VAXstation 4000 Model 60 and VLC

Condensed Service Information

Order Number: EK-V466H-PS. A01

August 1992

This manual is a condensed version of the *VAXstation 4000 Model 60 Service Information* and *VAXstation 4000 VLC Service Information* guides. The information in this manual supersedes the information in the original Model 60 and VLC service guides.

Revision/Update Information: This is a new manual.

Digital Equipment Corporation
Maynard, Massachusetts

First Edition, August 1992

This document was prepared using VAX DOCUMENT, Version 2.0.

Contents

3 Using the Console

4 FRU Removal and Replacement Hints

A Interpreting Error Codes

B Reading the Diagnostic LED Codes

C Troubleshooting

D FRU Part Numbers

Index

Examples

Figures

Tables

About This Guide

This guide is a support and reference document for Digital Services personnel who perform maintenance work on the VAXstation 4000 Model 60 and VLC systems. In addition, it is for customers who have a self-maintenance agreement with Digital Equipment Corporation.

This is a condensed version of the VAXstation 4000 Model 60 and VLC service guides. If you require a more detailed description of the system configuration, firmware, and diagnostic tests, refer to the *VAXstation 4000 Model 60 Service Information* and *VAXstation 4000 VLC Service Information* guides.

Manual Organization

This guide contains the following chapters and appendixes:

- Chapter 1, “System Configuration,” provides configuration information for the Model 60 and VLC system boxes.
- Chapter 2, “Diagnostic Testing,” provides information about diagnostic testing and test commands. It includes procedures for setting up diagnostic environments, running self-tests, and invoking utilities.
- Chapter 3, “Using the Console,” describes system console commands and alternate consoles.
- Chapter 4, “FRU Removal and Replacement Hints,” provides pointers about how to remove and replace system FRUs.
- Appendix A, “Interpreting Error Codes,” describes immediate and extended error messages and contains tables that list FRU codes and self-test error codes and messages. In addition, this appendix contains descriptions and tables for system tests that apply only to the Model 60.
- Appendix B, “Reading the Diagnostic LED Codes,” describes how to interpret the diagnostic LED codes.

- Appendix C, “Troubleshooting,” contains troubleshooting tables that list symptoms, possible causes, and corrective actions.
- Appendix D, “FRU Part Numbers,” contains tables that provide part numbers for field-replaceable units (FRUs).

Associated Documentation

The following documents provide additional information about the VAXstation 4000 Model 60 and VLC systems:

Document Title	Part Number
VAXstation 4000 Model 60 Quick Installation Guide	EK-PMARI-IN
VAXstation 4000 Model 60 Options Installation Guide	EK-PMARI-IG
VAXstation 4000 Model 60 Owner’s and System Installation Guide	EK-PMARI-OM
VAXstation 4000 Model 60 Service Information Kit	EK-V466H-SV
VAXstation 4000 Model 60 Service Information Guide	EK-V466B-SV
VAXstation 4000 VLC Service Information Guide	EK-V48VB-SV
VAXstation 4000 VLC Owner’s Manual	EK-VAXVL-OG
VAXstation 4000 3D Graphics Options Maintenance Guide	EK-SCP8P-MG
BA46 Storage Expansion Box Owner’s Guide	EK-STEXP-OM
SZ03 Storage Expansion Box Owner’s Guide	EK-SDDBY-OG

Conventions

This guide uses the following conventions:

Convention	Description
Warning	Contains important information about personal safety.
Caution	Contains information to prevent damage to the equipment.
Note	Contains general information.
PN	Part number.
UPPERCASE	Commands are shown in UPPERCASE to separate them from text.
Ctrl x	Ctrl x indicates that you hold down the Ctrl key while you press another key or mouse button (indicated here by *x*).
x	A lowercase italic *x* indicates the generic use of a letter or number. For example, *xxx* indicates a combination of three characters.
Return	A key name enclosed in a box indicates that you press that key.
{ }	In format descriptions, braces indicate required elements. You must choose one of the elements.
[ ]	In format descriptions, brackets indicate optional elements. You can choose none, one, or all of the options.
italic type	Italic type emphasizes important information, indicates variables, and indicates complete titles of manuals.
boldface type	Boldface type in examples indicates user input.

Note

Each section's descriptions and tables apply to both the VAXstation 4000 Model 60 and VAXstation 4000 VLC systems, unless stated otherwise.

1
System Configuration

This chapter describes the components, cabling, and specifications of the VAXstation 4000 Model 60 and VAXstation 4000 VLC system boxes. The following topics are included in this chapter:

1.1 VAXstation 4000 Model 60/VLC System Box Overview

Table 1–1 contains a comparison of the components located in the VAXstation 4000 Model 60 and VLC system boxes. The graphics/audio components are compared in a separate table, Table 1–3.

Table 1–1 VAXstation 4000 Model 60/VLC System Box Configuration Comparison

Component	VAXstation 4000 Model 60	VAXstation 4000 VLC
System module	VAXstation 4000 Model 60 (KA46)	VAXstation 4000 VLC (KA48)
Power supply/fan	Model H7819-AA/two 12 V fans	Model H7109-AA/two 12 V fans
Mass storage drives	Two half-height fixed (RZ23L, RZ24, RZ25) One half-height removable (RRD42, RX26, TZK10, TZ30) Expansion box options	One half-height fixed (RZ23L, RZ24L) Expansion box options
Memory	4 MB module (MS44-AA) 4 MB reduced cost module (MS44L-AL) 16 MB module (MS44-CA)	4 MB module (MS40-AA)
SCSI-FDI controller	SCSI-FDI with RX26 support module	Expansion box option
Synchronous communications option	DSW21 communications module	Not supported
Lights/switches	Lights and switches module	System module Frame buffer module

1.2 Monitor and Graphics Modules

Table 1–2 lists monitors supported by the Model 60 and VLC systems. Table 1–3 provides a detailed graphics module/monitor cross reference.

Table 1–2 Monitor Cross Reference for VAXstation 4000 Model 60 and VLC

Monitors	Resolution and Refresh Rate	Color Support
VRT13-DA,D3	1024x768 @ 60 Hz	Not supported on Model 60
VR297-DA,D3,D4	1024x864 @ 60 Hz	Color
VR299-DA,D3,D4	1024x864 @ 60 Hz	Color
VRT16-DA,D4	1280x1024 @ 66 Hz	Color
VRT16-HA,H4	1280x1024 @ 72 Hz or, 1280x1024 @ 66 Hz	Color Color
VR320-CA,C4	1280x1024 @ 66 Hz	Color
VR320-DA,D4	1280x1024 @ 72 Hz	Color
VRT19-DA,D3,D4	1280x1024 @ 66 Hz	Color
VRT19-HA,H4	1280x1024 @ 72 Hz or, 1280x1024 @ 66 Hz	Color Color
VRM17-AA,A4	1024x768 @ 72 Hz or, 1280x1024 @ 72 Hz	Greyscale Greyscale
VR319-CA,C4	1280x1024 @ 66 Hz	Greyscale
VR319-DA,D4	1280x1024 @ 72 Hz	Greyscale
VRC16-CA,C4 Multi scan (Not supported on Model 60)	640x350 @ 72 Hz (VGA) 640x400 @ 72 Hz (VGA) 640x480 @ 60 Hz/72 Hz (VGA) 800x600 @ 60 Hz/72 Hz 102x768 @ 60 Hz/72 Hz 1280x1024 @ 66 Hz	Color Color Color Color Color Color

Table 1–3 is a cross reference of the monitors supported by the Model 60 LCG modules and the monitors supported by the VLC frame buffers.

Table 1–3 VAXstation 4000 Model 60 and VLC Graphic Module/Monitor Cross Reference

Module Part Number Module ID Description	Module Connector	Resolution and Refresh Rate	Monitor Support
		VAXstation 4000 Model 60	
54-20365-01 PV21X-GD 8-Plane high res color LCG	3-pin coax D-sub	1280x1024 @ 66 Hz	VRT16-DA,D4,HA,H4 VR320-CA,C4 VRT19-DA,D3,D4,HA,H4 VR319-CA,C4 VRC16-CA,C4 (unsupported)
54-20365-02 PV21X-GB 4-Plane high res mono LCG	3-pin coax D-sub	1280x1024 @ 72 Hz	VRM17-AA,A4 VR319-DA,D4
54-20365-03 PV21X-GL 8-Plane HIGH RES COLOR LCG	3-pin coax D-sub	1280x1024 @ 72 Hz	VRM17-AA,A4 VRT16-HA,H4 VRT19-HA,H4 VR319-DA,D4 VR320-DA,D4
54-20363-01 PV21X-GC Low Res Color LCG	15-pin D-sub (miniature) and, 15-pin D-sub	1024x768 @ 60 Hz or, 1024x864 @ 60 Hz (autoswitching)	VRC16-CA,C4 (unsupported) VR297-DA,D3,D4, VR299-DA,D3,D4
54-20762-01 PV21X-GA 8-Plane high res dual-head color LCG	3-coax D-sub (2 connectors)	1280x1024 @ 66 Hz	VRT16-DA,D4,HA,H4 VR320-CA,C4 VRT19-DA,D3,D4,HA,H4 VR319-CA,C4 VRC16-CA,C4 (unsupported)

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Table 1–3 (Cont.) VAXstation 4000 Model 60 and VLC Graphic Module/Monitor Cross Reference

Module Part Number Module ID Description	Module Connector	Resolution and Refresh Rate	Monitor Support
VAXstation 4000 Model 60			
54-20770-01 PV21X-GA 8-Plane high res quad head color LCG	3-coax D-sub (4 connectors)	1280x1024 @ 66 Hz	VRT16-DA,D4,HA,H4 VR320-CA,C4 VRT19-DA,D3,D4,HA,H4 VR319-CA,C4 VRC16-CA,C4 (unsupported)
54-20452-01 PV61G-BA 8-Plane SPXg frame buffer	3-coax D-sub	1280x1024 @ 66 Hz/72 Hz (switchable)	VRT16-DA,D4,HA,H4 VR320-CA,C4 VRT19-DA,D3,D4,HA,H4 VR319-CA,C4 VRC16-CA,C4 (unsupported)
54-20854-01 PV61G-AA 24-Plane SPXgt frame buffer	3-coax D-sub	1280x1024 @ 66 Hz	VRT16-DA,D4,HA,H4 VR320-CA,C4 VRT19-DA,D3,D4,HA,H4 VR319-CA,C4 VRC16-CA,C4 (unsupported)
54-20854-02 PV61G-BB 24-Plane SPXgt frame buffer	3-coax D-sub	1280x1024 @ 72 Hz	VRT16-HA,H4 VR320-DA,D4 VRT19-HA,H4 VR319-DA,D4 VRC16-CA,C4 (unsupported)
VAXstation 4000 VLC			
54-20772-01 PV31G-AA Graphics/audio frame buffer module 1*	15-pin D-sub	1024x768 @ 72 Hz (ON) 1024x864 @ 60 Hz (OFF) (switchable)	VRC16-CA,C4 (unsupported) VRM17-AA,A4 VR297-DA,D3,D4 VR299-DA,D3,D4

*Works with other older monitors, but they are unsupported.

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Table 1–3 (Cont.) VAXstation 4000 Model 60 and VLC Graphic Module/Monitor Cross Reference

Module Part Number Module ID Description	Module Connector	Resolution and Refresh Rate	Monitor Support
		VAXstation 4000 VLC	
54-20774-01 PV31G-AB Graphics/audio frame buffer module 2	15-pin D-sub	1024x768 @ 60 Hz	VRT13-DA,D4 VRC16-CA,C4 (unsupported)
54-20776-01 PV31G-AC Graphics/audio frame buffer module 3	3-pin coax D-sub	1280x1024 @ 72 Hz	VRM17-AA,A4 VRT16-HA,H4 VRT19-HA,H4 VR319-DA,D4 VR320-DA,D4
54-20776-02 PV31G-AD Graphics/audio frame buffer module 4	3-pin coax D-sub	1280x1024 @ 66 Hz	VRT16-DA,D4,HA,H4 VR320-CA,C4 VRT19-DA,D3,D4,HA,H4 VR319-CA,C4 VRC16-CA,C4

Table 1–4 lists the **SHOW CONFIG** displays for each LCG and frame buffer module.

Table 1–4 LCG/Frame Buffer SHOW CONFIG Quick Reference

LCG/Frame Buffer Module	SHOW CONFIG Display	Model
PV21X-GD 8-Plane high res color LCG	`--> HR - 8 PLN FB - V x.x`	60
PV21X-GB 4-Plane high res mono LCG	`--> Mono - 4 PLN FB - V x.x`	60
Low Res Color LCG	`--> LR - 8 PLN FB - V x.x`	60
PV21X-GA 8-Plane high res dual head color LCG	`--> 2HHR - 8 PLN FB - V x.x`	60
PV61G-BA 8-Plane SPXg frame buffer	`--> Highres - SPXG 6Mpixel FB V x.x`	60
PV61G-AA 24-Plane SPXgt frame buffer	`--> Highres - SPXGT 4Mpixel FB V x.x`	60
Graphics/audio frame buffer module 1	`--> HR - 8 PLN FB - V x.x` `--> LR - 8 PLN FB - V x.x`	VLC
Graphics/audio frame buffer module 2	`--> LR - 8 PLN FB - V x.x`	VLC
Graphics/audio frame buffer module 3	`--> Mono - 4 PLN FB - V x.x`	VLC
Graphics/audio frame buffer module 4	`--> HR - 8 PLN FB - V x.x`	VLC

1.3 Power Supply

Table 1–5 contains a voltage comparison reference table for both the VAXstation 4000 Model 60 and VLC systems.

Table 1–5 VAXstation 4000 Model 60/VLC Voltage Comparison

Power Supply	VAXstation 4000 Model 60	VAXstation 4000 VLC
AVS	Automatic voltage select (AVS) to select ac input of either 100 to 120 Vac, or 220 to 240 Vac.	Automatic voltage select (AVS) to select ac input of either 100 to 120 Vac, or 220 to 240 Vac.

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Table 1–5 (Cont.) VAXstation 4000 Model 60/VLC Voltage Comparison

Power Supply	VAXstation 4000 Model 60		VAXstation 4000 VLC	
Wattage	251 W		106 W	
Voltages	**Volts dc**	**Ampere**	**Volts dc**	**Ampere**
	+5.1	19.52	+5.1	10.0
	+3.3	6.39	+3.3	1.98
	+12.1	3.82	+12.1	3.5
	-12.0	0.69	-12.0	0.39
	-9.0	0.17	-9.0	

Table 1–6 contains input and output power supply specifications for the VAXstation 4000 Model 60 and VLC systems. The specifications apply to both models except where noted.

Table 1–6 VAXstation 4000 Model 60/VLC Power Supply Specifications

Parameter (Input Characteristics)	Specifications	
Line voltage	120 V	240 V
Voltage tolerance	88 V to 132 V	176 V to 264 V
Frequency	60 Hz	50 Hz
Frequency tolerance	47 Hz to 63 Hz	47 Hz to 63 Hz
Input current		
Model 60	2.9 A (max.) PS only 4.0 A (max.) AUX only 2.7 A (max.) 4.0 A (max.)	1.4 A (max.) PS only 2.0 A (max.) AUX only
VLC		1.2 A (max.) PS only 2.0 A (max.) AUX only
Inrush current	45.0 A (max.) cold PS only	45.0 A (max.) cold PS only
Power consumption (max.)		
Model 60	251 W	251 W
VLC	106 W	106 W

Parameter (Output Characteristics)	Specifications		
	Minimum	Typical	Maximum
+5.1 V reg. short term	4.90 V	5.05 V	5.20 V
+5.1 V reg. long term	+4.85 V	+5.10 V	+5.25 V
+12.1 V reg. short term	+11.70 V	+12.10 V	+12.50 V
+12.1 V reg. long term	+11.50 V	+12.10 V	+12.70 V
-12.0 V reg. long term	-11.40 V	-12.00 V	-12.60 V
-9.0 V (isolated) long term	-8.55 V	-9.00 V	-9.45 V
+3.3 V long term	+3.13 V	+3.3 V	+3.46 V
Load range (Model 60)			
+3.3 V	3.20 A		6.39 A
+5.1 V	2.8 A		19.52 A
+12.1 V	0.18 A		3.82 A
-12.0 V	0.26 A		0.69 A
-9.0 V	0.12 A		0.17 A
Load range (VLC)			
+3.3 V	0.80 A		1.98 A
+5.1 V	1.20 A		10.0 A
+12.1 V	0.18 A		3.5 A
-12.0 V	0.14 A		0.39 A
-9.0 V			
Ripple and noise 1 Hz to 10 Hz			
+3.3 V	20.0 mV	30.0 mV	
+5.1 V	30.0 mV	50.0 mV	
+12.1 V	50.0 mV	70.0 mV	
-12.0 V		120.0 mV	
-9.0 V		50.0 mV	
Ripple and noise (except +5.1 V and +3.3 V) 10 MHz to 50 MHz		1.0%	2.0%
Ripple and noise 10 MHz to 50 MHz			
+5.1 V		30 mV	50 mV
+3.3 V		20 mV	30 mV

1.4 Internal Cabling

Table 1–7 compares the VAXstation 4000 Model 60 and VLC internal system devices and their cables.

Table 1–7 Internal System Devices and Their Cables Comparison

System Device /Cable	VAXstation 4000 Model 60	VAXstation 4000 VLC
SCSI devices	Three drives (2 fixed and 1 removable)	One fixed drive
SCSI device dc power harness	One (PN 17-02876-01)	One (PN 17-03210-01)
SCSI cable	One (PN 17-02875-01)	One (PN 17-03191-01)

1.5 Control Panel

Table 1–8 lists the location of the external controls and LED indicators that are on the VAXstation 4000 Model 60 and VLC systems.

Table 1–8 Control and Indicator Location

Control/Indicator	Location
Model 60	
Controls and LED indicators	Behind flip-down door on the front bezel of the box
OK LED	Upper left side of front bezel
VLC	
AC power switch	Rear left of system box
OK LED	Inside front left of system box
Diagnostic LEDs	I/O panel on back of system box
Remaining controls	Rear right side of system box

Table 1–9 contains a list and description of the VAXstation 4000 Model 60 and VLC system box controls and indicators. Unless noted, the controls apply to both models.

Table 1–9 VAXstation 4000 Model 60/VLC Control Panel

Control/Indicator	Description
AC power switch	Controls ac power to power supply Does not affect power outlet provided for add-on peripherals
Power OK LED	LED is lit when ac power is applied and correct voltage levels are present
Alternate console switch	Selects either graphics terminal or printer/console port as the system console
Halt control switch	Momentary switch sends halt signal to CPU module
Diagnostic LEDs	Display two binary fields, which represent a two-digit hexadecimal diagnostic code
Audio in/out	Four-pin MJ-type connector jack
Speaker/headset switch (Model 60 only)	Turns speaker either on or off

1.6 I/O Connectors

The I/O panel provides connectors to devices that are external to the system. The system configuration determines which external devices are connected to the panel.

Table 1–10 lists the I/O connectors that are found on the VAXstation 4000 Model 60 and VLC systems.

Table 1–10 VAXstation 4000 Model 60/VLC I/O Connectors

Model 60	VLC
Ethernet interface (includes: standard Ethernet port, network switch, and ThinWire port)	Standard thickwire Ethernet port • DESTA-BA adapter required for ThinWire Ethernet connection • H3350 adapter required for twisted-pair connection
RS423 communications port	RS423 communications port
Printer/console port with a DEC423 connector (MMJ)	Printer/console port with a DEC423 connector (MMJ)
Keyboard port	Keyboard port
Mouse port	Mouse port
SCSI port	SCSI port
Monitor video port	Monitor video port
Monitor power socket	Monitor power socket
AC power socket	AC power socket
Remote keyboard/mouse port	
Option port (for the DSW21 and TURBOchannel communications devices)	

2
Diagnostic Testing

This chapter provides the diagnostic testing information and test commands that are used with the VAXstation 4000 Model 60 and VLC systems. It includes procedures for setting up the diagnostic environments, running the self-tests, and invoking utilities. In addition, this chapter describes the system tests that run only on the Model 60. The following topics are included in this chapter:

Note

For the troubleshooting process, it is assumed that you have checked for faulty power cords or loose modules and connectors.

Actual error codes and their meanings are provided in Appendix A.

2.1 Diagnostic Functions

The VAXstation 4000 Model 60 and VLC system firmware provides the diagnostic functions listed in Table 2–1.

Table 2–1 Diagnostic Functions

Function	Description
Power-up test	Tests and initializes all devices
Extended self-test	Tests devices in the system sequentially with the TEST command
System test (Model 60 only)	Tests all devices in the system interactively
Utilities	Functions for visual screen test, mass storage devices, and the network listener
Error reporting	Displays error messages on the console when errors are found during power-up tests, self-tests, and system tests

2.2 Power-Up Test

The power-up test includes initialization and power-up testing of all devices. The initialization code executes when power to the system is turned on. During initialization, the system is configured by creating the Master Configuration Table (MCT) and the Device Configuration Table (DCT). During device testing, if a device fails, the system Test Dispatcher continues to test the remaining devices until all tests are completed.

Fatal Error Before Initialization

If the system finds a fatal error before initializing the console, the system tries to forward the error message to the eight error LEDs.

- Refer to Section B.3 for a list of power-up initialization diagnostic LED codes.
- If all error LEDs remain on, the ROM code does not start.

Alternate Console Switch

If the alternate console switch is set to **alternate console** (switch is in up position), then the system assumes a console terminal is connected to the printer/console port.

2.2.1 Successful Power-Up and the HALT Command

The following table explains the system's response to the three HALT commands during a successful power-up.

If the power-up is successful and the HALT parameter is set to...	Then the system...
1	Tries to restart the operating system. (The system continuously reboots after each restart failure.)
2	Tries to boot the default boot device. (If the system fails to reboot, it enters console mode.)
3	Enters console mode at the end of the power-up sequence. (Otherwise, the system autoboots from the default boot device.)

2.2.2 Unsuccessful Power-Up

If the power-up is unsuccessful, then an error message is displayed above the console prompt.

Error Format

Error information is displayed in the following format:

```
Fru  Dev_nbr  Dev_nam  Err_nbr
```

The following table describes the error format codes.

Code	Meaning
Fru	The failed FRU code. (Refer to Table A–1.)
Dev_nbr	Device number of the failed device.
Dev_nam	Device name of the failed device.
Err_nbr	A decimal number that corresponds with a specific device failure. The number refers to specific error tables for problem isolation and repair procedures.

2.3 Displaying System Configuration

The VAXstation 4000 Model 60 and VLC firmware provides two configuration commands, SHOW DEVICE and SHOW CONFIG.

Use this command...	To determine the...
SHOW DEVICE	Information on mass storage devices included in the system
SHOW CONFIG	Overall system configuration

2.3.1 SHOW DEVICE Command

To determine the presence of storage devices such as a hard disk, diskette drives, or other drives, at the console prompt enter:

```
>>> SHOW DEVICE Return
```

The system shows a display similar to the one shown in Example 2–1.

Example 2–1 SHOW DEVICE Command

```
VMS/VMB    ADDR      DEVTYPE  NUMBYTES   RM/FX  WP  DEVNAM   REV
-------    ----      -------  --------   -----  --  ------   ---
ESA0       08-00-2B-17-EA-FD
DKA100     A/1/0     DISK     121 MB     FX         RZ23L    1F25
DKA300     A/3/0     RODISK   594 MB     RM     WP  RRD42    1.1A
MKA500     A/5/0     TAPE                RM         TZK10    00AD
..HostID..  A/6/0     INITR
DKA700     A/7/0     DISK     332 MB     FX         RZ55     0900
```

The following table provides a description of each column shown in Example 2–1:

Column Name	Description
VMS/VMB	Is the operating system's interpretation of what the device is. For example, with a VMS operating system, a fixed drive is interpreted as a DKA300.
ADDR	Lists the Ethernet hardware address or SCSI device ID. The SCSI device ID has the following format: A/DEVICE_ID/LOGICAL_ID The LOGICAL ID is always 0.
DEVTYP	Shows the device type.
NUMBYTES	Gives the number of storage bytes.
RM/FX	Indicates whether the media device is removable or fixed.
WP	Indicates if the device is write protected (WP).
DEVNAM	Shows the device name.
REV	Indicates the firmware revision level for the drive.

2.3.2 SHOW CONFIG Command

To determine the presence of devices other than internal storage devices and to determine the quantity of memory in the system, enter:

```
>>> SHOW CONFIG Return
```

The system displays a configuration table similar to the one shown in Example 2–2.

Example 2–2 Configuration Table

```
KA46-A BL3-186-V1.0             ! System type and firmware revision *
08-00-2B-F3-31-03               ! Ethernet hardware address
16 MB                           ! Total memory

DEVNBR  DEVNAM  INFO
------  ------  ----
    1    NVR    OK                      ! Non-volatile RAM
    2    LCG    OK                      ! 2D high res. color graphics rev 2.7
                 HR - 8 PLN FB -2.7
    3    DZ     OK                      ! Serial line controller
    4    CACHE  OK                      ! Cache memory
    5    MEM    OK                      ! Memory configuration

                 16MB = SY=8MB, S0/S1=8MB, S2/S3=0MB, S4/S5=0MB

    6    FPU    OK                      ! Floating point accelerator
    7    IT     OK                      ! Interval Timer
    8    SYS    OK                      ! Other system functions
    9    NI     OK                      ! Ethernet
    10   SCSI   OK                      ! SCSI and drives
                1-RZ23L 6-INITR         ! One RZ23L at ID 1, system at ID 6.
    11   AUD    OK                      ! Sound
    12   COMM   OK                      ! DSW21 communications device **
    13   TCA    OK                      ! TURBOchannel adapter **
>>>

*  KA48 for the VLC
** Model 60 only (due to mechanical constraints of the VLC)
```

2.4 Displaying Error Information

The following table describes how to determine if a device is failing:

If you need to determine whether an error occurred on...	Then enter the...
Any device	SHOW ERROR command
A *specific* device	SHOW ERROR command followed by the device number

Example 2–3 shows the results of the SHOW ERROR command when an error is present.

Example 2–3 SHOW ERROR

```
>>> SHOW ERROR

?? 001  03  DZ     0023
        001 0010   00000001 00000001 00003f30 00000001

?? 001  09  NI     0009
        001 0001   200e0000 00005555 00005515

>>>
```

The SHOW ERROR command displays the following error code format:

Fru	Dev_nbr	Dev_nam	Err_nbr
(0001)	(03)	(DZ)	(0023)

The following table describes the error format codes.

Code	Meaning
Fru	The failed FRU code. (Refer to Table A–1.)
Dev_nbr	Device number of the failed device.
Dev_nam	Device name of the failed device.
Err_nbr	A hexadecimal number that corresponds with a specific device failure. The number refers to specific error tables for problem isolation and repair procedures.

2.5 Setting Up the Diagnostic Environment

Before you run a self-test, you must do the following:

Step	Action	Comment
1	Put the system in console mode.	Shut down the operating system or power up the system if you do not have the console prompt.
2	Select the diagnostic environment.	See Table 2–2 for a list of console commands.
3	Attach loopbacks if required.	See Table 2–3 for a list of device test IDs and mnemonics.

2.5.1 Selecting a Diagnostic Environment

The system diagnostics and utilities can run in one of three environments: customer, Digital Services, and manufacturing. The following table provides a description of each environment:

Environment	Description
Customer	Requires no setup beyond installation of the system. Type SET DIAGENV 1 at the >>> prompt to access.
Digital Services	Requires loopbacks and setup, but provides a more comprehensive test. The utilities required to install keys on writable media must be run in this environment. Type SET DIAGENV 2 at the >>> prompt to access.
Manufacturing	For manufacturing use. Type SET DIAGENV 3 at the >>> prompt to access. (**CAUTION: Do not use this environment for customers, because it may destroy customer data on mass storage devices.**)

To set the diagnostic environment, enter one of the console commands listed in Table 2–2.

Table 2–2 SET DIAGENV Commands

Command	Result
SET DIAGENV 1	Sets environment to customer environment.
SET DIAGENV 2	Sets environment to Digital Services environment.
SET DIAGENV 3	Sets environment to manufacturing environment.
SET DIAGENV 80000001	Sets environment to loop on error in Digital Services environment.
SET DIAGENV 80000002	Sets environment to loop on error in manufacturing environment.

Example 2–4 shows what appears when you enter the SET DIAGENV and SHOW DIAGENV commands.

Example 2–4 SET DIAGENV

```
>>> SET DIAGENV 2

    DIAGENV = 2
>>> SHOW DIAGENV

    DIAGENV = 2
```

2.6 Device Tests

Table 2–3 lists the device tests and corresponding mnemonics, decimal ID, binary ID, and loopback requirements for the VAXstation 4000 Model 60 and VLC systems. The synchronous communications device test (ID 12) and the TURBOchannel adapter device test (ID 13) apply only to the Model 60.

Table 2–3 Device Test IDs and Mnemonics

Device	Mnemonic	Decimal ID	Binary ID	Loopback Required, Digital Services Env.
Non-volatile RAM	NVR	1	0001	N/A
2D or other graphics	LCG	2	0010	N/A
Serial line controller	DZ	3	0011	Yes, on comm. port
Cache system	CACHE	4	0100	N/A
Memory	MEM	5	0101	N/A
Floating-point accelerator	FPU	6	0110	N/A
Interval timer	IT	7	0111	N/A
Other system board hardware	SYS	8	1000	N/A
Network interconnect	NI	9	1001	Yes, or connected to a network
SCSI controller	SCSI	10	1010	No
Sound chip	AUD	11	1011	N/A
Synchronous comm (or other option) (Model 60 only)	COMM	12	1100	No, but H3199 required for manufacturing environment.
TURBOchannel adapter (Model 60 only)	TCA	13	1101	No, but H3199 required for manufacturing environment.

2.7 Running Self-Tests

This section describes the test command interface and syntax rules used to run the self-test on a device.

Note

Refer to Table 2–3 for a complete list of device test IDs and mnemonics.

2.7.1 Device Test Syntax Rules

The following sections describe the correct syntax required to run device self-tests.

To Test One Device

If you want to test only one device, type T and one device number.

Example: `T 2`

To Test a Range of Devices

If you want to test a range of devices, then type T and separate the device numbers with a colon (:).

Example: `T 8:10`

To Separate Individual Tests

If you want to separate individual tests or ranges of devices, then type T and separate the device numbers with a comma (,) or a space.

Example: `T 6,5` or `T 6 5`

To Run a Self-Test Continuously

If you want to run a self-test continuously, then use the console REPEAT command. The REPEAT command executes a command continuously until you type the Ctrl C key sequence at the console or until an error occurs.

Example: `REPEAT T 1:4`

To Run Multiple Device Tests

Devices can be specified individually or as a range. The following example describes the order of execution for multiple device tests:

Example: `T 10:8,6,5:3`

This example tests devices 10 through 8, then device 6, then devices 5 through 3.

2.8 Descriptions of Self-Tests

This section describes the VAXstation 4000 Model 60 and VLC self-tests that are listed in Table 2–3.

Note

The self-tests are arranged numerically by decimal ID. Each section title contains the self-test name and decimal ID. Some sections contain **Setup Notes** which contain information that you should know before you run the tests.

2.8.1 TOY/NVR Self-Test (T 1)

Setup Notes:

- There are no extended error messages for the NVR test.
- Non-fatal errors (indicated by a single question mark (?)) indicate the following:
  - The time in the NVR has not been set.
  - The error is not caused by a hardware problem.

Table 2–4 lists the tests that are included in the TOY/NVR self-test.

Table 2–4 TOY/NVR Self-Test (1)

Self-Test	Function
NVR	Checks the NVR for valid data. If the NVR is not initialized, a register test is performed on all of the NVR locations and the NVR is initialized. If the NVR is initialized, *only* the temporary locations are tested in the NVR.
TOY	Checks to see if time has been set in the TOY. If not, a test of all the TOY registers is performed. This test writes/reads all possible values that a TOY register can hold.

Refer to Section A.2.1 for a list of the TOY/NVR error codes and to Section B.4 for a list of the TOY/NVR diagnostic LED codes.

2.8.2 Graphics Self-Test (T 2)

Note

In this section, "graphics" refers to all the graphics modules used by the VAXstation 4000 Model 60 and VLC systems.

Use T 2 for the graphics self-test.

Both the SHOW CONFIG and SHOW ERROR commands will display the specific graphics module mnemonic.

The following table identifies which graphics modules correspond to the Model 60 and the VLC systems.

Graphics Module	Model 60	VLC
LCG	X	
SPXg	X	
SPXgt	X	
Graphics/audio frame buffer		X

Setup Notes:

- The console uses only the left port on the Model 60 dual monitor board.
- The graphics test does not run extended tests in the customer environment (DIAGENV 1) because it clears the console. Refer to Section 3.1.2.6 for information about DIAGENV parameters.
- For the extended test, DIAGENV = 2 requires a 29-24795 loopback connector installed in the communication port.

  If the loopback is not installed, you receive an error message. For example,

  ```
  >>> SET DIAGENV 2
  ? 23 ILL CMD
  ```

- The low-resolution frame buffer clock jumpers must be installed correctly before power-up.
- If a graphics module with monitor is installed, the alternate console switch must be in the down position. Otherwise the console will connect to the DZ port.

Table 2–5 lists the tests that are included in the graphics self-test.

Table 2–5 Graphics Self-Test (2)

Self-Test	Function
Video test	Tests the VRAM cache memory and the communication between the S-chip and VRAM. Initializes the Brooktree and sets up the video screen. Sets up the video registers in the S-chip.
Register test	Uses the longword format to read/write test all graphics S-chip registers.
FIFO test	Creates a FIFO and clip list in the contiguous physical memory and tests setup packets, int/status bits, put/get pointers, FIFO and clip control flags, FIFO status bits. Makes sure that the FIFO can be reset.
AG test	Calls all of the graphics address generator specific self-test routines. These routines test the drawing functions, logic unit functions, and glyph functions.
Virtual Addressing Mode test	Calls all the graphics virtual drawing specific self-test routines.

Refer to Section A.2.20 for a list of the LCG self-test error codes and to Section B.5 for a list of the LCG diagnostic LED codes.

2.8.3 DZ Self-Test (T 3)

Setup Notes:

- The DZ interrupt test fails in the Digital Services or manufacturing environments if no external loopbacks are present on the communication ports.
- The pointing device test fails if the pointing device is not plugged in and the console is a video device.
- When you are in the Digital Services or manufacturing environments, loopbacks must be used on the standard communications port.

Table 2–6 lists the tests that are included in the DZ self-test.

Table 2–6 DZ Self-Test (3)

Self-Test	Function
Reset test	Resets the DZ chip and sets up its lines to their default values. An error occurs if the device does not reset or if the line parameters do not get set up properly.
Polled test	Tests each line in the internal loopback mode by using the chip in the polled mode. Characters are transmitted out a line and are expected to be looped back.
Interrupt test	Tests each line running interrupt driven. If the diagnostic environment is Digital Services or manufacturing, the lines are tested using an external loopback device on the communication port. Interrupts are disabled and characters are sent through the lines that are not being used by the console device. The characters are expected to be looped back.
LK401 test	Checks for the presence of an LK401 when the console device is a video device.
Mouse test	Checks for the presence of a mouse when the console device is a video device.

Refer to Section A.2.2 for a list of the DZ self-test error codes and to Section B.7 for a list of the DZ diagnostic LED codes.

2.8.4 Cache Self-Test (T 4)

Table 2–7 lists the tests that are included in the cache self-test.

Table 2–7 Cache Self-Test (4)

Self-Test	Function
Data store test	Tests the data store in the primary cache. A two pass memory test is performed on the data store. This test performs a read/compare/complement/write in both the forward and reverse directions. The data store is accessed through the I/O address space. Only the cache banks enabled in the BEHR are tested.
Tag store test	Tests the tag store in the primary cache. A two pass memory test is performed on the tag store. This test performs a read/compare/complement/write in both the forward and reverse directions. Tag store is accessed through the I/O address space. Only the cache banks enabled in the BEHR are tested.

Refer to Section A.2.19 for a list of the cache test error codes and to Section B.8 for a list of cache test diagnostic LED codes.

2.8.5 Memory Self-Test (T 5)

Setup Notes:

- If memory modules are not installed correctly, the memory test fails, and the memory modules will not be configured.
- Memory modules must be installed in pairs, with the 16-megabyte modules installed behind the 4-megabyte modules.

Table 2–8 lists the tests that are included in the memory self-test.

Table 2–8 Memory Self-Test (5)

Self-Test	Function
Byte mask test	Checks the byte mask signals that are generated by the CPU. Test is performed on each page boundary. Once the test is complete, all free memory is filled with AAh.

(continued on next page)

Table 2–8 (Cont.) Memory Self-Test (5)

Self-Test	Function
Memory test (forward)	Performs a read/compare/complement/write on the memory in the forward direction. If a page is found to be bad, the appropriate bit in the memory bitmap is cleared.
Memory test (reverse)	Starts at the last address to be tested and performs a read/compare/complement/write on memory. If a page is found to be bad, the appropriate bit in the memory bitmap is cleared.
Final parity test	Fills all of memory with a pattern of 01h (an odd bit pattern) to verify that the parity bit can be changed. This pattern is read and verified. A parity error occurs if the parity bit is not changed. The pattern 01010101h is the known state of unused memory after power-up.

Refer to Section A.2.3 for a list of the memory test error codes and to Section B.9 for a list of the memory test diagnostic LED codes.

2.8.6 Floating-Point Unit Self-Test (T 6)

Table 2–9 lists the tests that are included in the floating-point unit self-test.

Table 2–9 Floating-Point Unit Self-Test (6)

Self-Test	Function
Instruction tests	Tests are performed on the floating-point unit (FPU). Failure occurs if the instruction produces unexpected results or if an unexpected exception occurs during the execution of the instruction.

Refer to Section A.2.18 for a list of the FPU test error codes.

2.8.7 Interval Timer Self-Test (T 7)

Table 2–10 lists the tests that are included in the interval timer self-test.

Table 2–10 Interval Timer Self-Test (7)

Self-Test	Function
Interrupt test	Enables the interval timer interrupts. It lowers the IPL for 30 ms and counts the number of interrupts. An error occurs if there are too few or too many interrupts.

Refer to Section A.2.4 for a list of interval timer (IT) test error codes.

2.8.8 System Self-Test (T 8)

Table 2–11 lists the tests that are included in the system self-test.

Table 2–11 System Self-Test (8)

Self-Test	Function
System ROM	Checks the system ROMs one byte at a time to ensure that they contain the correct manufacturing check data and the correct checksum.
Filter RAM	Makes two passes on the invalidate filter RAMs. The test detects all stuck addressing and data faults.

Refer to Section A.2.5 for a list of the system device test error codes and to Section B.10 for a list of the system device diagnostic LED codes.

2.8.9 Network Interconnect Self-Test (T 9)

Setup Notes:

- You must install an external loopback connector or a network connection (cable) at the selected network port before running a self-test.

Table 2–12 lists the tests that are included in the Network Interconnect (NI) self-test.

Table 2–12 Network Interconnect Self-Test (9)

Self-Test	Function
Network Address ROM test	Verifies the 32-byte network address ROM which contains the unique 6-byte network address along with the 2-byte checksum and test data byte. Checks for a null or multicast address, calculates/compares the checksum, and verifies the test data bytes.
LANCE Register test	Tests the address and data paths to the LANCE register address port (RAP) and the register data port (RDP) for each of the four control status registers (CSRs).
LANCE Initialization test	Sets up the LANCE data structures and initializes the LANCE chip, which causes the LANCE to perform a single word DMA read to the system memory.
LANCE Internal Loopback test	Verifies the correct operation of the LANCE transmitter and receiver during an internal loopback. It also verifies the burst-mode DMA read and write on non-word-aligned data buffers for packets of different lengths and data patterns.
LANCE Interrupt test	Enables, forces, and services the LANCE interrupts for initialization, transmission, and reception using internal loopback.
LANCE CRC test	Tests the LANCE CRC generation on transmission. It checks for detection of a bad CRC on reception using internal loopback.
LANCE Receive MISS/BUFF test	Checks LANCE operation for missed packets and buffer error during reception with internal loopback.
LANCE Collision test	Verifies collision detection and retry during transmission with internal loopback.
LANCE Address Filtering test	Tests the LANCE receiver address filtering for broadcast, promiscuous, and null destinations during internal loopback.

Refer to Section A.2.30 for a list of the NI test error codes and to Section B.11 for a list of the NI test diagnostic LED codes.

2.8.10 SCSI Self-Test (T 10)

Setup Notes:

- Removable media drive devices will fail in extended mode if media is not installed.
- If some or all devices do not show up in the configuration display after running the test, check that:
  - All devices have a unique ID number.
  - Power is supplied to all devices and the system module.
  - The SCSI cable is connected to the system module and devices, and the bus is terminated.
- All expansion boxes must have power supplied *before* the system box is powered up, or the expansion box devices will not be configured.

Table 2–13 lists the tests that are included in the SCSI self-test.

Table 2–13 SCSI Self-Test (10)

Self-Test	Function
Register test	Verifies that the 53C94B controller chip registers are fully functional and that all read/write bits that can be written are written to. Verifies the bits.
Interrupt test	Verifies the SCSI bits in the interrupt mask register, interrupt request register, and the interrupt clear register. A SCSI interrupt is forced, with the SCSI bit in the interrupt mask first set and then cleared. This is repeated for both a high interrupt priority level and a low interrupt priority level.
Data Transfer test	Verifies SCSI bus communication between the controller and the available peripherals, and also verifies the data path of the controller to the S-chip and to memory. A series of four inquiry commands are issued to each device. Commands are issued in the programmed I/O mode, asynchronous mode with DMA, asynchronous mode with the DMA starting on a non-word-aligned boundary and crossing a page boundary, and synchronous mode with DMA.

Refer to Section A.2.6 for a list of SCSI self-test error codes and to Section B.12 for a list of SCSI device FRU LED codes.

2.8.11 Audio Self-Test (T 11)

The function of the audio self-test is to test the system's ability to send a beep code to the speaker.

The following table lists the location of all audio functionality for the VAXstation 4000 Model 60 and VLC systems:

VAXstation 4000 Model	Audio Functionality Location
Model 60	Lights and switches module
VLC	Graphics/audio frame buffer module

2.8.12 Synchronous Communication Self-Test (T 12) (Model 60 Only)

Note

If you use the Digital Services environment (SET DIAGENV 2), then you must use an H3199 loopback.

Table 2–14 lists the tests that are included in the synchronous communication self-test.

Table 2–14 Synchronous Communication Self-Test (12)

Self-Test	Function
Checksum	Checks the checksum; reads 128 KB ROM part and verifies checksum.
Static RAM	Checks the static RAM; writes, verifies, complements, verifies the 256 KB RAM.
MC68302	Performs the MC68302 test.
RAM	Checks the RAM dual access; checks shared RAM bus arbitration.
EPROM	Checks the EPROM dual access; checks EPROM bus arbitration.
Host interrupt	Checks the host interrupt; verifies option can interrupt the CPU.
Host loopback	Checks the host buffer loopback and interrupt; moves data from the CPU to the communication option, loops it back and waits for an interrupt.
Reset	Resets the communication options and waits for an interrupt.

Refer to Section A.2.10 for a list of the synchronous communication test error codes and to Section B.13 for a list of the synchronous communication test diagnostic LED codes.

2.8.13 TURBOchannel Adapter Self-Test (T 13) (Model 60 Only)

Restriction

The system power-up self-test run time restricts the self-test's ability to call the emulator to run power-up self-tests on the option firmware.

To Initialize the TURBOchannel and Option

Arbitrary TURBOchannel resets are not performed. The following explains the process to initialize the TURBOchannel and option:

If you halt VMS and want to run the emulator, but do not want to maintain the state of the TURBOchannel or the option, enter the UNJAM command at the console prompt. This initializes both the TURBOchannel and the option.

Table 2–15 lists the tests that are included in the power-up TURBOchannel Adapter (TCA) self-test. The power-up self-test is automatically invoked during the initial power-up of the VAXstation 4000 hardware and it tests the TCA in a sequential manner.

Table 2–15 TURBOchannel Adapter Self-Test (13)

Self-Test	Function
TCA register test	Tests the following functions of the CSR: • RESET (toggles and checks bit in CSR) • TURBOchannel timeout (reads the TURBOchannel while holding RESET) • FIFO (empties bit set and clears by writing and reading FIFO) • INV (does an invalid map DMA)
TCA interrupt test	Generates an interrupt. Tests to see if the Interrupt Service Routine (ISR) can be reached and then turns off interrupts and ensures that the ISR is not reached.

(continued on next page)

Table 2–15 (Cont.) TURBOchannel Adapter Self-Test (13)

Self-Test	Function
TCA FIFO test	Loads up the TCA FIFO at longwords with an increasing value, starting at 1 and ending with 512. The FIFO is then emptied and the count is checked against the read values from the FIFO. An error is reported if: • FIFO EMPTY does not get reset to 0 (empty) after reading 512 • The data read does not correspond to its count
TCA trigger test	Tests DMA functionality through the Read Trigger test and through the Write Trigger test
TCA size bus test	Accesses TURBOchannel slot 0 space to see if a device is there. If a TURBOchannel device is present, no TURBOchannel timeout will occur. When the SHOW CONFIG command is entered at the console prompt, the status of this test will be stated as one of the following: • `OPT PRES V1.0` • `NOOPT PRES V1.0`

2.9 Setting Up System Test Environments (Model 60 Only)

The system test is a strenuous test of the VAXstation 4000 Model 60 system. All devices are exercised simultaneously to find system interaction problems. The system test can be used to find faults that occur only when the system interaction is high.

The system test can be run in three environments, which you select with the SET DIAGENV command. Refer to Section 2.5.1 for information about selecting the diagnostic environment.

Important Notes About the System Test

The following are important notes about the system test:

- The system test runs under a modified VAXELN kernel which is loaded from ROM.
- The system test causes a worst-case environment in terms of system interaction, using maximum DMA and interrupts.

2.10 System Test Monitor (Model 60 Only)

This section describes the Model 60 test command interface that you use to run the system test on a device or on the whole system. Table 2–16 shows the general format for running the system test using the test command.

Table 2–16 Running the System Test Using the Test Command

Command	Action
T 100	Runs system test in the customer environment for two passes.
T 101	Runs system test in the Digital Services environment for two passes.
T 102	Runs system test in the Digital Services environment. Press Ctrl C to exit.
T 103*	Runs system test in the manufacturing environment. Press Ctrl C to exit.
T 106	Runs system test for specific devices. System prompts for specific device. 1=Yes, 0=No.

* This test runs the system test in the manufacturing environment. This test writes over data on hard disks. Do not use on customer systems; it erases customer data. Press Ctrl C to exit.

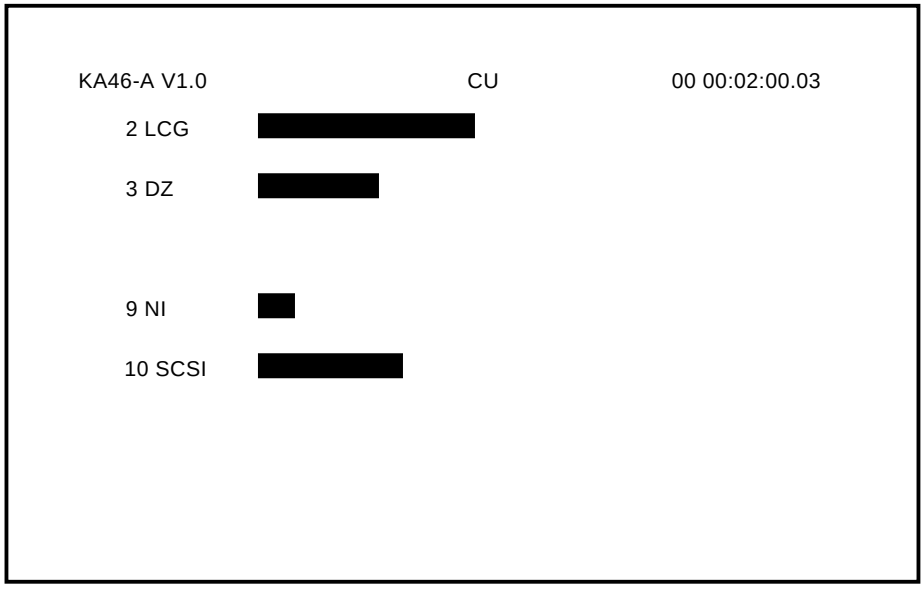
Note

Make sure that loopback connectors are installed while the system is in the Digital Services environment. SET DIAGENV 2 to run in Digital Services environment. (Table 3–2 and Table 2–2 contain descriptions and commands for the diagnostic environments.)

2.10.1 Display from the System Test

Figure 2–1 shows the output from a successful system test.

Figure 2–1 Successful System Test



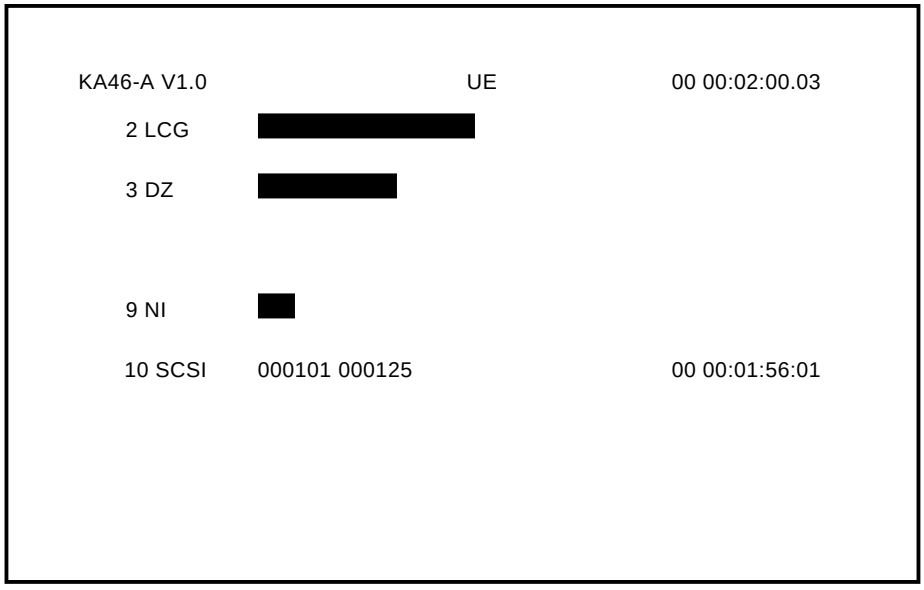
LJ-00633-TI0

The following table describes the fields in Figure 2–1.

Display Message	Description
KA46-A	System module ID
V1.0	ROM version
CU	Environment in which the test is running
00 00:02:00.03	CPU time used during testing

Figure 2–2 shows the display when the system test is unsuccessful.

Figure 2–2 Unsuccessful System Test



LJ-00119-TI0

If the Device Fails

If the device fails, then the device status line becomes the error message. Use the SHOW ERROR command to display extended error information.

Refer to Appendix A for the interpretation of error codes for each device.

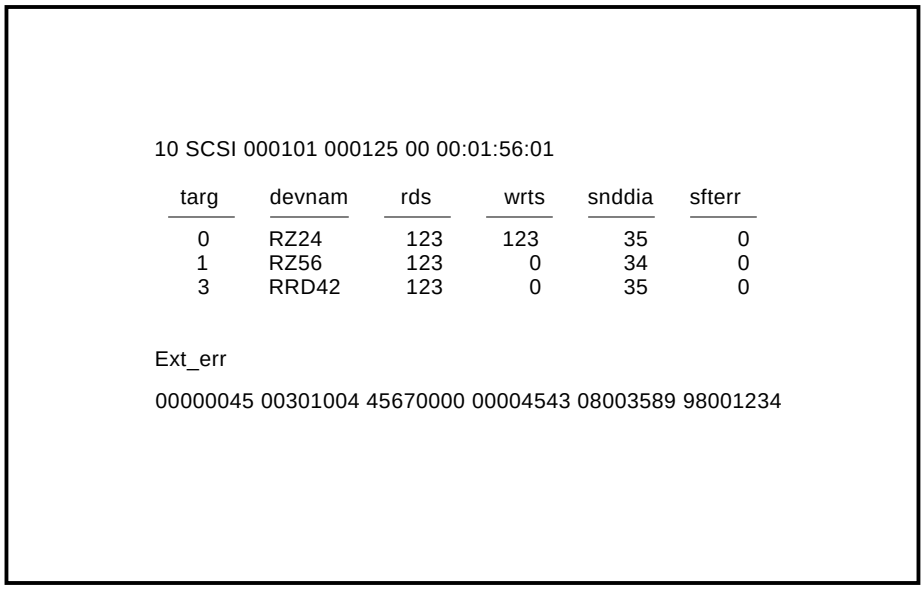
2.11 Descriptions of System Tests

You can get summary information about the most recent system test using either of the two methods described in the following table:

Method	Description
Interrupt system test by pressing Ctrl C.	Stops the system test and displays summary screens for the devices. The display prompts for each summary screen. It can take a few moments after entering Ctrl C to view the summary screens. This time is needed to clean up the interrupted system test.
Enter the SHOW ESTAT (error status) command at the console prompt.	Displays the summary from the most recent system test since power-up. The display prompts for each summary screen.

Each system diagnostic is also able to display extended status and error information on its own summary screen. Figure 2–3 shows an example of the summary screen with a SCSI failure.

Figure 2–3 Summary Screen



LJ-00120-TI0

2.11.1 DZ System Test (Model 60 Only)

Note

Be sure that loopback connectors are installed when the system is in the Digital Services environment.

The following table describes the two DZ System Test modes for the Model 60:

Mode	Description
Functional	Tests all lines other than the lines dedicated to the console. Loopback testing is done in all legal combinations of baud rate, parity, and character width. In Digital Services mode, external loopback testing is performed.

Mode	Description
Burst	Performs in the same way as functional mode except the lines are tested with the following specifications: Baud rate - 19.2K Character width - 8-bit Parity - odd

The following is an example of the DZ system test error.

Example 2–5 DZ System Test Error

```
?? 001 3 DZ 0220
```

This error code means that not all characters were received on line 1 and line 2.

The following is an example of the DZ system test summary screen:

Example 2–6 DZ System Test Summary Screen

```
Line L_Param Chr_Xmt Chr_Rec          Error
---- ------- ------- -------   --------------------
0     1fc8     25      25         ***** No Err ***
1     1fc9     25      22         ?? Xfr Timedout
2     1fca     25      24         ?? Xfr Timedout
3     1fcd      0       0        * Not Tstd - Cons
```

The summary screen gives information about the DZ test. The first column lists the serial line number that corresponds to the following devices:

Line	Device
0	Keyboard port
1	Mouse/pointing device port
2	Communications port
3	Printer/console port

2.11.2 Network Interconnect System Test (Model 60 Only)

Setup Notes:

- The selected NI port must be connected to a network, or have a loopback installed.
- Maximum testing of hardware occurs on a live network with MOP enabled.

The network system test tests the network port using external loopback packets. The packets vary in size from 1 byte of data to 32 bytes of data. The pattern for the packets comes from a set of 8 patterns: AA, 55, 34, CB, 99, 66, 43, and BC.

See Section A.2.30 for more information about NI system test error codes.

2.11.3 SCSI System Test (Model 60 Only)

Caution

Do not use the manufacturing environment in the field; this erases customer data on hard disks, except the system disk.

Setup Notes:

- If some or all devices do not show up in the summary screen after running system test, ensure that all devices have unique ID numbers.
- Make sure that the power cable is connected to the devices and the system module.
- Make sure that the SCSI cable is connected to the system and the SCSI bus is terminated.
- When in Digital Services or manufacturing environment, media must be present in the removable media drives, otherwise an error occurs.
- In order for destructive testing to be performed in Digital Services environment, a key pattern must be on the removable media disks and tapes.

Table 2–17 lists the tests that are in the SCSI system test.

Table 2–17 SCSI System Test

Self-Test	Function
Inquiries test	Performs inquiries to find out which devices are connected to the SCSI bus.
Size bus test	Spins up all the hard disk drives, makes sure the drives are ready (if not in customer environment), forces disk block sizes to 600 bytes, and obtains the capacity of the drives. Checks that removable media are not write protected; checks that key pattern is present on removable media in Digital Services environment, and that VMS boot block is present on the hard disk drives when in manufacturing environment.
Data transfer test	Verifies SCSI bus communication between the controller and available peripherals. Verifies the data path of the controller to the S-chip and to memory.
Device test	Verifies the peripheral devices attached to the SCSI bus and the DMA data path. Interrupts are enabled.

The following is an example of a successful SCSI system test display:

```
10 SCSI ################## 4
```

The following example shows an unsuccessful (error) SCSI system test display:

```
?? 10 SCSI 150 0076 8:18:41
```

The display shows an error (`0076`) on a SCSI device (`10 SCSI`) with ID 5 (`150`).

Example 2–7 shows a SCSI system test summary display.

Example 2–7 System Test Summary Display

```
ADR  RDS   WRTS   ERR   FRU  CMD  PHS  INF  LBNSTRT  XFERSIZ
---  ---   ----   ---   ---  ---  ---  ---  -------  -------
1/0  10987   0
3/0  5643  5643                          36   1378      119
4/0  28    28     160   150  28    1
-------------------------------------------------------------
4/0 XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX
```

System Test Summary Notes:

- Data is destroyed on hard disks in the manufacturing environment, except for disks with VMS installed.
- Data is not destroyed on hard disks in the Digital Services environment.
- All expansion boxes must have power supplied *before* the system box is powered up, or the expansion box devices will not be configured.
- Common causes of errors or devices missing from the configuration include the following:
  - The SCSI bus is not terminated.
  - All device IDs are not unique.
  - Internal cables to the drives are disconnected.
- The summary screen lists the test results by device ID.
- When in the Digital Services environment, media must be present in all removable media devices in order for devices to be fully tested.
- In order for writes to occur, a key pattern must be installed on writable removable media (floppies and tapes). The key pattern is put on the media by the SCSI utilities. The SCSI utilities are described in Section 2.12.7.
- Table A–14 lists the SCSI system test error codes.

2.11.4 DSW21 Synchronous Communication System Test (Model 60 Only)

The system test loads and runs 68302 test/scheduler.

The following shows a DSW21 synchronous communication system test error:

```
?? 12 COMM 020 001E 0 00:00:15.00
```

Example 2–8 shows the DSW21 synchronous communication system test summary.

Example 2–8 Communication System Test Summary

```
COMM Test Summary Screen.....................................
----------------------------------------------------------------
SCC1 Tx:         36 Rx:           36 Err:          0 INT-NOCABLE
SCC2 Tx:         36 Rx:           36 Err:          0 EXT-H3199
SCC3 Tx:         36 Rx:           36 Err:          0 INT-NOCABLE

Status Block:
-------------
FRU: 14 FTY: 6
CSR: 30 STA: 1
HWV:  2 SWV: 5
CC1:  F CC2: 0
MOD:  1 CNT: 1
CHN:  2 SEL: 2
PROT: 3 SCM: 9CF
```

2.12 Utilities

The TEST commands run or display available utilities. Utilities can be run with all parameters input either at the command line or at the utilities prompt for additional input.

2.12.1 Utility Groups

The console firmware provides four utility groups which are described in the following table:

Utility Group	Command Procedure	Functions
Graphics	T/UT 2	Provides colored screens and geometric patterns
NI	SET MOP 1 SET TRIGGER 1 SET PSE 1 SET PSWD	Enables MOP - NI listener Enables trigger - entity-based module Enables console password Allows user to set console password
SCSI	T/UT 10	Key utilities, floppy formatter, and disk eraser
TCA	T/UT TCA	Invokes the MIPS/REX TURBOchannel emulator

2.12.2 Utility Test Format

Following is the format for a utility test that runs completely from the command line:

```
>>> T [EST]/UT[ility] {dev_nbr} {util_nbr} {opt_p1,...,opt_pn}
```

The following table describes the utility test format:

Code	Description
dev_nbr	Number of the device on which you want to run the utility.
util_nbr	Number of the utility you want to run. The devices can have more than one utility.
opt_p1,...,opt_pn	Optional parameters that might be needed by a utility. For example, a SCSI utility might need to know the target ID of the device on which to run the utility.

2.12.3 TEST/UTILITY Command

The following sections provide information about the TEST/UTILITY command.

When to Use the TEST/UTILITY Command

If you are not familiar with the utilities that a device has available, then enter the TEST/UTILITY (T/UT) command, followed by the device number or utility mnemonic (such as LCG or SCSI). The utility prompts you for additional information, if needed.

TEST/UTILITY Command Procedure

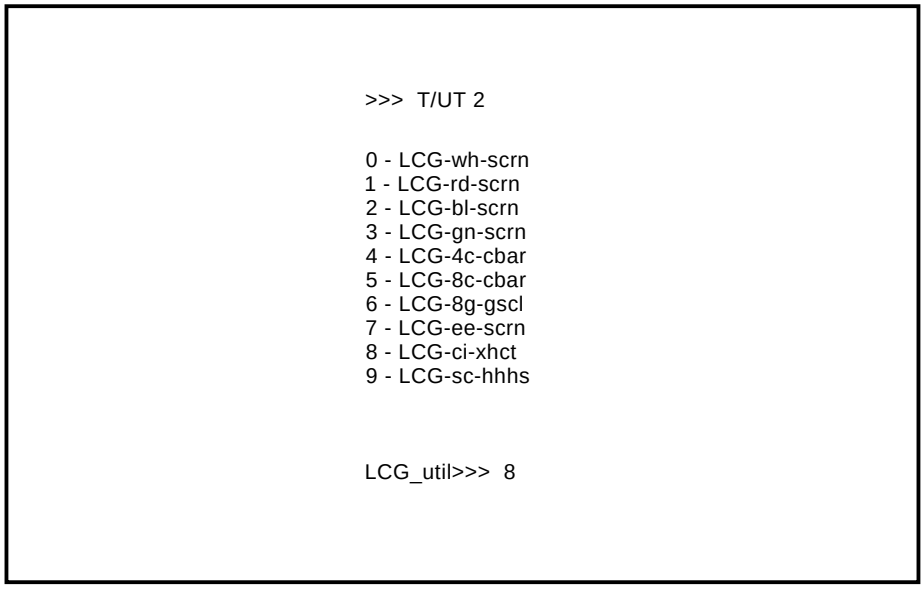
The following procedure describes how to run a graphics utility.

Step	Procedure
1	Enter T/UT 2 at the console prompt. The LCG's main utility routine displays a list of the available utilities (as shown in Figure 2–4) then displays the LCG_util>>> prompt.
2	Enter the utility number that you want to run.

TEST/UTILITY Command Screen Display

Figure 2–4 shows an LCG graphics utilities screen display.

Figure 2–4 Utilities List



LJ-00117-TI0

2.12.4 Utilities List Command Procedures

The following section describes several utilities list command procedures:

To Exit the Utility

To exit the utility *from the prompt*, press the Return key.

To exit the utility *after a test*, press Ctrl C.

If you accidentally enter an invalid utility number, control returns to the console.

To Return to the Utility Menu

To return to the utility menu, after the utility has run, press the space bar.

To Destroy Contents of Mass Storage Device

If you run a utility that will destroy the contents of a mass storage device, the following appears:

```
dev_nam OK ?
```

Enter the letters "OK" and press the Return key to start the utility. If any other combination of keys is entered, the control is returned to the console.

2.12.5 Graphics Utilities

The graphics utilities provide ten screens of color bars and geometric programs. Refer to Example 2–9 for a description of the ten screen utilities. The graphics utilities apply to the LCG, SPXg, SPXgt, and graphics/audio frame buffer graphics modules.

The following table describes how to use and exit the LCG utility:

Function	Procedure
Enter the LCG utility.	Enter the TEST/UTIL LCG command at the console prompt (>>>).
Display a screen.	Enter a command number at the LCG_util >>> prompt.
Go back to the LCG menu.	Press the space bar.
Go back to the LCG menu and clear the screen.	Press Ctrl C.
Exit the LCG utility.	Press Ctrl Y while a pattern is active.

Graphics Utility Menu

Example 2–9 shows the LCG utilities menu.

Example 2–9 LCG Utilities Menu

```
0 - LCG-wh-scrn       !White screen
1 - LCG-rd-scrn       !Red screen
2 - LCG-bl-scrn       !Blue screen
3 - LCG-gr-scrn       !Green screen
4 - LCG-4c-cbar       !4 color bars
5 - LCG-8c-cbar       !8 color bars
6 - LCG-8g-gscl       !8 gray scale bars
7 - LCG-ee-scrn       !Screen of EEs
8 - LCG-ci-xhct       !Cross hatch with circle
9 - LCG-sc-hhhs       !Screen of scrolling HHs

LCG_util >>>          !LCG utility prompt
```

2.12.6 Network Interconnect (NI) Utilities

The NI utilities are invoked by SET or SHOW commands, not by the TEST/UTIL command. The following table describes the NI utility functions:

Utility Function	Description
SET MOP	Enable/disable NI listener
SHOW MOP	NI listener state
SET TRIGGER	Enable/disable EBM
SHOW TRIGGER	EBM state

2.12.6.1 NI Listener

The NI listener has the following characteristics:

- The NI listener can send and receive messages while the system is in console mode.
- Operation is transparent to the console, and NI listener errors are not reported.
- NI listener failure can only be detected with the use of a network monitor device.
- The default is NI listener enabled.

The following lists the NI listener enable and disable commands:

If you want to...	Then type the following at the console prompt...
Enable listener	SET MOP 1
Disable listener	SET MOP 0

2.12.6.2 Entity-Based Module (EBM)

The entity-based module (EBM) is used to enable the remote console and remote boot. Remote boot allows another system to send a boot message to the workstation to start the bootloader. The remote console is discussed in Section 3.2.2.

The following lists the EBM enable and disable MOP boot commands:

If you want to...	Then type the following at the console prompt...
Enable MOP	SET TRIGGER 1
Disable MOP	SET TRIGGER 0

2.12.7 SCSI Utilities

The following table describes the SCSI utilities:

Utility	Description
Floppy Key utility	This utility is used in Digital Services environment. The key utility writes a key on block 0 of the floppy media. The key is used by the system test in Digital Services environment. If the key is found on the media, the system test writes to the media during the test. If the key is not found during the system test, only reads are done to the media.
Tape Key utility	This utility is used in Digital Services environment. The key utility writes a key at the beginning of the tape media. The key is used by the system test in Digital Services environment. If the key is found on the media, the system test writes to the media. If the key is not found, only reads are done to the media.
Hard Disk Erase utility	This utility erases all data from a hard disk. The pattern AA (hexadecimal) is written to all bytes on the disk. Any bad blocks are revectored.
Floppy Formatter utility	This utility erases a floppy disk and formats it.

2.12.8 Invoking SCSI Utilities

Note

Use the SHOW DEVICE command to display information about the Ethernet controller and the SCSI drives that are attached to the system. For more information about the SHOW DEVICE command, see Section 2.3.1.

To invoke the SCSI utilities, perform the following steps:

Step	Action	Result
1	Enter the TEST/UTIL SCSI command.	Displays the SCSI Utility Menu
2	Enter the utility number.	Selects the utility
3	Enter the SCSI ID.	Selects the drive
4	Enter the SCSI LUN*(always 0).	Displays the selected SCSI utility. Example: `SCSI ND_DSK_ERAS_UTIL`
5	Enter OK, if requested.	Verifies action for formatter and erases utilities.

*LUN = logical unit number

Refer to Example 2–10 for a sample SCSI utilities session.

2.12.9 SCSI Utility Menu

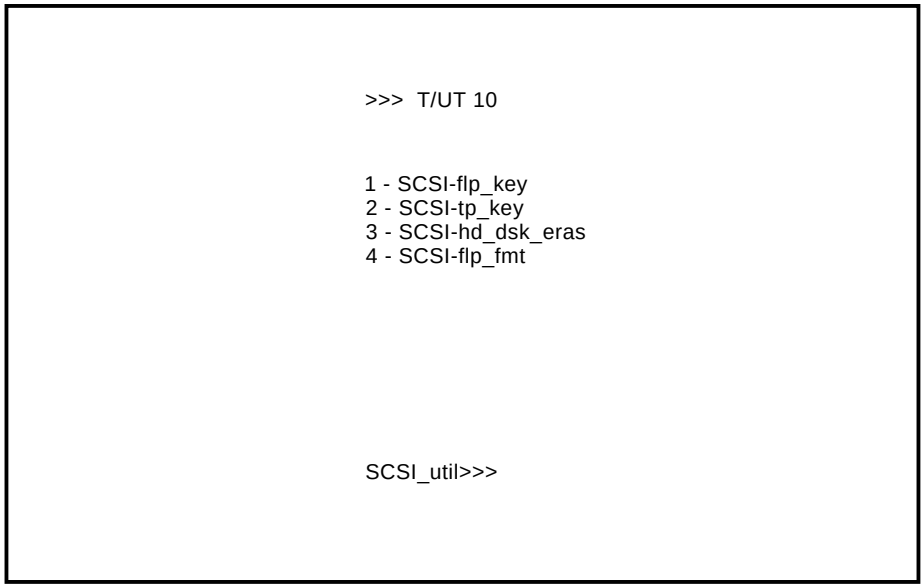
Example 2–10 shows a sample SCSI utilities session.

Example 2–10 SCSI Utilities Sample Session

```
>>> T/UT 10              ! Type in this command (or T/UT SCSI)

1 - SCSI-flp_key         ! Floppy key utility.
2 - SCSI-tp_key          ! Tape key utility.
3 - SCSI-hd_dis_eras     ! Hard disk erase.
4 - SCSI-flp_fmt         ! Floppy formatter.

SCSI_util>>> 3           ! Type in utility number
SCSI_id(0-7)>>> 5        ! Type in SCSI device ID
SCSI_lun(0-7)>>> 0       ! Type SCSI logical unit
                           number (always 0).

 SCSI HD_DSK_ERAS_UTIL

DKA500 OK ? ok           ! Confirm the action.

##############           ! Progress banner on ERASE
                           and FORMAT only.

SCSI_util_succ           ! Utility finished.
```

Figure 2–5 shows a SCSI utilities display.

Figure 2–5 SCSI Utilities Display



2.12.10 SCSI Utility Guidelines

Follow these guidelines about the SCSI utilities:

- The key utilities can only be run from the Digital Services environment. An error code of 181 displays if you run the key utilities from the customer environment.
- Never run a SCSI utility on the host ID (ID = 6).
- An error mnemonic of SCSI_E_type indicates you cannot perform the utility on the specified device, for example, running the tape key utility on a fixed disk. Refer to Table A–12 for a list of SCSI utility text messages.
- On the formatter and erase utilities, you must type OK at the DKA*xxx* OK prompt, or an error appears.
- An error occurs if an invalid device ID or logical unit number (always 0) is entered. Enter the SHOW DEVICE command at the console prompt for the correct IDs.
- If a drive is not listed in the SHOW DEVICE table, check SCSI and power connections, and check for duplicate device IDs.

2.12.11 TURBOchannel Adapter Utilities (Model 60 Only)

The MIPS/REX emulator utility executes TURBOchannel option firmware. The emulator functions as follows:

- Each MIPS instruction that would normally be executed by a MIPS processor, passes through the emulator software and executes.
- REX callback routines that would normally be provided by the DECstation console, are either mapped 1 to 1 to their VAXstation console equivalents or support routines are added where functions are different than those provided in the VAXstation.
- Allows the execution of canned tests and utilities for specific TURBOchannel options as if the user were sitting in front of a DECstation.

2.12.11.1 MIPS/REX Emulator

Invoking the Emulator

Enter the following command to invoke the emulator:

```
>>> T/UT TCA
```

The system will respond with the following message:

```
**KA46/49 TURBOCHANNEL REX EMULATOR**
  >>
```

Available Option Script Functions

Enter the following command to see a list of available script functions:

```
T TCO LS
```

Example:

```
>>T TC0 LS
    *emul: t tc0 ls
           28 | boot --> code
           28 | cnfg --> code
           28 | init --> code
           28 | t --> code
          256 | pst-q
          272 | pst-t
          288 | pst-m
        29264 | code*
```

Option Self-Tests

Enter the following command for self-test availability:

```
T TC0/?
```

Example:

```
>>T TC0/?

  flash
  eprom
  68K
  sram
  rmap
  phycsr
  mac
  elm
  cam
  nirom
  intlpbk
  iplsaf
  pmccsr
  rmc
  pktmem

       >>
```

Invoking Option Self-Test

Enter the following command to invoke an individual self-test:

Syntax:

```
>> T TC0/[Self-Test Name]
```

Example:

```
>> T TC0/FLASH
```

A successful test will return you to the prompt.

Option Error Message Example

The following is an example of an emulator self-test error message:

```
      >> t tc0 flash 10

      *emul: t tc0 flash 10
 ERR-MIPS - ROM OBJECT REPORTED A SEVERE ERROR

      >>
```

Note

If you receive an error message that is dependent on the device, consult the option firmware specifications for these errors.

Exiting the Emulator

Press Ctrl/D to exit the emulator and then access the system console prompt.

Example:

```
>> (CTRL/D will not be echoed)
bye
>>>
```

Refer to Section A.2.16 for additional REX commands that are supported by the MIPS/REX Emulator.

3
Using the Console

This chapter describes the system console commands and discusses how to use alternate consoles with the VAXstation 4000 Model 60 and VLC systems. Diagnostic commands, used to troubleshoot a system, are described in Chapter 2. The following topics are included in this chapter:

3.1 System Console

Standard console commands for the VAXstation 4000 Model 60 and VLC systems are listed by functional groups as follows:

Functional Group	Description or Example
Additional commands	HELP or ?, LOGIN, and REPEAT commands
SET/SHOW commands	Used to set or examine system parameters and configuration
Memory commands	DEPOSIT, FIND, and EXAMINE commands
Processor control commands	BOOT, CONTINUE, INITIALIZE, START, and UNJAM commands

3.1.1 Additional Console Commands

The following table describes the VAXstation 4000 Model 60 and VLC additional console commands:

Command	Description
HELP or ?	Lists console commands and syntax.
LOGIN	Enables restricted console commands when Password Enable (PSE) is set to 1. • Enter the LOGIN command at the >>> prompt. • Enter the 16-character password at the PSWD>>> prompt. Valid password characters are 0 through 9 and A through F.
REPEAT	Continuously repeats the console command that is entered directly after the REPEAT command. The following example repeats the memory test: >>> **REPEAT TEST MEM** Terminate the command by pressing Ctrl C. **Note:** The BOOT, INIT, and UNJAM commands cannot be repeated.

3.1.2 SET and SHOW Commands

The VAXstation 4000 Model 60 and VLC SET and SHOW commands are used to set and examine system parameters. Table 3–1 provides a description of the parameters for the SET and SHOW commands.

Table 3–1 SET/SHOW Parameters

Parameter	Meaning	SET	SHOW
BFLG	Default bootflag	X	X
BOOT	Default boot device	X	X
CONFIG	System configuration		X
DEVICE	Ethernet and SCSI devices information		X
DIAGENV	Diagnostic environment; must have loopback connector installed and mode set to 2 or 3	X	X
ETHER	Ethernet hardware address		X
ERROR	Errors from the last system or self-test		X
ESTAT (Model 60 only)	Status from the last system test		X
FBOOT	Power-up memory test flag	X	X
HALT	Halt recovery action	X	X
KBD	Keyboard language	X	X
MEM	Memory address range		X
MOP	MOP listener	X	X
PSE	Password enable	X	X
PSWD	Password	X	
SCSI	System SCSI ID	X	X
TRIGGER	Enable network console	X	X

3.1.2.1 SET and SHOW Command Syntax

The following table shows the syntax and examples of the SET and SHOW parameters:

Syntax	Example
`SHOW parameter`	`SHOW BOOT`
`SET parameter value`	`SET BOOT DKA200:`

3.1.2.2 BFLG

The BFLG parameter is the default bootflag. It is equivalent to R5:*xxxxxxxx* in the boot command.

BFLG is normally set to 0.

The following is an example of the SET BFLG and SHOW BFLG commands:

Command	Result
`SET BFLG 00000001`	`! Set BLFG to conversational boot` `BFLG = 00000001`
`SHOW BFLG`	`BLFG = 00000001`

3.1.2.3 BOOT

The BOOT parameter is the default boot device.

If you want to...	Then...
Set the boot device.	Select a bootable SCSI drive or network device.
See the current default boot device.	Enter the SHOW BOOT command.
See the valid device boot names.	Enter the SHOW DEVICE command. A table will appear on the screen; the first column (VMS/VMB) in the table lists the boot names.

The following is an example of the SET BOOT and SHOW BOOT commands:

Command	Result
`SET BOOT DKA200`	`BOOT = DKA200`
`SHOW BOOT`	`BOOT = DKA200`

3.1.2.4 CONFIG

The CONFIG parameter is used to display the system configuration and device status.

- The SET command does not apply to this parameter.
- Use SHOW DEVICE for more information on SCSI devices.

Refer to Section 2.3.2 for an example of a configuration display.

3.1.2.5 DEVICE

The DEVICE parameter is used to display SCSI and Ethernet device information.

The SET command does not apply to this parameter.

Refer to Section 2.3.1 for information displayed by the SHOW DEVICE command.

3.1.2.6 DIAGENV

The DIAGENV parameter determines the diagnostic environment that the diagnostics run under. Table 3–2 lists the diagnostic environments and their use.

Table 3–2 Diagnostic Environments

Environment	Usage
Customer	No setup is required. Default environment on power-up.
Digital Services	Provides a more thorough test than in customer environment. Some tests require loopback connectors for successful completion.
Manufacturing	Some tests require loopback connectors for successful completion. **Do not use this environment in the field. It can erase customer data.**
Loop on error Digital Services	The system loops on a test when an error occurs.
Loop on error manufacturing	The system loops on a test when an error occurs. **Do not use this environment in the field. It can erase customer data.**

To set the diagnostic environment, enter a console command from Table 3–3.

Table 3–3 SET DIAGENV Command

Command	Result
SET DIAGENV 1	Sets environment to customer environment
SET DIAGENV 2	Sets environment to Digital Services environment
SET DIAGENV 3	Sets environment to manufacturing environment
SET DIAGENV 80000001	Sets environment to loop on error in Digital Services environment
SET DIAGENV 80000002	Sets environment to loop on error in manufacturing environment

The following is an example of the SET DIAGENV and SHOW DIAGENV commands:

Command	Result
SET DIAGENV 2	DIAGENV = 2
SHOW DIAGENV	DIAGENV = 2

3.1.2.7 ERROR

The ERROR parameter displays extended error information about errors that that occur during the last execution of the following tests:

- Initialization (power-up) test
- Extended self-test
- System test

The SET command does not apply.

Refer to Section 2.4 and Section A.1 for additional information about immediate and extended error messages.

The following is an example of the SHOW ERROR command:

Command	Result
SHOW ERROR	?? 150 10 SCSI 0032 150 000E 00000005 001D001D 03200000 00000024 (cont.) 00000002 00000000 00000004

3.1.2.8 ESTAT

The ESTAT parameter displays status information about the system test.

The SET command does not apply.

The following is an example of the SHOW ESTAT command:

Command	Result
SHOW ESTAT	Displays the summary from the most recent system test since power-up. The display prompts for each summary screen.

3.1.2.9 ETHER

The ETHER parameter displays the Ethernet hardware address.

The SET command does not apply.

The following is an example of the SHOW ETHER command:

Command	Result
SHOW ETHER	ETHERNET = 08-00-2B-1B-48-E3

3.1.2.10 FBOOT

The FBOOT (fast boot) parameter determines whether the memory is tested when power is turned on.

- The test time is reduced when main memory is not tested.
- The setting only affects the power-up test.

If FBOOT is equal to...	Then the memory is...
0	Tested during power-up
1	Not tested during power-up **Note:** FBOOT should only be set to 1 when troubleshooting requires a number of power cycles, and memory is not the suspected fault.

The following is an example of the SET FBOOT and SHOW FBOOT commands.

Command	Result
SET FBOOT 1	FBOOT = 1

Command	Result
SHOW FBOOT	FBOOT = 1

3.1.2.11 HALT

The HALT parameter determines the recovery action that the system takes after power-up, system crash, or halt. The following table defines the HALT parameter values:

Value	Definition
1	System tries to restart operating system. If restart fails, then the system tries to reboot.
2	System tries to reboot. If the system fails to reboot, it enters console mode.
3	System halts and enters console mode.

The following is an example of the SET HALT and SHOW HALT commands:

Command	Result
SET HALT 2	HALT = 2
SHOW HALT	HALT = 2

3.1.2.12 KBD

The KBD parameter determines the keyboard language.

The following table defines the SET KBD and SHOW KBD commands:

Command	Definition
SHOW KBD	Allows you to display the numeric keyboard code.
SET KBD	Allows you to choose the language.

Example:

```
>>> SET KBD

0) Dansk                    8) Francais (Suisse Romande)
1) Deutsch                  9) Italiano
2) Deutsch (Schweiz)       10) Nederlands
3) English                 11) Norsk
4) English (British/Irish) 12) Portugues
5) Espanol                 13) Suomi
6) Francais                14) Svenska
7) Francais (Canadian)     15) Vlaams

3 >>> 4            ! Enter numeric code
```

3.1.2.13 MEM

The MEM parameter displays the memory address range and the unavailable memory address range.

- The unavailable range is memory that is used by the console and is marked unavailable by the diagnostics.
- The SET command does not apply.

The following is an example of the SHOW MEM command:

Command	Result
SHOW MEM	MEM_TOP = 01000000 MEM_BOT = 00000000 MEM_NOT_AVAIL ---------- 00FC0800:00FFFFFF

3.1.2.14 MOP

The MOP parameter enables the NI (Ethernet) listener while the system is in console mode. The NI listener can send and receive messages on the network.

The default mode is listener enabled (MOP = 1).

The following is an example of the SET MOP and SHOW MOP commands:

Command	Result
SET MOP 1	MOP = 1
SHOW MOP	MOP = 1

3.1.2.15 PSE and PSWD

The PSE parameter is the enable console password bit. When enabled, the console password is required to access the console.

The PSWD parameter is used to set the console password. The SHOW command does not apply.

The following are key points to remember about passwords:

If the PSE is equal to...	Then the password feature is...
1	Enabled
0	Disabled

The following table describes the SET PSWD and SET PSE commands:

Command	Result	Description
SET PSWD	PSDW0>>> *XXXXXXXXXXXXXXXX*	Old Password - only if a password has been previously set
	PSWD1>>> 1234567890ABCDEF	New password
	PSWD2>>> 1234567890ABCDEF	Verify new password
>>> SET PSE 1	PSE = 1	

How to Clear the Password

If you forget the password or need to clear the password, follow these procedures:

Step	Procedure
1	Turn the system power off.
2	Locate the two solder triangles near the TOY chip (alarm clock is painted on the chip). Using a screwdriver, briefly ground the two triangles together.

How to Log In

Follow these procedures to log in:

Step	Procedure
1	Set PSE to 1.
2	Enter the LOGIN command at the >>> prompt.
3	Enter the password at the PSWD0>>> prompt. The password must be *exactly 16 characters*. Valid password characters are 0 through 9 and A through F.

3.1.2.16 SCSI

The SCSI parameter sets the SCSI ID for the system SCSI controller.

The system SCSI ID default is set to 6.

The following is an example of the SHOW SCSI and SET SCSI commands:

Command	Result
`SHOW SCSI`	`SCSI = 6`
`SET SCSI 7`	`SCSI = 7`

3.1.2.17 TRIGGER

The TRIGGER parameter enables the entity-based module (EBM).

If both the TRIGGER and MOP parameters are equal to 1, then the EBM and the NI listener is enabled. You can then access the console or boot the system from a remote system.

The following is an example of the SET TRIGGER and SHOW TRIGGER commands:

Command	Result
`SHOW TRIGGER`	`TRIGGER = 0`
`SET TRIGGER 1`	`TRIGGER = 1`

3.1.3 Memory Commands

The following table describes three memory commands that manipulate memory and registers:

Command	Function
DEPOSIT	Enters values into memory locations or registers
EXAMINE	Displays the contents of memory locations or registers
FIND	Finds a good section of memory or restarts parameter block

3.1.3.1 DEPOSIT Command

The DEPOSIT command is used to write to memory locations from the console.

Syntax:

```
DEPOSIT /[qualifiers] {address} {data}
```

Table 3–4 lists the qualifiers and what each one specifies.

Table 3–4 DEPOSIT Command Qualifiers

Qualifier	Description
	Data Size[1]
/B	Byte (8 bits)
/W	Word (16 bits)
/L	Longword (32 bits)
/Q	Quadword (64 bits)
	Address Space[2]
/V	Virtual memory
/P	Physical memory
/I	Internal processor register
/G	General purpose register
/M	Machine register
	Range of Addresses
/N:X	Specifies that the X+1 locations be written with the value specified by DATA
	Protection
/U	Unprotects a protected memory location. An example of a protected area is the memory that the console uses.

[1]The *data* values must be given in hexadecimal format.

[2]The *address* specifies the address (or first address) to be written.

The following example of the DEPOSIT command writes the value 01234567 (data to be deposited) into 6 longword locations starting at address 00100000.

```
>>> DEPOSIT/P/N:5 00100000 01234567

  P 00100000 01234567
  P 00100004 01234567
  P 00100008 01234567
  P 0010000C 01234567
  P 00100010 01234567
  P 00100014 01234567
```

3.1.3.2 EXAMINE Command

The EXAMINE command is used to display the contents of specific memory locations from the console.

Syntax:

```
EXAMINE /[qualifier] [address]
```

Table 3–5 lists the qualifiers and what each one specifies.

Table 3–5 EXAMINE Command Qualifiers

Qualifier	Description
	Data Size[1]
/B	Byte (8 bits)
/W	Word (16 bits)
/L	Longword (32 bits)
/Q	Quadword (64 bits)
	Address Space[2]
/V	Virtual memory
/P	Physical memory
/I	Internal processor register
/G	General purpose register
/M	Machine register
	Range of Addresses
/N:X	Specifies that the X+1 locations be read with the value specified by DATA
	Protection
/U	Unprotects a protected memory location. An example of a protected area is the memory that the console uses.

[1]The *data* values must be given in hexadecimal format.

[2]The *address* specifies the address (or first address) to be written.

The following example of the EXAMINE command reads the Ethernet hardware address:

```
>>> EXAMINE/P/N:5 20090000

  P 20090000 0000FF08
  P 20090004 0000FF00
  P 20090008 0000FF2B
  P 2009000C 0000FF1B
  P 20090010 0000FF48
  P 20090014 0000FFE3
```

3.1.3.3 FIND Command

Use the FIND command to search memory for either of the following:

- A page-aligned 128 KB segment of good memory
- A restart parameter block (RPB)

If the memory segment is...	Then...
Found	The starting address plus 512 is left in the stack pointer (SP).
Not found	An error message appears.

Syntax:

`FIND /[qualifier]`

The following table defines the two qualifiers:

Qualifier	Description
MEMORY	128 KB section of memory
RPB	Restart parameter block

3.1.4 Processor Control Commands

The following table lists the processor control commands:

Command	Function
BOOT	Bootstraps the operating system
CONTINUE	Starts the CPU running at the current program counter (PC)
HALT	Stops the CPU
INITIALIZE	Initializes processor registers
START	Starts the CPU at a given address
UNJAM	Sets devices to an initial state

3.1.4.1 BOOT Command

The BOOT command starts the bootloader, which loads the operating system and starts it. The BOOT command causes the system to exit console mode and enter program mode. The BOOT command has the following syntax:

Syntax:

```
>>> BOOT /[qualifier] [boot_device],[boot_device]...
```

Table 3–6 describes each term in the BOOT command.

Table 3–6 BOOT Command Syntax

Term	Description
/qualifier	This optional qualifier sets the value for R5 for the bootloader. It is used to select a boot on the disk, or to select a conversational boot. The R5 qualifier can be specified in either of the following formats: • /R5:*xxxxxxxx* • /*xxxxxxxx*
boot_device,	This optional term is the primary boot device. If no device is specified, the system attempts to boot the default device. You can set the default boot device by using the SET BOOT command. You may enter optional secondary devices as well; the secondary device is the device that the bootloader tries to boot if the primary boot device fails.

The following example shows the system performing a conversational boot from DKA200. If the system cannot boot from DKA200, it tries a conversational boot from DKA400.

Example:

```
>>> BOOT /R5:00000001 DKA200, DKA400
```

3.1.4.2 CONTINUE Command

The CONTINUE command switches the system from console mode to program mode. The CPU starts running at the current program counter (PC). To execute this command, enter the CONTINUE command at the console prompt. For example,

```
>>> CONTINUE
```

3.1.4.3 INITIALIZE and UNJAM Commands

The INITIALIZE command resets the processor registers. The UNJAM command resets the system devices. Together, these commands reset the system. The UNJAM command should be entered first. For example,

```
>>> UNJAM
>>> INITIALIZE
```

3.1.4.4 START Command

The START command is used to set the program counter (PC) and start the CPU. This command causes the system to exit console mode and enter program mode.

Syntax:

```
START [address]
```

Address is the value loaded into the PC.

The following example of the START command starts the bootloader:

```
>>> START 200
```

3.2 Alternate Consoles

The VAXstation 4000 Model 60 and VLC systems provide two ways to use alternate consoles if the graphics subsystem fails. Console commands may be entered on a terminal connected to the printer port of the workstation or from a network connection to the Ethernet port. The two alternate consoles, printer port consoles and network consoles, are described in the following sections.

3.2.1 Printer Port Console

To access the printer port console verify that:

- The baud rate of the terminal connected to the printer port is set at 9600 baud.
- The alternate console switch (S3) is up.
  - S2 on the Model 60 is located on the front panel.
  - S3 on the VLC is located on the rear right side of the system box.

Note

The state of the alternate console switch is read only at power-up. Changing the switch setting when the system is powering up has no effect until the system box is powered down and then up.

3.2.2 Network Console

The system console can also be accessed from the network. The network console allows you to remotely troubleshoot the system or provide a console when the other consoles are not available.

Some console tests and commands cause the network connection to be terminated because the commands use the network device, or they cause a connection timeout at the remote node.

Caution: Do Not Run the Memory Test

Do not run the memory test. It causes the console to hang up and you will have to power down the system.

Follow these procedures to access the console from the network:

Step	Procedure
1	Identify the Model 60 or VLC hardware Ethernet address.
2	Verify that there is a VMS operating system on the same Ethernet segment as the Model 60 or VLC (the systems cannot be separated by a bridge or router).
3	Set the following VAXstation 4000 computer parameters: • Console password • MOP = 1 • TRIGGER = 1

To connect to the console after the Model 60 or VLC is set up, follow these procedures from the other VMS operating system:

Step	Procedure
1	Log in to a user account; no special privileges are required.
2	Type the following commands:

Command	Action
$ **MC NCP**	Enters the Network Control Program (NCP)
NCP> **SHOW KNOWN CIRCUITS**	Shows available circuits you can connect through
NCP> **CONNECT VIA circuit SERVICE PASSWORD xxxxxxxxxxxxxxxx PHYSICAL ADDRESS 08-00-2B-xx-xx-xx**	Connects to the console
>>> console commands	Performs console functions
>>> **CTRL/D**	Disconnects console
NCP> **EXIT**	Exits NCP
$ **LO**	Logs off the system

Example 3–1 is an example of a network console session.

Example 3–1 Network Console Session

```
$ MC NCP
NCP>SHOW KNOWN CIRCUITS

Known Circuit Volatile Summary as of 27-MAR-1991 13:50:02

   Circuit          State                  Loopback     Adjacent
                                             Name      Routing Node

  SVA-0             on                              25.14

NCP>CONNECT VIA SVA-0 SERVICE PASSWORD 1111111111111111 -
_ PHYSICAL ADDRESS 08-00-2B-1B-48-E3 ! Connects to the console

Console connected (press CTRL/D when finished)
>>> LOGIN RETURN    ! PSE must be set to 1

PSWD0>>> xxxxxxxxxxxxxxxx !Type 16 character password

>>> SHOW CONFIG     ! Type console command

 KA46-A BL3-186-B3.1       ! System type and firmware revision
 08-00-2B-F3-31-03         ! Ethernet hardware address
 16 MB                     ! Total memory

 DEVNBR  DEVNAM  INFO
 ------  ------  ----
     1    NVR    OK                    ! Non-volatile RAM
     2    LCG    OK                    ! 2D high res. color graphics rev 2.7
                  HR - 8 PLN FB - 2.7
     3    DZ     OK                    ! Serial line controller
     4    CACHE  OK                    ! Cache memory
     5    MEM    OK                    ! Memory configuration

                 16MB = SY=8MB, S0/S1=8MB, S2/S3=0MB, S4/S5=0MB

     6    FPU    OK                    ! Floating point accelerator
     7     IT    OK                    ! Interval timer
     8    SYS    OK                    ! Other system functions
     9     NI    OK                    ! Ethernet
     10   SCSI   OK                    ! SCSI and drives
                 1-RZ23L 6-INITR       ! One RZ23L at ID 1, system at ID 6.
     11   AUD    OK                    ! Sound
     12   COMM   OK                    ! DSW21 communications device
     13   TCA    OK                    ! TURBOchannel adapter
CTRL/D

NCP> EXIT
$
```

4

FRU Removal and Replacement Hints

The following section contains VAXstation 4000 Model 60 and VLC FRU removal and replacement hints. Refer to the *VAXstation 4000 Model 60 Service Information* and *VAXstation 4000 VLC Service Information* guides for complete FRU removal and replacement procedures, illustrations, and part numbers. The following topics are included in this chapter:

4.1 Precautions

Only qualified service personnel should remove or install FRUs.

Note

It is the customer's responsibility to back up the software before Digital Services personnel arrive at the site. This is important to ensure that data is not lost during the service process.

The customer should also shut down the workstation software. Before performing any maintenance work, Digital Services personnel must confirm that the customer has completed both of these tasks.

Caution

Electrostatic discharge (ESD) can damage integrated circuits. Always use a grounded wrist strap (part number 29-11762-00) and a work-surface-to-earth ground when working with the internal parts of the workstation.

4.2 Preliminary Steps

Perform these preliminary steps before removing and replacing an FRU:

Step	Procedure
1	Verify that the symptom is not caused by improper configuration or a loose cable.
2	Confirm with the customer that data has been backed up. If not, the data could be lost (when a hard disk is at fault).
3	Be sure that the operating system is shut down before turning off the system or halting the CPU.

Step	Procedure
4	Use the SHOW CONFIG command and write down the following information: • System ROM version • Graphics type • Memory configuration • SCSI devices and IDs
5	Make sure this configuration agrees with the actual hardware. If the configuration does not agree, make sure the following are true: • SCSI IDs are all unique. • Cables are correctly installed. • The expansion box power is turned on first.
6	Wait three minutes after turning off a monitor before you move or service it.

4.3 System Preparation

Follow these steps to prepare the system for removing and replacing FRUs:

Step	Procedure
1	Shut down the operating system.
2	Put the system into console mode by pressing the halt button on the system box.
3	At the console prompt, set the system to halt on future power-ups after the power-up tests are completed by entering the following command: >>> **SET HALT 3** Return

Step	Procedure
4	Use the SHOW CONFIG command to determine the presence of devices, test status, and quantity of memory inside the system. • Record the current system configuration information for reference. • After adding the new device or module: – Compare the new configuration with the previous one to help verify that all devices are present and functioning correctly. – Halt the system when you first turn it on. Use the diagnostic tests described in Chapter 2 to determine if the new device or module is connected correctly.
5	Turn off (O) the system power.
6	Disconnect the system power cord from the wall outlet and then from the system.

Warning

Turn the monitor power off for at least three minutes before removing the power cord. Remove the power cord before moving the monitor.

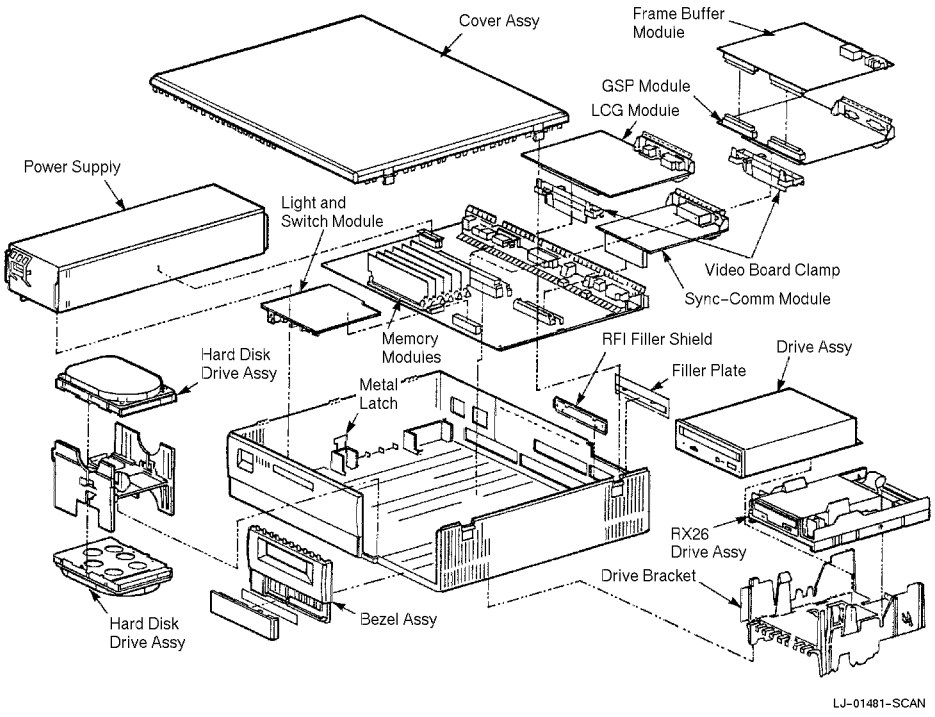
4.4 Model 60 FRU Removal/Replacement Hints

The following section contains Model 60 FRU removal and replacement hints.

4.4.1 Model 60 FRU Locations

Figure 4–1 shows the location of the Model 60 system FRUs.

Figure 4–1 System FRU Locations (Front View)



4.4.2 Hard Disk Drive

The following hints provide removal and replacement assistance:

Hint	Procedure
	Bracket/Disk Removal
1	Pull the colored tab on the drive bracket toward the front of the system. The tab is located at the upper left corner of the bracket.
2	Lift the drive and bracket from the system box. Disconnect the SCSI and dc power cable from the drive(s).
	Disk Removal
1	Push down on the plastic tab at the end of the bracket (opposite to where the SCSI and power cables connect to the drive).
2	Slide the drive over the plastic tab until the metal peg on each side of the drive is aligned with the vertical slot on the bracket.
	Replacement
1	When installing the drive into the bracket, apply pressure on the drive to seat it properly.

Note

Never set two devices on the same SCSI ID; the system cannot service devices with identical IDs.

4.4.3 RX26 Diskette Drive

The following hints provide removal assistance:

Hint	Procedure
	Bracket/Diskette Removal
1	Pull the tab on the drive bracket toward the power supply of the system. The tab is located at the upper front right corner of bracket.
2	Push the tab behind the screw hole at the bottom center of the bracket to the right.
3	Lift the drive and bracket from the system box. Disconnect the SCSI and dc power cable from drive(s).
	Diskette Removal
1	Release the latches on each side of bracket to remove the drive. Lift the drive and secondary bracket (RX26 bracket) from the bracket.

4.4.4 TZK10 QIC Tape Drive and RRD42 CD-ROM Drive

The following hints apply to both the CD-ROM and tape drive media.

Hint	Procedure
	Bracket/Drive Removal
1	Push the tab behind the screw hole at the bottom center of the bracket to the right.
2	Remove the drive from the bracket by releasing the latches on each side of the bracket. Lift the drive from the bracket.

4.4.5 Power Supply

The following hints provide removal and replacement assistance:

Warning

Do not attempt to open the power supply. There are dangerous voltages inside; there are no user-serviceable parts.

Hint	Procedure
	Removal
1	Remove the hard disk drive.
2	Pull forward on the blue tab (on the right toward the front of the box) just under the supply and lift the front of the supply slightly.
3	Lift the rear of power supply and remove it from the system box.
	Replacement
1	Align the two guides (one on the right front of the supply, and one on the right rear) with the slots on the system box.
2	Push the supply down in place. The supply snaps in place if properly positioned.

4.4.6 Lights and Switches Module

The following hints provide removal assistance:

Hint	Procedure
	Removal
1	Remove the hard disk drive bracket.
2	Remove the removable media drive bracket.
3	Disconnect the module connector from the system module by lifting up on the module where it overlaps the system module.
4	Lift the module away from the front of the system.

4.4.7 MS44 Memory Module

Caution

You can easily damage memory components with static electricity. Wear an antistatic wrist strap when you install or remove memory components.

Hint	Procedure
	Removal
1	If you replace a module toward the front of the system board, you must remove the modules at the back first, and work toward the front.
2	Release the two metal retainers at each end of the memory module connector.
3	Rotate the module backwards (approximately 55 degrees to the rear of the unit) and lift it out of the slot.

4.4.8 LCG Graphics Module

Caution

Wear an antistatic wrist strap and place an antistatic mat under the system when removing and replacing any modules.

Hint	Procedure
	Removal
1	Pull the two tabs above the module towards the front of the system. Rotate the front of the module up.
	Replacement
1	Make sure that the two slots in the metal bracket on the graphics module line up with the two notches on the plastic bracket that is along the rear of the system module.
2	Press down firmly on the module until it secures within the two front latches.
3	Check to see if the front edge of the metal bracket locks behind the ridge on the plastic bracket that is described in Hint 1.
	QUAD Head Replacement
1	Remove the CPU and install the QUAD head option card on the CPU.
2	Replace the CPU with the option card.

4.4.9 ScanProc Graphics Module

The following hints provide removal and replacement assistance:

Hint	Procedure
	SPXg Removal
1	Remove the frame buffer/graphics subsystem processor (GSP) assembly.
	SPXg Replacement
1	If the new FRU is a SIMM memory module, install it on the frame buffer module.
2	Set the switch 2 setting toward the B marker on the frame buffer module for a 66 Hz refresh rate. Set the switch 2 away from the B marker on the frame buffer module for a 72 Hz refresh rate. Switch 1 can be in either position (inactive).
3	Replace the RFI gasket.
4	Replace the GSP module. **Note:** The GSP module and frame buffer module are replaced separately.
5	Make sure the two slots in the metal bracket on the graphics module line up with the two notches on the plastic bracket along the rear of the system module.
6	Press down firmly on module until it secures within the two front latches.
7	Check to see if the front edge of the metal bracket locks behind the ridge on the plastic bracket described in Hint 5.
8	Replace the frame buffer module.

Hint	Procedure
	SPXgt Removal
1	Remove the plastic clip that holds the GSP module to the frame buffer module. **Note:** Attempting to remove both the GSP module and the frame buffer module, by grasping the frame buffer module tail, could result in damage to the module.
2	Lift the frame buffer tail bracket just enough to free it from the ridge on the disk drive H-bracket.
3	Hold the frame buffer module above the GSP inter-module connectors. The GSP module will remain connected to the system module. Gently work the frame buffer module loose from the GSP inter-module connectors.
4	Pull the frame buffer free from the RFI gasket.
5	Release the board latches and lift the GSP module from the system module.
	SPXgt Replacement
1	Install RFI gasket.
2	Replace the GSP module. **Note:** The GSP module and frame buffer module are replaced separately.
3	Make sure the two slots in the metal bracket on the graphics module line up with the two notches on the plastic bracket along the rear of the system module.
4	Press down firmly on the module until it secures within the two front latches.
5	Check to see if the front edge of the metal bracket locks behind the ridge on the plastic bracket described in Hint 3.
6	Replace the frame buffer module. Snap the frame buffer module tail bracket over the ridge on the disk drive H-bracket.

4.4.10 System Module (CPU)

The following hints provide removal and replacement assistance:

Hint	Procedure
	Removal
1	Remove the system module (CPU) by lifting the front slightly, so that it clears the two guides at the front right and left of the module.
2	Use the large center connector and pull the module toward the front of the system box. Lift the system module out.
	Replacement
1	Make sure the five slots in the module line up with the five latches on the base of the system box.

Note: Remove the Ethernet ROM

The Ethernet ROM must be removed and installed on the new system module so that the customer's unique Ethernet ID will not be lost.

4.4.11 Synchronous Communication Module

The following hint provides removal assistance:

Hint	Procedure
	Removal/Installation
1	Remove the SCSI cable before removing and installing the module.

4.4.12 TURBOchannel Adapter and Option Modules

The following hints provide removal and replacement assistance:

Hint	Procedure
	TURBOchannel Adapter/Option Removal
1	Disconnect the TURBOchannel option cable.
2	Remove the two screws that hold the option plate over the outside of the TURBOchannel option.
3	Disconnect and remove the SCSI cable from system board and from the opening over the external TURBOchannel port.
4	Remove the graphics module. For additional information about removing the graphics module, refer to Section 4.4.8 or Section 4.4.9.
5	Pivot the TURBOchannel option upward and lift it out.
6	Remove the TURBOchannel adapter from the four plastic standoffs.

4.5 VLC FRU Removal/Replacement Hints

The following section contains VLC FRU removal and replacement hints.

Note

Refer to Section 4.2 and Section 4.3 before you begin any FRU removal or replacement.

4.5.1 VLC FRU Locations

Figure 4–2 shows the location of the VLC system FRUs.

❶ CPU module (PN 54-20768-01)

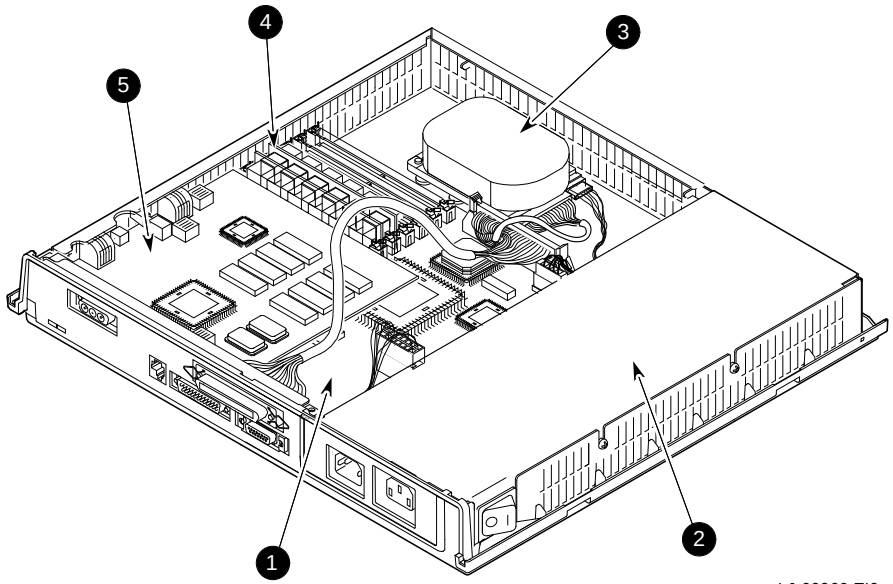
❷ Power supply (PN H7109-AA)

❸ RZ23L 121 MB disk drive (PN RZ23L-E), or RZ24L 245 MB disk drive (PN RZ24L-E)

❹ Memory modules (PN 20-36453-05; in Europe, order PN 54-21231-AA)

❺ Graphics/audio frame buffer modules

Figure 4–2 System FRU Locations (Rear View)



4.5.2 Hard Disk Drive

The following hints provide removal and replacement assistance:

Hint	Procedure
	Removal
1	Depress the cricket clip on the side of the drive and slide the drive towards the power supply until the metal screws (on the bottom of the drive) are aligned with the mounting holes on the skid plate.
	Replacement
1	It is easier to mount the drive on the system box when the cables are attached to the drive.
2	When you install the drive into the bracket, apply pressure to seat the drive properly.

4.5.3 Power Supply

The following hints provide removal assistance:

Hint	Procedure
	Removal
1	Disconnect the power supply cable from the connector on system module.
2	Loosen the two torx screws that hold the power supply against the left side of the system box.
3	Tilt the power supply up until it clears the system box.

Caution

Wear an antistatic wrist strap and place an antistatic mat under the system when removing and replacing any modules.

4.5.4 Graphics/Audio Frame Buffer Module

The following hints provide removal assistance:

Hint	Procedure
	Removal
1	Remove the two mounting screws.
2	Lift the module up and to the front until the video jack clears the plastic system box enclosure.

4.5.5 System Module (CPU)

The following hint provides removal assistance:

Hint	Procedure
	Removal
1	The Ethernet ROM *must* be removed and installed on the new system module, so that the customer's unique Ethernet ID will not be lost.

4.5.6 MS40 Memory Module

Caution

You can easily damage memory components with static electricity. Wear an antistatic wrist strap when you install or remove memory components.

The following hints provide removal assistance:

Hint	Procedure
	Removal
1	If you replace a module in the back of the system board, you must remove the modules at the front first, and work towards the back.
2	Release the two metal retainers at each end of the memory module connector.
3	Rotate the module forwards (approximately 55 degrees to the rear of the unit) and lift it out of the slot.

A

Interpreting Error Codes

The VAXstation 4000 Model 60 and VLC system firmware always tries to report any detected hardware errors to the console device and to the LEDs. The Model 60 LEDs are located on the front of the system box and the VLC LEDs are located on the rear of the system box. Errors are reported as a result of failures during the power-up tests or during user-initiated tests. The error codes identify the device and the test that failed. The following topics are included in this appendix:

A.1 Error Messages Overview

The console reports the following two types of errors:

Error Type	Description
Immediate	These errors are displayed immediately after running a test, without additional user intervention.
Extended	These errors display more error information in a different format. To get the extended error information, enter the SHOW ERROR command at the console prompt (>>>).

Immediate Error Message Format

The following example shows the format for immediate error messages:

```
?? 150 10 SCSI 0050
```

The following table describes each code:

Code	Meaning
??	Indicates whether the failure is fatal or nonfatal. • A double question mark (??) indicates a fatal error. • A single question mark (?) indicates a non-fatal error.
150	Field-replaceable unit (FRU). See Table A–1. In this case it is a SCSI drive with the device ID set to 5.
10	Device identification (decimal). Corresponds to the left bank of four LEDs (hexadecimal). Also corresponds to the mnemonic (next field). Use Table 2–3 to correlate the error code to a device.
SCSI	Mnemonic of device ID.
50	Error code displayed following the test is in decimal. The extended message error codes have a hexadecimal format. When you look up an error code in the error code tables, be sure you know whether the code is in hexadecimal or decimal format.

A.1.1 Extended Error Message

To display an extended error message, enter the SHOW ERROR command at the console prompt after the completion of a test.

The extended error display has two lines:

- An error line similar to the immediate error message. The error code (last field of the first line) is in hexadecimal.
- A second line with up to eight longwords of error information.

Extended Error Message Format

The extended error messages appear in the following format:

```
?? 150 10 SCSI 0032
150 000E 00000005 001D001D 03200000 00000024
  (cont.) 00000002 00000000 00000004
```

The following table describes each code:

Code	Meaning
First line of error message	
??	Indicates whether the failure is fatal or non-fatal. • A double question mark (??) indicates a fatal error. • A single question mark (?) indicates a nonfatal error.
150	Field-replaceable unit (FRU). See Table A–1.
10	Device identification (decimal). Corresponds to SCSI.
SCSI	Mnemonic of failed module.
32	Error code in hexadecimal.
Second line of error message	
150	Field-replaceable unit (FRU).
000E	Error code format. The format dictates the meaning of the remaining longwords of error information. This remaining information is not normally required for nonmemory service.

A.1.2 FRU Codes

The FRU code for the VAXstation 4000 Model 60 and VLC systems identifies the field-replaceable unit that failed. FRU codes and names are listed in the following table:

Table A–1 FRU Codes

FRU Code	FRU
001	System module; the mnemonic identifies the device.
002	Keyboard
003	Mouse
004	Monitor 1
005	Monitor 2
010-019	Graphics modules
020-029	COMM options (Model 60 only)
030-039	BUS adapters (Model 60 only)

Memory Module Codes 040-045

FRU Code	Module Location	
	Model 60	**VLC**
040	J25	J6
041	J24	J5
042	J23	J4
043	J22	J3
044	J21	J2
045	J20	J1

SCSI Drive Codes 100-170

FRU Code	Drive with ID
100	0
110	1
120	2
130	3
140	4
150	5
160	6
170	7

A.2 Error Codes: Self-Tests, Systems Tests, and Utilities

The following tables describe the self-tests, system tests, and utilities for the Model 60 and VLC systems.

Notes

- The following tables apply to both the Model 60 and VLC systems, unless specified otherwise.
- In the self-test tables, decimal errors display after the self-test, and hexadecimal errors display after the extended test.

A.2.1 TOY/NVR Self-Test Error Codes

The TOY/NVR self-test produces the error codes in the following table:

Table A–2 TOY/NVR Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
4	4	Battery was found to be bad
8	8	NVR register test has failed
12	C	Battery down and NVR register test has failed
16	10	TOY register test has failed
32	20	Valid RAM and time bit have failed to set
36	24	VRT bit failure and battery was found to be bad
44	2C	Battery down, VRT failure, and NVR test has failed
48	30	TOY register test and VRT have failed
64	40	Battery check test has failed; hard error
65	41	Battery check test has failed; soft error
72	48	Battery check test and NVR register test have failed
96	60	VRT bit failure and battery check test has failed

(continued on next page)

Table A–2 (Cont.) TOY/NVR Test Error Codes

Error Decimal	Hexadecimal	Meaning
104	68	Battery check, VRT, and NVR test have failed
128	80	Update in progress has failed to clear; hard error
129	81	Update in progress has failed to clear; soft error
160	A0	Update in progress has failed and VRT bit failure

A.2.2 DZ Self-Test Error Codes

The DZ self-test produces the error messages in the following table:

Table A–3 DZ Self-Test Error Codes

Error Decimal	Hexadecimal	Meaning
16	10	DZ reset test has failed
32	20	DZ read LPR test has failed
48	30	DZ modem test has failed
64	40	DZ polled test has failed
80	50	DZ interrupt driver transfer test has failed
96	60	DZ LK401 test has failed
112	70	DZ mouse test has failed
128	80	DZ INIT DRIVER has failed
144	90	No memory to use for data area

The DZ self-test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. The extended error code format is shown in the following example.

Extended Error Format:

This extended error message is returned by the DZ read LPR test or if a character comparison error occurs in the other DZ tests. The second field (4-digit field) is the extended error format.

```
001 000a ssssssss cccccccc lprlprlp llllllll rrrrrrrr eeeeeeee
```

Where:

- ssssssss - is the suberror code
- cccccccc - is the value of the DZ CSR
- lprlprlp - is the contents of the line parameter register
- llllllll - is the line number
- rrrrrrrr - is the data read back
- eeeeeeee - is the expected data

The extended error code returned by polled and interrupt test when a transfer times out is in the following format:

```
001 000b ssssssss cccccccc lprlprlp llllllll xxxxxxxx tttttttt
```

Where:

- ssssssss - is the suberror code
- cccccccc - is the value of the DZ CSR
- lprlprlp - is the contents of the line parameter register
- llllllll - is the line number
- xxxxxxxx - is the number of characters transmitted
- tttttttt - is the value of the DZ transmit control register

The suberror codes reported by the DZ self-test are as follows:

Table A–4 DZ Suberror Codes

Suberror-Hexadecimal	Meaning
	Read LPR
21	Read LPR baud rate is incorrectly set
22	Read LPR character width is incorrectly set
23	Read LPR parity bit is incorrectly set
24	Read LPR receiver on bit is incorrectly set
	DZ Modem Test
31	DZ modem test - failed RTS or CTS loopback
32	DZ modem test - failed DSRS or DSR & CD loopback
33	DZ modem test - failed LLBK or SPDMI loopback
34	DZ modem test - failed DTR or RI loopback
	DZ Polled Test
41	DZ polled test - transfer has timed out
42	DZ polled test - data is not valid
43	DZ polled test - parity error
44	DZ polled test - framing error
45	DZ polled test - overrun error
46	DZ polled test - character received (character transmitted)
	DZ Interrupt Test
51	DZ interrupt test - transfer has timed out
52	DZ interrupt test - data is not valid
53	DZ interrupt test - parity error
54	DZ interrupt test - framing error
55	DZ interrupt test - overrun error
56	DZ interrupt test - character received (character transmitted)
	DZ LK401 Test
61	DZ LK401 test - transfer has timed out
62	DZ LK401 test - LK401 has failed self-test
	DZ Mouse Test
71	DZ mouse test - transfer has timed out
72	DZ mouse test - mouse has failed self-test

A.2.2.1 DZ System Test Error Codes (Model 60 Only)

The following are error codes for the system test DZ module:

```
?? DZ   0     ABCD    0 00:00:00.00
```

ABCD are the four DZ lines. The error codes are identical for each line. The following table identifies each line:

Line	Identification
A (line 3)	Printer port
B (line 2)	25-pin connector
C (line 1)	Mouse
D (line 0)	Keyboard

The following table describes the eight error codes possible for each line:

Error Code	Definition
1	Not all characters transmitted
2	First character not received
3	Timeout
4	More characters received than expected
5	Parity error
6	Framing error
7	Overrun error
8	Data compare error

These errors are translated by the summary screen. Refer to Section 2.11.1 for an example of the DZ system test summary screen.

A.2.3 Memory Self-Test Error Codes

The memory test produces the error messages in the following table:

Table A–5 Memory Test Error Codes

Error Decimal	Hexadecimal	Meaning
64	40	16 MB memory module and a 4 MB memory module are plugged in as a pair
66	42	Gap was found between memory module pairs
68	44	16 MB memory module found on a PVAX2
70	46	4 MB memory modules found after 16 MB memory modules
72	48	Memory modules not plugged in as pairs
256	100	Failure has occurred in the byte mask test
260	104	Parity error occurred during the byte mask test
514	202	Data compare error occurred during the forward pass
516	204	Parity error occurred during the forward pass
770	302	Data compare error occurred during the reverse pass
772	304	Parity error occurred during the reverse pass
1028	404	Parity error occurred during parity test 1
1288	504	Parity error occurred during parity test 2

The memory test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. The extended error code format is shown in the following example:

Extended Error Format:

```
xxx 4 MEM yyyy
xxx 00a bbbbbbbb ccccccc ddddddd eeeeeee
```

Code	Meaning
xxx	FRU that failed
yyyy	Hexadecimal error code
00a	Extended error information format type
bbbbbbbb	Contents of the memory system error register (MSER)
ccccccc	Failing address
ddddddd	Expected data
eeeeeee	Data that was read

The following table lists the Model 60 and VLC memory module FRU codes and their corresponding system board module, bank, and connector locations. Remember that memory boards must be added in pairs (banks).

Table A–6 MEM Memory Module FRU Values

FRU	Module	Bank	Connector
040			
Model 60	1	0	J25
VLC	1	2	J6
041			
Model 60	2	0	J24
VLC	2	2	J5
042			
Model 60	1	1	J23
VLC	1	1	J4
043			
Model 60	2	1	J22
VLC	2	1	J3
044			
Model 60	1	2	J21
VLC	1	0	J2
045			
Model 60	2	2	J20
VLC	2	0	J1

A.2.4 Interval Timer Self-Test Error Codes

The interval timer test produces the error code in the following table:

Table A–7 Interval Timer Test Error Codes

Error		
Decimal	Hexadecimal	Meaning
2	2	Interval timer is not interrupting at the correct rate

A.2.5 System Device Self-Test Error Codes

The system device self-test produces the error messages in the following table:

Table A–8 System Device Self-Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
2	2	System ROM has failed
128	80	Invalidate filter RAM error
256	100	ROM illegal data path value
512	200	ROM checksum error
768	300	ROM manufacturing check data error
1024	400	ROM index number did not agree with address

If the invalidate filter RAM error occurs, an extended error message displays. Enter the SHOW ERROR command to view the extended error information. The extended error code format is shown in the following example.

Extended Error Format:

This format displays when there is an invalidate filter RAM error.

```
001 0010 aaaaaaaa rrrrrrrr eeeeeeee
```

Code	Meaning
001	FRU number (system board)
0010	Format number
aaaaaaaa	Failing invalidate filter address
rrrrrrrr	Data read
eeeeeeee	Data expected

A.2.6 SCSI Self-Test Error Codes

The SCSI self-test produces the error messages in the following table:

Table A–9 SCSI Self-Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
2	2	SCSI reset register test has failed
4	4	SCSI configuration registers test has failed
6	6	SCSI FIFO register test has failed
8	8	SCSI transfer count registers test has failed
		SCSI Interrupt Test Failures
10	10	Status registers test has failed
20	14	No cause has failed
22	16	High IPL, mask disabled has failed
24	18	High IPL, mask enabled has failed
26	1A	Low IPL, mask disabled has failed
28	1C	Low IPL, mask enabled has failed
		SCSI Data Transfer Test Failures
30	1E	PROM function has failed
32	20	DMA mapping has failed
34	22	Non-DMA inquiry has failed
36	24	Not enough data returned failure
38	26	DMA inquiry has failed
40	28	Non-DMA/DMA miscompare
42	2A	DMA inquiry nonaligned has failed
44	2C	Non-DMA/DMA nonaligned miscompare
46	2E	Synchronous inquiry has failed
48	30	Non-DMA/synchronous miscompare
50	32	SCSI minimal device test has failed

(continued on next page)

Table A–9 (Cont.) SCSI Self-Test Error Codes

Error Decimal	Hexadecimal	Meaning
		SCSI Map Error Test Failures
60	3C	DMA mapping has failed
62	3E	DMA inquiry has failed
64	40	Map error will not clear
66	42	Map error will not set
68	44	Parity error will not clear
70	46	PROM function has failed
80	50	SCSI PROM function has failed
82	52	SCSI INIT driver has failed

The SCSI test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. There are several types of extended error codes as shown in the following examples.

Extended Error Format 0001:

This format is used by the register test.

```
001 0001 aaaaaaaa bbbbbbbb cccccccc dddddddd
```

Code	Meaning
aaaaaaaa	Error code
bbbbbbbb	Address of the register or location being accessed
cccccccc	Expected data or data written
dddddddd	Actual data or data read

Extended Error Format 000B:

This format is used by the register test.

```
001 000B aaaaaaaa bbbbbbbb cccccccc
```

Code	Meaning
aaaaaaaa	Error code
bbbbbbbb	Address of the register or location being accessed
cccccccc	Information about the error

Extended Error Format 000C:

This format is used by the interrupt test.

```
001 000C aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee ffffffff
```

Code	Meaning
aaaaaaaa	Error code
bbbbbbbb	Information about the error
cccccccc	Contents of interrupt mask register
dddddddd	Contents of interrupt request register
eeeeeeee	Contents of controller status register
ffffffff	Contents of the controller interrupt register

Extended Error Format 000D:

This format is used when not enough data are returned to the self-test after a SCSI command is executed.

```
aaa 000D bbbbcccc ddddeeee ffffgggg hhhhhhhh
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddd	Actual command opcode
eeee	Current command opcode

Code	Meaning
ffff	Error code
gggg	Mode of operation
hhhhhhhh	Number of data bytes received

Extended Error Format 000E:

This format is used when execution of a SCSI command fails.

```
aaa 000E bbbbcccc ddddeeee ffffgggg hhhhiiii jjjjjjjj kkkkllll mmmmmmmm
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddd	Actual command opcode
eeee	Current command opcode
ffff	Error code
gggg	Mode of operation
hhhh	Byte 14 of the request sense packet (device FRU)
iiii	Information about the error[1]
jjjjjjjj	SCSI bus phase at the time of the error
kkkk	Contents of the controller status register at the time of the error
llll	Contents of the controller interrupt register at the time of the error
mmmmmmmm	Request sense key

[1]Refer to Table A–10.

Extended Error Format 000F:

This format is used when the status phase returns a bad status, or when a bad sense key is seen after a request sense.

```
aaa 000F bbbbcccc ddddeeee ffffgggg hhhhiiii jjjjjjjj kkkkkkkk
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddd	Actual command opcode
eeee	Current command opcode
ffff	Error code
gggg	Mode of operation
hhhh	Byte 14 of the request sense packet (device FRU)
iiii	Information about the error[1]
jjjjjjjj	Status byte returned in the status phase
kkkkkkkk	Request sense key

[1]Refer to Table A–10.

Extended Error Format 0010:

This format is used when a request sense command is executed, but not enough sense bytes are received.

```
aaa 0010 bbbbcccc ddddeeee ffffgggg hhhhiiii jjjjjjjj kkkkkkkk
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddd	Actual command opcode
eeee	Current command opcode
ffff	Error code
gggg	Mode of operation

Code	Meaning
hhhh	Byte 14 of the request sense packet (device FRU)
iiii	Information about the error[1]
jjjjjjjj	Number of bytes of sense data returned from the request sense
kkkkkkkk	Request sense key

[1]Refer to Table A–10.

Extended Error Format 0011:

This format is used when the data out phase sends fewer bytes than expected.

```
aaa 0011 bbbbcccc ddddeeee ffffgggg hhhhiiii jjjjkkkk llllllll mmmmmmmm
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddd	Actual command opcode
eeee	Current command opcode
ffff	Error code
gggg	Mode of operation
hhhh	Byte 14 of the request sense packet (device FRU)
iiii	Information about the error[1]
jjjj	Contents of the controller status register at the time of the error
kkkk	Contents of the controller interrupt register at the time of the error
llllllll	Number of bytes actually sent in the data in/out phase
mmmmmmmm	Number of bytes that should have been sent in the data in/out phase

[1]Refer to Table A–10.

Extended Error Format 0012:

This format is used when an unsupported message is seen.

```
aaa 0012 bbbbcccc ddddeeee ffffgggg hhhhiiii jjjjjjjj kkkkllll mmmmmmmm
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddd	Actual command opcode
eeee	Current command opcode
ffff	Error code
gggg	Mode of operation
hhhh	Byte 14 of the request sense packet (device FRU)
iiii	Information about the error[1]
jjjjjjjj	First message byte of the message in the phase that the error occurred
kkkk	Contents of the controller interrupt register at the time of the error
llll	Contents of the controller status register at the time of the error
mmmmmmmm	Request sense key

[1]Refer to Table A–10.

Extended Error Format 0013:

This format is used by the map error test.

```
aaa 0013 bbbbcccc dddddddd eeeeeeee ffffffff gggggggg hhhhhhhh iiiiiiii
```

Code	Meaning
aaa	FRU
bbbb	Logical unit number
cccc	Device ID
dddddddd	DMA address where the SCSI command is located
eeeeeeee	DMA address where the SCSI data is located
ffffffff	Contents of the parity control register

Code	Meaning
gggggggg	Map register address
hhhhhhhh	Contents of the map register
iiiiiiii	Error code

Extended Error Format 0014:

This format is used by the data transfer test when the numbers received from two transfers are different.

```
aaa 0014 bbbbbbbb cccccccc dddddddd
```

Code	Meaning
aaa	FRU
bbbbbbbb	First number of the bytes
cccccccc	Second number of the bytes
dddddddd	Error code

Extended Error Format 0015:

This format is used by the data transfer test when the data bytes received from two transfers are compared and found to be different.

```
aaa 0015 bbbbbbbb cccccccc
```

Code	Meaning
aaa	FRU
bbbbbbbb	Number of the byte that failed
cccccccc	Error code

Note

The FRU reported by all error formats is either 001 for the system board FRU, or (100 + device_id*10 + logical unit number).

The information values reported by some extended SCSI self-test errors are as follows. Refer to Table A–10 when an iiii message is displayed within the extended error format.

Table A–10 SCSI Information Values

Information Value		
Decimal	**Hexadecimal**	**Meaning**
1	1	Valid group code bit clear in controller status register
2	2	Valid group code bit set in controller status register
3	3	Terminal count bit clear in controller status register
4	4	Terminal count bit set in controller status register
5	5	Parity error bit clear in controller status register
6	6	Parity error bit set in controller status register
7	7	Gross error bit clear in controller status register
8	8	Gross error bit set in controller status register
9	9	Interrupt bit clear in controller status register
10	A	Interrupt bit set in controller status register
11	B	Selected bit clear in controller interrupt register
12	C	Selected bit clear in controller interrupt register
13	D	Select with attention bit clear in controller interrupt register
14	E	Select with attention bit set in controller interrupt register
15	F	Reselected bit clear in controller interrupt register
16	10	Reselected bit set in controller interrupt register
17	11	Function complete bit clear in controller interrupt register
18	12	Function complete bit set in controller interrupt register
19	13	Bus service bit clear in controller interrupt register
20	14	Bus service bit set in controller interrupt register
21	15	Disconnect bit clear in controller interrupt register

(continued on next page)

Table A–10 (Cont.) SCSI Information Values

Information Value		
Decimal	**Hexadecimal**	**Meaning**
22	16	Disconnect bit set in controller interrupt register
23	17	Illegal command bit clear in controller interrupt register
24	18	Illegal command bit set in controller interrupt register
25	19	SCSI reset bit clear in controller interrupt register
26	1A	SCSI reset bit set in controller interrupt register
27	1B	Arbitration not won
28	1C	Selection timeout
29	1D	Invalid sequence in sequence step register
30	1E	FIFO flags are not clear
31	1F	FIFO flags are clear
32	20	Unexpected ISR hit
33	21	SCSI interrupt request set in system interrupt request register
34	22	SCSI bit set unexpectedly in controller status register
35	23	Interrupt service routine was not entered
36	24	No SCSI interrupt request was seen
37	25	Interrupt bit in controller status register will not clear
38	26	SCSI bit in system interrupt request register will not clear
39	27	Bad request sense key
40	28	Bad status returned from status phase
41	29	Not enough sense data returned from a request sense command
42	2A	Phase did not go to command phase
43	2B	Phase did not go to message out phase
44	2C	Phase did not go to message in phase

(continued on next page)

Table A–10 (Cont.) SCSI Information Values

Information Value		
Decimal	**Hexadecimal**	**Meaning**
45	2D	Command phase changed too soon
46	2E	Data out phase changed too soon
47	2F	Message in phase changed too soon
48	30	Message out phase changed too soon
49	31	Stuck in command phase
50	32	Stuck in message in phase
51	33	Stuck in message out phase
52	34	Stuck in data out phase
53	35	Stuck in data in phase
54	36	Should not be in message out phase
55	37	No interrupt after sending SCSI command
56	38	No interrupt after sending command complete
57	39	No interrupt after sending message accepted
58	3A	No interrupt after sending transfer information
59	3B	All data out bytes were not sent
60	3C	Command complete message was sent but device did not drop off bus
61	3D	Unexpected message reject from device
62	3E	FIFO flag count is wrong
63	3F	Message is unsupported
64	40	Bus device reset was sent, but device did not drop off bus
65	41	Illegal phase
66	42	Should not be in data in phase
67	43	Problem with a device trying to reconnect
68	44	Unexpected disconnect message received
69	45	Device not seen before trying to reconnect
70	46	Bad identify message received on reconnection

(continued on next page)

Table A–10 (Cont.) SCSI Information Values

Information Value		
Decimal	**Hexadecimal**	**Meaning**
71	47	Out of re-tries for this command
72	48	Too many bytes sent in data out phase
73	49	Too many bytes sent in data in phase
74	4A	Reconnection timeout
75	4B	SCSI parity error
76	4C	SCSI map error

The mode values reported by some extended SCSI self-test errors are as follows:

Table A–11 SCSI Mode Values

Mode - Hexadecimal	Meaning
0	Asynchronous mode with programmed I/O
1	Asynchronous mode with DMA
2	Synchronous mode with DMA

A.2.7 SCSI Utilities Messages

The following table describes error messages returned by a SCSI utility. All Model 60 and VLC SCSI utility errors appear in the format *text_message information_value*.

Table A–12 Text Messages for SCSI Utilities

Text	Meaning
SCSI_E_badparam	Bad parameter entered by the user
SCSI_E_err	Generic utility error
SCSI_E_devtyp	Wrong device type for this utility
SCSI_E_media	Problem with the media
SCSI_E_lun	Logical unit is not present
SCSI_E_inq_err	Error in inquiry command
SCSI_E_modsns_err	Error in mode sense command
SCSI_E_modsel_err	Error in mode select command
SCSI_E_tur_err	Error in test unit ready command
SCSI_E_rwnd_err	Error in rewind command
SCSI_E_wrt_err	Error in write command
SCSI_E_rd_err	Error in read command
SCSI_E_rdcap_err	Error in read capacity command
SCSI_E_st_unt_err	Error in start unit command
SCSI_E_ver_	Error in verify command
SCSI_E_fmt_unt_err	Error in format unit command
SCSI_E_reass_err	Error in reassign command

In addition to the information values reported by the extended SCSI self-test errors, the following information values are reported in decimal:

Table A–13 Additional SCSI Information Values for Utilities

Information Value Decimal	Meaning
176	Bad utility number received from the user
177	Bad device number received from the user
178	Bad logical unit number received from the user
180	Device number entered by the user is the same as the controller
181	Utility cannot be executed in this mode of operation
182	Not enough data was returned from a SCSI command
183	Device is not a disk
184	Device is not a tape
185	Media is not removable
186	Media is removable
187	Media is write-protected
188	Device is not ready
189	Wrong data read back from a SCSI command
190	Logical unit is not present
191	Initialize driver failed
192	Error in format page
193	Error in flexible page
194	PROM function error
195	Disk capacity is too small
196	Error receiving character from console
197	Illegal floppy drive
198	Illegal floppy media

A.2.8 SCSI System Test Error Codes (Model 60 Only)

The following error codes are produced by the Model 60 SCSI system test:

Table A–14 SCSI System Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
90	5A	WST call failed
92	5C	ELN call failed
100	64	Inquiry failed when sizing bus
102	66	Not enough inquiry data returned when sizing bus
104	68	Start unit failed when sizing bus
106	6A	Test unit ready failed when sizing bus
108	6C	Mode select failed when sizing bus
110	6E	Read capacity failed when sizing bus
112	70	Mode sense failed when sizing bus
114	72	Media is write-protected in manufacturing mode
116	74	Not enough mode sense data returned when sizing bus
118	76	Read failed when sizing bus
120	78	Not enough read data when sizing bus
122	7A	Verify failed when sizing bus
130	82	Read failed when checking for key
132	84	Rewind failed when checking for key
134	86	Wrong number bytes read when checking for boot block
140	8C	Read failed when checking for boot block
142	8E	Wrong number bytes read when checking for boot block
150	96	Non-DMA inquiry failed in data transfer test
152	98	Synchronous DMA inquiry failed in data transfer test
154	9A	Number bytes miscompare in data transfer test
156	9C	Data miscompare in data transfer test
160	A0	Device test failed
162	A2	Wrong number bytes read in device test

(continued on next page)

Table A–14 (Cont.) SCSI System Test Error Codes

Error Decimal	Hexadecimal	Meaning
164	A4	Wrong number bytes written in device test
166	A6	Data miscompare in device test
168	A8	Reselection timeout in device test

A.2.9 SCSI System Test Summary Screen (Model 60 Only)

The SCSI summary screen displays the following information:

```
ADR RDS WRTS ERR FRU CMD PHS INF LBNSTRT XFERSIZ
```

Code	Meaning
ADR	ID and logical unit number (LUN)
RDS	Number of reads performed on this device (decimal)
WRTS	Number of writes performed on this device (decimal)
ERR	Error code (hexadecimal)
FRU	Field-replaceable unit (hexadecimal if FRU received from request sense packet)
CMD	SCSI command that failed (hexadecimal)
PHS	SCSI bus phase at time of error
INF	Informational value (same as those reported by the self-test; hexadecimal)
LBNSTRT	Starting logical block number of failed transfer (hexadecimal)
XFERSIZ	Transfer size in blocks of failed transfer (hexadecimal)

A.2.10 DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

The following table describes the DSW21 synchronous communication device self-test error codes:

Table A–15 DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error		
Decimal	**Hexadecimal**	**Meaning**
1	1	Self-test was unsuccessful
2	2	Transmit underflow
4	4	Transmitter busy
6	6	Receiver busy
8	8	Transmitter error
10	A	Carrier detect loss
	Sync Comm Receive Failures	
12	C	Receive overflow
14	E	Receive CRC error
16	10	Receive abort
18	12	Receive non-octet aligned
20	14	Receive parity error
22	16	Receive frame error
24	18	Receive length too large
26	1C	Receive DLE follow
30	1E	No external loopback connector
32	20	Invalid test specified
34	22	PVAX timeout waiting for response
36	24	Comm module timeout waiting
38	26	PVAX invalid test

(continued on next page)

Table A–15 (Cont.) DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error		
Decimal	**Hexadecimal**	**Meaning**
		DSW21 Comm. Device Failures
40	28	Comm option test failure
42	2A	Comm option copy to RAM failed
44	2C	Comm option RAM test failed
46	2E	Comm option dual RAM access test
48	30	Comm option interrupt test
50	32	Comm option reset test
52	34	Comm option internal loopback
54	36	Comm option external loopback
56	38	Comm option modem signal test
58	3A	Comm option H3199 failure
60	3C	Comm option H3248 failure
62	3E	Comm option H3250 failure
64	40	Comm option H3047 failure
66	42	Comm option host internal buffer failure
68	44	Comm option external buffer loop
70	46	Data compare error

(continued on next page)

Table A–15 (Cont.) DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error Decimal	Error Hexadecimal	Meaning
		DSW21 Comm. IMP Failures
128	80	IMP IDMA timeout
130	82	IMP SCC transmit timeout
132	84	IMP SCC receive timeout
134	86	IMP command timeout
136	88	IMP ERR timeout
138	8A	IMP PB8 timeout
140	8C	IMP SMC2 timeout
142	8E	IMP SMC1 timeout

(continued on next page)

Table A–15 (Cont.) DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error Decimal	Error Hexadecimal	Meaning
		DSW21 Comm. IMP Failures
144	90	IMP watchdog timeout
146	92	IMP SCP timeout
148	94	IMP timer 2 timeout
150	96	IMP SCC3 timeout
152	98	IMP PB9 timeout
154	9A	IMP timer 1 timeout
156	9C	IMP SCC2 timeout
158	9E	IMP IDMA timeout
160	A0	IMP SDMA timeout
162	A2	IMP SCC1 timeout
164	A4	IMP PB10 timeout
166	A6	IMP PB11 timeout
168	A8	IMP internal loopback system test
170	AA	IMP external loopback system test
172	AC	IMP timer 1 timeout
174	AE	IMP timer 2 timeout
176	B0	IMP transmit ready timeout
178	B2	IMP receive ready timeout

(continued on next page)

Table A–15 (Cont.) DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error Decimal	Error Hexadecimal	Meaning
		DSW21 Comm. IMP Failures
180	B4	IMP invalid SCC channel
182	B6	PVAX data compare error
184	B8	IMP carrier detect asset timeout
186	BA	IMP carrier detect deassert timeout
188	BC	IMP CTS assert timeout
190	BE	IMP CTS deassert timeout
192	C0	IMP IDL assert timeout
194	C2	IMP IDL deassert timeout
196	C4	IMP invalid cable attached
198	C6	IMP no test indicator
200	C8	IMP no data set ready
202	CA	IMP no ring indicator
204	CC	IMP no speed indicator
206	CE	IMP no carrier detect
208	D0	IMP no clear to send
210	D4	IMP power up block initialization
212	D6	IMP DSR assert timeout
214	D6	IMP DSR deassert timeout
216	D8	IMP reset error
218	DA	IMP mode initialization error
220	DC	PVAX memory allocation error
222	DE	PVAX memory free error
224	E0	UTIL invalid utility number

(continued on next page)

Table A–15 (Cont.) DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error Decimal	Error Hexadecimal	Meaning
226	E2	UTIL invalid cable code
		DSW21 Comm. Timeout Failures
228	E4	Timeout comm option set response RA
230	E6	Timeout comm option clear command CA
232	E8	Timeout comm option set scheduler run SR
234	EA	Timeout comm option set transmit ready TR
236	EC	Timeout comm option set receive ready RR
238	EE	Comm option exception occurred
240	F0	Comm option command register timeout
242	F2	Comm option transmit clear to send lost
244	F4	PVAX test memory allocation error
246	F6	PVAX test memory free error
248	F8	Comm option reported invalid configuration
250	FA	PVAX ROM test
252	FC	PVAX ROM checksum error
254	FE	PVAX control C entered at console
256	100	Comm option receive error-CRC follow error
258	102	Comm option MC68302 component is not REV B
260	104	Test request sequence error
262	106	IMP timeout waiting for host to clear RA

(continued on next page)

Table A–15 (Cont.) DSW21 Synchronous Communication Device Self-Test Error Codes (Model 60 Only)

Error		
Decimal	**Hexadecimal**	**Meaning**
264	108	IMP timeout waiting for host to clear SR
266	10A	ROM test error
268	10C	FBUG secure error-reserved operation
270	10E	Port PB3 signal stuck high
272	110	Timer 3 not counting
274	112	Comm option diagnostics did not complete
276	114	Comm option SDMA bus error occurred
278	116	Timeout waiting for IRQ assertion
280	118	Transmit restart of 10 exceeded

A.2.11 DSW21 Synchronous Communication Device Self-Test Sequence Numbers (Model 60 Only)

Table A–16 lists the test sequence numbers reported by the DSW21 during self-test. The sequence number is reported in location 2C02F604 of the status block. The table also lists the test routines in addition to those of the M68302.

Table A–16 DSW21 Synchronous Communication Self-Test Sequence Numbers (Model 60 Only)

Test Number			
Decimal	**Hexadecimal**	**Routine**	**Description**
01	01	imp_exc	Exception vector initialization
02	02	imp_vec	User interrupt vector initialization
03	03	imp_rdb	Local register RDB initialization
04	04	imp_pub_init	Up block initialization

(continued on next page)

Table A–16 (Cont.) DSW21 Synchronous Communication Self-Test Sequence Numbers (Model 60 Only)

Test Number			
Decimal	**Hexadecimal**	**Routine**	**Description**
05	05	imp_op_init	Option register initialization
06	06	imp_br_init	Base register initialization
07	07	imp_cs_switch	Power-up switch initialization
08	08	imp_cfg	Get hardware configuration
09	09	imp_scr_init	System control register initialization
10	0A	imp_core	MC68302 core confidence test
11	0B	imp_dwcn	Watchdog timer counter clear
12	0C	imp_aport_init	Port A initialization
13	0D	imp_bport_init	Port B initialization
14	0E	imp_cisdn	ISDN configuration
15	0F	imp_loc_init	Local scratch RAM SCR initialization
16	10	imp_idb_init	Interrupt data block initialization
17	11	imp_pcb_init	Process control block initialization
18	12	imp_ic_init	Interrupt controller initialization
19	13	imp_cable_code	Read cable code
20	14	imp_dma_test	IDMA transfers test
21	15	imp_rings	Initialize rings
22	16	imp_s1_inte	SCC1 ISR enable
23	17	imp_s2_inte	SCC2 ISR enable
24	18	imp_s3_inte	SCC3 ISR enable
25	19	imp_it1_test	Timer 1 test
26	1A	imp_it2_test	Timer 2 test
27	1B	imp_imode	Initialize mode
28	1C	imp_reset	Initialize CP

(continued on next page)

Table A–16 (Cont.) DSW21 Synchronous Communication Self-Test Sequence Numbers (Model 60 Only)

Test Number			
Decimal	**Hexadecimal**	**Routine**	**Description**
29	1D	imp_ilb_test	SCC internal loop
30	1E	imp_modem_ test	Modem signal test
31	1F	imp_elb_test	SCC external loop
32	20	imp_isdn_test	ISDN test
33	21	imp_rdb	Runtime register RDB initialization
34	22	imp_loc_init	Runtime SCR RAM initialization
35	23	imp_cable_code	Runtime read adapter cable code
36	24	imp_ic_init	Runtime interrupt controller initialization
37	25	imp_idb_init	Runtime IDB initialization
38	26	imp_pcb_init	Runtime PCB initialization
39	27	imp_reset	Runtime communication processor initialization
40	28	imp_rings	Runtime initialize transmit and receive rings
41	29	imp_s1_inte	Runtime SCC1 ISR
42	2A	imp_s2_inte	Runtime SCC2 ISR
43	2B	imp_s3_inte	Runtime SCC3 ISR
44	2C	imp_t1_start	Runtime timer 1 start
45	2D	imp_t2_start	Runtime timer 2 start
46	2E	imp_t3_start	Runtime timer 3 start
47	2F	imp_dainit	Runtime RAM dual access initialization
48	30	imp_xvec	Runtime transfer vector initialization

The Model 60 DSW21 synchronous communication device test displays error information in decimal when an error occurs. Enter the SHOW ERROR

command to view the extended error information in hexadecimal. The extended error codes can be of several types as shown in the following examples.

Extended Error Format 0001:

This format is used by the synchronous communication option RAM test.

```
0020 0001 aaaa0000 00000000 00000000 00000000 bbbb0000 ccccdddd eeeeffff
```

Code	Meaning
0014	FRU code for the DSW21 synchronous communication option
0001	Format type for the RAM test
aaaa	Test status
bbbb	Data size (1=byte access, 2=word access, 4=long access)
cccc	Address low
dddd	Address high
eeee	Actual data
ffff	Expected data

Extended Error Formats 0002 through 0006 are used by the DSW21 synchronous communication self-tests.

Extended Error Format 0002:

```
0020 0002 aaaabbbb ccddeeff gghhiijj kkkkllll mmmmnnnn oooopppp qqqqrrrr
```

Extended Error Format 0003:

```
0020 0003 aaaabbbb ccddeeff gghhiijj kkkkllll mmmmnnnn oooopppp qqqqrrrr
```

Extended Error Format 0004:

```
0020 0004 aaaabbbb ccddeeff gghhiijj kkkkllll mmmmnnnn oooopppp qqqqrrrr
```

Extended Error Format 0005:

```
0020 0005 aaaabbbb ccddeeff gghhiijj kkkkllll mmmmnnnn oooopppp qqqqrrrr
```

Extended Error Format 0006:

```
0020 0006 aaaabbbb ccddeeff gghhiijj kkkkllll mmmmnnnn oooopppp qqqqrrrr
```

The following table describes extended error formats 0002 through 0006:

Code	Meaning
0020	FRU code for the DSW21 synchronous communication option
0002 0003 0004 0005 0006	Format type for the test
aaaa	Test status
bbbb	MC68302 diagnostic test number
cc	Cable code for channel 1 SCC1
dd	Cable code for channel 2 SCC2
ee	Current hardware revision
ff	Current software revision
gg	Current channel under test (1, 2, 3)
hh	Current electrical interface
ii	Internal loopback mode (0=internal, 1=external)
jj	External channel count
kkkk	Current SCC mode
llll	Current protocol
mmmm	Data size
nnnn	Current channel speed
oooo	Address low
pppp	Address high
qqqq	Expected data
rrrr	Actual data

Extended Error Format 0007:

This format is used by the DSW21 synchronous communication device reset test. The reset test only returns a timeout status if it does not get a posted interrupt controller.

```
0020 0007 00070000 00000000 00000000 00000000 00000000 00000000 000000000
```

Code	Meaning
0020	FRU code for the DSW21 synchronous communication device
0007	Format type
0007	Currently running reset test

Extended Error Format 0008:

This format is used by the DSW21 synchronous communication option null request.

```
0020 0008 0008 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000
```

Code	Meaning
0020	FRU code for the DSW21 synchronous communication device
0008	Format type
0008	Currently running null request

Extended Error Format 0009:

This format is used by the DSW21 synchronous communication device when an exception occurs.

```
0020 0009 00EEaaaa bbbbcccc dddd0000 00000000 0000eeee ffffgggg 00000000
```

Code	Meaning
0020	FRU code for the DSW21 synchronous communication device
0009	Format type
aaaa	Command status register
bbbb	Stack pointer high
cccc	Exception vector

Code	Meaning
dddd	Stack pointer low
eeee	Status register
ffff	PC low
gggg	PC high

Extended Error Format 10:

This format is used by the DSW21 synchronous communication device when it first executes code, and is used to verify that the 68K is executing instructions.

```
 0020 000A 00040003 00060005 00080007 00100009 00120011 00140013
00160015
```

Code	Meaning
0020	FRU code for the DSW21 synchronous communication device
000A	Format type

A.2.12 DSW21 Synchronous Communication Utilities Error Codes (Model 60 Only)

The following table lists DSW21 synchronous communication utilities error codes:

Table A–17 DSW21 Synchronous Communication Utilities Error Codes

Decimal	Hexadecimal	Meaning
224	E0	Invalid utility request
226	E2	Invalid test request
255	FF	Control C entered

A.2.13 DSW21 Synchronous Communication Device System Test Error Codes (Model 60 Only)

Errors reported for the system test are the same as those reported for the extended test, in addition to errors that may be reported by the VAXELN kernel service.

A.2.14 TURBOchannel Adapter Self-Test Error Codes

The following table describes the TURBOchannel adapter self-test error codes.

Table A–18 TURBOchannel Adapter Self-Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
0002	0002	TURBOchannel reset bit stuck at 1
0004	0004	Forced TURBOchannel timeout not seen
0006	0006	Timeout bit stuck at 1
0008	0008	FIFO is empty after loading data
0010	000A	FIFO not empty after retrieving data
0012	000C	Data read from FIFO does not match loaded data
0014	000E	Forced invalid reference error not seen
0016	0010	Forced ERROR condition not seen
0018	0012	TCA interrupt at VAX INT_REG not set
0020	0014	Interrupt bit on TCA not set
0022	0016	ISR was not entered on interrupt
0024	0018	FIFO data was bad after DMA TRIGGER read operation
0026	001A	FIFO data does not match loaded data after DMA TRIGGER write

The TURBOchannel adapter self-test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information.

TURBOchannel error codes appear in the following format:

?? 013 13 TCA *XXXX*

XXXX refers to the error code format.

- Errors reported directly from the console are in decimal format.
- Errors displayed after the SHOW ERROR command is entered, are in hexadecimal format.

Decimal Format

The following example shows a TCA decimal error code:

```
>>>T TCA
?? 013 13 TCA    0026
```

Hexadecimal Format

The following example shows a TCA hexadecimal error code:

```
>>>SHOW ERROR

?? 013 13 TCA    001A
```

A.2.15 TURBOchannel Adapter System Test Error Codes (Model 60 Only)

There is no system test for the TURBOchannel adapter. Refer to Section 2.12.11 and Section A.2.16 for additional diagnostic test information.

A.2.16 TURBOchannel Adapter MIPS/REX Emulator Utility Commands (Model 60 Only)

The MIPS/REX emulator utility allows you to execute TURBOchannel option firmware.

Note

If you refer to an option's user's manual for examples on how to run tests, remember that the VAXstation 4000 Model 60 only has TURBOchannel emulator slot 0. The emulator slot is entered as TC0 on the command line.

Help Command

Enter the following command to display the commands that are required to invoke the available TURBOchannel options:

```
T TC0 ?
```

Example

This example is for the single-width DEFZA TURBOchannel FDDI option.

```
>> T TC0 ?
REX CMDS:
T TC0 / <tstnam> | ?
T TC0 SCRIPT <scriptnam>
T TC0 INIT
T TC0 CNFG
T TC0 LS
T TC0 CAT <scriptnam>

>>
```

ROM Object List

ROM objects reside on the TURBOchannel option card.

Enter the following command to display all ROM objects for the TURBOchannel device.

```
T TC0 LS
```

Example:

```
>> T TC0 LS

  *emul: t tc0 ls

         28 | boot --> code
         28 | cnfg --> code
         28 | init --> code
         28 | t --> code
        256 | pst-q
        272 | pst-t
        288 | pst-m
      29264 | code*

>>
```

Each line is in the following format: [size_in_bytes] | [object_name]

ROM Object Symbols

The following table defines the ROM object symbols.

Symbol	Meaning
-->	Symbolic Link (don't be concerned with this)
*	Executable Image
|	Separator between the two parameters
pst-q pst-t pst-m	Scripts (built-in tests to be executed one after the other) Use these tests with the T TC0 CAT [SCRIPTNAM] and T TC0 SCRIPT [SCRIPTNAM] commands.

Note

After entering `T TC0 LS` It is not always safe to run tests which do not appear in any script. Consult the TURBOchannel option user's guide before you run any tests individually.

Script Contents

Enter the following command to display the contents of a script:

```
T TC0 CAT <scriptnam>
```

Example:

```
>> T TC0 CAT PST-M

    *emul: t tc0 cat pst-m
pst-m:
t ${#}/flash
t ${#}/eprom
t ${#}/68K
t ${#}/sram
t ${#}/rmap
t ${#}/phycsr
t ${#}/mac
t ${#}/elm
t ${#}/cam
t ${#}/nirom
t ${#}/intlpbk
t ${#}/iplsaf
t ${#}/pmccsr
t ${#}/rmc
t ${#}/pktmem
t ${#}/rtostim
t ${#}/botim
t ${#}/extlpbk
t ${#}/extmemtst
t ${#}/dmatst

    >>
```

Definition of ${#}

${#} is script language for "substitute the slot number here". When the emulator executes each test in a script, it automatically substitutes the slot number for "${#}. The slot number is always 0 for the VAXstation 4000 Model 60.

Option Tests

Enter the following command to display all the option tests:

```
T TC0 / ?
```

Example:

```
>> T TC0 /?
       *emul: t tc0/?
     flash
     eprom
     68K
     sram
     rmap
     phycsr
     mac
     elm
     cam
     nirom
     intlpbk
     iplsaf
     pmccsr
     rmc
     pktmem
     rtostim
     botim
     extlpbk
     extmemtst
     dmatst
     enablerem
     disablerem

>>
```

The option test display is option dependent. TURBOchannel options can display the tests differently. Some options show only the <tstnam> strings. Also, some options do not have a HELP feature so the `T TC0 /?` command will not display; it may even cause an error to be reported by some options.

Note

Read the specific TURBOchannel option user's guide to properly test the option.

Running an Option Test

Enter the following command to run an option test:

```
T TC0 / <tstnam>
```

Example:

```
>> T TC0 SRAM
>>
```

The DEFZA STATIC RAM is now tested. The SRAM option is listed in the TURBOchannel option test display.

Note

If some devices have qualifiers to a particular subtest, you can add these on to the end of the command line as outlined in the option's firmware specification or user's guide.

Executing a Script

Enter the following command to execute a script:

```
T TC0 SCRIPT <SCRIPTNAM>
```

Example:

```
    >> T TC0 SCRIPT <SCRIPTNAM> PST-Q
    *emul: t tc0 pst-q
t 0/flash
t 0/eprom
t 0/68K
t 0/sram
t 0/rmap
t 0/phycsr
t 0/mac
t 0/elm
t 0/cam
t 0/nirom
t 0/intlpbk
t 0/iplsaf
t 0/pmccsr
t 0/rmc
t 0/pktmem
t 0/rtostim
t 0/botim
t 0/dmatst

    >>
```

The emulator shows each test within the script as it is executed. Also, error status is checked after each test completes and is saved for the end of the script.

Note

Standard scripts pst-q, pst-t, and pst-m can be run as single tests. The SCRIPT command can be omitted on the command line for these scripts. The presence of standard scripts is optional.

Initialization

Enter the following commnd to run the initialization function provided by the object ROM:

```
T TC0 INIT
```

Example:

```
>> TC0 INIT
        >>
```

The initialization object is optional, therefore a TURBOchannel option may or may not have an initialization function. No error occurs if an option does not have an initialization object.

Configuration

Enter the following command to run the configuration function provided by the object ROM:

```
T TC0 CNFG
```

Example:

```
>> T TC0 CNFG
*emul: t tc0 cnfg
DEC       PMAF-AA   T5.2P-     (fddi: 08-00-2b-27-4c-91)

>>
```

The configuration object is optional, therefore a TURBOchannel option may or may not have an configuration function. No error occurs if an option does not have a configuration object.

A.2.17 MIPS/REX Emulator Errors

The emulator's function is to execute the tests. While an error status code is maintained during testing, the emulator does not diagnose TURBOchannel hardware failures.

Option Error Messages

Error messages should be printed by the option, using the following format:

```
?TFL: #/test [message]
```

The following example shows the message that results from a byte test on a CB module:

```
?TFL:  4/byte (FAIL! BYTE MASK = 00, should be 0E)  [TC4]
```

Emulator Error Messages

Presently, there are only three MIPS/REX emulator error messsages. The following table describes the three error messages:

Message	Description	Corrective Action
ERR-MIPS - DID NOT FIND ROM IN SLOT *nn*	Emulator cannot read the ROM header in slot nn.	Check option seating. Check option connector for bent pins. Check option ROM for bent pins.
ERR-MIPS - ROM OBJECT REPORTED A SEVERE ERROR	Emulator received a *severe error status* code from a TURBOchannel object.	Check for a ?TFL error message displayed before this message. Consult the option user's guide.
ERR-MIPS - BAD ADDRESS DETECTED (ADDR address), CODE = mm	Indicates that the TURBOchannel ROM code has gone outside the expected range of addresses permitted by the TURBOchannel firmware specification.	Check that the module is supported. Check if running a test that is not supported by the emulator.

A.2.18 Floating-Point Unit (FPU) Self-Test Error Codes

The FPU test produces the error messages in the following table:

Table A–19 FPU Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
258	102	MOVF instruction test has failed
260	104	Unexpected exception has occurred during MOVF test
514	202	MNEGF instruction test has failed
516	204	Unexpected exception has occurred during MNEGF test
770	302	ACBF instruction test has failed
772	304	Unexpected exception has occurred during ACBF test
1026	402	ADDF2/ADDF3 instruction test has failed
1028	404	Unexpected exception has occurred during ADDFx test
1282	502	CMPF instruction test has failed
1284	504	Unexpected exception has occurred during CMPF test
1538	602	CVTFD/CVTFG instruction test has failed
1540	604	Unexpected exception has occurred during CVTFD or CVTFG test
1794	702	CVTFx instruction test has failed
1796	704	Unexpected exception has occurred during CVTFx test
2050	802	CVTFx instruction test has failed
2052	804	Unexpected exception has occurred during CVTFx test
2306	902	DIVF2/DIVF3 instruction test has failed
2308	904	Unexpected exception has occurred during DIVFx test
2562	A02	EMODF instruction test has failed

(continued on next page)

Table A–19 (Cont.) FPU Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
2564	A04	Unexpected exception has occurred during EMODF test
2818	B02	MULF2/MULF3 instruction test has failed
2820	B04	Unexpected exception has occurred during MULFx test
3074	C02	POLYF instruction test has failed
3076	C04	Unexpected exception has occurred during POLYF test
3330	D02	SUBF2/SUBF3 instruction test has failed
3332	D04	Unexpected exception has occurred during SUBFx test
3586	E02	TSTF instruction test has failed
3588	E04	Unexpected exception has occurred during TSTF test

The FPU test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. The extended error code format is shown in the following example.

Extended Error Format:

This format is used by the FPU test when it receives an exception while running one of the floating-point tests.

```
001 000 VVVVVVV EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE
```

Code	Meaning
VVVVVVVV	Vector of the unexpected interrupt
EEEEEEEE	Other exception data and is printed out *only* on machine checks and arithmetic traps

The following table lists the vectors that the floating-point test detects during unexpected interrupts:

Table A–20 FP Exception Vectors

Vector	Description
004	Machine check vector number
010	Privileged instruction vector
014	Customer reserved instruction vector
018	Reserved operand vector
01c	Reserved addressing mode vector
034	Arithmetic trap vector

A.2.19 Cache Self-Test Error Codes

The cache self-test produces error messages in the following table:

Table A–21 Cache Test Error Codes

Error		
Decimal	Hexadecimal	Meaning
512	200	Error in write/read to the DATA store
768	300	Error in write/read to the TAG store
1024	400	Valid bit is not set when it should be
1280	500	TAG does not contain TAG for diagnostic space
1536	600	Unexpected TAG parity error
1792	700	Cache did not provide expected data during a cache hit
2048	800	Cache DATA parity error
2304	900	Tag not valid during cache hit testing
2560	A00	Data not valid during cache hit testing
2816	B00	Cache data write through test failed because of invalid data in the cache data store
3072	C00	Cache data write through test failed because of invalid data in memory

The cache test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. The extended error format is shown in the following example:

Extended Error Format:

This format is used by the cache test.

```
001 000a aaaaaaaa eeeeeeee rrrrrrrr
```

Code	Meaning
aaaaaaaa	Address within the DATA or TAG store that failed
eeeeeeee	Expected value of the data pattern
rrrrrrrr	Data that was read from the failing address

A.2.20 Graphics Self-Test Error Codes

Note

The graphics self-test error codes describe the LCG and graphics/audio frame buffer error messages. Refer to Section A.2.21 for a description of the SPXg and SPXgt graphics module error codes.

The graphics self-test produces the error messages in the following table. The error messages apply to both the Model 60 and VLC unless specified otherwise.

Table A–22 Graphics Self-Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
	Graphics Register Test Failure	
2	2	Graphics register test has failed
	Graphics FIFO Test Failures	
16	10	FIFO status bits error
18	12	FIFO setup packet error
20	14	FIFO interrupt status bit error
22	16	FIFO control status bit error
24	18	FIFO memory pointers error
26	1A	FIFO data flow error
28	1C	FIFO clip list pointers error

(continued on next page)

Table A–22 (Cont.) Graphics Self-Test Error Codes

Error		
Decimal	**Hexadecimal**	**Meaning**
	Graphics Interrupt Test Failures	
32	20	Write protect not set
34	22	Write protect not cleared
36	24	Bad opcode interrupt not set
38	26	Bad opcode interrupt not cleared
40	28	Clip list wrap interrupt not set
42	2A	Clip list wrap interrupt not cleared
44	2C	Packet breakpoint interrupt not set
46	2E	Packet breakpoint interrupt not cleared
48	30	Packet breakpoint single step
50	32	Address breakpoint not set
52	34	Address breakpoint not cleared
54	36	Address breakpoint not cancelled
56	38	Access breakpoint not set
58	3A	Access breakpoint not cleared
60	3C	Access breakpoint single step
62	3E	NOP interrupt not set
64	40	NOP interrupt not cleared
66	42	Halt interrupt not set
68	44	Halt interrupt not cleared
70	46	Graphics interrupt line
72	48	Graphics memory error interrupt
	Video Option Board VRAM Test Failures	
80	50	Pass 1 failed
82	52	Pass 2 failed
84	54	Pass 3 failed
86	56	Address pass test failed

(continued on next page)

Table A–22 (Cont.) Graphics Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		Video Option Board Brooktree Test Failures
88	58	BT read mask register
90	5A	BT blink mask register
92	5C	BT command register
94	5E	BT test register
96	60	BT pallette red entry
98	62	BT pallette green entry
100	64	BT pallette blue entry
102	66	BT overlay red entry
104	68	BT overlay green entry
106	6A	BT overlay blue entry
108	6C	Video option board of unknown type
110	6E	Video option board video readback test failed
111	6F	This is a soft error, same as 6E

(continued on next page)

Table A–22 (Cont.) Graphics Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		Graphics Video Timing Test Failures
112	70	Vertical retrace never detected
114	72	Graphics video counters not counting
116	74	Graphics video timing test has failed - VSTATE or HSTATE not changing
118	76	Graphics plane mask test has failed - LCG plane mask error
160	A0	BT463 cursor color error
162	A2	BT463 ID REG error - wrong part
164	A4	BT463 command REG error
166	A6	BT463 blink mask REG error
168	A9	BT463 test REG error
170	AA	BT463 revision REG error - wrong part rev.
172	AC	BT463 window type REG error
174	AE	BT463 color palette error
		Graphics Virtual Drawing Test Failures
128	80	Virtual status bits error
130	82	Virtual translation error
132	84	Virtual rasterop error
134	86	Virtual fault error
136	88	Virtual invalidate error
		Graphics Physical Drawing Test Failures
144	90	Physical rasterop error
146	92	Logical function error
148	94	Action code error

The Model 60 and VLC graphics test displays error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. For all formats, the first field is the field-replaceable unit, either 001 for the system board or 10 (hexadecimal) for the frame buffer board. The

next field is the extended error format, one of the eight formats listed in the following examples.

Extended Error Format 0001:

This format is used by the graphics register test, FIFO test, video test, and the virtual test.

```
xxx 0001 aaaaaaaa bbbbbbbb cccccccc dddddddd
```

Code	Meaning
xxx	FRU
aaaaaaaa	Error code
bbbbbbbb	Address of the register or location being accessed
cccccccc	Expected data or data written
dddddddd	Actual data or data read

Extended Error Format 000B:

This format is used by the graphics FIFO test.

```
001 000B aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee
```

Code	Meaning
001	FRU
aaaaaaaa	Error code
bbbbbbbb	FIFO control flag being tested
cccccccc	Address of the register
dddddddd	Expected register content
eeeeeeee	Register content

Extended Error Format 000C:

This format is used by the graphics FIFO test.

```
001 000C aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee
```

Code	Meaning
001	FRU
aaaaaaaa	Error code
bbbbbbbb	LCG command packet being tested
cccccccc	Address of the register
dddddddd	Expected register content
eeeeeeee	Register content

Extended Error Format 000D:

This format is used by the graphics FIFO test, interrupt test, video test, and the virtual drawing test.

```
xxx 000D aaaaaaaa bbbbbbbb cccccccc dddddddd
```

Code	Meaning
xxx	FRU
aaaaaaaa	Error code
bbbbbbbb	LCG status bits of interest
cccccccc	Address of the graphics status register
dddddddd	Graphics status register content

Extended Error Format 000E:

This format is used by the graphics FIFO test and the virtual drawing test.

```
001 000E aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee ffffffff
```

Code	Meaning
001	FRU
aaaaaaaa	Error code
bbbbbbbb	Graphics FIFO control flags

Code	Meaning
cccccccc	Graphics status bits
dddddddd	Graphics status register address
eeeeeeee	Graphics status register contents
ffffffff	Expected state of status bits

Extended Error Format 000F:

This format is used by the video option board readback test for 4- and 8-plane modules.

```
xxx 000F aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee
```

Code	Meaning
xxx	FRU
aaaaaaaa	Error code
bbbbbbbb	Color that the Brooktree is programmed
cccccccc	Value of the video option board readback register
dddddddd	Expected value of the video board readback register
eeeeeeee	Head/failure (10-16 for one head, 21-23 for two heads)

Table A–23 describes Model 60 and VLC color compare failures for one head.

Table A–23 Color Compare Failures - One Head

Error	Description
10	red > blue
11	red <= blue
12	blue > green
13	blue <= green
14	green > red
15	green <= red
16	sync < green

Table A–24 describes Model 60 color compare failures for two heads.

Table A–24 Color Compare Failures - Two Heads

Error	Description
20	blue > green
21	blue <= green
22	green > red
23	green <= red

Extended Error Format 000F:

This format is used by the Model 60 video option board readback test for 24-plane modules.

```
xxx 000F aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee
```

Code	Meaning
aaaaaaaa	Error code
bbbbbbbb	Programmed test mode, colors
cccccccc	Result read from the Brooktree test reg
dddddddd	Expected value of the Brooktree test reg
eeeeeeee	No meaning; always 0
dddddddd	No meaning; always 0

Extended Error Format 0010:

This format is used by the graphics virtual drawing test and the physical drawing test.

```
001 0010 aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee ffffffff gggggggg
```

Code	Meaning
001	FRU
aaaaaaaa	Error code
bbbbbbbb	LCG (31:24) op_code, (23:16) flags
cccccccc	Physical address for operation
dddddddd	Expected pixel values
eeeeeeee	Pixel values read

Code	Meaning
ffffffff	Graphics-LU function
gggggggg	Graphics-action code (ag_test), op_setup (_virtual tests)

A.2.21 SPXg and SPXgt Graphics Self-Test Error Codes (Model 60 Only)

The SPXg and SPXgt modules provide error information that can be utilized by manufacturing, Digital Services, and the customer to identify faults down to a logical block. Below is a break down of the error information provided in the power-up error code format by the SPXg and SPXgt diagnostic ROM.

Figure A–1 SPXg and SPXgt Power-Up Error Code Format

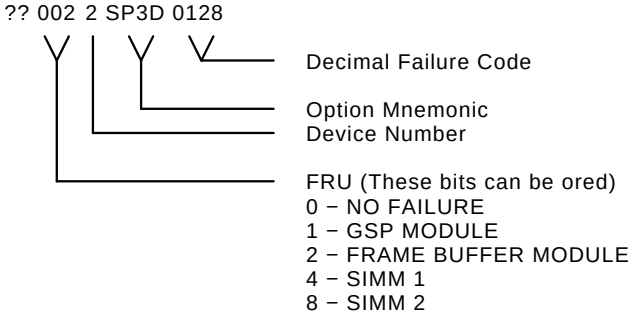


Table A–25 describes the SPXg and SPXgt graphics FRU numbers.

Table A–25 SPXg and SPXgt FRU Codes

FRU Code	Description
000	No failure
001	Graphics Subsystem Processor module (GSP)
002	Frame buffer module (8-plane) Frame buffer module (24-plane)
003	GSP module or frame buffer module
004	SIMM 1
008	SIMM 2

A.2.22 SPXg and SPXgt Graphics Self-Test Extended Summary Screen (Model 60 Only)

In addition to the normal error code listed in Figure A–1, the diagnostic also provides extended error information. This extended error information can be displayed only with the system error summary command (SHOW ERROR) entered on the console keyboard.

The following example shows a typical error report for the SPXg module. Refer to the *VAXstation 4000 3D Graphics Maintenance Guide* (EK-SCP8P-MG) for additional test and extended error information.

Figure A–2 SPXg and SPXgt Self-Test Extended Summary Screen

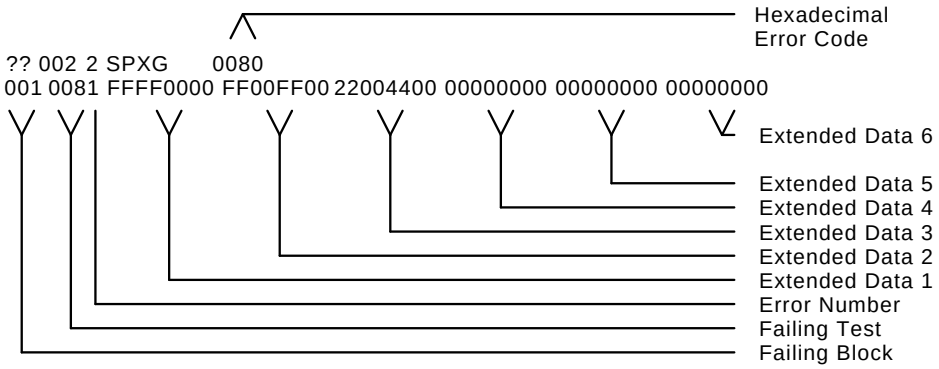


Table A–26 lists the failing logical blocks that display when you enter the SHOW ERROR command. The failing block field points to an area that you can use as a starting point for diagnosing the fault. The error is detected at this point, but is not always the actual fault.

Table A–26 SPXg and SPXgt Graphics Failing Logical Blocks

Block Number	Failing Block
001	ScanProc
002	VRAM
003	SIMM1
004	SIMM2
005	JChip
006	i860
007	Cursor Generator 0
008	Cursor Generator 1
009	SRAM
00A	VDAC

The SPXg and SPXgt graphics self-tests produce the error messages in the following table:

Table A–27 SPXg and SPXgt Graphics Self-Test Error Codes (Model 60 Only)

Error			
Decimal	Hexadecimal	Meaning	LED Codes (Hexadecimal)
16	10	JChip register test	21
32	20	SRAM test	21
48	30	FIFO register test	21
64	40	FIFO auto increment location test	21
80	50	FIFO auto increment buffer test	21
96	60	i860 doorbell test	22
112	70	Brooktree register test	22
128	80	ScanProc register test	22
144	90	ScanProc SRAM test	22
160	A0	i860 ScanProc register test	22

(continued on next page)

Table A–27 (Cont.) SPXg and SPXgt Graphics Self-Test Error Codes (Model 60 Only)

Error			
Decimal	**Hexadecimal**	**Meaning**	**LED Codes (Hexadecimal)**
176	B0	VRAM test	22
192	C0	ScanProc basic rectangle test	23
208	D0	ScanProc clip rectangle test	23
224	E0	ScanProc fill rectangle mask test	23
242	F0	ScanProc draw logical ops test	23
256	100	ScanProc copy rectangle test	23
272	110	ScanProc copy rectangle logical ops test	23
288	120	ScanProc copy rectangle mask test	23
304	130	ScanProc copy stipple test	23
320	140	ScanProc copy opaque test	23
336	150	ScanProc stream write test	23
352	160	FIFO transfer test	24
368	170	ScanProc external write test	24
384	180	ScanProc stream read test	24
400	190	LCG DMA test	25
416	1A0	LCG OTF test	25
432	1B0	DMA stream test	25
448	1C0	OTF stream test	25
464	1D0	Auto increment location stream test	25
480	1E0	Command FIFO OTF stream test	25
496	1F0	Command FIFO external stream test	25
512	200	Brooktree plane walk test	26
528	210	Brooktree output signature test	26

(continued on next page)

Table A–27 (Cont.) SPXg and SPXgt Graphics Self-Test Error Codes (Model 60 Only)

Error			
Decimal	**Hexadecimal**	**Meaning**	**LED Codes (Hexadecimal)**
544	220	Brooktree off screen test	26
560	230	Brooktree input signature test	26
576	240	Brooktree cursor window test	26
592	250	JChip window test	26
608	260	Brooktree analog compare test	26
624	270	Set/clear interrupt test	27

A.2.23 Graphics Utilities

Model 60 and VLC graphics utilities can be used for visual verification of some functions of the graphics subsystem. No tests are performed. The utilities allow you to verify screen alignment and adjust or verify screen colors and gray scales. The graphics utilities apply to the LCG, SPXg, SPXgt, and graphics/audio frame buffer graphics modules.

The following table lists the graphics utilities:

Table A–28 Graphics Utilities

Utility	Description
0	White screen
1	Red screen
2	Blue screen
3	Green screen
4	Four color bars
5	Eight color bars
6	Eight gray scale bars
7	Screen of EEs
8	Cross hatch with circle
9	Screen of scrolling HHs

A.2.24 Graphics System Test Overview - LCG (Model 60 Only)

The LCG system test sets up the graphics modules to execute drawing commands from the graphics FIFO and clip list command buffers. The first pass draws a checkerboard on the screen by copying a "box" from main memory to each of the 24 box locations in the checkerboard, inverting every other box. Subsequent passes copy each box from the next box, and the last box from the first box on each pass. After 50 passes, the pattern is checked one byte at a time. The first error is flagged and testing stops.

A.2.25 Graphics System Test Overview - SPXg and SPXgt Modules (Model 60 Only)

Note

The 2D graphics and 3D graphics system test displays are significantly different.

The first display of the 3D graphics system test consists of gray-shaded diagonal bars drawn continuously between the four sides of the screen. The dynamic diagonal bar display continues to fill the screen for approximately 30 seconds. The screen is then cleared and the device status display begins.

The 2D graphics checkerboard pattern does not appear at the bottom of the 3D graphics system test display.

A.2.26 LCG System Test Error Codes (Model 60 Only)

The following table lists possible error codes that can be generated by the LCG system test:

Table A–29 LCG System Test Error Codes

Error	Description
F001	Initialize the test module, set up communication links with the monitor
F002	MAP VRAM 1 memory for checkerboard
F003	MAP LUT in VRAM 1 0x21800000
F004	MAP VRAM 2 memory for checkerboard

(continued on next page)

Table A–29 (Cont.) LCG System Test Error Codes

Error	Description
F005	MAP LUT in VRAM 2 0x21800000
F006	MAP VRAM 3 memory for checkerboard
F007	MAP LUT in VRAM 3 0x21800000
F008	MAP VRAM 4 memory for checkerboard
F009	MAP LUT in VRAM 4 0x21800000
F00A	Create the video device
F00B	Time out, no interrupt occurred
F00C	Allocate system memory space for the drawing source
F00D	Allocate space in main memory for drawing the checkerboard
F00E	Error WST$_SEND_SUMMARY
F00F	Error WST$_CHECK
F010	De-allocate space for the drawing source
F011	FIFO BAD_OPCODE
F012	MAP the graphics FIFO registers
F013	MAP the graphics int registers
F014	MAP the interrupt registers
F015	MAP the graphics go register
F016	MAP the FIFO I/O range
F017	MAP the EDAL addresses
F018	MAP the video_ref_base reg 0x20100e34
F019	MAP the configuration and test reg 20020000
F0F0	Check checkerboard error, bad read from the VRAM 1
F0F1	Check checkerboard error, bad read from the VRAM 2
F1F1	Check checkerboard error, bad read from the main memory

A.2.27 Graphics System Test Summary Screen

The following is an example of a LCG system test summary screen:

```
********** FST EXT_ERRPT   2LCG      0 00:12:30 **********
   LCG error summary -       Pass count =  0000002B

   ------------------------------------------------------
   error code       no error
   ------------------------------------------------------
   checker board    address  expect  read
   ------------------------------------------------------
   main mem error
   vram error

   checker board start in main mem = 00180000
   vram offset to checker board    = 000A6000
   box width                       = 000000A0
   box height                      = 000000A5
   FIFO start                      = 00140000
   CLIP start                      = 00160000
   Graphics int status             =
```

To find the error on the screen, note that VRAM on_screen memory starts at 21800000 (or 22800000) for head 1. Each additional head is offset by 200000.

22800000 - head 1
22A00000 - head 2
22C00000 - head 3
22D00000 - head 4

The "vram offset to checker board" is added to the VRAM start to find the beginning of the checkerboard.

Each block begins one "box width" after the previous one.

A.2.28 SPXg and SPXgt Graphics System Test Summary Screen

The following is an example of a SPXg system test summary screen:

```
********** FST EXT_ERRPT   2SP3D      0 00:00:27 **********
   SP3D error summary -       Pass count =

   ------------------------------------------------------
   error code       0000F021
   ------------------------------------------------------
   Frame Buffer checksum
```

```
    expected = D7DAFF0F        actual = D7DAFF0F
-----------------------------------------------------
Brooktree Signature Collection

signature error count   00000004
A pixel group    expected sig = 07BFCC actual = 5A31B5
B pixel group    expected sig = E81E51 actual = E81E51
C pixel group    expected sig = AA698B actual = 5F9587
D pixel group    expected sig = BC0C72 actual = BC0C72
```

```
********** SYSTST_NXT_SCR (('1'=Y), ('0'=N))................?
```

A.2.29 SPXg and SPXgt Graphics System Test Error Codes (Model 60 Only)

The following table lists possible error codes that can be generated by the SPXg and SPXgt graphics system tests:

Table A–30 SPXg and SPXgt Graphics System Test Error Codes

Error	Description
F000 through F012	Memory allocation failure
F00C	WST initialization failure
F020	Frame buffer checksum failure
F021	Pixel group A signature analysis failure
F022	Pixel group B signature analysis failure
F023	Pixel group C signature analysis failure
F024	Pixel group D signature analysis failure

A.2.30 Network Interconnect (NI) Self-Test Error Codes

The following tables contain error codes produced by the Network Interconnect (NI) self-test.

Note

If an NI error occurs, first verify that the loopback connector is installed on the selected network port on the back of the system box and the network cable is firmly connected. Then re-execute the NI self-test if necessary.

Table A–31 NI Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		Network Address ROM Test Failure
16	10	Read access failed
18	12	Null address failure
20	14	Bad group address
22	16	Bad checksum
24	18	Bad group 2
26	1A	Bad group 3
28	1C	Bad test patterns
		LANCE CSR Test Failures
32	20	LANCE register address port R/W error
34	22	LANCE CSR0 read/write error
36	24	LANCE CSR1 read/write error
38	26	LANCE CSR2 read/write error
40	28	LANCE CSR3 read/write error
		LANCE Initialization Test Failures
48	30	Initialization failed
50	32	Receiver disabled
52	34	Transmitter disabled
54	36	Receiver enabled
56	38	Transmitter enabled

(continued on next page)

Table A–31 (Cont.) NI Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		LANCE Internal Loopback/DMA Test Failures
64	40	Initialization failed
66	42	Transmit failed
68	44	Receive failed
70	46	Packet comparison failed
72	48	Initialization DMA error
74	4A	Transmit DMA error
76	4C	Receive DMA error
78	4E	Unknown tx of rx error
		LANCE Interrupt Test Failures
80	50	Initialization failed
82	52	Transmit failed
84	54	Receive failed
86	56	Packet comparison failed
88	58	NI bit in INT_REQ register not set
90	5A	NI bit in INT_REQ register not clear
92	5C	NI ISR not entered
94	5E	NI ISR entered multiple times

(continued on next page)

Table A–31 (Cont.) NI Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		LANCE CRC Test Failures
96	60	Initialization failed
98	62	Transmit failed
100	64	Receive failed
102	66	Packet comparison failed
104	68	LANCE generated bad CRC
106	6A	LANCE rejected good CRC
108	6C	LANCE accepted bad CRC
110	6E	Other error
		LANCE rx MISS/BUFF Test Failures
112	70	Initialization failed
114	72	Transmit failed
116	74	Unknown receive error
118	76	MISS error not flagged
120	78	BUFF error not flagged
		LANCE Collision Test Failures
128	80	Initialization failed
130	82	Unknown transmit error
132	84	RETRY not flagged
134	86	Transmitter disabled

(continued on next page)

Table A–31 (Cont.) NI Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		LANCE Address Filtering Test Failures
144	90	Initialization failed
146	92	Transmit failed
148	94	Receive failed
150	96	Packet comparison failed
152	98	Broadcast filtering failed
154	9A	Promiscuous mode failed
156	9C	Null destination accepted
158	9E	Good logical address rejected
		LANCE External Loopback Test Failures
160	A0	Initialization failed
162	A2	Transmit failed
164	A4	Receive failed
166	A6	Packet comparison failed
168	A8	Unknown transmit error
170	AA	Unknown receive error
172	AC	Check NI port loopback connector
		LANCE tx BUFF Test Failures
176	B0	Initialization failed
178	B2	BUFF error not flagged
180	B4	Transmitter enabled
182	B6	Unknown transmit error

(continued on next page)

Table A–31 (Cont.) NI Self-Test Error Codes

Error Decimal	Error Hexadecimal	Meaning
		DMA Registers Test Failures
208	D0	MAP_BASE register error
210	D2	I/O write access to map registers failed
212	D4	I/O read access to map registers failed
214	D6	Parity error not flagged
		LANCE DMA Test Failures
224	E0	Non-existent DMA not flagged
226	E2	Invalid DMA not flagged
228	E4	Valid DMA failed
230	E6	DMA failed during initialization
232	E8	DMA failed during transmit
234	EA	DMA failed during receive

The NI test does not display extended error information when an error occurs. Enter the SHOW ERROR command to view the extended error information. The extended error code is shown in the following examples.

Extended Error Format 0001:

This format is used by the register test.

```
0001 0001 aaaaaaaa bbbbbbbb cccccccc
```

Code	Meaning
aaaaaaaa	Register address
bbbbbbbb	Expected data or data written
cccccccc	Actual data or data read

Extended Error Format 0002:

This format is used when a DMA error occurs.

```
0001 0002 0000aaaa bbbbbbbb cccccccc dddddddd eeeeeeee ffffffff
```

Code	Meaning
aaaa	Actual value of the LANCE CSR0
bbbbbbbb	Contents of the parity control (PAR_CTL) register
cccccccc	Device DMA address (24 bits)
dddddddd	Map register physical address
eeeeeeee	Map register contents
ffffffff	Interrupt register contents

Extended Error Format 000B:

This format is used when there is a network address ROM address group error.

```
0001 000B aaaaaaaa bbbbbbbb cccccccc 0000dddd
```

Code	Meaning
aaaaaaaa	Base address of the network address ROM
bbbbbbbb	First four bytes of the network address
cccccccc	Next two bytes of the network address and the two byte checksum
dddd	Calculated checksum

Extended Error Format 000C:

This format is used when there is a network address ROM test pattern error.

```
0001 000C aaaaaaaa bbbbbbbb cccccccc
```

Code	Meaning
aaaaaaaa	Base address of the network address ROM test pattern
bbbbbbbb	First four bytes of the test patterns
cccccccc	Last four bytes of the test patterns

Extended Error Format 000D:

This format is used when there is an initialization error.

```
0001 000D 0000aaaa bbbbbbbb 0000cccc dddddddd eeeeeeee
```

Code	Meaning
aaaa	Actual value of the LANCE CSR0
bbbbbbbb	Physical address of the initialization block
cccc	Initialization block mode
dddddddd	Upper longword of the logical address filter
eeeeeeee	Lower longword of the logical address filter

Extended Error Format 000E:

This format is used when there is a transmit error.

```
0001 000E 0000aaaa bbbbbbbb cccccccc dddddddd
```

Code	Meaning
aaaa	Actual value of LANCE CSR0
bbbbbbbb	Physical address of the current transmit descriptor
cccccccc	First longword of the transmit descriptor
dddddddd	Second longword of the transmit descriptor

Extended Error Format 000F:

This format is used when there is a receive error.

```
0001 000F 0000aaaa bbbbbbbb cccccccc dddddddd
```

Code	Meaning
aaaa	Actual value of LANCE CSR0
bbbbbbbb	Physical address of the current receive descriptor
cccccccc	First longword of the receive descriptor
dddddddd	Second longword of the receive descriptor

Extended Error Format 0010:

This format is used when there is a packet error.

```
0001 0010 0000aaaa bbbbbbbb cccccccc dddddddd
```

Code	Meaning
aaaa	Actual value of LANCE CSR0
bbbbbbbb	Packet length
cccccccc	Packet pattern or packet index
dddddddd	Packet CRC

Extended Error Format 0011:

This format is used when there is an interrupt error.

```
0001 0011 0000aaaa bbbbbbbb cccccccc
```

Code	Meaning
aaaa	Actual value of LANCE CSR0
bbbbbbbb	Contents of the interrupt mask (INT_MSK) register
cccccccc	Contents of the interrupt request (INT_REQ) register

A.2.31 Network Interconnect (NI) System Test Error Codes (Model 60 Only)

The following example and table explain and list Model 60 NI system test error messages.

```
?? 9 NI   000X     00YY         0 00:00:00.00
```

In the example, *X* is the source of the error:

- 1 - Test
- 2 - System test monitor
- 3 - Device driver
- 4 - VAXELN
- 5 - System

YY indicates the specific error code (shown in Table A–32).

Table A–32 NI System Test Error Codes (Model 60 Only)

Error Source (X)	Error Code (YY)	Meaning
1	02	Initialization failed
1	04	LANCE underflow reported
1	06	DMA transmit failed
1	08	Unknown transmit error
1	0A	Receive failed
1	12	DMA receive failed
1	14	Unknown receive error
1	16	Data compare error
2	02	WST$INIT failed
4	02	Bad memory allocation
4	04	Create device failed
4	06	Create area failed
5	02	Unknown transmit error
5	04	Bad transmit status
5	06	Transmit own bit says LANCE

(continued on next page)

Table A–32 (Cont.) NI System Test Error Codes (Model 60 Only)

Error Source (X)	Error Code (YY)	Meaning
5	08	Bad receive status from LANCE
5	0A	Timeout waiting for receive interrupt
5	0C	Memory error on initialization
5	0E	BABL error on initialization
5	10	MISS error on initialization
5	12	Parity error on initialization
5	14	MAP error on initialization
5	16	Memory error on receive
5	18	BABL error on receive
5	1A	MISS error on receive
5	1C	Parity error on receive
5	1E	MAP error on receive
5	20	Memory error on transmit
5	22	BABL error on transmit
5	24	MISS error on transmit
5	26	Parity error on transmit
5	28	MAP error on transmit

B

Reading the Diagnostic LED Codes

This appendix describes how to interpret the diagnostic LEDs. On the Model 60, the LEDs are located at the control panel on the front of the system box, and on the VLC, the LEDs are located on the back of the system box. The diagnostic LEDs apply to both the Model 60 and the VLC unless stated otherwise. The following topics are included in this appendix:

B.1 Diagnostic LED Overview

The system uses the eight LEDs on the control panel to indicate the currently executing test. When power is turned on, all the LEDs light (LED code is FF(h)), and then display different codes as the devices are tested.

The LED codes are divided into two fields. The left-most four LEDs represent the device number and the right-most four LEDs represent a substate that the device test is currently in. LED codes E0h - FFh are reserved for the console.

B.2 LED Error Codes

The eight LEDs can be translated into two hexadecimal or binary digits of the form:

```
X X X X   Y Y Y Y
7 6 5 4   3 2 1 0
```

Where:

- X X X X is the device number (binary) currently under test. Use Table 2–3 to match the code from the LEDs to a device.
- Y Y Y Y is the subtest at which the diagnostic hung.

The LEDs can be used for troubleshooting when the console device is inoperable.

The Model 60 and VLC system LED codes are listed in the following tables.

B.3 Power-Up and Initialization LED Codes

Table B–1 lists the system power-up and initialization LED codes.

Table B–1 Power-Up and Initialization LED Codes (1111 XXXX)

LED Depiction*	LED Code	Description	FRU
1111 1111	FFh	Power has been applied but no instruction has been run	System module
1111 1110	FEh	ROM has been entered and initialization and testing have started	System module
1111 1101	FDh	Waiting for memory to initialize	System module, memory modules
1111 1100	FCh	Sizing memory in the system	System module, memory modules
1111 1011	FBh	Running a byte mask test on the memory needed by the console	System module, memory modules
1111 1010	FAh	A full memory data path test is being performed on the memory needed by the console	System module, memory modules
1111 1001	F9h	Initializing the console data structures	System module
1111 1000	F8h	Performing auto configuration on the machine	System module
1111 0111	F7h	Testing the NVR device	System module
1111 0110	F6h	Testing the DZ device	System module, mouse, keyboard
1111 0101	F5h	Testing the graphics output device	System module, graphics module
1111 0100	F4h	Initializing the console device	System module, graphics module
1111 0011	F3h	Entering the console program	System module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.4 TOY and NVR LED Codes

Table B–2 lists the TOY and NVR LED codes.

Table B–2 TOY and NVR LED Codes (0001 XXXX)

LED Depiction*	LED Code	Description	FRU
0001 0000	10h	TOY and NVR clock test has failed	System module
0001 0001	11h	TOY and NVR test has failed	System module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.5 LCG and Graphics/Audio Frame Buffer LED Codes

Table B–3 lists the LED codes for the LCG and graphics/audio frame buffer graphics modules.

Table B–3 Graphics LED Codes (0010 XXXX)

LED Depiction*	LED Code	Description	FRU
0010 0000	20h	Graphics test has been entered	System module, Graphics module
0010 0001	21h	Graphics video RAM test has failed	System module, Graphics module
0010 0010	22h	Graphics register test has failed	System module, Graphics module
0010 0011	23h	Graphics FIFO test has failed	System module, Graphics module
0010 0100	24h	Graphics interrupt test has failed	System module, Graphics module
0010 0101	25h	Graphics address generator test has failed	System module, Graphics module
0010 0110	26h	Graphics virtual test has failed	System module, Graphics module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

Model 60 Note

If the graphics option fails, the system may not give you a console error message. In this case you must use the error LEDs on the lights and switches module to isolate the fault.

B.6 SPXg and SPXgt Graphics LED Codes

Table B–4 lists the LED codes for the SPXg and SPXgt graphics modules.

Table B–4 SPXg and SPXgt Graphics LED Codes (0010 XXXX)

LED Depiction*	LED Code	Description	FRU
0010 0001	21h	JChip/SRAM test has failed	System module, frame buffer module, GSP module
0010 0010	22h	i860/ScanProc/Frame Buffer test has failed	System module, frame buffer module, GSP module
0010 0011	23h	ScanProc drawing operations test has failed	System module, frame buffer module, GSP module
0010 0100	24h	Stream transfer test has failed	System module, frame buffer module, GSP module
0010 0101	25h	OTF and normal DMA tests have failed	System module, frame buffer module, GSP module
0010 0110	26h	RAMDAC operations test has failed	System module, frame buffer module, GSP module
0010 0111	27h	Interrupts test has failed	System module, frame buffer module, GSP module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.7 DZ LED Codes

Table B–5 lists the DZ LED codes.

Table B–5 DZ LED Codes (0011 XXXX)

LED Depiction*	LED Code	Description	FRU
0011 0000	30h	DZ test has been entered	System module
0011 0001	31h	DZ reset test has failed	System module
0011 0010	32h	DZ modem test has failed	System module
0011 0011	33h	DZ polled test has failed	System module
0011 0010	34h	DZ interrupt test has failed	System module
0011 0101	35h	LK401 test has failed	Keyboard, system module
0011 0110	36h	Mouse test has failed	Mouse, system module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.8 Cache LED Codes

Table B–6 lists the cache LED codes.

Table B–6 Cache LED Codes (0100 XXXX)

LED Depiction*	LED Code	Description	FRU
0100 0001	41h	Error in the data store read/write	System module
0100 0010	42h	Error in the read/write to the tag area	System module
0100 0011	43h	The cache did not contain the proper state of the valid bit	System module
0100 0100	44h	Error during the cache tag validation	System module
0100 0101	45h	Unexpected TAG parity error	System module
0100 0110	46h	Cache did not provide the expected data during cache hit testing	System module
0100 0111	47h	Parity not what was expected	System module
0100 1000	48h	Tag not valid during cache hit test	System module
0100 1001	49h	Data not expected during cache hit test	System module
0100 1010	4Ah	Cache write through test failed. The information in the data store did not agree with the information it was to receive.	System module
0100 1011	4Bh	Cache write through test failed. The information in the memory did not agree with the information it was to receive.	System module
0100 1011	4Ch	Write miss failed	System module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.9 Memory LED Codes

Table B–7 lists the memory LED codes.

Table B–7 Memory LED Codes (0101 XXXX)

LED Depiction*	LED Code	Description	FRU
0101 0000	50h	Memory byte mask test has failed	System module or memory modules
0101 0001	51h	Memory error occurred in the forward pass	System module or memory modules
0101 0010	52h	Memory error occurred in the reverse pass	System module or memory modules
0101 0011	53h	Memory error in parity test 1	System module or memory modules
0101 0100	54h	Memory error in parity test 2	System module or memory modules

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.10 System Device LED Codes

Table B–8 lists the system device LED codes.

Table B–8 System Device LED Codes (1000 XXXX)

LED Depiction*	LED Code	Description	FRU
1000 0000	80h	ROM verify test has failed	System module
1000 0001	81h	Interrupt controller test has failed	System module
1000 0010	82h	Invalidate filter test has failed	System module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.11 Network Interconnect (NI) Device LED Codes

Table B–9 lists the NI device LED codes.

Table B–9 NI Device LED Codes (1001 XXXX)

LED Depiction*	LED Code	Description	FRU
1001 0000	90h	NI test has been entered	System module
1001 0001	91h	Network address test has failed	System module
1001 0010	92h	NI register test has failed	System module
1001 0011	93h	NI initialization test has failed	System module
1001 0100	94h	NI internal loopback/DMA test has failed	System module
1001 0101	95h	NI interrupt test has failed	System module
1001 0110	96h	NI CRC test has failed	System module
1001 0111	97h	NI receive MISS/BUFFER test has failed	System module
1001 1000	98h	NI collision test has failed	System module
1010 1001	99h	NI address filtering test has failed	System module
1001 1010	9Ah	NI external loopback test has failed	Network, loopback, system module
1001 1011	9Bh	NI transmit buffer test has failed	System module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.12 SCSI Device LED Codes

Table B–10 lists the SCSI device LED codes.

Table B–10 SCSI Device LED Codes (1010 XXXX)

LED Depiction*	LED Code	Description	FRU
1010 0000	A0h	SCSI test has been entered	System module
1010 0001	A1h	SCSI register test has failed	System module
1010 0010	A2h	SCSI interrupt test has failed	System module
1010 0011	A3h	SCSI data transfer test has failed	Device, system module
1010 0100	A4h	SCSI map error test has failed	Device, system module
1010 0101	A5h	SCSI minimal device test has failed	Device, system module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.13 DSW21 Synchronous Communication Device LED Codes (Model 60 Only)

Table B–11 lists the DSW21 synchronous communication device LED codes.

Table B–11 DSW21 Synchronous Communication Device LED Codes (1100 XXXX)

LED Depiction*	LED Code	Description	FRU
1100 0000	C0h	Comm option code entered	DSW21, system module
1100 0001	C1h	Comm option ROM test has failed	DSW21, system module
1100 0010	C2h	Comm option RAM test has failed	DSW21, system module
1100 0011	C3h	Comm option self-test has failed	DSW21, system module
1100 0100	C4h	Comm option dual RAM access test has failed	DSW21, system module
1100 0101	C5h	Comm option dual ROM_RAM access test has failed	DSW21, system module
1100 0110	C6h	Comm option interrupt test has failed	DSW21, system module
1100 0111	C7h	Comm option integrated loopback test has failed	DSW21, system module
1100 1000	C8h	Comm option reset test has failed	DSW21, system module

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

B.13.1 TURBOchannel Adapter LED Codes (Model 60 Only)

Table B–12 lists the TURBOchannel adapter LED codes.

Table B–12 TURBOchannel Adapter LED Codes (1100 XXXX)

LED Depiction*	LED Code	Description	FRU
1101 0000	D0h	Entry into test	TCA module, TCA option
1101 0001	D1h	TCA register test	TCA module, TCA option
1101 0010	D2h	TCA interrupt test	TCA module, TCA option
1101 0011	D3h	TCA FIFO test	TCA module, TCA option
1101 0100	D4h	TCA DMA trigger test	TCA module, TCA option
1101 0110	D5h	TCA size bus test	TCA module, TCA option

*In this column, 1 indicates the LED is on; 0 indicates the LED is off.

C

Troubleshooting

Troubleshooting is the process of isolating and diagnosing problems with the system. This appendix contains a troubleshooting table that lists symptoms, possible causes, and corrective actions for the following components:

- System
- Monitor
- Mouse/tablet
- Keyboard
- Drives
- Network
- Audio
- Expansion box

C.1 Troubleshooting Overview

The troubleshooting techniques described in Table C–1 do not identify all possible problems with the system, nor do the suggested corrective actions remedy all problems. For additional information, refer to Chapter 2 for diagnostic testing and test command procedures.

When to Use the Console

If the power-up tests are not successful, then use the console error messages to identify the failed FRU, or you can run the self-test, system test, and utility tests in the Digital Services environment to help isolate the failing FRU. The console error messages are interpreted in Appendix A.

When to Use the Diagnostic LEDs

If the system is unable to set up the console, then use the diagnostic LEDs that are located on the front of the Model 60 system box and on the rear of the VLC system box. The diagnostic LEDs are listed in Appendix B.

C.2 Troubleshooting: Symptoms, Causes, and Corrective Action

The following describes how to use Table C–1, which lists possible symptoms, causes, and corrective action.

Step	Procedure
1	Note the symptoms of the problem.
2	Check the Symptom column in Table C–1 for a match.
3	Check the conditions for that symptom in the Possible Cause column.

Note

If there is more than one possible cause, then check the possible causes and solutions in the order shown in the table.

4	Follow the advice in the Corrective Action column.

Table C–1 provides troubleshooting techniques.

Table C–1 Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	System Problems	
System fan is off.	Power cord is not connected.	Check the power cord connections at both ends.
	Faulty power cord.	Replace power cord.
	Power supply fan has failed.	Replace the power supply.
Power light is off.	Power cord is not connected.	Check the power cord connections at both ends.
	Wall socket may not be operative.	Try a different wall socket, or try an electrical device that you know works in the wall socket.
		Turn the system off for 10 seconds and then back on.
		Turn the system off. Unplug the video cable, communication cable, and printer. Then plug all cables back in and turn the system on.
	Defective power supply.	Replace the power supply.
Power-up display does not show after two minutes.	Monitor is not turned on.	Turn on the monitor.
	Monitor brightness and contrast controls are too dark to see the screen display.	Adjust the monitor brightness and contrast controls. Verify that the monitor power switch is on (|).
	Monitor cable or video cable is not connected.	Check that the monitor cable and video cable are plugged in at both ends.
	Alternate console switch is in wrong position.	Turn the power off. Change alternate console switch to down (off) position. Use a small pointed object. Do NOT use a pencil to set the switch. Turn the power back on.
	Monitor fuse is blown.	See the monitor guide for fuse replacement instructions.

(continued on next page)

Table C–1 (Cont.) Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	System Problems	
	Wall socket may not be operative.	Try a different wall socket, or try an electrical device that you know works in the wall socket.
		Check the diagnostic LED code. Compare the code to the LED error code tables in Appendix B. Replace monitor failed FRU. Refer to the monitor service manual for instructions on how to replace the FRU.
	Color monitor is installed, but the color graphics board is not installed.	Check the graphic module part number; check to see that the monitor is designed to work with that graphics module.
Power-up display contains an error message.	Possible system error.	Enter the SHOW ERROR command. Refer to Section 2.4 for information on interpreting the error code.
		Interpret the diagnostic LEDs. Refer to Appendix B for the diagnostic LED error code meanings.
System does not boot on power-up.	Software is not installed.	Install the system software. Refer to the software documentation for installation instructions.
	Default recovery action is set to halt.	Change the default recovery action to boot the system from the system disk.
	Incorrect boot device was specified.	Change the default boot action to boot the system from the system disk.
	Expansion boxes were not powered on first.	Turn the system box off, make sure the expansion boxes are on, and then turn on the system box.
	Boot device is not properly configured.	Enter the SHOW DEVICE command and check to see that all devices are configured properly. If not, check SCSI IDs and SCSI cables.
	Faulty boot device.	Run system exerciser; replace drive if defective.

(continued on next page)

Table C–1 (Cont.) Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	System Problems	
	Unable to boot off the network (ESA0).	Refer to the Network Problems section of this table.
	Monitor Problems	
No display appears on the monitor screen.	Monitor is not turned on.	Check the monitor on/off switch. Check that the monitor power cord is connected at both ends.
	Contrast and brightness controls are too dark to see the screen display.	Adjust the contrast and brightness controls. Refer to the monitor guide for more information.
	Alternate console switch is not set correctly.	Power down the system. Change the alternate console switch to the down (off) position. Use a small pointed object. Do NOT use a pencil to set the switch. Power up the system. Turn on the system box last.
	System board or graphics board failure.	Use the diagnostics LEDs to interpret the error code and identify the failed FRU.
VRC 16 is powered up before the system.	Power down VRC 16 and the system. Power up system first, then VRC 16.	
	Mouse/Tablet Problems	
System boots but mouse or optional tablet pointer does not appear on the screen, or monitor does not respond to pointing device commands.	Pointing device cable is installed incorrectly or is loose.	Shutdown system software. Turn off the system. Unplug and then replug the cable to reset the device. Turn on the system.
	The system is halted; no pointer appears on the screen.	Reboot the system.
	Pointing device is faulty.	Replace the pointing device.

(continued on next page)

Table C–1 (Cont.) Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	Keyboard Problems	
Keys do not work.	Hold Screen key is active. Hold screen light is on.	Press the Hold Screen key to release hold on screen.
	Keyboard cable is loose or not connected.	Check the keyboard cable at both ends.
	Keyboard has failed.	Replace the keyboard.

(continued on next page)

Table C–1 (Cont.) Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	SCSI Device Problems	
An installed drive does not work.	Two SCSI identifiers are set to the same ID number.	Reset each SCSI ID to a unique number.
	Loose cables.	Check to make sure all cables are connected.
	Defective drive.	Run diagnostics to isolate fault. Replace FRU.
Software does not work from the diskette drive, or a diskette read or write error message is displayed.	No diskette is in the diskette drive.	Insert a diskette with software. Use the instruction in the software documentation.
	Diskette was inserted incorrectly.	Check that the write-protect notch on the diskette is to your left when you insert the diskette and that the label is up.
	Diskette is damaged or does not contain software.	Try another diskette that contains software.
	Two SCSI identifiers are set to the same ID number.	Reset each SCSI ID to a unique number.
Software does not boot from the fixed disk drive.	Problem exists with the fixed disk.	Refer to Section 2.8.10.
	Default boot device set incorrectly.	Set or change default boot device.
	Recovery action may be set to Halt.	Change default recovery action.
	Problem with software (if installed) on the fixed disk.	Refer to software documentation.
	Two SCSI identifiers are set to the same ID number.	Reset each SCSI ID to a unique number.

(continued on next page)

Table C–1 (Cont.) Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	Network Problems	
NI error message is displayed when verifying Ethernet.	No ThinWire or thickwire terminator or cable was installed.	Attach a ThinWire or standard Ethernet terminator.
	Network switch is not set properly.	Verify that the network switch is set to network connector with cable or terminator.
	Terminator is missing from network.	Check by replacing cable with a terminator. If problem is corrected, then check the network segment for missing terminators.
	Cable connection is loose.	Check that all connections on the Ethernet segment are secure.
	Power supply failure.	Replace the power supply.
Diagnostic LED lights 7,4,3, and 0 are on.	T-connector is disconnected.	Make sure that the T-connector is disconnected to an operating ThinWire Ethernet segment.
Cannot boot from the network.	Local network problem.	Problem is most likely caused by the customer server system or the network.
	Defective NI interface.	Run diagnostics (TEST NI command) with terminators attached. Replace faulty FRU if test fails.
	Audio Problems (Model 60 Only)	
No audio tone (beep) when the system is turned on.	Speaker is turned off.	Turn on speaker (switch in down position) using the switch located on the front of the Model 60 system box.
	Audio speaker is not working.	Turn off the system. Plug in the headset and turn the system on. If you hear an audio tone from the headset, then there is a problem with the speaker. Replace the lights and switches module.

(continued on next page)

Table C–1 (Cont.) Symptoms, Causes, and Corrective Action

Symptom	Possible Cause	Corrective Action
	Expansion Box Problems	
Expansion box fan is off.	Power cord is not connected.	Check the power cord connections at both ends.
	Faulty power cord.	Replace power cord.
	Power supply fan has failed.	Replace the power supply.
Power light is off.	Power cord is not connected.	Check the power cord connections at both ends.
	Wall socket may not be operative.	Try a different wall socket, or try an electrical device that you know works in the wall socket.
		Turn the system off for 10 seconds and then back on.
	Defective power supply.	Replace the power supply.
Drive does not work.	Loose cables.	Make sure all cables are connected.
	Two SCSI identifiers are set to the same ID number.	Reset each SCSI ID to a unique number. (See *BA46 Storage Expansion Box Owner's Guide* for SCSI settings.)
	Defective drive.	Run diagnostics to isolate fault. Replace FRU.

D

FRU Part Numbers

The tables in this appendix provide the names and part numbers for the VAXstation 4000 Model 60 and VLC field-replaceable units (FRUs). FRUs, miscellaneous hardware, and cables are also listed for the SZ03 and SZ16 expansion boxes used with the Model 60 and VLC. The following topics are included in this appendix:

D.1 Precautions

Follow these precautions when removing or installing FRUs:

- Only qualified service personnel should remove or install FRUs.
- **Electrostatic discharge (ESD)** can damage integrated circuits. Always use a grounded wrist strap (part number 29-11762-00) and grounded work surface when working with the internal parts of the workstation.

Note

It is the customer's responsibility to back up the software before Digital Services personnel arrive at the site. This is important to ensure that data is not lost during the service process. The customer should also shut down the workstation software. Before performing any maintenance work, Digital Services personnel must confirm that the customer has completed both of these tasks.

D.2 Model 60 System Box FRUs

Table D–1 contains the part numbers for the Model 60 system box FRUs.

Table D–1 Model 60 System Box FRUs

FRU	Part Number
KA46 system board	54-20346-01
Lights and switches module	54-20367-01
DSW21 synchronous communication module	54-20377-01
SCSI-FDI control module	54-20764-02
Low res LCG 1024x768 @60 Hz or 1024x864 @60 Hz (autoswitching)	54-20363-01
8-Plane high resolution color LCG 1280x1024 @ 66 Hz	54-20365-01
8-Plane high resolution monochrome LCG 1280x1024 @ 72 Hz	54-20365-03
8-Plane high resolution dual head color LCG	54-20762-01

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Table D–1 (Cont.) Model 60 System Box FRUs

FRU	Part Number
8-Plane high resolution quad head color LCG	54-20770-01
SPXg/gt GSP module	54-20450-01
PV61G-BA 8-plane SPXg frame buffer	54-20452-01
2 MB video SIMM memory module (for SPXg 8-Plane Graphic)	54-20454-01
24-Plane SPXgt frame buffer (66 Hz)	54-20854-01
24-Plane SPXgt frame buffer (72 Hz)	54-20854-02
TURBOchannel adapter card DWCTX-BX	54-20430-01
TURBOchannel SCSI option board	PMAZ-AB
TURBOchannel FDDI option board (fiber)	DEFZA-AA
TURBOchannel FDDI option board (twisted-pair)	DEFZA-CA
TURBOchannel NI option board	PMAD-AB
TURBOchannel VME option board	PMABV-AA
H7819-AA power supply	30-34690-01
MS44L-AA 4 MB reduced cost SIMM memory module	54-19145-AA
MS44-AA 4 MB SIMM memory module	54-19103-AA
MS44-CA 16 MB SIMM memory module	54-19103-CA
RRD42 CD-ROM reader	RRD42-AA
RX26 floppy	RX26-AA
RZ23L 121 MB drive	RZ23L-E
RZ24 209 MB drive	RZ24-E
RZ25 425 MB drive	RZ25-E
TZK10 QIC tape drive	TZK10-AA
TZ30 tape drive	TZ30-AX

D.3 Model 60 Monitor FRUs

Table D–2 contains the model numbers for the Model 60 supported monitors.

Table D–2 Model 60 Monitors

Monitor	Part Number
16-inch color	VRT16-DA,D4,HA,H4
19-inch monochrome	VR319-DA,D4
19-inch color	VR320-CA,C4
19-inch color	VRT19-DA,D3,D4,HA,H4
17-inch color	VRM17-AA,A4
17-inch color	VR297-DA,D3,D4
19-inch color	VR299-DA,D3,D4

D.4 Model 60 System Box Miscellaneous Hardware FRUs

Table D–3 contains the part numbers for the Model 60 miscellaneous hardware.

Table D–3 Model 60 Miscellaneous Hardware

FRU	Part Number
Remote keyboard and mouse kit	BC13M-10
Keyboard	LK401-AA LK402-AA
Logitech mouse	VSXXX-GA
Tablet	VSXXX-AB
Gray mouse pad	VSXXX-EA
Vertical stand	BA46X-AA
Multiple box stand	H9855-AA
RRD42 (in tabletop expansion box)	RRD42-DA
Front bezel (without opening)	70-28099-01

(continued on next page)

Table D–3 (Cont.) Model 60 Miscellaneous Hardware

FRU	Part Number
Front bezel (with opening for 3 ½-inch drive)	70-28099-03
Base plastic assembly	70-28096-01
Top plastic cover	70-28107-01
Bracket, 5 ¼-inch half-height drive	74-40430-01
Bracket, RX26 half-height removable media (with FDI module)	74-41127-01
Bracket, half-height 3 ½-inch drive (Refer to next line for RZ25 bracket)	RZ25-E
Bracket, RZ25 3 ½-inch drive	74-41128-02
Rear opening filler	74-41472-01
Rear opening RFI shield filler	74-41473-01
Mounting plate, removable media drives	74-41734-01
Cover, diagnostic ports	74-42419-01
Power supply metal wire form	74-42497-01
Plastic handle for half-height HDD bracket	74-42662-01
Clamp, LCG, and SPXg video boards	74-42680-01
Clamp, SPXgt video board	74-42680-02

D.5 Model 60 System Box Cables and Terminators

Table D–4 contains Model 60 system box cable and terminator part numbers.

Table D–4 Model 60 Cables and Terminators

FRU	Part Number
SCSI terminator	12-30552-01
Internal wire harness power cable	17-02876-01
Cable assembly - high-resolution 10-foot monitor cable (BC29G-09)	17-02906-01

(continued on next page)

Table D–4 (Cont.) Model 60 Cables and Terminators

FRU	Part Number
Cable assembly - high-resolution 3-foot monitor cable (BC29G-03)	17-02906-02
External audio adapter cable	17-03345-01
Internal SCSI data cable assembly	70-28108-01
Thickwire, ThinWire Ethernet kit	70-26209-01
ThinWire Ethernet cable (xx = 06/15/30 refers to length in feet)	BC16M-xx
Thickwire transceiver cable with straight connector (PVC) (xx = 05/10/20/40 refers to length in meters)	BNE3H-xx
Thickwire transceiver cable with right-angle connector (PVC) (xx = 05/10/20/40 refers to length in meters)	BNE3K-xx
Thickwire transceiver cable with straight connector (Teflon) (xx = 05/10/20/40 refers to length in meters)	BNE3L-xx
Thickwire transceiver cable with right-angle connector (Teflon) (xx = 05/10/20/40 refers to length in meters)	BNE3M-xx
System-to-VRT13 monitor cable (BCC27-05)	30-34762-03
DSW21 synchronous communication option cable	BC19x (x=V,W,U,X,Q)
DSW21 synchronous communication option cable	BC20Q
TURBOchannel option cable	BZOD-03,06,12
TURBOchannel option terminator	H8578-AA
System power cable (IEC to 3-prong ac 6-foot cable)	17-00606-10
System power cable for Europe	17-00365-19
System-to-monitor power cable (IEC to IEC 39-inch cable)	17-00442-25
External SCSI data cable	17-02446-02
SCSI signal cable (from FDI to RX26)	17-00285-00

D.6 VLC System Box FRUs

Table D–5 contains the part numbers for the VLC system box FRUs.

Table D–5 VLC System Box FRUs

FRU	Part Number
MS40-AA SIMM memory module	20-36110-05
CPU module thickwire	54-20768-01
Graphics/audio frame buffer module 1 1024x768 @ 72 Hz or 1024x864 (switchable) 1280x1024 @ 72 Hz	54-20772-01
Graphics/audio frame buffer module 2 for VRT13 1024x768 @ 60 Hz or 640x480 @ 60 Hz (switchable)	54-20774-01
Graphics/audio frame buffer module 3 1280x1024 @ 72 Hz	54-20776-01
Graphics/audio frame buffer module 4 1280x1024 @ 66 Hz	54-20776-02
RZ23L half-height hard disk drive	RZ23L-E
RZ24L half-height hard disk drive	RZ24L-E
Power supply (with either CPU module only)	H7109-D

D.7 VLC Monitor FRUs

Table D–6 contains the model numbers for the VLC supported monitors.

Table D–6 VLC Monitors

Monitor	FRU
16-inch color	VRT16-DA,D4,HA,H4
19-inch monochrome	VR319-CA,C4,DA,D4
19-inch color	VR320-CA,C4,DA,D4
19-inch color	VRT19-DA,D3,D4,HA,H4
17-inch color	VRM17-AA,A4
17-inch color	VR297-DA,D3,D4

(continued on next page)

Table D–6 (Cont.) VLC Monitors

Monitor	FRU
19-inch color	VR299-DA,D3,D4

D.8 VLC System Box Miscellaneous Hardware

Table D–7 contains the part numbers for the VLC miscellaneous hardware.

Table D–7 VLC Miscellaneous Hardware

FRU	Part Number
Plastic rivet	12-36064-01
Insulator washer for CPU screws	12-38661-01
Keyboard	LK401-AA
Logitech mouse	VSXXX-GA
Hanging device	BA10X-AA
Thickwire, ThinWire Ethernet kit	70-26209-01
Chassis assembly	70-29792-01
Enclosure cover	70-29793-01
Cricket clip	74-43478-01
Dog bone bracket	74-41364-01
Enclosure (bottom)	74-43475-01
Bezel (front)	74-43598-01

D.9 VLC System Box Cables

Table D–8 contains VLC system box cable part numbers.

Table D–8 VLC Cables

FRU	Part Number
System power cable (IEC to 3-prong ac 6-foot cable)	17-00606-10

(continued on next page)

Table D–8 (Cont.) VLC Cables

FRU	Part Number
System power cable for Europe	17-00365-19
System-to-monitor power cable (IEC to IEC 39-inch cable)	17-00442-25
Internal power cable	17-03210-01
Cable assembly, high-resolution monitor cable	17-02906-01
Internal SCSI cable	17-03191-01
System-to-VRT13 monitor cable (BCC27-05)	30-34762-03

D.10 SZ16 Expansion Box FRUs

Table D–9 contains the part numbers for the SZ16 expansion box.

Table D–9 SZ16 Expansion Box FRUs

FRU	Part Number
RZ55 whole option swap (332 MB)	RZ55-E
RZ56 whole option swap (665 MB)	RZ56-E
RZ57 whole option swap (1.0 GB)	RZ57-E
RZ58 whole option swap (1.3 GB)	RZ58-E
Label (for metal bracket screw hole locations)	36-34745-01
SCSI ID select switch module	54-19325-02
Load board	54-20422-01
H7819-AA power supply	30-34690-01*
RRD42 CD-ROM reader	RRD42-AA*
RDAT drive	TLZ04-GG
TZ30 tape drive	TZ30-AX
TZK10 QIC tape drive	TZK10-AA

*Same part number as in the system box

D.11 SZ16 Expansion Box Miscellaneous Hardware

Table D–10 contains the miscellaneous part numbers for the SZ16 expansion box.

Table D–10 SZ16 Expansion Box FRUs - Miscellaneous Hardware

FRU	Part Number
Vertical stand	BA46X-AA
Multiple box stand	H9855-AA
SCSI bracket assembly	70-28097-01
Front bezel (without opening)	70-28099-01
Front bezel (with opening for single 5 ¼-inch drive)	70-28099-02
Front Bezel (with opening for 3 ½-inch drive)	70-28099-03
Base plastic assembly	70-28096-01
Enclosure assembly	70-28106-01
Top plastic cover	70-28107-01
Middle RFI shield between half-height removable media drives	74-40966-01
Bottom RFI shield (when TZ30 installed)	74-40967-01
Plastic handle (for half-height removable media drive bracket)	74-41948-01
Power supply metal wire form	74-42497-01*
Half-height drive mounting bracket (for single 5 ¼-inch drives and RX26)	74-40430-01
Half-height metal mounting bracket (for dual 5 ¼-inch drives)	74-41175-01
Rear opening filler	74-41472-01
Rear opening RFI shield filler	74-41473-01
Bezel, RDAT/dual half-height	74-41939-01
Cover, diagnostic ports	74-42419-01

*Same part number as in the system box

D.12 SZ16 Expansion Box Cables and Terminators

Table D–11 contains the part numbers for the SZ16 expansion box cables and terminators.

Table D–11 SZ16 Expansion Box Cables and Terminators

FRU	Part Number
SCSI ID select cable	17-02445-01
Internal wire harness power cable	17-02876-02
System power cable (IEC to 3-prong ac 6-foot cable)	17-00606-10
System power cable for Europe	17-00365-19
System-to-monitor power cable (IEC to IEC 39-inch cable)	17-00442-25
Internal SCSI data cable	70-28109-01
External SCSI cable BC09K-02	17-02446-02
SCSI terminator	12-30552-01

D.13 SZ03 Expansion Box FRUs

Table D–12 contains the part numbers for the SZ03 expansion box.

Table D–12 SZ03 Expansion Box FRUs

FRU	Part Number
Chassis and power supply (with open bezel)	BA41A-A9
Chassis and power supply (with closed bezel)	BA41A-B9
SCSI-FDI control module	54-20764-03
RX26 floppy	RX26-AA
RZ23L 121 MB drive	RZ23L-E
RZ24 209 MB drive	RZ24-E
RZ25 425 MB drive	RZ25-E

D.14 SZ03 Expansion Box Miscellaneous Hardware

Table D–13 contains the miscellaneous part numbers for the SZ03 expansion box.

Table D–13 SZ03 Expansion Box FRUs - Miscellaneous Hardware

FRU	Part Number
Screw (Sems 6-32 Pan .250 Torx)	12-30934-01
Bracket, RX26 drive	74-43972-01
Standoff (male/female for mounting disk drives)	90-00001-49
Screw (Sems 6-32 Pan)	90-00049-47
Washer (helical split SST)	90-07801-00
Screw (drive position)	90-11187-01

D.15 SZ03 Expansion Box Cables and Terminators

Table D–14 contains the part numbers for the SZ03 expansion box cables and terminators.

Table D–14 SZ03 Expansion Box Cables and Terminators

FRU	Part Number
SCSI terminator	12-30552-01
SCSI signal cable (from FDI to RX26)	17-00285-00
External SCSI cable	17-02446-02
Power cable (IEC to 3-prong ac 6-foot cable)	17-00606-10
Power cable for Europe	17-00365-19
Switch harness, ID, SCSI, RZ23L	70-29498-01
Switch harness, ID, SCSI, RZ24, RZ24L	70-29499-01
Switch harness, ID, SCSI, RZ25	70-29500-01

Index

E

F

G

I

L

M

N

P

S

T

U

W