
DECstation 350

DECstation 350 Service Guide

Order Number EK-PC63A-SV-001

digital equipment corporation
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FCC NOTICE: The equipment described in this manual has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etcetera) certified to comply with the Class B limits may be attached to this computer. Operation with noncertified peripherals may result in interference to radio and television reception. This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004–000–00398–5

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2 Troubleshooting

3 Ethernet Connections

4 Monitor Adjustments

5 FRU Removal and Replacement

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About This Guide

The DECstation 350 Service Guide is designed to help you diagnose and repair the DECstation 350 system.

Guide Organization

The guide is organized as follows:

- Chapter 1 provides an overview of the DECstation 350 system.
- Chapter 2 details troubleshooting instructions.
- Chapter 3 contains procedures for disconnecting from an Ethernet.
- Chapter 4 describes monitor adjustment procedures
- Chapter 5 contains procedures for removing and replacing field replaceable units.
- Appendix A provides information about jumpers and switches, memory configuration, math coprocessor jumper settings, 40Mbyte streaming tape, floppy disk drive, Video Graphics Array (VGA), ESDI hard disk controller, mouse controller, multiport, DEPCA boards supported by Digital.

  NOTE
  The DEPCA board used in this system is a DEPCB board. It is equivalent to a DEPCA REV S3 board.

- Appendix B contains information about Interrupt Request (IRQ) signals used in the DECstation 350 architecture.

For information about network troubleshooting, refer to the *PCSA Network Troubleshooting Guide*. For additional information about personal computer architecture and the Digital Ethernet Personal Computer Bus Adapter (DEPCA) option board, refer to the *DEPCA Service Guide*.

Intended Audience

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

Conventions

This document uses the following conventions:

Convention	Meaning
Warning	Provides information to prevent personal injury
Caution	Provides information to prevent damage to equipment
Note	Provides general information you should be aware of
Ctrl Alt Del	Press and hold Ctrl while you press both Alt and Del. Control key sequences have special functions.
`Press the F1 key`	What the screen displays as a prompt or an instruction is shown in monospaced type.

The computer industry recognizes two open architectures as industry standards: the IBM-PC/XT/AT bus structure and the Microsoft disk operating system, MS-DOS. The term industry-standard refers to compatibility with these architectures. Support for MS-DOS requires a defined set of Read-Only Memory Basic I/O System (ROM-BIOS), which the DECstation offers.

Documentation Part Numbers

The following documents are referred to in this guide:

Document	Part Number
PCSA Network Troubleshooting Guide	AA-JU54A-TH
DEPCA Service Guide	EK-DEPCB-SV
DECconnect System Stand-alone ThinWire Networks Planning and Installation Guide	EK-DECSY-TG
DECconnect System Planning and Configuration Guide	EK-DECSY-CG
DECconnect System Installation and Verification Guide	EK-DECSY-VG
DECstation 350 Installation and Operations Guide	ER-PC630-OM-001
DECstation 350 Technical Reference Manual	ER-PC63Y-AA

CHAPTER 1

1
Overview

1.1 Introduction

The DECstation 350 (Figure 1–1) is a desktop computer. It can be used as a standalone personal computer using MS-DOS operating system or as a node on a network using a DEPCA board connected to a VAX computer or another DECstation with network server software. The DECstation runs Digital and other industry-standard applications.

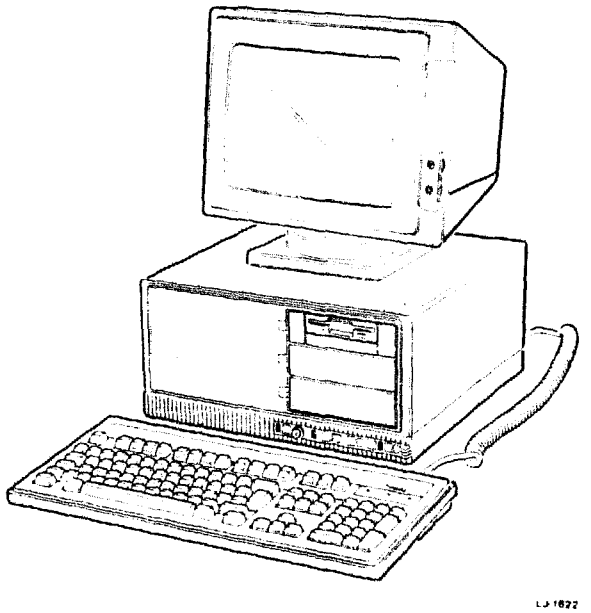


Figure 1–1 DECstation 350

As a node on a Personal Computing System Architecture (PCSA) network, the DECstation is the user's interface with the applications and services that the PCSA family of products provides. As part of a network, the DECstation communicates with other computers on the network and shares the various resources and services offered by Digital computers and servers.

1.2 Components and Options

The following is a list of the DECstation 350 components:

- Monochrome or color monitor
- System with 3.5 inch, 1.44 Mbyte floppy disk drive
- Memory expansion board with 2 Mbyte of RAM (expandable to 4 Mbytes)
- 230 watt power supply
- Cooling fan
- 101/102-key keyboard
- Main logic board containing:
  - — 80386 processor (20MHZ)
  - — Socket for math coprocessor
  - — Floppy drive controller
  - — Speaker
  - — Serial and parallel interface

    NOTE
    In some cases, there is not enough space around the parallel port to connect a printer cable to it. If so, use a 25-pin male-to-female adapter (part number 12-27591).

  - — Keyboard interface
- Seven option slots for industry-standard options
- Video Graphics Array (VGA) board
- Hard disk unit (HDU) controller

The following are options for the DECstation 350:

- Intel 80387 math coprocessor (20 MHz)
- Single In-line Memory Module (SIMM) boards for memory upgrade (256 Kbyte or 1 Mbyte)
- Additional memory expansion board containing 1 Mbyte of memory (four SIMMs, 256 Kbytes each)
- One Mbyte memory upgrade (four SIMMs, 256 Kbytes each) for 1 Mbyte expansion board
- Additional memory expansion board containing 4 Mbytes of memory (four SIMMs, 1 Mbyte each)
- Four Mbyte memory upgrade (four SIMMs, 1 Mbyte each) for 4 Mbyte expansion board
- Maximum of three memory expansion boards providing 2 to 48 Mbytes of memory.
- Support for three magnetic peripherals
  - — Floppy disk drive
  - — Hard disk drive
  - — Streaming tape drive
- 3.5 inch 1.44 Mbyte floppy drive
- 5.25 inch 1.2 Mbyte floppy drive
- 3.5 inch 80 Mbyte hard disk drive
- 3.5 inch 135 Mbyte hard disk drive
- Enhanced Small Device Interface (ESDI) controller board for base system
- 3.5 inch 40 Mbyte streaming tape drive
- 3.5 inch 80 Mbyte streaming tape drive
- Digital Ethernet Personal Computer Adapter (DEPCA) board
- Two-button mouse and interface board
- *DECstation 350 Technical Reference Manual*

1.3 Model Numbers and Configurations

The DECstation 350 is available in four configurations as shown in Table 1–1. The DECstation options are listed in Table 1–2.

Table 1–1 DECstation 350 Configurations

Model Number	Configuration
PC630-A2	Base system: Intel 80386 processor based, 20 MHz personal computer with 2 Mbytes RAM, keyboard cable, 1.44 Mbyte floppy disk drive, VGA controller, keyboard port, parallel and serial ports, starter kit, floppy disk controller, 120 VAC.
PC630-A3	Base system using 220/240 VAC
PC635-A2	Base system with ESDI controller, 80 Mbyte hard disk drive
PC635-A3	Same as PC635-A2 using 220/240 VAC
PC636-A2	Base system with ESDI controller, 135 Mbyte hard disk drive
PC636-A3	Same as PC636-A2 using 220/240 VAC

Table 1–2 DECstation 350 Option Configurations

Model Number	Option Configuration
PC63P-AA	80387 Math coprocessor
PC63M-AA	Memory expansion board containing 1 MByte (four 256Kbyte SIMMs) of memory
PC63M-AB	1 Mbyte upgrade (four 256Kbyte SIMMs) for memory expansion board
PC63M-BA	Memory expansion board containing 4 Mbyte (four 1 Mbyte SIMMs) of memory
PC63M-BB	4 Mbyte upgrade (four 1 Mbyte SIMMs) for memory expansion board
PC63R-AA	Additional 1.44 Mbyte floppy disk drive
PC63R-BA	1.2 Mbyte 5.25 inch floppy disk drive
PC63R-CA	ESDI controller board for PC630-A2 and -A3
PC63R-CB	80 Mbyte hard disk drive
PC63R-CC	135 Mbyte hard disk drive
PC63T-AA	40 Mbyte streaming tape drive
PC63T-BA	80 Mbyte streaming tape drive
PC63S-AA	Two-button mouse with interface board
PC63Y-AA	*DECstation 350 Technical Reference Manual*

1.4 Description of Components and Options

This section describes the components of the DECstation 350. Figure 1–2 is a block diagram of the components within the system.

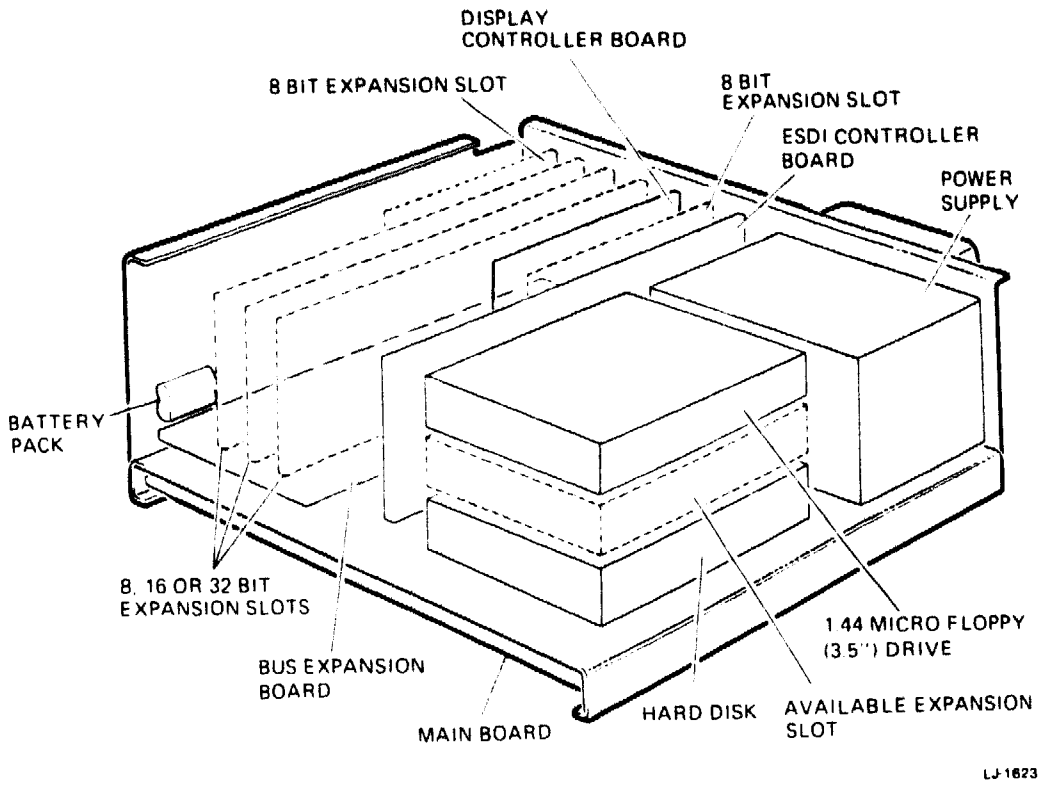


Figure 1–2 System Unit Components

1.4.1 DECstation 350 Main Logic Board

The main logic board contains an Intel 80386 CPU chip with onboard memory management and protection. An optional Intel 80387 math coprocessor may be added to enhance the CPU by providing fast processing of math functions on floating point and other data types. The keyboard interface, floppy disk interface, parallel and serial interfaces, and speaker are all on the main logic board.

1.4.2 Bus Adapter Board

The bus adapter board is mounted on a plane above the main logic board and is connected to the logic board by the U-turn board. It contains seven expansion slots:

- 3 32-bit expansion slots
- 3 16-bit expansion slots
- 1 8-bit expansion slot

You can install the boards according to the following table:

Board Configuration	Expansion Slot
8-Bit board	8, 16, and 32-bit slot
16-Bit board	16 and 32-bit slot
32-Bit board	32-bit slot

NOTE
Two of the 16 bit expansion slots are used by the VGA and ESDI controller board.

These provide connections for industry standard options such as the display, hard disk, floppy disk drive, mouse, and DEPCA controllers, and memory expansion boards.

1.4.3 Enhanced Small Device Interface (ESDI)

The Enhanced Small Device Interface (ESDI) board is used to connect one ESDI hard disk drive. The main characteristics include:

- A transfer rate of 10 Mbits per second
- 16-bit data bus for high speed transfers
- 8-bit bidirectional bus for control and status transfers
- Encoding scheme (transparent to the controller) generated by the hard disk unit while the controller sends and receives NRZ data and read/write clock cycles

1.4.4 Memory Expansion Board

There are two types of SIMMs available for expanding the memory on an expansion board: 256 Kbytes and 1 Mbyte. Each board contains 16 connectors for SIMMs. The standard memory expansion board shipped with each DECstation 350 has 2 Mbytes (eight 256 Kbyte SIMMs) of dynamic RAM memory and can be expanded to 4 Mbytes using eight more 256 Kbyte SIMMs.

Through the bus expansion board, two more memory expansion boards can be added (totaling three memory boards). Each board contains 16 connectors for SIMMs. Three different configurations are available. You can order a memory expansion board with 1 Mbyte (PN 20-31803), 2 Mbytes (PN 29-27756), or 4 Mbytes (PN 20-31805). The 1 Mbyte board comes with four 256 Kbyte SIMMs. The 2 Mbyte board comes with eight 256 Kbyte SIMMs. Both boards are expandable to 4 Mbytes using 256 Kbyte SIMMs. The 4 Mbyte board comes with four 1 Mbyte SIMMs. It can be expanded to 16 Mbytes using 12 1 Mbyte SIMMs. The DECstation 350 can contain as much as 48 Mbytes of memory if all three memory expansion boards contain 1 Mbyte SIMMs.

CAUTION

You can not mix 256 Kbyte and 1 Mbyte SIMMs within banks A, B, C, and D on the memory expansion board.

NOTE

Depending on the type of SIMMs installed in the memory expansion board (256 Kbyte or 1 Mbyte), the maximum amount of memory that can be installed on each memory board is 1, 2, 4, 8, or 16 Mbytes. Refer to Section A-2 for memory expansion board switch settings.

1.4.5 Power Supply

The DECstation has a 230 Watt power supply and cooling fan. The power supply provides the necessary power to operate the main logic board, floppy disk drive, and other options installed in the system.

1.4.6 Cooling Fan

The cooling fan is a separate assembly used to cool the power supply, standard and option boards, hard disk drive, and floppy disk drive. It cools these components by drawing the hot air out of the DECstation chassis. Power to run the fan is supplied by DC voltage from the power supply.

1.4.7 Monitors

The DECstation 350 supports 12-inch, diagonal monochrome and 14-inch, diagonal color monitors. They are compatible with industry-standard Video Graphics Array (VGA). The graphic resolution of the color monitor offers the following scanning modes and color palettes:

- 640 dots x 480 lines displaying 16 colors from a palette of 256,000
- 320 dots x 200 lines displaying 256 colors from a palette of 256,000

The graphic resolution of the monochrome monitor offers the following scanning modes and levels of gray:

- 640 dots x 480 lines displaying 16 levels of grey from 256
- 320 dots x 200 lines displaying 64 levels of grey from 256

1.4.8 Floppy Disk Drives

The DECstation 350 can house a maximum of two 3.5 inch floppy disk drives. A 1.44 Mbyte floppy disk drive is supplied with the system. A second drive added to the system may be either of the following types:

- 1.44 Mbyte, 3.5 inch floppy disk drive
- 1.2 Mbyte, 5.25 inch floppy disk drive

1.4.9 Hard Disk Drive

Only one hard disk drive may be added to the base system. The hard disk drive is available in either 80 Mbyte or 135 Mbyte capacity.

1.4.10 Streaming Tape Unit

A 40 Mbyte or 80 Mbyte streaming tape unit may be installed in the DECstation 350 as an alternative to the second floppy disk drive.

1.4.11 VGA Board

The DECstation is shipped with the VGA board installed. This board provides the video display control functions of the DECstation. The VGA board is compatible with the following video standards:

- MCGA - Multi-Color Graphics Array
- EGA - IBM Extended Graphics Adapter

- CGA - IBM Color Graphics Adapter
- MDA - IBM Monochrome Display Adapter
- Hercules graphics - Hercules graphic card

The VGA board can run software written for any of the video standards on any supported monitor. For example, you can run monochrome or color software on the color monitor.

1.4.12 Keyboards

The keyboards supplied as standard configuration is compatible with Digital and other industry-standard computers when the appropriate cable is used. Keyboards are available for different countries.

NOTE
A Digital LK250 keyboard can be used with the DECstation 350 when the appropriate cable is used.

1.4.13 Math Coprocessor

The math coprocessor (80387 chip) plugs into the system board and allows the DECstation to process numeric data faster.

1.5 Connectors, Indicators, and Controls

The external connectors for the system unit are shown in Figure 1–3.

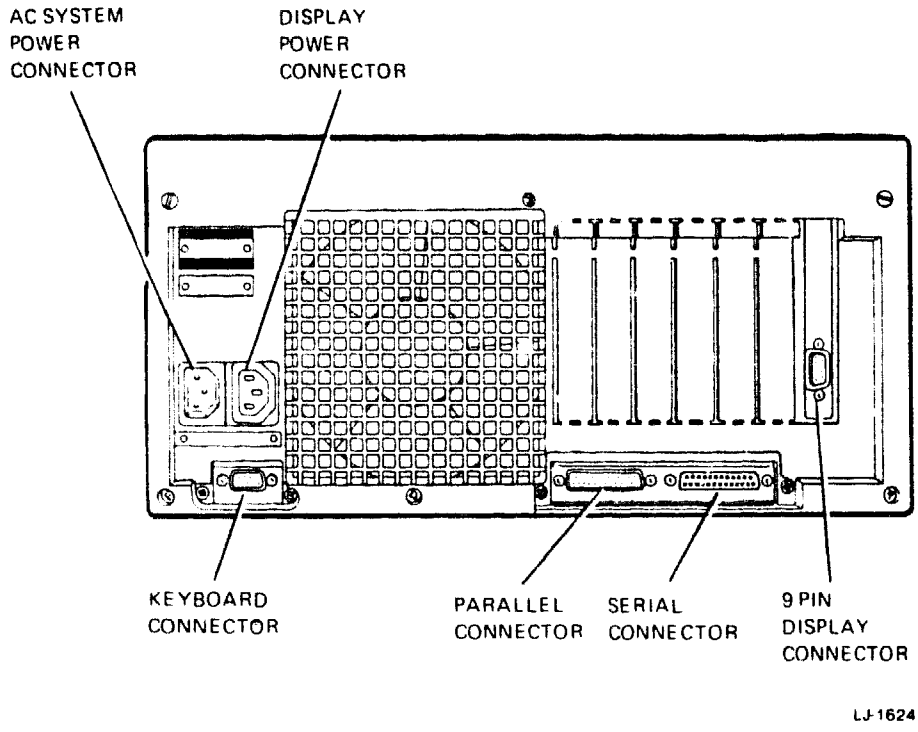


Figure 1–3 External Connectors

Figure 1–4 shows the location of the light emitting diodes (LEDs) and controls in a fully configured system. These are described as follows:

- 0/1 is used to turn system power off (0) and on (1).
- The key switch enables the keyboard. Turning the key clockwise enables the keyboard; counter-clockwise disables it.
- The keyboard LED is on when the keyboard is disabled.
- The reset button causes the system to software reset.
- The hard disk access LED is on when the system accesses the hard disk.
- The power LED is on when the system is on.
- The volume control knob changes the volume level of the system speaker.
- The diskette access LED is on when the system accesses the diskette in the floppy disk drive.
- The streaming tape access LED is on when there is a tape in the unit.

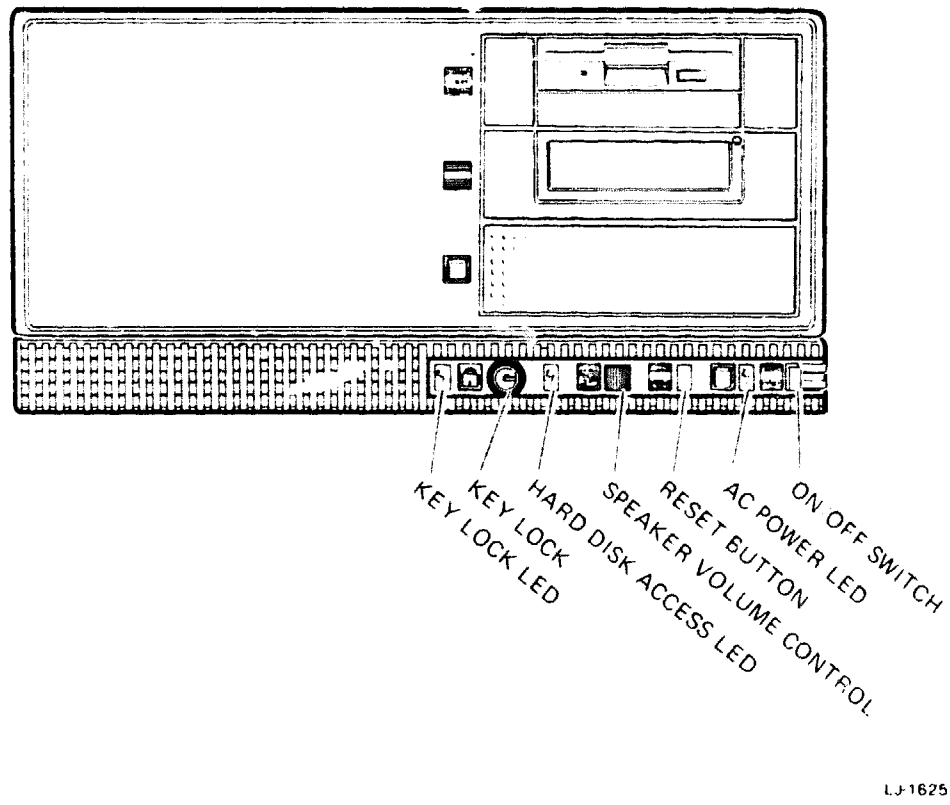


Figure 1–4 Indicators and Controls

1.6 Block Diagram

The functional block diagram is shown in Figure 1–5.

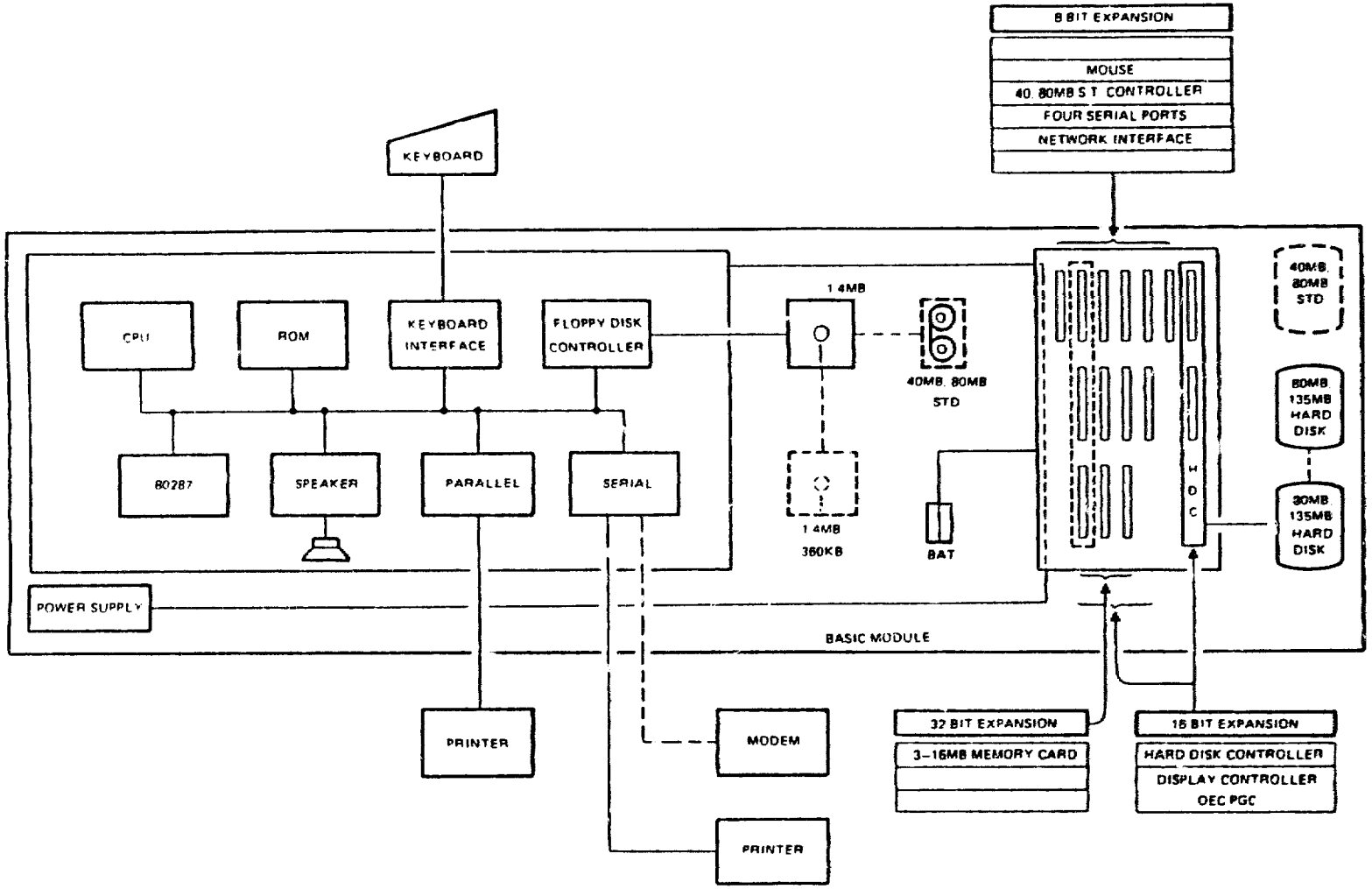
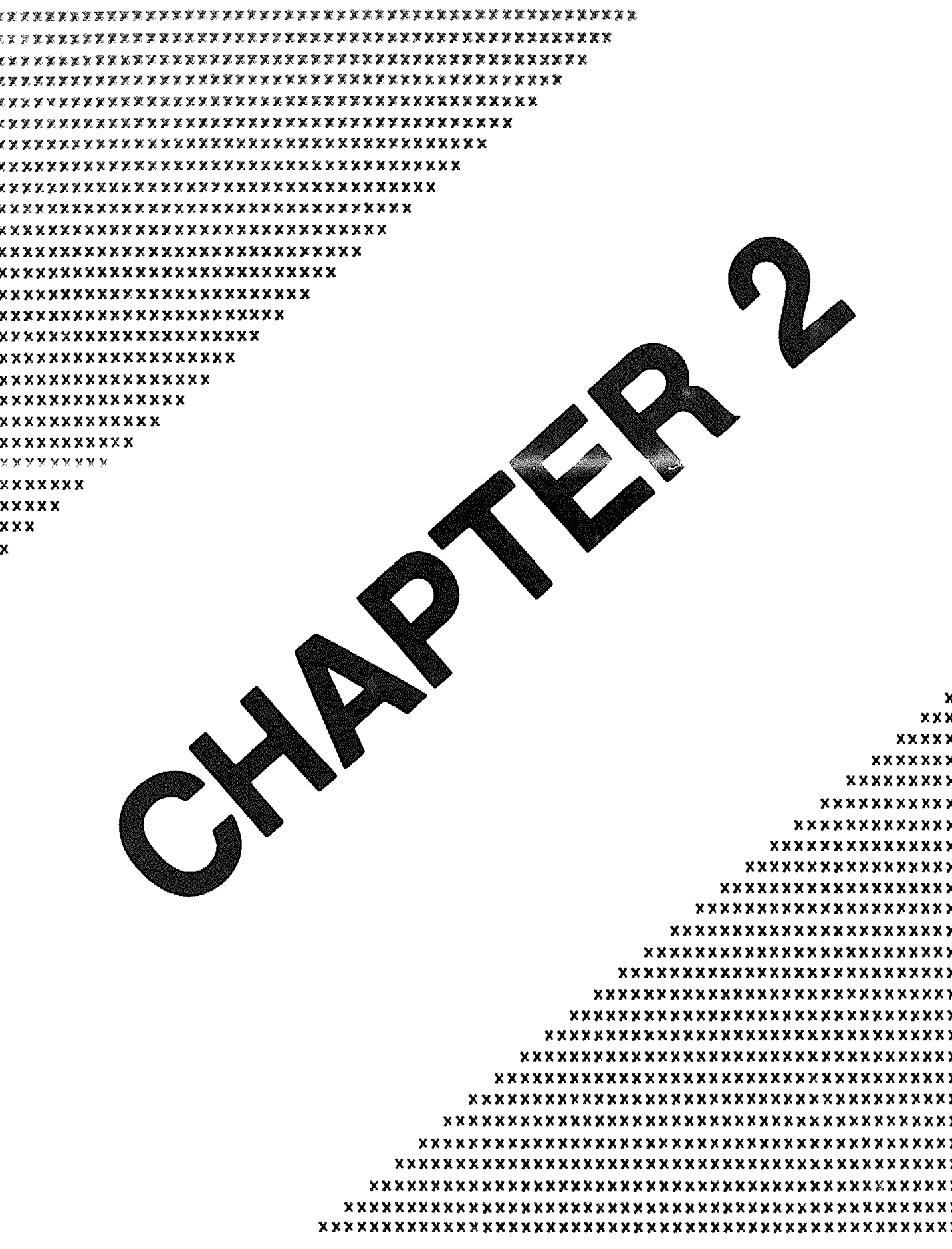


Figure 1–5 Functional Block Diagram


CHAPTER 2

2
Troubleshooting

This chapter provides information for troubleshooting the DECstation 350. This chapter contains the following sections:

- Normal power-up sequence
- Special tools
- Diagnostic tools
- SETUP utilities
- Troubleshooting procedure
- Power-up error message table with corrective action
- Troubleshooting by symptom table with corrective action

2.1 Normal Power-Up

To perform a normal power-up, turn the system off, wait 10 seconds, then turn it on again. Each time you turn the system on, the system automatically runs the power-up diagnostics. In a normal system power-up, the following takes place:

1. Power to the monitor and system is turned on. The system power indicator (green LED) is on.
2. The system generates a single beep and the fan starts.
3. The resident diagnostics are run and display a list that includes the following:
   - The amount and type of memory

     NOTE
     While in SETUP mode, if you inaccurately select the amount of total memory installed in the system, the incorrect value displays the next time you power the system. The system then displays the message "Memory Size Error, RUN SETUP".

   - The modules being tested and their pass/fail status
   - The presence/absence of fixed disk, floppy disk, tape drive

   A successful power-up test produces the sample shown in Example 2–1.
4. The system boots from either the diskette (if one is in the drive), the hard disk (if one is installed), or the network (if connected), in that order.

NOTE
The actual information displayed at this time depends on the operating system software.

```
Resident diagnostics Rev n.nn

   CPU (i80386)                 Pass
   Keyboard controller          Pass
   Base Memory                  640 KB
   Extended Memory             1048 KB
   Dedicated Memory             384 KB
   Total Memory                2048 KB
   Parity Circuitry             Pass
   Interrupts Controllers       Pass
   DMA Controllers              Pass
   Keyboard                     Pass
   Clock/Calendar               Pass
   CPU Protected Mode           Pass
   CMOS RAM                     Pass
   Fixed disks              Not present
   Floppy disks              2 present
   Option ROM at DC000:0000   Pass      (*)

   (*) DEPCA was installed on the system
```

Example 2–1 Sample of Successful Power-Up

2.2 Special Tools

The following tools are included in the service diagnostic kit (22-00484) and are needed to troubleshoot the DECstation 350:

- Loopback connectors for:
  - — Mouse (2-button) (not used on the DECstation 350)
  - — Serial port
  - — Parallel port
- 3.5 inch formatted blank diskette for running the diskette drive test
- Service diagnostics diskette

2.3 Diagnostic Tools

There are three types of diagnostics available with the DECstation 350.

- Power-on diagnostics
- System Checkout diagnostics (Utilities Diskette)
- Service diagnostics

2.3.1 Power-on Diagnostics

Power-on diagnostics are resident on the system and run automatically when power to the system is turned on. They determine what hardware is present and if the hardware is functioning. The power-on diagnostics also run automatically when a hardware reset is performed (by pressing the reset button on the front panel), or when a software reset is performed (by pressing Ctrl Alt Del).

Power-on diagnostics tests are run automatically when the system is switched on, or whenever the system is software reset. Testing is performed in individual steps, called checkpoints, so that all components are tested before being called into operation. If an error occurred during a test, an error message is returned.

The following are two types of errors:

- *Fatal errors* indicate that the system is unable to function correctly.
- *Non-fatal errors* normally indicate that an error condition has been detected and is still current. Depending on the severity of the error, the system may or may not be able to function correctly.

A check is made to ensure that actual system configuration conforms to the information stored in CMOS RAM memory. If any discrepancies are found, the diagnostics inform the operator to run the SETUP program. SETUP must be run to update the memorized configuration.

Malfunctions on the main logic board are traced to the defective component. Malfunctions on other boards or peripherals are traced only to the board or peripheral in question.

A number of basic system components must be functional for the diagnostics to run correctly. These components include the following:

- The CPU
- The clock generator
- The bus controller
- The BIOS EPROM
- The EPROM address, data and control buses
- A minimum subgroup of 80386 processor instructions
- A video controller with at least in 80 x 25 alphanumeric mode must be operational
- A video or parallel port must be functional for test results to be displayed or communicated

2.3.2 System Checkout Diagnostics (Utilities Diskette)

System Checkout diagnostics are located on the utility diskette packaged with each system as part of the customer starter kit. These diagnostics are menu-driven. They perform a more thorough test of the system than the power-on diagnostics. The diskette contains the following utilities:

System Checkout diagnostics	Runs a test of the entire system, displays a picture of each component as it is tested, tracks percentage of completion, issues pass or fail status
SETUP Utility	Lists available system parameters. Allows you to modify configuration values stored in CMOS memory. These values are what the system uses when power is on or reset. Section 2.4.1 describes the SETUP utility.
Park Disk Heads	Stabilizes disk heads for shipping.
Test One Module	Tests a single component at a time, allows you to fully test a suspected faulty component. The test displays a picture of the component as it is tested, tracks the percentage of completion, and issues a pass or fail status.

The Utilities diskette also contains utility programs for altering the speed and performance of the system. These are the GOFAST/GOSLOW, AUTOSLOW, and SOUND utilities.

2.3.3 Service Diagnostics

The following diagnostics are used only by Customer Service personnel. The menu-driven diagnostics are located on the Service Diagnostics diskette. It is packaged in the Service Diagnostic Kit (22-00484) and includes the following:

- Service Diagnostics diskette for the DECstation 350
- Service Diagnostics diskette for the DECstation 300
- Service Diagnostics diskette for the DECstation 200
- Service Diagnostic manual
- Spare 3.5 inch floppy diskette
- Serial loopback connector
- Parallel loopback connector

- Mouse loopback connector (not used on the DECstation 350)

The service diagnostics are more in-depth than the system checkout diagnostics; however, some of the functions are the same. Refer to the *DECstation 350 Service Diagnostics* for detailed information.

The service diagnostics offer the following test options:

System Configuration Check	Tests for the presence of components and options then issues a configuration report after 60 seconds. The presence of components/options displays in reverse video.
SETUP Utility	Allows you to modify the configuration values stored in CMOS RAM. The function is similar to the SETUP utility on the Utilities diskette. See Table 2–1 for the setup parameters and values.
Test One Module	Tests a single module of your choice. Offers subtests for each module and various parameters for running the tests.
Test List	Allows you to create a file containing a list of modules to be tested and test control instructions. Once you create the file, it may be executed or saved on diskette for future use.
Set Test Options	Allows you to select operating modes that affect testing. For example, stop the test or sound the bell if an error is detected.
Error Logging	Allows you to select where you want the list of errors to be logged. You can display the error log on the screen, send it to the printer, store it in a file, or send it to the serial port. If you choose to send it to a serial port, be sure to set the baud rate, parity, bits/character, and number of stop bits.
Disk Utilities	Allows you to format the hard disk, format the defects, or park the disk heads. **NOTE** **Parking the disk heads disables the keyboard. To enable the keyboard, turn the system off then on again.**

2.4 SETUP Utilities

There are three types of SETUP programs available for the DECstation 350:

- SETUP on the System Checkout Diagnostics (Utilities diskette)
- SETUP on the Service Diagnostics Diskette

2.4.1 Using the SETUP Utility on the Utilities Diskette

The SETUP Utility is located on the Utilities diskette. There are several circumstances when SETUP must be run:

- When the power-up diagnostics issue a `Run SETUP` message
- When any hardware component is added, removed, or changed in the system
- When the system battery fails or is replaced
- When the memory configuration is changed

To run SETUP, follow these steps.

1. Insert a copy of the Utilities diskette into the diskette drive.
2. If the system is off, turn it on. If the system is already on, reset it by pressing Ctrl Alt Del. The power-up diagnostics display on the monitor, the floppy disk drive automatically loads the System Checkout diagnostics (Utilities Diskette) application.
3. Select the language you want, and press Enter. A message about the usage displays. Press Enter. In certain cases, such as when the battery has been changed, the System Checkout diagnostics will automatically run SETUP. Otherwise, the Main Menu displays.
4. At the Main Menu, choose the SETUP utility. The first page of a list of setup parameters displays (there are two pages).
5. Verify the list of parameters. To change the selected parameter select one by depressing the ↑ and ↓ keys. Insert your selection by pressing Enter.
6. When your selections are complete, press ESC and remove the diskette from the drive.

The SETUP utility parameters and possible values are listed in the following table:

Table 2–1 SETUP Utility Parameters

Parameter	Value	Comments
Date	mm-dd-yyyy	*mm* is month, *dd* is day, *yyyy* is year.
Time	hh:mm:ss	*hh* is hours, *mm* is minutes, *ss* is seconds.
Base Memory Size	256, 384, 512, or 640 Kbytes	Sets the amount of base memory present in the system.
Extended Memory Size	Excess of 1 Mbyte	Tells the system how much memory over the standard 1 Mbyte is installed. The value increases or decreases in 128 Kbytes increments with ↑ and ↓ keys. The value increases or decreases in 1 Mbyte increments with PG/UP or PG/DN.
Floppy Drive #1	1.2 Mbyte, 1.44 Mbyte	Presence and storage capacity.
Floppy Drive #2	Not present, 360 Kbyte, 720 Kbyte, 1.2 Mbyte, 1.44 Mbyte	Presence and storage capacity.
Hard Disk #1	Not Present, Type, Capacity	Value on bottom of system unit. Type 32 for the 80Mbyte or type 33 for 135Mbyte hard disk.
80387 Math Coprocessor	Not present, Present	If a coprocessor is installed, select Present. If a coprocessor is not installed, select Not present.
Primary CRT Adapter Type	Enhanced graphics, 40 or 80 column color, 80 column monochrome	This is the type of primary controller when there is more than one controller. The DECstation 350 uses enhanced graphics for the VGA controller board.
System Board Serial Port	Disabled, Enabled Com1 or Com2	Defines how the serial port is addressed.

Table 2–1 (Cont.) SETUP Utility Parameters

Parameter	Value	Comments
System Board Parallel Port	Disabled, Enabled LPT1 or LPT2	Defines how the parallel port is addressed.
Base Memory	All enabled, Disabled above 512 Kbytes	Certain third party packages require a smaller base memory.
Power On Memory Test	Small, Medium, Large	Large is the most complete memory test but it is the slowest.
Scrolling Type	Fast, Slow, Flicker, Dual port	Adjust the scrolling type to match the controller. If the prime controller is VGA, select Dual port.
I/O Delay	None, Small, Medium, Large	Use for timing dependent applications written for the 80386 and 80286 microprocessor. Can work in conjunction with Memory Delay. See also the GOFAST/GOSLOW utility description in the *DECstation 350 Installation and Operations Guide.*
Memory Delay	None, Small, Medium, Large	Use for timing dependent software. Can work in conjunction with I/O Delay. See also the GOFAST/GOSLOW utility description in the *DECstation 350 Installation and Operations Guide.*
Video Controller	PGC, OGC, OEC or Other	Use OEC or Other for VGA controllers.

2.5 Troubleshooting Procedure

Troubleshoot the DECstation 350 as follows:

CAUTION
Inform the System Administrator before disconnecting the system from the network. Make sure the disconnection does not interfere with other users on the network. Disconnect the system from the network before running the diagnostics. See Chapter 3, Ethernet Connections for a description of the disconnection procedure.

1. Ask the customer to describe the problem. You might want to ask the following:
   - If an error message was displayed and what was the error message.
   - When the problem started.
   - If any new hardware options were added to the system around the time the problem started and if the options are Digital certified or third party.
   - If any new software was added to the system around the time the problem started.
   - If the top cover was removed for any other reason than adding an option.
   - If the operating speed was changed through the GOFAST/GOSLOW, or AUTOSLOW utility.
   - Describe the results of running the Customer Utility diskette.
2. Have the customer supply you with a *copy* of the Utilities diskette and the MS-DOS Startup and Operating diskette that came with the system.
3. Have the customer provide you with the system configuration. The customer may have recorded the configuration in the Information Log located in the *DECstation 350 Installation and Operations Guide*. If the customer does not have this information and the system boots, you may want to run the following service diagnostics configuration check:
   - Type and amount of memory
   - Type of monitor
   - Type of keyboard

- Type and number of disk drives
- Type of tape drive
- Type of video adapter board
- Type of disk adapter board
- Type of serial/parallel adapter board
- Type of network adapter board
- Type of mouse
- Type of math coprocessor or coprocessor board
- Any other options installed in the system

4. Set the power switch to 1 (ON) to run the power-on test (Section 2.1 describes what happens during normal power-up). Refer to Section 2.6, Troubleshooting by Symptom, or to one of the following procedures:
   - If the system does not power-up, refer to Section 2.5.1, No Power.
   - If the system powers up but does not boot or there is no video display, refer to Section 2.5.2, System Does Not Boot/No Video Display.
   - If the system powers up and boots, refer to Section 2.5.3, System Boots.
5. Run the Service Diagnostics if you still have not found the problem. See Section 2.3.3.

2.5.1 No Power

If the system does not power up, follow these steps. Make sure you have completed the steps in Section 2.5.

1. Set the power switch to 0 (OFF).
2. Check the system for loose cables and connections.
3. Plug the system unit power cord into a working ac outlet.
4. Set the power switch to 1 (ON). The following are indications that the system and monitor have powered up. If the system powers up go to step 13.
   - The green power indicator is **on**.
   - You can hear the fan running.
   - You can hear the hard disk spinning.
   - The floppy disk drive LED will light momentarily if there is a diskette in the drive and the system accesses it.
   - The hard disk drive LED will light momentarily if the system accesses the disk.
5. Center the brightness and contrast controls on the monitor.
6. Check that the power switch and power switch bar are functioning correctly. To do this, remove the system cover (Section 5.2.4). If the switch or switch bar are not functioning, replace the one that is faulty, then repeat step 4. Otherwise go to step 7.
7. Turn the power switch to off again.
8. Unplug the system from the ac outlet. Wait 20 seconds.
9. Remove all options except the VGA board, and one memory expansion board. Refer to Chapter 5 for removing options.
10. Plug the system into a working ac outlet.
11. Turn the system power switch on.

    If the system powers up this time that indicates there was either a faulty device, too many options installed, or another power related problem. Go to step 12.

    If there is still no power, replace the power supply as described in Section 5.2.18, and turn the power on again.

12. Replace the Digital certified options one at a time and see if the system powers up each time an option is replaced or a disk drive is reconnected.
13. Run the diagnostics on the Utilities diskette.
14. Try booting the system from the MS-DOS Startup and Operating diskette.
    - If the system powers up but does not boot, refer to Section 2.5.2.
    - If the system powers up and boots, refer to Section 2.5.3.

2.5.2 System Does Not Boot/No Video Display

This procedure is to help determine why the DECstation 350 does not boot. Before starting this procedure be sure to complete the steps in Section 2.5.

1. Check that the video power and signal cables are connected and that the monitor brightness and contrast controls are adjusted correctly.
2. Replace the monitor and try to boot the system.
3. Replace the VGA board and try booting the system.
4. Remove any third party options and try to boot the system.
5. Remove four SIMMs installed in bank 0 of the memory expansion board.
6. Try booting from the MS-DOS Startup and Operating diskette.
    - If the system does not boot, verify that all jumpers are set correctly (See Appendix A). Reboot the system by typing Ctrl Alt Del.
    - If the system still does not boot, remove all options except the VGA board, and one memory expansion board. Try to boot the system.
    - Replace the Digital certified options one at a time and see if the system powers up and boots each time an option is replaced or a disk drive is reconnected.
7. When the system boots, refer to Section 2.5.3.

2.5.3 System Boots

If the system successfully boots but a problem still exists, follow these steps. Make sure you have completed the steps in Section 2.5.

CAUTION
The system must be disconnected from the network before running the diagnostics.

1. Determine what the failure is by any or all of the following methods:
   - Refer to the list of possible error messages (Section 2.7)
   - Refer to the list of possible symptoms (Section 2.6)
   - Run the power-up diagnostics
   - Run the diagnostics on the Utilities diskette
   - Run the service diagnostics
2. Make sure the system is configured correctly by running the SETUP utility on either the Utilities diskette or the Service Diagnostics diskette.
3. Replace the necessary FRU and set the appropriate jumpers correctly, if there are any.
4. Run the power-up diagnostics to test the system.
5. You must run the SETUP utility on the Utilities Diskette when a new option is installed or when the main logic board or battery are replaced.

2.6 Troubleshooting by Symptom

The following list contains all the troubleshooting tables in this chapter. Each table describes symptoms, the possible causes, and suggested corrective actions.

- Table 2–2 - Power up Symptoms
- Table 2–3 - No Boot Symptoms
- Table 2–4 - Magnetic Peripherals Symptoms
- Table 2–5 - Monitor Symptoms
- Table 2–6 - Printer Symptoms
- Table 2–7 - Power up Test Messages (Section 2.7)

Table 2–2 Power up Symptom

Symptom	Possible Cause	Corrective Action
No display, all LEDs are off, and the fan is not working.	The AC power cable is not plugged in.	Plug the cable into a working wall outlet.
	The wall outlet is not working.	Plug the AC power cable into a working wall outlet.
	Power switch is not on.	Turn power switch to on.
	Power switch is not working. Or, the power switch bar is not connected.	Replace the switch or make sure switch bar is connected.
	Power supply is not working.	Replace the power supply.
No display, all LEDs are on, and the fan is on	Brightness or contrast needs adjustment.	Adjust the brightness and contrast controls on the monitor.
	Video power and signal cables are not plugged in.	Plug in the cables securely.
	Monitor failure.	Replace the monitor.

Table 2–2 (Cont.) Power up Symptom

Symptom	Possible Cause	Corrective Action
	VGA board failure or not connected correctly.	Ensure that the board is firmly seated in the connector. If this does not correct the problem, replace the board.
	Memory board switches are set incorrectly.	Set switches correctly.
No keyboard response.	The keyboard cable may not be plugged in.	Plug in the keyboard cable.
	The key switch is off causing a keyboard disable.	Turn the key counter-clockwise.
	The key is missing.	Replace the key.
System clock and calendar inaccurate.	Battery failure.	Replace the battery.
	The battery cable is not plugged in.	Plug in the battery cable.
Volume cannot be adjusted.	The volume control knob not aligned with the volume control lever on main board.	Remove the bottom cover and realign the knob with the lever.

Table 2–3 No Boot Symptoms

Symptom	Possible Cause	Corrective Action
System does not boot from the hard disk.	There is no software on the partition.	Install software on the partition.
	The system software is not on the disk.	Load the system software on the hard disk.
	The requested partition does not exist or is not formatted.	Check the partitions. Format the partition; repartition if necessary.
	The primary and secondary drives are set incorrectly.	Make sure the drive jumpers are correctly set.
	The hard disk is not installed properly.	Check the hard disk installation.
System does not boot from the diskette drive.	The diskette is not in the diskette drive.	Insert a diskette containing bootable system software.
	The drive switch is set incorrectly.	Make sure the drive switch is set correctly.
	The diskette is not bootable.	Use a diskette containing bootable system software.
	The diskette is worn or damaged.	Try another diskette.
	Hardware conflict (remote boot).	Make sure the system is not set up for a remote boot.
System does not reboot when the power is turned off and on.	The power was not off long enough.	Turn the power off for at least 10 seconds before rebooting.
A DEPCA is installed but the node does not boot after using the utility diskette.	The reset generated by the Utilities diskette is not compatible with the DEPCA board.	Press Ctrl Alt Del at the same time (a soft reset) to correctly reset the hardware; then turn the system power off and on. See the *DEPCA Service Guide*.

Table 2–4 Magnetic peripheral Symptoms

Symptom	Possible Cause	Corrective Action
System won't start from the diskette drive or displays the message: Abort, Retry, Ignore	The diskette has been demagnetized.	Make sure the diskette drive cable is correctly installed. Replace the diskette.
	Improperly formatted diskette.	Reformat the diskette.
Diskette drive cannot read or write information.	The diskette drive is empty.	Insert a diskette into the diskette drive.
	Diskette is not formatted.	Use a formatted diskette.
	Diskette is worn or damaged.	Try another diskette.
Hard disk cannot read or write information.	A problem exists with the drive or drive adapter.	Make sure all jumpers are set correctly.
Intermittent hard disk read/write problems.	Possible corrupted files.	Restore the disk from back-up files.
Hard disk works but produces extra characters or garbled text.	Hard disk is affected by static electricity.	Move system away from any motors, magnetic devices, or photocopiers.
		Increase the humidity in the room and use antistatic mats around the system.
Can read from hard disk but cannot write.	The voltage is too low.	Use a DVM (digital voltage meter) to measure the +5V connector and ground connector on power supply. It should measure no less than 4.75V
	The hard disk is damaged.	Replace hard disk.

Table 2–4 (Cont.) Magnetic peripheral Symptoms

Symptom	Possible Cause	Corrective Action
Tape does not work in the tape drive.	The tape is not fully inserted into the tape drive.	Make sure the tape is fully inserted and the cartridge release handle is locked down.
	The tape is worn or damaged.	Try another tape.
Copy protection failure on application programs.	Disk access speed is too fast for copy-protection check of application program.	Run the AUTOSLOW.EXE utility located on the Keyboard Drivers and Utilities diskette. Refer to *DECstation 350 Installation and Operations Guide*.
		Change the I/O Delay, Memory Delay parameters in SETUP to a slower speed. If this does not correct the problem, run the AUTOSLOW.EXE utility located on the Utilities diskette. See the description of the GOFAST/GOSLOW, and AUTOSLOW utilities in the *DECstation 350 Installation and Operations Guide*.

Table 2–5 Monitor Symptoms

Symptom	Possible Cause	Corrective Action
Screen displays distorted images or goes blank when you run your software.	The software is not configured for, or is incompatible with the current settings of the VGA board.	Reconfigure your software for VGA or set the VGA board to a standard supported by your software. See your software and VGA manuals.
Screen display distorted, rolling, flickering, or wrong or uneven color.	The monitor cable connector pins are bent or broken.	Straighten the pins or replace the monitor.
	Electromagnetic interference exists.	Move any electromechanical device away from the monitor or move the monitor.
Screen displays partially highlighted characters.	The main logic board video and VGA board jumpers are incorrectly set.	Make sure the jumper setting on the main logic board matches the setting on the VGA board.
Complete white screen.	Monitor cable is not securely plugged in.	Plug in the monitor cable.
	The VGA board is defective.	Replace the VGA board.
	The monitor is defective.	Replace the monitor.

Table 2–6 Printer Symptoms

Symptom	Possible Cause	Corrective Action
Printer problems.	The printer cable is not plugged in.	Plug in the printer cable.
	The printer is set to local mode.	Set printer to on-line mode.
	Incorrect printer configuration.	Refer to the printer operating manual for correct configuration.

2.7 Power-Up Error Messages

Power-up messages are listed in Table 2–7. If a message occurs and the diagnostics do not continue, press the F1 key to resume the power-up testing.

Table 2–7 Power-Up Test Messages

Error Message	Possible Problem	Corrective Action
Illegal Shutdown Error <nn>	There is a shutdown condition but the relative code is illegal or undefined.	The system proceeds to Primitive Diagnostic tests.
Resident Diagnostics Rev. x.xx	This is a normal message when the Primitive Diagnostic tests are complete.	The system proceeds to Advanced Diagnostic tests.
Relace Disk and Strike Any Key	Bootstrap error	Re-boot the system
Unrecoverable power-up error	There is a possible failure on one or more boards.	Remove all third party boards and run the Service Diagnostics program.
i80386 Error: 1	The CPU failed the FLAG test.	The system proceeds with test. Replace the CPU board.
i80386 Error: 2	The CPU failed the ALU test.	The system proceeds with test. Replace the CPU board.
i80386 Error: 3	The CPU failed the register test.	The system proceeds with test. Replace the CPU board.
Memory Error:	A compare error was found during the RAM test.	Replace the CPU board.

Table 2–7 (Cont.) Power-Up Test Messages

Error Message	Possible Problem	Corrective Action
Memory Refresh Error	The memory refresh did not occur error 15.1ms.	Press F1 to continue testing. Check that jumper W010 is installed. Replace the CPU board.
Memory Error	An error was found in the first 8KB of system memory.	Press F1 to continue testing.
Parity Circuitry	An Internal Parity Error has occurred.	Replace the CPU board.
NMI Error	Unexpected NMIs.	Replace the CPU board.
Parity Error:	A parity error was found during memory tests.	Replace the CPU board.
Parity Error	A parity error was found during parity generator test.	Replace the CPU board.
Interrupt Controller Error: 1	No timer interrupt occurred when the first interrupt controller was tested.	Replace the CPU board.
Interrupt Controller Error: 2	Timer 0 failed to count when the first interrupt controller was tested.	Replace the CPU board.
DMA Controller Error: 1	The first DMA controller failed the register read-write test.	Replace the CPU board.
DMA Controller Error: 2	The first DMA controller failed to do a DMA transfer.	Replace the CPU board.
DMA Controller Error: 3	The second DMA controller failed the register read-write test.	Replace the CPU board.

Table 2–7 (Cont.) Power-Up Test Messages

Error Message	Possible Problem	Corrective Action
DMA Controller Error: 4	The second DMA controller failed to do a DMA transfer.	Replace the CPU board.
DMA Page Registers Error	The DMA Page register has failed the write-read test.	Replace the CPU board.
Timer Error: n	One of the 3 timers does not count, counts too fast or too slow.	Press F1 to continue testing. Replace the CPU board.
Keyboard Error: n	The keyboard cable is disconnected.	Connect the keyboard cable to the system.
	Recycled power too quickly.	Press F1 to continue testing.
		Replace the keyboard.
Speaker Error	The speaker port has failed.	Connect the cable to the system and the keyboard.
	The speaker is faulty.	Replace the keyboard.
Clock/Calendar Error.	The battery fails to keep the correct time.	Replace the battery.
Protected Mode Error: 1	The CPU failed the LIDT-SIDT and LGDT-SGDT instruction set.	Replace the CPU board.
Protected Mode Error: 2	The CPU failed to enter protected mode.	Replace the CPU board.
Protected Mode Error: 3	The CPU failed the LDT-SDT LTR-STR VERR/VERW LAR-SLR ARPL AND POPA-PUSHA instruction set.	Replace the CPU board.
Turn Key to Unlocked Position.	The front panel keyswitch is locked.	Turn the key to the unlocked position.
ROM Checksum Error	The resident ROM checksum test failed.	Press F1 to continue testing.

Table 2–7 (Cont.) Power-Up Test Messages

Error Message	Possible Problem	Corrective Action
		Run the SETUP program on the Utilities diskette.
CMOS RAM Battery Error	The battery is low.	Replace the battery.
CMOS RAM Checksum Error - Run SETUP	CMOS is not initialized.	Run the SETUP program on Utilities diskette.
	The battery is low.	Replace the battery.
	There is a software problem.	Run the SETUP program on the Utilities diskette.
CMOS RAM Error: 1	The CMOS RAM shutdown byte test has failed.	Run the SETUP program on the Utilities diskette.
CMOS RAM Error: 2	The CMOS RAM shutdown read-write test has failed.	Run the SETUP program on the Utilities diskette.
RUN SETUP	The configuration does not match the CMOS information.	Run the SETUP program on the Utilities diskette.
ROM BASIC not present.	The hard disk has no active partition defined and formatted.	Define the partition and format the disk. Refer to the disk operating system installation guide.
Configuration Port Failed.	There is a conflict in serial or parallel addresses.	Check the addresses of the ports.
Primary boot-strap.	This is a normal message at test completion.	Run the System Checkout program on the Utilities diskette.
Non-system disk or disk error. Replace disk and strike any key.	There is no disk in drive A. Or, either the floppy or hard disk do not contain correct system files.	Use the correct bootable disk and press any key to continue.

CHAPTER 3

3
Ethernet Connections

3.1 Introduction

This chapter describes ThinWire Ethernet and standard Ethernet connections and how to disconnect the DECstation from a network. Figure 3–1 shows the cabling for two ThinWire Ethernet networks linking DECstation systems that have a DEPCA option board.

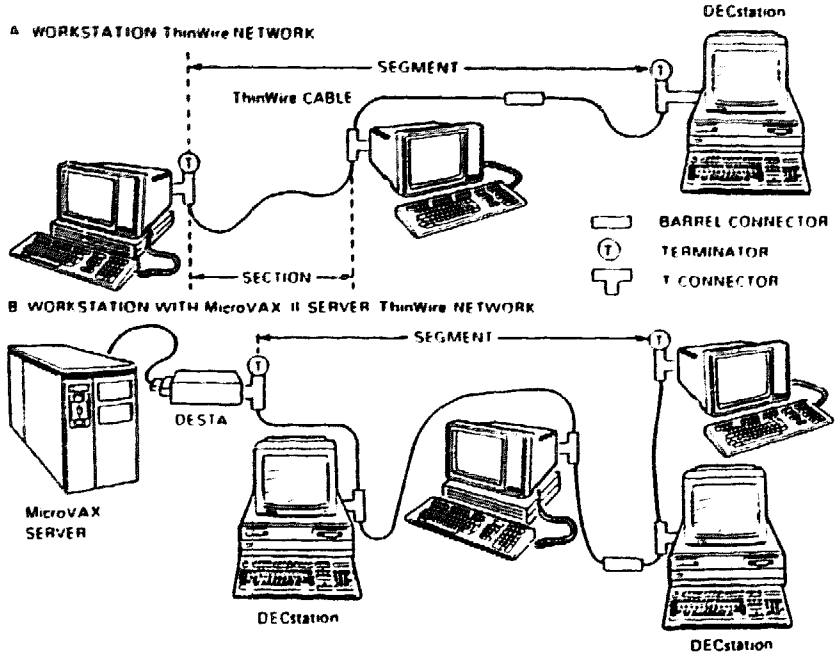


Figure 3–1 Two Sample ThinWire Networks

3.2 Disconnecting From ThinWire Ethernet

Before servicing the DECstation system, disconnect it from the ThinWire network by following these steps.

CAUTION
Inform the system administrator before you disconnect the DECstation system from the network.

1. Turn power to the system off.
2. Disconnect the T-connector from the DECstation system (Figure 3–2). **Do not** disconnect the T-connector from the ThinWire Ethernet cable or from the terminator, if one is present.

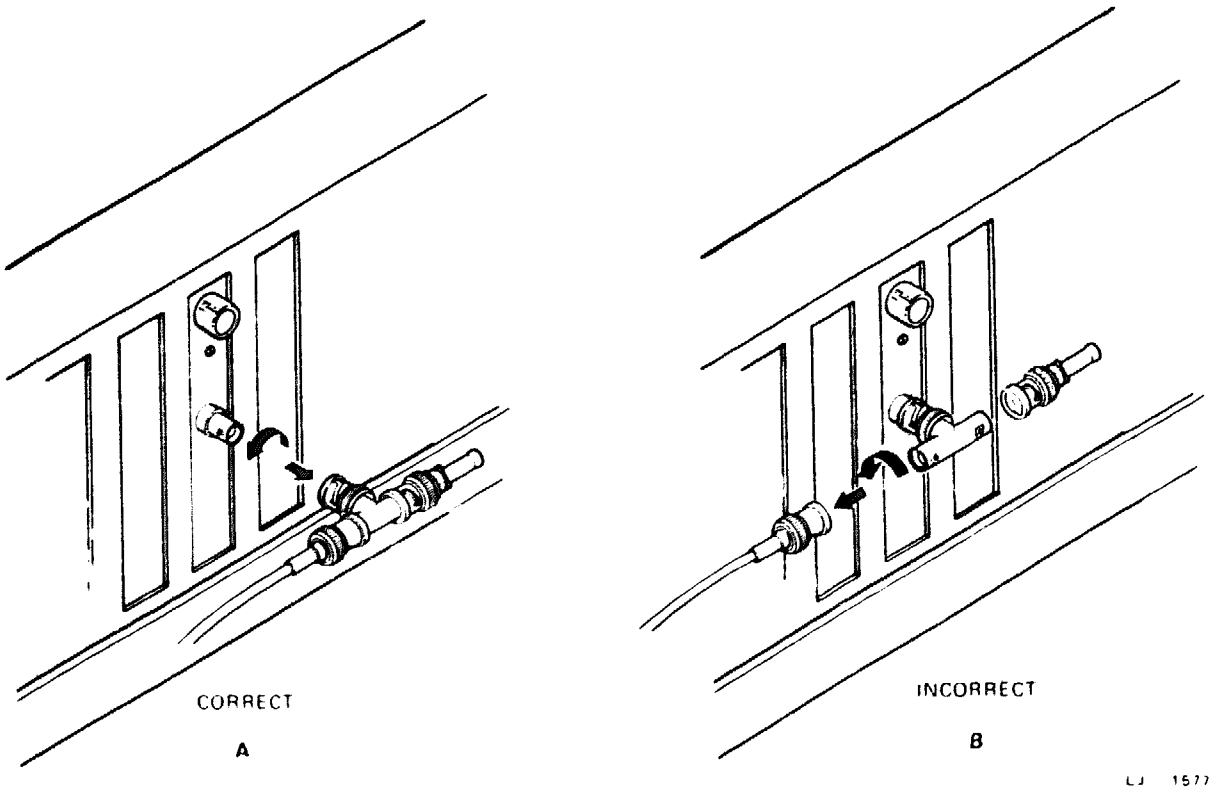


Figure 3–2 Disconnecting a T-Connector from a DECstation

When re-connecting a DECstation system to a ThinWire network observe the following:

- Never install a cable at the stem of a T-connector. (Figure 3–3, Example A, shows a correct Ethernet installation.)
- Never join two T-connectors or a barrel and a T-connector together.
- Never create a loop configuration. (Figure 3–3, Example C). There **must** be a terminator at both ends of a segment (Figure 3–3, Example A). Only one end can be a DEMPR.

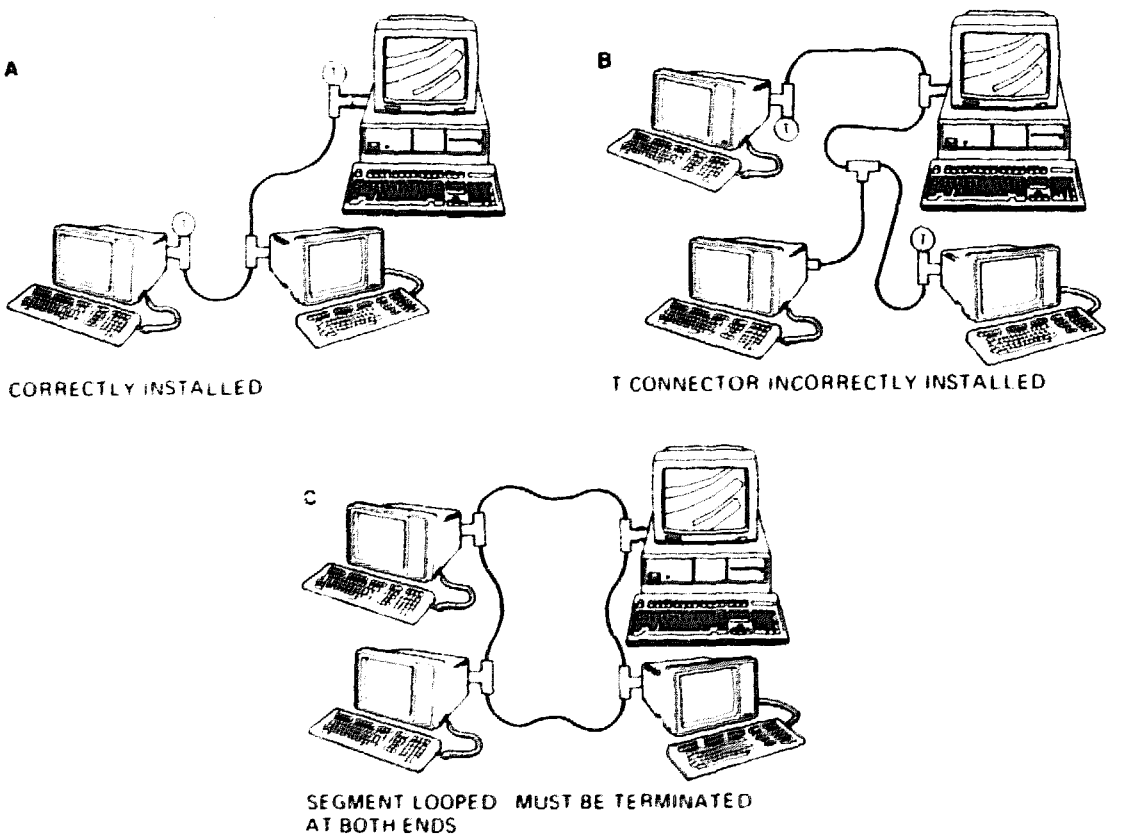


Figure 3–3 Correct and Incorrect ThinWire Segment Connections

For information about installing complex ThinWire networks, see the *DECconnect System Stand-alone ThinWire Networks Planning and Installation Guide*, the *DECconnect System Planning and Configuration Guide*, and the *DECconnect System Installation and Verification Guide*.

3.3 Standard Ethernet Networks

A DECstation system can also be linked directly to a standard Ethernet network. A DEPCA board with the Attachment Unit Interface (AUI) can connect to a standard Ethernet network through a Digital Ethernet Local Network Interconnect (DELNI) or H4000 transceiver (Figure 3–4).

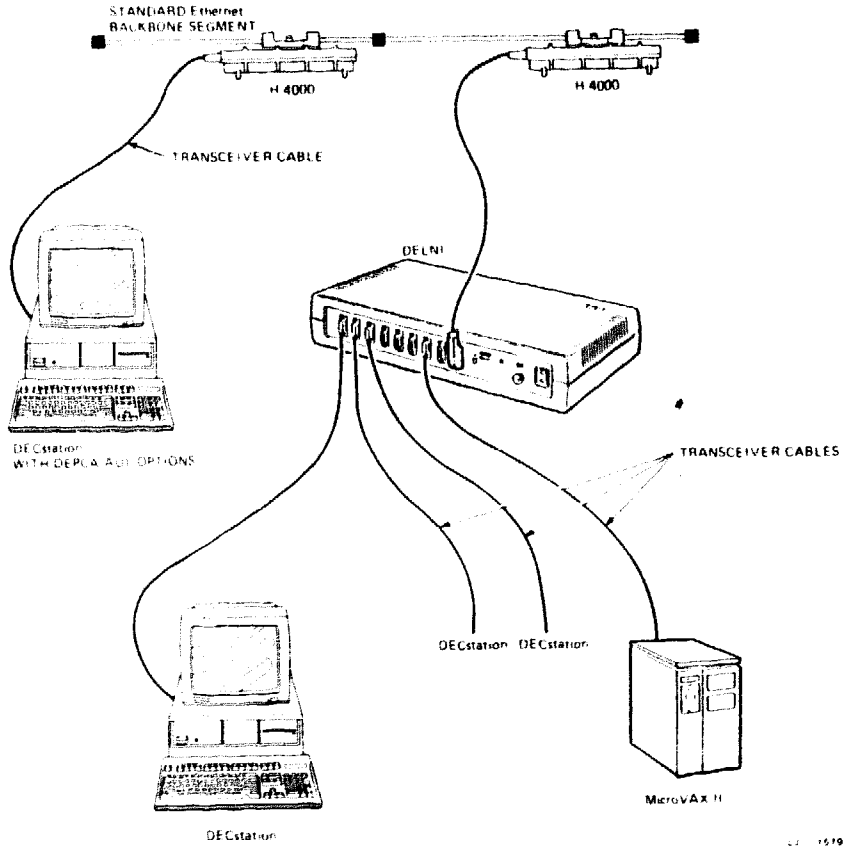


Figure 3–4 DEPCA/AUI Option Network Configurations

To disconnect a DECstation from a standard Ethernet network, use the following procedure.

CAUTION
Inform the system administrator before you disconnect the DECstation system from the network.

1. Turn power to the system off.
2. Disconnect the transceiver cable from the connector on the DECstation system.

To connect the DECstation to a standard Ethernet network, reverse this procedure.

For more information about connecting a DECstation system to a standard Ethernet network, see the *DECconnect System Planning and Configuration Guide*.

CHAPTER 4

4
Monitor Adjustments

4.1 Introduction

This chapter describes general adjustment procedures for the monochrome and color monitors.

4.1.1 Tools

Use the following tools when adjusting either monitor:

- Insulated Phillips (cross head) screwdriver
- Trimming tool (part number 29-26128) and extension (part number 29-23789)
- Service Diagnostics diskette

4.1.2 System Display Check - Monochrome and Color

Before making any adjustments, you need to do the following:

CAUTION
Before you turn power to the system off, the MS-DOS prompt (for example, C>) should display.

1. Turn power to the system off.
2. Insert the Service Diagnostics diskette in the drive.
3. Turn power to the system on. Allow the Power-Up test to complete, then wait 10 minutes. If there is no video display, increase the brightness until the display produces a raster.

4.2 Monochrome Monitor Adjustments

This section contains the following adjustment procedures for the monochrome monitor:

- Horizontal phase
- Vertical and Horizontal linearity
- Width
- Height
- Focus

4.2.1 Removing the Cover - Monochrome Monitor

Only qualified personnel should remove the monitor cover to access the adjustment potentiometers. All adjustment potentiometers, except brightness and contrast, are located inside the monitor.

WARNING
High voltages are present within the monitor case.

CAUTION
Before you turn power to the system off, the MS-DOS prompt (for example, C>) should display.

Remove the cover as follows:

1. Turn power to the system off.
2. Disconnect the power cable from the wall outlet.
3. Disconnect all peripheral cables connected to the system.
4. Remove the cover retaining screws (Figure 4–1).
5. Slide the cover off by lifting it upward (Figure 4–1).

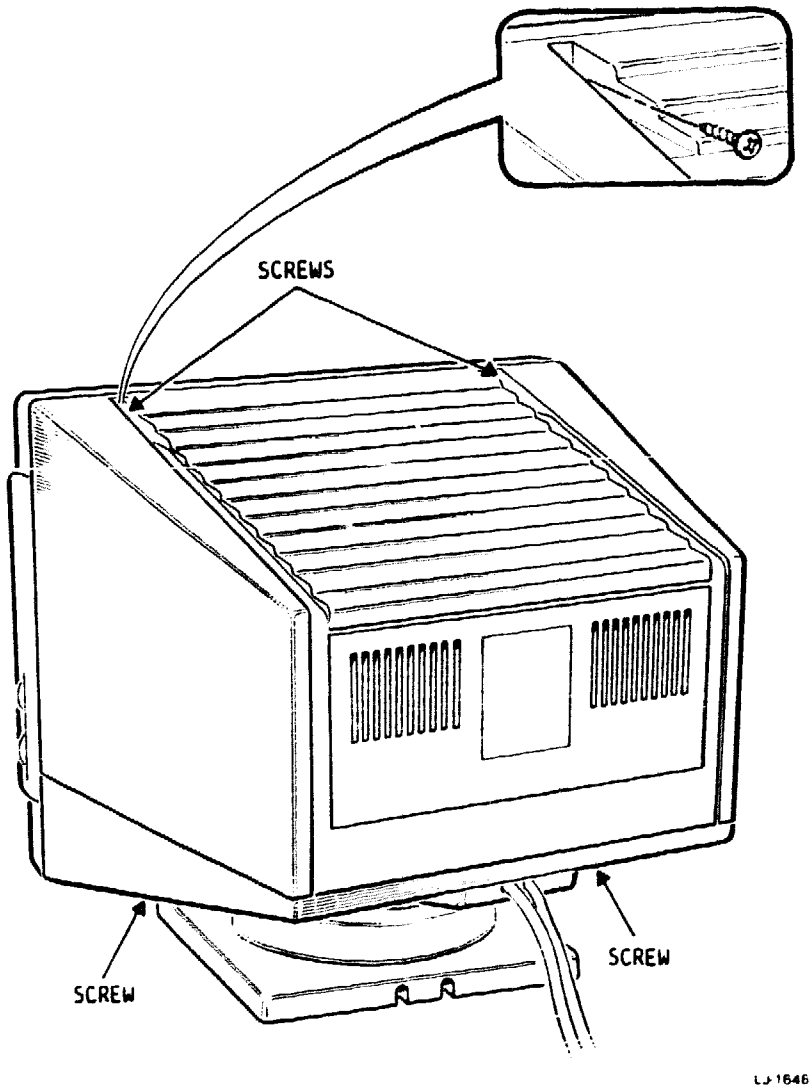


Figure 4–1 Removing the Monochrome Monitor Cover

4.2.2 Making the Adjustments - Monochrome Monitor

To make any adjustments you must:

1. Reconnect the power cable to the wall outlet.
2. Turn power to the system on. Allow the monitor to stabilize for 5 minutes.
3. Perform the required adjustments procedures (Section 4.2.4 through Section 4.2.8).

CAUTION
You must make the adjustments according to the sequence given in these procedures; all the adjustments interact with each other. When done, if the monitor performance is not satisfactory, repeat all the procedures in this sequence.

4.2.3 Quick Reference Chart - Monochrome Monitor

The following table is a quick reference to the adjustment procedure for *experienced* technicians.

Parameter	Test Pattern	Adjustment	
Horizontal phase	Cross Hatch with Circle Option	RV8	-
Vertical linearity	Check Linearity	RV6	-
Horizontal linearity	Check Linearity	-	B3
Width	640 x 480 Graphics	-	B4
Height	640 x 480 Graphics	RV5	-
	640 x 350 Graphics	RV2	-
	640 x 400 Graphics	RV3	-
Focus	Check Linearity	RV10	-

4.2.4 Horizontal Phase Adjustment - Monochrome Monitor

Adjust the horizontal phase as follows:

1. Run the Service Diagnostics diskette and choose the Test One Module selection. Press Return.
2. After the configuration test, choose the VGA and Monochrome Video selection. Press Return.
3. Choose the Cross Hatch with Circle selection. Press Return.
4. Increase the brightness using the external brightness control until the raster area is visible.
5. Adjust trimmer RV8 on the monitor board (Figure 4–2) to bring the character area to the center of the raster area (Figure 4–3).

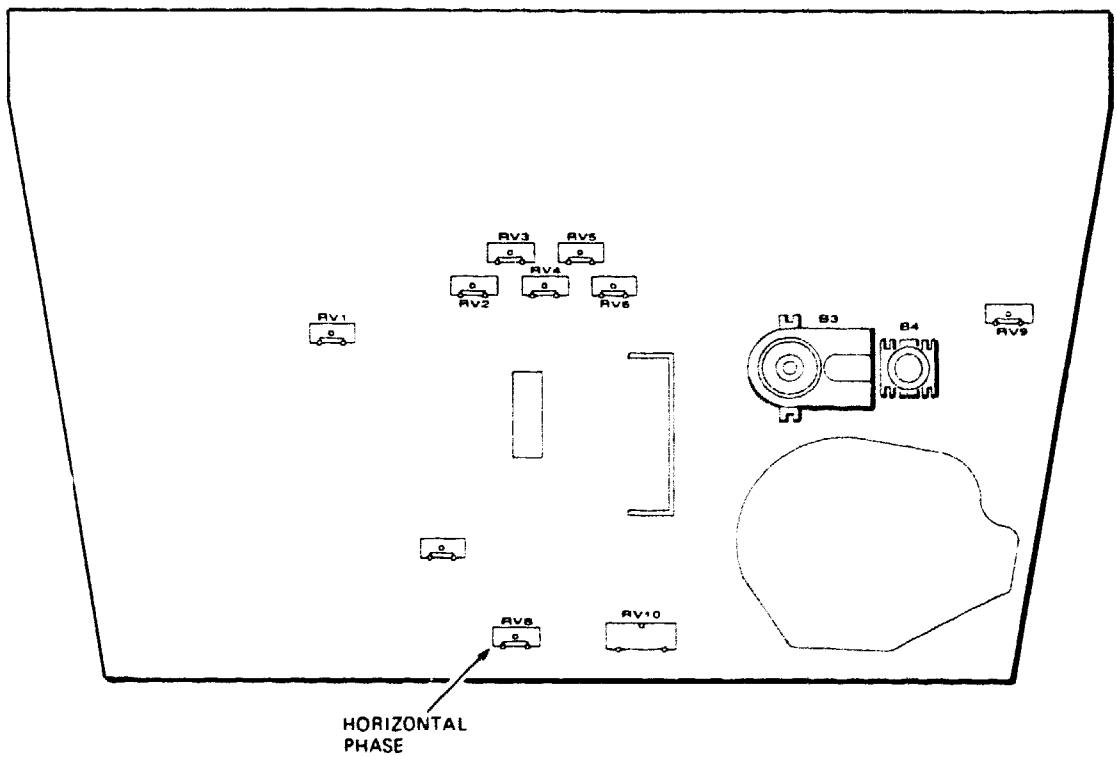


Figure 4–2 Monitor Board Trimmer RV8

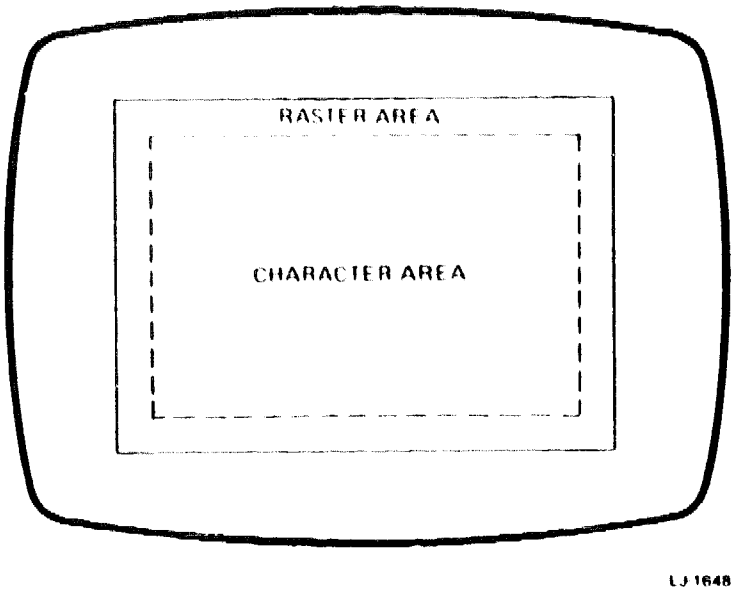


Figure 4–3 Raster/Character Area

4.2.5 Vertical and Horizontal Linearity Adjustment - Monochrome Monitor

Adjust vertical and horizontal linearity as follows:

1. Run the Service Diagnostics diskette and choose the Test One Module selection. Press Return.
2. After the configuration test, choose the VGA and Monochrome monitor selection. Press Return.
3. Choose the Check Linearity selection and press Return.
4. Adjust trimmer RV6 (Figure 4–4) to obtain equal character height (Figure 4–5).
5. Adjust coil B3 (Figure 4–4) to obtain equal character width (Figure 4–5).

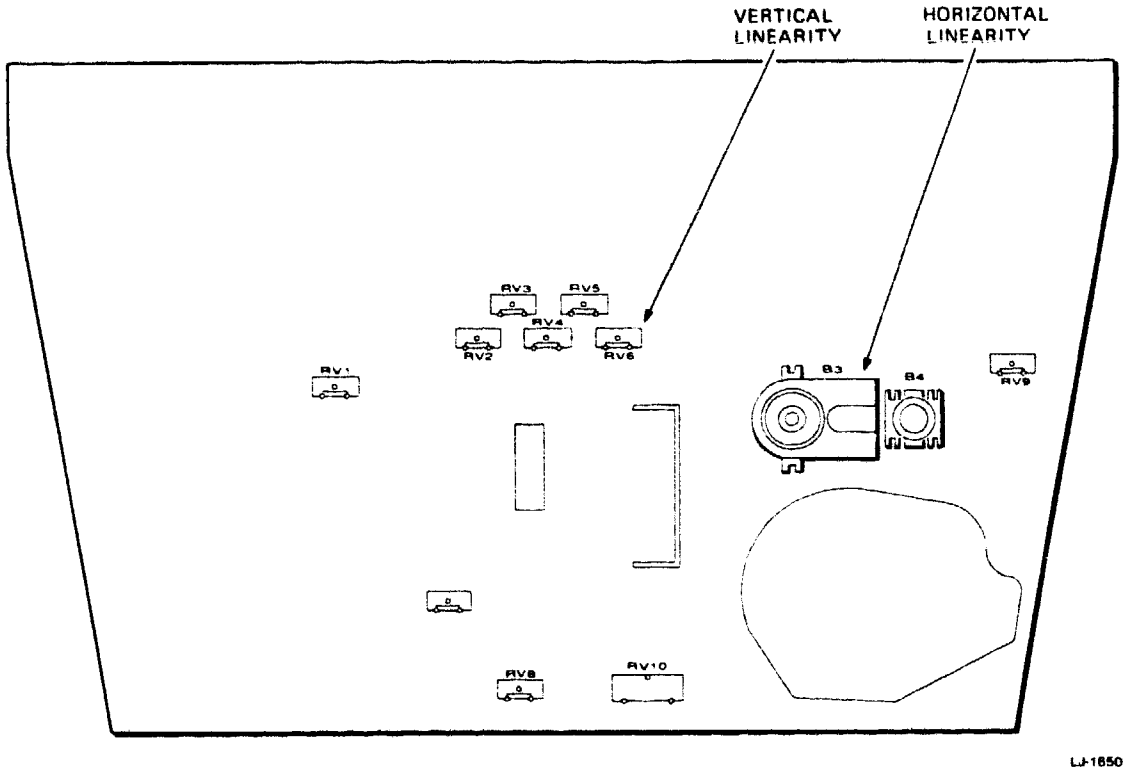
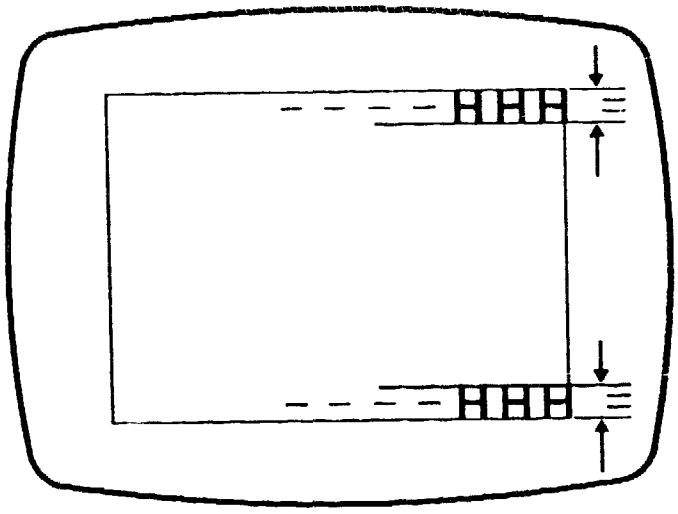
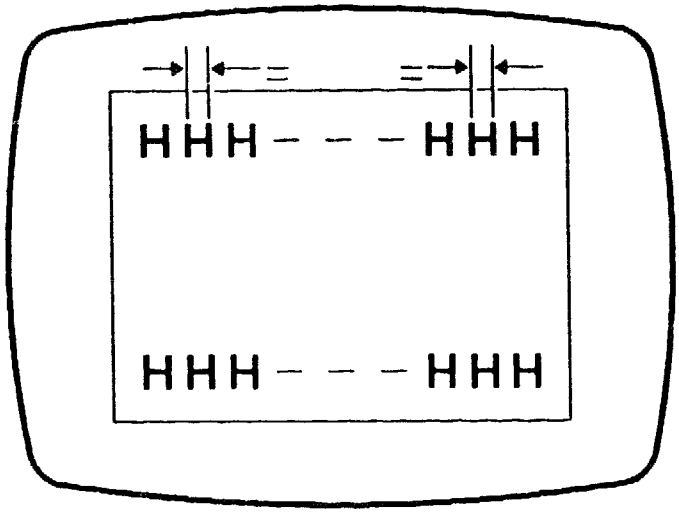


Figure 4–4 Monitor Board Trimmer RV6 & Coil B3



VERTICAL LINEARITY



HORIZONTAL LINEARITY

LJ-1649

Figure 4–5 Vertical Linearity Screen Display

4.2.6 Width - Monochrome Monitor

Adjust the width as follows:

1. Run the Service Diagnostics diskette and choose the 640 x 480 Graphics selection.
2. Adjust coil B4 (Figure 4–6) to obtain an image width of 207 mm (8-3/16 inches).

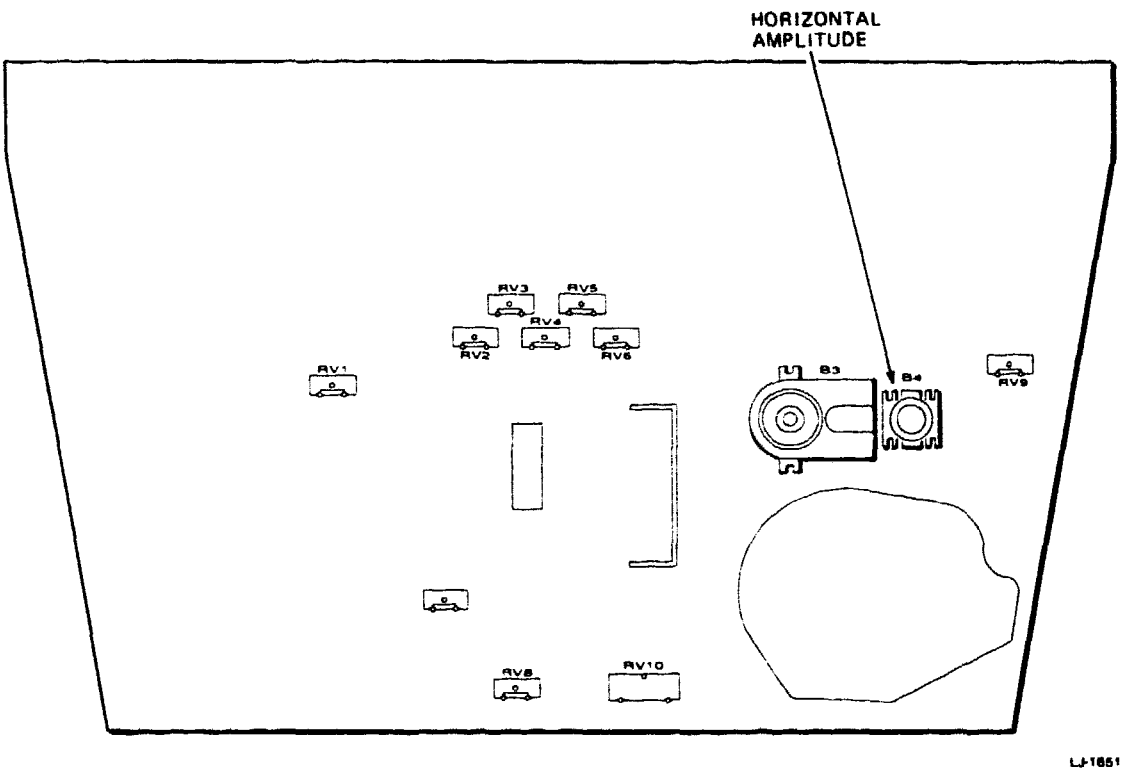


Figure 4–6 Monitor Board Coil B4

4.2.7 Height - Monochrome Monitor

Adjust the height for each of the three possible graphic resolutions as follows:

1. Run the Service Diagnostics diskette and choose the 640 x 480 Graphics test selection.
2. Adjust trimmer RV5 (Figure 4–7) for an image height of 155 mm (5-15/16 inches).
3. Choose the 640 x 350 Graphics test selection and adjust trimmer RV2 (Figure 4–7) to obtain an image height of 155 mm (5-15/16 inches).
4. Choose the 640 x 400 Graphics test selection and adjust trimmer RV3 (Figure 4–7) for an image height of 155 mm (5-15/16 inches).
5. Choose 640 x 480 graphics test selection and recheck the image height. The height should still be 155 mm (5-15/16 inches).

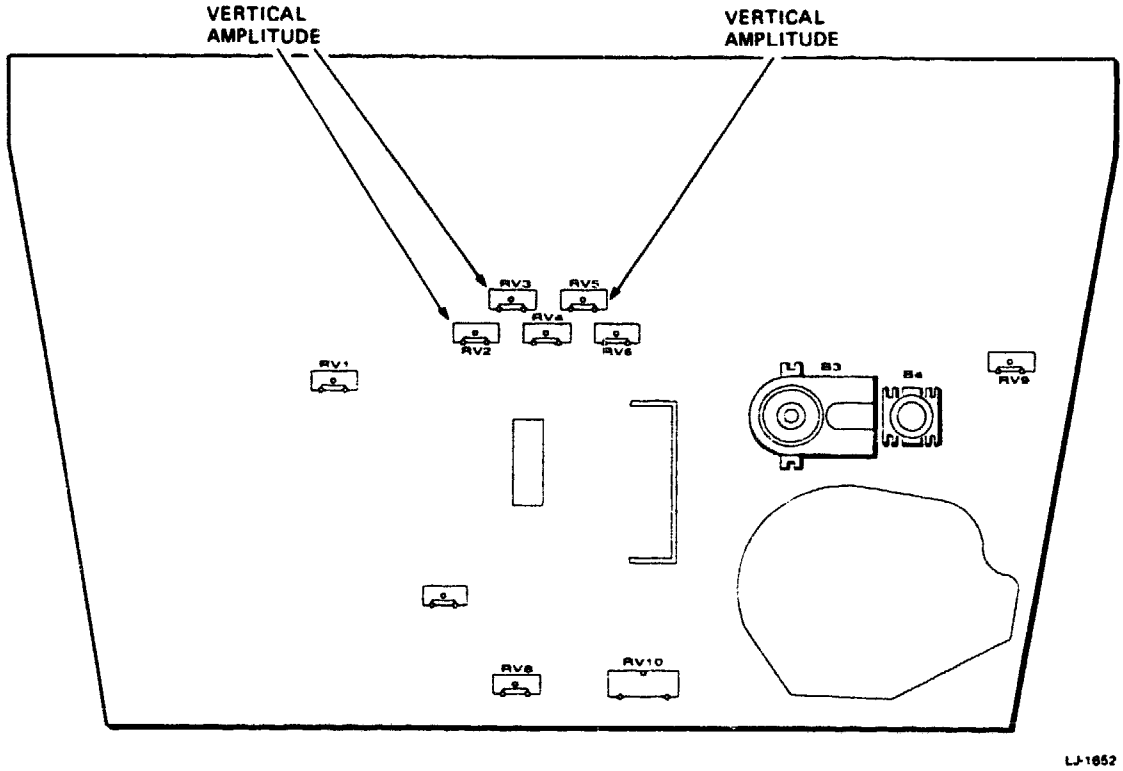


Figure 4–7 Monitor Board Trimmer RV2, RV3, & RV5

4.2.8 Focus

Adjust the monitor focus as follows:

1. Run the Service Diagnostics diskette and choose the Check Linearity selection.
2. Use the external brightness control to increase the brightness until the raster area is visible.
3. Reduce the brightness control until the raster area is no longer visible.
4. Adjust the external contrast control to the maximum position.
5. Adjust RV10 (Figure 4–8) so the character display in the center and corners has the best possible clarity.

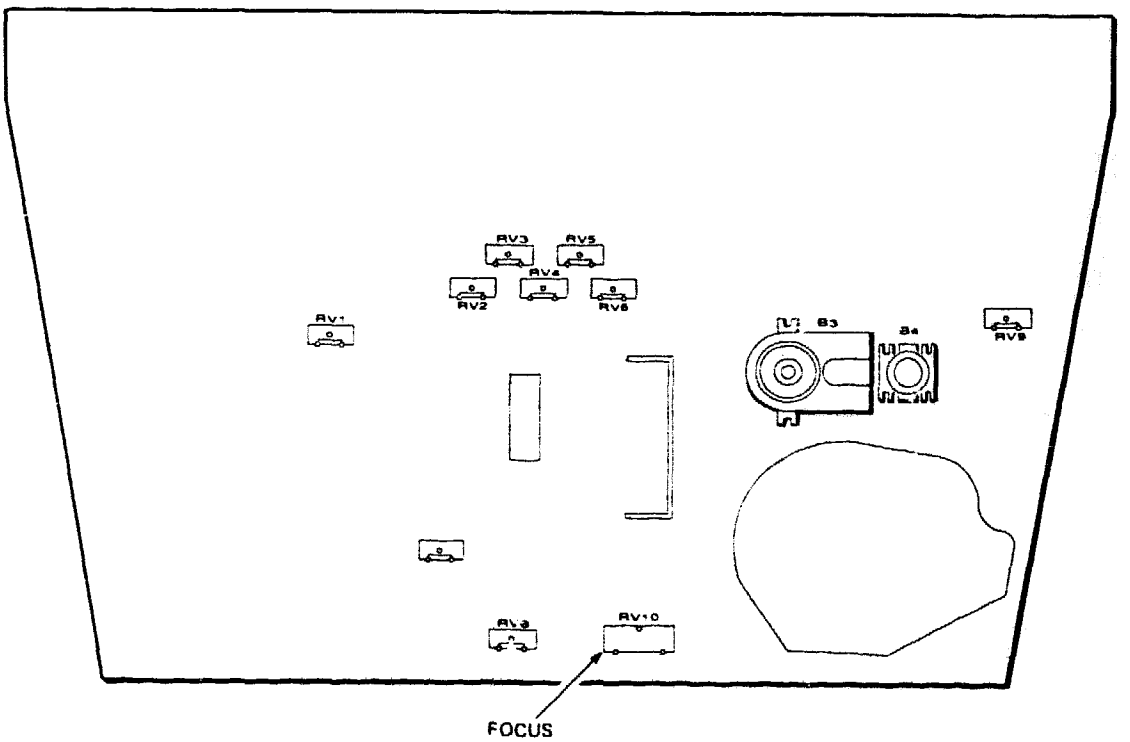


Figure 4–8 Monitor Board Trimmer RV10

4.2.9 Checking the Adjustments - Monochrome Monitor

Check the adjustments as follows:

1. Run the full video system test.
2. If the display passes all the video tests continue to the next step; otherwise return to Section 4.2.
3. Turn power to the system off.
4. Unplug the power cable.
5. Wait 20 seconds then replace the monitor cover.

4.3 Color Monitor Adjustments

This section contains the following adjustment procedures for the color monitor:

- Horizontal phase
- Pincushion distortion
- Horizontal linearity
- Height
- Vertical linearity
- Width

4.3.1 Removing the Cover - Color Monitor

Only qualified personnel should remove the monitor cover to access the adjustment potentiometers. All adjustment potentiometers, except brightness and contrast, are located inside the monitor.

WARNING
High voltages are present within the monitor case.

CAUTION
Before you turn power to the system off, the MS-DOS prompt (for example, C>) should display.

Remove the monitor cover as follows:

1. Turn power to the system off.
2. Disconnect the power cable from the wall outlet.
3. Disconnect all peripheral cables from the system.
4. Remove the cover retaining screws (Figure 4–9).
5. Slide the cover off by first lifting it up then away from the unit (Figure 4–9).
6. Remove the top plate retaining screws and lift the plate off to clear the bracket (Figure 4–10).
7. Slide the plate to the back of the monitor and remove it (Figure 4–10).

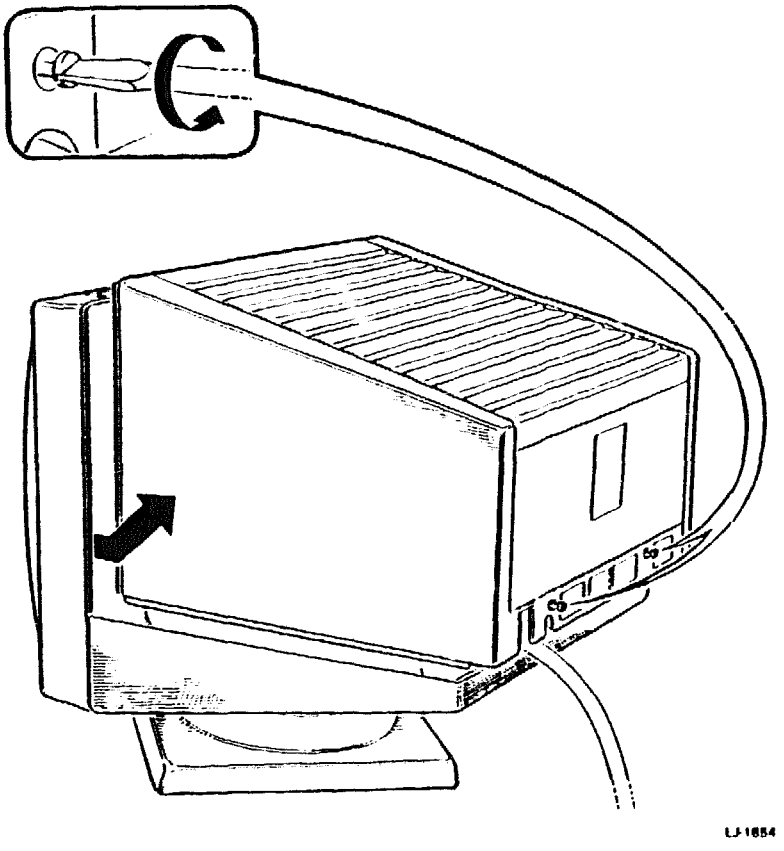


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Figure 4–9 Removing the Color Monitor Cover

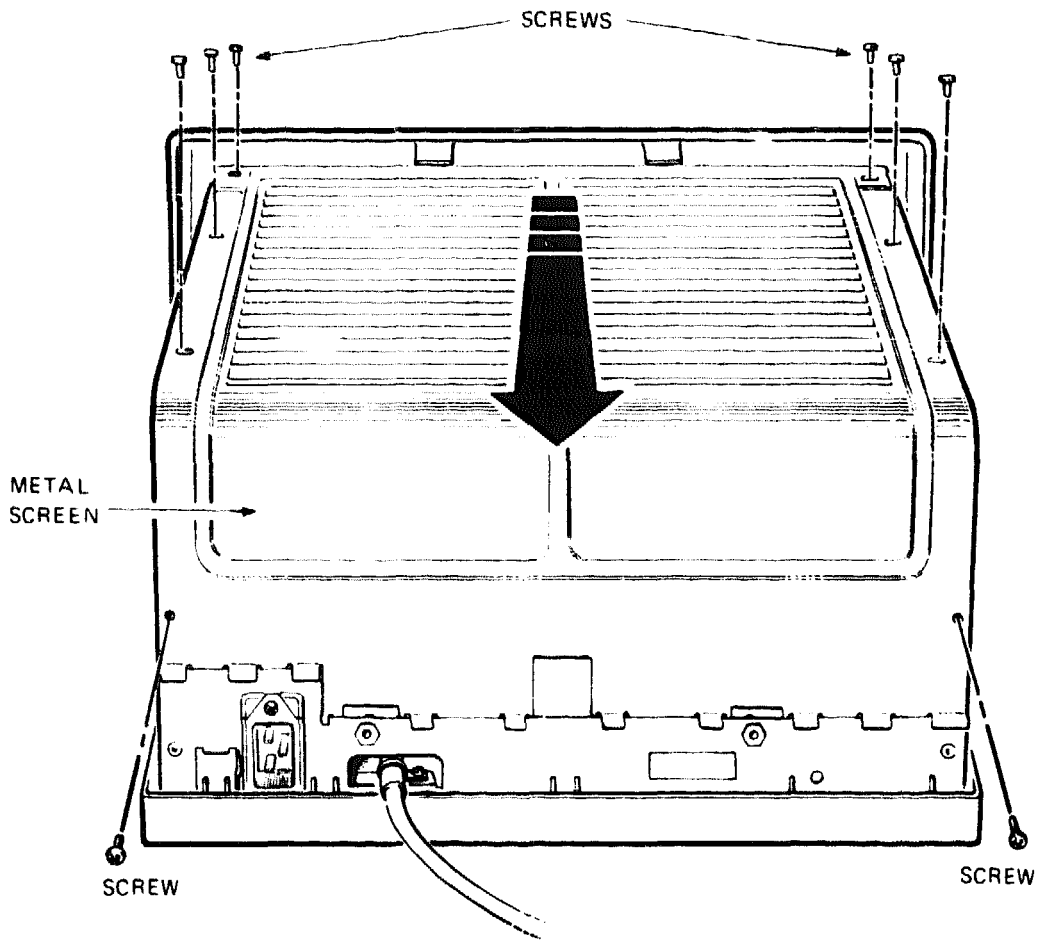


Figure 4–10 Top Plate Removal

4.3.2 Making the Adjustments - Color Monitor

Before making any adjustments, you must:

1. Reconnect the power cable to the wall outlet.
2. Turn power to the system on and allow the monitor to stabilize for 10 minutes.
3. Perform all the adjustment procedures in Section 4.3.4 through Section 4.3.8.

CAUTION
You must make the adjustments according to the sequence given in these procedures; all the adjustments interact with each other. When done, if the monitor performance is not satisfactory, repeat all the procedures in this sequence.

4.3.3 Quick Reference Chart - Color Monitor

The following table is a quick reference to the adjustment procedures for *experienced* technicians.

Parameters	Test Pattern	Adjustment	
Horizontal phase	Cross Hatch	RV2	-
Pincushion distortion	Cross Hatch	RV9	-
Horizontal linearity	Check Linearity	-	B1
Height	640 x 350	RV2	-
Vertical linearity	Check Linearity	RV6	-
Width	640 x 480	RV10	-

4.3.4 Horizontal Phase Adjustment - Color Monitor

Adjust the horizontal phase as follows:

1. Run the Service Diagnostics diskette and choose the Test One Module selection. Press Return.
2. After the configuration test, choose the VGA and Color Video selection. Press Return.
3. Choose the Test Patterns with Cross Hatch selection. Press Return.
4. Use the external brightness control to increase the brightness until the raster area is visible.
5. Adjust trimmer RV2 on the monitor board (Figure 4–11) to bring the character area to the center of the raster area (Figure 4–12).

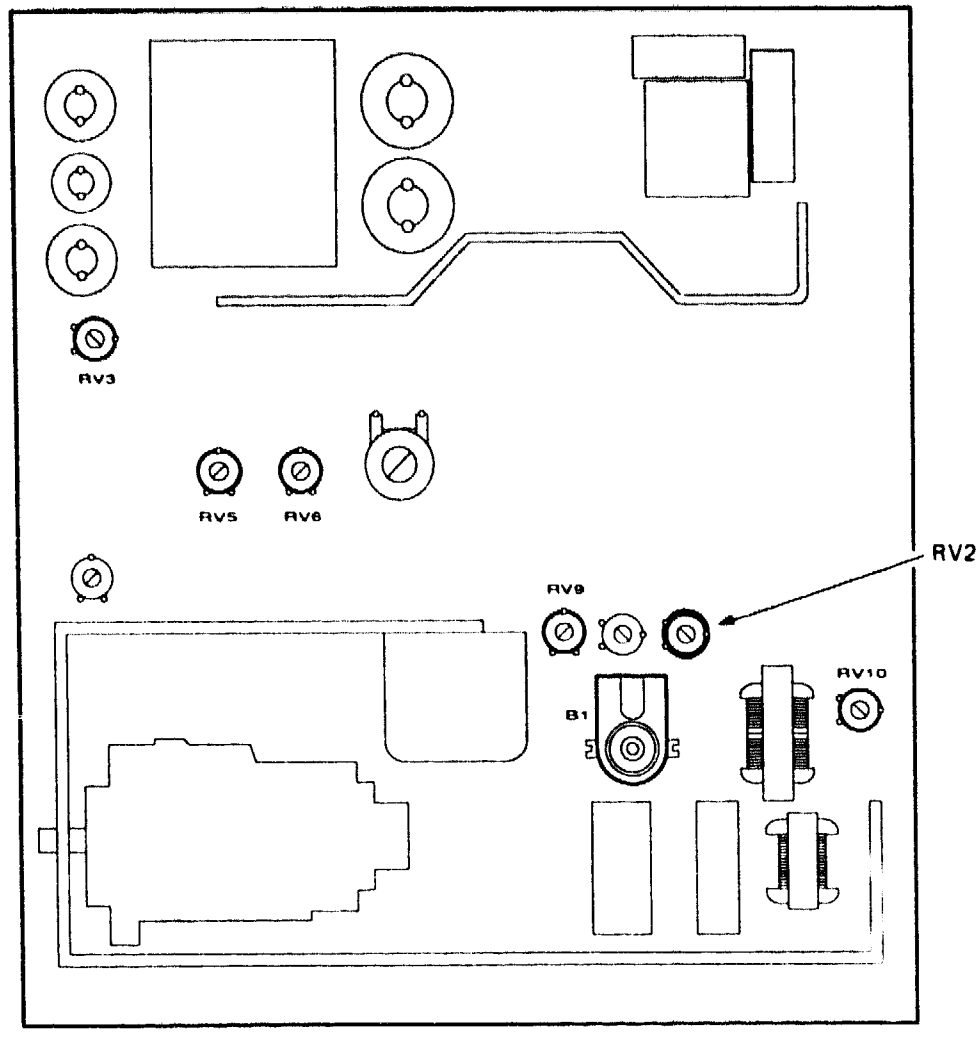


Figure 4–11 Mother Board Trimmer RV2

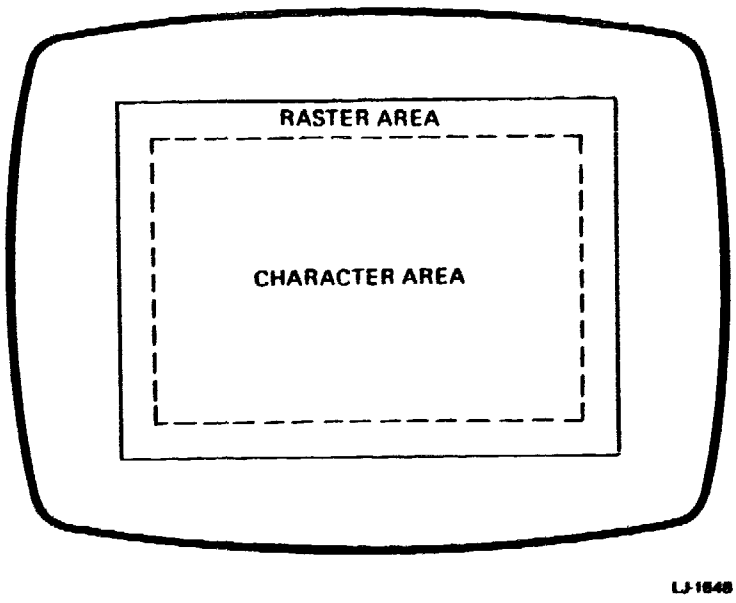


Figure 4–12 Raster/Character Area

4.3.5 Pincushion Distortion Reduction - Color Monitor

Reduce pincushion distortion as follows:

1. Run the Service Diagnostics diskette and choose the Cross Hatch with Circle selection.
2. Adjust trimmer RV9 (Figure 4–13) to obtain a rectangular image.

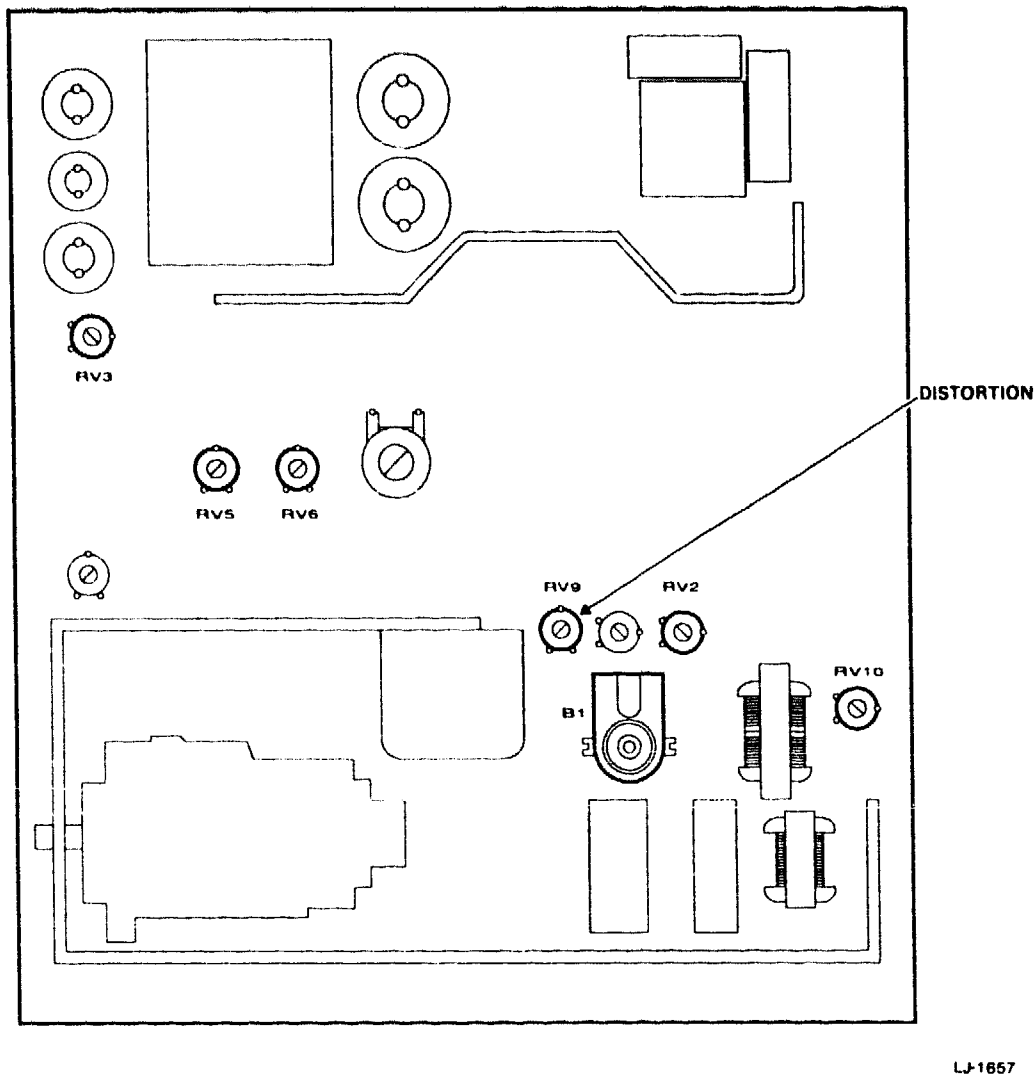


Figure 4–13 Mother Board Trimmer RV9

4.3.6 Horizontal Linearity - Color Monitor

Adjust the horizontal linearity as follows (Figure 4–14):

1. Run the Service Diagnostics diskette and choose the Check Linearity selection.
2. Adjust coil B1 to achieve uniform character width across the screen.

4.3.7 Height - Color Monitor

Adjust the height as follows (Figure 4–14):

1. Run the Service Diagnostics diskette and select the 640 x 350 Graphics selection.
2. Adjust trimmer RV2 for an image height of 180 mm (7-1/8").
3. Choose the 640 x 480 Graphics selection and adjust trimmer RV5 to obtain an image height of 180 mm (7-1/8 inches).

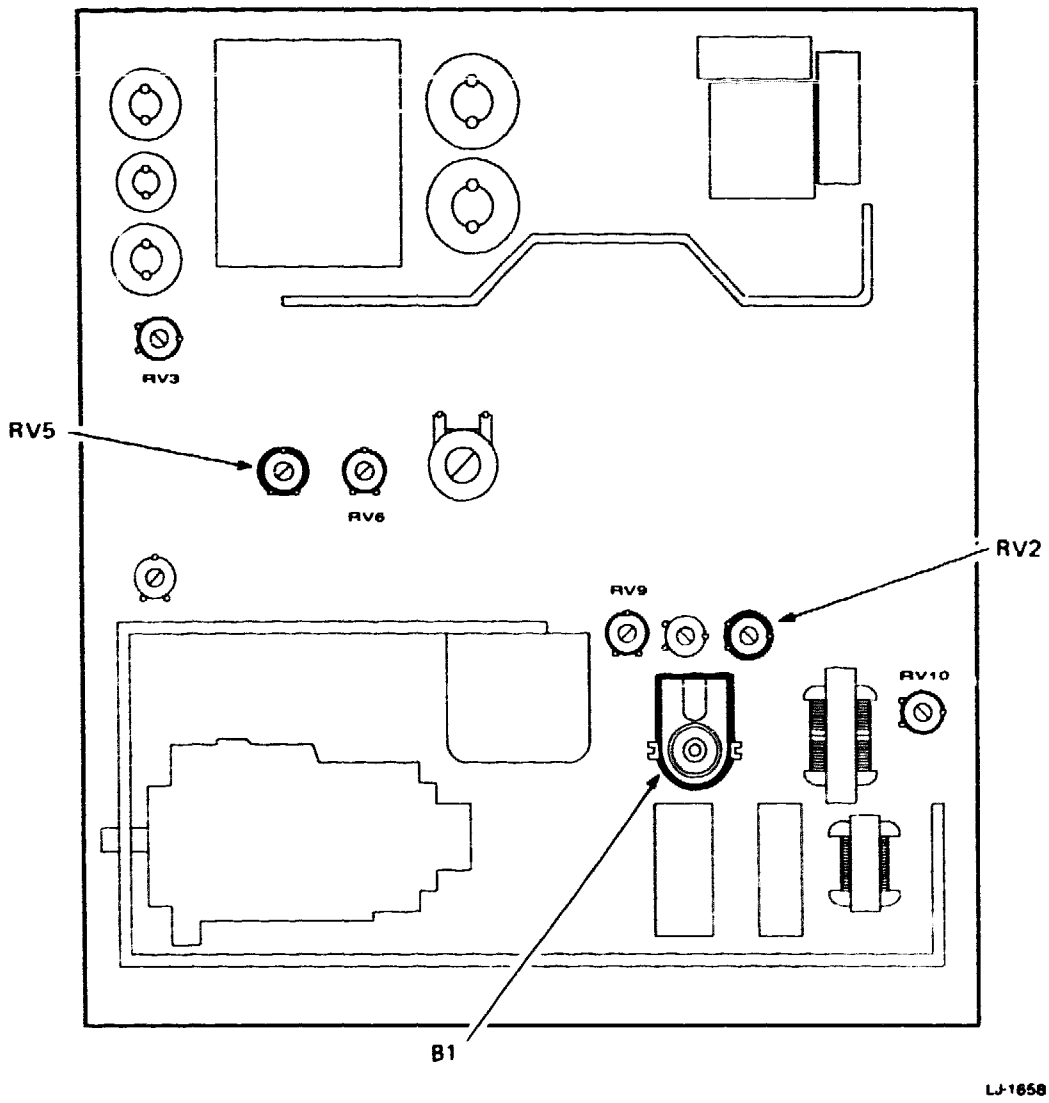


Figure 4–14 Mother Board Trimmer RV2, RV5, and Coil B1

4.3.8 Vertical Linearity - Color Monitor

Adjust vertical linearity as follows (Figure 4–15):

1. Run the Service Diagnostics diskette and choose the Check Linearity selection.
2. Adjust trimmer RV6 to obtain uniform character height at all points of the screen.

4.3.9 Width - Color Monitor

Adjust the width as follows (Figure 4–15):

1. Run the Service Diagnostics diskette and choose the 640 x 480 Graphics selection.
2. Adjust the trimmer RV10 to obtain an image width of 240 mm

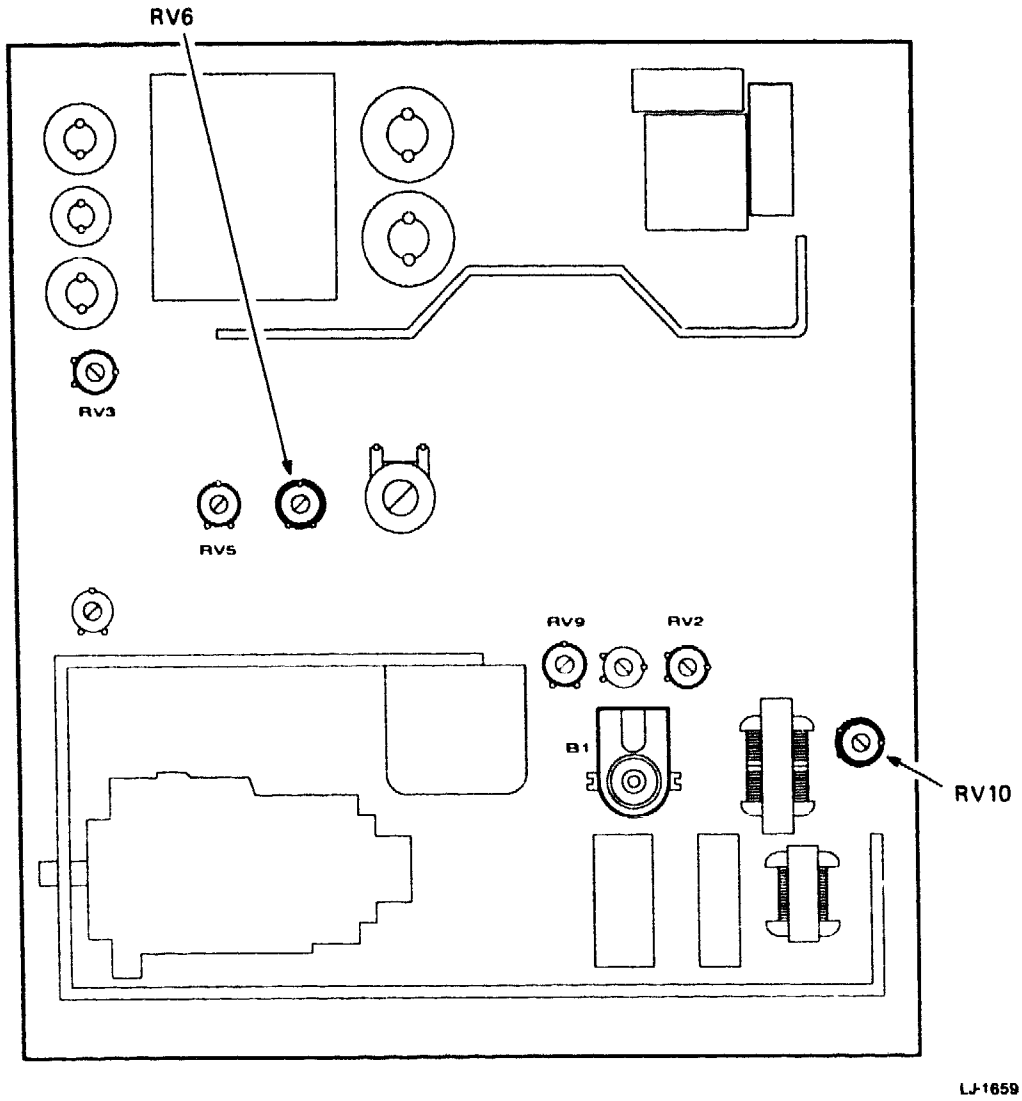
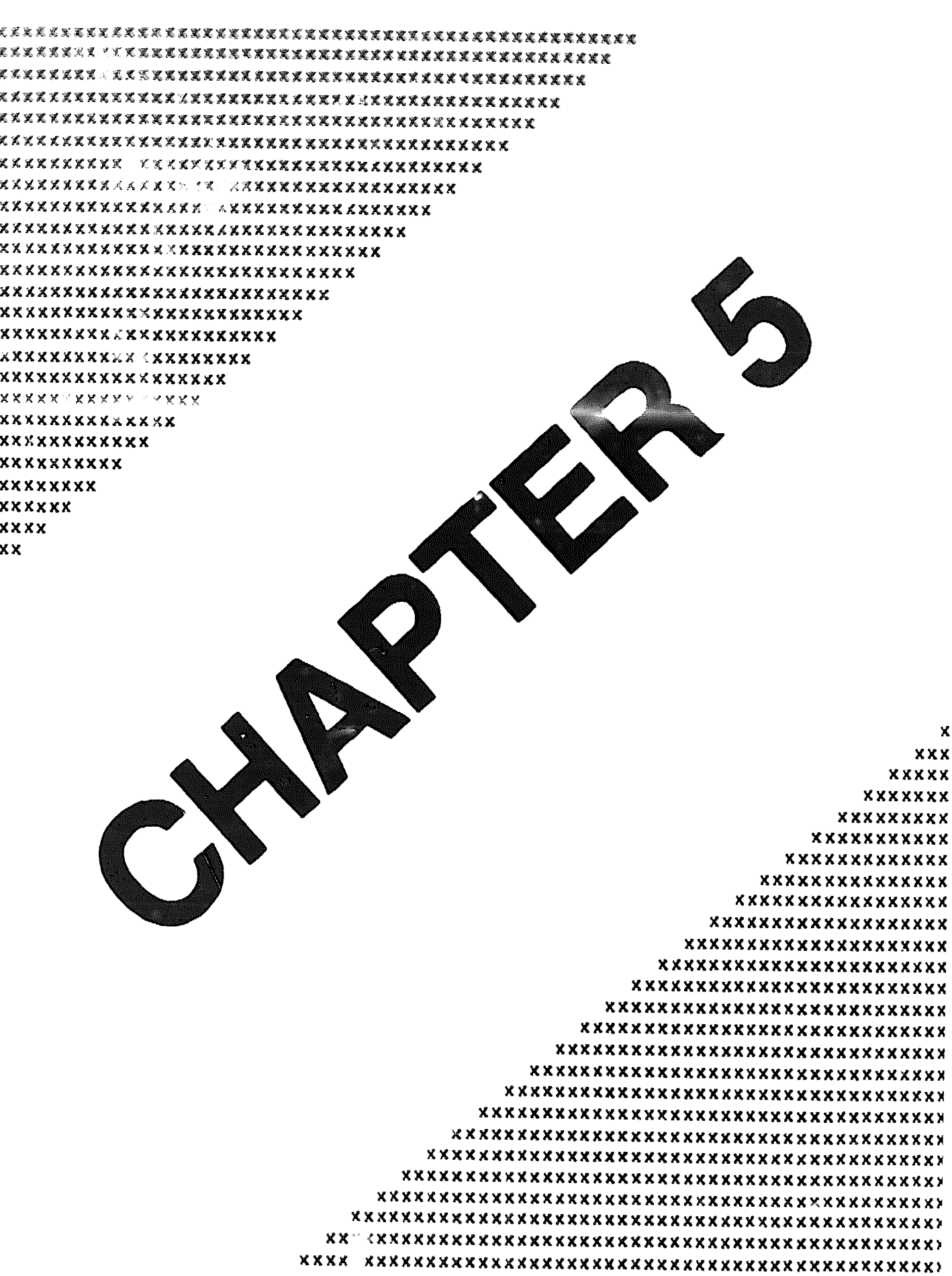


Figure 4–15 Mother Board Trimmer RV6 and RV10

4.3.10 Checking the Adjustments - Color Monitor

1. Run the full video system test.
2. If the display passes all the video tests continue to the next step; otherwise return to Section 4.3.
3. Turn power to the system off.
4. Unplug the power cable from the AC outlet.
5. Wait 20 seconds then replace the monitor cover.


CHAPTER 5

5
FRU Removal and Replacement

This chapter describes how to remove and replace each DECstation 350 field replaceable unit (FRU). To install many of the FRUs, reverse the removal procedure. Only qualified service technicians should remove and replace FRUs.

Table 5–1 lists the DECstation 350 FRUs and their part numbers.

Table 5–1 DECstation 350 Field Replaceable Units

FRU	Digital Part Number
Recommended Spare Part	
MB BA814 (1 MB RAM)	29-27673-01
Bus adapter board IF624	29-27674-01
CRT controller (GO481)	29-27675-01
ESDI controller board (GO728)	20-31751-01
Power supply assembly 120V LIE 21C	29-27761-01
Power supply assembly 22OV LIE 21C	29-27677-01
Floppy disk drive 3.5 inches 1.44 Mbytes	30-31850-01
Hard disk drive 5.25 inches 80 Mbytes	30-31752-01
Streaming tape drive 3.5 inches 40 Mbytes	30-31833-01
Streaming tape drive 80 Mbytes	30-31847-01
Memory expansion board with 1 MByte (four 256 Kbyte SIMMs) (ME928)	20-31803-01
Memory expansion board with 2 Mbytes (eight 256 Kbyte SIMMs) (ME929)	29-27756-01
Memory expansion board with 4 Mbytes (four 1 Mbyte SIMMs) (ME925)	20-31805-01
SIMM board 256 Kbyte x 9 80 nseconds	29-27760-01
SIMM board 1 Mbyte x 9 100 nseconds	29-27717-01
Floppy disk drive 5.25 inches 1.2 Mbyte30-31839-01	
Hard disk drive 135 Mbyte	30-31753-01
Streaming tape drive 80 Mbyte	30-31847-01
80387 Math coprocessor	19-31802-01
Mouse and interface board	30-31749-01
Multiport serial card	20-31808-01
Single serial port card	20-31809-01

Table 5–1 (Cont.) DECstation 350 Field Replaceable Units

FRU	Digital Part Number
Recommended Spare Part	
Keyboards:	
USA 101-key keyboard	30-31826-01
Israel 101-key keyboard	30-31820-01
Greek/Latin-101 key keyboard	30-31823-01
Belgium 102-key keyboard	30-31827-01
Danish 102-key keyboard	30-31828-01
Finish/Swedish 102-key keyboard	30-31829-01
German 102-key keyboard	30-31835-01
Italian 102-key keyboard	30-31836-01
Swiss French/German 102-key keyboard	30-31837-01
Norwegian 102-key keyboard	30-31838-01
French 102 key-keyboard	30-31810-01
Spain National 102-key keyboard	30-31811-01
Portuguese 102 key-keyboard	30-31821-01
U.K. 102 key-keyboard	30-31822-01
Spain International 102-key keyboard	30-31825-01
French querty 102-key keyboard	30-31824-01
Monitors:	
Monochrome 12 inches 120V N.H.[1]	30-31812-01
Monochrome 12 inches 220V N.H.	30-31815-01
Monochrome 12 inches 120V S.H.[1]	30-31814-01
Monochrome 12 inches 220V S.H.	30-31813-01
Color 14 inches 120V N.H.	30-31816-01
Color 14 inches 220V N.H.	30-31819-01
Color 14 inches 120V S.H.	30-31818-01

[1]N.H. stands for Northern Hemisphere; S.H. stands for Southern Hemisphere

Table 5–1 (Cont.) DECstation 350 Field Replaceable Units

FRU	Digital Part Number
Recommended Spare Part	
Color 14 inches 220V S.H.	30-31817-01
System Box Power Cord	
North European	17-02467-01
Swiss	17-02468-01
UK	17-02469-01
USA	17-02470-01
Australia	17-02471-01
Diagnostic kit	22-00484-01
Extended Spare Parts	
Key group	29-27681-01
Fan	29-27698-01
Fan fixing rubber	29-27699-01
PCB U-TURN IF614	29-27700-01
Board support	29-27701-01
Switch spring	29-27702-01
Battery assembly	29-27720-01
Hard disk drive LED power cable	29-27704-01
Hard disk drive data signal cable	29-27705-01
Hard disk drive command signal cable	29-27706-01
Hard disk - floppy disk drive power cable	29-27707-01
Second and third drive power cable	29-27708-01
Second drive power cable	29-27709-01
First and fourth drive power cable	29-27710-01
Data cable for 3.5 inch drives	29-27711-01
Data cable for 5.25 inch drives	29-27712-01

Table 5–1 (Cont.) DECstation 350 Field Replaceable Units

FRU	Digital Part Number
Extended Spare Parts	
Data cable for floppy/hard disk drive	29-27713-01
Streaming tape drive 40 Mbyte 3.5 inch controller	29-27668-01
Front panel frame	29-27990-01
Upper front panel	29-27991-01
Cover	29-27992-01
Back panel	29-27993-01
Lower front panel	29-27994-01
Trimmer knob	29-27995-01
Reset switch	29-27996-01
ON/OFF switch	29-27997-01
Keyboard cable	29-27980-01

5.1 Before Replacing FRUs

The following criteria apply when removing or installing any DECstation FRUs.

CAUTION
The system should display the MS-DOS prompt (for example, C>) before turning the system power off.

CAUTION
If a hard disk is present, wait 20 seconds after turning power to the system off before disconnecting the power cord.

- Always turn power to the system and monitor off, unplug the system from the wall outlet, and disconnect all external cables before removing any FRU.

  NOTE
  Before disconnecting the DECstation 350 from a network, inform the system administrator that you are going to disconnect the ThinWire T-connector from the computer. Do not disconnect any cable or terminator from the T-connector. Doing so disrupts network operation.

- Always use a grounded wrist strap and grounded work surface when opening the system box and handling suspected damaged or replacement components. Static electricity can damage printed circuit boards and mass storage devices.

- After replacing the FRU verify that the FRU and the system function correctly.

5.2 Replacing FRUs

This section describes removal and replacement procedures. Figure 5–1 shows the location of components inside the system.

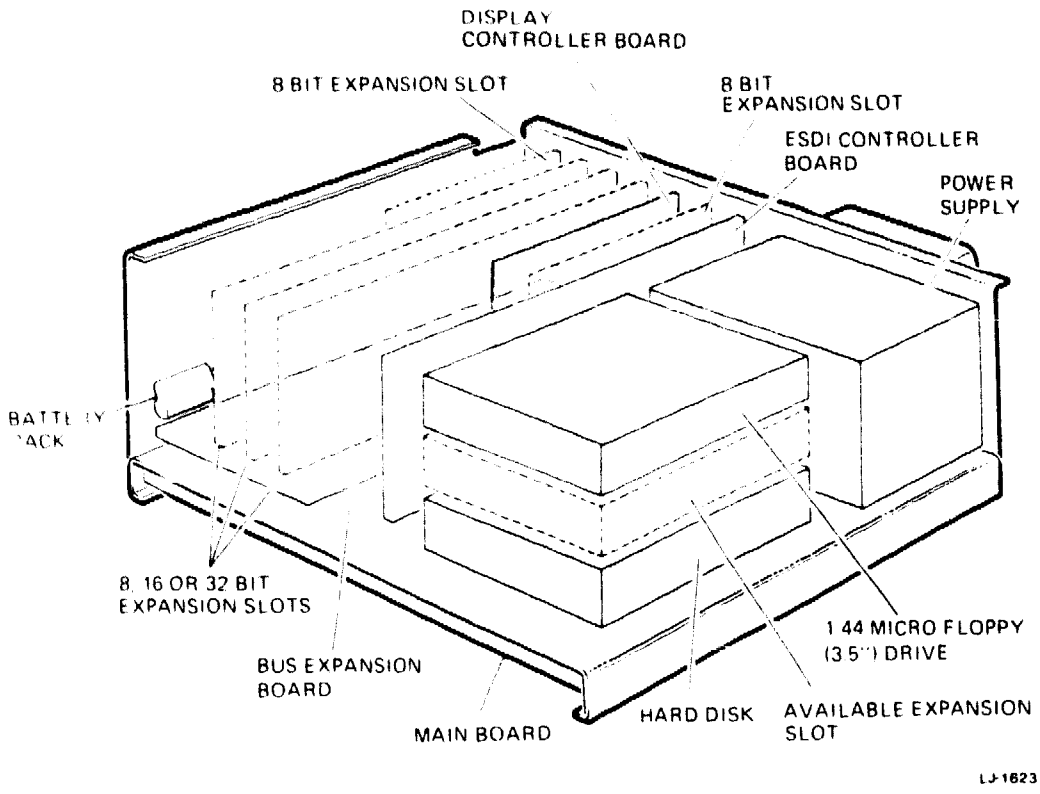


Figure 5–1 Inside the DECstation 350

5.2.1 Keyboard Replacement

Replace the keyboard as follows:

1. Turn power to the system and monitor off. Wait 20 seconds.
2. Disconnect the keyboard cable from the system.
3. Connect the cable from the new keyboard to the system.
4. Turn the power on.

5.2.2 Monitor Replacement

Replace the monitor as follows:

1. Turn power to the system off. Wait 20 seconds.
2. Unplug the main power cord from the wall outlet.
3. Unplug the monitor power cord and signal cord from the system box.

   NOTE
   The monochrome monitor has two cables permanently attached to it. The color monitor's power cable is detachable.

4. Connect the replacement monitor power cord and signal cord to the system box.
5. Plug the main power cord from the system into the wall outlet.
6. Turn power to the system on.

5.2.3 Mouse Replacement

Replace the mouse as follows:

1. Turn power to the system and monitor off. Wait five seconds.
2. Disconnect the mouse cable from the system.
3. Connect the cable from the new mouse to the system.
4. Turn power to the system on.

5.2.4 Top Cover Removal

Remove the top cover as follows:

1. Turn power to the system and monitor off. Wait 20 seconds.
2. Disconnect all cables from the back of the system.
3. Remove the monitor and other external devices from the system.
4. Loosen the two top cover mounting screws (Figure 5–2).
5. Remove the top cover by pushing it towards the front of the system, then lifting it at the front.

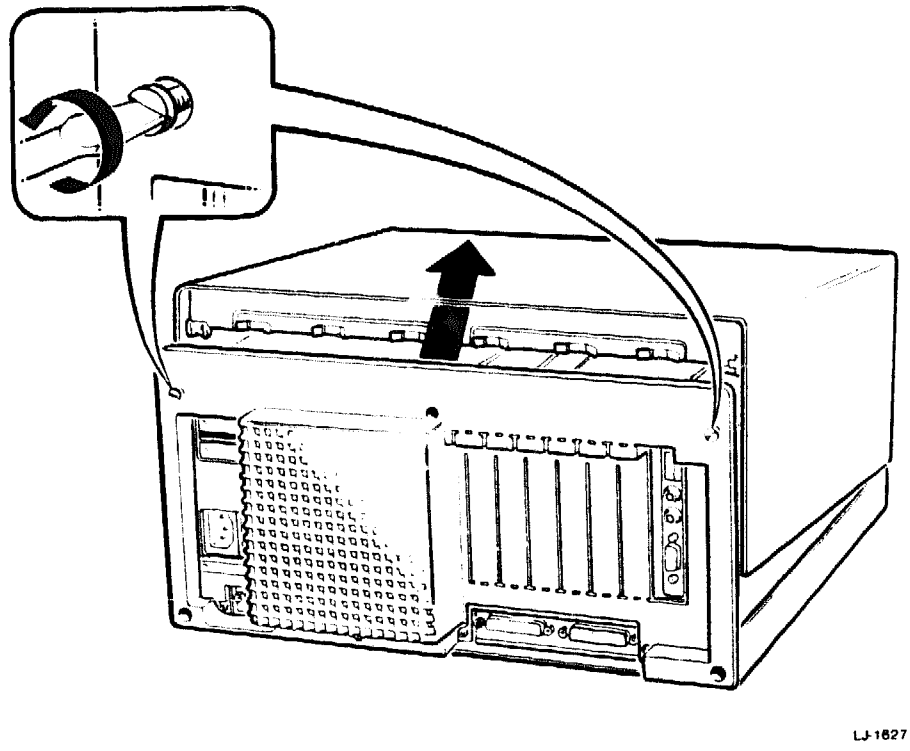


Figure 5–2 Removing the Top Cover

5.2.5 Battery Replacement

Replace the battery as follows:

1. Remove the top cover (Section 5.2.4).)
2. Disconnect the battery cable from the U-turn board and detach the battery from the Velcro mounting (Figure 5–3).
3. Install the battery and battery connector.
4. Run the SETUP program to restore the CMOS-RAM contents. See Section 2.4.1, Using the SETUP Utility on the Utilities Diskette.
5. Use the Service Diagnostics diskette to run the following:
   - The System Configuration Check
   - The SETUP utility on the Utilities diskette

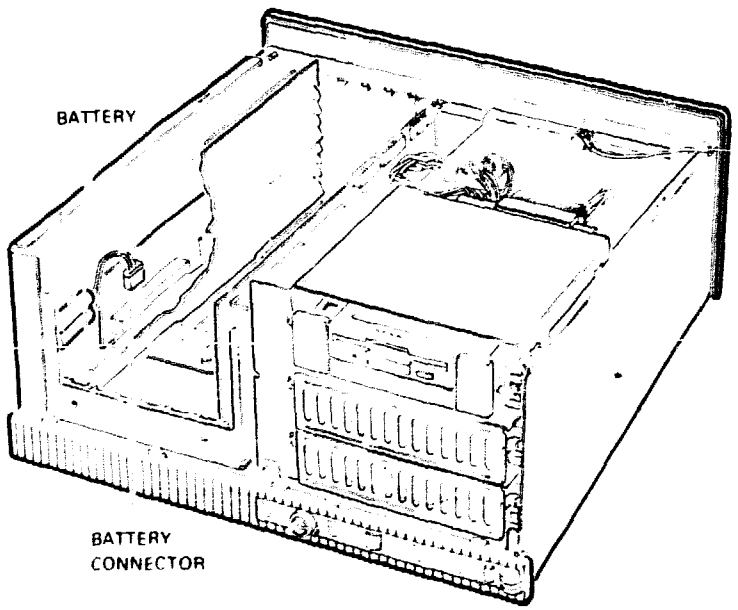


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Figure 5–3 Battery Location

5.2.6 Bottom Cover Removal

Remove the bottom cover as follows:

1. Turn power to the system and monitor off. Wait 20 seconds.
2. Disconnect all cables from the back of the system.
3. Remove the monitor and other external devices from the system.
4. Turn the system upside down and place it on a smooth stable surface.
5. Loosen the four mounting screws (Figure 5–4).
6. Slide the cover toward the front of the system so the larger ends of the slots are beneath the screw heads, then lift the cover away from the system.

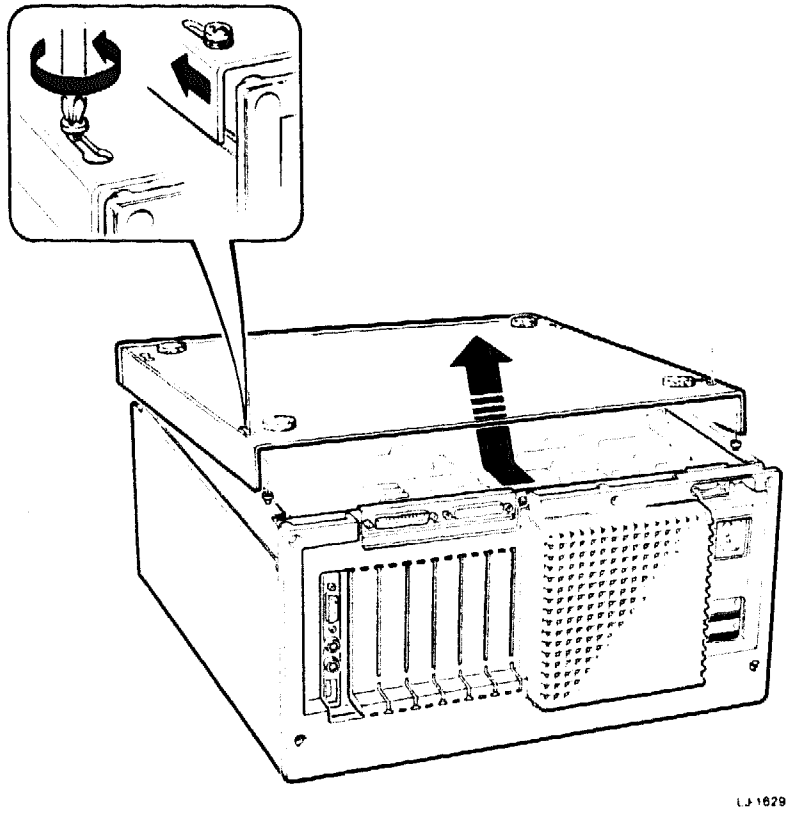

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Figure 5–4 Removing the Bottom Cover

5.2.7 Bottom Cover Re-installation

CAUTION
When re-installing the bottom cover, make sure the volume control knob is correctly aligned with the volume control lever.

Re-install the bottom cover as follows:

1. Slide the volume control lever on the main board to the extreme right toward the key lock (Figure 5–5).
2. Rotate the volume control knob on the bottom cover to the extreme right.
3. Align the screw holes on the cover over the screws. Slide the cover toward you and secure the four mounting screws (Figure 5–4).
4. Rotate the volume control knob away from the key lock until it makes a clicking sound. This step engages the knob with the volume control lever on the main board.

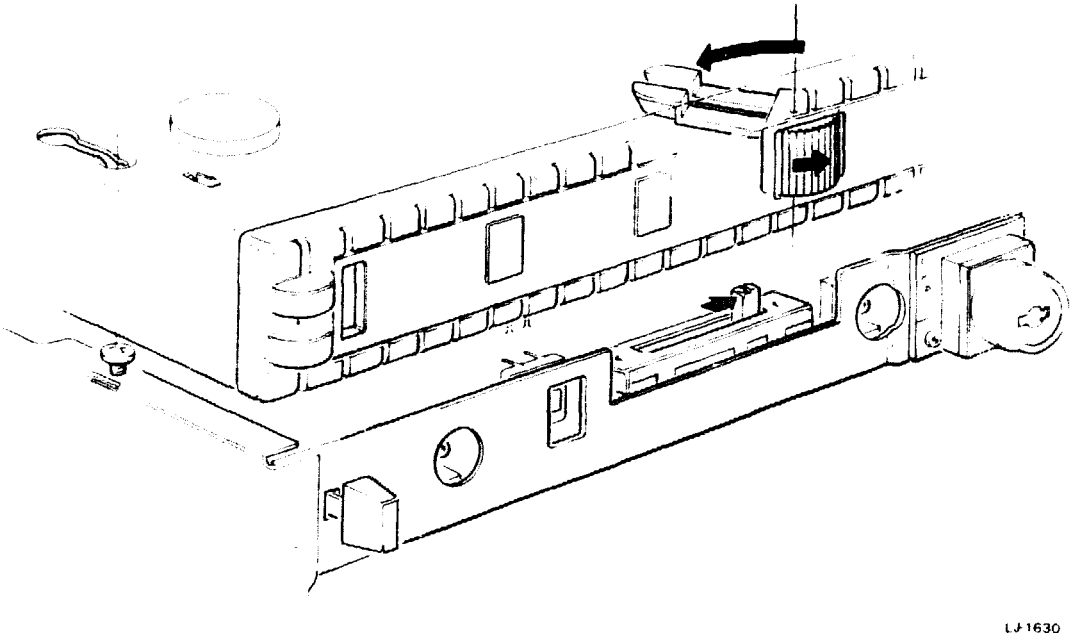


Figure 5–5 Engaging the Volume Control

5.2.8 Back Panel Removal

Remove the back panel as follows:

1. Turn power to the system and monitor off. Wait 20 seconds.
2. Disconnect all cables from the back of the system.
3. Remove the monitor and other external devices from the system.
4. Facing the rear of the system, loosen the two retainer screws in the top left and top right corners. Note that the screws are small and can easily fall out once they are loosened.
5. Facing the rear of the system, remove the two Phillips head screws in the lower left and lower right corners.

   CAUTION
   The plastic grill covering the fan is fragile and can easily be damaged.

6. Remove the panel by gently pulling it toward you.

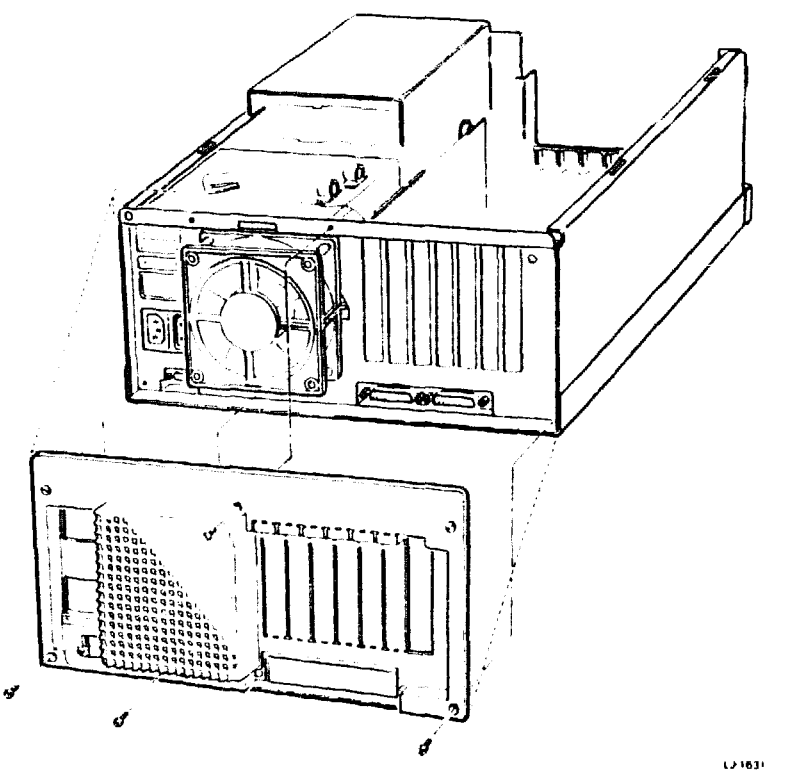


Figure 5–6 Removing the Back Panel

5.2.9 Math Coprocessor Replacement

Replace the math coprocessor as follows:

1. Turn the power to the system off and wait 20 seconds.
2. Unplug the system from the wall outlet.
3. Turn the system over and set it on a smooth, stable surface.
4. Remove the bottom cover of the system (Section 5.2.6).
5. Lift the math coprocessor from its socket by pulling straight up.
6. Insert the new math coprocessor by aligning the corner notch as shown in Figure 5–7.

   CAUTION
   Be careful not to bend the pins of the coprocessor when you are installing it in the socket.

7. Press the math coprocessor evenly on opposite corners so that all the pins are submerged in the connector.
8. Replace the bottom cover of the system (Section 5.2 6).
9. Run the SETUP Utility on the Utilites to update the system configuration.

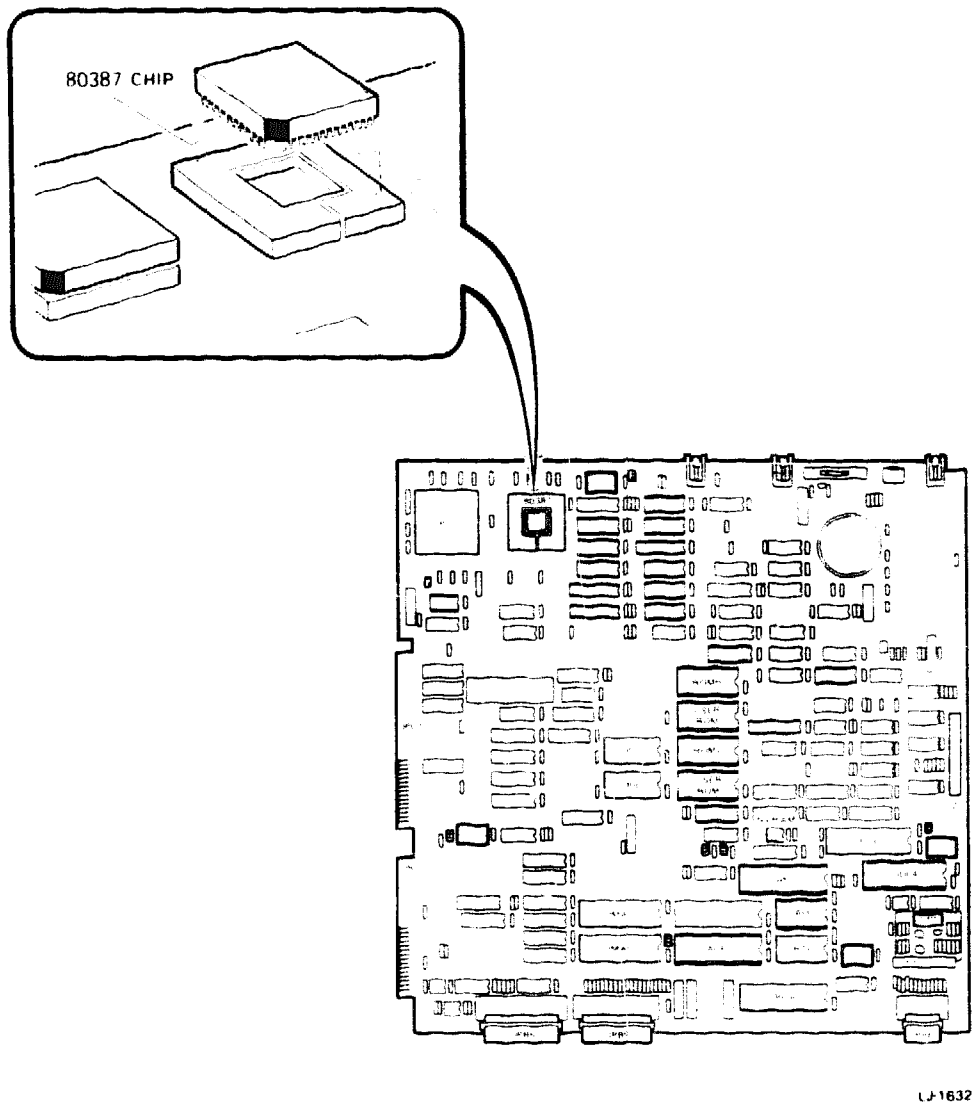


Figure 5–7 Replacing the Math Coprocessor

5.2.10 Main Board Replacement

Replace the main board as follows:

1. Turn the power to the system off and wait 20 seconds.
2. Unplug the system from the wall outlet.
3. Turn the system over and set it on a smooth, stable surface (Figure 5–8).
4. Remove the bottom cover of the system (Section 5.2.6).
5. Remove the floppy disk cable connector from the main board (Figure 5–8).
6. Remove the math coprocessor, if there is one. The math coprocessor must be transferred to the new main board (Section 5.2.9).
7. Remove the two screws from the serial and parallel connectors (Figure 5–8).
8. Remove the two keyboard connector mounting screws (Figure 5–8).
9. Remove the 15 main board mounting screws (including those marked +5 V and GND).
10. Disconnect the main board from the U-turn board connectors by sliding it from the U-turn board, then lift the main board from the chassis (Figure 5–8).
11. Install the new main board. Be sure to set all jumpers correctly (Appendix A). If there was a math coprocessor on the faulty main logic board, install the coprocessor on the new main logic board.
12. Use the Service Diagnostics diskette to run the following:
    - The System Configuration Check
    - The SETUP utility
    - The Test One Module utility for the System Board

NOTE
Whenever the main board is replaced, the system SETUP utility on the Utilities Diskette must be run to restore the CMOS-RAM contents. This is because disconnecting the main board from the U-turn board also disconnects the main board from the CMOS backup battery.

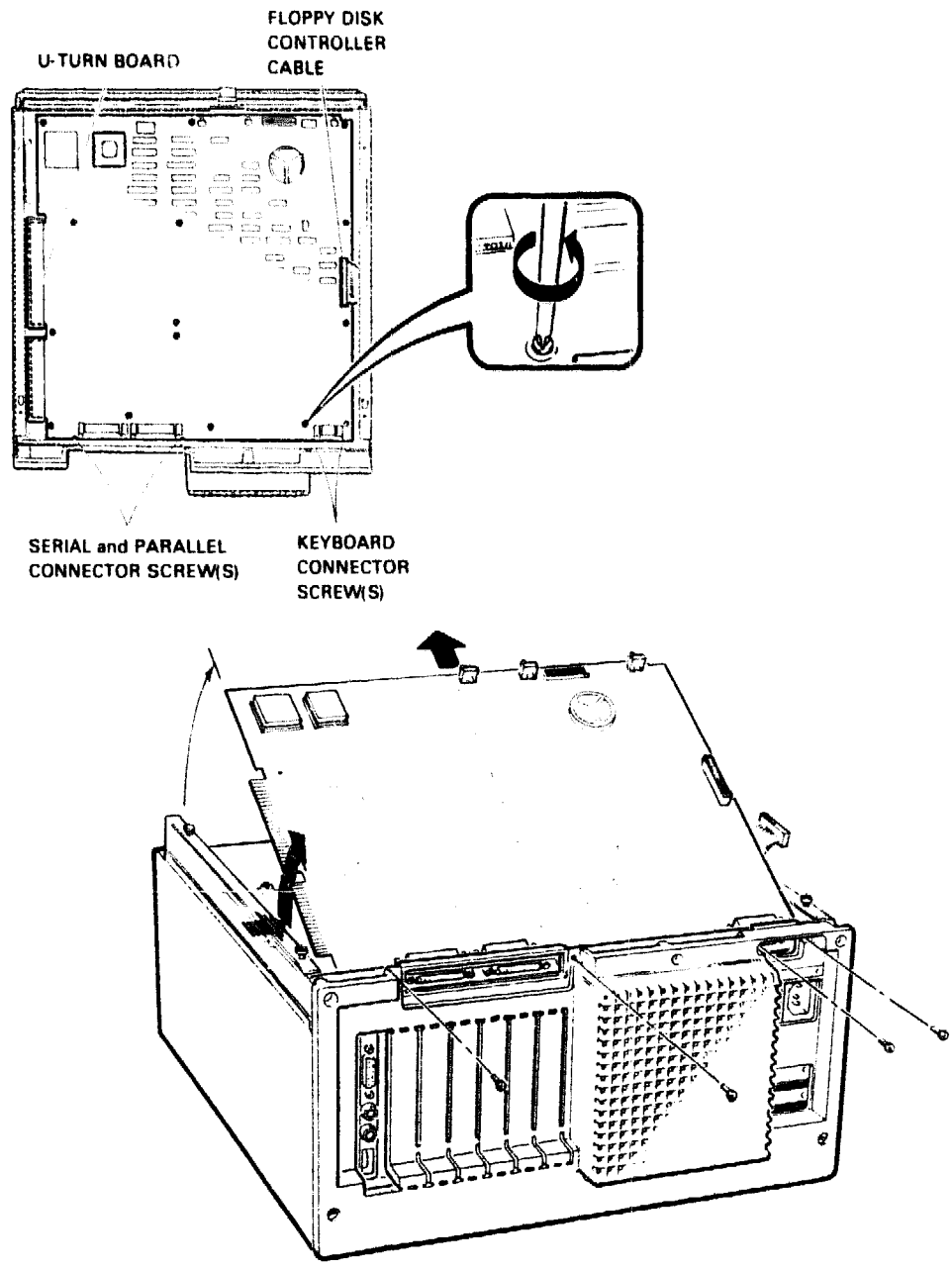


Figure 5–8 Removing the Main Board

5.2.11 Option Board Replacement

Replace an option board as follows (Figure 5–9):

1. Turn the power to the system off and wait 20 seconds.
2. Unplug the system from the wall outlet.
3. Remove the top cover from the system (Section 5.2.4).
4. Remove any cables attached to the board.
5. Remove the screw that secures the board retaining bracket into the expansion slot.
6. Detach the board(s) from the bus expansion board connector(s) by pulling in an upward direction.
7. Make the necessary switch and jumper settings to the replacement board (Appendix A, Jumpers and Switches).
8. Install the replacement board.
9. Replace the top cover and all cables.
10. Run the SETUP Utility on the Service Diagnostics diskette.

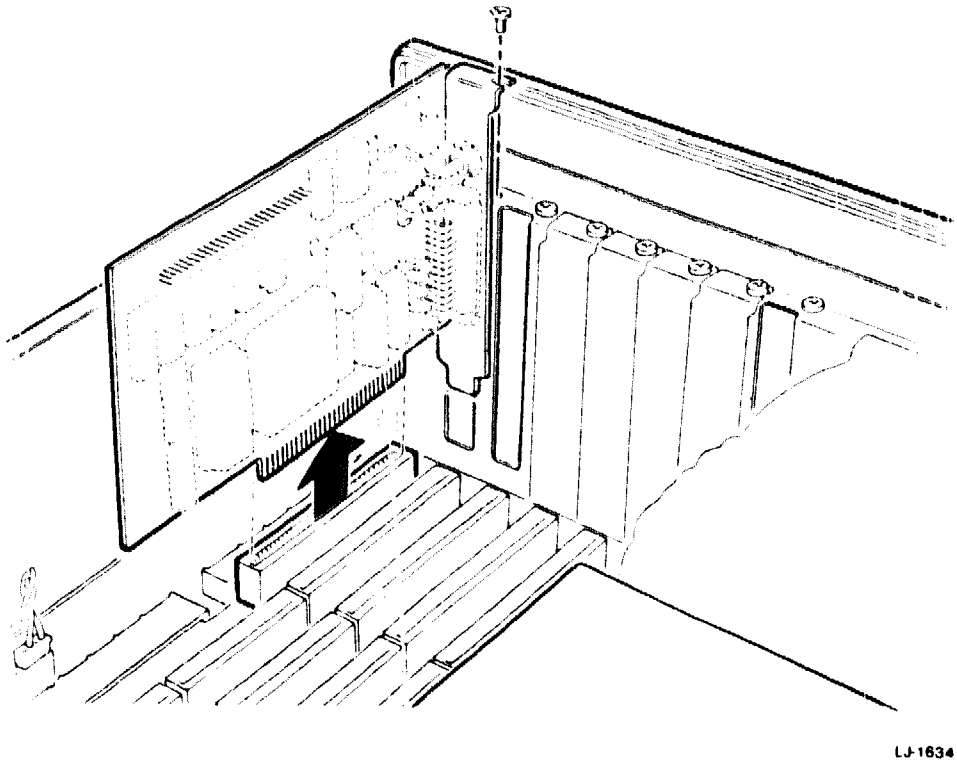


Figure 5–9 Removing an Option Board from the Bus Expansion Board

5.2.12 8-, 16-, and 32-Bit Option Boards

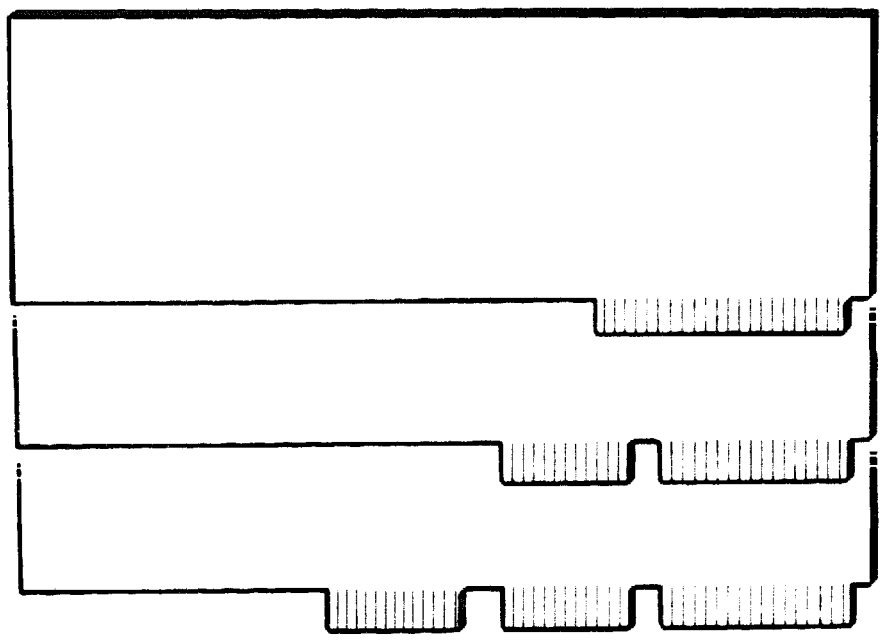
The bus expansion board has seven slots into which option boards may be inserted. The *first slot*, near the power supply, is for the hard disk drive controller board (16-bit slot). The *third slot* is for the display controller board (16-bit slot). However, both boards may be installed in any 16- or 32-bit slots.

The following table lists the possible board configurations and the expansion slots option boards can be installed in.

Board Configurations	Expansion Slot
8-Bit board	8-, 16-, and 32-bit slot
16-Bit board	16- and 32-bit slot
32-Bit board	32-bit slot

Install a board on the bus expansion board by doing the following:

1. Determine which option slot to use by identifying the shape of the board (Figure 5–10).
2. Insert the board in the correct slot according to the following:
   - 8-bit board may be inserted in any slot
   - 16-bit board may be inserted in any slot **except** slot two.
   - 32-bit board may be inserted only in slots four, five, or six
3. Re-install the retaining screw and any cables.
4. Replace the top cover and all cables.



LJ-1635

Figure 5–10 8-, 16-, and 32-bit Board Shapes

5.2.13 Memory Expansion Board Replacement

Replace a memory expansion board as follows (Figure 5–9):

1. Turn the power to the system off and wait 20 seconds.
2. Unplug the system from the wall outlet.
3. Remove the top cover from the system (Section 5.2.4).
4. Remove any cables attached to the board.
5. Remove the screw that secures the board retaining bracket into the expansion slot.
6. Detach the board(s) from the bus expansion board connector(s) by pulling upward.
7. Make the necessary switch and jumper settings to the replacement board (Appendix A, Jumpers and Switches).
8. Install the replacement board.
9. Replace the top cover and all cables.
10. Run the SETUP Utility on the Service Diagnostics diskette.

NOTE

If there are any memory SIMMs installed on the faulty board, remove them and install them on the new board before installing the new board. For more information about the different memory configurations used in this system refer to Section 1.4.4. For jumper information refer to Section A.2. For information on SIMM removal refer to Section 5.2.14.

5.2.14 Single In-line Memory Module Replacement

Replace a Single In-line Memory Module (SIMM) on the memory board as follows (Figure 5–11).

1. Remove the top cover from the system (Section 5.2.4).
2. Remove the screw that secures the board retaining bracket to the expansion slot.
3. Remove the memory board from the bus expansion board (Section 5.2.11, Option Board Replacement).

   The memory board has sixteen connectors that hold the SIMMs. The connectors are logically grouped into four banks (A, B, C, and D), each containing four connectors (Figure 5–12). There must be four SIMMs per bank. A bank cannot have less than four SIMMs to be complete.
4. Remove the defective SIMM(s) by releasing the retaining clips, pushing the SIMM into a vertical position and lifting the SIMM out of the socket.
5. Install the new SIMM(s) in the correct memory board bank by pushing the SIMM into the connector and snapping it in place.
6. Re-install the memory board.

NOTE
Switches L07LL and L06LL on the memory board only have to be reconfigured if you have changed the total amount of memory contained on the board (Section A.2).

CAUTION
You can not mix 256 Kbyte and 1 Mbyte SIMMs within banks A, B, C, and D on the memory expansion board.

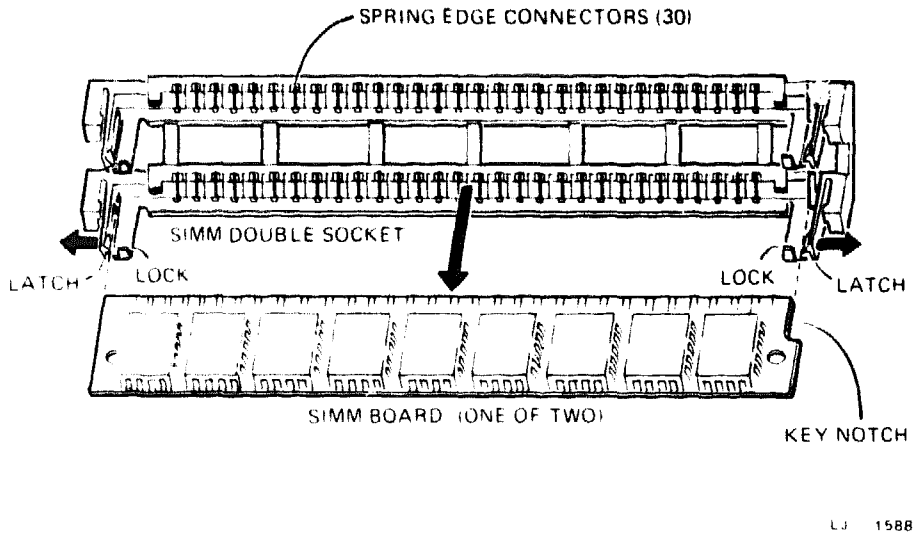


Figure 5–11 Replacing a SIMM

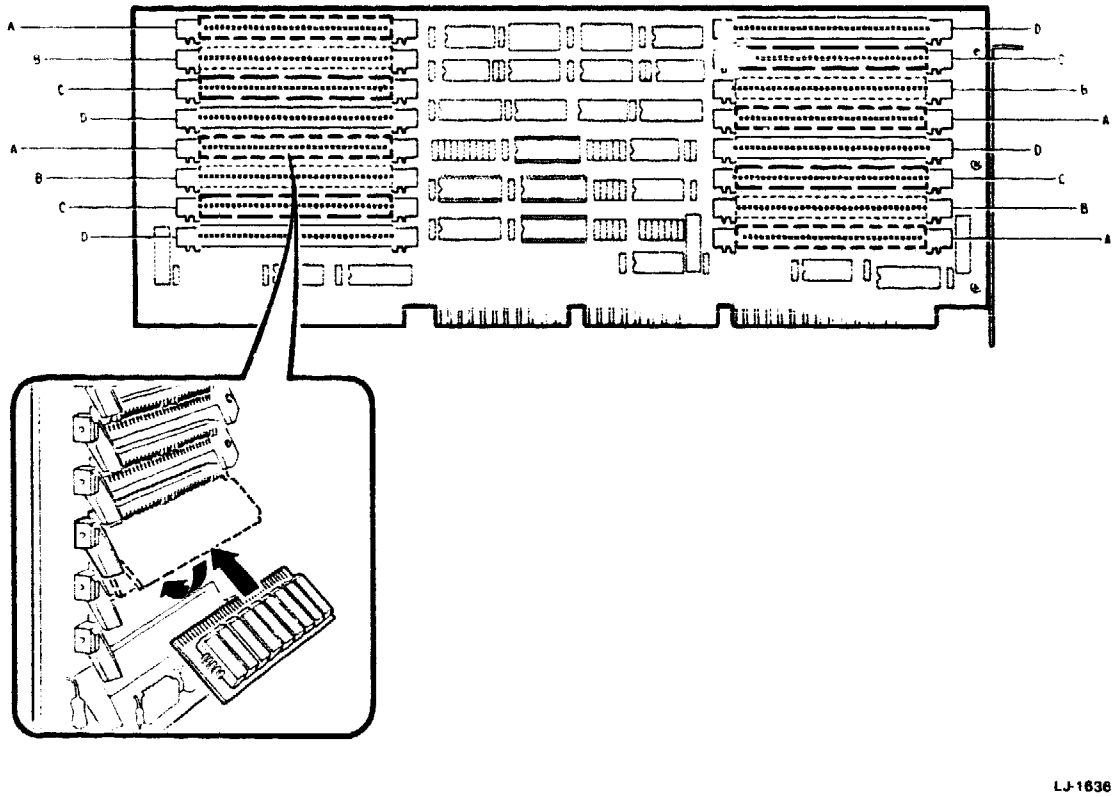


Figure 5–12 SIMM Banks

5.2.15 Video Display Controller Board Replacement

Replace a video display controller board as follows (Figure 5–9):

1. Turn the power to the system off and wait 20 seconds.
2. Unplug the system from the wall outlet.
3. Remove the top cover from the system (Section 5.2.4).
4. Remove the screw that secures the board retaining bracket into the expansion slot.
5. Detach the board(s) from the bus expansion board connector(s) by pulling in an upward direction.
6. Make the necessary switch and jumper settings to the replacement board (Appendix A, Jumpers and Switches).
7. Install the replacement board.
8. Run the SETUP Utility on the Service Diagnostics diskette.

5.2.16 Mouse Controller Board Replacement

Replace a mouse controller board as follows (Figure 5–9):

1. Turn the power to the system off and wait 20 seconds.
2. Unplug the system from the wall outlet.
3. Remove the top cover from the system (Section 5.2.4).
4. Remove the screw that secures the board retaining bracket into the expansion slot.
5. Detach the board(s) from the bus expansion board connector(s) by pulling in an upward direction.
6. Make the necessary switch and jumper settings to the replacement board (Appendix A, Jumpers and Switches).
7. Install the replacement board.
8. Run the SETUP Utility on the Service Diagnostics diskette.

5.2.17 Bus Expansion Board Replacement

Replace the bus expansion board as follows:

1. Remove the top cover of the system (Section 5.2.4).
2. Remove the cables from the hard disk controller.
3. Remove all boards from the bus expansion board (Section 5.2.11).
4. Remove all cables (including the +5 VDC and GND cables) from the bus expansion board (Figure 5–13).

CAUTION
Gently remove the 12 VDC fan power connector from the bus expansion board.

5. Remove the six screws that secure the bus expansion board to the chassis.
6. Remove the +5 VDC and GND screws.
7. Gently slide the bus expansion board toward the power supply until the edge connectors clear the U-turn board.
8. Lift the bus expansion board from the system.
9. Reverse procedure to install the new bus expansion board.

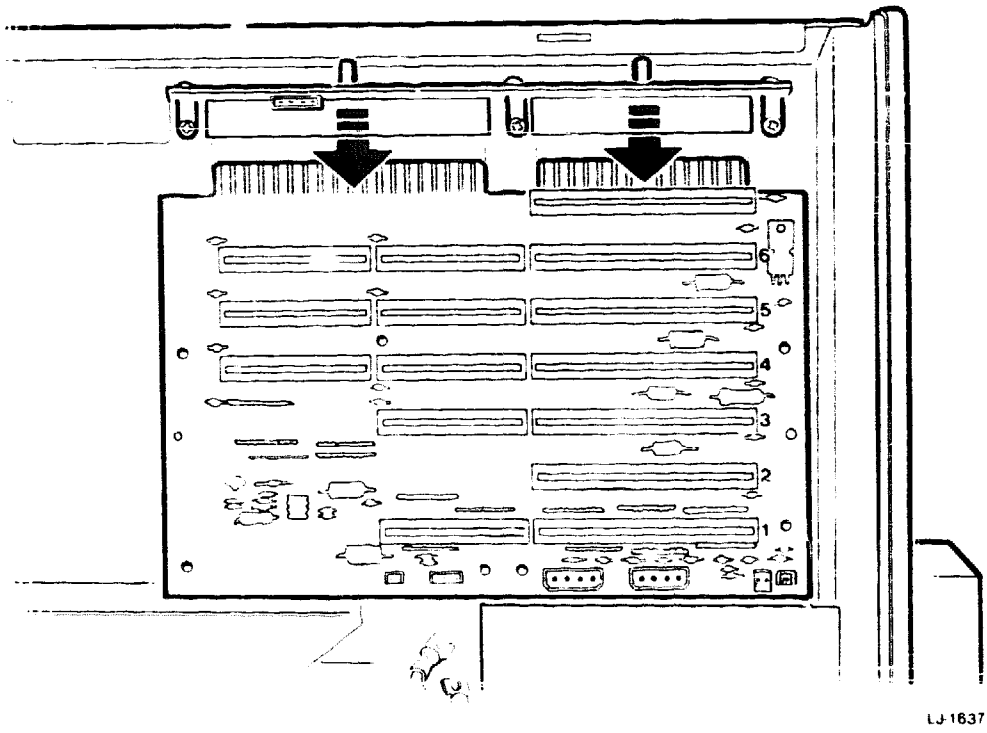


Figure 5–13 Removing the Bus Expansion Board

5.2.18 Power Supply Replacement

Replace the power supply as follows:

1. Remove the top cover of the system (Section 5.2.4).
2. Remove the hard disk controller board, if present (Figure 5–21).
3. Disconnect the cable(s) from the floppy disk drive connectors on the power supply (Figure 5–14).
4. Loosen the screws attaching the +5 VDC and GND cables to the power supply, then slide the cables from the connector (Figure 5–14).
5. Disconnect the +12 VDC connector from the power supply (Figure 5–14).
6. Slide the cables out of the two retaining clips on top of the power supply (Figure 5–14).
7. Remove the screw securing the power supply ground strap to the chassis and the screw securing the power supply to the chassis (Figure 5–14).
8. Slide the power supply toward the bus expansion board (Figure 5–14).

   WARNING
   Make sure the power supply does not interfere with the power switch bar and the chassis.

9. Lift the power supply out of the system module.

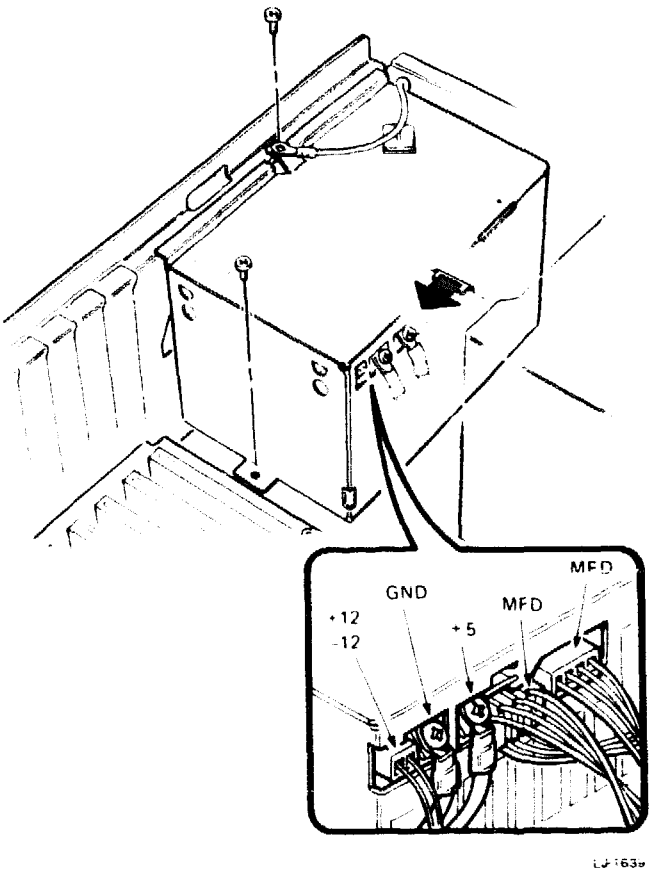


Figure 5–14 Removing the Power Supply

Install the power supply as follows.

1. Depress the power switch on the power supply (Figure 5–15).
2. Using a screwdriver, hold the power-on switch bar toward the front of the system (Figure 5–15).
3. Place the power supply in the chassis and slide it toward the side of the system to engage the locking tab at the bottom of the chassis with the slot in the bottom of the power supply (Figure 5–14).

   NOTE
   Make sure there are no cables trapped between the power supply and chassis.

4. Test the power-on switch to make sure it both depresses and releases. If not, the power supply must be removed and installed again.
5. Re-install the mounting screw and plug in the remaining cables.
6. Re-install the power supply ground strap.

7. Re-install the hard disk cable.
8. Re-install the cover.

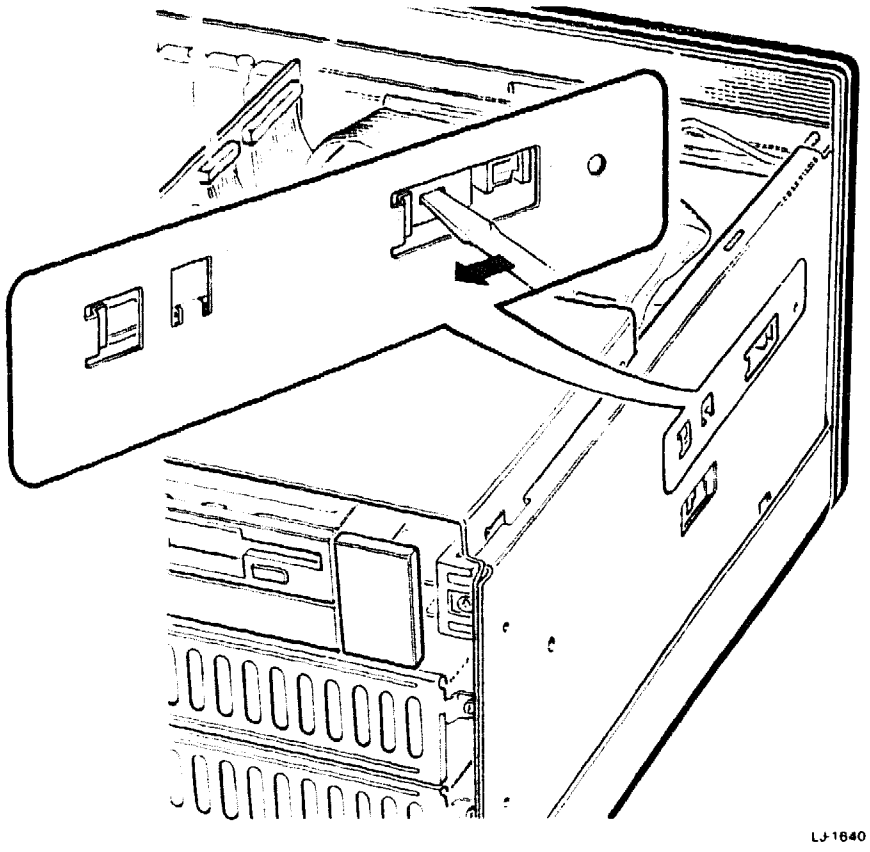


Figure 5–15 Depressing the Power Supply Switch

5.2.19 Fan Replacement

Replace the fan as follows:

1. Remove the power supply (Section 5.2.18).
2. Disconnect the fan power cable from the bus expansion board.
3. Remove the back panel of the system (Section 5.2.8).
4. Cut the rubber shock mounts that secure the fan to the chassis. (Figure 5–16)
5. Remove the fan.

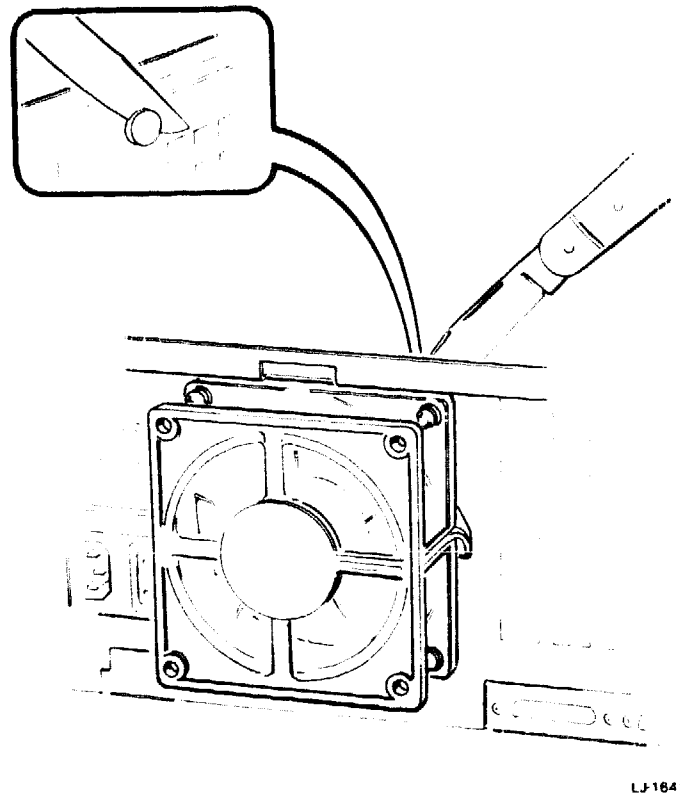


Figure 5–16 Removing the Fan

Install the fan as follows:

1. From inside the chassis, slide the new rubber shock mounts through the fan mounting holes until they snap into position.
2. Align the replacement fan with the rubber shock mounts. Be sure the power connector is on the side nearest the option slots.
3. Feed the power connector through the chassis.
4. Slide the new rubber inserts through the corresponding holes in the fan until they protrude through the fan chassis.
5. Gently pull the inserts until they snap into place and hold the fan flush against the chassis.
6. Connect the fan power cable to the bus expansion board.
7. Re-install the power supply (Section 5.2.18).

5.2.20 U-turn Board Replacement

Replace the U-turn board as follows:

1. Remove the main board (Section 5.2.10).
2. Replace the bottom cover to protect the machine and turn the system right side up.
3. Remove the bus expansion board (Section 5.2.17).
4. Remove the three screws that secure the U-turn board (Figure 5–17).
5. Lift out the U-turn board (Figure 5–17).
6. Remove the four plastic spacers from the U-turn board and install them on the new U-turn board.
7. Install the new U-turn board.
8. Re-install the bus expansion board (Section 5.2.17).
9. Re-install the main board (Section 5.2.10).

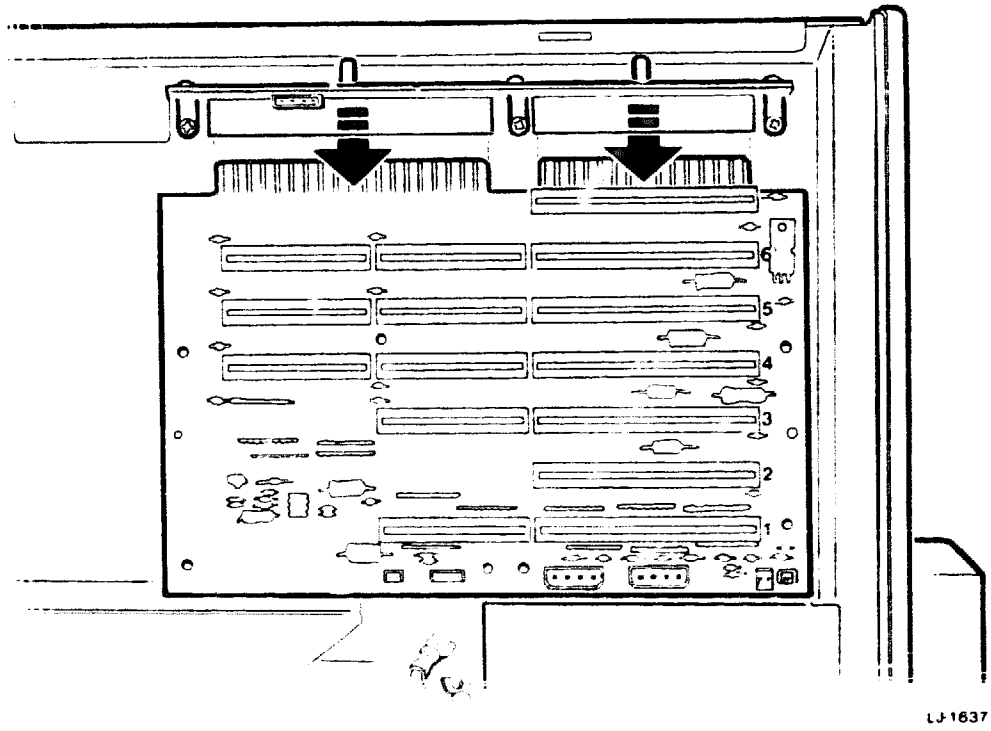


Figure 5–17 Removing the U-turn Board

5.2.21 Floppy Disk Drive Replacement

Replace the floppy disk drive as follows:

1. Remove the top cover (Section 5.2.4).
2. Remove the cables from the floppy disk drive.

   NOTE
   If you are removing drive B, you must pull drive A out slightly to reach the connectors on drive B.

3. Remove the two screws that secure the drive to the system chassis (Figure 5–18).
4. Slide the drive out of the system (Figure 5–18).
5. Insert the new drive.
6. Replace the two screws (Figure 5–18).
7. Re-attach the cables to the new floppy disk drive.

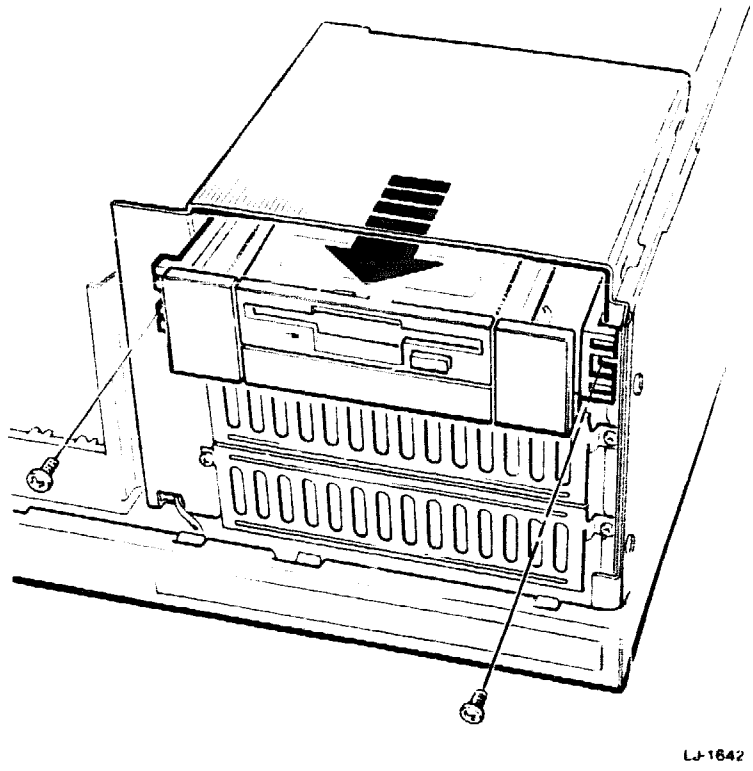


Figure 5–18 Removing the Floppy Disk Drive

5.2.22 Streaming Tape Drive Replacement

Replace the streaming tape drive as follows:

1. Remove the top cover (Section 5.2.4).
2. Remove the cables from the streaming tape drive.

NOTE
Pull out the floppy disk drive slightly to reach the connectors.

3. Remove the two screws that secure the drive to the system chassis (Figure 5–19).
4. Slide the drive out of the system (Figure 5–19).
5. Insert the new drive.
6. Replace the two screws (Figure 5–19).
7. Re-attach the cables to the new streaming tape drive.

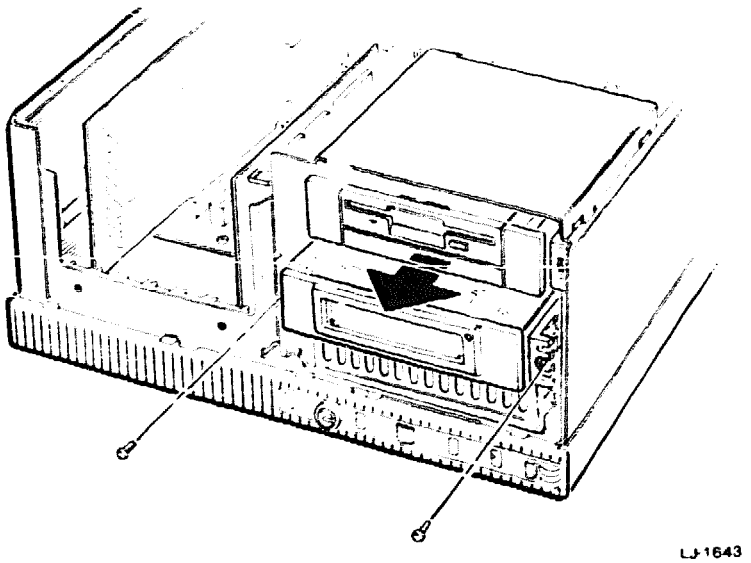


Figure 5–19 Removing the Streaming Tape Drive

5.2.23 Hard Disk Drive Replacement

Replace the hard disk drive as follows:

1. Remove the top cover (Section 5.2.4).
2. Remove the two screws that secure the metal shield and drive to the system chassis (Figure 5–20).
3. Disconnect the two signal cables from the controller board.
4. Slide the drive out of the system just enough to disconnect the four-wire power cable from the drive (Figure 5–20).
5. Remove the cables from the hard disk.

   NOTE
   Disconnect the interface and power cables at the rear of the floppy disk drive.

6. Slide the drive out of the system.
7. Transfer the signal cables to the new drive.
8. Slide the new drive into the system while feeding the signal cables into the chassis ahead of the drive.
9. Attach all cables.
10. Install the metal shield and mounting screws.
11. Re-install the floppy disk drive cables

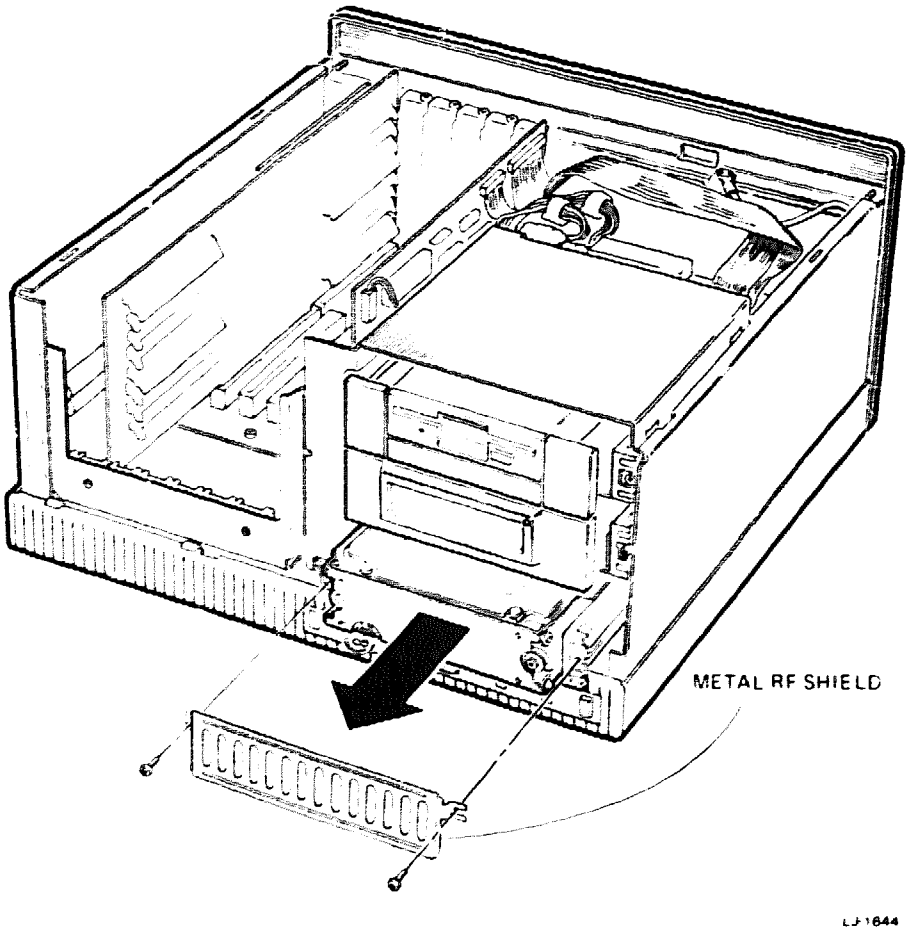


Figure 5–20 Removing the Hard Disk Drive

5.2.24 Hard Disk Controller Board Replacement

Replace the hard disk controller board as follows: (Figure 5–21)

1. Remove the top cover (Section 5.2.4).
2. Disconnect all cables attached to the board.
3. Remove the screw that secures the board retaining bracket into the expansion slot.
4. Remove the controller board from the bus expansion board. This procedure is similar to removing an option board and described in Section 5.2.11.
5. Install the new hard disk controller board.
6. Install the screw that secures the board retaining bracket into the expansion slot.
7. Re-install all cables that were attached to the board.

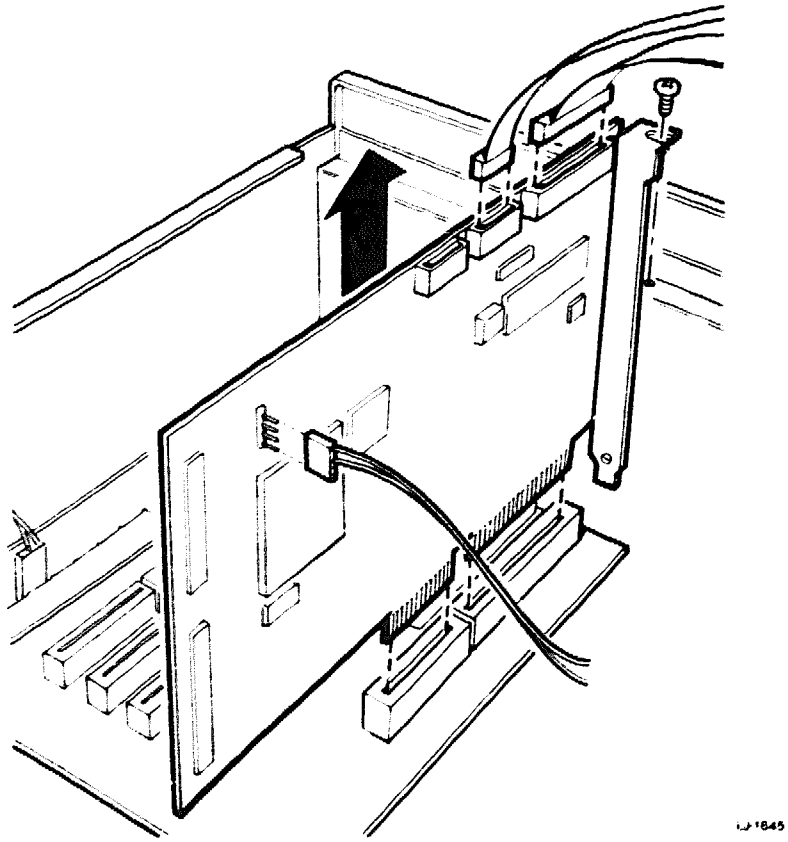


Figure 5–21 Removing the Hard Disk Controller Board


APPENDIX A

A
Jumpers and Switches

This appendix shows the location and describes the function of the jumpers and switches on the following DECstation 350 items:

- Main logic board
- Memory board
- Video controller
- ESDI hard disk controller
- Streaming tape drive
- Floppy disk drive
- Numeric coprocessor
- Mouse controller
- Multiport board
- DEPCA Board

A.1 Main Logic Board Jumpers

There are eight jumpers on the DECstation 350 main logic board. The jumpers are set to the default at the factory. These default settings are shown in Figure A–1 and described in Table A–1.

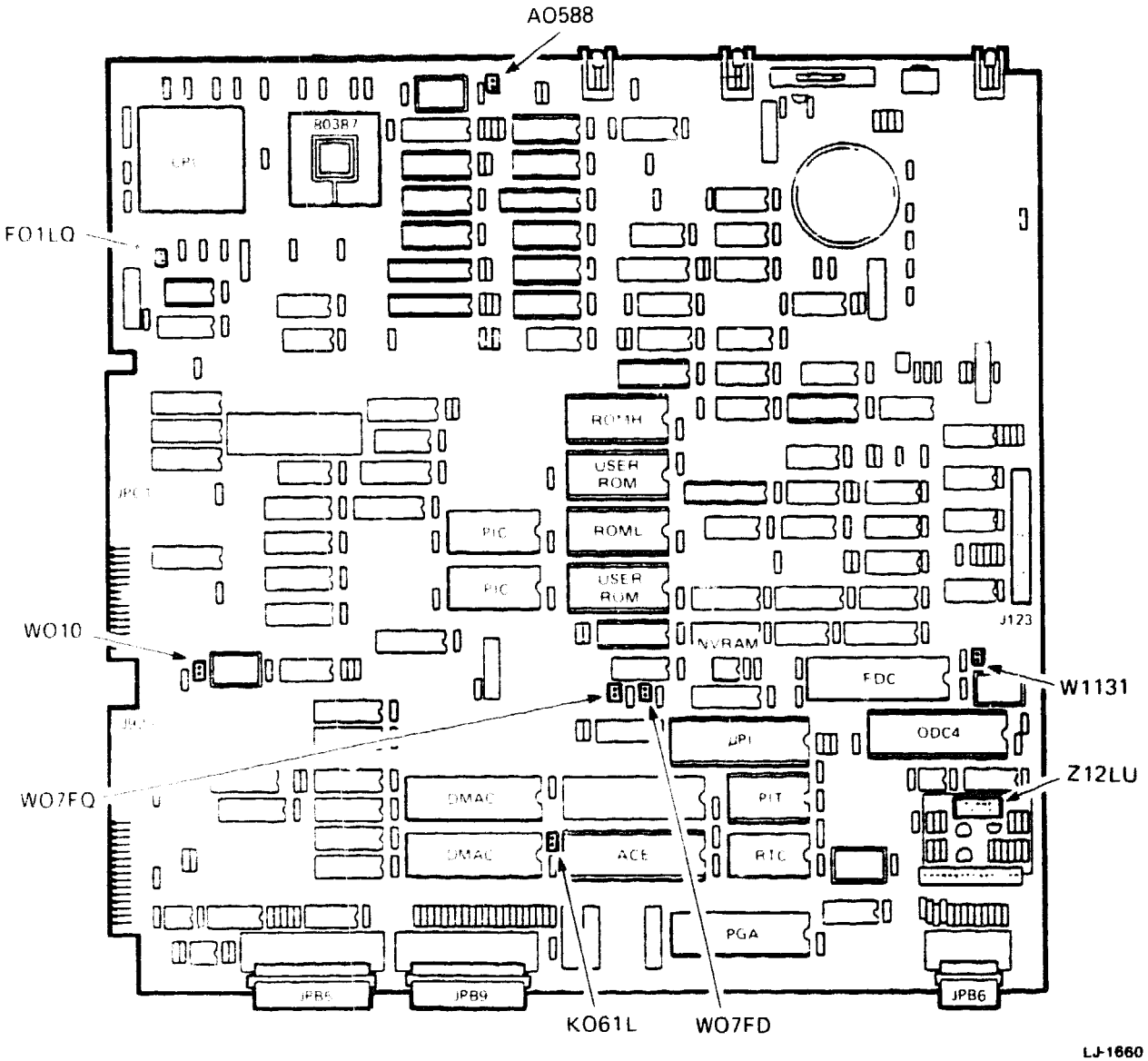


Figure A–1 Location of Jumpers on Main Logic Board

Table A–1 Main Logic Board Jumper Settings

Jumper	Function	Jumper Plug Setting
AO5BB	Repair or factory test	Installed
FO1LQ	Clockmode on 80387 math coprocessor	Removed
WO10	Repair or factory test	Installed
WO7FQ	Video controller. Always on for VGA board.	Installed
WO7FD	Repair or factory test	Removed
W1131	Repair or factory test	Installed
KO61L	Repair or factory test	Installed
Z12LU	Reserved	See Figure A–1

A.2 Memory Expansion Board

The memory board has sixteen connectors that hold the Single-In-line Memory Modules (SIMMs). The connectors are logically grouped into four banks (A, B, C, and D) each containing four connectors (Figure A–2). There must be four SIMMs per bank. A bank cannot have less than four SIMMs to be complete.

The capacity of the memory board depends on the number of SIMMs and the Kbyte value of each SIMM installed on the board. The Kbyte value is printed on the SIMM; it is either 256 Kbyte or 1024 Kbyte. The following table gives board configuration and capacity information. Refer to Section 1.4.4 or Section 5.2.13 for more information.

NOTE
Sometimes the manufacturer uses memory identifing codes on the dip that does not clearly specify the memory capacity of the SIMM. One way to identify the capacity is by the physical size of each dip. For example: a 256 Kbyte dip is approximately 127 mm x 64 mm (1/2 inch x 1/4 inch) and a 1 Mbyte dip is approximately 176 mm x 64 mm (11/16 inch x 1/4 inch).

CAUTION
You can not mix 256 Kbyte and 1 Mbyte SIMMs within banks A, B, C, and D on the memory expansion board.

NOTE
Depending on the type of SIMMs installed in the memory expansion board (256 Kbyte or 1 Mbyte), the maximum amount of memory that can be installed on each memory board is 1, 2, 4, 8, or 16 Mbytes.

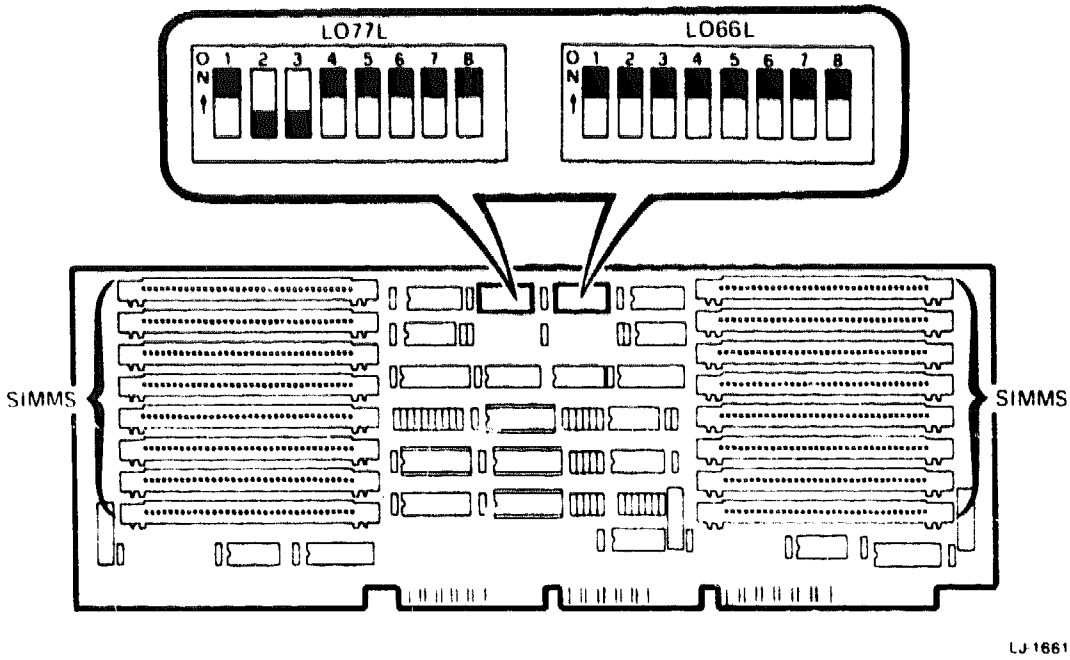


Figure A–2 Location of SIMMs and Switches on Memory Board

Configuration		Capacity	
Number of SIMMs	Bank(s) Used	SIMM Number 256	SIMM Number 1024
4	A	1 Mb	4 Mb
8	A, B	2 Mb	8 Mb
16	A, B, C, D	4 Mb	16 Mb

A.2.1 Setting Switches L07LL and L06LL

Follow these steps to set switches L07LL and L06LL.

1. Determine the board memory capacity (Mbytes) by using the previous table. If there is more than one memory board plugged into the bus expansion board, determine the capacity of each memory board installed.
2. Write the memory capacity (Mbytes) of each memory board on the following line. Start with the board that has the highest capacity.

   Board 1: _____ Board 2: _____ Board 3: _____

3. Calculate the **X** value for Board 1 in the following figure. The **Y** for Board 1 is always 0.

   If there is more than one memory board, calculate the **X** and **Y** values for each memory board.

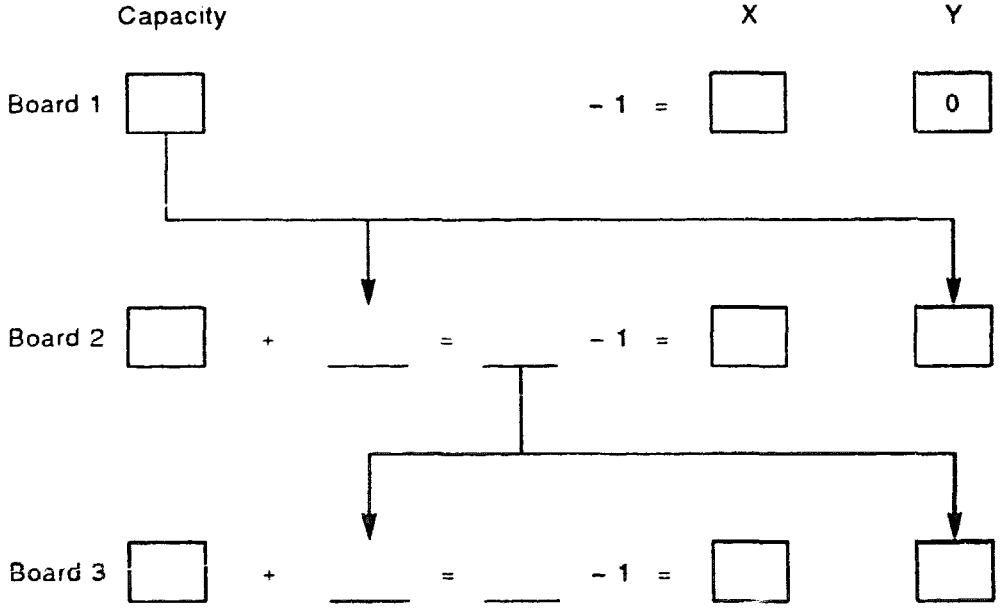


Figure A–3 Calculating X and Y Values for Memory Board

CAUTION
The capacity determines the settings for L07LL switches 1 through 6. The X value determines the settings for L06LL switches 1 through 4. The Y value deterines the settings for L07LL switches 7 through 8 and for L06LL switches 5 through 8.

4. Set L07LL switches according to the following tables for Board 1:

   If there is more than one board, repeat this step for each board.

Switches 1 - 6 on L07LL:

Board Capacity		L07LL Switches 1 - 6					
256 Kb	**1024 Kb**	**1**	**2**	**3**	**4**	**5**	**6**
1	4	on	off	off	on	on	on
2	8	on	off	on	on	on	on
4	16	on	on	on	on	on	on

Switches 7 and 8 on L07LL:

	L07LL Switches 7 - 8	
Y values	**7**	**8**
0 - 13	on	on
16 - 31	on	off
32 - 47	off	on
48 - 63	off	off

5. Set L06LL switches for Board 1 according to the following tables:

   If there is more than one board, repeat this step for each board.

Switches 1 - 8 on L06LL:

X values				Switches[1] 1 2 3 4	Y values				Switches[1] 5 6 7 8
0	16	32	48	• • • •	0	16	32	48	• • • •
1	17	33	49	• • • ○	1	17	33	49	• • • ○
2	18	34	50	• • ○ •	2	18	34	50	• • ○ •
3	19	35	51	• • ○ ○	3	19	35	51	• • ○ ○
4	20	36	52	• ○ • •	4	20	36	52	• ○ • •
5	21	37	53	• ○ • ○	5	21	37	53	• ○ • ○
6	22	38	54	• ○ ○ •	6	22	38	54	• ○ ○ •
7	23	39	55	• ○ ○ ○	7	23	39	55	• ○ ○ ○
8	24	40	56	○ • • •	8	24	40	56	○ • • •
9	25	41	57	○ • • ○	9	25	41	57	○ • • ○
10	26	42	58	○ • ○ •	10	26	42	58	○ • ○ •
11	27	43	59	○ • ○ ○	11	27	43	59	○ • ○ ○
12	28	44	60	○ ○ • •	12	28	44	60	○ ○ • •
13	29	45	61	○ ○ • ○	13	29	45	61	○ ○ • ○
14	30	46	62	○ ○ ○ •	14	30	46	62	○ ○ ○ •
15	31	47	63	○ ○ ○ ○	15	31	47	63	○ ○ ○ ○

[1] • = On, ○ = Off

A.3 ESDI Hard Disk Controller

Figure A–4 shows the jumper locations on the ESDI hard disk controller. Table A–2 describes the function of the jumpers.

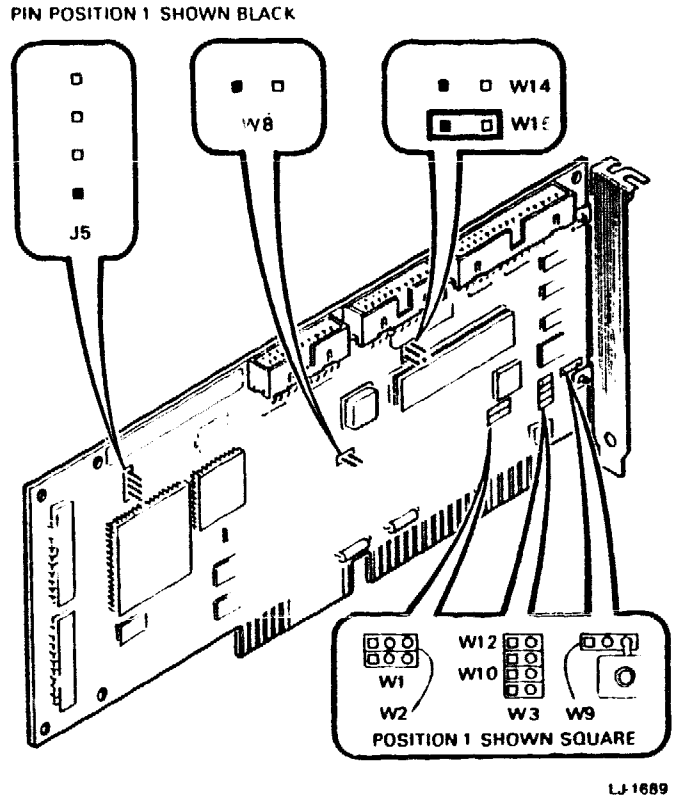


Figure A–4 ESDI Jumper Locations

Table A–2 ESDI Jumper Settings

Jumper	Function	Setting
W1	BIOS address Not used	Not installed
W2	BIOS address Not used	Not installed
W3	BIOS address Not enabled	Not installed
W8	Mode is WD1005 or WD1007	Not installed = WD1007 mode
W9		Not installed = not ground
W10	Digital input register latch	Not installed = not latched
W12	Hard disk address range is primary or secondary	Not installed = primary
W14	Translation	Not installed = enabled
W15	Number of ECC bytes is 4 or 7	Installed = 7 bytes

A.4 40 Mbyte Streaming Tape Drive

The tape drive must have jumper DS4 installed on pins 7 and 8 (Figure A–5). The jumper between pins 9 and 10 must **not** be installed. Terminator A must **not** be installed.

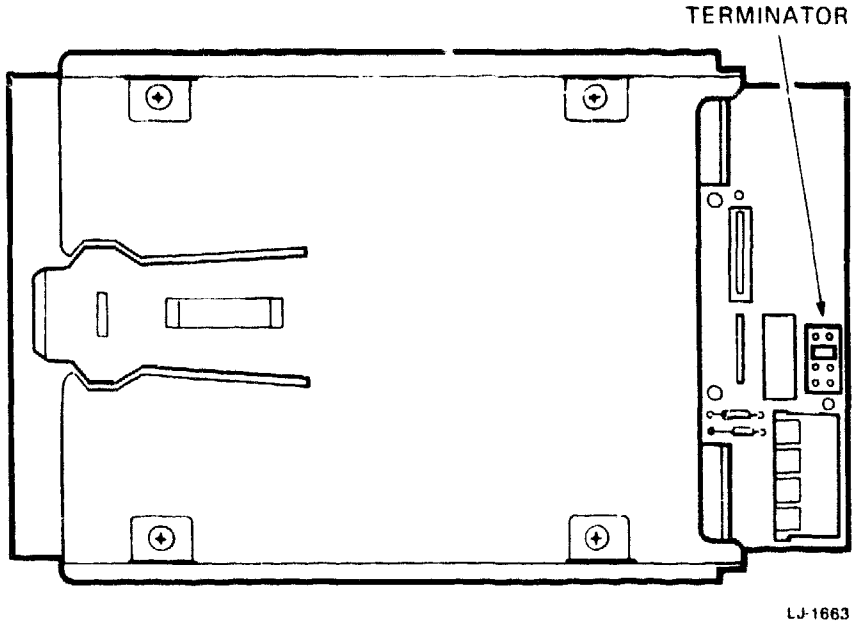


Figure A–5 40 Mbyte Tape Drive Jumper and Terminator Setting

A.5 Floppy Disk Settings

Set the jumpers according to Figure A–6 and switches according to Figure A–7, depending on the drive you have.

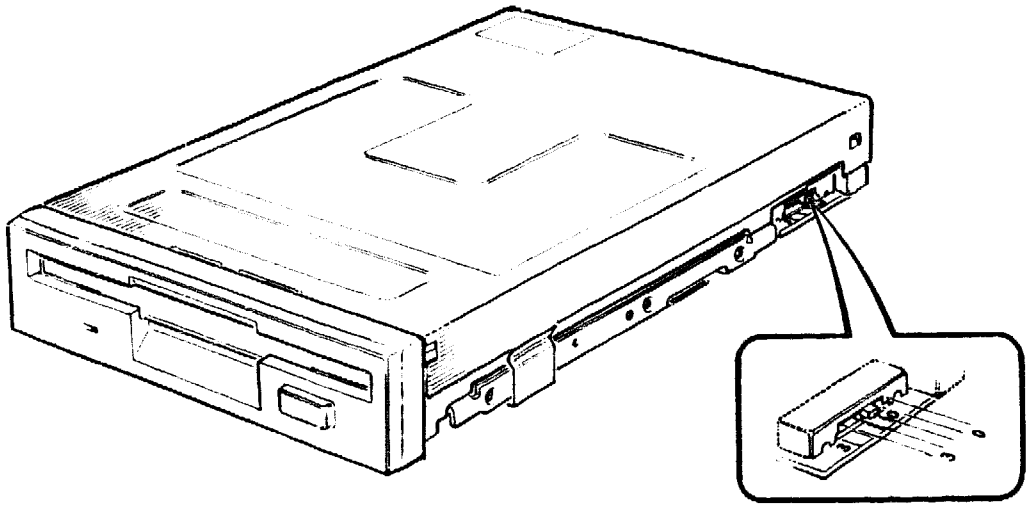


Figure A–6 Location of Jumper

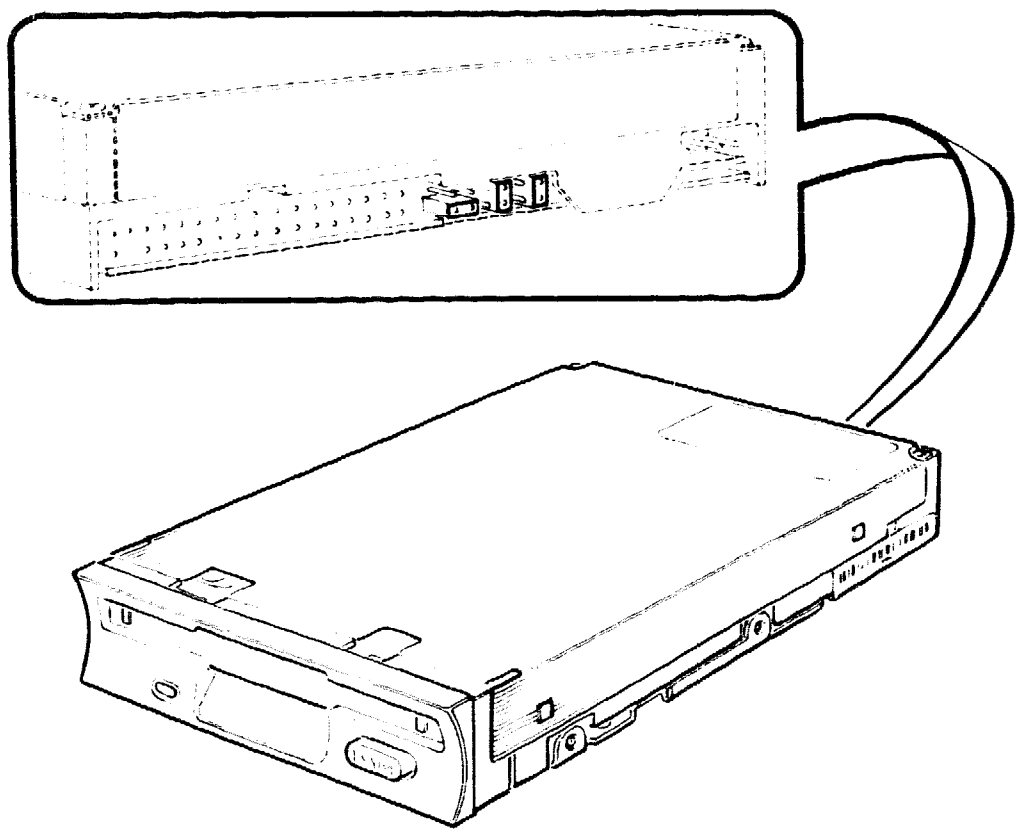


Figure A–7 Location of Jumper

A.6 Math Coprocessor Jumper Setting

Jumper F01.LQ, used with the 80387 math coprocessor, is shown in Figure A–8. If the coprocessor will be using the system clock, the jumper must **not** be installed. If the coprocessor will run with an external clock, the jumper must be installed.

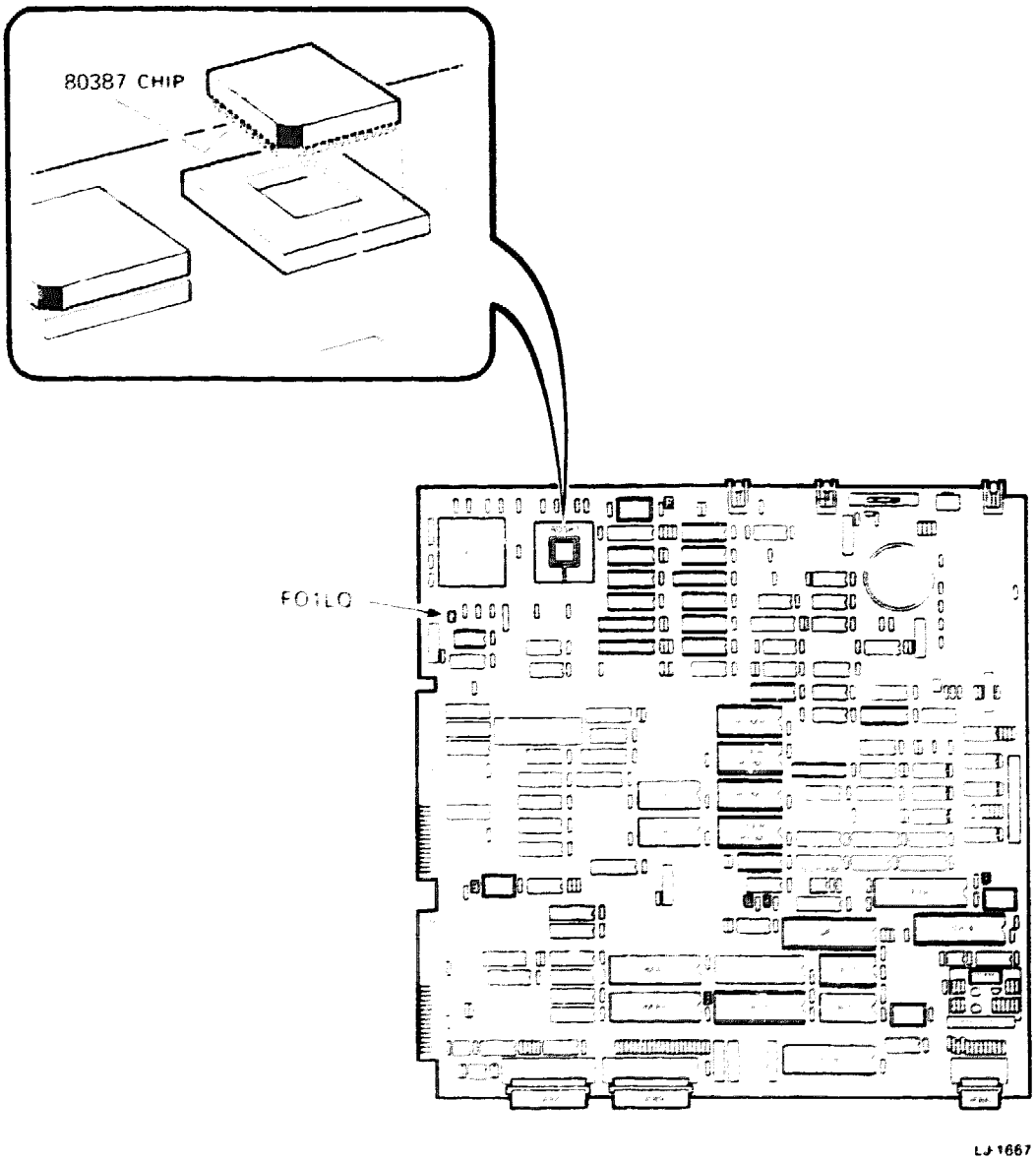


Figure A–8 Math Coprocessor Jumper

A.7 Mouse Controller Board Jumper J4

Set jumper J4 to position 5 on the mouse controller board (Figure A–9). This is interrupt request line 5 (IRQ5).

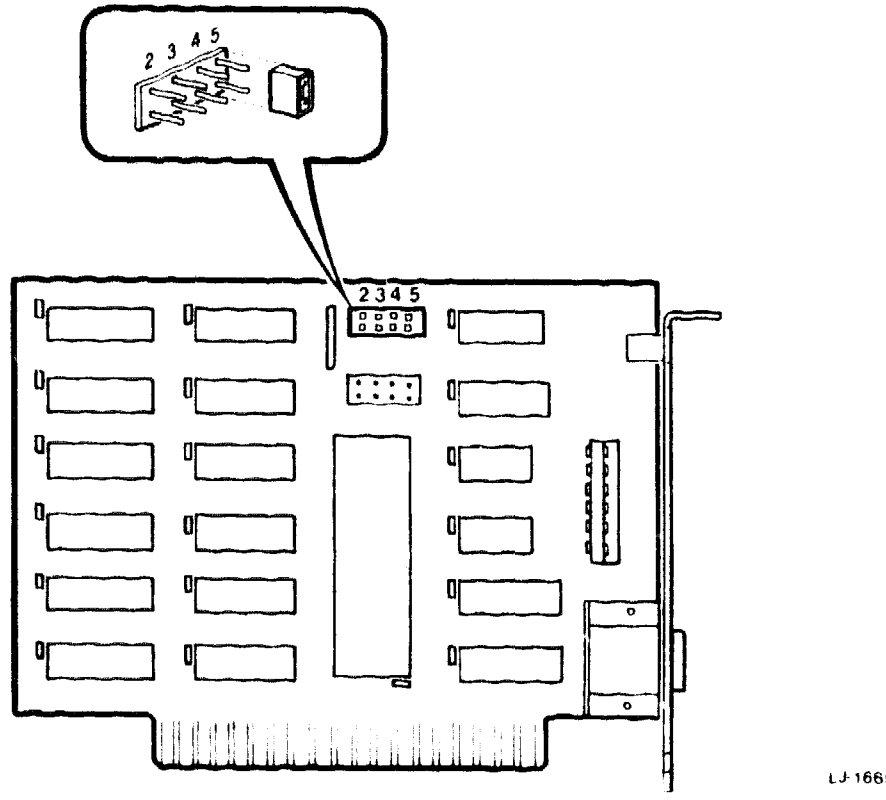


Figure A–9 Mouse Jumper J4 Set to IRQ5

A.8 Multiport Board Settings

Set the switches on the multiport board according to whether there is one board or two boards installed in the system. See Figure A–10.

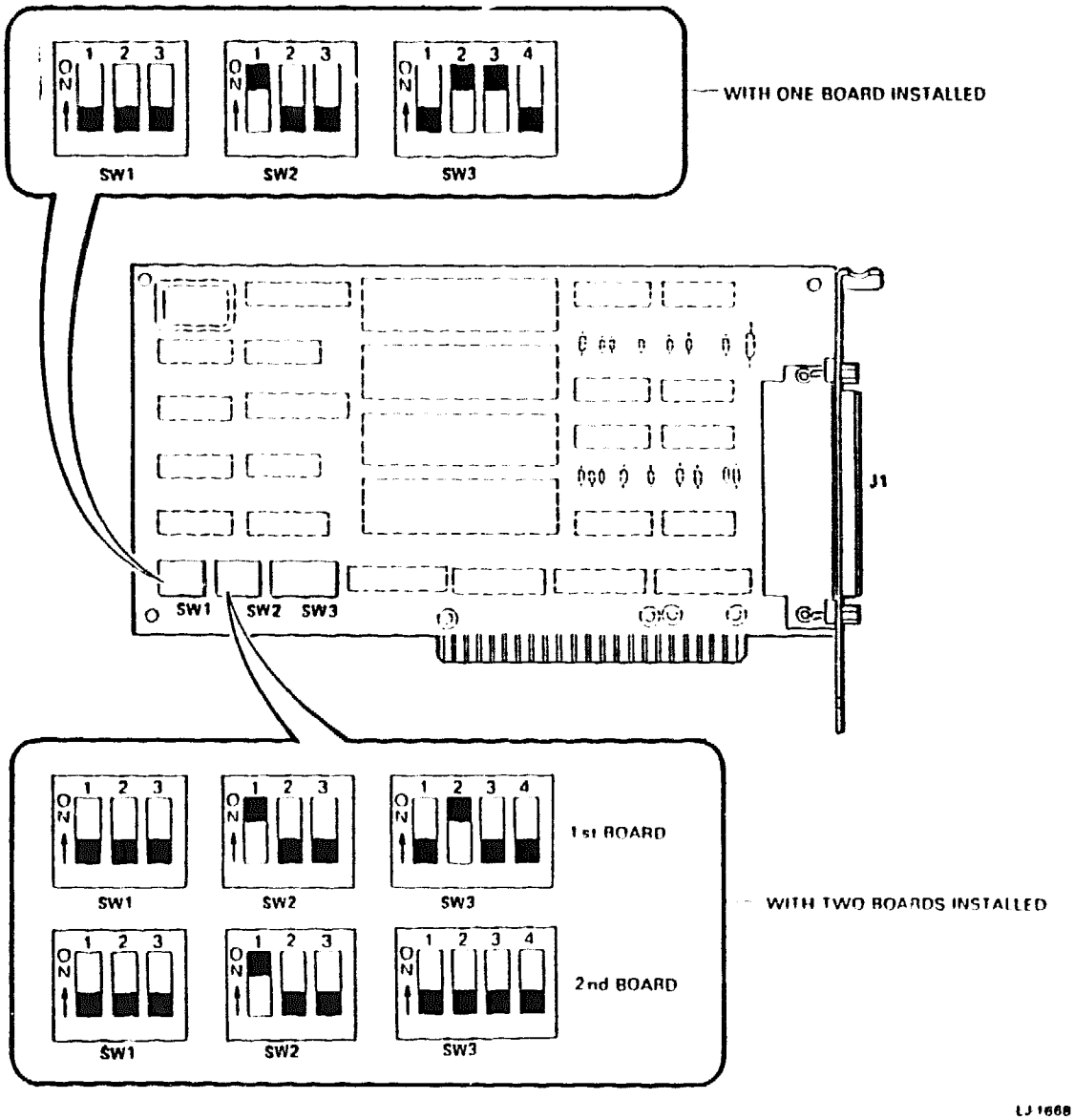


Figure A–10 Location of Jumper on Multiport Board

A.9 DEPCA Board Jumpers W1 and W2

Set the DEPCA board jumpers on pins W1 and W2 (Figure A–11). W1 selects IRQ2 as the default mouse setting. W2 selects IRQ3 as the default network setting. Make sure the jumper for W1 is connected to the top and middle pins. Make sure the jumper for W2 is connected to the middle and bottom pins.

NOTE

The DEPCA board used in this system is a DEPCB board. It is equivalent to a DEPCA REV. S3 board. For all DEPCA settings refer to the DEPCA Service Guide.

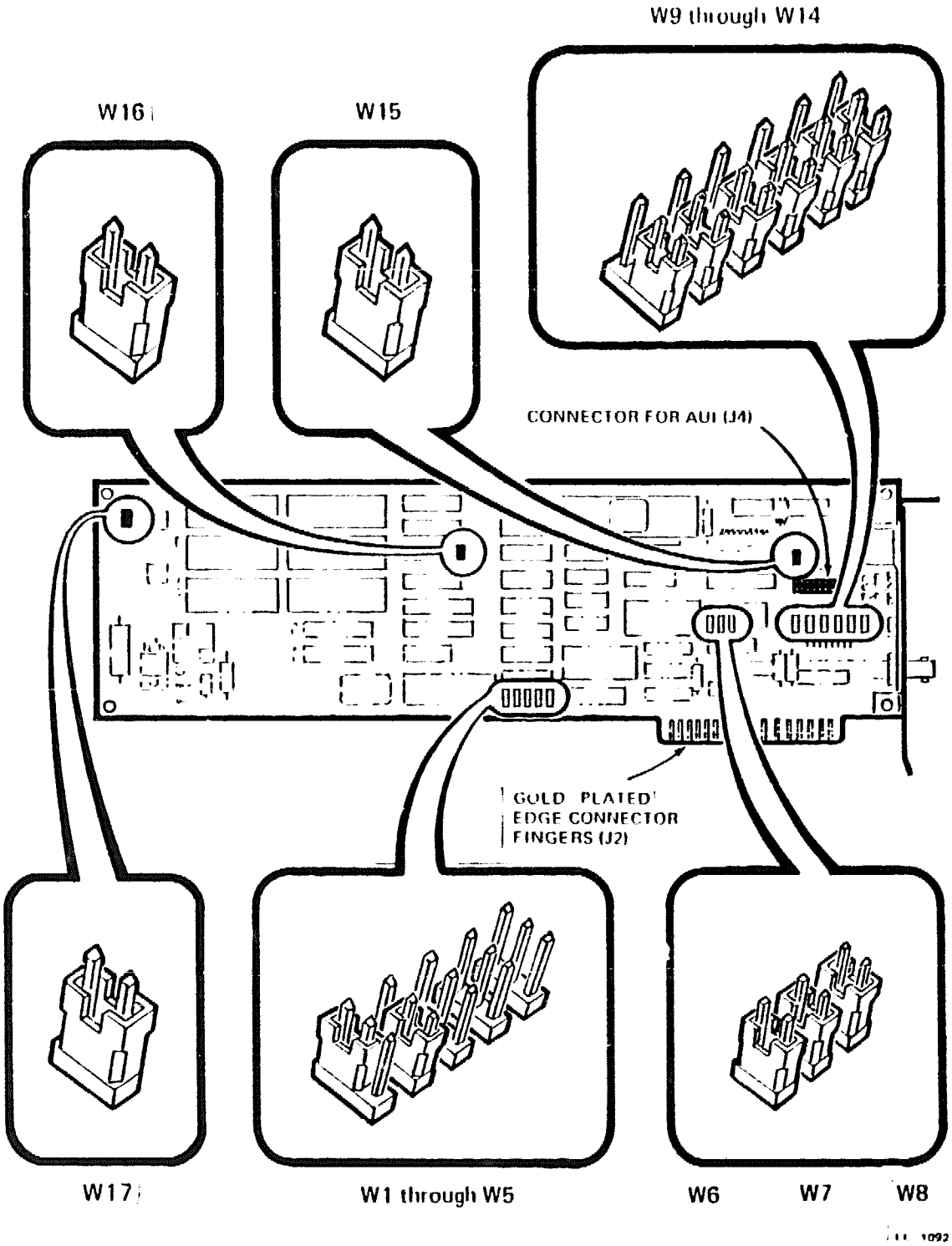


Figure A–11 DEPCA Board Settings

APPENDIX B

B
Interrupt Requests

This appendix describes the function of each interrupt request (IRQ) line within the DECstation 350.

When an interrupt request line is enabled the system automatically interrupts the current process and then processes the event that caused the interrupt. When the interrupt has been processed the system returns to the point were the original process was interrupted. The interrupt controller can handle up to 16 maskable interrupt request lines. Only 15 interrupt lines are available because IRQ2 is used by the controller hardware.

The following table lists all the interrupt request lines available, a priority level the CPU assigns to each interrupt line, and a functional description of each interrupt line:

NOTE
An interrupt line with a priority level one has a higher priority level to the system than an interrupt line with a priority level 17.

IRQ Line	Priority Level	Description of Interrupt Request
NMI[1]	1	Parity error in the on-board RAM, or external device
IRQ0	2	Channel 0 of the intergrated timer chip
IRQ1	3	Keyboard controller
IRQ2	4	Second interrupt controller. Not available externally
IRQ3	13	Reserved for optional boards (DEPCA) or serial interface board 2
IRQ4	14	Serial interface board 1
IRQ5	15	Reserved for optional boards or (DEPCA mouse) or parallel interface board 2
IRQ6	16	Floppy disk drive controller
IRQ7	17	Parallel interface board 1
IRQ8	5	Real time clock
IRQ9	6	Reserved for option boards
IRQ10	7	Reserved for option boards
IRQ11	8	Reserved for option boards
IRQ12	9	Reserved for option boards
IRQ13	10	80387 math coprocessor
IRQ14	11	Hard disk drive controller
IRQ15	12	Reserved for option boards

[1]NMI stands for non-maskable interrupt.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