

**Qume**  
A Subsidiary of ITT

# Manual

**QumeTrak 242  
Maintenance Manual**

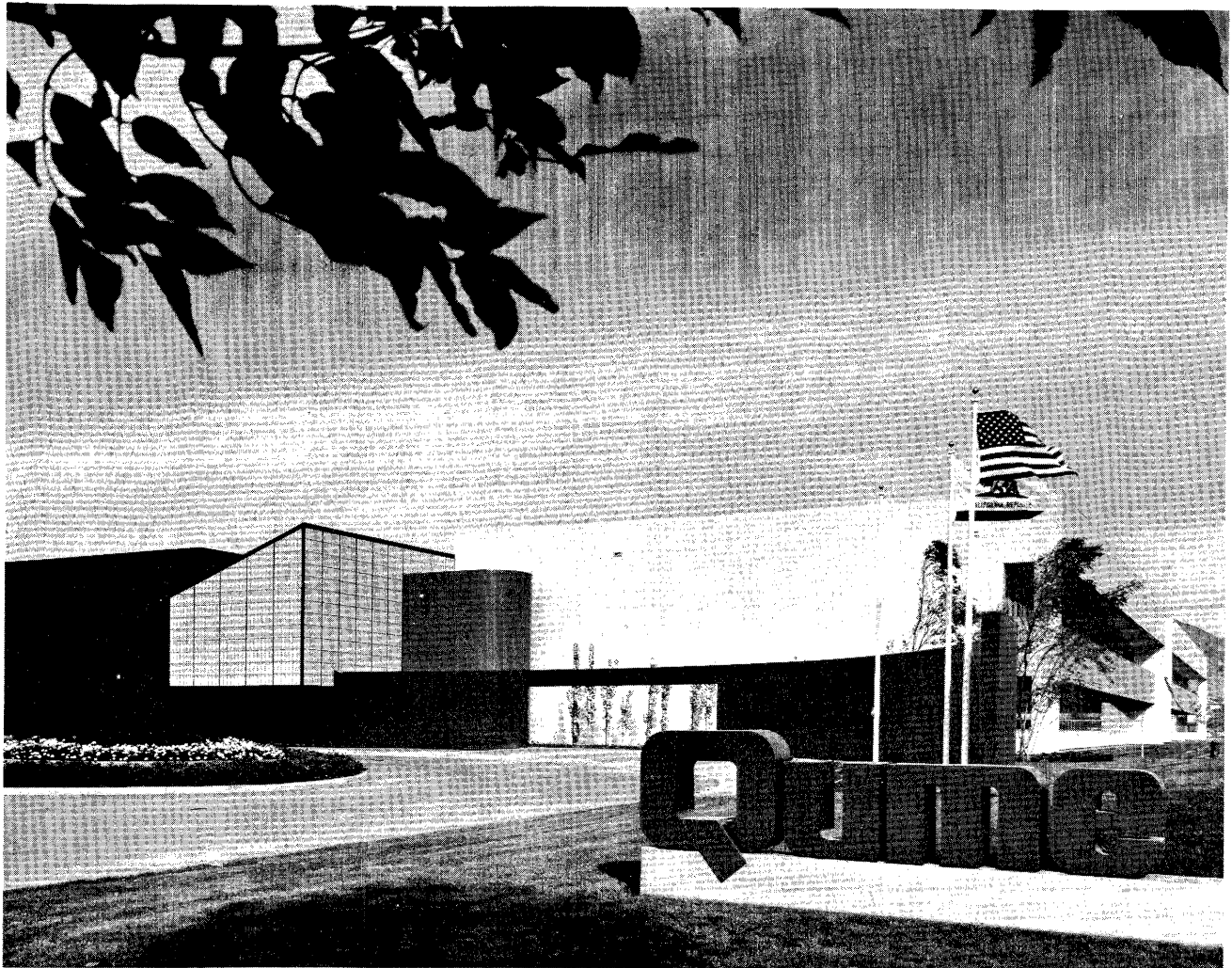
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## FOREWORD

This manual is one of a group of publications concerning the QumeTrak 242 flexible disk drive. Each manual documents the entire disk drive, but from a different aspect. Some subjects may be found in more than one publication, with the text description being more or less technically detailed as required for the intended reader.

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# INTRODUCTION

## SCOPE OF MANUAL

The scope of this manual is to provide maintenance information to support the QumeTrak 242 flexible disk drive in the field. The manual is divided into the following sections: Introduction, Interface, Installation, Customer Strap-pable Options, Maintenance, Troubleshooting, Recommended Spare Parts, and Diagrams.

## GENERAL DESCRIPTION

The QumeTrak 242 flexible disk drive offers low cost, direct access data storage, utilizing a removable eight-inch IBM diskette or equivalent as storage medium

### NOTE

In this manual the medium will be referred to as simply a **disk**.

It is compatible with the following IBM disk drives and systems:

- Single sided IBM 3740 and System 32 drives: 33FD.
- Two sided IBM 3600 and 4964 drives: 43FD.
- Two sided double density IBM System 34 drives: 53FD.

The QumeTrak 242 provides a storage capacity of 0.56M bytes on a two-sided single density flexible disk (IBM DISKETTE 2 or equivalent), and 1.2M bytes on a two-sided double density flexible disk (IBM DISKETTE 2D or equivalent).

The QumeTrak 242 uses a two-sided head carriage assembly containing two ceramic read/write tunnel erase heads, and a flexured mounting arrangement for extremely high reliability.

Fast access time (3ms track-to-track) is accomplished by a precision steel belt drive mechanism that affords minimal wear with low power dissipation.

Standard features include:

- Positive DC power required only (no negative DC or AC)
- Four drive daisy chain capability
- ISO write protect
- Program controlled door lock
- In Use LED activity indicator on the front panel

INTRODUCTION

SPECIFICATIONS SUMMARY

Table 1. Performance Specifications

SPECIFICATION	SINGLE DENSITY	DOUBLE DENSITY
CAPACITY PER DISK UNFORMATTED	0.8M bytes	1.6M bytes
IBM FORMAT	0.56M bytes	1.2M bytes
RECORDING DENSITY (TRACK NO. 76)	3408 BPI	6816 BPI
TRACK DENSITY	48 TPI	48 TPI
NUMBER OF CYLINDERS	77	77
NUMBER OF TRACKS	154	154
RECORDING METHOD	FM	MFM
ROTATIONAL SPEED	360 RPM	360 RPM
TRANSFER RATE	250K bits/sec	500K bits/sec
LATENCY (AVERAGE)	83 ms	83 ms
ACCESS TIME AVERAGE	91 ms	91 ms
TRACK-TO-TRACK	3 ms	3 ms
SETTLING	15 ms	15 ms
HEAD LOAD TIME	50 ms	50 ms
MOTOR START TIME	2 sec	2 sec

Table 2. Reliability and Maintenance

ERROR RATE	RECOVERABLE READ ERROR RATE	ONE ERROR PER 10 <sup>9</sup> BITS READ	MTRR	30 MINUTES
	NON-RECOVERABLE READ ERROR RATE	ONE ERROR PER 10 <sup>12</sup> BITS READ	PREVENTATIVE MAINTENANCE	6000 POWER ON HOURS OR 2 YEARS
	SEEK ERROR RATE	ONE ERROR PER 10 <sup>6</sup> SEEKS	DESIGN LIFE	15000 POWER ON HOURS OR 5 YEARS
MTBF	8500 HOURS AT 100% DUTY CYCLE 13000 HOURS AT 50% DUTY CYCLE		MEDIA LIFE*	3.5 x 10 <sup>6</sup> PASSES/TRACK

\*USEFUL MEDIA LIFE IS EXCEEDED WHEN "HEAD OUTPUT" DROPS TO BELOW 80% OF INITIAL VALUE, AS MEASURED BY USING IBM DISKETTE (IBM P/N 1766872).

## COMPATIBILITY

The QumeTrak 242 uses a standard 8-inch flexible disk (IBM Diskette, P/N 1766872 or equivalent) as the recording medium.

The QumeTrak 242 complies with the physical and electrical characteristics described below for full compatibility with an IBM system.

### Read/Write/Erase Head

The geometry of the QumeTrak 242 Read/Write/Erase head is equivalent to the IBM Read/Write/Erase head.

### Read Output Level

The QumeTrak 242 read output level, as measured by the following procedure, satisfies the requirements listed in the table below.

1. Data is written by the QumeTrak 242 on a standard disk (IBM Diskette P.N. 1766872).
2. The read output level from the standard disk is checked between test points TP1A and TP1B (the integrated outputs of the head preamplifier).

Table 3. Minimum Read Output Level Requirements

Track	Output (all '1')	Resolution = $\frac{\text{all '1' output}}{\text{all '0' output}} \times 100$
76	150 mV p-p MIN.	50% MIN.

### Write Current

IBM compatibility requires a 20% reduction in write current on tracks 44 through 76.

### Switch Filter

IBM compatibility requires an increase in the read output resolution on tracks 60 through 76.

## TRACK POSITIONING

The QumeTrak 242 positions the R/W head to the center line of track 40 to within  $\pm 0.04$  mm ( $\pm 0.0016$  of an inch). Track 40 positioning accuracy can be checked by using a Qume CE disk (Q.P.N. 50152-02).

## INTRODUCTION

### **INDEX POSITIONING**

The QumeTrak 242 Index Sensor allows precise positioning in relation to the read/write head gap.

The dynamic positional difference of the QumeTrak 242 is  $500 \text{ us} \pm 500 \text{ us}$ , which can be checked by using a Qume CE disk (Q.P.N. 50152-02).

# INTERFACE

## ELECTRICAL INTERFACE

The QumeTrak 242 has two interface connectors: connector P1/J1 interfaces digital I/O signals, and connector P5/J5 interfaces the +5V and +24V DC power source. Refer to the Interface Connections illustration.

All I/O signal interface lines are TTL compatible and are active (true) when low.

The QumeTrak 242 uses 7438 NAND buffers (open collector) as line drivers and 7414 Schmitt trigger inverters as line receivers. The input of all receiver lines in a single drive, and those in the last drive of a daisy chain, must be terminated in 150 ohms pulled up to +5V.

The illustration below shows the recommended controller interface circuit.

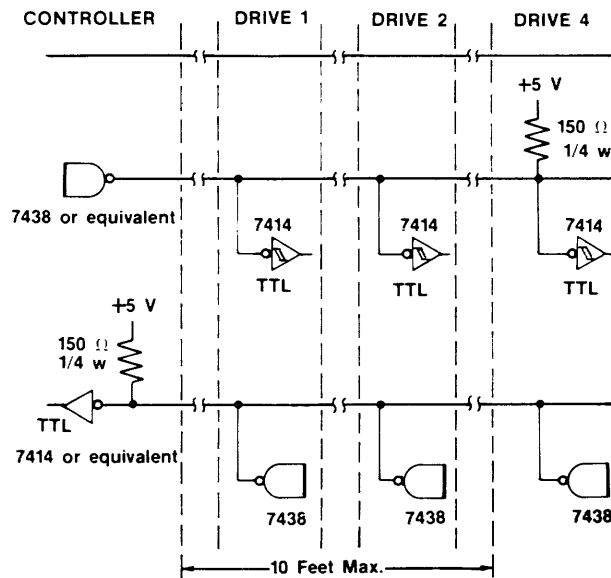
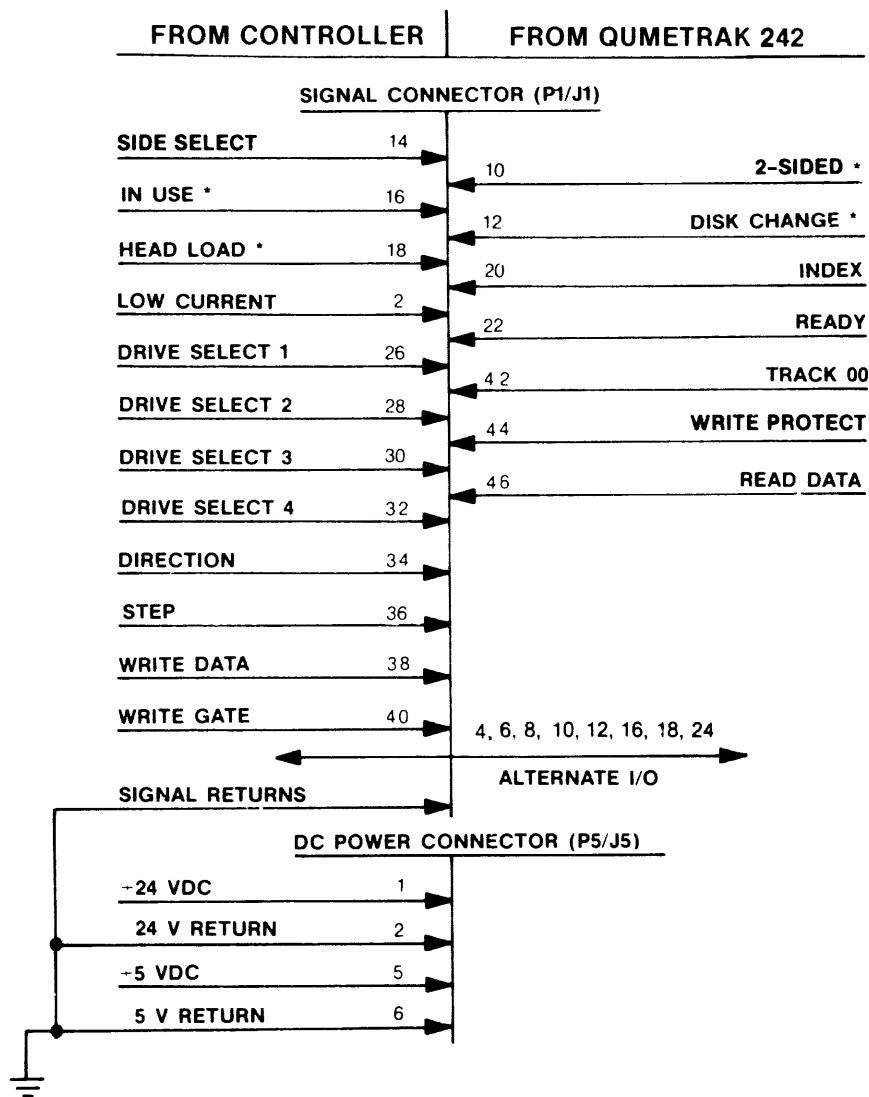


Figure 1. Recommended Controller Interface Circuit



- NOTES:**
1. \*Optional.
  2. Signal returns (all odd numbered pins on P1/J1), +24 V return, +5 V return, and frame ground must be connected together at the controller.
  3. Pins 48 and 50 on P1/J1 and Pins 3 and 4 on P5/J5 are reserved.

Figure 2. Interface Connections

## INPUT LINES

There are twelve (12) active low TTL input lines to the QumeTrak 242. Ten (10) are standard and two (2) are user installable options. Individual signal line characteristics are described below.

High Level:	Logical False	2.4 to 5.25V
Low Level:	Logical True	0 to 0.4V
Impedance:	150 ohms to 5V	

## Drive Select 1-4

An active low level on the appropriate line (pin 26, 28, 30, or 32) enables communication between the individual drive and the controller.

When two or more (up to 4) drives are daisy chained, each drive must have a unique DRIVE SELECT address. The DRIVE SELECT address is controlled by jumpers DS1 through DS4. When the two pins of jumper DS1 are connected, that drive will be activated by an active low signal on the DRIVE SELECT number one line. If the two pins of jumper DS2 are connected, that drive will be activated when DRIVE SELECT line number two is low active. The same system applies to jumpers DS3 and DS4.

Table 4. Drive Selection

Drive Number	Drive Select Input				Jumper Pins			
	1	2	3	4	DS1	DS2	DS3	DS4
1	L	H	H	H	S	O	O	O
2	H	L	H	H	O	S	O	O
3	H	H	L	H	O	O	S	O
4	H	H	H	L	O	O	O	S

L = low level, H = high level, S = short, O = open

### NOTE

Only one jumper can be connected within a single drive. Each drive within a daisy chain must have a unique DRIVE SELECT number.

## Direction

DIRECTION (pin 34) defines the direction of read/write head movement. A low level on this line causes the head positioning mechanism to move the read/write head toward the center of the disk when the STEP Line is pulsed. With the DIRECTION line at a high level, a pulse on the STEP line causes the head positioning mechanism to move the read/write head away from the center of the disk. The logic state of DIRECTION can be changed at any time after the trailing (positive going) edge of the STEP pulse, and to within 1 microsecond before the trailing edge of a following STEP pulse. The logic state of DIRECTION cannot be changed during the positive going transition of STEP, or within the preceding 1 microsecond of the positive going transition of STEP.

**Step**

The negative going edge of a STEP pulse applied to this line (pin 36) will cause the read/write head to be moved one track. The direction of movement is controlled by the DIRECTION line. STEP pulses have the timing characteristics shown below.

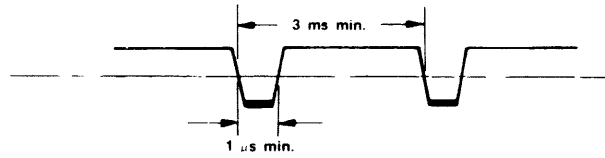


Figure 3. Step Timing

**Write Data**

This interface line (pin 38) provides the data to be written on the disk. Each transition from high level to an active low level causes the write current polarity through the head to be reversed. The WRITE DATA timing characteristics for Frequency Modulation (FM) and Modified Frequency Modulation (MFM) formats are shown below.

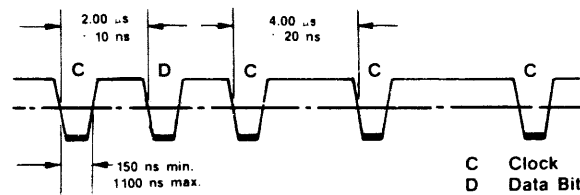


Figure 4. Write Data Timing for Frequency Modulation (FM)

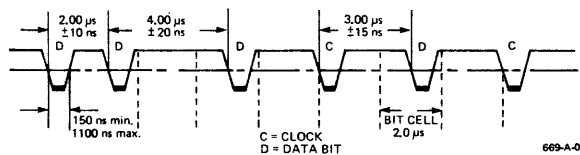


Figure 5. Write Data Timing for Modified Frequency Modulation (MFM)

**Write Gate**

An active low level on this line (pin 40) enables the write current source and disables the stepping (head movement circuitry). A high level on this line enables the read circuitry.

Deactivation of DRIVE SELECT and/or changing SIDE SELECT must be delayed at least 590 μs following a write operation, to assure that the track is fully tunnel erased.

Refer to the READ TIMING and WRITE TIMING diagrams for the timing relationships.



### Side Select

Side Select (pin 14) defines which surface of a two-sided disk is used for data recording or retrieval. An active low level on this line selects the R/W head for side 1 (the disk surface that faces the carrier assembly). A high level on this line selects the R/W head for side 0 of the disk (the disk surface that faces the PCB). When switching from side 0 to side 1 and conversely, a 100 us delay is required before any read or write operation can be initiated. Refer to CUSTOMER STRAPPABLE OPTIONS for alternate operation.

### Low Current / Switch Filter

When WRITE GATE is low, this signal line (pin 2) should be high on tracks 0 through 43, and active low on tracks 44 through 76 (low current). When data is read, this line should be high on tracks 0 through 59, and active low on tracks 60 through 76, in order to improve read output resolution on the inner tracks (switch filter).

### Head Load

An active low level on this optional input line (pin 18), when READY is active low, causes the R/W head to be loaded against the disk.

Refer to CUSTOMER STRAPPABLE OPTIONS for uses and method of installation.

### In Use

An active low level on this optional input line (pin 16) will energize the In Use LED. Refer to CUSTOMER STRAPPABLE OPTIONS for uses and method of installation.

### OUTPUT LINES

There are seven (7) output lines from the QumeTrak 242; five (5) are standard and two (2) are optional. Each line has the following properties.

High Level:	Logical False	2.4 to 5.25V, MAX. leakage current 250 uA when 7438 NAND buffers are at cutoff.
Low Level:	Logical True	0 to 0.4 V, MAX. sink current 48 mA when the 7438 NAND buffers draw current.

## INTERFACE

### Index

This interface signal (pin 20) is provided by the drive once each revolution. The leading (negative going) edge of an INDEX pulse indicates to the controller the beginning of the next track. The timing characteristics for INDEX are shown below.

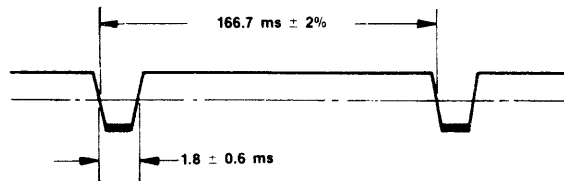


Figure 6. Index Timing

### Ready

An active low level on this line (pin 22) indicates that at least three index pulses have been sensed (two complete disk revolutions by a properly inserted disk with the door closed). When using a single-sided disk, READY will go true only when side 0 is selected.

### Track 00

An active low level on this line (pin 42) indicates that the R/W head is positioned at Track 00.

### Write Protect

An active low level on this line (pin 44) indicates that a disk with an ISO write protect notch is loaded. Under normal operation, the drive will inhibit writing when a protected disk is installed in addition to notifying the controller.

Refer to CUSTOMER STRAPPABLE OPTIONS for alternate operation.

### Read Data

Data from the disk is output to the host system in the same form as it was received on the WRITE DATA line. Each flux reversal that is sensed on the disk produces a transition to an active low level on the READ DATA line (pin 46).

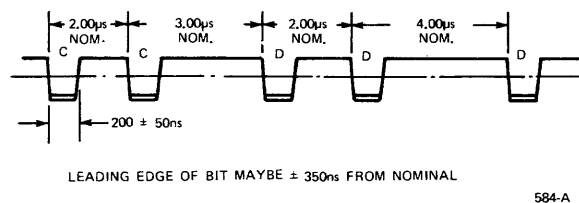


Figure 7. Read Data Timing for Frequency Modulation (FM)

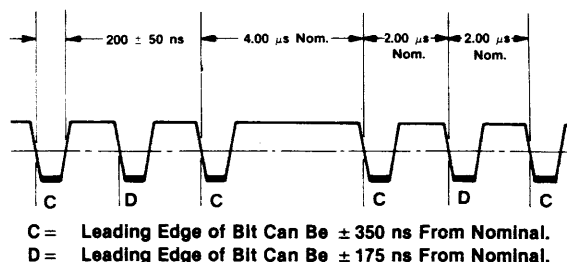


Figure 8. Read Data Timing for Modified Frequency Modulation (MFM)

### Disk Change

An active low level on this optional output line (pin 12) indicates that the disk drive door has been opened and the disk removed after the DRIVE SELECT signal has gone false. The DISK CHANGE circuit is reset on the true to false transition of DRIVE SELECT provided that READY is true. Refer to the section on CUSTOMER STRAPPABLE OPTIONS for method of installation.

### Two-Sided

With a disk installed and the drive selected, an active low level on this optional output line (pin 10) indicates that a two-sided disk is in use. A high level indicates that a single-sided disk is in use. Refer to the section on CUSTOMER STRAPPABLE OPTIONS for method of installation.

### ALTERNATE I/O PINS

Eight alternate I/O pins are provided on connector J1 for interfacing the disk drive with additional control signals. These eight alternate I/O pins (4, 6, 8, 10, 12, 16, 18 and 24) connect to PCB pads for customer installable optional jumpers. Two factory designated input and two factory designated output lines of the drive internal circuits are selectable by installing jumpers to I/O pine 10, 12, 16, and 18.

**TIMING**

The following illustrations (3) indicate the control and data timing requirements.

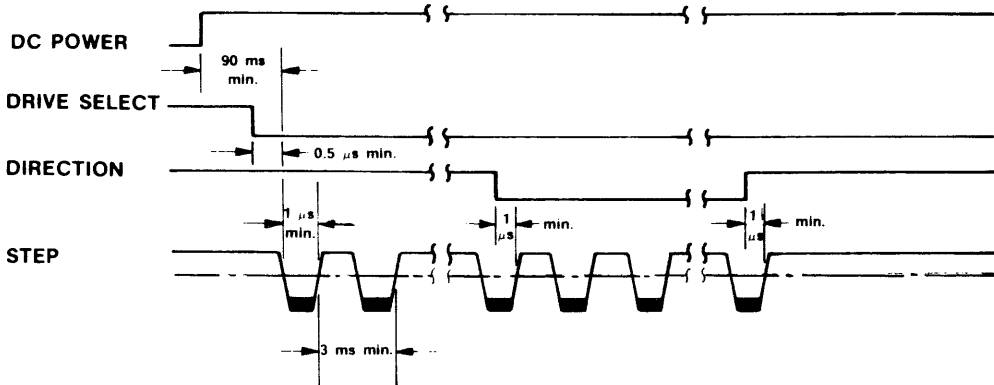


Figure 9. Track Access Timing

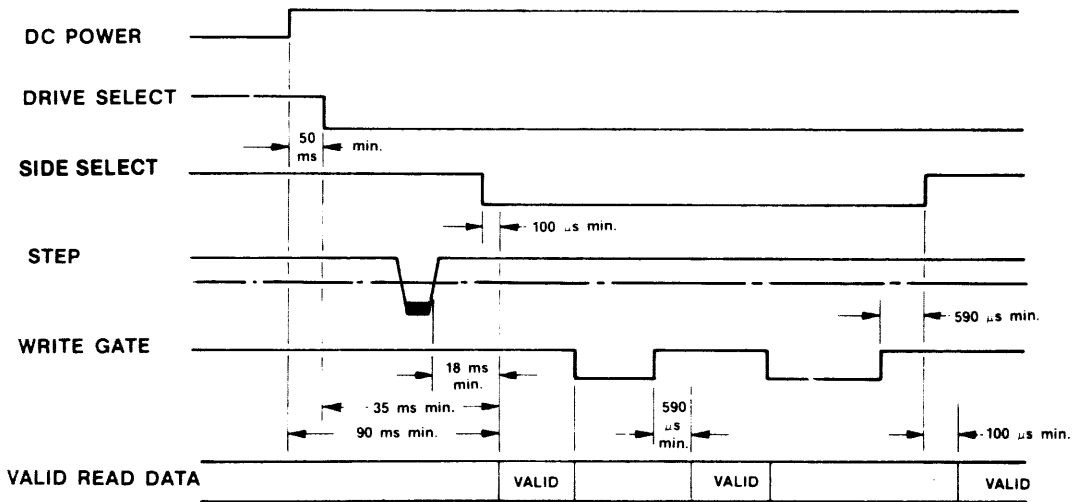


Figure 10. Read Timing

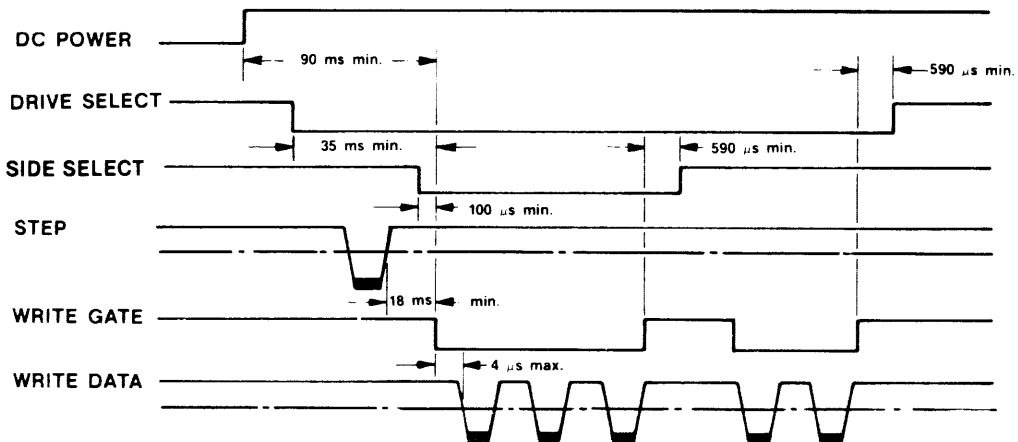


Figure 11. Write Timing

**PHYSICAL INTERFACE**

The interface between the QumeTrak 242 and the host system is via two (2) connectors: I/O Signals (P1/J1), and DC power (P5/J5).

Refer to the CONNECTORS AND CABLES paragraph for specific pin assignments.

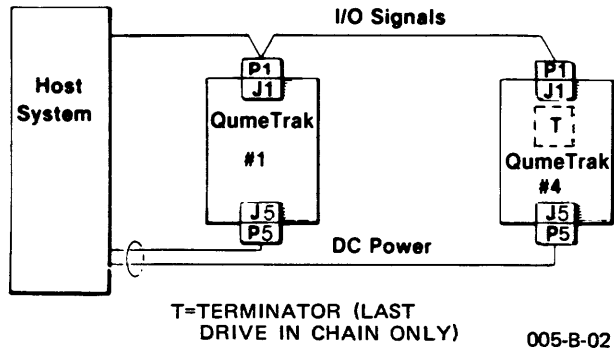


Figure 12. Interface Connection

**CONNECTORS AND CABLES**

**I/O Signals (P1/J1)**

Connection to J1 is through a 50 pin PCB edge card connector. The dimensions for this connector are shown in the figure below.

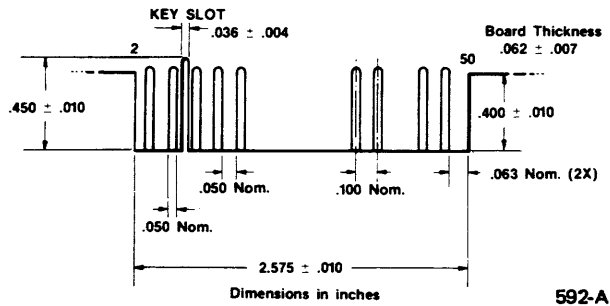


Figure 13. Connector J1 Dimensions (component side)

Table 5. I/O Signal Connector P1 Requirements for a Flat Cable

PARTS		3M P/N
CONNECTOR		3415-0001
POLARIZING KEY		3439-0000
CRIMP TOOL	PRESS	3440
	LOCATOR PLATE	3443-11
	PLATEN	3442-1
FLAT CABLE (10 FEET MAX.)		3365-50

Table 6. I/O Signal Connector P1 Requirements for Twisted Wire Pairs

PARTS	CRIMP TYPE	SOLDER TYPE	
	AMP P/N	AMP P/N	VIKING P/N
HOUSING	1-583717-1	1-583717-1	3VH25/1JN-5
CONTACT	583616-5	583854-3	—
POLARIZING KEY	583274-1	583274-1	091-0071-000
CRIMP TOOL	90268-1	—	—
EXTRACTOR TOOL	91073-1	91073-1	—
TWISTED PAIRS (20 FEET MAX.)	AWG 26	AWG 26	AWG 26

Table 7. I/O Signal Connector P1/J1 Pin Assignments

SIGNAL RETURN	SIGNAL	SIGNAL NAME	
PIN NO.	PIN NO.	STANDARD	OPTION
1	2	LOW CURRENT/ SWITCH FILTER	
3,5,7	4,6,8	ALTERNATE I/O	
9	10	ALTERNATE I/O	TWO-SIDED
11	12	ALTERNATE I/O	DISK CHANGE
13	14	SIDE SELECT I/O	ALTERNATE I/O
15	16	ALTERNATE I/O	IN USE
17	18	ALTERNATE I/O	HEAD LOAD
19	20	INDEX	
21	22	READY	
23	24	ALTERNATE I/O	
25	26	DRIVE SELECT 1	
27	28	DRIVE SELECT 2	
29	30	DRIVE SELECT 3	
31	32	DRIVE SELECT 4	
33	34	DIRECTION	
35	36	STEP	
37	38	WRITE DATA	
39	40	WRITE GATE	
41	42	TRACK 00	
43	44	WRITE PROTECT	
45	46	READ DATA	
47	48	RESERVED	
49	50	RESERVED	

NOTE

Also check Factory Configuration of Option Traces and Program Shunt Trace Functions table when interfacing.

**Power (P5/J5)**

Table 8. DC Power Connector P5/J5 Requirements

	P5 (CABLE SIDE)	J5 (DRIVE SIDE)
PARTS	AMP P/N	AMP P/N
HOUSING	1-480270-0	1-380999-0
CONTACT (6 PINS)	60619-1	—
CRIMP TOOL	90124-2	—
EXTRACTOR TOOL	1-305183-2	—
CABLE (10 FEET MAX.)	AWG 16 OR 18	—

Table 9. DC Power Connector P5/J5 Pin Assignments

PIN NO.	SIGNAL NAME
1	+ 24 VDC
2	+ 24 V RETURN (GND)
3	NOT USED (GND)
4	NOT USED
5	+ 5 VDC
6	+ 5 V RETURN (GND)

**TERMINATORS**

The QumeTrak 242 requires that two DIP resistor terminator modules be installed in the DIP sockets on the PCB of a single drive or in those of the last drive in a daisy chain. No other drives in a daisy chain should have terminators installed.





## INSTALLATION

### RECEIVING AND INSPECTION

Each disk drive is packaged in an individual container for protection during shipment. Unpack and inspect the disk drive as follows:

1. Inspect the shipping container for any signs of damage. If damage is observed, have the delivery agent note the damage on the shipping document. Some shippers may wish to be present when the container is opened if external damage is apparent.
2. Open the container and remove the disk drive.
3. Remove the cardboard insert installed between the heads, and any other packaging or restraining material from within the drive.
4. Retain all packaging materials for possible reshipment.
5. Inspect the disk drive for scratches, dents, loose or damaged parts, or other signs of damage. Note any evidence of such damage on the invoice, and file a claim with the carrier immediately if the condition of the unit so warrants.
6. Inspect the interior of the disk drive. Look for loose or broken parts, evidence of electrical damage, or other signs of damage.
7. If damage that might impair drive operation is detected, do not attempt to operate the disk drive. Contact Qume for advice and instructions.
8. If the drive will not be used for some time, it is advisable to replace the cardboard insert after completing inspection.
9. When repacking the disk drive for shipment or storage, use only the original packaging material.

**MOUNTING**

**Mechanical Dimensions**

The mounting and clearance dimensions for the QumeTrak 242 are shown below.

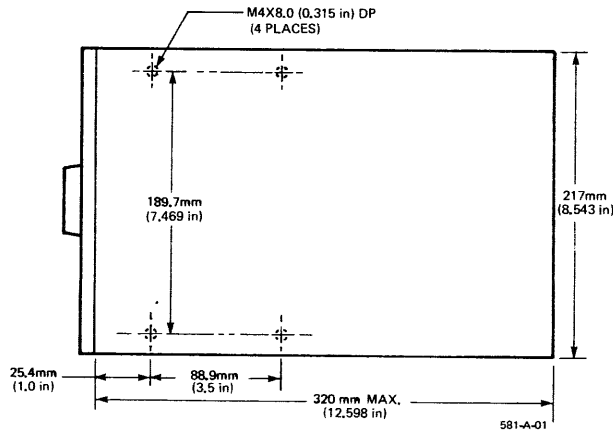


Figure 14. QumeTrak 242 (Top View)

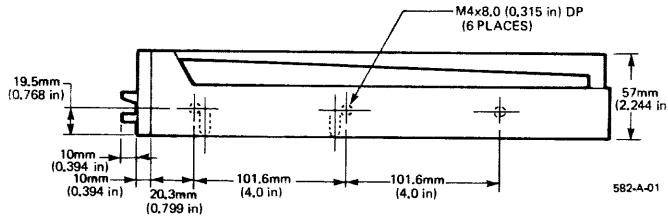
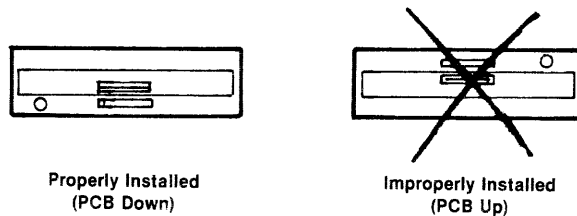


Figure 15. QumeTrak 242 (Side View)

**Recommendations**

The QumeTrak 242 can be mounted in any one of three positions to allow horizontal front loading, vertical front loading, or vertical top loading.

When the QumeTrak 242 is mounted in a horizontal front loading position, the In Use LED on the front bezel must be under the front door as shown below.



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Figure 16. Disk Drive Mounting

**INSTALLATION REQUIREMENTS**

The following table summarizes the installation requirements of the QumeTrak 242 disk drive.

Table 10. Installation Requirements

DC POWER REQUIREMENTS	VOLTAGE	MAX. RIPPLE	CURRENT (AMPS)				
	+24 V ±10%	0.1 V (P-P)		1 DRIVE	2 DRIVES	3 DRIVES	4 DRIVES
			TYP.	0.5	1.0	1.5	2.0
			MAX. RUN. START-UP	1.0 1.0	1.7 2.0	2.4 3.0	3.1 4.0
	+5 V ±5%	0.05 V (P-P)	TYP.	0.9	1.6	2.3	3.0
			MAX.	1.3	2.2	3.1	4.0
POWER DISSIPATION	LESS THAN 30W, 17W TYP.						
ENVIRONMENTAL	TEMPERATURE		OPERATING		STORAGE		
			+5°C TO +43°C (41°F TO 110°F)		-10°C TO +45°C (14°F TO 113°F)		
	RELATIVE HUMIDITY		20 TO 80%		8 TO 80%		
MAX. WET BULB		+29°C (84°F)		NO CONDENSATION			
MECHANICAL DIMENSIONS	HEIGHT	WIDTH	DEPTH		WEIGHT		
	57mm (2.25in)	217mm (8.55in)	320mm (12.6in)		3.5Kg (7.7lbs)		
NOTES:							
<p>1. DC power voltage as specified is at the DC power connector (J5) on the PCB.</p> <p>2. DC supply current is for drives that are normally installed without customer options.</p> <p>3. If the stepper motor and door solenoid are energized on all drives continuously, the maximum current requirement for the +24 V supply is 1.0 A times the number of drives on the daisy chain.</p>							



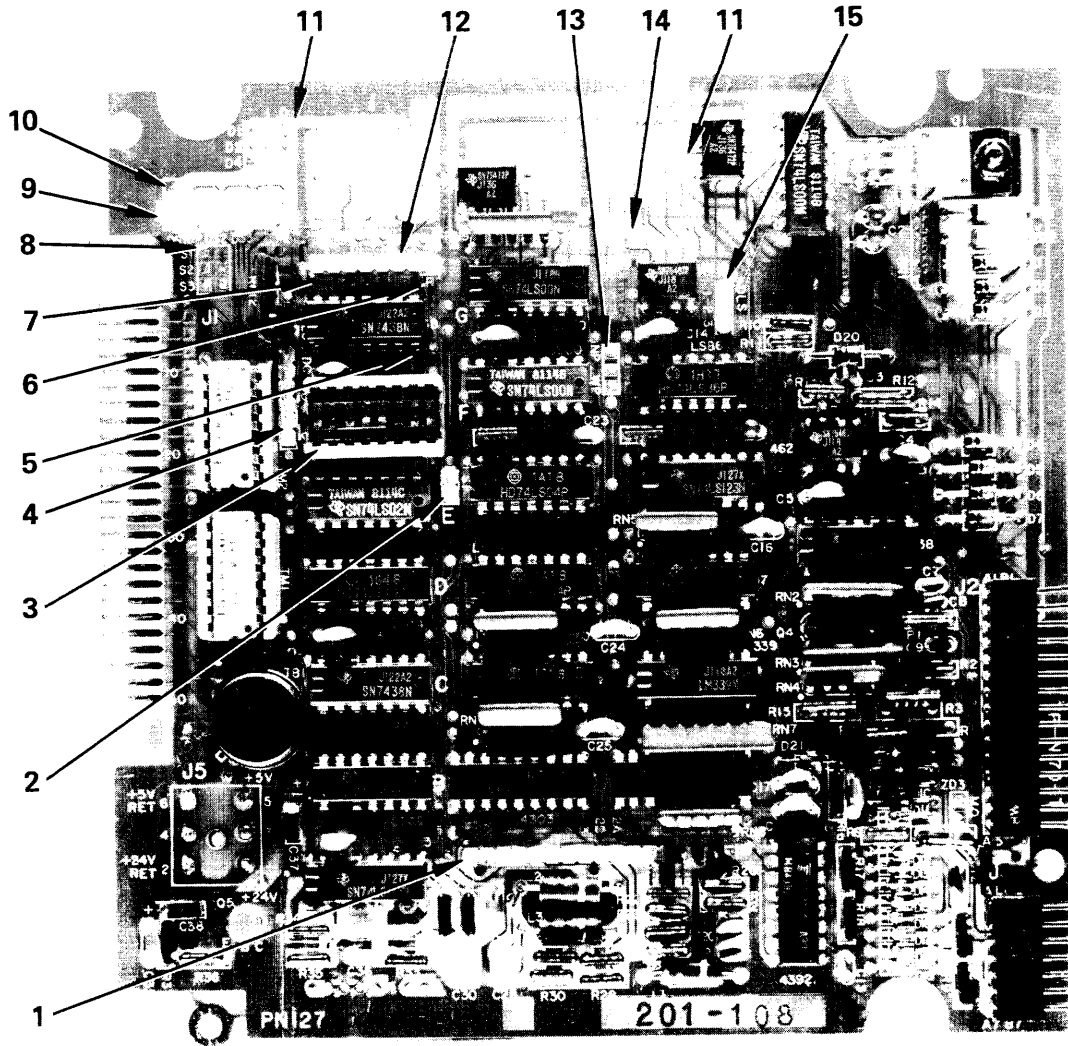
## CUSTOMER STRAPPABLE OPTIONS

### GENERAL

The QumeTrak 242 can be modified by the user to alter functions that were described previously. These modifications are made by adding or deleting traces and by using the Alternate I/O pins. The following table shows the configuration of the option traces and jumpers as shipped from the factory.

Table 11. Factory Configuration of the Customer Strappable Options

DESIGNATOR	DESCRIPTION	FROM FACTORY	
		OPEN	SHORT
DS1 - DS4	DRIVE SELECT ADDRESS PINS (UP TO 4 DRIVES)	DS2, DS3 DS4	DS1
A,B,X	RADIAL HEAD LOAD		X
Z	IN USE FROM DRIVE SELECT		X
HL	STEPPER POWER FROM HEAD LOAD		X
R	ALTERNATE OUTPUT READY PAD		X
I	ALTERNATE OUTPUT INDEX PAD		X
C	ALTERNATE INPUT HEAD LOAD	X	
D	ALTERNATE INPUT IN USE	X	
DC	ALTERNATE OUTPUT DISK CHANGE	X	
2S	ALTERNATE OUTPUT TWO SIDED DISK	X	
Y	IN USE FROM HEAD LOAD	X	
DL	DOOR LOCK LATCH	X	
RR	RADIAL READY		X
RI	RADIAL INDEX		X
WP	INHIBIT WRITE WHEN WRITE PROTECT		X
NP	ALLOW WRITE WHEN WRITE PROTECT	X	
D1,D2,D4,DDS	DRIVE ADDRESS SELECT (UP TO 8 DRIVES)	X	
B1 - B4	TWO, DOUBLE-SIDED DRIVE SELECT	X	
S1 - S3	HEAD SELECT OPTION	S1,S3	S2
T40	TEST TRACK 40	X	
HA	TEST ACTUATE HEAD LOAD	X	
4,6,8,10, 12,16,18,24	ALTERNATE I/O PINS	X	
SF	SWITCH FILTER		X
SP	STEPPER POWER (USED WITH HL)	X	



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**LEGEND**

1. Test Pins
2. Switch Filter Option Pins - SF
3. Programmable Shunt Trace/Cut Options - A, B, X, R, I, Z, HL
4. Optional I/O Pins - 2S, DC, D, C
5. Alternate Output Index Pad - I
6. Alternate Output Ready Pad - R
7. Radial Ready/Index Option Pads - RR, RI
8. Side Select Option Pads - S1, S2, S3
9. Drive Select Address Pins - DS1, DS2, DS3, DS4
10. 2-Double Sided Drive Side Select Option Pads - B1, B2, B3, B4
11. 8-Drive Multiplex Option Pads - D1, D2, D4, DDS
12. Optional I/O Pins - Y, DL, HA, T40
13. Enable/Disable Write Protect Option Pads - WP, NP
14. Stepper Power Enable (used with HL) - SP
15. Door Lock Solenoid Power Configuration Pins - DLS 1, 2, 3

Figure 17. PCB Option Features

**PROGRAMMABLE SHUNT**

A 16-pin programmable shunt is provided for the seven commonly used trace/cut options. All of these traces are usually shorted when shipped from the factory. The shorted and open functions of the programmable trace/ cut options are shown in the following table.

Table 12. Programmable Shunt Trace/Cut Functions

TRACE	FUNCTION - SHORTED (STD.)	FUNCTION - OPEN (OPTION)
A	DRIVE SELECT ACTIVE	DRIVE SELECT ACTIVE, HEAD LOAD ACTIVE FROM DRIVE SELECT
B	DRIVE SELECT ACTIVE	DRIVE SELECT ACTIVE HEAD LOAD ACTIVE
X	HEAD LOAD ACTIVE FROM DRIVE SELECT	HEAD LOAD ACTIVE, DRIVE SELECT ACTIVE FROM HEAD LOAD
Z	IN USE ACTIVE FROM DRIVE SELECT	IN USE ACTIVE FROM HEAD LOAD OR OPTIONAL IN USE I/O
HL	STEPPER MOTOR POWER ACTIVE FROM HEAD LOAD	STEPPER MOTOR POWER IS ALWAYS ACTIVE
R	READY IN MULTIPLEX MODE (REFER TO NOTE 1)	READY IN RADIAL MODE (REFER TO NOTE 2)
I	INDEX IN MULTIPLEX MODE (REFER TO NOTE 1)	INDEX IN RADIAL MODE (REFER TO NOTE 2)

NOTES:

1. Multiplex mode requires DRIVE SELECT to check that the READY and/or INDEX lines are active on any drive.
2. Radial mode allows the controller to check that the READY and/or INDEX lines are active on any drive without DRIVE SELECT.

**DRIVE SELECT OPTIONS**

Factory configuration of the Drive Select circuit allows for up to four drives to be addressed in a daisy chain arrangement. Normally, a jumper is factory installed in location DS1, designating the drive as number one. Moving this jumper to any one of the three remaining locations (DS2-4), designates the drive for the corresponding position number. Two other options are available.

**Option 1**

This option allows direct selection of a particular disk side from among two daisy chained double-sided drives. The four disk sides are addressing as if they were separate drives on the existing four DRIVE SELECT input lines. Detailed instructions on input configuration and jumper status are presented below under Side Select Options.

**Option 2**

This option allows up to eight drives to be multiplexed together. The four DRIVE SELECT lines are used for addressing the drive. DRIVE SELECT 1 is used to enable the DRIVE SELECT 2 (binary 1), DRIVE SELECT 3 (binary 2), and DRIVE SELECT 4 (binary 4) address lines. The logical drive assignment is accomplished by properly jumpering traces D1, D2, and D4, where D1 = (binary 1), D2 = (binary 2), D4 = (binary 4). The jumper pads are arranged to appear as a 3 X 3 matrix. Within each column, the center pad must be jumpered to an adjacent logical 1 or logical 0 pad. The proper jumpers for each drive select number are shown in the table below.

Installation (refer to the PCB Option Features illustration):

1. Add a 74L85, 4-bit comparator IC in PCB location 1K.
2. Jumper trace DDS.
3. Unplug trace DS1-DS4.
4. Properly jumper traces D1, D2, and D4.

Table 13. Drive Select Options

DRIVE NUMBER	DRIVE SELECT INPUT				JUMPER CENTER PAD TO:		
	1	2	3	4	D1	D2	D4
0	L	H	H	H	0	0	0
1	L	L	H	H	1	0	0
2	L	H	L	H	0	1	0
3	L	L	L	H	1	1	0
4	L	H	H	L	0	0	1
5	L	L	H	L	1	0	1
6	L	H	L	L	0	1	1
7	L	L	L	L	1	1	1

L = LOW LEVEL, H = HIGH LEVEL

**HEAD LOAD OPTIONS**

When a factory configured drive is selected, its heads are loaded and the stepper motor is energized. Three other options are available.

**Option 1**

This option allows a drive to be selected without loading the heads or enabling the stepper motor. The advantage is that the output status signals can be monitored while the head is unloaded, thereby extending the media life.

Installation (refer to the PCB Option Features illustration):

1. Open trace X on the programmable shunt with a small screwdriver.
2. Plug pins C on the optional I/O pins near connector J1.



**Option 2**

This option allows a drive to be selected and the stepper motor to be enabled without loading the heads. As an example of this option, initial reset to Track 00 at power-up can be performed without the READY condition.

Installation (refer to the PCB Option Features illustration):

1. Open traces B and HL on the programmable shunt with a small screwdriver.
2. Plug pins C on the optional I/O pins.
3. Open pads SP.

**Option 3**

This option (RADIAL READY) allows a drive to load the heads without selecting the drive or enabling the stepper motor. The advantage is that the heads can be kept loaded on all the drives, thereby eliminating the head load time when the drive is performing a disk copy operation.

Installation (refer to the PCB Option Features illustration):

1. Open traces A and HL on the programmable shunt with a small screwdriver.
2. Plug pins C on the optional I/O pins.
3. Open pads SP.

**SIDE SELECT OPTIONS**

Normally, a R/W head is selected by the SIDE SELECT interface line in a daisy chain system of up to four drives. Two options are available.

**Option 1**

This option allows both SIDE SELECT and DIRECTION to be multiplexed on the same DIRECTION line. DIRECTION can be used in this way because it is not being used during reading or writing (STEP must accompany DIRECTION to initiate head movement).

Installation (refer to the PCB Option Features illustration):

Open pads S2 and jumper pads S1.

**Option 2**

This option uses the existing DRIVE SELECT lines to address up to two double-sided drives. It selects up to four sides as if the sides were separate drives.

## CUSTOMER STRAPPABLE OPTIONS

Installation (refer to the PCB Option Features illustration):

Open pads S2 and jumper pads S3. Disk sides are then selected according to the table below.

Table 14. Side Select Options

DRIVE NUMBER	HEAD SELECT	DRIVE SELECT INPUT				TRACES
		1	2	3	4	
1	0	L	H	H	H	PLUG DS1
1	1	H	L	H	H	JUMPER B2
2	0	H	H	L	H	PLUG DS3
2	1	H	H	H	L	JUMPER B4

L = LOW LEVEL, H = HIGH LEVEL

### RADIAL READY OPTION

Normally, the READY line from a factory configured drive is only available to the interface when it is selected. This option enables the user to monitor the READY line of each drive on the interface continuously.

Installation (refer to the PCB Option Features illustration);

1. Open pads RR.
2. Open trace R on the programmable shunt with a small screwdriver.
3. Jumper pad R to one of the available Alternate I/O pins (4, 6, 8, or 24). READY will then appear on the chosen Alternate I/O pin.

### RADIAL INDEX OPTION

Normally, the INDEX line from a factory configured drive is only available to the interface when the drive is selected. This option enables the user to monitor the INDEX line of each drive on the interface at all times.

Installation (refer to the PCB Option Features illustration):

1. Open pads R1.
2. Open trace 1 on the programmable shunt with a small screwdriver.
3. Jumper pad 1 to one of the available Alternate I/O pins (4, 6, 8, or 24). INDEX will then appear on the chosen Alternate I/O pin.

## IN USE OPTIONS

Normally, the In Use LED indicator will be energized when DRIVE SELECT is active. The door solenoid will be activated when DRIVE SELECT and READY are active. The three options listed below will energize the In Use LED when activated to a low level.

### Option 1

The option will energize the In Use LED when the DRIVE SELECT or IN USE line is active.

Installation (refer to the PCB Option Features illustration):

Plug pins D on the optional I/O pins.

### Option 2

This option will energize the In Use LED when the HEAD LOAD or IN USE line is active.

Installation (refer to the PCB Option Features illustration):

1. Open trace Z on the programmable shunt with a small screwdriver.
2. Plug pins D on the optional I/O pins.
3. Plug pins Y on the optional I/O pins.

### Option 3

This option will energize the In Use LED only when the IN USE line is active.

Installation (refer to the PCB Option Features Illustration):

1. Open trace Z on the programmable shunt with a small screwdriver.
2. Plug pins D on the optional I/O pins.

## DOOR LOCK LATCH OPTION

With this option, the door lock actuator can be attached without maintaining the IN USE signal throughout the door lock interval. IN USE may be activated by DRIVE SELECT.

Installation (refer to the PCB Option Features illustration):

1. Plug pins D on the optional I/O.
2. Plug pins DL on the optional I/O pins.

## CUSTOMER STRAPPABLE OPTIONS

### WRITE PROTECT OPTION

With this option installed, a Write Protected disk will not inhibit writing but it will be reported to the controller.

Installation (refer to the PCB Option Features illustration):

Open pads WP and jumper pads NP (located near the center of the PCB).

### DISK CHANGE (ALTERNATE OUTPUT)

An active low level on this option line indicates that the READY signal has gone false (door opened) after DRIVE SELECT went false. The DISK CHANGE circuit is reset on the true to false (low/high) transition of DRIVE SELECT provided that the drive is READY. Refer to the following illustration.

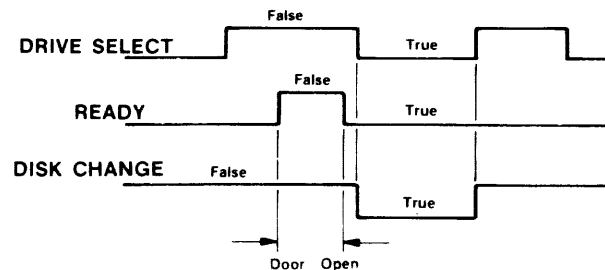


Figure 18. Disk Change Timing

Installation (refer to the PCB Options Features illustration):

Plug pins DC on the optional I/O pins.

### TWO-SIDED (ALTERNATE OUTPUT)

A low level on this line indicates that a two-sided disk is in use, and a high level indicates that a single-sided disk is in use.

Installation (refer to the PCB Option Features illustration):

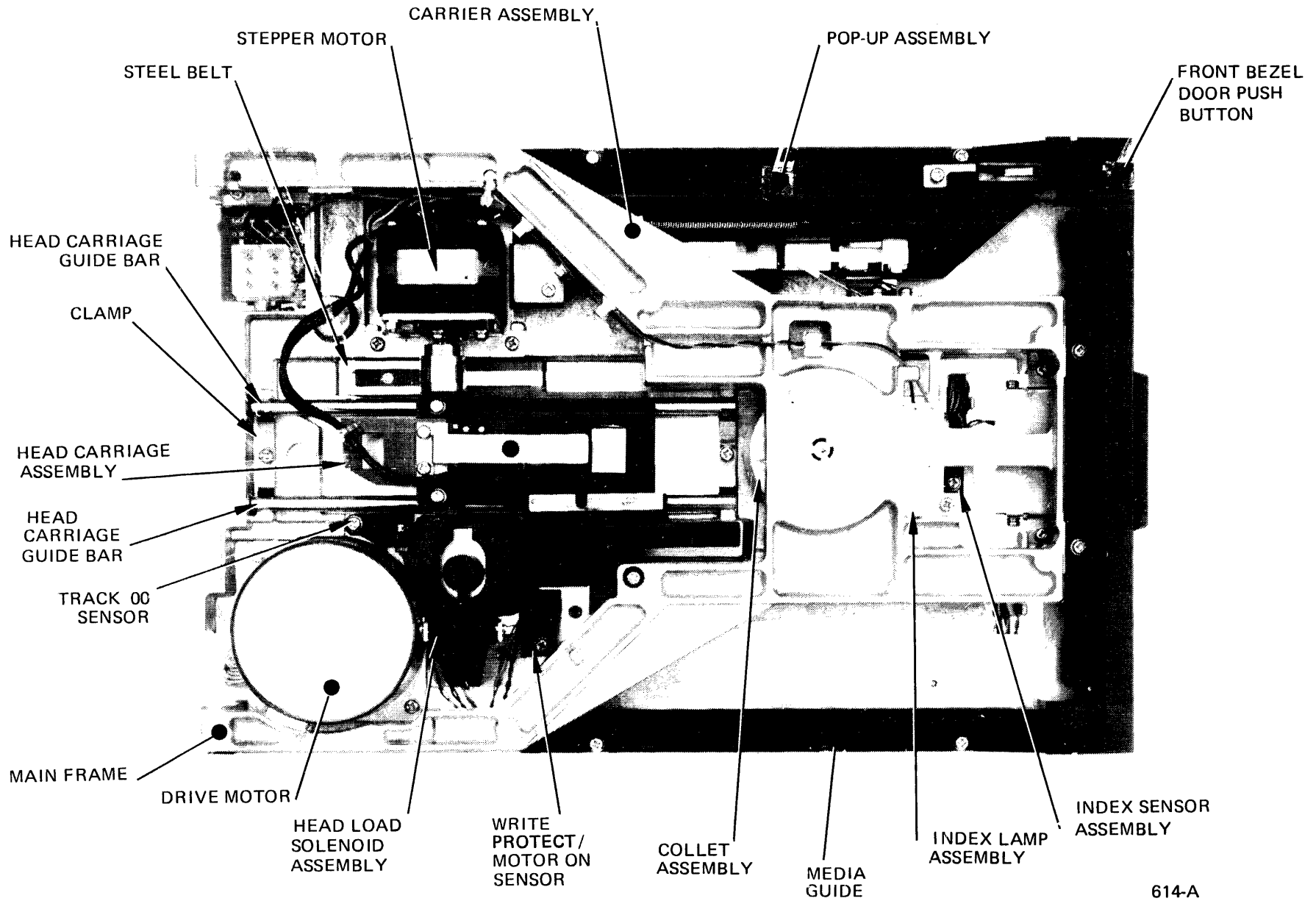
Plug pins 2S on the optional I/O pins.

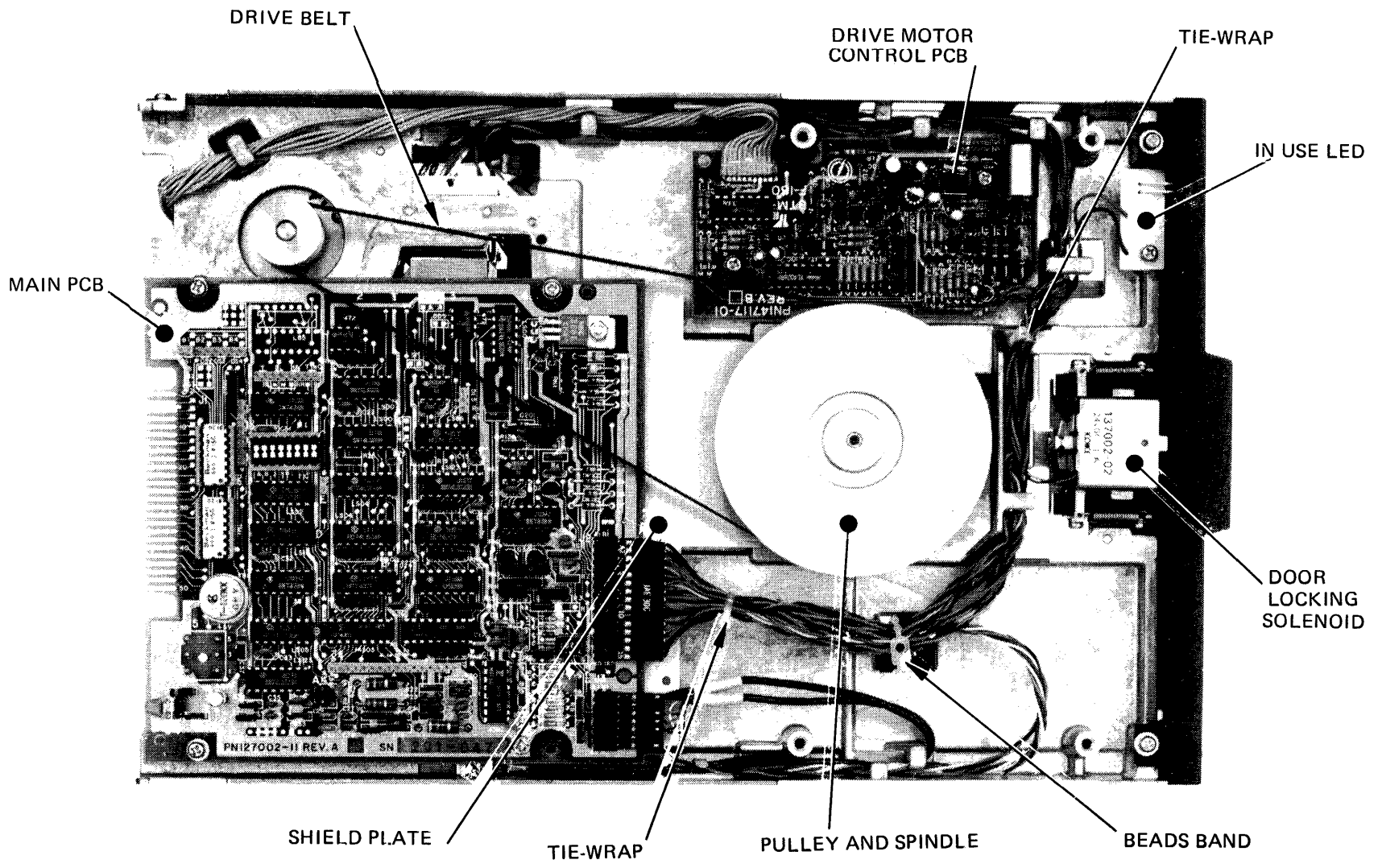
## **MAINTENANCE**

### **GENERAL**

It is recommended that before beginning any maintenance procedure in this section, that one become familiar with the arrangement and layout of the various subassemblies and components of the QumeTrak 242 disk drive. Refer to the following Parts Locations illustrations.

Figure 19a. QumeTrak 242 Parts Locations (Top View)





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Figure 19b. QumeTrak 242 Parts Locations (Bottom View)

**PREVENTIVE MAINTENANCE**

Preventive maintenance should be performed on the QumeTrak 242 every 6000 power on hours or every two years. The entire unit should be inspected for cleanliness, loose parts, and any indications of unusual wear. The following table presents a preventive maintenance summary.

Table 15. Preventive Maintenance Summary

ITEM	INSPECTION	PREVENTIVE MAINTENANCE
<p><b>MAIN FRAME</b></p>	<p><b>ACCUMULATED DUST</b></p>	<p><b>REMOVE ANY DUST WITH A SOFT BRUSH OR LINT-FREE CLOTH</b></p>
	<p><b>ANY FOREIGN MATTER</b></p>	<p><b>REMOVE ANY FOREIGN MATTER</b></p>
	<p><b>LOOSE PARTS</b></p>	<p><b>SECURE ANY LOOSE PARTS</b></p>
<p><b>DRIVE BELT</b></p>	<p><b>FRAYING</b></p>	<p><b>REPLACE THE DRIVE BELT</b></p>
<p><b>HEAD CARRIAGE GUIDE BARS</b></p>	<p><b>ACCUMULATED DUST</b></p>	<p><b>REMOVE ANY DUST WITH A SOFT BRUSH OR LINT FREE CLOTH</b></p>
	<p><b>ANY OBSTRUCTION</b></p>	<p><b>CLEAR ANY OBSTRUCTION</b></p>

**CAUTION**

The head carriage assembly is factory adjusted. Do not attempt to perform any maintenance on this part; refer all head carriage maintenance to authorized personnel.



**CHECKS AND ALIGNMENT****Index Lamp Assembly**

**CHECK** Power ON the disk drive and verify that the voltage between J2-B8 and ground is 2.0 to 3.4 V. If the voltage measured is not within this tolerance range, verify that the power supply voltage is satisfactory, and/or remove and replace the index lamp assembly.

**ALIGNMENT** The index lamp assembly is properly aligned when it is seated snugly on the carrier assembly against its mounting stops.

**Index Sensor Assembly**

**CHECK** With the disk drive powered ON, the door closed, and no disk installed, verify that the voltage between J2-A7 and ground is 4.0 to 5.25 V. Next, insert a disk upside down, close the door, and verify a voltage between 0.0 and 0.3 V. Remove and replace the index sensor assembly if the voltage measured is not within this tolerance range.

Repeat this same check between J2-A7 and ground.

**ALIGNMENT** The index sensor assembly is properly aligned when it is seated snugly on the main frame against its mounting stops.

**Track 00 Sensor Assembly**

- CHECK**
1. Manually locate the head carriage assembly full opposite the spindle hub.
  2. Power ON the disk drive.
  3. Verify that the voltage between J2-B12 and ground is 1.0 to 1.7 V.
  4. Verify that the voltage between J2-A11 and ground is 0.0 to 0.3 V.
  5. Power OFF the disk drive and manually locate the head carriage assembly a random distance toward the spindle hub.
  6. Power ON the disk drive and verify that the voltage between J2-A11 is 4.0 to 5.25 V.
  7. If the voltages measured are not within these tolerance ranges, remove and replace the track 00 sensor.

**ALIGNMENT** There is no alignment procedure for the track 00 sensor; its positioning on the main frame is not adjustable.

### **Write Protect Sensor Assembly**

- CHECK
1. Power ON the disk drive and verify that the voltage between J2-B14 and ground is 2.0 to 3.4 V.
  2. Verify that the voltage between J2-A13 and ground is 0.0 to 0.3 V.
  3. Install a disk without a write protect notch and verify that the voltage between J2-A13 and ground is 4.0 to 5.25 V.
  4. If the voltages measured are not within these tolerance ranges, remove and replace the write protect sensor assembly.

ALIGNMENT There is no alignment procedure for the write protect sensor assembly; its positioning on the main frame is not adjustable.

### **Carrier Assembly**

CHECK With the door closed, visually inspect that there is a gap between the top of the carrier assembly and the E-ring on the collet assembly shaft.

ALIGNMENT None.

### **Pop-Up Assembly**

- CHECK
1. Engage the pop-up slider by sliding it backward (opposite the front bezel) until it is latched.
  2. Depress the door release button, but restrict the door from opening.
  3. Allow the door to open slowly, but stop the door when the pop-up slider latch begins to disengage.
  4. Observe a gap of 2 to 4 mm between the spindle hub and collet assembly.

ALIGNMENT Loosen the two screws that secure the pop-up release lever to the carrier assembly. Adjust the pop-up release lever so that it disengages the pop-up slider when a 2.5 mm (approx.) gap exists between the spindle hub and the collet assembly. Tighten the two pop-up release lever mounting screws.

### **Head Load Solenoid Assembly / Head Gap**

- CHECK
1. Remove the spring from the pop-up assembly.
  2. Install a disk and power ON the drive.

3. Install a shorting plug at HL to activate the head load solenoid.
4. Verify that there is a gap between the bail and the carriage arm tab throughout the entire travel of the carriage assembly.
5. Remove the shorting plug from HL and power OFF the drive.
6. Remove the disk and close the door.
7. Verify with an inspection mirror that there is a gap between the heads.
8. Install the spring in the pop-up assembly.
9. Move the head carriage assembly to approximately the track 40 position.
10. Power ON the drive
11. Install a shorting plug at HL to activate the head load solenoid once, then remove the shorting plug.
12. Verify with an inspection mirror that there is a 0.1 to 0.3 mm gap between the heads.
13. Power OFF the drive.

#### ALIGNMENT

1. Remove the spring from the pop-up assembly.
2. Close the door.
3. Move the head carriage assembly to approximately the track 40 position.
4. Power ON the drive.
5. Install a shorting plug at HL to activate the head load solenoid once, then remove the shorting plug.
6. Using an inspection mirror, adjust the back stop screw on the carrier assembly to adjust the heads for a gap of 0.1 to 0.3 mm. Turn the screw clockwise to make the gap smaller.
7. Install the spring in the pop-up assembly.
8. Repeat the Head Load Solenoid Check Procedure.

## MAINTENANCE

**Read/Write (R/W) Head Radial Positioning.** This procedure requires the use a dual-trace oscilloscope, a disk drive exerciser, and a Qume certified CE alignment disk (Q.P.N. 50235-02).

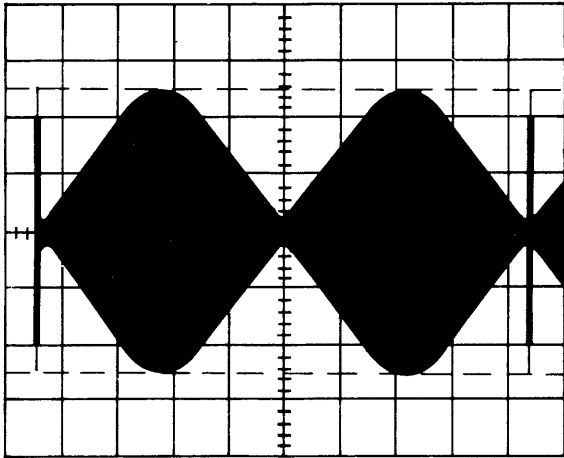
- CHECK
1. Remove the spring from the pop-up assembly.
  2. Connect the disk drive exerciser to the unit.
  3. Install the CE disk and power ON the drive.
  4. Connect the oscilloscope to the drive and set the controls as follows:
    - Connect the channel 1 probe to TP1A and the channel 2 probe to TP1B on the main PCB. Connect both probe ground leads to the Ground test point on the main PCB. TP1A and TP1B are the read/write head preamplifier outputs.
    - Connect the trigger probe to TP3 (Index) on the main PCB.
    - Volts/Div..... 50 mV
    - Input (AC/GND/DC)..... AC
    - Channel 2..... INVERT
    - Vertical Mode..... ADD
    - Horizontal Time/Div..... 20 ms
    - Trigger Mode..... NORMAL
    - Trigger Coupling..... AC
    - Trigger Source..... EXTERNAL
  5. Load the heads and step the head carriage in to track 40. Observe on the oscilloscope a "cat-eyes" pattern similar to that shown in the R/W Head Radial Positioning illustration. The heads are correctly aligned when the lobes are equal in amplitude, or at least within 70% of each other.
  6. Select the opposite head and perform the above procedure again.
  7. If the lobes displayed on the oscilloscope are not at least within 70% of each other for both Head 0 and Head 1, perform the following alignment procedure.

## ALIGNMENT

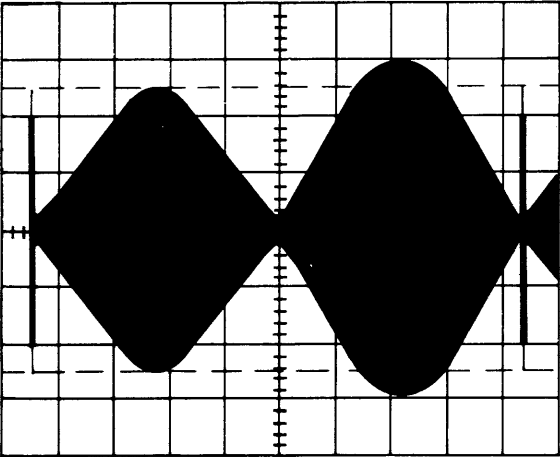
1. Loosen the two screws that secure the stepper motor to the main frame. Carefully maneuver the stepper motor into a position that affords an oscilloscope display in which the lobes are at least within 70% of each other.
2. Select the opposite head and observe the "cat-eyes" amplitude relationship.
3. Alternately select between Head 0 and Head 1, and balance the left lobe of Head 0 with the right lobe of Head 1 while still remaining within the 70% relationship.

- 4. If the heads can not be aligned within the 70% specification, it may be advisable to replace the head carriage assembly.

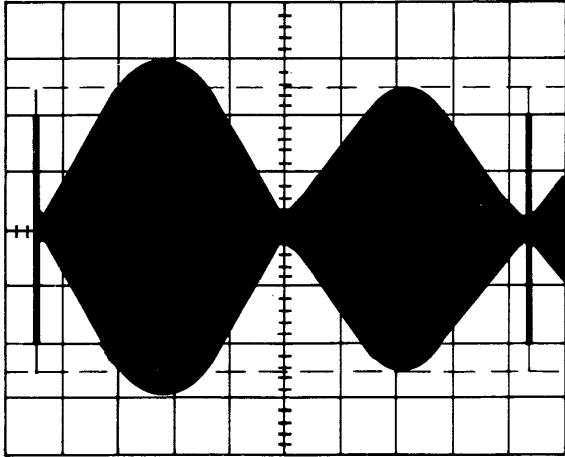
"CAT EYES" LOBE PATTERN ON TRACK 40 USING QUME CE DISK



EQUAL AMPLITUDE (EXACTLY ON TRACK 40)



LEFT LOBE IS ABOUT 70% OF RIGHT LOBE



RIGHT LOBE IS ABOUT 70% OF LEFT LOBE

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Figure 20. R/W Head Radial Positioning ("Cat-eyes")

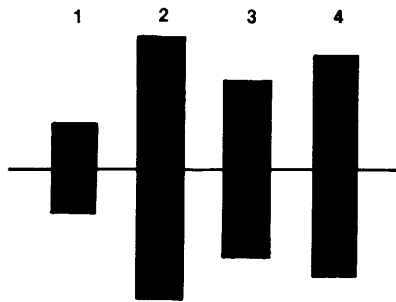
## MAINTENANCE

**Read/Write (R/W) Head Azimuth.** Head azimuth can significantly influence the signal amplitude of read and write data. Head azimuth within  $\pm 12$  minutes of zero is acceptable. If the head azimuth exceeds  $\pm 18$  minutes, the head carriage should be replaced. This procedure requires the use of a dual-trace oscilloscope, a disk drive exerciser, and a Qume certified CE disk (Q.P.N. 50235-02).

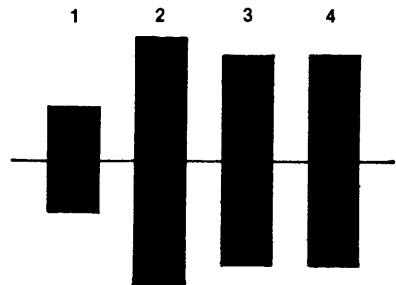
- CHECK
1. Connect the disk drive exerciser to the unit.
  2. Install the CE disk and power ON the drive.
  3. Connect the oscilloscope to the drive and set the controls as follows:
    - Connect the channel 1 probe to TP1A and the channel 2 probe to TP1A on the main PCB. Connect both probe ground leads to the Ground test point on the main PCB. TP1A and TP1B are the read/write head preamplifier outputs.
    - Connect the trigger probe to TP3 (Index) on the main PCB.
    - Volts/Div..... 50 mV
    - Input (AC/GND/DC)..... AC
    - Channel 2..... INVERT
    - Vertical Mode..... ADD
    - Horizontal Time/Div..... 0.5 ms
    - Trigger Mode..... NORMAL
    - Trigger Coupling..... AC
    - Trigger Source..... EXTERNAL
  4. Load the heads and step the head carriage in to track 76. Observe on the oscilloscope a pattern similar to that shown in the Azimuth Check illustration.
  5. Select the opposite head and perform the above procedure again.

## ALIGNMENT

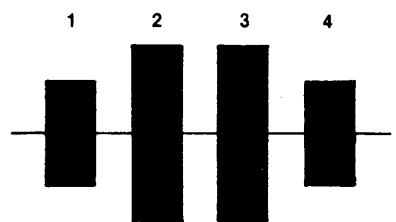
The head carriage assembly is factory adjusted and tested; no field alignment procedure is prescribed. Remove and replace the head carriage assembly if it is found to be defective.



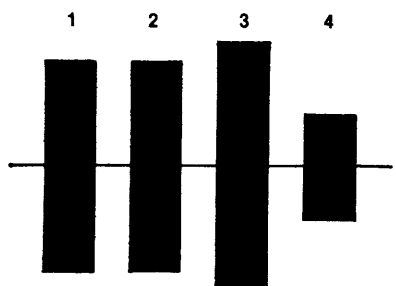
MAXIMUM ALLOWABLE AZIMUTH ERROR OF +18 MINUTES. BURST #4 IS 25% LARGER IN AMPLITUDE THAN BURST #3.



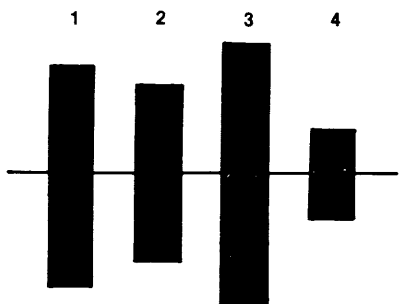
TYPICAL AZIMUTH ERROR OF +12 MINUTES. BURSTS #3 AND #4 ARE EQUAL IN AMPLITUDE.



AN OPTIMUM ALIGNMENT OF ZERO MINUTES AZIMUTH ERROR. BURSTS #1 AND #4 ARE EQUAL IN AMPLITUDE, AS ARE BURSTS #2 AND #3.



TYPICAL AZIMUTH ERROR OF -12 MINUTES. BURSTS #1 AND #2 ARE EQUAL IN AMPLITUDE.



MAXIMUM ALLOWABLE AZIMUTH ERROR OF -18 MINUTES. BURST #1 IS 25% LARGER IN AMPLITUDE THAN BURST #2.

USING A QUME CERTIFIED 12 MINUTE CE DISK (Q.P.N. 50235-02) THE AZIMUTH SHALL BE ACCEPTABLE IF A DRIVE SHOWS LESS THAN THE MAXIMUM ALLOWABLE 18 MINUTE AZIMUTH. THE MAXIMUM ALLOWABLE AZIMUTH IS CONSIDERED TO BE ATTAINED WHEN BURST #1 IS 25% LARGER THAN BURST #2, OR IF BURST #4 IS 25% LARGER THAN BURST #3.

419-A-02

Figure 21. Azimuth Check

**Read/Write (R/W) Head Amplitude.** This procedure offers a means to verify the functional integrity of the read/write heads; it should be performed only after head gap, radial positioning, and azimuth have been found to be acceptable. This procedure requires the use of a dual-trace oscilloscope, a disk drive exerciser, and a Qume certified R/W disk (Q.P.N. 50151-01).

- CHECK
1. Install the certified R/W disk and power ON the drive.
  2. Connect the oscilloscope to the drive and set the controls as follows:
    - Connect the channel 1 probe to TP1A; connect the probe ground lead to the Ground test point on the main PCB.
    - Volts/Div..... 50 mV
    - Input (AC/GND/DC)..... AC
    - Horizontal Time/Div..... 0.5 ms
    - Trigger Mode..... NORMAL
    - Trigger Coupling..... DC
    - Trigger Source..... INTERNAL
  3. Load the heads and step the head carriage in to track 76. At track 76, write a 2F data signal (all 1's).
  4. Read the just recorded 2F signal. Note the amplitude of the displayed read signal; it should be at least 100 mV pp.
  5. Next, write 1F data (all 0's) on track 76.
  6. Read the just recorded 1F signal. Again note the amplitude of the displayed read signal.
  7. Divide the 2F read amplitude by the 1F read amplitude to calculate the ratio of the two signals. Minimum acceptable ratio is 0.4 (40%).
  8. Select the other disk side and repeat the above procedure.
  9. Move the scope probe from TP1A to TP1B and repeat the above procedure for both disk sides again. If any of the ratios calculated are less than 40%, the head carriage should be replaced.

ALIGNMENT      The head carriage assembly is factory adjusted and tested; no field alignment procedure is prescribed. Remove and replace the head carriage assembly if it is found to be defective.



**SUBASSEMBLY REMOVAL AND INSTALLATION****Track 00 Sensor Assembly**

REMOVAL (Refer to the Track 00 Sensor Removal and Installation illustration)

1. Remove the track 00 switch with its mounting bracket from the unit. It is secured on the main frame by a single screw.
2. Note the routing of the four track 00 sensor leads to connector P2 on the main PCB. Cut the two tie-wraps and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the four track 00 sensor leads from connector P2 by depressing the locking tabs as follows: Black A11, blue A12, red B11, and orange B12.
4. Remove the track 00 switch with its mounting bracket from the unit. Remove the two screws that secure the track 00 switch to its mounting bracket. Remove the track 00 switch.

INSTALLATION (Refer to the Track 00 Sensor Removal and Installation illustration)

1. Install the track 00 switch on its mounting bracket and secure with two screws.
2. Install the track 00 sensor with its mounting bracket in the unit. It is secured on the main frame by a single screw.
3. Route the four track 00 sensor leads to connector P2 (as noted in Step 2, Removal). Install the four leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
4. Install connector P2 on the main PCB. Secure all connector P2 leads with two tie-wraps and beadsband.

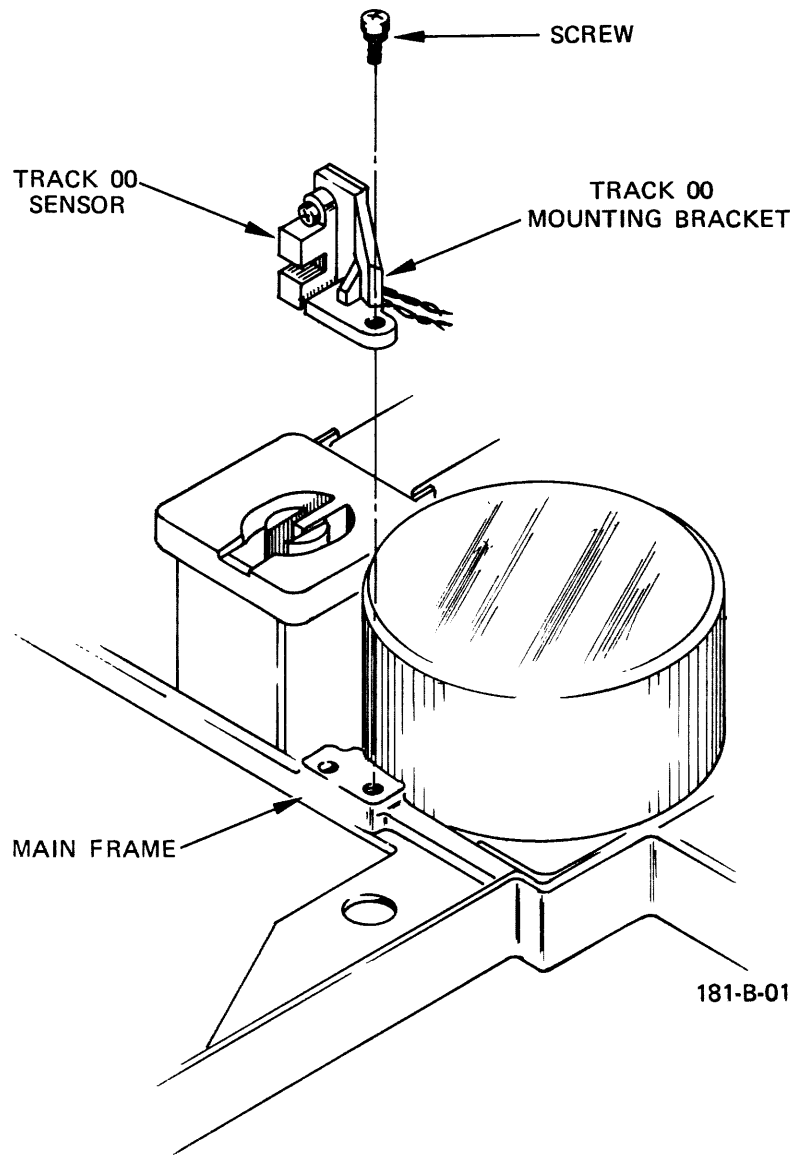


Figure 22. Track 00 Sensor Assembly Removal and Installation

**Write Protect / Motor On Sensor Assembly**

REMOVAL (Refer to the Write Protect / Motor On Sensor Removal and Installation illustration)

1. Remove the write protect/motor on sensor assembly from the unit. It is secured to the main frame by a single screw.
2. Note the routing of the assembly leads to connector P2 on the main PCB. Cut the two tie-wraps and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the four assembly leads from connector P2 by depressing the locking tabs with tweezers as follows: Blue A13, black A14, orange B13, and red B14.
4. Remove the write protect/motor on sensor assembly from the unit.

INSTALLATION (Refer to the Write Protect / Motor On Sensor Removal and Installation illustration)

1. Install the write protect/motor on sensor assembly in the unit. It is secured on the main frame by a single screw.
2. Route the four assembly leads to connector P2 (as noted in Step 2, Removal). Install the four leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Install connector P2 on the main PCB. Secure all connector P2 leads with two tie-wraps and beadsband.

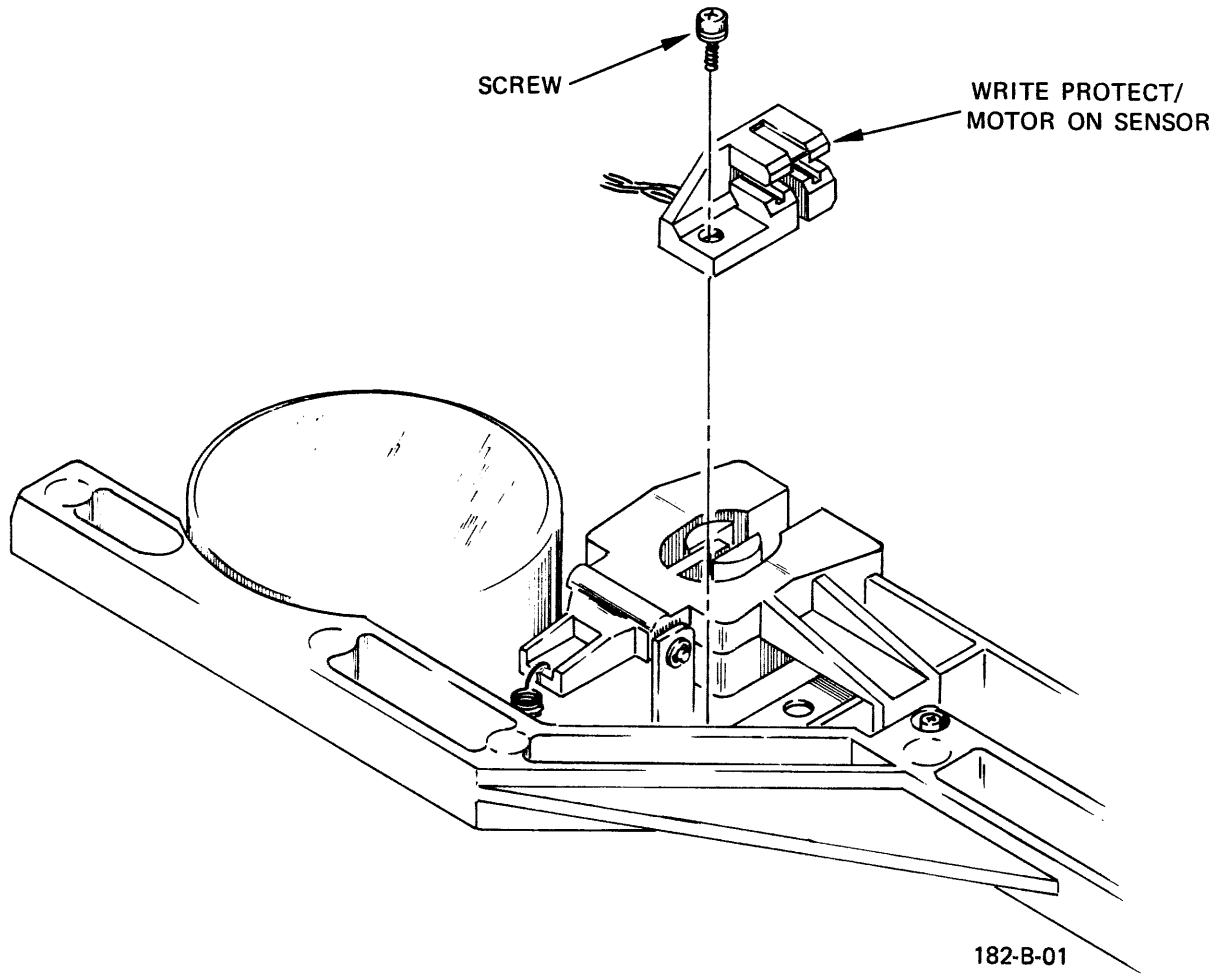


Figure 23. Write Protect / Motor On Sensor Assembly Removal and Installation

**Head Load Solenoid Assembly**

REMOVAL (Refer to the Head Load Solenoid Assembly Removal and Installation illustration)

1. Remove the head load solenoid from the unit. It is secured on the main frame by two screws.
2. Note the routing of the two solenoid leads to connector P2 on the main PCB. Cut the two tie-wraps and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the two solenoid leads from connector P2 by depressing the locking tabs with tweezers as follows: Black A1 and red B1.
4. Remove the head load solenoid from the unit.

INSTALLATION (Refer to the Head Load Solenoid Assembly Removal and Installation illustration)

1. Install the head load solenoid in the unit. It is secured to the main frame by two screws.
2. Route the solenoid leads to connector P2 (as noted in Step 2, Removal). Install the two leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Install connector P2 on the main PCB. Secure all connector P2 leads with two tie-wraps and beadsband.

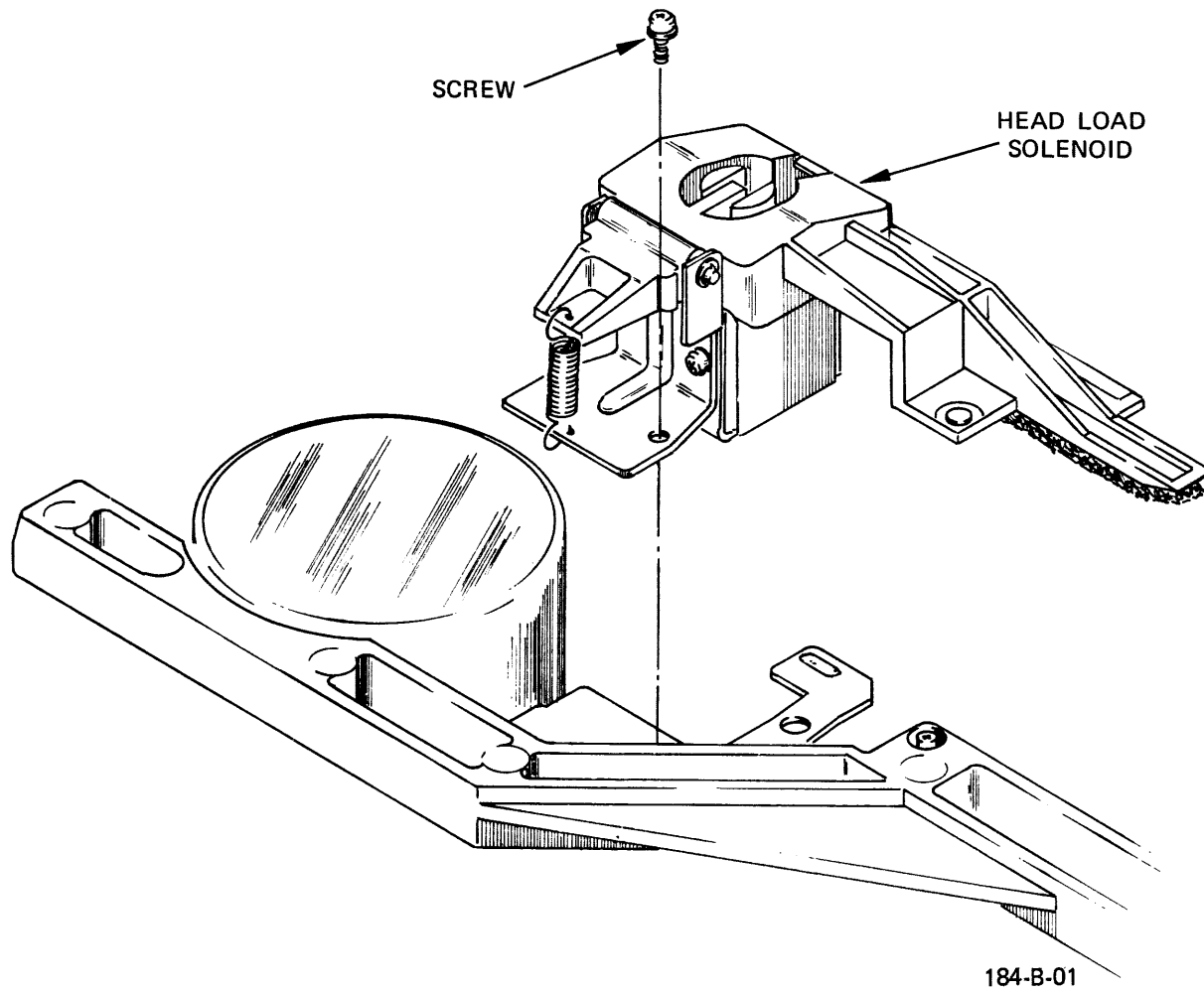


Figure 24. Head Load Solenoid Assembly Removal and Installation

**Door Lock Solenoid Assembly**

REMOVAL (Refer to the Door Lock Solenoid Removal and Installation illustration)

1. Remove the door lock solenoid from the unit. It is secured to the main frame by two screws.
2. Note the routing of the two solenoid leads to connector P2 on the main PCB. Cut the tie-wrap nearest connector P2 and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the two solenoid leads from connector P2 by depressing the locking tabs with tweezers as follows: Black A2 and red B2.
4. Remove the door lock solenoid from the unit. It can be maneuvered out of the unit through the bottom of the main frame.

INSTALLATION (Refer to Door Lock Solenoid Removal and Installation illustration)

1. Install the door lock solenoid in the unit. Maneuver it through the bottom of the main frame and secure it to the top of the main frame with two screws.
2. Route the two solenoid leads to connector P2 (as noted in Step 2, Removal). Install the two leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Install connector P2 on the main PCB. Secure all connector P2 leads with a tie-wrap near the base of the connector and tighten the beadsband.

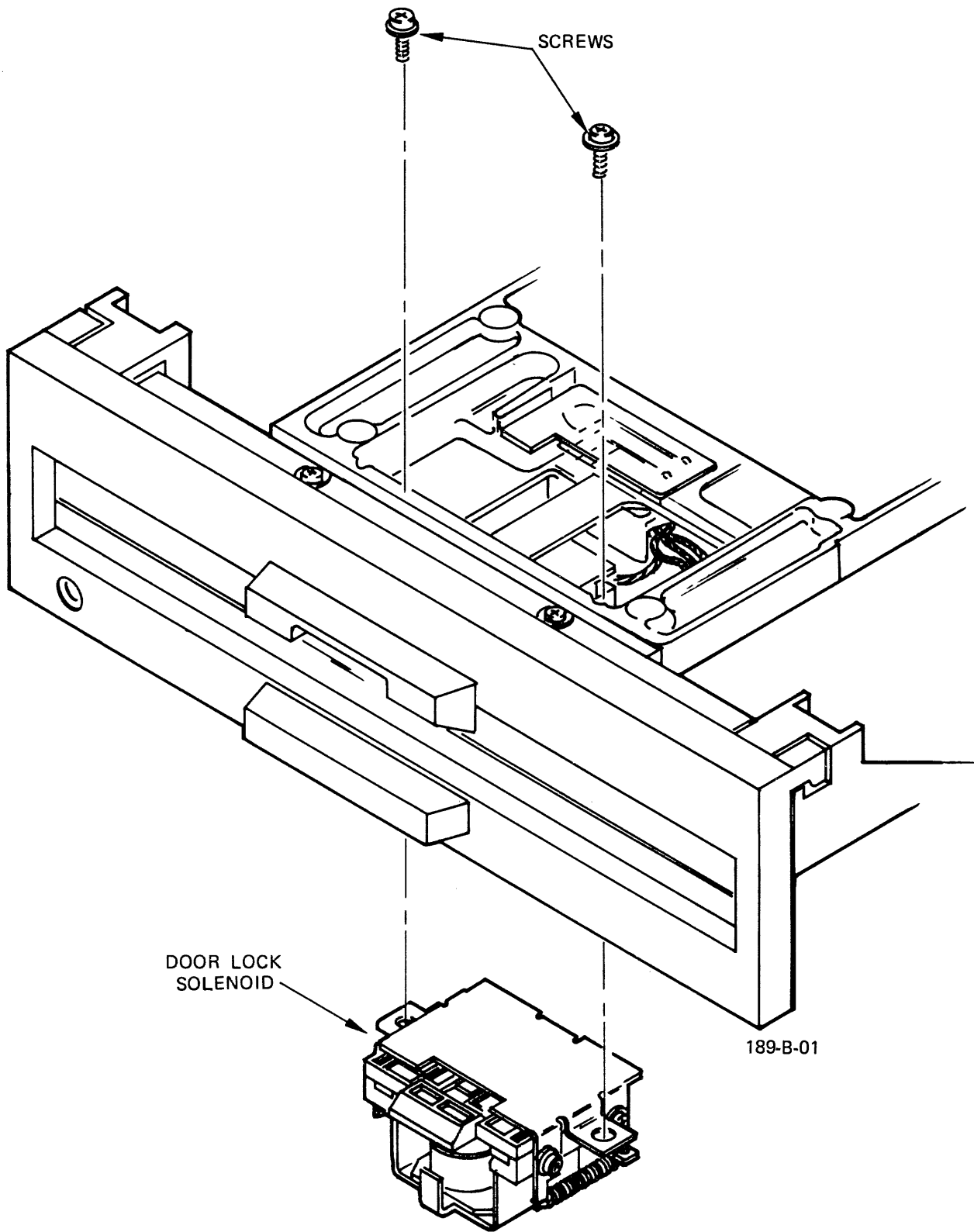


Figure 25. Door Lock Solenoid Assembly Removal and Installation



**In Use LED**

## REMOVAL

1. Remove the in use LED from the front panel. It is secured to the main frame by a single screw.
2. Note the routing of the two LED leads to connector P2 on the main PCB. Cut the two tie-wraps and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the two LED leads from connector P2 by depressing the locking tabs with tweezers as follows: Black A15 and red B15.
4. Remove the in use LED from the unit.

## INSTALLATION

1. Install the in use LED in the front panel. It is secured to the main frame by a single screw.
2. Route the two LED leads to connector P2 (as noted in Step 2, Removal). Install the two leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Install connector P2 on the main PCB. Secure all connector P2 leads with two tie-wraps and tighten the beadsband.

**Index Lamp Assembly**

REMOVAL (Refer to the Index Lamp Assembly Removal and Installation illustration)

1. Remove the index lamp assembly from the unit. It is secured to the carrier assembly by a single screw.
2. Note the routing of the two lamp leads to connector P2 on the main PCB. Cut the tie-wrap that secures the two leads to the carrier assembly, the tie-wrap at the base of connector P2, and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the two lamp leads from connector P2 by depressing the locking tabs with tweezers as follows: Black A8 and red B8.
4. Remove the index lamp assembly from the unit.

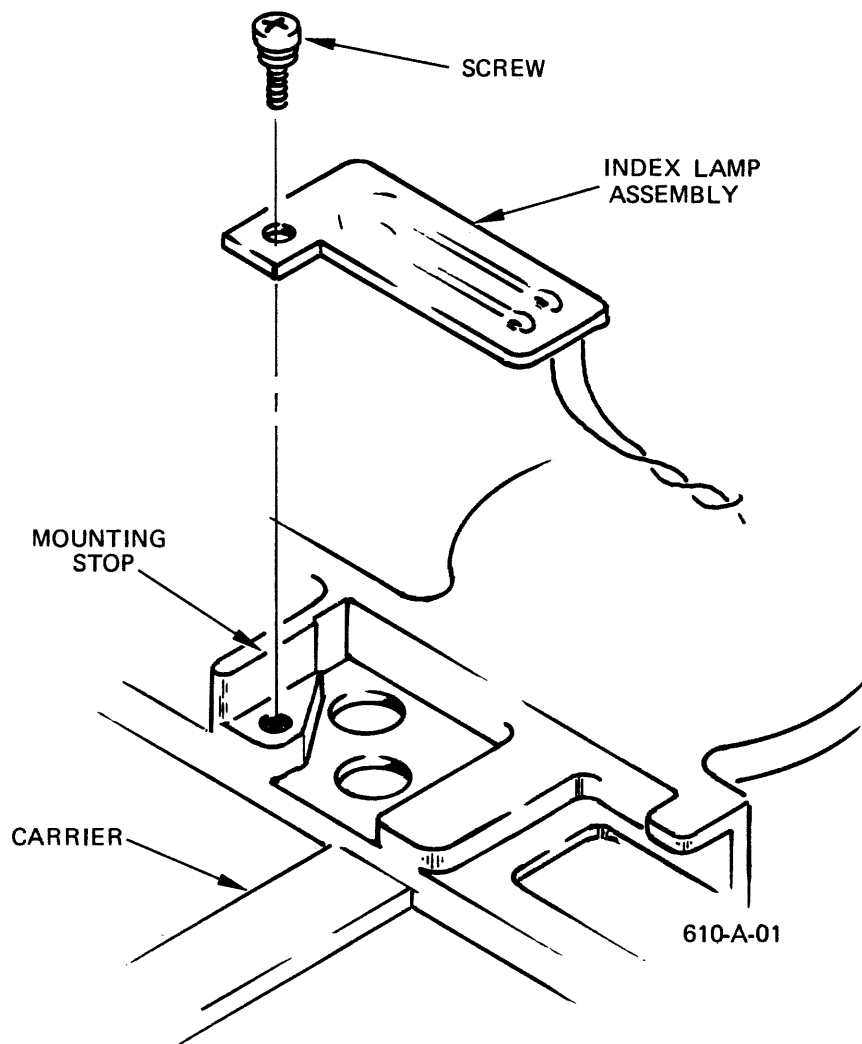


Figure 26. Index Lamp Assembly Removal and Installation

INSTALLATION (Refer to the Index Lamp Assembly Removal and Installation illustration)

1. Install the index lamp assembly in the unit, snugly against its mounting stops. It is secured on the carrier assembly by a single screw.
2. Route the two lamp leads to connector P2 (as noted in Step 2, Removal). Install the two leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Install connector P2 on the main PCB. Secure the two lamp leads to the carrier assembly with a tie-wrap. Secure all connector P2 leads with a tie-wrap near the base of the connector and tighten the beadsband.

## Index Sensor Assembly

REMOVAL (Refer to the Index Sensor Assembly Removal and Installation illustration)

1. Remove the index sensor assembly from the unit. It is secured to the main frame by a single screw. Screwdriver access and sensor removal is possible through the carrier assembly.
2. Note the routing of the four sensor leads to connector P2 on the main PCB. Cut the tie-wrap nearest the connector and remove the beadsband from the leads of connector P2.
3. Disconnect connector P2 from the main PCB. Remove the four sensor leads from the connector by depressing the locking tabs with tweezers as follows: Blue A6, orange B6, black A7, and red B7.
4. Remove the index sensor assembly from the unit.

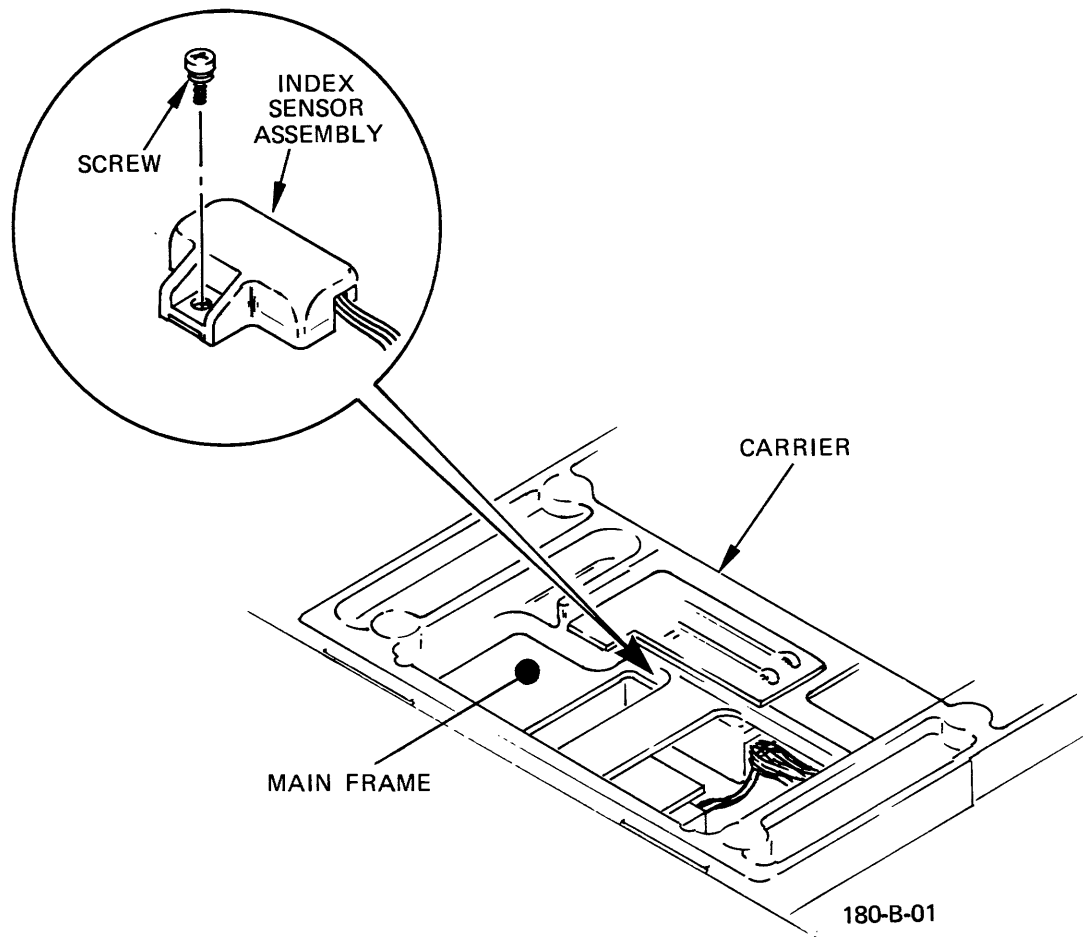


Figure 27. Index Sensor Assembly Removal and Installation

## MAINTENANCE

INSTALLATION (Refer to the Index Sensor Assembly Removal and Installation illustration)

1. Install the index sensor assembly in the unit snugly against its mounting stops. It is secured to the main frame by a single screw.
2. Route the four sensor leads to connector P2 (as noted in Step 2, Removal). Install the four leads in connector P2 (refer to Step 3, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Install connector P2 on the main PCB. Secure all connector P2 leads with a tie-wrap near the base of the connector and tighten the beadsband.

### Main Printed Circuit Board (PCB)

#### REMOVAL

1. Remove the drive belt.
2. Disconnect connectors P2 and P3 from the main PCB.
3. Remove the four screws that secure the PCB to the main frame. Remove the PCB from the unit.
4. If necessary, remove the PCB shield plate.

#### INSTALLATION

1. If removed, reinstall the PCB shield plate.
2. Install the main PCB in the unit. It is secured to the main frame by four screws.
3. Reconnect connectors P2 and P3 to the main PCB.
4. Install the drive belt.

### Steel Belt

REMOVAL (Refer to the Head Carriage Assembly Removal and Installation illustration)

1. Remove the main PCB and the shield plate.
2. From the underside of the unit, remove the two screws and clamps that secure the steel belt to the head carriage assembly.
3. From the topside of the unit, remove the screw and clamp that secures the steel belt to the pulley on the shaft of the stepper motor.

4. Remove the steel belt from the unit. Take note how the steel belt is wound around the stepper motor pulley.

INSTALLATION (Refer to the Head Carriage Assembly Removal and Installation illustration)

1. Loop the steel belt around the stepper motor pulley. Secure the belt to the pulley with clamp and screw (Step 3, Removal).
2. Feed the ends of the belt to the underside of the head carriage assembly. Secure the ends of the belt to the head carriage assembly with two clamps and screws (Step 2, Removal).
3. Install the shield plate and the main PCB.

### Stepper Motor

REMOVAL (Refer to the Head Carriage Assembly Removal and Installation illustration)

1. Remove the main PCB and shield plate.
2. Remove the steel belt.
3. Note the routing of the five motor leads to connector P2. Cut the tie-wrap at the base of the connector and remove the beadsband from the leads of connector P2.
4. Remove the five motor leads from the connector by depressing the locking tabs with tweezers as follows: Green A3, white B3, red A4, yellow B4, and blue A5.
5. Remove the stepper motor from the unit. It is secured to the main frame by two screws.

INSTALLATION (Refer to the Head Carriage Assembly Removal and Installation illustration)

1. Install the stepper motor in the unit snugly against its mounting stops. It is secured to the main frame by two screws.
2. Route the five motor leads to connector P2 (as noted in Step 3, Removal). Install the five leads in connector P2 (refer to Step 4, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
3. Secure the leads of connector P2 with a tie-wrap near the base of the connector and tighten the beadsband.
4. Install the steel belt.
5. Install the shield plate and the main PCB.

## Head Carriage Assembly

REMOVAL (Refer to the Head Carriage Assembly Removal and Installation illustration)

1. Remove the main PCB and shield plate. Refer to the appropriate removal instructions.
2. Remove the steel belt. Refer to the appropriate removal instructions.
3. Remove the head carriage leads. First, cut the tie-wrap that secures the leads to the main frame. Then carefully pass the leads with connector through the main frame adjacent to the stepper motor.
4. Remove the two screws that secure the two guide bar clamps. Remove the guide bar clamps.
5. Temporarily remove the stepper motor to facilitate removal of the head carriage. Remove the head carriage with guide bars from the unit. Loosely reinstall the stepper motor.

INSTALLATION (Refer to the Head Carriage Assembly Removal and Installation illustration)

1. Temporarily remove the stepper motor to facilitate installation of the head carriage and guide bars. Maneuver the head carriage and guide bars into position on the main frame. Route the head carriage leads and connector through the main frame (adjacent to the stepper motor) to the main PCB. Secure the stepper motor snugly against its mounting stops on the main frame.
2. Install the two guide bar clamps to secure the guide bars and head carriage in the main frame. Each guide bar clamp is secured by a single screw.
3. Install the steel belt. Refer to the appropriate installation instructions.
4. Install the shield plate and main PCB. Refer to the appropriate installation instructions.
5. Install the head carriage connector on the main PCB. Secure the leads to their tie-down with a tie-wrap.

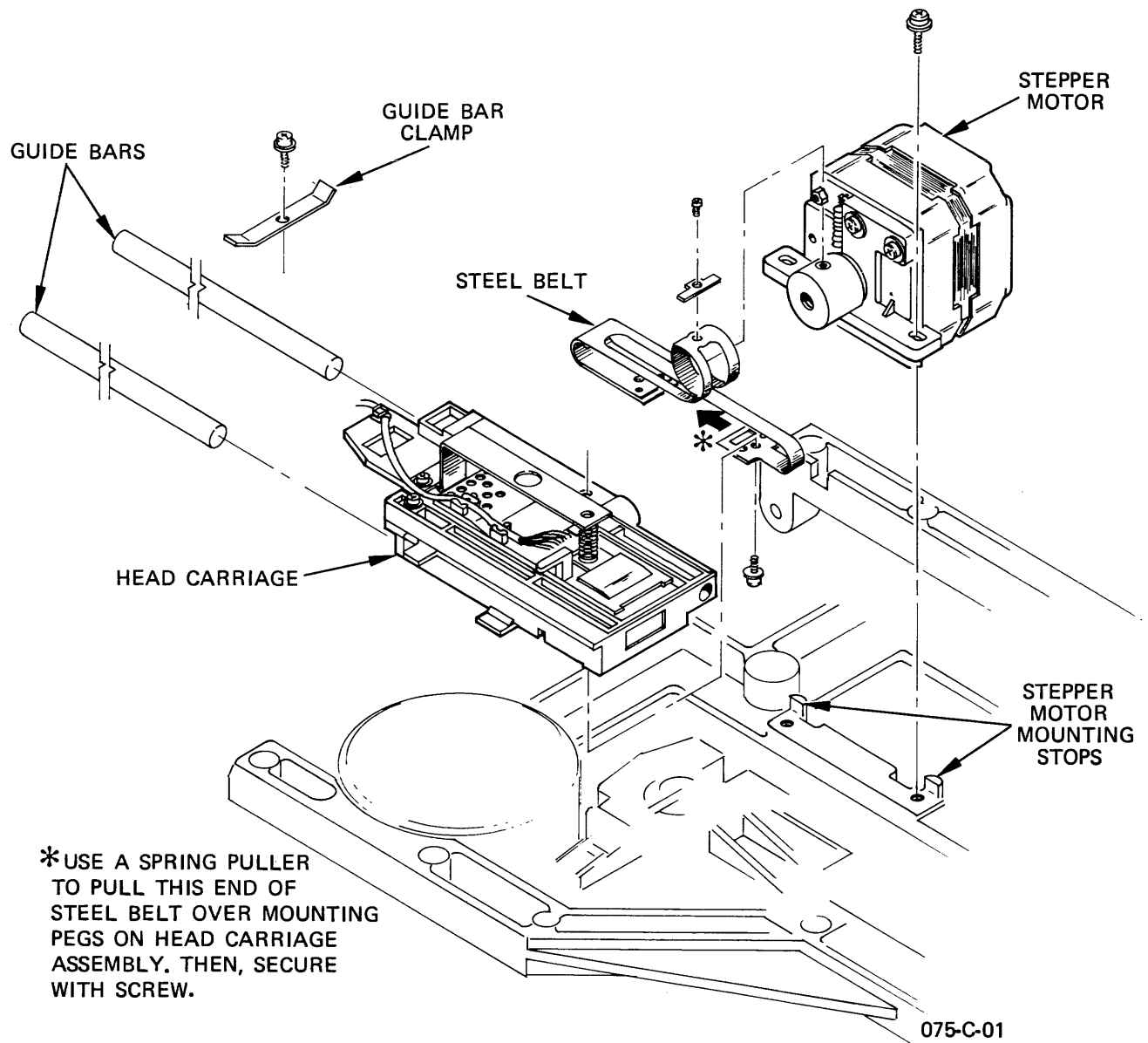


Figure 28. Head Carriage Assembly Removal and Installation

## Motor Control PCB Assembly

### REMOVAL

1. Cut the two tie-wraps and remove the beadsband from the leads of connector P2.
2. Disconnect connector P2 from the main PCB. Remove the three motor control PCB leads from connector P2 by depressing the locking tabs with tweezers as follows: Black A9, red B9, and blue B10.
3. Unsolder the eleven drive motor leads from their solder pads on the motor control PCB.
4. Remove the two screws that secure the motor control PCB to the main frame. Take care to note the routing of all wiring. Remove the motor control PCB from the unit.

### INSTALLATION

1. Install the motor control PCB in the unit. It is secured to the main frame by two screws.
2. Solder the eleven drive motor leads to their respective solder pads on the motor control PCB.
3. Install the three motor control PCB leads in connector P2 (refer to Step 2, Removal). Be sure the locking tabs engage the connector slots to prevent the leads from pushing out when the connector is installed on the main PCB.
4. Install connector P2 on the main PCB. Route all wiring (as noted in Step 4, Removal) and secure all connector P2 leads with two tie-wraps and tighten the beadsband.

## Drive Motor

### REMOVAL

1. Remove the drive belt from the spindle pulley and drive motor.
2. Unsolder the eleven drive motor leads from their solder pads on the motor control PCB.
3. Remove the drive motor from the unit. It is secured to the main frame by two screws.

### INSTALLATION

1. Install the drive motor in the unit snugly against its mounting stops. It is secured to the main frame by two screws.
2. Solder the eleven drive motor leads to their respective solder pads on the motor control PCB.



3. Install the drive belt between the drive motor and the spindle pulley.

### **Front Bezel, Push Button, and Front Door**

#### REMOVAL

1. Front Bezel. Remove the front bezel and push button from the unit. The front bezel is secured to the main frame by two screws - one screw at each bottom front corner.
2. Push Button. The push button easily slips in and out of the front bezel after the front bezel is removed from the unit. To remove the push button, first remove the front bezel.
3. Front Door. The front door is secured to the carrier assembly by two screws. To remove the front door, first remove the front bezel (with push button), then remove the two screws that secure the front door to the carrier. Remove the front door.

#### INSTALLATION

1. Front Door. Install the front door in the unit. Secure the front door to the carrier assembly with two screws.
2. Push Button. Install the push button in the front bezel. The push button easily slips into the rear of the front bezel.
3. Front Bezel. Install the front bezel on the unit. It is secured to the main frame by two screws - one screw at each bottom front corner.

### **Media Guide, Pop-Up Assembly**

#### REMOVAL

1. Remove the front bezel and push button. Refer to the appropriate removal instructions.
2. Both the media guide and pop-up assembly are secured to the main frame by two screws. Remove either or both parts as desired.

#### INSTALLATION

1. Install the media guide and/or the pop-up assembly in the unit. Each part is secured to the main frame by two screws.
2. Install the push button and front bezel. Refer to the appropriate installation instructions.

## **Carrier Assembly**

### REMOVAL

1. Remove the index lamp assembly from the carrier assembly. Refer to the appropriate removal procedure.
2. Remove the front door from the carrier assembly. The front door is secured to the carrier assembly by two screws.
3. Remove the carrier spring plate from the unit. The spring plate is located on the left rear corner of the unit; it secures the carrier assembly to the main frame. A single screw secures the spring plate to the main frame.
4. Slide the carrier assembly out of its hinge points and remove it from the unit. Be aware that the carrier assembly hinges under spring tension. Take the necessary precautions not to lose the springs when removing the carrier assembly from the unit.

### INSTALLATION

1. Install the carrier assembly in the unit. Position the carrier springs under the carrier and slide the carrier into its hinge points on the main frame. Secure the carrier to the main frame with the spring plate and spring plate screw.
2. Install the front door on the carrier assembly. The front door is secured to the top edge of the carrier by two screws.
3. Install the index lamp assembly on the carrier assembly. Refer to the appropriate installation procedure.

## **Collet Assembly**

### REMOVAL

1. Remove the carrier assembly. Refer to the appropriate removal procedure.
2. Remove the collet assembly from the carrier. To remove the collet, remove the E-ring from the collet shaft. Remove the collet, spring, and two washers from the carrier.

### INSTALLATION

1. Install the collet, spring, and two washers on the carrier assembly. The collet assembly is secured to the carrier by an E-ring.
2. Install the carrier assembly in the unit. Refer to the appropriate installation procedure.

# TROUBLESHOOTING

## GENERAL

This section presents troubleshooting information dealing with the most common disk drive functional errors; namely, Not Ready, Seek Error, Read Error, Write Error, and No Head Load. The troubleshooting of these errors is accomplished by systematic progression through a flowchart routine.

## DEFINITIONS OF QUMETRAK 242 FUNCTIONAL ERRORS

- Not Ready** A condition in which the controller fails to receive a Ready signal from the disk drive when it expects to receive one.
- Seek Error** A condition in which the disk drive is unable to access a particular disk side or track, or to confirm track 00 access to the controller.
- Read Error** A condition in which the disk drive is unable to recover data previously written onto the disk.
- Write Error** A condition in which the disk drive is unable to write data onto a disk.
- No Head Load** A condition in which the R/W heads fail to load onto a disk. This condition may be associated with any of the above errors.

## TROUBLESHOOTING TECHNIQUE

Effective troubleshooting should always begin with a thorough visual inspection. Look for such things as faulty wiring, damaged or misaligned components, and the presence of foreign matter such as dust. Inspect for anything that could obviously alter the performance of the disk drive.

Next, proceed to isolate the problem to the disk, disk drive, or controller.

Disk related malfunctions can be easily isolated by comparing the performance of the suspect disk to one known to be in good condition. Most disk problems can be attributed to either soft or hard errors. Soft errors resulting from contamination of the disk surface, by such things as dust or body oil, are usually caused by careless handling. Soft errors diminish the accurate read/write capability of the disk, but do not necessarily render the disk unusable. Conversely, hard errors caused by such things as scratches, abrasions, etc., permanently damage the disk.

Likewise, a quick and easy way to determine if a disk drive is defective or not, is to exchange the original unit with one that is known to be fully functional. Verify that the disk drive is installed correctly. Specifically, check to see that the power requirements are satisfied and that the strappable options are configured correctly. Proceed to the troubleshooting flowcharts to further isolate a disk drive malfunction.

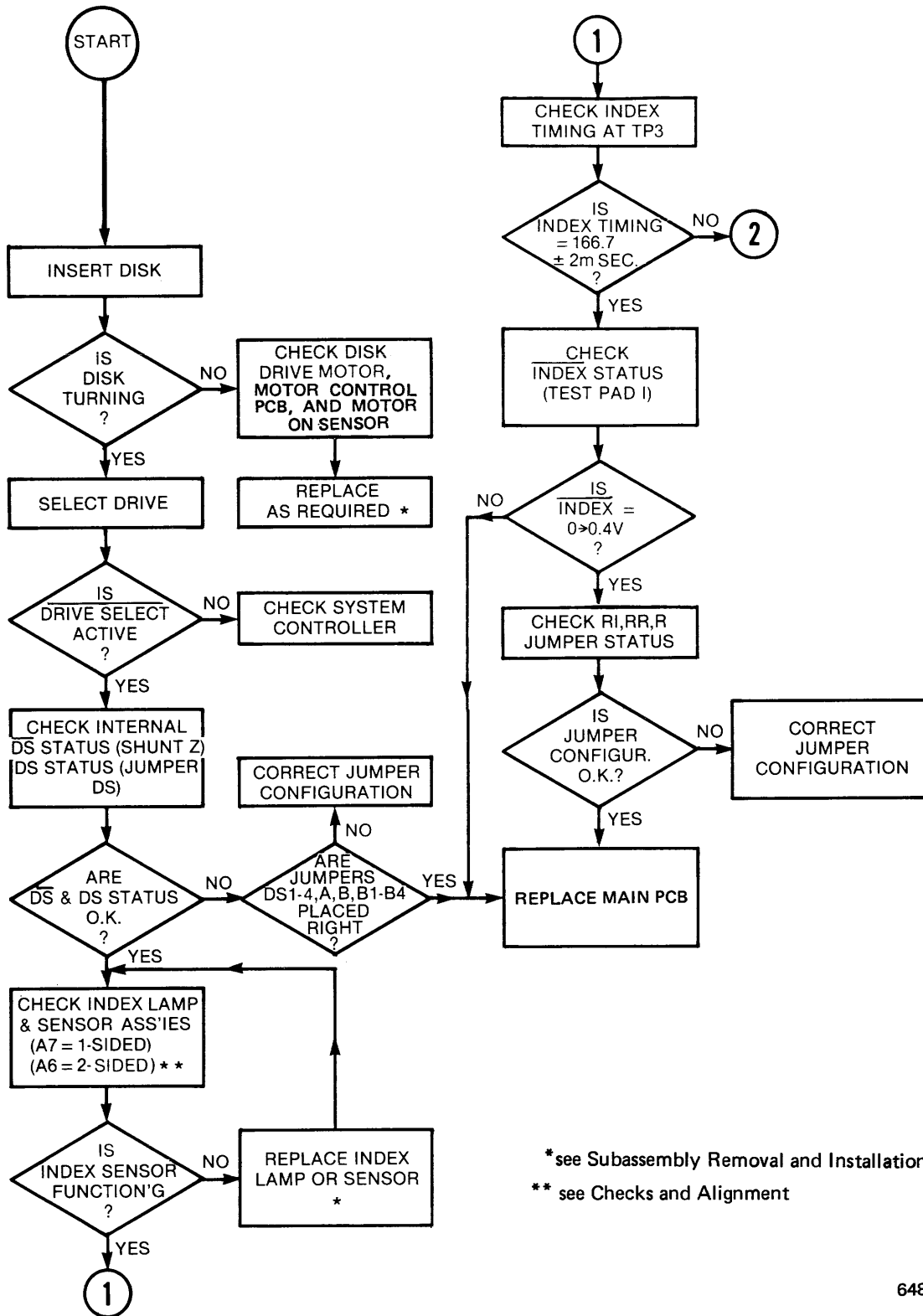
## TROUBLESHOOTING

If the disk drive is found to be functional, verify that the interface and controller programming are viable.

### TROUBLESHOOTING FLOWCHART ROUTINES

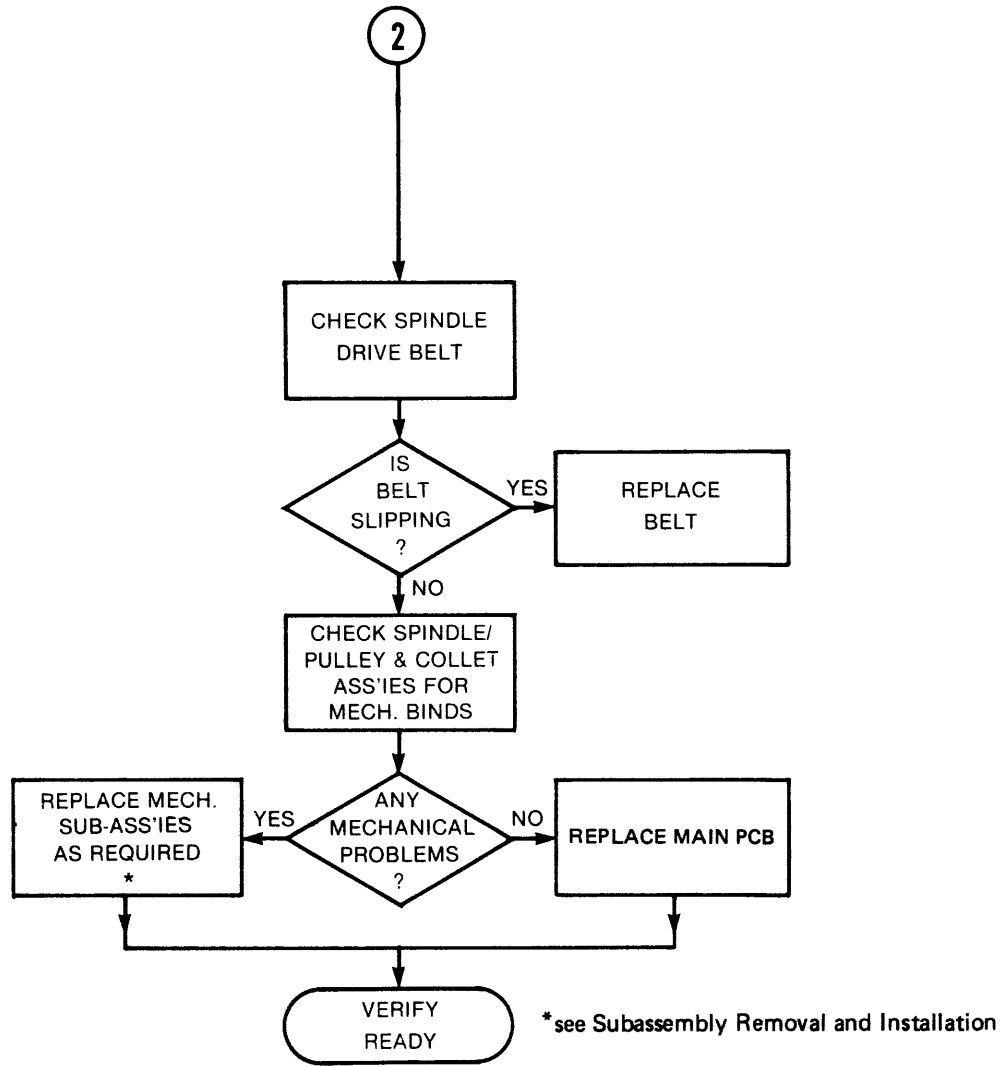
To proceed through the following troubleshooting flowcharts, it is necessary to have the following test equipment:

- a disk of known good integrity (a Qume certified R/W disk; Q.P.N. 50151-01, and a Qume certified CE disk; Q.P.N. 50235-02 may be helpful).
- a multimeter, 20,000 ohms/volt.
- a dual-trace oscilloscope.



648-A

Figure 29. Not Ready Troubleshooting Flowchart Routine



649-A

Figure 29. (Not Ready - Continued)

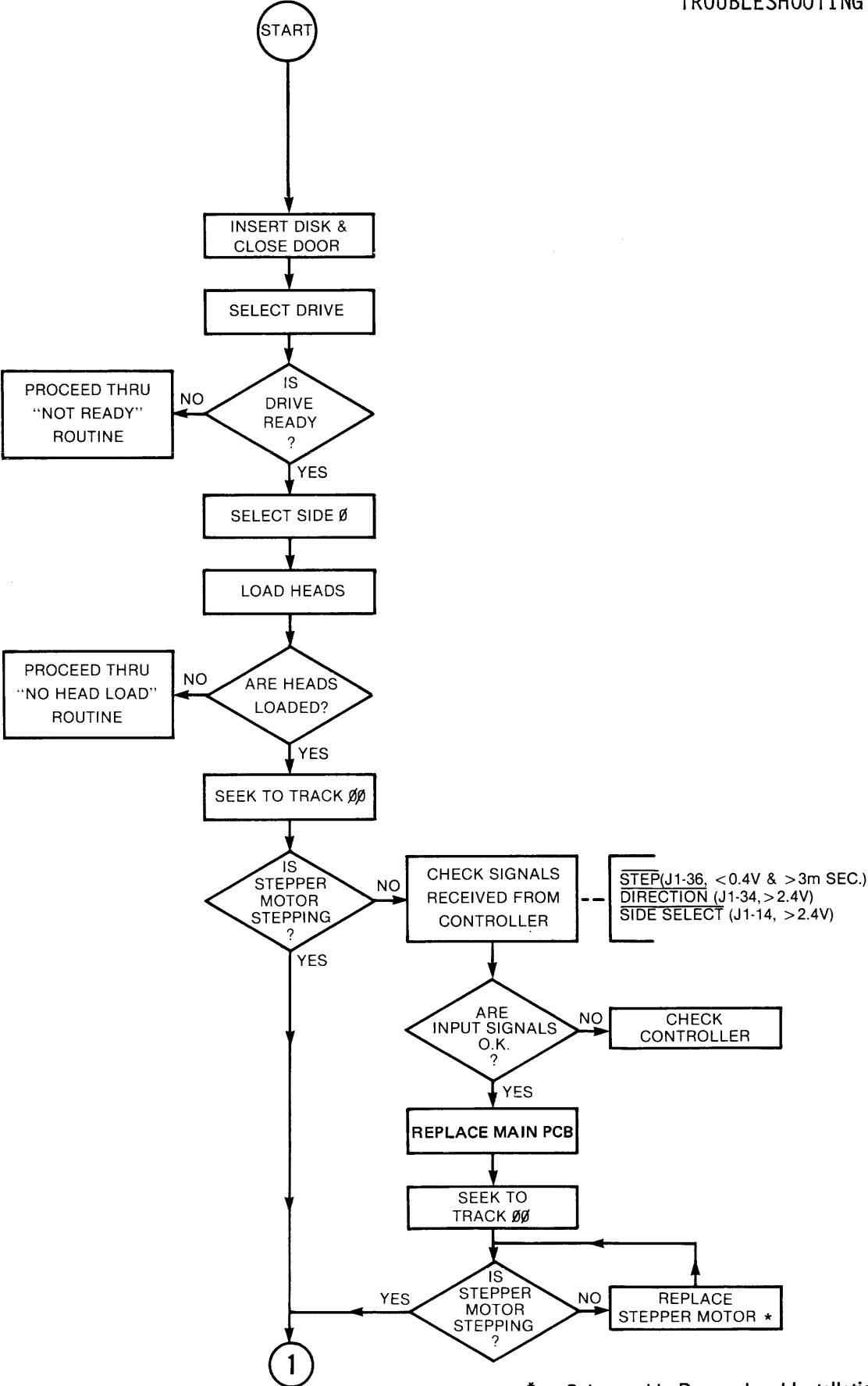
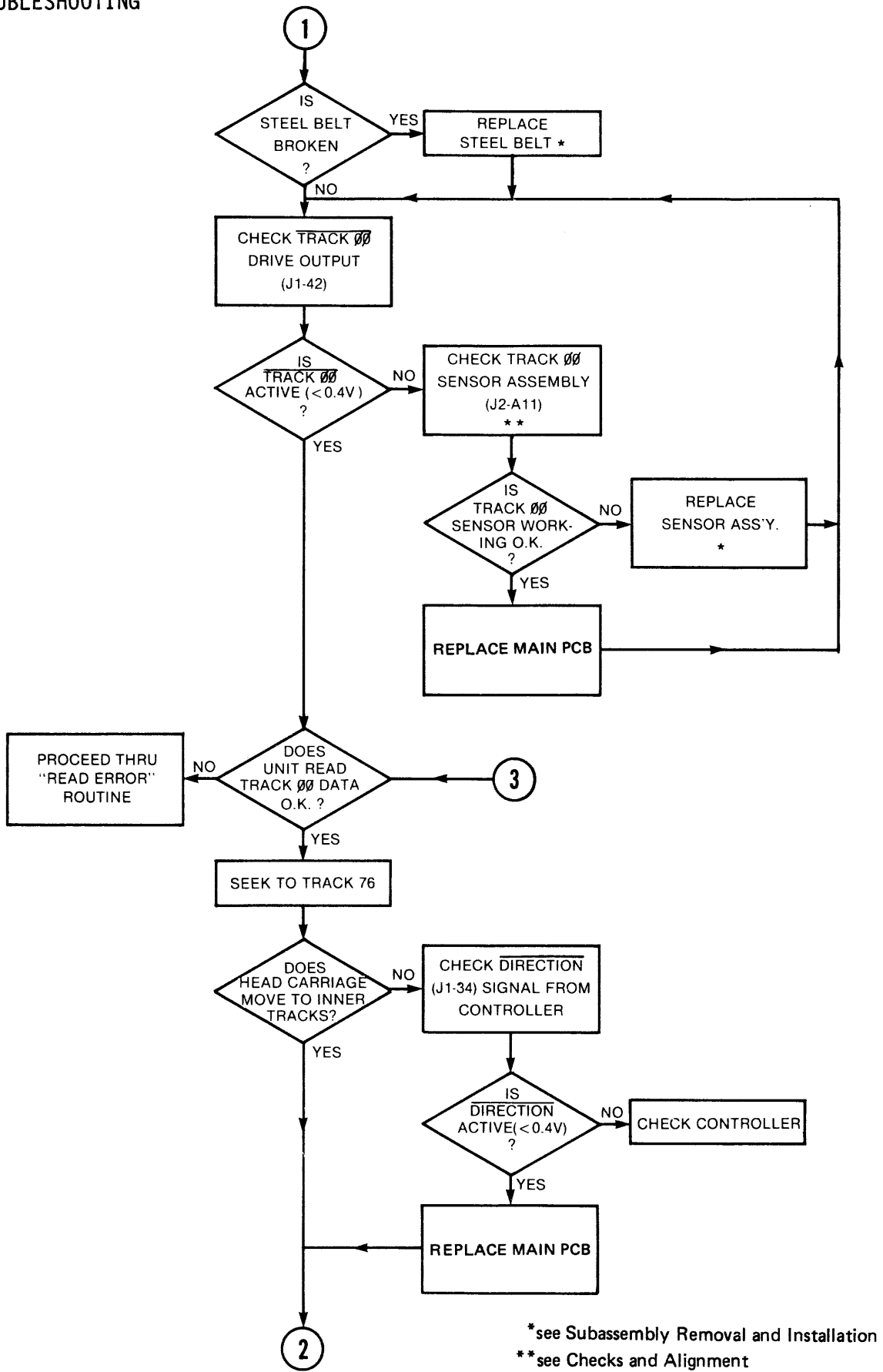


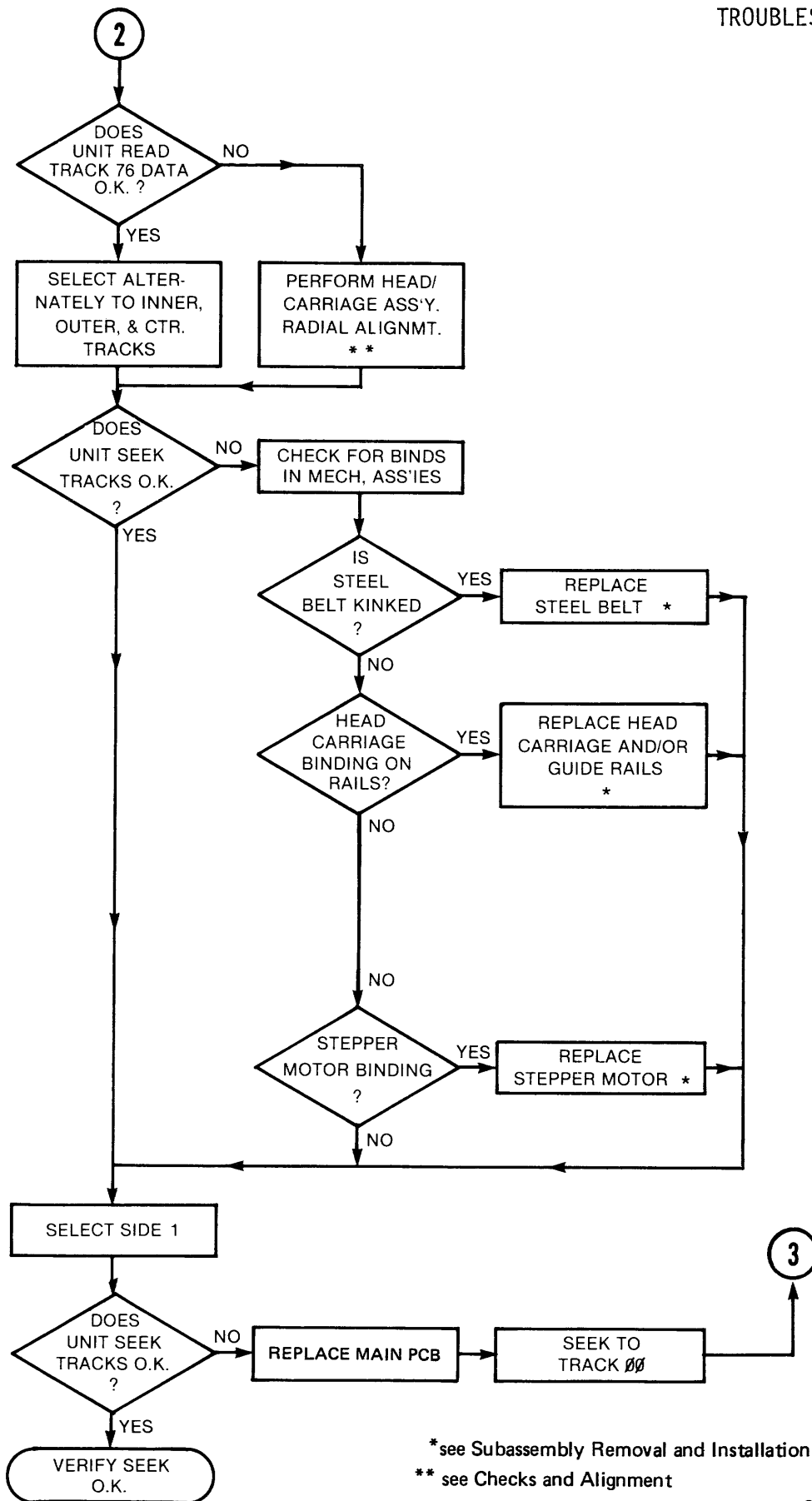
Figure 30. Seek Error Troubleshooting Flowchart Routine



651-A

Figure 30. (Seek Error - Continued)

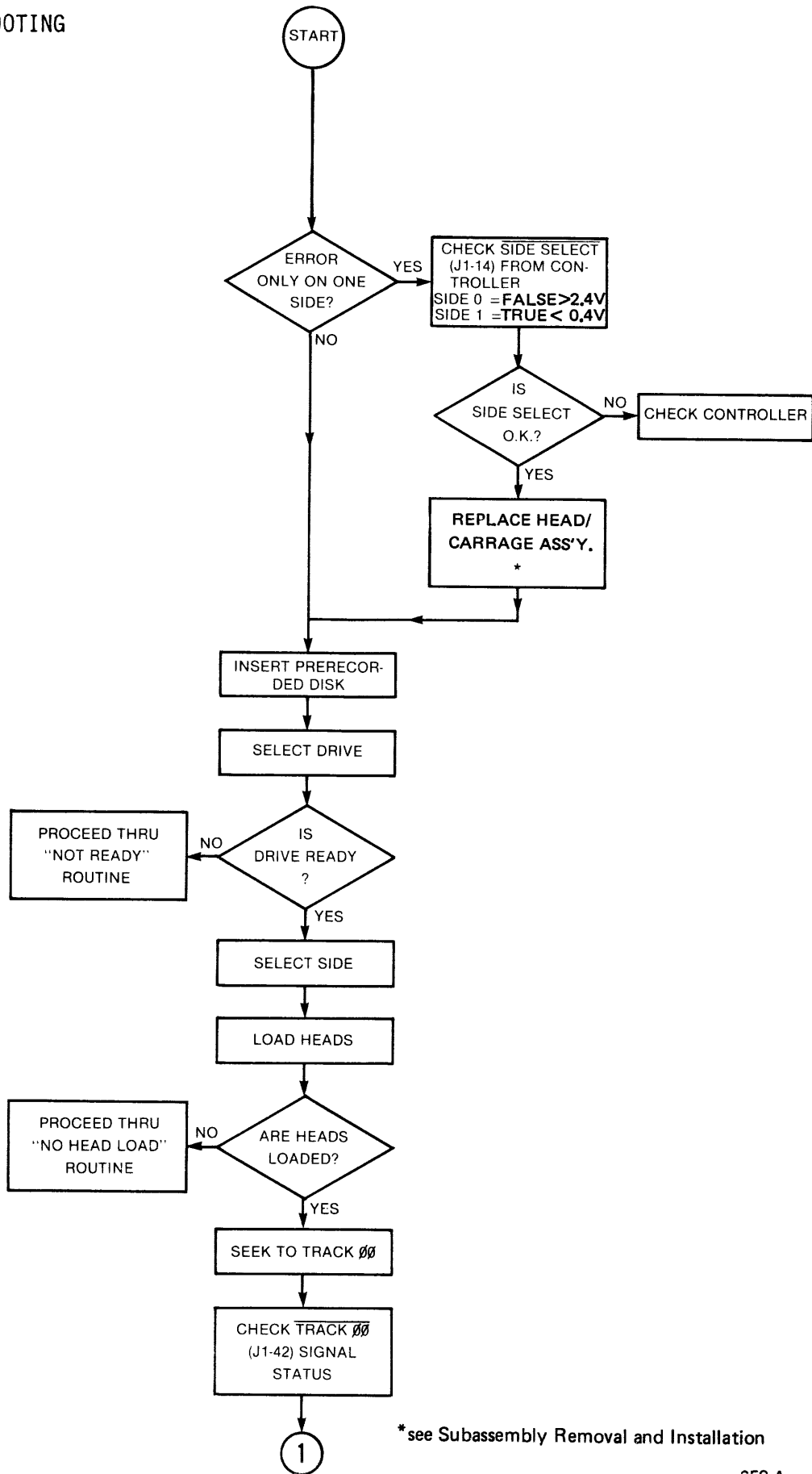




\* see Subassembly Removal and Installation  
 \*\* see Checks and Alignment

652-A

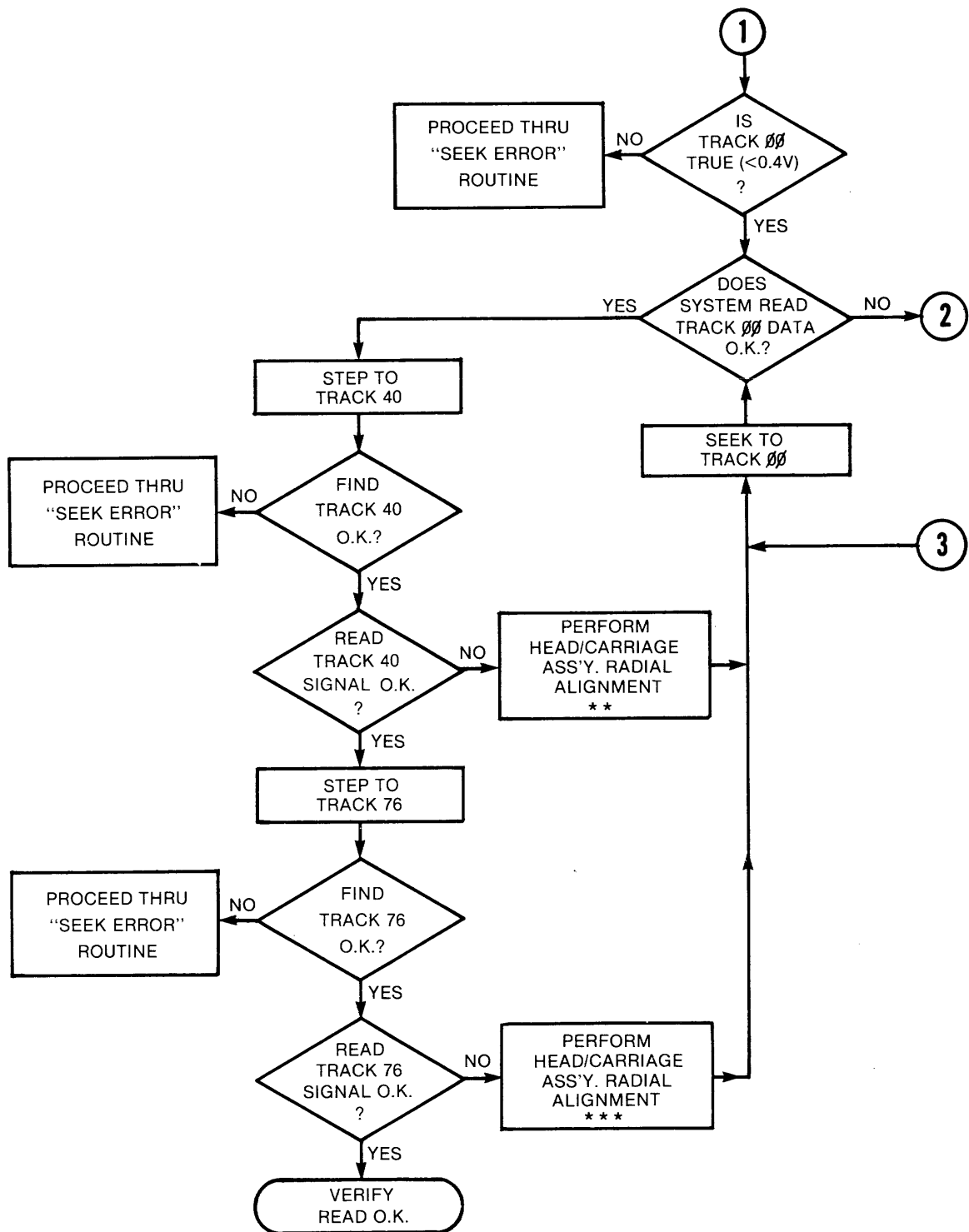
Figure 30. (Seek Error - Continued)



\*see Subassembly Removal and Installation

659-A

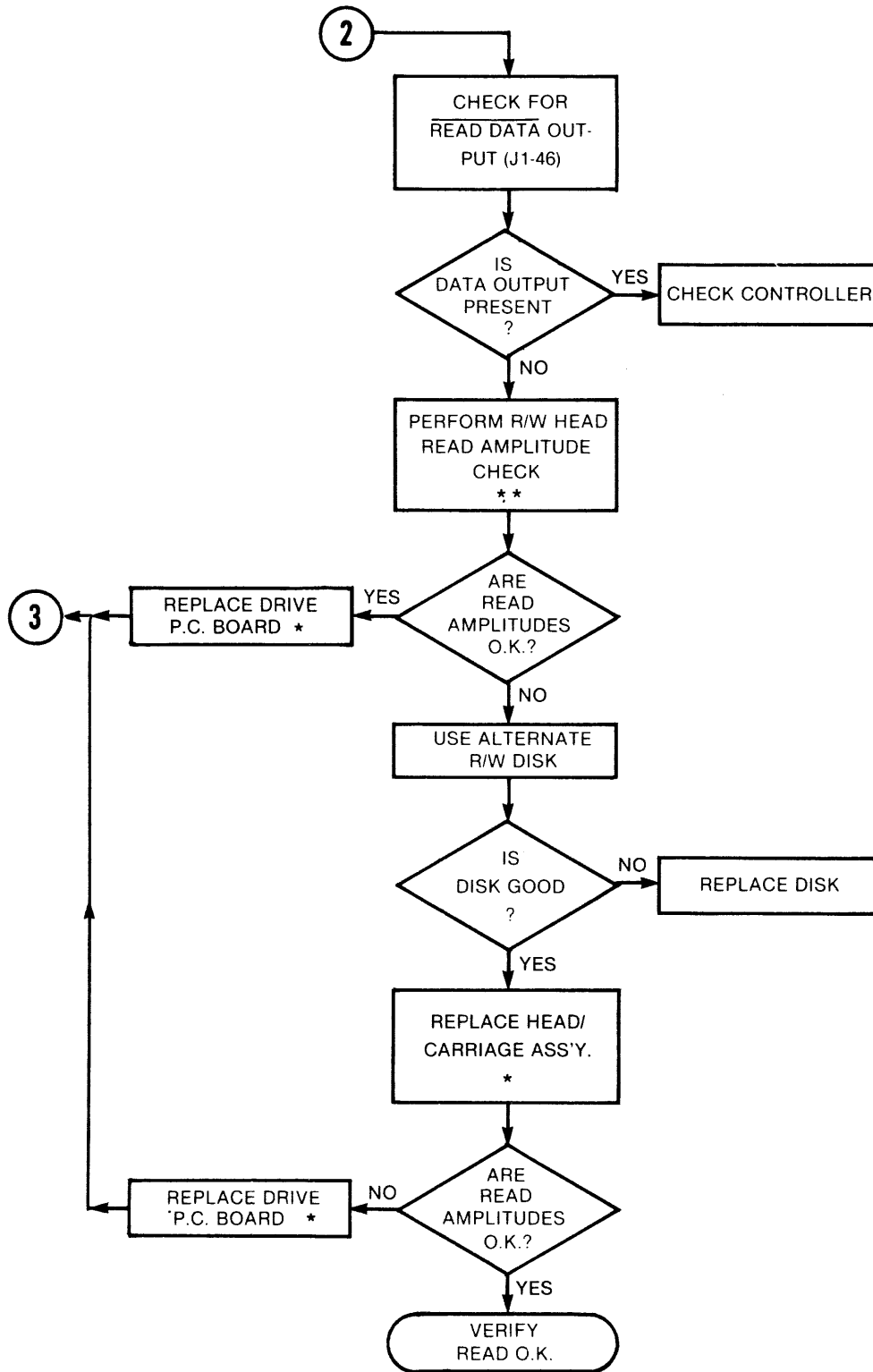
Figure 31. Read Error Troubleshooting Flowchart Routine



\* see Subassembly Removal and Installation  
 \*\* see Checks and Alignment

653-A

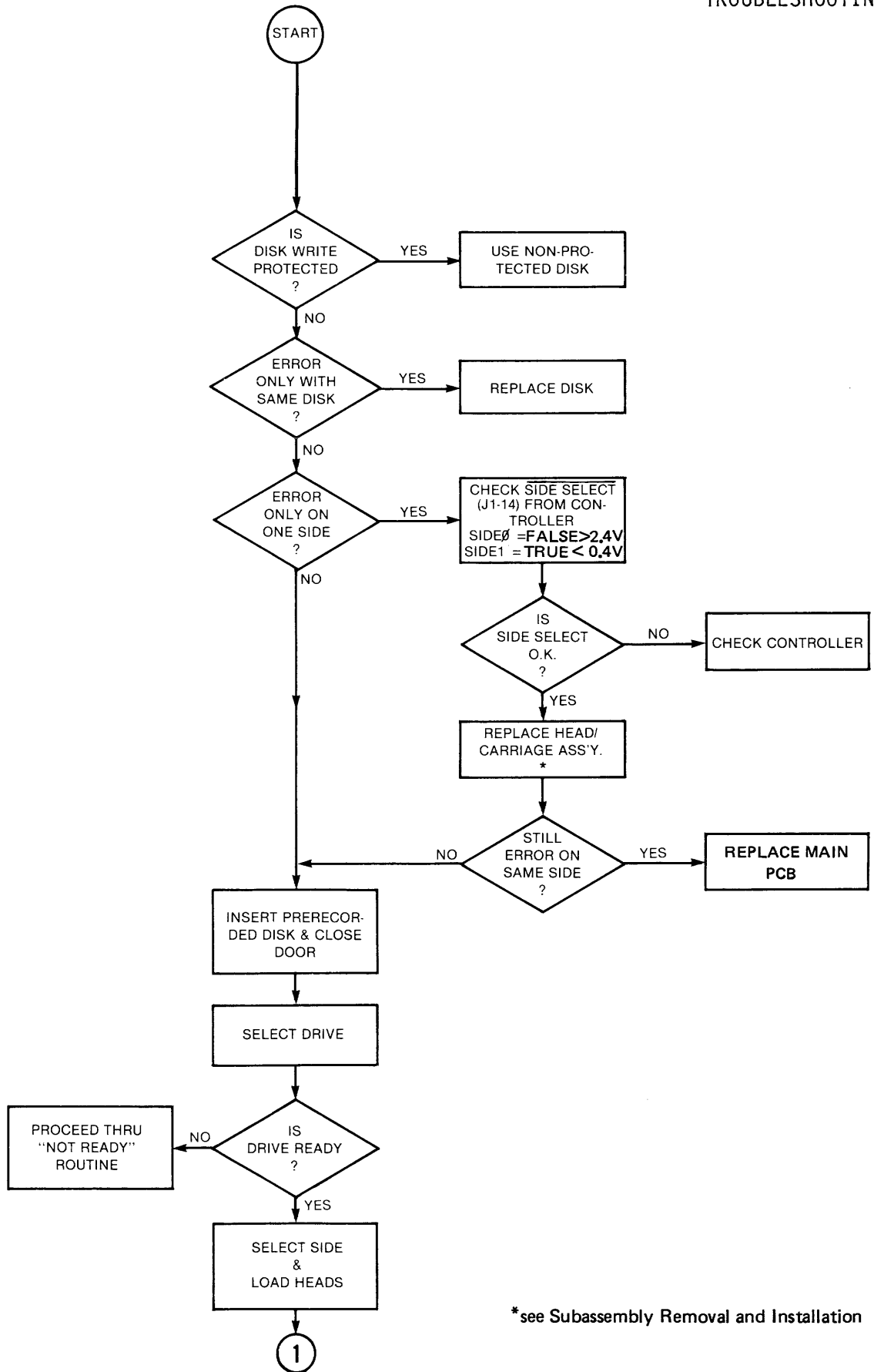
Figure 31. (Read Error - Continued)



\*see Subassembly Removal and Installation  
 \*\*see Check and Alignment

654-A

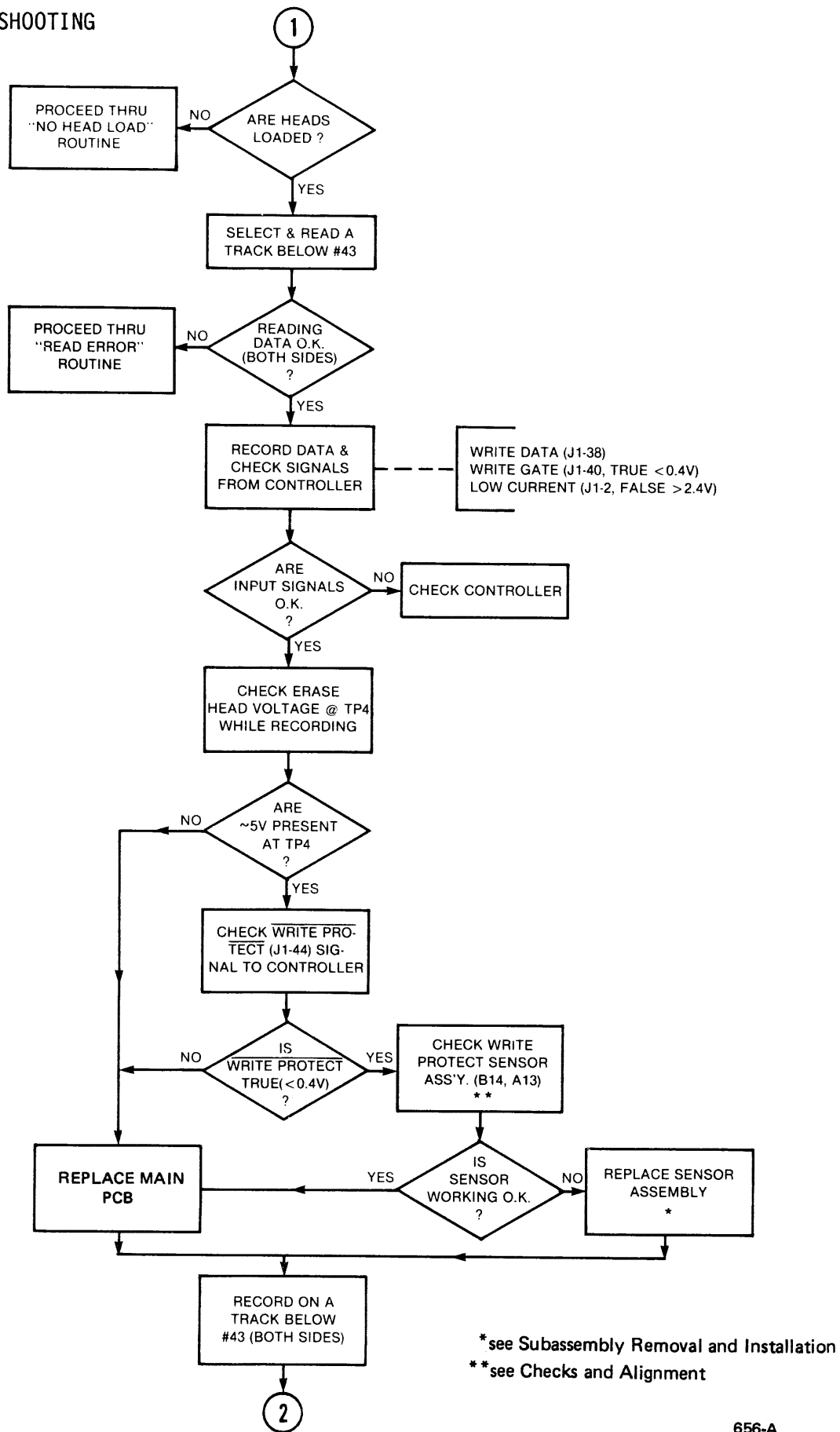
Figure 31. (Read Error - Continued)



\*see Subassembly Removal and Installation

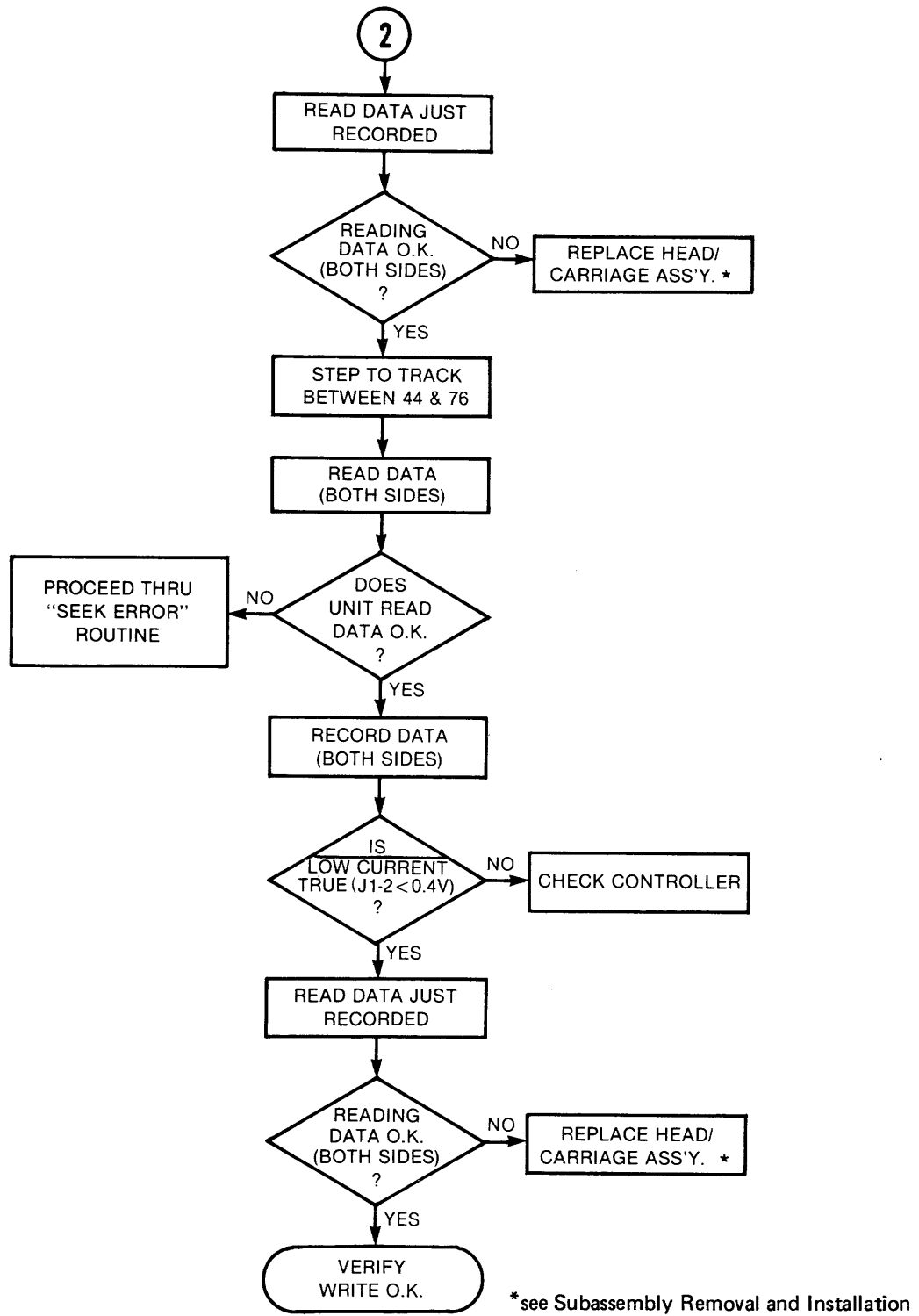
655-A

Figure 32. Write Error Troubleshooting Flowchart Routine



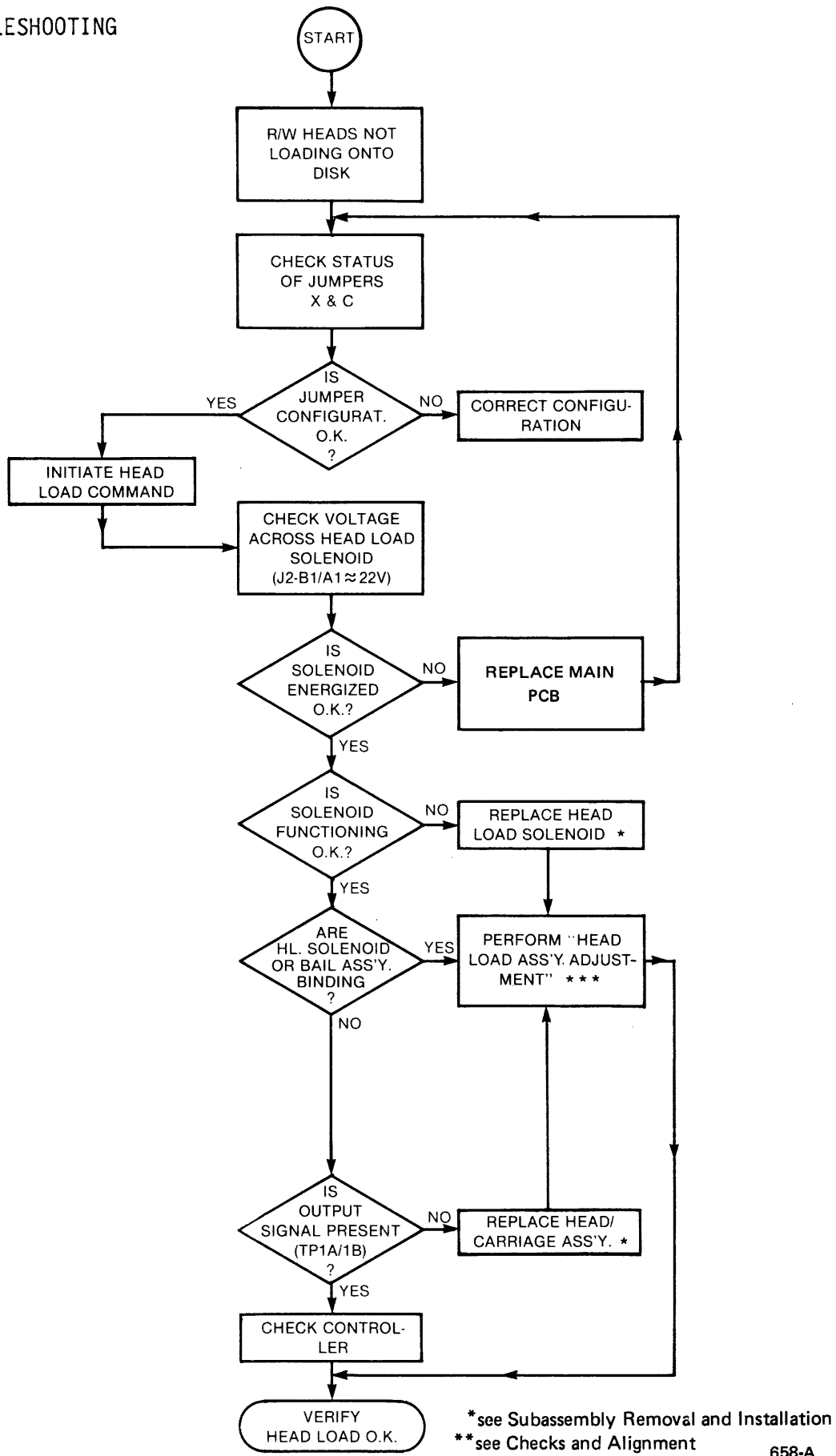
\* see Subassembly Removal and Installation  
 \*\* see Checks and Alignment

Figure 32. (Write Error - Continued)



657-A

Figure 32. (Write Error - Continued)



658-A

Figure 33. No Head Load Troubleshooting Flowchart Routine



## RECOMMENDED SPARE PARTS

The following is a listing of the recommended spare parts for supporting the QumeTrak 242 disk drive in the field.

Table 16. Recommended Spare Parts

Q.P.N.	DESCRIPTION	QUANTITY			
		50	100	250	500
54101-01	MAIN PCB		1	1	1
54102-01	DRIVE MOTOR CONTROL PCB				1
54103-01	DRIVE MOTOR				1
54104-01	STEPPER ASSEMBLY				1
54105-01	CARRIAGE ASSEMBLY		1	1	1
54106-01	STEEL BELT	1	1	2	2
54107-01	DRIVE BELT				1
54118-01	COLLET ASSEMBLY			1	1



## **DIAGRAMS**

The following diagrams are provided for reference:

- Interconnect Diagram
- Main PCB Schematic Diagram
- Drive Motor Control PCB Schematic Diagram



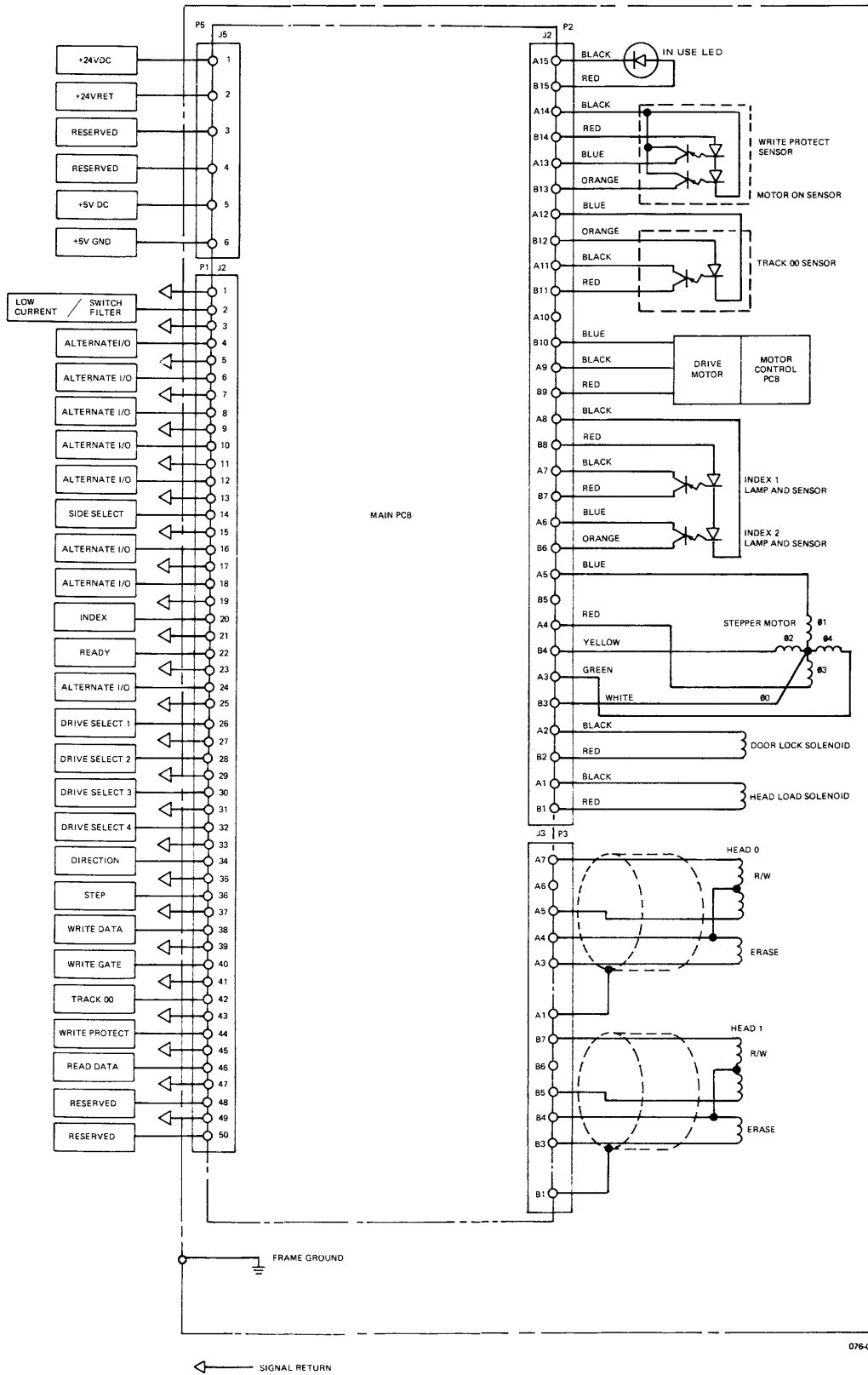


Figure 34. QumeTrak 242 Interconnect Diagram



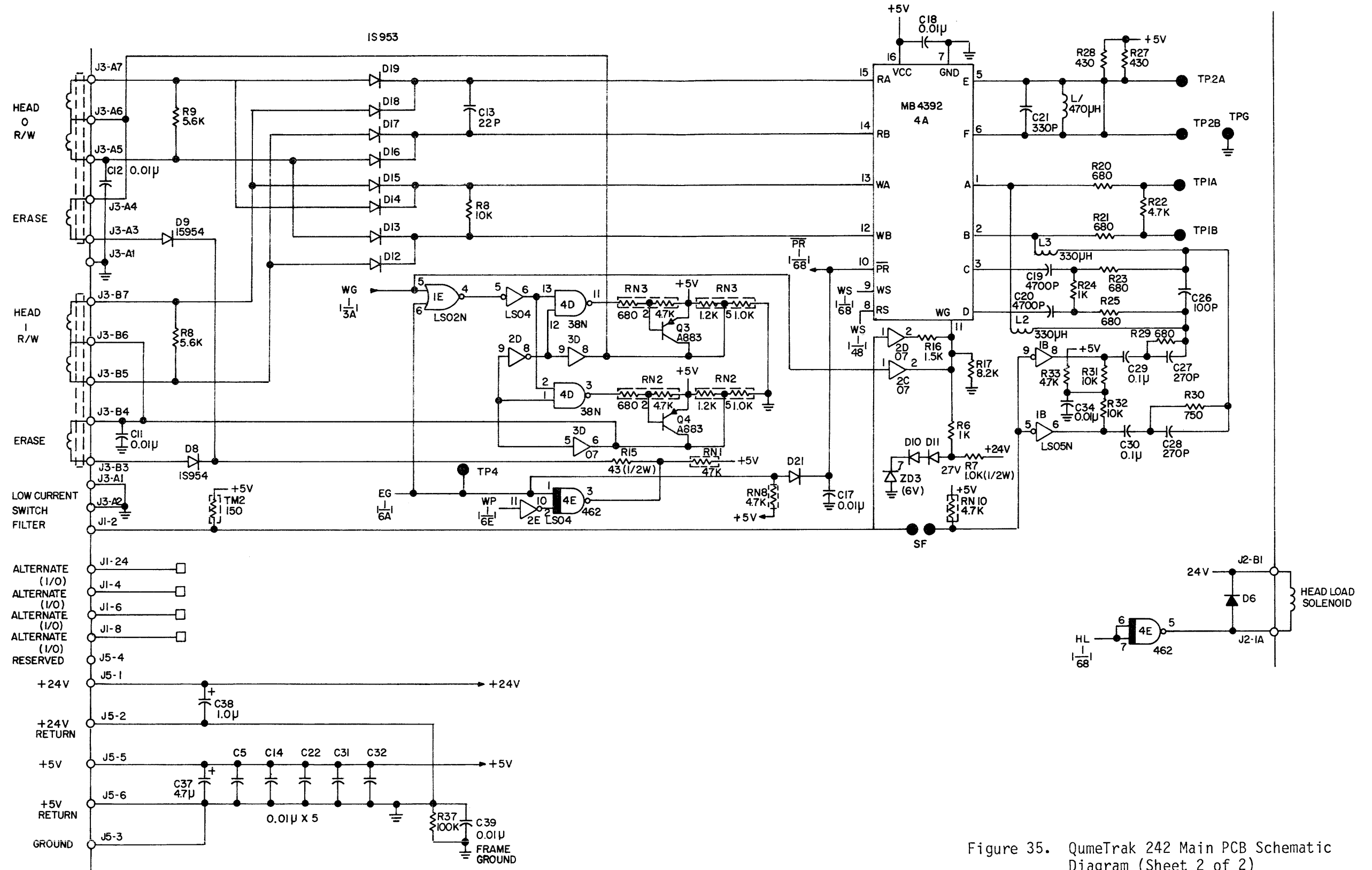


Figure 35. QumeTrak 242 Main PCB Schematic Diagram (Sheet 2 of 2)

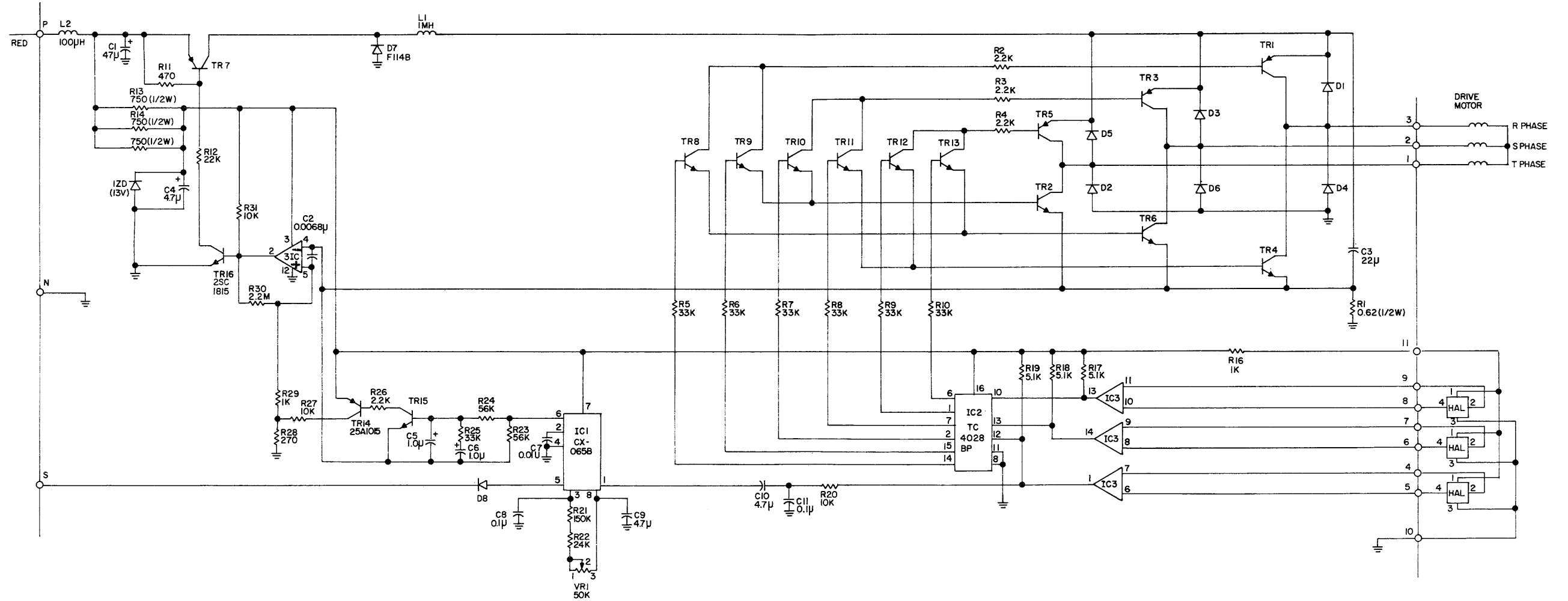


Figure 36. QumeTrak 242 Drive Motor Control PCB Schematic Diagram



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