

RD54-D, -R Fixed Disk Drive Subsystem

Owner's Manual

Prepared by Educational Services
of
Digital Equipment Corporation

© Digital Equipment Corporation 1986.
All rights reserved.
Printed in U.S.A.

The material in this document is for informational purposes and is subject to change without notice; it 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.

NOTICE: This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user at his own expense may be required to take measures to correct the interference.

The following are trademarks of Digital Equipment Corporation.

digital™
DEC
DECmailer
DECmate
DECservice
DECUS
DECwriter
DIBOL

MASSBUS
MicroPDP-11
MicroVAX
MicroVMS
PDP
P/OS
Professional
Q-Bus
Rainbow

RSTS
RSX
RT
UNIBUS
VAX
VMS
VT
Work Processor

Contents

Preface

Chapter 1 Installation

Selecting a Location.....	1-1
Unpack the RD54-R Rackmount Subsystem	1-2
Install the RD54-R Subsystem and Front Cover	1-3
Unpack the RD54-D Desktop Subsystem.....	1-4
Connecting an RD54-D, -R Subsystem to a MicroPDP-11 or MicroVAX.....	1-5
Connecting One or Two RD54-D, -R Subsystems to a PDP-11/23 PLUS*	1-6
Identify the Power Cord and Check the Voltage Switch	1-8
Connect the Power Cord to the Subsystem and the Wall Outlet	1-9
Set the Power Switch of the Computer and the Subsystem to 1 (On).....	1-9
Formatting the RD54 Disk Drive.....	1-9
Formatting Modes.....	1-11
XXDP+ Formatting with an RQDX3.....	1-12
Run the User Test.....	1-14
Formatting Help and Information.....	1-14
MDM Formatting with an RQDX3.....	1-16

Chapter 2 Operation

Introduction	2-1
Front Panel.....	2-2
Rear Panel.....	2-4
Care and Handling of the RD54 Subsystem	2-5

Chapter 3 Technical Description

Introduction 3-1
Physical Features..... 3-2
Operating Features..... 3-3
Environmental Requirements..... 3-3
Power Supply..... 3-3
DC Cooling Fan 3-4
Front Panel..... 3-4
Rear Panel..... 3-5
Logical Unit Number (LUN)..... 3-7
Configuration 3-7
 System Controller and Cable Options..... 3-7
MicroPDP-11 and MicroVAX 3-9
 MicroPDP-11 and MicroVAX Configuration 3-10
PDP-11/23 PLUS..... 3-11
 PDP-11/23 PLUS Configuration..... 3-12

Chapter 4 Troubleshooting

Introduction 4-1
Troubleshooting Tables 4-1
Removing and Replacing RD54 Parts..... 4-3
Removing an RD54 Fixed Disk Drive 4-4
Removing the Device Electronics Board 4-8
Installing an RD54 Fixed Disk Drive..... 4-11
Removing the Power Supply..... 4-13
Removing the Fan Assembly 4-14

Appendix A Logical Unit Number Designation

Disk Unit Number Designation..... A-1
Logical Unit Numbers (LUNs)..... A-2

Appendix B System Specifications

Environment B-1
Subsystem Dimensions..... B-1
RD54 Fixed Disk Drive B-2
Power Supply..... B-2

Appendix C Connector Pin Numbers and Signals

J1, J2, and J3 Connectors C-1
 Power Supply Connectors C-3

Appendix D Service Options

On-Site Service D-1
 Carry-In Service D-1
 DECmailer D-2
 Per Call Service D-2
 Per Call D-2
 On-Site Per Call Service D-2
 Carry-In Per Call Service D-2
 Digital-International Field Service Information Numbers D-3
 Index Index-1

Figures

1-1 Unpacking the RD54-R Rackmount Subsystem 1-2
 1-2 Installing an RD54-R Subsystem in a Rackmount Assembly 1-3
 1-3 Unpacking the RD54-D Desktop Subsystem 1-4
 1-4 Connecting an RD54 Subsystem to a MicroPDP-11 or MicroVAX
 (BA23 Enclosure) 1-5
 1-5 Connecting One RD54 Subsystem to a PDP-11/23 PLUS (H349
 Panel) 1-6
 1-6 Connecting Two RD54 Subsystems to a PDP-11/23 PLUS (H349
 Panel) 1-7
 1-7 Identify the Power Cord and Check the Voltage Switch 1-8
 2-1 Front Panel 2-2
 2-2 Rear Panel 2-4
 3-1 Desktop and Rackmount Subsystems 3-2
 3-2 Front Panel 3-4
 3-3 Rear Panel 3-5
 3-4 BA23 I/O Distribution Panel 3-9
 3-5 Adding One RD54 Subsystem to a BA23 Enclosure 3-10
 3-6 PDP-11/23 PLUS H349 I/O Distribution Panel 3-11
 3-7 Adding One RD54 Subsystem to a PDP-11/23 PLUS 3-12
 3-8 Adding Two RD54 Subsystems to a PDP-11/23 PLUS 3-13



Preface

This guide shows you how to install, operate and maintain the RD54-D, -R fixed disk drive subsystems. An RD54 fixed disk drive can store 159 Mbytes of information.

You can use your free-standing RD54-D (desktop) or RD54-R (rackmount) subsystems as an add-on to MicroPDP-11, MicroVAX, PDP-11/23 PLUS, and other Q-Bus systems. You can easily connect these subsystems to an existing system or include them in new designs.

HOW TO USE THIS GUIDE

This guide has four chapters and four appendices. They describe the following topics.

Chapter 1 shows you how to install your RD54 subsystem, connect the subsystem to a MicroPDP-11, MicroVAX, or MicroPDP-11 system, and how to format the subsystem.

Chapter 2 describes the function of the RD54 front panel switches, buttons, and indicator lights. Refer to your software documentation for information on how to use the subsystem with your system.

These subsystems operate with an RQDX3 controller module installed in the host computer. Chapter 3 describes the modules and cables you need to prepare the MicroPDP-11, MicroVAX, and PDP-11/23 PLUS systems.

NOTE

Only qualified service personnel should install the necessary boards and cables in the host computer. Refer to the RQDX3 Subsystems User's Guide for more information.

Chapter 4 describes how to troubleshoot minor problems. This chapter also includes removal and replacement procedures for RD54 subsystem parts.

NOTE

Only qualified field service personnel should make major repairs or replace subsystem parts.

The appendices list logical unit numbers, system specifications, and connector pin numbers and signals. Appendix D describes service option available from Digital.

FOR THE BEST RESULTS

Your RD54 fixed disk drive subsystem is a delicate precision instrument, and subject to damage if handled incorrectly. It will give you good, reliable service if you observe the following precautions.

- Follow instructions carefully when installing your RD54 fixed disk drive subsystem.
- Do not drop or bump the fixed disk drive. The maximum impact a fixed disk installed in a desktop box can withstand is a drop of 15 cm (6 in) to a hard surface.
- Use care when you move your RD54 subsystem.
- Pack your fixed disk drive in its original packing material. This prevents damage from shocks and vibrations when transporting or shipping your subsystem.

IF YOU NEED HELP

- Refer to Chapter 4, Troubleshooting.
- For hardware questions, call your service representative.
- For software questions, call your sales representative and ask for an access code number for the Digital Phone Support Center (PSC).

RELATED DOCUMENTATION

You can order the following documents from Digital.

Document	Order Number
MicroPDP-11 Systems Technical Manual (BA23)	AZ-FI14A-MC
MicroPDP-11 (BA123) Owner's Manual	AZ-FE00A-TC
MicroPDP-11 (BA123) Technical Manual	AZ-FE01A-TC
MicroVAX II (BA23) Owner's Manual	AZ-FE05A-TN
MicroVAX II (BA23) Technical Manual	AZ-FE06A-TN
MicroVAX II (BA123) Owner's Manual	AZ-FE08A-TN
MicroVAX II (BA123) Technical Manual	AZ-FE09A-TN
H9302 Rackmount Kit Installation Guide	EK-LEP03-IN
RQDX3 Subsystems User's Guide	EK-RQDX3-UG
RQDXE Expander Module User's Guide	EK-RQDXE-UG
11C23-UC/11C23-UE RD52 Upgrade Installation Guide	EK-RD52U-IN
DEC/X11 User's Manual	AC-F053-MC
DEC/X11 Cross Reference Manual	AC-F055-MC
XXDP+/SUPR User's Manual	AC-F348A-MC

ORDERING INFORMATION

You can obtain ordering information by telephone from 8:30 a.m. to 6:00 p.m. Eastern Standard Time (EST) or by mail.

Continental USA and Puerto Rico

Call 1-800-258-1710, or mail order to:

Digital Equipment Corporation
PO Box CS2008
Nashua, New Hampshire 03061

New Hampshire, Alaska, Hawaii

Call 1-603-884-6660, or mail order to above address.

Outside the USA and Puerto Rico

Mail order to:

Digital Equipment Corporation
Attn: Accessories and Supplies Business Manager
c/o Local Subsidiary or Digital-Approved Distributor

WARNINGS, CAUTIONS, AND NOTES

Warnings, cautions, and notes have the following meanings in this guide.

WARNING Contains information essential to your personal safety.

CAUTION Contains information essential to the safety of equipment and software.

NOTE Contains general information you should be aware of.

SELECTING A LOCATION

Find a suitable location for your RD54-D, -R subsystem, using the following guidelines.

- Leave space around the unit for air circulation and servicing.
- Place the unit away from heaters, photocopiers, and direct sunlight.
- Minimize static by placing the unit away from busy office corridors.
- Keep the area free from dust and other abrasive materials.
- Keep the unit away from magnets and equipment that generate magnetic fields, such as motors, transformers, and terminals.

To install an RD54-R, start at page 1-2.

To install an RD54-D, start at page 1-4.

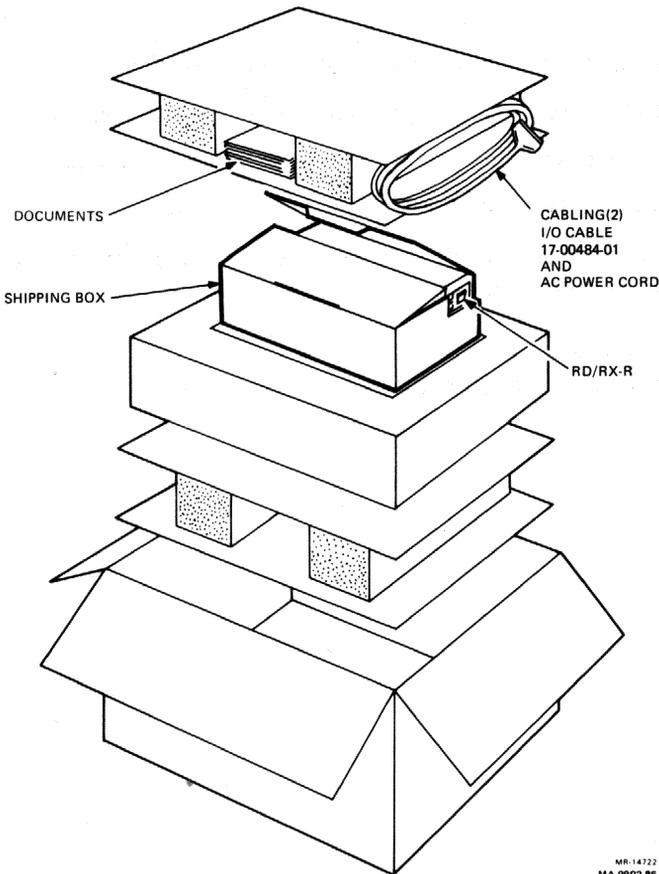
UNPACK THE RD54-R RACKMOUNT SUBSYSTEM

The RD54-R subsystem is already assembled and ready to install in an H9302 rackmount assembly.

If any item is missing or damaged:

- Contact your sales representative.
- Contact your delivery agent.

You must order the H9302 rackmount kit separately. Prepare the H9302 kit, using the documentation provided with the kit.

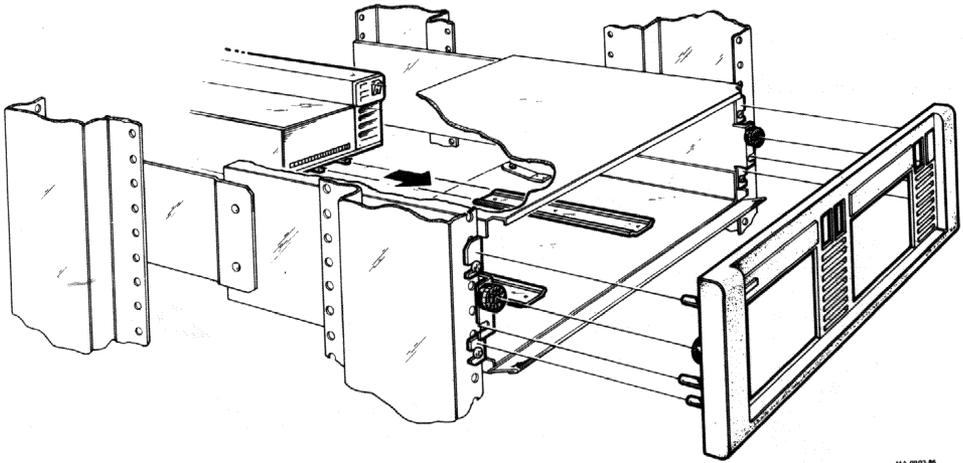


MR-14722
MA-0902-86

Figure 1-1 Unpacking the RD54-R Rackmount Subsystem

INSTALL THE RD54-R SUBSYSTEM AND FRONT COVER

The front cover is part of the H9302 rackmount kit.



MA 0903 86

Figure 1-2 Installing an RD54-R Subsystem in a Rackmount Assembly

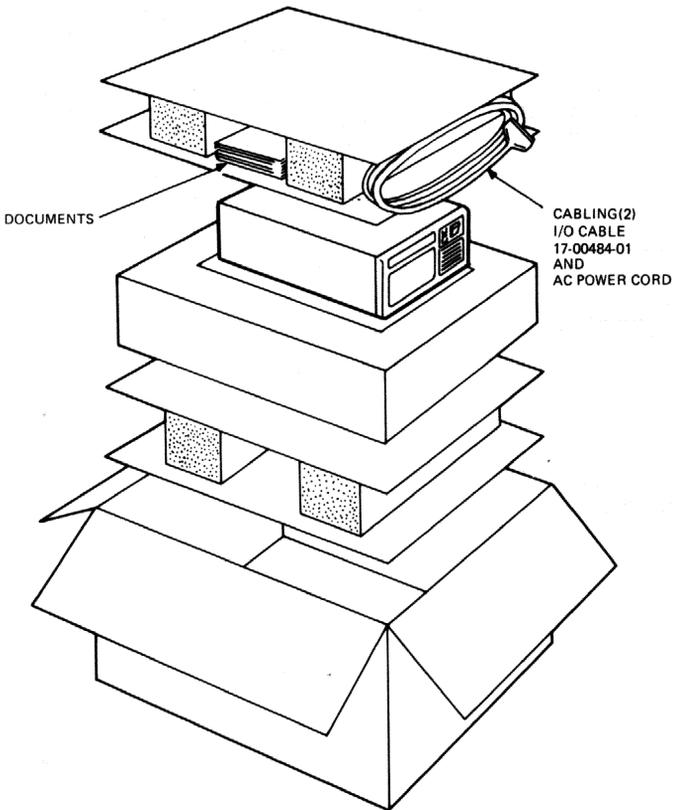
Go to page 1-5 to continue.

UNPACK THE RD54-D DESKTOP SUBSYSTEM

The RD54-D subsystem is already assembled and ready to connect to the computer system.

If any item is missing or damaged:

- Contact your sales representative.
- Contact your delivery agent.



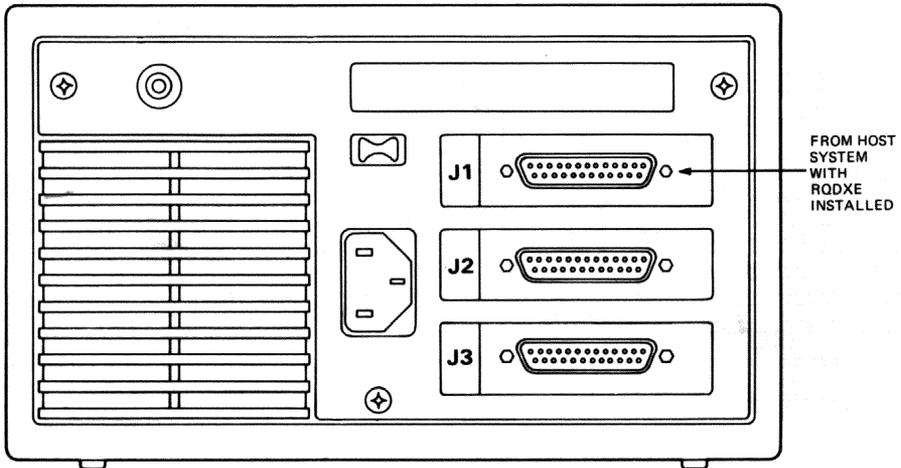
MR-14721
MA-0904-86

Figure 1-3 Unpacking the RD54-D Desktop Subsystem

CONNECTING AN RD54-D, -R SUBSYSTEM TO A MicroPDP-11 OR MicroVAX

For systems with an RQDXE

Connect the I/O signal cable to the J1 connector of RD54 disk drive and to the 50-pin connector in the computer's I/O distribution panel (Figure 1-4).

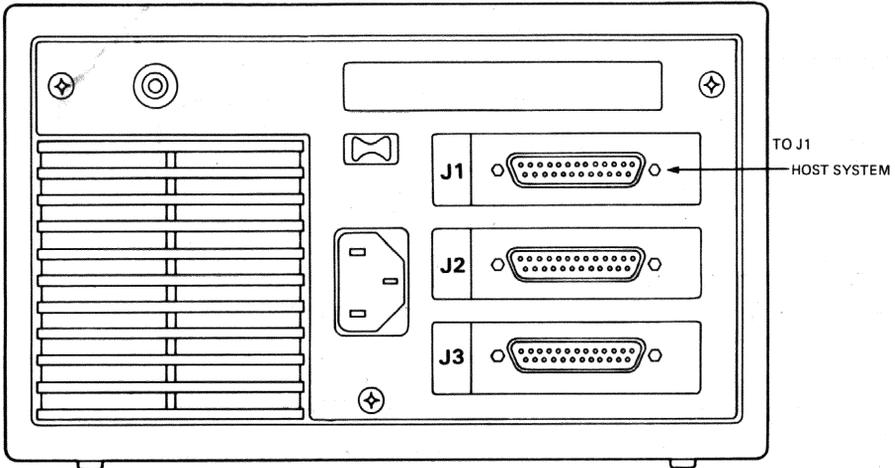


MR-14724
MA-0905-86

Figure 1-4 Connecting an RD54 Subsystem to a MicroPDP-11 or MicroVAX (BA23 Enclosure)

CONNECTING ONE OR TWO RD54-D, -R SUBSYSTEMS TO A PDP-11/23 PLUS*

Connect the I/O signal cable to the J1 connector of the RD54 subsystem and to the 50-pin connector in the computer's H349 I/O distribution panel.



MR 14724
MA-0905-BG

Figure 1-5 Connecting One RD54 Subsystem to a PDP-11/23 PLUS (H349 Panel)

* An RQDX3 Controller Module must be used to support an RD54-D, -R.

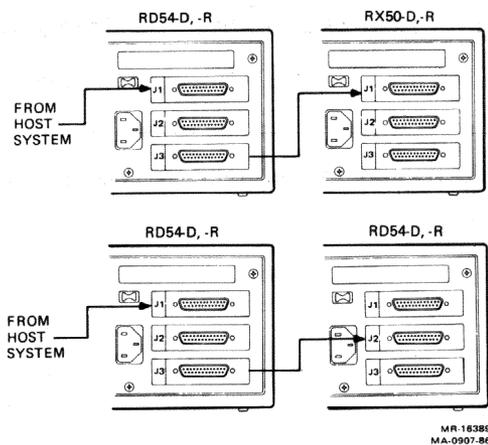


Figure 1-6 Connecting Two RD54 Subsystems to a PDP-11/23 PLUS (H349 Panel)

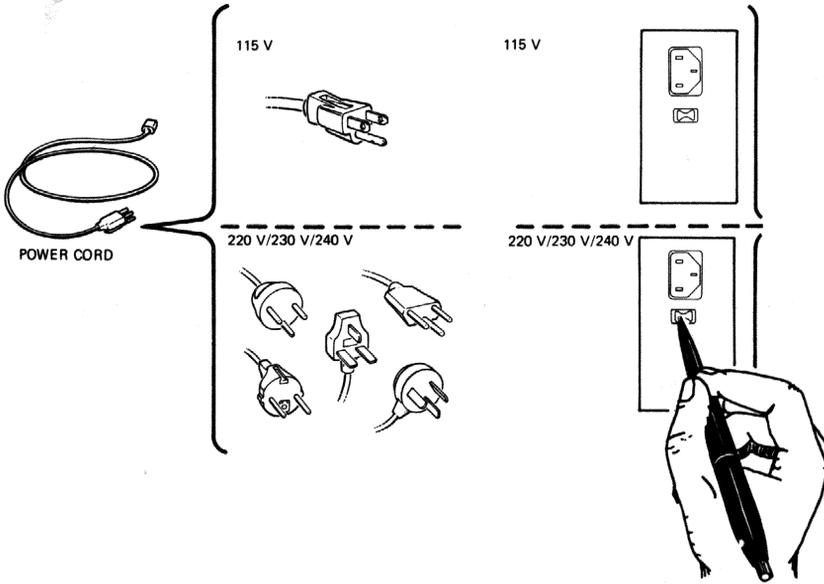
The "Configuration" section in Chapter 3 has more information on installing multiple RD54-D, -R systems.

IDENTIFY THE POWER CORD AND CHECK THE VOLTAGE SWITCH

Make sure the plug on the power cord matches the wall outlet.

CAUTION

An incorrect voltage setting can damage your subsystem and your computer.



MR-14728
MA-0908-86

Figure 1-7 Identify the Power Cord and Check the Voltage Switch

CONNECT THE POWER CORD TO THE SUBSYSTEM AND THE WALL OUTLET

If you are adding an RD54D, -R subsystem to a PDP-11/23 PLUS, connect the power cord to the power controller in the rack.

SET THE POWER SWITCH OF THE COMPUTER AND THE SUBSYSTEM TO 1 (ON)

Make sure the ready button on the subsystem's front panel is in the out position (with the button's green indicator on). After 15 seconds, the system displays its start-up message.

FORMATTING THE RD54 DISK DRIVE

Before you can test the system and use the RD54 subsystem, you must format the subsystem.

NOTE

Formatting the RD54 subsystem destroys any current files on the disk drive. If there are files on the disk, make a backup copy before you proceed. Write-protect any other fixed disk drives. Refer to your software documentation for instructions.

Your new subsystem becomes DU1 (disk unit 1) if the I/O cable is connected to the J2 connector and you have a MicroPDP-11 or MicroVAX with an internal RX50 or a TK50 and an RD52, RD53, or RD54 fixed disk drive.

Refer to Table A-1 for the disk unit designation for other configurations, including an RD54-D, -R subsystem installed on a PDP-11/23 PLUS.

Make sure you label the subsystem. Drive unit labels come with the base computer system.

To format your RD54 subsystem, go to the format program for your system.

System	Page
MicroPDP-11 with an RQDX3	1-12
MicroVAX with an RQDX3	1-16

All the screen displays and user responses that follow show typical displays and responses. For more information on the format programs for MicroPDP-11 or PDP-11/23 PLUS systems, refer to the following documents.

- DEC/X11 User's Manual AC-F053-MC
- DEC/X11 Cross Reference Manual AC-F055-MC
- XXDP+/SUPR User's Manual AC-F348A-MC

For more information on the format program for MicroVAX systems, refer to the *MicroVAX System Maintenance Guide*.

NOTE

The RQDX1 or RQDX2 does not support the RD54 disk drive.

To support the RD54 disk drive, the RQDX3 controller microcode must be at a minimum of rev 1.10. The rev number is printed on the ROM chip.

Formatting Modes

You can select the type of format mode to run: reformat, restore, or reconstruct. You select the mode by answering from the XXDP+ program.

1. Use existing bad block information?
2. Down-Line Load?
3. Continue if bad block information is inaccessible?

The first two questions determine which mode to run. Question 2 does not appear unless you answer N (no) to question 1. If you answer N (no) to question 3, the XXDP+ program stops and prints an error if a bad spot is found.

Reformat Mode – If you answer Y to question 1, questions 2 and 3 do not appear. The XXDP+ program reads the manufacturer's bad blocks from a block on the disk. The program then formats the disk, except for these bad blocks. This takes more than 12 minutes. If the program fails, try restore mode.

Restore Mode – If you answer N to question 1, the program asks you to type a list of the bad blocks. Then the program formats the disk, except for the bad blocks you specify. You can type the bad blocks by using the list that comes with the drive. The program asks you for the serial number. You can find this number on the top of the RD54 disk drive. The program only lets you type in the last 8 digits of the serial number. Restore mode takes more than 15 minutes.

Reconstruct Mode – If you answer N to both questions 1 and 2, the program searches the disk and identifies all bad blocks. It does not use the manufacturer's bad block information. The program then formats the disk, except for the bad blocks it identified. This takes 75 minutes.

XXDP+ FORMATTING WITH AN RQDX3 (MicroPDP-11 SYSTEMS)

User responses are in **color**.

Find the Field/EXT OPT TSTS #5 diskette (CZXD5xx) and insert it in drive 1. Press the **Return** key.

Type **R ZRQC??** after the (.) screen prompt. Press the **Return** key.

This command selects the diagnostic program. The question marks allow you to use any revision of the program.

NOTE

If the message "File not found" appears when you run the program, repeat this procedure with other Field/EXT OPT TSTS diskettes until the file is found.

A response similar to the following appears on the terminal.

DR>

You must respond to this prompt with a command to run the program.

Type **START**. Press the **Return** key.

Then answer the following questions.

CHANGE HW (L) ?

This program answers hardware questions.

Type **Y** (yes). Press the **Return** key.

UNITS (D) ?

Type **1** for one unit. Press the **Return** key.

IP ADDRESS (0) 172150 ?

If your system has one RQDX3, press the **Return** key. If you have two or more controllers, refer to the RQDX3 Subsystems User's Guide for the IP address.

VECTOR ADDRESS (0) 154 ?

If your system has one RQDX3, press the **Return** key. If you have two or more controllers, refer to the RQDX3 Subsystems User's Guide for the vector address.

AUTO FORMAT MODE (L) Y ?

Type **Y** (yes) to start auto format mode. Press the **Return** key.

LOGICAL DRIVE (0-255) (D) 0 ?

Jumpers on the RQDX3 select the logical drive unit number. If your system has one RQDX3, press the **Return** key. If you have two or more controllers, refer to the RQDX3 Subsystems User's Guide for logical unit number (LUN) jumpering.

DRIVE SERIAL NUMBER (1-32000) (D) ?

Type your serial number **XXXXXXXXXX** (located on the back panel of your unit). Press the **Return** key.

**** WARNING ALL THE DATA ON THIS DRIVE WILL BE DESTROYED ****

PROCEED TO FORMAT THE DRIVE (L) N ?

Type **Y** (yes) to start the drive format. Press the **Return** key.

MSCP CONTROLLER MODEL # :

Type the number **19** for the RQDX3. Press the **Return** key.

MICROCODE VERSION # :

Type the number on the RQDX3 ROM chip. Press the **Return** key.

FORMAT BEGUN

After about 75 minutes, the system displays a completion message similar to the following.

FORMAT COMPLETED

Remove the diskette.

If formatting is not successful, the system displays an error message when the error occurs. Refer to page 1-17 for help.

Run the User Test

Refer to the owner's manual for your computer system for instructions.

After completing the user test successfully, the system displays a message similar to the following.

TESTING OF THIS SYSTEM IS NOW COMPLETE.

You have successfully installed, formatted, and tested your RD54-D, -R disk drive subsystem.

If the program finds any errors, refer to the troubleshooting section in the owner's manual for your computer system.

Formatting Help and Information

This section lists error messages displayed by the formatter, their probable cause, and suggested solution. Errors 1 and 11 are the most commonly reported errors.

(1) DUP PROTOCOL ERROR, UNEXPECTED MESSAGE

This is a hardware error, indicating a problem with the disk drive or the drive's configuration. Make sure your drive is configured correctly.

(2) CONTROLLER CAN EXECUTE LOCAL PROGRAMS OR NON STD DUP DIALOG PROGRAM

This error may come from a hardware or software program. Make sure the controller is configured correctly. If configured correctly, the controller may be defective.

(3) CONTROLLER IN AN UNEXPECTED ACTIVE STATE

This error is similar to error 2. The error may be a defective disk drive or the wrong microcode version. Try to format again. If error 3 occurs again, check for new controller ECOs or microcode.

(4) CONTROLLER NEVER ADVANCED TO NEXT STEP

This is controller initialization error. Check the controller's IP address. Make sure no other device has the same address.

(5) CONTROLLER INITIALIZATION TIMEOUT

The controller is defective or the Q-Bus is not operating. Run the format program again.

(6) WRONG MODEL NUMBER ON CONTROLLER

You are using the wrong formatter. Check the title of the diskette in the disk drive.

(7) NXM TRAP AT THE CONTROLLERS IP ADDRESS

The controller's IP address is wrong for this configuration. Check the jumpers on the controller.

(8) UNEXPECTED OR DELAYED CONTROLLER INTERRUPT

The controller is being interrupted by a system device. Run the format program again.

(9) FATAL SA ERROR CTRLR OFFLINE

This is a controller error. Check the controller's configuration, then run the format program again. If this error occurs again, then the controller is defective.

(10) BAD RESPONSE PACKET RETURN

This is probably a software controller error. Run the format program again.

(11) NO PROGRESS SHOWN AFTER A CMD HAD TIMED OUT

This could be a hardware disk drive or a drive with many revector blocks. Let the program run a few minutes. If this error does not occur again, the disk drive is probably defective. If this error occurs gain, the drive may contain many revector blocks.

(12) GET DUST CMD TIME-OUT AFTER ANOTHER CMD TIME-OUT

The controller and the host are out of sync. Check the controller for loose cables or circuit board. Reboot the system.

MDM FORMATTING WITH AN RQDX3 (MicroVAX SYSTEMS)

User responses are in **color**.

Find the numbered diskettes from the MicroVAX Maintenance System, service version. Insert diskette number 1 into drive 1. Boot the system and follow the instructions on the terminal until the main menu appears. Then do the following.

Press the RETURN key to continue. >

MAIN MENU

- 1 - Test the system**
- 2 - Display System Configuration and Devices**
- 3 - Display the Utilities Menu**
- 4 - Display the Service Menu**
- 5 - Exit MicroVAX Maintenance System**

Type the number; then press the RETURN key. >

MR-16213
MA-0911-86

Type 4. Press the **Return** key. This selects the service menu.

SERVICE MENU

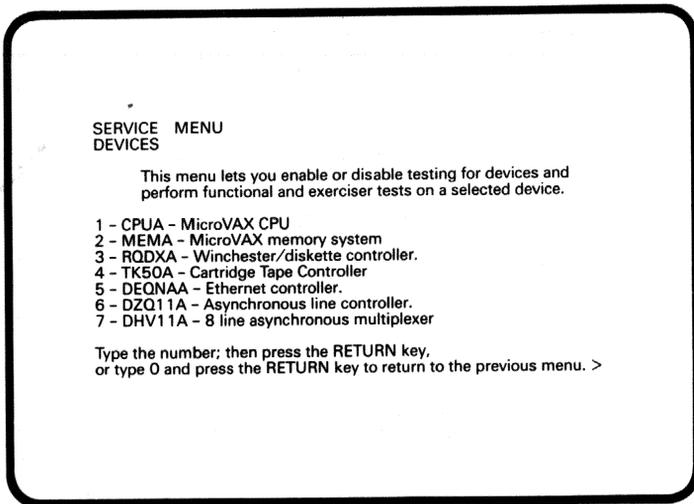
CAUTION: This menu is intended for use by qualified service personnel only. Misuse of the commands could destroy data.

- 1 - Set test and message parameters
- 2 - Exercise system continuously
- 3 - Display the device menu
- 4 - Enter system commands

Type the number; then press the RETURN key, or type 0 and press the RETURN key to return to the Main Menu. > 1

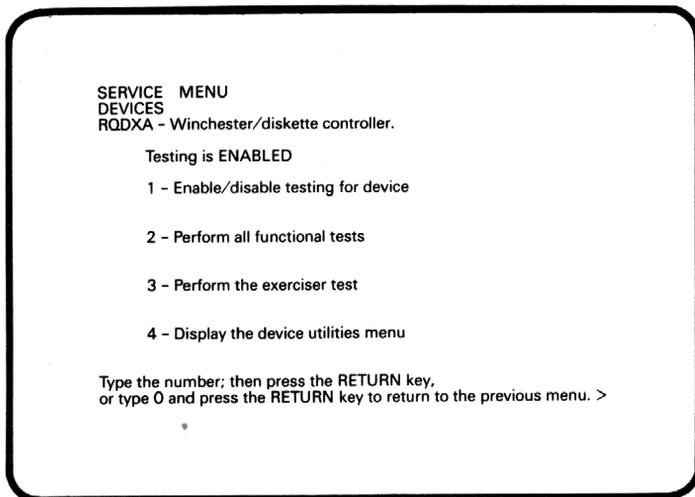
MR-0186-0024
MA-0912-86

Type 3. Press the **Return** key. This selects the device menu.



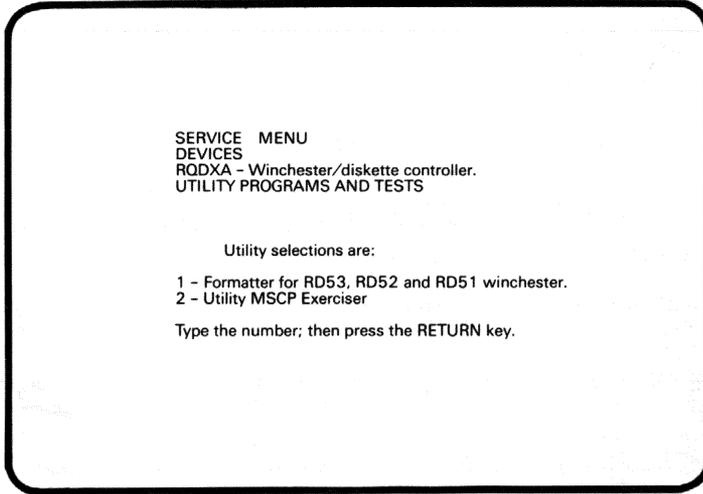
MR-0186-0021
MA-0914-86

Type 3. Press the **Return** key. This selects the menu for RQDXA specific functions.



MR-0186-0018
MA-0915-86

Type **4**. Press the **Return** key. This selects the utility programs and tests menu as shown below.



Type **1**. Press the **Return** key. This starts the MDM format program.

The following message appears:

WARNING, THIS UTILITY WILL DESTROY ANY USER DATA ON THE SELECTED DRIVE.

Answer the following questions.

DO YOU WANT TO CONTINUE [YES=1, NO=0] :=

Type **1** to continue. Press the **Return** key.

DO YOU WANT TO USE THE "AUTOFORMAT" MODE [YES=1, NO=0] :=

Type **1** to select auto format mode. Press the **Return** key.

WHAT UNIT DO YOU WANT TO FORMAT (0-3) ?

Type **0** for the first unit. Press the **Return** key.

IS THIS THE CORRECT UNIT NUMBER [YES=1, NO=0] :=

Type **1**. Press the **Return** key.

PLEASE ENTER THE DATE [MM-DD-YYYY] :=

Type in today's date. Press the **Return** key.

PLEASE TYPE IN A SIX DIGIT SERIAL NUMBER :=

Type your serial number XXXXXXXXX (located on the back panel of your unit).
Press the **Return** key.

FORMAT BEGUN

The formatting time varies from 50 to 120 minutes. After completing the formatting, the system displays the following message.

THE CONTROLLER REPORTED A SUCCESSFUL TERMINATION OF THE
FORMAT COMMAND

After an unsuccessful attempt to format the disk, the system displays the following message.

THE FAILURE OF THE FORMAT COULD HAVE BEEN CAUSED BY ANY OF THE
FOLLOWING.

- THE WINCHESTER DRIVE IS OFFLINE.
- THE WINCHESTER DRIVE IS WRITE-PROTECTED.
- THE DRIVE IS DEAD.
- BAD BLOCK INFORMATION SHOULD NOT HAVE BEEN SPECIFIED.
- THE CABLES TO THE DRIVE ARE NOT MAKING GOOD CONTACT.
- A NONEXISTENT DRIVE HAS BEEN SPECIFIED.
- THE DRIVE SELECT SWITCHES ARE SET UP WRONG.

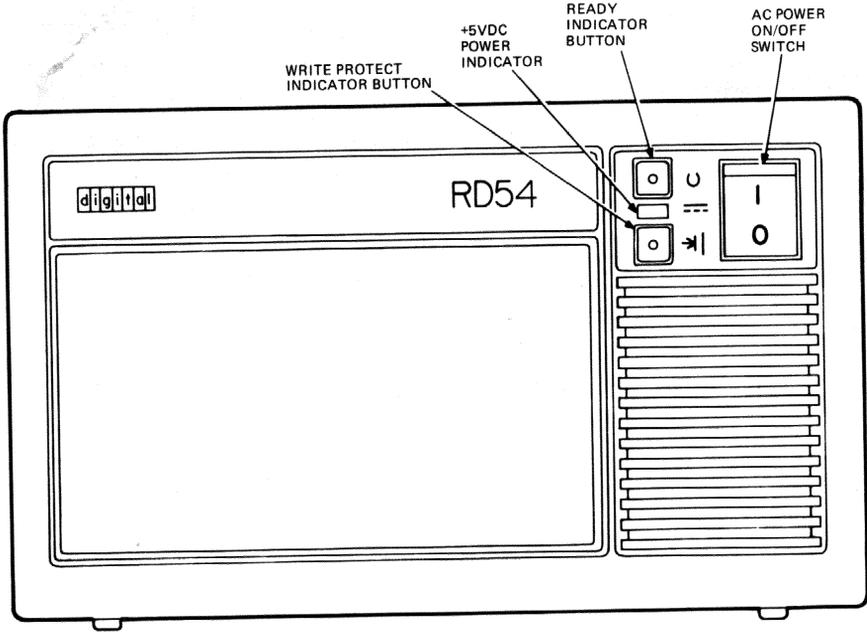
INTRODUCTION

This chapter contains an overview of the operating controls for the RD54 subsystem. You can use this information for quick reference. The chapter also describes how to take care of the subsystem. Chapter 3 provides a detailed explanation of the subsystem.

The RD54 subsystem is a 133.4 mm (5.25 in) fixed disk drive enclosed in a free-standing or rackmount housing. Each RD54-D, -R contains its own power supply and fan. An RD54 can store 159 Mbytes of information. Information is stored magnetically, in much the same way that sound is recorded on audio tape. You can erase and replace information stored on an RD54.

FRONT PANEL

You control the RD54 subsystem by using the on/off (1/0) switch and the ready and write-protect buttons. These controls have indicator lights to show their status. A separate dc indicator shows the voltage status of the subsystem. Figure 2-1 shows the front panel. Table 2-1 summarizes the controls and indicators.



MR 16390
MA:0917-86

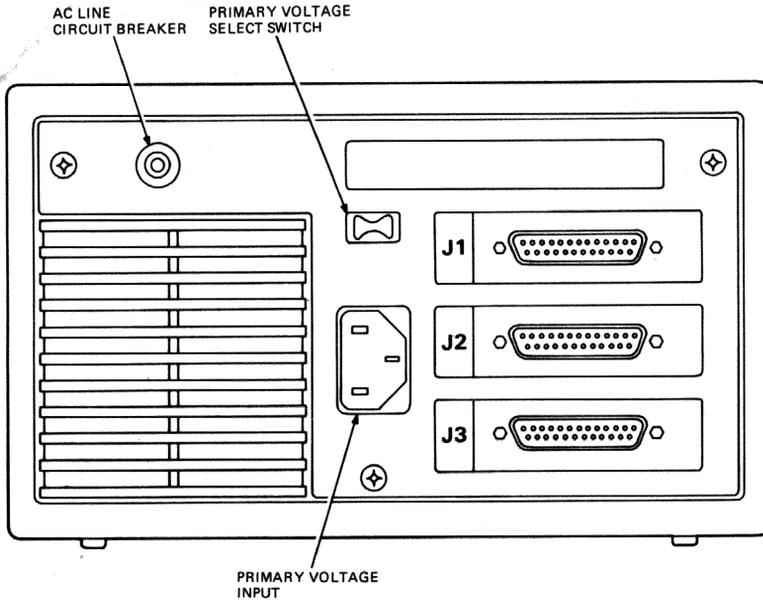
Figure 2-1 Front Panel

Table 2-1 Front Panel Switch, Buttons, and Indicator

Control	Position	Function
On/Off Switch	1 (red indicator on)	Switches the subsystem on.
	0	Switches the subsystem off.
Ready button	Out (green indicator on)	The subsystem is ready to store information from the system.
	In	Disables the subsystem. In effect, the subsystem is turned off.
Write-protect button	Out	Out is the normal operating position. System software can read and write information on the disk.
	In (yellow indicator on)	Prevents the system software from writing on the fixed disk. Write-protect the disk when you make backup copies of the disk's contents. Also write-protect the disk when you run tests. This prevents accidental erasure if you select the wrong diagnostic program.
DC indicator	-	This indicator is on (green) when the power supply is generating the correct dc voltage.

REAR PANEL

The rear panel contains three multipin connectors, an ac power outlet, voltage switch, ac circuit breaker, and fan exhaust (Figure 2-2). Table 2-2 describes the use of the three connectors.



MR 14730
MA-0910-86

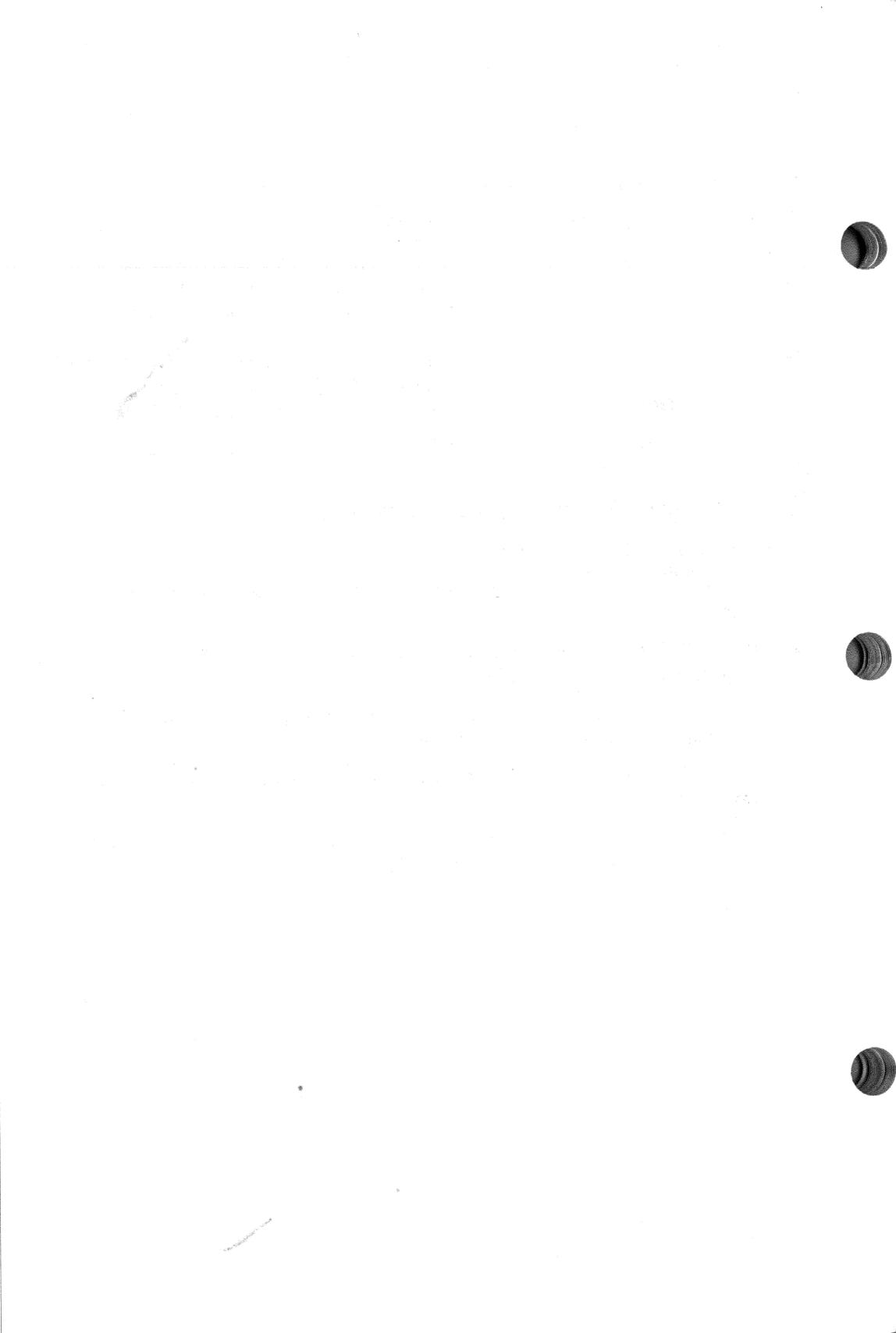
Figure 2-2 Rear Panel

Table 2-2 Rear Panel Connectors

Connector	Input/Output	Function
J1 and J2	Input	Receive signals from the computer or another subsystem. You can only use one of these connectors at a time on a subsystem.
J3	Output	Connects two subsystems together. A cable connects J3 to J1 or J2 on another subsystem. Only a PDP-11/23 PLUS system can use more than one subsystem.

CARE AND HANDLING OF THE RD54 SUBSYSTEM

- Never bump or drop the subsystem.
- Back up all files on a regular basis. Refer to your system software documentation for instructions.
- Write-protect the disk when you make backup copies onto diskettes or tape. This prevents accidental loss of information.
- Write-protect the disk when you test the system. This prevents accidental loss of information if you select the wrong test.
- Keep the fixed disk drive away from direct sunlight, heaters, photocopiers, and X-ray equipment.
- Keep the unit away from magnets and equipment that generates magnetic fields, such as motors, transformers, and terminals.



INTRODUCTION

This chapter contains two sections. The first section describes the following areas of the RD54-D, -R fixed disk drive.

- Physical features
- Operating features
- Environmental requirements
- Power supply
- Fan
- Front panel controls
- Rear panel
- Logical unit numbers

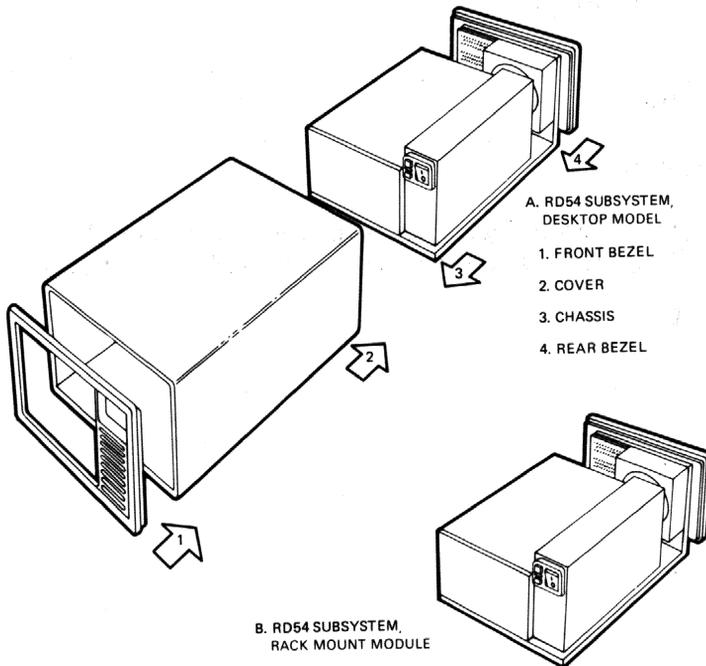
The second section discusses configuration requirements for MicroPDP-11, MicroVAX, and PDP-11/23 PLUS systems. The section includes several typical configurations.

PHYSICAL FEATURES

The RD54 subsystem is a free-standing 133.4 mm (5.25 in) mass storage device. You can use it as an add-on to MicroPDP-11, MicroVAX, PDP-11/23 PLUS, and some other Q-Bus hosts. The RD54 has desktop and rackmount models (Figure 3-1). You can expand either type of RD54 subsystem into a multiple-drive configuration. You simply connect subsystems with a cable.

The RD54 is also a random-access storage device with four nonremovable disks to store data. The 18-sector format has a total capacity of 159 Mbytes. Refer to Chapter 1 for the formatting procedure.

Each RD54 subsystem consists of a mounting chassis that holds the fixed disk drive, power supply, dc cooling fan, printed circuit board for external cable signal distribution, and front and rear panels.



MR-16079
MA-0918-85

Figure 3-1 Desktop and Rackmount Subsystems

Rackmount units must be mounted in an H9302 rackmount kit. The rackmount kit (ordered separately) holds two subsystems side by side and fits a standard 19-inch rack. Desktop units have a cover, front bezel, and rear bezel already installed.

The subsystem operates with either 120 V (RD54-DA, -RA) or 240 V (RD54-DB, -RB) primary power. You control the primary power by using the on/off switch on the front panel. Appendix B lists specifications for the power supply.

The RD54 disk drive is a field replaceable unit (FRU). Chapter 4 shows how to remove and replace FRUs.

OPERATING FEATURES

The RD54 subsystem operates with the following modules installed in MicroPDP-11, MicroVAX, or PDP-11/23 PLUS systems.

- RQDX3 (M7555) controller module
- RQDXE (M7513) expander module

The RD54 disk drive is fully supported by PDP-11 and MicroVMS software. The drive is also compatible with the Digital storage architecture (DSA) mass storage control protocol (MSCP).

ENVIRONMENTAL REQUIREMENTS

Disk drives are susceptible to high humidity, shock, and radiated emissions. The fixed disk drive can withstand a maximum impact of a drop of 15 cm (6 in) to a hard surface. Appendix B lists environmental and operating specifications.

POWER SUPPLY

The RD54 power supply uses 120 Vac or 240 Vac primary power, selected by the VOLT SEL switch on the rear panel. The switch is factory-set to 120 Vac (RD54-DA, -RA) or 240 Vac (RD54-DB, -RB). The power supply provides the following voltages.

- +12 A Vdc for the fixed disk drive
- +12 B Vdc for the dc cooling fan
- +5 Vdc for the control logic

You cannot adjust the +5 Vdc and +12 Vdc regulators.

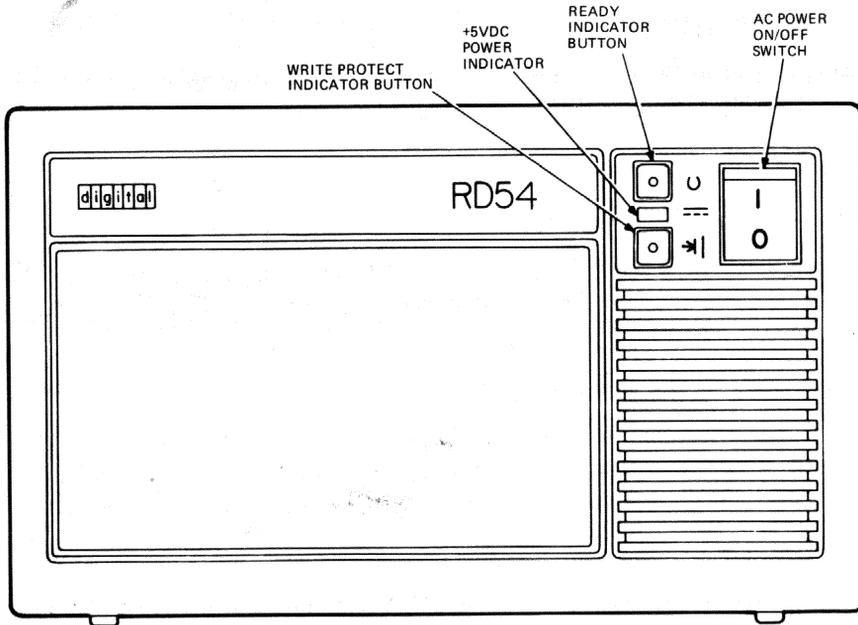
The circuit breaker (CB) protection on the primary line includes protection to prevent overheating of the disk media. Appendix B lists specifications for the power supply.

DC COOLING FAN

The dc cooling fan receives +12 B Vdc from the power supply. The fan attaches to the inside of the rear panel. The fan pulls air from the front of the subsystem and exhausts it out the rear.

FRONT PANEL

The front panel contains control switches, buttons, and indicators (Figure 3-2).



MR-16390
MA-0917-86

Figure 3-2 Front Panel

The function of the switches and indicators is as follows. Table 2-1 summarizes this information.

- The on/off switch is a rocker switch, labeled 1/0. This switch connects or disconnects ac power to the internal power supply.
- The ready indicator is an operator-controlled pushbutton. The green ready indicator is on when the disk drive is ready for use by the system software.

The indicator turns off when you press the button in. This indicates the disk drive is unavailable for read/write operations.

- The green dc power indicator is on when the correct dc power is present.
- The write-protect indicator is an operator-controlled pushbutton. The yellow write-protect indicator is on when the disk drive is write-protected. This indicates the system software can only read the disk drive.

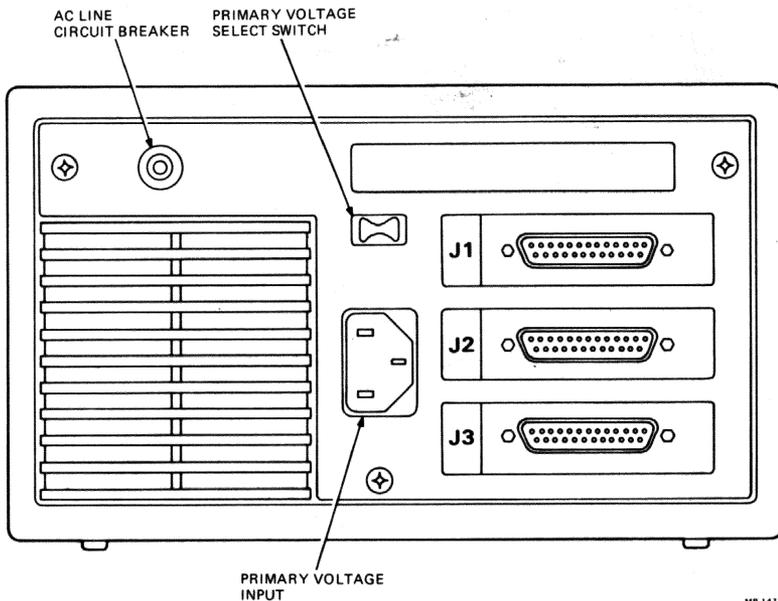
The indicator turns off when you release the button out. This indicates the system software can read and write to the disk drive.

WARNING

Never access the internal chassis without unplugging the unit from the ac power source. AC power can be present in the chassis, even though the green dc indicator is not on or the dc fan is not turning.

REAR PANEL

The rear panel contains the circuit breaker (CB) and primary voltage selection switch (VOLT SEL). The circuit breaker fuses the ac power coming into the sub-system. The VOLT SEL switch selects 120 Vac or 240 Vac. The rear panel also contains the ac line connector for the ac power cord, the exhaust opening for the dc fan, and connectors J1 through J3. Figure 3-3 shows the rear panel.



MR-14730
MA-0910-86

Figure 3-3 Rear Panel

The J1 connector responds to a DRV SEL 3 (L) signal on the drive interface cable from the host. When you use J1, the system software labels the RD54 as DU0 (disk unit 0). Use J1 only when you are installing an RD54 subsystem with a PDP-11/23 PLUS system. Appendix A lists DU (disk unit) designations and possible logical unit numbers (LUNs) on the RQDX3 modules.

The J2 connector responds to a DRV SEL 4 (L) signal on the drive interface cable from the host. When you use J2, the system software labels the RD54 as DU1. Appendix A lists DU designations and possible LUNs on the RQDX3 module. Refer to your system's technical manual for more information.

NOTE

You can only use one of these connectors (J1 or J2) on a single drive at one time.

The J3 connector connects two adjacent disk drive subsystems. J3 carries the signal out from the first subsystem connected to the host.

NOTE

The design of the RD54 subsystems allow a maximum total cable length of 3.6 m (12 ft). If your total cable length is longer, you may have problems.

Appendix C lists J1, J2, and J3 pin number and signal names. Appendix C also lists pins and voltages on the 12-pin dc power output connector.

LOGICAL UNIT NUMBER (LUN)

The RQDX3 controller module supports a variety of peripheral devices, including multiple arrangements of RD5n (RD51, RD52, RD53, or RD54) and RX50 disk drives.

The LUNs and the LUN jumpers may prove useful for future expansions. Jumpers on the RQDX3 module select the LUN. These jumpers determine the lowest LUN assigned to any RD5n and RX50 disk drives in the system.

The RQDX3 module automatically sizes the logical unit configuration during system initialization, to determine how many of the four possible units are present. This automatic sizing eliminates the need to reconfigure jumpers when you add or remove units (RD5n or RX50 drives) from the controller module. The system software automatically assigns disk unit numbers (DUNs) to any drives that are present.

The system software always assigns the lowest DUNs to any RD5n fixed disks that are present. For example, the system software assigns DU0 to an internal fixed disk and DU1 to a fixed disk connected to the host computer through the J2 connector on the subsystem. The system software then assigns DU2 and DU3 to the RX50 diskette drive.

Appendix A lists the standard LUN jumper configuration for the RQDX3 module. Appendix A also lists the DUN assignment for various combinations of RD5n and RX50 drives. An RX50 diskette drive is two units.

CONFIGURATION

Configuring an RD54 disk drive into a computer system requires auxiliary equipment. The following section describes the cables and other requirements for each system configuration.

System Controller and Cable Options

Tables 3-1 and 3-2 describe the components needed to configure various systems. Refer to your system's technical manual and the RQDX3 Subsystems User's Guide for more details.

Table 3-1 System Controller Options and Kits

Model	Description
RQDX3 (M7555)	One controller handles up to four logical units, with up to two RD54 subsystems per system. One RX50 disk drive is equal to two LUNs.*
RQDXE (M7513)	This expander module and cables allow external disk drives (RX50 and RD5n) to connect to the MicroPDP-11 internal controller-to-drive bus. The RQDXE supports up to four external drives, as long as the controller limits are not exceeded. The module allows one external RX50 or RD5n drive to connect to the MicroPDP-11 controller, depending on the RQDX3 configuration guidelines.
RQDXE-AA	This kit contains an RQDXE expander module, cables, and hardware for the BA23 enclosure (MicroPDP-11 or MicroVAX).
CK-RQDXE-KC	This cabinet cable kit is for installing the RQDX3 controller in a H349 I/O distribution panel (PDP-11/23 PLUS system).

* The RQDX3 controller has a capacity of four logical unit numbers (LUNs). Three of these LUNs are used internally by standard MicroPDP-11 and MicroVAX systems. An internal RX50 disk drive uses two of these LUNs. An RD5n-D, -R subsystem can use the remaining LUN. The system software labels these LUNs as disk unit numbers 0 to 3 (DU0 to DU3).

The RQDX3 controller can accommodate up to four fixed disk drives.

Table 3-2 Cable Options*

Model	Description
17-00484-01	This 2.75 m (9 ft) cable connects a host computer to an external drive. The cable is a 50-pin D subminiature male to a 50-pin D subminiature male, shielded, molded cable.
BC17Y 1J	This 0.3 m (1 ft) cable connects two external drives. The cable is a 50-pin D subminiature male to a 50-pin D subminiature male, shielded, molded cable.

* The RD54-D, -R subsystem allows a maximum total cable length of 3.6 m (12 ft). If your total cable length is longer, you may have problems.

MicroPDP-11 AND MicroVAX

Most MicroPDP-11 and MicroVAX systems contain internal RD5n-A and RX50-AA drives. Each system resides in a BA23 enclosure. Each system also contains an RQDX3 controller. Before you install a subsystem, add an RQDXE expander module and cable to the BA23 enclosure. Connect the cable to the I/O distribution panel (Figure 3-4).

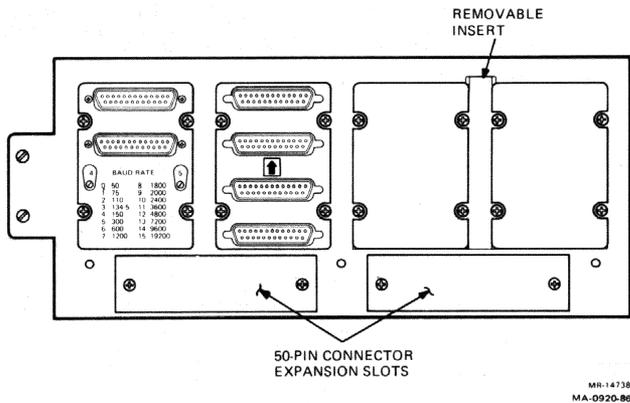


Figure 3-4 BA23 I/O Distribution Panel

The BA23 I/O distribution panel contains areas for system expansion. The cabinet cable kits (Table 3-1) contain the necessary cabling for system expansion. This cabling connects to a proper connector on the internal side of the I/O distribution panel. The RD54 subsystem can simply connect to the external connector on the I/O distribution panel. Table 3-2 lists the external cable options to connect the subsystem.

MicroPDP-11 and MicroVAX Configuration

A BA23 enclosure (MicroPDP-11 and MicroVAX) contains the following items.

- 1 RQDX3 controller
- 1 RD52, RD53, or RD54 (drive only)
- 1 RX50-AA (drive only)

Figure 3-5 shows how to add one RD54 subsystem to a MicroPDP-11 or MicroVAX (BA23 enclosure). In this configuration, the BA23 enclosure already contains two internal drives (an RD52-A, RD53-A, or RD54-A and an RX50-AA), an RQDX3 controller, and internal cables.

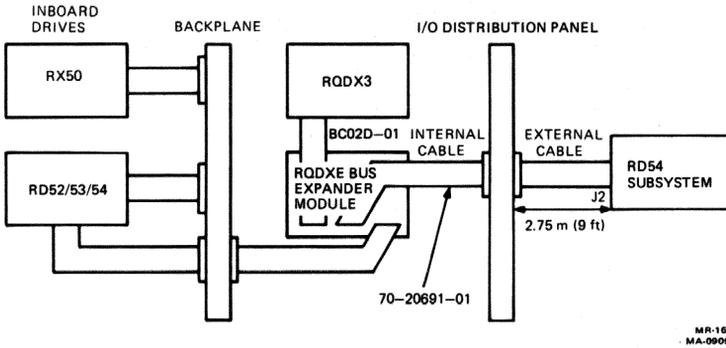


Figure 3-5 Adding One RD54 Subsystem to a BA23 Enclosure

The requirements for adding the external RD54 subsystem are as follows.

- 1 RQDXE-AA kit, which includes
 - 1 RQDXE expander module
 - 1 BC02D-01 cable
 - 1 70-20691-01 cable
- 1 RD54-D or 1 RD54-R subsystem (with 1 H9302 rackmount kit)

PDP-11/23 PLUS

The PDP-11/23 PLUS does not contain any internal RD/RX disk drives. Before you add a subsystem to a PDP-11/23 PLUS, you must connect an RQDX3 controller and cabinet kit cable (CK-RQDXE-KC) to the H349 I/O distribution panel (Figure 3-6).

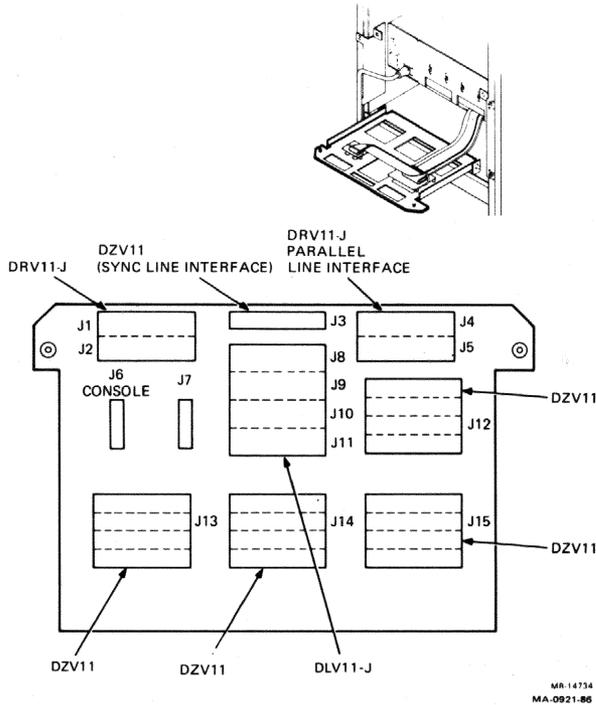


Figure 3-6 PDP-11/23 PLUS H349 I/O Distribution Panel

The H349 I/O distribution panel contains areas for use in system expansion. The cabinet kits (Table 3-1) contain the cabling for system expansion. This cabling connects to a proper connector on the internal side of the H349 panel. The RD54 subsystem can simply connect to the external connector on the H349 panel. Table 3-2 lists the external cable options to connect the subsystem.

PDP-11/23 PLUS Configuration

To use external add-on drives with a PDP-11/23 PLUS system, you need an RQDX3 controller and a cabinet kit cable (CK-RQDXE-KC) connected to the H349 I/O distribution panel.

Figure 3-7 shows how to add one RD54 subsystem to a PDP-11/23 PLUS via the H349 panel. This arrangement is suitable for a range of applications involving a single add-on RD54 subsystem.

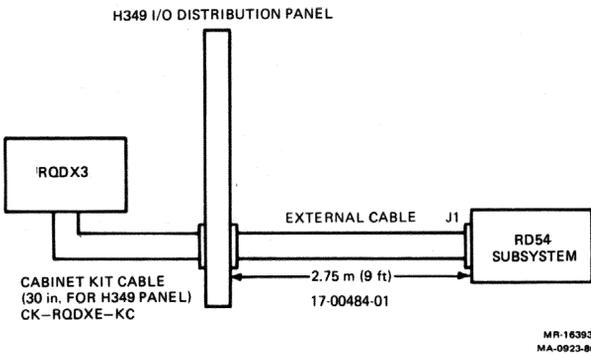


Figure 3-7 Adding One RD54 Subsystem to a PDP-11/23 PLUS

The requirements for adding one external RD54 subsystem drive are as follows.

- 1 RQDX3 controller
- 1 CK-RQDXE-KC cabinet kit
- 1 RD54-D or 1 RD54-R subsystem (with 1 H9302 rackmount kit)

Figure 3-8 shows how to add two RD54 subsystems via the H349 panel.

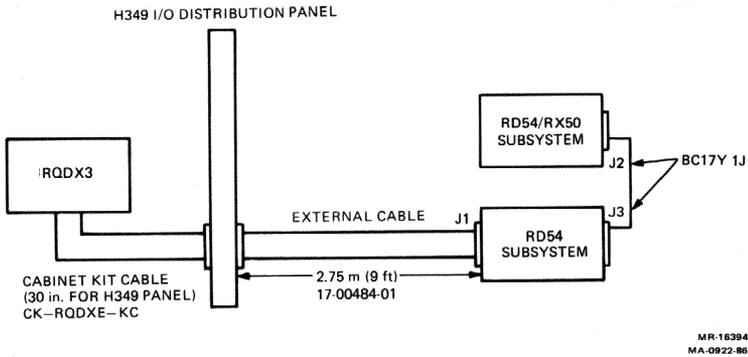
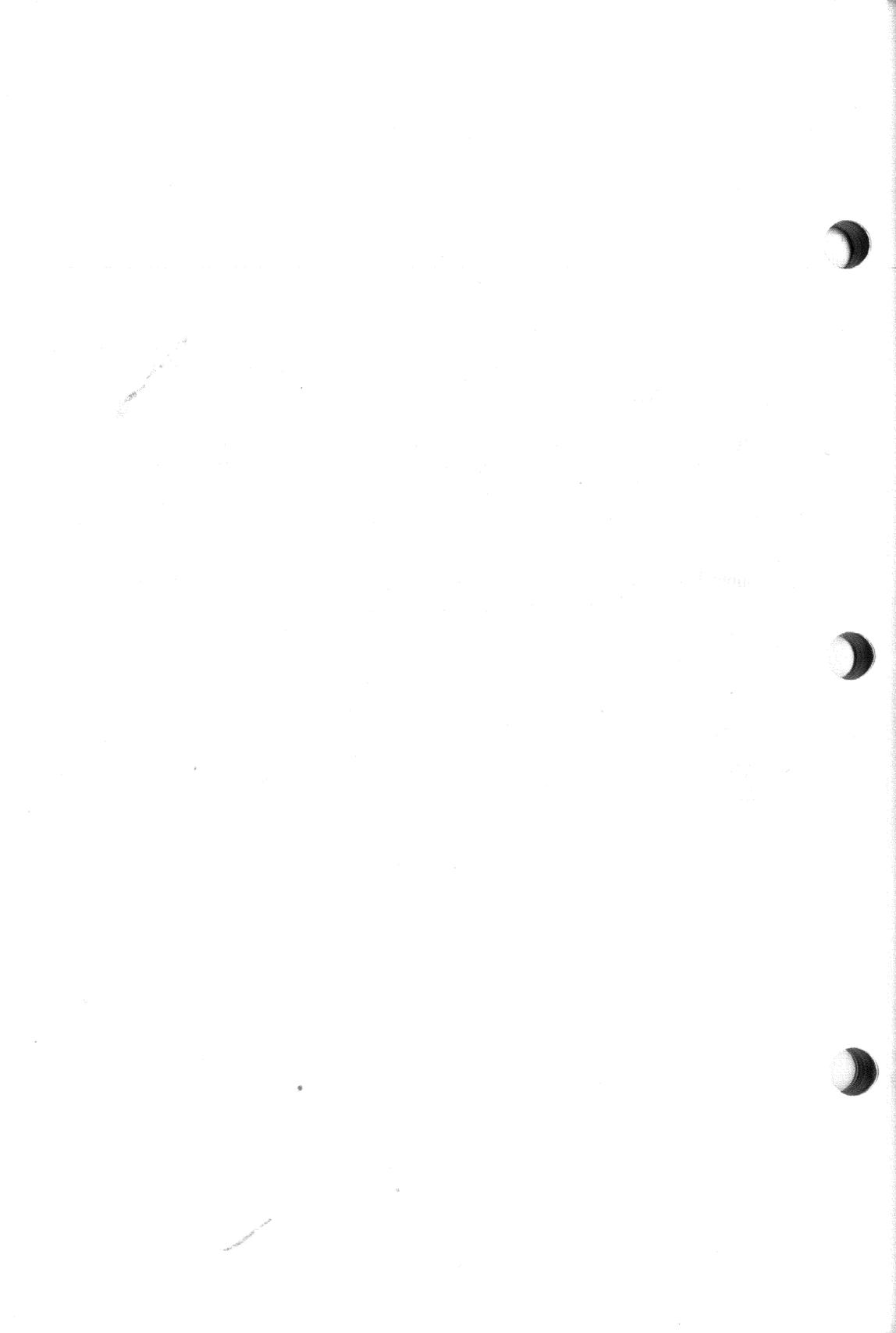


Figure 3-8 Adding Two RD54 Subsystems to a PDP-11/23 PLUS

The requirements for adding two subsystems are as follows.

- 2 RD54-D or 2 RD54-R subsystems (with 1 H9302 rackmount kit)
or
- 2 RX50-D or 2 RX50-R subsystems (with 1 H9302 rackmount kit)
or
- 1 RD54-D or 1 RD54-R subsystem (with 1 H9302 rackmount kit) and 1 RX50-D or 1 RX50-R subsystem
- 1 BC17Y-1J subsystem interconnection cable for 2-drive configurations



INTRODUCTION

Troubleshooting is the process of isolating and repairing minor problems. Your system has diagnostic tests that check almost every part of the system every time you turn the system on. In addition, the MicroPDP-11 and MicroVAX user test and field service diskettes contain extended tests for the circuitry and various devices that may be installed on the system.

Troubleshooting the RD54 subsystem usually involves running the system user test or running the program from the system boot/diagnostic ROM. Refer to the owner's manual for your system to run the user test. Refer to the technical manual for your system to run the system boot/diagnostic ROM test.

TROUBLESHOOTING TABLES

From time to time you may encounter an error that is not related to system diagnostic tests. Table 4-1 lists some of these problems, their possible cause, and suggested solutions.

NOTE

Only qualified field service personnel should make major repairs or replace any subsystem parts.

The procedure for replacing an RD54 subsystem starts on page 4-4.

Table 4-1 Basic Troubleshooting Procedure

Problem	Possible Cause	Suggested Solution
System does not start from the subsystem.	Power cable is not plugged in or power switch is off.	Plug in the subsystem power cord. Make sure the power switch is set to 1 (on).
	Subsystem cable is incorrectly installed.	Make sure the subsystem cables are installed in the correct connectors.
	The ready button is pressed in.	Press and release the ready button. The button should be out, and the button's green indicator should be on.
	The Halt button on the host is pressed in (red indicator on).	Press and release the Halt button on the host. The button should be out, and the button's red indicator should be off.
Fixed disk read error message.	There is no software on the subsystem.	Load your software onto the fixed disk drive. Follow the instructions provided with your software.
	The ready button is pressed in.	Press and release the ready button. The button should be out, and the button's green indicator should be on.
	The test detected a bad block.	Copy data from the RD54 disk drive to diskettes and retry the test. If the problem persists, replace the disk drive.

Table 4-1 Basic Troubleshooting Procedure (Cont.)

Problem	Possible Cause	Suggested Solution
Fixed disk write error message.	The ready button is pressed in.	Press and release the ready button. The button should be out, and the button's green indicator should be on.
	The disk is write-protected.	Press and release the write-protect button. The button should be out, and the button's yellow indicator should be off.
Subsystem did not write, but there were no read errors.	There is incompatible software.	Check that the correct software is installed.

REMOVING AND REPLACING RD54 PARTS

Table 4-2 lists the field replaceable units (FRUs) associated with the RD54-D, -R subsystem.

Table 4-2 RD54 Subsystem FRUs

FRU	Part Number
Cables	
Host to subsystem, 2.75 m (9 ft)	17-00484-01
Drive to drive, 0.3 m (1 ft)	BC17Y-1J*
RD54-A disk drive	RD54-A
Device electronics board	29-26103-00†
Power supply assembly	30-22561-01
Fan assembly	70-21260-01

* The RD54-D, -R is designed for a maximum total cable length of 3.6 m (12 ft). If your combined cable length is over 3.6 m (12 ft), you may have problems.

† Vendor part number

WARNING

Only qualified field service personnel should make major repairs or replace any subsystem parts.

Make sure you back up all files on a fixed disk before you attempt to repair or replace any parts.

Make sure you format any newly installed RD54 disk drive. See Chapter 1 for instructions.

Only format a disk drive when you replace a complete RD54 drive assembly.

REMOVING AN RD54 FIXED DISK DRIVE

Remove an RD54 fixed disk drive from the rackmount or desktop subsystem as follows.

1. Set the subsystem power switch to 0 (off).
2. Remove the ac power cord and all other cables from the subsystem.

WARNING

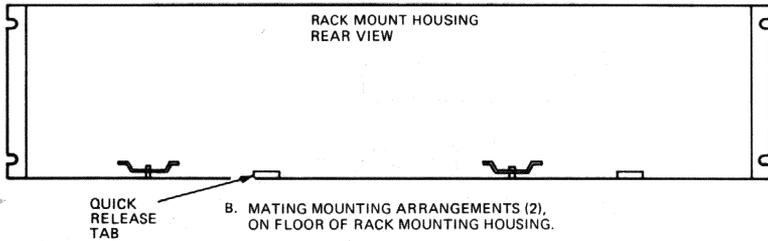
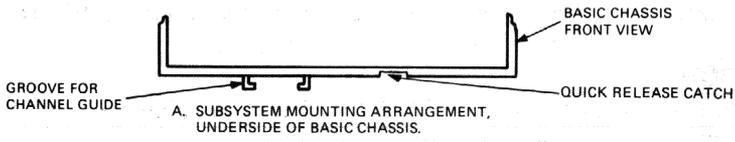
Failure to remove the power cord exposes you to extreme danger. AC power can be present in the chassis, even though the green dc power indicator is not on or the fan is not turning.

3. *For the rackmount model (RD54-R)*

Press the quick-release tab on the back of the rackmount unit and pull the basic chassis from the rack (Figure 4-1).

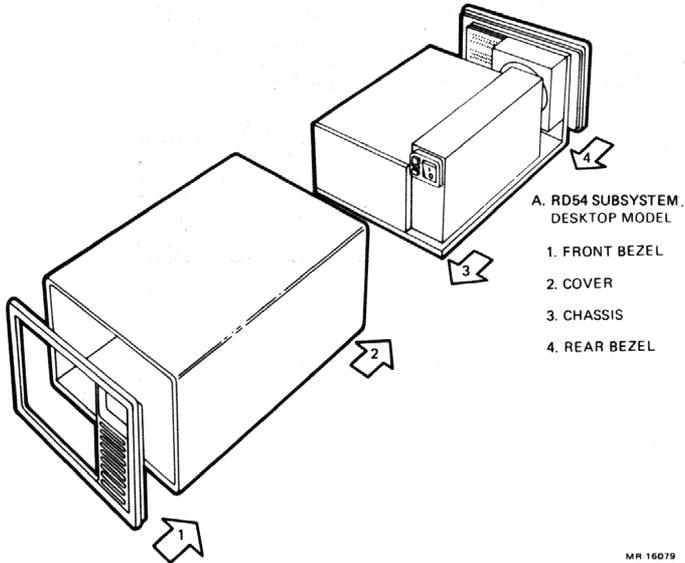
For the desktop model (RD54-D)

Remove the rear bezel (three screws) and slide the basic chassis out from the back of the unit (Figure 4-2). Use the tab on the upper-middle of the rear panel to pull the unit out.



MR 14740
MA-0924-86

Figure 4-1 Removing an RD54 Drive from a Rackmount Housing



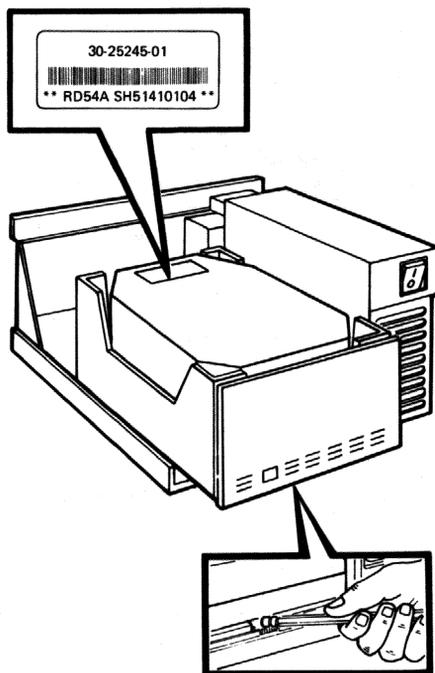
MR 16079
MA-0919-86

Figure 4-2 Removing an RD54 Drive from a Desktop Housing

4. Press the latch with a pencil and slide the RD54 drive forward (Figure 4-3).

CAUTION

Do not drop or bump the RD54 drive. It is a precision instrument and subject to damage if handled roughly.



MR. 16060
MA-0925-86

Figure 4-3 Sliding the RD54 Drive Forward

5. Disconnect the dc power connector from the back of the RD54 drive (Figure 4-4).
6. Pull the fixed disk drive cable straight out of the back of the RD54 drive (Figure 4-4). Do not pull this cable out at an angle to the RD54 drive.

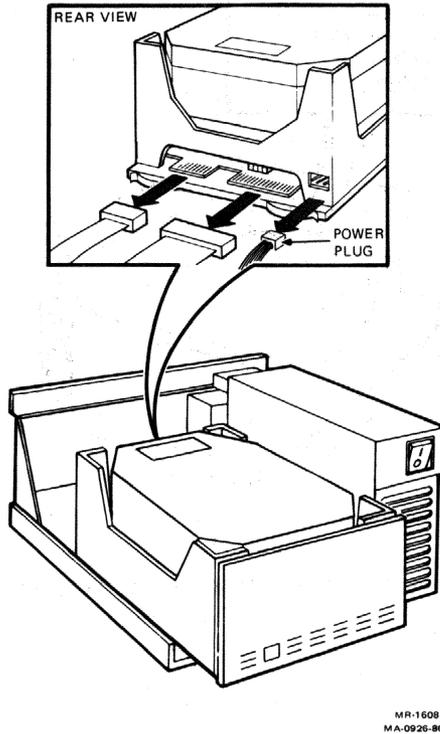
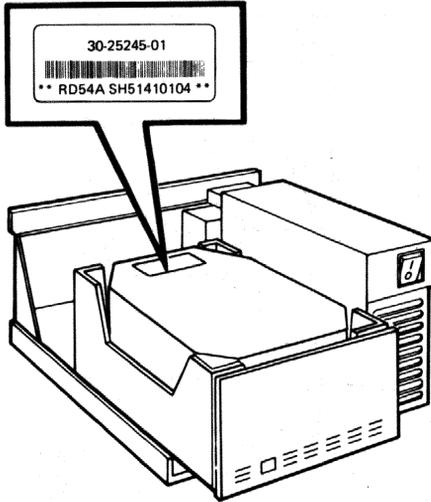


Figure 4-4 Removing the Power Cord and Drive Cables

7. Slide the RD54 drive out of the chassis. If you are returning this drive, pack it in the shipping carton the replacement drive came in.

REMOVING THE DEVICE ELECTRONICS BOARD

If you remove an RD54 fixed disk drive with the part number shown in Figure 4-5, replace the electronics board before replacing the whole drive.

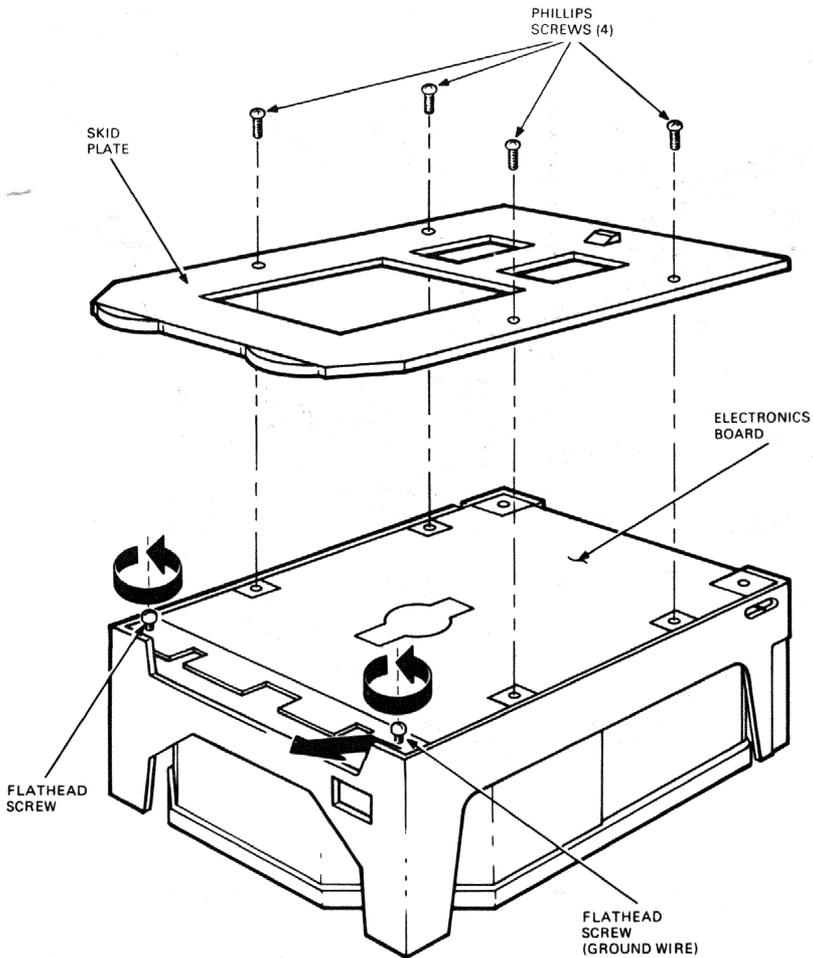


MR-16395
MA-0927-86

Figure 4-5 RD54 Drive Serial Number

Remove the device electronics board as follows.

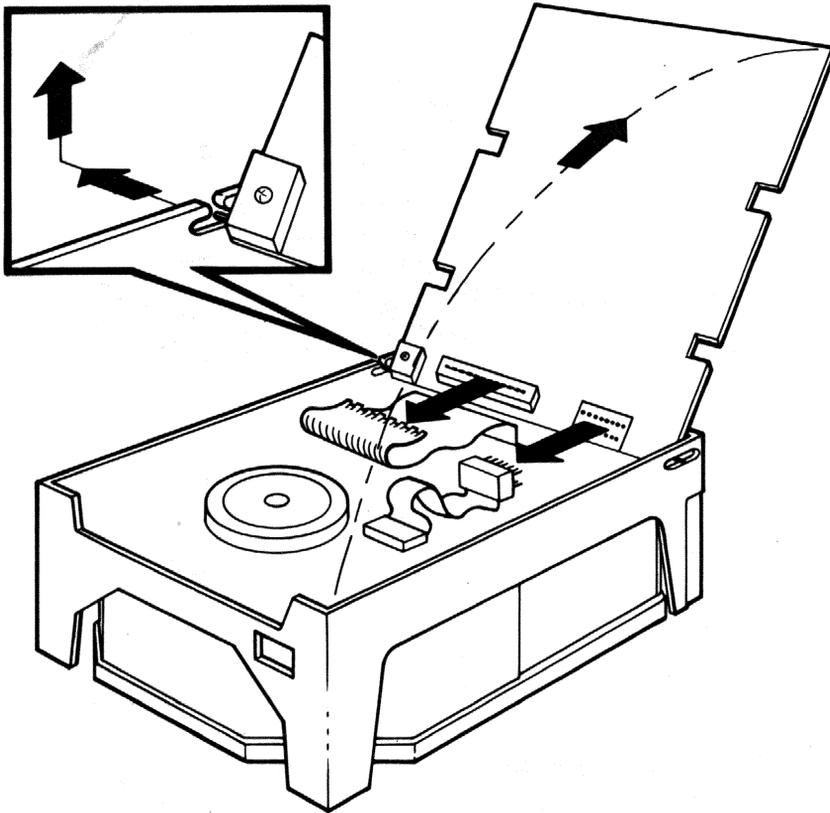
1. Place the drive upside down on a flat work surface and remove the four phillips screws holding the slide plate and ground clip (Figure 4-6). Set the slide plate aside.
2. Loosen the two flathead screws holding the electronics board (Figure 4-6). Slide the ground wire out.



MR 16083
MA-0928-86

Figure 4-6 Removing the Slide Plate

3. The electronics board is on hinges. Lift the board up and back, exposing its two connectors. Carefully pull the connectors loose (Figure 4-7).
4. Lift the pin on the left corner of the board up through the guide slot. Slide the board left, out of the right slot, and lift the board clear (Figure 4-7).



MPR 16089
MA 0912 86

Figure 4-7 Disconnecting and Removing the Device Electronics Board

To install a device electronics board, reverse steps 1 through 4.

INSTALLING AN RD54 FIXED DISK DRIVE

Install an RD54 fixed disk drive as follows.

1. Assign a logical unit number (LUN) to the drive unit by setting (turning on) one drive select switch, DS1 through DS4 (Figure 4-8).

For RD54-D, -R subsystems, set any drive select jumper. The system assigns drive unit numbers based on the distribution panel cabling, not the drive select jumper. However, you must set one jumper.

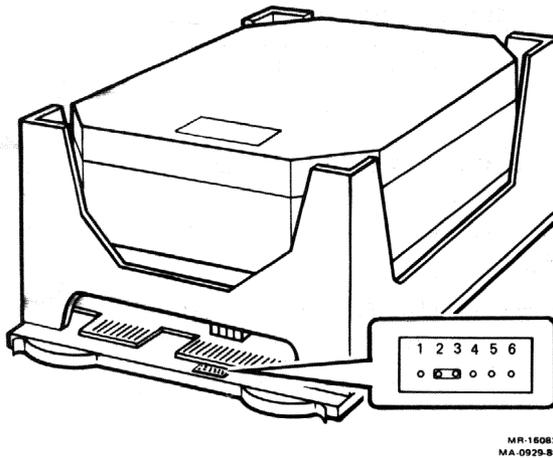


Figure 4-8 Setting a Drive Select Switch

2. Align the groove on the bottom of the disk drive with the channel guide on the floor of the chassis (Figure 4-9).

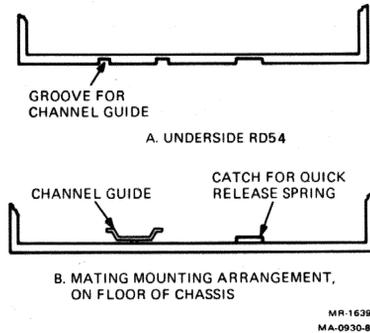


Figure 4-9 RD54-D, -R Subsystem Groove and Channel Guide

To complete the installation, reverse steps 1 through 7 of the RD54 fixed disk drive removal procedure.

You must format a newly installed RD54 fixed disk drive before using it. Make sure you use the correct disk unit number when you format the drive. (Appendix A lists the correct DUNs). Chapter 1 contains formatting and testing instructions.

WARNING

Write-protect any other fixed disk drives in the system before you format a newly installed RD54 fixed disk drive.

Only format a disk drive when you replace a complete RD54 drive assembly.

REMOVING THE POWER SUPPLY

Remove the power supply as follows.

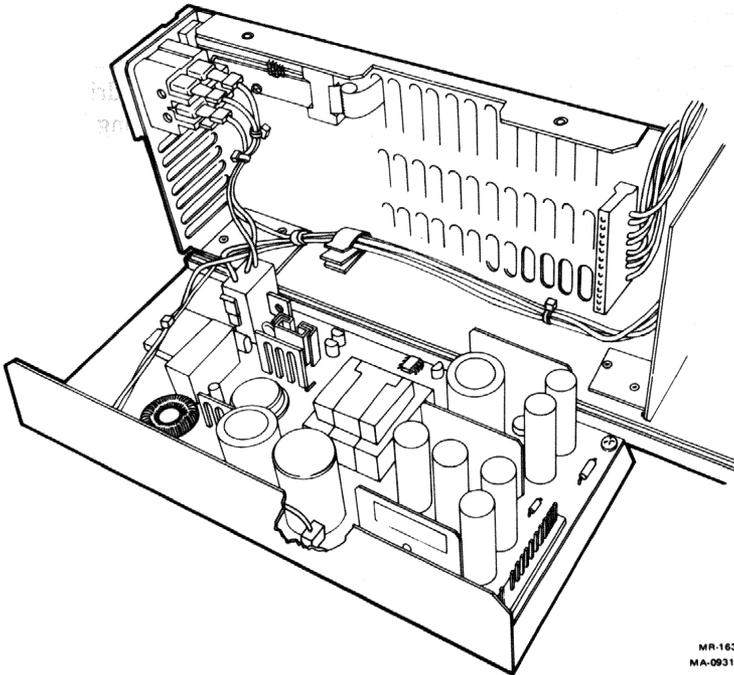
NOTE

The power supply is a single FRU. It is not adjustable and does not contain replaceable printed circuit boards.

1. Remove all cables from the RD54 subsystem.
2. Remove the rear bezel (three screws) and slide the chassis out from the back of the unit.

Remove the front bezel from rackmount units, press the quick-release tab, and remove the chassis from the rack.

3. Remove the two screws on the top plate of the power supply and tip the power supply assembly gently to the right (looking from the front).
4. Disconnect the dc power connector on the back of the power supply (Figure 4-10).



MR-16396
MA-0931-86

Figure 4-10 Power Supply, Component Side View

5. Lift the power supply assembly out of the chassis.
6. Disconnect the voltage select jumper and the ac power connector at the lower-front of the power supply.

To install a power supply, reverse steps 1 through 6.

REMOVING THE FAN ASSEMBLY

Remove the fan assembly as follows.

1. Remove all cables from the RD54 subsystem.
2. Remove the rear bezel (three screws) and slide the chassis out from the back of the unit.

Remove the front bezel from rackmount units, press the quick-release tab, and remove the chassis from the rack.

3. Disconnect the dc power connector from the fan assembly. Remove the four screws on the rear panel holding the fan assembly in place.
4. Remove the fan assembly.

To install a fan, reverse steps 1 through 4.

Appendix A

Logical Unit Number Designation

DISK UNIT NUMBER DESIGNATION

The microcode of the first RQDX3 module designates the associated disk units as DU0, DU1, DU2, and DU3. Table A-1 lists these designations for the MicroPDP-11, MicroVAX, and PDP-11/23 PLUS systems when the system has add-on disk units. Make sure you label each disk unit. Drive unit labels come with the base computer system.

An RQDX3 controller module supports up to four disk drives or two fixed disk drives and one RX50 diskette drive.

Table A-1 Disk Unit Designations

Disk Drive	MicroPDP-11	MicroVAX	PDP-11/23 PLUS
Internal RX50	DU0,DU1	NA	NA
Internal RX50 and Add-On RX50	DU0,DU1 DU2,DU3	NA NA	NA NA
Internal RX50 and Internal RD5n	DU1,DU2 DU0	DU1,DU2 DU0	NA NA
Internal RX50 and Internal RD5n with Add-On RD5n	DU2,DU3 DU0 DU1	DU2,DU3 DU0 DU1	NA NA NA

Table A-1 Disk Unit Designations (Cont.)

Disk Drive	MicroPDP-11	MicroVAX	PDP-11/23 PLUS
No internal drive, Add-On RX50*	NA	NA	DU0,DU1
No internal drive, Add-On RD5n	NA	NA	DU0
No internal drive, Add-On RX50 and RX50	NA NA	NA NA	DU0,DU1 DU2,DU3
No internal drive, Add-On RX50 and RD5n	NA NA	NA NA	DU1,DU2 DU0
No internal drive, Add-On RD5n and RD5n	NA NA	NA NA	DU0 DU1
No internal drive, Add-On RD5n and RD5n and RX50	NA NA NA	NA NA NA	DU0 DU1 DU2,DU3

* Refer to the *11C23-UC/11C23-UE RD52 Upgrade Installation Guide* for specific requirements for PDP-11/23 PLUS systems.

LOGICAL UNIT NUMBERS (LUNs)

The logical unit numbers and LUN jumpers provide for future expansion capability of more than one RQDX3 controller module per system. Jumpers on the controller module select the LUN. These jumpers determine the lowest LUN assigned to any RD5n, and RX50 disk drives in the system.

The RQDX3 controller module automatically sizes the logical unit configuration during system initialization, to determine how many of the four possible units are present. The microcode automatically assigns disk unit numbers to any drives that are present. An RX50 diskette drive is two units.

Appendix B System Specifications

ENVIRONMENT

To receive the best performance from your RD54-D, -R subsystem, you must provide the right operating environment. Table B-1 lists general requirements.

Table B-1 General Environmental Requirements

Environment	Operating	Nonoperating
	-0.3 km to +3 km	-0.3 km to +12 km
Maximum altitude range	(-1,000 to +10,000 ft)	(-1,000 to +40,000 ft)
Temperature range*	10° to 50° C (50° to 122° F)	-40° to +66° C (-40 to 15° F)
Temperature change rate	1.1° C/hour (2.0° F/hour)	2.0° C/hour (3.6° F/hour)
Relative humidity (noncondensing)	20% to 80%	10% to 95%
Heat dissipation	35 W	NA

* Reduce the temperature specification by 1.8° C (3.52° F) for each 1000 m (3,300 ft) increase in altitude.

SUBSYSTEM DIMENSIONS

Height	13.97 cm (5.50 in)
Width	22.86 cm (9 in)
Length	30.58 cm (12 in)
Weight	15.5 kg (34.4 lbs)

RD54 FIXED DISK DRIVE

Performance Specifications

Average access time	30 ms
Average rotational latency	8.33 ms
Transfer rate	5 Mbits/s

Media Characteristics

Formatted capacity	159 Mbytes
Recording surfaces (heads)	15
Disks	8
Bytes per track	8,704
Tracks per drive	18,374
Track density	1022 tracks per inch
Recording method	Modified frequency modulation (MFM)

Physical Specifications

Height	8.26 cm (3.38 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.29 in)
Weight	3.15 kg (7.25 lbs)

POWER SUPPLY

Inputs

Line voltage (switch selectable)	100 to 120 Vac nominal, single phase, 3 wire 200 to 240 Vac nominal, single phase, 3 wire
-------------------------------------	--

Line frequency	47 Hz to 63 Hz, either input range
----------------	------------------------------------

Line current	120 V, 2 amp RMS (maximum) 240 V, 1 amp RMS (maximum)
--------------	--

Outputs

Power	65 W (maximum)
-------	----------------

DC voltages	+12 A Vdc +5%, 0.1 A (min.) to 4.5 A (max.) +12 B Vdc +10%, 0.12 A (max.) (dc fan only) +5 Vdc +5%, 0.3 A (min.) to 2.0 A (max.)
-------------	--

Appendix C

Connector Pin Numbers and Signals

J1, J2, AND J3 CONNECTORS

Connectors J1, J2, and J3 have identical signal names and pin numbers.

Table C-1 Connector Signals

Pin Number	Signal Name
J1-01	MEMWRTDT1 (H) (RD5n only signal)
J1-34	MEMWRTDT1 (L) (RD5n only signal)
J1-18	GROUND
J1-02	HEAD SET 2 (L) (RDXX only signal)*
J1-35	GROUND
J1-19	SEEKOPLT
J1-03	RD1 RDY (H) (RD5n only signal)
J1-36	WPT FAULT (L)
J1-20	GROUND
J1-04	READ SEL 1 (L)
J1-37	RX0WPTLED (L) (RX50 only signal)
J1-21	RD0 RDY (H) (RD5n only signal)
J1-05	RX1WPTLED (L) (RX50 only signal)
J1-38	DRVSLOACK (L) (RD5n only signal)
J1-22	MEMRDDAT0 (H) (RD5n only signal)
J1-06	MFMRDDAT0 (L) (RD5n only signal)
J1-39	MFMWRTDT0 (H) (RD5n only signal)
J1-23	MFMWRTDT0 (L) (RD5n only signal)
J1-07	MFMRDDAT1 (H) (RD5n only signal)
J1-40	MFMRDDAT1 (L) (RD5n only signal)
J1-24	GROUND
J1-08	RFDUCWRTI (L)
J1-41	RD0WRTPRO (L) (RD5n only signal)

* Reserved for future use.

Table C-1 Connector Signals (Cont.)

Pin Number	Signal Name
J1-25	DRV SEL 4 (L)
J1-09	GROUND
J1-42	INDEX (L)
J1-26	RD1WRTPRO (L) (RD5n only signal)
J1-10	DRV SEL 1 (L)
J1-43	DRV SEL 2 (L)
J1-27	DRV SEL 3 (L)
J1-11	RX2WPTLED (L) (RX50 only signal)
J1-44	RXMOTORON (L) (RX50 only signal)
J1-28	GROUND
J1-12	DIRECTION (L)
J1-45	GROUND
J1-29	STEP (L)
J1-13	GROUND
J1-46	RXWRTDATA (L) (RX50 only signal)
J1-30	GROUND
J1-14	WRT GATE (L)
J1-47	GROUND
J1-31	TRACK 00 (L)
J1-15	RX3WPTLED (L) (RX50 only signal)
J1-48	DRVSL1ACK (L) (RD5n only signal)
J1-32	GROUND
J1-16	READ DATA (L)
J1-49	GROUND
J1-33	HEAD SEL 0 (L)
J1-17	GROUND
J1-50	READY (L)

POWER SUPPLY CONNECTORS**Table C-2 AC Power Input Connectors**

Pin Number	Signal
1	Ground
2	AC phase
3	AC neutral

Table C-3 DC Power Output Connectors

Pin Number	Signal
1	+5 V
2	+5 V
3	+5 V
4	Return
5	Return
6	Return
7	Return
8	+12 A V
9	+12 A V
10	+12 B V
11	No pin
12	No connection



Appendix D Service Options

If you have decided to have Digital Equipment Corporation maintain your system, Digital Field Service offers a flexible range of plans from which you may choose.

ON-SITE SERVICE

This offers the convenience of repair service at your site and the insurance against unplanned and unbudgeted repair costs. For a small monthly cost, you can receive personal service from our service specialists. Usually, within a few hours of your call, a specialist is dispatched to your site with the necessary equipment and spare parts to give your equipment fast, dependable service.

Under basic service, full coverage is available from 8 a.m. to 5 p.m., Monday through Friday. Options are available to extend your coverage to 12-, 16- or 24-hour coverage and to Saturdays, Sundays, and holidays.

If you require uninterrupted operations, you can choose DECservice, a premium on-site service that guarantees extra-fast response and nonstop remedial maintenance. The representative does not leave until the problem is solved.

Under basic service and DECservice, all parts, materials, and labor are covered in full.

CARRY-IN SERVICE

This service is offered to customers who do not need the convenience of on-site coverage, but do require the same fast, personal response and the ability to plan their maintenance expenditures, at a lesser monthly cost than on-site service.

When a unit is brought to one of the 160 Digital Service Centers worldwide, you can be sure that your unit will receive expert repair service from factory-trained personnel. Your unit is guaranteed to be repaired within two days, normally within 24 hours. Carry-in service is available on selected terminals and systems. Contact your local Digital Field Service Office to determine if this service is available for your unit.

DECmailer

This is our service for users who have technical resources to perform the first line of maintenance themselves. DECmailer customers can troubleshoot, identify, and isolate the component(s) that caused the problem and mail it to our Customer Returns Center. Here, the module receives expert repair and is mailed back to you within five days. With DECmailer service, you are charged for each use, rather than a monthly rate.

PER CALL SERVICE

This service is for users who wish to establish a maintenance program on a non-contractual, time, and materials cost basis. Per call service is available with either on-site or carry-in service, and is appropriate for users who can perform first-line maintenance, but who may occasionally need greater support from Field Service.

PER CALL

This service is also offered as a supplementary program for basic service plan customers who need remedial maintenance outside their contracted hours of coverage; in that case, however, there is no charge for materials.

ON-SITE PER CALL SERVICE

This service is provided on a best-effort basis, with a normal response time of two to three days. It is available 24 hours a day, 7 days a week.

CARRY-IN PER CALL SERVICE

Service is available during normal business hours, with a turnaround time of two to three days.

For additional information about these Digital service plans, their prices, and special rates for volume customers, contact your local Digital Field Service Office. Call one of the information numbers for the location of the Digital Field Service Office nearest you.

DIGITAL INTERNATIONAL FIELD SERVICE INFORMATION NUMBERS

U.S.A.	(800)554-3333
Australia	(02)4125555
Austria	(222)6776410
Belgium	(02)2425095
Canada	(800)267-5251
Denmark	(2)889666
Finland	(0)423511
France	(6)0778292
Holland	(30)640293
Ireland	(1)308433
Italy	(02)617961
Japan	(03)9897161
Norway	(2)160290
Portugal	(1)725402
Spain	(1)7331900
Sweden	(8)7338000
Switzerland	(01)8169111
United Kingdom	(734)868711
West Germany	(089)95910



Index

A

AC line connector, 3-5
Airflow, 1-1

B

BA23 enclosure
 cabinet kit, 3-9
 I/O distribution panel, 3-9
Backup files, 1-9, 2-3, 4-4
BC17Y-1J cable, 3-8, 3-13
Boot/diagnostic ROM, 4-1
Button
 Halt, 4-2
 ready, 2-2, 4-2
 write-protect, 2-2, 4-3

C

Cabinet kit
 MicroPDP-11, 3-8
 MicroVAX, 3-8
 ordering, 3-10
 PDP-11/23 PLUS, 3-8
Cable
 50-pin subminiature, 3-8
 dc power, 4-7
 drive-to-drive, 3-8
 fixed disk drive, 4-7
 host-to-subsystem, 1-2, 1-4,
 3-6, 3-10

install, 1-5 to 1-7, 3-10, 3-12
 to 3-13,
length, 3-6, 3-8
options, 3-8
power, 1-8 to 1-9
table, 3-8
troubleshooting, 4-2

Channel guide, 4-5
Circuit breaker, 3-3, 3-5
Configuration, 3-7 to 3-13
 examples, 3-10 to 3-13
 MicroPDP-11, 3-9
 MicroVAX, 3-9
 PDP-11/23 PLUS, 3-11
 table, 3-8

Connector

AC power, 3-5
I/O distribution panel, 3-9
guidelines, 3-6
J1, J2, J3, 2-5, 3-6
 disk unit number, 3-6
 pin assignment, C-1
 power supply, 2-4, C-3
 table 2-5
Control panel, 2-1, 3-4
 table, 2-3

D

Damaged items, 1-2, 1-4
DC cooling fan, 3-2
 removal, 4-14

DC indicator, 2-2, 3-5
 See also Indicator
Device electronics board, 4-8
Digital storage architecture, 3-3
Disk drive handling, 2-5
Disk unit number
 discussion, 3-7
 label, 1-9, 3-6, A-1
 table, A-1
 use in formatting, 1-10, 1-11
Diskette, 4-1
Drive select switch, 4-11
DRV SEL 3 signal, 3-6
DRV SEL 4 signal, 3-6
DU0, DU1. *See* disk unit number

E

Environment, 3-3
 table, B-1
Error messages
 systems with an RQDX3, 1-14

F

Fan, 3-4
 removal, 4-14
Field replaceable unit, 4-3 to 4-14
 cables, 4-3
 device electronics board, 4-8
 fan, 4-14
 mounting chassis, 4-5
 power supply, 4-13
 RD54, 4-4, 4-11
 table, 4-3
Field service diskette, 4-1
Formatting the RD54, 1-9 to 1-15
 address, 1-11

 capacity, 3-2, B-2
 help, 1-13
 MicroPDP-11 with an
 RQDX3, 1-12
 MicroVAX with an RQDX3, 1-16
 modes, 1-11
Front panel controls, 2-2, 2-3,
 3-4 to 3-5
FRU. *See* field replaceable unit

H

Help
 configuration, 3-9 to 3-13
 disk unit number, A-1
 formatting, 1-14
 phone, D-3
 troubleshooting table, 4-2

I

Indicator, 2-3, 3-5
 DC, 2-3, 3-5
 ready, 2-3, 3-4
 write-protect, 2-3, 3-4
Installation, 1-2 to 1-9
I/O distribution panel
 MicroPDP-11, 3-9
 MicroVAX, 3-9
 PDP-11/23 PLUS, 3-11

J

J1, J2, J3 connector, 2-5
 disk unit number, 3-6
 DRV SEL 3 (L) signal, 3-6
 DRV SEL 4 (L) signal, 3-6

DU1 designation, 3-6
guidelines, 3-6
pin assignment, C-1
use, 2-4, 3-6

L

Logical unit number
 automatic sizing of, 3-7
 discussion, 3-7, A-2
 tables, A-1, A-2
LUN. *See* logical unit number

M

Maintenance, 2-5
Mass storage control protocol, 3-3
MDM formatting, 1-16 to 1-20
MicroPDP-11
 cabinet kit, 3-8
 configuration, 3-10
 disk unit number, A-1
 format, 1-9, 1-12
MicroVAX
 cabinet kit, 3-8
 configuration, 3-10
 disk unit number, A-1
 format, 1-9, 1-15
Mode
 reconstruct, 1-11
 reformat, 1-11
 restore, 1-11
Module
 RQDX3 controller, 3-8
 RQDXE expander, 3-8
MSCP, 3-3

O

On/off switch, 2-3
Operation, 2-1 to 2-5
 features, 3-3

P

PDP-11/23 PLUS
 cabinet kit, 3-8
 configuration, 3-12
 disk unit number, A-1
Power supply, 3-3
 connector, 2-5, C-3
 description, 3-3
 indicator, 2-3
 pin number, C-3
 regulators, 3-3
 removal, 4-13
 specification, B-2
VOLT SEL, 3-3

Q

Q-Bus host, 3-2
Quick release tab, 4-4

R

Rackmount, 1-2
 cover, 1-3
 installation, 1-2
 kit H9302, 1-3, 3-3
RD54 disk drive
 cable, 4-7
 DC power cable, 4-7
 description, 2-1, 3-2 to 3-7
 device electronics board, 4-8
 drive select switch, 4-11
 formatted capacity, B-2
 four-wire power cable, 4-7
 handling, 2-5
 installation, 1-2 to 1-8
 media characteristics, B-2
 model number, 3-3
 operation, 2-3
 part number, 4-8
 removal, 4-4

- shipping, 4-7
- software, 3-3
- specification, B-2
- storage capacity, 2-1
- RD54-D, *See* RD54 disk drive
- RD54-R, *See* RD54 disk drive
- Read error message, 4-2
- Ready button, 2-3
 - See also* button
- Ready indicator, 2-3, 3-4
- Rear panel, 2-4, 3-5
- Reconstruct mode, 1-11
- Reformat mode, 1-11
- Related documents, ix
- Restore mode, 1-11
- RQDX3 controller 3-7, 3-8
 - logical unit number, 3-7
 - number of drives allowed, 3-8
- RQDXE module, 3-8
 - cable, 3-8
- RX50 diskette drive
 - logical unit number, 3-8, A-2

S

- Serial number
 - location, 4-8
- Service, D-1 to D-3
- Site requirement, 1-1, B-1
- Specification, B-1 to B-2
 - power supply, B-2
 - RD54, B-2
- Static, 1-1
- System controller options
 - table, 3-8
- System tests, 1-9, 1-14, 4-1

T

- Technical description, 3-1 to 3-7
- Troubleshooting, 4-1 to 4-14
 - table, 4-2
 - FRU procedures, 4-4 to 4-14

U

- User test, 1-14

V

- Vdc regulators, 3-3
- VOLT SEL. *See* voltage switch
- Voltage switch, 1-8, 2-4, 3-5

W

- Write error 4-3
- Write-protect
 - button, 2-3
 - See also* button
 - guidelines, 2-4
 - indicator, 3-4
 - troubleshooting, 4-3

X

- XXDP+ formatting
 - with an RQDX3, 1-12 to 1-15