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**CONTROL DATA®  
FLEXIBLE DISK DRIVE**

**GENERAL DESCRIPTION  
OPERATION  
INSTALLATION AND CHECKOUT  
THEORY OF OPERATION  
DIAGRAMS  
MAINTENANCE  
MAINTENANCE AIDS  
PARTS DATA  
WIRE LISTS**

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**MAGNETIC PERIPHERALS INC.**

 a subsidiary of  
CONTROL DATA CORPORATION

**HARDWARE MAINTENANCE MANUAL**

A3-ES8

FDD - FSM

R E V I S I O N R E C O R D															
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## PREFACE

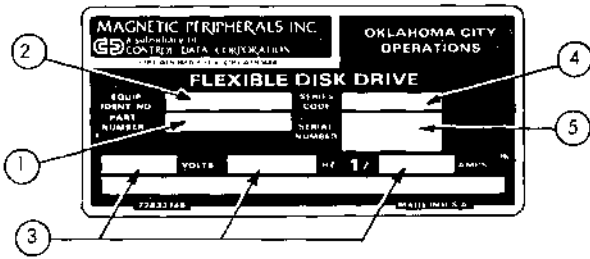
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This manual provides the information needed to install, operate and maintain the Control Data Corporation Flexible Disk Drive (FDD) and is intended to support customer engineers who require detailed information about the Flexible Disk Drive's operation.

The total content of the manual is comprised of two publications, each having a unique publication number, and is contained in one volume. The Manual's publication number (77834769) is that of the front matter, sections one through seven, and section nine. This number should be used when making reference to the Flexible Disk Drive Hardware Reference Maintenance Manual. Section VIII, Parts Data, is identified by the unique publication number 77834771.

This manual applies to several models of the FDD. A configurator sheet is provided on the following page which describes each FDD configuration that this manual will support. Refer to the equipment nameplate located on the right hand side of the unit (as viewed from the front) to determine the appropriate Top Mechanical Assembly (TMA) and Model numbers. Then use the Configurator sheet as a starting point to establish the maintenance level for the device.

# FLEXIBLE DISK DRIVE CONFIGURATOR SHEET



- ① TOP MECHANICAL ASSEMBLY NO. (TMA)
- ② MODEL NO. (BR8XXX)
- ③ AC POWER REQUIRED (ON UNITS LABELED 50/60 Hz CHECK CONFIGURATION OF PULLEY FOR FREQUENCY).
- ④ EQUIPMENT STATUS NUMBER
- ⑤ UNIT SERIAL NO.

POWER REQ	VDC	+5 & +24 AT J7																	
	VDC	+5 & +24 AT I/O J1																	
	VAC	240, 1Ø																	
		220, 1Ø																	
		120 1Ø																	
	100 1Ø																		
WRITE SPLICE ADJ. (See Table 6-2)																			
CIRCUIT BD. CONFIG. (See Table 5-1)																			
DAISY-CHAIN INTERFACE																			
STANDARD INTERFACE																			
TMA NO.		MODEL NO.										TMA NO.		MODEL NO.					
75744001	BR803A	X	506	603		X	X	X	X	75744041	BR8A2N	X	505	603	X				X
002	BR803B	X	506	603		X	X	X	X	042									
003	BR803C	X	506	603		X	X	X	X	043									
004	BR803D	X	506	603		X	X	X	X	044									
005	BR803E	X	502	603		X	X	X	X	045									
006	BR803F	X	502	603		X	X	X	X	046									
007	BR803G	X	502	603		X	X	X	X	047	BR8A5A	X	508	603		X			X
008	BR803H	X	502	603		X	X	X	X	048	BR8A5B	X	508	603		X	X		X
009										049	BR8A2W	X	501	603		X	X		X
010										050	BR8A2Y	X	501	603		X	X		X
011										051	BR8A6B	X	506	603		X	X		X
012										052	BR803U	X	506	603		X	X		X
013	BR803N	X	503	602		X	X	X	X	053	BR8A25	X	510	603		X	X		X
014	BR803P	X	503	602		X	X	X	X	054	BR8A2T	X	510	603		X	X		X
015	BR803R	X	503	602		X	X	X	X	055	BR8A2U	X	512	603		X	X		X
016	BR803S	X	503	602		X	X	X	X	056	BR8A2V	X	507	603		X	X		X
017	BR803J	X	502	603			X	X	X	057	BR8A2Z	X	505	603		X	X		X
018	BR803K	X	502	603			X	X	X	058	BR8A3G	X	504	601		X	X		X
019	BR803L	X	513	603		X	X	X	X	059	BR8A3H	X	504	601		X	X		X
020	BR803M	X	513	603		X	X	X	X	060		X	509	603		X	X		X
021	BR8A3C	X	502	603		X	X	X	X	061	BR8A5C	X	508	603		X	X		X
022	BR8A3D	X	502	603		X	X	X	X	062	BR8A5D	X	511	602		X	X		X
023	BR8A3E	X	502	603		X	X	X	X	063									
024	BR8A3F	X	502	603		X	X	X	X	064									
025	BR8A2A	X	505	603		X	X	X	X	065									
026	BR803T	X	503	603			X	X		066									
027										067									
028	BR8A3A	X	501	603		X	X	X		068									
029										069									
030	BR8A2B	X	505	603		X	X	X		070									
031	BR8A2C	X	505	603		X	X	X		071									
032	BR8A2D	X	505	603		X	X	X		072									
033	BR8A2E	X	505	603		X	X	X		073									
034	BR8A2F	X	506	603		X	X	X		074									
035	BR8A2G	X	510	603		X	X	X		075									
036	BR8A2H	X	506	603		X	X	X		076									
037	BR8A2J	X	505	603		X	X	X		077									
038	BR8A2K	X	509	603		X	X	X		078									
039	BR8A2L	X	507	603		X	X	X		079									

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## 1.1 INTRODUCTION

The Flexible Disk Drive (FDD) is a compact, portable, random access, data storage device that interfaces with a central processor via a control unit. Input/Output data and control signals are transmitted by means of an I/O cable.

## 1.2 PURPOSE AND USE OF EQUIPMENT

Data, in the form of magnetized bits, is written on, or read from the tracks of a rotating diskette. The FDD uses a single, flexible, removable diskette (one recording surface) enclosed in a sealed jacket. The unit is capable of hard-sector or soft-sector (missing clock) format operation, but the missing clock must be recovered externally (from the FDD).

## 1.3 PRODUCT DESCRIPTION

The major FDD components are the spindle, disk drive motor, read/write head, stepping motor, track indexing device, and printed circuit board.

The options include Write Protect, Data/Clock Separation, Power Reduction, Sector Separation, Unit Select, Ready, Door Unlock, Write Fault, and Hour Meter.

All FDD components are mounted on a base assembly. The front panel has a spring loaded door through which the diskette is installed. The door is mechanically linked to the disk loading mechanism and the head load interlock switch; therefore, when the door is closed the Read/Write head may be loaded on the diskette in preparation for the transfer of data.

Standard Models Versus Daisy-Chain Models - Throughout this manual certain features and operation of the Flexible Disk Drive are described in terms of the manner in which the FDD is designed to be connected to its controller, either standard or daisy chain.

Standard models are designed to be connected to their associated controller in star fashion wherein each FDD unit has its own complete umbilical cable connection to the controller, with no interconnection between FDD units. Standard FDD model units are always in a ready state for reading or writing operation after initial preparation and turn on.

Daisy-chain models are designed so that one to four FDD units may be connected serially to a common controller. The controller continuously monitors the operational readiness of each FDD in its chain and commands and controls the reading and writing operation of any selected FDD unit in its chain.

### 1.3.1 PHYSICAL DESCRIPTION

The physical dimensions for the equipment are as follows:

Height	4.97 inches (126.2mm)
Width	8.78 inches (223.0mm)
Depth	14.24 inches (361.7mm)
Weight	12 lbs. (5.44 kgm)

### 1.3.2 ELECTRICAL DESCRIPTION

The electrical specifications for the equipment are as follows:

- DC Power Source (Supplied by Host Equipment)
  - Without Stepper-Power Reduction
    - +24 Volts (+ 10%) @ 1.3 A Typical
    - + 5 Volts (+ 5%) @ 0.8 A Typical
  - With Stepper-Power Reduction
    - +24V (+10%) @ { 1.3A Typical, Stepping  
0.3A Typical, Not Stepping
    - + 5V (+ 5%) @ 1.0 A Typical, Not Stepping
- A. C. Power Source - Refer to the FDD configurator or FDD nameplate to determine A. C. Power requirements.

### 1.3.3 PERFORMANCE CHARACTERISTICS

The equipment specifications for the FDD are as follows:

- ACCESSING TIME

Maximum Access Time	770 ms
Maximum One-Track Access Time	20 ms
Average Access Time	263 ms

- RECORDING

Mode	<u>Double Freq.</u>	<u>MFM</u>
Density (nominal)	1836 BPI(72.3 BPmm) 3268 BPI(128.7 BPmm)	3672 BPI (144.6 BPmm) Outer Track 6536 BPI (257.3 BPmm) Inner Track
Data Transfer Rate	249, 984 bits/sec	499, 968 bits/sec
Bits/Byte	8	8
Bits/Track	41,664	83,328
Tracks	77	77
Sectors	Format Determined	Format Determined

- DATA CAPACITY

Bytes/Track	5,208	10,416
Bits/Track	41,664	83,328
Bits/Diskette	3,208,128	6,416,256

● FLEXIBLE DISKETTE  
(Optional)

Diskette Dimensions

CDC 421-60W, Single Density, or Equiv.  
CDC 423-60W, Double Density, or Equiv.

8 x 8 inches (203.2 x 203.2mm)  
(including jacket)

Useable Diskette Recording  
Surfaces

1

Diskette Surface Diameter  
Recording Radii

7.88 inches (200.1mm)

Track 76 (inner) 2.0290 inches (515mm)  
nominal

Track 00 (outer) 3.6123 inches (918mm)  
nominal

Diskette Surface Coating  
Diskette Velocity

Magnetic Oxide  
360 rpm

● READ/WRITE HEAD

Head Unit

1

Track Width

0.013 in. (0.33 mm)

Track Spacing

0.02083 in. (0.529 mm)

Erase to Read/Write Gap

0.035 in. (0.889 mm)

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## 2.1 INTRODUCTION

The FDD is under direct control of the input/output and power sources. No special start-up procedure is required. Operation is fully automatic and requires no operator intervention during normal operation.

## 2.2 OPERATING INSTRUCTIONS

Verify that power and I/O cables are securely attached before operation.

### 2.2.1 FLEXIBLE DISKETTE LOADING

- a. Apply AC/DC power to unit.
- b. Open FDD door.
- c. Remove diskette from storage envelope as shown in Figure 2-1.
- d. On units with the Write-Protect option, be sure the Write-Protect slot in the jacket is open, as shown in Figure 2-1, if the diskette is to be write-protected.
- e. If a diskette with a Write-Protect slot is not utilizing the Write Protect, that is, it will be written on, the slot must be covered with a piece of tape which is opaque to infrared.
- f. Carefully slide diskette into FDD, as shown in Figure 2-1, until jacket is solidly against stops.
- g. Carefully close unit door. Ensure that jacket is properly seated, spindle has engaged diskette, and door is closed and latched.
- h. Protect the empty envelope from liquids, dust, and metallic materials.

### 2.2.2 FLEXIBLE DISKETTE REMOVAL

- a. Open FDD door to stop diskette rotation and disengage spindle.
- b. Remove diskette from FDD and put it in its storage envelope.
- c. Close FDD door.

## 2.3 ERROR RECOVERY

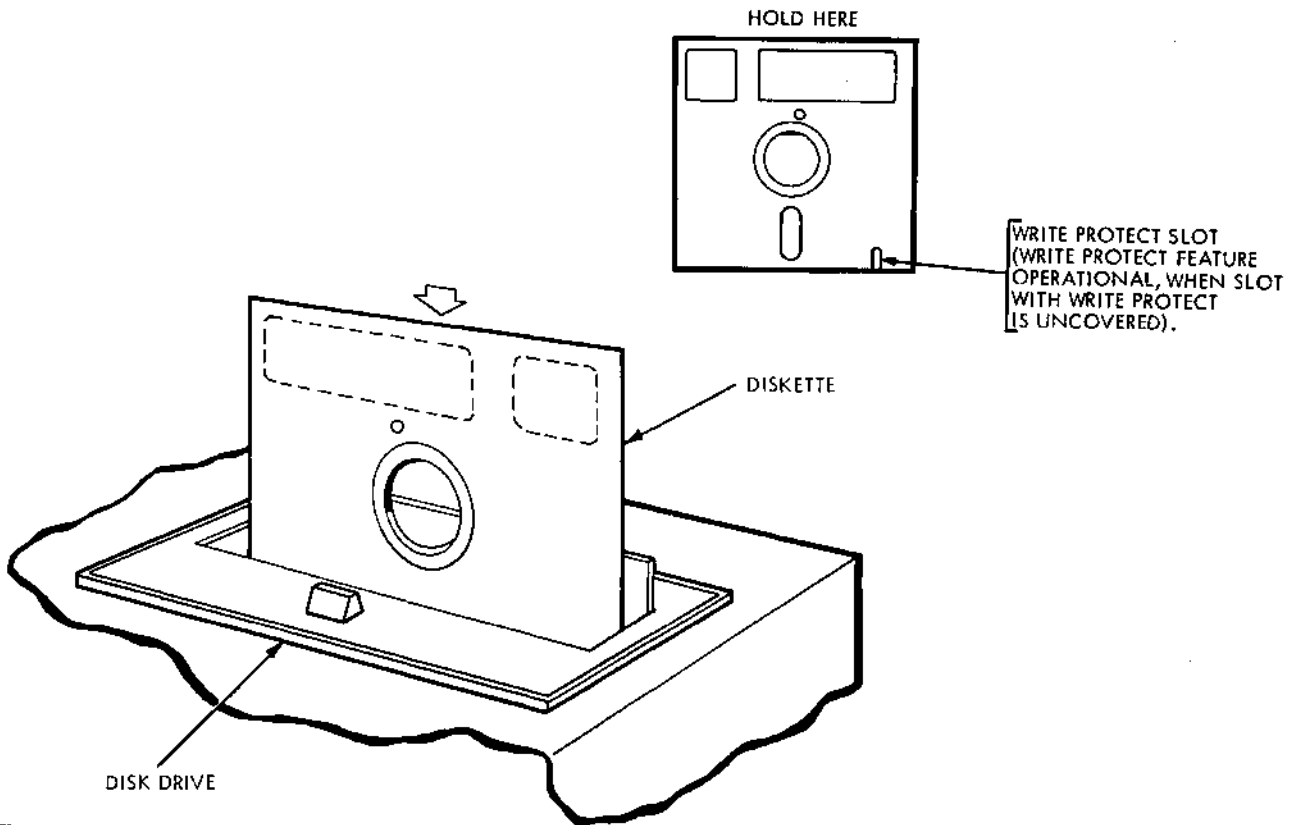
The following paragraphs give information needed to recover from possible errors in equipment operation.

### 2.3.1 SEEK ERROR

Seek errors will rarely occur unless the stepping rate is significantly exceeded. In the event of a seek error, recalibration of track location can be achieved by repetitive Step Out commands until a Track 00 signal is received.

### 2.3.2 WRITE ERROR

To guard against degradation from imperfections in the media, no more than four attempts to write a record should be used when Read After Write errors are encountered. In the event a record cannot be successfully written within four attempts, it is recommended that the sector or track be labeled defective and an alternate sector or track assigned. If more than two defective tracks are encountered, it is recommended that the diskette be replaced.



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Figure 2-1. Diskette Installation

### 2.3.3 READ ERROR

In the event of a Read error, up to 10 attempts should be made to recover with re-reads. If after 10 attempts the data has not been recovered, step the head several tracks away and then re-position to recover the data. Unloading the head when data transfers are not imminent will increase the data reliability and extend the diskette life.

### 2.4 DISKETTE HANDLING RECOMMENDATIONS

Since the recorded diskette contains vital information, reasonable care should be exercised in its handling. Longer diskette life and trouble free operation will result if the following recommendations are followed.

- a. Do not use a writing device which deposits flakes e.g., lead or grease pencils, when writing on diskette jacket label.
- b. Do not fasten paper clips to diskette jacket edges.
- c. Do not touch diskette surface exposed by jacket slot.
- d. Do not clean diskette in any manner.
- e. Keep diskette away from magnetic fields and from ferromagnetic materials that may be magnetized.

- f. Return diskette to envelope when removed from FDD.
- g. Protect diskette from liquids, dust, and metallic substances at all times.
- h. Do not exceed the following storage environmental conditions:

Temperature: 50° to 125°F (10° to 56.1°C)

Relative Humidity: 8% to 80%

Maximum Wet Bulb: 85°F (29.4°C)

- i. Diskettes should be stored in a box or cabinet when not in use.

C

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## 3.1 INTRODUCTION

This section provides the information and procedures necessary to put an FDD into operation.

## 3.2 UNPACKING

Unpack FDD as follows:

- a. Cut banding and lift top half of styrofoam shell from unit.
- b. Lift unit in polyethylene bag from bottom half of styrofoam shell and remove unit from polyethylene bag.

During unpacking, care must be used so that any tools being used do not inflict damage to the unit. As a unit is unpacked, inspect it for possible shipping damage. All claims for this type of damage should be filed promptly with the carrier involved. If a claim is filed for damages, save the original packing materials.

## 3.3 INSTALLATION

Install the FDD in the designated location in the host equipment.

## 3.4 CABLING AND CONNECTIONS

Connect the AC cable, I/O cable, and DC cable if applicable between the FDD and host equipment.

### 3.4.1 INPUT-OUTPUT CABLE

The maximum cable length from connector to connector is 25 feet. All inputs and outputs require pairs, one line for function, one for ground. The characteristic impedance is typically 120 ohms.

The information relative to the I/O connector (J1) and pin/signal assignments are defined in Table 5-1, Figure 5-2, and Figure 5-3.

On models designed for daisy-chain operation, the terminating resistor pack RM1 (See Figure 5-3) is to be installed in the end FDD (farthest from the controller) ONLY. Terminators in more than one FDD during daisy-chain hookup may result in damage to the controller.

For daisy-chain configurations, W32, W33, and W34 determine the FDD position in the daisy-chain. W32 is used with the door unlock option. Therefore, to change the position of the FDD in the daisy-chain, the jumpers must be unsoldered and moved to the desired location, see Figure 5-3B. Optionally switch S1 (S2 if door unlock option is included) is provided on the circuit board to enable changing the position of the FDD in the daisy-chain by switch selection.

### 3.4.2 DC POWER CONNECTION

DC power (user-supplied) for standard FDD models is transmitted from the controller via the I/O cable through the interface connector (J1) on the printed circuited board. Daisy-chain FDD models receive DC power (user-supplied) through a power cable which interfaces with its mating connector (J7) on the printed circuit board. The pin assignments and line functions are shown on sheets 1 and 6 of the schematics, Figure 5-2. The mating connector is described in Figure 5-3.

### 3.4.3 AC POWER CONNECTION

The AC Power Cable (CDC P/N 75292202 or equivalent - see Figure 3-1) is an optional item supplied on order. The cable consists of stranded wire, 18 AWG minimum with center pin connection utilized as frame ground. Refer to Figure 3-1 for connector part numbers and attachment.

## 3.5 ENVIRONMENT

Operating and storage environments of the FDD are as follows:

Operating: 50° to 100°F (10° to 38°C) 12°F (-11°C)/hr max. fluctuation  
20% to 80% relative humidity  
(providing there is no condensation)

Non-Operating:  
-30° to +150°F (-35° to 65°C)  
5% to 95% relative humidity  
(providing there is no condensation)  
Max. Wet Bulb 80°F (27°C)

## 3.6 INITIAL CHECKOUT

This procedure should be used to determine that FDD is operational. The procedure assumes that the unit is installed and the I/O and power cables are connected.

- a. Apply ac power to unit and visually check that the spindle rotates.
- b. Apply dc power to unit.
- c. For Daisy-Chain FDD models using dipswitch S1 or S2 instead of jumpers W32, W33, and W34:
  1. Close one of the Unit Select switches (dip switch positions 1, 2, 3, or 4) located on the circuit board.
  2. Close one of the Ready switches (dip switch positions 5, 6, 7, or 8) located on the circuit board.
  3. If the Door Unlock option is installed, close one of the Door Unlock switches (dip switch positions 9, 10, 11, or 12) located on the circuit board.
- d. Insert diskette as described in Section 2.
- e. Apply a head-load-command signal to the unit and close the access door. Check that the head-load solenoid actuates, and the door microswitch is actuated.
- f. Apply a stepping-command signal to the unit and check that the actuator steps the head as commanded.
- g. Remove diskette.
- h. Remove the command signals and power from the unit.

### 3.6.1 OPERATING FREQUENCY

If the required operating frequency is different than that which the unit is configured, the procedure for converting operating frequencies using the dual diameter reversible pulley is provided in Section 6, "Frequency Conversion" for applicable models.

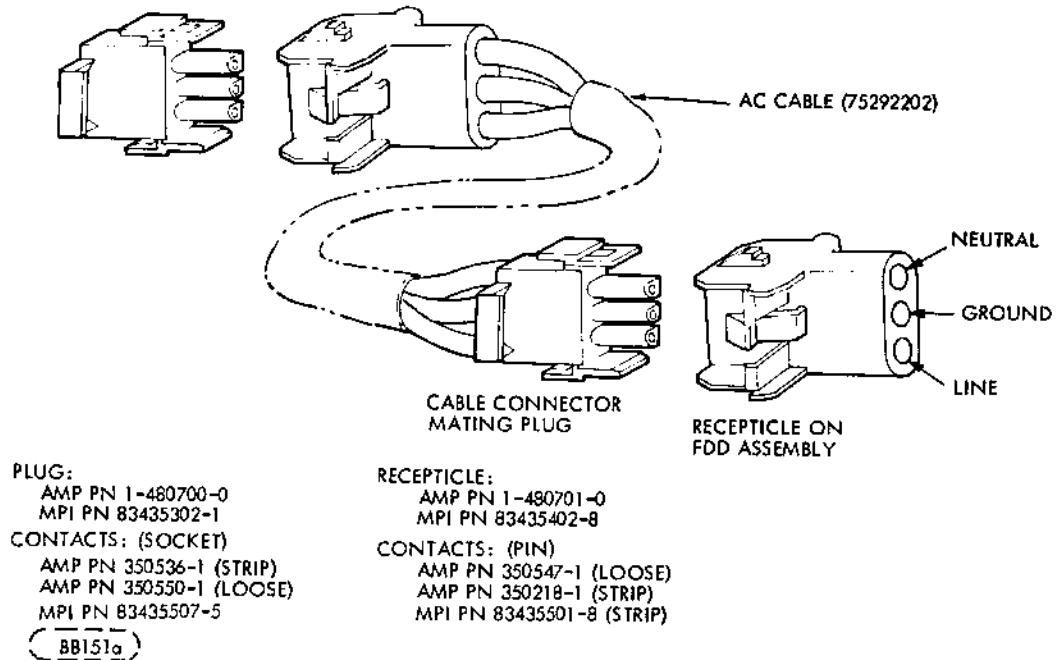
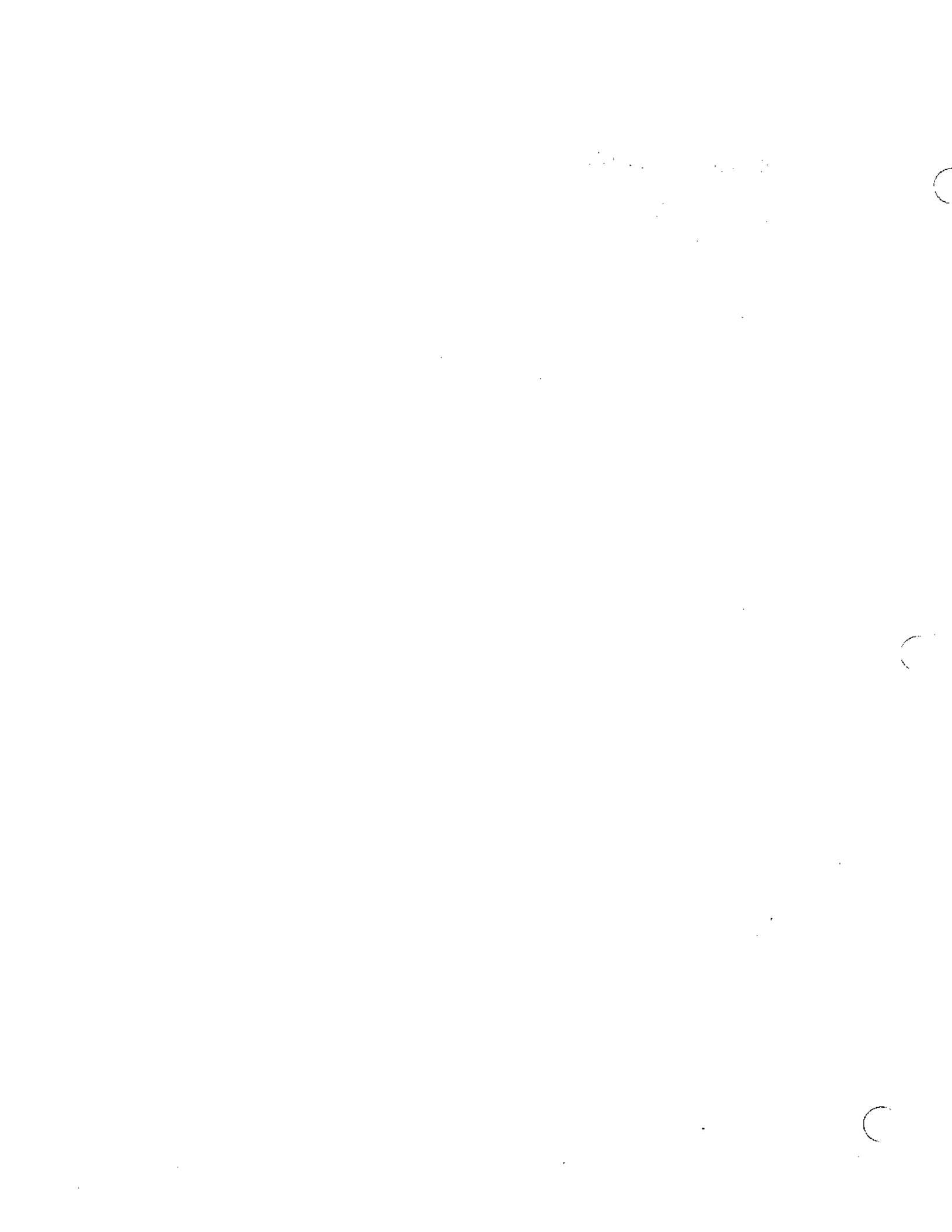


Figure 3-1. AC Cable Assembly



## 4.1 INTRODUCTION

The basic functions performed by the standard and daisy-chain models of the FDD are: (1) Receive and generate control signals, (2) Position the Read/Write head on selected tracks, and (3) Write or Read data upon command from the FDD controller. In the case of daisy-chain models, these functions are accomplished upon selection after initial indication to the controller that the FDD is ready to operate and accept commands. The standard models should be regarded as always selected.

The theory of operation for the FDD is divided into two parts. The first part gives a general theory of operation. The second part gives a detailed functional description of all major components both electronic and mechanical and describes all signals exchanged between the FDD and the controller.

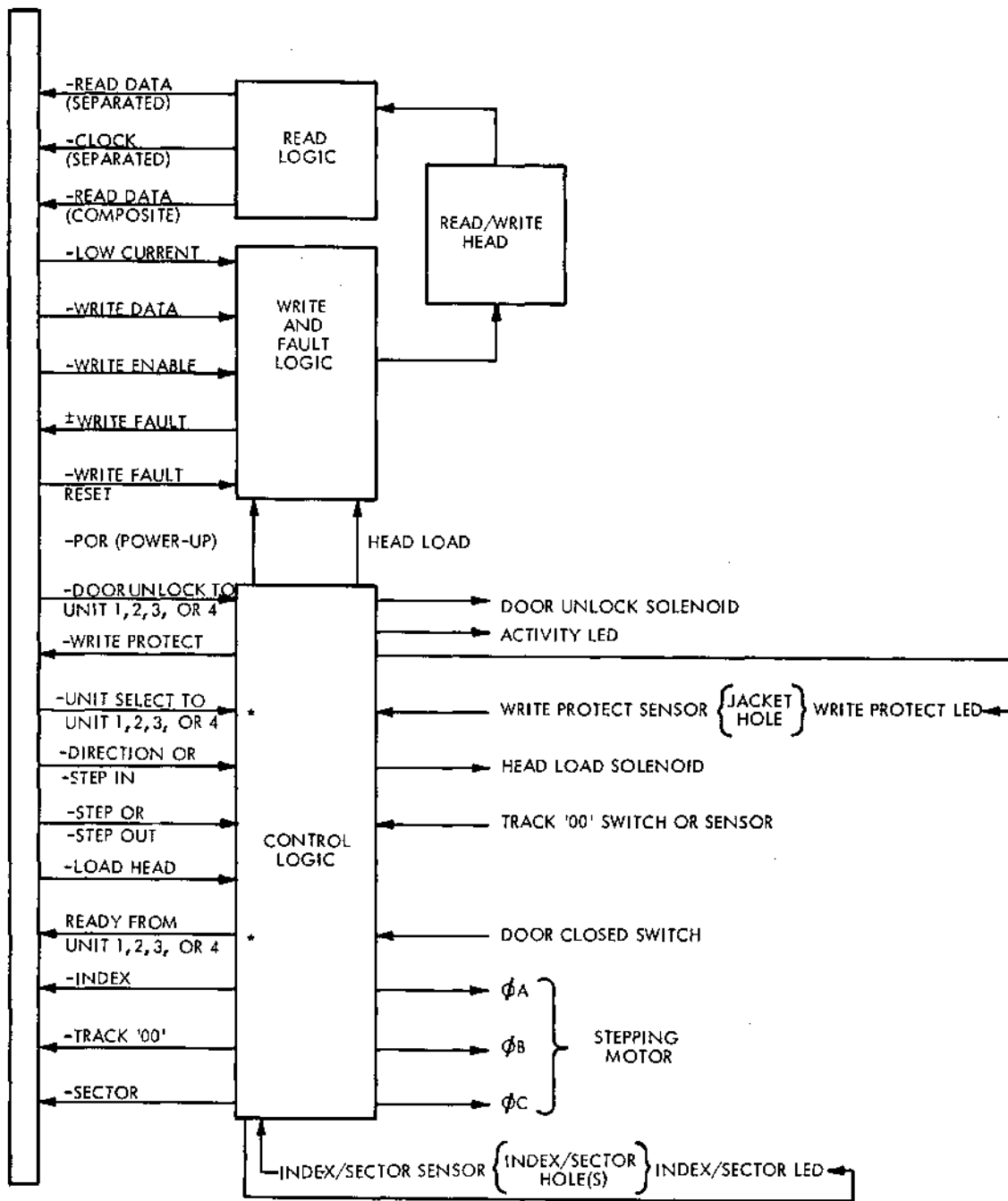
## 4.2 GENERAL DESCRIPTION

The basic function of the FDD is to indicate to the controller when it is ready to operate, and respond to the commands of the controller to: (1) Receive and generate control signals, (2) Position the Read/Write head to selected tracks, and (3) Write or Read data on the diskette when selected. All of the functions described which are options may not apply to your particular FDD model. (Refer to the Preface at the front of the manual).

Signals received and transmitted by the FDD are shown in Figure 4-1, and explained in Table 4-2. All signals received by the FDD, except the door unlock signal, are gated with Unit Select so that no stepping, reading, or writing can be performed on an unselected FDD. Also, all signals generated within the FDD, except the Ready signal, are gated with Unit Select so that no signals can be transmitted from an unselected FDD.

During the write operation, the selected FDD receives Write Enable, Head Load, Write Data, and Low Current (Track 43 or greater) signals. If a Write Fault occurs, it will be transmitted to the controller. During Read operation, the selected FDD will receive a Head Load command. The Write Enable line remaining high implies a read operation. Under these conditions, the FDD will transmit Separated Data, Separated Clock, and Composite Read Data signals to the controller. Controller step in and step out commands are received initiating a track seek operation on a selected FDD. The FDD transmits Index and Sector pulses as long as it is selected. Also, the selected FDD transmits a Track 00 signal to the controller whenever the Read/Write head is at Track 00.

Positioning of the carriage-mounted Read/Write head is accomplished by a lead screw driven by a stepper motor. Each step command from the user system increments the stepper motor which, in turn, rotates the lead screw 15°. Each 15° rotation of the lead screw moves the Read/Write head one track position. The FDD has a power reduction option which reduces the stepper motor power 15 milliseconds after the last step command.



\*DAISY CHAIN MODELS ONLY

BRQ94a

Figure 4-1. Functional Block Diagram

A reading or writing operation begins by placing the Read/Write head in contact with the disk with a Head Load command and at the desired track. To write on the disk, Write Enable is sent by the controller to condition the write logic. The write current then in the head, reverses polarity synchronous with the low-to-high transitions of the Write Data pulses from the controller. The current reversals cause magnetic flux reversals, the data and clock bits which are induced on the desired disk track. Erasure of previously recorded data is simultaneously accomplished during the writing operation in addition to a delayed-tunnel-erase which ensures disk interchangeability.

To read from the disk, magnetized bits in the format of the pre-recorded data are sensed by the read/write head. This signal is amplified, digitized, separated into clock and data information, and transmitted to the user system.

### 4.3 FUNCTIONAL DESCRIPTION

Refer to Figures 4-1, 5-1, and the Schematic Diagram, Figure 5-2, for the following discussion.

The FDD is divided into the following major functional areas:

- a. Control Logic
- b. Write and Fault Logic
- c. Read Logic
- d. Disk Drive
- e. Read/Write Head

#### 4.3.1 CONTROL LOGIC

The functions of the control logic are to generate the signals that (a) establish the ready status of the FDD, (b) step the Read/Write head in or out upon selection and command of the controller, (c) load the head on the disk for read/write operations, (d) protect the disk from writing if the write protect hole is present, (e) indicate when the Read/Write head is at Track 00, (f) generate the index and sector pulses when the diskette is rotating and the FDD is selected, (g) unlock the FDD door latch upon command of the controller through one of four switch or jumper-selected control lines, and (h) unit selection of the FDD.

- a. The Ready signal is generated when the disk comes up to proper operating speed. The index pulses are used to re-trigger the multivibrator (U31 pin 5). The output of this element will remain high on a continuous basis when the repetition rate of the index pulses is shorter than the time out of U31 pin 7. This logic function is used to control the R/S flip flop (U19) to generate the Ready signal. W33 or switches (5, 6, 7 and 8) allow selection of the relative position of each FDD within the Daisy Chain Configuration.

- b. At initial voltage application, the two flip flops of U25 are asynchronously reset through the action of comparater U30. At the instant the 5V appears, U30 pin 1 will go high, forcing pins 1 and 13 of U25 low, and forcing output pins 6 and 8 of U25 high. As capacitor C43 is charged, U30 pin 1 will switch low, assisted by hysteresis. This will cause the reset signal to go high and remain high as long as the +5 volts remains present.

Each step command received sequentially energizes one of the three phases of the stepper motor. Either the logic level of the Direction signal or the use of Step In or Step Out signals determine whether the phase sequence is  $\phi A, \phi B, \phi C, \phi A$  . . . or  $\phi A, \phi C, \phi B, \phi A$ .

Movement of the Read/Write head is initiated by the step commands from the controller. the head is stepped one track, either toward the spindle (In) or away from the spindle (Out), with each step command. The direction is regulated by the status of the Direction line (a low level of the Direction line causes the Read/Write head to step toward the spindle, and a high level causes the Read/Write head to step away from the spindle) or by commanding either the Step In or Step Out Line.

Drive to the specific stepper motor phases, A, B, and C, is provided by logic-driven darlington transistors Q3, 4, and 5. The logic drivers also decode the activated stepper phase information from the outputs of U25's flip flops. The leading edge of a step command triggers the three microsecond one-shot U16, whose trailing edge clocks the flip flops.

The phase sequence through which the stepper motor is driven (see Table 4-1) is controlled by the steering logic: gates U27 pin 8; U27 pin 11; U28 pin 3; and U28 pin 6. These gates receive direction information from U22 pin 4. The output of this gate is high during the rising edge of the flip-flop clock for the step in sequence. It is low during the step out sequence. Encoded information, indicating the active stepper motor phase at the time a step command has been issued, is fed to the steering logic from flip flop U25 output pins 5, 6, 8, and 9.

Table 4-1. Phase Sequence of Stepper Motor

Change the Active Phase $\phi$		To Step
From	To	
A	B	IN
B	C	
C	A	
A	C	OUT
B	A	
C	B	

The power reduction option, which reduces the stepper motor power 15 milliseconds after the last step command, is accomplished through the retriggerable one shot multivibrator U26 at pin 7. The time out of this one shot is approximately 15 milliseconds. Step commands which occur at a repetition rate of 10 milliseconds will hold U26 low. This has the effect of holding transistor Q2 on, and clamping the center tap of the stepper motor at + 24 volts. When the last step command is received, the one shot will time out and go high. This turns Q2 off, leaving the center tap of the stepper floating. The inductive reaction of the stepper motor winding in use at that



instant of time will force the voltage at the center tap toward a negative voltage; however, the +5 volt clamp through CR11 will prevent the voltage from dropping lower than approximately 4.3 volts. The stepper motor voltage will then remain at this level until the next step command is received, which will force Q2 to the on state again.

- c. The Read/Write head of a selected FDD can be loaded when the disk is fully installed and the front panel door is closed. Closing the front panel door actuates the door interlock switch which completes the circuit to the head load solenoid. When the controller sends a Head Load signal, the head load solenoid is energized causing the armature bail to actuate. The actuation of the bail permits the head load arm and its pressure pad, under tension, to hold the disk surface against the Read/Write head.
- d. The Write Protect function is accomplished through use of an LED (light-emitting diode) and a photo-transistor. These are mounted such that the presence of a write protect hole in the jacket of the diskette will cause pin 14 of comparator U30 to be driven high. This signal is gated with Unit Select and Write Enable to inhibit writing on any diskette possessing a write protect hole.
- e. Track 00 signal is generated when the carriage assembly closes the Track 00 switch. Closing this switch sets the latch formed by the two gates of U29 pin 2 and U29 pin 4. The output of this latch (pin 2) is gated with  $\bar{O}A$  and Unit Select to provide the Track 00 signal that is transmitted to the controller from U15 pin 6. Capability exists for an optical light source (LED) and sensor (photo-transistor) to be used instead of a switch. The sensor output is fed into U30 pin 10, a comparator with hysteresis.
- f. The beginning of each disk track is indicated by an Index pulse. The disk rotates between a light source (LED) and a sensor (photo transistor). When the index hole in the disk passes over the light source, light is detected by the sensor. The sensor output is amplified and transmitted to the controller as the Index pulse when the FDD is selected.

An index/sector separator can be provided on the FDD for use with hard sectored diskettes. Proper operation of the ready function requires that the index pulses be separated in the FDD. The composite index/sector signal is applied to input pin 11 of one-shot multivibrator U31. Feedback from output pin 10 to input pin 12 causes the one-shot to be non-retriggerable. ANDing the two outputs with the composite index/sector signal provides the separated index and sector signals.

- g. The Door Unlock function enables the controller to activate a door unlocking solenoid and LED indicator by applying a low level to one of four jumper or switch selectable control lines. These lines are not gates with Unit Select. The four unlock positions of dipswitch S2 are 13, 14, 15, and 16, when jumper W32 is not used.
- h. The unit select function inhibits all Command and status signals except Door Unlock and Ready. The position of the FDD in the daisy chain configuration is determined by the location of jumper W34 or the activation of switches 1, 2, 3, and 4.

### 4.3.2 WRITE AND FAULT LOGIC

A write operation begins with a Write Enable command from the controller when the FDD is selected. This command simultaneously enables the write data switching drivers (flip flop U9 pins 5 and 6), the write data gate (U5 pin 5), blocks the input to the read circuit by reverse biasing diodes CR1 through CR4, and after a delay energizes the erase windings. Data applied to the Write Data input alternately switches a constant write current through the write drivers to the head windings. Low Current operation, used when writing on track 43 or greater, is selected by switching a shunt resistor (R38) into the write current source. The current source, U11 pin 5, is a current mirror circuit which causes the current into pin 5 to mirror the current into U11 pin 1.

A Write Fault signal is generated if Write Enable is commanded and the head is not loaded (head load solenoid not energized), or Write Enable is commanded and no data is applied, or Write Enable is commanded but Write Data is applied at the wrong rate. Either one or both of the conditions sets the Write Fault latch (U6). Commanding a Write Fault Reset clears the Write Fault signal by resetting the Write Fault latch.

### 4.3.3 READ LOGIC

Read operation is enabled when the Read/Write head is loaded on the diskette and Write Enable is not commanded. With Write Enable not commanded, the data blocking diodes (CR1 through CR4) are forward biased and data sensed by the Read/Write head is fed to the read data circuit. The read signal from the diskette is in the form of a sine wave.

This analog signal is amplified by U3, filtered, differentiated by C12/R11 and C13/R12, amplified by U2, and coupled to a comparator/logic circuit to detect zero crossings and reject noise in the differentiated read signal.

The out-of-phase comparators U1 pins 7 and 12 have rise and fall times whose differences are exaggerated by slow-down capacitor C2. This results in a narrow negative pulse at U8 pin 11 which triggers a one microsecond retriggerable one-shot, U26 pin 9.

Flip flop U9 pins 8 and 9 perform a noise rejection function in that noise near the zero crossings of the amplified differentiated data only result in retriggering U26 pin 9. This appears as jitter in the clock for the flip flop whose data input, derived from redundant comparator U10 pin 12, has by that time stabilized.

Another slow-down capacitor, C5, causes a negative 60ns pulse to appear at the output of U8 pin 8 whenever the flip flop toggles. Although shifted in time by approximately the delay of one-shot U26 pin 9, each pulse corresponds to a zero crossing of the differentiated signal, and a peak of the analog read signal. Jitter at the flip flop clock input and U8 pin 8, which is due to noise at the zero crossings, will not affect the 250ns composite data pulse width.

Optional clock and data separation is provided by the 3/4 cell one shot U17 pin 9. It times out 2.9 microseconds from the leading edge of the 250 nanosecond composite data pulse. During the timeout of the one shot, the DC reset is removed from flip flop U19 pin 13. This enables the flip flop to clock a high from the data input pin 12 to output pin 9 on the trailing edge of the composite data pulse. (Note: The separator must be preconditioned with two cells of "zero" data bits for proper operation). When the flip flop changes state, steering logic gate U18 pin 8 holds the clocking inputs to the one shot and flip flop high. The separated clock signal is held high during this interval through the action of gates U20 pin 11 and U14 pin 6 identical to U18 pin 8. The flip flop enables the "one" data bit to appear at U18 pin 6, U20 pin 8, and U14 pin 3 during this 3/4



#### 4.4.4 CONTROL AND DATA LINE FUNCTIONS

The signals that are exchanged are described in Table 4-2 and are shown relative to a point of origin in Figure 4-1.

Table 4-2. Input/Output Lines

SIGNAL	FUNCTION
<u>INPUT LINES</u>	
-STEP	A 10 microsecond (minimum) logic 1 level pulse on this line causes the head to move one track as determined by the direction line.
-DIRECTION	
-STEP IN	A logic 1 level on this line and step pulse causes the head to move one track inward toward the center of the diskette. A logic 0 level on this line and step pulse causes the head to move one track outward from the center of the diskette.
-STEP OUT	
-HEAD LOAD	A 10 microsecond (minimum) logic 1 level pulse on this line causes the head to move one track inward toward the center of the diskette.
	A 10 microsecond (minimum) logic 1 level pulse on this line causes the head to move one track outward from the center of the diskette.
	A logic 1 level on this line loads the diskette against the head through the use of a pressure pad on the opposing side of the diskette. The logic 1 level must be initiated 60 milliseconds prior to initiating a read or write operation to allow for head load settling time.
	For increased head and media life, this signal should be at a logic 0 whenever a data transfer operation is not in process or pending.
**Only one pair of signals per FDD.	

Table 4-2. (continued)

SIGNAL	FUNCTION
<u>INPUT LINES</u>	
-WRITE ENABLE	<p>To enable the FDD write driver, this line is held at a logic 1.</p> <p>To disable the FDD write driver and enable the FDD read circuitry, this line is held at logic 0. 500 microseconds minimum is required after a write operation before read data is stable.</p>
-WRITE FAULT RESET	<p>A logic 1 level on this line clears the write fault latch.</p>
-WRITE DATA	<p>This line contains the composite double frequency coded write clock and data information to the FDD. The write clock and data pulses must be 250 nanoseconds <math>\pm 20\%</math> in length and are true at the logic 1 level. Information to be recorded on the diskette is derived from the transition of each pulse from logic 1 to logic 0 if W2 is present, or from logic 0 to logic 1 if W3 is present on the PWA.</p>
-LOW CURRENT	<p>This line reduces write current for tracks 43 or greater. A low level reduces write current.</p>
-UNIT SELECT	<p>On this line a logic 1 level with W21 and W22 present or a logic 0 level with W20 and W23 present enables the FDD interface except for -Door Unlock and -Ready.</p>
-DOOR UNLOCK	<p>A logic 1 level on this line illuminates an LED indicator on the front panel of the FDD and activates a solenoid which unlocks the door latch mechanism, permitting manual opening of the door.</p>
<u>OUTPUT LINES</u>	
-READY	<p>A logic 1 level indicates that the door is closed, a diskette is rotating, and that no write fault condition exists.</p>
-INDEX	<p>This line gives an indication of the rotational position of the diskette by outputting a logic 1 pulse for every index hole of the diskette. The 1.5 millisecond pulse is generated by sensing the index hole in the diskette using a photo-optical technique.</p>

Table 4-2. (continued)

SIGNAL	FUNCTION
<u>OUTPUT LINES</u>	
-SECTOR	<p>This line gives an indication of the rotational position of the diskette by outputting a logic 1 pulse for every sector hole of the diskette. The 1.5 millisecond pulse is generated by sensing the sector holes with the same photo-optical assembly used for index.</p>
+ WRITE FAULT	<p>A logic 0 level indicates one or more of the following fault conditions.</p> <ul style="list-style-type: none"> <li>-Write enable without head load.</li> <li>-Write enable without write data.</li> <li>Incorrect write data rate.</li> </ul>
-WRITE FAULT	<p>A logic 1 level indicates one or more of the following fault conditions.</p> <ul style="list-style-type: none"> <li>-Write enable without head load.</li> <li>-Write enable without write data.</li> <li>Incorrect write data rate.</li> </ul> <p>A write fault can be cleared by a logic 1 on the write fault reset line.</p>
-TRACK 00	<p>A logic 1 level indicates that the head is positioned over Track 00.</p>
-WRITE PROTECT	<p>Logic 1 level indicates that hole on diskette is uncovered.</p>
-READ DATA (Separated)*	<p>This line contains the separated data information. A logic 1 level pulse of 250 nsec corresponds to a data 1 bit read from the diskette.</p>
-CLOCK(Separated)*	<p>This line contains the separated clock information. A logic 1 level pulse of 250 nsec corresponds to a clock bit read from the diskette.</p>
-READ DATA (Composite)	<p>This line contains the unseparated data and clock information. A logic 1 level pulse of 250 nsec corresponds to a data or clock bit read from the diskette.</p>
<p>*The signals are valid only when double frequency recording without missing clock is used.</p>	

5.1 INTRODUCTION

This section contains the printed circuit board documentation and related timing diagrams. This documentation applies to the printed circuit boards listed in Table 5-1. Refer to the Configurator sheet, located in the front of the manual, to determine the assembly number of the circuit board being serviced.

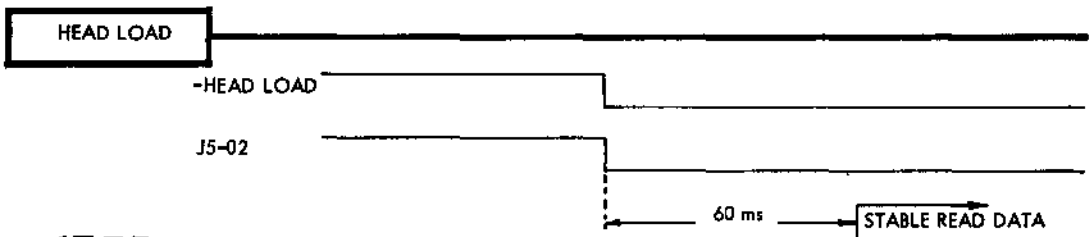
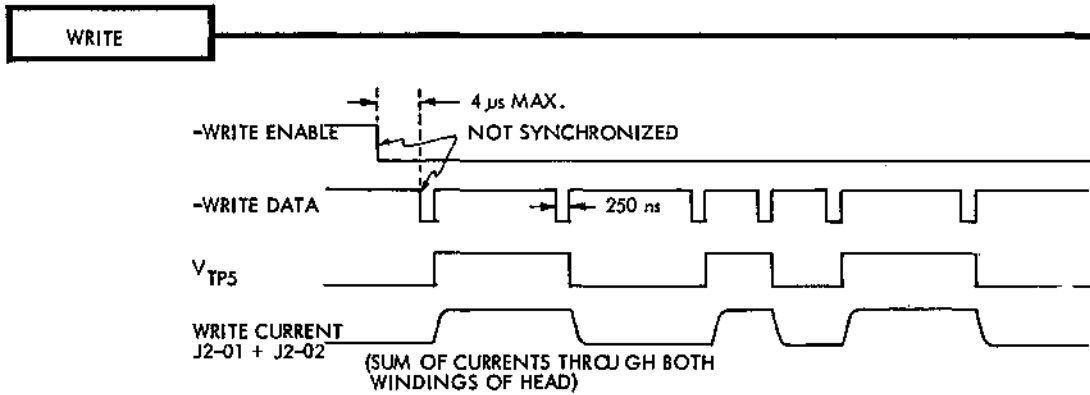
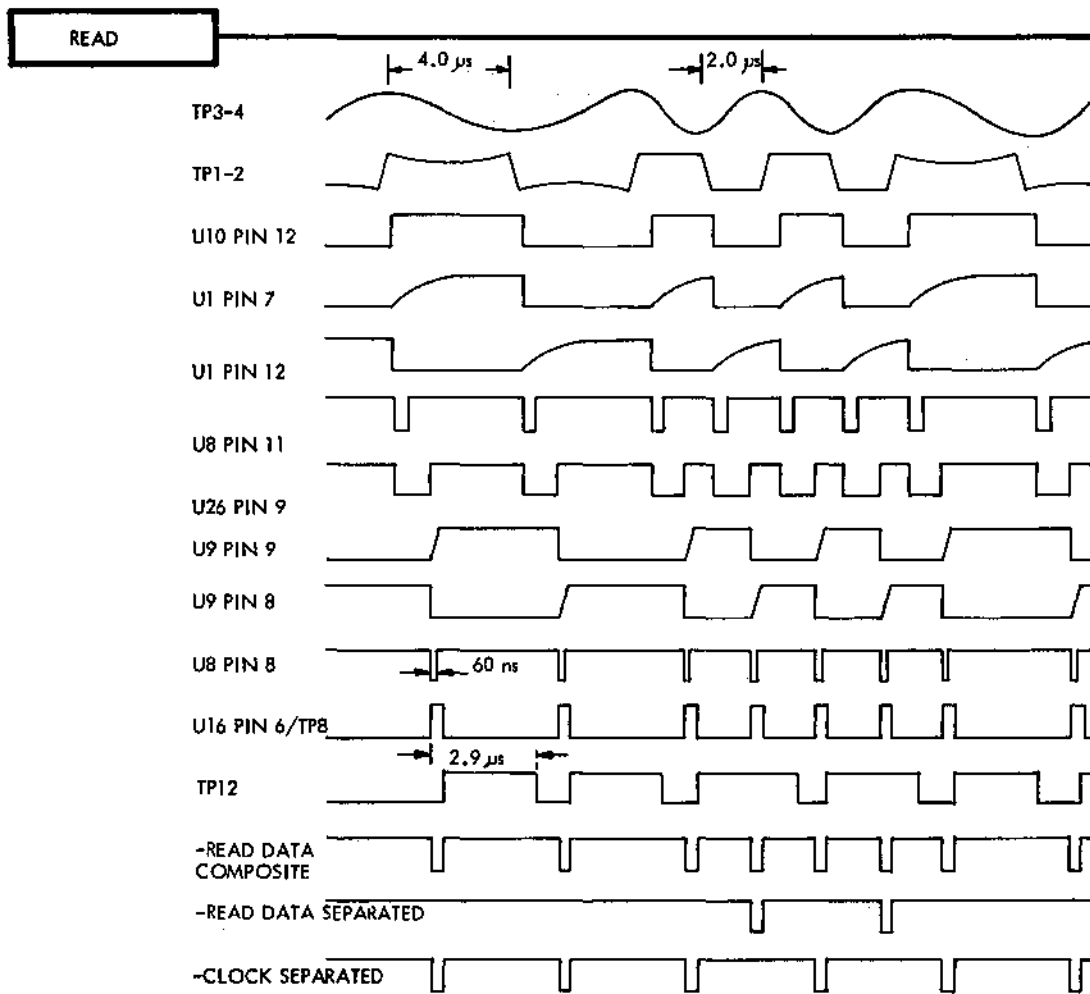
Figure 5-1 shows timing diagrams which illustrate signal/time relationships during read, write, step-in and step-out operations. Figure 5-2 is the printed circuit board schematics and Figure 5-3 contains the assembly drawing and parts list.

Table 5-1. PWA Configurator

(See Figure 5-3)

OPTIONAL CHART	ACTIVITY INDICATOR								
	WRITE FAULT								
	DOOR UNLOCK								
	READY								
	UNIT SELECT								
	SECTOR SEPARATION								
	POWER REDUCTION								
	DATA CLOCK SEPARATION								
	WRITE PROTECT								
	HOUR METER								
	INTERFACE CONNECTOR TYPE								
CONFIG. REF. NO.	CIRCUIT BOARD IDENT. NO.								
501	75890300	A						X	
502	75890350	C						X	
503	75890400	D	X	X	X	X	X	X	
504	75890450	A	X	X		X	X	X	
505	75890500	A	X	X	X	X	X	X	
506	75890550	B		X				X	
507	75890600	A	X			X	X	X	
508	75890650	A	X		X	X	X	X X	
509	75890700	A		X	X	X	X	X	
510	75890750	A	X	X	X	X	X	X	
511	75896300	A	X		X	X	X	X X	
512	75892150	C			X			X	
513	77614500	B		X				X	

X161a



BB154a

Figure 5-1. Timing



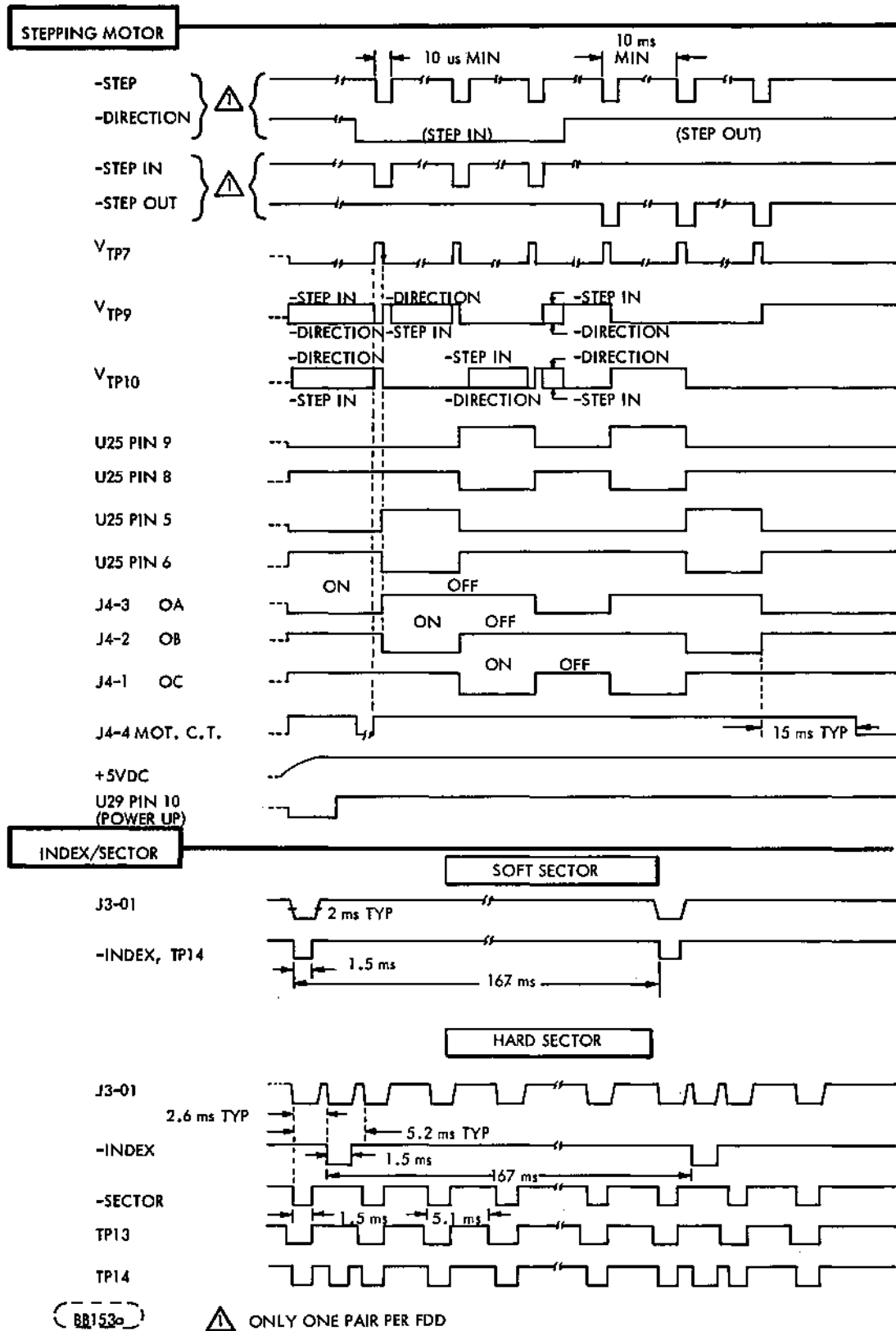


Figure 5-1. Timing (continued)



Figure 5-2. Schematics (Sheet 2 of 6)

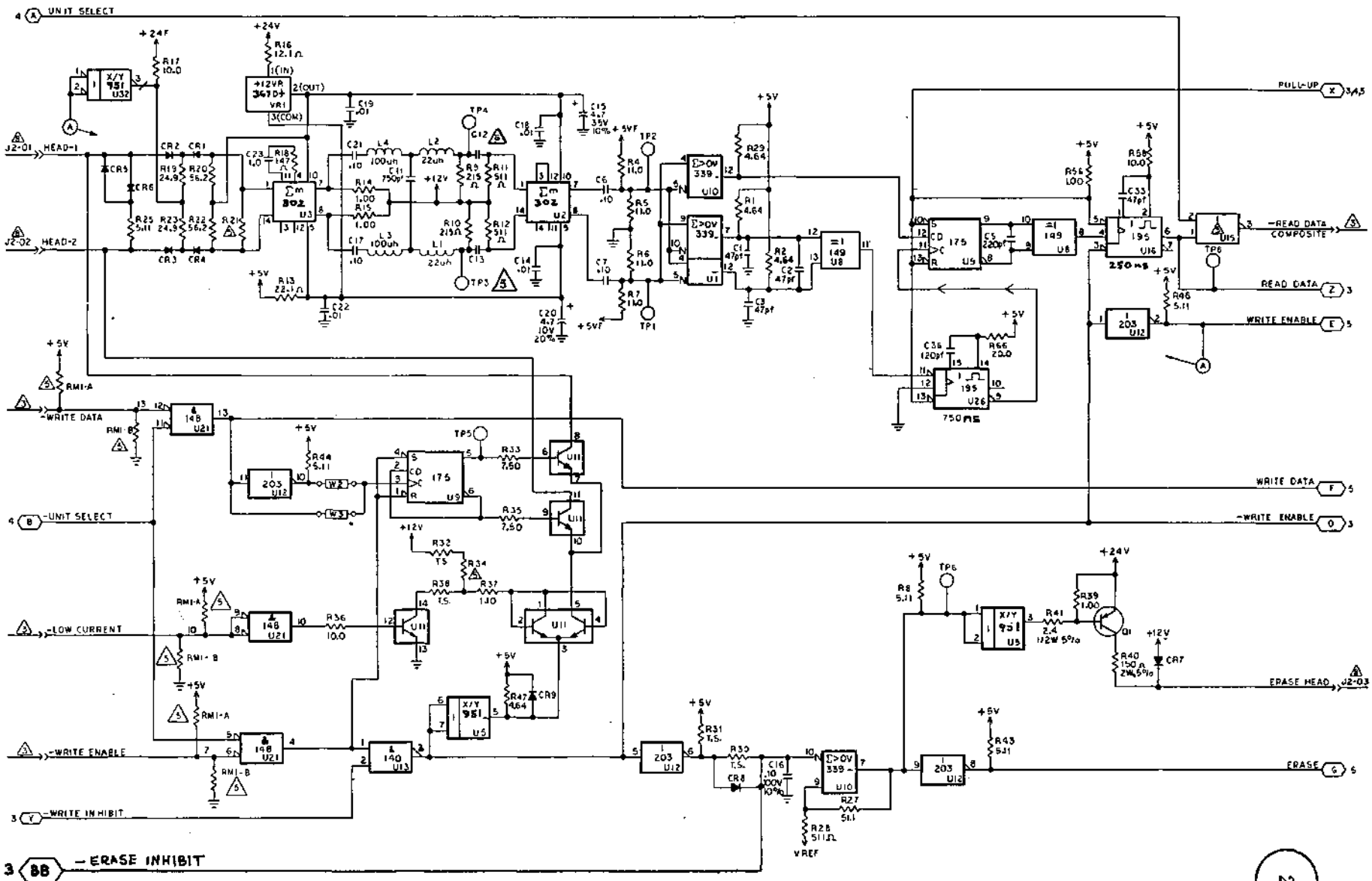


Figure 5-2. Schematics (Sheet 3 of 6)

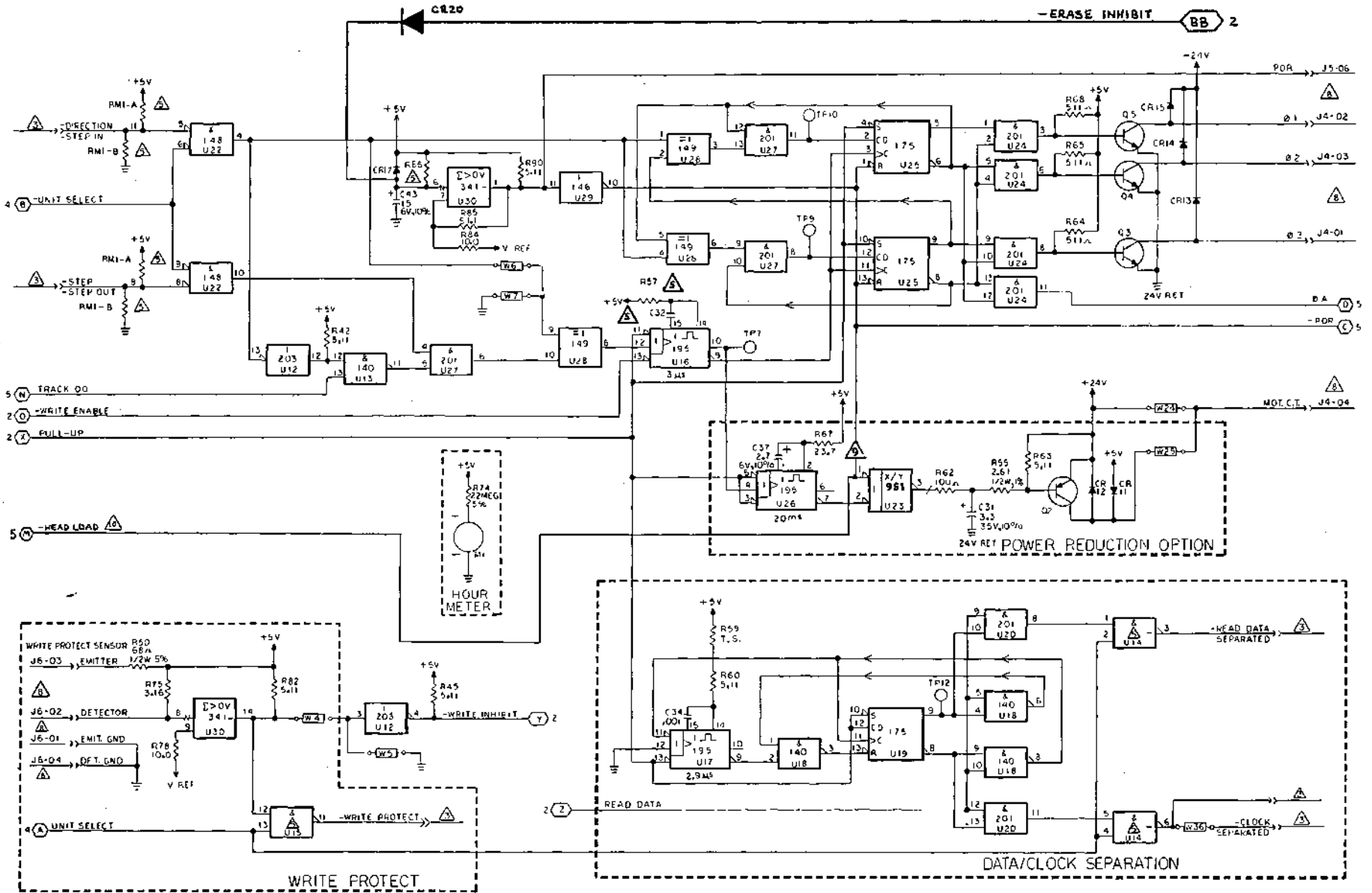


Figure 5-2. Schematics (Sheet 4 of 6)

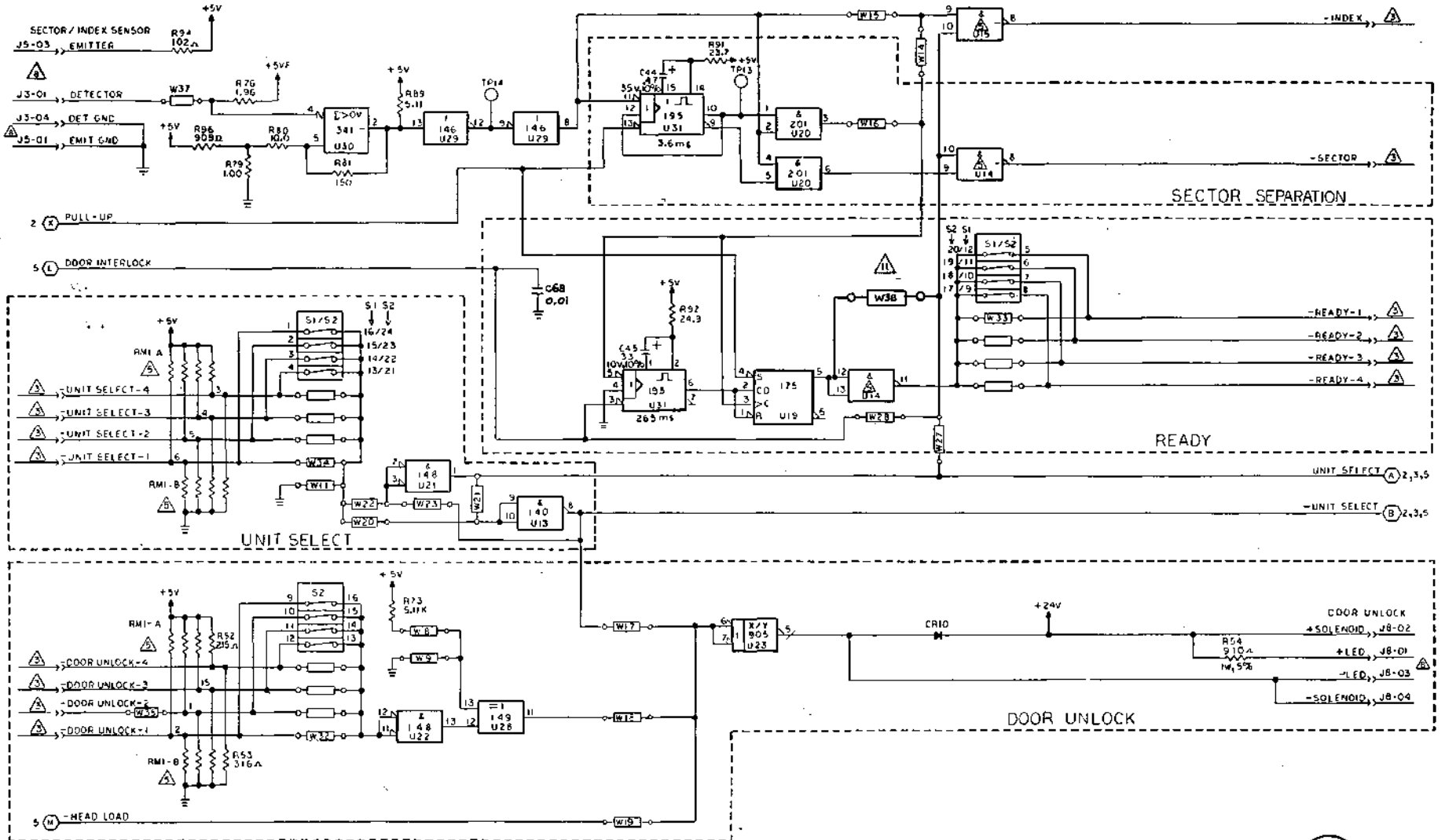


Figure 5-2. Schematics (Sheet 5 of 6)

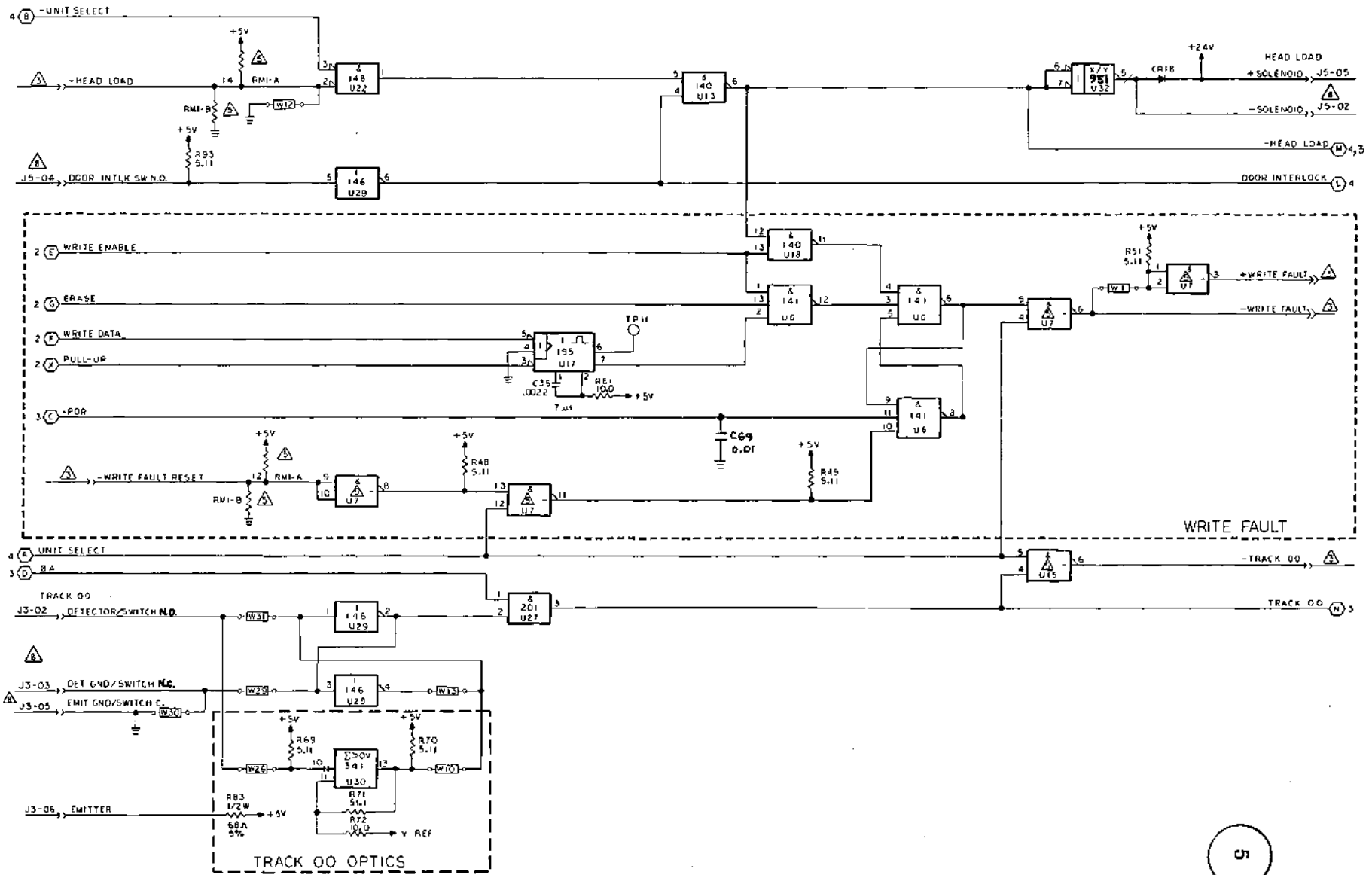
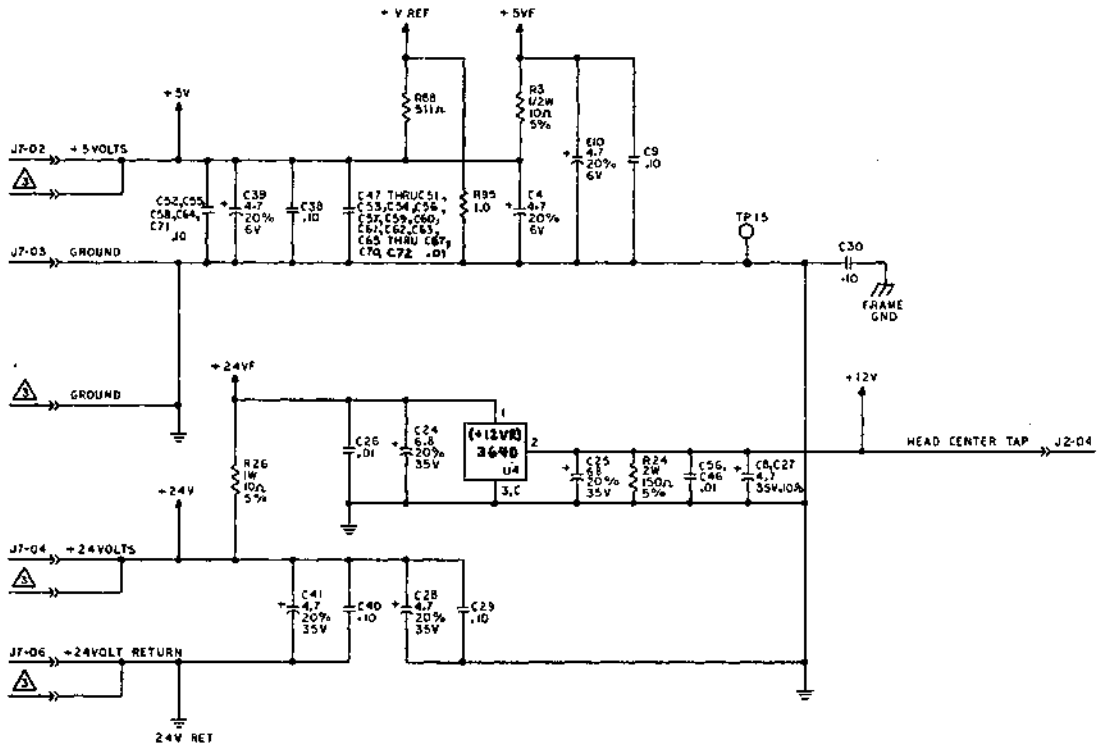


Figure 5-2. Schematics (Sheet 6 of 6)



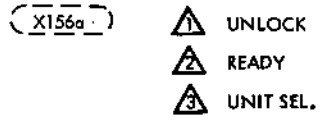
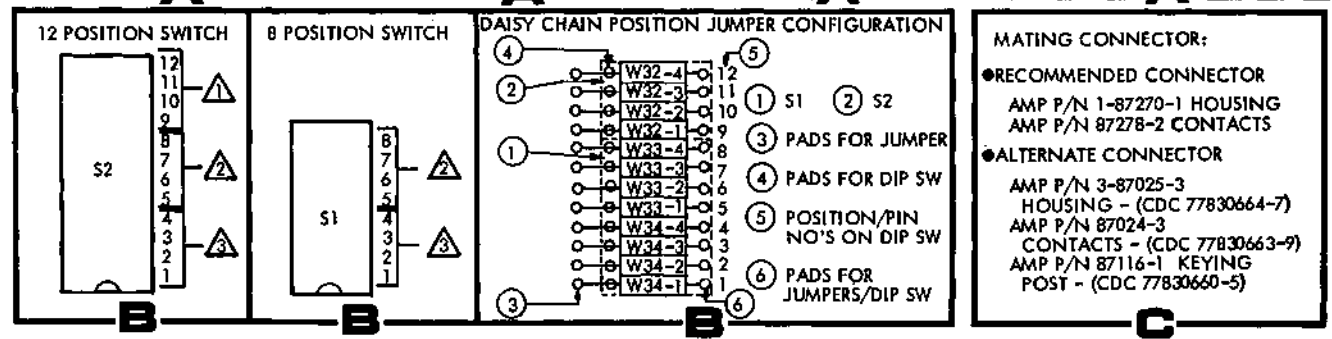
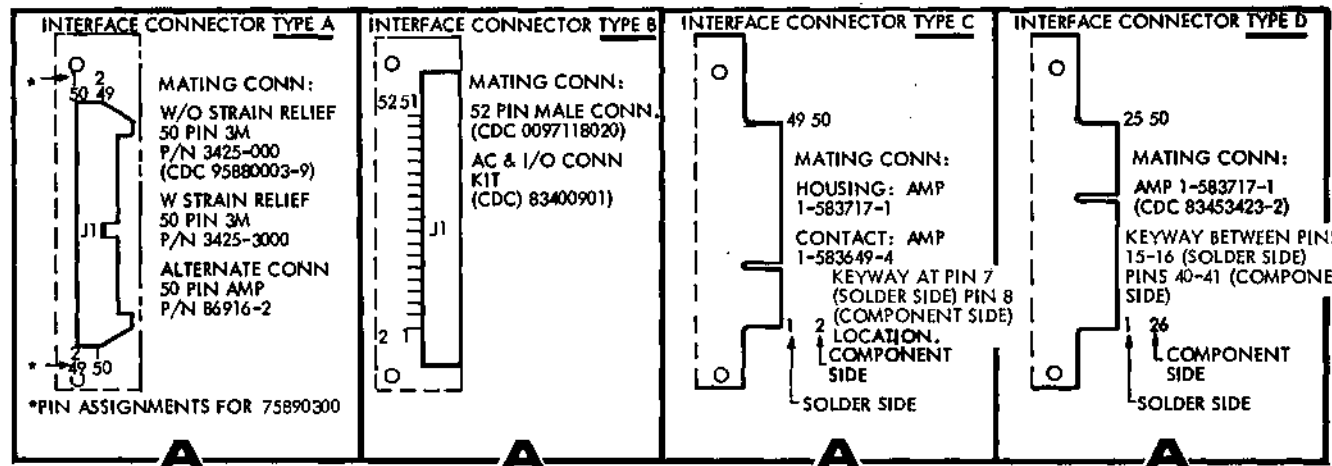
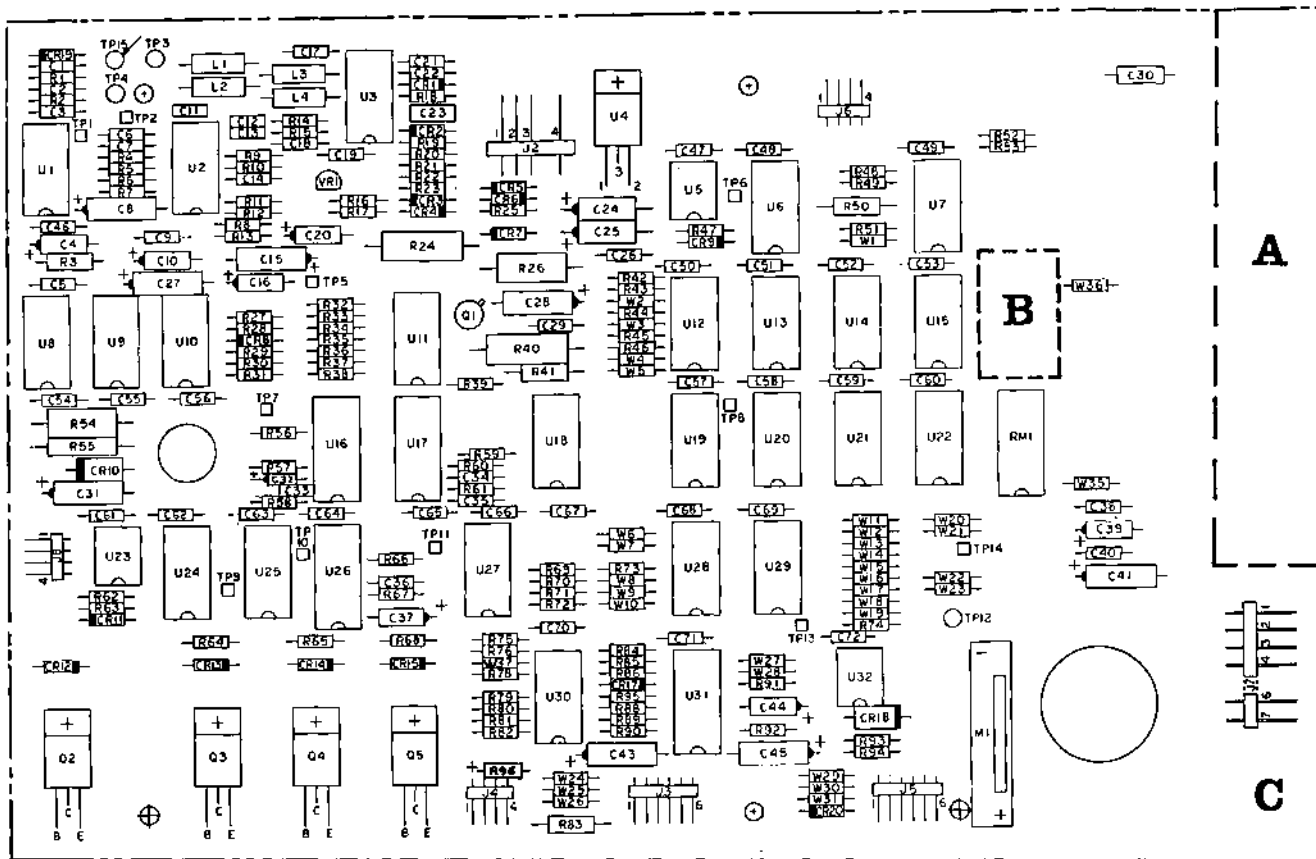


Figure 5-3. Assembly and Parts List (Sheet 1 of 5)



RES	PL ITEM	RES	PL ITEM	CAP	PL ITEM	CAP	PL ITEM	IC	PL ITEM	JMPR	PL ITEM	CONN	PL ITEM
R1	44	R48	52	C1	84	C48		U1	17	W1	106	J1	22
R2	44	R49	52	C2	84	C49		U2	16	W2	106	J2	23
R3	69			C3	84	C50		U3	16	W3		J3	116
R4	57	R51	52	C4	92	C51		U4	19	W4	106	J4	25
R5	57	R52	62	C5	107	C52	76	U5	4	W5	106	J5	24
R6	57	R53	38	C6	76	C53		U6	5	W6	106	J6	25
R7	57	R54	72	C7	76	C54		U7	6**	W7	106	J7	100
R8	52	R55	67	C8	94	C55	76	U8	13	W8	106	J8	101
R9	41	R56	43	C9	76	C56	76	U9	11	W9			25
R10	41	R57	53	C10	92	C57		U10	17	W10			
R11	54	R58	35	C11	77	C58	76	U11	18	W11	106		
R12	54	R59	63	C12	79△	C59		U12	7	W12	106	TSTR	PL ITEM
R13	39	R60	52	C13	79△	C60		U13	8	W13	106	Q1	28
R14	43	R61	35	C14	75	C61		U14	6**	W14	106	Q2	27
R15	43	R62	61	C15	94	C62		U15	6**	W15	106	Q3	26
R16	40	R63	52	C16	95	C63		U16	10	W16	106	Q4	26
R17	35	R64	54	C17	76	C64	76	U17	10	W17	106	Q5	26
R18	78	R65	54	C18	75	C65		U18	8	W18	106		
R19	60	R66	45	C19	75	C66		U19	11	W19			
R20	36	R67	55	C20	85	C67		U20	12	W20	106		
R21	37#	R68	54	C21	76	C68	82	U21	9	W21	106	SW	PL ITEM
R22	36	R69	52	C22	75	C69	82	U22	9	W22	106	S1	32
R23	60	R70	52	C23	80	C70		U23	4	W23	106	S2	33
R24	71	R71	50	C24	96	C71	76	U24	12	W24	106		
R25	52	R72	36	C25	96	C72	76	U25	11	W25	106		
R26	73	R73	52	C26	82	C73	123	U26	10	W26	106		
R27	50			C27	94			U27	12	W27	106		
R28	54			C28	102	DIO	PL ITEM	U28	13	W28	106		
R29	44	R76	42	C29	76	CR1	29	U29	14	W29	106		
R30	63	R77		C30	81	CR2	29	U30	15	W30			
R31	63	R78	35	C31	98	CR3	29	U31	10	W31	106		
R32	63	R79	43	C32	87**	CR4	29	U32	4	W32			
R33	46	R80	35	C33	83	CR5	29			W33			
R34	54##	R81	58	C34	87	CR6	29	RES MOD	PL ITEM	W34			
R35	46	R82	52	C35	88	CR7	29	RM 1	20###	W35	106		
R36	35			C36	86	CR8	29			W36	106		
R37	47△△△	R84	35	C37	93	CR9	29	MET	PL ITEM	W37	106		
R38	63	R85	50	C38	76	CR10	30			W38	106		
R39	43	R86	51*	C39	92	CR11	31	REG	PL ITEM	L1	65		
R40	71	R87		C40	76	CR12	31			L2	65		
R41	70	R88	54	C41	102	CR13	31	VR1	74	L3	64		
R42	52	R89	52	C42		CR14	31			L4	64		
R43	52	R90	52	C43	91	CR15	31						
R44	52	R91	55	C44	97	CR16							
R45	52	R92	60	C45	90	CR17	29						
R46	52	R93	52	C46	76	CR18	30						
R47	44	R94	56	C47	89	CR19	31						
		R95	43			CR20	114						
		R96	119										

X155a

\*EXCEPT 77890300 WHICH IS ITEM 118  
 \*\*EXCEPT 77890400 AND 77614500 WHICH IS ITEM 121  
 #EXCEPT 77890400 WHICH IS ITEM 118  
 ##EXCEPT 77890400 WHICH IS ITEM 120  
 ###EXCEPT 77614500 WHICH IS ITEM 122.  
 •EXCEPT 75896300 WHICH IS ITEM 45  
 ••EXCEPT 75896300 WHICH IS ITEM 124

△ EXCEPT 75890400 WHICH IS ITEM 123

△△△ EXCEPT 75890400 WHICH IS ITEM 125

Figure 5-3. Assembly and Parts List (Sheet 2 of 5)

Item No.	Part Number	Description	Remarks
2	75890320-7	PWB Improved FDD - Std	(6)
2	75890370-2	PWB Improved FDD - H	(7)
2	75890420-5	PWB Improved FDD-D/G	(8)
2	75890770-3	PWB Improved FDD-P	(10)
2	77624770-2	PWB Improved FDD-D/S	(11)
2	75890570-7	PWB Improved FDD-N	(9)
4	15161600-0	IC 75461 Driver, Dual Peripheral	
5	66299100-9	IC 7410 Triple 3-Input NAND	
6	15158300-2	IC 7438 Quad 2-Input NAND Buffer (OC)	(1)
7	15161300-7	IC 7405 Hex Invert (Open Collector)	
8	66299099-3	IC 7400 Quad 2- Input NAND	
9	66299103-3	IC 7402 Quad 2-Input NOR	
10	15104301-5	IC 9602 MV, Dual Retrigger TTL	
11	96744156-9	IC 7474 TTL Dual D Type F/F	
12	88897000-1	IC 7408 TTL Quad 2-Input AND	
13	88885700-0	IC 7486 TTL Quad 2-Input Exclusive OR	
14	39389700-4	IC 7404 TTL Hex Inverter	
15	95794600-7	IC LM339 Comparator, Quad	
16	15163100-9	IC 733C	
17	15161800-6	IC LM319 Comparator, Dual	
18	77832315-4	IC 3086 Transistor Array, 3 Single 1 current	
19	15161100-1	78M12 Voltage Regulator	
20	95894500-8	Res Pac 220/330	
21	94260301-0	Socket 16 Pin	(2)
21	51848401-1	Socket 16 Pin	(5)
22	94359504-1	Header-Flat Cable	(3)
22	75773900-8	Header-Right Angle	(4)
23	75772401-8	Connector Hdr	
24	75743719-9	Header-Right Angle	
25	75743717-3	Header-Right Angle	
26	77836043-8	Transistor T1P120	
27	77836044-6	Transistor T1P125	
28	77835186-6	Transistor 2N2907A	
29	51736700-9	Diode 1N914A	
30	56142000-1	Diode-Silicon	
31	94616400-1	Diode	
32	83452205-4	Switch-8 Position	
33	83452209-6	Switch-12 Position	
35	94360400-9	Res 1/4W 1% 10.0K	
36	94360472-8	Res 1/4W 1% 56.2K	
37	94360388-6	Res 1/4W 1% 8.25K	
38	94360248-2	Res 1/4W 1% 316	
39	94360133-6	Res 1/4W 1% 22.1	
40	94360108-8	Res 1/4W 1% 12.1	
41	94360232-6	Res 1/4W 1% 215	
42	94360328-2	Res 1/4W 1% 1.96K	
43	94360300-1	Res 1/4W 1% 1.0K	
44	94360364-7	Res 1/4W 1% 4.64K	
45	94360429-8	Res 1/4W 1% 20.0K	
46	94360384-5	Res 1/4W 1% 7.50K	
47	94360304-3	Res 1/4W 1% 1.10K	
50	94360468-6	Res 1/4W 1% 51.1K	
51	94360448-8	Res 1/4W 1% 31.6K	

Figure 5-3. Assembly and Parts List (Sheet 3 of 5)

<u>Item No.</u>	<u>Part Number</u>	<u>Description</u>	<u>Remarks</u>
52	94360368-8	Res 1/4W 1% 5.11K	
53	94360390-2	Res 1/4W 1% 8.66K	
54	94360268-0	Res 1/4W 1% 511	
55	94360436-3	Res 1/4W 1% 23.7K	
56	94360201-1	Res 1/4W 1% 102	
57	94360404-1	Res 1/4W 1% 11.0K	
58	94360517-0	Res 1/4W 1% 150K	
60	94360438-9	Res 1/4W 1% 24.9K	
61	94360200-3	Res 1/4W 1% 100	
62	94360232-6	Res 1/4W 1% 215	
63	94357500-1	Resistor Test Select	
64	75887607-2	Inductor 5% 100 UH	
65	75887599-1	Inductor 5% 22 UH	
67	92577340-0	Res 1/2W 1% 2.61K	
68	24500235-9	Res 1/2W 5% 68	
69	24500115-1	Res 1/2W 5% 10	
70	24500172-2	Res 1/2W 5% 2.4K	
71	24504843-4	Res 2W 5% 150	
72	24507162-6	Res 1W 5% 910	
73	24507101-4	Res 1W 5% 10	
74	83452805-1	78L12 AWC Volt Reg.	
75	92496227-7	Cap 100V 20% .01UF	
76	94361400-8	Cap 50V +80-20% 0.10UF	
77	94227247-7	Cap 100V 2% 750	
78	94360216-9	Res 1/4W 1% 147	
79	94227238-6	Cap 100V 2% 330	
80	77830567-2	Cap 25V + 80 -20% 1.0UF	
81	75890977-4	Cap 100V 0.10 UF	
82	75808537-7	Cap 100V 10% 0.01 UF	
83	94227218-8	Cap 500V +/- 1 PF 47	
84	75808509-6	Cap 100V 10% 47	
85	24504346-8	Cap 10V 20% 4.7UF	
86	75808514-6	Cap 100V 10% 120	
87	75808525-2	Cap 100V 10% 1000	
88	75808529-4	Cap 100V 10% 2200	
90	17706718-8	Cap 10V 10% 33 UF	
91	24505263-4	Cap 6V 10% 15 UF	
92	24504310-4	Cap 6V 20% 4.7UF	
93	24505254-3	Cap 6V 10% 2.7UF	
94	24505237-8	Cap 35V 10% 4.7 UF	
95	75808549-2	Cap 100V 10% 0.10UF	
96	24504339-3	Cap 35V 20% 6.8UF	
97	24505225-3	Cap 35V 10% .47UF	
98	24505235-2	Cap 35V 10% 3.3UF	
100	77600000-2	Right Angle Header	

Figure 5-3. Assembly and Parts List (Sheet 4 of 5)

<u>Item No.</u>	<u>Part Number</u>	<u>Description</u>	<u>Remarks</u>
101	77600002-8	Right Angle Header	
102	24504337-7	Cap 35V 20% 4.7UF	
103	10125103-1	Scr Nut-Hex Mach 4-40	
104	10126400-0	Washers Ext Tooth Lo	
105	93640012-6	Stud-Self Clinching	
106	94358500-0	Lead, Electrical	
106	77832252-9	Lead, Electrical	Intch
107	75808517-9	Cap 100V 10% 220	
113	92498021-2	Terminal, Swaged	
114	77612009-9	Diode, 1N770	
115	94360348-0	Res 1/4W 1% 3.16K	
116	75743718-1	Header-Right Angle	
118	94360380-3	Res 1/4W 1% 6.81K	
119	94360292-0	Res 1/4W 1% 909	
120	94360256-5	Res 1/4W 1% 383	
121	88885600-2	IC 7437	
122	75738655-2	Resistor Module	
123	94227250-1	Cap 100V 2% 1000	
124	38879326-7	Cap 50V 20% 0.68 UF	
125	94360276-3	Res 1/4W 1% 619	

NOTES:

- (1) Not Used on 75890400 & 77614500
- (2) Used on 75890600 & 75890750 Only
- (3) Not Used on 75890300, 75890350, 75890550, 75892150 & 77614500.
- (4) Used on 75890550 & 77614500 Only
- (5) Used on 75890450, 75890500, 75890650, 75890700
- (6) Used on 75890300 Only
- (7) Used on 75890350 & 75892150 Only
- (8) Used on 75890400 Only
- (9) Used on 75890550 & 77614500 Only
- (10) Used on 75890450, 75890500, 75890600, 75890650, 75890700 & 75890750 Only
- (11) Used on 77624750 Only

Figure 5-3. Assembly and Parts List (Sheet 5 of 5)

## 6.1 INTRODUCTION

This section contains the instructions required to maintain the FDD. The information is provided in the form of preventive maintenance, troubleshooting and corrective maintenance.

## 6.2 MAINTENANCE TOOLS

The special tools (or equivalent) required to maintain an FDD are as follows:

<u>DESCRIPTION</u>	<u>CDC PART NUMBER</u>
Alignment Diskette (Optional)	Model 421-51W
Outer Stop Gauge	83401300
Inner Stop Gauge	83401400

The standard tools required to maintain the FDD are as follows:

- Socket Wrenches  
 Sizes: 5/16" (7.94mm), 1/4" (6.35mm), 3/16" (4.76mm), 11/32" (8.73mm)
  
- Allen Wrenches  
 Sizes: 0.050" (1.27mm), 1/16" (1.59mm), 5/64" (1.98mm), 7/64" (2.78mm)
  
- Oscilloscope, Tektronix 335, or equivalent.
  
- Feeler Gauges, wire  
 Sizes: 0.030" (0.762mm), 0.058" (1.47mm), 0.060" (1.52mm), 0.062" (1.58mm), 0.079" (2.01mm)
  
- Feeler Gauge, Shim: 0.072" (1.83mm)  
 0.010" (0.254mm)

## 6.3 PREVENTIVE MAINTENANCE

The head load pad should be inspected after 650 hours of head-load time. If pad is worn, dirty, torn, or loose it should be replaced. (See paragraph 6.7.4).

## 6.4 HEAD CLEANING

On occasions the Read/Write head may require cleaning. If this situation occurs clean head as follows:

**CAUTION**

Do not smoke while cleaning. Do not touch a head surface with fingers. Do not leave residue or lint on the head surfaces. Residual particles can result in a scored disk and/or loss of a head.

Do not raise head-load arm to the 90-degree position and then release it; damage to the load-arm spring and/or to the head (core and ceramics) could result.

- a. Use lint-free cloth to lightly drybuff head surface. Cleaning is completed if deposits are removed.
- b. If oxide deposits were not removed in step (a), dampen (do not soak) cloth with cleaning solution (91% isopropyl alcohol) and wipe head surface. Finish by lightly dry buffing again to ensure that the head is dry and no alcohol residue is left.

## 6.5 TROUBLESHOOTING

An improperly adjusted FDD may exhibit symptoms of one that has a malfunction; therefore, the Adjustment Procedures (paragraph 6.6) should be performed before assuming that the unit has failed. If the malfunction still exists after the performance of the adjustment procedures, consult Table 6-1 and the Troubleshooting Flow Charts for the symptoms observed, checks to be made, and action to be taken. Refer to Figure 6-1 for test points. Before troubleshooting is started, check all DC supply voltages.

Table 6-1. Flowchart Reference

Flowchart Paragraph No.	Symptoms
6.5.2	Diskette Not Rotating
6.5.3	Read Signal Missing
6.5.4	Drive Not Responding to Commands
6.5.5	Index Pulse Missing
6.5.6	Head Not Loading
6.5.7	Read/Write Head Stepping
6.5.8	No Track 00 Indication
6.5.9	Read Errors
6.5.10	Write Errors
6.5.11	Write Protect Inoperative

### 6.5.1 DC VOLTAGE AND SIGNAL CHECK

- a. Input power should be +5VDC  $\pm 5\%$  and +24VDC  $\pm 10\%$  measured at the input to the FDD (refer to paragraph 3.4.2).
- b. Test Points: The signals at the test points should conform to the various diagrams and waveforms as listed:

<u>Test Point No.</u>	<u>Refer to Fig. No.</u>	<u>Comments</u>
1	5-1	Differentiated Analog
2	5-1	Read Data (Differential)
3	5-1, 6-2, 6-3	Analog Read Data
4	5-1, 6-2, 6-3	(Differential)
5	5-1, 6-4	Write flip flop
6	- - -	Not for Field Use*
7	5-1	Stepper One-Shot
8	5-1	+Composite Read Data
9	5-1	Stepper Steering Logic

\*Erase current should be 80mA typically into J2-03 when the FDD is write enabled.

b. -contd.

Test Point No.	Refer to Fig. No.	Comments
10	5-1	Stepper Steering Logic
11	---	Not for Field Use**
12	5-1	3/4 Cell Timing
13	5-1	Sector One-Shot
14	5-1	Index/Sector

c. Signals should conform to Figure 5-1 and Figures 6-1 through 6-4.

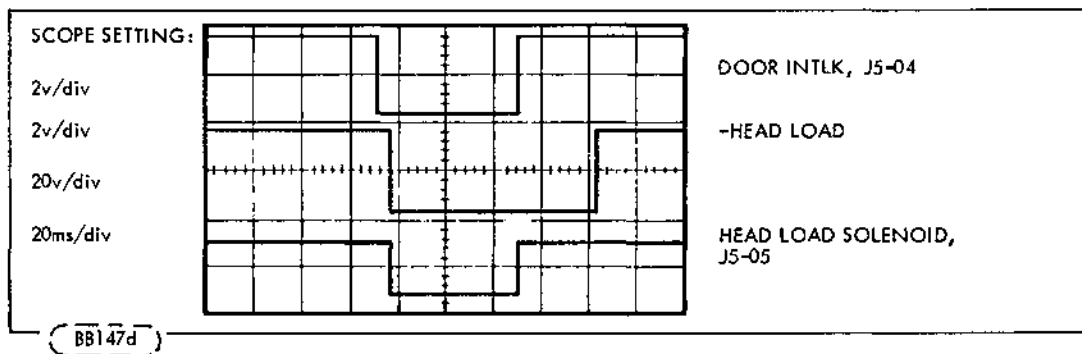


Figure 6-1. -Head Load and Door Interlock Switch

\*\*A Write Fault should occur when the FDD is Write Enabled and no Write Data is sent.

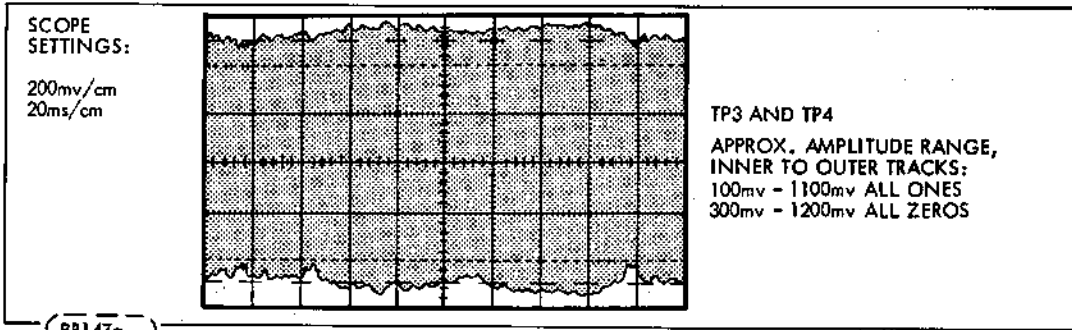


Figure 6-2. Differential Read Signal for Entire Track

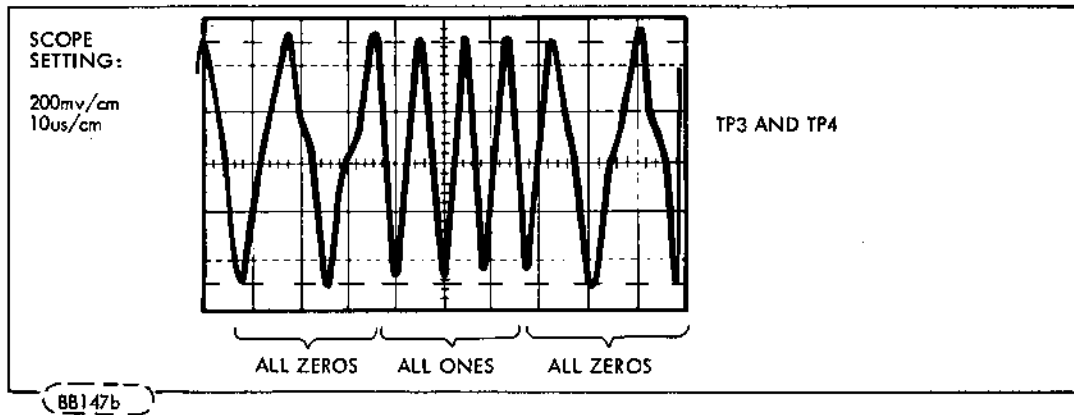


Figure 6-3. Differential Read Signal for Portion of Outer Track

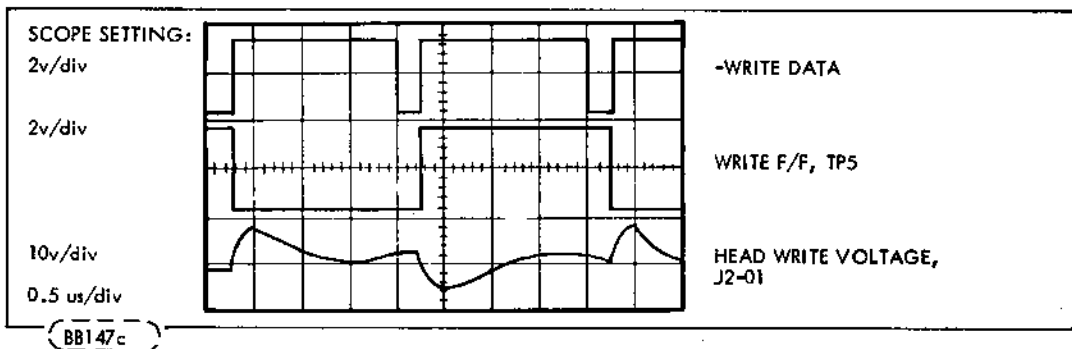
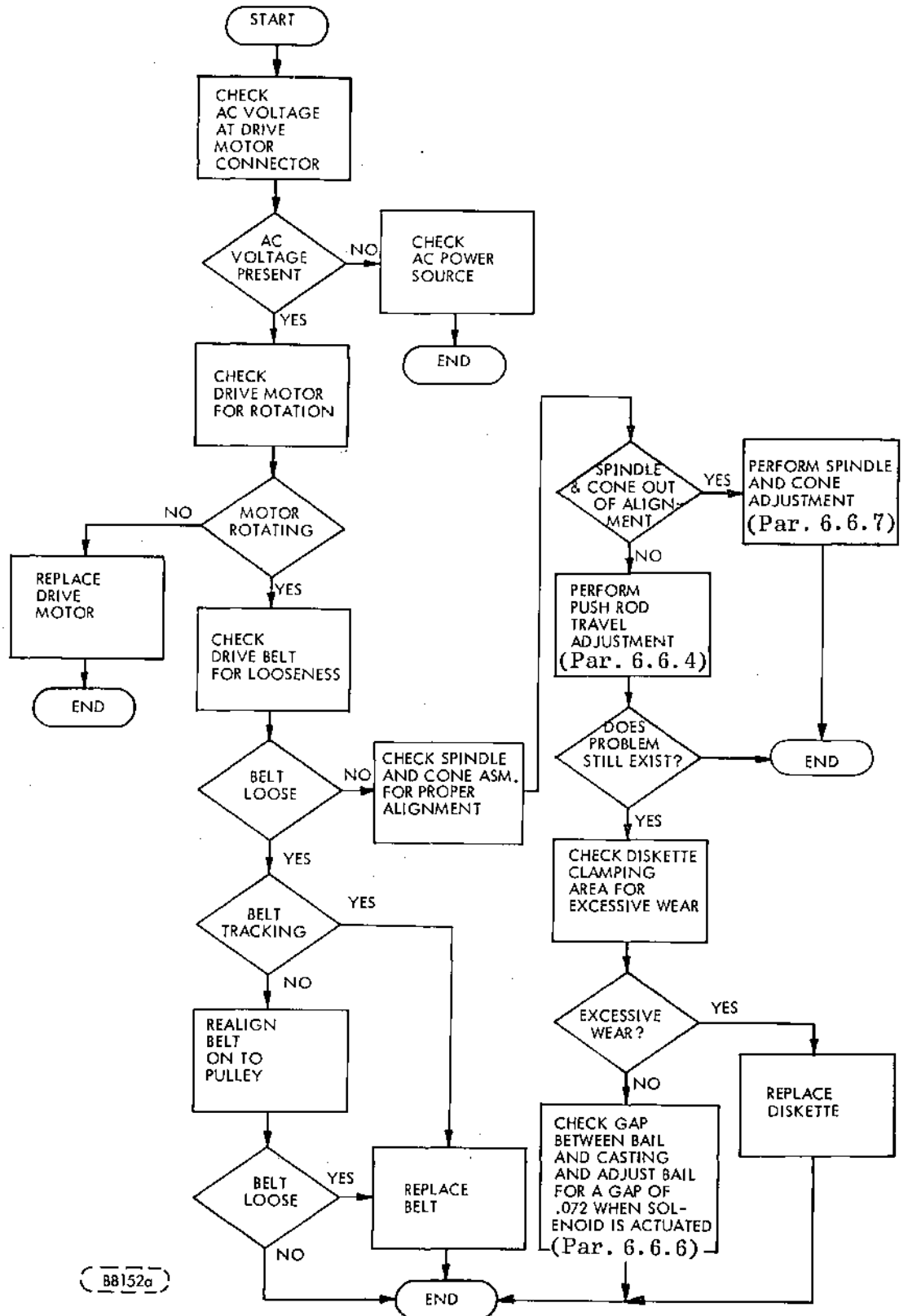


Figure 6-4. Write Data, Write F/F Output, and Head Write Voltage for Outer Track

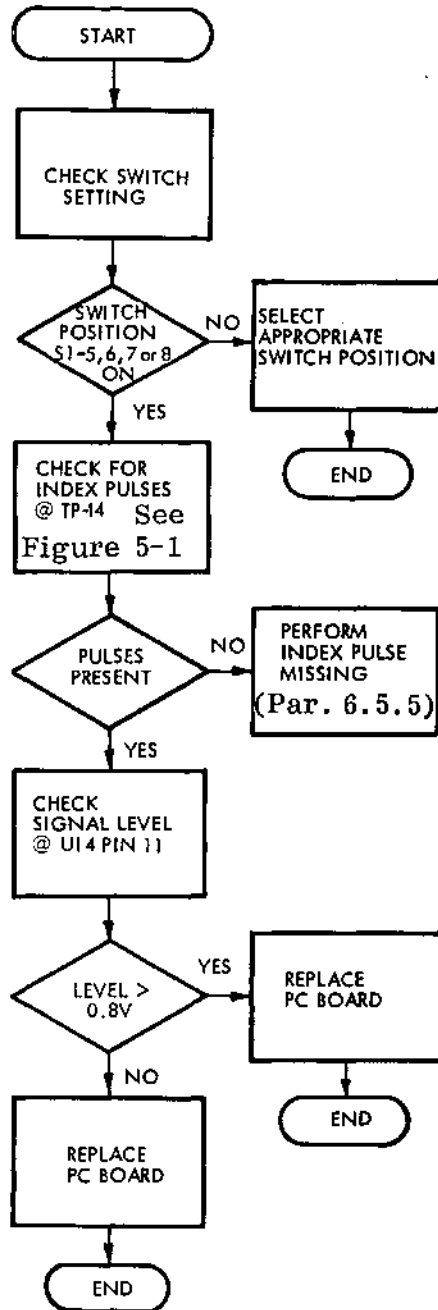


## 6.5.2 DISKETTE NOT ROTATING



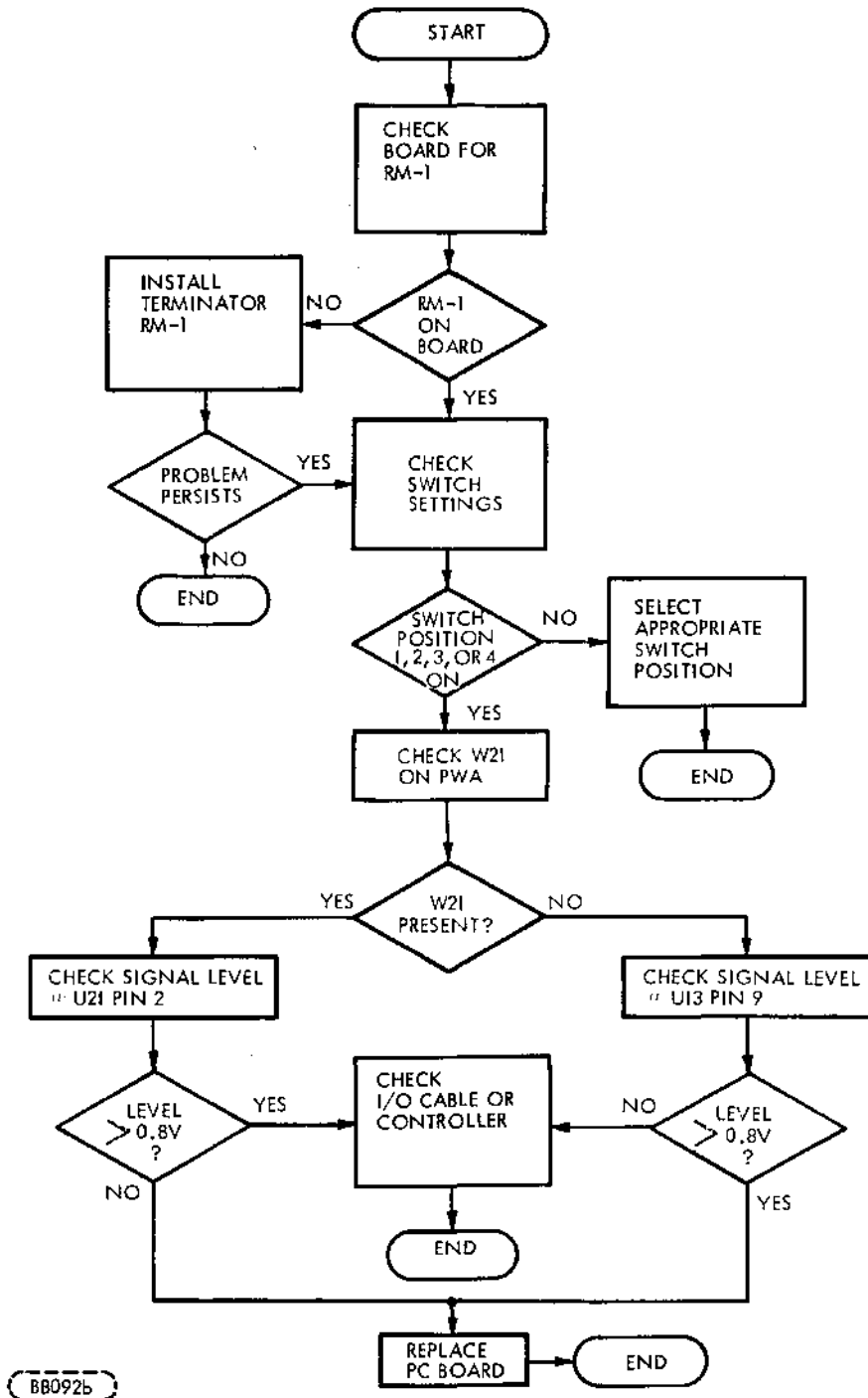
BB152a

### 6.5.3 READY SIGNAL MISSING (Daisy Chain Units)



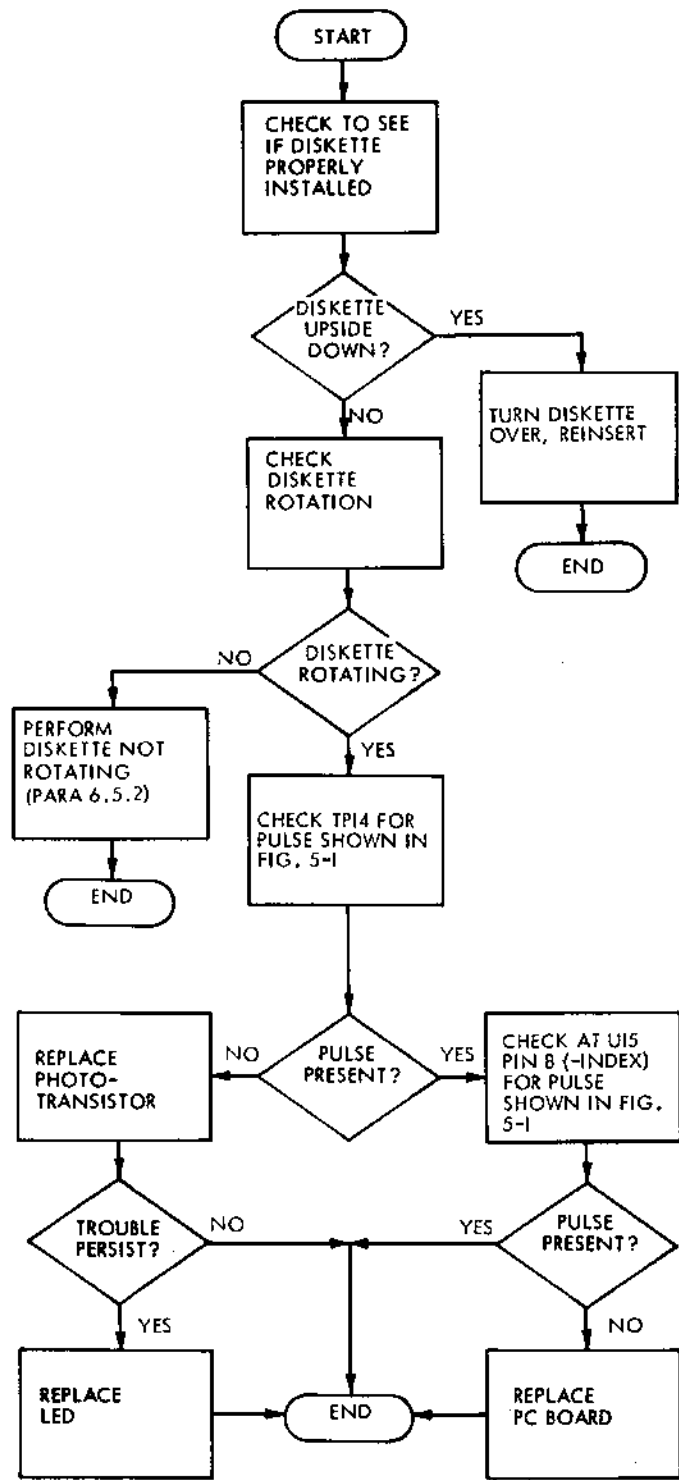
BB0886

## 6.5.4 DRIVE NOT RESPONDING TO COMMANDS (Daisy Chain Units)



BB092b

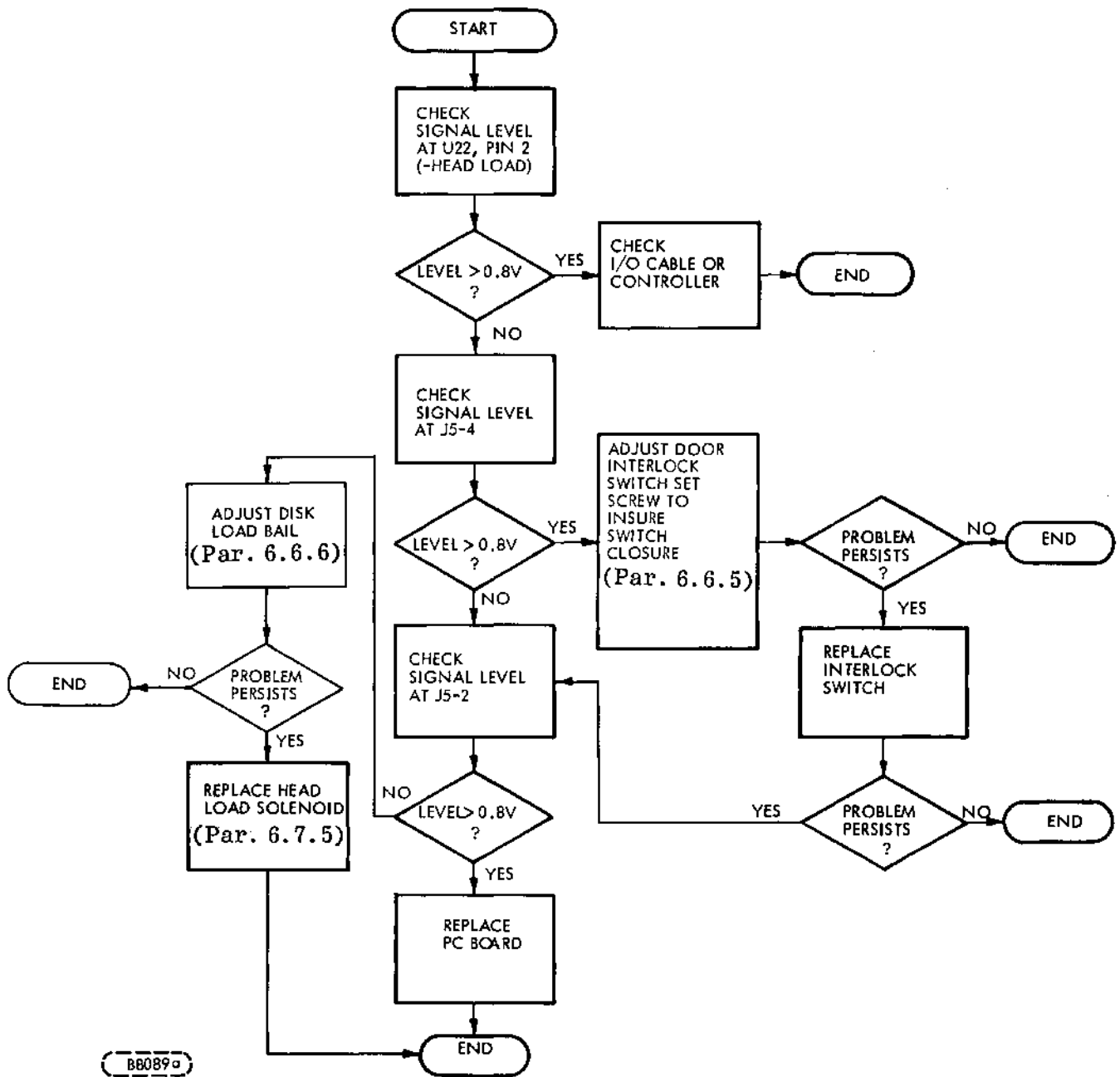
### 6.5.5 INDEX PULSE MISSING



B8091a

## 6.5.6 HEAD NOT LOADING

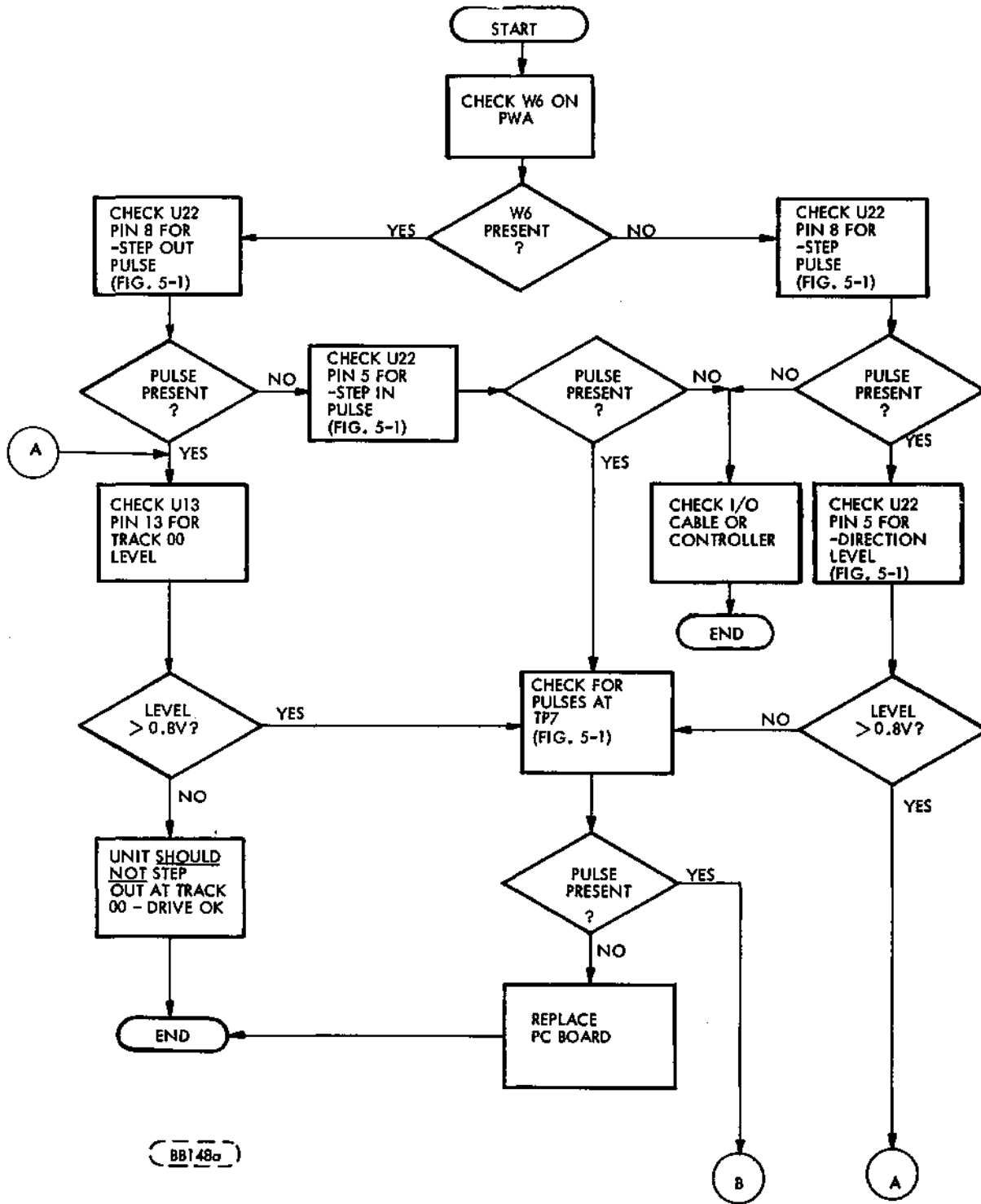
(Perform procedure 6.5.4 prior to performing this trouble shooting procedure).



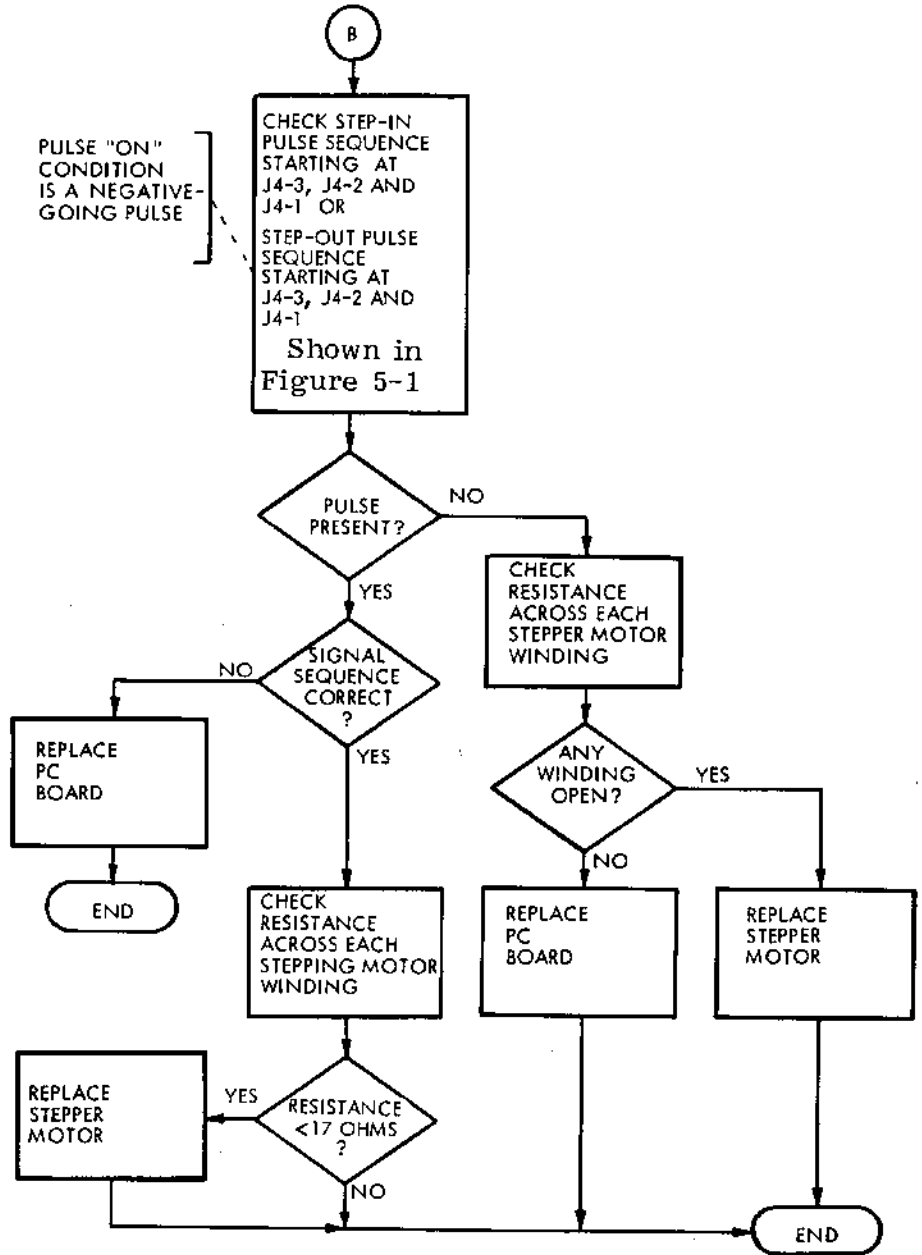
B8089

### 6.5.7 READ/WRITE HEAD NOT STEPPING

Refer to 6.5.4 prior to starting this trouble shooting procedure.

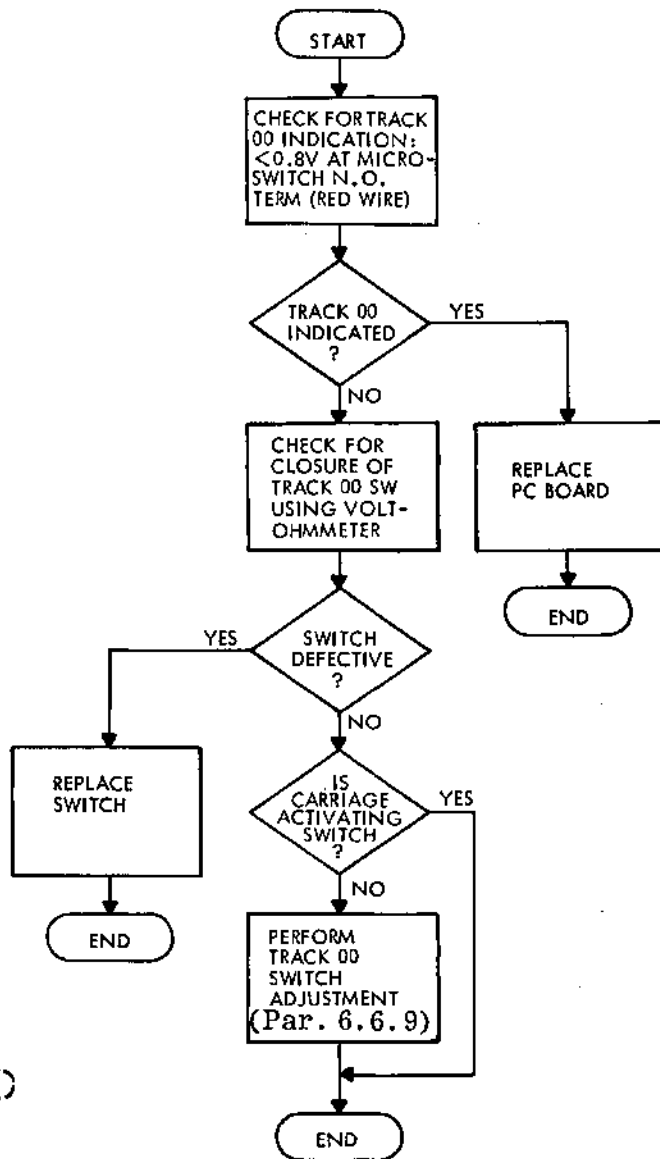


6.5.7 -contd.



BB091b

### 6.5.8 NO TRACK '00' INDICATION

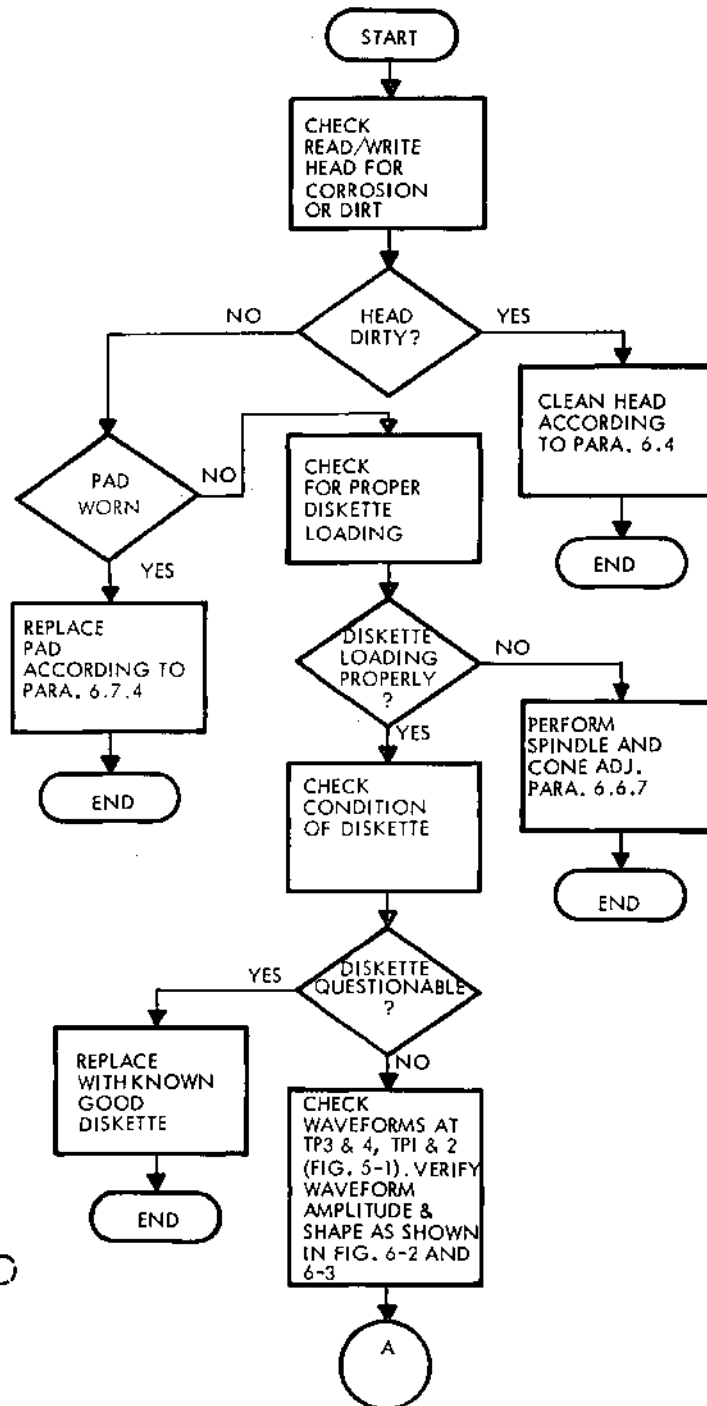


BB089b

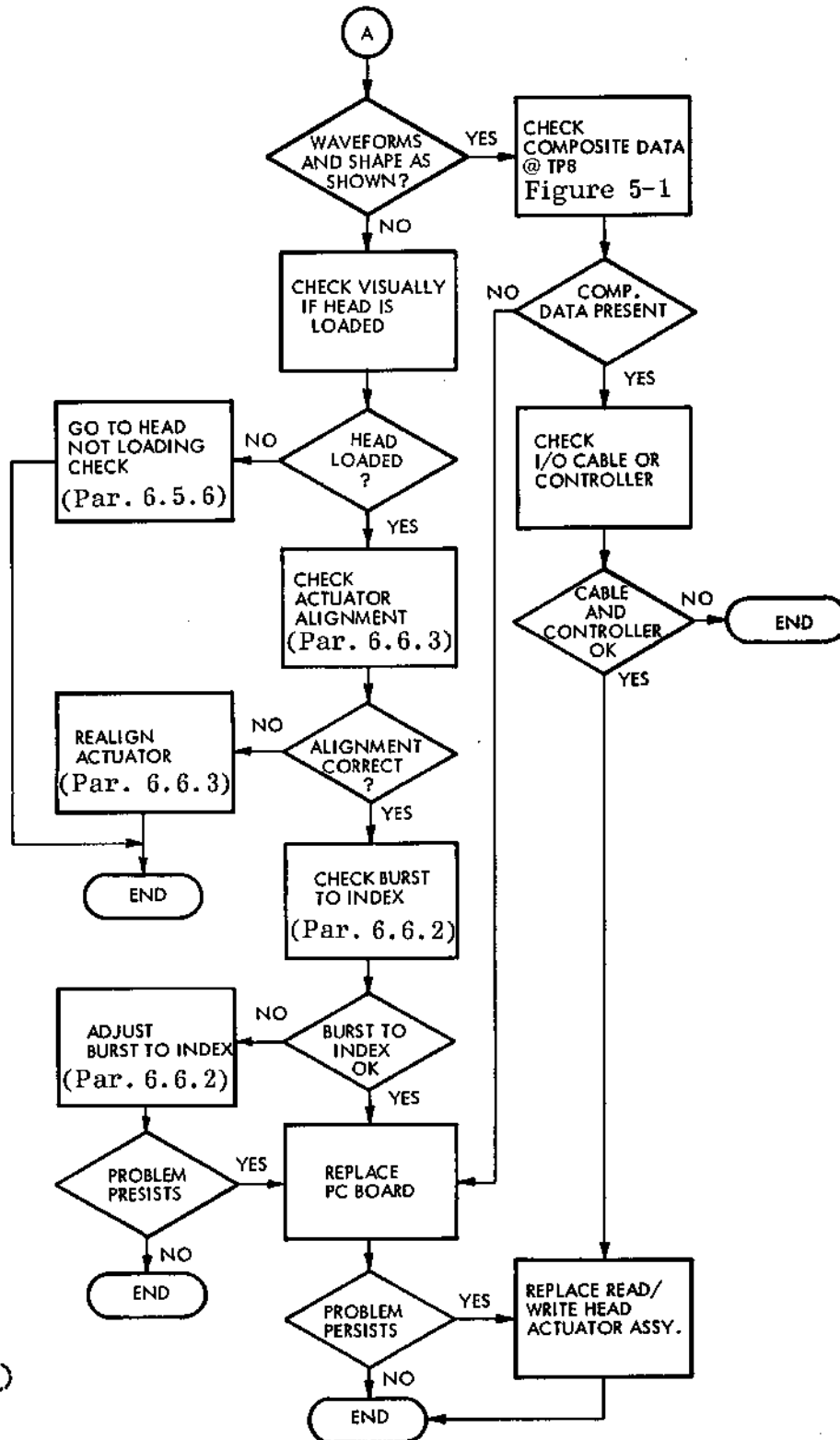


### 6.5.9 READ ERRORS

Refer to 6.5.4 prior to starting this trouble shooting procedure.



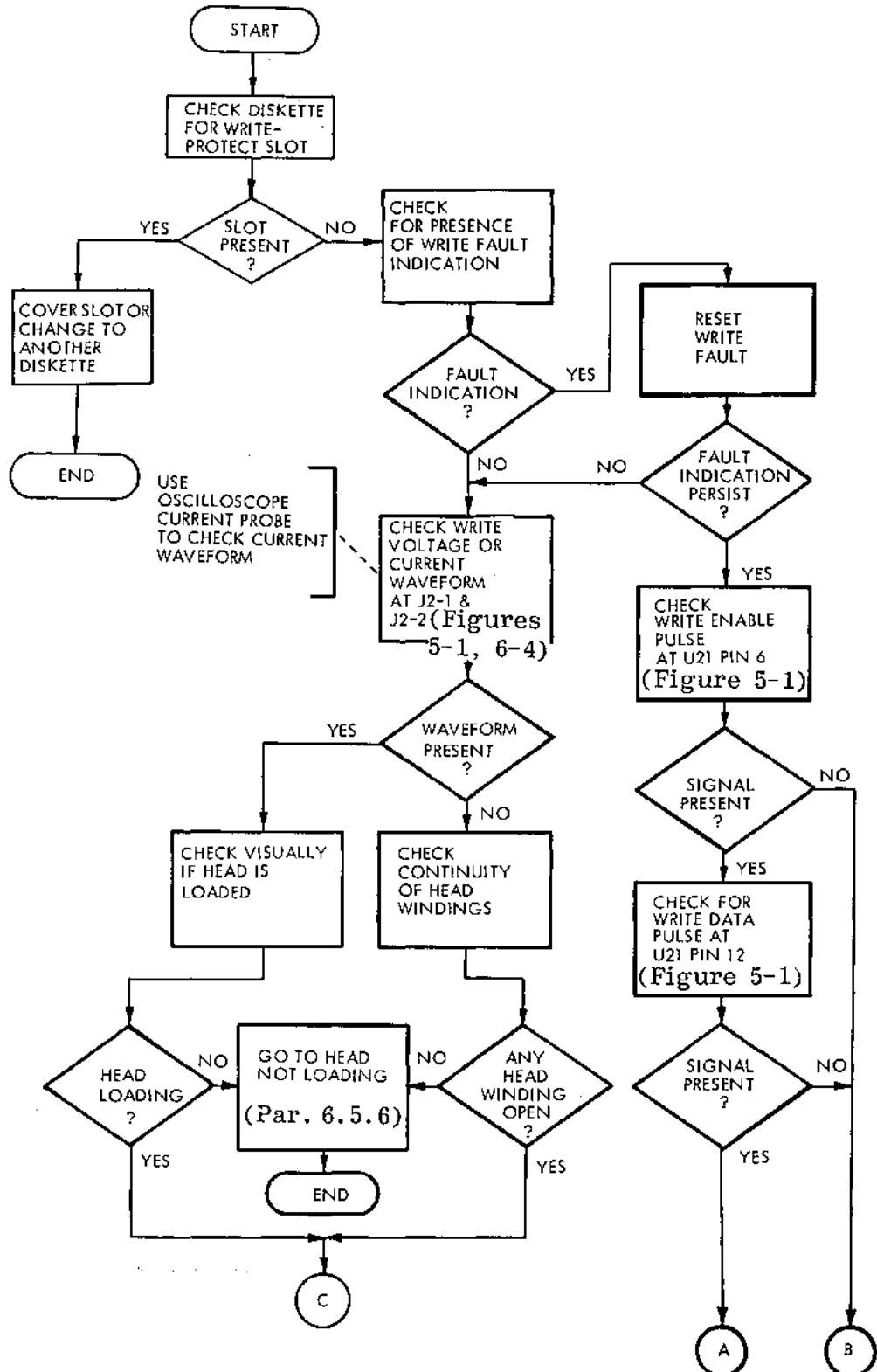
BB088a



BB087

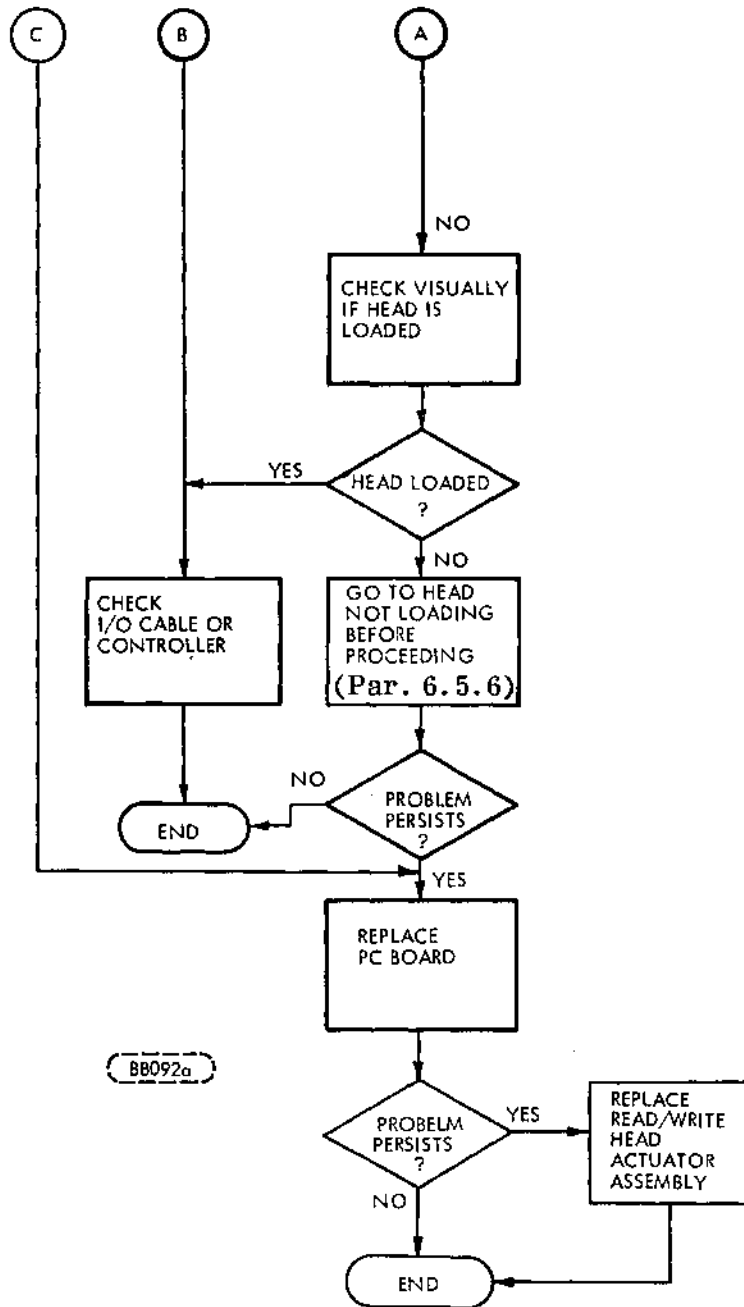
## 6.5.10 WRITE ERRORS

Refer to 6.5.4 prior to starting this trouble shooting procedure.

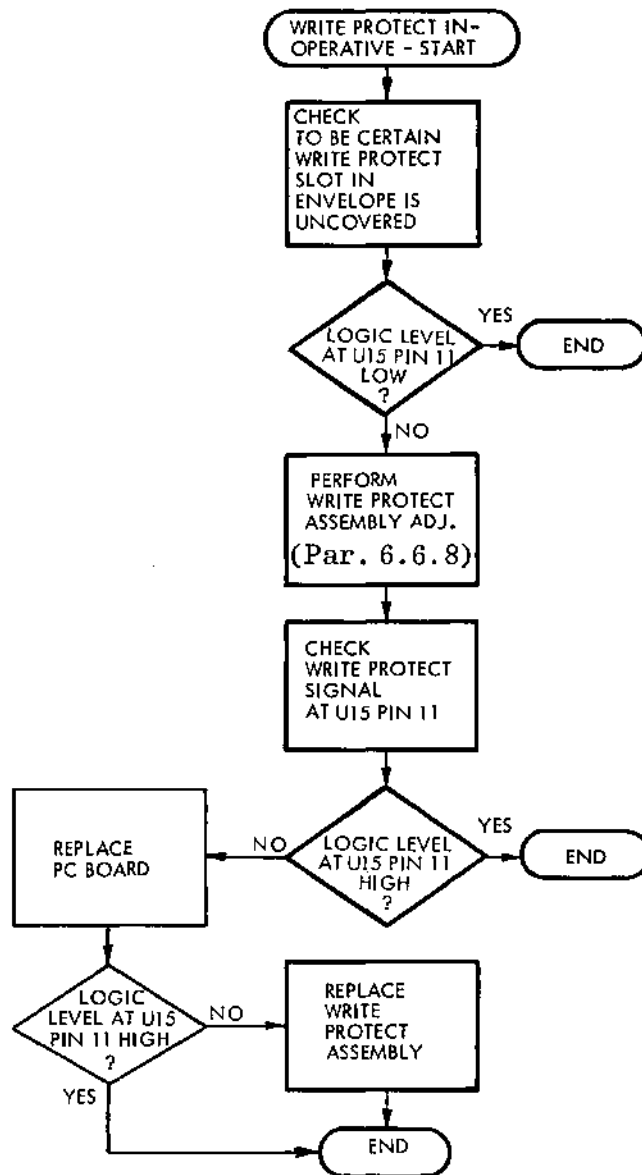


BB090a

6.5.10 -contd.



## 6.5.11 WRITE PROTECT INOPERATIVE



BB090b

## 6.6 ADJUSTMENT PROCEDURES

### 6.6.1 CARRIAGE-STOP ADJUSTMENT

This procedure must be performed whenever actuator alignment or Track 00 adjustment has been performed.

Visually inspect the head-carriage assembly and determine that it comprises either black plastic carriage stops as shown in Figure 6a, or a metal carriage-stop assembly mounted on the carriage guide bar as shown in Figure 6b. To adjust the plastic carriage stops (Figure 6a), follow the procedure given in 6.6.1.1. To adjust the metal carriage-stop assembly (Figure 6b), follow the procedure given in 6.6.1.2.

#### 6.6.1.1 Plastic Carriage-Stop Assembly

- a. Place outer stop gauge (CDC P/N 83401400) against carriage as shown in Figure 6-6.
- b. Loosen outer carriage stop screw (see Figure 6-6) and move outer stop until tooth contacts stop gauge as shown in Figure 6-6. Tighten stop screw and remove gauge.
- c. Step Read/Write head to Track 76.
- d. Place inner carriage stop gauge (CDC P/N 83401300) against carriage as shown in Figure 6-6.
- e. Loosen inner stop screw (see Figure 6-6) and move inner stop until it contacts stop gauge as shown in Figure 6-6. Tighten stop screw and remove gauge.

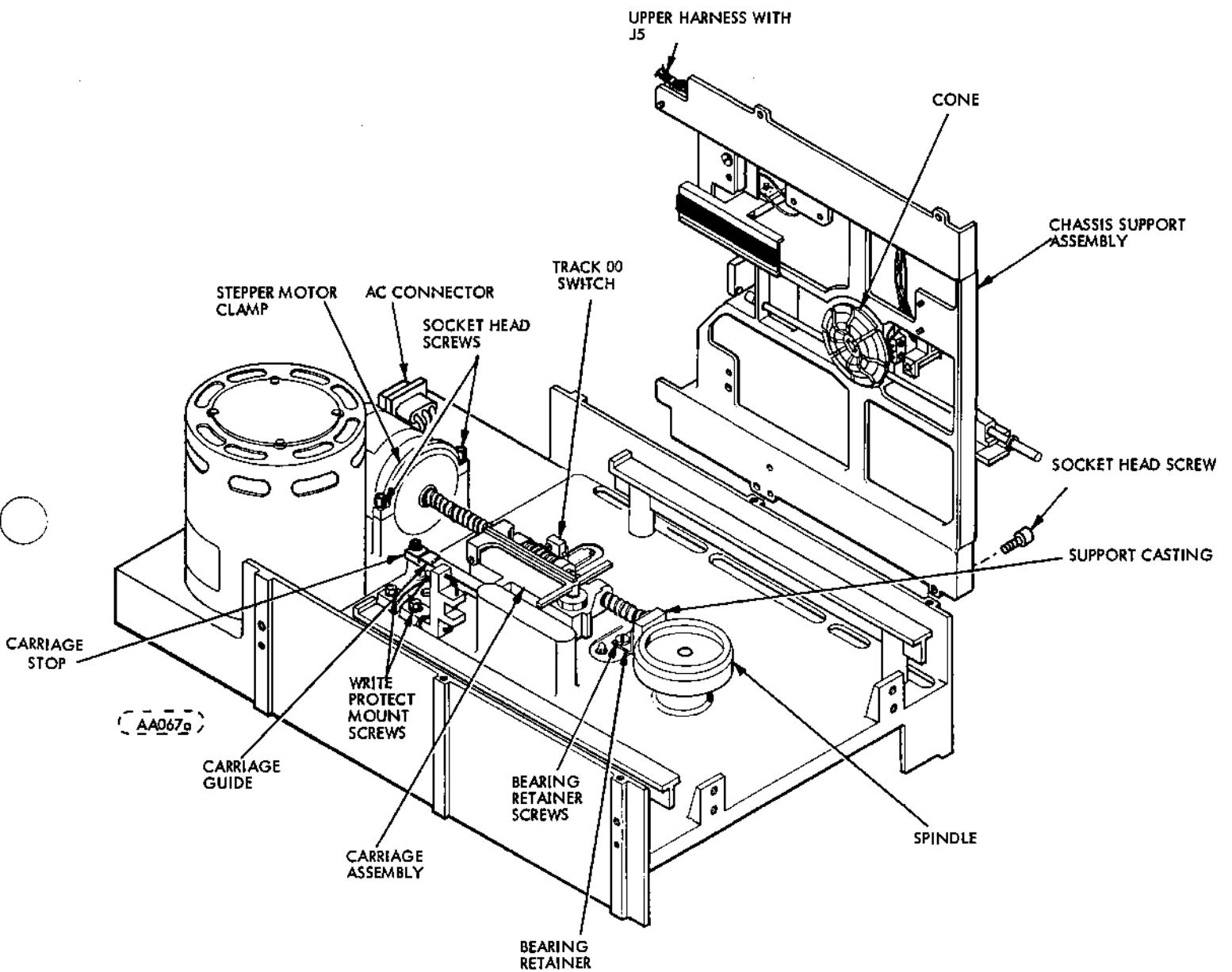
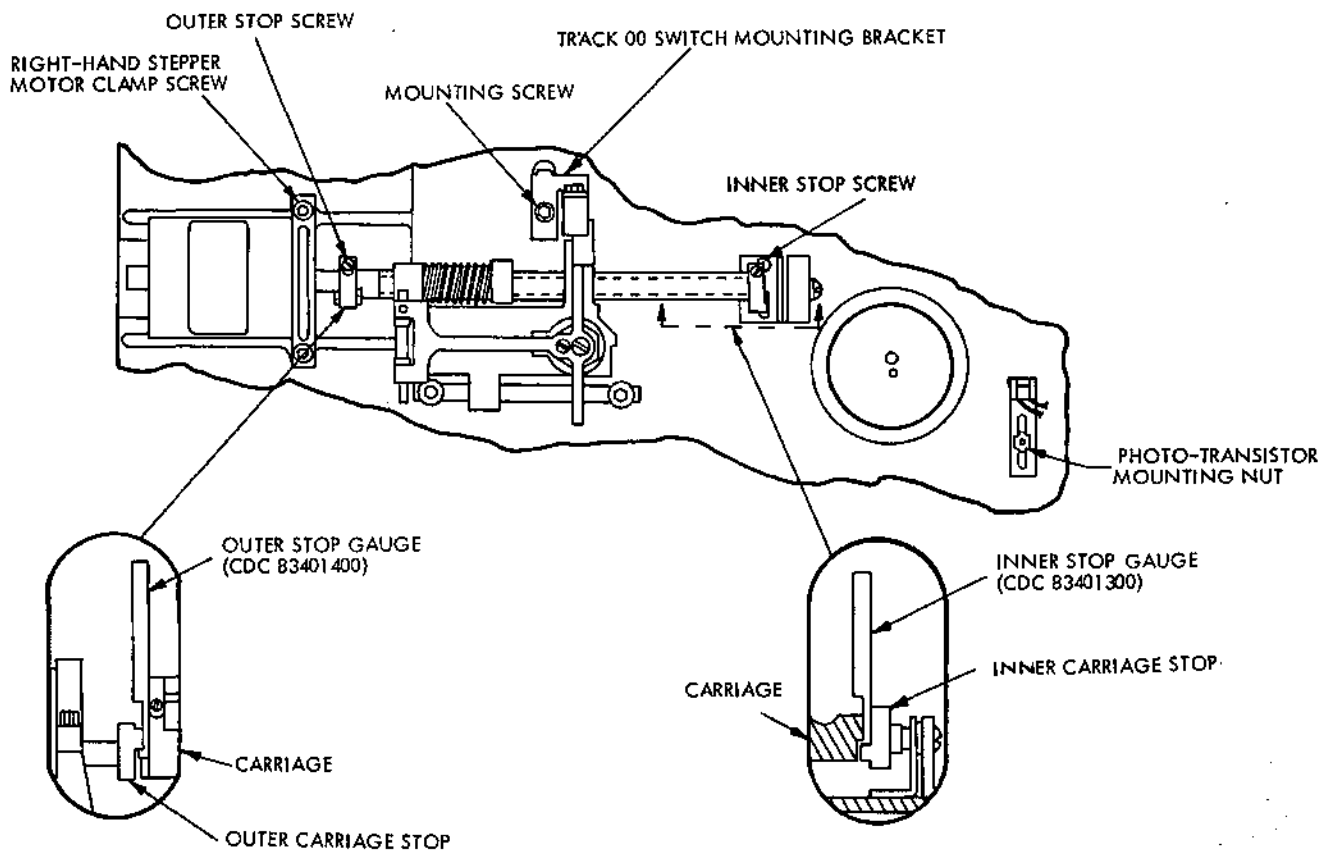
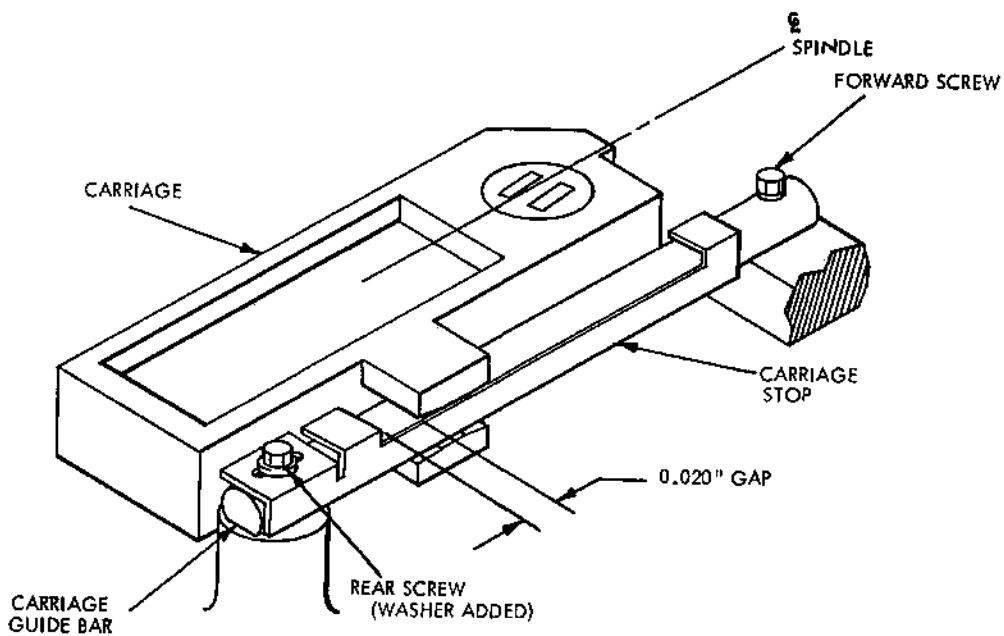


Figure 6-5. Base and Chassis Support Assembly



(D144b)

a. Plastic Carriage-Stop and Stop-Gauge Assemblies



(X327a)

b. Metal Carriage-Stop Assembly

Figure 6-6. Carriage-Stop Adjustment



### 6.6.1.2 Metal Carriage-Stop Assembly

This procedure must be performed whenever actuator alignment or Track 00 adjustment has been performed.

- a. As shown in Figure 6-6b, using a 0.020-inch shim, adjust outer (rear) stop clearance beyond track 00 and tighten rear screw, torque to 8-10 inch-lbs.
- b. Rotate the motor shaft manually to check for interference.

### 6.6.2 BURST TO INDEX CHECK AND ADJUSTMENT

The Alignment Diskette is used to perform this procedure.

- a. Precondition the alignment diskette (421-51W) by allowing it to reach room temperature for one hour.
- b. Install the alignment diskette.

#### CAUTION

The Alignment Diskette is for read only. Extreme caution should be used to assure this diskette is not written on.

- c. Seek to Track Zero, then seek to Track One and Read. (No data is recorded on Track One.)
- d. Connect Channel 1 of scope to TP3 on the PWA, Channel 2 to Index TP14 of the PWA. Set up the scope as follows:

Chan 1 Volt/Div to: 0.1 volt/div  
Chan 2 Volt/Div to: 2 volt/div



### 6.6.3 ACTUATOR ALIGNMENT (Diskette)

The Alignment Diskette is used to perform this procedure. Install jumper from U26 Pin 7 to ground.

- a. Alignment Diskette 421-51W shall be preconditioned by allowing it to reach room temperature for one hour.
- b. Install the alignment diskette.

#### CAUTION

The alignment diskette is for read only.  
Extreme caution should be used to assure  
this diskette is not written on.

- c. Step to track 38 (00100110) and perform a read. (No data is recorded on track 38. The tester or system requirements should be noted; refer to tester or system instructions for operation.)
- d. Connect Channel 1 of scope to TP3 on the PWA and Channel 2 to TP4 on the PWA.
- e. Connect the external sync probe to index at TP14 on PWA.
- f. Set up the scope as follows:

Channel 1: volts/div to: 0.1 volts/div  
Channel 2: volts/div to: 0.1 volts/div (inverted)  
Channel 1: input to: AC  
Channel 2: inputs to: AC

Vertical Mode to: Add  
Slope (Sync) to: Positive  
Trigger Source to: External  
Trigger Coupling to: Low Frequency (High Frequency Reject)  
Trigger Mode to: Normal  
Time Base to: 20 msec/div

#### NOTE

Scope trace after trigger level is adjusted for repetitive trace should display an envelope of data "Cateyes" consisting of two lobes (refer to Figure 6-8 A). If no such pattern can be displayed, manually turn the stepper motor shaft extending from the rear of the stepper motor one-quarter turn either way to locate pattern. Then proceed to step "h".

- g. Change the volts/div of Channel 1 and Channel 2 to 0.02 volts/div. Move the trace on the scope (Position Knob) up until the bottom of the two lobes are setting approximately on the base line (refer to Figure 6-8 B). For an acceptably aligned unit, the voltage ratio of the smaller lobe to the larger lobe should exceed 80%.
- h. If not in alignment, loosen the stepper motor clamp mounting screws to where a gap exists between the clamp and casting (see Figure 6-9) and slowly rotate the stepper motor to adjust the amplitude until the amplitude of both lobes is the same, that is, the difference between the bottoms of both lobes is less than 5mV.

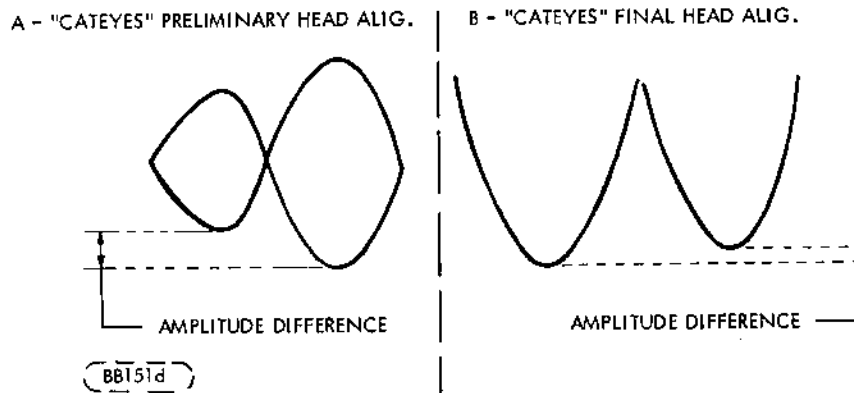


Figure 6-8. Head Alignment Amplitude

- i. Tighten the stepper motor clamp. Return to track 00, then seek back to track 38. Verify that the 5mv specification is still met. If the specification is not met, readjust the stepper motor, return to zero and seek back to track 38. Repeat the adjustment until the 5mv specification is met.
- j. Remove alignment diskette.
- k. Perform Track 00 Switch Adjustment Paragraph 6.6.9.
- l. Perform Stop Gauge Adjustment per Paragraph 6.6.1.
- m. Recheck all adjustments made in this procedure and repeat all steps having out-of-tolerance indications.

#### 6.6.4 PUSH ROD TRAVEL ADJUSTMENT

This procedure must be performed whenever chassis support (Figure 6-9) is removed and replaced.

- a. With front panel door closed, verify that a gap exists between the retaining ring and the disk load bushing of approximately 0.030 inch (0.762mm) (refer to Fig. 6-9 ). Perform steps b and c if out of adjustment.
- b. Back-off the Door Interlock Switch Adjustment set screw.
- c. Adjust disk load arm set screw (Figure 6-9 ) until gap is approximately 0.030 in. (0.762mm), with door closed.
- d. Proceed to Door Interlock Switch Adjustment (paragraph 6.6.5)

### 6.6.5 DOOR INTERLOCK SWITCH ADJUSTMENT

This procedure must be performed whenever the Push Rod Travel Adjustment procedure is performed.

- a. Verify that interlock switch closes (when closing the door) prior to the door latching. Perform step (b) if switch and door are out of sync.
- b. With door closed, adjust set-screw at end of disk load arm (Figure 6-9) while holding door closed against metal stop. Adjust set-screw until micro-switch is almost adjusted flush to top of switch case. This ensures that as the nylon tips on the push-rod wear down, the switch will still close.

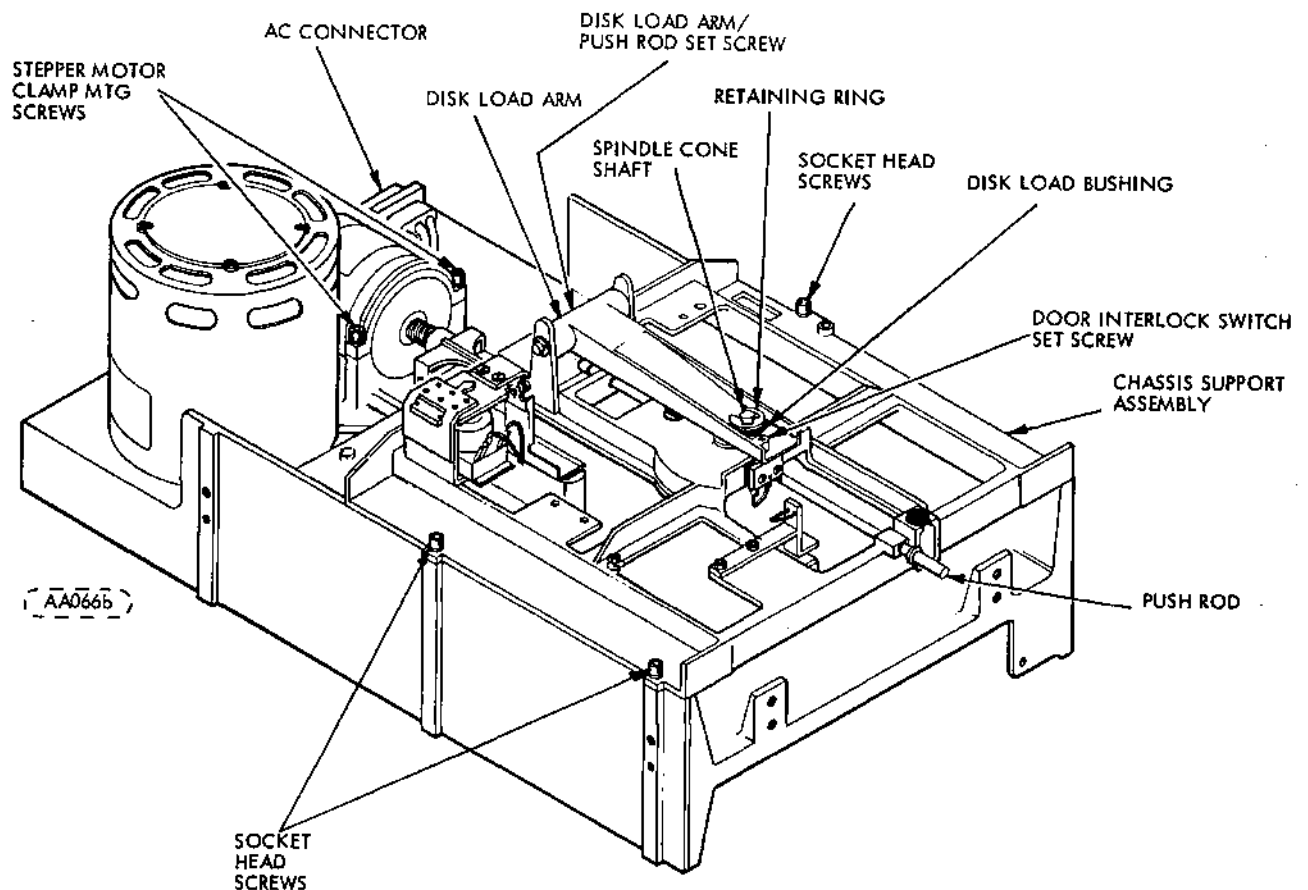


Figure 6-9. Chassis Base Assembly

### 6.6.6 DISK LOAD BAIL ADJUSTMENT

This procedure must be performed whenever the solenoid or bail are removed or the screw holding the bail becomes loose.

- a. Place a 0.010" (0.254mm) feeler gauge on boss of bottom support casting underneath bail.
- b. Energize solenoid.
- c. Loosen mounting screw on bail (Figure 6-10).
- d. Adjust Bail so the foam pad touches the feeler gauge.

#### NOTE

On early units, the bail did not have a convex dimple and guide slot. When adjusting these units, the spacing must be checked at both ends of the bail to ensure it is parallel to the boss.

- e. Tighten mounting screw.

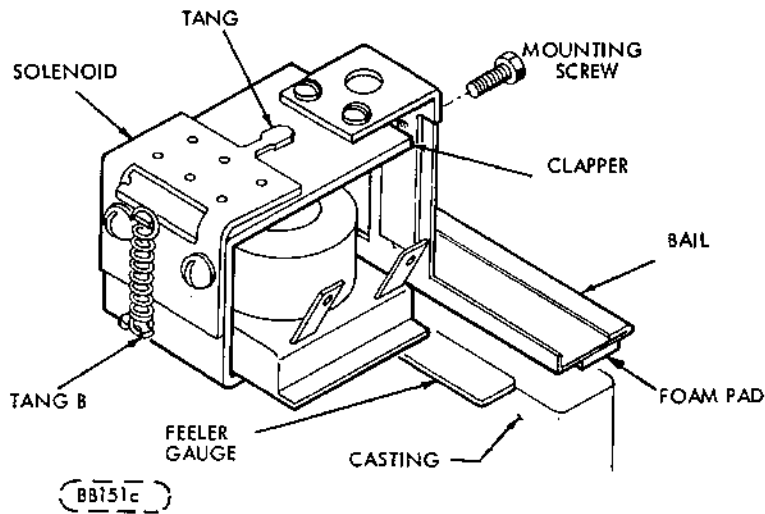


Figure 6-10. Disk Load Solenoid

### 6.6.7 SPINDLE AND CONE ADJUSTMENT

This procedure must be performed whenever the spindle and cone are out of alignment or whenever the actuator assembly is removed or replaced.

- a. Loosen chassis support assembly (Figure 6-9 ).
- b. Position chassis assembly by pushing down on the spindle cone shaft so cone seats in the spindle (Figure 6-11).
- c. Slowly close door without spindle turning. Spindle top surface and cone spindle contact surface must meet at the same time on the full circumference of the spindle (see Figure 6-11).
- d. Complete door closing slowly. Visually verify that all segments on the cone that can be seen are fully seated in the spindle. Slowly rotate spindle and verify that all cone segments are seated and that the segments do not seat as the spindle is rotated as evidenced by a "clicking" sound or observing the segments seating.
- e. Repeat fully opening and closing door four times. Verify that after each closing all cone segments are fully closed. Verify that the load arm does not bind when door is opened and closed.
- f. Secure socket head screws (Figure 6-9 ) and again recheck steps "c" through "e".

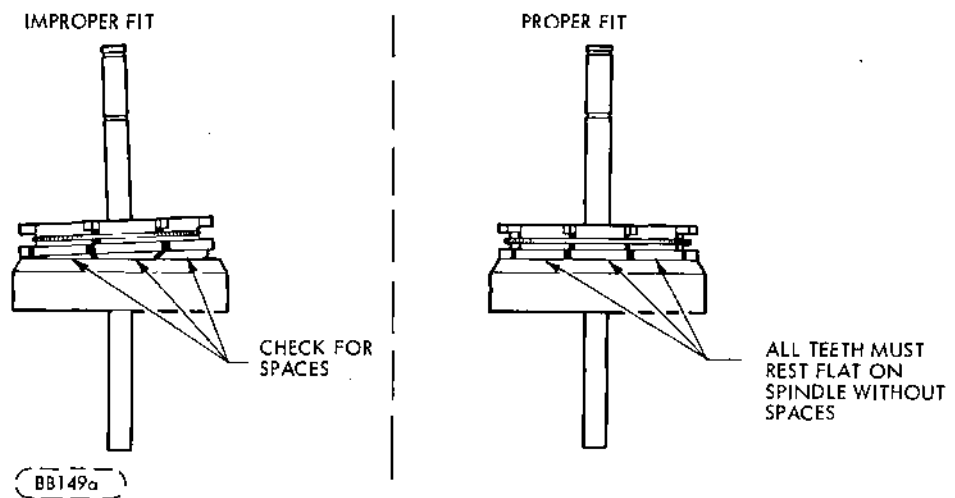


Figure 6-11. Spindle and Cone

### 6.6.8 WRITE PROTECT ASSEMBLY ADJUSTMENT (Where Applicable)

This adjustment will be required whenever the unit is dis-assembled, or a different style diskette is utilized in the unit.

- a. With a Write Protected diskette installed in the unit (Write Protect slot uncovered), monitor U30 pin 14/R82-East for the WRITE PROTECT signal. A continuous logically high signal will be present whenever the Write Protect assembly is properly adjusted. A logically low signal will appear if not properly adjusted.
- b. To adjust, loosen the two hex-head screws holding the sensor mount in place. With the front panel door open, push down on the disk load arm (Figure 6-9 ) to insure that the disk is in the loaded position (Figure 6-10). At the same time, grasp the end of the envelope and move from side-to-side, and forward and backward while observing the WRITE PROTECT signal at U30 pin 14/R82-East. Adjust the mount until the WRITE PROTECT signal is present for any position of the envelope.
- c. Tighten the mount screws, and re-check to verify signal under all conditions of envelope position.

### 6.6.9 TRACK '00' SWITCH ADJUSTMENT

Perform the procedure given below whenever the Track 00 switch has been replaced, or the device fails to give current Track 00 indication, or if the head has been realigned.

- a. Step the Read/Write head out to Track 01.
- b. Place a 0.010 (0.254 mm) feeler gauge between the carriage assembly and Track 00 switch.
- c. Verify that the Track 00 switch closes by observing a low level at terminal J3-2 on the Component Board Assembly.
- d. If the low level does not occur, loosen the Track 00 switch-bracket mount screw and rotate the switch bracket forward until the low level occurs.
- e. Place a 0.005 (0.127 mm) feeler gauge between the carriage assembly and Track 00 switch after removing the 0.010 (0.254 mm) feeler gauge.
- f. Verify that the Track 00 switch remains open by observing a high level at terminal J3-2 on the Component Board Assembly.
- g. If the high level does not occur, loosen the Track 00 switch-bracket mount screw and rotate the switch bracket backward until the high level occurs.
- h. Repeat "b" through "g".



## 6.7 REMOVAL AND REPLACEMENT PROCEDURES

The following procedures give the proper sequence for removal and replacement of major assemblies. To avoid damage to parts, the procedure must be performed in sequence.

### 6.7.1 PRINTED CIRCUIT BOARD (PWA)

- a. Disconnect I/O Cable from J1 (refer to Figure 6-1).
- b. Disconnect harnesses from connectors on printed circuit board.
- c. Remove two screws from printed circuit board adjacent to connector J1 (Figure 6-12).
- d. Remove PWA by detaching it from the four push-in clips shown in Figure 6-12.
- e. To replace printed circuit board push clips through printed circuit board.
- f. Replace two screws adjacent to connector J1.
- g. Reconnect harness and I/O cable.
- h. Set dipswitch S1/S2 if applicable.
- i. Perform Burst to Index Check and adjust if necessary (paragraph 6.6.2).

### 6.7.2 ACTUATOR ASSEMBLY

- a. Open front panel door.
- b. Disconnect harness from J2 and J4 on printed circuit board (see Figure 6-1).
- c. Remove four (4) socket head screws securing chassis support (Figure 6-5).
- d. Slide chassis support back far enough to clear push rod (Figure 6-16) of front panel and lift support clear of chassis.
- e. Remove two (2) screws securing bearing retainer (Figure 6-5).
- f. Remove stepper motor clamp by removing two socket head screws (Figure 6-5) Remove Cable Clamp.
- g. Carefully slide actuator assembly (stepper motor, actuator, and bearings at the end of stepper shaft) straight out toward the rear of the FDD until unit is clear of the casting.
- h. To replace actuator assembly, slip bearings into support casting, Figure 6-5 . (Assure carriage assembly is fitted on carriage guide.)

#### **CAUTION**

The wavy spring washer between the two bearings can prevent the bearings from being inserted into the support casting if the washer has slipped off-center and protrudes beyond the circumference of the bearings. If this happens, loosen the retainer screw on the end of the shaft so the bearings can separate and the washer can be repositioned. The screw must be retightened after the bearings are successfully inserted.

- j. Replace stepper motor clamp and two socket head screws (Figure 6-5 ).
- k. Secure the bearing retainer by replacing the two bearing retainer screws (Figure 6-5 ).

**CAUTION**

The bearing retainer clamp should have an included angle of approximately 92° between the base and side. When base is securely fastened to chassis, this will assure proper tension on bearings. If a gap exists between bearing and retainer or if bearing is being bound up by retainer, this angle must be checked.

- l. Perform Actuator Alignment Procedure, (paragraph 6.6.3).
- m. Perform Spindle and Cone Adjustment, (paragraph 6.6.7).
- n. Perform Push-Rod Travel Adjustment, (paragraph 6.6.4).

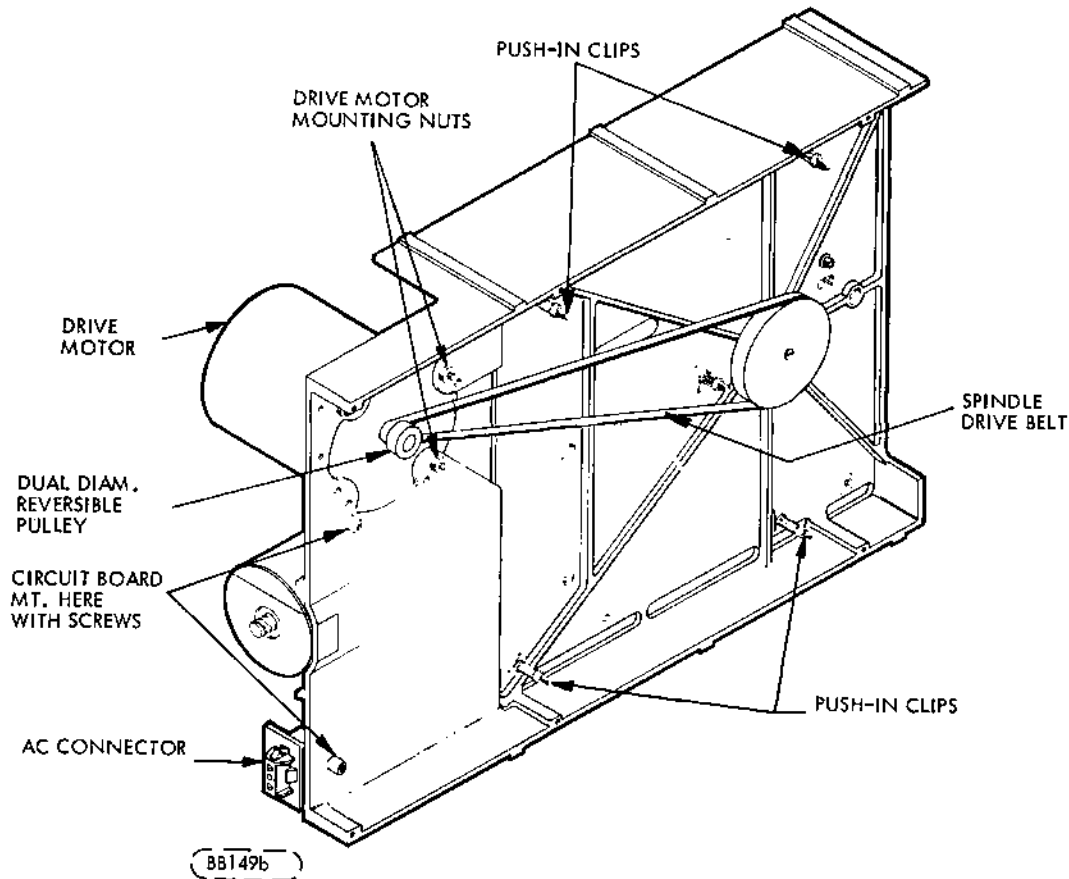


Figure 6-12. Base Casting Assembly

### 6.7.3 DRIVE MOTOR ASSEMBLY

- a. Perform removal procedure for printed circuit board (paragraph 6.7.1).
- b. Remove screws securing drive motor cable clamps.
- c. Remove AC connector from bracket. (Figure 6-12)
- d. Remove spindle drive belt (Figure 6-12)
- e. Remove three (3) nuts securing drive motor (Figure 6-12)
- f. Remove drive motor assembly (drive motor, capacitor, and AC connector).
- g. To replace drive motor assembly perform, in reverse order, steps f through a substituting word replace for word remove.

### 6.7.4 HEAD LOAD PAD REPLACEMENT

**CAUTION**

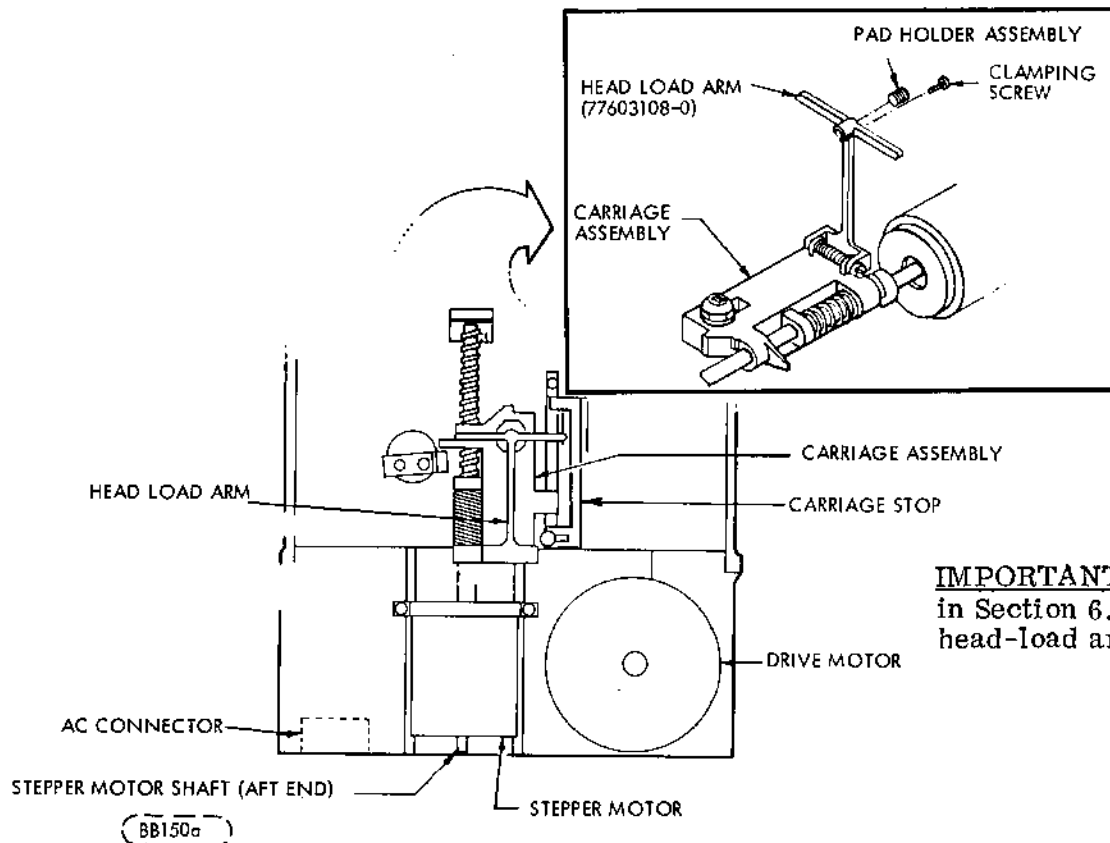
Do not raise the head-load arm to the 90-degree position and then release it; damage to the load-arm spring and/or to the head (core and ceramics) could result.

- a. Remove power from the unit.
- b. Move the carriage assembly to its rear most position (toward the stepper motor) by turning the aft part of the stepper motor shaft (Figure 6-13.) This will provide clearance for lifting the head load arm.
- c. Lift the head load arm until the head load pad is visible (see Figure 6-13).
- d. If head load arm is a 77603108 (Figure 6-13) proceed to step h, if not go to step e.
- e. Remove the used pad with a sharp tool, if necessary, and discard. Be sure to remove all of the old pad and adhesive. Alcohol may be used to remove the old adhesive.
- f. Remove the protective backing from the new head load pad and position pad in center of recess of head load arm. Press pad firmly to insure adhesion with a clean tongue depressor or with thumb using a lint free cloth to protect the pad from grease or dirt.
- g. Go to step n.
- h. Loosen clamping screw holding rim of head load pad.
- i. Insert screw driver and rotate head load pad so flattened side will clear clamping screw.
- j. Remove Pad Holder Assembly.
- k. Insert new Assembly, with flat side toward clamping screw.
- l. Assuring that head load pad is fully seated, rotate pad 180°.
- m. Tighten clamping screw to hold pad in place.
- n. Lower arm gently onto head.

### 6.7.5 SOLENOID REPLACEMENT AND TANG ADJUSTMENT

This procedure must be performed whenever the solenoid is out of alignment or whenever the solenoid assembly is replaced.

- a. Place the tapered end of a flat head screw driver between Tang A and solenoid clapper. (See Figure 6-10).
- b. Gently bend the tang upward with the screwdriver.
- c. Using a 0.060 inch (1.52mm) wire feeler gauge, insert the feeler gauge in the gap between the underside of the clapper and the coil core. (See Figure 6-14)



**NOTE**

**IMPORTANT:** Refer to **CAUTION** in Section 6.7.4 before handling head-load arm.

Figure 6-13. Head Load Pad Replacement Illustration

- d. If unable to insert 0.060 inch (1.52mm) wire feeler gauge, continue to gently bend tang upward until feeler gauge can be inserted.
- e. Next, attempt to insert a 0.062 in (1.58mm) wire feeler gauge between the underside of the clapper and the coil.
- f. If this gauge can be inserted, bend tang down until 0.062 inch (1.58mm) feeler gauge will not insert in gap between clapper and coil core.
- g. Insert a 0.058 in (1.47mm) wire feeler gauge in gap between underside of clapper and coil core.
- h. If 0.058 in (1.47mm) feeler gauge will not fit, bend tang up slightly.
- i. Continue checking with the 0.062 inch (1.58mm) wire gauge feeler and 0.058 inch (1.47mm) wire gauge until the following condition is achieved:
  1. 0.062 inch (1.58mm) feeler gauge will not pass between tang and clapper;
  2. 0.058 inch (1.47mm) feeler gauge passes freely between tang and clapper.
- j. Check spring adjustment by gently pressing down on clapper until the 0.060 inch (1.52mm)  $\pm 0.002$  in (0.051mm) gap is closed.
- k. Allow clapper to rise slowly and release.
  1. Clapper should be in contact with the tang.
- m. If not, bend the lower tang B, Figure 6-10; downward gently.
- n. Recheck that the clapper rise and perform step m until clapper and tang make contact.
- o. Check bail adjustment per paragraph 6.6.6.

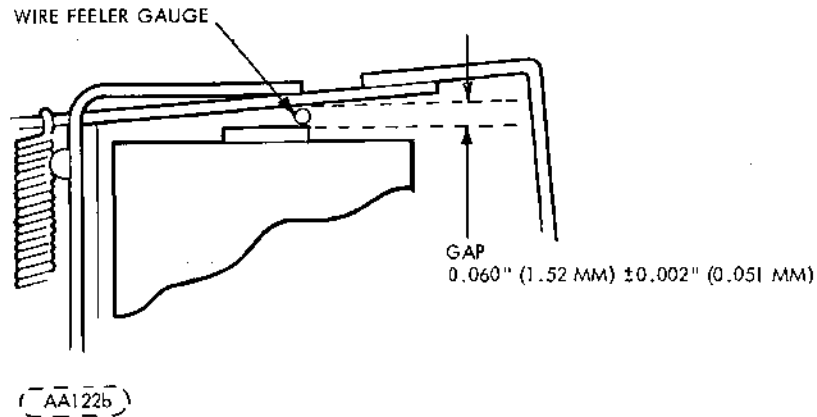


Figure 6-14. Solenoid Adjustment

### 6.7.6 CARRIAGE AND/OR STEPPER MOTOR REPLACEMENT

The carriage and stepper motor are to be replaced as one assembly, being factory assembled and tested only. Refer to Section 6.7.2.

## 6.8 FREQUENCY CONVERSION

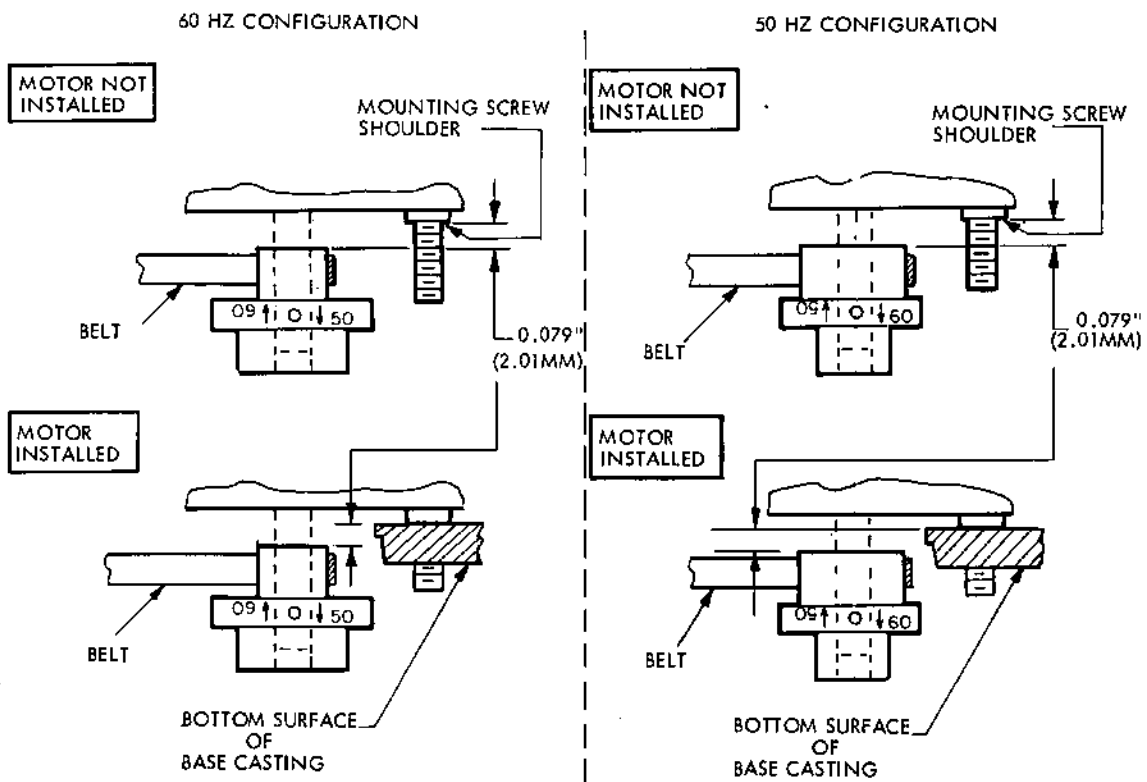
### 6.8.1 OPERATING FREQUENCIES CONVERSION PROCEDURE

This procedure is to be used to convert the FDD unit from 60 Hz operation to 50 Hz operation or vice versa. This is accomplished by reversing the dual diameter reversible pulley on the spindle motor shaft (Figure 6-12) using the following steps:

- a. Remove AC power.
- b. Remove Printed Circuit Board Assembly per paragraph 6.7.1.
- c. Remove the belt from the spindle motor pulley. (Accessible from the under side of unit).
- d. Loosen set-screw and remove pulley.
- e. Reverse pulley and replace on motor shaft.
- f. Position pulley allowing 0.079" (2.01 mm) ± 0.010" (0.254 mm) between shoulder of motor mounting screws and pulley (Figure 6-15).
- g. Tighten down set-screw.
- h. Replace belt and Printed Circuit Board.

#### CAUTION

It is **IMPORTANT** that the new operating frequency be marked on the unit's rating nameplate.



XX027a

Figure 6-15. Drive Pulley Reversal

### 7.1 INTRODUCTION

This section contains detailed information on the logic circuits used in the FDD. The logic consists of two types of circuits: discrete component and integrated circuits (IC). Integrated circuits are contained within a single chip and discrete component circuits contain individually identifiable resistors, capacitors, transistors, etc.

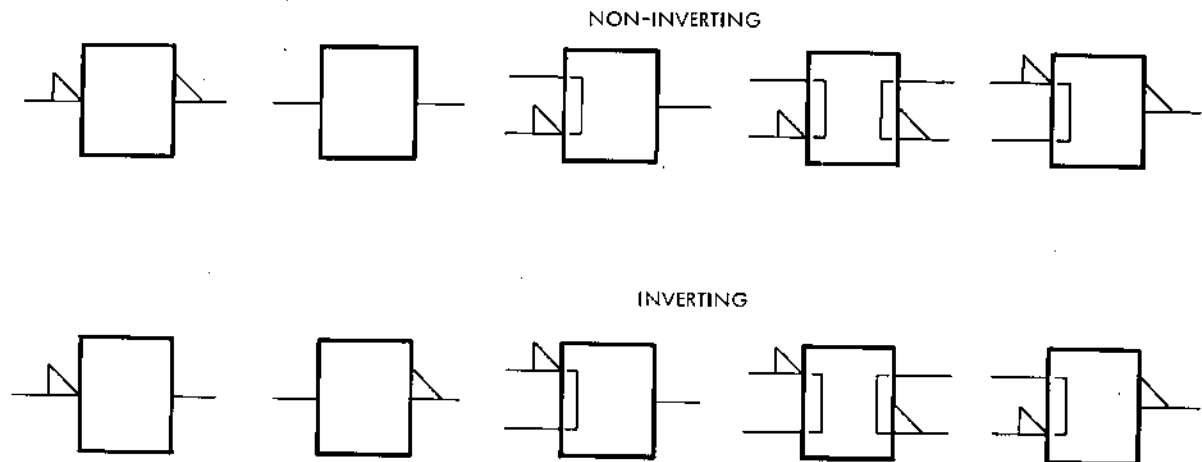
### 7.2 PHYSICAL DESCRIPTION (Logic)

All components are mounted on one side of the printed circuit board. The board is 8 x 11 inches (203.2mm x 279.4mm) and contain both IC and discrete component circuits.

### 7.3 USE OF RELATIVE LEVEL INDICATORS

The relative level indicator is a small triangle located on the input or output to a logic block. The presence or absence of this indicator indicates the conditions that are necessary to satisfy the function of the logic block. The presence of the triangle indicates a 0 logic level on that line is needed to satisfy the function. The absence of the triangle indicates a logical 1 is needed to satisfy the function.

The relative level indicator depicts the occurrence of inversion. Figure 7-1 shows some representative examples of the relative level indicator being used in this manner.



(AA042f)

Figure 7-1. Inversion Conventions

### 7.4 INTEGRATED CIRCUITS

Figure 7-2 shows an example of a schematic block and the information that it contains. The first line gives the function symbol which identifies the logic function that the block performs. Refer to Figure 7-3 for a summary of function symbols. The second line gives the CDC element number. The third line on the schematic block gives the circuit reference designation.

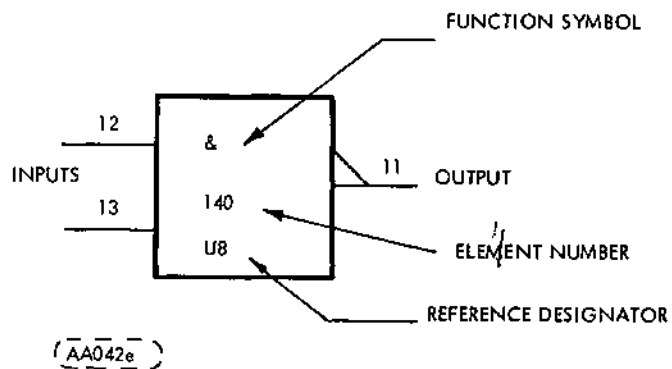


Figure 7-2. Integrated Circuit

FUNCTION SYMBOLS	
&	AND GATE OR INVERTER
1	OR GATE OR INVERTER
=1	EXCLUSIVE OR
1	ONE SHOT
$\Sigma$	SUMMING CIRCUIT. NUMBER FOLLOWING (EXAMPLE 100) INDICATES GAIN OF 100
X/Y	LEVEL CONVERSION - TRANSMISSION LINE TO LOGIC LEVEL, SWITCH STATE TO LOGIC LEVEL OR LOGIC LEVEL TO POWER OUTPUT
	SCHMITT TRIGGER (LOWER TRIP POINT ADJUSTABLE)
GENERAL SYMBOLS	
	INDICATES NON STANDARD LOGIC LEVEL
	INDICATES ANALOG SIGNAL
	TEST POINTS
	INHIBITING INPUT

(BB151b)

Figure 7-3. Schematic Symbols



# PARTS DATA

## 8.1 INTRODUCTION

This section contains an illustrated parts breakdown that describes and illustrates all variations of the Flexible Disk Drive (FDD). In general, parts are in disassembly sequence but do not necessarily indicate the maximum recommended disassembly of parts in the field.

## 8.2 ILLUSTRATIONS

Item numbers within a circle (1) indicate an assembly (group of parts). Item numbers without a circle, 1, indicate a single part; a group of parts that are pinned or press fitted together; or a group of parts which is normally replaced as an assembly.

## 8.3 PARTS LISTS

In addition to the accompanying parts list on each illustration, two additional Parts Lists are available; the Top-Down Assembly/Component Parts List and the Cross Reference Index. Instruction for the use of all Parts lists in paragraph 8.6.

## 8.4 TOP MECHANICAL AND ASSEMBLY LOCATION

In conjunction with Table 8-1, Figure 8-1 serves two purposes;

1. When used with Table 8-1, it identifies all unique parts and assemblies for each FDD variation.
2. It identifies by sheet location where all major assemblies are broken down.

### 8.4.1 TOP MECHANICAL ASSEMBLY (TMA)

To determine what parts are used on a particular model, find the applicable model in Table 8-1. The corresponding item number represents the last three digits of the TMA number. Example: Model BR803N, TMA number 75744013. The item numbers at the top of Table 8-1 corresponds with the item numbers in Figure 8-1. All parts and assemblies that apply will be identified with an 'X' ('0' means not applicable).

## 8.5 REPLACEMENT PARTS

When ordering replacement parts for the FDD, the inclusion of the Model designation and the figure, item and part identification numbers for each part ordered will ensure positive identification of parts. Before ordering parts however, refer to paragraph 8.7 spare parts.

### NOTE

Replacement parts for all OEM engineering evaluation units (BRXXXX TMA099) must be obtained from MPI OEM Engineering.

Table 8-1. Top Mechanical Assembly Configurator

		ITEM NUMBERS						
I	T	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111
MODELS	M E	0000000001	1111111112	2222222223	3333333334	4444444445	5555555556	6666666667
	A M	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890
BR803A	001	XX00000000	0000000000	0X000X0000	0X0000X000	XX0X0XX000	0000X00000	0000000000
BR803B	002	X0X0000000	0000000000	0X000X0000	0X0000X000	XX0X0XX000	0000X00000	0000000000
BR803C	003	X00X000000	0000000000	0X000X0000	0X0000X000	XX0X0XX000	0000X00000	0000000000
BR803D	004	X000X00000	0000000000	0X000X0000	0X0000X000	XX0X0XX000	0000X00000	0000000000
BR803E	005	X000000000	0000000000	0X000X0000	00X000X000	XX0X0XX000	0000X00000	0000000000
BR803F	006	X00000X000	0000000000	0X000X0000	00X000X000	XX0X0XX000	0000X00000	0000000000
BR803G	007	X000000000	X000000000	0X000X0000	000X00X000	XX0X0XX000	0000X00000	0000000000
BR803H	008	X0X0000000	0000000000	0X000X0000	000X00X000	XX0X0XX000	0000X00000	0000000000
BR805A	009	XX00000000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR805B	010	X0X0000000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR805C	011	X00X000000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR805D	012	X000X00000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR803N	013	XX00000000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR803P	014	X0X0000000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR803R	015	X000X00000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR803S	016	X00X000000	0000000000	0X00XX0000	0000X0X000	XX0X0XXX00	0000X00000	0000000000
BR803J	017	X000000X00	0000X00000	0X00X00000	00X000X000	XX0X0XX0X0	0000X00000	0000000000
BR803K	018	X000000X00	0000X00000	0X00X00000	00X000X000	XX0X0XX0X0	0000X00000	0000000000
BR803L	019	X000000000	0000000000	0X000X000X	00000XX000	XX000XX0X0	0000X00000	0000000000
BR803M	020	X000000000	0000000000	0X000X00X0	00000XX000	XX000XX0X0	0000X00000	0000000000
BR8A3C	021	X000000X00	0000000000	0X000X0000	00X000X000	XX0X0XX0X0	0000X00000	0000000000
BR8A3D	022	X0000000X0	0000000000	0X000X0000	00X000X000	XX0X0XX0X0	0000X00000	0000000000
BR8A3E	023	X000000X00	0000000000	0X000X0000	000X00X000	XX0X0XX0X0	0000X00000	0000000000
BR8A3F	024	X0000000X0	0000000000	0X000X0000	000X00X000	XX0X0XX0X0	0000X00000	0000000000
BR8A2A	025	XX00000000	0000000000	0X00XX0000	00X0000X00	XX0X0XX000	0000X00000	0000000000
BR803T	026	X00000X000	0000000000	0X00XX0000	00000X0000	XX0X0XXX00	0000X00000	0000000000
BR805E	027	X0000X0000	0000000000	0X00XX0000	00000X0000	XX0X0XXX00	0000X00000	0000000000
BR8A3A	028	X000000000	X000000000	0X000X0000	0X0000X000	XX0X0XX000	0000X00000	0000000000
BR8A3B	029	0000000000	0000000000	0000000000	0000000000	00000X0000	0000000000	0000000000
BR8A2B	030	X0X0000000	0000000000	0X00XX0000	000000X000	XX0X0XX000	0000X00000	0000000000
BR8A2C	031	X00X000000	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2D	032	X0000X0000	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2E	033	X000X00000	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2F	034	X000000000	00X0000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2G	035	XX00000000	0000000000	0X00XX0000	0000000X00	XX0X0XX000	0000X00000	000000000X
BR8A2H	036	X000000000	0000000000	0X0X0X0000	0X00000X00	XX00XXX000	0000X00000	0000000000
BR8A2J	037	XX00000000	0000000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2K	038	X000000000	00X0000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2L	039	X000000X00	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2M	040	X000000X00	0000000000	0X00XX0000	0X00000X00	XX0X0XX0X0	0000X00000	0X00000000
BR8A2N	041	X000X00000	0000000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2P	042	00000000X0	0000X00000	0X000X0000	X00000X000	00XX0X00X0	0000X0000X	000X000X00
BR8A2R	043	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
BR8A4A	044	0000000000	0000X00000	0X000XXX00	X00000X00X	00X00X00X0	0X00XXX000	000X0000X0
BR8A4B	045	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
BR8A7A	046	00000000X0	0000X00000	0X000X0000	X00000X00X	00XX0X00X0	0000X00000	000X0000X0
BR8A5A	047	X0000000X0	0000000000	0X00XX0000	0000000X00	XX0X0XX0X0	0000X00000	XX00000000
BR8A5B	048	X000000X00	0000000000	0X00XX0000	0000000X00	XX0X0XX0X0	0000X00000	XX00000000
BR8A2W	049	X00000X000	0000000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2Y	050	X000000000	00X0000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A6B	051	X0X0000000	0000000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR803U	052	X000000000	X000000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2S	053	X000000X00	0000000000	0X00XX0000	0X00000X00	XX0X0XX0X0	0000X00000	0000000000
BR8A2T	054	X000000X00	0000000000	0X00XX0000	0X00000X00	XX0X0XX0X0	0000X00000	0000000000
BR8A2U	055	X000000000	X000000000	0X000X0000	00X000X000	XX0X0XX000	0000X00000	0000000000
BR8A2V	056	X000000000	00X0000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A2Z	057	X0000000X0	0000000000	0X000X0000	0X00000X00	XX0X0XX0X0	0000X00000	0000000000
BR8A3G	058	XX00000000	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A3H	059	X0X0000000	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
	060	X000000000	00X0000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000X00000
BR8A5C	061	X000000X00	0000000000	0X00XX0000	0000000X00	XX0X0XX0X0	0000X00000	XX00000000
BR8A5D	062	X000000X00	0000000000	0X00XX0000	0000000X00	XX0X0XX0X0	0000X00000	XX00000000
BR8A5E	063	XX00000000	0000000000	0X00XX0000	0000000X00	XX0X0XX00X	0000X00000	0000000000
BR8A5J	064	XX00000000	0000000000	0X00XX0000	0000000X00	XX0X0XX000	X000X00000	0000000000
BR8A5F	080	XX00000000	0000000000	0X00XX0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A5G	081	XX00000000	0000000000	0X000X0000	0X00000X00	XX0X0XX000	0000X00000	0000000000
BR8A5H	082	XX00000000	0000000000	0X00XX0000	0000000X00	XX0X0XX000	X000X00000	0000000000
BRXXXX	099	OEM ENGINEERING UNIT						

ITEM NO	IDENT NO	DESCRIPTION	WHERE USED	ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	145	75272300	CONNECTOR BRACKET	TMA
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	146	77830538	CSA LABEL	TMA
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	147	77594901	TRACK SWITCH ASM	TMA
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA	148	83460101	AMP CONN KIT	TMA
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	149	75746702	CAPACITOR BRACKET	TMA
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	150	75898080	FRONT PANEL ASM	TMA
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	151	83401809	FRONT PANEL ASM	TMA
108	75881778	DRIVE MOTOR ASM 50 HZ	TMA	152	77832691	MOUNTING KIT	TMA
109	75881775	DRIVE MOTOR ASM 60 HZ	TMA	155	93592240	SCREW-WASHER	TMA
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA	156	77830641	AC CONN & RELAY ASM	TMA
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	157	77830995	COVER	TMA
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	158	17901508	SCREW	TMA
122	94277416	STRAP, CABLE TIE	TMA	160	77834336	LABEL, FCO	TMA
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	161	77834543	FRONT PANEL ASSY	TMA
125	83427801	WRITE PROTECT ASM	TMA	162	75746701	CAPACITOR BRACKET	TMA
126	92602001	CLAMP	TMA	164	77836055	LABEL	TMA
127	77830690	DISKETTE DETECT ASM	TMA	168	77594704	OPT TRACK SENSE ASSY	TMA
128	75801779	DRIVE MOTOR ASM 60 HZ	TMA	169	77594705	OPT TRACK SENSE ASSY	TMA
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	170	83401808	FRONT PANEL ASSY	TMA
130	75881781	DRIVE MOTOR ASM 60 HZ	TMA	336	93592160	SCREW, SELF TAP	TMA
131	83401806	FRONT PANEL ASM	TMA				
132	83401801	FRONT PANEL ASM	TMA				
133	83401802	FRONT PANEL ASM	TMA				
134	83401803	FRONT PANEL ASM	TMA				
135	83401804	FRONT PANEL ASM	TMA				
136	83401805	FRONT PANEL ASM	TMA				
137	75791610	ACTUATOR ASM	TMA				
138	75791511	ACTUATOR ASM	TMA				
140	77830685	UPPER HARNESS ASM	TMA				
141	75747301	UPPER HARNESS ASM	TMA				
142	83403502	LOWER HARNESS ASM	TMA				
143	83403503	LOWER HARNESS ASM	TMA				
144	83403700	CONNECTOR BRACKET	TMA				

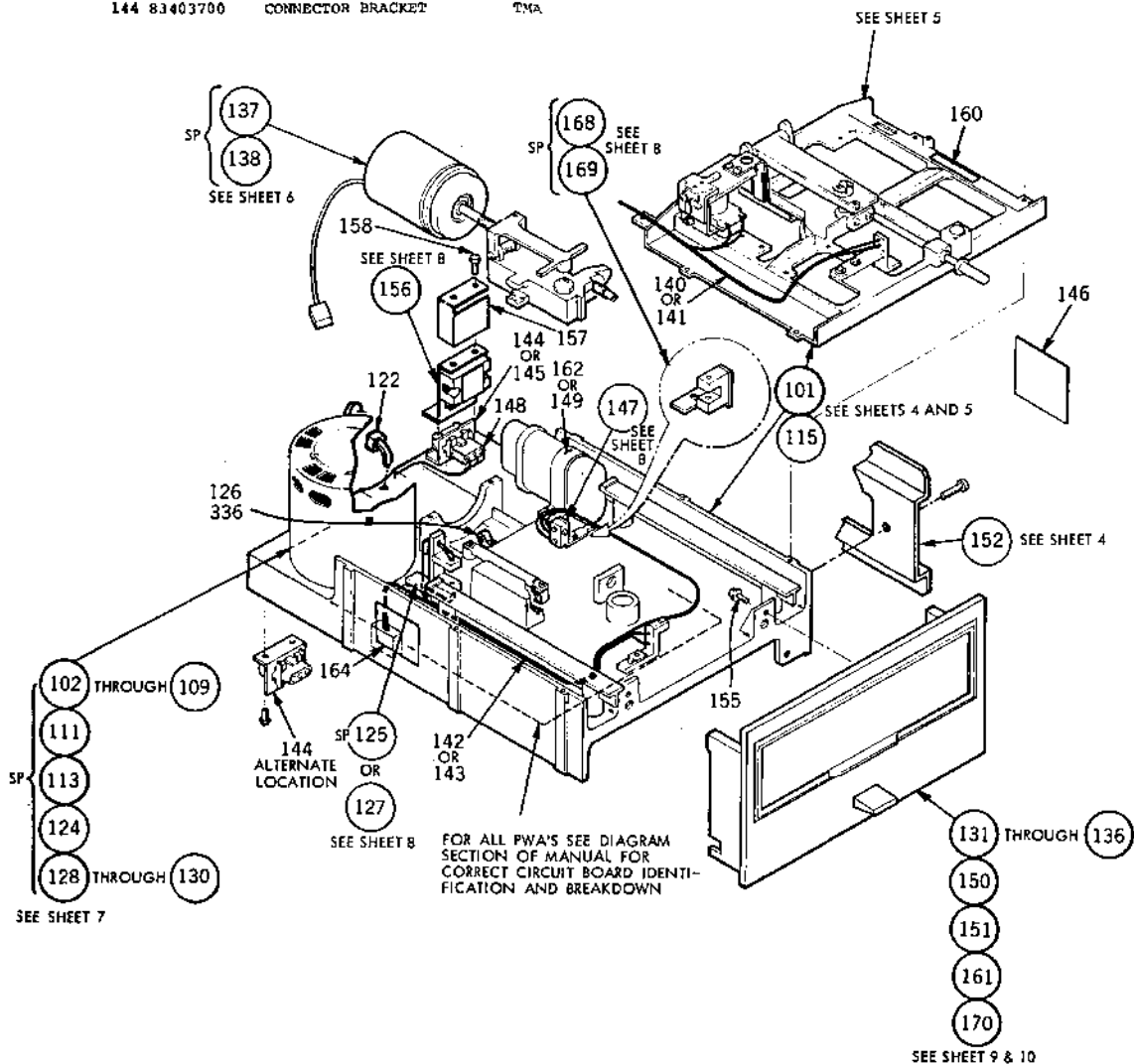


Figure 8-1. Top Mechanical Assembly

ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
101	83458201	CHASSIS ASM-COMMON PARTS	TMA
115	75891480	CHASSIS ARM-COMMON PARTS	TMA
152	77832691	MOUNTING KIT	TMA
178	10125801	WASHERS SPR LOCK	101 115
180	75293203	BRIT-PLAT	101 115
183	75774732	CLIP-PUSH IN	101 115
184	75774736	CLIP-PUSH IN	101 115
186	10125803	WASHERS SPR LOCK	101 115
187	10125605	WASHERS PLAIN	101 115
188	77832145	LABEL IDENT	101 115
190	94217702	NUT-SELF LOCK, STL 8	101 115
191	92073022	BEARING FLANGED	101 115
192	93529005	WASHER-SPRING WAVE	101 115
196	16402506	CLAMP CABLE	101 115
199	09000403	SCREW BIND HEAD	101 115
202	10126222	SCREW HEX SOC HD	101 115
205	93592086	SCR HEX SELF TAP	101 115
208	92602003	CLAMP, CABLE-NYLON	101 115
209	10126214	SCR HEX SOC HD CAP	101 115
210	83427900	PLATE-NUT	101 115
218	75882450	CARRIAGE STOP	101,115
219	93592488	SCREW	101,115
255	10127131	SCREW	152
256	10125805	LOCK WASHER	152
301	77830975	ADAPTER	152
336	93592160	SCREW, SELF TAP	101 115
339	10126401	STAR LOCK WASHER	101 115
340	75731302	ELECTRICAL SYMBOL	101 115
342	77594800	DECAL	152
360	75886086	BASE-MECHANISM, DIE	101
361	83403601	SPINDLE	101 115
362	75747000	SPACER BEARING	101 115
363	75745200	PULLEY-SPINDLE	101 115
364	75886087	BASE-MECHANISM, DIE	115
365	83461800	CLAMP, STEPPER MOTOR	101 115
366	75292400	GUIDE-CARRIAGE	101 115
377	93592486	SCREW	101 115
388	10125603	WASHER	101 115

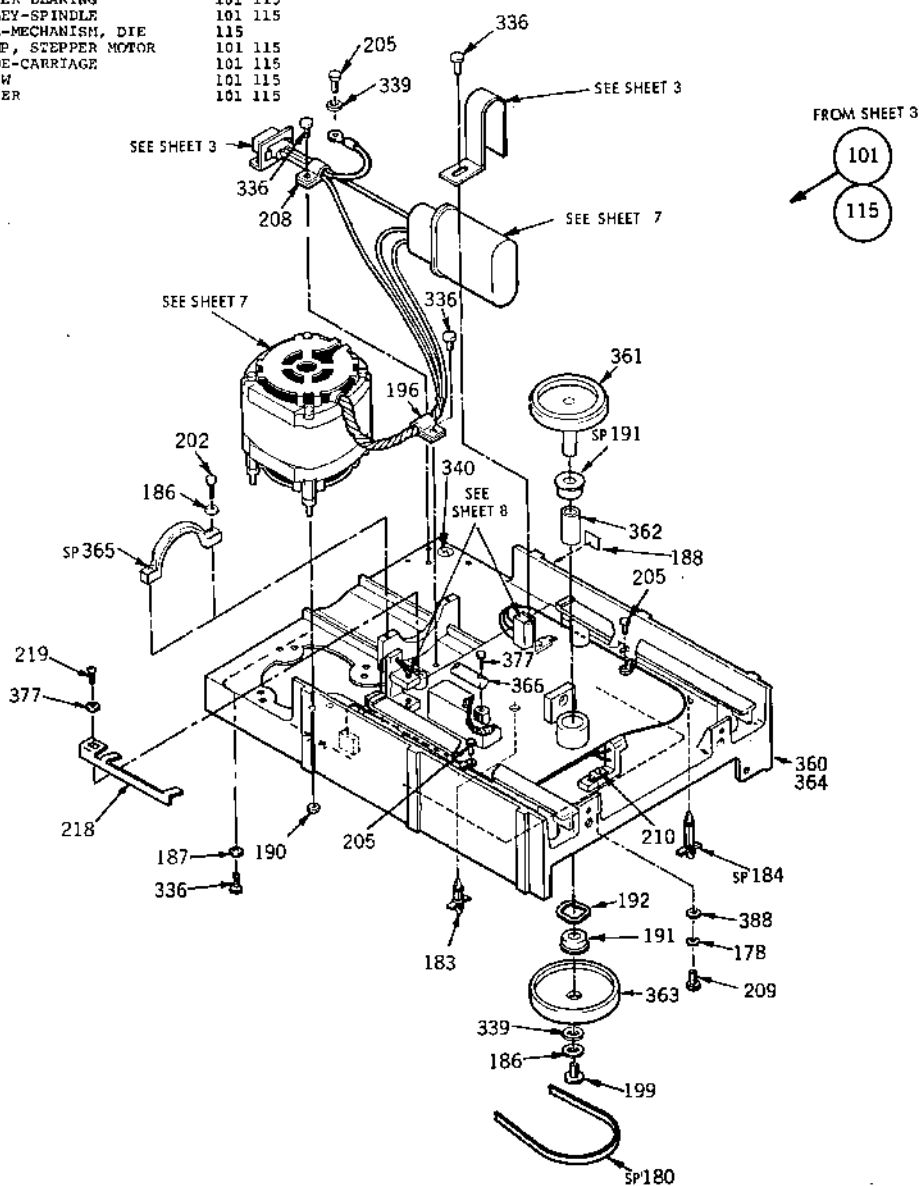
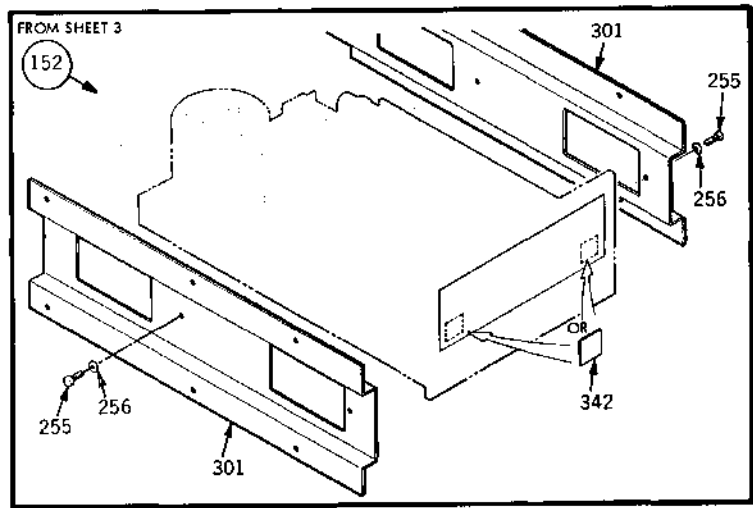
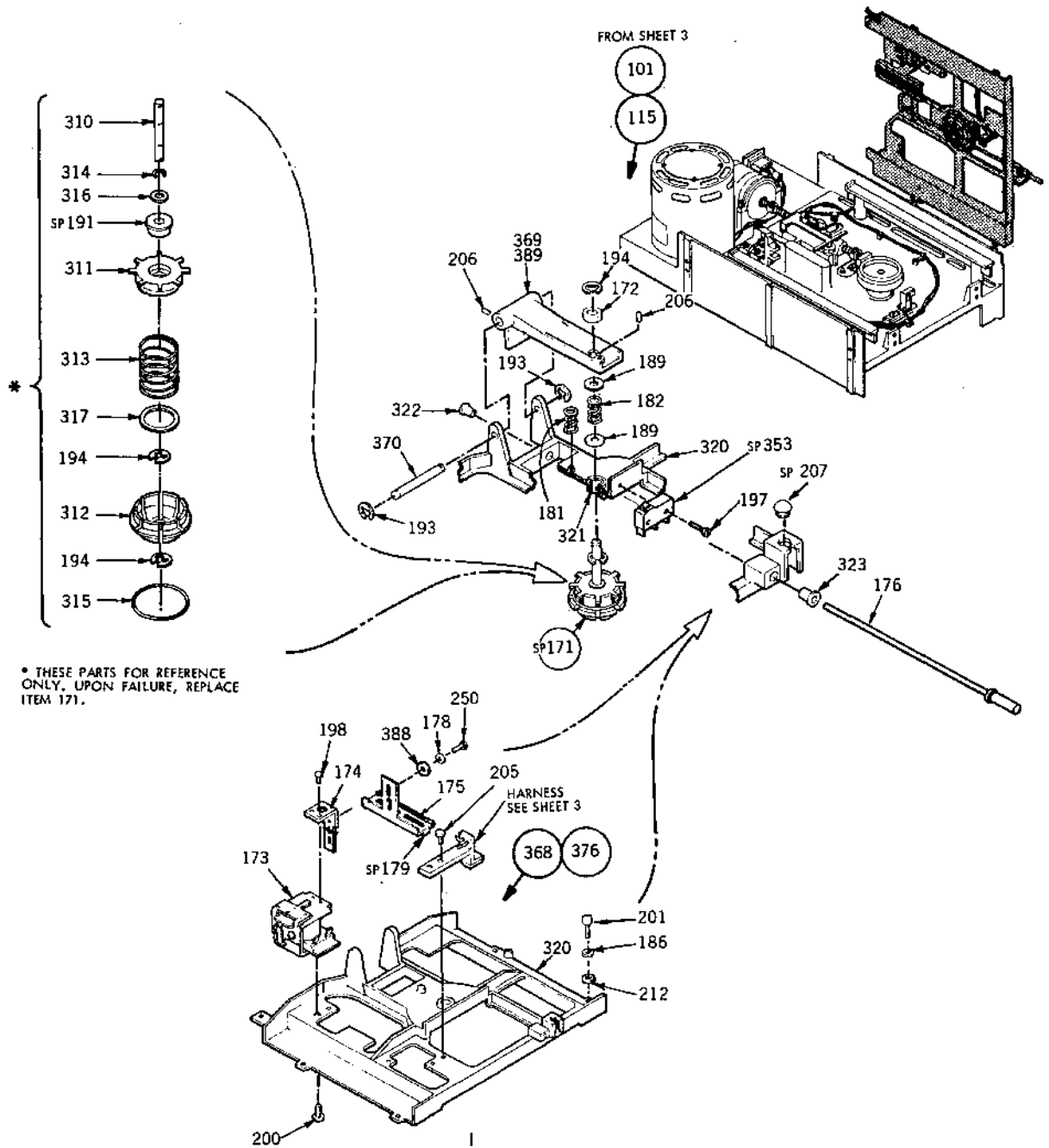


Figure 8-2. FDD Common Parts (Sheet 1 of 2)

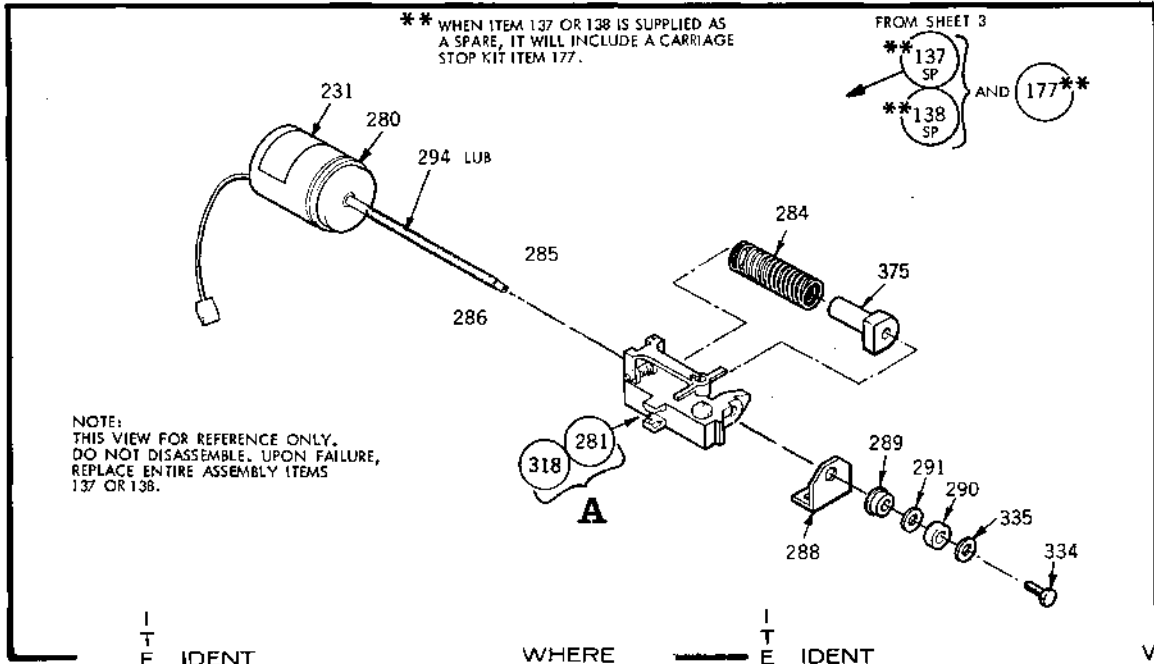


\* THESE PARTS FOR REFERENCE ONLY, UPON FAILURE, REPLACE ITEM 171.

ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
101	83458201	CHASSIS ASM-COMMON PARTS	TMA
115	75891480	CHASSIS ASM-COMMON PARTS	TMA
171	83402101	CONE ASM	101 115
172	75273200	BUSHING	101 115
173	75747202	SOLENOID	101 115
174	77834331	EXTENSION ARMATURE	101 115
175	77834326	BAIL ARMATURE	101 115
176	75885153	PUSH ROD ASSY	101 115
178	10125801	WASHERS SPR LOCK	101 115
179	77830732	FOAM PAD	101 115
181	75292609	SPRING-COMPRESSION	101 115
182	75292617	SPRING-COMPRESSION	101 115
186	10125803	WASHERS SPR LOCK	101 115
189	77835200	WASHER, NYLON	101 115
191	92073022	BEARING FLANGED	171
193	92033037	RING RETAINING	101 115
194	92033038	RETAINING RING	101 171
194	92033038	RETAINING RING	115
197	09000005	SCREW BIND HEAD	101 115
198	09000202	SCREW BIND HEAD	101 115
200	09000504	SCREW BIND HEAD	101 115
201	10126219	SCR HEX SOC HD CAP	101 115
205	93592086	SCR HEX SELF TAP	101 115

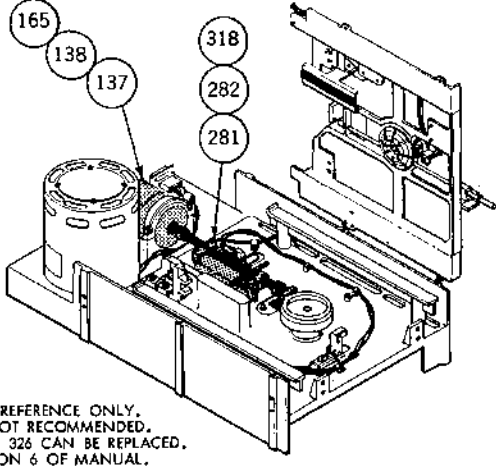
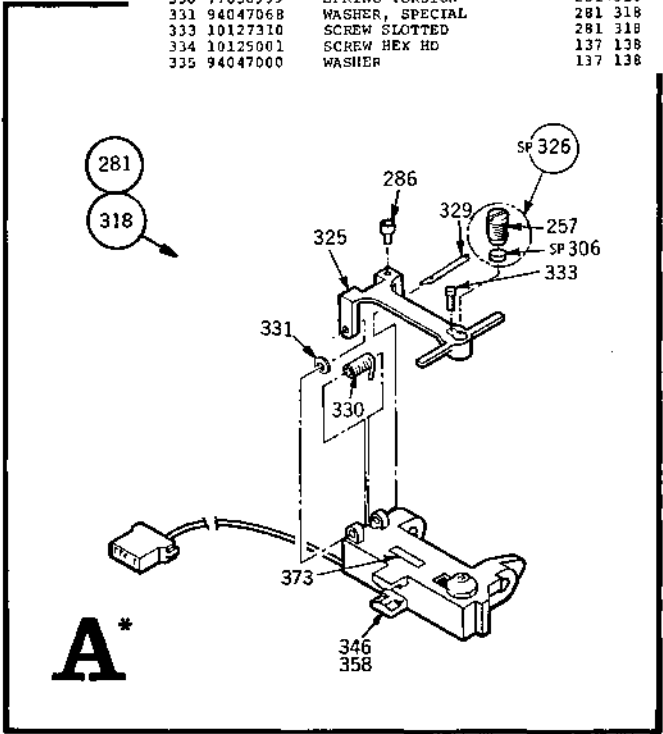
ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
206	83413408	SCREW-SELF LOCKING	101 115
207	83411202	BUMPER DOOR	101 115
212	94279109	FLAT WASHER	101 115
250	93592482	SCR HEX HD	101 115
310	75790803	SHAFT	171
311	83426400	EXPANDER-CONE	171
312	77830481	CONE-DISK LOAD	171
313	83402200	SPRING CONE	171
314	92033029	RETAINING RING	171
315	83409701	SPRING-GARTER	171
316	94047069	WASHER	171
317	94047070	WASHER	171
320	75812011	SUPPORT DIE CAST MACHINED	368
321	75292807	BEARING-CYLINDRICAL	368
322	75813201	BUSHING, PUSH ROD MOLDED	368
323	75813202	BUSHING, PUSH ROD MOLDED	368
353	75724401	ACTUATOR SWITCH	101 115
368	75812021	SUPPORT-ASSEMBLED	101
369	83402803	ARM-DISK LOAD	101
370	75273000	PIN DISK LOAD ARM	101 115
376	75812022	SUPPORT-ASSEMBLED	115
388	10125603	WASHER	101 115
389	83402804	ARM-DISK LOAD	115

Figure 8-2. FDD Common Parts (Sheet 2 of 2)



ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
137	75791510	ACTUATOR ASM	TMA
138	75791511	ACTUATOR ASM	TMA
177	75882711	CARRIAGE STOP KIT	137 138
231	75790000	CAUTION LABEL	137 138
257	83460400	HOLDER PAD	326
280	75747801	STEPPER MOTOR ASM	137 138
281	77839902	CARRIAGE ASM	137
284	77594000	SPRING-CARRIAGE	137 138
286	10126209	SCR-SOC HP CAP	281 318
288	75813000	RETAINER-BEARING	137 138
289	92073020	BEARING FLANGED	137 138
290	94217207	BRG BALL-EXT INNER R	137 138
291	93529001	WASHER-SPRING WAVE	137 138
294	77832456	LUBRICANT	137 138
306	83460701	PAD HEAD LOAD	326
318	77839901	CARRIAGE ASSY	138
325	77601100	ARM-HEAD LOAD	281 318
326	77830482	HOLDER-PAD ASSY	281 318
329	77830998	PIN CARRIAGE	281 318
330	77830999	SPRING TORSION	281 318
331	94047068	WASHER, SPECIAL	281 318
333	10127310	SCREW SLOTTED	281 318
334	10125001	SCREW HEX HD	137 138
335	94047000	WASHER	137 138

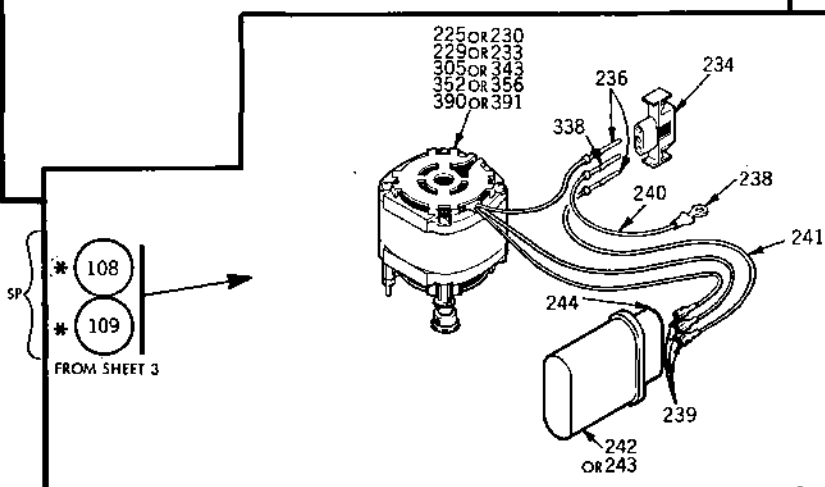
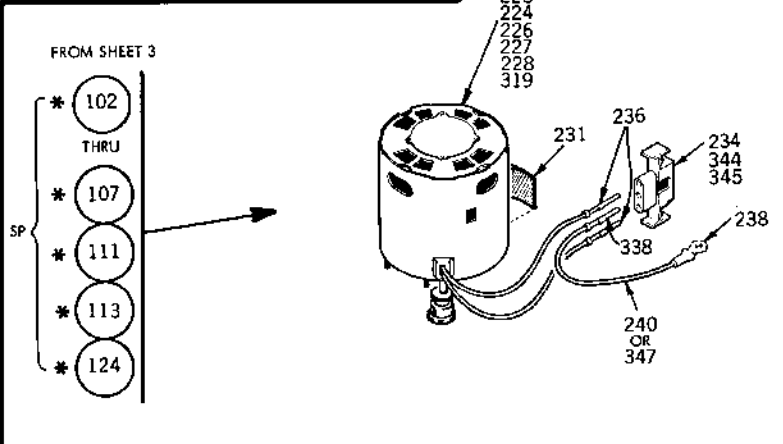
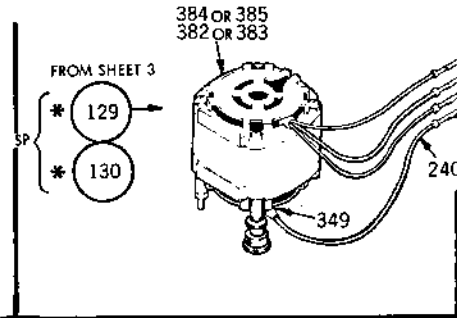
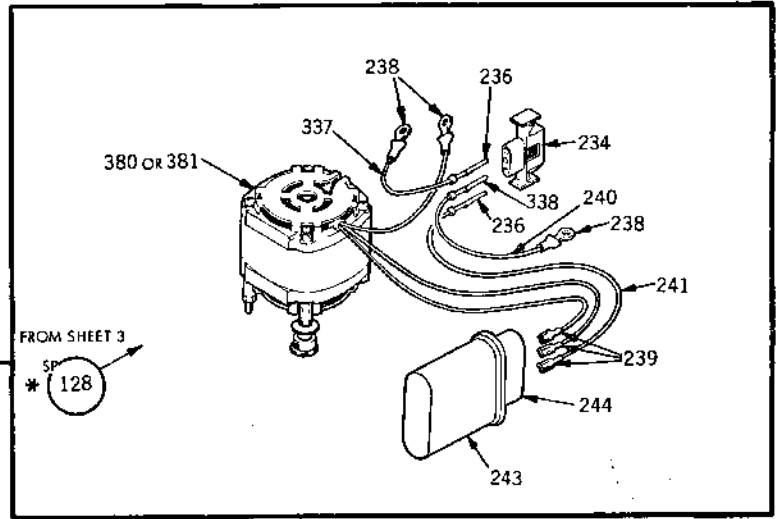
ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
346	83426204	CARRIAGE HEAD ASSY	281
358	83426205	CARRIAGE HEAD ASSY	318
373	77835304	LABEL	324 358
375	83427303	NUT CARRIAGE	137 138



\* THIS VIEW FOR REFERENCE ONLY.  
DISASSEMBLY NOT RECOMMENDED.  
HOWEVER, ITEM 326 CAN BE REPLACED.  
REFER TO SECTION 6 OF MANUAL.

Figure 8-3. Actuator and Carriage Assemblies

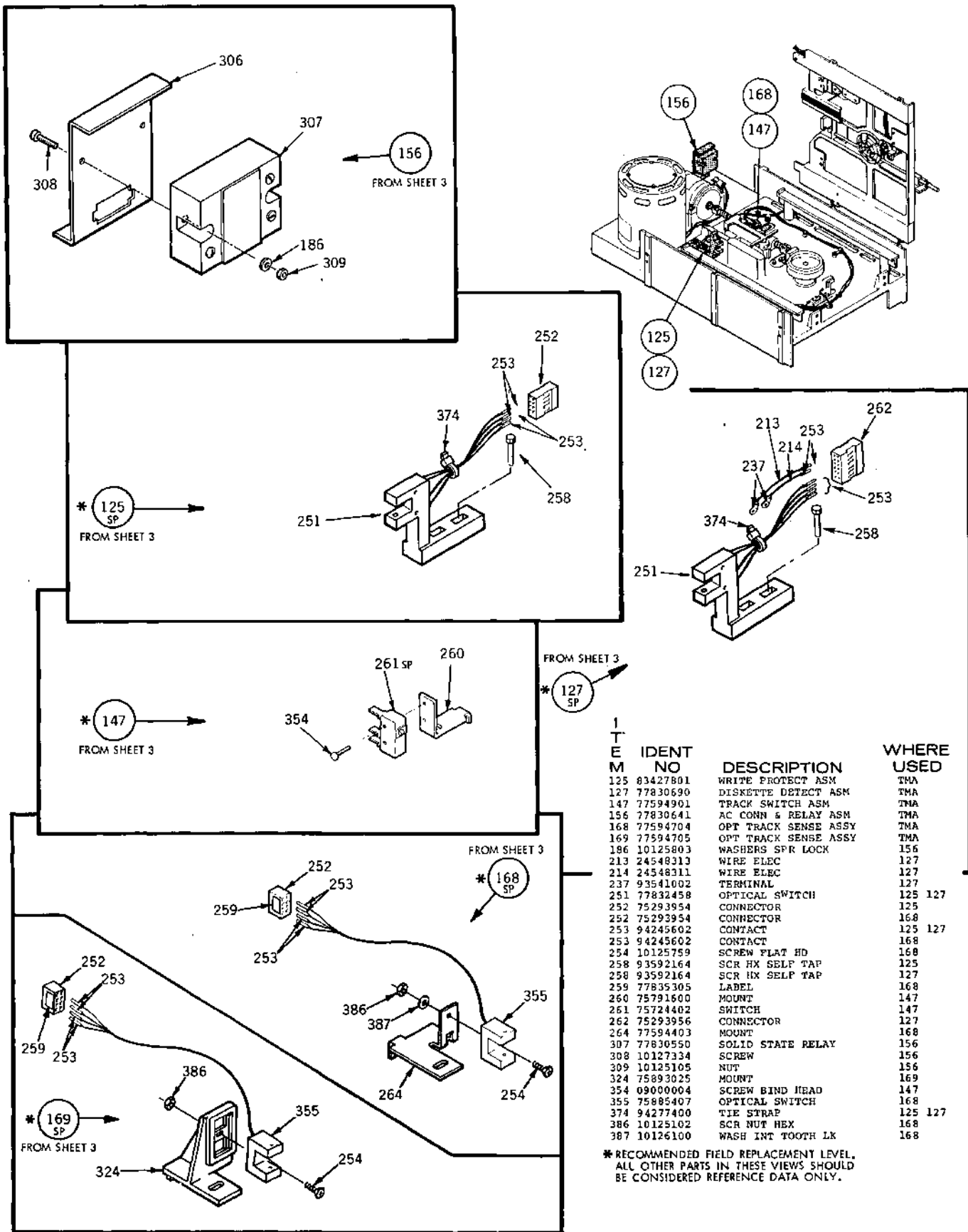
ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA
108	75881778	DRIVE MOTOR ASM 50 HZ	TMA
109	75881775	DRIVE MOTOR ASM 60 HZ	TMA
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA
130	77881781	DRIVE MOTOR ASM 60 HZ	TMA



ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
220	77833503	MOTOR PULLEY ASSY	111
221	77833504	MOTOR PULLEY ASSY	103
222	77833519	MOTOR PULLEY ASSY	107
223	77833520	MOTOR PULLEY ASSY	105
224	77833507	MOTOR PULLEY ASSY	106
225	77833535	MOTOR PULLEY ASSY	109
226	77833502	MOTOR PULLEY ASSY	102
227	77833501	MOTOR PULLEY ASSY	124
228	77833506	MOTOR PULLEY ASSY	104
229	77833527	MOTOR PULLEY ASSY	108
230	77833525	MOTOR PULLEY ASSY	109
231	75790000	CAUTION LABEL	124 139
231	75790000	CAUTION LABEL	102-107
231	75790000	CAUTION LABEL	111 112
231	75790000	CAUTION LABEL	113
233	77833532	MOTOR PULLEY ASSY	108
234	83435402	CONNECTOR	102-110
234	83435402	CONNECTOR	113 114
234	83435402	CONNECTOR	111 112
234	83435402	CONNECTOR	128 139
236	83435501	CONTACT PIN	102-128
236	83435501	CONTACT PIN	139
238	51797233	TERMINAL	102-128
238	51797233	TERMINAL	114 139
239	62121108	TERMINAL	108-110
239	62121108	TERMINAL	114 128
239	62121108	TERMINAL	139
240	15003254	WIRE (YELLOW)	102-128
240	15003254	WIRE (YELLOW)	129 130
240	15003254	WIRE (YELLOW)	114 139
241	15003309	WIRE	106-110
241	15003309	WIRE	114 128
241	15003309	WIRE	139
242	75738478	CAPACITOR	110 114
242	75738478	CAPACITOR	139
243	75738421	CAPACITOR	109
243	75738421	CAPACITOR	114 128
243	75738421	CAPACITOR	108
244	75772500	CAPACITOR FOOT	108-110
244	75772500	CAPACITOR FOOT	114 128
244	75772500	CAPACITOR FOOT	139
305	77833526	MOTOR PULLEY ASSY	110
319	77833505	MOTOR PULLEY ASSY	113
337	93464000	WIRE BLACK	114 128
338	83435511	CONTACT PIN	102-128
338	83435511	CONTACT PIN	139
343	77833531	MOTOR PULLEY ASSY	110
344	75724543	CONNECTOR PANEL MTC	124
345	75724586	CONNECTOR PANEL MTC	124
347	93464555	WIRE 16 GRN	124
348	75724587	CONTACT PIN	129 130
349	51797214	LUG TERM RING CRIMP	129 130
350	75724569	CONNECTOR PANEL MTC	129 130
351	75724585	CONNECTOR PANEL MTC	129 130
352	77833542	MOTOR PULLEY ASSY	139
356	77833545	MOTOR PULLEY ASSY	139
380	77833526	MOTOR PULLEY ASSY	128
381	77833531	MOTOR PULLEY ASSY	128
382	77833525	MOTOR PULLEY ASSY	129
383	77833535	MOTOR PULLEY ASSY	129
384	77833527	MOTOR PULLEY ASSY	130
385	77833532	MOTOR PULLEY ASSY	130
390	77833529	MOTOR PULLEY ASSY	114
391	77833534	MOTOR PULLEY ASSY	114

\* RECOMMENDED FIELD REPLACEMENT LEVEL. ALL OTHER PARTS SHOULD BE CONSIDERED REFERENCE DATA ONLY.

Figure 8-4. Drive Motor Assembly

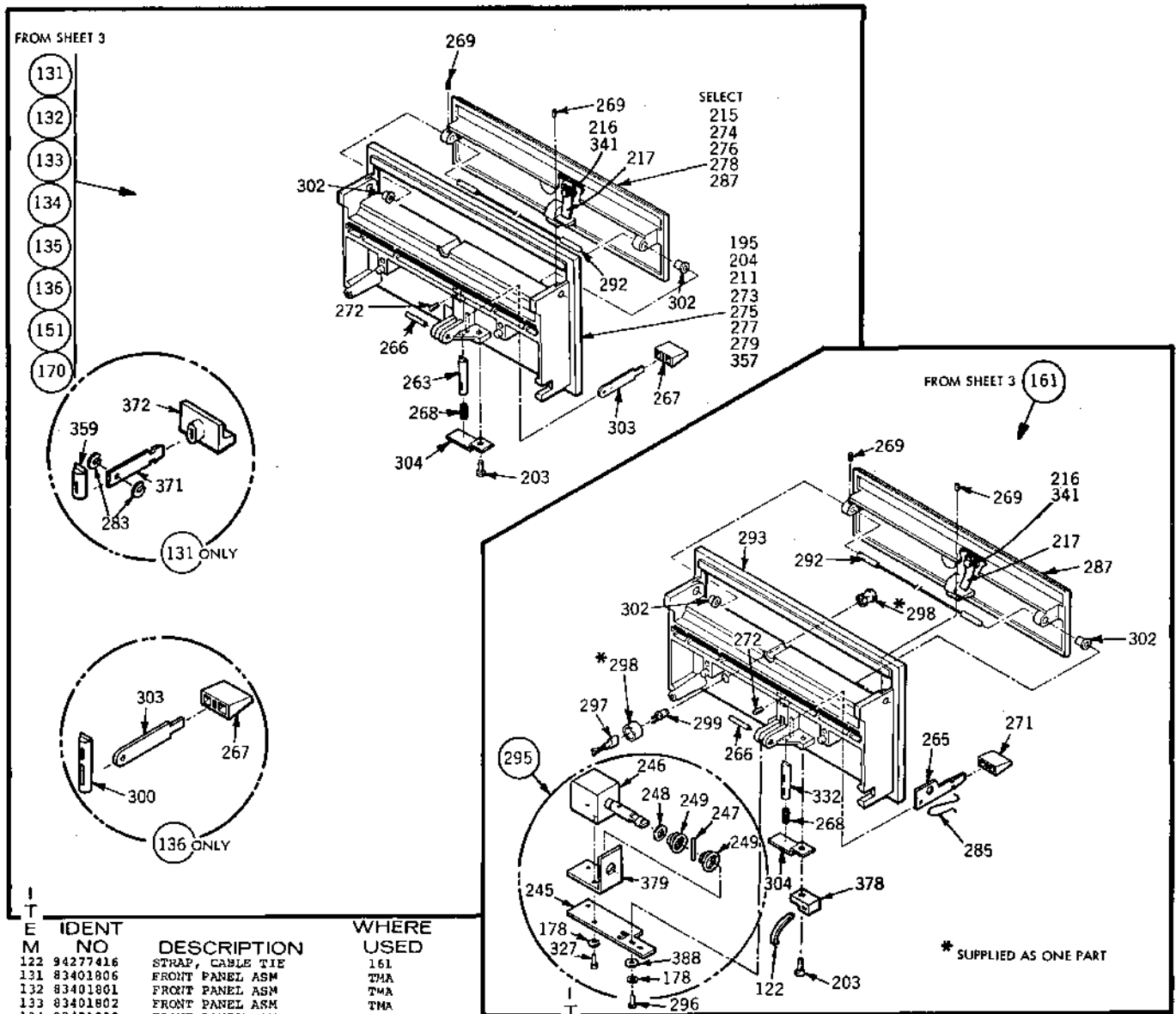


ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
125	83427801	WRITE PROTECT ASM	TMA
127	77830690	DISKETTE DETECT ASM	TMA
147	77594901	TRACK SWITCH ASM	TMA
156	77830641	AC CONN & RELAY ASM	TMA
168	77594704	OPT TRACK SENSE ASSY	TMA
169	77594705	OPT TRACK SENSE ASSY	TMA
186	10125803	WASHERS SFR LOCK	156
213	24548313	WIRE ELEC	127
214	24548311	WIRE ELEC	127
237	93541002	TERMINAL	127
251	77832458	OPTICAL SWITCH	125 127
252	75293954	CONNECTOR	125
252	75293954	CONNECTOR	168
253	94245602	CONTACT	125 127
253	94245602	CONTACT	168
254	10125759	SCREW FLAT HD	168
258	93592164	SCR HX SELF TAP	125
258	93592164	SCR HX SELF TAP	127
259	77835305	LABEL	168
260	75791600	MOUNT	147
261	75724402	SWITCH	147
262	75293956	CONNECTOR	127
264	77594403	MOUNT	168
307	77830550	SOLID STATE RELAY	156
308	10127334	SCREW	156
309	10125105	NUT	156
324	75893025	MOUNT	169
354	09000004	SCREW BIND HEAD	147
355	75885407	OPTICAL SWITCH	168
374	94277400	TIE STRAP	125 127
386	10125102	SCR NUT HEX	168
387	10126100	WASH INT TOOTH LX	168

\* RECOMMENDED FIELD REPLACEMENT LEVEL. ALL OTHER PARTS IN THESE VIEWS SHOULD BE CONSIDERED REFERENCE DATA ONLY.

Figure 8-5. Miscellaneous Sub-Assemblies





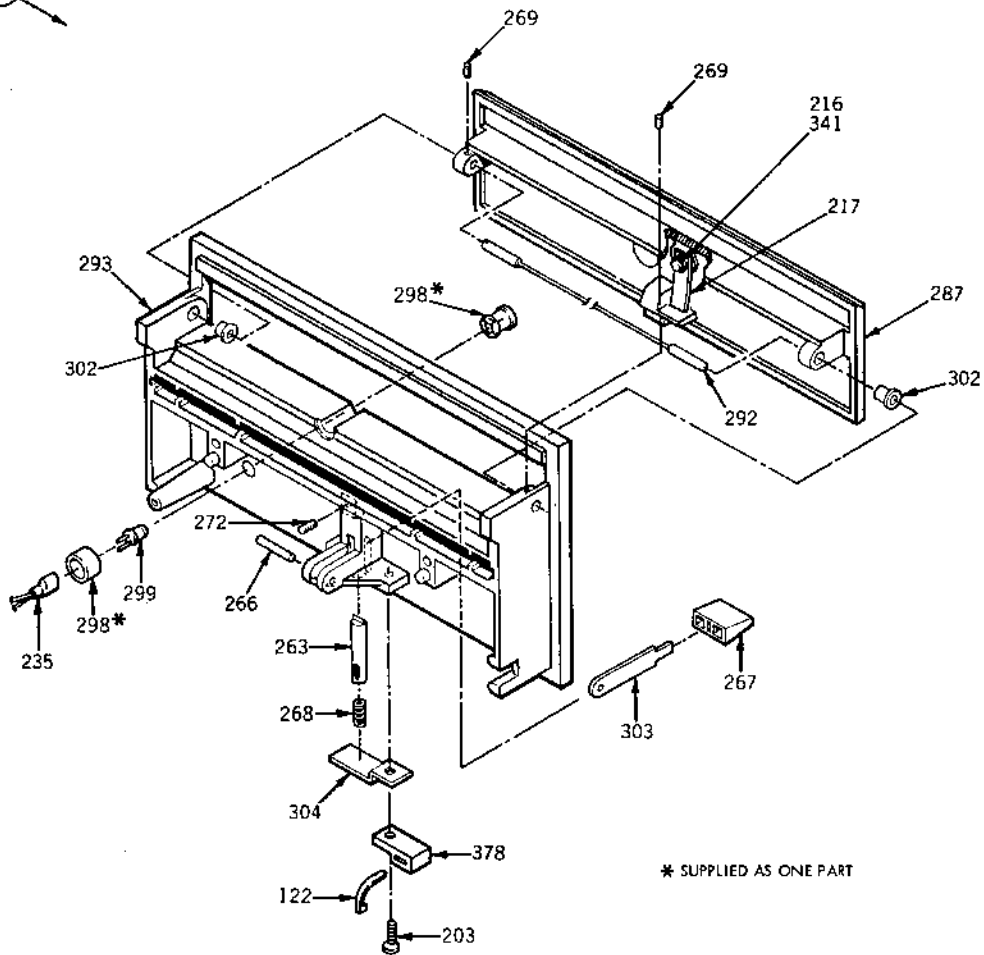
ITEM NO	DESCRIPTION	WHERE USED
122 94277416	STRAP, CABLE TIE	161
131 83401806	FRONT PANEL ASM	TMA
132 83401801	FRONT PANEL ASM	TMA
133 83401802	FRONT PANEL ASM	TMA
134 83401803	FRONT PANEL ASM	TMA
135 83401804	FRONT PANEL ASM	TMA
136 83401805	FRONT PANEL ASM	TMA
151 83401809	FRONT PANEL ASM	TMA
161 77834543	FRONT PANEL ASSY	TMA
170 83401808	FRONT PANEL ASSY	TMA
195 83426624	PANEL FRONT FIN BLK	132
203 93592162	SCR HX WASHER SLF TA	131-136
203 93592162	SCR HX WASHER SLF TA	141 170
204 75898043	PANEL, FRONT, FIN BLK	151
211 83426626	PANEL FRONT FIN BLU	170
215 75812126	DOOR FINISHRD BLU	170
216 93592080	SCR HEX WSR HD	131-136
216 93592080	SCR HEX WSR HD	161 170
217 75884657	LEAF SPRING	131-136
217 75884657	LEAF SPRING	161 170
245 77835131	SOLENOID BRKT	295
246 77834212	SOLENOID	296
247 93530103	PIN ROLL	295
248 75806507	WASHER	295
249 77834323	SPRING	295
263 83402301	LATCH-DOOR INJEC MOL	132-135
263 83402301	LATCH-DOOR INJEC MOL	170
265 77834318	LEVER-DOOR	161
266 92096099	PIN-GROOVED	131-136
266 92096099	PIN-GROOVED	161 170
267 75292700	KNOB-LEVER	132-136
267 75292700	KNOB-LEVER	170
268 83401200	SPRING-LATCH	131-136
268 83401200	SPRING-LATCH	161 170
269 83413406	SCR SET SOC HD 6-32	131-136
269 83413406	SCR SET SOC HD 6-32	161 170
271 75292701	KNOB-LEVER	161
272 83413404	SCREW-SELF LOCKING	131-136
272 83413404	SCREW-SELF LOCKING	161 170
273 83426621	PANEL FRONT, BLACK HW	133
274 75812121	DOOR, FINISHED, PA-BLK	133

ITEM NO	DESCRIPTION	WHERE USED
275 83426622	PANEL FRONT, WHITE HW	134
276 75812122	DOOR, FINISHED, PA-WHT	134
277 83426623	PANEL FRONT, FIN BLUE	135
278 75812123	DOOR, FINISHED, PA-BLU	135
279 83461110	FRONT PANEL FINISHED	136
283 75881371	SHIM	131
285 75896352	DOOR LEVER SPRING	161
287 75812124	DOOR FINISHED BLACK	132 136
287 75812124	DOOR FINISHED BLACK	131 161
292 83403202	BAR TORSION DOOR	131-136
292 83403202	BAR TORSION DOOR	161 170
293 83461111	FRONT PANEL	161
295 77835133	DOOR LK ASSY	161
296 91976207	SCREW	161
297 77833702	HARNES DR LK	161
298 75810703	RETAINING RING	161
299 75810701	DIODE LIGHT	161
300 83461200	LATCH DOOR	136
302 83401500	BUSHING-DOOR INJECT	131-136
302 83401500	BUSHING-DOOR INJECT	161 170
303 75746000	LEVER-DOOR	132-136
303 75746000	LEVER-DOOR	170
304 75746800	BRACKET LATCH	131-136
304 75746800	BRACKET LATCH	161 170
327 10127321	SCR PAN HD	295
332 75889161	LATCH DOOR	161
341 10126400	WASH EXT TOOTH LK	161 170
341 10126400	WASH EXT TOOTH LK	131-136
357 77832410	PANEL FRONT BLK-BURR	131
359 77830977	LATCH DOOR	131
371 75881370	LEVER DOOR	131
372 77832119	BUTTON LATCH	131
378 95862300	ANCHOR CABLE TIE	161
379 77835132	SPACER BRKT	295

Figure 8-6. Front Panel Assembly (Sheet 1 of 2)

FROM SHEET 3

150



\* SUPPLIED AS ONE PART

ITEM NO	IDENT NO	DESCRIPTION	WHERE USED
122	94277416	STRAP, CABLE TIE	150
150	75898080	FRONT PANEL ASM	TMA
203	93592162	SCR HX WASHER SLP TA	150
216	93592080	SCR HEX WRK HD	150
217	75884657	LEAF SPRING	150
235	75898086	HARNES	150
263	83402301	LATCH-DOOR INJEC MOL	150
266	92096049	PIN-GROOVED	150
267	75292700	KNOB-LEVER	150
268	83401200	SPRING-LATCH	150
269	83411406	SCR SET SOC HD 6-32	150
272	83411404	SCREW-SELF LOCKING	150
287	75812124	DOOR FINISHED BLACK	150
292	83403202	BAR TORSION DOOR	150
293	83461111	FRONT PANEL	150
298	75810703	RETAINING RING	150
299	75810701	DIODE LIGHT	150
302	83401500	BUSHING-DOOR INJECT	150
303	75746000	LEVER-DOOR	150
304	75746800	BRACKET LATCH	150
341	10126400	WASH EXT TOOTH LK	150
378	95862300	ANCHOR CABLE TIE	150

Figure 8-6. Front Panel Assembly (Sheet 2 of 2)

## 8.6 PARTS LIST INSTRUCTIONS

### 8.6.1 ILLUSTRATION PARTS LISTS

The parts list for each illustration is an extract from the Top-Down Assembly/Component Parts list and contains only those parts depicted. Refer to paragraph 8.6.2 for explanation of parts list.

### 8.6.2 TOP-DOWN ASSEMBLY/COMPONENT PARTS LIST

- a. Starts at TMA level and lists all parts in Item Number sequence.
- b. Correlates Item numbers with part Identification numbers and the Description of each.
- c. Identifies where each part is used (where used column) within the device by listing the item number(s) of the next higher assembly.

#### NOTE

Where used data for Figure 8-1 is labeled TMA. Refer to Table 8-1 for correct application of parts (refer to paragraph 8.4).

- d. Defines the location of each part by listing the sheet number(s) where depicted.

#### NOTE

The same part may be used in any number of assemblies or sheet locations.

### 8.6.3 CROSS REFERENCE INDEX

- a. Lists all parts in numeric sequence (by Identification Number).
- b. In conjunction with the referenced sheet number (third column) and illustrations defines the physical location of each item identified.

### 8.6.4 SHEET NUMBER REFERENCING

Sheet number references of Parts Lists and Illustrations refers to sheet locations in this section. Example: Sheet reference 3 represents sheet 8-3, sheet 4 represents sheet 8-4, etc.

## 8.7 SPARE PARTS (SP)

This Illustrated Parts Breakdown is complete to the extent that all parts and assemblies are depicted and identified. Replacement part availability depends on the materials and provisioning operation of the supplier.

To assist the service representative in selecting replacement parts with minimum requisitioning lead times, engineering recommended spare parts which reflect the intended service level of the device are identified with the letters SP adjacent to the item number on the face of each illustration. Replaceable non-spared items will require longer requisitioning lead times.

# Top-Down Assembly/Component Parts List

I T E M	IDENT NO	DESCRIPTION	WHERE USED		I T E M	IDENT NO	DESCRIPTION	WHERE USED		
			USED	SH				USED	SH	
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	S3	179	77830732	FOAM PAD	101	115	S5
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	S4	180	75293203	BELT-FLAT	101	115	S4
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	S5	181	75292609	SPRING-COMPRESSION	101	115	S5
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	S3	182	75292617	SPRING-COMPRESSION	101	115	S5
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	S7	183	75774732	CLIP-PUSH IN	101	115	S4
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	S3	184	75774736	CLIP-PUSH IN	101	115	S4
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	S7	186	10125803	WASHERS SPR LOCK	101	115	S4
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA	S3	186	10125803	WASHERS SPR LOCK	101	115	S5
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA	S7	186	10125803	WASHERS SPR LOCK	156		S8
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	S3	187	10125805	WASHERS PLAIN	101	115	S4
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	S7	188	77832145	LABEL IDENT	101	115	S4
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	S3	189	77835200	WASHER, NYLON	101	115	S5
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	S7	190	94217702	NUT-SELF LOCK, STL 8	101	115	S4
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	S3	191	92073022	BEARING FLANGED	101	115	S4
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	S7	191	92073022	BEARING FLANGED	171		S5
108	75881778	DRIVE MOTOR ASM 50 HZ	TMA	S3	192	93529005	WASHER-SPRING WAVE	101	115	S4
108	75881778	DRIVE MOTOR ASM 50 HZ	TMA	S7	193	92033037	RING RETAINING	101	115	S5
109	75881775	DRIVE MOTOR ASM 60 HZ	TMA	S3	194	92033038	RETAINING RING	101	171	S5
109	75881775	DRIVE MOTOR ASM 60 HZ	TMA	S7	194	92033038	RETAINING RING	115		S5
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA	S3	195	83426624	PANEL FRONT FIN BLK	132		S9
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA	S7	196	16402504	CLAMP CABLE	101	115	S4
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	S3	197	09000005	SCREW BIND HEAD	101	115	S5
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	S7	198	09000202	SCREW BIND HEAD	101	115	S5
115	75881480	CHASSIS ASM-COMMON PARTS	TMA	S3	199	09000403	SCREW BIND HEAD	101	115	S4
115	75881480	CHASSIS ASM-COMMON PARTS	TMA	S4	200	09000504	SCREW BIND HEAD	101	115	S5
115	75881480	CHASSIS ASM-COMMON PARTS	TMA	S5	201	10126219	SCR HEX SOC HD CAP	101	115	S5
122	94277416	STRAP, CABLE TIE	TMA	S3	202	10126222	SCREW HEX SOC HD	101	115	S4
122	94277416	STRAP, CABLE TIE	161		203	93592162	SCR HX WASHER SLF TA	131-136		S9
122	94277416	STRAP, CABLE TIE	150		203	93592162	SCR HX WASHER SLF TA	161-170		S9
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S10	204	93592162	SCR HX WASHER SLF TA	150		S10
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S3	204	75898043	PANEL, FRONT, FIN BLK	151		S9
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S7	205	93592086	SCR HEX SELF TAP	101	115	S4
125	83427801	WRITE PROTECT ASM	TMA	S3	205	93592086	SCR HEX SELF TAP	101	115	S5
125	83427801	WRITE PROTECT ASM	TMA	S6	206	83413408	SCREW-SELF LOCKING	101	115	S5
126	93602001	CLAMP	TMA	S3	207	83411202	BUMPER DOOR	101	115	S5
127	77830690	DISKETTE DETECT ASM	TMA	S6	208	92602003	CLAMP, CABLE-NYLON	101	115	S4
127	77830690	DISKETTE DETECT ASM	TMA	S8	209	10126214	SCR HEX SOC HD CAP	101	115	S4
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA	S3	210	83427800	PLATE-NUT	101	115	S4
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA	S7	211	83426626	PANEL FRONT FIN BLU	101	115	S4
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	S3	212	94279109	FLAT WASHER	170		S9
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	S7	213	24548313	WIRE ELEC	101	115	S5
130	75881781	DRIVE MOTOR ASM 60 HZ	TMA	S3	214	24548311	WIRE ELEC	127		S8
130	77881781	DRIVE MOTOR ASM 60 HZ	TMA	S7	215	75812126	DOOR FINISHED BLU	170		S9
131	83401806	FRONT PANEL ASM	TMA	S3	216	93592080	SCR HEX WSR HD	133-136		S9
131	83401806	FRONT PANEL ASM	TMA	S9	216	93592080	SCR HEX WSR HD	161-170		S9
132	83401801	FRONT PANEL ASM	TMA	S3	216	93592080	SCR HEX WSR HD	150		S10
132	83401801	FRONT PANEL ASM	TMA	S9	216	93592080	SCR HEX WSR HD	150		S10
133	83401802	FRONT PANEL ASM	TMA	S3	217	75884657	LEAF SPRING	131-136		S9
133	83401802	FRONT PANEL ASM	TMA	S9	217	75884657	LEAF SPRING	161-170		S9
134	83401803	FRONT PANEL ASM	TMA	S3	217	75884657	LEAF SPRING	150		S10
134	83401803	FRONT PANEL ASM	TMA	S9	218	75882450	CARRIAGE STOP	101,115		S4
135	83401804	FRONT PANEL ASM	TMA	S3	219	93592488	SCREW	101,115		S4
135	83401804	FRONT PANEL ASM	TMA	S9	220	77833503	MOTOR PULLEY ASSY	111		S7
136	83401805	FRONT PANEL ASM	TMA	S3	221	77833504	MOTOR PULLEY ASSY	103		S7
136	83401805	FRONT PANEL ASM	TMA	S9	222	77833519	MOTOR PULLEY ASSY	107		S7
137	75791510	ACTUATOR ASM	TMA	S3	223	77833520	MOTOR PULLEY ASSY	105		S7
137	75791510	ACTUATOR ASM	TMA	S6	224	77833507	MOTOR PULLEY ASSY	106		S7
138	75791511	ACTUATOR ASM	TMA	S3	225	77833535	MOTOR PULLEY ASSY	109		S7
138	75791511	ACTUATOR ASM	TMA	S6	226	77833502	MOTOR PULLEY ASSY	102		S7
140	77830685	UPPER HARNESS ASM	TMA	S3	227	77833501	MOTOR PULLEY ASSY	124		S7
141	75747301	UPPER HARNESS ASM	TMA	S3	228	77833506	MOTOR PULLEY ASSY	104		S7
142	83403502	LOWER HARNESS ASM	TMA	S3	229	77833527	MOTOR PULLEY ASSY	108		S7
143	83403503	LOWER HARNESS ASM	TMA	S3	230	77833525	MOTOR PULLEY ASSY	109		S7
144	83403700	CONNECTOR BRACKET	TMA	S3	231	75790000	CAUTION LABEL	137-138		S6
145	75272300	CONNECTOR BRACKET	TMA	S3	231	75790000	CAUTION LABEL	124-139		S7
146	77830538	CSA LABEL	TMA	S3	231	75790000	CAUTION LABEL	102-107		S7
147	77594901	TRACK SWITCH ASM	TMA	S3	231	75790000	CAUTION LABEL	111-112		S7
147	77594901	TRACK SWITCH ASM	TMA	S8	231	75790000	CAUTION LABEL	113		S7
148	83460101	AMP CONN KIT	TMA	S3	233	77833532	MOTOR PULLEY ASSY	108		S7
149	75746702	CAPACITOR BRACKET	TMA	S3	234	83435402	CONNECTOR	102-110		S7
150	75898080	FRONT PANEL ASM	TMA	S3	234	83435402	CONNECTOR	113-114		S7
150	75898080	FRONT PANEL ASM	TMA	S10	234	83435402	CONNECTOR	111-112		S7
151	83401809	FRONT PANEL ASM	TMA	S3	234	83435402	CONNECTOR	128-139		S7
151	83401809	FRONT PANEL ASM	TMA	S9	235	75898086	HARNESS	150		S10
152	77832691	MOUNTING KIT	TMA	S3	236	83435501	CONTACT PIN	102-128		S7
152	77832691	MOUNTING KIT	TMA	S4	236	83435501	CONTACT PIN	139		S7
155	93592240	SCREW-WASHER	TMA	S3	237	93541002	TERMINAL	127		S8
156	77830641	AC CONN & RELAY ASM	TMA	S3	238	51797233	TERMINAL	102-128		S7
156	77830641	AC CONN & RELAY ASM	TMA	S8	238	51797233	TERMINAL	114-139		S7
157	77830995	COVER	TMA	S3	239	62121108	TERMINAL	108-110		S7
158	17901508	SCREW	TMA	S3	239	62121108	TERMINAL	114-128		S7
160	77834336	LABEL, POO	TMA	S3	239	62121108	TERMINAL	139		S7
161	77834543	FRONT PANEL ASSY	TMA	S3	240	15003254	WIRE (YELLOW)	102-128		S7
161	77834543	FRONT PANEL ASSY	TMA	S9	240	15003254	WIRE (YELLOW)	129-130		S7
162	75746701	CAPACITOR BRACKET	TMA	S3	240	15003254	WIRE (YELLOW)	114-139		S7
164	77836055	LABEL	TMA	S3	241	15003309	WIRE	106-110		S7
168	77594704	OPT TRACK SENSE ASSY	TMA	S3	241	15003309	WIRE	114-128		S7
168	77594704	OPT TRACK SENSE ASSY	TMA	S8	241	15003309	WIRE	139		S7
169	77594705	OPT TRACK SENSE ASSY	TMA	S3	242	75738478	CAPACITOR	110-114		S7
169	77594705	OPT TRACK SENSE ASSY	TMA	S8	242	75738478	CAPACITOR	139		S7
170	83401808	FRONT PANEL ASSY	TMA	S3	243	75738421	CAPACITOR	109		S7
170	83401808	FRONT PANEL ASSY	TMA	S9	243	75738421	CAPACITOR	114-128		S7
171	83402101	CONE ASM	101	115	243	75738421	CAPACITOR	108		S7
172	75273200	BUSHING	101	115	244	75772500	CAPACITOR BOOT	108-110		S7
173	75747302	SOLENOID	101	115	244	75772500	CAPACITOR BOOT	114-128		S7
174	77834331	EXTENSION ARMATURE	101	115	244	75772500	CAPACITOR BOOT	139		S7
175	77834326	BAIL ARMATURE	101	115	245	77835131	SOLENOID BRKT	295		S9
176	75885163	PUSH ROD ASSY	101	115	246	77834212	SOLENOID	295		S9
177	75882711	CARRIAGE STOP KIT	137	138	247	93530103	PIN ROLL	295		S9
178	10125801	WASHERS SPR LOCK	101	115	248	75806507	WASHER	295		S9
178	10125801	WASHERS SPR LOCK	101	115	249	77834323	SPRING	295		S9

## Top-Down Assembly/Component Parts List (Cont.)

ITEM NO	IDENT NO	DESCRIPTION	WHERE USED		ITEM NO	IDENT NO	DESCRIPTION	WHERE USED	
			USED	SH				USED	SH
250	93592482	SCR HEX HD	101	115	324	75893025	MOUNT	169	S8
251	77832458	OPTICAL SWITCH	125	127	325	77603100	ARM-HEAD LOAD	281	318
252	75293954	CONNECTOR	125		326	77930482	HOLDER-PAD ASSY	281	318
252	75293954	CONNECTOR	168		327	10127321	SCR PAN HD	295	S9
253	94245602	CONTACT	125	127	329	77830998	FIN CARRIAGE	281	318
253	94245602	CONTACT	168		330	94030999	SPRING TORSION	281	318
254	10125759	SCREW FLAT HD	169		331	94047068	WASHER, SPECIAL	281	318
255	10127131	SCREW	152	S4	332	75889161	LATCH DOOR	161	S9
256	10125805	LOCK WASHER	152	S4	333	10127310	SCREW SLOTTED	281	318
257	83460400	HOLDER PAD	326	S6	334	10125001	SCREW HEX HD	137	138
258	93592164	SCR HX SELF TAP	125	S8	335	94047000	WASHER	137	138
258	93592164	SCR HX SELF TAP	127	S8	336	93592160	SCREW, SELF TAP	TMA	S3
259	77835305	LABEL	168	S8	336	93592160	SCREW, SELF TAP	101	115
260	75791600	MOUNT	147	S8	337	93464000	WIRE BLACK	114	128
261	75724402	SWITCH	147	S8	338	83435511	CONTACT PIN	102-128	S7
262	75293956	CONNECTOR	127	S8	338	83435511	CONTACT PIN	139	S7
263	83402301	LATCH-DOOR INJEC MOL	132-135	S9	339	10126401	STAR LOCK WASHER	101	115
263	83402301	LATCH-DOOR INJEC MOL	170	S9	340	75731302	ELECTRICAL SYMBOL	101	115
263	83402301	LATCH-DOOR INJEC MOL	150	S10	341	10126400	WASH EXT TOOTH LK	162	170
264	77594401	MOUNT	168	S8	341	10126400	WASH EXT TOOTH LK	131-136	S9
265	77834318	LEVER-DOOR	161	S9	341	10126400	WASH EXT TOOTH LK	150	S10
266	92096099	PIN-GROOVED	131-136	S9	342	77594800	DECAL	152	S4
266	92096099	PIN-GROOVED	161	170	343	77833531	MOTOR PULLEY ASSY	110	S7
266	92096099	PIN-GROOVED	150	S10	344	75724543	CONNECTOR PANEL MTG	124	S7
267	75292700	KNOB-LEVER	132-136	S9	345	75724586	CONNECTOR PANEL MTG	124	S7
267	75292700	KNOB-LEVER	170	S9	346	83426204	CARRIAGE HEAD ASSY	281	S6
267	75292700	KNOB-LEVER	150	S10	347	93464555	WIRE 16 GRN	124	S7
268	83401200	SPRING-LATCH	131-136	S9	348	75724587	CONTACT PIN	129	130
268	83401200	SPRING-LATCH	161	170	349	51797214	LUG TERM RING CRIMP	129	130
268	83401200	SPRING-LATCH	150	S10	350	75724569	CONNECTOR PANEL MTG	129	130
269	83413406	SCR SET SOC HD 6-32	131-136	S9	351	75724585	CONNECTOR PANEL MTG	129	130
269	83413406	SCR SET SOC HD 6-32	161	170	352	77833542	MOTOR PULLEY ASSY	139	S7
269	83413406	SCR SET SOC HD 6-32	150	S10	353	75724401	ACTUATOR SWITCH	101	115
271	75292701	KNOB-LEVER	161	S9	354	09000004	SCREW BIND HEAD	147	S8
272	83413404	SCREW-SELF LOCKING	131-136	S9	355	75885407	OPTICAL SWITCH	168	S8
272	83413404	SCREW-SELF LOCKING	161	170	356	77833545	MOTOR PULLEY ASSY	139	S7
272	83413404	SCREW-SELF LOCKING	150	S10	357	77832410	PANEL FRONT BLK-BURR	131	S9
273	83426621	PANEL FRONT, BLACK HW	133	S9	358	83426205	CARRIAGE HEAD ASSY	318	S6
274	75812121	DOOR, FINISHED, PA-BLK	133	S9	359	77830977	LATCH DOOR	131	S9
275	83426622	PANEL FRONT, WHITE HW	134	S9	360	75886086	BASE-MECHANISM, DIE	101	S4
276	75812122	DOOR, FINISHED, PA-WHT	134	S9	361	83403601	SPINDLE	101	115
277	83426623	PANEL FRONT, FIN BLUE	135	S9	362	75747000	SPACER BEARING	101	115
278	75812123	DOOR, FINISHED, PA-BLU	135	S9	363	75745200	PULLEY-SPINDLE	101	115
279	83461110	FRONT PANEL FINISHED	136	S9	364	75886087	BASE-MECHANISM, DIE	115	S4
280	75747801	STEPPER MOTOR ASM	137	138	365	83461800	CLAMP, STEPPER MOTOR	101	115
281	77839902	CARRIAGE ASM	137	S6	366	75292400	GUIDE-CARRIAGE	101	115
283	75881371	SHIM	131	S9	368	75812021	SUPPORT-ASSEMBLED	101	S5
284	77594000	SPRING-CARRIAGE	137	138	369	83402803	ARM-DISK LOAD	101	S5
285	75896352	DOOR LEVER SPRING	161	S9	370	75273000	PIN DISK LOAD ARM	101	115
286	10126209	SCR-SOC HP CAP	281	318	371	75881370	LEVER DOOR	131	S9
287	75812124	DOOR FINISHED BLACK	132	136	372	77832119	BUTTON LATCH	131	S9
287	75812124	DOOR FINISHED BLACK	131	161	373	77835304	LABEL	324	359
287	75812124	DOOR FINISHED BLACK	150	S10	374	94277400	TIE STRAP	125	127
288	75813000	RETAINER-BEARING	137	138	375	83427303	NUT CARRIAGE	137	138
289	92073020	BEARING-FLANGED	137	138	376	75812022	SUPPORT-ASSEMBLED	115	S5
290	94217207	BRG BALL-EXT INNER R	137	138	377	93592466	SCREW	101	115
291	93529001	WASHER-SPRING WAVE	137	138	378	95862300	ANCHOR CABLE TIE	161	S9
292	83403202	BAR TORSION DOOR	131-136	S9	378	95862300	ANCHOR CABLE TIE	150	S10
292	83403202	BAR TORSION DOOR	161	170	379	77835132	SPACER BKT	295	S9
292	83403202	BAR TORSION DOOR	150	S10	380	77833526	MOTOR PULLEY ASSY	128	S7
293	83461111	FRONT PANEL	161	S9	381	77833531	MOTOR PULLEY ASSY	128	S7
293	83461111	FRONT PANEL	150	S10	382	77833525	MOTOR PULLEY ASSY	129	S7
294	77832456	LUBRICANT	137	138	383	77833535	MOTOR PULLEY ASSY	129	S7
295	77835133	DOOR LK ASSY	161	S9	384	77833527	MOTOR PULLEY ASSY	130	S7
296	91976207	SCREW	161	S9	385	77833532	MOTOR PULLEY ASSY	130	S7
297	77833702	HARNES DR LK	161	S9	386	10125102	SCR NUT HEX	168	S8
298	75810703	RETAINING RING	161	S9	387	10126100	WASH INT TOOTH LK	168	S8
298	75810703	RETAINING RING	150	S10	388	10125603	WASHER	101	115
299	75810701	DIODE LIGHT	161	S9	388	10125603	WASHER	101	115
299	75810701	DIODE LIGHT	150	S10	389	83402804	ARM-DISK LOAD	115	S5
300	83461200	LATCH DOOR	136	S9	390	77833529	MOTOR PULLEY ASSY	114	S7
301	77830975	ADAPTER	152	S4	391	77833534	MOTOR PULLEY ASSY	114	S7
302	83401500	BUSHING-DOOR INJECT	131-136	S9					
302	83401500	BUSHING-DOOR INJECT	161	170					
302	83401500	BUSHING-DOOR INJECT	150	S10					
303	75746000	LEVER-DOOR	132-136	S9					
303	75746000	LEVER-DOOR	170	S9					
303	75746000	LEVER-DOOR	150	S10					
304	75746800	BRACKET LATCH	131-136	S9					
304	75746800	BRACKET LATCH	161	170					
304	75746800	BRACKET LATCH	150	S10					
305	77833526	MOTOR PULLEY ASSY	110	S7					
306	83460701	PAD HEAD LOAD	326	S6					
307	77830550	SOLID STATE RELAY	196	S9					
308	10127334	SCREW	156	S8					
309	10125105	NUT	156	S8					
310	75790803	SHAFT	171	S5					
311	83426400	EXPANDER-CONE	171	S5					
312	77830481	CONE-DISK LOAD	171	S5					
313	83402200	SPRING CONE	171	S5					
314	92033029	RETAINING RING	171	S5					
315	83409701	SPRING-GARTER	171	S5					
316	94047069	WASHER	171	S5					
317	94047070	WASHER	171	S5					
318	77839901	CARRIAGE ASSY	138	S6					
319	77833505	MOTOR PULLEY ASSY	113	S7					
320	75812011	SUPPORT DIE CAST MACHINED	368	S5					
321	75292807	BEARING-CYLINDRICAL	368	S5					
322	75813201	BUSHING, PUSH ROD MOLDED	368	S5					
323	75813202	BUSHING, PUSH ROD MOLDED	368	S5					

### Cross Reference List

ITEM NO	IDENT NO	SH	ITEM NO	IDENT NO	SH	ITEM NO	IDENT NO	SH	ITEM NO	IDENT NO	SH
354	09000004	S8	162	75746701	S3	330	77830999	S6	346	83426204	S6
197	09000005	S5	149	75746702	S3	372	77832119	S9	358	83426205	S6
198	09000202	S5	304	75746800	S9	188	77832145	S4	311	83426400	S5
199	09000403	S4	304	75746800	S9	357	77832410	S9	273	83426621	S9
200	09000504	S5	304	75746800	S10	294	77832456	S6	275	83426622	S9
314	10125001	S6	362	75747000	S4	251	77832458	S8	277	83426623	S9
386	10125102	S8	173	75747202	S5	152	77832691	S3	195	83426624	S9
309	10125105	S9	141	75747301	S3	152	77832691	S4	211	83426626	S9
388	10125603	S4	280	75747801	S6	227	77833501	S7	375	83427303	S6
388	10125603	S5	244	75772500	S7	226	77833502	S7	125	83427801	S3
187	10125605	S4	244	75772500	S7	220	77833503	S7	125	83427801	S8
254	10125759	S8	244	75772500	S7	221	77833504	S7	210	83427900	S4
178	10125801	S4	183	75774732	S4	319	77833505	S7	234	83435402	S7
178	10125801	S5	184	75774736	S4	228	77833506	S7	234	83435402	S7
186	10125803	S4	231	75790000	S6	224	77833507	S7	234	83435402	S7
186	10125803	S5	231	75790000	S7	222	77833519	S7	234	83435402	S7
186	10125803	S8	231	75790000	S7	223	77833520	S7	236	83435501	S7
256	10125805	S4	231	75790000	S7	230	77833525	S7	236	83435501	S7
387	10126100	S8	231	75790000	S7	382	77833525	S7	338	83435511	S7
286	10126209	S6	310	75790803	S7	305	77833526	S7	338	83435511	S7
209	10126214	S4	137	75791510	S3	380	77833526	S7	101	83458201	S3
201	10126219	S5	137	75791510	S6	229	77833527	S7	101	83458201	S4
202	10126222	S4	138	75791511	S3	384	77833527	S7	101	83458201	S5
341	10126400	S9	138	75791511	S6	390	77833529	S7	148	83460101	S3
341	10126400	S9	260	75791600	S8	343	77833531	S7	257	83460400	S6
341	10126400	S10	248	75806507	S9	381	77833531	S7	306	83460701	S6
339	10126401	S4	299	75810701	S9	233	77833532	S7	279	83461110	S9
255	10127131	S4	299	75810701	S10	385	77833532	S7	293	83461111	S9
333	10127310	S6	298	75810703	S9	391	77833534	S7	293	83461111	S10
327	10127321	S9	298	75810703	S10	225	77833535	S7	300	83461200	S9
308	10127334	S8	320	75812011	S5	383	77833535	S7	365	83461800	S4
240	15003254	S7	368	75812021	S5	352	77833542	S7	296	9 976207	S9
240	15003254	S7	376	75812022	S5	356	77833545	S7	314	92033029	S5
240	15003254	S7	274	75812121	S9	297	77833702	S9	193	92033037	S5
241	15003309	S7	276	75812122	S9	246	77834212	S9	194	92033038	S5
241	15003309	S7	278	75812123	S9	265	77834318	S9	194	92033038	S5
241	15003309	S7	287	75812124	S9	249	77834323	S9	289	92073020	S6
196	16402506	S4	287	75812124	S9	175	77834326	S5	191	92073022	S4
158	17901508	S3	287	75812124	S10	174	77834331	S5	191	92073022	S5
214	24548311	S8	215	75812126	S9	160	77834336	S3	266	92096099	S9
213	24548313	S8	288	75813000	S6	161	77834543	S3	266	92096099	S9
349	51797214	S7	322	75813201	S5	161	77834543	S9	266	92096099	S10
238	51797233	S7	323	75813202	S5	245	77835131	S9	126	92602001	S3
238	51797233	S7	371	75881370	S9	379	77835132	S9	208	92602003	S4
239	62121108	S7	283	75881371	S9	295	77835133	S9	337	93464000	S7
239	62121108	S7	109	75881775	S3	189	77835200	S5	347	93464555	S7
239	62121108	S7	109	75881775	S7	373	77835304	S6	291	93529001	S6
145	75272300	S3	108	75881778	S3	259	77835305	S8	192	93529005	S4
370	75273000	S5	108	75881778	S7	164	77836055	S3	247	93530103	S9
172	75273200	S5	128	75881779	S3	318	77839901	S6	237	93541002	S8
124	75291902	S3	128	75881779	S7	281	77839902	S6	216	93592080	S9
124	75291902	S7	129	75881780	S3	130	77881781	S7	216	93592080	S9
102	75291920	S3	129	75881780	S7	268	83401200	S9	216	9 592080	S10
102	75291920	S7	130	75881781	S3	268	83401200	S9	205	93592086	S4
111	75291921	S3	218	75882450	S4	268	83401200	S10	205	93592086	S5
111	75291921	S7	177	75882711	S6	302	83401500	S9	336	93592160	S3
103	75291923	S3	217	75884657	S9	302	83401500	S9	336	93592160	S4
103	75291923	S7	217	75884657	S9	302	83401500	S10	203	93592162	S9
113	75291924	S3	217	75884657	S10	132	83401801	S3	203	93592162	S9
113	75291924	S7	176	75885163	S5	132	83401801	S9	203	93592162	S10
107	75291925	S3	355	75885407	S8	133	83401802	S3	258	9 592164	S8
107	75291925	S7	360	75886086	S4	133	83401802	S9	258	93592164	S8
104	75291926	S3	364	75886087	S4	134	83401803	S3	155	93592240	S3
104	75291926	S7	332	758889161	S9	134	83401803	S9	250	93592482	S5
105	75291927	S3	115	75891480	S3	135	83401804	S3	377	93592486	S4
105	75291927	S7	115	75891480	S4	135	83401804	S9	219	93592488	S4
106	75291928	S3	115	75891480	S5	136	83401805	S3	335	94047000	S6
106	75291928	S7	324	75893025	S8	136	83401805	S9	331	94047068	S6
366	75292400	S4	285	75896352	S9	131	83401806	S3	316	94047069	S5
181	75292609	S5	204	75898043	S9	131	83401806	S9	317	94047070	S5
182	75292617	S5	150	75898080	S3	170	83401808	S3	290	94217207	S6
267	75292700	S9	150	75898080	S10	170	83401808	S9	190	94217702	S4
267	75292700	S9	235	75898086	S10	151	83401809	S3	253	94245602	S8
267	75292700	S10	284	77594000	S6	151	83401809	S9	253	94245602	S8
271	75292701	S9	264	77594403	S8	171	83402101	S5	374	94277400	S8
321	75292807	S5	168	77594704	S3	313	83402200	S5	122	94277416	S3
180	75293203	S4	168	77594704	S8	263	83402301	S9	122	94277416	S9
252	75293954	S8	169	77594705	S3	263	83402301	S9	122	94277416	S10
252	75293954	S8	169	77594705	S8	263	83402301	S10	212	94279109	S5
262	75293956	S8	342	77594800	S4	369	83402803	S5	378	95862300	S9
353	75724401	S5	147	77594901	S3	389	83402804	S5	378	95862300	S10
261	75724402	S8	147	77594901	S8	292	83403202	S9			
344	75724543	S7	325	77603100	S6	292	83403202	S9			
350	75724569	S7	312	77830481	S5	292	83403202	S10			
351	75724585	S7	326	77830482	S6	142	83403502	S3			
345	75724586	S7	146	77830538	S3	143	83403503	S3			
348	75724587	S7	307	77830550	S8	361	83403601	S4			
340	75731302	S4	156	77830641	S3	144	83403700	S3			
243	75738421	S7	156	77830641	S8	315	83409701	S5			
243	75738421	S7	140	77830685	S3	20	7 83411202	S5			
243	75738421	S7	127	77830690	S3	272	83413404	S9			
242	75738478	S7	127	77830690	S8	272	83413404	S9			
242	75738478	S7	179	77830732	S5	272	83413404	S10			
363	75745200	S4	301	77830975	S4	269	83413405	S9			
303	75746000	S9	359	77830977	S9	269	83413406	S9			
303	75746000	S9	157	77830995	S3	269	83413406	S10			
303	75746000	S10	329	77830998	S6	206	83413408	S5			

## 9.1 INTRODUCTION

The following paragraphs contain the wire lists for the Upper Harness Assembly, Lower Harness Assembly and the Stepper Motor.

## 9.2 UPPER HARNESS ASSEMBLIES

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>
Red	Solenoid-A	J5-5	11.0" (279.4mm)
Black	Solenoid-B	J5-2	11.0" (279.4mm)
Orange	Interlock Common	J5-6	13.5" (342.9mm)
White	Interlock N. O.	J5-4	13.5" (342.9mm)
Blue	LED Cathode	J5-1	13.5" (342.9mm)
Yellow	LED Anode	J5-3	13.5" (342.9mm)

## 9.3 LOWER HARNESS ASSEMBLY

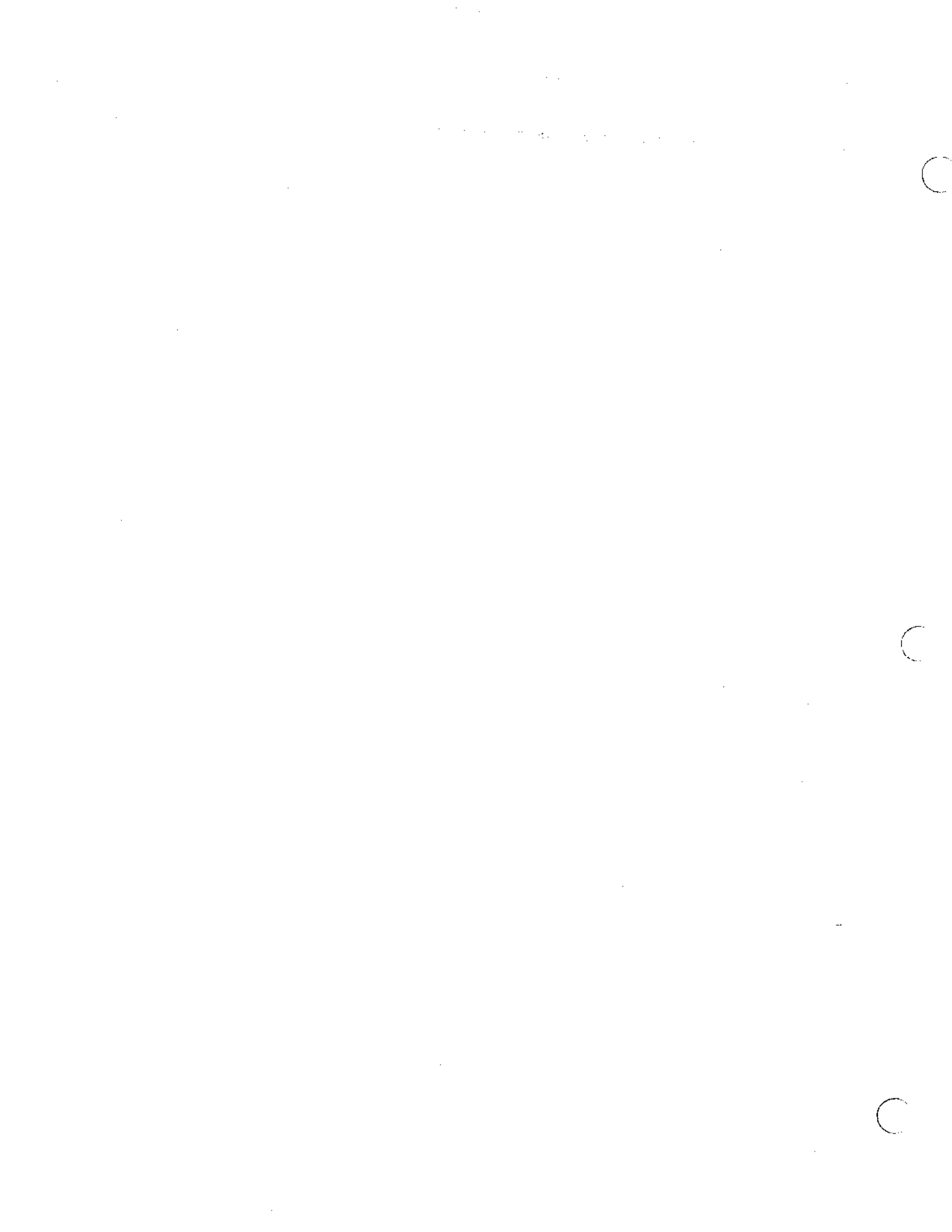
<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>
Black	Track 0 Common	J3-5	20.0" (508.0mm)
Red	Track 0 N. C.	J3-3	20.0" (508.0mm)
White	Track 0 N. O.	J3-2	20.0" (508.0mm)
Blue	Photo Transistor Emitter	J3-4	9.0" (228.6mm)
Yellow	Photo Transistor Collector	J3-1	9.0" (228.6mm)

## 9.4 STEPPER MOTOR

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>
Brown	Stepper Motor	J4-1	13.0" (330.2mm)
Red	Stepper Motor	J4-2	13.0" (330.2mm)
Orange	Stepper Motor	J4-3	13.0" (330.2mm)
Black	Stepper Motor	J4-4	13.0" (330.2mm)

## 9.5 WRITE PROTECT

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>
Blue	LED Cathode	J6-1	20.0" (508.0mm)
Red	Phototransistor Collector	J6-2	20.0" (508.0mm)
Green	LED Anode	J6-3	20.0" (508.0mm)
White	Phototransistor Emitter	J6-4	20.0" (508.0mm)







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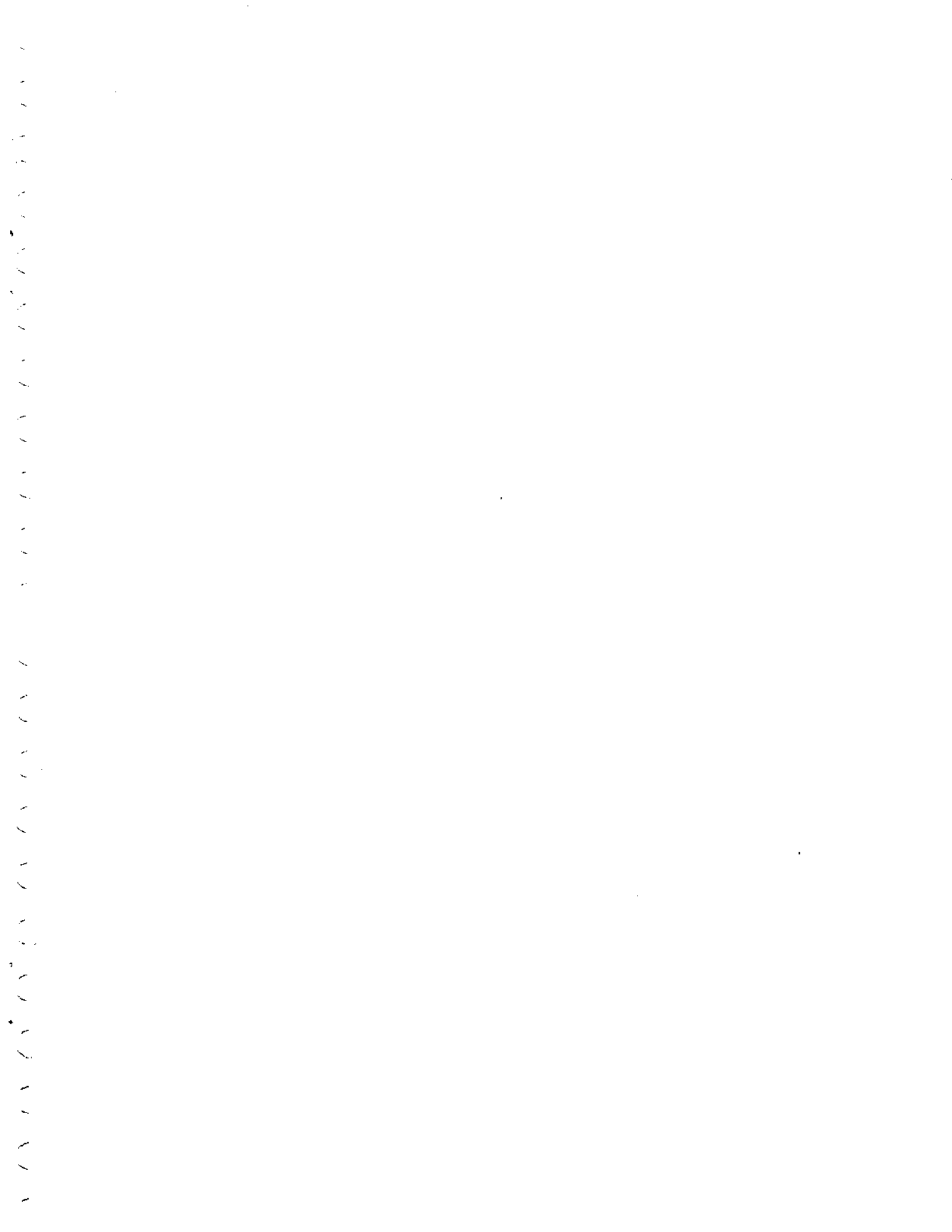
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