Order Number   EK-VS31M-MG.002

Digital Equipment Corporation

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About This Manual

This guide describes how to troubleshoot, adjust, and repair the
VAXstation 3100 Model 76 system to the field replaceable unit (FRU)
level. It covers all FRU options presently available for the VAXstation
3100 Model 76 system. The label on the rear of the system box indicates
the system you are working on (VS43A-xx).

Organization

This guide has four chapters and four appendices.

Chapter	Description
1	Describes testing procedures for a power-up test, self-test, and system exerciser tests.
2	Describes troubleshooting procedures to help isolate the problem to an FRU.
3	Provides a description of the utilities.
4	Describes the Model 76 system, gives a system overview, and outlines FRU removal and replacement procedures.
Appendix A	Lists the recommended spares list (RSL).
Appendix B	Lists the self-tests.
Appendix C	Lists the system tests.
Appendix D	Lists Diagnostic LED Definitions.

Intended Audience

This document is for Digital Customer Services personnel and self-
maintenance customers only.

Tools and Equipment

The following tools are needed to service the VAXstation 3100 Model 76.

Tools and Equipment	Part Number
Screwdriver (flat-head)	47-00043-03
Screwdriver (Phillips)	47-00043-04
Wriststrap and antistatic mat (included in Customer Services antistatic kit)	29-26246-00

Related Documents

The following documents can be ordered from Digital. This guide refers to many of these documents.

Documents	Order Number
BA42 Expansion Box Maintenance Guide	EK-BA42A-MG
RX23 Diskette Drive Service Manual	EK-RX23D-SV
RZ Series Disk Drive Subsystem Pocket Service Guide	EK-RZXXD-PS
RZ22 and RZ23 Disk Drive Service Manual	EK-RZ223-SV
RZxx Disk Drive Subsystem Pocket Service Guide	EK-RZXXD-PS
RZ22/23/24 Diskette Drive Service Manual	EK-RZ234-SV
RZ24 Pocket Service Guide	EK-RZ24D-PS
RZ55 Disk Drive Service Manual	EK-RZ55D-SV
RZ55 Pocket Service Guide	EK-RZ55D-PS
RZ56 Disk Drive Service Manual	EK-RZ56D-SV
RZ56 Pocket Service Guide	EK-RZ56D-PS
VAXstation 2000, MicroVAX 2000, VAXmate Network Guide	EK-NETAB-UG
VAXstation 3100 Maintenance Guide	EK-285AA-MG
VAXstation 3100 Model 76 Owner's Manual	EK-VX31M-UG
VAXstation 3100 Model 76 Upgrade Guide	EK-VX31M-CG
VR150 Pocket Service Guide	EK-VR150-PS

Documents	Order Number
VR160 Pocket Service Guide	EK-VR160-PS
VR262 Pocket Service Guide	EK-VR262-PS
VR299 Pocket Service Guide	EK-VR299-PS
VR297 Service Manual	EK-VR297-SG
VRT13 Service Manual	ER-VRT13-SM
VRT19 Service Manual	ER-VRT19-SM
VS3100 Maintenance Guide Addendum: Models 38 and 46	EK-344AA-AD
Workstations Network Guide	EK-VS315-GD
WS01X-GA/GB Graphics Coprocessor Maintenance Guide	EK-WS01X-MS

Digital personnel may order the documents listed from:

> Digital Equipment Corporation
> 444 Whitney Street
> Northboro, MA 01532

Attn: Publishing and Circulation Services (NRO2-2)
Order Processing Section

Conventions

This document uses the following conventions:

Convention	Meaning
Key	A terminal key used in text and examples. For example, Break indicates that you press the Break key on your terminal keyboard.
NOTE	Provides general information.
CAUTION	Provides information that prevents damage to equipment and software.
WARNING	Provides information to prevent personal injury.

1
Testing

This chapter provides an overview of the testing procedures for the VAXstation 3100 Model 76 system. Since the testing procedures for the VAXstation 3100 Model 76 are similar to the testing procedures for the previous VAXstation 3100 models, this chapter will not repeat the information described in Chapter 1 of the *VAXstation 3100 Maintenance Guide*. If you are not familiar with the diagnostics available on the VAXstation 3100 Model 76 system, you should read through the testing procedures in Chapter 1 of the *VAXstation 3100 Maintenance Guide*. Also refer to the *WS01X-GA/GB Graphics Coprocessor Maintenance Guide*.

The label on the back of the system box indicates which model you are working on. The VS43A-xx model number on the label identifies the VAXstation 3100 Model 76 system.

All testing is performed while in the console mode and diagnostic tests are ROM-based.

This chapter contains an overview of the following procedures:

- Running power-up tests

- Running self-tests

- Running system exerciser diagnostics

CAUTION
Do not remove or unplug the keyboard, mouse, printer, or terminator without turning the power OFF. If the system is up and running, use the proper shutdown procedure prior to halting the system.

1.1   Running Power-Up Tests

Power-up tests run each time you turn the system power ON and, if the
tests are successful, the operating system starts booting. Power-up testing
consists of a sequence of tests executed for each device installed in the
system. The test number of each device is listed on the power-up screen
display as the device is tested.

To run power-up tests, turn the system power switch ON.

Example 1–1 shows an example of the power-up screen display.

```
KA43-A   V1.0

F...E...D...C...B...A_..9...8...7...6...5...4...3_..2_..1...
OK
>>>
```

Example 1–1   Power-Up Tests Screen Display

Example 1–2 shows the power-up screen display with a hard error found
in TEST 9 and a soft error in TEST 8.

```
KA43-A   V1.0

F...E...D...C...B...A_..9?..8...7...6...5...4_..3_..2_..1...

?? 9   00B0   0001.F002     (Hard error)
 ? 8   0040   0000.0005     (Soft error)
```

Example 1–2   Power-Up Tests with Errors

Usually, a question mark (?) in the power-up summary indicates a soft
error and the system may be usable without replacing any FRUs.

Double question marks (??) in the power-up summary indicates a hard
error. This indicates a serious problem that may affect the normal
operation of some component in the system. The failing device must
be replaced before booting the operating system software.

If no power-up display is seen, refer to the *VAXstation 3100 Maintenance
Guide*.

1.1.1 Power-Up Test Codes

The power-up test codes indicate no error, soft errors, status information, or hard (fatal) error information. Any errors found by power-up tests are listed in the power-up tests summary. These errors, as well as the status of all devices installed in the system, are then stored in the configuration table (T 50). Refer to Example 1–3 for an example of the configuration table.

Table 1–1 lists the test numbers and the devices that are tested during that particular test. To look at the status of a device, display the configuration table.

```
>>>  TEST 50
```

The configuration table lists every device in the system and also lists the results of the power-up tests and self-test. The configuration table is updated each time a self-test is run (mouse status is not updated). Remember that the configuration table contains the results of the power-up tests and self-test, and not the results of the system exerciser.

Table 1–1   Power-Up and Self-Test Commands

Test	Mnemonics	Device
T F	MONO	Base video
T E	CLK	Time-of-year clock
T D	NVR	Nonvolatile random access memory (RAM)
T C	DZ	Serial line controller
T B	MEM	Memory
T 9	FP	Floating point unit
T 8	IT	Interval timer
T 7	SCSI-A	SCSI-A bus controller Internal RX23/SCSI adapter assembly Internal RX33/SCSI adapter assembly Internal RZ22, RZ23, and RZ24 disk drives

Table 1–1 (Cont.) Power-Up and Self-Test Commands

Test	Mnemonics	Device
T 6	SCSI-B	SCSI-B bus controller RRD40 storage expansion box RZ55 storage expansion box RZ56 storage expansion box RZ57 storage expansion box TK50 storage expansion box TZ30 in storage expansion box
T 5	SYS	Interrupt controller and Ethernet ID ROM
T 4	8PLN	Option module (GPX 8-plane graphics module **or** SPX ScanProc 8-plane graphics module)
T 3		Option module (not available)
T 2		Option module (not available)
T 1	NI	Ethernet circuits

Example 1–3 shows an example of the configuration table.

```
>>>  TEST 50


  KA43-A   V1.0
  ID 08-00-2B-02-CF-A4

   MONO       0000.0001
   CLK        0000.0001
   NVR        0000.0001
   DZ         0000.0001
     00000001 00000001 00000001 00000001 00000001 000012A0
   MEM        0008.0001
     00800000
   FP         0000.0001
   IT         0000.0001
   SCSI-A     0808.0001 V1.0
     FFFFFF05 FFFFFF05 FFFFFF05 00000001 FFFFFF05 FFFFFF05 FFFFFF03
   SCSI-B     3C3C.0001 V1.0
     FFFFFF05 FFFFFF05 00000001 00000001 05000001 01000001 FFFFFF03
   SYS        0000.0001
   8PLN       0000.0001 V1.0
   NI         0000.0001

>>>
```

Example 1–3   Configuration Table (T 50)

Any code in the configuration table other than 0000.0001 on the MONO, DZ, FP, IT, or SYS devices indicates a hard error and the system module must be replaced for proper operation of the system. The other devices such as CLK, NVR, MEM, SCSI-A, SCSI-B, and NI may have a code other than (0000.0001) and may still operate normally.

1.2 Running a Self-Test

Self-test allows you to test every device again after the power-up tests are complete. Devices can be tested individually (except for drives), a few at a time, or all of them sequentially just like power-up tests.

To individually test a device (drives are tested all together on their particular bus), enter the word (**TEST**) or just the letter (**T**), followed by a space and the test number of the device you want tested. Table 1–1 lists the devices and the test numbers that test the devices. Example 1–4 shows an example of running a self-test on a SCSI bus. All devices connected to the SCSI bus are tested and the results are listed in the configuration table (T 50).

```
>>>  TEST 6

   6...

 >>>

   NOTE: Enter TEST 50 to see the results
```

Example 1–4   Running a Self-Test on a SCSI Bus

1.2.1 Self-Test with Loopback Connectors

A customer mode self-test (that is, without any serial line loopbacks) does not test the drivers on the serial lines (DZ). To test the DZ drivers, run a self-test on the serial lines in customer service mode by installing loopbacks on the two MMJ connectors, then run TEST C. Display the configuration table to see the results.

If only one MMJ loopback is available, install it in the communications port and run the tests. An error code of 0000.0200 on the fourth line for the DZ indicates that the printer port does not have the loopback installed, but the communications port tested successfully.

NOTE
**The ThinWire Ethernet port or the standard Ethernet port
(depending on which port the customer is using) on the back
of the system box must be terminated properly when running
diagnostics on the Ethernet circuits (TEST 1). Otherwise, an
error code of 0000.7001 or greater is listed in the configuration
table. The Ethernet port and SCSI port must always either be
terminated or have an expansion box connected.**

1.2.2 Self-Test Codes

If an error is detected during a self-test, a question mark (?) is put next
to the test number and a failure message (84 FAIL) is displayed. You
must display the configuration table (enter **TEST 50**) after a self-test is
complete to see the error code.

The self-test error codes are located in Appendix B.

1.3   Running System Exerciser Diagnostics

The system exerciser simulates a worst-case operating system situation
test for each device, and checks how the device operates under these
conditions. This type of testing usually finds any interactive problems.

To run the customer service mode system exerciser, perform the following
steps:

1. Install a loopback on the communication port.

2. Insert and load the special-keyed test diskette, compact test disk, and
    tape cartridge.[1]

3. Enter **TEST 101**, **TEST 102**, or **TEST 80000106**.

    TEST 80000106 allows you to enter the test number of the individual
    devices you want to run the exerciser on. If the diskette or the tape
    drive are not loaded with the special-key media, the system exerciser
    does not do destructive writes to them, and tests them the same way
    as it does during the customer mode system exerciser. If the compact
    disk drive is not loaded with the test disk, the drive does not perform
    any reads. If the test disk is not available, any disk loaded allows
    the exerciser to perform reads but does not check the error correction
    circuits (ECC).

---

[1] This special key on the media prevents the exerciser from accidentally destroying
    data on the customer's diskette or tape cartridge. The compact disk never does
    write testing, only reads.

Refer to Chapter 3 of this guide for information on creating the special
diagnostic keys on the diskette and tape.

1.3.1 System Exerciser Diagnostic Commands

Table 1–2 lists the system exerciser diagnostic commands. When running
TEST 0 or TEST 101, the exerciser automatically stops after about 5
minutes and the HALT message (06 HLT INST) is displayed. This HALT
message is normal for these two tests.

1.3.2 System Exerciser Codes

The system exerciser displays the status of the devices on the screen as
the exerciser is running. Any errors found are displayed in the exerciser
display. When examining the exerciser display, a question mark (?) in the
far left column indicates a soft error, double question marks (??) indicate
a hard error, and the absence of question marks usually indicates success.
There may be times when there are no question marks, but a drive may
not be listed in the display (for example, an unplugged power cable). In
these instances you need to be familiar with the codes of all devices so
that when you examine the display, you know if a specific drive or device
is listed, and if the drive or device has a fault.

The system exerciser codes are located in Appendix C.

Table 1–2   System Exerciser Diagnostic Commands

Test	Description of Commands
T 0[1]	Runs customer mode system exerciser. No loopback connectors are needed. Removable media must be loaded in the RX23 disk drive for the exerciser to recognize the drive. The TZ30 does not require media to be loaded. The exerciser tests each device once sequentially, then tests them simultaneously, and stops when the slowest device finishes (about 5 minutes).
T 101[1]	Runs customer service mode system exerciser. Loopbacks and removable media are required. It exercises each device once sequentially, then exercises them simultaneously, and stops when the slowest device finishes (about 5 to 8 minutes). Do not stop the exerciser before it is finished.
T 102	Runs customer service mode system exerciser. Loopbacks and removable media are required. It exercises each device once sequentially and then exercises them simultaneously until you press CTRL C to terminate the tests. Note that the exerciser takes up to 30 seconds to stop after you press CTRL C. Do not stop the exerciser until every device is exercised twice (second pass). Also, do not press the Halt button to stop the exerciser. Once the tests are terminated, an extended summary for only the SCSI-A and SCSI-B tests can be displayed by pressing Return. Continue pressing Return to redisplay the extended summaries. Press CTRL C a second time to terminate the extended summary which will bring you back to the console prompt >>>.
T 80000106[2]	Used for individual device testing. Loopbacks and removable media are required. Runs system exerciser diagnostics on individual devices (TEST 6 and TEST 7 are considered individual devices even though they test several drives). This test allows you to test individual devices by entering the test number of the device at a second prompt. This individual testing saves time since you do not have to wait for all of the other devices to finish testing.

[1]The errors for these tests are only displayed on the screen.

[2]There is no system exerciser test in Memory Test B.

If
```
 >>>T80000106
 ?>>>B
```
is selected, you must hit the Halt button on the rear of the system to get back to the console mode.

2
Troubleshooting

This chapter contains information for troubleshooting the new devices available on the VAXstation 3100 Model 76 system. The label on the back of the system box indicates that you are working on the VS43A-xx. All troubleshooting procedures are performed while in console mode (operating system software halted).

2.1 Troubleshooting Procedures

This section contains troubleshooting information for the devices listed below.

- 4 Mbyte memory DSIMM (Section 2.2)

- RX23 disk drive with the SCSI/FDI adapter module (Section 2.3)

2.2 TEST B — Memory (4 Mbyte DSIMM)

The diagnostics used for the 4 Mbyte memory DSIMM test all of the main memory in the system. Therefore, any error for the memory must be deciphered to determine which DSIMM contains the error. There may be more than one module containing the error.

Running a Self-Test

A self-test performs a complete check of the memory in the system. The results are stored in the configuration table (T 50). To run a self-test:

1. Enter **TEST B**.

2. Enter **TEST 50** to see the results.

Self-Test Results

A code of 00XX.0001 next to the MEM mnemonic indicates no errors (the *XX* is the total amount of memory installed in the system [in hexadecimal]). Verify that the mnemonic matches the amount of memory in the system.

If an error is detected, refer to Section 2.2.1 to determine which module needs to be replaced. There is no further memory test in the system exerciser. The self-test will run complete memory tests if you:

1. Install a loopback on the communication port.

2. Enter **TEST B**.

3. Read the results on the screen during the test.

A code of 0*XXX*.0001 next to the MEM mnemonic indicates no errors (the *XXX* is the number of pages of memory tested during the last pass of the exerciser [1 page = 512 bytes]).

The following test will not work on this system:

```
>>>  t 80000106
?>>>  B
```

If this test is invoked, the system will have to be halted in order to get control in console mode again. If the DZ drivers were also invoked, CTRL C does not get you back to the console mode.

2.2.1 Additional MEM Information

The code for MEM in the configuration table indicates the amount of memory available if no errors are detected. For example, 0010.0001 indicates that 16 Mbytes of memory are available (10 in hexadecimal = 16). The second MEM line in the configuration table contains two 8-digit codes, one of which is displayed when errors are detected. The first code repeats the amount of memory in the system, and the second code (displayed only if an error is detected) contains the location of the failed memory.

There may be up to six more 8-digit codes listed in the configuration table. These codes represent the cache memory located on the system module. If this is seen, run the memory test again to see if the results are duplicated. If so, the cache is bad and the system module has to be replaced.

Example 2–1 shows the second 8-digit number of the MEM display in the configuration table. Each digit represents a SIMM memory module. A code other than 0 in any of the digits indicates an error on a memory SIMM.

Each digit contains the status of four banks of memory (1 bank = 1 Mbyte of memory).

```
                                              4–Digit Error Code



      ?? MEM          0010.0020
             01000000 00000000



                                        Bit map representation of the failed
                                        memory bank on a memory module if not
                                        all zeros (0000000).

                                        See Table 2–1 to determine the
                                        failed SIMM memory module.

                                        This field is displayed only when a failure
                                        is detected on one of the SIMM modules.



                                        8–Digit Error Code

                                        Hexadecimal representation of the
                                        total amount of memory in the system
                                        as listed below.

                                 00400000      4 Mbytes
                                 00800000      8 Mbytes
                                 00C00000     12 Mbytes
                                 01000000     16 Mbytes
                                 01400000     20 Mbytes
                                 01800000     24 Mbytes
                                 01C00000     28 Mbytes
                                 02000000     32 Mbytes
```

Example 2–1   MEM Error Display in the Configuration Table

Table 2–1 lists the location of each memory SIMM and contains possible failure codes.

Table 2–1   Locating a Failed Memory SIMM

Memory Module Configurations	8-Digit Error Code for MEM							
SIMM Callout on System Module	8	7	6	5	4	3	2	1
SIMM 1	0	0	0	0	0	0	0	X[1]
SIMM 2	0	0	0	0	0	0	X[1]	0
SIMM 3	0	0	0	0	0	X[1]	0	0
SIMM 4	0	0	0	0	X[1]	0	0	0
SIMM 5	0	0	0	X[1]	0	0	0	0
SIMM 6	0	0	X[1]	0	0	0	0	0
SIMM 7	0	X[1]	0	0	0	0	0	0
SIMM 8	X[1]	0	0	0	0	0	0	0

[1]A 0 in this SIMM location means this SIMM is good. Anything from 1 through F indicates this SIMM is failing. For example; a code of 00004000 indicates that the SIMM, numbered 4 on the etch of the system module, is bad.

2.3   SCSI-A Troubleshooting

SCSI-A is the internal SCSI bus. To test the internal SCSI bus, execute test 7. You will find only half-height hard disk and/or half-height 3.5-inch floppy drives internal to the system.

In the following procedure an RX23 is discussed. The procedure for troubleshooting the RX23 disk with the SCSI/FDI adapter module is the same as troubleshooting the other drives on the SCSI bus. Remember that the device name of the RX23 drive is usually DKA500. The 5 indicates the SCSI ID and the A indicates the RX23 is on the SCSI-A bus.

The diagnostics used to test the RX23 drive and the SCSI/FDI adapter module are the self-test and the system exerciser.

Running a Self-Test

A self-test performs an inquiry of the drive and reports the status of the drive and the SCSI adapter module. No read/write operations are performed. The results are stored in the configuration table (T 50). To run a self-test:

1. Enter **TEST 7**.

2. Enter **TEST 50** to see the results.

Self-Test Results

A code of 00000001 in the sixth position (if RX23 is at SCSI ID 5) in the SCSI-A bus status line indicates no errors. Example 2–2 shows an example of SCSI-A bus codes in the configuration table.

If any errors are detected, one or two question marks are flagged in the left column next to the SCSI-A mnemonic.
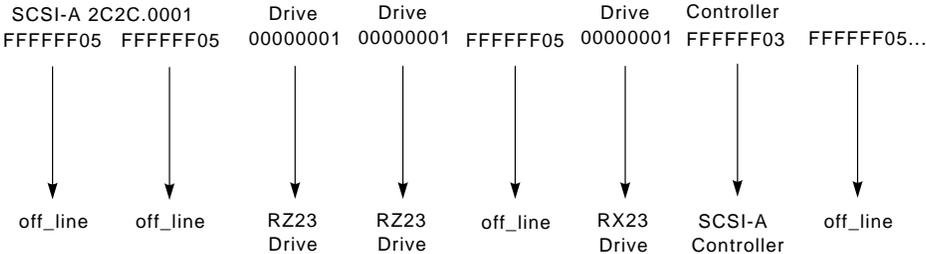
LJ-00735-TI0

Example 2–2   Self-Test Results on the SCSI-A or SCSI-B Bus

If a Self-Test Indicates an Error

The error may be on the RX23 drive, on the other drives on the SCSI-A bus, or on the SCSI-A bus controller. To determine which device is faulty, examine the status codes of the individual drives. The SCSI IDs are numbered 0 through 7 from left to right (for example, the RZ23 disk drive is located at SCSI ID 2 and the RX23 disk drive is located at SCSI ID 5). Table 2–2 lists the normal status codes for each SCSI device available on the SCSI bus.

Any code other than those listed indicates an error in the device at that SCSI ID.

Table 2–2   SCSI Devices Self-Test Status Codes

Status Code	SCSI Device
FFFFFF05	Device is off-line or not installed at this SCSI ID
	If a drive's status code indicates FFFFFF05, check the drive's cabling and power, then retest. If the code is still FFFFFF05 after retesting, replace the drive
FFFFFF03	SCSI bus controller
FFFFFFFF	Device not tested - possible SCSI bus controller error
00000001	RX23 SCSI/FDI adapter assembly or

Disk Drive	Tape Drive
RZ22	TK50
RZ23	TLZ04
RZ23L	TZK10
RZ24	—
RZ55	—
RZ56	—
RZ57	—
RX33	—

01000001	TZ30 tape drive
05000001	RRD40 compact disk drive

2.3.1 Running the System Exerciser

The system exerciser performs a more thorough test of the RX23 disk and the SCSI adapter module. It performs a read/write operation during the second pass of the exerciser when the special-keyed test diskette is loaded in the RX23 drive before starting the system exerciser. To run the system exerciser:

1. Install a loopback on the communication port.

2. Load the special-keyed test diskette in the RX23 drive. If the diskette does not contain the special key, go to Section 3.2 and perform the procedure to write the special key on the diskette.

3. Enter **TEST 80000106** Return .
    ? >>> **7** Return .

4. Read the results on the screen during the test.

5. Press the Halt button to stop the exerciser.

System Exerciser Results

A code of 5300.0001 listed under the SCSI-A bus indicates that there are no errors for the RX23 and that the read/write operation is successful.

A code of 5100.0001 listed under the SCSI-A bus indicates that there are no errors. However, a no write operation took place *either* because the exerciser is still executing the first pass, or the special key is not found on the diskette, or no diskette is loaded.

Example 2–3 shows the system exerciser display for the SCSI-A bus.
There is one line for the status of the SCSI-A controller on the system
module, and one line for each of the drives installed on the SCSI-A bus.
The status of the SCSI controller is next to the SCSI-A mnemonic (first
line), and the status of each drive is listed under the controller's code
(separate line for each drive).

```
7  80A0   SCSI–A   6000.0001   3   0000    0  00:05:26
                    2200.0001              ◄─────────────── RZ23 disk drive
                    3200.0001              ◄─────────────── RZ23 disk drive
                    5300.0001              ◄─────────────── RX23/SCSI adapter
```

Example 2–3   System Exerciser Results for the SCSI-A Bus

If an Error is Detected

If there are any question marks (?) on the SCSI controller's status line,
the SCSI controller is probably faulty and must be replaced.

If there are any question marks on a drive's status line, the problem could
be in either the drive, the SCSI bus cabling, the SCSI bus terminator,
or the SCSI controller. For example, an error that is listed in the drive's
code may be a data transfer error and does not isolate the problem to the
device itself; it may still be in the SCSI controller.

2.3.2 Power Connector Pinouts

Figure 2–1 illustrates the pinout locations for the power connector which
are located on the system module. See Table 2–3 for system module power
connector voltages.
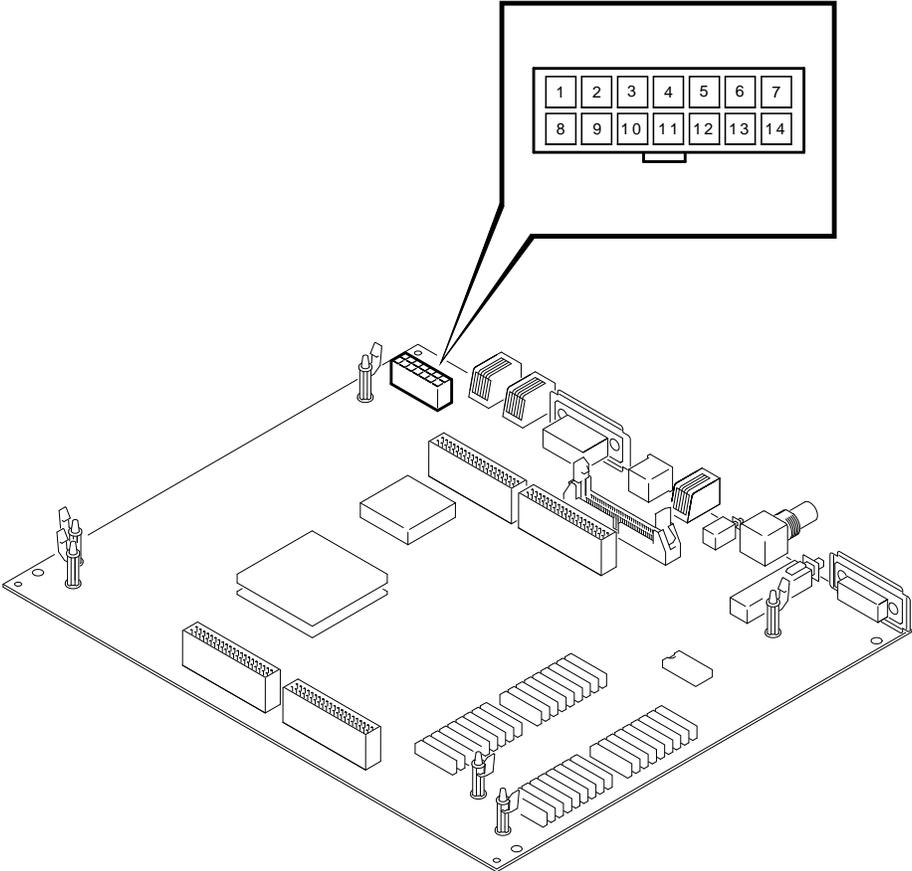
LJ-00687-TI0

Figure 2–1   Power Connector Pin Voltages on the System Module

Table 2–3   System Module Power Connector Voltages

Pin Number	Voltage	Tolerance	Color
1	– 12.1 Vdc	5%	Blue
2	Ground	—	Black
3	Ground	—	Black
4	Ground	—	Black
5	+5.1 Vdc	5%	Red
6	+5.1 Vdc	5%	Red
7	+3.5 to +5.25 Vdc	—	Brown
8	+5.1 Vdc	5%	Red
9	+12.1 Vdc	5%	Orange
10	+5.1 Vdc	5%	Red
11	Ground	—	Black
12	Ground	—	Black
13	– 9 Vdc[1]	5%	Yellow
14	– 9 Vdc return[2]	—	White

[1]Measurement made with negative lead connected to pin 14

[2]Ground for the –9 Vdc supply (an isolated supply)

3
Utilities

This chapter describes the new utilities available on the VAXstation 3100 Model 76. Table 3–1 lists all the utilities available on the VAXstation 3100 Model 76 system.

Table 3–1   Utilities

Test Number	Utility Invoked
T 50	Configuration table (also displays the Ethernet hardware address, for example; ID 08-00-2B-02-CF-A4)
T 51	Sets NVR default boot device
T 52	Sets NVR default boot flags
T 53	Sets NVR default recovery action flags
T 54	Sets keyboard language
SHO ESTAT	Shows system exerciser extended summary
T 60	Alignment circle and crosshatch (monochrome monitor, no graphics module installed)
T 61	Monochrome screen of Es (no graphics module installed)
T 62	Monochrome white screen (no graphics module installed)
T 73	Special key on tapes for customer service mode system exerciser
T 74	Special key on diskettes for customer service mode system exerciser
T 75	SCSI disk data eraser
T 76	Diskette formatter
T 80[1]	Circle-crosshatch (color monitor)

[1]Will work only with an SPX or GPX 8-plane graphics module installed.

Table 3–1 (Cont.)   Utilities

Test Number	Utility Invoked
T 81[1]	Screen of all Es (color monitor)
T 82[1]	White screen (color monitor)
T 83[1]	4-bar color bar (color monitor)
T 84[1]	Red screen (color monitor)
T 85[1]	Green screen (color monitor)
T 86[1]	Blue screen (color monitor)
T 87[1]	8-bar color bar (color monitor)
T 88	Gray scale (color and monochrome monitors)

[1]Will work only with an SPX or GPX 8-plane graphics module installed.

3.1   Diskette Formatter Utility

This utility formats RX23 diskettes. The command to start the formatter is TEST 76. Example 3–1 shows an example of running the formatter on a DKA500 (RX23).

CAUTION
Formatting destroys all user data on the diskette.

```
>>> TEST 76

                         ScsFlpFmtter

PV_SCS_FMT_CHN    (0=SCSIA \ 1=SCSIB)? 0    ◄─────    Enter SCSI bus.

PV_SCS_FMT_ID      (0,1,2,3,4,5,6,7)? 5     ◄─────    Enter SCSI ID of RX23.

  PV_SCS_FMT_RUsure (1/0)? 1                ◄─────    Enter a 1 for yes, 0 for no.

  PV_SCS_FMTing...                          ◄─────    Formatting diskette.

  PV_SCS_FMT_CHKpass..........              ◄─────    RX23 format checked OK.

  PV_SCS_FMT_SUCC                           ◄─────    Diskette is formatted
                                                      successfully.


>>>
```

Example 3–1   Formatting an RX23 Diskette

3.1.1 Diskette Formatter Messages

Table 3–2 lists all the formatter messages and gives an explanation for
each.

Table 3–2   Diskette Formatter Messages

Formatter Message	Explanation
PV_SCS_FMT_CHKpass	A check pass is being done on the diskette.
PV_SCS_FMT_CHN	Enter the SCSI bus that is connected to the RX23/SCSI adapter assembly. Enter 0 for the SCSI-A bus or enter 1 for the SCSI-B bus.
PV_SCS_FMTing	The RX23 diskette is being formatted.
PV_SCS_FMT_RUsure	The formatter uses this question as a safety check. Enter 1 for yes if you want to format the diskette, otherwise, enter any character other than 1 to abort the formatter.

Table 3–2 (Cont.)   Diskette Formatter Messages

Formatter Message	Explanation
PV_SCS_FMT_ID	Enter the SCSI ID of the RX23. Usually the RX23 ID is set for ID 5.
PV_SCS_FMT_SUCC	The diskette has been successfully formatted.
PV_SCS_FMTex	The RX23 formatter has been aborted.
PV_SCS_FMT_ERR#	The formatter has been stopped because of the error code indicated by the pound sign (#). Table 3–3 lists the error codes.

Table 3–3 lists all the T 76 error codes and gives a description for each.

Table 3–3   T 76 Error Codes for the Diskette Formatter

Code	Description
1	Wrong SCSI bus or SCSI ID entered[1]
2	SCSI command error[1]
3	Medium error. A read or write failed[1]
4	Unit not ready. No media
5	Illegal device type[1]
6	SCSI bus hung after reset attempt[1]
7	Data compare error

[1]See the section **Determining the Problem** for more details.

Determining the Problem

An 8-digit error code may be listed under the PV_SCS_FMT_ERR# error message. If this 8-digit error code is listed, you can determine which command was sent to the RX23 and why the command failed. Example 3–2 shows the 8-digit error code breakdown.

```
PV_SCS_FMT_ERR 2
03000006
```

Error code
Always zeros
Command code
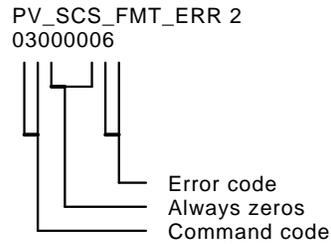
Example 3–2   PV_SCS_FMT_ERR# Error Code Breakdown

Table 3–4 lists the command codes for the 8-digit error code listed under the PV_SCS_FMT_ERR# error message.

Table 3–4   PV_SCS_FMT_ERR# Command Codes

Command Code	Command Sent to Device
00	Test Unit Ready
03	Request Sense
04	Format_Unit
08	Read
0A	Write
12	Inquiry
15	Mode Select
1A	Mode Sense
1B	Start Unit
25	Read Capacity
FF	No Command

Table 3–5 lists the error codes for the 8-digit error code listed under the PV_SCS_FMT_ERR# error message.

Table 3–5   PV_SCS_FMT_ERR# Error Codes

Error Code	Description of Code
04	Bad status returned by device
06	Not enough sense data returned
08	Bad sense key returned by device
0A	Too many retries of this command, failed after request_sense
0C	Attempt to select host
0E	No req was received within timeout period
10	Entered the same phase twice
12	Device in the command phase is out of order
14	Device in the data_in phase is out of order
16	Unexpected entry in the data_in phase (the command should not go in the data_in phase at all)
18	Device in the status phase is out of order
1A	Device in the message_in phase is out of order
1C	Device in the data_out phase is out of order
1E	Unexpected entry in the data_out phase (the command should not go in the data_out phase at all)
20	Entry in unsupported phase 4
22	Entry in unsupported phase 5
26	Device has not signaled a phase
32	No data transferred when receiving bytes
34	AIP bit not set soon enough
3C	Selection failed
4C	Too many REQs
4E	Timeout waiting for bus after command (req is not set)
60	Not enough inquiry data returned by device
68	Reset did not clear bus
6A	Attempt to access SCSI-B on ST506 board
6C	Unexpected message_out phase

Table 3–5 (Cont.)   PV_SCS_FMT_ERR# Error Codes

Error Code	Description of Code
6E	Too many retries of this command, failed after bus_device_reset
70	Timeout waiting for bus free after command (req is set)
72	No interrupt request for the DMA_in phase
74	SCD_CNT not zero following DMA_in phase
76	No interrupt request for the DMA_out phase
78	SCD_CNT wrong following DMA_in phase
7A	Phase did not change soon after data_xfer_in phase
7C	Phase did not change soon after data_xfer_out phase
82	Parity error on SCSI bus
84	SCSI req was not set in time
86	SCSI req was not cleared in time

3.2 Special Diagnostic Key on Diskettes for Customer Service System Exerciser

The diskette in the maintenance kit must have a special diagnostic code written on it to allow the system exerciser to write on the diskette when running in the customer service mode. Without this special key, such as on normal customer diskettes, the system exerciser does not perform write testing on the diskette. This safety feature prevents accidentally destroying the customer's programmed diskettes.

TEST 74 creates a special key on the diskette. First, the diskette in the maintenance kit must be formatted using the T 76 command (described in Section 3.1). Secondly, the diskette must have the special diagnostic key written on it before it can be used with the customer service mode system exerciser.

Example 3–3 shows a successful example of creating a special-keyed diskette.

```
>>> TEST 74

                    KA42 Flmker

    VSflmk_QUE_port (A,B) ? A          ◄──────      Enter SCSI bus port.

    VSflmk_QUE_id (0,1,2,3,4,5,7) ? 5  ◄──────      Enter ID address of drive.

    vsflmk_que_rusure (1/0) ? 1        ◄──────      Enter 1 for yes, 0 for no.

    vsflmk......... ok                 ◄──────      Keyed successfully.


>>>
```

Example 3–3   Creating the Special Key on a Diskette

If any errors occur while running TEST 74, ensure that the drive is on-line and operating properly, then run the special-key command again. Also ensure that the diskette was originally formatted using the T 76 command.

3.3 RX33 Formatting

Perform the following commands to format an RX33 diskette. When executing a command, an error may occur. If an error occurs, try executing the command again, then proceed to the next steps. The first two commands will execute while under the VMS operating system.

To format an RX33:

1. $ Init/Density = Double

2. $ Shutdown

3. Press halt button when prompted to do so.

4. >>> Test 74

3.4 Console Password Feature

The VAXstation 3100 workstations have a console password feature that allows the PVAX to be configured such that a console password must be entered before a user can do an interactive boot. The password and the configuration are stored in nonvolatile memory.

If a user enables this feature and then forgets his console password, the only way to regain full access to the workstation is to perform the following:

1. Open the system box

2. Interrupt the battery-power to the nonvolatile memory by doing the following:

   NOTE
   The chip is socketed and has a white drawing of an alarm clock on it.

   a. Use a small screwdriver or ROM puller to remove the Time-of-Year (TOY) chip (refer to Figure 3–1).
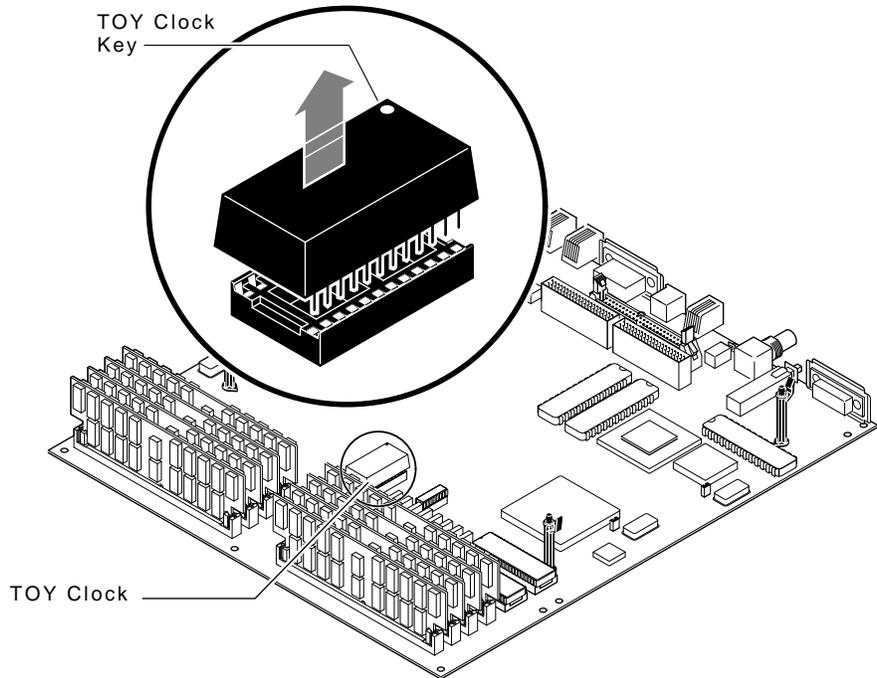
MA-1329-90.DG

Figure 3–1   Time-of-Year Chip

> **CAUTION**
> **Leaving the battery on a conductive surface for a period of time greater than 1-3 seconds may cause premature battery failure.**

b. Place the leads to the chip on top of the system power supply for 1-3 seconds.

c. Replace the TOY chip. The TOY clock key should be towards the rear of the system module.

This effectively shorts the battery internal to the TOY clock and resets the password to the disabled mode.

3. If you do not want to enable the console password feature **stop** here. Do not proceed to the next step.

4. To enable the console password feature:

   a. Set a password with the command `SET PSWD` .

   b. Enable the password feature with the command `SET PSE 1` .

      Use of these commands is further explained in the next two
      sections.

3.4.1 Setting the Password

Use the SET PSWD command to select a new password. SET PSWD is a
privileged command. The form of the command is:

```
>>>  SET PSWD
```

After you invoke the command, the console prompts for a password as
follows:

```
1 >>>
```

Enter the new password and press Return . Note that the console does not
display the password as you enter it.

The password must be a hexadecimal string of characters (0 through 9
and A through F) with a length of *exactly* sixteen characters. If the string
contains a nonhexadecimal character or is of the wrong length, the SET
PSWD command fails and the following error message is displayed:

```
?31 ILL PSWD
```

Some valid passwords are:

```
1ACED33BD23AF301
```

```
DAC324EABEA222EA
```

```
111111111AACCDEE
```

Invalid passwords include:

```
FACE             (not 16 characters long)
```

```
442ED2FFAC213SE2  (contains S, an illegal character)
```

If the password character string is of the right length, the console prompts
you to reenter the new password in order to verify that it is correct:

```
2 >>>
```

Reenter the new password and press ⎡Return⎤. Again, note that the password is not displayed. If the verification password matches exactly the password you first entered, then it becomes your new password. If the two passwords do not match, then the command fails and the console displays the following error message:

```
?31 ILL PSWD
```

3.4.2 Enabling the Password Feature

Use the SET PSE to enable or disable the password feature. The form of the command is:

```
>>>  SET PSE #
```

In place of #, enter a 1 to enable the feature. Enter a 0 to disable the feature.

If you enter something other than 1 or 0, the following error message is displayed:

```
?24 INV DGT
```

If you have not yet used the SET PSWD command to choose a password, the following error message is displayed:

```
?33 NO PSWD DEF
```

3.4.3 Placing the Workstation in Privileged Mode

If privileged mode is selected, it is necessary to type the password at the LOGIN command to enable console commands.

```
>>>  LOGIN
```

If the password feature is not enabled, the console displays the following error message:

```
?32 PSWD NOTEN
```

If the password feature is enabled, the prompt appears for the console password. The password typed in is not displayed on the screen. If the correct password is entered, the workstation is then in privileged mode with access to all commands.

If an incorrect password is entered, the following message is displayed:

```
?23 ILL CMD
```

3.4.4 Learning the Status of the Password Feature

To check on the status of the password feature, use the following command:

```
>>>  SHOW PSE
```

If a 1 is displayed, the feature is enabled. If a 0 is displayed, the feature is disabled.

3.4.5 Exiting Privileged Mode

The following console commands, when executed while the console is in the privileged mode, cause an exit from privileged mode before any other operations begin:

- BOOT (with any supplied parameters)

- CONTINUE

- HALT

- START

Once privileged mode is exited, you must use the LOGIN command and correctly enter the console password to regain the privileged mode.

3.5 Utility Differences for the Model 76

The following utilities are different from those used on the VS3100 Model 30, 38, 40, and 48:

- T 55 has been replaced with show ESTAT.

- T 70 has been replaced with T 76.

4
VAXstation 3100 (Model 76) System

4.1 System Contents

The VAXstation 3100 Model 76 (VS43A-xx) system consists of the system box, monitor, mouse or tablet, and keyboard. The label on the back of the system box indicates that you are working on the VS43A-xx.

The system box contains several field replaceable units (FRUs): the system module, up to eight memory DSIMMs, a graphics module, a power supply, and up to three internal mass storage devices (RX23 disk drive with either one or two RZ22, RZ23, RZ23L, or RZ24 disk drives; or either one, two, or three RZ22, RZ23, RZ23L, or RZ24 disk drives).

There are five expansion boxes available that contain additional mass storage devices. They are:

- TK50Z-GA storage expansion box

- RZ55 storage expansion box

- SZ12 storage expansion box

- RRD40 storage expansion box

- TLZ04 storage expansion box

The keyboard is an LK201 keyboard. There are eleven monitors available.
The eleven monitors are:

- VR160 color monitor
- VR290 color monitor
- VR297 color monitor
- VR299 color monitor
- VR320 color monitor
- VRT16 color monitor
- VRT19 color monitor
- VR150 monochrome monitor
- VR260 monochrome monitor
- VR262 monochrome monitor
- VR319 monochrome monitor

Figure 4–1 shows the VAXstation 3100 Model 76 system box.
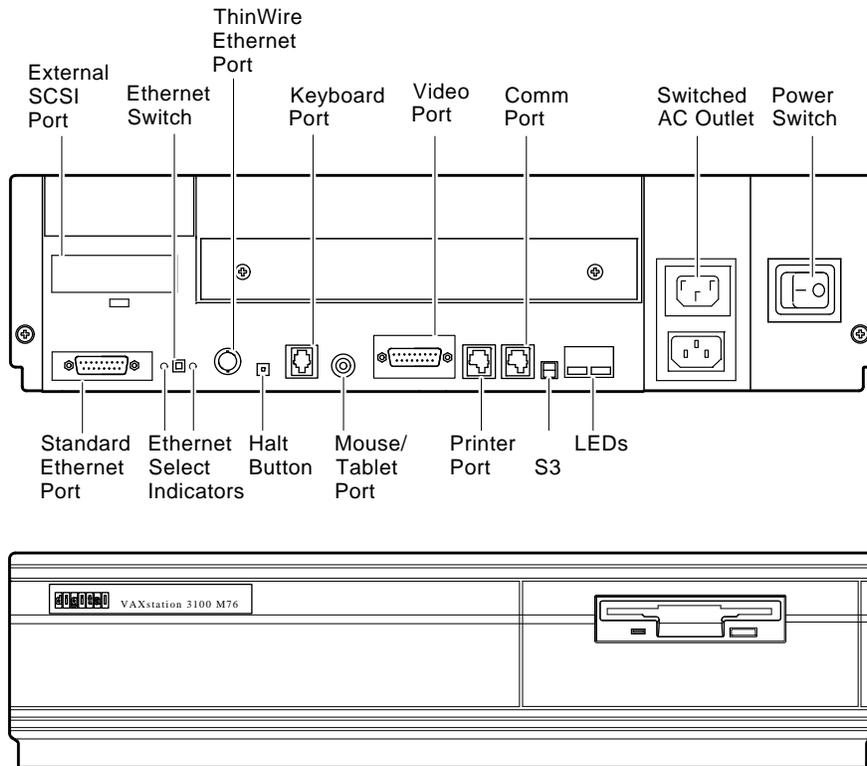
MA-1317-90.DG

Figure 4–1   VAXstation 3100 Model 76 System Box

Figure 4–1 shows the front and rear of the VAXstation 3100 Model 76
system box. The monitor is connected to the 15-pin video port. A printer
can be connected to the printer port. A terminal or another printer can be
connected to the communication port. Connection to the Ethernet is done
through either the ThinWire Ethernet port or the standard Ethernet port
depending on which type of Ethernet network is available.

The position of the Ethernet switch determines which of the Ethernet ports provides IEEE 802.3 network communications. An LED is lit next to the enabled port. The keyboard may only be connected to the keyboard port on the back of the system box. The mouse may only be connected to the mouse port on the back of the system box. The external SCSI port is for connecting external mass storage devices to the system. The monitor or an external mass storage device can be plugged into the switched ac outlet.

The S3 switch next to the LEDs on the back of the system module controls the console port. When the S3 switch is in the *down* position, it enables the monitor connected to the monitor port to be the console. When the S3 switch is in the *up* position, it enables a terminal connected to the printer port to be the console.

4.2   FRU Removal and Replacement

This section describes the removal and replacement procedures for the FRUs in the VAXstation 3100 Model 76 system.

CAUTION
Do not remove or unplug the keyboard, mouse, printer, or terminator without turning the power OFF. If the system is up and running, use the proper shutdown procedure prior to halting the system.

Figure 4–2 shows the location of the major FRUs. To use this section, find the name of the FRU that needs replacing in Table 4–1, then go to the section listed beside the FRU. Follow the steps in the section to remove the FRU and reverse the procedure to replace the FRU. Always test the replaced device for proper operation.

CAUTION
Wear an antistatic wriststrap and use an antistatic mat when replacing FRUs.

Table 4–1   FRU Section Listings

FRU	Section
System box cover	4.2.1
RZ22, RZ23, RZ23L, or RZ24 disk drive	4.2.2
RX23 disk drive	4.2.3
SCSI/FDI adapter	4.2.4
Drive plate	4.2.5
8-plane graphics coprocessor or scanprocessor option	4.2.6
Memory SIMMs	4.2.7
Internal SCSI bus data cable	4.2.9
System module	4.2.8
Power supply	4.2.10
Keyboard	4.2.11
Mouse	4.2.12
Printer	4.2.13

The FRUs for the monitors are not covered in this guide. This information is contained in the various pocket service guides listed in Table 4–2.

Table 4–2   Monitors

Monitor	Document Title	Order Number
VR150	*VR150 Pocket Service Guide*	EK-VR150-PS
VR160	*VR160 Pocket Service Guide*	EK-VR160-PS
VR260	*VR260 Pocket Service Guide*	EK-VR260-PS
VR262	*VR262 Pocket Service Guide*	EK-VR262-PS
VR290	*VR290 Service Guide*	EK-VR290-SV
VR297	*VR297 Service Guide*	EK-VR297-SG
VR299	*VR299 Service Guide*	EK-VR299-SG
VR319	*VR319 Service Guide*	EK-VR319-SV
VR320	*VR320 Service Guide*	EK-VR320-SV
VRT16	*VRT16 Service Guide*	ER-VRT16-SM
VRT19	*VRT19 Service Guide*	ER-VRT19-SM

Figure 4–2 shows the FRU locations.

SCSI/FDI
Module

RZ22, RZ23, RZ23L
or RZ24 Hard Disks

Drive Plate

RX23 Disk Drive

Power Supply

Graphics Coprocessor
Module

Memory Modules

System Module
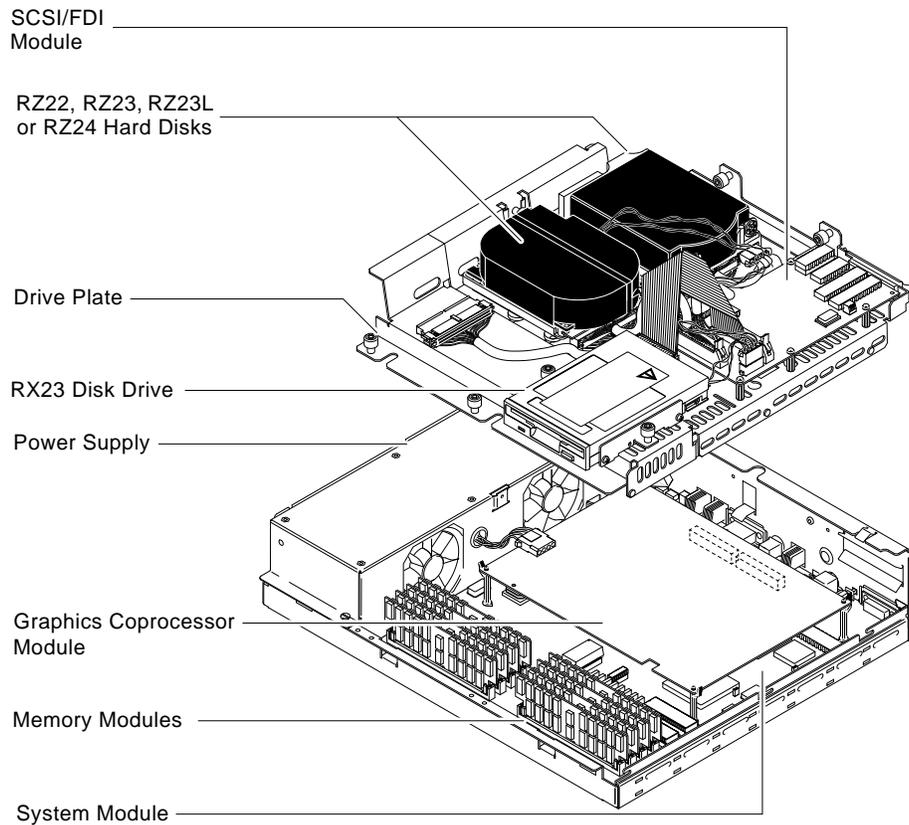
LJ-00688-TI0

Figure 4–2   FRU Locations

4.2.1 System Box Cover Removal

To remove the system box cover:

1. Shut down the system software.

2. Turn the system power switch OFF.

3.   Unscrew the two captive cover screws as shown in Figure 4–3.

4.   Slide the cover forward approximately 2 inches and lift up and off the
     system box.

Captive
Cover Screws

MA-1319-90.DG
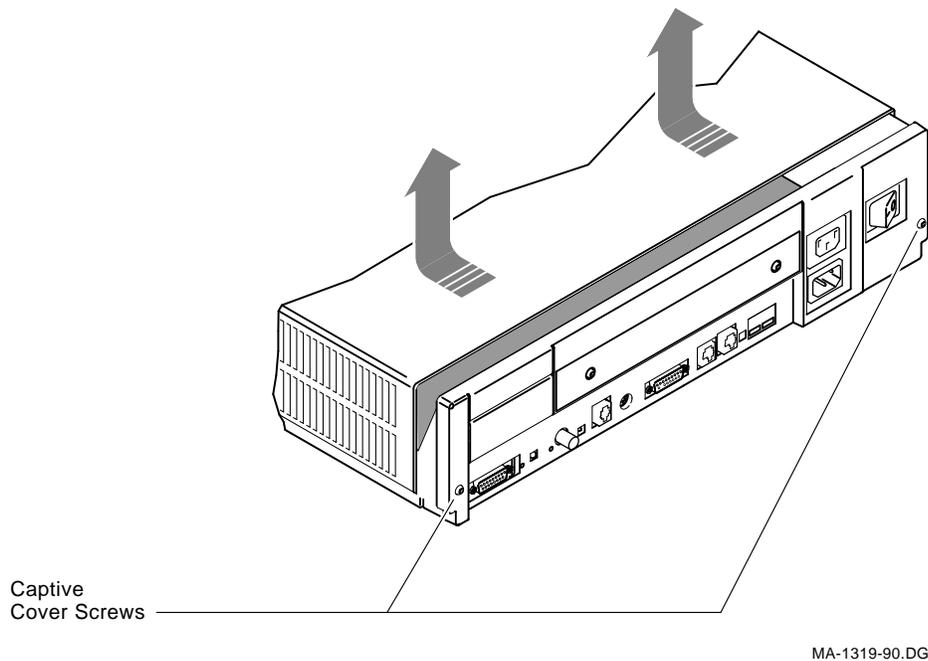
Figure 4–3   Cover Screw Locations

4.2.2 RZ22, RZ23, RZ23L, or RZ24 Disk Drive Removal

To remove an RZ22, RZ23, RZ23L, or RZ24 disk drive:

1. Remove the system box cover (refer to Section 4.2.1).

2. Determine your configuration by referring to Figure 4–4 and Figure 4–5.

System Back

Position 2
RZ-Series Hard Disk

Position 3
RZ-Series Hard Disk

Position 1
RZ-Series Hard Disk

System Front

MLO-005465
MA-1347-90.DG
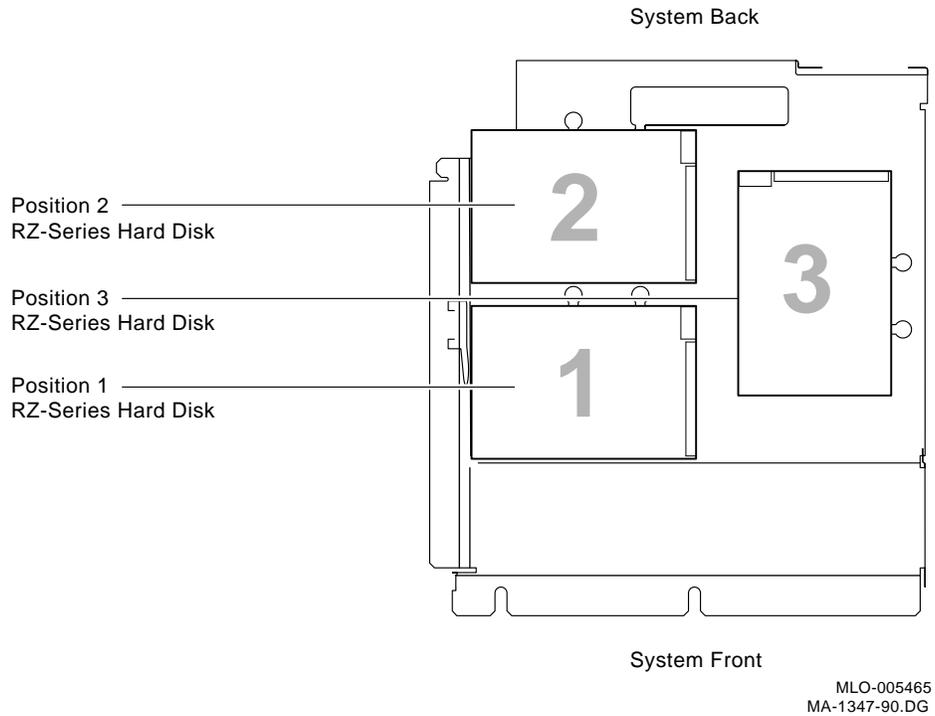
Figure 4–4   Configuration 1

System Back

SCSI/FDI
Module

2

Position 2
RZ-Series Hard Disk

Position 1
RZ-Series Hard Disk

1

Position 3
Diskette Drive

3

System Front

LJ-00689-TI0
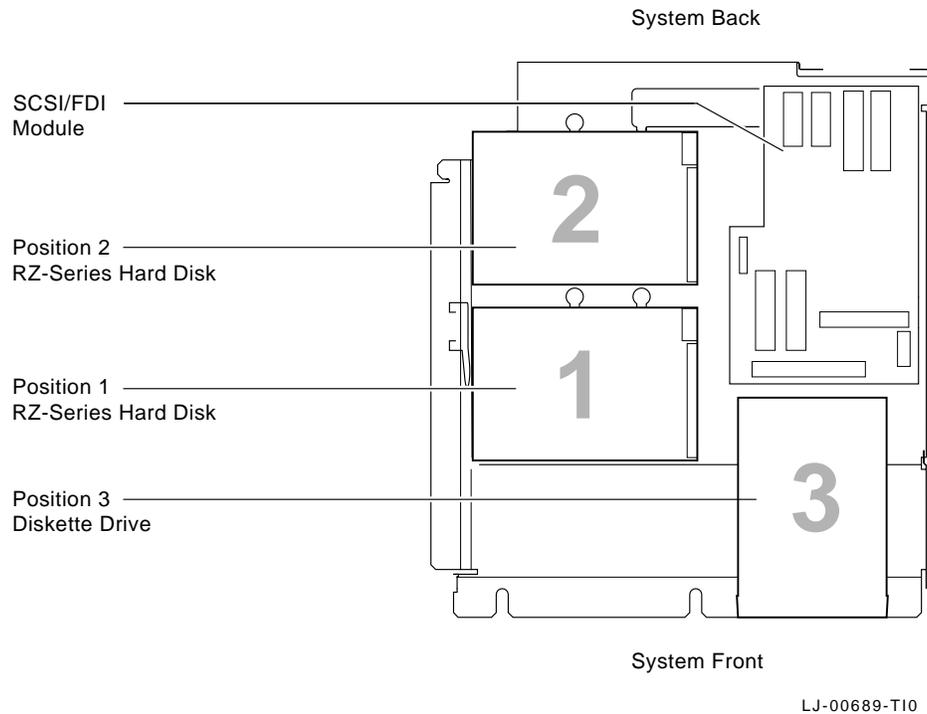
Figure 4–5   Configuration 2

3. Locate the drive plate lever under the disk drive that is being
    removed. Refer to Figure 4–6 for an RZ22, RZ23, or RZ23L and
    Figure 4–7 for an RZ24.

    NOTE
    **If drive 1 is being removed, release drive 2 first for easier
    access.**

4. Simultaneously press down on the drive plate lever and slide the drive toward the lever until you can lift the drive from the plate. Refer to Figure 4–6 for a disk drive in position 1 and Figure 4–7 for a disk drive in position 2.

RZ24 Hard Disk

Mount
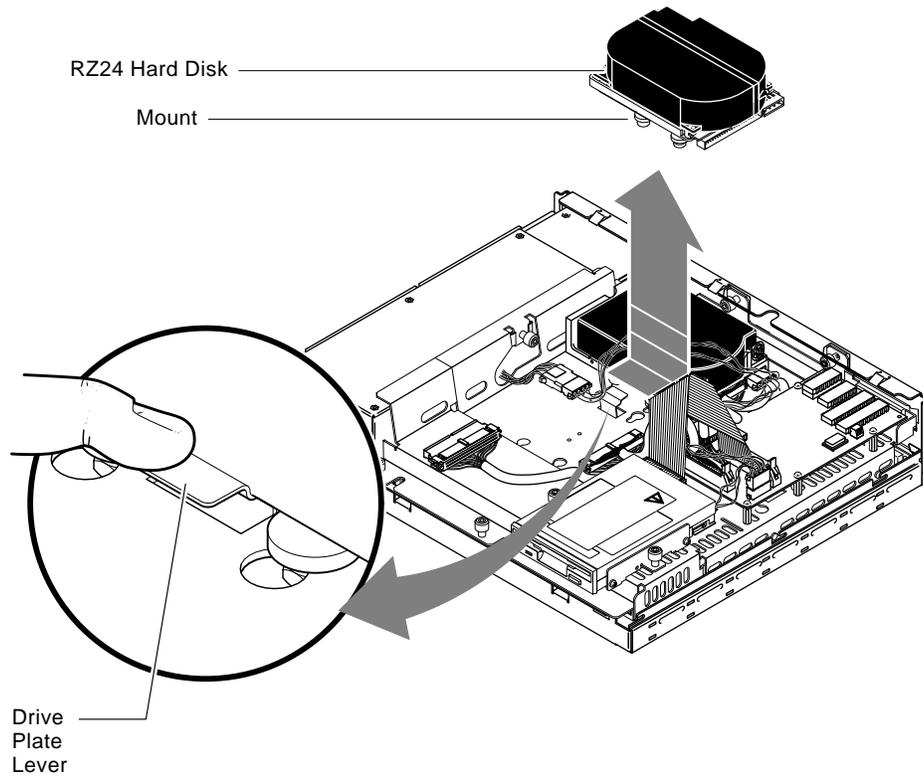
Drive
Plate
Lever

MA-1335-90.DG

Figure 4–6   Removing a Disk Drive from Position 1

RZ23 Hard Disk

Mount
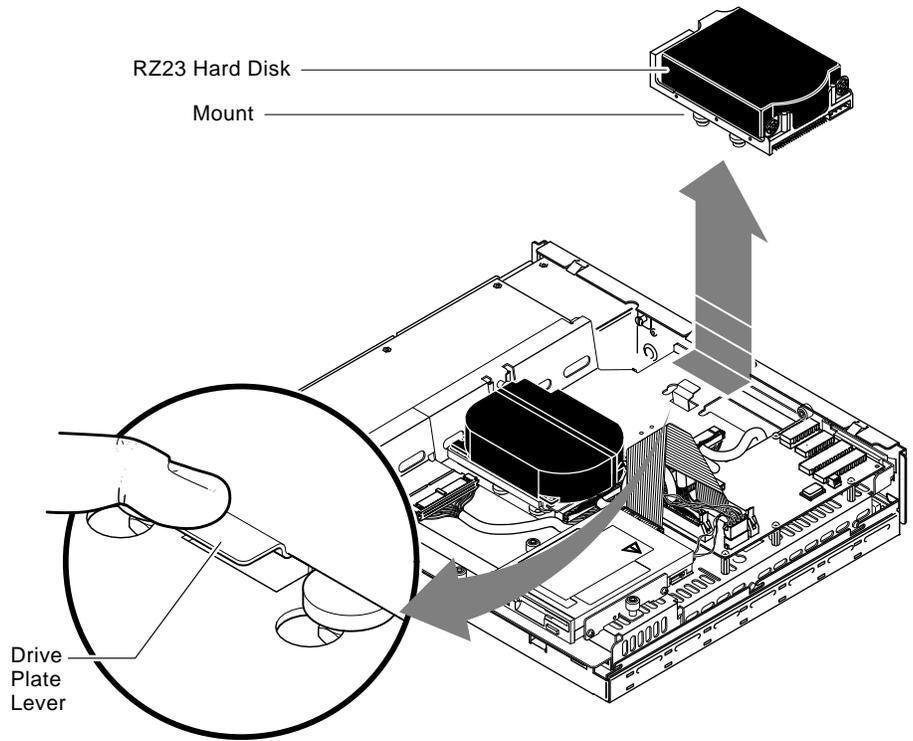
Drive
Plate
Lever

MA-1320-90.DG

Figure 4–7   Removing a Disk Drive from Position 2

5. Disconnect the disk power cable (P/N 17–02220–01) and the SCSI signal cable (P/N 17–02945–01) from the back of the disk that is being removed (Figure 4–8).

Disk
Power Cable

SCSI Signal Cable
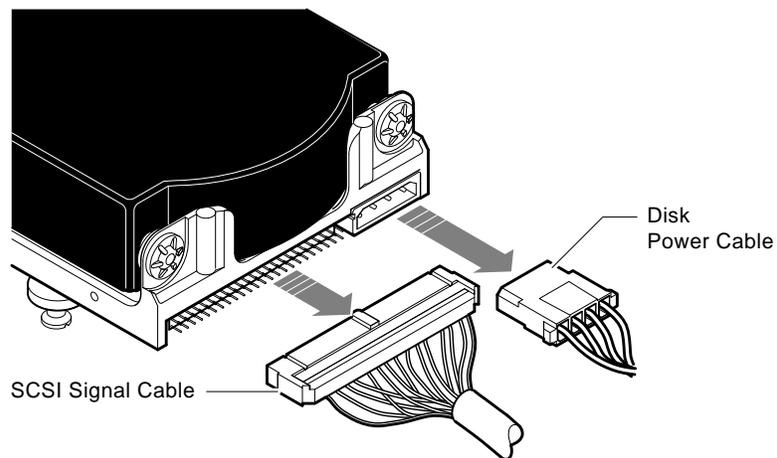
MA-1336-90.DG

Figure 4–8   Removing an RZ22/RZ23/RZ23L Disk Power and SCSI Cables

6. Turn the drive mounting panel over and remove the four screws from the drive (refer to either Figure 4–10 or Figure 4–11). Support the drive with one hand when removing the last screw.

    CAUTION
    When reinstalling the stiffener on the RZ23/RZ23L/RZ24, ensure that the raised edges are away from the drive PCB.

7. Disconnect the drive interconnect cable and remove the two screws
    with a 1/8-inch Allen wrench (refer to Figure 4–9).
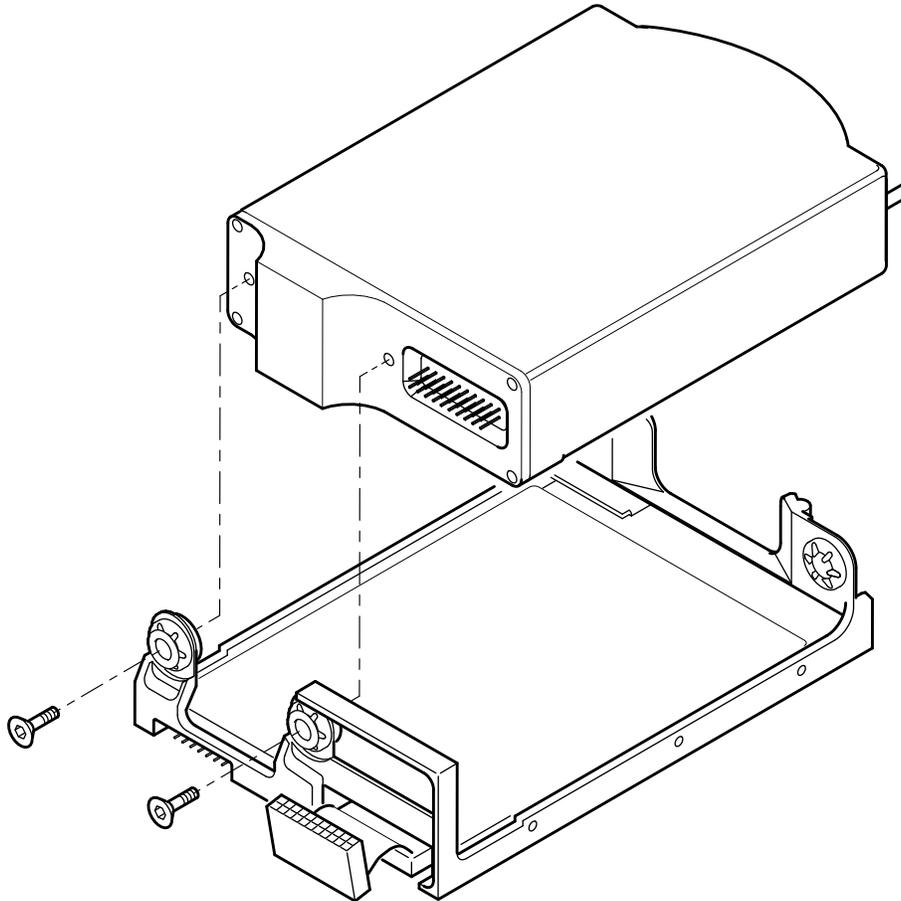
TTB_X1236_88

MA-X1046-88

Figure 4–9   Removing Drive Module/Frame

8. Turn the drive over and locate the SCSI ID jumper settings E1, E2,
    E3, and E4 as shown in either Figure 4–10 for the RZ22, RZ23, and
    RZ23L, or Figure 4–11 for the RZ24.

Record the positions of the jumpers on the drive so that you can set the jumpers on the new drive to the *same* positions.

NOTE
If for some reason the SCSI ID jumpers have been tampered with before the drive has been replaced, refer to Table 4–3 for the RZ22, RZ23, RZ23L, and RZ24 switch settings.

Table 4–3   RZ22, RZ23, RZ23L, and RZ24 Jumpers

SCSI ID[1]	E1	E2	E3	E4	E5[2]	E6[2]
0	Out	Out	Out	Out	Out	In
1	In	Out	Out	Out	Out	In
2	Out	In	Out	Out	Out	In
3	In	In	Out	Out	Out	In
4	Out	Out	In	Out	Out	In
5	In	Out	In	Out	Out	In
6	Out	In	In	Out	Out	In
7	In	In	In	Out	Out	In

[1]For RZ22, RZ23, and RZ23L.

[2]E5 or E6 are present on RZ22 and RZ23 drive/modules with revision levels BO2 or higher. For manufacturing use only.

Connector to
HDA Module

SCSI ID
Jumpers

Terminator
Packs

50-Pin SCSI
Signal
Connector

E 1
E 2
E 3

J 4
E 6   E 5

E 4

Signal
Port

For
Manufacturing
Only

Parity
Jumper

Power
Connector

MA-1321-90.DG
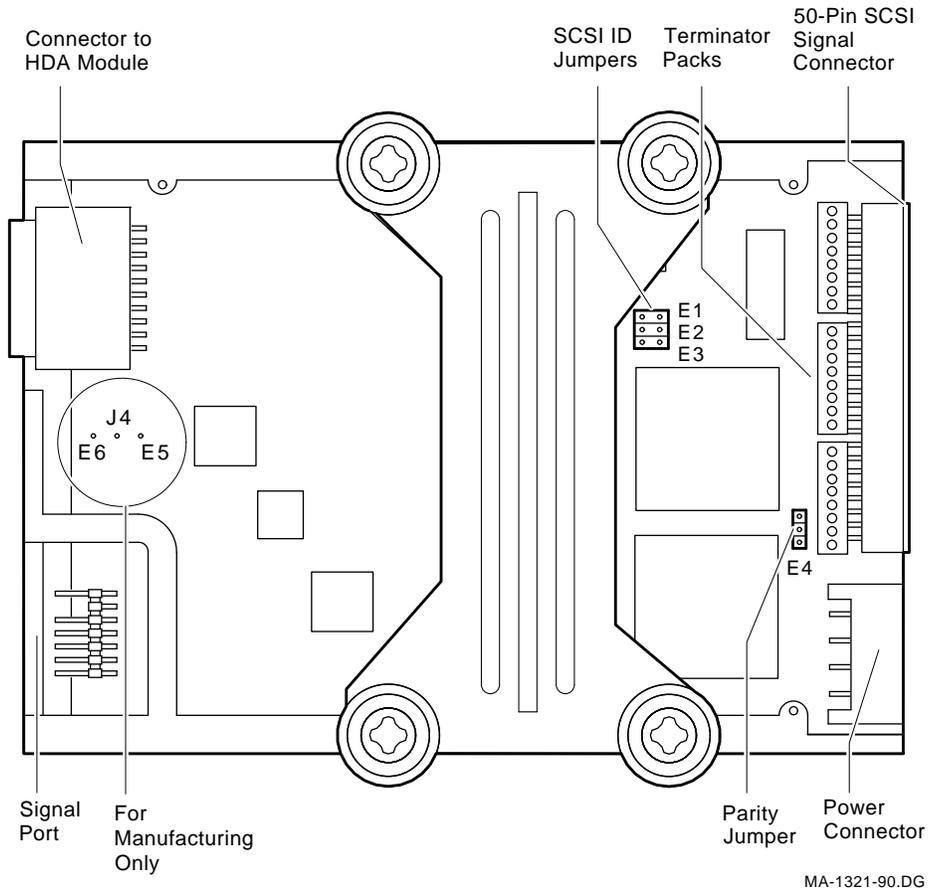
Figure 4–10   Setting the SCSI ID on the RZ22, RZ23, and RZ23L

SCSI ID
Jumpers

Raised
Edges

Terminator
Packs

50-Pin SCSI
Signal
Connector

E2
E1   E3

Connector to
HDA Module

RZ Drive
Stiffener

Power
Connector
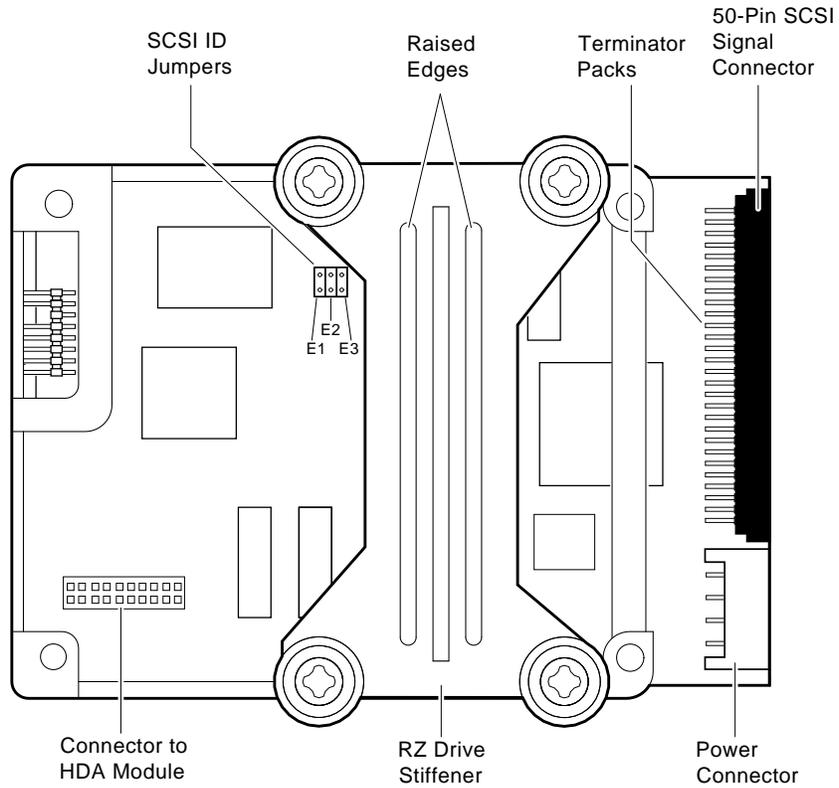
LJ-00690-TI0

Figure 4–11   Setting the SCSI ID on the RZ24

9. Reverse the removal procedure to install the new drive.

CAUTION
**When replacing the four drive screws and RZ2x drive
stiffeners during the installation procedure, ensure that the
stiffener's raised edges are away from the drive.**

4.2.3 RX23 Disk Drive Removal

To remove an RX23 disk drive:

1. Remove the system box cover (refer to Section 4.2.1).

2. Free the two mounting screws (refer to Figure 4–12).

Mounting
Screw
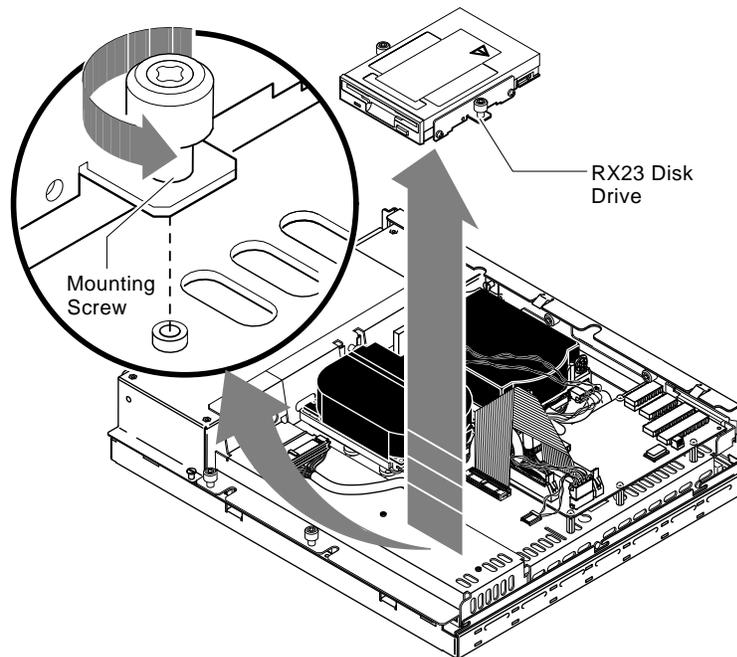
RX23 Disk
Drive

MA-1344-90.DG

Figure 4–12   Removing an RX23 Disk Drive

3. Disconnect the disk power cable (P/N 17–02220–01) and the SCSI signal cable (P/N 17–02221–01) from the back of the RX23 drive (refer to Figure 4–13).
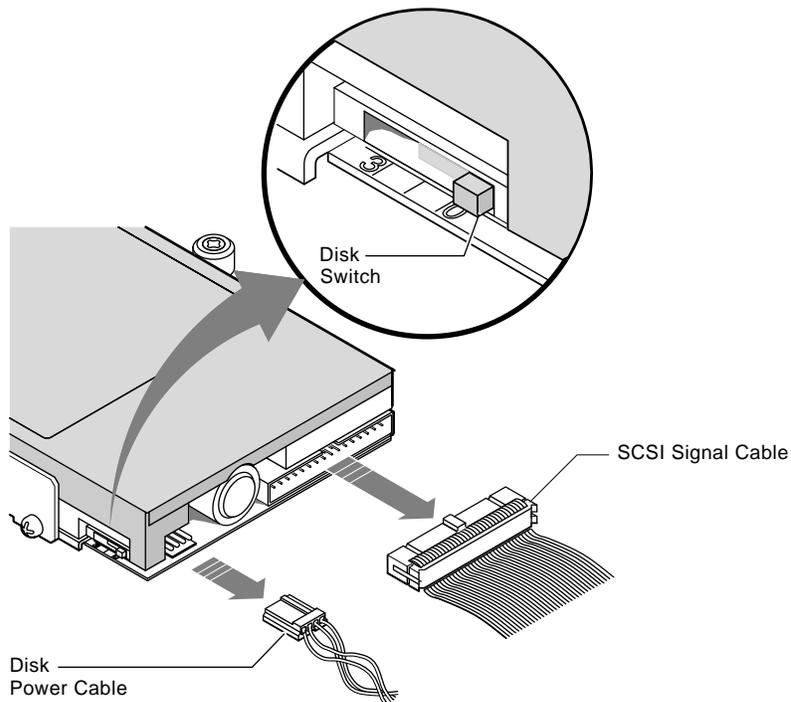
MA-1345-90.DG

Figure 4–13   Removing an RX23 Disk Drive Power and SCSI Cables

4. Record the switch setting on the side of the RX23 and set the switch on the new drive to the *same* position. This should be position 0.

NOTE
The RX23 drive plate lever may have shipping material under it. If it does, remove the shipping material and discard it before performing the next step.

5. Reverse the removal procedure to install the new RX23 drive.

CAUTION
To prevent possible damage to the RX23 SCSI bus data cable during the installation procedure, *do not* place the cable across the SCSI/FDI module connector *tabs*.

4.2.4 SCSI/FDI Adapter Removal

To remove the SCSI/FDI adapter:

1. Remove the system box cover (refer to Section 4.2.1).

2. Locate the SCSI ID switches 1, 2, and 3 as shown in Figure 4–14.

   Record the SCSI ID switch positions so that you can set the ID switches on the SCSI/FDI replacement board to the *same* positions. Usually, the switches are set to 5, as shown in Figure 4–14.

   NOTE
   If for some reason the SCSI ID jumpers have been tampered with before the board has been replaced, refer to Table 4–4 for the SCSI/FDI adapter switch settings.

Table 4–4   SCSI/FDI Adapter Switch Settings

SCSI ID	1	2	3
0	Up	Up	Up
1	Down	Up	Up
2	Up	Down	Up
3	Down	Down	Up
4	Up	Up	Down
5	Down	Up	Down
6	Up	Down	Down
7	Down	Down	Down
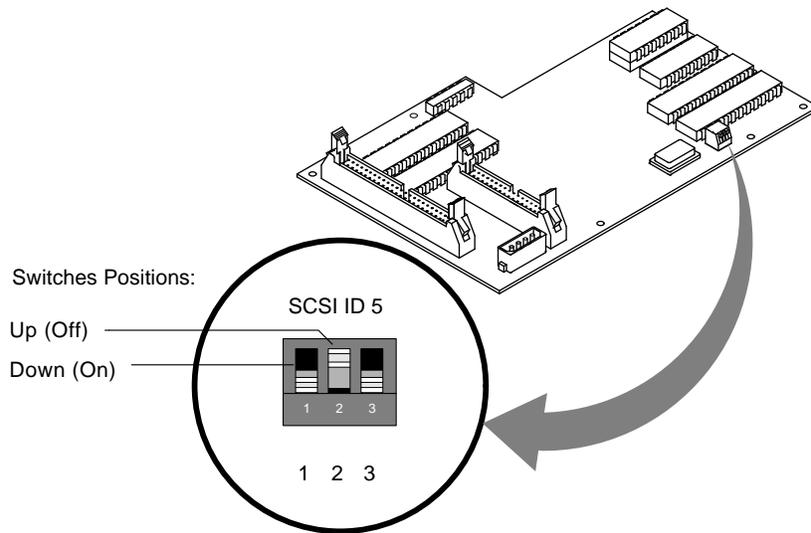
MA-1324-90.DG

Figure 4–14   SCSI ID Switch Location

3. Remove the two SCSI signal cables by spreading the tabs and pulling the connectors out as shown in Figure 4–15.

4. Remove the power cable by pulling the connector out.

5. Remove the six Phillips-head screws on the SCSI/FDI adapter board.

6. Reverse this removal procedure to install the new SCSI/FDI adapter.
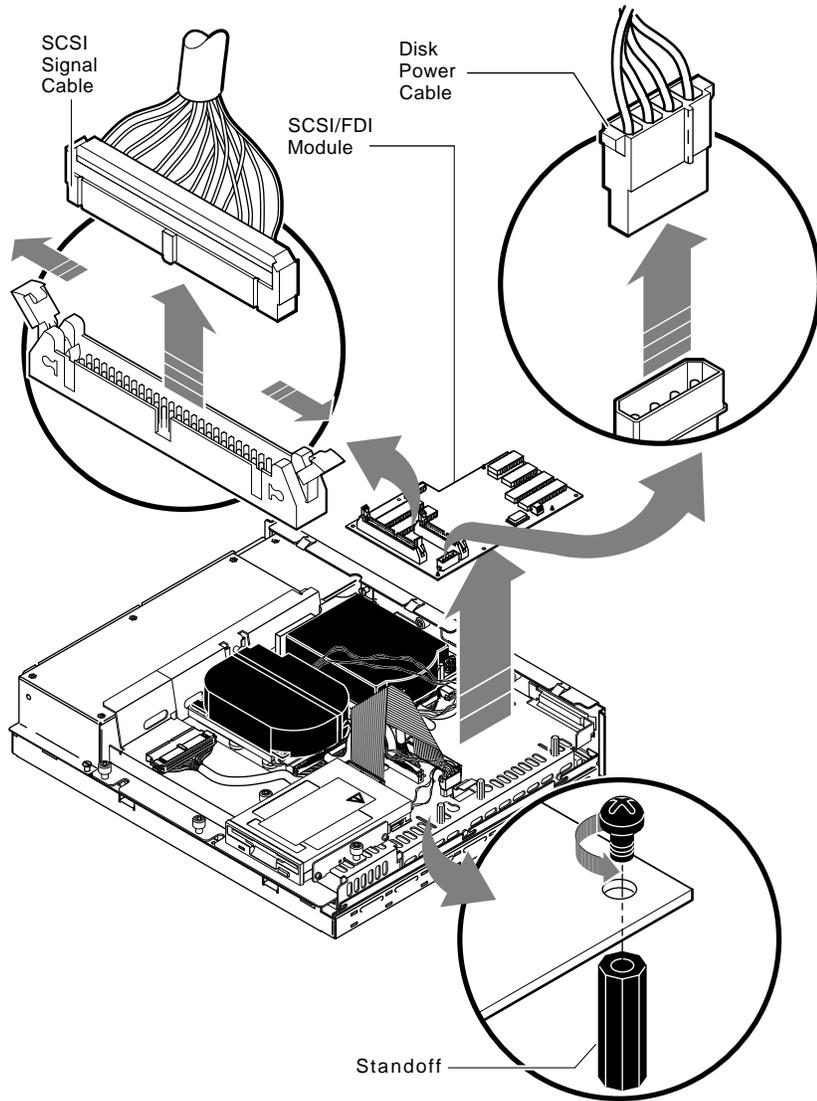
MA-1323-90.DG

Figure 4–15   SCSI/FDI Module Location

4.2.5 Drive Plate Removal

You do not have to remove any devices mounted on the drive plate to remove the drive plate from the system box.

To remove the drive plate:

1. Remove the system box cover (refer to Section 4.2.1).

2. If the drive plate has devices mounted on it, complete all the following steps. If the drive plate has no devices mounted on it, proceed to step 6.

3. Disconnect the disk power cable (P/N 17–02220–01) from the power supply (refer to Figure 4–16).

4. Remove the SCSI cable from the system board by spreading the tabs and pulling straight up.

SCSI Signal Cable
on System Module

Disk
Power Cable

Disk Power
Cable

Captive
Screws (3)

Drive Plate

Captive
Screws (2)

Slide Mount Screws (3)

Slide Mount Openings
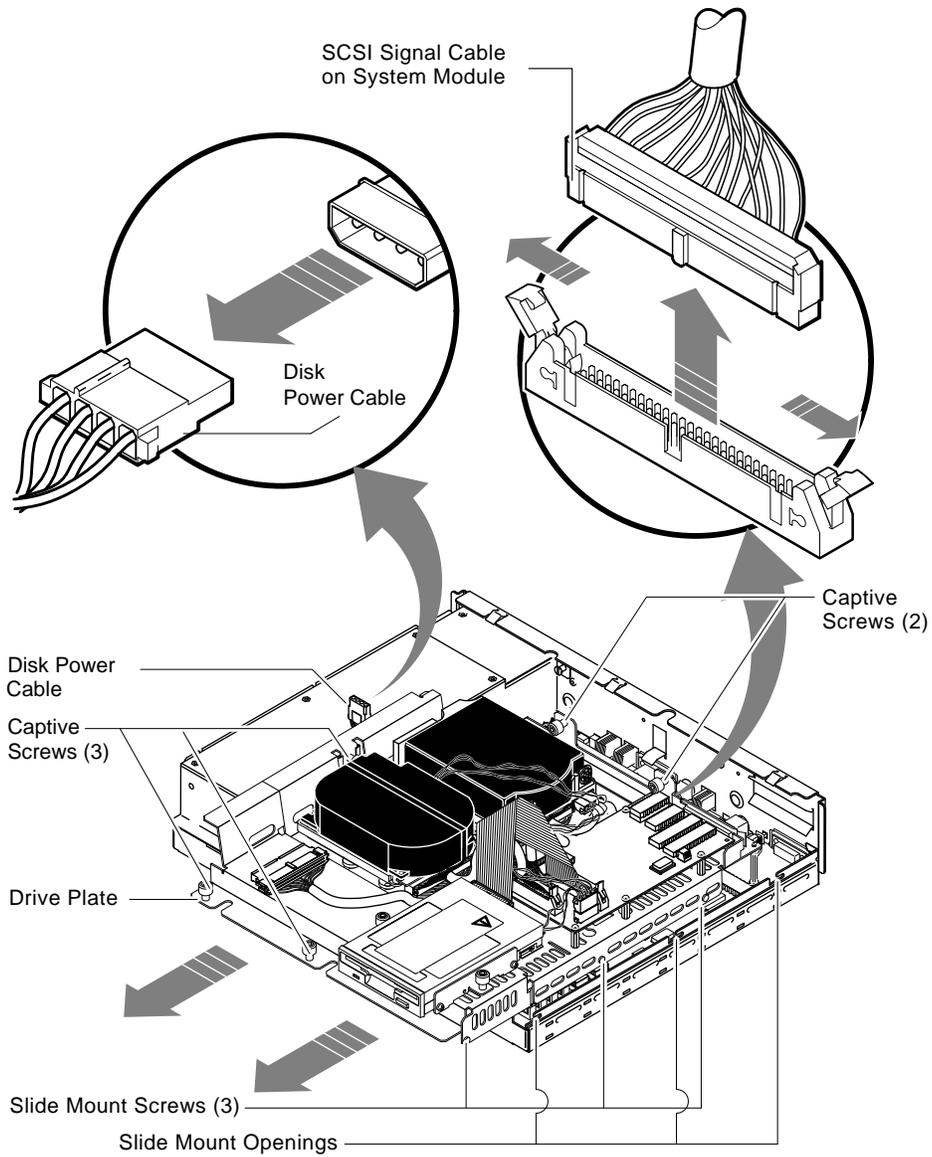
MA-1325-90.DG

Figure 4–16   Removing the Drive Plate

5. Disconnect the SCSI terminator or the external SCSI cable from the SCSI port on the back panel. If your system has a terminator installed, you must remove the terminator access door before you can remove the terminator. The access door can be released by applying upward pressure on the bottom until the door hinges upward (refer to Figure 4–17). At this point the whole door can be removed. Remove the terminator (refer to Figure 4–18).

SCSI Terminator
Access Door

SCSI Terminator

SCSI Terminator
Access Door

MA-1353-90.DG
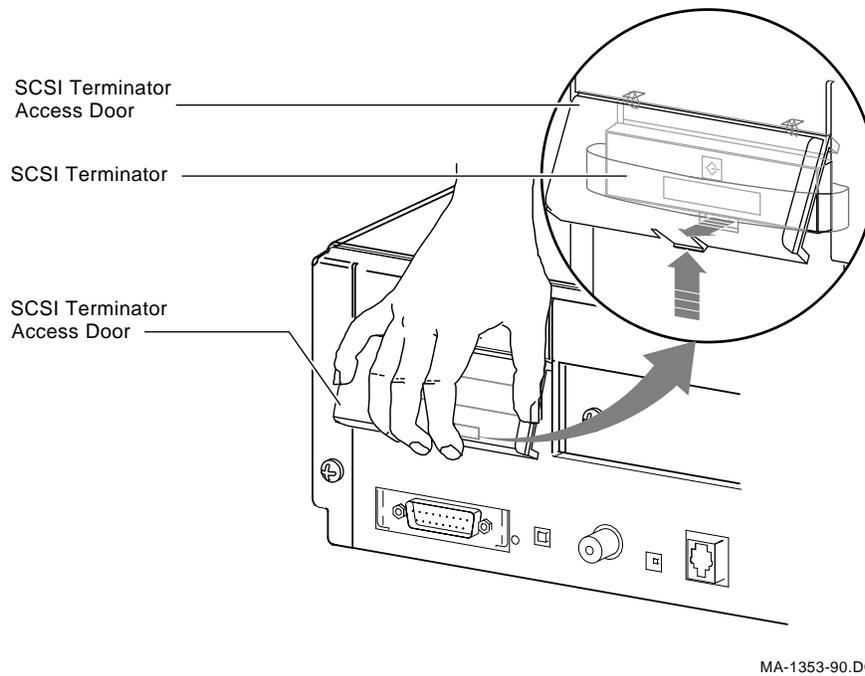
Figure 4–17   External SCSI Access Panel

MA-1354-90.DG
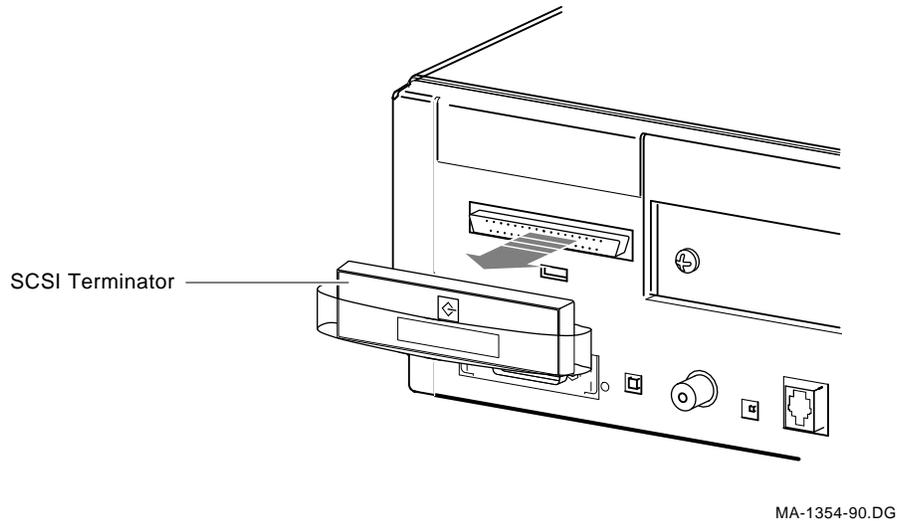
Figure 4–18   SCSI Terminator

6. Free the five captive screws and loosen the three slide mount screws on the drive plate as shown in Figure 4–16. Do not remove the screws from their mountings.

7. Slide the drive plate (with the drives) forward approximately 1/2-inch and then lift it up and off the system box. Feed through the disk power cable as shown in Figure 4–19. Set the plate aside.

8. To install the drive plate, feed through the disk power cable as shown in Figure 4–19 and then continue by reversing this removal procedure.

SCSI Signal Cable

Captive
Screw

Disk
Power Cable
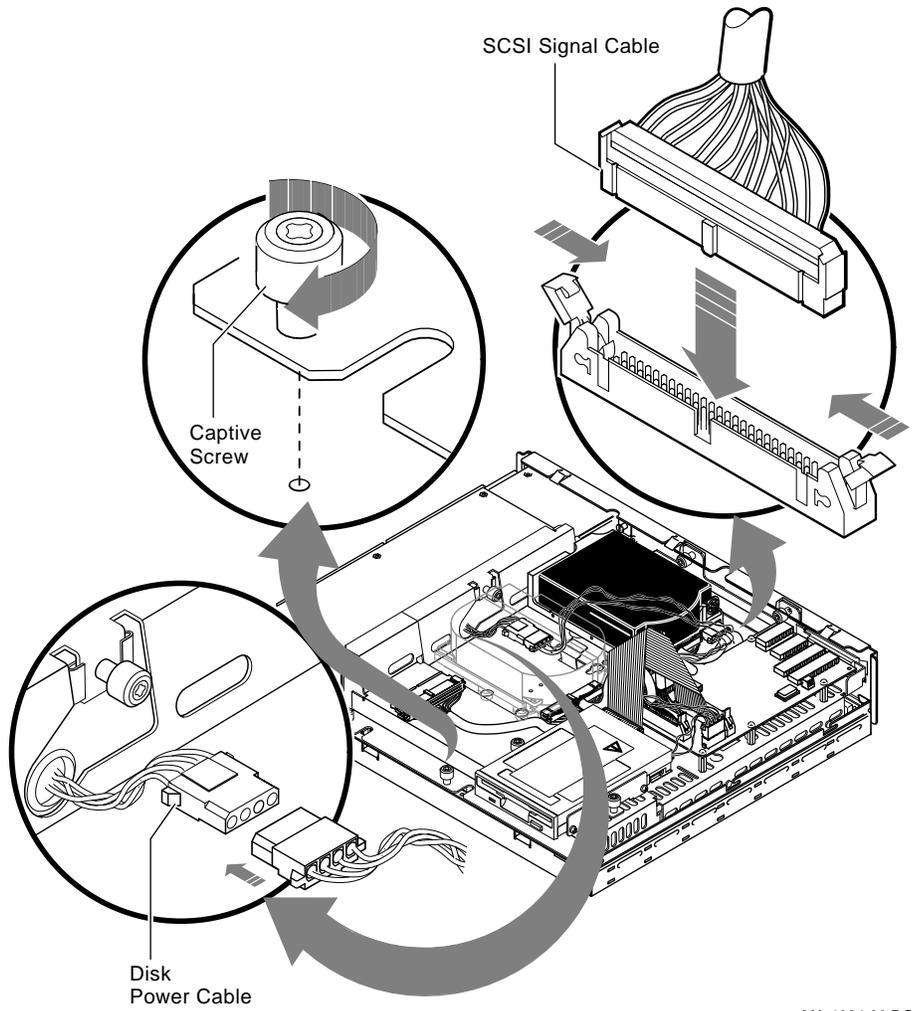
MA-1384-90.DG

Figure 4–19   Replacing the Drive Plate

4.2.6 Graphics Coprocessor Module Removal

To remove the graphics coprocessor module:

1. Remove the system box cover (refer to Section 4.2.1).

2. Remove the drive plate (refer to Section 4.2.5).

3. Remove the graphics coprocessor module from the four standoffs (refer to Figure 4–20).

> **CAUTION**
> **If you have an SPX color graphics accelerator, there is an IC (on the SPX graphics module) whose pins are susceptible to bending near the rear corner furthest from the power supply. Be extremely careful in handling this module so as not to cause permanent damage.**
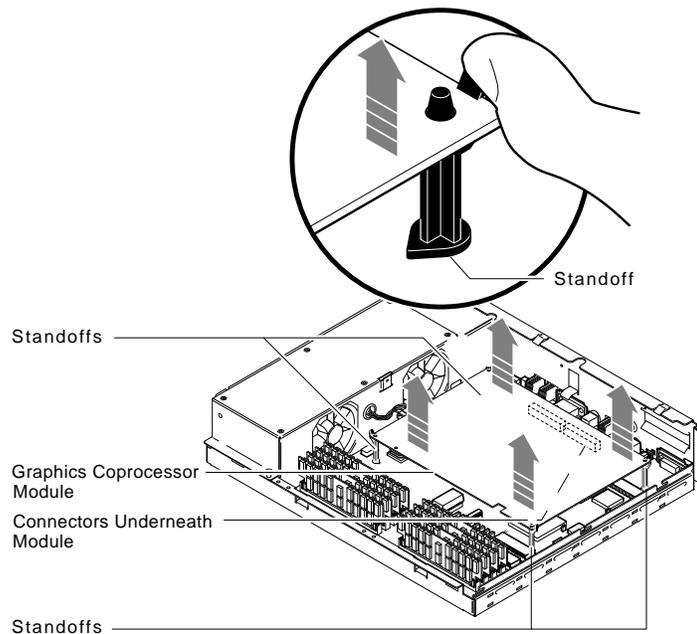
MA-1326-90.DG

Figure 4–20   Removing the Graphics Coprocessor Module

4. Grasp the module near the two connectors under the module and lift the graphics coprocessor module off the system module. Refer to Figure 4–21 for the location of the connector.

5. Reverse this removal procedure to install a new graphics module.

System Side View

Graphics Coprocessor Module

Module Connectors

Power Supply

Standoff

System Module

Module Connectors

Standoff

MA-1334-90.DG
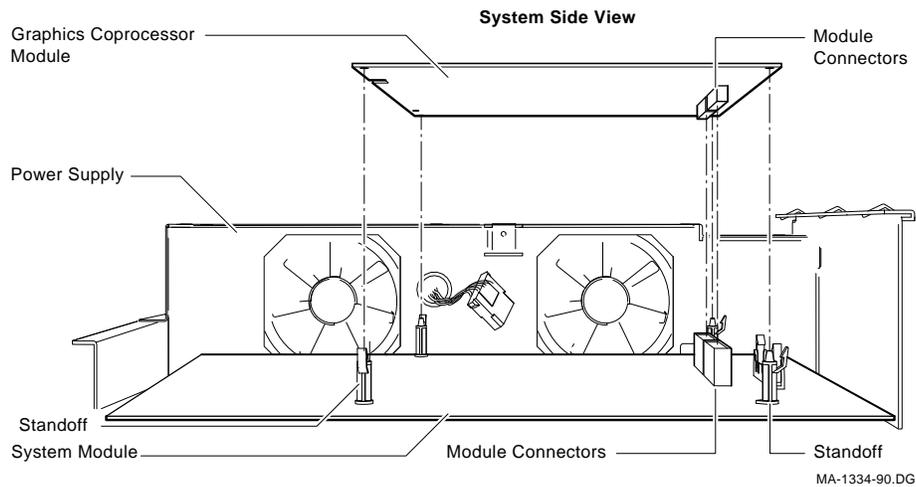
Figure 4–21   Removing the Graphics Coprocessor Module - Sectional View

4.2.6.1 Graphics Coprocessor Module 60Hz/66Hz Selection

There is a two position dip switch located on the Graphics Coprocessor module (non-component side) that is used to switch between 60Hz and 66Hz monitor support.

• Switch #1 is inactive.

• Switch #2 should be in the **ON position for 66 Hz monitors**.

The dip switch can be accessed without removing the drive plate. To set the dip switch:

1. Remove the storage drive located in drive position 1 (see Figure 4–5).

   NOTE
   Once the storage drive has been removed you can gain access to the dip switch (white) through a opening in the drive plate located near the power supply.

2. Select the appropriate dip switch setting.

4.2.7 Memory SIMM Removal

To remove a memory module:

1. Remove the system box cover (refer to Section 4.2.1).

2. Remove the drive plate (refer to Section 4.2.5).

    CAUTION 1
    Memory components are easily damaged with static electricity.
    An antistatic wriststrap should always be worn when
    installing or removing memory components.

    CAUTION 2
    The memory SIMMs are keyed and should be installed in only
    one direction. Excessive force applied to the SIMMs when
    they are not properly aligned with the connector can cause
    permanent damage to either the SIMM or connector.

    NOTE
    Memory SIMMs must always be removed starting from the
    rear of the system. For example, if you are going to replace
    the SIMM at the front of the system board, you must remove
    the other three starting at the rear and working toward the
    front. Memory modules are numbered on the outer edges of
    the memory connectors located on the system board.

3. To remove a SIMM, release the two metal retainers located on each
    SIMM memory connector (refer to Figure 4–22). Tilt the module
    approximately 55 degrees to the rear of the unit and lift out (refer to
    Figure 4–22).

    CAUTION
    Failure to release the two memory retainers will permanently
    damage the memory connector located on the system board.

4. Repeat the previous step for each memory SIMM that must be
    removed.

5. Reverse this removal procedure to install a new SIMM, noting the
    following. Be sure to insert the new SIMM at the angle it was
    removed, then tilt upward until the retainers lock into place.
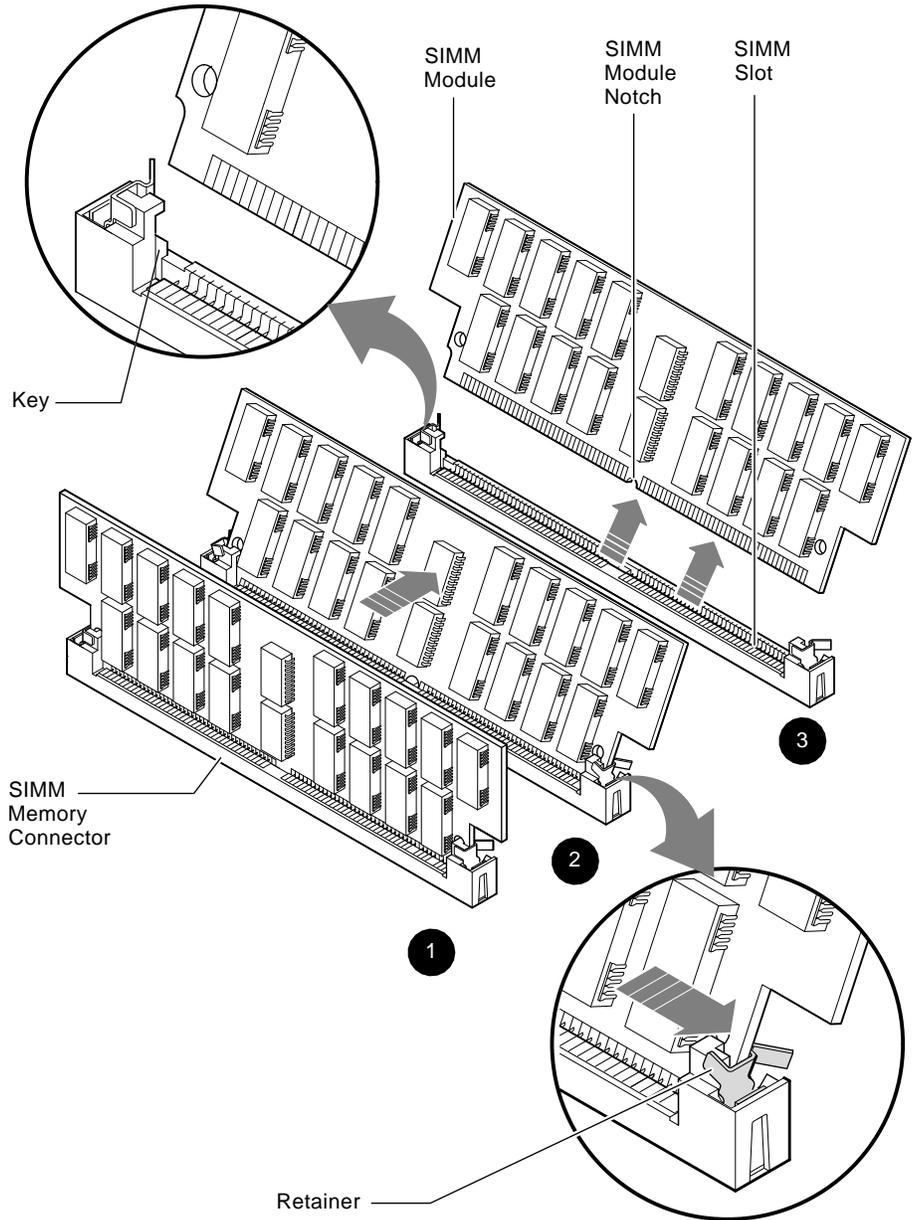
MA-1333-90.DG

Figure 4–22   Removing Memory Modules

4.2.8 System Module Removal

To remove a system module:

1. Disconnect all cables from the back of the system box.

2. Remove the system box cover (refer to Section 4.2.1).

3. Remove the drive plate (refer to Section 4.2.5).

4. Remove the graphics coprocessor module (if installed) from the system (refer to Section 4.2.6).

5. Disconnect the system power cable from the system module by releasing the lock on the connector (refer to Figure 4–23).

Phillips-head Screws (6)

System Power Cable

Phillips-head Screws (3)

Locating Post

Phillips-head Screws (3)
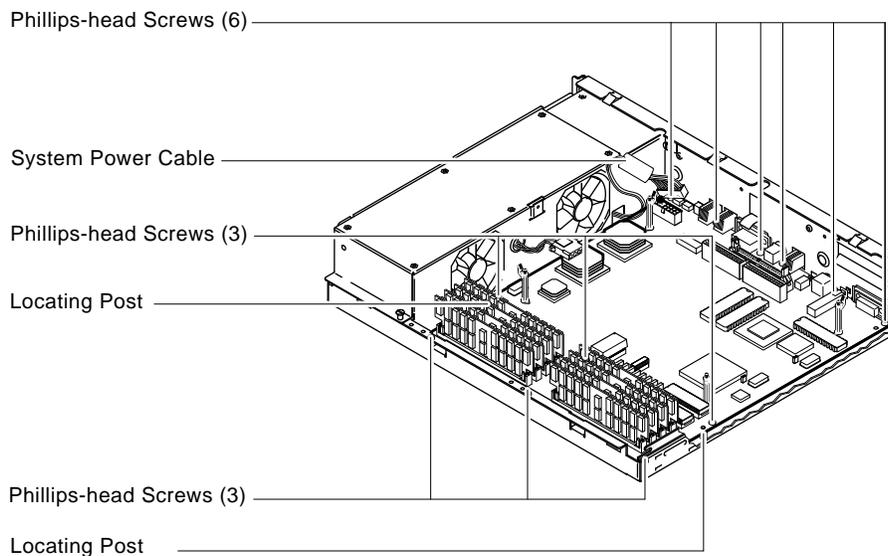
Locating Post

MA-1382-90.DG

Figure 4–23   System Module

6. Remove the twelve Phillips-head screws from the system module as shown in Figure 4–23.

7. Remove the system module by carefully popping up the two front corners off the two locating posts as shown in Figure 4–24.

> **CAUTION**
> **ROM chips are static sensitive devices. An antistatic wriststrap should be worn while removing or replacing a ROM chip.**

Phillips-head Screws (6)

System Power Cable

Phillips-head Screws (3)

Locating Post

Phillips-head Screws (3)

Locating Post
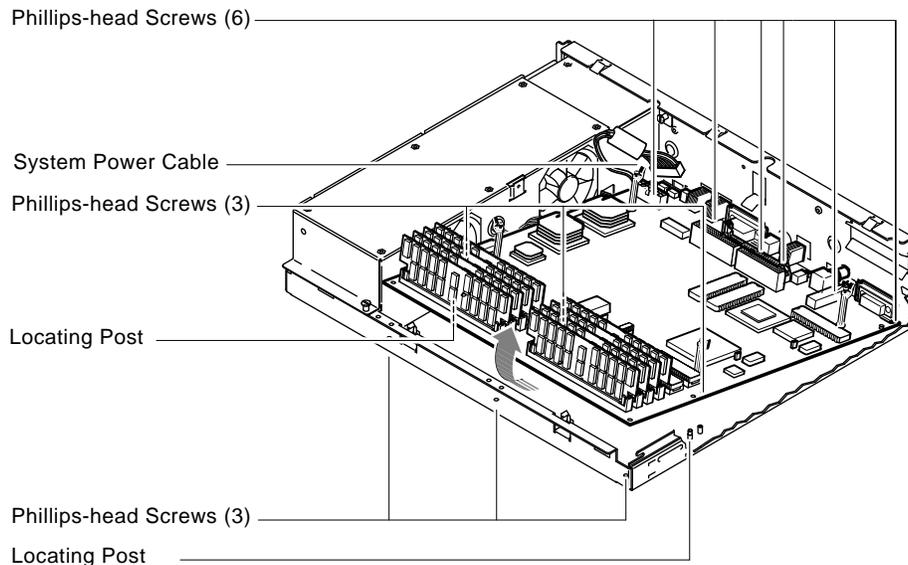
MA-1328-90.DG

Figure 4–24   Removing the System Module

8. Remove the memory SIMMs (refer to Section 4.2.7).

9. Use either a ROM puller or slide a small screwdriver under each end of the Ethernet ID ROM, and carefully lift the ends until you can remove the ROM from the system module. Figure 4–25 shows the Ethernet ID ROM.
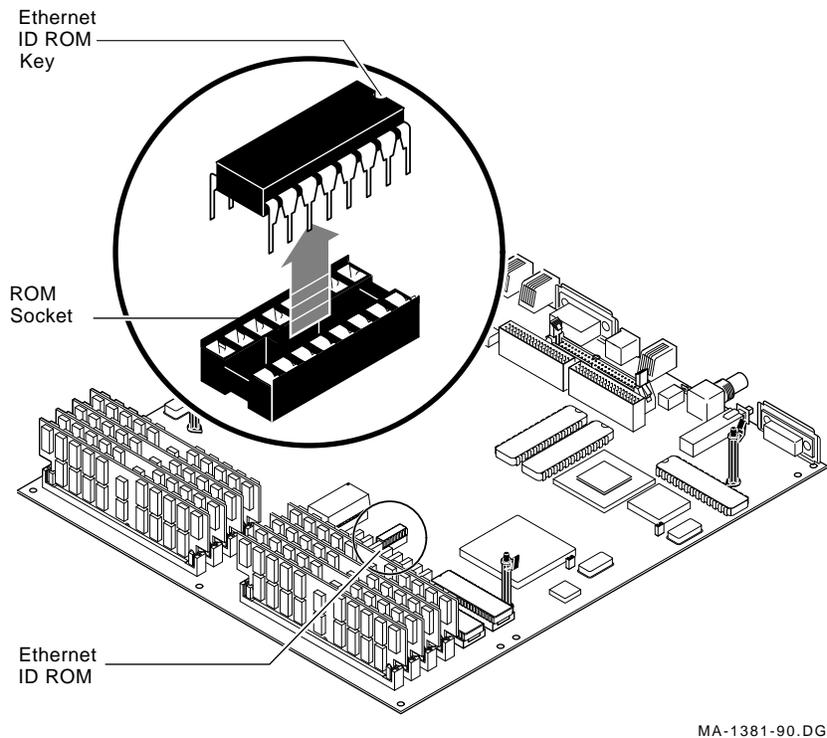
MA-1381-90.DG

Figure 4–25   Removing the Ethernet ID ROM

CAUTION
Do not bend the pins on the ROM. You must add this ROM to the replacement system module. The Ethernet ID ROM key must face the back of the system. If you put the Ethernet ID ROM in backwards, the system will not function properly. See Figure 4–25 for the proper orientation of the Ethernet ID ROM key.

To replace a system module:

1. Remove the Ethernet ID ROM from the new system module and reinstall it on the old system module.

2. Take the Ethernet ID ROM you removed from the old system module and insert it in the new system module. Use Figure 4–25 as a reference. The key faces the rear of the module.

3. Place the new system module in the system box making sure the connectors slide through the openings in the rear of the system box as shown in Figure 4–26.

Phillips-head Screws (6)

System Power Cable

Phillips-head Screws (3)

Locating Post

Phillips-head Screws (3)
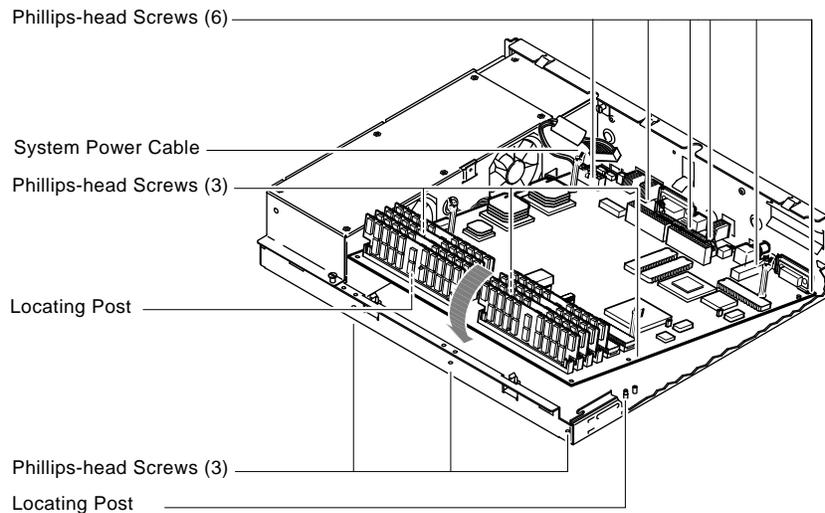
Locating Post

MA-1383-90.DG

Figure 4–26   Installing the System Module

4. Push the module toward the back of the box until the front set of holes on either side of the module fit on the two locating posts on the bottom of the box. You must apply some pressure because of the elasticity of the connector shieldings surrounding the connectors at the back of the module. Snap the module on the locating posts.

5. Check that the screw holes are aligned. Install and tighten the twelve Phillips-head screws.

6. Plug in the power cable on the system module.

7. Replace the memory SIMM(s).

8. Reinstall the graphics coprocessor by aligning it with the four standoffs and applying downward pressure so as to lock the locating pins.

9. Reinstall the drive plate and install all the cables in the system box.

10. Reinstall the system box cover.

11. Reinstall all the cables and terminators to the rear of the box.

4.2.9 Internal SCSI Bus Data Cable Removal

To remove the internal SCSI bus data cable, remove the system box cover
(refer to Section 4.2.1 and Figure 4–27) and then:

❶ Disconnect the SCSI bus data cable from the system module.

❷ If you have an RX23 disk drive, disconnect the SCSI bus data cable
from its drive module.

❸ Disconnect the SCSI bus data cable from all the hard drives. Note
that if you remove the drives from the drive plate, it is easier to
disconnect the cable.

❹ Remove the end of the SCSI bus data cable from the Velcro at the
front of the drive plate by lifting the cable straight up. Then remove
the terminator from the cable.

❺ Remove the SCSI/FDI module.

❻ Cut the tie wrap that holds the cable and the ferrite core on the drive.

❼ Remove the two screws that hold the cable to the drive plate at the
external SCSI port.

❽ Lift the cable out of the hole in the drive plate and away from the
external SCSI port.

CAUTION
**To prevent possible damage to the RX23 SCSI bus data cable *do
not* place cable across the SCSI/FDI module connector *tabs*.**

Reverse this removal procedure to reinstall the internal SCSI bus data
cable. Ensure that you replace the tie wrap and the internal terminator
(refer to Figure 4–27).
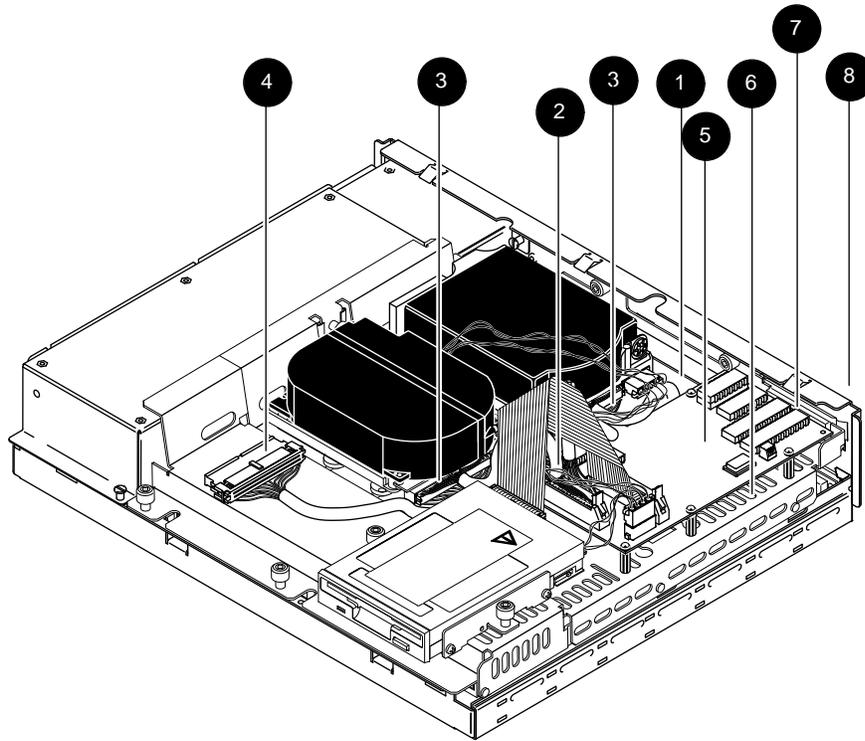
MA-1385-90.DG

Figure 4–27   Removing the Internal SCSI Bus Data Cable

4.2.10 Power Supply Removal

To remove a power supply:

1. Remove the system box cover (refer to Section 4.2.1).

2. Remove the drive plate (refer to Section 4.2.5).

3. Disconnect the power cable from the system module (refer to Figure 4–26).

4. Unscrew the two flat-head captive screws and the two Torx screws on the side as shown in Figure 4–28.

Captive Screw

Power Supply

Captive Screw

Torx Screws
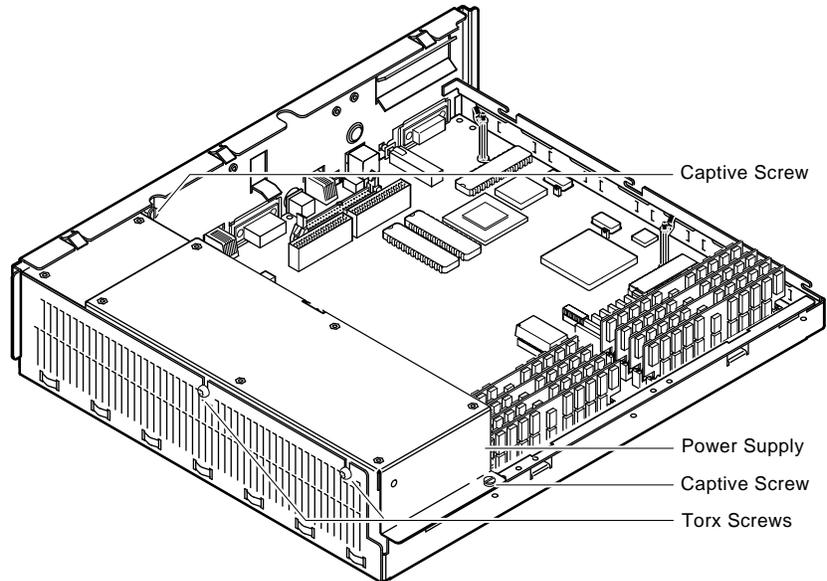
MA-1331-90.DG

Figure 4–28   Power Supply Screw Locations

5. Lift the power supply out of the system box.

6. Reverse this removal procedure to install a new power supply.

4.2.11 Keyboard Removal

CAUTION
Do not remove or unplug the keyboard, mouse, printer, or terminator without turning the power OFF. If the system is up and running, use the proper shutdown procedure prior to halting the system.

Unplug the keyboard cable from the rear of the system box (refer to Figure 4–29).

NOTE 1
The keyboard is a single FRU. Do not try to remove the keycaps or disassemble the keyboard.

NOTE 2
The keyboard must always be plugged directly into the back of the unit.
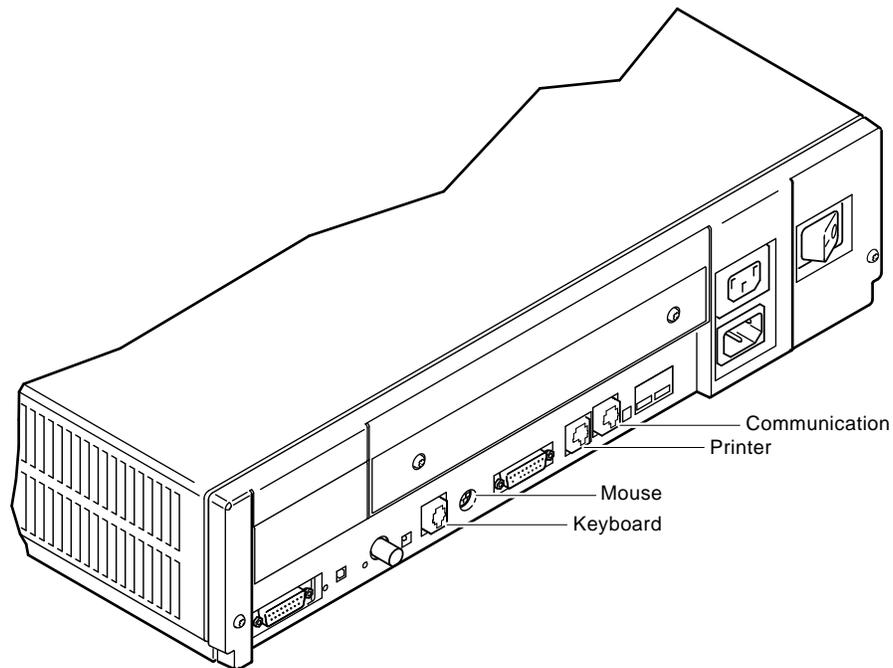
MA-1332-90.DG

Figure 4–29   Keyboard, Mouse, and Printer Removal

4.2.12 Mouse Removal

Disconnect the mouse from the back of the system box (refer to
Figure 4–29).

CAUTION
**Do not remove or unplug the keyboard, mouse, printer, or
terminator without turning the power OFF. If the system is up
and running, use the proper shutdown procedure prior to halting
the system.**

NOTE 1
**The mouse and the tablet are single FRUs. Do not try to
disassemble them.**

NOTE 2
**The mouse must always be plugged directly into the back of the
unit.**

4.2.13 Printer Removal

CAUTION
**Do not remove or unplug the keyboard, mouse, printer, or
terminator without turning the power OFF. If the system is up
and running, use the proper shutdown procedure prior to halting
the system.**

To remove a printer:

1. Switch the printer's power switch OFF.

2. Disconnect the printer cable from the back of the system box (refer to
   Figure 4–29) or from the back of the printer.

3. Refer to the specific printer's pocket service guide for troubleshooting
   and removal and replacement procedures for the printer.

A
Recommended Spares List

Part Number	Description	Quantity
	VAXstation 3100 Model 76	
.		
54-19847-01	VAXstation Model 76 system module (VS43A-xx)	1
54-19288-01	SCSI/FDI adapter module	1
54-17282-01	8-plane graphics coprocessor module (VS40X-PA)	1
RZ22-E	52 Mbyte SCSI disk drive with logic module	1
29-27240-01	104 Mbyte SCSI disk drive with logic module (RZ23-E)	1
RZ23L-E	121 Mbyte SCSI disk drive with logic module (RZ23L-E)	1
RZ24-E	209 Mbyte SCSI disk drive with logic module	1
29-27240-01	RZ22/RZ23 module/frame assembly	1
29-28144-01	Module/frame assembly (RZ24)	1
54-19623-01	8-plane SPX graphics coprocessor module (WS01X-GA/GB)	1
MS44-AA	4 Mbyte DSIMM memory	8
H7821-00	Power supply	1
RX23-AA	RX23 with SCSI adapter assembly (RX23-AA)	1
17-02220-01	Internal power cable	1
17-02221-01	Internal RX23 data cable	1
17-02221-02	RX23 data cable (connects RX23 to SCSI adapter module)	1
17-02945-01	Internal SCSI bus data cable	1

Part Number	Description	Quantity
12-33816-01	Internal SCSI terminator	1

<div align="center">VAXstation 3100 Model 76 (loopbacks, terminators, and external cables)</div>

Part Number	Description	Quantity
17-01992-01	BC23J-03 color monitor cable (short)	1
17-01993-01	BC23K monochrome monitor cable (short)	1
17-00606-10	System power cord (USA)	1
17-00442-26	System-to-monitor power cord	1
17-02008-01	68 to 50-pin external SCSI port cable	1
17-01351-01	50 to 50-pin SCSI cable	1
17-01351-04	50-pin SCSI cable (18 inches)	1
12-22196-01	Standard Ethernet loopback	1
12-25869-01	ThinWire Ethernet T-connector	1
12-26318-01	ThinWire Ethernet cable 50-ohm terminator	2
12-25083-01	MMJ loopback connector (H3103)	2
12-29635-01	68-pin external SCSI port terminator	1
12-30552-01	50-pin SCSI terminator	1
17-00811-03	BC16E-25 DECconnect office cable (25 feet)	2
17-00811-04	BC16E-50 DECconnect office cable (50 feet)	1

<div align="center">BA42 Expansion Box FRUs</div>

Part Number	Description	Quantity
RX23-AA	RX23 disk drive	1
RX33-A	RX33 disk drive	1
TZ30-A	TZ30 tape drive	1
54-19325-02	SCSI ID switch module	1
17-00606-10	System power cord (USA)	1
17-02443-01	68—50 external SCSI cable	1
17-02446-01	50—50 external SCSI cable	1
17-02445-01	SCSI ID switch cable	1
17-02447-01	Internal power supply cable w/resistor	1

Part Number	Description	Quantity
17-02444-01	Internal data cable	1
TZK10-ZZ	—	–
H7821-00	Power supply	1
17-00606-10	Power cord (USA)	1
29-28145-01	RZ24 HDA	1
70-26717-01	RZ55 disk drive	1
29-27347-01	RZ55 PCB	1
29-27890-01	RZ56 HDA	1
29-27889-01	RZ56 PCB	1
29-28159-01	RZ57 HDA	1
29-28158-01	RZ57 PCB	1
54-19288-01	SCSI/FDI adapter module	1
74-39202-01	Full height drive mounting bracket	1
74-41483-01	Half height drive mounting bracket	1
RX23-EA	RX23 3-1/2 inch floppy disk drive	1
RX33-A	RX33 5-1/4 inch floppy disk drive	1
RX23L-E	RX23L disk drive	1
TZ30-AX	TZ30 1/2 inch cartridge tape drive	1
TZK10-AA	TZK10 1/4 inch cassette (QIC) tape drive	1
	RRD40 Compact Disk Expansion Box FRUs	
RRD40-DA	RRD40 compact disk expansion box (with SCSI interface)	1
	Miscellaneous Parts	
LK201-XX	Keyboard (USA keycaps)	1
17-01480-01	VSXXX-AA mouse	1
29-25997-00	Tablet assembly	1
70-27986-01	Drive plate assembly	1

Part Number	Description	Quantity
74-41401-01	Metal standoff	1
74-41401-02	Metal standoff	1
74-41401-03	Metal standoff	1
74-41401-04	Metal standoff	1
12-31489-01	Thermal pad	1
30-23507-03	RRD40 test disk	1
29-27338-01	RRD40 empty caddy	1
30-20515-01	TZ30 blank media	1
30-25145-05	RX23 blank media	1
29-25995-00	Stylus	1
29-25996-00	Puck	1
29-25992-00	Mouse ball	1
29-25993-00	Mouse door	1
90-07032-00	Tie wrap	1
90-07031-00	Tie wrap	1
A2-M1329-10	Color maintenance kit (two 75-ohm terminators 29-26899-00)	1

B
Self-Tests

B.1 Console's Configuration Display Utility (T 50)

The results of the self-test are available through the console's
configuration display utility (T 50). The general format is as pictured
below.

```
>>>  T 50


KA43-A V1.0
ID xx-xx-xx-xx-xx-xx

   MONO     0000.0xxx                                                (test F)
   CLK      0000.00xx                                                (test E)
   NVR      0000.00xx                                                (test D)
   DZ       0000.xxxx                                                (test C)
      0000xxxx 0000xxxx 0000xxxx 0000xxxx kkkkkkkk mmmmmmmm
   MEM      000y.00xx                                                (test B)
      ssssssss 0000mmmm
   FP       0000.000x                                                (test 9)
   IT       0000.000x                                                (test 8)
   SCSI A   wxy0.wxyz                                                (test 7)
      ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt
   SCSI B   wxy0.wxyz                                                (test 6)
      ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt ddmmsstt
   SYS      0000.0xxx                                                (test 5)
   8PLN     0000.0001 V1.0
   NI       xxxx.yyyy                                                (test 1)
```

B.2 NI (test 1)

The NI status has one longword of status and error information,
formatted as follows:
```
xxxx.yzzz
```
where y is the subtest number, zzz is the subtest status, and $xxxx$ has
variable meaning depending upon the value of y.

Should the initialization code encounter an error, the test number will be zero.

```
#^x0002 ; could not find a good page of memory for init block
#^x0004 ; could not find 3 contiguous pages for receive buffer
#^x0006 ; could not find 3 contiguous pages for transmit buffer
```

B.2.1 TEST 1:

```
#^x1002 ; failed init
#^x1004 ; RX not enabled
#^x1006 ; TX enabled
#^x1008 ; init failed
#^x100A ; RX enabled
#^x100C ; TX not enabled
```

B.2.2 TEST 2:

high word : pkt data length (1 byte), index into pattern table (1 byte)

```
#^x2002 ; init failed
#^x2004 ; failed loop
```

B.2.3 TEST 3:

high word : pkt data length (1 byte), index into pattern table (1 byte)

```
#^x3002 ; init failed
#^x3004 ; failed loopback
#^x3006 ; no CRC match
#^x3008 ; init failed
#^x300A ; failed TX
#^x300C ; failed RX
#^x300E ; init failed
#^x3010 ; failed TX
#^x3012 ; OWN not toggled
#^x3014 ; no RX error
#^x3016 ; no STP
#^x3018 ; no ENP
#^x301A ; no CRC error
#^x301C ; no FRAM error
#^x301E ; no RINT
```

B.2.4 TEST 4:

high word : multicast filter bit number being tested

```
#^x4002 ; init failed
#^x4004 ; TX failed
#^x4006 ; packet received
#^x4008 ; bad filter value
#^x400A ; init failed
#^x400C ; failed loopback
#^x400E ; init failed
#^x4010 ; failed loopback
```

B.2.5 TEST 5:

```
#^x5002 ; init failed
#^x5004 ; OWN not toggled
#^x5006 ; no RTRY error
#^x5008 ; TX turned off
#^x500A ; init failed
#^x500C ; TX failed
#^x500E ; no rcv MISS
```

B.2.6 TEST 6:

```
#^x6002 ; init failed
#^x6004 ; loopback failed
#^x6006 ; bad CSR0
#^x6008 ; no NI interrupt
#^x600A ; init failed
#^x600C ; loopback failed
#^x600E ; wrong # of int's.
#^x6010 ; NI int. bits set
```

B.2.7 TEST 7:

```
#^x6002 ; init failed
#^x6004 ; loopback failed
#^x6006 ; bad CSR0
#^x6008 ; no NI interrupt
#^x600A ; init failed
#^x600C ; loopback failed
#^x600E ; wrong # of int's.
#^x6010 ; NI int. bits set
```

B.3   COLOR (test 4)

8-plane video option board:
Error code format :

```
xxx.yyyz Where z = 1 for normal
             2 for fatal error
     3 for soft error

     yyy = test that failed (from the error codes )

     xxx = error or status number within the
     particular test
```

```
error$_initialization  = x0001
error$_chip_select   = x0002
error$_long_memory  = x0003
error$_memory    = x0004
error$_id_data    = x0005
error$_scrolling   = x0006
error$_fcc_initialization = x0007
error$_fcc_ram_counters  = x0008
error$_fcc_ram   = x0009
error$_Display_List_Commands = x0010
error$_short_display_list = x0011
error$_packing    = x0012
error$_compression_b  = x0013
error$_adder_interrupt  = x0014
error$_fcc_interrupt  = x0015
error$_vdac    = x0016
error$_cursor_bitmap  = x0017
error$_sync_readback  = x0018
error$_left_edge_detect  = x0019
error$_right_edge_detect = x0020
error$_video_readback  = x0021
error$_cursor_readback  = x0022
```

8-plane video option board:
Error code format :

```
xxx.yyyz Where z = 1 for normal
            2 for fatal error
      3 for soft error

        yyy = test that failed (from the error codes )

      xxx = error or status number within the
      particular test
```

```
initialization    x01
chip_select     x02
memory_data_path   x3A
short_memory    x04
id_data      x05
scrolling     x06
fcc_initialization   x07
fcc_ram_counters   x08
fcc_ram      x09
short_display_list   x11
packing      x12
compression_b    x13
adder_interrupt    x14
fcc_interrupt    x15
vdac      x16
cursor_bitmap     x17
sync_readback    x18
video_readback    x21
left_edge_detect   x19
right_edge_detect   x20
cursor_readback    x22
```

B.4   SYS (test 5)

The system power-up self-test has one longword of status and error
information, formatted as follows:

```
SYS     0000.0XXX
```

where XXX is one of the status or error codes listed in the following table.

Error Code	Status	Description
1	Status:	Success
2	Error:	System ROM failed checksum
4	Error:	Ethernet ROM failed checksum
8	Error:	No interrupts pending
10	Error:	All of the expected interrupts failed to happen
20	Error:	One of the interrupts was not enabled but happened anyway
40	Error:	Improper priority
80	Error:	Default interrupt service routine was called. An interrupt that was not enabled occurred
100	Error:	No keyboard found in the system configuration

B.5   SCSI-B (test 6)

The SCSI-B power-up self-test has one longword of status information for the controller and eight longwords of status information for the devices. The formats of each are pictured below.

```
                            Controller Status


SCSI B    SSGG.FFCC
     DDMMSSTT DDMMSSTT DDMMSSTT DDMMSSTT DDMMSSTT DDMMSSTT DDMMSSTT DDMMSSTT


     ID 0     ID 1     ID 2     ID 3     ID 4     ID 5     ID 6     ID 7
     Status   Status   Status   Status   Status   Status   Status   Status
```
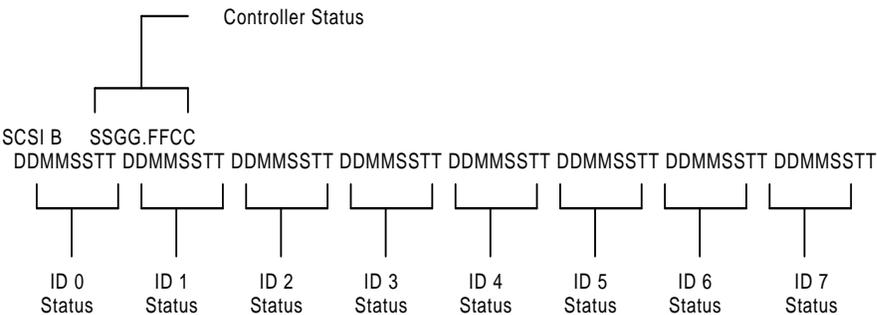
where the controller status fields are:

    SS is a bitmask of target IDs that could be selected
    GG is a bitmask of target IDs that tested OK
    FF is a set of bitmask flags
    CC is the controller status/error code

where each target status field is:

    DD is the first byte returned in the Inquiry data phase
    MM is the first byte returned in the Inquiry message_in phase
    SS is the first byte returned in the Inquiry status phase
    TT is the target status/error code

Another look at controller status:

```
     31             24 23          16 15          08 07           00
    ┌─────────────┬─────────────┬─────────────┬─────────────┐
    │  Selected   │  Tested OK  │   Flags     │   Status    │
    └─────────────┴─────────────┴─────────────┴─────────────┘
          │             │             │             │
          │             │             │             └── Controller Status
          │             │             │                 (see below)
          │             │             │
          │             │             └─ Binary Flags
          │             │                  00000001=problem on system board
          │             │                  00000010=problem off system board
          │             │                  00010000=reset required to free bus
          │             │                  00100000=not all selected devices OK
          │             │                  01000000=DMA and 'rupts untested
          │             │
          │             └── Binary Mask of Devices that tested successfully
          │                   00000001=ID 0
          │                   00000010=ID 1
          │                   00000100=ID 2
          │                   00001000=ID 3
          │                   00010000=ID 4
          │                   00100000=ID 5
          │                   01000000=ID 6
          │                   10000000=ID 7
          │
          └── Binary Mask of Devices that selected successfully
              (same format as above)
```

Controller Status Code	Status	Description
01	Status:	Everything is fine
02	Error:	Disk/tape buffer RAM addressing failure
04	Error:	Disk/tape buffer RAM byte mask failure
06	Error:	Disk/tape buffer data path failure
10	Error:	Error in 5380 SCSI registers during reset
12	Error:	Error in 5380 SCSI registers after reset
20	Error:	Unexpected interrupt after reset, IPL = 1Fh
22	Error:	No interrupt request after reset
24	Error:	No interrupt after reset when IPL has been lowered
26	Error:	Interrupt request not cleared following ISR (after reset)
28	Error:	Multiple interrupts following reset
2A	Error:	Unknown interrupt following reset
2C	Error:	Wrong interrupt following reset
30	Error:	Phase not 'bus free' at start of test (even after a reset)
40	Error:	First attempt to read 5380 SCSI register (ini_cmd) failed
42	Error:	5380 SCSI register address test failed at ini_cmd
44	Error:	5380 SCSI register address test failed at mode
46	Error:	5380 SCSI register address test failed at tar_cmd
48	Error:	5380 SCSI register address test failed at scd_cnt (in standard cell)
4A	Error:	Mode<dma> found set after being cleared when ini_cmd<bsy> clear
4C	Error:	Mode<dma>found set after being set when ini_cmd<bsy>clear
4E	Error:	Mode<dma> found set after being cleared when ini_cmd<bsy> set
50	Error:	Mode<dma> found clear after being set when ini_cmd<bsy>set
60	Error:	Data output to bus with ini_cmd<enout> clear

Controller Status Code	Status	Description
62	Error:	No data to bus with ini_cmd<enout>set
64	Error:	Parity bit (cur_stat<dbp>) does not correspond with data on bus
66	Error:	With bus free, data in did not match data out
68	Error:	ini_cmd<sel> to cur_stat<sel> mismatch
6A	Error:	ini_cmd<ack> to status<ack>, or ini_cmd<atn> to status<atn> mismatch
6C	Error:	tar_cmd<req> to cur_stat<req>, or tar_cmd<MSG> to cur_stat<MSG>, or tar_cmd<cd> to cur_stat<cd>, or tar_cmd<io> to cur_stat<io> mismatch with mode<targ> set
6E	Error:	Clearing mode<targ>does not prevent tar_cmd bits from appearing on the bus (in cur_stat)
70	Error:	ISR hit with IPL = 1Fh and int_msk<sc> clear
72	Error:	Interrupt request (int_req<sc>) set for no apparent reason
74	Error:	SCSI's status<intreq> set for no apparent reason
80	Error:	Bus busy at start of interrupt test so we cannot test them
82	Error:	ISR hit following bus free with IPL = 1Fh and int_msk<sc>clear
84	Error:	Interrupt request (int_req<sc>) not set following bus free
86	Error:	SCSI's status<intreq> not set following bus free
88	Error:	Status<bsyerr> was not set even though it caused an interrupt
90	Error:	Bus busy during interrupt test so we cannot test them
92	Error:	ISR hit following bus free with IPL = 1Fh and int_msk<sc> set
94	Error:	Interrupt request (int_req<sc>) not set following bus free
96	Error:	SCSI's status<intreq> not set following bus free
98	Error:	Status<bsyerr> not set following bus free
A0	Error:	Bus busy during interrupt test so we cannot test them
A2	Error:	Timeout waiting for bus free interrupt

Controller Status Code	Status	Description
A4	Error:	ISR not hit following bus free
A6	Error:	Interrupt request (int_req<sc>) not cleared following ISR after bus free
A8	Error:	SCSI's status<intreq> not set following bus free
AA	Error:	Multiple interrupts from bus free
AC	Error:	Unknown interrupt from bus free
AE	Error:	Wrong interrupt from bus free
B0	Error:	Bus busy during interrupt test so we cannot test interrupts
B2	Error:	Timeout waiting for parity interrupt
B4	Error:	ISR not hit following parity
B6	Error:	Interrupt request (int_req<sc>) not cleared following ISR after parity
B8	Error:	SCSI's status<intreq> not set following parity
BA	Error:	Multiple interrupts from parity
BC	Error:	Unknown interrupt from parity
BE	Error:	Wrong interrupt from parity
C0	Error:	Phase not 'bus free' before arbitration
C2	Error:	ini_cmd<aip> bit failed to set
C4	Error:	Lost arbitration (first check of ini_cmd<la>)
C6	Error:	Higher priority device on bus
C8	Error:	Lost arbitration (second check of ini_cmd<la>)
D0	Error:	Not all selected targets tested OK (basically the same as flag 2)

Another look at device status:

There is a status longword for each possible device (eight of them) on the bus. Each of these statuses has the following format:
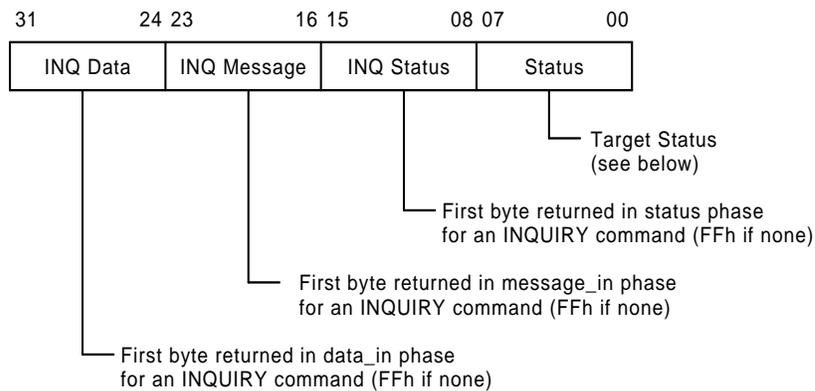
The device statuses appear on the screen in increasing ID order, that is, the device whose ID is zero is on the left and the device whose ID is seven is rightmost. Note that ID SIX is reserved by the system architecture to be the host ID.

Target Status Code	Status	Description
FF	Status:	Status: target untested
01	Status:	This target is fine
03	Status:	This ID used for the host
05	Status:	Target did not respond to selection
10	Error:	Target did not set cur_stat<req>soon enough when changing phase
12	Error:	Jitter on the phase lines when changing phase
20	Error:	Target set command phase twice
22	Error:	Target changed phase before command complete
24	Error:	Target failed to set cur_stat<req> when getting command

Target Status Code	Status	Description
26	Error:	Target failed to clear cur_stat<req> when getting command
28	Error:	Command phase out of sequence
2A	Error:	Stuck in command phase
30	Error:	Target set data_in phase twice
32	Error:	Target failed to set cur_stat<req> when returning data
34	Error:	Target failed to clear cur_stat<req> when returning data
36	Error:	Target changed data_in phase before transferring any data
38	Error:	Data_in phase out of sequence
3A	Error:	Stuck in data_in phase
40	Error:	Target set status phase twice
42	Error:	Target failed to set cur_stat<req> when returning data
44	Error:	Target failed to clear cur_stat<req> when returning data
46	Error:	Target changed status phase before transferring any data
48	Error:	Status phase out of sequence
4A	Error:	Stuck in status phase
50	Error:	Target set message_in phase twice
52	Error:	Target failed to set cur_stat<req> when returning data
54	Error:	Target failed to clear cur_stat<req> when returning data
56	Error:	Target changed message_in phase before transferring any data
58	Error:	Message_in phase out of sequence
5A	Error:	Stuck in message_in phase
60	Error:	Target set data_out phase (unexpectedly)
62	Error:	Target set phase to 100b (reserved phase)
64	Error:	Target set phase to 101b (reserved phase)
66	Error:	Target set message_out phase

Target Status Code	Status	Description
68	Error:	Selected target did not set any phase before releasing bus
70	Error:	Target not following expected phase sequence
72	Error:	Parity error detected during programmed I/O transfer
80	Error:	Unexpected interrupt at start of DMA test
90	Error:	Target failed to set command phase
92	Error:	Unexpected interrupt at start of command phase sequence
94	Error:	Timeout waiting for DMA complete in command phase in DMA test
96	Error:	No status<DMAEND> following command phase in DMA test
98	Error:	Wrong interrupt following command in DMA test
9A	Error:	scd_cnt not zero following command in DMA test
9C	Error:	DMA not complete after EOP in command phase (ACK not clear soon enough)
A0	Error:	Status<dmaend> bit not cleared by clearing mode<dma> at start of data_in phase in DMA test
A2	Error:	Target failed to set data_in phase in DMA test
A4	Error:	Timeout waiting for DMA complete in data_in phase in DMA test
A6	Error:	No status<dmaend> following data_in phase in DMA test
A8	Error:	Wrong interrupt following data_in phase in DMA test
AA	Error:	scd_cnt not zero following data_in phase in DMA test
AC	Error:	DMA not complete after EOP in data_in phase (ACK not clear soon enough)
B0	Error:	Status<dmaend>not cleared by clearing mode <dma> at start of status phase in DMA test
B2	Error:	Target failed to set status phase in DMA test
B4	Error:	Timeout waiting for DMA complete in status phase in DMA test
B6	Error:	No status<dmaend> following status phase in DMA test

Target Status Code	Status	Description
B8	Error:	Wrong interrupt following status in DMA test
BA	Error:	scd_cnt not zero following status in DMA test
BC	Error:	DMA not complete after EOP in status phase (ACK not clear soon enough)
C0	Error:	Status<dmaend> not cleared by clearing mode<dma> at start of message_in phase in DMA test
C2	Error:	Target failed to set message_in phase in DMA test
C4	Error:	Timeout waiting for DMA complete in message_in phase in DMA test
C6	Error:	No status<dmaend> following message_in phase in DMA test
C8	Error:	Wrong interrupt following message_in phase in DMA test
CA	Error:	scd_cnt not zero following message_in phase in DMA test
CC	Error:	DMA not complete after EOP in message_in phase (ACK not clear soon enough)
D0	Error:	Status<dmaend> not cleared by clearing mode <dma> at end of DMA test
D2	Error:	Bus not free soon enough at end of DMA test

Additional debug information in disk/tape buffer.

SCSI registers and software flags are saved in this format:

Offset	Size	Description
00	.byte	cur_data (5380 register)
04	.byte	ini_cmd (5380 register)
08	.byte	mode (5380 register)
0c	.byte	tar_cmd (5380 register)
10	.byte	cur_stat (5380 register)
14	.byte	status (5380 register)
18	.byte	in_data (5380 register)
1c	.word	scd_cnt (standard cell register)
20	.long	software's controller status
24	.byte	software's phase_seen flags bit 7=message_in, 6=message_out, 5=reserved, 4=reserved, 3=status, 2=command, 1=data_in, 0=data_out
28	.long	software's interrupt flags bit9=unknown interrupt, 8=bus reset, 7=bus disconnect, 6=phase mismatch, 5=parity error, 4=DMA EOP, 3=reselect, 2=select, 1=multiple interrupts detected, 0=at least one interrupt detected

200D.0x00 - SCSI registers following inquiry command to ID 'x'

200D.0x40 - request_sense data_in from ID 'x' (if any)

200D.0x80 - inquiry DMA data_in from ID 'x' (if any)

200D.0xC0 - inquiry DMA status from ID 'x' (if any)

200D.0xE0 - inquiry DMA message_in from ID 'x' (if any)

Offset	Size	Description
		200D.0a00 - SCSI registers at end of test_scsi_interrupts
		200D.0b00 - SCSI registers at end of test_scsi_reg_function
		200D.0c00 - SCSI registers at end of test_scsi_reg_addr
		200D.0d00 - SCSI registers at end of test_disk_buffer
		200D.0e00 - SCSI registers at end of test_scsi_bus_free
		200D.0f00 - SCSI registers at start of test

B.6   SCSI-A (test 7)

These tests, codes, and registers are the same as those shown for test 6.

B.7   IT (test 8)

The interval timer power-up self-test has one longword for status information in the following format:

```
IT      0000.000X
```

where x is one of the status or error codes listed in the following table:

Code	Status	Definition
1	Status:	Success
2	Error:	Fatal error

B.8   FP (test 9)

The floating point unit power-up self-test has one longword for status
information in the following format:

```
FP      0000.000X
```

where X is one of the status or error codes listed in the following table:

Code	Status	Definition
1	Status:	Success
2	Error:	Floating point error
4	Error:	Invalid floating point exception

B.9   MEM (test B)

The memory power-up self-test has two or three longwords for status
information in the following format:

```
MEM     00YY.00XX  (if no missing memory)
        SSSSSSSS

MEM     00YY.00XX  (if some memory is bad)
        SSSSSSSS  0000MMMM
```

where Y is the number of megabytes that are expected to be in the system
(from the CFGTST register), and XX is one of the status or error codes
listed in the following table. The first error code for the MEM indicates
the status of all the main memory system. The second line contains
additional information on the memory system, where SSSSSSSS is the
total number of bytes of good memory found in the system. If this field is
not in an even megabyte value (that is, 00020000), then the second field,
MMMM, will be displayed to indicate the failing megabyte bank. Each bit in
the YYYY status code indicates the status for one bank of memory (bit set
means bad). In some cases, where a parity error was detected, two banks
may indicate a bad bank of memory since the test does the testing on a
nonpage aligned region at the beginning of one page and at the end of the
previous page.

Code	Status	Definition
1	Status:	Success
2	Error:	Failure in test_address routine
4	Error:	Byte mask failure
8	Error:	Data/address test failure
10	Error:	No memory was found during sizing
20	Error:	Unexpected parity error
40	Error:	Memory sizing error
80	Error:	Actual memory size does not match CFGTST register

B.10 DZ (test C)

The serial line (DZ) power-up self-test has one longword for general controller status information, four longwords for line status information, and two longwords for status information of any keyboard or pointing device on the system. The format is as follows:
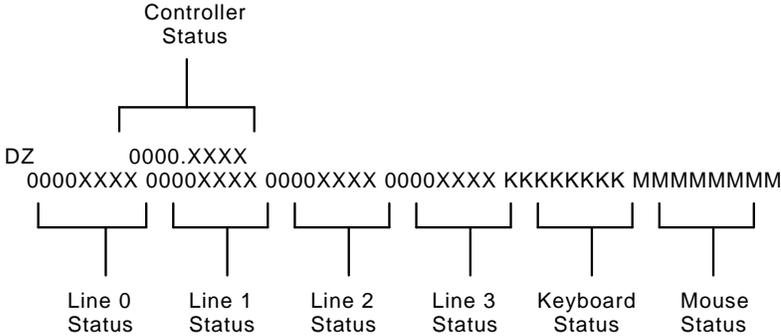
where XXXX is one of the status or error codes listed in the following table, KKKKKKKK is the keyboard's internal self-test status code, and MMMMMMMM is the mouse or tablet's internal self-test status code. The keyboard and mouse are tested only at power-up, so these values will not change when test C is executed from the console.

Expected values for the keyboard status code are:

   00000000 if TEAMmate or no keyboard
   00000001 if OK
   000000FD if loopback

Expected values for the mouse status code are:

   00000000 if TEAMmate or no mouse
   000012A0 if OK
   00000054 if loopback

Code	Status	Definition
1	Status:	Success
4000	Status:	This line is untested (for VAXstar: line 3 used as console: for TEAMmate: line 0 used as console)
2	Error:	Master reset failed
4	Error:	Failure in basic ser_csr test
8	Error:	Failure in ser_csr read/write test
10	Error:	Basic test of ser_tcr failed
20	Error:	Read/write test of ser_tcr failed
40	Error:	Transmitter ready test failed
80	Error:	Receiver ready test failed
100	Error:	Transmitter interrupt timeout
200	Error:	Receiver interrupt timeout
400	Error:	Either transmitter or receiver interrupted at the wrong priority
800	Error:	Receiver interrupt occurred when the receiver was not enabled
1000	Error:	Data comparison error
2000	Error:	Overrun error did not happen when expected
8000	Error:	Error in the modem control logic test

B.11 NVR (test D)

The nonvolatile RAM (NVR) power-up self-test has one longword of status information in the following format:

```
NVR      0000.00XX
```

where XX is one of the status or error codes listed in the following table:

Code	Status	Definition
1	Status:	Success
5	Status:	Battery voltage was low since last entry
8	Error:	NVR failed
80	Error:	The battery check code in the NVR did not agree with the expected check code

B.12 CLK (test E)

The time-of-year clock (CLK) power-up self-test has one longword of status information in the following format:

```
CLK      0000.00XX
```

where XX is one of the status or error codes listed in the following table:

Code	Status	Definition
1	Status:	Success
5	Status:	Clock has not been reset since the last time the battery voltage was low
3	Error:	Internal test value to inform dispatcher to check time at the end of the testing (should never be reported)
4	Error:	Invalid time set
10	Error:	Failure in time-of-year test
20	Error:	VRT bit failed to set after it was read the first time
40	Error:	Battery voltage level was down during the clock test

B.13   MONO (test F)

The monochrome video display controller (MONO) power-up self-test has one longword of status information in the following format:

```
MONO      0000.0XXX
```

where XXX is one of the status or error codes listed in the following table:

Code	Status	Definition
1	Status:	Success
4	Error:	Memory byte mask failure
8	Error:	Memory error
10	Error:	End-of-frame bit not in interrupt pending register
20	Error:	End-of-frame failed to set for second time
40	Error:	End-of-frame failed to set for third time
80	Error:	No end-of-frame interrupt seen
100	Error:	Wrong IPL level for EOF interrupt
200	Error:	Interrupt request failed to clear interrupt pending register bit
400	Error:	End-of-frame interrupt not seen when looking at the interrupt request register
800	Error:	Error during cursor test
1000	Error:	VDCSEL register read/write failure

C
System Tests

C.1 Error and Status Codes for the VS3100 System Test

In all cases, when examining the exerciser report, a single question mark (?) indicates a nonfatal error, a double question mark (??) indicates a fatal error, and the absence of question marks indicates success.

The system software error codes are as follows:

```
FFFE.xxxx -- A device control block was found which did not have
             a valid pointer to a system level test module.
FFFD.xxxx -- A system level test module failed to respond within
             the designated time period.
```

C.2 Ethernet Subsystem Status and Error Codes

```
TEST NUMBER   ID NAME
-----------  ---- ----
1   00C0 NI

000x.yyyy  --  x     is subtest number
               yyyy is error code
```

For x values, the testing being performed:

1. Verifies LANCE interrupt on initialization done

2. Performs internal loopback testing

3. Displays Ethernet subsystem status and error codes

4. Verifies multicast filtering and promiscuous receive

5. Forces collision error

6. Forces MISS error

7. Performs external loopback testing

For $yyyy$ values, the corresponding error is:

0002	No packet received
0004	Packet data miscompare
0006	Wrong received CRC
0008	Initialization failed
000A	Received a packet with bad CRC
000C	CRC flag was not set when forced
000E	Received an illegal multicast packet
0010	Rejected a packet when in promiscuous mode
0012	Rejected a legal multicast packet
0014	RTRY not set when forced
0016	BUFF not set when forced
0018	MISS not set when forced
001A	Transmit error
001C	Transmit timeout

C.3   8-Plane Video Option Status and Error Codes

```
TEST NUMBER   ID NAME
----------- ---- ----
4  00D0 8PLN


00yy.xxxx Where :

for soft error ( one question mark is displayed)
yy = soft error - video readback (should be 20 or 21)
xxxx = 0

for hard error ( 2 question marks are displayed)
yy = status code for test that failed
xxxx = error from exerciser error codes

Test numbers:
-------------
   program initialization   02
   FCC RAM       03
   FCC fifo control     04
   dragon initialization   05
   dragon timing chip     06
   video memory       07
   ID bus data path     08
   FCC data transfers     09
   byte packing      10
   byte packing ( burst mode )   11
   compression      12
   transfer display list command  13
   display list commands   14
   interrupts      15
   cursor      16
   VDAC read/write     17
   scrolling      18
   scrolling ( burst mode )   19
   video readback     20
   cursor readback     21
   left edge readback     22
   right edge readback     23
   sync readback      24
```

```
Status codes:
-------------
    err$_vse_init_failed                  01
    err$_kernel_allocate_failed           02
    err$_create_device_1_failed           03
    err$_create_device_2_failed           04
    err$_poll_failed                      05
    err$_data_path_failed                 06
    err$_fifo_path_failed                 07
    err$_fifo_empty_bit                   08
    err$_fifo_full_bit                    09
    err$_fwlt0_wrong                      0A
    err$_fwused_wrong                     0B
    err$_athere_wrong                     0C
    err$_adder_scans                      0D
    err$_viper_init                       0E
    err$_adder_init                       0F
    err$_update_enable                    10
    err$_memory_read                      11
    err$_plane                            12
    err$_data_path_crc                    13
    err$_data_path_compare                14
    err$_scroll_right_crc                 15
    err$_scroll_right_compare             16
    err$_scroll_up_crc                    17
    err$_scroll_up_compare                18
    err$_scroll_left_crc                  19
    err$_scroll_left_compare              1A
    err$_scroll_down_crc                  1B
    err$_scroll_down_compare              1C
    err$_fcsr_not_thresh                  1D
    err$_fcsr_not_empty                   1E
    err$_get_ne_put                       1F
    err$_fcc_transfer_crc                 20
    err$_fcc_data_wrong                   21
    err$_fcc_address_wrong                22
    err$_fcc_tx_noadder                   23
    err$_fcc_no_tx_adder                  24
    err$_fcc_transfer_compare             25
    err$_vdac_read_failed                 26
    err$_vdac_data_failed_a               27
    err$_vdac_data_failed_b               28
    err$_vdac_address_failed_a            29
    err$_vdac_address_failed_b            2A
    err$_vdac_address_failed_c            2B
    err$_vdac_init                        2C
    err$_compare_bitmap_failed            2D
    err$_read_bitmap_failed               2E
    err$_fcc_register_failed              2F
    err$_fifo_control_failed              30
```

```
err$_ptb_unpack                    31
err$_btp_pack                      32
err$_btp_pack_wrong                33
err$_fcc_no_idle_interrupt         34
err$_fcc_no_thresh_interrupt       35
err$_cursor_test_bit               36
err$_cursor_test_timeout           37
err$_adder_interrupt_timeout       38
err$_fcc_interrupt_timeout         39
err$_no_sys_request                3A
err$_sys_request                   3B
err$_no_interrupts                 3C
err$_wrong_count                   3D
err$_fcc_no_thresh_request         3E
err$_fcc_thresh_interrupt          3F
err$_wrong_csr_address             40
err$_fcc_thresh_request            41
err$_dlc_1                         42
err$_dlc_2                         43
err$_dlc_3                         44
err$_dlc_4                         45
err$_dlc_5                         46
err$_dlc_6                         47
err$_dlc_7                         48
err$_dlc_8                         49
err$_dlc_9                         4A
err$_dlc_10                        4B
err$_dlc_11                        4C
err$_dlc_12                        4D
err$_dlc_13                        4E
err$_foreground_map                4F
err$_background_map                50
err$_cursor_a_map                  51
err$_cursor_b_map                  52
err$_ptb_fcc_wrong_bits            53
err$_video_readback                54
err$_cursor_readback               55
err$_no_sync                       56
err$_decompression                 57
err$_comp_fifo                     58
err$_short_display_list            59
err$_right_readback                5A
err$_left_readback                 5B
err$_sync                          5C
err$_ptb_dlc                       5D
err$_btp_diag_failed_a             5E
err$_btp_diag_failed_b             5F
err$_fcc_bitmap_compare_a          60
err$_fcc_bitmap_compare_b          61
err$_rdbk_1                        62
```

```
err$_rdbk_2                        63
err$_rdbk_3                        64
err$_rdbk_4                        65
err$_rdbk_5                        66
err$_rdbk_6                        67
err$_cursor_test_true              68
err$_cursor_test_false             69
err$_vertical_sync                 6A

err$_init_adder_scans              100
err$_viper_initialization          200
err$_adder_initialization          300
err$_fill_bitmap_area              400
err$_quick_bitmap_read             500
err$_read_bitmap                   600
err$_compare_bitmap                700
err$_fcc_compare                   800

err$_viper_register_load           1000
err$_viper_z_load                  2000
err$_chip_select                   3000
err$_poll                          4000
```

EXERCISER TEST ORDER

NONBURST MODE, FIRST PASS

```
fcc ram data and address
fcc passive fifo control
dragon chips initialization
dtc chip select
quick video ram
id bus data path
fcc unpacking
interrupts
vdac
scrolling
short display list
processor to bitmap display
list command
cursor
fcc compression algorithm
video readback
```

NONBURST MODE, NOT FIRST PASS

```
fcc ram data and address
fcc passive fifo control
dragon chips initialization
dtc chip select
quick video ram
id bus data path
interrupts
vdac
short display list
processor to bitmap display
 list command
video readback
```

BURST MODE

```
If customer mode:
  fcc unpacking
  scrolling
  cursor
  fcc display list commands
  fcc compression algorithm
```

If manufacturing mode (loopbacks), then the burst mode testing is broken up into two groups that get executed on every other burst mode pass. This was done to decrease the amount of time that each pass spends on the color module, and hopefully, eliminate any timeouts that manufacturing was seeing with the 4-plane.

```
Group 1:
 fcc_unpacking
 scrolling
 display list commands
 fcc compression algorithm

Group 2:
 cursor
```

C.4   SCSI-B Status and Error Codes

```
TEST NUMBER   ID NAME
-----------   ---- ------
6   00A0 SCSI B
```

The first line of the SCSI-B report:
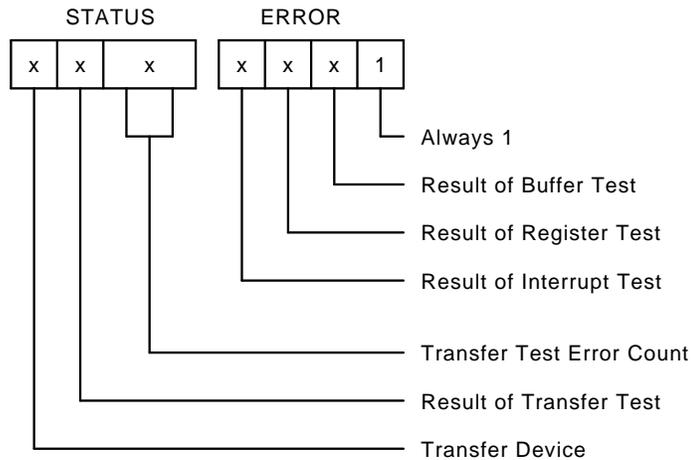
Result of Buffer Test: This position will contain a value from Table C–1.

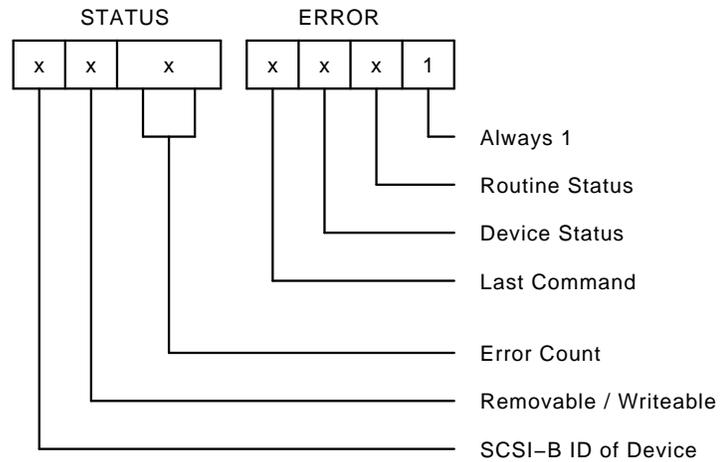**Result of Register Test:** This position will contain a value from Table C–1.

Result of Interrupt Test: This position will contain a value from Table C–1.

Transfer Test Error Count: This position will contain the number of transfer test errors.

Result of Transfer Test: This position will contain a value from Table C–1.

Transfer Device: This position will contain the ID of the SCSI-B device used. This value is ′F′ during the first pass, and ′8′ if unable to use any device as a transfer device.

Subsequent lines of the SCSI-B report:

```
        STATUS              ERROR
    ┌───┬───┬───┐       ┌───┬───┬───┬───┐
    │ x │ x │ x │       │ x │ x │ x │ 1 │
    └───┴───┴───┘       └───┴───┴───┴───┘
                                        └──── Always 1
                                    └──────── Routine Status
                                └──────────── Device Status
                            ────────────────── Last Command
                ────────────────────────────── Error Count
            ────────────────────────────────── Removable / Writeable
    ────────────────────────────────────────── SCSI–B ID of Device
```

Routine Status: This position will contain a value from Table C–1.

Device Status: This position will contain a value from Table C–2.

Last Command:

0 - com$unitready
1 - com$requestsense
2 - com$inquiry
3 - com$senddiagnostics
4 - com$recdiagnostics
5 - com$read
6 - com$write
7 - com$rewind

Removable/Writeable:

1 - Removable
2 - Writeable

SCSI-B ID of Device: This position will contain the ID on the SCSI-B bus of the device (that is, its address on the SCSI-B bus).

Table C–1   SCSI-B Error and Status Summary

Value	Error
0	Success
1	Controller error:
	DMA bit will not set in the SCSI-B controller mode register. Target command register not valid. Initiator command register not valid. Bus free not valid. Phase match bit in bus and status register not valid. Interrupt request bit in bus and status register not valid.
2	Data path error:
	Data path in longword, word, or byte access failed; unable to access all of data buffer.
	Unable to reach SCSI-B controller; unable to write to mode register.
3	DMA count error:
	Count register not verified. Count not 0 after DMA transfer.
4	Timeout error:
	No phase match within timeout period.
5	Interrupt error:
	Interrupt not received when expected. An error occurred while testing the system interrupt logic.
6	Unexpected interrupt error:
	Unexpected interrupt received.
7	Command error:
	Request sense command ended without sense data. Command terminated with bad device status.
8	Phase error:
	Unexpected phase or phase change on SCSI-B bus.
9	Buffer overflow error:
	Too many bytes read from target.

Table C–1 (Cont.)   SCSI-B Error and Status Summary

Value	Error
A	Arbitration error:
	AIP bit in initiator command register not set during arbitration process, or arbitration lost during arbitration process, or arbitration not won.
B	Target will not set BSY during selection process, or the SCSI-B is busy at start of register test, or the INI_CMD<BSY>bit could not toggle during the register test.
C	Unable to loop data out onto SCSI-B bus and back in again.
D	Direction and phase of SCSI-B bus, as set by the target and read from the controller, are incompatible.
E	SCSI-B bus will not drop REQ within timeout period, or SCSI-B bus will not assert REQ within timeout period.
F	DMAEND bit not verified in bus and status register, or DMA data not matching expected data.

Table C–2   SCSI Device Status

Code	Definition
0	Ready - SCSI device is on-line and ready for commands.
2	Off-line - Status given to SCSI ID devices that will not respond to selection process, or status given to all devices for initialization.
4	Not ready - Status given to devices that are selectable, but return a not ready status during status phase of a command (command tried five times).
6	Diagnostic error - Device returned an error status after a self-test.
8	Key error - Unable to rewrite Customer Services key on removable media sequential device.

C.5   SCSI-A Status and Error Codes

```
TEST NUMBER  ID NAME
----------- ---- ------
7  0090 SCSI A
```

The first line of the SCSI-A report:
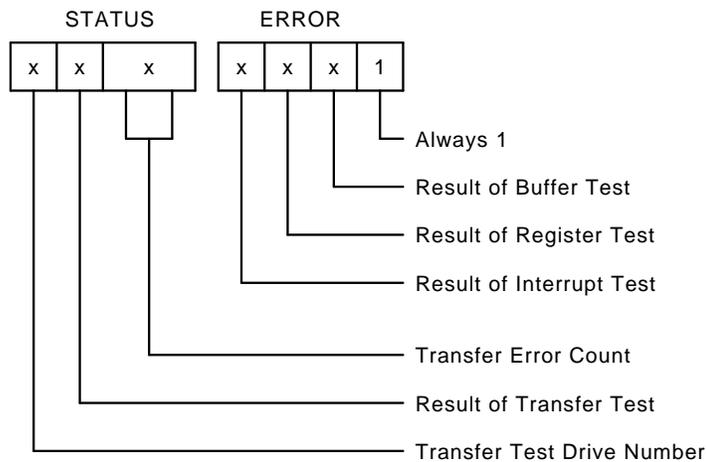
Result of Buffer Test: This position will contain a value from Table C–3.

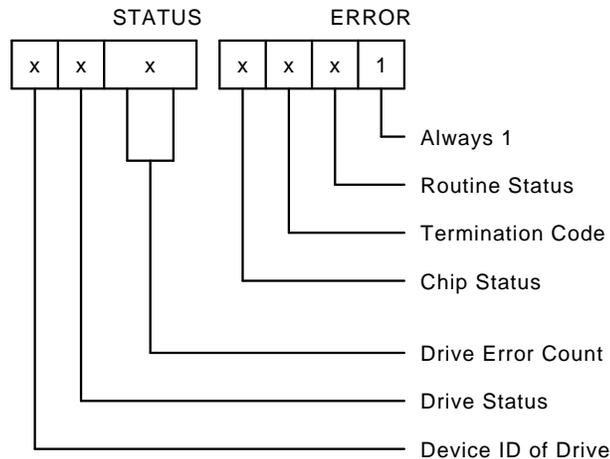**Result of Register Test:** This position will contain a value from Table C–3.

Result of Interrupt Test: This position will contain a value from Table C–3.

Transfer Error Count: This position contains a count (in hex) of the number of errors that have occurred during the transfer test.

Result of Transfer Test: This position will contain a value from Table C–3.

Transfer Test Drive Number: Number of the drive used for the transfer test. Value ID F if no drive is available.

Subsequent lines of the SCSI-A report:

```
          STATUS           ERROR
    ┌───┬───┬───┐     ┌───┬───┬───┬───┐
    │ x │ x │ x │     │ x │ x │ x │ 1 │
    └─┬─┴─┬─┴─┬─┘     └─┬─┴─┬─┴─┬─┴─┬─┘
      │   │   │         │   │   │   └──── Always 1
      │   │   │         │   │   │
      │   │   │         │   │   └──────── Routine Status
      │   │   │         │   │
      │   │   │         │   └──────────── Termination Code
      │   │   │         │
      │   │   │         └──────────────── Chip Status
      │   │   │
      │   │   └─────────────────────────── Drive Error Count
      │   │
      │   └─────────────────────────────── Drive Status
      │
      └─────────────────────────────────── Device ID of Drive
```

Routine Status: This position will contain a value from Table C–3.

Termination Code: This position will contain the TERMCOD bits of the interrupt status port register.

Chip Status: This position is divided into four binary bits.
    Revectored BB = VALUE F
    Error occurred while revectoring = VALUE E
    Ecc error = 4 \
    Sync error = 2 > Bit field
    Cmp error = 1 /

Drive Error Count: This position will contain the number of errors for this drive.

Drive Status: This position is also divided into three binary bits.
    WRITEABLE = 4
    UIB and RCT = 2
    FORMATTED = 1

Device ID of Drive: This position will contain a number between 0 and 3. It will represent the ID of the drive.

Table C–3   SCSI-A Error and Status Summary

Value	Error
0	Success
1	Registers 0, 1, 2, or 3 not completely verified, rtcnt, invrdy, intrdch, ready, presdrv, int_done selack(l), skcom(h) not verified.
2	Data path error: Data path in longword, word, or byte access failed; unable to verify all of data buffer or data path to register 10 not verified.
3	DMA count error: Count register not verified. Count not 0 after DMA transfer.
4	Command not finished before timeout.
5	Error in system interrupt logic.
6	Unexpected interrupt before command issued.
7	Command terminated with bad status.
8	Restore command terminated with error status.
9	Step command terminated with error status.
A	Seek command terminated with error status.
B	Read command terminated with error status.
C	Write command terminated with error status.
D	Unable to verify register sequencing in 9224.
E	Drive not formatted (UIB, RCT not found. Bad media).
F	Data checksum incorrect in transfer test.

C.6 SCSI-A Error Explanations

MEDIA PROBLEMS

For the 1st line of the report, any error that looks like this could be a media error:

```
XBYY.0001 Read Error
XCYY.0001 Write Error
```

where X is the transfer unit and YY is the error count

For the 2nd, 3rd, or 4th line reported (that is, the device status), the following codes indicate a media error:

```
XZYY.STA1      Seek Error
XZYY.STB1      Read Error
XZYY.STC1      Write Error
```

where:

X = Drive number
Z = Drive status
YY = Error count
S = Chip status
T = Termination code

CONTROLLER PROBLEMS

The following error codes are probably caused by controller problems. They will occur in the 1st line of the error report.

```
XXXX.ABCD
```

where XXXX is a don't care situation and if A, B, C, D are anything except 0.

CONTROLLER OR DRIVE PROBLEMS

The following errors could be controller or drive problems. They will occur in the 2nd, 3rd, or 4th line of the error report:

```
XZYY.ST81 Restore Error
XZYY.ST91 Step Error
```

where:

X = Drive number
Z = Drive status
YY = Error count
S = Chip status
T = Termination code (this must be a nonzero value)

If these errors only occur on one drive in a multidrive system, then the error is probably in the drive. If these errors occur on all the drives, then the error is probably in the controller. There was a bug in the earlier versions (REV J and back) that reported a RESTORE ERROR with a termination code equal to 0. This should be fixed in the later versions. If you see this error in versions after REV J, report it to the diagnostic group.

CONTROLLER OR MEDIA PROBLEMS

This error could be a problem with the media or the controller. It will be seen on the 1st line of the error report:

```
XFYY.0001 CRC/ECC error
```

where X is the transfer unit and YY is the error count.

C.7 Memory Status and Error Codes

```
TEST NUMBER   ID NAME
----------- ---- ----
B  0010 MEM


Status.error            Meaning
------------            -------
0000.0001  Success
0001.000F  System software error
0002.000F  System software error
0003.000F  System software error
0004.000F  System software error
0005.000F  System software error
0006.000F  System software error
0007.000F  System software error
0008.000F  System software error
0001.001F  Compare error on system board
0002.001F  Compare error on option board
0001.002F  Parity error on system board
0002.002F  Parity error on option board
```

When there is no error, the status word will reflect the number of 512 byte memory pages tested at the time of the report.

The monochrome status and error code display line is complimented with another field, progress reporting. Progress reporting is a four "nibble" wide field (just after the error field) that gives an indication of progress of the test module by increasing its count from zero after the first pass and during each subsequent pass. The progress count is always initialized at the beginning of each pass.

NOTES
System software errors are indicated with codes xxxx.000F**.**

When there is no error, the status word will reflect the number of 512 byte memory pages tested at the time of the report.

C.8   DZ Controller Status and Error Messages

```
TEST NUMBER   ID NAME
----------- ---- ----
C   0080 DZ
```

All errors detected during the DZ system exerciser are considered to be fatal. If the exerciser is being executed in Customer Services or manufacturing mode, then loopback connectors are required on the appropriate ports. If an error is detected during these modes, check that the loopbacks are installed before changing the system module.

Error messages will be displayed as follows:

```
0LSS.EEEE
```

The error message is broken up into two fields. The first field, ′0LSS′, represents the status word. The second field, ′EEEE′, represents the error code.

The status word portion of the error message from this test will be broken into two fields. The upper byte, ′0L′, will indicate the line preempted by the console. The lower byte, ′SS′ will give additional information on the error code as follows:

Status Code	Meaning
0	The error code is broken into four fields with each digit of the error code corresponding to one line on the DZ. The least significant four bits of the error code represents line 0.
FF	Device fatal error. The entire error code indicates the error.
0F	System software error. The entire error code indicates the error.

Error descriptions for status code = 0:

```
0X00.ABCD
```

where X represents the line preempted by the console and A, B, C, D represents a 4-bit error field for each line. ′A′ represents 4 bits for line 3, ′B′ represents 4 bits for line 2, ′C′ represents 4 bits for line 1, and ′D′ represents 4 bits for line 0.

A description of the 4-bit error codes are described in the following table:

Error Code	Meaning
0	No error detected for this line ** Error codes testing all lines simultaneously **.
1	No character received.
2	Failed to transmit all characters, or transfer took too long, or lost receive characters.
3	Too many characters received.
4	Character received not equal expected.
5	Parity, framing, or overrun error detected ** Error code testing baud rates on line 2 **.
6	Baud rate timing error ** Error code testing modem signals through loopback connector **.
7	Modem signals not equal expected ** Error codes testing each line for overrun errors **.
8	Overrun error not equal 0.
9	Character received not equal expected.
A	Overrun error failed to set ** Error codes testing each line for framing errors **.
B	Framing error failed to set ** Error codes testing transmit flag and interrupt request ** ** Register for each line. **.
C	TxRdy bit failed to set.
D	Transmit line received not equal expected.
E	Interrupt request bit ST not set in INT_REQ register.
F	Interrupt request bit ST not cleared in INT_REQ register.

Error descriptions for status code = FF

```
0XFF.EEEE
```

where:

X represents the line preempted by the console
FF represents a device fatal error
EEEE represents the error code

```
Error Code    Meaning
----------    -------
** Initial Startup code **

0001 - Interrupt Mask Register, INT_MSK,
                 register bits ST or SR stuck at 1

** Error Codes in READ_WRITE_REGISTER_TEST **

0002 - Master clear failed to reset DZQ
0003 - CSR register <> expected %x1028
0004 - CSR register failed to clear
0005 - TCR register <> expected %x0F0F
0006 - TCR register failed to clear

** Error Codes in INTERRUPT_BITS_TEST **
```

```
0007 - TRDY bit in CSR stuck at 1
0008 - TRDY bit in CSR failed to set
0009 - TRDY bit in CSR failed to clear
  after transmitting a character
000A - TRDY bit in CSR failed to set
  after transmitting a character
000B - RDONE bit failed to set after
  transmitting character in internal
  loopback mode.
000C - SR bit in INT_REQ register not set
  by RDONE
000D - SR bit in INT_REG register not cleared
  by writing bit in INT_CLR register
000E - Character received <> '0' or line
  number not equal expected
000F - Data valid bit not set in word read
0010 - Silo Alarm Enable failed to set in CSR
0011 - Silo Alarm failed to set after transmitting
  16 characters in internal loopback
0012 - RDONE not set after 16 characters received
0013 - SR bit in INT_REQ register not set by
  Silo Alarm
0014 - Silo Alarm failed to clear after reading
  a character from Silo
0015 - Master clear failed to reset the DZQ
0016 - Unexpected transmit interrupt occurred with
  Interrupt Mask bit cleared.
0017 - Unexpected receive interrupt occurred with
  Interrupt Mask bit cleared.

 ** Error Codes for BASIC_INTERRUPT_TEST **

0018 - INT_MSK register bit ST failed to set
0019 - Failed to receive a transmit interrupt
001A - Transmit interrupt occurred with INT_MSK
  bit ST cleared
001B - INT_MSK register bit SR failed to set
001C - Failed to receive a receive interrupt
001D - Receive interrupt occurred with INT_MSK
  bit SR cleared.

** Error Codes in BREAK_DETECT_TEST **

001E - TRDY failed to set after setting
  line enable for line in TCR register

** Error Codes in OUTPTR_CHAR_POLLED **

001F - TRDY failed to set in allotted time
```

Error descriptions for status code = 0F:

```
0X0F.EEEE
```

where:

X represents the line preempted by the console
0F represents a system software error
EEEE represents the error code

The error codes for this type of error range from 0001 to 000B. These errors are detected after making calls to the system exerciser monitor. They will be considered system software errors and considered to be fatal.

C.9 Monochrome Display Status and Error Codes

```
TEST NUMBER   ID NAME
-----------  ---- ----
F  00B0 MONO


Status.error            Meaning
------------            -------
0001.F001  System software error
0001.F002  System software error
0001.F003  System software error
0001.F004  System software error
0001.F005  System software error
0001.F006  System software error
0000.0001            No errors
0001.0002            VDC register error
0001.0003            Screen memory error
0001.0004            Unexpected end-of-frame interrupt
0001.0005            No end-of-frame interrupt
0001.0006            Interrupt register error
0001.0007            Cursor chip error
```

A system software error may indicate a corrupted ROM.

The monochrome status and error code display line is complimented with another field, progress reporting. Progress reporting is a four "nibble" wide field (just after the error field) that gives an indication of progress of the test module by increasing its count from zero after the first pass and during each subsequent pass. The progress count is always initialized at the beginning of each pass.

D
Diagnostic LEDs Definitions

This appendix defines the eight LEDs on the back of the system box during each phase of the testing and power-up initialization. The LEDs are divided into two fields. The first four LEDs indicate the current state of the system and the second set of four depend on the previous four.

There are sixteen possible combinations for each set of LEDs. The four LEDs that indicate the state of the system have the following definitions. The other four LEDs have another meaning as indicated in Table D–1. The number 1 indicates the LED is lit.

Table D–1   Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
1111	1111	Power is applied but no instruction is executed.	See Section D.1
1111	0000	Power is applied. The ROM code is successfully started and several instructions have been executed.	See Section D.1
1110	0000	Console memory sizing routine is entered. Memory to hold the console data structures is located. The substate variables have no meaning in this section of the test.	See Section D.1
1101	0000	The console data structures are initialized and have started testing the NVR.	See Section D.1
1100	0000	The NVR test completed and the DZ test has started.	See Section D.1

Table D–1 (Cont.)   Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
1011	0000	The DZ test completes. An optional video has been found but its testing has not been started. This is part of the console determination code.	See Section D.1
1011	0001	The DZ test completes. No optional video is installed or, if it is installed, fails self-test. In either case, the base monochrome video test has been entered.	See Section D.1
1010	0000	The video subsystem was tested and the console initialization sequence was entered.	See Section D.1
1001	xxxx[1]	The system initializes and power-up testing starts. The substate variable indicates the test being executed.	If the substate contains any lit LEDs, determine the failing device. If you have operational video, troubleshoot that device. If the video screen is blank, you have a dead system. See Section D.1.
1000	xxxx[1]	The self-test completes with the substate indicating the failing subsystem.	Enter **TEST 50** to see the results
0111	xxxx[1]	Self-test was entered from the console TEST command. The substate indicates the test currently being executed.	Enter **TEST 50** to see the results.
0110	xxxx[1]	The self-test completes from the TEST command with the substate indicating the failing subsystem.	Enter **TEST 50** to see the results.

[1]1111 = MONO, 1110 = CLK, 1101 = NVR, 1100 = DZ,1011 = MEM
1001 = FP, 1000 = IT, 0111 = SCSI-A or SCSI-B
0110 = SCSI-A or SCSI-B, 0101 = SYS, 0100 = 8PLN, 0011 = (option)
0010 = (option), 0001 = NI

Table D–1 (Cont.)   Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
0101	xxxx[1]	The self-test started under control of the APT system. The substate indicates the test currently being executed.	Enter **TEST 50** to see the results.
0100	xxxx[1]	The system exerciser started from a console TEST command. The substate indicates the value of the lower four bits of the command. If the system exerciser starts with a **T 101,** the substate contains a 1 (hexadecimal).	Read the test results on the screen. Troubleshoot the failing device.
0011	0000	The system exerciser started under control of the APT test delivery system.	Read the test results on the screen. Troubleshoot the failing device.
0010	xxxx[1]	The entity-based module received a request from a host to enter monitor mode. This lets the host send commands to the system. This is indicated if the functionality of the EBM is implemented at a later release of the ROM.	Reserved for future use.
0001	xxxx[1]	Console mode was successfully entered and is ready to accept commands. This does not apply to power on. The substate indicates the failing subsystem if there is one. This differs from a self-test complete, because the console can be entered by other means.	This code indicates that the console was entered from something other than a TEST command or power on halt, such as the HALT button.

[1]1111 = MONO, 1110 = CLK, 1101 = NVR, 1100 = DZ,1011 = MEM
1001 = FP, 1000 = IT, 0111 = SCSI-A or SCSI-B
0110 = SCSI-A or SCSI-B, 0101 = SYS, 0100 = 8PLN, 0011 = (option)
0010 = (option), 0001 = NI

Table D–1 (Cont.)   Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
0000	xxxx	Attempting to boot the system. Once control passes to VMB, the state LEDs have no meaning.	System is booting.

Figure D–1 shows the LEDs on the back of the system box.

State   Substate

LJ-00734-TI0
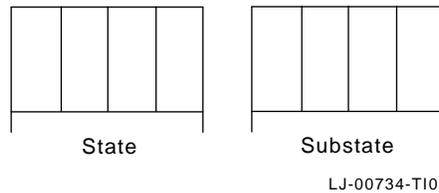
Figure D–1   LED Layout

D.1   Additional LED Information

When the system does not power up successfully or if the diagnostics find an error, the eight LEDs on the back of the system box usually indicate the failing device (the system takes 2 to 5 minutes to complete power-up initialization and testing). However, if the four state LEDs indicate 1111 (F in hexadecimal) through 1010 (A in hexadecimal, the substate LEDs offer no help in determining the failing FRU. You must disconnect a FRU as described in each step in the following procedure until the system does power up normally. Once the system does power-up normally, the last FRU you disconnected is the failing FRU. Replace the failing FRU and retest the system for any further problems.

1. Power down the system. Remove the system box cover, disconnect the cable connecting the system module to the MSC module, and disconnect the power cables to the drives. This disconnects the MSC module and all of the drives from the system.

2. Power up the system with the MSC module disconnected. If the system still does not power up properly, the problem is not with the drives or the MSC module, then proceed to step 3. If the system does power-up successfully after disconnecting the MSC module, replace the MSC module and retest the system.

3. Power down the system, remove drive mounting panel(s) from the system, and remove the graphics module from the system module. If the graphics module was not installed, then proceed to step 5. When you power-up the system after removing the graphics module, you must either connect an alternate console terminal to the printer port and set S3 to the up position (9600 baud rate) or watch the LEDs to see if the system does or does not power up successfully. The alternate console is used to display the video because there is no video signal output to the monitor when the graphics module is disconnected.

4. Power-up the system with the graphics module disconnected. If the system still does not power up properly, the problem is not in the graphics module, then proceed to step 5. If the system does power up successfully, replace the graphics module and retest the system.

5. Power down the system, remove the memory module from the system module.

6. Power up the system with the memory module disconnected. If the system does not power up properly, the problem is not the memory module, then proceed to step 7. If the system does power up successfully, replace the memory module and retest the system.

7. Power down the system. Replace the system module and power up the system again. If the system still does not power up properly after replacing the system module, replace the power cable.

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