VAXstation 3520/3540 and 3820/3840 Maintenance Guide

Order Number   EK-258AA-MG-003

AT&T is a trademark of American Telephone & Telegraph Company.

The following are trademarks of Digital Equipment Corporation:

DDCMP	MicroVMS	ThinWire	VAXcluster
DEC	PDP	TK	VAXELN
DECconnect	P/OS	TK50	VAXstation
DECmate	Professional	TMSCP	VMS
DECUS	Q-bus	TS	VT
DECwriter	Q22-bus	UNIBUS	VT100
DIBOL	Rainbow	ULTRIX	VT220
KA	RSTS	ULTRIX–32	Work Processor
MASSBUS	RSX	ULTRIX–32m	
MicroVAX	RT	VAX	**digital**™

Contents

2   Testing and Troubleshooting

3   Accessing the Hardware

4   Removing and Replacing FRUs

5   Installing Options

A   Equipment Specifications

B   Part Numbers

C Console Commands

D Cable and Connector Pin Assignments

E Interpreting LED Displays

F   SCSI and SSC Test Numbers and Utilities

Index

Examples

Figures

Tables

About This Manual

This book is a support and reference manual for Digital Customer Services personnel who perform maintenance work on the VAXstation 3520/3540 and VAXstation 3820/3840 workstations. It is also for Digital customers who have a self-maintenance agreement with Digital.

This book assumes that readers are trained technical personnel who have performed installation and maintenance work on computers such as the VAXstation 3520/3540 or the VAXstation 3820/3840 workstations. If you are not a trained technician and your workstation requires maintenance work, call your Digital service representative.

Organization

This guide contains the following chapters and appendixes:

Chapter 1, "Hardware," describes the workstation architecture and major components.

Chapter 2, "Testing and Troubleshooting," explains using self-tests and system tests to isolate problem field replaceable units (FRUs).

Chapter 3, "Accessing the Hardware," contains safety information. The chapter describes how to shut down the workstation and remove and replace covers and assemblies.

Chapter 4, "Removing and Replacing FRUs," describes how to remove and replace FRUs.

NOTE
Refer to Chapter 3 for information about removing and replacing any covers or assemblies associated with FRUs.

Chapter 5, "Installing Options," describes how to install options and upgrades for the VAXstation 3520/3540 and VAXstation 3820/3840 workstations.

Appendix A, "Equipment Specifications," lists environmental, regulatory, electrical, and physical specifications for major components of the workstation.

Appendix B, "Part Numbers," lists part numbers for basic components, add-on devices, and documentation.

Appendix C, "Console Commands," describes all console commands, including command syntax, qualifiers, and special keys.

Appendix D, "Cable and Connector Pin Assignments," lists the pin assignments for the cables and connectors used by system unit modules and options.

Appendix E, "Interpreting LED Displays," explains the LED displays for the graphics subsystem, modules, power supply, and options.

Appendix F, "SCSI and SSC Test Numbers and Utilities," explains the small computer system interface (SCSI) and system support chip (SSC) test numbers and utilities.

Conventions

This document uses the following conventions:

Convention	Description
checking	Text displayed on the screen appears in monospaced type.
test -a	Text you enter from the keyboard appears in bold type.
[*var*]	Italicized text appearing in square brackets indicates optional arguments you type on a command line.
arg	The word *arg* indicates you must type an argument on a command line.
Return	Text in a box identifies a key, such as the Return key.
Ctrl C	For sequences that use the Ctrl key, hold down Ctrl and press the second key.

Related Documents

See Appendix B for a list of related documentation.

1
Hardware

This chapter introduces the VAXstation 3520/3540 and 3820/3840 architecture. The chapter describes the following major components of the workstations:

- Monitor, including keyboard, mouse, and tablet

- System unit, including system modules, power supplies, and mass storage devices

NOTE
Make sure you read this chapter before you troubleshoot the workstation, remove and replace field replaceable units (FRUs), or install options.

Figure 1–1 shows the workstations.
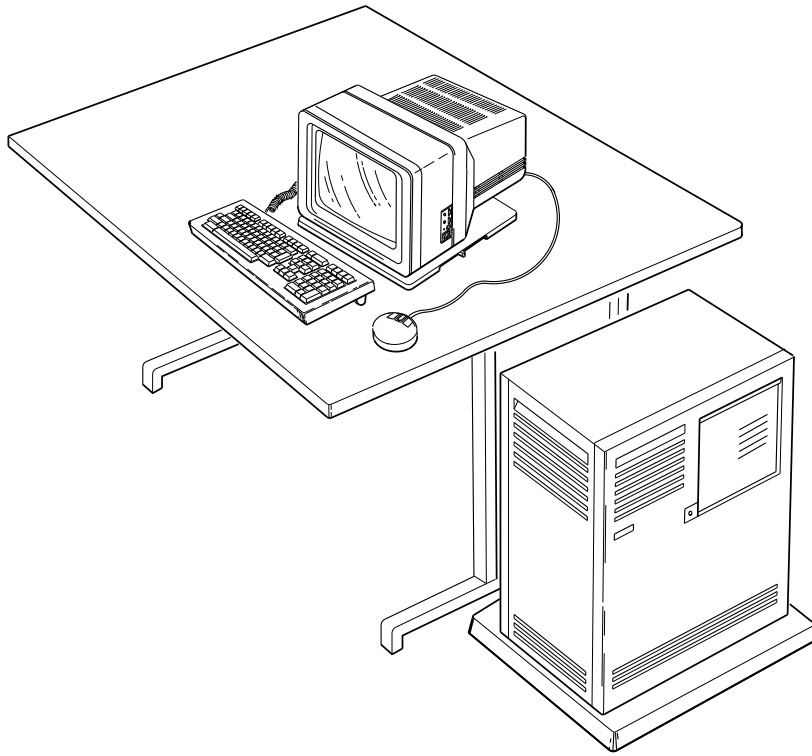
DEFM001

Figure 1–1   The VAXstation 3520/3540 and 3820/3840 Workstation

1.1   Workstation Architecture

The VAXstation 3520/3540 and 3820/3840 workstations support three system buses:

M-bus	A proprietary bus used only in this workstation.
Q-bus	Modified for use in this workstation.
Graphics bus	Used only by the graphics modules.

M-bus modules, such as the central processing unit (CPU), input/output (I/O), and memory modules, are plugged into the M-bus slots. One graphics module also plugs into the M-bus. The graphics module communicates with up to two more graphics modules through a special graphics bus. The monitor connects to a graphics module and receives red, green, and blue (RGB) input directly from it.

Q-bus options require an adapter for use with this workstation. Two adapter modules, the L2002 and the L2008, are currently available to support certain Q-bus options.

- L2002—This module plugs into slot 9 of the M-bus and supports the following Q-bus options:

    CXY08
    DSV11
    TQK70
    TSV05

- L2008—This module also plugs into slot 9 of the M-bus and supports only the TQK70 option.

Other mass storage devices connect to a small computer systems interface (SCSI) bus, which is part of the I/O module.

Figure 1–2 illustrates the VAXstation 3520/3540 and 3820/3840 architecture.

Keyboard-Mouse
Printer/Console
Ethernet
SCSI bus (Mass Storage)
Modem

CPU
Module

Memory
Module

I/O
Module

M-bus

Q-bus Adapter
or Tape Adapter
Module

Graphics
Base Module

Q-bus

Graphics bus

To/from Supported
Q-bus Modules

Graphics
Module

To/From
Monitor

MA-X0688-89
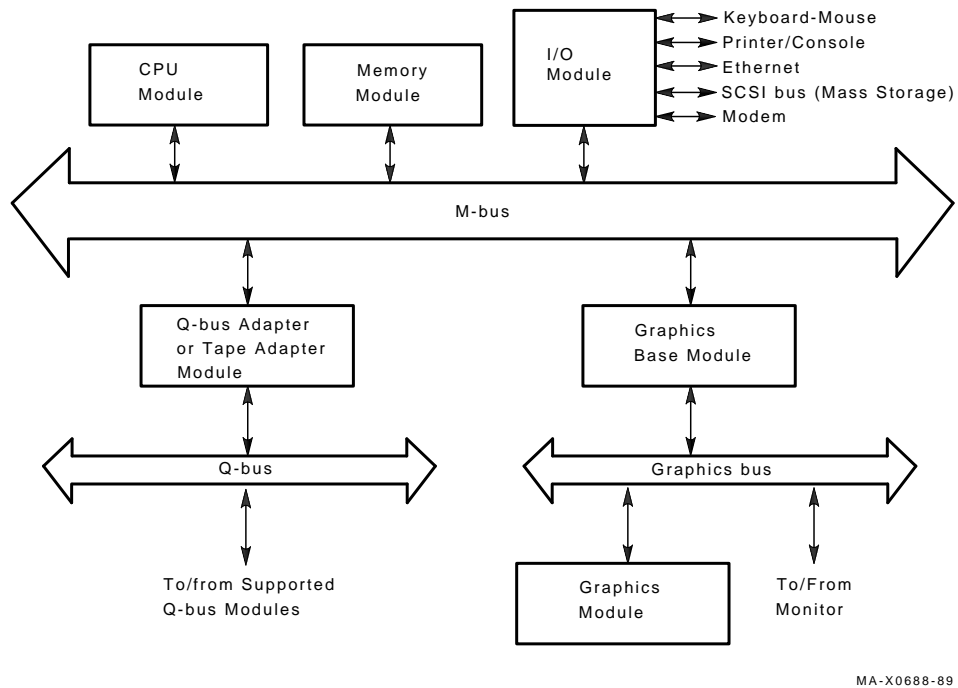
Figure 1–2   VAXstation Architecture (Sample Configuration)

1.1.1 External Connections

The workstation system unit has four kinds of external connectors:

- I/O connectors

- Graphics connectors

- SCSI connector

- Power connector

I/O connectors on the I/O cover connect the system to outside devices, such as a console, printer, modem, or Ethernet. A portion of the video cable connects the keyboard and mouse to the I/O cover.

The RGB graphics connectors on the graphics cover carry input signals to the monitor.

An SCSI connector on the I/O module connects to an SCSI cable that runs through the mass storage area and terminates at the recessed area on the upper-left side of the system unit, behind the mass storage cover. An external device can connect here.

The system unit's power cord connects to the system unit at the ac filter assembly on the lower-left side of the system unit.

Figure 1–3 shows the location of the system unit's external connections.

Optional Optical Compact Disc Drive Cable

Printer/Console Cable

Keyboard-Mouse Portion of the Video Cable

Modem or Printer/Console Cable

RGB Portion of the Video Cable

Ethernet Cable (ThickWire)
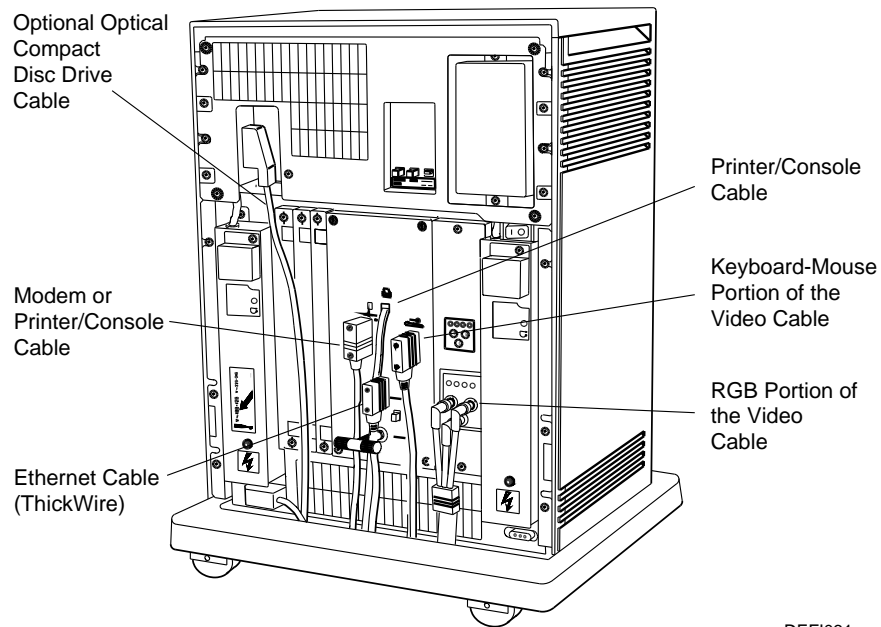
DEFI031

Figure 1–3   System Unit's External Connections

1.2 Monitor

The VR295 monitor connects to the system unit through a video cable assembly. The assembly carries signals from the I/O cover and RGB input from the graphics cover.

CAUTION
Placing the monitor near electromagnetic devices (such as printers or electric pencil sharpeners) or near magnetized objects (such as filing cabinets or steel beams in walls) can interfere with the monitor's performance.

1.2.1 Monitor Controls

The following monitor controls are located on the monitor:

- Contrast control

- Brightness control

- Degauss button

- On/off switch

- Power indicator

Figure 1–4 shows the location of the VR295 monitor controls.

The brightness and contrast controls are adjustable dials. The degauss button restores video display color after it has been affected by magnetic fields. Ten seconds after you press the degauss button, the circuit is reactivated. The green power indicator turns on when the on/off switch is set to the on (|) position.

Contrast Control

Brightness Control

Degauss Button

On/Off Switch
in the On
Position

Green
Power Indicator

DEFI016
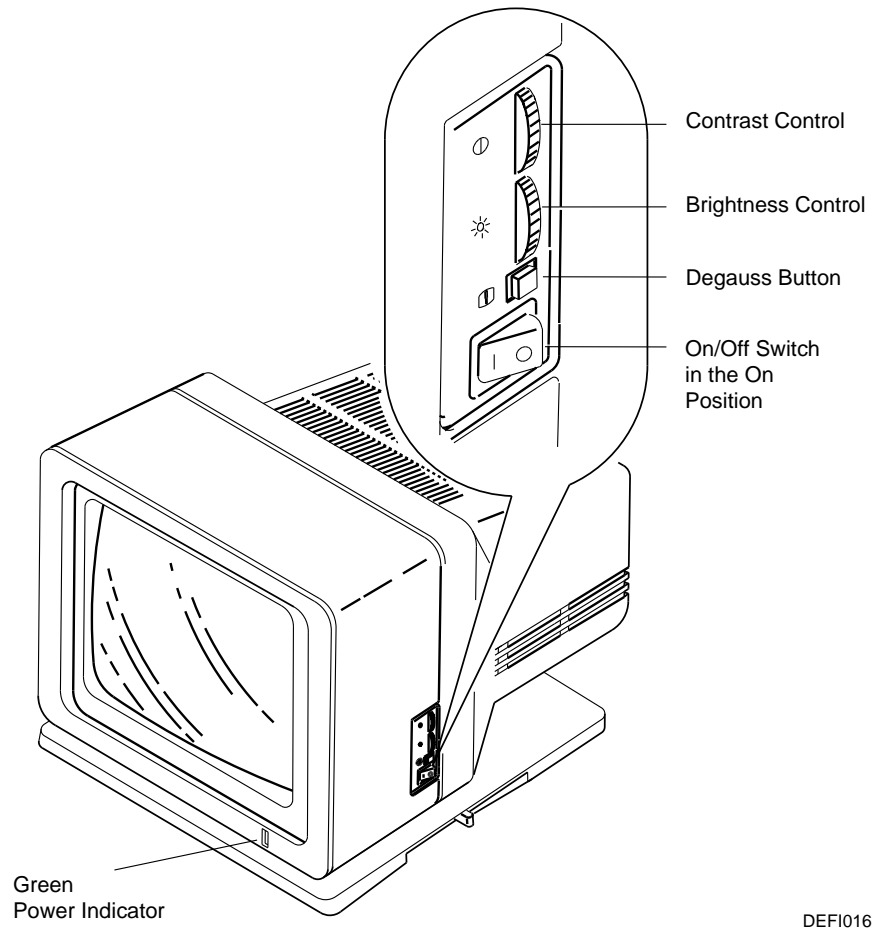
Figure 1–4   VR295 Monitor Controls

1.2.2 Monitor Connections

The following units connect to the monitor through the video cable:

- LK201 keyboard
- VSXXX-AA mouse
- VSXXX-AB tablet

1.2.2.1 Keyboard

The LK201 keyboard plugs into the video cable assembly connector block
mounted on the back of the monitor. Logic from the I/O module controls
the keyboard. The LK201 keyboard comes in 15 different versions, each
supporting a different language. The keyboard layout depends on the
selected language.

1.2.2.2 Mouse and Tablet

You can use the VSXXX-AA mouse or the VSXXX-AB tablet as a pointing
device. You can only use one pointing device at a time, since both plug
into the same connector on the video cable assembly connector block
mounted on the back of the monitor.

The optional tablet comes with a four-button puck and a stylus. The puck
or the stylus plug into the bottom of the tablet. You can only use one of
these devices at a time.

1.3   System Unit

The system unit includes the following:

- Control panel
- Backplane
- System modules—M-bus, graphics, and Q-bus
- Covers, connectors, and indicators
- Mass storage devices
- Power supplies and fans

To access the mass storage devices, you must remove the mass storage
cover. To access the modules, mass storage cover, and power supplies, you
must remove the front cover of the system unit. To access the backplane,
you must remove the back cover.

Figure 1–5 shows the system unit without the front cover. Disk or tape drives are behind the mass storage cover. An externally located optical compact disc drive connects to the SCSI connector. Chapter 3 gives directions for removing the front cover, back cover, graphics cover, and mass storage cover. Chapter 4 gives directions for removing modules, drives, and power supplies.
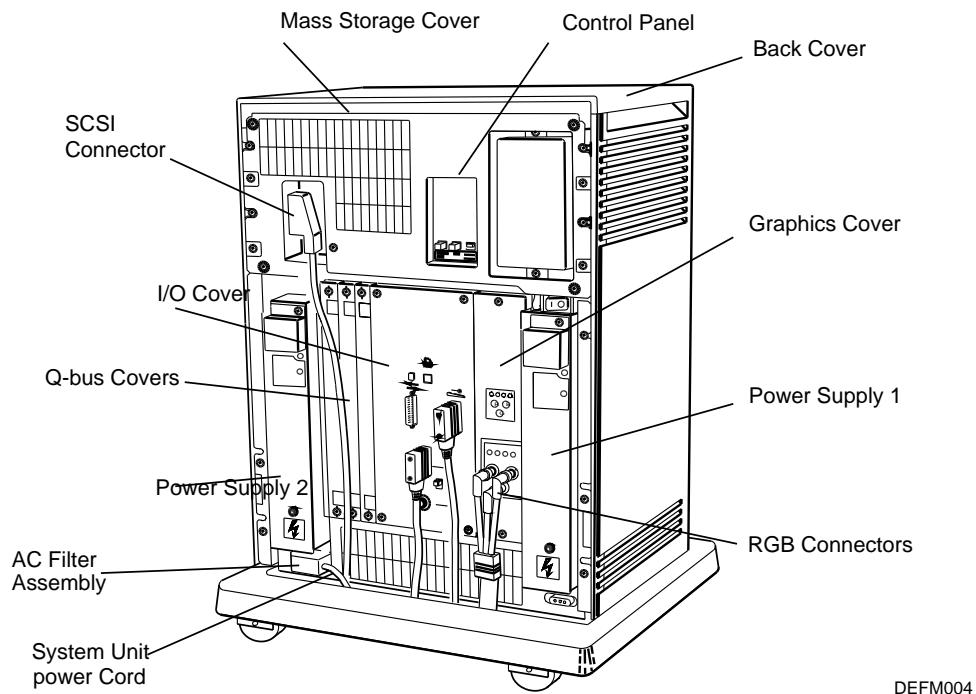
DEFM004

Figure 1–5   Inside the System Unit

1.3.1 Control Panel

At the front of the system unit, there is a three-position key switch and a sliding door. Figure 1–6 shows the control panel and switches.

Key Switch Setting	Function
Top dot	The panel locks in the up position.
Middle dot	The panel can slide down partway, allowing access to the control panel and the tape drive (if the system has one).
Bottom dot	The panel slides down all the way, revealing the on/off switch and latch.

Control Panel

Restart/ Run   Halt

On/off Switch
in the Off Position

Key
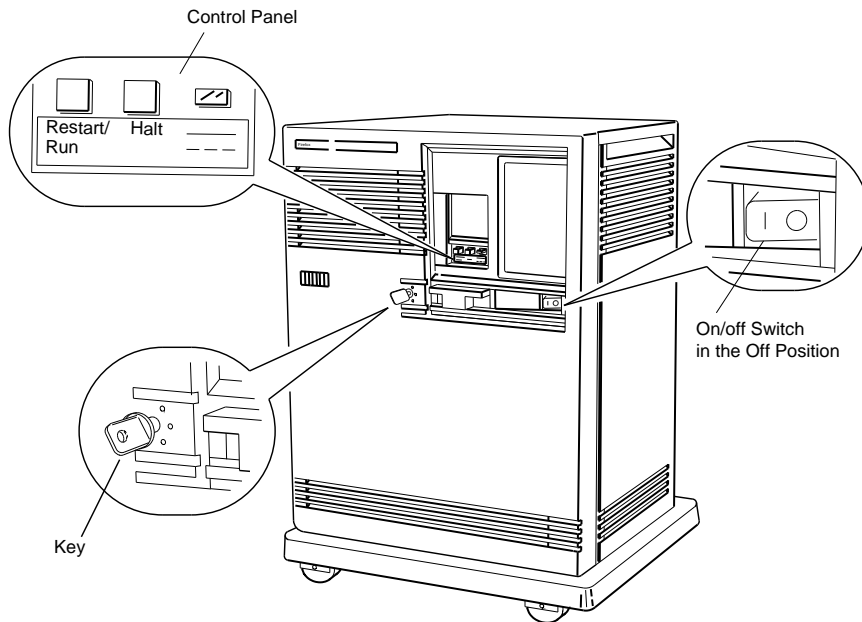
DEFM002

Figure 1–6   Control Panel, Key Switch, and On/Off Switch

When you turn on the system, the orange on/off switch on the system unit turns on and the system automatically performs a power-up self-test. If the power-up self-test finds major problems, the system displays a self-test result on the screen. For information about problems that occur at this stage, see Chapter 2.

1.3.1.1 Restart/Run **Button**

If you press the Restart/Run button, the system restarts and performs the power-up self-test.

After the workstation has bootstrapped, the green LED on the Restart/Run button turns on, indicating that the workstation is running worksystem software. When the workstation is running diagnostic or console software, the Restart/Run LED is off.

1.3.1.2 Halt **button**

If you press the Halt button, the workstation stops running worksystem software and enters console mode. For information about console mode, see Chapter 2 and Appendix B.

1.3.1.3 Power Output LED

The LED to the right of the Halt button on the control panel indicates that the workstation power supply output for both power supplies is within the proper range for system operation.

1.3.2 Backplane

The backplane has 12 slots and contains up to 12 system modules (Figure 1–7). The backplane supports three types of buses: the M-bus, Q-bus, and graphics bus.

Module ID (Mid) Numbers   0   1   2   3   4   5   7

Slots: Reserved | Reserved | TQK70 Module (Optional) | Q-bus Adapter Module (Optional) or Tape Adapter Module (optional) | Memory Module | CPU Module | CPU Module or Memory Module (OPtional) | Memory Module (Optional) | I/O Module | Graphics Base Module | Graphics Output Module | Graphics Expansion Module (OPtional)

Slot Numbers: 12 11 10 9 8 7 6 5 4 3 2 1

Q-bus Covers | I/O Cover | Graphics Cover

MA-X0689-89

Figure 1–7   System Unit Backplane Configuration

NOTE
To install the TQK70 module in slot 10, the tape adapter module (L2008) or the Q-bus adapter module (L2002) must be installed in slot 9.

To install other supported Q-bus options in slots 10 through 12, the Q-bus adapter module (L2002) must be installed in slot 9.

1.3.2.1 M-bus

The M-bus is a synchronous bus that is accessed through slots 3 through 9. The CPU module resides in slot 7, the I/O module in slot 4, and the memory module in slot 8. To regulate the power supplies properly, at least two modules must reside in slots 7 through 12.

1.3.2.2 Q-bus

Backplane slots 10 through 12 provide Q-bus signals on both the top two
and the bottom two connectors. The slots are in an AB AB configuration,
not ABCD (Figure 1–8). The Q-bus slots can accommodate supported
quad (four-connector) or dual (two-connector) Q-bus modules. If a Q-bus
module is installed, a Q-bus adapter module plugs into slot 9.

If a Q-bus module is installed and slots are skipped, the skipped slot
must contain a Q-bus grant module to provide Q-bus continuity. Q-bus
continuity is along the top half of slots 9 through 12, across the bottom of
the backplane, and across slots 12 through 10.
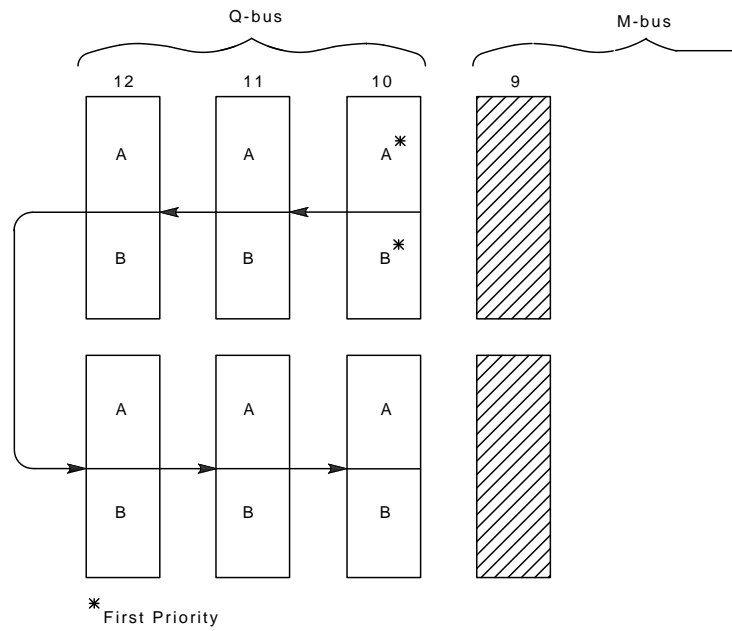
MA-X0690-89

Figure 1–8   Q-bus AB Configuration of the System Unit

1.3.2.3 Graphics Bus

The graphics bus supports graphics subsystem modules that reside in slots 1 through 3. The base graphics module resides in slot 3, and the graphics output module resides in slot 2. Slot 1 contains an optional graphics expansion module.

A graphics frontplane provides additional communication among the graphics modules. This connection supports the large amount of interaction among graphics modules. The graphics frontplane does not connect the graphics bus and M-bus (Figure 1–9).

Graphics Expansion Module (Slot 1)
Graphics Output Module (Slot 2)
Graphics Base Module (Slot 3)
I/O Module (Slot 4)
CPU Module (Slot 7)
Memory Module (Slot 8)
Tape Adapter Module (Slot 9)
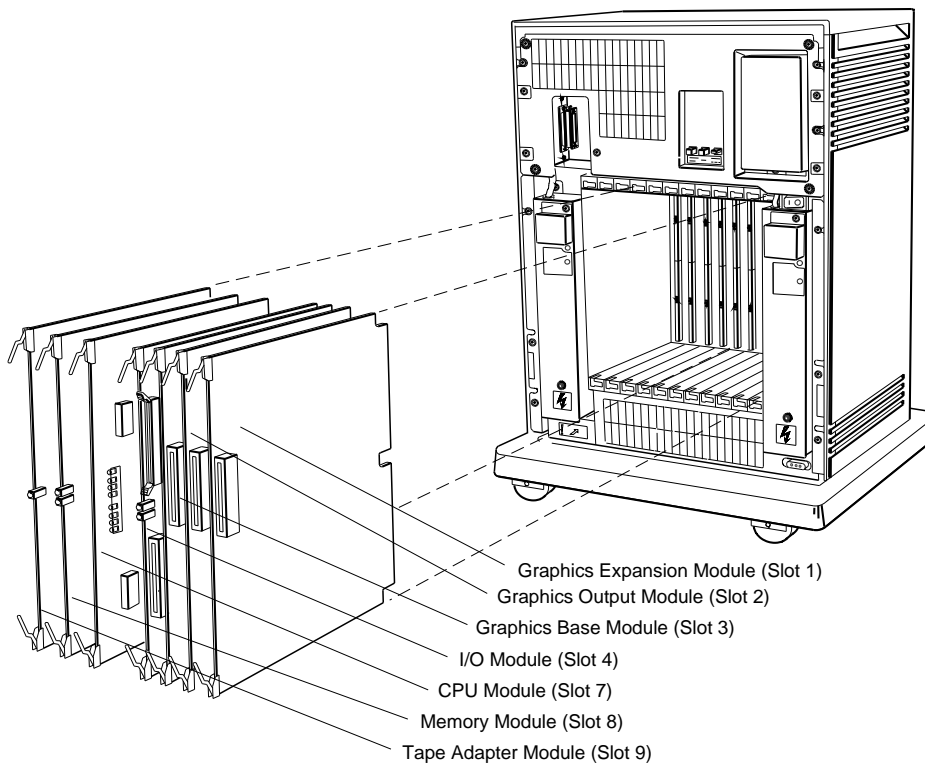
DEFM006

Figure 1–9   System Unit System Modules

1.3.3 M-Bus Modules

M-bus modules include the following:

- KA60-AA dual CPU module (VAXstation 3520/3540 workstations) or KA60-BA dual CPU module (VAXstation 3820/3840 workstations)

- MS60-AA (8 Mbyte), MS60-BA (16 Mbyte), or MS60-CA (32 Mbyte) memory modules

- I/O module

- Tape adapter module (L2008)

- Q-bus adapter module (L2002)

- Graphics base module

The M-bus can also accommodate additional optional memory modules and one additional dual CPU module.

1.3.3.1 KA60 Dual CPU Module

The KA60 dual CPU module is a single M-bus module. Each dual CPU module contains two functionally independent CPUs, which share a single set of bus transceivers, clocks, and test-mode connections.

The dual CPU module has its own diagnostic read-only memory (ROM), with 128 Kbytes for each CPU. The ROM contains console command codes as well as diagnostic-test firmware.

A VAXstation 3520 or 3820 configuration requires one dual CPU module. A VAXstation 3540 or 3840 configuration requires two dual CPU modules, for a total of four processors.

There are eight red LEDs and one green LED on the front edge of the dual CPU module. The green LED turns on if the module is operating correctly. If an error occurs, the red LEDs display an error code.

Figure 1–10 shows a dual CPU module.
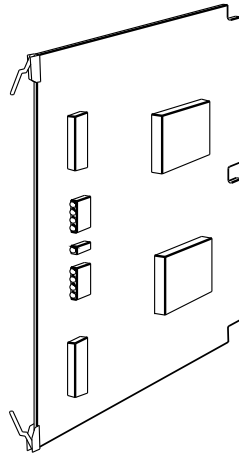
DEFM059

Figure 1–10   Dual CPU Module

1.3.3.2 MS60-AA, MS60-BA, and MS60-CA Memory Modules

The MS60-AA, MS60-BA, and MS60-CA are single M-bus memory modules. Table 1–1 compares the three memory modules.

Table 1–1   MS60-*XX* Memory Modules

Memory Module	Mbytes	Part Number
MS60-AA	8	L2007-AA
MS60-BA	16	L2007-AB
MS60-CA	32	L2007-AC

All three memory modules provide dynamic random-access memory (RAM), single-bit error correction, and double-bit error detection. Memory modules respond to M-bus protocol and retain and retrieve data, which is then used by the system unit's processors and I/O subsystem. In addition, memory modules perform self-tests and RAM array initialization.

The system unit can support up to four MS60 memory modules. With four MS60-BA memory modules, the maximum system unit memory capacity is 64 Mbytes. With four MS60-CA memory modules, the maximum system unit memory capacity is 128 Mbytes. Slot 8 must contain a memory module. Additional memory modules can be installed in slots 5, 6, and 9.

NOTE
Memory modules are not backed up by batteries. Any system unit power loss destroys data stored on them.

The front edge of the memory module includes one red and one yellow LED.

Yellow LED	Red LED	Indication
On	Off	The module has passed the self-test.
Off	On	The module has either failed or the test is not finished.
On	On	The test has not started.

Figure 1–11 shows the memory module.
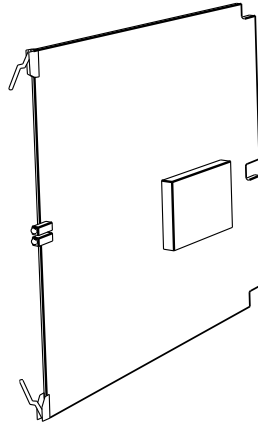
DEFM060

Figure 1–11   Memory Module

1.3.3.3 I/O Module (L2003)

The system unit must include an I/O module, in slot 4. The I/O module provides logic shared by the CPUs, including base workstation ROM, RAM with battery backup, an interval timer, and a time-of-year (TOY) clock. The I/O module also provides communications logic for the following:

* Ethernet
* SCSI
* Keyboard
* Mouse or tablet
* Modem
* Printer or alternate console

These external devices connect to the I/O module through the I/O cover or the SCSI connector. The I/O module has two connectors:

* I/O connector—Connects the I/O module to the I/O cover.

* SCSI connector—Connects the I/O module to the internal SCSI cable.

The green LED on the I/O module turns on when the module operates correctly.

Figure 1–12 shows the I/O module.
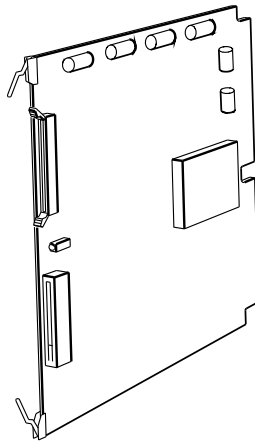
DEFM061

Figure 1–12   I/O Module

1.3.3.4 Q-bus and Tape Adapter Modules

The L2002 Q-bus adapter module (Figure 1–13) connects Q-bus modules
to the M-bus. The Q-bus adapter module installs in slot 9 and supports
the Q-bus modules installed in slots 10 through 12. The following Q-bus
options are currently supported:

CXY08   TQK70
DSV11   TSV05
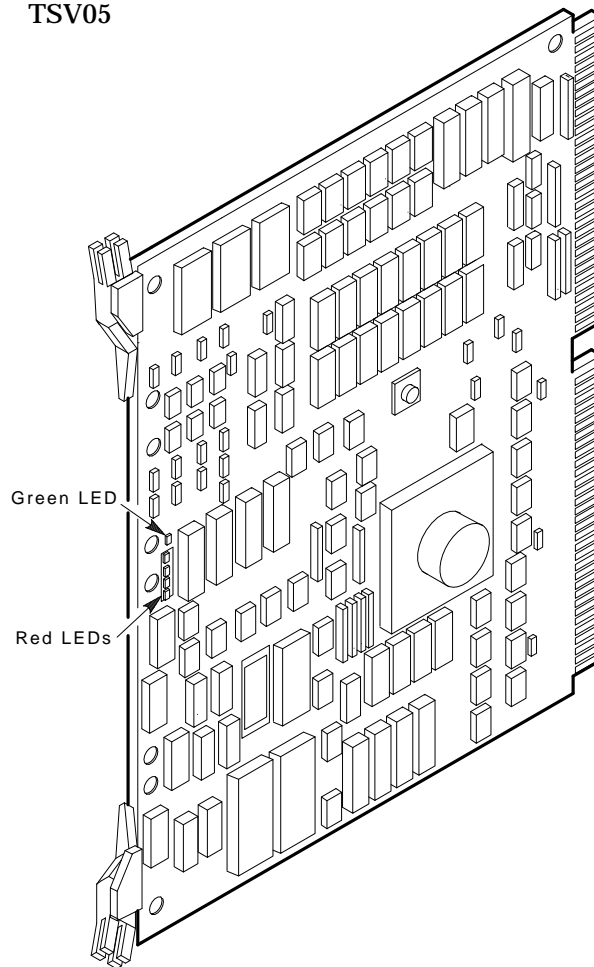
Green LED

Red LEDs

MA-X0693-89

Figure 1–13   Q-bus Adapter Module

The front edge of the adapter module has one green LED and a set of red LEDs. The green LED turns on if the adapter is operating properly. The red LEDs display an error code if the adapter module fails the self-test.

The L2008 tape adapter module supports only the TQK70 tape drive controller module. The tape adapter module installs in slot 9 and supports a tape drive controller module installed in slot 10.

The front edge of the adapter module has one green LED and a set of red LEDs. The green LED turns on if the adapter is operating properly. The red LEDs display an error code if the adapter module fails self-test (Figure 1–14).

Green LED

Red LEDs
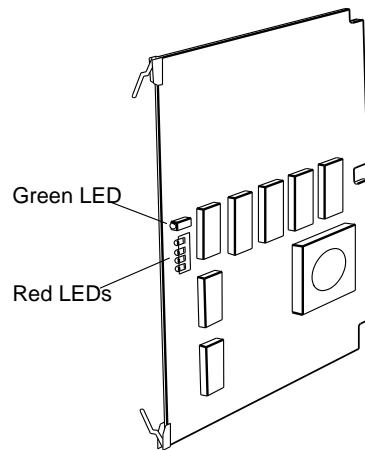
DEFM073

Figure 1–14   Tape Adapter Module

1.3.4 Graphics Bus Modules

The workstation graphics subsystem receives graphics commands and data from the CPU module and generates video images independently. The subsystem contains either two or three modules:

- Graphics base module

- Graphics output module

- Graphics expansion module (optional)

Modules in the graphics subsystem reside in slots 1 through 3 and communicate with each other through a special graphics bus.

1.3.4.1 Graphics Base Module (L2004)

The graphics base module serves as the graphics coprocesser for the workstation and links the M-bus and graphics bus. The module provides timing, addressing, and control functions for the graphics subsystem. Every workstation must have a graphics base module installed in slot 3.

1.3.4.2 Graphics Output Module (L2005)

The graphics output module provides video output circuitry for the workstation. This module also has eight planes of graphics memory, which provides bitmap color output to the monitor. Every system unit must have one graphics output module installed in slot 2.

1.3.4.3 Graphics Expansion Module (L2006)

The optional graphics expansion module provides an additional 16 planes of graphics memory, extending the graphics subsystem to 24 planes. When a graphics expansion module is installed in a workstation, the graphics output module (slot 2) provides true color output (16.7 million possible colors) to the monitor. If you use the graphics expansion module, it must be installed in slot 1.

1.3.4.4 Graphics Frontplane

The graphics frontplane carries additional signals between the graphics modules in slots 1 through 3.

Figure 1–15 shows the graphics subsystem.

Graphics Base Module

Graphics Output Module

1/4-Turn Captive
Fasteners

Graphics Cover

LED Status
Displays

BNC Connector
Icon

RGB Connectors

Graphics
Frontplane
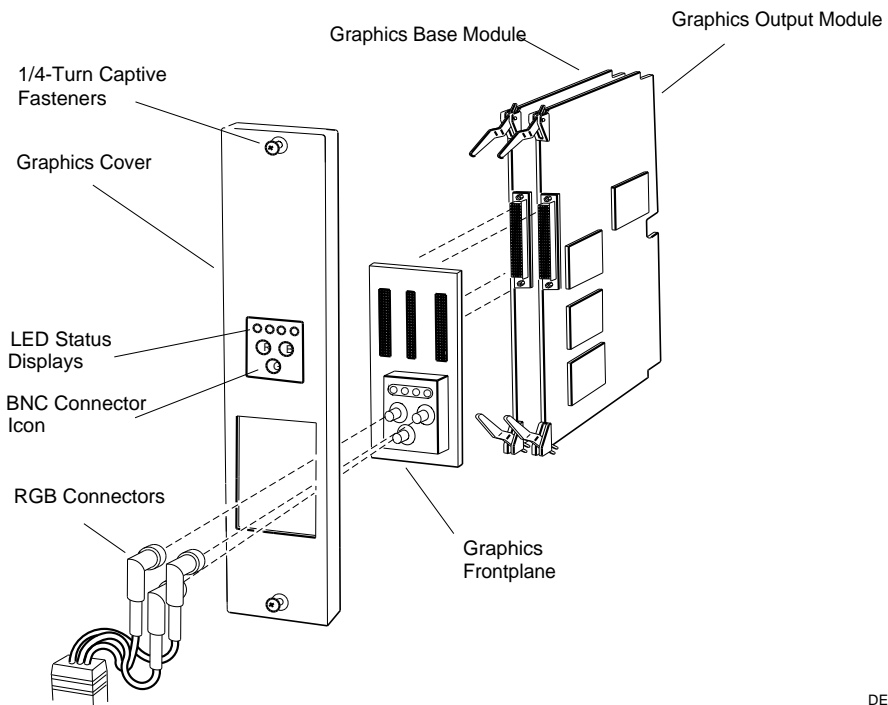
DEFM009

Figure 1–15   Graphics Subsystem

1.3.5 Q-Bus Modules

The following Q-bus modules are currently supported:

CXY08
DSV11
TQK70
TSV05

1.3.5.1 CXY08 8-Line Asynchronous Multiplexer

The CXY08 asynchronous multiplexer performs data concentration, real-time processing, and interactive terminal handling. The CXY08 is a quad-height module with a BA200 series handle (Figure 1–16). The CXY08 option also includes two cable assemblies. The module provides eight full-duplex serial data channels. Each cable assembly has a four-channel distributor.

All eight channels allow autoanswer dial-up operation over the public-switched telephone network. You can use AT&T 103, 113, and 212 modems, or the equivalent.
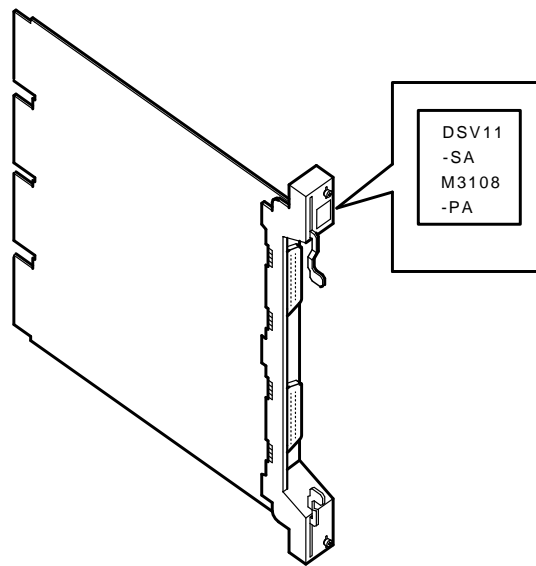
MA-X0009-88

Figure 1–16   CXY08 Module (M3119–YA)

1.3.5.2 DSV11 Communications Option

The DSV11 (Figure 1–17) is a two-channel, high-speed, synchronous communications option for use on Q-bus backplanes.

The DSV11 supports the following synchronous communications protocols:

DDCMP
HDLC/SDLC
BISYNC

The DSV11 allows any of the following synchronous interfaces:

RS–423
RS–422
RS–232/V.24
V.35
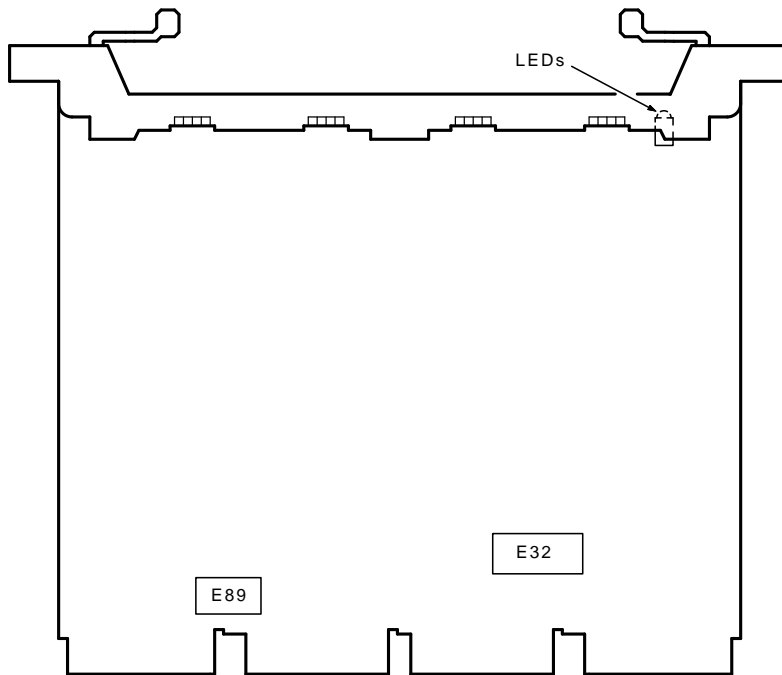
MA-X0014-88A

Figure 1–17   DSV11–S Module Layout (M3108–PA)

1.3.5.3 TQK70 Tape Drive Controller Module

The TQK70 tape drive controller module is an interface between the CPU and the TK70 tape drive. The TQK70 can be supported by either the L2008 tape adapter module or the L2002 Q-bus adapter module, installed in slot 9. If you use the L2008 tape adapter module, install the TQK70 in slot 10. If you use the L2002 Q-bus adapter module, install the TQK70 in slot 10, 11, or 12.

A cable attached to the tape controller module connects the module to the TK70 tape drive (Figure 1–18).

From TK70 Tape Drive
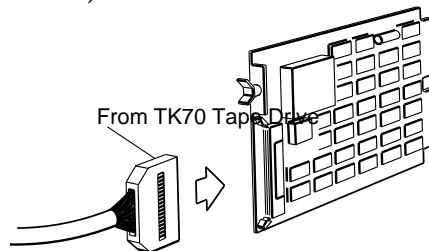
DEFM007

Figure 1–18   TQK70 Tape Drive Controller Module and Cable

1.3.5.4 TS05 Tape Drive

The TS05 is a magnetic streaming tape drive that provides 40.5 Mbytes of backup data storage.

The TS05 reads or writes up to 160 Kbytes per second (Kbytes/s) in standard ANSI format. The drive uses automatic read after write to verify that data is accurately recorded.

Tape data is buffered in 3.5 Kbytes of RAM on the drive's TSV05 controller (M7530). The TSV05 is a tape mass storage control protocol (TMSCP) device (Figure 1–19).
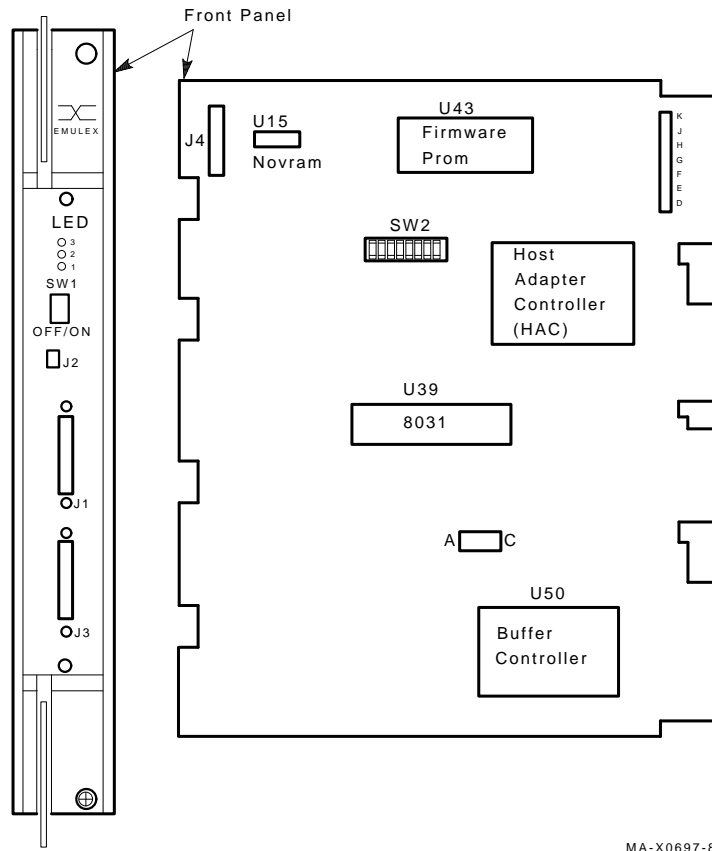
Figure 1–19   TSV05 (M7530) Controller Module

1.3.6 Covers, Connectors, and Indicators

The system unit has four types of internal covers (Figure 1–20):

- I/O cover
- Graphics cover
- Q-bus cover
- Mass storage cover

Each cover has various connectors and indicators.
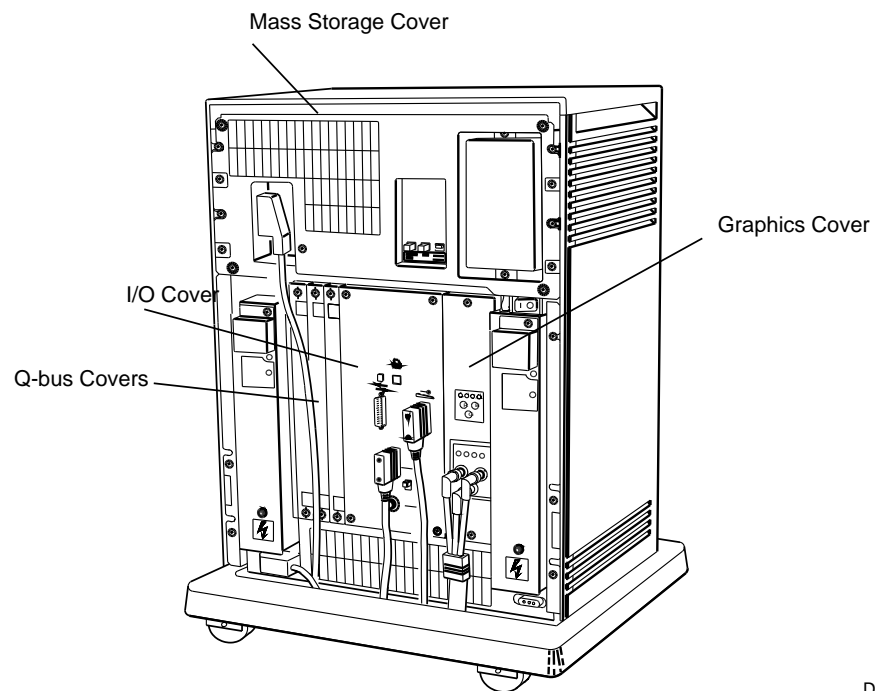
DEFM022

Figure 1–20   Internal Covers

1.3.6.1 I/O Cover

The I/O cover fits over the modules in slots 4 through 9. It contains external I/O cover connectors, a hexadecimal display, and a rechargeable battery. You remove the I/O cover (but not necessarily the I/O cable) to expose modules in slots 4 through 9. To remove the battery, you must remove the I/O cover.

The I/O cover contains the following (Figure 1–21):

- Hexadecimal system status display

- Serial modem connector (25 pins)

- ThickWire Ethernet connector (15 pins)

- ThinWire Ethernet connector

- Serial printer/console connector

- Serial keyboard-mouse connector (15 pins)

- Ethernet switch for selecting ThinWire or ThickWire Ethernet
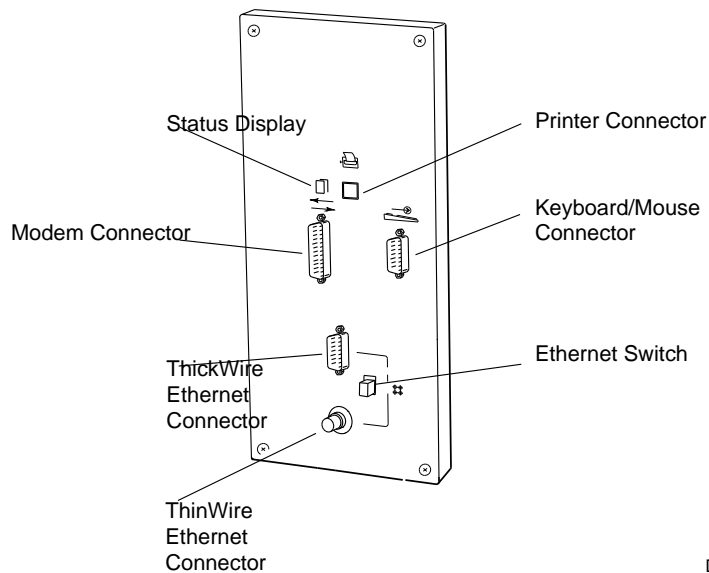
Figure 1–21   I/O Cover, Indicators, and Connectors

1.3.6.2 Graphics Cover

The graphics cover (Figure 1–22) fits over the graphics frontplane and the two or three graphics modules installed in slots 1, 2, and 3. You can see the LED displays and the RGB connectors on the frontplane.

1/4-Turn Captive
Fasteners

Graphics
Cover

Icon Label

RGB Connectors

Graphics
Frontplane
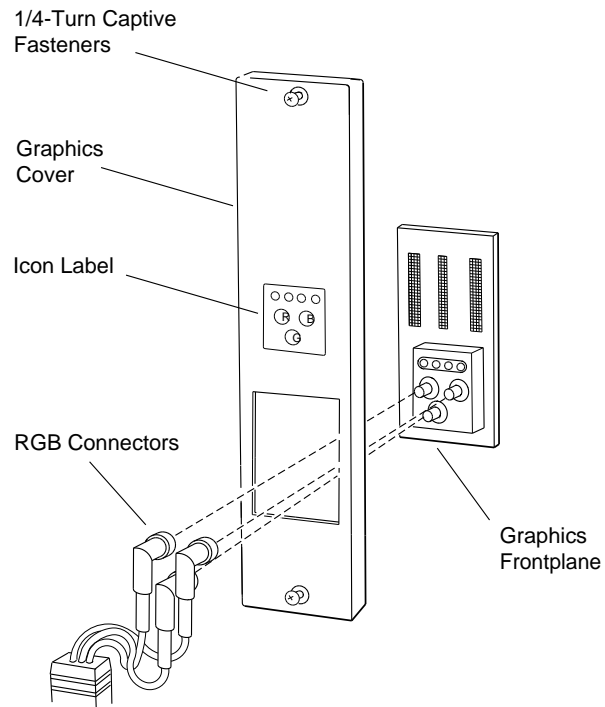
DEFM076

Figure 1–22   Graphics Cover, Frontplane, and Connectors

1.3.6.3 Q-bus Covers

Q-bus covers fit over the individual Q-bus slots.

1.3.6.4 Mass Storage Cover

The mass storage cover fits over the mass storage area, the control panel, and the mounting recess for the SCSI connector.

1.3.7 Mass Storage Devices

Five types of mass storage devices are available:

- Internal TK70 tape drive
- Internal RZ55 hard disk drive
- Internal RZ56 hard disk drive
- External TS05 tape drive
- External RRD40 optical compact disc drive

The internal devices are in the mass storage area at the top of the
system unit, behind the mass storage cover. The mass storage area can
accommodate a maximum of four standard 13.3 cm (5.25 in.) hard disk
drives or three hard disk drives and one TK70 tape drive.
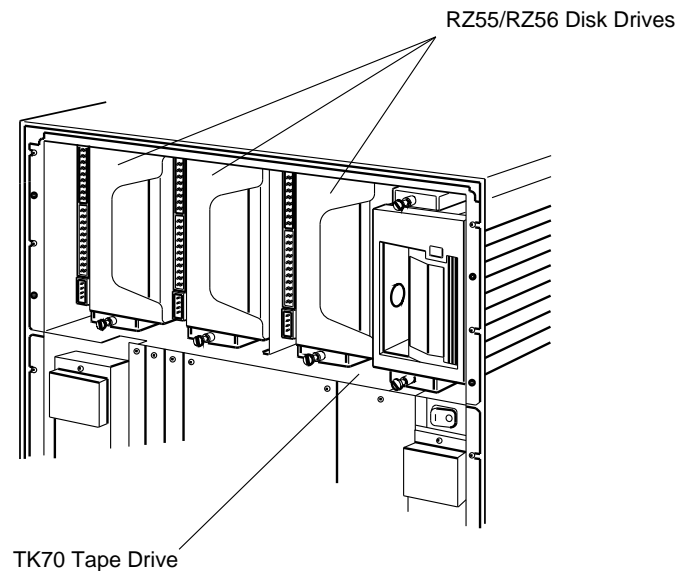
Figure 1–23   System Unit with Internal Mass Storage Devices Installed

The external, industry-standard TS05 tape drive connects to the TSV05
controller through the TSV05 handle (Figure 1–24).

Front Panel

U15
Novram
J4
U43
Firmware
Prom
EMULEX
LED
O 3
O 2
O 1
SW1
OFF/ON
J2
SW2
Host
Adapter
Controller
(HAC)
U39
8031
J1
A   C
J3
U50
Buffer
Controller

K J H G F E D
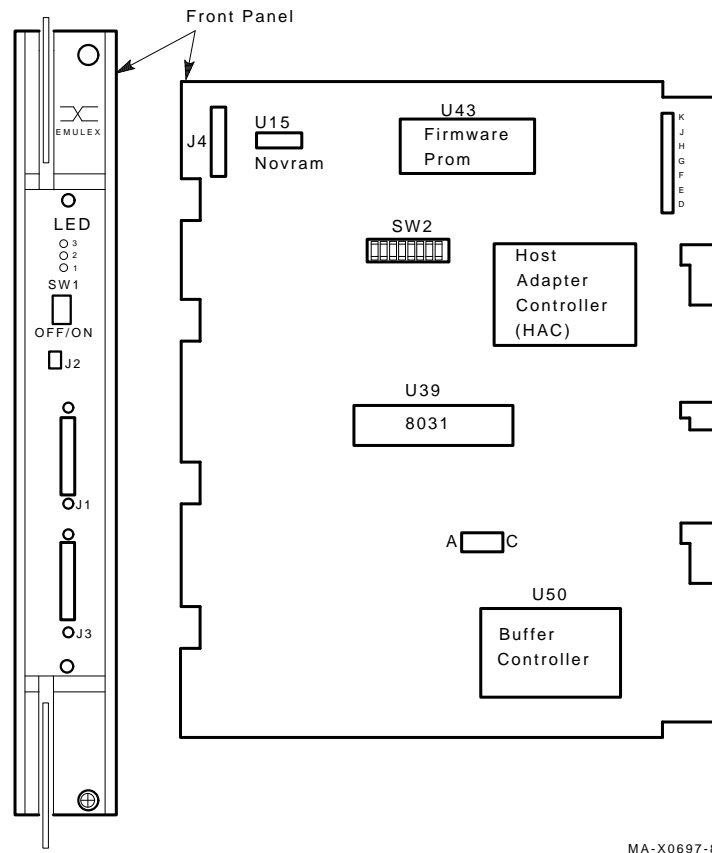
MA-X0697-89

Figure 1–24   TSV05 Tape Drive Controller

The external optical compact disc drive attaches to the system unit at the
SCSI connector. Figure 1–25 show the system unit with an RRD40 optical
compact disc drive connected.

CAUTION
**Using a cable other than the Digital-supplied seven-foot SCSI
cable can cause the device to malfunction.**
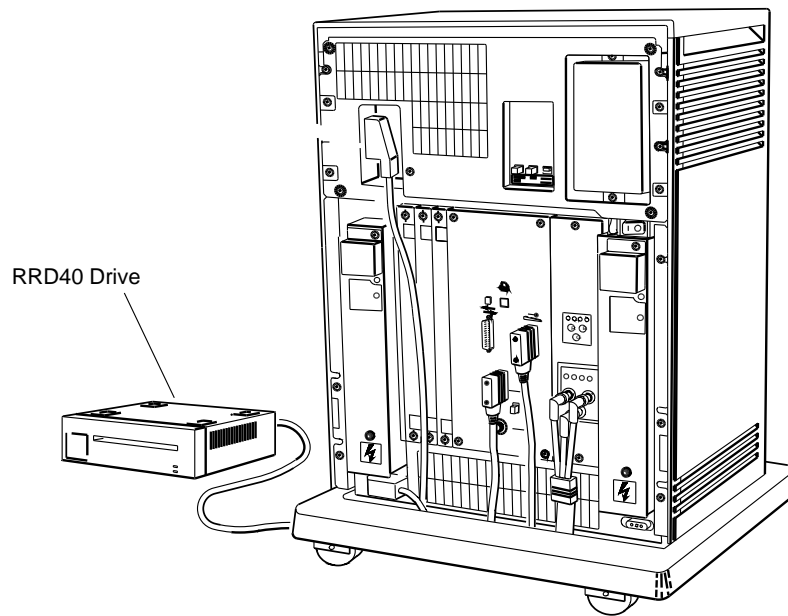
DEFI062

Figure 1–25   System Unit with an RRD40 Optical Compact Disc Drive Connected

1.3.7.1 TK70 Tape Drive

The TK70 tape drive can store up to 296 Mbytes of data on a single cartridge. The tape drive faces the front of the system unit and installs at the far right of the mass storage area, in the tape drive slot. The drive mounts on slide supports in the mass storage area to protect it from mechanical shock. Chapter 5 describes how to install the TK70 option.

RRD40 Drive

1.3.7.2 RZ55 Hard Disk Drive

The RZ55 hard disk drive is preformatted at the factory to provide a storage capacity of 332 Mbytes. Hard disk drives face the rear of the system unit to provide easy access to the drive signal and power cables. The drives install from right to left in the mass storage area. The drives mount on slide supports to protect them from mechanical shock. Chapter 5 describes how to install the RZ55 option.

NOTE
If the system unit does not have a tape drive, the first RZ55 must be installed in the tape drive slot at the far right of the mass storage area , facing the front of the system unit.

1.3.7.3 RZ56 Hard Disk Drive

The RZ56 hard disk drive is preformatted at the factory to provide a storage capacity of 665 Mbytes. Hard disk drives face the rear of the system unit to provide easy access to the drive signal and power cables. The drives install from right to left in the mass storage area. The drives mount on slide supports to protect them from mechanical shock. Chapter 5 describes how to install the RZ56 option.

NOTE
If the system unit does not have a tape drive, the first RZ56 must be installed in the tape drive slot at the far right of the mass storage area , facing the front of the system unit.

1.3.7.4 TS05 Tape Drive

The TS05 is a magnetic streaming tape drive that provides 40.5 Mbytes of backup data storage. The TS05 reads or writes up to 160 Kbytes/s in standart ANSI format. The drive uses automatic read after write to verify that the data is accurately recorded.

The TS05 is outside the system and connects to the system through the handle on the TSV05 controller (installed in slot 10, 11, or 12). Chapter 5 describes how to install the TS05 option.

1.3.7.5 RRD40 Optical Compact Disc Drive

The RRD40 optical compact read-only disc drive is preformatted to provide a storage capacity of 635 Mbytes. The RRD40 is outside the workstation and attaches to the system unit by means of a SCSI cable.

1.3.8 Power Supplies and Fans

The system unit comes with two H7868 power supplies that provide regulated voltage to the backplane, drives, and fans. Each power supply plugs directly into the backplane by means of a 56-pin connector and provides 230 watts of power with the following maximum current:

- 7.0 amps at +12 Vdc

- 33.0 amps at +5 Vdc

An ac line filter under the left power supply area distributes ac input power to the two power supplies. Each power supply has a six-pin ac input power connector at its base.

On the front of each power supply is a power indicator, a reset button button, and a circuit breaker. The on/off switch above the right power supply acts as an ac power indicator; the switch lights up when the workstation is turned on and ac voltage is present in the power supply. The green DCOK LED to the right of the Halt button on the control panel turns on when dc power from both power supplies is within the required range.

An LED on the front of each power supply turns on when the dc output from the power supply is within the required range. If the DCOK LED indicator on the control panel is off, the dc power-supply LED indicates which supply has failed.

System modules receive power through the backplane. A cable connects mass storage devices to the power supply. The cable connects to the power supply with a nine-pin connector and to each drive with a four-pin connector.

The right power supply (power supply 1) provides power to the six backplane slots and the two mass storage devices on the right side of the workstation. The left power supply (power supply 2) provides power to the six backplane slots and any mass storage devices on the left side of the workstation.

Fans are under the card cage slots. The right power supply provides power to both fans.

2
Testing and Troubleshooting

This chapter explains troubleshooting the VAXstation 3520/3540 and 3820/3840 workstations. This troubleshooting material discusses

- How to run and interpret self-tests

- How to run and interpret system tests

2.1 Troubleshooting Process

Figures 2–1 and 2–2 show the workstation troubleshooting process used to identify faulty field replaceable units (FRUs).

This troubleshooting process assumes that problems are not caused by such things as faulty power cords or loose modules and connectors.

Workstation troubleshooting involves two types of tests:

- Self-tests, which check modules as separate units

- System tests, which check modules both as separate units and together as a system

The self-test alone usually identifies faulty FRUs. The system test, however, is useful for finding intermittent failures and problems in module interaction. Always run both types of tests when troubleshooting the workstation.

These tests also check the operation of the monitor and mass storage devices.
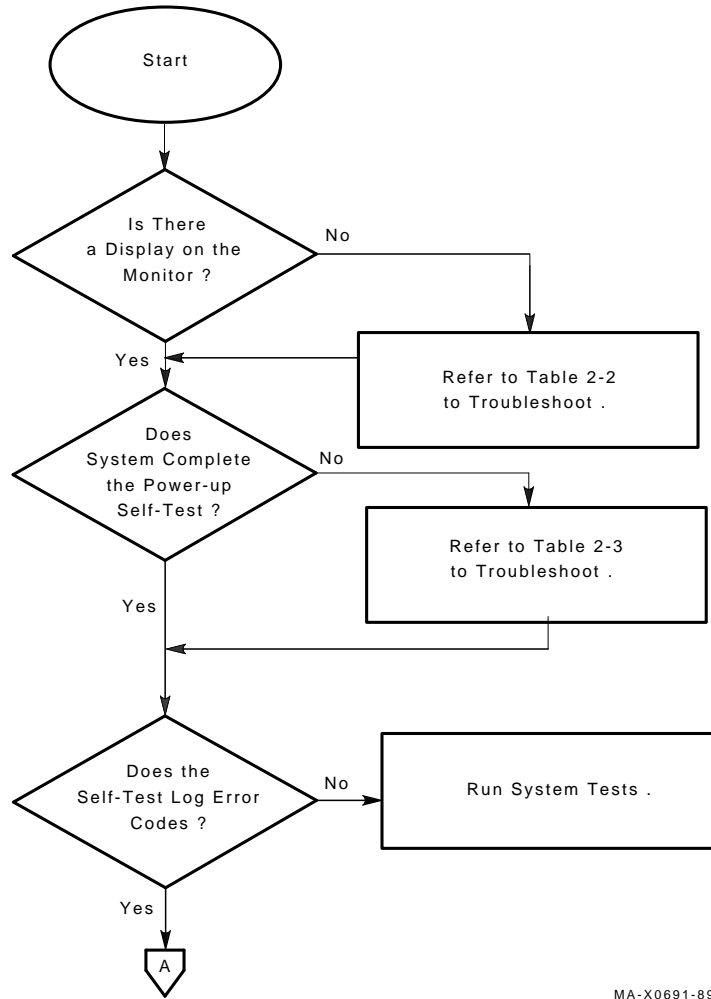
MA-X0691-89

Figure 2–1   Troubleshooting Process
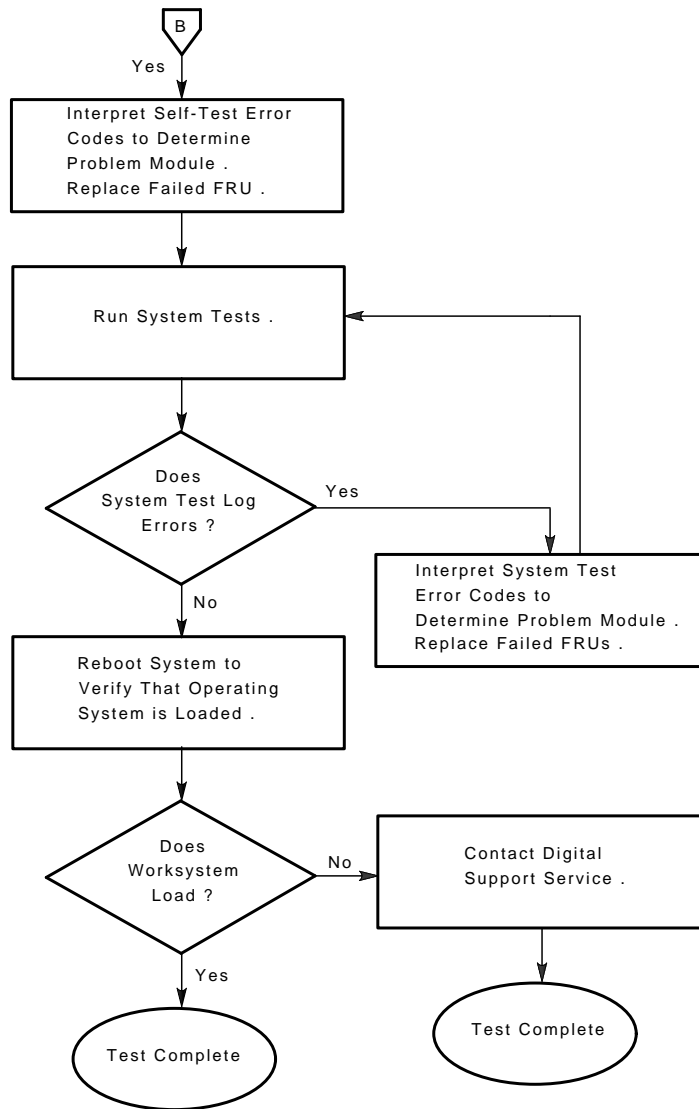
MA-X0696-89

Figure 2–2   Troubleshooting Process (continued)

2.1.1 Using Console Mode to Run Tests

The workstation operates in two modes:

- Console mode, used for test and boot functions

- Operating mode, used for regular workstation software operation

You must be in console mode to run tests.

The workstation automatically starts in console mode when the system powers up. When the system is in console mode, the monitor displays the prompt CPU*xx* >>> where *xx* represents the ID number of the CPU handling the console commands.

If you are in operating mode and wish to return to console mode, press either the ⎹ Restart/Run ⎸ or the ⎹Halt⎸ button.

- Pressing the ⎹ Restart/Run ⎸ button causes the system to enter console mode and complete a self-test before returning the console prompt.

- Pressing and holding the halt button stops system activity. When you release the ⎹Halt⎸ button, the system enters console mode without performing a self-test.

To exit console mode, enter operating mode by typing one of the following commands:

- BOOT

- START

- CONTINUE

Refer to Appendix C for an explanation of console commands.

2.1.2 Using an Alternate Console to Run Tests

You may use an alternate console to run tests. Use a VT100 or VT220 terminal set to 9600 baud, 8 bits and no parity.

To connect an alternate console:

1. Turn off the workstation.

2. Connect a DEConnect cable to the printer/console connector on the I/O cover.

3. Connect the other end of the cable to the alternate console.

4. Turn on the alternate console.

5. Turn on the workstation.

6. Press and hold the Halt button on the control panel until the power-up display appears on the alternate console screen (approximately 10 seconds). Then release the button.

If an alternate console is already connected to the workstation, press and hold the Halt button until the DCOK LED on the control panel begins to blink (approximately 10 seconds). The LED display blinks faster when the system transfers control to the alternate console.

The system monitor displays video test patterns if you enter the commands at the alternate console. The system monitor keyboard does not work while an alternate console is in use.

To return to using the original console, press the Restart/Run button or turn the system power off and then on again.

2.1.3 Selecting the Test Mode

Workstation tests run in either customer mode or field service mode, depending on whether loopback connectors and terminators are present on the I/O cover.

- Customer mode, the system's default setting, requires no loopback connectors. The test mode is set to customer mode each time the system powers up.

- Field service mode requires loopback connectors.

   NOTE
   Appendix B lists part numbers for all the required connectors.

To set the system to field service mode, first install the following connectors on the I/O cover:

- Printer/console loopback on the printer/console connector

- Either a T-connector with two terminators on the ThinWire Ethernet connector, or a ThickWire loopback connector on the ThickWire Ethernet connector

- H3200 loopback on the modem connector

Set the Ethernet switch to the correct position for the type of Ethernet connector on the system.

After the loopback connectors are in place, type **T 200** and press Return. If loopback connectors are present, the system enters field service mode. If loopback connectors are not present, the system stays in customer mode.

To return to customer mode, do one of the following:

* Remove the loopback connectors, type **T 200** and press Return , or

* Press the Restart/Run button.

2.2   Using Self-Tests

The VAXstation system is designed to perform a comprehensive self-test
when the system powers up or you press the Restart/Run button. The
monitor and LEDs on each module report power-up self-test results.
When the self-test sequence finishes, the monitor displays an error
message for each failure it detects.

Example 2–1 shows a sample display for a power-up self-test that detected
faults in the I/O and graphics modules.

```
        KA60 V1.1

        F..E..D..C..B..A..9..8..7..6..5..4..3..2..1..0

            4 01010004   L2003  5   ?   V1.1
1  SSC   00000001
2  DZ    00000001
3  NI    19210770    ?
4  SCSI  00000901
5  SYS   00000001

            7   01010002   L2004  3   ??  V1.1-B
1  GFX   20163B12    ??
            00000200  00000006


Tests completed.

OC-E1, P1
OF-E1, P1
OC

CPUxx >>>
```

Example 2–1   Sample Power-Up Self-Test Display

The first line shows the CPU name (KA60) and ROM version.
Hexadecimal numbers in the second line represent different parts
of the power-up self-test. The hexadecimal numbers F..E..D..C..
appear on the screen all at once. The other test numbers appear as
the corresponding test starts. The I/O cover LED simultaneously displays
the same numbers.

Error messages after the first two lines identify failed modules and include a code describing the particular failure. I/O, graphics, and tape adapter module error messages provide separate error messages for modules and devices in their subsystems.

Each module's error codes are explained later in this chapter.

2.2.1 Displaying Module Location and Error Information

Use the configuration display to find each module's physical location and quickly identify faulty modules.

The self-test reports error information by M-bus ID (mid) number, which depends on a module's location in the card cage. To find a module's mid number, type **T 50** and press Return .

A configuration display like the one in Example 2–2 appears.

```
KA60 V1.0
MID     MODTYPE    ID      SLOT   ERR
0       01010001   L2002    9
1       00020010   L2007AA  8
2       00000000    *       7
3       01010108   L2001    6
4       01010004   L2003    5     ?
5       00000000    *       4
7       01010002   L2004    3     ??

CPU08 >>>
```

Example 2–2   First-Level Configuration Display

- **MID** is the module's M-bus ID. The mid numbers begin at slot 9 and end at slot 3. **There is no mid number 6.**

- **MODTYPE** is the module-type number. Eight 0s appear in the MODTYPE listing if that slot is empty.

- **ID** represents the module's logical name. These numbers also appear on the module's front edge.

    — Asterisks appear in the ID listing if that slot is empty.

    — If an asterisk is in the ID column but 0s do not appear in the MODTYPE column, the module has a defective ROM chip. **Replace any module that has a defective ROM chip.**

Table 2–1 lists ID numbers and the modules they represent.

Table 2–1   Individual Module IDs

ID	Module Name
L2001	KA60-AA CPU module
L2002	Q-bus adapter module
L2003	I/O module
L2004	Graphics base module
L2005	Graphics output module
L2006	Graphics expansion module
L2007-AA	MS60-AA, 8-Mbyte memory module
L2007-BA	MS60-BA, 16-Mbyte memory module
L2007-CA	MS60-BA, 32-Mbyte memory module
L2008	Tape adapter module
L2010	KA60-BA CPU module

- **SLOT** indicates a module's physical slot in the card cage. Note the
  following:

  — Modules in slots 1 and 2 are subsets of the graphics base module
     in slot 3. If any graphics module generates an error, the graphics
     module in slot 3 reports the failure.

  — Slots 10 through 12 are Q-bus slots. If a Q-bus module fails the
     self-test, the error display reports a failure in the Q-bus adapter
     module (L2002) or the tape adapter module (L2008) in slot 9.

- **ERR** shows question marks if the corresponding module generated an
  error during the power-up self-test.

  — One question mark (?) indicates a nonfatal error.

  — Two question marks (??) indicate a fatal error.

2.2.2 Displaying Information for Individual Modules

To display configuration and test results for specific modules and devices, type **T 50 *mid*** where *mid* is the module ID number, and press Return. The monitor displays that module's configuration and any current error information.

For example, in Example 2–2 you can see that the M-bus ID for the I/O module (L2003) is 4. To display the I/O subsystem configuration, type **T 50 4** and press Return. The display will be similar to that in Example 2–3.

```
  4  01001004   L2003   5   V1.1

1  SSC   00000001
2  DZ    00000001
3  NI    BF070404      ?
4  SCSI  00000001
5  SYS   00000001
```

Example 2–3   Sample T 50 Mid Configuration Display

The top line lists the module's ID, type, name, and slot number. The ROM version number appears at the far right of this line.

The rows below these headings list the number, name, and current error information for each I/O device.

This sample display reports an error in the network interface (NI). The error code 00000001 in the other messages means the self-test detected no errors.

NOTE
If the self-test reports a nonfatal error in the network interface (NI), install a loopback connector on the Ethernet connector on the I/O cover and set the Ethernet switch to the correct setting. Then repeat the self-test. If the nonfatal error persists, the I/O module is faulty.

To display the configuration for the DWFQA Q-bus adapter module, type **T 50 0** and press Return. The display will be similar to that in Example 2–4.

NOTE
Note the CSR and vector settings for each Q-bus device. If a Q-bus device is installed in the system but does not appear in the configuration display, verify that the CSR and vector settings are correct.

```
  0   0101001   L2002   9   V1.1

1  QAM     00000001   X2.0
2  TQK70   00000001   X2.0
          CSR = 00001940
          VEC = 000000B0
```

Example 2–4   Sample T 50 0 Configuration Display

2.2.3 Troubleshooting when There Is No Display on the Monitor

If there is no display on the monitor, you can use the system's LEDS and indicators to troubleshoot. Refer to Table 2–2.

Table 2–2   Troubleshooting when There Is No Display on the Monitor

Problem	Remedy
The monitor's power indicator does turn on.	Make sure the monitor is turned on. Check the monitor's power supply and outlet. Refer to the monitor's maintenance guide if the power indicator still does not turn on.
The workstation's power indicator does not turn on.	Make sure the workstation's power supply is turned on. Check the workstation's power cord and outlet. If the power indicator still does not turn on, troubleshoot the workstation's power supply.

Table 2–2 (Cont.)   Troubleshooting when There Is No Display on the Monitor

Problem	Remedy
	The green DCOK LED turns on if both power supplies are operating correctly. If the DCOK LED does not turn on, first check the power supplies. A green LED at the top of each power supply turns on if that power supply is operating correctly. Reset any open power supply circuit breakers.
	If both power supplies do not operate, replace the ac power filter. If one power supply does not operate, replace the defective power supply.
The RGB video cable is not correctly connected to the monitor and system unit.	Connect the RGB cable correctly. Make sure the RGB connectors are attached in the proper order.
The system does not complete the power-up self-test.	Refer to Table 2–3 to troubleshoot the workstation.
The LEDs on the graphics frontplane do not count down to zero.	Check the red LEDs on the graphics frontplane. These LEDs display an error code if the graphics subsystem fails the self-test. Sometimes the tests cannot isolate the single failed module. In that case, the LEDs identify two or three probable failed modules. Refer to Appendix F for an explanation of graphics LED error codes.
There is still no display on the monitor.	Remove and replace the video cable.
There is no display on the monitor after the video cable is replaced.	Refer to the monitor's maintenance guide to troubleshoot the monitor.

2.2.4 Troubleshooting when the Power-Up Self-Test Does Not Complete

If the power-up self-test does not complete, you can use module LEDs to isolate faulty FRUs. Refer to Table 2–3.

Table 2–3   Troubleshooting when the Power-Up Self-Test Does Not Complete

Stop Location	Remedy
Beginning. Test does not start.	Check for loose and damaged connectors. Reseat any loose modules. If the system still does not start, there is a basic problem in the system. Contact Digital support service.
F	The problem is in the CPU module, I/O module, or I/O cover. Each CPU module has one green LED and two sets of red LEDs. The green LED turns on if the CPU is operating correctly. If the green LED does not turn on, one or both of the red LED sets displays an error code.
	• If the red LEDs do not display 9 (1001_2), the problem is in the CPU module itself. Replace the CPU module and retry the power-up self-test.
	• If the red LEDs do display 9, the problem may be in the CPU module, the I/O module, or the I/O cover. Troubleshoot these three modules to correct the problem. Contact Digital support service if the test still stops at F.
	The green LED may be on even if the module has failed. If troubleshooting other modules does not correct the problem, replace the CPU module. If the self-test still stops at F, contact Digital support service.
E	The problem is in the I/O module. The green LED on the I/O module turns on if the module is operating correctly. Replace the I/O module if the green LED does not turn on. If the I/O module LED is on and the self-test still stops at E, replace the I/O cover. Contact Digital support service if the problem continues.
D	The problem is in the CPU module. If the CPU module fails, the green LED does not turn on, and the red LEDs display an error code. Replace the CPU module. Contact Digital support service if the problem continues.

Table 2–3 (Cont.)   Troubleshooting when the Power-Up Self-Test Does Not Complete

Stop Location	Remedy
C	The problem is in the I/O or graphics subsystem. Check the red LEDs on the graphics frontplane and the green LED on the graphics base module.

- If the green LED is off and the red LEDs are on, there is a problem in the graphics subsystem. Follow Procedure 1 to troubleshoot the graphics modules.

- If the red LEDs on the graphics frontplane are all off, the graphics module is operating correctly. Follow Procedure 2 to troubleshoot the I/O module.

Procedure 1: The red LEDs display an error code that identifies a problem module in the graphics subsystem. Appendix F explains specific LED error codes. Sometimes the tests cannot isolate the failed FRU. In that case, the LEDs identify the two or three most probable failed modules.

If replacing modules does not correct the problem, replace the graphics frontplane. Contact Digital support service if the problem continues.

Procedure 2: The green LED on the I/O module is on if the I/O module is operating correctly. If the green LED does not turn on, replace the I/O module. If the green LED is on, replace the I/O cover. Contact Digital support service if the problem continues.

Table 2–3 (Cont.)   Troubleshooting when the Power-Up Self-Test Does Not Complete

Stop Location	Remedy
B	The problem is in the memory module. Check the memory module LEDs.

Each memory module has one red and one yellow LED.

Yellow	Red	Indication
On	Off	The module passed the self-test.
Off	On	The module has failed, or the test is still running.
On	On	The test has not started.
Off	Off	There is no power to the module, or the LEDs are not working.

The memory self-test can take several minutes to complete. Allow time for this test to complete before assuming the test has stopped. Replace any modules that have their red LED on and yellow LED off. Contact Digital support service if the problem continues.

9	If the DWFQA Q-bus adapter (L2002) module is installed in slot 9, the problem is in the Q-bus adapter module.

Check the Q-bus adapter module LEDs. The green LED turns on if the module is operating correctly. If there are Q-bus options installed, there may be a problem with one or more of the Q-bus options. Isolate the faulty module or modules by removing one module at a time.

If you isolate a faulty module or modules, verify that the CSR and vector settings are correct. Contact Digital support service if the problem continues.

Table 2–3 (Cont.)   Troubleshooting when the Power-Up Self-Test Does Not Complete

Stop Location	Remedy
9	If the tape adapter module (L2008) is installed, the problem is in the tape adapter module in slot 9 or the TQK70 tape drive controller module in slot 10. The self-test stops if the Q-bus contains any module other than a TQK70.
	Check the tape adapter module LEDs. The green LED turns on if the tape adapter module is operating correctly.
	If the tape adapter module is operating correctly, check the tape controller module. The top and bottom LEDs are both off if the tape drive controller module is operating correctly. If the tape drive controller module LEDs are flashing, the problem is probably in the CPU or interface between the tape controller and tape adapter modules.
	If the tape adapter module is operating correctly, check the two tape drive controller LEDs.
8 to 4	The problem is in the module in the slot number displayed.
3	The problem is in the module in slot 1, 2, or 3.
	Check the graphics module LEDs. The green LED on each module turns on if the module is operating correctly.
	If a module has a problem, the red LEDs on the graphics frontplane display an error code. Sometimes the tests cannot isolate the single failed module. In that case, the LEDs identify the two or three most probable failed modules. See Appendix F for an explanation of graphics frontplane LED displays.

2.2.5 Running Self-Tests on Individual Modules

To run a self-test on an individual module, type

> **T** *mid* [*dev*] [*arg-1*] [*arg-2*] [*arg-3*] . . .

The *mid* parameter represents the M-bus ID of the individual module you are testing.

The optional *dev* parameter represents a specific device within a module. Use the T 50 *mid* configuration display to find the device's number.

The optional extended arguments (*arg-1* and so on) specify individual tests and test conditions. To run a specific test on a module or device, type the number of the desired test.

The use of other extended arguments differ for each module. If you do not include any arguments, the workstation performs all self-tests for the module or device specified in the test command. The self-test information sections later in this chapter explain the extended arguments for each module.

2.2.6 Setting Loops for Self-Tests

In field service mode, you can specify self-tests to loop until they fail or succeed.

- Loop on test causes the test to continue repeating until it detects an error. To specify loop on test, type **T 200 1** and press Return . The following display appears on the monitor:

```
MODE=FS LOT
CPUxx >>>
```

- Loop on error causes the test to repeat until the test succeeds. To specify loop on error, type **T 200 2** and press Return . The following display appears on the monitor:

```
MODE=FS LOE
CPUxx >>>
```

To stop a looping test, press Ctrl C . Then type **T 200 0** and press Return . The following display appears on the monitor:

```
MODE=FS
CPUxx >>>
```

2.3   Using System Tests

The system test checks each module separately, then operates the modules together. This module interaction and repeated cycling help find system problems and intermittent failures that the self-test might not detect.

2.3.1   Running System Tests

You can run two types of system test, depending on the test mode.

*   In customer mode, the system test runs an extensive check of the system. Customer mode does not requires loopback connectors.

*   In field service mode, the system test includes some tests not run in customer mode. Field service mode requires loopback connectors.

The customer mode system test completes two test cycles, then stops. To run the customer mode system test, type **T 100** and press Return . The system test executes, then displays test results on the monitor.

Field service mode runs either auto-stop or continuous system tests.

*   To run an auto-stop field service test, type **T 101** and press Return . The system test runs for two cycles, then stops. Any error information then appears on the screen.

*   To run a continuous field service test, type **T 102** and press Return . The system test repeats continuously. To stop a continuous system test, press Ctrl C .

CAUTION
System tests can alter data on the tape or optical compact disc drive. If the system test involves these devices, insert a scratch tape in the TK70 tape drive and a test disc in the RRD40 optical compact disc drive before performing a system test.

2.3.2   Setting Up Special System Tests

To select specific modules for a system test, type **T 106** and press Return .

The screen displays a list of modules and devices you can include in the test cycle. At each choice in the list, type **1** to include an item or **0** to leave out an item. The default setting is 0.

The T 106 test is always continuous and runs only in field service mode. If the test selection does not include DZ, press the Halt button to stop the test.

To stop a T 106 test that includes DZ, you must stop each portion of the
test individually. Press Ctrl C to stop each test.

2.3.3 Displaying System Test Results

The monitor displays system test results. Example 2–5 shows a sample
system test display.

```
KA60-A VO.3  CU 0 00:28:41

   7   GFX     0000.0001 37 0 00:24:32 34
   5   DZ      0000.0001 45 0 00:25:00 20
   5   NI      0000.0001 40 0 00:26:43 23
   5   SCSI    70E5.0001 57 0 00:26:58 147
??             4103.0308
   3,2 MEMORY  0067.0001 52 0 00:26:38 32
?? 0   TQK70   052F.2200 20 0 00:17:32 09
```

Example 2–5   Sample System Test Error Display

The top line lists the system's test mode—either CU for customer mode or
CS for field service mode.

The top line also shows the total time this test has run. Time displays
use the format *dd hh:mm:ss*, where *dd* indicates days, *hh* indicates hours,
mm indicates minutes, and *ss* indicates seconds.

The left column displays an error indicator:

- Two question marks (??) indicate a fatal error.

- One question mark (?) indicates a nonfatal error.

- No question mark indicates no error.

Each row in the display lists

- The mid number of the module being tested

- A description of the module or device

- An eight-digit error message

- The total number of test passes made on the module in this test

- The time of the last test pass

A small letter *s* appears at the end of an error message if there is an
extended information summary. Error code explanations at the end of
this chapter discuss the extended information summaries that appear
with some error codes.

The system holds these extended information summaries in a wrap-around stack. After the system test stops, the next extended summary in the stack appears each time you press Return. Enter an exclamation point (!) to exit the extended summary displays.

To bring back a display that has left the screen, type **T 107** and press Return. The system test results reappear on the screen.

Later in this chapter, maps explain system test error codes.

2.4 Troubleshooting the Monitor

Monitor tests verify that the monitor is operating correctly.

NOTE
Whenever you reconnect the video cable, use the monitor color check tests to be sure the cable ends are connected in the correct order.

Perform an UNJAM operation to clear the graphics registers before running a monitor test.

To run a monitor test, type **UNJAM** and press Return. Then type **T 7 1 [*mt#*]** and press Return again.

The optional *mt#* parameter represents the number of the monitor test you wish to run. Table 2–4 lists monitor test numbers and their uses. If you do not specify a monitor test number, this command executes all monitor tests.

Table 2–4   Monitor Test Numbers

Test Number	Monitor Display
100	White color
101	Red pattern
102	Gray bar pattern
103	Color bar pattern
104	Circle-crosshatch pattern
105	Coherent halftone pattern
106	Red color
107	Green color

Table 2–4 (Cont.)   Monitor Test Numbers

Test Number	Monitor Display
108	Blue color
109	Black rectangle pattern
10A	Four-color bar pattern
10B	Letter E pattern

Use the controls on the side of the monitor to adjust brightness and contrast. If the display appears distorted, press and hold the degauss button and wait 10 seconds for the monitor to clear. Refer to the monitor's maintenance guide for more detailed information about repairing the monitor.

2.5   Troubleshooting Mass Storage Devices

Workstation tests also check the TK70 tape drive, the RZ55 and RZ56 disk drives, and the RRD40 compact disc drive operation. Refer to each device's maintenance guide for more detailed troubleshooting and maintenance information.

2.5.1   Troubleshooting the TK70 Tape Drive

To check the TK70 tape drive operation, use one of the following:

- Tape drive LED display

- System test

- T 10F read/write test

Tape drive LEDs quickly indicate the tape drive's condition. See Appendix F for an explanation of tape drive LED displays.

TQK70 system test includes a tape drive check. Interpret TQK70 system test results and extended information summaries for information about tape drive performance.

The T 10F read/write test performs a series of read and write operations between the tape drive controller and tape drive. The monitor then displays the test results. Error codes in these messages use the same format as TQK70 error codes. See the system test error code explanations later in this chapter to interpret read/write error messages.

CAUTION
The read/write test can alter existing data on a tape drive. Insert a scratch tape cartridge before running this test.

The system must be in field service mode to run the read/write test. After the system is in field service mode, type **T 10F** and press Return . The system then asks you to confirm that you want to run the read/write test before the test begins.

2.5.2 Troubleshooting the RZ55 Disk, RZ56 Disk, and the RRD40 Optical Compact Disc Drives

The SCSI system test checks the RZ55, RZ56, and RRD40 operation. The system test then reports the RZ55, RZ56, and RRD40 test results as part of the SCSI error messages. SCSI extended information summaries provide additional information about these devices on the SCSI bus. Interpret the SCSI system test results to obtain information about these drives' operation.

LEDs on the RRD40 quickly indicate the compact disc's condition. See Appendix F for an explanation of RRD40 LEDs.

2.6 TEST Command Summary

Table 2–5 is a quick reference for all TEST (T) commands used in troubleshooting.

Table 2–5   TEST Command Summary

TEST Command	Purpose
T 7 1 [*mt*]	Run the monitor test. The optional *mt* parameter indicates a specific monitor test number. The system performs all monitor tests if you do not specify a test number.
T *mid* [*dev*]	Perform the self-test on the module specified by *mid*. Include an optional *dev* number to test only the device with that dev number.
T 50 [*mid*]	Display system configuration and self-test results. Include an optional *mid* number to display information about the module with that mid number.
T 100	Perform the system test in customer mode.
T 101	Perform the auto-stop field service test.
T 102	Perform the continuous field service test.
T 106	Perform the selected system tests in Field Service mode.
T 107	Display system test results.
T 200	Set the system to customer or field service mode.
T 200 0	Remove test loops.
T 200 1	Set the self-test to loop on test.
T 200 2	Set the self-test to loop on error.
T 10F	Perform the read/write test on TK70 tape drive.
T 0 1	Perform the test on the DWFQA Q-bus adapter module.
T 0 2	Perform the test on the first Q-bus option listed in T 50 0.
T 0 3	Perform the test on the second Q-bus option listed in T 50 0.
T 0 4	Perform the test on the third Q-bus option listed in T 50 0.

2.7 Interpreting Self-Test Error Messages

The following sections explain self-test error codes and identify the FRUs indicated by each error code.

Error codes differ for different modules and devices. There is a separate section for each module and device error code format.

2.7.1 I/O Self-Test Error Messages

The self-test I/O error display provides a separate message for each I/O device. Example 2–6 shows a sample I/O self-test error display.

```
    4  01010004    L2003  5  ?   V1.1

1  SSC   00000001
2  DZ    00000001
3  NI    19210770    ?
4  SCSI  00000901
5  SYS   00000001
```

Example 2–6   Sample I/O Self-Test Display

The top line lists the module's ID, type, name, and slot number. Question marks appear if the self-test detected an error in an I/O device. The ROM version number appears on the far right of this line.

Rows after the first line list the ID number, name, and current error information for each device. Rows for devices that report errors also include a question mark.

If the self-test does not detect a problem in a device, the self-test assigns the code 00000001. Failed devices receive a specific error code. This sample display reports an error in the network interface (NI).

NOTE
If you replace the I/O module, be sure to insert the Ethernet address chip from the old I/O module onto the new I/O module. This is necessary to retain the Ethernet address. See Figure 4–2 for the chip's location.

2.7.2 SCSI Self-Tests

The small computer system interface (SCSI) self-test checks the SCSI controller and verifies bus operation. The SCSI self-test does not check the RZ55 disk, RZ56 disk, or the RRD40 compact disc drives. Use the system test or an appropriate SCSI utility to isolate problems with these devices.

Use SCSI utility commands to set system conditions for SCSI tests. See Appendix F for an explanation of using SCSI utilities.

Altering data on a SCSI device is not normally allowed in customer mode; you must intentionally use utility command T *mid* 4 1FF to enable write operations in customer mode.

Write operations are always enabled in field service mode. However, these commands warn that you may destroy data and ask you to confirm them before proceeding. See Appendix F for detailed information about Utility 1FF.

To stop a test or utility, press Ctrl C. The monitor diplays the warning code WRN$CTRLC.

If you interrupt the operating system or a SCSI utility, you do not need to do an UNJAM before issuing a SCSI utility command.

SCSI self-test error codes have the following format:

```
+---+---+---+---+---+---+---+---+
| x | x | x | x | x | x | x | x |
+---+---+---+---+---+---+---+---+
```

- Severity Level
- Error Code
- Test Number
- Error Number
- Error Group
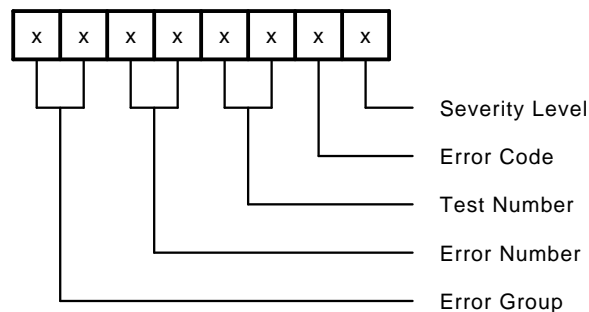
The *severity level* indicates the seriousness of the error.

The *error code* is a code for the actual failure.

Table 2–6 explains possible error code and severity level combinations in SCSI error messages.

The *test number* is the number of the failed test. See Appendix F for an explanation of the individual SCSI test numbers.

The *error group* and *error number* refer to the software calling out the error. These codes are not explained in this manual.

Here are some sample SCSI error codes:

- The error code 00000001 means the self-test did not detect any errors.

- The error code 01240922 means error number 24 in error group 01 found error 2, with a severity level of 2, in test 09.

2.7.2.1 Probable Failed FRU

Use the test number in the SCSI error code to determine the probable failed FRU.

- A test number from 0 to 8 indicates a failure in the I/O module.

- A test number greater than 8 indicates a failure in the SCSI bus. Disconnect the SCSI connector from the I/O module and repeat the self-test. If the self-test still reports an error with a test number greater than 8, the problem is probably in the I/O module. If the self-test does not report an error when SCSI is disconnected from the I/O module, the problem is probably in the SCSI bus.

2.7.2.2 SCSI Self-Test Error Codes

Table 2–6 explains possible SCSI error codes.

Table 2–6   SCSI Error and Severity Messages

Code	Meaning	
01	The test or utility ended successfully.	
10	Ctrl C aborted the test or utility.	
22	An SII register had an incorrect value. The extended status string has the following format:	
	regnamnn/cccc!=eeee	
	regnam	Represents the register from the SII specification.
	nn	Represents the offset to the register from the base of the SII register space.
	cccc	Represents the current register contents.
	eeee	Represents the expected register contents.

Table 2–6 (Cont.)   SCSI Error and Severity Messages

Code	Meaning
32	The RAM buffer contained an incorrect value. The extended status string is in the format:

RAMnnnnn/*cccccccc*!=*eeeeeee*

RAM	Indicates this is a RAM comparison.
nnnnn	Represents the offset into the SII RAM buffer.
cccccccc	Represents the current RAM location.
eeeeeeee	Represents the expected RAM location.

Code	Meaning
42	The SII chip or SCSI bus did not change to the expected state. The extended information string uses the same format as the string for error and severity code number 22.
52	The SII chip or SCSI bus did not change to the expected state within the allotted time. The extended information string has the same format as the string for error and severity code number 22.
62	The diagnostic executive failed to allocate the requested temporary storage space, so the typed command was not executed.
72	A machine check occurred during testing. The extended information string has the following format:

MCHK=*nn*, PC=*ppppppp*, VA=*aaaaaaaa*

nn	Represents the machine check code.
ppppppp	Represents the program counter when the machine check occurred.
aaaaaaaa	Represents the virtual address when the machine check occurred.
vvvvvvv	Represents the processor status longword when the machine check occurred.

Code	Meaning
82	An illegal parameter was entered. The extended status string indicates the incorrect parameter. Argument 1 is the test number, and argument 2 is usually the unit number. The unit number is the SCSI ID number multiplied by 100. Use the Show SCSI utility described in Appendix F to display SCSI ID numbers. The use of argument 3 depends on the test or utility being executed.

Table 2–6 (Cont.)   SCSI Error and Severity Messages

Code	Meaning
92	The mode is invalid. A test that can alter user data was attempted in customer mode, but write operations were not enabled. This code is generated for any device with a block size larger than 8 Kbytes.
A4	The bus failed the external loopback test, a loopback connector was present when a SCSI device operation was attempted, or a device on the SCSI bus has the same SCSI ID as the SII chip. Do not try further operations on the SCSI bus if this error code appears.
B2	You tried to access a nonexistent SCSI ID or logical unit number on an existing SCSI ID.
C2	The addressed SCSI device is not ready to accept the specified command. Usually, this means a disk has not been spun up.
D2	Data returned by the SCSI device was not consistent or expected. Associated sense information appears in the format: SNS=*n*, [ASNS=*mm*], [INF=*iiiiiiii*] n — Represents the sense value returned by the REQUEST SENSE SCSI command. *mm* — Represents a possible additional sense code. *iiiiiiii* — Represents the information bytes. Table 2–7 lists possible sense codes values.
E2	One of the following signals was asserted on the SCSI bus: RST — SCSI bus reset BER — SCSI bus error IPE — SCSI bus parity error OBC — Unused DSSI bits BUF — Unused DSSI bits LDN — Unused DSSI bits

2.7.2.3 SCSI Extended Information Messages

Extended information strings often appear after the first error message line and provide additional information about the device's condition.

These extended information strings frequently use the following symbols:

- A question mark (?) indicates that a value or condition is incorrect or unknown. For example, the string `ARG1(56), TSTNUM?` indicates that 56 is an incorrect test number for argument 1.

- An equal sign (=) indicates a value or state. For example, `BUS=LBK` indicates that the SCSI bus is in the loopback state. `BUS=?` indicates that the bus state is unknown.

- An exclamation point and equal sign together (!=) indicate that a value or condition is not equal to the desired value, as is common in parameter errors and data comparison errors.

2.7.2.4 Sense Code Values

Some extended information strings list sense code values. Sense code information strings have the following format:

SNS=n, [ASNS=mm], [INF=$iiiiiiii$]

where n represents the sense key, mm represents an additional sense code, and $iiiiiiii$ represents the information.

Table 2–7 defines sense code values found in SCSI extended information strings.

Table 2–7   Sense Code Values

Code	Meaning
0	No sense. The command was successful. This value indicates an error if it is returned after a check condition.
1	Recovered error. The last command was successful, but the device performed some recovery action.
2	Not ready. The device cannot be accessed.
3	Medium error. The device detected a nonrecoverable error condition, probably caused by a flaw in the medium or an error in the recorded data.
4	Hardware error. The device detected a nonrecoverable hardware failure.

Table 2–7 (Cont.)   Sense Code Values

Code	Meaning
5	Illegal request. The device detected an illegal parameter in the command descriptor block.
6	Unit attention. A removable medium was changed, the target was reset, or mode select parameters were changed by another initiator.
7	Data protect. A read or write was attempted on a block protected from this operation.
8	Blank check. A write-once, read-multiple or sequential access device encountered a blank medium or end-of-data indication while reading, or a write-once, read-multiple device encountered a nonblank medium while writing.
9	Vendor unique.
A	Copy aborted. An error on the source or destination device caused the system to abort a copy, compare, or copy and verify command.
B	Aborted command. The device aborted the command.
C	Equal. A search data command satisfied an equal comparison.
D	Volume overflow. A buffered peripheral device reached the end of the medium. Data not written to the medium may remain in the buffer.
E	Miscompare. The source data did not match the data read from the medium.
F	Reserved.

Refer to the ANSI SCSI specification or the device's documentation for more information about sense code information strings.

2.7.3 System Support Chip (SSC) Self-Tests

SSC error codes have the following format:

0	0	0	0	x	x	x	x

Severity Level

Error Code
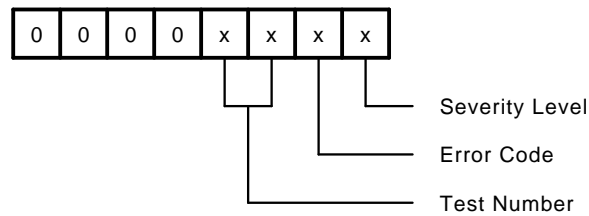
Test Number

The *severity level* indicates the seriousness of the error, as follows:

0   Warning

1   No error

2   Error

3   Fatal error

The *error code* identifies the specific error.

The *test number* is the number of the failed test.

SSC error codes do not use the four digits on the left. These digits are always 0.

Here are some examples of SSC error codes:

*   Error code 00000001 means the self-test did not detect an error.

*   Error code 00000632 means error number 3, with a severity level of 2, occurred in test 6.

See Appendix F for a detailed description of individual SSC self-tests.

2.7.3.1 Probable Failed FRUs

All SSC error codes indicate a failed I/O module, except in the following cases :

*   Error code 00000622 indicates a failed I/O or CPU module.

*   Error code 00000722 indicates a failed I/O module or failed battery.

2.7.4 Serial Line Adapter (DZ) Self-Tests

DZ self-test error codes have the following format:
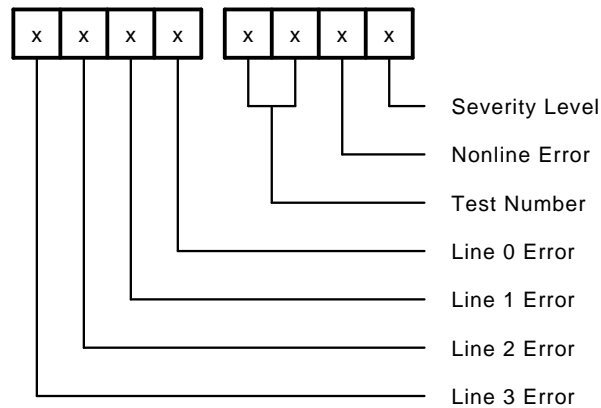
The *severity level* indicates the seriousness of the error.

The *nonline error code* identifies failures that are not specific to one line.

The *test number* is the number of the failed test. The test number is 0 if the test itself is invalid.

The four *line error* digits on the left report errors occurring in the individual line represented by the corresponding position in the error code.

Here are some examples of DZ error codes:

- Error code 000000001 means that all lines passed the self-test.

- Error code 00030502 means error number 3, with a severity level of 2, occurred on line 0 in test number 5.

2.7.4.1 Probable Failed FRUs

Specific failed tests indicate different failed FRUs. Table 2–8 lists the probable failed FRUs indicated by each failed test.

Table 2–8   Failed FRUs Indicated by DZ Error Codes

Test Number	What the Test Checks	Probable Failed FRU
1	Transmission and reception	I/O module
2	Internal baud rate	I/O module
3	Internal character length	I/O module
4	Internal parity	I/O module
5	Internal stopbit	I/O module
6	External baud rate	I/O module, I/O cover, or missing loopback connector
7	External character length	I/O module, I/O cover, or missing loopback connector
8	External parity	I/O module, I/O cover, or missing loopback connector
9	External stopbit	I/O module, I/O cover, or missing loopback connector
A	Silo alarm bit functionality	I/O module
B	Silo cell	I/O module
C	Silo alternating lines	I/O module
D	Overrun bit functionality	I/O module
E	Transmit interrupt	I/O module
F	Receive interrupt	I/O module
10	Break functionality	I/O module
11	Console (IOCSR) break	I/O module
12	Modem loopback connector	I/O module, I/O cover, or missing loopback connector

Table 2–8 (Cont.)   Failed FRUs Indicated by DZ Error Codes

Test Number	What the Test Checks	Probable Failed FRU
13	Keyboard	Keyboard, I/O cover, or I/O module
14	Mouse	Mouse, I/O cover, or I/O module

2.7.4.2 DZ Error Codes

Table 2–9 and Table 2–10 list DZ error codes. Error code values for test 0 are different than error code values for nonzero test numbers.

Table 2–9   DZ Error Codes for Test Number 0

Code	Meaning
0	No error.
1	Mode bits are invalid.
2	The TEST command received the wrong number of arguments.
3	The TEST command passed an invalid test number argument.
4	The test will not run in the current mode.

Table 2–10   DZ Error Codes for Nonzero Tests

Code	Meaning
0	No error.
1	Master-clear timeout.
2	Transmitter-ready timeout (txchar error).
3	Receiver done timeout.
4	Parity error for received character.
5	Frame error for received character.
6	Overrun error for received character.
7	Received data is not valid.
8	Expected character is not equal to received character.

2.7.5 Network Interface (NI) Self-Tests

NI error codes have the following format:
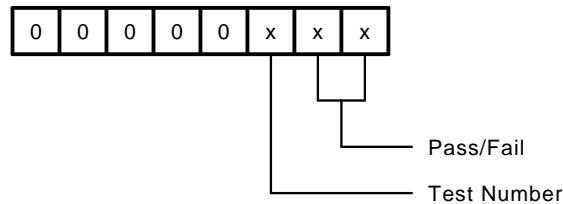
Pass/fail indicates whether a test failure occurred. This code is 01 if the test passed and *x*0 if a test failed, where *x* is the same number as the test number.

The *test number* is the number of the failed test.

NI error codes do not use the five digits on the left.

Here are some examples of NI self-test codes:

- Error code 00000301 means no error occurred in test number 3.

- Error code 00000331 indicates test number 3 failed.

2.7.5.1 Probable Failed FRU

Error codes 110 through 660 indicate a problem in the I/O module. Error code 770 indicates a problem in the I/O cover or its connecting cable.

NOTE
If an NI self-test logs an error, check the Ethernet switch first.

NI connects the workstation to a ThickWire or ThinWire Ethernet. The system shows an error if the Ethernet switch is not set for the connection or terminator being used. For the NI self-test to succeed, the Ethernet switch setting must be correct.

2.7.5.2 NI Error Codes

Table 2–11 explains possible NI error codes.

Table 2–11   NI Error Codes

Code	Meaning
00000110	NI RAM buffer test failed.
00000220	NI RAM registers test failed.
00000330	NI internal loopback promiscuous mode test failed.
00000550	NI internal loopback append CRC test failed.
00000660	NI internal loopback address filter mode test failed.
00000770	NI external loopback test failed.

2.7.6 CPU Self-Tests

CPU self-test error codes have the following format:
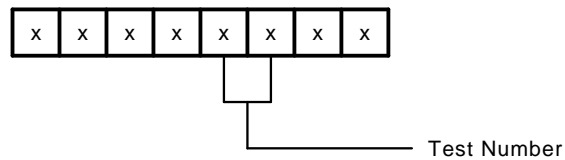
The *test number* is the number of the failed test.

The meaning of other error code numbers depends on the individual error code.

2.7.6.1 Probable Failed FRU

CPU error codes indicate a faulty CPU.

2.7.6.2 CPU Test Numbers and Error Codes

Table 2–12 lists CPU self-test numbers.

Table 2–12   CPU Self-Test Numbers

Test Number	What the Test Checks
01	CFPA
02	CPU virtual mode
03	FBIC interrupt (MIRQ/CIRQ)
04	C-bus parity
05	CPU cache 1
06	FBIC M-bus test modes (power-up only)
07	CPU ROM checksum
81	FBIC cache counters (power-up only)
82	CPU virtual mode (power-up only)

Table 2–13 lists possible CPU error codes grouped by test number.

Table 2–13   CPU Self-Test Error Codes

Code	Meaning
Test 01	
00010104	MNEGD failed.
00020104	CVTFL failed.
00030104	CVTLF failed.
00040104	CVTLG failed.
00050104	CVTLD failed.
00060104	ADDF3 failed.
00070104	MULF3 failed.
00080104	DIVF3 failed.
00090104	POLYF failed.
000A0104	Did not get expected reserved operand fault in MOVF.
000B0104	Error in underflow test.
000C0104	Error in overflow test.
000D0104	Error in divide-by-zero test.
00010114	Unexpected reserved operand fault.
00020114	Unexpected arithmetic exception fault.
Test 02	
00010204	No memory to run test.
00020204	Translation buffer error.
00030204	Data mismatch across page boundary.
00040204	Page not marked as modified when expected.
00050204	Did not get length access violation when expected.
00060204	Did not get write access violation when expected.
00070204	Did not get expected translation violation.
00010214	Unexpected interrupt or exception.
00020214	Invalid data for expected access violation
00030214	Invalid data in translation-not-valid fault handler.
00040214	Unexpected access violation.
00050214	Unexpected translation-not-valid fault.
Test 03	
00010302	Interrupt pending at given IPL. Examine IPDVINT.
00020302	Interrupt never received. Check FBICSR.
00030302	Interrupt pending, but not acknowledged.

Table 2–13 (Cont.)   CPU Self-Test Error Codes

Code	Meaning
00010312	Interrupt received at unexpected vector.
Test 04	
00010404	Unexpected machine check.
00020404	Did not get expected machine check; longword read.
00030404	Did not get expected machine check; word read.
00040404	Did not get expected machine check; byte read.
00050404	Machine check occurred even though parity checking was off.
00010414	Byte count in machine check frame not 16.
00020414	Not a machine check 80 (read).
00030414	Unused.
00040414	CDAL parity error not flagged in saved MSER. Check the CPU.
Test 05	
00010514	CADR failed read/write test.
00020514	Dialog mode: read/write miscomparison.
00030514	Dialog mode: MSER detected cache miss (should have hit).
00010524	Address shorts: cache miss or other memory error (LW0).
00020524	Address shorts: data miscomparison (LW0).
00030524	Address shorts: cache miss or other memory error (LW1).
00040524	Address shorts: data miscomparison (LW1).
00050524	Address shorts: cache miss or other memory error (LW0).
00060524	Address shorts: data miscompare (LW0).
00070524	Address shorts: cache miss or other memory error (LW1).
00080524	Address shorts: data miscomparison (LW1).
Test 06	
00010644	Did not get expected machine check. Complement MCMD parity.
00020644	Not all FBICS logged MCPE.
00030644	Did not get expected machine check. Complement MDAL parity.
00040644	Not all FBICS logged MDPE.
00050644	Did not get expected machine check. Complement MCMD valid.
00060644	Not all FBICS logged ICMD.
00070644	Not all FBICS frozen on generated MABORT.
00080644	Unused.

Table 2–13 (Cont.)   CPU Self-Test Error Codes

Code	Meaning
00090644	Did not get expected machine check. Complement MSTATUS parity.
00010654	Unexpected machine check.
Test 81	
000*x*8104	Read miscomparison.*x* is the number of the failing byte.

2.7.7 Memory Self-Tests

Table 2–14 lists possible memory self-test error codes.

Table 2–14   Memory Error Codes

00000001	No error detected.
0000FFF4	Could not find any good memory.
*xxxx*0104	Failed checkbits in mode 1.*xxxx* represents the failing checkbit.
FF010304	Failed DRAM state machine signature test.
FF020304	Failed M-bus state machine signature test.
44440444	Timeout waiting for module self-test to complete.
44440440	Bad sections of memory were found by BIST.
00000002	Too many bad pages.

2.7.7.1 Probable Failed FRU

A memory self-test error code indicates a faulty memory module.

2.7.8 Graphics Self-Tests

Graphics self-test error codes have the the following format:
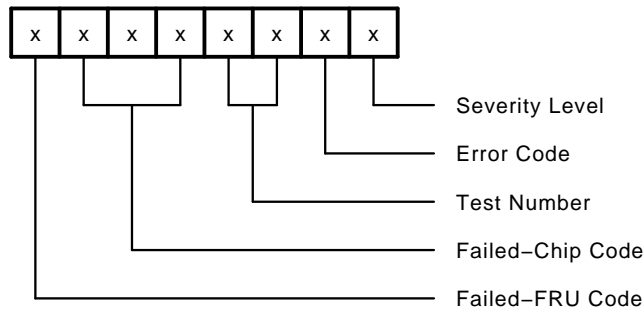
The *severity level* indicates the seriousness of the error.

The *error code* identifies the specific error that occurred.

The *test number* is the number of the failed test.

The *failed-chip code* indicates the problem chip in the failed module.

The *failed-FRU* code indicates the probable failed FRU.

Table 2–15 lists severity level values.

Table 2–15   Graphics Severity Levels

Code	Meaning
0	Warning
1	Success
2	Error
3	Information message
4	Severe error
5	Reserved
6	Reserved
7	Reserved

2.7.8.1 Probable Failed FRU

The failed-FRU code identifies the probable failed FRU. Values between 0 and 7 indicate specific problem modules. Values from 8 to C indicate general system failures.

The graphics self-test does not always single out one problem module, but may indicate two or three possible problem modules.

Table 2–16 lists possible failed FRUs.

Table 2–16   Graphics Failed-FRU Error Codes

Value	Faulty FRU
0	No error
1	Graphics base module
2	Graphics output module
3	Graphics base or output module
4	Graphics expansion module
5	Graphics expansion or base module
6	Graphics expansion or output module
7	Graphics base, output, or expansion module
8	Bad configuration
9	Restart code error
A	Unexpected interrupt
B	VDAC comparator error
C	CPU timeout
D	Insufficient resources (Fault is outside the graphics subsystem.)

2.7.9 Tape Adapter and Tape Drive Controller Self-Tests

The system reports failures in the tape adapter module and TQK70 tape drive controller as tape adapter failures.

This section lists each error code separately rather than provide a map, because there are relatively few tape adapter and tape drive controller error codes. Table 2–17 lists tape adapter module error codes. Table 2–18 lists tape drive controller error codes.

NOTE
The self-test does not check the tape drive. To check the tape drive, use system tests or the T 10F command.

Table 2–17   Tape Adapter Module Error Codes

Code	Meaning
00000100	FBIC register miscomparison.
00000200	FBIC register verification error.
00000400	Doorbell interrupt error.
00000003	No Q-bus devices found by sniffer.
00000002	CQBIC fatal error on Q-bus read access.
00000004	Error during sniff.
00FF0104	Sniffer could not allocate memory.

Table 2–18   TQK70 Self-Test Error Codes

Code	Meaning
00000001	The controller successfully completed its power-up self-test. No error was detected.
00000012	System was unable to initialize controller after two attempts.
00000022	Controller reported an error in the initialization step.
00000112	Controller timeout occurred in step 1 of the initialization sequence.
00000122	Controller found an error in step 1 of the initialization sequence.
00000132	Controller did not interrupt after completing step 1 of the initialization sequence.
00000212	Controller timeout occurred in step 2 of the initialization sequence.
00000222	Controller found an error in step 2 of the initialization sequence.
00000232	Controller did not interrupt after completing step 2 of the initialization sequence.
00000312	Controller timeout occurred in step 3 of the initialization sequence.
00000322	Controller found an error in step 3 of the initialization sequence.
00000332	Controller did not interrupt after completing step 3 of the initialization sequence.
00000632	Error occurred in allocating system memory.
00000642	Controller did not get a successful response to deallocate memory instruction.

Table 2–18 (Cont.)   TQK70 Self-Test Error Codes

Code	Meaning
00000922	Controller failed to clear the memory's DMA area.

2.7.9.1 Probable Failed FRUs

Tape adapter module errors codes indicate a failed tape adapter.

TQK70 errors almost always indicate a failed tape drive controller. However, a few error codes indicate a second possible cause for the failure:

- Error code 00000022 indicates a possible fault in the controller or a reversed tape drive connector cable. The tape drive connector has labels on each end that show which connector side faces out. Be sure these ends are connected correctly before replacing the TQK70 module.

- Error codes 00000632 and 00000642 indicate a possible problem in the memory module. Check the memory module before replacing the TQK70.

- The tape adapter module is also a possible cause of any error listed as a TQK70 error. If replacing other TQK70 devices fails to correct the fault, replace the tape adapter module.

2.7.10   DWFQA Q-bus Adapter and Q-bus Option Self-Tests

Table 2–19 lists fatal error codes for the DWFQA Q-bus adapter self-test.

Table 2–19   DWFQA Q-bus Adapter Self-Test Error Codes

Code	Test	Error	Meaning
00000114	1	1	Fatal: Failure accessing FBIC registers.
00000124	1	2	Fatal: Failure accessing SAVGPR FBIC register.
00000214	2	1	Fatal: Failure testing FQAM CSR.
00000314	3	1	Fatal: Failure testing the data path to scatter/gather map.
00000324	3	2	Fatal: Failure testing the address path to scatter/gather map.

Table 2–19 (Cont.)   DWFQA Q-bus Adapter Self-Test Error Codes

Code	Test	Error	Meaning
00000334	3	3	Fatal: Failure testing the address line (short/open) to scatter/gather map.
00000344	3	4	Fatal: Failure testing the data cell integrity of scatter/gather map.
00000414	4	1	Fatal: Failure testing pushs/pops in longword count FIFO.
00000424	4	2	Fatal: Failure testing data patterns in longword count FIFO.
00000514	5	1	Fatal: Failure testing the address/data FIFO (read bad pattern).
00000614	6	1	Fatal: Failure testing the path from the scatter/gather map to address/data FIFO.
00000714	7	1	Fatal: Failure testing the address/data FIFO dump. Dumped to incorrect address (lower than it should have).
00000724	7	2	Fatal: Failure testing the address/data FIFO dump. Dumped to incorrect address (higher than it should have).
00000734	7	3	Fatal: Failure testing the address/data FIFO dump. Bad pattern read back.
00000814	8	1	Fatal: Failure testing bytemask generation. Bytemask is incorrect.

2.7.10.1 CXY08 Self-Test Error Codes

CXY08 self-test errror codes have the following format:

   SSSS.EEEE

EEEE is a specific error code indicating a problem was found while running the test or with the device.

SSSS displays status information about the device. The CXY08 has two modes of operation, DHU and DHV, which are supported by this code. The DHU is the preferred mode of operation for the CXY08. The code only displays status information if the device is operating in DHV mode.

Table 2–20 lists the possible error codes for the CXY08 module.

Table 2–20   CXY08 Self-Test Error Codes

Code	Meaning
EEEE	
0001	CXY08 successfully passed the self-test.
0112	Reset flag cleared too quickly after the reset command was issued. (May not have run tests, or command was not received by the device.)
0122	Timed out while running Reset command (internal diagnostics).
0132	Internal diagnostics reported an error.
0212	TX.ACTION bit not set to indicate DMA happened in allowed time.
0222	No interrupt received to signal DMA complete.
0232	Error in data received, RX buffer did not match TX buffer.
0412	TX.ACTION and/or RX.AVAILABLE bits not set to indicate the character was transmitted and received.
0422	RX character invalid: DHV mode, single character transfer, RX character not the expected value.
0432	No interrupt received to signal new data in RX FIFO (DHV mode).
0512	CXY08/FQAM scatter/gather map access failure (shorted address lines).
0632	Error allocating system memory for use by this test.
0642	Error deallocating system memory used by this test.
0ff2	Unexpected interrupt occured while the running the CXY08 test.
SSSS	
xC08	The CXY08 is in DHU mode (switch setting).
xD11	The CXY08 is in DHV mode (switch setting).
0xxx	No unexpected interrupt occurred during the running of this test.
100x	An unexpected interrupt occured while running the CXY08 test.

2.7.10.2 DSV11 Self-Test Error Codes

DSV11 self-test error codes have the following format:

SSSS.EEEE

EEEE is a specific error code indicating a problem was found while running the test or with the device.

SSSS displays status information about the device or test. Table 2–21 lists the self-test error codes for the DSV11 module.

Table 2–21   DSV11 Self-Test Error Codes

Code	Meaning
EEEE	
0001	DSV11 successfully passed the self-test.
0212	Did not skip the self-test—DSV11 returned the incorrect status from command. Reset with skip self-test bit set.
0222	RSP bit not set—the command issued expected to set the bit, but it was not set within the allowed time.
0232	No interrupt received—the command issued expected an interrupt to be generated.
0312	Error allocating system memory—DE$A_allocate reported a problem allocating system memory for use by this test (TX buffer).
0322	Error allocating system memory—DE$A_allocate reported a problem allocating system memory for use by this test (RX buffer).
0332	RSP bit not set—the command issued expected the bit to be set, but it was not set within the allowed time.
0342	TX command reported an error—the transmit data command reported a failure.
0362	RX buffer does not equal the TX buffer—DSV11 failed to complete DMA.
0372	Error deallocating RX buffer—DE$A_Deallocate reported a problem deallocating system memory used by this test.
0382	Error deallocating TX buffer—DE$A_Deallocate reported a problem deallocating system memory used by this test.

Table 2–21 (Cont.)   DSV11 Self-Test Error Codes

Code	Meaning
EEEE	
0632	Error allocating system memory—DE$A_allocate reported a problem allocating system memory for use by this test.
0642	Error deallocating system memory—DE$A_Deallocate reported a problem deallocating system memory used by this test.
0ff2	Unexpected interrupt occurred while the running the DSV11 test.
SSSS	
0000	No unexpected interrupt occurred during the running of this test.
1000	An unexpected interrupt occurred.

2.7.10.3 TSV05 Self-Test Error Codes

TSV05 self-test error codes have the following format:

SSSS.EEEE

EEEE is a specific error code indicating a problem was found while running the test or with the device.

SSSS displays status information about the device.

Loopbacks are required for Customer Services and Manufacturing modes, but not for customer mode. Table 2–22 lists the self-test error codes for the TSV05 module.

Table 2–22   TSV05 Self-Test Error Codes

Code	Meaning
EEEE	
0112	System did not accept reset in two attempts.
0122	Subsystem ready bit not set in allowed time.
0132	Subsystem ready bit cleared when should be set
0212	Sanity check error, device detects an internal failure.
0222	Register modification refused, fatal controller problem.

Table 2–22 (Cont.)   TSV05 Self-Test Error Codes

Code	Meaning
EEEE	
0232	Nonexistent memory, CMD, CHR or MSG buffer not found or recognized.
0242	NBA bit set, supplied MSG buffer address not accepted.
0252	Unexpected error reported.
0262	Interrupt did not occur within allowed time.
0ff2	Unexpected interrupt occurred, with the device passing the self-test.
SSSS	
1XXX	Unexpected interrupt occurred during the self-test.

2.8 Interpreting System Test Error Messages

System test error codes have the following format:
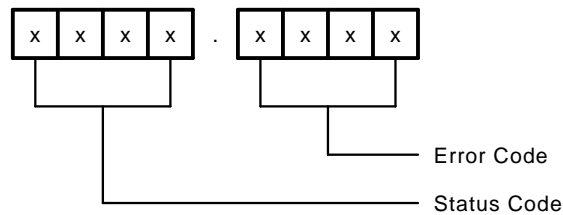
The *error code* identifies a specific error.

The *status code* may provide additional information about the system's condition. If no additional information is available, the four digits at the left are 0s.

System test error codes indicate a probable failure in the module reporting an error. If modules still report system test errors after you replace related FRUs, contact Digital support service.

The following sections provide maps for system test error codes. Each section also explains extended information strings that appear with each error message.

2.8.1 System Test Exception Messages

If an exception occurs during a system test, the workstation kernel displays several messages and halts all CPUs. The first message line indicates the type of fault. The following message lines give exact information about exception type and location. Table 2–23 lists system test exception messages.

Table 2–23   System Test Error Messages

Message	Meaning		
ker$mchk	Unrecoverable machine check.		
exc pc	Represents exception program counter (PC).		
exc psl	Represents exception program status longword (PSL).		
ker$acc_vio	Access violation.		
xxx	Represents an access violation reason mask. Possible bit values:		
	Bit 0	=	1, if the PTE access code did not permit intended access.
		=	0, if p0lr, p1lr, or s0lr have a length violation.
	Bit 1	=	0, if the specified virtual address is not accessible.
		=	1, if the associated page table entry is not accessible.
	Bit 2	=	0, if a read access was intended.
		=	1, if a modify access was intended.
acc vio vrt adr	Represents the access violation's virtual address.		
exc pc	Represents an exception PC.		
exc psl	Represents an exception PSL.		

Table 2–23 (Cont.)   System Test Error Messages

Message	Meaning
ker$arth	Arithmetic trap or fault.
xx	Represents an arithmetic exception code. Arithmetic exception codes have one of the following values:
	0 Undefined
	1 Integer overflow
	2 Integer divide by zero
	3 Floating overflow trap
	4 Floating divide-by-zero trap
	5 Floating underflow trap
	6 Decimal string overflow
	7 Decimal string divide by zero
	8 Floating overflow fault
	9 Floating divide-by-zero fault
	10 Floating underflow fault
exc pc	Represents exception PC.
exc psl	Represents exception PSL.
ker$breakpnt	Breakpoint fault.
exc pc	Represents exception PC.
exc psl	Represents exception PSL.

Table 2–23 (Cont.)   System Test Error Messages

Message	Meaning
ker$comp	Compatibility mode fault.
xx	Represents the compatibility exception code. The compatibility exception code has one of the following values:
	0 Reserved instruction execution
	1 BPT instruction execution
	2 IOT instruction execution
	3 EMT instruction execution
	4 Trap instruction execution
	5 Illegal instruction execution
	6 Odd address fault
	7 Tbit trap
exc pc	Represents exception PC.
exc psl	Represents exception PSL.
ker$ker_stk	Kernel stack not valid.
exc pc	Represents exception PC.
exc psl	Represents exception PSL.
ker$cus_res	Opcode reserved for customer.
exc pc	Represents exception PC.
exc psl	Represents exception PSL.
ker$dig_res	Opcode reserved to Digital.
exc pc	Represents exception PC.
exc psl	Represents exception PSL.

Table 2–23 (Cont.)   System Test Error Messages

Message	Meaning
ker$res_mde	Reserved addressing mode.
exc pc	Represents exception PC.
exc psl	Represents exception PSL.
ker$res_opr	Reserved operand.
exc pc	Represents exception PC.
exc psl	Represents exception PSL.

2.8.2 Machine Check Messages

If a machine check occurs during a system test, the workstation kernel
displays several messages and halts all CPUs. The first message line
describes the actual machine check error. The following message lines
give detailed information about the machine fault type and location.

Table 2–24 lists each machine check message and explains each message
line.

Table 2–24   Machine Check Error Messages

Message	Meaning
fpu mchk	Floating point errors.
10	Hexadecimal number of bytes in machine check log on stack.
typcde	Machine check type code:
	1 Protocol error detected FPA chip while attempting to execute a floating point instruction: reserved instruction execution.
	2 Reserved instruction detected FPA while attempting to execute a floating point instruction: IOT instruction execution.
	3 An error of unknown origin detected FPA.
	4 An error of unknown origin detected FPA.
rcntva	Represents the most recent virtual address.

Table 2–24 (Cont.)   Machine Check Error Messages

Message	Meaning
stat1	Represents internal state information 1.
stat2	Represents internal state information 2.
pc	Represents exception PC.
psl	Represents exception PSL.
mmu mchk	Memory management errors.
10	Hexadecimal number of bytes in machine check log on stack.
typcde	Machine check type code:
	5 The calculated virtual address for a process PTE was not in the system space when the CPU attempted to access a process PTE after a translation buffer miss.
	6 The calculated virtual address for a process PTE was in the P1 space instead of the system space when the CPU attempted to access a process PTE after a translation buffer miss.
	7 The calculated virtual address for a process PTE was in the P0 space instead of the system space when the CPU attempted to access a process PTE, to change the PTE M-bit before writing to a previously unmodified page.
	8 The calculated virtual ddress for a process PTE was in the P1 space instead of the system space when the CPU attempted to access a process PTE, to change the bit before writing to a previously unmodified page.
rcntva	Represents the most recent virtual address.
stat1	Represents internal state information 1.
stat2	Represents internal state information 2.
pc	Represents exception PC.
psl	Represents exception PSL.
mda mchk	Microcode detected errors.
10	Hexadecimal number of bytes in machine check log on stack.

Table 2–24 (Cont.)   Machine Check Error Messages

Message	Meaning
typcde	Represents machine check type code during a MOVC3 or MOVC5 instruction (not move forward, move backward, or fill.)
rcntva	Represents the most recent virtual address.
stat1	Represents internal state information 1.
stat2	Represents internal state information 2.
pc	Represents exception PC.
psl	Represents exception PSL.
md9 mchk	Undefined interrupt ID.
10	Hexadecimal number of bytes in machine check log on stack.
typcde	Represents machine check type code. There is only one mda machine check code:
	9 A hardware interrupt was requested at an unused IPL.
rcntva	Represents the most recent virtual address.
stat1	Represents internal state information 1.
stat2	Represents internal state information 2.
pc	Represents exception PC.
psl	Represents exception PSL.

Table 2–24 (Cont.)   Machine Check Error Messages

Message	Meaning
rde mchk	Read errors.
10	Hexadecimal number of bytes in machine check log on stack.
typcde	Represents machine check code type:
	80 An error occurred while reading an operand or a process page table.
	Entry during address translation, or any read generated as part of an interlocked instruction.
	81 An error occurred while reading one of these:
	• System page table entry during address translation
	• Process control block entry during a context switch
	• System control block entry while processing an interrupt
rcntva	Represents the most recent virtual address.
stat1	Represents internal state information 1.
stat2	Internal state information 2.
pc	Represents exception PC.
psl	Represents exception PSL.

Message	Meaning
wrt mchk	Write errors.
10	Hexadecimal number of bytes in machine check log on stack.
typcde	Represents machine check code type:
	82 An error occurred while writing an operand or a process page table entry to change the PTE (M) bit before writing a previously unmodified page.
	83 An error occurred while writing a system page table entry (SPTE) to change the PTE(M) bit before writing a previously unmodified page, or a process control block (PCB) during a context switch or during the executions that modify and stack pointers in the PCB.
rcntva	Represents the most recent virtual address.

Table 2–24 (Cont.)   Machine Check Error Messages

Message	Meaning
stat1	Represents internal state information 1.
stat2	Represents internal state information 2.
pc	Represents exception PC.
psl	Represents exception PSL.

2.8.3 Serial Line Adapter (DZ) System Test Error Messages

The DZ system test reports two types of errors, DZ device errors and software errors.

- DZ device errors indicate problems performing transfers through the DZ.

- DZ software error messages occur if the DZ system test receives a failure message during a VAXELN kernel call.

DZ Device Error Messages

DZ device error messages have the following format:
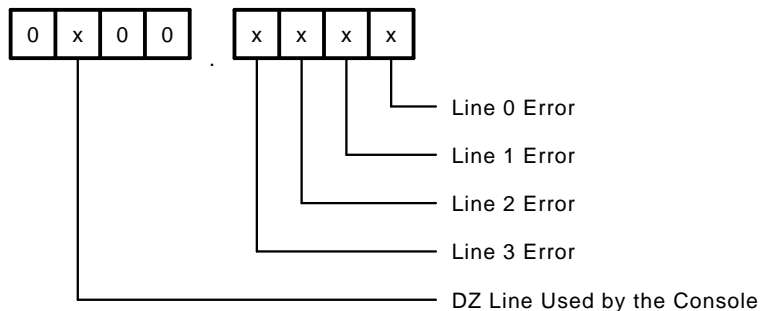
The *DZ line used by the console* is represented by the nonzero digit in the four digits at the left.

The *line error* codes indicate the line where the error occurred. An error code in one of these places indicates the exact error that occurred in that line.

Table 2–25 lists the DZ device system test error codes.

Table 2–25   DZ Device System Test Error Codes

Error	Meaning
0	Line check performed.
2	First character transmitted, but loopback was not received.
3	Transfer took too long to complete.
4	More characters have been received than expected.
5	Parity error occurred.
6	Framing error occurred.
7	Overrun error occurred.
8	Data compare error occurred.
9	Line failed to transmit all characters.

DZ Software Error Messages

DZ software error messages have the following format:

```
x  x  x  x      F  x  x  x
|_____|         |_____|
         |                 |
         |                 |_____ Returned Call
         |
         |_____ Failing VAXELN Status
```
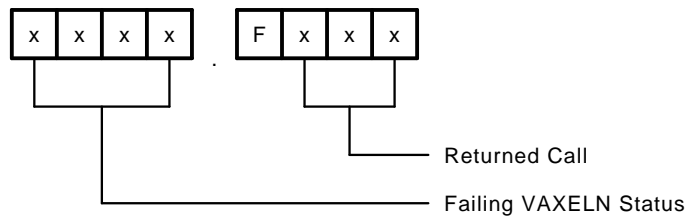
The *returned call* indicates the specific call that returned the failure.

The *failing VAXELN status* appears in the four digits at the left.

The F to the right of the separator always appears in DZ software error codes.

Table 2–26 lists software error messages for the DZ system test.

Table 2–26   DZ Software Error Codes

Error	Meaning
FF01	WST$_INIT call failed.
F004	Ctrl C area can not be obtained.
F005	Cannot attach to the DZ interrupt vector.
F006	DZ registers allocation failed.
F007	FBIC CSR allocation failed.
F008	Could not create *line processing enable* event.
F009	Could not create *line processing finished* event.
F00a	Could not create line processing.
F00b	Could not create Ctrl C *processing enable* event.
F00c	Could not create console input processing.
F00d	Could not create *no printing in progress* event.
F00e	Could not signal *line processing enable* event
F00f	Line processing did not complete successfully.
F010	Could not clear *line processing finished* event.
F011	Could not signal Ctrl C *processing enable* event.
F012	Wait for *line processing enable* event failed.
F013	Wait for Ctrl C *processing enable* failed.
F014	Wait for *system testing done* event failed.
FF0*x*	Line *x* test process timeout occurred.

2.8.3.1 DZ System Test Summary Messages

The DZ system test displays a statistics and error information summary
for each DZ line. Example 2–7 shows a sample DZ summary screen.

```
    ********** FST EXT_ERRPT  DZ        0 00:07:26 **********
❶          ❷          ❸          ❹          ❺
Line   L_Param  Chr_Xmt   Chr_Rec          Error
----   -------  --------  --------  ---------------------
  0             00002B50  00002B50  ***** No Errors *****
  1             00002B50  00002B50  ***** No Errors *****
  2     1FFA    00002B30  00002B29  ?? 1st Char not Rcvd
  3             00000000  00000000  *Not Tested - Console*

    ********** KA60_SYSTST_NXT_SCR ((RTN=Y), ('!'=N))...... ?
```

Example 2–7   Sample DZ System Test Summary Screen

❶ The first column lists the line number. Line 0 is the LK201 connector,
line 1 is the mouse connector, line 2 is the modem connector, and line
3 is the printer connector.

❷ The second column lists the contents of the line parameter register
when an error occurs. This entry is blank if no error occurred in that
line.

❸ The third column lists the total number of characters transmitted
over the line.

❹ The fourth column lists the total number of characters received on the
line.

❺ The fifth column lists the current line status.

2.8.4 Memory System Test Error Messages

There are relatively few memory system test error messages. Table 2–27
lists these possible messages.

Table 2–27   Memory Errors Reported by Memory System Test Module

Error Code	Meaning
PPPP.0001	Success, no error detected.
FEFE.0001	Monitor requested an exit.
PPPP.0011	At least one single bit error was detected and corrected.
000*M*.001F	Memory comparison error occurred.
000*L*.000F	Fatal error occurred.
SSSS.FF*LL*	Error from kernel call occurred.

Table Key:

PPPP = number of pages tested in the last pass.
SSSS = kernel's error code.
LL = failed kernel call location in memory system test.
M = failing module's *mid* number.

2.8.4.1 Memory Extended Information Messages

The memory system test offers an extended status screen.

Example 2–8 is a sample display for a system with 16 Mbyte memory
modules in MID 0 and MID 1. The actual extended status displays
depend on the number and type of memory modules in the workstation.

```
         ❶            ❷        ❸        ❹      ❺      ❻
MID   ADDR        SBE      POS      QUAD    #PAG    PAG_TST
---   --------    ---      ---      ----    ------  ---------
 0    00000000     4       **        *      008000  00000E77F
 1    01000000     2       **        *      008000  00000E77E
 1    000065B0     1       0F        0
 1    00006520     1       1A        0
 1    001A11A0     1       03        1
 0    00006530     1       1A        1
 1    001A2010     1       00        0
 0    0000652E     1       1A        1
```

Example 2–8   Sample Memory System Test Extended Information Display

❶ The M-bus base address for the module in MID 0 is 00000000_{16}.

❷ The module in MID 0 has four single-bit correctable errors (SBE). The second group of numbers is a log of the error events. The events are logged in chronological order and identified by the MID of the faulty module. The event address is a relative address, which when added to the base address gives the event's M-bus address. The relative address helps pinpoint the chip causing the fault.

❸ Any SBEs have a position code indicating which bit is in error. This may help uncover a stuck bit on a memory chip.

❹ There is also a field showing in which quadword the SBE occurred.

❺ This field shows the maximum number of pages per module.

❻ This field shows the number of pages tested per module.

2.8.5 Network Interface (NI) System Test Error Messages

There are two types of NI error messages, for system tests and kernel calls.

System Tests

NI error codes for system tests have the following format:
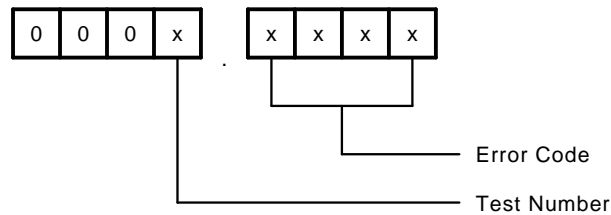
The *error code* at the right identifies the specific failure.

The *test number* of the failed test is the digit to the left of the separator.

Table 2–28 lists possible NI system test numbers.

Table 2–29 lists possible NI system test error codes.

Table 2–28   NI System Test Numbers

Test number	Description
1	Verify network controller chip interrupt done at initialization.
2	Test the internal loopback.
3	Reject a packet with a bad cyclic redundancy check (CRC) or accept a packet with a good CRC.
4	Perform multicast filtering and promiscuous receive operation.
5	Force a collision error.
6	Force an MISS error.
7	Test the external loopback.

Table 2–29   NI System Test Error Codes

Code	Meaning
0001	No error detected.
0002	No packet received.
0004	Packet data miscomparison
0006	Received wrong CRC.
0008	Initialization failed.
000A	Received a packet with bad CRC.
000C	CRC flag was not set when forced.
000E	Illegal multicast packet received.
0010	Rejected a packet when in promiscuous mode.
0012	Rejected a legal multicast packet.
0014	RTRY not set when forced.
0016	BUFF not set when forced.
0018	MISS not set when forced.
001A	Transmission error occurred.
001C	Transmission timeout occurred.

Kernel Call Errors

NI system test error codes for kernel calls have the following format:
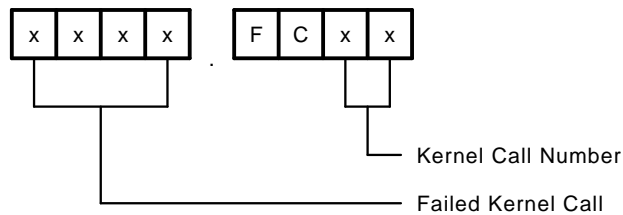
The *failed kernel call* appears in the four digits at the left. This error code has many possible meanings. Refer to the system test error message documentation for details.

The two digits at the right of the separator are always FC in kernel call error codes.

The *kernel call number* of the failed kernel call appears in the last two digits at the right. Use Table 2–30 to interpret kernel call numbers at the right side of the error code.

Table 2–30   NI Kernel Call Error Codes

Code	Kernel call
FC00	Create process.
FC02	Wait any.
FC04	Ker$lock device.
FC06	Ker$unlock device.
FC08	Signal.
FC10	Clear event.
FC12	Allocate memory.
FC14	Free memory.
FC16	Create device.
FC18	Ker$allocate system_region.
FC20	Ker$allocate system region.
FC22	Create event.
FC24	Create event.
FC26	Create event.
FC28	Create connector.
FC30	Create name.
FC32	Create connector.
FC34	Create name.
FC36	Allocate memory.
FC38	Free memory.
FC40	Ker$lock device.
FC42	Ker$unlock device.
FC44	Create message.
FC46	Ker$lock device.
FC48	Ker$unlock device.
FC50	Signal.
FC52	Ker$lock device.
FC54	Ker$unlock device.
FC56	Signal.
FC58	Signal.
FC60	Signal.

Table 2–30 (Cont.)   NI Kernel Call Error Codes

Code	Kernel call
FC62	Signal.
FC64	Signal.
FC66	Create message.
FC68	Create message.

2.8.5.1 Extended Information Messages

Example 2–9 shows a sample NI extended information display.

```
PKTS SNT = 000000E4
PKTS RCD = 000000D8
NUM PASS = 00000003

PKTS RCD = PKTS SNT - (4 * NUM PASS),

ERR DTCD:  TST 00000007 -- EXT LPBK TST

TEST #  ERR 0000001A -- XMT ERR
```

Example 2–9   NI Extended Information Display

The NI system test extended information displays show the total number of packets sent and received during system test. The numbers do not equal each other due to the forced errors within the test and are provided only for statistical purposes.

The extended information summary lists any current error information. This sample summary shows that a transmission error occurred in the external loopback test.

2.8.6 SCSI System Test Error Messages

The system test results list an individual error message for each item on the SCSI bus, including the host. SCSI error codes in this display have the following format:
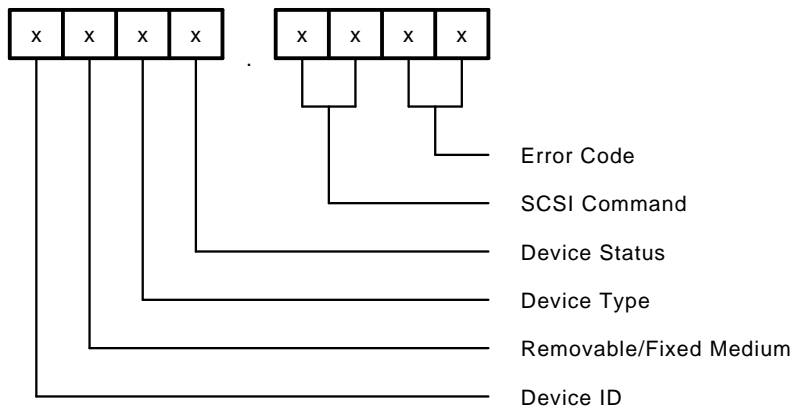
Device ID is the ID number of the device's address on the SCSI bus.

The *removable/fixed medium* status indicates the type of medium:

   1 indicates the medium is removable.
   0 indicates the medium is fixed.

Device type shows the device type at that address. Table 2–31 lists possible devices found on the SCSI bus.

Table 2–31   SCSI Device Type Codes

Code	Device
0	Direct access device (disk)
1	Sequential access device (tape)
2	Printer
3	Processing device
4	Reserved
5	Read-only direct access device
7	Logical unit not present
8	Vendor-unique
E	Host/controller

Table 2–31 (Cont.)   SCSI Device Type Codes

Code	Device
F	Undefined or unique device

Device status indicates the device's current condition. Table 2–32 lists possible device status codes.

Table 2–32   Device Status Codes

0	Device is ready to accept commands.
1	Device is offline.
2	Drive is not ready.
3	Diagnostic error occurred.
5	Device is the initiator/host.
6	Unit attention has been posted.
7	Data on this device is protected.

SCSI is the number of the test or utility command in which the error occurred. Table 2–33 lists possible SCSI command values.

Table 2–33   SCSI Command Codes

Code	Command
0	Test unit ready.
01	Rewind.
03	Request sense.
05	Read block limits.
07	Reassign block.
08	Read.
0A	Write.
0B	Track select.
16	Reserve unit.
10	Write filemarks.
11	Space.
12	Inquiry.
13	Verify.

Table 2–33 (Cont.)   SCSI Command Codes

Code	Command
14	Recover buffered data.
15	Mode select.
17	Release unit.
19	Erase.
1A	Mode sense.
1B	Start
1C	Receive diagnostic result.
1D	Send diagnostic.
25	Read capacity.
FF	Indicates external loopback test in progress.

NOTE
The preceding command listing does not mean all mentioned commands are implemented.

Error code indicates the exact error. Table 2–34 lists possible SCSI system test error codes.

Table 2–34   SCSI System Test Error Codes

Code	Meaning
01	No error occurred.
02	Illegal device type reported.
03	Error reported after a WST monitor call.
04	Error reported after an ELN call.
05	Illegal host ID read from NVR.
06	Media error reported by the device.
07	Hardware error reported by the device.
08	Read/write test failed.
09	Device is not ready.
0A	Data on this device is protected.
0B	Command did not complete succesfully.
0C	Read test failed.

Table 2–34 (Cont.)   SCSI System Test Error Codes

Code	Meaning
0D	External loopback test number 1 failed.
0E	External loopback test number 2 failed.
0F	External loopback test number 3 failed.
10	External loopback test number 4 failed.
11	External loopback test number 5 failed.
12	External loopback test number 6 failed.
13	External loopback test number 7 failed.
14	External loopback test number 8 failed.
15	Block reassignment failed.
16	Hardware error occurred during reassignment.
17	Medium error occurred during a send dialog level 2 command.
18	Hardware error occurred during a send dialog level 2 command.
19	Medium error occurred during a send dialog level 1 command.
1A	Hardware error occurred during a send dialog level 1 command.
1B	System failed to start the device.
1C	System failed to read device's capacity.
1D	Hardware error occurred during a write operation.
1E	Medium error occurred during a read operation.
1F	Hardware error occurred during a read operation.
20	Device is not ready.
21	Hardware error occurred during test unit ready state.
22	Medium error occurred during test unit ready state.
23	Bad block found during a read or write operation on the drive.
24	System is in Manufacturing mode, and the bus is empty.
25	SCSI bus configuration is illegal. One of the devices on the bus has the same ID as the host.
FF	Device is hung trying to complete the command.

2.8.6.1 SCSI System Test Summary Messages

The SCSI summary screen displays a line of information for each slot on
the SCSI bus. Example 2–10 shows a sample SCSI summary display.

```
----------------- SCSI Summary Screen -----------------
 ID     DevName     Reads    Writes     BBRs     SndDiag
-----   --------    ------   --------   --------  ---------
  0      RRD40     00022E94 00000000  00000000   00009F98
  1        .          .        .         .          .
  2        .          .        .         .          .
  3      RZ55      00027E60 00004FCC  00000000   00009F98
  4      RRD40     000005DA 00000000  00000000   000001AC
  5        .          .        .         .          .
  6        .          .        .         .          .
  7      Host         .        .         .          .
--------------- Extended Sense Packet  --------------

Id  6 :  06 00 00 00 00 00

---------------End of SCSI Summary Screen -------------
```

Example 2–10   Sample SCSI Summary Screen

Table 2–35 explains each column in the SCSI summary display.

Table 2–35   SCSI Summary Screen Entries

Heading	Meaning
ID	SCSI bus slot ID of the device
DevName	Device name from the inquiry data
Read	Number of read operations performed on the device
Writes	Number of write operations performed on the device
BBRs	Total number of bad blocks replaced on this device
SndDiag	Total number of send dialog level 1 and 2 commands performed on the device.

The extended sense packet message shows the last sense packet received
and that packet's ID. The following table lists the digits used in the
extended sense packet code.

Byte	Meaning
1	Sense key portion of the extended sense packet

Byte	Meaning
2	Information byte (MSB)
3	Information byte
4	Information byte
5	Information byte (LSB)
6	Additional sense length
7	Reserved byte
8	Reserved byte
9	Reserved byte
10	Reserved byte
11	Additional sense code

2.8.7 LEGSS System Test Error Messages

Table 2–36 lists possible graphics system test error messages.

Table 2–36   Graphics System Test Error Codes

Error Code	Meaning
0000.0001	No error detected.
0000.1000	Bus mastership error: GVAX executing in M-bus, and host executing in M-bus.
0000.1100	Bus mastership error: GVAX executing in M-bus, and host executing in DRAM.
0000.1200	Bus mastership error: GVAX executing in DRAM, and host executing in M-bus.
0000.1300	Bus mastership error: GVAX executing in DRAM, and host executing in DRAM.
0000.2000	GVAX error drawing into bitmap.
0000.2010	GVAX error drawing into bitmap, and pattern buffer was corrupted.
0000.4000	Host error writing into the bitmap.
0000.8000	Weitek error writing into DRAM.
0000.F000	Initialization error, could not allocate memory or could not connect to this device.

NOTE
A bus mastership error means that the lock (memory location) was incorrectly updated by GVAX, the host, or both.

During the LEGSS test, more than one processor may show an error. In that case, the appropriate error values from Table 2–36 (.2000, .4000, .8000) are added together. For example, if both the GVAX and the Weitek detect an error, the reported error code is 0000.A000.

For errors 0000.2000, 0000.2010, and 0000.4000, more information about the failure is in the DRAM memory locations described in Tables 2–37 and 2–38. These locations contain valid data only if one of these three failures occurred.

Table 2–37   GVAX Errors 2000 and 2010

Location	Meaning
3E7FFFD0	Bitmap address of failure
3E7FFFD4	Expected data
3E7FFFD8	Actual data
3E7FFFDC	Pattern buffer address of failure
3E7FFFE0	Expected data
3E7FFFE4	Actual data

Table 2–38   Host Error 4000

Location	Meaning
3E7FFFA8	Bitmap address of failure
3E7FFFAC	Expected data
3E7FFFB0	Actual data

2.8.8 TQK70 System Test Error Messages

TQK70 system test error messages have the following format:
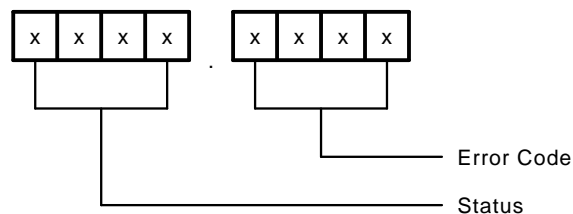
The four-digit *error code* on the right specifies the specific error.

The four-digit *status* code on the left represents some additional information about the system's status. The use of this additional code depends on the particular TQK70 error code.

Table 2–39 shows the possible TQK70 system test error codes. Where applicable, the table describes the status word in the left half of the error code.

Table 2–40 lists response packet error codes, Table 2–41 lists VAXELN status error codes, and Table 2–42 lists SA error codes used in TQK70 status codes.

Table 2–39   TQK70 System Test Error Codes

Error Code	Meaning
0001	No error occurred.
0002	Get DUST status response packet error. Status code: See Table 2–40.
0003	The controller is not in an idle state when it should be.
0004	Execute the local program response packet error. Status code: See Table 2–40.
0005	Send data response packet error. Status code: See Table 2–40.
0006	Receive data response packet error. Status code: See Table 2–40.
0007	Received unexpected data in the zeros test. Status code: shows where the miscomparison occurred (1 to 512).
0008	Received unexpected data from the ones test. Status code: shows the index where the miscomparison occurred (1 to 512).
0009	Received unexpected data from the counting data test. Status code: shows the index where the miscomparison occurred (1 to 512)*nnn*.
000A	Abort program response packet error. Status code: See Table 2–40.
000B	Get DUST status response packet error. Status code: See Table 2–40.
000C	The controller is not idle when it should be.
000D	Execute local program response packet error. Status code: See Table 2–40.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
000E	Wait-all kernel call failed.
000F	Get DUST status response packet error. Status code: See Table 2–40.
0010	Receive data response packet error. Status code: See Table 2–40.
0012	Receive error, data miscompared. Status code: represents the number of miscompared bytes.
0013	Data miscomparisons exceed the limit of 100. Status code: represents the number of miscomparisons.
0014	Abort program response packet error. Status code: See Table 2–40.
0015	Wait for response command returned bad status.
0016	Invalid command
0017	Command aborted.
0018	Drive unit offline. Status code values: 1 Unit unknown or on a line to another controller. 2 No volume mounted, or the drive is disabled. 3 Unit is inoperative. 4 Unknown subcode specified.
0019	Drive unit available.
001A	Media format error
001B	Unit write-protected. Status code values: 1 Unit is hardware write-protected. 2 Unit is software write-protected. 3 A TK50-formatted cartridge is in the TK70 drive. 4 Unknown subcode specified.
001C	Comparison error.
001D	Data error: long gap data error.
001E	Data error: data sync not found.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
001F	Data error: write lost data error.
0020	Software data error: software write error.
0022	Software data error: software read error.
0023	Hardware write error.
0024	Hardware read error.
0025	Host buffer access error. Status code values:
	1 Unknown cause to access error.
	2 Nonexistent memory error.
	3 Host memory parity error.
	4 Invalid page table.
	5 Unknown subcode specified.
0026	Controller error. Status code values:
	1 Communication channel timeout.
	2 Internal inconsistency.
	3 Unknown subcode specified.
0027	Drive error. Status code values:
	1 Drive command timeout.
	2 Controller detected a transmission error.
	3 Recoverable drive fault.
	4 Unrecoverable drive fault.
	5 Unknown subcode specified.
0028	Serious exception.
0029	Unexpected tape mark encountered.
002A	Record data truncated, unrecoverable data error.
002B	Tape position lost.
002C	Message from internal diagnostic.
002D	Power failure.
002E	Formatter error.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
002F	Invalid major error code returned.
0030	Controller timed out during start and wait state.
0032	Controller reported an error during start and wait state.
0033	Controller timed out in step 1 of the DMA test.
0034	Controller timed out in step 2 of the DMA test.
0035	Controller timed out in step 3 of the DMA test.
0036	Allocation of system memory failed. Status code values:
	1 Allocate failed.
	2 Invalid address.
	3 Invalid context.
	4 Invalid entry.
	5 Invalid priority.
	6 Invalid vector.
	7 Interrupts disabled.
	8 List too short.
	9 No access.
	A Nondecimal.
	B Null value.
	C Overflow.
	D Timed out.
	E Truncated data.
	F Undefined vector.
	10 Unknown status returned.
0037	Error found by step 1 of the controller initialization procedure. Status code: See Table 2–42.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
0038	Error in step 1 of the controller initialization procedure. Status code values:
	1 Unit failed to enter initialization step 1.
	2 No support for host interrupt vectors.
	3 Port does not support the enhanced diagnostic test.
	4 Port does not support odd host addressing.
	5 Port does not support address mapping.
	6 No support for 22-bit host bus.
0039	Error found by step 2 of the controller initialization procedure. Status code: See Table 2–42.
003A	Error occurred in step 2 of the controller initialization procedure. Status code values:
	1 Unit failed to enter initialization step 2.
	2 Incorrect connector type.
	3 Incorrect data during initialization step 2.
	4 Unit unexpectedly entered diagnostic wrap mode.
	5 Incorrect number of command ring descriptors.
	6 Incorrect number of response ring descriptors.
003B	Error found by step 3 of the controller initialization procedure. Status code: See Table 2–42.
003C	Error in step 3 of the controller initialization procedure. Status code values:
	1 Unit failed to enter initialization step 3.
	2 Interrupts not disabled.
	3 Incorrect interrupt vector returned.
003D	Error found by step 4 of the controller initialization procedure. Status code: See Table 2–42.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
003E	Error in step 4 of the controller initialization procedure. Status code values:
	1 Unit failed to enter initialization step 4.
	2 Incorrect hardware, not TQK70.
003F	CSR does not exist.
0040	Controller timed out during initialization. Status code: Value is the step (1 to 4) that did not interrupt.
0042	Controller did not interrupt. Status code: Value is the number of the step that did not interrupt.
0043	Controller detected an error. Status code: Shows the step that detected the error.
0044	DMA failed, area not written over by test.
0045	Controller is not a TK50 or TK70 type.
0046	Failed to deallocate IO buffer. Status code: See Table 2–41.
0047	Failed to deallocate command envelope. Status code: See Table 2–41.
0048	Command sequence error.
0049	Invalid command end message.
004A	Controller detected internal error.
004B	Controller hung error.
004C	Failed to allocate a new command envelope.
004D	Command sequence error.
004E	Controller timed out by host, no progress made on command.
004F	Data under error, fewer bytes written than requested.
0050	Duplicate drive detected.
0052	Drive operation failed, tape transfer error log received.
0053	Invalid command end message.
0054	Message received from controller with unknown end code.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
0055	Failed to allocate IO buffer. Status code: See Table 2–41.
0056	Invalid command.
0057	Command aborted.
0058	Drive unit is offline. Status code values:
	1 Unit unknown.
	2 Volume dismounted.
	3 Unit inoperative.
	4 Unknown subcode returned.
0059	Drive unit is available when it should not be.
005A	Media format error.
005B	Drive unit is write protected. Status code values:
	1 Unit hardware is write-protected.
	2 Unit software is write-protected.
	3 A TK50-formatted cartridge is in the TK70 drive.
	4 Unknown write-protection subcode returned.
005C	Data comparison error.
005D	Long gap data error. Staus code values:
	1 Hardware read error.
	2 Long gap data error.
005E	Data sync not found.
005F	Write data lost.
0060	Unrecoverable read error. Status code values:
	1 Error during a write operation.
	2 Error during a read operation.

Table 2–39 (Cont.)   TQK70 System Test Error Codes

Error Code	Meaning
0062	Host buffer access error. Status code values:
	1 Unknown cause to access error.
	2 Nonexistent memory error.
	3 Host memory parity error.
	4 Invalid page table.
	5 Unknown subcode returned.
0063	Controller error. Status code values:
	1 Communication channel timeout.
	2 Internal inconsistency.
	3 Unknown subcode returned.
0064	Drive error. Status code values:
	1 Drive command timeout.
	2 Controller detected a transmission error.
	3 Recoverable drive fault.
	4 Unrecoverable drive fault.
	5 Unknown subcode returned.
0065	Serious exception error.
0066	Unexpected tape mark encountered.
0067	Record data truncated.
0068	Tape position lost.
0069	Formatter error.
006A	Invalid status code returned in response packet.
006B	A response packet was received from an unknown command.
006C	Drive error byte decoder output. Status code: See Table 2–41.

Table 2–40   Response Packet Error Codes

Error Code	Meaning
1	Error in command reference number.
2	Error in endcode.
3	Invalid command.
4	No region available.
5	No region suitable.
6	Program not known.
7	Load failure.
8	Standalone system.
9	Unknown or invalid status.
A	Unknown or invalid status.
B	Host buffer access error.
C	Unknown or invalid status.
D	Error in step bits.

Table 2–41   VAXELN Status Error Codes

Code	Meaning
7C1C	KER$ BAD MODE
7C3C	KER$ BAD VALUE
7C9C	KER$ NO ACCESS
7CB4	KER$ NO MEMORY
7D2C	KER$ NO VIRTUAL
7C3C	KER$ BAD VALUE

Table 2–42   SA Error Codes

Code	Meaning
1	Envelope packet read error.
2	Envelope packet write error.
3	Controller ROM-RAM parity error.
4	Controller RAM parity error.
5	Controller ROM parity error.
6	Ring read error.
7	Ring write error.

Table 2–42 (Cont.)   SA Error Codes

Code	Meaning
8	Interrupt master error.
9	Host access timeout error.
A	Credit limit exceeded error.
B	Bus master error.
C	Diagnostic controller fatal error.
D	Instruction loop timeout error.
E	Invalid connection identifier error.
F	Interrupt write error.
10	Controller RAM error.
11	Initialization sequence error.
12	High-level protocol incompatibility error.
13	Purge-poll error.
14	Mapping register read error.
15	Mapping attempt error.
16	Divide error exception.
17	Single step interrupt.
18	Nonmaskable interrupt.
19	Breakpoint interrupt.
1A	Into detected overflow.
1B	Array bounds exception.
1C	Unused opcode error.
1D	Escape opcode exception.
1E	Reserved error code, unknown event.
1F	Into interrupt.
20	ROM checksum error.
21	MPU error.
22	RAM error (odd).
23	RAM error (even).
24	MPU timer error.
25	Miscellaneous register wrap error.
26	Gap detect circuit error.

Table 2–42 (Cont.)   SA Error Codes

Code	Meaning
27	USART wrap error.
28	USART wrap error, no CRC.
29	USART wrap error, CRC.
2A	Drive cable error.
2B	Unknown SA error code returned.

2.8.9 Q-bus Adapter (DWFQA) System Error Codes

Table 2–43 lists the possible fatal error codes for the DWFQA Q-bus adapter module.

Table 2–43   DWFQA Q-bus Adapter System Test Error Codes

Code	Test	Error	Meaning
00000914	9	1	Fatal Failure testing M-bus reads to address/data FIFO. Bad pattern read back.
00000A14	A	1	Fatal: Failure testing FIFO search logic (low word incorrect).
00000A24	A	2	Fatal: Failure testing FIFO search logic (high word incorrect).
00000B14	B	1	Fatal: Failure testing valid bit set recognition.
00000B24	B	1	Fatal: Failure testing valid bit clear recognition.
00000C14	C	1	Fatal: Failure testing FQAM interrupts.

2.8.10 CXY08 System Test Error Codes

Loopbacks are required for Customer Services and Manufacturing modes, but not for customer mode . Table 2–44 lists the possible system test error codes for the CXY08 module.

Table 2–44   CXY08 System Test Error Codes

Code	Meaning
0001	Successful pass of CXY08 system test diagnostics.
0002	Controller timed out during initialization.
0003	Controller failed to initialize without diagnostic error.
0004	Insufficient space in FIFO to transmit the character.
0005	Interrupt not seen when expected.
0006	There is an error in the data received, invalid data received.
0007	Received time out during FIFO read.
0008	Controller failed to initialize without diagnostic error.
0009	Received time out during FIFO read.
000A	There is an error in the data received, invalid data received.
000B	Could not force FIFO overrun.
000C	An interrupt timeout has occured, interrupt did not happen in allowed time.
000D	Invalid received line number during simultaneous DMA test.
000E	There is an error in the data received. Invalid received data during simultaneous DMA.
000F	Missing characters during simultaneous DMA.
0010	Controller failed to initialize without diagnostic error.
0012	DMA failed to stop on TX.ABORT bit being set.
0013	DMA did not resume after TX.ABORT bit cleared.
0014	There is an error in the data received. Faulty transfer after resumption from ABORT.
0015	Controller failed to initialize without diagnostic error.
0016	Port failed to interrupt on receipt of BREAK.
0017	Invalid BREAK indicator in FIFO.
0018	Controller failed to initialize without diagnostic error.
0019	Port failed to interrupt on receipt of BREAK.
001A	Faulty transfer during incoming flow-control test.

Table 2–44 (Cont.)   CXY08 System Test Error Codes

Code	Meaning
001B	There is an error in the data received. Faulty transfer during incoming flow-control test.
001C	Insufficient XOFFs generated during incoming flow-control test.
001D	There is an error in the data received. Faulty transfer during incoming flow-control test.
001E	There is an error in the data received. XON not generated during incoming flow-control test.
001F	Controller failed to initialize without diagnostic error.
0020	Insufficient space in FIFO to transmit character.
0022	TX.ENA not set/reset during outgoing flow-control test.
0023	Insufficient space in FIFO to transmit character.
0024	TX.ENA not set/reset during outgoing flow-control test.
0025	Controller failed to initialize without diagnostic error.
0027	An interrupt timeout has occurred.
0028	There is an error in the data received. Faulty transfer during forced flow-control test.
0029	There is an error in the data received. Faulty transfer during forced flow-control test.
002A	Insufficient XOFFs generated during forced flow-control test.
002B	There is an error in the data received. Faulty transfer during forced flow-control test.
002C	There is an error in the data received. XON not generated during forced flow-control test.
002D	Controller failed to initialize without diagnostic error.
002E	Call to Wait_any return non-success value.
002F	Fatal program error, ELN call failed.

2.8.11 DSV11 System Test Error Codes

Loopbacks are required for Customer Services and Manufacturing modes, but not for customer mode. Table 2–45 lists the system test error codes for the DSV11.

Table 2–45   DSV11 System Test Error Codes

Code	Meaning
0001	Successful pass of system test code.
0002	Modem flag stuck low.
0003	Failed to reset within 10 milliseconds (skip self-test).
0004	Command block status data not expected value.
0005	Running flag cleared by DSV11.
0006	ELN reports an error during allocate memory call.
0007	Wait_any call timed out before receiving an interrupt.
0008	Failed to complete command (no interrupt).
0009	ELN reports an error during Wait_any call.
000A	Interrupt caused by running flag being cleared.
000B	rsp_available flag not set, command did not complete.
000C	Timed out waiting for response.
000D	Command block status data not expected value.
000E	Unexpected end of command list.
000F	End of command list not seen (command not completed).
0010	End of command list found more then once in sequence.
0012	Received data errors detected, DMA failed.
0013	Error writing flag register.
0014	Error reading flag register.
0015	No free command/response block available.
0016	Response list link corrupted.
0017	Internal diagnostic program error, invalid command memory address.
0018	Error writing low word of command memory data register.

Table 2–45 (Cont.)   DSV11 System Test Error Codes

Code	Meaning
0019	Error writing high word of command memory data register.
001A	Error writing command memory address register.
001B	Internal diagnostic program error, invalid command memory address.
001C	Error reading low word of command memory data register.
001D	Error reading high word of command memory data register.
001E	Incorrect response sequence.
001F	Unexpected completion status in response.
0020	Internal diagnostic program error, invalid endcount.
0022	Write to CSR caused a machine check (no access or nonexistent memory).
0023	ELN reports an error during call to DSL$delay.

2.8.12 TSV05 System Test Error Codes

TSV05 system test codes have the following format:

   SSSS.EEEE

EEEE is a specific error code indicating a problem was found while running the test or with the device.

SSSS displays status information about the device.

Loopbacks are required for Customer Services and Manufacturing modes, but not for customer mode. Table 2–46 lists the system error codes for the TSV05 module.

Table 2–46   TSV05 System Test Error Codes

Code	Meaning
EEEE	
0001	TSV05 passed the system test.
0002	TSSR reports an error. Errors include SCE, BIE and/or NXM.

Table 2–46 (Cont.)   TSV05 System Test Error Codes

Code	Meaning
EEEE	
0003	Need buffer address (NBA) bit still set when it should be cleared.
0004	Initialization reports an failure.
0005	TSV05 failed to interrupt.
0006	Drive unit is offline. There may be a problem with the system. Otherwise, place drive online and start again.
0007	Data read was not data written (read forward after skipping tape mark).
0008	TC1 bit is set (tape status alert). End of tape found during write command.
0009	Data read was not data written (read forward).
000A	Data read was not data written (read with swap bits enabled).
000B	Error reported by ELN during WAIT call.
000C	Error writing to device registers.
000D	Error reading device registers.
000E	Error reading flags registers.
000F	SSR and NBA bits not set after an initialization.
0010	SSR bit not set after a initialization.
0012	NBA bit not set after a initialization.
0013	SC, TC2 and TC1 bits are set. Unrecoverable error— tape position lost.
0014	SC and TC2 bits set. Recoverable error—tape position is one record beyond what its position was when the function was begun.
0015	Wait_Any kernel call reported an error.
0016	Error writing to device registers. Nonexistent memory error reported by the kernel.
0017	Error reading device registers. Nonexistent memory error reported by the kernel.
0018	Error allocating system memory.

Table 2–46 (Cont.)   TSV05 System Test Error Codes

Code	Meaning
EEEE	
0019	SSR bit not set, indicating the command did not complete in allowed time.
1110	CS mode only: Operator failed to respond to output message concerning whether a scratch tape is installed in the drive.

2.9   Booting the System After Completing Repairs

After you repair the workstation, boot the system to verify that you corrected the problem and that the workstation operates correctly. To boot the workstation, use the BOOT command described in Appendix C.

If the workstation fails to boot, a boot error message appears on the monitor. Table 2–47 explains possible boot error messages.

Table 2–47   Boot Error Messages

Message	Meaning
BADCHKSUM = 00000808	Bad file header checksum reported.
BADFILEHDR = 00000810	Bad file header exists.
BADFILENAME = 00000818	Bad file name syntax used.
BADIRECTORY = 00000828	Bad directory file format used.
BUFFEROVF = 00000601	Output buffer overflow occurred.
CTRLERR = 00000054	Controller error reported.
DEVASSIGN = 00000848	Device has channels assigned.
DEVINACT = 000020D4	Device is inactive.
DEVOFFLINE = 00000084	Device is not in configuration or unavailable.
DEVREQERR = 00000334	Device request error occurred.
DRVERR = 0000008C	Fatal drive error occurred.
ENDOFFILE = 00000870	End of file reached.
FILESTRUCT = 000008C0	Unsupported file structure level used.

Table 2–47 (Cont.)   Boot Error Messages

Message	Meaning
FILNOTCNTG = 000002AC	File is not contiguous as required.
INSFMAPREG = 00000344	Map registers are insufficient.
MEDOFL = 000001A4	Medium is offline.
NORMAL = 00000001	Normal, successful completion occurred.
NOROM = 00008018	No ROM is present.
NOSUCHDEV = 00000908	No such device is available.
NOSUCHFILE = 00000910	No such file is available.
NOSUCHNODE = 0000028C	Remote node is unknown.
PARITY = 000001F4	Parity error occurred.
PROTOCOL = 00002074	Network protocol error occured.
SCB2NDINT = 00008010	Unknown interrupt occurred in secondary boot image.
SCBINT = 00008008	Unknown interrupt occurred in primary boot image.
TIMEOUT = 0000022C	Device timeout occurred.
WRITLCK = 0000025C	Write lock error occurred.

3
Accessing the Hardware

This chapter contains important safety information, as well as instructions for

- Turning off the system unit

- Removing and replacing covers and assemblies

- Attaching the shipping brackets for moving the system unit

Be sure to read this chapter before

- Removing and replacing any field replaceable units (FRUs) (Chapter 4)

- Installing options (Chapter 5)

3.1 Using an Antistatic Kit

The Digital antistatic kit (part number 29-26246-00) contains materials that you should use whenever you handle the static-sensitive components of the system unit.

CAUTION
Before handling any of the option modules or FRUs, or removing any static-sensitive materials from an antistatic bag, place the antistatic wrist strap around your wrist and attach the wrist strap and the antistatic mat to the metal chassis of the system unit.

When you remove a module or FRU from its antistatic bag, lay the module or FRU on the antistatic mat.

3.2 Turning Off the System Unit

You must turn off the system unit before you remove and replace any FRUs or options. The system unit controls are behind the sliding panel near the center of the system unit. A three-position lock to the left of the sliding panel guards access to the controls.

To turn off the system unit:

1. Insert the key into the lock on the front cover, then turn the key clockwise until it reaches the bottom position.

2. Slide the panel all the way down.

3. Turn the system unit off by setting the on/off switch to the off (0) position.

On/Off Switch
in the Off Position
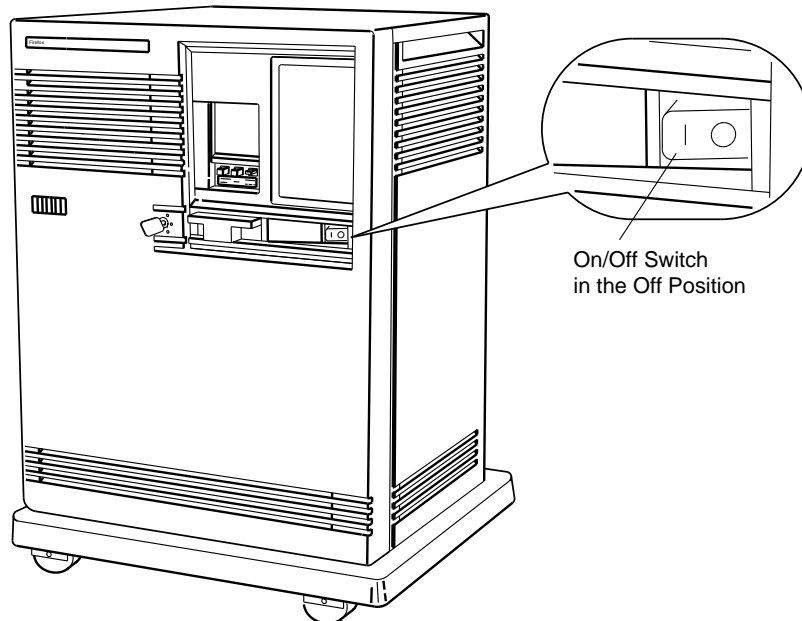
DEFM020

3.3   Removing and Replacing the Front Cover

The front cover fits over the front of the system unit and is removed as one piece. You must remove the front cover to access any FRU.

To remove the front cover:

1. Pull out the release latch.

2. Grasp the sides of the cover at the bottom and pull up and then out.

Key   Latch
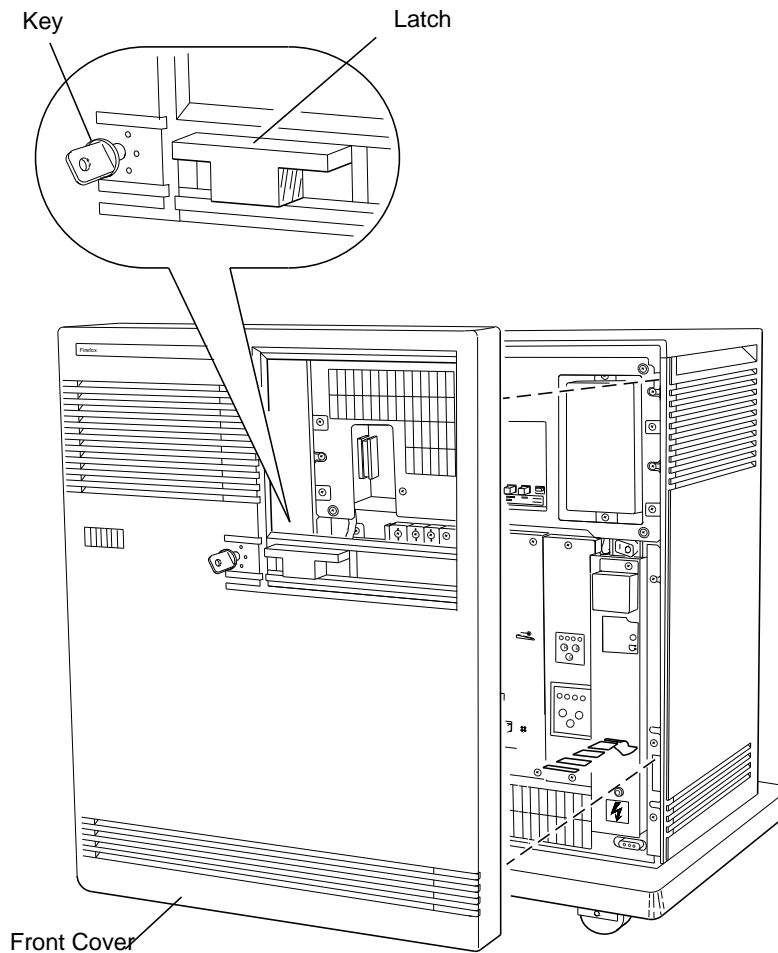
Front Cover

DEFM021

To replace the front cover:

1. Place the cover against the front of the system unit, about 5 cm (2 inches) up from the plastic base. Align the metal hooks on the back of the cover with the corresponding spaces on the system unit frame.

2. Slide the cover down until you feel it lock into place.

3. Push the release latch in.

Figure 3–1 shows the system unit with the front cover removed. All system modules reside in card cage slots, which are covered by the graphics, I/O, and Q-bus covers. A mass storage cover fits over the disk and tape drives in the mass storage area.

Mass Storage Cover

Graphics Cover

I/O Cover

Q-bus Covers
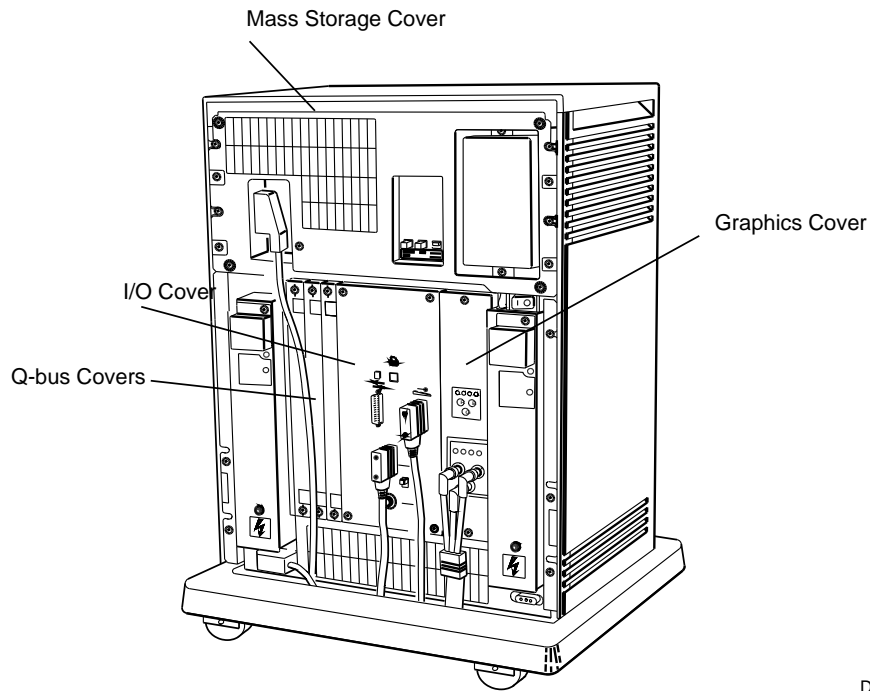
DEFM022

Figure 3–1   Inside the System Unit

3.4   Removing and Replacing the I/O Cover

The I/O cover fits over slots 4 through 9 in the card cage. A rechargeable battery is attached to the back side of the I/O cover.

Figure 3–2 shows the I/O cover and connectors.

Status Display

Printer Connector

Modem Connector

Keyboard/Mouse
Connector

ThickWire
Ethernet
Connector

Ethernet Switch

ThinWire
Ethernet
Connector
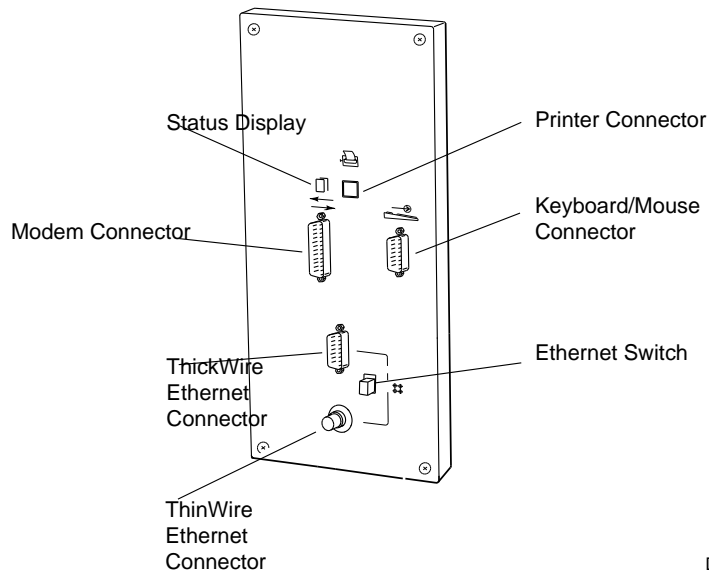
DEFM008

Figure 3–2   The I/O Cover and Connectors

You must remove the I/O cover to access the following modules:

- CPU module

- Memory module

- I/O module

- Tape adapter module

- Q-bus adapter module

If a failure occurs within the I/O cover itself, remove and replace the cover.

You do not need to disconnect the I/O cable from the I/O module to access or remove a module. Do not disconnect the I/O cable, unless necessary. Disconnecting the I/O cable effectively removes battery power, so the nonvolatile RAM (NVR) in the I/O module loses power and its memory contents. This RAM stores the workstation's default settings. If you remove the I/O cable, you must reset the default values when you turn the workstation on again.

To remove the I/O cover:

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Disconnect all external connectors on the I/O cover. You may want to label them, to help you remember where they go.

4. Release the four ¼-turn captive screws that hold the I/O cover in place.

5. Gently pull the I/O cover away from the card cage about two inches.

1/4-Turn
Captive Screw
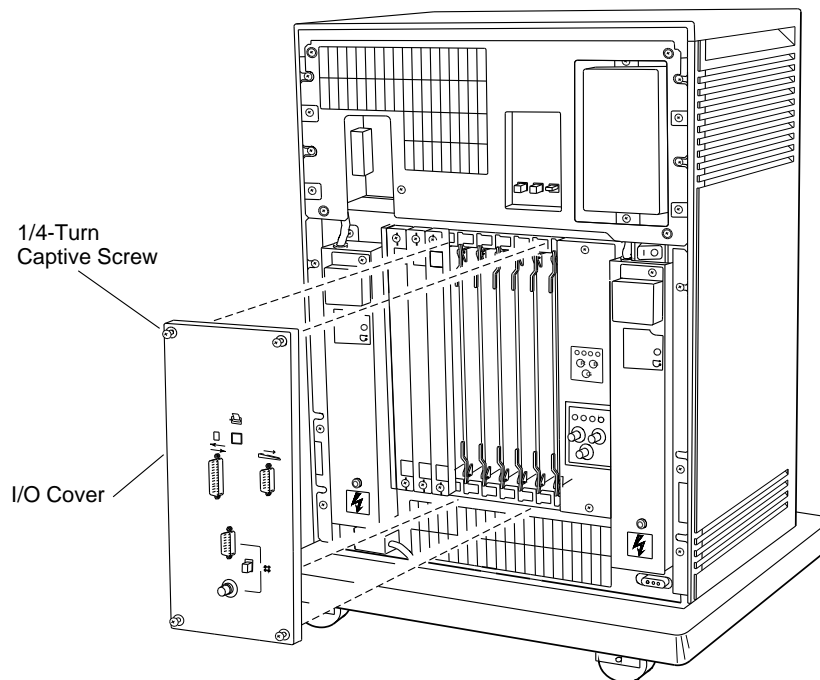
I/O Cover

DEFM024

6. If you need to disconnect the ribbon cable that connects to the I/O module, disconnect it at the I/O module (not at the I/O cover).

Ribbon Cable

Cable Ejector

I/O Module Connector

Cable Ejector
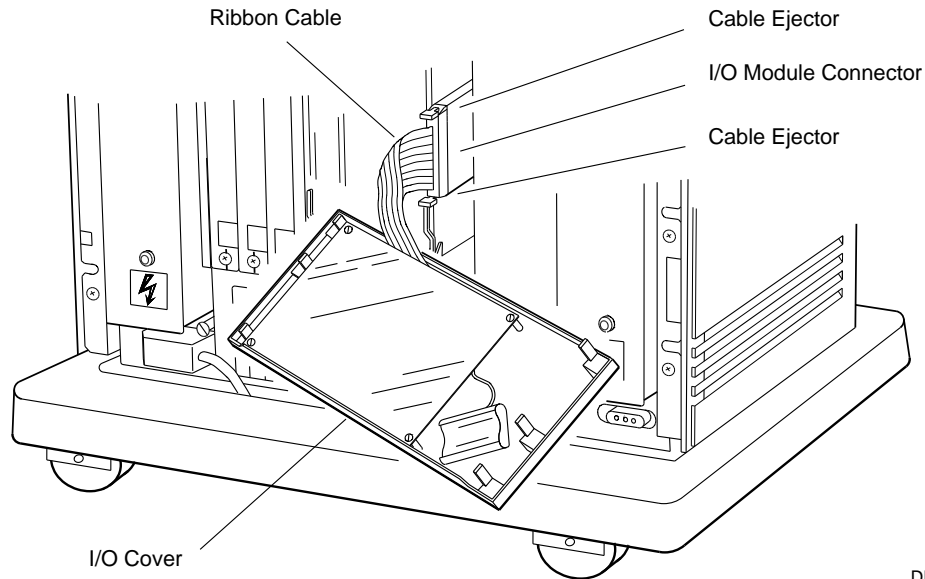
I/O Cover

DEFM025

7. Lift the I/O assembly away from the card cage and carefully set the assembly aside.

To replace the I/O cover, reverse the preceding steps.

3.5   Removing and Replacing the Graphics Cover

The graphics cover fits over the graphics frontplane and the two or three graphics modules in slots 1, 2, and 3.

You must remove the graphics cover to access the graphics frontplane and the graphics base, graphics output, and graphics expansion modules.

To remove the graphics cover:

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Find the graphics cover on the right side of the card cage. Note the location of the three RGB cables. They are labeled and stamped with red, green, and blue color bands.

   • If you are replacing the graphics frontplane, disconnect the RGB cables from the graphics cover.

   • If you are just removing the cover to look at the green LED display on the graphics base module, leave the RGB cables connected.

4. Release the two ¼-turn captive screws that hold the graphics cover in place.
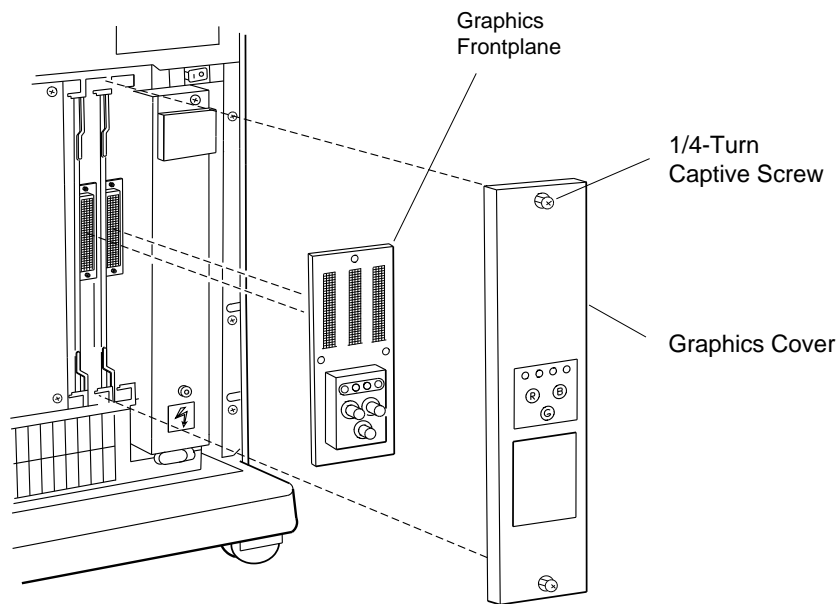
DEFM026

5. Gently pull the cover away from the card cage, bottom first.

To replace the graphics cover, reverse the preceding steps.

3.6   Removing and Replacing the Graphics Frontplane

The graphics frontplane connects the two or three graphics modules installed in slots 1 through 3 of the card cage. The frontplane also provides video output connections to the color monitor.

You must remove the graphics frontplane to access graphics modules in slots 1, 2, or 3.

To remove the graphics frontplane:

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the graphics cover (Section 3.5).

4. Loosen the three large captive thumbscrews on the graphics frontplane.

5. Grasp the top and bottom of the graphics frontplane. Remove the frontplane by gently rocking it back and forth, while pulling it away from the graphics module connectors. Be careful not to bend any pins on the connectors.

To replace the graphics frontplane:

1. Align the three long prongs that extend from the back of the graphics frontplane with the corresponding holes on the module connectors. The three connectors on the graphics frontplane correspond to the mating connectors on the graphics modules.

2. Push the graphics frontplane connectors onto the graphics module's mating connectors, using an even force to avoid bending connector pins. If necessary, rock the module back and forth slightly.

3. Tighten each of the three thumbscrews slightly. Then tighten each one a bit more, until all are sufficiently tightened.

4. Replace the graphics cover and tighten the two captive screws.

5. Replace the RGB connectors by connecting each RGB connector to its corresponding color.

6. Run the red, green and blue color check tests to verify that the connections are secure. See Chapter 2 for detailed information on how to run these tests.

3.7 Removing the SCSI Terminator From the System Unit

The SCSI terminator covers the SCSI connector at the upper-left corner of the system unit.

You must remove the SCSI terminator before you can remove the control panel or install an RRD40 optical compact disc drive (Chapter 5).

To remove the SCSI terminator:

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Pull apart the clamps holding the SCSI terminator to the SCSI connector.

4. Pull the SCSI terminator away from the connector, as shown.

   NOTE
   Remember to reconnect the SCSI terminator. If you install an optical compact disc drive, place the terminator on the drive (Chapter 5).

SCSI
Terminator
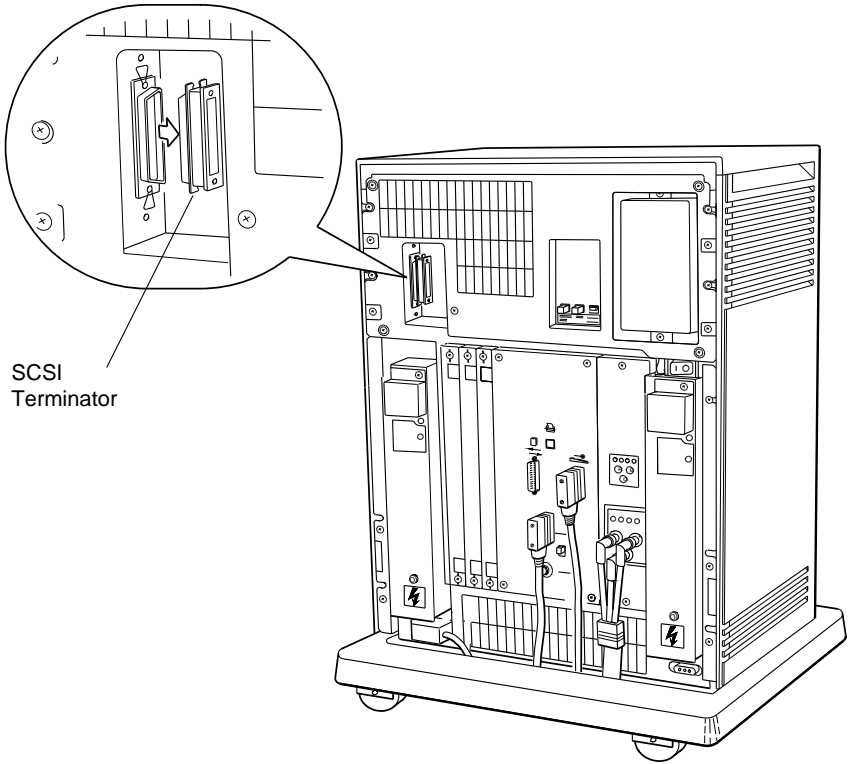
DEFM027

3.8   Removing and Replacing the Mass Storage Cover

The mass storage cover fits over the mass storage area at the top of the system unit. You must remove the mass storage cover in order to remove a disk drive, a tape drive, the control panel.

To remove the mass storage cover:

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Release the five captive screws that hold the mass storage cover in place.

Mass Storage
Captive Screws (5)
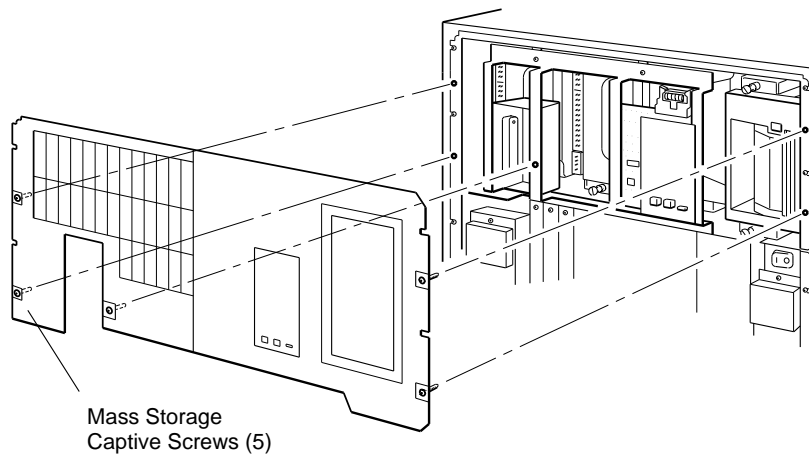
DEFM028

4. Pull the cover away from the mass storage area.

To replace the mass storage cover, reverse the preceding steps.

3.9 Securing the Shipping Brackets for Moving the Workstation

If you are moving the workstation a short distance, follow the instructions in Chapter 7 of the *VAXstation 3520/3540 Operator's Guide* or the *VAXstation 3820/3840 Owner's Manual* for dismantling the workstation.

If you are moving the workstation to another building or farther, you must secure the shipping brackets to protect the drives during the move.

To secure the shipping brackets to the system unit:

1. Perform all dismantling steps as instructed in the *VAXstation 3520/3540 Operator's Guide* or the *VAXstation 3820/3840 Owner's Manual*.

2. Remove the mass storage cover (Section 3.8).

3. Find the metal shipping brackets on each side of the mass storage area. Each side has a top bracket with an arm and a bottom bracket with an arm. You may need to use a flashlight to see the brackets.

4. Lift up on the top bracket—the left and right arms move as a unit. Hold the bracket against the top of the mass storage area, as you turn the orange screws to the right to tighten them. The mounting bracket arms should be held between the system unit frame and the shaft of the orange screws.

5. Push down on the bottom bracket. Hold the bracket against the bottom of the mass storage area, as you turn the orange screws to the right to tighten them. You may need to push hard to hold the bracket against the bottom of the mass storage area; use a screwdriver or other tool if necessary. The mounting bracket arms should be held between the system unit frame and the shaft of the orange screws.

6. Replace the mass storage cover.

To release the shipping brackets when unpacking the workstation, turn the four orange screws to the left until you hear a snapping sound as the brackets release.

3.10   Removing and Replacing the Back Cover

The back cover consists of the four panels that make up the sides, top, and back of the metal chassis. You remove this cover as one piece.

You must remove the back cover to access the backplane.

To remove the back cover:

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the 10 screws that hold the back cover on.

DEFM029
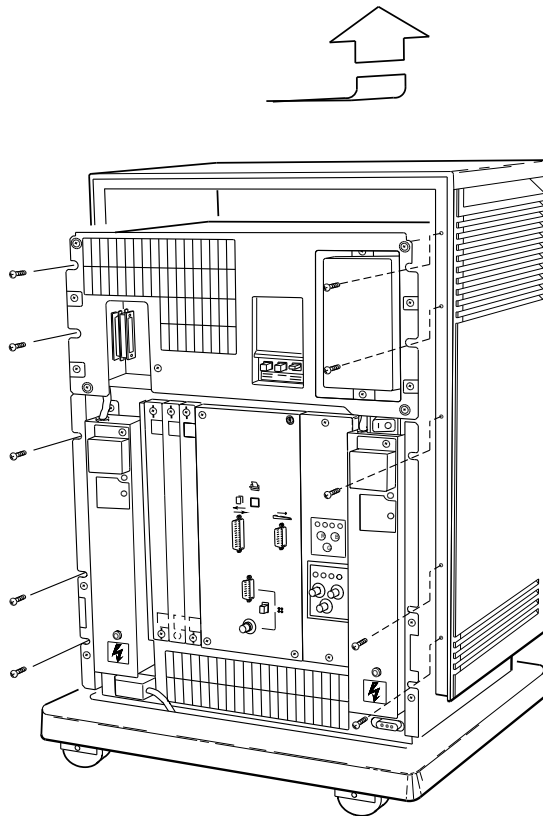
4. Slide the back cover away from you as far as it will go (about 5 cm, or 2 inches), to release the four fasteners that hold the cover to the top of the mass storage area.

5. Remove the cover by lifting it straight up and then away from the system unit.

To replace the back cover, reverse the preceding steps.

4
Removing and Replacing FRUs

This chapter describes how to remove and replace field replaceable units (FRUs) in the VAXstation 3520/3540 and VAXstation 3820/3840 workstations, including the following:

- Battery pack

- System modules

- Storage devices, such as tape and disk drives

- Power supplies

- Electrical and mechanical parts and assemblies

- Peripheral devices, such as the keyboard, mouse, and tablet

See Appendix B for a list of FRUs and their part numbers.

4.1   Before You Begin

It is the customer's responsibility to back up software before a Digital service representative arrives at the customer's site. This step is important to ensure that data is not lost during any service process. The customer should also shut down the worksystem software. Before you perform any maintenance work, confirm that the customer has completed both of these tasks.

CAUTION
Before handling any of the option modules or FRUs or removing any static-sensitive materials from an antistatic bag, place the antistatic wrist strap around your wrist and attach the wrist strap and the antistatic mat to the metal chassis of the system unit. When you remove a module or FRU from its antistatic bag, lay the module or FRU on the antistatic mat.

4.2 Removing and Replacing Internal FRUs

This section describes procedures for removing and replacing FRUs in the workstation. Before attempting any of these procedures, you must perform the following steps, as described in Chapter 3:

1. Turn off the workstation.

   NOTE
   In power-associated operations, you will also be instructed to unplug the system unit power cord from the power source.

2. Remove the front or back cover from the system unit.

3. Remove the cover that encloses the FRU you are replacing.

4.2.1 Inspecting the EOS and FCC Clips

To comply with FCC regulations, blank covers and the front covers of the system unit have transient-protection EOS and FCC clips. Before you install an FRU or cover, check that the FCC and EOS clips are in good condition.

Following proper antistatic procedures, inspect the FCC and EOS clips for residue or corrosion. If the clips are dirty, clean them using a cotton swab dampened with alcohol.

Check that the FCC clips are in an arched shape. If you push on them slightly, they should bend and then return to their original shape.

4.2.2 Battery Pack

A rechargeable battery pack is mounted on the inside of the I/O cover. The battery pack maintains the contents of the nonvolatile RAM (NVR) when the power to the workstation is turned off. Replace the rechargeable battery if the system prompts you for a language choice after you turn the power to the workstation on again.

To replace the battery pack (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the I/O cover (Section 3.4).

4. Disconnect the battery cable from the I/O cover, as shown. Remove the battery from its holder by spreading the sides of the battery holder and lifting the battery out.

Battery Pack Cable

Battery Pack

Battery Pack Connector

Battery Pack Holder
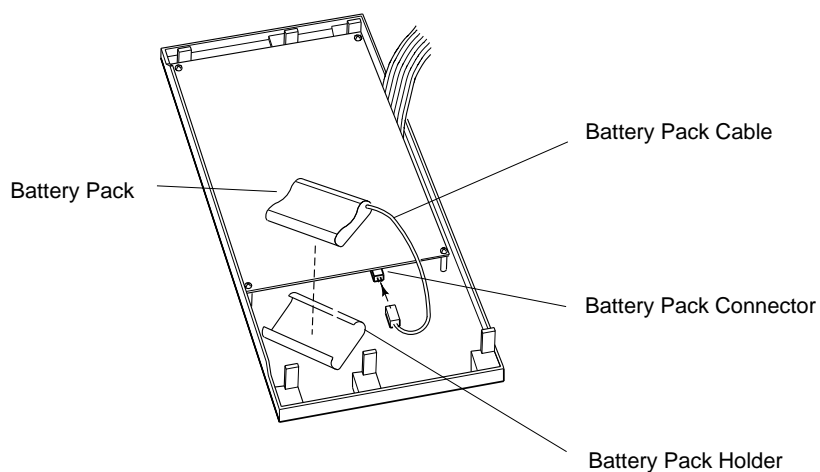
DEFM030

5. Place a new battery in the battery holder and reconnect the battery cable.

6. Replace all covers and turn on the workstation.

7. Reenter system default settings if necessary, using console commands (Appendix C).

NOTE
After you enter system default settings, keep the workstation running for several hours while the newly installed battery charges. Otherwise, the NVR contents will be lost again.

4.2.3 System Modules

This section describes how to remove and replace system modules in the M-bus and graphics bus slots (1 through 9) behind the I/O and graphics covers. Use the configuration display to see which modules are in each slot. Type **T 50** and press Return. The monitor displays a list that relates module IDs to physical slots.

See Section 2.2.2 for more details about the T 50 configuration display. Note that card cage slots 10 through 12 are reserved for Q-bus modules.

Figure 4–1 show the system unit backplane configuration.

Module ID (Mid) Numbers			0	1	2	3	4	5	7		
Slots	Reserved	Reserved	TQK70 Module (Optional)	Q-bus Adapter Module (Optional)or Tape Adapter Module (optional)	Memory Module	CPU Module	CPU Module or Memory Module (OPtional)	Memory Module (Optional)	I/O Module	Graphics Base Module	Graphics Output Module	Graphics Expansion Module (Optional)
Slot Numbers	12	11	10	9	8	7	6	5	4	3	2	**1**

Q-bus Covers	I/O Cover	Graphics Cover

MA-X0689-89

Figure 4–1   The System Unit Backplane Configuration

You remove and replace all M-bus and graphics bus modules in the same manner.

NOTE
When you remove modules, be sure to use proper antistatic procedures. Leave the system unit power cord plugged in, to provide a ground for the antistatic mat and wrist strap.

To remove an M-bus or a graphics bus module (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Disconnect cables as needed.

   NOTE
   If you disconnect the ribbon cable between the I/O module and I/O cover, you will have to reset the NVR default values when you turn the workstation on again.

4. If you are replacing the I/O module, take the Ethernet address chip from the old I/O module and put it onto the new I/O module. This step is necessary to retain the same Ethernet address. Be sure to insert the chip in the same direction on the new I/O module.

LED

Ethernet
Address Chip

Lance Chip

SIA Chip
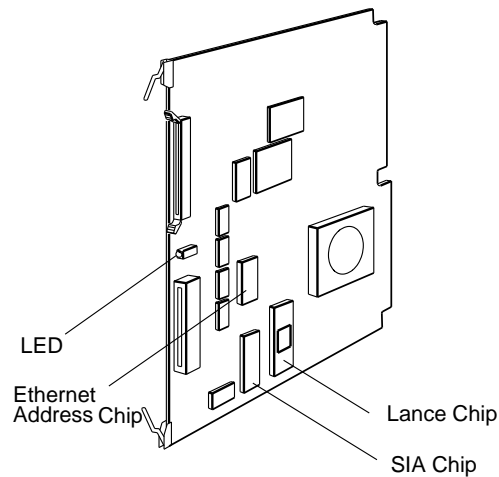
DEFM078

Figure 4–2   Ethernet Address Chip on the I/O Module

5. Remove the appropriate cover as needed.

6. Pull out on the module's top and bottom release levers, as shown.

7. Gently pull the module out of the card cage.
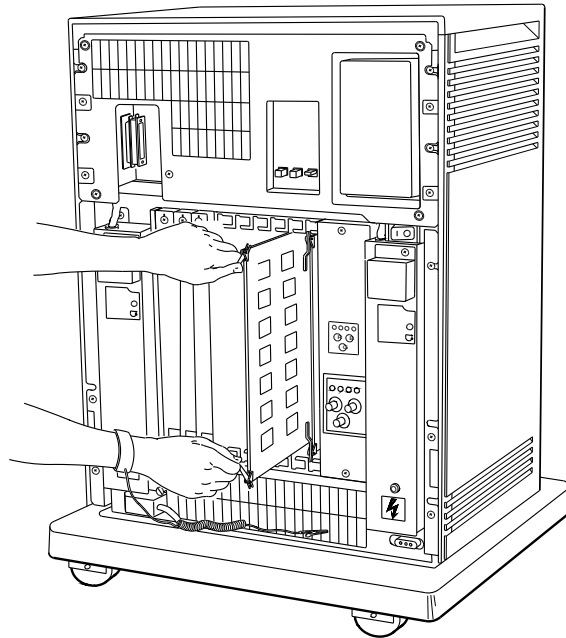
DEFM032

To replace an M-bus or graphics bus module:

1. Slide the module into the appropriate slot, making sure the module fits firmly into the backplane connectors.

2. Press the top and bottom release levers simultaneously. You must press these levers simultaneously for them to seat properly.

3. Replace the appropriate covers.

4.2.4 Control Panel Module

You must remove the mass storage cover to access the control panel assembly. The control panel assembly consists of the control panel cover and the control panel module.

To remove the control panel assembly (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the mass storage cover and the SCSI terminator (Section 3.8).

4. Remove the two screws that hold the control panel assembly in place and pull the assembly away from the mass storage area.

Control Panel
Assembly Screws

Mass Storage
Cover Screws (5)
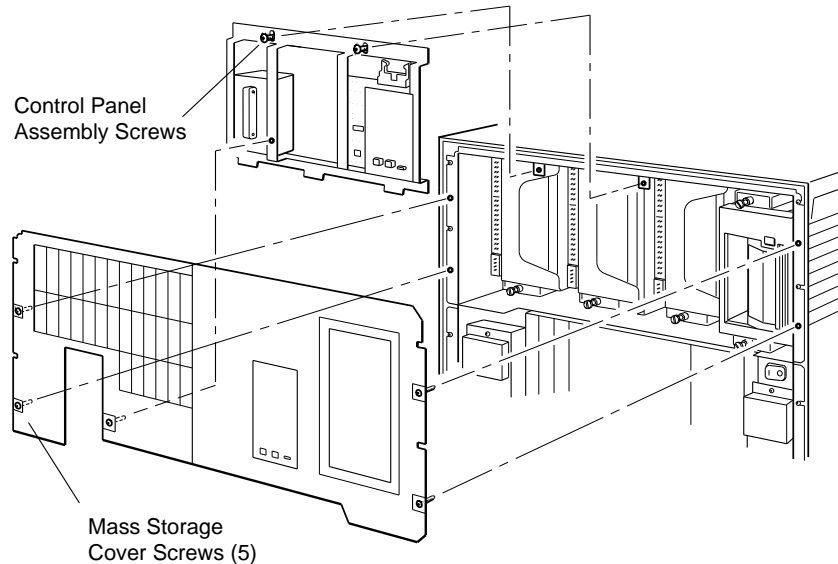
DEFM034

5. Holding the control panel assembly in one hand, disconnect the SCSI cable.

6. Place the control panel assembly on top of the system unit. Allowing it to dangle may damage the wiring.

To remove the control panel module from the control panel assembly:

1. Disconnect the ribbon cable from the control panel module by releasing the two plastic latches.

   NOTE
   If you need to replace a defective control panel, remove the ribbon cable.

2. Unscrew the four screws that secure the control panel module to the control panel cover and lift the module away from the control panel.

DEFM035
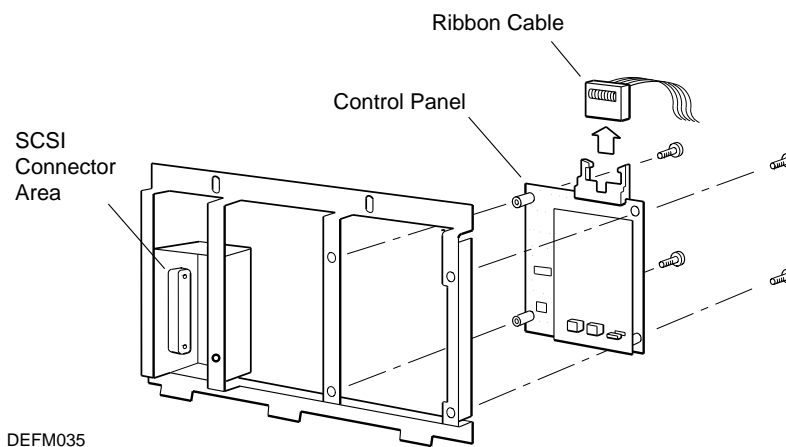
To replace the control panel assembly:

1. Screw in the four screws that hold the control panel module to the control panel.

2. Reconnect the ribbon cable to the control panel cover.

3. Place the three control panel tabs into chassis slots. Tighten the two captive screws.

4. Replace the mass storage cover and the SCSI terminator.

5. Replace the front cover.

4.2.5 Q-bus Options

Q-bus option modules are installed in slots 10, 11, and 12.

NOTE
When you remove modules, be sure to use proper antistatic procedures. Leave the system unit power cord plugged in to ground the antistatic mat and wrist strap.

To remove a Q-bus module (observing antistatic procedures):

1. To find the location of a Q-bus option in the system, type **T 50 0** and note the order of the option in the backplane. The Q-bus adapter option installs in slot 9. The first Q-bus option installs in slot 10, the second in slot 11, and the third in slot 12.

2. Turn off the workstation.

3. Remove the front cover from the system unit (Section 3.3).

4. Disconnect any external cables.

5. Remove any blank covers covering the Q-bus slot. If there are no covers, remove the screws on the module handle.

6. Remove the module from the the Q-bus slot.

7. Remove any internal cables.

To replace a Q-bus module, reverse the preceding steps. The next figure shows a TQK70 module being installed in slot 10.

Slot 10

TK70 Tape Drive
Controller Module
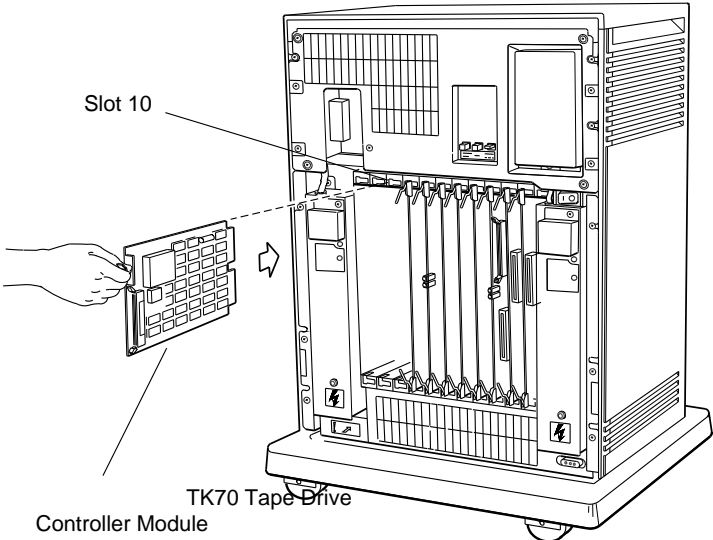
DEFM054

4.2.6 TK70 Series Tape Drive

The TK70 series tape drive has a formatted capacity of 296 Mbytes. The workstation can have one TK70 tape drive installed in the rightmost drive slot of the mass storage area, behind the mass storage cover.

To remove a TK70 tape drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the mass storage cover (Section 3.8).

4. Remove the control panel (Section 4.2.4).

5. Release the tape drive from its runners by loosening the captive screws above and below the drive.

Captive Screws
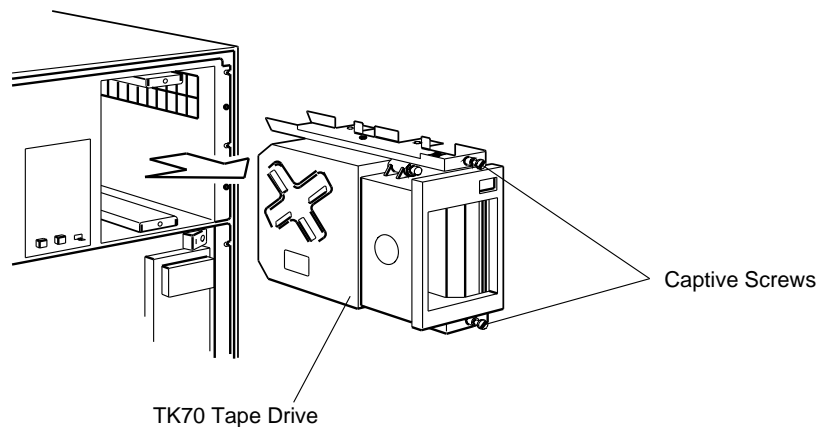
TK70 Tape Drive

DEFM039

6. Slide the tape drive out and hold it close to the tape drive slot until the signal and power cables at the back of the drive are accessible.

7. Disconnect the power cable from the back of the tape drive.

DEFM038

Signal Cable

Power Cable
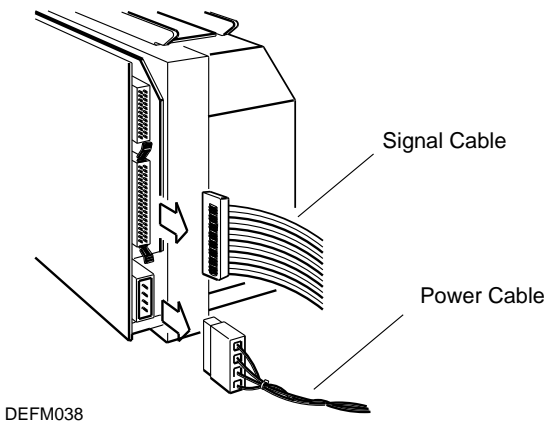
8. Note the orientation of the signal cable before disconnecting it from the back of the tape drive.

9. Slide the tape drive the rest of the way out of the tape drive slot.

10. If you are installing a new drive, transfer the drive mounting brackets from the old tape drive to the new one.

To replace a TK70 tape drive, reverse steps 1 through 9.

If you feel resistance when sliding the drive into the mass storage area, pull the drive out and move the cables at the back of the drive out of the way.

After you have replaced the drive and turned the workstation on, run diagnostic tests to test the drive.

4.2.7 TS05 Tape Drive

The TS05 tape drive has a capacity of 40.5 Mbytes of backup data storage. You install the TS05 in the top 26.3 cm (10.5 in) mass storage shelf of the H9642 cabinet.

To remove a TS05 tape drive from the H9642 cabinet, see the service documentation for the H9642 cabinet.

To remove the TSV05 tape drive controller from the backplane, see Section 4.2.5.

4.2.8 RZ55 Hard Disk Drive

The RZ55 series hard disk drive has a formatted capacity of 332 Mbytes. Up to four RZ55 drives can fit behind the mass storage cover. They are always installed from right to left in the drive slots.

NOTE
If the workstation does not have a tape drive, the first RZ55 must be installed in the tape drive slot at the far right of the mass storage area, facing the front of the system unit. The drives are mounted on slide supports to protect them from mechanical shock. Chapter 5 describes how to install the RZ55 option.

To remove an RZ55 drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the mass storage cover (Section 3.8).

4. Remove the control panel (Section 4.2.4).

5. Disconnect the SCSI connector and the power connector from the disk drive.

SCSI Connector

Power Connector

DEFM036

6. **Release the disk drive from its runners by loosening the captive screws above and below the disk drive, as shown.**

Drive ID
Jumpers

Captive Screws   DEFM037
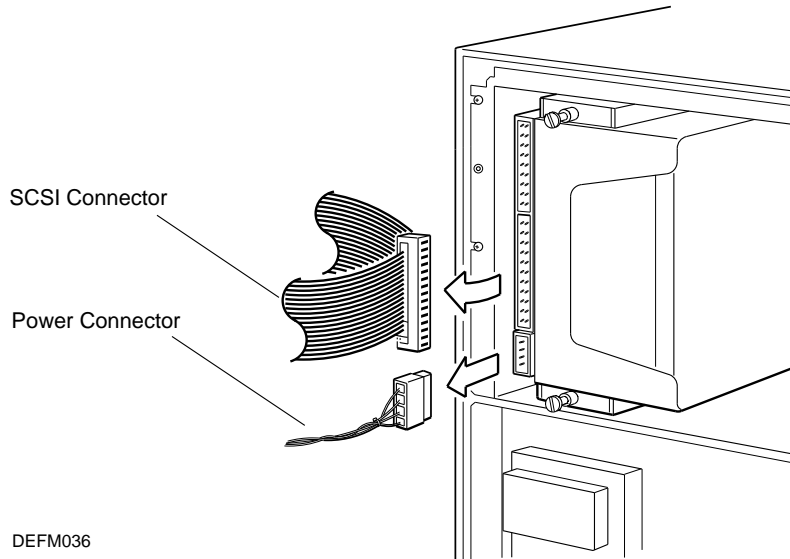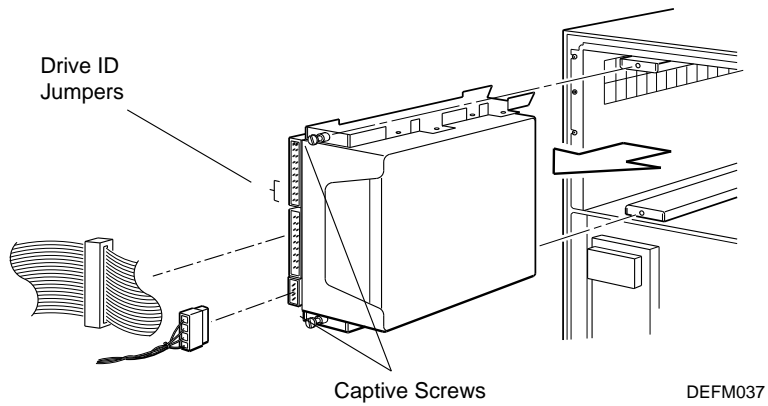
7. Carefully slide the disk drive out of the mass storage area.

8. To remove and replace the main device board on the drive, see the *RZ55 Service Manual.*

9. If you are installing a new drive, be sure to transfer the drive mounting brackets from the old RZ55 drive to the new one. See Section 5.12.2.

10. Set the drive ID on the new RZ55 disk drive to the same drive jumper as was on the old RZ55 disk drive you just removed. Refer to the previous figure and Table 4–1 for assistance.

To replace the RZ55 disk drive, reverse the preceding steps.

After you have replaced the drive and turned the workstation on, run diagnostic tests to test the drive.

Table 4–1   RZ55 Disk Drive SCSI ID Settings

Drive ID	Jumper Settings		
	1	2	3
0	Out	Out	Out
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

4.2.9 RZ56 Hard Disk Drive

The RZ56 hard disk drive has a formatted capacity of 665 Mbytes. Up to four RZ56 drives can fit behind the mass storage cover. They are always installed from right to left in the drive slots.

NOTE
If the workstation does not have tape drive, the first RZ56 must be installed in the tape drive slot at the far right of the mass storage area, facing the front of the system unit. The drives are mounted on slide supports to protect them from mechanical shock. Chapter 5 describes how to install the RZ56 option.

To remove an RZ56 drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the mass storage cover (Section 3.8).

4. Remove the control panel (Section 4.2.4).

5. Disconnect the SCSI connector and the power connector from the disk drive.

SCSI Connector

Power Connector

DEFM036

6. Release the disk drive from its runners by loosening the captive screws above and below the disk drive, as shown.

Drive ID Jumpers

Captive Screws   DEFM037
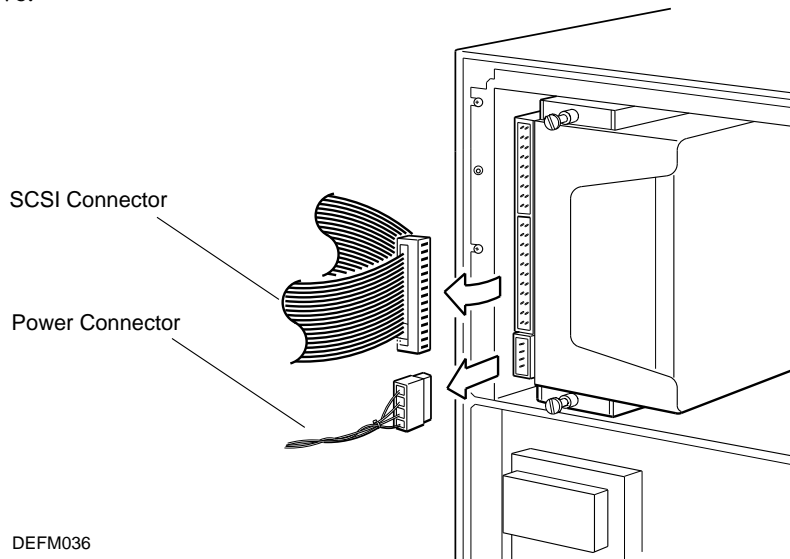
7. Carefully slide the disk drive out of the mass storage area.

8. If you are installing a new drive, be sure to transfer the drive-mounting brackets from the old RZ56 drive to the new one.

9. Set the drive ID on the new RZ56 disk drive to the same drive jumper as was on the old RZ56 disk drive you just removed. Refer to the previous figure and Table 4–2 for assistance.

To replace the RZ56 disk drive, reverse the preceding steps.

After you have replaced the drive and turned the workstation on, run diagnostic tests to test the drive.

Table 4–2   RZ56 Disk Drive SCSI ID Settings

Drive ID	Jumper Settings		
	1	2	3
0	Out	Out	Out
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

4.2.9.1 Drive Electronics Module

To remove the RZ56 disk drive electronics module (observing antistatic procedures):

1. Carefully apply outward pressure to the center of the bezel with your thumb and fingers until the two bezel locking pins clear the holes in the frame.

    NOTE
    The top center of the bezel must flex approximately 1/8-inch outward to clear the pins.
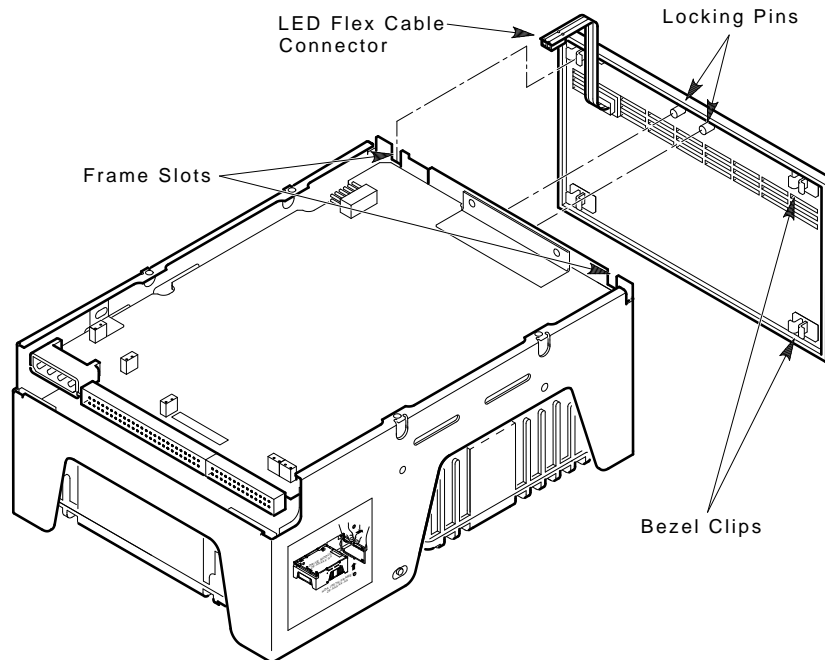
MA-X1003-89

2. While the bezel is clear of the locking pins, slide it upward until movement stops (about 3/8-inch). Then remove the bezel from the drive.

3.   **Remove the three screws shown.**

Spindle
motor
connector

Ⓐ

J5

J9

RZ56
Electronics
board

Insulator

Ⓐ

Preamplifier
cable
connector

MA-X0923-89
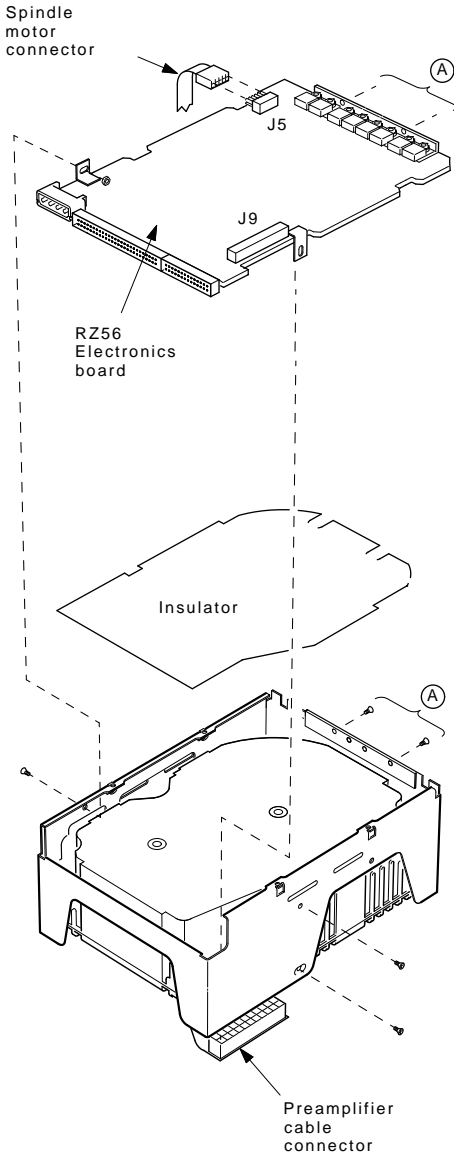
4.   Unplug the spindle motor connector at J5.

5.   Unplug the preamplifier cable connector at the auxiliary board. When you set the drive on the work surface, place a support under the drive to protect the loose preamplifier cable and connector.

6.   Lift the drive module and the auxiliary board up and out of the drive.

7.   Remove the screw and speednut holding the drive module.

8.   Unplug the auxiliary board from J9 on the drive module.

To replace the RZ56 drive electronics module, reverse the preceding steps.

Check the new module to be sure the jumpers are set to the same position as on the old module you just removed.

4.2.10 Power Supplies

The system unit has two power supplies, one on either side of the card cage. Both are connected directly to the backplane.

Remove a power supply if it is faulty or if you are replacing the ac switch or backplane assembly. You remove both power supplies in the same manner.

To remove a power supply:

1.   Turn off the workstation and unplug the system unit power cord from the power source.

2.   Remove the front cover from the system unit (Section 3.3).

3.   Unplug the system unit power cord from the ac filter.

4.   Loosen the screw on each pedestal cam and rotate the cams off the screws. Lift out each cam to remove it, as shown.
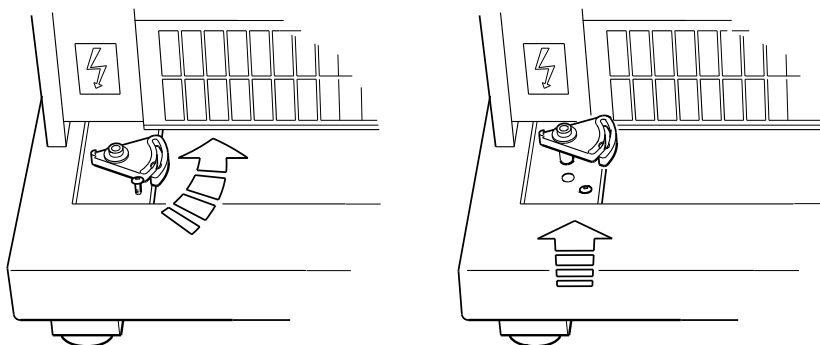
DEFM040

5. Release the five captive screws that fasten the metal grille to the chassis under the front of the card cage. Then remove the grille by rocking it away from the bottom of the chassis, as shown.

Power Supply 1

Power Supply 2

Grill
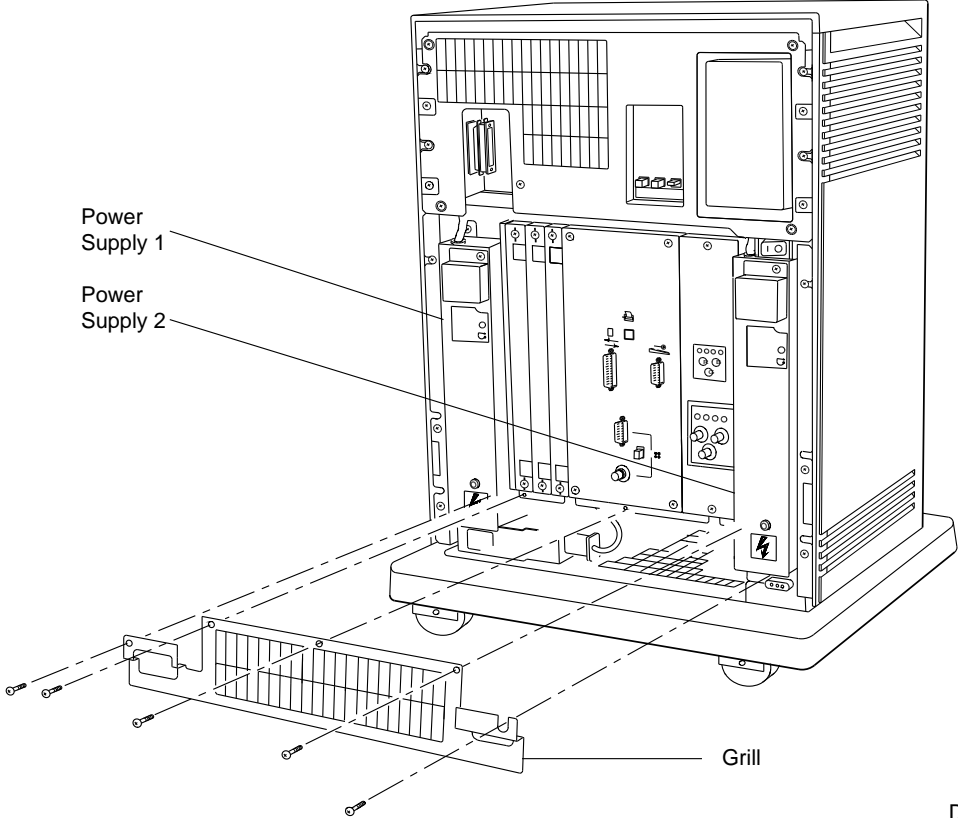
DEFM041

6. Remove the screw at the top of the power supply that holds the cover for the mass storage power cable.

Power Supply
Cable Cover

Mass Storage
Power Cable
Connector
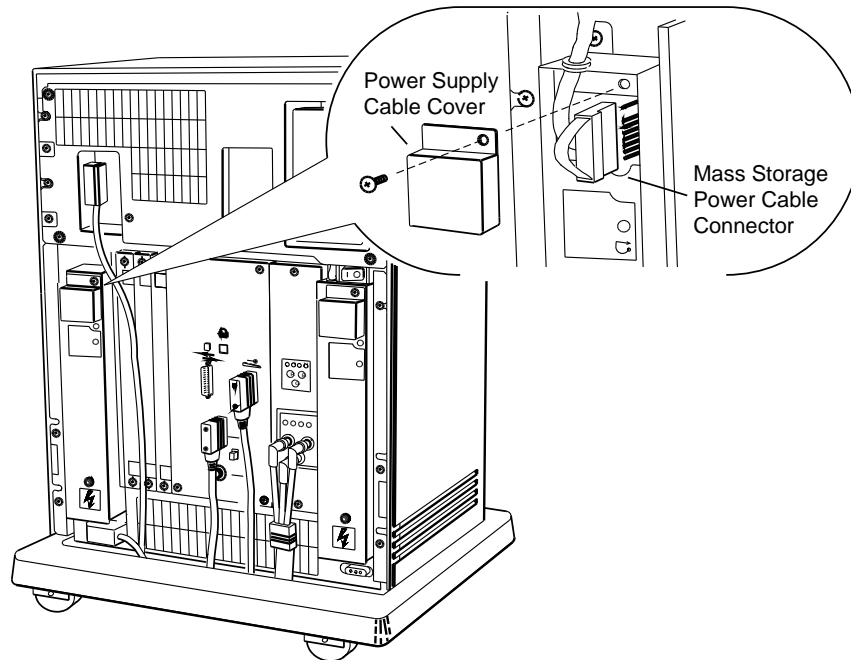
DEFM042

7. Remove the power cable cover.

8. Disconnect the mass storage power cable from the power supply and slide the adjacent rubber grommet off the metal chassis.

9. Loosen the two captive screws that hold the top and bottom of the power supply in place.

10. To avoid damage to the backplane connector, remove the power supply by pulling it straight out, as shown.
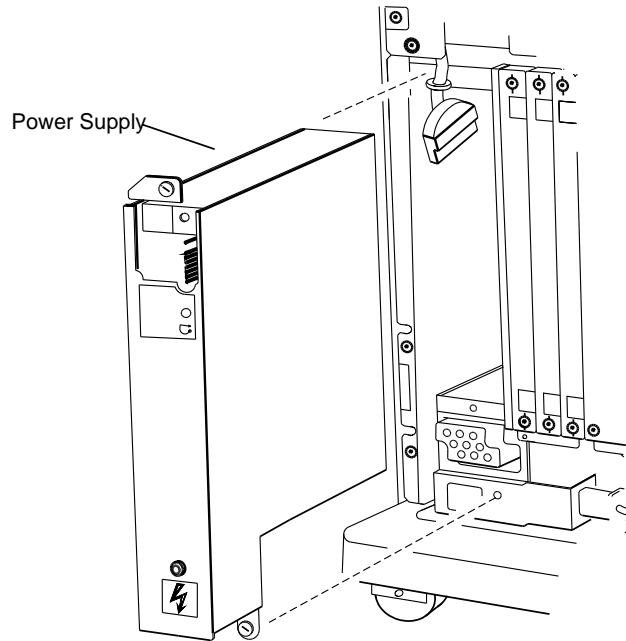
DEFM043

To replace a power supply:

1. Be sure the top and bottom edges of the power supply are mounted in the plastic guides in the card cage.

2. Slide the power supply all the way in, then push hard until it clicks into place.

3. Tighten the two captive screws on the power supply.

4. Slide the grommet back into place and reconnect the mass storage power cable.

5. Replace the power cable cover, making sure the lip on the bottom edge catches inside the opening and the notched tab at the top fits into the groove on the grommet.

6. Replace the grille, making sure the lip at the bottom of the grille fits between the two metal sheets at the bottom of the chassis.

7. Replace the cams snugly against the grille.

8. Plug the system unit power cord into the ac filter, then into the power source.

9. Turn on the workstation. The LED on each power supply should turn on. If they do not, repeat the replacement procedure, making sure that the power supply is firmly seated.

4.2.11 AC Filter

The ac filter is under the left power supply, behind the grille.

To remove the ac filter:

1. Turn off the workstation and unplug the system unit power cord from the power source.

2. Remove the front cover from the system unit (Section 3.3).

3. Unplug the system unit power cord from the ac filter.

4. Loosen the screw on each pedestal cam and rotate the cams off the screws. Lift out each cam and remove it, as shown in Section 4.2.10.

5. Release the five captive screws that fasten the metal grille to the chassis under the front of the card cage. Remove the grille by rocking it away from the bottom of the chassis, as shown in Section 4.2.10.

6. Remove the left power supply.

7. Find the ac input cable that runs across the front of the fan area.

8. Disconnect the ac input cable from the ac filter connector by pulling the mate-and-lock connector on the cable.
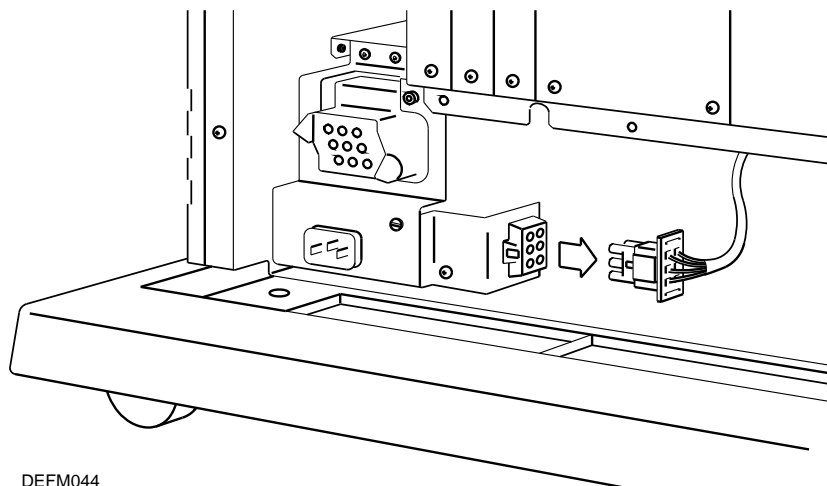
DEFM044

9.   Remove the three screws that hold the ac filter to the card cage.

DEFM045

10. Tilt the ac filter away from you as you remove it, so it does not catch on a rivet.

To replace the ac filter, reverse the preceding steps.

4.2.12 AC Switch Assembly

The ac switch assembly includes the ac on/off switch and an input cable. This assembly is at the right side of the system unit, under the mass storage area.

NOTE
When you order an ac switch assembly, be sure to order a switch frame to install behind the on/off switch.

To remove the ac switch assembly:

1.   Turn off the workstation and unplug the system unit power cord from the power source.

2.   Remove the front cover from the system unit (Section 3.3).

3.   Unplug the system unit power cord from the ac filter.

4. Loosen the screw on each pedestal cam and rotate the cams off the screws. Lift out each cam and remove it, as shown in Section 4.2.10.

5. Release the five captive screws that fasten the metal grille to the chassis under the front of the card cage. Remove the grille by rocking it away from the bottom of the chassis, as shown in Section 4.2.10.

6. Remove the right power supply from the enclosure.

7. Disconnect the ac input cable that runs across the front of the fan area from the ac filter connector by pulling the mating connector on the cable.

8. Remove the ac input cable from the clip under the card cage.

9. Remove the three screws from the front of the ac switch.

10. Loosen the three nuts that hold the ac switch assembly to the inside of the right panel on the bottom enclosure.
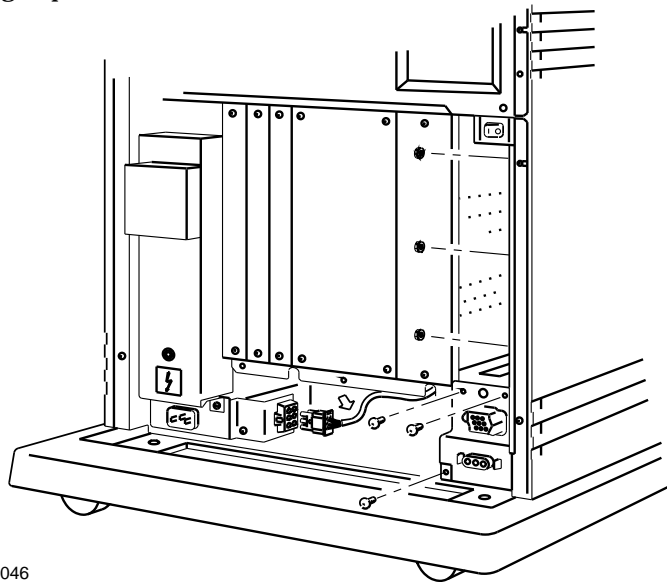
DEFM046

11. Grasp the ac switch assembly and pull it out of the enclosure.
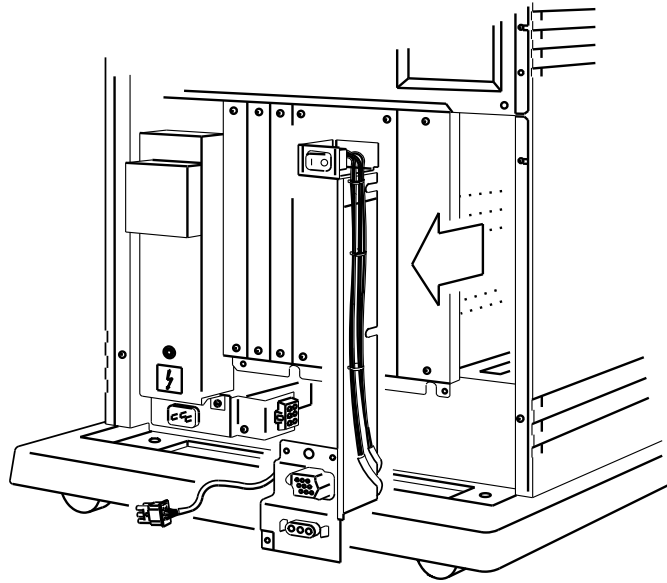
DEFM047

To replace the ac switch assembly, reverse the preceding steps and install a new switch frame around the on/off switch.

4.2.13 Fans

The two fans are attached to a metal plate bolted to the bottom of the card cage. Power to the fans is supplied through a Y cable from the backplane. You can remove and replace fans individually after you remove the metal plate from the bottom enclosure.

To remove the fans:

1. Turn off the workstation and unplug the system unit power cord from the power source.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the cams as shown in Section 4.2.10.

4. Remove the metal grille from the front of the bottom enclosure, as shown in Section 4.2.10.

5. Remove the left power supply (Section 4.2.10).

6. Remove the ac filter (Section 4.2.11).

7. Disconnect the Y cable from both fans, as shown.
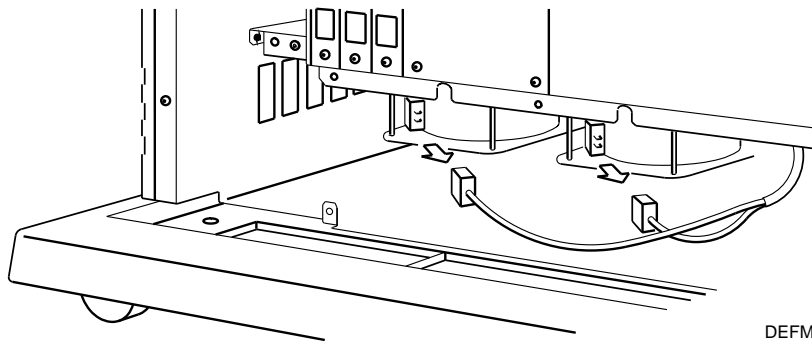
DEFM048

8. Holding the fan's metal plate so it will not fall, remove the two screws
    that hold the plate to the bottom enclosure.

9. Remove the metal plate with the fans attached.

DEFM049
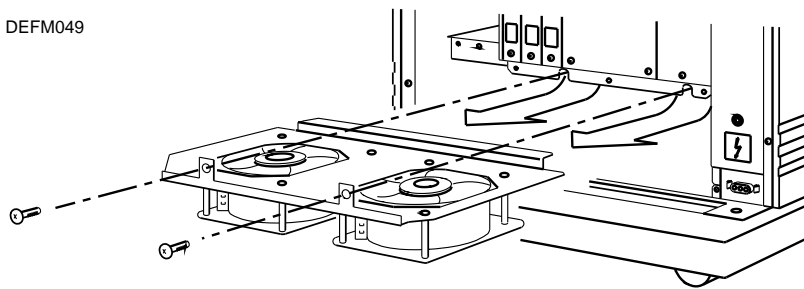
10. Remove the four screws that hold each fan to the metal plate, then
    remove the fans.

To replace the fans:

1. Reverse steps 4 through 9 for removing the fans.

2. Plug the system unit power cord into the power source and turn on
    the workstation.

3. Verify that both fans are pulling air into the bottom enclosure by holding your hand 5 cm (2 inches) away from each fan.

4. Turn off the workstation and unplug the system unit power cord from the power source.

5. Replace the metal grille.

6. Replace the cams.

7. Replace the front cover.

4.2.14 Backplane

The backplane provides all signal and power interconnections for the system modules. The backplane is connected to a metal plate. The plate is attached to the back of the bottom enclosure, inside the back cover of the system unit. You can reach the backplane when the back cover is removed. You need two people to remove the backplane.
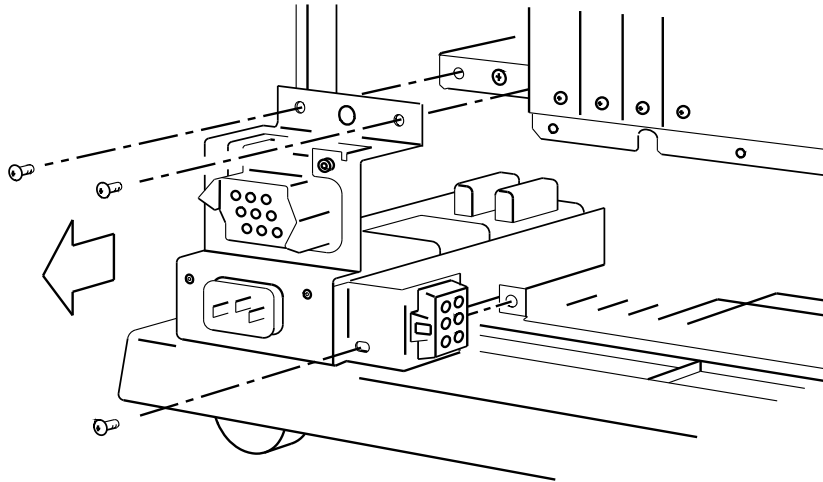
To remove the backplane:

1. Turn off the workstation and unplug the system unit power cord from the power source.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the back cover from the system unit (Section 3.10).

4. Remove both power supplies (Section 4.2.10).

5. Remove the graphics cover (Section 3.5).

6. Remove the graphics frontplane (Section 3.6).

7. Remove the I/O cover (Section 3.4).

8. Remove any Q-bus module blank covers on slots 10 through 12.

9. Release all M-bus, Q-bus, and graphics bus modules from the backplane. You do not have to remove the modules from the card cage so long as you release them from the backplane.

10. Working at the front right side of the bottom enclosure, disconnect the 10-pin DCOK ribbon cable and the fan power cable from the right side of the backplane.

CAUTION
To avoid damaging the backplane as it is removed, two people are needed to perform the remainder of this procedure.

DCOK Cable

Fan Power Cable
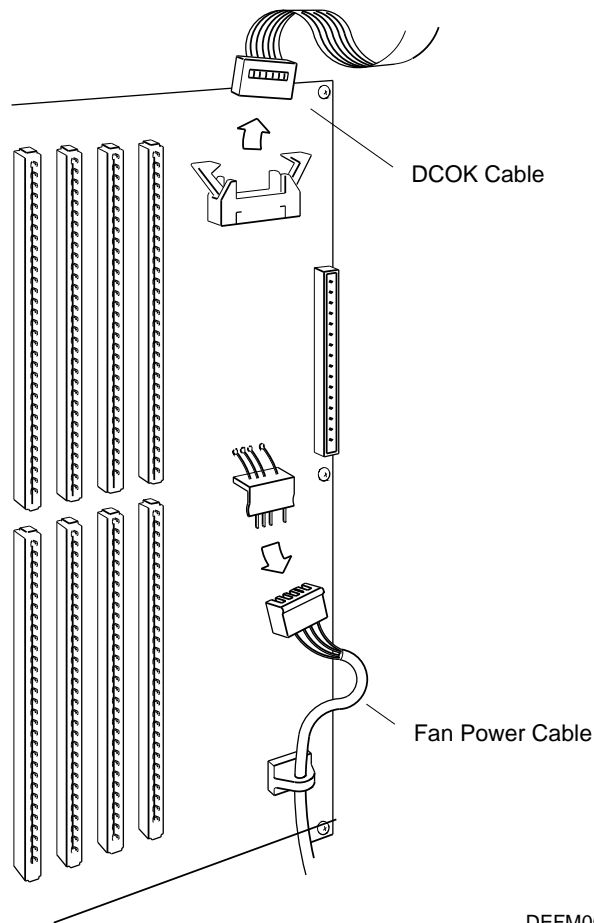
DEFM050

11. Working at the back of the bottom enclosure, remove the eight screws that secure the metal plate to the back of the enclosure.

Remove the lower screws first and the upper-right screw last. Another person should support the metal backing plate as the last screw is removed. Otherwise, the weight of the backplane will cause the assembly to drop when the last screw is removed, possibly damaging the backplane connectors.

Backplane

DEFM051
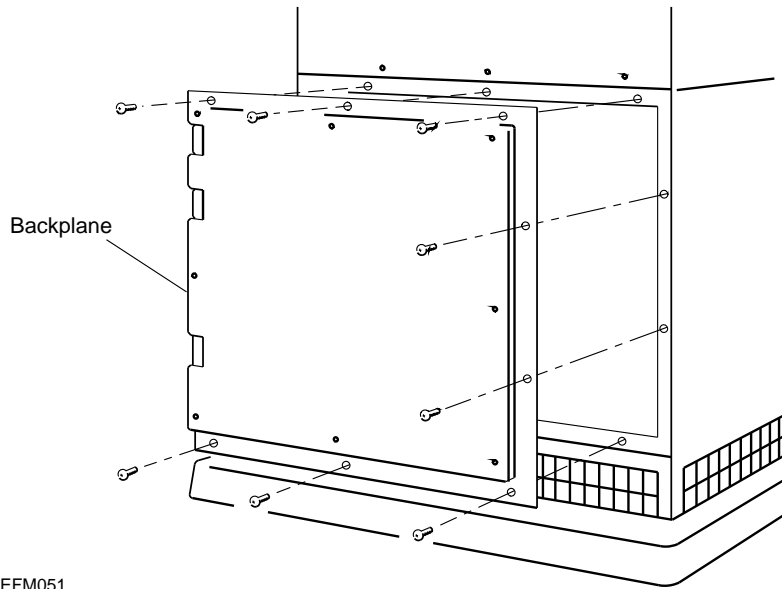
12. Slide the metal plate to the right, to release it from the two tabs on the left side of the enclosure. The backplane and metal plate make up a single FRU. Do not remove the plate from the backplane.

To replace a backplane:

1. Align the backplane with the back of the bottom enclosure.

2. Slide the two tabs on the side of the backplane onto the flanges on the sheet metal that makes up the left side of the enclosure.

3. Insert the eight screws that fasten the metal plate to the back of the enclosure and tighten them partially (enough to provide clearance for the modules).

4. Insert one module into backplane slot 3 and one into backplane slot 9. This step aligns the backplane with the card cage guides.

5. Tighten the eight screws the rest of the way.

6. Reverse steps 1 through 9 of the removal procedure.

4.3   Removing and Replacing External FRUs

The *VAXstation 3520/3540 Hardware Installation Guide* and the *VAXstation 3820/3840 Hardware Installation Guide* provide detailed instructions for removing and installing external FRUs. Those installation instructions are summarized here. For instructions on removing and installing the RRD40 optical compact disc drive, see Chapter 5 of this guide.

4.3.1   The Monitor

The VR295 monitor attaches to the video cable assembly, which is connected to the front of the system unit.

To remove the monitor:

1. Turn off the monitor.

2. Disconnect the keyboard-mouse connector and RGB signal cables from the front of the system unit.

3. Remove the back cover from the monitor.

4. Disconnect the video cable assembly RGB signal cables from the back of the monitor.

5. Detach the video cable assembly connector block from the back of the monitor.

To replace the monitor, reverse the preceding steps.

4.3.2   Keyboard

The LK201 keyboard attaches to the video cable assembly connector block, which is mounted on the back of the monitor.

To remove the keyboard:

1. Turn off the workstation.

2. Unplug the keyboard cable from the video cable assembly connector block on the back of the monitor.

To replace the keyboard, reverse the preceding steps.

4.3.3 Mouse or Tablet

The mouse or tablet attaches to the video cable assembly connector block, which is mounted on the back of the VR295 monitor. Only one pointing device can be connected at a time.

To remove the mouse or tablet:

1. Turn off the workstation.

2. Unplug the mouse or tablet cable from the video cable assembly connector block on the back of the monitor.

To replace the mouse or tablet, reverse the preceding steps.

5
Installing Options

This chapter describes how to inspect and install options for the VAXstation 3520/3540 and VAXstation 3820/3840 workstations. These options include the following:

- Expansion modules: memory, CPU, and graphics

- Q-bus adapter module

- Tape adapter module

- Q-bus options: CXY08, DSV11, TSV05, TQK70

- Mass storage options: tape drives, hard disk drive, and optical compact disc drive

There are two ways to order options:

- Factory-installed, as part of the original shipment

- As upgrades (option kits)

This chapter tells you how to install upgrade kits, which consist of the option itself plus any covers or cables needed to complete the installation.

5.1 Before You Begin

It is the customer's responsibility to back up software before a Digital service representative arrives at the customer's site. This step is important to ensure that data is not lost during any service process. The customer should also shut down the worksystem software. Before you begin installing options, confirm that the customer has completed both of these tasks.

CAUTION
**Before handling any of the option modules or FRUs or removing
any static-sensitive materials from an antistatic bag, place the
antistatic wrist strap around your wrist and attach the wrist
strap and the antistatic mat to the metal chassis of the system
unit. When you remove a module or FRU from its antistatic bag,
lay the module or FRU on the antistatic mat.**

5.2   Unpacking and Inspecting an Option Kit

When you inspect an option kit, look for external damage to the shipping
container, such as dents, holes, or crushed corners. If any damage is
apparent, write a note describing the damage on the packing slip before
proceeding.

Following antistatic procedures, carefully open the shipping container and
remove the contents. Save the container and packing materials in case
you need to ship the kit in the future.

Remove the option from its antistatic bag or packing materials and
inspect it for shipping damage. Lay it on the antistatic mat. Remove
the remaining kit parts from the container and check them against the
option kit listing to make sure nothing is missing. If any part is damaged
or missing, notify the customer before proceeding.

5.3   Testing the Present Configuration

Before you install any option, you should test the existing workstation to
verify that it is running properly.

To test the workstation, open the sliding panel on the right front of the
system unit and press the $\boxed{\text{Restart/Run}}$ button on the control panel. This
initiates the power-up self-test.

If the power-up self-test finds problems, an error code appears on the
screen. Refer to Chapter 2 to correct any problems before continuing with
the option installation.

If the power-up self-test succeeds, turn the workstation off and remove
any covers as necessary. Refer to Chapter 3 for detailed instructions.

5.4   Changing the Configuration

Before you change the Q-bus configuration, be sure to consider the module order in the backplane and the module configuration.

5.4.1   General Module Order

The order of modules in the backplane depends on four factors:

- Relative use of devices in the system

- Expected performance of each device relative to other devices

- The ability of a device to tolerate delays between bus requests and bus grants (delay tolerance)

- The tendency of a device to prevent other devices farther from the DWFQA Q-bus adapter from accessing the bus.

The recommended module order in a VAXstation 3520/3540 or 3820/3840 workstation is as follows:

    TSV05
    DSV11
    CXY08
    TQK70

5.4.2   Module Configuration

Each module in a system must use a unique device address and interrupt vector. The device address is also known as the control and status register (CSR) address. Most modules have switches or jumpers for setting the CSR address and interrupt vector values. Calculating these values is a complex procedure, because some modules use floating addresses and vectors. The value of a floating address depends on what other modules are installed in the system.

The VMS SYSGEN utility has a CONFIG program to determine CSR addresses and interrupt vectors. The next section describes how to use the CONFIG program.

5.4.3 Finding CSR Addresses and Interrupt Vectors with the CONFIG Program

You use the CONFIG program in the VMS SYSGEN utility to determine the correct CSR address and interrupt vector for a module. You type in a list of devices in the system. CONFIG automatically provides CSR address and interrupt vector information.

The CONFIG program uses a standard Q22-bus algorithm to determine the correct CSR addresses and interrupt vectors. You must use this method, so the operating system can recognize the CSR addresses and interrupt vectors. You can use these settings in VMS, ULTRIX-32m, and VAXELN systems.

To use SYSGEN, you must have system manager privileges. The assignment process is automated. You enter device names, and SYSGEN assigns the devices according to how the system is configured. Use SYSGEN as follows:

1. Log into the system manager account.

2. Enter MCR SYSGEN to access the SYSGEN utility as follows:

    ```
    $ MCR SYSGEN
    ```

3. At the SYSGEN> prompt, enter the CONFIGURE command. SYSGEN responds by issuing the DEVICE> prompt.

    ```
    SYSGEN>CONFIGURE
    DEVICE>
    ```

4. At the DEVICE> prompt, enter all the devices currently in the system and all the devices you want to add to the system. Table 5–1 lists the abbreviations. Example 5–1 shows a sample SYSGEN utility display.

```
DEVICE> TU81
DEVICE> DHV11
```

Example 5–1   Sample Output Using the SYSGEN CONFIG Program

5. To check how SYSGEN has configured the system, type Ctrl Z at the
    DEVICE> prompt. Then exit SYSGEN.

```
DEVICE> Ctrl  Z
Device: TU81   Name: PTA   CSR: 774500   Vector: 260   Support: yes
Device: DHV11  Name: TXA  CSR: 760440*   Vector: 300*  Support: no
```

Table 5–1   Device Abbreviations Used with SYSGEN

Device	Enter at DEVICE> Prompt
CXY08	DHV11
DSV11	DSV11
TQK70	TU81
TSV05	TS11

5.5 Testing a New Configuration

After installing an option, test the new configuration by pressing the
Restart/Run button on the control panel. The workstation unit will check
its new configuration and perform a power-up self-test.

If the workstation displays an error code, check all system unit
connections and press the Restart/Run button again. If an error still
occurs, install an option from a different option kit. If necessary, follow
the troubleshooting procedures described in Chapter 2.

5.6   CXY08 8-Line Asynchronous Multiplexer

The CXY08 asynchronous multiplexer performs data concentration, real-time processing, and interactive terminal handling. The CXY08 is a quad-height module with a BA200 series handle. The CXY08 option also includes two cable assemblies. The module provides eight full-duplex serial data channels. Each cable assembly has a four-channel distributor.

All eight channels allow autoanswer dial-up operation over the public-switched telephone network. You can use AT&T 103, 113, and 212 modems, or the equivalent.

To install the CXY08 asynchronous multiplexer:

The CXY08 asynchronous multiplexer is a Q-bus option. Before you install the CXY08, you must install the Q-bus adapter in slot 9, if the adapter is not already installed. See Section 5.9.

CAUTION
Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the antistatic kit (29–26246–00) when you work with the internal parts of a computer system.

To install the CXY08 in the backplane, remove the cover from the Q-bus slot where you are installing the module. To determine the location of the CXY08 module in the backplane, follow the module order list in Section 5.4.1. If the module has a recessed handle, you must add a gap filler.

To configure the CXY08 option:

Select the CSR address and interrupt vector for the CXY08 by using DIP switches on the module (Figure 5–1). The CXY08 uses a floating CSR address and interrupt vector.

E36   Closed = 1 = On   E28   Closed

DHV   A12   A4   V8   V3

DHC   Open = 0 = Off   Manf.   Open
                                    Test
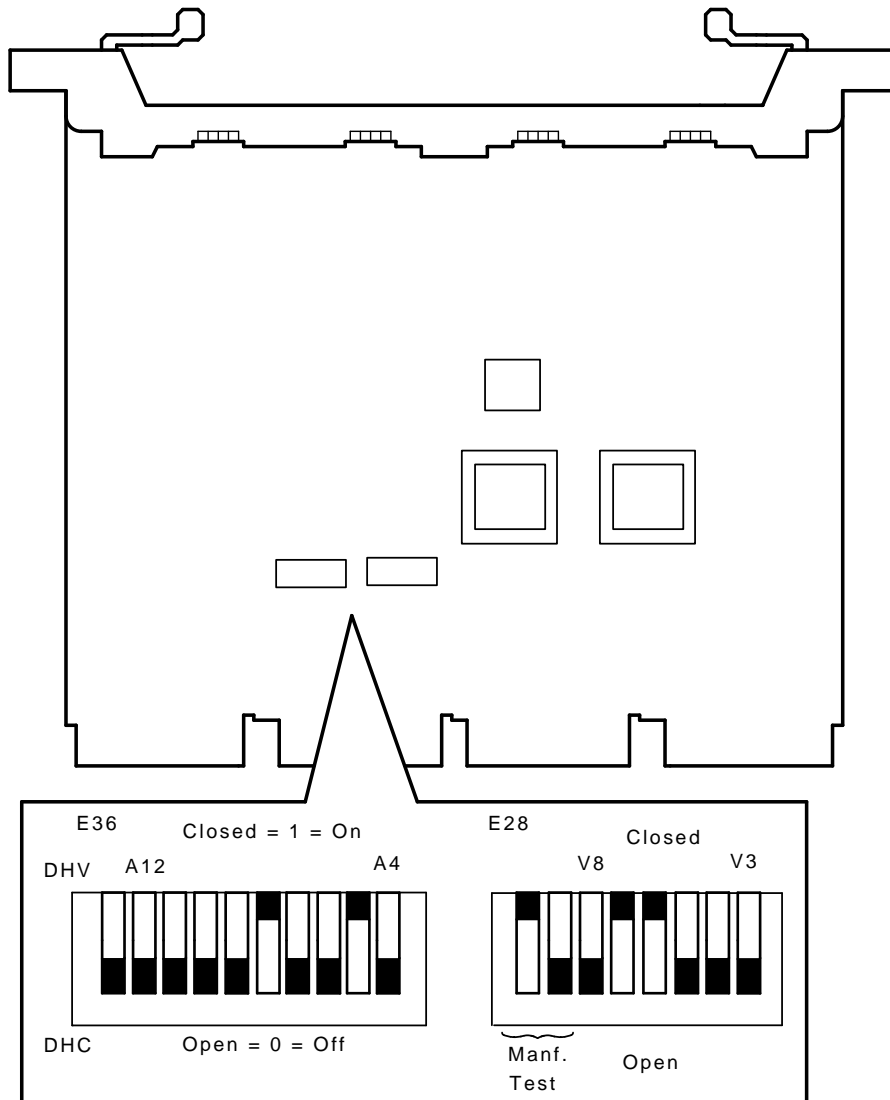
MA-X0698-89

Figure 5–1   CXY08 Module Layout

The CXY08 factory positions are as follows:

```
CXY08 CSR Address:   17760440 (factory position)
```
_____
```
Address Bits:   A12    A11 A10 A9   A8  A7  A6   A5   A4

E36 Switches:   2      3   4   5    6   7   8    9    10
```
_____
```
CSR Address
17760440:       0      0   0   0    1   0   0    1    0
```
_____
```
1 = closed, 0 = open
```

```
CXY08 Interrupt Vector:  300 (factory position)
```
_____
```
Vector Bits:    V8   V7  V6     V5  V4  V3

E28 Switches:   3    4   5      6   7   8
```
_____
```
Vector
Address 300:    0    1   1      0   0   0
```
_____
```
1 = closed, 0 = open
```

Switch E36–1 selects DHV11 or DHU11 programming mode. Select the mode appropriate to the device driver in the system. Generally, DHU11 mode gives better performance because it does not require as much CPU time. To select DHU11 mode, set the switch to 1 (closed).

Switch E28–1 should be set to 1 (closed), and switch E28–2 should be set to 0 (open). These switches are used during manufacturing.

5.7   DSV11 Communications Option

The DSV11 is a two-channel, high-speed, synchronous communications option for use on Q-bus backplanes. Figure 5–2 shows the DSV11–S option.

The DSV11 supports the following synchronous communications protocols:

DDCMP
HDLC/SDLC
BISYNC

The DSV11 allows any of the following synchronous interfaces:

RS–423
RS–422
RS–232/V.24
V.35

To install the DSV11 option:

The DSV11 is a Q-bus option. Before you install the DSV11, you must install the Q-bus adapter in slot 9 (if not already installed). See Section 5.9.

CAUTION
Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the antistatic kit (29–26246) when you work with the internal parts of a computer system.

To install the DSV11 in the backplane, remove the cover from the Q-bus slot where you are installing the module. To determine the location of the DSV11 module in the backplane, follow the module order list in Section 5.4.1. If the module has a recessed handle, you must add a gap filler.
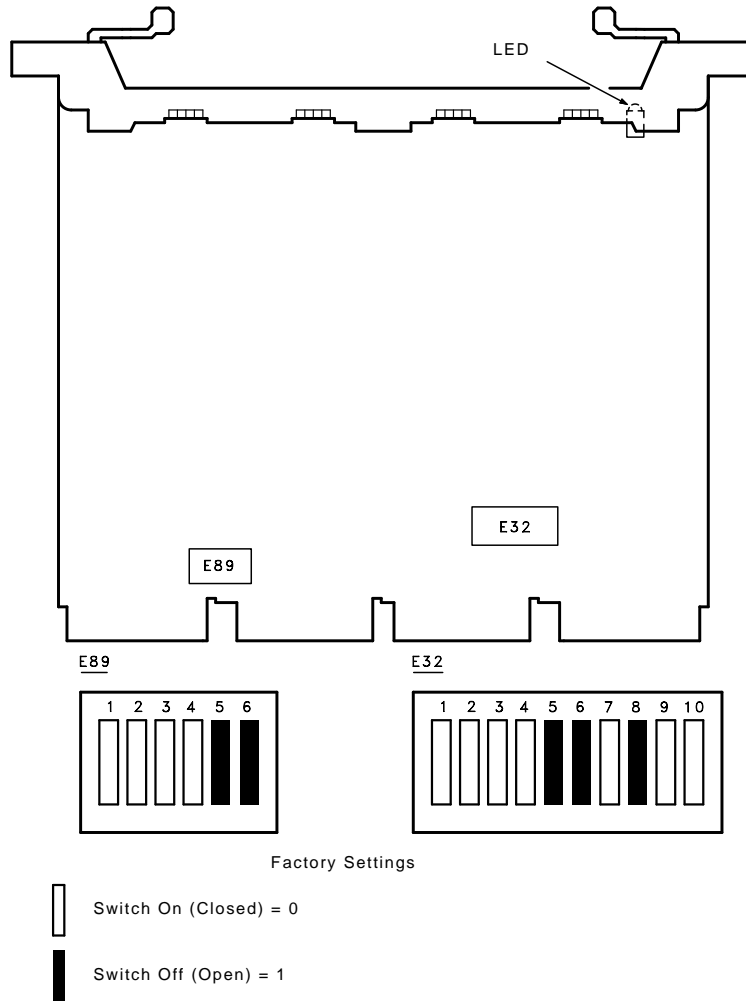
Figure 5–2   DSV11–S Module Layout (M3108–PA)

To configure the DSV11 option:

Use switchpack E32 (Figure 5–2) to set the CSR address. The CSR address floats. The actual DSV11 settings depend on the other modules in the system.

The interrupt vector also floats. It is set by the software and cannot be changed by switches.

Use switchpack E89 (Figure 5–2) to select the DSV11 bus grant and DMA continuity.

The following tables list the configurations for the CSR address and for the bus grant and DMA continuity:

```
DSV11 CSR Address:   17760640 (factory position)
Switchpack E32
_____
Address Bits:  A12   A11 A10 A9  A8  A7  A6   A5  A4  A3
E32 Switches:  1     2   3   4   5   6   7    8   9   10
_____
CSR Address:
  17760640     0     0   0   0   1   1   0    1   0   0
  17760740     0     0   0   0   1   1   1    1   0   0
_____
1 = open, 0 = closed


DSV11 Bus Grant and DMA Continuity
Switchpack E89
_____
E89 Switches           1   2   3    4   5   6
_____
DSV11-M, Q/Q Slots     0   0   0    0   0   0 (factory position)
DSV11-M, Q/CD Slots    0   0   0    0   1   1
DSV11-SF               0   0   0    0   1   1 (factory position)
_____
1 = open, 0 = closed
```

5.8   Expansion Modules

The following sections describe the installation of the memory, CPU, and graphics expansion modules.

5.8.1   Memory Expansion Module

The MS60 memory module option comes in three sizes:

- MS60-AA—8 Mbytes
- MS60-BA—16 Mbytes
- MS60-CA—32 Mbytes

You install a memory expansion module in slot 5, 6, or 9 of the card cage.

To install a memory expansion module (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the I/O cover (Section 3.4).

4. Slide the memory expansion module into slot 5, 6, or 9 of the card cage. Lock the module in place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever.

5. Replace the I/O cover.

6. Turn on the workstation.

7. Test the new configuration.

8. Replace the front cover.

5.8.2   CPU Expansion Module

You install the CPU expansion module in slot 6 of the card cage. An upgrade medallion comes with the module.

To install a CPU module (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the I/O cover (Section 3.4).

4. Slide the CPU expansion module into slot 6 of the card cage. Lock the module in place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever.

5. Replace the I/O cover.

6. Turn on the workstation.

7. Test the new configuration.

8. Replace the front cover.

9. Peel the VAXstation 3520 or 3820 medallion off the front cover and replace it with the VAXstation 3540 or 3840 medallion.

5.8.3 Graphics Expansion Module

The graphics expansion module is a graphics bus option that expands the workstation's graphic subsystem from 8 planes of memory to 24 planes. You install the graphics expansion module in slot 1 of the card cage.

To install a graphics expansion module (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the graphics cover (Section 3.5).

4. Remove the graphics frontplane assembly (Section 3.6).

5. Slide the graphics expansion module into slot 1 of the card cage. Lock the module in place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever.

6. Replace the graphics frontplane assembly.

7. Replace the graphics cover.

8. Turn on the workstation.

9. Test the new configuration.

10. Replace the front cover.

5.9   Q-bus Adapter Module

The Q-bus adapter module is a single M-bus module that provides an interface between the workstation's proprietary M-bus and the Q-bus. The Q-bus adapter module is installed in slot 9, and the supported Q-bus modules are installed in slots 10 through 12.

NOTE
The Q-bus adapter module must be installed in slot 9 in order for the Q-bus modules installed in slots 10 through 12 to work.

To install the Q-bus adapter module (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the I/O cover (Section 3.4).

4. Slide the Q-bus adapter module into slot 9 of the card cage. Lock the module in place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever.

5. Replace the I/O cover.

6. Turn on the workstation.

7. Test the new configuration.

8. Replace the front cover.

5.10   RRD40 Optical Compact Disc Drive

The RRD40 optical compact disc drive is outside the system unit and connects to the workstation by means of a SCSI cable. The option kit includes the drive, preinstalled in an expansion box, and a power cord.

Before you install an optical compact disc drive, you must configure the drive for a unique SCSI ID address. To find an open ID address for the drive, display the system's SCSI configuration on the screen by typing **show scsi**. Use Table 5–2 to set the correct SCSI ID switches on the back of the drive.
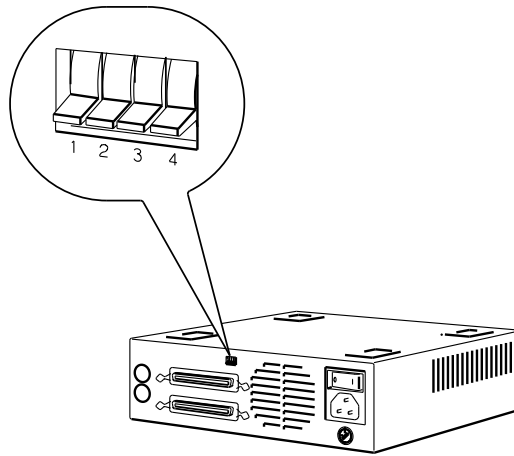
DEFM081

Table 5–2   RRD40 SCSI ID Switch Settings

SCSI ID	Switch Settings			
	1	2	3	4*
0	Down	Down	Down	Not used
1	Down	Down	Up	Not used
2	Down	Up	Down	Not used
3	Down	Up	Up	Not used
4	Up	Down	Down	Not used
5	Up	Down	Up	Not used
6	Up	Up	Down	Not used
7	Up	Up	Up	Not used

*Switch 4 is not used, so it can be in either position.

The SCSI bus runs from the I/O module, up into the mass storage area, around the back of the mass storage area, and back to the front of the mass storage area. The SCSI bus ends in a terminator at the front of the mass storage cover.

To install an optical compact disc drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Verify that the SCSI ID switches are set correctly on the drive.

4. Remove the SCSI terminator from the front of the mass storage area. Note that the SCSI bus must have a terminator. The terminator is a standard size and will be used to terminate the optical compact disc drive.

5. Connect the right-angle end of the SCSI cable to the SCSI connector.

    CAUTION
    Using a cable other than the Digital-supplied 7-foot SCSI cable can cause the device to malfunction.

    Route the SCSI cable down through the system unit and out the bottom of the chassis. Connect the other end of the SCSI cable to the top connector on the back of the drive.

Drive Cable   Drive Connector

DEFM069
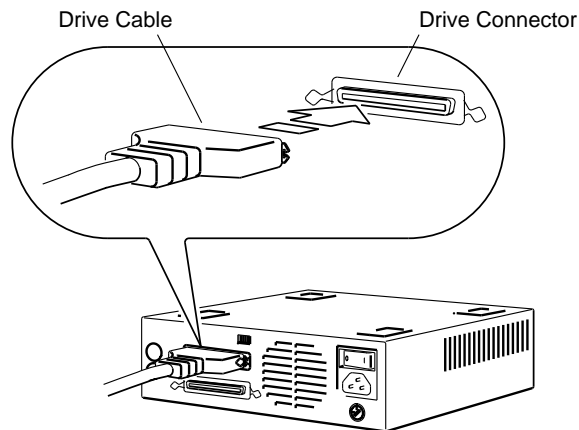
6. Place the terminator on the bottom connector on the back of the drive.

Wire Brackets

Terminator   Drive Connector
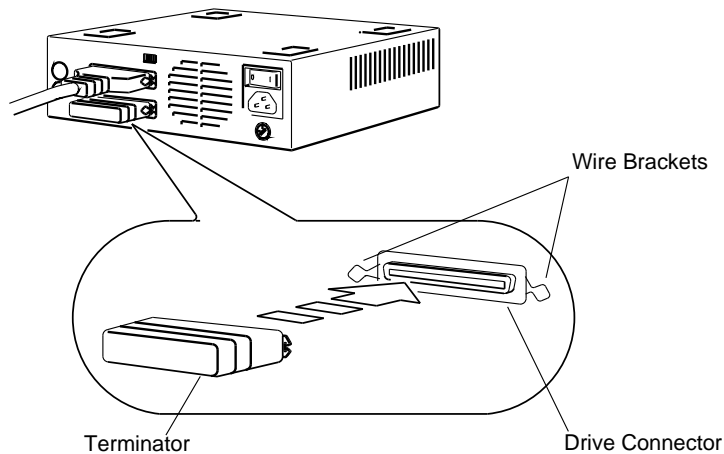
DEFM070

7. Connect the power connector to the drive and plug the power cord into the power source.

8. Turn on the drive.

9. Turn on the workstation.

10. Test the new configuration.

11. Run diagnostic tests to test the drive.

12. Replace the front cover.

For more information about the RRD40 drive, see the *RRD40 Owner's Manual*.

5.11 Tape or Q-bus Adapter Module

The tape adapter module is a single M-bus module that provides an interface between the workstation's proprietary M-bus and the TQK70 tape drive controller module, which is on the Q-bus. The tape adapter module or the Q-bus adapter module must be installed in slot 9 in order for the TQK70 tape drive controller module in slot 10 to work.

To install the tape adapter module (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Remove the I/O cover (Section 3.4).

4. Slide the tape adapter module or the Q-bus adapter module into slot 9 of the card cage. Lock the module in place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever.

5. Replace the I/O cover.

6. Turn on the workstation.

7. Test the new configuration.

8. Replace the front cover.

5.12   TK70 Tape and RZ55/RZ56 Disk Drives

Before you install a TK70 tape drive, an RZ55 hard disk drive, or an RZ56 hard disk drive, you must install slide supports on the drives so that you can slide the drives in and out of the drive slots in the mass storage area. Slide supports consist of top and bottom drive mounting brackets attached to the drive, and top and bottom drive shock mounts attached to the mass storage area.

If there are drive shock mounts already installed on your system, it is important to remove them and install the drive shock mounts that came with the drive option kit.

5.12.1   Installing Drive Shock Mounts

There are four drive shock mounts with screws included in the option kits for the TK70 tape drive, the RZ55 hard disk drive, and the RZ56 hard disk drive.

To install the shock mounts in the drive slot:

1. Attach two of the top shock mounts. Position each shock mount so the screws on the mount go into the captive nuts on the roof of the mass storage area. Tighten the screws.

2. Attach two of the bottom shock mounts to the bottom of the drive slot, as shown. Position each shock mount so the screws on the mount go into the captive nuts on the floor of the mass storage area. Tighten the screws.

   NOTE
   One of the bottom shock mounts has a thin metal finger that must be attached between the back screw and the system unit frame to ground the shock mount to the chassis.

Rubber
Shock Mount

Drive Track
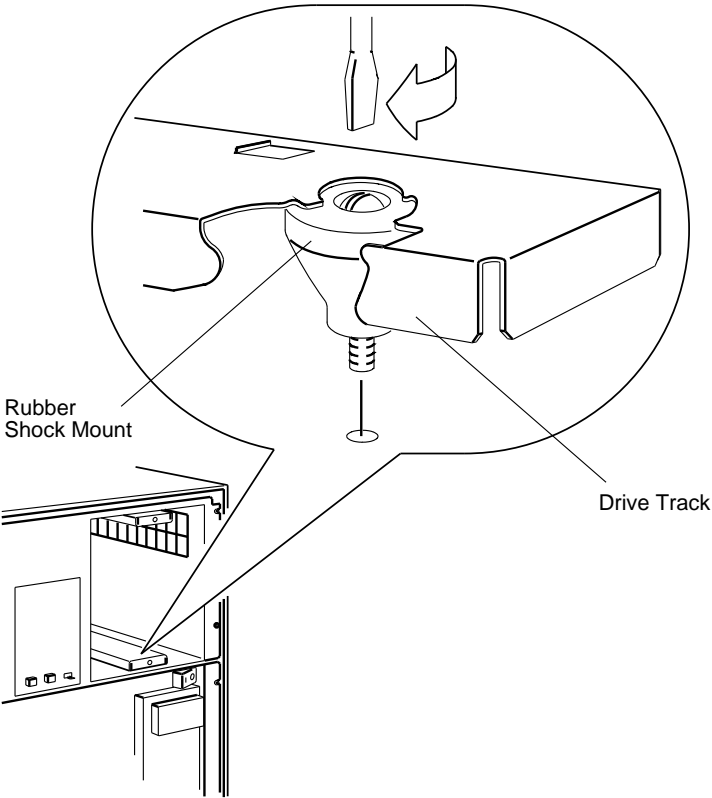
DEFM075

5.12.2 Installing Drive Mounting Brackets

Drive mounting brackets and screws are included in the option kits for the TK70 tape drive, the RZ55 hard disk drive, and the RZ56 hard disk drive.

There are three different situations for installing drive mounting brackets:

- On a TK70 tape drive
- On an RZ55 or RZ56 hard disk drive to be installed in the far-right drive slot (because there is no tape drive)
- On an RZ55 or RZ56 hard disk drive to be installed in any slot *except* the far-right slot

To install drive mounting brackets for a TK70 tape drive:

1. Attach the top bracket to the top of the drive, using two screws.

2. Attach the bottom bracket to the bottom of the drive, using two screws.

Drive Mounting Brackets

DEFM056

To install drive mounting brackets for an RZ55 hard disk drive that will reside in the far-right slot (because there is no tape drive):

1. Attach the top bracket to the top of the drive, using two screws.

2. Attach the bottom bracket to the bottom of the drive, using two screws.

DEFI055

To install drive mounting brackets for an RZ55 hard disk drive that will reside in any slot *except* the far-right slot:

1. Attach the top bracket to the top of the drive, using two screws.

2. Attach the bottom bracket to the bottom of the drive, using two screws.

RZ55 Disk Drives

Drive Mounting Bracket

Captive Screw

SCSI Connector

Power Connector

Captive Screw

Drive Mounting Bracket

DEFI056

To install drive mounting brackets for an RZ56 hard disk drive that will reside in the far-right slot (because there is no tape drive):

1. Attach the top bracket to the top of the drive, using two screws.

2. Attach the bottom bracket to the bottom of the drive, using two screws.

DEFM079

To install drive mounting brackets for an RZ56 hard disk drive that will reside in any slot *except* the far-right slot:

1. Attach the top bracket to the top of the drive, using two screws.

2. Attach the bottom bracket to the bottom of the drive, using two screws.

Drive Mounting Bracket

Captive
Screws

Drive Mounting Bracket
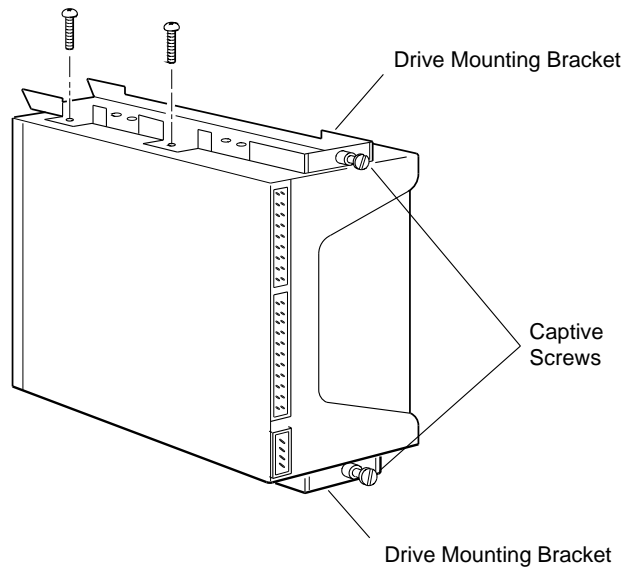
DEFM080

5.12.3 TQK70 Tape Drive Controller Module

The TQK70 tape drive controller module connects to and controls the
TK70 tape drive. The TQK70 is a dual-height Q-bus module.

NOTE
**You must install the tape adapter module in slot 9 before you
install the TQK70 in slot 10, or you must install the Q-bus adapter
module in slot 9 before you install the TQK70 in slot 10, 11, or 12.**

To determine the location of the TQK70 module in the backplane, follow
the module order list in Section 5.4.1. If the module has a recessed
handle, you must add a gap filler.

To install the tape drive controller module (observing antistatic
procedures):

1. Turn off the workstation.

2. Configure the tape drive controller module by setting the base
    address, interrupt vector address, and programming mode. (Refer
    to the *TQK70 User's Guide*.)

3. Remove the front cover from the system unit (Section 3.3).

4. Determine which slot to install the TQK70, following the preferred
    module order (Section 5.4.1).

5. Remove the blank cover from the appropriate Q-bus slot.

6. Slide the tape drive controller module into the top of the Q-bus slot.

7. Slide the blank panel into the bottom of the Q-bus slot.

Slot 10

TK70 Tape Drive
Controller Module
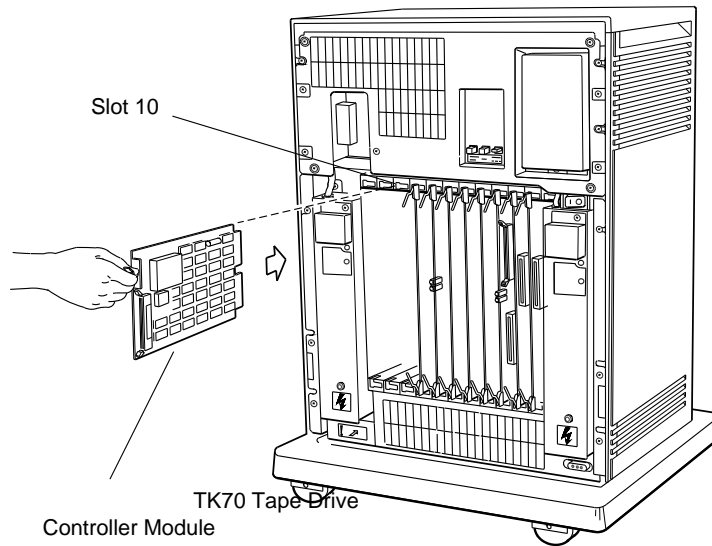
DEFM054

8. Remove the mass storage cover.

9. Connect the tape drive controller-to-TK70 cable to the tape drive
    controller connector. Route the cable up through the mass storage
    area to the back of the far-right drive slot.

    NOTE
    **When you attach the cable to the controller module, follow the
    instructions on the cable connector's green label as to which
    side must face up.**

5.12.4 TK70 Tape Drive

The TK70 tape drive is a streaming tape drive subsystem that provides up to 296 Mbytes of data storage on a single cartridge. The TK70 tape drive connects to and is controlled by the TQK70 tape drive controller module.

The TK70 always installs in the far-right drive slot of the mass storage area.

To install the TK70 tape drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3).

3. Install the TQK70 tape drive controller module (Section 5.12.3).

4. Remove the mass storage cover (Section 3.8).

5. Remove the control panel assembly (Section 4.2.4).

6. Install drive shock mounts in the far-right mass storage slot (Section 5.12.1).

7. Install drive mounting brackets on the tape drive (Section 5.12.2).

8. Route the cable from the TQK70 module up through an opening in the divider between the card cage and the mass storage area.

9. Connect that cable and the cable from the power supply to the back of the tape drive.

    NOTE
    When you attach the cable to the controller module, follow the instructions on the cable connector's green label asto which side must face up.

10. Align the drive mounting brackets with the top and bottom shock mounts before you begin to slide the drive into the mass storage area.

11. Slide the drive into the far-right slot in the mass storage area.
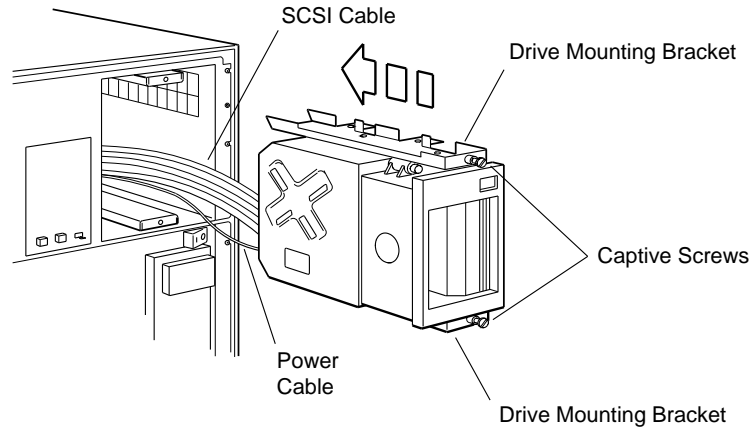
DEFM058

12. Secure the drive to the mass storage area by turning the captive screws on both drive mounting brackets.

13. Replace the control panel.

14. Replace the mass storage cover.

15. Turn on the workstation.

16. Test the new configuration.

17. Run diagnostic tests to test the drive.

18. Replace the front cover.

For more information about the TK70 drive, refer to the *TK70 Tape Drive Installation Guide*.

5.12.5 Internal RZ55 Hard Disk Drive

The internal RZ55 hard disk drive is preformatted at the factory to provide a storage capacity of 332 Mbytes. The system unit can hold up to four internal RZ55 drives in the mass storage area.

Always install and number RZ55 drives from right to left, starting with drive 0 and using drive jumpers to set the disk drive ID value. Before you install an internal RZ55 drive, your drive must be configured for a unique SCSI ID address. Display the system's SCSI configuration on the screen by typing **show scsi** to find an open ID address for the drive.

Use Table 5–3 to set the correct disk drive ID value on the RZ55 drive.
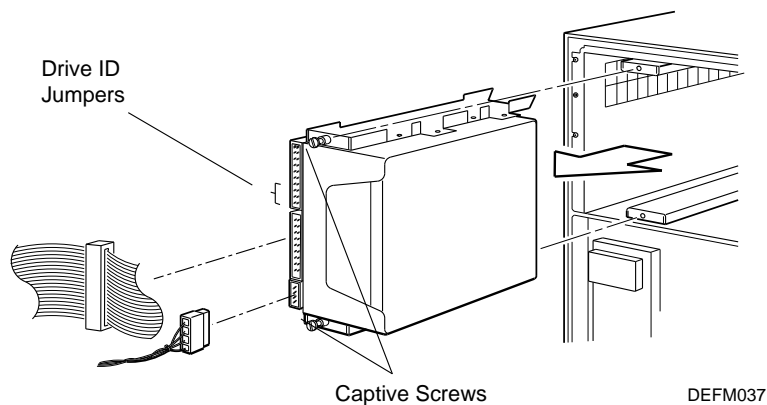
Table 5–3   Internal RZ55 Disk Drive SCSI ID Settings

	Jumper Settings		
Drive ID	**1**	**2**	**3**
0	Out	Out	Out
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

RZ55 drives connect to the SCSI bus. The SCSI bus runs from the I/O module, up into the mass storage area, around the back of the tape drive cavity, and back to the front of the mass storage area.

To install an RZ55 drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3) .

3. Remove the mass storage cover (Section 3.8).

4. Remove the control panel (Section 4.2.4).

5. Install drive shock mounts in the mass storage slot (Section 5.12.1).

6. Install drive mounting brackets on the drive (Section 5.12.2).

7. Verify that the SCSI ID switches are set correctly for each disk drive you are installing (Table 5–3).

8. Slide the drive into the rightmost available slot in the mass storage area, aligning the drive mounting brackets with the top and bottom shock mounts in the mass storage slot.

    •   If you install the RZ55 hard disk drive in the far-right slot of the mass storage area, you must installed the drive with the connectors facing the back of the mass storage area, as shown.
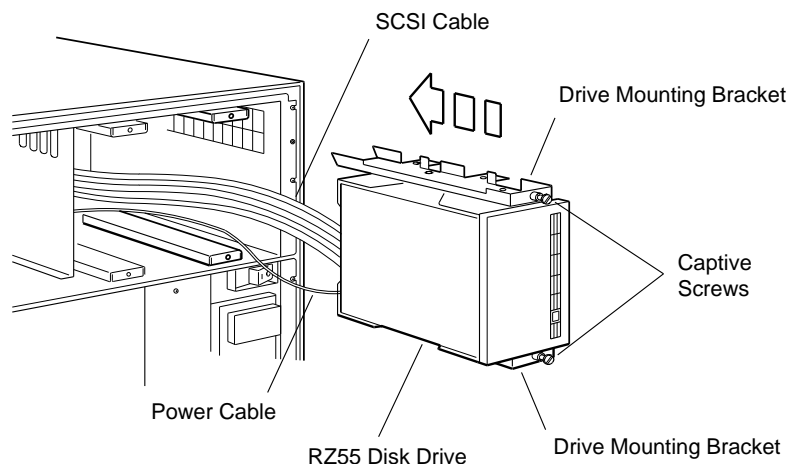
DEFI055

- The following figure shows how to install the RZ55 in a slot other than the far-right slot of the mass storage area.
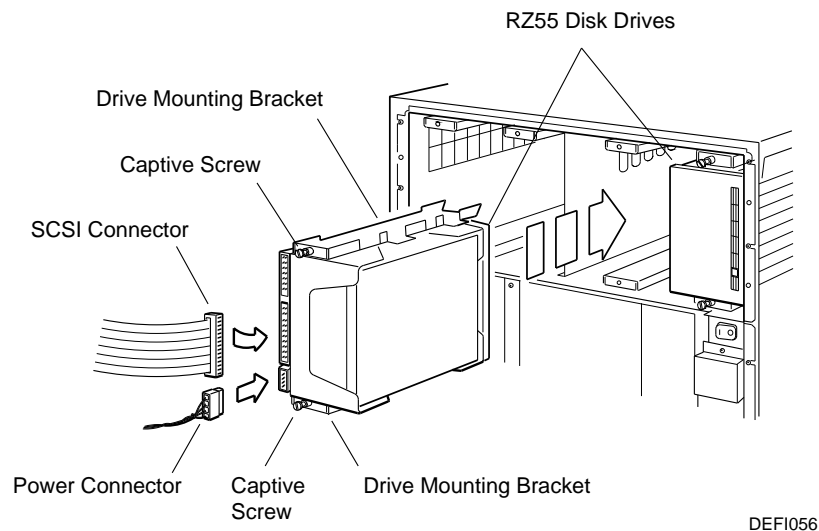
9. Secure the drive to the mass storage area by turning the captive screws on both drive mounting brackets.

10. Connect the SCSI cable connector for the drive slot to the drive.

11. Connect the power connector to the connector on the drive.

12. Replace the control panel.

13. Replace the mass storage cover.

14. Turn on the workstation.

15. Test the new configuration.

16. Run diagnostic tests to test the drive.

17. Replace the front cover.

For more information about the RZ55 drive, refer to the *RZ55 Disk Drive Service Manual*.

5.12.6 Internal RZ56 Hard Disk Drive

The internal RZ56 hard disk drive is preformatted at the factory to provide a storage capacity of 665 Mbytes. The system unit can hold up to four internal RZ56 drives in the mass storage area.

Always install and number RZ56 drives from right to left, starting with drive 0 and using drive jumpers to set the disk drive ID value. Before you install an internal RZ56 drive, your drive must be configured for a unique SCSI ID address. To find an open ID address for the drive, display the system's SCSI configuration on the screen by typing **show scsi**.

```
CPUxx >>> show SCSI
```

Use Table 5–4 to set the correct disk drive ID value on the RZ56 drive. The following figure shows where to set the jumper settings on the drive. Jumper setting 1 is the bottom row of pins.

MA-X1002-89
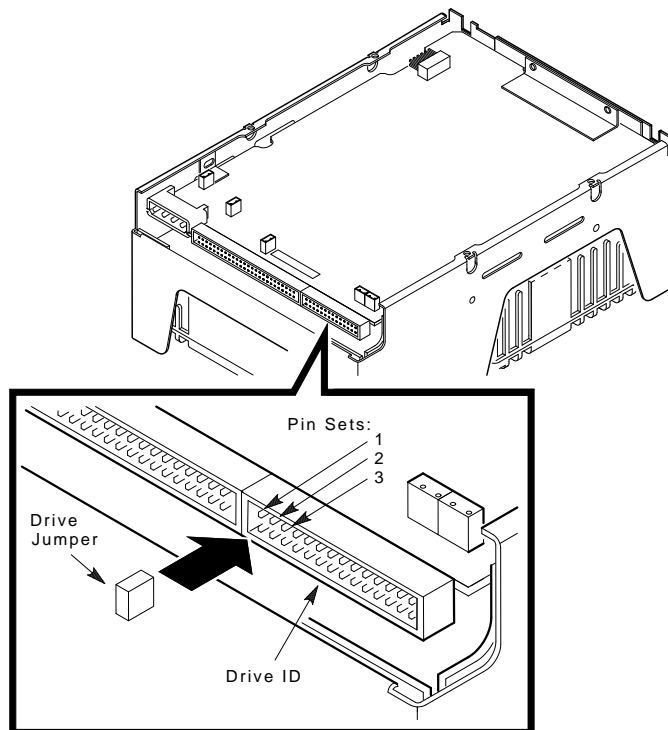
Table 5–4   RZ56 Disk Drive SCSI ID Settings

Drive ID	Jumper Settings		
	1	2	3
0	Out	Out	Out
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

The RZ56 drive connects to the SCSI bus. The SCSI bus runs from the I/O module, up into the mass storage area, around the back of the tape drive cavity, and back to the front of the mass storage area.

To install an RZ56 disk drive (observing antistatic procedures):

1. Turn off the workstation.

2. Remove the front cover from the system unit (Section 3.3) .

3. Remove the mass storage cover (Section 3.8).

4. Remove the control panel (Section 4.2.4).

5. Install drive shock mounts in the mass storage slot (Section 5.12.1).

6. Install drive mounting brackets on the drive (Section 5.12.2).

7. Verify that the SCSI ID switches are set correctly for each disk drive you are installing (Table 5–4).

8. Slide the drive into the rightmost available slot in the mass storage area, aligning the drive mounting brackets with the top and bottom shock mounts in the slot.

- If you are installing the RZ56 disk drive in the far-right slot of the mass storage area, you must install the drive with the connectors facing the back of the mass storage area, as shown.

SCSI Cable

Drive Mounting Bracket

Captive
Screws

Power Cable

RZ56 Disk Drive

Drive Mounting Bracket

DEFI055A
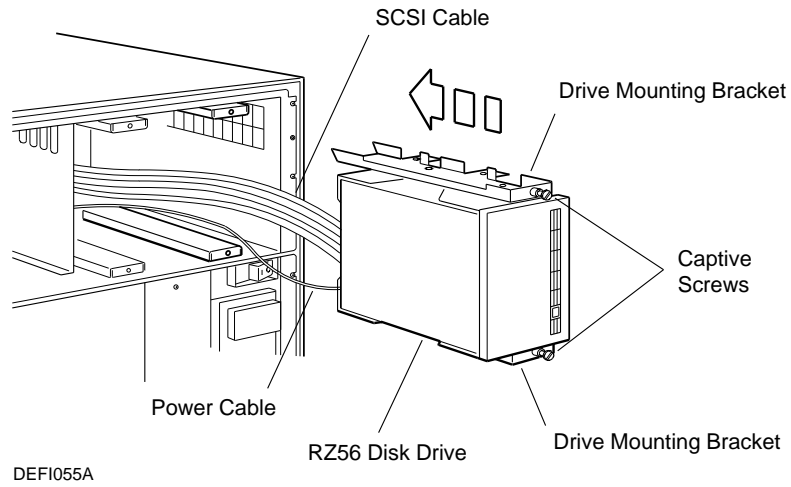
- The following figure shows how to install the RZ56 disk drive into any slot other than the far-right slot of the mass storage area.
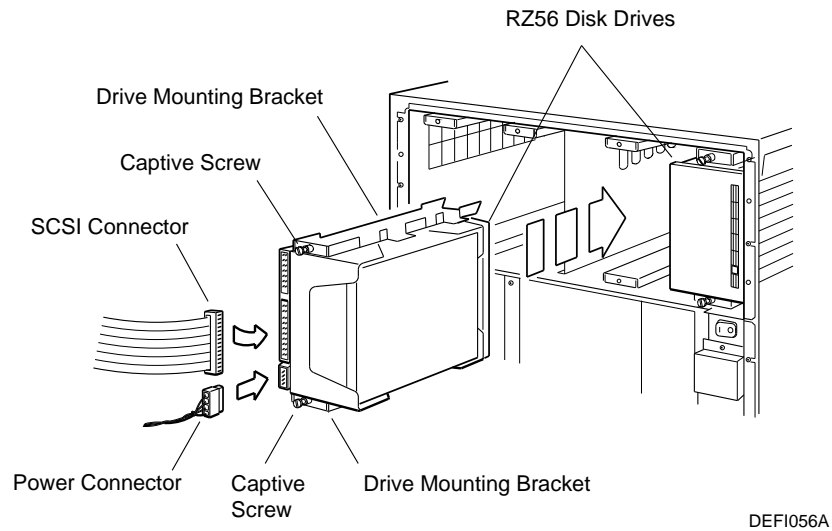
RZ56 Disk Drives

Drive Mounting Bracket

Captive Screw

SCSI Connector

Power Connector   Captive
Screw

Drive Mounting Bracket

DEFI056A

9. Secure the drive to the mass storage area by turning the captive screws on both drive mounting brackets.

10. Connect the power connector to the connector on the drive.

11. Connect the SCSI cable to the connector on the drive

12. Replace the control panel and the mass storage cover.

13. Turn on the workstation.

14. Test the new configuration.

15. Replace the workstation covers.

For more information about the RZ56 drive, refer to the *RZ56 Disk Drive Service Manual*.

5.13   TS05 Tape Drive

The TS05 is a magnetic streaming tape drive that provides 40.5 Mbytes of backup data storage. The TS05 reads or writes up to 160 Kbytes/s in standard ANSI format. The drive uses automatic read after write to verify that data is accurately recorded.

To install the TS05 tape drive:

The TS05 tape drive is a Q-bus option. Before you install the TSV05 controller and the TS05 tape drive, you must install the Q-bus adapter in slot 9 (if not already installed).

NOTE
A tape drive system includes two ribbon cables, two 50-conductor cables, and two type-A filtered connectors.

You install the TS05 in the top 26.3 cm (10.5 in.) mass storage shelf of the H9642 cabinet. For information about installing the TS05 drive in the H9642 cabinet, see the service documentation for the cabinet.

Tape data is buffered in 3.5 Kbytes of RAM on the drive's TSV05 controller (M7530). The TSV05 is a tape mass storage control protocol (TMSCP) device.

You install the TSV05 controller (Figure 5–3) in one of the Q-bus slots (slots 10 through 12) in the backplane. Section 5.4.1 lists the preferred module order.

CAUTION
Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the antistatic kit (29–26246–00) when you work with the internal parts of a computer system.
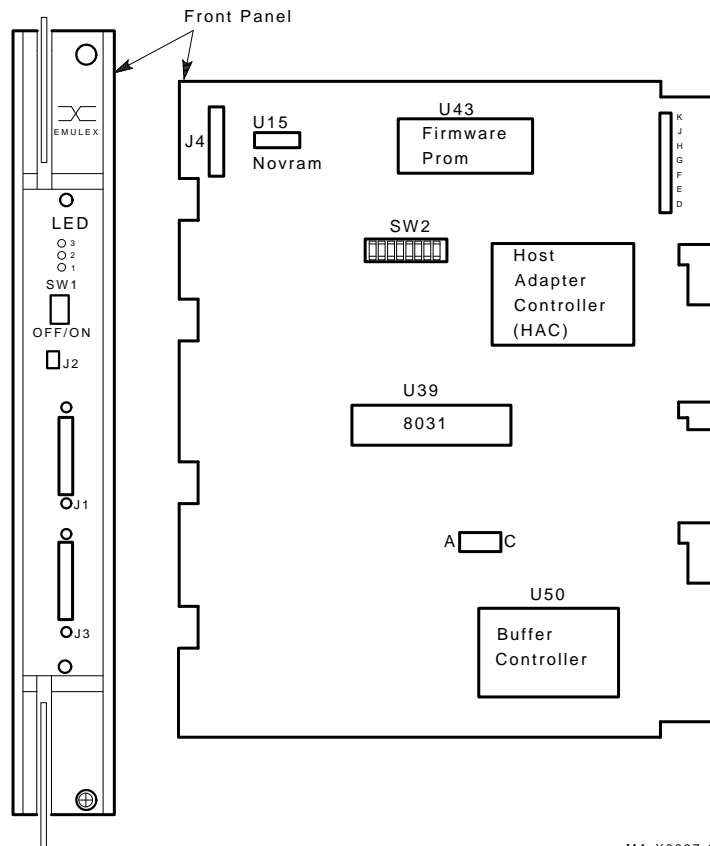
MA-X0697-89

Figure 5–3   TSV05 (M7530) Controller Module

The M7530 CSR address is selected by DIP switches SW2-1 through
SW2-3 as shown below.

TSV05 Bus Address	SW 2		
	1	2	3
772520	0	0	0
772524	1	0	0
772530	0	1	0
772534	1	1	0
772440	0	0	1
772444	1	0	1
772450	0	1	1
772454	1	1	1

Connect the two ribbon cables from the TS05 tape drive to the distribution
panel.

MA-X0695-89
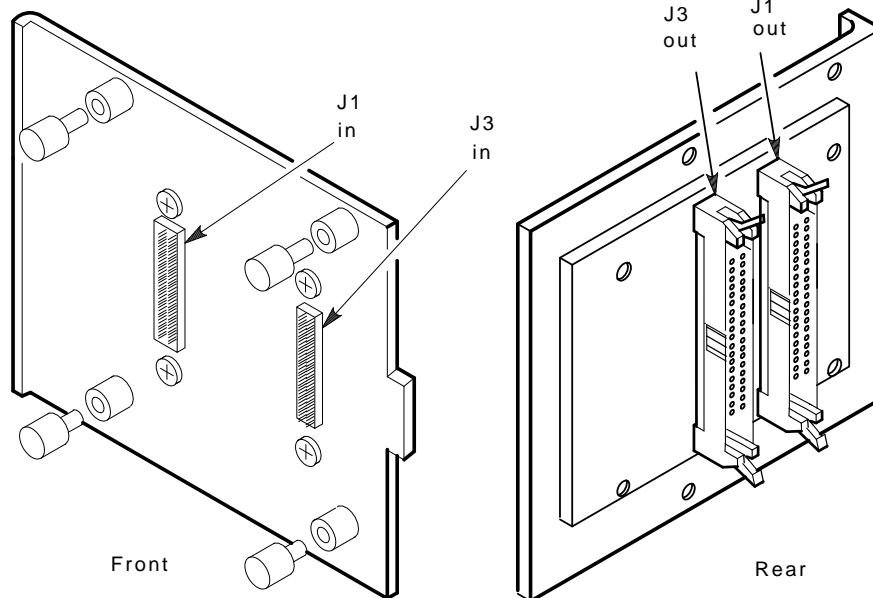
Two 50-conductor cables run between the distribution panel and the
TSV05 controller, as shown.
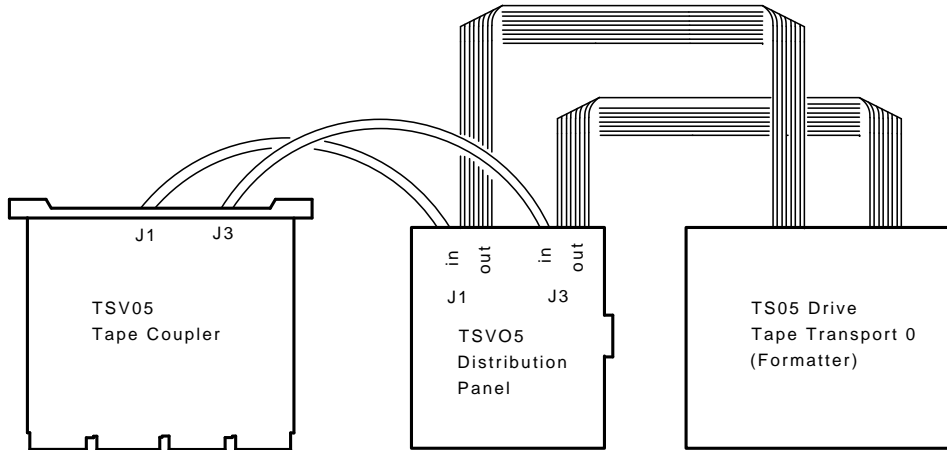
MA-X0694-89

The fan filter is a field replaceable unit (FRU) on the TS05 tape drive. See
the *TS05 Pocket Service Guide* for removal and replacement procedures.

A
Equipment Specifications

This appendix lists the physical specifications, operating conditions, and nonoperating conditions for these units:

- VS60S system unit

- VR295 monitor

- LK201 keyboard

- VXXX-AA mouse

- RZ55 hard disk drive

- RZ56 hard disk drive

- TK70 tape drive

- RRD40 optical compact disc drive

A.1   VS60S System Unit

Dimensions and Weight

	Weight	Height	Width	Depth
System unit	40.5 kg	68.58 cm	53.34 cm	45.08 cm
	90 lb (unloaded)	27 in.	21 in.	17.75 in.

Specifications

Noise power emission level	5.7 decibels, intermittent 5.0 decibels, continuous operation
Power	670 W

Operating Conditions

Temperature range	10° C to 40° C (50° F to 104° F)
Temperature change rate maximum	11° C (20° F) per hour
Relative humidity	20% to 80%, noncondensing
Maximum wet bulb temperature	28° C (82° F)
Minimum dew point temperature	2° C (36° F)
Altitude	2400 m (8000 ft) at 36° C (96° F)

Nonoperating Conditions

Temperature range	–40° C to 66° C (–40° F to 151° F)
Relative humidity	10% to 95%, noncondensing
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° C (36° F)
Altitude	4900 m (16,000 ft) at 36° C (96° F)

A.2   VR295 Monitor

Dimensions and Weight

	Weight	Height	Width	Depth
Monitor	33.75 kg	46.99 cm	50.8 cm	54.61 cm
	75 lb	18.5 in.	20 in.	21.5 in.

Specifications

Viewable size (measured diagonally)	48.3 cm (19 in.)
Resolution	1280 pixels x 1024 lines
Swivel on base	190°
Vertical tilt	–5° forward to 20° backward

Operating Conditions

Temperature range	10° to 40° C (50° to 104° F)
Relative humidity	10% to 95%, noncondensing
Maximum wet bulb temperature	32° C (90° F)
Minimum dew point temperature	2° C (36° F)
Altitude	2400 m (8000 ft) at 36° C (96° F)

Nonoperating Conditions

Temperature range	–40° C to 66° C (–40° F to 151° F)
Relative humidity	10% to 95%, noncondensing
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° C (36° F)
Altitude	4900 m (16,000 ft) at 36° C (96° F)

A.3 LK201 Keyboard

Dimensions and Weight

	Weight	Height	Width	Depth
Keyboard	2 kg 4.5 lb	51 mm 2 in.	533 mm 21 in.	171 mm 6.75 in.

Specifications

Number of keys	105
Indicators	4 status LEDs
Language variations	15
Diagnostics	Self-testing and self-identifying with respect to revision level but not with respect to language variations
Cable	1.76 m (6 ft) uncoiled, detachable; 4-pin mmj connector at both ends
Baud rate	4800
Power consumption maximum	4.2 W
Power input	11.8 V ±6% @ 350 ma
Electrical interface	EIA RS–423
Volume control	8 levels, plus off. Maximum 65 dba 1 ft above keyboard
Keystroke timing minimum	20 msec

Operating Conditions

Temperature range	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 90%
Maximum wet bulb temperature	2.8° C (82° F)
Minimum dew point temperature	2° C (36° F)
Altitude	2400 m (8000 ft) at 36° C (96° F)

Nonoperating Conditions

Temperature range	–40° C to 66° C (–40° F to 151° F)
Relative humidity	10% to 95%, noncondensing
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° C (36° F)
Altitude	49,000 m (16,000 ft) at 36° C (96° F)

A.4   VSXXX-AA Mouse

Dimensions and Weight

	Weight	Height	Diameter
Mouse	0.37 kg	4 cm	8.8 cm
	0.82 lb	1.57 in.	3.47 in.

Specifications

Baud rate	4800
Cable length	1.5 m (5 ft), shielded, 6 conductors and terminals in a 7-pin micro-DIN-type connector (male)
Resolution	79 counts/cm (200 counts/in)
Tracking speed	73.5 cm (30 in/s)
Electrical interfaces	EIA RS-232-C or TTL
Operating modes	Incremental or polling
Tracking rate	In incremental mode: 55 reports/s In polling mode: up to 95 reports/s
Accuracy	±3% 0 to 24.5 cm/s (0 to 10 in/s) any direction ±5% 24.5 to 49 cm/s (10 to 20 in/s) any direction ±30% 49 to 73.5 cm/s (20 to 30 in/s) any direction
Data format	Delta binary
Number of buttons	3

Diagnostics	Self-testing and self-identifying with respect to revision level
Power requirements	+5 V ±5% at 130 mA −12 V ±10% at 20 mA

Operating Conditions

Temperature range	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 90%, noncondensing
Maximum wet bulb temperature	28° C (82° F)
Minimum dew point temperature	2° C (36° F)
Altitude	2400 m (8000 ft) at 36° C (96° F)

Nonoperating Conditions

Temperature range	−40° C to 66° C (−104° F to 140° F)
Relative humidity	5% to 95%
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° (36° F)
Altitude	4900 m (16,000 ft) at 36° C (96° F)

A.5   VSXXX-AB Tablet

Dimensions and Weight

	Weight	Height	Width	Depth
Tablet	3.2 kg	2 cm	41.2 cm	40.6 cm
	7 lb	8 in.	16 in.	16.2 in.

Specifications

Cable length	1.5 m (5 ft), terminated in a 7-pin Micro-DIN-type connector
Active area	27.5 mm x 27.5 mm (11 in. x 11 in.)
Resolution	79 counts/cm (200 counts/in)
Proximity (nominal)	1.27 cm (5 in.) cursor
	0.63 cm (0.25 in.) stylus
Baud rate	4800 or 9600 baud (software selectable)
Power requirements	+12 Vdc ±10% at 0.3A
Output connector (power and data)	7–pin Micro–DIN (male)
Mating connector	7–pin Micro–DIN (female)
Operating modes	Incremental and polling
Remote request	X–Y coordinate update and proximity report when polled by host
Incremental	Position reports are generated as long as cursor is in motion. Reports are also generated when the pushbuttons are pressed or released.
Interfaces	Serial, asynchronous, full-duplex, with EIA RS-232-C signal levels
Tracking rates	In incremental mode: 55, 72, 120 reports/s
	In polling mode: 50 reports/s at 4800 baud and 80 reports/s at 9600 baud
Puck	4 buttons
Stylus	2 buttons

| Diagnostics | Self-testing and self-identifying (revision level and the fact that it is not a mouse). Diagnostics check electronics, communication, tablet, and transducers. |

Operating Conditions

Temperature range	10° C to 40° C (50° F to 104° F)
Relative humidity	20% to 80%, noncondensing
Maximum wet bulb temperature	28° C (82° F)
Minimum dew point temperature	2° C (36° F)
Altitude	2400 m (8000 ft) at 36° C (96° F)

Nonoperating Conditions

Temperature range	–40° C to 66° C (–40° F to 151° F)
Relative humidity	10% to 95%, noncondensing
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° C (36° F)
Altitude	4900 m (16,000 ft) at 36° C (96° F)

A.6   RZ55 SCSI Hard Disk Drive

Dimensions and Weight

	Weight	Height	Width	Depth
Internal drive	3.78 kg 8.4	8.25 cm 3.25 in.	14.60 cm 5.75 in.	20.82 cm 8.20 in.

Specifications

Capacity	332.3 Mbytes
Per surface	22.48 Mbytes
Per track	18,432
Per block	512 bytes
Blocks/track	36
Blocks/drive	649,040
Spare blocks/cylinder	8
Spare blocks/drive	10,300
Transfer rate to/from media	1.25 Mbytes/s
Bus asynchronous mode	1.5 Mbytes/s
Bus synchronous mode	4.0 Mbytes/s
Seek time, track-to-track	$\leq$ 4 msec
Seek time, average	$\leq$ 16 msec
Seek time, maximum	$\leq$ 35 msec
Average rotational latency	8.3 msec
Rotational speed	3600 rev/min ±0.5%
Start time, maximum	20 sec
Stop time, maximum	20 sec
Interleave	1:1
Bus latency maximum	600 μsec
Heat dissipation	28 W (typical) 32 W (random seek mode)
Recording density	21,231 bits/in. at ID

Track density	1075 tracks/in.
Tracks/surface (unformatted)	1224
R/W heads	15

Operating Conditions

Temperature range*	10° C to 55° C (50° F to 131° F)
Relative humidity	8% to 80%
Maximum wet bulb temperature	25.6° C (78° F), noncondensing
Minimum dew point temperature	2° C (36° F)
Altitude	–304 to 4600 m (–1000 to 15000 ft) at 36° C (96° F)

*Reduce maximum temperature by 1.8° C (3.24° F) for each 1000-meter increase in altitude.

Nonoperating Conditions

Temperature range	–40° C to 66° C (–40° F to 151° F)
Relative humidity	8% to 95%, packaged
Maximum wet bulb temperature	46° C (115° F), packaged, noncondensing
Minimum dew point temperature	2° C (36° F)
Altitude	–304 to 12,300 m (–1000 ft to 40,000 ft) at 36° C (96° F)

A.7   RZ56 Hard Disk Drive

Dimensions

	Weight	Height	Width	Depth
Internal drive	3.78 kg 8.4 lbs	8.25 cm 3.25 in	14.60 cm 5.75 in	20.0 cm 8.0 in

Specifications

Capacity	665.17 Mbytes
Per surface	50.9 Mbytes
Per track	31,248
Per block	512 bytes
Blocks/track	54
Blocks/drive	1,299,174
Spare blocks/cylinder	11
Spare blocks/drive	20,316
Space cylinders	3
Transfer rate to/from media	1.25 Mbytes/s
Bus asynchronous mode	1.6 Mbytes/s
Bus synchronous mode	4.0 Mbytes/s
Seek time, track-to-track	$\leq$ 4 msec
Seek time, average	$\leq$ 16 msec
Seek time, maximum	$\leq$ 35 msec
Average rotational latency	8.3 msec
Rotational speed	3600 rev/min ±0.5%
Start time, maximum	20 sec
Stop time, maximum	20 sec
Interleave	1:1
Bus latency maximum	600 µsec
Heat dissipation	28 W (typical) 32 W (random seek mode)

Recording density	31,846 bits/in. at ID
Track density	1440 tracks/in.
Tracks/surface (unformatted)	1632
Tracks/surface (formatted)	1626
R/W heads	15
Disks	8
Time to process ECC (512 bytes)	$\leq$ 100 msec

Operating Conditions

Temperature range*	10° C to 55° C (50° F to 131° F)
Relative humidity	8% to 80%
Maximum wet bulb temperature	25.6° C (78° F), noncondensing
Minimum dew point temperature	2° C (36° F)
Altitude	−304 to 4600 m (−1000 to 15000 ft) at 36° C (96° F)

*Reduce maximum temperature by 1.8° C (3.24° F) for each 1000 meter increase in altitude.

Nonoperating Condition

Temperature range	−40° C to 66° C (−40° F to 151° F)
Relative humidity	8% to 80%
Maximum wet bulb temperature	46° C (115° F), packaged, noncondensing
Minimum dew point temperature	2° C (36° F)
Altitude	−304 to 12,300 m (−1000 ft to 40,000 ft) at 36° C (96° F)

For additional information on the RZ56 drive, see the *RZ56 Disk Drive Service Manual*.

A.8   TK70 Tape Drive

Dimensions and Weight

	Weight	Height	Width	Depth
Internal drive	2.27 kg	8.25 cm	14.6 cm	21.44 cm
	5.0 lb	3.235 in	5.7 in	8.44 in

Specifications

Mode of operation	Streaming
Media	12.77 mm (1/2-in) magnetic tape
Bezel	5.87 x 3.40 x 0.350 inches
Bit density	10,000 bits/in
Number of tracks	48
Transfer rate (at host)	125 Kbytes/s
Tape speed	100 in/s
Track format	Multiple track serpentine recording
Cartridge capacity	94 Mbytes (approximately), formatted
Power requirements	12 V ±5% at 2.0 A (2.4 A surge),
	+5 V ±5% at 1.3 A (1.5 A surge)
Drive power, maximum	40 W
Host adapter (TQK70) power, maximum	15 W

Operating Conditions

Temperature range*	10° C to 40° C (50° F to 104° F)
Relative humidity	20% to 80%, noncondensing
Maximum wet bulb temperature	25° C (77° F)
Minimum dew point temperature	2° C (36° F)
Altitude	2400 m (8000 ft) at 36° C (96° F)

*Reduce maximum temperature by 1.8° C (3.24° F) for each 1000-meter increase in altitude.

Nonoperating Conditions (Without Tape Cartridge)

Temperature range	–40° C to 66° C (–40° F to 151° F)
Relative humidity	10% to 95%
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° C (36° F)
Altitude	30,000 ft at 36° C (96° F)

A.9   RRD40 Optical Compact Disc Drive (Tabletop)

Dimensions and Weight

	Weight	Height	Width	Depth
Expansion box	4.0 kg	76.2 mm	229 cm	280 cm
	8.8 lb	3 in	9.125 in	11 in

Specifications

Capacity/disc	635 Mbytes
Access time	Maximum 1000 msec, including latency average 500 msec
Average latency	155 msec at outer track 60 msec at inner track
Average transfer rate	175.2 Kbytes/s
Initialization startup time	Less than 6 sec
Heat dissipation	14 W (typical)

Operating Conditions

Temperature range*	10° C to 50° C (50° F to 122° F)
Relative humidity	10% to 80%, noncondensing
Maximum wet bulb temperature	28° C (82° F)
Minimum dew point temperature	2° C (36° F)
Altitude	3400 m (11,150 ft) at 36° C (96° F)

*Reduce maximum temperature by 1.8° C (3.24° F) for each 1000-meter increase in altitude.

Nonoperating Conditions

Temperature range	4° C to 70° C (40° F to 158° F)
Relative humidity	5% to 95%, noncondensing
Maximum wet bulb temperature	46° C (115° F), packaged
Minimum dew point temperature	2° C (36° F)
Altitude	13,600 m (44,600 ft) at 36° C (96° F)

B
Part Numbers

This appendix lists the part numbers for

- System FRUs
- Hardware option kits
- Hardware and software documentation

B.1   System FRUs

Table B–1   System FRUs

Item	Part Number
Components	
LK201 keyboard (North American/U.K.)	LK201-AA
LK201 keyboard (other)	LK201-XX
Mouse	VSXXX-AA
RRD40 optical compact disc drive, 635 Mbytes	RRD40-DA
RZ55 hard disk drive, 332 Mbytes	RZ55-E
RZ56 hard disk drive, 665 Mbytes	RZ56-E
Tablet	VSXXX-AB
TK70 tape drive, 296 Mbytes	TK70-EA or TK70E-SA
TS05 tape drive, 40.5 Mbytes	TS05-AA/-AB
VR295 monitor 120 V	VR295-DA
VR295 monitor, 240 V, Northern Hemisphere	VR295-D3
VR295 monitor, 240 V, Southern Hemisphere	VR295-D4

Table B–1 (Cont.)   System FRUs

Item	Part Number
Modules and Assemblies	
Backplane assembly (3520/3540 systems)	70-24589-01
Backplane assembly (3820/3840 systems)	70-24589-02
Control panel assembly	70-26174-01
CXY08 asyncronous interface module	M3119-YA
DSV11 synchronous I/O interface module	M3108-PA
DWFQA Q-bus adapter module	L2002-00
Graphics base module	L2004-00
Graphics expansion module, 16 planes	L2006-AA
Graphics frontplane assembly	70-24583-01
Graphics output module, 8 planes	L2005-AA
I/O cover assembly	70-24582-01
I/O module	L2003-00
KA60-AA dual CPU module (3520/2540 systems)	L2001-00
KA60-BA dual CPU module (3820/2840 systems)	L2010-AA
MS60-AA memory module, 8 Mbytes	L2007-AA
MS60-BA memory module, 16 Mbytes	L2007-BA
MS60-CA memory module, 32 Mbytes	L2007-CA
Tape adapter module (for FTAM)	L2008-00
TQK70 tape controller module	M7559-00
TSV05 tape controller module	M7530-PA
Video cable assembly	17-01864-01
Electrical/Mechanical Parts	
AC filter	70-23769-01
AC switch assembly	70-23999-01
AC switch frame	74-35417-01

Table B–1 (Cont.)   System FRUs

Item	Part Number
Electrical/Mechanical Parts	
Adapter, 25-pin D-sub. to 6-pin LAN (H8571-A)	12-23599-01
Battery	12-19245-01
Blank cover, single-width	70-23981-01
Blank panel	74-33507-01
Cable, backplane to control panel, 10-position	17-01964-01
Cable, backplane to fans, 5-position	17-01360-01
Cable, RH power harness	17-01362-01
Cable, LH power harness	17-01362-02
Cable, modem/communications, 10 feet (BCC38)	17-01862-01
Cable, printer LAN (BC16E-10)	17-00811-02
Cord, system unit power	17-00083-43
Cover, graphics	70-24581-01
Cover, mass storage	70-26175-01
Drive slide support screws	90-08404-02
Ethernet, ThinWire T-connector (H8223-A)	12-25869-01
Ethernet, ThinWire terminator (H8225-AA)	12-26318-01
Ethernet, ThinWire cable (BC16M)	17-01241-04
Ethernet, ThickWire cable, 5 meters (BNE4F-05)	17-01863-01
Fan assembly (both fans)	70-23998-01
Power supply, 120 V	H7868-A
Power supply, 240 V	7868-B
SCSI terminator, 50-pin	12-30552-01
RZ55 bracket, right (attaches to drive)	74-38204-02
RZ55 bracket, left (attaches to drive)	74-38204-01
RZ55 shock mount, right (attaches to enclosure)	70-25452-05
RZ55 shock mount, left (attaches to enclosure)	70-25452-06

Table B–1 (Cont.)   System FRUs

Item	Part Number
Electrical/Mechanical Parts	
RZ56 bracket, right (attaches to drive)	74-38204-02
RZ56 bracket, left (attaches to drive)	74-38204-01
RZ56 shock mount, right (attaches to enclosure)	70-25452-05
RZ56 shock mount, left (attaches to enclosure)	70-25452-06
TK70 bracket, right (attaches to drive)	74-33573-01
TK70 bracket, left (attaches to drive)	74-33573-02
TK70 shock mount, right (attaches to enclosure)	70-23997-01
TK70 shock mount, left (attaches to enclosure)	70-23997-02

B.2   Hardware Option Kits

Table B–2   Hardware Option Kits

Item	Field Number	Factory Number
CPU module, dual (L2001)	KA60-AA	N/A
CPU module, dual (L2010)	KA60-BA	N/A
CXY08 asynchronous interface module	CXY08-AF	CXY08-AA
DSV11 synchronous I/O interface module	DSV11-SF	DSV11-SA
DWFQA Q-bus adapter (L2002)	DWFQA-AF	DWFQA-AA
Graphics expansion module (L2006), 16 planes	VCB03-AF	VCB03-AA
Memory module, 8 Mbytes (L2007-AA)	MS60-AA	MS60-AA
Memory module, 16 Mbytes (L2007-BA)	MS60-BA	MS60-BA
Memory module, 32 Mbytes (L2007-CA)	MS60-CA	MS60-CA

Table B–2 (Cont.)   Hardware Option Kits

Item	Field Number	Factory Number
RRD40 optical compact disc drive, 635 Mbytes (includes drive, expansion box, cable, U.S. power cord)	RRD40-GA	RRD40-GA
RZ55 hard disk drive, 332 Mbytes (includes drive, brackets, mounts, screws)	RZ55A-SF	RZ55A-SA
RZ56 hard disk drive, 665 Mbytes (includes drive, brackets, mounts, screws)	RZ56-SF	RZ56-SA
TK70 tape drive, 296 Mbytes (includes drive, controller, adapter module, brackets, mounts, screws)	VS60B-AF	VS60B-AA
TS05 tape drive, 40.5 Mbytes (includes drive, TSV05 controller, H9642 cabinet)	TSV05-SE/SF	TSV05-SE/SF*

*TSV05-SE is for 110 V; TSV05-SF is for 240 V

B.3   Documentation

You can order the following documents from Digital:

Table B–3   Hardware Documentation

Item	Part Number
VAXstation 3520/3540 Workstation	
VAXstation 3520/3540 Release Notes	EK-313AA-RN-001
VAXstation 3520/3540 Hardware Installation Guide	EK-250AA-IN-001
VAXstation 3520/3540 Operator's Guide	EK-251AA-UG-001
VAXstation 3520/3540 Maintenance Guide	EK-258AA-MG-001
VS60S System Illustrated Parts Breakdown	EK-VS60S-IP-001

Table B–3 (Cont.)   Hardware Documentation

Item	Part Number
VAXstation 3820/3840 Workstation	
VAXstation 3820/3840 Release Notes	EK-381AA-RN-001
VAXstation 3820/3840 Hardware Installation Guide	EK-380AA-IN-001
VAXstation 3820/3840 Owner's Manual	EK-379AA-OP-001
VAXstation 3520/3540 and 3820/3840 Maintenance Guide	EK-258AA-MG-003
VS60S System Illustrated Parts Breakdown	EK-VS60S-IP-001
VAXstation 3520/3540 and 3820/3840 Components and Add-Ons	
CXY08 Technical Manual	EK-CXY08-TM
DSV11 User Guide	EK-DSV11-UG
Mouse Installation Instructions	EK-VSXXA-IN
RZ55 Disk Drive Service Manual	EK-RZ55D-SV
RZ56 Disk Drive Service Manual	EK-RZ56D-SV
RRD40 Owner's Manual	EK-RRD40-OM-001
Tablet Installation Instructions	EK-VSXXB-IN
TK70 Tape Drive Installation Guide	EK-TK70E-IN-001
TK70 Streaming Tape Drive Owner's Manual	EK-OTK70-OM-001
TSV05 User Guide	EK-TSV05-UG
VR295 Monitor Installation Guide	EK-VR295-IN-001
VR295 Monitor Pocket Service Guide	EK-VR29X-PS-001
Workstations Network Guide	EK-VS315-GD-001

Table B–4   Software Documentation

Item	Part Number
ULTRIX-32 Systems	
ULTRIX-32 Worksystem User Kit	QA-VV1AD-GZ
ULTRIX-32 Worksystem Programming Kit	QA-VV1AE-GZ
ULTRIX-32 Worksystem Full Kit	QA-VV1AA-GZ
VMS Systems	
VMS Base Set	QA-095AA-GZ-5.0
VMS Extended Set	QA-001AA-GZ-5.0
VMS General User Subkit	QA-001A1-GZ-5.0
VMS Programming Subkit	QA-001A3-GZ-5.0
VMS System Management Subkit	QA-001A2-GZ-5.0

B.4   Ordering Information

Customers can order documentation by phone or mail.

Continental USA and Puerto Rico

Call 800-258-1710 or mail to:

Digital Equipment Corporation
P.O. Box CS2008
Nashua, NH 03061

New Hampshire, Alaska, and Hawaii

Call 1-603-884-6660.

Outside the USA and Puerto Rico

Mail to:

Digital Equipment Corporation
Attn: Accessories and Supplies Business Manager c/o Local Subsidiary or
Digital-Approved Distributor

Digital personnel may order documents from:

Digital Equipment Corporation
444 Whitney Street
Northboro, MA 01532

Attn: Publishing and Circulation Services (NRO3/W3)
Order Processing Section

C
Console Commands

The VAXstation operates in two modes, program I/O mode and console I/O mode.

- Program I/O mode is the normal operating mode, where the operator interacts with the terminal.

- Console I/O mode is used to perform such functions as bootstrapping and diagnostic testing. This mode allows the user to control the processor and the console terminal.

This appendix explains

- How to use console commands

- The syntax and function of each console command

C.1 Overview

To enter console mode: The system automatically enters console mode whenever you start your VAXstation and whenever the processor halts. You can enter console mode by pressing the Halt button on the system unit control panel or by pressing the Break key on an alternate terminal. You can also use the SET HALT console command to program the processor to enter console mode automatically in the event of a restart or a failed boot.

To exit console mode: Enter the BOOT, CONTINUE, or START console command, or press the Restart/Run button on the system unit control panel.

When the system is in console I/O mode: The screen displays the prompt CPU *processor-id* >>>, where *processor-id* is a digit and a letter identifying the processor handling the command. When the console prompt appears, you can enter console commands.

C.1.1 Conventions Used in This Appendix

Console commands presented in this appendix follow these conventions:

device-name	Parameters shown in italics are placeholders that you replace with an actual value.
/MEMORY | /RPB	When parameters in a series are separated by vertical lines, you may specify one and only one parameter from the group.
[/A]	Parameters enclosed in brackets are optional. You do not need to specify them for the command to be valid.
Ctrl C	For Ctrl key sequences, press and hold Ctrl while pressing the other key.

C.1.2 Rules for Entering Console Commands

- The console program accepts commands up to 80 characters long, not including deleted characters or the terminating carriage return. If you try to enter a longer command, an error message appears.

- You can abbreviate most commands and arguments. You can enter most commands by typing just the first letter of the command keyword. Acceptable abbreviations are listed along with the commands in this appendix.

- The console program treats multiple adjacent spaces and tabs as a single space. The program ignores leading and trailing spaces and tabs.

- All numbers (addresses, counts, data) are in hexidecimal format, except for symbolic register names, which are in decimal format.

- Console commands are not case sensitive. You can enter commands in uppercase or lowercase characters.

- In console mode, certain keys have special functions. These keys are listed in Table C–1.

Table C–1   Keys with Special Functions in Console Mode

Key	Function
Break	Halts the processor and activates console mode.
Return	Sends the command on the command line to the console program for execution.
<X| Delete	Deletes the character to the left of the cursor on the command line. On video terminals, the deleted character disappears from the screen. On hardcopy terminals, deleted characters are echoed to the screen between backslashes. The console program assumes that unknown attached console devices are hardcopy terminals.
Ctrl C	Aborts the current command and displays the console prompt on the next line. The console terminal echoes ^C.
Ctrl O	Disables output to the console device until the next Ctrl O is entered. (Pressing Break or CtrlC also reenables output.) The console terminal echoes ^O when this key press disables output but not when it reenables output. To indicate that the console program is again accepting transmissions, the terminal prints an error message or displays the console prompt.
Ctrl P	Terminates the Z command. The console terminal echoes ^P.
Ctrl Q	Resumes output to the console terminal after a Ctrl S sequence. The console terminal does not echo this key press. Ctrl Q is equivalent to XON.
Ctrl R	Retypes the current line, eliminating all deleted characters.
Ctrl S	Stops output to the console terminal until Ctrl Q is typed. (Pressing Ctrl C, Ctrl O, or Break also clears Ctrl S.) The console terminal does not echo this key sequence. Ctrl S is equivalent to XOFF.
Ctrl U	Deletes the current command line and displays the console prompt on the next line. The console terminal echoes ^U. Pressing Ctrl U while a command is executing does not abort the command.

C.2   Console Commands

Three types of console commands are available:

Processor-control commands	BOOT
	CONTINUE
	HALT
	INITIALIZE
	START
	UNJAM
Data-transfer commands	EXAMINE
	DEPOSIT
	TRANSFER
Console-control commands	! (comment)
	REPEAT
	SET
	SHOW
	TEST
	Z

The following sections describe these commands in detail in alphabetical order.

BOOT

The BOOT command transfers control to the virtual machine boot (VMB) program, which loads and starts the operating system.

Format

B   *[/R5:data] [device-name]*

/R5:*data*

Specify /R5:*data* to pass a parameter to the VMB. The console program loads register 5 with the specified data after initializing the system and before starting the VMB.

device-name

The VMB boots the operating sytem from the device specified in *device-name*. The device name is generally specified in the form *LLLn*, where the first three characters are letters and n is from one to three digits. You can optionally include a colon at the end of the device name.

Device names for the VAXstation 3520/3540 workstation are listed here.

DKA000 (SCSI disk)
DKA100 (SCSI disk)
DKA200 (SCSI disk)
DKA300 (SCSI disk)
DKA400 (SCSI disk)
DKA500 (SCSI disk)
DKA600 (SCSI disk)
DKA700 (SCSI disk)
ESA0 (Ethernet network)
MUA0 (Tape drive on Q-bus)

If you do not specify a device name, the system boots from the device specified by the last SET BOOT command. If no device has been specified, the boot operation fails.

COMMENT

The COMMENT command is used to annotate console I/O command sequences. It is ignored by the console program.

Format

! *comment*

comment
For *comment*, specify text of up to 80 characters per line, not including the terminating return character.

CONTINUE

When you enter the CONTINUE command, the console switches to program I/O mode, and the processor begins execution at the address currently in the program counter. The processor is not reinitialized.

Format

C   *[/A] [processor-id]*

/A

Specify /A to resume execution of all enabled halted processors.

processor-id

Specify *processor-id* to resume execution of a particular processor. If you
do not specify a processor name, the current processor resumes execution.

DEPOSIT

The DEPOSIT command sets the specified data at the specified address.
You can optionally specify one or more address or data qualifiers. If you
do not specify any qualifiers, the system uses the address space and data
size used in the last DEPOSIT or EXAMINE command. At processor
initialization, the default address space is physical memory, the default
address is 0, and the default data size is a longword.

Format

D   *[data-size] [address-space] [/U] [/N:count] address data*

data-size

For *data-size*, specify one of the following:

/B	Sets the data size to a byte.
/W	Sets the data size to a word (two bytes).
/L	Sets the data size to a longword (four bytes).

address-space

For *address-space*, specify one of the following:

/V	Sets the address space to virtual memory. If memory mapping is not enabled, virtual addresses are equal to physical addresses.
/P	Sets the address space to physical memory.
/I	Sets the address space to the internal processor registers.
/G	Sets the address space to the general registers (R0 through R15).

/U

Specify /U to permit write access to console program memory and to disable virtual address protection checking.

/N

Specify /N:*count* to indicate that the specified address is the beginning of an address range. The console program deposits the specified data at the first address and then at the number of succeeding addresses specified by *count*.

The succeeding addresses are always larger than the specified address, even when the specified address is the symbolic address "-." (For repeated references to preceding addresses, enter the command REPEAT DEPOSIT *data*.)

address

For *address*, specify any valid address. You can also specify one of the following symbolic addresses:

PSL	The processor status longword sets the address space to M (machine-dependent). Do not specify any address qualifiers with PSL.
PC	The program counter (general register 15) sets the address space to G.
SP	The stack pointer (general register 14) sets the address space to G.
R*n*	Sets the address space to G and the address to general register *n*. Specify *n* as a decimal integer. For example: D R5 1234 is equivalent to D/G 5 1234 D R10 6FF00 is equivalent to D/G A 6FF00
Plus sign (+)	Sets the address to the location immediately following the last location referenced in a DEPOSIT or EXAMINE command. In references to physical or virtual memory spaces, *address* becomes the last address plus the data size of the last reference (+1 for a byte, +2 for a word, +4 for a longword). For other address spaces, the address is the last address plus 1.

Minus sign (-)	Sets the address to the location immediately preceding the last location referenced in a DEPOSIT or EXAMINE command. In references to physical or virtual memory spaces, *address* becomes the last address minus the data size of the last reference (-1 for a byte, -2 for a word, -4 for a longword). For other address spaces, the address is the last address minus 1.
Asterisk (*)	Sets the address to the last location referenced by an EXAMINE or DEPOSIT command.
At sign (@)	Causes the contents of the last location referenced by an EXAMINE or DEPOSIT command to become *address* for the current command.

data

For *data*, specify a hexidecimal value. If the specified data is too large for the specified data size, the console program ignores the command and issues an error message. If the specified data is smaller than the specified data size, the data is extended on the left with 0s.

EXAMINE

Use the EXAMINE command to examine the contents of memory at the specified address.

All arguments to the E command are optional.

Format

E   *[data-size] [address-space] [/U] [/N:count] [address]*

The console program response to this command appears in the following format:

address-space-identifier address data

The *address space identifier* will be one of the following:

P	Physical memory. Note that when virtual memory is examined, the address space and address in the response are the translated physical address.
G	General register.
I	Internal processor register.

M   Machine-dependent. Used only in PSL display.

Data-size

Defaults to the last values specified in a DEPOSIT or EXAMINE command.

For *data-size*, specify one of the following:

/B   Sets the data size to byte.

/W   Sets the data size to word (two bytes).

/L   Sets the data size to longword (four bytes).

address-space

Defaults to the last values specified in a DEPOSIT or EXAMINE command.

For *address-space*, specify one of the following:

/V   Sets the address space to virtual memory. If memory mapping is not enabled, virtual addresses are equal to physical addresses.

/P   Sets the address space to physical memory.

/I   Sets the address space to internal processor registers.

/G   Sets address space to the general registers (R0 through R15).

/U

Specify /U to permit write access to console program memory and to disable virtual address protection checking.

/N

Specify /N:*count* to indicate that the specified address is the beginning of an address range. The console program examines the specified data at the first address and then at the number of succeeding addresses specified by *count*.

The succeeding addresses always are larger than the specified address, even when the specified address is the symbolic address "-." (For repeated references to preceding addresses, enter the command REPEAT EXAMINE *data*.)

Address

Defaults to a plus sign (+).

For *address* specify any valid address. You can also specify one of the
following symbolic addresses:

PSL	The processor status longword sets the address space to M. Do not specify any address qualifiers with PSL.
PC	The program counter (general register 15) sets the address space to G.
SP	The stack pointer (general register 14) sets the address space to G.
R*n*	Sets the address space to /G and the address to general register *n*. Specify *n* as a decimal integer. For example:
	E R5 1234 is equivalent to E/G 5 1234 E R10 6FF00 is equivalent to E/G A 6FF00
Plus sign (+)	Sets the address to the location immediately following the last location referenced in a DEPOSIT or EXAMINE command. In references to physical or virtual memory spaces, the location referenced is the last address plus the size of the last reference (+1 for a byte, +2 for a word, +4 for a longword). For other address spaces, the address is the last address referenced plus 1.
Minus sign (-)	Sets the address to the location immediately preceding the last location referenced in a DEPOSIT or EXAMINE command. In references to physical or virtual memory spaces, the location referenced is the last address minus the size of the last reference (-1 for a byte, -2 for a word, -4 for a longword). For other address spaces, the address is the last address referenced minus 1.
Asterisk (*)	Sets the address to the last location referenced by an EXAMINE or DEPOSIT command.
At sign (@)	Causes the contents of the last location referenced by an EXAMINE or DEPOSIT command to become *address* for the current command.

HALT

Specify HALT to halt the specified processor. If you do not specify a processor number, the console program halts all processors.

Format

H   *[processor-id]*

processor-id
Specify *processor-id* to indicate the processor you want to halt.

INITIALIZE

The INITIALIZE command initializes the current processor. The command sets the address location to physical memory, the data size to longword, and the address to 0, and it disables the cache. INITIALIZE also sets the registers listed in Table C–2.

Format

Table C–2   Default Register Values

Register	Value
PSL	041F0000
IPL	1F
ASTLVL	4
SISR	0
ICCS	Clears bits 6 and 0; the rest are unpredictable.
RXCS	0
TXCS	80
MAPEN	0

REPEAT

Specify REPEAT to repeatedly display and execute the specified command. To stop the repetition, press Ctrl C. To pause the repetition, press Ctrl S, then use Ctrl Q to continue.

Format

R   *command*

command
For *command*, specify any valid console command except REPEAT.

SET

Use SET to define console program parameters.

Format

SET   *BOOT [device-name]* | *BFLG value* | *HALT value* | *L[NG] value* |
      KBD value |
      CPU processor-id E[NABLE] |
      CPU processor-id D[ISABLE] |
      CPU processor-id P[RIMARY] E[NABLE] |
      CPU processor-id P[RIMARY] D[ISABLE] |
      MOP value | *SCSI value* | *XTIM value*

BOOT *device-name*
Specify BOOT *device-name* to set the default boot device. For the optional *device-name* parameter, specify a valid device name as specified in the BOOT command. If you do not specify a device name, the program clears the default boot device name.

BFLG *value*
Specify BFLG *value* to set the default boot flags. For *value*, specify a hexidecimal number of up to eight digits.

HALT *value*

Specify HALT *value* to set the processor halt code. This code determines
the default action the console program takes when the processor halts
for errors and at system startup. The program stores this default code
in nonvolatile RAM, so it is not lost across power cycles. If power to
nonvolatile RAM is lost, the program initializes this value to 3.

For *value*, specify one of the codes in Table C–3.

Table C–3   Halt Codes

Code	Description
0	Restart processor. If restart fails, reboot. If reboot fails, halt.
1	Restart processor. If restart fails, halt.
2	Reboot processor. If reboot fails, halt.
3	Halt.

LNG *value*

Specify LNG *value* to change the console language. For *value*, specify one
of the codes in Table C–4.

Table C–4   Language Codes

Code	Language
0	No setting
1	Danish
2	German
3	English
4	Spanish
5	French
6	Italian
7	Dutch
8	Finnish
9	Norwegian
10	Swedish
11	Portuguese

KBD *value*

Specify KBD *value* to set the console keyboard type for the language
you are using. For *value*, specify one of the codes in Table C–5. This
parameter is effective only for a workstation using a separate LK201
keyboard.

Table C–5   Keyboard Type Codes

Code	Type
1	American/Canadian (English)
2	Flemish
3	Canadian (French)
4	Danish
5	British
6	Finnish
7	Austrian/German
8	Italian
9	Swiss (French)
A	Swiss (German)
B	Swedish
C	Norwegian
D	French/Belgian
E	Spanish
F	Portuguese

CPU *processor-id* **ENABLE**

Specify CPU *processor-id* ENABLE to set the enable flag of the processor
specified by *processor-id*. This processor operates normally.

CPU *processor-id* **DISABLE**

Specify CPU *processor-id* DISABLE to clear the enable flag of the
processor specified by *processor-id*. This processor is excluded from
normal use.

CPU processor-id **PRIMARY ENABLE**

Specify CPU *processor-id* PRIMARY ENABLE to set the primary processor enable flag of the processor specified by *processor-id*. During startup, this processor is eligible to compete with other processors to act as the system's primary processor.

CPU processor-id **PRIMARY DISABLE**

Specify CPU *processor-id* PRIMARY DISABLE to clear the primary processor enable flag of the processor specified by *processor-id*. During startup, this processor is ineligible to compete with other processors to act as the system's primary processor.

MOP value

Specify MOP *value* to set the maintenance operation protocol (MOP) network listener control field. For *value* specify one of the codes in Table C–6.

Table C–6   MOP Network Listener Control Codes

Code	Description
0	Network listener disabled.
1	Network listener enabled, currently inactive.
2	Network listener disabled.
3	Network listener will become active in console.
	I/O mode after 30 seconds of user inactivity.

SCSI value

Specify SCSI *value* to set the default small computer systems interface (SCSI) identifier. For *value* specify a valid SCSI identifier.

XTIM value

Specify XTIM *value* to change the default timeout interval for data transfer between the console program and automatic systems. For *value*, specify the timeout interval in seconds. If you do not specify XTIM, the console program uses a timeout interval of 10 seconds.

SHOW

Specify SHOW to display the value of console program parameters.

Format

SH   *BO[OT] | BF[LG] | H[ALT] | L[NG] | K[BD] | E[THER] | ME[M] |*
     C[PU] [processor-id] | MO[P] | S[CSI] | X[TIM]

BOOT
Specify BOOT to display the default boot device. If no default device is
set, the screen displays a blank.

BFLG
Specify BFLG to display the default boot flags. If no default flags are set,
the screen displays 0.

HALT
Specify HALT to display the default halt action codes.

LNG
Specify LNG to display the default console language. The possible values
are shown in Table C–4.

KBD
Specify KBD to display the console keyboard type. The possible values
are shown in Table C–5. If the console is not a workstation, the screen
displays a blank.

ETHER
Specify ETHER to display the Ethernet hardware address. If the system
is using multiple Ethernet devices, the screen displays the hardware
address for each device. The screen also displays the virtual machine
boot (VMB) device name for each Ethernet device. If the system is not
connected to Ethernet, the screen displays a blank.

MEM
Specify MEM to display the total memory size and the address of the first
contiguous 256-Kbyte block of good memory. MEM also displays a list
of all unavailable pages (zero entries in the bitmap). The format for the
MEM parameter display is as follows:

s	Total size of available memory
m	Beginning of the 256-Kbyte block of memory
b1:e1	Beginning and ending limits of hole 1 in good memory
b2:e2	Beginning and ending limits of hole 2 in good memory
.	
.	
.	
bn:en	Beginning and ending limits of up to as many holes as there are in good memory

CPU *processor-id*

Specify CPU *processor-id* to display the status of the enable and primary enable flags for the processor specified by *processor-id*. The format for the CPU parameter display is E*n*, P*n*, where E stands for enable flag, P stands for primary enable flag, and *n* is 0 (for disabled) or 1 (for enabled).

MOP

Specify MOP to display the current value in the MOP network listener control field.

SCSI

Specify SCSI to display the SCSI bus configuration. The following is an example of the resulting display.

```
ADDR    VMB      DEVTYP  DEVNAM   NUMBYTS  REV    CHAR
-----   ------   ------  -------  -------  ----   ----
5.1.0   DKA100   DISK    RZ55     332  MB  0100
5.7              HOST    SII-A
```

- The ADDR column shows the device address in the form *module-id.device-number.logical-unit-number* for each device except the controlling SII chip. The address for this chip is in the form *module-id.device-id*.

- The VMB column shows the device name to use when designating this as the boot device.

- The DEVTYP column shows what type of device this is.

- The DEVNAM column further specifies the type.

- The NUMBYTS column gives the capacity of the device to three significant digits.

- The REV column shows the revision number, where applicable.

- The CHAR column shows device characteristics such as removable
  media (RM) or write-protected (WP).

XTIM
Specify XTIM to display the current value of the timeout interval (in
seconds) for data transer between the console program and automatic
systems.

START

Specify START to start instruction execution at the specified address.
The START command is equivalent to a DEPOSIT command with PC
specified, followed by a CONTINUE command.

Format

S   *[address]*

address
Specify *address* to start execution at a particular location. If you do
not specify an address, execution starts at the location indicated by the
current program counter.

TEST

The TEST command invokes diagnostic tests and displays the test results.

Format

T   *50 [module-id] | module-id [device-number]*

T 50
Specify T 50 to see all the modules in your system. From this list you
can take the *module-id* number to use as an optional argument. T 50
module-id shows the devices on the given module.

T module-id, *T* module-id device-number

Specify T *module-id* or T *module-id device-number* to test an individual module or device.

UNJAM

Specify UNJAM to reset all modules. For some modules, this command has no effect.

Format

Z

Specify the Z command to send characters typed at the console terminal to the console of the specified processor. Typed characters are echoed back to the console terminal.

Format

Z   *processor-id*

processor-id

For *processor-id*, specify the destination processor. You can specify only one destination processor at a time; multiprocessor forwarding is not allowed.

To terminate the Z command and return control to the console terminal, press Ctrl P.

To send Ctrl P or an escape character to the destination processor, you must precede the character with an escape character, entering it as a literal.

D

Cable and Connector Pin Assignments

This appendix lists pin assignments for the following cables and connectors in the VAXstation 3520/3540 and VAXstation 3820/3840 workstations:

- I/O cover ribbon cable

- I/O cover SCSI cable

- I/O cover module external connectors

- M-bus, Q-bus, and graphics bus connectors

- System slot and backplane connectors

- Power connector

- Control panel connector

- Loopback connectors

Table D–1   I/O Cover Ribbon Cable Pin Assignments

Pin	Signal	Pin	Signal
50	+12 V	49	+12 V
48	GND	47	GND
46	TX0	45	RX0
44	CTS2	43	GND
42	RTS	41	DTR2
40	TX1	39	RX1
38	DSR2	37	GND
36	RI2	35	CD2
34	TX2	33	RX2
32	DSRS2	31	GND
30	SPDMI2	29	TMI2
28	TX3	27	RX3
26	+5 V	25	+5 VBAT
24	LLPBK2	23	GND
22	–12 V	21	–12 V
20	MFMD0	19	MFMD1
18	LED0	17	LED1
16	LED2	15	LED3
14	TX+	13	TX–
12	LED4	11	SPARE
10	COL+	9	COL–
8	GND	7	GND
6	RX+	5	RX–
4	GND	3	GND
2	+12 V	1	+12 V

Table D–2   I/O Cover SCSI Cable Pin Assignments

Pin	Signal	Pin	Signal
50	IO	49	GND
48	REQ	47	GND
46	CD	45	GND
44	SEL	43	GND
42	MSG	41	GND
40	RST	39	GND
38	ACK	37	GND
36	BSY	35	GND
34	GND	33	GND
32	ATN	31	GND
30	GND	29	GND
28	GND	27	GND
26	TERMPWR	25	<NC>
24	GND	23	GND
22	GND	21	GND
20	GND	19	GND
18	PARITY	17	GND
16	DATA<7>	15	GND
14	DATA<6>	13	GND
12	DATA<5>	11	GND
10	DATA<4>	9	GND
8	DATA<3>	7	GND
6	DATA<2>	5	GND
4	DATA<1>	3	GND
2	DATA<0>	1	GND

Table D–3   Keyboard and Mouse/Tablet Connector (I/O Cover) Pin Assignments

Pin	Source	Signal	Description
1		GND	Keyboard ground
2	L2003	kTX0	Keyboard transmitted data
3	KEYBRD	kRX0	Keyboard received data
4	L2003	+12 V	Keyboard power
5		MONORTN	Monochrome video return
6	MOUSE	nRX1	Mouse received data
7	L2003	nTX1	Mouse transmitted data
8		GND	Mouse ground
9		GND	Keyboard power return
10		MFMD1	Manufacturing mode input
11	L2003	MONO	Monochrome video data
12		MFMD0	Manufacturing mode input
13	L2003	+5.3 V	Mouse power
14	L2003	−10 V	Mouse power
15		GND	Mouse power return

Table D–4   Communications Connector (I/O) Pin Assignments

Pin	Source	Signal	CCITT*	EIA†	Description
1		GND	101	AA	Protective ground
2	L2003	CTX2	103	BA	Modem transmitted data
3	MODEM	CRX2	104	BB	Modem received data
4	L2003	CRTS2	105	CA	Request to send
5	MODEM	CCTS2	106	CB	Clear to send
6	MODEM	CDSR2	107	CC	Data set ready

*Comite Consultatif International telegraphique et Telephonique. An international consultative committee that sets international communications usage standards.

†Electronic Industries Association.

Table D–4 (Cont.)   Communications Connector (I/O) Pin Assignments

Pin	Source	Signal	CCITT*	EIA†	Description
7		GND	102	AB	Signal ground
8	MODEM	CCD2	109	CF	Carrier detector
9					Unconnected
10					Unconnected
11					Unconnected
12	MODEM	SPDMI2	112	CI	Speed-mode indicator
13					Unconnected
14					Unconnected
15					Unconnected
16					Unconnected
17					Unconnected
18	L2003	CLLPBK2	141		Local loopback
19					Unconnected
20	L2003	CDTR2	108/2	CD	Data terminal ready
21					Unconnected
22	MODEM	CRI2	125	CE	Ring indicator
23	L2003	CDSRS2	111	CH	Data signaling rate select
24					Unconnected
25	MODEM	CTMI2	142		Test-mode indicator

*Comite Consultatif International telegraphique et Telephonique. An international consultative committee that sets international communications usage standards.

†Electronic Industries Association.

Table D–5   Printer/Console Connector (I/O) Pin Assignments

Pin	Source	Signal	Description
1	L2003	PCO	Control output
2	L2003	PTX3	Printer/console transmitted data
3	L2003	GND	Transmission ground
4	PRNTR	GND	Reception ground
5	PRNTR	PRX3	Printer/console received data
6	PRNTR	PCI	Control input

Table D–6   ThickWire Ethernet Connector (I/O) Pin Assignments

Pin	Source	Signal	Description
1			Shield
2	XCVR	ACOL+	Collision presence
3	L2003	ATX+	Transmission
4		GND	Ground
5	XCVR	ARX+	Reception
6	XCVR	GND	Power return
7		CTL+	Control output
8		GND	Ground
9	XCVR	ACOL–	Collision presence
10	L2003	ATX–	Transmission
11		GND	Ground
12	XCVR	ARX–	Reception
13	L2003	+12 V	Power
14		GND	Ground
15		CTL–	Control output

Table D–7   Buses for Slots 1–9

Slot	Buses on Pins A1–A94		Buses on Pins B1–B94	
1	J1	VI-bus	J2	VI-bus
2	J3	VI-bus	J4	VI-bus
3	J5	VI-bus	J6	M-bus
4	J7	(reserved)	J8	M-bus
5	J9	(reserved)	J10	M-bus
6	J11	(reserved)	J12	M-bus
7	J13	(reserved)	J14	M-bus
8	J15	(reserved)	J16	M-bus
9	J17	Q-bus	J18	M-bus

Table D–8   Buses for Slots 10–12

Slot	Buses on J19, J21, J23	Buses on J20, J22, J24
10	Q22-bus	Q22-bus
11	Q22-bus	Q22-bus
12	Q22-bus	Q22-bus

Table D–9   Module IDs

Slot	MID2, MID1, MID0
1	Not applicable
2	Not applicable
3	111 (7)
4	101 (5)
5	100 (4)
6	011 (3)
7	010 (2)

Table D–9 (Cont.)   Module IDs

Slot	MID2, MID1, MID0
8	001 (1)
9	000 (0)
10	Not applicable
11	Not applicable
12	Not applicable

Table D–10   M-Bus Backplane Pin Assignments (Slots 3–9, Connector B)

Pin	Signal	Pin	Signal
B1	GND	B2	BATTERY5V
B3	MCLKA	B4	GND
B5	GND	B6	+5 V
B7	MCLKB	B8	GND
B9	GND	B10	+12 V
B11	+12 V	B12	+12 V
B13	MBRQ L	B14	GND
B15	MBRM0 L	B16	MBRM1 L
B17	+5 V	B18	MBRM2 L
B19	MBRM3 L	B20	MBRM4 L
B21	MBRM5 L	B22	GND
B23	MBRM6 L	B24	MSPAR
B25	GND	B26	MSTAT0
B27	MSTAT1	B28	MIRQ0 L
B29	MIRQ1 L	B30	+5 V
B31	MIRQ2 L	B32	MIRQ3 L
B33	GND	B34	MCPAR
B35	MCMD0	B36	MCMD1

**Table D–10 (Cont.)   M-Bus Backplane Pin Assignments
(Slots 3–9, Connector B)**

Pin	Signal	Pin	Signal
B37	MCMD2	B38	GND
B39	MCMD3	B40	MRSVB40
B41	+5 V	B42	MSLOT
B43	MDPAR	B44	MID0
B45	MID1	B46	GND
B47	MID2	B48	MCLKI
B49	GND	B50	GND
B51	MDAL00	B52	MDAL01
B53	MDAL02	B54	+5 V
B55	MDAL03	B56	MDAL04
B57	GND	B58	MDAL05
B59	MDAL06	B60	MDAL07
B61	MRESET L	B62	GND
B63	MDAL08	B64	MDAL09
B65	+5 V	B66	MDAL10
B67	MDAL11	B68	MDAL12
B69	MDAL13	B70	GND
B71	MDAL14	B72	MDAL15
B73	GND	B74	MDAL16
B75	MDAL17	B76	MDAL18
B77	MDAL19	B78	+5 V
B79	MDAL20	B80	MDAL21
B81	GND	B82	MDAL22
B83	MDAL23	B84	MDAL24
B85	MDAL25	B86	GND
B87	MDAL26	B88	MDAL27
B89	+5 V	B90	MDAL28

**Table D–10 (Cont.)   M-Bus Backplane Pin Assignments
                      (Slots 3–9, Connector B)**

Pin	Signal	Pin	Signal
B91	MDAL29	B92	MDAL30
B93	MDAL31	B94	GND

**Table D–11   M-Bus Backplane Pin Assignments
                (Slots 4–8, Connector A)**

Pin	Signal	Pin	Signal
A1	GND	A2	Not used
A3	Not used	A4	Not used
A5	Not used	A6	+5 V
A7	Not used	A8	Not used
A9	GND	A10	Not used
A11	Not used	A12	Not used
A13	Not used	A14	GND
A15	Not used	A16	Not used
A17	+5 V	A18	Not used
A19	Not used	A20	Not used
A21	Not used	A22	GND
A23	Not used	A24	Not used
A25	GND	A26	Not used
A27	Not used	A28	Not used
A29	Not used	A30	+5 V
A31	Not used	A32	Not used
A33	GND	A34	
A35	Not used	A36	Not used
A37	Not used	A38	GND
A39	Not used	A40	Not used
A41	+5 V	A42	Not used

**Table D–11 (Cont.)   M-Bus Backplane Pin Assignments
(Slots 4–8, Connector A)**

Pin	Signal	Pin	Signal
A43	Not used	A44	Not used
A45	Not used	A46	GND
A47	Not used	A48	Not used
A49	GND	A50	Not used
A51	Not used	A52	Not used
A53	Not used	A54	+5 V
A55	Not used	A56	Not used
A57	GND	A58	Not used
A59	Not used	A60	Not used
A61	Not used	A62	GND
A63	Not used	A64	Not used
A65	+5 V	A66	Not used
A67	Not used	A68	Not used
A69	Not used	A70	GND
A71	Not used	A72	Not used
A73	GND	A74	Not used
A75	Not used	A76	Not used
A77	Not used	A78	+5 V
A79	−12 V	A80	−12 V
A81	GND	A82	MRUN L
A83	MRSVA83	A84	MRSVA84
A85	MDATINV L	A86	GND
A87	MBUSY L	A88	MSHARED L
A89	+5 V	A90	MABORT L
A91	BHALT L	A92	MDCOK
A93	MPOK	A94	GND

Table D–12   M-Bus MBRQ Connection per Slot

Slot	9	8	7	6	5	4	3	2
M-bus	0	1	2	3	4	5	6	7
MBRQ								
0	B13	B15	B15	B15	B15	B15	B15	B15
1	B15	B13	B16	B16	B16	B16	B16	B16
2	B16	B16	B13	B18	B18	B18	B18	B18
3	B18	B18	B18	B13	B19	B19	B19	B19
4	B19	B19	B19	B19	B13	B20	B20	B20
5	B20	B20	B20	B20	B20	B13	B21	B21
6	B21	B21	B21	B21	B21	B21	B13	B23
7	B23	B23	B23	B23	B23	B23	B23	B13

Table D–13   Q-Bus Slot Priority

Priority	Slot
Highest	10 (J19)
	11 (J21)
	12 (J23)
	12 (J24)
	11 (J22)
Lowest	10 (J20)

Table D–14   Q-Bus Backplane Pin Assignments (Slots 10–12, Connector A)

Column 1	Row	Column 2
BIRQ5	AA	+5 V
BIRQ6	AB	Not used
BDAL16	AC	GND
BDAL17	AD	+12 V

Table D–14 (Cont.)   Q-Bus Backplane Pin Assignments (Slots 10–12, Connector A)

Column 1	Row	Column 2
SSPARE1	AE	BDOUT
SSPARE2	AF	BRPLY
SSPARE3	AH	BDIN
GND	AJ	BSYNC
MSPAREA	AK	BWTBT
MSPAREA	AL	BIRQ4
GND	AM	BIAKI
BDMR	AN	BIAKO
BHALT	AP	BBS7
BREF	AR	BDMGI
Not used	AS	BDMGO
GND	AT	BINIT
PSPARE1	AU	BDAL00
Not used	AV	BDAL01

Table D–15   Q-Bus Backplane Pin Assignments (Slots 10–12, Connector B)

Column 1	Row	Column 2
BDCOK	BA	+5 V
BPOK	BB	Not Used
BDAL18	BC	GND
BDAL19	BD	+12 V
BDAL20	BE	BDAL02
BDAL21	BF	BDAL03
SSPARE8	BH	BDAL04
GND	BJ	BDAL05
MSPAREB	BK	BDAL06

Table D–15 (Cont.)   Q-Bus Backplane Pin Assignments
(Slots 10–12, Connector B)

Column 1	Row	Column 2
MSPAREB	BL	BDAL07
GND	BM	BDAL08
BSACK	BN	BDAL09
BIRQ7	BP	BDAL10
BEVENT	BR	BDAL11
Not used	BS	BDAL12
GND	BT	BDAL13
PSPARE2	BU	14
+5 V	BV	BDAL15

Table D–16   Q-Bus Backplane Pin Assignments
(Slot 9, Connector A)

Pin	Signal	Pin	Signal
A1	GND	A2	BIRQ5
A3	Not used	A4	BIRQ6
A5	Not used	A6	+5 V
A7	BDAL16	A8	Not used
A9	GND	A10	BDAL17
A11	Not used	A12	BDOUT
A13	Not used	A14	GND
A15	BRPLY	A16	Not used
A17	+5 V	A18	BDIN
A19	Not used	A20	BSYNC
A21	Not used	A22	GND
A23	BWTBT	A24	Not used
A25	GND	A26	BIRQ4
A27	Not used	A28	BIAK01

**Table D–16 (Cont.)   Q-Bus Backplane Pin Assignments
(Slot 9, Connector A)**

Pin	Signal	Pin	Signal
A29	BDMR	A30	+5 V
A31	BBS7	A32	BREF
A33	GND	A34	BDMGO1
A35	BINIT	A36	BDAL00
A37	BDAL01	A38	GND
A39	Not used	A40	Not used
A41	+5 V	A42	BDAL18
A43	BDAL19	A44	BDAL20
A45	BDAL02	A46	GND
A47	BDAL21	A48	BDAL03
A49	GND	A50	BDAL04
A51	BDAL05	A52	Not used
A53	BDAL06	A54	+5 V
A55	BDAL07	A56	Not used
A57	GND	A58	BDAL08
A59	BSACK	A60	BDAL09
A61	Not used	A62	GND
A63	BIRQ7	A64	Not used
A65	+5 V	A66	BDAL10
A67	BEVENT	A68	BDAL11
A69	Not used	A70	GND
A71	BDAL12	A72	BDAL13
A73	GND	A74	BDAL14
A75	Not used	A76	BDAL15
A77	Not used	A78	+5 V
A79	−12 V	A78	−12 V
A81	GND	A82	MRUN L

Table D–16 (Cont.)   Q-Bus Backplane Pin Assignments (Slot 9, Connector A)

Pin	Signal	Pin	Signal
A83	MRSVA83	A84	MRSVA84
A85	MDATINV L	A86	GND
A87	MBUSY L	A88	MSHARED L
A89	+5 V	A90	MABORT L
A91	BHALT L	A92	BDCOK
A93	BPOK	A94	GND

Table D–17   Graphics Backplane Pin Assignments (Slot 3, Connector A)

Pin	Signal	Pin	Signal
A1	GND	A2	BUFVI31 H
A3	BUFVI30 H	A4	BUFVI29 H
A5	BUFVI28 H	A6	+5 VA
A7	BUFVI27 H	A8	BUFVI26 H
A9	GND	A10	BUFVI25 H
A11	BUFVI24 H	A12	BUFVI23 H
A13	BUFVI22 H	A14	GND
A15	BUFVI21 H	A16	BUFVI20 H
A17	+5 VA	A18	BUFVI19 H
A19	BUFVI18 H	A20	BUFVI17 H
A21	BUFVI16 H	A22	GND
A23	BUFVI15 H	A24	BUFVI14 H
A25	GND	A26	BUFVI13 H
A27	BUFVI12 H	A28	BUFVI11 H
A29	BUFVI10 H	A30	+5 VA
A31	BUFVI09 H	A32	BUFVI08 H
A33	GND	A34	BUFVI07 H

**Table D–17 (Cont.)   Graphics Backplane Pin Assignments
(Slot 3, Connector A)**

Pin	Signal	Pin	Signal
A35	BUFVI06 H	A36	BUFVI05 H
A37	BUFVI04 H	A38	GND
A39	BUFVI03 H	A40	BUFVI02 H
A41	+5 VA	A42	BUFVI01 H
A43	BUFVI00 H	A44	BUFBM3 L
A45	BUFBM2 L	A46	GND
A47	BUFBM1 L	A48	BUFBM0 L
A49	GND	A50	BUFWR L
A51	DATAS L	A52	BUFDS L
A53	GRSVA53 H	A54	+5 VA
A55	GRSVA55 H	A56	GRSVA56 H
A57	GND	A58	GRSVA58 H
A59	GRSVA59 H	A60	GRSVA60 H
A61	GRSVA61 H	A62	GND
A63	GRSVA63 H	A64	INIT L
A65	+5 VA	A66	GRSVA66 H
A67	GRSVA67 H	A68	GRSVA68 H
A69	GRSVA69 H	A70	GND
A71	Not used	A72	Not used
A73	GND	A74	Not used
A75	GRSVA75 H	A76	Not used
A77	Not used	A78	+5 VA
A79	−12 V	A80	−12 V
A81	GND	A82	MRUN L
A83	MRSVA83 H	A84	MRSVA84 H
A85	MDATINV L	A86	GND
A87	MBUSY L	A88	MSHARED L

**Table D–17 (Cont.)   Graphics Backplane Pin Assignments
(Slot 3, Connector A)**

Pin	Signal	Pin	Signal
A89	+5 VA	A90	MABORT L
A91	BHALT L	A92	MDCOK H
A93	MPOK H	A94	GND

**Table D–18   Graphics Backplane Pin Assignments
(Slots 1–2, Connector A)**

Pin	Signal	Pin	Signal
A1	GND	A2	BUFVI31 H
A3	BUFVI30 H	A4	BUFVI29 H
A5	BUFVI28 H	A6	+5 VA
A7	BUFVI27 H	A8	BUFVI26 H
A9	GND	A10	BUFVI25 H
A11	BUFVI24 H	A12	BUFVI23 H
A13	BUFVI22 H	A14	GND
A15	BUFVI21 H	A16	BUFVI20 H
A17	+5 VA	A18	BUFVI19 H
A19	BUFVI18 H	A20	BUFVI17 H
A21	BUFVI16 H	A22	GND
A23	BUFVI15 H	A24	BUFVI14 H
A25	GND	A26	BUFVI13 H
A27	BUFVI12 H	A28	BUFVI11 H
A29	BUFVI10 H	A30	+5 VA
A31	BUFVI09 H	A32	BUFVI08 H
A33	GND	A34	BUFVI07 H
A35	BUFVI06 H	A36	BUFVI05 H
A37	BUFVI04 H	A38	GND
A39	BUFVI03 H	A40	BUFVI02 H

**Table D–18 (Cont.)   Graphics Backplane Pin Assignments
(Slots 1–2, Connector A)**

Pin	Signal	Pin	Signal
A41	+5 VA	A42	BUFVI01 H
A43	BUFVI00 H	A44	BUFBM3 L
A45	BUFBM2 L	A46	GND
A47	BUFBM1 L	A48	BUFBM0 L
A49	GND	A50	BUFWR L
A51	DATAS L	A52	BUFDS L
A53	GRSVA53 H	A54	+5 VA
A55	GRSVA55 H	A56	GRSVA56 H
A57	GND	A58	GRSVA58 H
A59	GRSVA59 H	A60	GRSVA60 H
A61	GRSVA61 H	A62	GND
A63	GRSVA63 H	A64	INIT L
A65	+5 VA	A66	GRSVA66 H
A67	GRSVA67 H	A68	GRSVA68 H
A69	GRSVA69 H	A70	GND
A71	MX23B3 H	A72	MX23B2 H
A73	GND	A74	MX23B1 H
A75	GRSVA75 H	A76	MX23B0 H
A77	NIBCLK H	A78	+5 VA
A79	−12 V	A80	−12 V
A81	GND	A82	MX22B3 H
A83	MX22B2 H	A84	MX22B1 H
A85	CMP5 H	A86	GND
A87	CMP4 H	A88	CMP3 H
A89	+5 VA	A90	CMP2 H
A91	CMP1 H	A92	CMP0 H
A93	MPOK H	A94	GND

**Table D–19   Graphics Backplane Pin Assignments
(Slots 1–2, Connector B)**

Pin	Signal	Pin	Signal
B1	GND	B2	Not used
B3	MX22B0 H	B4	GND
B5	GND	B6	+5 VA
B7	MX21B3 H	B8	GND
B9	GND	B10	+12 VA
B11	+12 VA	B12	+12 VA
B13	MX21B2 H	B14	GND
B15	MX21B1 H	B16	MX21B0 H
B17	+5 VA	B18	MX20B3 H
B19	MX20B2 H	B20	MX20B1 H
B21	MX20B0 H	B22	GND
B23	MX19B3 H	B24	MX19B2 H
B25	GND	B26	MX19B1 H
B27	MX19B0 H	B28	MX18B3 H
B29	MX18B2 H	B30	+5 VA
B31	MX18B1 H	B32	MX18B0 H
B33	GND	B34	MX17B3 H
B35	MX17B2 H	B36	MX17B1 H
B37	MX17B0 H	B38	GND
B39	MX16B3 H	B40	MX16B2 H
B41	+5 VA	B42	VISLOT H
B43	MX16B1 H	B44	MID0
B45	MID1	B46	GND
B47	MID2	B48	MX16B0 H
B49	GND	B50	GND
B51	MX15B3 H	B52	MX15B2 H
B53	MX15B1 H	B54	+5 VA

Table D–19 (Cont.)   Graphics Backplane Pin Assignments (Slots 1–2, Connector B)

Pin	Signal	Pin	Signal
B55	MX15B0 H	B56	MX14B3 H
B57	GND	B58	MX14B2 H
B59	MX14B1 H	B60	MX14B0 H
B61	MRESET	B62	GND
B63	MX13B3 H	B64	MX13B2 H
B65	+5 VA	B66	MX13B1 H
B67	MX13B0 H	B68	MX12B3 H
B69	MX12B2 H	B70	GND
B71	MX12B1 H	B72	MX12B0 H
B73	GND	B74	MX11B3 H
B75	MX11B2 H	B76	MX11B1 H
B77	MX11B0 H	B78	+5 VA
B79	MX10B3 H	B80	MX10B2 H
B81	GND	B82	MX10B1 H
B83	MX10B0 H	B84	MX09B3 H
B85	MX09B2 H	B86	GND
B87	MX09B1 H	B88	MX09B0 H
B89	+5 VA	B90	MX08B3 H
B91	MX08B2 H	B92	MX08B1 H
B93	MX08B0 H	B94	GND

Table D–20   Power Connector Pin Assignments (Connector J25)

Pin	Signal	Pin	Signal
1	FANAPLUS	2	FANAMINUS
3	FANBPLUS	4	FANBMINUS
5	+5 VA	6	+5 VA

Table D–20 (Cont.)   Power Connector Pin Assignments (Connector J25)

Pin	Signal	Pin	Signal
7	+5 VA	8	+5 VA
9	+5 VA	10	+5 VA
11	+5 VA	12	+5 VA
13	+5 VA	14	+5 VA
15	+5 VA	16	+5 VA
17	+5 VA	18	+5 VA
19	+5 VA	20	+5 VA
21	+5 VA	22	GND
23	GND	24	GND
25	GND	26	GND
27	GND	28	GND
29	GND	30	GND
31	GND	32	GND
33	GND	34	GND
35	GND	36	GND
37	GND	38	GND
39	GND	40	GND
41	GND	42	GND
43	GND	44	GND
45	GND	46	GND
47	GND	48	GND
49	+12 VA	50	+12 VA
51	+12 VA	52	+12 VA
53	+12 VA	54	MDCOK
55	BEVENT L	56	MPOK

Table D–21   Fan Connector Pin Assignments (Connector J26)

Pin	Signal
1	FANAPLUS
2	No signal (used for keying)
3	FANAMINUS
4	FANBPLUS
5	FANBMINUS

Table D–22   DCOK Connector Pin Assignments (Connector J27)

Pin	Signal	Pin	Signal
1	+5 VA	2	+5 VA
3	BHALT L	4	GND
5	GND	6	GND
7	MPOK	8	Not used
9	MDCOK	10	MRUN L

Table D–23   Power Connector Pin Assignments (Connector J29)

Pin	Signal	Pin	Signal
1	Not used	2	Not used
3	Not used	4	Not used
5	+5 VB	6	+5 VB
7	+5 VB	8	+5 VB
9	+5 VB	10	+5 VB
11	+5 VB	12	+5 VB
13	+5 VB	14	+5 VB
15	+5 VB	16	+5 VB
17	+5 VB	18	+5 VB
19	+5 VB	20	+5 VB
21	+5 VB	22	GND

Table D–23 (Cont.)   Power Connector Pin Assignments (Connector J29)

Pin	Signal	Pin	Signal
23	GND	24	GND
25	GND	26	GND
27	GND	28	GND
29	GND	30	GND
31	GND	32	GND
33	GND	34	GND
35	GND	36	GND
37	GND	38	GND
39	GND	40	GND
41	GND	42	GND
43	GND	44	GND
45	GND	46	GND
47	GND	48	GND
49	+12 VB	50	+12 VB
51	+12 VB	52	+12 VB
53	+12 VB	54	MDCOK
55	+12 VB	56	MPOK

Table D–24   Summary of Loopback Connectors

Function	Standard/Unique	Part Number	Option Number
Printer/console loopback	Standard	12-25083-01	H3103
Communications loopback	New part	12-15336-13	H3200
ThickWire loopback	Standard	12-22196-02	N/A
ThinWire T-connector	Standard	12-25869-01	H8223
ThinWire terminator	Standard	12-26318-01	H8225

Table D–25   Printer/Console Loopback Connector Pin Assignments

From Pin No.	Signal	To Pin No.	Signal	Description
P1-1	CO	P1-6	CI	Control loopback
P1-2	TX+	P1-5	RX+	Data loopback
P1-3	TX-	P1-4	RX-	Signal ground

Table D–26   Modem Loopback Connector Pin Assignments

From Pin No.	Signal	To Pin No.	Signal
P4-2	TX2	P4-3	RX2
P4-4	RTS2	P4-5	CTS2
P4-6	DSR2	P4-20	DTR2
P4-12	SPDMI2	P4-23	DSRS2
P4-18	LLPBK2	P4-8	CI2
P4-18	LLPBK2	P4-22	RI2
P4-18	LLPBK2	P4-25	TMI2

Table D–27   Ethernet Loopback Connector Pin Assignments

From Pin No.	Signal	To Pin No.	Signal	Description
P6-3	TRA+	P6-5	REC+	Through capacitor
P6-10	TRA-	P6-12	REC-	Through capacitor
P6-13	PWR	P6-6	RET	Through resistor and LED

E
Interpreting LED Displays

This appendix explains the LED displays for the following items:

- Graphics subsystem

- Memory module

- CPU module

- I/O module

- Tape adapter module

- Tape drive controller module (TQK70)

- Tape drive (TK70)

- Optical compact disc drive (RRD40)

- Power supply

E.1   Graphics Subsystem LEDs

The graphics subsystem has one green LED on each module and a set of red LEDs on the graphics frontplane.

If a module is operating correctly, the module's green LED turns on. If the system detects an error in a graphics module, the red LEDs display an error code.

Table E–1 explains graphics error codes displayed by red LEDs.

Table E–1   Graphics Frontplane LED Error Displays

Display				Meaning
o	o	o	o	No power or faulty LEDs
o	o	o	●	Bad subsystem configuration
o	o	●	o	Faulty expansion module
o	o	●	●	Unused
o	●	o	o	Faulty output module
o	●	o	●	Unexpected interrupt
o	●	●	o	Faulty output or expansion module
o	●	●	●	Unused
●	o	o	o	Faulty base module
●	o	o	●	Restart error
●	o	●	o	Faulty base or expansion module
●	o	●	●	Insufficient capacity outside graphics subsystem
●	●	o	o	Faulty base or output module
●	●	o	●	Faulty VDAC comparator
●	●	●	o	Faulty base, output, or expansion module
●	●	●	●	Catastrophic failure, power-up fault

● = on.
o = off.

E.2 Memory Module LEDs

Each memory module has one red and one yellow LED. Table E–2 explains memory module LED displays.

Table E–2   Memory Module LED Error Displays

Red LED	Yellow LED	Meaning
o	o	No power to module or faulty LEDs.
●	●	Test not started.
●	o	Failed test or test not completed.
o	●	Test passed, no error detected.

● = on.
o = off.

E.3 CPU Module LEDs

Each CPU module has one green LED and two sets of red LEDs, one set for each CPU in the module. The green LED turns on if both CPUs are operating correctly. If a CPU fails the self-test, the green LED does not turn on and the failed CPU's red LEDs display an error code. Table E–3 explains the CPU red LED displays.

Table E–3   CPU Module Error Displays

Display				Failed Test
o	o	o	o	No error detected or no power to module.
o	o	o	●	Primary in diagnostic executive.
o	o	●	o	Jump to console.
o	o	●	●	Build data and signal secondaries to exit first wait loop.
o	●	o	o	Secondary in diagnostic executive wait loop.
o	●	o	●	Primary builds root configuration table.
o	●	●	o	Primary rebuild cache top of memory.
o	●	●	●	Secondaries exit wait loop and jump to console.

● = on.
o = off.

Table E–3 (Cont.)   CPU Module Error Displays

Display				Failed Test
●	o	o	o	Primary processor determination, secondary wait loop.
●	o	o	●	Search M-bus, save modtypes on stack, find I/O board.
●	o	●	o	Map cache.
●	o	●	●	Cache test, parity enabled.
●	●	o	o	Cache TAG test.
●	●	o	●	FPU test.
●	●	●	o	FBIC register test.
●	●	●	●	Power-on condition.

● = on.
o = off.

E.4   I/O Module LEDs

The I/O module has one green LED. This LED turns on if the I/O module is operating correctly. If the LED does not tun on, there is a problem in the module—the module has no power, or the LED is faulty.

E.5   Tape Adapter Module LEDs

The tape adapter module has one green LED and a set of red LEDs. The green LED turns on if the tape adapter module is operating correctly. If the system detects a tape adapter module fault, the red LEDs display an error code. Table E–4 explains the tape adapter module red LED displays.

Table E–4   Tape Adapter Module LED Displays

Display				Failed Test
●	o	●	●	Doorbell interrupt.
●	●	o	●	FBIC register verify error.
●	●	●	o	FBIC register miscompare occurred.

● = on.
o = off.

E.6   Tape Drive Controller Module (TQK70) LEDs

The tape drive controller module has two LEDs. If the LEDs do not turn
on, there is no power to the module. The LEDs flash alternately if there
is a problem in communication between the tape drive controller and the
tape adapter module.

E.7   Tape Drive (TK70) LEDs

The front of the tape drive has three LEDs. Table E–5 explains possible
LED displays.

Table E–5   TK70 Tape Drive LED Displays

LED	Condition	Meaning
Green	On	You can operate the handle.
	Off	Do not operate the handle.
	Flashing	The cartridge is defective.
Yellow	On	The drive is ready.
	Flashing	The drive is in use.
Orange	On	The tape is write-protected.
	Off	The tape is writable.
All three	Flashing	A drive fault exists. Press the Unload switch to attempt resetting.

E.8   Optical Compact Disc Drive (RRD40) LEDs

The optical compact disc drive has a green power indicator LED and a
green activity indicator LED. The power indicator turns on when the
optical compact disc drive power is on. The activity indicator turns on
when a disc is correctly loaded in the RRD40 drive. The activity indicator
flashes when the disc is transferring data.

E.9 Power Supply LEDs

Each power supply has one green LED. The green LED on each power supply turns on if the power supply is operating correctly. If neither power supply LED is on, the power filter is probably faulty. The green DCOK LED on the front panel turns on if the entire power supply system is operating correctly.

F
SCSI and SSC Test Numbers and Utilities

F.1   SCSI Test Numbers

Comprehensive self-test

Invokes tests 0 through 9, the same as during power-up.

Test 0: SII Register Test

Verifies that the SII is present at expected addresses and that all read/write bits can be written to 1 and 0.

Test 1: RAM Buffer Data Path Test

Verifies the data path from the CPU to the disk RAM buffer.

Test 2: RAM Buffer Data Access Path

Verifies that the RAM buffer can be accessed in longword, word, and byte modes without modifying data that is not addressed.

Test 3: RAM Buffer Address/Data Test

Verifies that the entire RAM buffer can be written, a longword at a time, without changing other data.

Test 4: SII Internal Loopback Test, SII Selection of Host

Verifies SII chip operation as an initiator selecting another device.

Test 5: SII Internal Loopback Test, Host Reselection of SII

Verifies SII operation as an initiator being reselected by another device.

Test 6: SII Internal Loopback Test, Host Selection of SII

Verifies SII operation as a target being selected by some other initiator.

Test 7: SII DMA Address and Byte Counter Test

Verifies SII DMA transfer capability.

Test 8: SII Interrupt Test 22

Verifies SII interrupts.

Test 9: SII External Loopback Test/Device Self-Test

Verifies the SCSI bus by checking for an installed loopback connector and checking the IDs of devices on the SCSI bus.

Extended information summaries are one line per device in the following format:

    mid.id.lun(*ttcuuu*) *errmsg*

mid	Represents the M-bus ID of the module containing the SII.
id	Represents the SCSI device ID.
lun	Represents the SCSI device's logical unit number(LUN).
tt	Will be DK for devices supported by VMB, and *xx* for others.
c	Represents the controller letter assigned to this SII.
uuu	Represents the unit number to be used when issuing utility commands that require a unit number, or when booting.
errmsg	This field has two possible values. An STERR message indicates a self-test command successfully executed but received a medium or hardware error. An NOST message is used for any other error. In both cases, the standard extended status for a SCSI error follows on the same line.

Here is a sample display:

❶ 5.1.0(DKA100)   NOST, OP = 1D, SNS = 2, ASNS = 04
❷ 5.7.0(DKA700)   STERR, OP = 1D, SNS = 3, ASNS = 11

❶ The first line indicates that the drive was not ready.

❷ The second line indicates that the medium had a nonrecoverable read error.

F.2   SCSI Utilities

SCSI utility commands perform functions necessary for the SCSI self-test. The following sections expain SCSI utility commands.

Utility 100: Show SCSI for One I/O Module

This utility generates information lines containing device address, that device's VMB name, device type, name, capacity, and characteristics.

Format

T   *mid 4 100 [unit] [full]*

unit

Indicates the unit number of a SCSI device in a SHOW SCSI command. The default setting is to show all units on this I/O module. Specifying FFFF also selects all units.

full

Specifies whether a full or partial listing is displayed, as follows:

0   Brief listing. (Default setting if no unit is specified.)

1   Full listing. (Default setting if a unit is specified.)

The following is a sample display of a brief listing:

```
❶         ❷         ❸        ❹        ❺         ❻      ❼
ADDR      VMB       DEVTYP   DEVNAM   NUMBYTS   REV    CHAR
-----     ------    ------   -------  -------   ----   ----
5.1.0     DKA100    DISK     RZ55     332  MB   0500
5.3.0     DKA300    DISK     RZ56     665  MB   0100
5.4.0     DKA400    RODISK   RRD40    599  MB   210D   RM,WP
5.6                 HOST     SII-A
5.7.0     DKA700    DISK     RZ23     104  MB   0610
```

❶ The ADDR column indicates the device address (*mid.id.lun*). The special case of *mid.lun* is for the SII chip controlling this SCSI bus and is always followed by the string SII-*c*, where *c* is the controller letter assigned to this I/O module.

❷ The VMB column indicates the device name to use with VMB. If the
   first two letters are *xx*, then VMB does not yet know about this device
   type.

❸ The DEVTYP column indicates the device type.

❹ DEVNAM is the device name.

❺ The NUMBYT column indicates the capacity of the device in bytes, to
   three digits of precision.

❻ The CHAR column contains optional device characteristics. RM is
   present if the device has removable media. WP is present if the device
   is write-protected. The question mark (?) following the WP indicates
   that the write-protect status could not be determined.

Optionally, a full listing can be generated. The following is a sample full
listing:

```
 ADDR    VMB       DEVTYP  DEVNAM   NUMBYTS  REV   CHAR
 -----   ------    ------  -------  -------  ----  ----
 5.1.0   DKA100  DISK    RZ55     332  MB  0100
❶       VID: DEC        PID: RZ55    (C) DEC
❷  ANSI = 1, ECMA = 0, ISO = 0, RSPDATFMT = 1

 5.3.0   DKA300  DISK    RZ55     332  MB  0500
         VID: DEC        PID: RZ55    (C) DEC
   ANSI = 1, ECMA = 0, ISO = 0, RSPDATFMT = 1

 5.4.0   DKA400  RODISK  RRD40    599  MB  210D  RM,WP
         VID: DEC        PID: RRD40     TM DEC
   ANSI = 1, ECMA = 0, ISO = 0, RSPDATFMT = 1

 5.6             HOST    SII–A

 5.7.0   DKA700  DISK    RZ23     104  MB  0610
         VID: DEC        PID: RZ23    (C) DEC
   ANSI = 1, ECMA = 0, ISO = 0, RSPDATFMT = 1
```

❶ The second line of output for each device lists the vendor identification
   (VID) and product identification (PID) strings from the INQUIRY
   command. The second line of output is only included if the *full*
   argument is 1.

❷ The third line indicates the conformance level of this device. The
   values following ANSI, ECMA, and ISO, indicate the conformance
   level with respect to the indicated standards. A 0 indicates no
   conformance to the indicated standards. RSPDATFMT indicates
   the response data format.

Utility 102: Spin Drive Up or Down

This utility spins the drive up or down as requested.

Format

T   *mid 4 102 unit*

Unit

Unit is the unit number of the SCSI device to start or stop:

1   Start (spin up, default setting).

0   Stop (spin down).

You do not need to use this command before other utility commands, since they will spin the drive up when necessary. This utility waits a maximum of 100 seconds for the drive to complete the start or stop command.

Either of the following conditions cause the TEST UNIT READY command, followed by the START command, to loop forever:

• Loop-on-error is set and an error occurs during the TEST UNIT READY or START UNIT command.

• Loop-on-test is set.

The command loops forever unless TEST UNIT READY reports ready.

Utility 103: Write/Read/Compare Blocks on Device

This utility writes, reads, and compares 8 Kbytes, starting at block 0 and then at the *block* specified in the command. Any compare errors are indicated. You can repeat this command to allow for acoustical testing of drives.

Format

T   *mid4 103 unit [block] [pattern]*

unit

Indicates the unit number of the SCSI device on which to perform the
write/read/compare operation.

block

Indicates the target block for the second write/read/compare operation.
The default target is the last blocks on the device.

pattern

Specifies a value from 0_{16} to FF_{16}. This value is used as the data pattern
for each byte of the write/read/compare operation. The default pattern is
55_{16}.

This command can alter the user data. If the system is in user mode
and write operations are disabled in user mode, an error is returned.
Otherwise, the following prompt appears:

```
%SCSI-I-DEVINF, 3.1.0 DKA100 DISK RZ55    332 MB 0500

%SCSI-W-WRTUSRDAT
%SCSI-Q-RUSURE?
```

At this point, you can type **yes** to proceed with the command execution.
Typing no or pressing Ctrl C or Return aborts the command.

Either of the following conditions cause the test to loop forever during the
read/write/compare operation:

- Loop-on-error is set and (1) an error occurs during the read or write
  operations, or (2) the compare operation fails.

- Loop-on-test is set.

NOTE
**This command is designed to work with direct-access SCSI
devices. Using this command with devices other than direct-
access SCSI devices can yield unpredictable results.**

Utility 104: Format Unit

This utility formats the specified unit, using all specified current or default parameters. You cannot specify additional defective blocks.

Format

T   *mid 4 104 unit [cur/def]*

unit
Indicates the unit number of the SCSI device to format.

cur/def
Lets you specify the current or default parameters.

1   Use the current format parameters (default setting).

0   Use the default format parameters.

This command can alter user data. If the system is in customer service mode and write operations are disabled, an error is returned. Otherwise, the following prompt appears:

```
%SCSI-I-DEVINF, 3.1.0 DKA100 DISK RZ55    332 MB 0500

%SCSI-W-WRTUSRDAT
%SCSI-Q-RUSURE?
```

Type **yes** to proceed with the command. Typing no or pressing Ctrl C or Return aborts the command.

The system displays the type of parameters, current or default, before the command proceeds:

```
%SCSI-I-DEFFMTPAR
      or
%SCSI-I-CURFMTPAR
```

Formatting is a time-consuming operation that destroys the data on the disk. For this reason, the system prompts you to confirm that you want to format the unit:

```
%SCSI-I-RDYFMT
%SCSI-Q-RUSURE?
```

To proceed with the format operation, type **yes**. The message `%SCSI-I-FMTUNIT...` confirms that the unit is being formatted.

To cancel the command without modifying the data on the device, enter no or press Ctrl C or Return .

This command waits upto 60 minutes for the format command to complete. Upon successful completion, a `complete` message appears on the screen.

NOTE
This command is designed to work with direct-access SCSI devices. Using this command devices with other than direct-access SCSI devices can yield unpredictable results.

Utility 106: Self-Test

This utility performs a send diagnostic command with the slftst bit (and optionally the unitof1 bit) asserted.

Format

T   *mid 4 106 unit [unitofl]*

unit
Indicates the unit number of the SCSI device on which to perform the self-test command.

unitof1
Indicates the unit off-line bit setting.

1   Set unitof1 bit.

0   Do not set unitof1 bit (default setting).

NOTE
Setting the *unitof1* bit to 1 may allow writing to user data.

This command can alter user data. If the system is in Customer Services mode and write operations are disabled, an error is returned. Otherwise, the following prompt appears:

```
%SCSI-I-DEVINF, 3.1.0 DKA100 DISK RZ55    332 MB 0500

%SCSI-W-WRTUSRDAT
%SCSI-Q-RUSURE?
```

To proceed with the command, type **yes**.

To cancel the command, enter no or press Ctrl C or Return .

The test waits upto 10 minutes for the self-test command to complete.

Either of the following conditions cause the test to loop forever while executing the Send Diagnostic command:

- Loop-on-error is set and an error occurs during the Send Diagnostic command.

- Loop-on-test is set.

Utility 107: Perform Seeks on Device

This utility performs a seek to logical block 0, then to the logical block specified in the command. You can repeat this command to allow for acoustical testing of drives.

Format

T *mid 4 107 unit [block]*

unit
Indicates the unit number of the SCSI device on which to perform the seek operation.

block
Indicates the target block for second seek operation. The default is the last block on the device.

Either of the following conditions cause the test to loop forever while executing the seek operation:

- Loop-on-error is set and an error occurs during the seek command.

- Loop-on-test is set.

Press Ctrl C to stop the utility.

NOTE
**This command is designed to work with direct-access SCSI
devices. Using this command with devices other than direct-
access SCSI devices can yield unpredictable results.**

Utility 108: Read Capacity

This utility executes a Read Capacity command, then reports the returned
data.

Format

T   *mid 4 108 unit*

unit
Indicates the unit number of the SCSI device on which to perform read
capacity operation.

Here is a sample output:

```
❶ BLKSIZ = 00000200
❷ MAXBLK = 0009E74F
```

❶   BLKSIZ indicates the size of the blocks on the SCSI device in bytes
     (hexadecimal).

❷   MAXBLK indicates the maximum logical block number (hexadecimal)
     addressable on the SCSI device.

Either of the following conditions causes the test to loop forever while
executing the Read Capacity command:

•   Loop-on-error is set and an error occurs during the Read Capacity
    command.

•   Loop-on-test is set.

In either case, the normal output is not generated. Press Ctrl C to stop the
utility.

Utility 10B: Write/Read/Compare Every Block on Disk and Reassign Bad Blocks

This command writes, reads, and compares all blocks on the device. If a media error (sense key 3) occurs during the write or read operation, or the compare operation fails, a reassign block command is executed specifying the failing block. Any other errors are reported. Errors while mapping out bad blocks do not terminate the operation.

Format

T   *mid 4 10B unit [pattern]*

unit
Indicates the unit number of the device on which to map bad blocks.

pattern
Used as the data pattern for each byte of the write/read/compare operation. Specify value from 0_{16} to FF_{16}. The default setting is 55_{16}.

This command can alter user data. If the system is in customer service mode and write operations are disabled in user mode, an error is returned. Otherwise, the following prompt appears:

```
%SCSI-I-DEVINF, 3.1.0 DKA100 DISK RZ55    332 MB 0500

%SCSI-W-WRTUSRDAT
%SCSI-Q-RUSURE?
```

To proceed with the command, type **yes**.

To stop the command, enter **no** or press Ctrl C or Return.

The message `%SCSI-I-MAPPNGBADBLKS...` confirms that the command is in progress.

The following is a sample dialog:

```
CPU10>> T 5 4 10B 100
%SCSI-I-DEVINF, 3.1.0 DKA100 DISK RZ55    332 MB 0500
```

```
%SCSI-W-WRTUSRDAT
%SCSI-Q-RUSURE? Y
%SCSI-I-MAPPNGBADBLKS...
%SCSI-E-RDERR, LBN = 000F1234
%SCSI-E-STS = D2
%SCSI-I-EXTSTS, OP = 2A, SNS = 3, ASNS = 11, INF = 000F123
%SCSI-I-BLKREASS
%SCSI-I-BADBLKS = 1
%SCSI-I-REASSBLKS = 1
%SCSI-I-ERRBLKS = 0
%SCSI-S-STS = 01
CPU10 >>>
```

NOTE
**This command is designed to work with direct-access SCSI
devices. Using this command with devices other than direct-
access SCSI devices can yield unpredictable results.**

Utility 1FF: Set User Write Enable Bit

This utility sets the state of the user write enable bit for the SCSI bus
on the I/O module specified by the module ID. SCSI buses on other I/O
modules are not affected.

Format

T   *mid 4 1FF enb/dis*

enb/dis

Enables or disables user write operations.

0   Disable user write operations. In user mode, do not allow commands
            that can alter user data.

1   Enable user write operations. In user mode, allow commands that can
            alter user data.

Even when the write bit is enabled, commands that can alter user data
still require confirmation before the system attempts the operation.

F.3   System Support Chip (SSC) Tests

The following section describes each system support chip (SSC) self-test. Because the meaning of each error code value is different for each SSC test, each test number entry explains the SSC error codes generated by that test. All SSC self-tests run in customer or field service mode.

SSC self-tests do not require loopback connectors.

Test 0: Test Format Errors

The self-test reports a test format error if a test command is invalid. The code shows the test number as 0 for these errors. An error of this type indicates that the desired test was not executed.

Table F–1 shows the possible codes for test 0.

Table F–1   Test Format Error Codes

Error Code	Meaning
00000010	Mode bits are invalid. (Both field service and Manufacturing bits were set).
00000020	Wrong number of arguments passed by T command.
00000030	Invalid test number passed by T command.
00000040	Test cannot be performed in the present mode.

Test 1: Programmable Timer Register

The timer next interval (TNIR) and the timer interrupt vector (TIV) registers are written/read/compared with various patterns.

Table F–2 shows the possible error codes for test 1.

Table F–2   Programmable Timer Error Codes

Error Code	Meaning
1	SSC base register was not initialized properly.
2	Timer interrupt vector (TIV) register write/read back error.
3	Timer next interval register (TNIR) write/read back error.

Probable cause for failure: The SSC or the pathway to the SSC.
Probable failed FRU: I/O module.

Test 2: Programmable Timers Transfer Bit

This test exercises the programmable timer transfer bit in the timer control register (TCR). Table F–3 shows the possible error codes for test 2.

Table F–3   Timer Transfer Error Codes

Error Code	Meaning
1	SSC base register was not initialized properly.
2	TNIR changed after run bit in TCR was set.
3	Transfer did not occur correctly.

Probable cause: SSC or the pathway to the SSC (assuming the previous tests have passed).
Probable failed FRU: The I/O module.

Test 3: Programmable Timers Run Bit

This test exercises the timer control register (TCR) run bit. Table F–4 shows the possible error codes for test 3.

Table F–4   Timer Run Bit Error Codes

Error Code	Meaning
1	SSC base register was not initialized properly.
2	Timer is not incrementing.
3	Timer is running with the run bit clear.
4	Run bit did not clear upon overflow of timer with stop bit set.
5	Timer not clear after timer overflow and stop step.
6	Run bit cleared upon overflow of timer with stop bit clear.
7	Either the timer is incrementing unexpectedly or TNIR did not transfer.

Probable cause: The SSC or the pathway to the SSC (assuming the previous tests have passed).
Probable failed FRU: The I/O module.

Test 4: Programmable Timer Single Step

This test exercises the timer control register (TCR) single-step bit.
Table F–5 shows the possible error codes for test 4.

Table F–5   Timer Single-Step Error Codes

Error Code	Meaning
1	SSC base register was not initialized properly.
2	Time out on ss interval.
3	TIR != TNIR upon (overflow and stop bit set).
4	TIR != TNIR upon (overflow and stop bit clear).
5	Run bit set unexpectedly.
6	TIR not incrementing.

Probable cause: The SSC or the pathway to the SSC (assuming the
previous tests have passed).
Probable failed FRU: The I/O module.

Test 5: Programmable Timer Interrupt

This test exercises the programmable timer in interrupt mode. Table F–6
shows the possible error codes for test 5.

Table F–6   Timer Interrupt Error Code

Error Code	Meaning
1	SSC base register was not initialized properly.
2	Interrupt time out error.
3	Interrupt enable bit does not work in disable mode.
4	FBIC CSR IRGEN bit (for IPL 14) does not work.
5	Either TIR is incrementing unexpectedly or TNIR did not transfer.
6	Wrong IPL level (should be 14).

Probable cause: Varies (assuming the previous tests have passed).
Table F–7 relates erors, causes, and probable failed FRU.

Table F–7   Causes of Timer Interrupt Errors

Error Code	Cause
1	SSC or pathway to SSC.
2	SSC or CPU to M-bus to SSC pathway.
3	SSC or pathway to SSC.
4	Pathway to IO FBIC or IO FBIC.
5	SSC or pathway to SSC.
6	FBIC, CPU to M-bus to SSC pathway, or CPU.

Test 6: 100 Hz Interval Timer

This test ensures that the 100 Hz interval timer can cause an interrupt and verifies the IOCSR clock interrupt enable bit function. Table F–8 shows the possible error codes for test 6.

Table F–8   Timer Error Codes

Error Code	Meaning
1	SSC base register was not initialized properly.
2	Interval timer interrupt did not occur.
3	Interrupt occurred with iocsr$clkien disabled.

Probable cause: Varies (assuming the previous tests have passed). Table F–9 relates errors, causes, and probable failed FRUs.

Table F–9   Timer Error Causes

Error	Cause	Probable Failed FRU
1	SSC or pathway to SSC	I/O module
2	SSC, IOCSR, or CPU to M-bus to SSC pathway	I/O or CPU module
3	IOCSR	I/O module

Test 7: Time-of-Year Clock

This test verifies that the time-of-year (TOY) clock counts up if it contains a nonzero value. The test also verifies that the counter stops at 0. Table F–10 shows the possible error codes for test 7.

Table F–10   Clock Error Codes

Error Code	Meaning
1	SSC base register was not initialized properly.
2	Battery low set warning.
3	TOY is not counting when it has nonzero value.
4	TOY did not stop counting at 0.

Probable cause: Varies (assuming the previous tests have passed). Table F–11 relates errors, causes, and probable failed FRUs.

Table F–11   Cause of Clock Errors

Error	Cause	Probable Failed FRU
1	SSC or pathway to SSC	I/O module
2	SSC or rechargeable battery mechanism	I/O module or battery
3, 4	SSC or pathway to SSC	I/O module

Test 8: Ethernet Station Address ROM

This test verifies the Ethernet station checksum address ROM (ESAR).

The format for the address in the ROM is

   A-B-C-D-E-F-G-H

The first six bytes (A to F) are the station address, and the last 2 bytes (G and H) are the checksum.

The following formula is used to verify the checksum:

$$Checksum = \left[(A * 2^{10}) + (B * 2^2) + (C * 2^9) + (D * 2^1) + (E * 2^8) + F \right] \bmod \left(2^{16} - 1 \right)$$

$$Checksum = G * 2^8 + H$$

The only possible error for test **8** is an invalid checksum. The error code **1** represents this failure.

Probable cause: An invalid checksum probably results from problems in the ESAR, IOCSR, or IOCSR-ESAR pathway.
Probable failed FRU: The I/O module.

F.4   CPU Test Numbers

Table F–12 outlines individual CPU self-test numbers.

Table F–12   CPU Test Numbers and Their Meaning

Test Number	Tested Module
01	CFPA
02	CVAX virtual mode
03	FBIC interrupt (MIRQ/CIRQ)
04	C-bus parity
05	CVAX cache 1
06	FBIC M-bus test modes (power-up only)
07	CPU ROM checksum
81	FBIC cache counters (power-up only)
82	CVAX virtual mode (power-up only)

Index