

**TU80
Magnetic Tape
Subsystem**

Pocket Service Guide

Prepared by Educational Services
of
Digital Equipment Corporation

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PREFACE

This document is designed to be used by someone trained to service a TU80 subsystem. Procedures are brief, concise, and support the maintenance philosophy of module replacement.

The first two chapters provide product overview and installation information for quick review. Chapter 3 is troubleshooting information. By using diagnostics and control panel features you can quickly locate malfunctions. Chapter 4 provides removal and replacement procedures. Appendix A provides electronic module layout. This document does not include programming information, but Appendix B does provide register summaries and definitions. There is a Troubleshooting Flowchart, which shows troubleshooting procedures, on the foldout in back of this document.

1 INTRODUCTION

1.1 GENERAL

The TU80 Magnetic Tape Subsystem is a dual-speed, nine-track streaming tape data storage system. The TU80 Tape Transport is a fully integrated tape transport, packaged with all its control and power electronics in a standard H9643 cabinet. The transport communicates with a host system via a shielded interface cable assembly connected to a M7454 UNIBUS adapter, plugged into the SPC slot of the host CPU.

1.2 SUBSYSTEM OVERVIEW

Figure 1-1 shows the TU80 subsystem functional block diagram. Figure 1-2 shows the cabling diagram.

NOTE

You can connect up to four TU80 tape transports to a single host CPU (Figure 1-3). Each TU80 interfaces with the CPU through a dedicated UNIBUS adapter module (M7454) and interface cable assembly.

Refer to Paragraph 2.2 for M7454 installation and set-up.

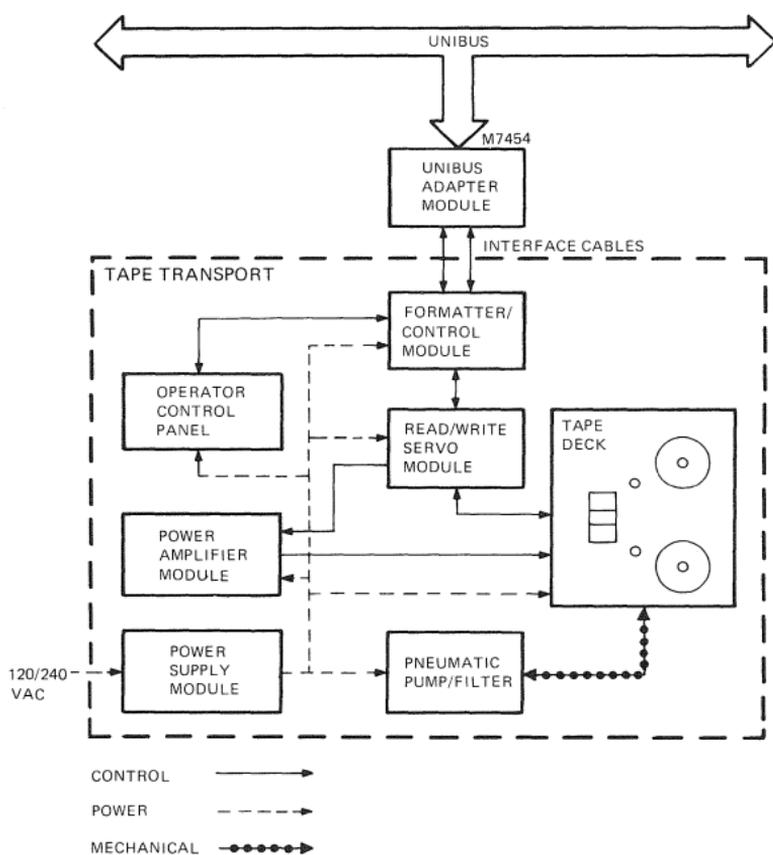
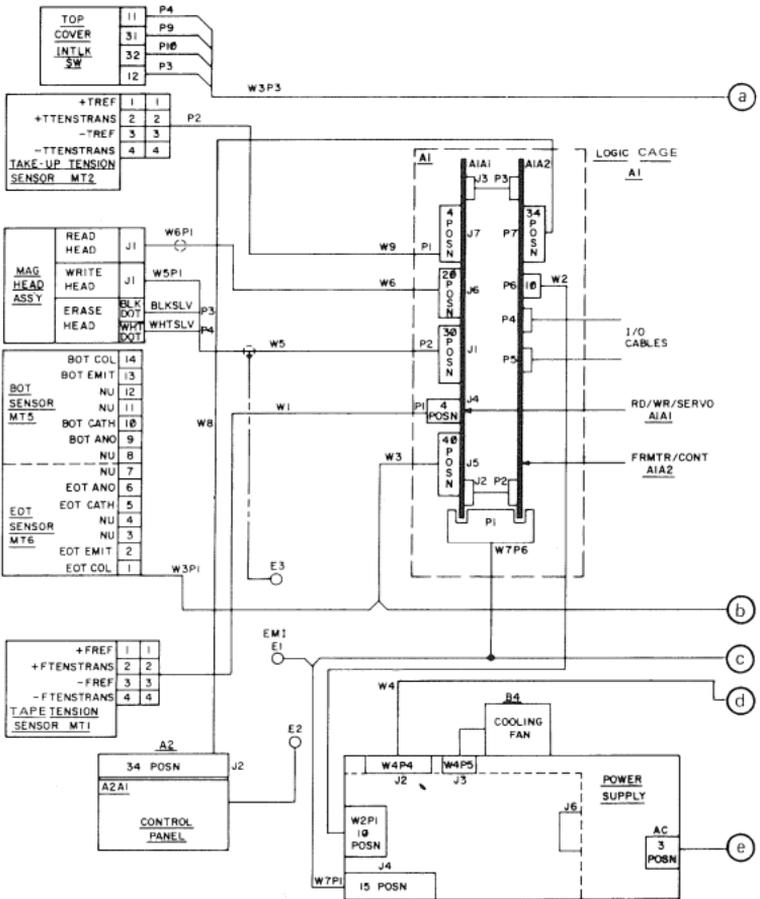


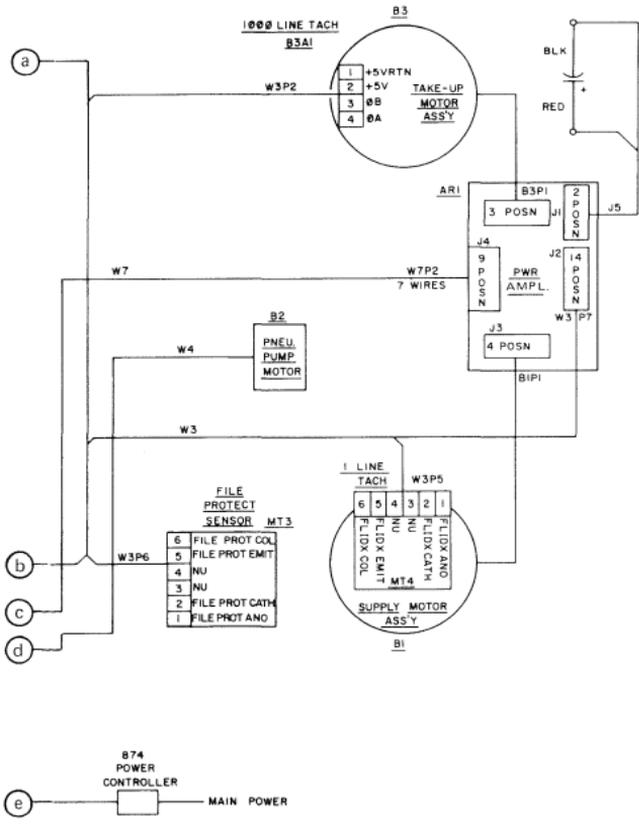
Figure 1-1 TU80 Functional Diagram



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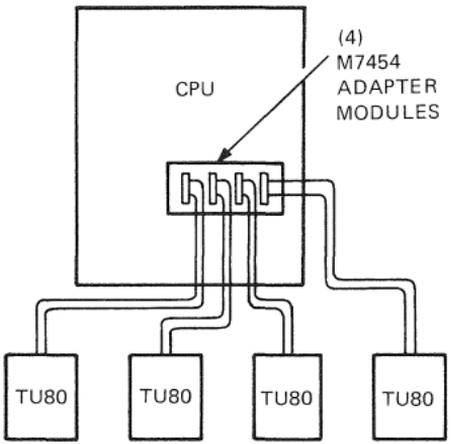
Figure 1-2 Tape Transport Cabling Diagram (Sheet 1 of 2)

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Figure 1-2 Tape Transport Cabling Diagram (Sheet 2 of 2)



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Figure 1-3 Maximum TU80 Configuration

1.3 TU80 CONFIGURATION

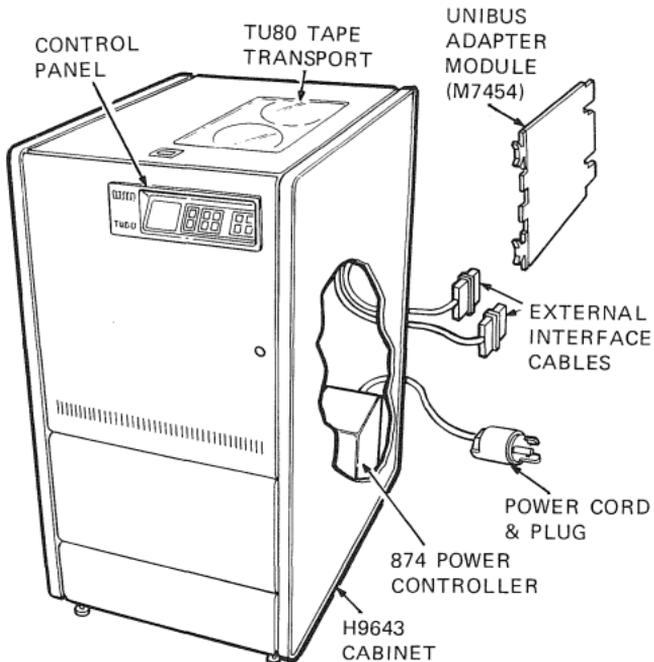
Figure 1-4 shows the TU80 subsystem basic components. The transport is compactly mounted in the upper portion of the H9643 cabinet. Figure 1-5 shows the tape deck.

NOTE

To ease TU80 transport maintenance, the transport deck is mounted on a pivot. The deck can be rotated from horizontal (operational) position to vertical (service) position. A special service lock (tape deck latch) on the left side of the cabinet under the tape deck, keeps the deck in one of those positions. (For more maintenance information, refer to Chapter 4).

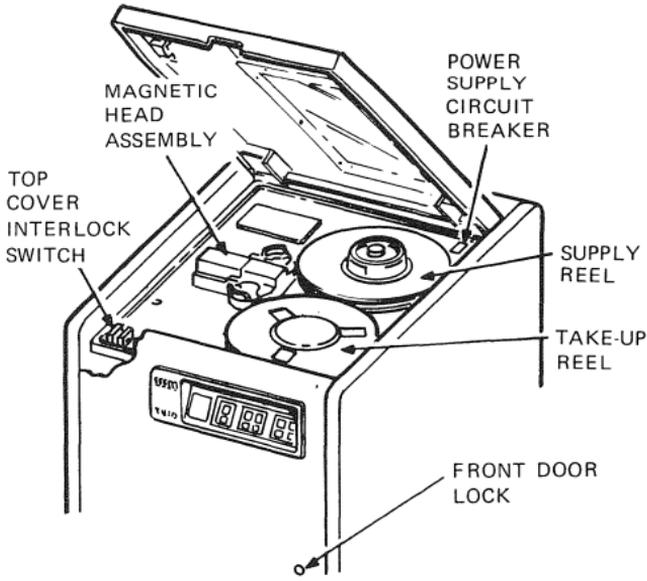
The TU80 has the following variations.

TU80-AA	120 Vac, 60 Hz
TU80-AB	240 Vac, 50 Hz



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Figure 1-4 TU80 Tape Subsystem



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Figure 1-5 Tape Deck

1.4 SPARES KIT

The TU80 CD Kit (PN A2-W0618-10) contains the *TU80 Pathfinder* (EK-0TU80-SV), the cover interlock defeat tool, and all spares. Table 1-1 is a list of field replaceable units (FRUs) or spare parts on the Recommended Spares List (RSL). Refer to figures in Chapter 4 (Removal/Replacement) and use the Illustrated Parts Breakdown (IPB) when you try to locate a particular part or assembly.

1.5 TOOLS

In addition to the Digital Tool Kit and the TUC01 Tape Cleaning Kit, you should have BOT/EOT (PN 90-09177-00) markers. You need a special 3/8 inch socket set (PN 29-22445-00) to remove the reel motors.

You do not need any other tools or instruments to *service* the TU80 tape transport.

However, to install the TU80 you need the following tools.

- 5/32 inch allen wrench
- 3/4 inch combination box and open-end wrench
- 7/16 inch open-end wrench
- 9/16 inch open-end wrench
- 5/16 inch flat blade screwdriver
- No. 2 phillips screwdriver

Table 1-1 Recommended Spares List (RSL)

Digital PN	Description
29-24210	Tape cleaner assembly
29-24211	Sensor, file protect
29-24212	Hub assembly, take-up reel
29-24213	Motor installation kit*
29-25046	Compressor (pump), universal 50/60 Hz
29-24215	Magnetic head installation kit
29-24216	Operator panel assembly
29-24220	Power supply, 60 Hz
29-24221	Formatter/control module
29-24222	Read/write/servo module
29-24223	Power amplifier module
29-24224	Hub assembly, supply reel
29-24227	Air filter
29-24228	Cooling fan
29-24354	Pressure regulator
29-25397	Switch, door interlock
29-24356	Sensor, EOT/BOT
29-24357	Capacitor
29-24358	Tachometer, 1 line
29-24359	Air bearing refurbishing kit
M7454	Adapter module
29-26372	Power supply, 50/60 Hz

* Used when replacing take-up reel and/or supply reel motor.

1.6 APPLICABLE DOCUMENTATION

If you need more information on the TU80 subsystem, Table 1-2 lists related documents.

Also, use manuals and handbooks appropriate for the PDP-11 and VAX computer systems and processors.

1.7 CONTROL PANEL

The following paragraphs discuss the control panel, diagnostic/maintenance panel operation, and on-line system diagnostics.

1.7.1 Control Panel Description

Figure 1-6 shows the TU80 control panel switches and status indicators.

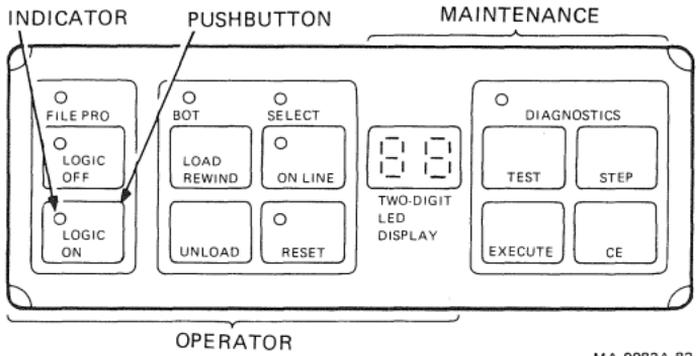
The left part of the control panel contains operator switches/indicators. The two-digit display indicates a fault code related to an abnormal operating condition, or a test code when in diagnostic mode. The right part of the panel contains switches for running internal diagnostic tests.

Table 1-2 Related Documents

Document/PN	Description
TU80 Field Maintenance Print Set (MP01603)	Provides schematic diagrams for TU80.
TU80 Magnetic Tape Subsystem User Guide (EK-0TU80-UG)	Contains functional overview, installation, operating and programming information.
TU80 Technical/Service Manual (EK-0TU80-TM)	Contains system functional description, installation and acceptance procedures, theory of operation, and maintenance information.
TU80 Pathfinder (EK-0TU80-SV)	Contains detailed troubleshooting information including troubleshooting procedures, tests, sub-fault codes.
TU80 Illustrated Parts Breakdown (EK-0TU80-IP)	Provides list and illustrations of replaceable parts.
874 Power Controller Illustrated Parts Breakdown (EK-00874-IP)	Provides list and illustrations of replaceable parts.

Operator Controls

Switch/Indicator	Function
LOGIC OFF	<p>Switch – When pressed, power is removed from transport logic circuitry and LOGIC OFF indicator turns on.</p> <p>Indicator – When on, indicates a standby power condition exists (power supply on, the cooling fan starts turning, and transport logic is off).</p> <p>If indicator is off and no other indicators are on, then power switch (circuit breaker) is off (0) or there is a power supply problem. If indicator is off and LOGIC ON indicator is on, all transport circuitry is in power-on condition and ready for use.</p>



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Figure 1-6 Control Panel

Operator Controls (Cont)

Switch/Indicator	Function
LOGIC ON	<p>Switch – If pressed when power switch (circuit breaker) is on (1), the transport logic and control system is powered up and TU80 is ready for operation.</p> <p>Indicator – When on, indicates transport circuitry is powered up and TU80 is ready for use.</p>
BOT	<p>Indicator – When on, indicates tape is positioned at beginning-of-tape (BOT) marker.</p>
LOAD/REWIND	<p>Switch – If transport is powered on and tape is threaded, pressing LOAD/REWIND causes load operation to be performed. If tape is loaded, pressing switch causes rewind operation to BOT.</p>
UNLOAD	<p>Switch – If tape is loaded at BOT, pressing UNLOAD causes tape to unload from take-up reel and tape path, onto supply reel. If tape is loaded beyond BOT, it rewinds to BOT. If tape is threaded, but not loaded, pressing switch causes transport to slowly unload tape onto supply reel.</p>

Operator Controls (Cont)

Switch/Indicator	Function
ON LINE	<p>Switch – If tape is loaded, pressing ON LINE causes TU80 to go on-line and become accessible by host system. Press RESET switch to take TU80 off-line.</p> <p>Indicator – When on, indicates that TU80 is in on-line mode. All switches except RESET and LOGIC OFF are inhibited.</p>
FILE PRO	<p>Indicator – When on, indicates absence of write-enable ring in supply reel and write operation is inhibited. Otherwise, write operation is allowed.</p>
SELECT	<p>Indicator – When on, indicates the following.</p> <ul style="list-style-type: none"> ● The address in TU80 and CPU are the same. ● When the two I/O cable are disconnected, the address decoder in the transport is functional. ● Pin 1 in I/O cables and Pin 1 on the M7454 are assembled correctly. ● TU80 is not in diagnostic mode.
RESET	<p>Switch – When pressed, transport goes off-line, tape motion stops, and error status clears. Switch can stop LOAD or REWIND operation. Also turns off RESET indicator and clears diagnostic test conditions.</p> <p>Indicator – When on, indicates that TU80 is in fault or diagnostic status. Two-digit display may contain fault or termination code, or diagnostic code.</p>

Diagnostic Controls

Switch/Indicator	Function
DIAGNOSTICS	Indicator – When on, indicates that TU80 is in diagnostic/test mode. Indicator stays on until you press RESET.
TEST	Switch – If TU80 has tape threaded but not loaded, pressing TEST places unit in diagnostic/test mode.
STEP	Switch – In diagnostic/test mode, pressing STEP increments diagnostic/test sequence numbers in two-digit display by one, or to the digit required.
EXECUTE	Switch – In diagnostic/test mode (with test number displayed), pressing EXECUTE initiates this internal diagnostic test.
CE (customer engineer)	Switch – If TU80 is in diagnostic/test mode, pressing CE (customer engineer) and TEST at the same time recalls an internal diagnostic routine (Field Service Tests) to aid a Field Service Representative.

1.7.2 Diagnostic/Maintenance Panel Operation

The TU80 has internal (resident) diagnostics which can be initiated through the transport's control panel. Internal diagnostics include operator diagnostic tests and Field Service diagnostic tests (customer engineer tests), described in Chapter 3.

To get into diagnostic mode and initiate Operator or Field Service diagnostic tests, use the diagnostic panel as follows.

1. To recall operator diagnostic tests (01, 02, 03), press TEST. 01 appears on the two-digit display. Each time you press STEP, the display number increments by one. Press EXECUTE to initiate the test you chose.

2. To recall Field Service diagnostics, press and hold CE and press TEST.
 - a. The DIAGNOSTICS indicator illuminates.
 - b. 00 appears on the two-digit display.
3. Press STEP.
 - a. The display number increments by one each time you press STEP, or increments automatically if you press and hold STEP. The display can show 00 through 09.
 - b. To select a test number, use the STEP and TEST switches. When you press TEST after you press STEP, the number multiplies by 10.

Example: TEST 39 is required

Step	Display
1. Press CE and TEST.	00
2. Press STEP three times.	03
3. Press TEST.	30
4. Press STEP until 9 displays.	39

- c. Press EXECUTE to initiate the test.

After the fault code appears on the display, you can recall the sub-fault code by pressing CE. The sub-fault code is displayed as long as you hold CE.

1.7.3 On-Line System Diagnostics

The TU80 is used with the PDP-11 and VAX systems. The TU80 subsystem status and performance can be verified by using PDP-11- and VAX-based on-line diagnostics. Paragraphs 3.3 and 3.4, respectively, describe these tests.

1.8 MAINTENANCE

NOTE

The TU80 does not need any mechanical and/or electrical adjustments or alignments for corrective or preventive maintenance.

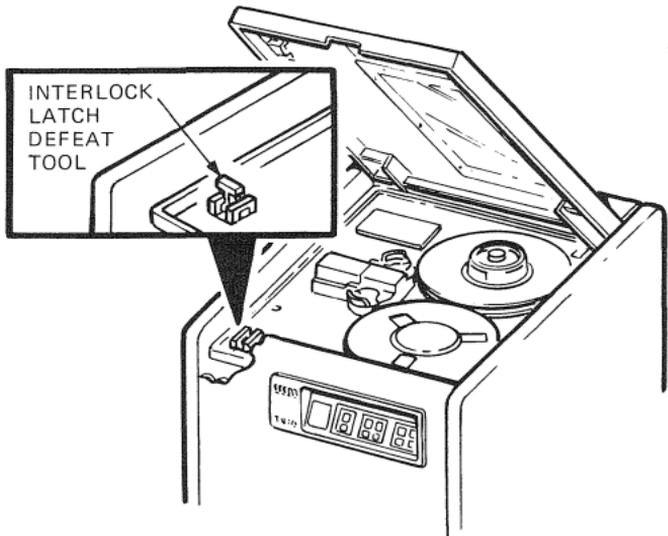
Maintenance procedures include only regular cleaning of the tape path components.

1.8.1 Cover Interlock Switch Defeat

When servicing the TU80, a Field Service Engineer may have to operate the unit and run diagnostic tests with the top cover open. To bypass the safety interlock switch, use the interlock defeat tool supplied in the TU80 CD Kit. You insert this tool into the interlock latch to keep the interlock switch depressed, which simulates the top cover closed condition (Figure 1-7).

Use the interlock tool as follows.

1. Insert the tool into the slot of the cover interlock.
2. Turn the tool 90 degrees to keep it locked in the latch cutouts.



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Figure 1-7 Cover Interlock Defeat Tool

2 INSTALLATION

This chapter provides information on how to select and check the transport-selectable addresses and options, and install or replace the M7454 UNIBUS adapter module.

2.1 TRANSPORT CONFIGURATION SELECTIONS

During TU80 installation and check-out, check the formatter/control module for correct setting of the transport address and option selection components that specify the transport operating status and characteristics.

Table 2-1 and Figure 2-1 identify these features and the location of the involved components on the formatter/control module.

NOTE

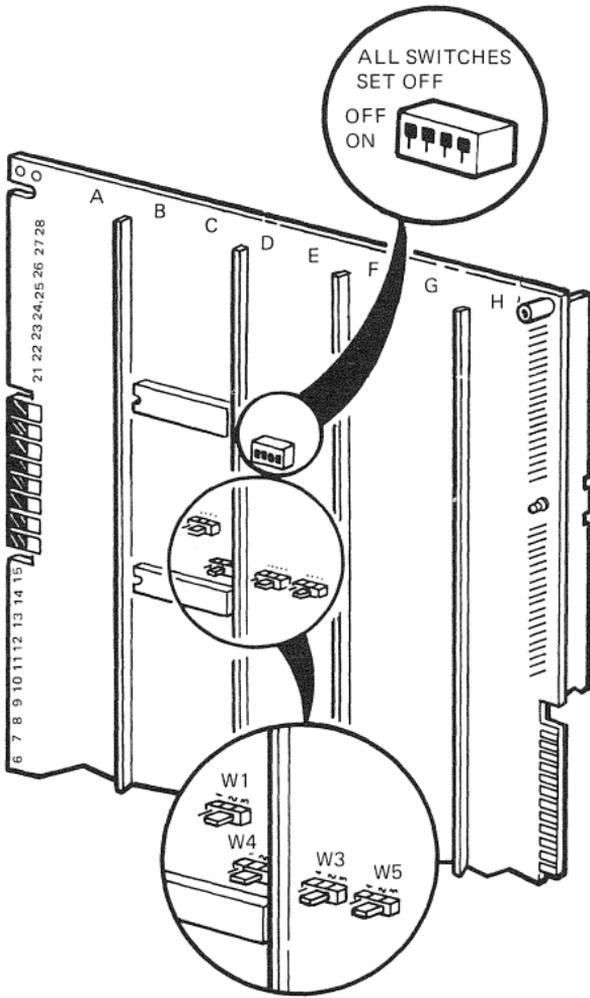
“Standard” means a standard component setting, good for normal operation in Digital computer systems.

Table 2-1 Tape Transport Configuration Selection

Option	Component/Location	Comments
<i>Channel Parity Check</i>	W1 Location 18C Positions 1 and 2	As shipped (standard) – Parity bit transferred with data
	Positions 2 and 3	Optional – Use if parity bit is not transferred with data
<i>Short Gap</i> Variable short gap (0.6 to 0.9 in)	W3 Location 16D Positions 1 and 2	As shipped (standard)
	Positions 2 and 3	Optional
<i>Long Gap</i> Variable long gap (0.6 to 1.2 in)	W4 Location 16C Positions 1 and 2	As shipped (standard)
	Positions 2 and 3	Optional
<i>Auto Speed</i> (see Note)	W5 Location 16E Positions 1 and 2	Optional – Disables auto speed select
	Positions 2 and 3	As shipped (standard) – Enables auto speed select
<i>Formatter</i> Address 0	Location 21D S1 – off	As shipped (standard)
<i>Transport</i> Address 0	Location 21D S2 – off, S3 – off	As shipped (standard)

NOTE

Jumper W5, Auto speed control – When you invoke this standard feature, the transport will not automatically select 25 inch per second (ips) mode when low speed is commanded. Instead, the transport chooses the optimum speed to match system requirements. If 100 ips mode gives the best throughput, this mode is used; the same applies to 25 ips streaming and 25 ips start/stop modes. The transport chooses the operating mode automatically; system involvement is not required. This feature allows the TU80 to run under standard Digital 1/2 inch tape software, yet, offer the advantage of streaming. With this option enabled, the unit responds to a Set 100 IPS command in the normal manner.



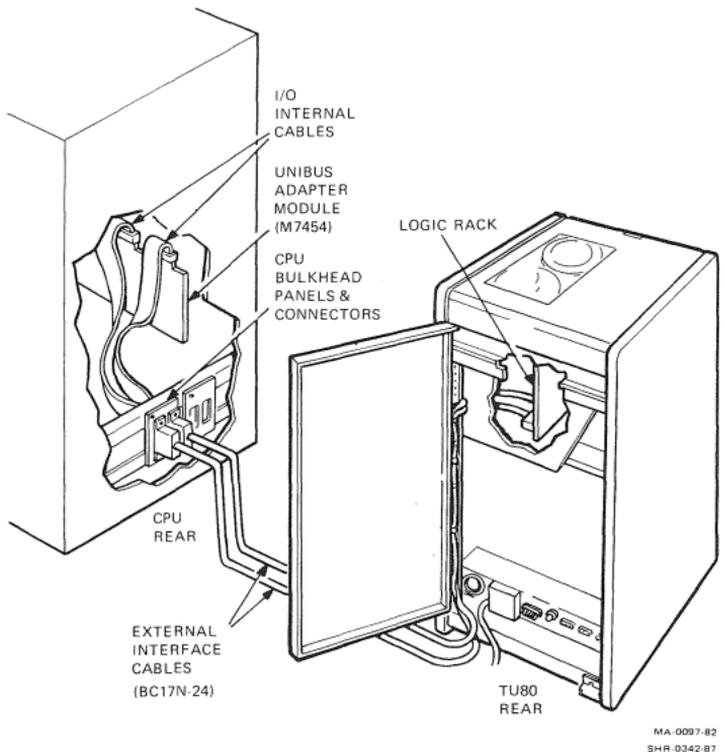
MA-0412-82

Figure 2-1 Option Selection Components on Formatter-Control Module

2.2 UNIBUS ADAPTER MODULE INSTALLATION/REPLACEMENT

The M7454 UNIBUS adapter module is a standard quad-height module positioned in a small peripheral controller (SPC) slot on the host computer backplane. The M7454 is connected to the TU80 transport by a set of internal and external interface cables (Figure 2-2).

When you have to install the M7454 in the CPU (during subsystem installation or module replacement), the installation procedure includes: preparing the M7454 (address switch checking or setting), installing the M7454 in the SPC slot, and interface cabling. Refer to the following paragraphs and figures for the required procedures.



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SHR. 0342-87

Figure 2-2 Interface Cabling

2.2.1 M7454 Preparation and Installation

NOTE

You need to use the CPU Kit (TU80K-CP) to perform this procedure.

1. Remove M7454 module, cables, bulkhead connectors, and mounting brackets from CPU kit shipping container. Unwrap and examine them for any damage.
2. On the M7454 adapter module, make sure selections are correct for the UNIBUS address, interrupt vector, and word burst on a single 10-position DIP switch in location 20C (Figures 2-3 and 2-4).

NOTE

Table 2-2 shows the typical UNIBUS address and vector for a single TU80 Subsystem configuration.

When more than one (up to four) TU80 subsystem is installed with the host system, use Table 2-3 to select the UNIBUS addresses and vectors.

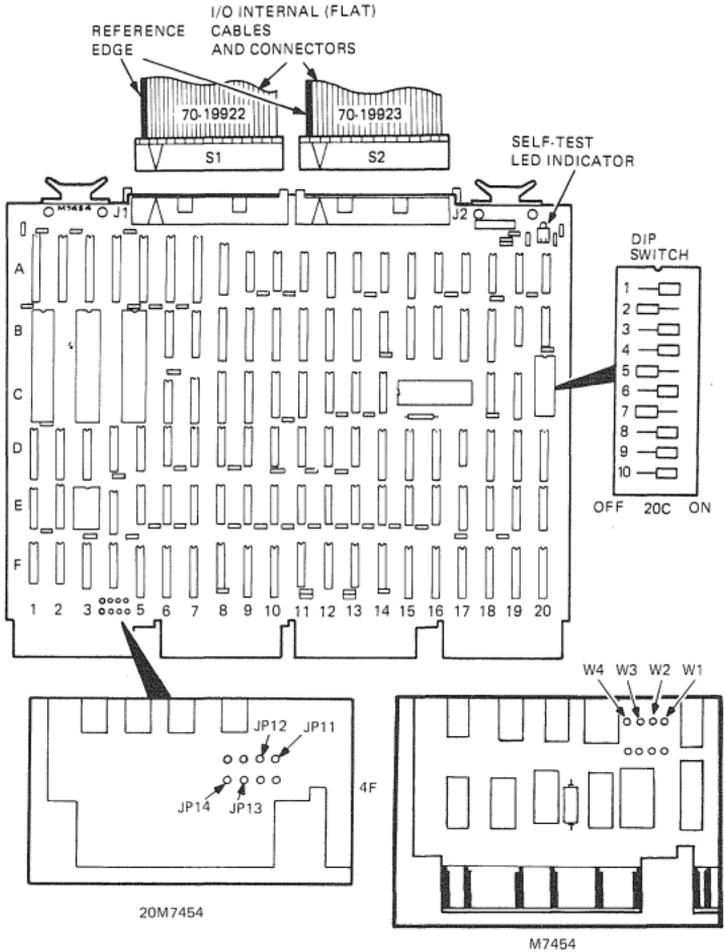
NOTE

Switch positions 1 to 7 select vector bits 8 to 2. Switch position 8 selects two-word or four-word burst size. Two-word burst size is used for UNIBUS operation. Switch positions 9 and 10 determine a transport number and the corresponding UNIBUS address.

CAUTION

Check jumpers in location 4F on the module. Jumpers JP11 (W4), JP12 (W3), JP13 (W2), and JP14 (W1) select the UNIBUS address range. The standard starting address is 772522_h, selected by JP11 (W4), which is etched on side two of 20M7454 (M7454).

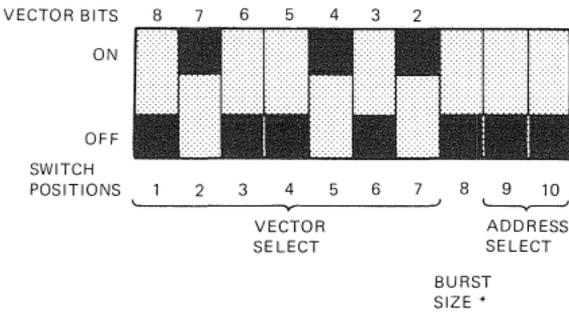
If another address range is required, cut JP11 and install JP12 (for address range starting at 772722), JP13 (777362), or JP14 (777422).



SHR-0341 B7

Figure 2-3 M7454 UNIBUS Adapter Module

EXAMPLE: SWITCH 1(BIT 8) IS IN ON POSITION



* ON - 2 WORDS
OFF - 4 WORDS

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SHR-0343 B7

Figure 2-4 DIP Switch Setting in a Single TU80 Configuration (Address 172522, Vector 224).

Table 2-2 Single TU80 Address Selection

Unit	Address	Vector	Switch 9	Switch 10
0	172522g F22 ₁₆	224g 94 ₁₆	on	on

Table 2-3 Address Selection in Multi-TU80 Configuration

Transport Unit	Address	Vector	Switches		Configuration
			9	10	
1	0 172522g F522 ₁₆	224g 94 ₁₆	on	on	1 (unit 0)
2	1 772526g F526 ₁₆	float*	on	off	2 (units 0,1)
3	2 172532g F55A ₁₆	float*	off	on	3 (units 0,1,2)
4	3 172536g F55E ₁₆	float*	off	off	4 (units 0,1,2,3)

* Floating vector – 300 to 700g.

- Remove G727 bus grant card from desired SPC slot. Remove (cut CA1 to CB1) nonprocessor grant (NPG) jumper from the backplane of the same SPC slot.
- Plug two internal ribbon cables (*not keyed connectors*) into the J1 and J2 edge connectors on M7454 module (Figure 2-3). Plug cable with male external connector into J1 on the board, and cable with female external connector into J2. To correctly connect all I/O cable plugs, follow Figure 2-5.
- Carefully insert M7454 module into SPC slot.

NOTE

If you are replacing the M7454, perform only the necessary steps from the following paragraphs.

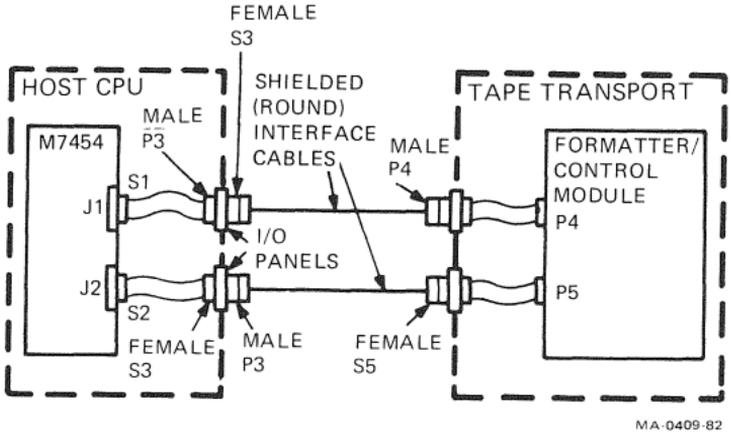


Figure 2-5 Plug-to-Plug I/O Cable Connections

2.2.2 CPU Internal Cabling

Examine the CPU for compliance with FCC installation specifications. According to FCC requirements, the CPU should have the I/O bulkhead connector frame at the bottom rear of its cabinet.

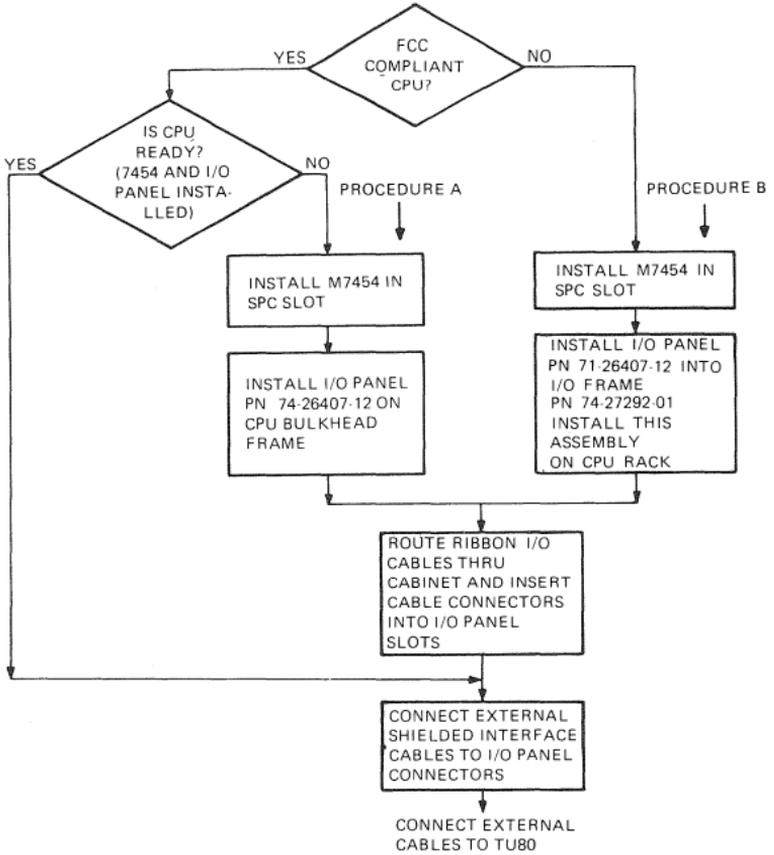
Then, follow the applicable procedures (A or B) shown in Figure 2-6.

Procedure A

1. Install I/O panel (PN 74-26907-12) on CPU's I/O bulkhead frame at bottom of CPU cabinet (Figure 2-6, Procedure A). Secure I/O panel with two screws.
2. Route internal I/O ribbon cables from M7454 module through CPU cabinet to CPU frame. Then, insert cable connectors into slots on I/O panel.
3. Go to Paragraph 2.2.3 and perform external interface cabling.

NOTE

Do not chafe the internal cables against other modules and chassis parts.



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Figure 2-6 TU80 Interface Cabling Flowchart

Procedure B

1. Mount I/O panel (PN 74-26407-12) on I/O frame (PN 74-27292-01). Secure with two screws (Figure 2-6, Procedure B).
2. Install I/O frame (with I/O panel) on CPU rack. Find location in CPU rack that will best accommodate internal and external interface cabling.

NOTE

Digital recommends locating the I/O frame at the bottom rear of the CPU cabinet.

3. Repeat steps 2 and 3 above.

2.2.3 TU80 External Cabling

NOTE

You need to use the Accessory Kit TU80K-AC to perform this procedure.

1. Use allen wrench to open rear door.

NOTE

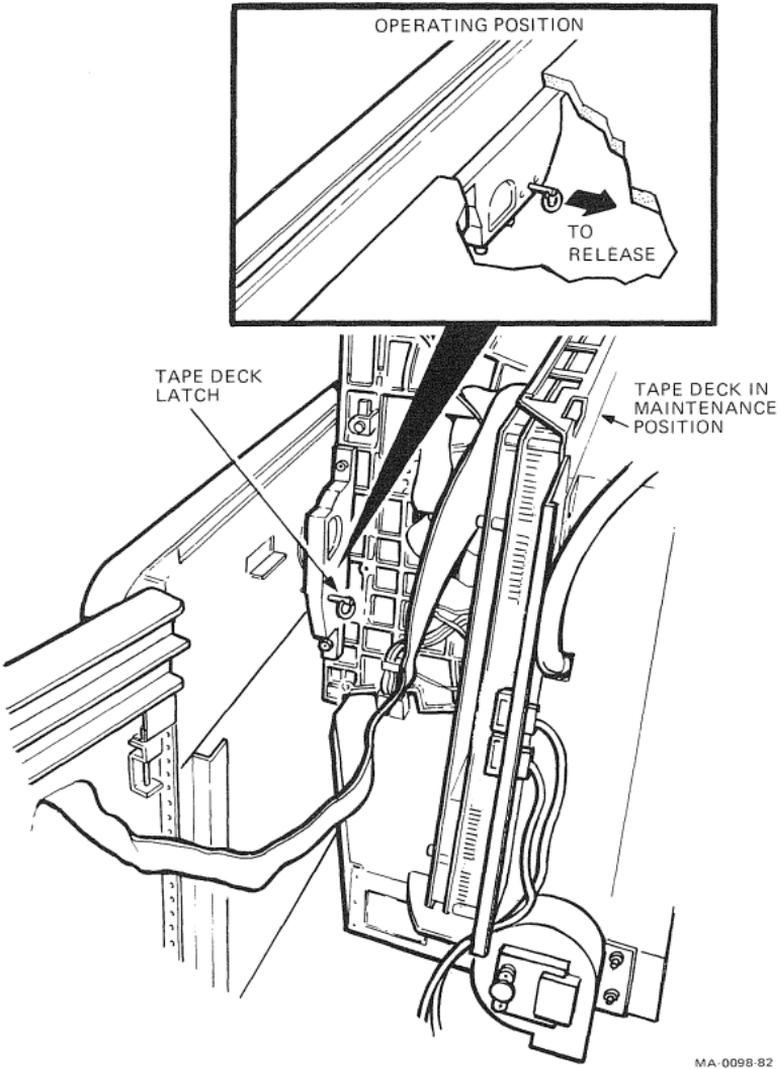
To check the I/O cables in the TU80, refer to Figure 2-7.

2. Route external shielded interface cables (PN BC17N-12) from TU80 to CPU (Figure 2-2).

NOTE

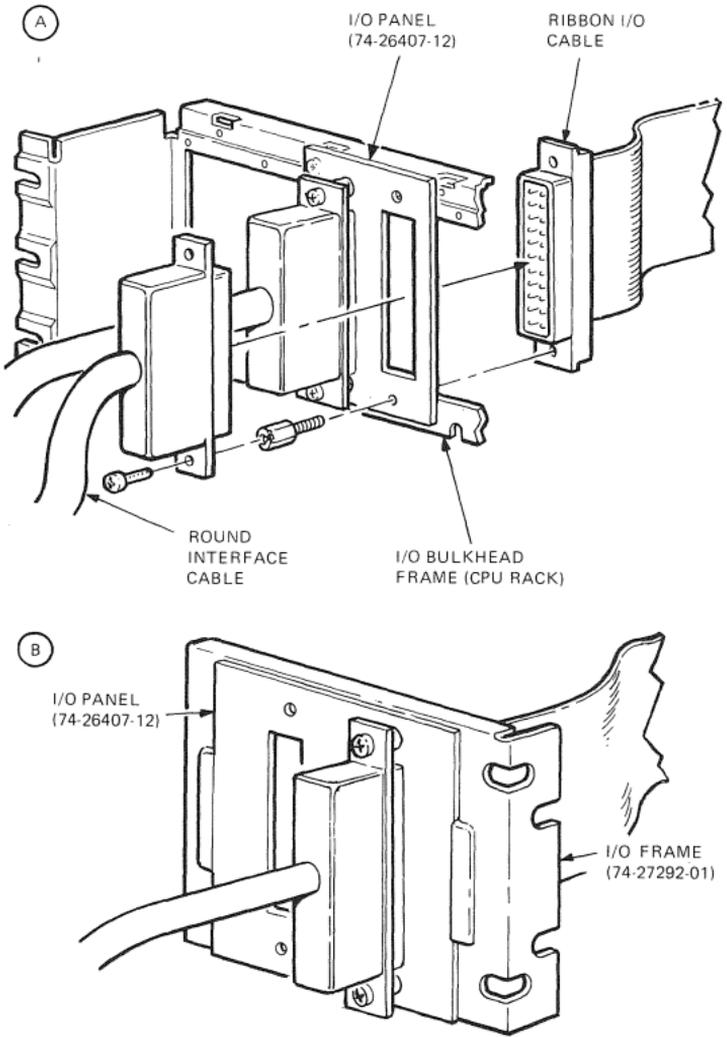
In configurations with three or four TU80s on one CPU, you can use 24 ft cables (PN BC17N-24).

3. On CPU side, insert external interface cables into keyed bulkhead connectors on the CPU I/O frame (or bracket). This step connects the cables with the internal UNIBUS cables. Secure each plug with two screws (Figure 2-8).
4. Close rear door.



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Figure 2-7 Tape Deck in Maintenance Position



MA-0109-82

Figure 2-8 I/O Cable Connections

3 TROUBLESHOOTING

3.1 GENERAL

Paragraph 3.2 describes internal (resident) diagnostics; Paragraphs 3.3 and 3.4 respectively, describe the PDP-11 and VAX on-line diagnostics.

When you report to the site, get all the available information from the operator and operating system. You should consider fault codes, the frequency at which they occur and, if possible, the operation in progress at that time before executing diagnostics. If the fault is intermittent, information from the operator and operating system may be instrumental in directing you to the appropriate test to duplicate the fault condition.

3.2 RESIDENT DIAGNOSTICS

TU80 resident diagnostics consist of operator diagnostics and Field Service diagnostics.

NOTE

Make sure that the TU80 power cord is plugged in, and the transport is energized (power switch ON) before you start any diagnostic routine.

The diagnostic tests designed into the TU80 are off-line tests initiated through the control panel. There are no built-in on-line diagnostics; however, the host CPU can monitor TU80 status through the Get Status command. A Channel Loopback command is also provided to exercise the TU80's formatter logic.

Although on-line diagnostics are not part of the TU80, the control microprocessor tests for many operational fault conditions while it runs on-line. These conditions are indicated on the control panel display as fault codes. The RESET indicator lights to indicate the fault condition and the control panel displays the appropriate fault code.

3.2.1 Corrective Fault Code Matrix

When a trouble call is received from the site, Field Service personnel should consult the fault code matrix (Table 3-1) and corresponding corrective action tables in the *TU80 Pathfinder* EK-0TU80-SV (supplied in the CD kit). These tables help Field Service personnel determine if operator action (A, B, or C) is required. If the fault persists after appropriate operator action, consult the tables for a list of FRUs to take to the site.

The fault code matrix lists all malfunctions or fault codes, and assemblies which may cause the fault condition. This table is designed to provide a list of related assemblies before you report to the customer site. Assemblies listed under individual malfunction or fault codes are arranged in a "most probable fault" order. In addition to listing assemblies, the table may direct the Field Service Representative to ask the operator to perform Operator Diagnostic Test 02 or Test 03.

When on-site, consult and use the *TU80 Pathfinder* (troubleshooting procedures and diagnostic tests) to isolate and correct the malfunction.

3.2.2 Operator Troubleshooting

Before you run any tests, do the following steps to isolate an easily correctable external malfunction.

1. Make sure the tape has a BOT marker.
2. If a write operation is to be performed, make sure the tape reel has the write-enable ring installed.
3. Make sure the tape path is clean.
4. Make sure the power switch is on (1).
5. In case of power failure, make sure the power controller circuit breaker is on.
6. Make sure the top cover door is closed and latched.

NOTE

If the host computer reports data (read/write) errors, "first-aid" action is to clean the tape path.

Table 3-1 Fault Code Matrix (Operator Test 01) (Cont)

Fault Code	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2			
Failing Assembly	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9							
Pneumatic pump															1																						
Filter														4																							
Upper air bearing																						1															
Lower air bearing																							1														
Head (amplitude error)	1	1																																			
Head (data reliability)				3	3	3	3	3	3		3																										
Supply motor/tach														3									3		1		2	2									
Supply hub													2			4							1		1												
Take-up motor/tach				5		5																	2		3	1											
EOT/BOT sensor												1			1																						1
Door switch											1																										
File protect sensor																	1																				
Pressure regulator														5																							

Table 3-1 Fault Code Matrix (Operator Test 01) (Cont)

Fault Code	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	6	6		
Failing Assembly	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1			
Pneumatic pump	4	4	4				4																												
Filter	5	5	5				5																												
Upper air bearing	7	7					7																												
Lower air bearing	8	8					8																												
Head (amplitude error)																																			
Head (data reliability)																																			
Supply motor/tach																					2			3											
Supply hub																																			
Take-up motor/tach	3	3	3	2			2	3													3			1											
EOT/BOT sensor																																			
Door switch																																			
File protect sensor																																			
Pressure regulator	6	6	6				6																												

3.2.3 Power-Up Health Check

This self-test diagnostic checks ac power, and the control panel's and major logic modules' functionality.

To start the health check, press the LOGIC ON push-button (assume the power switch is on).

The two-digit display should momentarily show 00, the LOGIC OFF indicator should go off, and the following indicators should go on momentarily: BOT, RESET, ON LINE, DIAGNOSTICS and SELECT. The LOGIC ON and FILE PRO indicators should go on and stay on.

NOTE

If a fault code appears on the display, press RESET and LOGIC OFF to clear the display. Then press LOGIC ON again to repeat the Health Check.

If the fault code reappears, refer to the TU80 Pathfinder for on-site troubleshooting procedures and Field Service diagnostic tests to isolate the failure.

3.2.4 Basic Operator Test 01

This test checks basic transport functions and tape motions including BOT/EOT tape motion, read data, and write data. Use a write-enabled, known good quality tape, for this test. The test takes about 10 minutes to complete (with 2400 foot tape).

Pre-Test Conditions

1. Power switch and LOGIC ON are on (power-up health check is successful); digital display is blank.
2. Tape is threaded through tape path and onto take-up reel.
3. Tape is not loaded.
4. Top cover is closed and latched.

Test Procedure

1. Press RESET.
2. Press TEST on control panel's diagnostic portion.
 - a. DIAGNOSTICS indicator lights.
 - b. Digital display indicates 01.
3. Press EXECUTE.
 - a. Test starts with display panel incrementing from 00, 11, 22, through 99. Make sure all numerical display segments are functioning.
 - b. Make sure all indicators except LOGIC OFF, BOT and SELECT are lit.

Test Successful

If the test completes, the TU80 performs a REWIND/UNLOAD operation and the digital display indicates 00; the RESET indicator is lit.

Test Unsuccessful

If the test is unsuccessful, the diagnostic program halts and the display shows a numerical code; the RESET indicator is lit. Record this number and refer to the *TU80 Pathfinder* for further instructions.

3.2.5 Optional Operator Tests

The optional tests are 02 and 03. The user may perform them on your request.

Test 02 checks tape tension characteristics. Test 03 checks operation of the velocity servo loop and the take-up motor/tach assembly.

When Test 01 calls for Test 02 or Test 03 to be executed, refer to the *TU80 Pathfinder* for more information.

3.2.6 M7454 Resident Diagnostic

The M7454 UNIBUS Adapter Module performs its own resident diagnostic routine at system power-up. To run this diagnostic, turn the CPU circuit breaker off and on.

The M7454 diagnostic resides in the on-board programmable ROM and checks the M7454 module only, without tape motion or interface testing. The diagnostic checks the M7454's microprocessor, sequencer, data paths, and buffer area. The lit LED on the module indicates a successful test.

3.2.7 M7454 Status Checking

3.2.7.1 TU80 Turnkey Configuration – When the M7454 (and TU80) fails during new system configuration (PDP-11 or VAX), the host configures around the TU80, not recognizing it. The computer console terminal displays the appropriate error message.

3.2.7.2 TU80 Add-On Configuration

1. If a TU80 is added to a PDP-11 system, an operator must reconfigure the host system by using an applicable SYSGEN routine. If the M7454 fails during SYSGEN, the host cannot access the TU80 and the console terminal displays the appropriate error message.
2. If a TU80 is added to a VAX system, the host automatically configures the unit into the system. If the M7454 fails at that time, the host cannot access the TU80, and the terminal displays the appropriate message.

3.2.7.3 On-Line Failure – If the M7454 fails during normal on-line operation, the host loses communication link with the TU80. The error message is entered in the system error log. When the operator tries to recall the TU80, the terminal displays the appropriate error message to indicate the “not found” status of the device.

To check TU80 operating status and localize the failed module, reset the TU80 unit and perform the host system power-up. Then, place the TU80 on-line and try to access the transport through the host. If the fault condition persists, replace the M7454 module.

3.3 PDP-11-BASED DIAGNOSTICS

3.3.1 PDP-11 Front-End Diagnostic (CZTUW, CZTUX, CZTUY, CZTUZ)

This diagnostic is a four-part complex test that checks the subsystem in all basic operating modes, and tests the interface bus, I/O silo and TU80 transport logic.

CZTUW

- TST : 001 Initialize 1
- TST : 002 RAM test
- TST : 003 Command reject test
- TST : 004 Write characteristics test
- TST : 005 Volume check
- TST : 006 Completion interrupt test
- TST : 007 Basic packet protocol test
- TST : 008 Non-tape motion command test
- TST : 009 DMA memory addressing test
- TST : 010 Initialization after write characteristic test
- TST : 011 Basic write subsystem memory test

CZTUX

- TST : 001 FIFO exercizer test
- TST : 002 Initialize 4 test
- TST : 003 Off-line reject and rewind test
- TST : 004 Basic write data test
- TST : 005 Basic read data (forward and reverse) test
- TST : 006 Manual intervention test
- TST : 007 Configuration timeout test
- TST : 008 Scope loops test

CZTUY

- TST : 001 Space records test
- TST : 002 Rereads test
- TST : 003 Write data retry test
- TST : 004 Write tape mark test

CZTUZ

- TST : 001 Write tape mark retry test
- TST : 002 Skip tape marks test
- TST : 003 No-op and initialize test
- TST : 004 Erase and operation incomplete test
- TST : 005 Test of operation at EOT test
- TST : 006 Function tuning test

3.3.2 PDP-11 Data Reliability Diagnostic (CZTUV)

This test simulates a typical customer operating environment and checks data integrity in both start/stop and streaming modes. It is mainly a data confidence test.

Data Reliability Program Tests

- Test 1 : Basic functions
- Test 2 : Data reliability
- Test 3 : Streaming test
- Test 4 : Write compatability/write utility
- Test 5 : Read compatability/read utility
- Test 6 : Operator selected sequence

NOTE

Refer to the diagnostic listing for program control flags.

3.3.3 Operating Instructions for PDP-11-Based Diagnostics

1. Load XXDP+ monitor.
 - a. Enter date.
2. Answer hard core questions.
 - a. 50 Hz? Type Y or N.
 - b. LSI? Type Y or N.

This is XXDP+, type H or H/L for details (help file).

[Receive XXDP+ prompt (dot)]

3. Enter R (space) program name (CZTUV or CZTUW, CZTUX, CZTUY, or CZTUZ).

The operator entry should look like:

[^R ZTUV??]

4. Receive DR> prompt.
5. Enter the appropriate command. For example, to start the test type:

DR>STA

6. Change HW(L)? Type Y to run the diagnostic.
7. Change SW(L)? Type Y or N.

NOTE

Refer to the diagnostic listing for specific program problems and instructions.

No hard errors are allowed.

Hardware Parameters

The following are TU80 base address and vector assignments.

TSSR ADDRESS (172522)?
VECTOR (224)?

Command example: STA/TES:2/FLA : IDU : LOE

Command example meaning: Start test 2, inhibit dropping unit and loop on error

Software Parameters

Refer to diagnostic listings.

3.4 VAX-BASED DIAGNOSTIC**3.4.1 VAX Front-End Diagnostic (EVMBD, EVMBE)**

These tests check the subsystem in all basic operating modes and test the TU80 transport logic, interface bus, and I/O silo.

3.4.2 VAX Data Reliability Diagnostic (EVMAA)

This check is designed to thoroughly check out the tape subsystem. It allows the operator to test the TU80 on-line without bringing the system down.

The data reliability test consists of the following.

- Test 1: Qualification test
- Test 2: Qualification test
- Test 3: Data reliability test
- Test 4: Multi-drive test
- Test 5: Conversation mode test
- Test 6: Streaming test

3.4.3 Operating Instructions for VAX-Based Diagnostics

1. Load the Diagnostic Supervisor (ECSAA, ENSAA, or ESSAA)

NOTE

Use ECSAA on VAX 11/750s.

Use ESSAA on VAX 11/780s.

Use ENSAA on VAX 11/730s.

2. Attach and select a device to be loaded in one of two ways:

- a. Prompt mode

```
DS> ATT DW7XX HUB DWO
```

```
DS> ATT
```

```
Device Type? TS11
```

```
Device Link? DWO
```

```
Device Name? MSAO
```

```
CSR? 772520*
```

```
Vector? 224
```

```
BR? 5
```

```
DS> SEL MSAO
```

- b. Explicit mode

```
DS> ATT DW7XX HUB DWO
```

```
DS> ATT TS11 DWO MSAO 772520 224 5
```

```
DS> SEL MSAO
```

3. Load and start the diagnostic in one of two ways:

- a. Example 1

```
DS> Load EVMAA (or EVMBD, EVMBE)
```

```
DS> Start/Switches
```

- b. Example 2

```
DS> Run EVMAA (or EVMBD, EVMBE)/  
Switches
```

No hard errors are allowed.

NOTE

Refer to the diagnostic listing for control flags.

* CSR address (TU80 starting address is 772522)

4 REMOVAL AND REPLACEMENT

This chapter describes removal and replacement procedures for TU80 components listed in the field replaceable unit (FRU) table (Table 1-1). Each procedure also names a test to perform which checks the replaced module.

Paragraph 4.1 describes the FRUs located on top of the tape deck. Paragraph 4.2 describes FRUs inside the cabinet and accessed only in the maintenance position.

4.1 TAPE DECK COMPONENTS

While you replace the tape deck components, refer to Figure 4-1 as well as applicable figures. All these components can be accessed easily when the TU80 top cover is open.

4.1.1 BOT/EOT Assembly

Removal

1. Remove magnetic head dust covers by pulling them straight out.
2. Disconnect W3P1 plug from BOT/EOT sensor. Mounting screw is under cable (Figure 4-2).
3. Remove mounting screw from assembly and lift off tape deck.

CAUTION

Do not loosen or remove phillips screw on top of assembly. This may cause misalignment.

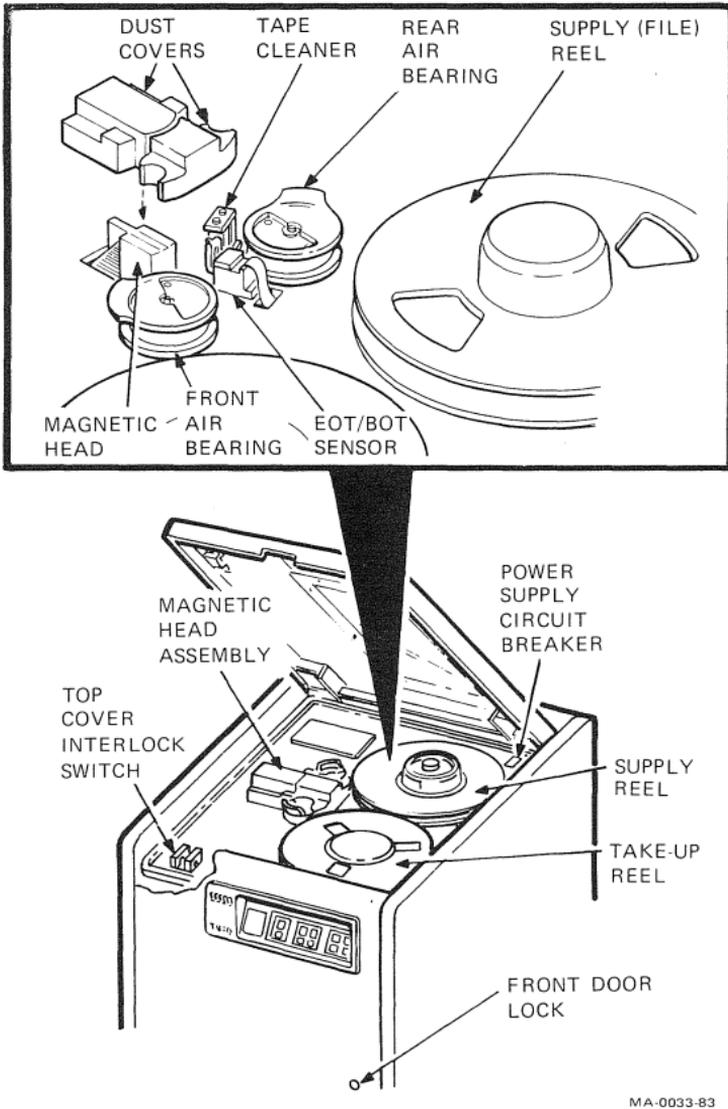
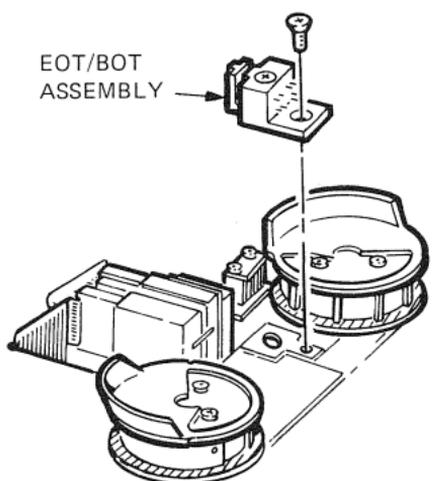


Figure 4-1 Tape Deck Components

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Figure 4-2 BOT/EOT Assembly

Replacement

NOTE

You must replace any defective sensor as a complete assembly.

1. Position assembly in its place on tape deck and install and slightly tighten flat-head mounting screw.
2. Thread a tape onto take-up reel and adjust BOT/EOT assembly so it is parallel to tape path. Sensor positioning is not critical.
3. Tighten mounting screw.
4. Reattach W3P1 plug to assembly connector as shown in Figure 4-2. If excess cable exists, pull excess under tape deck.

CAUTION

Make sure plug is positioned on correct pins.

5. Install dust covers.

Verification Check

NOTE

If available, use a 600-foot reel of tape (such as PN 29-22020) with properly installed BOT/EOT markers to reduce test time.

1. Install reel of tape onto supply hub and thread tape so BOT marker is located before BOT/EOT assembly.
2. Perform LOAD operation and observe that tape loads and positions itself at BOT marker (BOT indicator lights) to check BOT sensor operation.
3. Execute Field Service Test 44 to verify EOT sensor operation.
4. Unload test tape.

4.1.2 Tape Cleaner

Removal

1. Remove dust covers from magnetic head assembly.
2. Loosen two pan-head mounting screws and remove tape cleaner assembly from tape deck (Figure 4-3).
3. Remove screws, lockwashers, and cover plate from blade housing.
4. Slide platform mount out from tape cleaner.

NOTE

You must replace defective tape cleaner as a complete assembly.

Replacement

1. Inspect cleaner blades for damage. If blades are chipped or damaged, replace entire assembly.
2. If blades are not damaged, clean platform and reinstall. When you install platform, make sure flanges are positioned so platform fits firmly inside tape cleaner.
3. Install cover plate, two washers and mounting screws.
4. Position assembly onto guide pins on tape deck, and tighten screws.
5. Reinstall dust covers.

Verification Check

No functional checks are necessary.

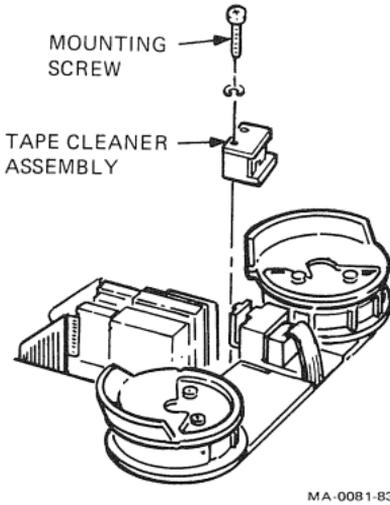


Figure 4-3 Tape Cleaner

4.1.3 File Protect Sensor

Removal

1. Remove tape reel from supply hub.
2. Remove supply hub (Paragraph 4.1.5).
3. Remove four mounting screws and file protect sensor cover plate from tape deck (Figure 4-4).
4. Remove the phillips mounting screw and washer securing the file protect sensor to the tape deck (Figure 4-4).
5. Detach connector W3P6 from sensor and discard sensor.

Replacement

NOTE

File protect sensor positioning is not critical.

1. Place sensor on tape deck as shown on Figure 4-4, and secure it with mounting screw and washer.
2. Attach W3P6 cable plug to sensor pins.
3. Reinstall sensor cover plate and secure to tape deck with four mounting screws.

Verification Check

Perform power-up troubleshooting procedure 1003.

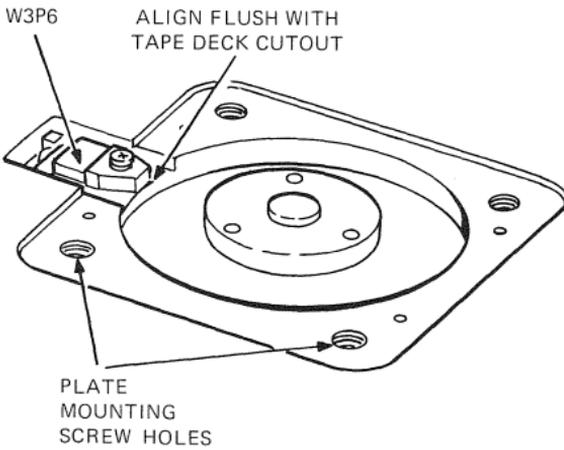


Figure 4-4 File Protect Sensor

4.1.4 Take-Up Reel and Hub Assembly

Removal

1. Remove four mounting screws from take-up reel hub cover and remove cover from hub assembly (Figure 4-5).
2. Remove three allen screws, lockwashers, and plain washers which secure reel to motor shaft assembly.

NOTE

Do not remove phillips screws.

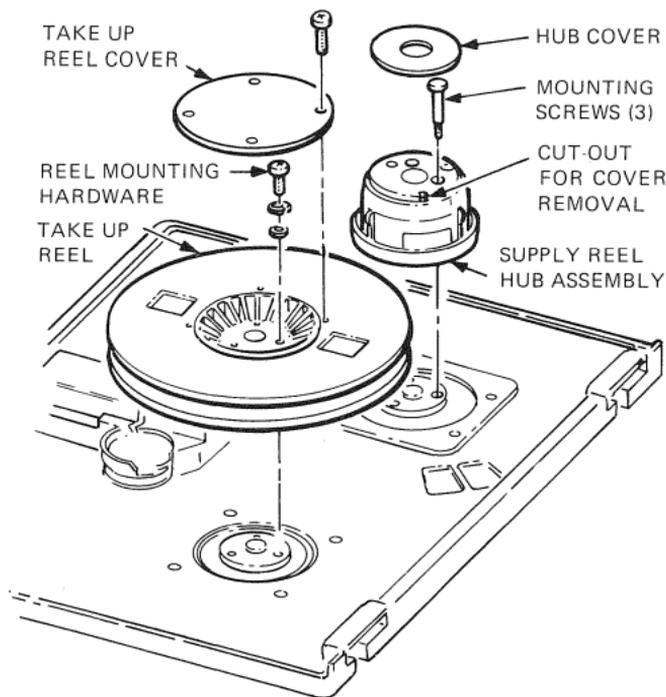
3. Remove take-up reel from transport.

Replacement

CAUTION

If you are installing new reel, inspect reel edges for burrs or cracks that could cause tape damage.

1. Perform above removal procedure in reverse (position take-up reel on transport; use three allen screws, lockwashers, and plain washers to secure reel to shaft assembly; etc.).



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Figure 4-5 Tape Reel Assemblies

Verification Check

1. Manually rotate tape reel to make sure reel does not contact tape deck.
2. Load known good reel of tape and observe reel during tape motion. Tape should not contact top reel flange.

4.1.5 Supply Reel and Hub Assembly

Removal

1. Press center button on hub to unlatch it.
2. Locate slot opening on periphery of reel cover. Insert small blade screwdriver into slot (cut-out) and twist to unsnap cover from hub assembly (Figure 4-5).

3. Place hub assembly in latched position by depressing cam carrier.

CAUTION

Make sure hub is latched before you proceed with further removal steps. Otherwise, parts could be lost due to unnecessary disassembly.

4. Remove three large shoulder mounting screws from cam carrier. You can then remove hub assembly from tape deck (Figure 4-5).

Replacement

1. Position hub assembly onto motor shaft assembly and secure with three large shoulder screws.
2. Install reel cover on face of hub assembly and snap securely.

Verification Check

1. Mount tape reel onto hub assembly. Reel should mount easily onto hub and against bottom flange.
2. Latch reel onto hub. Make sure reel is secure.
3. Load known good quality tape and observe reel during tape motion. Tape should not contact top reel flange.
4. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.1.6 Air Bearing Spring Guides

NOTE

Replacement parts for air bearing assembly are contained in a kit (PN 29-24359) which includes two spring guides, a transducer (sensor), and small and large O-rings. If a spring guide has to be changed, replace both guides at same time.

Removal

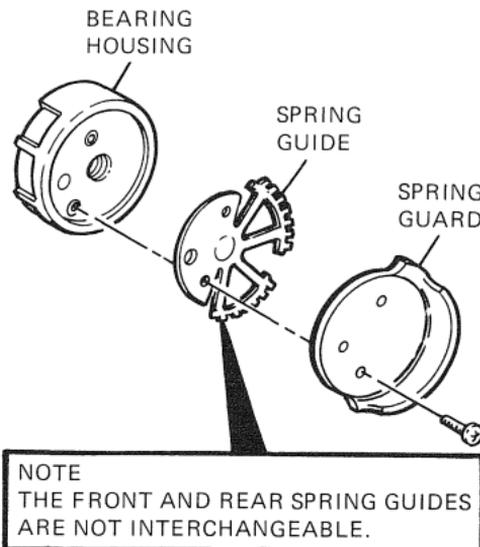
1. Remove head dust covers from tape deck.
2. Remove two phillips head screws that secure spring guide and a guard to bearing housing (Figure 4-6).
3. Remove spring guard and a guide from housing.
4. Repeat steps 2 and 3 to remove other spring guide.

Replacement

1. Place new spring guide (refer to Table 1-1 for guide's part number) and a guard into bearing housing. Holes for mounting screws provide positive alignment for both parts in housing.
2. Secure assembly with two phillips head screws.
3. Repeat steps 1 and 2 to replace second spring guide.
4. Reinstall head covers on tape deck.

Verification Check

1. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.
2. Examine tape for any tape edge damage.



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Figure 4-6 Air Bearing

4.2 INTERNAL (INSIDE CABINET) REPLACEMENTS

Refer to Figures 4-7 and 4-8 as well as applicable figures when you access and replace tape transport components in the cabinet and/or mounted on the bottom of the tape deck. Appendix A contains layouts of the formatter/control, read/write/servo and power amplifier modules, with all cable connectors called out.

Perform all replacements described hereafter with the tape deck in its service (vertical) position.

With the tape deck in the vertical position it is easy to service and repair any transport part or module.

The transport has a service release lock (tape deck latch) (Figure 4-7) which secures the tape deck in either horizontal (operational) or vertical maintenance position.

4.2.1 Rotating the Tape Deck

1. Use a 5/16 inch allen wrench to open front and rear doors. Release tape deck pawl fastener.
2. From front, reach under tape deck (Figure 4-7) and locate tape deck latch under tape deck on left side panel of cabinet.
3. Release latch as follows.
 - a. Gently lift or press tape deck to remove pressure from latch ring.
 - b. Pull latch ring and keep released.
4. Keep latch ring released with one hand and tilt tape deck up with other hand until deck is in full vertical (maintenance) position.

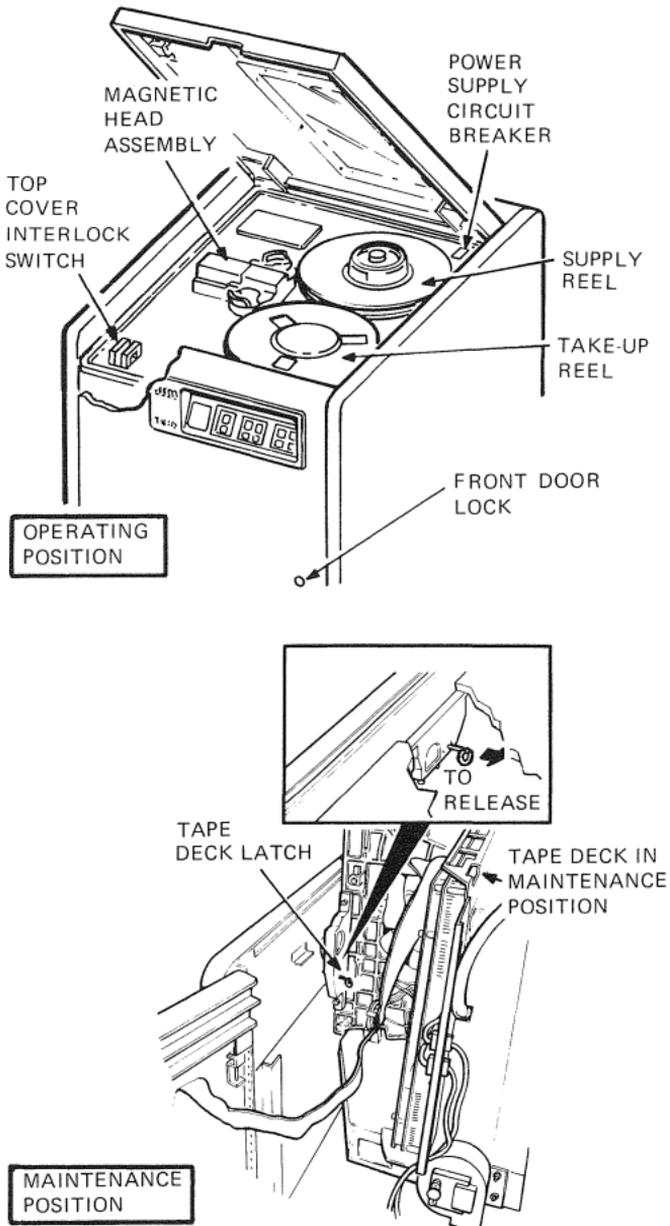
NOTE

Listen for a click which indicates tape deck is snapped in service position.

CAUTION

Be sure not to snag control panel cable or any other cable in cabinet.

5. To return tape deck to operating position, pull on latch ring, release tape deck latch, and then tilt deck down to horizontal position until latch is engaged again.



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Figure 4-7 Tape Deck Functional Positions

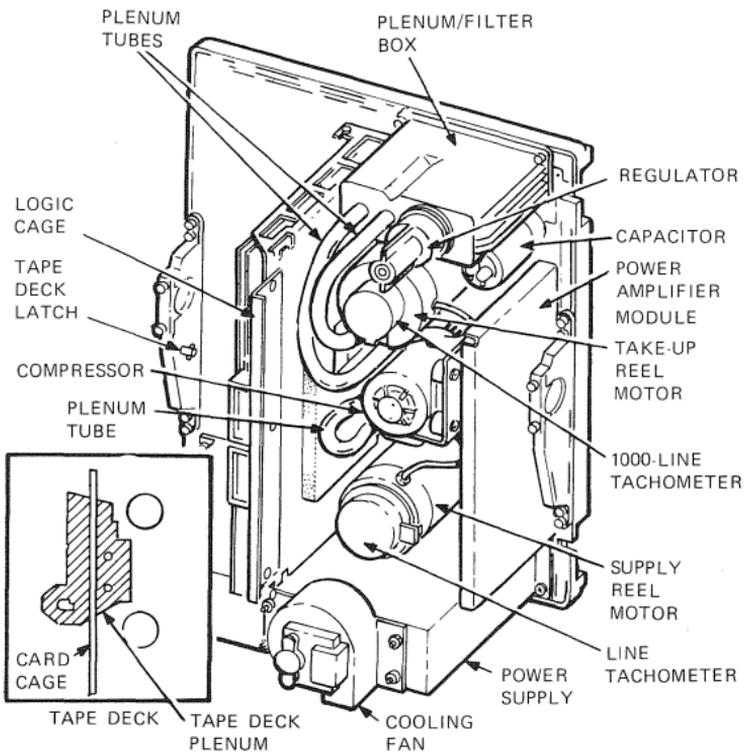
4.2.2 Protective Acoustic Cover

Removal

1. With tape deck in maintenance position, detach two pneumatic tubes from nipples on air filter plenum box. Mark tubes for proper replacement (Figure 4-8).
2. Release cover mounting screws. Remove cover.

Replacement

1. Place acoustic cover in place so that you can route pneumatic tubing through feed-through holes.
2. Tighten cover mounting screws.
3. Reattach pneumatic tubes to air filter box. Make sure IN and OUT tubes are connected to proper nipples.
4. Return tape deck to normal operating position.



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Figure 4-8 Tape Deck Assemblies (Bottom View with Protective Acoustic Cover Removed)

4.2.3 Supply Reel Motor

Removal

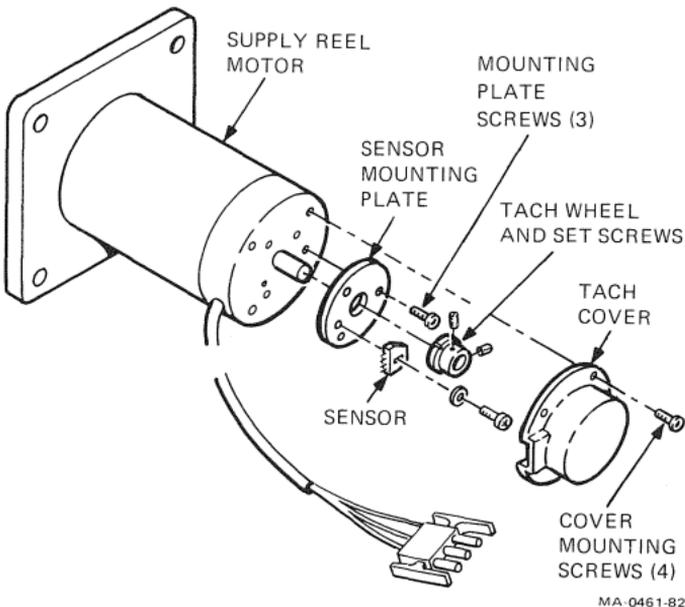
NOTE

Supply reel motor assembly is not supplied as a part of FRU kit. Instead, you must remove 1000-line tach on take-up reel motor assembly spare and use take-up motor as replacement for supply reel motor.

1. Remove supply reel and hub assembly as described in Paragraph 4.1.5.
2. Turn off power switch and unplug power cord.
3. With tape deck in maintenance position (Paragraph 4.2.1), remove protective acoustic cover (Paragraph 4.2.2).
4. Detach B1P1 connector from J3 plug on power amplifier module (Figure A-3).
5. Remove four mounting screws and tach cover from motor (Figure 4-9).
6. Detach W3P5 connector from tach sensor on motor.

NOTE

This connector is not keyed. Mark it for proper replacement.



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Figure 4-9 Supply Reel Motor Assembly

7. Remove four mounting screws that secure motor to rear of tape deck. Carefully remove motor from transport. Use 9/16 inch extender tool if necessary.

NOTE

You must replace motor tach and sensor on a new motor assembly. You must replace entire assembly as a unit.

Continue with motor disassembly and removal of one-line tachometer (Figure 4-9).

8. Remove mounting screw and one-line sensor from mounting plate on motor. Retain for re-use.
9. Loosen two set screws and remove tach wheel from motor shaft. Retain for re-use.
10. Remove four screws on mounting plate and remove plate. Retain for re-use.
11. Disassemble spare take-up reel motor assembly (Figure 4-10) as follows:
 - a. Remove two mounting screws and tach cover from washer assembly.
 - b. Loosen two screws and remove 1000-line tach sensor from motor (reel) shaft and tach wheel.
 - c. Loosen set screw and remove tach wheel from motor shaft.

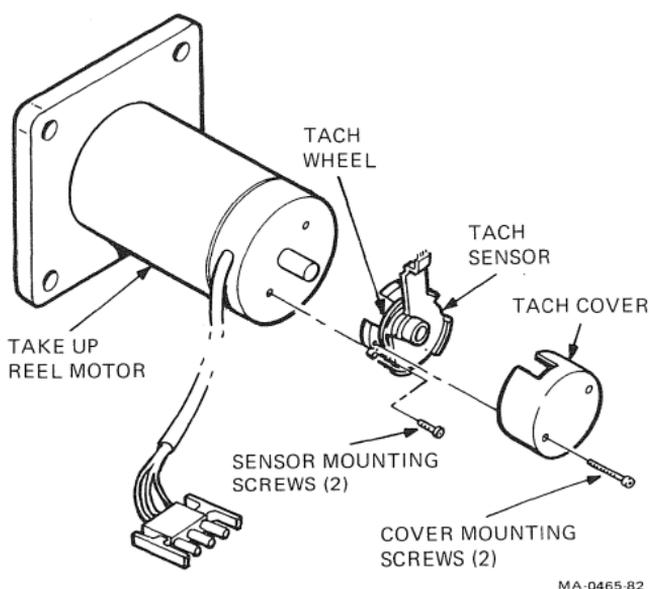


Figure 4-10 Take-Up Reel Motor Assembly

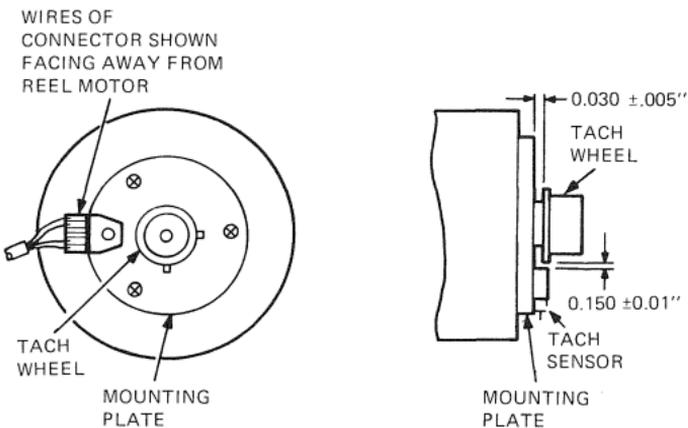
Replacement

1. Install one-line tachometer on new motor as follows.
 - a. Place mounting plate (from supply reel motor – removal step 10) onto new motor and secure with four mounting screws.
 - b. Install old one-line sensor and tach wheel (removal steps 8 and 9) onto new motor mounting plate and shaft, and adjust according to tolerance requirements listed in Paragraph 4.2.3.1 (Figure 4-11).

CAUTION

When you install a motor, make sure no loose wires are between motor mounting plate and tape deck.

2. Position replacement motor on rear of tape deck so B1P1 cable extends to right of motor assembly. Secure motor to deck with four mounting screws.
3. Connect B1P1 cable to J3 on power amplifier module (Figure A-3).
4. Connect W3P5 cable to tach assembly on motor.
5. Position tach cover on motor and secure with four mounting screws.
6. Replace protective cover (Paragraph 4.2.2). Return tape deck to operating position.
7. Perform supply reel and hub assembly replacement procedure (Paragraph 4.1.5).



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Figure 4-11 Tach Wheel/Sensor Installation

Verification Check

1. Check hub assembly (Paragraph 4.1.5).
2. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.3.1 Tach Wheel/Sensor

Installation

1. Insert tach wheel on motor shaft. Position tach for 0.030 ± 0.005 inch clearance between tach and sensor mounting plate (Figure 4-11).
2. Install sensor on mounting plate and position for 0.150 ± 0.01 inch clearance between sensor and tach. Tighten sensor mounting screw.

Verification Check

1. Verify that connector W3P5 is attached to the supply motor tach sensor pins.
2. Turn the drive power on before installing the tachometer cover.
3. Using a voltmeter, probe the top pin of connector W3P5 and verify that +5 volts (logical high) is present when the reflective strip on the tachometer wheel is not aligned with the sensor. Now align the reflective strip with the sensor by turning the tachometer wheel by hand and verify that +.2 volts (logical low) is present at the top pin of connector W3P5.

4.2.4 Take-Up Reel Motor

Removal

1. Remove take-up hub assembly (Paragraph 4.1.4).
2. With tape deck in maintenance position (Paragraph 4.2.1), remove acoustic cover (Paragraph 4.2.2).
3. Detach connector W4P2 from tach assembly on take-up motor (Figure 4-10).

NOTE

Check W4P2 position by using strip on connector.

4. Detach B3P1 connector from power amplifier module (connector J1 on power amplifier).

5. Remove four mounting screws that secure motor to rear of tape deck. Carefully remove motor from transport.

Replacement

CAUTION

When you install a motor, make sure no loose wires are between motor mounting plate and tape deck.

1. Position motor on rear of tape deck so B3P1 cable extends from right of motor assembly.
2. Connect B3P1 cable to power amplifier module.
3. Connect W4P2 cable to tach assembly on motor.
4. Replace protective acoustic cover (Paragraph 4.2.2).
5. Replace take-up reel and hub assembly (Paragraph 4.1.4).
6. If required, return tape deck to operating position.

Verification Check

1. With tape not threaded, execute Operator Diagnostic Test 03.
2. Thread tape (but do not load) and execute Operator Diagnostic Test 01.

4.2.5 Air Bearing Sensor

Removal

NOTE

Replacement parts for air bearing assembly are contained in spares under kit PN 29-24359. This kit contains two spring guides (one front and one rear), a sensor, and small and large O-rings. If you are replacing sensor Digital recommends that you also replace two spring guides and large and small O-rings.

CAUTION

Use tape to secure air bearings to tape deck.

1. Remove magnetic head dust covers.
2. Tilt tape deck into maintenance position (Paragraph 4.2.1).

3. Locate supply or take-up air pressure sensors and their respective connectors on bottom of tape deck. Detach cable connector (check W1 cable for supply sensor, and W9 cable for take-up sensor) from sensor pins (Figure 4-12).

NOTE

Check (and mark if necessary) pins on sensor and cable plug for proper reconnection.

CAUTION

Make sure not to bend sensor pins when you detach cable. Pins can easily bend and break.

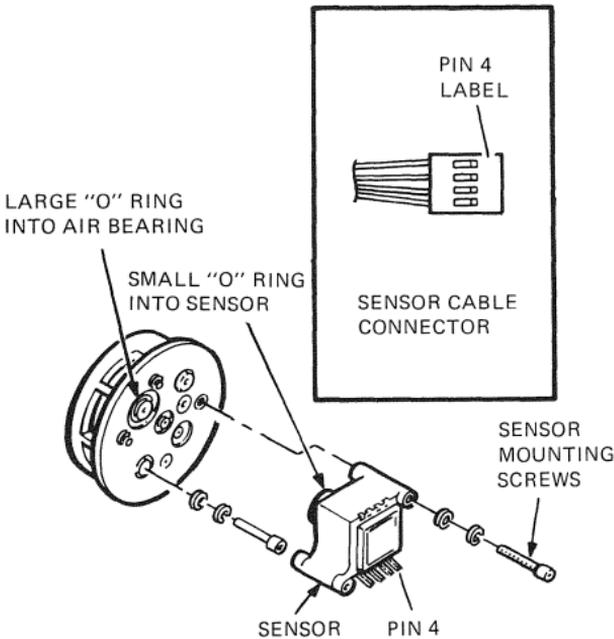
NOTE

Replace spring guide(s) as necessary.

4. Remove two mounting screws that secure air bearing assembly to bottom of tape deck. Tear off tape and remove complete air bearing assembly from top of tape deck.

CAUTION

Do not remove assembly screws. Make sure large O-ring does not fall out of air bearing.



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Figure 4-12 Air Bearing Sensor Assembly

5. Place assembly on flat surface and remove two screws that secure sensor to rear of air bearing.

CAUTION

Small O-ring is underneath sensor. Do not lose it.

NOTE

If necessary, you can now remove spring guide.

Replacement

1. Insert small O-ring in aperture at rear of air bearing housing.
2. Position new sensor on air bearing and secure with two mounting screws.
3. With large O-ring properly seated in aperture on air bearing, position air bearing assembly onto tape deck and tape it. Then, use two mounting screws to secure air bearing to bottom of tape deck.
4. Reattach connector to sensor pins (Figure 4-12).

Verification Check

1. With tape threaded, but not loaded, execute Operator Diagnostic Tests 02 and 03.

4.2.6 Pneumatic Pump Assembly (Compressor)**Removal**

1. Turn off power switch and unplug power cord.
2. With tape deck in maintenance position (Paragraph 4.2.1), remove acoustic cover (Paragraph 4.2.2).
3. On pneumatic pump (Figure 4-13), remove vacuum and pressure tubes from nipples on bottom of tape deck behind pump.

NOTE

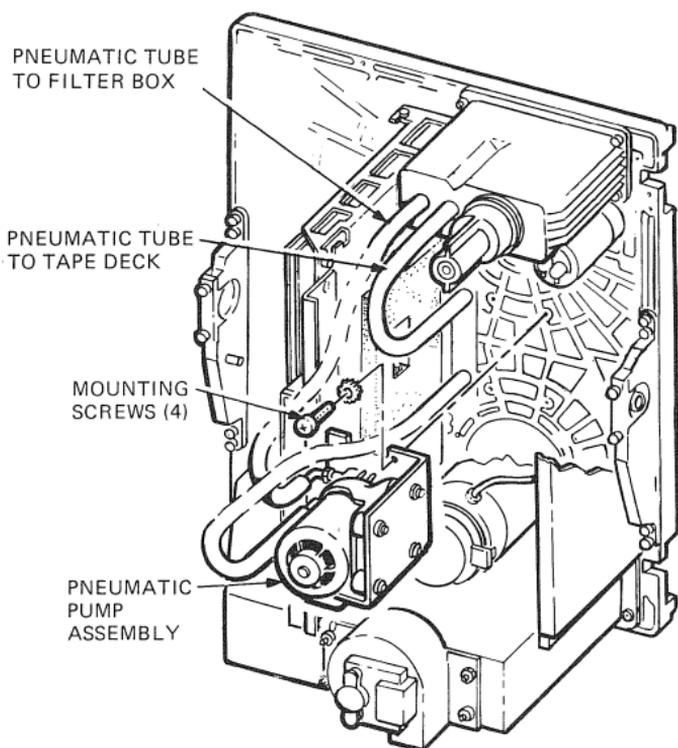
Mark nipples for proper tube reattachment.

4. Detach B2P1 connector (W4 cable) which connects pump to power supply connector W4P4.

NOTE

Detach any wiring that may interfere with removing pneumatic pump assembly.

5. Remove four mounting screws that secure pneumatic pump assembly to bottom of tape deck. Carefully withdraw assembly from transport.



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Figure 4-13 Pneumatic Pump Assembly

Replacement

1. Position new pneumatic pump assembly in place on tape deck and secure with mounting hardware.
2. Attach pneumatic tubing to corresponding nipples on tape deck plenum behind pump.
3. Attach B2P1 connector (W4 cable) to pump.

NOTE

Reattach any wiring disconnected during removal.

4. Replace acoustic cover (Paragraph 4.2.2).
5. If required at that time, return tape deck to operating position. Power on transport.

Verification Check

1. With tape threaded, but not loaded, execute Operator Diagnostic Test 02.
2. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.7 Pressure Regulator and Air Filter Assembly

Removal

1. Tilt tape deck into maintenance position (Paragraph 4.2.1).

NOTE

If you are replacing pressure regulator only, unscrew (counterclockwise) it from plenum box assembly, replace with new regulator; then perform verification check.

2. Remove two pressure tubes (Figure 4-14) from plenum box.

NOTE

You cannot mix up these tubes. Make sure they are marked for easy replacement.

3. Unscrew pressure regulator by turning counterclockwise (Figure 4-14).
4. Remove plenum box by removing four mounting screws.

NOTE

Make sure screws do not fall into cabinet. Screw in lower left corner is especially difficult.

5. Remove air filter by pulling straight out from plenum box interior.

Replacement

1. Position filter over shaft and press onto filter base.

NOTE

Make sure O-ring is in place on filter base so that seal is maintained between base and filter can.

2. Replace plenum box and secure to tape deck with four mounting screws.
3. Screw pressure regulator clockwise onto filter shaft.
4. Install two pressure tubes. Make sure they are on proper nipples.

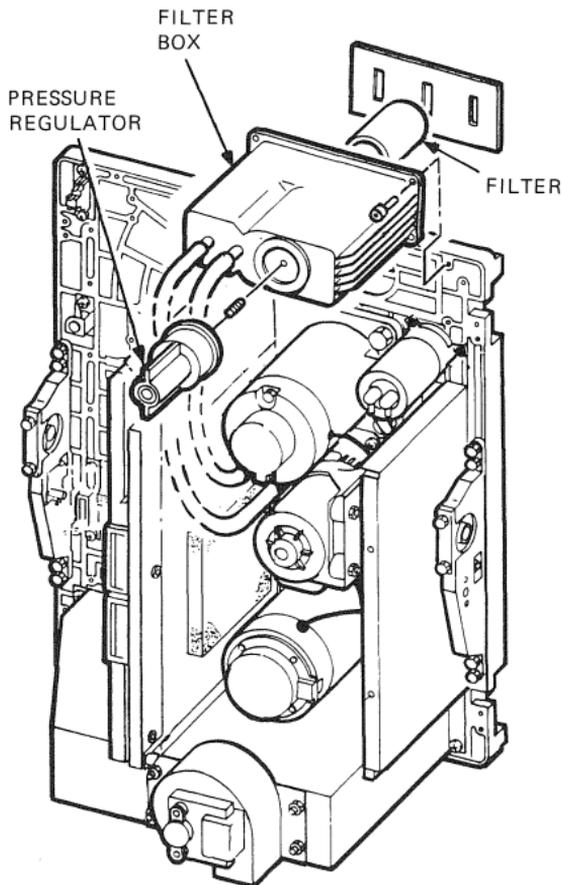


Figure 4-14 Pressure Regulator/Air Filter Assembly

Verification Check

1. With tape threaded, but not loaded, execute Operator Diagnostic Test 02.
2. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.8 Magnetic Head Assembly

CAUTION

Magnetic head and two write resistors on read/write/servo module (R224/R225) are matched components. If you are replacing head, you must also replace write resistors. Resistors are supplied with new head and labeled with head serial number, resistor number (R224 or R225), resistor value, and equivalent write current and dc voltage.

Removal

1. Remove head dust covers from tape deck.
2. From top of transport, detach read head connector (Figure 4-15) W6P1, write head connector W5P1, and erase head wires P3/P4 from magnetic head. Move cables out of way.

NOTE

Before you remove head, tape piece of soft, non-sticky material across recording surface. Then, tape head to tape deck to keep from falling.

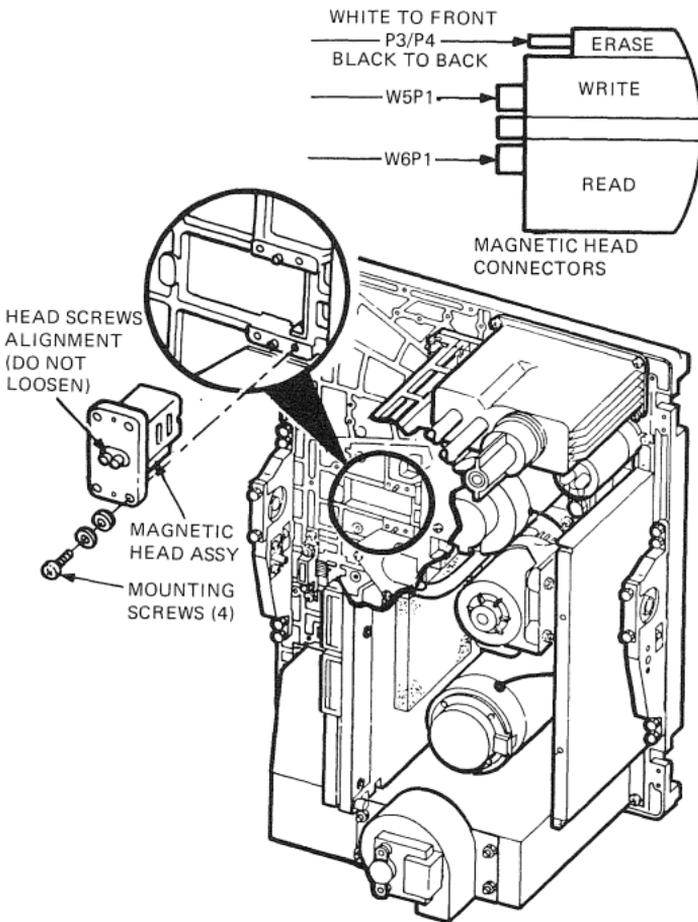


Figure 4-15 Magnetic Head Assembly

3. Turn off power switch and unplug power cord. Tilt tape deck into maintenance position (Paragraph 4.2.1).

CAUTION

Refer to Figure 4-15 for location of head mounting screws. Do not loosen factory alignment screws on head; otherwise, you must replace entire head with a new assembly. Head is factory-positioned on base and must never be moved.

5. Loosen four head mounting screws. Hold or tape head against tape deck while you remove mounting hardware.
6. Carefully withdraw complete head assembly from tape deck (Figure 4-15).
7. Open logic cage and gain access to read/write/servo module (Paragraph 4.2.12).

Remove write resistors R224 and R225 from read/write/servo module at location 17F (refer to Figure A-1). These resistors are plugged in and can be removed without removing board from logic cage.

NOTE

Keep magnetic head and write resistors together as package, if head is being returned to factory.

Replacement

1. Plug new write resistors R224 and R225 into read/write/servo module, location 17F.

NOTE

Before you install a magnetic head, make sure recording surface is protected with soft material.

2. Insert magnetic head up through tape deck, and position head onto guide pins.
3. While you hold head in place, insert mounting hardware and tighten four mounting screws.
4. Guide read and write erase cables through tape deck.
5. From top of tape deck, attach read, write and erase connectors to magnetic head (Figure 4-15). Remove recording surface protective covering.

Verification Check**NOTE**

To run tests, power on transport and secure tape deck in operating position.

1. Clean magnetic head recording surface with soft lint-free cloth moistened with tape transport cleaner (supplied). Wipe recording surface in same direction as tape motion, and at 90° to tape motion.
2. Load known good quality write-enabled scratch tape and execute Field Service Diagnostic Test 18 to move tape away from BOT. Press RESET to stop tape after about five seconds.

NOTE

For next step, set tape deck into service position.

3. Move jumper plug at location 13E on read/write/servo module from normal W3 to test 31 W4-STORE position (refer to Figure A-1).
4. Execute Field Service Test 31.
5. After test is successful (display 00), return jumper plug to normal W3 position. Close logic cage. Return tape deck to operating position.

If test is not successful, proceed with fault isolation and required actions described in *TU80 Pathfinder*.

6. With tape still threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.9 Cooling Fan Assembly**Removal**

1. Tilt tape deck in maintenance position (Paragraph 4.2.1).
2. Detach W4P5 connector from power supply.
3. Remove four hex nuts and washers and pull fan assembly from mounting studs (Figure 4-8).

Replacement

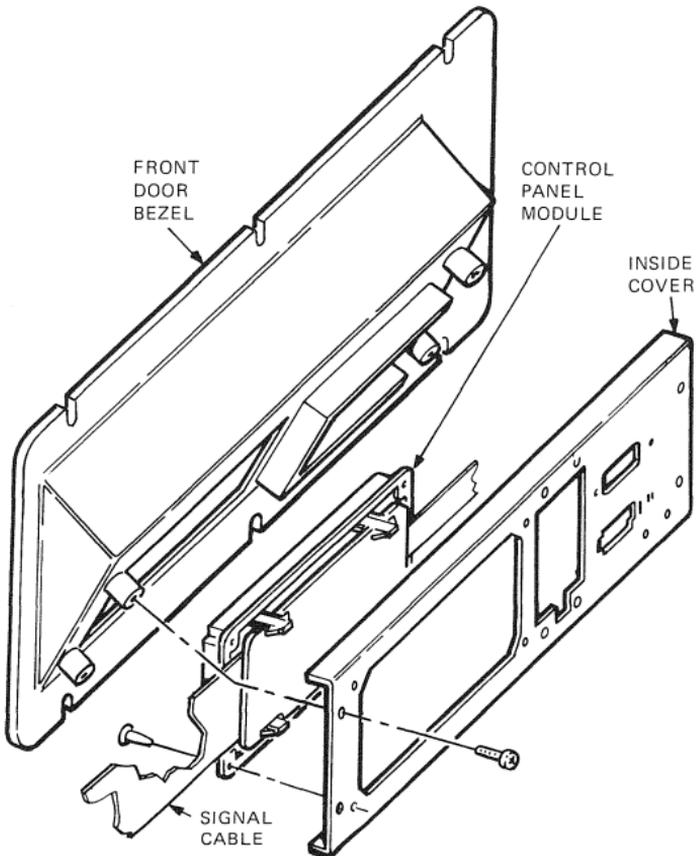
Perform Removal procedure in reverse.

Verification Check

Turn on power to transport and check for air flow from fan.

4.2.10 Control Panel Assembly

1. Turn off power switch and unplug power cord.
2. Open front door. Find ground strap and remove screw that secures strap to tape deck (point E2). Remove hex nut that secures strap to rear of door (Figure 4-16).
3. Tilt tape deck in maintenance position (Paragraph 4.2.1).
4. On formatter/control module (refer to Figure A-2) detach control panel cable connector W8P1 from P7 plug.
5. Remove cable from clips on front door and cabinet. (Cut straps if necessary.)
6. From front of transport, remove four hex screws that hold control panel to front door. Remove control panel assembly and cable.



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Figure 4-16 Control Panel Assembly

Replacement

1. Insert ground strap, W8 cable, and control panel through front door opening. Then secure panel to door with four mounting screws.
2. Attach and secure ground strap and ground wire on front door and tape deck. Connect W8P1 cable connector to P7 plug on formatter/control module. Use cable clips on back of front door to secure loose cable.
3. Power on transport.

Verification Check

1. Perform functional troubleshooting procedures 1001 through 1003.
2. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.11 Power Supply

Removal

1. Open front and rear doors. Remove frame stabilizing bar if high enough to be in the way (Figure 4-17).
2. Turn off power switch. Unplug 874 controller power cord. Tilt tape deck to maintenance position (Paragraph 4.2.1).
3. Disconnect power cable from 874 power controller and put cable aside).
4. Detach W4P4, W2P1, W7P1, and W4P5 connectors from power supply.

NOTE

Power supply weighs approximately 4.1 kg (9 lbs). Proceed with caution when you lift it.

5. Return tape deck to operating position. From rear of unit, remove stabilizing plate mounting screw (Figure 4-17).

NOTE

Power supply is attached to tape deck by four screws. Two screws on left are located in slots so you can slide power supply out from under these screws for removal.

6. Loosen but do not remove two mounting screws on left side of power supply.

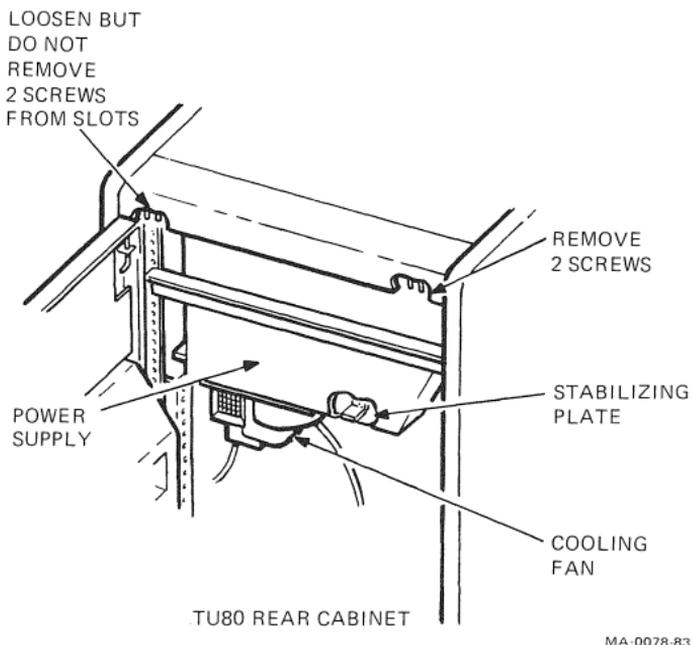


Figure 4-17 Power Supply Removal

7. Remove two mounting screws on right side of power supply while you support power supply from bottom.
8. Slide power supply out of slots on left and carefully remove power supply from cabinet.

Replacement

If your replacement power supply is PN 29-26372, you must complete the following procedure first.

1. Remove the voltage select access panel from new power supply and verify that the voltage select plug is inserted in the correct voltage receptacle. J11 is for 120 volt operation and J12 for 220-240 volt operation. Secure the voltage select access panel.
2. Check the position of the AUTO POWER ON switch. For use in a TU80, the switch should be set in the 'OFF' position.

CAUTION

If you are installing new power supply, remove top cover from power supply enclosure and observe position of voltage select card (Figure 4-18). Position of card must correspond to input voltage as defined on transport's identification plate. Ends of card are stenciled with "120 V" and "220 V" and two indicating arrows. Make sure card is installed to match input voltage.

You can lift card, turn it upside down, and replace it onto the main power supply module as required. Arrows for correct positioning are marked on module.

1. Remove top cover of power supply.
2. Make sure voltage select module (Figure 4-18) is installed in correct position. Then replace cover.
3. From rear of transport, slide power supply under two installed mounting screws.
4. Insert and tighten other two mounting screws. Then tighten two mounting screws on left.
5. Install stabilizing plate, and insert and tighten mounting screw.

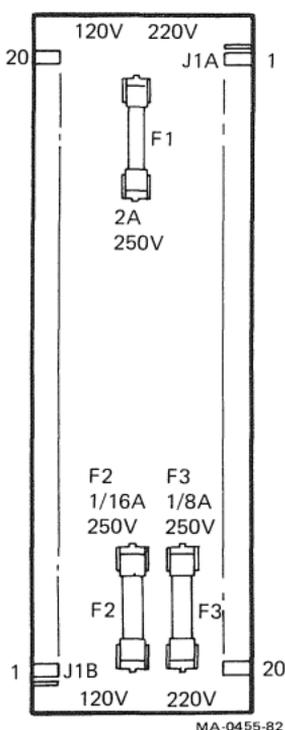


Figure 4-18 Voltage Select Card

6. Turn tape deck to maintenance position.
7. Attach W4P4, W2P1, W7P1, and W4P5 connectors to power supply plugs.
8. Connect power cable to TU80 power supply and plug 874 controller power cord into power outlet.

Verification Check

NOTE

Power Supply is provided as completely assembled FRU and does not require verification check. However, if power problem occurs, you may check dc voltages.

DC Voltage Checks – Use a digital voltmeter to measure all dc voltages. Connect meter's ground lead to either pin 4 or 6 of the W7P1 power connector on read/write/servo module (Figure 4-19). Connect other meter lead to points listed below to test all dc voltages.

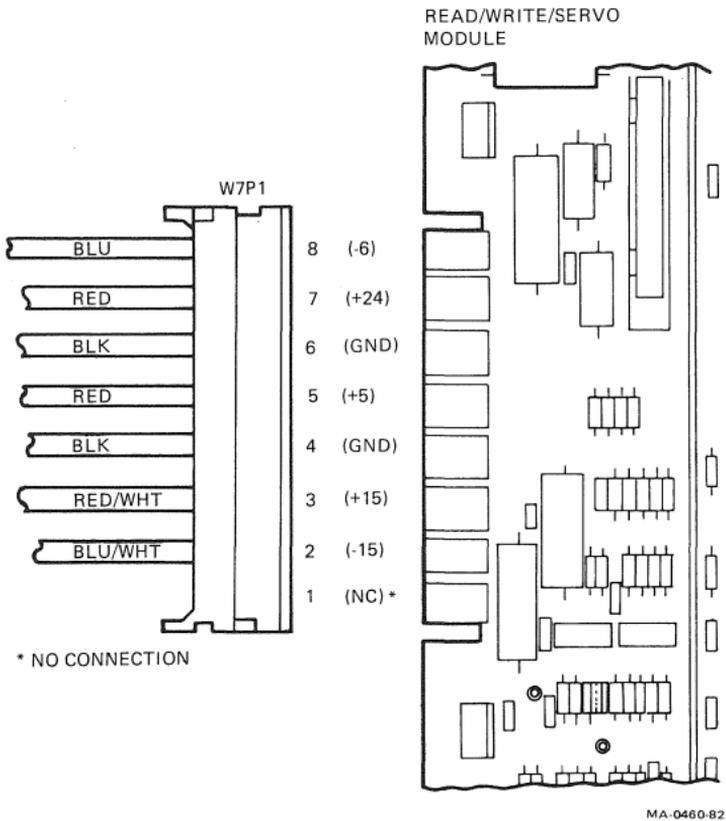


Figure 4-19 DC Voltage Checks

DC Voltages and Tolerances

Location	Voltage	Tolerance	
P1-5*	+5 V	±2%	(+4.90 to +5.10)
P1-2*	-15 V	±10%	(-13.5 to -16.5)
P1-3*	+15 V	±10%	(+13.5 to +16.5)
P1-7*	+24 V	±10%	(+21.6 to +26.4)
P1-8*	-6 V	±10%	(-5.4 to -6.6)
J4-6†	+38 V	±10%	(+34.2 to +41.8)

4.2.12 Read/Write/Servo Module

Removal

1. Turn off power switch.
2. Tilt tape deck into maintenance position (Paragraph 4.2.1).
3. Detach all cable connectors from read/write/servo board connectors (Figure A-1).
4. To release read/write/servo module, loosen thumbscrews on logic cage (Figure 4-20) as follows.
 - a. To open logic cage, loosen top and bottom thumbscrews.
 - b. To separate modules, loosen middle thumbscrews.

NOTES

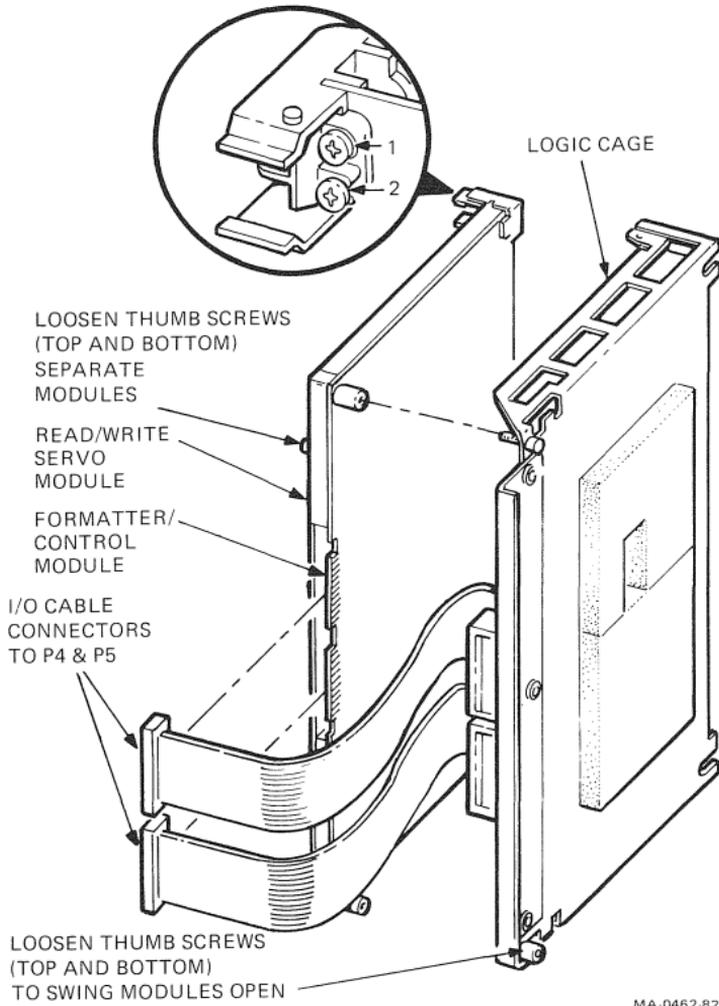
1. **Avoid undue stress on modules by loosening thumbscrews alternately until modules are separated.**
2. **There are two screws in each hinge of logic cage. The screws are never removed. They are loosened only enough to clear module they hold.**
5. Loosen and back out top screws on each hinge of logic cage (three) to release read/write/servo module (Figure 4-20).
6. Pull read/write/servo module from P1 connector and remove module from logic cage.

* P1 is power connector on read/write/servo module.

† J4 is power connector on power amplifier module.

70 REMOVAL AND REPLACEMENT

1. TOP SCREW (TOP & BOTTOM HINGES)
BACK OUT TO REMOVE READ/WRITE/
SERVO MODULE.
2. BOTTOM SCREW (TOP & BOTTOM HINGES)
BACK OUT TO REMOVE FORMATTER/
CONTROL MODULE.



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Figure 4-20 Logic Modules in Logic Cage

Replacement

NOTE

If you are installing a new logic module, remove R224 and R225 write resistors from removed module and insert these resistors into new module.

1. Install new read/write/servo module in its place in logic cage. Make sure module is fully inserted into top and bottom hinge slots.
2. Pull in and tighten hinge screws to lock read/write/servo module in position.
3. Attach cable plugs P2 and P3 from formatter/control module to J2 and J3 connectors on read/write/servo module (Figure A-1).
4. Attach remaining cable connectors to module plugs as listed below.

J1	W5P2 connector (write/erase heads)
J4	W1 cable (supply reel tension sensor)
J5	W3P8 connector (BOT/EOT sensors, cover interlock, power amplifier, tachs)
J6	W6P2 connector (read head)
J7	W9 cable (take-up reel tension sensor)

5. Push two modules together and tighten thumbscrews to secure read/write/servo module in logic cage.

Verification Checks

1. With tape threaded, but not loaded, execute Operator Diagnostic Test 02.
2. Move jumper plug at location 13E on read/write/servo module from normal W3 to test W4-STORE position.
3. With tape not threaded, execute Field Service Test 37.
4. Load known good quality write-enabled tape.
5. Execute Field Service Test 18 to move tape away from BOT. Press RESET to stop tape motion after about five seconds.
6. Execute Field Service Test 31.

7. After test is complete (display 00), return jumper plug to W3 position. Otherwise, proceed with fault isolation and required actions.
8. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.13 Formatter/Control Module

1. Turn off power switch.
2. Tilt tape deck to maintenance position (Paragraph 4.2.1).
3. Remove two screws from each I/O cable plug secured in logic cage mounting bracket. Then detach two external interface shielded cables (Figures 4-7 and 4-20).

NOTE

Tighten the screws to leave two ribbon I/O cables in slots inserted in logic cage mounting bracket.

4. Detach all remaining cable connectors (Figure A-2) from board connectors.
5. To release formatter/control module from logic cage (Figure 4-20) loosen thumbscrews on each side of cage.
 - a. To open logic rack, loosen top and bottom thumbscrews.
 - b. To separate modules, loosen middle thumbscrews.

NOTE

Avoid undue stress on modules by loosening thumbscrews alternately until modules are separated.

7. Loosen and back out (but do not remove) bottom screws on each hinge (three) to release formatter/control module.
8. Pull formatter/control module from P1 connector and remove module from logic cage.

Replacement

NOTE

Before you install formatter/control module, set all jumpers and switches to position they were set at in removed module (Figure 2-1). Set all switches (S1-S4) of four-segment DIP switch at location D21 to off. Also make sure jumpers (W5) at location E16 are in NORMAL position.

1. Install formatter/control module in top and bottom hinge slots of logic cage. Make sure module is fully inserted.
2. Pull in and tighten hinge screws (three) to lock formatter/control module in position.
3. Attach I/O ribbon cables to P5 and P4 connectors on module. Refer to Figure 2-5 for correct I/O cable interconnections.
4. Push two modules together. Then align and tighten thumbscrews.
5. Attach cable connectors to module plugs as listed below.

P1	W7 cable (power amplifier module and power supply)
P2 and P3	Cables from J2 and J3 connectors on read/write/servo module
P4 and P5	Flat I/O cables to bulkhead bracket connectors
P6	W2P1 cable connector (power supply)
P7	W8P1 cable connector (control panel)

Verification Check

1. With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

NOTE

After you successfully complete module replacement and checking, reattach and secure two external interface cables on mounting plate bracket of logic cage. Return tape deck to operating (horizontal) position.

4.2.14 Power Amplifier Module

Removal

1. Turn off power switch. Unplug power cord.
2. With tape deck in maintenance position (Paragraph 4.2.1), remove acoustic cover (Paragraph 4.2.2).
3. Detach cable connectors J1 through J4 from module (Figure A-3).
4. Remove three screws along outside edge of module to release it from mounting rack (Figure 4-8). Remove module.

Replacement

1. Insert new module into slots in mounting rack. Make sure module is in place.
2. Replace and tighten three screws to secure module in rack.
3. Reattach cable connectors as follows.

J1	B3P1 cable connector (take-up reel motor)
J2	W3P7 cable connector (read/write/servo module)
J3	B1P1 cable connector (supply reel motor)
J4	W7P2 cable connector (power supply)

Verification Check

Individually execute Operator Diagnostic Tests 03 (tape not threaded), 02 (tape threaded, but not loaded), and 01 (tape threaded, but not loaded).

NOTE

After you successfully complete module replacement and checking, replace protective acoustic cover and return tape deck to operating (horizontal) position.

4.2.15 Top Cover Interlock Switch

Removal

1. With tape deck in maintenance position (Figure 4-21), remove four labeled slip-on connectors from interlock switch connectors. (If any wires are not labeled, identify and mark each wire for proper reattachment.)
2. Remove two mounting screws that secure switch plate to tape deck. Remove switch and switch plate.
3. Press top and bottom release tabs on switch to separate switch from switch plate.

Replacement

1. Assemble switch to switch plate.
2. Position switch assembly on rear of tape deck so connector numbers on switch correspond to numbers on tape deck.
3. Insert two hex mounting screws. Position top cover door so interlock switch can be aligned with actuating stud on door. Tighten switch mounting screws when center of switch front is aligned with actuating stud.
4. Attach slip-on connectors to appropriate studs of interlock switch (Figure 4-21).

Verification Check

With tape threaded, but not loaded, execute Operator Diagnostic Test 01.

4.2.16 Capacitor Assembly

Removal

1. Tilt protective tape deck to maintenance position and remove acoustic cover.
2. Detach capacitor connector from J5 on power amplifier module.

NOTE

Do not remove protective terminal caps on top of capacitor during removal or replacement procedures.

3. Remove three screws from capacitor mounting assembly. Remove capacitor assembly.

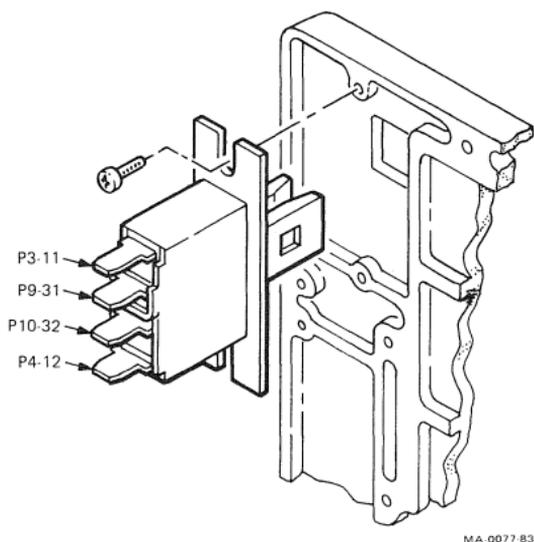


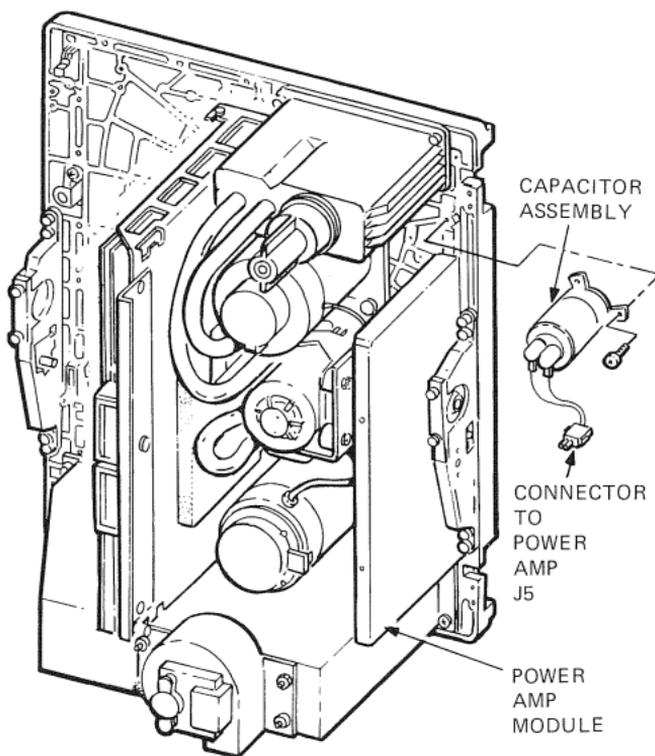
Figure 4-21 Door Interlock Switch (Maintenance View)

Replacement

1. Mount replacement capacitor assembly as shown in Figure 4-22 and install three screws. Tighten securely.
2. Install capacitor connector to J5 on power amplifier module.

Verification Check

Thread tape (not loaded) and run Operator Diagnostic Tests 01 and 02.



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Figure 4-22 Capacitor Assembly

A MODULE LAYOUTS

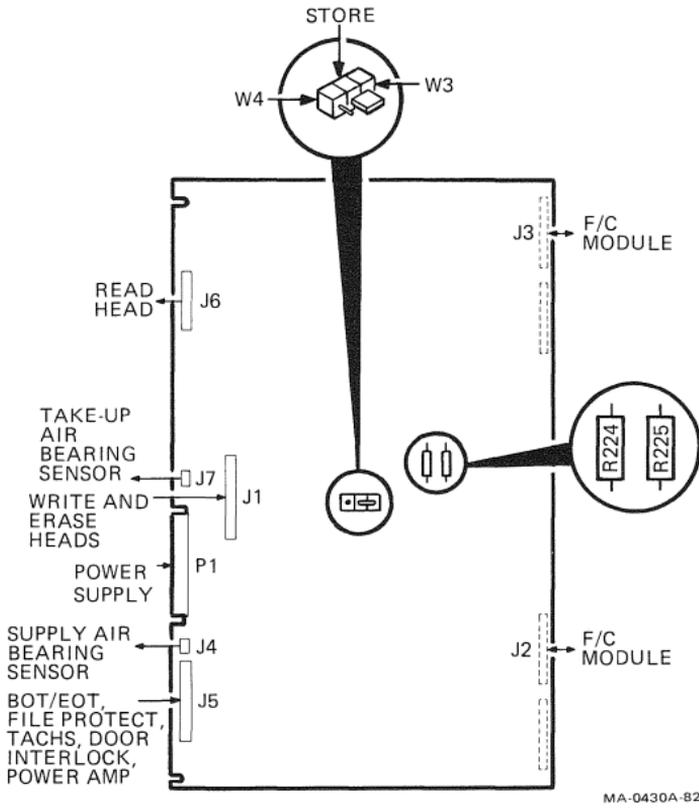


Figure A-1 Read/Write/Servo Module Layout

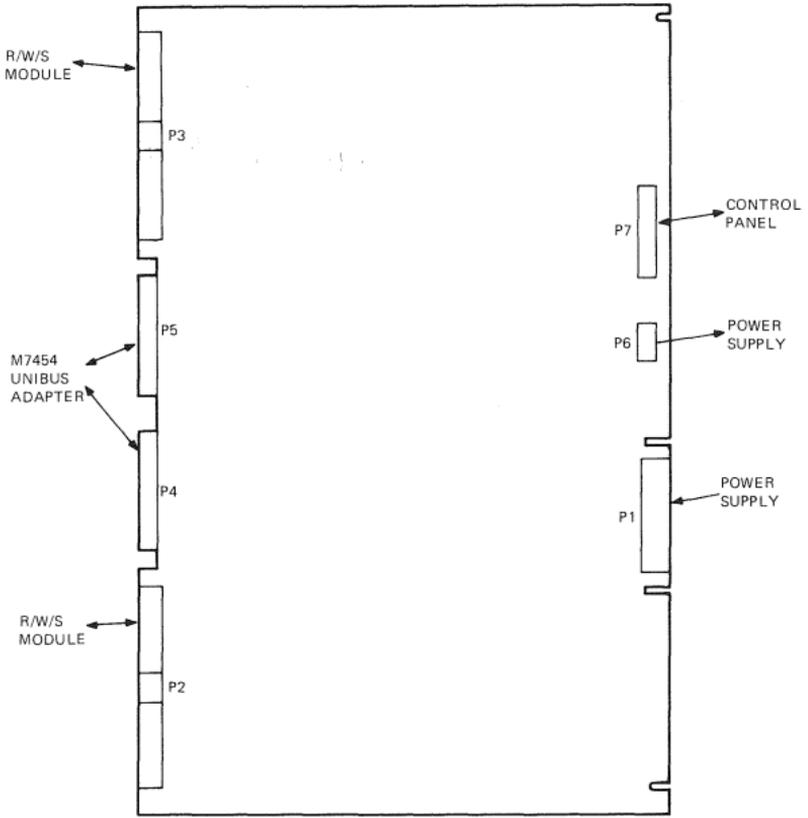


Figure A-2 Formatter/Control Module

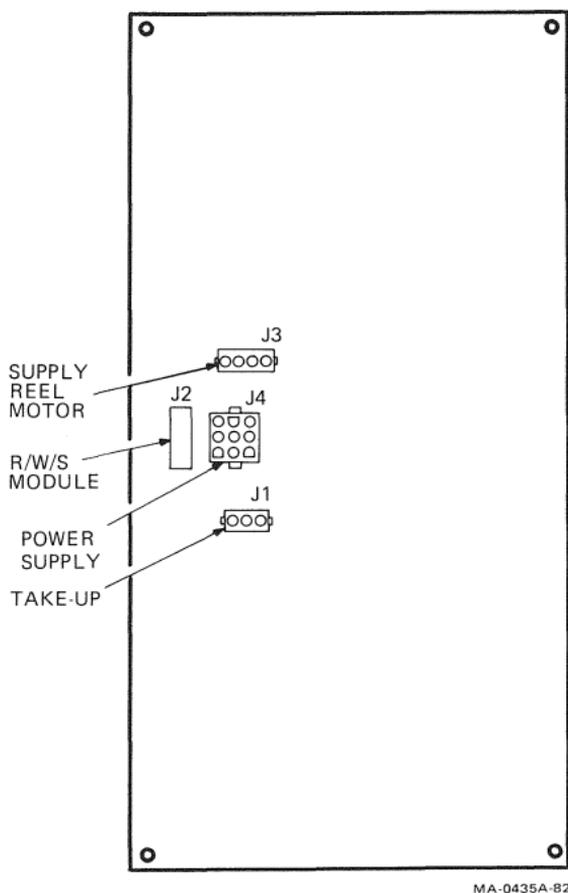


Figure A-3 Power Amplifier Module

B TU80 REGISTERS

REGISTER	BITS															
	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
TSBA (R/O)	A15	A14	A13	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03	A02	A01	A00
TSDB (W/O)	P15	P14	P13	P12	P11	P10	P09	P08	P07	P06	P05	P04	P03	P02	P17	P16
TSSR	SC			RMR	NXM	NBA	A17	A16	SSP	OFL			TC2	TC1	TC0	
	S			S	4/5	S	S	S	S	S			S	S	S	
RBPCR	C15	C14	C13	C12	C11	C10	C09	C08	C07	C06	C05	C04	C03	C02	C01	C00
XST0	TMK	RLS	LET	RLL	WLE	NEF	ILC	ILA	MOT	ONL	IE	VCK	PED	WLK	BOT	EOT
	S/2	2	2	2	3/6	3	3	3	S	S/1/3	S	S/3	S	S/3/6	S/2/3	S/2
XST1	DLT		COR					RPE			IPO				UNC	MTE
	4		S					4			S/4				4	4
XST2	OPM				TU80	WCF		DTP	DT7	DT6	DT5	DT4	DT3	DT2	DT1	DT0
	S					7		S	S	S	S	S	S	S	S	S
XST3	TRANSPORT ERROR CODE									OPI	REV		DCK			RIB
	7	7	7	7	7	7	7	7		6	S		S/6			2

Termination Class Codes:

- 0 = Normal Termination
- 1 = Attention Condition
- 2 = Tape Status Alert
- 3 = Function Reject
- 4 = Recoverable Error - Tape Position = One record down tape from start of function
- 5 = Recoverable Error - Tape not removed
- 6 = Unrecoverable Error - Tape position lost
- 7 = Fatal Controller Error

Fatal Class (FC) Codes (in TSSR): (NOT USED)

NON-TERMINATION CLASS CODE: S= STATUS

Figure B-1 TU80 Register Summary

BUS ADDRESS REGISTER (TSBA)

UNIBUS ADDRESS + 0 BUS ADDRESS – (READ ONLY) – TSBA

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
A15	A14	A13	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03	A02	A01	A00
S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

BIT	NAME		DEFINITION
15	A15	100000	BUS ADDRESS BIT 15
14	A14	40000	BUS ADDRESS BIT 14
13	A13	20000	BUS ADDRESS BIT 13
12	A12	10000	BUS ADDRESS BIT 12
11	A11	4000	BUS ADDRESS BIT 11
10	A10	2000	BUS ADDRESS BIT 10
09	A09	1000	BUS ADDRESS BIT 09
08	A08	400	BUS ADDRESS BIT 08
07	A07	200	BUS ADDRESS BIT 07
06	A06	100	BUS ADDRESS BIT 06
05	A05	40	BUS ADDRESS BIT 05
04	A04	20	BUS ADDRESS BIT 04
03	A03	10	BUS ADDRESS BIT 03
02	A02	4	BUS ADDRESS BIT 02
01	A01	2	BUS ADDRESS BIT 01
00	A00	1	BUS ADDRESS BIT 00

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Figure B-2 Bus Address Register

DATA BUFFER REGISTER (TSDB)

UNIBUS ADDRESS + 0 – DATA BUFFER – (WRITE ONLY) – TSDB

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
P15	P14	P13	P12	P11	P10	P09	P08	P07	P06	P05	P04	P03	P02	P17	P16

BIT	NAME		DEFINITION
15	P15	100000	COMMAND POINTER BIT 15
14	P14	40000	COMMAND POINTER BIT 14
13	P13	20000	COMMAND POINTER BIT 13
12	P12	10000	COMMAND POINTER BIT 12
11	P11	4000	COMMAND POINTER BIT 11
10	P10	2000	COMMAND POINTER BIT 10
09	P09	1000	COMMAND POINTER BIT 09
08	P08	400	COMMAND POINTER BIT 08
07	P07	200	COMMAND POINTER BIT 07
06	P06	100	COMMAND POINTER BIT 06
05	P05	40	COMMAND POINTER BIT 05
04	P04	20	COMMAND POINTER BIT 04
03	P03	10	COMMAND POINTER BIT 03
02	P02	4	COMMAND POINTER BIT 02
01	P17	2	COMMAND POINTER BIT 17
00	P16	1	COMMAND POINTER BIT 16

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Figure B-3 Data Buffer Register

STATUS REGISTER (TSSR)

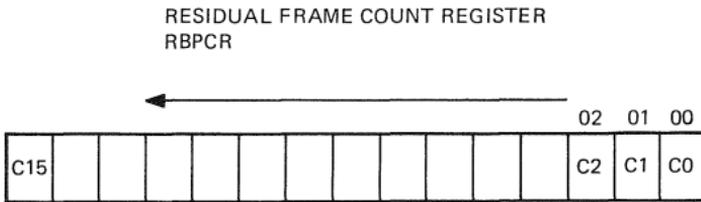
(UNIBUS ADDRESS + 2 – READ ONLY)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
SC			RMR	NXM	NEA	A17	A16	SSR	OFL			TC2	TC1	TC0	
S			S	4,5	S	S	S	S	S			S	S	S	

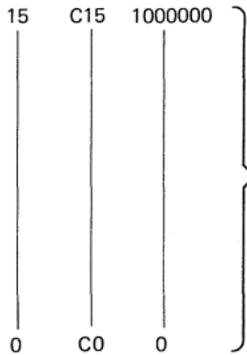
SC	100000	SPECIAL CONDITION
---	40000	NA
---	20000	NA
RMR	10000	REGISTER MODIFICATION REFUSED
NXM	4000	NON-EXISTENT MEMORY
NBA	2000	NEED BUFFER ADDRESS
A17	1000	UNIBUS ADDRESS BIT 17
A16	400	UNIBUS ADDRESS BIT 16
SSR	200	SUBSYSTEM READY
OFL	100	OFF-LINE
---	40	NA
---	20	NA
TC2	10	TERMINATION CLASS BIT 02
TC1	4	TERMINATION CLASS BIT 01
TC0	2	TERMINATION CLASS BIT 00
NA	1	NA

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Figure B-4 Status Register



BIT NAME



THIS WORD WILL CONTAIN THE OCTAL COUNT OF RESIDUAL BYTES/RECORDS/ TAPE MARKS FOR THE READ, SPACE RECORDS, AND SKIP TAPE MARK COMMANDS. THE CONTENTS ARE MEANINGLESS FOR ALL OTHER COMMANDS.

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Figure B-5 Residual Byte Count Register

EXTENDED STATUS REGISTER 0 (XSTAT 0)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
TMK	RLS	LET	RLL	WLE	NEF	ILC	ILA	MOT	ONL	IE	VCK	PED	WLK	BOT	EOT
S,2	2	2	2	3,6	3	3	3	S	S,1,3	S	S,3	S	S,3,6	S,2,3	S,2

TMK	100000	TAPE MARK (READ-SPACE/WRITE-SKIP/OTHER)
RLS	40000	RECORD LENGTH SHORT
LET	20000	LOGICAL END OF TAPE
RLL	10000	RECORD LENGTH LONG
WLE	4000	WRITE LOCK ERROR
NEF	2000	NON-EXECUTABLE FUNCTION
ILC	1000	ILLEGAL COMMAND
ILA	400	ILLEGAL ADDRESS
MOT	200	CAPSTAN MOVING
ONL	100	ON-LINE
IE	40	INTERRUPT ENABLE
VCK	20	VOLUME CHECK
PED	10	PE DRIVE
WLK	4	WRITE LOCK
BOT	2	BEGINNING OF TAPE
EOT	1	END OF TAPE

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Figure B-6 Extended Status Register 0

EXTENDED STATUS REGISTER 1 (XSTAT 1)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
DLT		COR					RPE			IPO				UNC	MTE
4		S,4								S,4				4	4

DLT	100000	DATA LATE ERROR
NA	40000	NA
COR	20000	CORRECTABLE DATA
NA	10000	NA
NA	4000	NA
NA	2000	NA
NA	1000	NA
RPE	400	READ BUS PARITY ERROR
NA	200	NA
NA	100	NA
IPO	40	INVALID POSTAMBLE
NA	20	NA
NA	10	NA
NA	4	NA
UNC	2	UNCORRECTABLE DATA *
MTE	1	MULTITRACK ERROR

*UNCORRECTABLE DATA WILL BE FLAGGED ON A WRITE ERROR.

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Figure B-7 Extended Status Register 1

EXTENDED STATUS REGISTER 2 (XSTAT2)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
OPM				TU	WCF		DTP	DT7	DT6	DT5	DT4	DT3	DT2	DT1	DT0
S				80	7		S	S	S	S	S	S	S	S	S

OPM	100000	OPERATION IN PROGRESS (TAPE MOVING)
----	40000	NA
----	20000	NA
----	10000	NA
TU80	4000	TU80
WCF	2000	WRITE CLOCK FAILURE
----	1000	NA
DTP	400	DEAD TRACK INDICATORS FOR TRACKS
DT7	200	
DT6	100	
DT5	40	
DT4	20	
DT3	10	
DT2	4	
DT1	2	
DT0	1	DEAD TRACK INDICATORS FOR TRACKS

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Figure B-8 Extended Status Register 2

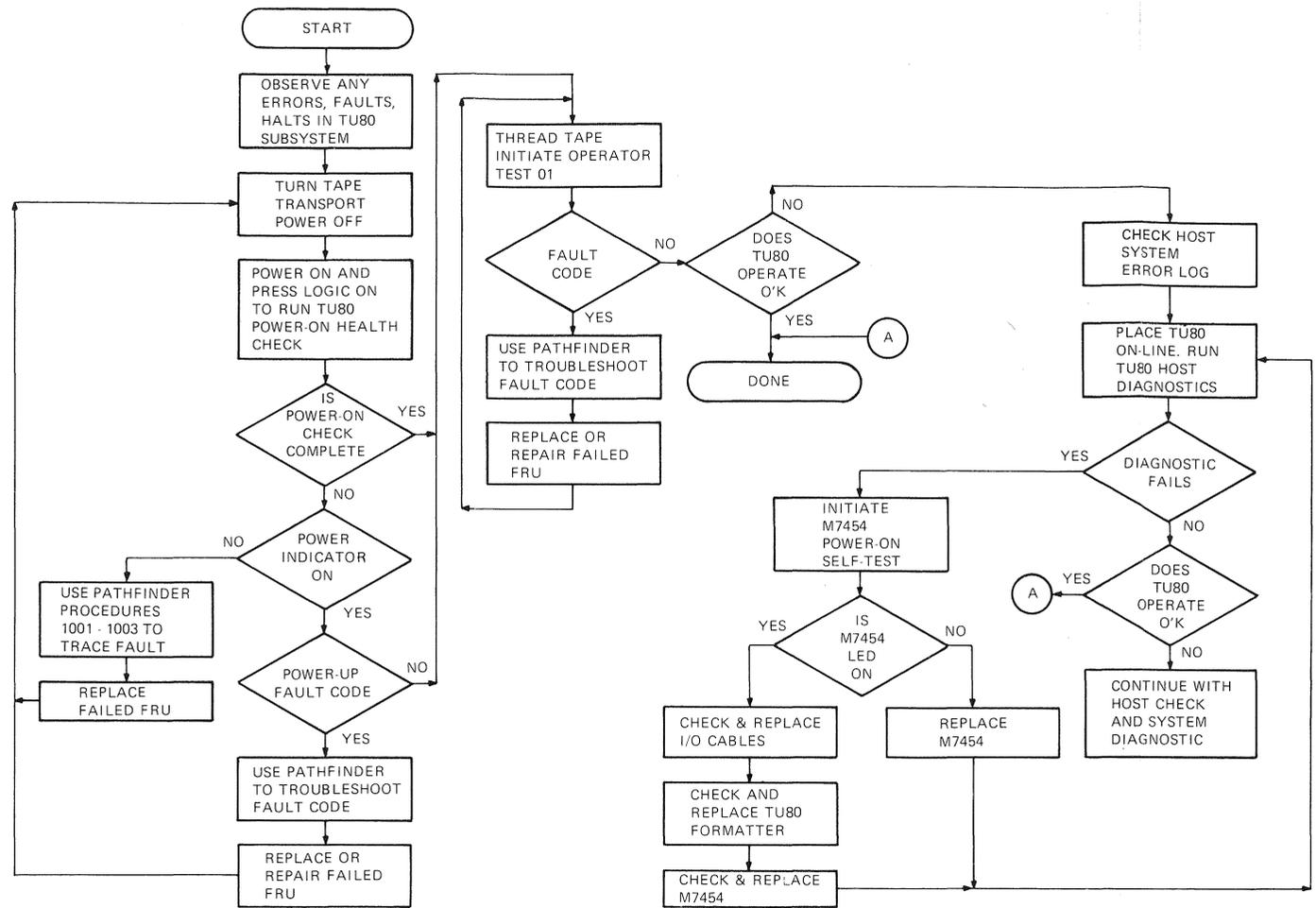
EXTENDED STATUS REGISTER 3 (XSTAT3)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
TRANSPORT ERROR CODE									OPI	REV		DCK			RIB
7	7	7	7	7	7	7	7		6	S		S,6			2

----	100000	NA
----	40000	NA
----	20000	NA
----	10000	NA
----	4000	NA
----	2000	NA
----	1000	NA
----	400	NA
----	200	NA
OPI	100	OPERATION INCOMPLETE
REV	40	TAPE MOTION REVERSE: IF MULTIPLE RETRY AT LEAST 1 WAS REVERSE
----	20	NA
DCK	10	DENSITY CHECK
----	4	NA
----	2	NA
RIB	1	REVERSE INTO BOT

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Figure B-9 Extended Status Register 3



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Troubleshooting Flowchart