# DECstation 300

# DECstation 300 Service Guide

Order Number   EK-PC62A-SV-001

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# About This Guide

The DECstation 300 Service Guide is designed to help you diagnose and repair the DECstation 300 system

## Guide Organization

The guide is organized as follows:

- Chapter 1 provides an overview of the DECstation 300 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, processor board, combination controller, memory configuration, 40Mbyte streaming tape, floppy disk drive, Video Graphics Array (VGA), asynchronous serial interface board, optional serial single port and optional serial multiport boards, and DEPCA boards supported by Digital.

    **NOTE**
    **The DEPCA board used in this system is a DEPCB board. It is equivalent to a DEPCA REV F3 board.**

- Appendix B contains information about Interrupt Request (IRQ) signals used in the DECstation 300 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 300 Installation and Operations Guide | ER-PC620-OM |
| DECstation 300 Technical Reference Manual | ER-PC62Y-AA |
| Olivetti M300 Functional Checks Manual | ER-PC62Y-DI |

CHAPTER 1

# 1
# Overview

## 1.1 Introduction

The DECstation 300 (Figure 1–1) is a desktop computer. It can be used as a standalone personal computer using the MS-DOS operating system or as a node on a network using a DEPCB board connected to a VAX computer or another DECstation with network server software. The DECstation runs Digital and other industry-standard applications.
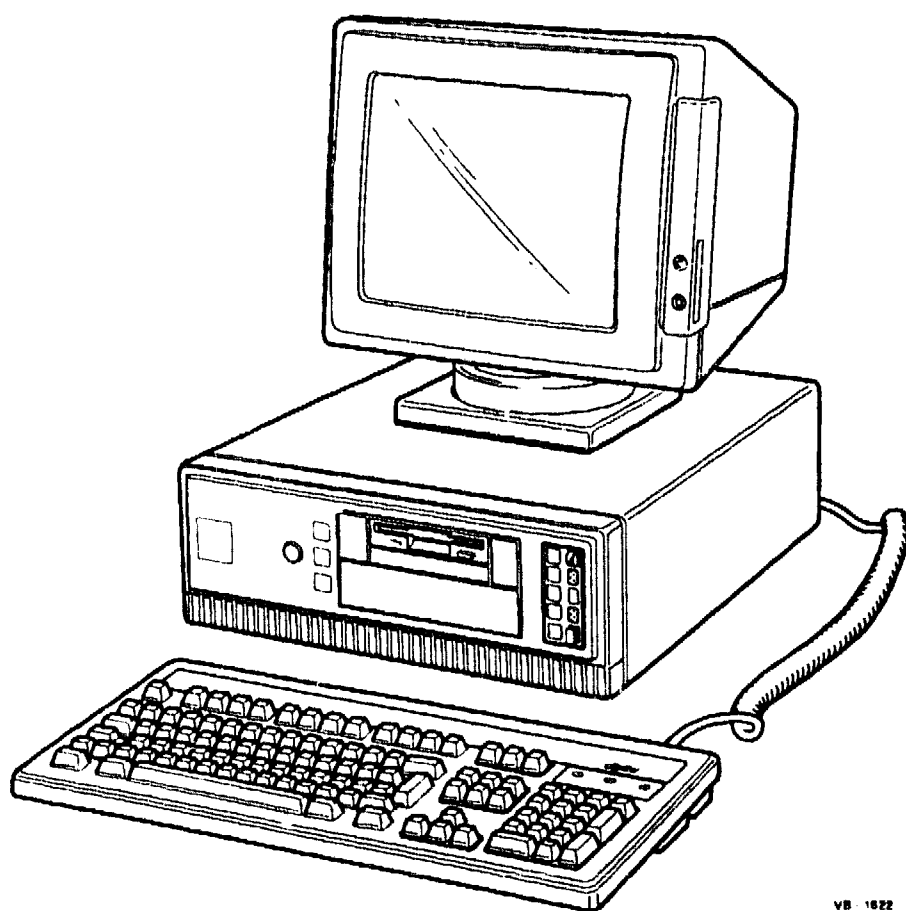
VB-1622

**Figure 1-1    The DS300 Workstation**

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

This section describes components and options available for the DECstation 300.

### 1.2.1 Components

The following is a list of the DECstation 300 components:

- System with 3.5 inch, 1.44 Mbyte floppy disk drive

- Monochrome or color monitor

- 101/102-key keyboard

- 130-watt continuous power supply

- Eight option slots for industry-standard options

- Processor board containing:

  — 80386SX INTEL processor (16 MHz)

  — Socket for math coprocessor

  — 2 Mbyte memory (2 1 Mbyte SIMMs) expandable to 4 Mbytes

  — Speaker

  — Parallel interface

  — 64 Kbyte ROM (AT BIOS compatible)

    **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/mouse interface

- Combination controller board containing:

  — Hard disk drive controller

- — Floppy disk drive controller

- — Streaming tape drive controller

- — Serial RS232-C interface with 25-pin connector

• Video Graphics Array (VGA) board

• Memory expansion board with 2 Mbytes of RAM (18 1 Mbit x 1 bit dips) (expandable to 4 Mbytes)

## 1.2.2  Options

The following are options for the DECstation 300:

- Intel 80387SX math coprocessor (16 MHz)

- Single In-line Memory Module (SIMM) boards for memory upgrade (2 1 Mbyte SIMMs) to processor board (increasing memory to 4 Mbytes)

- Memory expansion board with 2 Mbytes of RAM (18 1 Mbit x 1 bit dips) (expandable to 4 Mbytes)

- Two Mbyte memory upgrade (18 1 Mbit x 1 bit dips) for 2 Mbyte expansion board

  **NOTE**
  **You can install a maximum of three memory expansion boards providing 2 to 12 Mbytes of memory (in addition to the memory on the processor board).**

- 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 40 Mbyte hard disk drive

- 3.5 inch 100 Mbyte hard disk drive

- 3.5 inch 40 Mbyte streaming tape drive

- 3.5 inch 80 Mbyte streaming tape drive

- Digital Ethernet Personal Computer Adapter (DEPCB) board

- Two-button mouse

- LK250 keyboard

- *DECstation 300 Technical Reference Manual*

# 1.3   Model Numbers and Configurations

The DECstation 300 is available in four configurations as shown in Table 1-1. The DECstation options are listed in Table 1-2.

**Table 1-1   DECstation 300 Configurations**

| Model Number | Configuration |
|---|---|
| PC620-A2 | Base system: Intel 80386SX processor based, 16 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, combination controller, 120 VAC. |
| PC620-A3 | Base system using 220/240 VAC |
| PC625-A2 | Base system with 40 Mbyte hard disk drive |
| PC625-A3 | Same as PC625-A2 using 220/240 VAC |
| PC626-A2 | Base system with 100 Mbyte hard disk drive |
| PC626-A3 | Same as PC626-A2 using 220/240 VAC |

## Table 1–2 DECstation 300 Option Configurations

| Model Number | Option Configuration |
| --- | --- |
| PC62P-AA | 80387SX Math coprocessor |
| PC62M-AA | Memory expansion board containing 2 MBytes of RAM (expandable to 4 Mbytes) |
| PC62M-AB | 2 Mbyte upgrade (18 1 Mbit x 1 bit dips) for memory expansion board |
| PC62M-BA | 2 Mbyte upgrade (2 1 Mbyte SIMMs) for processor board |
| PC62R-AA | Additional 1.44 Mbyte floppy disk drive |
| PC62R-BA | 1.2 Mbyte 5.25 inch floppy disk drive |
| PC62R-CB | 40 Mbyte hard disk drive |
| PC62R-CC | 100 Mbyte hard disk drive |
| PC62T-AA | 40 Mbyte streaming tape drive |
| PC62T-BA | 80 Mbyte streaming tape drive |
| PC62S-AA | Two-button mouse |
| PC62Y-AA | *DECstation 300 Technical Reference Manual* |

## 1.4   Description of Components and Options

This section describes the components of the DECstation 300. Figure 1–2 is a block diagram of the components within the system.
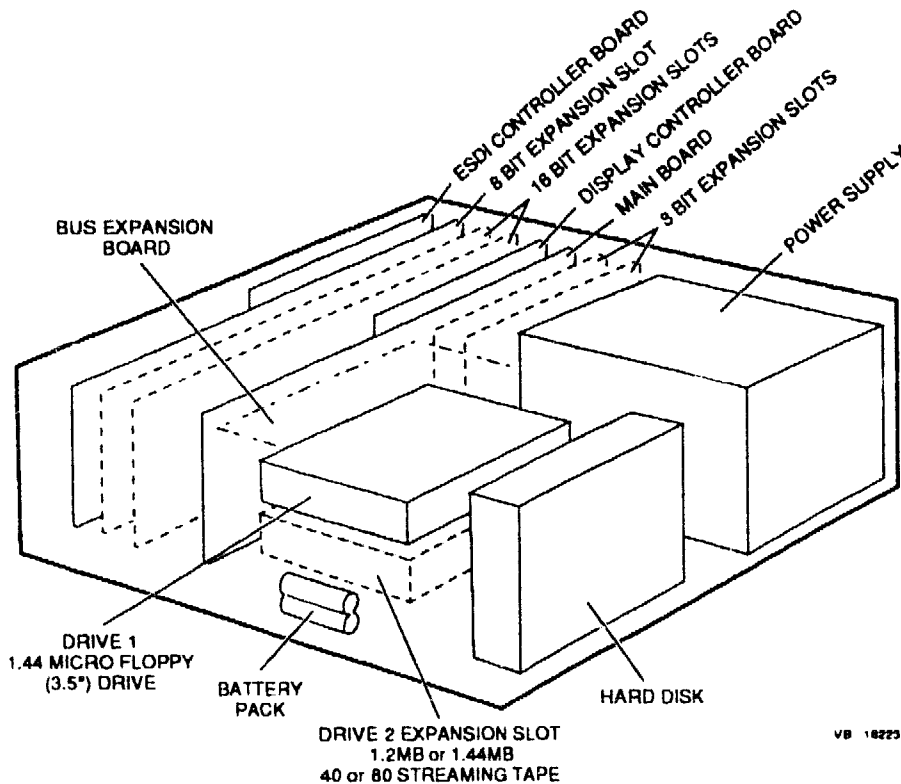


**Figure 1–2   System Unit Components**

### 1.4.1   DECstation 300 Processor Board

The processor board contains an Intel 80386SX CPU chip with onboard memory management and protection. An optional Intel 80387SX math coprocessor may be added to enhance the CPU by providing fast processing of math functions on floating point and other data types. The following are also on the processor board:

- 2 Mbyte memory (2 Mbyte SIMMs) (expandable to 4 Mbytes)

- Keyboard/mouse interface

- Parallel interface

- 64 Kbyte ROM (AT BIOS compatible)

- CMOS RAM (powered by external battery backup)

- Real-time clock

- Speaker

  **NOTE**
  **The maximum amount of memory that can be installed on the processor board is 2 or 4 Mbytes.**

## 1.4.2  Combination Controller Board

The combination controller board contains the following:

- Hard disk drive controller

- Floppy disk drive controller

- Streaming tape drive controller

- Serial RS232-C interface with 25-pin connector

## 1.4.3  Bus Adapter Board

The bus adapter board is mounted in the system chassis and contains eight expansion slots:

- 5 16-bit expansion slots

- 3 8-bit expansion slot

You can install the boards according to the following table:

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

**NOTE**
**Three of the 16-bit expansion slots are used by the processor board, the VGA controller board, and the combination controller board.**

The bus expansion slots provide connections for industry standard options such as the serial single port and serial multiport interfaces, DEPCB controllers and memory expansion boards.

## 1.4.4 Expanded Memory

One Mbyte SIMMs are available for expanding the memory on the processor board. The processor board is configured with two 1 Mbyte SIMMs as standard equipment. This provides 2 Mbytes of dynamic RAM memory. Memory can be increased by the installation of two 1 Mbyte SIMMs. This provides 4 Mbytes of dynamic RAM memory.

The user can install an optional memory expansion board and an upgrade option to the expansion board. Each optional memory board is configured with 2 Mbytes of memory. Each Mbyte of memory consists of nine dips giving a total of 18 dips soldered on the board. There are 18 sockets available for 2 Mbytes of optional memory expansion. If memory boards are installed in all three slots, the total dynamic RAM memory is expanded to 12 Mbytes, not including the SIMMs installed on the processor board.

**NOTE**
**The maximum amount of memory that can be installed on each memory expansion board is 2 or 4 Mbytes.**

## 1.4.5 Power Supply

The DECstation has a 130-watt continuous (150-watt peak) power supply and cooling fan. The power supply provides the necessary power to operate the processor board, floppy disk drive, VGA and bus expansion boards, combination controllers, and all options installed in the system.

The cooling fan is contained within the power supply. It is used to cool the power supply, standard and option boards, hard disk drive, and floppy disk drive. The fan 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.

**NOTE**
**The power supply is protected by thermal shutdown in case of fan failures.**

## 1.4.6 Monitors

The DECstation 300 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

## 1.4.7  Floppy Disk Drives

The DECstation 300 can house a maximum of two 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

## 1.4.8  Hard Disk Drive

Only one hard disk drive may be added to the base system. The hard disk drive is available in either 40 Mbyte or 100 Mbyte capacity.

## 1.4.9  Streaming Tape Unit

A 40 Mbyte or 80 Mbyte streaming tape unit may be installed in the DECstation 300 as an alternative to the second floppy disk drive.

## 1.4.10  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

- Herculcs 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.

## 1.4.11 Keyboards

The keyboard supplied in the 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 300 when the appropriate cable is used (See Chapter 5, FRU Removal and Replacement for a complete parts list.)**

## 1.4.12 Math Coprocessor

The math coprocessor (80387SX chip) plugs into the processor 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.
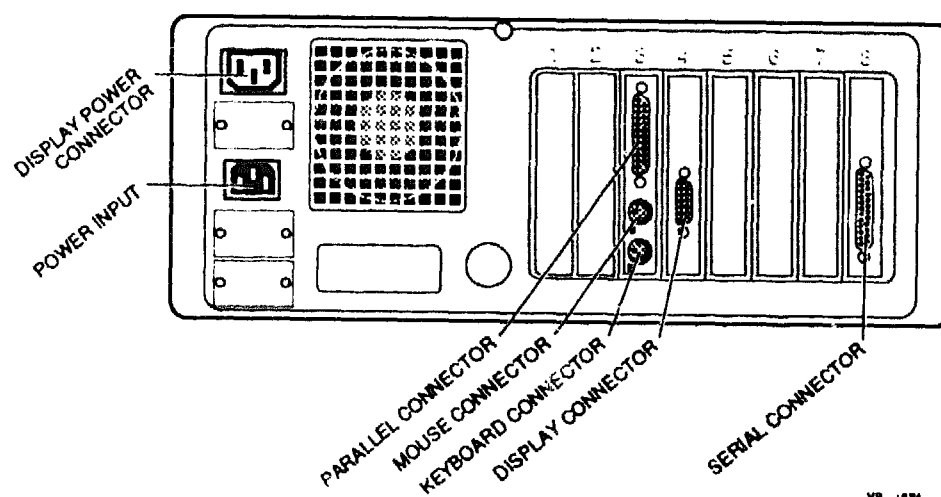
**Figure 1–3   External Connectors**

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

• The power switch (marked 0/1) turns system power off (0) and on (1).

• The key lock holds the cover to the chassis.

• 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.
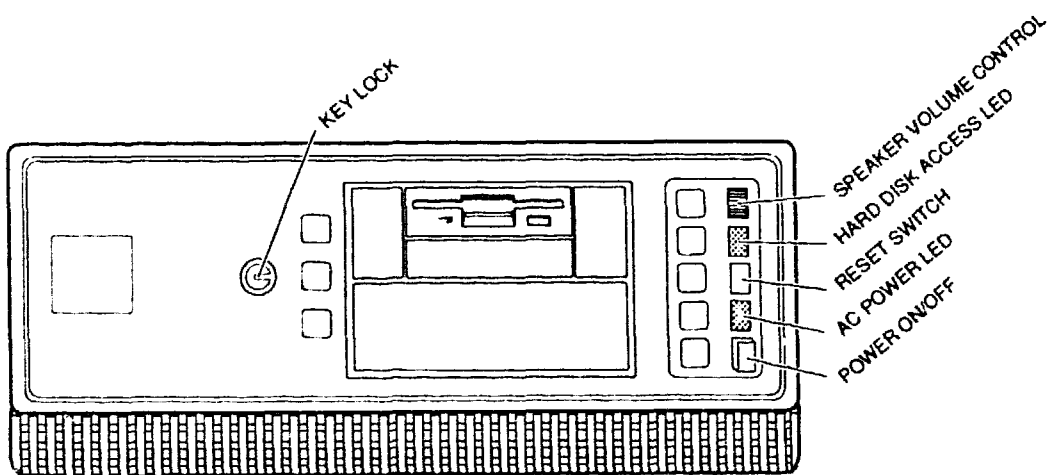


VB-1825

**Figure 1–4   Indicators and Controls**

## 1.6  Block Diagram

The functional block diagram is shown in Figure 1–5.
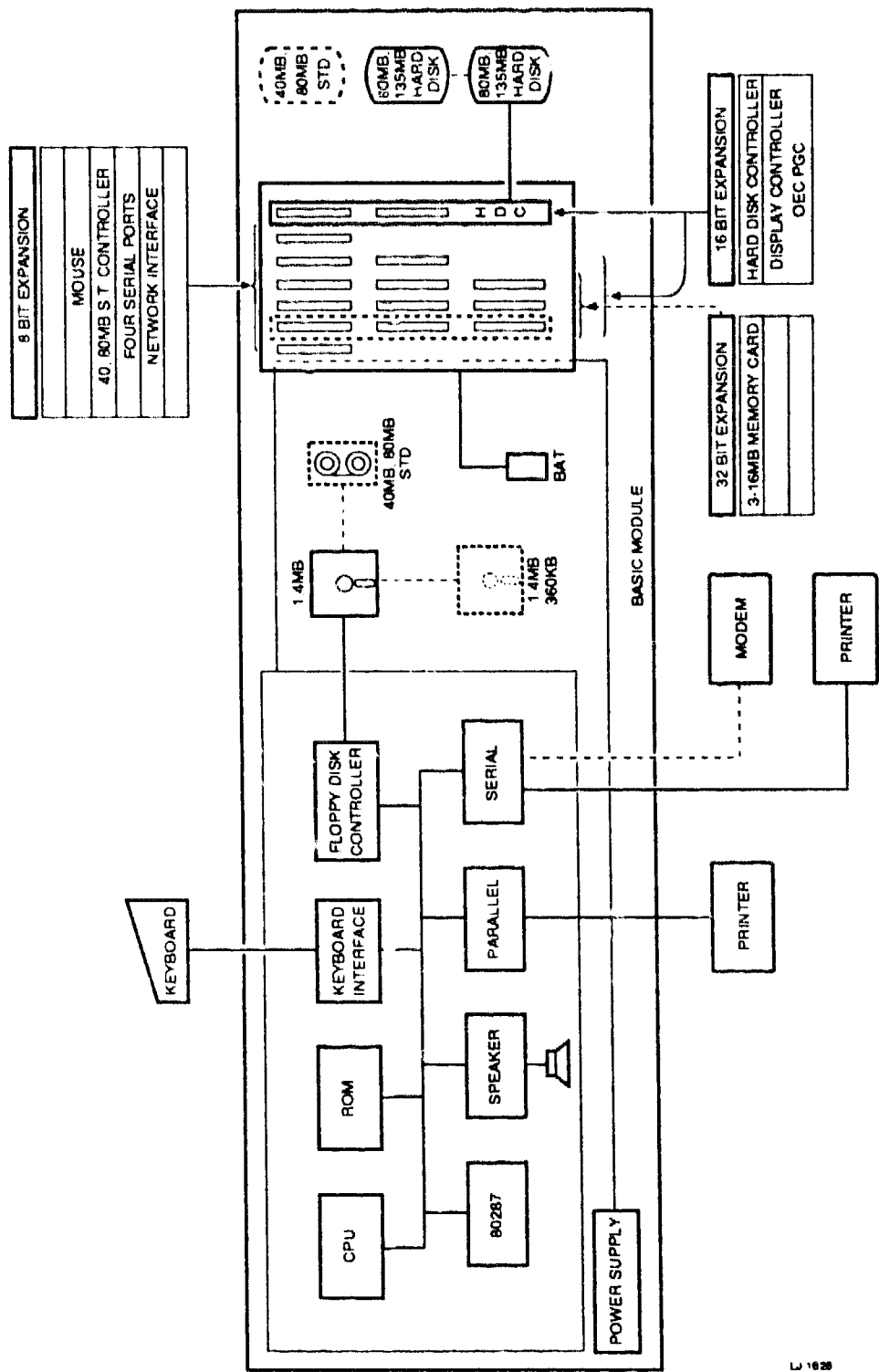
Figure 1-5 Functional Block Diagram

# CHAPTER 2

# 2
# Troubleshooting

This chapter provides information for troubleshooting the DECstation 300. This chapter contains the following sections:

- Normal power-up sequence

- Special tools

- Diagnostic tools

- SETUP utilities

- Troubleshooting procedure

- Troubleshooting by symptom table with corrective action

- Power-up error message 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 incorrectly select the total amount of memory installed in the system, the next time you turn the system on it will display the incorrect value and then prompt you that there is a "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 A-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.

```
     Resident diagnostics Rev x.xx

        CPU (i80386SX)                Pass
ROM Checksum          Pass
Memory Refesh         Pass
        Keyboard controller          Pass
        Base Memory                  640 KB
        Extended Memory              256 KB
        Shadow Memory                128 KB
        Total Memory                1024 KB
        Parity Circuit               Pass
        Interrupts Controllers       Pass
        DMA Controllers              Pass
        Keyboard                     Pass
        Clock/Calendar               Pass
        CPU Protected Mode           Pass
        CMOS RAM                     Pass
        Fixed disks                1 present
        Floppy disks               1 present
        Option ROM at DC000:0000   Pass        (*)

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

**Example 2-1    Sample of Successful Power-Up**

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

## 2.2   Special Tools

The following tools are included in the service diagnostic kit (22-00484) and are needed to troubleshoot the DECstation 300:

- Loopback connectors for:

  — Mouse (2-button)

  — 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 300.

- Power-on diagnostics

- System Checkout diagnostics (Utilities Diskette)

- Service diagnostics

### 2.3.1   Power-on Diagnostics

Power-on diagnostic test 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 software reset is performed (by pressing [Ctrl] [Alt] [Del]).

There is also a built-in setup program that permits the contents of CMOS to be modified. This resident setup program is different from the SETUP utility on the Utilities diskette. Section 2.4.1 describes the built-in setup program.

Testing is performed in individual steps so that all components are tested before being called into operation. If an error occurred during a test, an error message displays.

There 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 built-in SETUP is invoked, or a diagnostic message appears to inform the operator to run the SETUP utility on the Utilities Diskette.

Malfunctions on the processor 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 80386SX 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 (Utilities Diskette) | 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 2.4.2 describes the SETUP utility. |

**NOTE**
**The SETUP utility is different from the built-in setup program in the power-up diagnostics and the SETUP utility on the Service Diagnostics diskette.**

| | |
|---|---|
| Park Disk Heads | Stabilizes disk heads for shipping. |
| Test One Module | Allows the customer to test each suspected faulty component one at a time. 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 Goslow, Gofast, Autoslow, and Sound utilities.

## 2.3.3   Service Diagnostics

The following diagnostics are used only by Customer Services personnel. The menu-driven diagnostics are located on the Service Diagnostics diskette. It is packaged in the Service Diagnostic Kit (22-00484-01) 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

The service diagnostics are mo        'epth than the system checkout diagnostics; however, some of            '' ns are the same. Refer to the *DECstation 300 Service Diagnost*    r ᵤ.  ᵤiled information.

The service diagnostics offer the        ᵥ        .est 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 utilities available for the DECstation 300:

- Built-in SETUP utility

- SETUP on the System Checkout Diagnostics (Utilities diskette)

- SETUP on the Service Diagnostics Diskette

## 2.4.1 Using the Built-in Setup Utility

When the system powers up it performs a memory and hardware configuration check. It then checks the information stored in CMOS. If this information is inconsistent with the configuration check, the system invokes the built-in SETUP Utility. To use SETUP, follow these steps:

1. At the Language Selection Menu, enter the number of the language you want to use. The Configuration menu (Figure 2–1) is displayed. It lists nine symbolic items, five of which must be altered: time, date, hard disk unit, floppy disk unit, and video.

2. Select the item to be altered by using function keys 1 through 5:

   | F1 | key | selects time |
   | F2 | key | selects date |
   | F3 | key | selects hard disk unit |
   | F4 | key | selects floppy disk unit |
   | F5 | key | selects video |

   **NOTE**
   **The remaining four items must not be altered. They are for informational purposes only:**

   - Memory

   - 80387 coprocessor

   - Real time clock   (RTC)

   - Battery   (+ - )

3. Read the command line at the bottom of the screen for instructions on which commands to use to modify and save the information. Also, refer to the *DECstation 300 Installation and Operations Guide* for additional information on using these tests.

**Figure 2–1   Built-in Setup Configuration Menu**

## 2.4.2   Using the SETUP Utility on the Utilities Diskette

One of the SETUP utilities 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 memory configuration is changed

To run SETUP, follow these steps:

1. Insert a copy of the Service Diagnostics diskette into the disk 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, and the floppy disk drive automatically loads the System Checkout diagnostics (Utilities Diskette) application.

3. A message about the usage displays . Press [Enter]. In certain cases, such as when the battery has been changed, system checkout 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 us the ↑ and ↓ keys. Insert your selection by pressing [Enter].

6. When your selections are complete, press [ESC] and remove the diskette from the drive.

Table 2–1 lists the SETUP Utility parameters and possible values.

## 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 (defaults to 640 Kbytes). |
| Extended Memory Size | Excess of base memory size | Total Memory = Base Memory + Shadow Memory (if enabled) + Extended Memory. 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. |
| Shadow Memory | ENABLED, DISABLED | Can be enabled for Sytem and video BIOS or system BIOS only. |
| 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 | Type 34 for the 40 Mbyte, or type 33 for 100 Mbyte hard disk. **NOTE** **The numbers that correspond to the capacity of the disk drive are marked on the bottom of the system box.** |
| 80387SX Math Coprocessor | Not present, Present | If a coprocessor is installed, select Present. If a coprocessor is not installed, select Not present. |

**Table 2–1 (Cont.)   SETUP Utility Parameters**

| Parameter | Value | Comments |
|---|---|---|
| Primary CRT Adapter Type | Enhanced graphics, 40 or 80 column color, 80 column monochrome | The DECstation 300 uses enhanced graphics for the VGA controller board. |

## 2.5 Troubleshooting Procedure

Troubleshoot the DECstation 300 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 the error message was.

   - 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 reason other 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 in the *DECstation 300 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 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.

    • 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 2.3.6.

## 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. 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, this means that 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 5.2.19, 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.

When the system powers up, the power-up diagnostics will run automatically. Depending on what option you replaced, the system may activate the built-in setup program. Section 2.4.1 describes what information you must supply for the built-in setup program.

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

This procedure is to help determine why the DECstation 300 does not boot.

1. Turn power on

2. If no information is displayed on the screen refer to Section 2.6, Troubleshooting by Symptom.

3. Power-up Diagnostics.

   • Pay a special attention to the power-up diagnostics messages. Analyze any returned error with Table 2–7 in Section 2.7. This may already indicate a possible field replacement unit.

   • Compare the configuration reported on the screen with the configuration given by the customer, and try to find out some missing options. A successful power-up messages list is reported in Section 2.1, Example A–1.

   • If the system still does not boot, remove any third party options , try to reboot the system and go to step 1

4. 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 processor 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.

5. 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.  Make sure the system is configured correctly by running the SETUP utility on either the Utilities diskette or the Service Diagnostics diskette.

2.  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

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 processor 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. |

**Table 2-2 (Cont.)   Power up Symptom**

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| 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. |
| | 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. |
| | Processor board SIMM failure. | Check processor board for correct SIMM installation (Chapter 5), or replace SIMMs. |
| Fan runs but POWER LED not lit | Power supply connectors are unplugged. | Check that the two power supply connectors (6 wires each) are plugged firmly into the Bus expansion board. |

## Table 2–2 (Cont.)   Power up Symptom

| Symptom | Possible Cause | Corrective Action |
|---------|----------------|-------------------|
|  | Control panel connector is unplugged. | Check that the control panel connector is plugged into the processor board. |
|  |  | Replace the control panel. |
| No keyboard response. | The keyboard cable may not be plugged in. | Plug in the keyboard cable. |
|  | Keyboard or keyboard controller failure. | Replace keyboard or keyboard controller on processor board. |
| 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 operating | Change the sound board or the loud speaker group. |

## 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 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. |

## 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 form tted. | Use a formatted diskette. |
| | Diskette is worn or damaged. | Try another diskette. |
| | The drive switch on combination board is set uncorrectly | Check switch setting on combination board. |
| | Combination board failure. | Replace board. |
| Hard disk cannot read or write information. | A problem exists with the combination board. | Make sure all jumpers are set correctly. |
| | | Replace combination board. |
| | Hard disk damaged. | Replace hard disk |
| Intermittent hard disk read/write problems. | Possible corrupted files. | Restore the disk from back-up files. |

## Table 2-4 (Cont.)   Magnetic peripheral Symptoms

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| 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. |
| Any system failure. | 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 Replace power supply. |
| | The hard disk is damaged. | Replace hard disk. |
| 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. |

## Table 2-4 (Cont.)   Magnetic peripheral Symptoms

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| 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 Utilities diskette. Refer to *DECstation 300 Installation and Operations Guide*. |

## Table 2-5   Monitor Symptoms

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| 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 electrome-chanical device away from the monitor or move the monitor. |
| 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 2-5 (Cont.)  Monitor Symptoms

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| | Processor board SIMMs in bank 0 are defective | Change processor board SIMM strip (Chapter 5). |

## 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 ⊏1⊐ key to resume the power-up testing.

## Table 2–7   Power-Up Test Messages

| Error Message | Possible Problem | Corrective Action |
|---|---|---|
| CMOS RAM Error: 1 | CMOS RAM failed the shutdown byte test. | Replace CPU board. |
| CMOS RAM Error: 2 | CMOS RAM failed the write-read test. | Replace CPU board. |
| CPU (i80386SX) Error: 1 | CPU failed testing of its flag registers. | Replace CPU board. |
| CPU (i80386SX) Error: 2 | CPU failed testing of its ALU. | Replace CPU board. |
| CPU (i80386SX) Error: 3 | CPU failed testing of its general-purpose registers. | Replace CPU board. |
| DMA Controller Error: 1 | DMA Controller 1 failed a write-read test to its internal registers. | Replace CPU board. |
| DMA Controller Error: 2 | DMA Controller 2 failed a write-read test to its internal registers. | Replace CPU board. |
| DMA Page Registers Error | A page value written to DMA page register failed to return the same value. | Replace CPU board. |
| Illegal shutdown error: " code " | There is a shutdown condition, but the relative code is illegal or undefined. " code " = wrong shutdown code. | Replace CPU board. |
| Interrupt Controller Error: 1 | No timer interrupt occured when the first interrupt controller was tested. | Replace CPU board |

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

| Error Message | Possible Problem | Corrective Action |
|---|---|---|
| Interrupt Controller Error: 2 | Timer 0 failed to count when the first interrupt controller was tested. | Replace CPU board. |
| Interrupt Controller Error: 3 | An interrupt occured when an interrupt controller was tested, even though the interrupt was masked. | Replace CPU board. |
| Interrupt Controller Error: 5 | An interrupt occured when an interrupt controller was tested, even though the interrupt was masked. | Replace CPU board. |
| Interrupt Controller Error: 4 | An interrupt controller failed the test of its mask register. | Replace CPU board. |
| Interrupt Controller Error: 6 | An interrupt controller failed the test of its mask register. | Replace CPU board. |
| Keyboard Controller Error: 1 | The keyboard controller returned an error code at the end of its self test. | Replace CPU board. |
| Keyboard Controller Error: 2 | The keyboard controller timed out before completing its self test. | Replace CPU board. |
| Keyboard error: 1,2,3 | at the end of its self test, the keyboard: 1. Returned an error code, 2. Returned the code of a stuck key, 3. Failed to generate an interrupt. | Replace keyboard. |
| Memory error | An error was found when testing the first 8 KB of processor board RAM, vital to the Power-on Diagnostic testing. | Replace the Processor Board SIMM strips or the CPU board. |

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

| Error Message | Possible Problem | Corrective Action |
|---|---|---|
| Memory error: Addr=s000.oooo Wrote=wwww Read=rrrr | An error was found during the general RAM test; writing a value and then reading it retrieved a different value. | Replace the processor board SIMM strips or the CPU board. |
| Memory Refresh Error, Unrecoverable Power-up Error | Memory refresh did not occur every 15.1 microseconds | Replace the processor board SIMM strips or the CPU board. |
| NMI error | A non-maskable interrupt was generated, even with parity error checking disabled. | Replace CPU board. |
| Option ROM at s000:oooo Error | The option ROM at the given address failed a checksum test; fault caused by an expansion board. | Remove the expansion board causing the fault. |
| Parity Error | A parity error was detected during the parity generator test. | Replace CPU board. |
| Parity Error Addr=s000:oooo Wrote=wwww Read=rrrr | A parity error was detected during memory testing. | Replace Processor Board SIMM strips. |
| Protected mode error: 1,2,3,or 4 | The CPU failed to properly execute certain protected mode instructions | Replace CPU board. |
| ROM Checksum Error | The processor Board BIOS ROM returned an incorrect checksum,possibly indicating a bad ROM chip. | Replace CPU board |
| Serial Configuration Error-RUN SETUP | There is a conflict in serial port addresses | See Board information. |
| Speaker error | The speaker port test failed | Replace CPU board |

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

| Error Message | Possible Problem | Corrective Action |
|---|---|---|
| Timer error 1,2,or 3 | One of the three Timer Channels does not count, counts too fast, or too slowly | Replace CPU board. |

# 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.

**A** WORKSTATION Thinwire NETWORK

DECstation

SEGMENT

Thinwire CABLE

⊏⊐ BARREL CONNECTOR

Ⓣ TERMINATOR

◁ T - CONNECTOR

SECTION
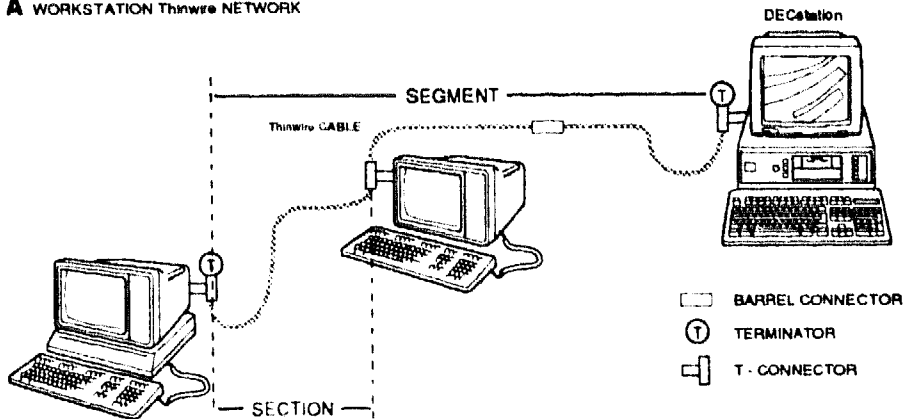
**B** WORKSTATION WITH microVAX II SERVER Thinwire NETWORK

SEGMENT

DESTA

MicroVAX
SERVER

DECstation
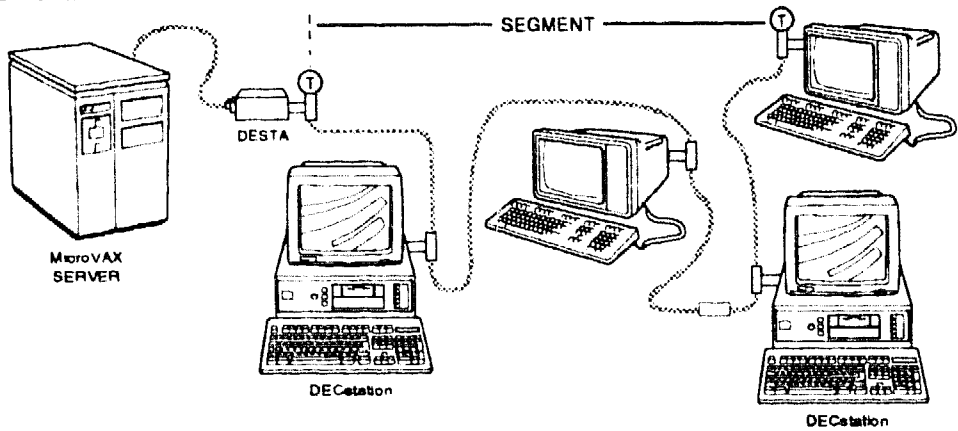
DECstation

VB 1576

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.
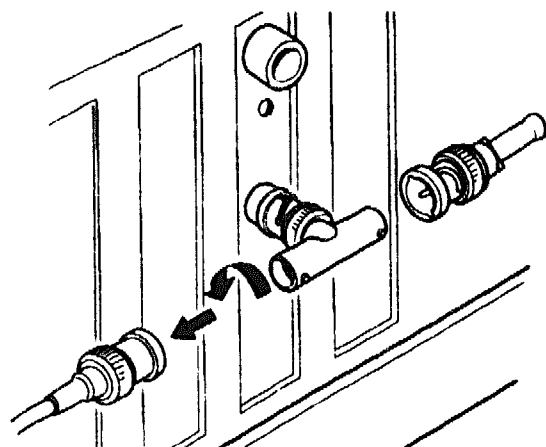
A CORRECT

B INCORRECT          VB 1577

**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.

**A**



CORRECTLY INSTALLED

**B**



T CONNECTOR INCORRECTLY INSTALLED

**C**



SEGMENT LOOPED · MUST BE TERMINATED
AT BOTH ENDS
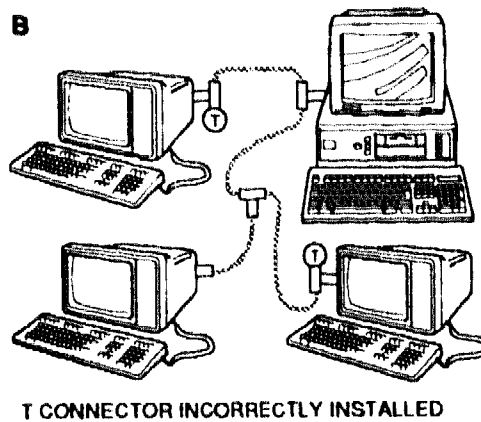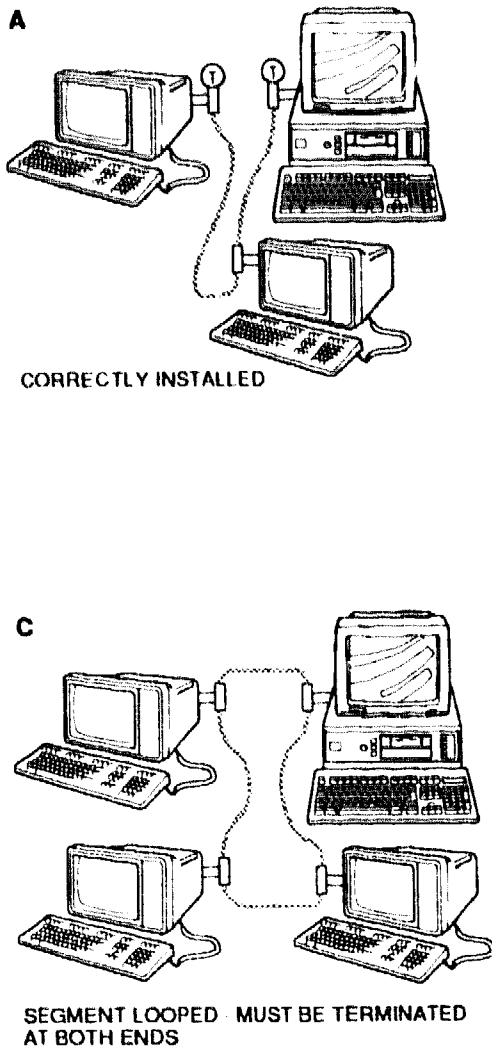
VB  1578

**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).
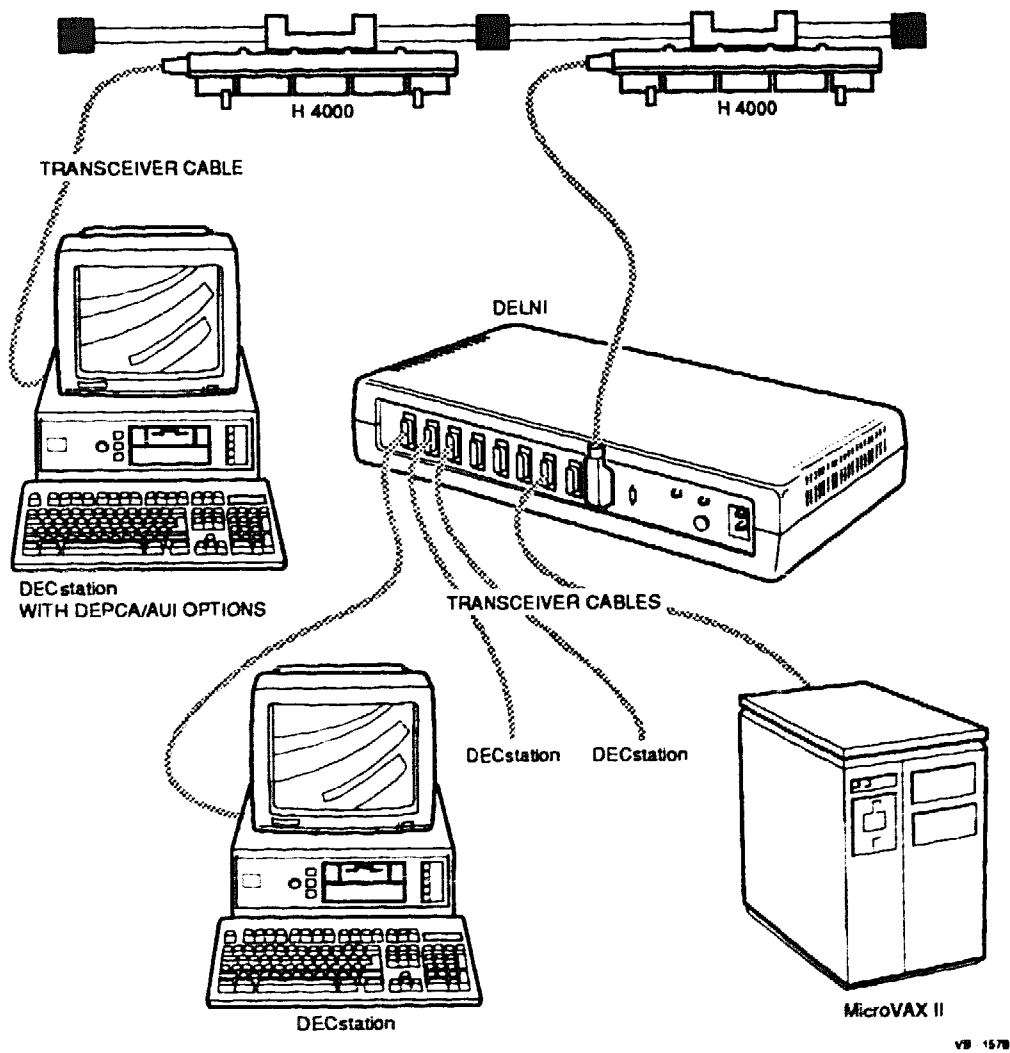
**Figure 3–4   DEPCA/AUI Option Network Configurations**

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).

SCREWS

SCREW

SCREW
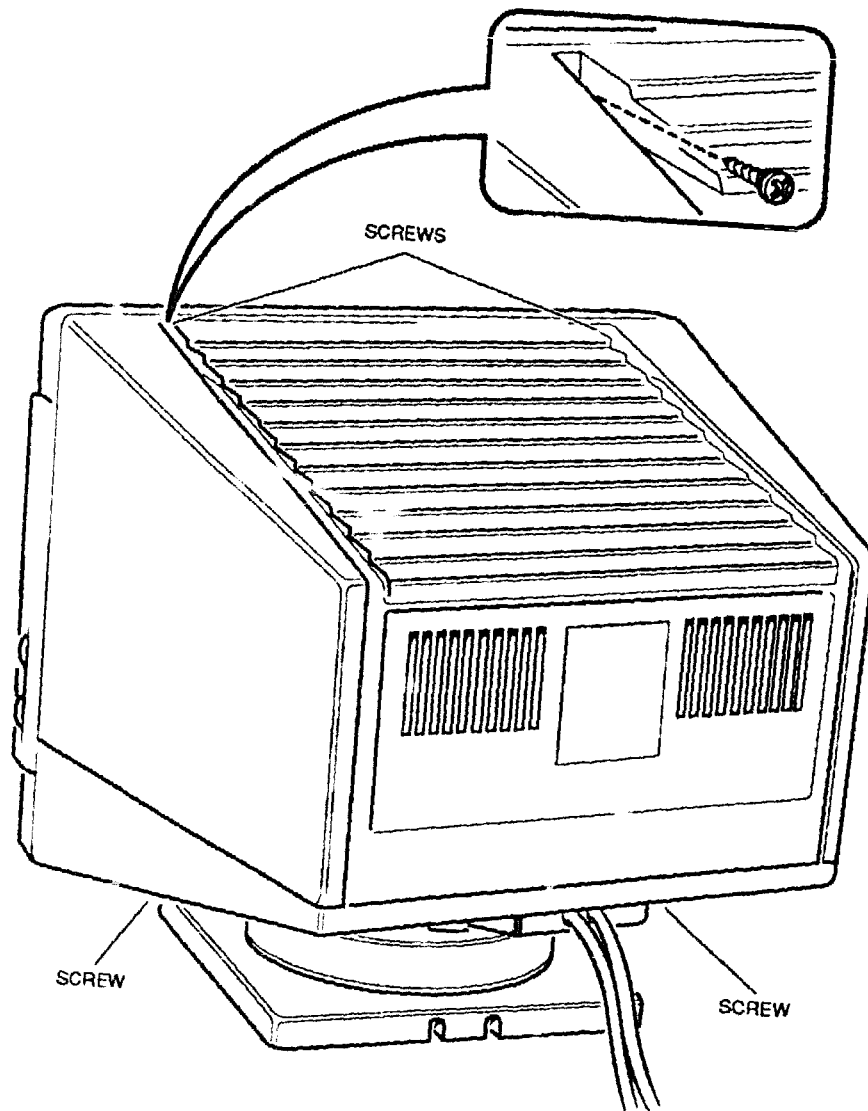
VB - 1848

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).
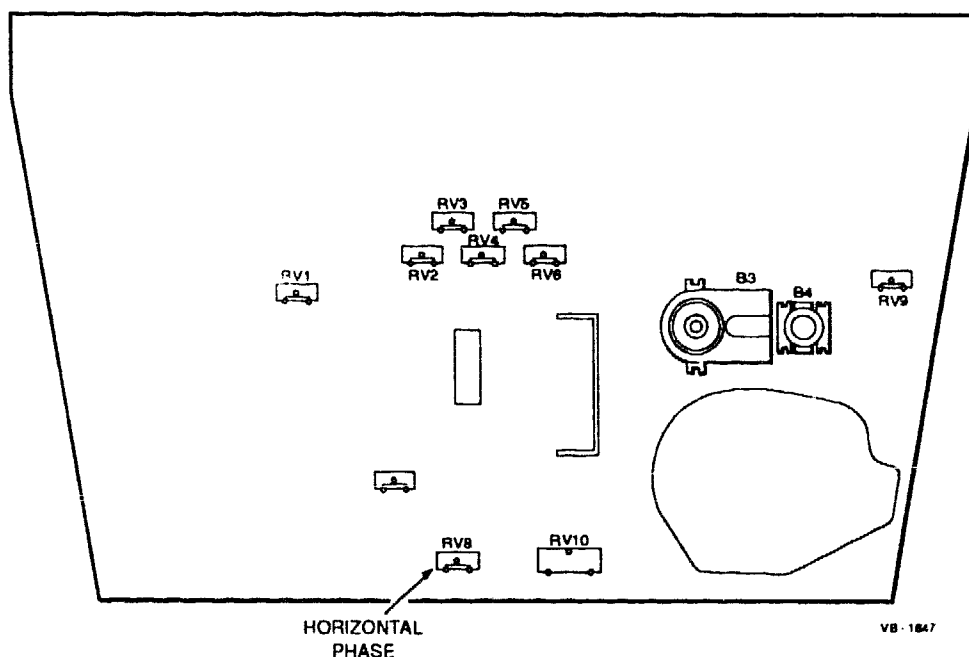
**Figure 4–2   Monitor Board Trimmer RV8**

VB · 1848
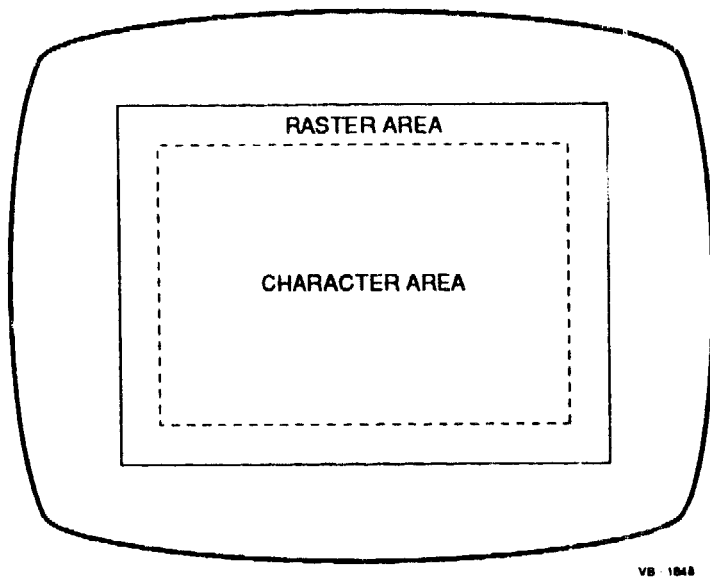
**Figure 4–3   Raster/Character Area**

## 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).
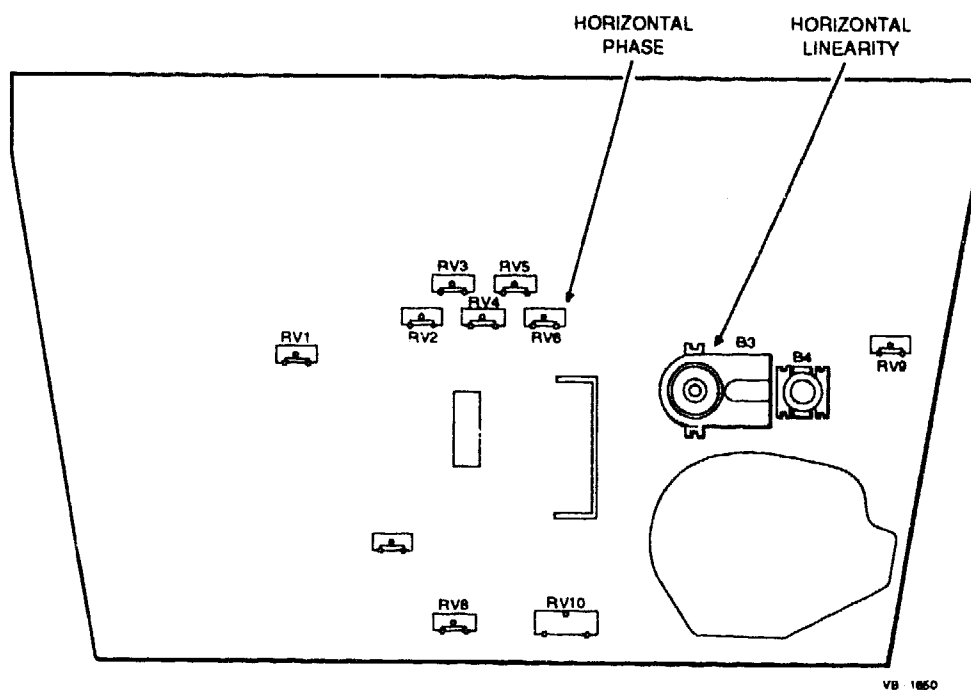
**Figure 4–4    Monitor Board Trimmer RV6 & Coil B3**
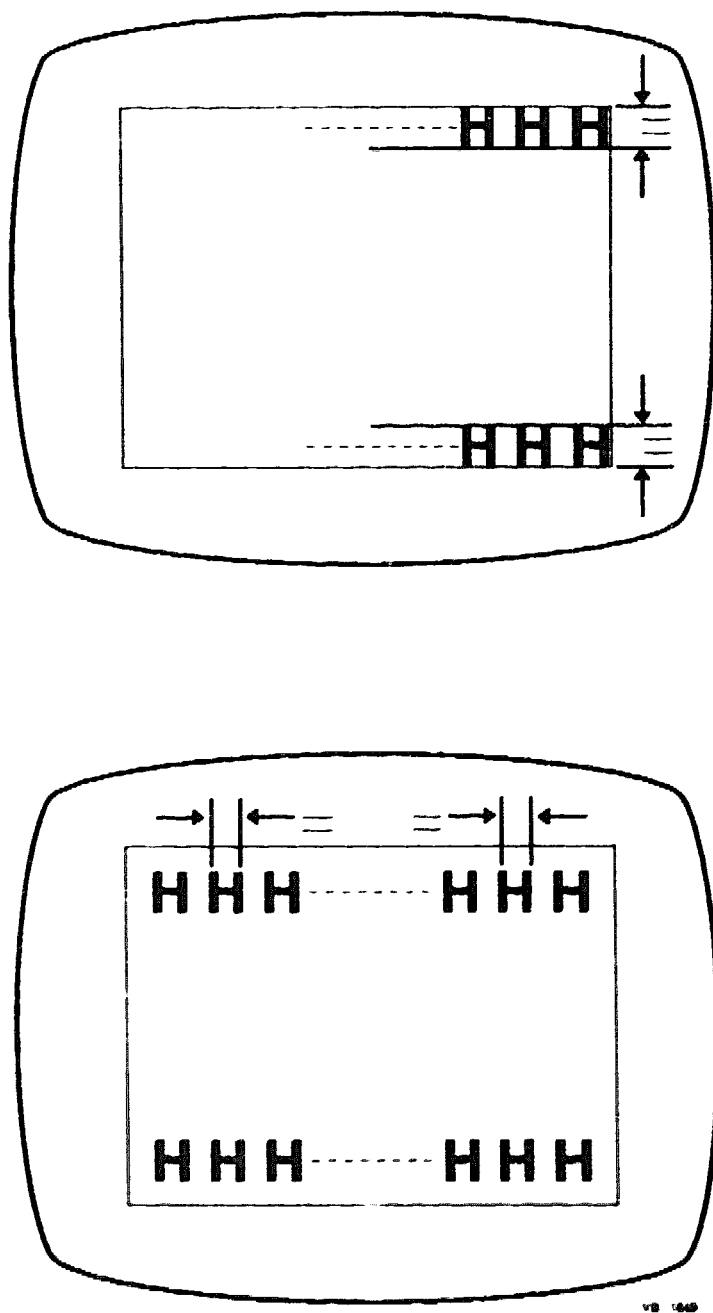
**Figure 4–5   Vertical Linearity Screen Display**

## 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).

HORIZONTAL
AMPLITUDE

RV3  RV5
RV4
RV2  RV6

RV1

B3  B4
RV9

RV8  RV10

VB-1851
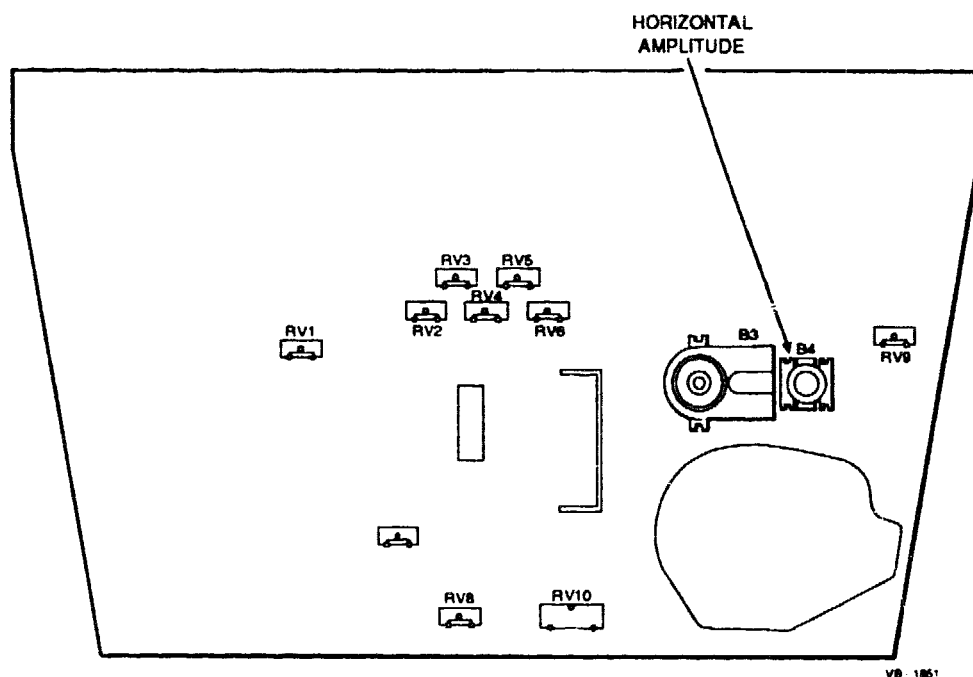
**Figure 4–6    Monitor Board Coil B4**

## 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 . 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).
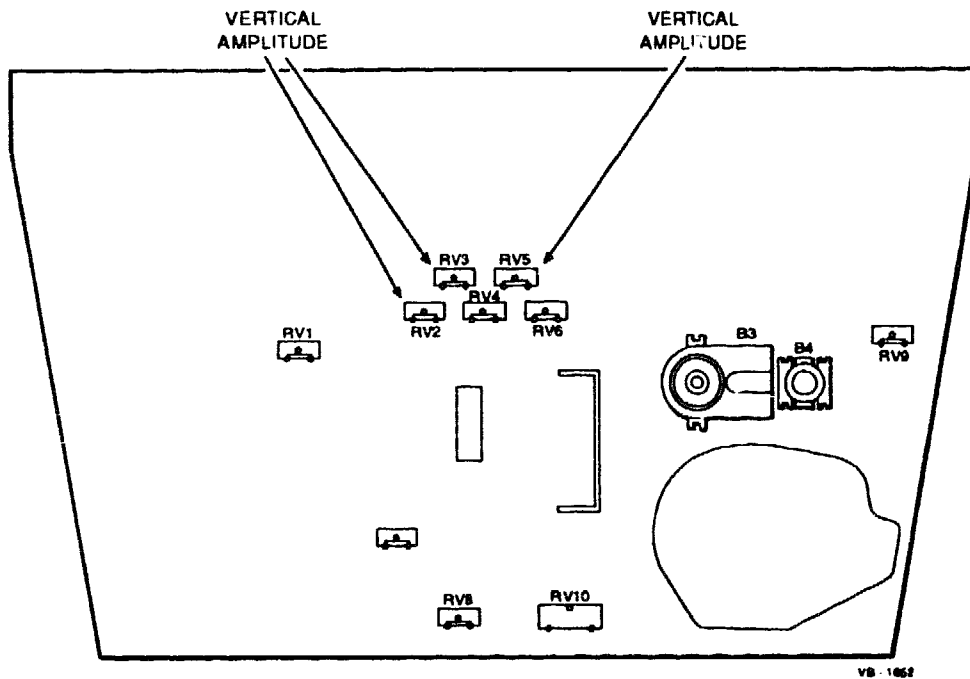
**Figure 4–7    Monitor Board Trimmer RV2, RV3, & RV5**

## 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.

FOCUS

VB-1853
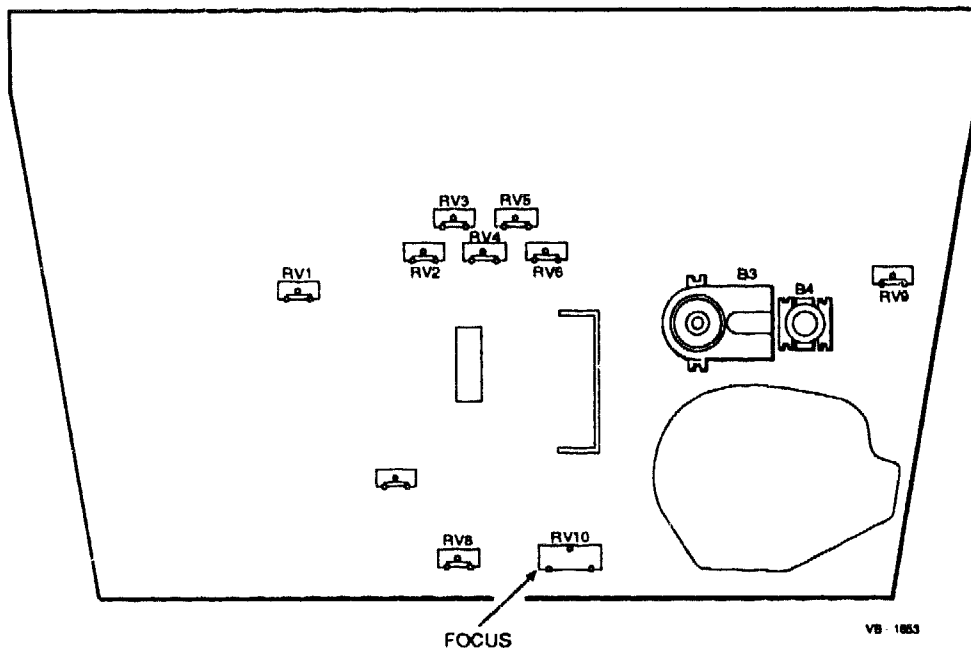
**Figure 4–8   Monitor Board Trimmer RV10**

## 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).
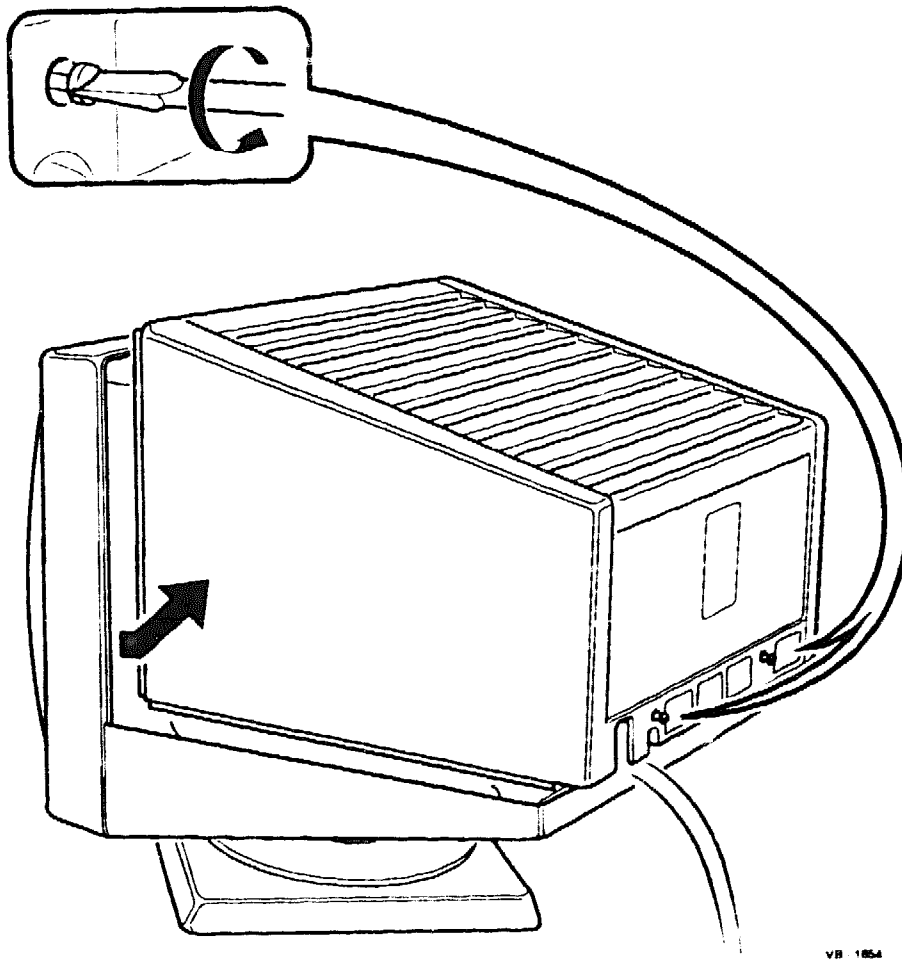
**Figure 4-9   Removing the Color Monitor Cover**

METAL SCREEN

VB · 1855
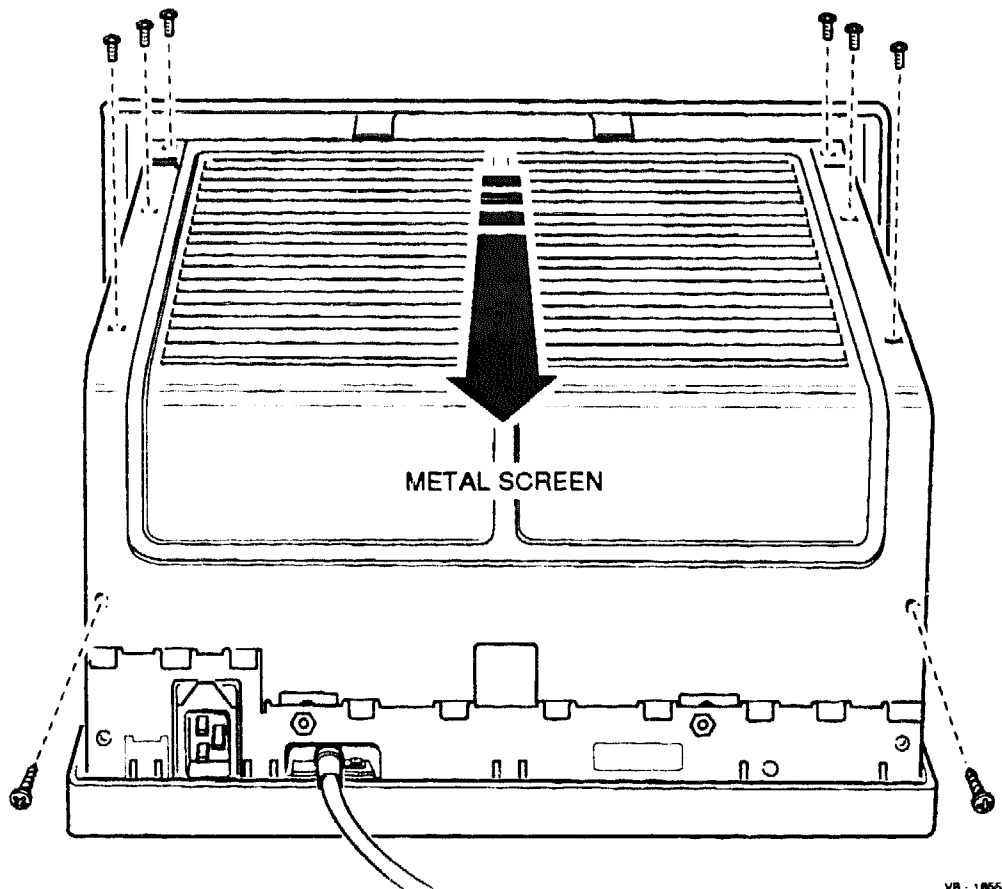
**Figure 4–10   Top Plate Removal**

## 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).

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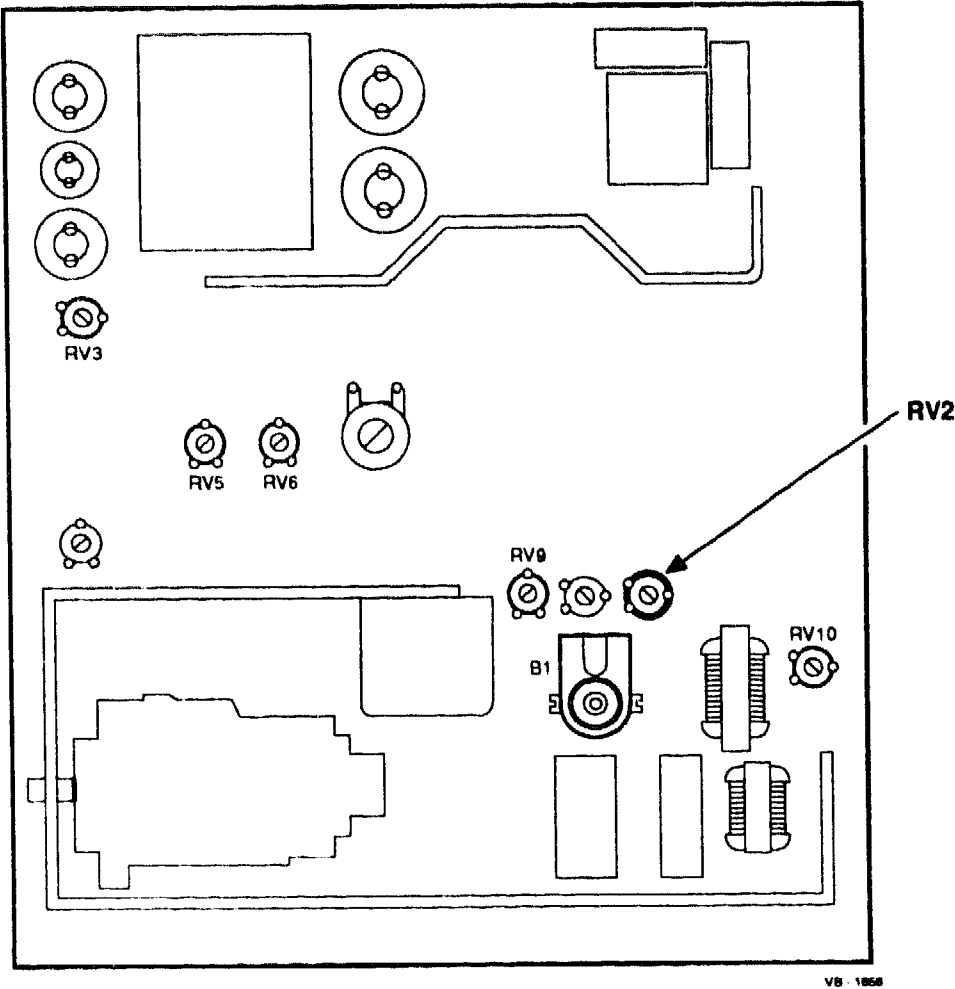
**Figure 4–11    Processor Board Trimmer RV2**
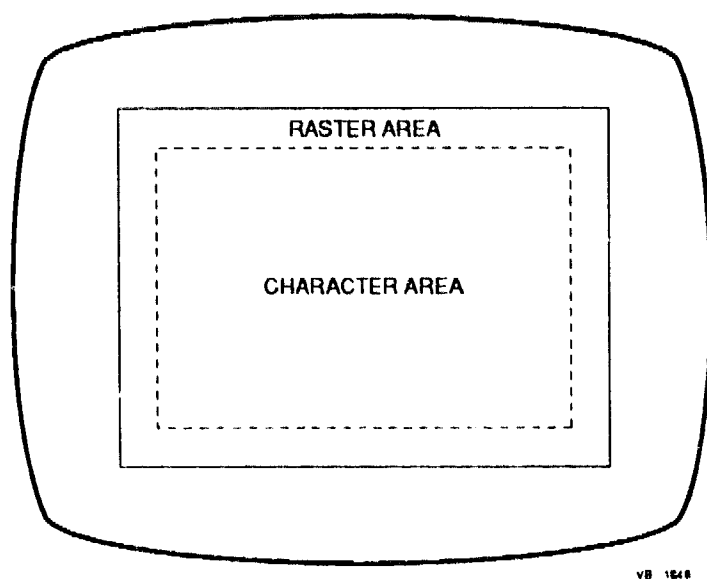
**Figure 4-12    Raster/Character Area**

## 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.
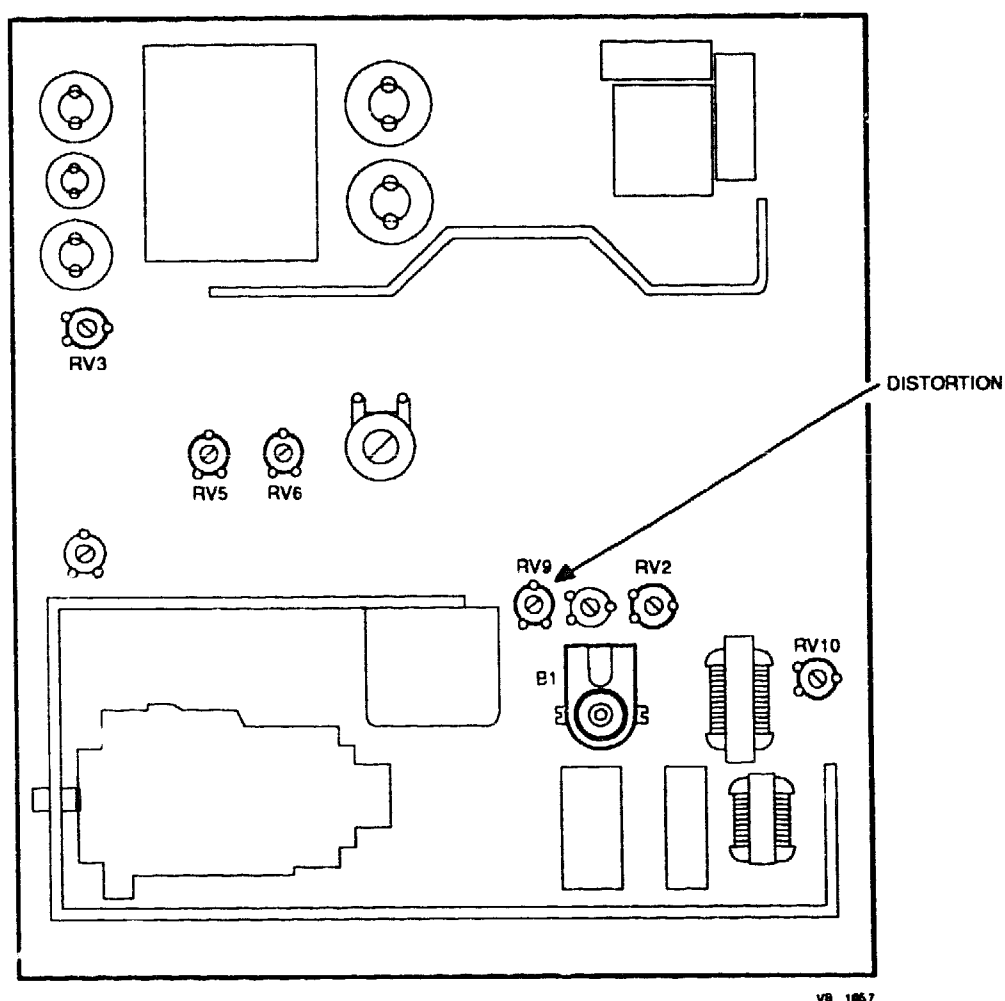


Figure 4–13    Processor Board Trimmer RV9

## 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.  Chuose the 640 x 480 Graphics selection and adjust trimmer RV5 to obtain an image height of 180 mm (7-1/8 inches).
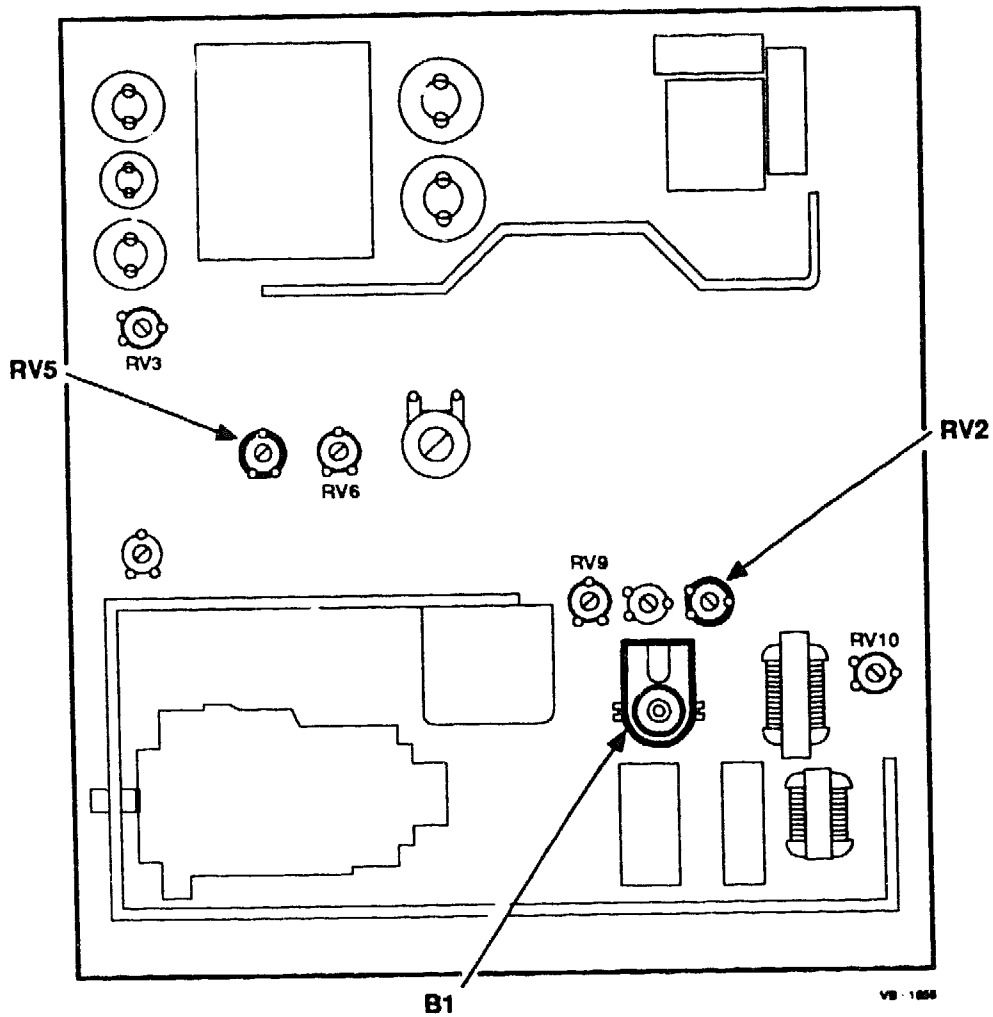
**Figure 4–14    Processor Board Trimmer RV2, RV5, and Coil B1**

### 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 (9-1/2 inches).
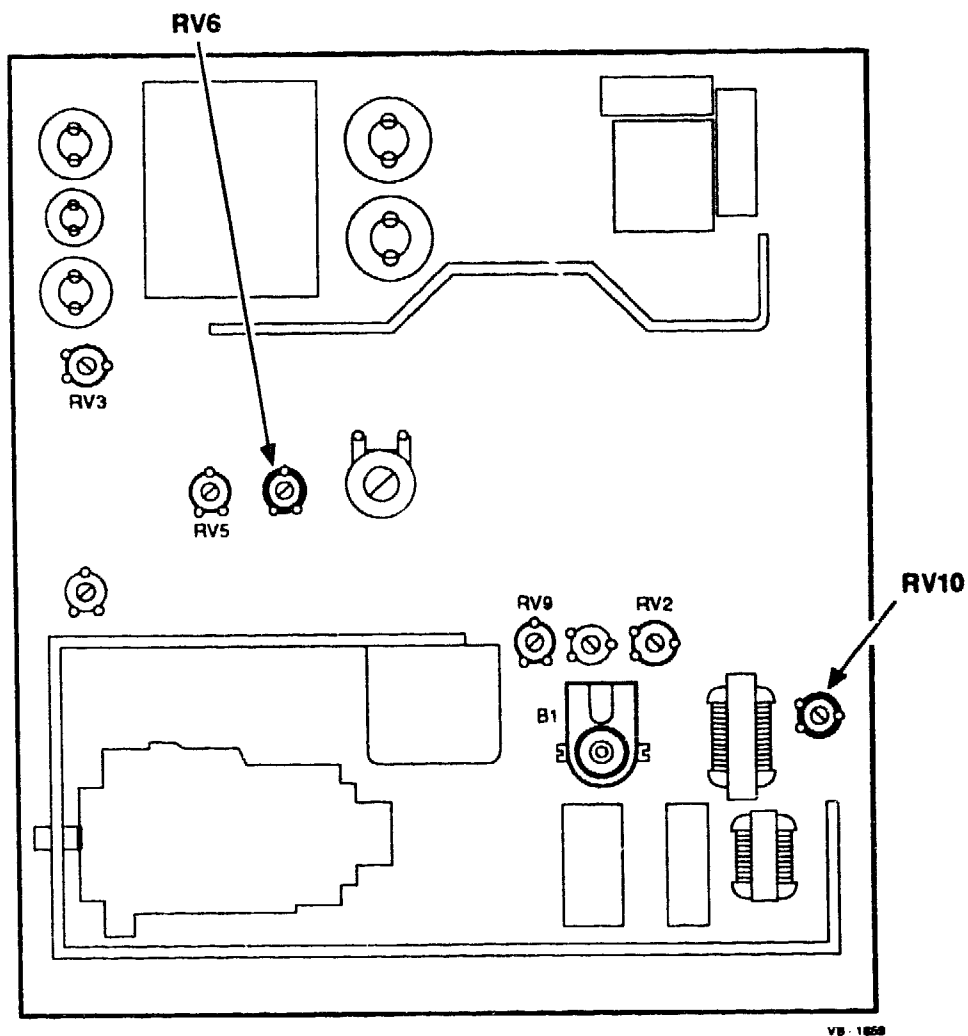
**Figure 4-15   Processor Board Trimmer RV6 and RV10**

## 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 300 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 300 FRUs and their part numbers.

**Table 5–1    DECstation 300 Field Replaceable Units**

| FRU | Digital Part Number |
|---|---|
| **Recommended Spare Part** | |
| Processor board with 2 Mbyte of DRAM (SIMMs) | 29-27748-01 |
| Processor board upgrade (2 1 Mbyte x 9 100 nseconds SIMMs) | 29-27717-01 |
| 80387SX math coprocessor | 19-31801-01 |
| Combination controller board (GO481) | 29-27749-01 |
| VGA controller board (GO481) | 29-27675-01 |
| Memory expansion board with 2 Mbytes (expandable to 4 Mbytes) (GO158) | 20-31795-01 |
| Memory expansion board 2 Mbytes upgrade (18, 1 Mbyte x 1 bit DIPs) (GO158) | TBD |
| Single serial port card | 20-31809-01 |
| Multiport serial card | 20-31808-01 |
| Bus adapter board IN108 | 29-27715-01 |
| Power supply assembly 120V LIE 21C | 29-27754-01 |
| Power supply assembly 220V LIE 21C | 29-27716-01 |
| Floppy disk drive 3.5 inches 1.44 Mbytes | 30-31850-01 |
| Floppy disk drive 5.25 inches 1.2 Mbytes | 30-31839-01 |
| Hard disk drive 40 Mbytes | 30-31849-01 |
| Hard disk drive 100 Mbytes | 30-31748-01 |
| Streaming tape drive 40 Mbytes | 30-31833-01 |
| Streaming tape drive 80 Mbytes | 30-31847-01 |
| PS2 compatible mouse | 30-31750-01 |
| **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 |

## Table 5–1 (Cont.)   DECstation 300 Field Replaceable Units

| FRU | Digital Part Number |
|---|---|
| **Recommended Spare Part** | |
| 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 | 30-31 ?? ?-01 |
| Swiss French/German 102-key keyboard | 30-318 ?7-01 |
| Norwegian 102-key keyboard | 30-3? ?38-?1 |
| French 102-key keyboard | 30 ?1810-01 |
| Spain National 102-key keyboard | 3?-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 |
| **LK250 Keyboard Cables:** | |
| 5-pin DIN keyboard cable for IBM AT | 17-01517-01 |
| 5-pin DIN keyboard cable for IBM XT | 17-02644-01 |
| 9-pin D-sub PC keyboard cable | 17-02645-01 |
| 6-pin mini-DIN PC keyboard cable | 17-02643-01 |
| **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 300 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 |
| U.K. | 17-02469-01 |
| USA | 17-02470-01 |
| Australia | 17-02471-01 |
| Diagnostic kit | 22-00484-01 |
| **Extended Spare Parts** | |
| Key group | 29-27718-01 |
| Loud speaker group | 29-27719-01 |
| Battery assembly | 29-27720-01 |
| ON/OFF spring | 29-27721-01 |
| Fan fixing rubber | 29-27690-01 |
| Sound board GE012 | 29-27724-01 |
| Floppy 5.25" signal cable | 29-27725-01 |
| UFD 3.5" & 5.25" signal cable | 29-27726-01 |
| UFD power cable | 29-27727-01 |
| M.B.-sound pcb cable | 29-27728-01 |
| HDU signal cable | 29-27730-01 |
| 1st & 2nd mfd signal cable | 29-27731-01 |
| MFD 3,5" & 5,25" signal cable | 29-27732-01 |
| HDU LED con. power cable | 29-27733-01 |
| STU 40MB 3.5" actuation pcb | 29-27668-01 |
| Back panel | 29-27984-01 |

## Table 5–1 (Cont.)   DECstation 300 Field Replaceable Units

| FRU | Digital Part Number |
|---|---|
| **Extended Spare Parts** | |
| Cover | 29-27985-01 |
| Front panel | 29-27986-01 |
| Front panel frame | TBD |
| Command front panel | 29-27987-01 |
| ON/OFF switch | 29-27988-01 |
| Reset switch | 29-27989-01 |

# 5.1 Before Replacing FRUs

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

**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.

   **CAUTION**
   **Before disconnecting the DECstation 300 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 the components inside the system.
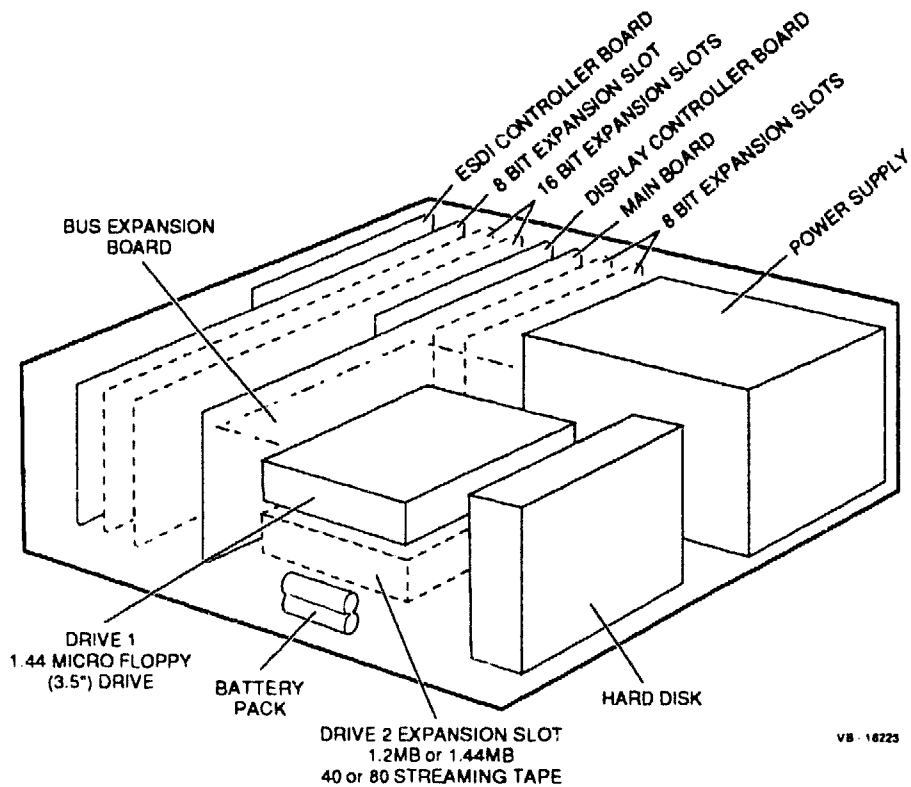


Figure 5–1    Inside the DECstation 300

## 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 replacement keyboard to the system.

4. Turn power to the system on.

## 5.2.2 Monitor Replacement

Replace the monitor as follows:

1. Turn power to the system and monitor off. Wait 20 seconds.

2. Disconnect the main power cord from the wall outlet.

3. Disconnect 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. Connect the main power cord from the system to 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 5 seconds.

2. Disconnect the mouse cable from the system.

3. Connect the cable from the replacement mouse to the system.

4. Turn power to the system on.

## 5.2.4  Cover Removal

Remove the top cover and cover plate as follows:

1. Turn power to the system and monitor off. Wait 20 seconds.

2. Disconnect the main power cord from the wall outlet.

3. Disconnect all cables from the system box.

4. Remove the monitor and other external devices from the system.

   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

5. Turn the front panel key counterclockwise to release the internal frame, then remove the key.

6. Stand the system box up with the rear of the system box against the work surface and the bottom facing you (Figure 5–2).

7. Remove four screws, one in the center of each foot cushion

8. Remove the cover by sliding it up

9. Lay the system box down with the bottom of the system box against the work surface.

10. Remove the two screws (located above the floppy disk drive) that secure the cover plate to the chassis.

11. Remove one screw (located above the serial port) on the processor board that secures the cover plate to the chassis.

    **NOTE**
    **The screw above the parallel port secures the cover plate and the processor board to the chassis.**

12. Lift the cover plate up, and remove it from the chassis.
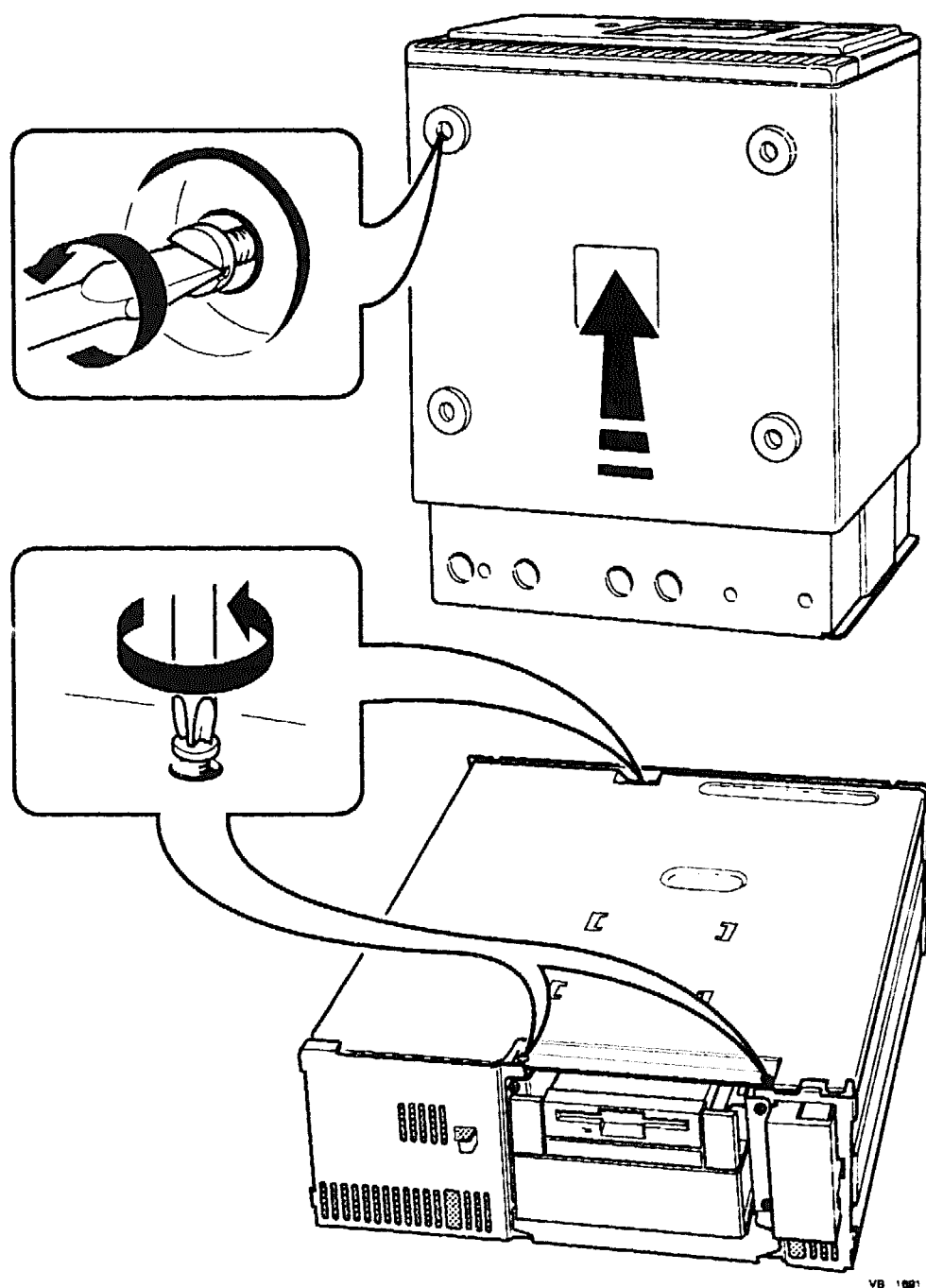
**Figure 5–2   Removing the Cover**

## 5.2.5 Floppy Disk Drive Replacement

Replace the floppy disk drive as follows:

1. Remove the system box cover (Section 5.2.4).

   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

   **NOTE**
   **If you are removing drive A or B, you must first remove the floppy disk/streaming tape drive sub-chassis from the main chassis.**

2. Remove the four screws that secure the floppy disk/streaming tape drive sub-chassis to the front panel of the main chassis (Figure 5-3).

3. Slide the floppy disk/streaming tape drive sub-chassis out of the main chassis about half an inch (releasing the sub-chassis locking tab from the main chassis), and then pull the sub-chassis up and out of the main chassis (Figure 5-3).

4. Remove the interface cable(s) and power cable(s) from the floppy disk drive(s) and streaming tape drive (if one is installed) (Figure 5-3).

5. Set the sub-chassis on a work surface.

6. Remove the two screws on each side of the sub-chassis that secures the defective floppy disk drive (Figure 5-3).

7. Slide the defective drive out of the sub-chassis (Figure 5-3).

8. Insert the replacement floppy disk drive.

9. Replace the two screws on each side of the sub-chassis that secures the replacement drive.

10. Connect the interface and power cables to the streaming tape drive (if one was installed) and the replacement floppy disk drive.

11. Lower the sub-chassis into the main chassis, and slide the sub-chassis so the locking tab locks into the slot on the main chassis.

12. Replace the system box cover (Section 5.2.4).

13. Connect all cables to the system box.

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**Figure 5–3    Removing the Floppy Disk Drive**

## 5.2.6  Streaming Tape Drive Replacement

Replace the streaming tape drive as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**
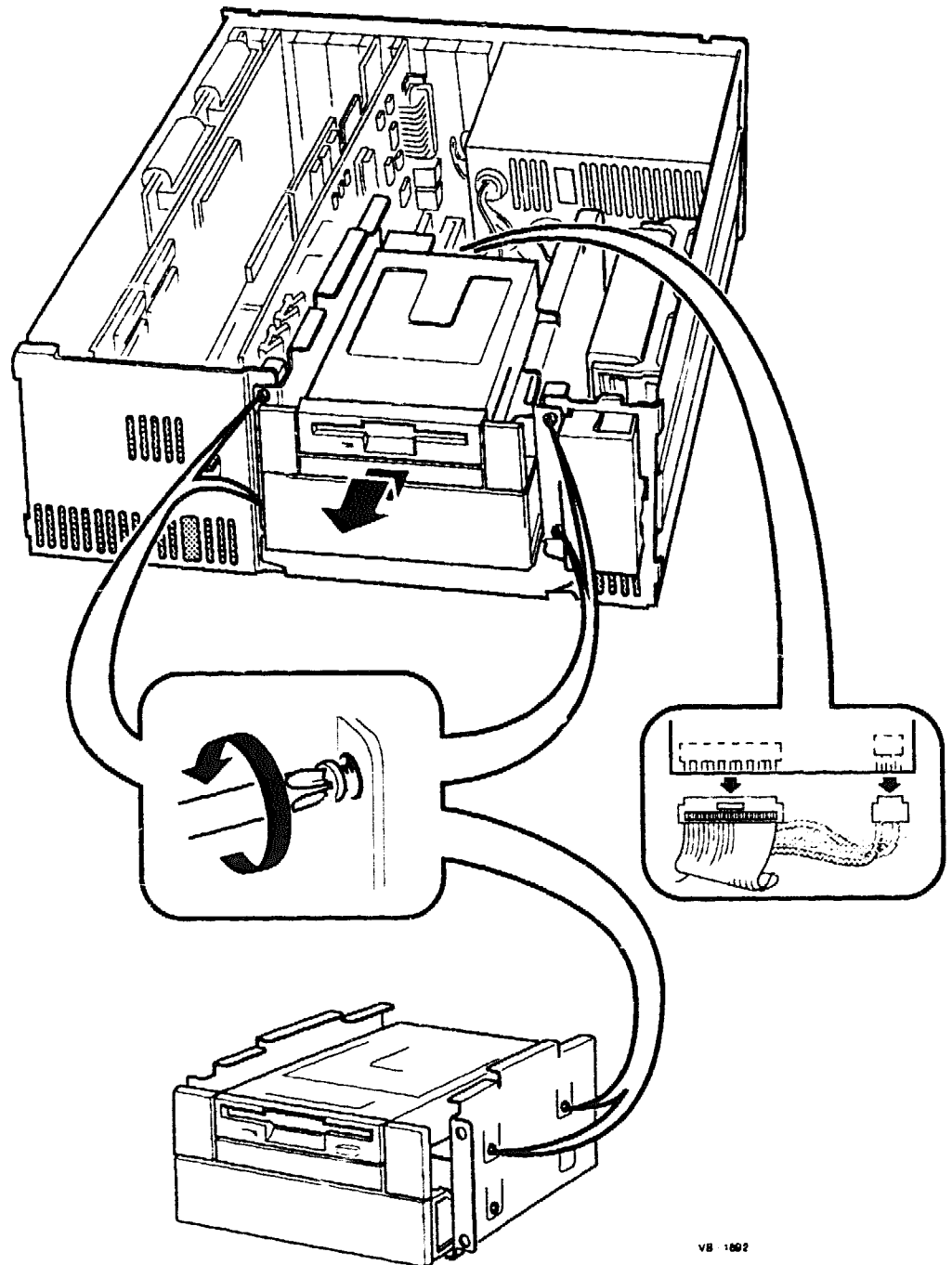
    **NOTE**
    **If you are removing drive A or B, you must first remove the floppy disk/streaming tape drive sub-chassis from the main chassis.**

2.  Remove the four screws that secure the floppy disk/streaming tape drive sub-chassis to the front panel of the main chassis (Figure 5–3).

3.  Slide the floppy disk/streaming tape drive sub-chassis out of the main chassis about half an inch (releasing the sub-chassis locking tab from the main chassis), and then pull the sub-chassis up and out of the main chassis (Figure 5–3).

4.  Remove the interface cable(s) and power cable(s) from the floppy disk drive and streaming tape drive (Figure 5–3).

5.  Set the sub-chassis on a work surface.

6.  Remove the two screws on each side of the sub-chassis that secures the defective streaming tape drive (Figure 5–3).

7.  Slide the defective drive out of the sub-chassis (Figure 5–3).

8.  Insert the replacement streaming tape drive.

9.  Replace the two screws on each side of the sub-chassis that secures the replacement drive.

10. Connect the interface and power cables to the floppy disk drive and the replacement streaming tape drive.

11. Lower the sub-chassis into the main chassis, and slide the sub-chassis so the locking tab locks into the slot on the main chassis.

12. Replace the system box cover (Section 5.2.4).

13. Connect all cables to the system box.



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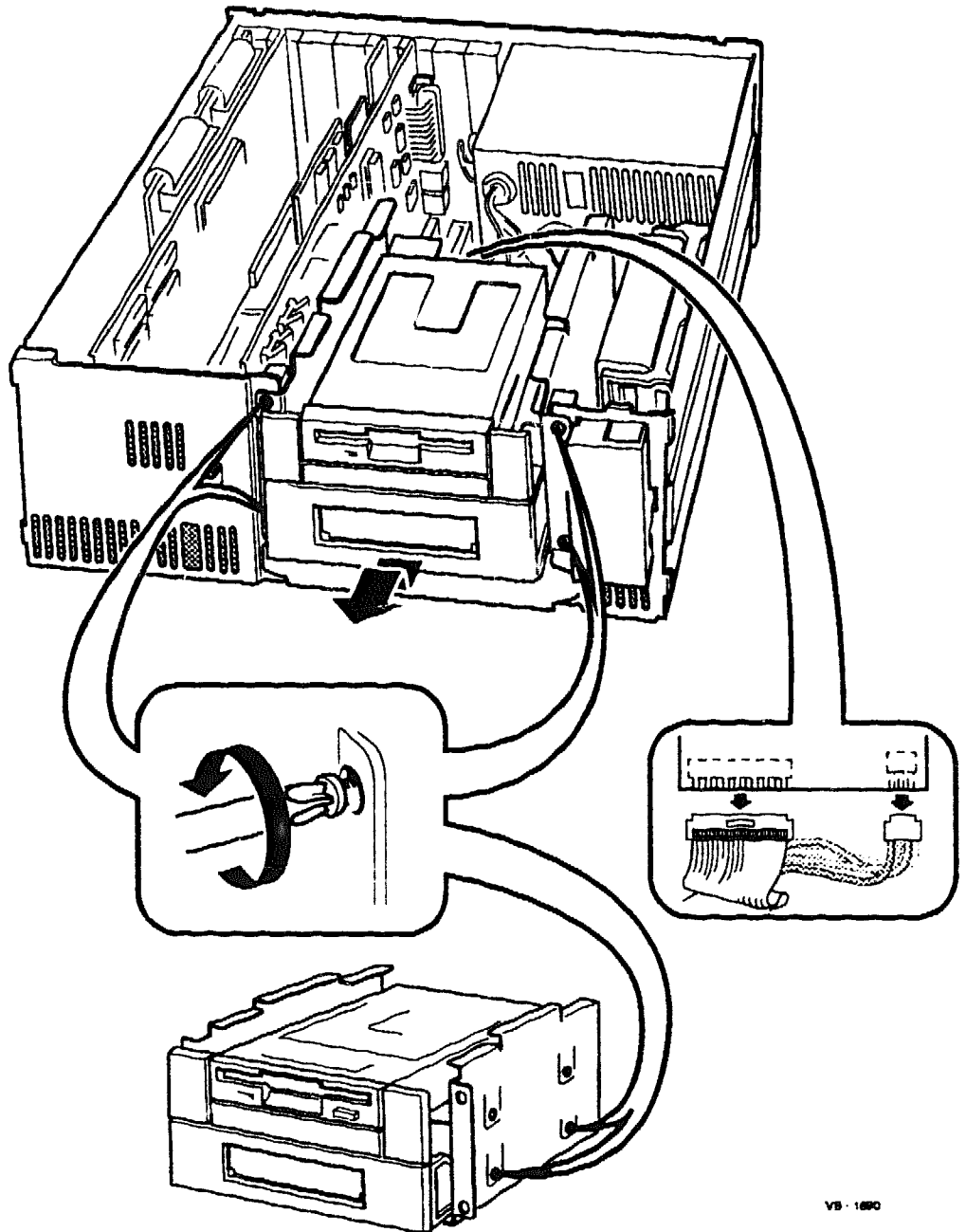
**Figure 5-4    Removing the Streaming Tape Drive**

## 5.2.7 Battery Replacement

Replace the battery as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

    **NOTE**
    **The battery is located under the floppy disk/streaming tape drive sub-chassis (Figure 5-5).**

2.  Remove the floppy disk/streaming tape drive sub-chassis from the main chassis (Section 5.2.5).

3.  Disconnect the battery cable from the processor board (J4) and pull the battery from the Velcro mounting (Figure 5-5).

4.  Remove the battery from the system box (Figure 5-5).

5.  Install the replacement battery and reconnect the battery connector to J4 on the processor board.

6.  Lower the sub-chassis into the main chassis, and slide the sub-chassis so the locking tab locks into the slot on the main chassis.

7.  Replace the system box cover (Section 5.2.4).

8.  Connect all cables to the system box.

9.  Run the SETUP program to restore the CMOS-RAM contents. See Section 2.4.2, Using the SETUP Utility on the Utilities Diskette.

10. Use the Service Diagnostics diskette to run:

    *   The System Configuration Check

    *   The SETUP utility on the Utilities diskette

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**Figure 5–5    Battery Location**

## 5.2.8 Hard Disk Drive Replacement

Replace the hard disk drive as follows:

1. Remove the system box cover (Section 5.2.4).

   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2. Remove the four screws that secure the hard disk drive to the system chassis (Figure 5–6).

3. Lift the hard disk drive straight up from the chassis until all the cable connections are exposed (Figure 5–6).

4. Disconnect one signal cable, power cable, and hard disk access LED cable from the hard disk drive (Figure 5–6).

   **NOTE**
   **The interface and power cables are connected on the right side of the hard disk drive (closest to the power supply). The hard disk access LED cable is connected to the hard disk drive printed circuit board in the lower left corner (between the hard disk drive and chassis).**

5. Lift the drive out of the system box (Figure 5–6).

6. Connect the signal cable, power cable, and hard disk drive access LED cable to the replacement hard disk drive.

7. Install the replacement drive in the system box.

8. Replace the system box cover (Section 5.2.4).

9. Connect all cables to the system box.

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**Figure 5–6   Removing the Hard Disk Drive**

## 5.2.9  Option Board Replacement

Replace an option board as follows:

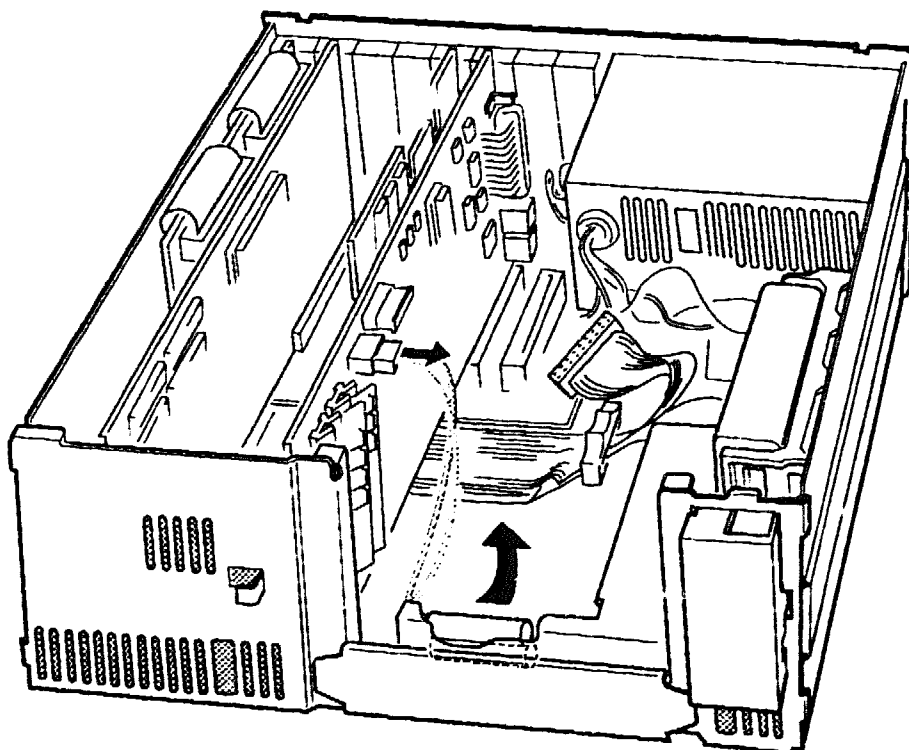1. Remove the system box cover (Section 5.2.4).
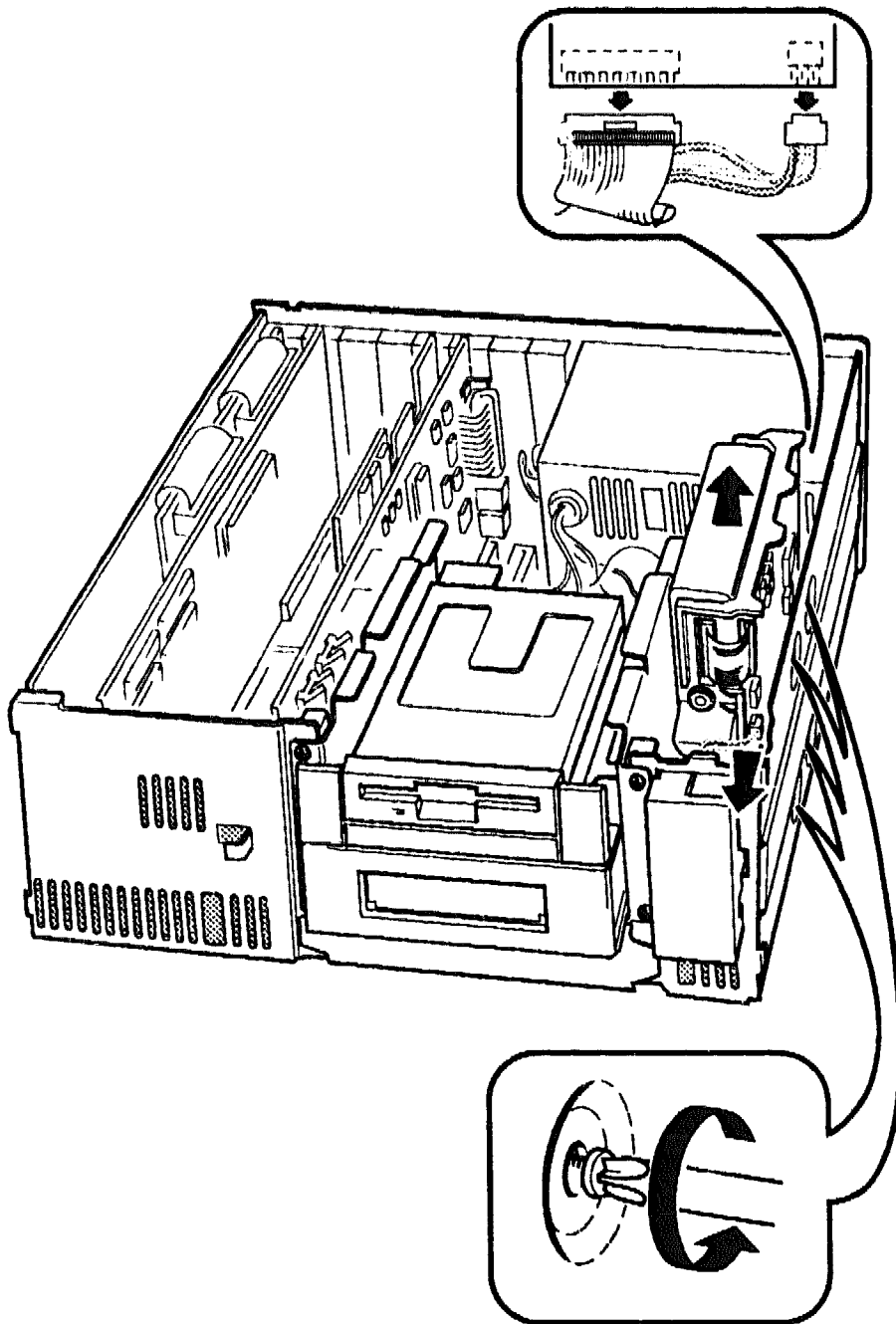
   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2. Remove any cables attached to the board (Figure 5-7).

3. Remove the screw that secures the board retaining bracket into the expansion slot (Figure 5-7).

4. Remove the defective board(s) from the bus expansion board connector(s) by pulling the board up (Figure 5-7).

5. Make the necessary switch and jumper settings to the replacement option board (Appendix A, Jumpers and Switches).

6. Install the replacement board.

7. Replace the screw that secures the board retaining bracket into the expansion slot.

8. Replace the system box cover (Section 5.2.4).

9. Connect all cables to the system box.

10. Turn power to the system on.
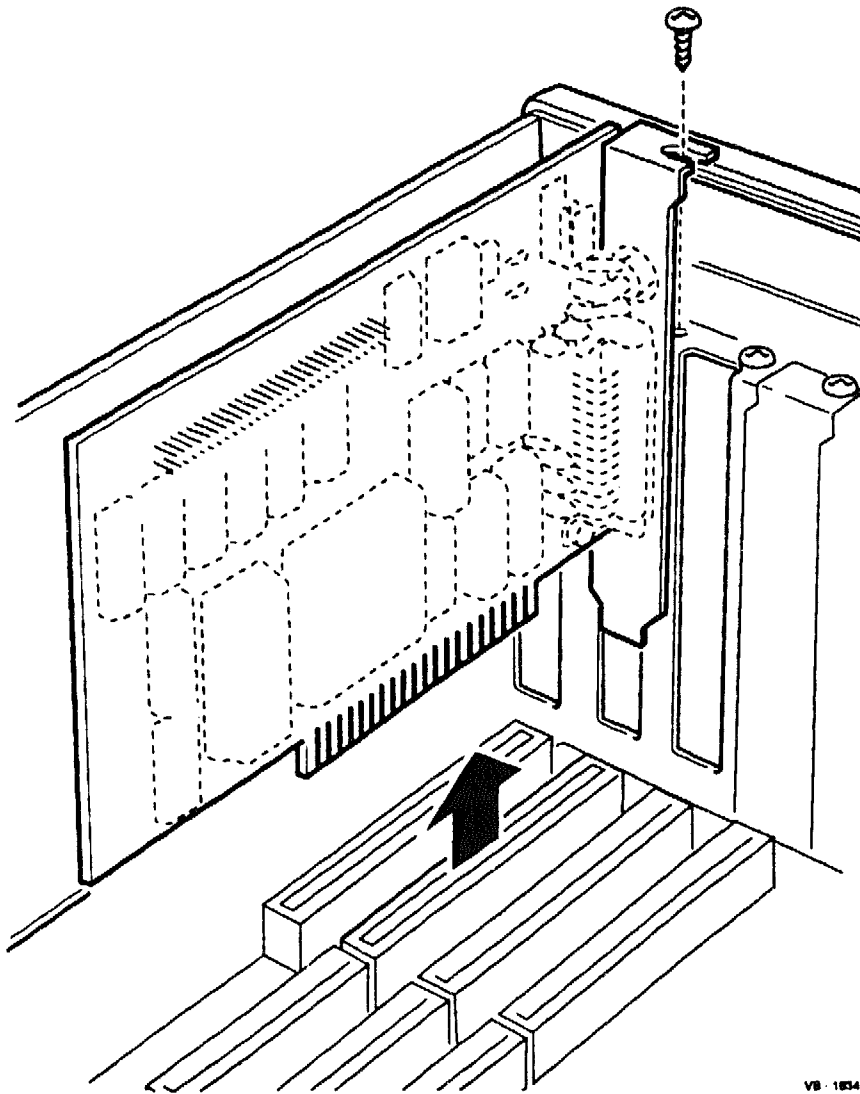
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Figure 5–7    Removing an Option Board from the Bus Expansion Board

## 5.2.10  8-Bit and 16-Bit Option Boards

The bus expansion board has eight slots where option boards can be installed. There are five 16-bit and three 8-bit expansion slots available. The expansion slot closest to the power supply is the *first slot* and, the expansion slot closest to the chassis is the *eighth slot*. The *third slot* is reserved for the processor board (16-bit slot). The *fourth slot* is reserved for the display controller board (16-bit slot). The *eighth slot* is reserved for the combination controller board (16-bit slot). However, each of the three boards can be installed in any one of five 16-bit expansion slots.

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

| Board Configurations | Expansion Slot |
|---|---|
| 8-bit board | 8-bit, and 16-bit slot |
| 16-bit board | 16-bit slot |
| 32-bit board | can not be installed |

Install a board on the bus expansion board as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Determine which option slot to use by identifying the shape of the board (Figure 5-8).

3.  Remove the screw that secures the board retaining bracket to the expansion slot (Figure 5-7).

4.  Make the necessary switch and jumper settings to the option board (Appendix A, Jumpers and Switches).

5.  Insert the board in the correct expansion slot according to the following:

    •  8-bit board may be inserted in any slot

    •  16-bit board may be inserted in any slot **except** the third slot, the fourth slot, and the eighth slot (already in use).

6.  Replace the screw that secures the board retaining bracket to the expansion slot.

7.  Connect all cables to the board.

8.  Replace the system box cover (Section 5.2.4).

9.  Connect all cables to the system box.

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**Figure 5–8   8-bit and 16-bit Board Shapes**

## 5.2.11  Processor Board Replacement

Replace the processor board as follows:

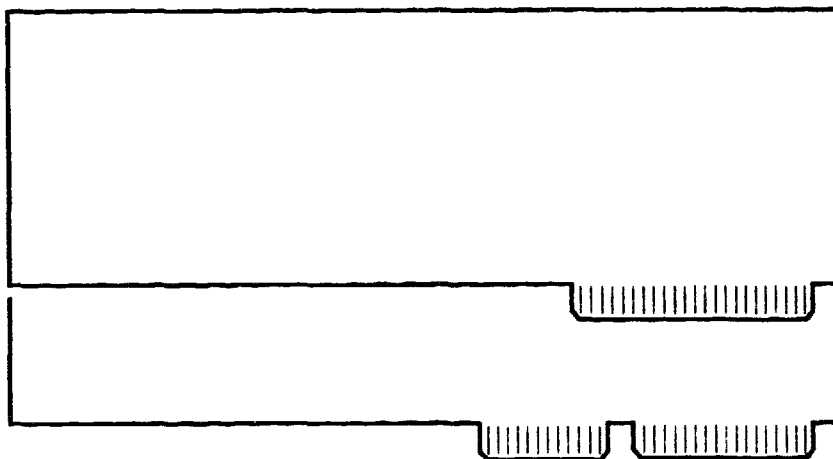1. Remove the system box cover (Section 5.2.4).

   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2. Place the system box on a work surface with the rear of the system box facing you (Figure 5-9).

3. Remove the control panel cable (J3) and battery cable (J4) from the processor board (Figure 5-9).

4. Remove the screw that secures the board retaining bracket to the expansion slot (Figure 5-9).

5. Remove the defective processor board from the bus expansion board connector by pulling the board up (Figure 5-9).

6. Remove the math coprocessor, if there is one.  The math coprocessor must be transferred to the replacement processor board (Section 5.2.13).

7. Make the necessary switch and jumper settings to the replacement processor board (Appendix A, Jumpers and Switches).

8. Connect the control panel cable (J3) and battery cable (J4) to the processor board (Figure 5-9).

9. Install the replacement processor board.

10. Replace the screw that secures the board retaining bracket to the expansion slot.

11. Replace the system box cover (Section 5.2.4).

12. Connect all cables to the system box.

13. Use the Service Diagnostics diskette to run:

   • The System Configuration Check

   • The SETUP utility

   •   The Test One Module utility for the system board

**NOTE**
**Whenever the processor 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 battery cable
(J4) from the processor board disconnects the CMOS backup
battery.**



**Figure 5–9   Removing the Processor Board**

## 5.2.12  Single In-line Memory Module Replacement

Replace a Single In-line Memory Module (SIMM) on the processor board as follows:

1.  Remove the system box cover (Section 5.2.4).
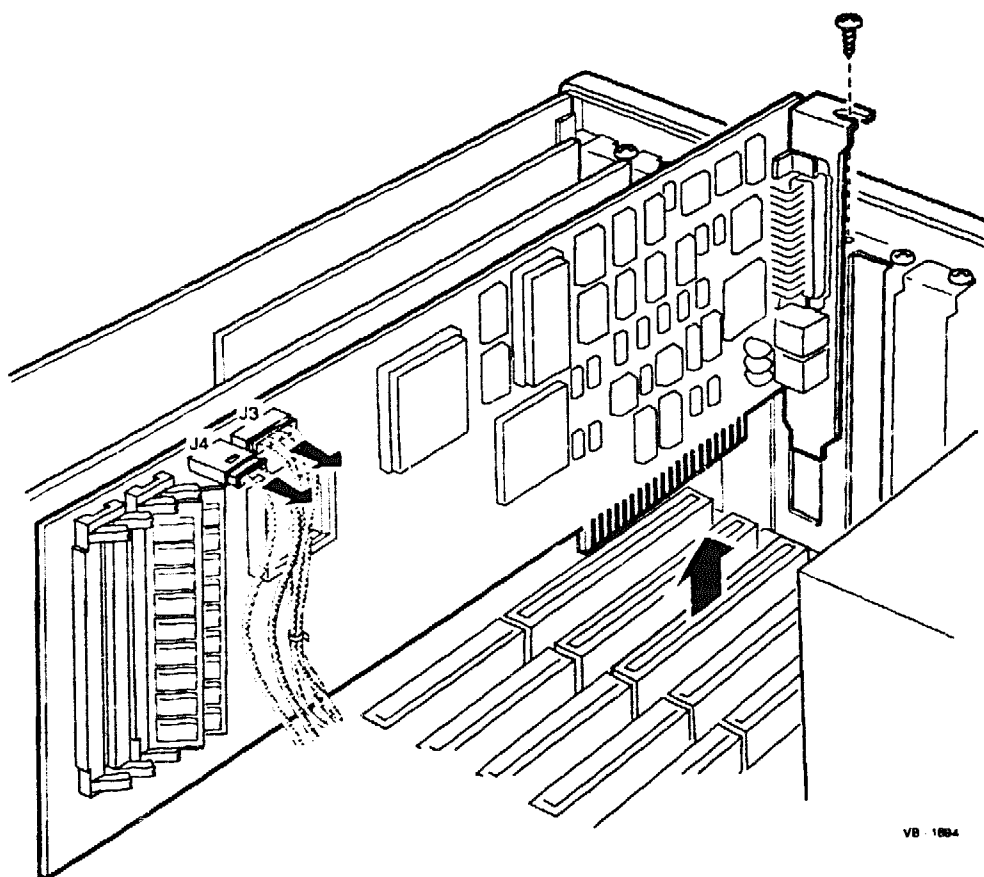
    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Remove the screw that secures the processor board retaining bracket into the expansion slot (Figure 5–9).

3.  Remove the processor board from the bus expansion board (Figure 5–9).

4.  Place the processor board on a work surface.

    The processor board has four connectors that hold the SIMMs. The connectors are logically grouped into two banks (0 and 1), each containing two connectors (Figure 5–11). There must be two SIMMs per bank to be complete.

5.  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 (Figure 5–10).

6.  Install the replacement SIMM(s) in the correct processor board bank by pushing the SIMM into the connector and snapping it in place (Figure 5–11 and Figure 5–10).

7.  If this installation has changed the total memory in the system make the necessary switch and jumper settings to the processor board (Appendix A, Jumpers and Switches).

8.  Replace the processor board.

9.  Replace the screw that secures the board retaining bracket to the expansion slot.

10. Replace the system box cover (Section 5.2.4).

11. Connect all cables to the system box.

12. Run the SETUP Utility on the Service Diagnostics diskette.

**CAUTION**
**If a memory expansion board has been installed in one or more of the bus expansion slots and memory SIMM(s) are being added to the processor board, the memory expansion board start and end addresses must be reconfigured. Refer to (Appendix A, Jumpers and Switches) for memory expansion board start and end address configurations.**

**CAUTION**
**If you have changed the total amount of memory (SIMMs) contained on the main logic board you must reconfigure the system by running the SETUP Utility on the Service Diagnostics diskette.**

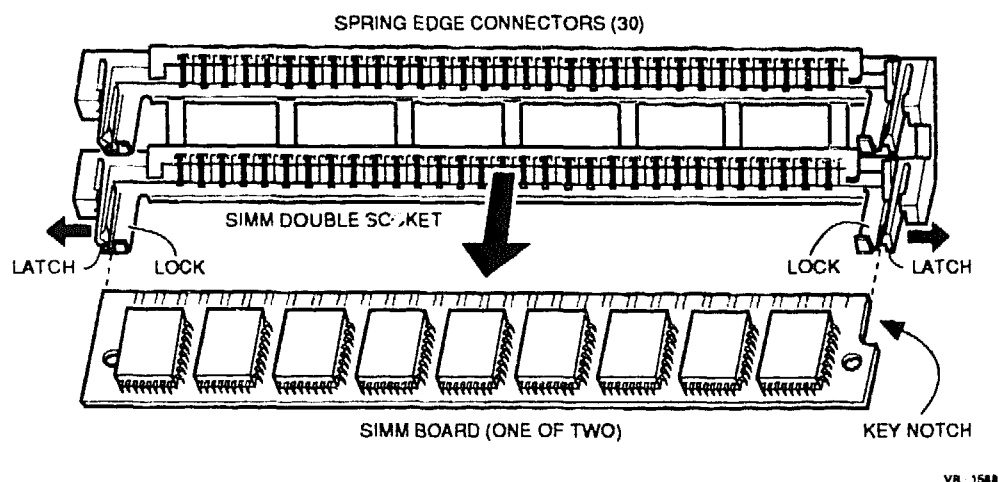SPRING EDGE CONNECTORS (30)

SIMM DOUBLE SC KET

LATCH    LOCK          LOCK    LATCH

SIMM BOARD (ONE OF TWO)          KEY NOTCH

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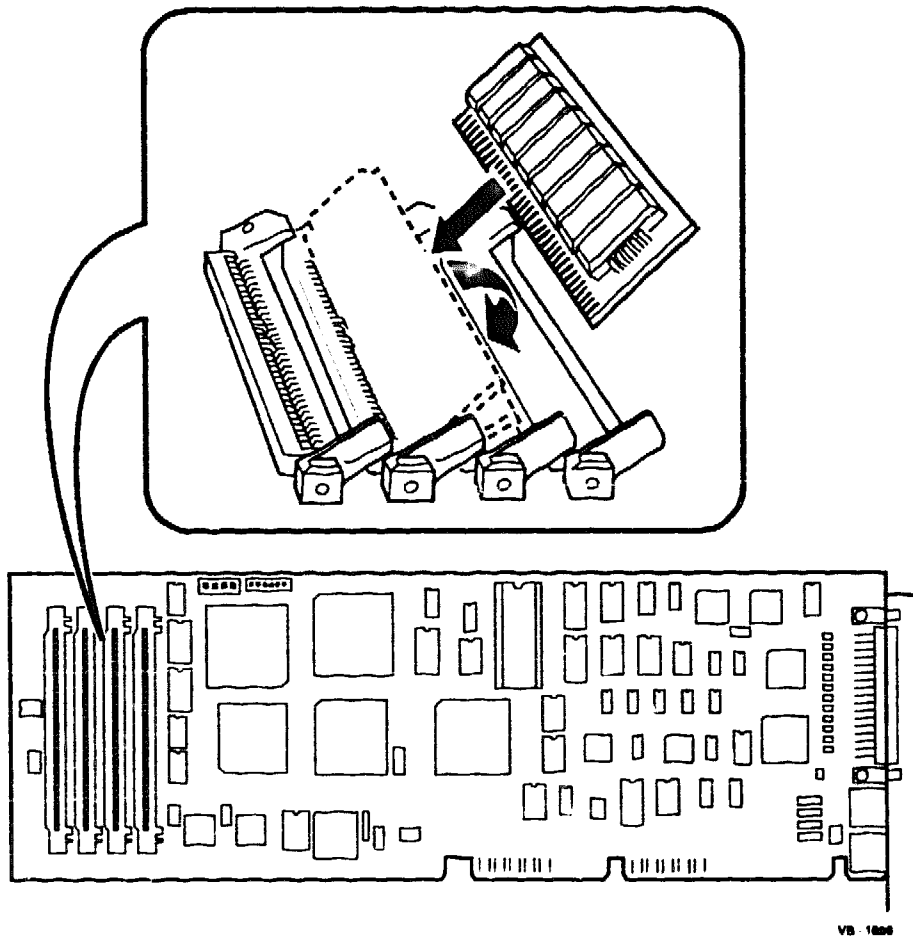**Figure 5-10    Replacing a SIMM on the processor board**

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Figure 5–11    SIMM Banks on the processor board

## 5.2.13 Math Coprocessor Replacement

Replace the math coprocessor as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Place the system box on a work surface with the rear of the system box facing you (Figure 5–9).

3.  Remove the control panel cable (J3) and battery cable (J4) from the processor board (Figure 5–9).

4.  Remove the screw that secures the board retaining bracket to the expansion slot (Figure 5–9).

5.  Remove the processor board from the bus expansion board connector by pulling the board up (Figure 5–9).

6.  Remove the math coprocessor by lifting it straight up with even pressure applied to opposite corners until it is removed from its socket (Figure 5–12).

7.  Install the replacement math coprocessor in the processor board by aligning the corner notch of the coprocessor into the socket and applying even pressure on opposite corners until it is seated (Figure 5–12).

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

8.  Connect the control panel cable (J3) and battery cable (J4) to the processor board.

9.  Replace the processor board in the bus adapter board.

10. Replace the screw that secures the board retaining bracket to the expansion slot.

11. Replace the system box cover (Section 5.2.4).
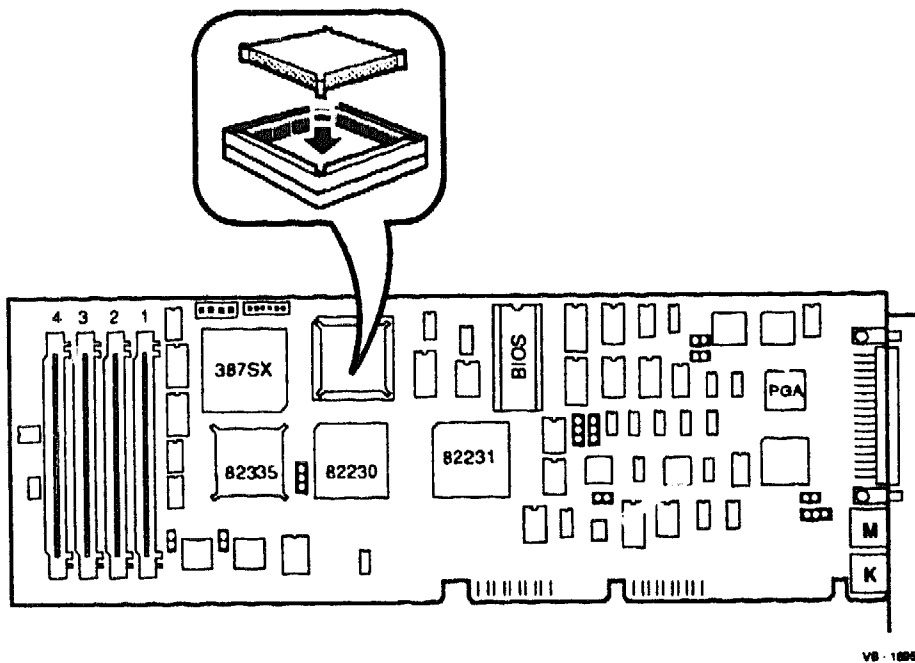
12. Connect all cables to the system box.



**Figure 5–12    Replacing the Math Coprocessor on the processor board**

## 5.2.14  Combination Controller Board Replacement

Replace the combination controller board as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Disconnect the floppy and hard disk drive cables attached to the combination controller board (Figure 5-13).

3.  Remove the screw that secures the board retaining bracket to the expansion slot (Figure 5-13).

4.  Remove the combination controller board from the bus expansion board (Figure 5-13).

5.  Make the necessary switch and jumper settings to the replacement combination controller board (Appendix A, Jumpers and Switches).

6.  Install the replacement combination controller board.

7.  Replace the screw that secures the board retaining bracket to the expansion slot.

8.  Connect the floppy and hard disk drive cables to the combination controller board.

9.  Replace the system box cover (Section 5.2.4).

10. Connect all cables to the system box.
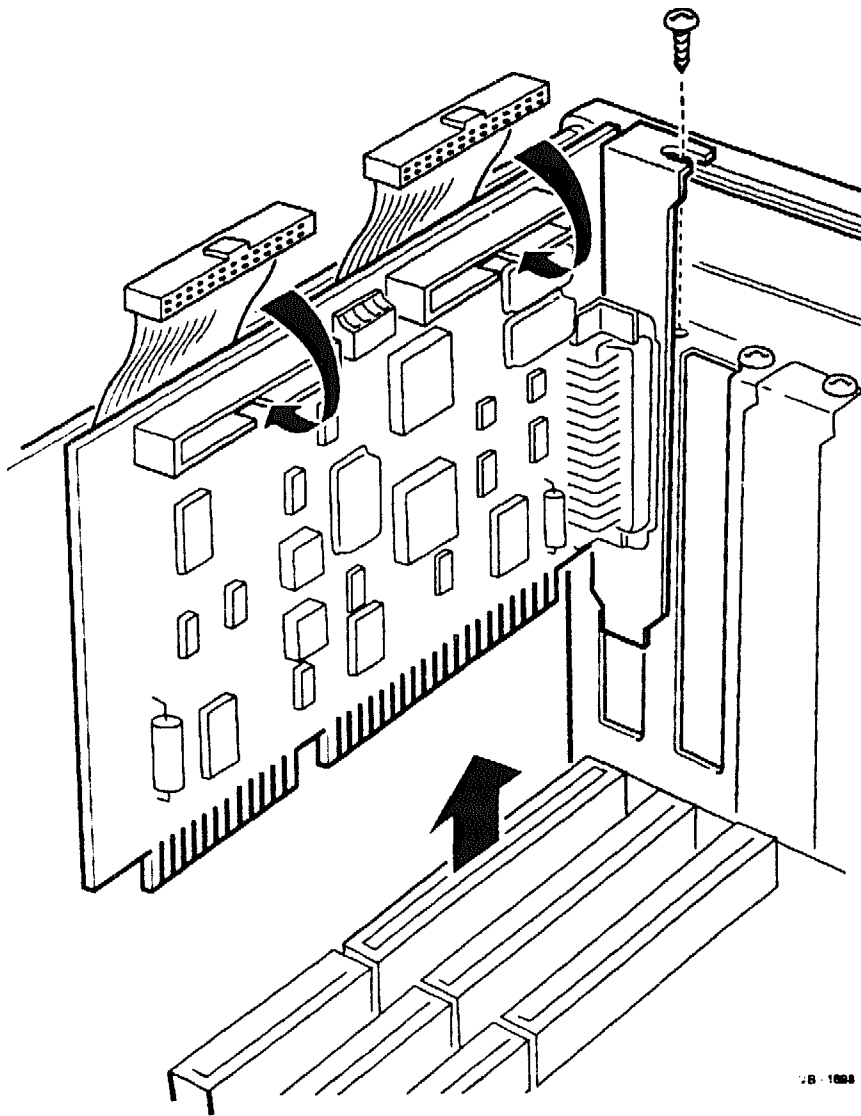
**Figure 5–13    Removing the Combination Controller Board**

## 5.2.15  Video Display Controller Board Replacement

Replace a video display controller board as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Remove the screw that secures the board retaining bracket to the expansion slot (Figure 5–14).

3.  Remove the board(s) from the bus expansion board connector(s) by pulling the board(s) up (Figure 5–14).

4.  Make the necessary switch and jumper settings to the replacement board (Appendix A, Jumpers and Switches).

5.  Install the replacement video display controller board.

6.  Replace the screw that secures the board retaining bracket to the expansion slot.

7.  Replace the system box cover (Section 5.2.4).

8.  Connect all cables to the system box.

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Figure 5–14    Removing the Video Display Controller Board
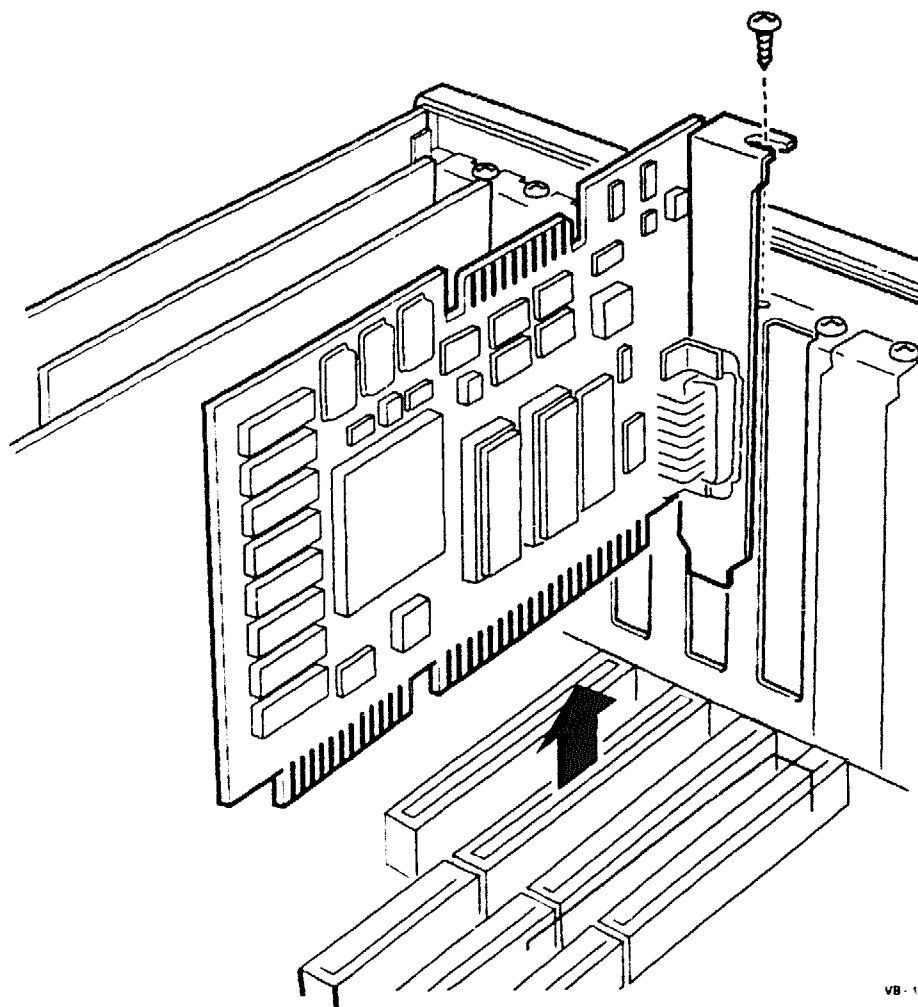
## 5.2.16 Memory Expansion Board Replacement

Replace a memory expansion board as follows:

1. Remove the system box cover (Section 5.2.4).

   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2. Remove the screw that secures the board retaining bracket to the expansion slot (Figure 5-7).

3. Remove the board(s) from the bus expansion board connector(s) by pulling the boards up (Figure 5-7).

4. Make the necessary switch and jumper settings to the replacement memory expansion board (Appendix A, Jumpers and Switches).

5. Install the replacement memory expansion board.

6. Replace the screw that secures the board retaining bracket to the expansion slot.

7. Replace the system box cover (Section 5.2.4).

8. Connect all cables to the system box.

**NOTE**
**If memory dip switches were installed on the defective r.emory expansion board, remove and install them on the replacement memory expansion board before installation. For more information about the different memory configurations used in this system refer to Section 1.4.4. For jumper information, refer to Appendix A, Jumpers and Switches.**

## 5.2.17  Bus Expansion Board Replacement

Replace the bus expansion board as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Remove all boards from the bus expansion board (Section 5.2.9).

3.  Remove floppy disk/streaming tape drive sub-chassis from the main chassis (Section 5.2.5).

4.  Remove the two power cables from the power supply to the bus expansion board (Figure 5–15).

5.  Remove the six screws that secure the bus expansion board to the chassis (Figure 5–15).

6.  Remove the bus expansion board from the system (Figure 5–15).

7.  Install the replacement bus expansion board.

8.  Replace the six screws that secure the bus expansion board to the chassis.

9.  Connect both power supply connectors to the bus expansion board.

    **NOTE**
    **The two connectors from the power supply to the bus adapter board are keyed to avoid incorrect installation.**

10. Replace all boards removed from the bus expansion board.

11. Replace the system box cover (Section 5.2.4).

12. Connect all cables to the system box.

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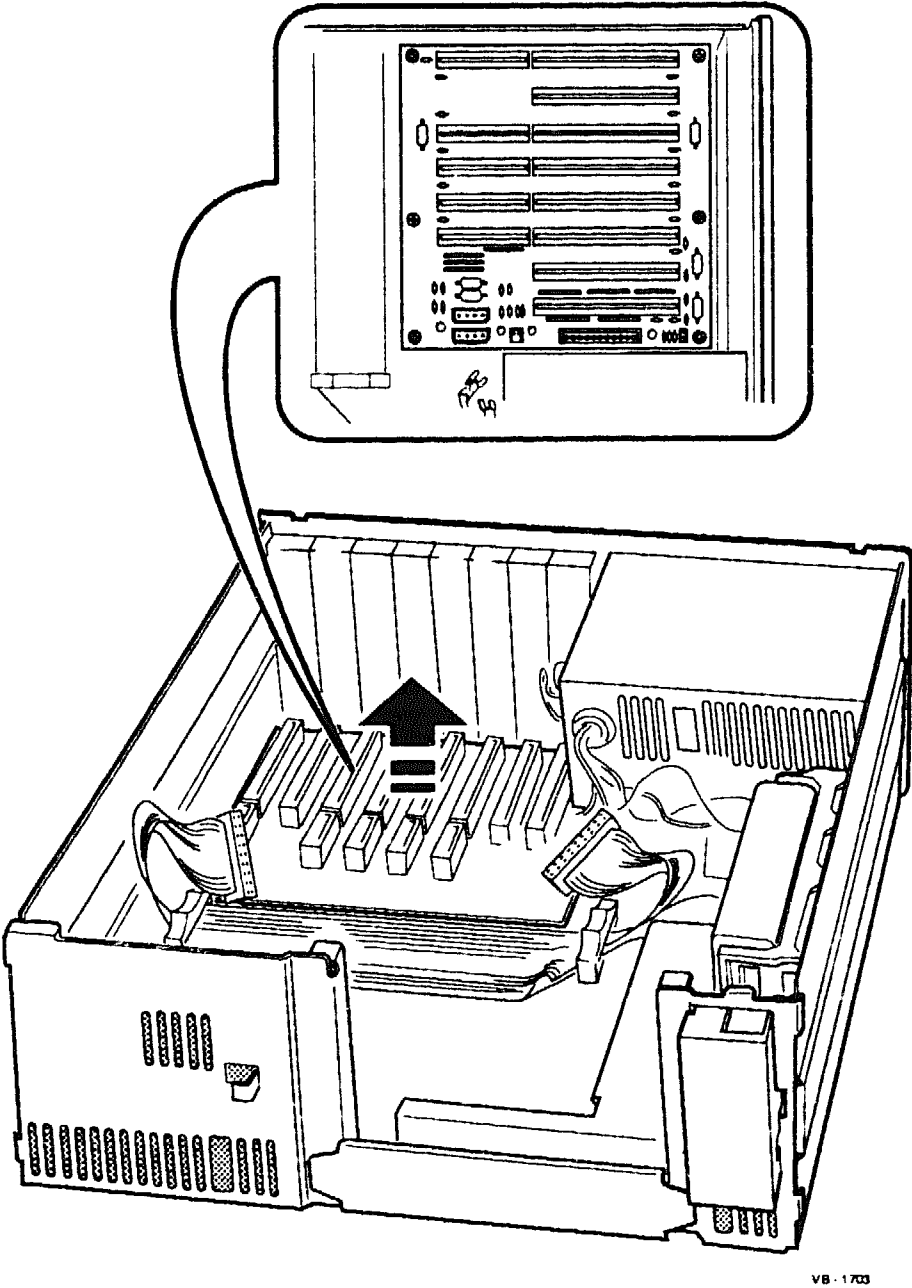
**Figure 5–15    Removing the Bus Expansion Board**

## 5.2.18  Back Panel Removal

Remove the back panel as follows:

1.  Remove the system box cover (Section 5.2.4).

    **WARNING**
    **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2.  Facing the rear of the system box, remove one screw in the top middle of the back panel (Figure 5–16).

3.  Lift the back panel up, releasing two back panel locking tabs from the chassis (Figure 5–16).

    **CAUTION**
    **Make sure you lift the back panel staight up from the chassis to avoid breaking the back panel locking tabs.**

4.  Replace the system box cover (Section 5.2.4).

5.  Connect all cables to the system box.

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**Figure 5–16    Removing the Back Panel**

## 5.2.19  Power Supply Removal and Replacement

This section describes how to remove and replace the power supply.

### 5.2.19.1 Power Supply Removal

Remove the power supply as follows:

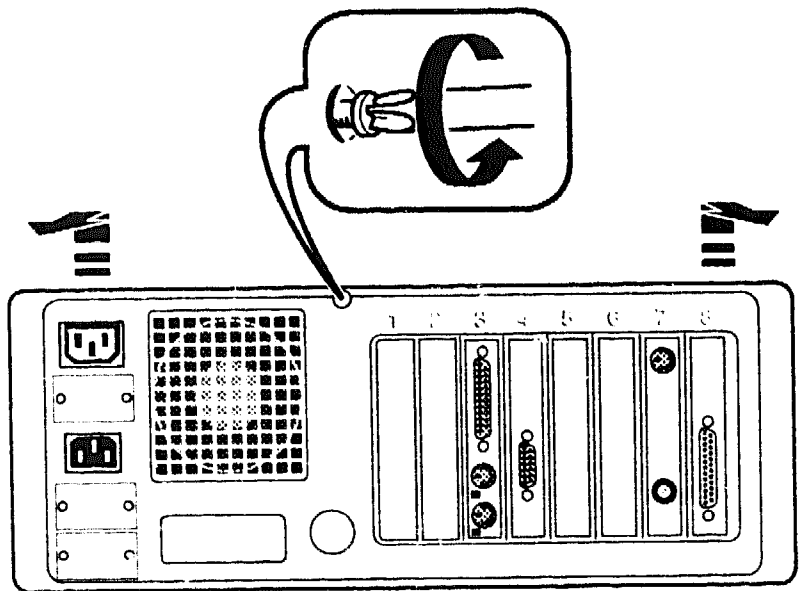1. Remove the system box cover (Section 5.2.4).

   **WARNING**
   **Always turn power to the system off, disconnect power from the wall outlet, and disconnect all cables from the system box whenever you remove the DECstation 300 cover.**

2. Position the system box so that you are facing the rear of the system. (Figure 5–17).

3. Remove the back panel from the system box (Section 5.2.18).

4. Remove any option boards in expansion slot 1 and 2 (closest to the power supply, if present) (Section 5.2.9).

5. Disconnect the power cable(s) from the power supply to the floppy disk drive connectors (Figure 5–17).

6. Remove the four screws that mount the power supply to the rear of the system box chassis (Figure 5–17).

7. Rotate the power supply counterclockwise (approx. -20°) until the switch bar releases from the power supply on/off switch and the two tabs on the bottom of the power supply release from the power supply chassis (Figure 5–17).

8. Holding the power supply in this position, push it forward approximately 3/8 inch until the power supply slides off of the power supply chassis (Figure 5–17).

9. Roll the power supply clockwise so that the left side (closest to the chassis) of the power supply is now facing up (power supply on/off switch side up) (Figure 5–17).

10. Lift the power supply up, a. d support it on the rear edge of the system box chassis (Figure 5–17).

11. Remove the power supply cable connected to the hard disk drive, and remove the two power supply cables connected to the bus expansion board (Figure 5–17).

**CAUTION**
**When removing the power supply, make sure it does not interfere with the power switch bar and the chassis.**

12. Remove the defective power supply from the system box chassis.
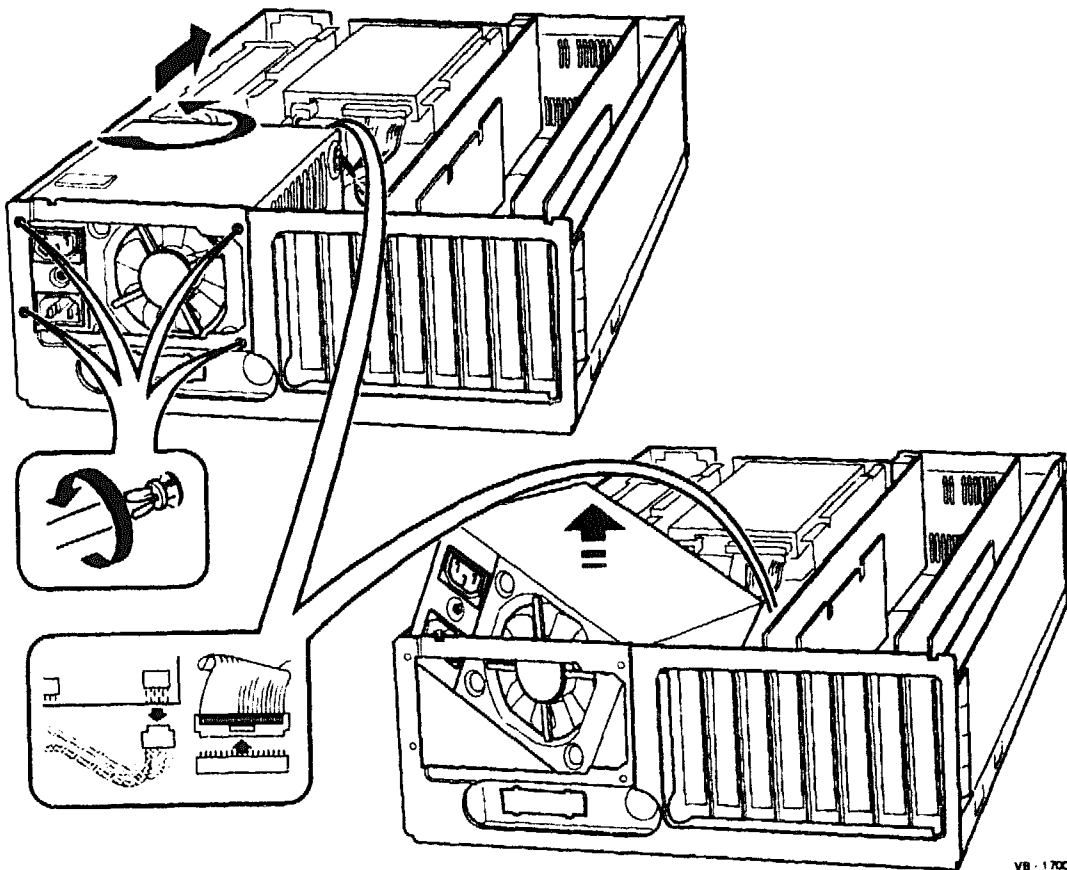


**Figure 5-17   Removing the Power Supply**

### 5.2.19.2 Power Supply Replacement

Replace the power supply as follows:

1. Position the system box so that you are facing the rear of the system.

2. Support the replacement power supply on the rear edge of the system box chassis with the power supply on/off switch side facing up.

3. Connect the power supply cable to the power connector on the hard disk drive, and connect the two keyed power supply cables to the connectors on the bus expansion board (Figure 5–18).

**NOTE**
**The two connectors from the power supply to the bus adapter board are keyed to avoid incorrect installation.**

4. Roll the power supply counterclockwise so that the switch side of the power supply is now facing the chassis.

5. Position the power supply as far forward (closest to the floppy disk drive(s)) as possible.

6. Rotate the power supply counterclockwise (approx. -20°).

7. Place your index finger between the hard disk drive and the control panel. Push the power switch bar outwards so that the on/off switch extrudes from the control panel.

8. Holding the power supply in this position, pull it backwards approximately 3/8 inch until the power supply slides onto the power supply chassis.

9. Rotate the power supply clockwise (approx. +20°) until the power supply is flush against the system box chassis. The two tabs on the bottom of the power supply lock into the power supply chassis.

**CAUTION**
**Make sure there are no cables trapped between the power supply, and the floppy disk drive(s).**

10. Release your index finger from the power switch bar.

11. Holding the power supply in position, push the control panel on/off power switch in and out to verify the power switch bar and power supply on/off switch make contact.

12. Replace the four screws that mount the power supply to the rear of the system box chassis.

13. Connect the power cable(s) from the power supply to the floppy disk drive connectors.

14. Replace any option boards in expansion slot 1 and 2 (closest to the power supply, if present) (Section 5.2.9).

15. Replace the back panel from the system box (Section 5.2.18).

16. Replace the system box cover (Section 5.2.4).

17. Connect all cables to the system box.



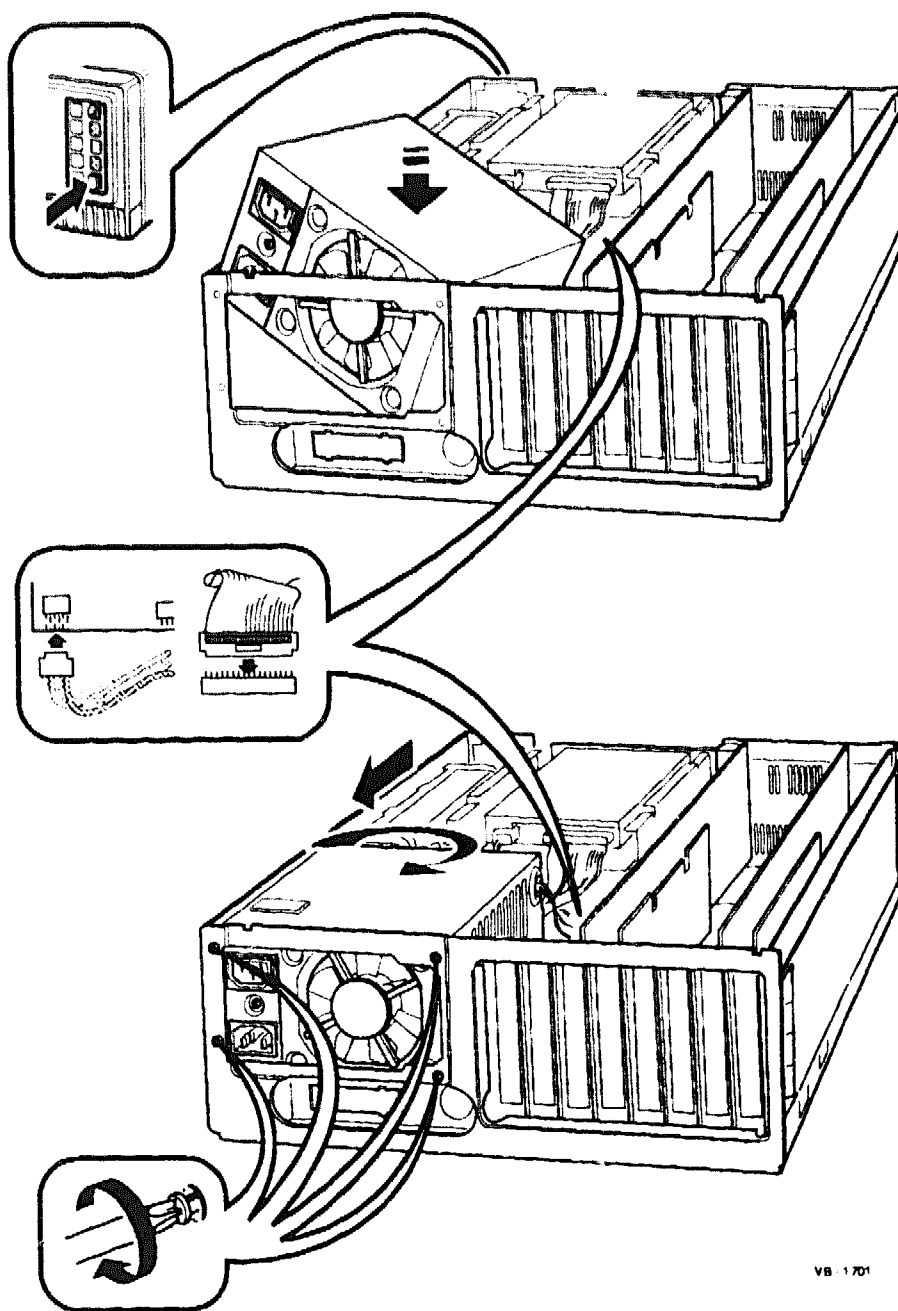**Figure 5–18    Replacing the Power Supply**

# APPENDIX A

# A
# Jumpers and Switches

This appendix shows the location and describes the function of the
jumpers and switches on the following DECstation 300 items:

- Processor board

- Combination controller board

- Video controller board

- Streaming tape drive

- Memory expansion board

- Asynchronous serial interface board

- Multiport board

- DEPCB Board

## A.1   Processor Board Jumpers

There are 10 jumpers on the DECstation 300 processor board. The jumpers are set to the default setting at the factory. These default settings are shown in Figure A-1 and described in Table A-1, Table A-2, Table A-3, Table A-4, and Table A-5



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**Figure A-1    Location of Jumpers on Processor Board**

The following table shows how to configure JP1 and JP2 on the processor board:

**Table A-1   Processor Board Settings: JP1 ,and JP2**

| JP1 | JP2 | Active pages | SIMM Speed and Description |
|---|---|---|---|
| removed | removed | 4 | 100 nsec. fast page mode DRAM (Normal) |
| removed | installed | 1 | 100 nsec. fast page mode DRAM (NA) |
| installed | removed | NA | 100 nsec. normal DRAM (NA) |
| installed | installed | NA | 120 nsec. normal DRAM (NA) |

The following table shows how to configure JP3 and JP5 on the processor board:

**Table A-2   Processor Board Settings: JP3 ,and JP5**

| JP3 | JP5 | Description |
|---|---|---|
| installed | installed | Normal operation setting (Normal) |
| removed | removed | Only during manufacture testing (NA) |

The following table shows how to configure JP4, JP7, JP8, and JP10 on the the processor board:

**Table A-3   Processor Board Settings: JP4 ,JP7, JP8, and JP10**

| JP4 | JP7 | JP8 | JP10 | Jumper Pin Position |
|---|---|---|---|---|
| installed | installed | installed | installed | Pin position 2 to 3 (Normal) |
| removed | removed | removed | removed | Pin position 1 to 2 (NA) |

The following table shows how to configure JP6 on the processor board:

**Table A–4   Processor Board Settings: JP6**

| JP6 | Jumper Pin Position |
|-----|---------------------|
| installed | Pin position 1 to 2 (Normal) |
| removed | Pin position 2 to 3 (NA) |

The following table shows how to configure JP9 on the processor board:

**Table A–5   Processor Board Settings: JP9**

| JP9 | Jumper Pin Position |
|-----|---------------------|
| installed | Video display controller with on-board BIOS (Normal) |
| removed | Video display controller without on-board BIOS (NA) |

## A.2  Combination Controller Board

The combination controller can be configured to enable or disable the floppy disk drive interface, hard disk drive interface, and the RS232-C serial port.

The following table shows how to configure the dip switch, positions 1 through 4 on the combination controller board:

**Table A-6   Combination controller Board Settings**

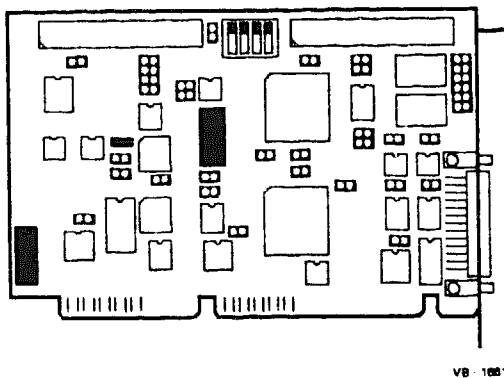| Switch Position | On Position | Off Position | Description |
|---|---|---|---|
| 1 | Disable FDI | Enable FDI | FDI (Floppy Disk Interface) |
| 2 | Disable HDI | Enable HDI | HDI (Hard Disk Interface) |
| 3 | Disable Port | Enable Port | RS232-C Serial Interface |
| 4 | COMM2 | COMM1 | RS232-C Serial Interface |

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**Figure A–2    Location of Combination Controller Board Switch**

## A.3  Video Controller Board

The following table shows how to configure PN10, PN11, and PN12 on the video control board:

**Table A–7    Video Controller Board Settings**

| Jumper | Installed | Removed | Description |
|--------|-----------|---------|-------------|
| PN10 | On-board oscillators (Normal) | External oscillators (NA) | Enable 36.000 MHz oscillator |
| PN11 | On-board oscillators (Normal) | External oscillators (NA) | Enable 25.175 MHz oscillator |
| PN12 | On-board oscillators (Normal) | External oscillators (NA) | Enable 28.322 MHz oscillator |

**NOTE**
**Normal operation is configured from the factory with all the jumper plugs installed on the video controller board.**
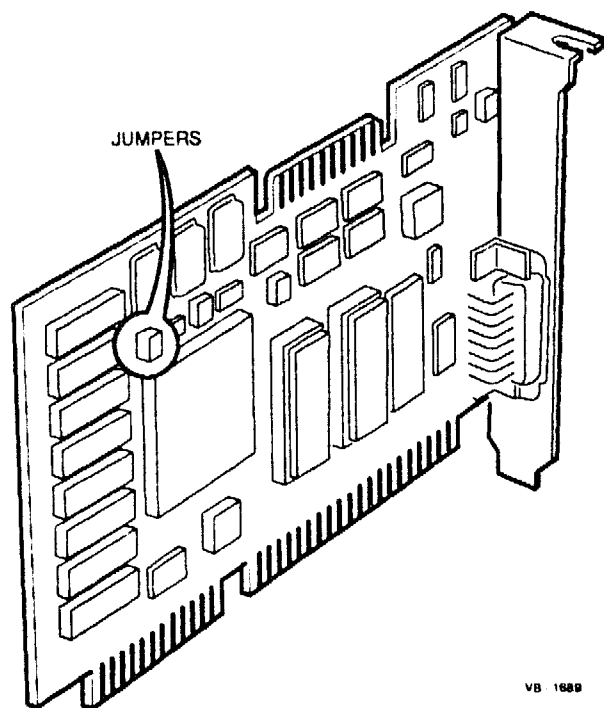
JUMPERS

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**Figure A–3   Location of Video Controller Board**

## A.4   40 Mbyte Streaming Tape Drive

The tape drive must have jumper DS4 installed on pins 7 and 8
(Figure A-4). The jumper between pins 9 and 10 must **not** be installed.
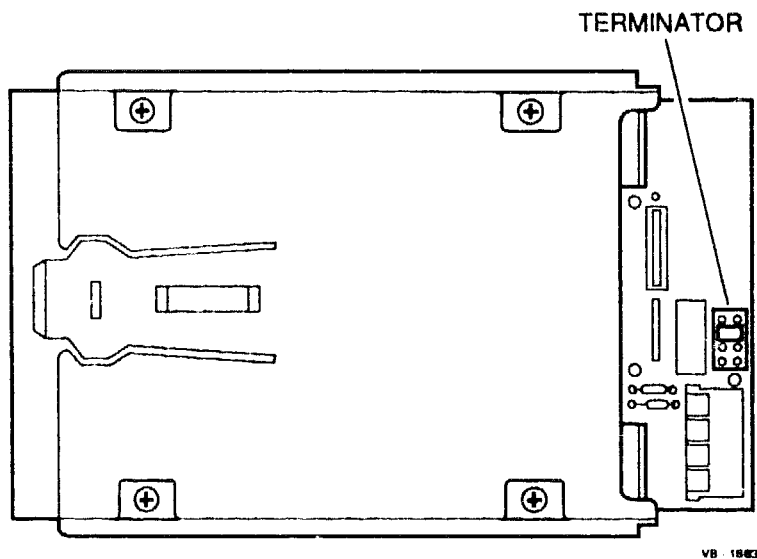Terminator A must **not** be installed.

TERMINATOR

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**Figure A-4   40 Mbyte Tape Drive Jumper and Terminator Setting**

# A.5  Memory Expansion Board

This section shows how to configure the DIP switches (DSW1, DSW2, and DSW3) on each memory expansion board installed in the DECstation 300.

The memory ⌐ oansion board is a 16-bit board. Each memory expansion board is shipp⌐ ⌐ with 2 Mbytes of RAM soldered into the board and has two rows of nine sockets for expansion. Each row on a memory expansion board equals 1 Mbyte of RAM. This allows the board to have a total capacity of 4 Mbytes of RAM. The board contains three DIP switches (DSW1, DSW2, and DSW3). These switches control the memory mode, board capacity (2 Mbyte or 4 Mbyte), I/O address, and memory start and end address.

## A.5.1  Memory Mode

The memory expansion board addressing format is configured using DSW1, position 1 and DSW2, position 1. This memory mode allows the system to continuously address memory from the memory expansion board byte-by-byte as it is needed (Section A.6.1).

## A.5.2  2 Mbyte or 4 Mbyte Expansion

Memory expansion boards are available in 2 Mbyte and 4 Mbyte sizes. You set DSW3, position 8 to select the board size (Section A.6.1.)

## A.5.3  I/O Address

The I/O address (DSW3, positions 1 through 7) is the location where the input/output port recognizes the memory expansion board (Section A.6.2).

## A.5.4  Start and End Addresses

The start address (DSW2, positions 2 through 8) and end address (DSW1, positions 2 through 8) determine the location where the system recognizes the memory expansion board. If more than one board is installed in the system, the second memory expansion board begins where the first memory expansion board address ends, and the third memory expansion board address begins where the second memory expansion board address ends (Section A.7).

## A.6  Overview of Procedure

This overview summarizes the steps to configure up to three memory expansion boards.

1.  Order each board from high (most memory) to low (least memory).

2.  Each board contains three switches (DSW1, 2, and 3). Set the switches in the following order:

    a.  Memory mode

    b.  2 Mbyte or 4 Mbyte

    c.  I/O address

    d.  Start and end addresses

3.  After you set the switches on all the memory expansion boards, install each board in the system bus expansion slots.

Table A–8 shows each switch position and its function.

**Table A–8   Switch Settings and Functions**

| DSW | Switch Position(s) | Description of Switch Settings |
|---|---|---|
| 1 | 1 | Memory mode (This switch is always on.) |
| 2 | 1 | Memory mode (This switch is always off.) |
| 3 | 8 | 2 or 4 Mbyte selection |
| 3 | 1 through 7 | Memory I/O address |
| 2 | 2 through 8 | Memory starting address |
| 1 | 2 through 8 | Memory ending address |

### A.6.1  Setting the Memory Mode and Board Size

The memory expansion board addressing format is configured using DSW1, position 1 and DSW2, position 1,. Memory expansion boards are available in 2 Mbytes and 4 MBytes. Configure the switches for memory mode and board size as follows:

### A.6.1.1 Memory Mode Using a 2 Mbyte Board

Configure a 2 Mbyte memory expansion board as follows:

**Table A–9   Memory Mode Switch Settings - 2 Mbyte**

| DSW | Switch Settings | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | on | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 2 | off | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 3 | § | § | § | § | § | § | § | on |

§This switch setting is determined in Section A.6.2.

‡This switch setting is determined in Section A.7.

### A.6.1.2 Memory Mode Using a 4 Mbyte Board

Configure a 4 Mbyte memory expansion board as follows:

**Table A–10   Memory Mode Switch Settings - 4 Mbyte**

| DSW | Switch Settings | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | on | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 2 | off | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 3 | § | § | § | § | § | § | § | off |

§This switch setting is determined in Section A.6.2.

‡This switch setting is determined in Section A.7.

## A.6.2   Determining the I/O Address on DSW3

The I/O address is set by selecting DSW3, switch position 1 though 7. It is preset at the factory for 120 hex. You should check this setting with the following table:

**Table A–11   I/O Switch Settings**

| DSW | Switch Settings | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 3 | on | on | off | on | on | off | on | † |

†This switch setting is determined in Section A.6.1.

# A.7   Determining the Start and End Addresses

The system can have up to three memory expansion boards. Each memory board must have a start and end address in order to configure the memory correctly. If you are installing fewer than three memory expansion boards, you only configure the start and end addresses of the boards you have and then install the boards in the Bus expansion slots (Chapter 5).

Before determining the start and end address of each board, arrange the boards (if you have more than one) from high (most on-board RAM) to low (least on-board RAM). The board with the most on-board RAM is the first memory board.

With the memory expansion boards in front of you, set each switch as you follow this procedure. Set all the switches on all the memory expansion boards before you install the boards in the bus expansion slots in the system.

## A.7.1   Determining the amount of memory in the system

Determine the total amount of extended memory installed in the system by powering on the system. The power-on diagnostics display the amount of extended memory currently installed in the system.

In the following example, the system has 2048 Kbytes of memory. Out of the total memory in the system, 1280 Kbytes are used for extended memory, 640 Kbytes for base memory, and 128 Kbytes for shadow memory.

```
Resident diagnostics Rev n.nn

    CPU (i80386SX)             Pass
    ROM Checksum               Pass
    Memory Refresh             Pass
    Keyboard controller        Pass
    Base Memory                640 KB
    Extended Memory           1280 KB
    Shadow Memory              128 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      (*)

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

**Example A–1   Sample of Power-Up**

### A.7.1.1 Determine the Starting Address for the First Memory Expansion Board

To determine the starting address for the first memory expansion board:

1.  Power the system on.

2.  Record the total amount of extended memory in the system as shown by the power-on diagnostics.

3.  Divide the amount of extended memory by 128.

4.  Add eight to that number.

5.  Find that number in the line column of Table A–14.

6.  Read across the table row to the switch settings for that number, and set DSW2, positions 2 through 8 according to the switch settings shown.

You have just calculated the system starting address for the first memory expansion board. The following example illustrates this calculation and shows the switch settings for DSW2, positions 2 through 8 taken from line 18 of Table A–14:

```
1280 Kbytes (extended memory) / 128 (Bytes) =
10 + 8 (bits) = 18 (starting address)
```

| Line | Link | Start and End Addresses | Switch Settings | | | | | | |
|------|------|-------------------------|-----|-----|-----|-----|-----|-----|-----|
| | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 18 | 4 | 24 0000   25 FFFF | on | on | off | on | on | off | on |

### A.7.1.2 Determine the Ending Address for the First Memory Expansion Board

To determine the ending address for the first memory expansion board:

1. Record the starting address calculated in Section A.7.1.1.

2. If the memory expansion board contains 2 Mbytes, add 15 to the number recorded. If the memory expansion board contains 4 Mbytes, add 31 to the number recorded.

3. Find that number in the line column of Table A-14.

4. Read across the table row to the switch settings for that number, and set DSW1, positions 2 though 8 according to the switch settings shown

You have just calculated the system ending address for the first memory expansion board. The following example illustrates this calculation and shows the switch settings for DSW1, positions 2 through 8 taken from line 49 of Table A-14:

```
18 (starting address) + 31 (4 Mbyte board) = 49 (ending address)
```

| Line | Link | Start and End Addresses | Switch Settings | | | | | | |
|------|------|-------------------------|-----|-----|-----|-----|-----|-----|-----|
| | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 49 | 4 | 62 0000   63 FFFF | on | off | off | on | on | on | off |

### A.7.1.3 Determine the Starting Address for the Second Memory Expansion Board

To determine the starting address for the second memory expansion board:

1.  Record the ending address calculated in Section A.7.1.2.

2.  Add one to the number recorded.

3.  Find that number in the line column of Table A-14.

4.  Set DSW2, positions 2 though 8 according to the switch settings shown.

You have just calculated the system starting address for the second memory expansion board. The following example illustrates this calculation and shows the switch settings for DSW2, positions 2 through 8 taken from line 50 of Table A-14:

```
49 (ending address) + 1 = 50 (starting address)
```

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 50 | 4 | 64 0000 | 65 FFFF | on | off | off | on | on | off | on |

### A.7.1.4 Determine the Ending Address for the Second Memory Expansion Board

To determine the ending address for the second memory expansion board:

1.  Record the starting address calculated in Section A.7.1.3.

2.  If the memory expansion board contains 2 Mbytes add 15 to the number recorded. If the memory expansion board contains 4 Mbytes add 31 to the number recorded.

3.  Find that number in the line column of Table A-14.

4.  Set DSW1, positions 2 through 8 according to the switch settings shown on this line.

You have just calculated the system ending address for the second memory expansion board. The following example illustrates this calculation and shows the switch settings for DSW1, positions 2 through 8 taken from line 65 of Table A-14:

```
50 (Starting Address) + 15 (2 Mbyte board) = 65 (ending address)
```

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|-------------|---|-----|---|---|---|---|---|---|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 65 | 4 | 82 0000 | 83 FFFF | off | on | on | on | on | on | off |

### A.7.1.5 Determine the Starting Address for the Third Memory Expansion Board

To determine the starting address for the third memory expansion board:

1. Record the ending address calculated in Section A.7.1.4.

2. Add one to the ending address.

3. Find that number in the line column of Table A–14.

4. Set DSW2, positions 2 through 8 according to the switch settings shown.

You have just calculated the system starting address for the third memory expansion board. The following is an example of this calculation and the switch settings for DSW2, positions 2 through 8 taken from line 66 of Table A–14:

```
65 (ending address) + 1 = 66 (starting address)
```

### Table A–12   Start Address Switch Settings of Board 3

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|-------------|---|-----|---|---|---|---|---|---|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 66 | 4 | 84 0000 | 85 FFFF | off | on | on | on | on | off | on |

### A.7.1.6 Determine the Ending Address for the Third Memory Expansion Board

To determine the ending address for the third memory expansion board:

1. Record the starting address calculated in Section A.7.1.5.

2.   If the memory expansion board contains 2 Mbytes, add 15 to the
     number recorded. If the memory expansion board contains 4 Mbytes,
     add 31 to the number recorded.

3.   Find this number in the line column of Table A–14.

4.   Set DSW1, positions 2 through 8 according to the switch settings
     shown on this line.

You have just calculated the system ending address for the third memory
expansion board. The following example illustrates this calculation and
shows the switch settings for DSW1, positions 2 through 8 taken from line
81 of Table A–14:

```
66 (Starting Address) + 15 (2 Mbyte board) = 81 (ending address)
```

**Table A–13   End Address Switch Settings of Board 3**

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 81 | 4 | A2 0000 | A3 FFFF | off | on | off | on | on | on | off |

## A.7.2   How to Use the Table for DSW1 and 2 Addresses

This section describes each column of Section A.7 and explains how to use
the table to set the switches.

1.   Calculate the start and end addresses as described in Section A.7.

2.   Find the line number that corresponds to each address in the line
     column of Table A–14.

3.   Follow across the row to the number or letter under the link column.

4.   If there is a "2" in this column, you can only install a two Mbyte
     memory expansion board at this address. If there is a "4" in this
     column, you can install a 2 or a 4 Mbyte memory expansion board at
     this address. If there is an "N" in this column, you cannot install a
     memory expansion board at this address.

5.   Follow across the row to the address under the start and end
     addresses column. This is the address where the memory expansion
     board can be enabled by the system.

6.  Follow across the row to the switch settings under the switch settings
    columns. There are seven columns that represent the switch settings
    for DSW1 (ending address) and DSW2 (starting address), positions 2
    through 8.

**CAUTION**
Under the link column in Table A-14 the numbers 2 or 4 or the
letter N appears. The number 2 means only a 2 Mbyte board can
be enabled at this address. The number 4 means either a 2 Mbyte
or a 4 Mbyte board can be enabled at this address. The letter N
mean neither board can be enabled at this address. To prevent
damage to the equipment, do not install a memory expansion
board in an incorrect address.

**Table A-14   Memory Expansion Board DSW1 and DSW2 Settings**

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|----------|---------|-----|-----|-----|-----|-----|-----|-----|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0 | N | 00 0000 | 01 FFFF | on | on | on | on | on | on | on |
| 1 | N | 02 0000 | 03 FFFF | on | on | on | on | on | on | off |
| 2 | N | 04 0000 | 05 FFFF | on | on | on | on | on | off | on |
| 3 | N | 06 0000 | 07 FFFF | on | on | on | on | on | off | off |
| 4 | N | 08 0000 | 09 FFFF | on | on | on | on | off | on | on |
| 5 | N | 0A 0000 | 0B FFFF | on | on | on | on | off | on | off |
| 6 | N | 0C 0000 | 0D FFFF | on | on | on | on | off | off | on |
| 7 | N | 0E 0000 | 0F FFFF | on | on | on | on | off | off | off |
| 8 | 4 | 10 0000 | 11 FFFF | on | on | on | off | on | on | on |
| 9 | 4 | 12 0000 | 13 FFFF | on | on | on | off | on | on | off |
| 10 | 4 | 14 0000 | 15 FFFF | on | on | on | off | on | off | on |
| 11 | 4 | 16 0000 | 17 FFFF | on | on | on | off | on | off | off |
| 12 | 4 | 18 0000 | 19 FFFF | on | on | on | off | off | on | on |
| 13 | 4 | 1A 0000 | 1B FFFF | on | on | on | off | off | on | off |
| 14 | 4 | 1C 0000 | 1D FFFF | on | on | on | off | off | off | on |
| 15 | 4 | 1E 0000 | 1F FFFF | on | on | on | off | off | off | off |
| 16 | 4 | 20 0000 | 21 FFFF | on | on | off | on | on | on | on |

## Table A–14 (Cont.)    Memory Expansion Board DSW1 and DSW2 Settings

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|------------|-----------|-----|-----|-----|-----|-----|-----|-----|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 17 | 4 | 22 0000 | 23 FFFF | on | on | off | on | on | on | off |
| 18 | 4 | 24 0000 | 25 FFFF | on | on | off | on | on | off | on |
| 19 | 4 | 26 0000 | 27 FFFF | on | on | off | on | on | off | off |
| 20 | 4 | 28 0000 | 29 FFFF | on | on | off | on | off | on | on |
| 21 | 4 | 2A 0000 | 2B FFFF | on | on | off | on | off | on | off |
| 22 | 4 | 2C 0000 | 2D FFFF | on | on | off | on | off | off | on |
| 23 | 4 | 2E 0000 | 2F FFFF | on | on | off | on | off | off | off |
| 24 | 4 | 30 0000 | 31 FFFF | on | on | off | off | on | on | on |
| 25 | 4 | 32 0000 | 33 FFFF | on | on | off | off | on | on | off |
| 26 | 4 | 34 0000 | 35 FFFF | on | on | off | off | on | off | on |
| 27 | 4 | 36 0000 | 37 FFFF | on | on | off | off | on | off | off |
| 28 | 4 | 38 0000 | 39 FFFF | on | on | off | off | off | on | on |
| 29 | 4 | 3A 0000 | 3B FFFF | on | on | off | off | off | on | off |
| 30 | 4 | 3C 0000 | 3D FFFF | on | on | off | off | off | off | on |
| 31 | 4 | 3E 0000 | 3F FFFF | on | on | off | off | off | off | off |
| 32 | 4 | 40 0000 | 41 FFFF | on | off | on | on | on | on | on |
| 33 | 4 | 42 0000 | 43 FFFF | on | off | on | on | on | on | off |
| 34 | 4 | 44 0000 | 45 FFFF | on | off | on | on | on | off | on |
| 35 | 4 | 46 0000 | 47 FFFF | on | off | on | on | on | off | off |
| 36 | 4 | 48 0000 | 49 FFFF | on | off | on | on | off | on | on |
| 37 | 4 | 4A 0000 | 4B FFFF | on | off | on | on | off | on | off |
| 38 | 4 | 4C 0000 | 4D FFFF | on | off | on | on | off | off | on |
| 39 | 4 | 4E 0000 | 4F FFFF | on | off | on | on | off | off | off |
| 40 | 4 | 50 0000 | 51 FFFF | on | off | on | off | on | on | on |
| 41 | 4 | 52 0000 | 53 FFFF | on | off | on | off | on | on | off |
| 42 | 4 | 54 0000 | 55 FFFF | on | off | on | off | on | off | on |

## Table A-14 (Cont.)   Memory Expansion Board DSW1 and DSW2 Settings

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 43 | 4 | 56 0000 | 57 FFFF | on | off | on | off | on | off | off |
| 44 | 4 | 58 0000 | 59 FFFF | on | off | on | off | off | on | on |
| 45 | 4 | 5A 0000 | 5B FFFF | on | off | on | off | off | on | off |
| 46 | 4 | 5C 0000 | 5D FFFF | on | off | on | off | off | off | on |
| 47 | 4 | 5E 0000 | 5F FFFF | on | off | on | off | off | off | off |
| 48 | 4 | 60 0000 | 61 FFFF | on | off | off | on | on | on | on |
| 49 | 4 | 62 0000 | 63 FFFF | on | off | off | on | on | on | off |
| 50 | 4 | 64 0000 | 65 FFFF | on | off | off | on | on | off | on |
| 51 | 4 | 66 0000 | 67 FFFF | on | off | off | on | on | off | off |
| 52 | 4 | 68 0000 | 69 FFFF | on | off | off | on | off | on | on |
| 53 | 4 | 6A 0000 | 6B FFFF | on | off | off | on | off | on | off |
| 54 | 4 | 6C 0000 | 6D FFFF | on | off | off | on | off | off | on |
| 55 | 4 | 6E 0000 | 6F FFFF | on | off | off | on | off | off | off |
| 56 | 4 | 70 0000 | 71 FFFF | on | off | off | off | on | on | on |
| 57 | 4 | 72 0000 | 73 FFFF | on | off | off | off | on | on | off |
| 58 | 4 | 74 0000 | 75 FFFF | on | off | off | off | on | off | on |
| 59 | 4 | 76 0000 | 77 FFFF | on | off | off | off | on | off | off |
| 60 | 4 | 78 0000 | 79 FFFF | on | off | off | off | off | on | on |
| 61 | 4 | 7A 0000 | 7B FFFF | on | off | off | off | off | on | off |
| 62 | 4 | 7C 0000 | 7D FFFF | on | off | off | off | off | off | on |
| 63 | 4 | 7E 0000 | 7F FFFF | on | off | off | off | off | off | off |
| 64 | 4 | 80 0000 | 81 FFFF | off | on | on | on | on | on | on |
| 65 | 4 | 82 0000 | 83 FFFF | off | on | on | on | on | on | off |
| 66 | 4 | 84 0000 | 85 FFFF | off | on | on | on | on | off | on |
| 67 | 4 | 86 0000 | 87 FFFF | off | on | on | on | on | off | off |
| 68 | 4 | 88 0000 | 89 FFFF | off | on | on | on | off | on | on |

## Table A–14 (Cont.)   Memory Expansion Board DSW1 and DSW2 Settings

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 69 | 4 | 8A 0000 | 8B FFFF | off | on | on | on | off | on | off |
| 70 | 4 | 8C 0000 | 8D FFFF | off | on | on | on | off | off | on |
| 71 | 4 | 8E 0000 | 8F FFFF | off | on | on | on | off | off | off |
| 72 | 4 | 90 0000 | 91 FFFF | off | on | on | off | on | on | on |
| 73 | 4 | 92 0000 | 93 FFFF | off | on | on | off | on | on | off |
| 74 | 4 | 94 0000 | 95 FFFF | off | on | on | off | on | off | on |
| 75 | 4 | 96 0000 | 97 FFFF | off | on | on | off | on | off | off |
| 76 | 4 | 98 0000 | 99 FFFF | off | on | on | off | off | on | on |
| 77 | 4 | 9A 0000 | 9B FFFF | off | on | on | off | off | on | off |
| 78 | 4 | 9C 0000 | 9D FFFF | off | on | on | off | off | off | on |
| 79 | 4 | 9E 0000 | 9F FFFF | off | on | on | off | off | off | off |
| 80 | 4 | A0 0000 | A1 FFFF | off | on | off | on | on | on | on |
| 81 | 4 | A2 0000 | A3 FFFF | off | on | off | on | on | on | off |
| 82 | 4 | A4 0000 | A5 FFFF | off | on | off | on | on | off | on |
| 83 | 4 | A6 0000 | A7 FFFF | off | on | off | on | on | off | off |
| 84 | 4 | A8 0000 | A9 FFFF | off | on | off | on | off | on | on |
| 85 | 4 | AA 0000 | AB FFFF | off | on | off | on | off | on | off |
| 86 | 4 | AC 0000 | AD FFFF | off | on | off | on | off | off | on |
| 87 | 4 | AE 0000 | AF FFFF | off | on | off | on | off | off | off |
| 88 | 4 | B0 0000 | B1 FFFF | off | on | off | off | on | on | on |
| 89 | 4 | B2 0000 | B3 FFFF | off | on | off | off | on | on | off |
| 90 | 4 | B4 0000 | B5 FFFF | off | on | off | off | on | off | on |
| 91 | 4 | B6 0000 | B7 FFFF | off | on | off | off | on | off | off |
| 92 | 4 | B8 0000 | B9 FFFF | off | on | off | off | off | on | on |
| 93 | 4 | BA 0000 | BB FFFF | off | on | off | off | off | on | off |
| 94 | 4 | BC 0000 | BD FFFF | off | on | off | off | off | off | on |

## Table A–14 (Cont.)   Memory Expansion Board DSW1 and DSW2 Settings

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 95 | 4 | BE 0000 | BF FFFF | off | on | off | off | off | off | off |
| 96 | 2 | C0 0000 | C1 FFFF | off | off | on | on | on | on | on |
| 97 | 2 | C2 0000 | C3 FFFF | off | off | on | on | on | on | off |
| 98 | 2 | C4 0000 | C5 FFFF | off | off | on | on | on | off | on |
| 99 | 2 | C6 0000 | C7 FFFF | off | off | on | on | on | off | off |
| 100 | 2 | C8 0000 | C9 FFFF | off | off | on | on | off | on | on |
| 101 | 2 | CA 0000 | CB FFFF | off | off | on | on | off | on | off |
| 102 | 2 | CC 0000 | CD FFFF | off | off | on | on | off | off | on |
| 103 | 2 | CE 0000 | CF FFFF | off | off | on | on | off | off | off |
| 104 | 2 | D0 0000 | D1 FFFF | off | off | on | off | on | on | on |
| 105 | 2 | D2 0000 | D3 FFFF | off | off | on | off | on | on | off |
| 106 | 2 | D4 0000 | D5 FFFF | off | off | on | off | on | off | on |
| 107 | 2 | D6 0000 | D7 FFFF | off | off | on | off | on | off | off |
| 108 | 2 | D8 0000 | D9 FFFF | off | off | on | off | off | on | on |
| 109 | 2 | DA 0000 | DB FFFF | off | off | on | off | off | on | off |
| 110 | 2 | DC 0000 | DD FFFF | off | off | on | off | off | off | on |
| 111 | 2 | DE 0000 | DF FFFF | off | off | on | off | off | off | off |
| 112 | N | E0 0000 | E1 FFFF | off | off | off | on | on | on | on |
| 113 | N | E2 0000 | E3 FFFF | off | off | off | on | on | on | off |
| 114 | N | E4 0000 | E5 FFFF | off | off | off | on | on | off | on |
| 115 | N | E6 0000 | E7 FFFF | off | off | off | on | on | off | off |
| 116 | N | E8 0000 | E9 FFFF | off | off | off | on | off | on | on |
| 117 | N | EA 0000 | EB FFFF | off | off | off | on | off | on | off |
| 118 | N | EC 0000 | ED FFFF | off | off | off | on | off | off | on |
| 119 | N | EE 0000 | EF FFFF | off | off | off | on | off | off | off |
| 120 | N | F0 0000 | F1 FFFF | off | off | off | off | on | on | on |

### Table A–14 (Cont.)   Memory Expansion Board DSW1 and DSW2 Settings

| Line | Link | Start and End Addresses | | Switch Settings | | | | | | |
|------|------|-------|-------|-----|-----|-----|-----|-----|-----|-----|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 121 | N | F2 0000 | F3 FFFF | off | off | off | off | on | on | off |
| 122 | N | F4 0000 | F5 FFFF | off | off | off | off | on | off | on |
| 123 | N | F6 0000 | F7 FFFF | off | off | off | off | on | off | off |
| 124 | N | F8 0000 | F9 FFFF | off | off | off | off | off | on | on |
| 125 | N | FA 0000 | FB FFFF | off | off | off | off | off | on | off |
| 126 | N | FC 0000 | FD FFFF | off | off | off | off | off | off | on |
| 127 | N | FE 0000 | FF FFFF | off | off | off | off | off | off | off |

## A.8   Asynchronous Serial Interface Board

The switch settings for the asynchronous serial interface board are shown in Figure A–5.



CURRENT LOOP                    RS232C
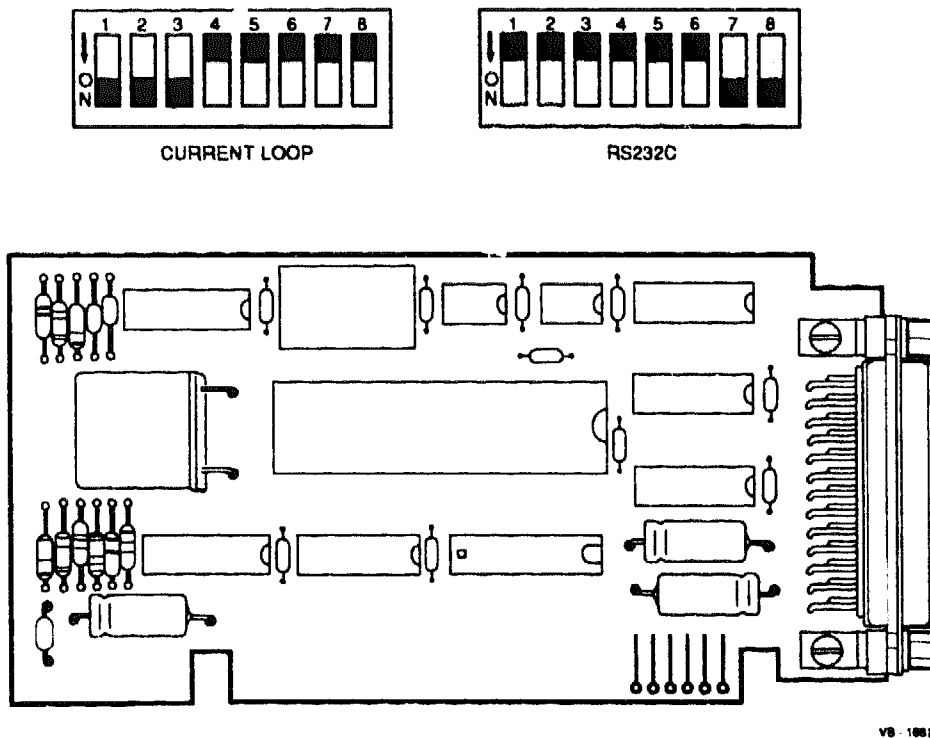


**Figure A–5    Asynchronous Serial Interface Board Switches**

## A.9   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–6.

**CAUTION**
**If a RS232-C serial port and multiport port board are installed in the system, you must disable the serial port on the RS232-C serial port board to avoid any hardware conflict. This port is disabled through DSW1, position 3 on the combination controller board (Section A.2).**
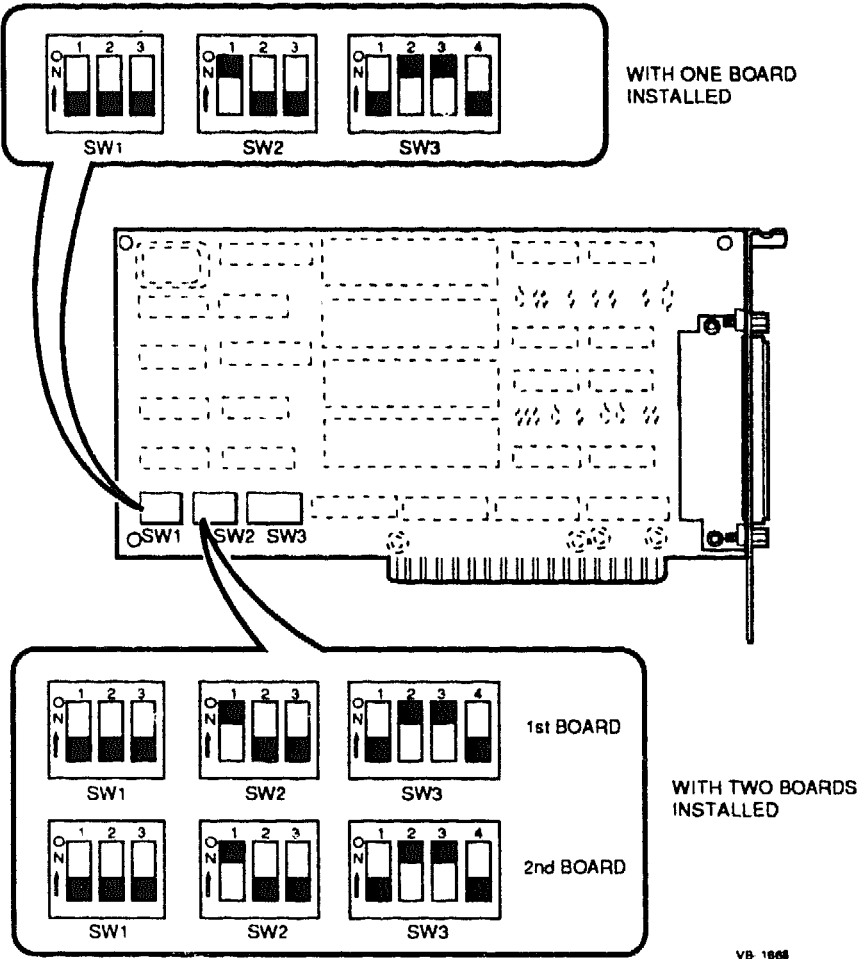
**Figure A–6    Location of Jumper on Multiport Board**

## A.10   DEPCB Board Jumpers W1 and W2

Set the DEPCB board jumpers on pins W1 and W2 (Figure A–7). W1
selects IRQ5 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. F3 board. For all DEPCA settings
refer to the DEPCA Service Guide.**

W16

W15

W9 through W14

CONNECTOR FOR AUI (J4)

GOLD PLATED
EDGE CONNECTOR
FINGERS (J2)

W17

W1 through W5

W6   W7   W8
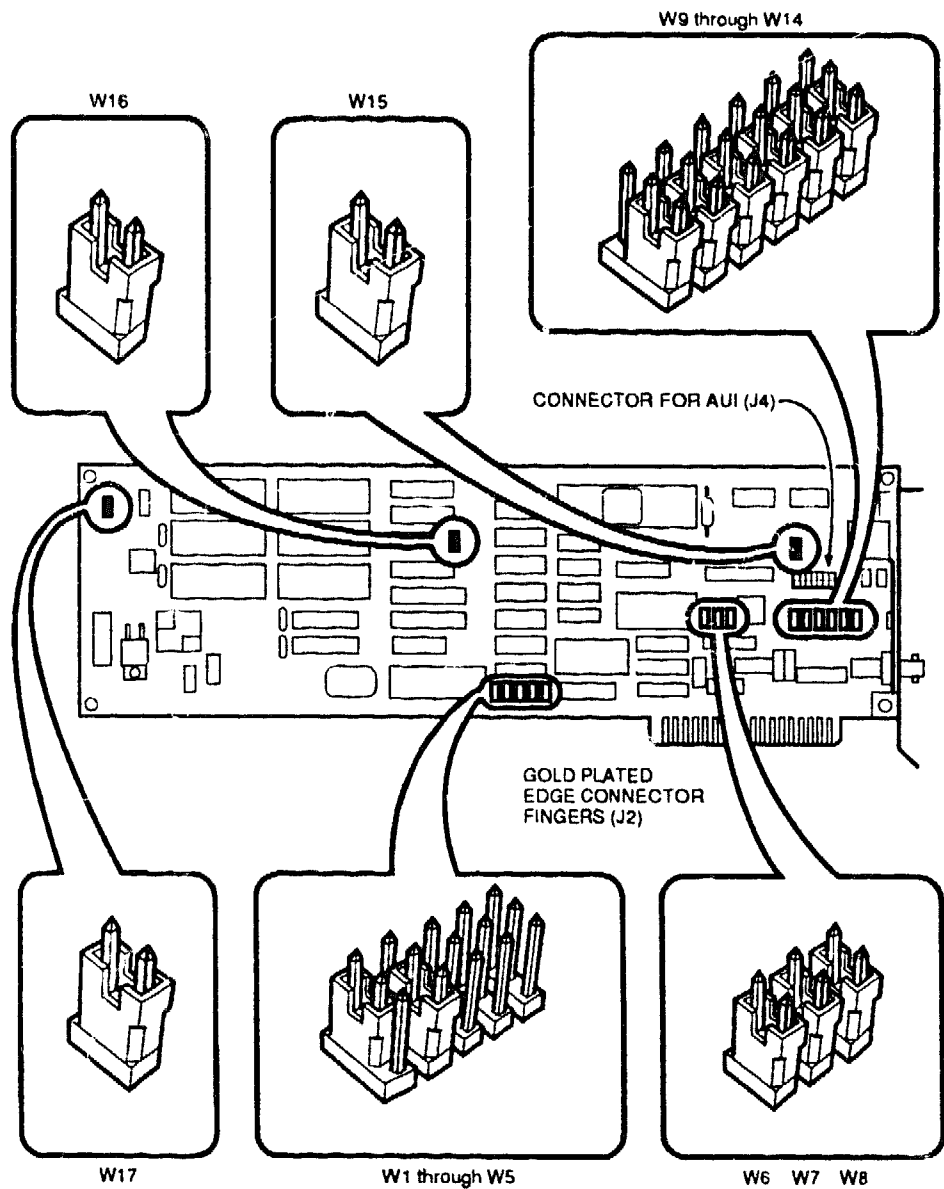
VB  1092

**Figure A–7    DEPCA Board Settings**

APPENDIX B

# B

# Interrupt Requests

This appendix describes the function of each interrupt request (IRQ) line within the DECstation 300.

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.

# INDEX

# Index