

Introduction

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 Intended Readers
 For Field Service Representative Only
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GENERAL

This manual describes how to install the TK50 UNIBUS kit in computers that include a UNIBUS. The UNIBUS kit consists of an M7547 UNIBUS controller module and a ribbon cable. The ribbon cable plugs into the controller module and the other end connects to a bulkhead on the cabinet.

The UNIBUS kit comes in two variations -- a TUK50-AB and TUK50-BB. The TUK50-AB version comes with a 10 foot cable and is used for all installations except the PDP-11/84-AA/AB/BA/BB. The TUK50-BB comes with a 3 foot cable and is used for PDP-11/84-AA/AB/BA/BB only.

The TK50 tape drive comes in two variations -- a TK50-R and a TK50-D. The TK50-R is a rackmount unit and the TK50-D is a desktop unit.

The TK50-R or TK50-D tape drive consists of a TK50 drive and an FCC cable assembly. The cable connects the system bulkhead and the tape drive.

You can use your rackmounted TK50-R or free-standing subsystem TK50-D as an add-on to PDP-11 systems or VAX systems. You can easily attach the subsystems to an existing system or incorporate them into new designs.

TK50 TAPE DRIVE -- WHAT YOU NEED TO KNOW

Your TK50 tape drive subsystem is a delicate, precision instrument. It will be damaged if handled improperly. It will give you reliable service if you observe the following precautions.

- Follow instructions carefully when installing your TK50 tape drive subsystem.
- Do not drop or bump the tape drive. (See Appendix B, System Specifications.)
- When transporting or shipping your subsystem, pack your tape drive in its original packing material to prevent damage from shocks and vibrations.
- Do not put foreign objects into the tape drive.
- Always remove the cartridge (TK50-K) before powering down or moving the tape drive.

INTENDED READERS

This book provides reference material for the owner (see Chapters 1 and 4) as well as technical information for service personnel (see Chapters 2, 3, 5, and 6). Refer to your software documentation for information on how to use the subsystem with your computer.

NOTE: Chapters 2 and 3 contain installation instructions for service personnel or the owner. Read the following information BEFORE you install your TK50 drive. Only trained service personnel can install the controller.

If a TK50 controller module is already installed in the computer, you can attach the TK50-R or TK50-D subsystem.

If a TK50 controller module needs to be installed, make sure the installation is done by trained service personnel.

WARNING: There are dangerous voltages in the system. Do not touch the inside of either the subsystem or your computer unless you are a trained service representative.

FOR FIELD SERVICE REPRESENTATIVE ONLY

This manual provides instructions for installing the TK50 controller module in PDP-11 UNIBUS systems, and VAX systems, with a TK50-R or TK50-D subsystem. This is a representative installation on a typical UNIBUS system.

CAUTION: Static electricity can damage modules installed in the system and in mass storage devices. Always use a grounded wrist strap and grounded work surface (Velostat kit PN 29-11762-00) when touching internal parts of the computer or handling modules.

HOW TO USE THIS BOOK

Some of the procedures in this book can ONLY be performed by trained service personnel. The following paragraphs describe the contents of each chapter and which procedures must be performed by trained service personnel.

Introduction

This chapter describes the TK50 tape drive, this book, what to do if you need help, and the mnemonics used in this book.

Chapter 1 Preparing for Installation

This chapter describes how to prepare your site, unpack and prepare the equipment, and prepare the module for installation. The owner can perform the first three procedures. Only trained service personnel or self-maintenance customers can perform the last procedure, Preparing the M7547 UNIBUS Controller Module.

Chapter 2 Installing in PDP-11 Systems

This chapter describes how to install a TK50 tape drive in a PDP-11 UNIBUS system. Only trained service personnel or self-maintenance customers can perform this procedure.

Chapter 3 Installing in VAX Systems

This chapter describes how to install a TK50 tape drive in VAX systems. Only trained service personnel or self-maintenance customers can perform this procedure.

Chapter 4 Operation

This chapter briefly describes how to operate the TK50 subsystem.

Chapter 5 Technical Description

This chapter provides technical information for service personnel and self-maintenance customers.

Introduction

Chapter 6 Removal and Replacement Procedures

This chapter describes procedures to remove and replace the Field Replaceable Units (FRUs) in the TK50. Only trained service personnel and self-maintenance customers can perform these procedures.

Appendices

The appendices describe the following.

Appendix A	Connector Pin Numbers and Signals
Appendix B	System Specifications
Appendix C	Related Documentation
Appendix D	Service Options

HELP

If you need help:

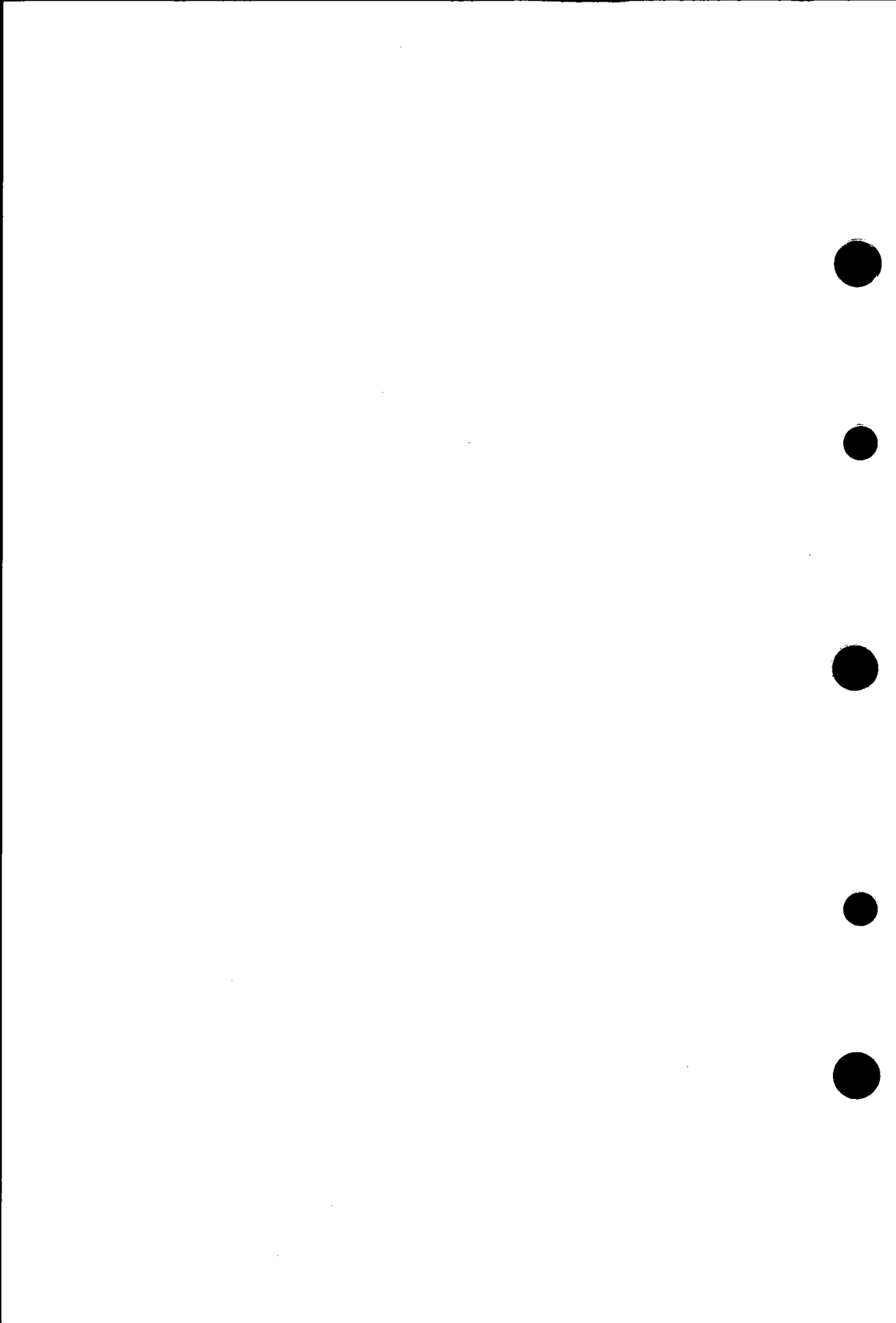
- Refer to Table 5-5 Basic Troubleshooting Checklist.
- For hardware questions, call your service representative.
- For software questions, call your sales representative and ask for an access code number for the Digital Phone Support Center (PSC).

MNEMONICS

The following are commonly used mnemonics.

BLK	Block
BOT	Beginning of tape
CB	Circuit breaker
CONFIG	Configure -- refers to software program
CPU	Central processing unit
CSR	Control status register
DIP	Dual in-line process; refers to switches
DMA	Direct memory access
DRV	Drive
DRV SEL	Drive select
DSA	Digital storage architecture
DMSCP	Disk mass storage protocol
DUP	Diagnostics utilities protocol
EOT	End of tape
ERR	Error

FRU	Field replaceable unit
I/O	Input/output
IDR	Inhibit drop units
IP	Initialize polling -- refers to a register
LED	Light emitting diode
LEOT	Logical end of tape
LOE	Loop-on-error
MFM	Modified frequency modulation
MSCP	Mass storage control protocol
PP	Purge and poll
RAM	Random access memory
REG	Register
ROM	Read-only memory
SA	Status/address register
SYSGEN	System generation refers to software program
TMSCP	Tape mass storage control protocol
TYP	Type
UQSSP	U/Q-bus storage system protocol
VOLT SEL	Voltage select -- usually refers to a switch



INTRODUCTION

This chapter describes how to prepare your site and equipment for installation. Chapter 2 describes how to install the TK50 UNIBUS kit in PDP-11 computers that include a UNIBUS. (Chapter 3 describes the same installation, but in VAX systems.)

PREPARING THE SITE

Place the TK50 tape drive subsystem where it is to be used.

Minimize static by placing the unit away from busy office corridors.

Place the unit away from heaters, photocopiers, and direct sunlight.

Keep the unit away from magnets and equipment that generate magnetic fields, such as motors, transformers, and terminals.

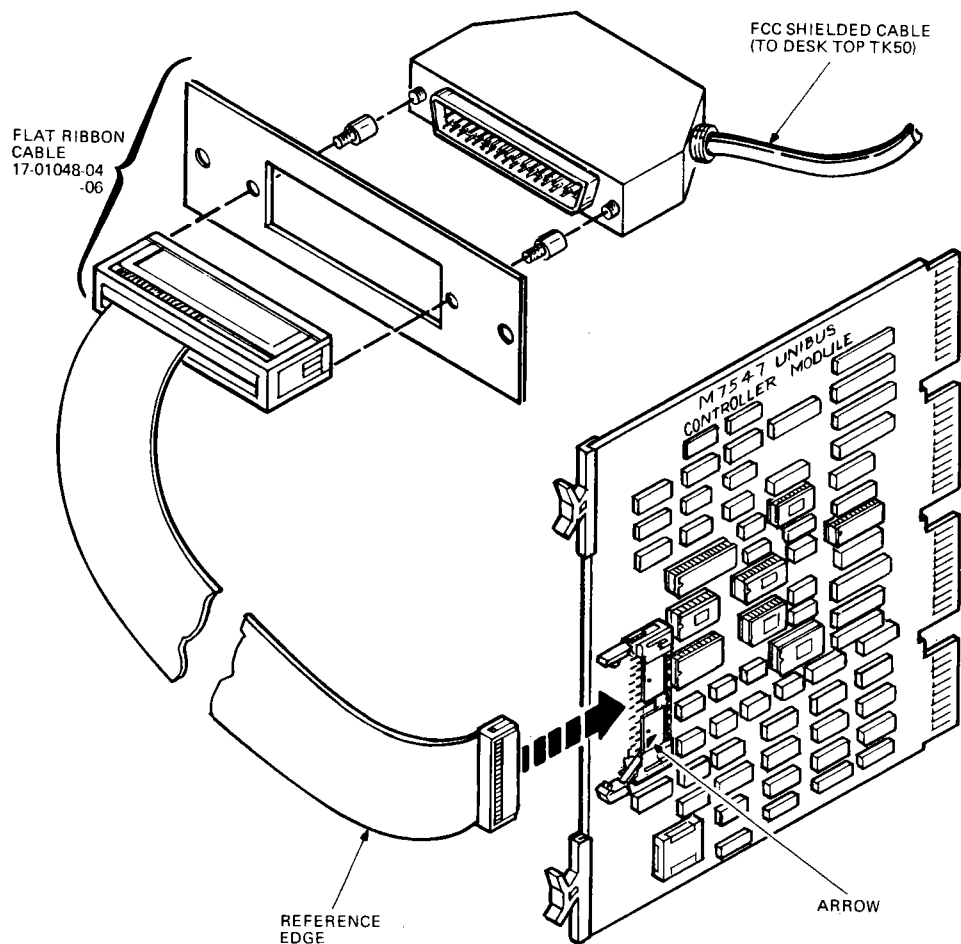
UNPACKING THE TK50-R (RACKMOUNT) SUBSYSTEM

If any item is missing or damaged:

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

Unpack and check the H9302 rackmount kit (Figure 1-2), which is shipped separately. Refer to documentation provided with the kit for instructions.

The TK50-R tape drive is shipped completely assembled and ready to install in an H9302 rackmount assembly.



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Figure 1-1 UNIBUS Controller Module and Cable

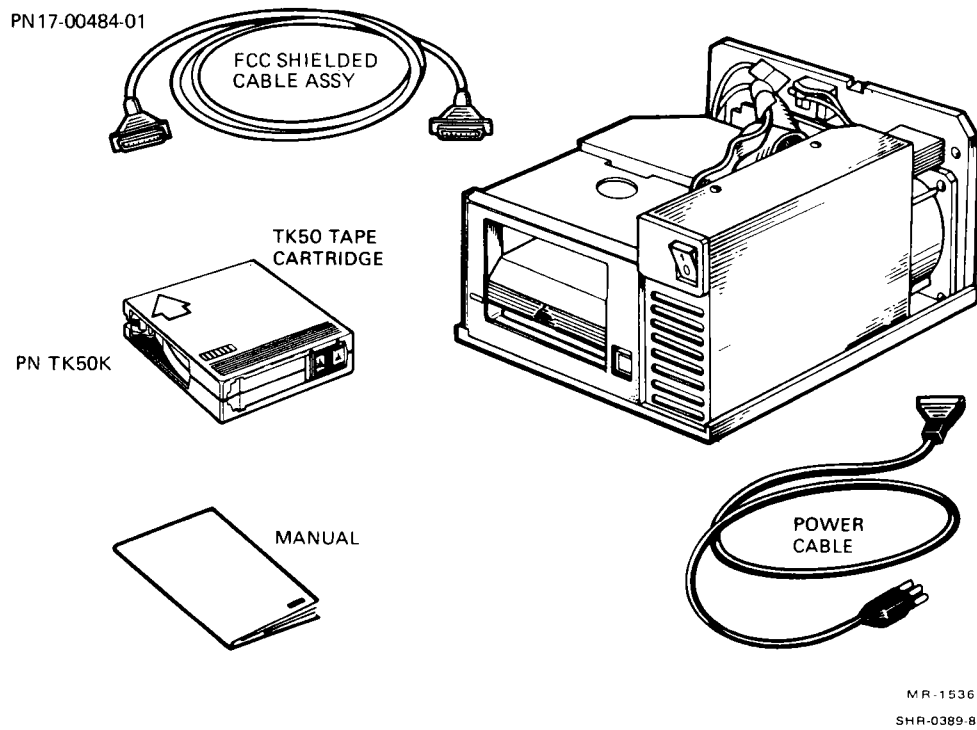


Figure 1-2 TK50-R System and Parts

PREPARING THE RACK AND INSTALLING THE TK50-R AND FRONT COVER

The front cover is provided with the H9302 Rackmount Kit (Figure 1-3).

If you are installing a TK50 controller module, go first to Preparing the M7547 UNIBUS Controller Module, then to Installing the M7547 UNIBUS Kit in PDP-11/44 Systems in Chapter 2, or Chapter 3 if you are installing in a VAX.

If your computer already has a TK50 controller module, go to Connecting the TK50-R or TK50-D to Host in Chapter 2, or Chapter 3 if you are installing in a VAX.

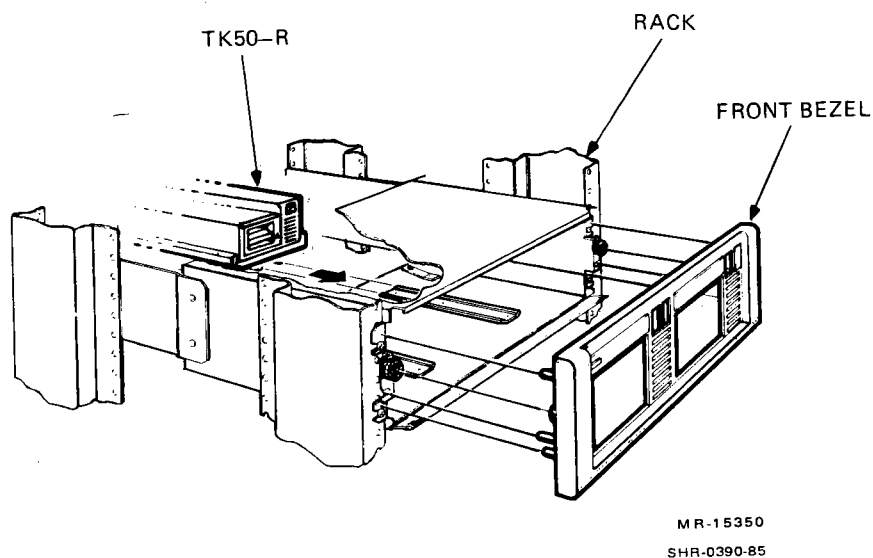


Figure 1-3 Installing a TK50-R in a Rackmount Assembly

UNPACKING THE TK50-D (DESKTOP) SUBSYSTEM (FIGURE 1-4)

If any item is missing or damaged:

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

The TK50-D (Figure 1-4) is shipped completely assembled and ready to connect to the computer system.

If your computer already has a TK50 controller module, go to Connecting a TK50-R or TK50-D to Host in this chapter.

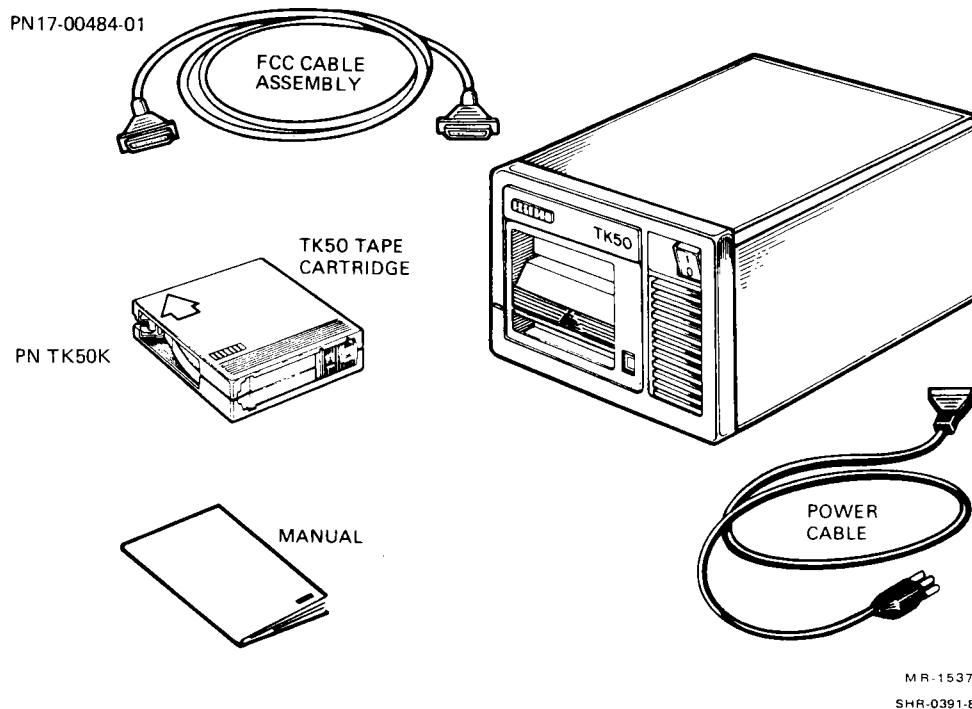


Figure 1-4 TK50-D System and Parts

PREPARING THE M7547 UNIBUS CONTROLLER MODULE

NOTE: This procedure must be performed by trained service personnel or self-maintenance customers.

This procedure describes how to prepare the M7547 controller module for installation in the computer. The controller module may be installed in any small peripheral controller (SPC) slot of the computer backplane.

The controller responds to two addresses as a slave device on the UNIBUS. These addresses are the addresses of the initialize poll register and the starting address register. The installer may change these addresses by changing the address jumpers on the board (Figure 1-5). The base address is the address of the initialize poll (IP) register and the base address plus 2 locations is the address of the status address (SA) register. Additional devices are assigned floating addresses. Example: If the base address or IP register is located at 17774500 (base 8), the SA register is then located at 1774502 (base 8).

The controller module has the following jumpers and switches.

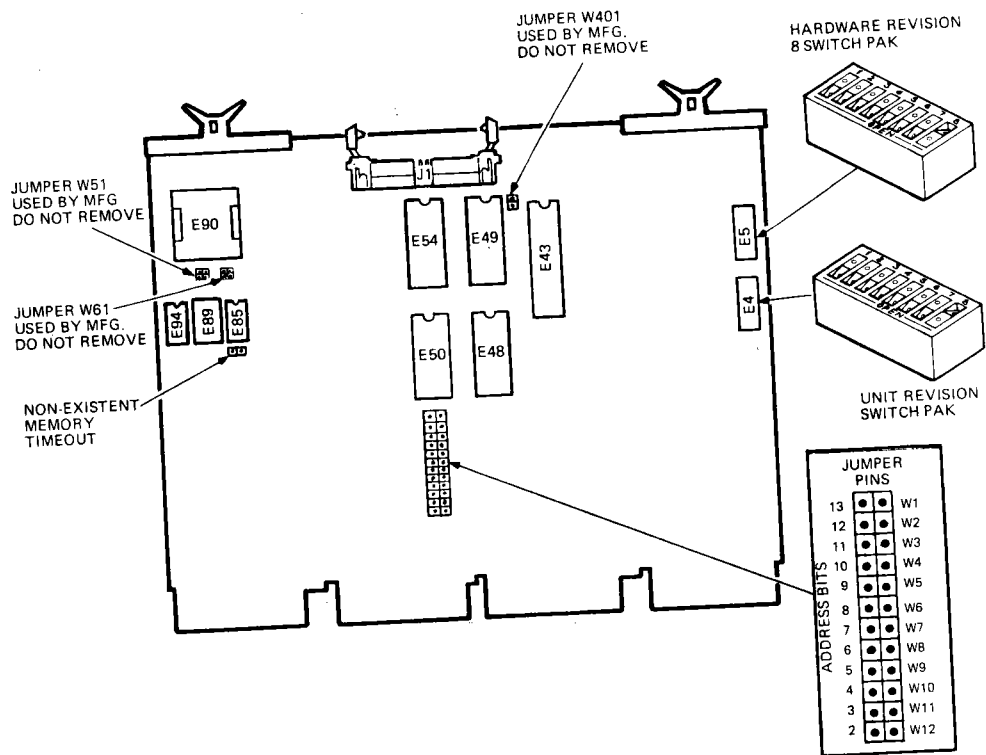
Jumper W51, W61, W401 -- Used by manufacturing -- Do not remove.

Jumpers W1 through W12 -- Address jumpers -- Used to set starting address. The first UNIBUS base address is fixed at 774500 (octal).

Jumper W201 -- Nonexistent memory timeout extend -- With jumper removed, nonexistent memory timeout is extended from 28 nanoseconds to 37 microseconds. Factory setting is installed.

Hardware revision switchpack -- An 8-switch switchpack used to set the hardware revision level of the module. If a switch is pressed on the open side, the switch is off or 0. If the switch is pressed on the opposite side, the switch is on or 1.

Unit number switchpack -- An 8-switch switchpack used to set the TMSCP unit number of the subsystem. If a switch is pressed on the open side, the switch is off or 0. If the switch is pressed on the opposite side, the switch is on or 1.



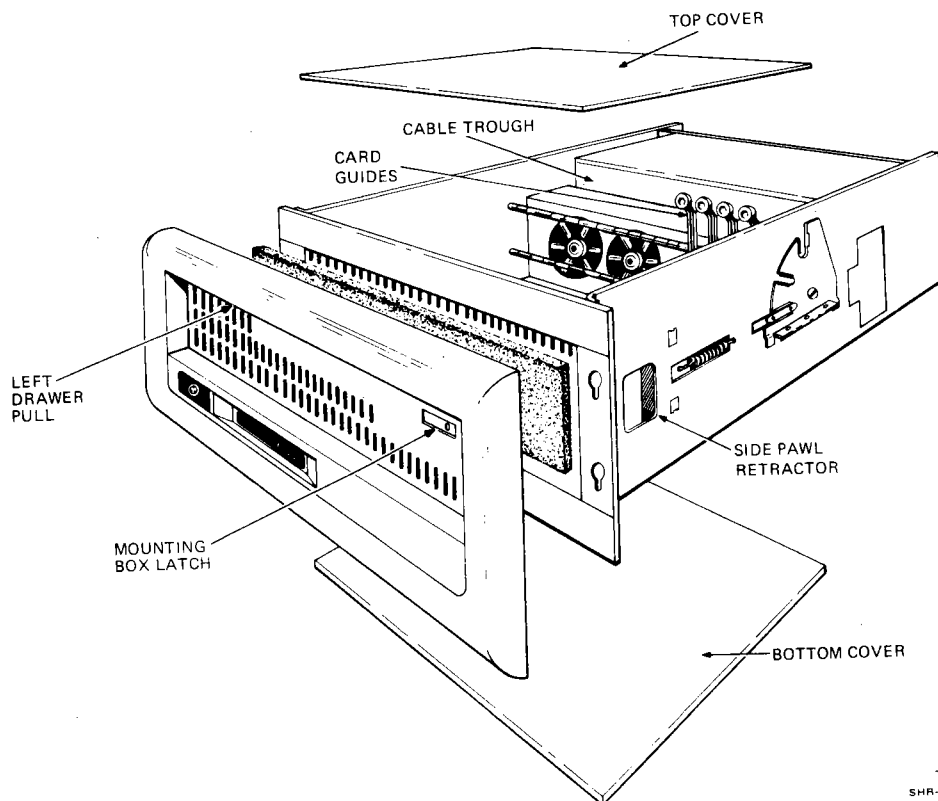
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Figure 1-5 Controller Module Address

INSTALLING THE M7547 UNIBUS KIT IN PDP-11/44 SYSTEMS

Installing M7547 Module in Computer Mounting Box

1. Turn system power off. Disconnect system line cord from 115/230 Vac wall receptacle.
2. Remove back covers from system cabinet. Turn cover locks one quarter turn clockwise and lift covers off mounting tabs.
3. Insert blade of small screwdriver into hole of mounting box latch at top-right side of computer front bezel (Figure 2-1).
4. Slide screwdriver to left and hold to release mounting box latch.
5. Grasp left drawer pull, and pull mounting box out. Release latch.



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6. Pull mounting box all the way out to its locked position.
7. Remove top cover of mounting box (Figure 2-1).
8. Select any backplane slot with grant continuity card in place (Figure 2-2) for adapter module installation. Remove the card.
9. Pull pawl retractors on each side of mounting box fully forward (Figure 2-1).
10. Carefully rotate mounting box to servicing (vertical) position. Release pawl retractors.
11. Remove bottom cover of mounting box (Figure 2-1).

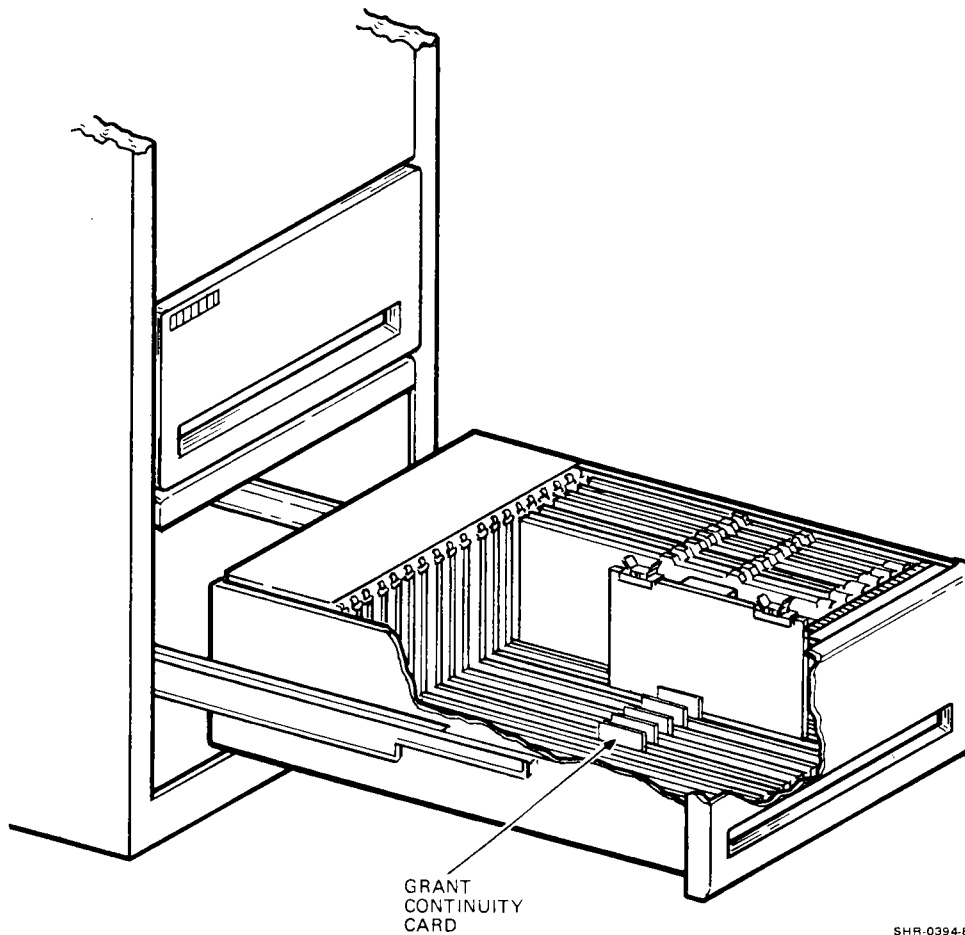


Figure 2-2 Grant Continuity Card Location

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12. Remove nonprocessor grant (NPG) wirewrap jumper (CA1 -- CB1) from row C of SPC slot selected for adapter module installation (Figure 2-3).
13. Install bottom cover. Carefully return mounting box to operating (horizontal) position.
14. If there is a module (or modules) in the next slot to the right of the selected mounting slot (facing cabinet), remove module(s) from that slot.

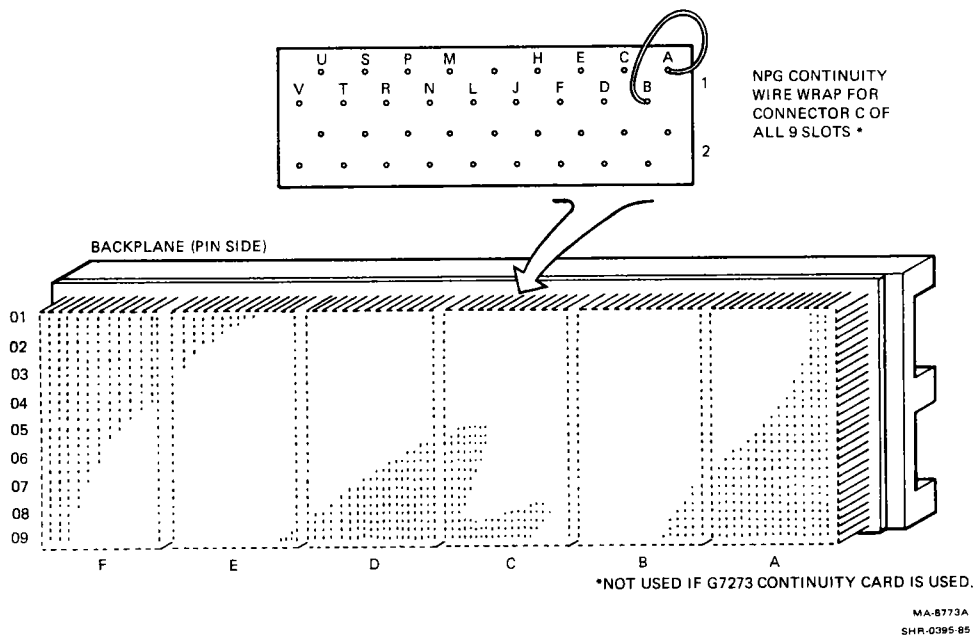
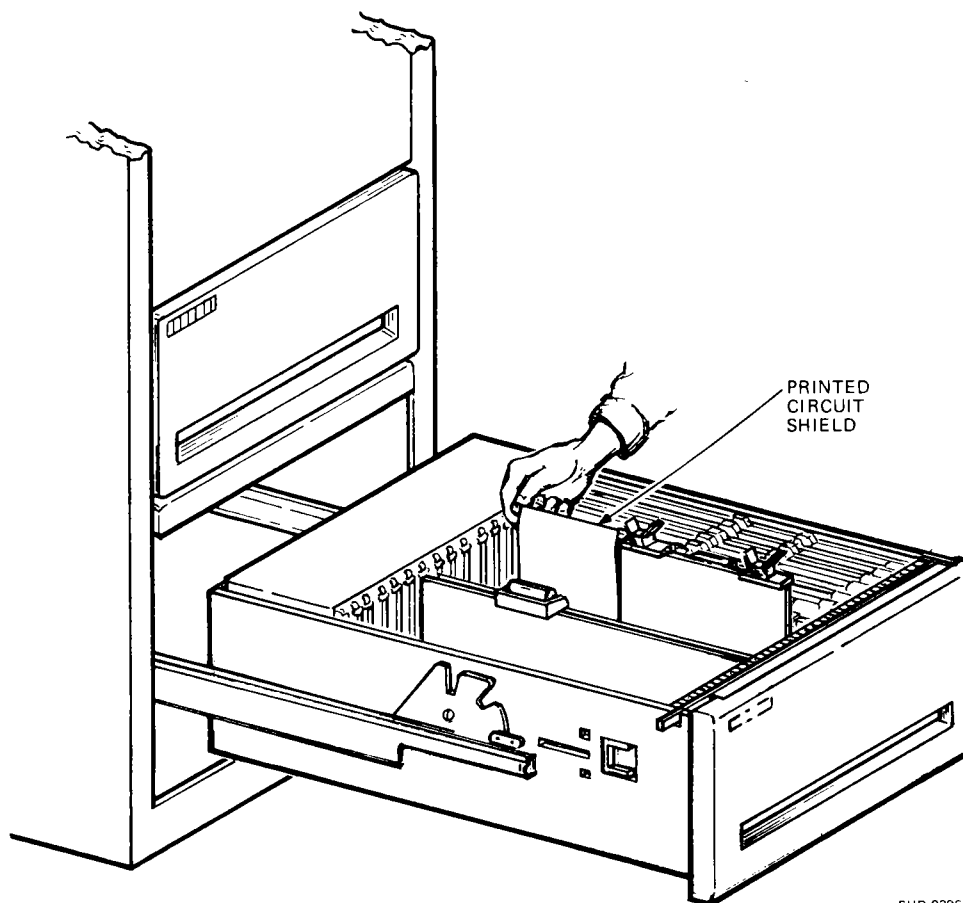


Figure 2-3 NPG Jumper

15. Install shields on printed wiring side of the removed module(s) (Figure 2-4). Press pad end of each shield onto printed circuit etch.
16. Replace shielded module(s) in original slot.
17. With component side at right, carefully insert controller module into front card slide.

CAUTION: Plugging the adapter module in backwards damages the computer backplane.

18. When module connectors engage with the backplane, press both module handles at the same time until connectors are fully seated.

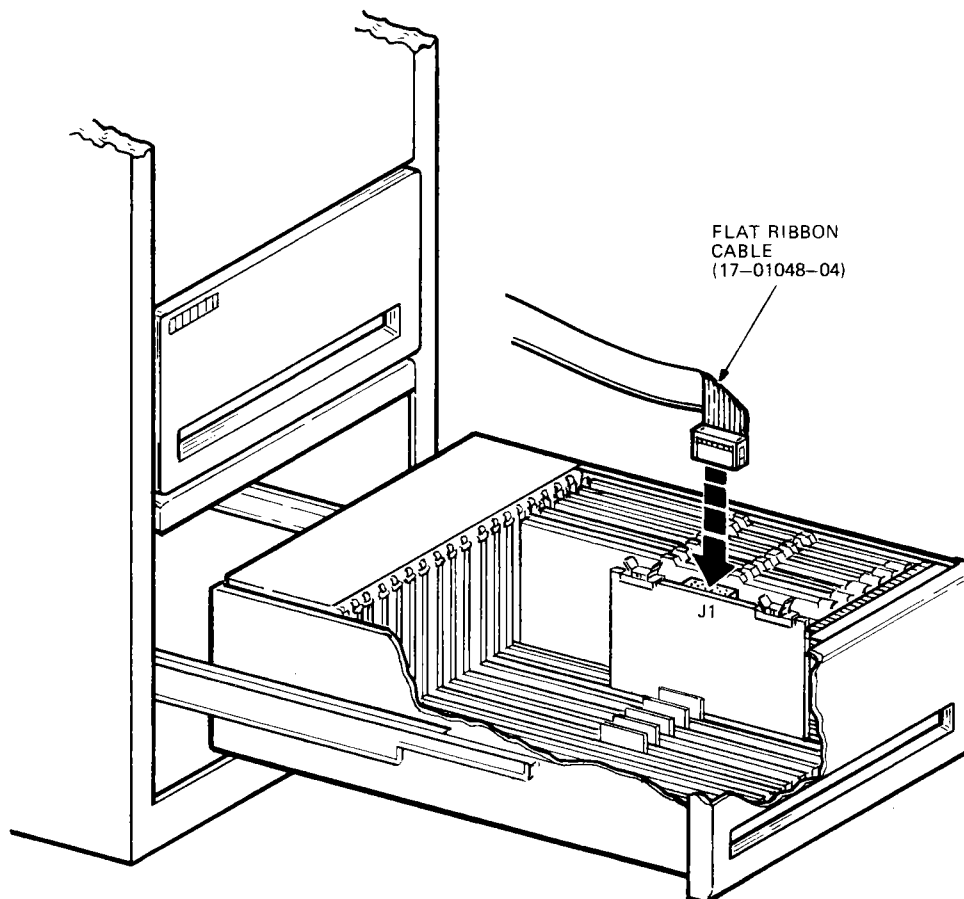


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Figure 2-4 Installing Shields on Modules

INSTALLING THE M7547 CABLING TO DRIVE IN PDP-11/44 SYSTEMS

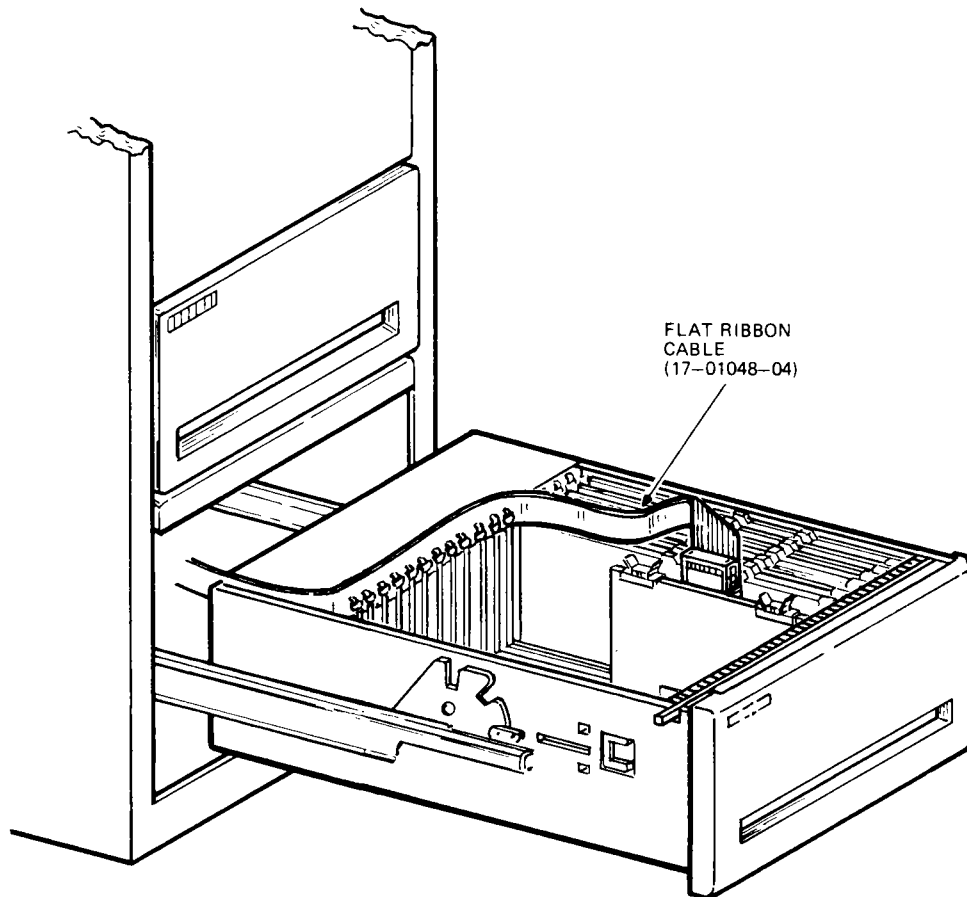
1. Find the connector key on the straight end of the internal interface cable connector.
2. Plug connector into jack J1 on controller module (Figure 2-5). Be sure that connector keys match up. The reference edge (red) of the cable is positioned on the same side as the arrow on the connector (Figure 1-1).
3. Bend the cable 90 degrees (Figure 2-5). Carefully slide the cable down between the controller module and shielded module.



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Figure 2-5 Installing Cable in Module

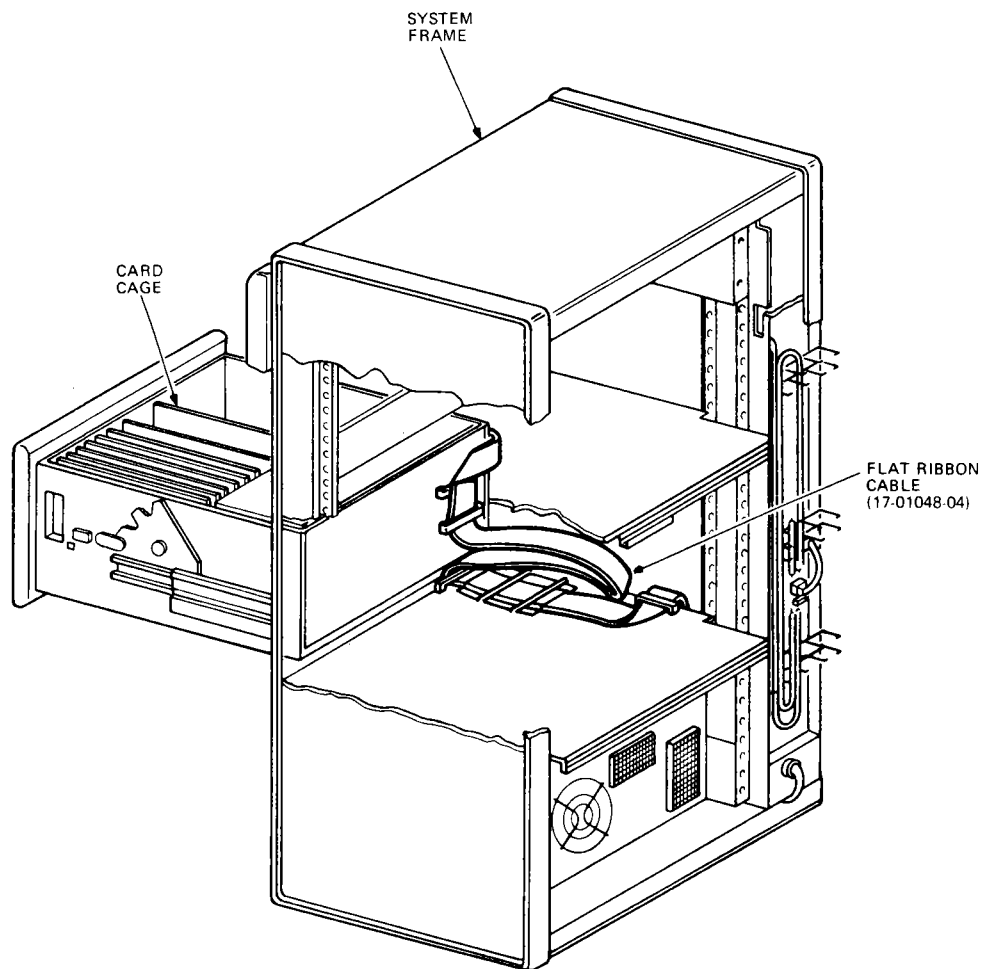
4. Route the cable between card guides, into cable trough, and around power supply (Figure 2-6).



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Figure 2-6 Routing a Cable Around Power Supply

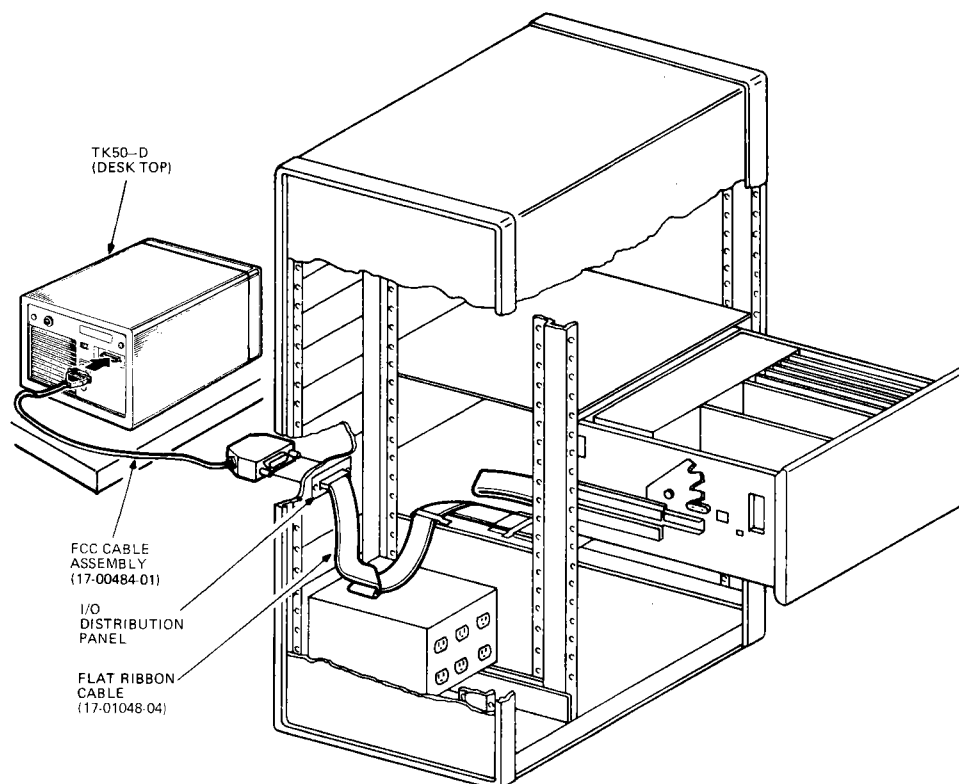
5. Remove cable retainer on rear of power supply box (Figure 2-7).
6. Bend the cable 90 degrees (Figure 2-7) and hold in place. Be sure to leave some slack around box edges.
7. Replace the cable retainer.
8. Loosen both screws securing cable retainer on cabinet frame (Figure 2-7).
9. Swing slotted inner end of retainer up out of the way.
10. Make loop in cable about 2 feet long. Slide loop in front of cable retractor (Figure 2-7) and hold against frame.
11. Swing cable retainer back down in front of cable. Engage slotted end on mounting screw, but do not secure.
12. Place remaining length of cable flat on shelf with connector end hanging over shelf edge.
13. From front of cabinet, release slide hold bars and carefully slide drawer fully into cabinet.
14. Check that the cable does not rub against bottom edge of power supply box. There should be enough slack to slide your finger between cable and box.
15. Pull drawer fully out to locked position and secure cable retainer mounting screws.
16. Repeat steps 13 and 14 to be sure there is enough cable slack. Adjust cable length if necessary.
17. Using cable ties provided, tie cable to cable retractor (and any existing ribbon cable) at about six inch lengths (Figure 2-7).



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Figure 2-7 Routing Cable in Cabinet

18. At rear of cabinet, loosen screws securing side frame cable retainer (Figure 2-8). Swing slotted end of retainer out of the way.
19. Bend the cable 90 degrees and slide cable under retainer as shown (Figure 2-8).
20. Swing retainer back over cable. Engage slotted end and secure.
21. Install connector panel and internal interface cable connector on I/O distribution panel as follows.
 - a. Remove one blank insert on the I/O distribution panel (Figure 2-8).
 - b. Mount connector panel as shown (Figure 2-8) using two 4-32 shoulder screws (PN 12-19534-1) and washers (PN 90-6688). Tighten screws using small screwdriver. See also Figure 3-5.



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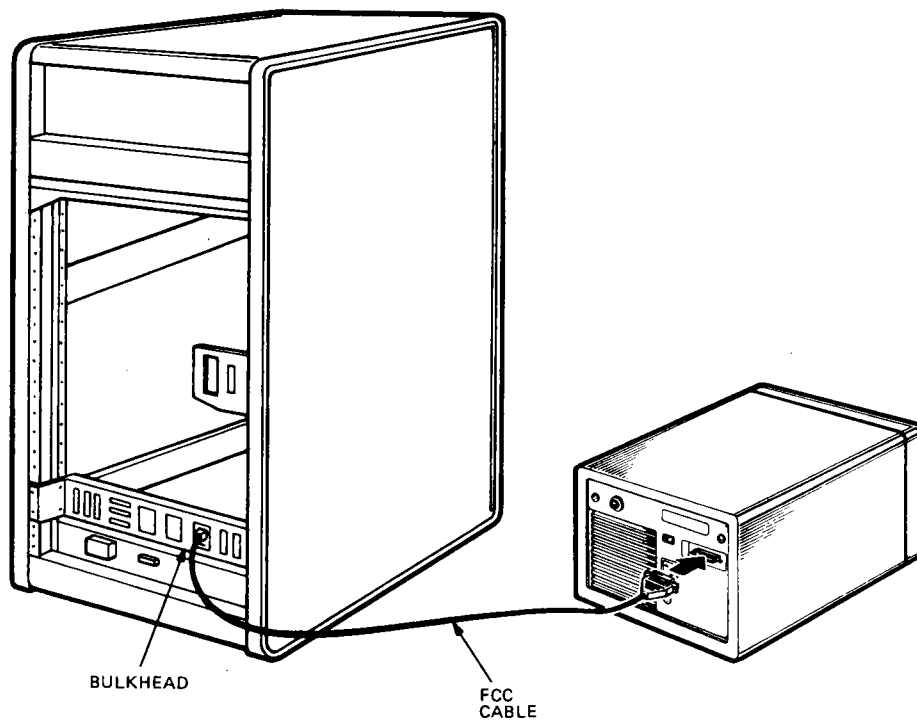
Figure 2-8 Routing Ribbon Cable to Bulkhead

- c. Mount right-angle end of internal interface cable connector to connector panel with two standoffs (PN 90-08451) supplied. Tighten sockets using small slotted screwdriver.

CONNECTING A TK50-R OR TK50-D TO HOST (FIGURE 2-9)

1. Connect the FCC cable assembly (PN 17-00484-01) to the J1 connector of the TK50-R (or TK50-D).
2. Connect the FCC cable assembly to the 50-pin connector on the I/O distribution panel.

Refer to Chapter 5, Technical Description, for considerations when installing multiple TK50-R or TK50-D tape drives.



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Figure 2-9 External Drive Cable Installation

IDENTIFYING POWER CABLE AND CHECKING VOLTAGE SWITCH (FIGURE 2-10)

Make sure the plug on the power cable matches the wall outlet or power controller.

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

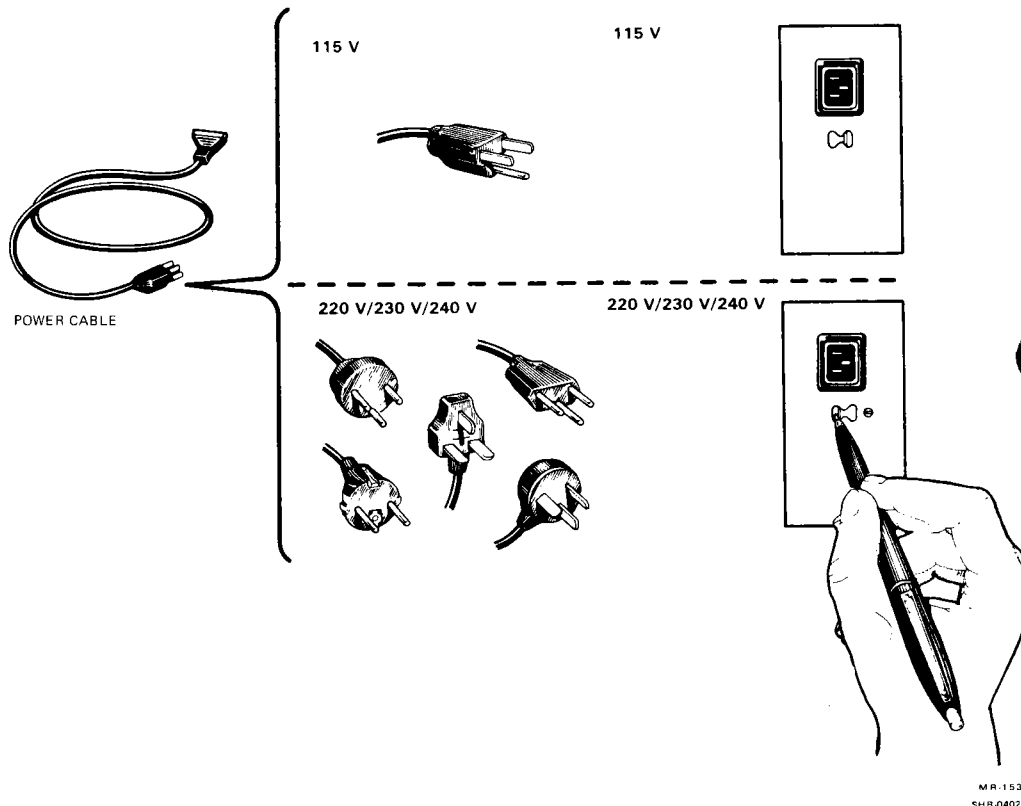


Figure 2-10 Power Cable and Voltage Switch

CONNECTING THE POWER CORD

When adding the TK50-R (or TK50-D) subsystem to a PDP-11/44 or VAX, connect the power cable to the TK50 subsystem power controller in the rack and the wall outlet.

REPLACING THE REAR COVER

Make sure you place all external cables behind the cable guide. Replace the rear cover on the system cabinet.

NOTE: Always turn the TK50 subsystem on first.

Set the TK50 subsystem to 1 (on). Then set the computer's power switch to 1 (on).

After a few moments, the system displays its start-up message.

You must test your TK50 subsystem with diagnostics before running under an operating system for the first time.

PREPARING YOUR OPERATING SYSTEM

Before using your TK50 tape drive for the first time, inform your operating system that the TK50 tape drive is a legal device that you can write data on. To do this perform a one time system generation (SYSGEN) or configure (CONFIG) operation. Refer to your software documentation for instructions.

If you want to boot from the TK50 subsystem, you need to add the TK50 boot ROM. Refer to your system's technical manual for instructions.

NOTE: VAX systems label the TK50 as MUA0, MUB1, MUC2, and so on. PDP systems label the TK50 as MU0, MU1, MU2, and so on.



INTRODUCTION

NOTE: The procedures in this chapter can only be performed by trained service personnel or self-maintenance customers.

This chapter describes how to install the TUK50 UNIBUS kit in VAX computers that include a UNIBUS. (Chapter 2 describes the same installation, but in PDP-11 systems.) There are two basic UNIBUS kit variations. One variation (TUK50-AB) is for VAX systems (such as the VAX-11/730, VAX-11/750, VAX-11/780) and PDP-11 computers (such as the PDP-11/44, PDP-11/34, PDP-11/70). The second variation (TUK50-BB) is for PDP-11/84 systems. The kits include the following components.

NOTE: The mounting hardware and printed circuit board shields not shown.

- 1 TK50 UNIBUS Subsystem Owner's Manual (EK-TUK50-OM)
- 1 M7547 Host Adapter Module (UNIBUS controller)
- 1 Package mounting hardware
- 1 Internal interface ribbon cable
- 1 Quad I/O panel (PN 74-27292) (used for TUK50-AB variation only)

A TK50 UNIBUS subsystem is formed when the M7547 UNIBUS controller module (Figure 1-1) is installed in the computer and the computer is connected to the tape drive.

The TK50 communicates with the host computer through the UNIBUS interface, which consists of the interface cabling and the M7547 UNIBUS controller. The M7547 is a standard quad-height PC board. It plugs into a small peripheral controller (SPC) slot on the backplane of the host computer. The module has the following switches and jumpers.

- UNIBUS address
- Nonexistent memory timeout
- Hardware revision switchpack
- Unit number switchpack

These are described in Preparing M7547 UNIBUS Controller Module in Chapter 1. The interrupt vector is not hardware settable but is software selectable from the host computer at SYSGEN. The M7547 connects to the TK50 through an internal interface cable and external interface cable.

This chapter is divided in two parts -- Installing the M7547 UNIBUS kit in VAX systems and Installing FCC cable assembly in VAX systems. Installing the M7547 UNIBUS kit in VAX systems must be performed by trained service personnel or a self-maintenance customer. Installing the FCC external cabling is a user-oriented procedure and does not require special training.

SPECIFICATIONS

See Appendix B for complete specifications.

Electrical power	+5 V at 3.5 amps
Environmental operating temperature	10 to 60°C (50 to 140°)
Humidity	10 to 90 percent

INSTALLING M7547 UNIBUS KIT IN VAX SYSTEMS

NOTE: The following procedures must be performed by a trained Field Service representative.

CAUTION: To prevent modules from being damaged by static electricity, always use a grounded wrist strap and grounded work surface (Velostat kit 29-11762-00) when handling modules or accessing the computer internally.

1. Remove the M7547 module, ribbon cable, CPU's bulkhead connector panels, and mounting hardware from the CPU UNIBUS Kit. Unwrap and examine them for damage.
2. On the M7547 module, select the correct UNIBUS address by setting the appropriate jumpers (W1 through W12). Refer to Chapter 5, Technical Description, for address settings.

NOTES: The module has 12 jumpers for setting the desired address. These jumpers, the 8-bit unit select switchpack, and the 8-bit hardware revision level switchpack were described in Chapter 1.

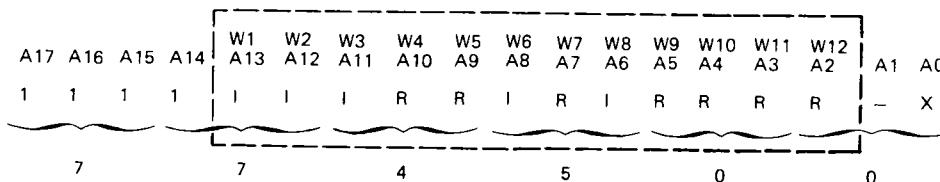
The typical UNIBUS address and vector for a single TK50 subsystem configuration are given in Table 3-1.

Table 3-1 Address Settings

Transport	Unit Number	Address	Vector	Configuration
1	0	774500 ₈	260 ₈	1 (unit 0)
2 to 4	1 to 3	CSR range 760000 ₈ to 8	Vector range 300 ₈ to 700 ₈	2 to 4 (units 1 to 3)

When more than one (up to four) TK50 is installed with the host system, select the UNIBUS addresses for the second, third, and fourth TK50 with SYSGEN>CONFIG. SYSGEN>CONFIG shows the available CSR addresses. Refer to the example in Table 3-1 and step 5.

3. Use address setting diagram (Figure 3-1) to set the UNIBUS address. This diagram also shows starting address 774500 in the basic configuration.
4. Install the address jumpers as shown. Address bits 12 through 2 are specified by jumpers. Address bits 17 through 13 are hardwired to 1s. Address bits 1 and 0 are ignored.



I = JUMPER INSTALLED
 R = JUMPER REMOVED
 X = UNSELECTABLE (IGNORED)
 1 = UNSELECTABLE (HARDWIRED AS 1)
 A1 SELECTS IP OR SA REGISTER

SHR-0403-85

Figure 3-1 Address Selection Scheme

5. Plug the ribbon I/O cable (PN 70-19923) into edge connector J1 on the M7547 module (Figure 3-2).

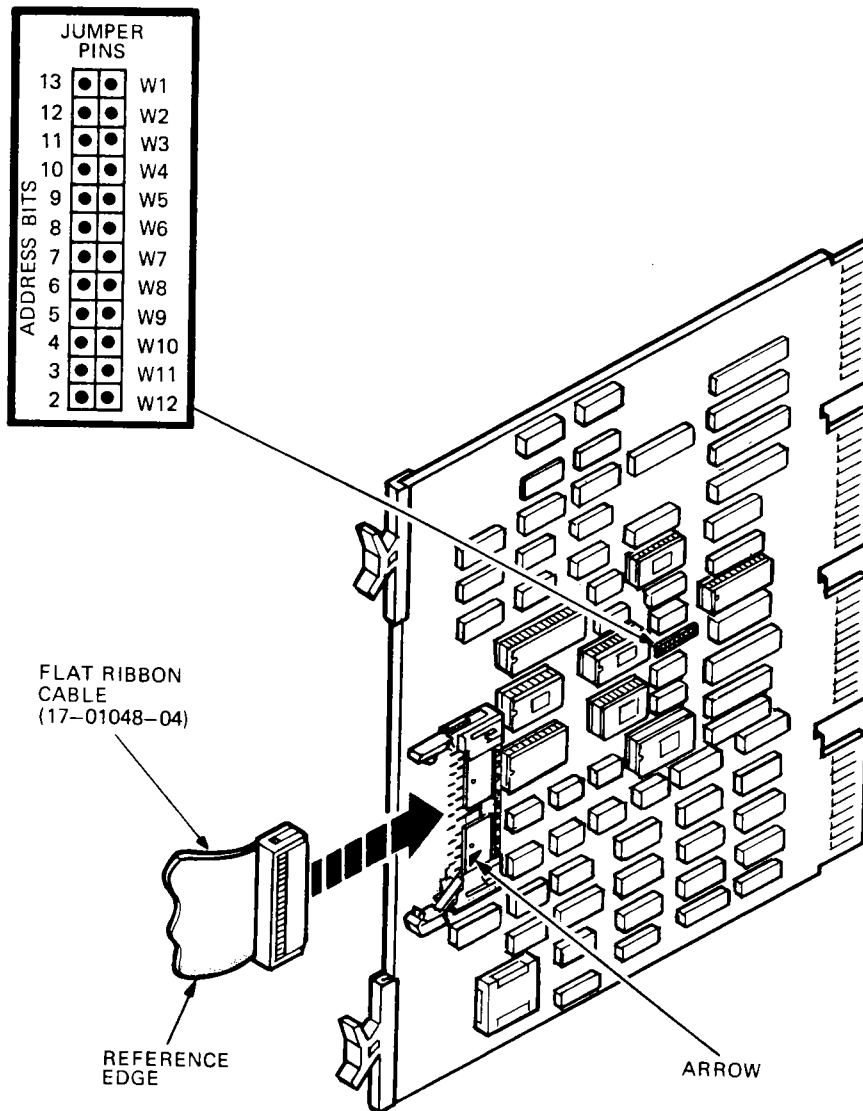
Example -- For multiple drive installations, use the following SYSGEN procedure to find the available CSR addresses and vectors. Then set the CSR address through the address selection jumpers. Remember to list all devices on the UNIBUS before running the program.

```
$ MCR SYSGEN
SYSGEN> CONFIG
DEVICE> RK 611
DEVICE> DZ11
DEVICE> TK50, 3
DEVICE> ^Z
```

```
DEVICE: RK611 NAME: DMA CSR: 777400 VECTOR: 210
DEVICE: TK50 NAME: PTA CSR: 774500 VECTOR: 260
DEVICE: DZ11 NAME: TTA CSR: 760100 VECTOR: 300
DEVICE: TK50 NAME: PTB CSR: 760444 VECTOR: 310
DEVICE: TK50 NAME: PTC CSR: 760450 VECTOR: 314
SYSGEN> ^Z
$
```

NOTE: You may have to use the TU81 device name instead of the TK50. Both devices are TMSCP devices.

6. Turn off the power to the CPU.



SHR-0404-85

Figure 3-2 M7547 Module

7. On the CPU backplane, remove G727 bus grant card from the desired SPC slot (Figure 3-3). A bus grant (continuity) card must be in connector D of any unused SPC slot. Otherwise, bus grant continuity is lost.

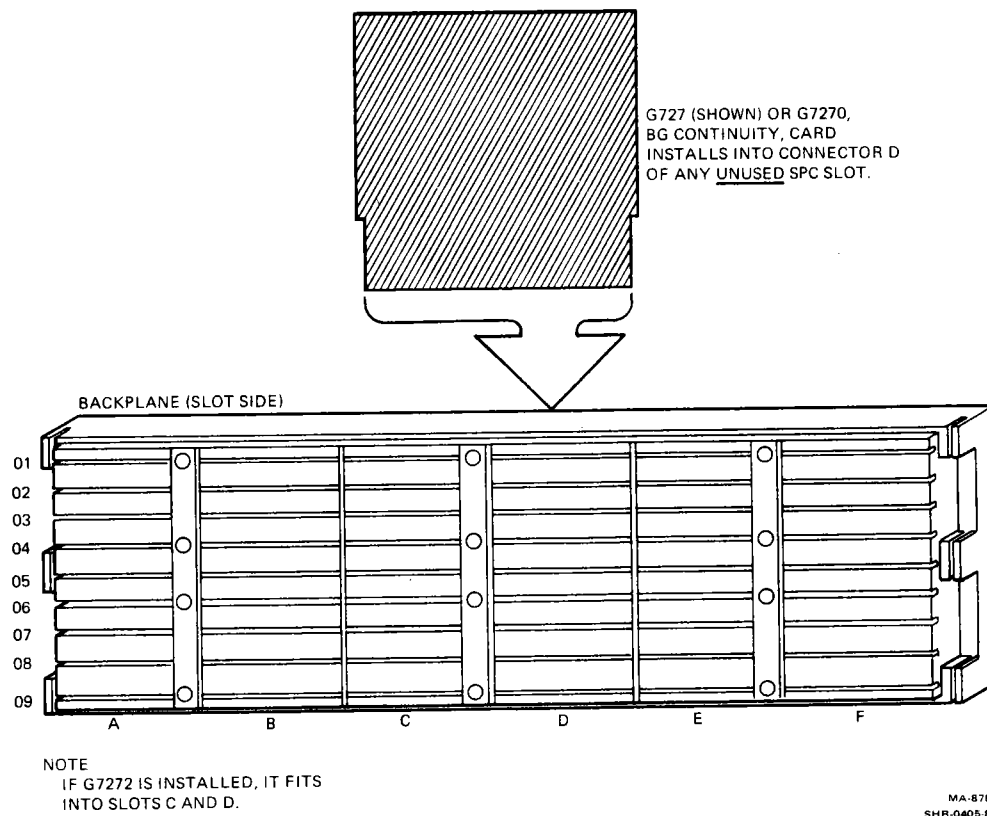


Figure 3-3 Bus Grant Continuity Card

8. Also in the same SPC slot, remove the nonprocessor grant (NPG) jumper (CA1 to CB1) on the pin side of the backplane (Figure 3-4).
9. Carefully insert the M7547 module into the SPC slot.

NOTE: Check the CPU for compliance with FCC specifications. The CPU should have the I/O bulkhead connector frame. If this frame is not installed, perform steps 10 and 11. Otherwise, go directly to step 12.

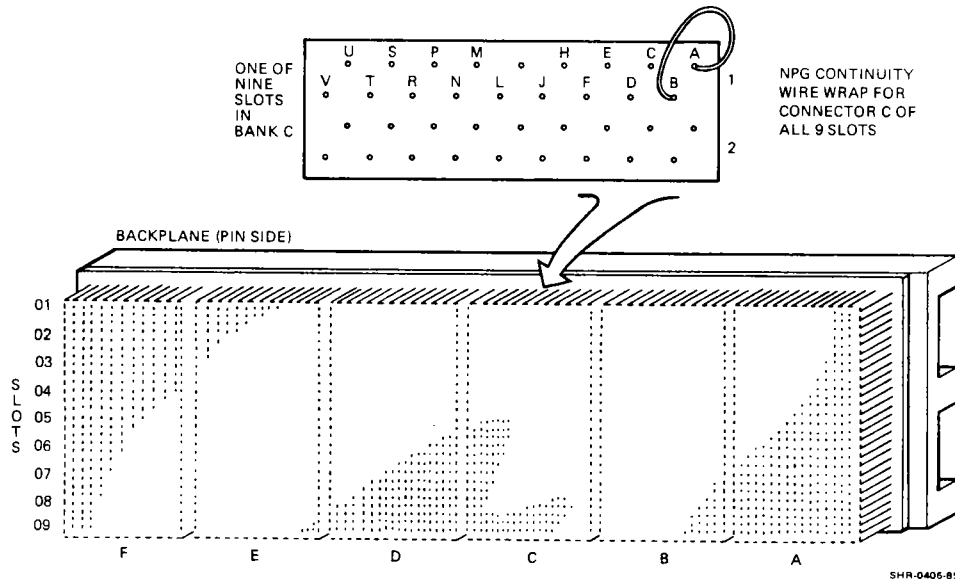
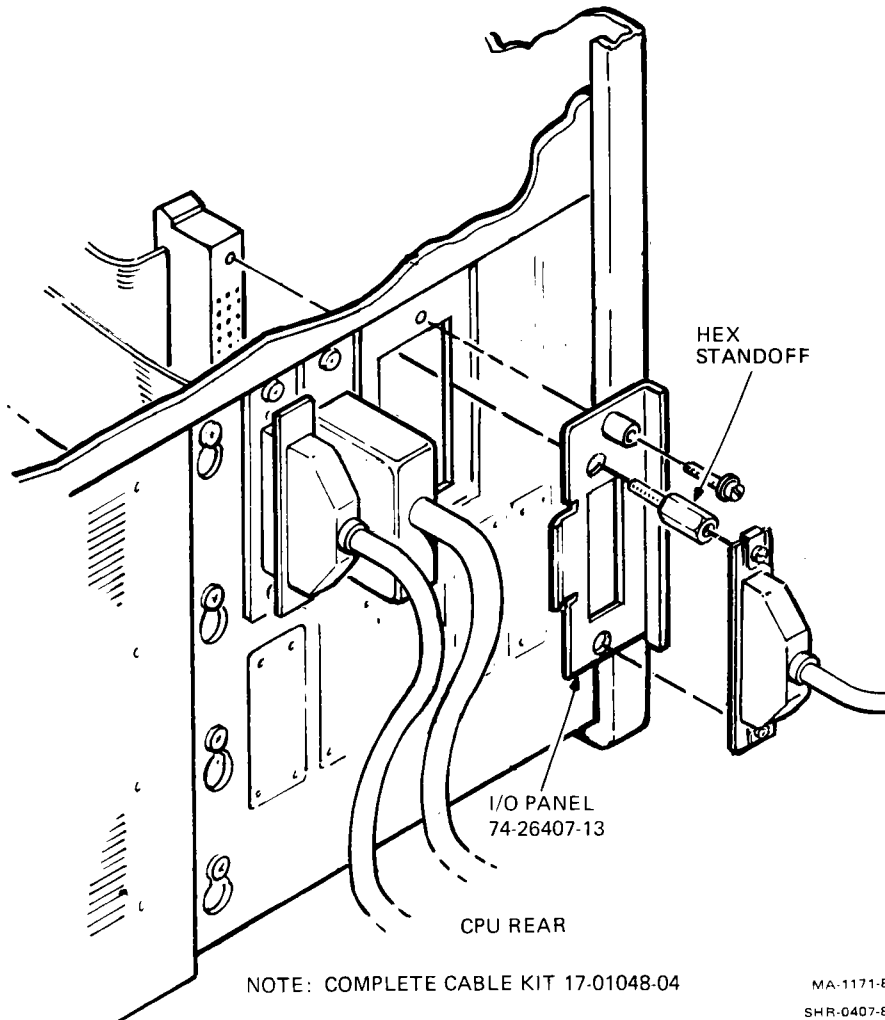


Figure 3-4 NPG Jumper

10. Mount the I/O panel (PN 74-26407-13) on the I/O frame and secure it with two screws (Figure 3-5).
11. Install the I/O frame (with the I/O panel) on the CPU rack at the rear bottom of the CPU cabinet.

NOTE: The best location for the I/O frame is at the rear bottom of the CPU cabinet.

12. Mount the I/O panel onto the rear system bulkhead.

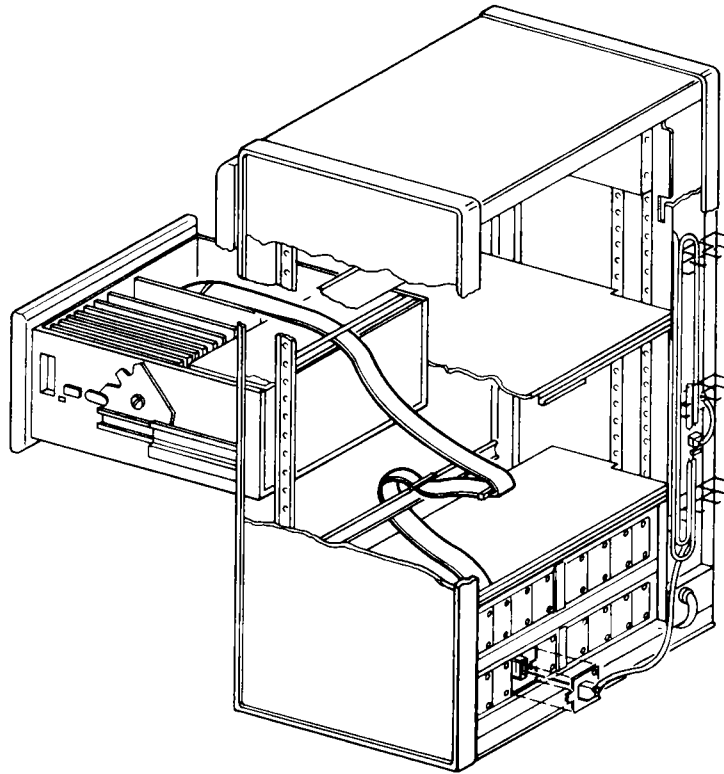


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SHR-0407-85

Figure 3-5 Installing Drive Cable on Bulkhead

13. Install and secure the I/O panel on the CPU's bulkhead frame (FCC-compliant system) at the bottom of the CPU cabinet (Figure 3-5).
14. Route the ribbon I/O cable from the M7547 through the CPU cabinet down to the I/O frame. Insert the cable connector (female) into the I/O panel slot (Figure 3-6). Secure this connector in its position with the two 4/40 hex standoffs (PN 74-26407-13) provided. For the VAX-11/780 hi-boy cabinet, refer to Figure 3-7 for typical cable routing.

NOTE: Do not chafe the ribbon I/O cable against other PC cards and chassis parts.



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Figure 3-6 Internal UNIBUS Controller Cabling

INSTALLING FCC CABLE ASSEMBLY IN VAX SYSTEMS

The TK50-R and TK50-D are shipped with an FCC cable assembly (PN 17-00484-01) that plugs into the TK50-R and TK50-D. The other end of this cable plugs into the system's bulkhead I/O plate. The other end of this I/O plate connects to the flat ribbon cable.

Plug the FCC cable assembly into the I/O bulkhead's outside. The inside mates with the flat internal cable.

To install a rackmounted version of the TK50 (which is mounted in expander cabinet) (Figure 3-7):

1. Plug FCC cable assembly into drive.
2. Route the FCC cable down the back of the expander cabinet and plug it into the outside of the I/O bulkhead connector on the CPU cabinet (see Figure 3-7). The inside of the I/O bulkhead connector connects the internal flat ribbon cable to the TUK50 controller. The TUK50 controller is in the CPU backplane.

To install a tabletop unit in the expander cabinet, the procedure is the same as when the drive is mounted in an expander cabinet, except that the drive sits on a desktop rather than in a rack in an expander cabinet.

Now run the appropriate diagnostics to test the subsystem. Refer to the diagnostics' documentation.

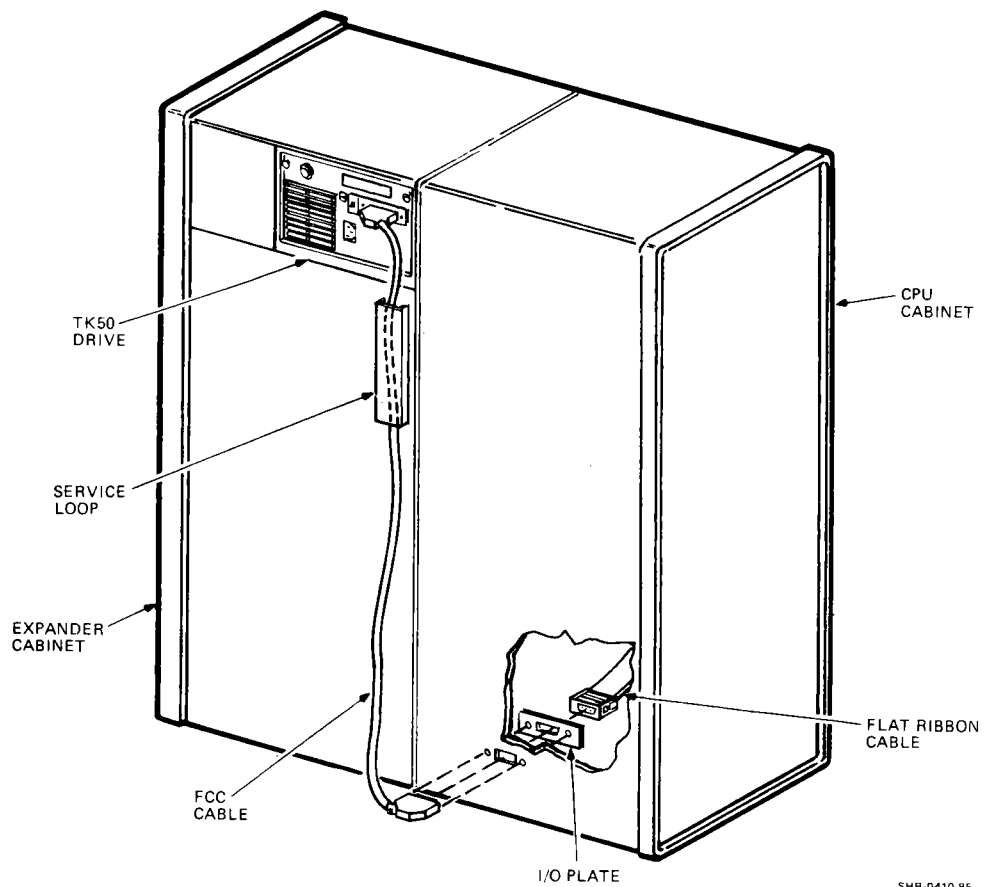


Figure 3-7 Drive Cabling in Cabinet



INTRODUCTION

NOTE: The procedures in this chapter can only be performed by trained service personnel or self-maintenance customers.

This chapter describes how to install the TUK50 UNIBUS kit in PDP-11 computers that include a UNIBUS. (Chapter 3 describes the same installation, but in VAX systems.) There are two basic UNIBUS kit variations. One variation (TUK50-AB) is for PDP-11 computers (such as the PDP-11/44, PDP-11/34, PDP-11/70) and VAX systems. The second variation (TUK50-BB) is for PDP-11/84-AA/AB/BA/BB systems. The kits include the following components.

NOTE: The mounting hardware and printed circuit board shields are not shown.

- 1 TK50 UNIBUS Subsystem Owner's Manual (EK-TUK50-OM)
- 1 M7547 Host Adapter Module (UNIBUS controller)
- 1 Package mounting hardware
- 1 Internal interface ribbon cable
- 1 Quad I/O panel (PN 74-27292) (used for TUK50-AB variation only)

A TK50 UNIBUS subsystem is formed when the M7547 UNIBUS controller module (Figure 1-1) is installed in the computer and the computer is connected to the tape drive.

SPECIFICATIONS

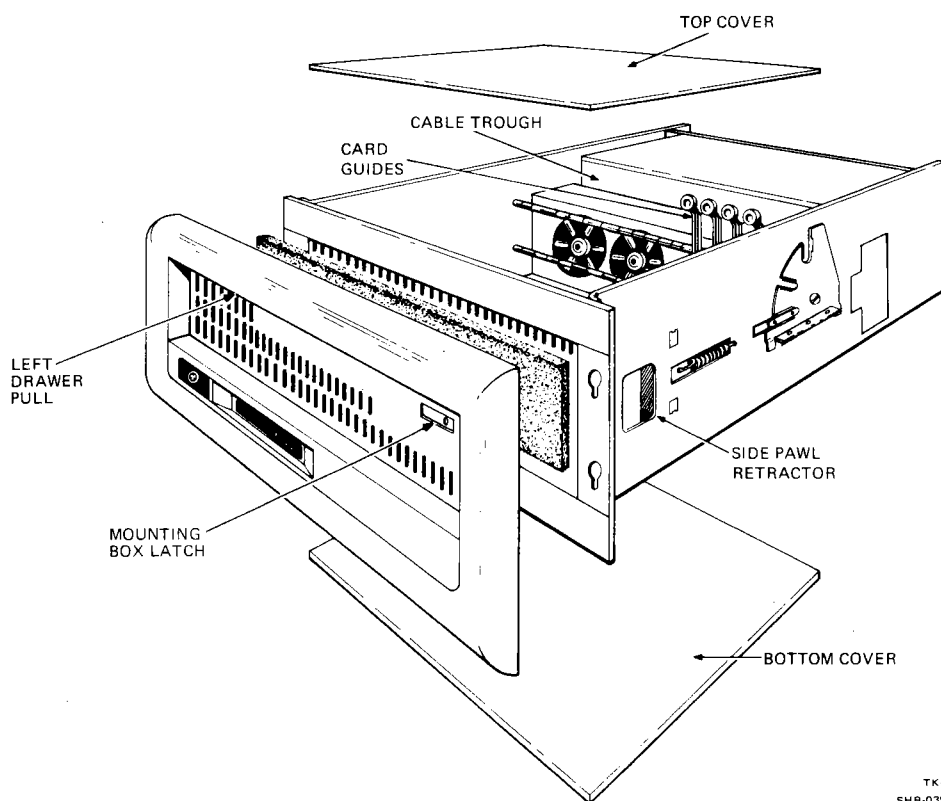
See Appendix B for complete specifications.

Electrical power	+5 V at 3.5 amps
Environmental operating temperature	10 to 60°C (50 to 140°)
Humidity	10 to 90 percent

INSTALLING THE M7547 UNIBUS KIT IN PDP-11/44 SYSTEMS

Installing M7547 Module in Computer Mounting Box

1. Turn system power off. Disconnect system line cord from 115/230 Vac wall receptacle.
2. Remove back covers from system cabinet. Turn cover locks one quarter turn clockwise and lift covers off mounting tabs.
3. Insert blade of small screwdriver into hole of mounting box latch at top-right side of computer front bezel (Figure 2-1).
4. Slide screwdriver to left and hold to release mounting box latch.
5. Grasp left drawer pull, and pull mounting box out. Release latch.



TK-4368
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Figure 2-1 PDP-11/44 Mounting Box

INTRODUCTION

This chapter describes the controls and indicators used to operate the TK50-R or TK50-D subsystem. It is a quick reference for the user. The in-depth explanation of the subsystem is in Chapter 5, Technical Description.

The following information is also provided for users who are not familiar with TK50 tape drives and tape cartridges.

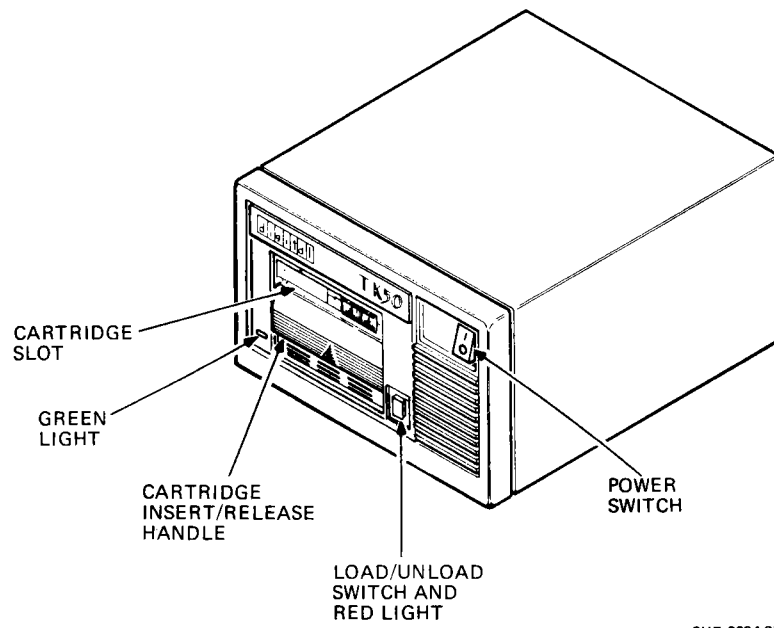
- How to handle and store TK50 tape cartridges.
- How to use the TK50 tape drive.

NOTE: First-time users should refer to the TK50 Tape Drive Subsystem User's Guide (EK-OTK50-UG) and the TK50 Tape Drive Subsystem User Reference Card (EK-OTK50-RC) for instructions.

FRONT PANEL

You control the TK50 desktop (TK50-D) subsystem by using the On/Off switch and the Load/Unload button. The rackmount (TK50-R) On/Off switch is covered and forced to the on position. The reason for this is to give the system power on switch control over the TK50's power. Two indicator lights show the current operating status of the subsystem (Figure 4-1).

Table 4-1 lists the functions of TK50 subsystem controls. Table 4-2 lists operating conditions indicated by the two lights.



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Figure 4-1 TK50 Controls and Indicators

Table 4-1 TK50 Subsystem Controls

Controls	Condition	Function
On/Off	1	Switches the subsystem on.
	0	Switches the subsystem off.
Load/Unload	In	Loads the tape (10 to 15 seconds).*
	Out	Rewinds and then unloads the tape.
Cartridge insert/release handle	Up	Unlocks the tape drive. The tape cartridge can now be inserted.
		Unlocks the tape drive to remove cartridge after rewind and unload operations.
	Down	Locks tape in position.

* If tape is new, the system performs a calibration sequence that takes about two minutes.

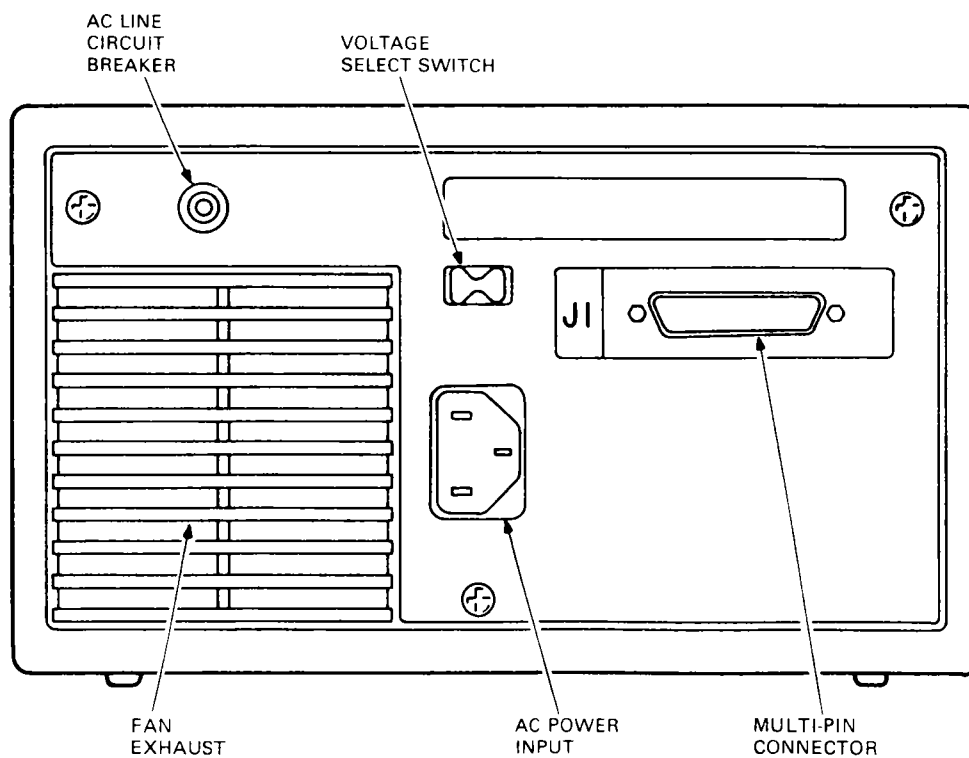
Table 4-2 TK50 Subsystem Indicator Lights

Red	Green	Condition
Off	Off	No power to the tape drive.
Off	On	It is okay lift cartridge insert/release handle and power is present.
On	Off	Do not lift cartridge insert/release handle. • Power-up self-test is running. • Cartridge is inserted but handle is still up. • Tape is loading or unloading. • Tape is stopped.
On	On	Tape loaded successfully.
On	Blinking	Tape in motion (except rewind). Read/write commands are being processed. Irregular fast blinking means tape calibration is occurring.*
Blinking	Blinking	Tape is rewinding.
Flashing rapidly		There is a fault. Press and release the Load/Unload button four times. If the problem persists, stop the operation of the tape drive and call your service representative.

* If tape is new, the system performs a calibration sequence that takes about two minutes.

REAR PANEL

The rear panel has one multipin connector that connects the TK50 subsystem to your computer. It also has an ac power input, the fan exhaust, an ac circuit breaker, and a voltage select switch (Figure 4-2).



MR-15510
SHR-0382-85

Figure 4-2 Rear Panel Assembly

TK50-R, TK50-D TAPE DRIVE

The TK50 subsystem is a tape drive enclosed in either a rackmount or free-standing housing. Each TK50-D or TK50-R subsystem has its own power supply and fan. The tape drive holds one removable magnetic tape cartridge.

- Each tape cartridge stores up to 94 million characters or about 34,800 typewritten pages.
- Information stored on a tape can be written or erased.

You must insert the tape cartridge correctly into the tape drive. Make sure the arrow on the tape cartridge faces up (Figure 4-3).

NOTE: First-time users should refer to the TK50 Tape Drive Subsystem User's Guide (EK-OTK50-UG) and the TK50 Tape Drive Subsystem User Reference Card (EK-OTK50-RC) for instructions.

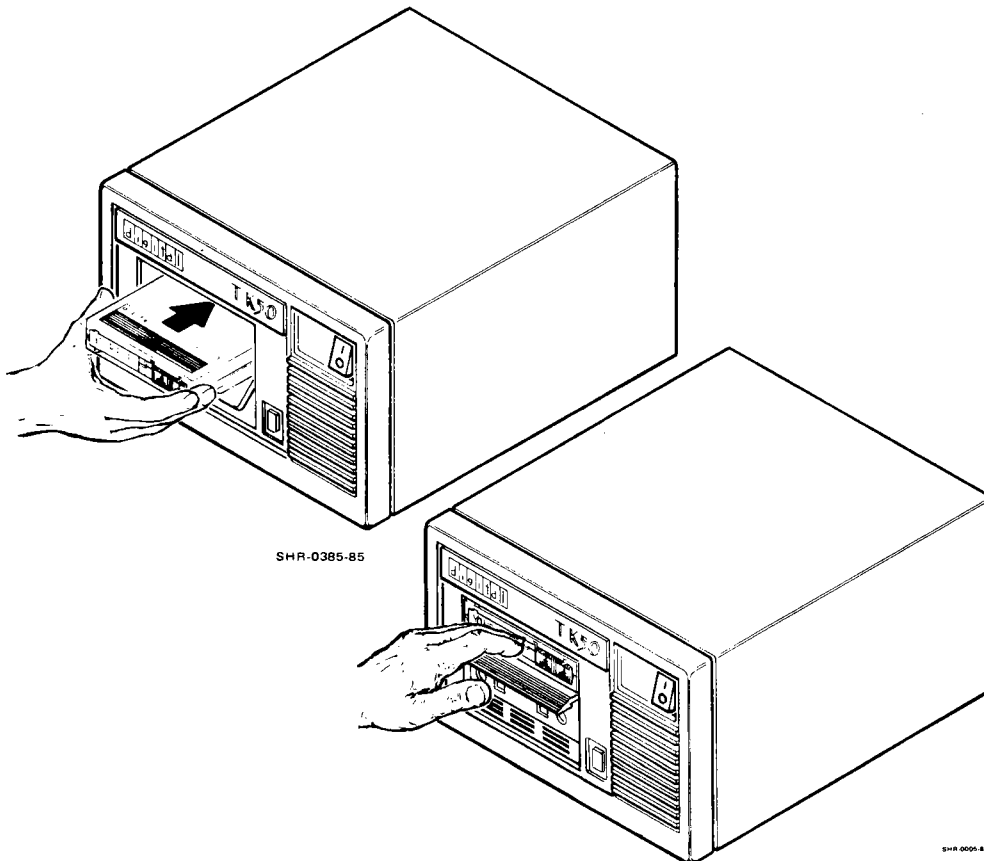


Figure 4-3 Inserting a Tape Cartridge

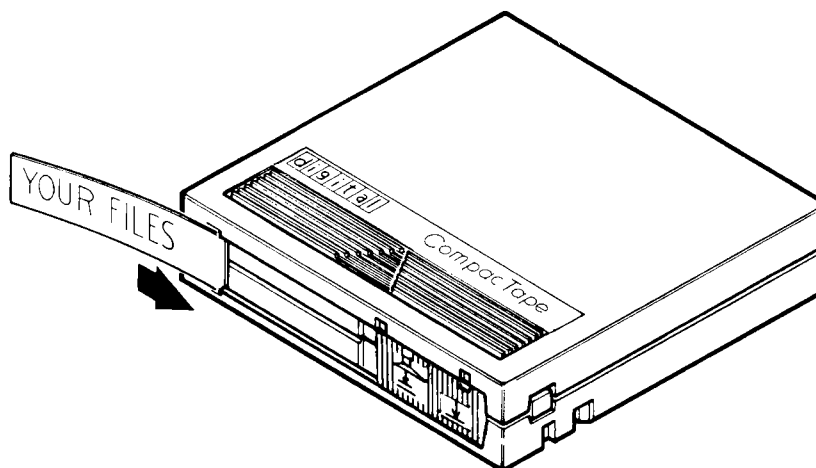
LABELING A TK50 TAPE CARTRIDGE

Insert the label in the slot on the front of the tape cartridge (Figure 4-4).

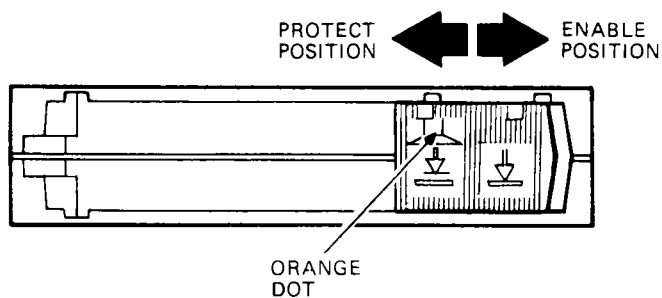
WRITE-PROTECTING A TAPE CARTRIDGE

Write-protecting a tape prevents accidentally overwriting information on the tape (Figure 4-4).

Slide the write-protect switch to the left. If the cartridge is write protected, an orange indicator is visible in the slide area.



SHR-0298 84 A



SHR-0299 84 A

Figure 4-4 Labeling and Write Protecting
a TK50 Tape Cartridge

CARE AND HANDLING OF TK50 TAPE DRIVE AND TAPES

Use these procedures when using the TK50 and tapes.

- Allow any new prerecorded tape to stabilize for up to 24 hours at room temperature before using it. The tape should stabilize for at least as long as it was outside its operating temperature (up to 24 hours).
- Store tapes in a dust-free environment.
- Store tapes at an even temperature between 10 to 40° (50 to 104°F).
- Never bump or drop the TK50 tape drive.
- Keep the tape drive and tapes away from:
 - Heaters, photocopiers, and direct sunlight.
 - Magnets and equipment that generate magnetic fields (such as motors and transformers).
 - Terminals and X-ray equipment.

BACKING UP FILES ON A TK50 TAPE CARTRIDGE

The TK50 tape is an ideal storage medium for backup copies of files created on diskette and fixed disk drives. Refer to your software documentation for how to perform a backup or file copy operation.

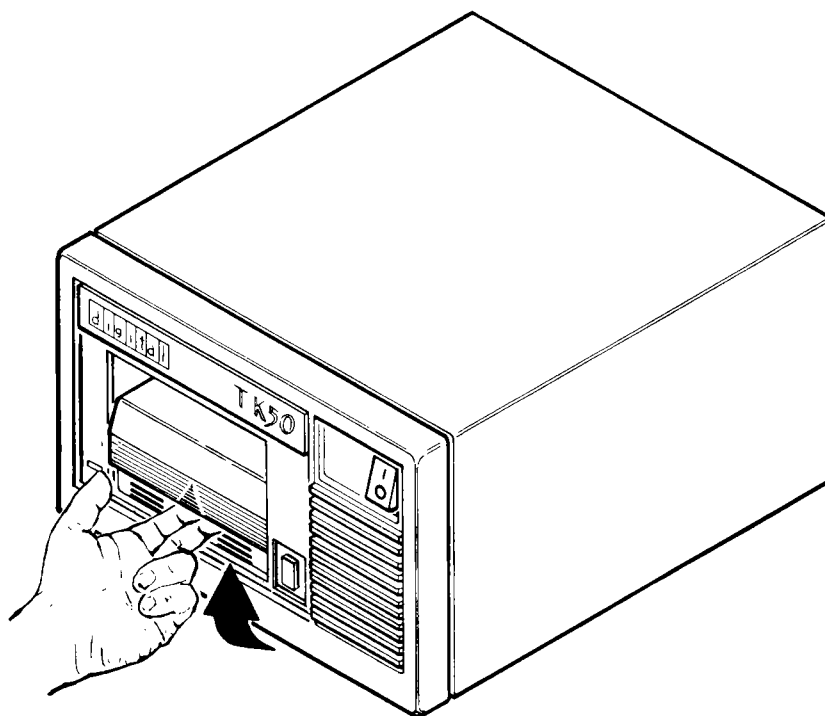
- Make a daily backup copy of all information you have changed or created.
- Make a weekly backup copy of all information stored on your fixed disk drive.
- Store all backup copies in a safe place.

NOTE: Write protect diskettes and fixed disk drives when making backup copies to prevent information loss.

INSERTING A TK50 TAPE CARTRIDGE

Use the following procedure to insert a TK50 cartridge. First-time users should refer to the TK50 Tape Drive Subsystem User's Guide (EK-OTK50-UG) and the TK50 Tape Drive Subsystem User Reference Card (EK-OTK50-RC) for instructions.

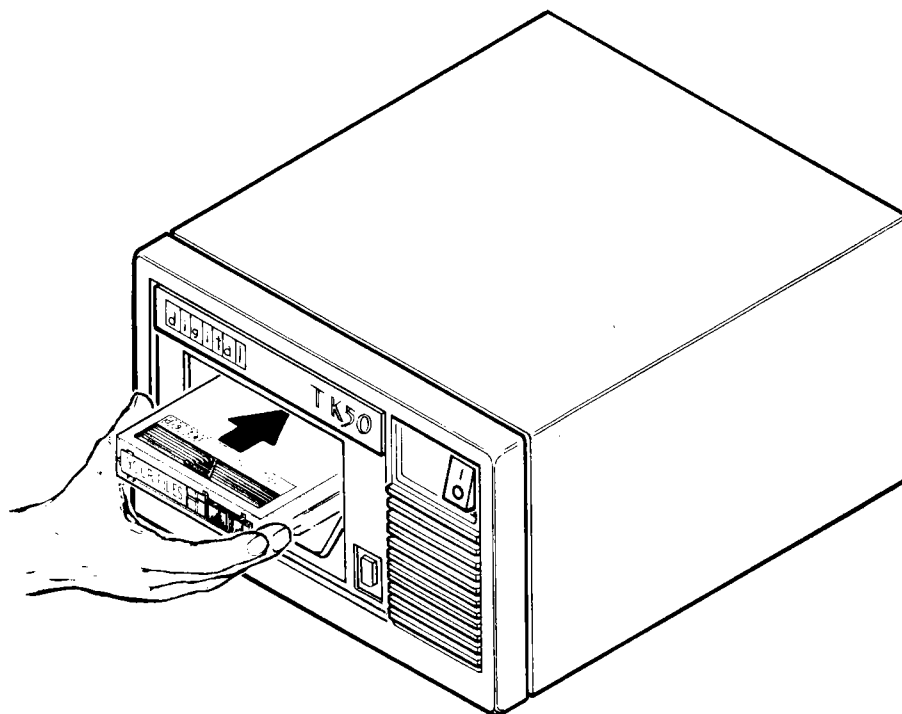
1. Make sure the Load/Unload button is out.
2. Set the TK50 subsystem power switch to 1 (on), then set the computer power switch to 1 (on).
 - a. The red light stays on during the tape drive power-up self-test (about 5 to 15 seconds).
 - b. The red light goes off and the green light goes on.
3. Lift the cartridge insert/release handle (Figure 4-5).



SHR-0302-84-B

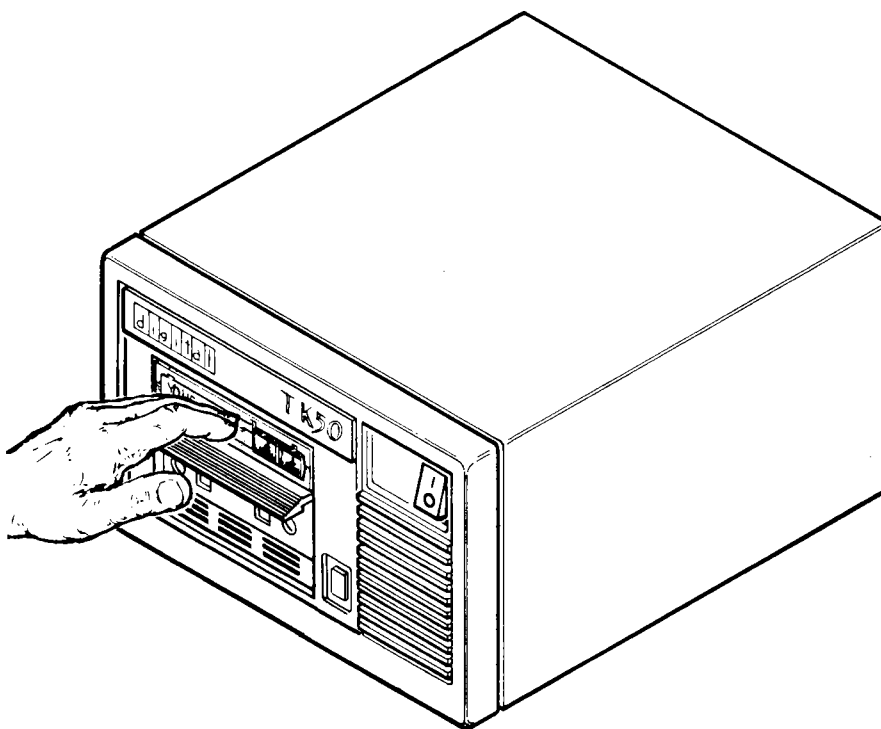
Figure 4-5 Lifting Cartridge Insert/Release Handle

4. Smoothly and completely insert the tape cartridge into the tape drive. Make sure the arrow on the tape cartridge faces up (Figure 4-6). When the tape cartridge is correctly seated, it locks in place (Figure 4-7).
 - a. The red light goes on.
 - b. The green light goes off.



SHR-0303-84-B

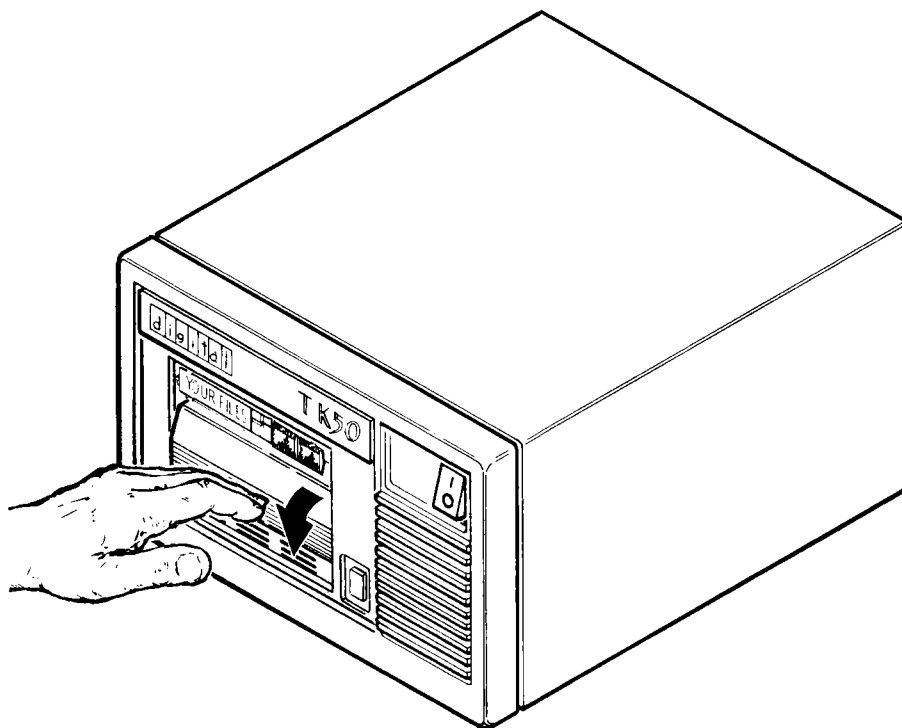
Figure 4-6 Positioning Tape in Drive



SHR-0005-86

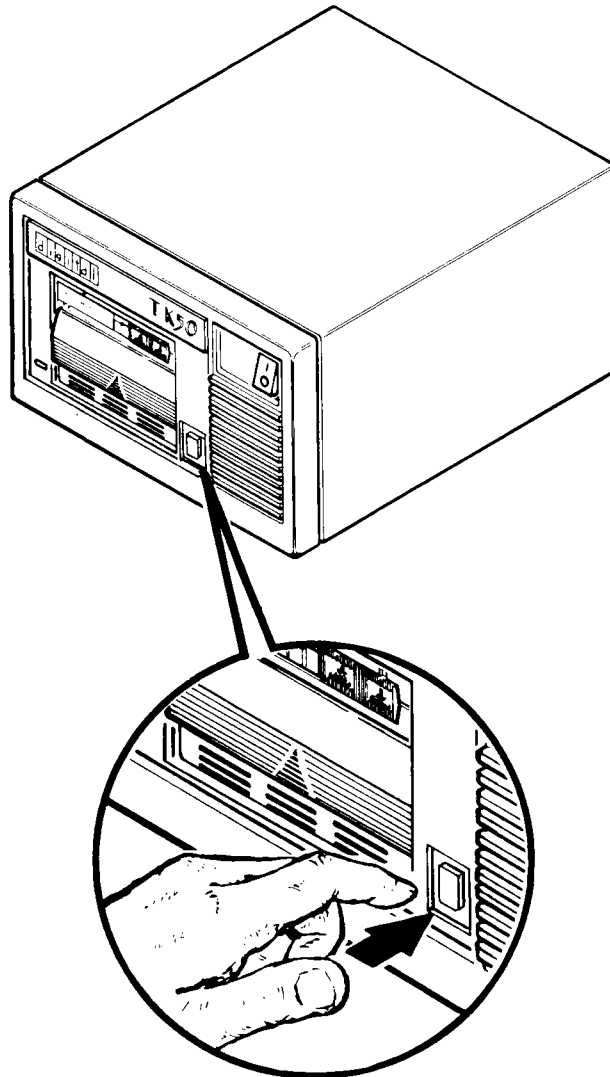
Figure 4-7 Inserting Tape

5. Push the cartridge insert/release handle down firmly (Figure 4-8).
 - a. The red light goes off.
 - b. The green light goes on.
6. Press the Load/Unload button (Figure 4-9).
 - a. The red light goes on.
 - b. The green light goes off.



SHR-0304 B4-B

Figure 4-8 Lowering Cartridge Insert/Release Handle



SHR-0305-84-C

Figure 4-9 Pressing Load/Unload Button

7. The tape loads to the beginning of tape (BOT) in 10 to 15 seconds.*
 - a. The red light stays on.
 - b. The green light goes on.
8. While the tape drive responds to a read or write command (including the time to seek the correct part of the tape):
 - a. The red light stays on.
 - b. The green light is blinking.

CAUTION: If the red light ever flashes rapidly, press and release the Load/Unload switch four times. If the problem persists, stop the tape drive and call your nearest service representative. Do not use the tape drive or remove the tape cartridge.

REMOVING A TK50 TAPE CARTRIDGE

You must rewind and unload the tape before you remove the cartridge from the tape drive.

1. Press the Load/Unload button to rewind and unload the tape. Rewinding a tape can also be done under software control. Refer to your software documentation for information.
 - a. The red and green lights both blink slowly as the tape rewinds to the BOT.
 - b. The red light stays on and the green light goes off as the tape unloads into the cartridge.
 - c. The red light goes off and the green light goes on when the tape is completely rewound in the cartridge.
2. Lift the cartridge insert/release handle. The tape cartridge pops out far enough to grasp.
3. Remove the tape cartridge and store it in a safe place.
4. Lower the cartridge insert/release handle. The green light stays on, showing that there is power to the drive.

CAUTION: Never lift the cartridge insert/release handle until red light turns off. Make sure the lights are not between blinks. Make sure the green light is on.

* If tape is new, the system writes a calibration track on the tape that takes about two minutes. The green light blinks fast and irregularly during calibration.

INTRODUCTION

This chapter has two sections. The first section describes the TK50-R or TK50-D subsystem's:

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

The second section describes:

- Configuration rules
- Module starting address and interrupt vectors
- System controller and cable option kits.

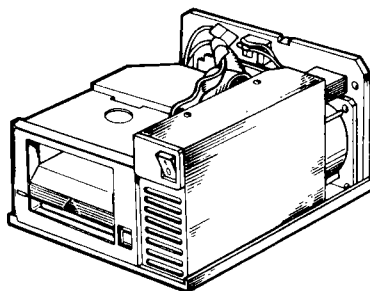
PHYSICAL FEATURES

The TK50 subsystem (Figure 5-1) is a free-standing mass storage device. You can use it as an add-on to PDP-11, VAX, and some other UNIBUS hosts. The subsystem can also be expanded into multiple configurations.

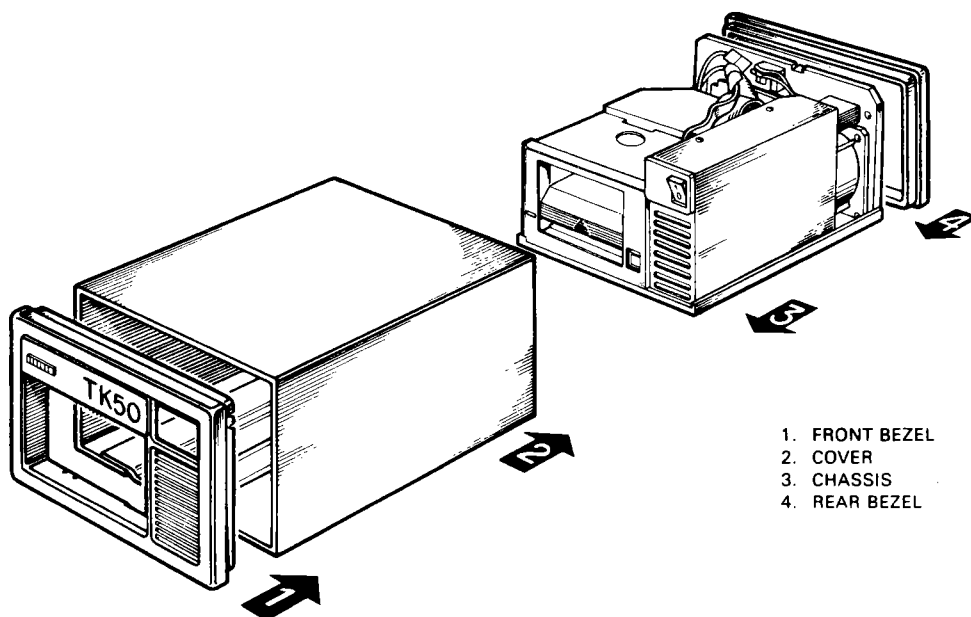
The number of TK50 subsystems that can attach to a UNIBUS host depends on the space available in the host backplane, the available 50-pin connectors on the I/O distribution panel, availability of proper power, and the number supported by the software (see your system software documentation).

Each TK50 subsystem has two major parts.

1. TK50 subsystem tape drive and removable tape cartridge
2. TUK50 controller module (M7547) and signal cable



A. TK50 RACK MOUNT MODEL



1. FRONT BEZEL
2. COVER
3. CHASSIS
4. REAR BEZEL

B. TK50 DESKTOP MODEL

MR-15360
SHR-0380-85

Figure 5-1 Desktop and Rackmount Subsystems

TK50 Subsystem

The TK50 streaming tape drive subsystem provides 94 Mbytes of backup data storage and uses Digital magnetic tape cartridges (CompactTape). Each tape cartridge has 182.88 m (600 ft) of 1.27 cm (1/2 in) wide tape.

Each TK50 subsystem has a mounting chassis that holds the tape drive, power supply, dc cooling fan, printed circuit board for external cable signal distribution, and front and rear panels. Rackmount units must be mounted in an H9302 rackmount kit. This kit, which ships separately, holds two subsystems side-by-side and fits a standard 48.26 cm (19 in) rack. Desktop units have a cover and front and rear bezels already installed. This dual configuration may require an H9504-FC filler panel.

The subsystem operates with either 120 V (TK50-RA, TK50-DA), or 240 V (TK50-RB, TK50-DB) primary power. The On/Off switch on the front panel controls primary power for the TK50-D (desktop). The TK50-R's (rackmount) power switch is covered and forced to the on position. Refer to Appendix B for specifications.

The TK50 tape drive is a field replaceable unit (FRU). Refer to the Table 5-5 and Chapter 6, Removal and Replacement for FRU procedures.

M7547 Controller Module

The M7547 controller module is a dual-height module that provides the interface between the TK50 tape drive and the UNIBUS. Figure 5-2 shows the two DIP switches on the controller module and the jumpers. Use these DIP switches and jumpers to configure the following.

- Unit number
- Device starting address
- Hardware revision level (set at the factory)

The factory setting of the unit number DIP switch is set for the first M7547 module installed in a system.

The factory setting of the jumpers is set to an address of 774500. This is the correct address to use for the first M7547 (TMSCP) device module installed in a system.

The hardware revision level switch is set at the factory and should match the revision level on the module.

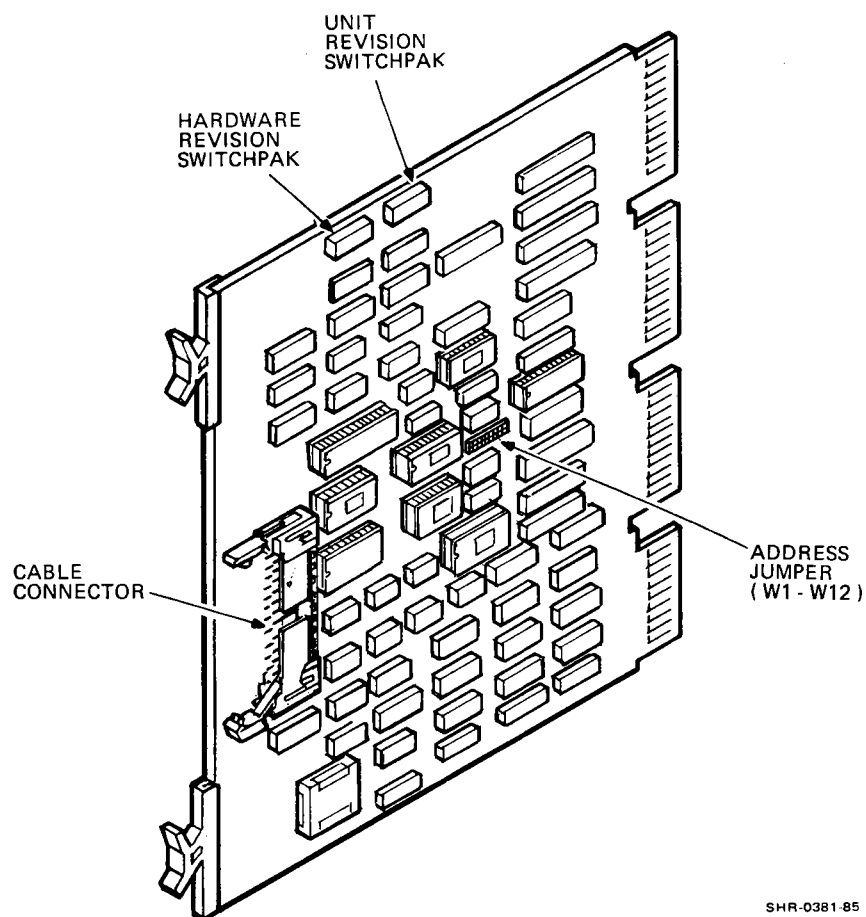


Figure 5-2 M7547 Module

OPERATING FEATURES

The TK50 subsystem operates with the M7547 controller module installed in PDP-11 or VAX systems. It provides backup requirements when installed as an add-on.

The TK50 subsystem is supported by PDP-11 and VMS software and is compatible with the Digital Storage Architecture (DSA) Mass Storage Control Protocol (MSCP).

ENVIRONMENTAL REQUIREMENTS

Tape drives are susceptible to high humidity, high temperature, shock, and radiated emissions. The tape drive operates within a temperature range of 10 to 40°C (50 to 104°F). Refer to Appendix B for detailed environmental and operating specifications.

POWER SUPPLY

The TK50 subsystem power supply uses either 120 or 240 Vac primary power selected by a voltage select switch (VOLT SEL) on the rear panel. The switch is factory set to 120 Vac (TK50-RA, TK50-DA) or 240 Vac (TK50-RB, TK50-DB). The power supply provides:

- +12 A Vdc for the tape drive
- +12 B Vdc for the dc cooling fan
- +5 Vdc for the control logic.

The +5 Vdc and +12 Vdc regulators are not adjustable.

Circuit breaker (CB) protection on the primary line includes protection to prevent overheating of the tape drive. Refer to Appendix B for power supply specifications.

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, pulls air from the subsystem front and exhausts it out the rear.

FRONT PANEL CONTROLS AND INDICATORS

The front panel has controls and indicators for operating the TK50 tape drive. Figure 5-3 shows the layout of the control panel.

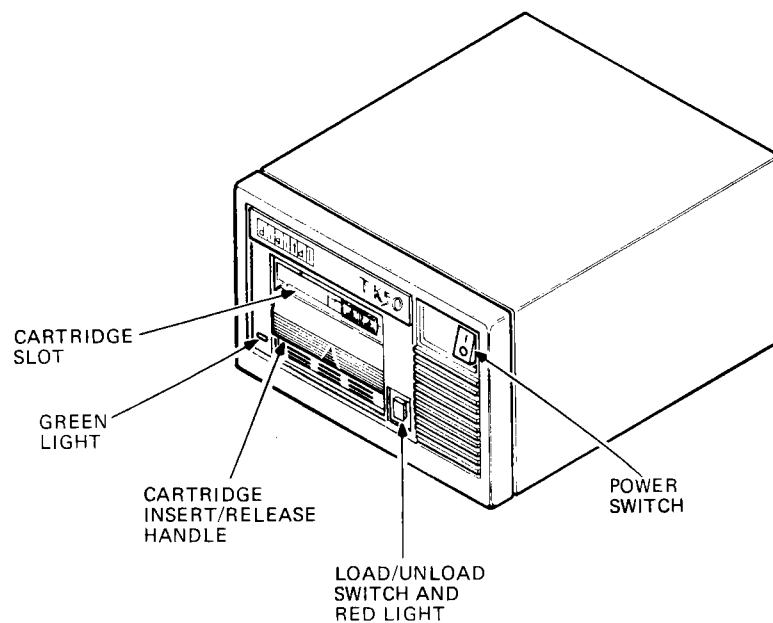
The following describes the function of the switches and indicators.

ON/OFF Switch

This switch connects and disconnects ac power to the internal power supply.

LOAD/UNLOAD Button

When this button is pushed in, the tape loads (10 to 15 seconds). This is the normal operating position. When this switch is released, the tape rewinds and then unloads.



SHR-0384-85

Figure 5-3 TK50 Controls and Indicators

LED Indicators

There are two LED indicators. The TK50 Load/Unload button has an internal red LED. This LED indicates cartridge insert/release handle and fault conditions. The green LED to the left of the Load/Unload button indicates tape and power conditions.

Under normal operating conditions, the LEDs indicate the following states.

Red LED

- On always means that the cartridge insert/release handle cannot be raised.
 - Lights for two seconds during power-up self-test
 - Stays on during tape operation
 - Stays on during tape unloading
- Off means that you can lift the cartridge insert/release handle and insert or remove a tape cartridge.
- Blinking means the tape is loading or rewinding. The cartridge insert/release handle can be raised soon.
 - Blinks slowly during tape loading (10 to 15 seconds)
 - Blinks slowly during tape rewinding
- Fast flashing always means there is a fault condition. The cartridge insert/release handle cannot be raised.
 - Press the Load/Unload button four times.
 - If the problem persists, there is a hardware fault.

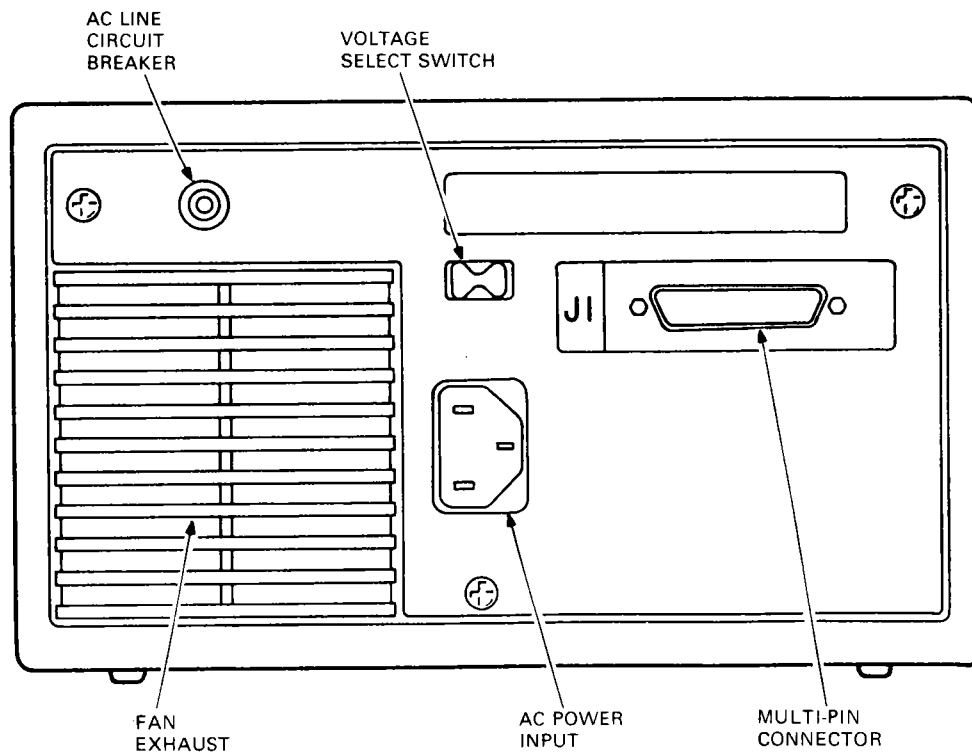
Green LED

- It is on under two conditions.
 - When power is present and it is okay to lift the cartridge insert/release handle (red LED off).
 - When tape is fully loaded (red LED on).
- Blinking means the tape is in motion.
 - Blinks slowly during read/write executions (red LED stays on).
 - Blinks slowly during tape rewind (red LED blinking).
 - Blinks irregularly during new tape calibration (red LED off).

REAR PANEL (FIGURE 5-4)

The rear panel has the following.

- Circuit breaker (fuses ac power coming into the subsystem)
- Primary voltage selection switch (VOLT SEL) set for either 120 or 240 Vac
- Fan exhaust opening
- AC line connector for the ac power cord
- J1 multipin connector



MR-15510
SHR-0382-85

Figure 5-4 Rear Panel

The J1 connector of the TK50 subsystem responds to a drive select signal (DRV SEL 3) on the drive interface cable coming from the host system. Refer to Appendix A for a list of the J1 connector pin numbers and signal names, and for a list of pins and voltages on the 12-pin power output connector.

LOGICAL UNIT NUMBERS

The M7547 controller module supports a single TK50 tape drive. Jumpers on the controller module select the starting address for the module, while the unit number DIP switch selects the unit number for the TK50 tape drive connected to that module. The system software displays the first unit number as MU0.

Since you cannot install more than one module in the backplane with the same starting address, the address jumpers and unit number DIP switch must be changed on a second or third module. The unit number for a second tape drive is MU1, for a third tape drive it is MU2, and so on.

CONFIGURATION

Configuring a TK50-R or TK50-D subsystem into a particular system requires auxiliary equipment. Before installing a TK50 subsystem and TUK50 controller module, you must consider the following factors.

- Module physical priority
- Backplane and I/O distribution panel expansion space
- Power requirement
- Interrupt vectors and module starting addresses

Refer to your system's technical manual for more information.

POWER REQUIREMENTS

Stay aware of the total current and power used to be sure you do not overload the system. Also, take note of the number of ac and dc bus loads for each UNIBUS module.

The current used by the M7547 controller is:

3.0 A at +5 V.

The current used by the TK50-R/TK50-D is:

1.5 A at +5 V
2.5 A at +12 V
120 V 2A RMS (max), 240 V 1A RMS (max)

The power dissipation of the TUK50 (M7547) is 17 watts maximum.

The bus loads for the TUK50 (M7547) are 2 ac and 1 dc.

MODULE STARTING ADDRESSES/INTERRUPT VECTORS

Any M7547 module you install must be set to the correct starting address and interrupt vector. The interrupt vector is set to 260 under program control. The vector for additional TK50 modules installed in the system becomes a floating vector, which is also set under program control.

The starting address of the first tape controller is fixed at 774500. Currently, there are two TMSCP devices -- TK50 and TU81 -- that can be assigned the fixed address of 774500, depending on system implementation. All other TK50 devices are installed in a floating address space of 760nnn (octal). The floating address space is set using the address jumpers on the M7547 module. Other TK50 devices are assigned other floating addresses based on system configuration. For example, if there are three TK50s in a system with no TU81, the first TK50 is assigned the fixed address of 775400, the second 760404, and the third 760444, for example. Table 5-1 shows the jumper connections for these addresses.

Table 5-1 Common Jumper Settings

774500		760404		760444	
A12	o-o	A12	o o	A12	o o
	o-o		o o		o o
	o o 4		o o 0		o o 0
	o o		o o		o o
	o-o		o-o		o-o
	o o 5		o o 4		o o 4
	o-o		o o		o o
	o o		o o		o-o
	o o 0		o o 0		o o 4
	o o		o o		o o
A2	o o	A2	o-o	A2	o-o
	0		4		4
	Unit		Unit		Unit
	Number 0		Number 1		Number 2

Figure 5-5 shows the jumper settings for the fixed 774500 address.

		ADDRESS BITS													
MODULE	FACTORY	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	JUMPER	SETTING
NUMBER	ADDRESS	I	I	I	R	R	I	R	I	R	R	R	R		

I = Jumper installed

R = Jumper removed

* The jumper nearest the module fingers is W12 which represents address bit 2.

Figure 5-5 Jumper Settings

As devices are added to a system, the floating address assigned to a device may change. For PDP-11 UNIBUS devices, a Float program run under XXDP+ Diagnostic Supervisor is available to identify and assign the device addresses. For additional information, refer to PDP-11 Architecture Handbook, Appendix A (EB-23657-18). For VAX UNIBUS devices, the field engineer can use SYSGEN to identify and assign the CSR address and vector for each device.

Address bit A1 decodes the IP or SA registers. Address bit 0 is ignored. Address bits 17 through 14 are hardwired as 1s. If address bit 12 is set, the address is fixed at 774500. If address bit 12 is reset, a floating address of the form 760nnn is indicated.

UNIT NUMBER DIP SWITCH (E4, 4-B7)

The unit number DIP switch must be set to correspond to the address jumper setting. The first setting in Table 5-2 shows the unit number factory setting that matches the starting address jumper setting of 774500.

Table 5-2 Unit Number Switchpack Settings

Jumper Set for an Address of	Unit Number Switch Pack Bits								Unit Number Name
	1	2	3	4	5	6	7	8	
774500	0	0	0	0	0	0	0	0	MU0 (first TK50)
760nnn	1	0	0	0	0	0	0	0	MU1 (second TK50)
760nnn	0	1	0	0	0	0	0	0	MU2 (third TK50)
760nnn	1	1	0	0	0	0	0	0	MU3 (fourth TK50)

0 = Switch open
1 = Switch closed

NOTE: Pressing a switch on the open side turns the switch off (0). Pressing a switch on the opposite side turns the switch on (1).

REVISION LEVEL SWITCHPACK (E5, 4-C7)

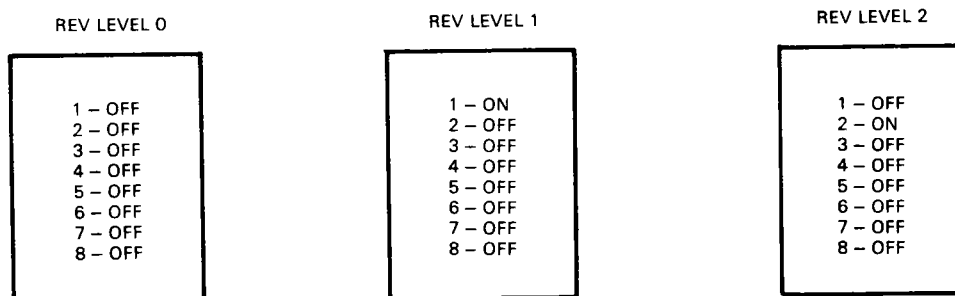
Make sure the revision level switchpack matches the revision level stamped on the back of the module (see Table 5-3 and Figure 5-6).

Table 5-3 Revision Level Dip Switch

Revision Level Number	Switch Bits							
	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0

0 = Switch open
1 = Switch closed

NOTE: Pressing a switch on the open side turns the switch off (0). Pressing a switch on the opposite side turns the switch on (1).



MR-15352
SHR-0383-85

Figure 5-6 Revision Level Switch Settings

SYSTEM CONTROLLER AND CABLE OPTIONS

Table 5-4 describes the function of the components needed to configure various systems.

Table 5-4 System Controller and Cable Option Kits

Model	Description
TUK50-AB	The TUK50-AB is the controller and 10 foot cable (17-01048-04) for a large cabinet enclosure and accommodates the MSCP UNIBUS. One controller handles one TK50.
TUK50-BB	This kit is similar to the one above except the controller cable is 3 feet long (17-01048-06) and the kit is used with the PDP-11/84-AA/AB/BA/BB system.
17-00484-01	This 2.75 m (9 ft) shielded, molded, FCC cable assembly has a 50-pin D subminiature male connector on each end. It connects the host to the external drive and comes with the TK50-R, TK50-D subsystem.

TROUBLESHOOTING TABLE

From time-to-time you may have an error not related to system diagnostic tests. Table 5-5 is a basic checklist of some of these problems, their possible causes, and ways to correct them. The corrective procedures listed are for minor problems.

NOTE: Major repair or replacement of any subsystem parts should be done by qualified repair personnel.

Table 5-5 Basic Troubleshooting Checklist

Problem	Possible Cause	Corrective Action
TK50 does not boot from the subsystem.	Power cable is not plugged in or power switch is off.	Plug in the subsystem power cable. Make sure the power switch is set to 1 (on).
	Subsystem cable is loose.	Make sure the subsystem cable is firmly installed.
	The Halt button on the host is pressed in.	Press and release the host Halt button. The Halt button should not be lit.
	The circuit breaker has tripped.	Press and release the circuit breaker on the back of the subsystem.

Table 5-5 Basic Troubleshooting Checklist (Cont)

Problem	Possible Cause	Corrective Action
TK50 passes power-up test but does not work.	There is no tape or it is not loaded.	Insert tape and press the Load/unload button to load the tape.
	The controller module/cable may be faulty.	Call your service representative or run the field service tests.
TK50 indicator light flashes rapidly.	Problem with the tape drive.	Press the Load/unload button four times. If the problem persists, call your service representative or replace the drive.
Not configured or illegal device name message.	Operating system does not know a TK50 is present.	Perform a SYSGEN or CONFIG operation. See Installation, step 21, or call your service representative.
Cartridge insert/release handle does not lift.	Power-up test still in process.	Wait for the red light to go out and try again. If the problem persists, call your service representative.
Tape does not unload.	Load/Unload button is in load position.	Make sure the Load/Unload button is in the unload position. Wait for the light to go out before removing the tape cartridge.
Tape read error message displays.	The tape may be bad.	If the problem persists, try another tape.
Tape write error message displays.	The tape is write-protected.	Slide the write-protect switch on the tape cartridge to the right. If the problem persists, try another tape.

CHAPTER 6
REMOVAL AND REPLACEMENT

INTRODUCTION

This chapter gives removal and replacement procedures for field replaceable units (FRUs). Table 6-1 lists the FRUs associated with the TK50 subsystem.

Table 6-2 shows the specific enclosure and the TUK50 variations that include the M7547 UNIBUS controller module and a cable. The controller accommodates the TMSCP UNIBUS. One controller handles one TK50 tape drive.

Table 6-1 TK50 Subsystem FRUs

FRU	Part Number
304.8 cm (120 in) cable with I/O insert	17-01048-04
91.44 cm (36 in) cable with I/O insert	17-01048-06
TK50-A tape drive	TK50-AX
Power supply assembly	30-22561-01
Fan assembly	70-21260-01
FCC cable	

Table 6-2 TUK50 Part Number and Description

Part Number	Description
TUK50-AB	Controller and 304.8 cm (120 in) cable with FCC bulkhead plate used on compliant systems (except the PDP-11/84-AA/AB/BA/BB). Included is a 74-27292 quad I/O frame for mounting the bulkhead plate on non-FCC compliant systems. For field upgrade only.
TUK50-BB	Controller and 91.44 cm (36 in) cable with I/O panel insert used on a PDP-11/84-AA/AB/BA/BB system.

TK50 TAPE DRIVE REMOVAL

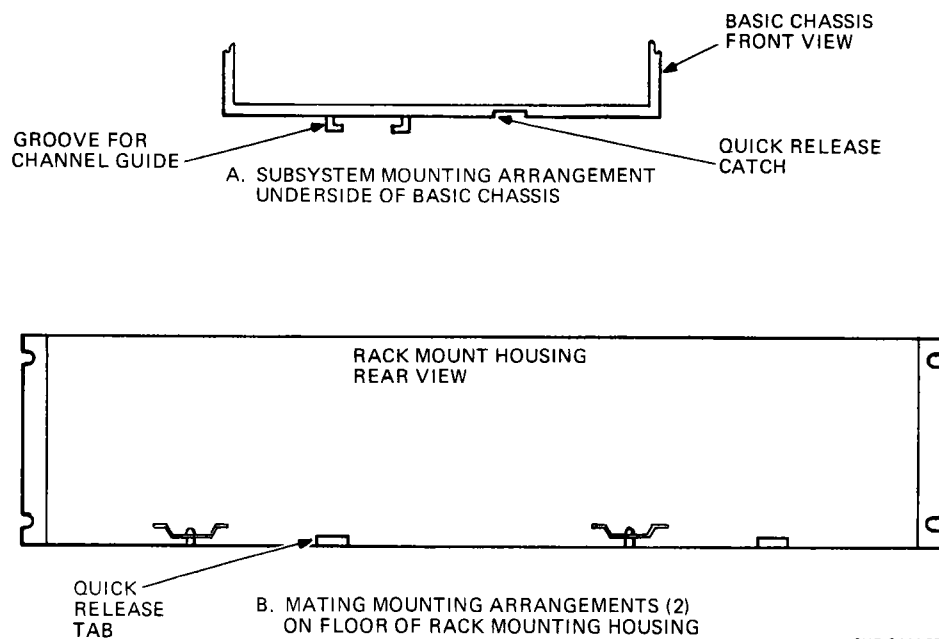
NOTE: Repair or replacement of any of this subsystem's parts must be done by qualified repair personnel.

Use the following procedure to remove the TK50 tape drive from rackmount or desktop subsystems.

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

WARNING: You are in extreme danger if you do not remove the power cable. AC power can still be in the chassis, even though the green dc LED is not lit and the fan is not turning.

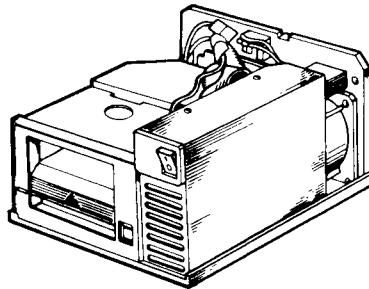
4. Press the quick-release tab on the rear of the rackmount unit and pull the basic chassis from the rack (Figure 6-1).



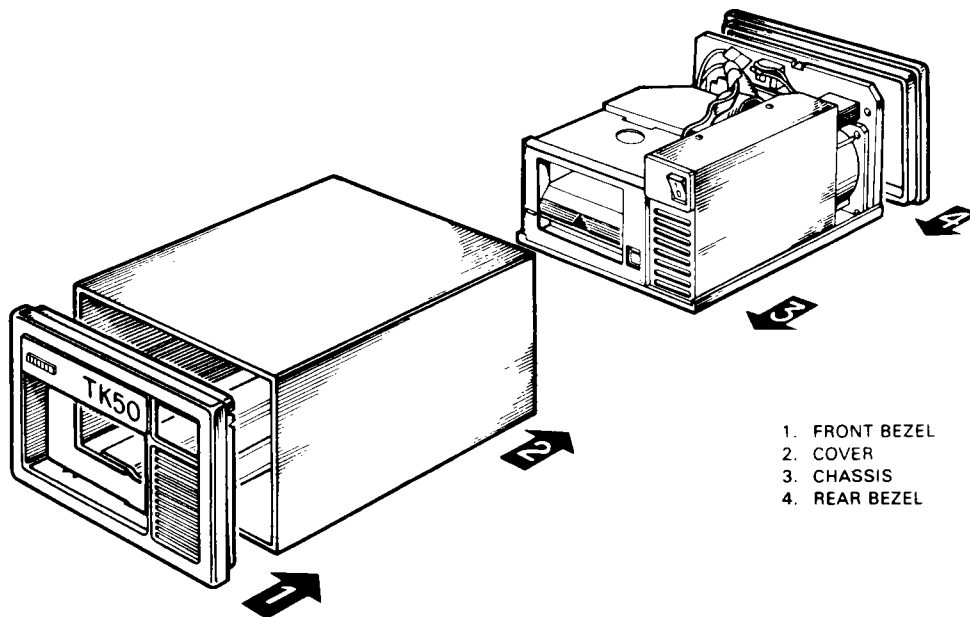
SHR-0444-85

Figure 6-1 Removal from Rackmount Housing

For the desktop model (TK50-D), remove the rear bezel (three screws) and slide the basic chassis out from the rear of the unit. Use the tab at upper middle of rear panel to pull unit out (Figure 6-2).



A. TK50 RACK MOUNT MODEL



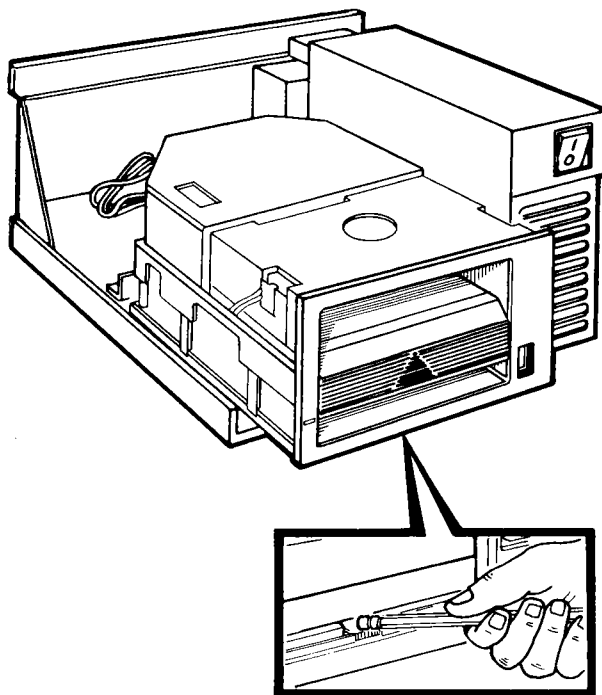
B. TK50 DESKTOP MODEL

1. FRONT BEZEL
2. COVER
3. CHASSIS
4. REAR BEZEL

MR-15360
SHR-0411-85

Figure 6-2 Removal from Desktop Housing

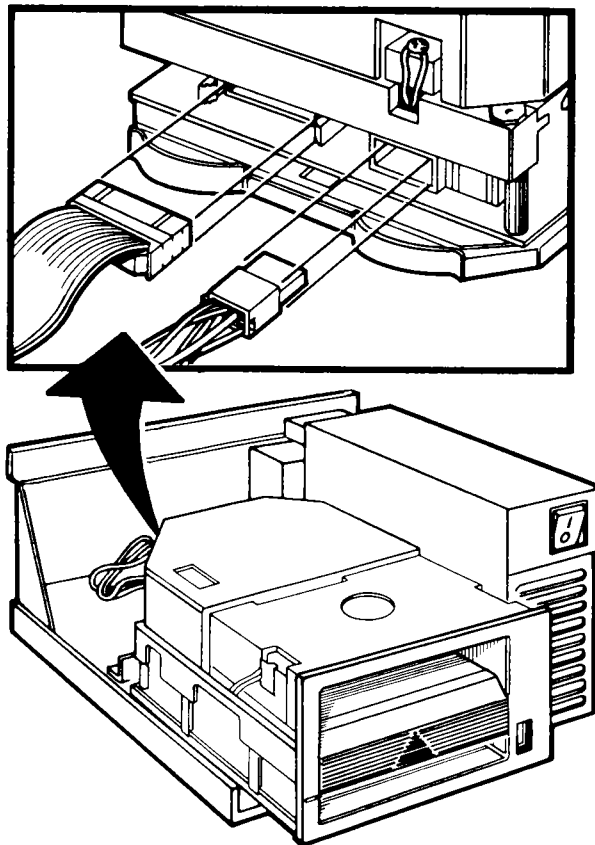
5. Press the latch with the eraser end of a pencil and slide the tape drive forward (Figure 6-3).



MR-15362
SHR-0414-85

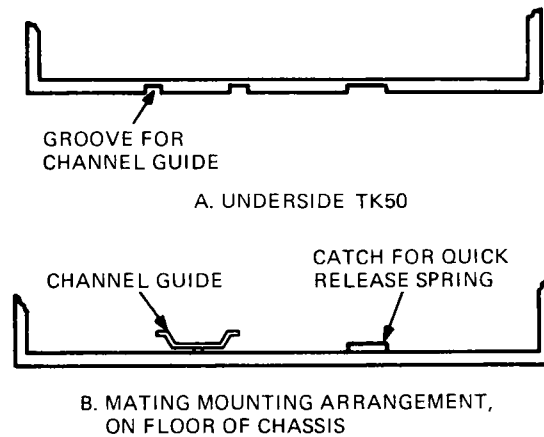
Figure 6-3 Sliding the Tape Drive Forward

6. Unplug the 4-wire power cable from the back of the tape drive (Figure 6-4).
7. Pull the tape drive cable straight out of the back of the tape drive.
8. Slide the tape drive out of the chassis. If the drive has to be returned, use the replacement tape drive's shipping carton.



MR-15365
SHR-0415-85

Figure 6-4 Remove the Power Cable and Drive Cables



MR-15373
SHR-0413-85

Figure 6-5 TK50-R and TK50-D Subsystem
Groove and Channel Guide

To install a replacement tape drive, align the groove on the bottom of the tape drive with the channel guide on the chassis floor (Figure 6-5).

Reverse steps 1 through 8 of the removal procedure to install the tape drive.

POWER SUPPLY REMOVAL

Use the following procedure to remove the power supply.

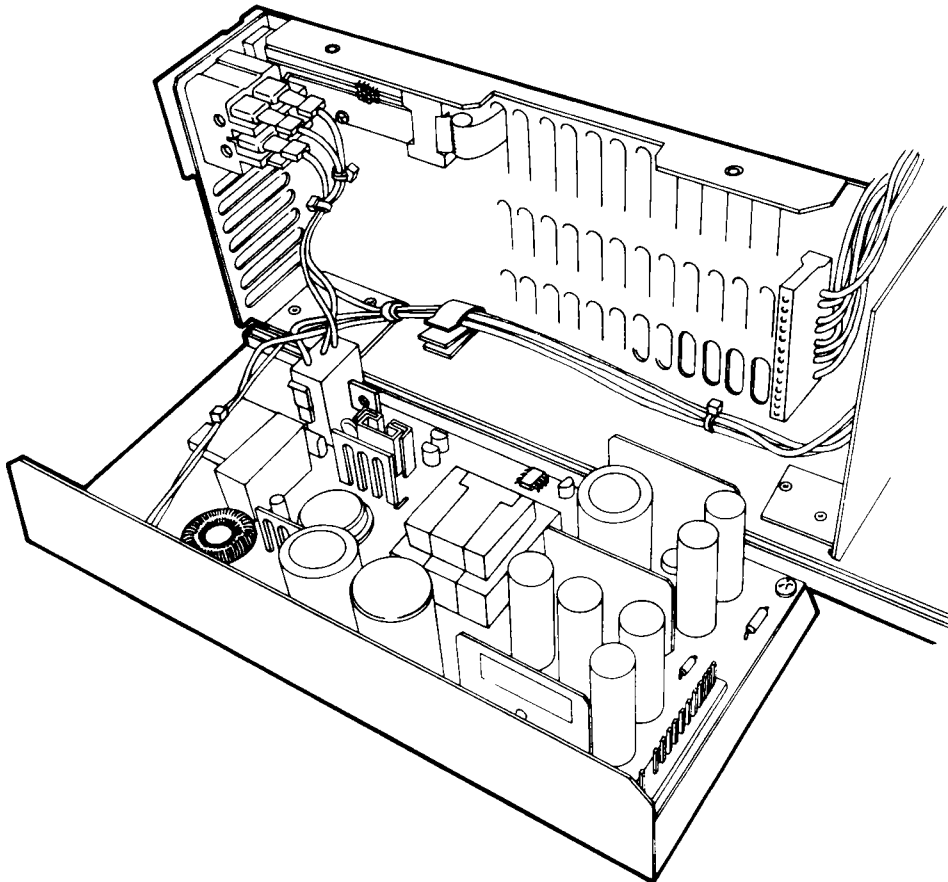
NOTE: The power supply is a complete FRU. It is not adjustable does not have replaceable printed circuit boards.

1. Remove all cables from the TK50 subsystem.
2. Remove the rear bezel (three screws) and slide the chassis out the rear 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 from the top plate of the power supply. Tip the power supply assembly gently to the right (as seen from the front). See Figure 6-6.
4. Disconnect the dc power connector at the rear of the power supply (Figure 6-6).
5. Lift the power supply assembly out of the chassis.
6. Disconnect the ac power connector at the lower front of the power supply (Figure 6-6).

Reverse steps 1 through 6 to install a replacement power supply.



MR-12186
SHR-0412-85

Figure 6-6 Power Supply, Component Side View

FAN ASSEMBLY REMOVAL

Use the following procedure to remove the fan.

1. Remove all cables from the TK50 subsystem.
2. Remove the rear bezel (three screws) and slide the chassis out the rear of the unit.
3. Remove the front bezel from rackmount units, press the quick-release tab, and remove the chassis from the rack.
4. Disconnect the dc plug to the fan assembly and remove the four screws on the rear panel holding the fan assembly in place.
5. Remove the fan assembly.

Reverse steps 1 through 5 to install a replacement fan.

APPENDIX A
CONNECTOR PIN NUMBERS AND SIGNALS

Table A-1 J1 Connector Signals and Pin Numbering

Pin Number	Signal Name	Pin Number	Signal Name
J1-01	Ground	J1-14	DR RD CLK L
J1-02	WRT Data H	J1-15	DR RD CLK H
J1-03	WRT Data L	J1-16	Ground
J1-04	Ground	J1-17	Read Data L
J1-05	DR CMD H	J1-18	Read Data H
J1-06	DR CMD L	J1-19	Ground
J1-07	Ground	J1-20	DR Status H
J1-08	WRT Gate H	J1-21	DR Status L
J1-09	WRT Gate L	J1-22	Ground
J1-10	Ground	J1-23	DR WRT CLK H
J1-11	Erase L	J1-24	DR WRT CLK L
J1-12	Erase H	J1-25	Ground
J1-13	Ground	J1-26	Ground

Table A-2 AC Power Supply Input Connectors

Pin Number	Signal
1	Ground
2	AC phase
3	AC neutral

Table A-3 DC Power Supply 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 B
SYSTEM SPECIFICATIONS

ENVIRONMENT

To receive the best possible performance from the TK50-R, TK50-D subsystem, you must provide the right operating environment (Table B-1).

Table B-1 General Environmental Requirements

Environment	Operating	Nonoperating
Maximum altitude	2.4 km (8,000 ft)	9.1 km (30,000 ft)
Temperature range*	10 to 40°C (50 to 104°F)	-30 to 66°C (-22 to 151°F)
Relative humidity (noncondensing)	20 to 80%	10 to 90%
Heat dissipation	119 BTU/h (typ) 148 BTU/h (max)	

* Reduce the temperature specification by 1.8°C (35.2°F) for each 1000 m (3,300 ft) increase in altitude.

Appendices

TK50 DIMENSIONS

Height	13.97 cm (5.50 in)
Width	22.86 cm (9 in)
Length	30.58 cm (12 in)
Weight	6.36 kg (14 lb)

Performance Specifications

Start distance	12.7 cm (5 in)(typ) 30.5 cm (12 in)(max)
Stop distance	8.9 cm (3.5 in)(typ) 12.7 cm (5 in)(max)
Data rate	45 Kbytes/s
Tape speed	75 in/s
Access time from insertion of a new cartridge	1 minute (min); 35 minutes (max)

Media Characteristics

Unformatted capacity	132 Mbytes
Recording medium	1.27 cm (1/2 in) wide, 182.88 m (600 ft) long magnetic tape
Recording density	6667 bits per inch
Number of tracks	22
Mode of operation	Streaming
Read/write method	Serpentine
Recording method	Modified Frequency Modulation (MFM)

Physical Specifications

Height	8.25 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.00 in)
Weight	2.3 kg (5 lbs)

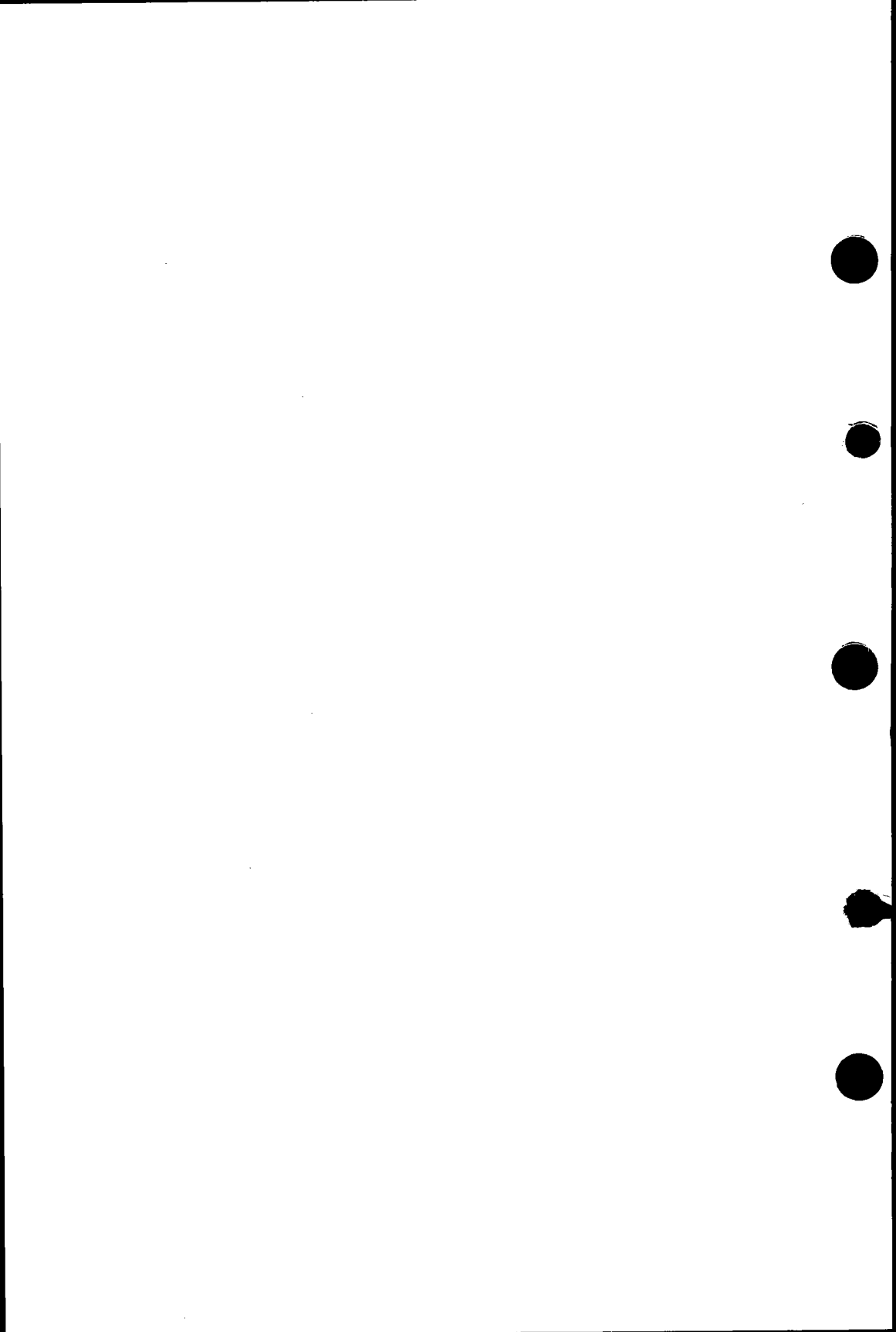
POWER SUPPLY

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 to 63 Hz either input range
Line current	120 V, 2 A Rms (max) 240 V, 1 A Rms (max)

Outputs

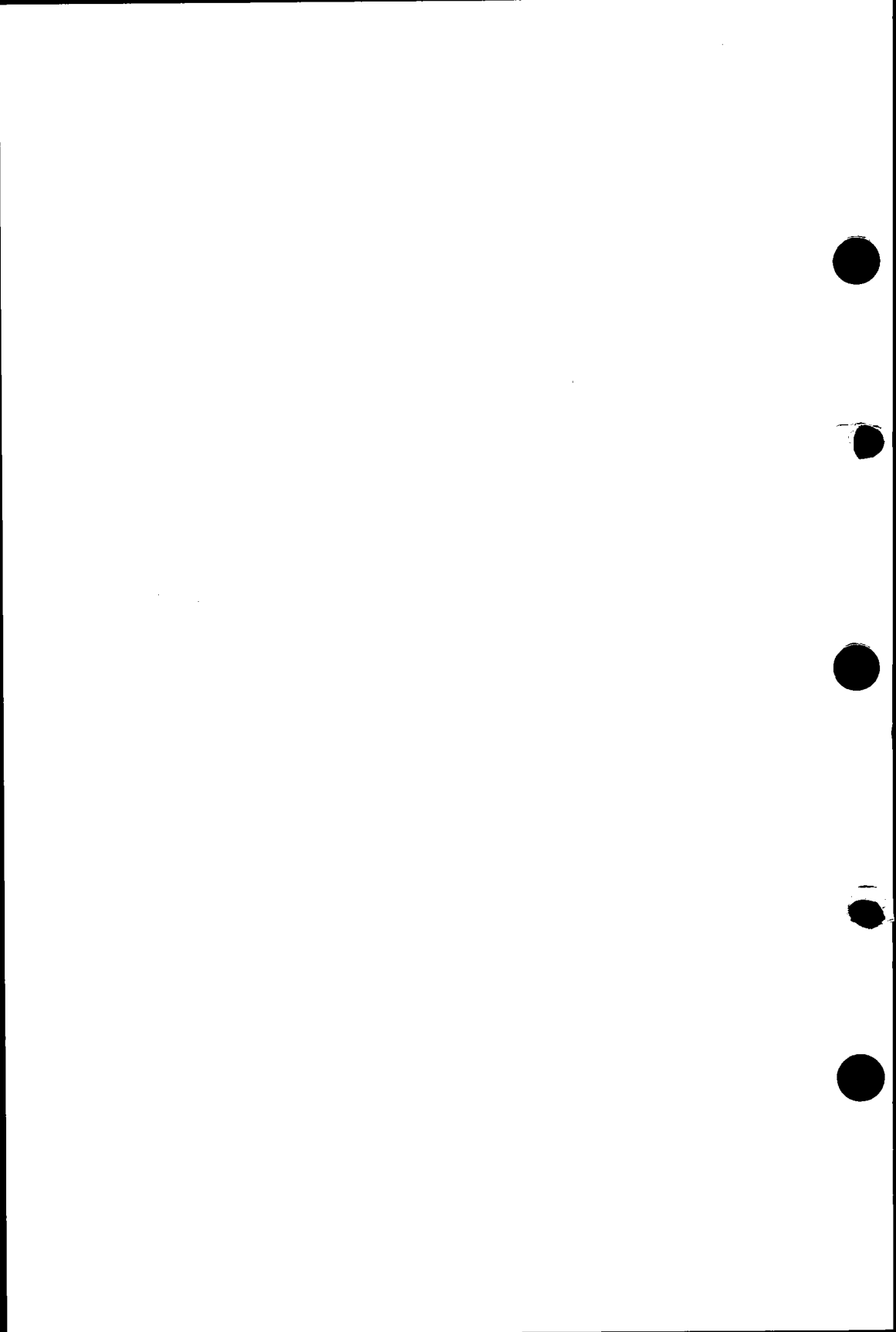
Power	65 W (max)
DC voltages	+12 A Vdc -5%, 0.1 A (min) to 4.5 A (max) +12 B Vdc -10%, 0.12 A (max) (dc fan only) +5 Vdc -5%, 0.3 A (min) to 2.0 A (max)



APPENDIX C
RELATED DOCUMENTATION

Table C-1 Related Documentation

Document	Order Number
Mass Storage Tabletop Enclosure (MSTE) Maintenance Guide	EK-LEP05-SG
TK50 Tape Drive Subsystem User's Guide	EK-0TK50-UG
H9302 Rack Mount Kit Installation Guide	EK-LEP03-IN
TK50 Tape Drive Subsystem Technical Manual	EK-0TK50-TM
The DEC/X11 User's Manual	AC-F053-MC
The DEC/X11 Cross Reference Manual	AC-F055C-MC
XXDP+/SUPR User's Manual	AC-F348A-MC



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 service 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 need uninterrupted operations, 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 for customers who don't need the convenience of on-site coverage, but do require the same fast, personal response, and the ability to plan their maintenance expenditures, at an 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 service is for users who have the technical resources to perform first-line maintenance themselves. DECmailer customers can troubleshoot, identify, and isolate 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 noncontractual, time and materials cost basis. It is available with either on-site or carry-in service, and is appropriate for users who have enough expertise to perform first-line maintenance, but may occasionally need more support from Field Service.

PER CALL

This service is offered as a supplementary program for Basic Service Plan Customers who need remedial maintenance beyond their contracted hours of coverage. In this 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, seven days a week.

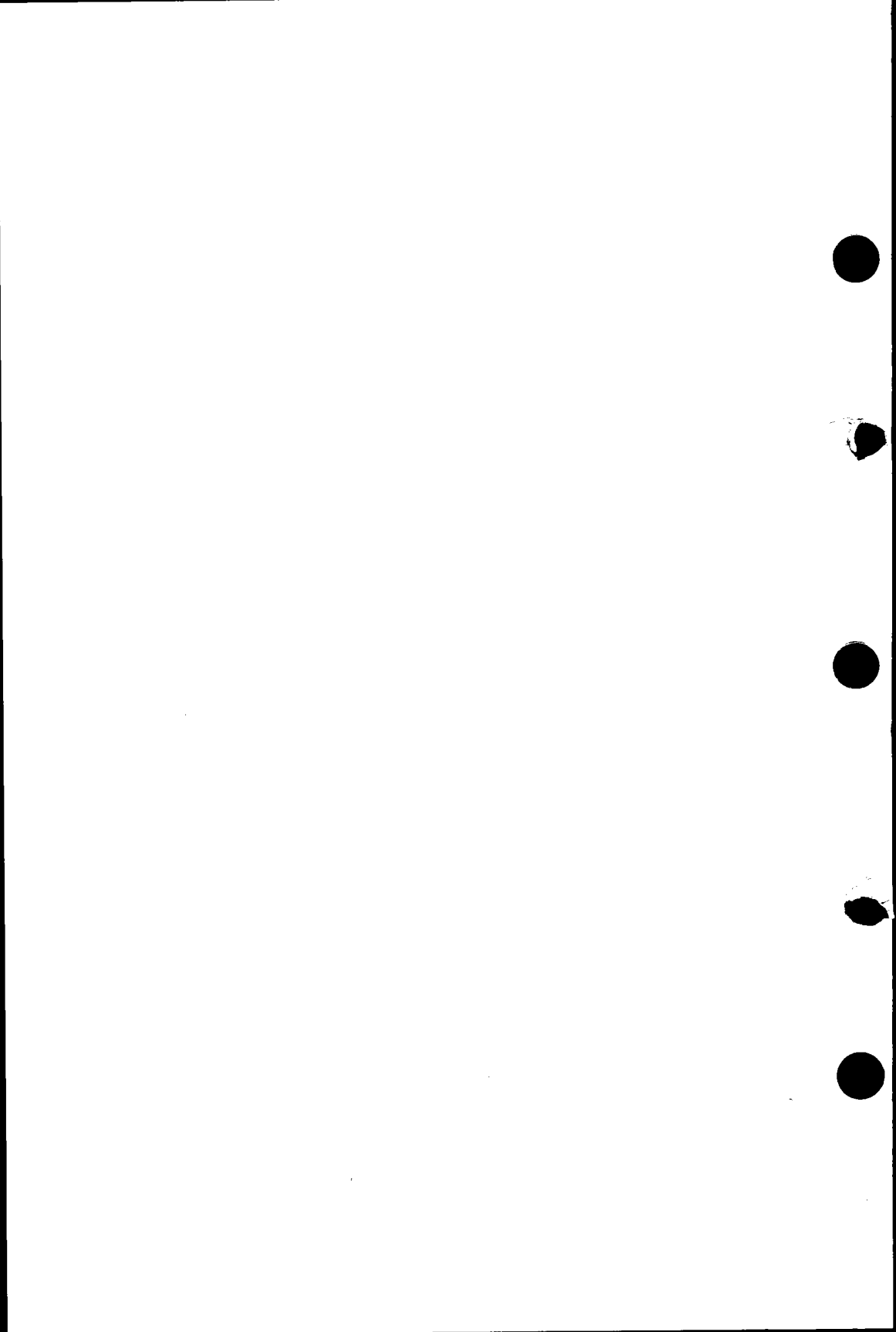
CARRY-IN PER CALL SERVICE

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

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

DIGITAL INTERNATIONAL FIELD SERVICE INFORMATION NUMBERS

U.S.A.	1-800-554-3333	Finland	(0) 423511
Canada	(800) 267-5251	Holland	(30) 640293
United Kingdom	(734) 868711	Switzerland	(01) 8169111
Belgium	(02) 2425095	Sweden	(8) 7338000
West Germany	(089) 95910	Norway	(2) 160290
Italy	(02) 617961	Austria	(222) 6776410
Japan	(03) 989-7161	Ireland	(1) 308433
France	(6) 0778292	Portugal	(1) 725402
Denmark	(2) 889666	Australia	(02) 4125555
Spain	(1) 7331900		



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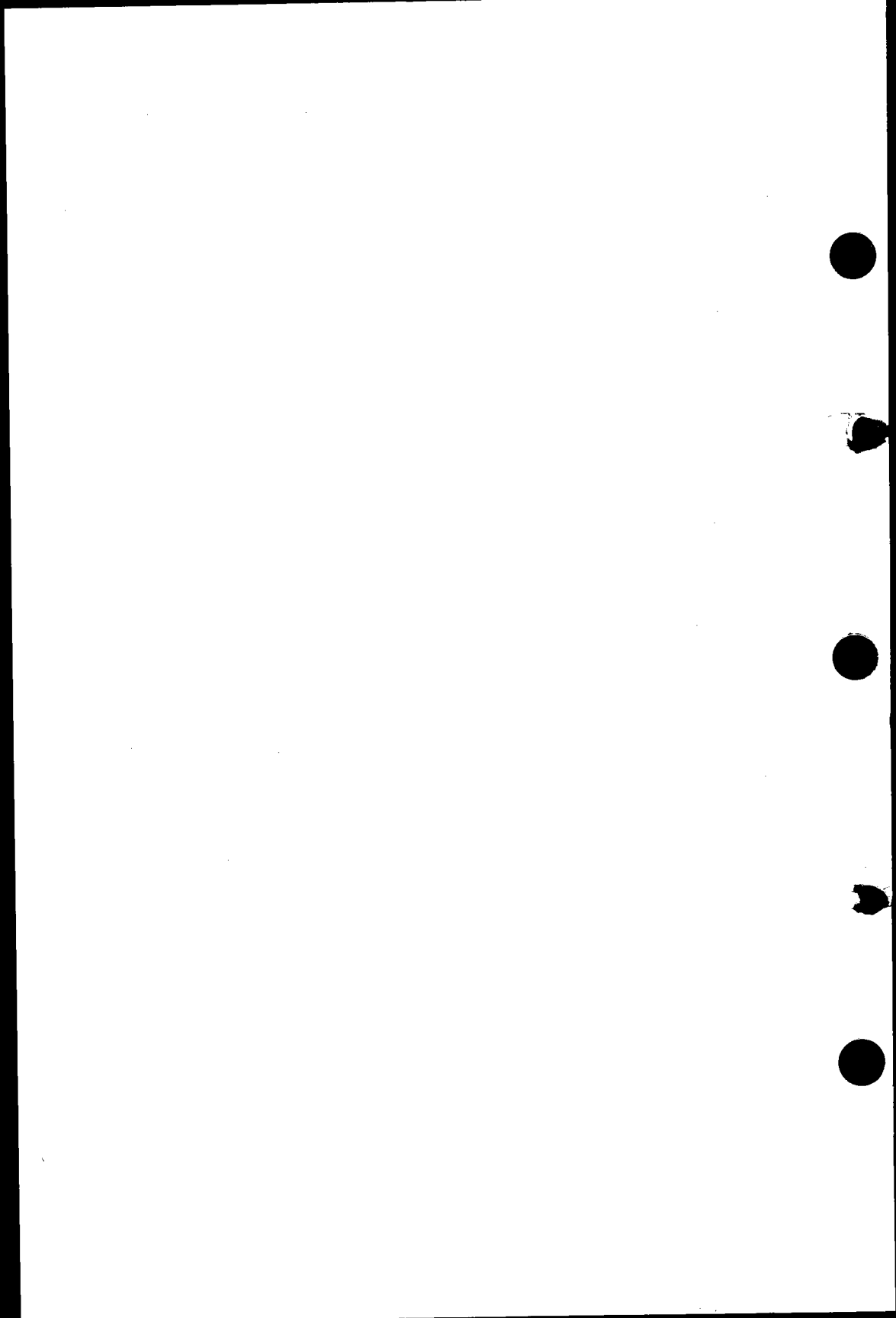
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TK50 UNIBUS Subsystem

Owner's Manual

Prepared by Educational Services
of Digital Equipment Corporation

1st Edition, March 1986

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EK-OTK50-UG-004

TK50 Tape Drive Subsystem

User's Guide

Prepared by Educational Services
of Digital Equipment Corporation

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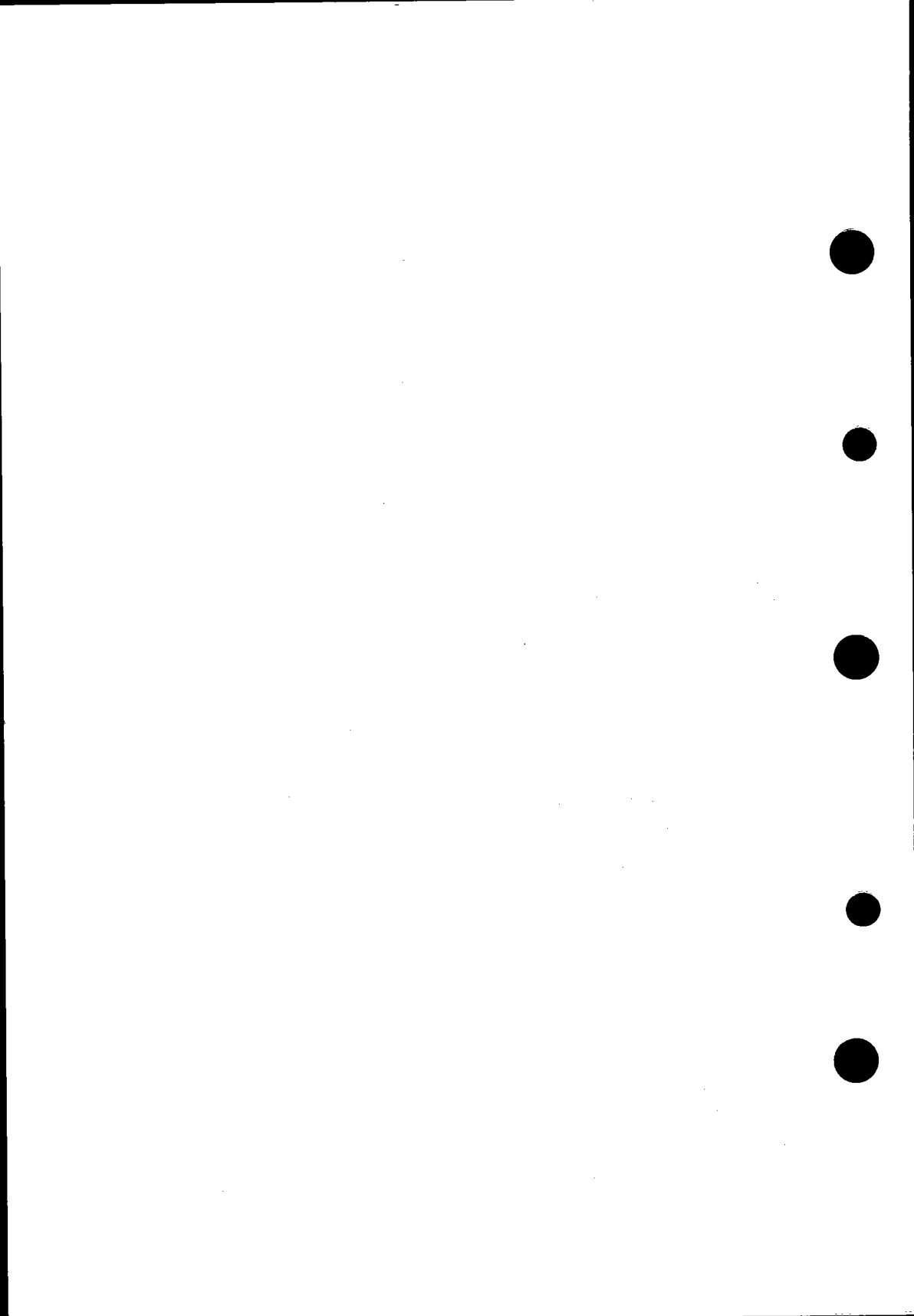
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CHAPTER 1
INTRODUCTION TO THE TK50

The TK50 is a powerful streaming tape drive which can store 94 million bytes (characters) on each of its associated tape cartridges (formatted). It runs with Digital computer systems such as the MicroPDP-11 and MicroVAX II. While the TK50 is physically small, it has much of the functionality of Digital's larger magnetic tape drives, such as the TU81.

Since the TK50 is a relatively new type of device, how to use it may not be immediately obvious. You should read this manual completely first, then perform the procedures in Chapters 2 and 3. The TK50 Tape Drive Subsystem User Reference Card (EK-OTK50-RC) is provided as a reminder after you become comfortable with using the drive.

The TK50 uses a tape cartridge (labeled CompactTape) that contains the magnetic tape on a single reel. This is an important concept to understand, because it directly affects the use of the TK50. The magnetic tape is the medium that stores the data.

When the tape cartridge is loaded into the drive, the tape is automatically threaded onto a reel inside the drive. If the tape is fully wound onto the reel inside the drive, it can take up to 90 seconds to rewind. It must be fully rewound into the cartridge before the cartridge can be removed.

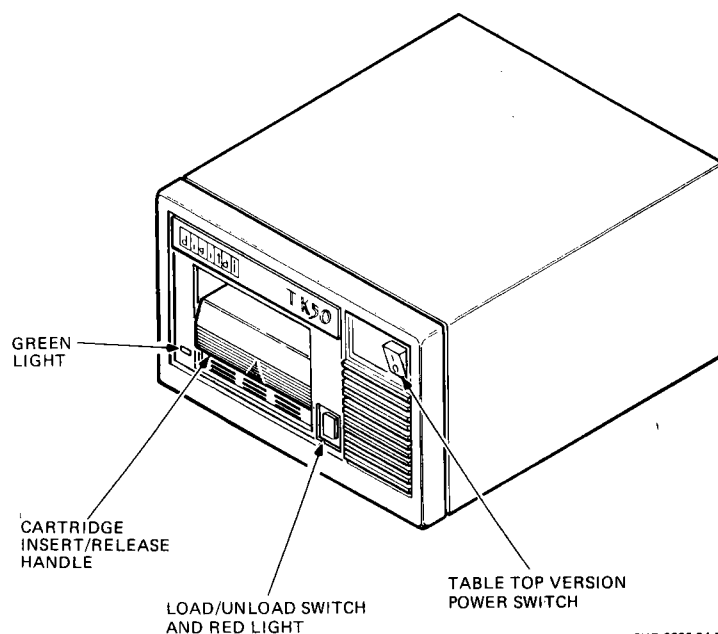
This method is different from a video cassette recorder (VCR) in that a VCR tape can be ejected at any time -- it does not have to be rewound first.

Two main components make up the TK50 Tape Drive Subsystem: the TK50 Drive Unit, and a single printed circuit board controller that plugs into a host computer system (such as the Micro/PDP-11). The controller provides an interface between the tape drive unit and the computer's central processor. An interface cable connects the tape drive to the controller.

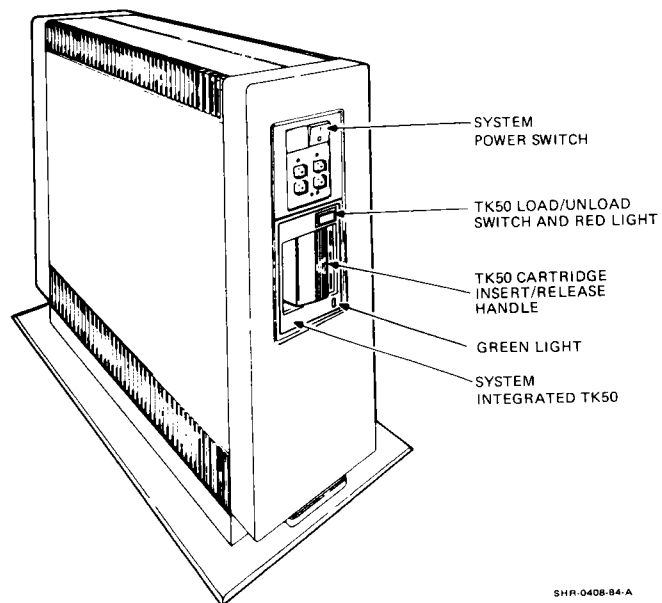
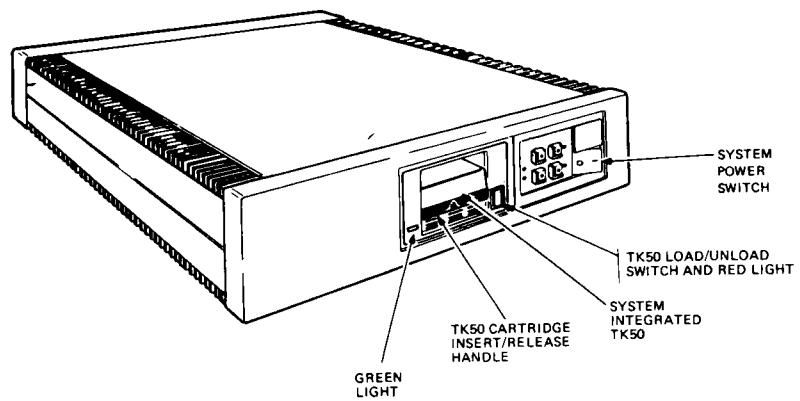
There are two possible versions of the TK50.

1. It can be integrated into the system unit of various Digital computers (certain models of the Micro/PDP-11 and MicroVAX are among them).
2. It can be a tabletop version where the TK50, residing in a separate housing, plugs into the rear bulkhead of Digital computer systems. A variation on the tabletop version allows the TK50 to be mounted in a rack (see the TK50-D, TK50-R Tape Drive Subsystem Owner's Manual, EK-LEP05-OM.)

NOTE: Most of the illustrations in this manual show the tabletop version of the TK50. The operating principles of the TK50 are the same, whether you have the tabletop or system-integrated version.



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ABOUT THE TAPE CARTRIDGE

The TK50 tape cartridge is a 4 inch by 4 inch plastic cartridge that is inserted into the TK50 tape drive. It is labeled CompacTape.

The tape cartridge has a write-protect switch to prevent accidental erasure of important data. When the switch is moved to the left and the orange indicator is visible, data cannot be written to the tape.

Inside the cartridge is a 600-foot single reel of magnetic tape, on which data is stored. At the beginning of the tape is a plastic leader. There are some rules to follow about the tape cartridge.

- Do not drop the cartridge. This may cause the leader to be displaced, in which case the tape cartridge is unusable, and it may damage the drive. (See Chapter 2 -- Inspecting a Cartridge.)
- If the tape cartridge has been exposed to extremes of heat or cold, let it stabilize at room temperature for the same amount of time -- up to 24 hours.
- Do not touch any exposed portion of magnetic tape.

Table 1-1 lists the available documentation (other than this book) for the TK50 Tape Drive Subsystem.

In addition to these manuals, the system manuals that cover various Digital computer systems contain information on how to install, use, and fix the TK50 Tape Drive Subsystem. For example, if the TK50 tape drive subsystem comes packaged in a version of the Micro/PDP-11 computer, then the system manuals shipped with the Micro/PDP-11 have information relating to the TK50.

Table 1-1 TK50 Subsystem Documentation

Document and Part Number	Description
TK50-D, TK50-R Tape Drive Subsystem Owner's Manual (EK-LEP05-OM)	Provides installing, servicing, using, and programming information for the tabletop or rackmount versions of the TK50.
Mass Storage Tabletop Enclosure Service Guide (EK-LEP05-SG)	Provides maintenance, troubleshooting, and repair information for the TK50 Subsystem (tabletop or rackmount version). It is used by Digital Field Service personnel.
TK50 Tape Drive Subsystem Technical Manual (EK-OTK50-TM)	Provides technical detail, theory of operation, and troubleshooting information about the TK50.
TK50 Tape Drive Subsystem Illustrated Parts Breakdown (IPB) (EK-OTK50-IP)	Illustrates and lists the various components and subassemblies that make up a TK50.

TERMS USED IN THIS MANUAL

Cartridge leader	A plastic leader at the beginning of the magnetic tape. Consider that the mating of the leaders (one of which is inside the cartridge, the other inside the drive) is like the threading of a needle. The leader inside the cartridge serves as the "eye" of the needle. This leader may be either black or white.
Take-up leader	A plastic leader inside the TK50. After the take-up leader mates with the cartridge leader, it draws the magnetic tape out of the cartridge and onto the take-up reel inside the tape drive. As the tape is wound onto the take-up reel, it passes the magnetic read and write heads. These heads let the TK50 perform its function: to write and read data to and from the magnetic tape.
Cartridge insert/release handle	This handle is used to set the internal mechanisms of the TK50 to accept or eject the tape cartridge. The handle is raised before inserting a cartridge, lowered during use, and raised again to eject the cartridge.

Insertion	The act of placing the tape cartridge in the TK50. It is during insertion that the cartridge leader and take-up leader mate. Before insertion it is important (especially the first time the cartridge or drive is used) to inspect the positions of both the cartridge leader and take-up leader. Refer to Chapter 2 for instructions.
Load	When the tape cartridge has been correctly inserted, the tape is brought to BOT by pushing the Load/Unload switch and releasing it to its In, or load, position.
Unload	After you finish using the tape cartridge, push and release the Load/Unload switch to its Out position. The tape rewinds to BOT, then to its unload point. Now you can lift the handle and remove the cartridge from the tape drive.
BOT	Beginning of Tape. It is the first spot on the magnetic tape where data can be written. BOT is set automatically. You need perform no functions in regard to BOT.
Write protect switch	A switch on the TK50 tape cartridge used to prevent data from being written on the tape. In its protected position, a small orange indicator is visible on the front of the tape cartridge. In its enabled position, there is no orange dot visible and data may be written to the cartridge.

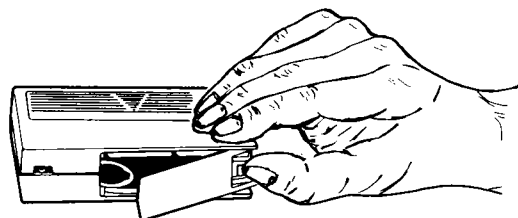
CHAPTER 2 INSPECTING AND LOADING A TAPE CARTRIDGE

This chapter is a 10-step procedure that explains how to inspect and label a tape cartridge, turn on power, and load the cartridge into the TK50 Tape Drive.

1. Inspect the tape cartridge.

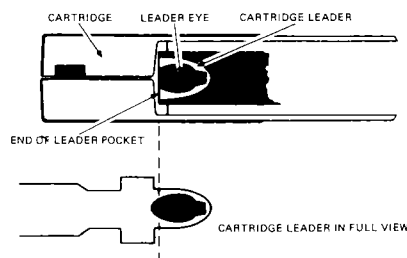
Always inspect the tape cartridge before you use it for the first time. Open the cartridge door by releasing the door lock with your thumb. The tape leader inside the cartridge should be positioned exactly like the one shown in the figure below. The cartridge leader may be either black or white.

CAUTION: If the leader is not positioned exactly as that shown below, do not use this cartridge. It may damage the drive. Do not pull the leader. Do not drop the tape cartridge.



DOOR LOCK
(RELEASE BY LIFTING
DOOR LOCK WITH THUMB)

51111 0002 86



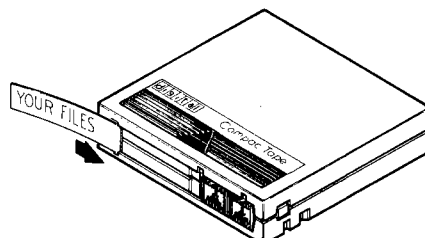
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Inspecting and Loading a Tape Cartridge

2. Label the tape cartridge.

Always label the tape cartridge you're using, so that later you'll know what information is on the tape.

There is a slot on the front of the tape cartridge for a slide-in label.



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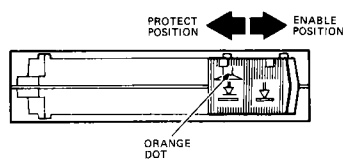
CAUTION: Use only the label slot provided to label a tape cartridge. Do not use stick-on labels on the top, bottom, or sides of the tape cartridge.

3. Write protect the tape cartridge (to protect data).

You can prevent the information on the tape from being overwritten by "write-protecting" the tape. To write protect the tape, slide the write protect switch (on the front of the tape cartridge) to the left. A small orange dot is visible on the switch when it is in the protected position.

If you are using the TK50 as a back-up device, leave the switch in the write enabled position when data is to be written to it.

If you are using the TK50 to read software or data from the tape, place the switch in the write-protected position.

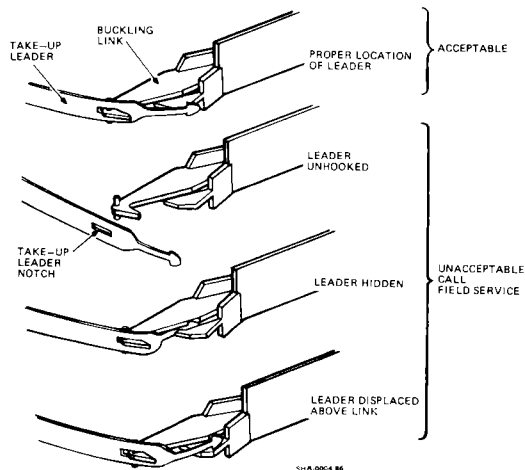
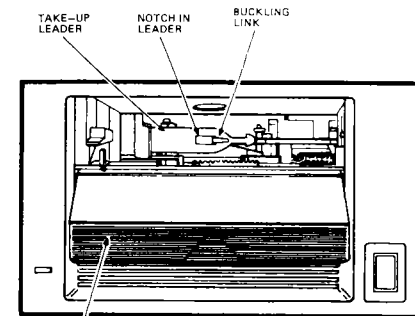


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4. Inspect the take-up leader inside the TK50.

Make sure that the take-up leader inside the tape drive is in the correct position, as shown below. Since the take-up leader in the TK50 must mate with the leader inside the tape cartridge, it is important that both are in their correct positions.

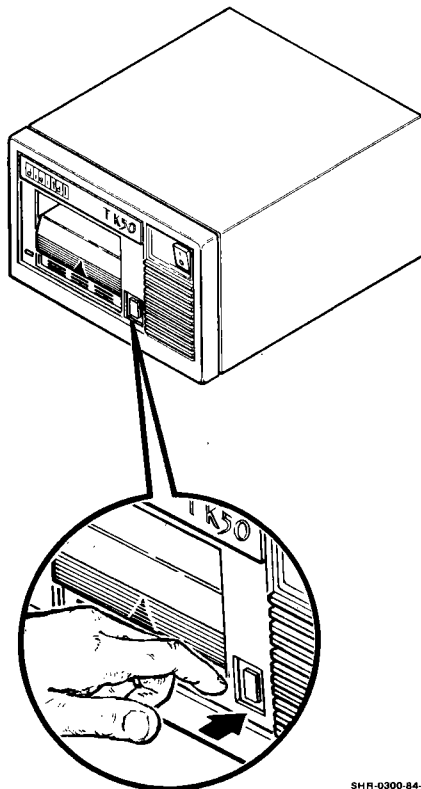
CAUTION: Do not try to fix the take-up leader inside the tape drive. If it is not in the correct position, call Digital Field Service.



Inspecting and Loading a Tape Cartridge

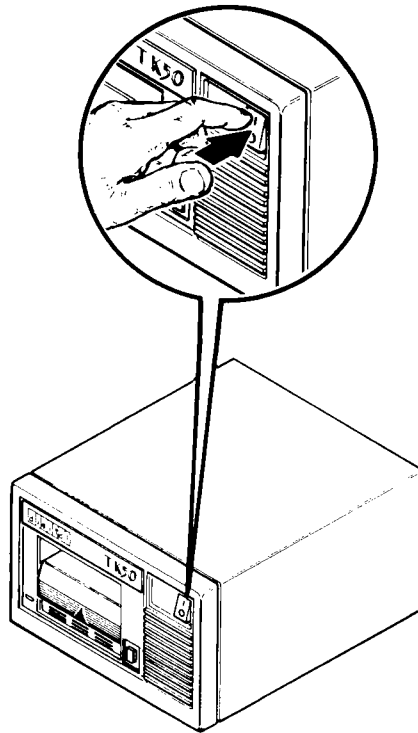
5. Set the LOAD/UNLOAD switch to UNLOAD.

Before turning on power, make sure the LOAD/UNLOAD switch is in the UNLOAD (out) position.



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6. Watch the lights and turn on the power.



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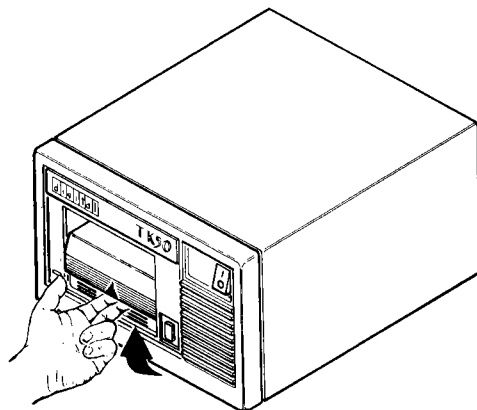
Turn on the power to the TK50. The tape drive's red light goes on steady for about 5 to 15 seconds (while it runs an internal self-test), then goes off. The green light comes on. If at any time the red light flashes rapidly, there is a problem with the TK50. Refer to Chapter 5.

Inspecting and Loading a Tape Cartridge

7. When the green light goes on (the red light is off), lift the cartridge insert/release handle.

If you have a TK50 that is mounted vertically in a floor stand computer system, "lifting" the cartridge insert/release handle means pulling it to the left.

CAUTION: Never lift the cartridge insert/release handle when the red light is on or blinking or you may cause a fault or damage the unit.



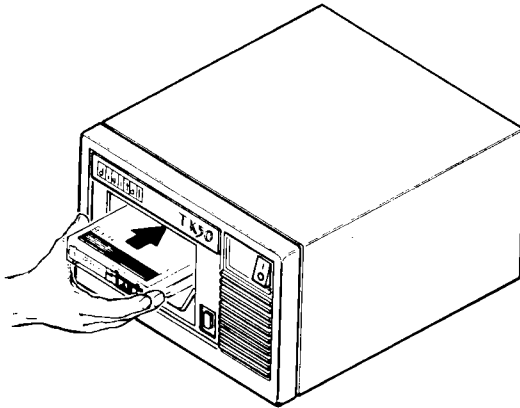
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Before performing step 8, read the Caution.

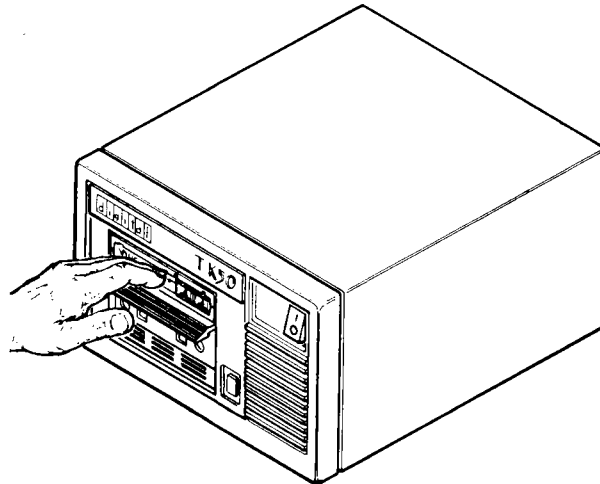
8. Smoothly and completely insert the tape cartridge.

Hold the tape cartridge with the arrow on top, pointing away from you. Make sure the label is facing you. Place the cartridge partially into the drive as shown in the first part of the figure below. Push the cartridge (as shown in the second part of the figure) into the drive, smoothly and firmly, until it locks in place inside the drive. Now the red light turns on and the green light goes off.

CAUTION: You will feel some resistance as you push the cartridge into place. It is very important NOT TO STOP AT THIS POINT, BUT TO CONTINUE TO PUSH THE CARTRIDGE FIRMLY UNTIL IT LOCKS IN PLACE.



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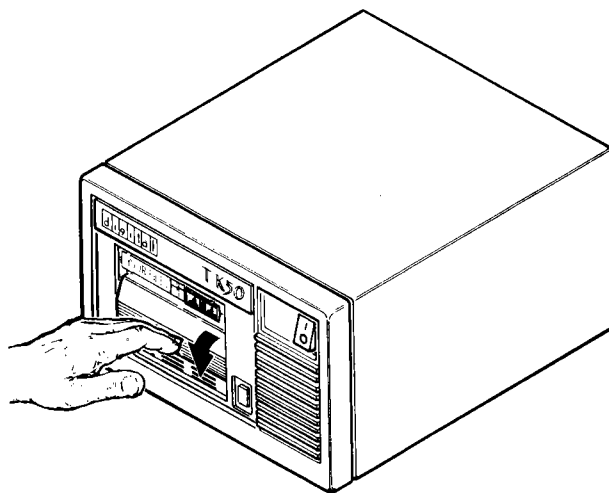
514-0009-84

Inspecting and Loading a Tape Cartridge

9. Lower the cartridge insert/release handle to locked (closed) position.

After a delay of several seconds, the green light turns on steady, the red light turns off.

At this point, you can remove the tape cartridge by lifting the handle, or go on to the next step.

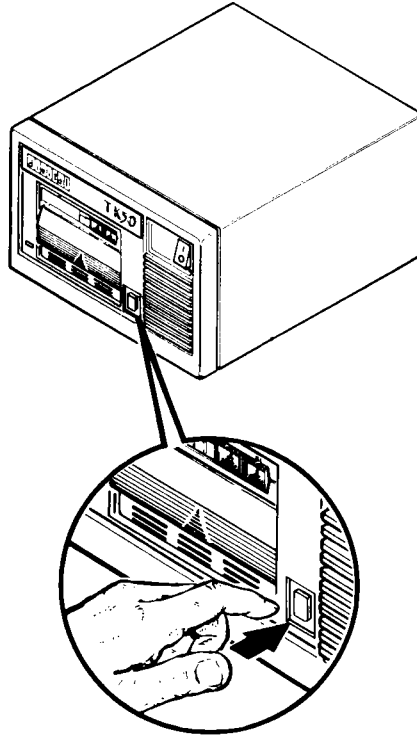


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10. Set the LOAD/UNLOAD switch to LOAD (In Position).

Push in the LOAD/UNLOAD switch. The tape goes through a load process that takes between 5 and 7 seconds. Both lights come on steady as the tape reaches BOT (the beginning of usable tape).

The tape cartridge is now ready to use.



SHR-0305-84-C

A RUNNING TK50

While the TK50 tape drive is reading or writing data to the magnetic tape, the red light stays on steady while the green light flashes.

CAUTION: Never move the cartridge release handle while the red light on the TK50 is on or blinking or you may cause a fault or damage the unit.

LIGHTS

Refer to Table 2-1 for a summary of the lights.

Table 2-1 Light Definitions

Green	Red	Drive State
Off	Off	Power off.
Off	On	1. After power-on this condition occurs for 5 to 15 seconds while the drive is initializing. (Red goes off and green comes on after initialization.) 2. Indicates handle is up following cartridge insertion. 3. Indicates tape has almost completed rewinding and is approaching the unload point. Light stays on during this sequence (8 to 10 seconds).
On	Off	Okay to lift handle. NOTE: Only under this condition can you lift the handle. Under any other condition, lifting the handle may damage the unit or cause a fault.
On	On	Tape at BOT and drive ready to accept system commands.
Flashing	On	Indicates tape motion during normal system operation.
Flashing	Flashing	Tape is rewinding to BOT.
Off	Fast flashing	Indicates fault condition. See Chapter 5, Solving Problems. Pushing the LOAD/UNLOAD switch four times may clear the fault.

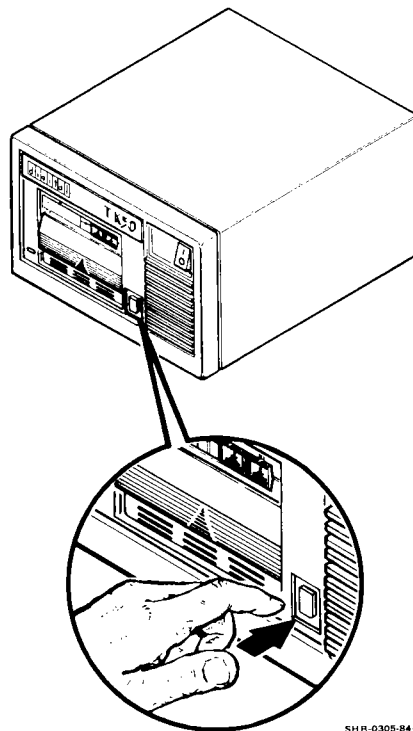
CHAPTER 3
UNLOADING THE TAPE CARTRIDGE

This chapter explains how to remove the tape cartridge from the drive.

1. Set the LOAD/UNLOAD switch to UNLOAD (OUT position).

If the tape is not already at BOT, both lights flash slowly while the tape is rewinding.

If very little tape was in the drive when you set the unload switch, you may not see the lights flash when the tape is rewinding. Whether or not you see the flash depends on how much of the tape was out on the take-up reel inside the drive.

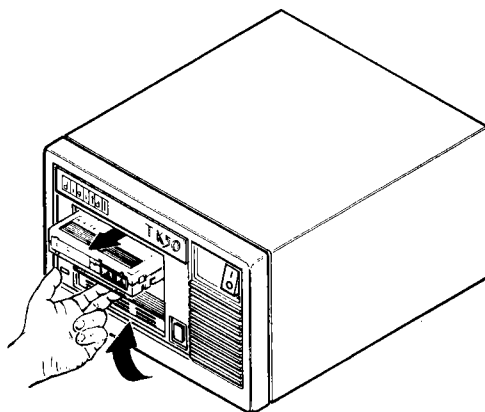


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Unloading a Tape Cartridge

The red light comes on steady while the tape is unloading. The unload process takes between 8 and 10 seconds to complete. After the tape unloads, the red light goes off and the green light comes on. It is now safe to remove the tape cartridge.

2. After the red light goes off and the green light goes on, lift the cartridge insert/release handle. If you have a system integrated TK50 mounted vertically in a floor stand computer, "lifting" the handle means pulling it to the left.



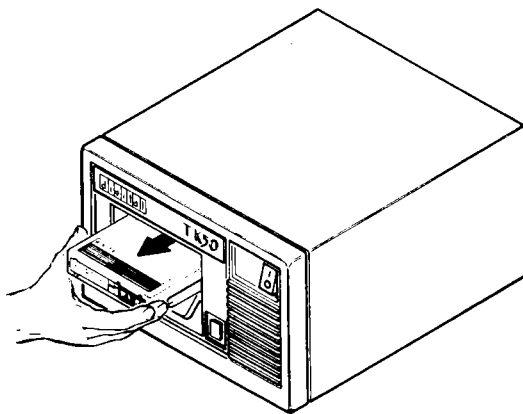
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The tape partially ejects.

CAUTION: Never lift the cartridge release handle while the red light is on or blinking or you may cause a fault or damage the unit.

3. Remove the cartridge and return it to its protective case.

CAUTION: Remove the tape cartridge from the drive before turning power off. Damage may occur if the tape drive is moved with a cartridge inserted and power is off.

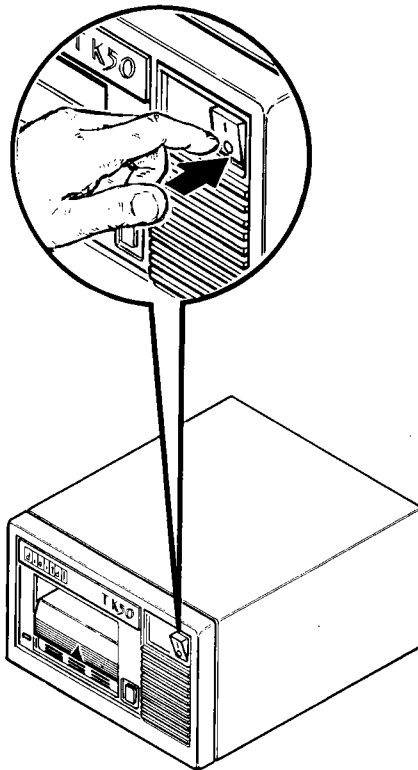


5-11-0200 5-1-1

Unloading a Tape Cartridge

4. Turn the power switch off (0 position). Push the cartridge insert/release handle down.

Whenever you turn the power off in a tabletop unit, you'll hear some whistling and whirring noises. Don't worry, this is normal.



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CHAPTER 4 USES FOR THE TK50

This chapter describes ways you can use the TK50 Tape Drive Subsystem.

To inform your operating system that the TK50 is a legal device on which you can write data, you may have to perform a one-time system generation (SYSGEN) or configure (CONFIG) operation. Refer to your operating system manuals for instructions on how to perform a SYSGEN or CONFIG. See Chapter 6, Programming.

AS A BACK-UP DEVICE

You can use the TK50 as a back-up device by copying files from another device (usually a fixed disk drive such as an RD51 or RD52), onto the TK50's cartridge. The TK50's large storage capacity makes it much easier to use for large backup operations than floppy disks, because it can store much more information.

To back up a file onto the TK50, you must run a "utility program" under your operating system that copies data from one device to another. Most operating systems have a variety of utility programs that can transfer files between devices. Refer to your operating system user manual for instructions on how to perform a back up or file copy operation.

AS A SOFTWARE DISTRIBUTION MEDIUM

The TK50 is ideal as a software distribution medium because an entire operating system can be stored on one cartridge. Rather than using many floppy disks to load an operating system onto your computer, you can use one TK50 cartridge. When used this way, the TK50 is almost exclusively a "read-only" device, which means that you won't be writing data to the cartridge. If you are using the TK50 to load software on your system, make sure that the tape cartridge is write protected.

AS A "JOURNALING" DEVICE

Due to its large storage capacity, the TK50 is ideal for systems where large amounts of data are sequentially written to a peripheral device. An example of this is a system used for monitoring a process over a long period of time. The data gathered can be sequentially written to the TK50 cartridge, then, at a convenient time, the cartridge can be removed and the data read back onto another system for analysis.

CHAPTER 5

SOLVING PROBLEMS

If the TK50 tape drive fails its self-test when you turn on the computer's power or detects a fault during operation, the red light flashes rapidly. Try to reset the fault by pushing the LOAD/UNLOAD switch four times. If the fault does not happen again, it is safe to continue. If the fault returns, then do one of the following.

- If you have the tabletop version of the TK50, try turning the power off, then back on. Do this only once. If the failure doesn't happen again, it is safe to continue. You'll hear some whistling and whirring noises when you turn off the TK50's power. This is normal.
- Report the problem to the system administrator.
- Call your Digital Field Service Representative.
- Follow the procedures in your system manuals for removing the tape drive from the system, to have it repaired at a Digital Service Center. See Chapter 7 -- Servicing.

TK50 SUBSYSTEM FAILURES

If the TK50 tape drive subsystem is not working correctly, yet the tape drive unit itself passes its power-on self-test, the problem may be the tape drive controller that is in the computer.

One way to isolate the problem is to run system diagnostic programs. Your system manuals provide instructions on how to run these diagnostic programs. The diagnostic programs include a comprehensive test of the TK50 subsystem. These diagnostics are not available unless you have signed a licensing agreement with Digital. Contact your Digital representative for more information.

If you have TK50 diagnostics, run them. If not, contact your Digital Field Service Representative.

Solving Problems

If the TK50 subsystem controller board is the failing component, call Digital Field Service to have the controller replaced. Do not replace the controller yourself. If you do, you will void your service contract and warranty, unless you have a self-maintenance agreement with Digital.

WARNING: Removing the controller can be very dangerous. To ensure safety during servicing, THE POWER SWITCH MUST BE OFF AND THE AC POWER CORD DISCONNECTED FROM BOTH THE WALL OUTLET AND THE BACK OF THE SYSTEM.

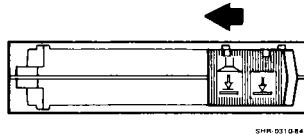
Diagnostic Failure with a Tape Cartridge Inserted

If the red light on the TK50 begins to flash rapidly during operation, the subsystem has detected an error. Depending on the type of error encountered, you may be able to clear the fault by pushing the load/unload switch four times. To remove the tape from the drive, place the switch in the UNLOAD position (Out).

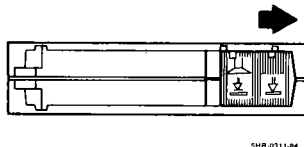
If the fault can be corrected, the tape starts to rewind (and both lights begin to flash slowly). If the red light continues to flash rapidly, the error is not correctable. Try this operation two or three times.

Read/Write Errors

If your computer system is reporting read or write errors that relate to the TK50, the problem may be with the tape. If your system is reporting write errors, the tape may be write protected. Check that the write protect switch on the tape cartridge is in the enabled position.



Tape Cartridge Write Protected



Tape Cartridge Write Enabled

Information on a tape can still be read by the system when the tape is write protected. If you have read errors, or if write errors continue to occur when the tape is write enabled, try another tape cartridge.

System Problems Caused by TK50

If you suspect that the TK50 has caused your system to fail during operation, set the LOAD/UNLOAD switch to its UNLOAD (out) position. The tape will rewind to its UNLOAD position. Follow the procedures for removing the tape from the drive. (See Chapter 3, steps 1 through 4.)



CHAPTER 6
PROGRAMMING

The TK50 Tape Drive Subsystem runs with Digital's Tape Mass Storage Control Protocol (TMSCP).

LEGAL NOTICE: TMSCP and STI protocols and documentation are the proprietary information of Digital Equipment Corporation. UNIBUS/Q-BUS/BI-BUS port drivers and documentation for MSCP/TMSCP products are also proprietary information of Digital Equipment Corporation.

The standard base address for the subsystem is 774500 (octal). This is the location of the Initialization and Polling (IP) register. The Status and Address (SA) register is at location 774502 (octal).

Interrupt vectors are software settable. The standard interrupt vector for the first TK50 Tape Drive Subsystem is 260.

The addresses and interrupt vectors for TK50s on your system depend on your system configuration. If you have more than one TMSCP device (that is, TU81, TK50) on your system, you will need to use the appropriate software tools to determine the addresses and interrupt vectors for each device. In VMS systems, use the SYSGEN utility; its use is described below. In PDP-11 systems, the appropriate tool is the Float diagnostic, which is run under the XXDP+ diagnostic supervisor. Refer to the PDP-11 Architecture Handbook (EB-23657-18), Appendix A (Assignment of Bus Addresses and Vectors). Refer also to the XXDP+ Operating Manual.

SYSGEN PROCEDURE

To determine the proper device address for a VMS based system, use the 'SYSGEN' utility. The sysgen utility and VMS use the same rules for address selection.

To determine the proper addresses for the TMSCP and MSCP devices, first determine the existing system components. The following list shows some of the possible options and the symbols by which the SYSGEN utility recognizes them. These options can be entered into SYSGEN for address calculation; more will be added as the products become supported under future versions of the VMS/MicroVMS operating systems.

Device	Symbol	Device	Symbol	Device	Symbol
QDA50	UDA	TU81	TU81	DEUNA	UNA
RQDX1	UDA	TK50	TU81	DEQNA	QNA
RQDX2	UDA	DZV11	DZV	LVPl1	LP
RQDX3	UDA				
RRD50	UDA				

When you have listed the components, use the following steps to determine the proper MSCP device address for a VMS system:

1. On a running VAX/VMS system, enter the SYSGEN utility after logging onto the system. This is done as follows:

\$ MC SYSGEN <CR>
SYSGEN>
2. Enter the configuration section of SYSGEN

SYSGEN> CONFIGURE <CR>
DEVICE>
3. At the DEVICE prompt (from the SYSGEN utility), key in the list of Q-bus or Unibus options present on the VAX system. Make sure that the device count is correct; for example, any MSCP disk controller (UDA, KDA, RQDX3, RRD50) looks to the system like a UDA, and any host-based TMSCP controller looks like a TU81. For example, a system with a DEQNA, two TK50s, a KDA and an RQDX3 would be entered as shown.

NOTE: Make sure all devices connected to the host have been listed.

```
DEVICE> QNA
DEVICE> TU81 2
DEVICE> UDA 2
```

4. When ALL devices have been entered, press CTRL Z to end the input session and have the SYSGEN utility calculate the proper addresses for the set of hardware you have entered.

```

DEVICE> CTRL Z
DEVICE: UDA      NAME: PUA  CSR: 772150  Vector: 154  Support: yes
DEVICE: TU81     NAME: PTA  CSR: 774500  Vector: 260  Support: yes
DEVICE: QNA      NAME: XQA  CSR: 774440  Vector: 120  Support: yes
DEVICE: UDA      NAME: PUB  CSR: 760334*  Vector: 300*  Support: yes
DEVICE: TU81     NAME: PTB  CSR: 760444*  Vector: 350*  Support: yes

```

```

SYSGEN> EXIT
$
$

```

5. Entering EXIT at the SYSGEN prompt allows you to exit from SYSGEN.



CHAPTER 7
SERVICING

If you have decided to have Digital maintain your system, Digital Field Service offers a flexible range of plans to choose from. Select the one that is right for you.

ON SITE SERVICE offers the convenience of repair service at your site and the insurance against unplanned and unbudgeted repair bills. For a small monthly fee, you receive personal service from our service specialists. Usually, within a few hours of your call, the specialist is dispatched to your site with all the parts and test equipment to give you fast, dependable maintenance.

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 days, 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 non-stop remedial maintenance. We don't leave until the problem is solved.

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

CARRY-IN SERVICE is for you if you don't need the convenience of On-Site coverage, but do require the same fast, personalized response and the ability to plan your maintenance expenditures, all at an even smaller monthly fee than On-Site service.

When you bring your unit in to one of our 160 Digital Service Centers world-wide, you can be sure that your unit will receive expert repair service from factory-trained personnel. Your unit is guaranteed to be fixed 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. Call one of our information numbers for the location of the Digital Field Service Office nearest you.

Digital Service Centers are open during normal business hours, Monday through Friday. For the location of a Service Center in your area, call one of our Field Service Information numbers below.

Servicing

DECmailer is our service for users who have technical resources to perform the first line of maintenance themselves. DECmailer customers can troubleshoot, identify, and isolate a component causing problems 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 monthly. It is most important that self-maintenance customers use standard static-control procedures when handling any part of the TK50 subsystem.

PER CALL SERVICE is for users who wish to establish a maintenance program on a non-contractual, time-and-materials-cost basis. It is available with either On-Site or Carry-In service, and is appropriate in situations where the user has sufficient expertise to perform first-line maintenance, but may occasionally need in-depth support from Field Service.

PER CALL is also offered as a supplementary program for Basic Service Plan Customers who require remedial maintenance outside their contracted hours of coverage; however, there is no charge for materials in that case.

ON-SITE PER CALL 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, seven days a week.

CARRY-IN PER CALL Service is available during normal business hours, with a turn-around time of two to three days.

For more information on these Digital Service Plans, their prices, and special rates for volume customers, contact your local Digital Field Service Office. Call one of our information numbers for the location of the Digital Field Service Office nearest you.

Digital International Field Service Information Numbers

U.S.A.	1-(800)-554-3333
Canada	(800)-267-5251
United Kingdom	(734) 868711
Belgium	(02) 2425095
West Germany	(089) 95910
Italy	(02) 617961
Japan	(03)-989-7161
France	(6) 0778292
Denmark	(2) 889666
Spain	(1) 7331900
Finland	(0) 423511
Holland	(30) 640293
Switzerland	(01) 8299111
Sweden	(8) 7338000
Norway	(2) 160290
Austria	(222) 6776410
Ireland	(1) 308433
Portugal	(1) 725402
Australia	(02) 4125555

APPENDIX A
TK50 TAPE DRIVE SPECIFICATIONS

Mode of operation	Streaming
Read/write method	Serpentine
Recording method	MFM
Recording medium	1/2 inch wide, 600-foot long magnetic tape
Start speed	130 msec min, 300 msec max
Stop speed	90 msec min, 130 msec max
Start distance	5 inch min, 12 inch max
Stop distance	3.5 inch min, 5 inch max
Recording density	6667 bits per inch
Number of tracks	22
Data rate	360 Kbits/sec (45 Kbytes/sec)
Tape speed	75 inches per second
Read time	35 minutes min for a full tape
Storage capacity (unformatted)	131 megabytes
Input voltages	+12 Vdc +/-5% +5 Vdc +/- 5%
Environmental Requirements: Modified Class-B DEC Spec 102	
Operating temperature	10 to 40°C (50 to 104°F) non-condensing. Reduced by 1.8°C/1000 ft (1°F/1000 ft) altitudes above sea level.
Non-operating temperature	-30 to 66°C (-22 to 151°F)
Operating/non-operating humidity	10 to 80% RH max wet bulb 28°C (82°F) and min dew point 2°C (36°F)
Physical Specifications	
Size	5.75 in X 3.25 in X 8.44 in (not including bezel)
Weight	5 lbs not including cartridge

