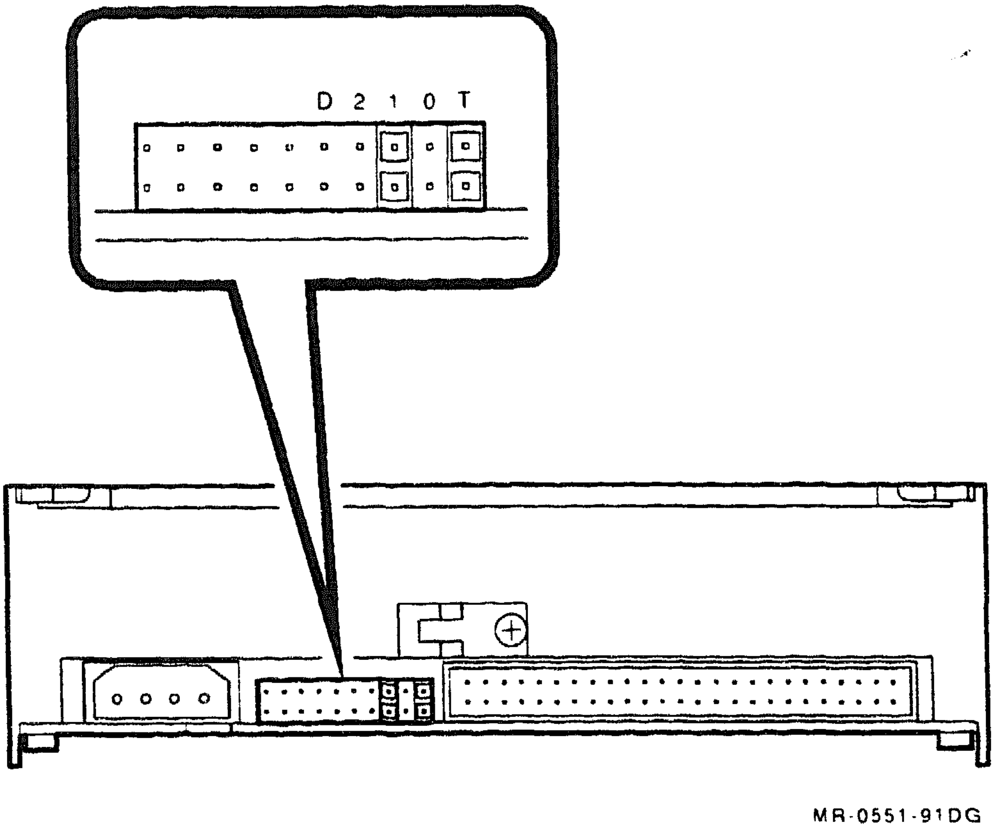
2.13.1 Preinstallation Configuration

Before you install a QIC tape drive in the applicationDEC 433MP system, verify that the SCSI ID address is set to 2 and configuration jumpers D and T are installed as shown in Figure 2–31. Table 2–13 describes the jumpers.

Table 2–13 QIC Tape Configuration

Jumper	Operating Position	Description
D	Out	Automatic density. Enables automatic density when removed.
2	Out	SCSI ID E3. This jumper must be removed.
1	In	SCSI ID E2. Select binary value 2 when installed.
0	Out	SCSI ID E1. This jumper must be removed.
T	In	Terminator power source. Power for the SCSI terminator is provided by the drive when installed.

Figure 2–31 QIC Tape Jumpers



2.13.2 Cleaning and Maintenance

The QIC tape drive heads need to be cleaned after every 8 hours of use to ensure maximum longevity of the heads. This 8-hour figure is a guideline and should be adjusted if the environment is particularly dirty.

The TZK1X-HA tape cleaning cartridge is recommended for cleaning the tape heads.

2.13.3 Retensioning Tapes

Tapes must be retensioned prior to use. To retension a tape, use the SCO UNIX command:

```
$ tape -s reten [Enter]
```

2.13.4 Software Support

If this is a uniprocessor system, use the **mkdev tape** command to configure the QIC tape drive. Refer to the *SCO UNIX Administrator's Guide* for further information on defining the device to the operating system. If this is a multiprocessor system, use the **mkdev corollary** command to configure the QIC tape drive. Refer to the *SCO MPX Release Notes and Installation Guide* for information on this command.

SCO UNIX and SCO Open Desktop come configured with cassette and SCSI tape support. To declare the SCSI tape as the default tape, use the **mkdev tape** command.

There can be different devices defined in your system for the tape drive. For example, the */dev/rct0* device rewinds tapes after use. The */dev/ct0* device accesses the same tape drive, but does not rewind the tape after use.

2.14 CD-ROM Drive

The CD-ROM drive, model number RRD42, provides the ability to read High Sierra and ISO-9660 format diskettes.

Note

At the time this guide was printed, SCO MPX did not provide support for CD-ROM devices. Therefore, Digital Equipment Corporation does not currently support the use of a CD-ROM device for SCO UNIX, SCO Open Desktop, and SCO MPX environments.

2.14.1 Preinstallation Configuration

Before you install a CD-ROM drive in the applicationDEC 433MP system, verify that the SCSI ID is set to 6 and configuration jumper P is removed as shown in Figure 2–32. Table 2–14 describes the jumpers.

Figure 2–32 CD-ROM Jumpers

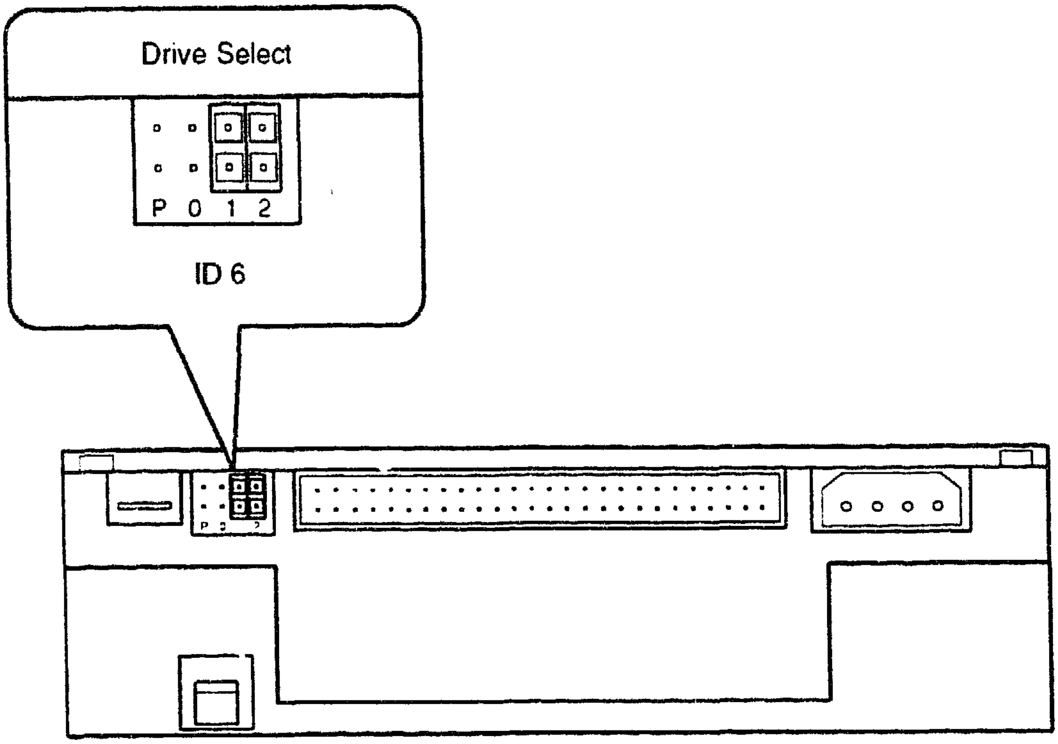


Table 2–14 CD-ROM Configuration

Jumper	Operating Position	Description
P	Out	Microcode select. Microcode for SCO UNIX selected when removed.
0	Out	SCSI ID E1. This jumper must be removed.
1	In	SCSI ID E2. Select binary value 2 when installed.
2	In	SCSI ID E3. Select binary value 4 when installed.

2.14.2 Software Support

The CD-ROM drive is defined to the operating system using the **mkdev cdrom** command. The **mkdev high-sierra** command defines the CD-ROM filesystem. Refer to the *SCO UNIX System Administrator's Guide* for further information on defining the device to the operating system.

2.15 3.5-Inch 1.44 MB Diskette Drive

The RX23 is a 3.5-inch 1.44 MB diskette drive. The controller for this diskette drive is on the bridge module. An internal cable from the backplane connector to the RX23 provides control and data signals for the drive.

The RX23 diskette drive is factory configured as the boot media (drive A) for the applicationDEC 433MP system. To set the 5.25-inch diskette drive as the boot media, you must change a jumper on the bridge module. See Section 2.4.3 for more information.

The RX23 drive has a formatted capacity of 1.44 MB. It has 135 tracks per inch (TPI) and can read and write industry compatible 3.5-inch, high-density diskette media. It is compatible with the field formatted industry-standard, 18-sector format on 700 Oersted type media.

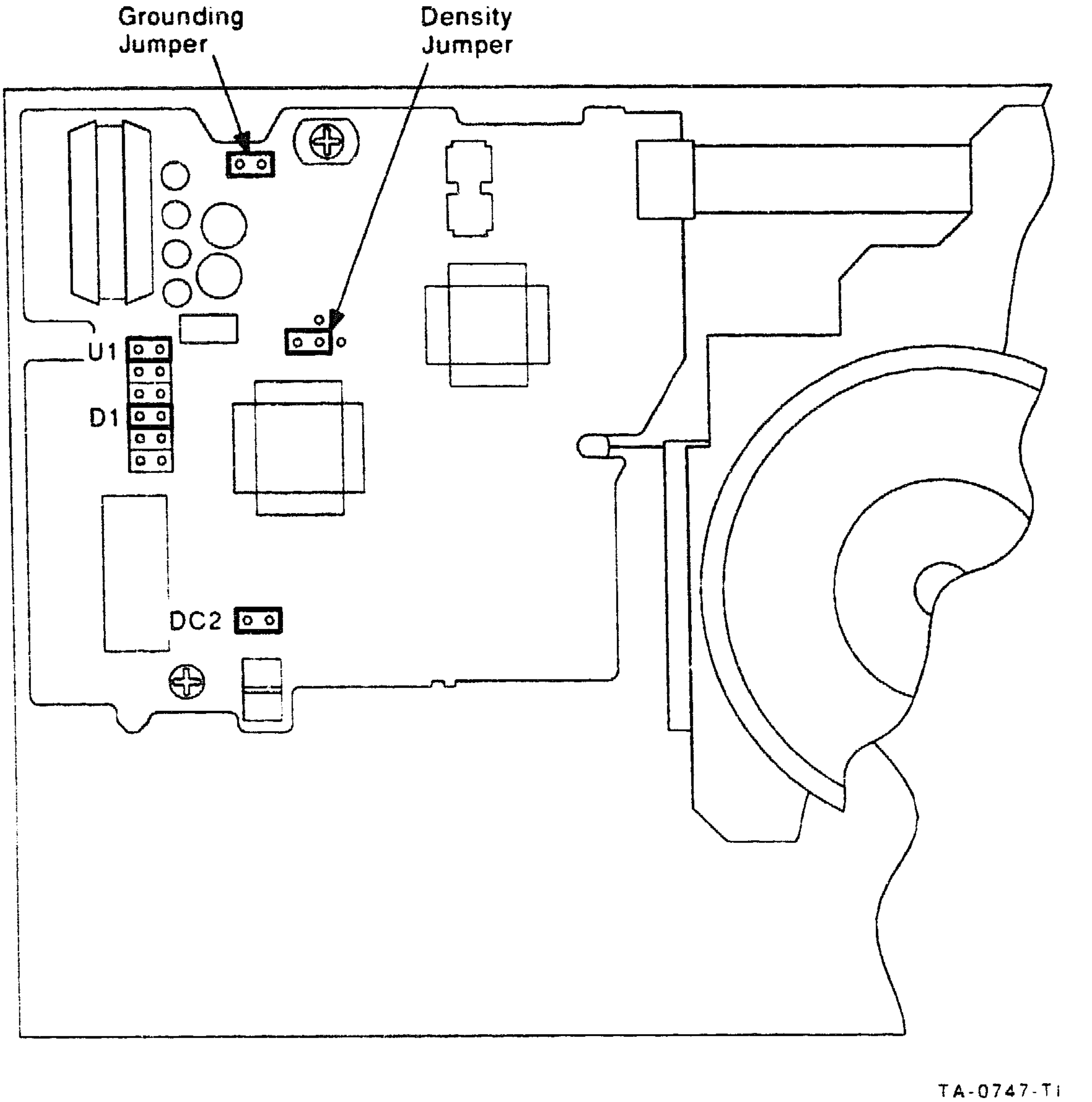
The media for the RX23 diskette drive is a 3.5-inch diskette. This diskette can be either 1 or 2 MB. The existence of a 2 MB detect slot on the diskette determines the byte capacity of the diskette. If no detect slot exists, the byte capacity is 1 MB. If a detect slot exists, the byte capacity is 2 MB. A microswitch on the front of the drive detects whether there is a detect slot.

The RX23 drive is automatically recognized by the operating system. The RX23 drive is factory configured as the boot media for the applicationDEC 433MP system. To specify the optional 5.25-inch 1.2 MB RX33 diskette drive as the boot drive, you must change a jumper setting on the bridge module. See Section 2.4.3.

2.16 5.25-Inch 1.2 MB Diskette Drive

The 5.25-inch 1.2 MB diskette drive, model number RX33, is an optional diskette drive for the applicationDEC 433MP system. The controller for this diskette drive is on the bridge module. Internal cabling from the backplane provides connection to the RX33 diskette drive. Figure 2–33 shows the RX33 diskette drive jumper locations.

Figure 2–33 RX33 Diskette Drive Jumpers



CHAP 3

3 Troubleshooting the System

This chapter describes a procedure for troubleshooting the applicationDEC 433MP system.

3.1 Electrostatic Protection

Observe standard antistatic precautions and guidelines when handling static sensitive materials during the troubleshooting process.

3.2 Preliminary Checks

Before troubleshooting any system problem, refer to the *Site Maintenance Guide* to determine the system's service history. If options have been installed or reconfigured recently, make sure that:

- System modules are in the correct slots
- Modules are seated firmly in the backplane slots
- Cables are connected properly and firmly
- Jumpers and switches are set correctly
- Configuration information displayed by the setup utility matches the physical configuration of the system

3.3 Troubleshooting Procedure

Figure 3–1 shows the recommended troubleshooting procedure for a system.

Figure 3–1 System Troubleshooting Procedure

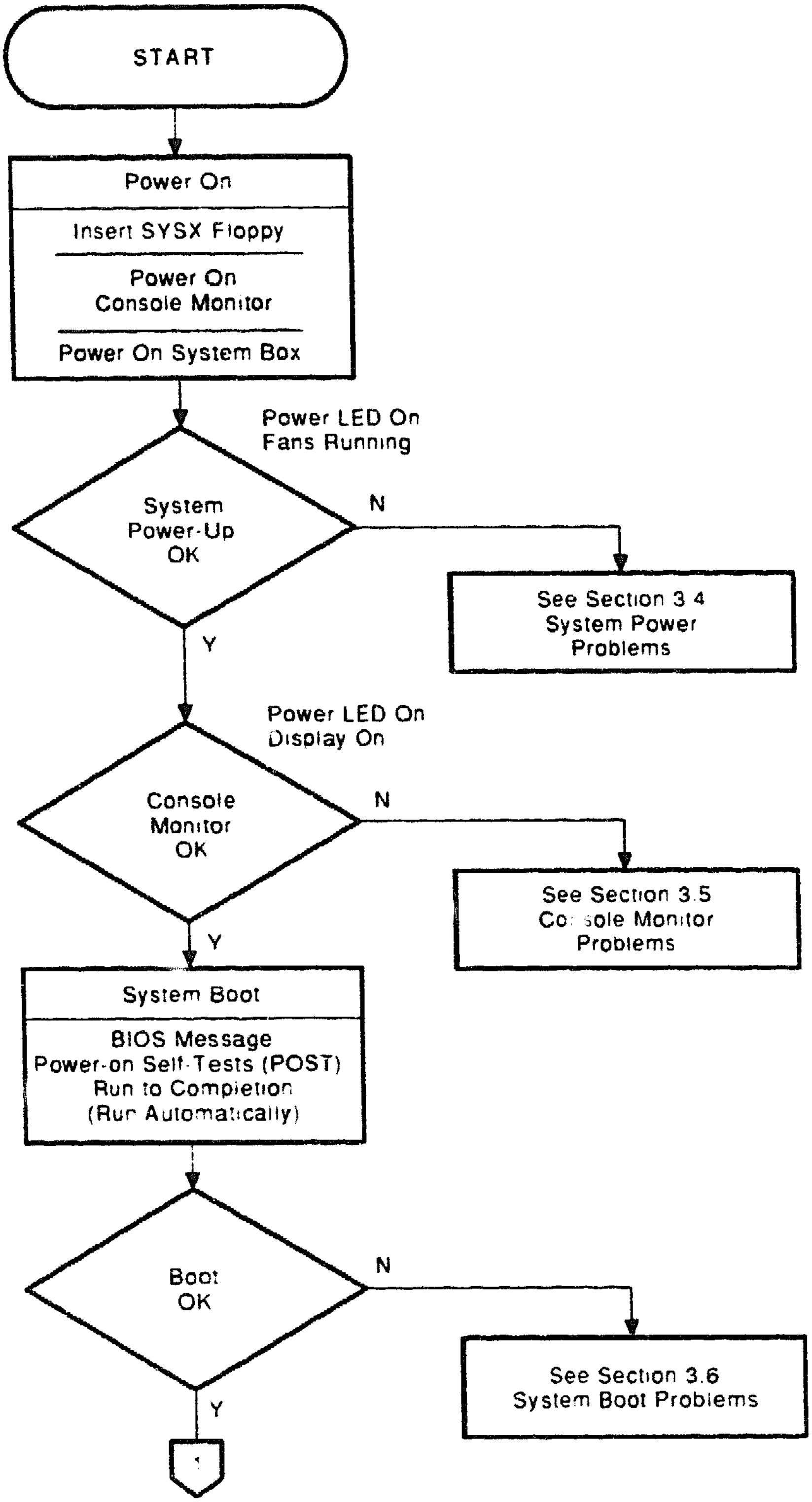


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Figure 3–1 (Cont.) System Troubleshooting Procedure

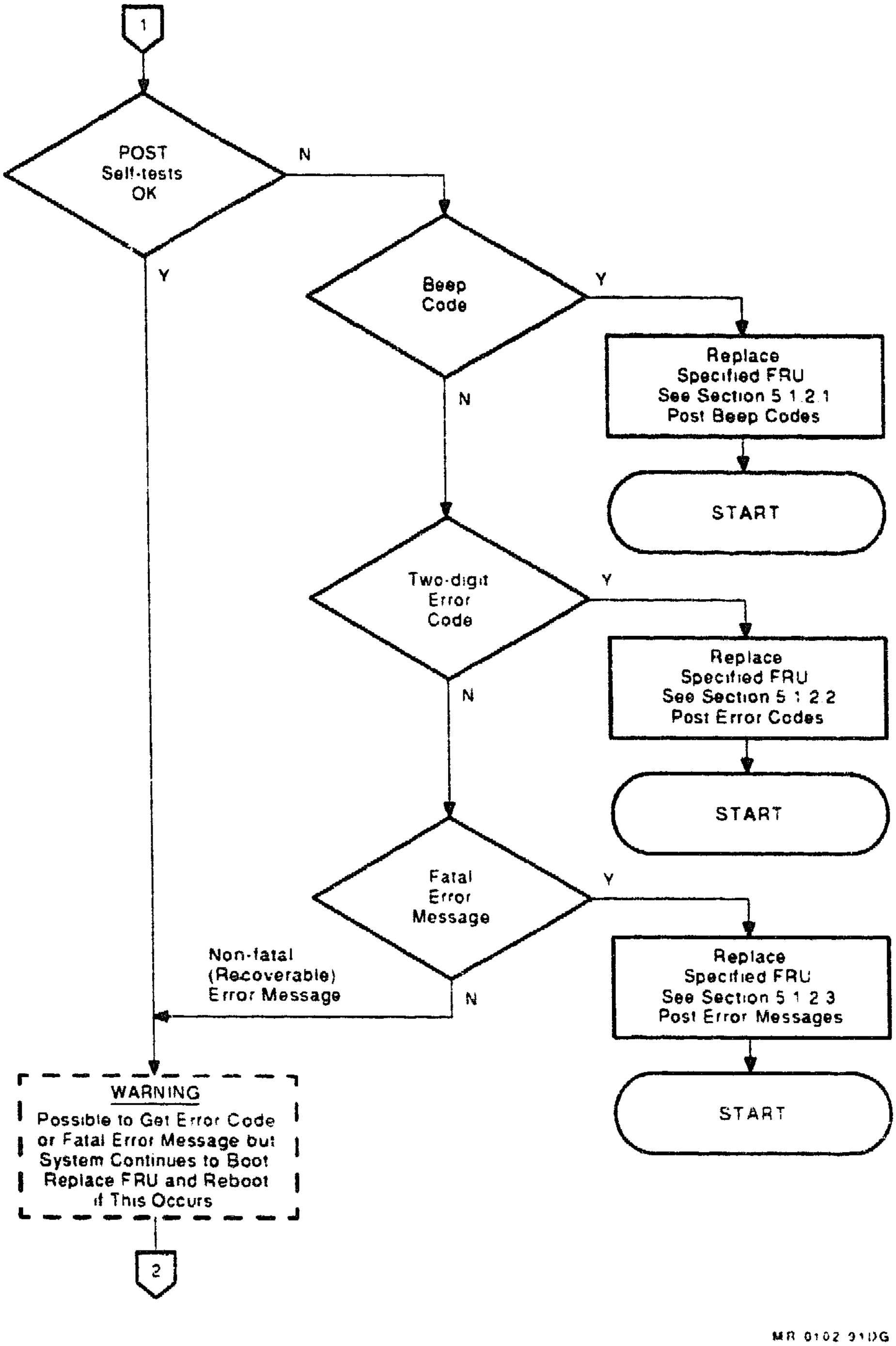

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Figure 3–1 (Cont.) System Troubleshooting Procedure

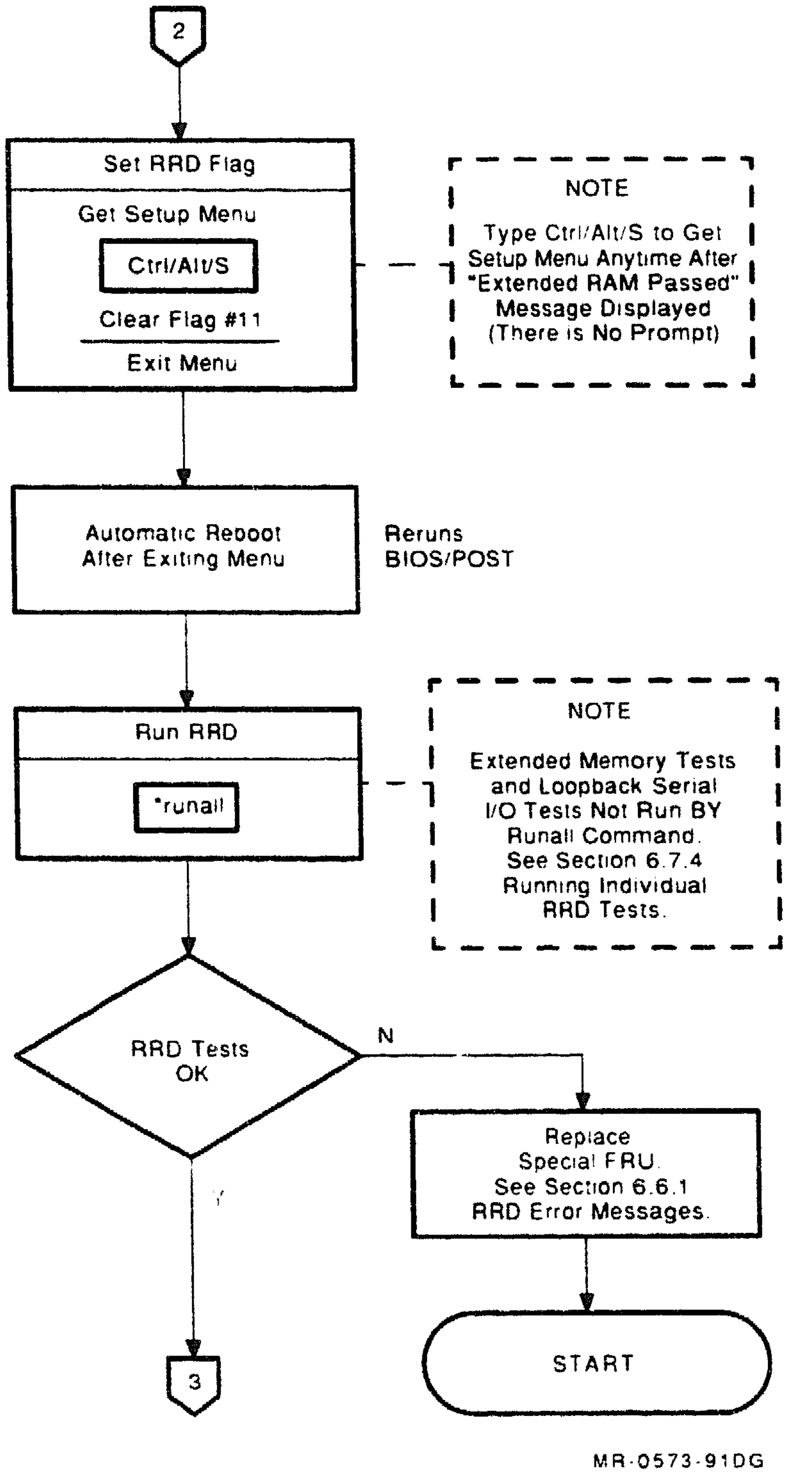

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Figure 3–1 (Cont.) System Troubleshooting Procedure

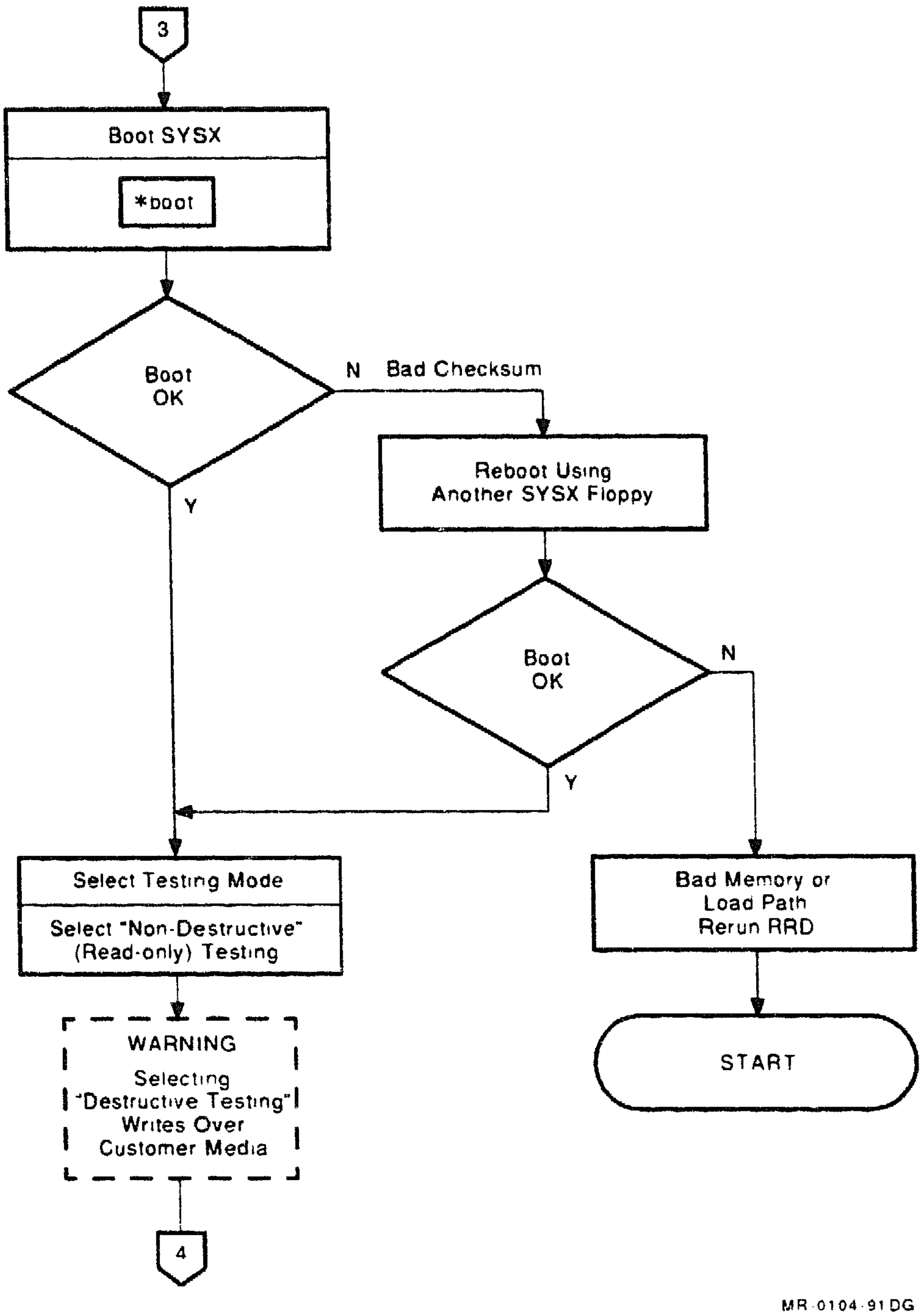

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Figure 3–1 (Cont.) System Troubleshooting Procedure

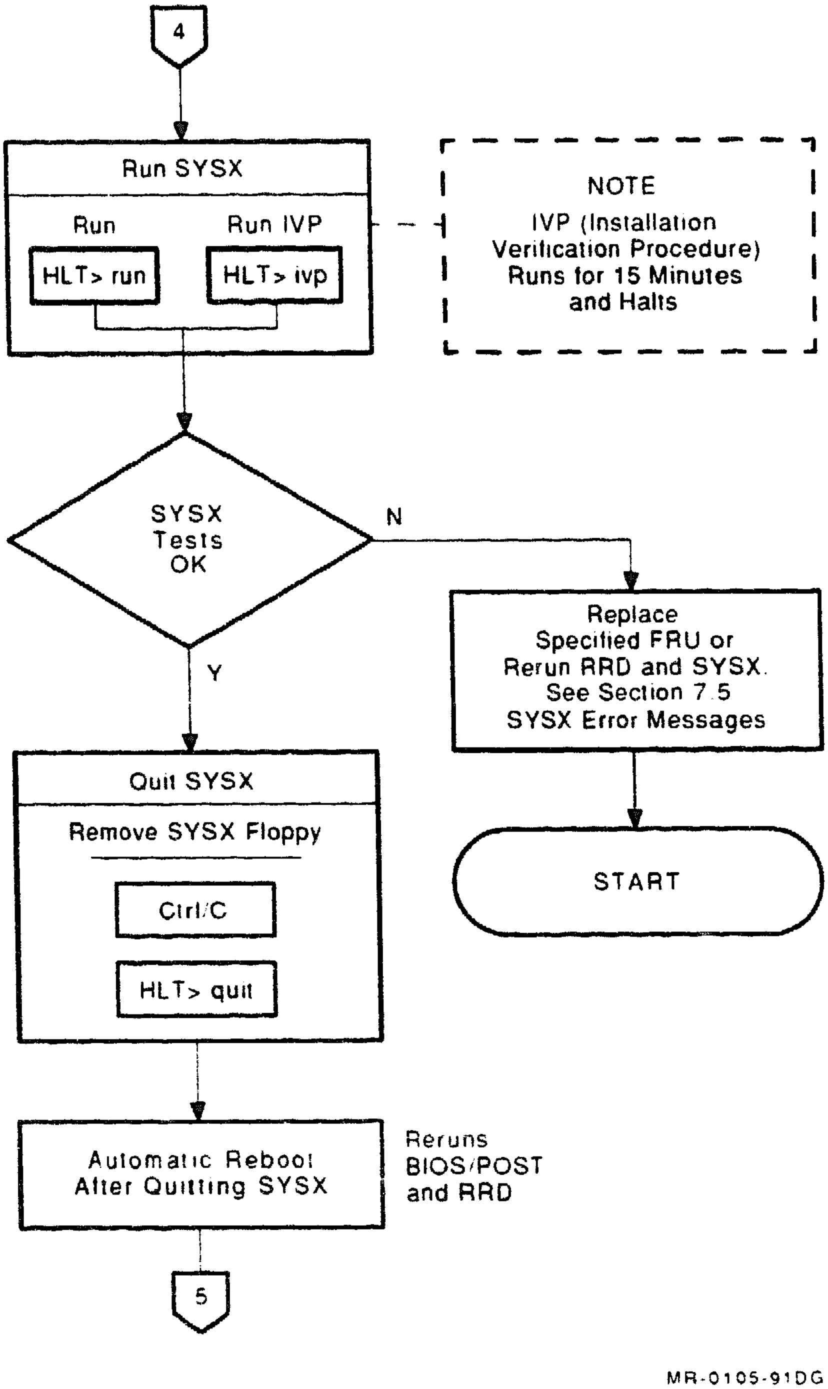

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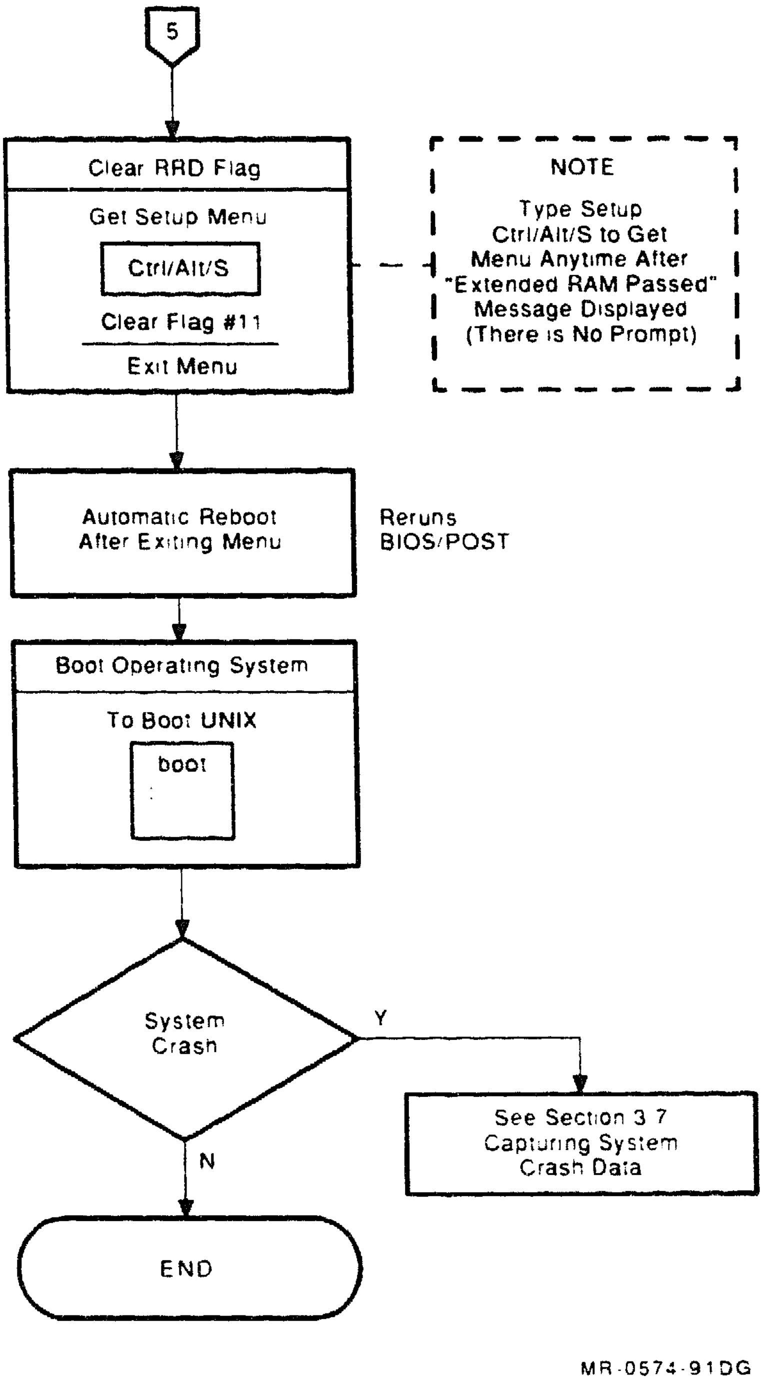
Figure 3–1 (Cont.) System Troubleshooting Procedure



The steps are as follows:

1. Insert the system exerciser (SYSEX) diskette in the drive. Next, power up the console monitor and then the system cabinet. (If the SYSEX diskette is not inserted now, the system will try to boot the operating system rather than SYSEX.) If you experience system power problems, see Section 3.4. If you experience console monitor power or display problems, see Section 3.5.

Note

Incorrect system configuration can crash the system exerciser. See the *applicationDEC 433MP EISA Technical Configuration and Option Installation Guide* (EK-PS110-CG) and Chapter 7 of this guide for system configuration information.

2. Following a successful power-up, SYSEX should boot automatically. The BIOS message should be displayed and the power-on self-test (POST) should run to completion. If there are system boot problems (system hung in an undefined state), see Section 3.6.
3. Check that no fatal errors were found by the POST. Errors are indicated in three ways:

Beep code	Indicates a fatal error was detected before the console terminal/monitor was initialized. Specifies a faulty FRU. See Section 5.3.1.
Two-digit error code	Indicates a fatal error was detected after the console terminal was initialized. Specifies a faulty FRU. See Section 5.3.2.
Error message (textual)	Indicates either a fatal or nonfatal (recoverable) error was detected. If a fatal error, specifies a faulty FRU. See Section 5.3.3.

   Return to step 1 after replacing a FRU.
4. Call the setup menu and enable the ROM Resident Diagnostics (RRD) by setting the RRD flag (#11). The setup menu is called by pressing [Ctrl/Alt/S] during the boot sequence anytime after the "Extended RAM Passed" message is displayed. See Section 6.2 for instructions on using the setup menu.
5. Run RRD by typing **runall** at the asterisk (*) prompt. If these diagnostics detect an error, see Section 6.6 to determine the failing FRU. Return to step 1 after replacing the FRU.
6. Call the setup menu again (see step 4) and disable the RRD by clearing the RRD flag (#11).

7. Boot the system exerciser (SYSEX) by typing **boot** at the asterisk (*) prompt. If a bad checksum message is displayed, reboot using the same diskette or (if that fails) another SYSEX diskette. If SYSEX will not boot after repeated attempts, return to step 1 and rerun RRD. The problem is probably a memory failure (run RRD extended memory tests) or a bad diskette drive or drive cable.

8. After SYSEX is booted, you must select the testing mode. Select nondestructive (read-only) testing for each drive by pressing [Enter] at each prompt.

Caution

Customer media will be overwritten causing data to be lost if destructive (write/read) testing is selected.

9. Run SYSEX by typing the **run** or **ivp** command at the HLT> prompt. The **run** command causes SYSEX tests to run continuously. The **ivp** command performs a 15-minute installation verification procedure. If SYSEX detects an error, see the system exerciser error flags in Section 8.5 to determine the failing FRU. Return to step 1 after replacing the FRU.

Note

If an error report is generated but a failing FRU is not specified, return to step 1 and rerun RRD and SYSEX. A possibility is that the failing FRU is the processor module reporting the error.

10. Boot the operating system.

11. If a system crash occurs, see Section 3.7 for procedures on capturing crash dump data.

3.4 System Power Problems

Figure 3–2 shows the steps to be taken if a system fails to power up properly.

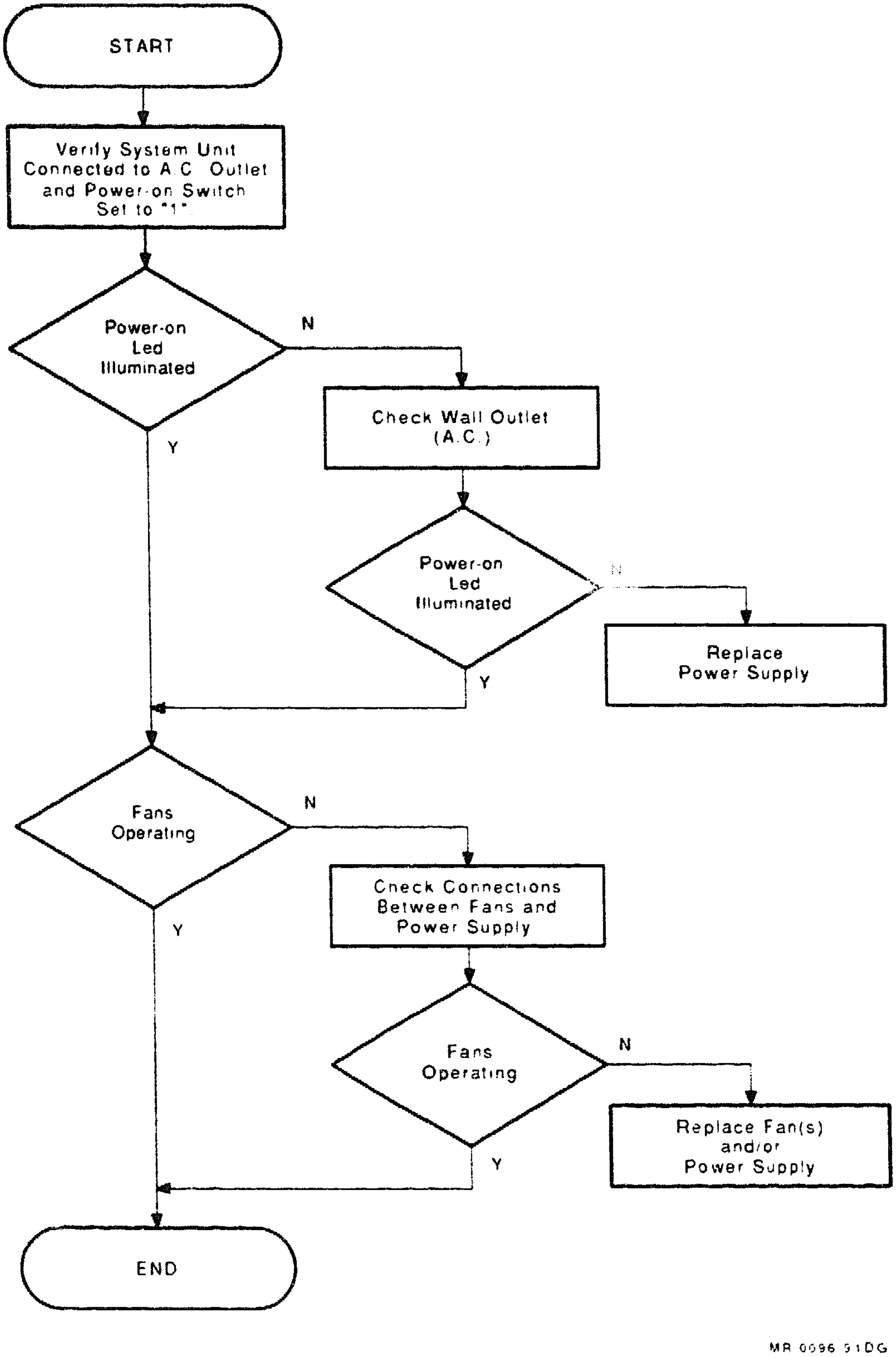
The steps are as follows:

1. Verify that the system cabinet power cord is connected to the wall outlet, and that the power switch is set to 1.
2. If the power LED is not illuminated, check that power is applied to the wall outlet.
3. If power is applied to the wall outlet and the power LED is still not illuminated, remove the system cabinet covers and replace the power supply. See Section 9.25.
4. If the power LED is illuminated and the system fan is not turning, remove the system cabinet covers and check the connections between the fan and the power supply. If connected properly, replace the fan (see Section 9.26). If that does not correct the problem, replace the power supply (see Section 9.25).

Note

If the fan is not turning in the power supply, replace the power supply.

Figure 3–2 Troubleshooting System Power Problems



3.5 Console Monitor Problems

Figure 3–3 shows the steps to troubleshoot console monitor problems.

The steps are as follows:

1. Verify that the console monitor power cord is connected to the wall outlet and that the power switch is set to 1.
2. If the power LED is not illuminated, check that power is applied to the wall outlet.
3. If power is applied to the wall outlet and the power LED is still not illuminated, refer to the service guide for the console monitor. Replace the console monitor if necessary.
4. If the power LED is illuminated and there are display problems, verify that the console monitor brightness and contrast controls are set correctly. Refer to the console monitor service guide.
5. If there are still display problems, check the cable between the console monitor and the VGA connector at the rear of the system cabinet. If connections appear correct, remove and replace the cable. Finally, if the problem remains, replace the VGA module in the system cabinet, or the console monitor itself.

Figure 3–3 Troubleshooting Console Monitor Problems

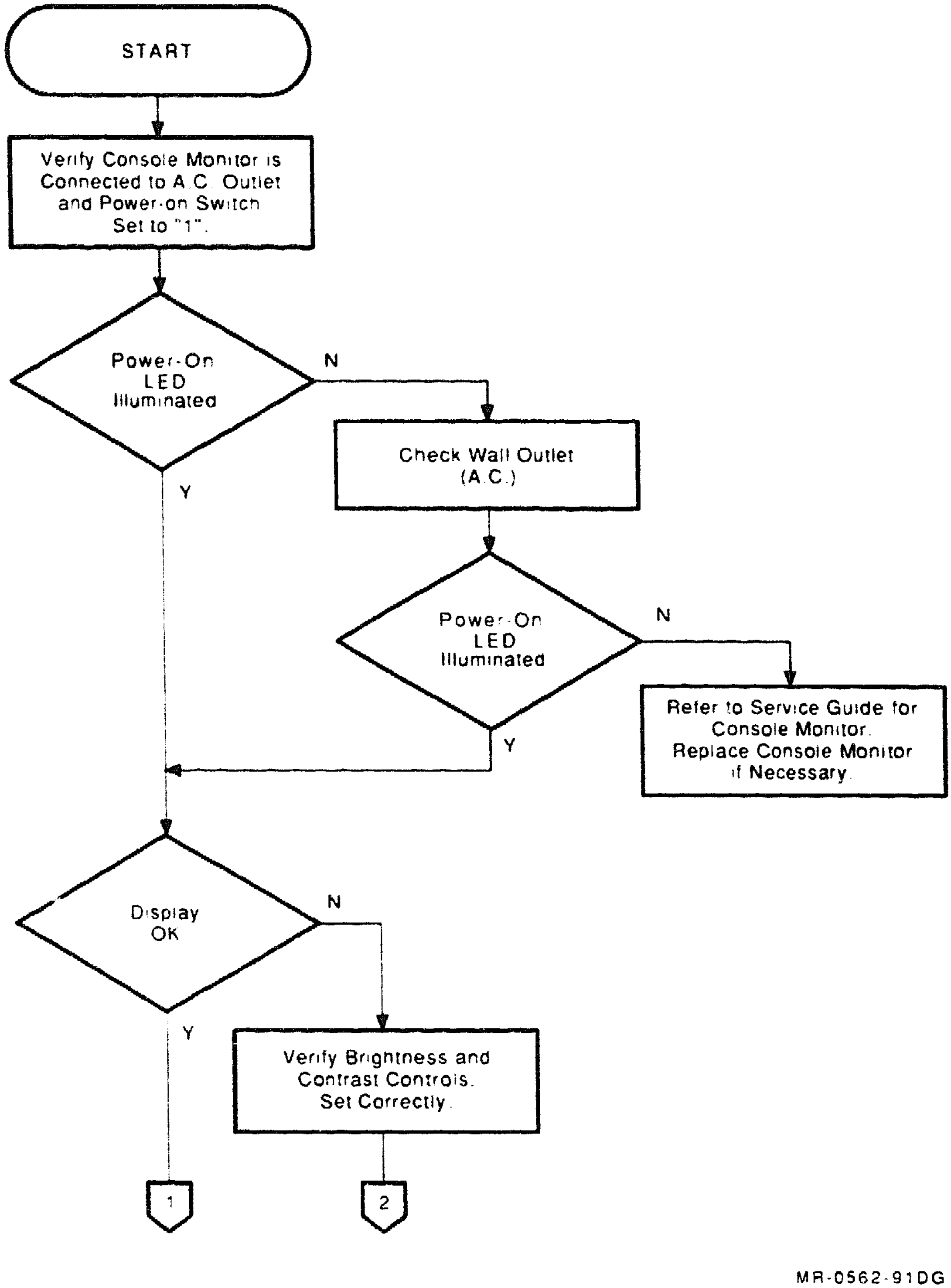


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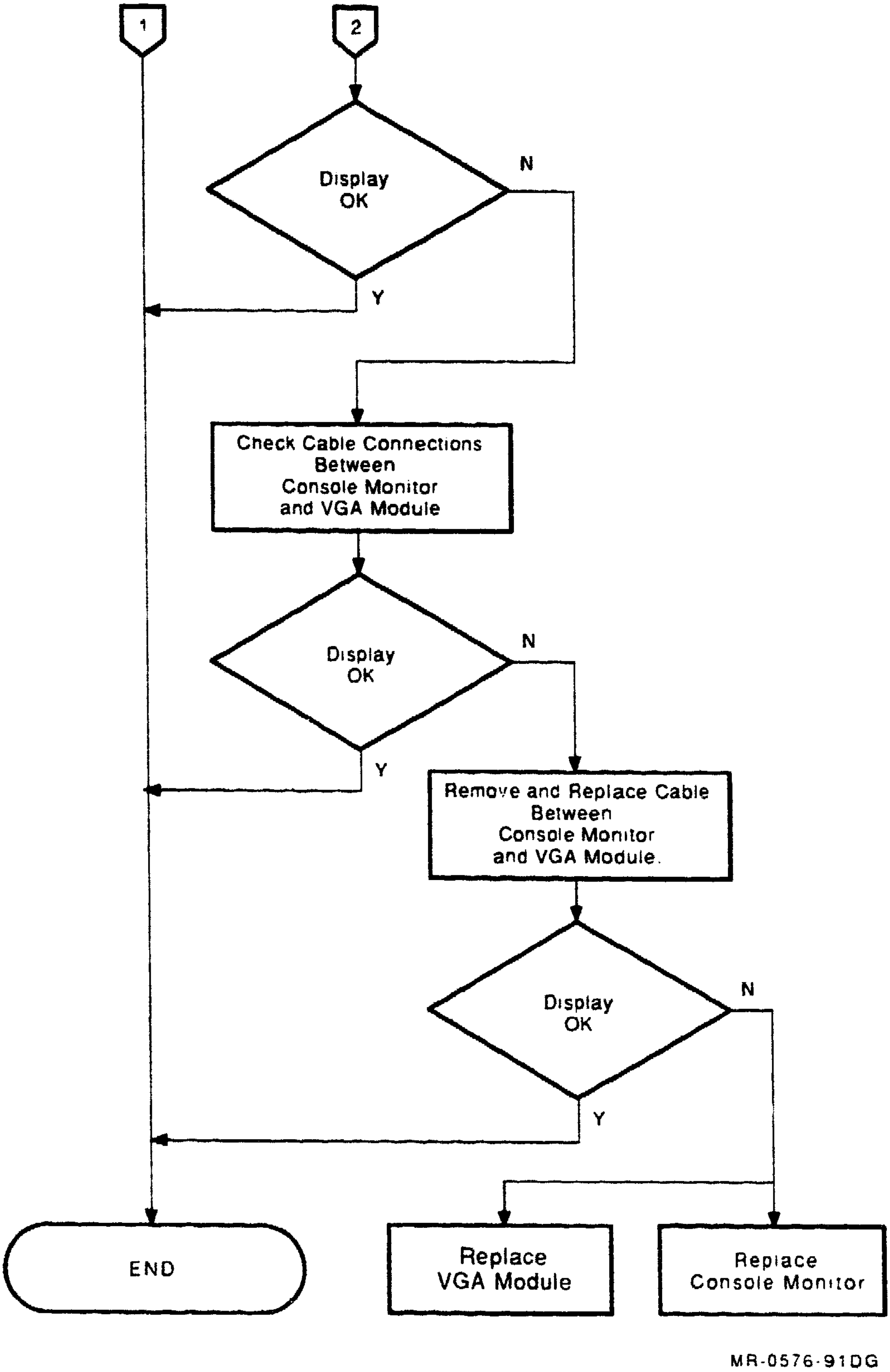
Figure 3–3 (Cont.) Troubleshooting Console Monitor Problems



3.6 System Boot Problems

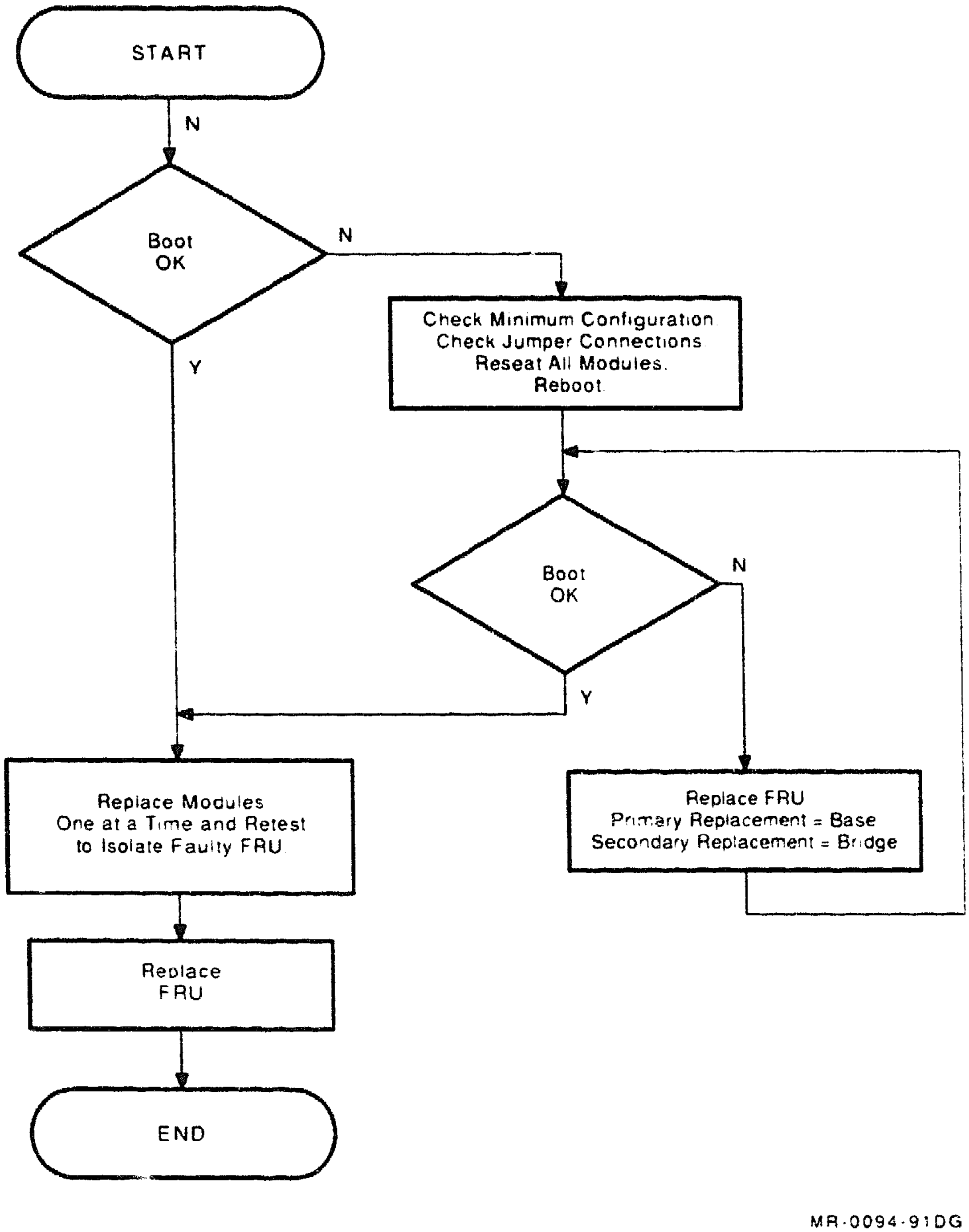
Figure 3–4 shows the steps to take if the system fails to boot immediately after power up. Use these steps if the POST fails to execute or complete and the system is left in an undefined state.

The procedure calls for removing all modules except for a test configuration, ensuring that the test configuration works, and then rebooting, adding a module after each successful reboot. This is continued until a failure occurs, in which case, the last module added is the failing FRU. The steps are as follows:

1. Power down the system and remove the left side panel and the card cage cover.
2. Unplug all modules from the card cage except the following:

   Base processor module
   Bridge module
   ISA SCSI adapter
   Video graphics adapter (VGA)
3. Power up the system. If the system still does not boot, power down and check jumper and cable connections and also module seating. Now, power up again. If the system still does not boot, replace the modules in the test configuration one at a time, checking to see if the system boots after each replacement. The first module replaced should be the base CPU. The second should be the bridge module.
4. When the test configuration boots successfully, add the modules removed in step 2 one at a time, but now check to see if the boot *fails* after the module is inserted. Continue this procedure and replace any FRU causing a failure until all previously removed modules or their replacements are inserted in the backplane and the system boots successfully.

Figure 3–4 Troubleshooting System Boot Problems



3.7 Capturing System Crash Data (SCO UNIX)

When the SCO UNIX operating system crashes, it usually displays a panic message on the system console. The panic message gives some information about the error. After displaying the message, the system writes the system image to the swap device and stops.

To save the crash dump image file, the image must be saved from the swap device to another device before rebooting the system. Refer to the */dev* directory for information on possible device files you can specify. Also review "Recovering from a System Crash" in Chapter 11 of the *SCO UNIX System Administrator's Guide*. Review **messages**(M) for information on the panic message.

3.7.1 Creating a Crash Dump File

After a system crash and during the reboot process, the system displays:

```
There may be a system dump memory image in the swap device.
Do you want to save it? (y/n)_
```

If you enter y, the system responds:

```
Use floppy drive 0 (/dev/rfd0) by default
Press ENTER to use default device.
Enter valid Floppy Drive number to use if different.
Enter "t" to use tape.
```

The following example uses a tape drive device to capture the crash dump image:

```
>t

Enter choice of tape drive :

1 - /dev/rct0
2 - /dev/rctmini
n - no,QUIT

>1

Insert tape cartridge and press Enter, or enter q to quit. >
Wait.
dd if=/dev/swap of=/dev/rct0 bs=120b count=274 skip=0

250+0 records in
250+0 records out

Done. Use /etc/ldsysdump to copy dump from tape or diskettes
Press Enter to continue >
```

When you press Enter, the system reboots.

3.7.2 Copying the Crash Dump to the System

Before you analyze the crash dump image, you must copy the dump file from the dump media to the system after it has rebooted. To copy the crash dump file to the system, enter the following, specifying a file name for <dumpfile name>:

```
#/etc/ldsysdump <dumpfile name>
Use Floppy Drive 0 (/dev/rfd0) by default.
```

The system responds:

```
Press ENTER to use default.
Enter valid Floppy Drive number to use if different than default.
Enter "t" to use tape drive.
```

Continuing the example using a tape drive:

```
>t

Enter choice of tape drive :

1 - /dev/rct0
2 - /dev/rctmini
n - no,QUIT

>1

Insert tape cartridge and press Enter, or enter q to quit. >
Wait.
dd if=/dev/rct0 bs=120b count=274

250+0 records in
250+0 records out

System dump copied into <dumpfile name>. Use crash(ADM) to
analyze dump.
```

3.7.3 Analyzing the Crash Dump

The utility that SCO UNIX provides for crash dump analysis is the **crash**(ADM) utility. The command to invoke the utility is:

```
#/etc/crash -d <filename> -n <namelist> -w <outputfile>
```

where:

<filename> is the dumpfile name specified with the **stdio/etc/ldsysdump** command
<namelist> is either the default (*/unix*) or a namelist you specify
<outputfile> is either *stdio* or a file name

The utility returns an angle (>) prompt. Press [?] to observe the **crash** commands that can be used. Table 3–1 lists three of the most useful commands.

Table 3–1 Crash Commands

Command	Description
panic	Print the latest system notices, warnings, and panic messages
proc	Print the process table
trace	Print the kernel stack trace

3.8 Using a VT420 Terminal with SCO UNIX

To use SCO UNIX, you must alter the VT420 terminal's factory default settings. Instructions for the setup changes are as follows:

1. Press [F3] on the keyboard to invoke the VT420 setup screen.
2. In setup, use the arrow keys to highlight your selection. Press [Enter] to invoke the next menu or to select a feature.
3. Select the Display menu.
4. Use the arrow keys to highlight the "No Auto Wrap" feature. Press [Enter] to change the selection to "Auto Wrap."
5. Change the "Smooth-2 Scroll" selection to "Jump Scroll."
6. Return to the main directory and select the Keyboard menu.
7. Change the "<X]" selection from "Delete" to "Backspace."
8. Change the "<> Key" selection from its default setting to "Sends ‘~."
9. Change the "‘~ Key" selection from its default setting to "Sends ESC." (This makes the key marked "ESC" send an ESC character.)
10. Return to the main setup menu and SAVE the setup features. These setup features will be used every time the terminal is powered on.

All other default terminal setup features can be used in their default settings.

These terminal settings must be used when the terminal is a user terminal connected to a terminal concentrator.

CHAP 4

4 Boot Sequence

4.1 Overview

When power is first applied to the system, the firmware is activated and begins operation. This BIOS firmware prepares the system for operation and then begins the boot sequence.

The boot sequence has four basic steps:

- Power-on self-test (POST)
- ROM resident diagnostics (RRD) prompt (if enabled)
- Boot from diskette (if present)
- Boot from hard disk SCSI ID 0 (if there was no boot from a diskette)

The power-on self-tests provide a brief test of memory and CPU presence. If the power-on self-tests pass, the system proceeds with the RRD prompt, if enabled. If the RRD prompt is not enabled, the system proceeds directly to booting from diskette drive A.

The ROM resident diagnostics prompt is displayed only if the RRD is enabled in the setup menu. Section 6.2 provides information on how to enable RRD. When the RRD diagnostics are enabled, the system pauses at the RRD prompt and waits for your input. You can take one of the following three actions:

- Enter **runall** to run the RRD
- Enter **b** to bypass the RRD and continue the boot procedure
- Wait 10 seconds for the system to autoboot

Section 4.2.1 describes the screen display for the boot sequence when the RRD is enabled. Section 4.2.2 describes the screen display when the RRD is disabled.

The system always attempts to boot from the diskette drive first. The boot diskette drive is drive A. Drive A is factory configured to be the 3.5-inch diskette drive. The optional 5.25-inch diskette drive can be configured to be drive A, the boot drive, if desired. See Section 2.4.3, for details on how to change the boot drive jumpers.

Note

Do not leave nonbootable diskettes in drive A during the boot sequence.

If nonbootable diskettes are in drive A during the boot sequence, the system attempts to boot from the diskette and will hang. A nonbootable diskette is a diskette such as a data file diskette, an application diskette, or a UNIX file system diskette.

If there is no diskette in drive A, the system attempts to boot from the hard disk SCSI ID 0 on the SCSI bus controlled by the ISA SCSI adapter. If the operating system is present on this disk, the system boots the operating system and begins operation.

If there is no operating system present, the system issues a message as shown below.

```
NO OS
```

The operating system should be installed after you see this message.

4.2 Booting the System

To boot the system from a diskette, use the following procedure:

1. Insert the diskette into drive A. The 3.5-inch diskette drive is factory configured as drive A.
2. Power up the system or press the reset switch on the bridge module if the system is already powered up.
3. If the RRD is enabled, the RRD prompt appears. Type **b** at the RRD prompt or wait for the system to autoboot.

   The system begins the boot sequence as described above and then loads and begins execution of the program on the diskette.

If the operating system is installed on the hard disk, boot the system as follows:

1. Power-on the system or press the reset switch on the bridge module if the system is already powered up.
2. If RRD is enabled, the RRD prompt appears. Type **b** at the RRD prompt or wait for the system to autoboot.

   The system loads the operating system from the hard disk and begins execution.

4.2.1 With RRD Enabled

If the POST is successful and the setup menu is set to enable the RRD tests, the following messages are displayed on the console screen:

- Quadtel BIOS identifier message
- applicationDEC 433MP system identifier message
- RRD prompt (*)

4.2.2 With RRD Disabled

If the RRD is disabled, the boot sequence executes only the following tests:

- Power-on self-test (POST)
- First seven RRD tests which initialize system bus memory modules and slave CPUs

If the POST is successful and the setup menu is set to bypass the RRD tests, the following messages are displayed on the console screen:

- Quadtel BIOS identifier message
- VGA identifier
- Memory size
- Vendor identifier messages

CHAP 5

5
Power-On Self-Test (POST)

This chapter describes the power-on self-test (POST).

5.1 Overview

During the boot sequence, the applicationDEC 433MP system calls the system diagnostics beginning with the POST. The POST verifies nonvolatile RAM, DMA controllers, diskette drives, and the real-time clock.

While the POST is executing, the system also calls some of the RRD routines to initialize system bus memory modules and slave CPUs.

5.2 Power-On Self-Test Success

When the POST executes successfully, an "Extended RAM Passed" message is printed.

Note

Even if a fatal error condition occurs and a hardware problem exists, the system might boot and appear to work normally. You should investigate error messages that are displayed before the system prompt appears. These error messages are erased from the screen when the system prompt appears.

5.3 Power-On Self-Test Failure

The POST notifies you of an error in three ways:

- Beep codes are issued if the power-on self-tests encounter a fatal error before the console monitor has been initialized. See Section 5.3.1.
- Two-digit error codes are displayed if the power-on self-tests encounter a fatal error after the console monitor has been initialized. See Section 5.3.2.

- Error messages are displayed if the power-on self-tests encounter a nonfatal recoverable error. The power-up sequence continues if possible. See Section 5.3.3.

Each of these types of error messages are described below.

5.3.1 Beep Codes Generated by the POST

Table 5–1 lists the beep codes generated by the POST and the corrective action you should take.

Table 5–1 POST Beep Codes

Beep Code	Problem	Suggested Corrective Action
1 long beep, 2 short beeps	(1) Monitor not connected (2) Faulty monitor (3) Faulty ROM module that does not properly checksum	(1) Connect monitor. (2) Replace monitor. (3) Replace VGA module.
4 short beeps	Faulty bridge module	(1) Reseat bridge module in backplane. (2) Replace bridge module.
5 short beeps	Memory error	(1) Check that SIMM modules have been installed sequentially. SIMM modules must be inserted sequentially starting with slot J20 and descending to slot J1. There can be no empty slots between SIMMs. (2) Reseat memory module in backplane. (3) Replace memory module.

5.3.2 Two-Digit Error Codes Generated by the POST

Table 5–2 lists each two-digit error code and the corrective action you should take.

Note

Before replacing any module, reseat the module in the backplane and rerun the POST.

Table 5–2 POST Two-Digit Error Codes

Error Code	Test Description	FRU and Corrective Action
02–04	Reserved	
06	System hardware initialization	Replace base processor module Replace bridge module.
08	Initialize chip set registers	Replace base processor module. Replace bridge module.
0A	BIOS ROM checksum	Replace base processor module. Replace bridge module.
0C	DMA page register	Replace bridge module. Replace base processor module.
0E–12	Reserved	
14	8237 DMA initialization	Replace bridge module. Replace base processor module.
16	Initialize 8259/reset coprocessor	Replace base processor module. Replace bridge module.
18–28	Reserved	
2A	Autosize memory chips	Replace base processor module.
2C–30	Reserved	
32	System board memory size	Replace base processor module. Replace bridge module.
34	Relocate shadow RAM if configured	Replace base processor module. Replace bridge module.
36	Configure E.M.S. system	Replace base processor module. Replace bridge module.
38	Reserved	
3A	Retest 64K base RAM	Replace base processor module.
3C	CPU speed calculation	Replace base processor module.
3E–40	Reserved	
42	Initialize interrupt vectors	Replace base processor module.
44	Verify video configuration	Replace VGA module. Replace base processor module.
46	Reserved	

(continued on next page)

Table 5–2 (Cont.) POST Two-Digit Error Codes

Error Code	Test Description	FRU and Corrective Action
48	Test unexpected interrupts	Replace base processor module. Replace bridge module.
4A–54	Reserved	
56	Unexpected exception	Replace base processor module. Replace bridge module.
58–5A	Reserved	
5C	Determine AT or XT keyboard	Replace base processor module.
5E	Reserved	
60	Base memory test	Check that all SIMMs are installed with no empty slots between them. Replace memory module.
62	Base memory address test	Check that all SIMMs are installed with no empty slots between them. Replace memory module.
64–68	Reserved	
6A	Determine memory size	Replace base processor module. Replace bridge module.
6C	Reserved	
6E	Copy BIOS to shadow memory	Replace base processor module. Replace bridge module.
70–74	Reserved	
76	Initialize hardware interrupt vectors	Replace base processor module. Replace bridge module.
78	Reserved	
7A	Determine COM ports available	Replace bridge module. Replace base processor module.
7C	Determine LPTR ports available	Replace bridge module.
7E	Initialize BIOS data area	Replace base processor module.
80	Determine diskette/fixed controller	Replace bridge module. Replace ISA SCSI module.
82–84	Reserved	

(continued on next page)

Table 5–2 (Cont.) POST Two-Digit Error Codes

Error Code	Test Description	FRU and Corrective Action
86	External ROM scan	Replace bridge module. Replace base processor module.
88–B0	Reserved	

5.3.3 Error Messages Generated by the POST

Table 5–3 lists POST error messages and the corrective action you should take.

Table 5–3 POST Error Messages

Error Message	Problem	Suggested Corrective Action
Bad boot record - Press any key	Displayed when BIOS attempts to load the boot record from a diskette and finds it incompatible for booting.	Insert a good replacement diskette in drive and reattempt the booting procedure.
Color graphics adapter error	A color adapter is present but fails its POST.	Replace VGA module.
Diskette drive A error	POST diskette (drive A or B) test failure.	(1) Run the setup program[1] and verify that drive A is configured. (2) Replace drive A diskette.
Extended RAM failed at offset	Error in the extended memory area. The K address that failed is displayed. (Offset in 64K block where error occurred.)	(1) Replace SIMM if applicable. (2) Replace base processor module. (3) Replace bridge module.
Extended RAM passed	Displayed while the extended memory test is running. Amount of RAM tested will be displayed before this message.	This is the status message.

[1]See Section 6.2 for information on how to invoke the setup program.

(continued on next page)

Table 5–3 (Cont.) POST Error Messages

Error Message	Problem	Suggested Corrective Action
Failing bits	Memory test failure. This message may be displayed while performing the system, extended, or shadow-related memory tests. A hex number is displayed, which is a map of the bits that have failed the test. A 1 bit of the number displayed is a failing bit.	(1) Replace SIMM if applicable. (2) Replace memory module. (3) Replace base processor module. (4) Replace bridge module.
Fixed disk 0 failure	POST hard disk 0 or 1 test failure.	(1) Check that the SCSI cable is attached to the 209 MB hard disk drive at SCSI ID 0. (2) Replace the 209 MB hard disk drive.
Fixed disk controller failure	POST hard disk controller test failure.	Replace ISA SCSI module.
Incorrect drive A type - Run SETUP or ECU	The diskette drive type detected by the BIOS does not match the type defined in setup or the ECU and stored in CMOS.	Run setup program[1] or ECU and alter drive A type.
Keyboard controller error	POST keyboard controller test failure.	Replace bridge module.
Keyboard error	POST keyboard stuck. Key test failure. Before error message is displayed the "stuck" key code will be displayed.	(1) If this message appears while you are entering the key sequence to invoke the setup program, ignore the message. (2) Make sure the keyboard is securely connected. (3) Replace keyboard.
Monitor type does not match CMOS - Run ECU	Monitor adapter type does not match the type defined by the ECU and stored in CMOS.	Run ECU and confirm or alter monitor type.

[1]See Section 6.2 for information on how to invoke the setup program.

(continued on next page)

Table 5–3 (Cont.) POST Error Messages

Error Message	Problem	Suggested Corrective Action
Monochrome adapter error	A monochrome adapter is present but fails its POST.	Replace VGA module.
Previous boot incomplete	POST was terminated by a reset or a power-down before it had completed.	Run ECU and confirm or alter configuration, then reboot.
Real-time clock error	(1) Battery failed. (2) Bridge module failed.	Replace bridge module.
Shadow RAM failed at offset	Error in the shadow memory area. The K address that failed is displayed. (Offset in 64K block where error occurred.)	(1) Replace SIMM if applicable. (2) Replace memory module. (3) Replace base processor module. (4) Replace bridge module.
Shadow RAM passed	Displayed while the shadow memory test is running. Amount of RAM tested will be displayed before this message.	
System battery died, replace it, run SETUP & ECU	Battery is dead.	(1) Replace bridge module, then run ECU and reset time and date.
System CMOS checksum bad - Run SETUP & ECU	CMOS has been modified improperly by a software program or CMOS is corrupted.	(1) Run ECU and confirm or alter configuration, then reboot. (2) Replace base processor module.
System RAM failed at offset	Error in the RAM of system memory. The K address that failed is displayed. (Offset in 64K block where error occurred.)	(1) Replace SIMM if applicable. (2) Replace memory module. (3) Replace base processor module. (4) Replace bridge module.
System RAM passed	Displayed while the system memory test is running. Amount of RAM tested is displayed before this message.	

(continued on next page)

Table 5–3 (Cont.) POST Error Messages

Error Message	Problem	Suggested Corrective Action
System timer error	POST system timer test failure.	Replace base processor module.

CHAP 6

6
ROM Resident Diagnostics

6.1 Overview

The ROM resident diagnostics (RRD) are firmware diagnostics that can be run whether the system has an operating system installed or not. The RRD must be enabled prior to use. When enabled, the boot sequence is interrupted and an RRD prompt (*) appears. At the RRD prompt, you can execute the diagnostics with a **runall** command, or bypass the RRD and proceed with the boot sequence by typing the **boot** command. If you do neither, the RRD times out in 10 seconds and the boot sequence continues.

6.2 Enabling RRD with Setup

The RRD diagnostics must be enabled in the setup menu in order to be invoked during the boot sequence.

To get to the setup menu, press Ctrl/Alt/S during the boot sequence anytime after the "Extended RAM Passed" message is displayed. If the "Keyboard Error" message appears when you enter the key sequence, you can ignore it.

Note

Do not press Ctrl/Alt/S while the ECU is running. Setup cannot be accessed while the ECU is running.

An applicationDEC 433MP system with one diskette drive and 8 MB of memory will display the following information on the setup screen:

```
BIOS Setup Version 3.05
Copyright 1990 Quadtel Corporation.  All rights reserved.
 1> Diskette Drive A.............: 3.50-inch (1.44 MB)
 2> Diskette Drive B.............: Not Installed
 3> RRD Menu Status..............: Off
 4> Boot Device..................: EISA Bus
 5> Save Current Options
Select option to change [0 to Exit]:
```

Select item 3 from the setup menu, and then type 1 to enable the RRD diagnostics. The RRD is then invoked during the boot sequence.

Note

If the RRD was enabled before system service, be sure to disable the RRD when service is complete.

6.3 Loopback Connectors

Tests 49 and 50 are run only if a loopback connector is installed on the CPU/SIO ports. Use the terminal concentrator communications cable for a loopback. Disconnect the cable from the terminal concentrator and attach it to a CPU/SIO port. Ports A and C should be connected together and ports B and D should be connected together.

The loopback flag must be set to run tests 49 and 50.

If no loopback is installed, tests 49 and 50 are skipped.

6.4 Executing the runall Command

When the RRD diagnostics are enabled, the RRD prompt always appears during the boot sequence. At the RRD prompt, you can enter the **runall** command to execute most of the RRD tests sequentially. (Loopback and some memory tests are excluded. See Section 6.7.1.)

To run the ROM resident diagnostics, type the **runall** command at the RRD (*) prompt and press [Enter], as follows:

```
* runall [Enter]
```

As each test executes successfully, the number and name of the test is displayed on the console monitor.

The entire RRD diagnostic can take from 10 to 30 minutes, depending upon the configuration of your system.

Note

If you do not type a command at the RRD prompt, the RRD diagnostics time out and the system continues with the boot sequence.

6.5 Exiting RRD

If the RRD tests execute successfully, you can exit RRD by typing **b** at the RRD prompt. The system resumes the boot sequence.

6.6 Interpreting RRD Errors

The RRD diagnostics do not stop when errors are encountered, unless the abort on flag is set. If an error message is overwritten, you can review the error messages when the prompt appears with the **summary** command.

```
* summary [Enter]
```

The **summary** command lists the tests which failed and the number of failed tests. You should rerun the failed tests for complete information on the failed FRU.

You can rerun the individual test that failed by typing the test number, or set the abort on flag and rerun **runall**, as follows:

```
* abort on [Enter]
* runall [Enter]
```

When the abort on flag is set, the RRD stops when it encounters an error.

6.6.1 RRD Error Messages

When an error message occurs, look up the corrective action in Table 6–1. The RRD error message identifies the test number and slot number of the module.

Before replacing the module or device, check that the modules are:

- Located in the correct backplane slot
- Firmly seated in the slot
- Firmly connected to any cables

Table 6-1 RRD Error Messages

Error Message	Corrective Action
addr *memory address*, was *n*, exp *expected-pattern* memory module *n*, SIMM *n*	Replace SIMMs. Replace memory module.
addr *memory address*, was *n*, exp *memory address* memory module *n*, SIMM *n*	Replace SIMMs. Replace memory module.
addr *memory address*, was *n*, exp 0 memory module *n*, SIMM *n*	Replace slave CPU module. Replace SIMMs. Replace memory module.
addr *memory address*, was *n*, exp *expected-value* memory module *n*, SIMM *n*	Replace slave CPU module. Replace SIMMs. Replace memory module.
address range overlaps diagnostic ram	User error; reenter.
address range overlaps undefined system bus region	User error; reenter.
address range must be between *logical_addr1* (physical_addr1) and *logical_addr2* (physical_addr2)	User error; reenter.
base exp 0x66, was *n*	Replace slave CPU module. Replace base processor module.
base, already unlocked	Replace slave CPU module. Replace base processor module.
1 bit error not corrected, exp *expected-value*, got *n*, addr *memory address* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
1 bit error address bad, exp *expected-address*, got *actual-address* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.

(continued on next page)

Table 6–1 (Cont.) RRD Error Messages

Error Message	Corrective Action
2 bit error address bad, exp *expected-address*, got *actual-address* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
2 bit error syndrome bad, got *syndrome-number* (bits *bit-number-1* and *bit-number-2*) memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
1 bit then 1 bit error address bad, exp *expected-value* got *n* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
1 bit then 1 bit syndrome bad, exp *expected-syndrome-number* got *actual-syndrome-number* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
1 bit then 2 bit error address bad, exp *expected-address*, got *actual-address* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
1 bit then 2 bit syndrome bad, got *syndrome-number* (bits 2 and 3) memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
2 bit then 2 bit error address bad, exp *expected-address*, got *actual-address* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
2 bit then 2 bit error syndrome bad, got *syndrome-number* (bits 4 and 5) memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
2 bit then 1 bit error address bad, exp *expected-address*, got *actual-address* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
2 bit then 1 bit syndrome bad, exp *expected-syndrome-number*, got *actual-syndrome-number* memory module *n*, SIMM *n*	ECC logic is not functioning. Before you replace SIMMs, move them to a new memory module.
ch *channel-number* reg *register-number* was *n*, expected *expected-value*	Check loopback wires. Replace slave CPU module.

(continued on next page)

Table 6-1 (Cont.) RRD Error Messages

Error Message	Corrective Action
cpu arbitration failed to complete	Remove all slave CPU modules and reinsert one module at a time; repeat the test after you add each module. Replace slave CPU module. Replace base processor module.
cpu did not start	Replace slave CPU module. Replace base processor module.
cpu not running	Replace slave CPU module. Replace base processor module.
cpu *slot n* invalid cpu type *type-number*	Replace slave CPU module. Replace base processor module.
cpu *slot n* shutdown during cflush	Replace bridge module. Replace base processor module. Replace slave CPU module.
cpu *slot n* cflush failure seg *segment-number*	Replace bridge module. Replace base processor module. Replace slave CPU module.
cpu *slot n* did not finish cflush	Replace bridge module. Replace base processor module. Replace slave CPU module.
code bad verify at *memory address*, exp *code-value*, was *actual value*	Replace bridge module. Replace base processor module.
count too large	User error; reenter.
data, was *actual-sync-data*, expected *expected-sync-data*	Replace slave CPU module.
data, was *actual-sdlc-data*, expected *expected-sdlc-data*	Check loopback wires. Replace slave CPU module.
data at *memory-address* changed from 0x99 to *n*	User error; reenter.
EISA memory fails at memory address	Replace bridge module. Replace base processor module.
finit did not complete	Replace slave CPU module. Replace base processor module.
fld did not complete	Replace slave CPU module. Replace base processor module.

(continued on next page)

Table 6–1 (Cont.) RRD Error Messages

Error Message	Corrective Action
fmul did not complete	Replace slave CPU module. Replace base processor module.
fstp did not complete	Replace slave CPU module. Replace base processor module.
fstsw did not complete	Replace slave CPU module. Replace base processor module.
fwait did not complete	Replace slave CPU module. Replace base processor module.
interrupt to base used vector *vector-number*	RRD software failure. Contact a Digital Equipment Corporation representative.
interrupt to cpu *slot n* used vector *n*	Replace slave CPU module. Replace base processor module.
invalid address range	User error; reenter.
Keymodule Error: Input Buffer Full bit stuck at 1	Make sure VGA keymodule is connected. Replace VGA adapter. Replace bridge module.
Keymodule Error: No ack received from keymodule	Make sure VGA keymodule is connected. Replace VGA adapter. Replace bridge module.
LED not clear	Replace bridge module. Replace base processor module. Replace slave CPU module if test number is 34 or 35.
LED not set	Replace bridge module. Replace base processor module. Replace slave CPU module if test number is 34 or 35.
lmsw did not complete	Replace slave CPU module. Replace base processor module.
lock timeout	Replace slave CPU module. Replace base processor module.
no co-processor installed, status *status_value*	Replace slave CPU module. Replace base processor module.
no previous command	User error; reenter.

(continued on next page)

Table 6–1 (Cont.) RRD Error Messages

Error Message	Corrective Action
n out of 10 interrupts succeeded interrupts from base to base not working	Replace bridge module. Replace base processor module.
n out of 10 interrupts succeeded interrupts from cpu *slot n* to base not working	Replace slave CPU module. Replace bridge module.
n out of 10 interrupts succeeded interrupts from base to cpu *slot n* not working	Replace slave CPU module. Replace base processor module.
out of poke entries	RRD software failure. Contact a Digital Equipment Corporation representative.
product *product-number* was *value*, exp *same-value*	Replace slave CPU module. Replace base processor module.
result not stored	Replace slave CPU module. Replace base processor module.
result not returned	Replace slave CPU module. Replace base processor module.
SCC *scc_identifier* reg *register-number* timeout, was *actual-register-value*, expected *expected-register-value*	Replace slave CPU module.
SCC *scc_identifier* reg *register-number*, was *actual-register-value*, expected *expected-register-value*	Replace slave CPU module.
SCC *scc_identifier* reg 12 was *actual-register-value*, expected *expected-register-value*	Replace slave CPU module.
SCC *scc_identifier* reg 13 was *actual-register-value*, expected *expected-register-value*	Replace slave CPU module.
Shadow diff lo hi, *lo-value*, *hi-value*	Replace bridge module. Replace base processor module.
slave command done timeout *dbg=debug-flag*	User error; reenter. Replace slave CPU module.
slave cpu *slot-number* does not exist	User error; reenter.
slave cpu *slot-number* already running	User error; reenter.

(continued on next page)

Table 6–1 (Cont.) RRD Error Messages

Error Message	Corrective Action
slave did not start	User error; reenter.
slave died	Replace slave CPU module. Replace base processor module.
slave error, count was *actual value*, exp *n*	Replace slave CPU module. Replace base processor module.
slave linear address *memory address*, *number-of* pages	Replace base processor module. Run memory tests and replace correct memory module.
slave *slot n* died	Replace slave CPU module. Replace base processor module.
slave *slot n*, error at *memory address*, exp *expected-value* memory module *n*, SIMM *n*	Replace slave CPU module. Replace SIMMs. Replace memory modules.
slave *slot n*, addr *memory address*, exp *expected-value*, was *actual value* + *error-number* others memory module *n*, SIMM *n*	Replace slave CPU module. Replace SIMMs. Replace memory modules.
slave *slot n*, addr *memory address*, was *actual value*, exp *expected-pattern* or *1's-complement-expected-pattern* memory module *n*, SIMM *n*	Replace slave CPU module. Replace SIMMs. Replace memory modules.
slave reports bad command *dbg=debug-flag*	Replace slave CPU module. Replace base processor module.
starting address too small	User error; reenter.
TC timeout, DMA channel *channel-number*	Check loopback wires. Replace slave CPU module.
unknown condition, *trace-value*	Replace slave CPU module. Replace base processor module.

6.7 Executing Individual RRD Tests

Enter a test number at the prompt to execute individual tests. For example, if you want to determine the type and location of all secondary processors in the system, execute Test 5 at the prompt as follows:

```
* 5 [Enter]
```

Run tests in numerical order to ensure that preliminary tests have been run.

When you run RRD tests individually, you may wish to set additional flags for greater control of the tests. Sections 6.7.1, 6.7.2, and 6.7.3 contain descriptions of individual RRD tests, flags, and commands.

6.7.1 Test Descriptions

The RRD verifies the functionality of the system hardware through a series of tests that proceed from the simplest to the most complex function.

Note

It is important to run the tests in order because higher-level tests assume system functionality that has been tested at a lower level. After you have used the **runall** command, which executes all the standard RRD tests in order, you can execute any individual RRD test.

The RRD tests initialize system bus memory modules and slave CPUs, check memory, bus cycles and multiprocessor capability. The tests isolate a system problem to a single module.

The **runall** command runs all of the RRD diagnostic tests with the exception of the following:

- Tests 11–16 — Memory tests that require almost 1 hour to execute
- Tests 49–50 — CPU/SIO serial I/O tests that require loopback connectors

Section 6.7 provides information about how to run individual RRD tests. If you want to run one test continuously, see Section 6.9. If you want to run several tests continuously, see Section 6.10.

Table 6–2 lists the RRD tests. The test name that displays on the screen is shown in parentheses after the test description.

Appendix A contains a full description of each test.

Table 6–2 RRD Tests

Number	Description
Test 1	Reset System Bus CPUs and Flush Bridge Cache (reset)
Test 2[1]	Reset System Bus CPU (creset)
Test 3[1]	Poll System Bus Slots (carb)
Test 4	Flush all System Bus CPUs (cflush)
Test 5[1]	Determine CPU Type (ctype)
Test 6	Bridge Cache Integrity (bflush)
Test 7	Size Memory (msize)
Test 8	Check Bits with Memory Fill Ones (mones)
Test 9	Check Bits with Memory Fill Zeros (mzeroes)
Test 10	Check Addresses (maddr)
Test 11	Check Bits with Memory Walking Ones (mwones)
Test 12	Check Bits with Memory Walking Zeros (mwzeros)
Test 13	Memory Inversions (minv)
Test 14	Memory Inversions with Flush (minvf)
Test 15	Memory Address Inversions (madrinv)
Test 16	Memory Address Inversions with Flush (madrinvf)
Test 17	Memory Error Correcting Code (ECC) (memory ECC)
Test 18	Reset DMA Controller and Initialize the 8237 Registers (bdma reset)
Test 19	Verify Access to DMA Controller (bdma reg I/O)
Test 20[1]	Base to Base Interrupt (bintb)
Test 21	CPU to Base Interrupt (cintb)
Test 22[1]	Base to CPU Interrupt (bintc)
Test 23[1]	Verify Bridge Map RAM Register (bram)
Test 24[1]	Base CPU Blinks Bridge LED (bLEDb)
Test 25[1]	Slave CPU Blinks Bridge LED (bLEDc)
Test 26	Base CPU Blinks LED on Default CPU (cLEDc)
Test 27[1]	Start and Reset the Default CPU (cnop)
Test 28	Read/Write by Default CPU (cr/w once)
Test 29[1]	Read/Write in a Loop by Default CPU (cr/w)
Test 30[1]	Check Multiplication (cfloat)
Test 31[1]	Check Locking Mechanism (exch)
Test 32[1]	Check Slave CPUs and Blink Base LED (cminv cLED)
Test 33	Check Slave CPUs and Blink Bridge LED (cminv bLED)
Test 34[1]	Check Slave CPUs and Run Data Inversion (cminv bminv)
Test 35[1]	Check Slave CPUs and Operation of All CPUs (cminv bck)
Test 36[1]	Check Slave CPUs and Run Address Inversions (cmadrinv bck)
Test 37[1]	Verify Memory (cminv mI/O)
Test 38[1]	Check Slave CPUs and Run Address Inversions (mult cpu mchk)

[1]Test can be used with the RRD **scopeloop** command. See Section 6.9.

(continued on next page)

Table 6-2 (Cont.) RRD Tests

Number	Description
Test 39[1]	Run Memory Inversions on Slave Processor with Flush (mult cpu mchkf)
Test 40[1]	Reset SIO DMA Controller Using Zero Fill (dzero)
Test 41[1]	Reset SIO DMA Controller Using Ones Fill (dones)
Test 42	Reset the SIO DMA Controller/Initialize the 8237 Registers (dr)
Test 43[1]	Check the SIO DMA Controller (dsrI/O)
Test 44[1]	Check the SIO DMA Controller with Rotating Pattern (drI/O)
Test 45[1]	Check SCC Controller on SIO Module (srI/O)
Test 46[1]	Check SCC Controller on the SIO Module (SDasync)
Test 47[1]	Test Channel A of the SCC Controller (Sasyncloop)
Test 48[1]	Test the 8530 Using 8237 Controller (SDasyncloop)
Test 49[1]	Test Channels A and C of the SCC Controller (A–C)
Test 50[1]	Test Channels B and D of the SCC Controller (B–D)
Test 51[1]	Check FIFO and Configuration Registers in SCSI I/O Controller (SCSI I/O reg)
Test 52[1]	Check the 486 SCSI Module DMA Transmit Buffer (SCSI tr buf)
Test 53[1]	Check the 486 SCSI Module DMA Receive Buffer (SCSI rcv buf)
Test 54[1]	Verify Entries in the DMA Page Map (SCSI dma map)
Test 55[1]	Check Page Index Counter (SCSI pg ndx cntr)
Test 56[1]	Check DMA Control Logic — Main Memory to FIFO (SCSI tr dma)
Test 57[1]	Check DMA Control Logic — FIFO to Main Memory (SCSI rcv dma)
Test 58[1]	Check DMA Control Logic — Misaligned Byte Boundary (SCSI rcv odd)
Test 59	Verify Shadow RAM Functionality (eisa shadow mem)
Test 60	Verify EISA Mapping Functionality (eisa system mem)

[1]Test can be used with the RRD **scopeloop** command. See Section 6.9.

6.7.2 Flag Descriptions

You can use flags to control the RRD diagnostics. For example, you can choose whether to stop testing if an error is encountered and whether to display or suppress error messages.

Each flag command takes ON or OFF as an argument.

To change the status of a flag, enter the flag name and the desired setting at the RRD prompt. For example, to set the abort flag to ON (stop testing on error), enter the following:

```
* abort on [Enter]
```

To set the abort flag to OFF (continue testing on error), enter the following:

```
* abort off [Enter]
```

Table 6–3 describes each flag.

Table 6–3 RRD Flags

Flag	Default	Description
Abort	OFF	Abort test when the first error is encountered. The Abort flag is automatically set to OFF when an abort occurs. If the Abort flag is OFF, the RRD tests continue to execute and test status messages scroll across the screen monitor.
Flags		Display the state of all flags.
Loopback on/off	OFF	Run the two tests that check channels A and C, B and D. If the Loopback flag is OFF, the system displays a warning that these tests cannot be run.
Quiet	OFF	Display only error messages; suppress informative messages about each test status.
Scopeloop	OFF	Execute the specified test in loop mode. (Not all tests are run with scopeloop flag on. See Table 6–2.) A test run with the Scopeloop flag set executes faster because it repeats without reexecuting initialization code. A test that runs with the Scopeloop flag set can only be stopped by an error abort or Ctrl/C. The Scopeloop flag is automatically disabled when the test aborts.
Silent	OFF	Suppress all messages, including error messages. (Use the **summary** command to review errors that occurred while the Silent flag was set.)
Verbose	OFF	Display error messages and informative messages about each test status as the test executes.

6.7.3 Command Descriptions

The RRD commands can be categorized as follows:

- Screen commands
- Test commands
- Command loops
- Peek and poke commands
- Commands to display memory within specified range
- Commands to search memory
- Commands to test memory
- CPU commands

- Error correcting code (ECC)
- Commands for Symbol Control

The peek and poke commands can be used on both EISA and system bus memory. The memory test commands can be used only on system bus memory.

Table 6–4 describes all RRD commands.

Table 6–4 RRD Commands

Command	Description
	Screen Commands
?	List all interactive commands.
!!	Repeat last command.
Ctrl/C	Abort test.
Ctrl/S	Halt screen output.
Ctrl/Q	Resume screen output.
	Test Commands
runall	Run selected numbered tests. The **runall** command runs most of the numbered tests. It omits some tests, including time-consuming memory tests (11–16). The RRD help screen indicates, with an asterisk, tests that are not executed by the **runall** command.
summary	Display the number of errors in the most recently executed list of tests. The **summary** command allows you to run one test or loop of tests for long periods of time without losing error messages that scroll off the screen.
1–99	Run all numbered tests.
t	List all tests.
n	Run the specified test. (If more than one test is specified, the tests run in ascending numerical order.)
n n n	Run the specified list of tests.
n–n	Run the specified range of tests.

(continued on next page)

Table 6–4 (Cont.) RRD Commands

Command	Description
	Command Loops
cloop	Begin a command loop definition. During a loop definition, the RRD prompts you for test numbers with a + prompt instead of the usual * prompt. You can enter up to twenty test numbers or commands. Press Enter with no command to terminate the loop definition. Type **L** to execute the command loop definition.
L	Execute a command loop definition. Enter an uppercase **L** to run this command.
lloop	List the current command loop definition.
	Peek and Poke (For EISA and System Bus Memory)
cib *address*	Input byte from system bus to a user-specified address.
cob *address user-specified data*	Output user-specified data byte to a user-specified system bus I/O address.
ib *address*	Input byte from a user-specified EISA I/O address.
iw *address*	Input word from a user-specified EISA I/O address.
ob *address user-specified data*	Output a user-specified byte to a user-specified EISA I/O address.
ow *address user-specified data*	Output a user-specified word to a user-specified EISA I/O address.
rb *address*	Read a byte from a user-specified address.
rw *address*	Read a word from a user-specified address.

(continued on next page)

Table 6–4 (Cont.) RRD Commands

Command	Description
Peek and Poke (For EISA and System Bus Memory)	
rl *address*	Read a longword from a user-specified address.
wb *address user-specified data*	Write a user-specified byte to a user-specified address.
ww *address user-specified data*	Write a user-specified word to a user-specified address.
wl *address user-specified data*	Write a user-specified longword to a user-specified address.
xb *address user-specified data*	Exchange a user-specified byte with the byte at a user-specified address.
xw *address user-specified data*	Exchange a user-specified word with the word at a user-specified address.
Display Memory Within Specified Range	
db *addr1* [*addr2*]	Display hexadecimal addresses, in bytes, in the range specified.[1]
dw *addr1* [*addr2*]	Display hexadecimal addresses, in words, in the range specified.[1]
dl *addr1* [*addr2*]	Display hexadecimal addresses, in longwords, in the range specified.[1]
Search Memory	
sb *addr1 addr2d1* [*d2 d3 d4*]	Search specified address range for up to four byte patterns.[1]
sw *addr1 addr2d1* [*d2 d3 d4*]	Search specified address range for up to four word patterns.[1]
sl *addr1 addr2d1* [*d2 d3 d4*]	Search specified address range for up to four longword patterns.[1]

[1]The address range for any numbered test or series of tests is set, with *addr1* as the starting address and *addr2* as the ending address. If *addr2* is less than *addr1*, *addr2* becomes the number of bytes. The *addr2* default is 0x1ffff.

(continued on next page)

Table 6–4 (Cont.) RRD Commands

Command	Description
	Test Memory (For System Bus Memory Only)
afill *addr1 addr2*	Fill each longword with its own address in the user-specified address range. Make a second pass to verify the data.[1]
fb *addr1 addr2* [*pattern*]	Fill specified address range with byte pattern.[1,2]
fw *addr1 addr2* [*pattern*]	Fill specified address range with word pattern.[1,2]
fl *addr1 addr2* [*pattern*]	Fill specified address range with longword pattern.[1,2]
invb *addr1 addr2 pattern*	Perform byte inversions on specified address using specified pattern.[1,3]
invw *addr1 addr2 pattern*	Perform word inversions on specified address using specified pattern.[1,3]
invl *addr1 addr2 pattern*	Perform longword inversions on specified address using specified pattern.[1,3]
	CPU Commands
cpu	List CPUs. If you enter the *cpu* command without a slot number, a list of all CPUs and their status is displayed.
cpu *slot number*	Select default CPU.
cache *slot number* off	For the specified CPU, turn cache off.[4]
cache *slot number* on	For the specified CPU, turn cache on.[4]
slave	Start or resume slave CPU execution.
sinv *addr1 addr2 pattern*	Start inversion tests on slave CPU.[3]
shalt	Abort the slave execution and reset the slave CPU.

[1]The address range for any numbered test or series of tests is set, with *addr1* as the starting address and *addr2* as the ending address. If *addr2* is less than *addr1*, *addr2* becomes the number of bytes. The *addr2* default is 0x1ffff.

[2]The fill includes two passes: the first to fill, the second to verify. If a pattern is not specified, the default is 0.

[3]The inversions algorithm includes six passes.

[4]If no processor is specified, the default CPU is turned on/off. If no parameters are specified, the status of the default CPU is returned.

(continued on next page)

Table 6–4 (Cont.) RRD Commands

Command	Description
	CPU Commands
base	Switch to base without halting slave. Restore control to the base CPU, while leaving the slave executive running. If the *slave* command is issued later, the RRD knows that the executive is still running and can quickly switch back into slave mode.
	Error Correcting Code (ECC)
ecc *user-specified data*	Compute the ECC check byte value for the specified longword.
ecc	Print the ECC bit table.
map	Display map of system bus memory.
eccoff	Disable ECC checking. ECC is on by default; it is reenabled if Test 7, the memory sizing test, is run.
	Symbol Control
list	List symbols and values.
set *symbol value*	Assign longword value to symbol.
	Miscellaneous
b[oot]	Boot the operating system.
map	Display map of system bus memory.
setup	See Section 6.2 for information about how to access the setup menu.
mfg	Reserved for Digital.

6.8 Executing Tests on CPU/SIO and CPU/SCSI Modules

When you execute the **runall** command, the RRD automatically tests the base processor and every slave CPU module (processing capability of CPU/SCSI and CPU/SIO modules). However, if you run individual RRD tests, only the slave CPU that has been designated as the default CPU is tested.

Note

A slave CPU is a CPU/SCSI or CPU/SIO. Slave CPUs are identified by slot number. The default CPU is either the CPU in the highest numbered system bus slot (closest to the base processor), or the CPU you have designated as the default with the **cpu** command.

Before you run individual tests on a specific SIO or SCSI module, you might have to use the **cpu** command to designate the module as the default CPU.

By default, the RRD selects the secondary processor in the highest numbered slot as the default CPU. The slot numbers on the backplane increase from top to bottom. Therefore, if there is an SIO module in slot 3 (the third slot from the top) and a SCSI module in slot 5 (the fifth slot from the top), the SCSI module in slot 5 is designated as the default CPU.

To select a CPU as the default CPU, use the **cpu** command and the slot number of the module you want to test. For example, if you want to test the module in slot 5:

```
* cpu 5 [Enter]
```

If you attempt to run a SCSI test on an SIO module, or if you attempt to run an SIO test on a SCSI module, the system returns the following error message:

```
warning, test n requires a SCSI or SIO
CPU -- test not run
```

6.9 Executing One Test Continuously

The Scopeloop flag allows you to run a test in loop mode. A test runs faster in loop mode because it repeats without reexecuting initialization code. Section 6.7.1 provides a list of RRD tests you can use with the Scopeloop flag.

If you want to run one numbered test continuously, set the Scopeloop flag to ON at the RRD prompt as follows:

```
* scopeloop on [Enter]
```

Enter the number of the RRD test you want to run at the RRD prompt. Press [Ctrl/C] if you want to interrupt testing.

6.10 Executing Several Tests Continuously

The **cloop** command accepts up to 20 entries. (Each entry might include a series of tests.) To execute tests with **cloop**, use the following procedure:

1. Enter the **cloop** command at the RRD prompt. (The system displays a plus sign (+) prompt.)
2. At the + prompt, enter the number of one test or a range of tests.
3. Press [Enter]. (The system again displays a + prompt.)
4. Continue entering test numbers and pressing [Enter] at the prompt until you have entered the numbers of all tests you want to run.
5. Press [Enter] at the + prompt.
6. Enter **L** to execute the loop. (**L** must be entered as an uppercase character.)
7. Press [Ctrl/C] to stop execution of the loop.

You can use the **summary** command to gain information about tests that failed during the execution of the loop.

For example, if you use **cloop** with the **summary** command to run tests 10 through 12, test 19, and test 27, the system prompts you as follows:

```
* cloop [Enter]
+
+ 10-12 [Enter]
+
+ 19 [Enter]
+
+ 27 [Enter]
+ summary [Enter]
+
+ L [Enter]
```

The error report, produced by the **summary** command, is overwritten when you enter a new series of commands.

You can also use **cloop** with the **runall** command as follows:

```
* cloop [Enter]
+
+ runall [Enter]
+
+ summary [Enter]
+
+ L [Enter]
```

CHAP 7

7 EISA Configuration Utility

This chapter describes the diskette-based EISA configuration utility (ECU) software you use to configure your applicationDEC 433MP system.

7.1 Description

The EISA architecture includes a means of configuring a system by software. EISA option modules also have no jumpers or switches and their addresses and interrupt selections are all made with software.

The EISA configuration utility (ECU) is used to configure the system. The ECU performs many of the same functions that a firmware-based setup utility does in ISA systems. However, the ECU provides additional functionality beyond traditional setup utilities.

When the ECU executes, it is able to automatically detect your system module configuration (CPUs and memory) and any EISA modules that are installed. System modules are detected by reading data created by the RRD firmware diagnostics which execute on power-up. EISA modules are detected by polling modules on the EISA bus. ISA modules are detected by use of ISA CFG files; you define the ISA modules installed in your system.

The ECU then creates a system configuration file which represents the configuration of your system. The ECU saves system configuration files in two ways:

- By writing system configuration data to nonvolatile RAM on your base processor module
- By writing a system configuration file to your system configuration diskette

The NVRAM data is accessed by the system firmware. The NVRAM data must be accurate. Therefore the ECU must be run whenever your system configuration changes.

The system configuration file is also written to your ECU diskette as a backup. The file is included on your system as an SCI file.

Note

The ECU diskette must be write-enabled to write a system configuration file to your diskette. No error message is produced if the ECU is able to write to NVRAM but not to your diskette. You must ensure that the ECU diskette is write-enabled.

7.2 Diskettes Provided

Two diskettes are provided for use with the applicationDEC 433MP system. The ECU and system configuration diskette, labeled "appDEC 433MP ECU SYS CFG," contains both the ECU program and the system configuration files. When the ECU prompts you for the "System Configuration Diskette," this is the diskette that is needed. Also provided is a library diskette, labeled "Library Diskette," which contains vendor-supplied ISA CFG files for many ISA modules.

7.3 When to Use the ECU

You must run the ECU whenever any of the following occurs:

- When the system is first installed.
- When you add a system module such as memory or a CPU
- When you add or remove an ISA or EISA option module
- When you change a jumper or switch setting on an ISA option module
- When you need to set the date or time
- Whenever the base processor module or bridge module is replaced

It is important to remember that the ECU writes system configuration information to nonvolatile RAM (NVRAM) on the base processor module. The system relies on the information in this NVRAM for configuration information. Therefore, whenever the configuration of your system changes, you must run the ECU and save the system configuration file to your system NVRAM.

7.4 Booting the ECU

Boot the ECU from the 3.5-inch diskette drive. Insert the diskette labeled "appDEC 433MP ECU SYS CFG" into the drive and press the reset switch on the bridge module I/O panel.

Note

The setup menu cannot be accessed when the ECU is executing. Do not press Ctrl/Alt/S while the ECU is running.

7.5 Main Menu Selections

When the ECU boots, five selections are presented on the main menu. These are:

- Learn about configuring your computer
- Set time
- Set date
- Configure computer
- Maintain configuration files

7.5.1 Learn About Configuring Your Computer

This brief series of screens provides a good overview of the EISA architecture including the difference between ISA and EISA modules and how the ECU controls system configuration.

7.5.2 Set Time

This selection allows you to set the time used by your system clock.

7.5.3 Set Date

This selection allows you to set the date used by your system clock.

7.5.4 Configure Computer

This selection is used to configure your system.

You must select this option to create a system configuration file. When the "Configure computer" menu appears, five steps are shown:

1. Important EISA information
2. Add or remove boards
3. View or edit details
4. Examine required switches
5. Save and exit

Step 2, "Add or remove boards," shows the entire configuration of your system. System modules and EISA option modules are automatically detected and are shown in this step. ISA modules must be "installed" in the system configuration file through the use of ISA CFG files. See Section 7.8 below.

Step 3, "View or edit details," is used to select the configurable features of the system and option modules. When you make a selection for system or EISA options, the feature will be set when you save the system configuration file in step 5. When you make a selection for an ISA module, you must ensure that the physical jumper or switch on the ISA module is set to reflect the change you select in the ECU.

Note

It is your responsibility to ensure that the ISA module features set in the ECU accurately reflect the true settings of the ISA module. The ECU cannot detect or change features on ISA modules; the ECU only records those settings.

For example, the ISA CFG file for the VGA module contains a selection indicating whether the mouse is enabled or not. This selection does not enable the mouse; enabling the mouse is done with the VSETUP program provided with the VGA module. Enabling the mouse in the ECU tells the ECU that IRQ5 is being used and that the mouse port address is being used. If you enable the mouse with the VSETUP program, but do not enable the mouse in the ECU, the ECU may believe that IRQ 5 is available and either assign it to an EISA module or list it as an available resource for other ISA modules.

Step 4, "Examine required switches," helps ensure that ISA modules are set on the module as defined in the ECU. This step is required if you have set any ISA module's configurable features. The jumpers shown in this step reflect the settings you selected in step 3. (If you change a feature in step 3, the jumper settings shown here change.)

Step 5, "Save and exit," creates the system configuration file that is written to NVRAM. A backup copy is also made on your system configuration diskette. You must save the system configuration file to complete the configuration process.

Note

The ECU system configuration diskette must be write-enabled to create a system configuration file backup on your diskette.

Note

In the "Save and exit" menu, an option is available for returning to the operating system. This option is for DOS environments only and is not supported on a applicationDEC 433MP system.

7.6 Maintain Configuration

This selection allows you to:

- Add ISA CFG files to your system configuration diskette library
- Copy or delete system configuration files (SCI files)

7.7 System Configuration Features in the ECU

In step 3, "View or edit details," of the "Configure computer" menu, several system level configuration choices are possible. Table 7–1 lists the system options that can be set in the ECU, along with the recommended default settings.

Table 7–1 System Configurable Options in the ECU

Feature	Default Setting	Description
Diskette drive A size	3.5-inch, 1.44 MB	This setting specifies the size of drive A. It does not specify which drive is drive A; jumpers on the bridge module specify which drive is drive A. The 3.5-inch drive is drive A by factory default.
Diskette drive B size	Not installed	If you ordered a 5.25-inch drive and it was factory integrated, this option will show 5.25-inch, 1.2 MB.
Video adapter	EGA/VGA	This should be changed only if you are using a monitor other than VGA.
Fixed disk drive 0	Drive not installed	This feature is for use with ST506 drives where the number of cylinders must be specified. Digital recommends that you use the SCSI bus for hard disk drives, not ST506 drives.
Fixed disk drive 1	Drive not installed	This feature is for use with ST506 drives where the number of cylinders must be specified.
Base processor cache	Disabled	The Intel 80486 chip has 8K of cache on board. This selection controls whether this cache is used or is disabled. Because of the large 256K cache on the processor modules, use of the chip cache does not significantly affect performance.
Boot device	ISA SCSI	The hard disk drive with SCSI ID of 0 attached to the ISA SCSI adapter is the boot device. Placing the boot drive on a disk attached to the CPU/SCSI is not currently supported by the CPU/SCSI software drivers. Therefore, this selection must indicate ISA SCSI.

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Table 7–1 (Cont.) System Configurable Options in the ECU

Feature	Default Setting	Description
Shadow memory	Disabled	For each memory range, select disabled when running SCO UNIX or SCO ODT.

All of the other features listed as system features are informational only and cannot be changed.

7.8 Configuring Your System with the ECU for ISA Modules

When you have ISA modules in your system, you must install an ISA CFG file for that module. The ISA CFG file is used to record the settings of the ISA module. The settings must be accurate since the ECU uses the settings when determining available resources for auotconfiguration of EISA modules.

7.8.1 Adding an ISA CFG File

1. Boot the ECU.
2. Select "Configure computer."
3. Select "Add or remove boards."
4. With the arrow keys, highlight the backplane slot in which the module is (will be) installed and press [Enter].
5. A menu choice is shown. Press [Enter] to see a list of available ISA CFG files on the system configuration diskette. The ISA CFG files for use with the three supplied ISA modules are shown in Table 7–2. To view ISA CFG files on the library diskette, replace the system configuration diskette with the library diskette and press [Enter].
6. Use the arrow keys to select the desired ISA CFG file and press [Enter].
7. The ISA CFG file is now installed in the slot you selected.

Table 7–2 ISA CFG Files for applicationDEC 433MP ISA Modules

ISA Module	ISA CFG File on System Configuration Diskette
ISA SCSI adapter (factory installed in slot 10)	ADP0100.CFG Adaptec AHA-1540/1542 ISA SCSI Host Adapter
Serial/parallel adapter (factory installed in slot 11)	DEC0040.CFG DEC Serial/Parallel Adapter
VGA adapter (factory installed in slot 12)	ATI0060.CFG VGA Wonder+
Terminal multiplexer host adapter (option module, any slot)	ISAC001.CFG Corollary 8x4 MUX

If the ISA module you are installing does not have an ISA CFG file shipped with it, and there is not one listed on the library diskette, you can use the generic ISA configuration file, "ISA0000.CFG." This file can be used to specify the I/O address, IRQ setting, DMA channel, and memory resources used by your ISA module.

You must configure the ISA CFG file to accurately represent the configuration of your ISA module. Use the "View or edit details" step to do this.

1. Select "View or edit details" from the "Configure computer" menu.
2. Use the arrow keys to highlight the module feature you need to set. Items such as addresses are shown.
3. Press F6 to see a list of resources used by the system. These resources include items such as IRQ settings. Many resources displayed by the F6 key are informational only and cannot be changed. If a resource can be changed, it is displayed with a plus (+) or minus (–) symbol. Press the plus or minus symbol at the top of the keyboard to select the resource used by your module.

Note

Setting an ISA module feature in the ECU does not set the feature on the module. You must ensure that the ISA feature in the ECU matches the physical configuration of the module.

Note

ISA modules which use memory in any range between 8 MB and 15 MB must have an ISA CFG file installed in the ECU. The ISA CFG file must be used to identify memory locations used by the option. When an ISA module uses memory between 8 MB and 15 MB, the ECU marks that memory location as noncacheable. Options that use memory locations which do not have ISA CFG files installed will cause system memory conflicts.

7.9 Configuring Your System with EISA Option Modules

EISA options are shipped with an EISA CFG file. This EISA CFG file must be installed on your system configuration diskette to enable the ECU to recognize all of the features selectable on your EISA module. The ECU can automatically configure your module using the available resources.

Although your system will detect the EISA option automatically, you must install the EISA CFG file to set all the configurable options on the module. The EISA CFG file is installed using the "Add or remove boards" step of the "Configure computer" menu. This EISA CFG file must be removed if the module is removed.

When EISA options are removed from a system, you must use "Add or remove boards" to tell the ECU that the option has been removed. Highlight the removed EISA module and press delete to remove it from the configuration.

When you make a selection for an EISA module in the "View or edit details" step, the selections are made on the module when you exit. No physical configuration of the module is necessary.

7.10 Automatic Configuration

The ECU will configure your system automatically. If you have only EISA modules installed, the configuration is completely automatic. The ECU scans the EISA modules you have installed, and selects available IRQs, I/O addresses, and memory options for each module. When you exit from the ECU, the selected settings will be configured for each EISA module.

When ISA modules are installed, and you select an I/O address or IRQ for the module, the ECU automatically checks to see if that resource is available. If it is not available, the ECU identifies the conflicting resource and suggests a change.

Automatic configuration can be disabled for the entire system:

1. Select the advanced configuration screen from the "View or edit details" menu by pressing [F7]. A submenu is displayed.
2. Highlight the "Set verification mode" item and press [Enter].
3. Use the arrow keys to highlight the "Manual" item and press [Enter].

In manual verification mode, the ECU will not identify resource conflicts until you select the "Verify" option during the "View or edit details" menu. The "Verify" option does not appear unless you are in manual verification mode.

Automatic configuration can be disabled for individual modules. By "locking" a board, you prevent the ECU from automatically changing the module's resources, or suggesting a change. To lock a module:

1. Select the advanced configuration screen from the "View or edit details" menu by pressing [F7]. A submenu is displayed.
2. Highlight the "Lock/unlock boards" item.
3. The list of slots with the modules installed is displayed. Use the arrow keys to select the module whose resources you do not want to change.
4. Press [Enter] to lock the board.

In all displays of the system, locked boards are designated with an exclamation mark (!).

7.11 Viewing Total System Configuration

The "Add or remove boards" step provides a complete view of all boards installed in your system. To view a summary of all system resources being used, press F7 during this display. The resources available are shown by resource. Thus, if you need to know what IRQ or I/O addresses are available, use this feature.

Note

The available system amperage resource is for future use. Any number displayed in this resource should not be relied upon since not all ISA CFG files contain information about the amperage used by the board.

7.12 Library Diskette

The EISA architecture is backwards compatible with the ISA architecture. However, since ISA modules were created and used before ISA CFG files were created, many ISA modules are in use which were shipped without ISA CFG files. In order to use these modules in EISA systems, ISA CFG files are required. To assist users of older ISA modules, many vendors have submitted ISA CFG files to the EISA consortium. These ISA CFG files are contained on the library diskette shipped with the ECU.

When you install an ISA module for which you have no ISA CFG file, look on the library diskette. The files are listed by their EISA standard file name, as well as by the vendor product name. The ISA CFG file for your ISA module can be installed in your system configuration file. Under the "Add or remove boards" step of the "Configure computer" menu, you have the option of inserting the library diskette to search for an ISA CFG file. Files for many popular ISA CFG files are contained on this diskette.

Note

ISA CFG files contained on the Library Diskette are submitted to the EISA consortium by individual vendors. Digital Equipment Corporation has not qualified or tested any of the files on the library diskette and these files are provided as is.

CHAP 8

8 System Exerciser

8.1 Overview

The applicationDEC 433MP system exerciser (SYSEX) is a standalone, diskette-based diagnostic that detects and isolates hardware problems to the FRU level. SYSEX tests each system unit simultaneously with peripheral and communication transfers to detect interactive errors.

SYSEX verifies the following:

- All CPU and memory modules
- Bridge module
- Serial I/O logic on the CPU/SIO module
- SCSI logic on the CPU/SCSI module
- Terminal multiplexer module
- EtherWORKS Turbo Ethernet controller
- 3.5-inch diskette drive
- 5.25-inch diskette drive
- CD-ROM drive (RRD42)
- 320/525 MB QIC tape drive (TZK10)
- Digital hard disk drives:
  - 204 MB disk drive (RZ24)
  - 426 MB disk drive (RZ25)
  - 665 MB disk drive (RZ56)
  - 1.0 GB disk drive (RZ57)

You can run the system exerciser two ways:

- The installation verification procedure (IVP) performs a 15-minute test session that returns the system status.
- The **run** command executes the system exerciser tests continuously.

Press [Ctrl/C] to halt SYSEX at any time.

The SYSEX commands let you **run**, **halt**, and **block** tests. In addition, you can display the following information:

- System configuration
- Data at specified locations
- Status of tests and devices
- Error reports

You can dedicate CPU resources to specified tests by blocking unwanted tests. Section 8.9.1 provides information on how to block tests.

8.2 Loading the System Exerciser

Load the system exerciser as follows:

1. Insert the system exerciser diskette into the 3.5-inch diskette drive.
2. Boot the system from the diskette in either of the following ways:
   - Turn the system power off and then on again.
   - Press the reset switch on the bridge module I/O panel.

If a bad checksum message is displayed, see Section 8.4.

8.3 Running the System Exerciser

Note

Before you run SYSEX, verify the system configuration with the EISA configuration utility (ECU). See Chapter 7.

When the system exerciser has been booted, system configuration information is displayed on the screen:

```
12/19/91 15:00:08    applicationDEC System Exerciser    Rev 4.00     0000:00:00
        applicationDEC System Exerciser    Rev 4.00    12/13/91

applicationDEC 433mpE

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Verifying program loaded correctly

System Configuration:
Slot            Type
====            ====
01              Memory  Base Address = 0, Size = 16 MB, SIMM size = 1 MB
02              Memory  Base Address = 1000000, Size = 16 MB, SIMM size = 1 MB
06              486 Serial I/O
08              EISA Bridge
09              486 Base

EISA slot configur.tion:
Slot  IRQ  Ports        Type
====  ===  =====        ====
 8     6   3F0-3F7      Floppy controller
 8     4   3F8-3FF      Serial port, COM1
10    11   330-332      Adaptec 1540B, firmware rev = 05
11     3   2F8-2FF      Serial port, COM2
11     7   378-37A      Parallel port, LPT2
12                      Video Adapter (80x25 color)
13    15   300-30C      DE200 Ethernet, Node addr = 08-00-2B-18-7B-60
16    12   EC0000       8x4 Mux
Load scratch media into all drives to be tested in write-read mode
Hit any key to continue
```

After you load the drives to be tested, press [Enter]. The following message is displayed.

```
Is a printer connected to COM1 (Y/N)?
```

Enter your response by pressing [Y] or [N]. The following message is displayed:

```
Sizing devices (please wait - up to 5 min.) ...
```

Then you are prompted to select destructive (write/read) or nondestructive (read only) testing for each device:

```
Test mode selection.  Use keyboard to make selections.
Space key selects write/read testing. ENTER key protects media.
```

The screen should resemble the following display during and after test mode selections:

```
BUS Configuration:
Slot  ID  LUN    Device   Type                 Rev     Selection
 8    0    *      Disk    RX23/1.44M                   Read only
 8    1    *      Disk    RX33                         Write/Read
10    0    0      Disk    RZ56                  0300   Read only
10    1    0      Disk    RZ24                  1D18   Read only
10    2    0      Tape    TDC 3800                B3   Read only
10    6    0      CD-ROM  CD-ROM CDU-541        3.0a   Read only
```

Next, you are prompted to enable or disable external loopback testing:

```
Loopback Selection. Hit SPACE to enable external loopback, ENTER to disable.
16      E00000  8x4 Mux              A-C disabled    B-D disabled

06              486 Serial I/O       A-C enabled     B-D enabled
08              Serial port              disabled
11              Serial port              disabled
11              Parallel port            enabled
```

Note

If you selected destructive (write/read) testing for any device, the following message is also displayed:

```
*******************************************
* WARNING! Destructive testing enabled.   *
* Data will be lost when testing begins!  *
*******************************************
```

If loopback testing is enabled, loopback connectors must be installed on the serial I/O ports of the CPU/SIO module or the SIO related tests will fail.

The next display shows the tests that the system exerciser will run. The display is based on the selections you made and the recognized system configuration.

```
Scheduled tests:
```

```
Test    Name                    Rev
====    ====                    ===
 1.     Memory                   1
 2.     Memory Retention         1
 3.     Numeric                  0
 4.     Serial I/O     [Slot 6]  2
 5.     Motherboard    [Slot 9]  2
 6.     Serial Line    (COM1)    2
 7.     Serial Line    (COM2)    2
 8.     Parallel Port  (LPT2)    1
 9.     Console                  1
10.     SCSI Disk 10:0:0         3
11.     SCSI Disk 10:1:0         3
12.     SCSI Tape 10:2:0         2
13.     SCSI CD-ROM 10:6:0       2
14.     Floppy Disk  8:0         3
15.     Floppy Disk  8:1         3
16.     8x4 Mux       [Slot 16]  1
17.     Ethernet/13   (DE200)    0

Type "HELP" for information, "RUN" or "IVP" to begin testing
HLT>
```

When the HLT> prompt is displayed, you can run the 15-minute installation verification procedure. Type the **ivp** command and press [Enter]:

```
HLT> ivp [Enter]
```

When the IVP is running, the following message is displayed:

```
        Installation Verification Procedure Running
```

Also, the HLT> prompt will change to RUN>.

After 15 minutes, a success message is displayed, indicating that the system is functional. Then the HLT> prompt is reissued:

```
Installation Verification Procedure Complete: No Errors Detected
HLT>
```

If an error is detected, an error message is displayed immediately. See Section 8.5 for details on how to interpret the message.

If you wish to rerun the IVP, you must reboot the system exerciser. You cannot rerun the IVP by typing **ivp** again. By typing the **run** command, you can run the same tests without rebooting the system, but the tests run continuously (without the 15-minute timeout).

Type **status** to see error summaries. Press [Ctrl/C] to stop the tests. Type **quit** to reboot.

8.4 Loading Failure

After you load SYSEX, one or two messages appear on the console monitor. If the only message is the following, loading was successful:

```
Verifying program loaded correctly
```

If the error message "Checksum error detected at load time" follows the above message, the loading failed. Take the following action:

1. Reload the diskette.
2. Reboot. If this fails to correct the loading failure, try a different SYSEX diskette in case the first diskette is bad.
3. If this load also fails, check for failed memory or a bad load path. A bad load path occurs when either the diskette drive itself is bad or the cable to the diskette drive is bad. Section 2.5 provides information on memory modules. Section 9.12 provides information on replacing memory modules.
4. Run the RRD tests again for possible further information.

8.5 Interpreting Error Messages

If the IVP detects an error condition, an error message is displayed. By default, SYSEX stops execution when an error is detected.

Error messages are listed in Table 8–1. The error message identifies the failing FRU.

Before replacing a FRU identified by SYSEX:

1. Make sure that the module in the designated slot is the correct module for the slot. (Table 2–1 provides information on how to locate each system bus module.)
2. Make sure that all switches and jumpers are set correctly on the module. (Chapter 2 provides information on the settings for each module.)
3. Check any cable connections.
4. Reseat modules in the backplane.

Now, rerun SYSEX. If the same FRU is called out again, replace the FRU.

System Exerciser Error Messages

If SYSEX identifies a FRU as failing, an error message is displayed on the screen and written to the error log. (Information in the error log can be displayed using the **log** command.)

Each error message calls out a FRU. Because there may be more than one of any type of FRU in the system, additional information is provided to identify which of the multiple units has failed:

- For modules, the slot number indicates the module which has failed.
- For SIMM failures, the socket number of the failed SIMM is indicated.
- For SCSI storage devices, the bus ID and logical unit number of the device is indicated. Also, the slot number of the associated adapter is identified. SCSI devices controlled by a CPU/SCSI are identified by the slot number of the CPU/SCSI.
- SCSI devices controlled by the ISA SCSI adapter or an EISA SCSI adapter are identified by the slot number of the controller. (The factory installed ISA SCSI adapter is installed in slot 10.)

After an error, continued testing is dependent on the state of the halt flag:

Halt flag set to on = suspend test execution (until the **run** command is reissued)
Halt flag set to off = continue test execution (immediately after completion of error report)

Table 8–1 System Exerciser Error Messages

Error Message
FRU = slot *n* 486 ISA Base
FRU = slot *n* 486 Serial I/O
FRU = slot *n* 486 SCSI
FRU = Memory board in slot *n*, SIMM = *n*
FRU = RRD42 (CD-ROM) *slot-number*: *bus id*: *logical unit number*
FRU = TZK10 (QIC tape) *slot-number*: *bus id*: *logical unit number*
FRU = RZ24 PCB *slot-number*: *bus id*: *logical unit number*
FRU = RZ24 HDA *slot-number*: *bus id*: *logical unit number*

8.6 System Exerciser Test Descriptions

Table 8–2 describes the SYSEX tests.

Table 8–2 System Exerciser Tests

Name	Description
Memory	Write/read main memory.
Memory retention	Memory refresh circuitry.
Numeric	CPU floating point.
Cache coherency	Cache coherency logic on the processor module(s).
Multiprocessor (locks)	Bus locking feature of Intel CPU.
Motherboard	Logic specific to the base/bridge intercommunication.
Console	Writes test patterns to the console for visual verification.
Serial I/O	SIO specific logic on the CPU/SIO processor module(s).
Terminal multiplexer	Internal/external data loopback and registers.
Serial port	Internal/external data loopback and registers.
Parallel port	Internal/external data loopback and registers.
Floppy	Write/read (destructive) or read-only (nondestructive) verification. User selectable. Requires that diskette be installed in device.
Ethernet	Send, receive, and verify messages internally and with other network nodes.
SCSI disk	Write/read (destructive) or read-only (nondestructive) verification. User selectable.
SCSI tape	Write/read verification. Requires that tape cartridge be installed in device.
SCSI CDROM	Read-only verification. Requires that CD-ROM be installed in device.

8.7 System Exerciser Modes

SYSEX has two modes. The modes are described in Table 8–3.

Table 8–3 System Exerciser Modes

Mode	Prompt	Meaning
Halt	HLT>	Tests have not begun or testing is suspended.
Run	RUN>	Tests are running.

You can run most SYSEX commands in either mode. The exceptions are the **ivp** command, which is valid only in the halt mode, and the **istep** command, which is valid only at a breakpoint.

You can place SYSEX in the halt mode at any time by pressing [Ctrl/C]. Because no tests are running when SYSEX is in the halt mode, response to commands is immediate. When SYSEX is in the run mode and tests are running, the keys you press are echoed to the screen as they are typed, but the commands are not executed until the completion of the current test pass. This can sometimes cause a short delay.

8.8 System Exerciser Flags

You can set flags to control whether:

- Information sent to the console monitor and the error log should include data about memory allocation, task swapping, and segment descriptors.
- Information is sent to the console monitor in one-screen segments.
- Testing should continue when an error is encountered.
- Console output should be echoed to a serial printer on the COM1: port.
- Failing tests should automatically block themselves.

Flags are set with the **flag** command. Table 8–4 describes the SYSEX flags.

Table 8–4 System Exerciser Flags

Flag	Default	Description
Halt	On	Stop testing when error is reported; return to halt mode prompt. If off, continue testing after an error is reported.
Long	Off	Include test environment information in the error report. This information describes the machine state during the most recent task swaps, segment descriptor data, and the memory allocation table. If off, generate an abbreviated error report that contains only the header block and text.
More	Off	Displays information on the console in single screen segments. Press [Enter] to display the next line of information. Press [Spacebar] to display the next screen of information. Press [Q] to stop displaying information. If off, any information containing more than 23 lines will have some lines that scroll off the console monitor.
Print	Off	Allows the console output to be echoed to a serial printer on the COM1: port. The print flag is ignored if the startup "Is a printer connected to COM1 (Y/N)?" question is not answered with Y.
Threshold	On	Automatically blocks any test that reaches the error threshold. The threshold is ten failed passes in a row. If off, allows the failing test to keep running and reporting failures.

Use the **flag** command to change the status of a flag. For example, to set the long flag, enter the following:

```
HLT> flag on long [Enter]
```

If you boot the system, the SYSEX flags return to the default settings.

8.9 System Exerciser Commands

Table 8–5 lists SYSEX commands. The commands are not case sensitive and may be abbreviated.

Table 8–5 System Exerciser Commands

Command	Description
B[lock]	Prevent specified tests from running.
B[lock] (no argument)	Display all tests that are currently blocked from running.
Cac[he]	Set internal processor cache state (enabled or disabled).
Cac[he] (no argument)	Display current state (enabled or disabled) of the internal processor cache.
Cal[culate]	Make a calculation in one of three radices: decimal, octal, or hexadecimal. Hexadecimal is the default radix.
Co[nfiguration]	Display the configuration of the system.
Ctrl/C	Halt testing; return to the halt mode prompt.
De[vices]	Display or modify the flag state of devices under test.
De[vices] (no argument)	Display a list of the supported devices.
Di[splay]	Display the data at specified locations in memory.
E[xamine]	Examine the data at a specified location in memory. You can also deposit data at the specified location in memory.
F[lags]	Modify the flag settings.
F[lags] (no argument)	Display the state of all flags (on or off).
G[o]	Set and run until a breakpoint.
H[elp]	Obtain information on any command.
H[elp] (no argument)	Display a list of all system exerciser commands.
Is[tep]	Execute individual instruction(s) while in debug mode.
Ivp	Run 15-minute installation verification procedure.
L[og]	Play back or delete previous error reports or write error reports to a DOS diskette.
Q[uit] or Ctrl/Alt/Delete	Stop all tests and reboot the system.
R[un]	Begin or resume testing (change from halt mode to run mode.)
Se[t]	Set or display the values of state variables.
Se[t] (no argument)	Display a list of all state variables.
Sh[ow]	Show a machine state.
Sh[ow] (no argument)	Display a list of all machine states.

(continued on next page)

Table 8–5 (Cont.) System Exerciser Commands

Command	Description
St[atus] or Ctrl/T	Display which tests are running, whether they are blocked, and how many test passes have been made.
T[ime]	Display current date and time and elapsed test time.
U[nblock]	Allow tests that have been blocked to resume running.
U[nblock] (no argument)	Display all tests that are currently unblocked.

8.9.1 Block

Use the **block** command to prevent one or more tests from running. This might be helpful if you want to focus CPU time on one test. For example, you might want to eliminate a test from which you have already gathered sufficient error information, or you might want to eliminate constantly scrolling error messages from a failing test.

Format: BLOCK [option_argument]

Table 8–6 describes the options that you can use with the **block** command.

Table 8–6 Block Command Options

Command	Description
B[lock]	Display all tests that are currently blocked.
B[lock] t	Block the specified test.
B[lock] t-t	Block a range of tests that begins with the first test number specified and ends with the second test number specified.

For example, to block test 1:

```
RUN> block 1 Enter
```

If you display the test status, the screen display indicates that test 1 is blocked by placing the letter B next to the number of the test.

To block test 1 and test 3, use either of the following:

```
RUN> block 1 3 Enter
RUN> block 1,3 Enter
```

To block test 1, test 2, and test 3:

```
RUN> block 1 - 3 Enter
```

8.9.2 Cache

The **cache** command lets you set or display the state (enabled or disabled) of the internal cache of the specified processor(s).

Format: CACHE[/*n*] [enable,disable]

You can use the /*n* modifier to specify a particular processor. Otherwise, all processors are affected.

```
RUN> cache/1 disable [Enter]
```

8.9.3 Calculate

The **calculate** command lets you make calculations and includes functions similar to a pocket calculator, such as addition, subtraction, multiplication, and division.

Format: CALCULATE[/radix] argument_list

The **calculate** command provides support for the following three radices:

- Octal
- Decimal
- Hexadecimal (default)

The result of the calculation is displayed in all three radices in the order octal, decimal, hexadecimal.

The **calculate** command is a convenient way to convert radices.

Table 8–7 describes the qualifiers that you use to set the default radix for all numbers in a calculation.

Table 8–7 Calculate Command Qualifiers

Command	Description
Cal[culate]/o	Calculate using the octal radix.
Cal[culate]/d	Calculate using the decimal radix.
Cal[culate]/h	Calculate using the hexadecimal radix.

Hexadecimal is the default radix. If you set the default radix to decimal or octal, the system immediately defaults to hexadecimal when the calculation is finished.

To convert the value of 100 octal to hexadecimal or decimal, use the following command:

```
HLT> caculate/o 100 [Enter]
        100, 64, 40
```

To convert the value of 100 decimal to octal or hexadecimal, use the following command:

```
HLT> calculate/d 100 [Enter]
        144, 100, 64
```

To see the value of 100 hexadecimal in the three radices, use the following command:

```
HLT> calculate 100  [Enter]
        400, 256, 100
```

Note that because hexadecimal is the default, you do not have to specify */h* when calculating in hexadecimal.

If you use more than one radix in a calculation, use the symbols shown in Table 8–8 to specify the radix of an individual number.

Table 8–8 Calculate Command Radix Symbols

Radix	Symbol	Example
Decimal	.	10.
Hexadecimal	H	10H
Octal	o	10o

For example, in the equation that follows, the number 13 is hexadecimal, 59 is decimal, and 100 is octal:

```
HLT> calculate 13 + 59. + 100o [Enter]
        216, 142, 8e
```

You can use the following functions with the **calculate** command:

- Add (+)
- Subtract (-)
- Multiply (*)
- Divide (/)
- Exponentiation (^)

The order of precedence is:

- Exponentiation (highest precedence)
- Multiply or divide
- Add or subtract (lowest precedence)

Use parentheses to change the order.

8.9.4 Configuration

The **configuration** command lets you display the system configuration

Format: CONFIGURATION

```
RUN> configuration [Enter]
```

8.9.5 Ctrl/C

Press [Ctrl/C] at any time to suspend testing and enter halt mode.

Note that although testing is stopped when suspended, the clock that measures elapsed test time continues to operate. The clock will always reflect the elapsed time since you started testing. If you suspend testing, the clock does not reflect the actual test time.

8.9.6 Devices

The **devices** command lets you display or modify the flag state of devices under test.

Format: DEVICES [device[/*n*]] [flag_list]

The **devices** command is extremely useful for changing the test state of devices that were set up incorrectly at the start. Without this command, you would have to reboot SYSEX to set up the device tests differently.

For example, if you select destructive (write/read) testing for a disk that really should be write protected, then you can use this command to change to nondestructive (read only) testing for the disk. Or, if you set up a COM or LPT for external loopback testing and find that loopback plugs are not installed, then you can use the **devices** command to reconfigure the COM or LPT for internal loopback testing only.

The first argument must be the name of the requested device. The /*n* modifier can be used to request a specific device of the type given. The following example specifies COM2: and no other COM devices:

```
RUN> devices com/2 [Enter]
```

The format of the /*n* modifier depends on the device type. Table 8–9 shows the format for each device type.

Table 8–9 Devices Command Formats

Device Type(s)	Format	Description
COM LPT	*n*	*n* = device port number
Disk	x:y[:z]	x = disk adapter slot number y = SCSI ID address z = logical unit number (hard disk drives only)
Ethernet	*n*	*n* = device slot number

If the /*n* modifier is not provided, then all devices of the given type will be affected.

A flag list can be included in the command line, which will cause the specified device flag(s) to be set to the requested state. When a flag list is not included, the current state of the specified device(s) is displayed. A flag list has the format (enable/disable) flag1, flag2, ..., flag*n*. You must specify the state followed by a list of all flags that should be set to that state.

The /*n* modifier for the disk device type has the format x:y[:z], where x:y:z specifies the disk whose flag state should be displayed or modified. The disk number can be found in the test list. For example, **dev disk/8:0** specifies the RX23 diskette drive, and **dev disk/10:1:0** specifies a disk on the SCSI bus controlled by the ISA SCSI adapter.

Table 8–10 shows the available state flags for supported devices.

Table 8–10 Devices Command State Flags

Device	Flag(s)	Description(s)
COM	Lpbk	External loopback
Disk	Protect	Data protect flag[1]
Ethernet[2]	Auto_census Census Int_lpbk Network	Automatic census every "time *x*" minutes[3] Issue **census** command Internal loopback[4] Network testing[5]
LPT	Lpbk	External loopback
MUX	AClpbk, BDlpbk	A->C and B->D loopback flags
SIO	AClpbk, BDlpbk	A->C and B->D loopback flags

[1]Enabled runs test as read only.

[2]Ethernet devices support two additional command qualifiers: add and remove. You use these qualifiers to add node addresses to the network partners table or to remove nodes from test. The remove qualifier leaves the entry in the table, but sets the status to "not testing". Following the qualifier verb is the node address in the form xx-xx-xx-xx-xx-xx, which is the 48-bit LAN address. An example is **dev ether add 08-00-2B-5E-1C-5A**.

[3]Automatic census can be disabled for network devices to prevent periodic census commands from being issued. The time interval can also be set to zero in order to disable the automatic census feature. To set the time, enter the command **dev ethernet/*n* enable auto *x***, where *x* is the time in munutes.

[4]Versus external loopback.

[5]Versus internal or external loopback testing. If network testing is enabled, test packets are sent. If network testing is disabled, then either internal or external loopback testing is performed, based on the state of the int_lpbk flag.

8.9.7 Display

The **display** command lets you display data at specified locations in memory.

Format: DISPLAY[/mode] [address]

Data can be displayed in the following modes:

- Byte (default)
- Word
- Doubleword
- ASCII

To choose a display mode, use one of the **display** command qualifiers shown in Table 8–11.

Table 8–11 Display Command Qualifiers

Command	Display Mode
D[isplay]/b	Byte (default)
D[isplay]/w	Word
D[isplay]/d	Doubleword
D[isplay]/a	ASCII

If you do not designate an address, the system defaults to the last address selected for display or to address 0 if no previous display command was executed.

Addresses have the format task:seg:offset. The task:seg fields are optional, but are always displayed by the system. The offset field is required and is the address offset within the segment. For example, to display the data in the byte display mode (default) at address location 32FH in segment 8 (default), use either of the following:

```
HLT> display 32F [Enter]
0:8:32F 53

HLT> display 0:8:32F [Enter]
0:8:32F 53
```

You can also specify an argument list to display an address range. The range can be any size from one unit or more and can be in ascending or descending order. The range is specified as *addr addr* (starting address, ending address) or as *addr length value* (starting address, length qualifier, length value in display mode units).

In *addr addr* mode, the ending address is another offset within the segment. If the ending offset (address) is greater than the starting offset, then memory is displayed in order of ascending addresses. If the ending offset is less than the starting offset, data is displayed in descending order.

In *addr length value* mode, the length value specifies how many units (byte, word, and so on) of data to display beginning with the starting address. If the length is a positive number, data is displayed in ascending addresses. A negative length displays addresses in descending order. For example, to display eight doublewords of data beginning at location 32FH in segment 8 (default), use the following:

```
HLT> display/dword 0 length 8 [Enter]
0:8:32F  F000FF53  F000FF53  F105ED41  F000FF53
0:8:33F  F000FF53  F000EDF2  F0008C8C  F000FF53
```

8.9.8 Examine

The **examine** command lets you analyze and modify data at a specified location in memory.

Format: EXAMINE[/mode] [address]

When data is displayed, the system cursor remains in place and waits for you to input new data. To modify the data at the current location, input the new data and then use the [⇑], [⇓], or [Enter] keys to store the new data. With or without data modification, the [⇑] key examines data at the previous location in memory. The [⇓] key examines data at the next location in memory. The [Enter] key exits **examine** mode.

The [ESC] key exits **examine** mode, but will not modify the location whether new data was typed in or not.

You can examine the contents of memory as bytes, words, doublewords, or as ASCII by using the **examine** command qualifiers shown in Table 8–12.

Table 8–12 Examine Command Qualifiers

Command	Display Type
E[xamine]/b	Byte (default)
E[xamine]/w	Word
E[xamine]/d	Doubleword
E[xamine]/a	ASCII

If you do not designate an address, the system defaults to the last address selected for display or to address 0 if no previous display command was executed.

8.9.9 Flags

The **flags** command lets you display or modify flags.

Format: FLAGS [flags_list]

See Section 8.8, System Exerciser Flags.

8.9.10 Go

The **go** command lets you set and run until a breakpoint.

Format: GO[/*n*] [(instruction,write,access,task,forever) (byte,word dword) addr]

The **go** command is an advanced feature of the system exerciser debugger and is reserved for use by Digital Equipment Corporation development personnel. Debug operations at the lowest hardware levels are extremely complex and can result in unexpected consequences.

8.9.11 Help

The **help** command lets you view on-line help information.

Format: HELP [command]

```
RUN> help display [Enter]
```

8.9.12 Istep

The **istep** command lets you execute individual instruction(s) while in debug mode. The **istep** command can be issued only from a breakpoint.

Format: ISTEP [n]

The **istep** command is an advanced feature of the system exerciser debugger and is reserved for use by Digital Equipment Corporation development personnel. Debug operations at the lowest hardware levels are extremely complex and can result in unexpected consequences.

8.9.13 Installation Verification Procedure (IVP)

The **ivp** command lets you verify system functionality within 15 minutes (default) of testing.

Format: IVP [test_time_in_minutes]

```
HLT> ivp [Enter]
```

When the IVP starts, the system displays the following message:

```
        Installation Verification Procedure Running
```

After 15 minutes, a success message is displayed, indicating that the system is functional. Then the HLT> prompt is reissued:

```
Installation Verification Procedure Complete: No Errors Detected
HLT>
```

If an error is detected, an error message is displayed and the IVP run is aborted. Table 8–1 lists the system exerciser error messages.

If you wish to rerun the IVP, you must reboot the system exerciser. Type **run** to continue running SYSEX tests, but without the 15-minute timeout.

8.9.14 Log

The **log** command lets you write error reports to a DOS diskette, play back error reports that have been logged, and remove reports from the log.

Format: LOG[/error, /recovered] [<PLAY,CLEAR> entry_number, last]
or
Format: LOG ARCHIVE filename.ext

Table 8–13 describes options that can be used with the **log** command.

Table 8–13 Log Command Options

Command	Description
L[og]	Display error log summary.
L[og] archive	Write all error reports to a DOS diskette.
L[og] clear entry-number	Remove specific error reports.
L[og] clear	Remove all error reports.
L[og] play entry-number	Play back specific error reports.
L[og] play	Play back all error reports.

```
RUN> log [Enter]
```

Table 8–14 illustrates a typical log summary report.

Table 8–14 System Exerciser Error Log Report, Example

Entry	Error	Test	Log Address
0	1	9	28316
1	2	6	27FFA
2	3	15	27AB2

The Entry column denotes which entry from the error log is being described. The Error column denotes whether this is the first, second, third, or *n*th encounter of an error in the test run. The Test column denotes which of the SYSEX tests reported the error. The Log Address column describes where the report is logged in memory.

To review an error report from the log, use the **log play** command and specify the entry number of the error. For example, to review entry 0 from the sample report in Table 8–14:

```
RUN> log play 0 [Enter]
```

You can specify one entry number to review a single error report or a range of entry numbers to review several error reports. However, you cannot enter both single numbers and a range of numbers on the same command line.

Memory space for error reports is limited, but there should be space available for at least 50 error reports.

Note

When the error log is full, new error reports are not included in the error log. Errors must be cleared before new error reports can be included.

To remove an error report from the log, use the **log clear** command and specify an entry number obtained from the error summary report. For example, to remove entry 0 from the sample report in Table 8–14:

```
RUN> log clear 0 [Enter]
```

Note

Error reports that have been removed from the error log are permanently deleted; they cannot be restored.

You can specify one entry number to remove a single error report or a range of entry numbers to remove several error reports. However, you cannot enter both single numbers and a range of numbers on the same command line.

8.9.15 Quit

You can use the **quit** command at the SYSEX prompt.

Format: QUIT

You can also use the key sequence [Ctrl/Alt/Delete] to duplicate the **quit** command. This key sequence can be used at any time to duplicate the **quit** command.

8.9.16 Run

The **run** command lets you run SYSEX tests continuously.

Format: RUN [test_time_in_minutes]

To start or resume testing, enter **run** or **r** at the HLT> prompt as follows:

```
HLT> run [Enter]
RUN>
```

All unblocked tests begin executing immediately. Devices are tested concurrently. Testing continues until you press [Ctrl/C] or until an error is encountered while the halt flag is on. Section 8.8 provides information on how to use SYSEX flags.

While the tests run, you can execute the **status** command at the RUN> prompt to obtain information about SYSEX tests.

8.9.17 Set

The **set** command lets you set or display state variables.

Format: SET [variable [value]]

Table 8–15 describes the available state variables that you can set or display.

Table 8–15 Set Command State Variables

State Variable	Value(s)	Description
Baud	2400 4800 9600	Baud rate of the line printer on the COM1: port. This variable is valid only if there is a printer available on the COM1: port. • Viewing or setting the baud variable is illegal if the startup "Is a printer connected to COM1 (Y/N)?" question is not answered with Y. • Specifying an incorrect baud value is flagged as illegal and the current baud rate is not changed.
Status	*n*	Auto status display. Automatically displays test status every *n* minutes when *n* is set to a value greater than zero. When the value of *n* is zero, automatic test status displays are disabled. • Auto status display lets you see a recent test status in the event that the system gets into a hung state. This feature is useful on systems that are monitored at infrequent intervals. • Auto status display does not occur if SYSEX is in halt mode or is at the MORE prompt when status is ready to be displayed.

If you do not specify a state variable, a list of all available state variables is displayed:

```
HLT> set [Enter]
Avaliable state to be set:
        BAUD
        STATUS
```

If you specify a state variable without providing a new value, the current value of that variable is displayed:

```
HLT> set status [Enter]
Status auto display time = 8
```

To set a state variable, specify the variable and the new value. The following example sets the baud rate state to 9600 baud:

```
HLT> set baud 9600 [Enter]
```

8.9.18 Show

The **show** command lets you examine the machine states. Table 8–16 describes the available machine states that you can examine.

Format: SHOW [machine_state]

Table 8–16 Show Command Machine States

Machine State	Description
Breakpoints	Active breakpoints
GDT	Global descriptor table entries
IDT	Interrupt descriptor table
Physical	Physical address of specified logical address
Task	Task state segments for each task
TSS	Individual task state segment

8.9.19 Status

The **status** command (or Ctrl/T) lets you display the test statistics for all tests. The command also lets you display the status of all devices that are under test.

Format: STATUS [option]

The test statistics that you can display are:

- Test number and description
- The letter B to the left of the test name, if a test is blocked
- Test module revision level
- Total number of test passes made
- Total number of errors detected in each test
- Total number of page faults encountered in each test

For example, to obtain the status of all SYSEX tests, enter **status** or **st** at the prompt:

```
RUN> status Enter
```

Table 8–17 lists the options for the **status** command.

Table 8–17 Status Command Options

Command	Description
St[atus]	Display status of all tests.
St[atus] COM[/*n*]	Display status of communication device(s) under test.
St[atus] devices	Display status of currently running devices (disk, tape, CD-ROM).
St[atus] Ethernet/*n*[1]	Display status of an Ethernet device.
St[atus] network/*n*[1]	Display network table for an Ethernet device.
St[atus] t	Display status of specified test.
St[atus] t-t	Display a range of tests that begins with the first test number specified and ends with the second test number specified.

[1]Device slot number.

8.9.20 Time

The **time** command lets you display the current date and time and also the elapsed time since the start of testing.

Format: TIME

```
RUN> time [Enter]
12/19/91 15:00:08     applicationDEC System Exerciser    Rev 4.00      0000:07:32
```

8.9.21 Unblock

The **unblock** command lets you resume a test that was prevented from running by the **block** command.

Format: UNBLOCK [argument_list]

Table 8–18 describes the options that can be used with the **unblock** command.

Table 8–18 Unblock Command Options

Command	Description
U[nblock]	Display tests that are currently unblocked.
U[nblock] t	Unblock the specified test.
U[nblock] t-t	Unblock a range of tests that begins with the first test number specified and ends with the second test number specified.

For example, to unblock test 1:

```
RUN> unblock 1 [Enter]
```

To unblock test 1 and test 3:

```
RUN> unblock 1 3 [Enter]
RUN> unblock 1,3 [Enter]
```

To unblock test 1, test 2, and test 3:

```
RUN> unblock 1 - 3 [Enter]
```

If you use the **unblock** command without an argument, a list of all unblocked tests is displayed on the screen.

CHAP 9

9
Removal and Replacement

This chapter provides a list of the applicationDEC 433MP field replaceable units (FRUs) and special diagnostics tools. It also provides the procedures for removing and replacing FRUs.

9.1 FRU Parts List

Table 9–1 lists the applicationDEC 433MP field replaceable units (FRUs).

Table 9–1 applicationDEC 433MP Field Replaceable Units

Part Number	FRU	Order Number
	Base System Major Components	
54-20892-01	Base processor module	
54-20894-01	Bridge module	
54-19553-01	Memory module	
54-19557-AA	1 MB SIMM	
54-19555-01	16-slot backplane	
30-35157-01	Serial/parallel module	
29-29053-01	VGA	PS1XG-AA
30-35472-02	Mouse, 3-button	PS1XS-AA
29-29054-01	3.5-inch driver/diagnostic diskettes (3) for PS1XG-AA graphics adapter	
00-H7828-AA	Power supply	
	Option Modules	
54-19549-01	CPU/SIO module	
54-20845-01	CPU/SCSI module	
30-34571-02	ISA/SCSI adapter	PS1XR-AA
29-28310-01	Terminal multiplexer module	

(continued on next page)

Table 9–1 (Cont.) applicationDEC 433MP Field Replaceable Units

Part Number	FRU	Order Number
	Storage Devices	
	CD-ROM drive	RRD42-AA
30-34261-01	QIC tape drive, 320/525 MB	TZK10-E
29-28144-02	209 MB SCSI disk drive, spinup PCBA	RZ24-SF
29-28145-01	209 MB head disk assembly	RZ24-SF
	426 MB SCSI drive	RZ25-SJ
30-30000-01	3.5-inch diskette drive	RX23-AA
30-24962-01	5.25-inch diskette drive	RX33-AA
	Power Cords	
17-00083-39	US	BN26J-1K
17-00209-15	UK/Ireland	BN26B-2E
17-00199-21	Central Europe	BN19W-2E
17-00210-13	Switzerland	BN24T-2E
17-00198-14	Australia/New Zealand	BN24R-2E
17-00310-08	Denmark	BN19K-2E
17-00364-18	Italy	BN19Z-2E
17-00456-16	India	BN22Z-2E
17-00457-16	Israel	BN22P-2E

(continued on next page)

Table 9–1 (Cont.) applicationDEC 433MP Field Replaceable Units

Part Number	FRU	Order Number
	Accessories	
29-28309-01	Terminal concentrator, 8-channel	PC4XD-DB
29-28312-01	Terminal multiplexer software	
12-33529-01	Connector/adapter, 8-pos'n. male to 6-pos'n. female	H8577-A
17-00811-02	Cable assembly, 6-cond. oval, 26 AWG	BC16E-10
17-02867-01	Cable assembly, 25-cond. round, shielded	BC13F-08
17-02874-01	Cable assembly, 8-pos'n. molded	BC13K-10
17-02797-01	Cable assembly, 25-pos'n. male D subminiature to 8-pos'n.	BC13G-04
17-02798-01	Cable assembly, 25-pos'n. female D subminiature to 8-pos'n.	BC13H-04
12-33190-01	Connector/adapter, 25-pos'n.	H8751-K
30-34761-01	VRC16 color monitor (no power cord)	VRC16-D3
30-34761-02	VRC16 color monitor	VRC16-D4
30-34761-03	VRC16 video cable	BC13L-10
29-29049-01	VRC16 tilt and swivel base	

(continued on next page)

Table 9–1 (Cont.) applicationDEC 433MP Field Replaceable Units

Part Number	FRU	Order Number
	Miscellaneous Parts	
00-H8571-J	Adapter for MMJ connector	
11-17373-00	Green LED assembly	
12-30552-01	SCSI terminator, 50-pos'n.	
12-23609-11	4.5-inch system fan	
12-33816-01	Terminator	
12-32905-3A	Low-profile jumper, 8-pos'n., 2 x 4	
12-17119-01	Plastic key	
12-31734-01	209/426 MB disk drive mounting grommets	
74-41364-02	426 MB disk drive stiffener bracket	
17-02866-01	SCSI cable assembly, 50-cond., 1.2 ft	
17-02866-02	SCSI round cable, 50-pos'n.	
17-02963-01	SCSI cable	
17-02983-01	50-pin flat cable, 1.2 ft	
17-02985-01	34-pin 5.25-inch diskette drive cable, 2.7 ft	
21-33453-02	80486 microprocessor, 33 MHz	
36-35153-01	Configuration label	
70-26625-01	Speaker assembly	
70-26605-01	Power wire assembly	
70-26613-01	Front panel assembly	
70-26614-01	Rear panel assembly	
70-26615-01	Top cover assembly	
70-26616-01	Side panel assembly	
70-26617-01	Module cover assembly	
70-26618-01	Brake assembly	
70-26623-01	Contact plate cover assembly	
74-41424-01	3.5-inch diskette drive mounting bracket	
74-41425-01	5.25-inch diskette drive mounting bracket	
74-41422-01	CD-ROM drive mounting bracket	
74-41423-01	Hard disk drive mounting bracket	
74-41434-01	Fan spacer	
74-41445-01	Module guide	
74-41861-01	Duct cover, backplane	
74-42113-01	Power supply lock	
74-42132-01	Holder, SCSI terminator	

(continued on next page)

Table 9–1 (Cont.) applicationDEC 433MP Field Replaceable Units

Part Number	FRU	Order Number
	PC Keyboard	
	USA	PCXAL-AA
	Belgium	PCXAL-AB
	Denmark	PCXAL-AD
	UK/Ireland	PCXAL-AE
	Germany	PCXAL-AG
	Italy	PCXAL-AI
	Norway	PCXAL-AN
	France	PCXAL-AP
	Spain	PCXAL-AS
	Israel	PCXAL-AT
	Portugual	PCXAL-AV
	Finland/Sweden	PCXAL-CA
	Switzerland (French/German)	PCXAL-CH

9.2 Special Tools

Table 9–2 lists the special tools required to service the applicationDEC 433MP system.

Table 9–2 applicationDEC 433MP Special Tools

Number	Tool
30-23507-03	CD-ROM test disk
QZ-K43AA-FC	EISA configuration utility (ECU) kit (DIGITAL ECU FOR appDEC 433MP FIELD KIT)
AK-PJW2A-CA	EISA configuration utility diskette #1 (appDEC 433MP ECU SYS CFG V2.0)
AK-PLADA-CA	EISA configuration utility diskette #2 (LIBRARY DISK OF ISA CFG FILES)
AK-PGV7A-CA	System exerciser diagnostics diskette
29-29054-01	3.5-inch driver/diagnostic diskettes (3)
FD-10164-00	Loopback, serial port 9-pin

9.3 Precautionary Steps

Before you open the system cabinet, shut the system down:

1. Notify users to log off (if a multiuser system).
2. Type **shutdown** on the system console. This command closes all open files and prepares hard disk drives and other hardware for loss of power.
3. Remove any diskettes from the diskette drives. (If you leave a diskette in the drive, the system will try to boot from the diskette drive when power is reapplied to the system.)
4. Remove power from the system by turning the ON/OFF switch to the OFF (O) position.
5. Unplug the power cord from the wall socket.

Caution

Before you remove or install any option in the applicationDEC 433MP system, make sure that the operating system has been halted with the **shutdown** command and that power is removed from the system.

9.4 Opening the System Cabinet

To add a module to the backplane, it is necessary to:

1. Remove the top cover.
2. Remove the left side panel.
3. Remove the card cage door.

To add a storage or media device to the system, it is necessary to:

1. Remove the top cover.
2. Remove the right side panel. (If installing a QIC tape drive or 3.5-inch diskette drive, it may not be necessary to remove the side panel.)

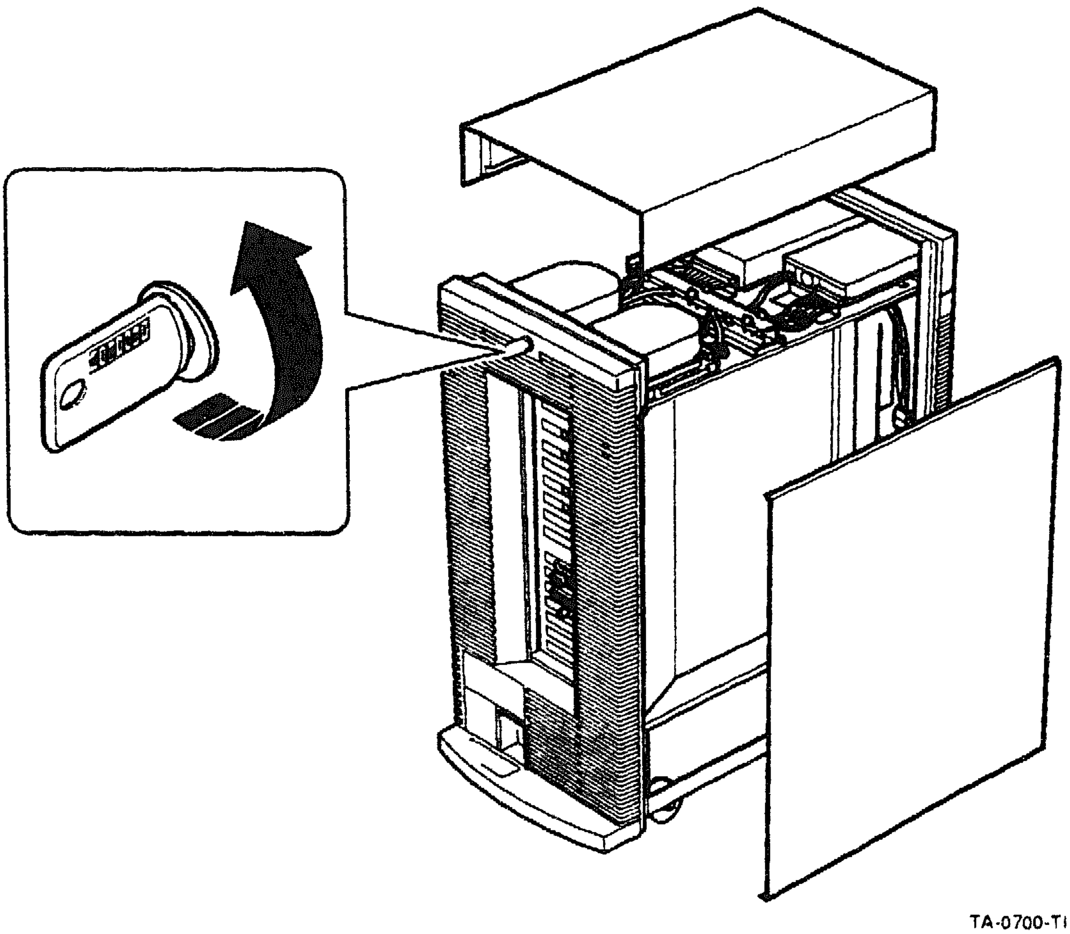
To replace the power supply, it is necessary to remove the rear bezel (Section 9.6).

9.4.1 Top Cover and Side Panels

The top cover and side panels are easily removed (Figure 9–1) as follows:

1. Unplug the power cord.
2. Insert the system key and turn it fully to the left. This unlocks the top cover.
3. Remove the top cover by lifting it straight up.
4. Remove the side panels by lifting them up and away from the system.

Figure 9–1 Top Cover and Side Panel Removal



Reverse the above procedure to install the top cover or side panels.

9.4.2 Card Cage Door

To gain access to the backplane, you must remove the card cage door. Figure 9–2 illustrates the following steps:

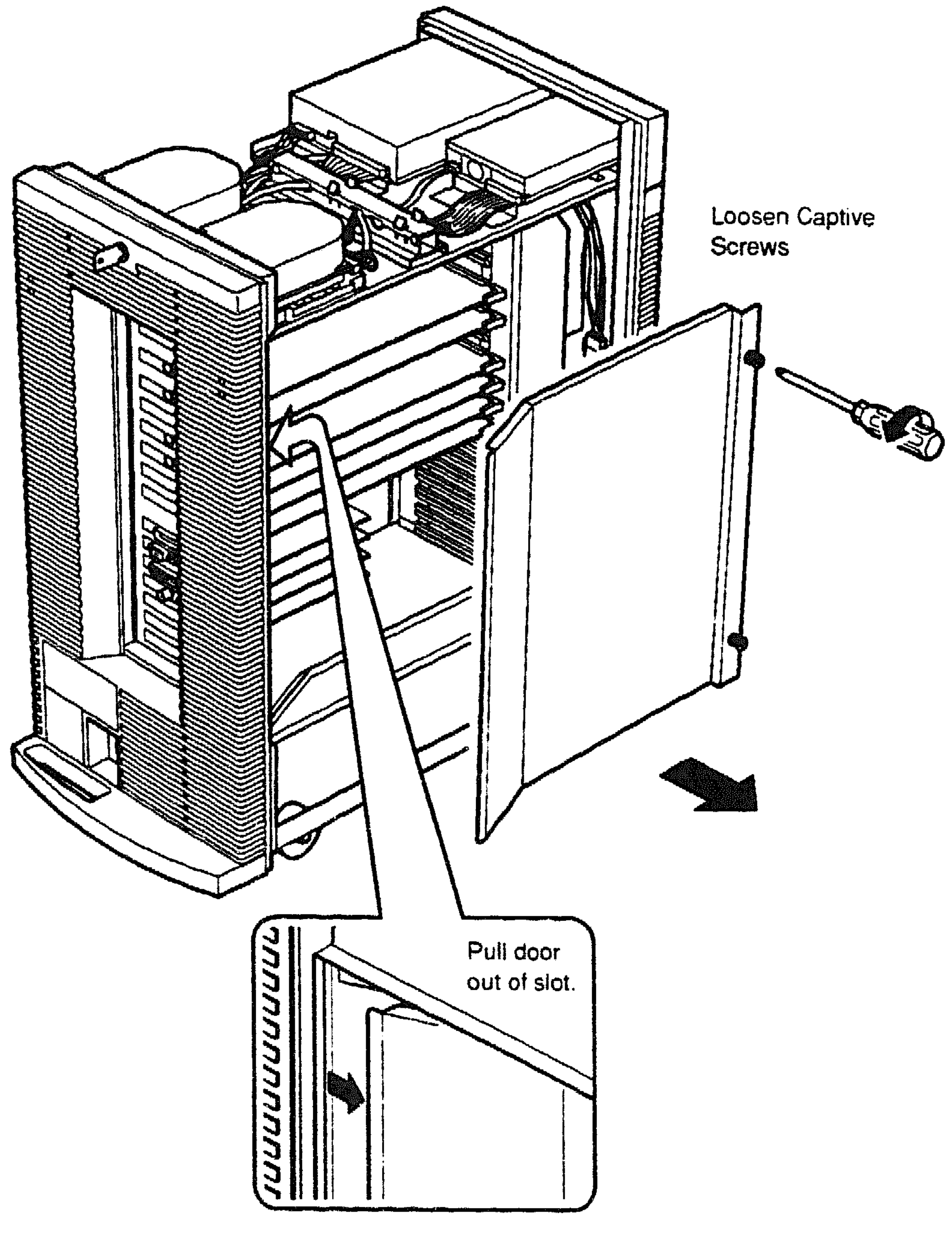
1. Loosen the two captive screws on the right side of the door.
2. Pull the right side of the door open slightly.
3. Pull the door out of the slot in the left side of the chassis.

Reverse the above steps to replace the card cage door.

Note

When you replace the card cage door, make sure that the door is seated in the retaining slot before you tighten the captive screws.

Figure 9–2 Card Cage Door Removal



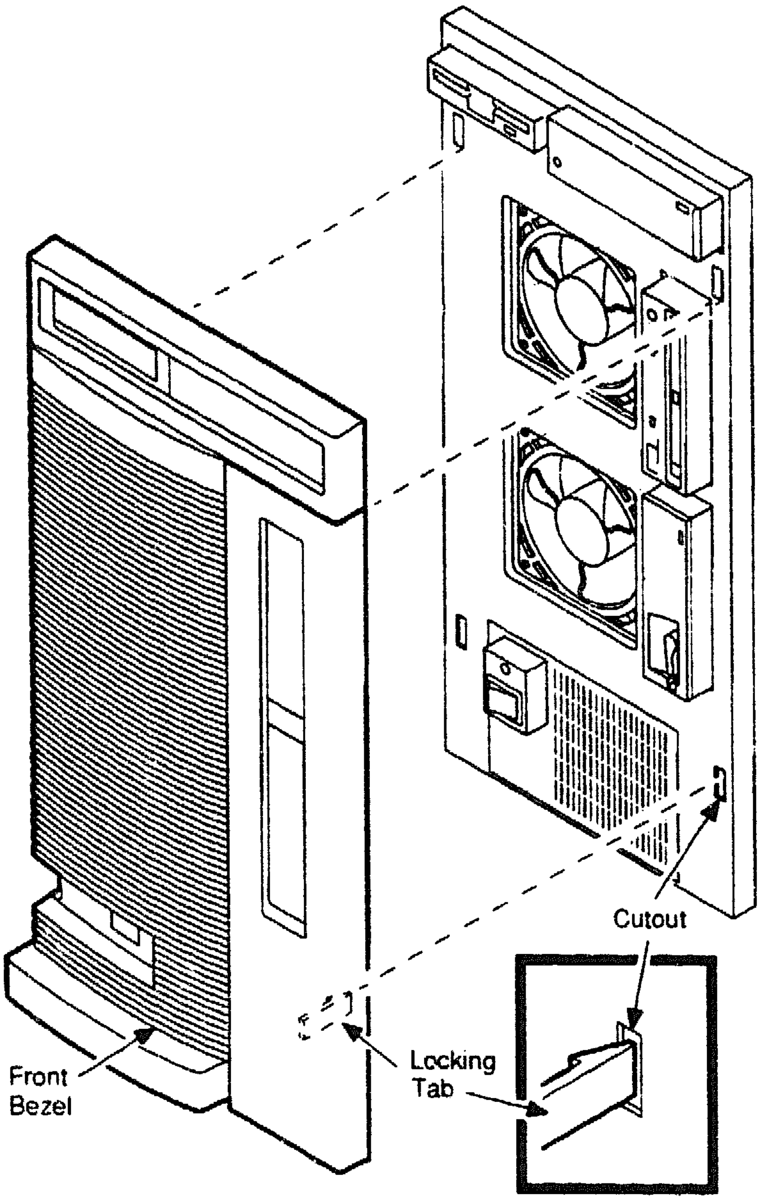
9.5 Front Bezel

The front bezel has four flexible, wedge-shaped locking tabs that snap into matching cutouts on the system cabinet (Figure 9–3). There are no retaining screws. Remove the front bezel as follows:

1. Unplug the power cord.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Reach behind the bezel to locate the top two locking tabs. While pressing the tabs, pull the top of the bezel away from the system cabinet.
4. Reach behind the bezel to locate the bottom two locking tabs. While pressing the tabs, remove the bezel.

To replace the bezel, hold it in position against the system cabinet and push until it locks. Alignment pins on the bezel help to guide it into position.

Figure 9–3 Front Bezel Removal



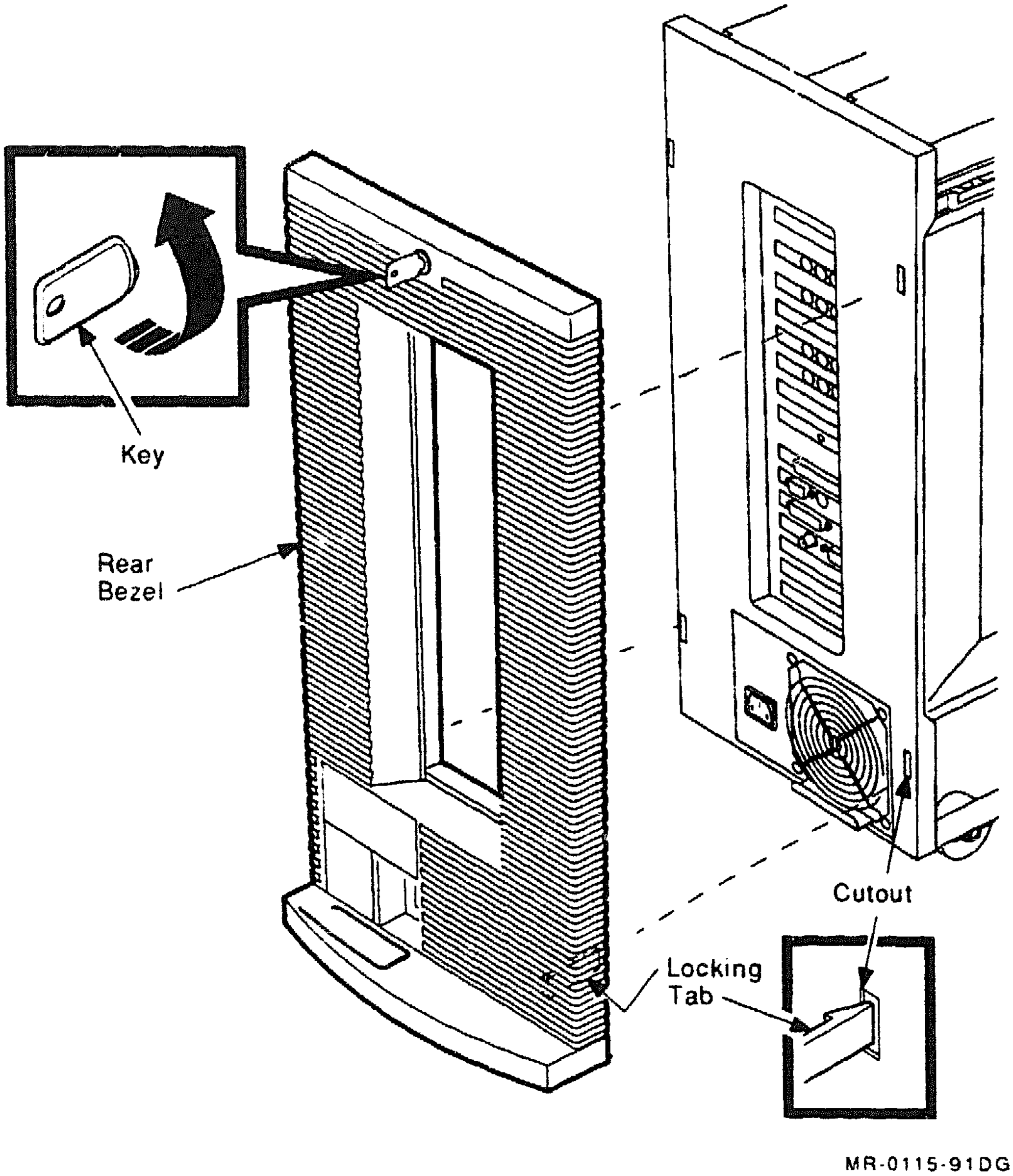
9.6 Rear Bezel

The rear bezel has four flexible, wedge-shaped locking tabs that snap into matching cutouts on the system cabinet (Figure 9–4). Remove the bezel as follows:

1. Unplug the power cord.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Remove the card cage door, as described in Section 9.4.2.
4. Reach behind the bezel to locate the top two locking tabs. While pressing the tabs, pull the top of the bezel away from the system cabinet.
5. Reach behind the bezel to locate the bottom two locking tabs. While pressing the tabs, remove the bezel.

To replace the bezel, hold it in position against the system cabinet and push until it locks. Alignment pins on the bezel help to guide it into position.

Figure 9–4 Rear Bezel Removal



9.7 System Bus Modules

Remove a system bus module as follows. See Figure 9–5.

Caution

Electrostatic discharge (ESD) can damage integrated circuits and circuit modules. To prevent costly ESD damage, handle the modules by their finger grips and wear an antistatic wrist strap attached to chassis ground.

---

1. Disconnect any external cables attached to the module or distribution panel.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Remove the card cage door, as described in Section 9.4.2.
4. Loosen the captive screw on the module's distribution panel. (This screw holds the panel to the chassis.) Reverse the instructions in Figure 9–5.
5. Hold the module by the finger grips and pull the module out of the backplane slot.

Install a system bus module as follows. See Figure 9–5.

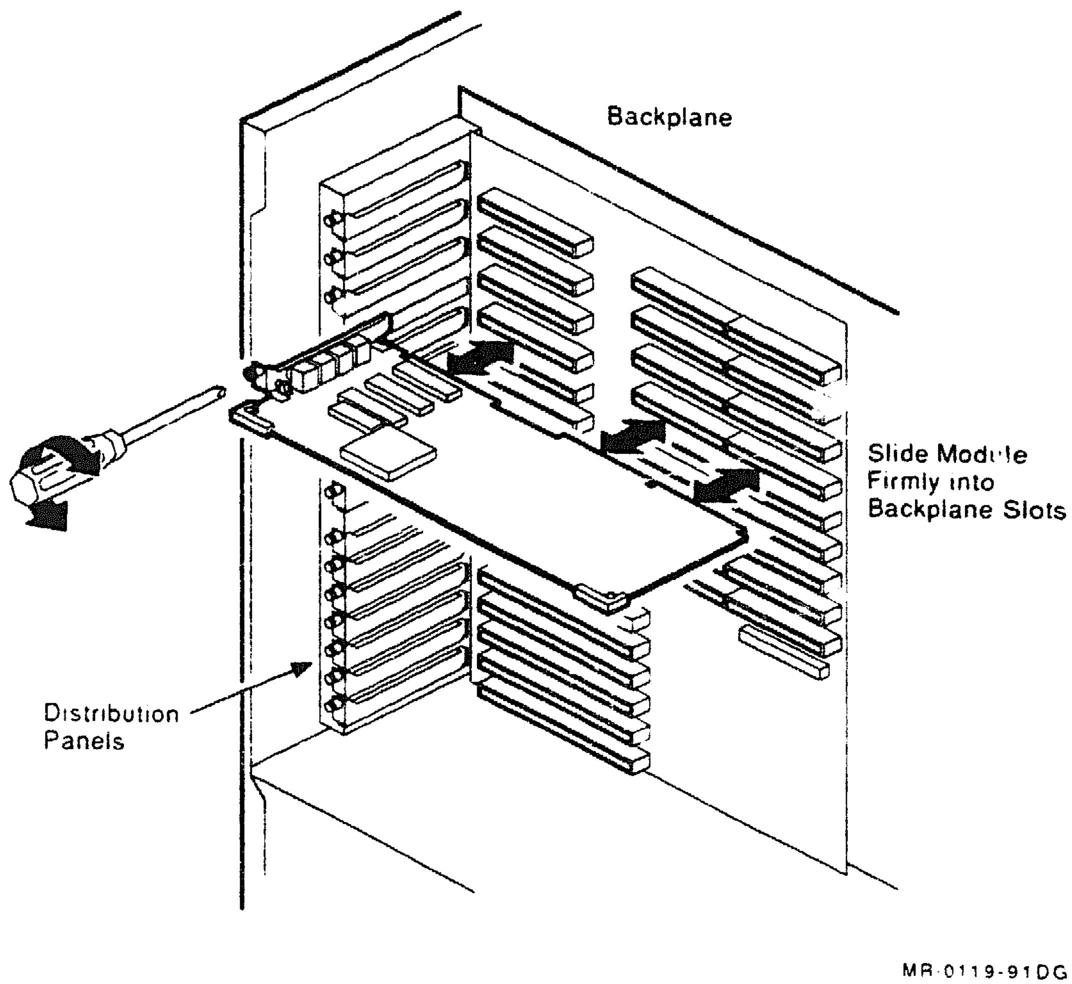
1. Remove the blank distribution panel, if present, by loosening the captive screw holding the panel to the chassis.

   The blank distribution panel will not be reused. (Save the distribution panel for future use if the module is ever removed.)
2. Hold the module by the finger grips and slide the module into the backplane slot with the component side facing up. Make sure that the fingers of the module are fully inserted into the backplane slot.
3. Align the module's distribution panel with the screw hole in the chassis and tighten the captive screw.
4. Replace the card cage door and install the top cover and side panels before applying power to the system.

Caution

Because system bus modules must be inserted in certain slots, the backplane receptacles are keyed. Make certain that the system bus slot is correct for the module. If you encounter resistance installing a system bus module, double check that the slot is correct. If you attempt to install a system bus module in an incorrect slot, you may damage the module.

Figure 9-5 System Bus Module Installation and Removal



9.8 ISA or EISA Module

Remove an ISA or EISA module as follows. See Figure 9–6.

1. Remove the top cover and side panels, as described in Section 9.4.1.
2. Remove the card cage door, as described in Section 9.4.2.
3. Remove the screw on the module's distribution panel. (This screw holds the panel to the chassis.)
4. Hold the module by the finger grips and pull the module out of the backplane slot. See Figure 9–6.

You can install ISA or EISA modules in any EISA slot in the backplane. Install ISA or EISA modules as follows. See Figure 9–6.

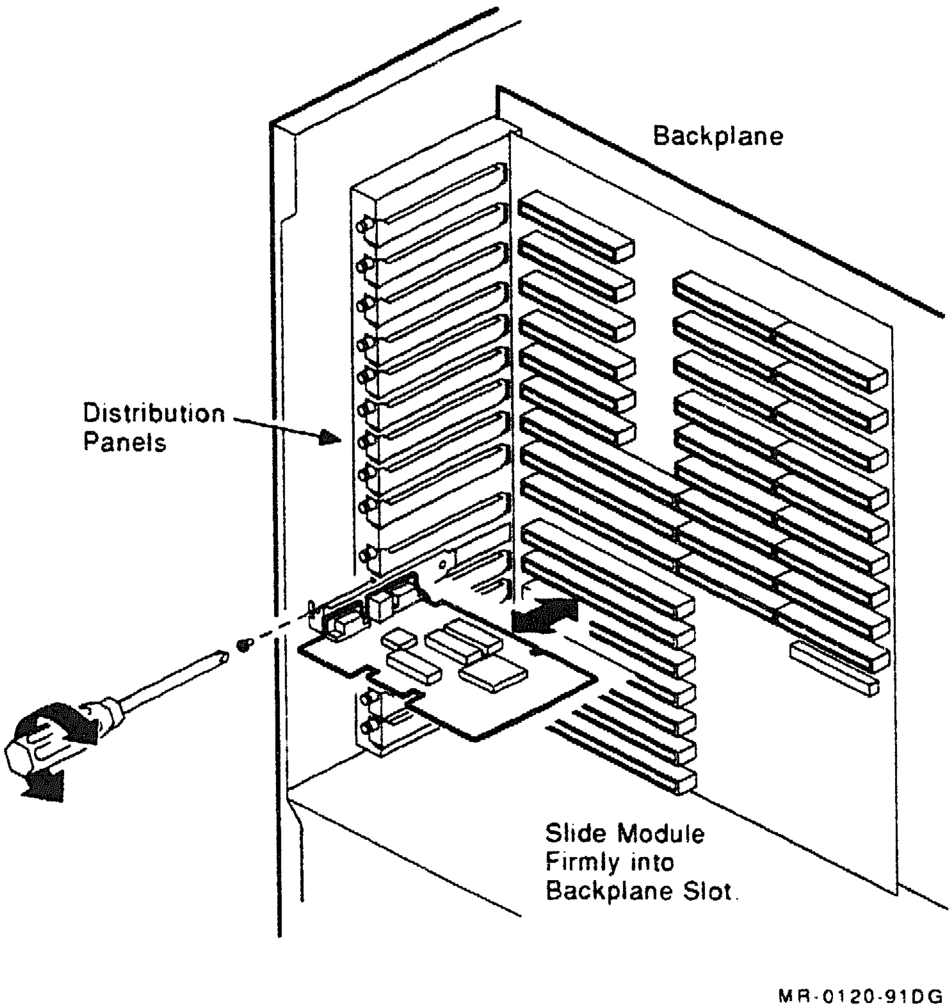
1. Remove the blank distribution panel, if present, by removing the screw holding the panel to the chassis. Be careful not to drop the screw onto a module as it is removed from the chassis. Save the screw.

   The blank distribution panel will not be reused. (Save the distribution panel for future use if the module is ever removed.)
2. Slide the module into the backplane slot with the component side facing up. Make sure that the fingers of the module are fully inserted into the backplane slot.
3. Align the module's distribution panel with the screw hole in the chassis and insert the screw saved from step 1.
4. Replace the card cage door and install the top cover and side panels before applying power to the system.

Note

All connections to modules installed in the backplane are made through the distribution panels in the back of the system cabinet. The distribution panels are part of each module.

Figure 9–6 EISA Bus Module Installation and Removal



9.9 Base Processor Module

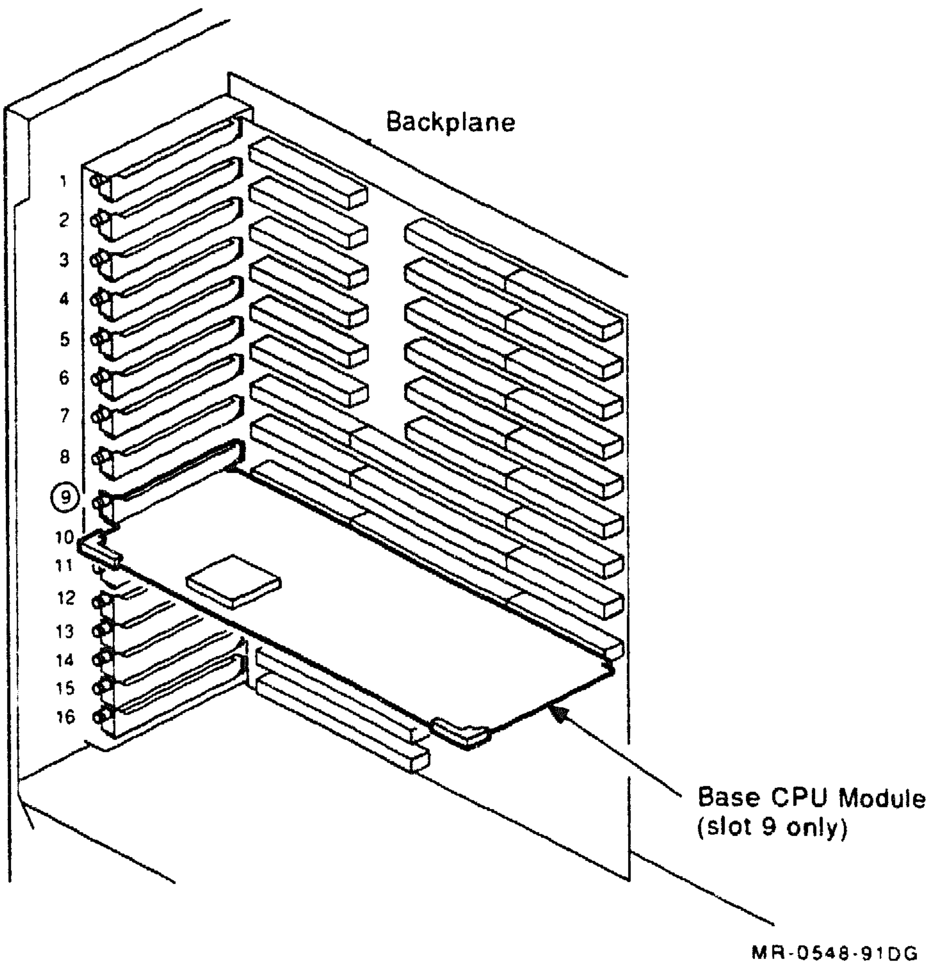
Remove the base processor module as follows:

1. Remove the top cover and left side panel, as described in Section 9.4.1.
2. Remove the card cage door, as described in Section 9.4.2.
3. Remove the module. Removal of a system bus module is described in Section 9.7.

Replace the base processor module as follows:

1. Install the module in backplane slot 9. (See Figure 9–7.) Installation of a system bus module is described in Section 9.7.
2. Close the system by replacing the card cage door and the side panel and top cover.

Figure 9–7 Base Processor Module Removal



9.10 Bridge Module

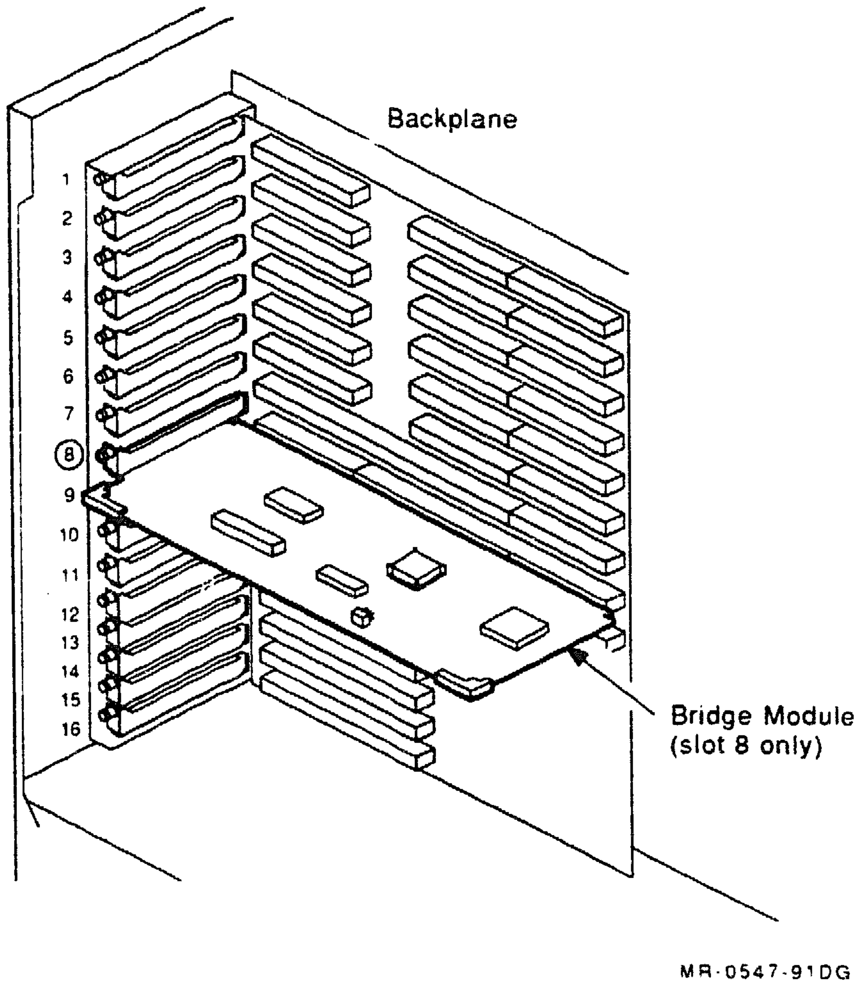
Remove the bridge module as follows:

1. Remove the module. Removal of a system bus module is described in Section 9.7.

Replace the bridge module as follows:

1. Set jumper J11 as it was set on the failed module. This jumper designates which diskette drive is the boot drive. See Section 2.4.3.
2. Install the module in backplane slot 8. (See Figure 9–8.) Installation of a system bus module is described in Section 9.7.
3. Close the system by replacing the card cage door and the side panels and top cover.

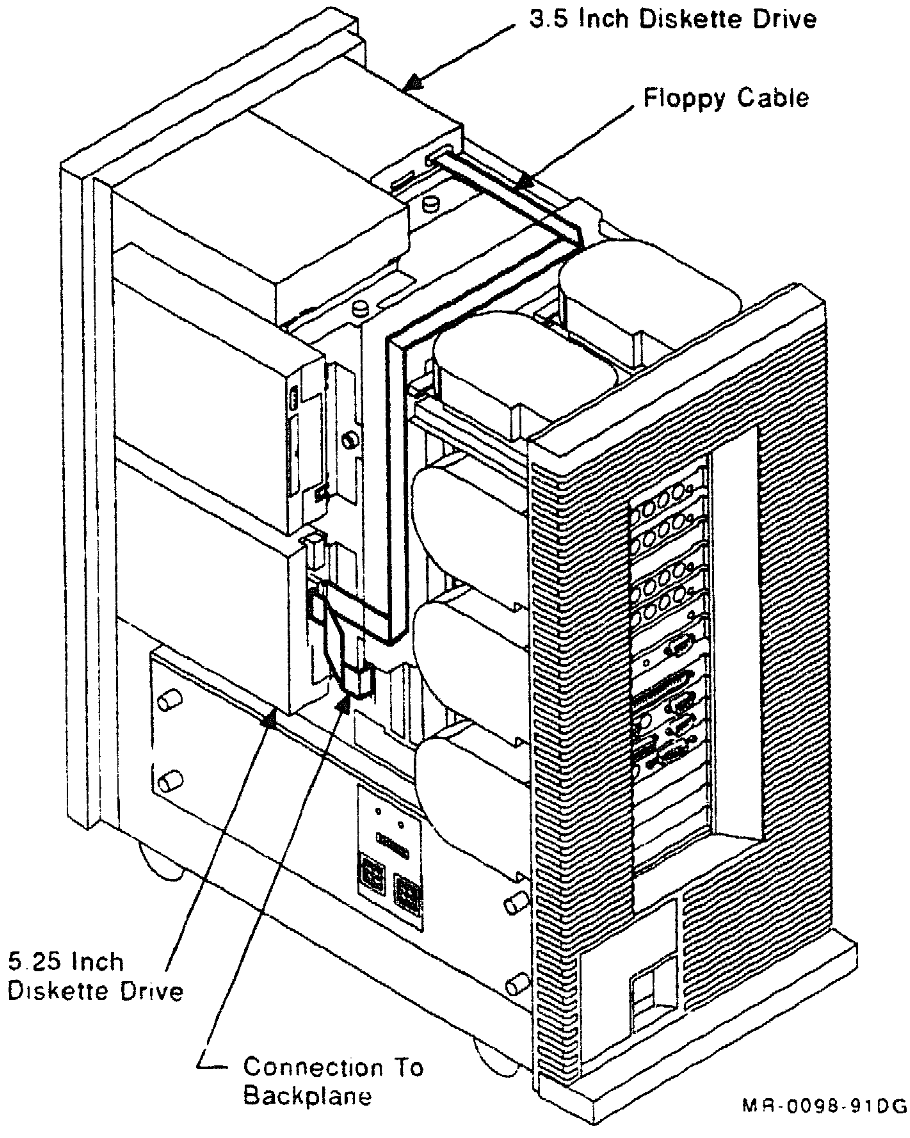
Figure 9–8 Bridge Module R...noval



9.11 Diskette Cable

The bridge module also controls the 1.44 MB 3.5-inch diskette drive and the 1.2 MB 5.25-inch diskette drives. The cable connecting the module to the diskette drives is factory installed as part of the cable harness. Figure 9–9 illustrates this cable in the cable harness.

Figure 9–9 Diskette Cabling from Bridge Module to Cable Duct

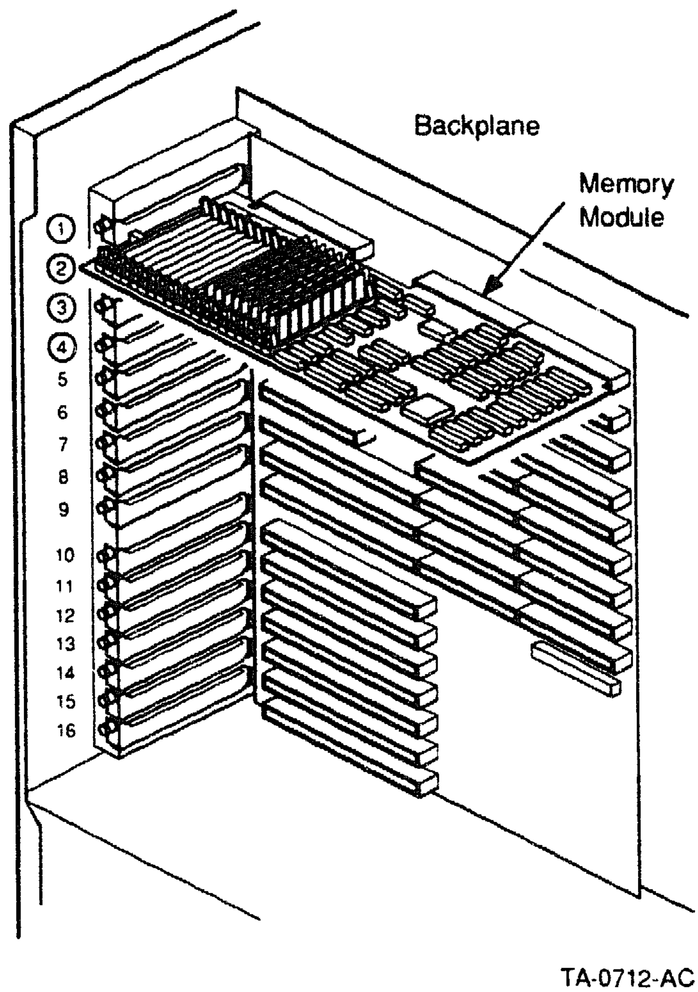


9.12 Memory Module

Remove a memory module as follows:

1. Remove the top cover and left side panel, as described in Section 9.4.1.
2. Remove the card cage door as described in Section 9.4.2.
3. Locate the memory module in backplane slot 1, 2, 3, or 4, as shown in Figure 9–10.

Figure 9–10 Memory Module Backplane Locations



4. Remove the module. Removal of a system bus module is described in Section 9.7.

Replace a memory module as follows:

1. Install any additional SIMMs. See Section 9.13. (Option level memory modules are shipped with no SIMMs installed.)
2. Install the module. Installation of a system bus module is described in Section 9.7.

   Memory modules must be installed in the top four slots of the backplane. These are slots 1, 2, 3, and 4, as shown in Figure 9–10. Memory modules should be installed sequentially starting from the top slot. The first memory module is in slot 1, the second in slot 2, the third in slot 3, and a fourth in slot 4.
3. Replace the card cage door, the top cover, and the side panel.

9.13 SIMMs

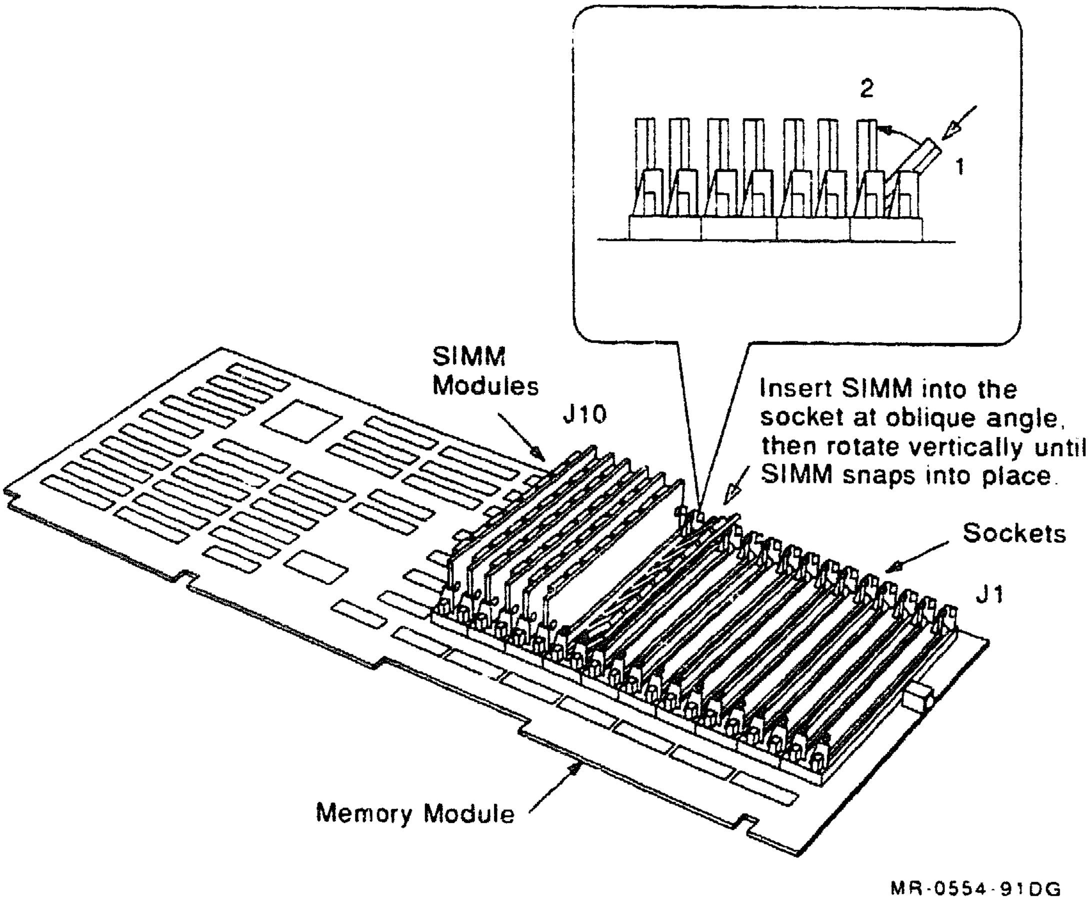
A SIMM is removed by pulling back the two tabs at either end, tilting the SIMM back, and pulling it out of its slot. You must remove all the SIMMs in the lower numbered slots before you can remove the identified SIMM. For example, if you have a failed SIMM in slot 18, you must remove the SIMMs in slots 17, 16, 15, and so on, before you can remove the SIMM in slot 18.

Caution

Be careful when you pull back the SIMM tabs. They are fragile.

SIMMs are installed in slots in the memory module. SIMMs must be inserted in the module as shown in Figure 9–11. SIMMs must be inserted sequentially starting with slot J10 and descending to J1. There must be no empty slots between SIMMs.

Figure 9–11 SIMM Installation



9.14 CPU/SIO Module

Remove the CPU/SIO module as follows:

1. Remove the top cover and left side panel, as described in Section 9.4.1.
2. Remove the card cage door, as described in Section 9.4.2.
3. Locate the CPU/SIO module in backplane slot 5, 6, or 7, as shown in Figure 9–12.
4. Disconnect any terminal concentrators that are connected to the CPU/SIO terminal multiplexer ports.
5. Remove the module. Removal of a system bus module is described in Section 9.7.

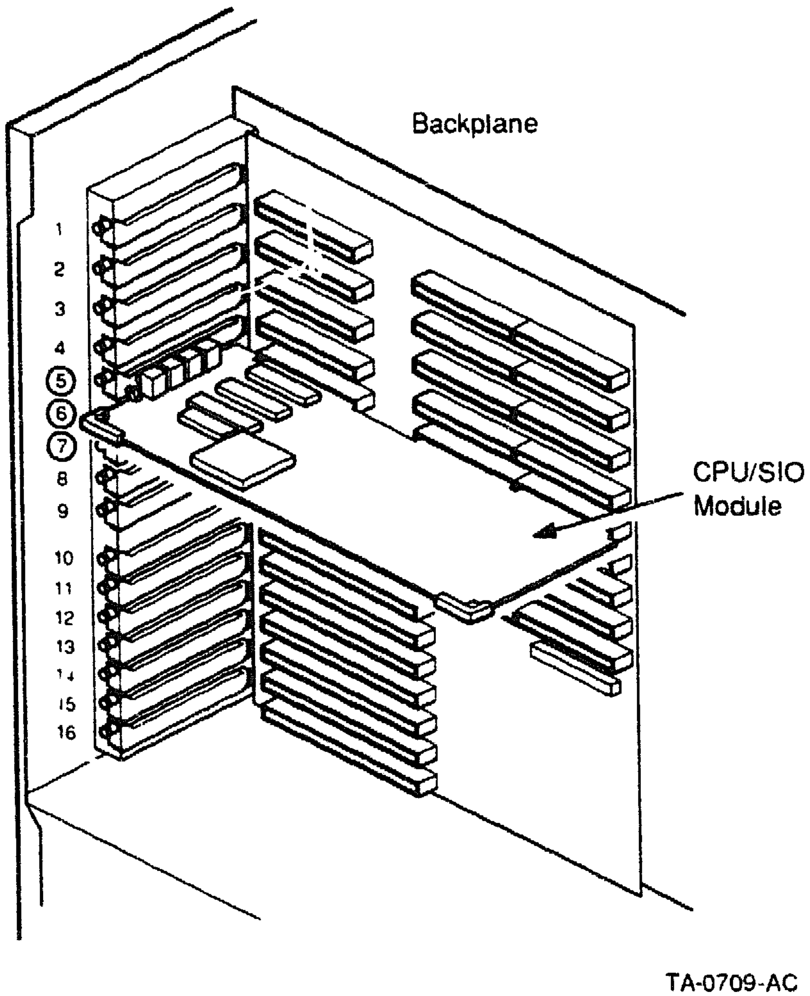
Replace the CPU/SIO module as follows:

1. Install the module. Installation of a system bus module is described in Section 9.7.

   CPU/SIO modules must be installed in backplane slots 5, 6, or 7, as shown in Figure 9–12.
2. Replace the card cage door, the top cover, and the side panel.
3. Connect any terminal concentrators to the CPU/SIO terminal multiplexer ports.

For each CPU/SIO module installed in the system, you must install one copy of SCO MPX. Refer to the *SCO MPX Release Notes and Installation Guide* for information on how to define the terminal devices used on the CPU/SIO module and for details on how to install SCO MPX.

Figure 9–12 CPU/SIO Module Backplane Locations



9.15 CPU/SCSI Module

Remove the CPU/SCSI module as follows:

1. Remove the top cover and left side panel, as described in Section 9.4.1.
2. Remove the card cage door, as described in Section 9.4.2.
3. Locate the failed module. Slot 5 is for control of the internal SCSI bus in a dual SCSI system. Slot 6 is for control of the external SCSI bus only. See Figure 9–13.
4. Disconnect the external storage expansion box or remove the terminators from the module's external connector.

   Table 9–3 summarizes the slots for the CPU/SCSI module.

Table 9–3 CPU/SCSI System Bus Slot Locations

Slot	Use
5	Adapter for internal SCSI bus, and external, if desired.
6	Adapter for external connections only.

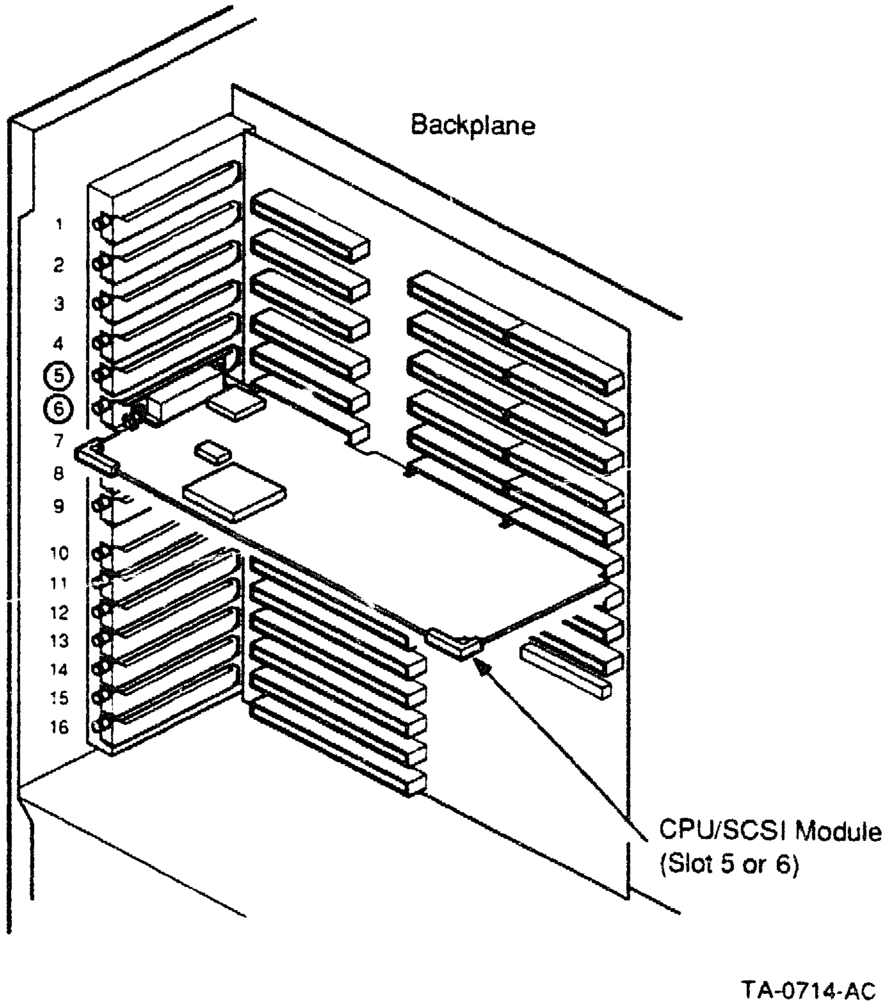
5. Remove the module. Removal of a system bus module is described in Section 9.7.

Replace the CPU/SCSI module as follows:

1. Install the CPU/SCSI module into backplane slot 5 or 6. Installation of a system bus module is described in Section 9.7.

   Slot 5 is for control of the internal SCSI bus in a dual SCSI system. Slot 6 is for control of the external SCSI bus only. See Figure 9–13.
2. Connect the storage expansion box cables or install the terminators on the module's external connector.

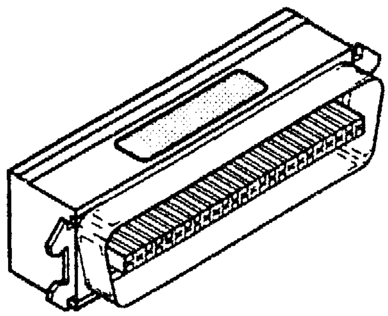
Figure 9–13 CPU/SCSI Backplane Location



9.15.1 Terminator

The CPU/SCSI module has an external connector for attachment of additional SCSI devices. When external devices are not connected, a SCSI terminator (H8574-A) must be installed on this connector to terminate the SCSI bus. Figure 9–14 shows the terminator needed.

Figure 9–14 SCSI Terminator

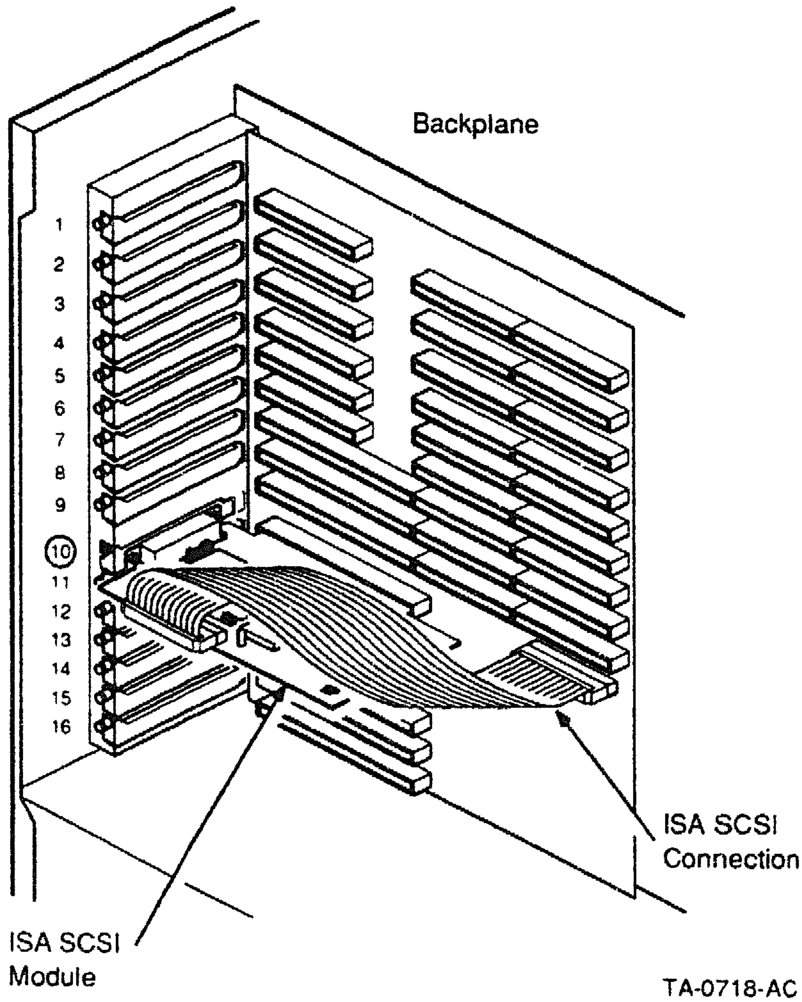


9.16 ISA SCSI Host Adapter

Remove the ISA SCSI host adapter as follows:

1. Remove the top cover and left side panel, as described in Section 9.4.1.
2. Remove the card cage door, as described in Section 9.4.2.
3. Locate the ISA SCSI host adapter in backplane slot 10, the top ISA backplane slot. It is below the base processor module, as shown in Figure 9–15.

Figure 9–15 ISA SCSI Adapter Installation and Cabling



4. Disconnect any devices attached to the ISA SCSI host adapter.
5. Disconnect the ribbon cable that connects the ISA SCSI host adapter to the backplane. Figure 9–15 shows this connection.
6. Hold the module by the finger grips and pull the module out of the backplane slot. See Figure 9–6.

Replace the ISA SCSI host adapter as follows:

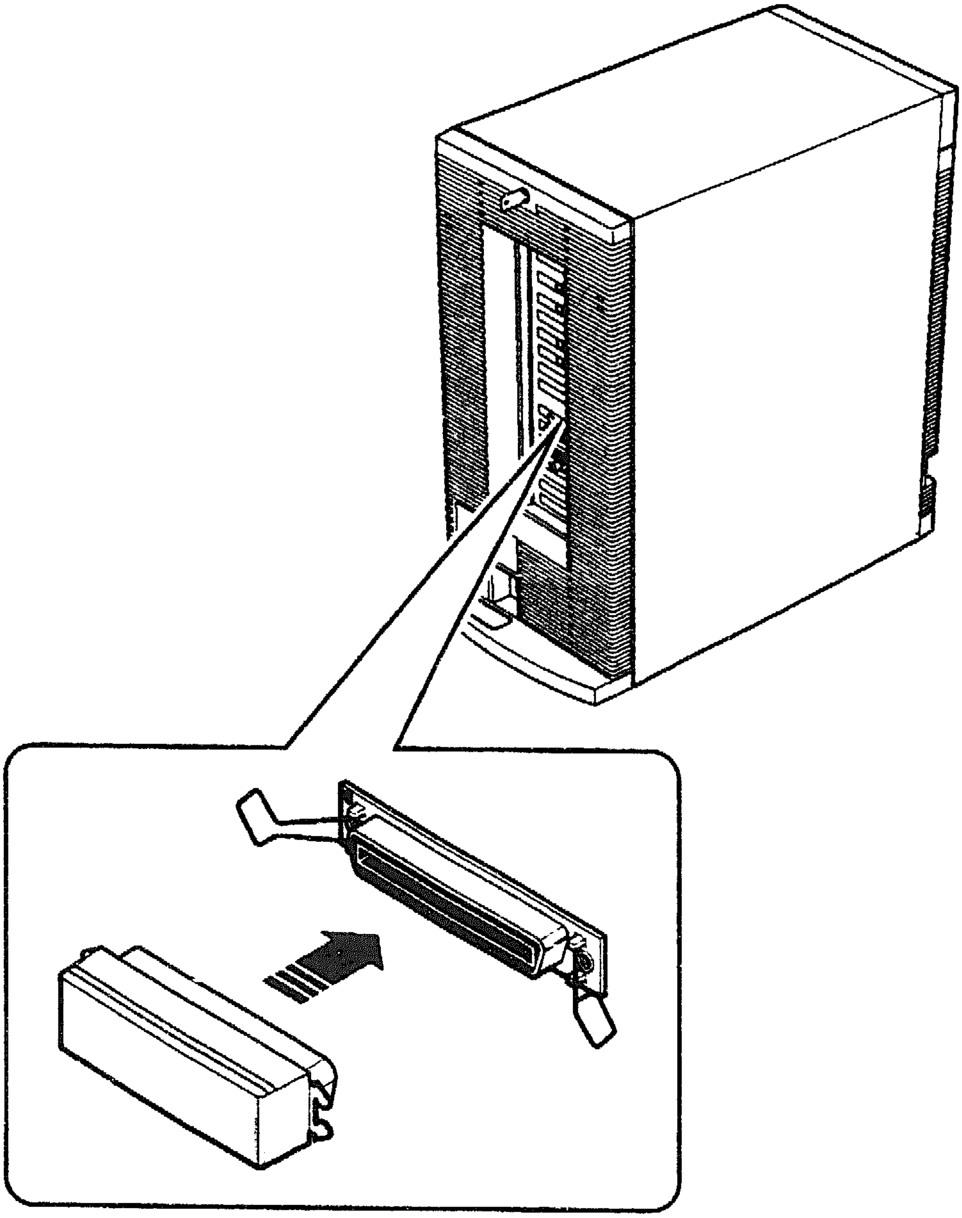
1. Remove the blank distribution panel, if present, by removing the screw holding the panel to the chassis. Be careful not to drop the screw onto a module as it is removed from the chassis. Save the screw.

   The blank distribution panel will not be reused. (Save the distribution panel for future use if the module is ever removed.)
2. Slide the module into the backplane slot with the component side facing up. Make sure that the fingers of the module are fully inserted into the backplane slot.
3. Align the module's distribution panel with the screw hole in the chassis and insert the screw saved from step 1.
4. Replace the card cage door and install the top cover and side panels before applying power to the system.

9.16.1 Terminator

The ISA SCSI adapter has an external connector on it for attaching additional SCSI devices. When external devices are not connected, an H8574-A SCSI terminator must be installed on this connector to terminate the SCSI bus. Figure 9–16 shows how to install the terminator.

Figure 9–16 SCSI Terminator Installed on External Connector



9.17 Serial/Parallel Adapter

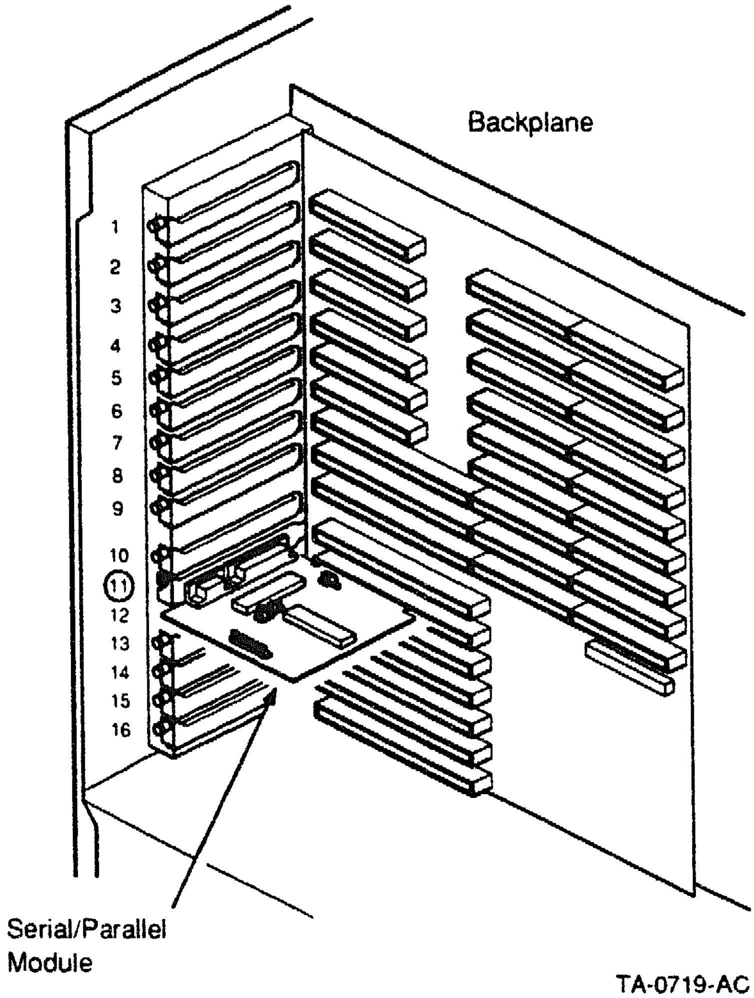
Remove the serial/parallel adapter as follows:

1. Remove the top cover and left side panel, as described in Section 9.4.1.
2. Remove the card cage door, as described in Section 9.4.2.
3. Locate the serial/parallel adapter in backplane slot 11, as shown in Figure 9–17.
4. Disconnect any cables attached to the serial or parallel ports. There are no internal cables or other connections to the module.
5. Remove the module. Removal of an ISA or EISA module is described in Section 9.8.

Replace the serial/parallel adapter as follows:

1. Set the adapter jumpers as they were set on the failed module.
2. Install the adapter in backplane slot 11. (See Figure 9–17.) Installation of an ISA or EISA module is described in Section 9.8.
3. Close the system by replacing the card cage door and the side panels and top cover.
4. Reconnect any cables that were attached to the serial or parallel ports.

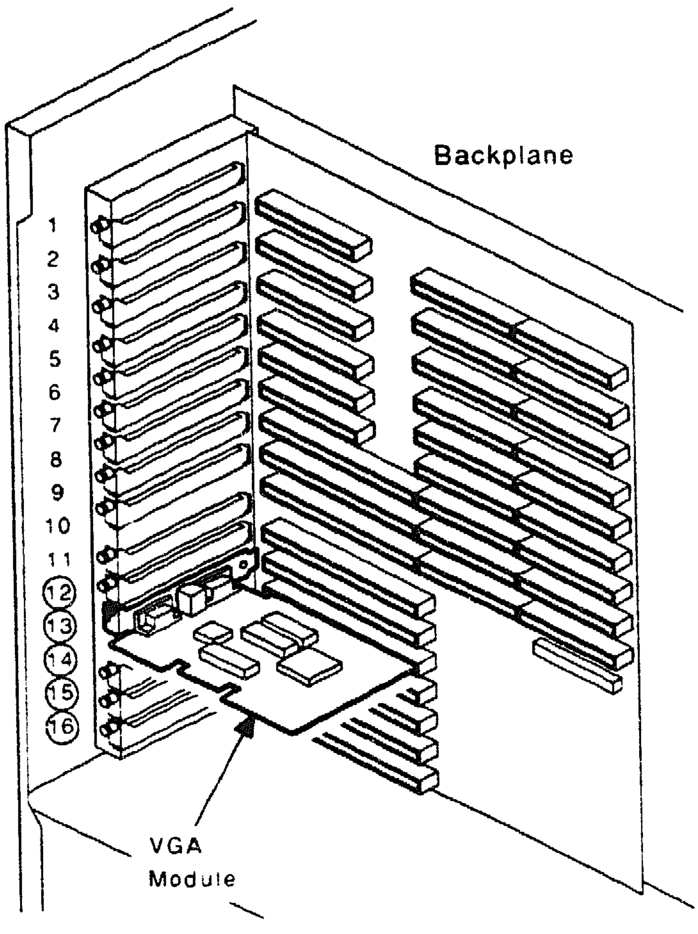
Figure 9–17 Serial/Parallel Adapter Installation



9.18 Video Graphics Adapter (VGA)

The VGA module is located in an EISA bus backplane slot. See Figure 9–18 and Table 2–1.

Figure 9–18 Video Graphics Adapter Backplane Location

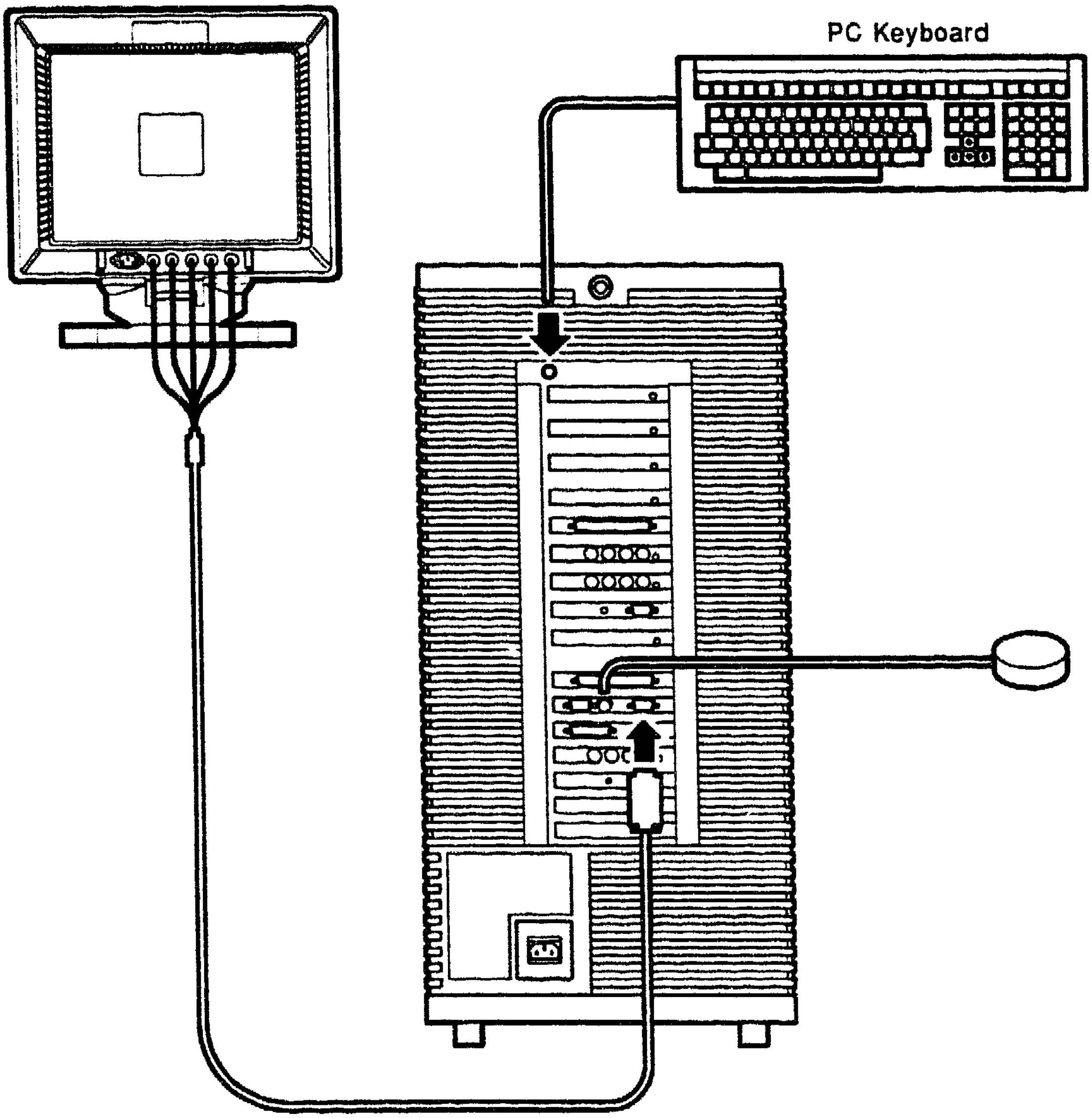


Remove the VGA as follows:

1. Disconnect the VGA monitor and mouse. Connections are shown in Figure 9–19.
2. Remove the top cover and left side panel, as described in Section 9.4.1.
3. Remove the card cage door, as described in Section 9.4.2.

4. Remove the module. Removal of an ISA or EISA module is described in Section 9.8.

Figure 9–19 Connecting a VRC16 VGA Monitor



Replace the VGA as follows:

1. Install the module. Installation of an ISA or EISA module is described in Section 9.8.

The VGA must be installed in an EISA bus backplane slot. See Figure 9–18 and Table 2–1.

2. Replace the card cage door, the top cover, and the side panel.
3. Connect the VGA monitor and mouse. Connections are shown in Figure 9–19.

9.19 Terminal Multiplexer Host Adapter

The terminal multiplexer host adapter is located in an EISA bus backplane slot. See Figure 9–20.

Remove the terminal multiplexer host adapter as follows:

1. Disconnect any terminal concentrator attached to the terminal multiplexer host adapter.
2. Remove the top cover and left side panel, as described in Section 9.4.1.
3. Remove the card cage door, as described in Section 9.4.2.
4. Remove the module. Removal of an ISA or EISA module is described in Section 9.8.

Install the terminal multiplexer host adapter as follows:

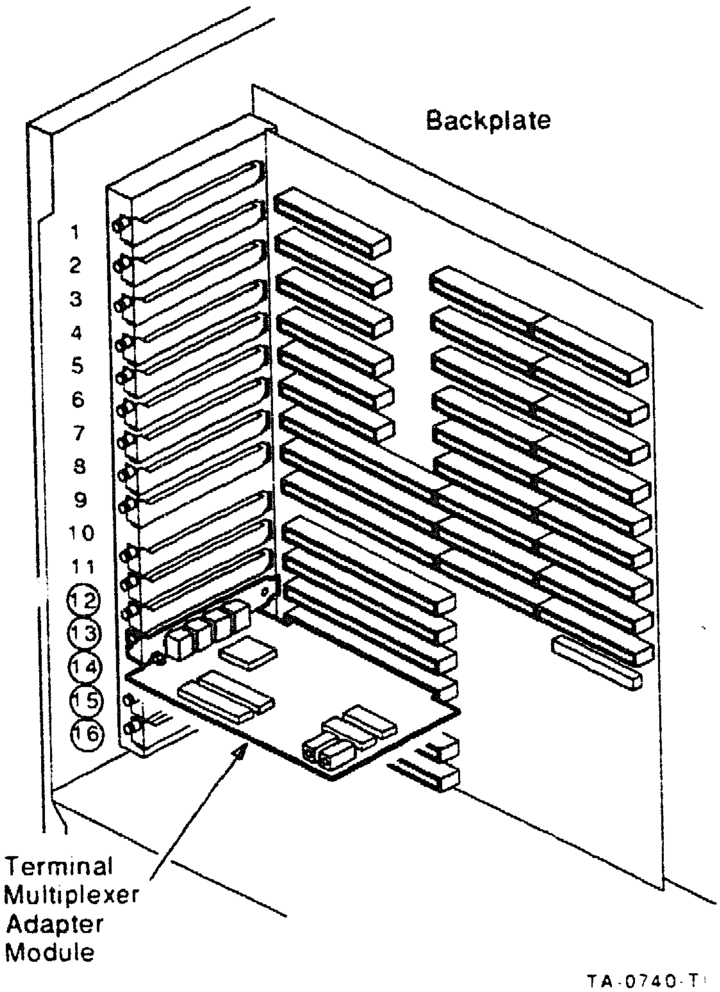
1. Remove the blank distribution panel, if present, by removing the screw holding the panel to the chassis. Be careful not to drop the screw onto a module as it is removed from the chassis. Save the screw.

   The blank distribution panel will not be reused. (Save the distribution panel for future use if the module is ever removed.)
2. Set the terminal multiplexer host adapter address. The first terminal multiplexer should be set to E1; the second should be set to E2. For more information about the terminal multiplexer, see Section 2.11.
3. Install the terminal multiplexer host adapter in the same slot as the failed terminal multiplexer host adapter.

   Slide the module into the backplane slot with the component side facing up. Make sure that the fingers of the module are fully inserted into the backplane slot.
4. Align the module's distribution panel with the screw hole in the chassis and insert the screw saved from step 1.

5. Connect any terminal concentrator that was attached to the failed terminal multiplexer host adapter.

Figure 9–20 Terminal Multiplexer Host Adapter Backplane Location



9.20 SCSI Hard Disk Drives

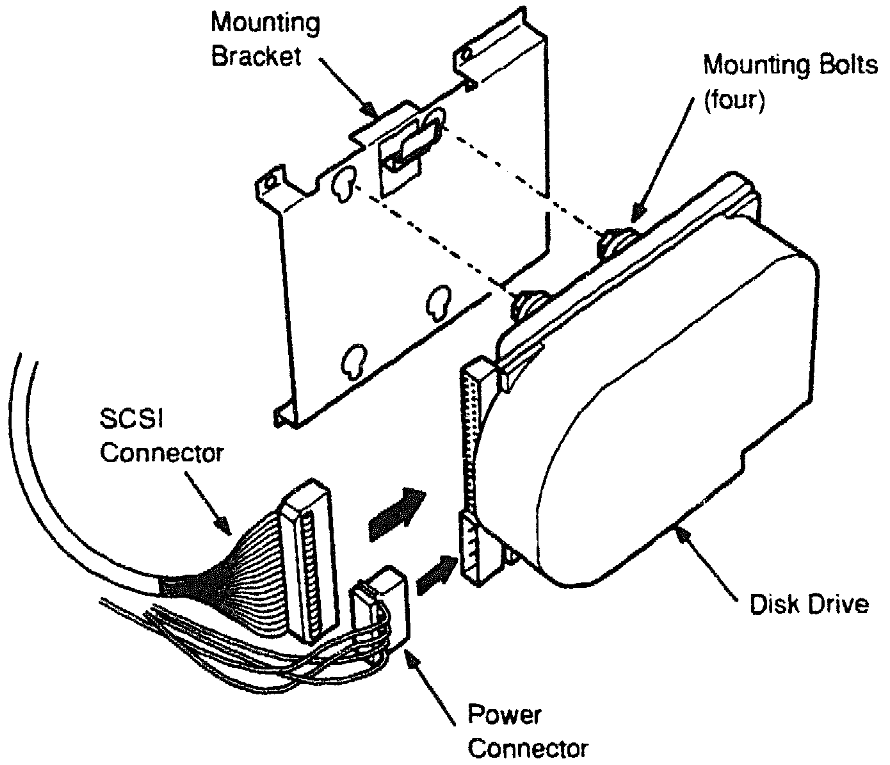
Remove the 209 MB and 426 MB hard disk drives as follows:

1. Remove the top cover and right side panel, if necessary, as described in Section 9.4.1.
2. Disconnect the power connector from the drive.
3. Disconnect the SCSI connector from the drive. See Figure 9–21.
4. Press the clip that holds the drive in place.
5. Slide the drive up in the mounting bracket holes.
6. Lift the drive away from the mounting bracket.

Install the 209 MB and 426 MB hard disk drives as follows:

1. Align the disk drive mounting bolts with the mounting bracket holes. The grommets over the mounting bolts provide protection against shock and vibration. See Figure 9–21.
2. Insert the disk drive mounting bolts into the mounting bracket holes.
3. Slide the disk drive sideways to lock the mounting bolts into the bracket holes.
4. Connect the power connector to the drive. See Figure 9–21.
5. Connect the SCSI connector to the drive. See Figure 9–21.
6. Replace the top cover and side panel.

Figure 9–21 SCSI Hard Disk Drive Removal



9.21 320/525 MB QIC Tape Drive

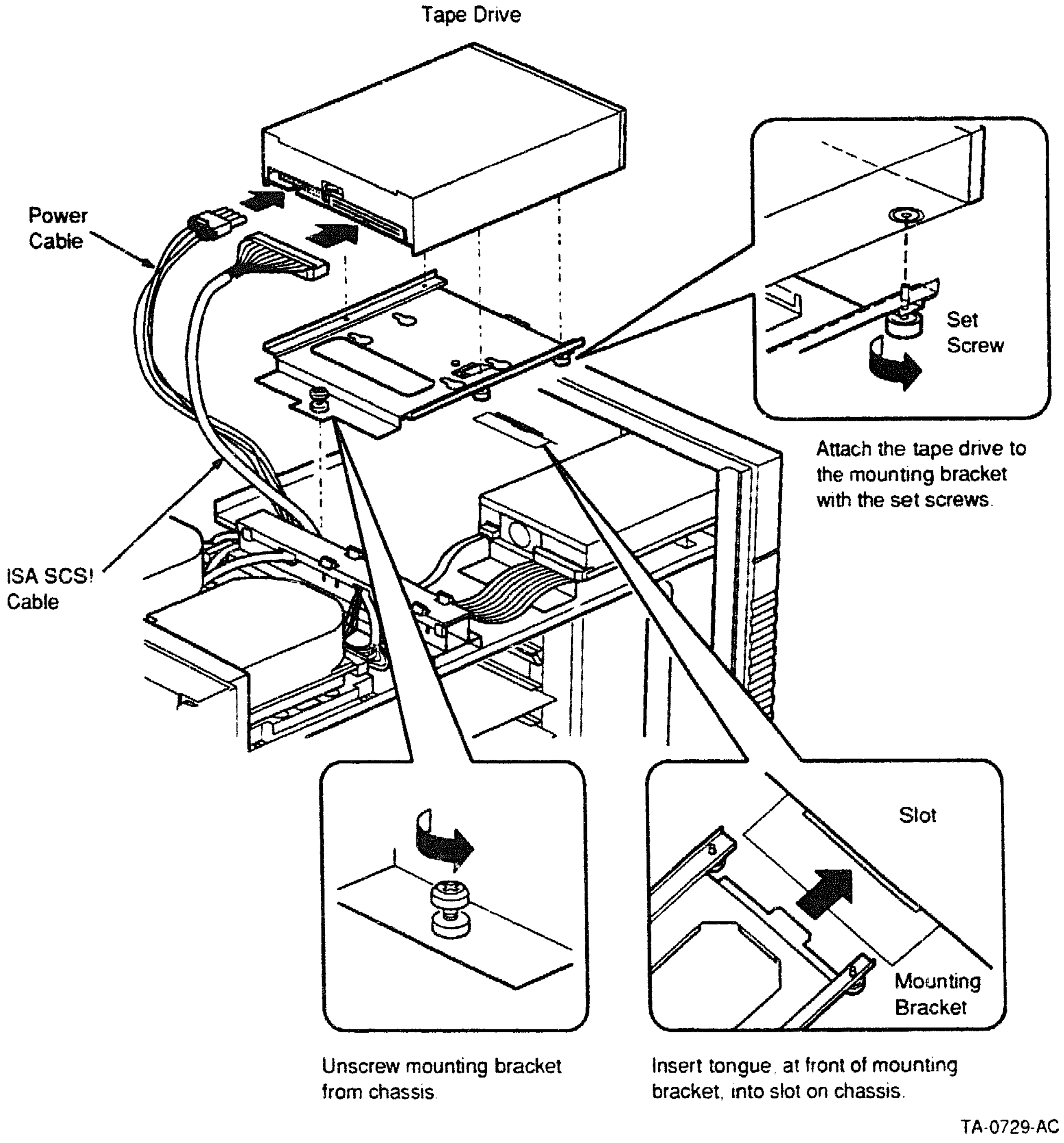
Remove the QIC tape drive as follows:

1. Remove the top cover and right side panel, as described in Section 9.4.1.
2. Disconnect the power cable and the SCSI cable from the back of the tape drive.
3. Loosen the large mounting screw that connects the mounting bracket to the system chassis.
4. Remove the tape drive and mounting bracket assembly.
5. Loosen the four set screws that hold the drive to the mounting bracket.
6. Remove the drive from the bracket. See Figure 9–22.

Replace the QIC tape drive as follows:

1. Attach the QIC tape drive to the mounting bracket. Align the four set screws with the holes in the QIC tape drive outer case and tighten the screws, as shown in Figure 9–22. The front of the QIC tape drive must be opposite the large set screw on the mounting bracket.
2. Place the front of the QIC tape drive through the front bezel opening while placing the mounting bracket tab into the metal lip of the chassis.
3. Align the mounting bracket set screw over the hole in the system chassis and tighten it to attach the mounting bracket to the chassis.
4. Connect the SCSI cable to the back of the QIC drive.
5. Connect the power cable to the back of the QIC drive.
6. Replace the top cover and side panel.

Figure 9–22 QIC Tape Mounting Bracket and Cabling



9.22 CD-ROM Drive

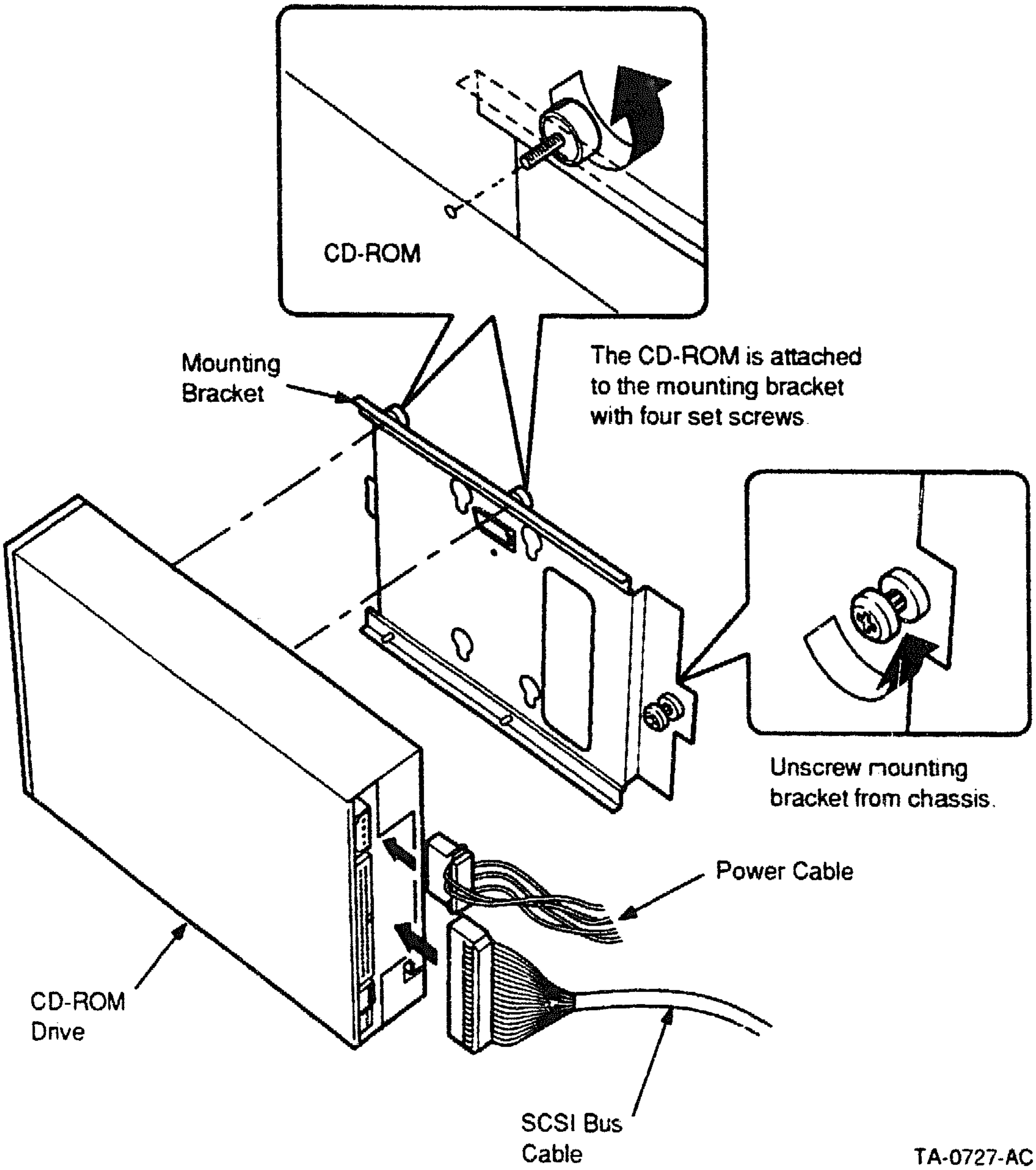
Remove the CD-ROM drive as follows:

1. Remove the top cover and right side panel, as described in Section 9.4.1.
2. Disconnect the power cable from the back of the CD-ROM drive.
3. Disconnect the SCSI bus cable from the back of the CD-ROM drive.
4. Remove the CD-ROM mounting bracket by loosening the large mounting screw at the rear of the mounting bracket.
5. Lift the drive and the mounting bracket away from the system chassis. See Figure 9–23.
6. Loosen the four set screws on the mounting bracket. See Figure 9–23.
7. Remove the CD-ROM drive from the mounting bracket.

Install the CD-ROM drive as follows:

1. Attach the CD-ROM drive to the mounting bracket. Align the four set screws with the holes in the CD-ROM drive outer case and tighten the screws, as shown in Figure 9–23. The front of the CD-ROM drive must be opposite the large set screw on the mounting bracket.
2. Place the front of the CD-ROM drive through the front bezel opening while placing the mounting bracket tab into the metal lip of the chassis.
3. Align the mounting bracket set screw over the hole in the system chassis and tighten it to attach the mounting bracket to the chassis.
4. Connect the power cable to the back of the CD-ROM drive.
5. Connect the SCSI bus cable to the CD-ROM drive.
6. Replace the top cover and side panel.

Figure 9–23 CD-ROM Drive Installation



9.23 3.5-Inch 1.44 MB Diskette Drive

Before replacing a 3.5-inch 1.44 MB diskette drive as faulty, ensure that the drive address switch, on the right side of the drive, is set to address 1.

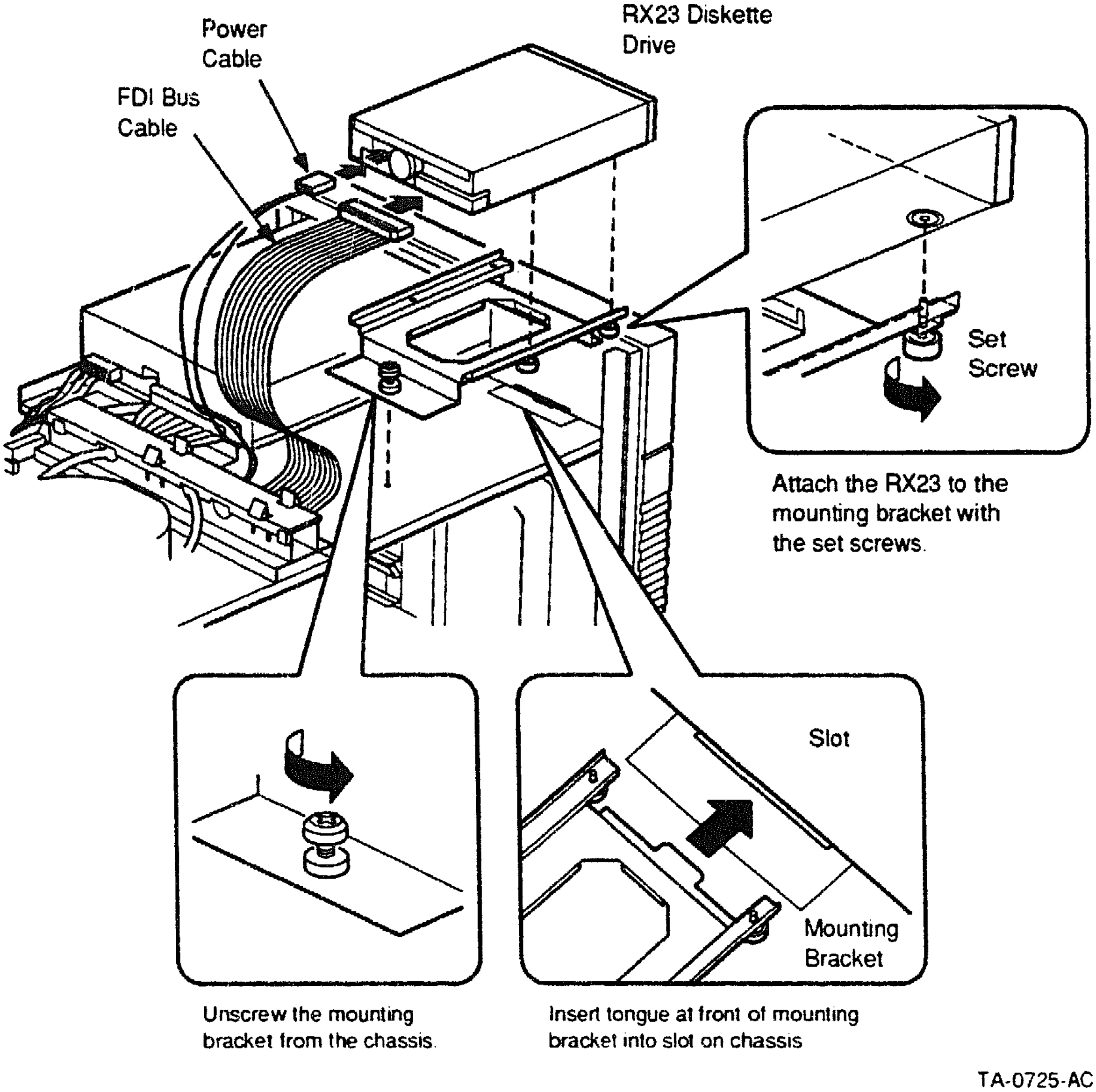
Remove the drive as follows:

1. Disconnect the power cable from the back of the diskette drive.
2. Disconnect the FDI bus cable from the back of the diskette drive.
3. Remove the top cover and right side panel, as described in Section 9.4.1.
4. Loosen the single large screw at the back of the mounting bracket. (This connects the diskette drive mounting bracket to the system chassis.) See Figure 9–24.
5. Lift the diskette drive and the mounting bracket away from the system chassis. See Figure 9–24.
6. Loosen the four set screws on the mounting bracket. See Figure 9–24.
7. Remove the drive from the mounting bracket.

Install the drive as follows:

1. Set the drive address switch, on the right side of the drive, to address 1.
2. Attach the diskette drive to the mounting bracket. Align the four set screws with the holes in the drive outer case and tighten the screws, as shown in Figure 9–24.
3. Slide the drive into position on the side of the chassis and tighten the mounting bracket screw to attach the mounting bracket to the chassis. See Figure 9–24.
4. Attach the power cable to the back of the diskette drive.
5. Attach the FDI bus cable to the back of the diskette drive.

Figure 9–24 3.5-Inch 1.44 MB Diskette Drive Mounting Bracket



9.24 5.25-Inch 1.2 MB Diskette Drive

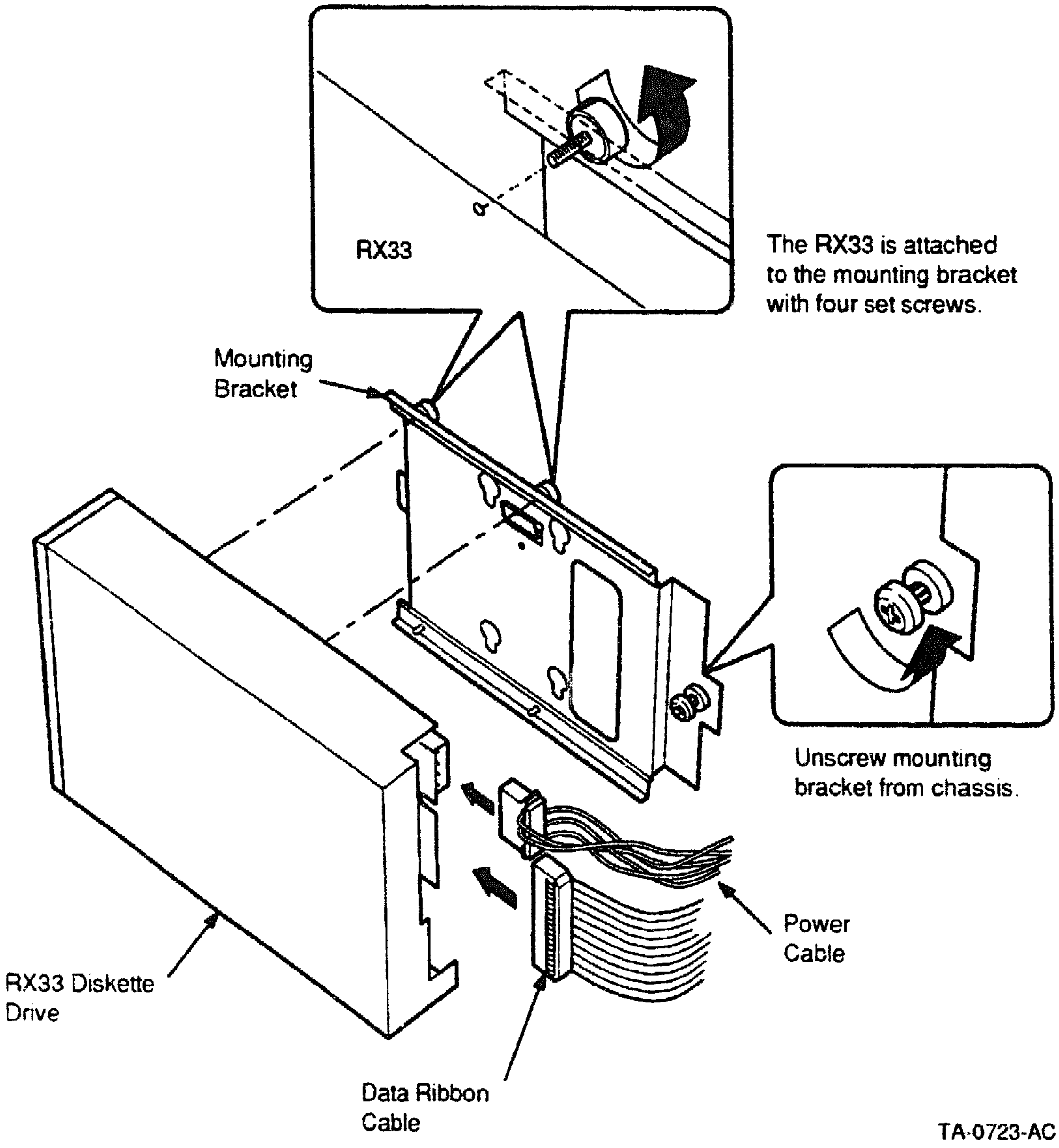
Remove the drive as follows:

1. Disconnect the power cable from the back of the diskette drive.
2. Disconnect the data ribbon cable from the back of the diskette drive.
3. Remove the top cover and right side panel, as described in Section 9.4.1.
4. Remove the diskette drive mounting bracket from the system chassis by loosening the single large screw at the back of the bracket. See Figure 9–25.
5. Slide the drive mounting bracket through the front bezel opening.
6. Loosen the four set screws on the mounting bracket. See Figure 9–25.
7. Remove the drive from the mounting bracket.

Install the drive as follows:

1. Before you install the 5.25-inch diskette drive into the applicationDEC 433MP system, verify that the drive is configured as shown in Figure 2–33.
2. Remove the top cover and right side panel, as described in Section 9.4.1.
3. Remove the diskette drive mounting bracket from the system chassis by loosening the single large screw at the back of the bracket.
4. Attach the drive to the mounting bracket. Align the four set screws with the holes in the drive outer case and tighten the screws, as shown in Figure 9–25. The front of the drive must be opposite the large set screw on the mounting bracket.
5. Slide the mounting bracket through the front bezel opening and under the metal lip on the chassis.
6. Tighten the mounting bracket screw to attach the mounting bracket to the chassis. See Figure 9–25.
7. Connect the power cable to the back of the diskette drive.
8. Connect the data ribbon cable to the back of the diskette drive. This cable comes from under the cable harness and is attached to the bridge module through the backplane.
9. Replace the top cover and side panel.

Figure 9–25 5.25-Inch 1.2 MB Diskette Drive



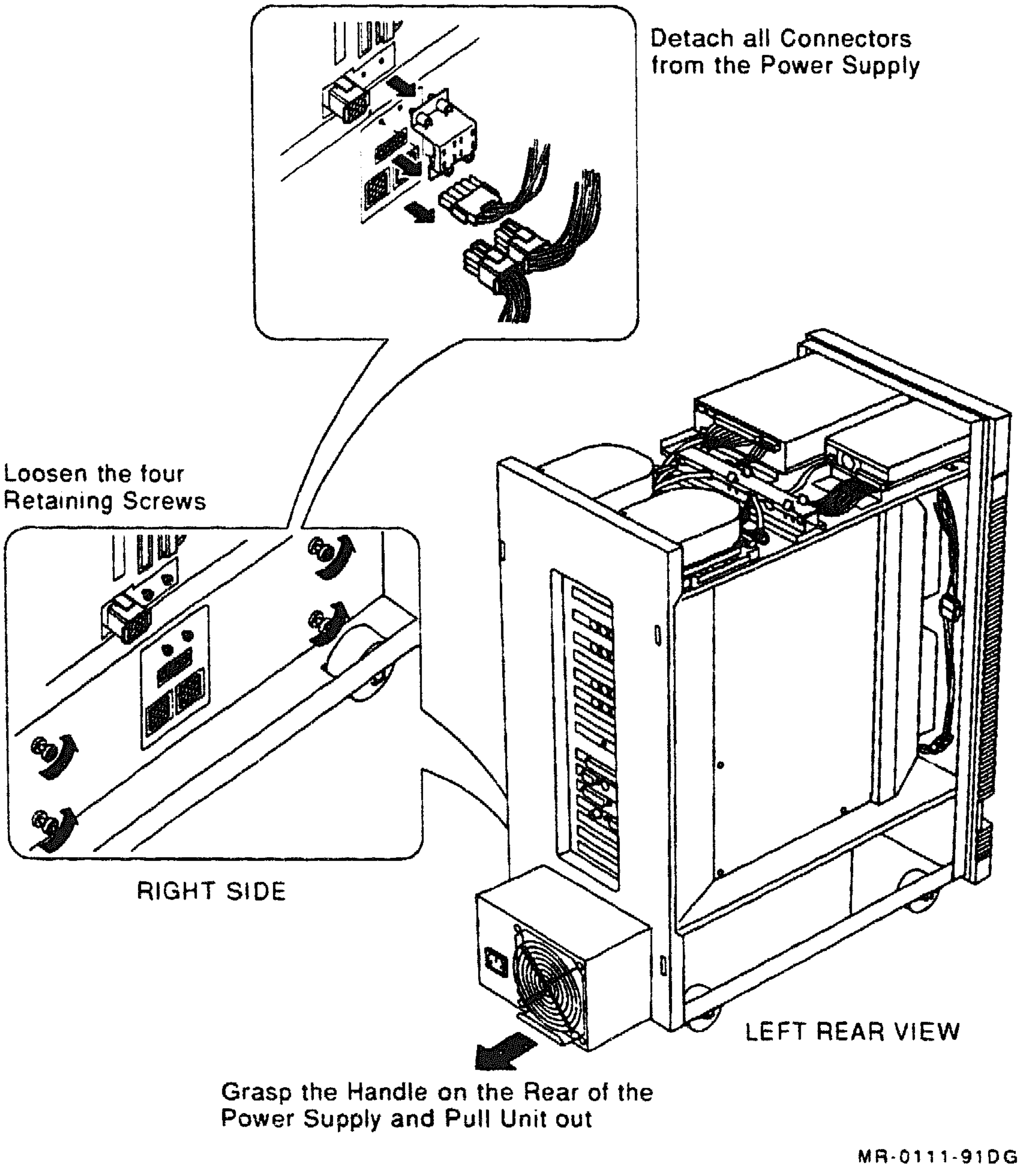
9.25 Power Supply

The following steps describe the removal procedure for the power supply. See Figure 9–26.

1. Unplug the power cord.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Remove the rear bezel, as described in Section 9.6.
4. Disconnect all connectors and the bus bar from the power supply. Bus bar removal is described in Section 9.27.
5. Loosen the four screws holding the power supply in place.
6. Grasp the handle on the rear of the power supply and pull the power supply out of the system cabinet.

Reverse the above procedure to install a power supply.

Figure 9–26 Power Supply Removal



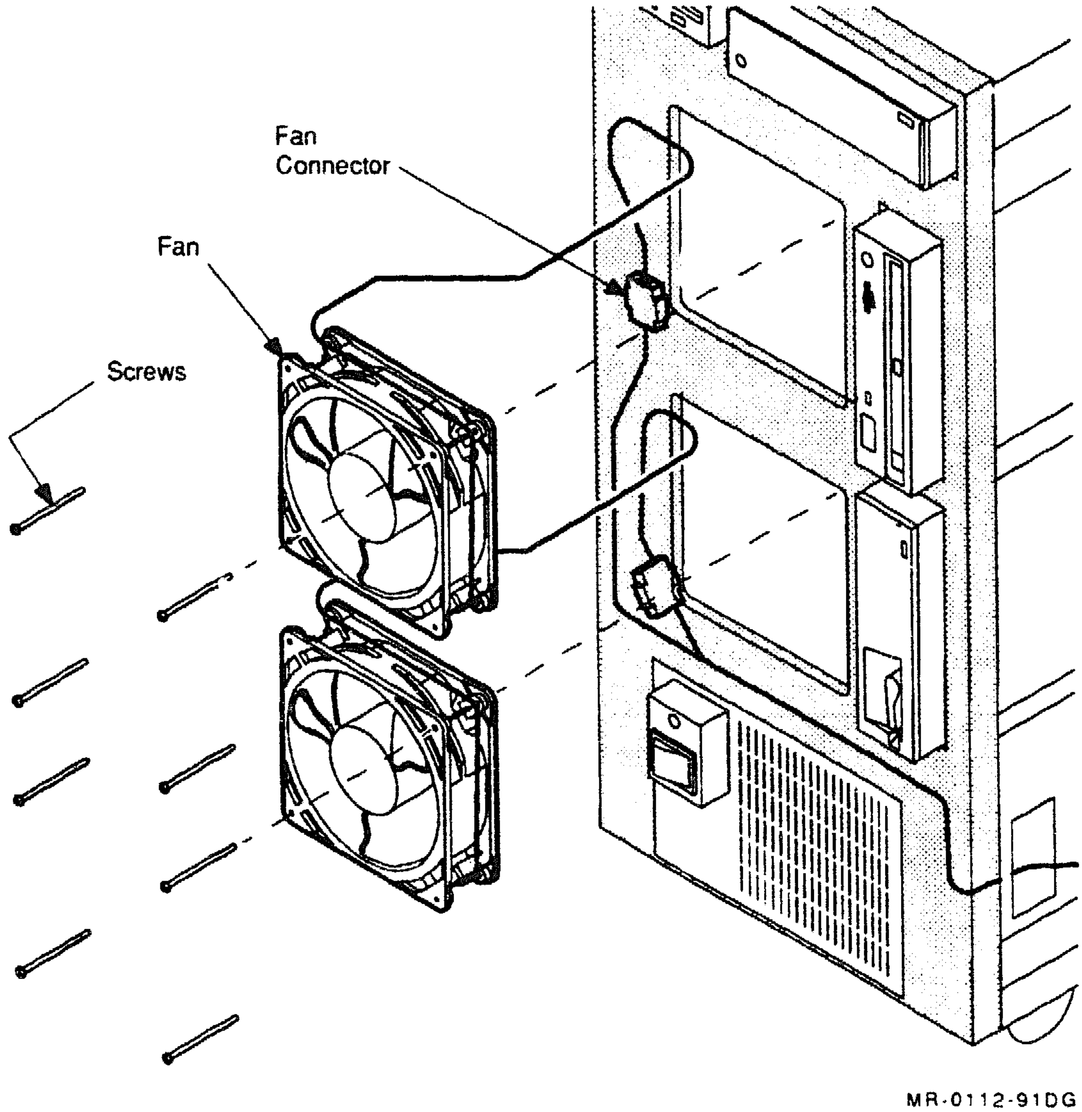
9.26 Fans

The following steps describe the removal procedure for a fan. See Figure 9–27.

1. Unplug the power cord.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Remove the front bezel, as described in Section 9.5.
4. Disconnect the fan connector.
5. Loosen the four screws holding the fan on the system chassis.
6. Remove the fan.

Reverse the above procedure to install a fan.

Figure 9–27 Fan Removal



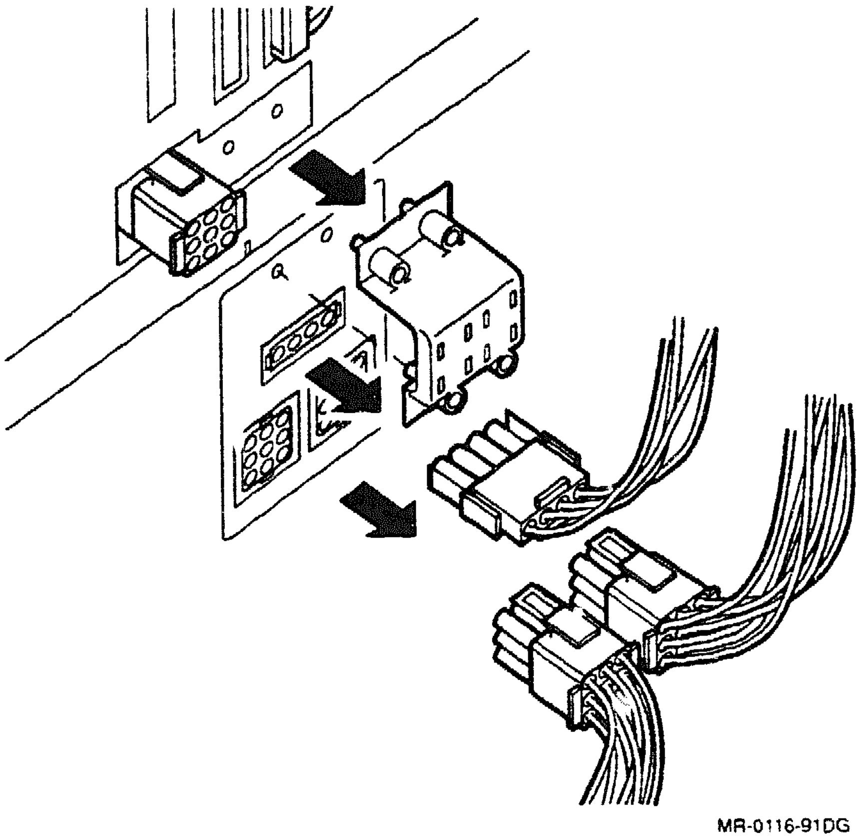
9.27 Bus Bar

The following steps describe the removal procedure for the bus bar. The bus bar connects between the power supply and the backplane. See Figure 9–28.

1. Unplug the power cord.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Loosen the four screws connecting the bus bar between the power supply and the backplane.
4. Remove the bus bar.

Reverse the above procedure to install a bus bar.

Figure 9–28 Bus Bar Removal



9.28 Speaker

The following steps describe the removal procedure for the speaker. See Figure 9–29.

1. Unplug the power cord.
2. Remove the top cover and side panels, as described in Section 9.4.1.
3. Remove the card cage door, as described in Section 9.4.2.
4. If installed, remove the modules from the card cage in the two slots directly below the speaker.
5. Disconnect the speaker connector.
6. Lift the speaker locking tab on top of the system chassis (behind the 3.5-inch diskette drive) and pull the speaker out of the system cabinet.

Reverse the above procedure to install a speaker.

9.29 Backplane

To remove the backplane, use the following steps. See Figure 9–30.

1. Open the system cabinet, as described in Section 9.4.
2. Remove the bus bar, as described in Section 9.27.
3. Disconnect the SCSI cables.
4. Disconnect the power connection to the backplane.
5. Disconnect any cables attached to the I/O connections at the back of the system. Remove all modules from the backplane. Note their slot locations.
6. Remove the 22 screws that hold the backplane in place.
7. Slowly pull the backplane away from the chassis.

To install the backplane, reverse the above procedure. Make sure that the modules are installed in the same slots and that all external connections are made.

Figure 9–29 Speaker Removal

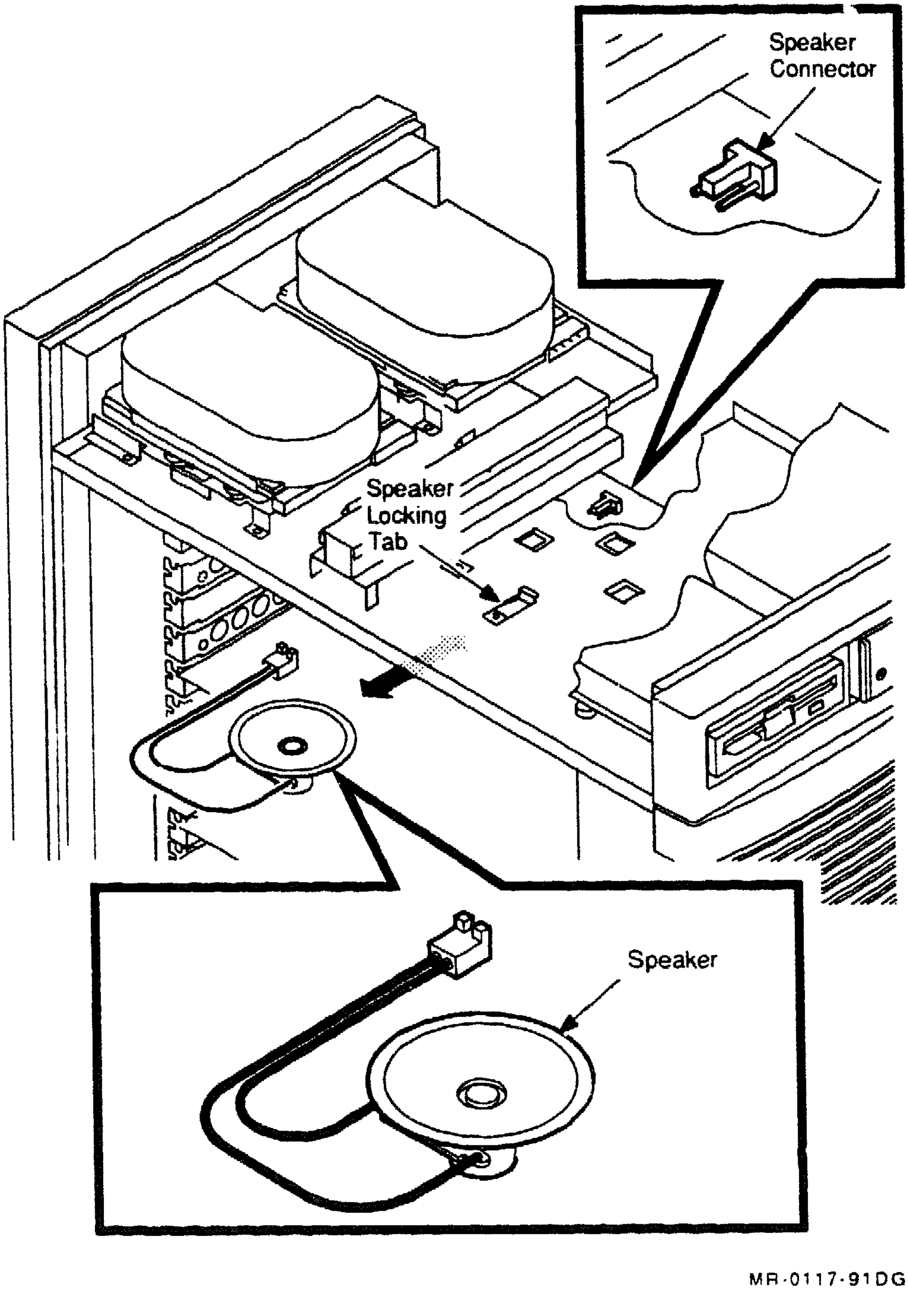
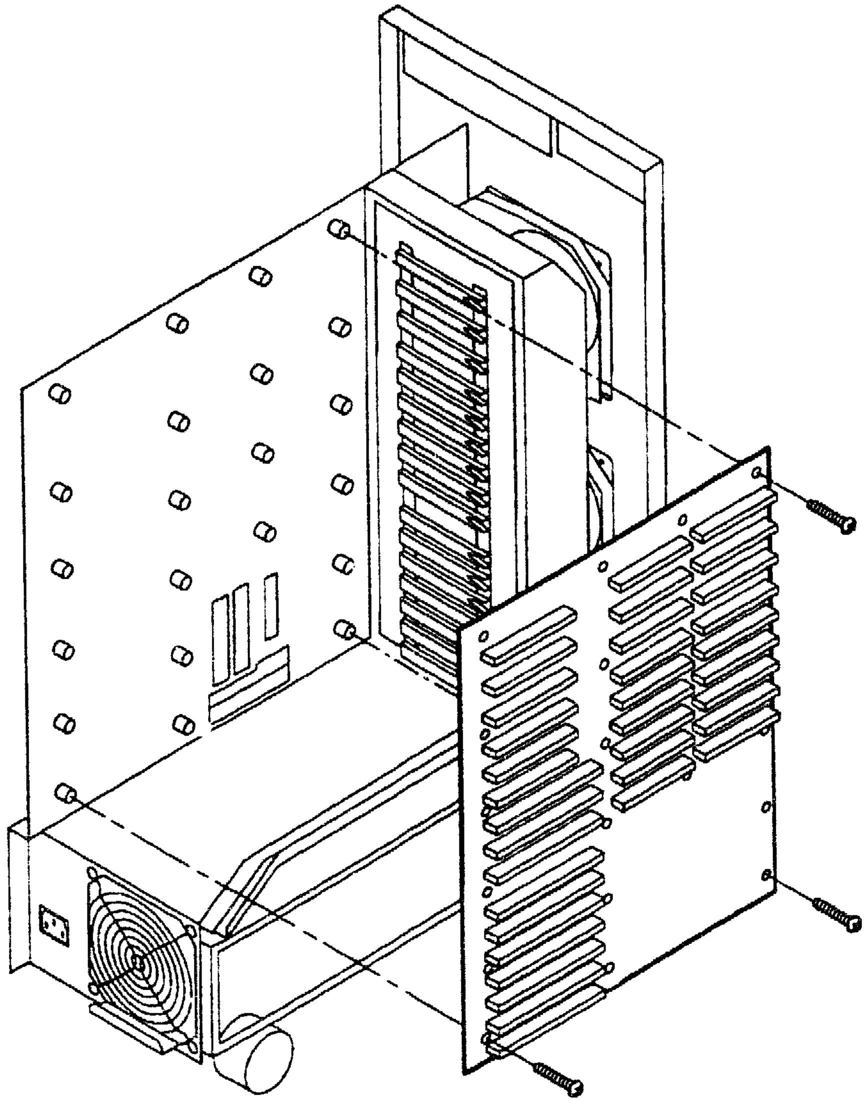


Figure 9–30 Backplane Removal



MR-0114-91DG

CHAP 10

10 Other Diagnostics

This chapter lists additional diagnostics that are available for the applicationDEC 433MP system. It describes the PS1XG-AA video graphics adapter diagnostics.

10.1 Vendor Diagnostics

Digital recommends the purchase of the following items because they are fully supported by SCO UNIX System V Release 3.2 Version 2.0. These items are not sold by Digital Equipment Corporation.

- Western Digital 8003 Ethernet module
- 3Com 3c503 Ethernet module

Refer to the manuals shipped with the modules for information on how to use the diagnostic diskettes from Western Digital and 3Com.

10.2 PS1XG-AA Video Graphics Adapter Diagnostics

A bootable video graphics adapter diagnostic is available for testing the VGA adapter. The diskette that contains the diagnostic ships with the adapter. It includes a setup program, VSETUP, and a test program, VGATEST.

Use the VGATEST diagnostic when the adapter produces a display but does not work properly. For example:

- Adapter does not display graphics.
- Display is missing characters.
- Display has no color.
- Adapter can display in some modes, but not others.

Place the diskette in drive A (the 3.5-inch 1.44 MB diskette drive is the drive A default) and reset the system by pressing the reset switch, or by recycling power.

When the diskette boots, a menu appears. It allows you to select either VSETUP or VGATEST. Select VGATEST.

The VGATEST menu displays the available tests. Select "run all tests" to test the module completely. You are prompted for a delay between the tests. If you select a short delay, such as 5 seconds, you can see the results of each test before the program proceeds to the next test.

If any VGATEST test fails, exit VGATEST and select VSETUP to examine the current settings. The adapter has automatic monitor detection circuitry. If it is able to identify the monitor, it automatically configures itself for that monitor. If it is unable to identify the monitor, use VSETUP to select the monitor (a list of brand names is displayed), or configure the adapter to match your monitor.

Digital Equipment Corporation monitors that are listed in the VSETUP display include the VRC16 and the VRT13 monitors.

APP A

A

Description of RRD Numbered Tests

A.1 Test 1 — Reset System Bus CPUs and Flush Bridge Cache (reset)

This test verifies that all processors can be reset and that the bridge cache can be flushed. The CPUs on the system bus all respond to slot 0xf, a nonexistent slot number. All CPUs are reset by sending a reset command to slot 0xf.

The bridge cache is flushed by first zeroing and then reading system bus RAM.

Caution

The first bridge cache flush following system powerup can destroy system bus memory contents.

A.2 Test 2 — Reset System Bus CPUs (creset)

This test verifies that all processors can be reset. As in Section A.1, this test resets all CPUs on the system bus by outputting a reset command to slot 0xf.

A.3 Test 3 — Poll System Bus Slots (carb)

This test polls system bus slots to determine whether a module is resident in each slot. Figure 2–1 illustrates the system bus and EISA bus slots. Table 2–1 lists configuration options for each backplane slot.

A.4 Test 4 — Flush All System Bus CPUs (cflush)

This test verifies that the external caches of all CPUs on the system bus can be flushed.

Note

The first CPU cache flush following system powerup can destroy system bus memory contents.

A.5 Test 5 — Determine CPU Type (ctype)

This test determines the type and location of all additional processors in the system. It also sets up the configuration structure that is passed to the boot loader and the system exerciser.

The type and location of processors is tested as follows:

1. CPU slots are polled.
2. If there is memory in the system, a server is started on the processor in question.
3. The processor determines whether each additional processor is a SCSI CPU or an SIO CPU.

A.6 Test 6 — Bridge Cache Integrity (bflush)

This test verifies the integrity of the bridge cache RAMs. A walking ones pattern test is run over the first 16 bytes of RAM without causing a cache flush. The test then does an address inversions test over the first 64K of RAM without causing a cache flush. This test should be able to run with no system bus RAM installed. Since RRD and the local RAM are not cached, their use does not cause any cache lines to be flushed.

A.7 Test 7 — Memory Sizing (msize)

This test performs the following functions:

- Determines how many memory modules are installed
- Determines how much RAM is on each module
- Determines what kind of DRAMs (1 MB or 4 MB) are on a module

- Assigns starting addresses for each module to make the maximum amount of contiguous memory available

This test sets up part of the configuration structure that is passed to the boot loader and the system exerciser.

A.8 Test 8 — Check Bits with Memory Fill Ones (mones)

This test verifies that each bit can be set by filling a range of addresses in memory with ones.

A.9 Test 9 — Check Bits with Memory Fill Zeros (mzeros)

This test verifies that each bit can be cleared. It verifies a range of addresses in local RAM by filling the addresses with zeros.

A.10 Test 10 — Check Addresses (maddr)

This test verifies that each address is unique by filling each longword (32 bits) in a range of addresses in local RAM with its own physical address, then verifying the address.

A.11 Test 11 — Check Bits with Memory Walking Ones (mwones)

This test verifies that each bit is set individually and is not connected to any other bit. It verifies a range of addresses in local RAM by performing a walking ones memory test (march ones into a field of zeros), as follows:

1. Memory is filled with zeros.
2. Each bit is individually set (changed from 0 to 1).
3. Each pass sets the next bit and verifies the previous pattern. In this way, the zeros are replaced by a series of marching ones.

A.12 Test 12 — Check Bits with Memory Walking Zeros (mwzeros)

This test verifies that each bit is cleared individually and is not connected to any other bit. The procedure is the same as Section A.11 except that the test verifies a range of addresses in memory by performing a walking zeros test (marching zeros into a field of ones).

A.13 Test 13 — Memory Inversions (minv)

This test verifies that data in a longword (32 bits) can be inverted without affecting other longwords in memory. The inversions algorithm performs a ones complement operation within a range of addresses in memory, and goes up and down memory to check that other longwords are not affected by the inversions.

The inversions algorithm makes six passes over the memory, performing a read/write in the following way:

1. Fill a range of memory with a pattern of the letter *a* from low address to high address.
2. Invert the pattern (the letter *a* is inverted to become the number *5*) from high address to low address while verifying the previous pattern.
3. Invert the pattern from low address to high address while verifying the previous pattern.
4. Repeat step 3.
5. Repeat step 2 (except that the number *5* is inverted to become letter *a*).
6. Check for the original pattern from low address to high address.

A.14 Test 14 — Memory Inversions with Flush (minvf)

This test verifies that all data stored in cache is written to memory. The test performs the same memory inversions algorithm described in Section A.13, the memory inversions test. However, this test also forces every memory reference into system bus RAM by flushing the cache entry.

A.15 Test 15 — Memory Address Inversions (madrinv)

This test verifies that all data stored in cache is written to memory. It performs the memory inversions algorithm described in Section A.13, except that it uses the address of the memory as the data pattern.

A.16 Test 16 — Memory Address Inversions with Flush (madrinvf)

This test performs the memory inversions algorithm described in Section A.15, the memory address inversions test. However, it also forces every memory reference into system bus RAM by flushing the cache entry.

A.17 Test 17 — Memory Error Correcting Code (memory ECC)

This test checks that the system bus RAM error correcting code (ECC) is working. The error correcting code corrects single-bit errors and identifies double-bit errors. It also verifies the following:

- Bits in *error address status* register
- Corrected data and address generation
- One-bit and two-bit error detection precedence

A.18 Test 18 — Reset DMA Controller and Initialize 8237 Registers (bdma reset)

This test resets the 8237 DMA controller on the base CPU and initializes the 8237 registers.

See Section A.42 for information about resetting the 8237 DMA controller on the CPU/SIO.

A.19 Test 19 — Verify Access to DMA Controller (bdma reg I/O)

This test verifies access to the 8237 register by writing a pattern to the address register and reading it.

A.20 Test 20 — Base to Base Interrupt (bintb)

This test verifies that the base can interrupt itself. Interrupts are generated by addressing the base interrupt location, which is located in memory-mapped system bus I/O.

A.21 Test 21 — CPU to Base Interrupt (cintb)

This test verifies that a slave processor can interrupt the base. A slave program is started on the slave processor, and the processor is directed to interrupt the base.

A.22 Test 22 — Base to CPU Interrupt (bintc)

This test verifies that the base can interrupt a slave processor. A slave program is started on the slave processor. The base interrupts the slave processor and then checks to see if the processor received the interrupt.

A.23 Test 23 — Verify Bridge Map RAM Register (bram)

This test verifies the bridge map RAM register by executing the following tests over the address range 0xfdf000 through 0xfdf1bd:

- A ones fill test
- An inversions test
- An address fill test
- A zeros fill test

A.24 Test 24 — Base CPU Blinks Bridge LED (bLEDb)

This test verifies that the base can control a slave processor. In this test, the base CPU blinks the bridge LED and verifies that the test was successful by watching the LED bit in the bridge status register.

A.25 Test 25 — Slave CPU Blinks Bridge LED (bLEDc)

This test verifies that one processor can control another processor. In this test, a slave processor blinks the LED on the bridge module. A slave process is started on the slave processor, and it is directed by the base to blink the LED on the bridge.

A.26 Test 26 — Base CPU Blinks LED on Default CPU (cLEDc)

This test verifies that one processor can control another processor. In this test, the base CPU blinks the LED on the default CPU.

A.27 Test 27 — Start and Reset Default CPU (cnop)

This test verifies that the default CPU can be started and reset. The test procedure is as follows:

1. Poll the system bus CPU slots.
2. Place a short nop loop at the default CPU start vector.
3. Start the default CPU.

4. Reset the default CPU (after the nop delay, and only if the scopeloop flag is not enabled).

The base processor does not verify whether the default CPU executed the test correctly.

A.28 Test 28 — Read/Write by Default CPU (cr/w once)

This test verifies that the default CPU can move data from one address to another. The test procedure is as follows:

1. Poll the system bus CPU slots.
2. Load test code into system bus memory.
3. Start the default CPU; the default CPU begins executing the code.
4. Read and verify bytes and words from one memory address to another through the default CPU.
5. Halt the default CPU.
6. Verify through the base CPU that the data was correctly moved.

A.29 Test 29 — Read/Write in a Loop by Default CPU (cr/w)

This test verifies that the default CPU can move data from one address to another. The test operation is the same as Section A.28, read/write by default CPU, except that the test code uses a rotating ones pattern in a loop. This allows the base to vary the data.

A.30 Test 30 — Check Multiplication (cfloat)

This test verifies that the 80486 chip on the default CPU can perform multiplication. If the processor is an 80386, an 80387 floating chip must be installed on the default CPU module.

The test procedure is as follows:

1. Poll the system bus slots.
2. Load the test code into system bus memory.
3. Start the default CPU and begin executing the code.
4. The test code initializes the floating-point chip, reads two multiplication operands from memory, multiplies them using the floating-point chip, stores the product in another memory location, and loops.
5. The base CPU uses several test numbers and verifies the correct result.

A.31 Test 31 — Check Locking Mechanism (cxch)

This test verifies that different CPUs honor each other's locking mechanism during a read/write cycle by the base CPU and the default CPU.

The test procedure is as follows:

1. Poll the system bus slots.
2. Load the test code into system bus memory.
3. Start the default CPU and begin executing the code.
4. Two memory locations are used, one as a lock and the other as data. The CPU code attempts to gain control of the data by locking the lock byte. When the default CPU gets control, it puts a unique value in the data byte. (The base CPU simultaneously attempts to gain control of the data.) The exchange instructions, which cause locked bus cycles, are used to perform the test-and-set lock functions. Each CPU verifies that there is no corruption of the data while it has control of the lock.

   In addition, the CPUs use a variety of back-to-back exchanges, and exchanges separated by various numbers of nops, to vary the timing and to increase the number and variety of locked bus cycles.

A.32 Test 32 — Check Slave CPUs and Blink Base LED (cminv cLED)

This test verifies that each slave processor can do a memory inversions test without interfering with the memory space of the other CPUs. Each CPU is assigned a unique 128K region of memory and each slave processor executes the test code. The test procedure is as follows:

1. Poll the system bus slots.
2. Load memory inversions test code into system bus memory.
3. Start all CPUs.
4. The slave CPUs execute the memory inversions code, which performs a memory inversions test of 128K of system bus memory.
5. The base CPU verifies the correct operation of all CPUs and executes a loop, which turns on its own LED and the LEDs of all the slave processors.

See Section A.13, the memory inversions test, for a description of the algorithm used to check that data can be inverted without affecting other longwords.

Section A.38, check slave CPUs and Run Memory Inversions, describes a similar test, except that the CPUs run concurrently instead of serially, and the test code performs a memory inversions test over all available system bus memory, rather than only 128K of memory.

A.33 Test 33 — Check Slave CPUs and Blink Bridge LED (cminv bLED)

Section A.32, check slave CPUs and blink base LED, describes the same test, except that the bridge LED, rather than the base LED, is blinked.

A.34 Test 34 — Check Slave CPUs and Run Data Inversions (cminv bminv)

Section A.32, check slave CPUs and blink base LED, describes a similar test. It also verifies that each slave processor can do a memory inversions test without interfering with the memory space of the other CPUs. However, instead of blinking the LED, it executes a memory inversions test over a unique 128K region of memory.

A.35 Test 35 — Check Slave CPUs and Operation of All CPUs (cminv bck)

Section A.32, check slave CPUs and blink base LED, describes a similar test. It also verifies that each slave processor can do a memory inversions test without interfering with the memory space of the other CPUs. However, instead of blinking the LED, the base verifies the operation of the CPUs.

A.36 Test 36 — Check Slave CPUs and Run Address Inversions (cmadrinv bck)

Section A.35, check slave CPUs and operation of all CPUs, describes a similar test. It verifies that each slave processor can do a memory inversions test without interfering with the memory space of the other CPUs. However, the CPUs execute address inversions instead of the normal inversions test.

A.37 Test 37 — Verify Memory (cminv mI/O)

This test verifies memory while it is being used by a slave processor. It uses AT addresses to access system bus memory.

The test procedure is as follows:

1. Read a cache entry.

2. Read the memory control register.
3. Write the memory control register while doing a memory inversions test on the slave.

A.38 Test 38 — Check Slave CPUs and Run Memory Inversions (mult cpu mchk)

This test verifies that each slave processor can do a memory inversions test without interfering with the memory space of the other CPUs. This test divides system bus memory between all slave processors and runs an inversions test for each slave processor in the area of memory allocated to it. This test code performs the memory inversions test over all available system bus memory. See Section A.13, the memory inversions test, for a description of the inversions algorithm.

The base CPU performs a locked OR with every byte in memory and blinks the LEDs on the slave processors, while it checks the status of each CPU.

See Section A.32 for a description of a similar test in which the CPUs run serially instead of concurrently.

A.39 Test 39 — Run Memory Inversions on Slave Processor with Flush (mult cpu mchkf)

Section A.38 describes a similar test, except that every memory reference is forced into system bus RAM by flushing the cache entry.

A.40 Test 40 — Reset SIO DMA Controller Using Zero Fill (dzero)

This test validates the 32K of DMA RAM that is private to the 386/486 SIO processors. The DMA RAM occupies addresses 0x80000 thru 0x87fff in the address space of the SIO CPU. Direct access by the base CPU is not possible. To execute this test, the SIO CPU runs a slave executive which allows the base to have indirect access. Only the DMA RAM on the default (currently selected) SIO CPU is tested.

The test procedure is as follows:

1. Poll the system bus slots.
2. Load the slave code into system bus memory.
3. If the default CPU is an SIO, execute the code "slave start".

4. Perform a zero fill memory test over the DMA RAM address range as the slave code is instructed by the base CPU.

A.41 Test 41 — Reset SIO DMA Controller Using Ones Fill (dones)

Section A.40 desribes a similar test, except that the memory test is a ones fill rather than a zero fill.

A.42 Test 42 — Reset SIO DMA Controller/Initialize 8237 Registers (dr)

This test does a reset of the 8237 DMA controller on the SIO CPU and initializes the 8237 registers. Access to the 8237 is through private memory-mapped I/O, and is not directly accessible by the base CPU. The 8237 occupies addresses 0xc0000 thru 0xc000f in the address space of the SIO CPU. The CPU that controls the 8237 runs the slave executive and allows the base indirect access to the 8237.

A.43 Test 43 — Check SIO DMA Controller (DsrI/O)

This test verifies access to the 8237 register by writing a pattern to the address register and reading it back.

A.44 Test 44 — Check SIO DMA Controller with Rotating Pattern (DrI/O)

Section A.43 describes a similar test, except that all address and count registers are tested with a rotating ones and rotating zeros pattern.

A.45 Test 45 — Check SCC Controller on SIO Module (SrI/O)

This test verifies access to both of the 8530 serial communications controllers (SCC) on the default SIO CPU. The test performs a rotating ones and rotating zeros pattern in the time-constant registers for each of the four 8530 channels.

Access to the 8530 is through private memory-mapped I/O, and is not directly accessible by the base CPU. The two 8530s occupy addresses 0xc0018 through 0xc001f in the address space of the SIO CPU. The CPU that controls the 8530s runs the slave executive and allows the base indirect access to the 8530 channels.

A.46 Test 46 — Check SCC Controller on SIO Module (SDasync)

This test sets up a continuous output stream from 8530 channel A, using 8237 DMA. No verification of operation is possible.

A.47 Test 47 — Test Channel A of SCC Controller (Sasyncloop)

This test checks the SCC controller using a rotating bit pattern.

This test sets channel A of the 8530 to async loopback mode. Data is transmitted, and the received data is verified.

A.48 Test 48 — Test the 8530 Using 8237 Controller (SDasyncloop)

Section A.46 describes the same test, except that the 8237 DMA controller is used.

A.49 Test 49 — Test Channels A and C of 8530 (A–C)

This test sets channels A and C of the 8530 into DMA async mode. It requires a cable connected between channels A and C. Data is transmitted on A, and the received data from C is verified. Data is transmitted on C, and the received data from A is verified. A rotating bit pattern is used.

A.50 Test 50 — Test Channels B and D of 8530 (B–D)

Section A.49 describes the same test, except that Channels B and D are used.

A.51 Test 51 — Check FIFO and Configuration Registers in SCSI I/O Controller (SCSI I/O reg)

This test verifies that the FIFO and configuration registers in the 53C90 SCSI I/O controller can be addressed, written to, and read from. This test uses a walking ones and walking zeros pattern.

A.52 Test 52 — Check 486 SCSI Module DMA Transmit Buffer (SCSI tr buf)

This test verifies that the DMA control logic can transfer data from main memory to the SCSI module DMA transmit buffer.

The test procedure is as follows:

1. Use the page map to assign a start location in main memory or cache.
2. Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is the address of the data.)
3. Enable DMA to copy data from main memory to the SCSI module DMA transmit buffer.
4. Read and verify the data in the SCSI transmit buffer. (The data is not transmitted across the SCSI bus.)
5. Repeat this loop twice, once in burst mode and once in nonburst mode. In burst mode, the data is transmitted 16 bytes at a time. In nonburst mode, the data is transmitted 4 bytes (doublewords) at a time.

A.53 Test 53 — Check 486 SCSI Module DMA Receive Buffer (SCSI rcv buf)

This tests the ability of the DMA control logic to transfer data from the SCSI module DMA receive buffer to main memory.

The test procedure is as follows:

1. Use the page map to get a start location in main memory or cache.
2. Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is zeros.)
3. Enable DMA to copy data from the receive buffer to main memory.
4. Load the SCSI module DMA receive buffer with a test pattern.
5. Read the data in main memory to verify that the DMA logic transferred the data from the SCSI module DMA receive buffer.
6. Repeat this loop twice, once in burst mode and once in nonburst mode. In burst mode, the data is transmitted 16 bytes at a time. In nonburst mode, the data is transmitted 4 bytes (doublewords) at a time.

A.54 Test 54 — Verify Entries in DMA Page Map (SCSI DMA map)

This test verifies that all entries in the DMA page map can address main memory correctly.

The test procedure is as follows:

1. Use the page map to assign a start location in main memory or cache.
2. Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is the address of the data.)
3. Enable DMA to copy 16 bytes of data from main memory to the SCSI module DMA transmit buffer.
4. Read and verify the 16 bytes of data copied to the SCSI transmit buffer. (The data is not transmitted across the SCSI bus.)
5. Repeat the above steps 256 times, going from low address to high address.
6. Repeat the above steps 256 times, this time going from high address to low address. (This loop is repeated 256 times to account for each map register in the DMA page map.) This test is performed in nonburst mode. The data is transmitted 4 bytes (doublewords) at a time.

A.55 Test 55 — Check Page Index Counter (SCSI pg ndx cntr)

This test verifies that the page index counter can start at any of the 256 possible start addresses.

The procedure is as follows:

1. Use the page map to assign a start location in main memory or cache.
2. Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is the address of the data.)
3. Enable DMA to copy 16 bytes of data from main memory to the SCSI module DMA transmit buffer.
4. Read and verify the 16 bytes of data copied to the SCSI transmit buffer. (The data is not transmitted across the SCSI bus.)
5. Repeat this loop 256 times, once for each increment of the page index counter. This test is performed in nonburst mode. The data is transmitted 4 bytes (doublewords) at a time.

A.56 Test 56 — Check DMA Control Logic — Main Memory to FIFO (SCSI tr DMA)

This tests the ability of the DMA control logic to transfer data from main memory to the 53C90 SCSI I/O controller 16-byte FIFO.

The test procedure is as follows:

1. Use the page map to assign a start location in main memory or cache.
2. Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is the address of the data.)
3. Enable DMA to copy data from main memory to the SCSI module 53C90 SCSI I/O controller FIFO buffer.
4. Read and verify the data in the SCSI FIFO buffer. (The data is not transmitted across the SCSI bus.) This test is performed in nonburst mode. The data is transmitted 4 bytes (doublewords) at a time.

This test might require an external jumper from REQ to ACK.

A.57 Test 57 — Check DMA Control Logic — FIFO to Main Memory (SCSI rcv DMA)

This tests the ability of the DMA control logic to transfer data from the 53C90 SCSI I/O controller 16-byte FIFO to main memory.

The test procedure is as follows:

1. Use the page map to assign a start location in main memory or cache.
2. Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is the address of the data.)
3. Load the 53C90 SCSI I/O controller 16-byte FIFO buffer.
4. Enable DMA to copy data from the FIFO buffer to main memory.
5. Read and verify the data in main memory.

This test might require an external jumper from REQ to ACK.

A.58 Test 58 — DMA Control Logic — Misaligned Byte Boundary (SCSI rcv odd)

This test verifies that the DMA control logic can handle data starting on a misaligned byte boundary. The test procedure is as follows:

- Use the page map to assign a start location in main memory or cache.
- Allocate and fill 1024 bytes at the location specified by the page map. (The data used to fill the memory is the address of the data.)
- Misalign the data by performing three processor writes on the receive buffer.
- Load the 53C90 SCSI I/O controller 16-byte FIFO buffer.
- Enable DMA to copy data from the FIFO buffer to main memory.
- Verify three processor writes were discarded.
- Read and verify that the 16 bytes in main memory are correct.

A.59 Test 59 — Verify Shadow RAM Functionality — (eisa shadow mem)

This test verifies that when shadow RAM is turned on, addresses map from low memory to high memory. The test procedure is as follows:

- Write a data pattern to high shadow RAM memory.
- Set the shadow RAM bits to the on (1) state.
- Read low EISA memory and verify that the data pattern is present.

A.60 Test 60 — Verify EISA Mapping Functionality — (eisa system mem)

This test verifies that when EISA mapping is turned on, the system bus is not accessed. The test procedure is as follows:

- Write a data pattern to system bus memory in the 8 to 15 MB space.
- Set the EISA map bits to the on (1) state.
- Read system bus memory in the 8 to 15 MB space and verify that the data pattern is not present.

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