VAXstation 3520/3540 Maintenance Guide Addendum: RZ56 and MS60-CA Options

Order Number EK-258AA-AD-001

The following are trademarks of Digital Equipment Corporation:

DEC	DIBOL	UNIBUS
DEC/CMS	EduSystem	VAX
DEC/MMS	IAS	VAXcluster
DECnet	MASSBUS	VMS
DECsystem–10	PDP	VT
DECSYSTEM–20	PDT	
DECUS	RSTS	
DECwriter	RSX	**digital**™

1
Description

MS60-CA Memory Module

The MS60-CA (Figure 1–1) is a double-sided 32 megabytes (Mbytes) memory for VAXstation 3520/3540 systems. The MS60-CA has the capability of performing dynamic random access (DRAM) single bit error correction and double bit error detection. Similar to other MS60 memories, the MS60-CA can perform self-test and initialization of its DRAM array.

Four MS60 memory modules can be installed in a VAXstation 3520/3540 workstation. With four MS60-CA modules installed, memory capacity of 128 Mbytes can be achieved.

NOTE
The MS60-CA memory module *does not* have battery backup capability. Any VAXstation power loss destroys data stored in memory.
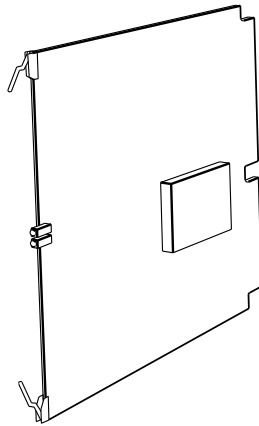
DEFM060

Figure 1–1   MS60-CA Memory Module

RZ56 Disk Drive

The RZ56 disk drive is a full-height (13 cm/5.25 in), high performance fixed-disk drive. This disk drive stores up to 665 Mbytes of data with the small computer systems interface (SCSI). The disk drive is a random-access, rotating memory device, which stores data in fixed-length blocks of 512 bytes on 130 millimeter thin film rigid media disks. The storage medium contained within the RZ56 disk drive is in a fixed, non-operator-removable configuration.

Figure 1–2 shows the drive and its major components.
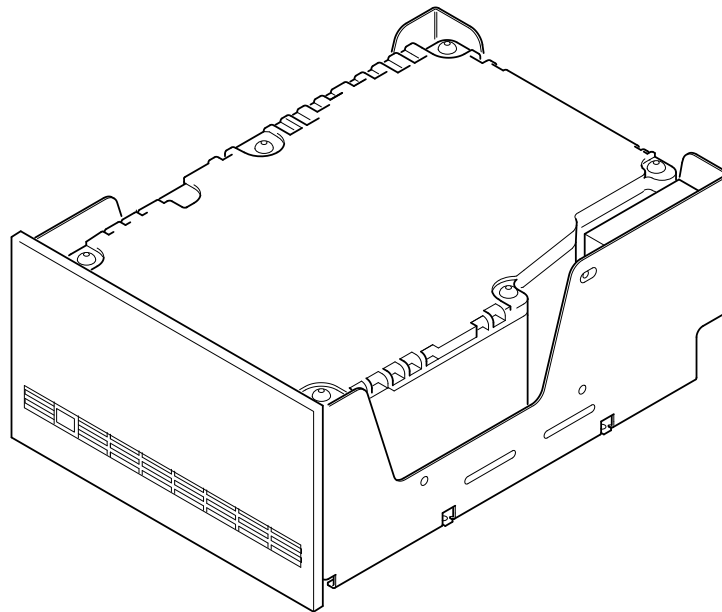
MA-X0922-89

Figure 1–2   RZ56 Disk Drive

The following tables list the various specifications for the RZ56 disk drive. Table 1–1 lists the drive dimensions. Table 1–2 lists the general specifications. Table 1–3 lists the operating conditions. Table 1–4 lists the nonoperating conditions.

Table 1–1   RZ56 Disk Drive Dimensions

	Weight	**Height**	**Width**	**Depth**
Internal drive	3.78 kg	8.25 cm	14.60 cm	20.0 cm
	8.4 lbs	3.25 in	5.75 in	8.0 in

Table 1–2   RZ56 Disk Drive Specifications

Capacity	665.17 Mbytes
Per surface	50.9 Mbytes
Per track	31,248
Per block	512 bytes
Blocks per track	54
Blocks per drive	1,299,174
Spare blocks per cylinder	11
Spare blocks per drive	20,316
Space cylinders	3
Transfer rate to/from media	1.25 Mbytes/s
Bus asynchronous mode	1.6 Mbytes/s
Bus synchronous mode	4.0 Mbytes/s
Seek time track to track	<= 4 msec
Seek time average	<= 16 msec
Seek time maximum	<= 35 msec
Average rotational latency	8.3 msec
Rotational speed	3600 RPM ±0.5%
Start time maximum	20 sec
Stop time maximum	20 sec
Interleave	1:1
Bus latency maximum	600 μsec
Heat dissipation	28 W (typical) 32 W (random seek mode)
Recording density (bpi at ID)	31,846
Track density (tpi)	1440
Tracks/surface (unformatted)	1632
Tracks/surface (formatted)	1626
R/W heads	15
Disks	8
Time to process ECC (512 bytes)	<= 100 msec

Table 1–3   RZ56 Disk Drive Operating Condition

Temperature range[1]	10° C to 55° C (50° F to 131° F)
Relative humidity	8% to 80%
Maximum wet bulb temperature	25.6° C (78° F), noncondensing
Minimum dew point temperature	2° C (36° F)
Altitude	-304 to 4600 m (-1000 to 15000 ft) at 36° C (96° F)

[1]Reduce maximum temperature by 1.8° C (3.24° F) for each 1000 meter increase in altitude.

Table 1–4   RZ56 Disk Drive Nonoperating Condition

Temperature range	-40° C to 66° C (-40° F to 151° F)
Relative humidity	8% to 80%
Maximum wet bulb temperature	46° C (115° F), packaged, noncondensing
Minimum dew point temperature	2° C (36° F)
Altitude	-304 to 12,300 m (-1000 ft to 40,000 ft) at 36° C (96° F)

For additional information on the RZ56 drive, refer to the *RZ56 Disk Drive Service Manual* (EK-RZ56-SV).

2
Installation

This chapter describes how to unpack, inspect, and install the MS60-CA memory module and RZ56 disk drive options for the VAXstation 3520/3540 workstation.

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

Unpacking and Inspecting the Options

When inspecting an option kit, look for external damage to the shipping container, such as dents, holes, or crushed corners. If any damage is apparent, write a note describing the damage on the packing slip before proceeding.

Following antistatic procedures, carefully open the shipping container and remove the contents.

Remove the option from its antistatic bag or packing materials and inspect it for shipping damage. If any part in the option kit is damaged or missing, notify the customer before proceeding.

Testing the System

Before installing any option, you should test the existing VAXstation 3520/3540 workstation to verify that it is running properly.

Testing the Present Configuration

Press the restart/run button on the control panel. This initiates the power-up self-test.

If the self-test did not conclude successfully, refer to Chapter 2 of the *VAXstation 3520/3540 Maintenance Guide* and correct any problems before continuing with the installation.

If the self-test succeeds, turn the power off and remove any covers as necessary. Refer to Chapter 3 of the *VAXstation 3520/3540 Maintenance Guide* for detailed instructions.

Testing the New Configuration

After installing an option, test the new configuration by pressing the restart/run button. The workstation checks its new configuration and performs a power-up self-test.

If an error code is displayed, check the cable connections. Run the power-up self-test again. If an error still occurs, follow the troubleshooting procedures described in Chapter 2 of the maintenance guide.

Installing the MS60-CA Memory Module

Install the MS60-CA memory module in slot 5, 6, or 9 of the card cage. If the module is factory installed, it will be installed in slot 8.

Perform the following procedure to install the memory module.

NOTE
Adhere to antistatic procedures during installation.

1. Turn off the workstation

2. Remove the workstation front cover and I/O cover to gain access to the card cage.

    NOTE
    See Chapter 3 of the *VAXstation 3520/3540 Maintenance Guide* for instructions on how to remove the workstation covers.

3. Slide the memory module into slot 5, 6, or 9 of the card cage and lock it into place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever.

4. Replace the I/O cover.

5. Turn on the workstation.

6. Test the new configuration.

7. Replace the front cover.

Installing the RZ56 Disk Drive

Before installing an RZ56 hard disk drive, you must install slide supports on the drive so that you can slide the drive in and out of the drive slot. Slide supports consist of top and bottom drive mounting brackets (attached to the drive) and top and bottom drive shock mounts (attached to the mass storage area).

If drive shock mounts are already installed on the workstation, it is important to remove them and install the drive shock mounts that came with the RZ56 drive option kit.

Installing the Drive Shock Mount

Do the following steps to install the drive shock mount:

NOTE
See Chapter 3 of the *VAXstation 3520/3540 Maintenance Guide* for instructions on how to remove the workstation covers.

1. Turn off the workstation.

2. Attach the top shock mounts by positioning each shock mount so the screws on the mount go into the captive nuts on the roof of the mass storage area. Tighten screws.

    NOTE
    One of the bottom shock mounts has a thin metal finger that must be attached between the back screw and the system unit frame to ground the shock mount to the chassis.

3. Attach two of the bottom shock mounts to the bottom of the drive slot by positioning each shock mount so the screws on the mount go into the captive nuts on the floor of the mass storage area (Figure 2–1). Tighten screws.
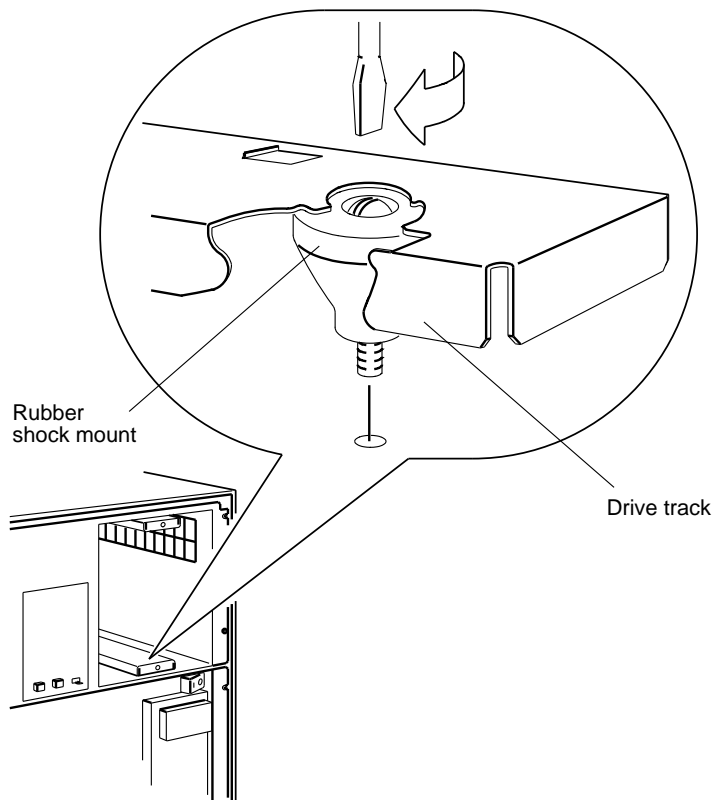
DEFM075

Figure 2–1   Installing the Drive Shock Mounts

Installing the Drive Mounting Brackets

There are two different ways of installing drive mounting brackets:
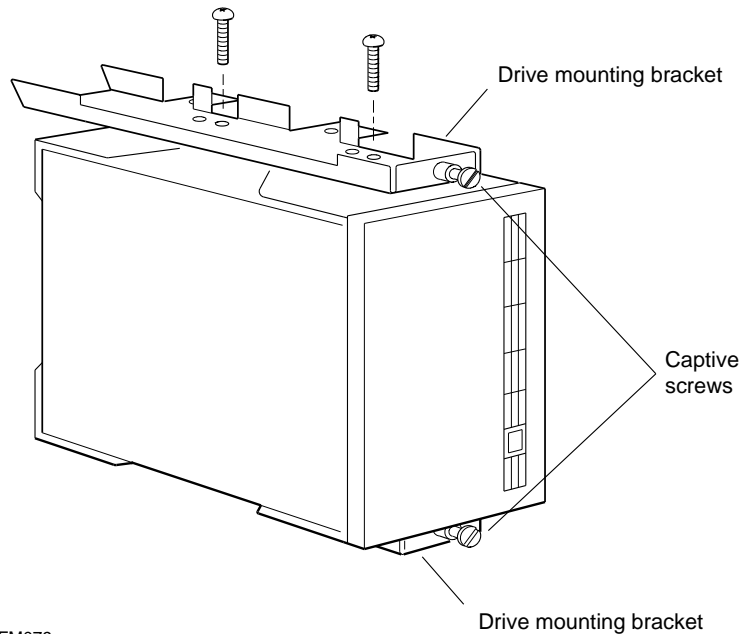
- On an RZ56 disk drive to be installed in the rightmost drive slot (no tape drive)

- On an RZ56 disk drive to be installed in any slot **except** the rightmost slot.

Installing the Drive Mounting Brackets for the Rigthmost Slot
Do the following steps to install the drive mounting brackets on an RZ56
drive that will reside in the rightmost drive slot.

1. Attach the top bracket to the top of the drive, using two screws
    (Figure 2–2).

2. Attach the bottom bracket to the bottom of the drive, using two
    screws.

DEFM079

**Figure 2–2   Installing Drive Mounting Brackets on an RZ56
Drive for the Rightmost Slot**

**Installing Drive Mounting Brackets for Any Slot Except the Rightmost
Slot**

Do the following steps to install drive mounting on an RZ56 drive that
will reside in any slot **except** the rightmost drive slot.

1. Attach the top bracket to the top of the drive, using two screws
    (Figure 2–3).

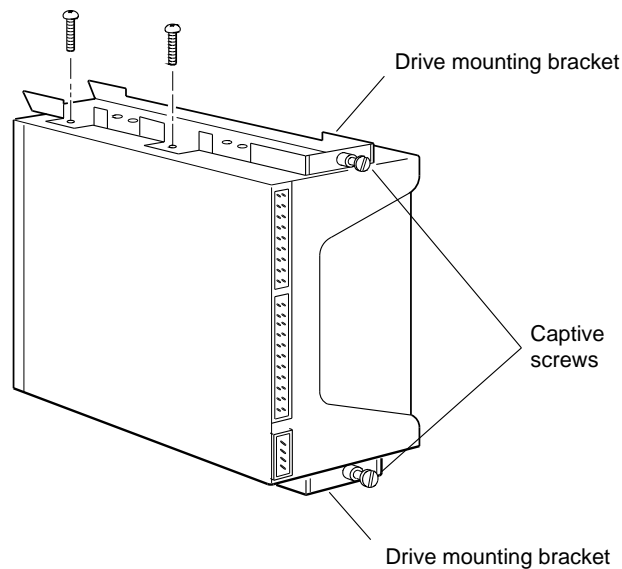2. Attach the bottom bracket to the bottom of the drive, using two
    screws.

DEFM080

**Figure 2–3   Installing Drive Mounting Brackets on an RZ56
Drive for Any Slot Except the Rightmost Slot**

Configuring the RZ56 Disk Drive

The RZ56 disk drive is preformatted at the factory to provide a storage
capacity of 655 Mbytes. The workstation can hold up to four RZ56 drives
in the mass storage area.

Always install and number RZ56 drives from right to left, starting
with drive 0 and using drive jumpers to the set drive ID value. Before
installing an RZ56 drive, the drive must be configured for a unique SCSI
ID address. The following SCSI configuration displays on the screen when
you type **show scsi** at the workstation prompt to find an open ID address
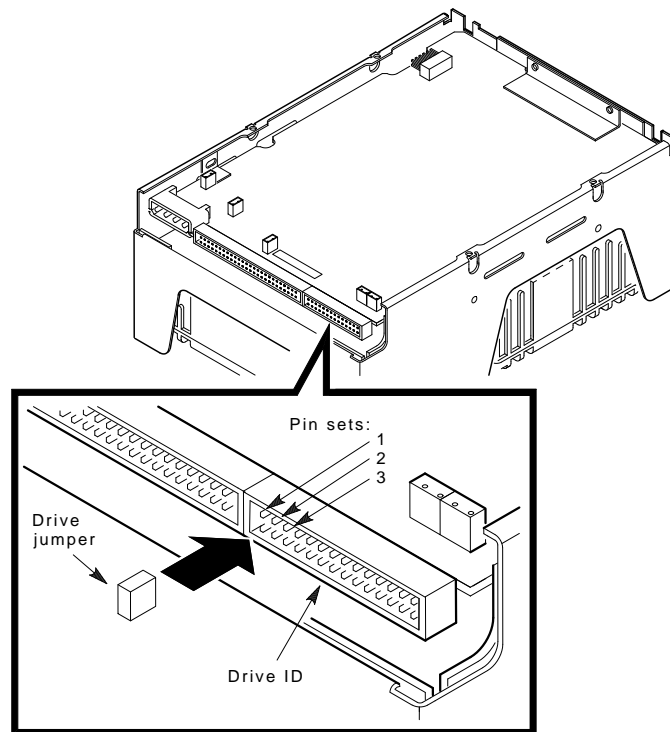for the drive.

```
CPUxx >>> show SCSI
```

Use Table 2–1 to set the correct disk drive ID value on the RZ56 drive.

Table 2–1   RZ56 Disk Drive SCSI ID Settings

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

Figure 2–4 shows where to set the jumper settings on the drive. Jumper setting 1 is the bottom row of pins.

MA-X1002-89

Figure 2–4   Setting RZ56 Disk Drive SCSI ID Jumpers

The RZ56 drive connects to the SCSI bus, which runs from the I/O
module, up into the mass storage area, around the back of the tape drive
cavity, and back to the front of the mass storage area.

Installing the RZ56 Disk Drive into the Drive Slots

Do the following steps to install the RZ56 disk drive into the rigthmost
slot or any other drive slot on the mass storage area.

1. Turn off the workstation.

2. Remove the front cover from the workstation. Refer to Chapter 3 of
    the *VAXstation 3520/3540 Maintenance Guide*.

3. Remove the mass storage cover. Refer to Chapter 3 of the *VAXstation 3520/3540 Maintenance Guide*.

4. Remove the control panel. Refer to Chapter 4 of the *VAXstation 3520/3540 Maintenance Guide*.

5. Verify that the SCSI ID switches are set correctly for each drive being installed (Table 2–1).

    NOTE
    If the RZ56 disk drive is being installed in the rightmost slot of the mass storage area, it must be installed with the connectors facing the back of the mass storage area.

6. Slide the drive into the rightmost available slot in the mass storage area, aligning the drive mounting brackets with the top and bottom shock mounts in the slot (Figure 2–5).

    Figure 2–6 shows how to install the RZ56 disk drive into any slot other than the rightmost slot of the mass storage area.
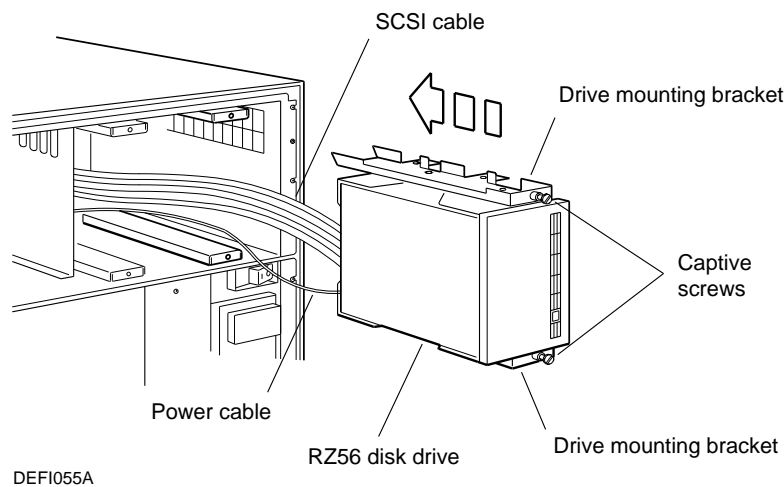

DEFI055A

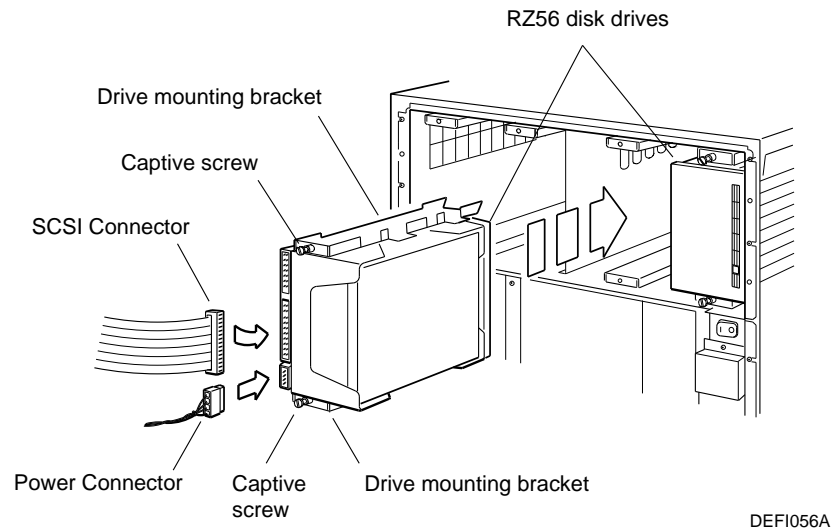**Figure 2–5   Installing the RZ56 Disk Drive in the Rightmost Slot**

Figure 2–6   Installing the RZ56 Disk Drive in Any Slot Other Than the Rightmost Slot

7. Secure the drive to the mass storage area by turning the captive screws on both drive mounting brackets.

8. Connect the power connector to the connector on the drive.

9. Connect the SCSI cable to the connector on the drive

10. Replace the control panel and the mass storage cover.

11. Turn on the workstation.

12. Test the new configuration.

13. Replace the workstation covers.

For more information about the RZ56 drive, refer to the *RZ56 Disk Drive Service Manual*.

3
Troubleshooting

This chapter describes how to troubleshoot the MS60-CA memory module and the RZ56 disk drive options by using self-test and system exerciser diagnostics for the workstation.

MS60-CA Memory Module

The MS60-CA memory module uses internal diagnostics to perform self-test and DRAM array initialization.

Self-Test Results

The results of the self-test, in addition to the screen message, are indicated by the red and yellow LEDs on the front edge of the module. If the yellow LED is on and the red LED is not on, the module has passed the self-test. If the yellow LED is not on and the red LED is on, the module has either failed or the test is not finished. If both LEDs are on, the test has not started.

If the module failed self-test, replace the module. Refer to Chapter 4, *Removal and Replacement* for instructions on how to replace the module.

For additional information on troubleshooting, refer to Chapter 2 of the *VAXstation 3520/3540 Maintenance Guide*.

RZ56 Disk Drive

To troubleshoot the RZ56 disk drive, use the self-test and system exerciser diagnostics for the workstation.

Self-Test Results

Figure 3–1 shows a sample power-up self-test display. This displays shows an error on SCSI 01240922.

For more information on self-test error codes, refer to Chapter 2 of the *VAXstation 3520/3540 Maintenance Guide*.

```
        KA60  V1.1

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

            5 01010004   L2003  4   ?   V1.1

1  SSC   00000001
2  DZ    00000001
3  NI    19210770
4  SCSI  01240922    ?
5  SYS   00000001

            7   01010002   L2004  3  ??   V1.1-B

1  GFX   20163B12    ??
             00000200  00000006

Tests completed.

OC-E1, P1
OF-E1, P1
OC

CPUxx >>>
```

Figure 3–1   Sample Power-Up Self-Test Display

System Exerciser Results

Table 3–1 lists the results of the system exerciser when in Field Service mode. The code for the drive shows that it is writeable and that no errors are present. Any error code other than those listed indicates an error is most likely on the disk, but never rule out the possibility of an error on the SCSI bus controller itself.

Figure 3–2 shows a sample display of a system exercise test results.

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

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

Figure 3–2   Sample System Exerciser Test Display

Table 3–1   System Exerciser Results

Code	Description
SCSI 0000.0D01	Good results. No error for drive at SCSI address ID 0.
SCSI 1000.1D01	Good results. No error for drive at SCSI address ID 1.
SCSI 2000.1D01	Good results. No error for drive at SCSI address ID 2.
SCSI 3000.1D01	Good results. No error for drive at SCSI address ID 3.
SCSI 4000.1D01	Good results. No error for drive at SCSI address ID 4.

For additional information on troubleshooting, refer to Chapter 2 of the *VAXstation 3520/3540 Maintenance Guide*.

4
Removal and Replacement

This chapter describes how to remove and replace the MS60-CA memory module, the RZ56 disk drive, and the RZ56 disk drive electronic module.

Table 4–1 lists part numbers for Digital Field Service personnel who need to order individual items for replacement.

Table 4–1   System Field Replaceable Units (FRUs)

Item	Part Number
Q-bus adapter module, DWFQA	L2002-00
Synchronous I/O interface module, DSV11	M3108-PA
Asynchronous interface module, CXY08	M3119-YA
Tape drive TK70, 296 Mbytes	TK70E-SA
TK70 tape drive controller module, TQK70	M7559-00
Tape drive TS05, 40.5 Mbytes	TS05-AA/AB
TS05 tape drive controller module, TSV05	M7530-PA
32 Mbytes memory module, MS60-CA	L2007-CA
Fixed-disk drive RZ56, 665 Mbytes	RZ56-E

Removing the MS60-CA Memory Module

The MS60-CA memory module resides in slot 5, 6, 8, or 9. If one module is configured with the workstation, it resides in slot 8. Slots 5, 6, and 9 are for additional memory modules.

Do the following steps to remove the MS60-CA memory module (observing antistatic procedures).

NOTE
When removing a module, be sure to use proper antistatic procedures. Leave the workstation power cord plugged in to provide a ground for the antistatic mat and wrist strap.

1. Turn off the workstation.

2. Remove the front cover from the workstation.

3. Remove the appropriate cover as needed.

4. Pull outward on the top and bottom release levers on the module.

5. Gently pull the module out of the card cage.

To replace a MS60-CA module, do the following:

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

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

3. Replace the appropriate covers.

4. Test the module.

Removing the RZ56 Disk Drive

Do the following steps to remove the RZ56 disk drive (observing antistatic procedures).

1. Turn off the workstation.

2. Remove the front cover from the workstation. See Chapter 3 of the *VAXstation 3520/3540 Maintenance Guide*.

3. Remove the mass storage cover. See Chapter 3 of the *VAXstation 3520/3540 Maintenance Guide*

4. Remove the control panel. See Chapter 4 of the *VAXstation 3520/3540 Maintenance Guide*.

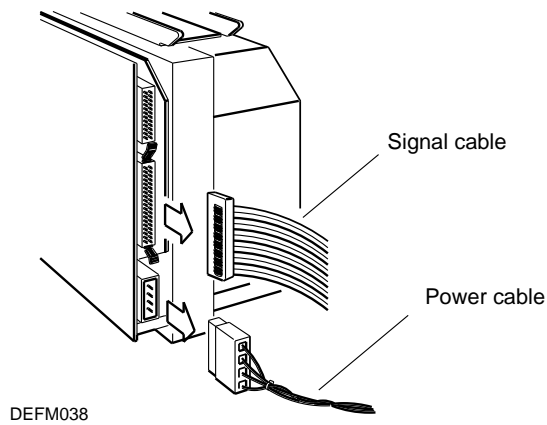5. Disconnect the SCSI connector and the power connector from the disk drive (Figure 4–1).

Signal cable

Power cable

DEFM038

Figure 4–1   Disconnecting the RZ56 Disk Drive Connectors

6. Release the disk drive from its runners by loosening the captive screws above and below the disk drive (Figure 4–2).

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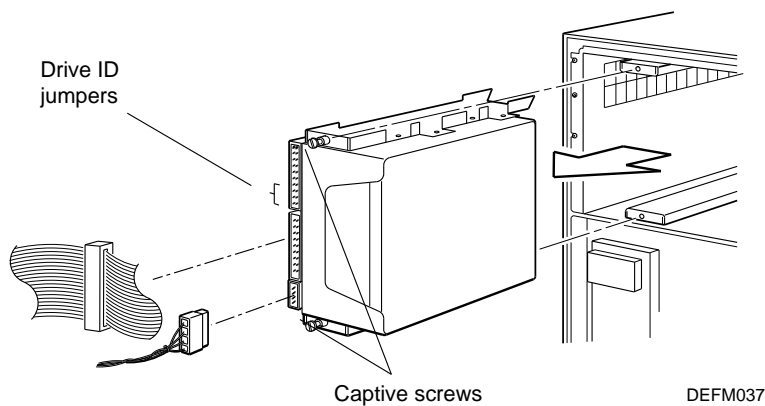

Drive ID
jumpers

Captive screws

DEFM037

Figure 4–2   Removing an RZ56 Disk Drive

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

9. Set the drive jumper ID on the new RZ56 disk drive to the same position as on the old RZ56 disk drive you just removed. Refer to Figure 4–2 and Table 2–1 for assistance.

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

After replacing the drive, turn on the workstation and run diagnostic tests to test the drive.

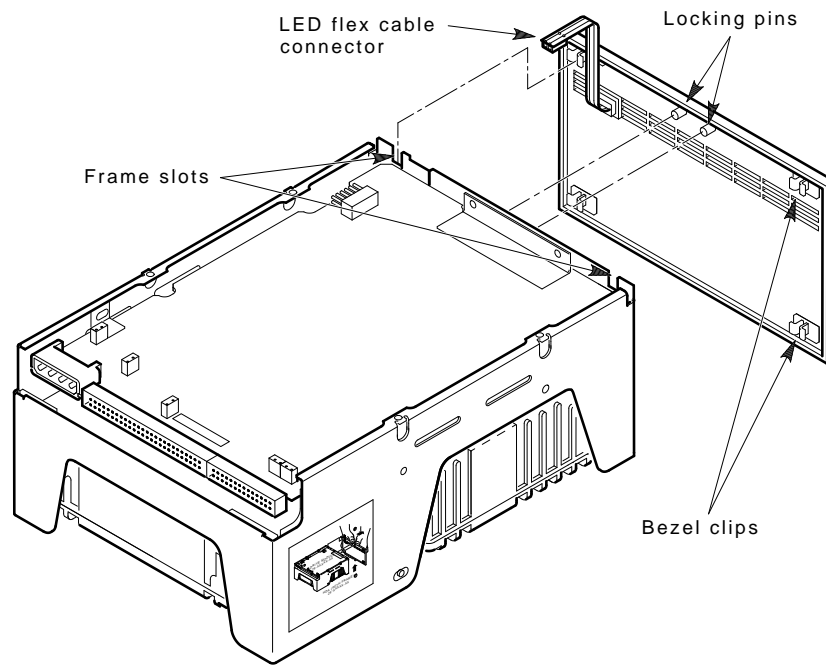## Removing the Drive Electronics Module

Do the following steps to remove the RZ56 disk drive electronic module (observing antistatic procedures).

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

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

2. While the bezel is clear of the locking pins, slide it upward until movement stops (about 3/8 inch). Then remove the bezel from the drive (Figure 4–3).
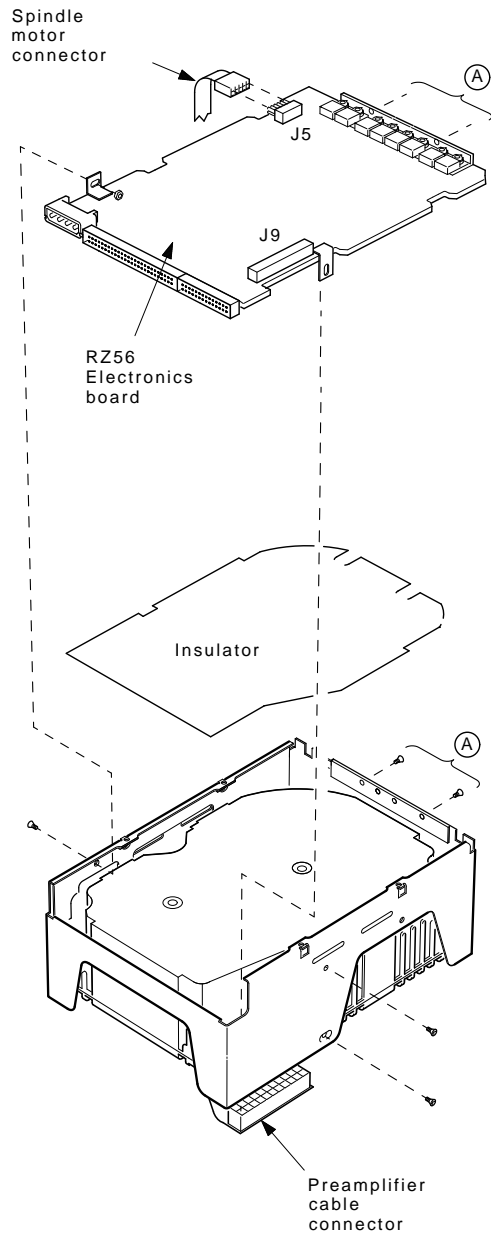
MA-X1003-89

Figure 4–3   RZ56 Disk Drive Bezel Removal

3.   Remove the three screws (Figure 4–4).

Spindle
motor
connector

Ⓐ

J5

J9

RZ56
Electronics
board

Insulator

Ⓐ

Preamplifier
cable
connector

MA-X0923-89

Figure 4–4   RZ56 Disk Drive Electronic Module Removal

4. Unplug the spindle motor connector at J5.

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

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

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

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

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

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