applicationDEC 400*x*P

Service Guide

Order Number: EK-PS200-SV. A01

This document provides the information a service technician needs to diagnose and repair the applicationDEC 400*x*P system. It also describes the features and capabilities of the system.

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, April 1992

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Dieses Gerät erfüllt in Verbindung mit den hierfür geprüften weiteren Geräten

- Bildschirmgeräte nach — DIN IEC 380/VDE 0806 oder EN 60950
  — ZH1/618
- Datensichtgerät — System to be used with GS approved terminals
- Bildschirmtreiberkarte Digital Equipment Corporation

die Anforderungen an Bildschirmarbeitsplätze im Bürobereich.

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MA-0347-90-CPG.DG

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Preface

Intended Audience

This manual is intended for service technicians trained by Digital Equipment Corporation.

Purpose

This manual is designed to help service technicians diagnose and repair the applicationDEC 400*x*P system. It contains service information for the base system and for options supplied by Digital Equipment Corporation. For information on configuration and installation of options supplied by Digital, refer to the *applicationDEC 400xP User Guide*.

applicationDEC 400*x*P Documentation Set

This manual is part of a documentation set shipped with each applicationDEC 400*x*P system. The manuals in this set are listed in Table 1.

Table 1 applicationDEC 400*x*P Documentation Set

Manual	Part Number
System Installation Guide[1]	EK-PS200-IG
Minimum Requirements for Operating Systems[1]	EK-PS200-AD
Electrostatic Discharge Notice[1]	EK-PS200-ED
Product Information Request[1]	EK-PS200-CC
Software Support Notice[1]	EK-PS100-SW
User Guide	EK-PS200-CG
SCO UNIX Boot Process Notice[1]	EK-PS200-SB

[1] Part of the *applicationDEC 400xP Installation Package* (EK-PS200-IP)

Conventions

The following conventions are used in this manual:

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

Notes, Cautions, and Warnings are used throughout this manual to emphasize specific kinds of information:

Warning

A Warning indicates the presence of a hazard that can cause personal injury.

Caution

A Caution indicates the presence of a hazard that might damage the hardware or currupt the software.

Note

A Note indicates important or explanatory information.

1
System Overview

The applicationDEC 400*x*P system is a versatile, industry standard computer system suitable for use in any of the following configurations:

- Multiuser timesharing configurations running SCO UNIX System V
- Network file server for Digital PATHWORKS, Novell NetWare, or Banyan Vines network operating systems
- Single user workstation environments running MS–DOS or Open Desktop

1.1 Features

The applicationDEC 400*x*P system features include:

- Intel 80486 CPU speeds of 25, 33, or 50 MHz
- Up to 256 KB of cache memory
- Up to 192 MB of system memory
- Support for 2, 4, 8, and 16 MB single in-line memory modules (SIMMs)
- Support for IDE and SCSI hard disks
- Up to 4.8 GB of internal SCSI disk storage
- Up to 14 GB of additional external disk storage
- Universal 350 W power supply
- 1.44 MB 3.5-inch diskette drive standard
- Seven half-height storage bays, convertible to three full-height and one half-height bay

The applicationDEC 400*x*P system supports:

- SCO UNIX System V
- Open Desktop
- All industry standard SCO UNIX System V applications
- MS–DOS
- Banyan Vines
- Novell NetWare

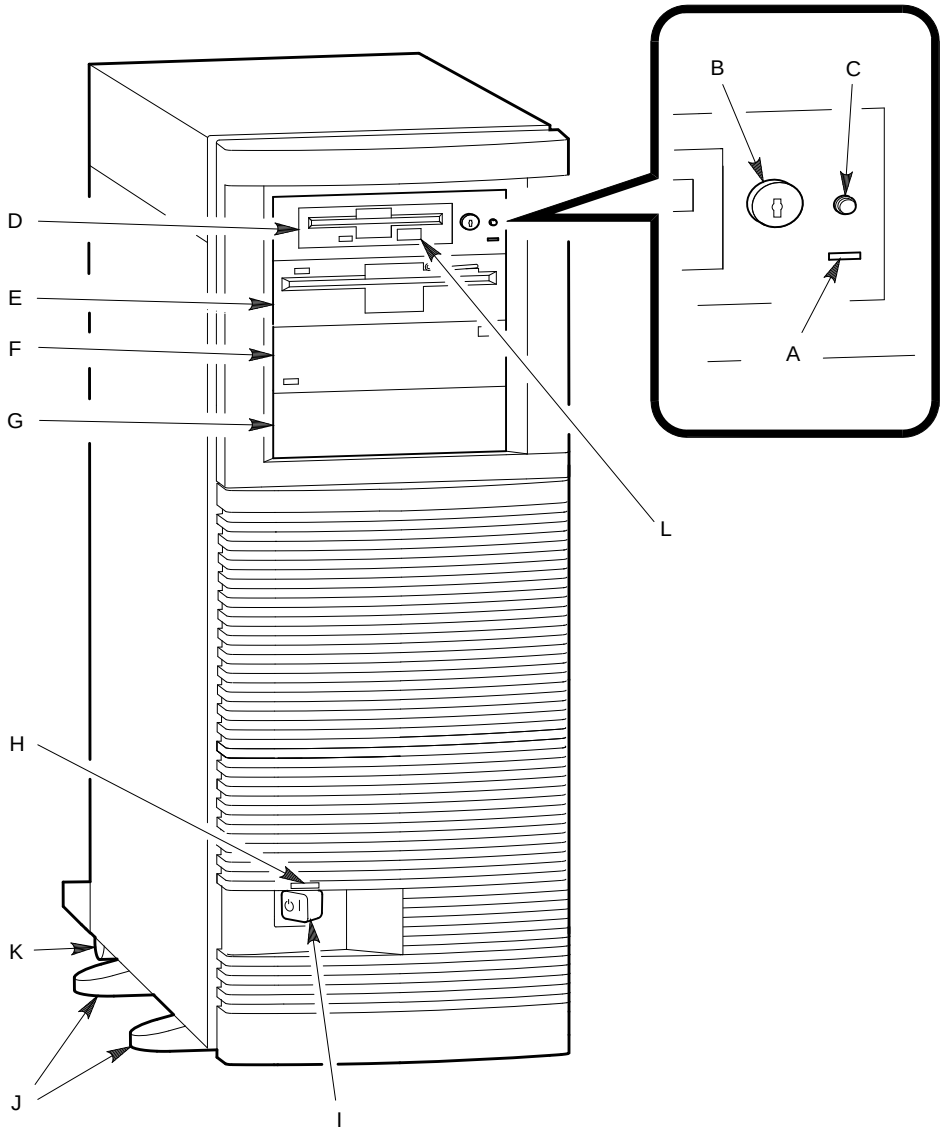
1.2 System Cabinet

The system cabinet front panel is shown in Figure 1–1. Refer to the figure key in Table 1–1.

Table 1–1 Key for Figure 1–1

Key	Description
A	Disk activity LED — indicates activity on the IDE and SCSI bus
B	Keyboard lock — disables system keyboard and mouse
C	Reset button — resets the system by emulating a power-off/power-on sequence and causes POST to run
D	1.44 MB, 3.5-inch diskette drive
E	1.2 MB, 5.25-inch diskette drive (optional)
F	525 MB QIC tape drive (optional)
G	Blank panel
H	Power indicator — indicates power is applied to the system
I	Power switch (Standby/On) — applies power to the system
J	Support feet
K	Cabinet rear wheels
L	Diskette eject button

Figure 1–1 System Cabinet, Front View



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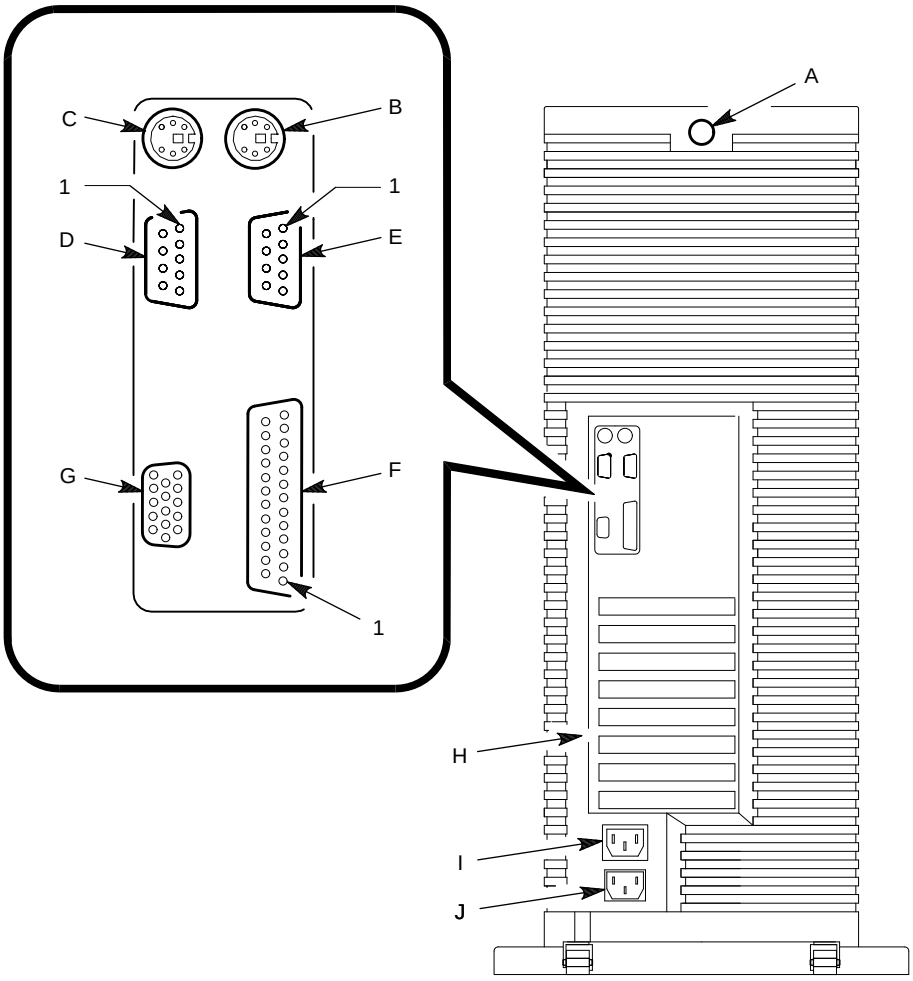
1.2.1 Rear Connectors

The system cabinet rear panel connectors are shown in Figure 1–2. Refer to the figure key in Table 1–2. For more information about the rear panel connectors, refer to Appendix C.

Table 1–2 Key for Figure 1–2

Key	Description
A	Cabinet keylock
B	Mouse connector — connects mouse used with VGA analog monitor
C	Keyboard connector — connects keyboard used with VGA analog monitor
D	Serial port 1 — RS-232 port for serial printers, UPS control, configured as COM1
E	Serial port 2 — RS-232 port for serial printers, UPS control, configured as COM2
F	Parallel port — parallel printer port, configured as LPT1
G	VGA monitor connector — connects VGA analog monitor
H	Option module external connector slots (8)
I	Auxiliary ac output — unswitched IEC-320 connector
J	AC input

Figure 1–2 System Cabinet, Rear View



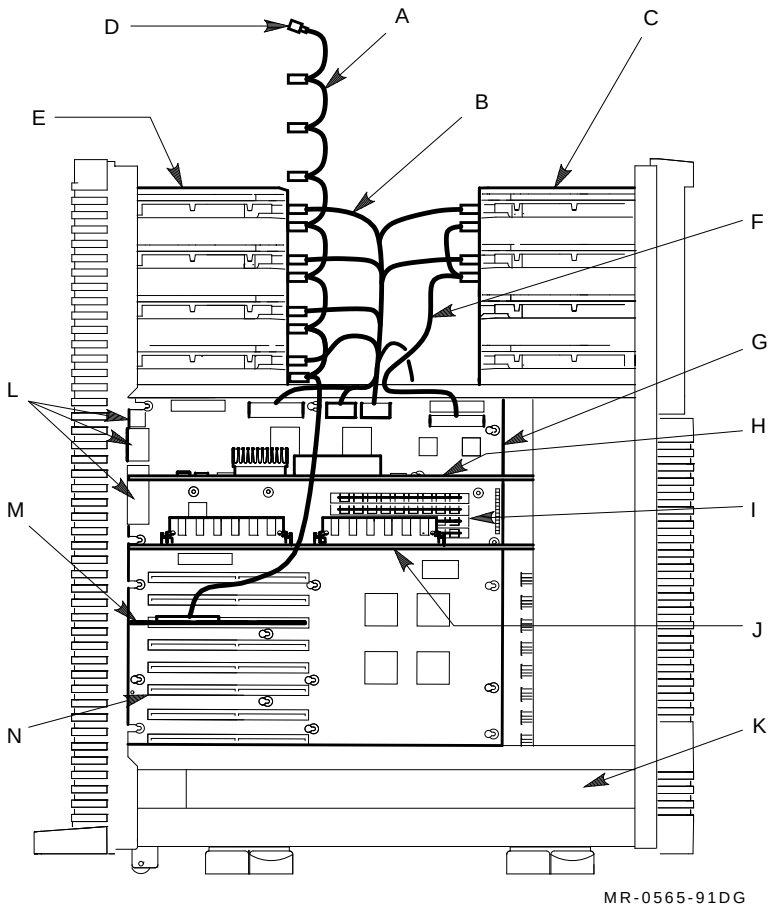
1.2.2 Internal Layout

Figure 1–3 shows the internal layout of the system when the cabinet is opened. Refer to the figure key in Table 1–3.

Table 1–3 Key for Figure 1–3

Key	Description
A	SCSI bus cable
B	Power cables
C	Front drive bays
D	SCSI terminator
E	Rear drive bays
F	Diskette drive cable
G	System board
H	CPU module
I	On-board memory SIMMs
J	Memory expansion module
K	Power supply
L	I/O connectors
M	SCSI host adapter
N	EISA option module slots (8)

Figure 1–3 System Cabinet, Internal View



1.3 System Logic

The applicationDEC 400*x*P system consists of three logic modules (see Figure 1–3):

- System board
- CPU module with optional plug-in cache (25 MHz and 33 MHz CPU) or attached cache (50 MHz CPU)
- Optional memory expansion module

1.3.1 System Board

The system board, shown in Figure 1–4, contains the following features:

- Slot for CPU module
- Slot for memory expansion module
- 8 EISA slots (6 bus master slots, 2 slave slots)
- On-board VGA with 512K RAM (optional upgrade to 1 MB RAM) and 1024 x 768 resolution
- 4 SIMM sockets (accepts 2, 4, 8, and 16 MB SIMMs for maximum of 64 MB)
- Diskette drive control
- IDE drive control
- 2 9-pin serial ports
- 1 25-pin parallel port
- Keyboard and mouse connections
- VGA monitor connection

Refer to the figure key in Table 1–4.

1.3.1.1 Option Module Slots

Eight extended industry standard architecture (EISA) option slots are available on the system board. The slots are industry standard architecture (ISA) compatible, so both EISA and ISA option modules can be installed.

Six of the EISA slots are EISA master slots. EISA master modules must be installed in EISA master slots. EISA master modules are devices which assume control of the bus for activities such as direct memory access (DMA). ISA modules and EISA slave modules may be installed in any slot.

Note

When you replace the system board, always install the modules in the same slots from which they were removed.

1.3.1.2 System Board Jumpers

System board jumpers allow you to set certain system options. For more information, refer to Appendix B.

1.3.1.3 Real-Time Clock Chip

The real-time clock chip, which contains a lithium battery, provides power for nonvolatile memory when power is removed from the system.

1.3.2 CPU Module

The CPU and all associated speed-dependent components are isolated on a separate CPU module. Upgrading a system is as easy as removing the current CPU module and replacing it with a faster CPU module. The system can be configured for use with the following Intel 80486 CPU modules.

- 25 MHz Intel 486SX
- 33 MHz Intel 486DX
- 50 MHz Intel 486DX

The 25 MHz and 33 MHz CPU modules contain a socket for installation of an optional 64 or 128 KB cache card. The 50 MHz CPU module comes standard with 256 KB cache installed.

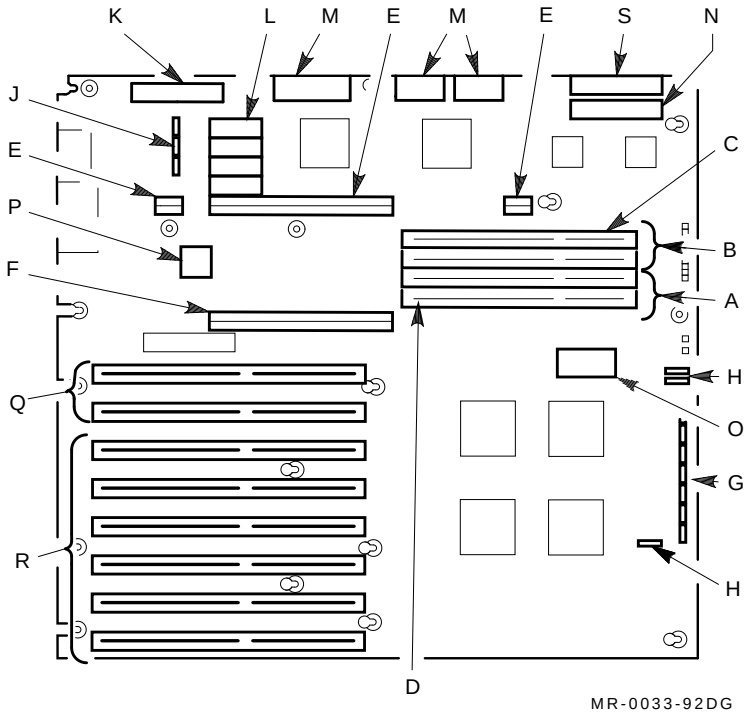
Table 1–4 Key for Figure 1–4

Key	Description
A	Memory bank 0
B	Memory bank 1
C	Install first SIMM here
D	Pin 1 of SIMM socket
E	CPU module slot
F	Memory module slot
G	System setup jumpers[1]
H	SCSI/IDE disk drive activity LED cable connectors[2]
J	VGA setup jumpers[1]
K	IDE cable connector
L	VGA 512K memory upgrade sockets
M	Power connector (cable from power supply is factory installed)
N	Diskette cable connector (cable is factory installed)
O	Real-time clock
P	Western Digital WD90C30 VGA chip
Q	EISA slave slots
R	EISA master slots
S	Front panel connector (cable is factory installed)

[1]Table B–1 lists the system board jumpers and factory default settings.

[2]On some system boards, J0190 and/or J0491 may not be populated.

Figure 1–4 System Board



1.3.3 Memory Expansion Module

The memory expansion module:

- Allows for increased memory beyond the 64 MB of memory that can be installed on the system board
- Is installed in a slot on the system board
- Contains 8 SIMM slots
- Accepts 2, 4, 8, and 16 MB SIMMs

If 16 MB SIMMs are installed on the memory expansion module, an additional 128 MB of memory is provided. Combined with the maximum possible 64 MB available on the system board, 192 MB of memory is available.

All of the memory logic is designed for future support of 32 MB SIMMs. When 32 MB SIMMs are available, the total possible memory will be 384 MB.

1.4 Power Supply

In the lower area of the cabinet is the system power supply. The supply provides 350 W to the system cabinet and autosenses input power. This means the cabinet can be connected to 110/120 V or 220/240 V, 50 or 60 Hz, without making any mechanical settings.

1.5 Disk Storage and Media Options

The system board supports IDE drives directly. An IDE drive connector on the board allows connection of up to two 105 MB half-height IDE drives.

By installing a SCSI adapter in an EISA expansion slot, greater expansion is possible. A SCSI bus can have up to seven SCSI devices. The system enclosure has seven half-height expansion bays. These are convertible to full-height bays. Any combination of full- and half-height bays is possible. For maximum storage, three 1.3 GB full-height SCSI drives and one 852 MB half-height drive can be installed for a total of 4.8 GB inside the enclosure.

Three of the seven half-height storage bays are accessible. These bays are directly below the standard 3.5-inch 1.44 MB diskette drive in the front of the enclosure. These bays can be used for the installation of SCSI half-height or full-height tape drives, if desired.

1.6 Keyboard

There are no service procedures for the keyboard other than replacement.

1.7 Mouse

Service procedures for the mouse are limited to cleaning the mouse ball and tracking mechanism. Refer to the documentation supplied with the mouse.

2
System Troubleshooting

2.1 Introduction

This chapter describes troubleshooting of the applicationDEC 400*x*P system. It contains the following sections:

- Diagnostic tools
- Power-on self-test
- Setup utility
- Run-time error messages
- Troubleshooting

2.2 Diagnostic Tools

Table 2–1 lists the diagnostic tools required to service the applicationDEC 400*x*P system.

Table 2–1 Diagnostic Tools

Tool	Part Number	Description
System Configuration Utility Diskette (APPLICATIONDEC 400 XP SYS 2.0)	AK-PNHPA-CA	This utility is used to reconfigure the system when options are installed.
Library Diskette (LIBRARY DISK OF ISA CFG FILES)	AK-PLADB-CA	Library of ISA configuration files used to reconfigure the system when ISA options are installed.
applicationDEC System Exerciser diagnostics diskette (APPLICATIONDEC SYSX 4.0)	AK-PGF7D-CA	Standalone system diagnostic diskette. (See Chapter 3).
Loopback, 9-pin serial port	FD-10164-00	External loopback test connector.

2.3 Power-On Self-Test

Before the applicationDEC 400*x*P system can be used, all components must be initialized and tested, and the operating system must be loaded into memory. The BIOS that is stored in ROM controls this sequence of actions. A portion of the BIOS contains a power-on self-test (POST). POST is responsible for initializing and testing system components each time power is applied or when the system boots. The remainder of the BIOS loads the operating system and specific applications.

Each time you turn on the system, POST displays a numeric countdown (880 to 000) sequence as it tests the system board, Intel 486, system board timers and logic devices, keyboard, memory, and so on. POST countdown numbers 800 through 520 are not displayed on the monitor, but are represented as beep codes (see Section 2.3.5).

The power-on self-tests are divided into two types of tests: system board hardware and peripheral hardware. The following sections describe these tests as well as the POST sequence and POST messages.

2.3.1 System Board Hardware Tests

Post checks the system board hardware first. If any of these tests fails, a fatal error condition exists and further testing and initialization is not possible. You are notified that an error condition exists by an error message displayed on the monitor or by beeps from the system speaker. Refer to Section 2.3.4 for descriptions of the POST messages and Section 2.3.5 for more on the beep codes. The following list of the system hardware tests shows the order of execution:

CPU
ROM BIOS (checksum)
Programmable interrupt timer (PIT)
Base 64 KB DRAM
CMOS RAM
EISA devices
DMA controller
Programmable interrupt controller (PIC)
Video controller
Keyboard controller
Real-time clock

2.3.2 Peripheral Hardware Tests

The first peripheral hardware test procedure verifies that the system configuration data stored in CMOS RAM matches the hardware present. Then, the procedures continue to test and initialize other peripheral hardware. This testing includes memory on the system board and, if one is installed, the memory module. A test failure generally results in an error message on the monitor screen. The following list of the peripheral hardware tests shows the order of execution:

ISA CMOS RAM and EISA nonvolatile (FLASH) memory configuration data
Serial/parallel interface circuitry
Video
Keyboard
RAM memory above 64 KB
Coprocessor
Diskette drive controller
Hard disk controller
Option ROMs, such as SCSI and LAN
Intel 486 CPU internal cache memory

2.3.3 POST Sequence

While POST is running, a numeric countdown (800 to 000) is displayed on the monitor.

Note

During the POST memory test, the amount of memory being tested is displayed on the screen. Depending on the amount of extended memory installed, the POST memory test can take several minutes to complete. POST does not check memory after a soft boot.

The POST message displayed may take one of two forms, depending on whether POST detected any configuration errors. Examples follow.

If POST does not detect any configuration errors, the system beeps once and displays a message similar to the following:

```
PhoenixBIOS (TM) E486 Version x.xx.xx.xxx
Copyright (c) 1985-1991 Phoenix Technologies Ltd.
All Rights Reserved
. . .

  640K Base Memory

03072K Extended

000

To continue press:.............................SPACEBAR
To configure system press:.....................F1
```

Note

After the above message appears, you have approximately 10 seconds to press the appropriate function key to display the initial setup screen. If you do not press the appropriate function key within the specified time, and if POST failed to detect any configuration errors, the system will continue with the boot sequence.

If configuration errors are found, the system beeps more than once and displays a message similar to the following:

```
PhoenixBIOS (TM) E486 Version x.xx.xx.xxx
Copyright (c) 1985-1991 Phoenix Technologies Ltd.
All Rights Reserved
. . .

  640K Base Memory

03072K Extended

150: Invalid configuration information

To continue press:.................................Esc
To configure system press:.....................F1
```

It is normal for the above message to appear the first time you start the system. Run the system configuration utility (SCU) to create a valid system configuration. If any other error messages appear on the screen, refer to Section 2.3.4 for decriptions and solutions.

2.3.4 POST and Boot Messages

POST displays messages to alert you to errors in hardware, software, and firmware. It also displays information about your system.

During POST, the system board speaker beeps to alert you to specific POST steps. Two beeps signal the start of the time during which you can enter setup. Another beep signals the end of that time, and then a subsequent beep signals that a system boot has begun.

If an error occurs during POST, the countdown is stopped. If an error occurs before the monitor is initialized, specific beep codes sound to alert you to a problem. If an error occurs after the monitor is initialized, both the POST number and the error message are displayed on the monitor.

Table 2–2 lists POST and boot messages by number.

Table 2–2 POST and Boot Messages

POST No.	Error Name	Description	Solution
880	POST starts		
860	Set processor speed for POST		
850	Chipset initialization 2		
840	Chipset initialization 3		
830	CPU register test		
820	8742 initialization		
810	Real-time clock RAM and register test	Real-time clock RAM and register test failure	Replace the real-time clock chip.
800	System BIOS checksum test	System BIOS checksum failure	Replace the system board.
790	Initialize programmable interval timer	Programmable interval timer failure	Replace the system board.
780	DMA channel test	DMA channel failure	Replace the system board.
770	DMA page register test	DMA page register failure	Replace the system board.
760	Verify RAM refresh test	RAM refresh failure	Replace the system board.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
759		First 64 KB RAM parity test failure	Memory has failed. Run SYSEX. Replace any failed SIMM.
758		First 64 KB RAM address line failure	Memory has failed. Run SYSEX. Replace any failed SIMM.
757		First 64 KB RAM odd/even logic failure	Memory has failed. Run SYSEX. Replace any failed SIMM.
756		First 64 KB RAM chip or data line failure, multibit	Memory has failed. Run SYSEX. Replace any failed SIMM.
755–740		First 64 KB RAM chip or data line failure, bit 0–15	Memory has failed. Run SYSEX. Replace any failed SIMM.
730	Initialize stack		
710	Initialize keyboard buffer		
700	Chipset initialization 4	Shadow of on-board BIOS failed	Memory has failed. Run SYSEX. Replace any failed SIMM.
692		Extended CMOS checksum failure	See 690.
691		CMOS checksum failure	See 690.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
690	CMOS checksum test	CMOS power failure	The configuration information stored in CMOS does not agree with your hardware configuration. Run the SCU to verify configuration. Reboot system.
680	Initialize EISA slots		
670	Initialize serial ports		
660	Initialize parallel ports		
655	DMA register test (slave)	DMA register failure (slave)	Replace the system board.
650	DMA register test (master)	DMA register failure (master)	Replace the system board.
645	Programmable interrupt controller register test (master)	Programmable interrupt controller register failure (master)	Replace the system board.
640	Programmable interrupt controller register test (slave)	Programmable interrupt controller register failure (slave)	Replace the system board.
620	Initialize interrupt vector table		
610	Enable timer tick interrupt		
600	Initialize keyboard controller	Keyboard controller failure	Replace the system board.
590	Check video configuration		
580	Search for video ROM		
570	Initialize video controller		
560	Using alternate video controller	Primary display adapter failed, using alternate	Replace the system board.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
540	Scan and initialize video ROM		
530	Verify video configuration		
520	Initialize console redirection		
500	Display sign on message		
490	Timer tick interrupt test	No timer tick interrupt	Replace the system board.
480	Shutdown test	Shutdown failure	Replace the system board.
461		Software port NMI failure	Replace the system board.
460	EISA extended devices test	Fail safe timer NMI failure	Replace the system board.
450	Chipset initialization 6		
441		Unexpected interrupt in protected mode	The computer received an interrupt while in protected mode (probably while testing memory). If the problem persists, replace the system board.
440	Size memory above 64 KB	Gate A20 failure	The computer cannot switch into protected mode. Replace the system board.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
430	Interval timer 2 test	Timer 2 failure	The integrated system peripheral (ISP) chip on the system board might have failed. If the problem persists, replace the system board.
390	Initialize keyboard flags		
374		Keyboard failure	Replace keyboard.
373		Keyboard stuck key failure	One or more of the keys was pressed. Release the key or keys and try again. If the problem persists, replace the keyboard.
372		Keyboard data line failure	See 371.
371		Keyboard clock line failure	The keyboard or the keyboard cable connection has failed. Check the keyboard connection. If the connection is good, the keyboard might have failed. Try another keyboard. If the problem persists, replace the system board.
370	Test keyboard	Keyboard controller failure	Replace the system board.
350	Reinitialize keyboard controller		
330	Initialize auxiliary device		

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
310	Initialize keyboard controller output port		
300	Initialize gate A20		
297		Decreasing available memory	This message immediately follows any memory error message informing you that memory modules are failing. Check that all SIMMs are installed correctly.
296		Memory write/read failure at XXXX–YYYY, read QQQQ expecting ZZZZ	See 292.
295		Memory address line failure at XXXX–YYYY, read QQQQ expecting ZZZZ	See 292.
294		Memory high address failure at XXXX–0000 to XXXX–FFFF	See 292.
293		Memory double word logic failure at XXXX–0000 to XXXX–FFFF	See 292.
292		Memory odd/even logic failure at XXXX–0000 to XXXX–FFFF	One of the SIMMs or associated circuitry has failed. Run SYSEX to check for failed SIMM and replace if necessary. If the message repeats, replace the system board or memory expansion module, if applicable.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
291		Memory data line failure at XXXX–0000 to XXXX–FFFF	See 290.
290	Test memory above 64 KB	Memory parity failure at XXXX–0000 to XXXX–FFFF	One of the SIMMs or associated circuitry has failed. Run SYSEX to check for failed SIMM and replace if necessary. If the message repeats, replace the system board or memory expansion module, if applicable.
270	Initialize extended BIOS data area		
250	Chipset initialization 7		
230	Enable hardware interrupts		
210	Read keyboard ID		
190	Real-time clock test	Real-time clock failure	The internal battery for the clock is probably dead. Replace the real-time clock. If the problem persists, replace the system board.
160	Coprocessor test	Coprocessor failed	The coprocessor failed or is missing.
150	Check for invalid configuration		Run the SCU.
140	Chipset initialization 8		
132		Diskette drive 1 failure	See 131.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
131		Diskette drive 0 failure	Drive 0 has either failed or is missing. Verify the settings for drive 0 using the BIOS Setup Utility. Make sure drive 0 is present and the diskette is inserted properly. If it is, drive 0 might have failed.
130	Initialize diskette subsystem	Diskette drive failure	Drive has either failed or is missing. Verify the drive settings using the BIOS Setup Utility. Make sure drive is present and the diskette is inserted properly. If they are, drive might have failed.
122		Hard drive 0 failure	See 120 and 121.
121		Hard drive controller failure	See 120. Check both ends of the controller's cables. Replace hard drive controller.
120	Initialize hard drive subsystem	Hard drive configuration error	Check the system configuration and drive type by running the SCU.
110	Chipset initialization 9		
101		Shadow of off-board video BIOS aborted, no video ROM found	Run the SCU and turn off video BIOS shadow.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
100	Shadow ROMs	Shadow of off-board video BIOS failed	The video controller board might have failed. Check that it is installed correctly. Run the SCU. Also, see 700.
090	Enable cache	Internal cache test failed, cache disabled	Cache failed. Replace the CPU module.
080	Initialize option ROMs	XXXX0h optional ROM bad checksum=YYh	Expansion board configuration error. Run the SCU.
070	Set system clock	Time of day clock not set	Run the SCU.
060	Check for electrical keylock	Keyboard is locked, please unlock	Unlock the keyboard.
043		Invalid EISA configuration information	An EISA board has not been properly configured. Run the SCU and verify all settings. Make sure that an EISA CFG file has been installed for the module.
042		Invalid ISA configuration information	An ISA board has not been properly configured. Run the SCU and check switch and jumper settings. Make sure that an ISA CFG file has been installed for the module.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
041		ID mismatch error, slot X	(A) The board in slot X is bad and returns a bad ID. (B) The board ID does not match the ID that the SCU expects for slot X. The mismatch is due to either the wrong board in the slot or the wrong configuration file for the board. Run the SCU to configure slot X, or replace the bad board.
040	Report configuration errors and prompt for configuration utility	Configuration error, slot X	Run the SCU for the board in slot X.
020	Enable parity checking and NMI		
004		No boot sector on hard drive	The hard disk drive is not formatted as a bootable disk. Format the drive.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
003		Hard drive read failure	The hard disk drive has failed. Check the system configuration and drive type by running the SCU. Check both ends of the controller's cables, and reseat the hard disk controller board. Try another hard disk drive. If the problem persists, replace the hard disk controller.
002		No boot device available	If booting from a diskette, it is a nonbootable type or the diskette drive has failed. If booting from a hard disk drive, it might not be formatted or the drive might have failed. The problem might also be the SCSI controller board. Make sure the diskette in drive A contains an operating system. If applicable, make sure the hard disk drive contains an operating system.

(continued on next page)

Table 2–2 (Cont.) POST and Boot Messages

POST No.	Error Name	Description	Solution
001		Not a bootable diskette	The diskette in drive A is not formatted as a bootable diskette. Replace the diskette with a bootable diskette and try again.
000	Boot	Diskette read failure	No diskette in drive A. Insert a diskette and try again.

2.3.5 Beep Codes

If POST finds an error and cannot display a message, the system board speaker beeps to indicate the error and places a value in I/O port 80h. For example, a failure of bit 3 in the first 64 KB of DRAM is indicated by a 2-1-4 beep code (a burst of two beeps, a single beep, and a burst of four beeps).

Tables 2–3 and 2–4 list the beep codes and the values POST writes to I/O port 80h when it encounters an error. Table 2–3 lists fatal errors (errors that lock the computer), and Table 2–4 lists nonfatal errors (errors that do not lock the computer).

One beep code is not listed in either table: a long beep followed by one or more short beeps. This beep code indicates a video controller failure.

Table 2–3 Beep Codes for Fatal Errors

Beep Code	Error Message	Port 80h
1-1-3	Real-time clock write/read failure	02h
1-1-4	ROM BIOS checksum failure	03h
1-2-1	Programmable interval timer failure	04h
1-2-2	DMA initialization failure	05h
1-2-3	DMA page register write/read failure	06h
1-3-1	DRAM refresh verification failure	08h

(continued on next page)

Table 2–3 (Cont.) Beep Codes for Fatal Errors

Beep Code	Error Message	Port 80h
1-3-3	1st 64 KB DRAM chip or data line failure	0Ah
1-3-4	1st 64 KB DRAM odd/even logic failure	0Bh
1-4-1	1st 64 KB DRAM address line failure	0Ch
1-4-2	1st 64 KB DRAM parity test in-progress failure	0Dh
2-1-1	Bit 0 1st 64 KB DRAM failure	10h
2-1-2	Bit 1 1st 64 KB DRAM failure	11h
2-1-3	Bit 2 1st 64 KB DRAM failure	12h
2-1-4	Bit 3 1st 64 KB DRAM failure	13h
2-2-1	Bit 4 1st 64 KB DRAM failure	14h
2-2-2	Bit 5 1st 64 KB DRAM failure	15h
2-2-3	Bit 6 1st 64 KB DRAM failure	16h
2-2-4	Bit 7 1st 64 KB DRAM failure	17h
2-3-1	Bit 8 1st 64 KB DRAM failure	18h
2-3-2	Bit 9 1st 64 KB DRAM failure	19h
2-3-3	Bit A 1st 64 KB DRAM failure	1Ah
2-3-4	Bit B 1st 64 KB DRAM failure	1Bh
2-4-1	Bit C 1st 64 KB DRAM failure	1Ch
2-4-2	Bit D 1st 64 KB DRAM failure	1Dh
2-4-3	Bit E 1st 64 KB DRAM failure	1Eh
2-4-4	Bit F 1st 64 KB DRAM failure	1Fh
3-1-1	Slave DMA register failure	20h
3-1-2	Master DMA register failure	21h
3-1-3	Master interrupt mask register failure	22h
3-1-4	Slave interrupt mask register failure	23h
3-2-4	Keyboard/mouse controller test failure	27h

Table 2–4 Beep Codes for Nonfatal Errors

Beep Code	Error Message	Port 80h
3-3-4	Screen memory test failure	2Bh
3-4-1	Screen initialization failure	2Ch
3-4-2	Screen retrace test failure	2Dh

2.4 Setup Utility

The system BIOS also contains a setup utility that enables you to change configuration settings that are stored in CMOS RAM. BIOS setup options are the same as those provided in the "Configure computer" option of the SCU, with the exception of password. For information on configuring the system with the SCU, refer to Chapter 5.

To run the setup utility, wait for POST to complete. Then, press the appropriate function key to display the following initial setup screen:

```
                    **** NOTE ****

Since values specified using the BIOS Setup Utility will be overwritten when
the system configuration utility (SCU) is run, it is recommended that the BIOS
Setup Utility be used only if you:

o   Need to enable your diskette drive
o   Do not have access to a diskette drive
o   Have only ISA expansion boards and will not be using the SCU

To exit setup press ESC. To continue setup press F1.
```

Note

Always use the SCU to configure the system. Do not use setup to configure the system. Setup is used primarily to enable the diskette drive.

2.5 Run-Time Error Messages

Run-time error messages are displayed on the monitor if an error occurs after the system boots. Table 2–5 lists the run-time error messages by number.

Table 2–5 Run-Time Error Messages

POST No.	Message	Solution
988	Software NMI	
987	Bus timeout NMI, slot X	
986	Unresolved bus timeout NMI	See 985.
985	Fail safe timeout NMI	Expansion board malfunction. Replace defective board.
984	Expansion board disabled	Configuration error or malfunctioning expansion board. Run the SCU and verify settings.
983	Unresolved I/O expansion board NMI	See 982. Slot is unknown.
982	I/O expansion board NMI, slot X	Malfunction or configuration error for expansion board in slot X. Run the SCU and verify settings.
981	Memory parity error at XXXX–YYYY	See 980.
980	Unresolved memory parity error	Computer DRAM has failed. Replace any failed SIMM.
971	Unexpected hardware interrupt	This could be any hardware-related problem. Check all cables, connections, jumpers, and boards.
970	Unexpected software interrupt	There is an error in a software utility. Try turning the system off and then on again.

2.6 Troubleshooting

Follow this general procedure to troubleshoot the system.

1. Press the reset button on the front panel. If your system fails to boot, turn it off, wait 20 seconds, and then turn it back on.
2. Check for non-bootable diskette in A: (drive A).
3. Check for loose cables and connections.
4. Check the system and monitor indicator lights.

5. Observe any POST messages. Refer to Section 2.3.4, POST and Boot Messages, take the appropriate steps to correct the problem, and then reset the computer.
6. Run the SCU and make sure the system is configured correctly for the installed hardware and software. For information on configuring the system with the SCU, refer to Chapter 5.
7. Run the applicationDEC system exerciser (SYSEX). SYSEX tests each system unit simultaneously with peripheral and communication transfers to detect interactive errors. For further information on testing the system with SYSEX, refer to Chapter 3.
8. Contact Digital Customer Services for software or hardware problems.
9. Package the failed component in the original container and return it to Digital for service.

Tables 2–6 through 2–8 help you to identify and solve system, disk drive, and monitor problems.

Table 2–6 System Troubleshooting

Problem	Possible Cause	Action
No response when the system is turned on	System is not plugged in	Turn off the system, plug it in, and turn it on again.
	No power at the wall outlet	Use another wall outlet.
Power is on, but there is no monitor display	Monitor brightness and contrast controls are not properly set	Adjust the monitor brightness and contrast controls.
	Monitor is off	Turn on the monitor.
	Monitor cable is incorrectly installed	Check all monitor connections.
	Video expansion board failure	Make sure the video expansion board is properly installed and firmly seated.
System does not boot from an IDE hard disk drive	Operating system software is not installed on the IDE hard disk drive	Install the operating system on the hard disk.

(continued on next page)

Table 2–6 (Cont.) System Troubleshooting

Problem	Possible Cause	Action
	IDE hard disk drive is not properly formatted or the requested partition does not exist	Format the IDE hard disk drive or correctly partition the IDE hard disk drive using the supplied operating system software.
	There is no software on the requested partition	Install software on the requested partition.
	IDE hard disk drive jumpers incorrectly set	Refer to the supplied IDE hard disk drive kit installation instructions.
	IDE drive type incorrect	Run the SCU to identify the correct drive type.
	Loose cables	Check all cable connections.
System does not boot from a SCSI hard disk drive	Operating system software is not installed on the SCSI hard disk drive	Install the operating system.
	Requested partition does not exist	Partition the SCSI hard disk drive and then reload the operating system.
	SCSI hard disk drive jumpers incorrect	Refer to the supplied SCSI hard disk drive kit installation instructions.
	SCSI ID conflicts	Refer to the supplied SCSI hard disk drive kit installation instructions on setting SCSI IDs.
	Terminating resistors not removed from the SCSI hard disk drive	Remove terminating resistors. Refer to the supplied kit installation instructions.
	System not configured for SCSI hard disk operation	Run the SCU to configure the system for SCSI operation.
	IDE drive is configured in the system	Remove the IDE drive or install the boot software on the IDE drive.

(continued on next page)

Table 2–6 (Cont.) System Troubleshooting

Problem	Possible Cause	Action
System does not boot from a target diskette drive	Drive ID incorrectly set	Make sure the drive ID is correctly set.
	Diskette drive not enabled	Run setup utility to enable diskette drive.
	Diskette does not contain start-up files	Insert diskette with correct start-up files.
	Diskette drive is empty	Insert the diskette that contains an operating system.
	Diskette is worn or damaged	Try another diskette.
	Loose cables	Check all cable connections.
System will not boot from system configuration diskette	System configuration diskette faulty	Use another system configuration diskette.
No response to keyboard commands	Keyboard is password protected	Run the SCU to enter the keyboard password.
	Keyboard is not connected	Connect the keyboard.
	Keyboard is connected to the mouse port	Connect the keyboard to keyboard port.
	Keyboard is locked	Unlock the keyboard.

Table 2–7 Disk Drive Troubleshooting

Problem	Possible Cause	Action
IDE/SCSI hard disk drive cannot read or write information	Incorrect jumper settings	Refer to the supplied kit installation instructions.
	Loose or incorrectly installed cables	Make sure all cables are correctly installed.
	IDE/SCSI hard disk drive is not properly formatted or partitioned	Format and partition as required using the supplied operating system.
	IDE drive type incorrect	Run the SCU to identify the correct drive type.
	System not configured for SCSI hard disk operation	Run the SCU to configure the system for SCSI operation.
Target diskette drive cannot read or write information	Diskette is not formatted	Format the diskette.
	Diskette is worn or damaged	Try another diskette.
	Diskette is write-protected	Slide the write-protect switch so the hole is not visible (3.5-inch diskette) or uncover the write-protect notch (5.25-inch diskette).
	Diskette drive is empty	Insert a diskette.

Table 2–8 Monitor Troubleshooting

Problem	Possible Cause	Action
Monitor power indicator is not on	Monitor is turned off	Turn on the monitor.
	Power cord is not connected	Connect the power cord to the system.
	No power at wall outlet	Use another outlet.
	Power indicator is defective	Replace monitor.
No monitor display	Configuration error	Check video board cabling and jumper settings.
	Monitor brightness and contrast controls are not properly set	Adjust the monitor brightness and contrast controls.
Distorted, rolling, or flickering screen display, or wrong/uneven color	Monitor incorrectly adjusted	Adjust accordingly.
	Monitor signal cable incorrectly installed	Straighten any bent connector pins and then reseat.
Color monitor displaying monochrome	System was turned on before the monitor was turned on	Turn off the system and monitor, turn on the monitor, and then turn the system on.

3

System Exerciser

3.1 Overview

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

Note

Version 4.0 or higher of the applicationDEC System Exerciser is required for use with the applicationDEC 400*x*P system.

SYSEX verifies the following:

- System motherboard logic
- Memory expansion module
- Serial port (COM1, COM2) logic
- Parallel port (LPT1) logic
- Terminal multiplexer module
- EtherWORKS Turbo Ethernet controller
- 3.5-inch diskette drive
- 5.25-inch diskette drive
- 2.2 GB helical 8 mm tape drive (TKZ08)
- 320/525 MB QIC tape drive (TZK10)

- Digital hard disk drives:

  209 MB disk drive (RZ24)
  426 MB disk drive (RZ25)
  665 MB disk drive (RZ56)
  852 MB disk drive (RZ35)
  1.0 GB disk drive (RZ57)
  1.3 GB disk drive (RZ58)

You can run the system exerciser two ways:

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

Press Ctrl/C to halt SYSEX at any time.

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

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

You can dedicate CPU resources to specified tests by blocking unwanted tests. Section 3.9.1 provides information on how to block tests.

3.2 Loading the System Exerciser

Load the system exerciser as follows:

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

If a bad checksum message is displayed, see Section 3.4.

3.3 Running the System Exerciser

Note

Before you run SYSEX, verify the system configuration with the system configuration utility (SCU). For information on configuring the system with the SCU, refer to Chapter 5.

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

```
03/12/92 15:00:08   applicationDEC System Exerciser Rev 4.0  400xP    0000:00:00
        applicationDEC System Exerciser    Rev 4.0     03/01/92

applicationDEC 400xP

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Verifying program loaded correctly

System Configuration:
Slot            Type
====            ====
0               33MHz Viceroy Motherboard
0               0 KB  Secondary Cache
0               16MB  Memory

EISA slot configuration:
Slot  IRQ  Ports        Type
====  ===  =====        ====
0      6   3F0-3F7      Floppy controller
0      7   378-37B      Parallel port, LPT1
0      4   3F8-3FF      Serial port, COM1
0      3   2F8-2FF      Serial port, COM2
0                       Video Adapter (80x25 color)
1     10   D0000        8x4 Mux
3     11   330-332      Adaptec 1540B, firmware rev = 05
2      5   300-30C      DE200 Ethernet, Node addr = 08-00-2B-27-73-31

Load scratch media into all drives to be tested in write-read mode
Hit any key to continue
```

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

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

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

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

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

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

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

```
BUS Configuration:
Slot  ID  LUN    Device   Type              Rev    Selection
0      0    *     Disk     RX23/1.44M               Protected
0      1    *     Disk     RX33/1.2M                Read only
3      0    0     Disk     RZ25     (C) DEC  0700   Read only
3      1    0     Disk     RZ24     (C) DEC  211B   Read only
```

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

```
Loopback Selection. Hit SPACE to enable external loopback, ENTER to disable.
1       D0000   8x4 Mux                A-C disabled    B-D disabled

00              COMM1                     disabled
00              COMM2                     disabled
00              LPT1                      disabled
```

Note

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

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

If loopback testing is enabled, loopback connectors must be installed on the enabled ports (8x4 mux, serial port 1, serial port 2, parallel port) or the related tests will fail.

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

```
Scheduled tests:

Test    Name                  Rev
====    ====                  ===
 1.     Memory                 1
 2.     Memory Retention       1
 3.     Numeric                0
 4.     Serial Line   (COM1)   2
 5.     Serial Line   (COM2)   2
 6.     Motherboard   [Slot 0] 2
 7.     Parallel Port (LPT1)   1
 8.     Console                1
 9.     SCSI Disk  3:0:0       1
10.     SCSI Disk  3:1:0       1
11.     Floppy Disk  0:0       1
12.     Floppy Disk  0:1       1
13.     8x4 Mux      [Slot 11] 2
14.     Ethernet/2   (DE200)   0

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

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

```
HLT> ivp Enter
```

You can run the IVP for less than the full 15 minutes by specifying a number of minutes in the **ivp** command. The following command specifies 5 minutes:

```
HLT> ivp 5 Enter
```

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

```
Installation Verification Procedure Running
```

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

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

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

If an error is detected, an error report is displayed immediately and the IVP is aborted. See Section 3.5 for details on how to interpret the error report.

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

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

3.4 Loading Failure

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

```
Verifying program loaded correctly
```

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

1. Reload the diskette.
2. Reboot. If this fails to correct the loading failure, try a different SYSEX diskette in case the first diskette is bad.
3. If this load also fails, check for failed memory or a bad load path. A bad load path occurs when either the diskette drive itself is bad or the cable to the diskette drive is bad. Section 4.9 provides information on replacing memory modules.
4. Run the POST tests again for possible further information.

3.5 Error Reports

If SYSEX detects an error condition or a failed FRU, an error report is displayed on the monitor and written to the error log. By default, SYSEX stops execution when an error is detected. (Information in the error log can be displayed using the **log** command.)

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

- For modules, the slot number indicates the module which has failed.
- For SIMM failures, the socket number of the failed SIMM is indicated.
- For SCSI storage devices, the bus ID and logical unit number of the device is indicated. Also, the slot number of the associated adapter is identified. SCSI devices controlled by an ISA SCSI adapter or an EISA SCSI adapter are identified by the slot number of the adapter.

The following SYSEX error report shows that the loopback plug was found missing during external loopback testing of serial port 1 (COM1):

```
    applicationDEC System Exerciser  Rev: 4.0  03/01/92  (400xP)

Current time = 03/12/92   15:50:06              Elapsed time = 2:41:58
Test # 4        Serial Line   (COM1)   2        Subtest # 3
Passes 1828     Errors 1        Task # 3        Processor # 0   Slot: 0

FRU = slot 0  Serial Port, loopback plug

Registers at time of error:
eax = 44E924FE  ebx = 44E9245F  ecx = 0000FF04  edx = 000003F8
esi = 00001000  edi = 0000005F      Error address = 33F
Current UART registers:
LCR = 3B    MCR = 18    LSR = 60    MSR = 8A    DL = 11F

Test: External loopback (xmit -> rcvr)
        Interrupt wait elapsed, outstanding interrupts = 9.

Transmit string, length = 9.
CC AC 7E 78 75 0C 38 C2 29

Receive string, length = 0.
```

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

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

Before replacing a FRU identified by SYSEX:

1. Make sure that the module in the designated slot is the correct module for the slot.
2. Make sure that all switches and jumpers are set correctly on the module.
3. Check any cable connections.
4. Reseat modules installed in the EISA bus slots.

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

3.6 Test Descriptions

Table 3–1 describes the system exerciser tests.

Table 3–1 System Exerciser Tests

Name	Description
Memory	Write/read main memory.
Memory retention	Memory refresh circuitry.
Numeric	CPU floating point.
Motherboard	System motherboard logic.
Console	Writes test patterns to the console for visual verification.
Terminal multiplexer	Internal/external data loopback and registers.
Serial port (COM1, COM2)	Internal/external data loopback and registers.
Parallel port (LPT1)	Internal/external data loopback and registers.
Floppy	Write/read (destructive) or read-only (nondestructive) verification. User selectable. Requires that diskette be installed in device.
Ethernet	Send, receive, and verify messages internally and with other network nodes.
SCSI disk	Write/read (destructive) or read-only (nondestructive) verification. User selectable.
SCSI tape	Write/read verification. Requires that tape cartridge be installed in device.

3.7 Modes

The system exerciser has two modes. The modes are described in Table 3–2.

Table 3–2 System Exerciser Modes

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

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

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

3.8 Flags

You can set flags to control whether:

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

Flags are set with the **flag** command. Table 3–3 describes the SYSEX flags.

Table 3–3 System Exerciser Flags

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

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

```
HLT> flag on long Enter
```

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

3.9 Commands

Table 3–4 lists the system exerciser commands. The commands are not case sensitive and may be abbreviated.

Table 3–4 System Exerciser Commands

Command	Description
B[lock]	Prevent specified tests from running.
B[lock] {no argument}	Display all tests that are currently blocked from running.
Cac[he]	Set internal processor cache state (enabled or disabled).
Cac[he] {no argument}	Display current state (enabled or disabled) of the internal processor cache.
Cal[culate]	Make a calculation in one of three radices: decimal, octal, or hexadecimal. Hexadecimal is the default radix.
Co[nfiguration]	Display the configuration of the system.
Ctrl/C	Halt testing; return to the halt mode prompt.
De[vices]	Display or modify the flag state of devices under test.
De[vices] {no argument}	Display a list of the supported devices.
Di[splay]	Display the data at specified locations in memory.
E[xamine]	Examine the data at a specified location in memory. You can also deposit data at the specified location in memory.
F[lags]	Modify the flag settings.
F[lags] {no argument}	Display the state of all flags (on or off).
G[o]	Set and run until a breakpoint.
H[elp]	Obtain information on any command.
H[elp] {no argument}	Display a list of all system exerciser commands.
Is[tep]	Execute individual instruction(s) while in debug mode.
Ivp	Run the installation verification procedure.

(continued on next page)

Table 3–4 (Cont.) System Exerciser Commands

Command	Description
L[og]	Play back or delete previous error reports or write error reports to a DOS diskette.
Q[uit] or Ctrl/Alt/Delete	Stop all tests and reboot the system.
R[un]	Begin or resume testing (change from halt mode to run mode).
Se[t]	Set or display the values of state variables.
Se[t] {no argument}	Display a list of all state variables.
Sh[ow]	Show a machine state.
Sh[ow] {no argument}	Display a list of all available machine states that can be shown.
St[atus] or Ctrl/T	Display which tests are running, whether they are blocked, and how many test passes have been made.
T[ime]	Display current date and time and elapsed test time.
U[nblock]	Allow tests that have been blocked to resume running.
U[nblock] {no argument}	Display all tests that are currently unblocked.

3.9.1 Block

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

Format: BLOCK [option_argument]

Table 3–5 describes the options that you can use with the **block** command.

Table 3–5 Block Command Options

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

For example, to block test 1:

```
RUN> block 1 Enter
```

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

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

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

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

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

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

3.9.2 Cache

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

Format: CACHE [enable,disable]

If no argument is given, the **cache** command displays the current state of the cache.

```
RUN> cache disable Enter
```

3.9.3 Calculate

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

Format: CALCULATE[/radix] argument_list

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

- Octal
- Decimal
- Hexadecimal (default)

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

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

Table 3–6 describes the qualifiers that you use to set the default radix for all numbers in a calculation.

Table 3–6 Calculate Command Qualifiers

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

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

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

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

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

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

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

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

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

If you use more than one radix in a calculation, use the symbols shown in Table 3–7 to specify the radix of an individual number.

Table 3–7 Calculate Command Radix Symbols

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

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

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

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

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

The order of precedence is:

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

Use parentheses to change the order.

3.9.4 Configuration

The **configuration** command lets you display the same system and EISA bus configuration information that was displayed during initial SYSEX startup.

Format: CONFIGURATION

```
RUN> configuration Enter
```

3.9.5 Ctrl/C

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

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

3.9.6 Devices

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

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

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

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

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

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

The format of the /*n* modifier depends on the device type. Table 3–8 shows the format for each device type.

Table 3–8 Devices Command Formats

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

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

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

The /*n* modifier for the disk device type has the format x:y[:z], where x:y:z specifies the disk whose flag state should be displayed or modified. The disk number can be found in the test list. For example, **dev disk/0:0** specifies the RX23 diskette drive, and **dev disk/3:1:0** specifies a disk on the SCSI bus.

Table 3–9 shows the available state flags for supported devices.

Table 3–9 Devices Command State Flags

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

[1] Enabled runs test as read only.

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

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

[4] Versus external loopback.

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

3.9.7 Display

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

Format: DISPLAY[/mode] [address]

Data can be displayed in the following modes:

- Byte (default)
- Word
- Doubleword
- ASCII

To choose a display mode, use one of the **display** command qualifiers shown in Table 3–10.

Table 3–10 Display Command Qualifiers

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

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

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

```
HLT> display 32f Enter
0:8:32F 53

HLT> display 0:8:32f Enter
0:8:32F 53
```

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

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

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

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

3.9.8 Examine

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

Format: EXAMINE[/mode] [address]

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

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

You can examine the contents of memory as bytes, words, doublewords, or as ASCII by using the **examine** command qualifiers shown in Table 3–11.

Table 3–11 Examine Command Qualifiers

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

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

3.9.9 Flags

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

Format: FLAGS [flags_list]

See Section 3.8, Flags.

3.9.10 Go

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

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

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

3.9.11 Help

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

Format: HELP [command]

```
RUN> help display Enter
```

3.9.12 Istep

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

Format: ISTEP [n]

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

3.9.13 Installation Verification Procedure (IVP)

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

Format: IVP [test_time_in_minutes]

```
HLT> ivp Enter
```

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

```
Installation Verification Procedure Running
```

After 15 minutes (default time) of error-free operation, a success message is displayed, indicating that the system is functional. Then the HLT> prompt is reissued:

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

If an error is detected, an error report is displayed and the IVP is aborted. See Section 3.5 for details on how to interpret the error report.

If you wish to rerun the IVP, you must reboot the system exerciser or type **run** to continue running SYSEX tests, but without the 15-minute (default time) timeout.

3.9.14 Log

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

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

Table 3–12 describes options that can be used with the **log** command.

Table 3–12 Log Command Options

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

```
RUN> log Enter
```

Table 3–13 illustrates a typical log summary report.

Table 3–13 System Exerciser Error Log Report, Example

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

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

To review an error report from the log, use the **log play** command and specify the entry number of the error. For example, to review entry 0 from the sample report in Table 3–13:

```
RUN> log play 0 Enter
```

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

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

Note

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

To remove an error report from the log, use the **log clear** command and specify an entry number obtained from the error summary report. For example, to remove entry 0 from the sample report in Table 3–13:

```
RUN> log clear 0 Enter
```

Note

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

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

3.9.15 Quit

You can use the **quit** command to end a test run and reboot the system.

Format: QUIT

You can also use the key sequence Ctrl/Alt/Delete to duplicate the **quit** command.

3.9.16 Run

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

Format: RUN [test_time_in_minutes]

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

```
HLT> run Enter
RUN>
```

All unblocked tests begin executing immediately. Devices are tested concurrently. Testing continues until you press Ctrl/C or until an error is encountered while the halt flag is on. Section 3.8 provides information on how to use SYSEX flags.

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

3.9.17 Set

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

Format: SET [variable [value]]

Table 3–14 describes the available state variables that you can set or display.

Table 3–14 Set Command State Variables

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

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

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

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

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

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

```
HLT> set baud 9600 Enter
```

3.9.18 Show

The **show** command lets you examine the machine state. Table 3–15 describes the available machine states that you can examine.

Format: SHOW [machine_state]

Table 3–15 Show Command Machine States

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

3.9.19 Status

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

Format: STATUS [option]

The test statistics that you can display are:

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

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

```
RUN> status Enter
```

Table 3–16 lists the options for the **status** command.

Table 3–16 Status Command Options

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

[1]Device slot number.

3.9.20 Time

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

Format: TIME

```
RUN> time Enter
03/01/92 15:00:08   applicationDEC System Exerciser Rev 4.0  400xP    0000:07:32
```

3.9.21 Unblock

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

Format: UNBLOCK [argument_list]

Table 3–17 describes the options that can be used with the **unblock** command.

Table 3–17 Unblock Command Options

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

For example, to unblock test 1:

```
RUN> unblock 1 Enter
```

To unblock test 1 and test 3:

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

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

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

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

4

FRU Removal and Replacement

This chapter contains a list of field replaceable units (FRUs) and special diagnostics tools. It also contains information regarding electric shock and electrostatic discharge (ESD) that you should read before beginning any FRU removal and replacement procedure.

4.1 FRU Parts List

Table 4–1 lists the available FRUs for the applicationDEC 400*x*P system.

Many FRU replacement procedures require you to run the system configuration utility (SCU) to configure the system. For information on configuring the system with the SCU, refer to Chapter 5.

Table 4–1 Field Replaceable Units

Part Number	FRU	Order Number
	Base System Major Components	
30-37794-01	System board (EISA, 8-slot)	
54-21819-01	486/25 MHz CPU module (SX25)	PS2XK-AA
54-21821-01	486/33 MHz CPU module (DX33)	PS2XK-BA
54-21823-01	486/50 MHz CPU module (DX50)	PS2XK-CA
	Power supply (350 W)	H7882-AA
	US 101-key keyboard	PCXAL-AA
	3 button mouse (Logitech)	PCXAS-AA
17-00083-39	US power cord (125 V)	BN26J-1K
	14-inch color monitor (1024 x 768, 60 Hz)	VRT13-DA
RX23-AA	RX23 3.5-inch diskette drive (grey bezel)	

(continued on next page)

Table 4–1 (Cont.) Field Replaceable Units

Part Number	FRU	Order Number
	Options	
	International 102-key keyboard	PCXAL-*xx*
19-32971-01	64 KB cache card (for DX25, DX33)	PSWXM-AA
19-32971-02	128 KB cache card (for DX25, DX33)	PSWXM-AB
	512 KB video RAM kit	PSWXM-BA
	4 MB SIMM kit (2 x 2 MB, 80 ns)	PS2XM-AA
	8 MB SIMM kit (2 x 4 MB, 80 ns)	PS2XM-AB
	16 MB SIMM kit (2 x 8 MB, 80 ns)	PS2XM-AC
	32 MB SIMM kit (2 x 16 MB, 70 ns)	PS2XM-AD
	Memory expansion module	PS2XM-AE
	Terminal multiplexer kit	PC4XD-DA
29-28309-01	8-port terminal concentrator	PC4XD-DB
	EtherWORKS Turbo	DE200-AC
30-37789-01	Adaptec 1520 SCSI adapter	PSXAZ-AA
29-29052-01	Adaptec 1540B 16-bit SCSI adapter	PSXAZ-CA
30-37790-01	Adaptec 1740A SCSI adapter	PSXAZ-BA
30-24962-01	RX33 5.25-inch diskette drive	PS20R-FA
	105 MB IDE 3.5-inch hard disk drive	PC4XR-EB
	RZ24-S 209 MB SCSI 3.5-inch hard disk drive	PS20R-AA
	RZ25-S 426 MB SCSI 3.5-inch hard disk drive	PS20R-BA
	RZ35-E 852 MB SCSI 3.5-inch hard disk drive	PS20R-GA
	RZ56-E 665 MB SCSI 5.25-inch hard disk drive	PS20R-CA
	RZ57-E 1.0 GB SCSI 5.25-inch hard disk drive	PS20R-DA
	RZ58-E 1.38 GB SCSI 5.25-inch hard disk drive	PS20R-HA
TKZ08-AA	TKZ08 2.2 GB SCSI helical tape drive	
	TZK10-AA 320/525 MB SCSI QIC tape drive	PS20R-EA
30-34761-01	16-inch color monitor (1280 x 1024, multisync)	VRC16-DA
	Miscellaneous	
70-28293-01	Wire assembly, front panel	
70-28294-01	Wire assembly, DC switch	
12-22355-12	DC switch, DPST (on-none-off)[1]	
12-23609-11	4.5-inch fan, tube axial	
12-17119-01	Cabinet key	
29-26246-01	Field engineer ESD kit	
12-36175-01	Disposable ESD strap	

[1]The DC switch (12-22355-12) is part of the DC switch wire assembly (70-28294-01), but can be ordered and replaced separately. The switch is plastic and is connected with push-on terminals.

(continued on next page)

Table 4–1 (Cont.) Field Replaceable Units

Part Number	FRU	Order Number
	Miscellaneous	
74-43107-01	Shielding, driver	
70-28286-01	Stand assembly, plastic stabilizer	
74-43105-01	Opening insert, plastic	
74-43772-01	RX23 insert, plastic	
74-43102-01	Lower rear bezel, plastic	
74-42776-01	Upper rear bezel, plastic	
74-42785-01	Upper front bezel, plastic	
70-28259-01	Lower front bezel, plastic	
17-02985-02	Diskette drive internal cable assembly	
29-27912-01	IDE internal cable assembly (part of PC4XR-EB)	
70-28301-01	System power cable	
70-28273-02	SCSI internal cable assembly (includes 12-33816-01, SCSI terminator)	PSXAZ-DA
21-32423-01	Real-time clock chip (Dallas Semiconductor DS1287)	

4.2 Required Tools

The following tools are required to service the applicationDEC 400*x*P system:

- Phillips screwdriver
- Flat-blade screwdriver
- Antistatic wrist strap
- Needlenose pliers (for real-time clock disposal)
- Insulating tape (for real-time clock disposal)

4.3 Moving the System

To move the system, grasp the handle inside the front bezel (near the top of the system cabinet) and lift the front of the cabinet slightly. The system can then be moved by wheeling it on the rear wheels.

4.4 Before You Begin

Before you open the system cabinet, shut the system down and remove power:

Warning

Risk of electrical shock. Failure to disconnect the source of power before opening the system can result in personal injury.

Caution

Do not touch any logic component unless you are grounded. Grounding can be established by wearing a grounded wrist strap or by touching an exposed metal part of the system chassis. A static discharge from your fingers can result in permanent damage to logic components.

1. If the SCO UNIX System V operating system is being used, type **shutdown** on the system console. This command closes all open files and prepares hard disk drives and other hardware for loss of power.
2. Remove any diskettes from the diskette drives. (If you leave a diskette in the drive, the system will try to boot from the diskette drive when power is reapplied to the system.)
3. Turn the power switch to the Standby position.
4. Unplug the power cord from the wall socket.

Warning

You must unplug the power cord from the wall socket to ensure there is no electricity in the system.

4.5 Opening the System Cabinet

This section describes how to open the applicationDEC 400*x*P system cabinet to gain access to the internal components. Refer to Figure 4–1 and Table 4–2.

4.5.1 Removing the Top Cover and Side Panels

1. Shut the system down and unplug the power cord (Section 4.4).
2. Unlock the top cover by inserting the cabinet key and turning it fully to the left. This will pull the top cover toward the rear of the cabinet. Remove the cabinet key.
3. Push the cover toward the rear to free the front locking tabs. Remove the top cover by lifting it straight up.
4. Remove the side panels by lifting them up and away from the cabinet. The two side panels are identical.

Reverse the above procedure to replace the top cover and side panels.

Note

An arrow on the underside of the top cover points to the front.

4.5.2 Removing the Card Cage Cover

1. Shut the system down and unplug the power cord (Section 4.4).
2. Remove the top cover and left side panel using the procedure in Section 4.5.1.
3. Loosen the two screws on the right side of the card cage cover. Do not remove the screws.
4. Slide the cover to the right to clear the keyhole and remove the cover.

Reverse the above procedure to replace the card cage cover.

Figure 4–1 System Cover and Side Panel Removal

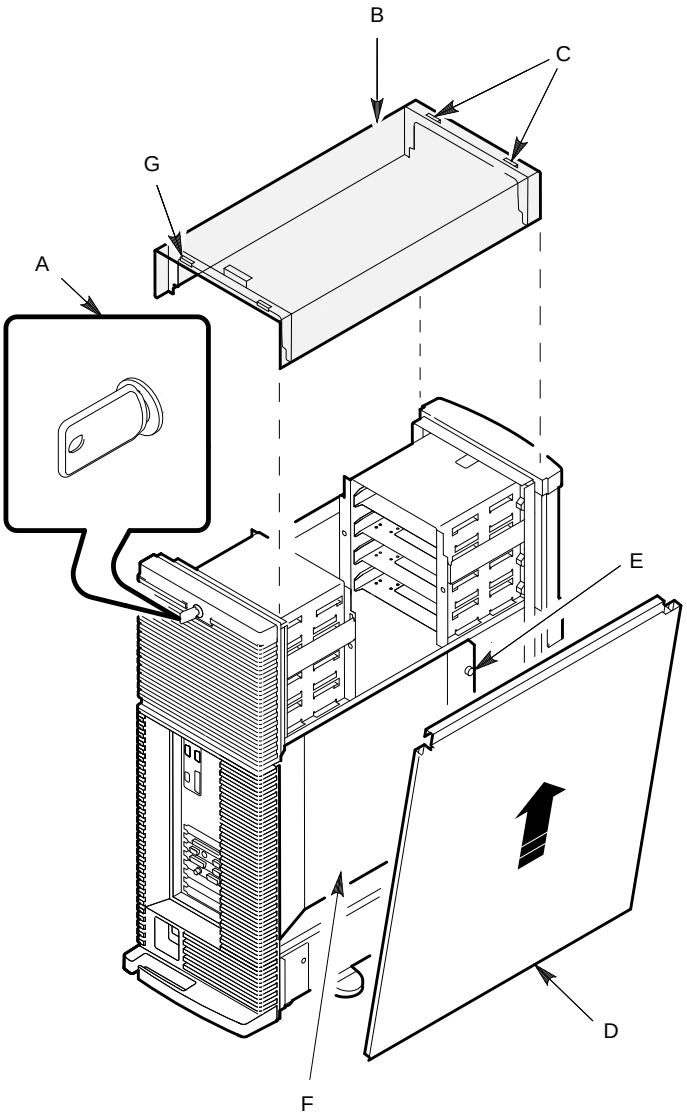

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Table 4–2 Key for Figure 4–1

Key	Description
A	Cabinet key
B	Top cover
C	Front locking tabs
D	Left side panel
E	Cover retaining screw
F	Card cage cover
G	Rear locking tabs

4.5.3 Removing the Bezels

The front (upper and lower) and rear (upper and lower) bezels are removed the same way. Each bezel has four flexible, wedge-shaped locking tabs that snap into matching cutouts on the system cabinet. There are no retaining screws.

The following steps describe the removal procedure for a bezel. See Figure 4–2 and Table 4–3.

1. Shut the system down and unplug the power cord (Section 4.4).
2. Remove the top cover and both side panels using the procedure in Section 4.5.1.
3. Reach behind the bezel and press the top two locking tabs to release them. While pressing the tabs, pull the top of the bezel away from the system chassis.
4. Similarly, reach behind the bezel and release the bottom two locking tabs. Remove the bezel.

Note

You may need to use a tool, such as a flat-blade screwdriver, to release some bezel locking tabs.

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

Figure 4–2 Bezel Removal

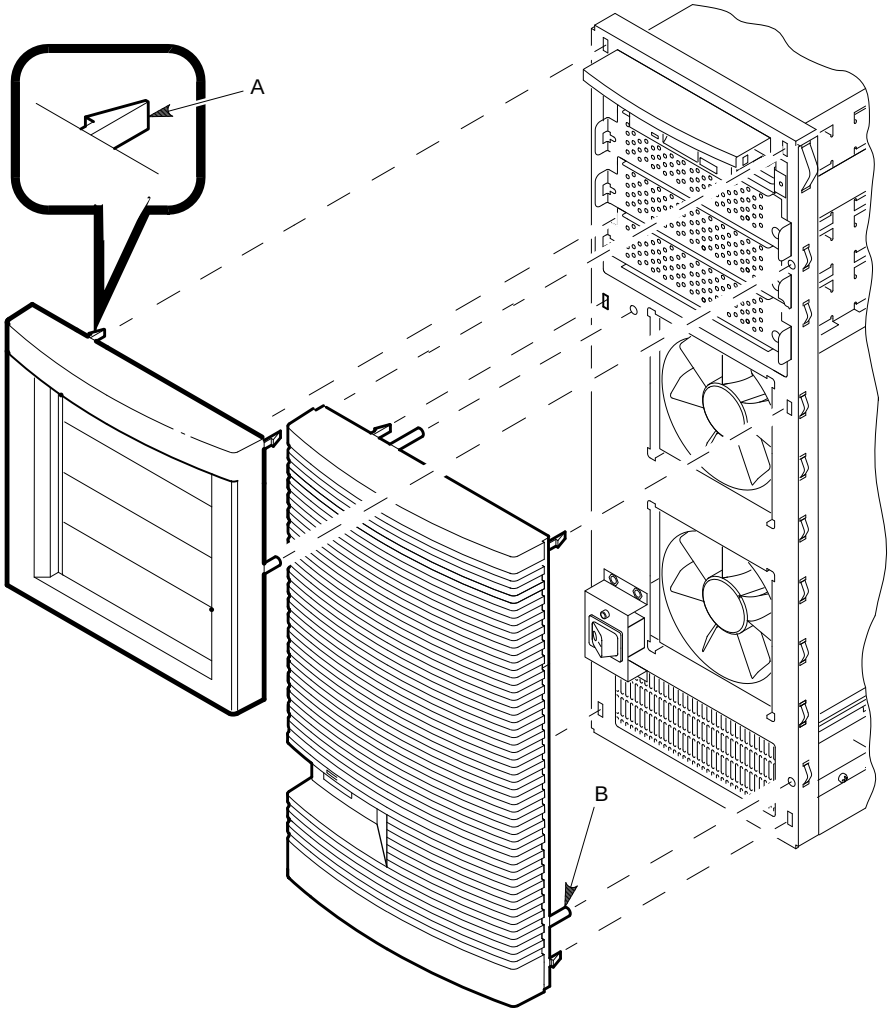

Table 4–3 Key for Figure 4–2

Key	Description
A	Locking tab (1 of 4)
B	Guide pin (1 of 2)

4.6 Replacing the CPU Module

The following steps describe the removal procedure for the CPU module. Refer to Figure 4–3 and Table 4–4 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the cabinet top cover, left side panel, and card cage cover using the procedures in Section 4.5.
3. Remove the screw on the left end of the CPU module retaining bar and slide the bar out of the slot on the right side. Save this screw.
4. Pull the CPU module from its slot and slide the module out of the card cage.
5. Place the module on an antistatic package, antistatic foam pad, or a grounded workstation surface.
6. Remove the replacement CPU module from its antistatic package and place it on an an antistatic package, antistatic foam pad, or a grounded workstation surface.
7. If you are replacing a 25 MHz (SX25) or 33 MHz (DX33) CPU module and an optional cache card is installed on the failed module:
   a. Remove the cache card and install it on the replacement CPU module using the procedure in Section 4.7.
   b. Ensure that the cache size jumper (J3) on the replacement module matches the position of the jumper on the failed module. Jumper J2 on the module is not used. Refer to Figure 4–4 and Table 4–5. Table 4–6 describes the jumper J3 positions.
8. Place the failed CPU module in an antistatic package.

Reverse the above procedure to install the replacement CPU module.

Figure 4–3 CPU Module Removal

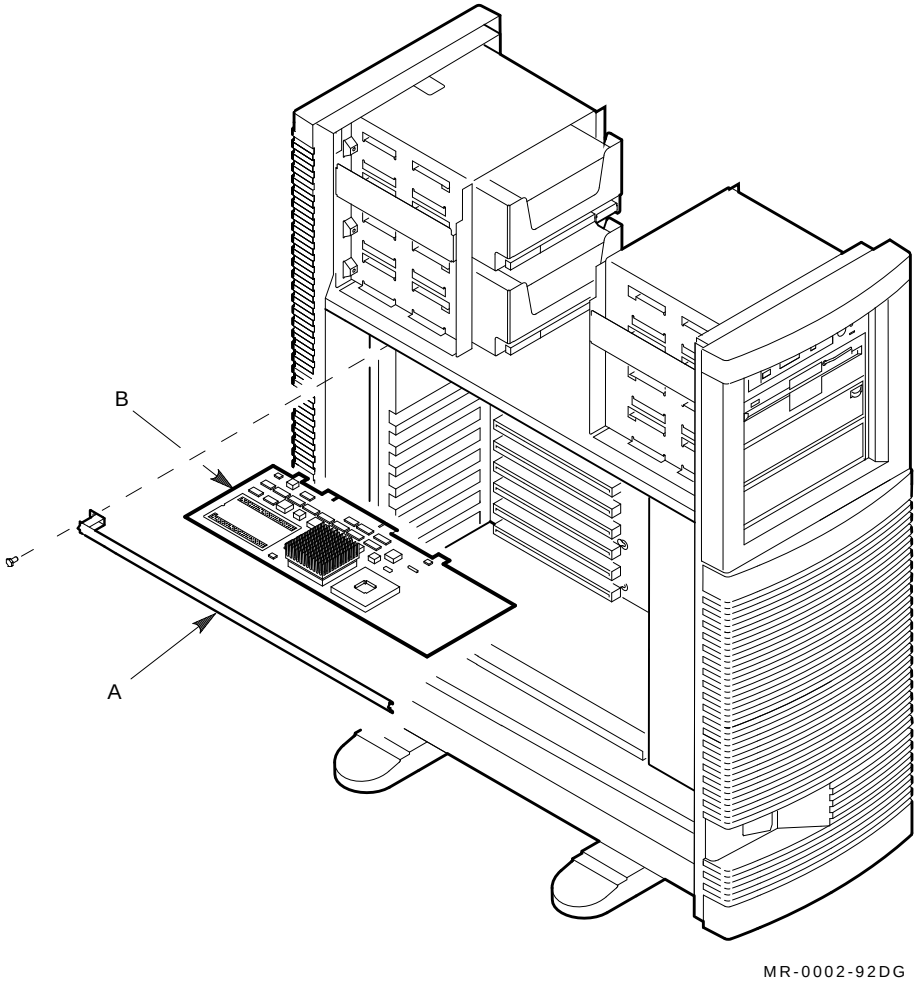

Table 4–4 Key for Figure 4–3

Key	Description
A	Retaining bar
B	CPU module

Figure 4–4 CPU Module Layout

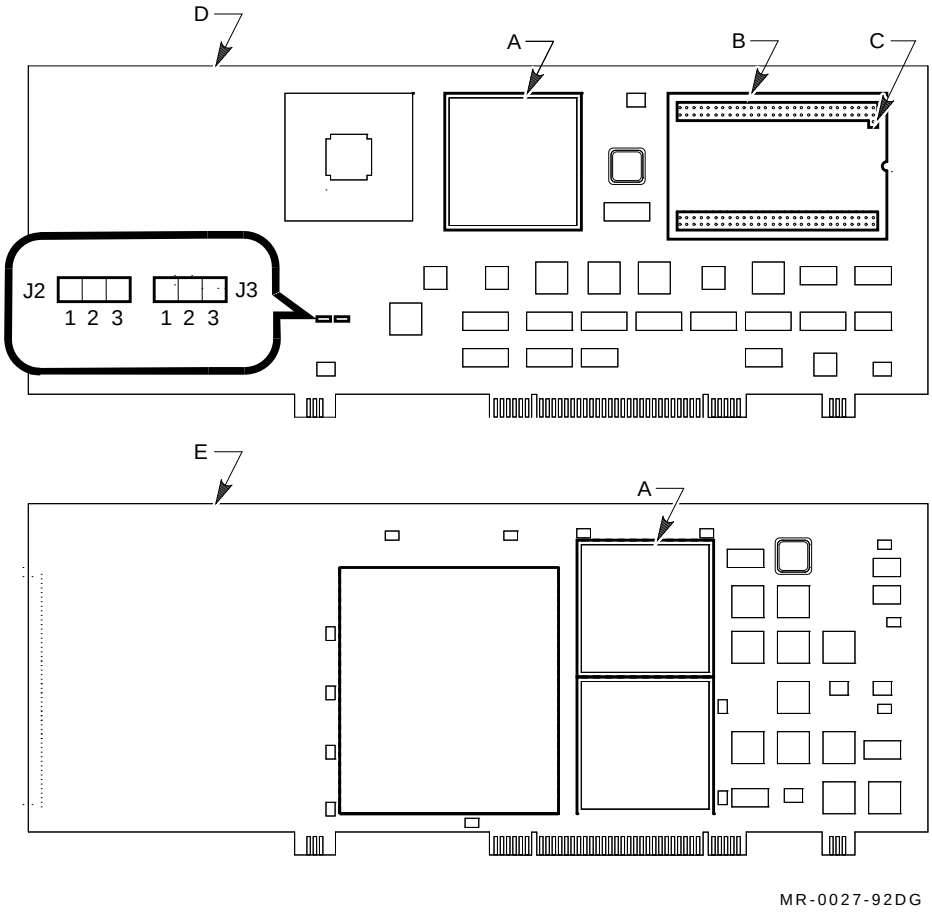

Table 4–5 Key for Figure 4–4

Key	Description
A	CPU
B	Cache socket
C	Guide pin
D	25 MHz or 33 MHz CPU module
E	50 MHz CPU module

Table 4–6 Cache Size Jumper

Cache Size	Jumper J3 Position
128 KB	1–2
64 KB	2–3
No cache installed	Either position is okay.

4.7 Replacing the Cache Card

The following steps describe the removal and replacement of the cache card. Refer to Figure 4–5 and Table 4–7 during the procedure.

1. Use the procedure in Section 4.6 to remove the CPU module.
2. Place the CPU module on an antistatic package, antistatic foam pad, or a grounded workstation surface.
3. Use a flat-blade screwdriver to lift the cache card and remove it from from the CPU module. Refer to Figure 4–4 and Table 4–5.
4. Remove the replacement cache card from its antistatic package. Do not touch any pins.
5. Position the cache card over the CPU module with the guide pin over the corresponding pin socket.
6. Gently insert the pins on the cache card in the socket on the CPU module.
7. Push the cache card down evenly on the CPU module. Do not bend the pins.
8. Install the CPU module.

Figure 4–5 Cache Card Removal

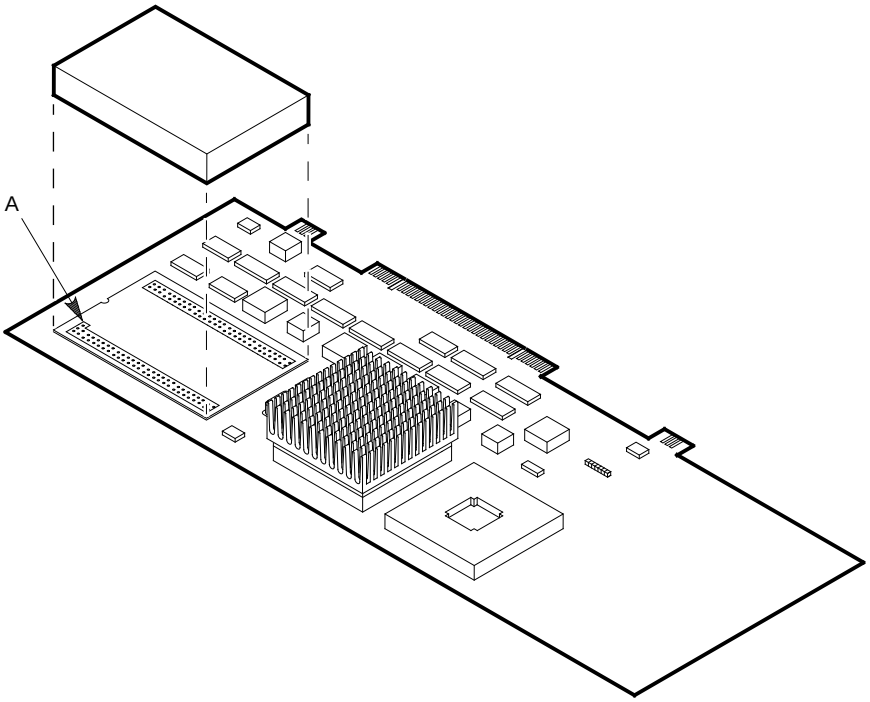

Table 4–7 Key for Figure 4–5

Key	Description
A	Guide pin

4.8 Replacing a SIMM

SIMMs are removed from their slots at oblique angles, as shown in Figure 4–6. Therefore, any SIMMs installed above a failed SIMM must be removed first:

- On the system board, remove SIMMs in order from slots J0651, J0650, J0551, and J0550 (see Figure 4–7 and Table 4–8).
- On the memory expansion module, remove SIMMs in order from slots J1 or J5, J2 or J6, J3 or J7, and J4 or J8. (see Figure 4–8 and Table 4–9).

The following steps describe the removal procedure for a SIMM.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the cabinet top cover, left side panel, and card cage cover using the procedure in Section 4.5.
3. If the failed SIMM is on the memory expansion module, remove the memory module using the procedure in Section 4.9.
4. If the failed SIMM is on the system board:
   a. Remove the CPU module using the procedure in Section 4.6.
   b. If a memory expansion module is installed, remove it using the procedure in Section 4.9.
5. Clips on each end of the memory slot hold the SIMM in place. Use your finger or a small flat-blade screwdriver to press these clips outward.
6. Tip the SIMM toward the top edge of the board or module and pull the SIMM out of its slot.

Reverse the above procedure to install the SIMM.

Figure 4–6 SIMM Removal

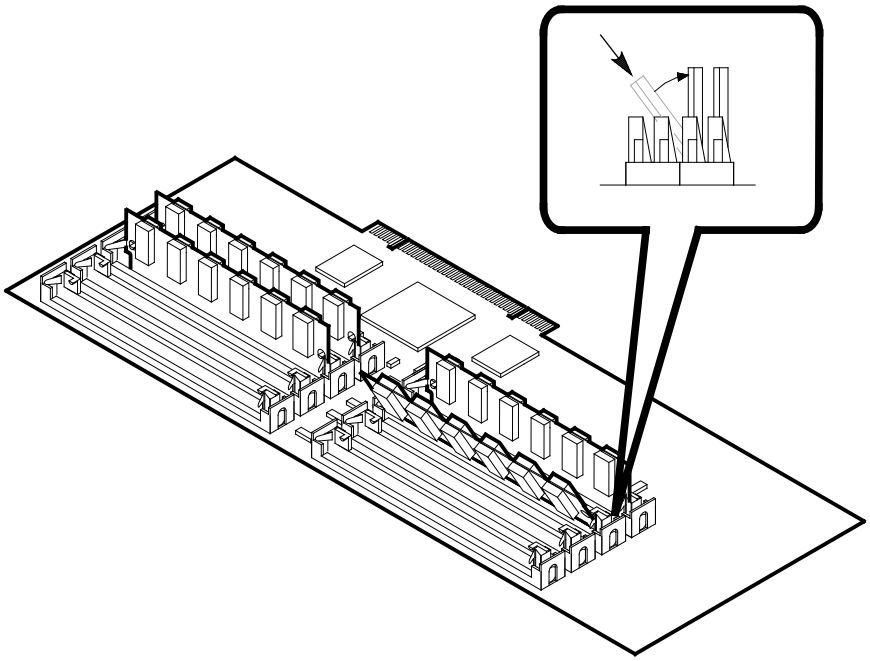

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Figure 4–7 SIMM Slots on the System Board

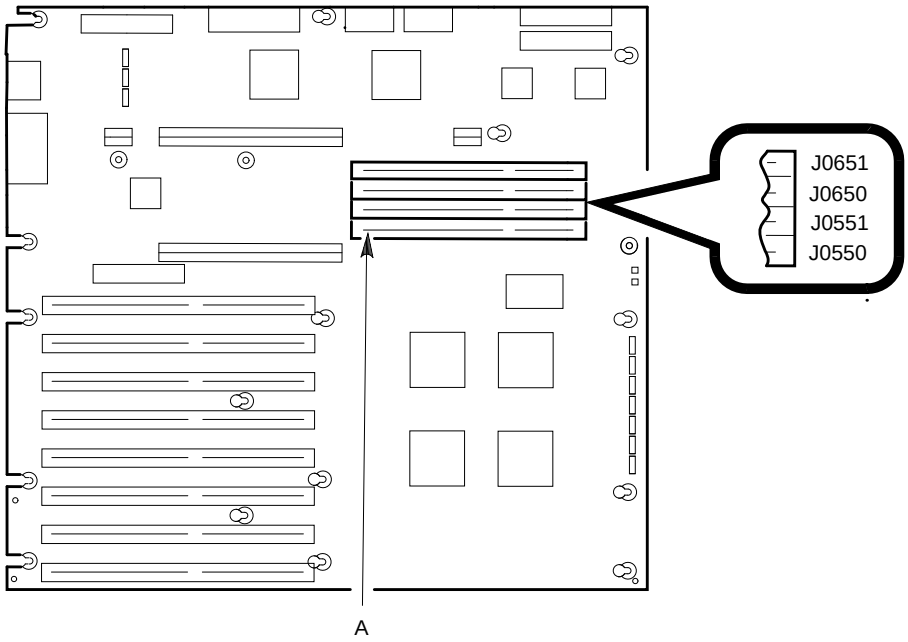

Table 4–8 Key for Figure 4–7

Key	Description
A	Pin 1 of SIMM slot

Figure 4–8 SIMM Slots on the Memory Module

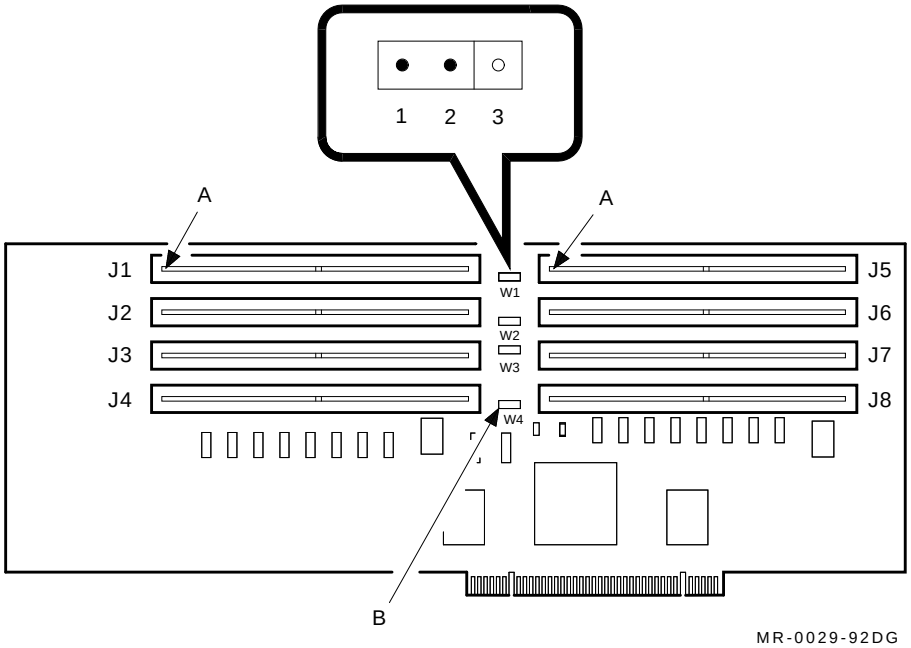

Table 4–9 Key for Figure 4–8

Key	Description
A	Pin 1 of SIMM slot
B	Memory bank jumpers (4), one for each bank

4.9 Replacing the Memory Expansion Module

The following steps describe the removal procedure for the memory expansion module. Refer to Figure 4–9 and Table 4–11 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the cabinet top cover, left side panel, and card cage cover using the procedure in Section 4.5.
3. Remove the screw on the left end of the memory expansion module retaining bar and slide the bar to the left. Save this screw.
4. Pull the memory module from its slot and slide the module out of the card cage.
5. Place the module on an antistatic package, antistatic foam pad, or a grounded workstation surface.
6. Remove all of the SIMMs from the failed module using the procedure in Section 4.8.
7. Remove the replacement memory module from its antistatic package and place it on an antistatic package, antistatic foam pad, or a grounded workstation surface.
8. Install the SIMMs that you removed from the failed module into the same memory slots on the replacement module.
9. Ensure that the jumpers on the replacement module match the positions of the jumpers on the failed module. Figure 4–8 shows the jumper locations on the memory expansion module. Table 4–10 shows the correct jumper positions.
10. Place the failed memory module in an antistatic package.

Reverse the above procedure to install the memory module.

Table 4–10 Memory Expansion Module Jumpers

SIMM Size (MB)	W1/W2/W3/W4 Jumper Position
2, 4, 8	1–2
16, 32	2–3

Figure 4–9 Memory Expansion Module Removal

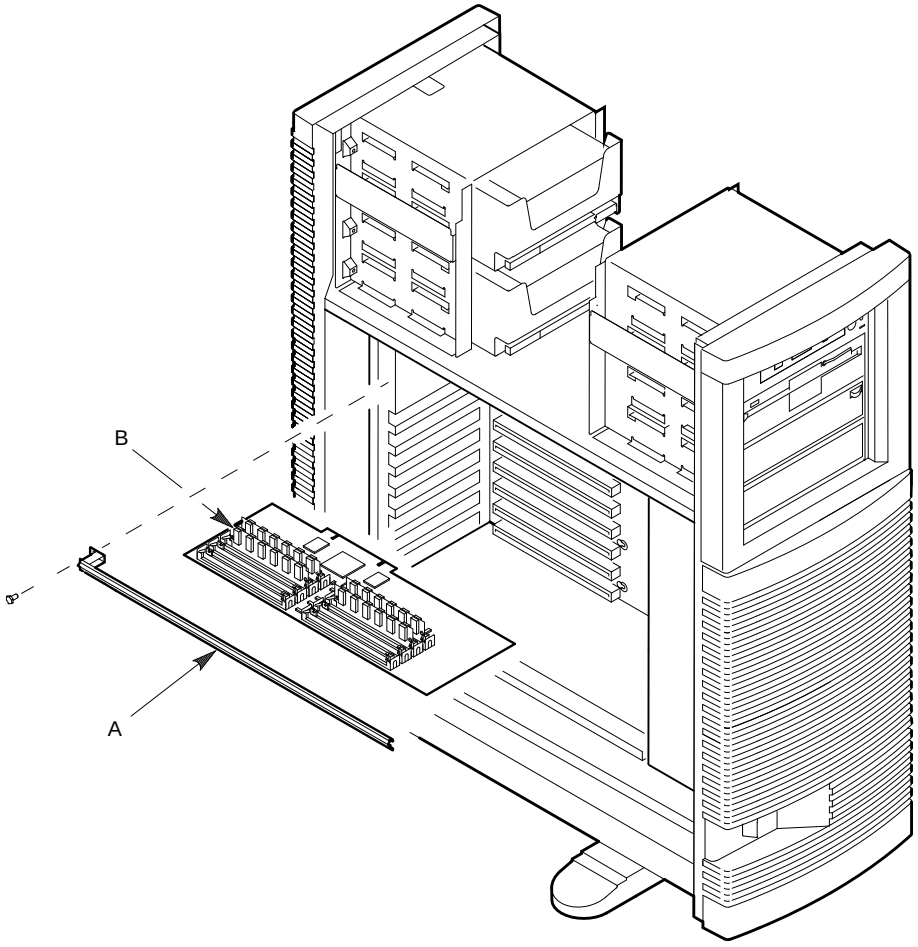

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Table 4–11 Key for Figure 4–9

Key	Description
A	Retaining bar
B	Memory expansion module

4.10 Replacing Option Modules

The following steps describe the removal procedure for option modules. Refer to Figure 4–10 and Table 4–12 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the cabinet top cover, left side panel, and card cage cover using the procedure in Section 4.5.
3. Disconnect any external cables attached to the option module I/O connections at the back of the system.
4. Disconnect any internal cables from the option module.
5. Remove the screw that secures the module. Save this screw.
6. Pull the failed option module from its slot and slide the module out of the card cage.
7. Place the module on top of an antistatic package, antistatic foam pad, or a grounded workstation surface.
8. Remove the replacement module from its antistatic package and place it on an antistatic package, antistatic foam pad, or a grounded workstation surface.
9. Ensure that the jumpers on the replacement module match the positions of the jumpers on the failed module.
10. Place the failed memory module in an antistatic package.

Install the replacement module into the same slot from which you removed the failed module. Reverse the above procedure to install the module.

Figure 4–10 Option Module Removal

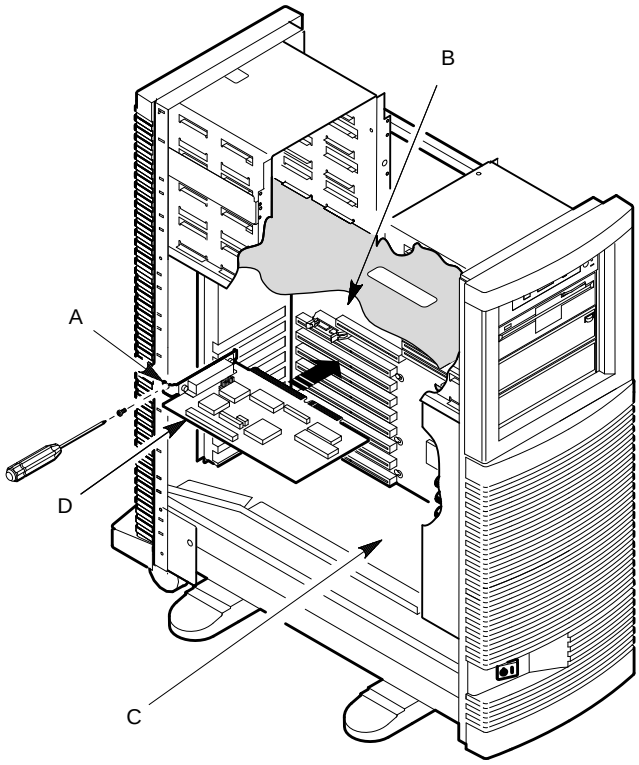


Table 4–12 Key for Figure 4–10

Key	Description
A	I/O connector
B	System board
C	Module guide
D	Option module

4.11 Replacing the System Board

The following steps describe the removal procedure for the system board. Refer to Figure 4–11 and Table 4–13 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the cabinet top cover, left side panel, and card cage cover using the procedure in Section 4.5.
3. Disconnect the external cables attached to the rear panel connectors.
4. Remove the two hex standoff nuts (and lock washers) from each of the four rear panel D connectors. Save these eight nuts (and washers).
5. Remove the CPU module using the procedure in Section 4.6.
6. Remove the memory module retaining bar, and the memory module (if one is present), using the procedure in Section 4.9.
7. Disconnect any internal cables from option modules installed in the EISA bus slots.
8. Remove any option modules installed in the EISA bus slots using the procedure in Section 4.10.
9. Disconnect the internal cables from the system board connectors.

Caution

Connector J0840 has two 6-pin power cables connected to it, each with a different wire color code. Make a note of the wire color code before you remove these power cables. Be sure to connect them in the correct order.

10. Carefully pull the internal cables up into the upper storage bay area.
11. Remove the retaining screws that secure the board to the chassis.
12. Loosen the keyslot screws that secure the board to the chassis.
13. Pull the board to the right until the keyslot screw heads clear the keyholes in the board. Carefully lift the board toward you and out of the card cage.

Note

If the board does not come out of the chassis easily, remove the keyslot screws.

14. Place the system board on an antistatic package, antistatic foam pad, or a grounded workstation surface.
15. Remove the replacement system board from its antistatic package and place it on an antistatic package, antistatic foam pad, or a grounded workstation surface.
16. Remove all of the SIMMs from the failed board and install the SIMMs into the same memory bank slots on the replacement board.
17. Remove the VGA 512 KB memory upgrade chips, if present, and install them into the sockets on the replacement board.
18. Ensure that the jumpers on the replacement board match the positions of the jumpers on the failed board. Table B–1 lists the system board jumpers and factory default settings.
19. Place the failed system board in an antistatic package.

Reverse the above procedure to install the system board. Run the SCU.

Figure 4–11 System Board Removal

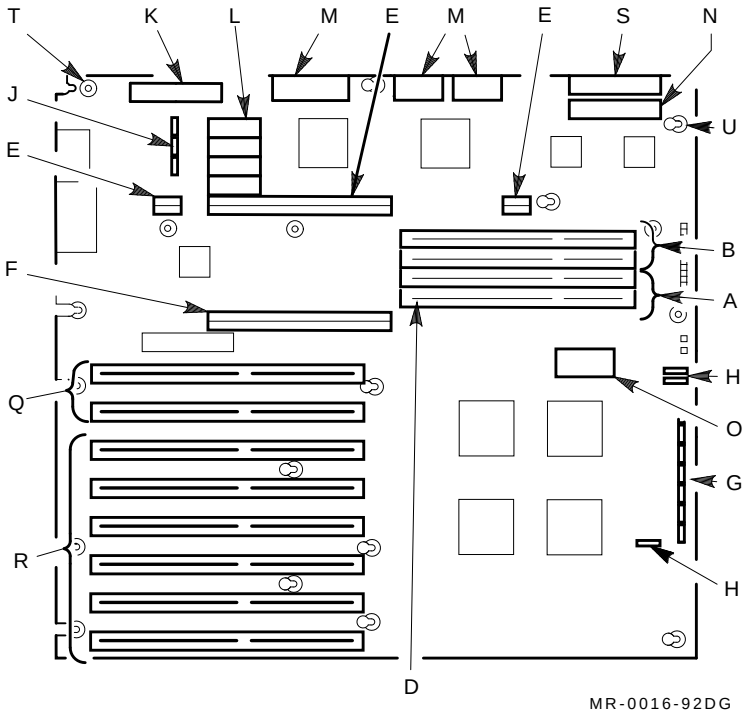


Table 4–13 Key for Figure 4–11

Key	Description
A	Memory bank 0
B	Memory bank 1
D	Pin 1 of SIMM slot
E	CPU module slot
F	Memory module slot
G	System setup jumpers[1]
H	SCSI/IDE disk drive activity LED cable connectors (J0190, J0490, J0491)[2]
J	VGA setup jumpers[1]
K	IDE cable connector (J0821)
L	VGA 512 KB memory upgrade sockets (U0730, U0731, U0732, U0830)
M	Power connectors (J0840,[3] J0850, and J0860)
N	Diskette cable connector (J0880)
O	Real-time clock chip (U0740)
Q	EISA slave slots
R	EISA master slots
S	Front panel wire assembly connector (J0881)
T	Retaining screw (1 of 5)
U	Keyslot screw (1 of 13)

[1] Figure B–1 shows the location of the system board jumpers. Table B–1 lists the system board jumpers and factory default settings.

[2] On some system boards, J0190 and/or J0491 may not be populated. Use J0490 instead.

[3] Has two power cables connected, each with a different wire color code.

4.12 Replacing the Real-Time Clock Chip

This section describes how to replace and dispose of the real-time clock chip on the system board. A lithium battery inside the real-time clock chip provides power for the CMOS RAM which holds system configuration information.

Caution

The real-time clock chip contains a lithium battery. It is sealed and should not be opened. To prevent explosion, avoid shorting the battery. Do not attempt to recharge it.

For safe operation of this computer system, replace the real-time clock chip with the recommended Digital part (DS1287).

The following steps describe how to remove and dispose of the real-time clock chip.

1. If you have not created a SYSTEM.SCI file on your system configuration diskette, create one using the SCU. For information on configuring the system with the SCU, refer to Chapter 5.
2. Shut down the system and unplug the power cord (Section 4.4).
3. Remove the cabinet top cover, left side panel, and card cage cover using the procedure in Section 4.5.
4. Remove the CPU module using the procedure in Section 4.6.
5. Remove the memory module retaining bar, and the memory module (if one is present), using the procedure in Section 4.9.
6. Remove any option modules installed in the EISA bus slots using the procedure in Section 4.10.
7. Locate the real-time clock chip on the system board (Figure 4–11 and Table 4–13).

8. Use a flat-blade screwdriver to lift the chip from its socket.
9. Dispose of the chip as follows:
    a. Clip all exposed chip leads. Do not short any leads together.
    b. Wrap the chip in insulating tape to prevent accidental shorting.
    c. Pack the chip so it cannot be crushed.
    d. Place the chip into an appropriate trash receptacle.
10. Carefully remove the replacement real-time clock chip from its antistatic package. Do not touch its pins.
11. Position the chip over the socket on the system board so that pin 1 (marked with a dot) is aligned with the pin 1 mark on the system board.
12. Align the pins of the chip with the socket.
13. Gently insert the chip, being careful not to bend the pins.
14. Install the CPU module and the memory module (if one was present).
15. Replace the card cage cover, side panel, and top cover.
16. Boot the system and run the SCU following the procedure given in Chapter 5.

4.13 Replacing the RX23 3.5-Inch Diskette Drive

The following steps describe the removal procedure for the RX23 diskette drive. Refer to Figures 4–12 and 4–13 and Tables 4–14 and 4–15 during the procedure.

1. Remove the top cover, side panels, and upper front bezel using the procedure in Section 4.5.
2. Disconnect the power and data cables from the rear of the drive.
3. Disconnect the two speaker wire push-on terminals (white and black wires) from the speaker connector tabs (see Figure 4–25). The speaker wires are part of the front panel wire assembly.
4. Disconnect the front panel wire assembly push-on ground terminal (black wire) from the chassis ground connector tab (see Figure 4–26).
5. Loosen the two captive screws that secure the mounting bracket.
6. Pull the mounting bracket out of the front of the storage bay, as far as the front panel wire assembly allows.
7. Remove the four screws that secure the RX23 adapter plate to the mounting bracket. Save these screws.
8. Tilt the back of the mounting bracket and adapter plate down and slide the bracket off the back of the adapter plate.
9. Remove the four screws that secure the RX23 drive on the adapter plate. Save these screws.
10. Lift the RX23 drive off the adapter plate.

Note

Make sure that the RX23 drive ID switch is set correctly before you replace the drive. The drive ID switch should be set to ID 1.

Locate the drive ID switch on the right side of the replacement drive, near the back. Make sure that it is set to ID 1. Then reverse the above procedure to install the replacement drive.

Figure 4–12 RX23 3.5-Inch Diskette Drive Removal (Part 1 of 2)

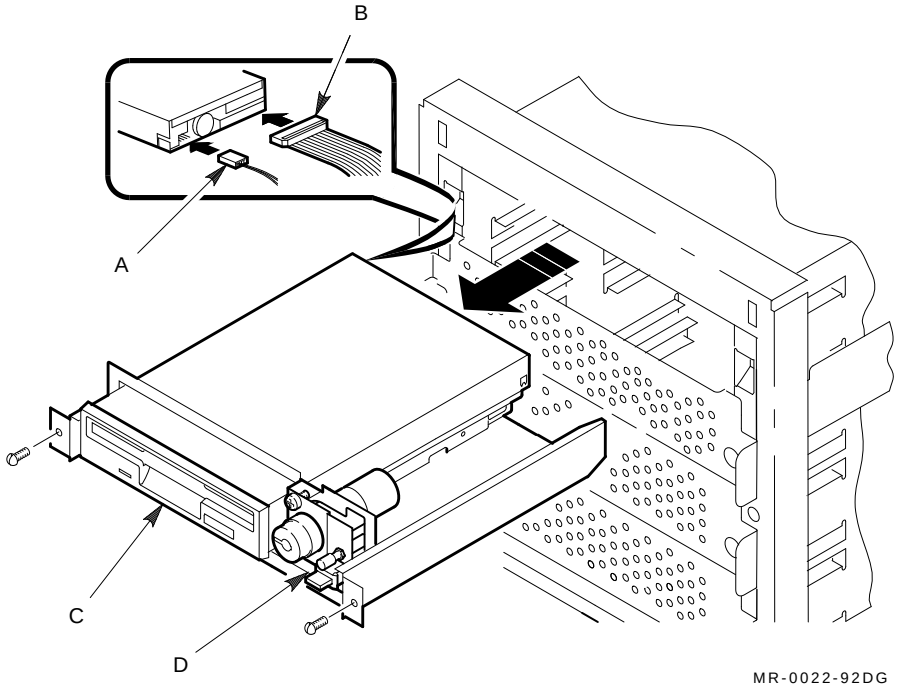


Table 4–14 Key for Figure 4–12

Key	Description
A	Power cable
B	Data cable
C	RX23 drive
D	Front panel wire assembly

Figure 4–13 RX23 3.5-Inch Diskette Drive Removal (Part 2 of 2)

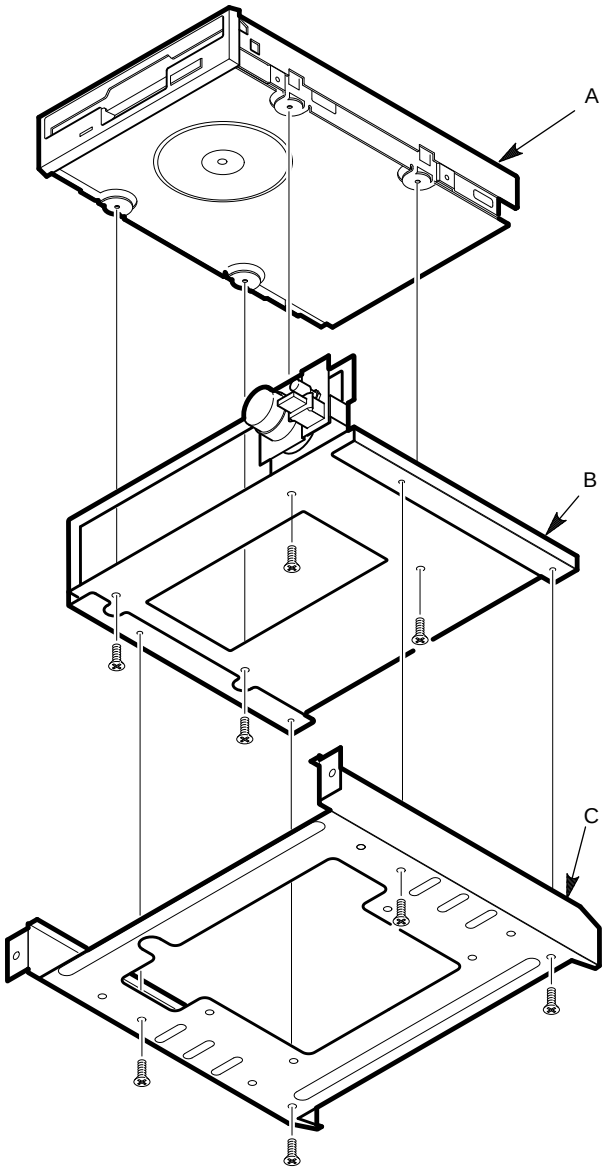


Table 4–15 Key for Figure 4–13

Key	Description
A	RX23 drive
B	Adapter plate
C	Mounting bracket

4.14 Replacing an Option Drive

The following steps describe the removal procedure for the disk and tape drive options installed in the front and rear bays of the system cabinet. Refer to Figure 4–14 and Table 4–16 during the procedure.

1. Remove the top cover, side panels, and upper bezel using the procedure in Section 4.5.
2. Disconnect the power and data cables from the rear of the drive.
3. Loosen the two captive screws that secure the drive mounting bracket.
4. Slide the mounting bracket out of the chassis.
5. Remove the drive mounting screws and lift the drive off the mounting bracket. Save these screws.
6. Remove the replacement drive from its protective package.
7. Ensure that the jumpers on the replacement drive match the positions of the jumpers on the failed drive. Refer to Section 4.14.1, Option Drive Installation Data.

Reverse the above procedure to install the replacement drive.

Figure 4–14 Option Drive Removal

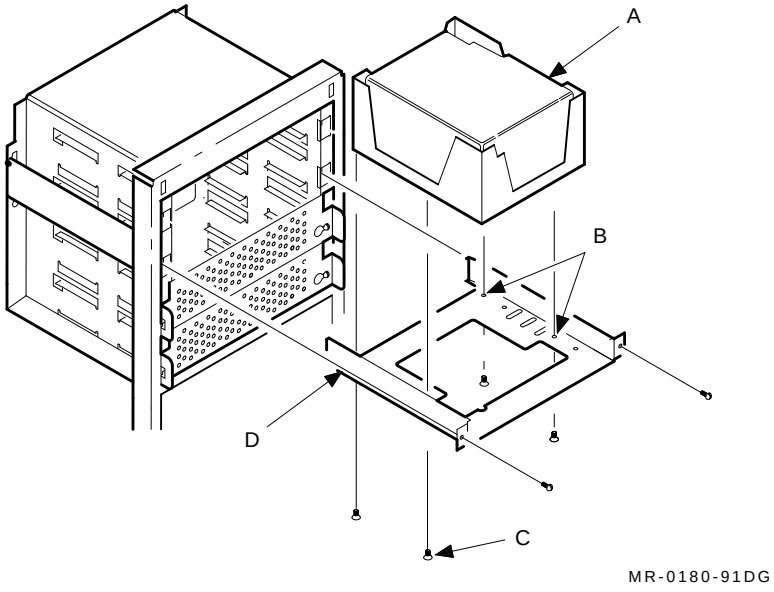


Table 4–16 Key for Figure 4–14

Key	Description
A	Option drive (full-height shown)
B	Full-height drive mounting holes
C	Mounting screw (1 of 4)
D	Mounting bracket

4.14.1 Option Drive Installation Data

Table 4–17 contains installation data on the optional drives supplied by Digital.

Table 4–17 Bay Option Installation Data

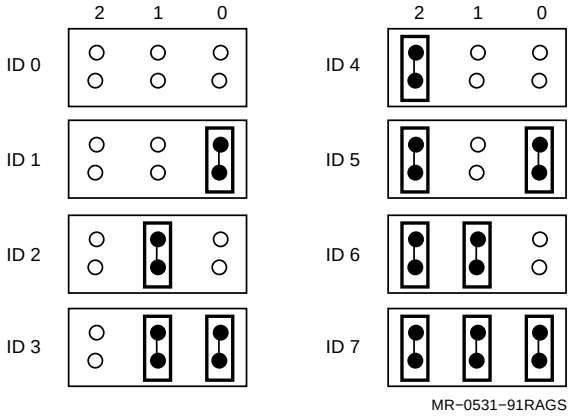
Description	Model No.	Jumpers	Screws	Connect to:
525 MB QIC tape drive	TZK10-AA	Figure 4–16	Metric	SCSI bus cable
209 MB HH disk drive	RZ24-S	Figure 4–17	SAE	SCSI bus cable
426 MB HH disk drive	RZ25-S	Figure 4–18[1]	SAE	SCSI bus cable
665 MB FH disk drive	RZ56-E	Figure 4–19	SAE	SCSI bus cable
1.0 GB FH disk drive	RZ57-E	Figure 4–19 and Figure 4–20[1]	SAE	SCSI bus cable
852 MB HH disk drive	RZ35-E	Figure 4–21[1]	SAE	SCSI bus cable
1.3 GB FH disk drive	RZ58-E	Figure 4–22[1]	SAE	SCSI bus cable
105 MB HH IDE disk drive	PC4XR-EB	Figure 4–23	SAE	IDE bus cable
1.2 MB 5.25-inch HH diskette drive	RX33-AS	Figure 4–24[2]	Metric	Diskette drive cable

[1]Verify that the drive is jumper configured for spin-up on power.

[2]Verify that jumpers U1, D1, DC2, Density, and Grounding are installed.

Figures are listed in Table 4–17 to help you locate the drive's ID jumpers (and other jumpers, if applicable). Each SCSI drive has three ID jumpers which assign its unique ID on the bus. The jumpers specify the ID in binary format as shown in Figure 4–15. The drive IDs on the SCSI bus are assigned according to the system configuration. Drives on the IDE bus are jumpered according to how many drives are on the bus and, if there are two, which is the primary and which is the secondary (Figure 4–23).

Figure 4–15 ID Jumper Code



Figures 4–16 through 4–24 show the jumper locations and configurations for the bay options. See also the corresponding figure keys in Tables 4–18 through 4–26.

Figure 4–16 TZK10-AA ID Jumper Locations

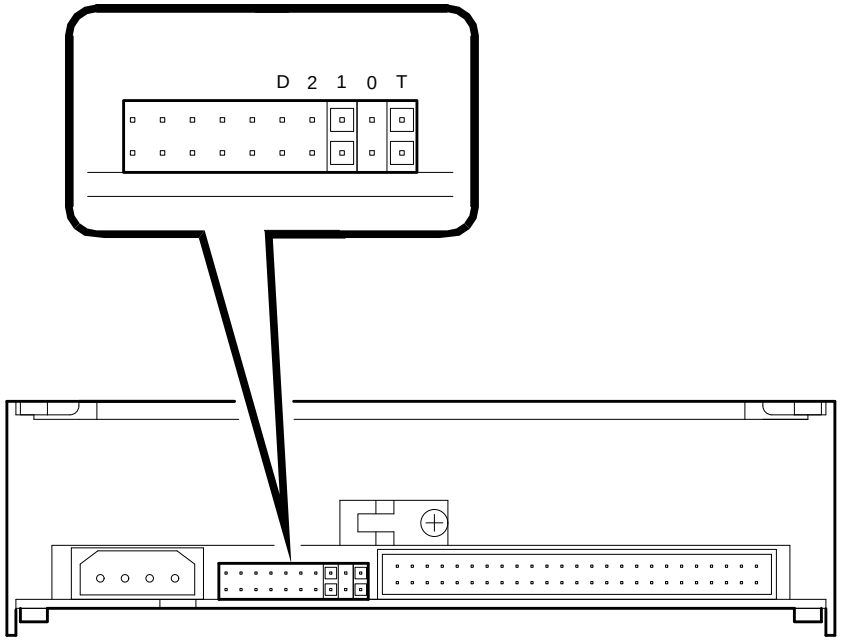


Table 4–18 Key for Figure 4–16

Jumper	Operating Position	Description
D	Out	Automatic density. Enables automatic density when removed.
2	Out	SCSI ID bit 2
1	In	SCSI ID bit 1
0	Out	SCSI ID bit 0
T	In	Terminator power source. When installed, power for the SCSI terminator is provided by the drive.

Figure 4–17 RZ24-S Jumper Locations

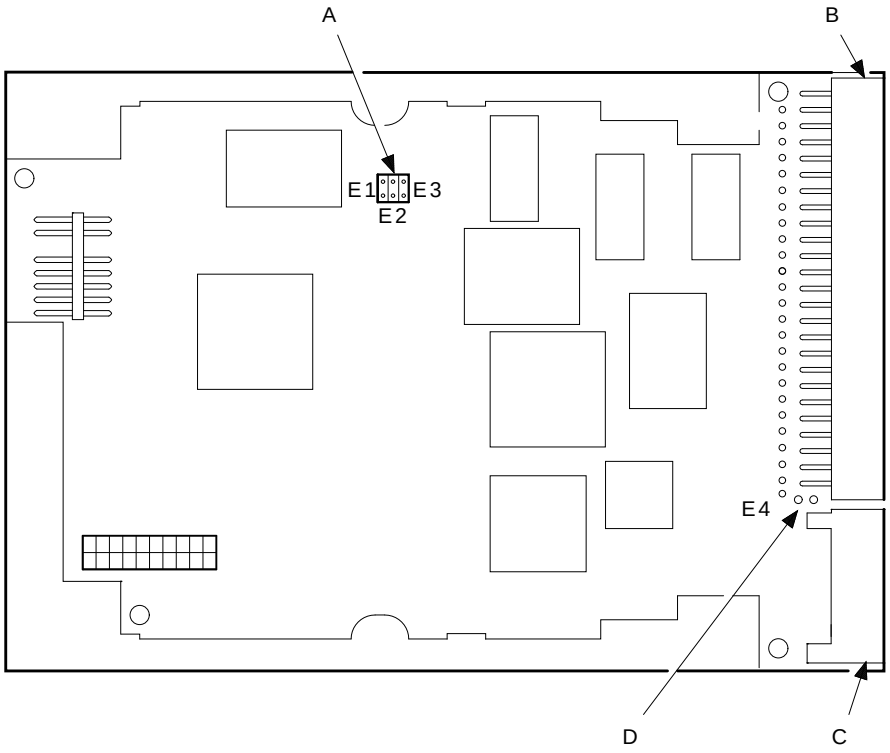
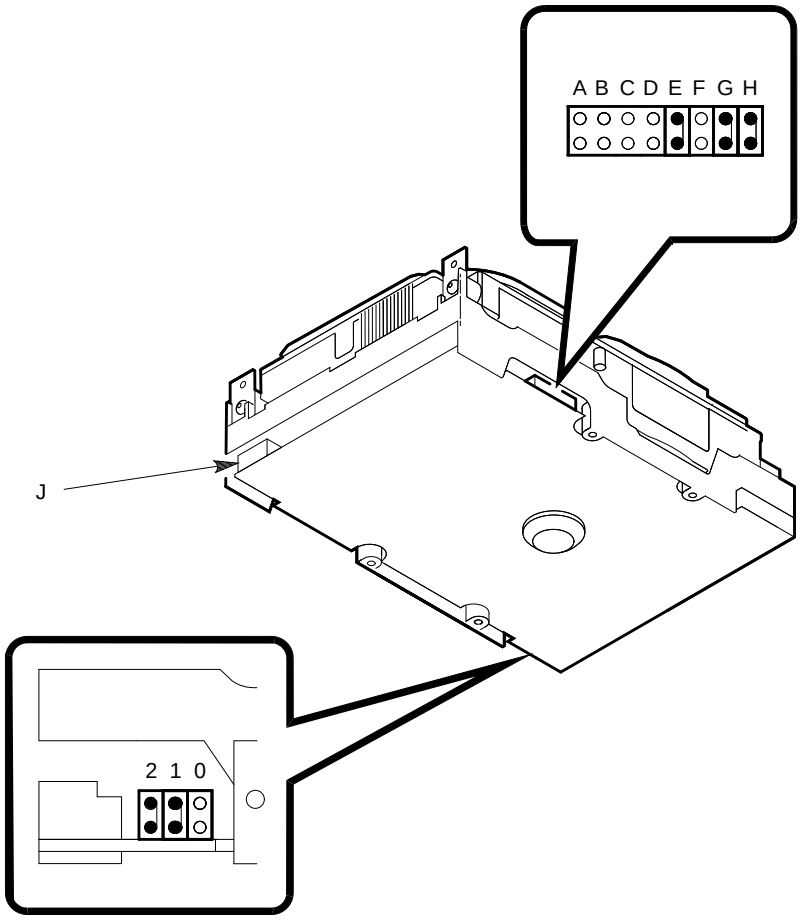


Table 4–19 Key for Figure 4–17

Key	Description
A	SCSI ID jumpers. E1, E2, and E3 = binary bits 0, 1, and 2, respectively. ID 0 shown.
B	SCSI data connector
C	Power connector
D	Parity jumper

Figure 4–18 RZ25-S Jumper Locations



MR-0040-92DG

Table 4–20 Key for Figure 4–18

Jumper	Operating Position	Description
A	Out	Factory use only.
B	Out	Spin-up on power when removed. Spin-up on command when installed.
C	Out	Spin-up delay (valid only if jumper B is removed). Drive spins up after *n*-second delay when installed. (*n* = 16 x SCSI ID setting.) Drive spins up immediately when removed.
D	Out	Write-protect. Drive is write protected when installed.
E	In	Parity checking. Parity checking is enabled when installed.
F	Out	Reserved. Do not install jumper.
G	In	Terminator power source. The drive supplies power to SCSI bus, pin 26.
H	In	Terminator power source. The drive supplies power to its own terminators. Jumpers G and H should both be installed.
J	—	Factory use only. Do not install (or remove) jumpers on (or from) these 5 jumper-pin pairs.
2, 1, 0	—	SCSI ID jumpers. ID 6 shown.

Figure 4–19 RZ56-E/RZ57-E ID Jumper Locations

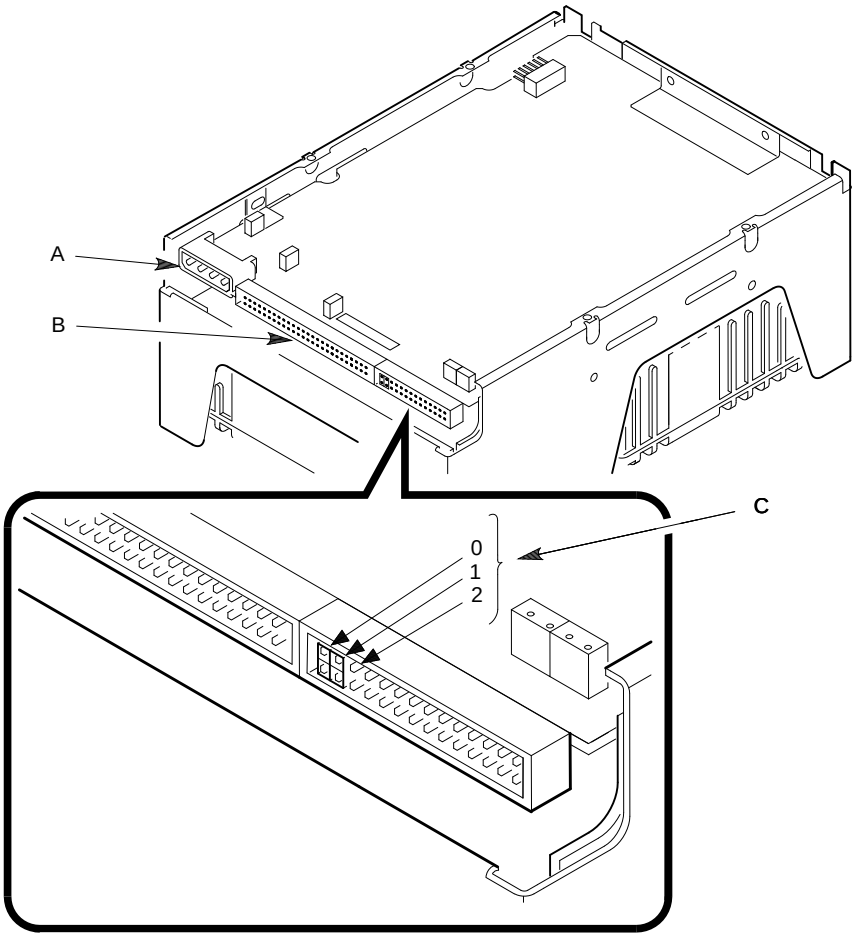


Table 4–21 Key for Figure 4–19

Key	Description
A	Power connector
B	Data connector
C	SCSI ID jumpers. ID 3 shown.

Figure 4–20 RZ57-E ID and Configuration Jumpers Location

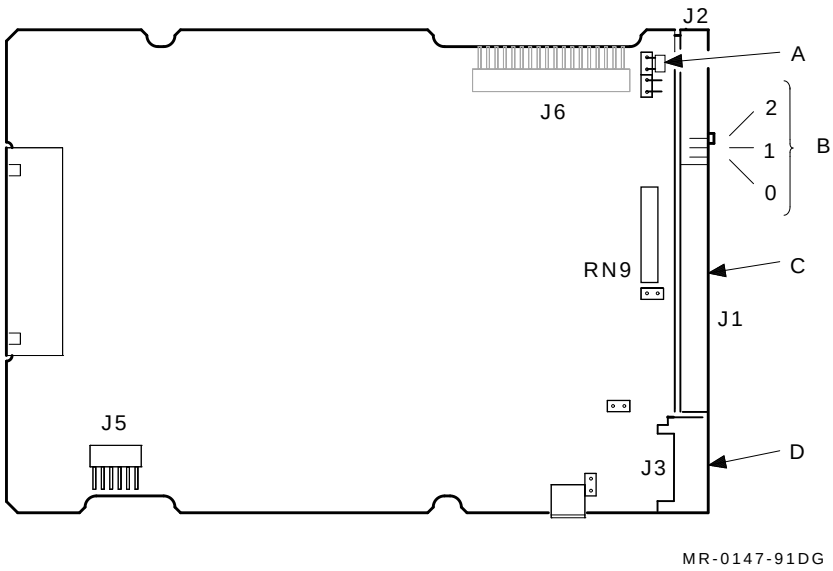
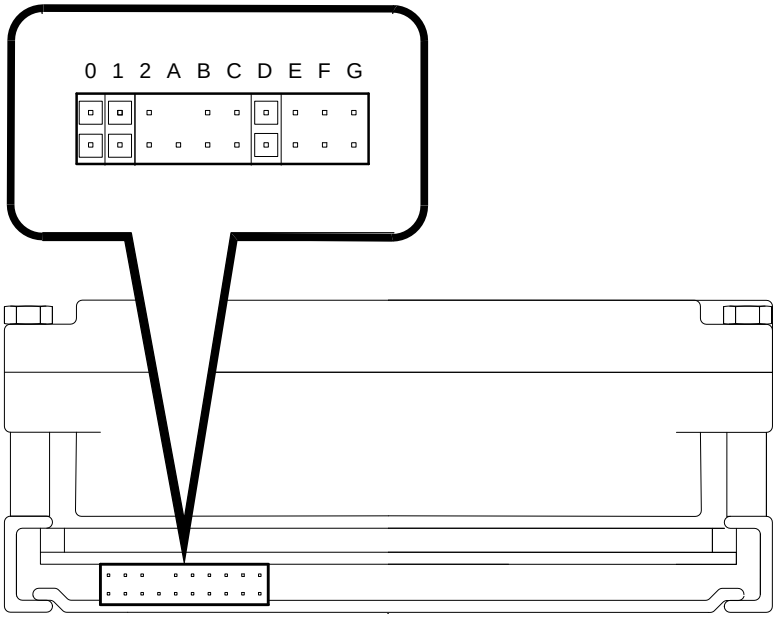


Table 4–22 Key for Figure 4–20

Key	Description
A	Spin-up jumper. Remove jumper for spin-up on power.
B	SCSI ID jumpers. ID 4 shown.
C	Data connector
D	Power connector

Figure 4–21 RZ35-E Jumper Locations

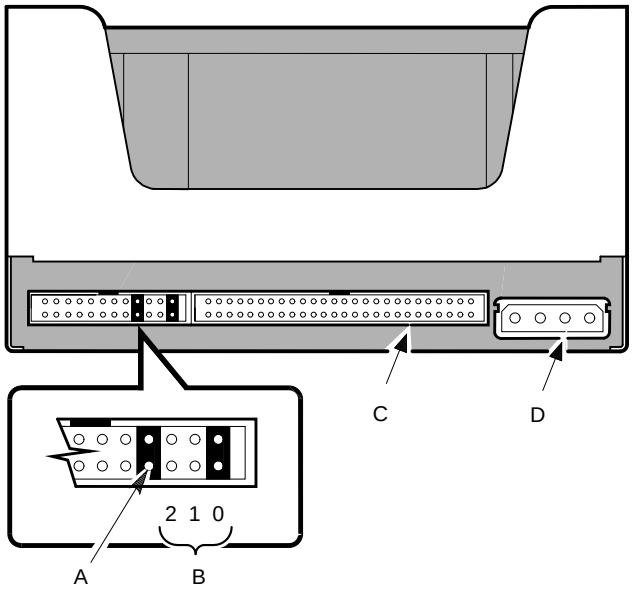


MR-0043-92DG

Table 4–23 Key for Figure 4–21

Jumper	Operating Position	Description
0, 1, 2	—	SCSI ID jumpers. ID 3 shown.
A	None	FLT_SINK signal (lower pin [7]) — for connection to a remote fault LED cable.
B	Out	BSY_SINK signal (lower pin [9]) — for connection to a remote busy LED cable. Do not install jumper.
C	Out	+5.0 V (lower pin [11]) — power connection for remote LEDs. Do not install jumper.
D	In	Spin-up on power when installed. Spin-up on START INIT command when removed.
E	Out	ACOK signal (lower pin [15]). Do not install jumper.
F	Out	Reserved. Do not install jumper.
G	Out	SPNDL_SYNC_REF signal (lower pin [19]). For manufacturing use. Do not install jumper.

Figure 4–22 RZ58-E Jumper Locations



MR-0034-92DG

Table 4–24 Key for Figure 4–22

Key	Description
A	Spin-up jumper. Install jumper for spin-up on power.
B	SCSI ID jumpers. ID 1 shown.
C	Data connector
D	Power connector

Figure 4–23 105 MB IDE Drive Jumper Locations

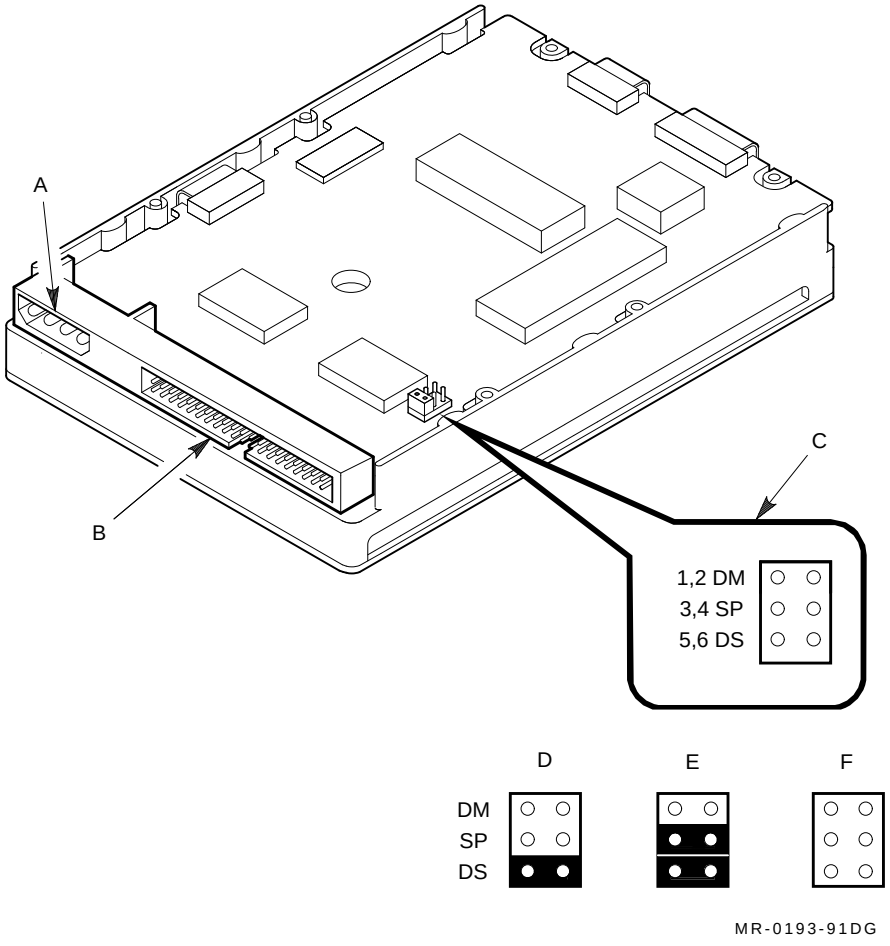


Table 4–25 Key for Figure 4–23

Key	Description
A	Power connector
B	Data connector
C	ID address jumpers
D	Setting for drive in single IDE drive system
E	Setting for primary drive in dual IDE drive system
F	Setting for secondary drive in dual IDE drive system

Figure 4–24 RX33-AS Jumper Locations

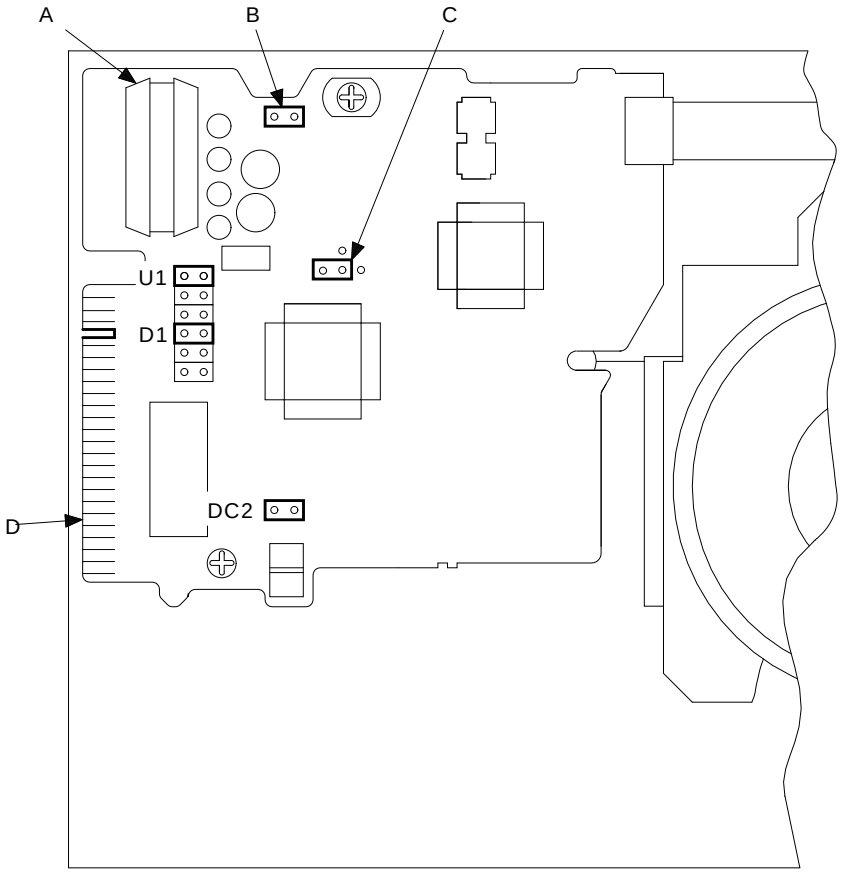


Table 4–26 Key for Figure 4–24

Key	Description
A	Power connector
B	Grounding jumper
C	Density jumper
D	Data connector

4.15 Replacing the Speaker

The following steps describe the removal procedure for the speaker. Refer to Figure 4–25 and Table 4–27 during the procedure.

1. Remove the top cover and side panel using the procedure in Section 4.5.
2. Disconnect the two speaker wire push-on terminals (white and black wires) from the speaker connector tabs. The speaker wires are part of the front panel wire assembly.
3. Press the right side of the speaker retaining spring down, out, and up.
4. Lift the speaker up and out of the chassis.

Reverse the above procedure to install the replacement speaker.

Figure 4–25 Speaker Removal

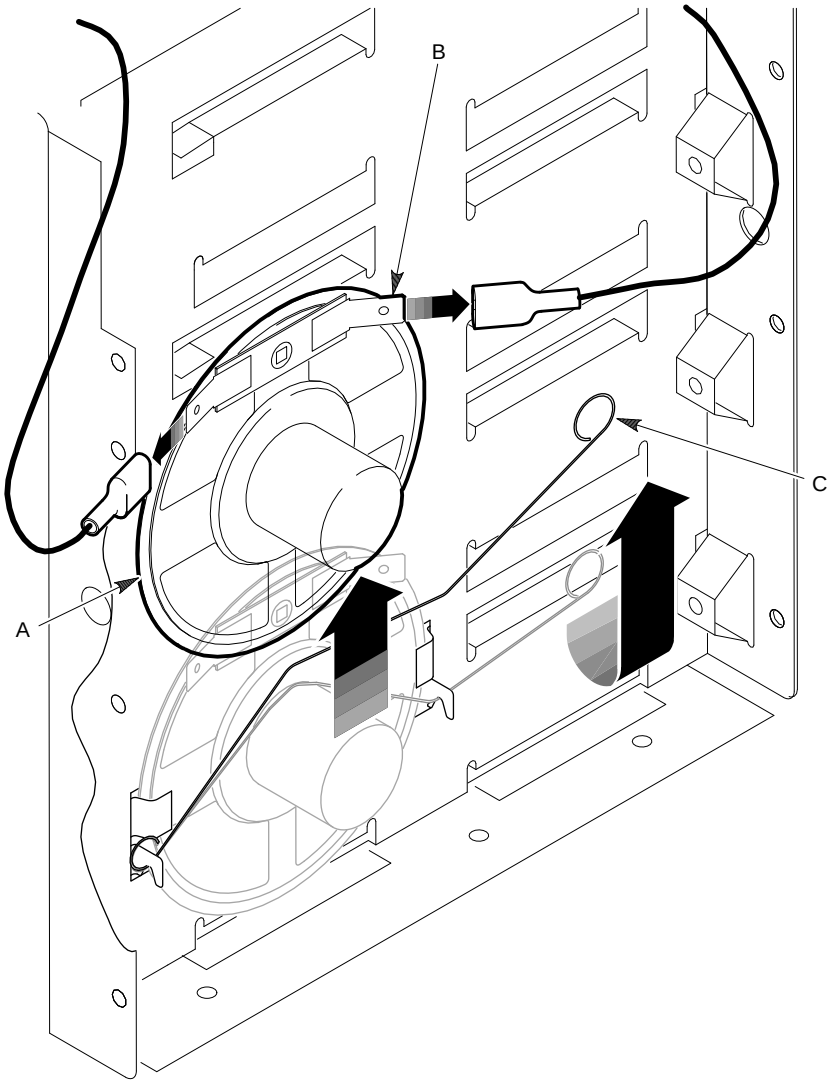


Table 4–27 Key for Figure 4–25

Key	Description
A	Speaker
B	Speaker connector tab (1 of 2)
C	Retaining spring

4.16 Replacing the Front Panel Wire Assembly

The following steps describe the removal procedure for the front panel wire assembly. Refer to Figure 4–26 and Table 4–28 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the top cover, side panels, card cage cover, and upper front bezel using the procedure in Section 4.5.
3. Remove the CPU module using the procedure in Section 4.6.
4. Remove the memory module retaining bar, and the memory module (if one is present), using the procedure in Section 4.9.
5. Remove the screw that secures the front panel to the RX23 drive adapter plate. Save this screw.
6. Disconnect the two speaker wire push-on terminals (white and black wires) from the speaker connector tabs (see Figure 4–25).
7. Disconnect the push-on ground terminal (black wire) from the chassis ground connector tab.
8. Disconnect the system board connector (see Figure 4–11 and Table 4–13).
9. Pull the wire assembly and system board connector up through the chassis opening into the upper storage bay area.
10. Pull the wire assembly and system board connector through the opening in the RX23 drive adapter plate.

Reverse the above procedure to install the replacement front panel wire assembly.

Figure 4–26 Front Panel Wire Assembly Removal

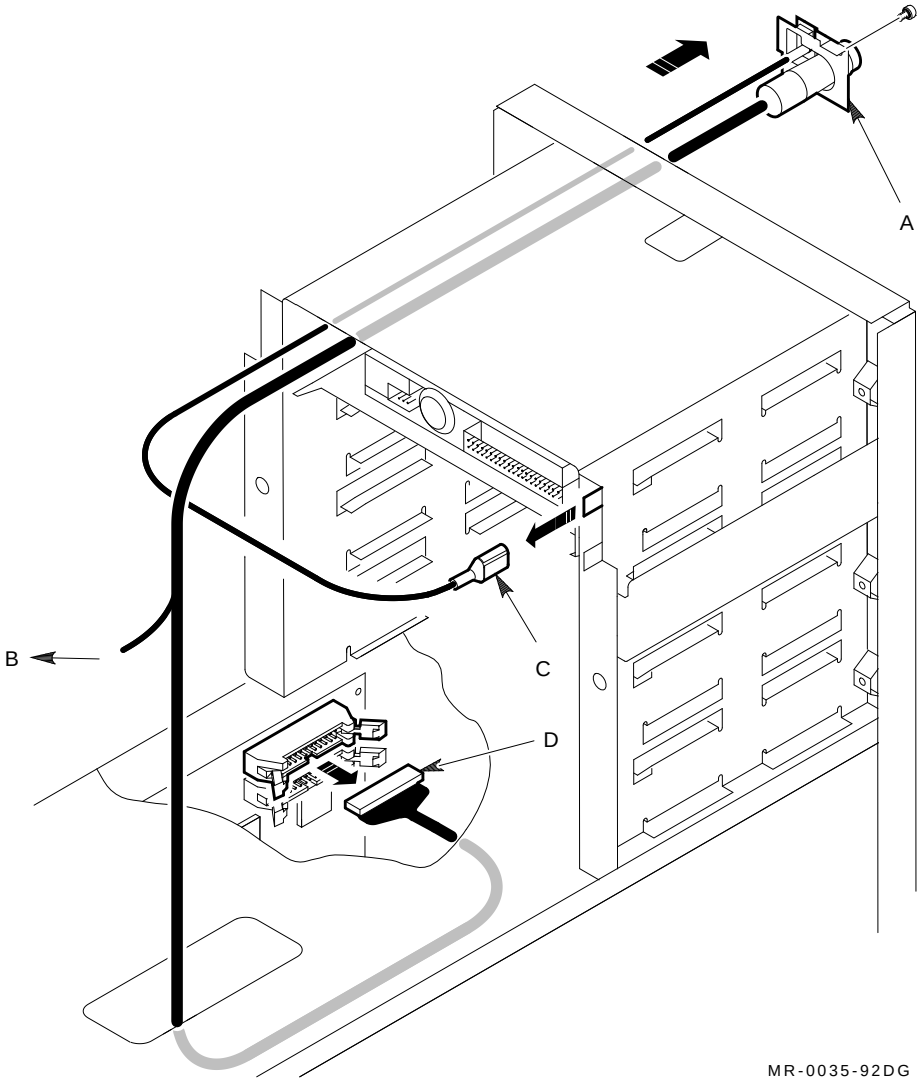


Table 4–28 Key for Figure 4–26

Key	Description
A	Front panel
B	Speaker wires
C	Push-on ground terminal
D	System board connector

4.17 Replacing a Fan

The following steps describe the removal procedure for a fan. Refer to Figure 4–27 during the procedure.

1. Remove the top cover and left side panel using the procedure in Section 4.5.
2. Loosen the four captive screws that secure the fan to the chassis.
3. Unplug the fan power connector located along the left side of the chassis.
4. Pull the fan out of the front of the chassis.

Reverse the above procedure to install the replacement fan.

Figure 4–27 Fan Removal

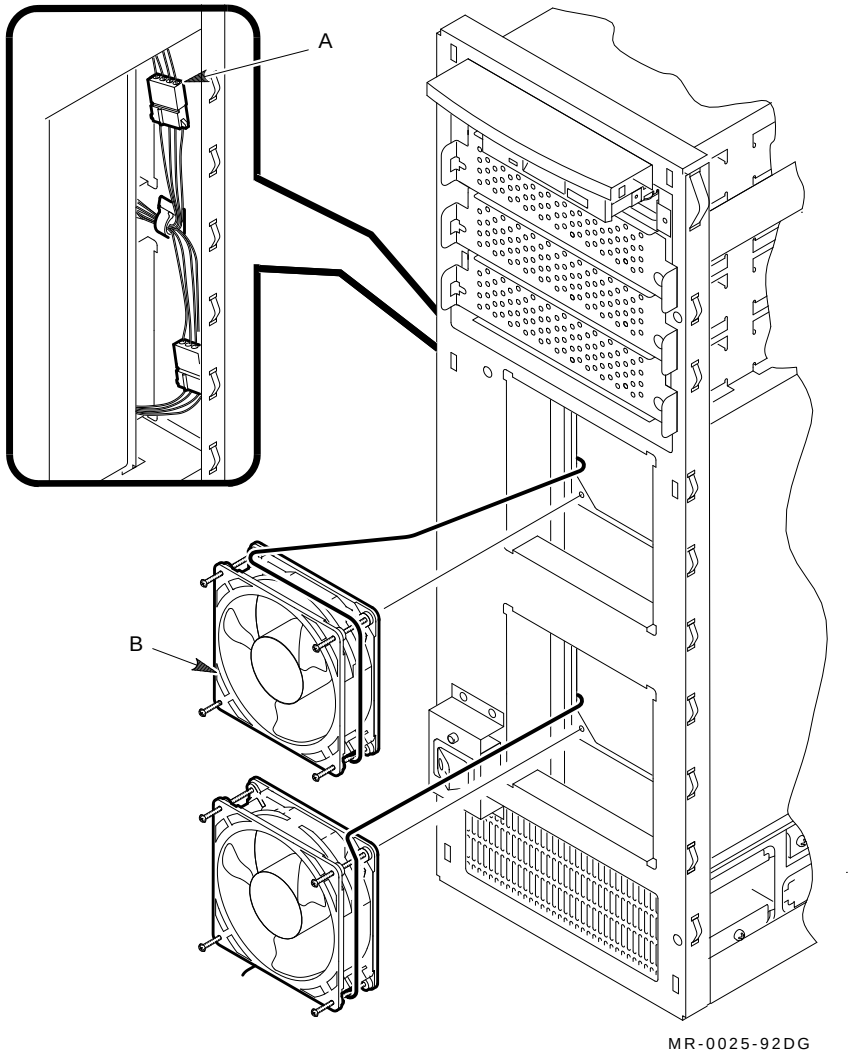


Table 4–29 Key for Figure 4–27

Key	Description
A	Power connector (1 of 2)
B	Fan (1 of 2)

4.18 Replacing the Power Supply

The following steps describe the removal procedure for the power supply. Refer to Figures 4–28 and 4–29 and Tables 4–30 and 4–31 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the top cover, side panels, and lower front and rear bezels using the procedure in Section 4.5.
3. Press the locking tabs on the sides of the 15-pin power harness connector and pull the connector off of the power supply. This connector is part of the system power cable (70-28301-01).
4. Remove the screw that secures the +5 V (red) power bus wires to the power supply.
5. Remove the screw that secures the 5 V RTN (black) power bus wires to the power supply.
6. Remove the screw that secures the DC switch wire assembly protective cover and remove the cover.
7. Remove the DC switch wire assembly connector from the power supply:
   a. Carefully insert a flat-blade screwdriver under the connector and lift the tip of the screwdriver up to release the latch on the bottom of the connector.
   b. Pull the connector off of the power supply.
8. Loosen the two captive screws on the sides near the rear of the power supply.
9. Slide the power supply out of the rear of the chassis.

Reverse the above procedure to install the replacement power supply. Be sure to align the power supply between the chassis guide rails as you slide it into the chassis.

Figure 4–28 Power Supply Cable Removal

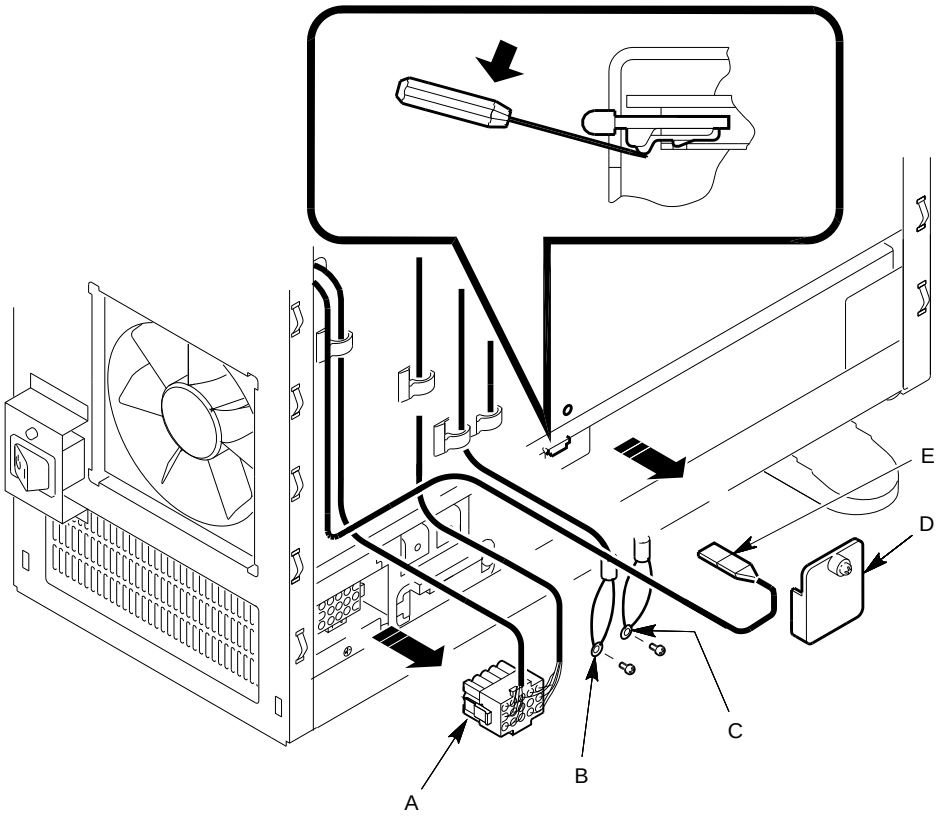


Table 4–30 Key for Figure 4–28

Key	Description
A	15-pin power harness connector
B	+5 V power bus wires (red)
C	5 V RTN power bus wires (black)
D	DC switch wire assembly protective cover
E	DC switch wire assembly connector

Figure 4–29 Power Supply Removal

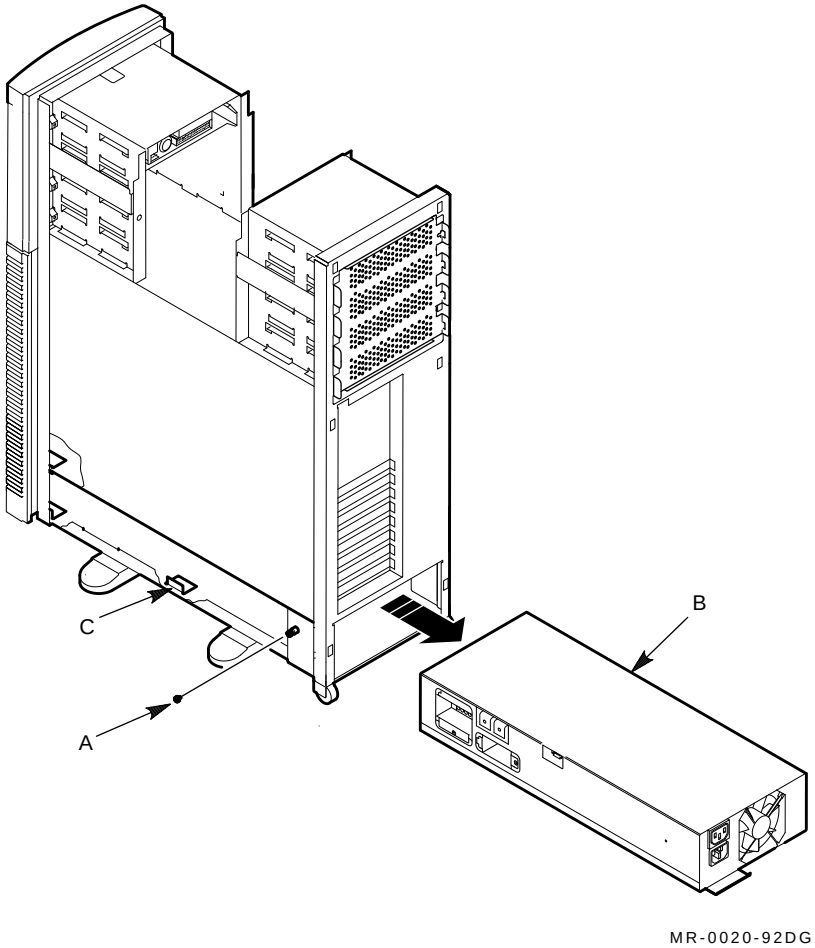


Table 4–31 Key for Figure 4–29

Key	Description
A	Retaining screw (1 of 2)
B	Power supply
C	Chassis guide rails

4.19 Replacing the DC Switch

The following steps describe the removal procedure for the DC power switch. Refer to Figure 4–30 and Table 4–32 during the procedure.

1. Shut down the system and unplug the power cord (Section 4.4).
2. Remove the top cover, side panels, and lower front bezel using the procedure in Section 4.5.
3. Pull off the two push-on terminals from the back of the DC switch. These push-on terminals are part of the DC switch wire assembly.
4. Push the plastic spring ears on each side of the switch and lift the switch out of the front of the chassis.

Reverse the above procedure to install the DC switch.

Figure 4–30 DC Switch Removal

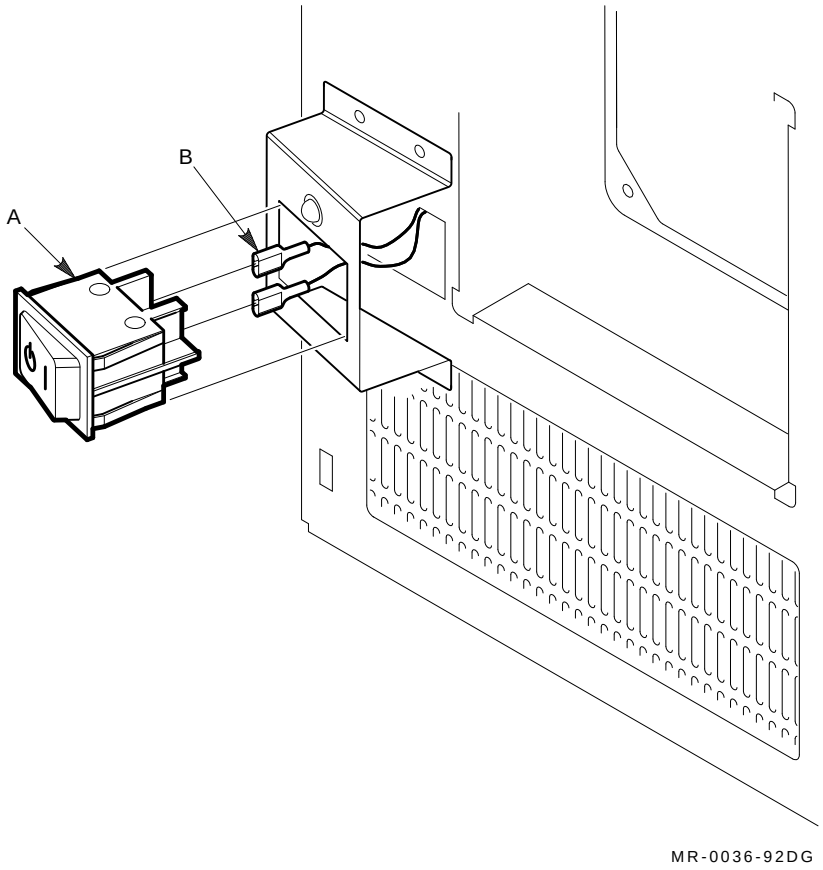


Table 4–32 Key for Figure 4–30

Key	Description
A	DC switch
B	Push-on terminals

5
System Configuration

This chapter provides detailed information on how to use the EISA system configuration utility (SCU).

5.1 EISA Architecture

The EISA bus provides an open architecture for installation of any EISA or ISA compliant option module. Specific parameters must be configured according to the option modules installed and how the system is configured. Parameters that can be assigned include:

- Interrupt request (IRQ) lines
- Memory address
- Port address
- DMA channel

The EISA architecture includes a means of configuring these parameters by the SCU. ISA modules are generally configured with jumpers and switches. EISA option modules have no jumpers or switches, and their addresses and interrupt selections are all made with the SCU.

The EISA architecture is an industry standard architecture shared by many manufacturers. The EISA system configuration utility (revision 2.0) is an industry standard utility which is customized for each manufacturer's system.

5.2 System Configuration Utility

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

When the SCU executes, it is able to detect automatically the system board configuration (CPUs and memory) and any EISA modules that are installed. EISA modules are detected by polling modules on the EISA bus. ISA modules are detected by the use of ISA CFG files; you define the ISA modules installed in the system.

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

- By writing system configuration data to nonvolatile memory on the system board
- By writing a system configuration file to the system configuration diskette

The stored data is accessed by the system firmware and must be accurate. Therefore the SCU must be run whenever the system configuration changes.

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

Note

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

5.2.1 Diskettes Provided

Two configuration diskettes are provided for use with the applicationDEC 400*x*P system, the SCU diskette and the library diskette. The SCU diskette contains both the SCU program and the system configuration files. When the SCU prompts you for the "System Configuration Diskette," this is the diskette that is needed. Also provided is a library diskette, labeled "Library Diskette," which contains ISA CFG files for many ISA modules.

5.2.2 When to Use the SCU

Features controlled by the SCU include the following:

- Select a specific keyboard type
- Copy the System Configuration Diskette
- Learn about configuring the computer
- Set the computer date and time
- Configure the computer
- Maintain the System Configuration Diskette
- Access the password utility

Each item is available through the main menu of the SCU (see Figures 5–1 and 5–2). You must run the SCU:

- When the system is first installed
- When you add or remove an ISA or EISA option module
- When you change a jumper or switch setting on an ISA option module
- When you need to set the date or time

Note

Refer to Chapter 2 for error messages that may be received during power-on, system boot, and SCU execution. Chapter 2 also lists recommended solutions.

5.2.3 Booting the SCU

Boot the SCU from the 3.5-inch diskette drive. Insert the system configuration diskette into the drive and press the reset switch on the front panel.

Note

Make a copy of the SCU using the SCU copy diskette function before proceeding with any system configuration tasks.

Figure 5–1 SCU Main Menu Options (Part 1 of 2)

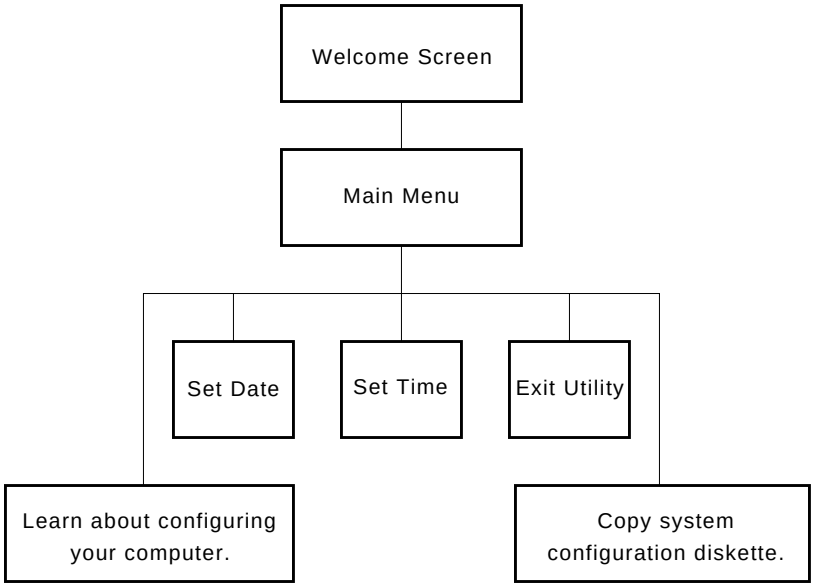
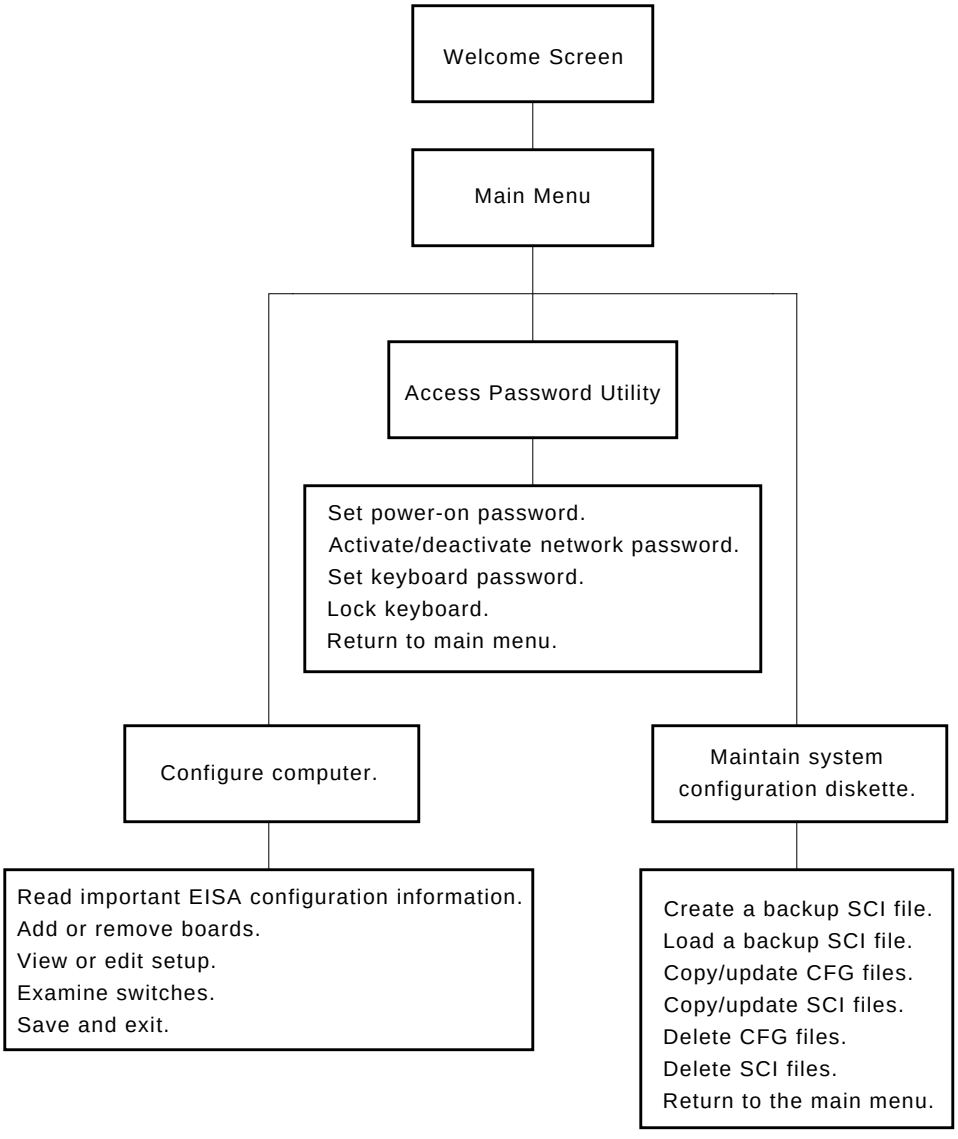


Figure 5–2 SCU Main Menu Options (Part 2 of 2)



5.2.4 How to Use the SCU

Table 5–1 lists the keyboard function keys used to access the SCU, scroll through the menu screens, and select specific menu items.

Table 5–1 SCU Keyboard Function Keys

Keyboard Key	Function
↓	Moves the cursor down one menu item.
↑	Moves the cursor up one menu item.
→	Moves the cursor one character to the right.
←	Moves the cursor one character to the left.
Enter	Selects the highlighted item.
F1	Displays the selected menu item's help screen.
Esc	Returns the monitor screen to the previously selected menu item.

You can also use a mouse. To use the mouse:

1. Highlight menu items by placing the mouse pointer on your choice and clicking the left mouse button once.
2. Select menu items by placing the mouse pointer on your choice and clicking the left mouse button twice.
3. Highlight pull-down menus by placing the mouse pointer on your choice, holding the left mouse button down while sliding the mouse to the bottom of the menu, and then releasing the left mouse button.

5.2.5 SCI Files and CFG Files

The SCU creates a system configuration information (SCI) file each time you configure the computer system. This file is stored in nonvolatile memory on the system board and is used during operation. The SCI file is also copied to the SCU diskette and can serve as a backup to the EISA configuration stored in nonvolatile memory. The SCI file is maintained on the System Configuration Diskette and has the default name *SYSTEM.SCI*.

Configuration (CFG) files contain system board, EISA, and ISA expansion board vital characteristics and the system resources they require for proper operation. The System Configuration Diskette contains a CFG file for the system board. If you install additional EISA or ISA expansion boards, make sure you have the appropriate CFG files for those modules. If a CFG file was not shipped with the ISA option module, look for the ISA CFG file on the library diskette.

5.3 Configuring the Computer System

This section describes how to configure the system using the SCU. If this is the first time using the SCU, it is recommended that you follow the procedures in the order given. If this is a subsequent session, refer to the appropriate sections to update the system configuration.

1. Install any optional hardware (disk drives, EISA expansion boards, and so on) following the instructions in the specific chapter for the board.
2. Insert the System Configuration Diskette into drive A (the 1.44 MB 3.5-inch diskette drive).
3. Press the reset button on the front panel. After a short wait, the SCU introductory screen will be displayed on the monitor screen.

Note

The SCU contains pop-up help screens for selected menu items. Press F1 at any time to display them and Esc to remove them.

4. Press Enter to display the SCU Welcome screen.

   If no configuration errors appear, the Welcome screen will display information about the SCU. Press Enter to display the Main menu, run the "Configure computer" option to create the computer SCI file, and then exit to boot the system so the changes can take effect.

   If a configuration error appears, the Welcome screen will display information about the error and tell you to reconfigure the system. Press Enter to display the Main menu, select the "View or edit details" menu item from the "Configure computer" option, make any changes as indicated by POST error messages, and then exit to boot the system so the changes can take effect.

Note

Make a backup copy of the original System Configuration Diskette. Store the original in a secure place and use the backup copy when running the SCU.

5. Using the "Select keyboard type" option, select the keyboard type.

6. Using the "Copy System Configuration Diskette" option, make a backup copy of the original System Configuration Diskette. Two copy options are available:

   a. Copy diskette from diskette drive A to diskette drive A

   b. Copy diskette from drive A to diskette drive B

   Note

   Always copy from diskette drive A to diskette drive A. Drive B is a 1.2 MB 5.25-inch diskette drive.

   Follow the prompts on the monitor screen to back up the System Configuration Diskette. You will have to swap diskettes several times to copy the entire diskette.

7. Using the "Maintain System Configuration Diskette" option, copy the CFG files supplied with any EISA or ISA expansion board.

8. Select "Learn about configuring your computer" to familiarize yourself with the SCU.

9. Set the current computer time and date using the "Set time" and "Set date" menu items.

10. Select the "Configure computer" option to configure the system. Refer to Section 5.3.2 for further information.

    Note

    If the message "Unable to update configuration information in FLASH memory" appears on the monitor screen while you are accessing the "Configure computer" option, make sure the FLASH memory jumper is set correctly before you continue. The FLASH memory jumper is jumper E0721 and should be in the 1–2 position.

11. Select the "Maintain System Configuration Diskette" option to create, change, or update SCI or CFG files.

12. Select the "Access password utility" option to set system and network passwords and lock the keyboard.

13. To write the configuration data shown in the SCU to the system's memory, select the "Exit from this utility" option.

Note

Do not install the SCU or any of its utilities on a hard disk drive. Running the SCU or any of its utilities from a hard disk drive might cause memory conflicts between the SCU and application software. This specifically applies to memory managers and Windows applications.

5.3.1 Access Password Utility

The password utility allows you to:

- Set or change the power-on password.
- Activate or deactivate a network password.
- Set a different keyboard password.
- Lock the keyboard (locks the keyboard until the password is reentered).

Use the SCU to set the power-on password. Passwords may be from one to seven characters. The power-on password is the default for the keyboard and network passwords; you can select different passwords for all three.

The password utility must be enabled with the password jumper, E0390. To enable passwords, move the jumper to the 2–3 position. If the jumper is in the disable position (1–2), the password defined in the SCU will not be written to memory. When the password jumper is enabled and a password is defined, the boot sequence pauses with a password prompt. The correct password must be entered for the system to continue booting.

If you are locked out of the system because you forgot the password, open the system and set the password jumper to the disable position. The system can then be booted successfully. The system cabinet key prevents unauthorized access to the password jumper.

To change the password, run the SCU and select the "Access password utility" option.

The password can also be changed at the password prompt. To change the power-on password, type the following string at the password prompt:

```
Current password/new password/new password
```

To delete the power-on password, type the following string at the password prompt:

```
Current password/
```

5.3.2 Configure Computer

If you are accessing this menu item for the first time, it is recommended that you follow the menu items listed below in order. If this is a subsequent session, refer to the appropriate menu item to update the system configuration.

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

5.3.3 Important EISA Configuration Information

This menu item provides basic EISA configuration information on seven screens. These screens are available at any time during the configuration process by pressing F1 and selecting "EISA configuration" from the help menu.

5.3.4 Adding or Removing Boards

This menu item allows you to add or delete ISA expansion boards. This menu item also allows you to display the location of the system board and all expansion boards installed in the system.

Note

The SCU automatically detects any EISA expansion board installed in the system. The SCU does not automatically detect ISA expansion boards.

The SCU automatically detects EISA modules, but you must load an EISA CFG file to configure an EISA module. If the EISA CFG file is already on the System Configuration Diskette, the SCU loads it automatically.

5.3.5 View or Edit Details

This menu item allows you to view or edit the configuration of the system board, all EISA expansion modules, and certain ISA expansion modules. Note that the number of options depends on the configuration.

Table 5–2 lists the configuration (setup) options for the system board. The options are listed in the order in which they appear in the SCU. The order might not be the same for the BIOS Setup Utility, which is based on the installed options. Following Table 5–2 are detailed descriptions of the setup options that need further explanation.

For more information on a specific option, move the cursor to that option and press F1 to display the corresponding help screen.

Table 5–2 System Board Setup Options

SCU Setup Field	Settings	Comments
CPU module	Not user selectable	Displays the currently installed CPU module.
System board extended memory	Not user selectable	Displays the current amount of extended memory.
System base memory option	512 KB 640 KB[1]	Sets size of base memory; should be changed to 512 KB only when software explictly requires 512 KB base memory.
User definable hard drives	Types 2 and 3[1] Types 48 and 49	The SCU allows types 2 and 3 or types 48 and 49 to be user definable.[2]
Cache control	Enabled[1]	Enables the internal Intel 486 and external cache memory (if installed).
	Disabled	Disables all cache memory resources.
On-board floppy controller	Enabled[1]	Enables the on-board diskette controller interface.
	Disabled	Disables the on-board diskette controller interface.

[1] Default.

[2] Some operating systems do not recognize hard disk drive types above 29.

(continued on next page)

Table 5–2 (Cont.) System Board Setup Options

SCU Setup Field	Settings	Comments
Diskette A Diskette B	Disabled	Disables the selected diskette drive.
	3.5-inch 720 KB, 1.44 MB, or 2.88 MB densities	Selects size and density of 3.5-inch diskette drives; standard 3.5-inch RX23 diskette drive set to 1.44 MB.
	5.25-inch 720 KB or 1.2 MB densities	Selects size and density of 5.25-inch diskette drives; optional 5.25-inch RX33 diskette drive set to 1.2 MB.
On-board IDE hard disk controller	Enabled	Enables the on-board IDE controller interface; the controller can be used as the primary interface to the bootable hard disk drive.
	Disabled[1]	Disables the on-board IDE controller interface.
Hard drive 1 Hard drive 2	Drive types 1–49	Enables hard drive size and specific parameters from a predetermined list of drive types. Drive types 2 and 3 or 48 and 49 are user definable for hard drives not listed in the BIOS drive table.[3] Obtain number of cylinder heads, number of sections, and so on, from drive documentation or label on the drive.
	Not installed	Disables the selected hard disk drive.

[1]Default.

[3]Drive type 48 or 49 information is aliased to drive type 2 or 3 when application software does not recognize drive types above 47.

(continued on next page)

Table 5–2 (Cont.) System Board Setup Options

SCU Setup Field	Settings	Comments
Parallel port	Disabled	Disables any desired on-board printer port.[4]
	Enabled Base address 378h compatible[1] Base address 378h bi-directional Base address 278h compatible Base address 278h bi-directional	Enables bi-directional mode (PS/2 compatible) or compatible mode (PC AT Centronics compatible).[4] 378h is LPT1.
Serial port 1	Disabled	Disables any desired on-board serial port at the specified base address.[4]
	Enabled Base address 03F8h[1] Base address 02F8h Base address 03E8h	Enables any desired on-board serial port.[4] 3F8 is COM1.
Serial port 2	Disabled	Disables any desired on-board serial port at the specified base address.[4]
	Enabled Base address 02F8h[1] Base address 03E8h Base address 02E8h	Enables any desired on-board serial port.[4] 2F8 is COM2.
COM1 redirection, COM2 redirection	Disabled[1]	Disables redirection of video signals to the COM1 or COM2 serial ports.
	Enabled 1200 baud 2400 baud 9600 baud	Allows the use of "scan-code" terminals to act as the system console through the COM1 and COM2 serial ports. [5,6]

[1]Default.

[4]Refer to the appropriate section after this table for further explanation.

[5]Overall system performance will be degraded if this option is enabled but not used.

[6]Redirection is not available for the COM3 and COM4 serial ports.

(continued on next page)

Table 5–2 (Cont.) System Board Setup Options

SCU Setup Field	Settings	Comments
Video type	Not installed EGA/VGA[1] CGA 40 columns CGA 80 columns MDA	Allows you to specify the type and mode of the video adapter that has been installed.
Shadow off-board video BIOS	Enabled	Enables shadowing of off-board video BIOS.
	Disabled[1]	Disables shadowing of off-board video BIOS.
On-board video	Enabled[1]	Enables on-board video.
	Disabled	Disables on-board video.
800 x 600 mode refresh rate	56 Hz 60 Hz[1] 72 Hz	Selects refresh rate.
1024 x 768 mode refresh rate	Interlaced at 44/88 Hz Non-interlaced at 60 Hz[1] Non-interlaced at 70 Hz	Selects refresh rate.
Video font	9 x 16[1] 8 x 16	9 x 16 is standard VGA font. 8 x 16 provides TUV-compliant font character spacing.
On-board video controller	Primary[1] Secondary	Selects on-board video controller.
On-board video BIOS mapping	To E0000h[1]	Selects video BIOS mapping.
	To E0000h and C0000h	Maps video BIOS into the C0000h to C7FFFh space. Required by some graphics software. Does not free up the E0000h space.
Keyboard control	Enabled[1]	Requires you to enter a keystroke during the boot process.
	Disabled	Allows the system to boot without a keyboard.

[1]Default.

(continued on next page)

Table 5–2 (Cont.) System Board Setup Options

SCU Setup Field	Settings	Comments
On-board mouse control	Enabled[1]	Enables the on-board PS/2 mouse port. IRQ = 12.
	Disabled	Disables the on-board PS/2 mouse port.
Speaker control	Enabled[1]	Turns the speaker on.
	Disabled	Turns the speaker off.
CPU speed	Fast[1]	CPU module operates at its full rated speed.
	Slow	CPU module simulates 8 MHz Intel 286 microprocessor operation.
NumLock	No	Off when system boots.
	Yes	On when system boots.
I/O bus performance	Standard[1]	Some ISA and EISA modules can be run in standard or enhanced mode. Set this feature to match the mode of the module. Adaptec 1520, 1540B, and 1740A are default in standard mode.
	Enhanced	Set when the 1740A is set for enhanced mode.
LCD operation	Enabled	For future use. Do not enable LCD operation.
	Disabled[1]	Disables the LCD option.
	Enabled - suppress POST messages	Enables the LCD option, but suppresses any POST messages.
Reserved system resources	Configuration file and overlay	For future use.

[1]Default.

5.3.5.1 System Board Extended Memory

This function indicates the amount of extended memory (memory addressable beyond 1 MB) resident on the system board and on an optional memory expansion module (if installed). The amount of extended memory is automatically detected and cannot be modified using the SCU.

Note

Extended memory installed on EISA or ISA boards is not included in the quantity of extended memory indicated.

5.3.5.2 System Base Memory

System base memory is automatically detected by the POST. It selects 640 KB unless you have an expansion board that uses the address space between 512 KB and 640 KB.

5.3.5.3 Shadow Off-Board Video BIOS

The system board reserves an area of fast 32-bit DRAM for a copy of off-board video BIOS. If you choose to shadow off-board video BIOS, the computer copies the video BIOS to the appropriate area in DRAM and disables the slower ROM. Faster graphics performance may be obtained if you choose to shadow off-board video BIOS.

Note

Only EGA and VGA video controllers have a video BIOS that can be shadowed. Some high-resolution monitor controllers do not work properly when video BIOS is shadowed. If you have a high-resolution monitor controller installed and you experience monitor problems, select "Disable off-board video BIOS."

5.3.5.4 User Definable Hard Disk Drive

System BIOS contains a table of drive types for IDE hard disk drives. Of these, you can define the number of sectors, cylinders, heads, and so on, for types 2 and 3 or types 48 and 49. Choose types 48 and 49, unless the local area network (LAN) software does not recognize them.

5.3.5.5 Hard Drive 1

This option must be configured to determine drive-specific parameters. Choose from types 1 through 47. If hard drive 1 is not installed, then select "Disabled."

User-definable types 2, 3, 48, and 49 require you to enter specific parameters (cylinders, heads, precompensation, landing zone, and sectors). You can select either types 2 and 3 or types 48 and 49 as user definable. IDE hard drives are usually selected as "Drive Type 1." Because certain operating systems do not recognize BIOS drive type parameters above type 47, the parameters for drive types 48 and 49 should be aliased to types 2 and 3 using this option.

5.3.5.6 Hard Drive 2

This option is the same as the hard drive 1 option.

5.3.5.7 Parallel Port and Serial Ports

The system logically assigns LPT*x* and COM*x* names to:

- Parallel ports in the address order 378h and 278h
- Serial ports in the address order 3F8h, 2F8h, 3E8h, and 2E8h

This occurs during each boot process. For example, if you are using the DOS operating system and you disable the serial port that is assigned to 3F8h as COM1, during the next boot cycle the system will reassign the name COM1 to the next enabled serial port in the sequence.

5.3.5.8 CPU Speed

This option determines the speed used by the system each time you turn it on or reboot it. Fast is the normal setting for CPU speed. The fast setting enables operation at the rated speed. Slow (equivalent to 8 MHz) is used to reduce the effective CPU speed to be compatible with some speed-dependent application programs (mostly games). If an application program does not run correctly at full speed, try changing the CPU speed to slow.

5.3.6 Examine Required Switches

This menu item allows you to display the switches and jumpers that must be set manually on the system board and on any expansion board. This menu item also lists applicable software drivers that need to be installed.

If you need to set switches or jumpers, make sure you write them down before you exit the SCU and power down the system.

5.3.7 Save and Exit

This menu item allows you to save all changes and exit from the "Configure computer" menu. Note that when you exit, the system boots and all changes take effect immediately.

When you exit from the SCU, all of the SCU changes are written to NVRAM. All new configuration settings take place upon a soft reboot of the system, except for video features. If you have changed any video settings (refresh rate, font size, video type, or mapping), you must put the system through a hard reboot in order to have the data in NVRAM written to the video chip. If you change any video features, save and exit from the SCU, remove the SCU diskette, and then press the reset button on the front panel. Now you can be sure that the video features you changed have been written to the video controller.

5.4 Configuring the System with the SCU for ISA Modules

You must install an ISA CFG file for every ISA module in the system. The ISA CFG file is used to record the settings of the ISA module. The settings must be accurate because the SCU uses the settings to determine available resources for autoconfiguration of EISA modules.

5.4.1 Adding an ISA CFG File

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

7. Use the arrow keys to select the slot in which the ISA module is installed.
8. Press Enter. The ISA CFG file is now installed in the slot you selected.

Table 5–3 ISA CFG Files for applicationDEC 400*x*P ISA Modules

ISA Module	ISA CFG File on System Configuration Diskette
Adaptec 1540B	ADP0100.CFG Adaptec AHA-1540/1542 ISA SCSI Host Adapter
Terminal multiplexer host adapter (option module, any slot)	ISAC001.CFG Corollary 8x4 MUX (Rotary Switches)

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

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

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

Note

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

5.5 Configuring the System with EISA Option Modules

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

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

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

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

5.6 Automatic Configuration

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

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

Automatic configuration can be disabled for the entire system:

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

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

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

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

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

5.7 Viewing Total System Configuration

To view a list of all used and available system resources, select the "View or edit details" screen. Press F7 during this display. A secondary menu appears with "View additional system information" as an option. Select this choice by highlighting it and pressing Enter. You then have a choice of viewing all used system resources, or all available resources. This is a very useful feature.

Note

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

5.8 Library Diskette

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

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

Note

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

5.9 Advanced System Configuration Utility Feature

The SCU is equipped with an advanced system configuration utility feature. With this feature you can allocate memory in the 15 MB to 16 MB range for use by EISA or ISA I/O option modules. Generally these modules use memory locations between 640 KB and 1 MB. The advanced SCU feature allows you to install up to four Digital terminal multiplexers in the system.

Note

The advanced SCU feature can be used only with SCO UNIX System V Release 3.2 Version 4.0. It is not supported with SCO ODT 1.1, DOS, or Novell operating systems. Your option module must also support use of memory in the 15 MB space.

To use the advanced SCU feature:

1. If the system has more than 16 MB of memory, you must inform SCO UNIX that the 15 MB to 16 MB memory area is not for system use. To do this, you must edit the */etc/default/boot* file. Search for the following string:

   ```
   DEFBOOTSTR=hd(40)unix
   ```

   Change it to read:

   ```
   DEFBOOTSTR=hd(40)unix mem=1m-15m,16m-192m/s/n
   ```

   You must make this change before you enable the advanced feature in the SCU. If you forget to change this file, type the following string at the boot prompt:

   ```
   hd(40)unix mem=1m-15m,16m-192m/s/n
   ```

2. Reboot the system and run the SCU.
3. At the second SCU screen ("Welcome"), press Ctrl/A. The "Welcome" changes to "Advanced Configuration."
4. Select "Configure computer" and then "View or edit details."
5. Two new choices are added to the system board settings: "Extended memory range definition" and "Additional expansion board address space." Do not change the "Extended memory range definition" option. Highlight "Additional expansion board address space," press Enter, and select Enabled. The 15 MB to 16 MB memory range can now be used by options.

For more information on how to specify a memory range, refer to the man page on "boot."

5.9.1 Installing More than One Terminal Multiplexer

The Digital terminal multiplexer supports addressing in the 15 MB range. Up to four terminal multiplexers can be installed, if the addresses of the multiplexers are between FA0000h and FD0000h.

Install the multiplexers as follows:

1. Set the first multiplexer installed to an address of FA0000h, the second to FB0000h, the third to FC0000h, and the fourth to FD0000h.
2. Use the multiplexer's ISA CFG file (ISAC0001.CFG) to specify these addresses for the modules.

3. Use the rotary switches on each module to set the address. (For example, set the H switch to F and the L switch to A for FA0000h, and set the H switch to F and the L switch to B for FB0000h.)

A

System Specifications

A.1 Introduction

This appendix provides information about the technical characteristics of the system. It includes:

- System specifications
- Power supply and input power requirements
- Expansion slot current limitations
- System component current requirements

A.2 System Specifications

Tables A–1 through A–4 list the applicationDEC 400*x*P system dimensions, and the environmental and acoustic specifications.

Table A–1 System Dimensions

Dimension	Specification
Width, top	23.0 cm (9 in)
Width, bottom	30.5 cm (12 in)
Length, top	56 cm (22 in)
Length, bottom	61 cm (24 in)
Height	63.5 cm (25 in)
Weight[1]	26.6 kgm (59 lb)

[1]With standard 1.44 MB diskette drive, but without CPU module or other options.

Table A–2 Environmental Specifications

Attributes	Specification
Operating temperature	10°C to 40°C (50°F to 104°F)
Storage temperature	–20°C to 60°C (–4°F to 140°F)
Operating humidity (noncondensing)	20% to 80% relative humidity, max wet bulb 33°C
Storage humidity (noncondensing)	95% relative humidity, max wet bulb 35°C
Operating altitude	3,048 m (10,000 ft) maximum
Operating shock	2.0 G
Nonoperating shock	30 G, trapezoidal wave, 170 ips D velocity

Table A–3 Acoustics — Declared Values per ISO 9296 and ISO 7779

	Sound Power Level L_{WAd}, B(A)	Sound Pressure Level, L_{pAm}, dB(A)	
		Operator Position	Bystander Position
Idle (2RZ25)[1]	5.5	40	39
Operating (2RZ25)[1]	5.5	40	39

[1]Current values for specific configurations are available from Digital representatives.

Table A–4 Schallemissionswerte — Vorläufige Werteangaben nach ISO 9296 und ISO 7779/DIN45635-19

	Schalleistungspegal L_{WAd}, B(A)	Schalldruckpegel, L_{pAm}, dB(A)	
		Bediener Position	Zuschauerpositionen
Leerlauf (2RZ25)[1]	5,5	40	39
Betrieb (2RZ25)[1]	5,5	40	39

[1]Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Digital Equipment Vertretungen erhältlich.

A.3 Power Supply and Input Power Requirements

The power supply provides four dc voltages: +12 Vdc, –12 Vdc, +5 Vdc, and –5 Vdc. These voltages are used by the various components within the system. Table A–5 lists the power requirements.

Table A–5 System Power Requirements

Parameter	Specification
AC voltage (nominal)	110/120 V or 220/240 V (autosensing)
Frequency (nominal)	60 Hz or 50 Hz
AC phases	1
AC power input (maximum, including auxiliary ac outlet)	840 W
AC power output	350 W
Inrush current (maximum)	50 A
Auxiliary ac output current (maximum)	
110/120 V	3.0 A
220/240 V	1.5 A

A.4 Expansion Slot Current Limitations

The system board contains eight EISA bus master expansion slots, which are also ISA compatible. The maximum +5 Vdc current for any expansion slot depends upon the following four parameters:

- Power supply capacity of 35 A at +5 Vdc
- The +5 Vdc requirements of the board set, including CPU and memory modules
- The +5 Vdc requirements of the peripherals
- The power demands of all other slots in use

Caution

Each EISA bus expansion board is limited to 4.5 A at +5 Vdc maximum. The power supply supports 8 EISA options at an average of 2.0 A per option. Do not exceed 35 A when computing the total +5 Vdc current drain for the system board (including options, memory, and CPU). This avoids damage to the power supply and system board.

A.5 System Component Current Requirements

The system has a 350 W power supply. Table A–6 specifies the nominal current requirements for typical computer components.

Table A–6 Computer Component Current and Power Requirements

Assembly	+5 Vdc	+12 Vdc	-12 Vdc	Total Power (without surge)
System board (32 MB memory)	6.0 A	0.06 A	0.06 A	31.4 W
486/50, 256 KB cache	4.7 A			23.5 W
486/33, 128 KB cache	4.2 A			21.0 W
486/25, 128 KB cache	4.0 A			20.0 W
64 MB memory	3.0 A			15 W
3.5-inch diskette drive	0.8 A	1.00 A		16 W
5.25-inch diskette drive	0.2 A	0.20 A		3.4 W
Keyboard and mouse	0.5 A			2.5 W
1 EISA slot[1]	2.0 A	0.06 A	0.06 A	11.4 W
8 EISA slots[1]	16 A	0.48 A	0.48 A	91 W
3.5-inch hard drive[1]	1.1 A	0.80 A (2 A surge)		15.1 W
5.25-inch hard drive (half-height)[1]	1.0 A	1.50 A (4.5 A surge)		23 W
5.25-inch hard drive (full-height)[1]	1.5 A	2.00 A (4.5 A surge)		31.5 W

[1]Options vary. Typical values are shown.

B

System Board Jumpers

B.1 Introduction

Jumper pins allow you to set specific system parameters. They are set by changing the pin location of jumper blocks. A jumper block is a small plastic-encased conductor (shorting plug) that slips over the pins. To change a jumper setting, remove the jumper from its current location with your fingers. Position the jumper over the two pins designated for the desired setting. Press the jumper evenly onto the pins. Be careful not to bend the pins.

B.2 Jumper Settings

Figure B–1 shows the location of the system board jumpers. Table B–1 lists the system board jumpers and factory default settings.

Figure B–1 Location of System Board Jumpers

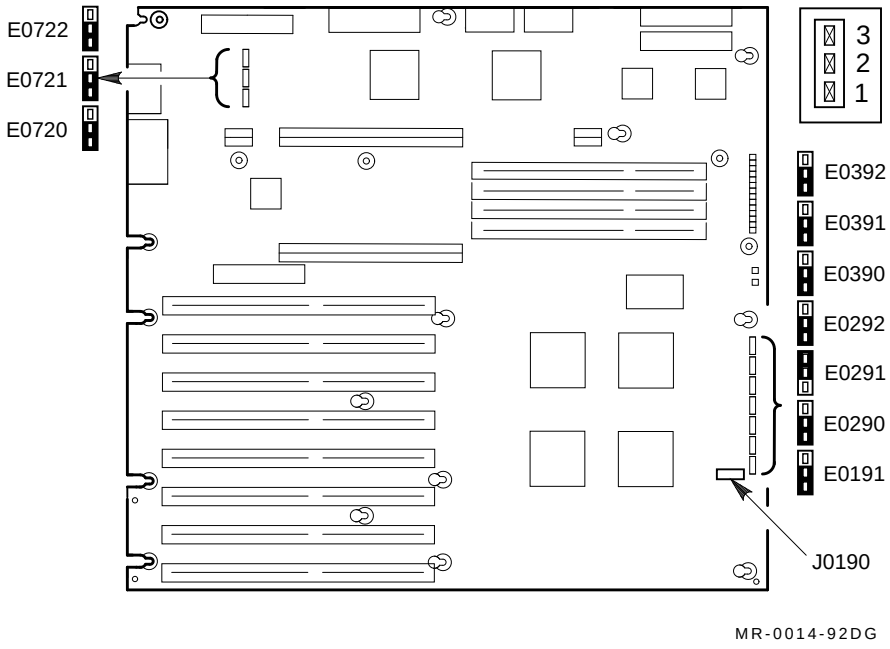


Table B–1 System Board Jumper Settings

Board Designation	1–2 jumper	2–3 jumper
FLASH		
E0191 FLASH	Normal BIOS boot block[1]	Update BIOS boot block
E0721 F-P	Flash write enable[1]	Flash read only
FLOPPY		
E0291 FLOPPY	Diskette write-protected	Diskette read/write enabled[1]
KEYBOARD		
E0292 NVRAM	Retain configuration memory[1]	Clear configuration memory
E0390 PASSWORD	Password disable/clear[1]	Password enable
MEMORY		
E0391 SIMM0	2, 4, 8 MB SIMMs in bank 0[1]	16, 32 MB SIMMs in bank 0
E0392 SIMM1	2, 4, 8 MB SIMMs in bank 1[1]	16, 32 MB SIMMs in bank 1
VGA		
E0290 VGA	On-board VGA enabled[1]	On-board VGA disabled
E0720 VID1M	512 KB video memory[1]	1 MB video memory
E0722 VID	Video base address = 03C3h[1]	Video base address = 46E8h

[1]Default.

C

Interface Connectors

C.1 Introduction

This appendix provides information about the external connectors on the applicationDEC 400*x*P system.

C.2 External System Connectors

This section lists all external computer connectors located at the rear of the system cabinet. The system cabinet rear panel connectors are shown in Figure 1–2. Refer to the figure key in Table 1–2. Each of the following external connectors is described:

- Parallel printer connector, 25-pin D-subminiature female
- Serial port connectors, 9-pin D-subminiature male
- Keyboard and mouse connectors, 6-pin mini-DIN

C.2.1 Parallel Printer Connector

The parallel printer connector provides an interface to a printer or other parallel devices. Table C–1 lists its pin assignments.

Note

The system logically assigns LPT*x* names to parallel ports in the address order 378h and 278h. This occurs during each boot process.

Table C–1 Parallel Printer Connector Pinout

DB25 Pin	Signal	Function
1	STB-R[1]	Strobe
2	PRTD0	Printer data bit 0
3	PRTD1	Printer data bit 1
4	PRTD2	Printer data bit 2
5	PRTD3	Printer data bit 3
6	PRTD4	Printer data bit 4
7	PRTD5	Printer data bit 5
8	PRTD6	Printer data bit 6
9	PRTD7	Printer data bit 7
10	ACK[1]	Acknowledge
11	BUSY	Busy
12	PE	Paper end
13	SLCT	Select
14	AUTOFDXT[1]	Auto feed
15	ERR[1]	Error
16	INIT[1]	Initialize printer
17	SLCTIN[1]	Select input
18–25	GND	Ground

[1]Asserted low.

C.2.2 Serial Port Connectors

The serial port connectors consist of two 9-pin D-subminiature connectors. Table C–2 lists the pin assignments. The baud rates supported by the system for the serial ports are 300, 1200, 2400, 4800, 9600, 19200, and 38400.

Note

The system logically assigns COM*x* names to serial ports in the address order 3F8h, 2F8h, 3E8h, and 2E8h. This occurs during each boot process.

Table C–2 Serial Port Connector Pinout

DB9 Pin	Signal	Function
1	DCD	Data carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

C.2.3 Keyboard and Mouse Connectors

The keyboard and mouse connectors consist of two 6-pin mini-DIN connectors. The connector closest to the system board is the keyboard connector; the other is the mouse connector. Table C–3 lists the pin assignments.

Table C–3 Keyboard and Mouse Connector Pinouts

Pin	Signal
1	Data
2	No connection
3	Ground
4	+5 Vdc (fused)
5	Clock
6	No connection

D
Device Mapping

Tables D–1 through D–5 list the computer system's memory, I/O address, interrupt, and DMA maps.

Resources used by the system board are shown in Table D–1. Resources used by option modules are not shown. Use the SCU to view total system resources.

Table D–1 Memory Map, Without Options

Address Range (Hex)	Function	Size	Shadow	Cache	WP[1]
0010 0000–01FF FFFF	Extended memory	63 MB	No	Yes	No
000F 0000–000F FFFF	System BIOS	64 KB	Yes	Yes	Yes
000E 8000–000E FFFF	Reserved system resources[2]	32 KB	No	Yes	Yes
000E 0000–000E 7FFF	On-board video BIOS extension	32 KB	No	Yes	Yes
000D 0000–000D FFFF	Available for options	64 KB	No	Yes	Yes
000C 8000–000C FFFF	Available for options	32 KB	No	Yes	Yes
000C 0000–000C 7FFF	Video BIOS (when mapped)	32 KB	Yes	Yes	Yes
000A 0000–000B FFFF	Video RAM	128 KB	No	Yes	Yes
0000 0000–0009 FFFF	Base memory	640 KB	No	Yes	Yes

[1]Write protected (not cached in the Intel 486).

[2]Used only before operating system boot.

Table D–2 Memory Map, Typical Configuration

Address Range (Hex)	Function	Size	Shadow	Cache	WP[1]
0010 0000–01FF FFFF	Extended memory	63 MB	No	Yes	No
000F 0000–000F FFFF	System BIOS	64 KB	Yes	Yes	Yes
000E 8000–000E FFFF	Reserved system resources[2]	32 KB	No	Yes	Yes
000E 0000–000E 7FFF	On-board video BIOS extension	32 KB	No	Yes	Yes
000D 0000–000D FFFF	Terminal multiplexer	64 KB	No	Yes	Yes
000C 8000–000C FFFF	Adaptec SCSI host adapter	32 KB	No	Yes	Yes
000C 2000–000C 7FFF	Available for options	24 KB	No	Yes	Yes
000C 0000–000C 1FFF	3Com 3C503 Ethernet	8 KB	No	Yes	Yes
000A 0000–000B FFFF	Video RAM	128 KB	No	Yes	Yes
0000 0000–0009 FFFF	Base memory	640 KB	No	Yes	Yes

[1]Write protected (not cached in the Intel 486).

[2]Used only before operating system boot.

Table D–3 I/O Address Map

Range (Hex)	Function
0000–000F	ISP DMA controller one
0020–0021	ISP interrupt controller one
0026	MECA and CLASIC configuration index
0027	MECA and CLASIC configuration data
0040–0043	IPS timer one
0048–004B	ISP timer two
0060	Keyboard data
0061	ISP NMI
0064	Keyboard command/status
0070 (bit 7)	ISP enable NMI
0070 (bits 6–0)	Real-time clock address
0071	Real-time clock data

(continued on next page)

Table D–3 (Cont.) I/O Address Map

Range (Hex)	Function
0078	BIOS timer
0080–008F	ISP DMA
0092	System control port
00A0–00A1	ISP interrupt
00C0–00DE	ISP DMA
00F0	Reset numeric error
01F0–01F7	IDE controller
0278–027B	Parallel 2
02E8–02EF	Serial 4
02F8–02FF	Serial 2
0378–037F	Parallel 2
03B0–03BB	Video registers
03C0–03BF	Parallel 1
03E8–03EF	Serial 3
03F0–03F5	Diskette controller
03F6	IDE
03F7 (bits 6–0)	IDE read
03F8–03FF	Serial 1
0400–040B	ISP high DMA
040C–040F	ISP control and test
0461–0464	ISP extended NMI
0464–0465	ISP bus master
0480–048F	ISP high DMA
04C2–04CE	ISP extended DMA
04D0–04D1	ISP interrupt edge/level
04D2–04FF	ISP extended DMA
0C01–0C07	Baseboard configuration
0C09–0C79	Baseboard configuration
0C80–0C83	Baseboard EISA identification

(continued on next page)

Table D–3 (Cont.) I/O Address Map

Range (Hex)	Function
0C84	Baseboard enable
0C85–0CFF	Baseboard configuration

Table D–4 Interrupt Map

Priority	Interrupt Controller	Interrupt Number	Interrupt Source
1	1	IRQ0	System timer
2	1	IRQ1	Keyboard controller
3–10	1	IRQ2	Interrupt controller 2
3	2	IRQ8	Real-time clock
4	2	IRQ9	Available for EISA options
5	2	IRQ10	Available for EISA/ISA options
6	2	IRQ11	Available for EISA/ISA options
7	2	IRQ12	Mouse
8	2	IRQ13	Numeric coprocessor
9	2	IRQ14	IDE hard disk drive (available for EISA/ISA options if no IDE)
10	2	IRQ15	Available for EISA/ISA options
11	1	IRQ3	COMx[1]
12	1	IRQ4	COMx[1]
13	1	IRQ5	LPTy[2]
14	1	IRQ6	Diskette drive
15	1	IRQ7	LPTy[2]

[1]Can be COM1 through COM4.

[2]Can be either LPT1 or LPT2.

Table D–5 DMA Map

Channel	Controller	Function
0	1	Refresh
1	1	Not used
2	1	Diskette controller
3	1	Not used
5	2	Not used
6	2	Not used
7	2	Not used

E

ISA Option Configuration Files

Table E–1 is a list of the ISA CFG files on the SCU library diskette supplied with the applicationDEC 400*x*P system.

Table E–1 ISA Option Configuration Files

Company	Description	CFG File	Category
3Com Corporation	Etherlink 3C500B, ASM 34-0780	ISA8C02	NET
	Etherlink 3C501, ASM 1221	ISA8C01	NET
	Etherlink II 3C503	ISA8C03	NET
	Etherlink Plus 3C505-2012, 16 bit	ISA8C00	NET
	Etherlink Plus 3C505-2012, 8 bit	ISA8C06	NET
	Tokenlink 3C603, 16 bit	ISA8C04	NET
	Tokenlink 3C603, 8 bit	ISA8C08	NET
	Tokenlink Plus 3C605-2065, 16 bit	ISA8C07	NET
	Tokenlink Plus 3C605-2065, 8 bit	ISA8C05	NET
Alloy	FTFA Tape and Floppy Controller	ISABA03	MSD
	IMP2 Multiuser Port Controller	ISABA00	COM
	IMP8 Multiuser Port Controller	ISABA01	COM
	PC-HIA XBUS Controller	ISABA02	OTH
American Megatrends, Inc. (AMI)	SMART PACK 2 W/ PAL 5.1	ISAD800	MEM
	SMART PACK 2 W/ PAL 6.1	ISAD801	MEM
	SMART PACK 2 W/ PAL 6.2	ISAD802	MEM
Anvil	Stallion Intelligent I/O Controller	ISAB000	COM
Archive	SC499R Tape Controller	ISAB800	MSD
	VP402 Tape Adapter	ISAB801	MSD

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
Arnet	Modular SMARTPORT Card	ISAAE02	COM
	SMARTPORT 16 Card	ISAAE03	COM
	SMARTPORT Card	ISAAE01	COM
AST Research	3270/COAX II Rev. X4	ISA8200	COM
	5251/11 Enhanced Plus	ISA8201	COM
	Rampage 286	ISA8203	MEM
	RAMvantage	ISA8204	MEM
	SixPackPlus, Version A	ISA8202	MEM
AT&T	Starlan Network adapter	ISA8F00	NET
	Truevision Image Capture	ISA8F01	VID
ATI Technologies	EGA Wonder	ISAAC00	VID
	VGA Wonder	ISAAC01	VID
Atronics	Professional Image Board Plus	ISACF00	VID
Attachmate	3270 COAX adapter (long board)	ISA8100	COM
	Advanced 3270 COAX adapter (Short board)	ISA8101	COM
	SDLC Adapter	ISA8103	COM
	SDLC/Autolink adapter	ISA8102	COM
Banyan	Intelligent Communications Adapter	ISAB500	COM
Bell Technologies	ACE Multiport Serial Card	ISAC100	COM
Bi-Tech Enterprises, Inc.	SCSI 2110 HD/Tape Controller	ISAD000	MSD
	SCSI 2200 Controller	ISAD001	MSD
BICC	ISOLAN Ethernet adapter	ISAA600	NET
BIT3	403/404/405 Bus Communication Adaptors	ISABB00	OTH
BlueLynx	BlueLynx 3270 Enhanced Coax	ISAC304	COM

(continued on next page)

Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
	BlueLynx 3270 Remote	ISAC302	COM
	BlueLynx 5250	ISAC301	COM
	BlueLynx 5251-12	ISAC300	COM
	BlueLynx Enhanced 5251-11	ISAC303	COM
Boca Research, Inc.	Bocaram/AT Plus	ISABC00	MEM
	I/O Master AT	ISABC01	OTH
Capital Equipment Corporation	PC 488 IEEE Printer Controller	ISAC500	OTH
Chase Research	AT4/AT8/AT16	ISADD00	COM
Codonol	Codenet 3051	ISAA800	NET
Computer Peripherals	Graphmaster Plus EGA	ISAB602	VID
	Monographic Video	ISAB600	VID
	Vision Master VGA	ISAB601	VID
Computone	IntelliPort ATCC Cluster Controller	ISAAF01	COM
	IntelliPort Multiport Serial Card	ISAAF00	COM
Comtrol Corporation	SMART HOSTESS Multiport Serial Card	ISAD200	COM
Control Systems	Artist 10	ISAA700	VID
	Artist XJ10	ISAA701	VID
Core International, Inc.	CNT-ATP ESDI Internal FD Controller	ISAC400	MSD
Corollary	8x4 Mux (Jumpers)	ISAC000	COM
	8x4 Mux (Rotary Switches)	ISAC001	COM
DCA (Digital Comm. Associates)	10 Net adapter	ISA8507	NET
	IRMA 3278 Emulation adapter	ISA8501	COM
	IRMA 3279 Graphics adapter	ISA8502	COM
	IRMA Remote SDLC Adapter	ISA8506	COM

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
	IRMA2 3279 Graphics adapter	ISA8508	COM
	IRMA2 adapter	ISA8500	COM
	IRMA3 Convertible adapter	ISA8503	COM
	Smart Alec 5250	ISA8505	COM
DEC (Digital Equipment Corp.)	DEPCA EtherLink adapter, Rev D1	ISA8B00	NET
	DEPCA EtherLink adapter, Rev E, F	ISA8B01	NET
DigiBoard	DigiBoard Com/8s	ISAB904	COM
	DigiChannel PC/8	ISAB905	COM
	DigiChannel PC/8e	ISAB903	COM
	DigiChannel PC/8i	ISAB901	COM
	DigiChannel PC/Xe	ISAB900	COM
Digital Storage Systems	ARC6000	ISACD00	MSD
Emerald	3XPlus 5250 Remote	ISAB101	COM
	3XTwin 5250 Twinax	ISAB100	COM
Emulex	MPC-II Comm Controller	ISAD300	COM
Eotron	EOgraph Plus	ISABF00	OTH
Equinox Systems	Megaport Board	ISAD100	COM
Everex	Evercom 24 2400 Baud modem	ISAB200	COM
Excelan	EXOS 205E	ISAA400	NET
	EXOS 205T 16-bit	ISAA401	NET
GammaLink	GammaFax CP	ISAD501	COM
	GammaFax NA	ISAD500	COM
Gateway	G/Ethernet 8-bit PC	ISA9401	NET
	G/Ethernet AT	ISA9400	NET
	G/Net LNIM	ISA9405	NET
	G/Net VS	ISA9404	NET

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
	G/Token Ring 8-bit	ISA9402	NET
	G/Token Ring AT	ISA9403	NET
Genoa Systems Corp.	QIC-02 Tape Controller	ISA9F07	MSD
	Super VGA, 16 bit	ISA9F00	VID
	SuperEGA HiRes+	ISA9F03	VID
	SuperSpectrum Model 4640	ISA9F05	VID
	SuperSpectrum Model 4650	ISA9F04	VID
	SuperVGA	ISA9F02	VID
Hayes Microcomputer Products,Inc	Smartmodem 1200B	ISAAB00	COM
	Smartmodem 2400B	ISAAB01	COM
Hercules Computer Technology	GB222 InColor Card	ISA9000	VID
	Graphics Card Plus	ISA9001	VID
	VGA Card	ISA9002	VID
Hewlett Packard Company	Dual Serial Interface Board (24541B)	HWP1400	COM
	Enhanced Graphics Adapter Board (45983A)	HWP0030	VID
	HP 82328A Intelligent Graphics Controller	ISA9B00	VID
	HP Serial/Parallel Interface Board (24540B)	HWP1C00	COM
	HP-IB Interface board (82335A)	HWP1450	OTH
	Internal 1200 Baud Modem (24550A)	HWP1420	COM
	Internal 2400 Baud Modem (24551A)	HWP1410	COM
	Monochrome Plus Video Board (35732A)	HWP0000	VID
	Multimode Color Adapter Board (45984A)	HWP0020	VID
	Multimode Video Adapter (45981A)	HWP0010	VID
	Scanjet Plus Interface (88290A)	HWP1460	COM
	ThinLAN Interface Card (27210B)	HWP1810	NET

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
Hughes Lan Systems	4140 Ethernet Board	ISAD700	NET
	6130 Broadband Network Card	ISAD701	NET
	6140 Token Ring Network Board	ISAD702	NET
IBM	Advanced 3278/79 adapter	ISA8303	COM
	Enhanced 5250 Emulator	ISA8300	COM
	Enhanced 5250 Emulator, Rev B	ISA8301	COM
	Enhanced Graphic adapter	ISA830C	VID
	Monochrome adapter	ISA8308	VID
	PC Network	ISA8305	NET
	PGA	ISA830D	VID
	SDLC (3270 or 5250 Remote)	ISA8302	COM
	Serial/Parallel Adapter	ISA8304	OTH
	Token Ring Adapter I	ISA8306	NET
	Token Ring adapter II	ISA8307	NET
	Token Ring adapter, 16/4	ISA830B	NET
	Token Ring II adapter, Short card	ISA830A	NET
	VGA display adapter	ISA8309	VID
Idea	5250/Remote	ISA8400	COM
	5251 Twinax Plus, Rev D	ISA8401	COM
	IDEAcomm 5251 Twinax Plus, Rev C	ISA8402	COM
	IDEAcomm 5251 Twinax, Rev A, B, C	ISA8403	COM
Ideatech, Inc.	Ideaphone Input Device	ISACE00	OTH
IMC Networks Corporation	PCnic, 16 bit NIC	ISA9700	NET
Intel Corporation	Above Board 286 (no Piggyback)	ISA9202	MEM
	Above Board 286 with 2MB Piggyback	ISA9203	MEM
	Above Board Plus 8 (including 6 MB Piggyback)	ISA9206	MEM
	Above Board PS/286 (no Piggyback)	ISA9204	MEM
	Above Board PS/286 with 2MB Piggyback	ISA9205	MEM
	Above Board/AT (no Piggyback)	ISA9200	MEM
	Above Board/AT with 2MB Piggyback	ISA9201	MEM

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
	Visual Edge printing enhancement system	ISA9207	OTH
Iomega Corporation	Bernoulli II Combo Adapter Board	ISAB702	OTH
	Bernoulli PC2/50, PC2B/50 Boards	ISAB701	OTH
	Bernoulli PC3B/50 Board	ISAB700	OTH
Konan	TNT-1050 Caching Disk Controller	ISACB00	MSD
LSE Electronics	Platinum VGA 16 card	ISAC701	VID
	YC808 Color Graphics Printer adapter	ISAC700	OTH
Madge	AT Ring Node	ISA9600	NET
Matrox	PG-1024	ISA9C02	VID
	PG-1281	ISA9C01	VID
	PG-641	ISA9C03	VID
Metheus	UGA 1104 Graphics Controller	MET1104	VID
	UGA 1124/1128 Graphics Controller	MET1128	VID
Micom-Interlan	NI5210/16 Ethernet	ISA9303	NET
	NI5210/8 Ethernet adapter	ISA9302	NET
	NP600A Ethernet adapter, 16 bit	ISA9300	NET
Micro Integration	PC-MICOAX	ISAC201	COM
	PC-STWINAX	ISAC200	COM
Microsoft Corporation	Mouse Controller	ISA8E00	OTH
National Instruments	AT-GPIB	ISACA01	OTH
	GPIB-PC	ISACA02	OTH
	GPIB-PCIIA	ISACA00	OTH
NEC	Multisync Graphics Board GB-1	ISAD900	VID
Nestar	ARCNET Plan 2000	ISA8A00	NET

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
Novell	Coax adapter 3270 connection	ISA8700	COM
	COAX Graphics, Rev. A	ISA8701	COM
	NE1000 Ethernet adapter	ISA8711	NET
	NE2000 Ethernet adapter	ISA8712	NET
	RX-Net, Rev B,C,D network interface	ISA8713	NET
	RX-Net, Rev E,F,G network interface	ISA8714	NET
	Twinax 5250	ISA8702	COM
Nth Graphics	Nth Engine	ISADC00	VID
Orchid	Enhanced Board OM	ISAA102	MEM
	Enhanced Board w/IO	ISAA103	MEM
	ProDesigner VGA/VGA+	ISAA101	VID
	Turbo PGA	ISAA100	VID
Packard Bell	PB 3270 Coax	ISACC00	COM
Paradise Systems	Autoswitch EGA	ISAA202	VID
	VGA Plus, 8 bit	ISAA201	VID
	VGA Professional, 16 bit	ISAA200	VID
Pixel Works	Micro Clipper Graphics	ISA9E00	VID
	Ultra Clipper Graphics	ISA9E01	VID
Practical Peripherals	Practical Modem 2400	ISAB300	COM
Proteon Corporation	ProNET-4/AT P1344	ISA9500	NET
Pure Data	PDI508 ArcNet	ISAA501	NET
	PDI8025 Token Ring	ISAA500	NET
QMS	Jet Script	ISADE00	OTH
Qua Tech	DS-201 Dual Channel RS-422	ISABE04	OTH
	DSDP-402 Dual Serial/Dual Parallel	ISABE06	OTH
	ES-100 8 Channel Asynchronous	ISABE01	COM
	MXI-100 IEEE 488 GPIB	ISABE03	OTH
	PXB-1608 Parallel Expansion Board	ISABE00	OTH

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
	PXB-721 Parallel Expansion	ISABE05	OTH
	QS-100M 4 Channel Asynchronous	ISABE02	COM
	SmartLynx Multiport Adapter	ISABE08	COM
	WSB-10 Waveform Synthesizer	ISABE07	OTH
Quadram	QuadEGA+	ISA9100	VID
	QUADMEG-AT	ISA9102	MEM
	Quadram+ w/IO	ISA9103	MEM
	QuadVGA Video adapter	ISA9101	VID
Rabbit Software	RB14 X.25 Adapter	ISADB00	COM
	RB24 Multi-Protocol Comm	ISADB01	COM
Racal-Interlan	NI5210/16 Ethernet	ISABD03	NET
	NI5210/8 Ethernet	ISABD02	NET
	NP600A Ethernet 16-bit	ISABD00	NET
Renaissance	Rendition I	ISA9D00	VID
	Rendition II Intelligent Graphics Controller	ISA9D01	VID
Sigma Designs	SigmaVGA or VGA/HP8	ISA9901	VID
	VGA-PC-HP160/162	ISA9900	VID
SIIG Inc.	ARCLAN-100 Arcnet network board	ISAC900	NET
SMC	ARCNET PC	ISA8900	NET
	ARCNET PC100	ISA8901	NET
	ARCNET PC110	ISA8902	NET
	ARCNET PC130/E	ISA8903	NET
	ARCNET PC220/120	ISA8904	NET
	ARCNET PC270/E	ISA8905	NET
	ARCNET PC500	ISA8906	NET
	Ethernet PC510	ISA8907	NET
STB Systems	Chauffer HT	ISAB402	VID
	EGA MultiRes	ISAB404	VID
	EGA Plus	ISAB401	VID
	VGA Extra	ISAB403	VID

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
Street Electronics Corporation	ECHO PC+ Speech Synthesizer	ISAC800	OTH
Sun Micro Systems	TOPS Flashcard	ISAAD00	COM
Tecmar	EGA Master 480/800	ISA8804	VID
	Maestro AT	ISA8805	MEM
	QIC PC36 Tape Controller	TEC8001	MSD
	QIC60 Host adapter	TEC8000	MSD
	QT Host Adapter	TEC8002	MSD
	QT PC36 Tape Controller	TEC8003	MSD
The Complete PC, Inc.	FAX/9600	ISAD600	COM
Thomas-Conrad Corporation	TC6042 ARC-Card/CE	TCO030D	NET
	TC6045 ARC-Card/AT	TCO010C	NET
	TC6142 ARC-Card/CE	TCO040B	NET
Tiara	LANCARD/A, Rev B	ISA8D00	NET
	LANCARD/E PC 16	ISA8D01	NET
Torus	Ethernet adapter	ISADA00	NET
	Ethernet adapter /SB	ISADA01	NET
Truevision	ATVista ICB	ISAA300	VID
Ungerman-Bass Inc.	3270 NIUpc	UBIB200	NET
	NIC	UBIC100	NET
	NIUpc	UBIB100	NET
	NIUpc / Token Ring	UBID100	NET
	Personal NIU	UBIA100	NET
	Personal NIU/ex	UBIA200	NET
Vector International	SCC Async/BSC/SDLC	ISAC600	COM

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Table E–1 (Cont.) ISA Option Configuration Files

Company	Description	CFG File	Category
Vermont Micro Systems	Cobra	VMI0211	VID
	Cobra Plus	VMI0E01	VID
	Image Manager 1024	VMI0201	VID
	Image Manager 640	VMI0601	VID
	Page Manager 100	ISAA000	VID
Verticom, Inc.	M16/M256E	ISA9A00	VID
	MX16/AT & MX256/AT	ISA9A01	VID
Video Seven	FastWrite VGA Video adapter	ISA9802	VID
	V-RAM VGA	ISA9800	VID
	Vega Deluxe EGA adapter	ISA9801	VID
Western Digital Corporation	EtherCard + 8003EB 61-600090-00	WDC03E4	NET
	EtherCard + 8003EB 61-600245-02	WDC03E2	NET
Western Digital Corporation	EtherCard PLUS 16 8013EBT	WDC13E0	NET
	EtherCard PLUS 8003E	WDC03E0	NET
	EtherCard PLUS TP 8003WT	WDC03E3	NET
	EtherCard PLUS w/Boot 8003EBT	WDC03E1	NET
	StarCard PLUS 8003S	WDC0300	NET
	StarLink PLUS 8003SH	WDC0301	NET
	TokenCard 8005TR/8005TRWS	WDC0510	NET
	WD1004A-WX1 Controller	ISAD400	MSD
	WD1006V-MM2 Winchester/Floppy Controller	ISAD401	MSD
	WD1006V-SR2 Winchester/Floppy Controller	ISAD402	MSD
	WD1007A-WAH Winchester Controller	ISAD403	MSD
	WD1007V-SE1 Winchester Controller	ISAD40	MSD

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