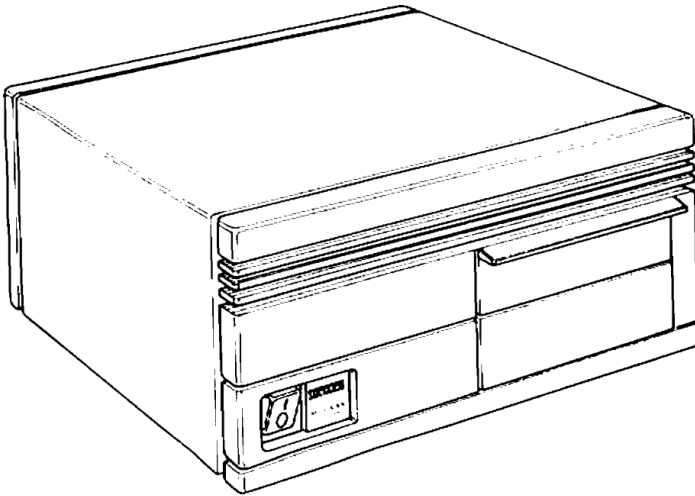


# **VAXstation 2000 and MicroVAX 2000 Maintenance Guide**

Order Number EK-VSTAA-MG-001



**digital equipment corporation  
maynard, massachusetts**

First Edition, January 1987

Copyright ©1987 by Digital Equipment Corporation.  
All Rights Reserved.  
Printed in U.S.A.

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation.

Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The software, if any, described in this document is furnished under a license and may be used or copied only in accordance with the terms of such license. No responsibility is assumed for the use or reliability of software or equipment that is not supplied by Digital Equipment Corporation or its affiliated companies.

The following are trademarks of Digital Equipment Corporation:

**digital**™

BASEWAY

BIBus

COMPACTape

DEC

DECconnect

DEC/MAP

DECmate

DECnet

DECUS

DECwriter

DIBOL

EDCS

FMS

MASSBUS

Micro/RSTS

MicroPDP-11

Micro/RSX

MicroVAX II

PDP

P/OS

Professional

Q-Bus

Rainbow

RSTS

RSX

RT

ThinWire

UNIBUS

VAX

VAXeluster

VAXstation II

VAXstation II/GPX

VMS

VT

# Contents

---

|          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Systems Introduction</b>  | <b>1</b> |
| 1.1      | The VAXstation 2000 and MicroVAX 2000 Systems . . . . .                                | 1        |
| 1.2      | Mass Storage Expansion Box for Both Systems . . . . .                                  | 5        |
| 1.3      | Options . . . . .  | 8        |
| 1.3.1    | Internal Memory Options . . . . .  | 8        |
| 1.3.2    | ThinWire Ethernet Option on MicroVAX 2000 . . . . .                                    | 8        |
| 1.4      | FRU Locations . . . . .  | 8        |
| <b>2</b> | <b>Testing and Troubleshooting</b>   | <b>1</b> |
| 2.1      | Introduction . . . . .   | 1        |
| 2.2      | Using Console Mode . . . . .   | 1        |
| 2.2.1    | Determining the Console Device . . . . .   | 2        |
| 2.2.2    | Entering Console Mode . . . . .  | 2        |
| 2.2.3    | Exiting Console Mode . . . . .   | 3        |
| 2.2.4    | Diagnostic Console Device . . . . .  | 4        |
| 2.2.5    | Console Commands . . . . .   | 4        |
| 2.3      | Testing . . . . .  | 5        |
| 2.3.1    | Power-up Tests . . . . .   | 5        |
| 2.3.2    | Self-test . . . . .  | 9        |
| 2.3.3    | System Exerciser Diagnostics . . . . .   | 13       |
| 2.4      | Troubleshooting Procedures . . . . .   | 16       |
| 2.4.1    | MONO – Monochrome Video Troubleshooting Procedures<br>(VAXstation 2000 only) . . . . . | 16       |
| 2.4.2    | CLK – Time-of-Year Clock Troubleshooting Procedures . . . . .                          | 17       |
| 2.4.3    | NVR – Non-Volatile RAM Troubleshooting Procedures . . . . .                            | 17       |
| 2.4.4    | DZ – Serial Line Controller Troubleshooting Procedures . . . . .                       | 17       |
| 2.4.5    | MEM – Memory Troubleshooting Procedures . . . . .                                      | 19       |
| 2.4.6    | MM – Memory Management Unit Troubleshooting Procedures . . . . .                       | 20       |
| 2.4.7    | FP – Floating Point Unit Troubleshooting Procedures . . . . .                          | 21       |

|        |   |    |
|--------|---|----|
| 2.4.8  | IT – Interval Timer Troubleshooting Procedures . . . . .  | 21 |
| 2.4.9  | HDC – Disk Drives and Controller Troubleshooting Procedures                                     | 21 |
| 2.4.10 | TPC – Tape Drive Controller Troubleshooting Procedures . .                                      | 29 |
| 2.4.11 | SYS – Interrupt Controller and ThinWire Ethernet ID ROM<br>Troubleshooting Procedures . . . . . | 38 |
| 2.4.12 | NI – ThinWire Ethernet Network Option Troubleshooting<br>Procedures . . . . .                   | 39 |
| 2.4.13 | Power Supply Troubleshooting Procedures . . . . .   | 40 |
| 2.4.14 | VR260 Monochrome Monitor Troubleshooting Procedures . .   | 42 |

## Figures

|      |   |    |
|------|---|----|
| 1-1  | Front View of the VAXstation 2000 and MicroVAX 2000 Systems . . .     | 2  |
| 1-2  | Rear View of the VAXstation 2000 System . . . . .                     | 3  |
| 1-3  | Rear View of the MicroVAX 2000 System . . . . .                       | 4  |
| 1-4  | Front View of the Hard Disk Expansion Box . . . . .                   | 5  |
| 1-5  | Front View of the Tape Drive Expansion Box . . . . .                  | 6  |
| 1-6  | System Box with Expansion Adapter . . . . .                           | 7  |
| 1-7  | FRU Locations in the System Box . . . . .                             | 8  |
| 1-8  | FRU Locations in the Expansion Boxes . . . . .                        | 9  |
| 2-1  | Example of Power-up Tests Screen Display . . . . .                    | 5  |
| 2-2  | Power-up Symbols Defined . . . . .                                    | 6  |
| 2-3  | Example of Power-up Tests Screen Display with Errors. . . . .         | 7  |
| 2-4  | Example of the Configuration Table . . . . .                          | 8  |
| 2-5  | Example of Running Self-test on the Disk Controller . . . . .         | 9  |
| 2-6  | Example of Running a Series of Self-tests . . . . .                   | 10 |
| 2-7  | Example of a Self-test Error on the Disk Controller . . . . .         | 12 |
| 2-8  | System Exerciser Display Example . . . . .                            | 15 |
| 2-9  | Example of MEM System Exerciser Error Code . . . . .                  | 20 |
| 2-10 | HDC Power-up and Self-test Error Code . . . . .                       | 22 |
| 2-11 | Example of System Exerciser Display for the Disk Controller . . . . . | 24 |
| 2-12 | RD32 Drive Select Jumper Setting for DUA0 . . . . .                   | 28 |

2-13 RD53 Drive Select Jumper Setting for DUA0 and DUA1 . . . . . 28

2-14 RX33 Drive Select Jumper Setting for DUA2 . . . . . 29

2-15 TPC Power-up and Self-test Error Code . . . . . 30

2-16 Example of System Exerciser Display for the Tape Controller . . . . . 32

2-17 TZK50 Controller Board Jumper Locations . . . . . 37

2-18 Flowchart for Troubleshooting the Power Supply . . . . . 40

2-19 Power Connectors Pin Voltages . . . . . 41

**Tables**

2-1 Prompts . . . . . 2

2-2 Keyboard LEDs Defined . . . . . 7

2-3 Self-test Commands . . . . . 10

2-4 System Exerciser Diagnostic Commands . . . . . 14

2-5 MEM System Exerciser Error Codes . . . . . 20

2-6 Power-up and Self-test Error Codes for each Dlsk Drive . . . . . 23

2-7 HDC Disk Controller System Exerciser Error Codes . . . . . 25

2-8 HDC Dlsk Drive System Exerciser Error Codes . . . . . 26

2-9 TPC Tape Controller System Exerciser Error Codes . . . . . 33

2-10 Tape Drive Expansion Box System Exerciser Error Codes . . . . . 34

2-11 VR260 Troubleshooting Table . . . . . 42

## ABOUT THIS BOOK

This book describes how to troubleshoot, adjust, and repair the VAXstation 2000 and the MicroVAX 2000 Workstation to the field replaceable unit (FRU) level in the field. It covers all FRU options presently available for these two Systems.

- [Chapter 1](#) contains a System overview that outlines the components of the VAXstation 2000 and MicroVAX 2000 Systems.
- [Chapter 2](#) contains testing and troubleshooting procedures to help isolate the problem to an FRU.
- [Chapter 3](#) contains FRU removal and replacement procedures.
- [Chapter 4](#) contains video monitor adjustment procedures for the VAX station 2000 monitor.
- [Chapter 5](#) contains installation instructions for each option available on both the VAXstation 2000 and the MicroVAX 2000.
- [Appendix A](#) contains a list of the test commands.
- [Appendix B](#) contains a complete listing and definitions of the console commands.
- [Appendix C](#) contains a complete listing and definitions of the console messages.
- [Appendix D](#) contains a complete listing and definitions of the VMB boot error Status codes.

The detailed [index](#) and [glossary](#) also help you find Information.

### Notes, Cautions, and Warnings

Notes, cautions, and warnings appear throughout this book.

- Notes contain general, supplemental Information about a topic.
- Cautions contain information to prevent damage to equipment.
- Warnings contain information to prevent personal injury.

## REFERENCE MANUALS

| Manual  | Order Number                |
|---|-----------------------------|
| VAXstation 2000 Hardware Installation Guide           | <a href="#">EK-VAXAA-IN</a> |
| VAXstation 2000 Owner's Manual                        | <a href="#">EK-VAXAA-OM</a> |
| VAXstation 2000/MicroVAX 2000 Technical Manual        | <a href="#">EK-VTTAA-TM</a> |
| MicroVAX 2000 Hardware Installation Guide             | <a href="#">EK-MVXAA-IN</a> |
| MicroVAX 2000 Owner's Manual                          | <a href="#">EK-MVXAA-OM</a> |
| VR290 Service Guide                                   | <a href="#">EK-VR290-SM</a> |
| VAXstation 2000, MicroVAX 2000, VAXmate Network Guide | <a href="#">EK-NETAA-UG</a> |
| RD53 Technical Description Manual                     | <a href="#">EK-RD53A-TD</a> |
| RX33 Technical Description Manual                     | <a href="#">EK-RX33T-TM</a> |
| TZK50/SCSI Controller Technical Manual                | <a href="#">EK-TZK50-TM</a> |

## TOOLS AND MATERIALS

You will need the following tools and materials to service the VAXstation 2000 and MicroVAX 2000 Systems.

- Field Service Tool Kits
  - 50 Hz Tool Kit p/n 29-23270-00
  - 60 Hz Tool Kit p/n 29-23268-00
- VR260 Video Monitor Tools
  - Metric Measuring Tape p/n 29-25342-00
  - High-Voltage Anode Discharge Tool p/n 29-24717-00
- ThinWire Ethernet Tools
  - Face Plate Installation Kit p/n H8242





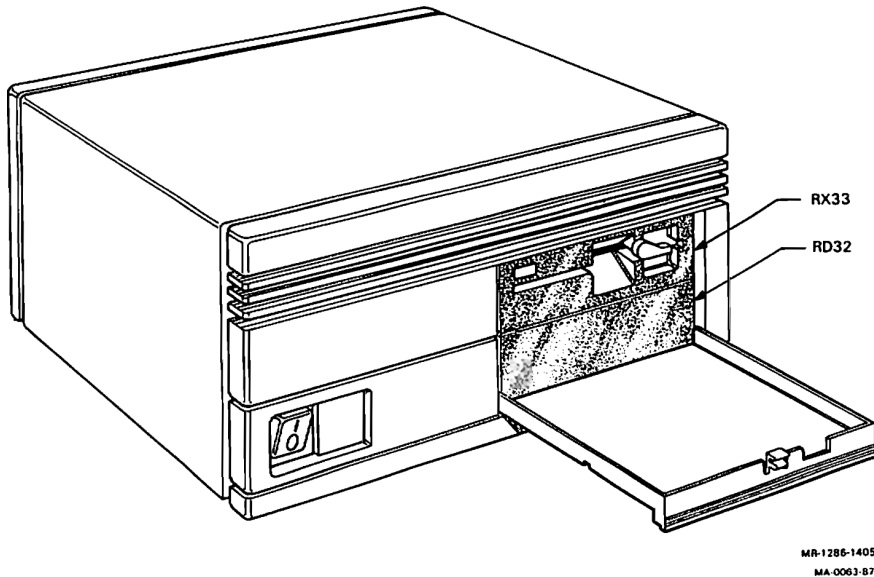
## **1.1 The VAXstation 2000 and MicroVAX 2000 Systems**

The VAXstation 2000 and MicroVAX 2000 systems are mechanically identical. Both come in the same style box, both use the same drives, and both use the same mass storage expansion boxes. Also, both use the same diagnostic tools for troubleshooting and repair. Once familiar with troubleshooting one system, you'll be able to troubleshoot the other if necessary. One major difference is the VAXstation 2000 is a single-user system and the MicroVAX 2000 is a multiuser system. Another difference is the VAXstation 2000 uses a video monitor while the MicroVAX 2000 uses video terminals.

Both the VAXstation 2000 and the MicroVAX 2000 have three main pieces of hardware. They are the System box, the hard disk expansion box, and the tape drive expansion box. The System box can have a half-height RX33 floppy disk drive, a half-height RD32 hard disk drive, or both the RX33 and the RD32. A full-height RD53 hard disk drive can be substituted for the half-height drives in the System box. The hard disk expansion box comes with a full-height RD53 hard disk drive. The tape drive expansion box comes with a TK50 tape drive.

Figure 1-1 shows the front of the VAXstation 2000 and MicroVAX 2000 systems. There are three ways to differentiate between the two systems: the medallion next to the power switch on the front, the DEC423 converter on the back, or the system jumper position on the system module inside the box.

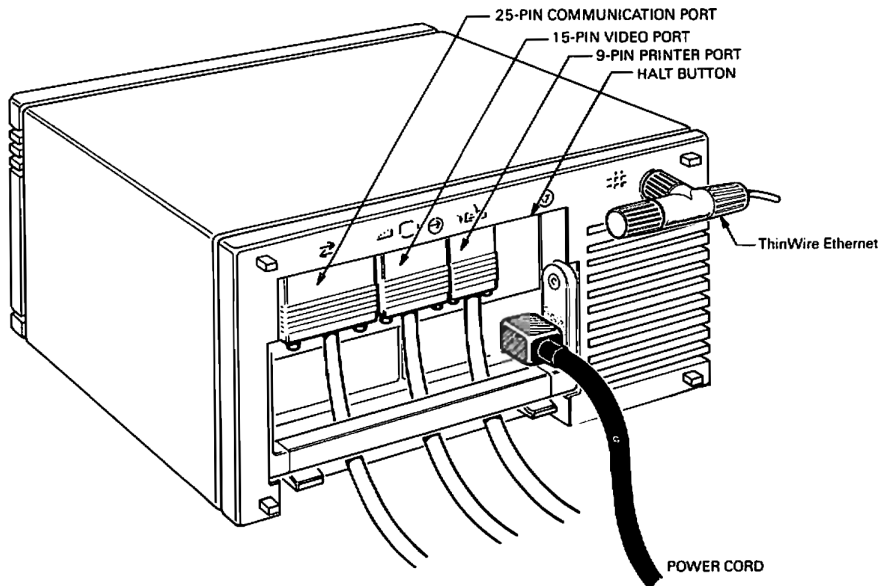
**Figure 1-1: Front View of the VAXstation 2000 and MicroVAX 2000 Systems**



MR-1286-1405  
MA-0063-87

Figure 1-2 shows the rear view of the VAXstation 2000 and labels each connector. A modem or a terminal can be connected to the 25-pin communication port. A VR260 monochrome monitor can be connected to the 15-pin video port. A printer can be connected to the 9-pin printer port. The ThinWire Ethernet port Supports IEEE 802.3 (Standard Ethernet) network communications connections over the ThinWire Ethernet cable.

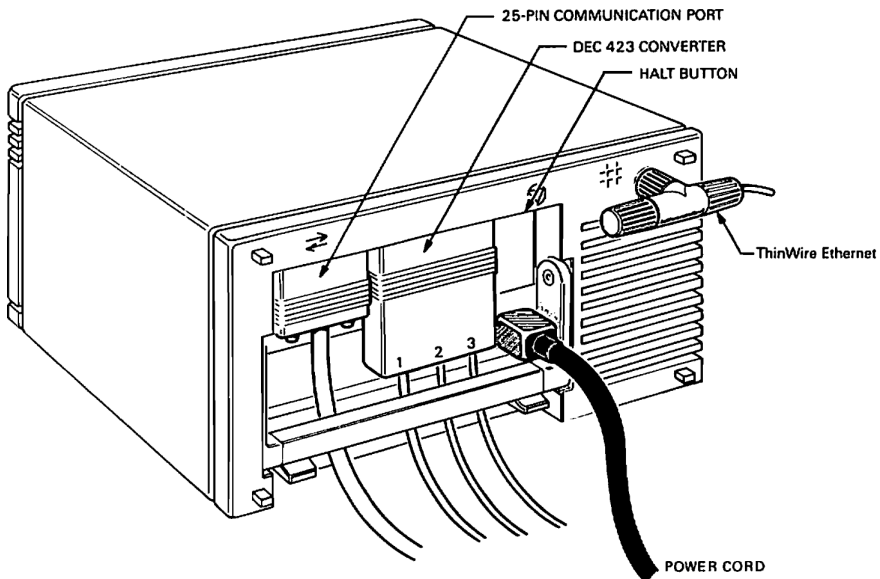
**Figure 1-2: Rear View of the VAXstation 2000 System**



MR-1086-1246  
MA-0132-87

Figure 1-3 shows the rear view of the MicroVAX 2000 and labels each connector. Like the VAXstation 2000, the MicroVAX 2000 supports a modem or a terminal on the 25-pin communication port. The MicroVAX 2000 supports the DECconnect strategy which uses the modified modular jack (MMJ) 6-conductor telephone type cable (DEC423 asynchronous protocol) for connection to the terminals. The DEC423 Converter changes the 15-pin video port and the 9-pin printer port (RS232 protocol) to three MMJ communication ports. Port 1 on the DEC423 Converter is reserved for the console terminal. Ports 2 and 3 can have either a terminal or a printer attached to them. The operating system Software configures each port for either a terminal or a printer. The ThinWire Ethernet port supports IEEE 802.3 (Standard Ethernet) network communications connections over the ThinWire Ethernet cable.

**Figure 1-3: Rear View of the MicroVAX 2000 System**



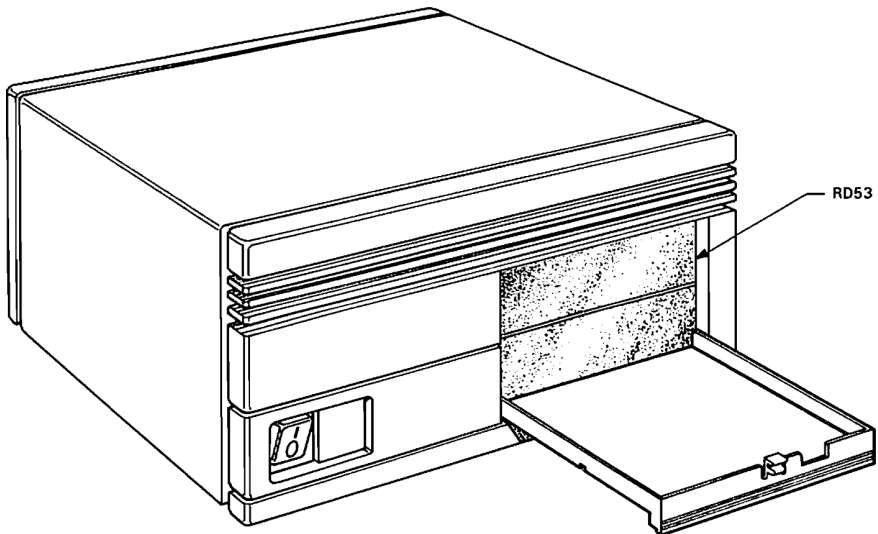
MR-1086-1245  
MA-0134-B7

## 1.2 Mass Storage Expansion Box for Both Systems

Additional mass storage devices are contained in expansion boxes that look very similar to the system box. [Figure 1-4](#) and [1-5](#) show the front view of the expansion boxes.

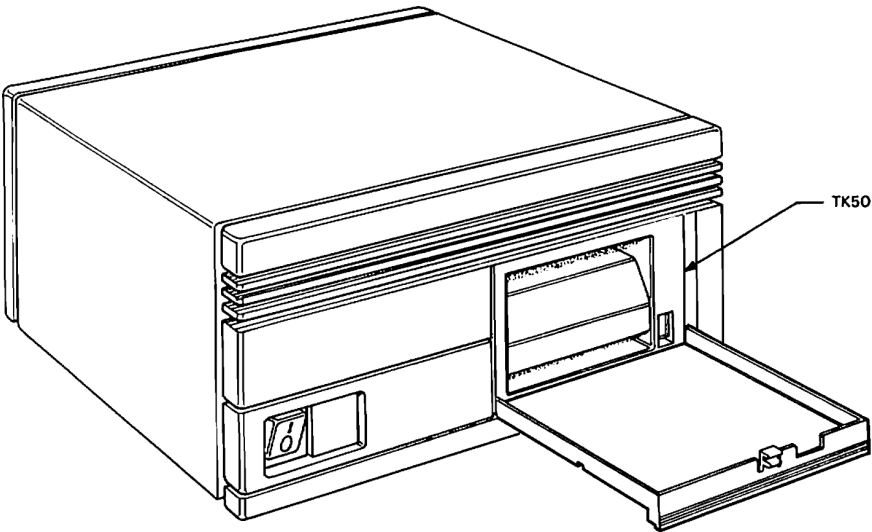
The hard disk expansion box contains an RD53 or RD54 hard disk drive. The tape drive expansion box contains a TK50 tape drive and a controller board. Each expansion box contains a power supply, a resistor load board (to regulate the power supply), and the drive.

**Figure 1-4: Front View of the Hard Disk Expansion Box**



MR-1286-1406  
MA-0065-87

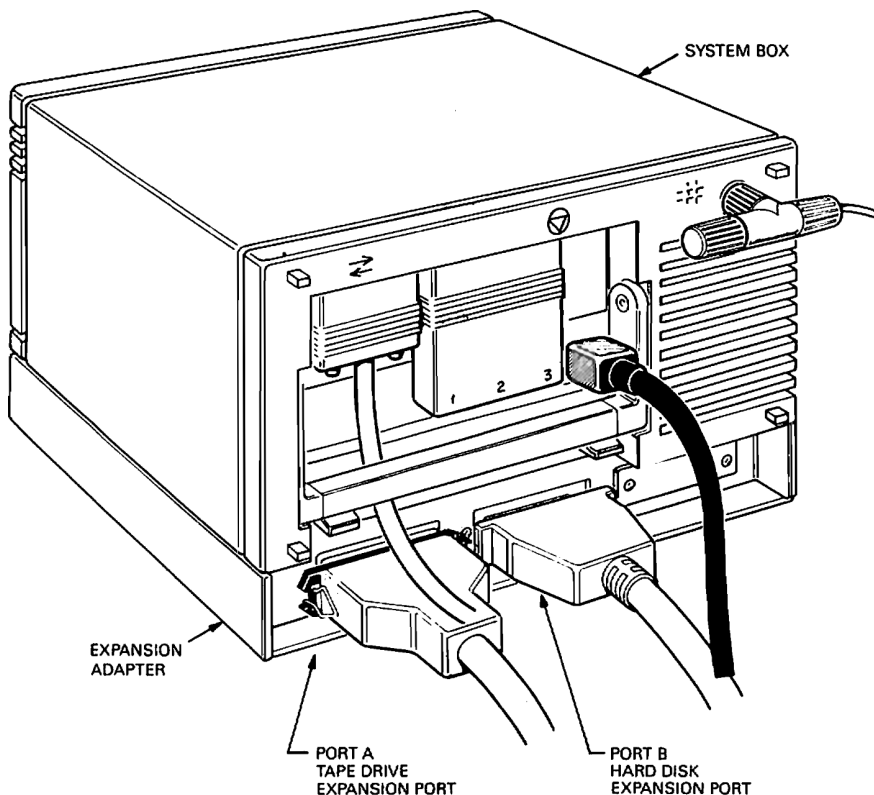
**Figure 1-5: Front View of the Tape Drive Expansion Box**



MR-1285-1410  
MA-0064-B7

Both expansion boxes connect to the system box through an expansion adapter that attaches to the bottom of the system box. The expansion adapter has three connectors on the back labeled ports A, B, and C. Port A connects the tape expansion box to the system. Port B connects the hard disk expansion box to the system. Port C is reserved for future options. [Figure 1-6](#) shows the back of a MicroVAX 2000 system box with an expansion adapter.

**Figure 1-6: System Box with Expansion Adapter**



MR-1286-1409  
MA-0135-B7

# 1.3 Options

## 1.3.1 Internal Memory Options

Two additional memory modules are available for both systems. One is a 2-megabyte memory module and the other is a 4-megabyte memory module. The memory module is located in the system box and is connected directly to the system module.

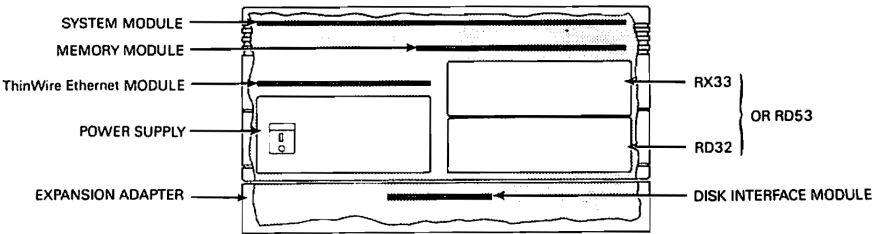
## 1.3.2 ThinWire Ethernet Option on MicroVAX 2000

ThinWire Ethernet is an option on the MicroVAX 2000. It comes standard on the VAXstation 2000. It adds the capability of connecting the system to the DECnet through the ThinWire Ethernet network. The option consists of a network interconnect module that is located in the system box and is connected to the system module through two 40-conductor cables.

# 1.4 FRU Locations

Figure 1-7 shows the locations of the FRUs in the system box. Figure 1-8 shows the locations of the FRUs in the expansion boxes.

**Figure 1-7: FRU Locations in the System Box**

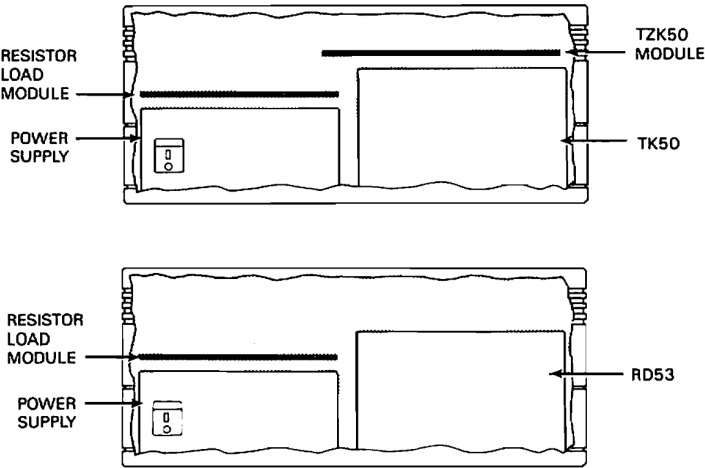


VAXstation 2000 AND MicroVAX 2000 SYSTEM BOX

MA-0180-87



**Figure 1-8: FRU Locations in the Expansion Boxes**



VAXstation 2000 AND MicroVAX 2000 EXPANSION BOXES

MR-1186-1275  
MA-0133-B7



## Chapter 2

# Testing and Troubleshooting

---

## 2.1 Introduction

This chapter describes how to test and troubleshoot the VAXstation 2000 and the MicroVAX 2000 systems. Differences between the VAXstation 2000 and the MicroVAX 2000 are specifically identified in the text.

This chapter contains the following sections.

- How to use console mode: determining the console device, entering console mode, exiting console mode, utilizing the diagnostic console device, and where to find a list of the console commands.
- How to run the diagnostic tests and interpret the error codes for each test: power-up tests, self-test, and system exerciser.
- How to troubleshoot all devices in the system.
- How to use the utilities.

## 2.2 Using Console Mode

The VAXstation 2000 and the MicroVAX 2000 systems have two modes of operation: program mode and console mode. Normal operation of the VAXstation 2000 and the MicroVAX 2000 is in program mode, that is, with the operating system controlling the system. Console mode allows the user to control the system from the console terminal using the console commands described in [Appendix B](#). Console mode is contained in ROM on the system module.

Testing is done while in console mode. The system returns the >>> prompt when it is in console mode. [Table 2-1](#) lists the prompts and the mode of operation each prompt represents.

**Table 2-1: Prompts**

| Prompt | Mode of operation   |
|--------|---|
| >>>    | Console mode. Console commands are listed in <a href="#">Appendix B</a> . |
| \$     | Program mode (VMS operating system)                                       |
| %      | Program mode (Ultrix operating system)                                    |

## 2.2.1 Determining the Console Device

The console device for a VAXstation 2000 system is the keyboard (LK201) and monitor (VR260) connected to the video port. The keyboard inputs commands at 4800 baud and the monitor displays output from the video circuits.

The console device for a MicroVAX 2000 system is the terminal (VT220 or similar terminal) connected to connector 1 on the DEC423 converter. The terminal operates at 9600 baud.

## 2.2.2 Entering Console Mode

Console mode is entered any time the CPU halts. The CPU can be halted automatically or manually. A halt means that CPU control has passed control from the operating system to the console mode program in ROM. If the system halts the CPU, then the console mode program checks the nonvolatile RAM (NVR) for user-defined instructions on how to handle the halt. If you manually halt the CPU, the system enters console mode program immediately without checking the NVR for instructions.

You can manually halt the CPU and enter console mode by one of the following methods.

- **HALT button** – Press the halt button. It is located next to the printer port on the back of the system box. The >>> prompt is displayed when ready for console commands.
- **BREAK key** – Press the BREAK key on the diagnostic console device that is connected to the printer port with the BCC08 cable. The >>> prompt is displayed when ready for console commands.

The system automatically halts the CPU for the following reasons.

- **After power-up testing** – If the default recovery action is halt, the system automatically halts the CPU and enters console mode after power-up tests are complete. See Section 2.5.4 for information on setting the default recovery actions.
- **For a boot failure** – If the system fails to boot properly, the system automatically halts the CPU and enters console mode. See Section 2.5.2 for

information on setting the default boot device.

- On a system error – If the CPU detects a severe corruption of its operating environment, it halts and reads the default recovery action in the NVR. The default recovery action can be restart, boot, or halt. When it is restart and the restart fails, then the system automatically tries to boot the operating system software. If the boot fails, the CPU halts and enters console mode. When the default recovery action is boot and the boot fails, the CPU halts and enters console mode. When the default recovery action is halt, the CPU unconditionally halts and enters console mode.

One other way to halt the CPU is when the operating system software executes a halt instruction. The CPU then reads the default recovery action in the NVR and acts on it as described above.

## 2.2.3 Exiting Console Mode

Console mode is exited by typing one of the following console commands.

- BOOT – This command initializes the CPU and boots the operating system software from the device specified. If no device is specified, the system searches each on-line device until the operating system software is found. The boot command starts the system similar to when power is turned on except that the power-up tests are not run. If the system attempts to boot over the net (ESA0) and no software is available on another node, the system keeps looking for the software indefinitely. If a boot message for the operating system software does not appear shortly after the Ethernet boot message (ESA0) is displayed, then you must press the halt button to abort the Ethernet boot. If you still need to boot over the Ethernet, make sure the node with the operating system software is operating normally and the software is loaded. Run the Ethernet loopback Utility (TEST 90) to check the networking capability of the system if the Ethernet boot continues to fail. When a boot is invoked using this boot command, you can specify several boot command flags by bit encoding the flags in a flag word specified with the /R5: qualifier. These command flags are listed in Paragraph 2.5.3.
- CONTINUE – This command instructs the CPU to continue the operating system software at the address contained in the program counter (PC). This command starts up the operating software where it was halted provided no console test commands were run. Running a test command alters the PC and memory so that the operating system software cannot be started properly by entering the continue command. If a test command was entered, use the boot command to start the operating system software. The continue command is similar to the start command. The start command can specify the address to start the operating software and the continue command has the operating software continue where it left off.

- **START** – This command starts the operating system software at a specified address. If no address is given, the contents of the PC are used. However, running a test command alters the PC and memory so that the operating system software cannot be started properly by entering the start command. If a test command was entered, use the boot command to start the operating system software.

## 2.2.4 Diagnostic Console Device

There is a diagnostic console device available on the VAXstation 2000. The MicroVAX 2000 can use this device if the DEC423 Converter is removed.

The diagnostic console device can be utilized by connecting a terminal (such as the VT100 or VT220) to the printer port with the special BCC08 cable. The terminal operates at 9600 baud. Field service technicians can use this terminal as a diagnostic tool to isolate a problem in the normal console device.

To use this diagnostic console device you must turn off power, connect the BCC08 cable to the printer port and terminal, and then turn power back on. The diagnostic console device now controls the system. The normal console monitor displays video test patterns on the VAXstation 2000 when the video circuits are tested. The normal console keyboard does not operate.

## 2.2.5 Console Commands

Console commands are listed in [Appendix B](#).

## 2.3 Testing

Testing procedures on the VAXstation 2000 and the MicroVAX 2000 systems are almost identical. The differences between the systems are explained where applicable. All diagnostic tests are ROM-based and testine is done while in console mode. Tests are executed in either of two ways:

- Automatically – When power is turned on the power-up tests begin.
- Manually – By entering one of the console test commands on the console terminal. See [Appendix A](#) for a complete listing of the test commands.

### 2.3.1 Power-up Tests

Power-up tests run each time the system power is turned on. 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. [Figure 2-1](#) shows an example of the powerup screen display. The first line indicates the CPU name (KA410-A) and the ROM version (V1.0). The test numbers are listed next in descending order from the first test, F, to the final test, 1. TEST F will have an underscore after it on the MicroVAX 2000 to indicate that TEST F was not run. Note in [Figure 2-1](#) that tests 4, 3, 2, and 1 have an underscore (\_) immediately after them. This underscore indicates that there is no option device installed for that test; thus, no tests are done. TEST F has an underscore after it on the MicroVAX 2000 systems because the monochrome video circuits are not used by the MicroVAX 2000. No other test numbers can have underscores after them. An asterisk (\*) after TESTS 4 through 1 indicate that an option is installed, but its ROM is destroyed and the Option device must be replaced. Only TESTS 1 through 4 can have an asterisk after them. [Figure 2-2](#) lists the symbols that can appear in between the tests and what they indicate.

#### Figure 2-1: Example of Power-up Tests Screen Display

```
KA410-A V1.0
F...E...D...C...B...A...9...8...7...6...5...4...3...2...1...
```

[Figure 2-2](#) lists the definitions of the symbols that appear between the test numbers in the power-up test countdown.

## Figure 2-2: Power-up Symbols Defined

```
... Device tested successfully or has a soft error
?... Device has a hard error
_.. Device not installed or not tested
*.. Device installed but its ROM is destroyed
```

If any hard errors (errors that indicate the device must be replaced for proper operation) are found during power-up testing, a question mark is placed after the failing test number during the countdown sequence. An error summary of all errors detected is listed after the power-up sequence is complete. Two question marks in the error summary indicate a hard error. Error codes that indicate the status or soft errors do not put a question mark after the failing test number in the sequence, but do list the error code in the error summary. [Figure 2-3](#) shows the power-up screen display with a hard error found in TEST F and a soft error found in TEST E. The error summary for each failed device is displayed before the boot sequence is started. However, the screen usually scrolls so fast when the system starts to boot that you may not be able to see what the error summary contained (if there was an error summary). To see what errors the power-up tests found, press the halt button and enter TEST 50 on the console terminal. TEST 50 is the command for bringing up the configuration table. The configuration table is created during power-up testing. This configuration table contains all of the error codes listed in the power-up error summary as well as error codes for all devices installed in the system. The error codes in the configuration table are updated every time self-test is run. See Paragraph 2.5.1 for an explanation of how to use the configuration table.

Each error summary consists of one or two question marks, a test number, the ID number of the failed device, and an eight-digit error code. For example, in [Figure 2-3](#), the first line of the error summary shows a hard error for TEST F, a device ID number of 00B0, and an error code of 0001.F002. The second line shows a soft error for TEST E, a device ID of 0040, and an error code of 0000.0005. [Section 2.3.1.1](#) describes the error codes.



**Figure 2-3: Example of Power-up Tests Screen Display with Errors.**

```
KA410-A V1.0

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

?? F  00B0  0001.F002
?  E  0040  0000.0006
```

If there is a fatal error in the NVR during power-up testing, the system stops testing the other devices and displays ?14 TOY ERR on the screen. When this happens, the only way to determine the cause of the problem is by viewing the LEDs on the keyboard. One of the LEDs will be lit to indicate the failing module. [Table 2-2](#) lists the LEDs and which module has failed.

**Table 2-2: Keyboard LEDs Defined**

| Keyboard LED | Failing module                  |
|--------------|---------------------------------|
| Hold Screen  | System module                   |
| Lock         | Not used                        |
| Compose      | ThinWire Ethernet option module |
| Wait         | Not used                        |

Once power-up testing is complete and no fatal or hard errors are found, the system boots the operating system software. Both the VAXstation 2000 and the MicroVAX 2000 boot the operating system software the same. The only difference between the two is that the VAXstation 2000 clears the console screen before it boots and the MicroVAX 2000 does not. If a default boot device is loaded in the NVR, the system boots off of that device. If no default device is loaded in the NVR, the system searches every on-line storage drive for the operating software. DUA2 is searched first if a floppy diskette is loaded. Otherwise, it is not searched at all. The hard disks are searched next, DUA0 then DUA1. MUA0, the tape drive, is checked after the hard disk drives if it is installed and a cartridge is loaded. Finally, the system searches the Ethernet network for the software and ESA0 is listed on the screen. The system continues to search the Ethernet network until the operating system software is found.

### 2.3.1.1 Power-up Test Error Codes

The power-up test error codes indicate status and/or error information. Any errors found by power-up tests are listed in the error summary after the power-up test countdown sequence. This summary, if any, gives you a brief summary of the errors. [Table 2-3](#) lists the test numbers and the devices that are tested during that particular test. To look at the complete list of devices and the status of that device, you must display the configuration table. The configuration table lists every device in the system and also lists the results of the self-test and power-up tests and is updated each time self-test is run. The error codes for each device in the configuration table are explained in the troubleshooting section for that individual device. Remember that the configuration table contains the results of the self-test and power-up tests and not the results of the system exerciser. [Figure 2-4](#) shows an example of the configuration table and for an explanation of the configuration table, see [Paragraph 2.5.1](#).

**Figure 2-4: Example of the Configuration Table**

```
>>> TEST 50

KA410-A V1.0
ID 08-00-2B-02-CF-A4

?? MONO          0001.F002
? CLK            0000.0005
NVR              0000.0001
DZ              0000.0001
                00000001 00000001 00000001 00000001 00000001 000012A0
MEM              0002.0001
                00200000
MM               0000.0001
FP               0000.0001
IT               0000.0001
HDC              1710.0001
                000146B8 00000000 00000320
TPC              0202.0001
                FFFFFFF03 01000001 FFFFFFF06 FFFFFFF05 FFFFFFF05 FFFFFFF05 ...
SYS              0000.0001
NI               0000.0001 V1.0

>>>
```

The most common good error code is 0000.0001. There are, however, some devices that use the first four digits in the error code to indicate the status of the device and the last four digits to indicate the error found on the device. The memory (MEM) error code, for instance, contains 0002.0001 which indicates two megabytes of memory is available (0002.) and no error found (.0001). On devices like these, the last four digits always indicate .0001 as a good (non-error) indication.

Some error codes indicate no error at all and give a status of the device such as the clock (CLK) which shows that the date and time has not been set. This is not an error, just a status of the clock circuits.

Any error code other than 0000.0001 on the MONO, MM, FP, IT, or SYS devices indicates a hard error and that device must be replaced for proper operation of the system. The other devices such as CLK, NVR, DZ, MEM, HDC, TPC, and NI may have a status or a soft error message in the error codes and may still operate normally.

See the troubleshooting procedures section (Paragraph 2.4) for each device to determine whether or not the error code indicates a fault or a status for the device.

## 2.3.2 Self-test

Self-test allows you to test every device again individually, a few at a time, or all of them sequentially just like power-up tests. To individually test a device, enter TEST # where # is the test number of the device you want tested. [Table 2-3](#) lists the test numbers and the devices tested by those numbers. [Figure 2-5](#) shows an example of running self-test successfully on the disk controller.

**Figure 2-5: Example of Running Self-test on the Disk Controller**

```
>>> TEST 7
      7...
>>>
```

To test a group of devices, enter TEST followed by the test number of the first device to be tested and then the test number of the last device to be tested. [Figure 2-6](#) shows an example of testing a group of devices. In [Figure 2-6](#), all tests between C and 4 are tested successfully. Note that you cannot pick and choose which devices to test between C and 4, all tests between C and 4 are tested when entered as a group.

**Figure 2-6: Example of Running a Series of Self-tests**

```
>>> TEST C 4
    C...B...A...9...8...7...6...5...4_...
>>>
```

To test all devices, enter TEST F 1. The MicroVAX 2000 skips over the MONO video test (TEST F) since it does not use the video circuits.

**Table 2-3: Self-test Commands**

| Test Number | Device Tested   |
|-------------|---|
| 1           | Option module (Network Interconnect module) (NI)        |
| 2           | Option module (not available)                           |
| 3           | Option module (not available)                           |
| 4           | Option module (not available)                           |
| 5           | Interrupt Controller and ThinWire Ethernet ID ROM (SYS) |
| 6           | Tape Controller. (TPC)                                  |
| 7           | Disk conroller. (HDC)                                   |
| 8           | Interval timer. (IT)                                    |
| 9           | Floating point unit. (FP)                               |
| A           | Memory management unit. (MM)                            |
| B           | Memory. (MEM)   |
| C           | DZ Controller. (DZ)                                     |
| D           | Non-volatile RAM. (NVR)                                 |
| E           | Time-of-year dock. (CLK)                                |
| F           | Base video (MONO) (VAXstation 2000 only)                |

### 2.3.2.1 Self-test with Loopback Connectors

Customer mode self-test does not test the drivers or the lines of the serial line controller (DZ) since loopbacks are not used. Run self-test in field service mode to test the DZ drivers by installing the loopback connectors on the back of the system. Follow one of the procedures below.

To test the DZ on VAXstation 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and a loopback (p/n 29-24794) on the 9-pin printer port. Run TEST C. You cannot use loopback connectors if you are using the diagnostic console device with the BCC08 cable on the printer port since there is no loopback connector for the video port.

To test the DZ on MicroVAX 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and install an MMJ loopback on both ports 2 and 3. Run TEST C.

**NOTE:** *The ThinWire Ethernet port on the back of the system box must be terminated properly when running diagnostics on the network option (TEST 1) otherwise an error code of 0000.7001 or greater is listed in the configuration table.*

### 2.3.2.2 Self-test Error Codes

Figure 2-7 shows how an error is displayed if found during self-test. This example shows an error on the disk controller during self-test. The 84 FAIL indicates an error was found on the device tested. You must display the configuration table (TEST 50) after self-test is complete to see the error code, if there is an error during self-test, since the error codes do not appear on the screen. The configuration table lists every device in the system, lists the results of the self-test and power-up tests, and is updated each time self-test is run. The error codes for each device in the configuration table are explained in the troubleshooting section for that individual device. Remember that the configuration table contains the results of the self-test and power-up tests and not the results of the system exerciser. See Paragraph 2 5 1 for an explanation of the configuration table.

## Figure 2-7: Example of a Self-test Error on the Disk Controller

```
>>> TEST 7
7?..
84 FAIL
>>>
(You must display the configuration table to see the error code)
```

### 2.3.3 System Exerciser Diagnostics

The system exerciser simulates a worst-case situation test for each device and checks how the device operates under these conditions. It does not use the configuration table to list its results of the tests. The system exerciser has a separate display that appears on the screen as the exerciser is running. Any errors found are displayed in the exerciser display. When examining the exerciser display, a single question mark in the far left column indicates a soft error, a double question mark indicates a hard error, and the absence of question marks indicate success. [Figure 2-8](#) shows an example of the exerciser display.

The system exerciser exercises most of the devices. However, some devices such as the memory management unit (MM) and the interval timer (IT) are tested through the testing of other devices and are not displayed. Of the devices the exerciser does exercise, it runs each one sequentially until all have been run once, then it runs them all at the same time (worst-case). This type of testing usually finds any intermittent failures.

The system exerciser has two modes: customer mode and field service mode. Customer mode system exerciser (TEST 0) does not use loopback connectors and does not fully test all of the devices. Field service mode system exerciser requires loopback connectors installed and removable media from the maintenance kit inserted and loaded. You must initialize the floppy diskette in the maintenance kit with a special diagnostic key so the exerciser can perform write tests on the RX33. Refer to Paragraph 2.5.11 for more Information on creating the special diagnostic keys. Once the floppy has been initialized, load it into the RX33 (if a full read/write test of the RX33 is necessary) before you run the system exerciser in field service mode. You must also initialize the COMPACTape cartridge in the maintenance kit with a special diagnostic key so the exerciser can perform read/write tests on the TK50. Refer to Paragraph 2.5.11 for more information on creating the special diagnostic keys. Once the COMPACTape cartridge has been initialized, load it into the TK50 (if a full read/write test of the TK50 is necessary) before you run the system exerciser in field service mode. If the RX33 or the TK50 are not loaded with the special-key media, the system exerciser does not do destructive writes to them and tests them the same as it does during the customer mode system exerciser. This special-key on the media prevents the exerciser from accidentally destroying data on the customers floppy diskette or COMPACTape cartridge. The field service mode system exerciser is available in a run once (TEST 101) and a run forever (TEST 102) configuration.

2.3.3.1 System Exerciser Diagnostic Commands

Table 2-4 lists the system exerciser diagnostic commands.

Table 2-4: System Exerciser Diagnostic Commands

| Test Commands | Description of Commands  |
|---------------|--|
| 0             | Runs customer mode system exerciser. It exercises each device once sequentially, then exercises them simultaneously, and stops when the slowest device finishes its second pass. No loopback connectors and no removable media required.   |
| 101           | Runs field service system exerciser. It exercises each device once sequentially, then exercises them simultaneously, and stops when the slowest device finishes its second pass. Do not stop the exerciser before it finishes exercising every device twice (second pass). Loopbacks and removable media required.   |
| 102           | Runs field Service system exerciser. It exercises each device once sequentially and then exexcises them simultaneously until you enter a <b>[CTRL] - [C]</b> . Note that the exerciser takes up to thirty seconds to stop after you enter <b>[CTRL] - [C]</b> . Do not stop the exerciser until every device is exercised twice (second pass). Also, do not press the halt button to stop the exerciser. Loopbacks and removable media required. |

When the exerciser is started, PRA0 is displayed and the monitor connected to the video port on the VAXstation 2000 blinks white and black several times while the monochrome circuits are being tested. The results of the MONO tests are then displayed on the console screen. MicroVAX 2000 does not use the MONO circuits and, therefore, does not test them. The DZ test results are the first to be displayed on the console screen. The rest of the devices are then exercised one at a Urne and the results are listed on the display. The console displays the results of each device until the last device is finished testing. When the last device is done, the exerciser starts running all devices together at the same time. When this happens, the monitor connected to the video port starts blinking again until the slowest device finishes testing. On the MicroVAX 2000, the console terminal holds the first pass display until the slowest device is done testing then displays a new exerciser display. The console screen (VAXstation 2000 and MicroVAX 2000) displays the results of each device tested. This display stays on the screen for about 10 seconds, then the exerciser starts running all devices together again if TEST 102 was entered. If TEST 0 or TEST 101 was entered, the exerciser stops after the slowest device is done testing. The halt message is displayed when the exerciser is stopped.

To run the field service mode system exerciser on VAXstation 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and a loopback (p/n 29-24794) on the 9-pin printer port. Insert and load the floppy diskette and TK50 COMPACTape cartridge from the maintenance kit if the system has these devices installed. Run the exerciser by entering TEST 101 or TEST 102. If you are using the diagnostic console device, you will get errors on the DZ line since there is no



loopback for the video port.

To run the field service mode system exerciser on MicroVAX 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and install an MMJ loopback on both ports 2 and 3. Insert and load the scratch floppy diskette and scratch TK50 COMPACTape cartridge from the maintenance kit if the system has these devices installed. Run the exerciser by enter ing TEST 101 or TEST 102. If the scratch floppy or TK50 cartridge is not installed, the system tests those devices the same as in customer mode.

2.3.3.2 System Exerciser Error Codes

Figure 2-8 shows an example of the system exerciser display while running the system exerciser in field service mode. Customer mode gives the same display, but with a CU in place of the FS on the top of the display.

Figure 2-8: System Exerciser Display Example

```
KA410-A V1.0           01      FS

  F  00B0    MONO    0000.0001      2      0 00:00:55.01
  C  0080    DZ      0000.0001      5      0 00:01:28.03
  B  0010    MEM     0175.0001      2      0 00:02:03.07
  7  0090    HDC     2000.0001      4      0 00:02:08.58
?      0700.7091      0 00:02:08.58
??     1002.0051      0 00:01:03.45
      2500.0001
  6  00A0    TPC     1000.0001      9      0 00:02:44.04
      1300.0001
?? 1  00C0    NI     0000.7004      3      0 00:04:46.32

>>>
```

(The error codes are defined in the troubleshooting procedures for each individual device)

The first line indicates the CPU name (KA410-A), the ROM version (V1.0), the ROM Status (01 – the ROM is corrupted if this is anything other than 01), and the mode of the system exerciser (CU for customer and FS for field service mode). The next several lines list information on the devices that are exercised by the system exerciser.

The first column of the display lists the test number (F,C,B,7,6,1). TESTS 4 through 1 are option modules and these options may not be installed. They are listed in the display only if they are installed. The second column lists the device identifier (00B0, 0080, 0010,...). Next is the mnemonic for each device (MONO, DZ, MEM,...) followed by the error code (0000.0000) for that device (the HDC and TPC devices have additional error codes for each drive). After the error

code is the number of times the device was tested followed by the time of the last pass the exerciser made on that device. The time is in the format of days hours:minutes:seconds.hundredths of seconds. Question marks identify hard (??) and soft (?) errors. See the troubleshooting procedures ([Paragraph 2.4](#)) for the device that has an error detected with it.

## **2.4 Troubleshooting Procedures**

Each section below contains troubleshooting information for the device indicated. Find the section below with the mnemonic (such as MONO or TPC) that you want to troubleshoot. Once the section is located, read through the procedures to familiarize yourself with the testing of the device.

### **2.4.1 MONO – Monochrome Video Troubleshooting Procedures (VAXstation 2000 only)**

You can troubleshoot the monochrome circuitry on the system module in either customer mode or field service mode. Both modes test the monochrome circuits the same. This procedure does not troubleshoot the video monitor, just the video circuits on the system module.

#### **2.4.1.1 Self-test**

To run self-test on MONO, enter TEST F. The monitor connected to the video port blinks white and black several times. This is normal. The results of the self-test are displayed when self-test is complete. Any error code other than 0000.0001 indicates a fault in the monochrome video circuits. You must replace the system module to fix this problem.

#### **2.4.1.2 System Exerciser**

To run the system exerciser, enter TEST 0 for customer mode or TEST 101 for field service mode. The monitor connected to the video port blinks white and black several times while the monochrome circuits are being tested. The results of the MONO tests are displayed on the console screen after they are tested for the first time, then displayed again after each concurrent testing. Any error code other than 0000.0001 indicates a fault in monochrome video circuits. You must replace the system module to fix this problem. This device is not exercised on the MicroVAX 2000 system since MicroVAX 2000 does not use video monitors.

## **2.4.2 CLK – Time-of-Year Clock Troubleshooting Procedures**

You can troubleshoot the CLK circuitry in either customer mode or field service mode. Both modes test the CLK circuits the same.

### **2.4.2.1 Self-test**

To run self-test, enter TEST E. Any error code other than 0000.0001 indicates a fault in the CLK circuits. An error code of 0000.0005 indicates that the system time is not set. Refer to the operating system software documentation to set the time. If any other error code appears in the CLK error display, you must replace the system module.

The system exerciser does not display the Status of the CLK circuits. The CLK circuits are not directly tested but are tested through the testing of other circuits.

## **2.4.3 NVR – Non-Volatile RAM Troubleshooting Procedures**

You can troubleshoot the NVR circuitry in either customer mode or field service mode. Both modes test the NVR circuits the same.

### **2.4.3.1 Self-test**

To run self-test, enter TEST D. Any error code other than 0000.0001 indicates a fault in the NVR. An error code of 0000.0005 indicates that the battery charge is below the normal voltage level. If the battery is low, allow the system to charge the battery for five minutes and then run TEST D again. If the error code is still 0000.0005, replace the battery. A charging time of 20-25 hours is needed to fully charge the battery. Leaving the system powered up charges the battery. If any other error code appears in the CLK error display, you must replace the system module.

The system exerciser does not display the status of the NVR circuits. The NVR circuits are not directly tested but are tested through the testing of other circuits.

## **2.4.4 DZ – Serial Line Controller Troubleshooting Procedures**

You can troubleshoot the DZ in either customer mode or field service mode. The difference between the two modes is that field service mode tests the serial line drivers on the system module and customer mode does not.

#### **2.4.4.1 Self-test**

To run customer mode self-test on either the VAXstation 2000 or the MicroVAX 2000, enter TEST C. Loopback connectors must not be installed when in customer mode. Loopback connectors must, however, be installed to run field service mode diagnostics. Any error code other than 0000.0001 indicates a fault in the DZ controller. You must replace the system module to fix the problem. If you are using the diagnostic console device, any error code other than 0000.4001 indicates a fault in the DZ controller.

##### **VAXstation 2000**

To run self-test in field service mode on VAXstation 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and a loopback (p/n 29-24794) on the 9-pin printer port. Enter TEST C. If the error code is not 0000.0001, check to see if the loopbacks are still connected. Reconnect them, if necessary, and test again. Replace the system module if the error still exists. Loopbacks cannot be used to test the DZ controller when the console device is the diagnostic console with the BCC08 cable since there is no loopback for the video port.

##### **MicroVAX 2000**

To run self-test in field service mode on MicroVAX 2000, install a loop back (p/n 29-24795) on the 25-pin communication port and install an MMJ loopback on both ports 2 and 3. Enter TEST C. If the error code is not 0000.0001, check to see if the loopbacks are still connected. Reconnect them, if necessary, and test again. Replace the system module if the error still exists.

#### **2.4.4.2 System Exerciser**

To run the customer mode system exerciser on either the VAXstation 2000 or the MicroVAX 2000, enter TEST 0. The results are displayed on the video screen as the tests are completed.

##### **VAXstation 2000**

To run the field service mode system exerciser on VAXstation 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and a loopback (p/n 29-24794) on the 9-pin printer port. Enter TEST 101. If you are using the diagnostic console device, you will get errors on the DZ line since there is no loopback for the video port. Any error code other than 0X00.0001, where X is the serial line being used for the console device, indicates a fault in the DZ controller. You must replace the system module to fix the problem. If the console device is connected to the video port on VAXstation 2000, then you will see a 0 (zero) in the X position. If the console device is the diagnostic console device with the BCC08 cable on the printer port, then you will see a 3 in the X position. If the error code is not 0X00.0001, check to see if the loopbacks are still connected. Reconnect them, if necessary, and test again. Replace the system module if the error still exists.

## MicroVAX 2000

To run the field service mode system exerciser on MicroVAX 2000, install a loopback (p/n 29-24795) on the 25-pin communication port and install an MMJ loopback on both ports 2 and 3. Enter TEST 101 or TEST 102. Any error code other than 0X00.0001, where X is the serial line being used for the console device, indicates a fault in the DZ controller. You must replace the system module to fix the problem. With the console device connected to port 1 on the MicroVAX 2000, you will see a 0 (zero) in the X position. If the error code is not 0X00.0001, check to see if the loopbacks are still connected. Reconnect them, if necessary, and test again. Replace the system module if the error still exists. If the error still exists after replacing the system module, replace the DEC423 converter on the back of the system box.

## 2.4.5 MEM – Memory Troubleshooting Procedures

You can troubleshoot memory in either customer mode or field service mode. Both modes test the MEM circuits the same. These procedures are for both VAXstation 2000 and MicroVAX 2000.

### 2.4.5.1 Self-test

To run self-test, enter TEST B. Any error code other than 000X.0001, where X is the size of memory (megabytes) in the system, indicates a fault in the memory circuits. The problem could either be with the system module or the memory Option module. To determine which module is at fault go to [Paragraph 2.5.1.2](#).

### 2.4.5.2 System Exerciser

To run the system exerciser, enter TEST 0 for customer mode or TEST 101 for field service mode. [Figure 2-9](#) shows what the MEM system exerciser error code indicates. The status portion of the code indicates the number of pages tested during the last test pass (1 page = 512 bytes) if there were no errors found.

### Figure 2-9: Example of MEM System Exerciser Error Code

```
.  
. B   0010      MEM       0175.0001        2    0 00:02:03.07  
.  
.  
.  
.  
.  
     |         |  
     |         |-- Error code. 0001 = GOOD  
     |  
     |----- Status code. Number of  
                pages of memory tested  
                when error code is 0001.
```

An error code of .0001 indicates no errors. If errors were detected during the last test pass, the error portion of the code contains the error code. [Table 2-5](#) lists the MEM system exerciser errors and shows which module is causing the error.

### Table 2-5: MEM System Exerciser Error Codes

| Error Codes | Definition                         |
|-------------|------------------------------------|
| 0001.001F   | Compare error on the system module |
| 0002.001F   | Compare error on the Option module |
| 0001.002F   | Parity error on the system module  |
| 0002.002F   | Parity error on the Option module  |

## 2.4.6 MM – Memory Management Unit Troubleshooting Procedures

You can troubleshoot the memory management (MM) circuitry in either customer mode or field service mode. Both modes test the MM circuits the same.

#### 2.4.6.1 Self-test

To run self-test, enter TEST A. Any error code other than 0000.0001 indicates a fault in the memory managment circuits. You must replace the system module to fix the problem.

The system exerciser does not display the status of the MM circuits. The MM circuits are not directly tested but are tested through the testing of other circuits.

## **2.4.7 FP – Floating Point Unit Troubleshooting Procedures**

You can troubleshoot the floating point (FP) circuitry in either customer mode or field service mode. Both modes test the FP circuits the same.

### **2.4.7.1 Self-test**

To run self-test, enter TEST 9. Any error code other than 0000.0001 indicates a fault in the floating point circuits. You must replace the system module to fix the problem.

The system exerciser does not display the status of the FP circuits. The FP circuits are not directly tested but are tested through the testing of other circuits.

## **2.4.8 IT – Interval Timer Troubleshooting Procedures**

You can troubleshoot the interval timer (IT) circuitry in either customer mode or field service mode. Both modes test the IT circuits the same.

### **2.4.8.1 Self-test**

To run self-test, enter TEST 8. Any error code other than 0000.0001 indicates a fault in the timing circuits. You must replace the system module to fix the problem.

The system exerciser does not exercise the IT circuits.

## **2.4.9 HDC – Disk Drives and Controller Troubleshooting Procedures**

You can troubleshoot the disk controller and drives using self-test and the system exerciser. These diagnostics test the disk controller on the system module and also test the drives connected to the controller. There is a maximum number of three drives that can be supported in either a VAXstation 2000 or a MicroVAX 2000. The three drives are labelled DUA0, DUA1, and DUA2. DUA0 will always be the hard disk drive (RD) located in the system box. DUA0 can be a full-height or a half-height drive. DUA1 will always be the hard disk drive (RD) located in the expansion box. DUA1 communicates to the system module through port B on the expansion adapter; thus allowing you to isolate DUA1 during testing, if necessary, without opening the system box. DUA2 will always be the half-height floppy disk drive (RX33) and will only be located in the system box. If DUA0 is a full-height drive, then a floppy disk drive cannot be installed because of lack of space in the system box. The disk controller labels any drive off-line that is not installed. It also labels DUA2 off-line if a floppy diskette is not properly loaded.

#### 2.4.9.1 Self-test

To run self-test on the HDC, enter TEST 7. Self-test gives a quick status of the disk controller on the system module and the drives. You can run self-test in either customer mode or field service mode since both modes test these devices the same. The error code for the disk controller (HDC in the configuration table) contains the test results of the disk controller and the status of the three drives. [Figure 2-10](#) shows how the error code is broken into five segments: status of DUA2, DUA1, DUA0, tape controller, and the error code if a hard error is found. The power-up error code is the same as the self-test error code.

### Figure 2-10: HDC Power-up and Self-test Error Code

```
7 0090 0000.0000
||||| | |
||||| | _'
||||| | 
||||| \----> These four digits echo the first four digits
||||| if a hard error is found on the disk
||||| controller. Otherwise, 0001 = Good.
||||| 
|||\-----> Status of disk controller on system module.
||| 0 = Good.
||| 
|||\-----> Status code for DUA0, listed in Table 2-6.
||| 
|||\-----> Status code for DUA1, listed in Table 2-6.
||| 
||\-----> Status code for DUA2, listed in Table 2-6.
```

DUA0 is the hard disk drive in the system box.  
DUA1 is the hard disk drive in the expansion box.  
DUA2 is the floppy drive in the system box.

Each drive has the same set of error codes. These codes are listed in [Table 2-6](#). All odd-numbered error codes are soft errors or a status. All even-numbered error codes (including A and F) are hard errors. The last four digits of the error code repeat the first four digits if a hard error is found on the disk controller. Otherwise, the last four digits contain 0001 to indicate no errors or soft errors.



**Table 2-6: Power-up and Self-test Error Codes for each Disk Drive**

| Error Codes | Description of error codes for each disk drive  |
|-------------|---|
| 1           | Good – No error for this drive.   |
| 2           | Drive select error. Disk controller or the drive failed. Replace the system module first. Replace the drive if the problem is not fixed after replacing the system module.  |
| 3           | Read during read test error. The disk or diskette may not be formatted. Run the disk verifier to check out the disk. Copy the disk data onto another disk or to another system over the net if you have to reformat the drive.  |
| 4           | Read after write error. Drive failed. Replace the drive first. Replace the system module if the problem is not fixed after replacing the drive.   |
| 5           | Invalid UIB (DUA0 and DUA1 only). Disk needs formatting or the disk is not a Digital disk. Run the disk verifier to check out the disk. Copy the disk data onto another disk or to another system over the net if you have to reformat the drive.   |
| 6           | Drive failed to restore. Drive failed. Replace the drive first. Replace the system module if the problem is not fixed after replacing the drive.  |
| 7           | Off-line — No drive installed, no floppy diskette loaded in DUA2, or DUA1 (in expansion box) is not turned on.  |
| 8           | Drive not done error. Drive failed. Replace the drive first. Replace the system module if the problem is not fixed after replacing the drive.   |
| 9           | Invalid Status from controller. Disk controller or diskette failed. If DUA0 or DUA1, replace the system module first then replace the disk drive if the problem is not fixed after replacing the system module. If DUA2, replace the floppy diskette first or save the data on it and reformat it. If DUA2 and the floppy diskette is not the problem, replace the system module and then replace the floppy disk drive if replacing the system module did not fix the problem. |
| A           | Drive select timeout error. Drive failed. Replace the drive first. Replace the system module if the problem is not fixed after replacing the drive.   |
| F           | Untested – Drive was not tested because of a hard error found on the disk controller. For example, FFF8.FFF8 indicates an error on the disk controller and no drives were tested. Replace the system module.  |

If any error (except 7 and F) appears for any drive, check the drive for power and check the cables for a good connection. If the error still exists, the problem is either in the drive, in the cables, in the system module, or in the disk interface module located in the expansion adapter. If, for example, you replace one of the disks to fix an error code and the error still exists, replace the system module. If the system module does not fix the problem replace the disk interface module.

2.4.9.2 System Exerciser

Start the system exerciser by entering TEST 0 for customer mode or install the 25-pin loopback on the communications port and enter TEST 101 for field service mode. The customer mode system exerciser does not exercise the disks as thoroughly as the field service exerciser. The field service system exerciser performs a complete read/write test on all drives and also performs a data transfer test between the disk controller and one of the drives.

The results of the system exerciser are displayed on the screen after the first test pass of each device tested and again after all devices have been run concurrently. [Figure 2-11](#) shows the system exerciser display for the disk controller (HDC). There is one line for the controller Status and one line for each drive connected to the controller. A drive that is not installed or is off-line is not listed in the display. For example, no diskette in DUA2 or an unformatted diskette in DUA2 labels DUA2 as off-line and no display for DUA2 is listed. If there are two question marks on the controllers line, replace the system module. If there is a single question mark on the drive's line, there is a soft error in the drive and the drive may operate normally. Two question marks on the drive's line indicate a hard error in the drive or an error in the controller. You must replace one or both to fix the error. Two question marks for DUA2 may also indicate bad media on the floppy diskette.

Figure 2-11: Example of System Exerciser Display for the Disk Controller

```
.
.
.
7  0090      HDC      1000.0001      2      0 00:02:09.47
                        0700.0001
                        1700.0001
                        2500.0001
.
.
.
```

[Table 2-7](#) lists the error codes for the disk controller's line and [Table 2-8](#) lists the error codes for the drives.

**Table 2-7: HDC Disk Controller System Exerciser Error Codes**

| Error Codes | Possible Cause  | Corrective Action  |
|-------------|---|--|
| X000.0001   | The X indicates the drive used for the data transfer test   | 0 = DUA0, 1 = DUA1, 2 = DUA2, and F = no data transfer test was done.  |
| 0X00.0001   | Data transfer error if X is anything other than zero  | Replace the system module. If the error still exists after replacing the system module, replace the drive that was used for the data transfer test. Always replace the drive's device electronics board (hard disk drives only) before replacing the whole drive.  |
| 00XX.0001   | The XX indicates the number of errors detected during the data transfer test. Make note of the drive used for the data transfer test. | Run the exerciser again. Was the same drive used for the transfer test?<br>If yes, and the number of transfer errors are the same (or close to the same), replace system module. Replace the drive that was used for the data transfer test if replacing the system module did not fix the problem.<br>If no, and the number of transfer errors are zero, replace the drive that got errors during the data transfer test. Always replace the drive's device electronics board (hard disk drives only) before replacing the whole drive. |
| 0000.XXX1   | Controller error.   | If XXX is anything other than 000 (three zeros), replace the system module.  |

**Table 2-8: HDC Disk Drive System Exerciser Error Codes**

| Error Codes | Possible Cause  | Corrective Action   |
|-------------|---|---|
| X000.0001   | The X position indicates the drive that this error code is for.                   | 0 = DUA0, 1 = DUA1, and 2 - DUA2.   |
| 0X00.0001   | The X position indicates the drive Status.  | The X position indicates drive status as listed below.<br>DUA0 and DUA1:<br>7 writeable, formatted, UIB and RCT ok<br>5 writeable, formatted, no UIB and RCT<br>4 writeable, unformatted, no UIB and RCT<br>3 non-writeable, formatted, UIB and RCT ok<br>1 non-writeable, formatted, no UIB and RCT<br>0 non-writeable, unformatted, no UIB and RCT<br>DUA2:<br>5 writeable and formatted<br>4 writeable and unformatted<br>1 non-writeable and formatted<br>0 non-writeable and unformatted |
| 00XX.0001   | The XX position indicates the drive error count. 00 indicates no error.           | Run the exerciser again. Note the error count for the failing drive after each pass. If the count stays the same or increases, replace the failing drive. If the error still exists after replacing the drive, replace the system module. Always replace the drive's device electronics board (hard disk drives only) before replacing the whole drive.   |
| 0000.XXX1   | The XXX position indicates the error codes for the drive. 000 indicates no error. | If anything other than zeros (0001), replace the system module. Replace the drive if replacing the system module did not fix the problem. Always replace the drive's device electronics board (hard disk drives only) before replacing the whole drive.   |

### 2.4.9.3 Troubleshooting the Hard Disk Drive Expansion Box

Troubleshoot the hard disk in the expansion box (DUA1) using self-test and the system exerciser. However, if the diagnostic tests indicate an error on DUA1, perform the steps in the following procedure.

1. Check to make sure the expansion box has power to it and it is switched on.
2. Check to make sure the hard disk cable is properly connected to port B on the expansion adapter and the back of the expansion box.
3. Run the tests again and if the status code shows DUA1 to be off-line, troubleshoot the power supply in the expansion box.
4. Disconnect the cable from port B on the expansion adapter and run self-test (TEST 6). If any status other than the off-line indication (7) or the not tested indication (F) shows up in the status code for DUA1, then replace the disk controller on the system module.
5. If the status code does show that DUA1 is off-line after disconnecting it from port B, check the drive select jumpers on DUA1 for proper positioning. Refer to [Paragraph 2.4.9.4](#) below for proper drive select jumper settings.
6. If the drive select jumper is set properly, replace DUA1 in the disk expansion box. Always replace the drive's device electronics board before replacing the whole drive.

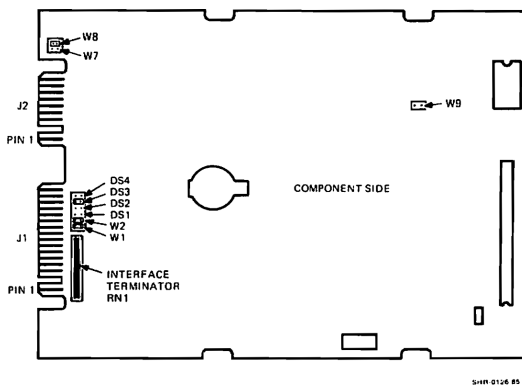
### 2.4.9.4 Drive Select Jumper Settings on Disk Drives

DUA0 – Refer to [Figure 2-12](#) to set the drive select jumper on an RD32 in the system box. Refer to [Figure 2-13](#) to set the drive select jumper on an RD53 in the system box.

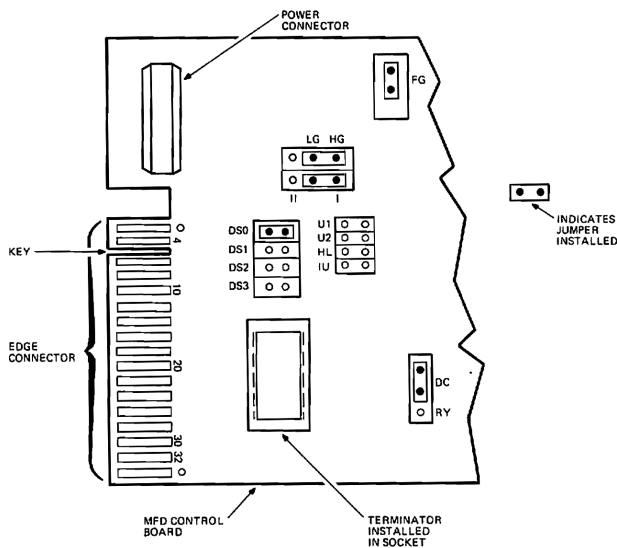
DUA1 – Refer to [Figure 2-13](#) to set the drive select jumper on an RD53 in the expansion box.

DUA2 – Refer to [Figure 2-14](#) to set the drive select jumper on an RX33 in the system box.

## 2-28 VAXstation 2000 and MicroVAX 2000 Maintenance Guide



**Figure 2-14: RX33 Drive Select Jumper Setting for DUA2**



## 2.4.10 TPC – Tape Drive Controller Troubleshooting Procedures

You can troubleshoot the tape drive Controller on the system module and the tape drive controller in the expansion box using self-test or the system exerciser. The tape drive expansion box has an internal self-test to troubleshoot the TK50 tape drive as described in [Paragraph 2.4.10.3](#).

These troubleshooting procedures assume that only one tape expansion box is connected to the tape port (port A) on the expansion adapter. Although the diagnostic firmware located in ROM supports up to seven devices on port A of the expansion adapter, we will only cover how to troubleshoot one tape expansion box since the VMS and ULTRIX operating systems support only one tape expansion box on either system. Also, the tape expansion box must be configured for ID address 1 on the tape port.

### 2.4.10.1 Self-test

To run self-test, enter TEST 6. Self-test gives a quick status of the tape controller on the system module and also the tape drive expansion box connected to the tape controller via port A of the expansion adapter. You can run self-test in either

customer mode or field Service mode since both modes test these devices the same. Enter TEST 50 to see the results of the self-test. The TPC error code contains the test results of the tape controller on the system module and the tape drives connected to port A on the expansion adapter. Figure 2-15 shows how the TPC error code is broken into five segments: ID addresses of devices connected to the tape port, ID addresses of the devices that tested successfully, two possible cause indicators, and a status of the tape controller.

**Figure 2-15: TPC Power-up and Self-test Error Code**

```

6  00A0 0000.0000
    |||  |||
    \ \  \ \
    | |  | |  \--> Status of tape controller on system module.
    | |  | |      01 = Good.
    | |  | |
    | |  | |  \-----> Possible cause indicator.
    | |  | |      0 = Good.
    | |  | |      1 = Error most likely on system module.
    | |  | |      2 = Error most likely in expansion box.
    | |  | |      3 = Error could be in either location.
    | |  | |  \-----> Possible cause indicator.
    | |  | |      0 = Good.
    | |  | |      1 = Retest TPC again.
    | |  | |      2 = Error most likely in expansion box.
    | |  | |      3 = Combination of 1 and 2.
    | |  | |      4 = DMA and interrupts not tested.
    | |  | |      5 = Combination of 1 and 4.
    | |  | |      6 = Combination of 2 and 4.
    | |  | |      7 = Combination of 1, 2, and 4.
    | |  | |
    | |  | |  \-----> Status of the tape expansion box. The
    | |  | |      ID address of the expansion box is
    | |  | |      displayed here if it tested
    | |  | |      diccessfully. These two digits should
    | |  | |      be the same as the first two digits.
    | |  | |      00 = No box connected to port A or
    | |  | |      no box tested successfully.
    | |  | |      02 = ID Address 1
    | |  | |      04 = ID Address 2
    | |  | |      08 = ID Address 3
    | |  | |      10 = ID Address 4
    | |  | |      20 = ID Address 5
    | |  | |      40 = ID Address 6
    | |  | |      80 = ID Address 7
    | |  | |
    | |  | |  \-----> ID Address (shown above) of the tape
    | |  | |      expansion box that is connected to
    | |  | |      port A.

```



A status code of 0000.4001 indicates a good status for the tape controller when no devices are connected to port A. If there is a tape expansion box connected to port A and the status code is 0000.4001, then the controller does not recognize it or it is not powered up.

If the second two digits of the status code shown in [Figure 2-15](#) (good devices) do not match the first two digits (connected devices), then there is a communication problem between the tape expansion box and the system. Disconnect the cable from port A on the expansion adapter and run self-test again. If the status code for TPC now contains anything other than 0000.4001, replace the system module. Otherwise, if the status code is 0000.4001, reconnect the cable to port A and make sure the tape expansion box is powered up. Run self-test again. If the status code for TPC is not 0202.0001 after reconnecting the cable, run the system exerciser to thoroughly test the tape controller and the tape expansion box. If the error code is 0202.0001 after reconnecting the tape expansion box, the tape Controller and the expansion tape box are operating properly. Note that there may be more than one tape expansion box on systems that run an operating system other than VMS or ULTRIX. This means that the status code may be 0606.0001 for two devices at ID address 1 and 2 or FEFE.0001 for all seven devices connected to the tape port. However, if the system does use VMS or ULTRIX, the tape expansion box at ID address 1 is the only device VMS and ULTRIX can communicate with.

#### **2.4.10.2 System Exerciser**

Start the system exerciser by entering TEST 0 for customer mode or install the 25-pin loopback on the communications port, load the COMPACTape cartridge with the special-key into the TK50, and enter TEST 101 for field Service mode. The customer mode system exerciser does not exercise the tape controller as thoroughly as the field Service exerciser. The field Service mode system exerciser performs a complete read/write test on the TK50 tape drive and also performs a data transfer test while the customer mode system exerciser does not test the TK50 tape drive at all.

The system exerciser runs a first pass test on MONO (VAXstation only), DZ, MEM, and HDC before it runs the first pass test on the TPC. The first pass test on the TPC tests the tape controller on the system module and checks the tape port for the presence of a tape expansion box only if the tape Controller is operating properly. If the tape controller on the system module tests bad, the error code for the tape controller lists an error and the tape port is not checked for the presence of the tape expansion box. The first pass test of the TPC does not perform any diagnostics or data transfer tests on the tape expansion box. The first pass test only checks whether or not the tape expansion box is there and whether or not it can communicate over the tape port to the tape controller. Complete data transfer and read/write (field Service mode only) testing is done on subsequent test passes. For example, in field Service mode with the Special keyed COMPACTape cartridge installed, the error code for the tape expansion box shows that the TK50 is not

writeable (1100.0001) during the first pass. However, the second pass shows that the TK50 is writeable (1300.0001) as long as the cartridge has a good Special key on it and the tape expansion box is operating properly. So you must wait for the system exerciser to complete at least two passes on the TPC to see if the tape expansion box is operating properly.

Figure 2-16 shows the system exerciser display for the TPC. There is one line for the status of the tape controller on the system module and one line for each tape expansion box connected to the tape port if it is powered up. The status of the tape controller is next to the TPC mnemonic (first line) and the status of the tape expansion box is listed under the status of the controller. An easy way of determining if any errors are detected is by looking for the question marks in the left column. If there are any question marks on the tape controllers status line, the tape controller is faulty and the error code identifies the problem. Refer to Table 2-9 to decipher the tape controllers error code and determine how to fix the problem. If there are any question marks on the tape expansion box's status line, the problem could be in either the tape expansion box, the tape expansion box cable, or the tape controller on the system module. An error that is listed in the tape expansion box's error code may be a data transfer error and thus does not isolate the problem to the tape expansion box; it may still be in the tape controller on the system module. Refer to Table 2-10 to decipher the tape expansion box's error code and determine how to fix the problem.

If errors are detected with the TPC, disconnect the tape expansion box cable from port A on the expansion adapter and run the test again. This procedure isolates the tape expansion box from the system box. If any errors appear in the tape controllers error code, the problem is with the tape controller and the system module must be replaced. Otherwise, the error is in the expansion box and you must run the internal self-test on the expansion box as described below.

**Figure 2-16: Example of System Exerciser Display for the Tape Controller**

```
.
.
.
6  00A0      TPC      1000.0001      2      0 00:03:18.26
                        1300.0001
.
.
.
```

Table 2-9 lists the system exerciser error codes for the controller's error line and Table 2-10 lists the system exerciser error codes for the tape drives error line.

**Table 2-9: TPC Tape Controller System Exerciser Error Codes**

| Error Codes | Possible Cause   | Corrective Action   |
|-------------|--|---|
| X000.0001   | This error code indicates no Controller error. The X indicates the transfer test drive number.                               | The X position indicates the tape drive that was used for data transfer testing. This number should be 1 if a tape expansion box is connected to the system and it is powered up. This number should be 8 if no tape expansion box is connected or if it is turned off. An F will always be in this position during the first pass of the exerciser. If the P is still in this position after the first pass is complete, a fatal error is detected in the tape controller on the system module and the tape expansion box is not tested. |
| 0X00.0001   | The X indicates a data transfer error if X is anything other than zero.  | Replace the system module. If the error still exists, replace the TK50 tape drive. Then if the error code still exists, replace the TZK50 controller board.   |
| 00XX.0001   | The XX indicates the number of data transfer errors detected. Make a note of the tape drive used for the data transfer test. | Run the exerciser again. Was the same drive used for the transfer test? If yes, and the number of transfer errors are the same (or close to the same), replace the system module. If no, and the number of transfer errors are zero or considerably less than before, replace the TK50 drive that was originally used for the transfer test. If the error code still exists, replace the TZK50 controller board.  |
| 0000.XXX1   | Controller error if any X is anything other than zero.   | Replace the system module.  |

**Table 2-10: Tape Drive Expansion Box System Exerciser Error Codes**

| Error Codes | Possible Cause   | Corrective Action   |
|-------------|--|---|
| X000.0001   | The X indicates the device ID address of tape expansion box.                                 | This device ID address can be 1, 2, 3, 4, 5, 6, or 7. It should normally be 1 unless the device ID address jumpers (P1, P2, P3) on the TZK50 controller board have been changed. It must never be 0. If a 0 is in this position, the device ID address jumpers are set to zero and they must be reset to another ID. The ID address must be 1 for systems running VMS or ULTRIX.  |
| 0X00.0001   | The X indicates the tape cartridge status.   | The X position indicates whether or not the device on the tape port has removeable or non-removeable media and also whether or not the device is writeable. 1 = removeable media, 2 = writeable, and 3 = removeable media and it is writeable. This digit should be a 1 or a 3 since the TK50 has removeable media. This digit should be a 1 in customer mode and a 3 in field Service mode if the special-keyed cartridge is installed and loaded in the TK50. Note that this digit can never be a 3 in field Service mode until a second pass test is done on the TPC since the system exerciser does not do a write test on the first pass.  |
| 00XX.0001   | The XX indicates the drive error count during the data transfer test. 00 indicates no error. | The error may be in the TZK50 controller board, the TK50 tape drive, or the tape controller on the system module. Run the exerciser again but with another tape expansion box, if possible, to determine if the error is on the tape controller or in the tape expansion box you removed. If the data transfer error still appears after replacing the tape expansion box, replace the system module. Otherwise, troubleshoot the tape expansion box as shown in <a href="#">Paragraph 2.4.10.3</a> below. If you do not have an other tape expansion box to swap out, replace the following FRUs one at a time and run the exerciser after each one is replaced until there are no more transfer errors. First, TZK50 controller board; second, TK50 tape drive; third, the system module. Remember that the TK50 tape drive is not tested in customer mode and is also not tested in field service mode if the special-keyed tape cartridge is not loaded in the TK50 tape drive. |

**Table 2-10 (Cont.): Tape Drive Expansion Box System Exerciser Error Codes**

| Error Codes | Possible Cause  | Corrective Action   |
|-------------|---|---|
| 0000.XXX1   | The XXX indicates the error codes. 000 indicates no errors. | If anything other than zeros (.0001) appear, Run the exerciser again but with another tape expansion box, if possible, to determine if the error is on the tape controller or in the tape expansion box you removed. If the error still appears after replacing the tape expansion box, replace the system module. Otherwise, troubleshoot the tape expansion box as shown in <a href="#">Paragraph 2.4.10.3</a> below. If you do not have another tape expansion box to swap out, replace the following FRUs one at a time and run the exerciser after each one is replaced until there are no more transfer errors. First, TZK50 controller board; second, TK50 tape drive; third, the system module. Remember that the TK50 tape drive is not tested in customer mode and is also not tested in field service mode if the special-keyed tape cartridge is not loaded in the TK50 tape drive. |

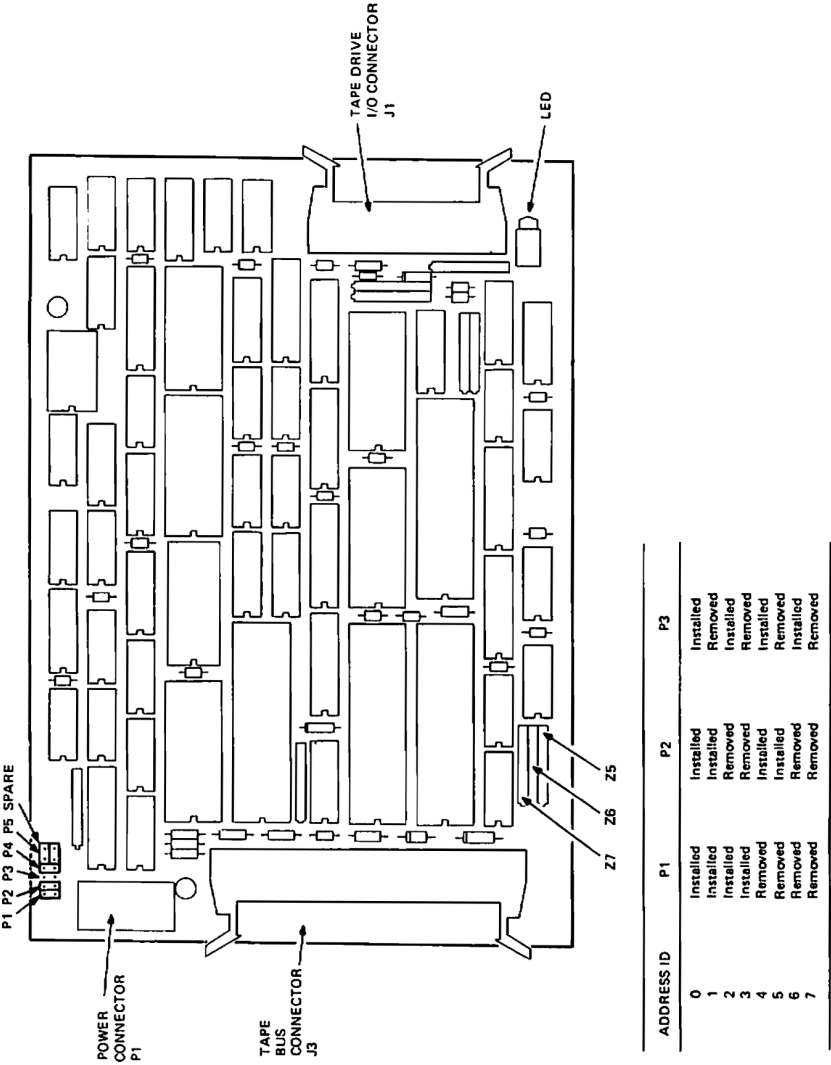
**2.4.10.3 Troubleshooting the Tape Expansion Box**

If the results for the TPC indicate a problem in the tape expansion box, the problem could be the TK50 tape drive, the TZK50 controller board, or the power supply. The TK50 tape drive performs an internal self-test every time the tape expansion box is powered up. The TZK50 controller also performs an internal self-test at power up. To do an in-depth self-test on the TK50 tape drive and the TZK50 controller board, follow the procedure below. Do each step indicated until you find and fix the problem.

1. Remove the tape drive expansion box cover.
2. Check all cables to make sure they are connected properly. Remove the shield to check the cables on the back of the drive. Note that there are two power cables connected to the resistor load board.
3. Check the jumpers on the TZK50 controller board for proper installation. Refer to [Figure 2-17](#) for jumper locations and tape port ID address confirmation. [Figure 2-17](#) shows the controller board set for ID address 1, with parity checking enabled, and internal diagnostics disabled. Make sure the three ID address jumpers (P1, P2, and P3) are set to ID address 1. Jumper P4 is the parity checking jumper and must be installed for normal operation. Jumper P5 is the diagnostic jumper and must not be installed for normal operation. Note the position of the spare jumper(s). Spare jumpers should be stored across P5 and one of the spare posts.

4. Check the three resistor network packs (Z7, Z6, and Z5) to make sure they are installed properly. If this expansion box is the only box connected to the tape port, these resistor network packs must be installed on this board. If this expansion box is not the only box connected to the tape port, then make sure the last box in the chain contains these resistor network packs and all other boxes in the chain have their resistor network packs removed.
5. Plug in the power cord and switch on power to the expansion box.
6. If the LED on the TZK50 controller board and on the TK50 tape drive do not light when power is first turned on or the fan does not turn, troubleshoot the power supply ([Paragaph 2.4.13](#)).
7. Watch the red light on the TK50 tape drive. It should shut off after five to six seconds after power up if no tape is installed. If it starts flashing, replace the TK50 tape drive. When a tape is installed, the red light stays lit.
8. Look at the LED on the TZK50 controller board. It turns on at power up, then turns off after two seconds. It must stay off once it turns off. If it does not stay off, replace the TZK50 controller board.
9. Insert and load a blank COMPACTape cartridge into the TK50 tape drive. Do not use the special-keyed cartridge from the kit or a cartridge that has good data, because the next few steps will erase the special key and the data on the cartridge. If you must use the special-keyed cartridge, reload the special key onto the cartridge using TEST 73 after you complete this procedure.
10. Switch off power to the expansion box.
11. Remove a spare jumper and install it onto P5. If there are two spare jumpers then both must be removed from their storage positions so one of them can be installed onto P5.
12. Switch on the power switch.
13. Wait about one minute for the test to finish. If the LED on the TZK50 controller board starts flashing during or at the end of the test, replace the TK50 tape drive. If the LED is on steady, replace the TZK50 Controller board. If the LED is off, the TZK50 controller board and the TK50 tape drive are operating properly. Note that the LED comes on again at the end of the test for about two seconds to indicate that the testing cycle has completed and is starting over again. The test will continue to cycle until the P5 diagnostic jumper is removed or power is switched off.

Figure 2-17: TZK50 Controller Board Jumper Locations



SHR-0282 86  
MA-0158 87

14. Replace the faulty component, if any, and retest.
15. Set up the jumpers on the TZK50 controller board for normal operation. Spare jumpers must be stored across P5 and one of the spare posts.
16. This concludes the troubleshooting procedures for the tape expansion box.

## **2.4.11 SYS – Interrupt Controller and ThinWire Ethernet ID ROM Troubleshooting Procedures**

You can troubleshoot the interrupt controller and ThinWire Ethernet ID ROM (SYS) in either customer mode or field service mode. Both modes test these circuits the same.

### **2.4.11.1 Self-test**

To run self-test, enter TEST 5. Any error code other than 0000.0001 or 0000.0100 indicates a fault in the interrupt Controller or the ThinWire Ethernet ID ROM on the system module. The 0000.0100 error code indicates that the keyboard is disconnected from the VAXstation 2000 systems. Replace just the ThinWire Ethernet ID ROM on the system module to fix an error code of 0000.0004. Replace the system module to fix any other error code. The replacement procedure for the system module instructs you to remove the Thinwire Ethernet ID ROM from the system module being removed and install it onto the new system module. If the ThinWire Ethernet ID ROM has been replaced for an error code of 0000.0004 and the same error code of 0000.0004 reappears when you retest, replace the system module instead of just the ThinWire Ethernet ID ROM.

The system exerciser does not display the status of the SYS circuits. The SYS circuits are not directly tested but are tested through the testing of other circuits.



## **2.4.12 NI – ThinWire Ethernet Network Option Troubleshooting Procedures**

You can troubleshoot the ThinWire Ethernet network option (NI) in either customer mode or field service mode. Both modes of self-test test the network option the same. The field service mode of the system exerciser does a more in-depth testing of the option. To troubleshoot the network option, run self-test (TEST 1) or run the system exerciser (TEST 0 for customer mode or TEST 101 for field service mode).

Self-test and the system exerciser test the network interconnect module, the ThinWire transceiver circuits on the system module, and also perform a loopback function on the ThinWire cable. All tests fail with an error code of 0000.7004 if the ThinWire cable is not connected to the back of the System box. An error code of 0000.7008 indicates the ThinWire cable is not terminated properly. Check the ThinWire cable first if any error code has a number seven in the fifth position (0000.7000). The seven in the fifth Position indicates a loopback error, but it does not exclude a problem on the network option inside the system box. An error code of 0000.0001 indicates no error and the network option is operational.

### **2.4.12.1 Self-test**

To run self-test, enter TEST 1. Any error code other than 0000.0001 indicates a fault in either the network interconnect module or on the ThinWire Ethernet cable. Note that positions 3 and 4 (00XX.0001) in the error code indicate the number of retries over the Ethernet cable before a success. If the error code is not 0000.0001, check the ThinWire Ethernet cable on the back of the system for proper connections and terminators. Reconnect the Thinwire cable and terminators, if disconnected, and test again. If the error code is 0000.7000 or above (for example, 0000.7001 or higher), disconnect the ThinWire T connector from the back of the system and install the T con nector with terminators from the service kit. Run the test again. If the error code is 0000.0001 after installing the T connector with both terminators, the problem is on the ThinWire Ethernet cable. Otherwise, if the error code is anything other than 0000.0001, replace the network interconnect module and test again with the T connector and both terminators installed. If the error code is still not 0000.0001 after repladng the network interconnect module, replace the system module.

### **2.4.12.2 System Exerciser**

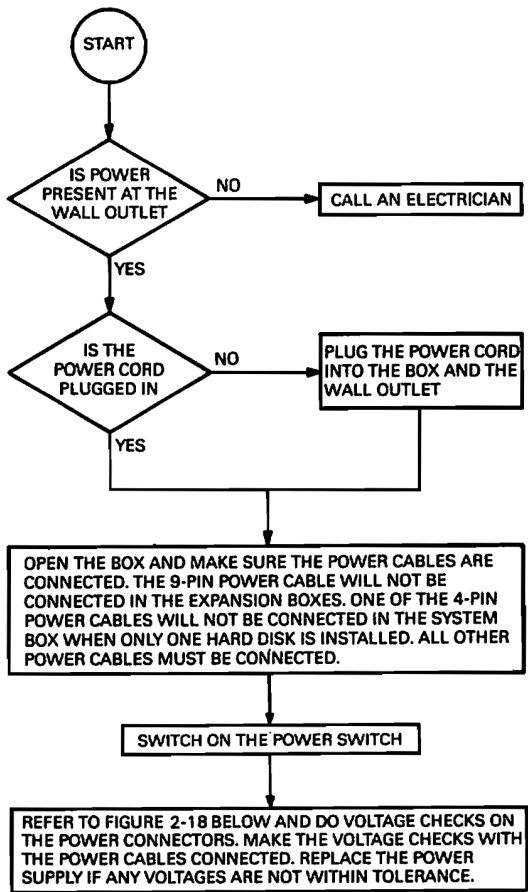
To run the system exerciser, enter TEST 0 for customer mode or TEST 101 for field service mode. Field service mode does a more in-depth test of the circuits. Any error code other than 0000.0001 indicates a fault in the network interconnect module or on the system module. Unlike the self-test for the network Option, the system exerciser does not do any testing over the ThinWire Ethernet cable. It only tests the internal circuitry. If the error code is not 0000.0001, replace the network interconnect module. If the error code is still not 0000.0001 after replacing the

network interconnect module, replace the system module.

### 2.4.13 Power Supply Troubleshooting Procedures

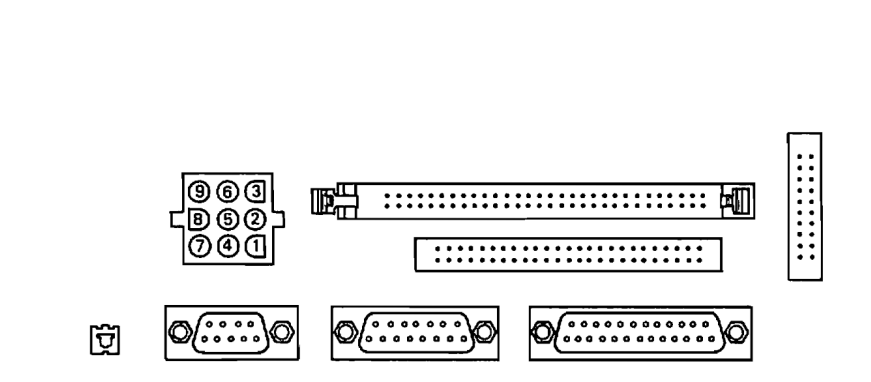
Follow the flowchart in [Figure 2-18](#) if a problem with the power supply in either the system box, hard disk expansion box, or tape drive expansion box exists. The flowchart is designed to troubleshoot the power supply in any of the three boxes.

**Figure 2-18: Flowchart for Troubleshooting the Power Supply**



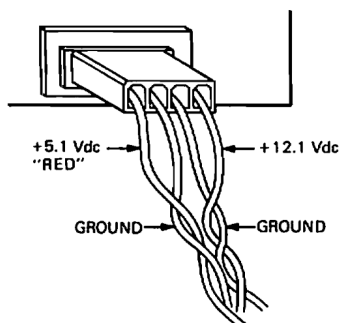
MA-0066-87

**Figure 2-19: Power Connectors Pin Voltages**



**CHECK VOLTAGE LEVELS WITH THE POWER CABLES CONNECTED!**

| PIN | VOLTAGE                 |
|-----|-------------------------|
| 1   | GROUND                  |
| 2   | GROUND                  |
| 3   | GROUND                  |
| 4   | -12.0 Vdc    -0.6 Vdc   |
| 5   | 5.1 Vdc       -0.25 Vdc |
| 6   | 5.1 Vdc       -0.25 Vdc |
| 7   | 12.1 Vdc      -0.60 Vdc |
| 8   | 9.0 Vdc TO PIN 9        |
| 9   | 9.0 Vdc TO PIN 8        |



MR-1286-1412  
MA-0156-87

# 2.4.14 VR260 Monochrome Monitor Troubleshooting Procedures

Table 2-11 lists some Symptoms of common problems with the VR260. When troubleshooting the VR260, follow the suggested corrective actions in the order listed.

Table 2-11: VR260 Troubleshooting Table

| Symptom                              | Corrective Action  |
|--------------------------------------|--|
| No LED; blank screen.                | Check the power cord connection.<br><br>Check the 120/240 Vac setting.<br><br>Check the fuse.<br><br>Remove the rear bulkhead assembly and check the connection to the transformer assembly.<br><br>Check the deflection board connections.<br><br>Replace the deflection board connections.   |
| Flashing LED.                        | Check the deflection board connections, including the chassis ground.<br><br>Make sure the high-voltage anode lead has a good connection with the CRT.<br><br>Replace the deflection board.  |
| Compressed raster; no video display. | Make sure the monitor cable is connected between the system and the monitor.<br><br>Adjust the contrast and brightness adjustments.<br><br>Run the monochrome video diagnostics (TEST F). If a failure is indicated, replace the System module in the system box before proceeding with troubleshooting the VR260.<br><br>Remove the rear bulkhead assembly and check the cable connections to the video amp board.<br><br>Remove the video amp board and check the CRT pin connections.<br><br>Replace the video amp board. |
| Raster; no video display.            | Run the monochrome video diagnostics (TEST F). If a failure is indicated, replace the system module in the System box before proceeding with troubleshooting the VR260.<br><br>Ensure good CRT connections.<br><br>Replace the video amp board.  |

**Table 2-11 (Cont.): VR260 Troubleshooting Table**

| Symptom                                  | Corrective Action   |
|--|---|
| No LED but good video display.           | Remove the LED bezel assembly and check for a good connection.<br><br>Replace the LED.<br><br>Ensure proper cable connections fr.om.the deflection board to the LED bezel assembly. |
| Video display but not to specifications. | Bring up the appropriate monochrome display alignment pattern (TESTS 60, 61, or 62) and perform the adjustment according to <a href="#">Chapter 4</a> .                             |