

EK-0TU80-SV-004

# TU80 Pathfinder

Prepared by Educational Services  
of  
Digital Equipment Corporation

## RECORD OF REVISIONS

<u>REVISION</u>	<u>COMMENTS</u>
A (2-16-83)	Manual Released. This manual is current with series code 10
B (7-29-83)	This manual is updated to include editorial changes to concur with series code 11 affecting the following pages: v, vi, viii, ix, 1-7, 1-9, 2-3 thru 2-6, 2-12, 2-15, 2-16, 2-18, 2-21, 2-22, 2-24, 5-3, 5-64, 5-65, A-3.
C (10-31-83)	Manual content is current with series code 12 and 13. This manual is updated to include editorial changes affecting pages: iii/iv, 1-9, 1-11, 2-2, 2-4 thru 2-9, 2-12, 2-15 thru 2-18, 3-2, 3-3, 3-4, 3-8, 5-2A/5-2B, 5-62, 5-63, 5-65, A-2, A-3, A-9.
D (6-15-84)	Manual content is current with serial code 14 and includes ECO's 51188, 51287. This manual is updated to include editorial changes affecting pages: 2-25, 3-5, 4-31, 5-16, 5-20, 5-35, 5-55, 5-56, 5-57, B-1.

Pub. No. 49762100 (CPI)  
Pub. No. EK-OTU80-TM (DEC)

1st Edition, March 1983  
2nd Edition, February 1984  
3rd Edition, March 1984  
4th Edition, July 1984

Copyright © 1984 by Digital Equipment Corporation.  
All Rights Reserved.  
Printed in U.S.A.

The reproduction of this material, in part or whole, is strictly prohibited. For copy information, contact the Educational Services Department, Digital Equipment Corporation, Maynard, Massachusetts 01754.

The information in this document is subject to change without notice. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The following are trademarks of Digital Equipment Corporation, Maynard, Massachusetts.

<b>digital</b>	DECwriter	P/OS	UNIBUS
DEC	DIGITAL	Professional	VAX
DECmate	LA	Rainbow	VMS
DECnet	MASSBUS	RSTS	VT
DECUS	PDP	RSX	Work Processor

## PREFACE

This manual contains information for troubleshooting the TU80 Subsystem Tape Transport. The maintenance philosophy in this manual is directed to a "module replacement" concept; i.e., defective Printed Circuit Modules are replaced rather than repaired. Persons responsible for maintenance of the TU80 should be familiar with the basic functions of all modules.

### RELATED PUBLICATIONS

TU80 Subsystem Users Guide, EK-OTU80-UG  
TU80 Technical Description/Service Manual, EK-OTU80-TM  
TU80 Illustrated Parts Manual, EK-OTU80-IP  
TU80 Pocket Service Guide, EK-OTU80-PS

## TABLE OF CONTENTS

<u>PARAGRAPH</u>	<u>TITLE</u>	<u>PAGE</u>
Section 1 - TROUBLESHOOTING		
1.1	GENERAL DESCRIPTION	1-1
1.2	FIELD SERVICE PROCEDURES	1-2
1.2.1	Pre-Site	1-2
1.2.2	Corrective Action Matrices	1-2
1.2.3	On-Site	1-9
1.3	DIAGNOSTIC TESTS	1-10
1.3.1	Operator Diagnostics	1-10
1.3.2	Operator Diagnostic Procedures	1-11
1.3.3	Field Service Functional Diagnostics	1-12
1.3.4	Field Service Functional Diagnostic Procedures	1-12
1.3.5	Sub-Fault Codes	1-13
1.4	FAULT CODE TROUBLESHOOTING PROCEDURES	1-14
Section 2 - FIELD SERVICE FUNCTIONAL DIAGNOSTIC TEST DESCRIPTIONS		
2.1	SCOPE	2-1
Section 3 - TU80 FAULT AND SUB-FAULT DESCRIPTIONS		
3.1	TU80 FAULT AND SUB-FAULT DESCRIPTIONS	3-1

## LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>	<u>PAGE</u>
1-1	MALFUNCTION MATRIX	1-3
1-2	FAULT CODE MATRIX (OPERATOR TEST 01)	1-4/1-5
1-3	TERMINATION CODES FOLLOWING FAULT CODE 22	1-6
1-4	TERMINATION CODES FOLLOWING FAULT CODE 24	1-6
1-5	TERMINATION CODES FOLLOWING FAULT CODE 26	1-7
1-6	TERMINATION CODES FOLLOWING FAULT CODE 30, 31 OR 36	1-7
1-7	TERMINATION CODES FOLLOWING FAULT CODE 04 OR 06	1-8
1-8	TERMINATION CODES FOLLOWING FAULT CODE 26 OR 32	1-8

LIST OF FIGURES

<u>FIGURE</u>	<u>TITLE</u>	<u>PAGE</u>
1-1	EXAMPLE OF FAULT CODE TROUBLESHOOTING PROCEDURE	1-14

## Section 1 - TROUBLESHOOTING

---

### 1.1 GENERAL DESCRIPTION

This manual contains Field Service Diagnostic Test Procedures, Fault Code Troubleshooting Procedures, and Field Service Functional Diagnostic Test Descriptions.

#### NOTES

1. The procedures contained in this section of the manual are intended for use by qualified field service personnel familiar with the operation of the TU80 Tape Transport. Under no circumstances should these procedures be performed by persons other than fully qualified field service personnel.
2. The operator diagnostic procedures referenced in this section of the manual are expanded for maintenance personnel use. Diagnostics for use by the operator are contained in the OPERATOR DIAGNOSTICS section of the TU80 Subsystem User Guide.

The diagnostic tests designed into the transport are an off-line function initiated through the operator control panel. The host controller is capable of monitoring transport status through the Status Transfer command. A Channel Loopback command is also provided to exercise the formatter logic of the transport.

The TU80 microprocessor-based control system tests for many operational fault conditions while operating on-line. These conditions are indicated as fault codes, appearing on the control panel display. The fault condition is indicated by illumination of the RESET indicator and the appropriate fault code being displayed. Faults, which occur while tape is loaded, may initiate a controlled removal by the microprocessor of servo and write circuitry power to prevent tape damage.

## 1.2 FIELD SERVICE PROCEDURES

Failure analysis procedures by a Field Service Representative consist of a pre-site determination of the reported problem, and an on-site procedure to isolate and correct verified faults.

### 1.2.1 Pre-Site

When the trouble call is received from the site, the Field Service Representative should proceed as follows:

1. Consult Tables 1-1 and 1-2, Corrective Action Matrices, to determine if operator action is required. Specific TU80 malfunctions or fault codes indicate the need for operator action in the form of visual checks, cleaning, or performing Operator Diagnostic Test #01. It should also be verified that Operator Diagnostic Test #01 has been performed after the operator corrective actions have been completed.
2. After verifying that the fault still occurs following completion of all operator actions, consult Table 1-1 or Table 1-2 for a list of assemblies related to the reported malfunction or fault code. As many of these assemblies, as are available, should be taken to the site to prevent unnecessary call-backs.

### 1.2.2 Corrective Action Matrices

The Malfunction and Fault Code Matrices (Tables 1-1 and 1-2) list all malfunctions or fault codes and possible assemblies which may cause the fault condition. The purpose of these tables is to provide a list of related assemblies prior to reporting to the customer site. Assemblies listed under the individual malfunction or fault codes are arranged in a "most probable fault" order. In addition to the assemblies listed, the tables may direct field service personnel to request the operator to perform Diagnostic Test #02 or Test #03.

Test #02 is required if Fault Codes 22, 24, 26, 30, 31 or 36 terminate Operator Diagnostic Test #01. Tables 1-3 thru 1-6 list possible failing assemblies for fault codes which terminate Diagnostic Test #02.

Test #03 is required if Fault Codes 04, 06, 22, 25, 26, 30, 31, 32, 33, 35, 36, 48 or 52 terminate Operator Diagnostic Test #01. Tables 1-7 and 1-8 list possible failing assemblies for fault codes which terminate Diagnostic Test #03.

Also contained on the matrices in Table 1-1 and 1-2 are those actions (A, B, C) which should be performed by the operator. These actions should be verified prior to any on-site call by field service.



Table 1-1. MALFUNCTION MATRIX

MALFUNCTION	FOLLOWING THE DEPRESSION OF POWER SWITCH (CIRCUIT BREAKER) TO THE '1' POSITION, THE "LOGIC OFF" LED DOES NOT ILLUMINATE.										
	FOLLOWING THE DEPRESSION OF THE "LOGIC ON" SWITCH, THE "LOGIC ON" LED DOES NOT ILLUMINATE.										
CORRECTIVE ACTION	TU80 DISPLAYS 00 ON POWER UP.										
	TU80 POWERS DOWN WHILE IN USE.										
OPERATOR PANEL SWITCH DOES NOT OPERATE.											
TU80 OPERATES WITH OPERATOR DOOR OPEN.											
FILE PROT. LED DOES NOT ILLUMINATE WHEN A WRITE PROTECTED TAPE IS LOADED.											
TAKE UP REEL DOES NOT TURN FREELY.											
SUPPLY REEL DOES NOT TURN FREELY.											
SUPPLY REEL HUB CANNOT BE LATCHED.											
EXCESSIVE PNEUMATIC NOISE.											
ENSURE TU80 IS PLUGGED INTO A LIVE SUPPLY	A										
ENSURE OPERATION IS LEGAL				A							
CHANGE TAPE									A		
READ/WRITE/SERVO		4		3		2	2				
FORMATTER/CONTROL		5	1		2		5				
POWER SUPPLY	1	1	2	1							
POWER AMPLIFIER		3		2							
OPERATOR PANEL	3	2			1		3				
PNEUMATIC PUMP											1
PRESSURE REGULATOR											2
SUPPLY MOTOR/TACH				5				1			
SUPPLY HUB						4		2	1		
TAKE-UP MOTOR/TACH				4				1			
TAKE UP HUB								2			
TOP COVER SWITCH						1					
FILE PROTECT SENSOR								1			
COOLING FAN	2										



Table 1-2. FAULT CODE MATRIX (Cont'd)

FAULT CODE FAILING ASSEMBLY	3 0	3 1	3 2	3 3	3 4	3 5	3 6	3 7	3 8	3 9	4 0	4 1	4 2	4 3	4 4	4 5	4 6	4 7	4 8	4 9	5 0	5 1	5 2	5 3	5 4	5 5	5 6	5 7	5 8	5 9	6 0	6 1					
Test Successful																																					
Clean Hub Pads																																					
Thread Tape Correctly																																					
Clean Head/Tape Path and Hub Pads	A	A																																			
Change Tape																																					
Close Top Cover																																					
Run Test #02 (See NOTE)	X	X																																			
Run Test #03 (See NOTE)	X	X	X	X			X	X												X																	
Read/Write/Servo	1	1	2	1	1	1	1												1	1		1	1	2	1	1	1	1	1								
Formatter/Control																						2														2	
Power Supply																																					
Power Amplifier	2	2	1								2																										
Control Panel																																				1	1
Pneumatic Pump	4	4	4								4																										
Filter	5	5	5								5																										
Supply Air Bearing	7	7									7																										
Take-Up Air Bearing	8	8									8																										
Head (Amplitude Error)																																					
Head (Data Reliability)																																					2
Supply Motor/Tach																																					2
Supply Hub																																					3
Take-Up Motor/Tach	3	3	3	2							2	3																									1
EOT/BOT Sensor	9	9																																			
Top Cover Switch																																					
File Protect Sensor																																					
Pressure Regulator	6	6	6								6																										

NOTE: Tests 02 and 03 should not be used unless Test 01 directs their use. Test 02 will fail if run Stand-alone.

1.2.2.1 Test #02 Follow-Up - Table 1-3 is referenced if, after running Operator Diagnostic Test #01, Fault Code 22 appears on the display. Referencing Table 1-2, Test #02 is required if operator actions A, B and C did not resolve the problem. If Test #02 is unsuccessful, the fault code displayed is referenced to this table for probable failing assemblies.

Table 1-3. TERMINATION CODES FOLLOWING FAULT CODE 22 AND DIAGNOSTIC TEST 02

TERMINATION CODE FAILING ASSEMBLY	7 1	7 2	7 3	7 4	7 5	8 0	8 1	8 2	8 3	8 4	8 5	8 6	8 7	8 8	8 9	9 0	9 1	9 2	9 7	9 8	9 0	
Ensure Tape is Thd'd	A																					
Repeat Test	B																					A
Read/Write/Servo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Power Amplifier		2	2	2	2	2	2	2	2		2	2	2	2	2	2	2		2	2	2	2
Pneumatic Pump																						
Filter																						
Supply Air Bearing																						
Take-Up Air Bearing																						
Supply Motor/Tach																					1	
Supply Hub		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Take-Up Motor/Tach		4	4	4	4	4	4	4	4	2	4	4	4	4	4	4	4		4	4	4	4
Pressure Regulator																						

Table 1-4 is referenced if, after running Operator Diagnostic Test #01, Fault Code 24 appears on the display. Referencing Table 1-2, Test #02 is required. If Test #02 is unsuccessful, the fault code displayed is referenced to this table for probable failing assemblies.

Table 1-4. TERMINATION CODES FOLLOWING FAULT CODE 24 AND DIAGNOSTIC TEST 02

TERMINATION CODE FAILING ASSEMBLY	7 1	7 2	7 3	7 4	7 5	8 0	8 1	8 2	8 3	8 4	8 5	8 6	8 7	8 8	8 9	9 0	9 1	9 2	9 7	9 8	9 0	
Ensure Tape is Thd'd	A																					
Repeat Test	B																					A
Read/Write/Servo	1	1	3	1	3	1			1	1	1	1	1	1	1	1	1	3	1	3	1	1
Power Amplifier		2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pneumatic Pump																						
Filter																						
Supply Air Bearing																						
Take-Up Air Bearing																						
Supply Motor/Tach			1		1														1		1	
Supply Hub																						
Take-Up Motor/Tach																						
Pressure Regulator																						

Table 1-5 is referenced if, after running Operator Diagnostic Test #01, Fault Code 26 appears on the display. Referencing Table 1-2, Test #02 is required. If Test #02 is unsuccessful, the fault code displayed is referenced to this table for probable failing assemblies.

Table 1-5. TERMINATION CODES FOLLOWING FAULT CODE 26 AND DIAGNOSTIC TEST 02

TERMINATION CODE	7	7	7	7	7	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	0
FAILING ASSEMBLY	1	2	3	4	5	0	1	2	3	4	5	6	7	9	0	1	2	7	8	9	0
Ensure Tape is Thd'd	A																				
Repeat Test	B																				A
Read/Write/Servo	1	1	1	1	1	1	3	3	1	2	1	1	1	1	1	1	1	1	1	1	1
Power Amplifier							1	1													1
Pneumatic Pump																					
Filter																					
Supply Air Bearing																					
Take-Up Air Bearing																					
Supply Motor/Tach							2														
Supply Hub																					
Take-Up Motor/Tach		2	2	2	2	2		2	2	1	2	2	2	2	2	2	2	2	2	2	2
Pressure Regulator																					2

Table 1-6 is referenced if, after running Operator Diagnostic Test #01, Fault Code 30, 31 or 36 appears on the display. Referencing Table 1-2, Test #02 is required if operator action "A" did not resolve the problem. If Test #02 is unsuccessful, the fault code displayed is referenced to this table for probable failing assemblies.

Table 1-6. TERMINATION CODES FOLLOWING FAULT CODES 30, 31 OR 36 AND DIAGNOSTIC TEST 02

TERMINATION CODE	7	7	7	7	7	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	0
FAILING ASSEMBLY	1	2	3	4	5	0	1	2	3	4	6	7	9	0	1	2	7	8	9	0	
Ensure Tape is Thd'd	A																				
Repeat Test	B																				A
Read/Write/Servo	1		2		2	3	3	3	3	2	3	3			3			3	3	3	3
Power Amplifier						1	1	1	1		1	1						1	1	1	1
Pneumatic Pump		3	4	3	4											2	2				
Filter		2		2													1				
Supply Air Bearing				1	1								1								
Take-Up Air Bearing		1	1											1							
Supply Motor/Tach																					
Supply Hub																					
Take-Up Motor/Tach						2	2	2	2	1	2	2						2	2	2	2
Pressure Regulator		4	3	4	3											1	3				

1.2.2.2 Test #03 Follow-Up - Table 1-7 is referenced if, after executing Operator Diagnostic Test #01, Fault Code 04 or 06 appears on the display. Referencing Table 1-2, Test #03 is required if operator actions A or B did not resolve the problem. If Test #03 is unsuccessful, the fault code displayed is referenced to this table for probable failing assemblies.

Table 1-7. TERMINATION CODES FOLLOWING FAULT CODES 04 OR 06 AND DIAGNOSTIC TEST 03

TERMINATION CODE FAILING ASSEMBLY	8	8	9	9	9	9	0
	2	4	4	5	6	8	0
Ensure Tape is Not Thd'd			A				
Repeat Test			B	A			A
Read/Write/Servo		2	1	1	2	1	1
Formatter Control				2			2
Power Amplifier	1						
Read/Write Head							3
Take-Up Motor/Tach		1			1	2	
Pneumatic Pump							
Filter							
Pressure Regulator							

NOTE: Termination Codes 85 thru 93 are not applicable.

Table 1-8 is referenced if, after executing Operator Diagnostic Test #01, Fault Code 26 or 32 appears on the display. Referencing Table 1-2, Test #03 is required. If Test #03 is unsuccessful, the fault code is referenced to this table for probable failing assemblies.

Table 1-8. TERMINATION CODES FOLLOWING FAULT CODE 26 OR 32 AND DIAGNOSTIC TEST 03

TERMINATION CODE FAILING ASSEMBLY	8	8	9	9	9	9	0
	1	4	4	5	6	8	0
Ensure Tape is Not Thd'd			A				
Repeat Test			B	A			A
Read/Write/Servo			1	1	2	2	1
Formatter/Control				2			
Power Amplifier	1						2
Read-Write Head							
Take-Up Motor/Tach		1			1	1	3
Pneumatic Pump							4
Filter							6
Pressure Regulator							

NOTE: Termination Codes 85 thru 93 are not applicable.

### 1.2.3 On-Site

Prior to initiating any diagnostic test, a thorough visual inspection of the transport should be performed. Inspection of the head recording surface, cleaner blades, write enable reflective ring, hub assemblies, and proper seating of electrical connectors is always the first step in an organized troubleshooting procedure.

After the visual inspection, a functional check of the transport should be performed as follows:

1. Perform Functional Troubleshooting Procedure 1001. This procedure checks out the functional operation of the transport, including ancillary sensors, which the microprocessor cannot fault detect, without manual operation and visual feedback.
2. Refer to the individual troubleshooting procedures for specific fault codes.
3. Perform any corrective action as directed by the troubleshooting procedures.
4. Verify operation of the transport by again performing Operator Diagnostic Test #01 or other verification tests, as directed by the troubleshooting procedure.

### 1.3 DIAGNOSTIC TESTS

The maintenance philosophy for trouble analysis of the TU80 is to minimize the time it takes to restore the TU80 to an on-line status, after a reported fault condition occurs. This is accomplished by providing two types of diagnostics:

1. Operator Diagnostic Tests which are initiated prior to reporting the fault condition.
2. Field Service tests to be performed by maintenance personnel when they report to the site for corrective action.

### 1.3.1 Operator Diagnostics

The operator diagnostics are a series of functional tests which direct the operator's actions after a fault code appears. Operator tests, procedures and a fault code/corrective action table are contained in the TU80 Subsystem User Guide. The fault code may indicate any one or more of the following types of fault conditions:

- o Environment or Media Problems  
This type of problem would direct the operator to clean the tape path area and/or use another known good quality tape.
- o Operator Error Problem  
This type of problem would indicate conditions such as door open, write enable ring not present, tape threaded incorrectly, etc.
- o Transport Circuit Problems  
These would be fault conditions which require field service personnel intervention.

It is the responsibility of the Field Service Representative to ensure that the operator performs the applicable diagnostic, and determine from the operator the fault code which appears, after running the operator diagnostic.

Because the operator diagnostics are an integral part of the trouble analysis procedures, subsequent paragraphs contain the procedure to initiate this diagnostic. The only difference between the procedure contained in the OPERATOR DIAGNOSTIC section of the TU80 Subsystem User Guide, and the following procedure, is an expanded feature to display a Sub-Fault Code for maintenance purposes.

### 1.3.2 Operator Diagnostic Procedure

The operator diagnostics consist of one selectable test which runs for approximately 10 minutes when a 2400 foot tape is used. Faults encountered during the test terminate the diagnostics and display a numerical code on the display panel. Any fault code should be logged by the operator and reported to field service personnel if operator corrective actions do not resolve the problem. The operator diagnostics are initiated as follows:



o Transport Status

1. TU80 powered on (LOGIC ON indicator illuminated).
2. Tape threaded through tape path and onto take-up reel, but not loaded (untensioned).

o Test Procedure

1. Press TEST switch.
  - a. DIAGNOSTIC indicator illuminates.
  - b. Display on control panel indicates 01.
2. Press EXECUTE switch.
  - a. Test starts with the display incrementing from 00, 11, 22 thru 99. Verify that all segments of the numerical display are functioning.
  - b. Concurrent with step a. above, the following indicators are illuminated: FILE PRO, LOGIC ON, ON-LINE, RESET and DIAGNOSTICS.
  - c. Test continues with various motion and read/write exercises for approximately 10 minutes.

The TU80 performs a Rewind/Unload operation and 00 is indicated on the display panel if the test runs to completion. If the test is unsuccessful, the test terminates and a fault code appears on the display panel. If the problem cannot be resolved through operator actions, as indicated in Table 1-2, the fault code is referenced directly to the corresponding troubleshooting procedure for corrective action.

When the Fault Code Troubleshooting Procedures are referenced for corrective action, a Sub-Fault Code interrogation may be required. With the fault code still indicated on the display panel, press and hold the CE switch. This action will cause the Sub-Fault Code to appear on the display.

### 1.3.3 Field Service Diagnostic Tests (Section 2)

The Field Service Diagnostic Tests should be performed, in conjunction with the requirements of the Fault Code Troubleshooting Procedures. When reporting to the site, obtain as much information from the operator and operating system, as is available. Fault Codes, the frequency at which they occur and, if possible, the operation in progress at that time, are all things which should be considered prior to execution of the diagnostics. If the fault is intermittent, the information received from the operator and operating system may be instrumental in directing field service personnel to appropriate test to duplicate the condition under which the fault occurs.

If the fault condition is a "hard error", or one which occurs frequently, start the troubleshooting procedure by executing Operator Diagnostic Test #01. This test is a lead-in to all fault codes and subsequent troubleshooting procedures.

### 1.3.4 Field Service Diagnostic Tests

The Diagnostic Tests are initiated as follows:

- o TU80 Status  
Status requirements of the transport are listed in the individual Field Service Diagnostic Tests.
- o Test Procedure
  1. While pressing CE switch, press TEST switch.
    - a. DIAGNOSTICS indicator illuminates.
    - b. Display panel indicates 00.

2. Press STEP switch.

- a. Display number increments each time STEP is pressed, or will increment automatically, if STEP is held pressed.
- b. To select a test, use the following procedure. Example: Test #39 selection required.
  - Press STEP switch until 03 appears on the display panel.
  - Press TEST switch and the 3 digit transfers to the left.
  - Display now indicates 30.
  - Press STEP switch again until the display increments from 30 to 39.
- c. If test options (see Section 2) are desired, press and hold CE switch, then press EXEC while CE is held pressed. Display will indicate 00. STEP switch is then pressed to select the desired option.

3. Press EXECUTE switch.

- a. Test is initiated.

If the test runs to completion, the display indicates 00. If test fails, the display indicates the fault code.

1.3.4.1 Field Service Special LOAD/UNLOAD Procedures - While performing specific Fault Code Procedures, the Field Service Representative may be directed to perform a TEST LOAD or an UNTENSIONED UNLOAD procedure. A description of these special procedures is as follows:

- o TEST LOAD - This function is used if a reel of tape is suspected of not being wrapped properly and a tape re-wrap is necessary.
  1. Press TEST Switch - DIAGNOSTIC indicator lights and display indicates 01.
  2. Press LOAD Switch - Forward tape motion is initiated to EOT. The take-up reel motor moves tape while the supply reel motor is completely untensioned. When EOT is detected, a normal rewind function is initiated (with tape tension) to BOT.
- o UNTENSIONED UNLOAD - This function is used to unwrap tape from the take-up reel onto the supply reel following a servo fault. The velocity servo (take-up reel motor) is completely untensioned while the supply reel moves tape in the reverse direction. Press the UNLOAD switch while tape is untensioned (not loaded). If tape is tensioned, press the logic "OFF" switch, then press the logic "ON" switch to untension tape.

#### 1.3.5 Sub-Fault Codes

The troubleshooting procedures may direct the Field Service Representative to display the sub-fault code associated with the primary fault code. The sub-fault code is displayed by pressing the CE switch after the primary fault code appears on the digital display. The sub-fault code will be displayed as long as the CE switch is held pressed.

# 1.4 FAULT CODE TROUBLESHOOTING PROCEDURES

After a fault code appears on the display, reference the fault code number directly to the corresponding number of the troubleshooting procedures listed numerically on subsequent pages. The basic troubleshooting procedure format (Figure 1-1) uses YES (Y) or NO (N) responses to sequential conditions to lead maintenance personnel to appropriate corrective action.

When a fault can be caused by any one of several factors, the separate actions to correct each of these factors are numbered according to priority level with the action, having the highest probability of success, being listed as number 1. If several actions have the same probability of correcting the fault, the one that is easiest to perform (takes the least time) is listed as the first action.

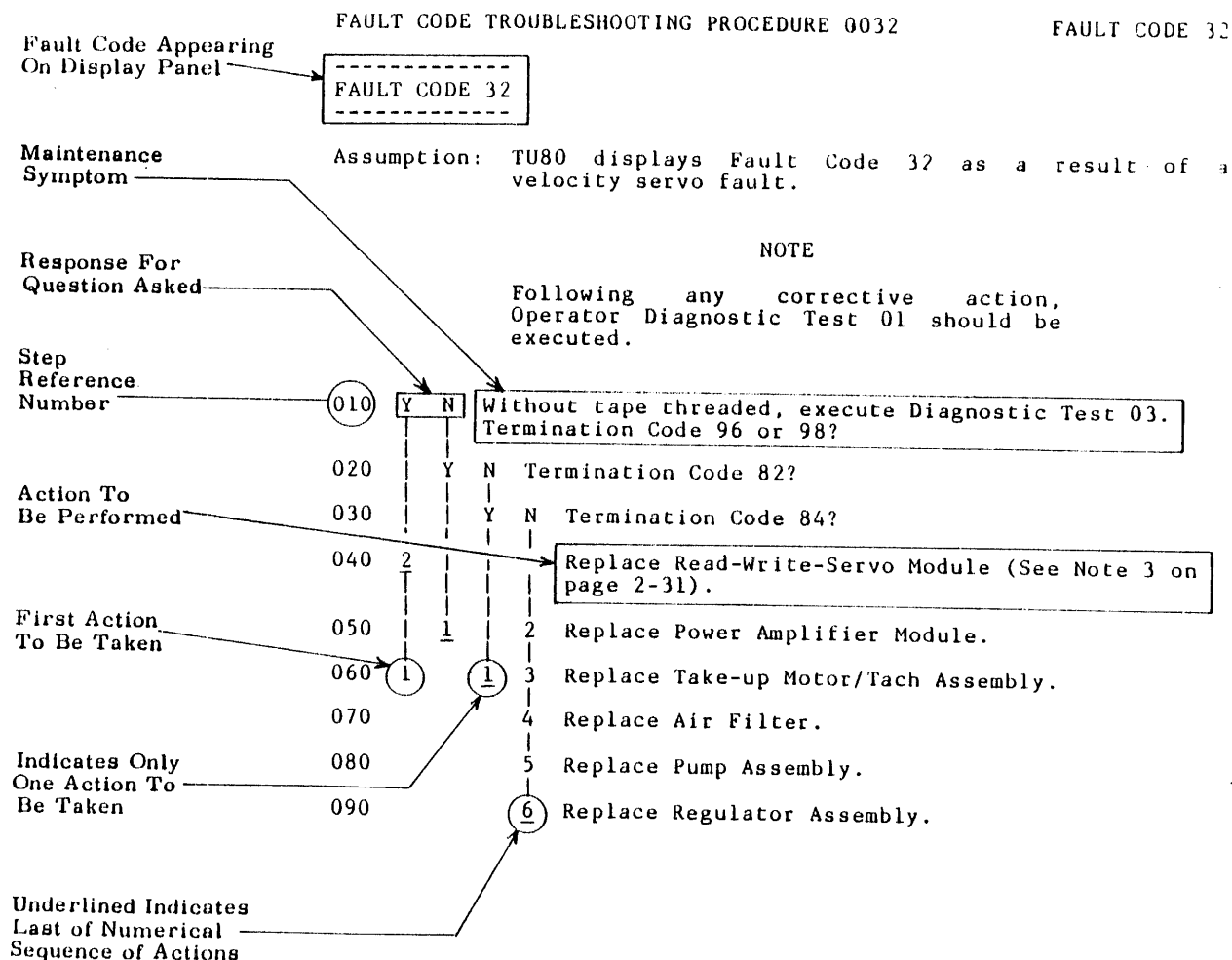


Figure 1-1. EXAMPLE OF FAULT CODE TROUBLESHOOTING PROCEDURE

-----  
 FAULT CODE 01  
 -----

Assumption: TU80 displays Fault Code 01 as a result of failing to detect a read signal during a read amplitude checking diagnostic test.

The most probable cause of this fault is a dirty read-write head. Another possible cause is damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Ensure that cables between read-write head and Read-Write-Servo Module are correctly connected.
- 040 4 Ensure that write current selection resistors (R224 and R225) are correctly installed in Read-Write-Servo Module.
- 050 5 Replace Read-Write Head Assembly.
- 060 6 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 070 7 Replace Formatter-Control Module.

-----  
 FAULT CODE 02  
 -----

Assumption: TU80 displays Fault Code 02 as a result of detecting a read amplitude out of range during a read amplitude checking diagnostic test.

The most probable cause of this fault is a dirty read-write head. Another possible cause is damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Ensure that cables between read-write head and Read-Write-Servo Module are correctly connected.
- 040 4 Ensure that write current selection resistors (R224 and R225) are correctly installed in Read-Write-Servo Module.
- 050 5 Replace Read-Write Head Assembly.
- 060 6 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 070 7 Replace Formatter-Control Module.

-----  
 FAULT CODE 03  
 -----

Assumption: TU80 displays Fault Code 03 during Operator Diagnostic Test 01 due to a failure to read or write the PE identification burst at load point.

The probable cause of this fault is damaged tape. The tape should be free of defects within the first six inches of tape after the BOT reflective marker.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Ensure that Formatter-Control and Read-Write-Servo Modules are firmly connected.
- 040 4 Replace Formatter-Control Module.
- 060 5 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 070 6 Replace Read-Write Head.



-----  
 FAULT CODE 04  
 -----

Assumption: TU80 displays Fault Code 04 during Operator Diagnostic Test 01 due to a failure to write a block within five attempts at low speed.

The probable causes of this fault are dirty head and damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Ensure that Formatter-Control and Read-Write-Servo Modules are firmly connected.
- 040 Y N Without tape threaded, execute Test 03.  
Termination Code 98?
- 050 Y N Termination Code 96?
- 060 Y N Termination Code 82?
- 070 Y N Termination Code 84?
- 080 1 2 | 2 1 Replace Read-Write-Servo Module (See Note 3 on page 2-31).
- 090 | | 2 Replace Formatter-Control Module.
- 100 | | 3 Replace Read-Write Head Assembly.
- 110 2 1 | 1 Replace Take-Up Motor Assembly.
- 120 | | 1 Replace Power Amplifier Module.

-----  
 FAULT CODE 05  
 -----

Assumption: TU80 displays Fault Code 05 during Operator Diagnostic Test 01 due to a failure to read a block in forward or reverse direction at low speed.

The probable causes of this fault are dirty head and damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 040 4 Replace Formatter-Control Module.
- 050 5 Replace Read-Write Head.

-----  
 FAULT CODE 06  
 -----

Assumption: TU80 displays Fault Code 06 during Operator Diagnostic Test 01 due to a failure to write a block within 5 attempts at high speed, or due to too many write errors while writing to EOT.

The probable causes of this fault are dirty head and damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- |     |   |   |   |   |  |
|-----|---|---|---|---|--|
| 010 | 1 |   |   |   | Clean read-write head, tape cleaner and tape guides.                             |
| 020 | 2 |   |   |   | Change tape to a known good write enabled tape.                                  |
| 030 | 3 |   |   |   | Ensure that Formatter-Control and Read-Write-Servo Modules are firmly connected. |
| 040 | Y | N |   |   | Without tape threaded, execute Test 03.  |
|     |   |   |   |   | Termination Code 98?   |
| 050 |   | Y | N |   | Termination Code 96?   |
| 060 |   |   | Y | N | Termination Code 82?   |
| 070 |   |   |   | Y | N Termination Code 84?   |
| 080 | 1 | 2 |   | 2 | 1 Replace Read-Write-Servo Module (See Note 3 on page 2-31).                     |
| 090 |   |   |   | 2 | Replace Formatter-Control Module.  |
| 100 |   |   |   | 3 | Replace Read-Write Head Assembly.  |
| 110 | 2 | 1 |   | 1 | Replace Take-Up Motor Assembly.  |
| 120 |   |   |   | 1 | Replace Power Amplifier Assembly.  |

-----  
 FAULT CODE 07  
 -----

Assumption: TU80 displays Fault Code 07 during Operator Diagnostic Test 01 due to a failure to read a block at high speed.

The probable causes of this fault are dirty head and damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 040 4 Replace Formatter-Control Module.
- 050 5 Replace Read-Write Head.

-----  
FAULT CODE 08  
-----

Assumption: TU80 displays Fault Code 08 during Operator Diagnostic Test 01 due to detection of noise during IBG.

The probable causes of this fault are dirty head and damaged tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good write enabled tape.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 040 4 Replace Formatter-Control Module.
- 050 5 Replace Read-Write Head.

-----  
 FAULT CODE 10  
 -----

Assumption: TU80 displays Fault Code 10 as a result of detecting an open top cover condition.

The most probable cause of this fault is the top cover being open. During any normal operation, including execution of diagnostic tests that require reel motion, the top cover must be closed.

NOTE

Following any corrective action, the top cover should be closed and Operator Diagnostic Test 01 should be executed.

- |     |          |          |   |
|-----|----------|----------|---|
| 010 | 1        |          | Ensure that all interlock switch leads are unbroken and firmly connected to the top cover switch assembly.  |
| 020 | 2        |          | Ensure that all cables are firmly connected to the Read-Write-Servo Module.   |
| 030 | Y        | N        | Using a DVM with negative terminal connected to TP8 of Read-Write-Servo Module, measure voltages on outermost terminals of interlock switch while the top cover is closed. Is voltage difference greater than 0.2 volt? |
| 040 |          | Y        | N Repeat previous operation for innermost terminals. Is voltage difference greater than 0.2 volt?   |
| 050 |          |          | <u>1</u> Replace Read-Write-Servo Module (See Note 3 on page 2-31).   |
| 060 | 1        | 1        | Ensure Door Switch Plunger on the top cover lines up with interlock switch and depresses switch when the top cover is closed.   |
| 070 | <u>2</u> | <u>2</u> | Replace Interlock Switch Assembly.  |

-----  
 FAULT CODE 11  
 -----

Assumption: TU80 displays Fault Code 11 as a result of detecting an absence of tape condition during a load operation, or a diagnostic test that requires tape threaded.

The most probable cause of this fault is that tape is not threaded. Another possible cause is that tape is threaded with tape that has oxide removed.

NOTE

Following any corrective action, a tape load operation should be performed.

- |     |   |   |  |
|-----|---|---|--|
| 010 | 1 |   | Thread tape and retry load operation   |
|     |   |   |  |
| 020 | 2 |   | Mount a new reel of tape and retry load operation.   |
|     |   |   |  |
| 030 | Y | N | Disconnect cable from BOT/EOT Sensor Assembly. With operator door closed, press Load/Rewind switch. Is Fault Code 11 reported? |
|     |   |   |  |
|     |   |   |  |
| 040 |   | 1 | Replace BOT/EOT Sensor Assembly.   |
|     |   |   |  |
| 050 | 1 | 2 | Replace Read-Write-Servo Module (See Note 3 on page 2-31).   |
|     |   |   |  |

-----  
 FAULT CODE 12  
 -----

Assumption: TU80 displays Fault Code 12 as a result of detecting a hub unlatched condition.

The most probable cause of this fault is that supply hub was not latched after mounting a new reel of tape.

A possible cause is that tape being loaded has been subjected to extreme temperature or humidity changes. These tapes can sometimes be recognized by shaking the full reel and hearing tape pack move relative to reel. Also, while loading tape, it will be seen that hub and reel rotate counterclockwise while pack of tape rotates clockwise. To continue using these tapes, the pack requires to be rewrapped at correct tension. This is achieved by performing a test load operation which wraps all tape onto take-up reel, and then returns tape, correctly tensioned, to the supply reel.

Other possible causes of Fault Code 12 are:

1. Loading a tape while in tape trailer.
2. Loading a tape with a short leader.
3. Loading a tape with EOT/BOT sensor cable disconnected.

NOTE

Following any corrective action, a tape load operation should be performed.

- |     |     |  |
|-----|-----|--|
| 010 | 1   | Mount a new reel of tape and retry load operation.   |
|     |     |  |
| 020 | 2   | Remove supply reel from supply hub and clean hub pads.   |
|     |     |  |
| 030 | Y N | Remount reel and latch hub. While holding hub, can reel be easily rotated in either direction? |
|     |     |  |
| 040 | 1   | Replace Read-Write-Servo Module (See Note 3 on page 2-31).                                     |
|     |     |  |
|     | 2   | 2  |
|     | A   | B  |



-----  
FAULT CODE 12 (Cont'd)  
-----

	A	B	
	<u>1</u>	<u>1</u>	
050			
		2	Replace Supply Motor/Tach Assembly.
		<u>3</u>	Replace BOT/EOT Sensor Assembly
060	<u>1</u>		Replace Supply Reel Hub Assembly.

-----  
 FAULT CODE 13  
 -----

Assumption: TU80 displays Fault Code 13 during a load operation as a result of not establishing tension within 10 seconds.

The most probable cause of this fault is that tape has been threaded with a long loop, or tape has not been tightly wrapped on take-up hub.

NOTE

Following any corrective action, a tape load operation should be performed.

- |     |  |          |  |  |
|-----|--|----------|--|--|
| 010 |  | 1        |  | Thread tape and retry load operation.                                |
| 020 |  | <u>2</u> |  | Mount a new reel of tape and retry load operation.                   |
| 030 |  | Y        |  | N Execute Field Service Functional Test 43. Does pump fail to start? |
| 040 |  |          |  | Y N Does air pressure lift tape off air bearings?                    |
| 050 |  |          |  | 1 Replace Filter.  |
| 060 |  | 1        |  | 2 Replace Pump Assembly.   |
| 070 |  |          |  | <u>3</u> Replace Regulator Assembly.                                 |
| 080 |  | 2        |  | <u>1</u> Replace Read-Write-Servo Module (See Note 3 on page 2-31).  |
| 090 |  | <u>3</u> |  | Replace Power Supply Assembly.                                       |

-----  
 FAULT CODE 14  
 -----

Assumption: TU80 displays Fault Code 14 during a load operation as a result of running off the end or beginning of tape without detecting BOT or EOT marker during a load operation, or absence of tape is not found during an unload operation.

The most probable cause of this fault is that tape leader is too long, or BOT or EOT reflective marker is missing. A possible cause is that a load operation was initiated while in trailer. ANSI Standard X3.39 specifies that BOT reflective marker should be placed from 14 feet to 18 feet from physical beginning of tape.

NOTE

Following any corrective action, a tape load operation followed by an unload operation should be performed.

- 010 1 Mount a new reel of tape and retry load operation.
- 020 2 Replace BOT/EOT Sensor Assembly.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 15  
 -----

Assumption: TU80 displays Fault Code 15 as a result of load or unload operation being aborted.

The most probable cause of this fault is that operator pressed RESET switch during a load or unload operation.

NOTE

Following any corrective action, a tape load operation followed by an unload operation should be performed.

- 010 1 Repeat a load or unload operation.
- 020 2 Replace Operator Panel Assembly.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 040 4 Replace Formatter-Control Module.

-----  
 FAULT CODE 16  
 -----

Assumption: TU80 displays Fault Code 16 on execution of a Read/Write Diagnostic Test with a write protected scratch tape.

The most probable cause of this fault is that the scratch tape in use does not have a write permit ring installed.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Install a write enable ring in a scratch tape reel.
- 020 2 Remove write enable sensor cover plate and ensure connector is correctly connected to sensor.
- 030 Y N Does write permit ring push reflective ring part of Supply Reel Hub Assembly in line with write enable sensor?
- 040 | 1 Replace Supply Reel Hub Assembly.
- 050 1 Replace Write Enable Sensor Assembly.
- 060 2 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 070 3 Replace Formatter Control Module.

-----  
 FAULT CODE 17  
 -----

Assumption: TU80 displays Fault Code 17 as a result of running off the physical end of tape.

The most probable cause of this fault is that the system continued issuing Forward Read/Write commands after EOT has been sensed. A possible cause is that trailer is too short (ANSI Standard X3.39 specifies trailer should be longer than 25 feet).

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- |     |          |          |   |
|-----|----------|----------|---|
| 010 | Y        | N        | Load a known good tape and execute Field Service Functional Test 44. Does tape stop within trailer? |
|     |          |          |   |
| 020 | <u>2</u> | 1        | Replace Read-Write-Servo Module (See Note 3 on page 2-31).  |
|     |          |          |   |
| 030 | 1        | <u>2</u> | Replace Formatter-Control Module.   |

-----  
FAULT CODE 18  
-----

Assumption: TU80 displays Fault Code 18 as a result of attempting to execute a Diagnostic Test which requires tape to be untensioned.

The most probable cause of this fault is that tape is already loaded while attempting to execute a test that requires tape to be untensioned.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Unload, thread tape, and retry operation.
- 020 2 Replace Formatter-Control Module.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 20  
 -----

Assumption: TU80 displays Fault Code 20 as a result of a file tension fault.

NOTE

Following any corrective action, a tape load operation or Operator Diagnostic Test 01 should be executed.

010	1			Ensure that cable between Supply Air Bearing Assembly and Read-Write-Servo Module is correctly connected.
020	Y	N		Sub-Fault Code 05?
030		Y	N	Sub-Fault Code 02 or 04?
040			Y	N Disconnect cable between Supply Air Bearing Assembly and Read-Write-Servo Module at Read-Write-Servo Module Assembly. Try to load a tape. Fault Code 20, Sub-Fault Code 05?
050	1		1	Replace Supply Air Bearing Assembly. Reconnect cable.
060	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u> Replace Read-Write-Servo Module (See Note 3 on page 2-31). Reconnect cable.



-----  
 FAULT CODE 21  
 -----

Assumption: TU80 displays Fault Code 21 as a result of a take-up tension fault.

NOTE

Following any corrective action, a tape load operation or Operator Diagnostic Test 01 should be executed.

- |     |          |          |          |  |
|-----|----------|----------|----------|--|
| 010 | 1        |          |          | Ensure that cable between Take-Up Air Bearing Assembly and Read-Write-Servo Module is correctly connected.   |
| 020 | Y        | N        |          | Sub-Fault Code 05?   |
| 030 |          | Y        | N        | Sub-Fault Code 02 or 03 or 04?   |
| 040 |          |          | Y        | N Disconnect cable between Take-Up Air Bearing Assembly and Read-Write-Servo Module at Read-Write-Servo Module Assembly. Try to load tape. Fault Code 21, Sub-Fault Code 05? |
| 050 | 1        |          | 1        | Replace Take-Up Air Bearing Assembly. Reconnect cable.   |
| 060 | <u>2</u> | <u>1</u> | <u>2</u> | <u>1</u> Replace Read-Write-Servo Module (See Note 3 on page 2-31). Reconnect cable.   |

-----  
 FAULT CODE 22  
 -----

Assumption: TU80 displays Fault Code 22 as a result of being unable to maintain tape tension during a tape load operation.

The most probable cause of this fault is that the tape being loaded has been subjected to extreme temperature or humidity changes. These tapes can sometimes be recognized by shaking the full reel and hearing the tape pack move relative to the reel. To continue using these tapes, the pack requires to be re-wrapped at the correct tension. At the time of reporting the fault, all the tape may have been removed from the supply reel. Recovery for this case will be to re-wrap the tape onto the file reel (to the BOT side of the EOT marker) and perform a normal load operation. If tape was not removed from the supply reel, an unload operation should be performed to remove the tape.

NOTE

A tape load operation should be performed following any corrective action. During load operation, file reel should be observed for pack slip.

- 010 1 Rewind tape onto file reel and repeat load operation.
- 020 2 Mount a new reel of tape and retry load operation.
- 030 3 Clean read-write head, tape cleaner and tape guides.
- 040 4 Unload reel using Untensioned Unload command. Remove reel and clean hub pads.
- 050 Y N Mount reel and latch the hub. While holding hub, can reel be easily rotated in either direction?
- 060 | Y N Sub-Fault Code 03 or 04 or 05?
- 070 | | Y N Execute Diagnostic Test 02 with tape threaded. Termination Code 70.
- 2 2 2 2
- A B C D

-----  
 FAULT CODE 22 (Cont'd)  
 -----

	A	B	C	D	
	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	
080					Invalid operator sequence (Refer to Diagnostic Test 02, page 2-7).
090				Y N	Termination Code 84?
100				Y N	Termination Code 92?
110				Y N	Execute Operator Diagnostic Test 03 without tape threaded. Termination Code 96 or 98?
120		<u>1</u>	<u>1</u>	<u>2</u> <u>2</u>	<u>1</u> Replace Read-Write-Servo Module (See Note 3 on page 2-31).
130					<u>2</u> Replace Power Amplifier Module.
140				<u>1</u>	Replace Supply Motor/Tach Assembly.
150			<u>2</u>	<u>1</u>	Replace Take-up Motor/Tach Assembly.
160	<u>1</u>				Replace Supply Hub Assembly.

-----  
 FAULT CODE 23  
 -----

Assumption: TU80 displays Fault Code 23 as a result of being unable to re-establish tape tension during a tape load operation.

The most probable cause of this fault is that the tape being loaded has been subjected to extreme temperature or humidity changes. These tapes can sometimes be recognized by shaking the full reel and hearing the tape pack move relative to the reel. To continue using these tapes, the pack requires to be re-wrapped at the correct tension. At the time of reporting the fault, all the tape may have been removed from the supply reel. Recovery for this case will be to re-wrap the tape onto the file reel (to the BOT side of the EOT label) and perform a normal load operation. If tape was not removed from the supply reel, an unload operation should be performed to remove the tape.

NOTE

A tape load operation should be performed following any corrective action. During load operation, file reel should be observed for pack slip.

- 010 1 Rewind tape onto file reel and repeat load operation.
- 020 2 Mount a new reel of tape and retry load operation.
- 030 3 Ensure that the cable is correctly connected to BOT/EOT Sensor Assembly.
- 040 4 Replace Read-Write-Servo Module (See Page 3, page 2-31).
- 050 5 Replace Supply Motor Tach Assembly.

-----  
 FAULT CODE 24  
 -----

Assumption: TU80 displays Fault Code 24 as a result of a high tension detected on both air bearings.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- |     |          |          |  |
|-----|----------|----------|--|
| 010 | Y        | N        | Execute Diagnostic Test 02 with tape threaded.<br>Termination Code 70? |
| 020 | <u>1</u> |          | Invalid operator sequence (Refer to Diagnostic Test 02 on page 2-7).   |
| 030 | Y        | N        | Termination Code 81 or 82?   |
| 040 |          | Y N      | Termination Code 73 or 74 or 92 or 98?                                 |
| 050 |          | <u>3</u> | 1 Replace Read-Write-Servo Module (See Note 3 on page 2-31).           |
| 060 | <u>1</u> | <u>2</u> | <u>2</u> Replace Power Amplifier Module.                               |
| 070 |          | 1        | Replace Supply Motor/Tach Assembly.                                    |

-----  
 FAULT CODE 25  
 -----

Assumption: TU80 displays Fault Code 25 as a result of a low tension condition being detected on one of the air bearings.

The most probable cause of this fault is damaged tape. Should tape be torn, then the fault can occur as tape passes over air bearing. Another cause, with stiction tapes, is when tape sticks to read-write head.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Clean read-write head, tape cleaner and tape guides.
- 020 2 Change tape to a known good, write enabled scratch tape.
- 030 3 Unload reel using Untensioned Unload command. Remove reel and clean hub pads.
- 040 Y N Remount reel and latch hub. While holding hub, can reel be rotated in either direction?
- 050 Y N Execute Diagnostic Test 03 without tape threaded. Termination Code 98?
- 060 1 Replace Power Amplifier Module.
- 070 2 2 Replace Read-Write-Servo Module (See Note 3 on page 2-31).
- 080 1 Replace Take-Up Motor/Tach Assembly.
- 090 1 Replace Supply Hub Assembly.

-----  
 FAULT CODE 26  
 -----

Assumption: TU80 displays Fault Code 26 as a result of a servo fault.

NOTE

Following any corrective action Operator Diagnostic Test 01 should be executed. Following any corrective action for Sub-Fault Codes 01 to 06, tape should be threaded onto take-up reel, wound on by hand for approximately 50 turns, and then perform an Untensioned Unload. For all other Sub-Fault Codes, tape should be loaded and then unloaded.

- 010 | 1 | Ensure all cables to Power Amplifier Assembly are correctly connected.
- 020 | 2 | Ensure all leads to door switch are unbroken and correctly connected.
- 030 | Y | N | Sub-Fault Code 09?
- 040 | | Y | N | With tape threaded, execute Diagnostic Test 02. Termination Code 70?
- 050 | | 1 | | Invalid operator sequence (Refer to Diagnostic Test 02 on page 2-7).
- 060 | | Y | N | Termination Code 81?
- 070 | | | Y | N | Termination Code 82?
- 080 | | | | Y | N | Termination Code 84?
- 090 | | 3 | 3 | | 1 | Replace Read-Write-Servo Module (See Note 3 on page 2-31).
- 100 | | | 2 | 1 | Replace Take-Up Motor/Tach Assembly.
- 110 | | 1 | 1 | Replace Power Amplifier Assembly.
- 120 | | 2 | | Replace Supply Motor Assembly.

2  
 A

-----  
 FAULT CODE 26 (Cont'd)  
 -----

	A			
	1			
130	Y	N		Without tape threaded, execute Diagnostic Test 03. Termination Code 84?
140		Y	N	Termination Code 96?
150			Y	N Does Take-Up Reel move during execution of Test 03?
160			1	Ensure cable is correctly connected to Take-Up Tach.
170			1	Replace Take-Up Motor/Tach Assembly.
180			<u>2</u>	<u>2</u> Replace Read-Write-Servo Module (See Note 3 on page 2-31).
190			<u>3</u>	Replace Door Switch (Interlock).
200		Y	N	Does Take-Up Reel move during execution of Test 03?
210			1	Replace Door Switch (Interlock).
220	1	2	2	Replace Take-Up Motor/Tach Assembly.
230	<u>2</u>		<u>3</u>	Replace Read-Write-Servo Module (See Note 3 on page 2-31).
240		1		Ensure cable is correctly connected to Take-Up Tach.
250			<u>3</u>	Replace Power Amplifier Assembly.



-----  
 FAULT CODE 27  
 -----

Assumption: TU80 displays Fault Code 27 as a result of not detecting any single line tachs from the supply reel.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Ensure that cable is correctly connected to Supply Motor Tach.
- 020 Y N Tach positioned properly?  
 (Refer to Technical Manual, EK-OTU80-TM/ Pocket Service Guide, EK-OTU80-PS)  
 1 Position Tach properly.
- 030 2 Replace Read-Write-Servo Module (See Note 3, Page 2-31)
- 040 3 Replace Supply Motor/Tach Assembly.

-----  
FAULT CODE 28  
-----

Assumption: TU80 displays Fault Code 28 as a result of a  
tension recovery timeout.

NOTE

Following any corrective action,  
Operator Diagnostic Test 01 should be  
executed.

010 1 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 29  
 -----

Assumption: TU80 displays Fault Code 29 as a result of detecting absence of tape. This fault can be caused by the use of a damaged tape that has oxide missing, such that the BOT and EOT sensors detect light passing through the tape.

Unloading of tape with a short leader may also result in Fault Code 29.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 | Mount a new reel of tape and retry operation.
- 020 Y N | Disconnect cable from the EOT/BOT Sensor Assembly.  
 | | Remove the reel of tape, close the top cover, and  
 | | press the LOAD switch. Fault Code 11?
- 030 1 | Replace BOT/EOT Sensor Assembly.
- 040 2 1 | Replace Read-Write-Servo Module (See Note 3 on  
 page 2-31).



-----  
 FAULT CODE 30 (Cont'd)  
 -----

	A	B	C	D	E	F	G	H	I	J	K			
	1	1	1	1	1	1	1	1	1	1	1	Y	N	Termination Code 96?
140														
												Y	N	Termination Code 82?
150														
													Y	N
160														Termination Code 84?
170												1		1 Replace Power Amp Module.
180						1				<u>1</u>	1		1	2 Replace Take-Up Motor Assembly.
190			2		2	<u>2</u>		<u>3</u>			<u>2</u>	<u>2</u>	<u>2</u>	3 Replace Read-Write-Servo Module (See Note 3 on page 2-31).
														4 BOT/EOT Sensor.
200		2		2					1					1 Replace Air Filter.
210		<u>4</u>	3	<u>4</u>	3			1	<u>3</u>					1 Replace Regulator Assembly.
220		3	<u>4</u>	3	<u>4</u>			2	2					2 Replace Pump Assembly.
230	<u>1</u>			1	1									1 Replace Supply Air Bearing Assembly.
240		1	1				<u>1</u>							1 Replace Take-Up Air Bearing Assy.



-----  
 FAULT CODE 31 (Cont'd)  
 -----

	A	B	C	D	E	F	G	H	I	J	K			
140	1	1	1	1	1	1	1	1	1	1	1	Y	N	Termination Code 96?
150	1	1	1	1	1	1	1	1	1	1	1	Y	N	Termination Code 82?
160	1	1	1	1	1	1	1	1	1	1	1	Y	N	Termination Code 84?
170	1	1	1	1	1	1	1	1	1	1	1	1	1	1 Replace Power Amp Module.
180	1	1	1	1	1	1	1	1	1	1	1	1	2	2 Replace Take-Up Motor Assembly.
190	1	1	2	1	2	2	3	1	1	1	2	2	2	3 Replace Read- Write-Servo Module (See Note 3 on page 2-31).
														4 BOT/EOT Sensor.
200	1	2	1	2	1	1	1	1	1	1	1	1	1	1 Replace Air Filter.
210	1	4	3	4	3	1	1	1	3	1	1	1	1	1 Replace Regulator Assembly.
220	1	3	4	3	4	1	2	2	2	1	1	1	1	1 Replace Pump Assembly.
230	1	1	1	1	1	1	1	1	1	1	1	1	1	1 Replace Supply Air Bearing Assembly.
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1 Replace Take-Up Air Bearing Assy.

-----  
 FAULT CODE 32  
 -----

Assumption: TU80 displays Fault Code 32 as a result of a velocity servo fault.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

010	Y	N	Without tape threaded, execute Diagnostic Test 03. Termination Code 96 or 98?
020		Y	N Termination Code 82?
030			Y N Termination Code 84?
040	<u>2</u>		1 Replace Read-Write-Servo Module (See Note 3 on page 2-31).
050		<u>1</u>	2 Replace Power Amplifier Module.
060	1		<u>1</u> 3 Replace Take-up Motor/Tach Assembly.
070			4 Replace Air Filter.
080			5 Replace Pump Assembly.
090			<u>6</u> Replace Regulator Assembly.



-----  
FAULT CODE 33  
-----

Assumption: TU80 displays Fault Code 33 as a result of a tape positioning fault when about to write.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- |     |          |          |  |
|-----|----------|----------|--|
| 010 | Y        | N        | Remove reel of tape and execute Diagnostic Test 03. Termination Code 98? |
| 020 |          | <u>1</u> | Replace Read-Write-Servo Module (See Note 3 on page 2-31).               |
| 030 | <u>1</u> |          | Replace Take-up Motor/Tach Assembly.                                     |

-----  
FAULT CODE 34  
-----

Assumption: TU80 displays Fault Code 34 as a result of the transport losing positioning control at Load Point.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

010 1 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 35  
 -----

Assumption: TU80 displays Fault Code 35 as a result of the transport losing positioning control.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 Y N Remove reel of tape and execute Diagnostic Test 03.  
       | | Termination Code 98?
- 020 | 1 Replace Read-Write-Servo Module (See Note 3 on  
       | page 2-31).
- 030 1 Replace Take-up Motor/Tach Assembly.

-----  
 FAULT CODE 36  
 -----

Assumption: TU80 displays Fault Code 36 as a result of a speed fault.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

010	Y	N	With tape threaded, execute Diagnostic Test 02. Termination Code 70?													
020	<u>1</u>		Invalid operator sequence (Refer to Diagnostic Test 02, page 2-7).													
030	Y	N	Termination Code 89?													
040		Y	N	Termination Code 72?												
050			Y	N	Termination Code 73?											
060				Y	N	Termination Code 74?										
070					Y	N	Termination Code 75?									
080						Y	N	Termination Code 84?								
090							Y	N	Termination Code 90?							
100								Y	N	Termination Code 91?						
110									Y	N	Termination Code 92?					
120										Y	N	Without tape threaded, execute Diagnostic Test 03. Termination Code 98?				
130											Y	N	Termination Code 96?			
140												Y	N	Termination Code 82?		
150													Y	N	Termination Code 84?	
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	A	B	C	D	E	F	G	H	I	J	K	L	M	N		

FAULT CODE 36

-----  
 FAULT CODE 36 (Cont'd)  
 -----

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Replace Power Amplifier Module.
170	1	1	1	1	1	1	1	1	1	<u>1</u>	1	1	1	2	Replace Take-Up Motor Assembly.
180	1	1	2	1	2	<u>2</u>	1	3	1	1	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>	Replace Read-Write-Servo Module (See Note 3 on page 2-31).
190	1	2	1	2	1	1	1	1	1	1	1	1	1	1	Replace Air Filter.
200	1	4	3	4	3	1	1	1	3	1	1	1	1	1	Replace Regulator Assembly.
210	1	3	4	3	4	1	1	2	2	1	1	1	1	1	Replace Pump Assembly.
220	<u>1</u>	1	1	1	1	1	1	1	1	1	1	1	1	1	Replace Supply Air Bearing Assembly.
230	1	1	1	1	1	1	1	<u>1</u>	1	1	1	1	1	1	Replace Take-Up Air Bearing Assembly.

-----  
FAULT CODE 37  
-----

Assumption: TU80 displays Fault Code 37 as a result of not being able to re-establish tension within 5 seconds of pump power-up.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 020 2 Replace Power Amplifier Module.
- 030 3 Replace Supply Motor/Tach Assembly.

-----  
FAULT CODE 47  
-----

Assumption: TU80 displays Fault Code 47 resulting from a velocity correction calculation fault.

This fault can be caused by the velocity correction factor in the back-up memory being corrupted. Should this be the case, the Power-on Health Check should fault, displaying Fault Code 51. To overcome this problem, Field Service Diagnostic Test 37 could be executed. However, if all precautions are taken, the back-up memory should never be corrupted.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

010 1 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 48  
 -----

Assumption: TU80 displays Fault Code 48 resulting from an unload fault. This fault can be caused by a damaged tape leader.

NOTE

Following any corrective action, tape should be loaded and unloaded again.

- |     |  |   |  |  |
|-----|--|---|--|--|
| 010 |  | 1 |  | Clear Read-Write Head, tape cleaner and tape guides. |
| 020 |  | 2 |  | Change tape to a known good tape.                    |
| 030 |  | Y |  | N Without tape threaded, execute Diagnostic Test 03. |
|     |  |   |  | Termination Code 98?                                 |
| 040 |  | Y |  | N Termination Code 96?                               |
| 050 |  | 2 |  | 1 Replace Read-Write-Servo Module (See Note 3 on     |
|     |  |   |  | page 2-31).  |
| 060 |  |   |  | 2 Replace Supply Motor/Tach Assembly.                |
| 070 |  | 1 |  | 1 Replace Take-up Motor/Tach Assembly.               |



-----  
FAULT CODE 50  
-----

Assumption: TU80 displays Fault Code 50 as a result of a Read-Write-Servo Module Health Check fault.

NOTE

Following any corrective action, the unit should be powered off and on again.

- |     |          |          |  |
|-----|----------|----------|--|
| 010 | Y        | N        | Sub-Fault Code 06 or 07?                                   |
|     |          |          |  |
| 020 | <u>1</u> | <u>1</u> | Replace Read-Write-Servo Module (See Note 3 on page 2-31). |
|     |          |          |  |
| 030 | <u>2</u> |          | Replace Formatter-Control Module.                          |

-----  
FAULT CODE 51  
-----

Assumption: TU80 displays Fault Code 51 during Power-On Health Check.

A possible cause of this fault is that the write enable jumper on the Read-Write-Servo Module, which protects the contents of the back-up memory, has been left in the "STORE" position. Should this have occurred, the back-up memory should be re-initialized by executing Field Service Diagnostic Test 37.

NOTE

Following any corrective action, the unit should be powered off and powered on again.

010 1 Replace Read-Write-Servo Module (See Note 3, page 3-21).

-----  
 FAULT CODE 52  
 -----

Assumption: TU80 displays Fault Code 52 as a result of a radius calculation fault.

A possible cause of this fault is that BOT reflective marker is not positioned correctly. ANSII Standard X3.39 specifies that the BOT marker should be placed from 14 feet to 18 feet from the physical beginning of tape.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 | 1 | Check BOT marker position or try a new tape.
- 020 | Y | N | Without tape threaded, execute Diagnostic Test 03.  
 | | | Termination Code 98?
- 030 | | Y | N | Termination Code 96?
- 040 | | | 1 | Remove tape reel and clean hub pads.
- 050 | | 2 | 2 | Replace Read-Write-Servo Module (See Note 3 on  
 | | | | page 2-31).
- 060 | | | 3 | Replace Supply Motor/Tach Assembly.
- 070 | | | 4 | Replace Supply Reel Hub Assembly.
- 080 | 1 | 1 | Replace Take-up Motor/Tach Assembly.

-----  
FAULT CODE 53  
-----

Assumption: TU80 displays Fault Code 53 as a result of a radius calculation arithmetic error.

NOTE

Following any corrective action,  
Operator Diagnostic Test 01 should be  
executed.

010 1 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 54  
 -----

Assumption: TU80 displays Fault Code 54 as a result of an erase current fault.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- |     |          |          |  |
|-----|----------|----------|--|
| 010 | Y        | N        | Sub-Fault Code 10?   |
|     |          |          |  |
| 020 | 2        | <u>1</u> | Replace Read-Write-Servo Module (See Note 3 on page 2-31).   |
|     |          |          |  |
| 030 | 1        |          | Ensure leads are correctly connected to the erase head with black lead to the back and white to the front. |
|     |          |          |  |
| 040 | <u>3</u> |          | Replace Read-Write Head Assembly.  |

-----  
FAULT CODE 55  
-----

Assumption: TU80 displays Fault Code 55 as a result of the Read-Write-Servo microprocessor timing out during a Rewind or Load-Rewind operation.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

010 1 Replace Read-Write-Servo Module (See Note 3, page 2-31).

-----  
 FAULT CODE 56  
 -----

Assumption: TU80 displays Fault Code 56 as a result of a communication problem between the two TU80 microprocessors.

NOTE

Following any corrective action, device DC power should be turned off and then turned on, followed by the execution of Operator Diagnostic Test 01.

- 010 1 Ensure that Formatter Control and Read-Write-Servo Modules are firmly connected.
- 020 2 Ensure that the DC power connector is firmly connected to Read-Write-Servo Module.
- 030 3 Replace Read-Write-Servo Module (See Note 3, page 2-31).
- 040 4 Replace Formatter Control Module.

-----  
 FAULT CODE 57  
 -----

Assumption: TU80 displays Fault Code 57 as a result of the Formatter-Control Microprocessor not detecting the correct response from the Read-Write-Servo Microprocessor.

NOTE

Following any corrective action, Operator Diagnostic Test 01 should be executed.

- 010 1 Ensure that Formatter-Control and Read-Write-Servo  
 | Modules are firmly connected.
- 020 2 Replace Read-Write-Servo Module (See Note 3, page 2-31).  
 |
- 030 3 Replace Formatter Control Module.



-----  
FAULT CODE 58  
-----

Assumption: TU80 displays Fault Code 58 during Power-On due to a failure in the functional operation of Formatter-Control Module.

NOTE

Following any corrective action, the transport should be powered off and on again.

- 010 1 Replace Formatter-Control Module.

-----  
FAULT CODE 59  
-----

Assumption: TU80 displays Fault Code 59 as the result of a Formatter-Control PROM Checksum Error being detected during Power-On Health Check.

NOTE

Following any corrective action, the transport should be powered off and powered on again.

020 1 Replace Formatter-Control Module.

-----  
FAULT CODE 60  
-----

Assumption: TU80 displays Fault Code 60 as the result of a functional operator panel switch being closed during Power-On Health Check.

This fault can also be generated if any of the LOAD/REWIND, UNLOAD, ON-LINE or RESET switches are depressed for 15 seconds during the Power-On Health Check.

NOTE

Following any corrective action, the transport should be powered off and powered on again.

- 010 1 Check control panel functional switches and repeat the Power-on Health Check.
- 020 2 Replace Control Panel Assembly.
- 030 3 Replace Formatter-Control Module.

-----  
 FAULT CODE 61  
 -----

Assumption: TU80 displays Fault Code 61 as the result of a diagnostic control panel switch being closed during Power-On Health Check.

This fault can also be generated if any of the TEST, STEP, CE, or EXECUTE switches are depressed for 15 seconds during the Power-On Health Check. Should this fault occur, normal on-line operation of the TU80 is available after pressing the Reset switch. However, the use of TU80 diagnostics will not be made available.

NOTE

Following any corrective action, the transport should be powered off and powered on again.

- 010 1 Check control panel diagnostic switches and repeat the  
 | Power-on Health Check.
- 020 2 Replace Control Panel Assembly.  
 |
- 030 3 Replace Formatter-Control Module.

-----  
FAULT CODE 70/71 - INVALID OPERATOR SEQUENCE  
-----

Assumption: TU80 displays Fault Code 70/71 as a result of tests being run in improper sequence.

Refer to procedures for test being run.

-----  
 POWER-ON 1001  
 -----

This Power-On/Installation Procedure is for the isolation of AC power faults.

Assumption: The transport's AC circuit breaker is turned off and the TU80 is plugged into a "live" AC supply of the correct voltage.

NOTE

Following any corrective action, reconnect any assemblies that may have been disconnected and restart this procedure with circuit breaker turned off.

010	Y	N	Turn Power Switch (circuit breaker) ON. Does circuit breaker remain on?		
020		Y N	Disconnect cooling fan cable from power supply. Turn circuit breaker ON. Does circuit breaker remain on?		
030		<u>2</u>	<u>1</u> Replace Power Supply Assembly.		
040		1	Replace Cooling Fan Assembly.		
050	Y	N	Is the LOGIC-OFF LED on control panel illuminated?		
060		Y N	Is the LOGIC-ON LED on control panel illuminated?		
070		Y N	Press LOGIC-ON switch. Does LOGIC-ON LED illuminate and stay illuminated?		
080			Y N Is cooling fan operating?		
090			1 Ensure AC supply cable is plugged into Power Supply Assembly.		
100			2 Ensure that AC supplied to TU80 is "live" and the correct voltage for the unit.		
	2	2	2	2	2
	A	B	C	D	E

-----  
 POWER-ON 1001 (Cont'd)  
 -----

	A	B	C	D	E	
	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	
110		<u>1</u>	<u>2</u>	<u>3</u>	<u>3</u>	Replace Power Supply Assembly.
120				<u>1</u>		Ensure control panel cable is plugged into Formatter-Control Module.
130				<u>2</u>		Ensure logic cable between power supply and Formatter-Control Module firmly connected at each end.
140		<u>2</u>	<u>1</u>	<u>4</u>		Replace Control Panel Assembly.
150	<u>Y</u>	<u>N</u>	Is cooling fan operating?			
160		<u>1</u>	Replace Cooling Fan Assembly.			
170		<u>2</u>	Replace Power Supply Assembly.			
180	<u>1</u>	Go to Functional Troubleshooting Procedure 1002.				

-----  
 LOGIC-ON 1002  
 -----

This Logic-On Procedure is for the isolation of DC power faults.

Assumption: The transport's AC circuit breaker is turned on, the LOGIC-OFF LED is illuminated and the cooling fan is operating.

NOTE

Following any corrective action, reconnect any assemblies that may have been disconnected and restart this procedure.

010	Y	N	Press LOGIC-ON switch on control panel. Does LOGIC-ON LED illuminate and stay illuminated?
015		1	Ensure DC Cable harness is firmly connected to the underside of the Power Supply.
020	Y	N	Disconnect DC supply cable from Power Amplifier Module. Press LOGIC-ON switch. Does LOGIC-ON LED illuminate and stay illuminated?
030		Y	N Reconnect DC supply cable to Power Amplifier Module. Disconnect DC supply cable from Formatter-Control Module and Read-Write-Servo Module. Press LOGIC-ON switch. Does LOGIC-ON LED illuminate and stay illuminated?
040			1 Replace Power Supply Assembly.
050			<u>2</u> Replace Control Panel Assembly.
060		Y	N Remove Read-Write-Servo Module and reconnect DC supply cable to Formatter-Control Module. Press LOGIC-ON switch. Does LOGIC-ON LED illuminate and stay illuminated?
070			1 Replace Formatter-Control Module.
	2	2	2
	A	B	C
			D



-----  
 LOGIC-ON 1002 (Cont'd)  
 -----

	A	B	C	D	
	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	
080		<u>2</u>	<u>2</u>	<u>2</u>	Replace Power Supply Assembly.
090			<u>1</u>		Replace Read-Write-Servo Module (See Note 3 on page 2-31).
100		<u>1</u>			Replace Power Amplifier Module.
110	Y	N			Is the LOGIC-OFF LED illuminated?
120		Y	N		Is the two-digit display blank and FILE PROT LED illuminated and RESET, ON-LINE, and DIAGNOSTICS LEDs all extinguished?
130			Y	N	Are the RESET, ON-LINE, and DIAGNOSTICS LEDs all illuminated?
140				Y	Is the display blank?
150				Y	N Wait for 15 seconds. Is RESET LED extinguished?
160				Y	N Is Fault Code 50 or 51 or 56 or 58 or 59 or 60 or 61 displayed?
170				<u>1</u>	<u>1</u> Replace Formatter-Control Module.
180				<u>1</u>	Go to the appropriate troubleshooting procedure for the displayed fault code.
190			Y	N	Is FILE PROT LED illuminated?
200	<u>2</u>			<u>1</u>	Replace Control Panel Assembly.
210				<u>2</u>	Replace Read-Write-Servo Module (See Note 3 on page 2-31).
220			<u>1</u>	<u>3</u>	Replace Formatter-Control Module.
230	<u>1</u>		<u>2</u>		Replace Power Supply Assembly.
240		<u>1</u>			Go to Functional Troubleshooting Procedure 1003.

-----  
 LOAD/TEST 1003  
 -----

This procedure is for detection/isolation of operational faults.

Assumption: The transport is powered on with the LOGIC-ON LED pressed, the LOGIC-OFF LED extinguished, the LOGIC-ON LED illuminated, the FILE PROT LED illuminated, and the display blank.

## NOTE

Following any corrective action, this procedure should be restarted.

010	Y	N	Thread a write enabled tape and close the top cover. Press TEST switch. Does DIAGNOSTICS LED illuminate?
020		1	Replace Control Panel Assembly.
030		<u>2</u>	Replace Formatter-Control Module.
040	Y	N	Is 01 displayed?
050		1	Replace Control Panel Assembly.
060		<u>2</u>	Replace Formatter-Control Module.
070	Y	N	Press EXECUTE switch and observe LEDs and display of control panel. Does display sequence from 00 to 11 to 22 to 99 without any missing segments? And while display is sequencing, are ON-LINE and RESET LEDs both illuminated?
080		1	Replace Control Panel Assembly.
090		<u>2</u>	Replace Formatter-Control Module.
100	Y	N	Does Operator Diagnostic Test 01 terminate displaying 00?
110		<u>1</u>	Go the specific Fault Code Troubleshooting Procedure for the displayed fault code.
120	Y	N	Is the BOT LED extinguished?
		2	2
	A	B	

-----  
 LOAD/TEST 1003 (Cont'd)  
 -----

	A	B	
	1	1	
130		1	Replace Formatter-Control Module.
140		<u>2</u>	Replace Control Panel Assembly.
150	Y	N	Press the RESET switch. Is the display blank?
160		1	Replace Control Panel Assembly.
170		<u>2</u>	Replace Formatter-Control Module.
180	Y	N	Thread tape and close the top cover. Press LOAD switch. Does the transport load tape?
190		Y	N Fault Code displayed?
200		1	Replace Control Panel Assembly.
210		<u>2</u>	Replace Formatter-Control Module.
220		<u>1</u>	Go to the specific Fault Code Troubleshooting Procedure for displayed fault code.
230	Y	N	Is BOT LED illuminated?
240		1	Replace Control Panel Assembly.
250		<u>2</u>	Replace Formatter-Control Module.
260	Y	N	Is FILE PROT LED extinguished?
270		1	Replace Control Panel Assembly
280		<u>2</u>	Replace Formatter-Control Module.
290	Y	N	Press ON-LINE switch. Does ON-LINE LED illuminate?
300		1	Replace Control Panel Assembly.
	3	3	
	A	B	

	A	B	
	2	2	
310		<u>2</u>	Replace Formatter-Control Module.
320	Y	N	Press RESET switch followed by UNLOAD switch. Does the transport unload tape?
330		Y	N Fault Code displayed?
340			1 Replace Control Panel Assembly.
350			<u>2</u> Replace Formatter-Control Module.
360		<u>1</u>	Go to the specific Fault Code Troubleshooting Procedure for the displayed fault code.
370	Y	N	While pressing CE switch, press TEST switch. Is 00 displayed?
380			1 Replace Control Panel Assembly.
390		<u>2</u>	Replace Formatter-Control Module.
400	Y	N	Press STEP switch. Is 01 displayed?
410			1 Replace Control Panel Assembly.
420		<u>2</u>	Replace Formatter-Control Module.
430	Y	N	Press RESET switch. Remove write permit ring from reel and rethread tape. With the top cover open, press LOAD switch. Is Fault Code 10 displayed?
440			1 Replace Top Cover Interlock Switch Assembly.
450		<u>2</u>	Replace Read-Write-Servo Module (See Note 3 on page 2-31).
460	Y	N	Press RESET switch and close the top cover. Press LOAD switch. Does transport load tape successfully?
	4	4	
	A	B	



## Section 2 - FIELD SERVICE DIAGNOSTIC TEST DESCRIPTIONS

---

### 2.1 SCOPE

Information contained in this appendix includes descriptions of all Field Service Diagnostic Tests.

Those tests referenced by the Removal/Replacement Procedures and Fault Code Troubleshooting Procedures (Tests 1, 2, 3, 18, 31, 37, 43, 44, and 48) in Section 1, can be referred to by all levels of maintenance personnel.

Tests which are not referenced in Section 1 of this manual are to be used only by second level field service personnel (Technical Specialists) who have been instructed in the use and limitations of these tests.

## DIAGNOSTIC TESTS

---

### OPERATOR/FIELD SERVICE DIAGNOSTIC TESTS

<u>TEST NO.</u>	<u>DESCRIPTION</u>
01	Functional Fault Detection Diagnostic

### FIELD SERVICE DIAGNOSTIC TESTS

<u>TEST NO.</u>	<u>DESCRIPTION</u>	<u>OPTION</u>
02	Tension Fault Isolation Diagnostic	
03	Velocity Fault Isolation Diagnostic	
04-09	Reserved	
10	25 ips Forward to EOT	L
11	25 ips Reverse to BOT	L
12	25 ips Forward Ramps to EOT	L
13	25 ips Reverse Ramps to BOT	L
14	25 ips Repositioning	L
15	100 ips Forward Ramps to EOT	L
16	100 ips Reverse Ramps to BOT	L
17	100 ips Repositioning	L
18	100 ips Forward to EOT	L
19	100 ips Reverse to BOT	L
20	Formatter Internal Fault Detection Diagnostic	B
21	Write 2K Byte Records at 25 ips to EOT (At EOT, Rewind to BOT.)	B
22	Read at 25 ips to EOT (At EOT, Rewind to BOT.)	B
23	Write 256 Byte Records at 100 ips to EOT (At EOT, Rewind to BOT.)	B
24	Read at 100 ips to EOT (At EOT, Rewind to BOT.)	B
25-27	Reserved	
28	Perform Command Stack entered by Diagnostic 97 at 25 IPS Start/Stop	B
29	Perform Command Stack entered by Diagnostic 97 at 100 IPS Thrashing	B
30	Check Read Amplitudes at 25 and 100 ips to be within tolerance of 0.8 volt.	B

FIELD SERVICE DIAGNOSTIC TESTS (Cont'd)

<u>TEST NO.</u>	<u>DESCRIPTION</u>	<u>OPTION</u>
31	Determine EGC Gains at 25 and 100 ips and store gains in Backup Memory. Then check read amplitudes at 25 and 100 ips to be within tolerance of 0.1 volt.	X
32	Check Read Amplitudes at 25 and 100 ips with pre-recorded all 1's tape with tolerance of 0.3 volt.	B
33	Determine EGC Gains at 25 ips and store gains in Backup Memory.	X
34	Determine EGC Gains at 100 ips and store gains in Backup Memory.	X
37	Determine Velocity Servo Correction Multiplier and store multiplier in Backup Memory.	X
38	Apply approximately 8 ounce tension by pulsing supply reel with take-up reel in Stoplock.	X
39	Write all 1's to EOT at 25 ips (At EOT, Rewind to BOT.)	B
40	Write all 1's to EOT at 100 ips (At EOT, Rewind to BOT.)	B
41	Stoplock Take-up Reel	X
42	Enable Tension Servo	X
43	Turn-on Pump	X
44	Fast Search Forward For EOT	X
45	EGC DAC Scope Loop	X
46	Velocity DAC Scope Loop	X
47	R/W/S Microprocessor Outputs Scope Loop	X
48	Set Up Pump Power-Down Timer	X
49	Reserved	
50	25 IPS Forward Streaming Ramps to EOT	L
51	25 IPS Reverse Streaming Ramps to BOT	L
52-60	Reserved	
61	Take-up Motor and Power Amp Marginal Fault Detection	X
62	Take-Up Fine-Line Tach Fault Detection	X
63-90	Reserved	



FIELD SERVICE DIAGNOSTIC TESTS (Cont'd)

<u>TEST NO.</u>	<u>DESCRIPTION</u>	<u>OPTION</u>
91	Functional Fault Detection (Same as Operator Diagnostic Test 01 except: a) Will start in Loaded or Unloaded condition, b) Will not unload upon completion, and c) bypass EGC test.)	B
92-96	Reserved	
97	Read/Write Command Stack Generation Diagnostic	X

---

OPTION KEY

- X = Do not use any options.
- L = Test will loop. Do not use any options.
- B = Field Service Personnel may use options.

NOTE

Refer to paragraph 1.3.4.c for option initialization procedure.

- 00 = Halt if read or write errors exceed limit specified, Halt on completion of test (Default Option).
- 01 = Loop on test, Halt if read or write errors exceed limit specified on any given pass.
- 02 = Loop on test, bypass read or write error halts.

NOTE

Option of halting or bypassing errors only exists for read/write type errors; all other errors will cause test to halt, with the appropriate fault code displayed, regardless of the option selected.

TEST 01: FUNCTIONAL FAULT DETECTION TEST

TEST REQUIREMENT: A write enabled scratch tape should be threaded, but NOT loaded (untensioned).

DESCRIPTION: Test 01 performs various functions normally performed during functional operations. Unit halts with appropriate fault code if a functional fault occurs.

TEST SEQUENCE:

- a. Illuminate ONLINE and RESET LEDs. Increment display from 00 to 99. Extinguish ONLINE and RESET LEDs. Display 01.
- b. Load tape.
- c. Check read amplitudes at low and high speeds. Rewind.
- d. Write 100 blocks at 25 IPS start/stop (see NOTE 1).
- e. Space reverse, erase, and write file mark (check for file mark detect). Space reverse and check for file mark detect. Read forward and again check for file mark detect.
- f. Read reverse 100 blocks previously written at 25 IPS start/stop mode.
- g. Read forward 2 blocks at 25 IPS start/stop.
- h. Check gap lengths twice.
- i. Read forward 94 blocks at 25 IPS start/stop.
- j. Repeat steps d. to i. at 25 IPS continuous mode.
- k. Repeat steps d. to i. at 100 IPS streaming mode.
- l. Change speed from high to low and then low to high.
- m. Write 10 blocks at 100 IPS "thrashing" (see NOTE 2).
- n. Space reverse 10 blocks at 100 IPS "thrashing".
- o. Read forward 10 blocks at 100 IPS "thrashing".
- p. Rewind.
- q. Speed mode change.
- r. Read forward 200 blocks at 100 IPS streaming. (Check for file mark detect.)

TEST 01: (Cont'd)

- s. Write to EOF at 100 IPS streaming (see NOTE 2).
- t. Space reverse 200 blocks at 100 IPS streaming.
- u. Read forward 10 blocks at 100 IPS "thrashing".
- v. Read forward 20 blocks at 25 IPS start/stop.
- w. Read reverse 20 blocks at 25 IPS start/stop
- x. Rewind/Unload.

NOTE 1: Data blocks written at 25 IPS are 2K bytes with first 256 bytes "random" and remaining bytes of fixed pattern.

NOTE 2: Data block written at 100 IPS are 256 bytes of all zeros.

POSSIBLE TERMINATION CODES:

- 00 - Test Successful
- 01 - Read Envelope Fault
- 02 - Read Amplitude Range Fault
- 03 - ID Check
- 04 - Low Speed Write Error
- 05 - Low Speed Read Error
- 06 - High Speed Write Error
- 07 - High Speed Read Error
- 08 - Noise In IBG
- 10 to 69 - Refer to respective Troubleshooting Procedures

TEST 02: TENSION FAULT ISOLATION

TEST REQUIREMENT: Tape should be threaded, but NOT loaded (untensioned).

Valid fault code displayed in operator panel.

NOTE

Test 02 will run only if, during execution of Test 01, one of the following codes appears in the operator panel display: 22, 24, 26, 30, 31, 36.

Test will not run unless conditions above are met.

TEST DESCRIPTION: Test 02 is an extension of Test 01. Test 02 isolates servo faults by checking various assemblies of the TU80.

TEST SEQUENCE:

- a. Verify that top cover is closed and tape is not loaded.
- b. Verify EGC DAC of Read/Write/Servo Module is operational. If not, display Termination Code 80.
- c. Verify file (supply) reel power amp is operational. If not, display Termination Code 81.
- d. Verify take-up reel (TU) power amp is operational. If not, display Termination Code 82.
- e. Verify Demand Velocity DAC of Read/Write/Servo Module is operational. If not, display Termination Code 83.
- f. Move take-up reel slightly in forward direction. Check for correct count of quarter-tach pulses. If incorrect, display Termination Code 84.
- g. Repeat step f. in the reverse direction. Display Termination Code 84 if tach count is incorrect.
- h. Verify velocity feedback loop of Read/Write/Servo Module is operational by putting take-up motor in stoplock mode, and monitoring forward and reverse quarter-tachs. Display Termination Code 85 if any fault is detected.

TEST 02: (Cont'd)

- i. Verify that tension comparators on Read/Write/Servo Module are operational. Vary tension offsets and monitor status of tension level status lines. If any fault is detected, display Termination Code 87.
- j. With pneumatic pump off, zero tension offsets. If fault occurs, display Termination Code 97.
- k. Turn on pneumatic pump. If take-up sensor detects at least 2.0 ounces of tension, display Termination Code 90. If file sensor detects at least 2.0 ounces of tension, display Termination Code 89.
- l. Enable take-up servo. Move take-up reel from 0 IPS to 6 IPS in forward direction.
- m. If both sensors do not detect at least 2.0 ounces of tension within 15 seconds, display Termination Code 91.
- n. If, during this 15 seconds, the file sensor does not detect 2.0 ounces of tension within 100 milliseconds after take-up sensor, display Termination Code 74. If take-up sensor does not detect 2.0 ounces within 100 milliseconds after file sensor, display Termination Code 72.
- p. Move file reel slowly in reverse direction while take-up reel is moving forward at 6 IPS. If neither sensor detects at least 16 ounces of tension within 500 milliseconds, display Termination Code 92.
- q. If, during this 500 milliseconds, the file sensor does not detect 16 ounces of tension within 100 milliseconds after take-up sensor, display Termination Code 75. If take-up sensor does not detect 16 ounces of tension within 100 milliseconds after file sensor, display Termination Code 73.
- r. Stop moving file reel in reverse direction. If tension detected on both sensors is not within limits in 100 milliseconds, display Termination Code 98.
- s. Stop reel motion. Display Fault Code 00 to indicate test is successful.

POSSIBLE TERMINATION CODES:

- 00 - Test Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure

TEST 02: (Cont'd)

POSSIBLE TERMINATION CODES: (Cont'd)

- 70 - Invalid Operator Sequence (See Test Req'mts on page 2-7.)
- 71 - Invalid Operator Sequence (Tape Loaded Fault)
- 72 - TU Sensor Fault 1
- 73 - TU Sensor Fault 2
- 74 - File Sensor Fault 1
- 75 - File Sensor Fault 2
- 80 - EGC DAC Fault
- 81 - File Power Amp Fault
- 82 - TU Power Amp Fault
- 83 - Demand Velocity DAC Fault
- 84 - TU Motor/Tach Fault
- 85 - Velocity Feedback Loop Fault
- 86 - TU Comparator Fault
- 87 - File Comparator Fault
- 89 - File Sensor - 0 Fault
- 90 - TU Sensor - 0 Fault
- 91 - Pump Failure Fault
- 92 - Filter/Regulator, Pump, R/W/S Module Fault
- 97 - R/W/S Module, Sensor Intermittent Fault
- 98 - R/W/S Module, Power Amp Fault

TEST 03: VELOCITY FAULT ISOLATION

TEST REQUIREMENT: Tape should not be threaded.

Test 03 should not be used unless Test 01 directs its use. This test may fail if run Stand-alone.

TEST DESCRIPTION: Test 03 isolates velocity servo faults by checking the take-up motor/tach assembly and the velocity servo loop.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is absent.
- b. Ramp up to 4 IPS.
- c. Check if distance between two consecutive quarter tachs is within tolerable limits.
- d. If, after five tries, at least once, the distance between two consecutive quarter tachs is within limits, go to step f.
- e. Display Termination Code 96.
- f. Check that the distance between all consecutive quarter tachs is within tolerable limits.
- g. If distance between any two consecutive quarter tachs is not within limits, report fault, otherwise, go to step i.
- h. Repeat steps e. and f. If the error is detected five times, display Termination Code 98.
- i. Apply diagnostic lines to move take-up motor in forward direction from 0 to 100 IPS, and measure time it requires to ramp-up. Stop take-up motor.
- j. Calculate motor constant from this data.
- k. If motor constant is within range, go to step e. If motor constant is out of range the first time, repeat steps i. and j. Otherwise, display Termination Code 84.
- l. Apply full current to move take-up motor in forward direction from 0 to 100 IPS, and measure time it requires to ramp-up. Stop take-up motor.
- m. If power amp is not capable of delivering full current in forward direction, flag a fault, otherwise, go to step o.

TEST 03: (Cont'd)

- n. If fault is the first time, repeat steps l. and m., otherwise, display Termination Code 82.
- o. Apply full current to move take-up motor in reverse direction from 0 to 100 IPS, and measure time it requires to ramp-up. Stop take-up motor.
- p. If power amp is not capable of delivering full current in reverse direction, flag a fault, otherwise, go to step r.
- q. If fault is the first time, repeat steps o. and p., otherwise, display Termination Code 82.
- r. Display Termination Code 00 to indicate successful completion of test.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 82 - Take-Up Power Amp Fault
- 84 - Take-Up Motor/Tach Fault
- 94 - Tape Present Fault
- 95 - Formatter Interrupt received while test in progress.
- 96 - Servo Loop Fault
- 98 - Take-up Motor/Tach Fault



TEST 10: FORWARD 25 IPS CONTINUOUS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 10 exercises the transport in a continuous mode at 25 IPS in the forward direction. When EOT is detected, tape is stopped and 25 IPS continuous mode is executed in the reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run forward continuously 25 IPS until EOT is detected.
- c. Stop and run reverse continuously at 25 IPS until BOT is detected.
- d. Stop motion and go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 11: REVERSE 25 IPS CONTINUOUS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 11 exercises the transport in a continuous mode at 25 IPS in the reverse direction. When BOT is detected, tape is stopped and 25 IPS continuous mode is executed in the forward direction. When EOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run reverse continuously 25 IPS until BOT is detected.
- c. Stop and run forward continuously at 25 IPS until EOT is detected.
- d. Stop motion and go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 12: FORWARD 25 IPS RAMPS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 12 exercises the transport in a start/stop mode at 25 IPS in the forward direction. When EOT is detected, the same 25 IPS start/stop mode is executed in the reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run forward at 25 IPS for 120 ms.
- c. Stop and pause for 120 ms.
- d. Repeat steps b. and c. until EOT is detected.
- e. Run reverse at 25 IPS for 120 ms.
- f. Stop and pause for 120 ms.
- g. Repeat steps e. and f. until BOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 13: REVERSE 25 IPS RAMPS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 13 exercises the transport in a start/stop mode at 25 IPS in the reverse direction. When BOT is detected, the same 25 IPS start/stop mode is executed in the forward direction. When EOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run reverse at 25 IPS for 120 ms.
- c. Stop and pause for 120 ms.
- d. Repeat steps b. and c. until BOT is detected.
- e. Run forward at 25 IPS for 120 ms.
- f. Stop and pause for 120 ms.
- g. Repeat steps e. and f. until EOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.  
70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 14: 25 IPS REPOSITIONING

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 14 is a repositioning routine at 25 IPS. It repositions the tape in the forward direction. When EOT is detected, it repositions the tape in the reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run forward at 25 IPS for 100 ms.
- c. Run reverse at 25 IPS for 30 ms.
- d. Repeat steps b. and c. until EOT is detected.
- e. Run forward at 25 IPS for 30 ms.
- f. Run reverse at 25 IPS for 100 ms.
- g. Repeat steps e. and f. until BOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 15: FORWARD 100 IPS RAMPS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 15 exercises the transport in a start/stop mode at 100 IPS in the forward direction. When EOT is detected, the same 100 IPS start/stop mode is executed in the reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run forward at 100 IPS for 500 ms.
- c. Stop and Pause for 500 ms.
- d. Repeat steps b. and c. until EOT is detected.
- e. Run reverse at 100 IPS for 500 ms.
- f. Stop and pause for 500 ms.
- g. Repeat steps e. and f. until BOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 16: REVERSE 100 IPS RAMPS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 16 exercises the transport in a start/stop mode at 100 IPS in the reverse direction. When BOT is detected, the same 100 IPS start/stop mode is executed in the forward direction. When EOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run reverse at 100 IPS for 500 ms.
- c. Stop and Pause for 500 ms.
- d. Repeat steps b. and c. until BOT is detected.
- e. Run reverse at 100 IPS for 500 ms.
- f. Stop and pause for 500 ms.
- g. Repeat steps e. and f. until EOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 17: 100 IPS REPOSITIONING

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 17 is a repositioning routine at 100 IPS. It repositions the tape in the forward direction. When EOT is detected, it repositions the tape in the reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run forward at 100 IPS for 1 second.
- c. Run reverse at 100 IPS for 30 ms.
- d. Repeat steps b. and c. until EOT is detected.
- e. Run forward at 100 IPS for 30 ms.
- f. Run reverse at 100 IPS for 1 second.
- g. Repeat steps e. and f. until BOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)



TEST 18: FORWARD 100 IPS CONTINUOUS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 18 exercises the transport in a continuous mode at 100 IPS in the forward direction. When EOT is detected, tape is stopped and 100 IPS continuous mode is executed in the reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run forward continuously 100 IPS until EOT is detected.
- c. Stop and run reverse continuously at 100 IPS until BOT is detected.
- d. Stop motion and go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 19: REVERSE 100 IPS CONTINUOUS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 19 exercises the transport in a continuous mode at 100 IPS in the reverse direction. When BOT is detected, tape is stopped and 100 IPS continuous mode is executed in the forward direction. When EOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Run reverse continuously 100 IPS until BOT is detected.
- c. Stop and run forward continuously at 100 IPS until EOT is detected.
- d. Stop motion and go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 20: FORMATTER INTERNAL DIAGNOSTICS

TEST REQUIREMENT: None.

TEST DESCRIPTION: Test 20 checks out the internal hardware of the formatter. It does not check host interface or device interface hardware.

TEST SEQUENCE:

- a. Check out programmable timer hardware.
- b. Check out hardware used to write ID or file mark.
- c. Check out hardware used to write or read a block of data.
- d. Check out hardware used to detect dead tracks and correct errors.
- e. Check out hardware used for high speed and reverse operations.

POSSIBLE TERMINATION CODES:

- 00 - Test is Successful
- 58 - Formatter Internal Diagnostic Failure

TEST 21: 25 IPS WRITE TO EOT

TEST REQUIREMENT: A write enabled scratch tape should be loaded.

TEST DESCRIPTION: Test 21 writes 2K byte records, first 256 bytes of random data and then the remaining bytes of fixed data, from the present position of the tape to EOT at 25 IPS. On detection of EOT, it rewinds and positions at BOT. If a write error occurs, the unit performs Backspace, Erase, and attempts to write again. If more than five consecutive erases are required, the test terminates with a write fault. If 16 erases are required in one complete pass, the test terminates with a write fault. All functional checks are active throughout the test.

TEST SEQUENCE:

- a. Write 2K byte records at 25 IPS continuous to EOT.
- b. Rewind to BOT.

POSSIBLE TERMINATION CODES:

- 00 - Test is successful
- 03 - ID Check
- 04 - Low Speed Write Error
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 22: 25 IPS READ TO EOT

TEST REQUIREMENT: A pre-written tape should be loaded.

TEST DESCRIPTION: Test 22 reads any pre-written tape from present tape position to EOT at 25 IPS. Any read error halts the test with a fault code. All functional checks are active. On detection of EOT, it rewinds and positions at BOT.

TEST SEQUENCE:

- a. Read records at 25 IPS continuous to EOT.
- b. Rewind to BOT.

POSSIBLE TERMINATION CODES:

- 00 - Test is Successful
- 03 - ID Check
- 05 - Low Speed Read Error
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 23: 100 IPS STREAMING WRITE TO EOT

TEST REQUIREMENT: A write enabled scratch tape should be loaded.

TEST DESCRIPTION: Test 23 writes 256 byte records, all zeros patterns, from present position of tape to EOT at 100 IPS in streaming mode. On detection of EOT, it rewinds and positions at BOT. If a write error occurs, the unit performs Backspace, Erase, and attempts to write again. If more than five consecutive erases are required, the test terminates with a write fault. If 16 erases are required in one complete pass, the test terminates with a write fault. All functional checks are active throughout the test.

TEST SEQUENCE:

- a. Write 256 byte records at 100 IPS streaming to EOT.
- b. Rewind to BOT.

POSSIBLE TERMINATION CODES:

- 00 - Test is successful
- 03 - ID Check
- 06 - High Speed Write Error
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 24: 100 IPS READ TO EOT

TEST REQUIREMENT: A pre-written tape should be loaded.

TEST DESCRIPTION: Test 24 reads any pre-written tape from present tape position to EOT at 100 IPS. Any read error halts the test with a fault code. All functional checks are active. On detection of EOT, it rewinds and positions at BOT.

TEST SEQUENCE:

- a. Read records at 100 IPS streaming to EOT.
- b. Rewind to BOT.

POSSIBLE TERMINATION CODES:

- .00 - Test is Successful
- 03 - ID Check
- 07 - High Speed Read Error
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 28: PERFORM COMMAND STACK AT 25 IPS START/STOP

- TEST REQUIREMENT:
- a. If a write-type operation is desired, a write enabled scratch tape should be loaded.
  - b. If a read-type operation is desired, a pre-recorded tape should be loaded.

TEST DESCRIPTION: Test 28 performs the three-level command stack entered by Test 97. If option 01 is entered, the stack will be repeated until EOT or BOT is detected. If write operation is being performed upon an error, a Backspace, Erase, and Rewrite is performed. If read operation is being performed, any uncorrectable read error will cause the test to fail with a read fault. All functional checks are active throughout the test.

Option 2 bypasses read and write errors as in all read/write tests.

POSSIBLE TERMINATION CODES:

- 00 - Test is Successful
- 03 - ID Check
- 04 - Low Speed Write Error
- 05 - Low Speed Read Error
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)



TEST 29: PERFORM COMMAND STACK AT 100 IPS THRASHING

- TEST REQUIREMENT:
- a. If a write-type operation is desired, a write enabled scratch tape should be loaded.
  - b. If read-type operation is desired, a pre-recorded tape should be loaded.

TEST DESCRIPTION: Test 29 performs the three-level command stack entered by Test 97. If option 01 is entered, the stack will be repeated until EOT or BOT is detected. If write operation is being performed upon an error, a Backspace, Erase, and Rewrite is performed. If read operation is being performed, any uncorrectable read error will cause the test to fail with a read fault. All functional checks are active throughout the test.

Option 2 bypasses read and write errors as in all read/write tests.

POSSIBLE TERMINATION CODES:

- 00 - Test is Successful
- 03 - ID Check
- 06 - High Speed Write Error
- 07 - High Speed Read Error
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 30: CHECK READ AMPLITUDES AT 25 AND 100 IPS WITH TOLERANCE OF + 0.8 VOLTS

TEST REQUIREMENT: Tape should be loaded and not write protected, and should not be near EOT.

TEST DESCRIPTION: Test 30 checks that read amplitudes at 25 and 100 IPS are  $1.5 \pm 0.8$  volts. For 25 IPS, the minimum read amplifier gain value is determined for each track, such that peak-to-peak voltage at the analog test point is 1.5 volts. This generates an envelope signal for that track. If, at the end of the test, an envelope is not detected for any track, a fault is reported. The gain determined for each track is compared to corresponding gain value stored in the back-up memory (determined by Test 31). If the difference for any track is such, that it causes an amplitude difference of 0.8 volts, a fault is reported. All options are available for the test. The same operation is carried out for 100 IPS.

TEST SEQUENCE:

- a. Check if the top cover door is closed, tape is not write protected, tape is loaded and not at EOT.
- b. Calculate the minimum read gain values for all tracks for 25 IPS as described.
- c. Display Fault Code 01 if an envelope is not detected in track at the end of the test.
- d. Display Fault Code 02 if the difference in gain, between that determined and the corresponding value stored in the back-up memory for any track, is such that it causes an amplitude difference of 0.8 volts.
- e. Execute steps b., c., and d. for 100 IPS.
- f. Display Termination Code 00 if test is successful.

POSSIBLE TERMINATION CODES:

00 - Test Is Successful  
01 - EGC Envelope Fault  
02 - EGC Wear Tolerance Fault  
10 to 69 - Refer to respective Troubleshooting Procedure  
70 - Invalid Operator Sequence (Tape Not Loaded Fault)  
72 - Tape Write Protected Fault  
77 - EOT On EGC Fault

NOTE: Test 30 is a part of Operator Test 01.

TEST 31: SET UP AND CHECK READ AMPLITUDES AT 25 AND 100 IPS

TEST REQUIREMENT: Tape should be loaded and not write protected, and should not be near EOT. Jumper to the back-up memory (on Read-Write-Servo Module) should be in W4 ("STORE") position.

TEST DESCRIPTION: Test 31 sets up and checks the read amplitudes at 25 and 100 IPS. For 25 IPS, it determines the minimum gain value for each track, in the same manner as described in Test 30, and stores them in the back-up memory. It again determines the minimum gain value for each track and compares it to the previously stored value. If the difference in gain between the two values for any track is such that it causes an amplitude difference of 0.1 volts, the test is repeated. Also, if any fault is detected while determining the minimum gain values, the test is repeated. If, after 5 attempts, the operation is not successful, a fault is reported.

The same operation is carried out for 100 IPS.

TEST SEQUENCE:

- a. Check if the top cover is closed, tape is not write protected, tape is loaded, and tape is not at EOT.
- b. Determine the minimum gain values for 25 IPS and store them in the back-up memory. Report a fault if the jumper on the back-up memory is not in the "STORE" position.
- c. Determine the minimum gain values for 25 ips and compare them with the previously stored values. If, for any track, the difference is such that it causes an amplitude difference greater than 0.1 volts, the test is repeated.
- d. If, while determining the minimum gain values in steps b. and c., a fault is detected, the test is repeated.
- e. If, after five tries, the test is still not successful, terminate the test with Termination Code 78.
- f. Execute steps b., c., and d. for 100 IPS. If test is not successful after five tries, display Termination Code 79.
- g. Display Termination Code 00 if test is successful.

TEST 31: (Cont'd)

POSSIBLE TERMINATION CODES:

- 00 - test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)
- 72 - Tape Write Protected Fault
- 78 - EGC Low Speed Set-Up Failure
- 79 - EGC High Speed Set-Up Failure
- 99 - Attempt to Loop on Test

NOTE 1: After completing the test, replace the jumper to the back-up memory from the W4 ("STORE") position to the W3 position before powering down the transport.

NOTE 2: Loop on test option is not permitted with this test.

NOTE 3: Make certain resistors R224 and R225 are moved from old module to replacement module. Move jumper plug at location 13E on Read-Write-Servo Module from normal W3 to Test W4 - Store position. With tape not threaded, execute Field Service Tests 37 and 48. Load known good quality write enabled tape. Execute Field Service Test 18 to move tape away from BOT. Press RESET to stop tape motion. Execute Field Service Test 31. After test is complete (display 00), return jumper plug to W3 position. With tape threaded, but not loaded, execute Operator Test 01.

TEST 32: CHECK READ AMPLITUDES AT 25 AND 100 IPS

TEST REQUIREMENT: Tape should be loaded and pre-written with all 1's, and should not be near EOT.

TEST DESCRIPTION: Test 32 checks that read amplitudes at 25 and 100 IPS are  $1.5 \pm 0.3$  volts, with pre-written tape of all 1's. This test is similar to Test 30 except that it requires pre-written tape and the tolerance value is  $\pm 0.3$  volts instead of 0.8 volts. All options are available for the test.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 01 - EGC Envelope Fault
- 02 - EGC Wear Tolerance Fault
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)
- 77 - EOT On EGC Fault

TEST 33: SET UP READ AMPLITUDES AT 25 IPS

TEST REQUIREMENT: Tape should be loaded and not write protected, and should not be near EOT. Jumper to the back-up memory (on Read-Write-Servo Module) should be in the W4 ("STORE") position.

TEST DESCRIPTION: Test 33 determines and stores the read gains at 25 IPS. This test is similar to Test 31 except it is done only at 25 IPS, and whenever a fault is detected, the test is terminated and the fault is reported.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 01 - EGC Envelope Fault
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)
- 72 - Tape Write Protected Fault
- 73, 74 - Back Up Memory Not Write Enabled
- 75, 76 - Bad Back Up Memory
- 77 - EOT On EGC Fault
- 99 - Attempt to Loop on Test

NOTE 1: After completing the test, replace the jumper to the back-up memory from the W4 ("STORE") position to the W3 operating position before powering down the transport.

NOTE 2: Loop on test option is not permitted with this test.

TEST 34: SET UP READ AMPLITUDES AT 100 IPS

TEST REQUIREMENT: Tape should be loaded and not write protected, and should not be near EOT. Jumper to the back-up memory (on Read-Write-Servo Module) should be in the W4 ("STORE") position.

TEST DESCRIPTION: Test 34 determines and stores the read gains at 100 IPS. This test is similar to Test 31 except it is done only at 100 IPS, and whenever a fault is detected, the test is terminated and the fault is reported.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 01 - EGC Envelope Fault
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)
- 72 - Tape Write Protected Fault
- 73, 74 - Back Up Memory Not Write Enabled
- 75, 76 - Bad Back Up Memory
- 77 - EOT On EGC Fault
- 99 - Attempt to Loop on Test

NOTE 1: After completing the test, replace the jumper to the back-up memory from the W4 ("STORE") position to the W3 operating position before powering down the transport.

NOTE 2: Loop on test is not permitted with this test.

TEST 37: SET UP VELOCITY CORRECTION MULTIPLIER

TEST REQUIREMENT: Tape should not be threaded. Jumper to the back-up memory (on Read-Write-Servo Module) should be in the W4 ("STORE") position.

TEST DESCRIPTION: Test 37 sets up the velocity correction multiplier for the velocity DAC.

TEST SEQUENCE:

- a. Check if the top cover door is closed and tape is absent.
- b. Move take-up reel forward at about 19 IPS velocity (for BOT radius).
- c. Calculate velocity correction multiplier for velocity DAC.
- d. Display Termination Code 93 if velocity correction multiplier is out of range.
- e. Stop take-up reel and store velocity correction multiplier in back-up memory.
- f. Display Termination Code 00 if complete test is successful.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 73, 74 - Back Up Memory Not Write Enabled
- 75, 76 - Bad Back Up Memory
- 93 - Velocity Correction Multiplier Factor Out of Range
- 94 - Tape Present Fault
- 99 - Attempt to Loop on Test

NOTE 1: Upon successful completion of this test, CE Test 48 should be initiated to set up pump power-down timer.

NOTE 2: After completing the test, replace the jumper to the back-up memory from the W4 ("STORE") position to the W3 operating position before powering down the transport.

NOTE 3: Loop on test is not permitted with this test.



TEST 38: PULSE FILE REEL AT 8 OUNCES

TEST REQUIREMENT: Tape (10.5 inch reel) should be threaded close to BOT without any loop.

TEST DESCRIPTION: This test puts the take-up reel in Stoplock. It pulses the file reel in the reverse direction to maintain approximately 8 ounces of tension. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is present.
- b. Put take-up reel in Stoplock.
- c. Turn on pump.
- d. Pulse the file reel.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 71 - Invalid Operator Sequence (Tape Loaded Fault)

TEST 39: WRITE ALL 1'S TO EOT AT 25 IPS

TEST REQUIRMENT: Tape should be loaded and not write protected.

TEST DESCRIPTION: Test 39 writes tape with all 1's at 25 IPS to EOT. At EOT, tape is rewound to BOT. All options are available for the test.

TEST SEQUENCE:

- a. Check if the top cover is closed.
- b. Check if tape is loaded and not write protected.
- c. Write all 1's to EOT at 25 IPS.
- d. Rewind to BOT.
- e. Display Termination Code 00 if test is successful.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)
- 72 - Tape Write Protected Fault

TEST 40: WRITE ALL 1'S TO EOT AT 100 IPS

TEST REQUIRMENT: Tape should be loaded and not write protected.

TEST DESCRIPTION: Test 40 writes tape with all 1's at 100 IPS to EOT. First, it checks if tape is not write protected. It then writes all 1's at 100 IPS to EOT. At EOT, it is rewound to BOT. All options are available for the test.

TEST SEQUENCE:

- a. Check if the top cover is closed.
- b. Check if tape is loaded and not write protected.
- c. Write all 1's to EOT at 100 IPS.
- d. Rewind to BOT.
- e. Display Fault Code 00 if test is successful.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)
- 72 - Tape Write Protected Fault

TEST 41: STOPLOCK TAKE-UP REEL

TEST REQUIREMENT: Tape should not be loaded.

TEST DESCRIPTION: Test 41 checks the stoplock mode of the take-up reel servo. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed.
- b. Put take-up reel servo in stoplock mode.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 71 - Invalid Operator Sequence (Tape Loaded Fault)

TEST 42: ENABLE TENSION SERVO

TEST REQUIREMENT: Tape should be threaded.

Tape slack should be removed to allow File Servo to be enabled.

TEST DESCRIPTION: Test 42 allows tape tension to be checked via the tension servo. It produces 8 ounces of tension by enabling tension servo.

TEST SEQUENCE:

- a. Check if the top cover is closed. If tape is absent, go to step d.
- b. Take up slack in tape by slowly moving take-up reel in reverse direction until tension is reached.
- c. Enable tension servo operation at 8 ounces.
- d. If tape is pulled out of tape path, display Termination Code 00.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 71 - Invalid Operator Sequence (Tape Loaded Fault)

TEST 43: TURN ON PUMP

TEST REQUIREMENT: Tape should not be loaded.

TEST DESCRIPTION: Test 43 turns on the pump. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is not loaded.
- b. Turn on pump.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 71 - Invalid Operator Sequence (Tape Loaded Fault)

TEST 44: FAST FORWARD TO EOT

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 44 moves tape forward at rewind speed to EOT.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Gradually increase speed and then maintain rewind speed.
- c. Wait until EOT is detected.
- d. Stop motion and display Termination Code 00.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 45: EGC DAC SCOPE LOOP

TEST REQUIREMENT: Tape should not be loaded.

TEST DESCRIPTION: Test 45 exercises the EGC DAC on the Read/Write/Servo Module. Use TP 12 as a sync point and observe output at TP 14. If EGC DAC is operational, a triangle waveform of 35 ms period will be observed on the scope. Manual termination is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed.
- b. Issue a trigger signal at TP 12.
- c. Output zero voltage at TP 14 through EGC DAC, and increase it by 20 mv at every 60 microseconds (approximate) until it reaches 5 volts.
- d. Decrease output at TP 14 through EGC DAC by 20 mv at every 60 microseconds (approximate) until it reaches 0 volt.
- e. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.  
71 - Invalid Operator Sequence (Tape Loaded Fault)



TEST 46: VELOCITY DAC SCOPE LOOP

TEST REQUIREMENT: Tape should not be loaded.

TEST DESCRIPTION: Test 46 exercises the Velocity DAC on the Read/Write/Servo Module. Use TP 12 as a sync point and observe output at TP 13 on the scope. If Velocity DAC is operational, a triangle waveform of 35 ms period will be observed on the scope. Manual termination is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed.
- b. Issue a trigger signal at TP 12.
- c. Output zero voltage at TP 13 through Velocity DAC, and increase it by 20 mv at every 60 microseconds (approximate) until it reaches 6.9 volts.
- d. Decrease output at TP 13 through Velocity DAC by 20 mv at every 60 microseconds (approximate) until it reaches 0 volt.
- e. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 71 - Invalid Operator Sequence (Tape Loaded Fault)

TEST 47: READ/WRITE/SERVO MICROPROCESSOR OUTPUTS SCOPE LOOP

TEST REQUIREMENT: Tape should not be loaded.

TEST DESCRIPTION: Test 47 generates a pulse of 50 microseconds every 5 ms on each of the addressable outputs of the Read/Write/Servo Module. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is not present.
- b. Generate a 50 microsecond pulse every 5 ms on each of the addressable outputs of Read/Write/Servo microprocessor.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 94 - Tape Present Fault

TEST 48: SET UP PUMP POWER-DOWN TIMER

TEST REQUIREMENT: Tape should not be threaded. Jumper to the backup memory (on the Read-Write-Servo module) should be in the W4 ("STORE") position.

TEST DESCRIPTION: Test 48 sets up the pump power-down timer for one minute if no tape motion has occurred.

POSSIBLE TERMINATION CODES:

- 00 - Test is successful
- 73, 74 - Backup memory is not write enabled.
- 75, 76 - Bad backup memory
- 94 - Tape Present Fault

NOTE 1: After completing the test, replace the jumper to the back-up memory from the W4 ("STORE") position to the W3 operating position before powering down the transport.

NOTE 2: To disable the pump power-down timer, run CE Test 37.

TEST 50: 25 IPS FORWARD STREAMING RAMPS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 50 exercises the transport in a start/stop mode at 25 ips using the streaming ramps in the forward direction. When EOT is detected, the same 25 ips mode is executed in reverse direction. When BOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Ramp up to 25 ips using streaming ramp and run for 250 ms.
- c. Stop using streaming ramp and pause for 250 ms.
- d. Repeat steps b. and c. until EOT is detected.
- e. Ramp up to 25 ips in the reverse direction and run for 250 ms.
- f. Stop and pause for 250 ms.
- g. Repeat steps e. and f. until BOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 51: 25 IPS REVERSE STREAMING RAMPS

TEST REQUIREMENT: Tape should be loaded.

TEST DESCRIPTION: Test 51 exercises the transport in a start/stop mode at 25 ips using the streaming ramps in the reverse direction. When BOT is detected, the same 25 ips mode is executed in the forward direction. When EOT is detected, the routine starts again. Manual intervention is required to terminate the test.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is loaded.
- b. Ramp up to 25 ips using streaming ramp and run for 250 ms.
- c. Stop using streaming ramp and pause for 250 ms.
- d. Repeat steps b. and c. until BOT is detected.
- e. Ramp up to 25 ips in the forward direction and run for 250 ms.
- f. Stop and pause for 250 ms.
- g. Repeat steps e. and f. until EOT is detected.
- h. Go to step b.

POSSIBLE TERMINATION CODES:

- 10 to 69 - Refer to respective Troubleshooting Procedure
- 70 - Invalid Operator Sequence (Tape Not Loaded Fault)

TEST 61: TAKE-UP MOTOR AND POWER AMP FULL CAPABILITY DETECTION TEST

TEST REQUIREMENT: Tape should not be threaded.

TEST DESCRIPTION: Test 61 checks out whether take-up motor performance is within range or not. It also checks out whether take-up section of the power amp is capable of delivering full current or not.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is absent.
- b. Apply diagnostic lines to move take-up motor in forward direction from 0 to 100 IPS, and measure time it requires to ramp-up. Stop take-up motor.
- c. Calculate motor constant from this data.
- d. If motor constant is within range, go to step e. If motor constant is out of range the first time, repeat steps b. and c. Otherwise, display Termination Code 84.
- e. Apply full current to move take-up motor in forward direction from 0 to 100 IPS, and measure time it requires to ramp-up. Stop take-up motor.
- f. If power amp is not capable of delivering full current in forward direction, flag a fault, otherwise, go to step h.
- g. If fault is the first time, repeat steps e. and f., otherwise, display Termination Code 82.
- h. Apply full current to move take-up motor in reverse direction from 0 to 100 IPS, and measure time it requires to ramp-up. Stop take-up motor.
- i. If power amp is not capable of delivering full current in reverse direction, flag a fault, otherwise, go to step k.
- j. If fault is the first time, repeat steps h. and i., otherwise, display Termination Code 82.
- k. Display Termination Code 00 to indicate successful completion of test.

TEST 61: (Cont'd)

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 82 - Take-Up Power Amp Fault
- 84 - Take-Up Motor/Tach Fault
- 94 - Tape Present Fault

TEST 62: TAKE-UP FINE TACH FAULT DETECTION

TEST REQUIREMENT: Tape should not be threaded.

TEST DESCRIPTION: Test 62 checks that the distance between two consecutive quarter tachs (derived from fine line tachs at the take-up motor) is within tolerable limits.

TEST SEQUENCE:

- a. Check if the top cover is closed and tape is absent.
- b. Ramp up to 4 IPS.
- c. Check if distance between two consecutive quarter tachs is within tolerable limits.
- d. If, after five tries, at least once, the distance between two consecutive quarter tachs is within limits, go to step f.
- e. Display Termination Code 96.
- f. Check that the distance between all consecutive quarter tachs is within tolerable limits.
- g. If distance between any two consecutive quarter tachs is not within limits, report fault, otherwise, go to step i.
- h. Repeat steps e. and f. If the error is detected five times, display Termination Code 84.
- i. Display Termination Code 00 to indicate successful completion of test.

POSSIBLE TERMINATION CODES:

- 00 - Test Is Successful
- 10 to 69 - Refer to respective Troubleshooting Procedure.
- 84 - Take-Up Motor/Tach Fault
- 94 - Tape Present Fault
- 95 - Formatter Interrupt received while test in progress.
- 96 - Servo Loop Fault



TEST 91: FUNCTIONAL FAULT DETECTION TEST

TEST REQUIRMENT: A write enabled scratch tape should be loaded.

TEST DESCRIPTION: Test 91 performs those functions that the TU80 would normally perform during functional operations. Unit halts with the appropriate error code, if a functional fault occurs.

TEST SEQUENCE:

- a. If tape is unloaded then load tape, otherwise, rewind tape.
- b. Write 100 blocks at 25 IPS start/stop (NOTE 1).
- c. Space Reverse, Erase, Write File Mark (check for File Mark Detect), Space Reverse (check for File Mark Detect), Read Forward, Read Reverse (check for File Mark Detect).
- d. Read reverse 100 blocks previously written at 25 IPS start/stop mode.
- e. Read forward 2 blocks at 25 IPS start/stop mode.
- f. Check gap lengths twice.
- g. Read forward 94 blocks at 25 IPS start/stop mode.
- h. Repeat steps d. to i. at 25 IPS continuous mode.
- i. Repeat steps d. to i. at 100 IPS start/stop mode.
- j. Change speed from high to low and then low to high.
- k. Write 100 blocks at 100 IPS "thrashing" (NOTE 2).
- l. Space reverse 10 blocks at 100 IPS "thrashing".
- m. Read forward 10 blocks at 100 IPS "thrashing".
- n. Rewind.
- o. Speed mode change.
- p. Read forward 200 blocks at 100 IPS streaming (check for File Mark Detect).
- q. Write to EOT at 100 IPS streaming (NOTE 2).

TEST 91: (Cont'd)

- r. Space reverse 200 blocks at 100 IPS streaming.
- s. Read forward 10 blocks at 100 IPS "thrashing".
- t. Read forward 20 blocks at 25 IPS start/stop mode.
- u. Read reverse 20 blocks at 25 IPS start/stop mode.
- v. Rewind.

NOTE 1: Data blocks written at 25 IPS are 2K bytes with the first 256 bytes "random" and remaining bytes of fixed pattern.

NOTE 2: Data blocks written at 100 IPS are 256 bytes of all zeros.

POSSIBLE TERMINATION CODES:

- 00 - Test is Successful
- 01 - Read Envelope Fault
- 02 - Read Amplitude Range Fault
- 03 - ID Check
- 04 - Low Speed Write Error
- 05 - Low Speed Read Error
- 06 - High Speed Write Error
- 07 - High Speed Read Error
- 08 - Noise In IBG
- 10 to 69 - Refer to respective Troubleshooting Procedure.

TEST 97: READ/WRITE COMMAND STACK

TEST REQUIREMENT: None.

TEST DESCRIPTION: Test 97 allows Field Service Representative to set up a command stack using Read, Write, Space, and Erase commands. Up to three commands can be entered. The commands available are:

Read Forward - 00  
Read Reverse - 80  
Space Forward - 08  
Space Reverse - 88  
Write - 40  
Erase - 58  
No-Op - 70 (included to allow "in-place"  
analysis)  
Write File Mark - 50  
Rewind - 74  
Speed Change - 04

TEST SEQUENCE:

- a. Set up for test 97 and depress EXECUTE.
- b. Display goes to "00" - enter first desired command using STEP and TEST (to multiply by 10) and depress EXECUTE.
- c. Repeat step b. two more times to enter second and third commands.
- d. After third entry, display goes to "00" and fault indicator will illuminate. Test is terminated.

## Section 3 - SUB-FAULT CODE DESCRIPTIONS

---

### 3.1 TU80 FAULT AND SUB-FAULT DESCRIPTIONS

The sub-fault code is displayed by pressing the CE switch after the primary fault code is indicated. The numerical sub-fault code will remain illuminated as long as the CE switch is held pressed.

Interpretation of the numerical display using the tables in this section is as follows:

1. Example 1 - Fault Code 25, Sub-Fault Code 65
  - a. 40 - Take Up sensor saw fault code first.
  - b. 20 - Fault code occurred on up ramp.
  - c. 04 - Fault occurred in reverse direction.
  - d. 01 - Fault occurred with 100 ips demanded.

65

#### FAULT CODE 25 - LOW TENSION FAULT

	SUB-FAULT
a. →	00 File sensor saw the fault first
	40 Takeup sensor saw the fault first

	SUB-FAULT
	00 Fault occurred during constant motion
	10 Fault occurred on down ramp
b. →	20 Fault occurred on up ramp
	30 Fault occurred in stoplock

	SUB-FAULT
	00 Fault occurred in forward direction
c. →	04 Fault occurred in reverse direction

	SUB-FAULT
	00 Fault occurred with 25 ips demanded
d. →	01 Fault occurred with 100 ips demanded
	02 Fault occurred with 200 ips demanded
	03 Fault occurred with 200 ips demanded

Figure 3-1. SUB-FAULT CODE INTERPRETATION - EXAMPLE 1

2. Example 2 - Fault Code 25, Sub-Fault Code 11

- a. 00 - File sensor saw fault first.
- b. 10 - Fault occurred on down ramp.
- c. 00 - Fault occurred in forward direction.
- d. 01 - Fault occurred with 100 ips demanded.

11

FAULT CODE 25 - LOW TENSION FAULT

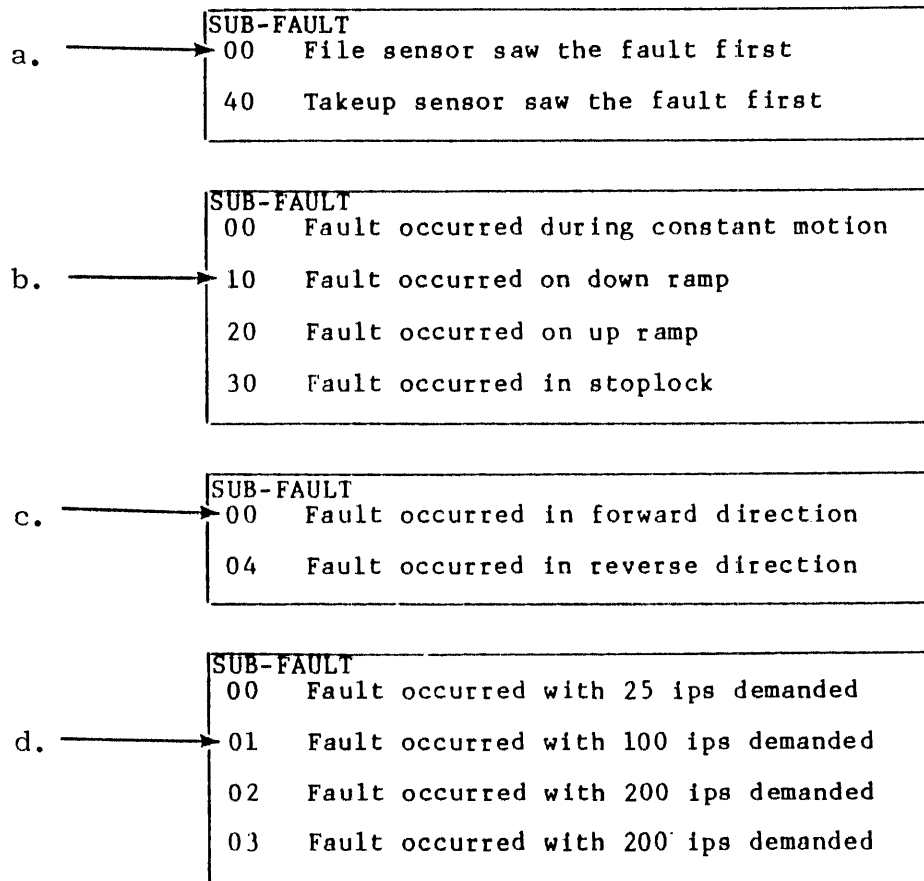


Figure 3-2. SUB-FAULT CODE INTERPRETATION - EXAMPLE 2

FAULT CODE 01 - READ ENVELOPE FAULT

SUB-FAULT

00 Envelope not detected during read amplitude check  
(EGC test)

---

FAULT CODE 02 - READ AMPLITUDE TOLERANCE FAULT

SUB-FAULT

00 Read amplitude outside range 1.5 volts + 0.8 volts  
(i.e. difference between EGC gain and gain in backup  
memory would cause an amplitude difference  
greater than 0.8 volts)

---

FAULT CODE 03 - ID FAULT

SUB-FAULT

00 Unable to read or write PE Identification Burst

---

FAULT CODE 04 - LOW SPEED WRITE ERRORS

SUB-FAULT

00 Unable to write a block at low speed within 5 attempts

37 Filemark detection error

38 More than 16 write error recoveries performed while  
writing to EOT at low speed during Field Service  
Diagnostic Test 21

---

FAULT CODE 05 - LOW SPEED READ ERROR

---

SUB-FAULT

- 00 Data error detected while reading at low speed  
(No error recovery performed)
  - 36 Short IBG detected
  - 37 Filemark detection error
- 

FAULT CODE 06 - HIGH SPEED WRITE ERROR

---

SUB-FAULT

- 00 Unable to write a block at high speed within 5 attempts
  - 37 File mark detection error
  - 38 More than 16 write error recoveries performed while  
writing to EOT at high speed during operator test 1 or  
Field Service Diagnostic Test 23
- 

FAULT CODE 07 - HIGH SPEED READ ERROR

---

SUB-FAULT

- 00 Data error detected while reading at high speed (No  
error recovery performed)
  - 36 Short IBG detected
  - 37 File mark detection error
- 

FAULT CODE 08 - NOISE IN IBG

---

SUB-FAULT

- 00 Noise detected during IBG or while erasing
-

FAULT CODE 10 - OPERATOR DOOR OPEN

---

SUB-FAULT

- 01 Door open on load
  - 02 Door open after tensioning
  - 03 Door opened during unload
  - 04 Door open on untensioned unload
  - 05 Door opened during untensioned unload
  - 06 Door opened during retensioned load unload
  - 07 Door open on diagnostic test
- 

FAULT CODE 11 - ABSENCE OF TAPE

---

SUB-FAULT

- 01 Absence of tape on load
  - 02 Absence of tape on Operator Diagnostic Test 02
- 

FAULT CODE 12 - HUB NOT LATCHED

---

SUB-FAULT

- 01 Hub not latched on load
- 

FAULT CODE 13 - TAPE THREADED INCORRECTLY

---

SUB-FAULT

- 01 Tension not detected on both sensors within 10 seconds
  - 02 Second course tach not detected within 10 seconds
-



FAULT CODE 14 - BOT LOCATION FAULT

---

SUB-FAULT

- 01 BLTL loading not seen BOT
  - 02 AOT loading not seen BOT
  - 03 Did not get BLTL within 30 seconds during unload
- 

FAULT CODE 15 - LOAD/UNLOAD ABORTED BY OPERATOR

---

SUB-FAULT

- 01 Reset pressed during load
  - 02 Reset pressed during unload
- 

FAULT CODE 16 - DIAGNOSTIC TAPE IS WRITE PROTECTED

---

SUB-FAULT

- 00 Attempted to execute a read/write diagnostic with write protected tape
- 

FAULT CODE 17 - RAN OFF END OF TAPE

---

SUB-FAULT

- 01 AOT trailer forward
  - 02 BLTL trailer forward
  - 03 BOT trailer reverse
-

FAULT CODE 18 - TAPE ALREADY LOADED

---

SUB-FAULT

00 Attempted to execute Operator Test 1 with tape already loaded

---

FAULT CODE 20 - FILE TENSION SENSOR FAULT

---

SUB-FAULT

00 Offset comparator is low with minimum offset  
01 Offset comparator is high with maximum offset  
02 2 oz. detected with no tension  
04 Upper tension detected with no tension  
05 Did not reach 2 oz. within 100 ms of takeup sensor detecting 2 oz. during load.

---

FAULT CODE 21 - TAKEUP TENSION SENSOR FAULT

---

SUB-FAULT

00 Offset comparator is low with minimum offset  
01 Offset comparator is high with maximum offset  
02 2 oz detected with no tension  
03 9 oz. detected with no tension  
04 Upper tension detected with no tension  
05 Did not reach 2 oz. within 100 ms of file sensor detecting 2 oz during load

---

FAULT CODE 22 - UNABLE TO TENSION TAPE

---

SUB-FAULT

- 01 Unable to successfully maintain tension during load  
(Fault is reported after tape is unloaded off EOT).
  - 02 Unable to successfully maintain tension during load  
(Fault is reported with tape still in the tape path  
after failing to find AOT within 30 seconds)
  - 03 Tape slipping on file reel while accelerating during  
tension recovery
  - 04 Tape slipping on file reel while decelerating during  
tension recovery
  - 05 Tape slipping on file reel while decelerating during  
tension recovery/test load
- 

FAULT CODE 23 - UNABLE TO RE-ESTABLISH TENSION

---

SUB-FAULT

- 01 Unable to establish tension during Test Load
  - 02 Unable to maintain tension after stopping tape  
following a test load
- 

FAULT CODE 24 - HIGH TENSION FAULT

---

SUB-FAULT

- 00 Fault occurred during constant velocity motion
  - 10 Fault occurred on down ramp
  - 20 Fault occurred on up ramp
  - 30 Fault occurred in stoplock
-

FAULT CODE 24 (Cont'd)

---

SUB-FAULT

- 00 Fault occurred in forward direction
  - 04 Fault occurred in reverse direction
- 

---

SUB-FAULT

- 00 Fault occurred with 25 ips demanded
  - 01 Fault occurred with 100 ips demanded
  - 02 Fault occurred with 200 ips demanded
- 

---

SUB-FAULT

- 00 Fault occurred while drive was moving at constant velocity, on ramp, or in stoplock for less than 1 sec.
  - 01 Fault occurred with drive in stoplock for more than 1 sec.
- 

---

SUB-FAULT

- 00 Fault occurred with pneumatic pump enabled.
  - 08 Fault occurred with pneumatic pump shut down.
- 

FAULT CODE 25 - LOW TENSION FAULT

---

SUB-FAULT

- 00 File sensor saw the fault first
  - 40 Takeup sensor saw the fault first
-

FAULT CODE 25 (Cont'd)

---

SUB-FAULT

- 00 Fault occurred during constant motion
  - 10 Fault occurred on down ramp
  - 20 Fault occurred on up ramp
  - 30 Fault occurred in stoplock
- 

---

SUB-FAULT

- 00 Fault occurred in forward direction
  - 04 Fault occurred in reverse direction
- 

---

SUB-FAULT

- 00 Fault occurred with 25 ips demanded
  - 01 Fault occurred with 100 ips demanded
  - 02 Fault occurred with 200 ips demanded
- 

---

SUB-FAULT

- 00 Fault occurred while drive was moving at constant velocity, on ramp, or in stoplock for less than 1 sec.
  - 01 Fault occurred with drive in stoplock for more than 1 sec.
- 

---

SUB-FAULT

- 00 Fault occurred with pneumatic pump enabled.
  - 08 Fault occurred with pneumatic pump shut down.
-

FAULT CODE 26 - SERVO FAULT

---

SUB-FAULT

- 01 Takeup reel moving in wrong direction during untensioned unload
  - 02 Takeup reel not moving during untensioned unload
  - 03 Takeup reel too fast during untensioned unload
  - 04 Takeup reel too slow during untensioned unload
  - 05 Voltage sensed in wrong half of file reel amplifier bridge while pulsing file reel
  - 06 Timeout to get unwind speed during untensioned unload
  - 07 Voltage sense fault in file reel amplifier bridge during load
  - 08 Voltage sense fault in takeup reel amplifier bridge during load
  - 09 Fine line tach fault on load
- 

FAULT CODE 27 - NO COARSE TACHS

---

SUB-FAULT

- 01 No coarse tachs during load
  - 02 No coarse tachs during tension recovery section of load
- 

FAULT CODE 28 - TENSION RECOVERY PROBLEM

---

SUB-FAULT

- 01 Tension recovery lasting longer than 0.5 second
-

FAULT CODE 29 - ABSENCE OF TAPE

---

SUB-FAULT

01 Absence of tape

---

FAULT CODE 30 - UP RAMP FAULT

---

SUB-FAULT

- 01 Failed to move 4 quarter tachs in reverse direction within deadman time
- 02 Failed to move 4 quarter tachs in forward within deadman time
- 03 Failed to move 0.08 inch in forward direction within deadman time (detected by stiction test)
- 04 Failed to move 0.125 inch in forward direction within deadman time (detected by stiction test)
- 05 Failed to reach top of ramp within deadman time
- 06 Ramp time less than nominal - 50% (i.e. too fast)
- 07 Ramp time greater than nominal + 50% (i.e. too slow)
- 

---

SUB-FAULT

- 00 Fault occurred on forward ramp
- 20 Fault occurred on reverse ramp
- 

---

SUB-FAULT

- 00 Fault occurred on 25 ips start/stopramp
- 40 Fault occurred on 100 ips ramp
- 80 Fault occurred on 25 ips streaming ramp
-

FAULT CODE 31 - DOWN RAMP FAULT

---

SUB-FAULT

- 01 Failed to detect any quarter tachs in forward direction
  - 02 Failed to detect any quarter tachs in reverse direction
  - 03 Failed to detect change of direction (forward to reverse) on forward 100 ips down ramp.
  - 04 Failed to detect change of direction (reverse to forward) on reverse 100 ips down ramp
  - 05 Failed to reach end of forward 25 ips ramp within deadman time
  - 06 Failed to reach end of reverse 25 ips ramp within deadman time
  - 07 25 ips ramp time less than nominal - 50% (i.e. too fast)
  - 08 25 ips ramp time greater than nominal + 50% (i.e. too slow)
  - 11 100 ips ramp time less than nominal - 50% (i.e. too fast)
  - 12 100 ips ramp time greater than nominal + 50% (i.e. too slow)
- 

SUB-FAULT

- 00 Fault occurred on forward ramp
  - 20 Fault occurred on reverse ramp
- 

SUB-FAULT

- 00 Fault occurred on 25 ips start/stop ramp
  - 40 Fault occurred on 100 ips ramp
  - 80 Fault occurred on 25 ips streaming ramp
-



FAULT CODE 32 - STOPLOCK OVER-RUN

---

SUB-FAULT

- 01 TU Reel position is 32 quarter tachs reverse of correct stoplock position.
  - 02 TU Reel position is 32 quarter tachs forward of correct stoplock position.
- 

---

SUB-FAULT

- 00 Fault occurred with drive in stoplock less than 1 sec.
  - 04 Fault occurred with drive in stoplock more than 1 sec.
- 

---

SUB-FAULT

- 00 Fault occurred with pneumatic pump enabled.
  - 10 Fault occurred with pneumatic pump shut down.
- 

FAULT CODE 33 - TAPE POSITIONING FAULT

---

SUB-FAULT

- 01 Passed erase head turn-on point when about to write at low speed
  - 02 Passed erase head turn-on point when about to write at high speed
- 

FAULT CODE 34 - BOT POSITIONING FAULT

---

SUB-FAULT

- 01 Timed out waiting for BOT in forward direction during a Load point "reposition".
  - 02 Time out waiting for BOT in reverse direction during a Load point "reposition".
-

FAULT 35 - POSITIONING FAULT

---

SUB-FAULT

00 Failed to reach target at 25 ips.

02 Failed to reach target at 100 ips

---

---

SUB-FAULT

00 Failed to reach target in forward direction

01 Failed to reach target in reverse direction

---

FAULT CODE 36 - SPEED FAULT

---

SUB-FAULT

00 Speed fault at 25 ips

04 Speed fault at 100 ips

---

---

SUB-FAULT

00 Speed fault occurred in forward direction

02 Speed fault occurred in reverse direction

---

---

SUB-FAULT

00 Speed less than nominal - 12.5% (i.e. too slow)

01 Speed greater than nominal + 12.5% (i.e. too fast)

---

FAULT CODE 37 - PUMP POWER-UP FAULT

---

SUB-FAULT

01 Unable to re-establish tension within 5 seconds.

---

FAULT CODE 47 - VELOCITY CORRECTION FAULT

---

SUB-FAULT

- 01 Speed correction multiplier in the backup memory is out of range
- 

FAULT CODE 48 - STT ILLOGICAL FAULT

---

SUB-FAULT

- 01 Did not find AOT within 6 seconds of losing tension on unload
- 

FAULT CODE 50 - IRRECOVERABLE DEVICE HEALTHCHECK FAULT

---

SUB-FAULT

- 01 Read-write-servo diagnostic PROM checksum fault
  - 02 Read-write-servo flag memory fault
  - 03 Read-write-servo PTM fault
  - 06 Read-write-servo healthcheck did not complete
  - 07 Read-write-servo initialization did not complete
  - 08 Read-write-servo functional PROM checksum fault
- 

FAULT CODE 51 - RECOVERABLE DEVICE HEALTHCHECK FAULT

---

SUB-FAULT

- 11 EEPROM checksum fault
  - 12 EEPROM defective
  - 14 EGC DAC fault
-

FAULT CODE 52 - SPEED CALCULATION FAULT

---

SUB-FAULT

- 10 A previous fault caused by modulus being too large
  - 20 A previous fault caused by modulus change inconsistent with direction of tape
  - 40 A previous fault caused by modulus being outside expected range
  - 80 Unable to obtain consistent harvest counts in determining the file reel radius
  - 90 Unable to obtain harvest counts in determining file reel radius within 5 seconds during load.
- 

---

SUB-FAULT

- 01 This fault caused by modulus being too large
  - 02 This fault caused by modulus change inconsistent with direction of tape
  - 04 This fault caused by modulus being outside expected range
  - 08 This fault caused by harvest count greater than 8000
- 

FAULT CODE 53 - ARITHMETIC ERROR

---

SUB-FAULT

- 01 Attempt to divide by 0
  - 02 Integer overflow on floating point to integer conversation
  - 03 Negative result on floating point subtraction
-

FAULT CODE 54 - ILLOGICAL FAULT

---

SUB-FAULT

- 01 Erase current present after degauss
  - 02 Erase Current present when reading
  - 10 Erase Current not present when writing
- 

FAULT CODE 55 - ILLOGICAL FAULT

---

SUB-FAULT

- 01 Failed to reach BOT within 5 minutes during load
  - 02 Failed to reach BOT within 5 minutes during rewind
- 

FAULT CODE 56 - PROCESSOR COMMUNICATION FAULT

---

SUB-FAULT

- 04 Read-write-servo did not respond to system enable
  - 05 Bus integrity test fault
  - 20 Read-write-servo did not go busy in response to command from formatter
  - 21 Read-write servo rejected command from formatter
  - 22 Read-write-servo did not acknowledge command from formatter
  - 32 Read-write servo did not respond to sense command from formatter
-

FAULT CODE 57 - ILLOGICAL FAULT

---

SUB-FAULT

- 30 Device did not stop after stop commanded
  - 31 Device did not stop after reset
  - 33 Device not at BOT after load
  - 34 Device not at BOT after rewind
  - 39 Device did not reset busy on reverse into BOT
- 

FAULT CODE 58 - RECOVERABLE FORMATTER HEALTHCHECK FAULT

Second byte defines formatting logic fault.

FAULT CODE 59 - IRRECOVERABLE FORMATTER HEALTHCHECK FAULT

---

SUB-FAULT

- 00 Formatter PROM checksum fault
- 

FAULT CODE 60 - IRRECOVERABLE OPERATOR PANEL FAULT

---

SUB-FAULT

- 00 LOAD/REWIND or UNLOAD or ONLINE or RESET switch permanently pressed
- 

FAULT CODE 61 - RECOVERABLE OPERATOR PANEL FAULT

---

SUB-FAULT

- 00 TEST or STEP or CE or EXEC switch permanently pressed
-