APPENDIX B

FAULT ISOLATION PROCEDURES

B1 HOW TO USE THE FAULT ISOLATION PROCEDURES APPENDIX

The Fault Isolation Procedures Appendix is organized as follows:

Paragraph	Title
B1	How to Use the Fault Isolation Procedures Appendix
B2	Test Equipment Required
B3	Troubleshooting Procedure Chart
B4	Emergency Unload Troubleshooting Guide
B4.1	Static Emergency Unload Troubleshooting Procedure
B4.2	Dynamic Emergency Unload Troubleshooting Procedure
B5	Alternate Method for Troubleshooting in Response to Emergency Unload
B6	Power Supply Fault Isolation Procedure
B7	Read/Write Troubleshooting Guide
B7.1	Margin Testing, Read/Write
B7.2	Pulse Pairing, Read/Write
B8	Head-Loading Error Troubleshooting Flowchart, Introduction
B9	Speed Out of Tolerance Troubleshooting Flowchart, Introduction
B10	Disk Speed Error Troubleshooting Flowchart, Introduction
B11	Position Limit Error Troubleshooting Flowchart, Introduction
B12	Position Transducer Lamp Failure Troubleshooting Flowchart, Introduction
B13	Write Emergency Error
B14	External Emergency Unload
B15	Seek Time Error
B16	Power Clear

All references to paragraph numbers preceded by the letter B refer to paragraphs in this Appendix, as do references to figures and tables. All references to the manual refer to PERTEC Manual No. 104630, Models D3300 and D3400 Disk Drives. Table B-1 directs the reader to the appropriate troubleshooting procedure.

Complex troubleshooting procedures are shown in troubleshooting flowcharts, as follows.

Figure Number	Title
B-1	Emergency Unload Caused by Head-Loading Error, Troubleshooting Flowchart
B-2	Emergency Unload Caused by Speed Out of Tolerance, Troubleshooting Flowchart
B-3	Emergency Unload Caused by Disk Speed Error, Troubleshooting Flowchart
B-4	Emergency Unload Caused by Position Limit Error, Troubleshooting Flowchart
B-5	Emergency Unload Caused by Position Transducer Lamp Failure, Troubleshooting Flowchart

Table B-1

Trouble Location Guide

General Trouble Indicator: Emergency Unload NOTE: An emergency unload is one of the following: a. The positioner retracts during operation. b. Pressing the RUN/STOP pushbutton does not start the disk drive motor. c. The positioner does not load the heads.	Paragraph B4 which provides instructions for locating the specific cause of trouble.
Specific Troubles:	
1. SAFE lamp does not light.	Table B-2, Problem 1
2. Pressing RUN/STOP pushbutton does not start motor.	Table B-2, Problem 2
3. Emergency Unload relay, K1 on Servo PCBA, does not engage.	Table B-2, Problem 3
4. Spindle speed does not change to purge cycle during start-up.	Table B-2, Problem 4
5. Heads do not load properly.	Table B-2, Problem 5
6. Disk drive does not go into ready state.	Table B-2, Problem 6
7. READY lamp lights but positioner does not seek.	Table B-2, Problem 7
8. Heads unload when trying to write.	Table B-2, Problem 8
9. Disk Drive does not read data properly.	Table B-2, Problem 9
10. Disk drive has incorrect sector count.	Table B-2, Problem 10
11. Positioner seeks to wrong track location.	Table B-2, Problem 11
12. Heads crash.	Table B-2, Problem 12

B2 TEST EQUIPMENT REQUIRED

Test equipment required for testing and troubleshooting are:

(1) Oscilloscope, dual trace, with at least 100 MHz bandwidth and a horizontal module with a Delayed Sweep mode.

Minimum sweep rate: ≤50 ns/division.

Vertical and horizontal sensitivity: ±3 percent accuracy.

(2) Three calibrated X10 test probes with ground clips.

(3) One X1 test probe with ground clip.

(4) Digital Volt Meter, Fairchild 7050 (±0.1 percent specified accuracy) or equivalent, with test leads.

(5) PERTEC Hand-Held Disk Exerciser, Model TE-D01.

(6) PERTEC Emergency Unload Status Monitor, Part No. 895490-01.

B3 TROUBLESHOOTING PROCEDURE CHART

Table B-2, Troubleshooting Procedure Chart, lists common problems, probable causes, and recommended repairs.

Table B-2
Troubleshooting Procedure Chart

PROBLEM	PROBABLE CAUSE	RECOMMENDED REPAIR
1. SAFE lamp does not light.	1. Defective lamp.	1. Replace lamp.
	2. Positioner has moved out, away from fully retracted position.	2. Push positioner back to fully retracted position.
	3. Power supply voltages not within tolerances.	3. Refer to Power Supply Fault Isolation Procedure, Paragraph B6.
	4. Disk rotation detector counter circuitry (on Logic PCBA) continues to indicate rotation after disk has stopped.	4. Check U283-15 on Logic PCBA. If U283-15 is low when the disk has stopped rotating, and U284-2 is also low, replace the Logic PCBA. If U283-15 is low and U284-2 is high, refer to Paragraph B16.
	5. Brake cycle enable flip-flop U384-15 on Logic PCBA does not go high; therefore, the brake cycle enable circuit is not enabling the safe mode.	5. If U384-15 is low when U384-3 is high, replace Logic PCBA.
2. Pressing RUN/STOP pushbutton does not start motor.	1. Cartridge interlock switch is defective or other problem exists in cartridge interlock system.	1. Check cartridge interlock switch; check cartridge interlock system. Refer to Paragraph 6.15 in manual, Cartridge Interlock System — Front Load models. Check logic level at J109-2 (Logic PCBA). If low, replace the Logic PCBA. If high, replace the RUN/STOP pushbutton.
	2. Emergency unload abort.	2. Check logic level at U306-8 on Logic PCBA. If high, see Paragraph B4, Emergency Unload Troubleshooting Guide. A low at U306-8 indicates an absence of the emergency unload condition.
	3. RUN/STOP pushbutton does not set U364-15 high.	3. Check logic level at U447-5 while pressing the RUN/STOP pushbutton. If U447-5 stays high, replace the RUN/STOP pushbutton. Replace the Logic PCBA if the following conditions occur simultaneously: a. U47-5 is low (Logic PCBA). b. U364-15 stays low (Logic PCBA). c. An emergency unload is not present. d. The SAFE lamp is lit.

Table B-2
Troubleshooting Procedure Chart (Continued)

PROBLEM	PROBABLE CAUSE	RECOMMENDED REPAIR
3. Emergency unload relay, K1, on Servo PCBA, does not engage.	1. Emergency unload condition being activated prevents K1 relay from engaging during purge cycle.	1. Refer to Paragraph B4, Emergency Unload Troubleshooting Guide.
	2. Defective relay or defective relay engage circuit.	2. Replace relay K1 (Servo PCBA). If still not engaging, check logic level at J202-32. If low, relay driver circuit is defective; replace the Servo PCBA. If J202-32 is high and does not go low when going into purge cycle, replace the Logic PCBA.
	3. —20v dc at J212-3 out of tolerance.	3. Refer to Paragraph B6, Power Supply Fault Isolation Procedure.
4. Spindle speed does not change to purge cycle during start-up.	1. Lower magnetic transducer misaligned.	1. Refer to Paragraph 6.18.3 in manual for alignment instructions. NOTE: Purge cycle refers to a 10% increase in spindle speed within 25 seconds after start-up. To see if disk drive goes into purge cycle, check the waveform at TP2 (Logic PCBA) with oscilloscope. 1500 rpm = 40 ms between pulses. Purge cycle = 36 ms between pulses. (Spindle speed returns to normal after heads are loaded and before READY lamp lights.)
	2. Lower magnetic transducer output out of tolerance.	2. Check the magnetic transducer voltage waveform on oscilloscope at U409-2. The positive swing must be + 600 mv or more positive. The negative swing must be —400 mv or more negative. If the output is out of tolerance (output too low), replace the magnetic transducer assembly.
	3. Purge cycle flip-flop U344-15 on Logic PCBA stays low beyond 25 seconds.	3. If run flip-flop U364-15 (Logic PCBA) goes high and U344-15 stays low for more than 25 seconds, replace the Logic PCBA.

Table B-2
Troubleshooting Procedure Chart (Continued)

PROBLEM	PROBABLE CAUSE	RECOMMENDED REPAIR
5. Heads do not load properly.	1. Positioner shipping restraint is not removed. 2. Positioner is not adjusted correctly. 3. Emergency unload.	1. Remove shipping restraint. 2. Adjust positioner. Refer to Paragraph 6.8 in manual, Static Positioner Adjustments. 3. Refer to Paragraph B4, Emergency Unload Troubleshooting Guide.
6. Disk drive READY lamp does not light.	1. Defective READY lamp. 2. Defective ready circuit on Logic PCBA.	1. Replace READY lamp. 2. Replace Logic PCBA.
7. READY lamp lights but positioner does not seek.	1. Disk drive thumbwheel Unit Select Switch is not set on proper unit number. 2. Disk drive is not selected although Unit Select Switch is set to the correct number. 3. Busy logic circuit (Logic PCBA) does not go into non-busy state.	1. Rotate Unit Select Switch to proper setting. Unit Select Switch setting number must match computer select interface line number. (If the TE-D01 Exerciser is used, unit 1 is automatically selected.) 2. If the Unit Select Switch is set correctly and U328-11 is low (Logic PCBA), replace Unit Select Switch. If problem remains, replace Logic PCBA. 3. Check logic level at U263-6 on Logic PCBA. If low, the disk drive is constantly busy. Therefore, the exerciser is not allowed to send new track information to the disk drive. This causes the positioner to stop seeking. Replace Logic PCBA.
8. Heads unload when trying to write.	1. Write emergency condition when going into Write mode.	1. Replace the head that is selected when disk drive unloads. Refer to Paragrph 6.22 in manual for head replacement instructions. If problem persists, replace the Read/Write PCBA.

Table I

Troubleshooting Procedure Chart (Continued)

PROBLEM	PROBABLE CAUSE	RECOMMENDED REPAIR
9. Disk drive does not read data properly.	1. If Exerciser Model TE-D01 is used, exerciser switches set to wrong values.	1. Set exerciser switches to 1500 rpm and 2200 bpi.
	2. Read/Write PCBA is misaligned.	2. Refer to Paragraph 6.12 in manual, Read Decode Adjustments.
	3. Defective circuit on Read/Write PCBA.	3. Replace Read/Write PCBA.
	4. Incorrect index and sectoring.	4. Check for index indication and correct number of sectors. Set exerciser switch to select upper disk. On Logic PCBA, check index indication at TP2. Correct 1500 rpm indication is one pulse per 40 ms. Check sector count at TP3. Correct 1500 rpm sector count is 12 pulses per 40 ms. If the wrong number of sectors are observed, check output waveform of upper photoelectric transducer for possible out-of-tolerance output. Positive swing shall be + 1.5v or more positive. Negative swing shall be —1.0v or more negative. If output is out of tolerance, replace transducer. If output is within tolerance but trouble persists, replace Logic PCBA. Set exerciser switch to select lower disk. Check index indication at TP2. Correct 1500 rpm indication is one pulse per 40 ms. Check sector count at TP3. Correct 1500 rpm sector count is 12 pulses per 40 ms. If the wrong number is observed, check phase lock loop as instructed in Paragraph 6.11 in the manual. If the phase lock loop cannot be adjusted, check the lower magnetic transducer output voltage waveform on an oscilloscope. The positive swing must be + 600 mv or more positive. The negative swing must be —400 mv or more negative. If the output is out of tolerance (output too low), replace the magnetic transducer assembly. If the lower magnetic transducer output is within tolerance, replace Logic PCBA.
	5. Defective Read channel.	5. Refer to Paragraph B7. Read/Write Trouble-shooting Guide.

Table B-2
Troubleshooting Procedure Chart (Continued)

PROBLEM	PROBABLE CAUSE	RECOMMENDED REPAIR
10. Disk drive has incorrect sector count. (Correct sector count is indicated by waveform at TP3 on Logic PCBA as follows: 1500 rpm = 12 pulses per 40 ms.)	1. Upper photoelectric transducer has incorrect output.	1. Check upper photoelectric transducer output waveform at U425-6 on Logic PCBA. Positive swing shall be +1.5v or more positive. Negative swing shall be —1.0v or more negative. If output is out of tolerance, replace transducer. If output is within tolerance, replace Logic PCBA.
	2. Sector electronics on Logic PCBA has malfunction.	2. Replace the Logic PCBA.
	3. Disk cartridge has defective sector ring.	3. If sector ring has scratches on outer edges, replace the disk cartridge.
	4. Lower magnetic transducer output out of tolerance.	4. Check the magnetic transducer voltage waveform on oscilloscope at U409-2. The positive swing must be +600 mv or more positive. The negative swing must be —400 mv or more negative. If the output is out of tolerance (output too low), replace the magnetic transducer assembly.
	5. Defective sector phase lock loop (Logic PCBA).	5. Adjust phase lock loop as instructed in Paragraph 6.11 in the manual. If the adjustment cannot be made, replace the Logic PCBA.
11. Positioner seeks to wrong track location.	1. Positioner improperly adjusted on Servo PCBA.	1. Refer to Paragraph 6.7 in manual, Positioner Servo Calibration.
	2. Address logic on Logic PCBA does not count track location correctly.	2. Replace Logic PCBA.
12. Heads crash.	1. Dirty heads and/or dirty disk surfaces.	1. Clean heads and disk surfaces. Refer to Paragraph 6.4.1 in manual, Cleaning the Heads. Refer to Paragraph 6.4.2 in manual, Cleaning the Fixed Disk. If heads cannot be cleaned, replace heads. If disk surfaces cannot be cleaned, replace disk.

B4 EMERGENCY UNLOAD TROUBLESHOOTING GUIDE

An emergency unload condition is defined as one of the following:

(1) The positioner retracts during operation.

(2) Pressing the RUN/STOP pushbutton switch does not start the disk drive motor.

(3) The positioner does not load heads.

The emergency unload serves two purposes: It is a safety feature that protects the equipment; it also provides an indication of trouble somewhere in the disk drive.

There are two troubleshooting methods for finding the cause of an emergency unload; static and dynamic. Use the static troubleshooting method first, it will usually serve to locate the source of trouble. If the problem is not solved using the static method, use the dynamic method.

B4.1 STATIC EMERGENCY UNLOAD TROUBLESHOOTING PROCEDURE

The following is used to search for the cause of an emergency unload under static conditions:

(1) Check logic level at U306-4 (Logic PCBA). Low indicates a head-loading error. Refer to Paragraph B8 and Figure B-1 for troubleshooting details.

(2) Check logic level at U306-5 (Logic PCBA). Low indicates a speed out of tolerance error. Refer to Paragraph B9 and Figure B-2 for troubleshooting details.

(3) Check logic level at U306-12 (Logic PCBA). Low indicates either a position transducer lamp failure or a Write emergency error. A high at J105-18 indicates a position transducer lamp failure. Refer to Paragraph B12 and Figure B-5 for position transducer lamp failure troubleshooting details. A high at J103-30 indicates a Write emergency error. Refer to Paragraph B13 for Write emergency error troubleshooting details.

(4) Check logic level at U306-3 (Logic PCBA). Low indicates an external emergency unload; e.g., trouble in the computer. Refer to Paragraph B14 for troubleshooting details.

(5) Check logic level at U306-11 (Logic PCBA). Low indicates position limit error. Refer to Paragraph B12 and Figure B-4 for troubleshooting details.

(6) Check logic level at U306-1 (Logic PCBA). Low indicates disk speed error. Refer to Paragraph B10 and Figure B-3 for troubleshooting details.

(7) Check logic level at U306-6 (Logic PCBA). Low indicates seek time error. Refer to Paragraph B15 for troubleshooting details.

(8) Check logic level at U405-8 (Logic PCBA). High indicates power clear fault. Refer to Paragraph B16 for troubleshooting details.

B4.2 DYNAMIC EMERGENCY UNLOAD TROUBLESHOOTING PROCEDURE

The dynamic emergency unload troubleshooting procedure is indicated as follows. After pressing the RUN/STOP pushbutton switch, either a low logic level or a negative pulse appears at U284-4 (Logic PCBA). Proceed as follows.

(1) Connect oscilloscope probe to U405-8 (Logic PCBA). Press RUN/STOP pushbutton switch. A positive pulse at U405-8 indicates a power clear source of trouble. Refer to Paragraph B16 for troubleshooting details. If a negative level is seen at U405-8, go to Step (2).

(2) Connect oscilloscope channel 1 probe to U306-1 (Logic PCBA). Press RUN/STOP pushbutton switch. A negative pulse at U306-1 indicates disk speed error. Refer to Paragraph B10 and Figure B-3 for troubleshooting details.

(3) Connect oscilloscope probe to U306-6 (Logic PCBA). Press RUN/STOP pushbutton switch. A low logic level at U306-6 indicates a seek time error. Refer to Paragraph B15 for troubleshooting details.

(4) Connect oscilloscope probe to U306-11 (Logic PCBA). Press RUN/STOP pushbutton switch. A low logic level at U306-11 indicates a position limit error. Refer to Paragraph B11 and Figure B-4 for troubleshooting details.

(5) Insert an emergency unload bypass jumper plug, PERTEC Part No. 103618-01 into J128 (Logic PCBA). Connect oscilloscope probe to U306-12 (Logic PCBA). Press RUN/STOP pushbutton switch. A low logic level or negative pulse indicates either a position transducer lamp failure or Write emergency error. To isolate the cause of trouble, check logic level at U327-5 (Logic PCBA). A high level indicates a position transducer lamp failure. Refer to Paragraph B12 and Figure B-5 for troubleshooting details. If U327-5 is low, check output at U327-6. If a positive pulse or high level appears at U327-6, trouble is caused by a Write emergency error. Refer to Paragraph B13 for troubleshooting details.

(6) Insert an emergency unload bypass jumper plug, PERTEC Part No. 103618-01 into J128 (Logic PCBA). Connect oscilloscope probe to U306-3. Press RUN/STOP pushbutton switch. A low pulse or low logic level at U306-3 indicates an external emergency unload, e.g., trouble in the computer. Refer to Paragraph B14 for troubleshooting details.

(7) Connect oscilloscope probe to U306-4 (Logic PCBA). Press RUN/STOP pushbutton switch. A negative pulse at U306-4 indicates a head loading error. Refer to Paragraph B8 and Figure B-1 for troubleshooting details.

(8) Connect oscilloscope probe to U306-5 (Logic PCBA). Press RUN/STOP pushbutton switch. A negative pulse at U306-5 indicates a speed out of tolerance error. Refer to Paragraph B9 and Figure B-2 for troubleshooting details.

B5 ALTERNATE METHOD FOR TROUBLESHOOTING IN RESPONSE TO AN EMERGENCY UNLOAD

Emergency unload fault detection can be accomplished through use of an Emergency Unload Status Monitor, PERTEC Part No. 895490-01. The monitor provides a read-out of the fault condition that has occurred. Plug the 16-pin male connector into J128 on the Logic PCBA. Connect the single-probe voltage clip to TP18 on the Logic PCBA.

B6 POWER SUPPLY FAULT ISOLATION PROCEDURE

(1) Check fuses F1, F2, F3, and F4. Refer to Power Supply assembly drawing 102741 for fuse locations.

(2) Refer to Servo PCBA drawing number 102811 for test point locations. Use an oscilloscope or digital voltmeter to check voltages as follows.

Test Point	Voltage
TP4	+5v dc ±0.25v dc
TP12	—5v dc ±0.25v dc
TP21	+10v dc ±0.8v dc
TP25	—10v dc ±0.8v dc

(3) If voltage at TP4 is incorrect, adjust variable resistor R158. If voltage at TP12 is incorrect, adjust variable resistor R167. Both variable resistors are shown at the upper left corner of drawing 102811.

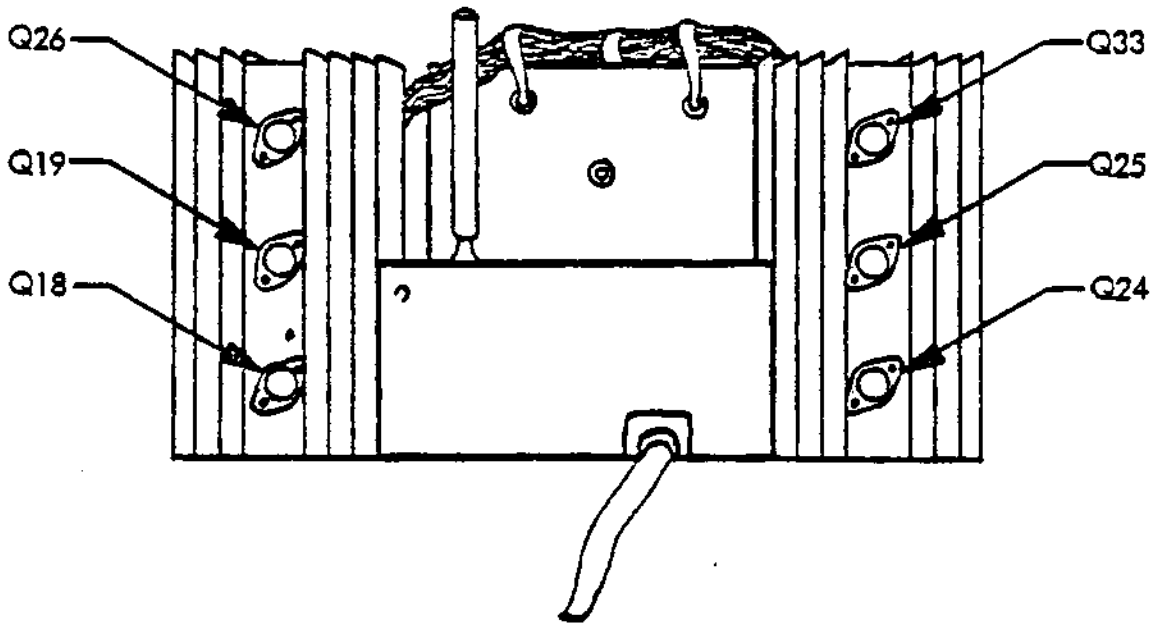
(4) If any voltage cannot be correctly adjusted, check the input voltages at J212, as follows.

J212-8	+10v dc	—0.5 +5v dc
J212-11	+20v dc	—3.0 +5v dc
J212-3	—20v dc	—5.0 +3v dc

(5) If any voltage specified in Step (4) is not present, replace the power supply; otherwise, go to Step (6).

(6) If one of the voltages is not correct, disconnect all boards that are powered from the Servo PCBA. If voltages are correct after the boards are disconnected, begin reconnecting the boards one at a time until an incorrect voltage is measured. Replace the board that caused the incorrect voltage to appear.

(7) If voltage at any test point is incorrect after the preceding tests, refer to the following illustration and continue troubleshooting procedure.



- If voltage at TP21 is incorrect, check Q26 on the heatsink. If Q26 is defective, replace it. If Q26 checks good, replace the Servo PCBA.
- If voltage at TP25 is incorrect, check Q33. If Q33 is defective, replace it. If Q33 checks good, replace the Servo PCBA.
- If voltage at TP4 is incorrect, check Q24 and Q25. If either transistor is defective, replace it. If both transistors check good, replace the Servo PCBA.
- If voltage at TP12 is incorrect, replace the Servo PCBA.

B7 READ/WRITE TROUBLESHOOTING GUIDE

Read/Write errors are indicated by a computer printout (or other output indication) specifying this type of error. Use the PERTEC Model TE-D01 Disk Exerciser to locate the Read/Write error source. Insert the exerciser plug into J101 (Logic PCBA); refer to the PERTEC Model TE-D01 Disk Exerciser manual for exerciser switch settings and test instructions. (If an exerciser is not available, use the computer to provide the required test signals.)

Read/Write problems in the disk drive normally originate from three sources. These are the heads, the disk, or the Read/Write PCBA. The following can be used to isolate the problem to one source.

(1) Refer to Paragraph 6.12 in the manual, Read Decode Circuit Adjustments. If the Read/Write problem is an error occurring on one track location on the same disk surface, the disk surface is defective. Replace the disk. If adjustments cannot be made properly, replace the Read/Write PCBA.

(2) If random Read errors occur on different tracks, refer to Paragraph B7.1, Margin Testing, or Paragraph B7.2, Pulse Pairing. If the problem persists, replace the Read/Write PCBA.

B7.1 MARGIN TESTING, READ/WRITE

Read/Write margin testing is accomplished as follows.

(1) Connect the PERTEC Model TE-D01 Disk Exerciser to the disk drive under test.

(2) Press the RUN/STOP pushbutton switch; wait for the READY lamp to light.

(3) Calibrate the oscilloscope horizontal sweep rate on the 100 ns/division scale using the 10 MHz oscillator output of the Logic PCBA, TP13. Each period of the oscillator (10 MHz) waveform should be equal to exactly one vertical graticule division.

(4) Connect the oscilloscope channel 1 probe to TP25 and channel 2 probe to TP23. Connect both oscilloscope ground leads to TP17. (All three test points are on the Read/Write PCBA.)

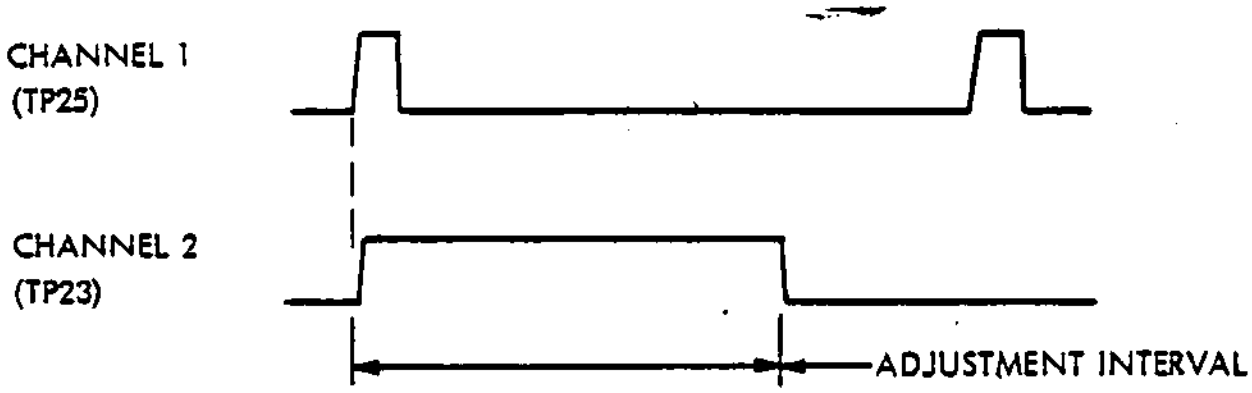
(5) Adjust both oscilloscope vertical channels to 0.1v/division. Use normal sync, alternate mode, and internal trigger on channel 1 positive (leading) edge.

(6) Place the Read/Write heads over cylinder address $405_{10}(625_8)$.

(7) Write an alternate one-zero data pattern on the disk surface to be tested.

(8) Set the exerciser to the READ mode with the ERR toggle switch toward the lettering (stop on data error).

(9) Make sure that the data decoder one-shots have been adjusted to their specifications. If not, adjust to the specification illustrated as follows.



- Long one-shot adjustment interval variable resistor (R115): 510 ±5 ns (1500 rpm)
- Short one-shot adjustment interval variable resistor (R113): 450 ±5 ns (1500 rpm).

(10) Observe the readback performance of the disk drive for all surfaces. An acceptable goal consists of no errors for two full minutes of operation for each surface.

(11) Continue reading and adjust R115 (long one-shot) counterclockwise until a data error occurs. Reset the exerciser and readjust R115 until the occurrence of errors is approximately one every 10 seconds.

(12) Set the exerciser to write an all-zeros data pattern. Reset to the READ mode.

(13) Note the adjustment interval. The acceptable limits for this interval are ≤450 ns (1500 rpm).

(14) Readjust R115 until the long one-shot adjustment interval is as specified in Step (9).

(15) Write an alternate one-zero data pattern on the disk surface to be tested.

(16) Set the exerciser to the READ mode with the ERR toggle switch toward the lettering (stop on data error).

(17) Adjust R113 (short one-shot) clockwise until the data error rate is as specified in Step (11).

NOTE

In some cases, connection of the oscilloscope probes to the Read/Write PCBA reduces the Read/Write margins. The oscilloscope probes may, therefore, be removed during margin testing and reconnected only to measure the adjustment interval.

(18) Set the exerciser to write an all ones pattern, then reset to the READ mode.

(19) Note the adjustment interval. The acceptable limits for this interval are ≥510 ns (1500 rpm).

(20) Readjust R113 until the short one-shot adjustment interval is as specified in Step (9).

(21) If a head fails to meet margin tolerances as stated, replace the head. If margins are still out of tolerance, replace the disk.

B7.2 PULSE PAIRING, READ/WRITE

Follow the steps below.

(1) Connect the PERTEC Model TE-D01 Disk Exerciser to the disk drive under test.

(2) Press RUN/STOP pushbutton switch; wait for the READY lamp to light.

(3) Raise the Logic PCBA and Servo PCBA to the vertical position.

(4) Calibrate the oscilloscope horizontal sweep rate on the scale to be used. Use the 10 MHz clock output, TP13, on the Logic PCBA for this purpose.

(5) Connect oscilloscope probe to TP25 on the Read/Write PCBA. Connect ground lead to TP17 on the Read/Write PCBA.

(6) Set oscilloscope vertical amplifier gain to 0.1v/division. Use internal trigger on positive slope and normal sync modes.

(7) Place Read/Write heads over cylinder address $400_{10}(620_8)$.

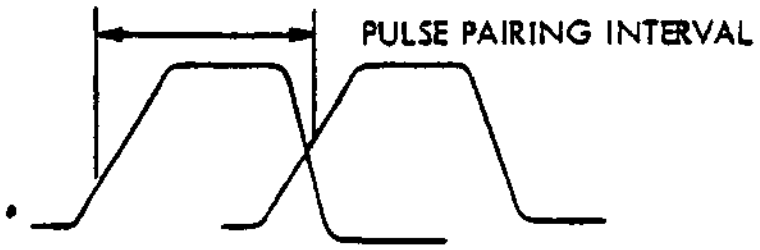
(8) Write all zeros data pattern on all surfaces.

(9) Select one surface and set exerciser to the READ mode. A series of positive-going pulses will be displayed on the oscilloscope.

(10) Adjust horizontal sweep rate (normal sweep mode) and triggering mode until at least six pulses are seen. If pulse pairing exists, fine tune the trigger control until every other pulse appears as a pair of pulses as shown in the following illustration.

(11) Using the delayed trigger mode, expand one of the pulse pairs to 50 ns/division sweep rate, or if possible, to 20 ns/division.

(12) Measure the time interval between the leading edge of the expanded pulses. This interval is defined as the pulse pairing error and is shown in the following illustration.



(13) Repeat the above measurement for each of the remaining heads. The pulse pairing error shall not exceed 50 ns (1500 rpm disk drive).

(14) If the speed is out of tolerance, replace the head.

B8 HEAD-LOADING ERROR TROUBLESHOOTING FLOWCHART, INTRODUCTION

A low logic level at U306-4 (Logic PCBA) indicates a head-loading error emergency unload.

The following will cause an emergency unload due to a head-loading error.

(1) Heads are not loaded while the disk drive is in the purge cycle.

(2) The sequence timing pulse comes before the positioner goes into position mode.

Refer to Figure B-1, Emergency Unload Caused by Head-Loading Error, Troubleshooting Flowchart, for the troubleshooting procedure.

B9 SPEED OUT OF TOLERANCE TROUBLESHOOTING FLOWCHART, INTRODUCTION

A low logic level at U306-5 (Logic PCBA) before the READY lamp lights, indicates speed out of tolerance emergency unload. Speed out of tolerance is checked after the disk drive goes into the purge cycle (spindle speed increases) but before heads are loaded. If the speed is out of tolerance at this time, NLDSFG (disk starting fault) is generated followed by an emergency unload. Refer to Figure B-2, Emergency Unload Caused by Speed Out of Tolerance, Troubleshooting Flowchart, for the troubleshooting procedure.

B10 DISK SPEED ERROR TROUBLESHOOTING FLOWCHART, INTRODUCTION

A low logic level at U306-1 (Logic PCBA) indicates a disk speed error emergency unload. A disk speed error emergency unload occurs if the spindle speed varies ±3 percent after the disk drive READY lamp lights. Refer to Paragraph 6.10.2 in the manual, Spindle Speed Accuracy Test. Refer to Figure B-3, Emergency Unload Caused by Disk Speed Error, Troubleshooting Flowchart, for the troubleshooting procedure.

B11 POSITION LIMIT ERROR TROUBLESHOOTING FLOWCHART, INTRODUCTION

A low logic level at U306-11 (Logic PCBA) indicates a position limit error emergency unload. A position limit error occurs when the positioner exceeds the limits of track −1.5 and track 205. The error is caused by the positioner's index signal being misadjusted or by the servo system going out of control. Refer to Figure B-4, Emergency Unload Caused by Position Limit Error, Troubleshooting Flowchart, for the troubleshooting procedure.

B12 POSITION TRANSDUCER LAMP FAILURE TROUBLESHOOTING FLOWCHART, INTRODUCTION

A low logic level at U306-12 (Logic PCBA) indicates a position transducer lamp failure. An emergency unload caused by a position transducer lamp failure protects the positioner when the lamp fails because all other unloads can occur only when the lamp is working properly. Refer to Figure B-5, Emergency Unload Caused by Position Transducer Lamp Failure, Troubleshooting Flowchart, for the troubleshooting procedure.

U303 Gnd=7

B13 WRITE EMERGENCY ERROR

A low logic level at U306-12 (Logic PCBA) indicates a Write emergency error emergency unload. A Write emergency error occurs when either of the following occurs.

(1) The disk drive tries to write through two heads simultaneously.

(2) The write or erase current is on but not enabled.

If the emergency unload caused by a Write emergency error is diagnosed, the problem is caused by a defective Read/Write PCBA or defective head. Check heads for shorts or opens. If heads are good, replace the Read/Write PCBA.

B14 EXTERNAL EMERGENCY UNLOAD

A low logic level at U306-3 (Logic PCBA) indicates an external emergency unload; e.g., trouble in the compuer. However, the trouble may be in the disk drive. To determine whether the trouble is in the disk drive or external device, check the logic level at U50-13 (Logic PCBA). If U50-13 is low, trouble is in the external device. If U50-13 remains high while U306-3 is low, replace the Logic PCBA.

B15 SEEK TIME ERROR

A low logic level at U306-6 (Logic PCBA) indicates a seek time error emergency unload. A seek time error occurs when the positioner takes longer than 200 msec to complete a seek to a new track location. When disk is turning at the correct speed, disconnect J205 (Servo PCBA) and load the head manually. Check to make sure that the positioner is free to move properly. Binding may be caused by foreign matter on the voice coil, or scale on the reticle. Look for any obstruction that would prevent free movement of the carriage. A defective bearing may also cause positioner malfunction. If the problem persists, replace the Logic PCBA.

B16 POWER CLEAR

A high logic level at U405-8 (Logic PCBA) indicates a power clear emergency unload. This unload protects the disk drive and data written on the disk in the event of line dropouts or loss of power. The power clear unload also puts logic in the correct state during power-up.

If U405-8 (Logic PCBA) goes high, check to determine whether the +5v dc and ±20v dc are within tolerance. Refer to Paragraph 6.6.2 in the manual. If voltages are out of tolerance, refer to Power Supply Fault Isolation Procedure, Paragraph B6. If voltages are within tolerance, then the power clear circuit is malfunctioning. Replace the Servo PCBA.

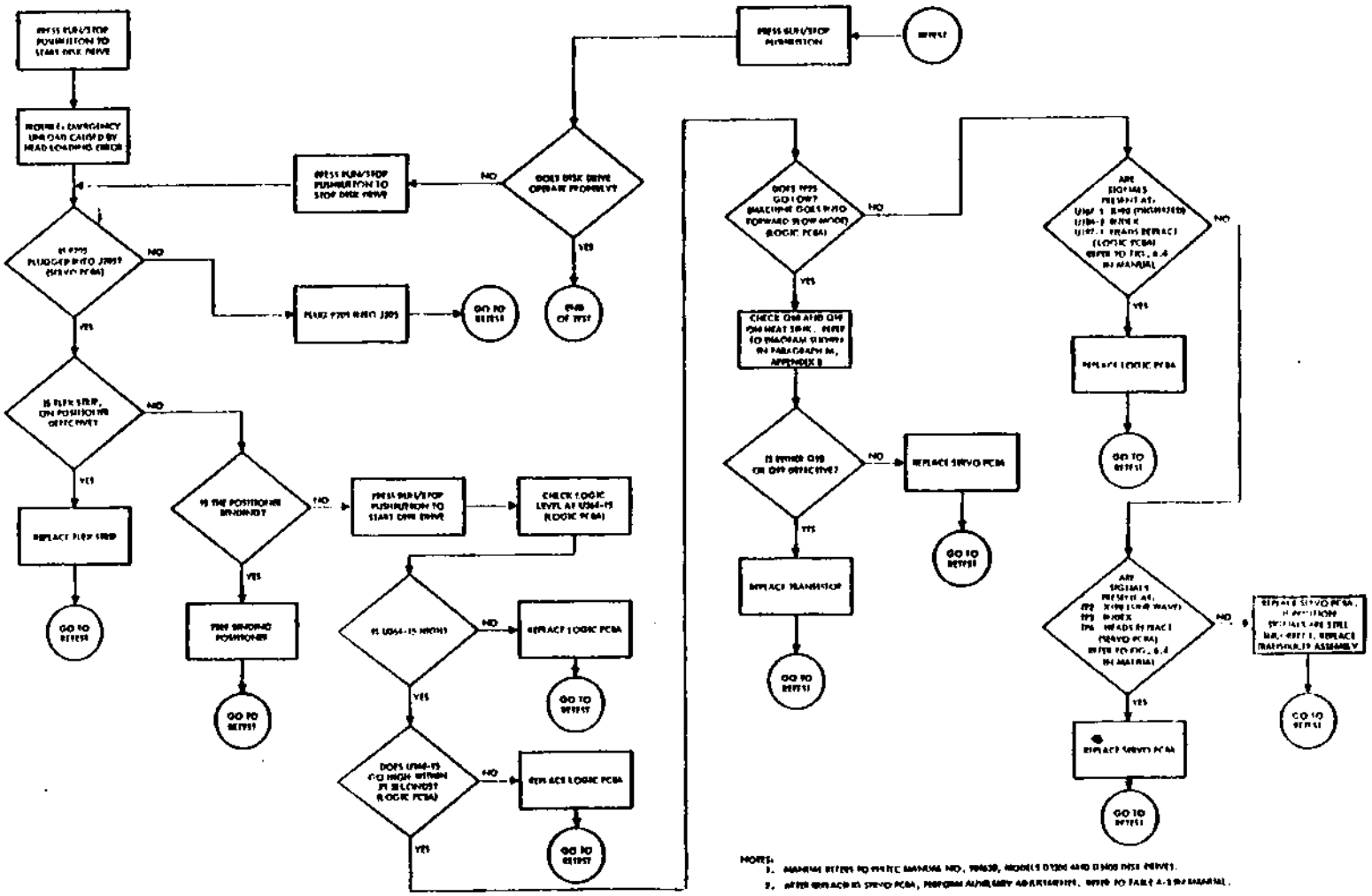


Figure B-1. Emergency Unload Caused by Head-Loading Error, Troubleshooting Flowchart

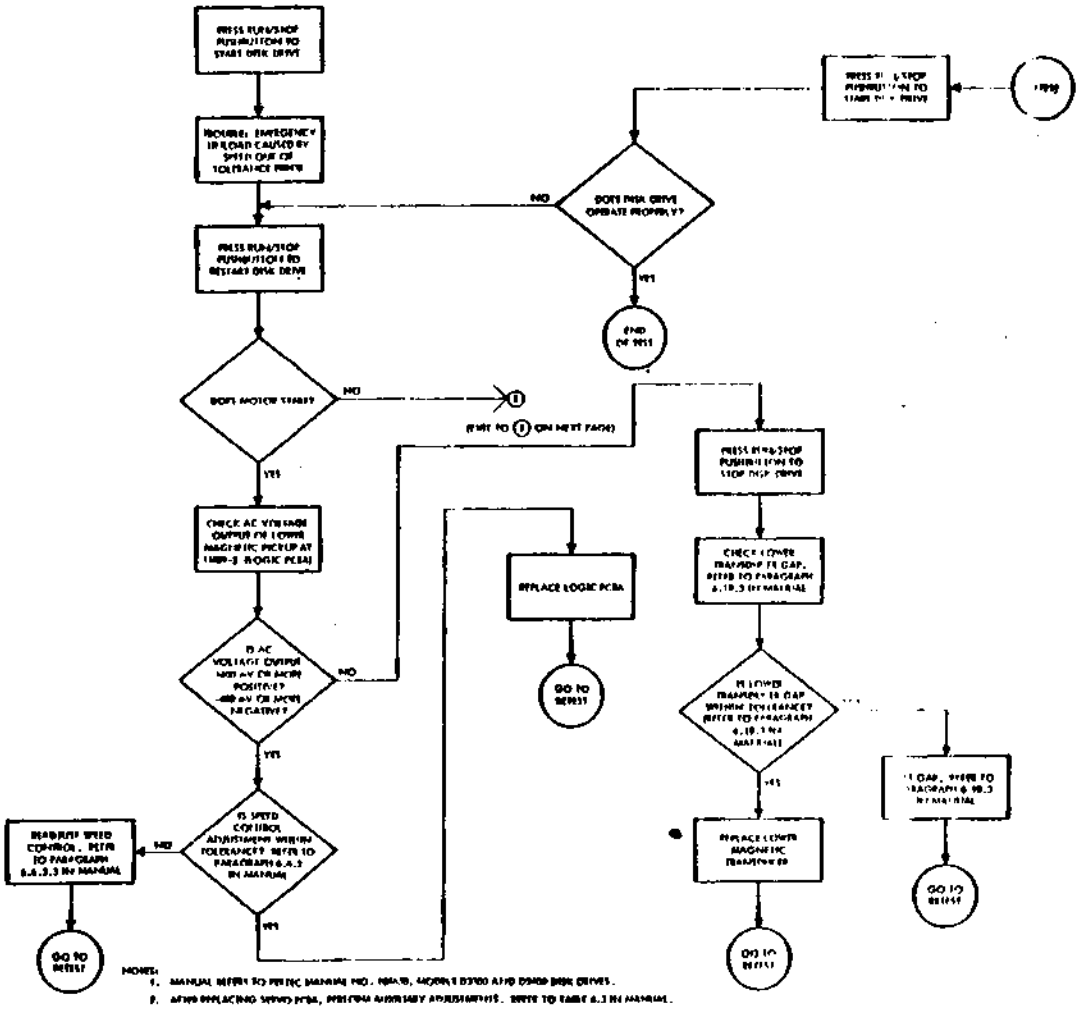


Figure B-2. Emergency Unload Caused by Speed Out of Tolerance, Troubleshooting Flowchart

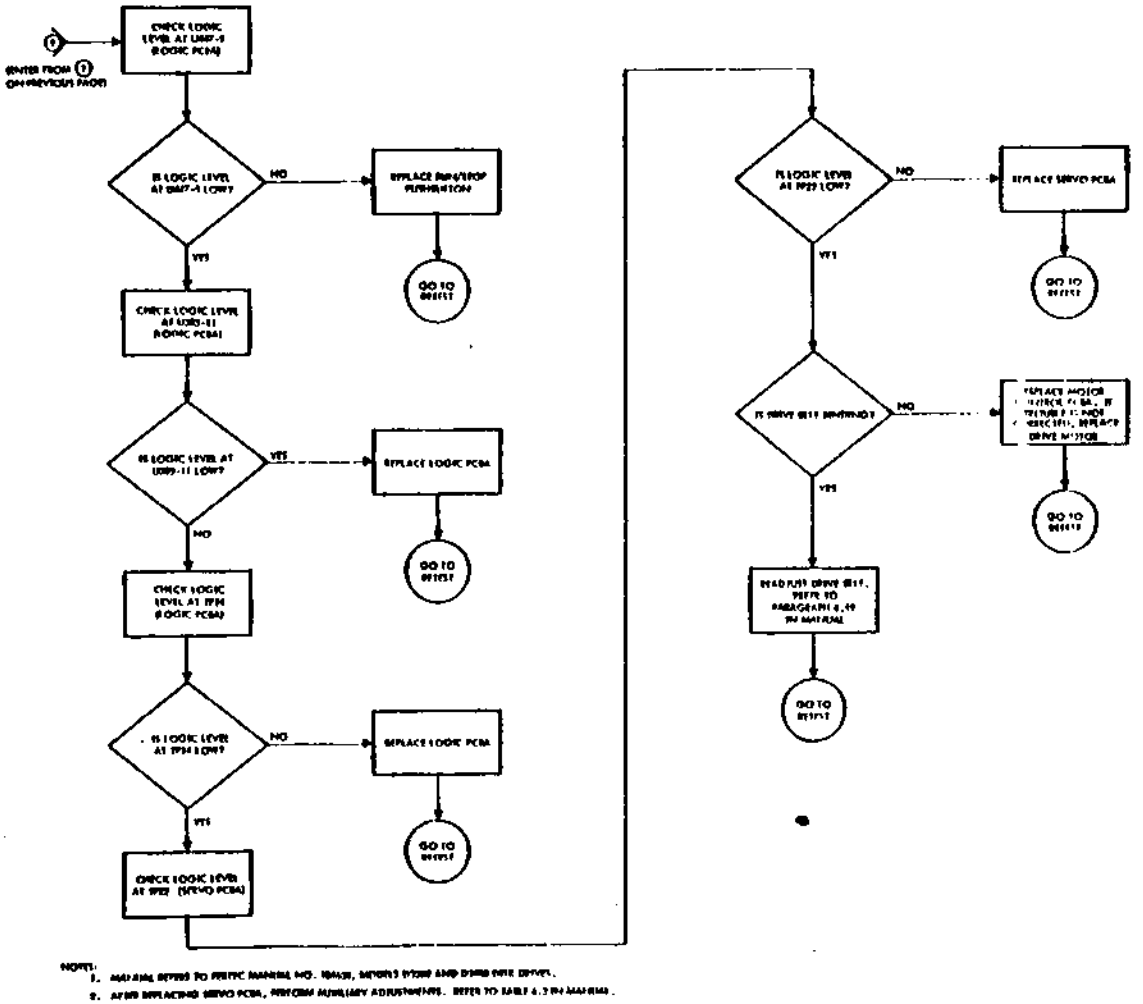


Figure B-2. Emergency Unload Caused by Speed Out of Tolerance, Troubleshooting Flowchart (Continued)

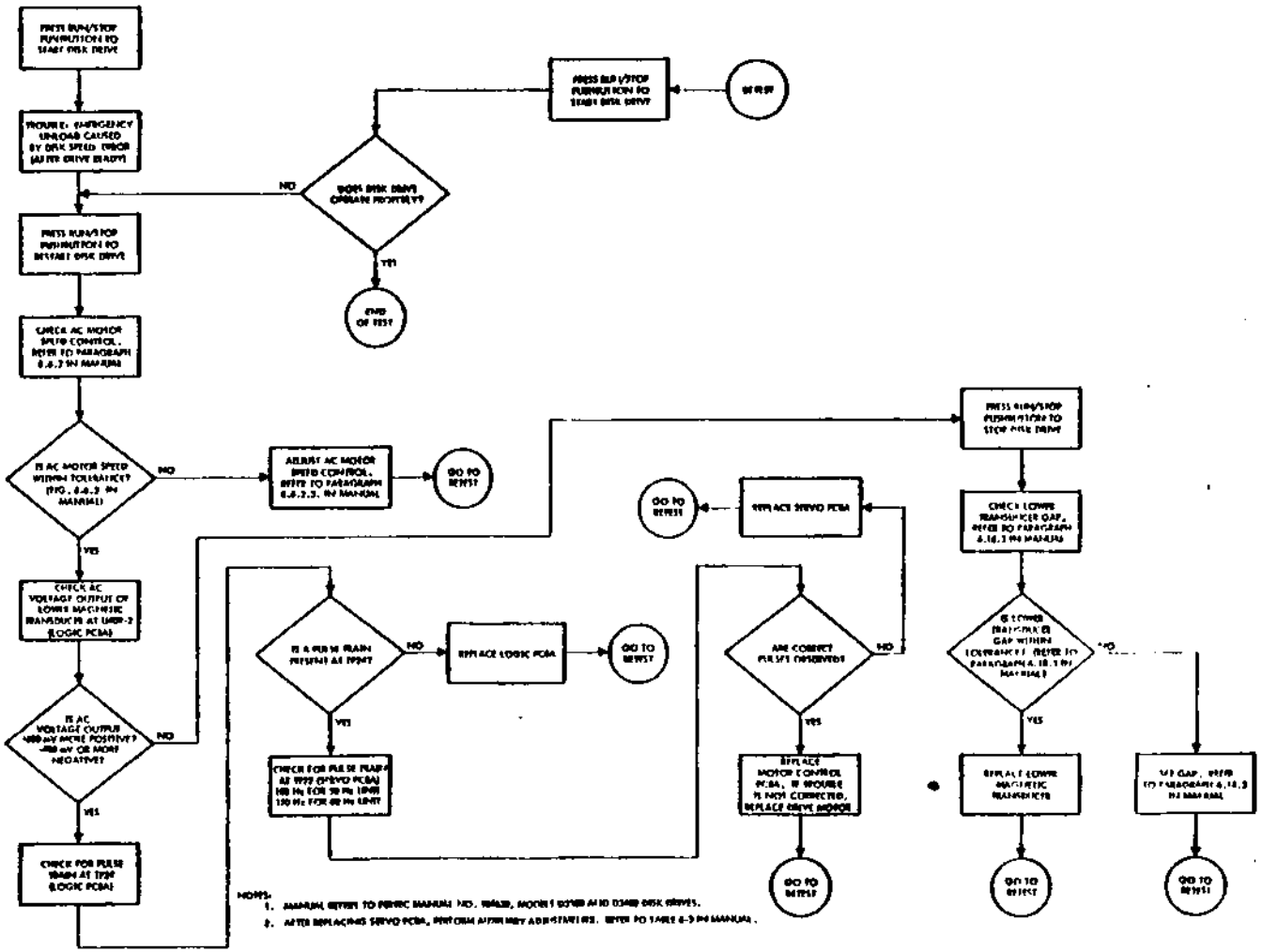


Figure B-3. Emergency Unload Caused by Disk Speed Error, Troubleshooting Flowchart

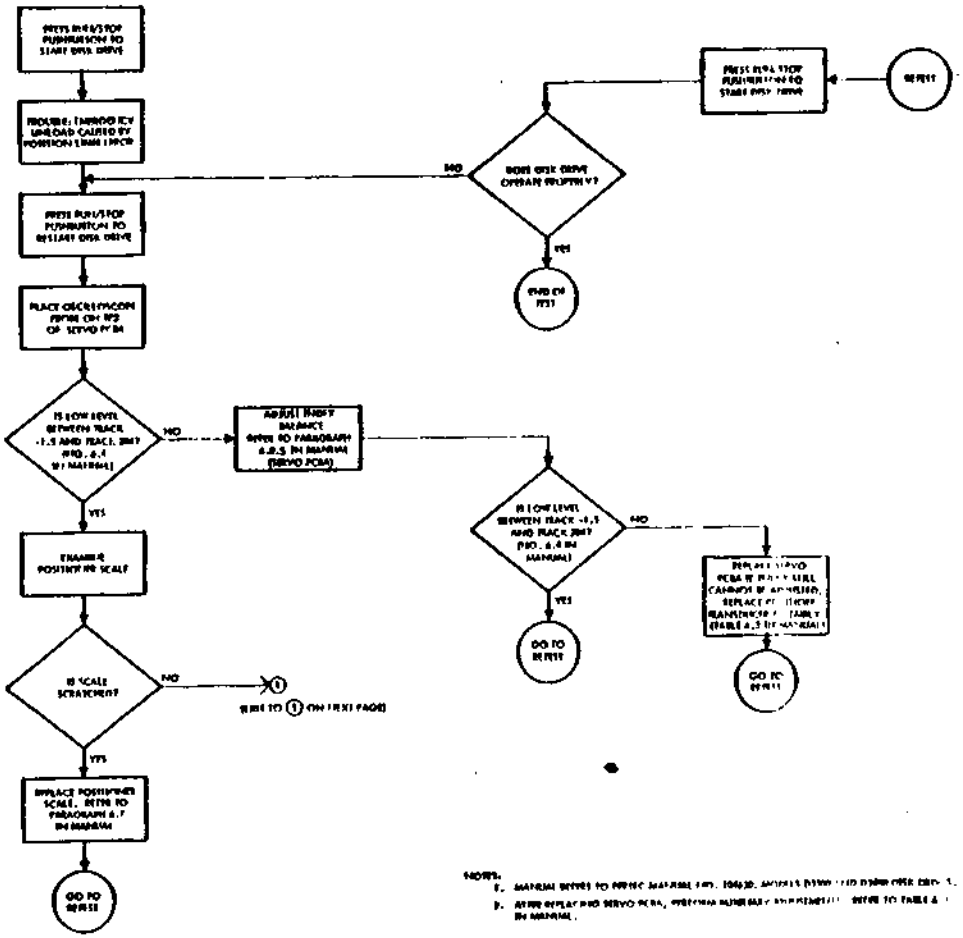


Figure B-4. Emergency Unload Caused by Position Lin I
Error, Troubleshooting Flowcha I

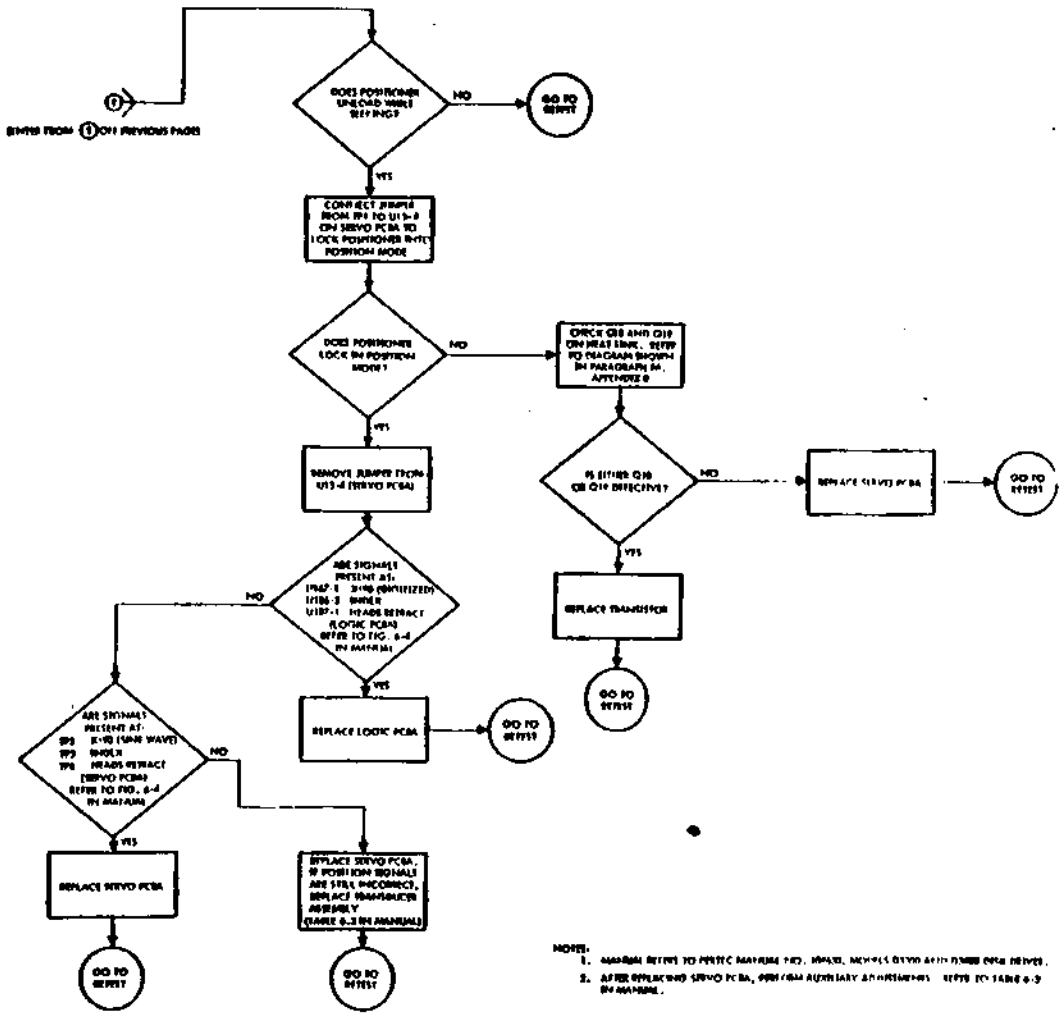


Figure B-4. Emergency Unload Caused by Position Limit Error, Troubleshooting Flowchart (Continued)

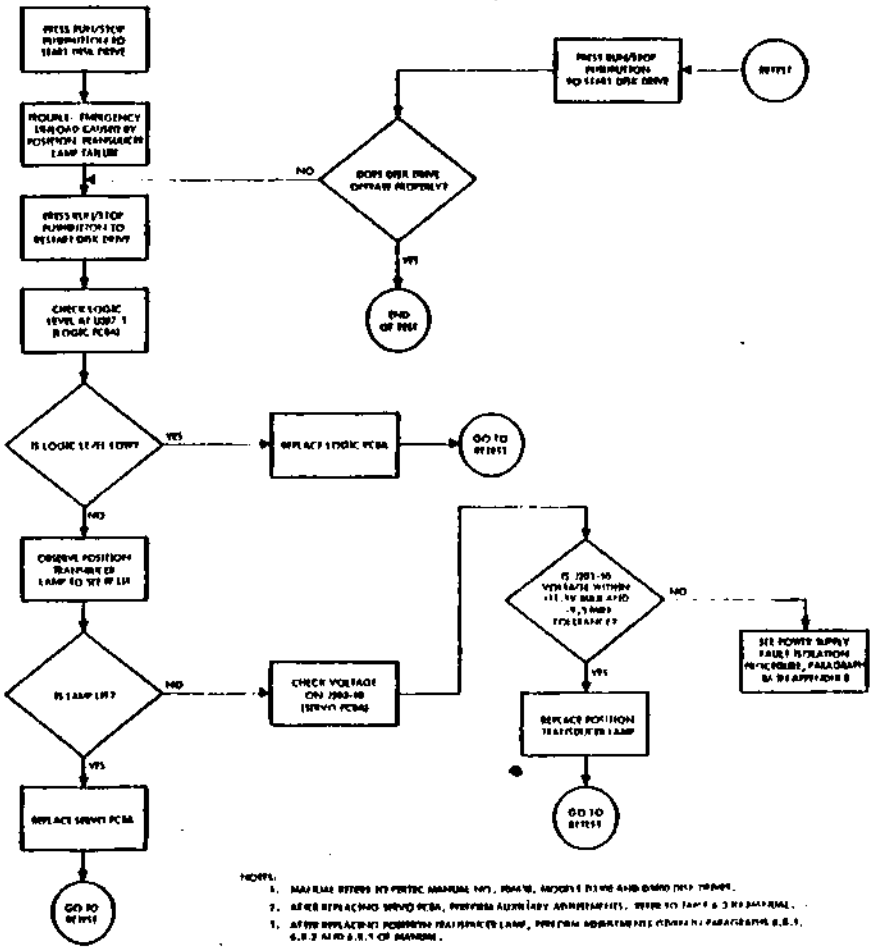


Figure B-5. Emergency Unload Caused by Position Transducer Lamp Failure, Troubleshooting Flowchart

D3000 SERVO ADJUSTMENT AID

R		TP
*226	X+90 GAIN	2
158	+5V LTP	18
167	-5V LTP	19
55	SEEK TIME →	
98	INDEX BAL	3
70	X+0 BAL	20
79	X+90 BAL	2
204	TACH BAL	16
22	SUM.AMP BAL	20
69	X+0 GAIN	20
111	CUR.FBK.	15

Cut out and paste onto cardboard.

X+0, X+90 GAIN: 12V P-P

SEEK TIME: LTP12(P) LTP9(D)
134(67)TRK.SK.=38(35)MS.

CUR.FBK: LONG SEEK, 1.4V P-P

1 REVOLUTION LTP7: 40MS@1500
25MS@2400