



**CONTROL DATA®
FLEXIBLE DISK DRIVE**

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

MAGNETIC PERIPHERALS INC.
 a subsidiary of
CONTROL DATA CORPORATION

FDD - FSM

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

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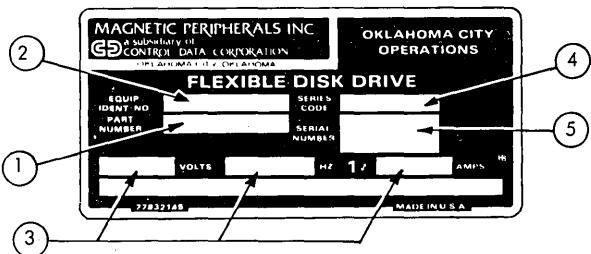
PREFACE

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.

P O W E R R E Q	V D C	+5 & +24 AT J7																																								
		+5 & +24 AT I/O J1																																								
R E Q	V A C	240, 10'																																								
		220, 10'																																								
		120, 10'																																								
		100, 10'																																								
WRITE SPLICING 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				75744041	BR8A2N	X	505	603	X					X																				
002	BR803B	X	506	603		X	X		X				042																													
003	BR803C	X	506	603	X	X			X				043																													
004	BR803D	X	506	603	X	X			X				044																													
005	BR803E	X	502	603		X			X				045																													
006	BR803F	X	502	603		X	X		X				046																													
007	BR803G	X	502	603		X	X		X				047																													
008	BR803H	X	502	603		X	X		X				048																													
009													049																													
010													050																													
011													051	BR8A6B	X	506	603		X	X	X	X																				
012													052	BR803U	X	506	603																									
013	BR803N	X	503	602		X		X					053	BR8A2S	X	510	603																									
014	BR803P	X	503	602		X		X					054	BR8A2T	X	510	603																									
015	BR803R	X	503	602	X	X		X					055	BR8A2U	X	512	603																									
016	BR803S	X	503	602	X		X		X				056	BR8A2V	X	507	603		X	X	X	X																				
017	BR803J	X	502	603		X		X	X				057	BR8A2Z	X	505	603																									
018	BR803K	X	502	603		X		X	X				058	BR8A3G	X	504	601		X	X	X	X																				
019	BR803L	X	513	603		X		X	X				059	BR8A3H	X	504	601		X	X	X	X																				
020	BR803M	X	513	603	X	X		X	X				060		X	509	603																									
021	BR8A3C	X	502	603		X	X		X				061	BR8A5C	X	508	603			X	X		X																			
022	BR8A3D	X	502	603		X	X		X				062	BR8A5D	X	511	603																									
023	BR8A3E	X	502	603		X	X		X				063																													
024	BR8A3F	X	502	603	X	X		X					064																													
025	BR8A2A	X	505	603		X		X					065																													
026	BR803T	X	503	603		X		X	X				066																													
027													067																													
028	BR8A3A	X	501	603		X		X					068																													
029													069																													
030	BR8A2B	X	505	603		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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GENERAL DESCRIPTION

1

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 ($\pm 10\%$) @ 1.3 A Typical
+ 5 Volts ($\pm 5\%$) @ 0.8 A Typical

With Stepper-Power Reduction

+24V ($\pm 10\%$) @ { 1.3A Typical, Stepping
0.3A Typical, Not Stepping
+ 5V ($\pm 5\%$) @ 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	Double Freq.	MFM
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)	CDC 421-60W, Single Density, or Equiv. CDC 423-60W, Double Density, or Equiv.
Diskette Dimensions	8 x 8 inches (203.2 x 203.2mm) (including jacket)
Useable Diskette Recording Surfaces	1
Diskette Surface Diameter	7.88 inches (200.1mm)
Recording Radii	Track 76 (inner) 2.0290 inches (515mm) nominal
Diskette Surface Coating	Track 00 (outer) 3.6123 inches (918mm) nominal
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)

C

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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 disenage 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.

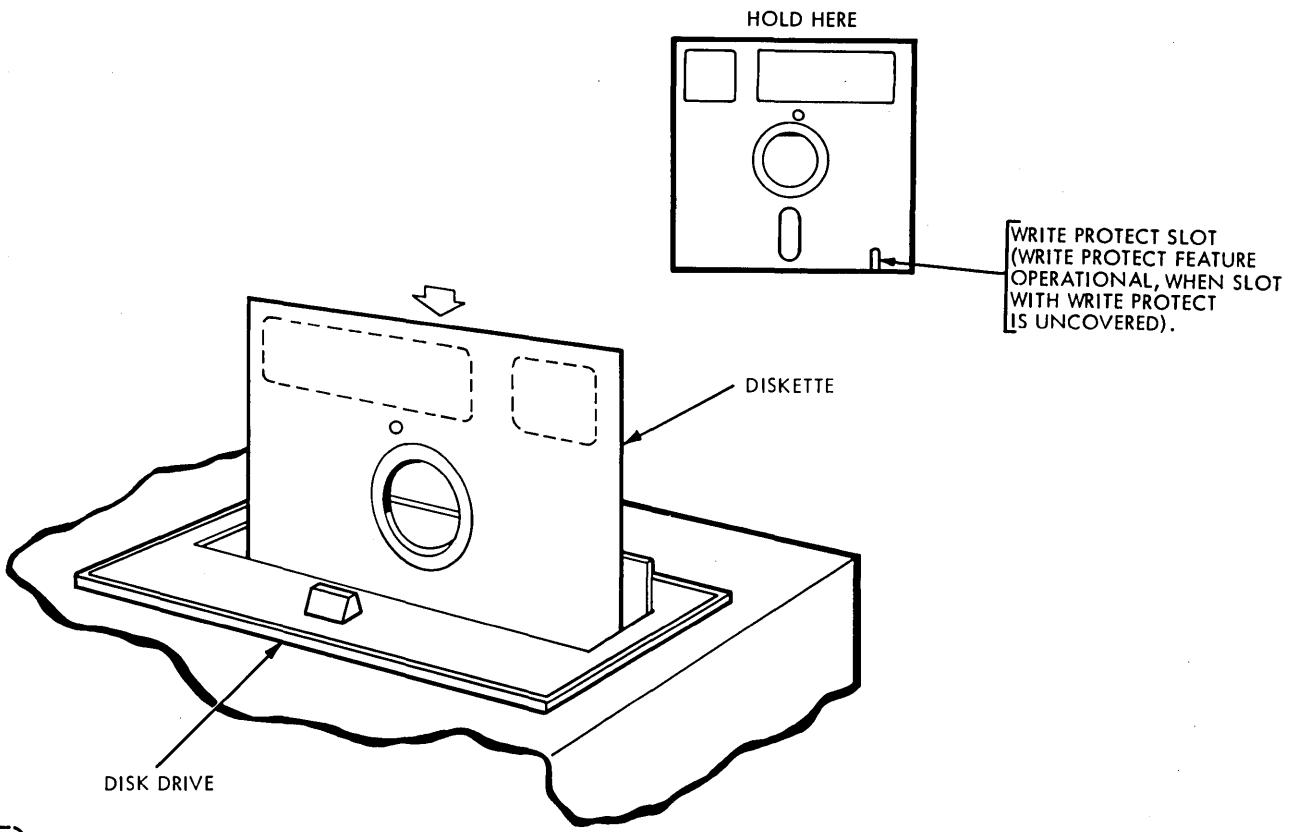


Figure 2-1. Diskette Installation

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

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.

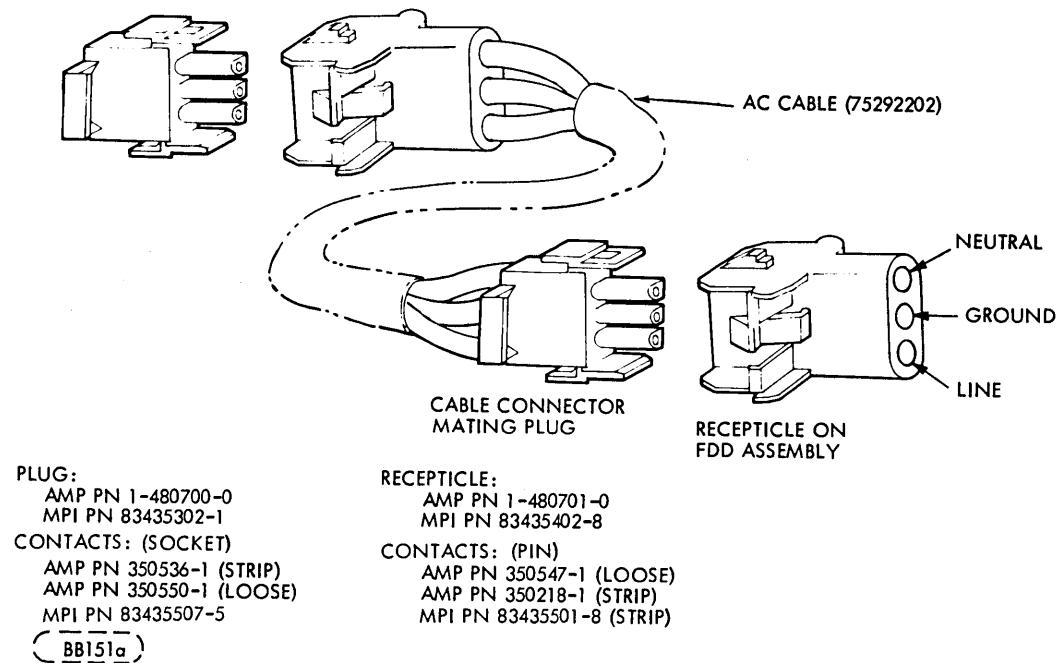
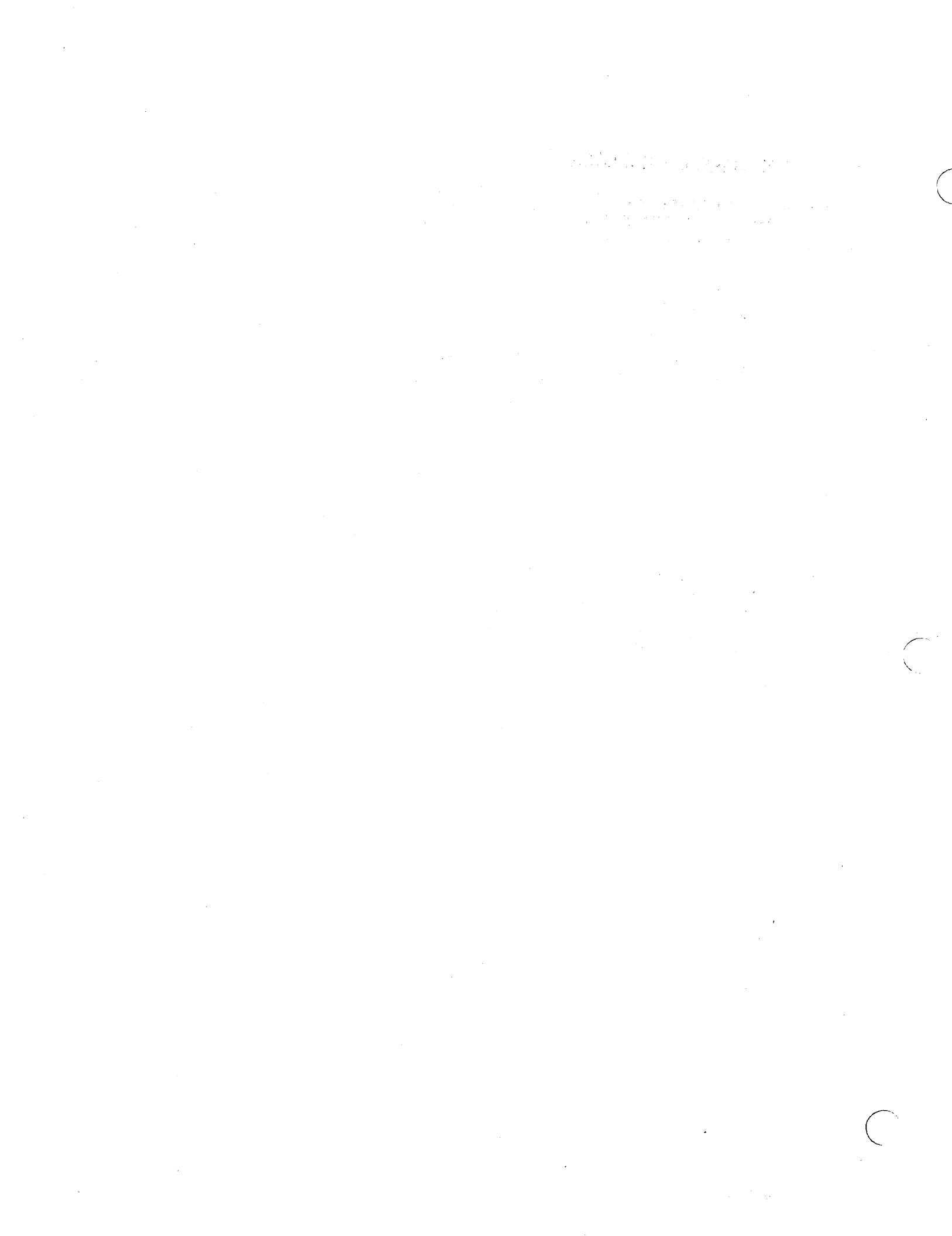


Figure 3-1. AC Cable Assembly



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.

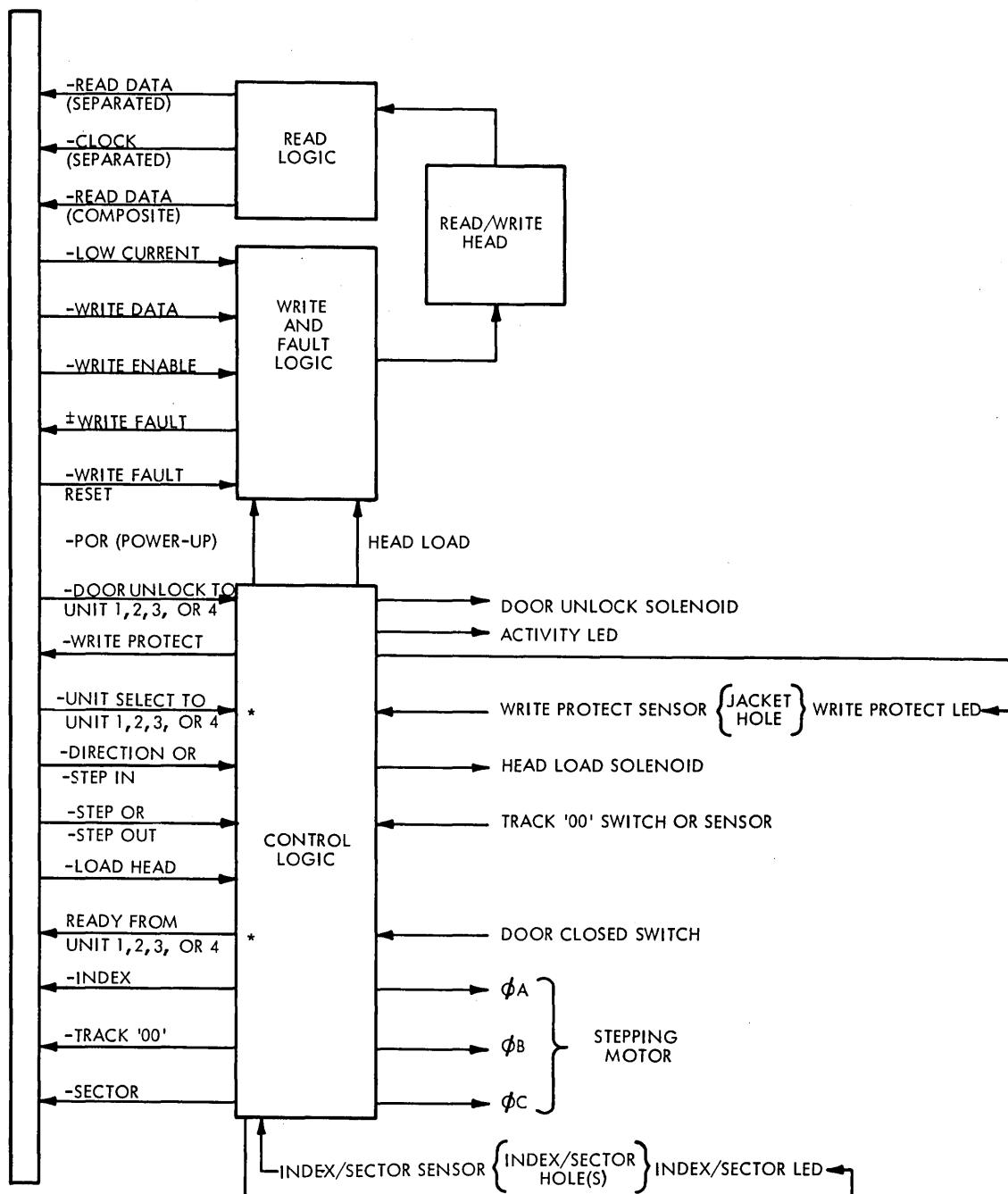


Figure 4-1. Functional Block Diagram

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 $\emptyset A$, $\emptyset B$, $\emptyset C$, $\emptyset A \dots$ or $\emptyset A$, $\emptyset C$, $\emptyset B$, and $\emptyset A$.

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 \emptyset		To Step
From	To	
A	B	
B	C	IN
C	A	
A	C	
B	A	OUT
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 $\bar{Q}A$ 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

cell time. If no "one" data bit is present in the composite data, the -Read Data Separated signal will remain high. At the end of the 3/4 cell timeout, the flip flop is reset to repeat the operation.

4.3.4 DISK DRIVE

Disk drive is accomplished by clamping the diskette between the cone assembly and a belt driven spindle. The spindle is rotated at 360 rpm by the disk drive motor. A dual pulley option permits 50 or 60 Hz operation without a motor change.

4.3.5 READ/WRITE HEAD

The Read/Write head is in direct contact with the diskette during read or write operation. Since the head is rigidly mounted on the carriage assembly, head load is achieved by a solenoid actuated bail allowing the head load arm to force the diskette against the Read/Write head. The head surface is designed for maximum signal transfer to and from the magnetic surface of the diskette with minimum head/disk wear. The tunnel erase gap DC-erases the intertrack area to improve off-track signal-to-noise ratio and permit diskette interchange between units.

4.4 CONTROL AND DATA LINE CHARACTERISTICS

All signal lines must be terminated at the receiver with a characteristic impedance of 120 ohms, typically. Transmission is by 26 AWG (min.), 120 ohm flat cable or twisted pair (one twist per inch) with a maximum line length of 25 feet. Figure 5-1 shows the timing of typical operations.

4.4.1 LOGIC LEVELS

The following definitions will be used throughout this manual:

low = Logic 1, Active State	Refers to the low-voltage condition + 0.4VDC Max.
high = Logic 0, Inactive State	Refers to the high-voltage condition + 2.4 VDC Min.

4.4.2 TRANSMITTER CHARACTERISTICS

The FDD uses the TTL7438 (quad 2-input buffer or driver) to transmit all control and data signals. This transmitter is capable of sinking a current of 48ma with an output voltage of 0.4 volt.

4.4.3 LINE RECEIVER CHARACTERISTICS

The FDD uses the SN7400 family gates for line receivers. The input of each receiver is terminated in 120 ohms.

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	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 IN	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.
-STEP OUT	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.
-HEAD LOAD	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	To enable the FDD write driver, this line is held at a logic 1.
	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.
-WRITE FAULT RESET	A logic 1 level on this line clears the write fault latch.
-WRITE DATA	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 $\pm 20\%$ 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.
-LOW CURRENT	This line reduces write current for tracks 43 or greater. A low level reduces write current.
-UNIT SELECT	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.
-DOOR UNLOCK	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.
<u>OUTPUT LINES</u>	
-READY	A logic 1 level indicates that the door is closed, a diskette is rotating, and that no write fault condition exists.
-INDEX	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.

Table 4-2. (continued)

SIGNAL	FUNCTION
<u>OUTPUT LINES</u>	
-SECTOR	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.
+ WRITE FAULT	A logic 0 level indicates one or more of the following fault conditions. -Write enable without head load. -Write enable without write data. Incorrect write data rate.
-WRITE FAULT	A logic 1 level indicates one or more of the following fault conditions. -Write enable without head load. -Write enable without write data. Incorrect write data rate. A write fault can be cleared by a logic 1 on the write fault reset line.
-TRACK 00	A logic 1 level indicates that the head is positioned over Track 00.
-WRITE PROTECT	Logic 1 level indicates that hole on diskette is uncovered.
-READ DATA (Separated)*	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.
-CLOCK(Separated)*	This line contains the separated clock information. A logic 1 level pulse of 250 nsec corresponds to a clock bit read from the diskette.
-READ DATA (Composite)	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.

*The signals are valid only when double frequency recording without missing clock is used.

DIAGRAMS

5

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)

OPTION CHAR T	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.	A							
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	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
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
512	75892150	C		X					X
513	77614500	B		X					X

X161a

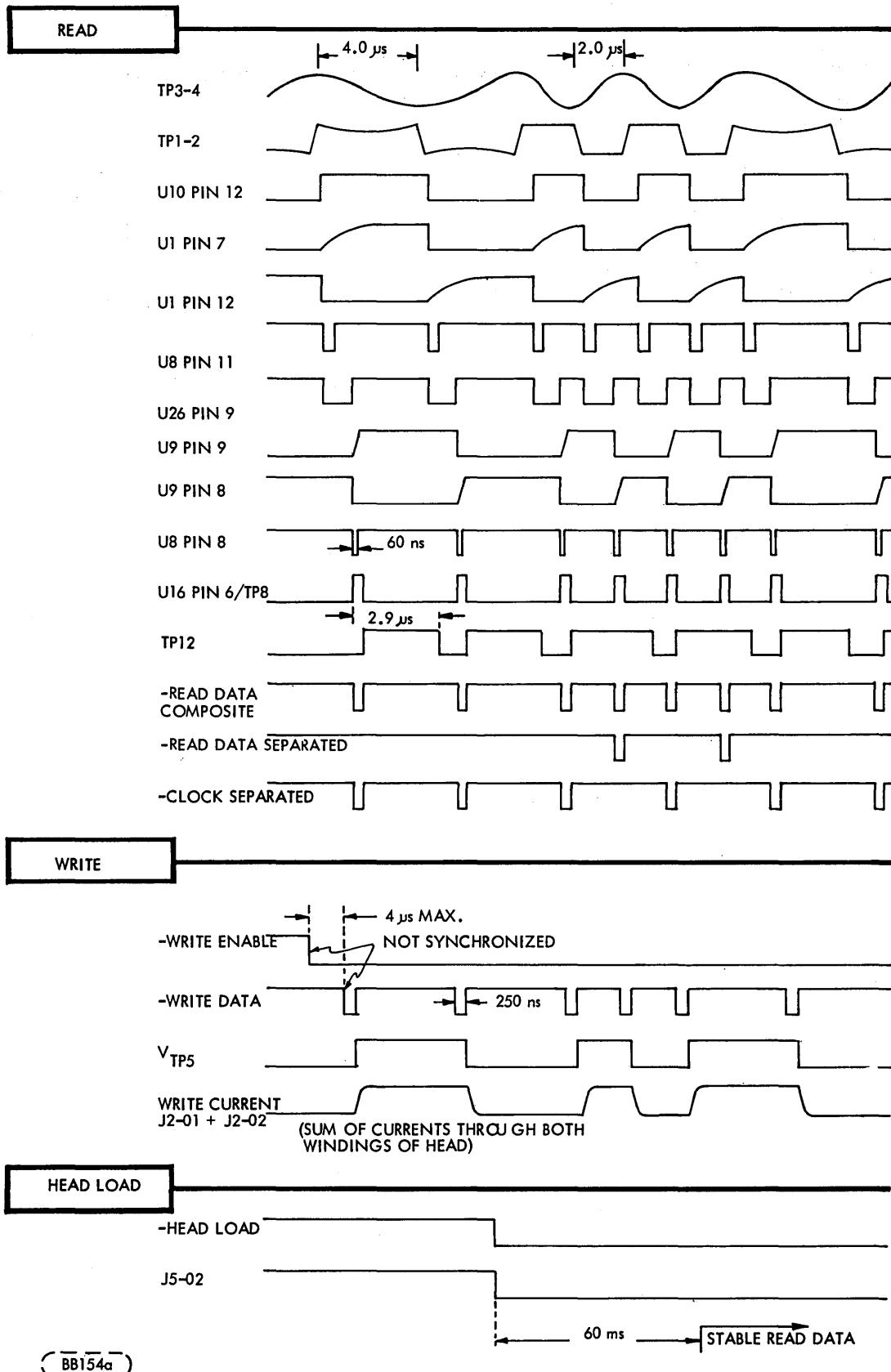


Figure 5-1. Timing

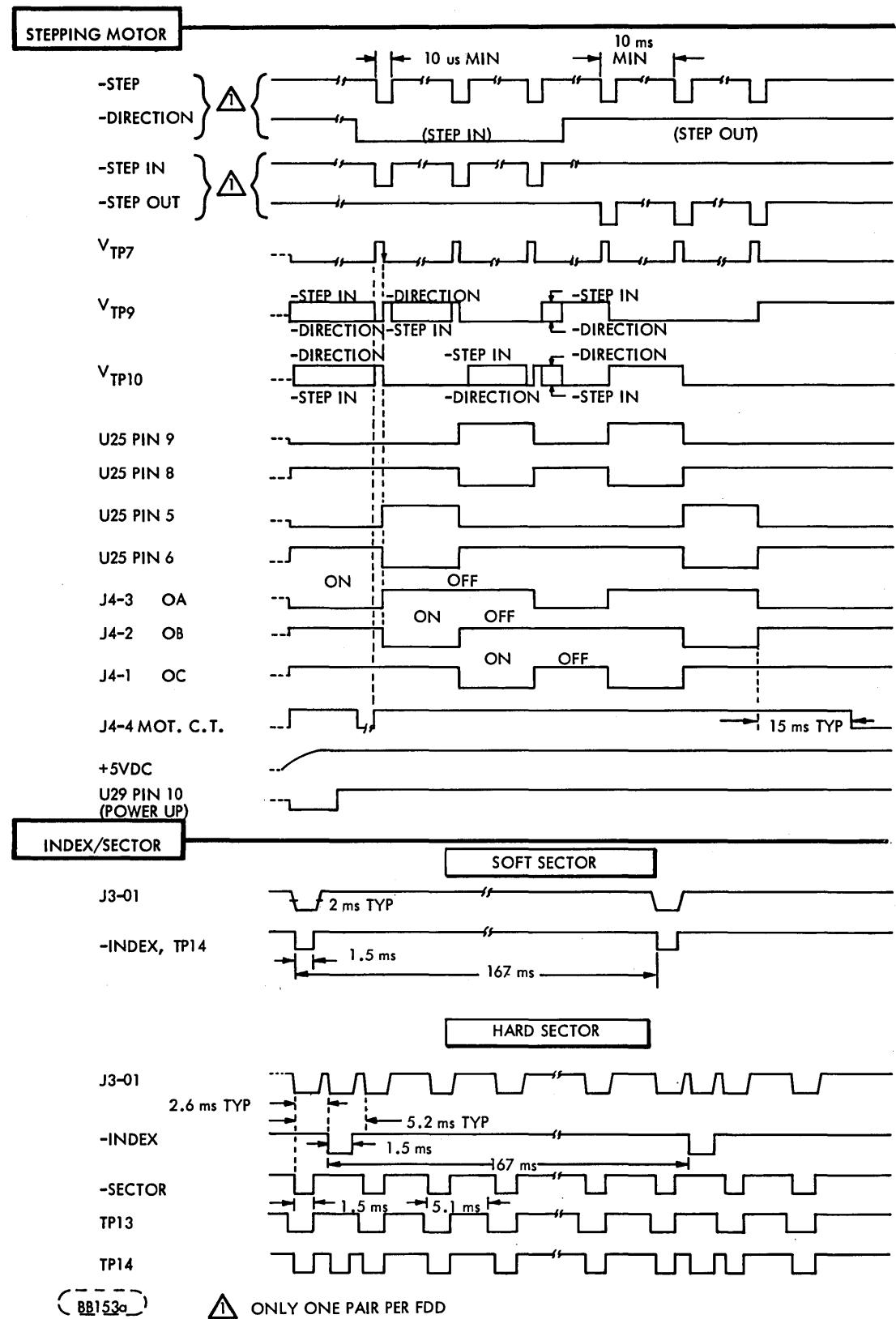


Figure 5-1. Timing (continued)

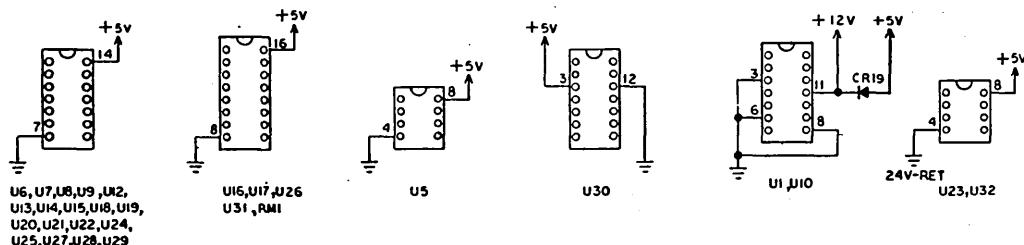


Figure 5-2. Schematics (Sheet 1 of 6)

TABLE B JUMPER CONFIGURATION																																						
ASSEMBLY NO.	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38
75890300-9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
75890350-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890400-7	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890450-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890500-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890550-9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890600-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890650-7	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890700-0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
75890750-5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
77622600-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
77624750-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
77630400-8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			

TABLE A														
ASSEMBLY NO.	R21	R34	R37	R57	R86	U7	U14	U15	RMI-A	RMI-B	C12	C13	C73	C32
75890300-9	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890350-4	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890400-7	8.25	383Ω	619Ω	8.66	31.6	210	210	210	220Ω	330Ω	1000PF	1000PF	—	.001
75890450-2	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890500-4	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890550-9	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890600-2	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890650-7	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890700-0	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75890750-5	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
75892150-6	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
77614500-5	8.25	511Ω	1.10	8.66	31.6	210	210	210	330Ω	NONE	330PF	330PF	—	.001
75896300-3	8.25	511Ω	1.10	20.0	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.68
77622600-3	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
77624750-3	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001
77630400-8	8.25	511Ω	1.10	8.66	31.6	204	204	204	220Ω	330Ω	330PF	330PF	—	.001

JI PIN CONFIGURATION AND ASSEMBLY USAGE								
FUNCTION NAME	75890450-6	75890500-5	75890550-3	75890600-2	75890650-7	75890700-0	75890750-5	75890800-1
-WRITE FAULT RESET	46	52	6	48	46	49		
-WRITE DATA	18	50	9	42	18	47		
-WRITE ENABLE	16	48	10	40	16	45		
-LOW CURRENT	10	36	7	44	10	35		
+WRITE FAULT	—	—	50	—	—	—		
-HEAD LOAD	4	26	8	26	4	25		
-DIRECTION	14	—	—	—	—	14		
-STEP	12	—	—	—	12	—		
-INDEX	8	32	5	28	8	31		
-READ DATA COMPOSITE	2	20	14	34	2	19		
-TRACK 00	6	28	13	30	6	27		
-WRITE FAULT	44	40	4	—	44	39		
-READ DATA SEPARATED	38	18	1	—	38	17		
-CLOCK SEPARATED	42	22	2	—	42	21		
-WRITE PROTECT	36	—	3	—	36	—		
-UNIT SELECT 1	20	—	—	—	20	—		
-UNIT SELECT 2	22	—	—	—	22	—		
-UNIT SELECT 3	24	—	—	—	24	—		
-UNIT SELECT 4	26	—	—	—	26	—		
-READY 1	28	—	—	—	28	—		
-READY 2	30	—	—	—	30	—		
-READY 3	32	—	—	—	32	—		
-READY 4	34	—	—	—	34	—		
-DOOR UNLOCK 1	—	—	—	—	40	—		
-DOOR UNLOCK 2	—	—	—	—	42	—		
-DOOR UNLOCK 3	—	—	—	—	48	—		
-DOOR UNLOCK 4	—	—	—	—	50	—		
GROUND	I THRU 49 ODD NO'S ONLY	I THRU 9, 17 THRU 51 ODD ONLY	I THRU 48 23-49 ODD ONLY	I — 15 23-49 ODD ONLY	I — 49 23-49 ODD ONLY	I — 10 23-49 EVEN ONLY		
+5 VOLTS	—	2 & 4	18 & 19	2,4 & 6	—	1,3,7 & 9		
+24 VOLTS	—	12 & 14	24 & 25	18,20 & 22	—	11,13 & 15		
+24 VOLTS RETURN	—	11 & 13	49 & 50	17,19 & 21	—	12,14 & 16		
-12 VOLTS	—	—	—	14	—	—		
-5 VOLTS	—	6	21 & 22	10	—	5		
-SECTOR	—	—	—	—	—	—		
-STEP IN	—	46	11	38	—	43		
-STEP OUT	—	44	12	46	—	41		
-SECTOR	—	—	—	—	—	—		

- NOTES:
UNLESS OTHERWISE SPECIFIED:
1. RESISTOR VALUES ARE IN K-OHMS 1/4W, 1%
2. CAPACITOR VALUES ARE IN MICRO-FARADS
- SEE TABLE FOR JI CONNECTOR PIN DESIGNATIONS. ALL OTHER CONN. NO'S SHOWN IN BODY OF SCHEMATIC
- DOTTED BOXES INDICATE OPTIONS
- SEE TABLE A FOR COMPONENT VALUES OR IC. ELEMENT IDENTIFIERS
- SEE TABLE B FOR PWB JUMPER CONFIGURATION
- THESE PINS RESERVED; VOLTAGES NOT USED
- FOR EXTERNAL COMPONENT INFORMATION SEE SH. 6
- NOT PRESENT ON 77624750.ASSY CONFIGURATION.
- PRESENT ONLY ON 77624750 ASSY CONFIGURATION.
- OPTION AVAILABLE ONLY ON 77630400

1

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

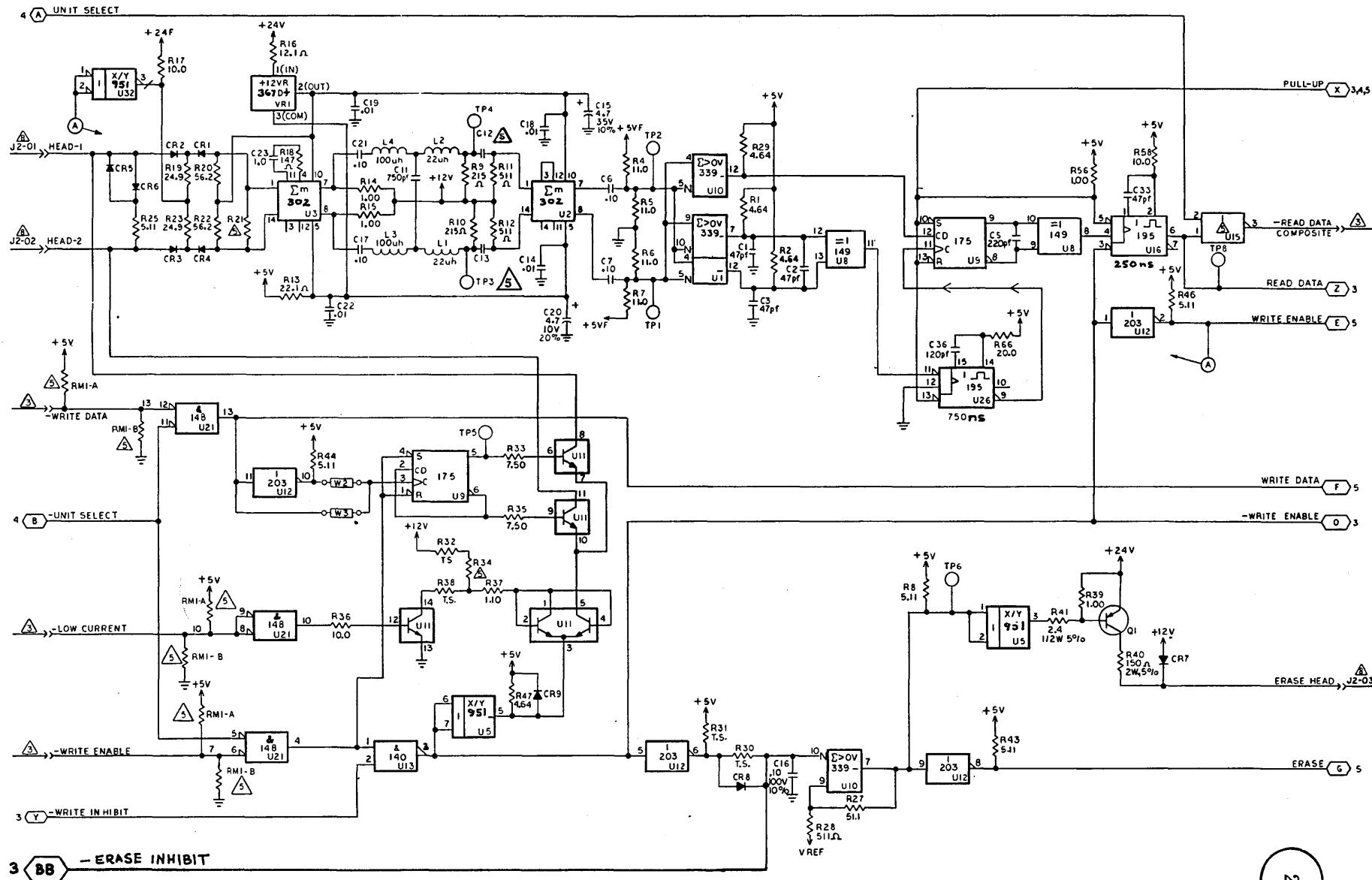


Figure 5-2. Schematics (Sheet 3 of 6)

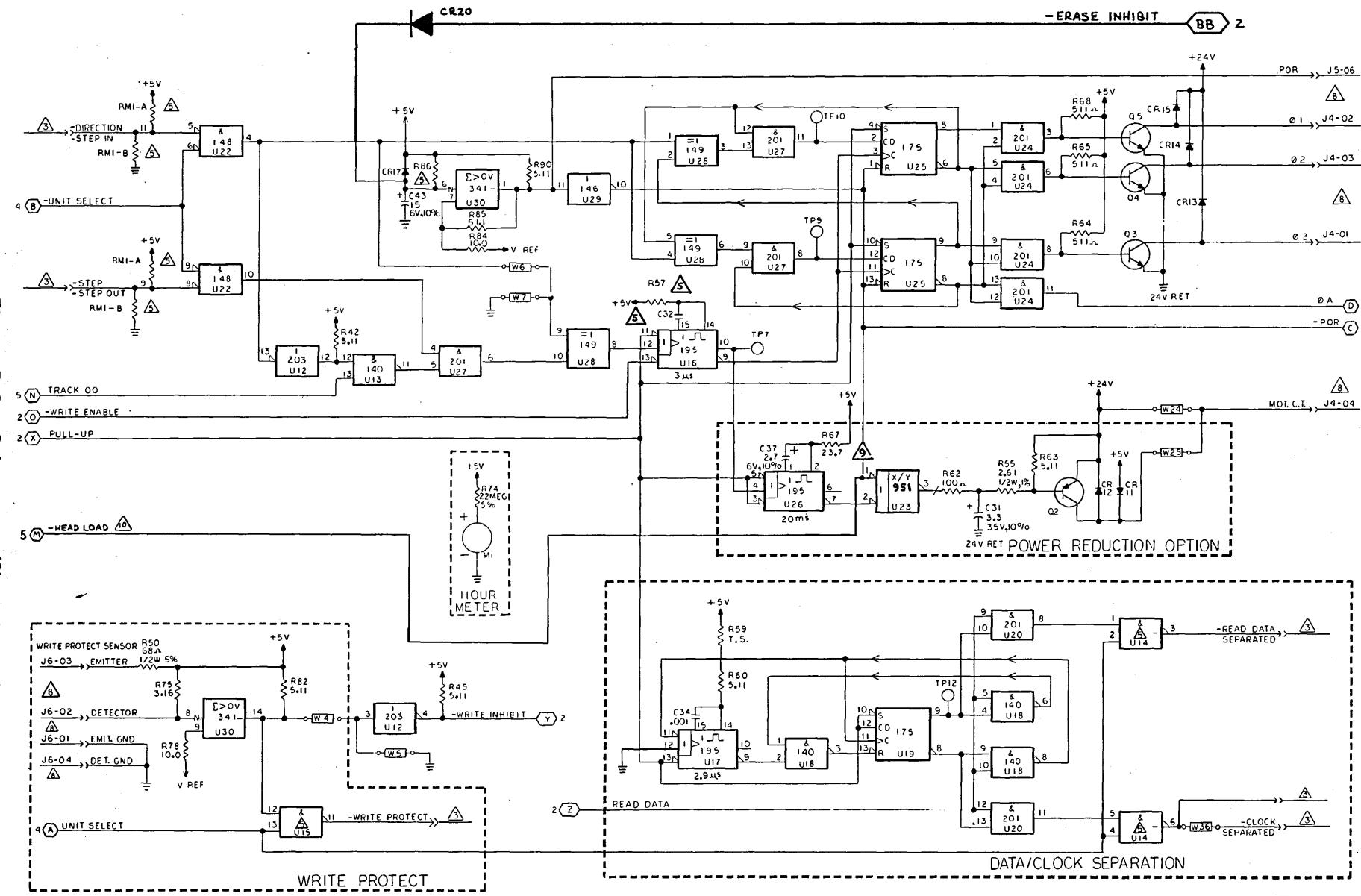


Figure 5-2. Schematics (Sheet 4 of 6)

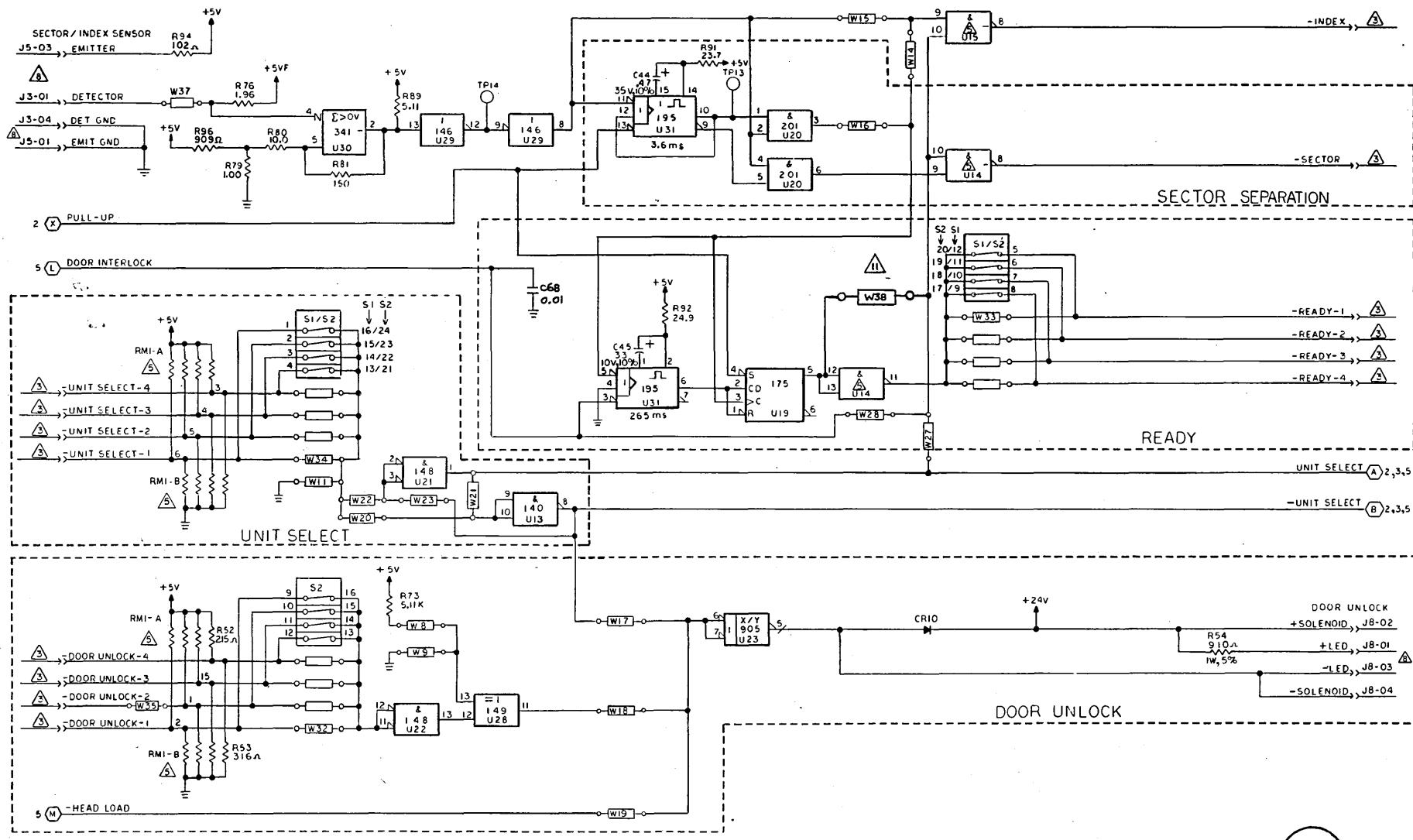


Figure 5-2. Schematics (Sheet 5 of 6)

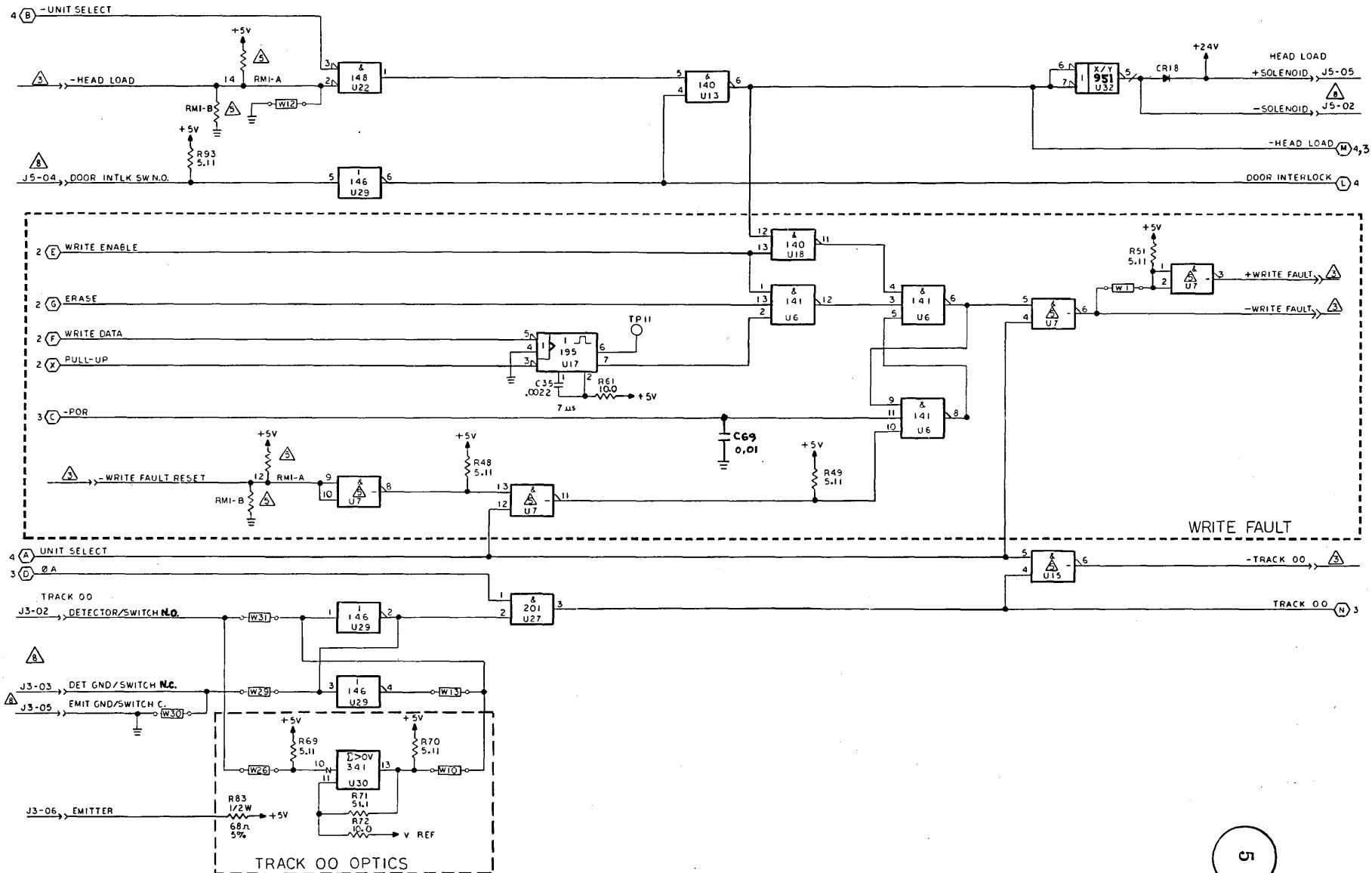
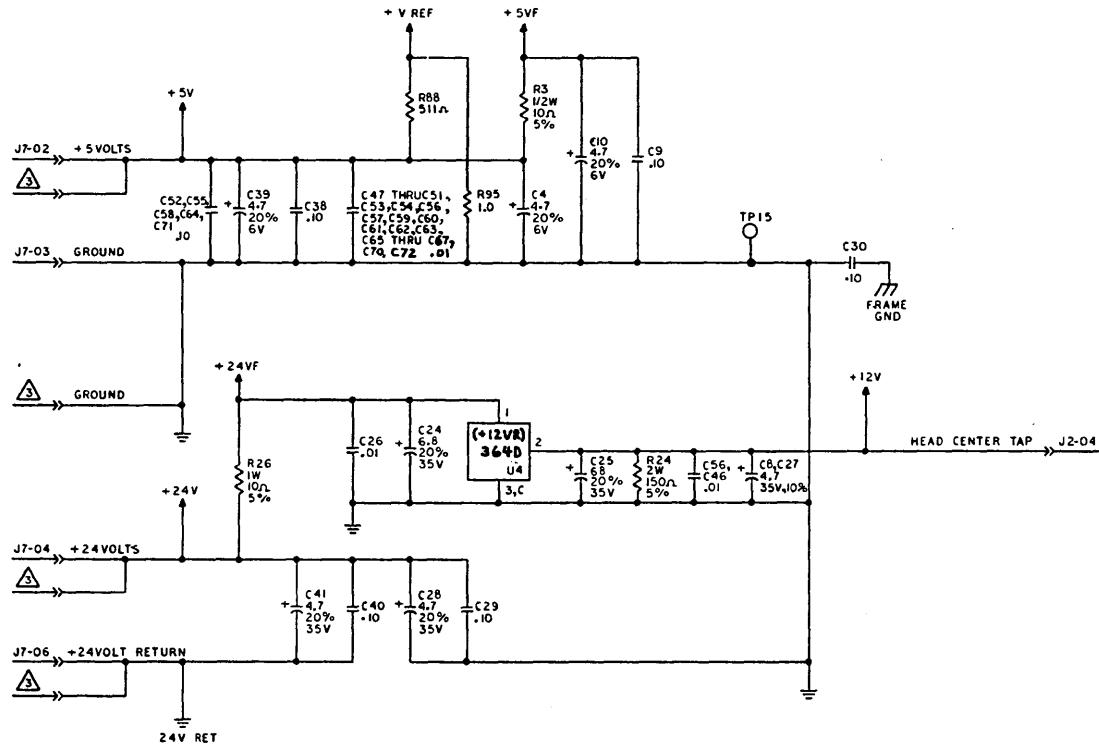
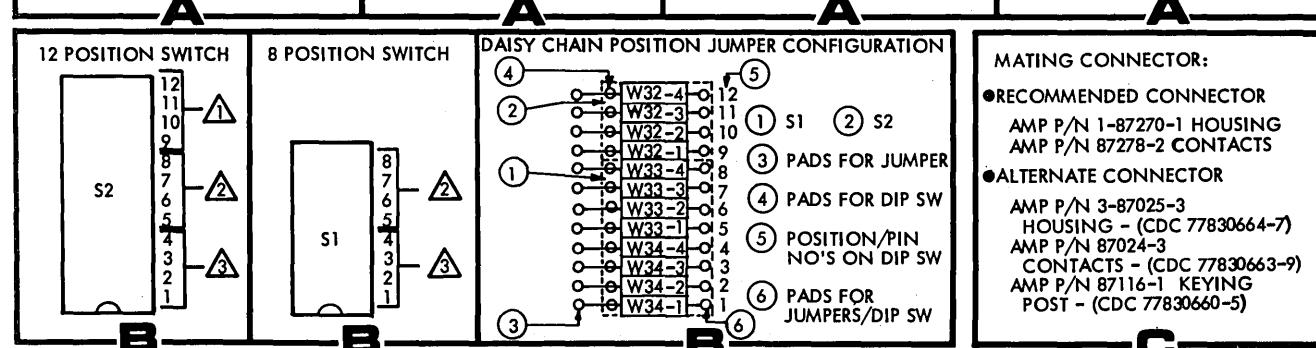
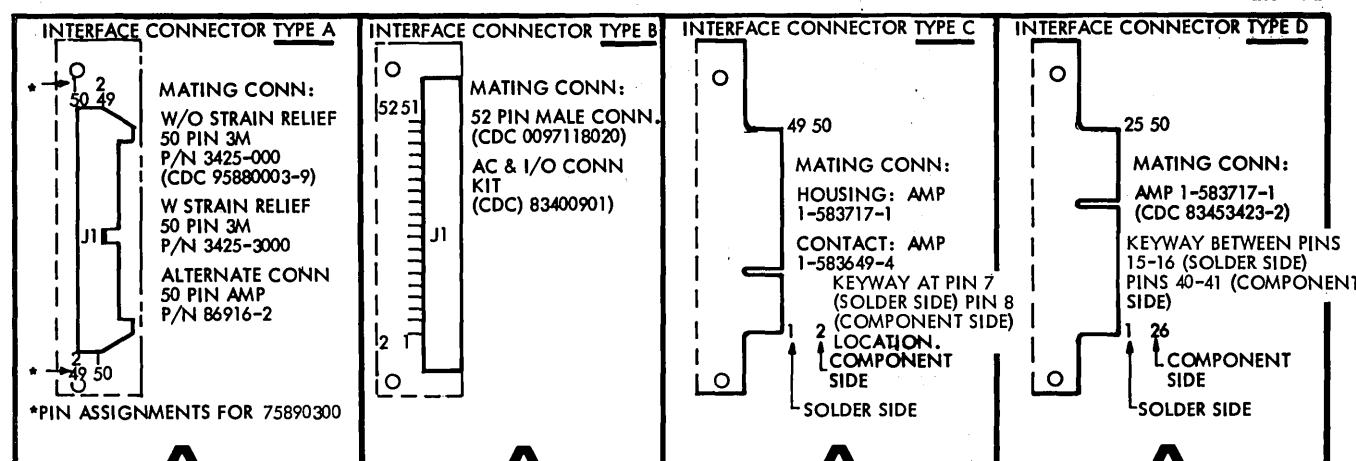
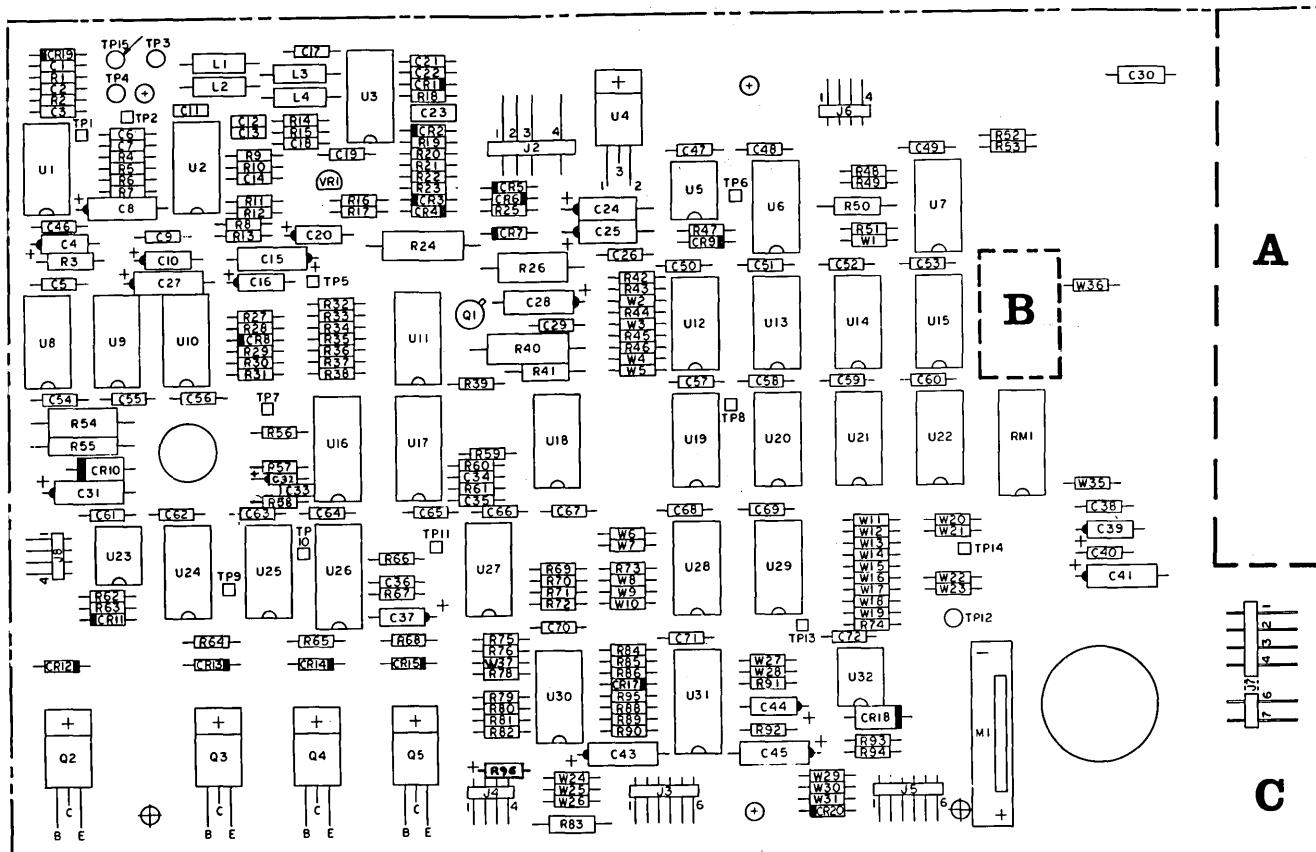


Figure 5-2. Schematics (Sheet 6 of 6)





X150a) ▲ UNLOCK
▲ READY
▲ UNIT SEL.

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	25
R9	41	R56	43	C9	76	C56	76	U9	11	W9			
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		
R13	39	R60	52	C13	79	C60		U13	8	W13	106		
R14	43	R61	35	C14	75	C61		U14	6**	W14	106		
R15	43	R62	61	C15	94	C62		U15	6**	W15	106		
R16	40	R63	52	C16	95	C63		U16	10	W16	106		
R17	35	R64	54	C17	76	C64	76	U17	10	W17	106		
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		
R22	36	R69	52	C22	75	C69	82	U22	9	W22	106		
R23	60	R70	52	C23	80	C70		U23	4	W23	106		
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			
R27	50			C27	94			U27	12	W27	106		
R28	54			C28	102			U28	13	W28	106		
R29	44	R76	42	C29	76	DIO	PL ITEM	U29	14	W29	106		
R30	63	R77		C30	81	CR1	29	U30	15	W30			
R31	63	R78	35	C31	98	CR2	29	U31	10	W31	106		
R32	63	R79	43	C32	87**	CR3	29	U32	4	W32			
R33	46	R80	35	C33	83	CR4	29			W33			
R34	54#	R81	58	C34	87	CR5	29			W34			
R35	46	R82	52	C35	88	CR6	29			W35	106		
R36	35			C36	86	CR7	29			W36	106		
R37	47△△△	R84	35	C37	93	CR8	29			W37	106		
R38	63	R85	50	C38	76	CR9	29			W38	106		
R39	43	R86	51*	C39	92	CR10	30						
R40	71	R87		C40	76	CR11	31						
R41	70	R88	54	C41	102	CR12	31						
R42	52	R89	52	C42		CR13	31						
R43	52	R90	52	C43	91	CR14	31						
R44	52	R91	55	C44	97	CR15	31						
R45	52	R92	60	C45	90	CR16							
R46	52	R93	52	C46	76	CR17	29						
R47	44	R94	56	C47	89	CR18	30						
		R95	43			CR19	31						
		R96	119			CR20	114						

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)

MAINTENANCE

6

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 buffering 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:

Test Point No.	Refer to Fig. No.	Comments
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.

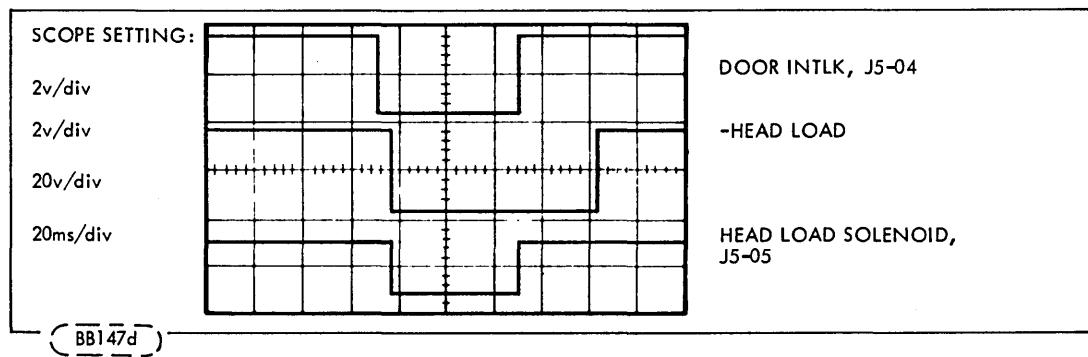


Figure 6-1. -Head Load and Door Interlock Switch

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

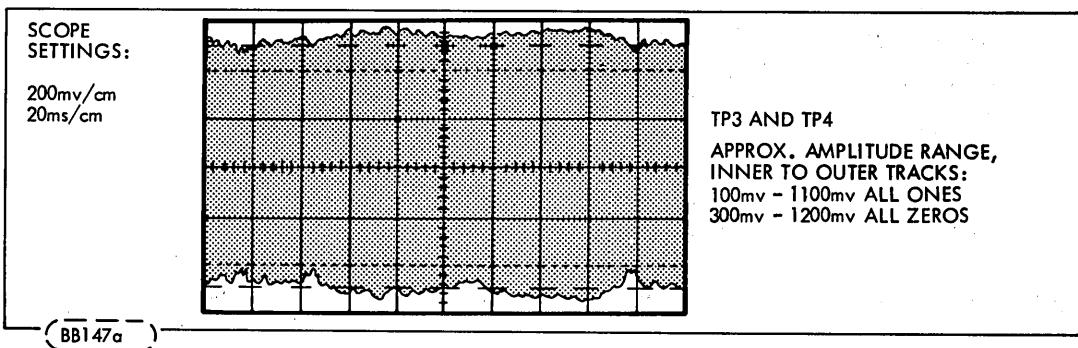


Figure 6-2. Differential Read Signal for Entire Track

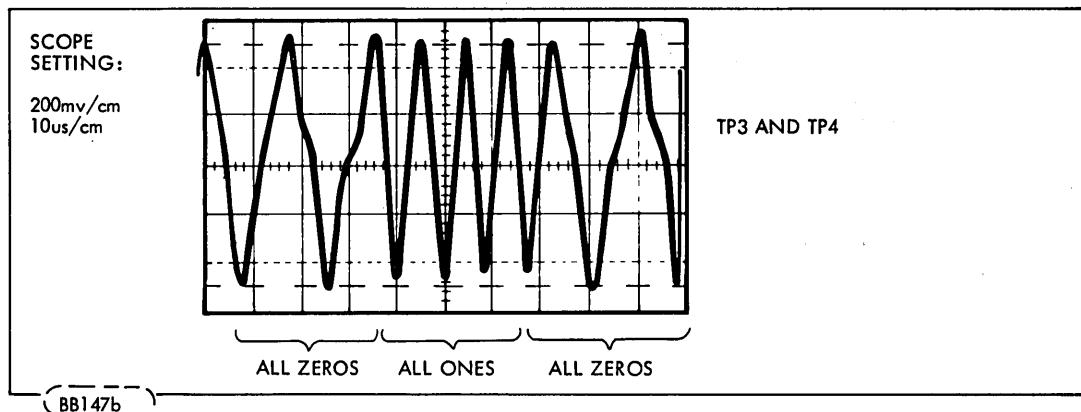


Figure 6-3. Differential Read Signal for Portion of Outer Track

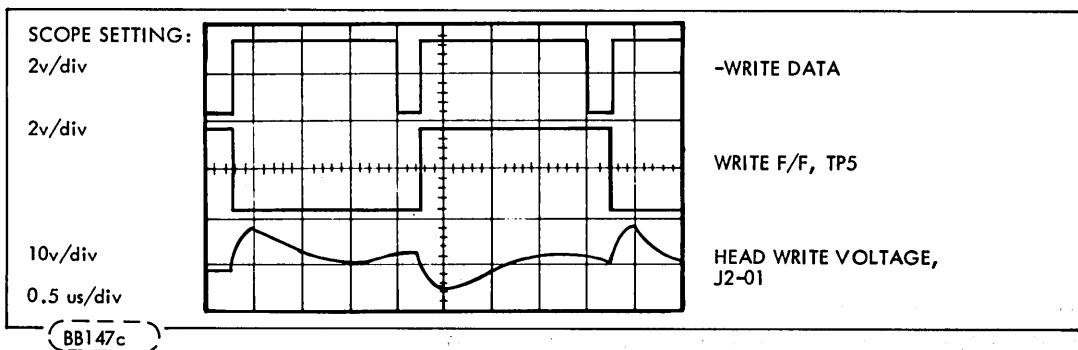
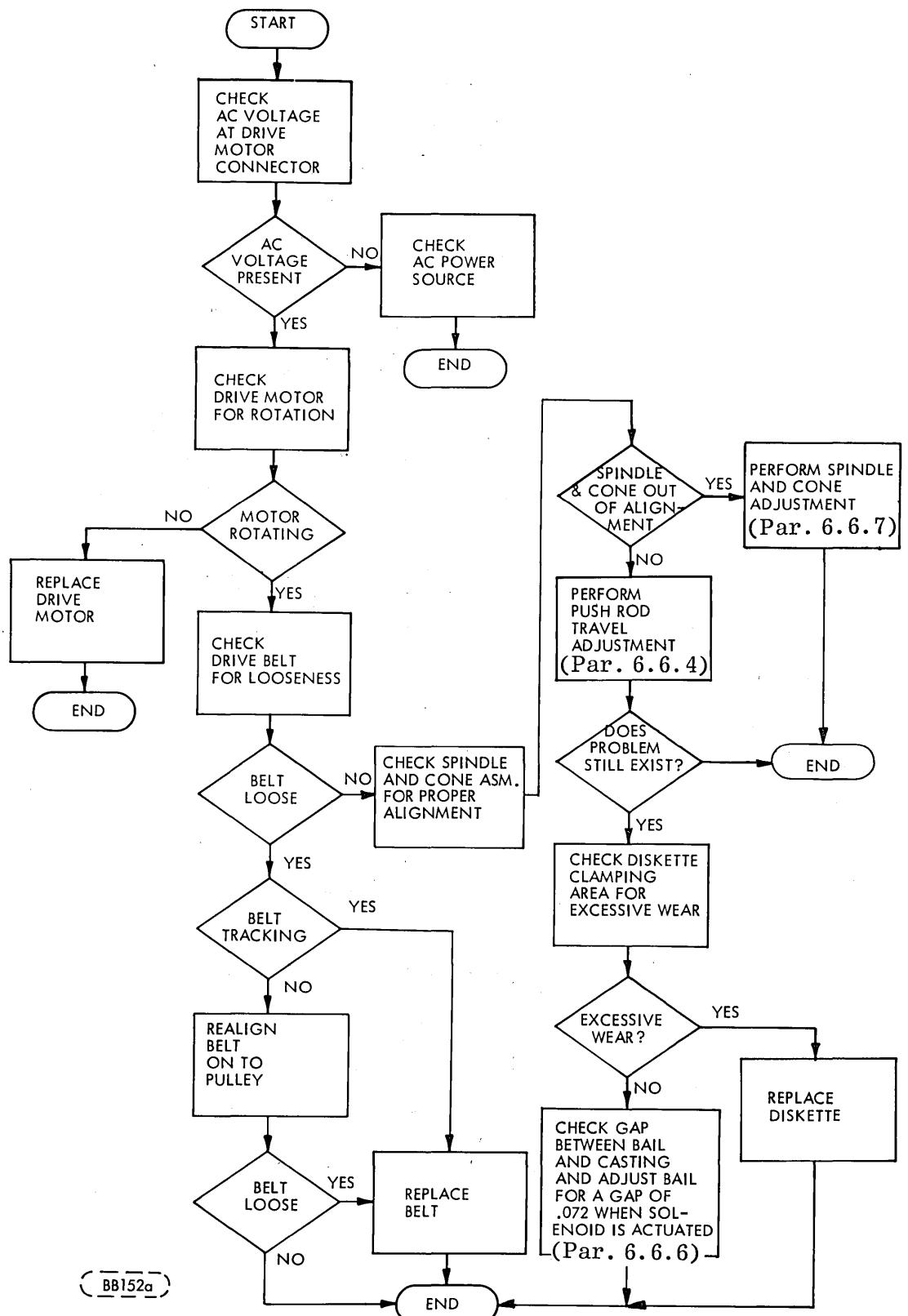
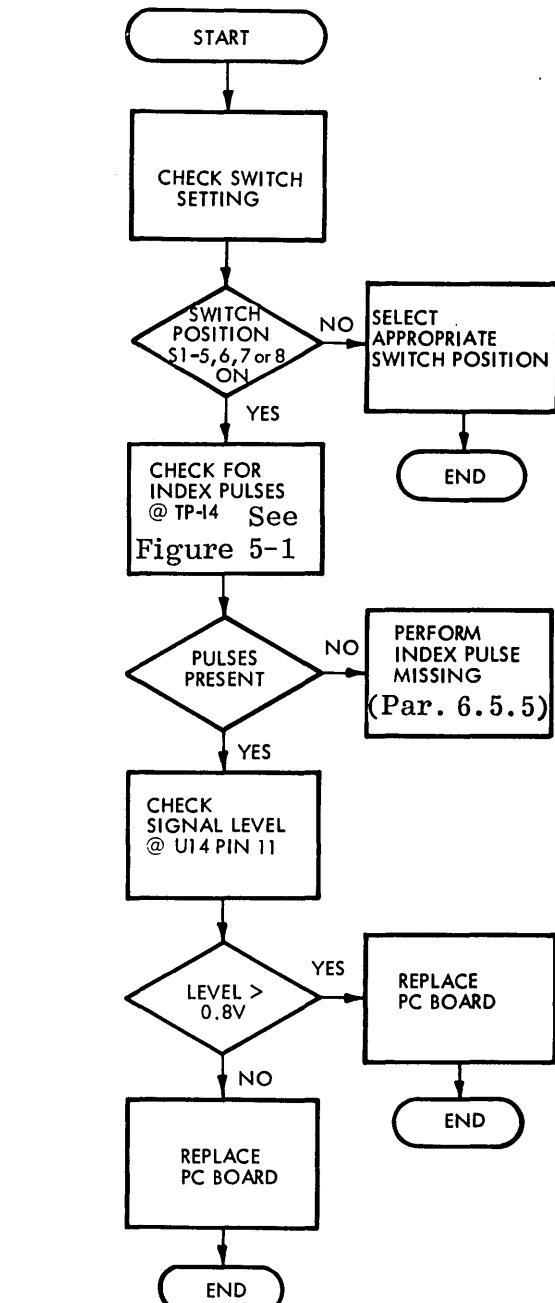


Figure 6-4. Write Data, Write F/F Output, and Head Write Voltage for Outer Track

6.5.2 DISKETTE NOT ROTATING

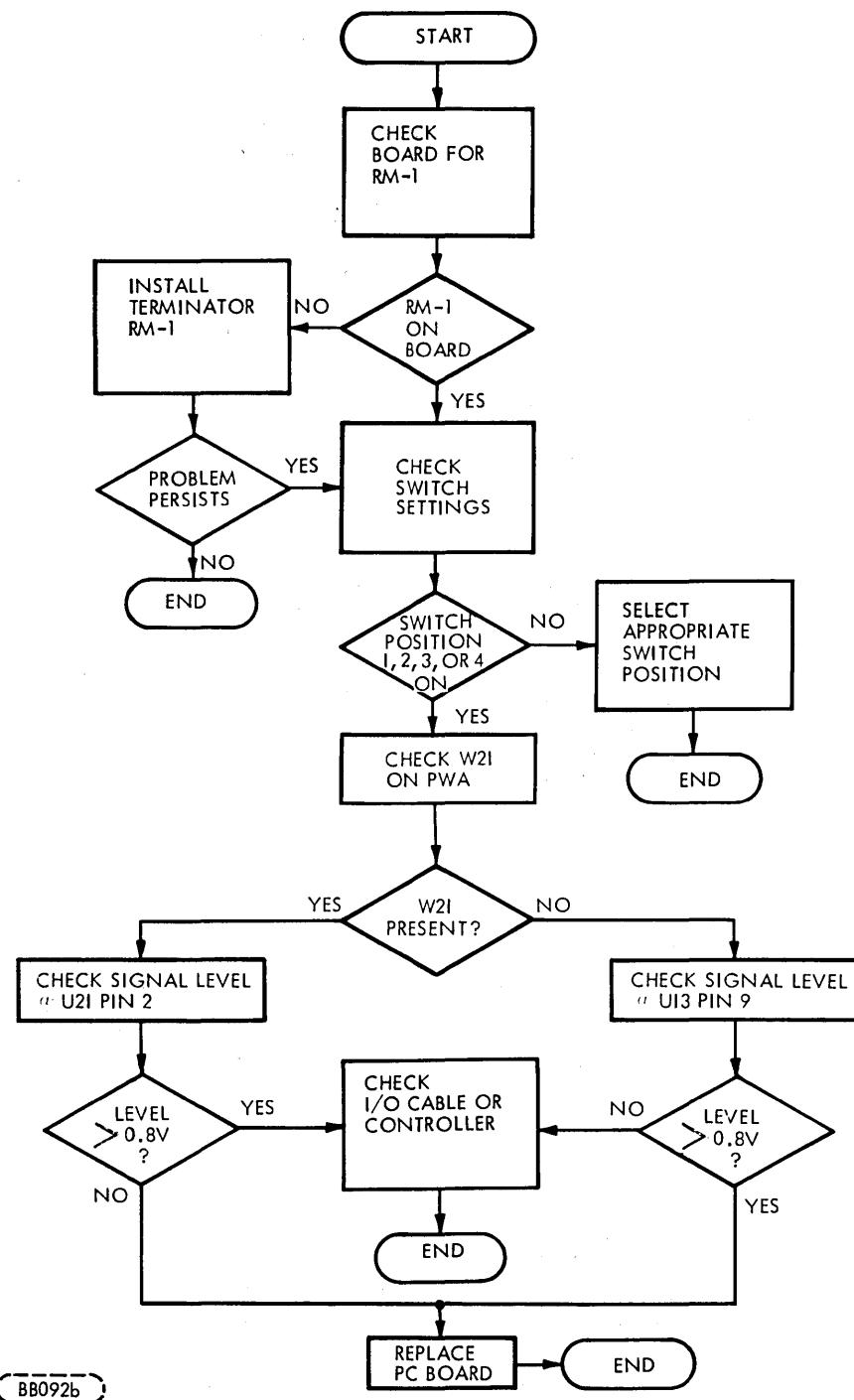


6.5.3 READY SIGNAL MISSING (Daisy Chain Units)

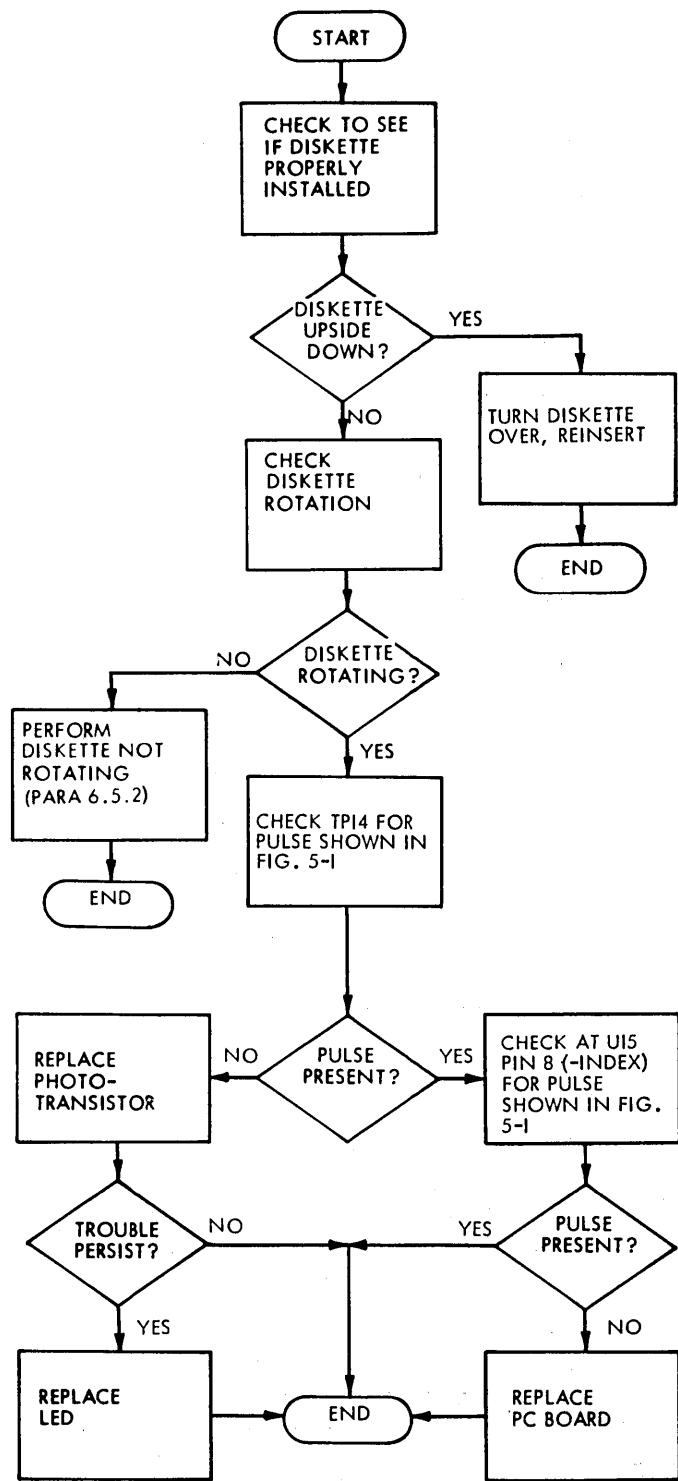


(BB088b)

6.5.4 DRIVE NOT RESPONDING TO COMMANDS (Daisy Chain Units)



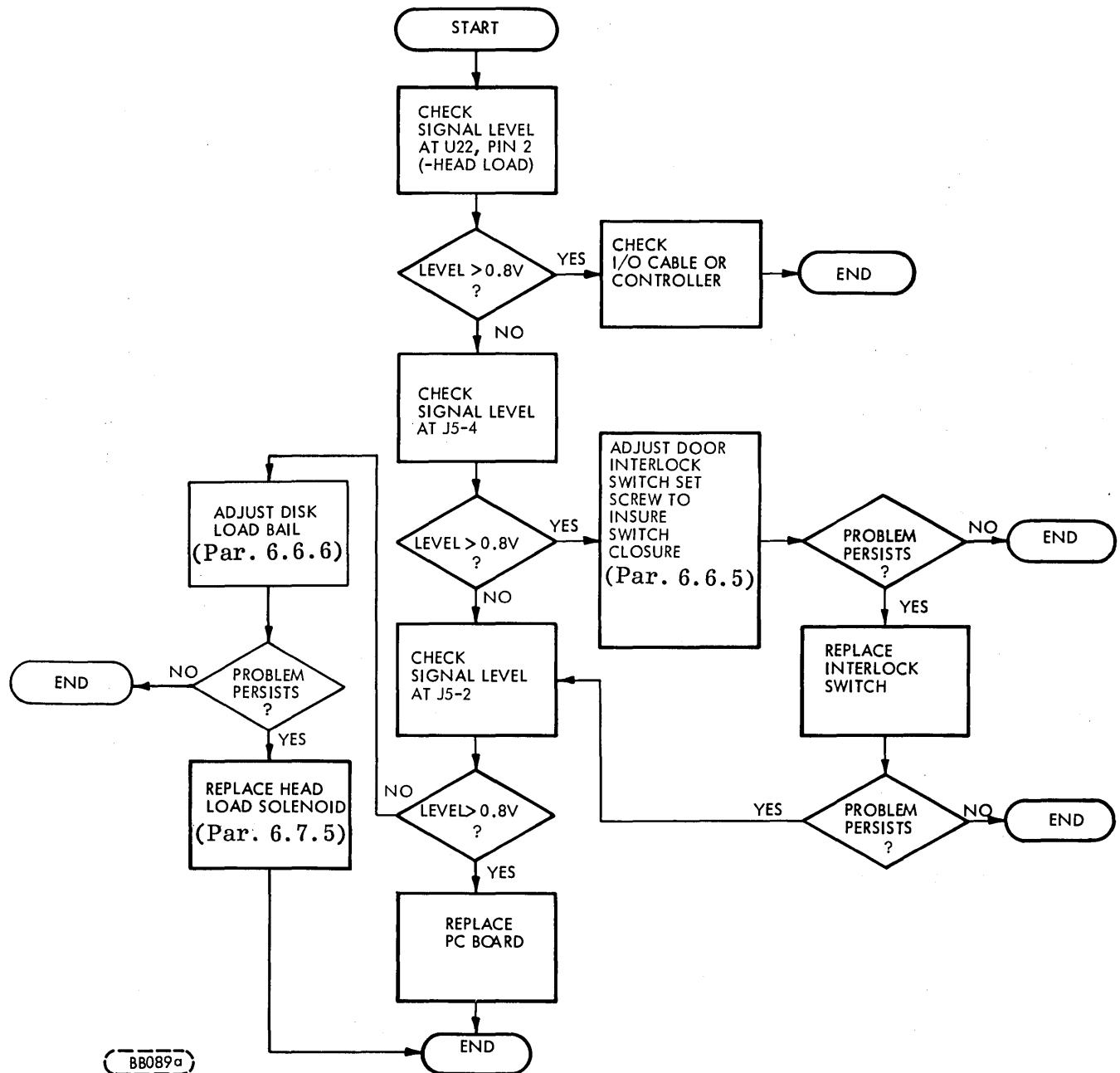
6.5.5 INDEX PULSE MISSING



BB091a

6.5.6 HEAD NOT LOADING

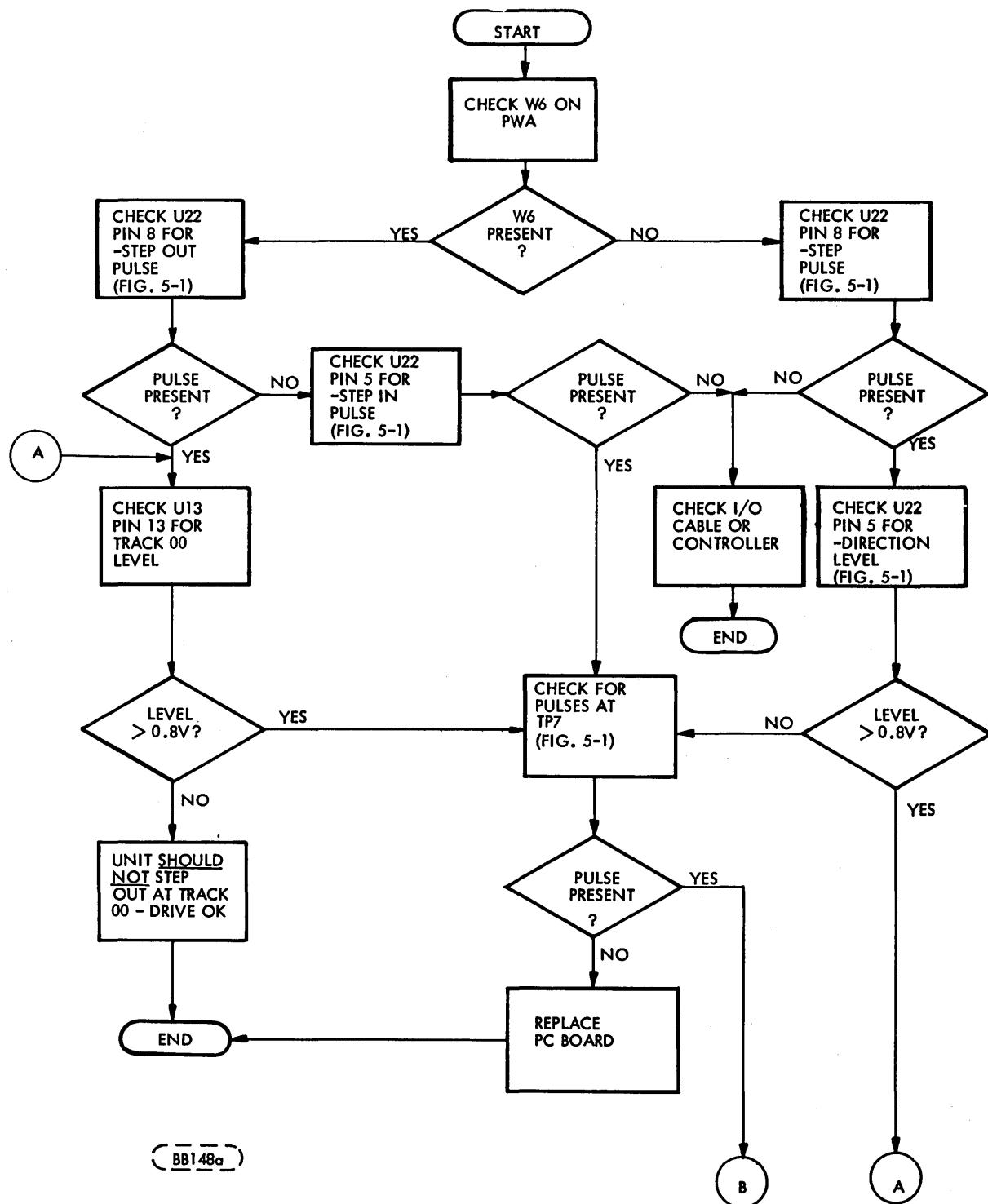
(Perform procedure 6.5.4 prior to performing this trouble shooting procedure).



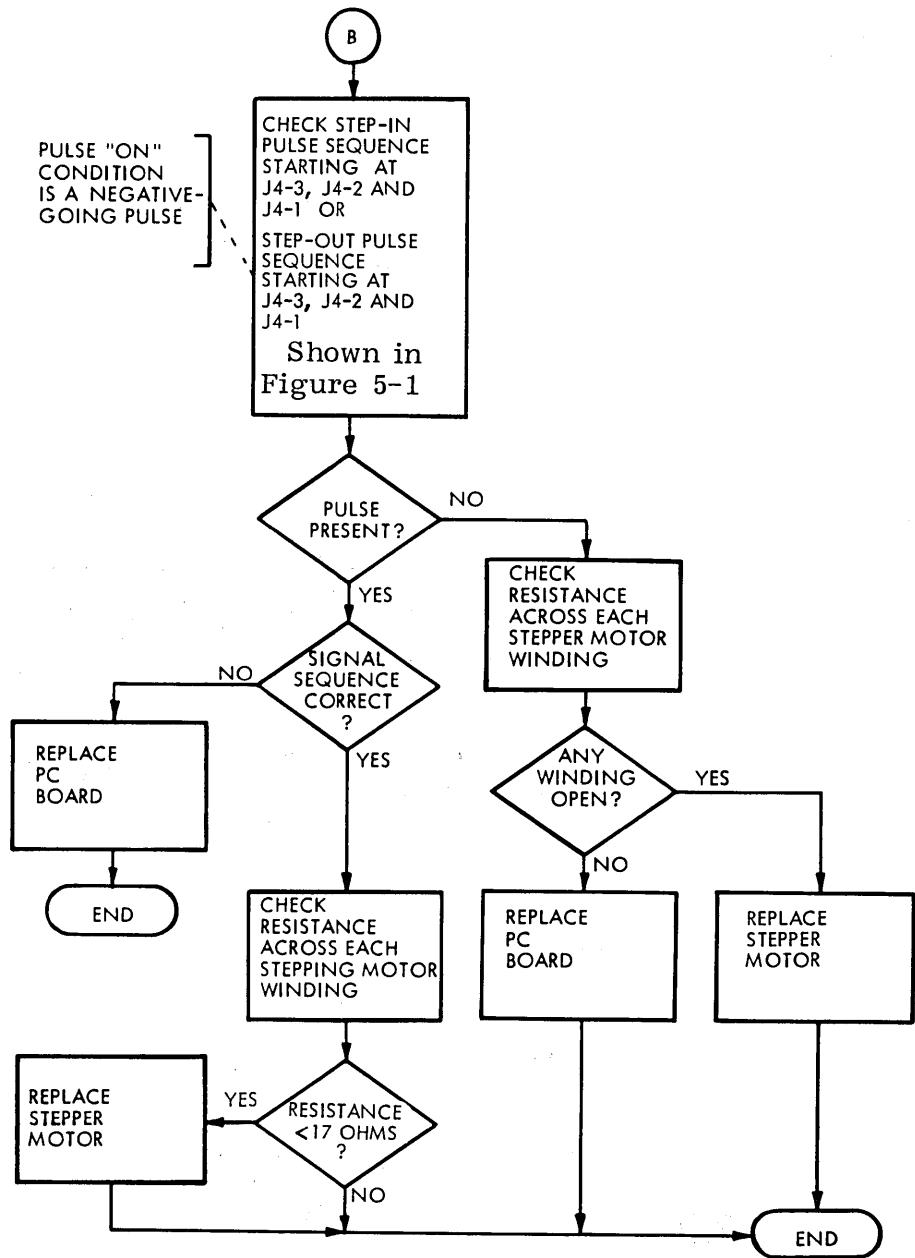
BB089a

6.5.7 READ/WRITE HEAD NOT STEPPING

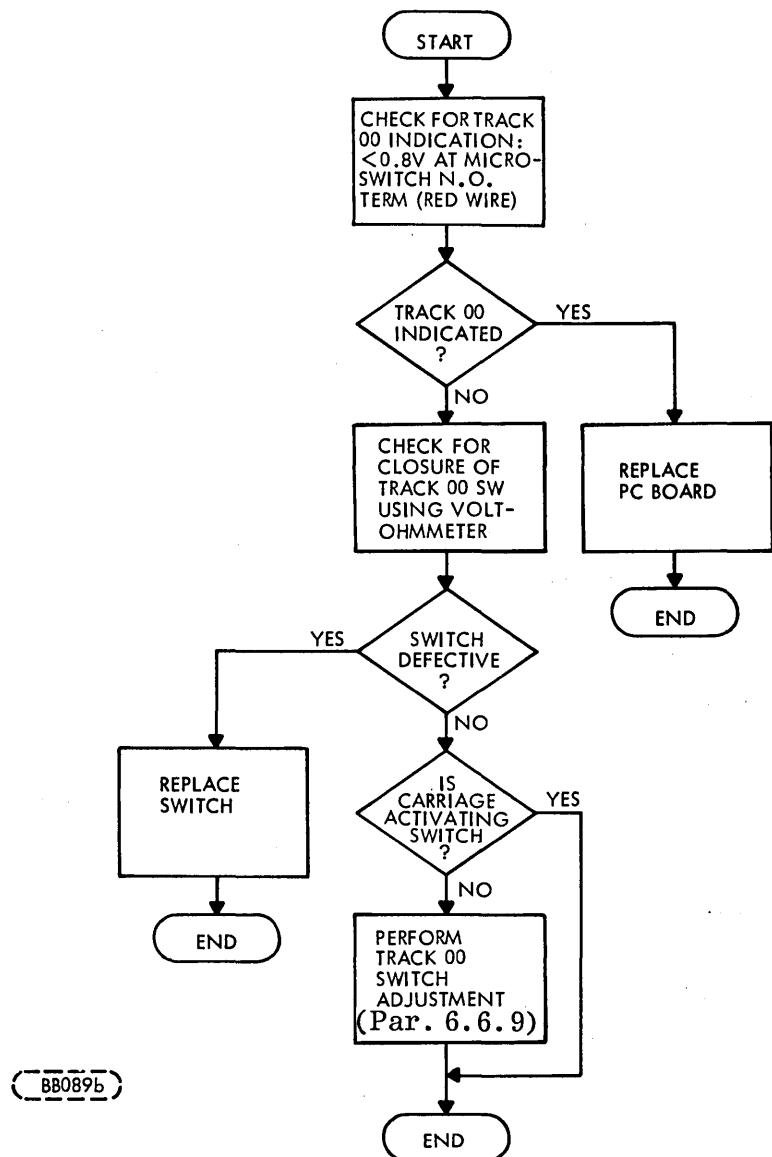
Refer to 6.5.4 prior to starting this trouble shooting procedure.



6.5.7 -contd.

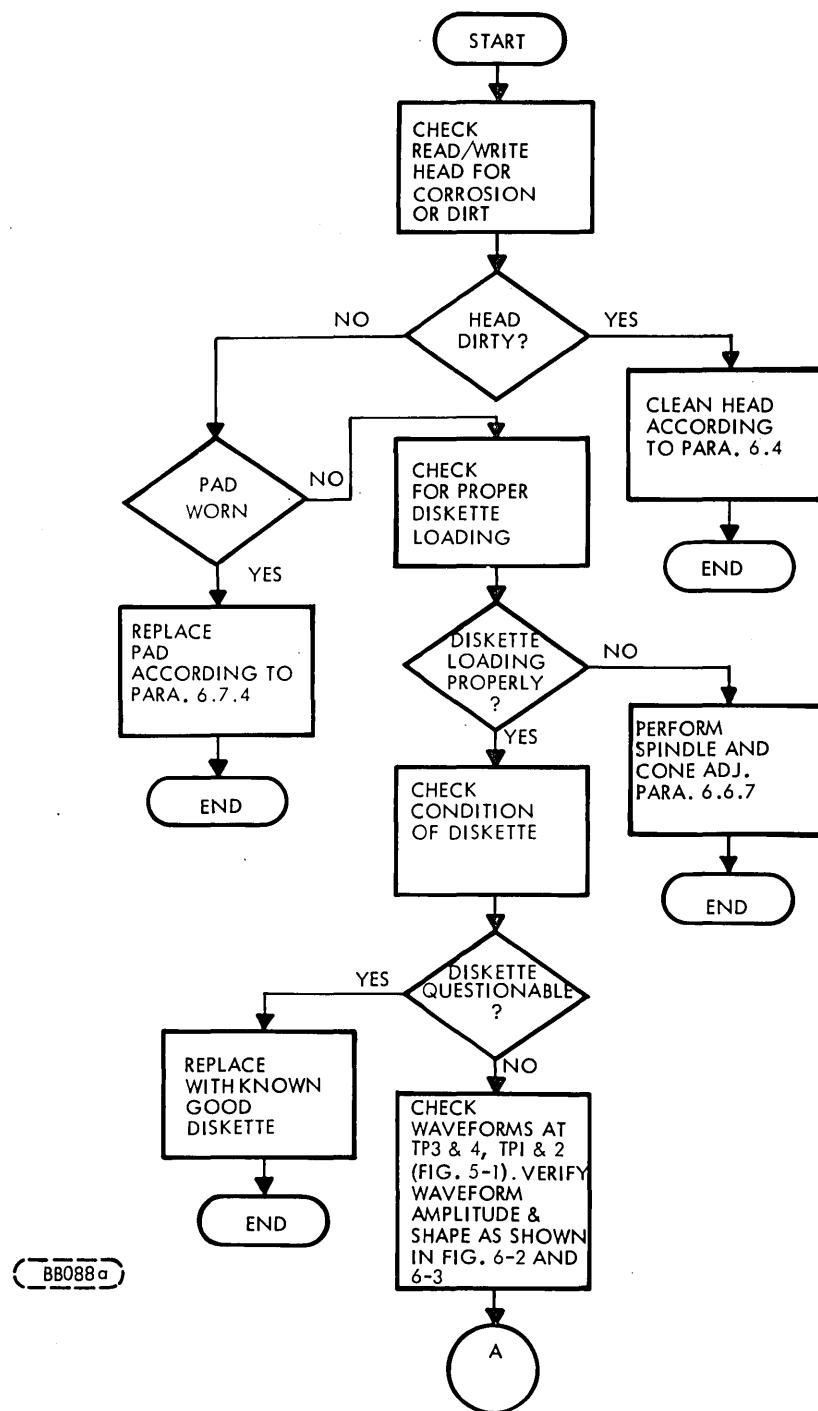


6.5.8 NO TRACK '00' INDICATION

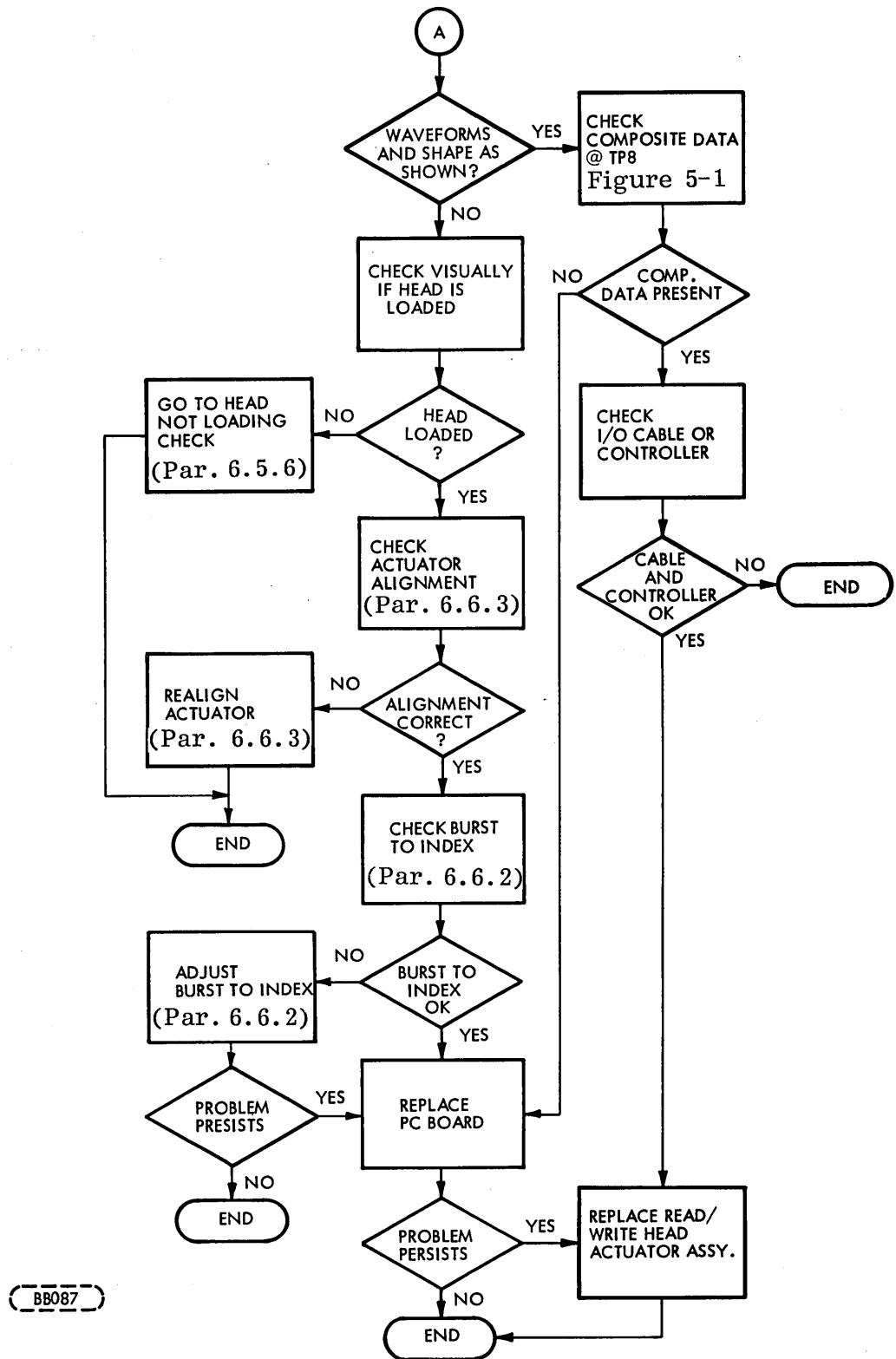


6.5.9 READ ERRORS

Refer to 6.5.4 prior to starting this trouble shooting procedure.

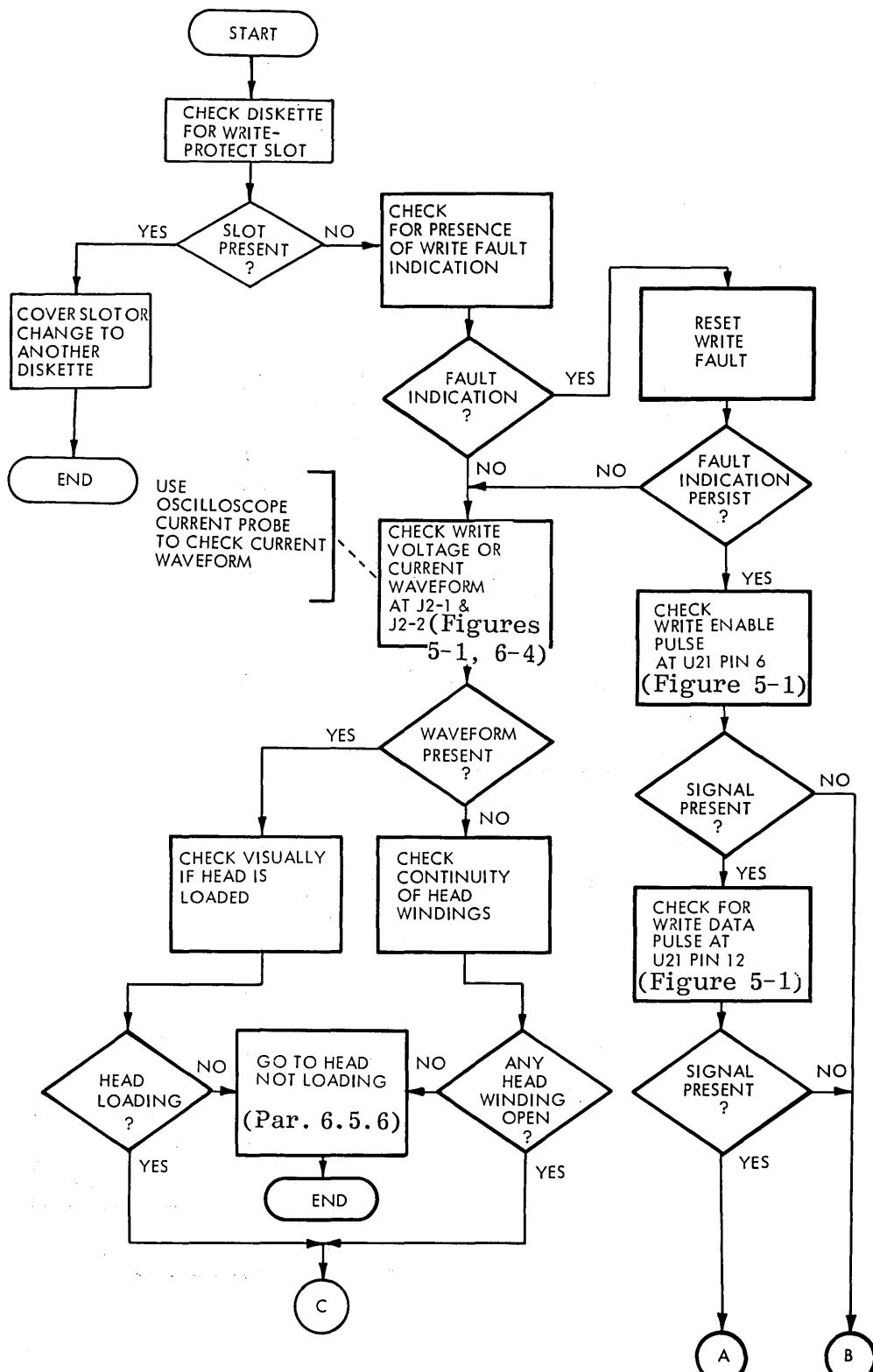


6.5.9 -contd.



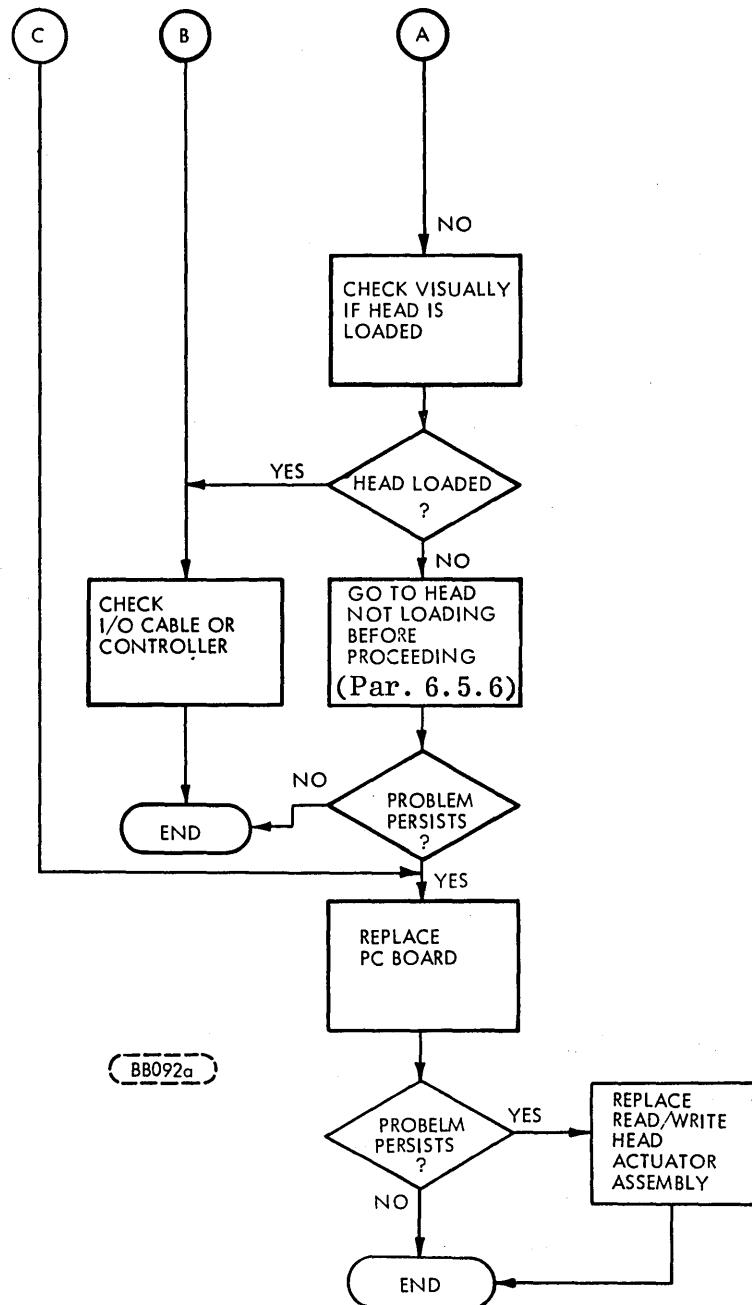
6.5.10 WRITE ERRORS

Refer to 6.5.4 prior to starting this trouble shooting procedure.



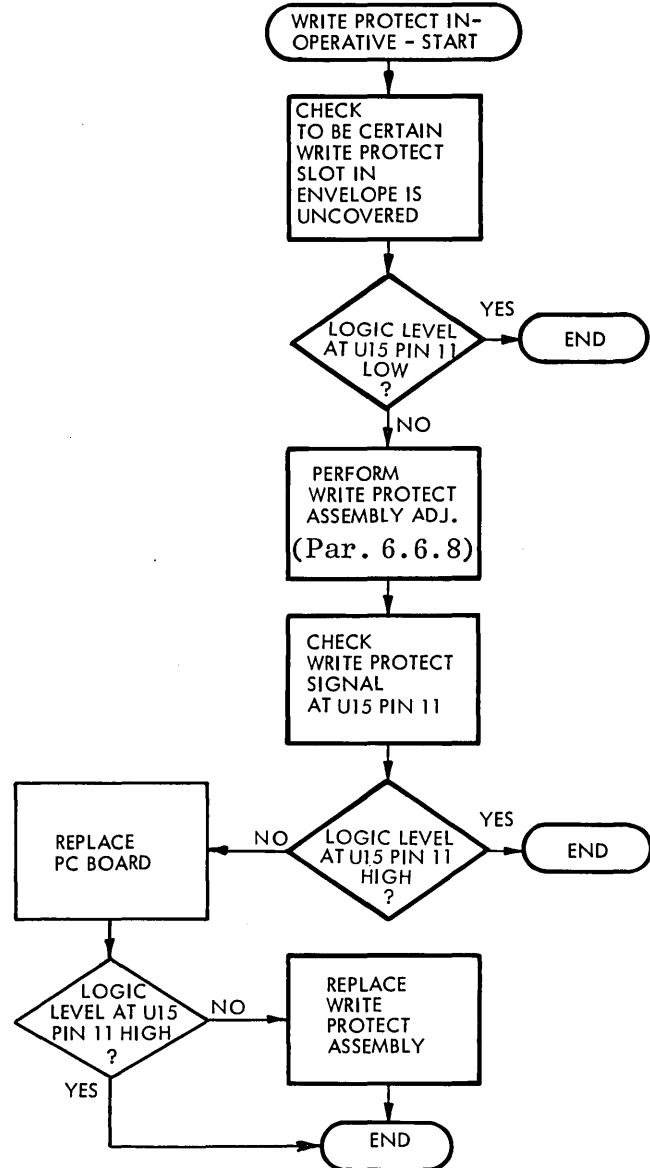
BB090a

6.5.10 -contd.



BB092a

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.

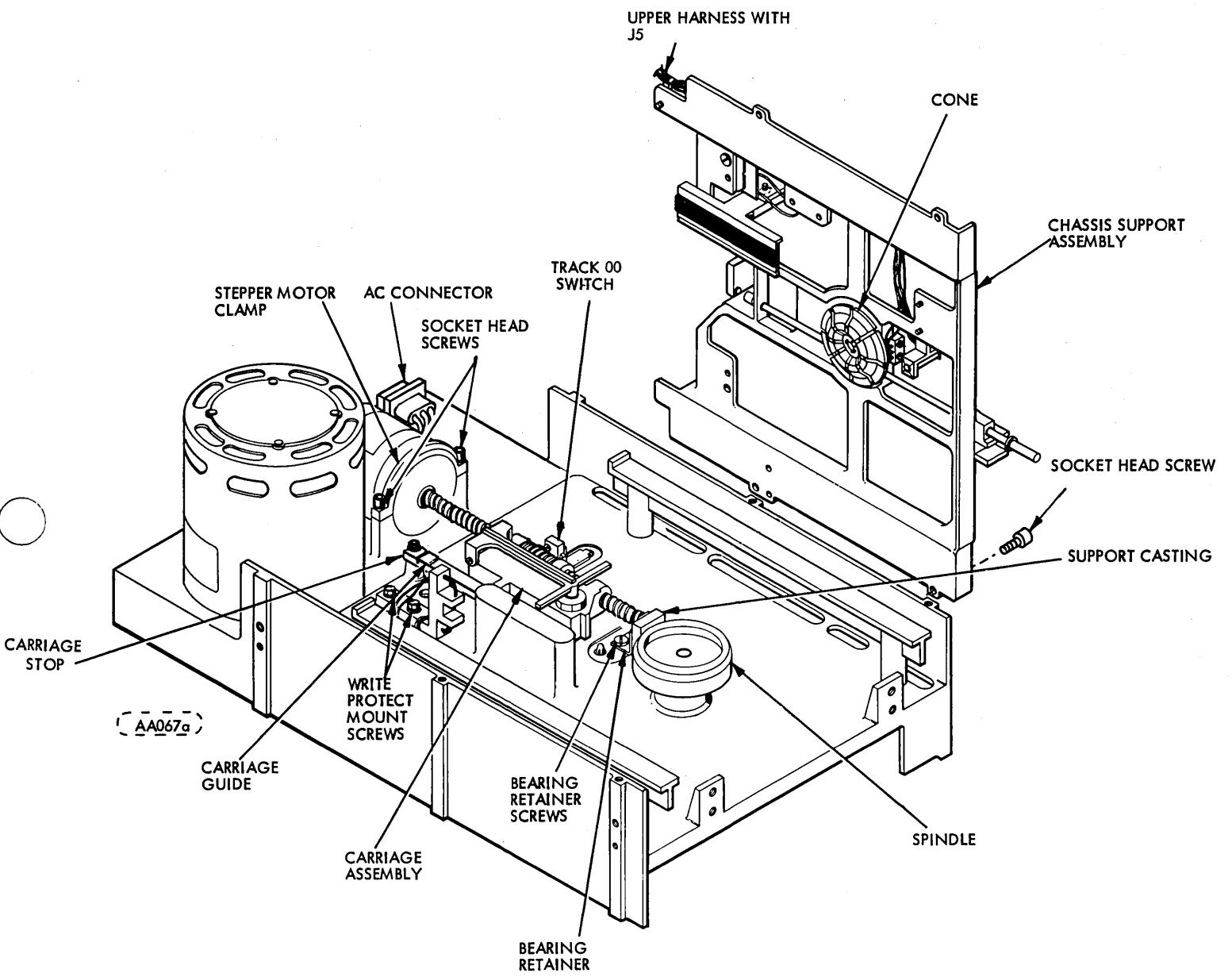
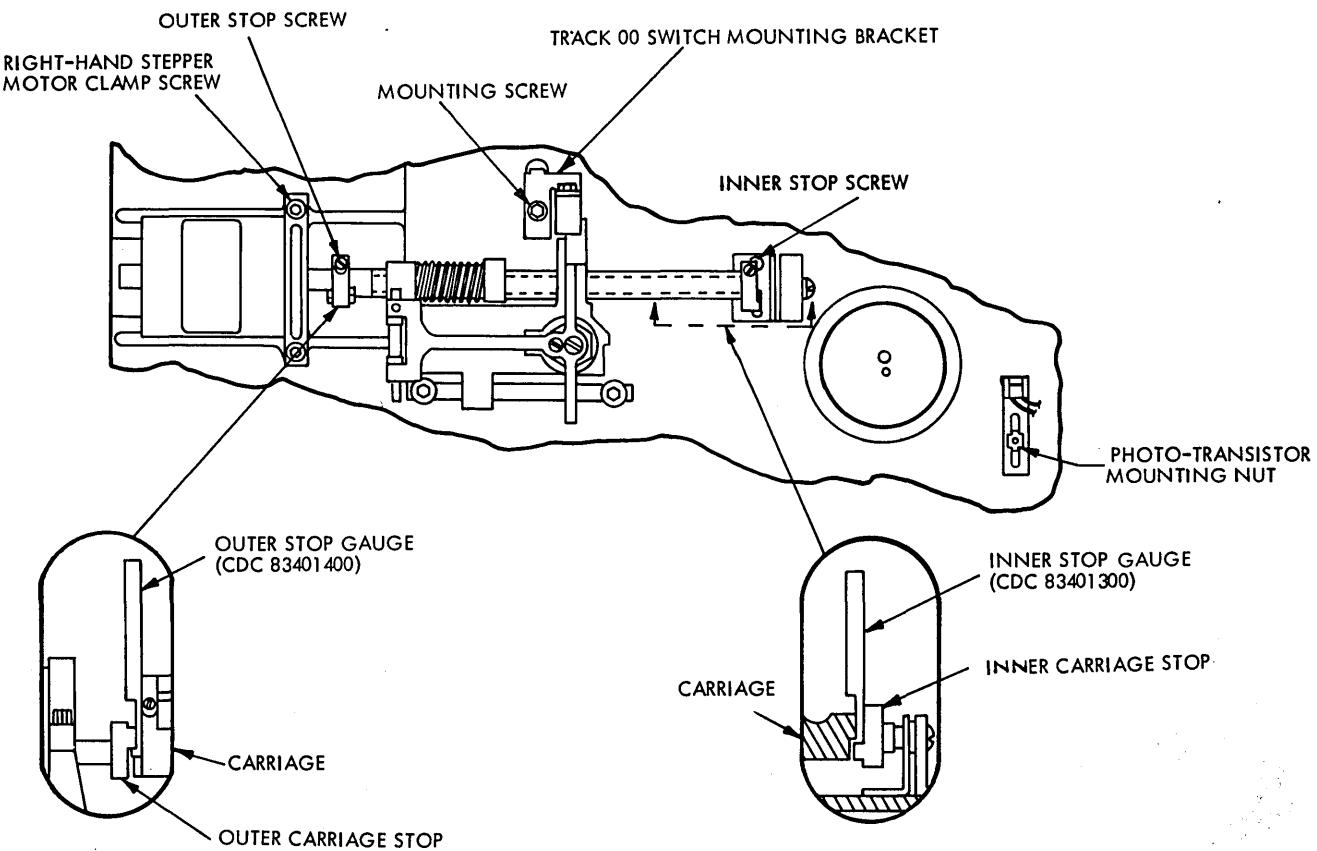
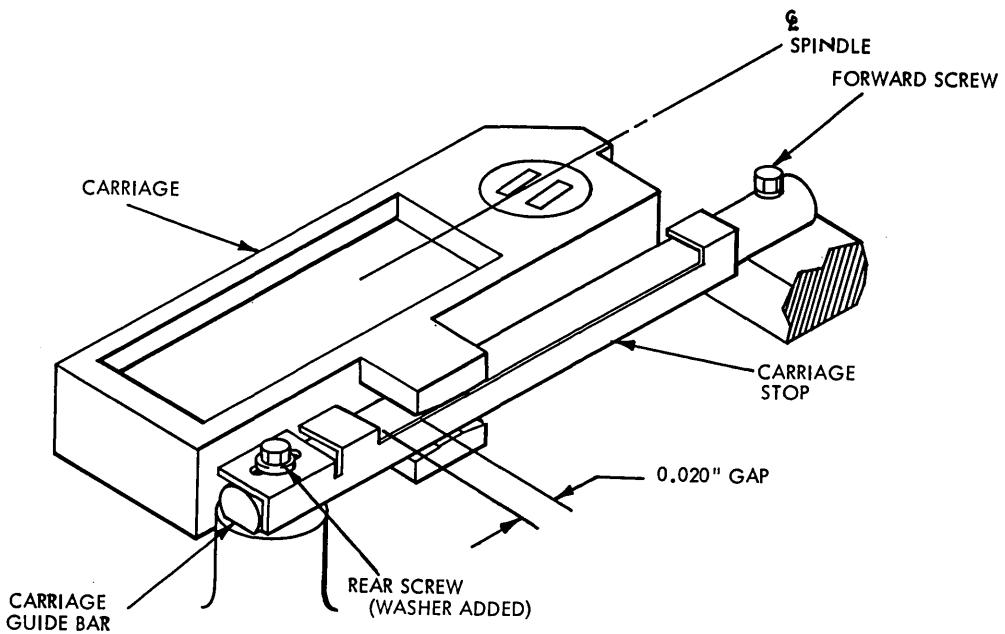


Figure 6-5. Base and Chassis Support Assembly



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

d. -contd.

Vert. Mode to: Add Trig. Mode to: Normal
Slope (Sync) to: Pos. Time Base to: 50us/div

- e. Adjust the time from write splice bit to the leading edge of the index pulse until it measures per Table 6-2. (Refer to Figure 6-7 to adjust the write splice to index time, loosen the Allen head screw holding the phototransistor located on bottom of chassis toward the front of the unit.) Using the adjustment handle protruding through the casting, move the phototransistor until the specification is met. Tighten the Allenscrew while observing the scope signal. Verify that the adjustment did not change. If the adjustment cannot be achieved, it may be necessary to adjust the LED sensor located on the top plate assembly.
 - f. After the adjustment has been made and specification met, change the scope time base to 0.5ms/div and verify that the index pulse width measures $1.5 \pm 0.7\text{ms}$ (from 0.8ms to 2.2ms). If the index pulse width is not within specification, adjust the LED sensor located on the top plate assembly. If the pulse width cannot be adjusted to meet specification, the sensor assembly or PWA must be replaced and steps "a" through "f" repeated.
 - g. All scope settings are to remain as defined in the original setup in step "d", but it may be necessary to slightly adjust the sync. Seek to track 00 then seek to track 1 and perform a read. While observing the signal on the signal on the scope, remove and reinsert the diskette three times.

After each insertion, verify that the change in the time from write splice to leading edge of index is less than 50 us. If the change is greater than 50 us, the cone and spindle must be aligned or replaced (see section 6.6.7) and steps "a" through "g" repeated.

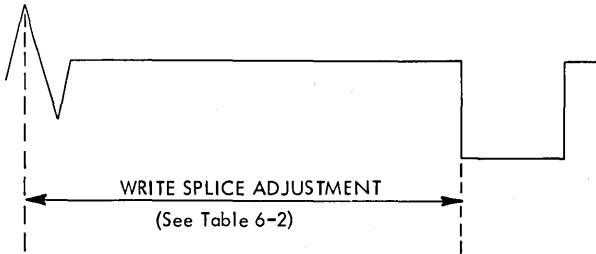


Figure 6-7. Write Splice Bit to Index Timing

Table 6-2. Write Splice Adjustment

CONFIG. REF. NO.	WRITE SPLICE ADJ. (μ S)
601	450 \pm 50
602	150 \pm 60
603	450 \pm 100

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.

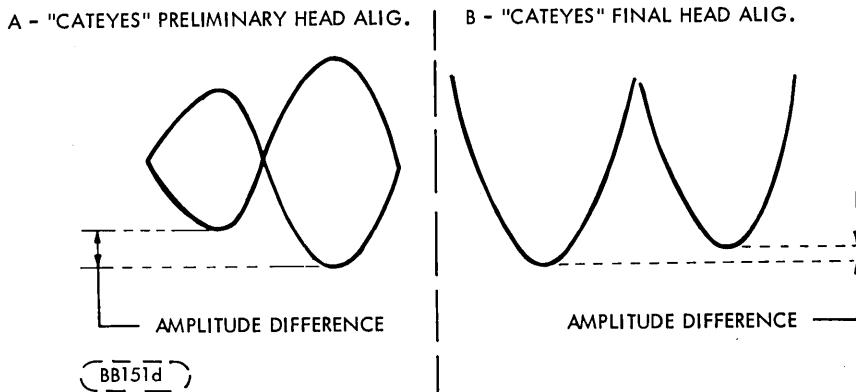


Figure 6-8. Head Alignment Amplitude

- 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.

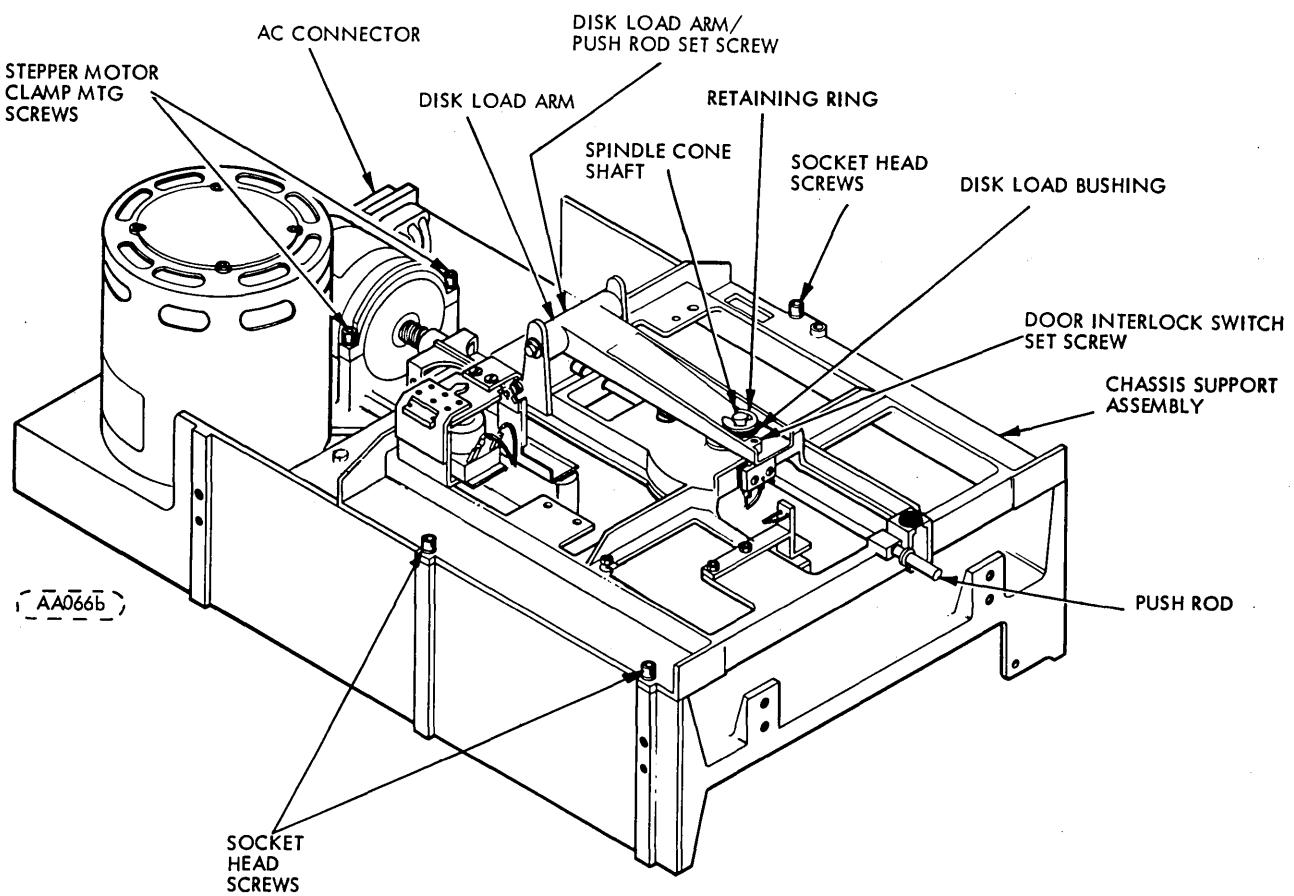


Figure 6-9. Chassis Base Assembly

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.

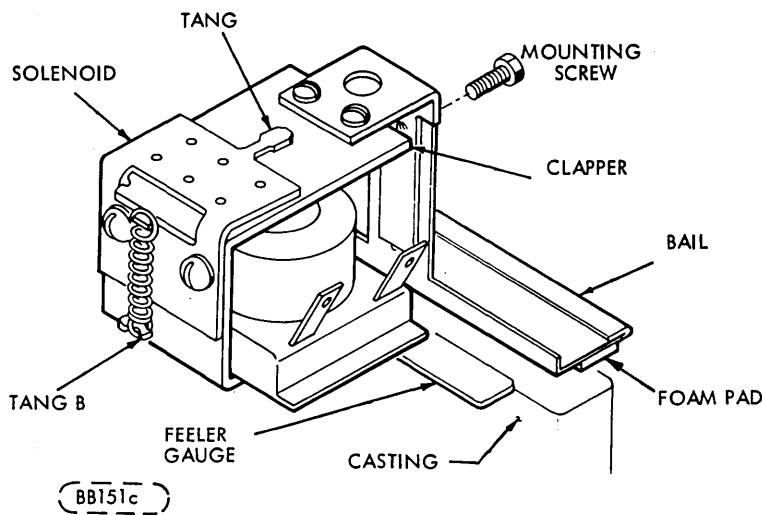


Figure 6-10. Disk Load Solenoid

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".

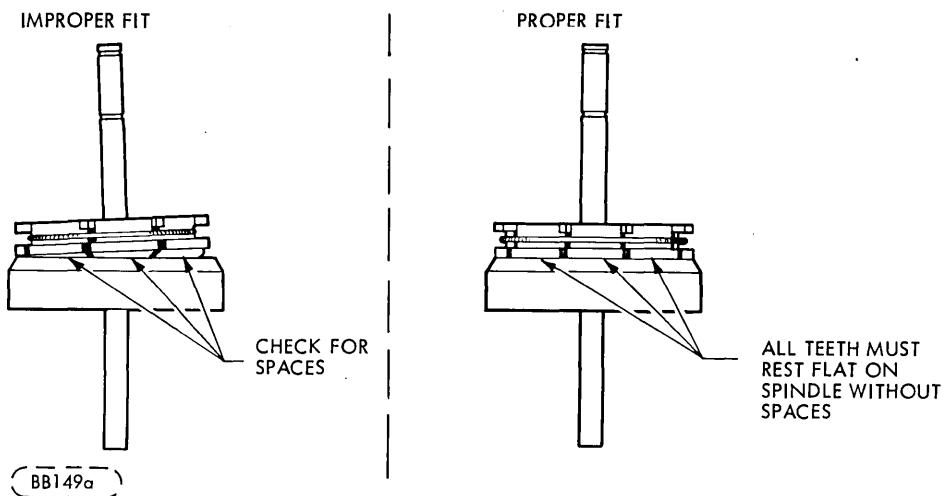


Figure 6-11. Spindle and Cone

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 6-9).
- 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).

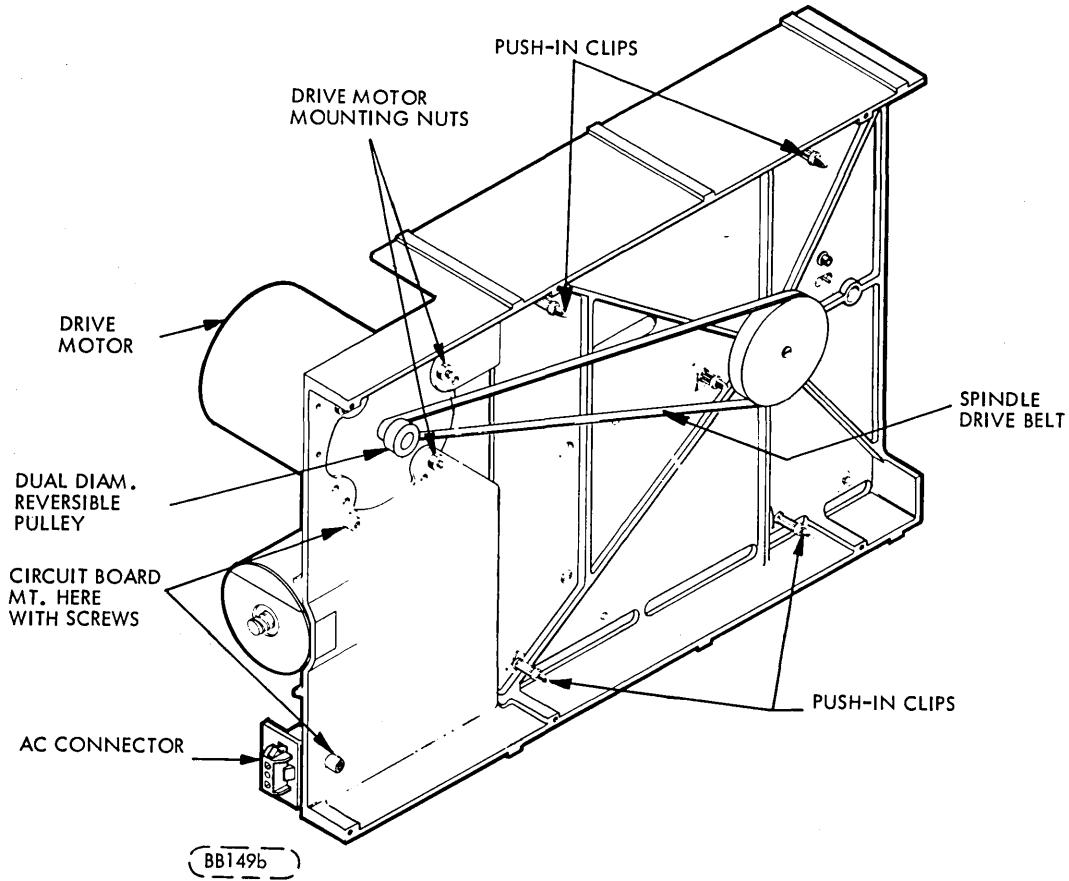


Figure 6-12. Base Casting Assembly

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)

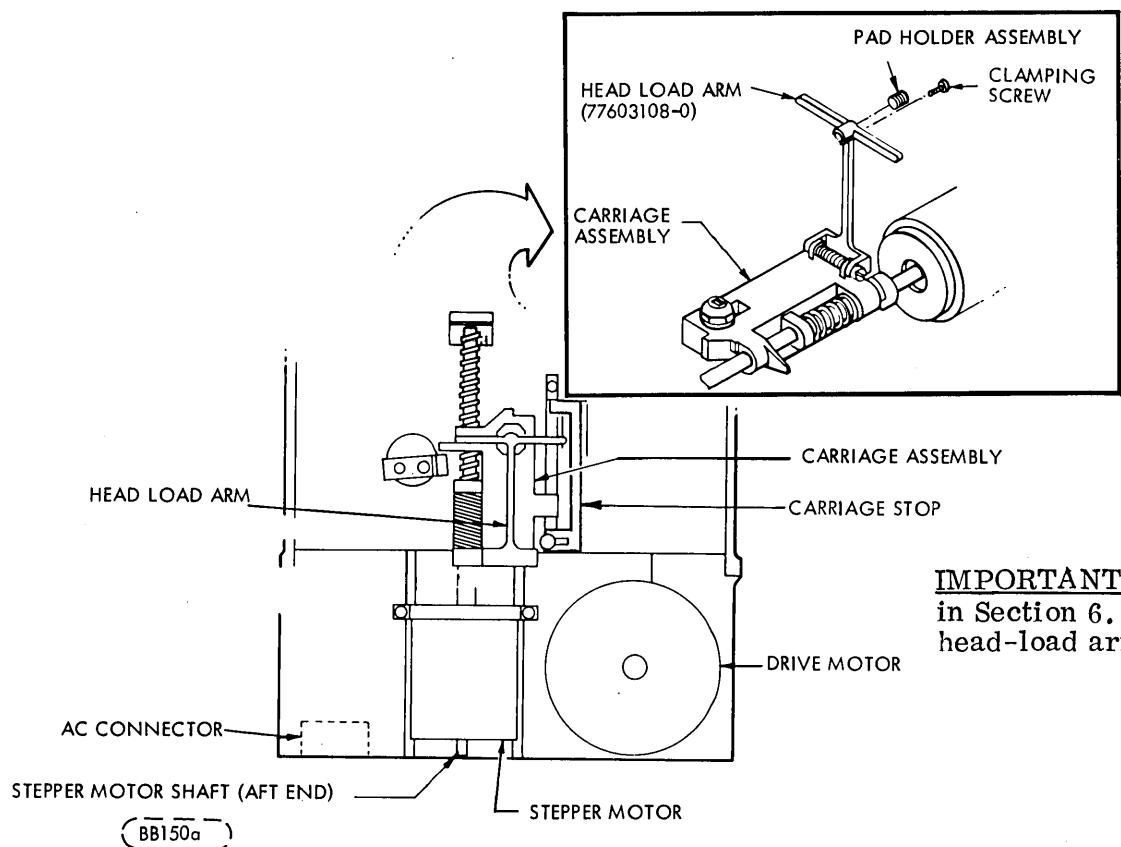


Figure 6-13. Head Load Pad Replacement Illustration

- 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 under-side 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) ± 0.002 in (0.051mm) gap is closed.
- k. Allow clapper to rise slowly and release.
- l. 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.

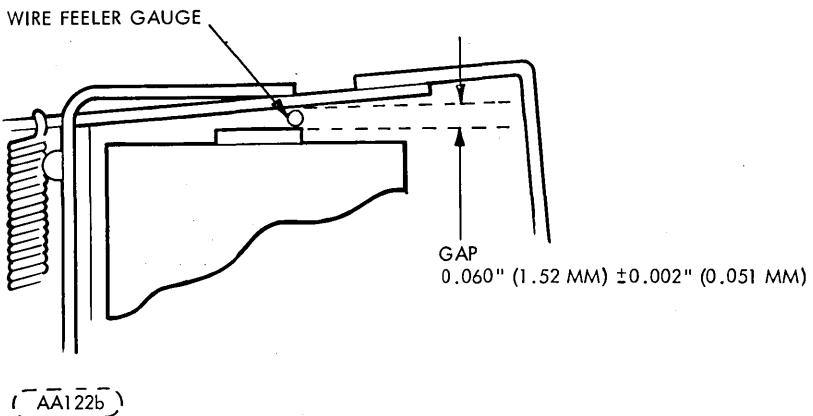


Figure 6-14. Solenoid Adjustment

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) $\pm 0.010"$ (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.

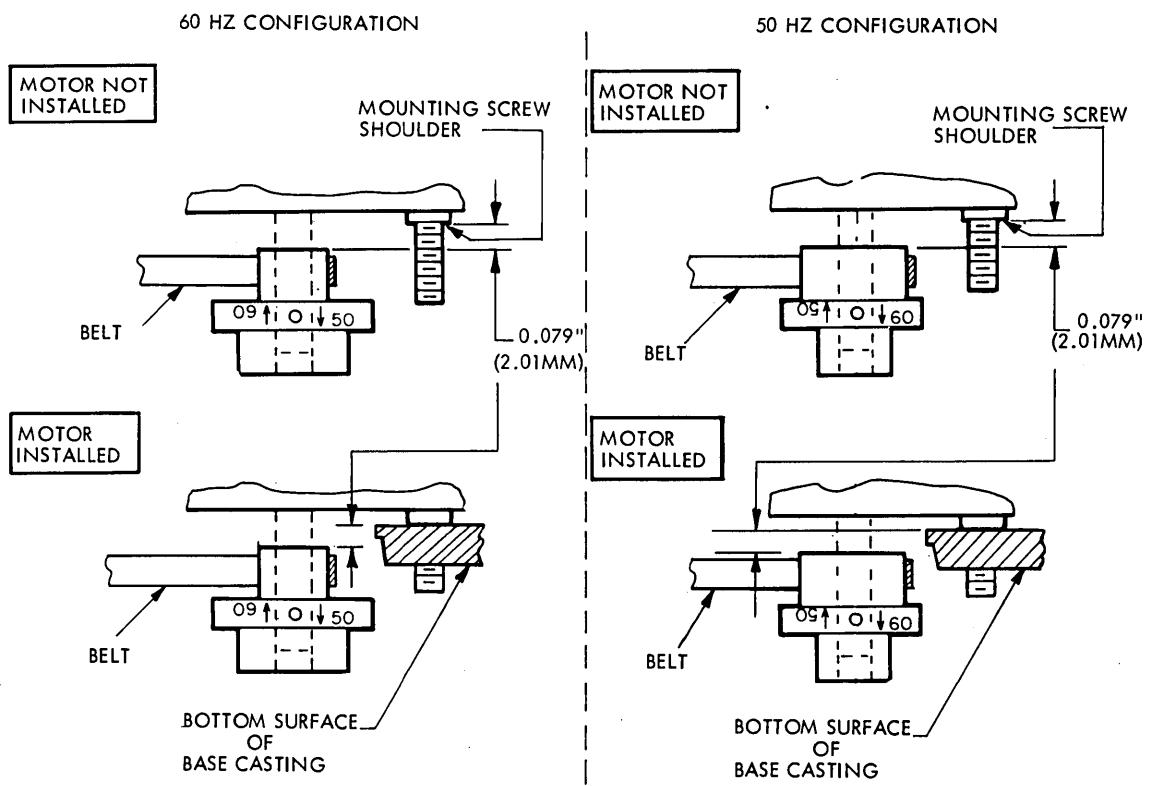


Figure 6-15. Drive Pulley Reversal

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.

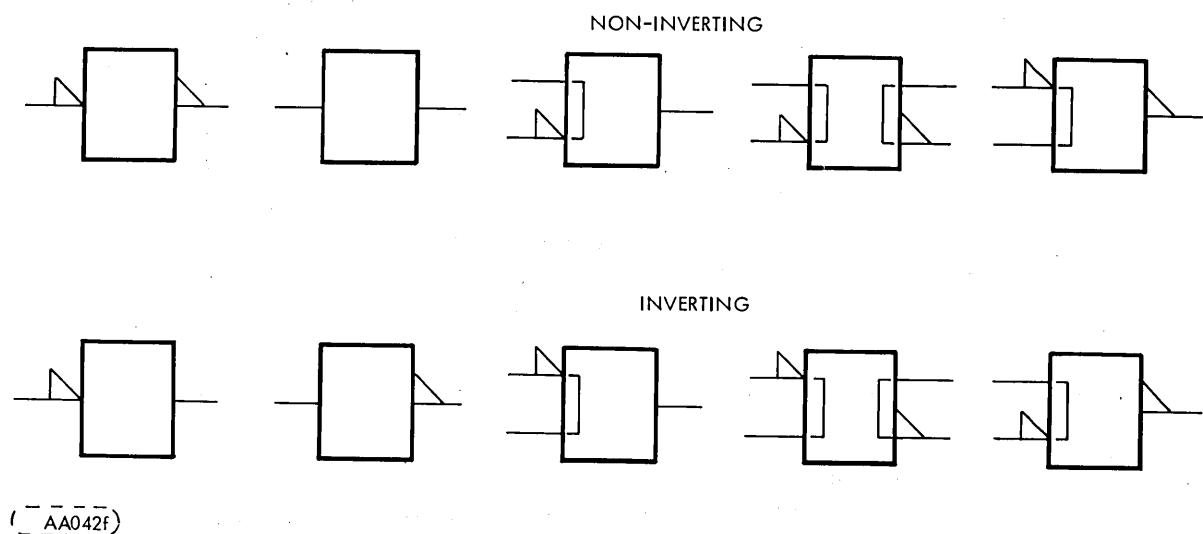


Figure 7-1. Inversion Conventions

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.

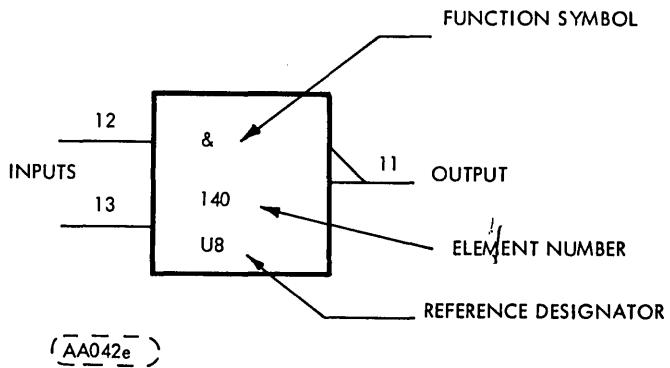


Figure 7-2. Integrated Circuit

FUNCTION SYMBOLS	
&	AND GATE OR INVERTER
1	OR GATE OR INVERTER
=1	EXCLUSIVE OR
1JK	ONE SHOT
Σ	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
— X —	INDICATES ANALOG SIGNAL
— O —	TEST POINTS
— + —	INHIBITING INPUT

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

I	ITEM NUMBERS									
T T	111111111111	111111111111	111111111111	111111111111	111111111111	111111111111	111111111111	111111111111	111111111111	111111111111
MODELS M E	0000000001	1111111112	2222222223	3333333334	4444444445	5555555556	6666666667			
A M	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890
BR803A 001	XX0000000000	000000000000	0X000X0000	0X0000X0000	XX0X0XX000	0000X00000	000000000000			
BR803B 002	X0X000000000	000000000000	0X000X0000	0X0000X0000	XX0X0XX000	0000X00000	000000000000			
BR803C 003	X00X00000000	000000000000	0X000X0000	0X0000X0000	XX0X0XX000	0000X00000	000000000000			
BR803D 004	X000X000000	000000000000	0X000X0000	0X0000X0000	XX0X0XX000	0000X00000	000000000000			
BR803E 005	X0000000000	X000000000000	0X000X0000	0X0000X0000	XX0X0XX000	0000X00000	000000000000			
BR803F 006	X00000X000	000000000000	0X000X0000	0X0000X0000	XX0X0XX000	0000X00000	000000000000			
BR803G 007	X0000000000	X0000000000	0X000X0000	00X00X0000	XX0X0XX000	0000X00000	000000000000			
BR803H 008	X0X00000000	000000000000	0X000X0000	00X00X0000	XX0X0XX000	0000X00000	000000000000			
BR805A 009	XX0000000000	000000000000	0X000XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR805B 010	X0X00000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR805C 011	X00X00000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR805D 012	X000X000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR803N 013	XX0000000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR803P 014	X0X00000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR803R 015	X000X000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR803S 016	X00X00000000	000000000000	0X00XX000	00000X0000	XX0X0XXX00	0000X00000	000000000000			
BR803J 017	X000000X00	0000X00000	0X000X0000	0X0000X0000	XX0X0XX00	0000X00000	000000000000			
BR803K 018	X000000X00	0000X00000	0X000X0000	0000X00000	XX0X0XX00	0000X00000	000000000000			
BR803L 019	X0000000000	000000000000	0X000X000X	00000XX000	XX000XX00	0000X00000	000000000000			
BR803M 020	X0000000000	000000000000	0X000X00X0	00000XX000	XX000XX00	0000X00000	000000000000			
BR8A3C 021	X000000X00	000000000000	0X000X000	00X00X0000	XX0X0XX00	0000X00000	000000000000			
BR8A3D 022	X0000000X0	000000000000	0X000X000	00X00X0000	XX0X0XX00	0000X00000	000000000000			
BR8A3E 023	X0000000X0	000000000000	0X000X000	00X00X0000	XX0X0XX00	0000X00000	000000000000			
BR8A3F 024	X0000000X0	000000000000	0X000X000	00X00X0000	XX0X0XX00	0000X00000	000000000000			
BR8A2A 025	XX0000000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR803T 026	X0000X0000	000000000000	0X00XX000	0000X0000	XX0X0XXX00	0000X00000	000000000000			
BR805E 027	X0000X0000	000000000000	0X00XX000	0000X0000	XX0X0XXX00	0000X00000	000000000000			
BR8A3A 028	X0000000000	X0000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A3B 029	000000000000	000000000000	000000000000	000000000000	00000X0000	000000000000	000000000000			
BR8A2B 030	X0X000000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2C 031	X00X00000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2D 032	X0000X00000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2E 033	X000X000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2F 034	X0000000000	00X00000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2G 035	XX0000000000	000000000000	0X00XX000	00000000X00	XX0X0XX00	0000X00000	000000000000			
BR8A2H 036	X0000000000	000000000000	0X0X0X000	0X0000X000	XX0XXX000	0000X00000	000000000000			
BR8A2J 037	XX0000000000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2K 038	X0000000000	00X00000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2L 039	X00000X000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2M 040	X000000X00	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	0X0000000000			
BR8A2N 041	X000X000000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2P 042	000000000X0	0000X000000	0X000X000	0X0000X000X	00XX0X00	0000X0000X	00X00X00X0			
BR8A2R 043	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000			
BR8A4A 044	000000000000	0000X0000000	0X000XX00	X0000X00X	0X00X0X00	0X00XXX00	000X0000X0			
BR8A4B 045	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000			
BR8A7A 046	000000000X0	0000X000000	0X000X000	0X0000X000X	00XX0X00	0000X00000	000X0000X0			
BR8A5A 047	X0000000X0	000000000000	0X00XX000	00000000X00	XX0X0XX0	0000X00000	XX00000000			
BR8A5B 048	X000000X00	000000000000	0X00XX000	00000000X00	XX0X0XX0	0000X00000	XX00000000			
BR8A2W 049	X000000X000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2Y 050	X0000000000	00X00000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A6B 051	X0X00000000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR803U 052	X0000000000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2S 053	X000000X000	000000000000	0X00XX000	0X0000X000	XX0X0XX0X	0000X00000	000000000000			
BR8A2T 054	X0000000X00	000000000000	0X00XX000	0X0000X000	XX0X0XX0X	0000X00000	000000000000			
BR8A2U 055	X0000000000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2V 056	X0000000000	00X00000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A2Z 057	X0000000X00	000000000000	0X000X000	0X0000X000	XX0X0XX0X	0000X00000	000000000000			
BR8A3G 058	XX0000000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A3H 059	X0X00000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
	060	X0000000000	00X00000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	0000X00000		
BR8A5C 061	X0000000X00	000000000000	0X00XX000	00000000X00	XX0X0XX0X	0000X00000	XX00000000			
BR8A5D 062	X0000000X00	000000000000	0X00XX000	00000000X00	XX0X0XX0X	0000X00000	XX00000000			
BR8A5E 063	XX0000000000	000000000000	0X00XX000	00000000X00	XX0X0XX0X	0000X00000	000000000000			
BR8A5J 064	XX0000000000	000000000000	0X00XX000	00000000X00	XX0X0XX00	0000X00000	X000X00000			
BR8A5F 080	XX0000000000	000000000000	0X00XX000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A5G 081	XX0000000000	000000000000	0X000X000	0X0000X000	XX0X0XX00	0000X00000	000000000000			
BR8A5H 082	XX0000000000	000000000000	0X00XX000	0000000X00	XX0X0XX00	X000X00000	000000000000			
BRXXXX 099	OEM ENGINEERING UNIT									

WHERE USED			WHERE USED			
E IDENT	M NO	DESCRIPTION	E IDENT	M NO	DESCRIPTION	
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	145	75272300	CONNECTOR BRACKET
102	75291200	DRIVE MOTOR ASM 60 HZ	TMA	146	77830538	CSA
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	147	77594901	TRACK SWITCH ASM
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA	148	83460101	AMP CONN KIT
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	149	75746702	CAPACITOR BRACKET
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	150	75898080	FRONT PANEL ASM
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	151	83401809	FRONT PANEL ASM
108	75881778	DRIVE MOTOR ASM 50 HZ	TMA	152	77832691	MOUNTING KIT
109	75881775	DRIVE MOTOR ASM 60 HZ	TMA	153	93592240	SCREW-WASHER
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA	156	77830641	AC CONN & RELAY ASM
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	157	77830995	COVER
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	158	17901508	SCREW
122	94277416	STRAP, CABLE TIE	TMA	160	77834336	LABEL, FCO
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	161	77834543	FRONT PANEL ASSY
125	83427801	WRITE PROTECT ASM	TMA	162	75746701	CAPACITOR BRACKET
126	92602001	CLAMP	TMA	164	77836055	LABEL
127	77830690	DISKETTA DETECT ASM	TMA	168	77594704	OPT TRACK SENSE ASSY
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA	169	77594705	OPT TRACK SENSE ASSY
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	170	83401808	FRONT PANEL ASSY
130	75881781	DRIVE MOTOR ASM 60 HZ	TMA	336	93592160	SCREW, SELF TAP
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	75791510	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			

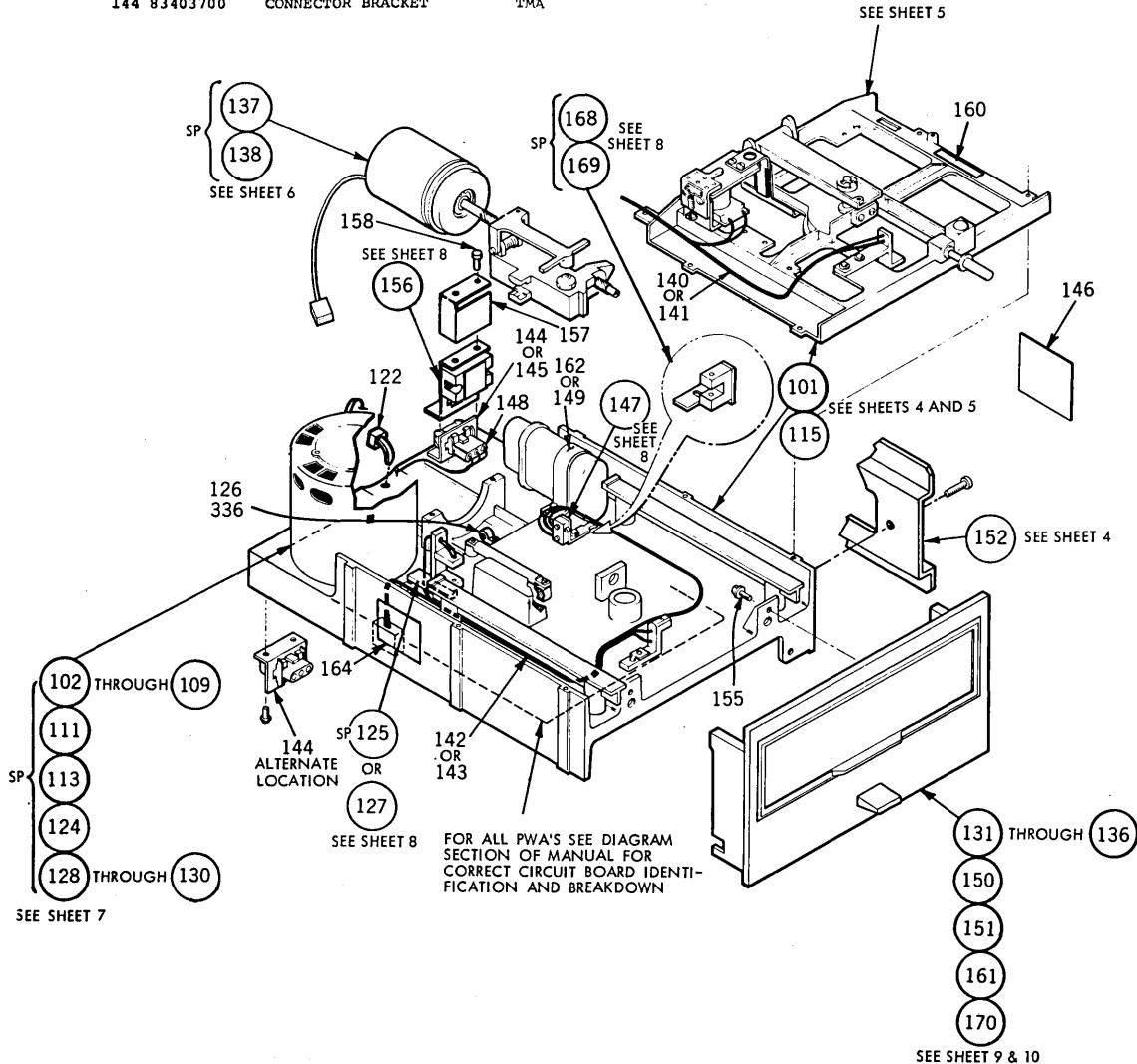


Figure 8-1. Top Mechanical Assembly

E	IDENT	M	NO	DESCRIPTION	WHERE USED
101	83458201			CHASSIS ASM-COMMON PARTS	TMA
115	75891480			CHASSIS ASM-COMMON PARTS	TMA
152	77832691			MOUNTING KIT	TMA
170	10125801			WASHERS SPR LOCK	101 115
	75293203			BELT-FLAT	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			WASHFR-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
	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

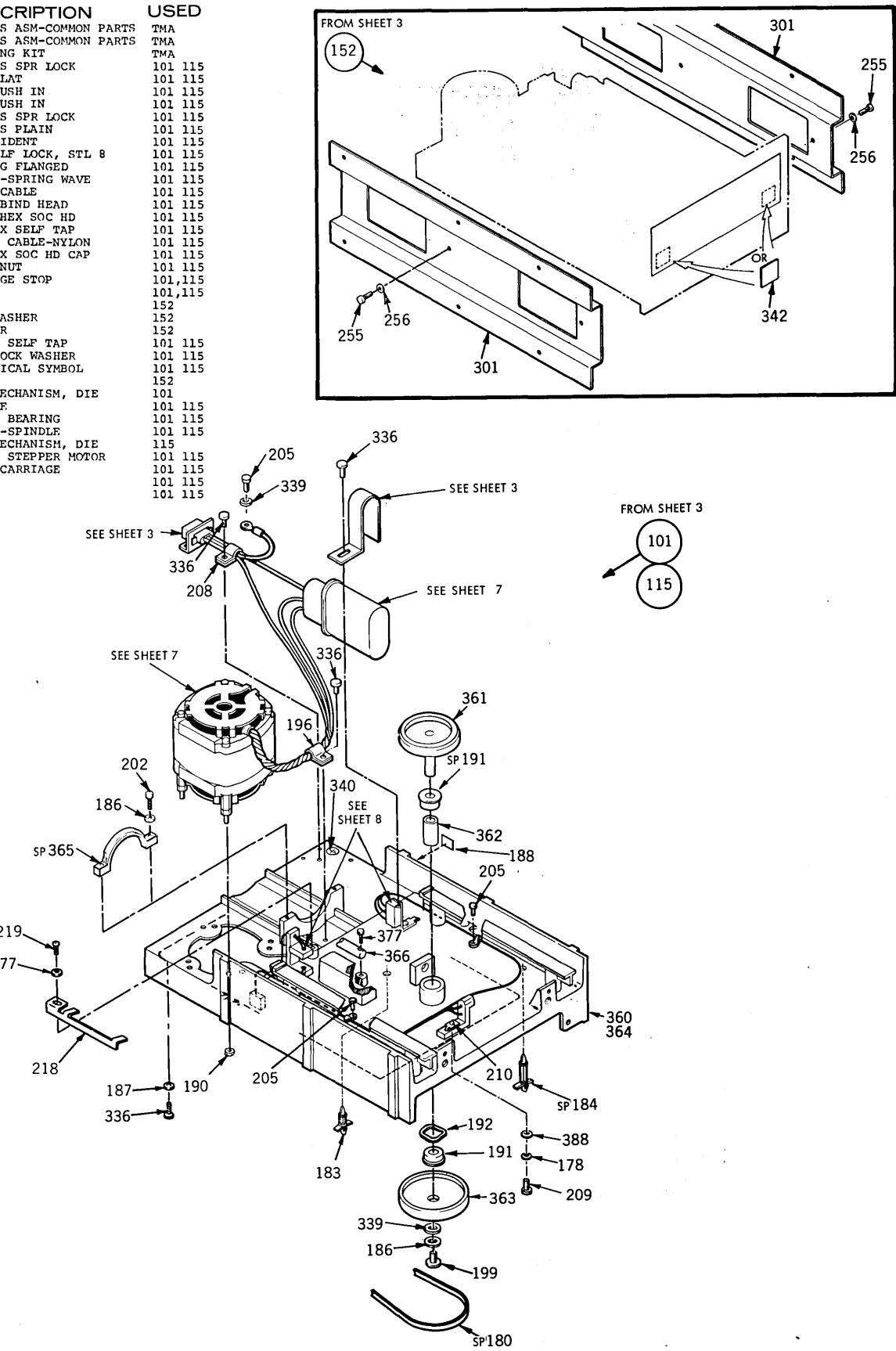


Figure 8-2. FDD Common Parts (Sheet 1 of 2)

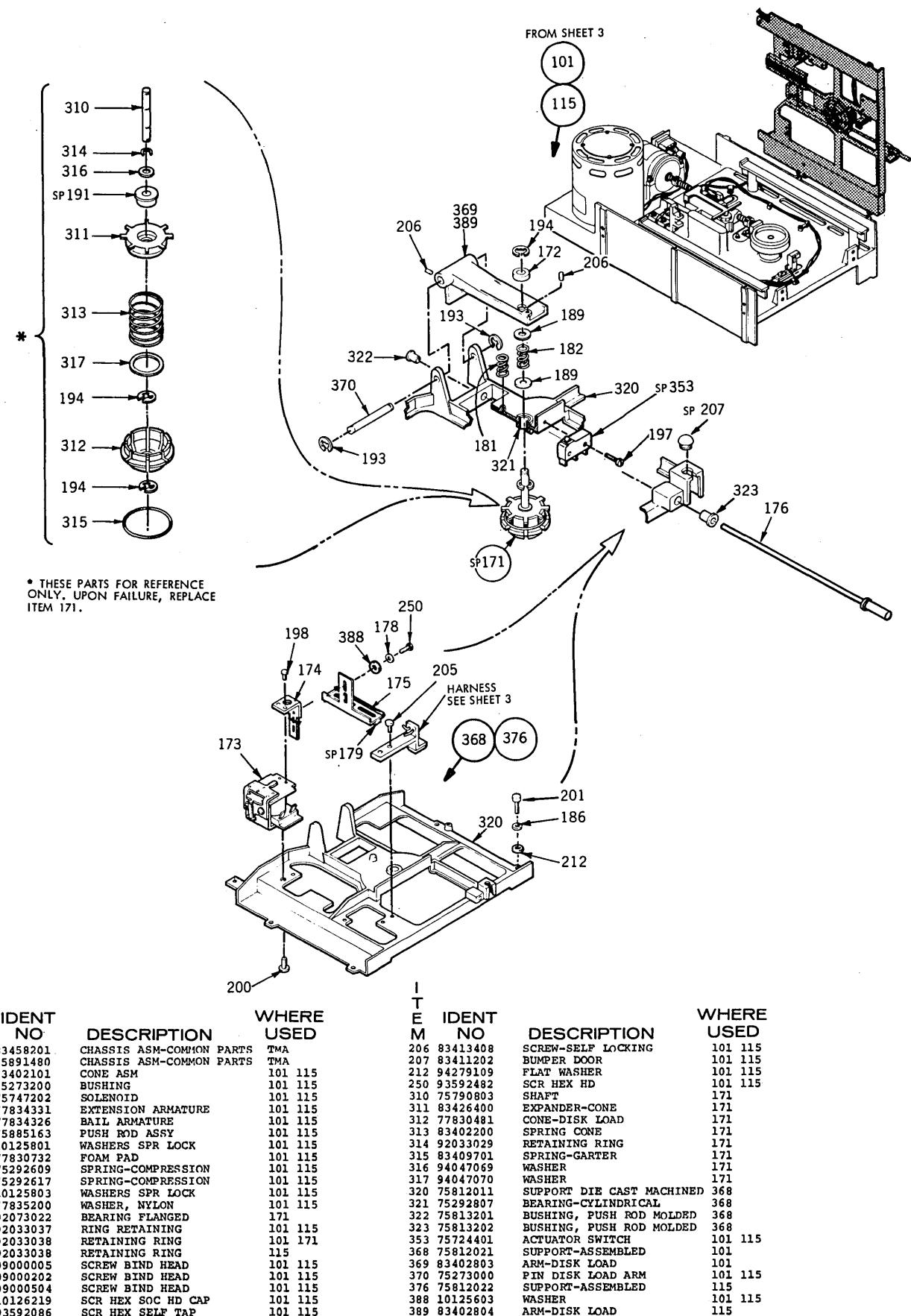
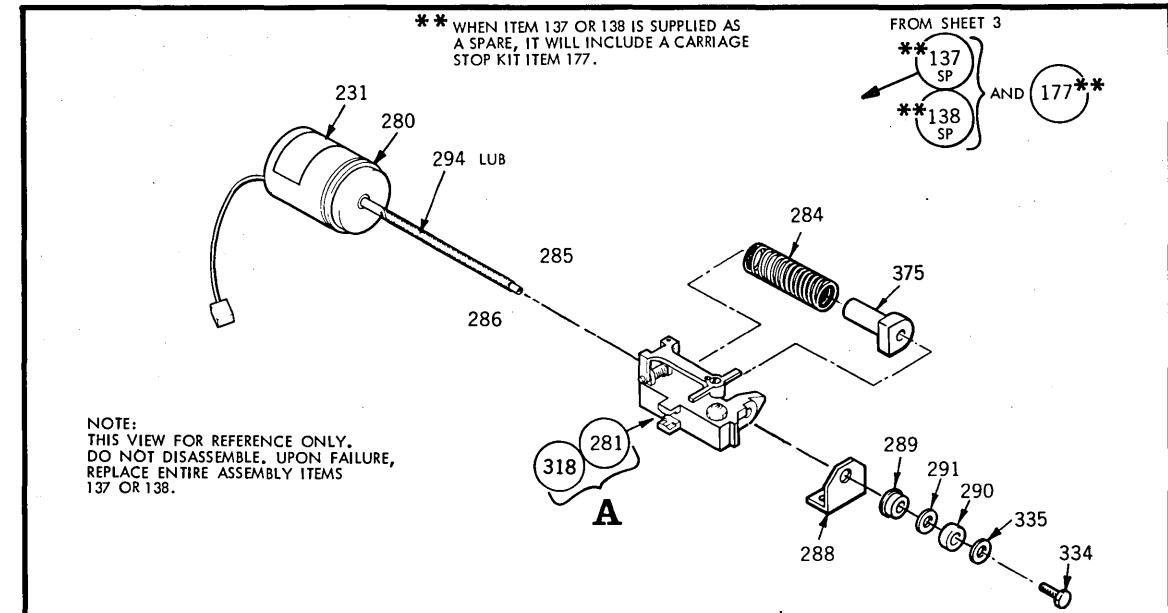
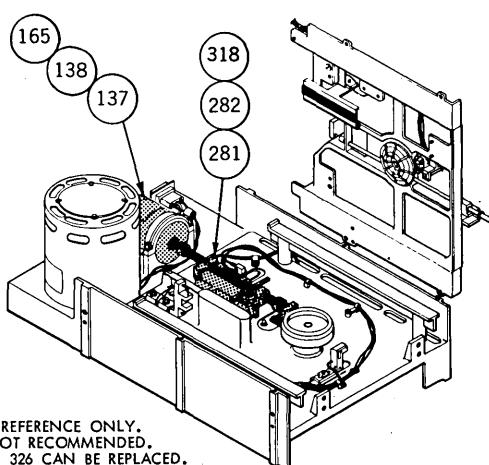
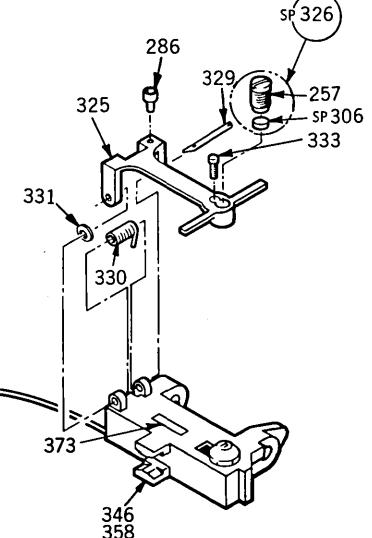


Figure 8-2. FDD Common Parts (Sheet 2 of 2)



I T E M NO	IDENT 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 77603100	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

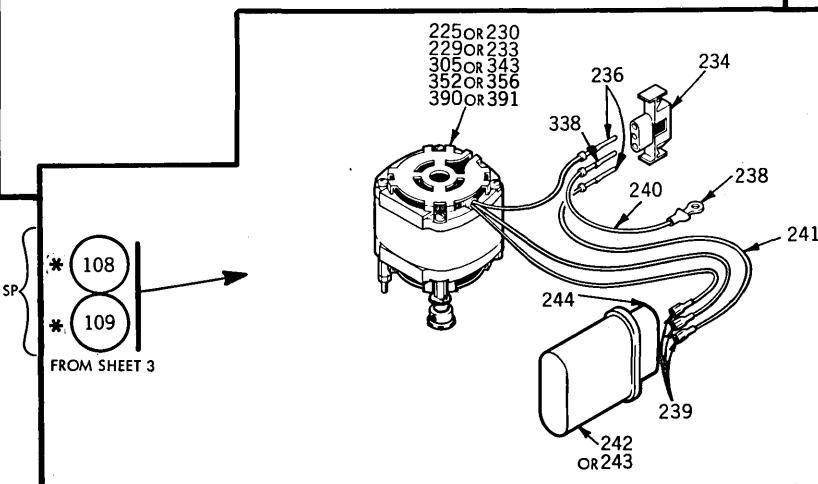
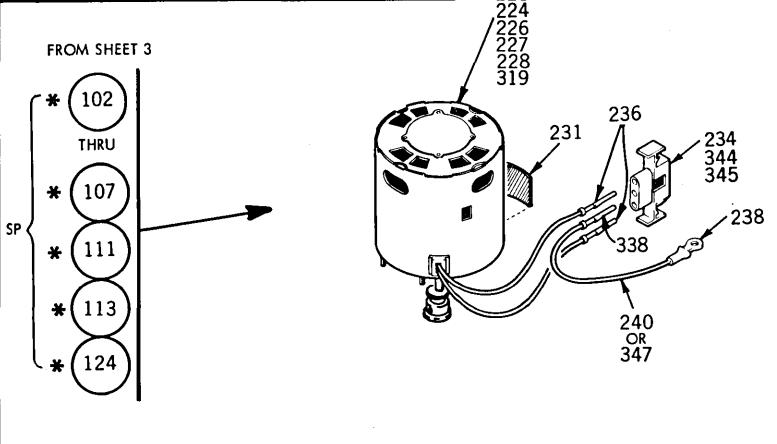
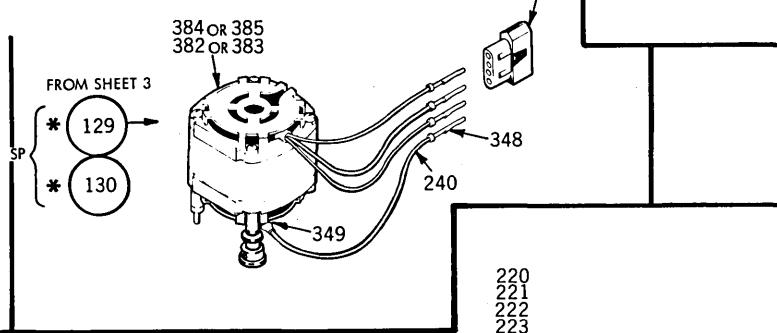
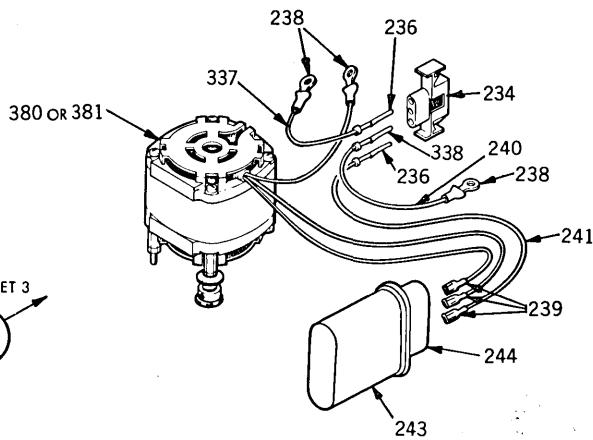
I T E M NO	IDENT DESCRIPTION	WHERE USED
346 83426204	CARRIAGE HEAD ASSY	281
358 83426205	CARRIAGE HEAD ASSY	318
373 77835304	LABEL	324 358
375 83427303	NUT CARRIAGE	137 138



* 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

E	IDENT	DESCRIPTION	WHERE USED
M	NO		
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



E	IDENT	DESCRIPTION	WHERE USED
M	NO		
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 BOOT	108-110
244	75772500	CAPACITOR BOOT	114 128
244	75772500	CAPACITOR BOOT	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 MTG	124
345	75724586	CONNECTOR PANEL MTG	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 MTG	129 130
351	75724585	CONNECTOR PANEL MTG	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

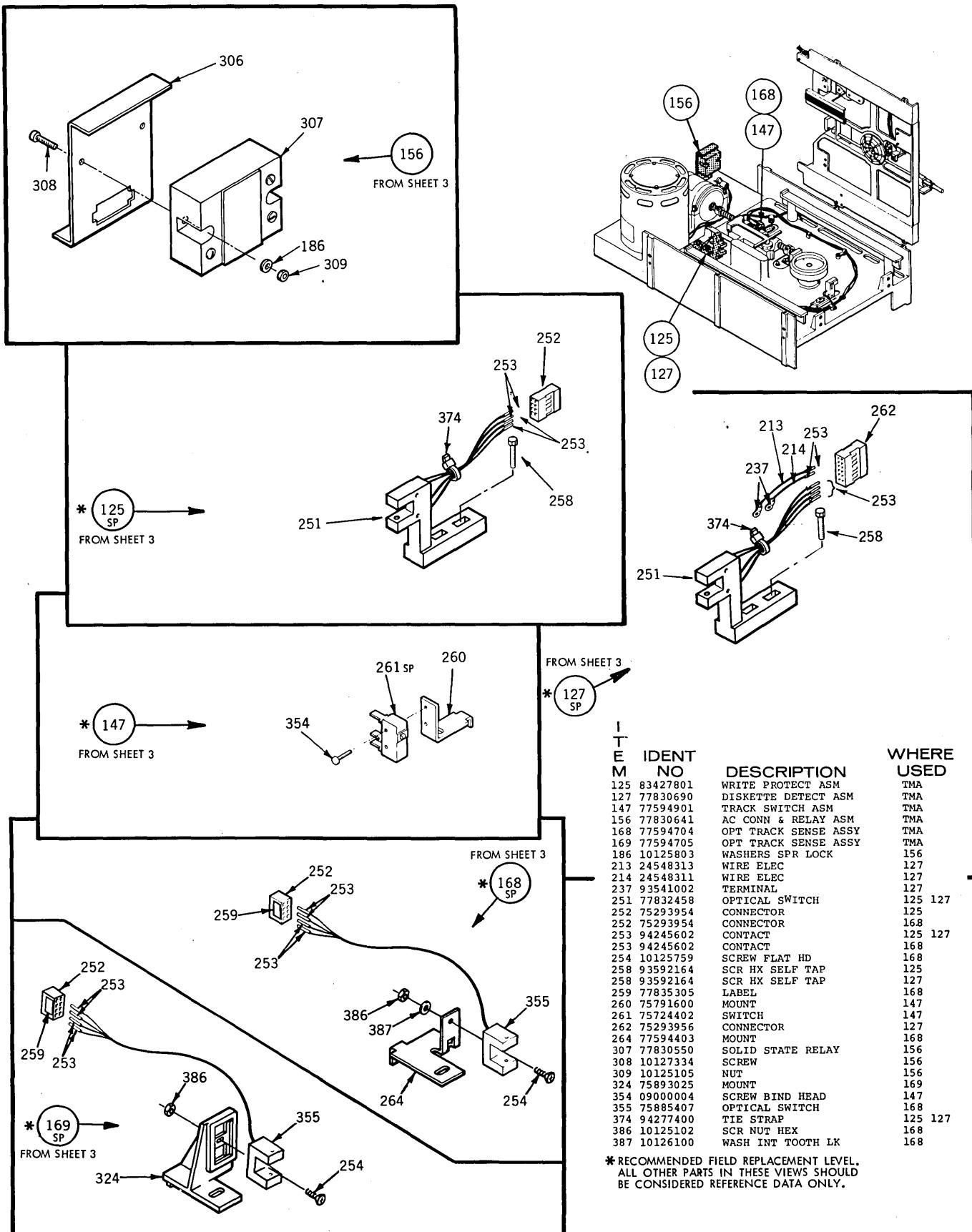


Figure 8-5. Miscellaneous Sub-Assemblies

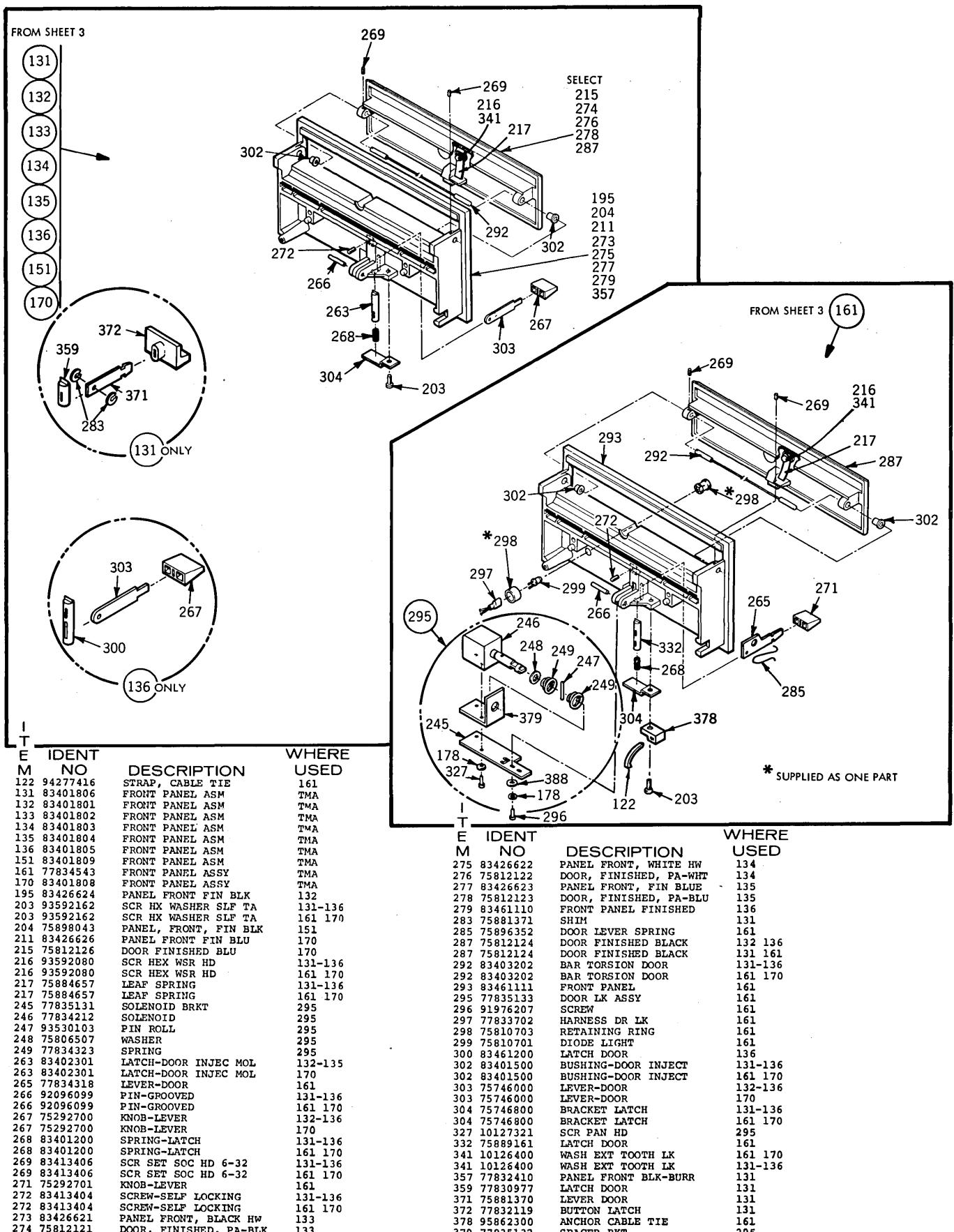
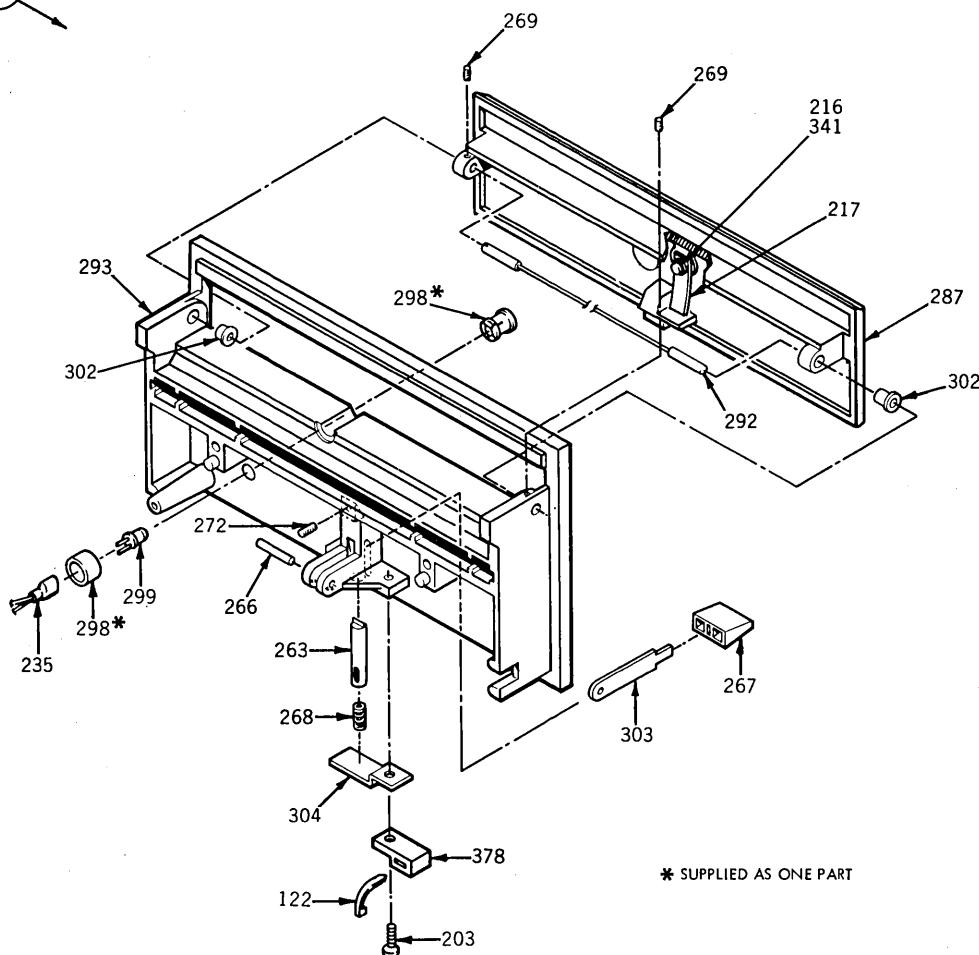


Figure 8-6. Front Panel Assembly (Sheet 1 of 2)

FROM SHEET 3

150



* SUPPLIED AS ONE PART

E	T	IDENT	DESCRIPTION	WHERE USED
M		NO		
122		94277416	STRAP, CABLE TIE	150
150		75898080	FRONT PANEL ASM	TM
203		93592162	SCR HEX WASHER SLF TA	150
216		93592080	SCR HEX WSR HD	150
217		75884657	LEAF SPRING	150
235		75898086	HARNESS	150
263		83402301	LATCH-DOOR INJEC MOL	150
266		92096099	PIN-GROOVED	150
267		75292700	KNOB-LEVER	150
268		83401200	SPRING-LATCH	150
269		83413406	SCR SET SOC HD 6-32	150
272		83413404	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 IDENT	M NO	DESCRIPTION	WHERE USED	SH	I T E IDENT	M NO	DESCRIPTION	WHERE USED	SH
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	S3	179	77830732	FOAM PAD	101	S5
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	S4	180	75293203	BELT-FLAT	101	S4
101	83458201	CHASSIS ASM-COMMON PARTS	TMA	S5	181	75292609	SPRING-COMPRESSION	101	S5
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	S3	182	75292617	SPRING-COMPRESSION	101	S5
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	S7	183	75774732	CLIP-PUSH IN	101	S4
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	S3	184	75774736	CLIP-PUSH IN	101	S4
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	S7	186	10125803	WASHERS SPR LOCK	101	S4
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA	S3	186	10125803	WASHERS SPR LOCK	101	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	10125605	WASHERS PLAIN	101	S4
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	S7	188	77832145	LABEL IDENT	101	S4
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	S3	189	77835200	WASHER, NYLON	101	S5
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	S7	190	94217702	NUT-SELF LOCK, STL 8	101	S4
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	S3	191	92073022	BEARING FLANGED	101	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	S4
108	75881778	DRIVE MOTOR ASM 50 HZ	TMA	S7	193	92033037	RING RETAINING	101	S5
109	75881775	DRIVE MOTOR ASM 60 HZ	TMA	S3	194	92033038	RETAINING RING	101	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	16402506	CLAMP CABLE	101	S4
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	S3	197	09000005	SCREW BIND HEAD	101	S5
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	S3	200	090000403	SCREW BIND HEAD	101	S4
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	S4	200	090000504	SCREW BIND HEAD	101	S5
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	S5	201	10126219	SCR HEX SOC HD CAP	101	S5
122	94277416	STRAP, CABLE TIE	TMA	S3	202	10126222	SCR HEX SOC HD	101	S4
122	94277416	STRAP, CABLE TIE	161	S9	203	93592162	SCR HX WASHER SLF TA	131-136	S9
122	94277416	STRAP, CABLE TIE	150	S10	203	93592162	SCR HX WASHER SLF TA	161	S9
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S3	203	93592162	SCR HX WASHER SLF TA	150	S10
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S7	204	75898043	PANEL, FRONT, FIN BLK	151	S9
125	83427801	WRITE PROTECT ASM	TMA	S3	205	93592086	SCR HEX SELF TAP	101	S4
125	83427801	WRITE PROTECT ASM	TMA	S8	205	93592086	SCR HEX SELF TAP	101	S5
126	92602001	CLAMP	TMA	S3	206	83413408	SCREW-SELF LOCKING	101	S5
127	77830690	DISKETTE DETECT ASM	TMA	S3	207	83411202	BUMPER DOOR	101	S5
127	77830690	DISKETTE DETECT ASM	TMA	S8	208	92602003	CLAMP, CABLE-NYLON	101	S4
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA	S3	209	10126214	SCR HEX SOC HD CAP	101	S4
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA	S7	210	83427900	PLATE-NUT	101	S4
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	S3	211	83426626	PANEL FRONT FIN BLU	170	S9
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	S7	212	94279109	FLAT WASHER	101	S5
130	75881781	DRIVE MOTOR ASM 60 HZ	TMA	S3	213	24548313	WIRE ELEC	127	S8
130	75881781	DRIVE MOTOR ASM 60 HZ	TMA	S7	214	24548311	WIRE ELEC	127	S8
130	75881806	FRONT PANEL ASM	TMA	S3	215	75812126	DOOR FINISHED BLU	170	S9
131	83401806	FRONT PANEL ASM	TMA	S9	216	93592080	SCR HEX WSR HD	131-136	S9
132	83401801	FRONT PANEL ASM	TMA	S3	216	93592080	SCR HEX WSR HD	161	S9
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	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	83401502	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	S6
145	75272300	CONNECTOR BRACKET	TMA	S3	231	75790000	CAUTION LABEL	124	S7
146	77830538	CSA LABEL	TMA	S3	231	75790000	CAUTION LABEL	112	S7
147	778304901	TRACK SWITCH ASM	TMA	S3	231	75790000	CAUTION LABEL	102-107	S7
147	778304901	TRACK SWITCH ASM	TMA	S8	231	75790000	CAUTION LABEL	111	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	S7
151	83401809	FRONT PANEL ASM	TMA	S10	234	83435402	CONNECTOR	111	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	S9
157	77830995	COVER	TMA	S3	239	62121108	TERMINAL	108-110	S7
158	17901508	SCREW	TMA	S3	239	62121108	TERMINAL	114	S7
160	77834336	LABEL, FCO	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	S7
162	75746701	CAPACITOR BRACKET	TMA	S3	240	15003254	WIRE (YELLOW)	114	S9
164	77836055	LABEL	TMA	S3	241	15003309	WIRE	106-110	S7
168	77594704	OPT TRACK SENSE ASSY	TMA	S3	241	15003309	WIRE	114	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	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	S7
171	83402101	CONE ASM	101	S5	243	75738421	CAPACITOR	108	S7
172	75273200	BUSHING	101	S5	244	75772500	CAPACITOR BOOT	108-110	S7
173	75747202	SOLENOID	101	S5	244	75772500	CAPACITOR BOOT	114	S7
174	77834331	EXTENSION ARMATURE	101	S5	244	75772500	CAPACITOR BOOT	139	S7
175	77834326	BAIL ARMATURE	101	S5	245	77835131	SOLENOID BRKT	295	S9
176	75885163	PUSH ROD ASSY	101	S5	246	77834212	SOLENOID	295	S9
177	75882711	CARRIAGE STOP KIT	137	S6	247	93530103	PIN ROLL	295	S9
178	10125801	WASHERS SPR LOCK	101	S4	248	75806507	WASHER	295	S9
178	10125801	WASHERS SPR LOCK	101	S5	249	77834323	SPRING	295	S9

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

I T E IDENT M NO	DESCRIPTION	WHERE USED	SH	I T E IDENT M NO	DESCRIPTION	WHERE USED	SH
250 93592482	SCR HEX HD	101 115	S5	324 75893025	MOUNT	169	S8
251 77832458	OPTICAL SWITCH	125 127	S8	325 77630100	ARM-HEAD LOAD	281 318	S6
252 75293954	CONNECTOR	125	S8	326 77830482	HOLDER-PAD ASSY	281 318	S6
252 75293954	CONNECTOR	168	S8	327 10127321	SCR PAN HD	295	S9
253 94245602	CONTACT	125 127	S8	329 77830998	PIN CARRIAGE	281 318	S6
253 94245602	CONTACT	168	S8	330 77830999	SPRING TORSION	281 318	S6
254 10125759	SCREW FLAT HD	168	S8	331 94047068	WASHER, SPECIAL	281 318	S6
255 10127131	SCREW	152	S4	332 75889161	LATCH DOOR	161	S9
256 10125805	LOCK WASHER	152	S4	333 10127310	SCREW SLOTTED	281 318	S6
257 83460400	HOLDER PAD	326	S6	334 94047000	SCREW HEX HD	137 138	S6
258 93592164	SCR HX SELF TAP	125	S8	335 94047000	WASHER	137 138	S6
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	S4
260 75791600	MOUNT	147	S8	337 93464000	WIRE BLACK	114 128	S7
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	S4
263 83402301	LATCH-DOOR INJEC MOL	170	S9	340 75731302	ELECTRICAL SYMBOL	101 115	S4
263 83402301	LATCH-DOOR INJEC MOL	150	S10	341 10126400	WASH EXT TOOTH LK	161 170	S9
264 77594403	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	S9	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	S7
268 83401200	SPRING-LATCH	161 170	S9	349 51797214	LUG TERM RING CRIMP	129 130	S7
268 83401200	SPRING-LATCH	150	S10	350 75724569	CONNECTOR PANEL MTG	129 130	S7
269 83413406	SCR SET SOC HD 6-32	131-136	S9	351 75724585	CONNECTOR PANEL MTG	129 130	S7
269 83413406	SCR SET SOC HD 6-32	161 170	S9	352 77833542	MOTOR PULLEY ASSY	139	S7
269 83413406	SCR SET SOC HD 6-32	150	S10	353 75724401	ACTUATOR SWITCH	101 115	S5
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	S9	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	S4
277 83426623	PANEL FRONT, FIN BLUE	135	S9	362 75747000	SPACER BEARING	101 115	S4
278 75812123	DOOR, FINISHED, PA-BLU	135	S9	363 75745200	PULLEY-SPINDLE	101 115	S4
279 83461110	FRONT PANEL FINISHED	136	S9	364 75886078	BASE-MECHANISM, DIE	115	S4
280 75747801	STEPPER MOTOR ASM	137 138	S6	365 83461800	CLAMP, STEPPER MOTOR	101 115	S4
281 77839092	CARRIAGE ASM	137	S6	366 75292400	GUIDE-CARRIAGE	101 115	S4
283 75881371	SHIM	131	S9	368 75812021	SUPPORT-ASSEMBLED	101	S5
284 77594000	SPRING-CARRIAGE	137 138	S6	369 83402803	ARM-DISK LOAD	101	S5
285 75896352	DOOR LEVER SPRING	161	S9	370 75273000	PIN DISK LOAD ARM	101 115	S5
286 10126209	SCR-SOC HP CAP	281 318	S6	371 75881370	LEVER DOOR	131	S9
287 75812124	DOOR FINISHED BLACK	132 136	S9	372 77832119	BUTTON LATCH	131	S9
287 75812124	DOOR FINISHED BLACK	131 161	S9	373 77835304	LABEL	324 358	S6
287 75812124	DOOR FINISHED BLACK	150	S10	374 94277400	TIE STRAP	125 127	S8
288 75813000	RETAINER-BEARING	137 138	S6	375 83427303	NUT CARRIAGE	137 138	S6
289 92073020	BEARING FLANGED	137 138	S6	376 75812022	SUPPORT-ASSEMBLED	115	S5
290 94217207	BRG BALL-EXT INNER R	137 138	S6	377 93592486	SCREW	101 115	S4
291 93259001	WASHER-SPRING WAVE	137 138	S6	378 95862300	ANCHOR CABLE TIE	161	S9
292 83403202	BAR TORSION DOOR	131-136	S9	379 77835132	ANCHOR CABLE TIE	150	S10
292 83403202	BAR TORSION DOOR	161 170	S9	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	S6	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	HARNESS 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	S4
299 75810701	DIODE LIGHT	161	S9	388 10125603	WASHER	101 115	S5
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	S9				
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	S9				
305 77833526	MOTOR PULLEY ASSY	110	S7				
306 83460701	PAD HEAD LOAD	326	S6				
307 77830550	SOLID STATE RELAY	156	S8				
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				
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314 92033029	RETAINING RING	171	S5				
315 83409701	SPRING-GARTER	171	S5				
316 94047069	WASHER	171	S5				
317 94047070	WASHER	171	S5				
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322 75813201	BUSHING, PUSH ROD MOLDED	368	S5				
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Cross Reference List

I T E IDENT M NO	I T E IDENT M NO	I T E IDENT M NO	I T E IDENT M NO
SH	SH	SH	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
334 10125001 S6	362 75747000 S4	251 77832458 S8	277 83426623 S9
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309 10125105 S8	141 75747301 S3	152 77832691 S4	211 83426626 S9
388 10125603 S4	280 75747901 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
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202 10126222 S4	138 75791511 S3	384 77833527 S7	101 83458201 S5
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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 376207 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
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239 62121108 S7	109 75881775 S3	189 77835200 S5	347 93464555 S7
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113 75291924 S3	217 75884657 S10	132 83401801 S3	203 93592162 S9
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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
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352 75724401 S5	147 77594901 S3	389 83402804 S5	378 95862300 S10
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303 75746000 S9	157 77830995 S3	269 83413406 S9	
303 75746000 S10	329 77830998 S6	206 83413408 S5	

WIRE LISTS

9

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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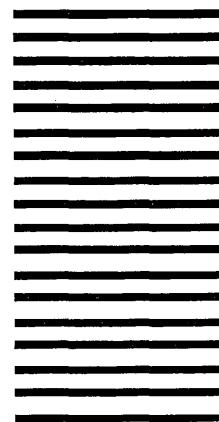
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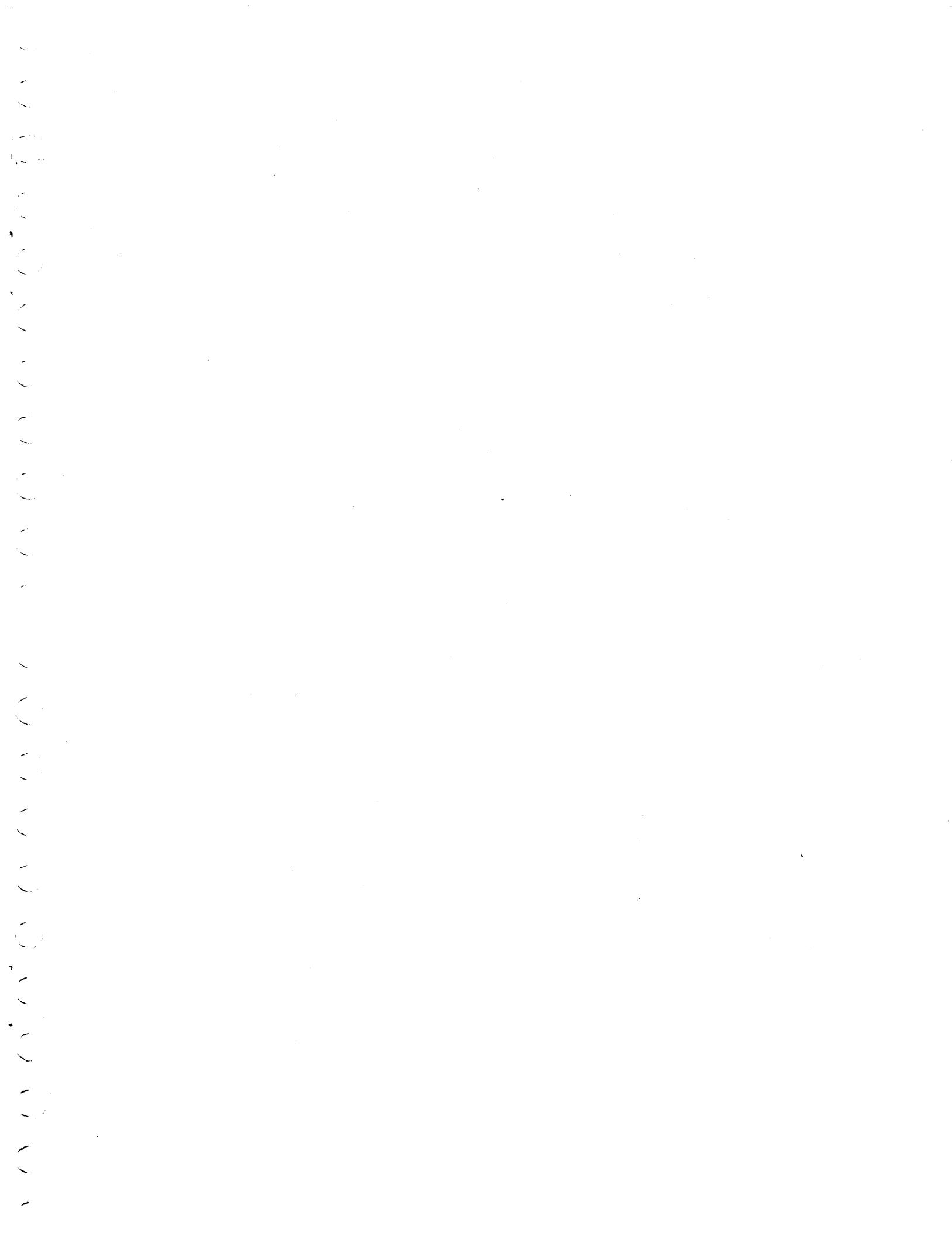
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