

Honeywell

Process Management
Systems Division

**FLOPPY DISC DRIVE
Hardware Maintenance Manual/1**



FLOPPY DISC DRIVE^{N. 310} HARDWARE MAINTENANCE MANUAL/1

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1.1 INTRODUCTION

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

1.2 PURPOSE AND USE OF EQUIPMENT

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

1.3 PRODUCT DESCRIPTION

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

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

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

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

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

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

1.3.1 PHYSICAL DESCRIPTION

The physical dimensions for the equipment are as follows:

Height	4.97 inches (126.2 mm)
Width	8.78 inches (223.0 mm)
Depth	14.24 inches (361.7 mm)
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
 - +24 V ($\pm 10\%$) @ $\begin{cases} 1.3 \text{ A Typical, Stepping} \\ 0.3 \text{ A Typical, Not Stepping} \end{cases}$
 - + 5 V ($\pm 5\%$) @ 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

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

Bytes/Track	5,208	10,416
Bits/Track	41,664	83,328
Bits/Diskette	3,208,128	6,416,256
- FLEXIBLE DISKETTE (Optional)

Diskette Dimensions	CDC 421-60W, Single Density, or Equiv. CDC 423-60W, Double Density, or Equiv.
Useable Diskette Recording Surfaces	8 x 8 inches (203.2 x 203.2 mm) (including jacket)
Diskette Surface Diameter	7.88 inches (200.1 mm)
Recording Radii	Track 76 (inner) 2.0290 inches (515 mm) nominal Track 00 (outer) 3.6123 inches (918 mm) nominal
Diskette Surface Coating	Magnetic Oxide
Diskette Velocity	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)

2.1 INTRODUCTION

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

2.2 OPERATING INSTRUCTIONS

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

2.2.1 FLEXIBLE DISKETTE LOADING

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

2.2.2 FLEXIBLE DISKETTE REMOVAL

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

2.3 ERROR RECOVERY

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

2.3.1 SEEK ERROR

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

2.3.2 WRITE ERROR

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

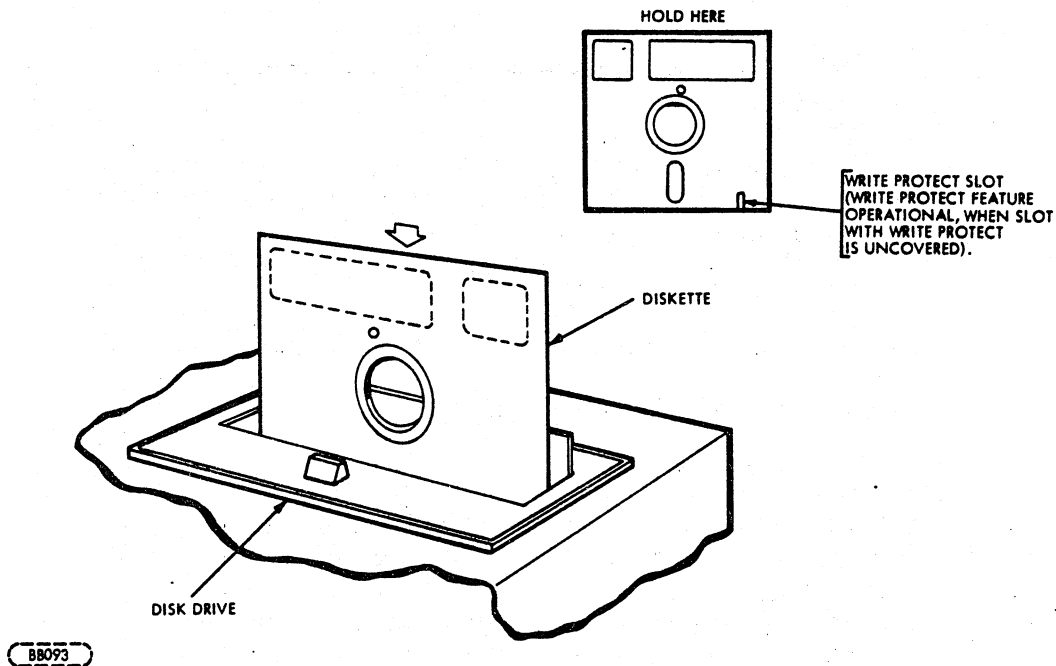


FIGURE 2-1. DISKETTE INSTALLATION

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.

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 (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.

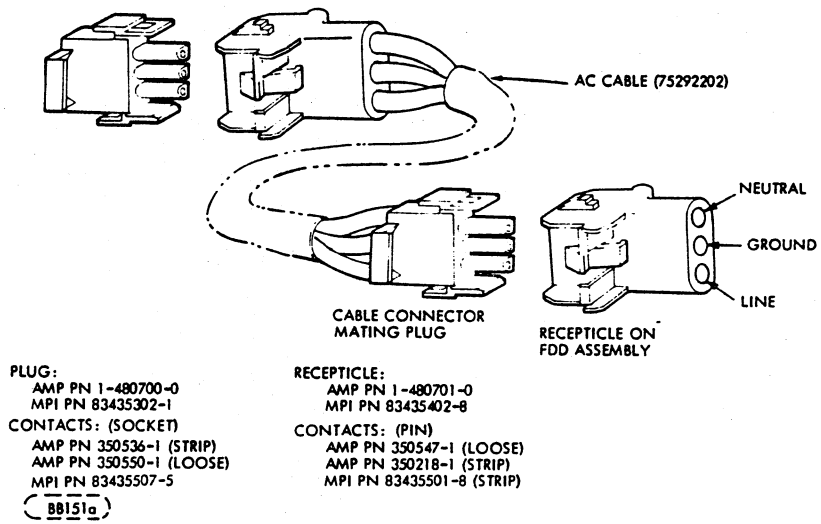


FIGURE 3-1. AC CABLE ASSEMBLY

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.

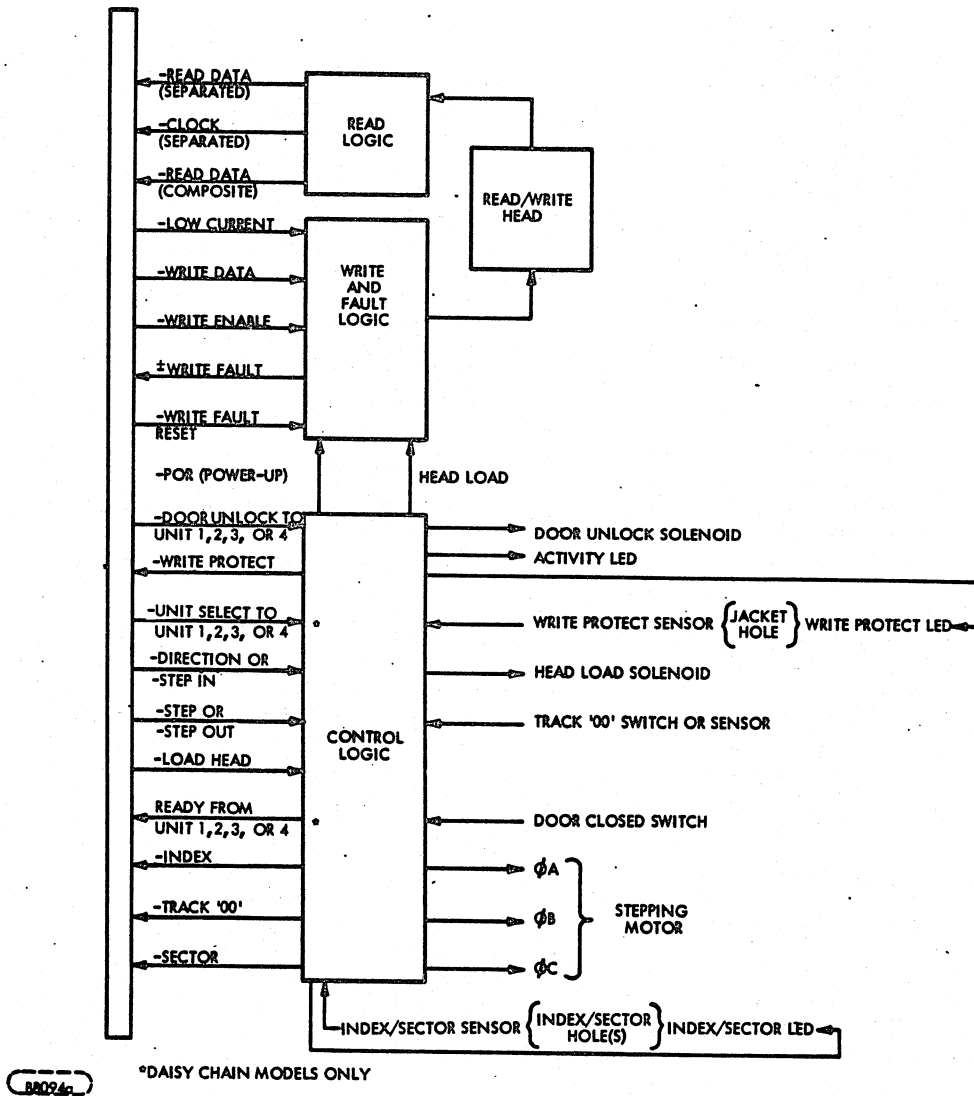


FIGURE 4-1. FUNCTIONAL BLOCK DIAGRAM

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 comparator 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 $\emptyset A$, $\emptyset B$, $\emptyset C$, $\emptyset A$. . . 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 step-per 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	IN
B	C	
C	A	
A	C	OUT
B	A	
C	B	

The power reduction option, which reduces the stepper motor power 15 milliseconds after the last step command, is accomplished through the retriggerable one shot multivibrator U26 at pin 7. The time out of this one shot is approximately 15 milliseconds. Step commands which occur at a repetition rate of 10 milliseconds will hold U26 low. This has the effect of holding transistor Q2 on, and clamping the center tap of the stepper motor at +24 volts. When the last step command is received, the one shot will time out and go high. This turns Q2 off, leaving the center tap of the stepper floating. The inductive reaction of the stepper motor winding in use at that instant of time will force the voltage at the center tap toward a negative voltage; however, the +5 volt clamp through CR11 will prevent the voltage from dropping lower than approximately 4.3 volts. The stepper motor voltage will then remain at this level until the next step command is received, which will force Q2 to the on state again.

- c. The Read/Write head of a selected FDD can be loaded when the disk is fully installed and the front panel door is closed. Closing the front panel door actuates the door interlock switch which completes the circuit to the head load solenoid. When the controller sends a Head Load signal, the head load solenoid is energized causing the armature bail to actuate. The actuation of the bail permits the head load arm and its pressure pad, under tension, to hold the disk surface against the Read/Write head.
- d. The Write Protect function is accomplished through use of an LED (light-emitting diode) and a photo-transistor. These are mounted such that the presence of a write protect hole in the jacket of the diskette will cause pin 14 of comparator U30 to be driven high. This signal is gated with Unit Select and Write Enable to inhibit writing on any diskette possessing a write protect hole.
- e. Track 00 signal is generated when the carriage assembly closes the Track 00 switch. Closing this switch sets the latch formed by the two gates of U29 pin 2 and U29 pin 4. The output of this latch (pin 2) is gated with $\emptyset A$ 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 60 ns 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 250 ns 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 U19 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 U19 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 +0.4 VDC 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 48 ma 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 } -DIRECTION } **	A 10 MICROSECOND (MINIMUM) LOGIC 1 LEVEL PULSE ON THIS LINE CAUSES THE HEAD TO MOVE ONE TRACK AS DETERMINED BY THE DIRECTION LINE. 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 } -STEP OUT } **	A 10 MICROSECOND (MINIMUM) LOGIC 1 LEVEL PULSE ON THIS LINE CAUSES THE HEAD TO MOVE ONE TRACK INWARD TOWARD THE CENTER OF THE DISKETTE. A 10 MICROSECOND (MINIMUM) LOGIC 1 LEVEL PULSE ON THIS LINE CAUSES THE HEAD TO MOVE ONE TRACK OUTWARD FROM THE CENTER OF THE DISKETTE.
-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.
-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 ±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.
-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	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. **ONLY ONE PAIR OF SIGNALS PER FDD.	

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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

O P T I O N C H A R T	ACTIVITY INDICATOR									
	WRITE FAULT									
	DOOR UNLOCK									
	READY									
	UNIT SELECT									
	SECTOR SEPARATION									
	POWER REDUCTION									
	DATA CLOCK SEPARATION									
	WRITE PROTECT									
	HOUR METER									
INTERFACE CONNECTOR TYPE (SEE FIGURE 5-3)										
CONFIG. REF. NO.	CIRCUIT BOARD IDENT. NO.									
501	75890300	A								X
502	75890350	C								X
503	75890400	D	X	X	X	X	X			X
504	75890450	A	X	X	X	X	X			X
505	75890500	A	X	X	X	X	X			X
506	75890550	B		X						X
507	75890600	A	X			X	X			X
508	75890650	A	X		X	X	X	X	X	X
509	75890700	A		X	X	X	X			X
510	75890750	A	X	X	X	X	X			X
511	75896300	A	X		X	X	X	X	X	X
512	75892150	C			X					X
513	77614500	B		X						X
514	75744250	A	X	X		X	X			X
515	77622600	A	X	X	X	X	X			X

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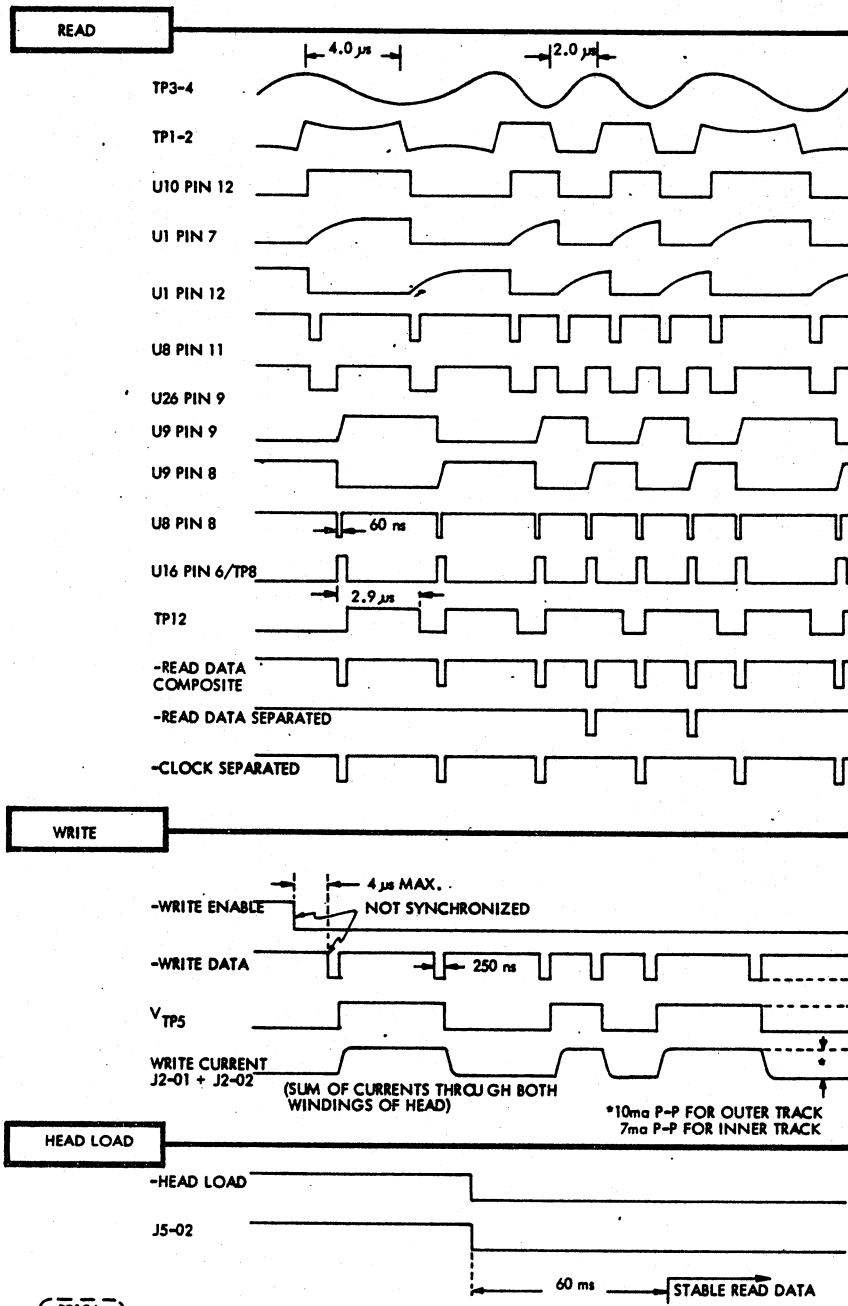


FIGURE 5-1. TIMING

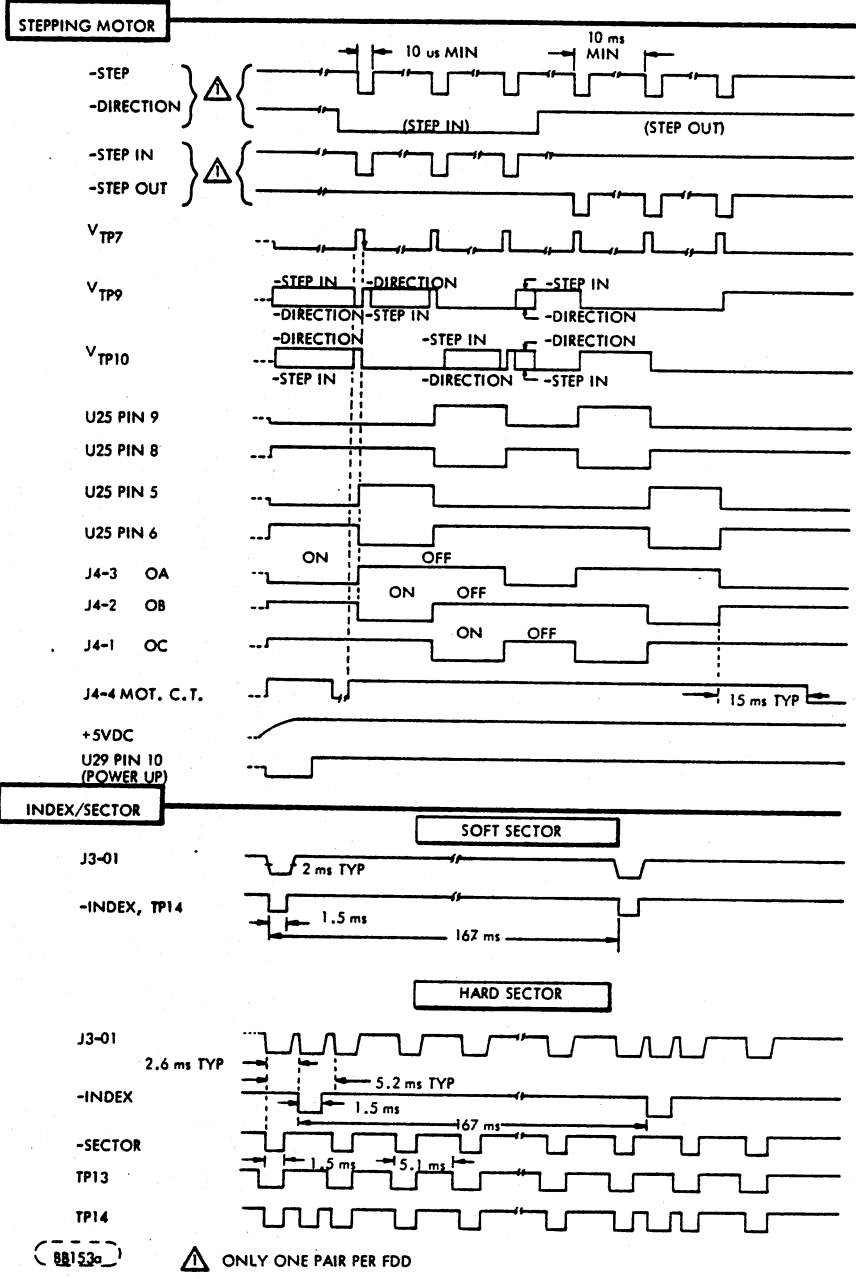


FIGURE 5-1. TIMING (CONTINUED)

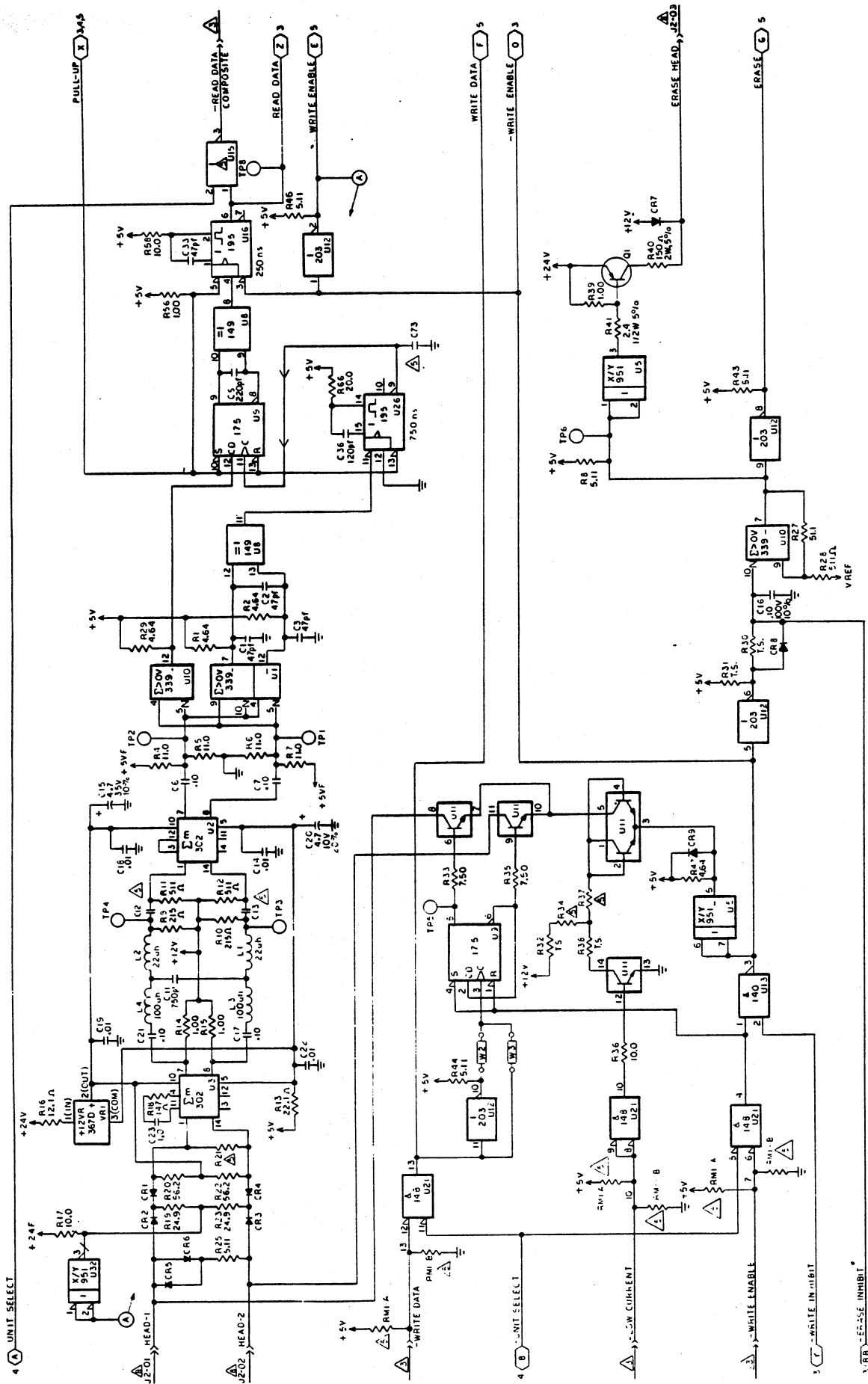


FIGURE 5-2. SCHEMATICS (SHEET 2 OF 6)

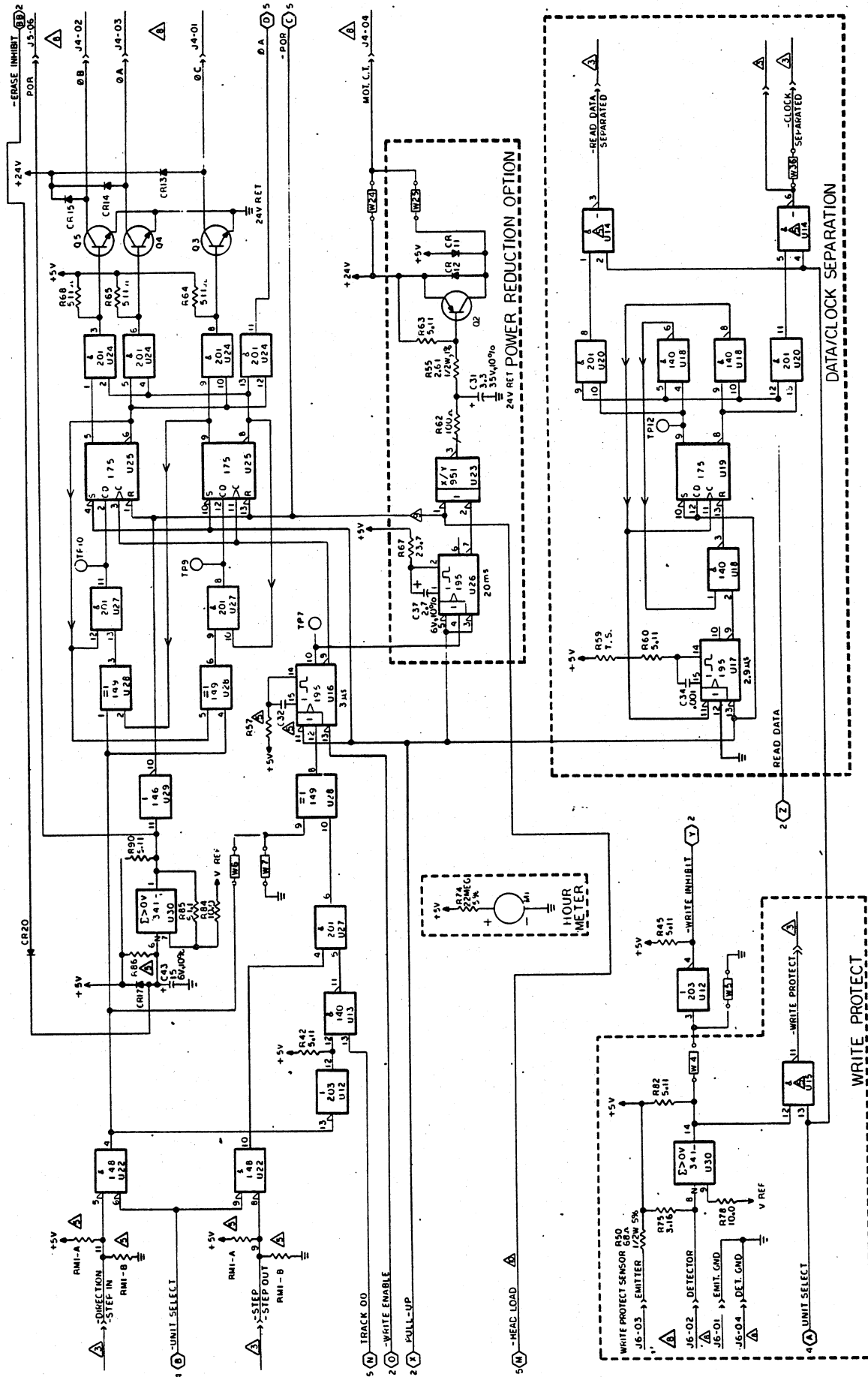


FIGURE 5-2. SCHEMATICS (SHEET 3 OF 6)

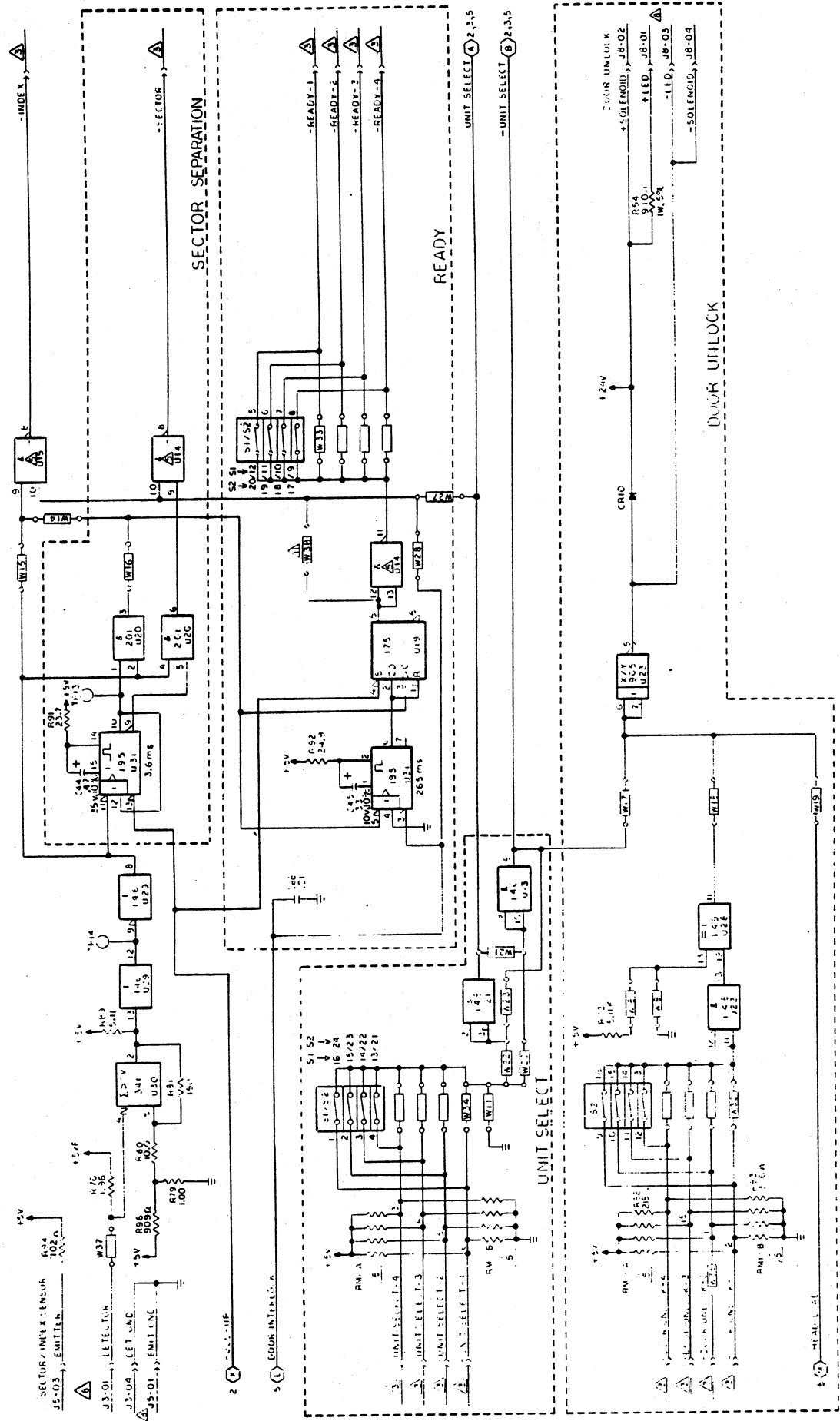


FIGURE 5-2. SCHEMATICS (SHEET 4 OF 6)

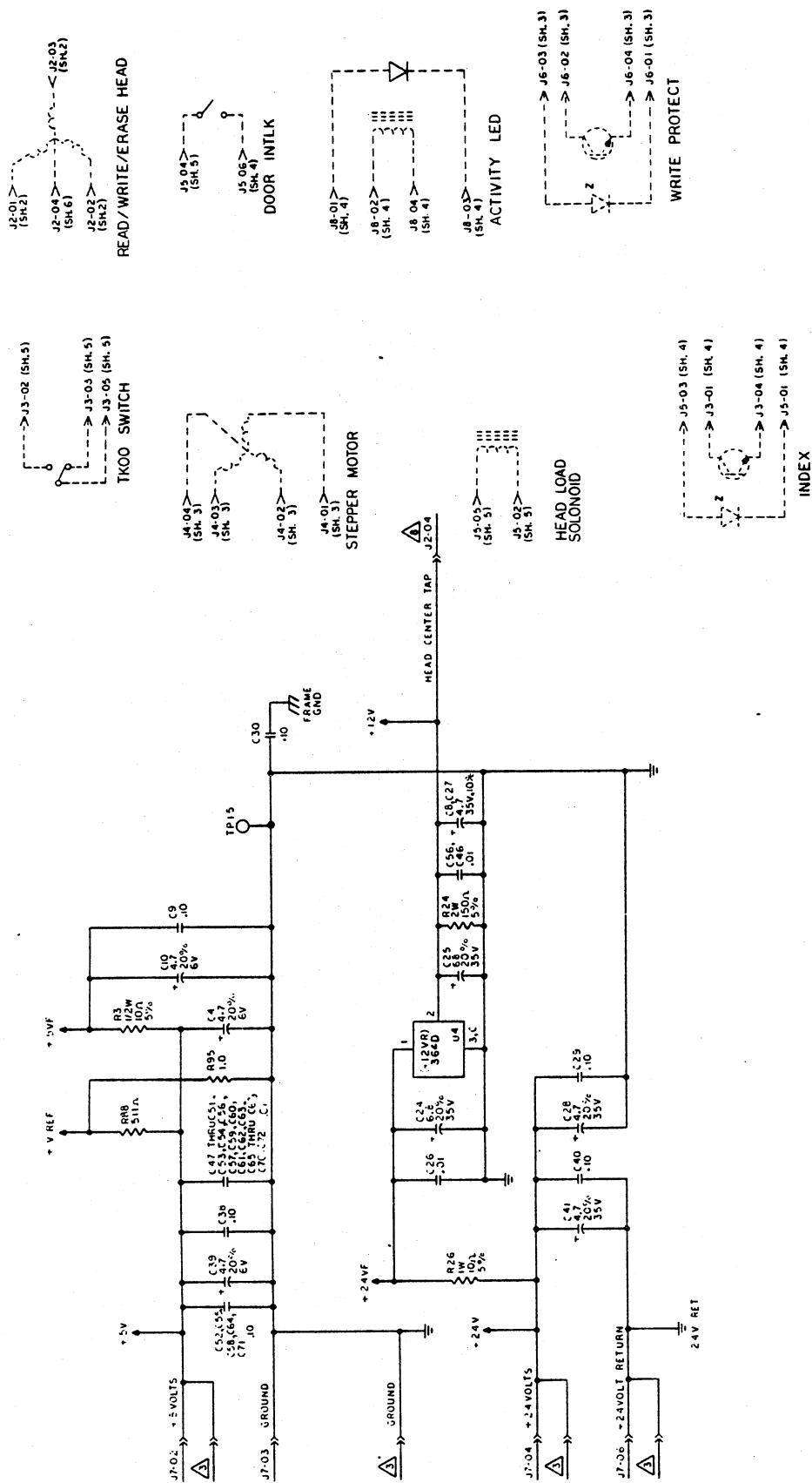


FIGURE 5-2. SCHEMATICS (SHEET 6 OF 6)

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	67ΔΔ	C8	94	C55	76	U8	13	W8	106	J8	101
R9	41	R56	43	C9	76	C56	76	U9	11	W9			25
R10	41	R57	53	C10	92	C57		U10	17	W10			
R11	54	R58	35	C11	77	C58	76	U11	18	W11	106		
R12	54	R59	63	C12	79Δ	C59		U12	7	W12	106		
R13	39	R60	52	C13	79Δ	C60		U13	8	W13	106	TSTR	PL ITEM
R14	43	R61	35	C14	75	C61		U14	6**	W14	106	Q1	28
R15	43	R62	61ΔΔ	C15	94	C62		U15	6**	W15	106	Q2	27ΔΔ
R16	40	R63	32ΔΔ	C16	95	C63		U16	10	W16	106	Q3	26
R17	35	R64	54	C17	76	C64	76	U17	10	W17	106	Q4	26
R18	78	R65	54	C18	75	C65		U18	8	W18	106	Q5	26
R19	60	R66	45	C19	75	C66		U19	11	W19			
R20	36	R67	55ΔΔ	C20	85	C67		U20	12	W20	106	SW	PL ITEM
R21	37#	R68	54	C21	76	C68	82	U21	9	W21	106	S1	32
R22	36	R69	52	C22	75	C69	82	U22	9	W22	106	S2	33
R23	60	R70	52	C23	80	C70		U23	4 ΔΔ	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	106ΔΔ		
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			U29	14	W29	106		
R30	63	R77		C30	81			U30	15	W30			
R31	63	R78	35	C31	98ΔΔ	CR1	29	U31	10	W31	106		
R32	63	R79	43	C32	87**	CR2	29	U32	4	W32			
R33	46	R80	35	C33	83	CR3	29			W33			
R34	54**	R81	38	C34	87	CR4	29	RES	PL	W34			
R35	46	R82	52	C35	88	CR5	29	MOD	ITEM	W35	106		
R36	35			C36	86	CR6	29	RM 1	20###	W36	106		
R37	47ΔΔΔ	R84	35	C37	93ΔΔ	CR7	29			W37	106		
R38	63	R85	50	C38	76	CR8	29	MET	PL	W38	106		
R39	43	R86	51*	C39	92	CR9	29	ITEM	ITEM				
R40	71	R87		C40	76	CR10	30			IND	PL		
R41	70	R88	54	C41	102	CR11	31ΔΔ			ITEM	ITEM		
R42	52	R89	52	C42		CR12	31ΔΔ					L1	65
R43	52	R90	52	C43	91	CR13	31					L2	65
R44	52	R91	55	C44	97	CR14	31	REG	PL			L3	64
R45	52	R92	60	C45	90	CR15	29	ITEM	ITEM			L4	64
R46	52	R93	52	C46	76	CR16	29						
R47	44	R94	56	C47	89	CR17	30	VR1	74				
		R95	43			CR18	30						
		R96	119			CR19	31						
						CR20	114						

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*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

Δ EXCEPT 75890400 WHICH IS ITEM 123
 ΔΔ NOT USED ON 75744253
 ΔΔΔ 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	(12)
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	(12)
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	(12)
62	94360232-6	Res 1/4W 1% 215	(12)
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	(12)
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	(12)
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	(12)
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	(8)
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
- (12) Not used on 75744250.

FIGURE 5-3. ASSEMBLY AND PARTS LIST (SHEET 5 OF 5)

6.1 INTRODUCTION

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

6.2 MAINTENANCE TOOLS

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

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

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

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

6.3 PREVENTIVE MAINTENANCE

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

6.4 HEAD CLEANING

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

CAUTION

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

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

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

6.5 TROUBLESHOOTING

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

TABLE 6-1. FLOWCHART REFERENCE

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

6.5.1 DC VOLTAGE AND SIGNAL CHECK

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

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

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

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

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

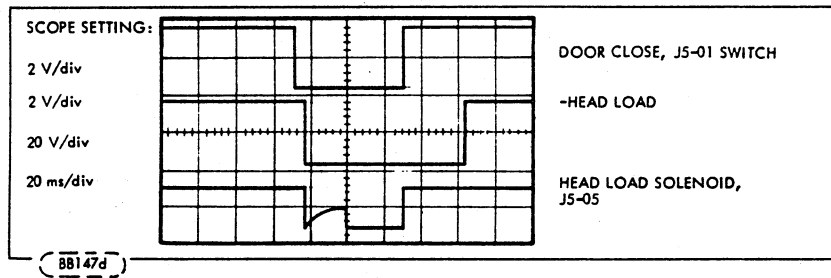


FIGURE 6-1. -HEAD LOAD AND DOOR INTERLOCK SWITCH

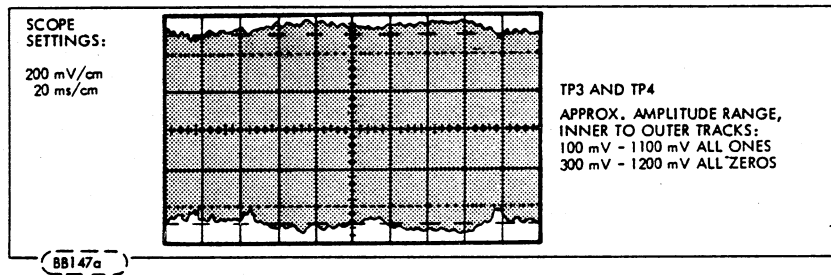


FIGURE 6-2. DIFFERENTIAL READ SIGNAL FOR ENTIRE TRACK

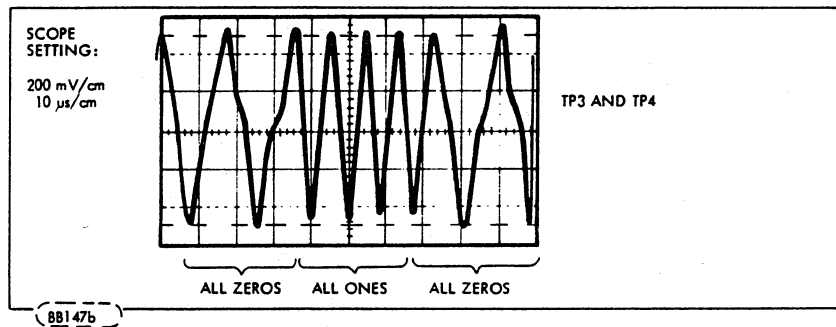


FIGURE 6-3. DIFFERENTIAL READ SIGNAL FOR PORTION OF OUTER TRACK

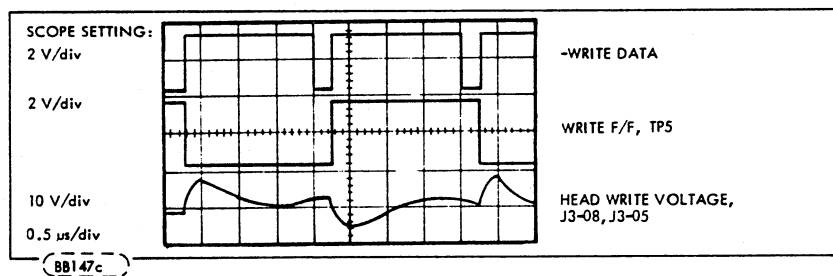
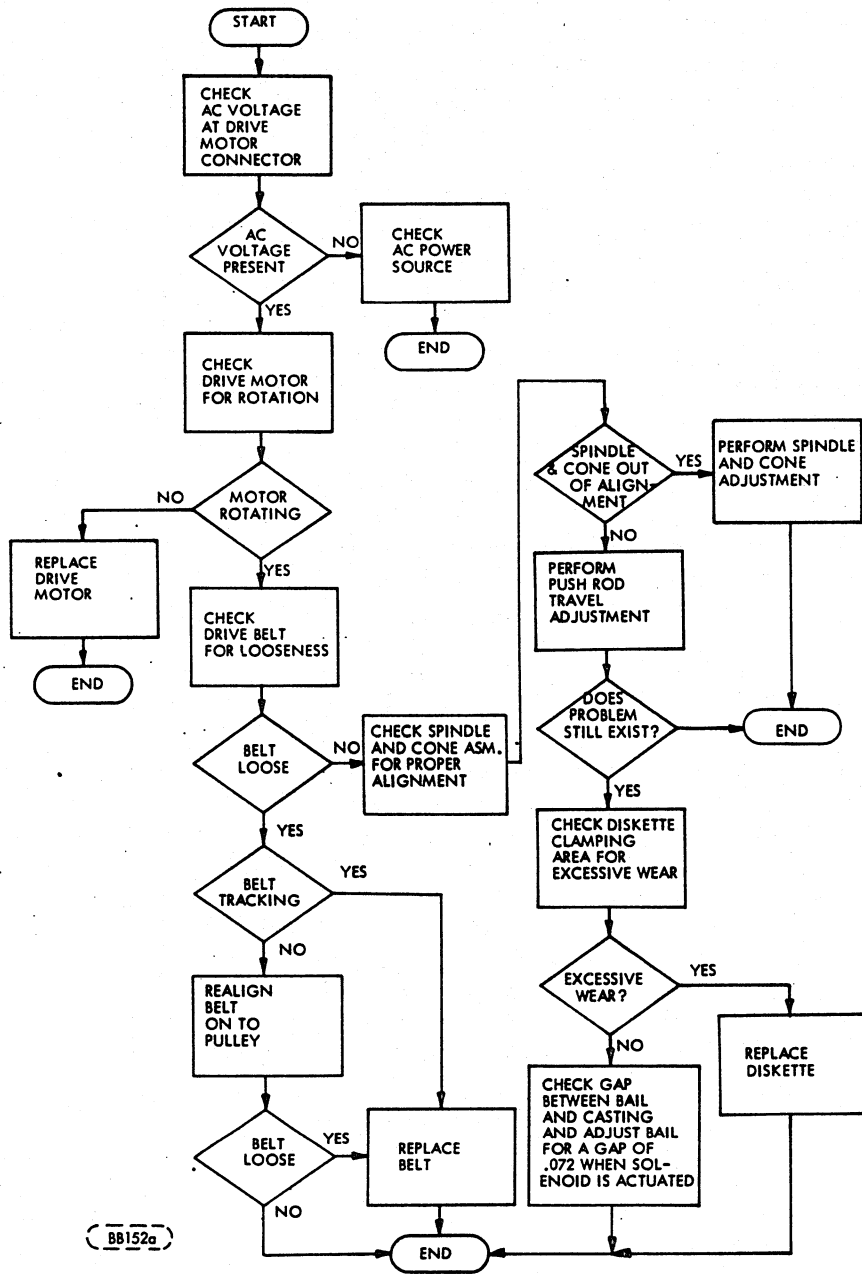
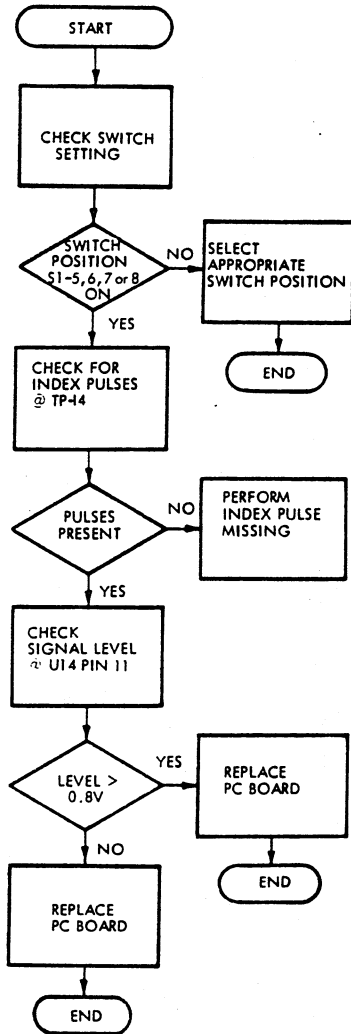


FIGURE 6-4. WRITE DATA, WRITE F/F OUTPUT, AND HEAD WRITE VOLTAGE FOR OUTER TRACK

6.5.2 DISKETTE NOT ROTATING

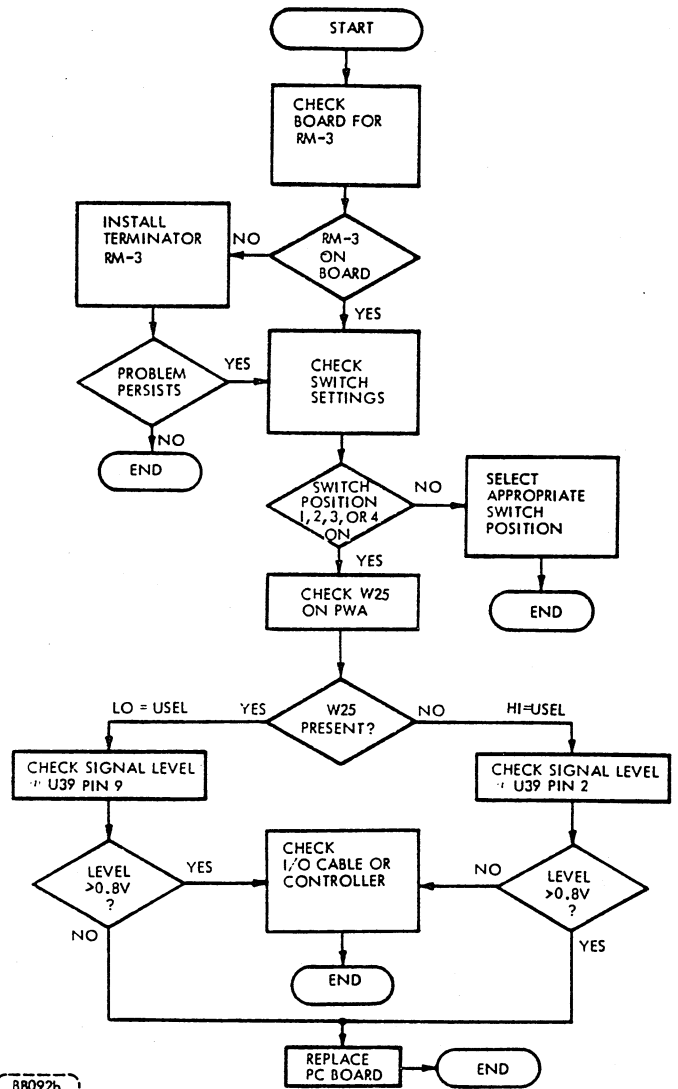


6.5.3 READY SIGNAL MISSING (DAISY CHAIN UNITS)



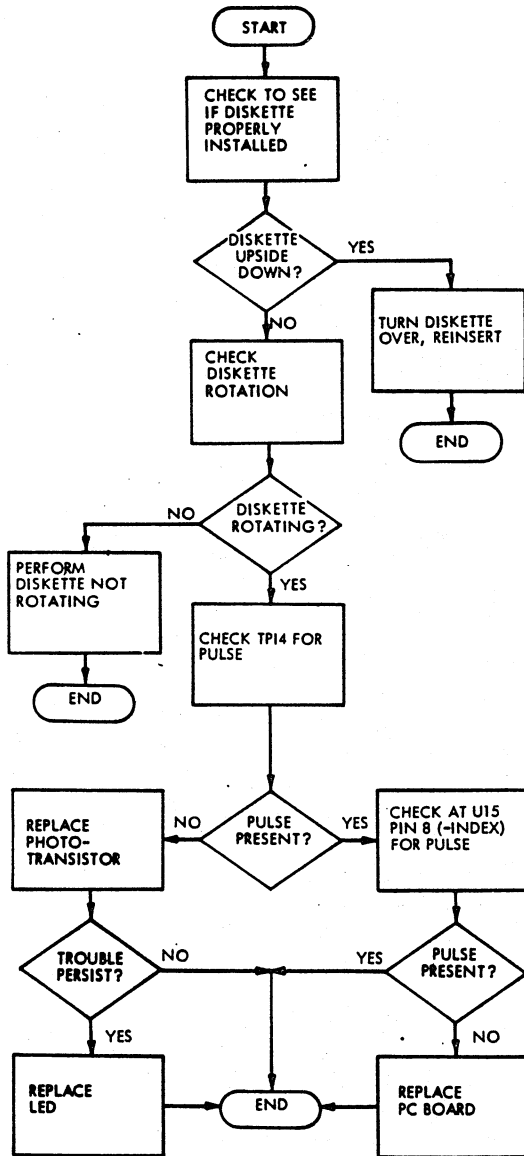
8B088b

6.5.4 DRIVE NOT RESPONDING TO COMMANDS (DAISY CHAIN UNITS)



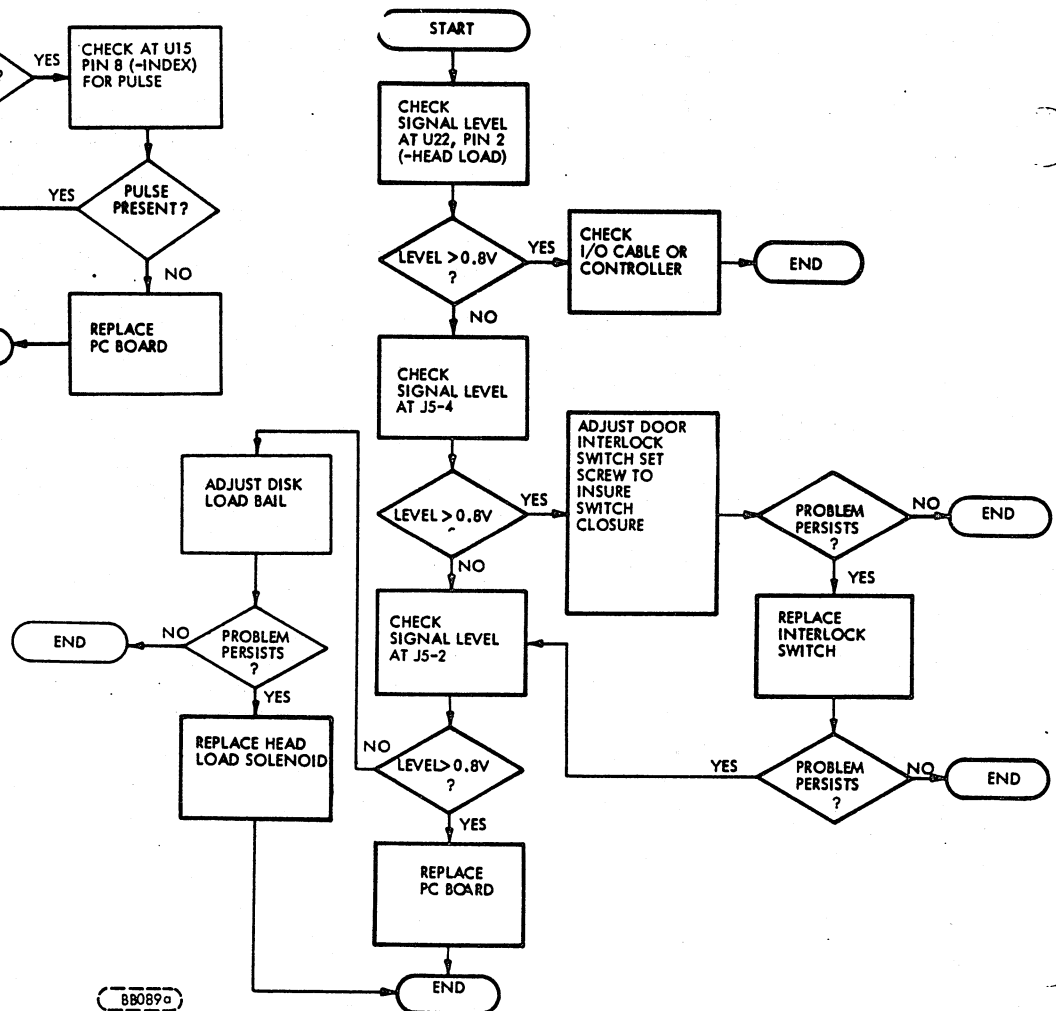
8B092b

6.5.5 INDEX PULSE MISSING



6.5.6 HEAD NOT LOADING

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

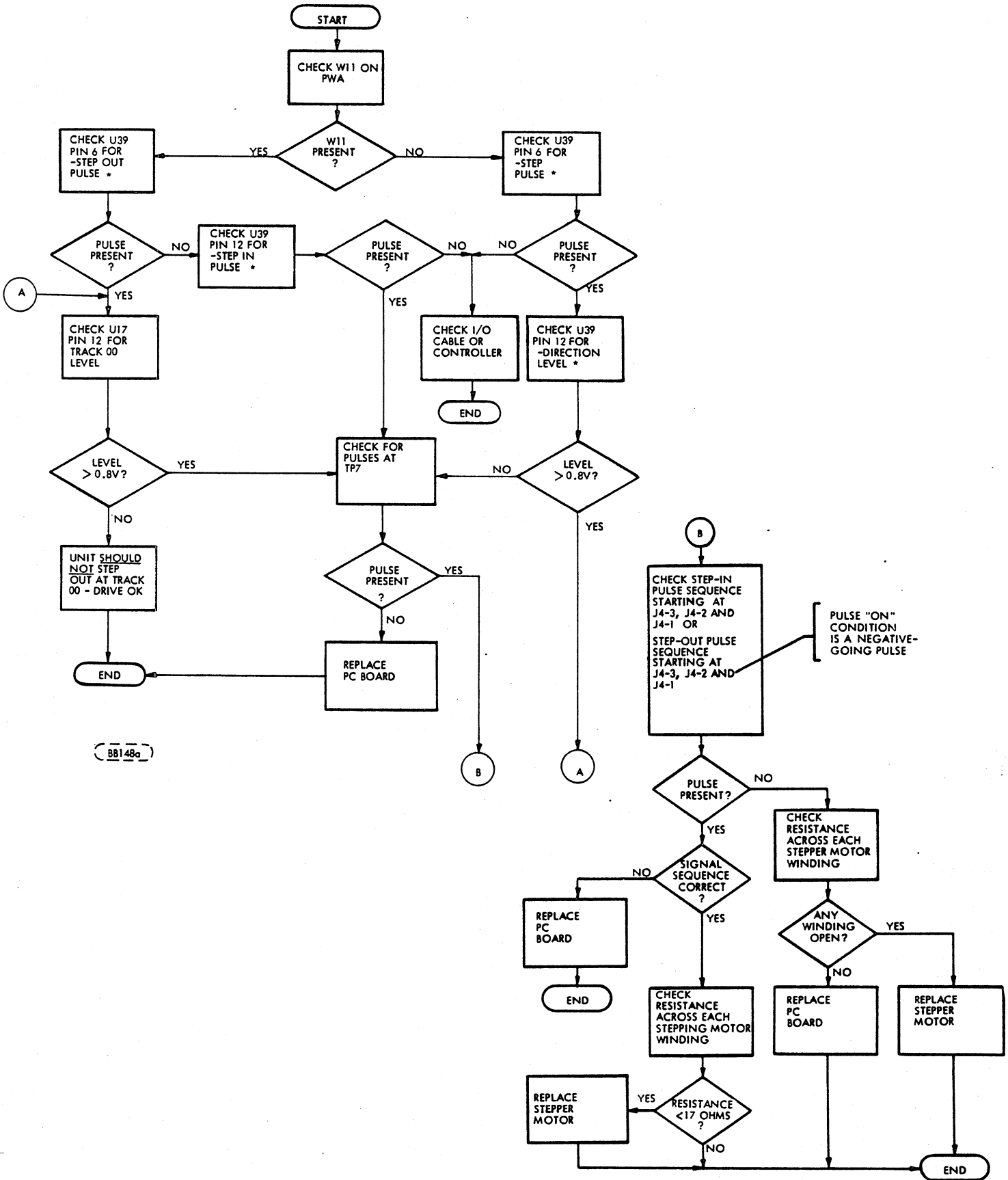


BB091a

BB089a

6.5.7 READ/WRITE HEAD NOT STEPPING

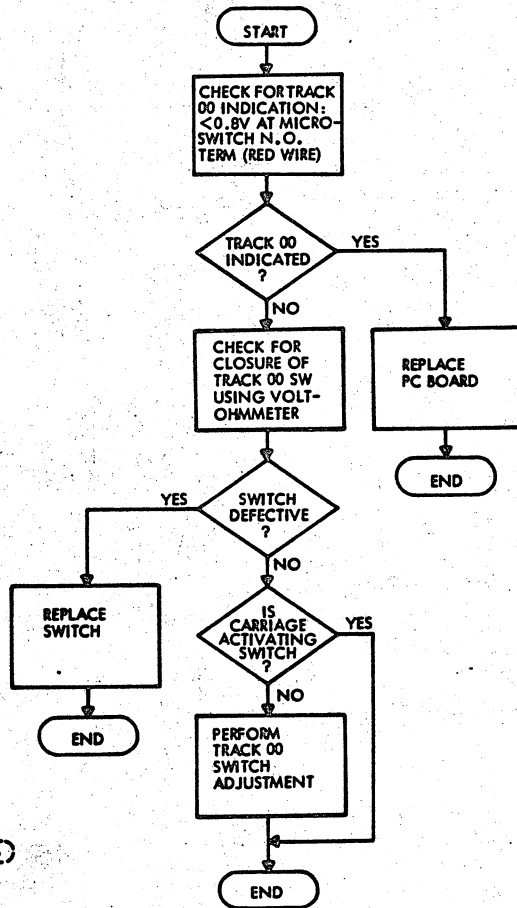
Refer to 6.5.4 prior to starting this trouble shooting procedure.



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BB091b

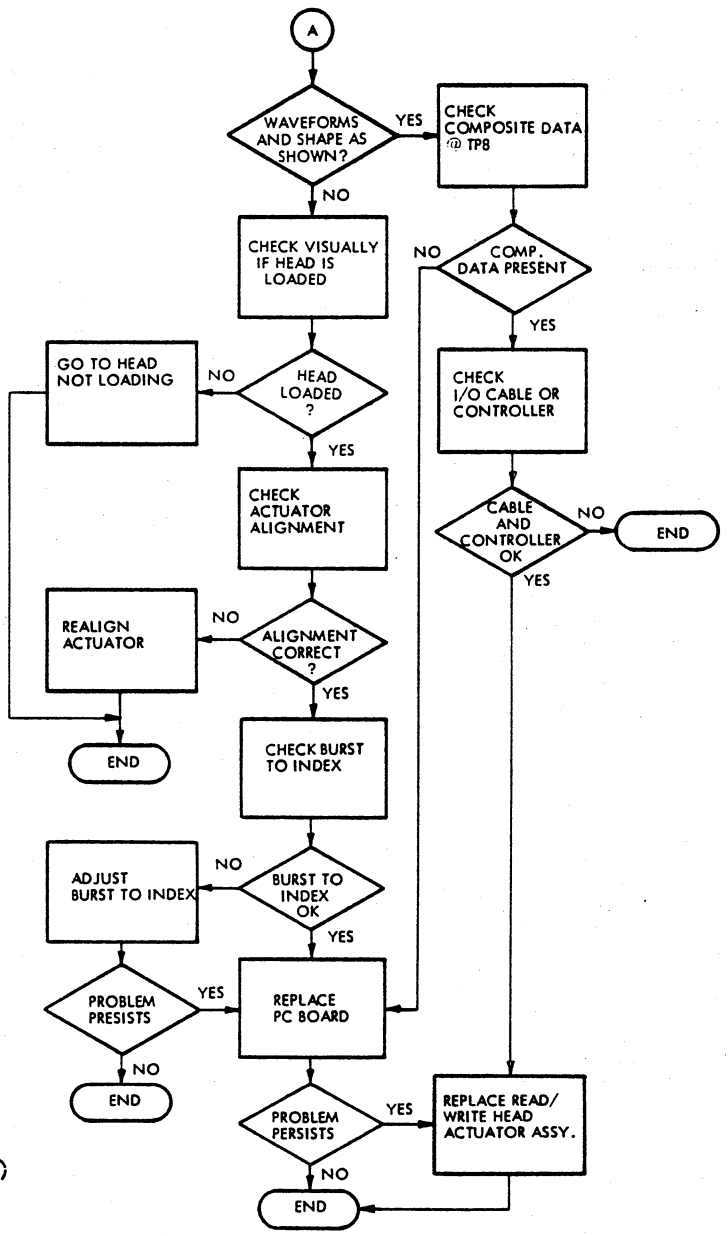
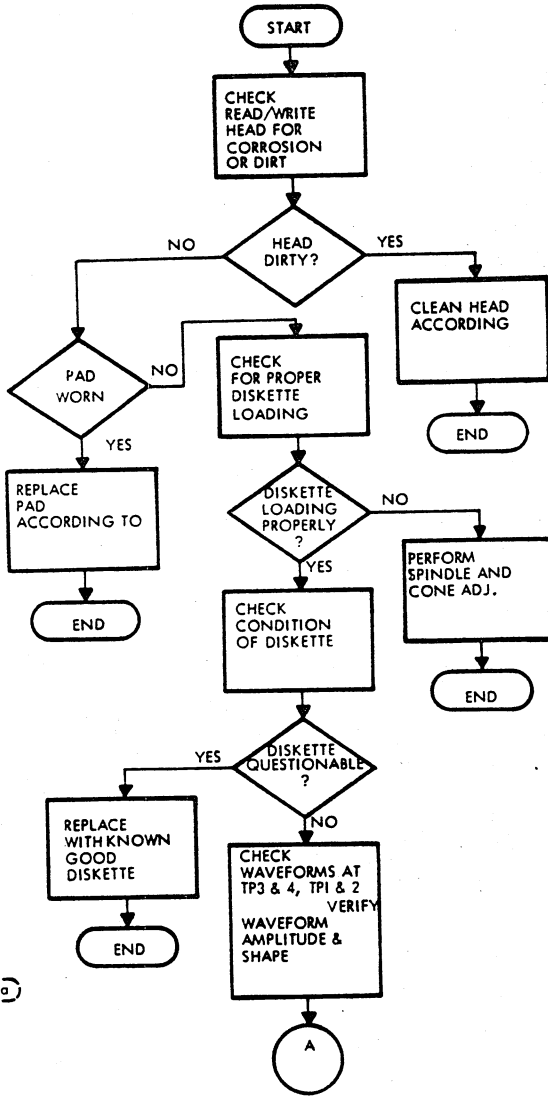
6.5.8 · NO TRACK '00' INDICATION



BB089b

6.5.9 READ ERRORS

Refer to 6.5.4 prior to starting this trouble shooting procedure.

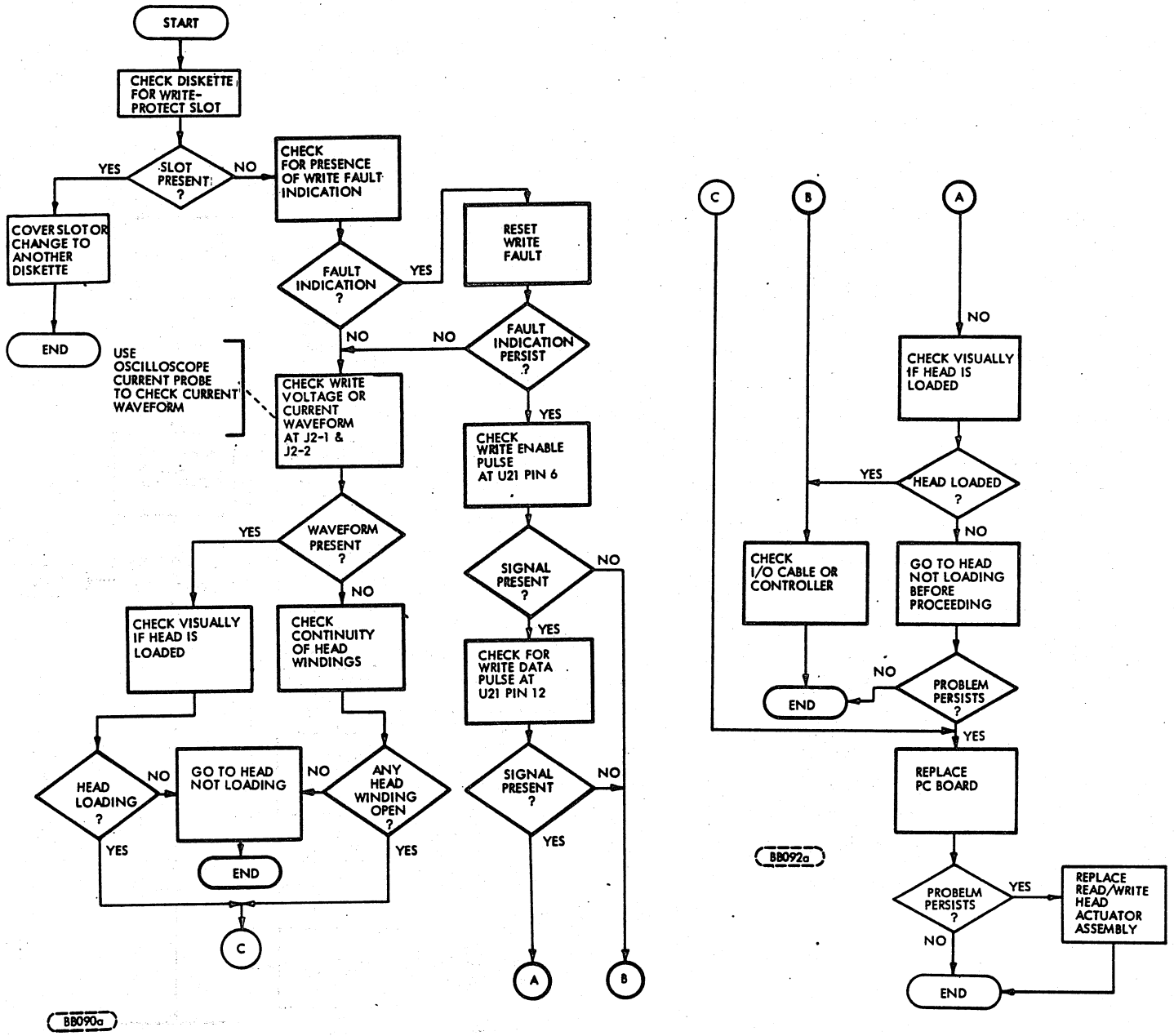


BB088a

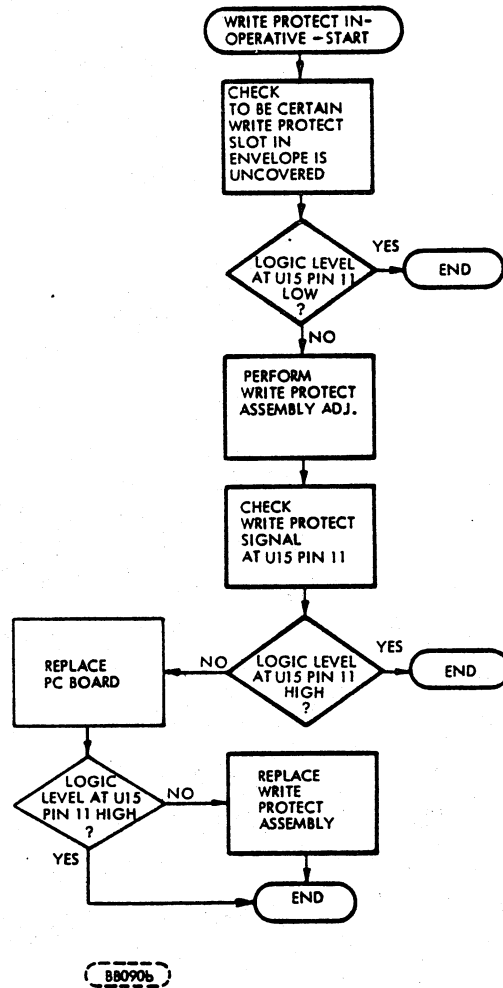
BB087

6.5.10 WRITE ERRORS

Refer to 6.5.4 prior to starting this trouble shooting procedure.



6.5.11 WRITE PROTECT INOPERATIVE



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

- Place outer stop gauge (P/N 83401400) against carriage as shown in Figure 6-6.
- 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.
- Step Read/Write head to Track 76.
- Place inner carriage stop gauge (P/N 83401300) against carriage as shown in Figure 6-6.
- 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.

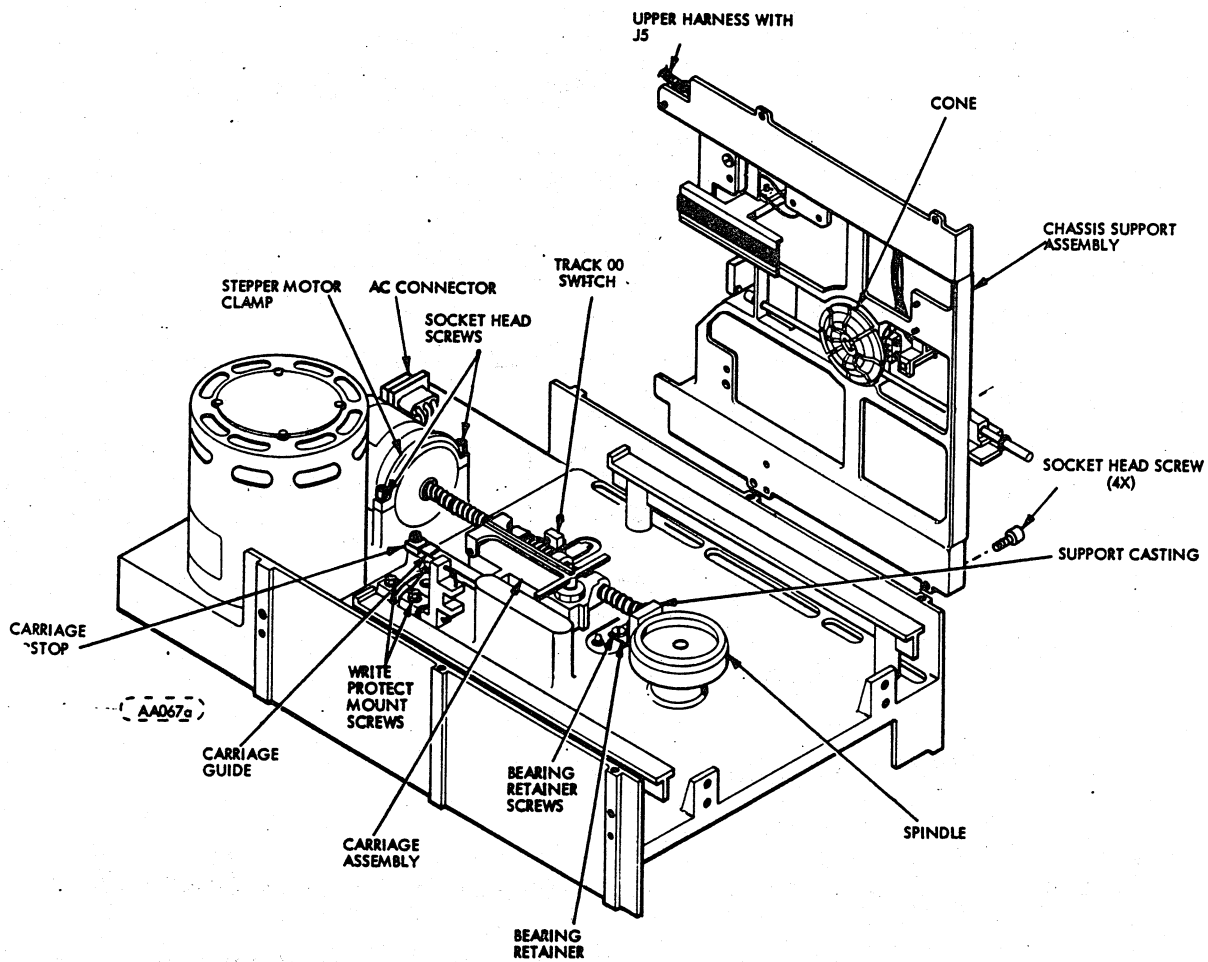
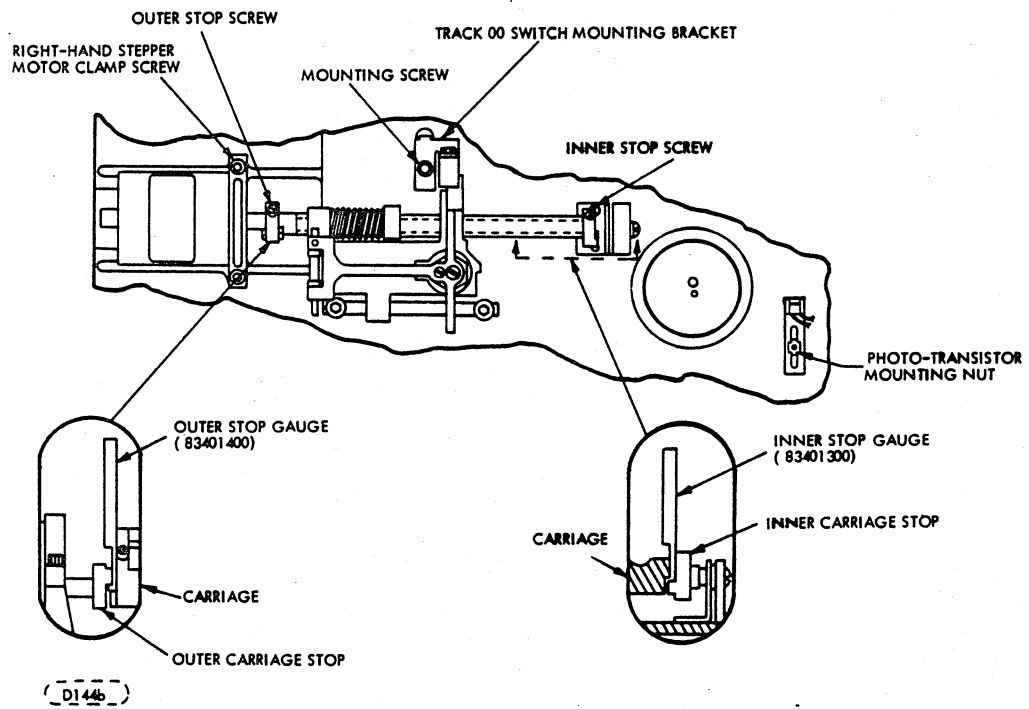
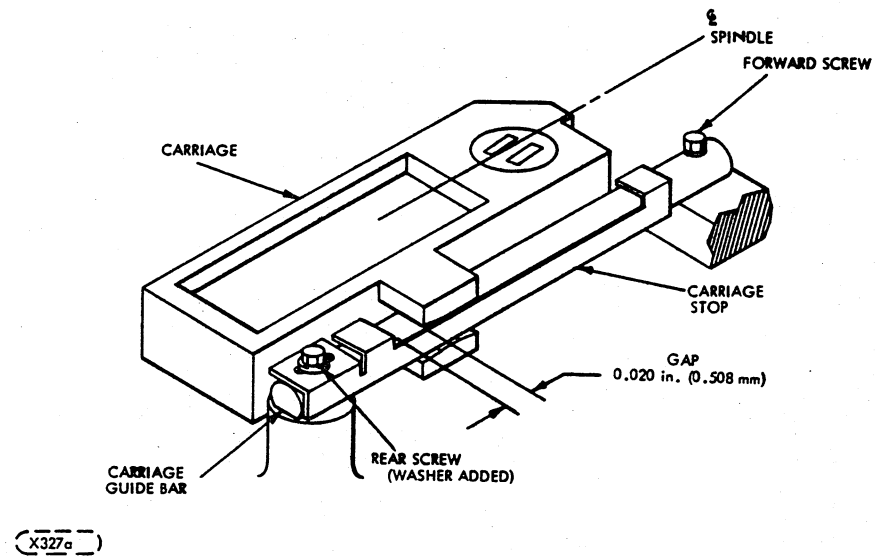


FIGURE 6-5. BASE AND CHASSIS SUPPORT ASSEMBLY



A. PLASTIC CARRIAGE-STOP AND STOP-GAUGE ASSEMBLIES



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

Chan 1 voltage to: AC

Source to: Chan 1

Chan 2 voltage to: AC

Coupling to: Low Freq.

(Hi Freq. Reject)

Vert. Mode to: Add

Trig. Mode to: Normal

Slope (Sync) to: Pos.

Time Base to: 50 μ s/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 Allen screw 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 0.5 ms/div and verify that the index pulse width measures 1.5 +0.7, -0.1 ms (from 1.4 ms to 2.2 ms). 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. If pulse-width adjustment was necessary, check the write-splice-bit-to leading edge of the index pulse and readjust if necessary. Repeat Steps e and f until the write-splice-to-index time and index pulse width are both within specification.
- 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 μ s. If the change is greater than 50 μ s, the cone and spindle must be aligned or replaced (see Section 6.6.7) and Steps "a" through "g" repeated.

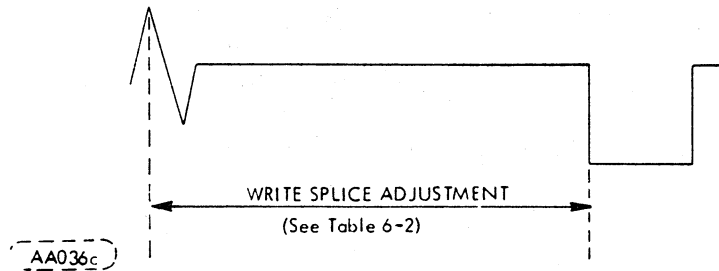


FIGURE 6-7. WRITE SPLICE BIT TO INDEX TIMING

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: input 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 "Catcyes" consisting of two lobes (refer to Figure 6-8A). 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 6-8B). 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 5 mV.

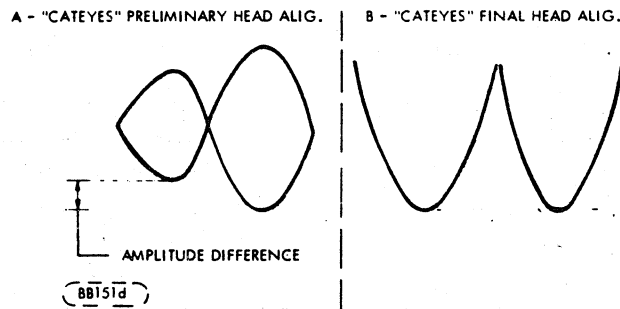


FIGURE 6-8. HEAD ALIGNMENT AMPLITUDE

- i. Tighten the stepper motor clamp. Return to track 00, then seek back to track 38. Verify that the 5 mV 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 5 mV 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 between 0.025 and 0.035 in. (0.635 and 0.889 mm) (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. (0.762 mm), 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.

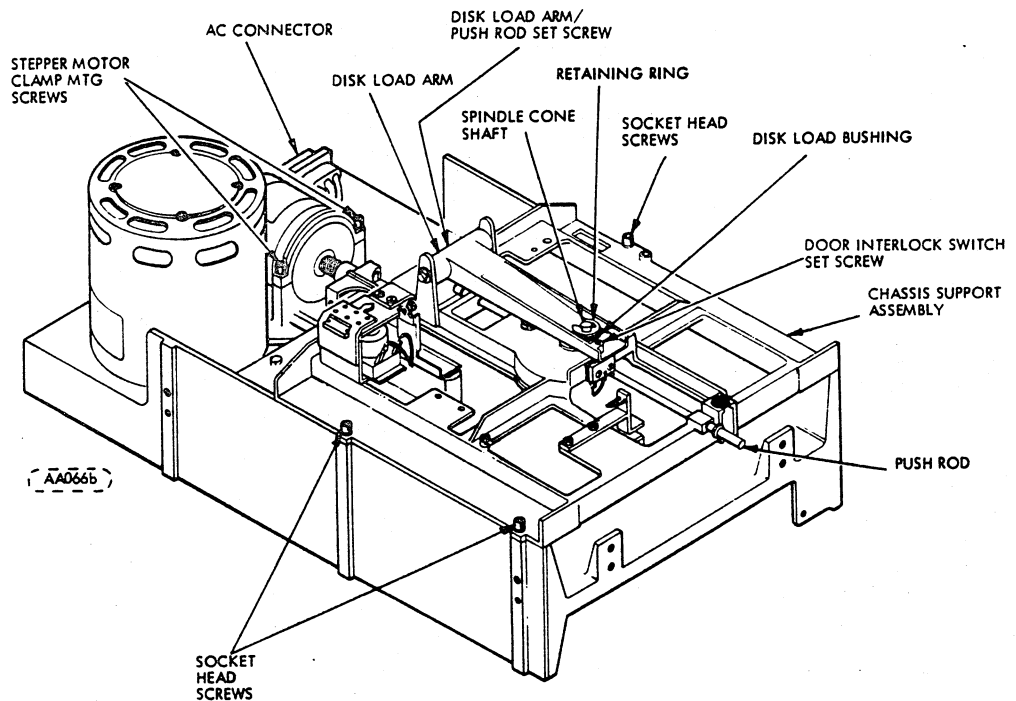


FIGURE 6-9. CHASSIS BASE ASSEMBLY

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 in. (0.254 mm) 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.

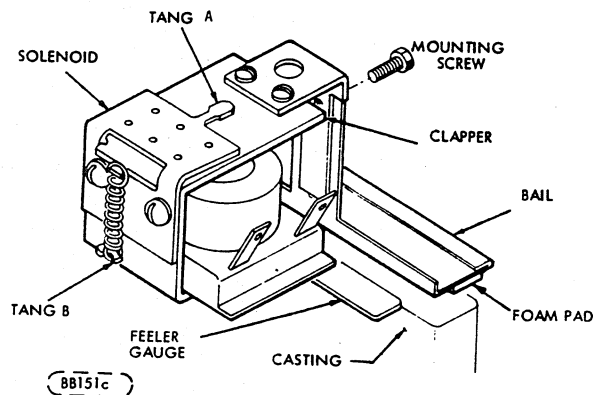


FIGURE 6-10. DISK LOAD SOLENOID

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".

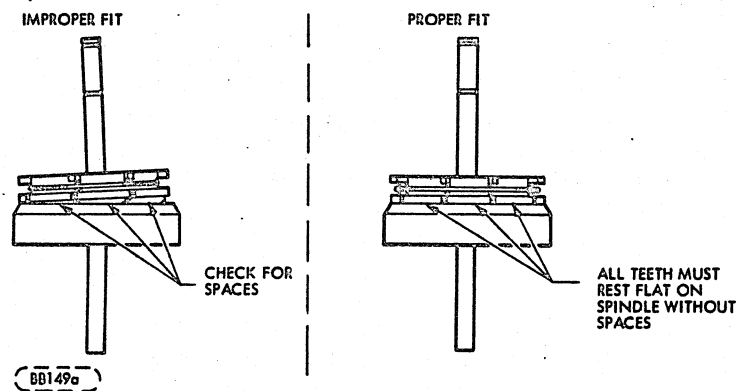


FIGURE 6-11. SPINDLE AND CONE

6.6.8 WRITE PROTECT ASSEMBLY ADJUSTMENT (WHERE APPLICABLE)

This adjustment will be required whenever the unit is disassembled, 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 re-aligned.

- 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.

- i. Replace stepper motor clamp and two socket head screws (Figure 6-5).
- j. 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.

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

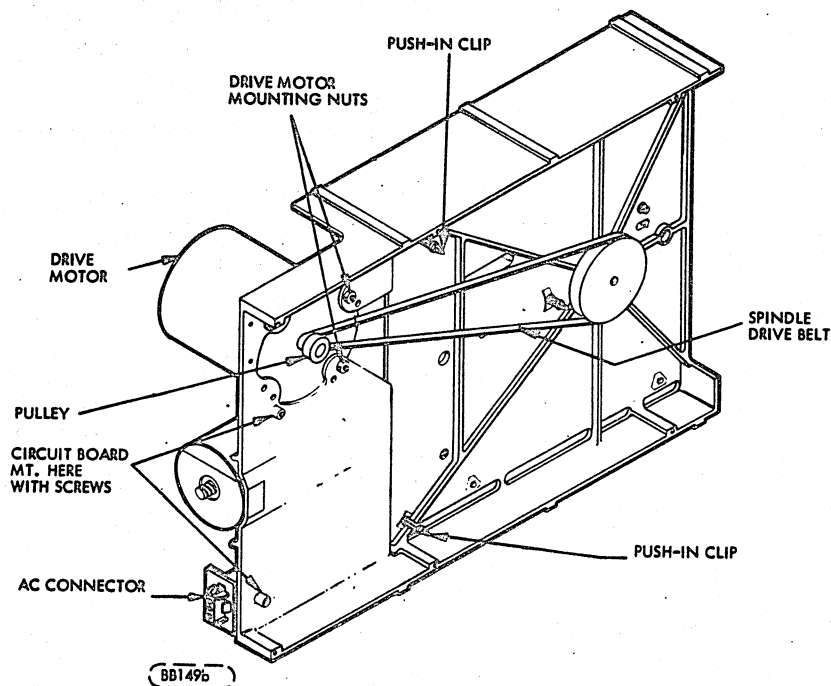


FIGURE 6-12. BASE CASTING ASSEMBLY

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

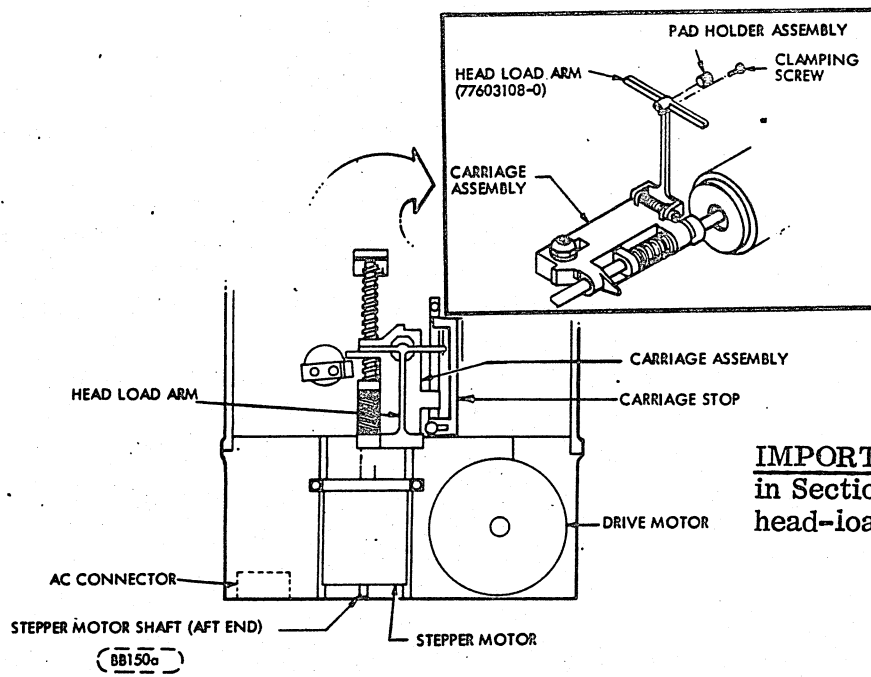
Do not raise the head-load arm to the 90-degree position and then release it; damage to the load-arm spring an/or to the head (core and ceramics) could result.

- 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 (1.52 mm) wire feeler gauge, insert the feeler gauge in the gap between the underside of the clapper and the coil core. (See Figure 6-14).



NOTE

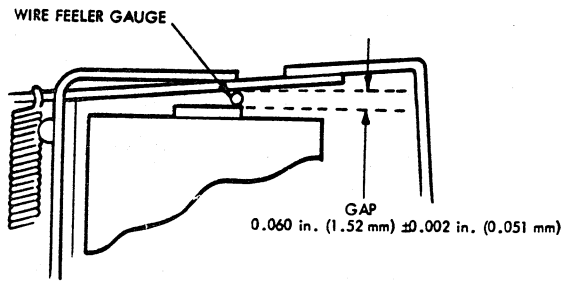
IMPORTANT: Refer to CAUTION in Section 6.7.4 before handling head-load arm.

FIGURE 6-13. HEAD LOAD PAD REPLACEMENT ILLUSTRATION

- d. If unable to insert 0.060 inch (1.52 mm) wire feeler gauge, continue to gently bend tang upward until feeler gauge can be inserted.
- e. Next, attempt to insert a 0.062 in. (1.58 mm) wire feeler gauge between the underside of the clapper and the coil.
- f. If this gauge can be inserted, bend tang down until 0.062 inch (1.58 mm) feeler gauge will not insert in gap between clapper and coil core.
- g. Insert a 0.058 in. (1.47 mm) wire feeler gauge in gap between underside of clapper and coil core.
- h. If 0.058 in. (1.47 mm) wire feeler gauge will not fit, bend tang up slightly.
- i. Continue checking with the 0.062 inch (1.58 mm) wire feeler gauge and 0.058 inch (1.47 mm) wire gauge until the following condition is achieved:
 - 1. 0.062 inch (1.58 mm) feeler gauge will not pass between tang and clapper;
 - 2. 0.058 inch (1.47 mm) feeler gauge passes freely between tang and clapper.
- j. Check spring adjustment by gently pressing down on clapper until the 0.060 inch (1.52 mm) ± 0.002 in. (0.051 mm) 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.

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.



(AA122b)

FIGURE 6-14. SOLENOID ADJUSTMENT

6.8 FREQUENCY CONVERSION

6.8.1 OPERATING FREQUENCIES CONVERSION PROCEDURE

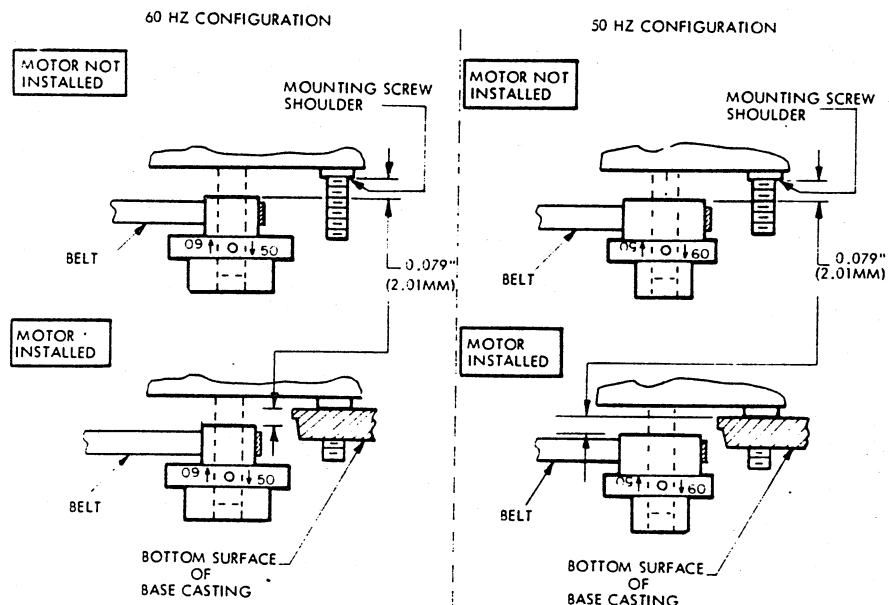
This procedure is to be used to convert the FDD unit from 60 Hz operation to 50 Hz operation or vice versa. This is accomplished by reversing the dual diameter reversible pulley on the spindle motor shaft (Figure 6-12) using the following steps:

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

CAUTION

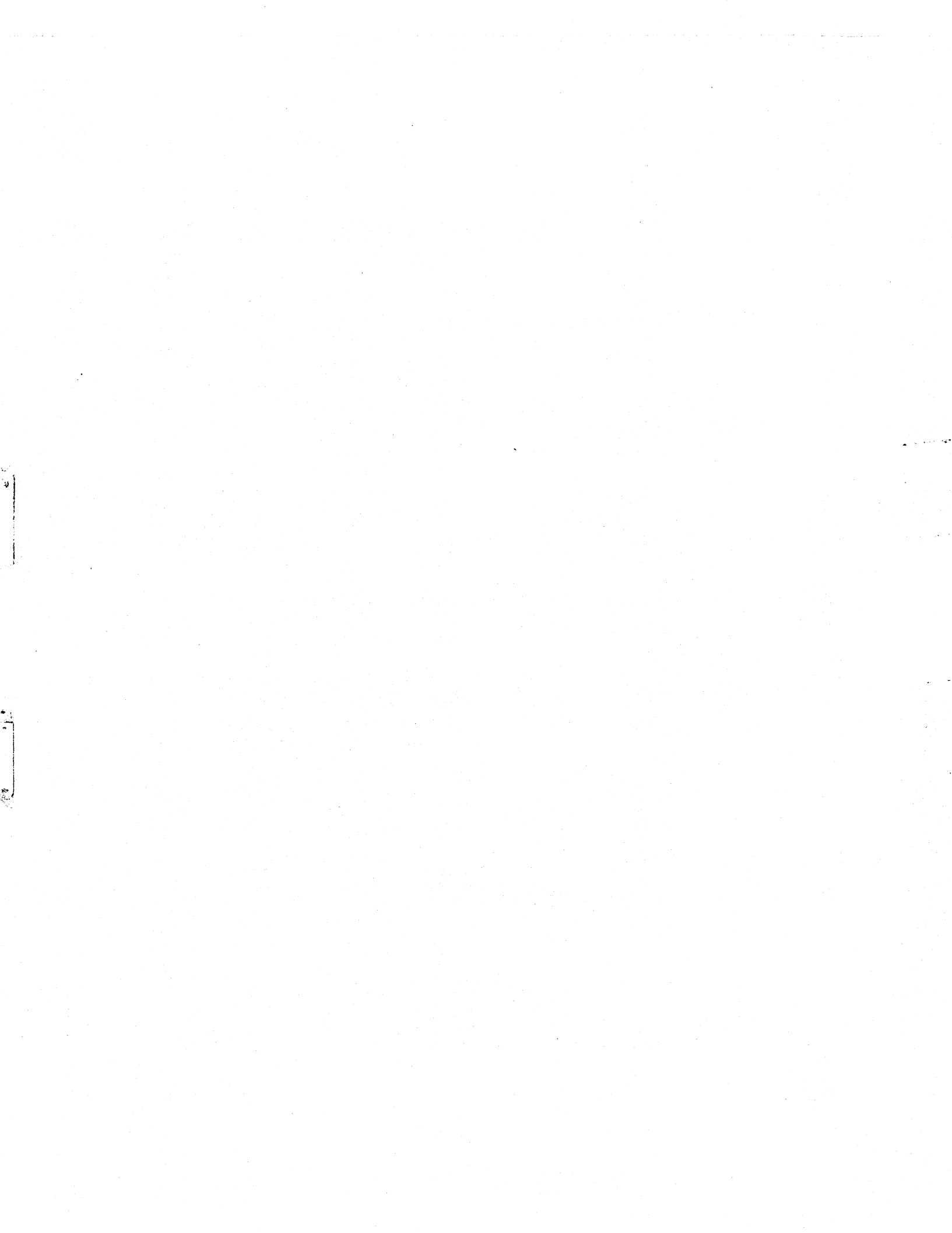
It is IMPORTANT that the new operating frequency be marked on the unit's rating nameplate.

NOTE: When converting from 60 Hz to 50 Hz, the same belt may be used. When converting from 50 Hz to 60 Hz, a new belt must be installed.



(XX127a)

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 (203.2 mm x 279.4 mm) 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.

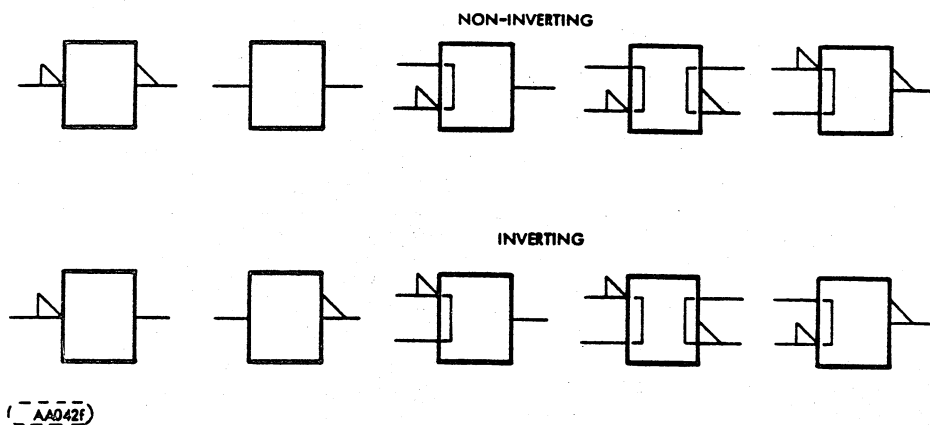


FIGURE 7-1. INVERSION CONVENTIONS

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 element number. The third line on the schematic block gives the circuit reference designation.

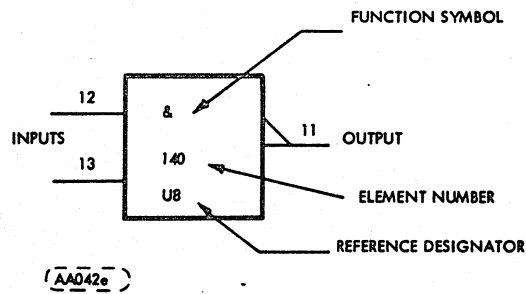


FIGURE 7-2. INTEGRATED CIRCUIT

FUNCTION SYMBOLS	
&	AND GATE OR INVERTER
1	OR GATE OR INVERTER
=1	EXCLUSIVE OR
1⏏	ONE SHOT
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

(BB151b)

FIGURE 7-3. SCHEMATIC SYMBOLS

PARTS DATA

8.1 INTRODUCTION

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

8.2 ILLUSTRATIONS

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

8.3 PARTS LISTS

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

8.4 TOP MECHANICAL AND ASSEMBLY LOCATION

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

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

8.4.1 TOP MECHANICAL ASSEMBLY (TMA)

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

8.5 REPLACEMENT PARTS

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

TABLE 8-1. TOP MECHANICAL ASSEMBLY CONFIGURATOR

		ITEM NUMBERS						
I		1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111
MODELS	T T	0000000001	1111111112	2222222223	3333333334	4444444445	5555555556	6666666667
	M E	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890
	A M							
BR803A	001	XX00000000	0000000000	0X00000000	0X0000X0X0	XX0X0XX000	0000X00000	0000000000
BR803B	002	X0X0000000	0000000000	0X00000000	0X0000X0X0	XX0X0XX000	0000X00000	0000000000
BR803C	003	X00X000000	0000000000	0X00000000	0X0000X0X0	XX0X0XX000	0000X00000	0000000000
BR803D	004	X000X00000	0000000000	0X00000000	0X0000X0X0	XX0X0XX000	0000X00000	0000000000
BR803E	005	X000000000	X000000000	0X00000000	00X000X0X0	XX0X0XX000	0000X00000	0000000000
BR803F	006	X00000X000	0000000000	0X00000000	00X000X0X0	XX0X0XX000	0000X00000	0000000000
BR803G	007	X000000000	X000000000	0X00000000	00X000X0X0	XX0X0XX000	0000X00000	0000000000
BR803H	008	X0X0000000	0000000000	0X00000000	000X00X0X0	XX0X0XX000	0000X00000	0000000000
BR805A	009	XX00000000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR805B	010	X0X0000000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR805C	011	X00X000000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR805D	012	X000X00000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR803N	013	XX00000000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR803P	014	X0X0000000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR803R	015	X000X00000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR803S	016	X00X000000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR803J	017	X000000X00	0000X00000	0X00000000	00X000X0X0	XX0X0XX0X0	0000X00000	0000000000
BR803K	018	X000000X00	0000X00000	0X00000000	00X000X0X0	XX0X0XX0X0	0000X00000	0000000000
BR803L	019	X000000000	0000000000	0X0000000X	00000XX0X0	XX000XX0X0	0000X00000	0000000000
BR803M	020	X000000000	0000000000	0X0000000X	00000XX0X0	XX000XX0X0	0000X00000	0000000000
BR8A3C	021	X000000X00	0000000000	0X00000000	00X000X0X0	XX0X0XX0X0	0000X00000	0000000000
BR8A3D	022	X0000000X0	0000000000	0X00000000	00X000X0X0	XX0X0XX0X0	0000X00000	0000000000
BR8A3E	023	X000000X00	0000000000	0X00000000	000X00X0X0	XX0X0XX0X0	0000X00000	0000000000
BR8A3F	024	X0000000X0	0000000000	0X00000000	000X00X0X0	XX0X0XX0X0	0000X00000	0000000000
BR8A2A	025	XX00000000	0000000000	0X00000000	0X00000XX0	XX0X0XXX00	0000X00000	0000000000
BR803T	026	X0000X0000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR805E	027	X0000X0000	0000000000	0X00X00000	0000X0X0X0	XX0X0XXX00	0000X00000	0000000000
BR8A3A	028	X000000000	X000000000	0X00000000	0X0000X0X0	XX0X0XX000	0000X00000	0000000000
BR8A2B	030	X0X0000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2C	031	X00X000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2D	032	X0000X0000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2E	033	X0000X0000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2F	034	X000000000	0X00000000	0X00000000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2G	035	XX00000000	0000000000	0X00X00000	0000000XX0	XX0X0XX000	0000X00000	000000000X
BR8A2H	036	X000000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2J	037	XX00000000	0000000000	0X00000000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2K	038	X000000000	00X0000000	0X00000000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2L	039	X00000X000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2M	040	X000000X00	0000000000	0X00X00000	0X00000XX0	XX0X0XX0X0	0000X00000	0X00000000
BR8A2N	041	X000X00000	0000000000	0X00000000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2P	042	000000000X	0000X00000	0X00000000	X00000X00X	00XX0X00X0	0000X0000X	000X000X00
BR8A4A	044	0000000000	0000X00000	0X0000XX00	X00000X00X	00X00X00X0	0X00XXX000	000X0000X0
BR8A7A	046	000000000X	0000X00000	0X00000000	X00000X00X	00XX0X00X0	0000X00000	000X0000X0
BR8A5A	047	X0000000X0	0000000000	0X00X00000	0000000XX0	XX0X0XX0X0	0000X00000	XX00000000
BR8A5B	048	X0000000X0	0000000000	0X00X00000	0000000XX0	XX0X0XX0X0	0000X00000	XX00000000
BR8A2W	049	X00000X000	0000000000	0X00000000	0X00000X0X0	XX0X0XX000	0000X00000	0000000000
BR8A2Y	050	X000000000	00X0000000	0X00000000	0X00000X0X0	XX0X0XX000	0000X00000	0000000000
BR8A6B	051	X0X0000000	0000000000	0X00000000	0X00000X0X0	XX0X0XX000	0000X00000	0000000000
BR803U	052	X000000000	X000000000	0X00000000	0X00000X0X0	XX0X0XX000	0000X00000	0000000000
BR8A2S	053	X000000X00	0000000000	0X00X00000	0X00000XX0	XX0X0XX0X0	0000X00000	0000000000
BR8A2T	054	X000000X00	0000000000	0X00X00000	0X00000XX0	XX0X0XX0X0	0000X00000	0000000000
BR8A2U	055	X000000000	X000000000	0X00000000	00X000X0X0	XX0X0XX000	0000X00000	0000000000
BR8A2V	056	X000000000	00X0000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A2Z	057	X0000000X0	0000000000	0X00000000	0X00000XX0	XX0X0XX0X0	0000X00000	0000000000
BR8A3G	058	XX00000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A3H	059	X0X0000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
	060	X000000000	00X0000000	0X00000000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A5C	061	X000000X00	0000000000	0X00X00000	0000000XX0	XX0X0XX0X0	0000X00000	XX00000000
BR8A5D	062	X000000X00	0000000000	0X00X00000	0000000XX0	XX0X0XX0X0	0000X00000	XX00000000
BR8A5E	063	XX00000000	0000000000	0X00X00000	0000000XX0	XX0X0XX00X	0000X00000	0000000000
BR8A5J	064	XX00000000	0000000000	0X00X00000	0000000XX0	XX0X0XX000	X000X00000	0000000000
BR8A5T	066	X000000000	X000000000	0X00X00000	0X00000XX0	XX0X0XX00X	0000X00000	0000000000
BR8A5F	080	XX00000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A5G	081	XX00000000	0000000000	0X00000000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A5H	082	XX00000000	0000000000	0X00000000	0000000XX0	XX0X0XX000	X000X00000	0000000000
BR8A5K	083	X0X0000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A5L	084	X0X0000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A5N	085	X000000X00	0000000000	0X00X00000	0000000XX0	XX0X0XX0X0	X000X00000	0000000000
BR8A5P	086	X000X00000	0000000000	0X00X00000	0000000XX0	XX0X0XX000	X000X00000	0000000000
BR8A5R	087	XX00000000	0000000000	0X00X00000	0X00000XX0	XX0X0XX000	0000X00000	0000000000
BR8A5S	088	X000000X00	0000000000	0X00X00000	0X00000XX0	XX0X0XX0X0	0000X00000	0000000000

ITEM IDENT NO	DESCRIPTION	WHERE USED
101	83458201	CHASSIS ASM-COMMON PARTS TMA
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	75888178	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
115	75891480	CHASSIS ASM-COMMON PARTS TMA
122	94277416	STRAP, CABLE TIE TMA
124	75291902	DRIVE MOTOR ASM 50 HZ TMA
125	83427801	WRITE PROTECT ASM TMA
127	77830690	DISKETTE DETECT ASM TMA
128	75881779	DRIVE MOTOR ASM 60 HZ TMA
129	75881780	DRIVE MOTOR ASM 50 HZ TMA
130	75888181	DRIVE MOTOR ASM 60 HZ TMA
131	83401806	FRONT PANEL ASM TMA
132	83401801	FRONT PANEL ASM TMA
133	83401802	FRONT PANEL ASM TMA
134	83401803	FRONT PANEL ASM TMA
135	83401804	FRONT PANEL ASM TMA
136	83401805	FRONT PANEL ASM TMA
137	75791510	ACTUATOR ASM TMA
138	75791511	ACTUATOR ASM TMA

ITEM IDENT NO	DESCRIPTION	WHERE USED
139	75774736	CLIP-PUSH IN TMA
140	77830685	UPPER HARNESS ASM TMA
141	75747301	UPPER HARNESS ASM TMA
142	83403504	LOWER HARNESS ASM TMA
143	83403503	LOWER HARNESS ASM TMA
144	83403700	CONNECTOR BRACKET TMA
145	75272300	CONNECTOR BRACKET TMA
146	77830538	CSA LABEL TMA
147	77594901	TRACK SWITCH ASM TMA
148	83460101	AMP CONN KIT TMA
149	75746702	CAPACITOR BRACKET TMA
150	75898080	FRONT PANEL ASM TMA
151	83401809	FRONT PANEL ASM TMA
152	77832691	MOUNTING KIT TMA
155	93592240	SCREW-WASHER TMA
156	77830641	AC CONN & RELAY ASM TMA
157	77830995	COVER TMA
158	17901508	SCREW TMA
160	77834336	LABEL, FCO TMA
161	77834543	FRONT PANEL ASSY TMA
162	75746701	CAPACITOR BRACKET TMA
164	77836055	LABEL TMA
168	77594704	OPT TRACK SENSE ASSY TMA
169	77594705	OPT TRACK SENSE ASSY TMA
170	83401808	FRONT PANEL ASSY TMA

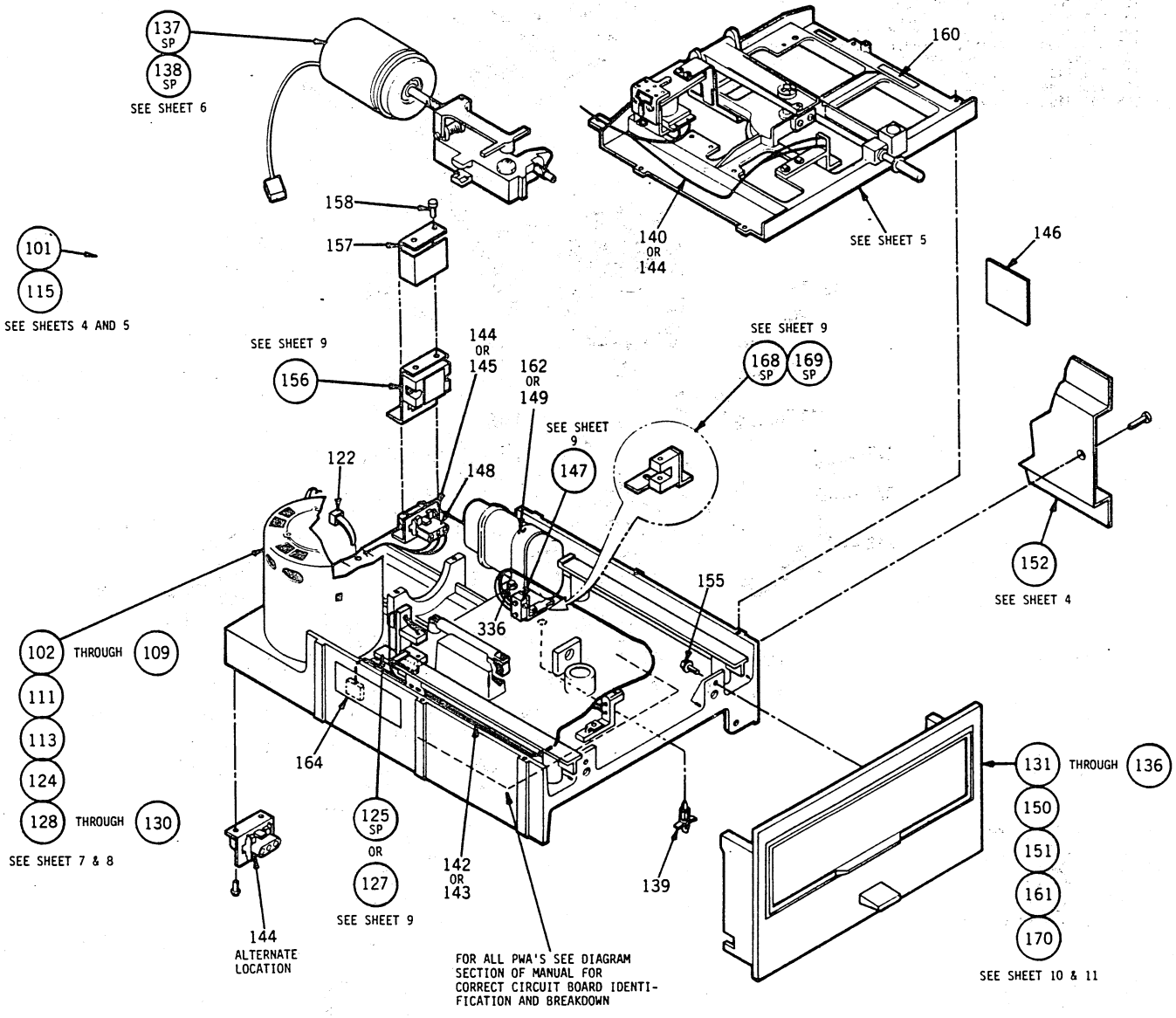


FIGURE 8-1. TOP MECHANICAL ASSEMBLY

ITEM IDENT NO	DESCRIPTION	WHERE USED	
101	83458201	CHASSIS ASM-COMMON PARTS	TMA
115	75891480	CHASSIS ASM-COMMON PARTS	TMA
152	77832691	MOUNTING KIT	TMA
153	92602001	CLAMP	101 115
178	10125801	WASHERS SPR LOCK	101 115
180	75293203	BELT-FLAT	101 115
183	75774732	CLIP-PUSH IN	101 115
186	10125803	WASHERS SPR LOCK	101 115
187	10125605	WASHERS PLAIN	101 115
198	77832145	LABEL IDENT	101 115
191	92073070	BEARING FLANGED	101 115
192	93529005	WASHER-SPRING WAVE	101 115
196	16402506	CLAMP CABLE	101 115
199	09000403	SCREW BIND HEAD	101 115
202	10126222	SCREW HEX SOC HD	101 115
205	93592086	SCR HEX SELF TAP	101 115
208	92602003	CLAMP, CABLE-NYLON	101 115
209	10126214	SCR HEX SOC HD CAP	101 115
210	83427900	PLATE-NUT	101 115
218	75882450	CARRIAGE STOP	101 115
219	93592488	SCREW	101 115
255	10127131	SCREW	152
256	10125805	LOCK WASHER	152
301	77830975	ADAPTER	152
336	93592160	SCREW, SELF TAP	101 115
339	10126401	STAR LOCK WASHER	101 115
340	75731302	ELECTRICAL SYMBOL	101 115
342	77594800	DECAL	152
360	75886086	BASE-MECHANISM, DIE	101
361	83403601	SPINDLE	101 115
362	75747000	SPACER BEARING	101 115
363	75745200	PULLEY-SPINDLE	101 115
364	75886087	BASE-MECHANISM, DIE	115
365	83461800	CLAMP, STEPPER MOTOR	101 115
366	75292400	GUIDE-CARRIAGE	101 115
374	94277400	TIE STRAP	101
377	93592486	SCREW	101 115
388	10125603	WASHER	101 115

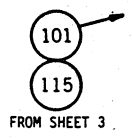
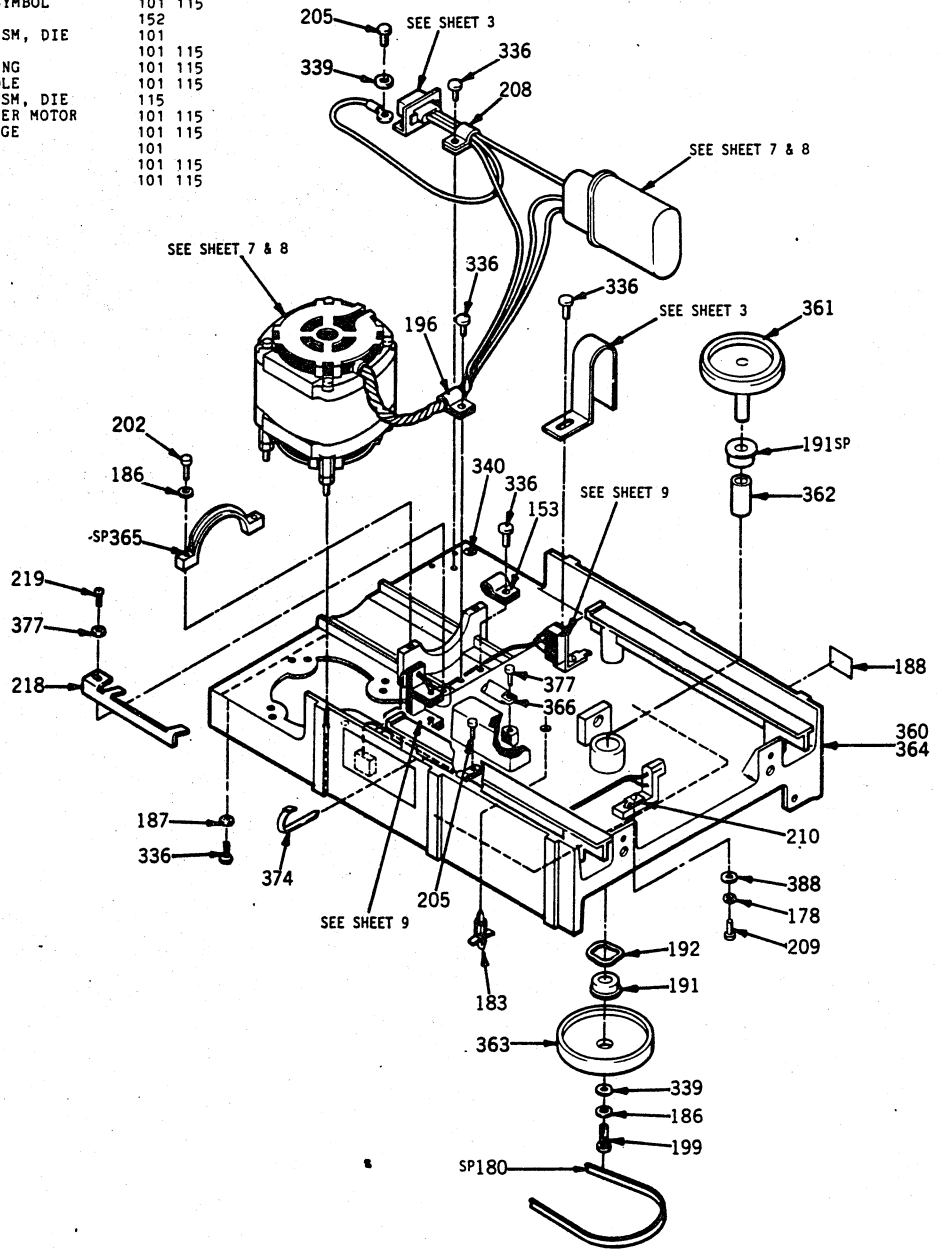
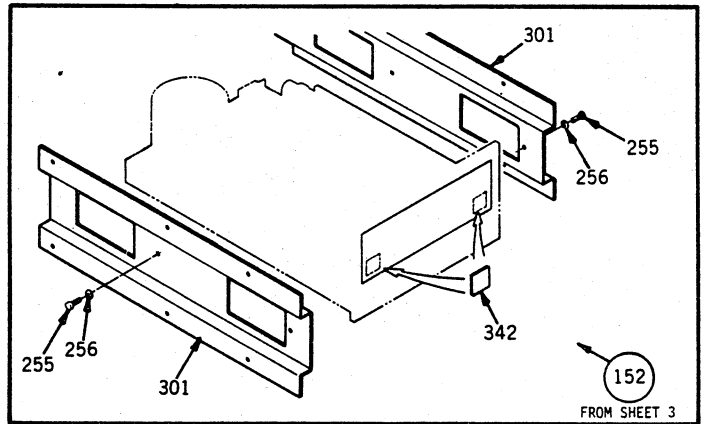
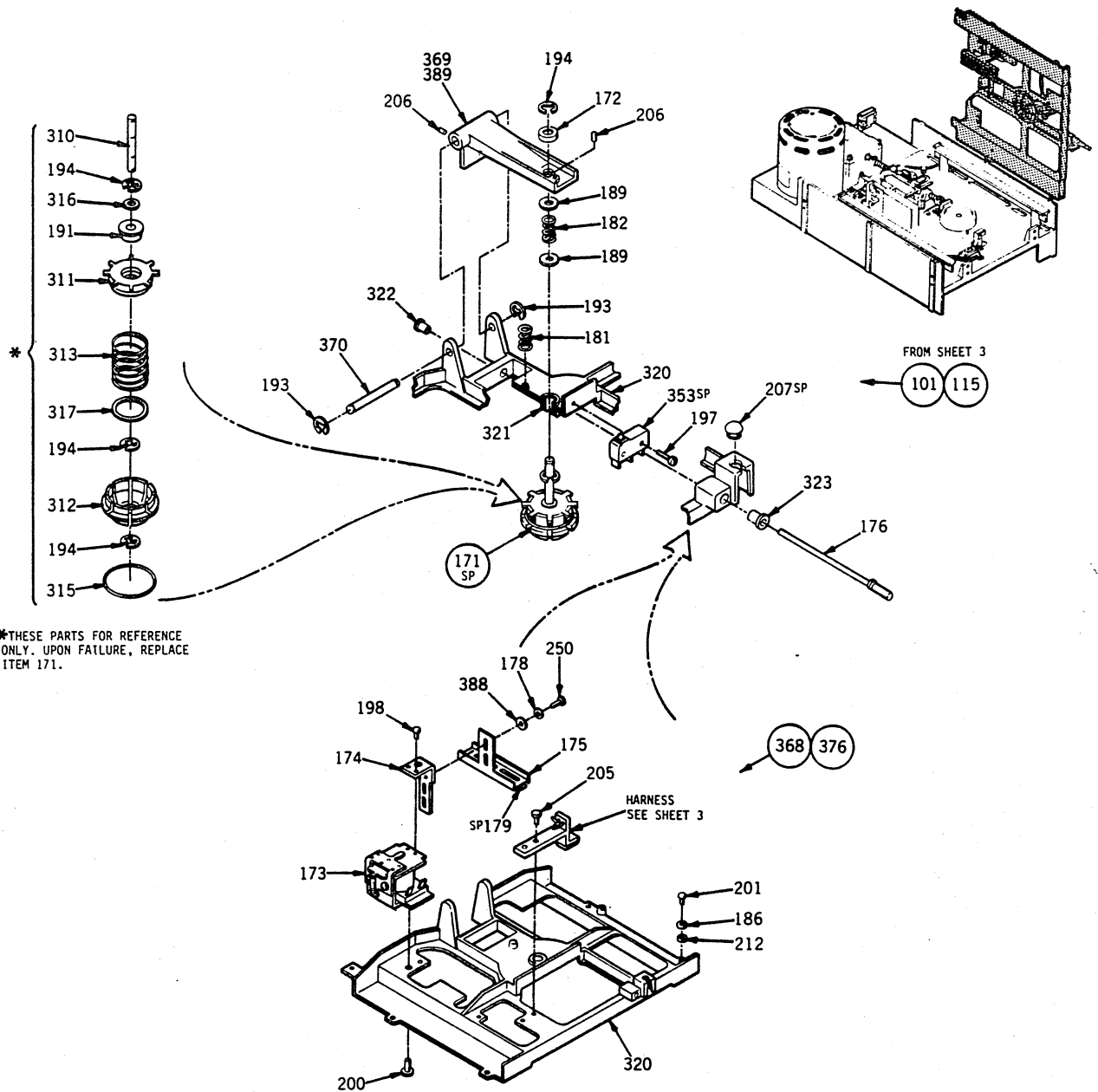


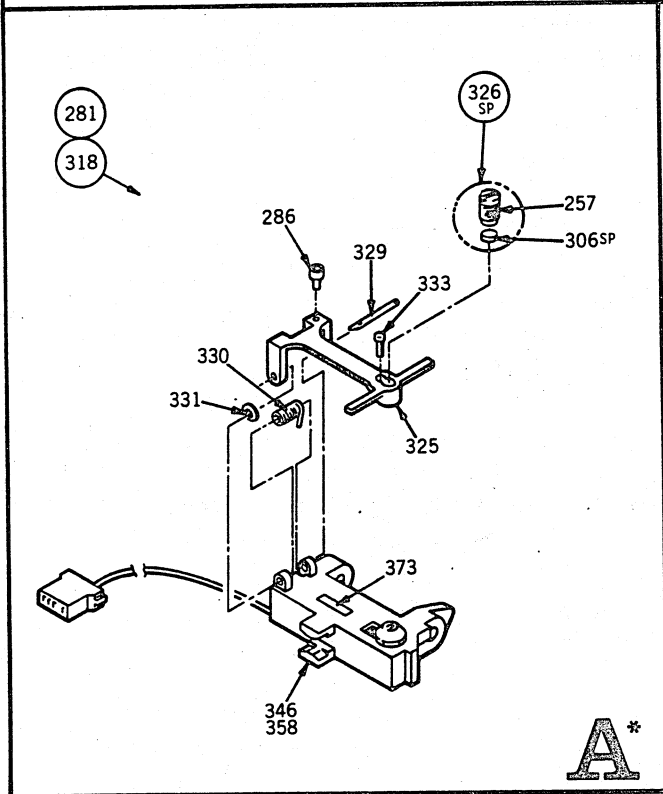
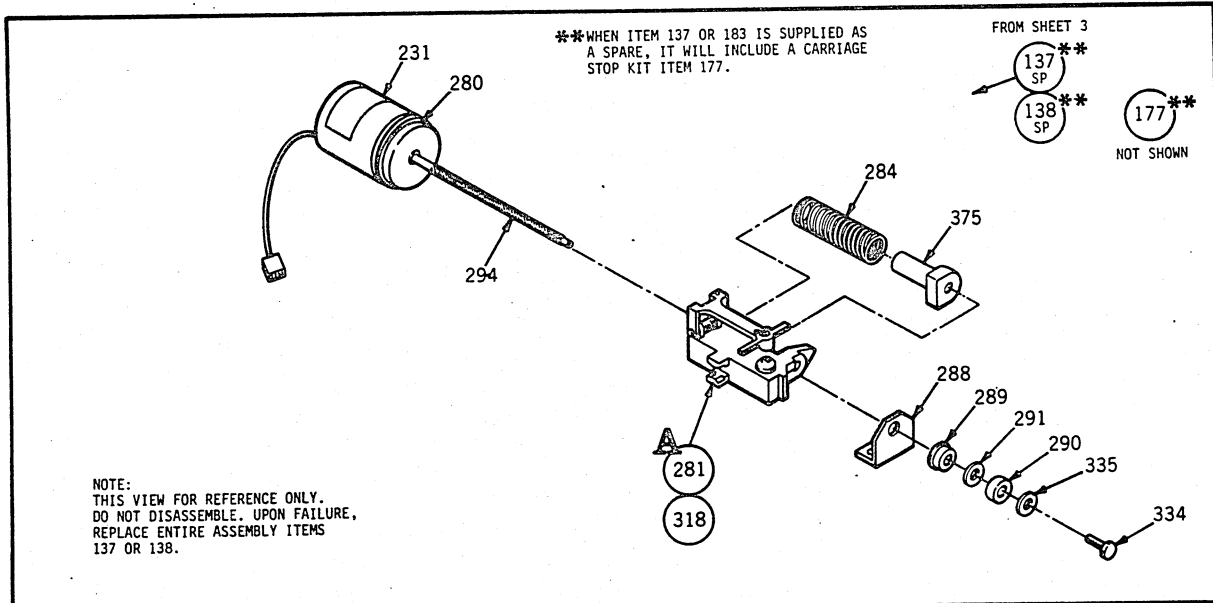
FIGURE 8-2. FDD COMMON PARTS (SHEET 1 OF 2)



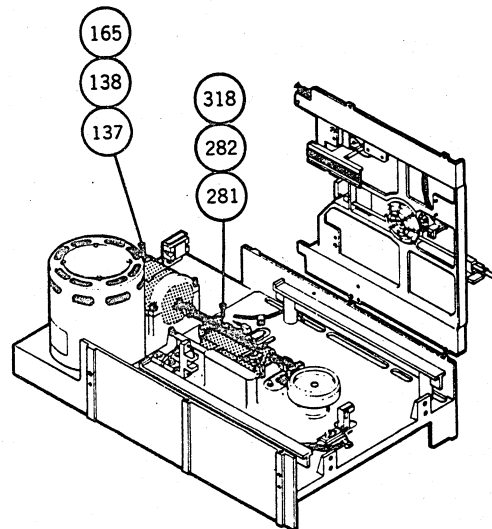
*THESE PARTS FOR REFERENCE ONLY. UPON FAILURE, REPLACE ITEM 171.

ITEM IDENT NO	DESCRIPTION	WHERE USED	ITEM IDENT NO	DESCRIPTION	WHERE USED
101 23458201	CHASSIS ASM-COMMON PARTS	TMA	205 93592086	SCR HEX SELF TAP	101 115
115 75891480	CHASSIS ASM-COMMON PARTS	TMA	206 93820248	SCREW-SELF LOCKING	101 115
171 83402101	CONE ASM	101 115	207 83411202	BUMPER DOOR	101 115
172 75273200	BUSHING	101 115	212 94279109	FLAT WASHER	101 115
173 75747202	SOLENOID	101 115	250 93502482	SCR HEX HD	101 115
174 77834331	EXTENSION ARMATURE	101 115	310 75790803	SHAFT	171
175 77834326	BAIL ARMATURE	101 115	311 83426400	EXPANDER-CONE	171
176 75885163	PUSH ROD ASSY	101 115	312 77830481	CONE-DISK LOAD	171
177 10125801	WASHERS SPR LOCK	101 115	313 83402200	SPRING-CONE	171
178 10125801	WASHERS SPR LOCK	101 115	315 83409701	SPRING-GARTER	171
179 77830732	FOAM PAD	101 115	316 94047069	WASHER	171
181 75891000	SPRING-COMPRESSION	101 115	317 94047070	WASHER	171
182 75292417	SPRING-COMPRESSION	101 115	320 75812011	SUPPORT DIE CAST MACHINED	368
186 10125803	WASHERS SPR LOCK	101 115	321 75292807	BEARING-CYLINDRICAL	368
189 77835200	WASHER, NYLON	101 115	322 75813201	BUSHING, PUSH ROD MOLDED	368
191 92073079	BEARING FLANGED	171	323 75813202	BUSHING, PUSH ROD MOLDED	368
193 92033937	RING RETAINING	101 115	353 75724401	ACTUATOR SWITCH	101 115
194 92033038	RETAINING RING	101 171	368 75812021	SUPPORT-ASSEMBLED	101
194 92033038	RETAINING RING	115	369 83402803	ARM-DISK LOAD	101
197 09000095	SCREW BIND HEAD	101 115	370 75273000	PIN DISK LOAD ARM	101 115
198 09000202	SCREW BIND HEAD	101 115	376 75812022	SUPPORT-ASSEMBLED	115
200 09000504	SCREW BIND HEAD	101 115	388 10125603	WASHER	101 115
201 10126219	SCR HEX SCC HD CAP	101 115	389 83402804	ARM-DISK LOAD	115

FIGURE 8-2. FDD COMMON PARTS (SHEET 2 OF 2)



ITEM IDENT NO	DESCRIPTION	WHERE USED	
137	75791510	ACTUATOR ASM	TMA
138	75791511	ACTUATOR ASM	TMA
177	75882711	CARRIAGE STOP KIT	137 138
231	75790000	CAUTION LABEL	137 138
257	83460400	HOLDER PAD	326
280	75747801	STEPPER MOTOR ASM	137 138
281	77839902	CARRIAGE ASM	137
284	77594000	SCR-SOC HP CAP	137 138
286	10126209	RETAINER-BEARING	137 138
288	75813000	BEARING FLANGED	137 138
289	92073020	BRG BALL-EXT INNER R	137 138
290	94217207	WASHER-SPRING WAVE	137 138
291	93529001	LUBRICANT	137 138
294	77832456	PAD HEAD LOAD	326
306	83460701	CARRIAGE ASSY	138
318	77839901	ARM-HEAD LOAD	281 318
325	77603100	HOLDER-PAD ASSY	281 318
326	77830482	PIN CARRIAGE	281 318
329	77830998	SPRING TORSION	281 318
330	77830999	WASHER, SPECIAL	281 318
331	94047068	SCREW SLOTTED	281 318
333	10127310	SCREW HEX HD	137 138
334	10125001	WASHER	137 138
335	94047000	CARRIAGE HEAD ASSY	281
346	83426204	CARRIAGE HEAD ASSY	318
358	83426205	LABEL	324 358
373	77835304	NUT CARRIAGE	137 138
375	83427303		



*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

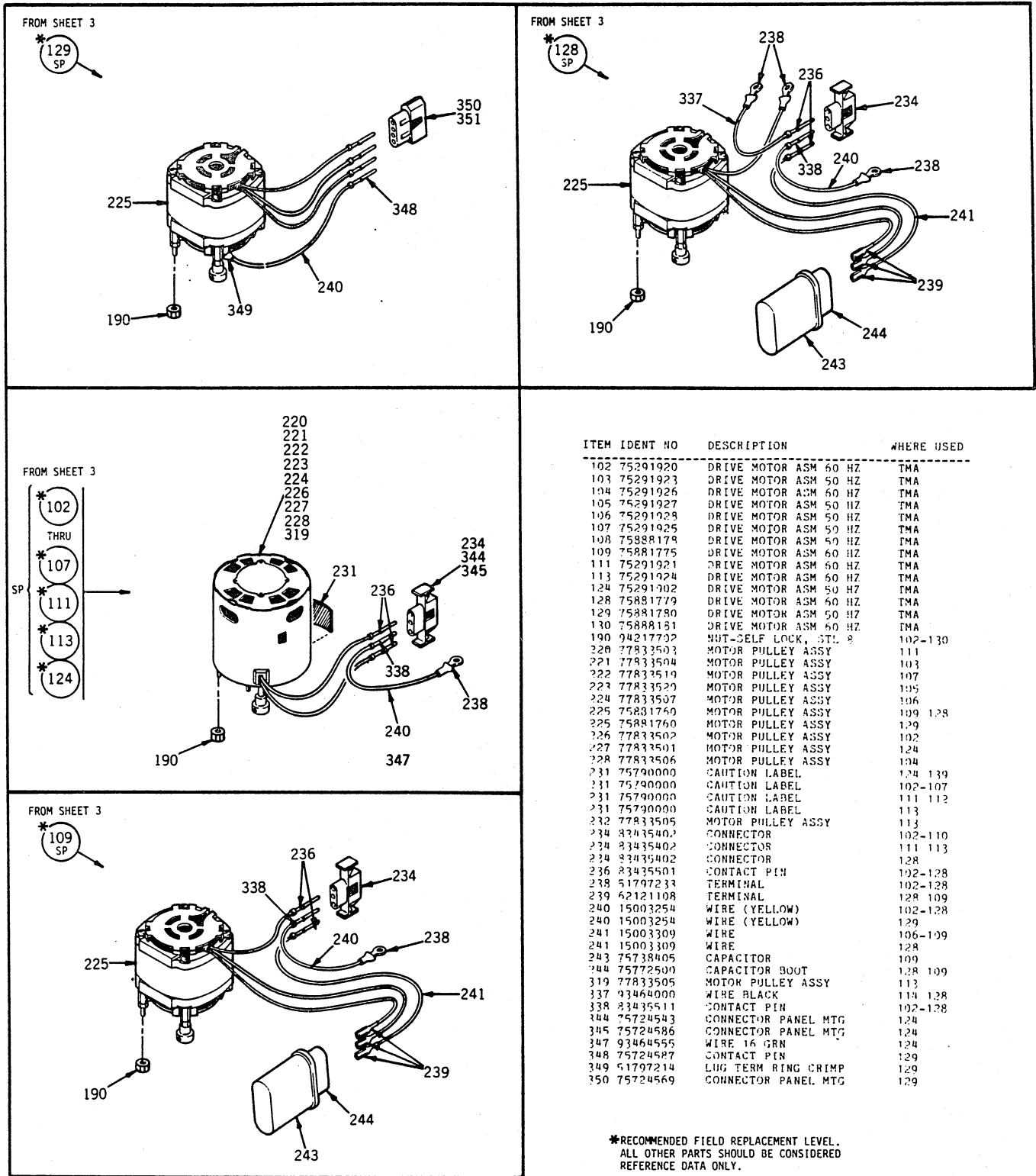
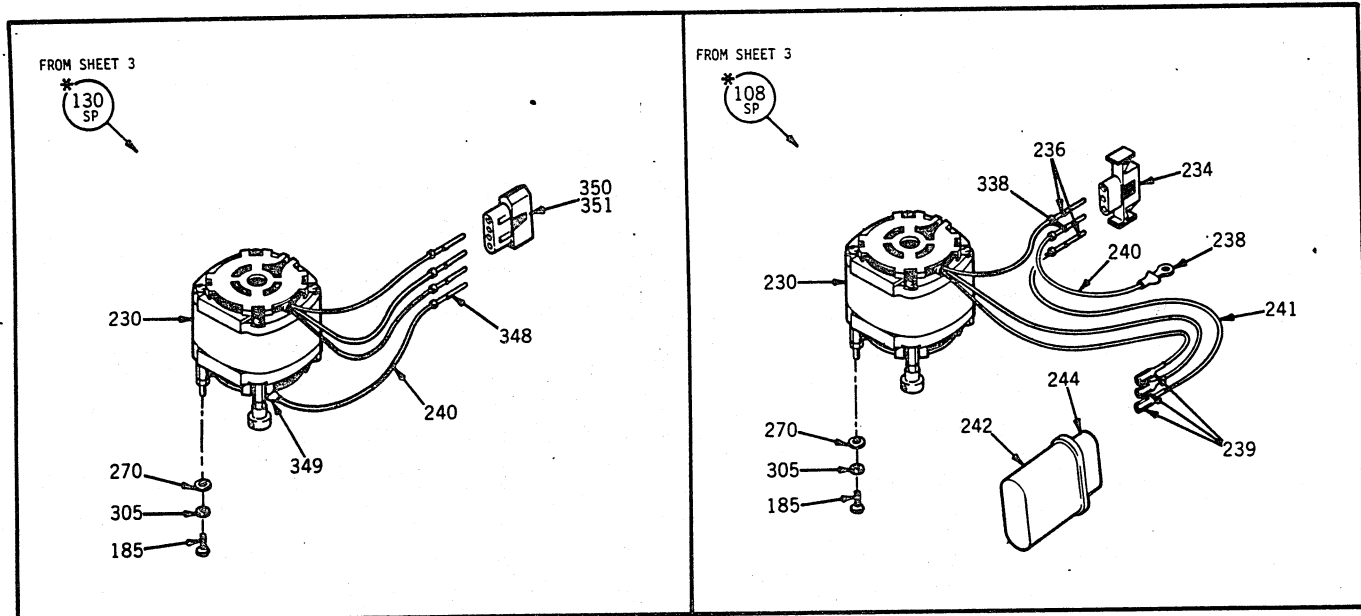


FIGURE 8-4. DRIVE MOTOR ASSEMBLY (SHEET 1 OF 2)



ITEM IDENT NO	DESCRIPTION	WHERE USED
185 10127123	SCREW	108 130
229 75881768	MOTOR PULLEY ASSY	108
230 75881762	MOTOR PULLEY ASSY	130
234 83435402	CONNECTOR	108
236 83435501	CONTACT PIN	108
238 51797233	TERMINAL	108
239 62121108	TERMINAL	108
240 15003254	WIRE (YELLOW)	108 130
241 15003309	WIRE	108
242 75738480	CAPACITOR	108
244 75772500	CAPACITOR BOOT	108
270 10125606	WASHER	108 130
305 10125804	LK WASHER	108 130
338 83435511	CONTACT PIN	108
348 75724587	CONTACT PIN	130
349 51797214	LUG TERM RING CRIMP	130
350 75724569	CONNECTOR PANEL MTG	130
351 75724585	CONNECTOR PANEL MTG	130

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

FIGURE 8-4. DRIVE MOTOR ASSEMBLY (SHEET 2 OF 2)

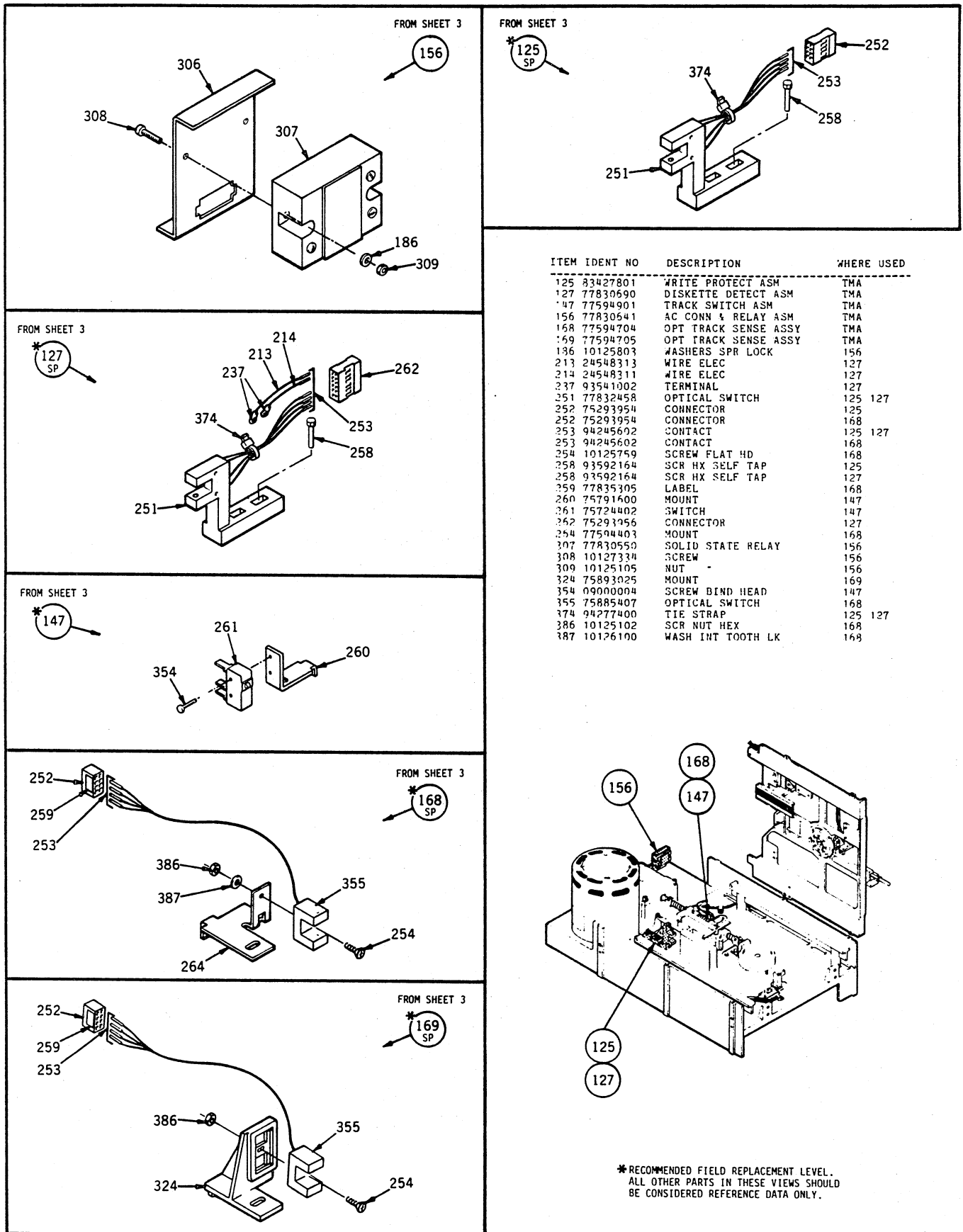
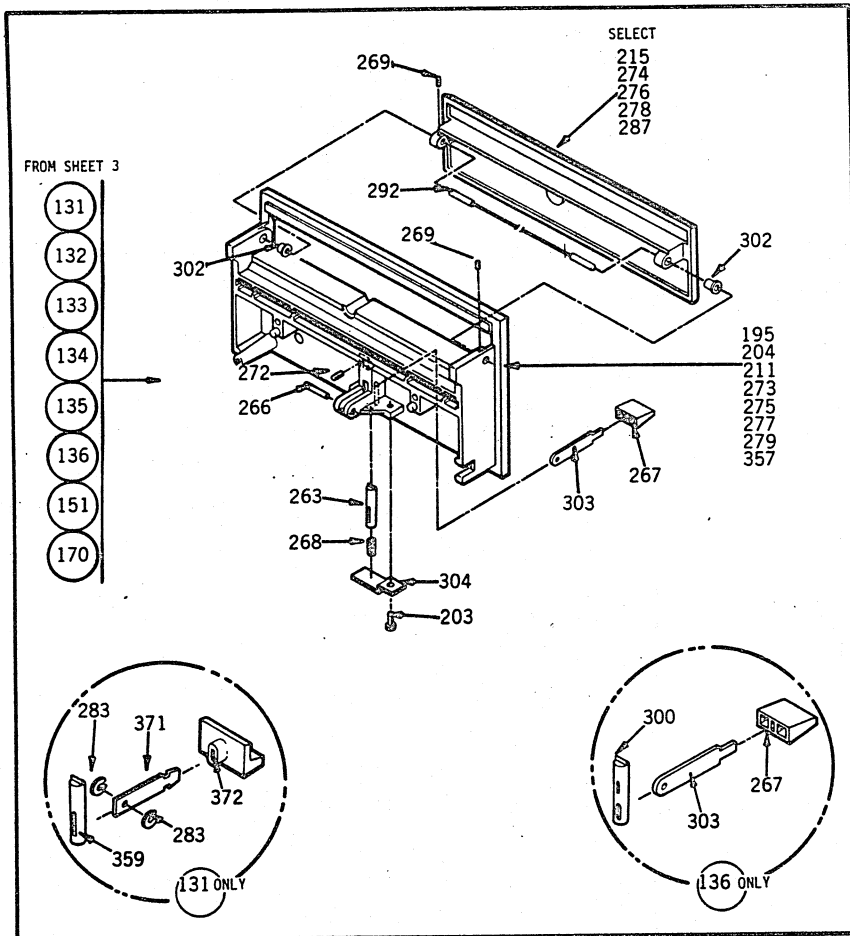


FIGURE 8-5. MISCELLANEOUS SUB-ASSEMBLIES



ITEM IDENT NO	DESCRIPTION	WHERE USED
122	94277416 STRAP, CABLE TIE	161
131	83401806 FRONT PANEL ASM	TMA
132	83401801 FRONT PANEL ASM	TMA
133	83401802 FRONT PANEL ASM	TMA
134	83401803 FRONT PANEL ASM	TMA
135	83401804 FRONT PANEL ASM	TMA
136	83401805 FRONT PANEL ASM	TMA
151	83401809 FRONT PANEL ASM	TMA
161	77834543 FRONT PANEL ASSY	TMA
170	83401808 FRONT PANEL ASSY	TMA
195	83426624 PANEL FRONT FIN BLK	132
203	93592162 SCR HX WASHER SLF TA	131-136
203	93592162 SCR HX WASHER SLF TA	161 170
204	75898043 PANEL, FRONT, FIN BLK	151
211	83426626 PANEL FRONT FIN BLU	170
215	75812126 DOOR FINISHED BLU	170
245	77835131 SOLENOID BRKT	295
246	77834212 SOLENOID	295
247	93530103 PIN ROLL	295
248	75806507 WASHER	295
249	77834323 SPRING	295
263	83402301 LATCH-DOOR INJEC MOL	132-135
263	83402301 LATCH-DOOR INJEC MOL	170
265	77834318 LEVER-DOOR	161
266	92096099 PIN-GROOVED	131-136
266	92096099 PIN-GROOVED	161 170
267	75292700 KNOB-LEVER	132-136
267	75292700 KNOB-LEVER	170
268	83401200 SPRING-LATCH	131-136
268	83401200 SPRING-LATCH	161 170
259	83413406 SCR SET SOC HD 6-32	131-136
269	83413406 SCR SET SOC HD 6-32	161 170
271	75292701 KNOB-LEVER	161
272	83413404 SCREW-SELF LOCKING	131-136
272	83413404 SCREW-SELF LOCKING	150
273	83426621 PANEL FRONT, BLACK HW	133
274	75812121 DOOR, FINISHED, PA-BLK	133
275	83426622 PANEL FRONT, WHITE HW	134
276	75812122 DOOR, FINISHED, PA-WHT	134
277	83426623 PANEL FRONT, FIN BLUE	135
278	75812123 DOOR, FINISHED, PA-BLU	135
279	83461110 FRONT PANEL FINISHED	136

ITEM IDENT NO	DESCRIPTION	WHERE USED
283	75881371 SHIM	131
285	75896352 DOOR LEVER SPRING	161
287	75812124 DOOR FINISHED BLACK	132 136
287	75812124 DOOR FINISHED BLACK	131 161
292	83403202 BAR TORSION DOOR	131-136
292	83403202 BAR TORSION DOOR	161 170
293	83461111 FRONT PANEL	161
295	77835133 DOOR LK ASSY	161
296	91976207 SCREW	161
297	77833702 HARNESS DR LK	161
298	75810703 RETAINING RING	161
299	75810701 DIODE LIGHT	161
300	83461200 LATCH DOOR	136
302	83401500 BUSHING-DOOR INJECT	131-136
302	83401500 BUSHING-DOOR INJECT	161 170
303	75746000 LEVER-DOOR	132-136
303	75746000 LEVER-DOOR	170
304	75746800 BRACKET LATCH	131-136
304	75746800 BRACKET LATCH	161 170
327	10127321 SCR PAN HD	295
332	75889161 LATCH DOOR	161
357	77832410 PANEL FRONT BLK-BURR	131
359	77830977 LATCH DOOR	131
371	75881370 LEVER DOOR	131
372	77832119 BUTTON LATCH	131
379	95862300 ANCHOR CABLE TIE	161
379	77835132 SPACER BKT	295

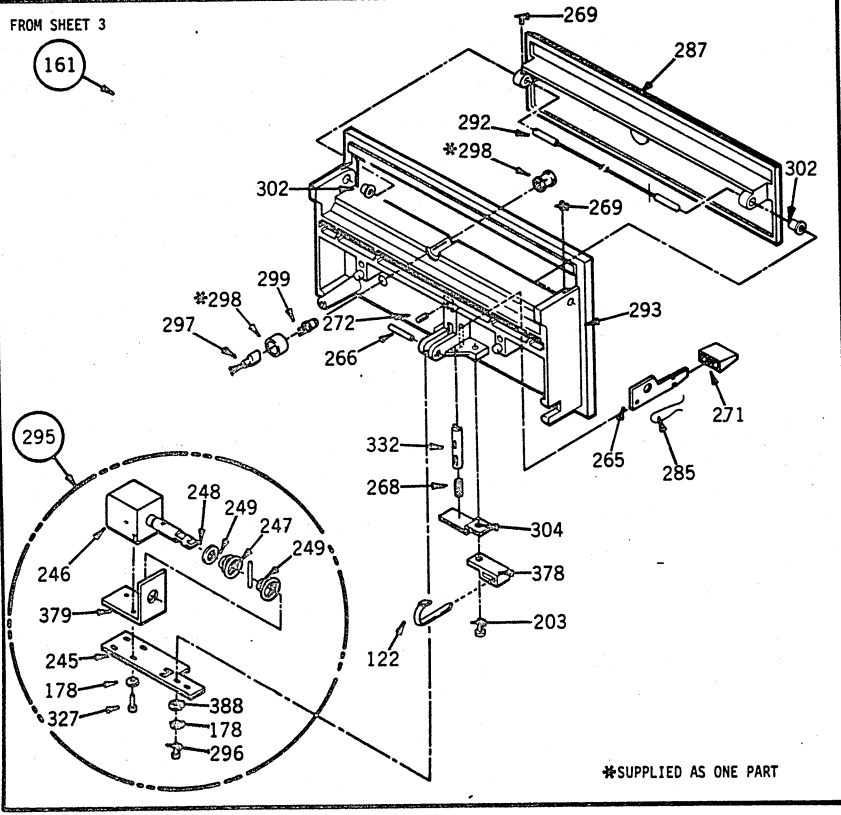
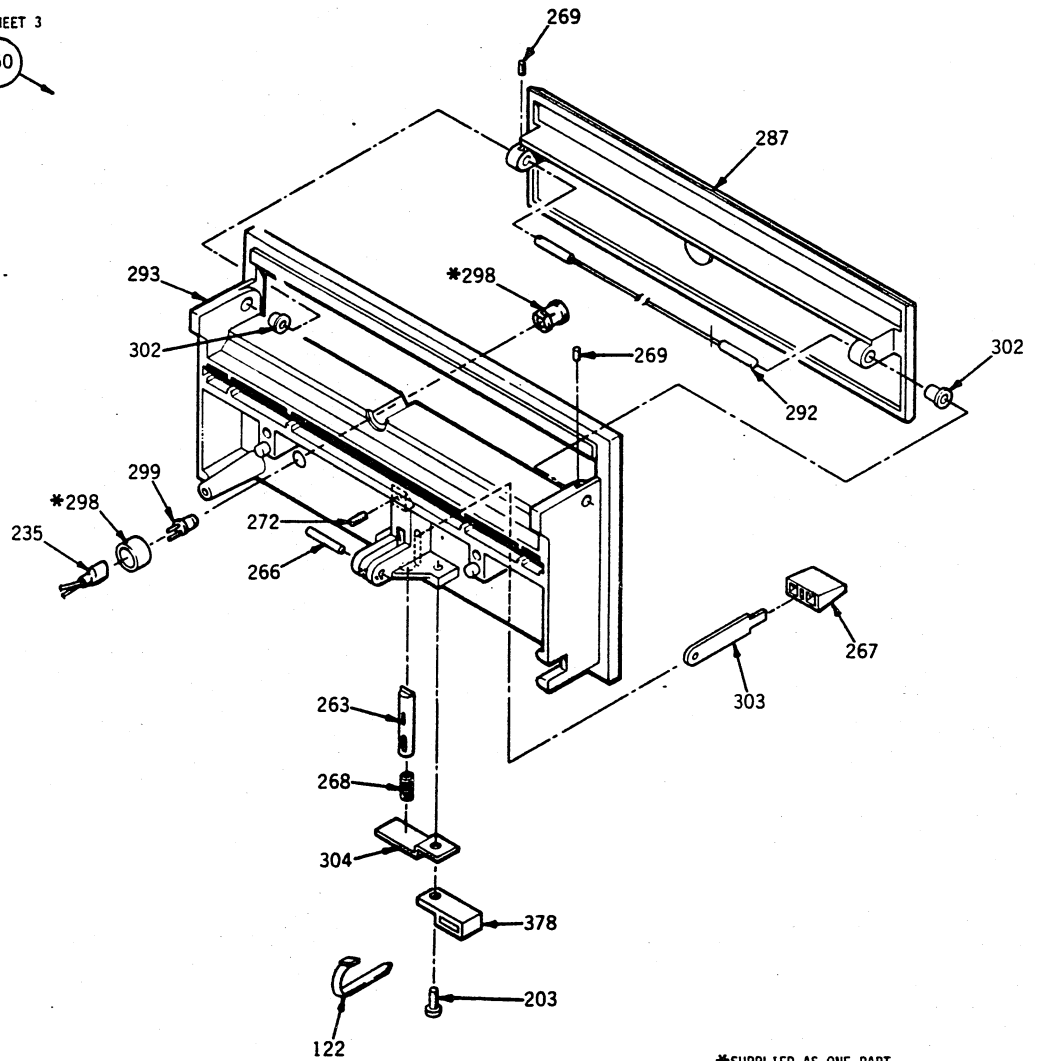


FIGURE 8-6. FRONT PANEL ASSEMBLY (SHEET 1 OF 2)

FROM SHEET 3

150



*SUPPLIED AS ONE PART

ITEM IDENT NO	DESCRIPTION	WHERE USED
122 94277415	STRAP, CABLE TIE	150
150 75899080	FRONT PANEL ASM	TMA
203 93592162	SCR HX WASHER SLF TA	150
235 75898086	HARNES	150
263 93402301	LATCH-DOOR INJEC MOL	150
266 22096099	PIN-GROOVED	150
267 75292700	KNOB-LEVER	150
268 83401200	SPRING-LATCH	150
269 93413406	SCR SET SOC HD 6-32	150
272 83413404	SCREW-SELF LOCKING	161 170
287 75812124	DOOR FINISHED BLACK	150
292 93403292	BAR TORSION DOOR	150
293 93461111	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
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. Replacement non-spared items will require longer requisitioning lead times.

TOP-DOWN ASSEMBLY/COMPONENT PARTS LIST

ITEM	IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM	IDENT NO	DESCRIPTION	WHERE USED	SHEET
101	33458201	CHASSIS ASM-COMMON PARTS	TMA	S3	178	10125801	WASHERS SPR LOCK	101 115	S4
101	33458201	CHASSIS ASM-COMMON PARTS	TMA	S4	178	10125801	WASHERS SPR LOCK	101 115	S5
101	33458201	CHASSIS ASM-COMMON PARTS	TMA	S5	179	77830732	FOAM PAD	101 115	S5
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	S3	180	75293203	BELT-FLAT	101 115	S4
102	75291920	DRIVE MOTOR ASM 60 HZ	TMA	S7	181	75891000	SPRING-COMPRESSION	101 115	S5
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	S3	182	75292617	SPRING-COMPRESSION	101 115	S5
103	75291923	DRIVE MOTOR ASM 50 HZ	TMA	S7	183	75774732	CLIP-PUSH IN	101 115	S4
104	75291925	DRIVE MOTOR ASM 60 HZ	TMA	S3	185	10127123	SCREW	108 130	S8
104	75291926	DRIVE MOTOR ASM 60 HZ	TMA	S7	186	10125803	WASHERS SPR LOCK	101 115	S4
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	S3	186	10125803	WASHERS SPR LOCK	101 115	S5
105	75291927	DRIVE MOTOR ASM 50 HZ	TMA	S7	186	10125803	WASHERS SPR LOCK	156	S9
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	S3	187	10125605	WASHERS PLAIN	101 115	S4
106	75291928	DRIVE MOTOR ASM 50 HZ	TMA	S7	188	77832145	LABEL IDENT	101 115	S4
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	S3	189	77835200	WASHER, NYLON	101 115	S5
107	75291925	DRIVE MOTOR ASM 50 HZ	TMA	S7	190	94217702	NUT-SELF LOCK, STL 8	102-130	S7
108	75888179	DRIVE MOTOR ASM 50 HZ	TMA	S3	191	92073070	BEARING FLANGED	101 115	S4
108	75888178	DRIVE MOTOR ASM 50 HZ	TMA	S7	191	92073070	BEARING FLANGED	171	S5
109	75881775	DRIVE MOTOR ASM 50 HZ	TMA	S3	192	93529005	WASHER-SPRING WAVE	101 115	S4
109	75881775	DRIVE MOTOR ASM 50 HZ	TMA	S7	193	92033037	RING RETAINING	101 115	S5
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA	S3	194	92033038	RETAINING RING	101 171	S5
111	75291921	DRIVE MOTOR ASM 60 HZ	TMA	S7	194	92033038	RETAINING RING	115	S5
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	S3	195	83426624	PANEL FRONT FIN BLK	132	S10
113	75291924	DRIVE MOTOR ASM 60 HZ	TMA	S7	196	16402506	CLAMP CABLE	101 115	S4
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	S3	197	09000005	SCREW BIND HEAD	101 115	S5
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	S4	198	09000202	SCREW BIND HEAD	101 115	S5
115	75891480	CHASSIS ASM-COMMON PARTS	TMA	S5	199	09000403	SCREW BIND HEAD	101 115	S4
122	94277415	STRAP, CABLE TIE	TMA	S3	200	09000504	SCREW BIND HEAD	101 115	S5
122	94277415	STRAP, CABLE TIE	161	S10	201	10126219	SCR HEX SOC HD CAP	101 115	S5
122	94277415	STRAP, CABLE TIE	150	S11	202	10126222	SCREW HEX SOC HD	101 115	S4
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S3	203	93592162	SCR HX WASHER SLF TA	131-136	S10
124	75291902	DRIVE MOTOR ASM 50 HZ	TMA	S7	203	93592162	SCR HX WASHER SLF TA	161 170	S10
125	83427301	WRITE PROTECT ASM	TMA	S3	203	93592162	SCR HX WASHER SLF TA	150	S11
125	83427301	WRITE PROTECT ASM	TMA	S9	204	75898043	PANEL, FRONT, FIN BLK	151	S10
127	77830690	DISKETTE DETECT ASM	TMA	S3	205	93592086	SCR HEX SELF TAP	101 115	S4
127	77830690	DISKETTE DETECT ASM	TMA	S9	205	93592086	SCR HEX SELF TAP	101 115	S5
128	75881779	DRIVE MOTOR ASM 50 HZ	TMA	S3	206	93820248	SCREW-SELF LOCKING	101 115	S5
128	75881779	DRIVE MOTOR ASM 60 HZ	TMA	S7	207	83411202	BUMPER DOOR	101 115	S5
129	75881750	DRIVE MOTOR ASM 50 HZ	TMA	S3	208	92602003	CLAMP, CABLE-NYLON	101 115	S4
129	75881780	DRIVE MOTOR ASM 50 HZ	TMA	S7	209	10126214	SCR HEX SOC HD CAP	101 115	S4
130	75888181	DRIVE MOTOR ASM 60 HZ	TMA	S3	210	83427900	PLATE-NUT	101 115	S4
130	75888181	DRIVE MOTOR ASM 60 HZ	TMA	S7	211	83426626	PANEL FRONT FIN BLU	170	S10
131	83401206	FRONT PANEL ASM	TMA	S3	212	94279109	FLAT WASHER	101 115	S5
131	83401306	FRONT PANEL ASM	TMA	S10	213	24548313	WIRE ELEC	127	S9
132	83401301	FRONT PANEL ASM	TMA	S3	214	24548311	WIRE ELEC	127	S9
132	83401301	FRONT PANEL ASM	TMA	S10	215	75812126	DOOR FINISHED BLU	170	S10
133	83401802	FRONT PANEL ASM	TMA	S3	218	75882450	CARRIAGE STOP	101 115	S4
133	83401902	FRONT PANEL ASM	TMA	S10	219	93592488	SCREW	101 115	S4
134	83401803	FRONT PANEL ASM	TMA	S3	220	77833503	MOTOR PULLEY ASSY	111	S7
134	83401303	FRONT PANEL ASM	TMA	S10	221	77833504	MOTOR PULLEY ASSY	103	S7
135	83401804	FRONT PANEL ASM	TMA	S3	222	77833519	MOTOR PULLEY ASSY	107	S7
135	83401804	FRONT PANEL ASM	TMA	S10	223	77833520	MOTOR PULLEY ASSY	105	S7
136	83401305	FRONT PANEL ASM	TMA	S3	224	77833507	MOTOR PULLEY ASSY	106	S7
136	83401805	FRONT PANEL ASM	TMA	S10	225	75881760	MOTOR PULLEY ASSY	109 128	S7
137	75791510	ACTUATOR ASM	TMA	S3	225	75881760	MOTOR PULLEY ASSY	129	S7
137	75791510	ACTUATOR ASM	TMA	S6	226	77833502	MOTOR PULLEY ASSY	102	S7
138	75791511	ACTUATOR ASM	TMA	S3	227	77833501	MOTOR PULLEY ASSY	124	S7
138	75791511	ACTUATOR ASM	TMA	S6	228	77833506	MOTOR PULLEY ASSY	104	S7
139	75774736	CLIP-PUSH IN	TMA	S3	229	75881768	MOTOR PULLEY ASSY	108	S8
140	77830685	UPPER HARNESS ASM	TMA	S3	230	75881762	MOTOR PULLEY ASSY	130	S8
141	75747301	UPPER HARNESS ASM	TMA	S3	231	75790000	CAUTION LABEL	137 138	S6
142	83403504	LOWER HARNESS ASM	TMA	S3	231	75790000	CAUTION LABEL	124 139	S7
143	83403503	LOWER HARNESS ASM	TMA	S3	231	75790000	CAUTION LABEL	102-107	S7
144	83403700	CONNECTOR BRACKET	TMA	S3	231	75790000	CAUTION LABEL	111 112	S7
145	75272300	CONNECTOR BRACKET	TMA	S3	231	75790000	CAUTION LABEL	113	S7
146	77830538	CSA LABEL	TMA	S3	232	77833505	MOTOR PULLEY ASSY	113	S7
147	77594901	TRACK SWITCH ASM	TMA	S3	234	83435402	CONNECTOR	102-110	S7
147	77594901	TRACK SWITCH ASM	TMA	S9	234	83435402	CONNECTOR	111 113	S7
148	83460101	AMP CONN KIT	TMA	S3	234	83435402	CONNECTOR	128	S7
149	75746702	CAPACITOR BRACKET	TMA	S3	234	83435402	CONNECTOR	108	S8
150	75898080	FRONT PANEL ASM	TMA	S3	235	75898086	HARNESS	150	S11
150	75898080	FRONT PANEL ASM	TMA	S11	236	83435501	CONTACT PIN	102-128	S7
151	83401309	FRONT PANEL ASM	TMA	S3	236	83435501	CONTACT PIN	108	S8
151	83401809	FRONT PANEL ASM	TMA	S10	237	93541002	TERMINAL	127	S9
152	77832691	MOUNTING KIT	TMA	S3	238	51797233	TERMINAL	102-128	S7
152	77832691	MOUNTING KIT	TMA	S4	238	51797233	TERMINAL	108	S8
153	92602001	CLAMP	101 115	S4	239	62121108	TERMINAL	128 109	S7
155	93592240	SCREW-WASHER	TMA	S3	239	62121108	TERMINAL	108	S8
156	77830641	AC CONN & RELAY ASM	TMA	S3	240	15003254	WIRE (YELLOW)	102-128	S7
156	77830641	AC CONN & RELAY ASM	TMA	S9	240	15003254	WIRE (YELLOW)	129	S7
157	77830995	COVER	TMA	S3	240	15003254	WIRE (YELLOW)	108 130	S8
158	17901508	SCREW	TMA	S3	241	15003309	WIRE	106-109	S7
160	77834336	LABEL, FCO	TMA	S3	241	15003309	WIRE	128	S7
161	77834543	FRONT PANEL ASSY	TMA	S3	241	15003309	WIRE	108	S8
161	77834543	FRONT PANEL ASSY	TMA	S10	242	75738480	CAPACITOR	108	S8
162	75746701	CAPACITOR BRACKET	TMA	S3	243	75738405	CAPACITOR	199	S7
164	778326055	LABEL	TMA	S3	244	75772500	CAPACITOR BOOT	128 109	S7
168	77594704	OPT TRACK SENSE ASSY	TMA	S3	244	75772500	CAPACITOR BOOT	108	S8
168	77594704	OPT TRACK SENSE ASSY	TMA	S9	245	77835131	SOLENOID BRKT	295	S10
169	77594705	OPT TRACK SENSE ASSY	TMA	S3	246	77834212	SOLENOID	295	S10
169	77594705	OPT TRACK SENSE ASSY	TMA	S9	247	93530103	PIN ROLL	295	S10
170	83401808	FRONT PANEL ASSY	TMA	S3	248	75806507	WASHER	295	S10
170	83401308	FRONT PANEL ASSY	TMA	S10	249	77834323	SPRING	295	S10
171	83402101	CONE ASM	101 115	S5	250	93592482	SCR HEX HD	101 115	S5
172	75273200	BUSHING	101 115	S5	251	77832458	OPTICAL SWITCH	125 127	S9
172	75747202	SOLENOID	101 115	S5	252	75293954	CONNECTOR	125	S9
174	77834331	EXTENSION ARMATURE	101 115	S5	252	75293954	CONNECTOR	168	S9
175	77834326	BAIL ARMATURE	101 115	S5	253	94245602	CONTACT	125 127	S9
175	75885163	PUSH ROD ASSY	101 115	S5	253	94245602	CONTACT	168	S9
177	75882711	CARRIAGE STOP KIT	137 138	S6	254	10125759	SCREW FLAT HD	168	S9

TOP-DOWN ASSEMBLY/COMPONENT PARTS LIST (CONT.)

ITEM IDENT NO	DESCRIPTION	WHERE USED SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED SHEET
255	10127131	SCREW	152	S4	
256	10125805	LOCK WASHER	152	S4	
257	83460400	HOLDER PAD	326	S6	
258	93592164	SCR HX SELF TAP	125	S9	
258	93592164	SCR HX SELF TAP	127	S9	
259	77835305	LABEL	168	S9	
260	75791600	MOUNT	147	S9	
261	75724402	SWITCH	147	S9	
262	75293956	CONNECTOR	127	S9	
263	83402301	LATCH-DOOR INJEC MOL	132-135	S10	
263	83402301	LATCH-DOOR INJEC MOL	170	S10	
263	83402301	LATCH-DOOR INJEC MOL	150	S11	
264	77594403	MOUNT	168	S9	
265	77834318	LEVER-DOOR	161	S10	
266	92096099	PIN-GROOVED	131-136	S10	
266	92096099	PIN-GROOVED	161 170	S10	
266	92096099	PIN-GROOVED	150	S11	
267	75292700	KNOB-LEVER	132-136	S10	
267	75292700	KNOB-LEVER	170	S10	
267	75292700	KNOB-LEVER	150	S11	
268	83401200	SPRING-LATCH	131-136	S10	
268	83401200	SPRING-LATCH	161 170	S10	
268	83401200	SPRING-LATCH	150	S11	
269	83413406	SCR SET SOC HD 6-32	131-136	S10	
269	83413406	SCR SET SOC HD 6-32	161 170	S10	
269	83413406	SCR SET SOC HD 6-32	150	S11	
270	10125606	WASHER	108 130	S8	
271	75292701	KNOB-LEVER	161	S10	
272	83413404	SCREW-SELF LOCKING	131-136	S10	
272	83413404	SCREW-SELF LOCKING	161 170	S11	
272	83413404	SCREW-SELF LOCKING	150	S10	
273	83426621	PANEL FRONT, BLACK HW	133	S10	
274	75812121	DOOR, FINISHED, PA-BLK	133	S10	
275	83426622	PANEL FRONT, WHITE HW	134	S10	
276	75812122	DOOR, FINISHED, PA-WHT	134	S10	
277	83426623	PANEL FRONT, FIN BLUE	135	S10	
278	75812123	DOOR, FINISHED, PA-BLU	135	S10	
279	83461110	FRONT PANEL FINISHED	136	S10	
280	75747801	STEPPER MOTOR ASM	137 138	S6	
281	77839902	CARRIAGE ASM	137	S6	
281	77839902	CARRIAGE ASM	131	S10	
283	75881371	SHIM	131	S10	
284	77594000	SPRING-CARRIAGE	137 138	S6	
285	75896352	DOOR LEVER SPRING	161	S10	
286	10126209	SCR-SOC HP CAP	281 318	S6	
287	75812124	DOOR FINISHED BLACK	132 136	S10	
287	75812124	DOOR FINISHED BLACK	131 161	S10	
287	75812124	DOOR FINISHED BLACK	150	S11	
287	75812124	DOOR FINISHED BLACK	137 138	S6	
288	75813000	RETAINER-BEARING	137 138	S6	
289	92073020	BEARING FLANGED	137 138	S6	
290	94217207	BRG BALL-EXT INNER R	137 138	S6	
291	93529001	WASHER-SPRING WAVE	137 138	S6	
292	83403202	BAR TORSION DOOR	131-136	S10	
292	83403202	BAR TORSION DOOR	161 170	S10	
292	83403202	BAR TORSION DOOR	150	S11	
293	83461111	FRONT PANEL	161	S10	
293	83461111	FRONT PANEL	150	S11	
293	83461111	FRONT PANEL	137 138	S6	
294	77832456	LUBRICANT	161	S10	
295	77835133	DOOR LK ASSY	161	S10	
296	91976207	SCREW	161	S10	
297	77833702	HARNES DR LK	161	S10	
298	75810703	RETAINING RING	161	S10	
298	75810703	RETAINING RING	150	S11	
299	75810701	DIODE LIGHT	161	S10	
299	75810701	DIODE LIGHT	150	S11	
300	83461200	LATCH DOOR	136	S10	
301	77830975	ADAPTER	152	S4	
302	83401500	BUSHING-DOOR INJECT	131-136	S10	
302	83401500	BUSHING-DOOR INJECT	161 170	S10	
302	83401500	BUSHING-DOOR INJECT	150	S11	
303	75746000	LEVER-DOOR	132-136	S10	
303	75746000	LEVER-DOOR	170	S10	
303	75746000	LEVER-DOOR	150	S11	
304	75746800	BRACKET LATCH	131-136	S10	
304	75746800	BRACKET LATCH	161 170	S10	
304	75746800	BRACKET LATCH	150	S11	
305	10125804	LK WASHER	108 130	S8	
306	83460701	PAD HEAD LOAD	326	S6	
307	77830550	SOLID STATE RELAY	156	S9	
308	10127334	SCREW	156	S9	
309	10125105	NUT	171	S5	
310	75790803	SHAFT	171	S5	
311	83426400	EXPANDER-CONE	171	S5	
312	77830481	CONE-DISK LOAD	171	S5	
313	83402200	SPRING CONE	171	S5	
315	83409701	SPRING-GARTER	171	S5	
316	94047069	WASHER	171	S5	
317	94047070	WASHER	171	S5	
318	77839901	CARRIAGE ASSY	138	S6	
319	77833505	MOTOR PULLEY ASSY	113	S7	
320	75812011	SUPPORT DIE CAST MACHINED	368	S5	
321	75292807	BEARING-CYLINDRICAL	368	S5	
322	75813201	BUSHING, PUSH ROD MOLDED	368	S5	
323	75813202	BUSHING, PUSH ROD MOLDED	368	S5	
324	75893025	MOUNT	169	S9	
325	77603100	ARM-HEAD LOAD	281 318	S6	
326	77830482	HOLDER-PAD ASSY	281 318	S6	
327	10127321	SCR PAN HD	295	S10	
329	77830998	PIN CARRIAGE	281 318	S6	
330	77830999	SPRING TORSION	281 318	S6	
331	94047068	WASHER, SPECIAL	281 318	S6	
332	75889161	LATCH DOOR	161	S10	
333	10127310	SCREW SLOTTED	281 318	S6	
334	10125001	SCREW HEX HD	137 138	S6	
335	94047000	WASHER	101 115	S4	
336	93592160	SCREW, SELF TAP	114 128	S7	
337	93464000	WIRE BLACK	102-128	S7	
338	83435511	CONTACT PIN	108	S8	
338	83435511	CONTACT PIN	101 115	S4	
339	10126401	STAR LOCK WASHER	101 115	S4	
340	75731302	ELECTRICAL SYMBOL	152	S4	
342	77594800	DECAL	124	S7	
344	75724543	CONNECTOR PANEL MTG	124	S7	
345	75724586	CONNECTOR PANEL MTG	281	S6	
346	83426204	CARRIAGE HEAD ASSY	124	S7	
347	93464555	WIRE 16 GRN	129	S7	
348	75724587	CONTACT PIN	130	S8	
348	75724587	CONTACT PIN	129	S7	
349	51797214	LUG TERM RING CRIMP	130	S8	
349	51797214	LUG TERM RING CRIMP	129	S7	
350	75724569	CONNECTOR PANEL MTG	130	S8	
350	75724569	CONNECTOR PANEL MTG	130	S8	
351	75724585	CONNECTOR PANEL MTG	101 115	S5	
353	75724401	ACTUATOR SWITCH	147	S9	
354	09000004	SCREW BIND HEAD	168	S9	
355	75885407	OPTICAL SWITCH	131	S10	
357	77832410	PANEL FRONT BLK-BURR	318	S6	
358	83426205	CARRIAGE HEAD ASSY	131	S10	
359	77830977	LATCH DOOR	101	S4	
360	75886086	BASE-MECHANISM, DIE	101 115	S4	
361	83403601	SPINDLE	101 115	S4	
362	75747000	SPACER BEARING	101 115	S4	
363	75745200	PULLEY-SPINDLE	115	S4	
364	75886087	BASE-MECHANISM, DIE	101 115	S4	
365	83461800	CLAMP, STEPPER MOTOR	101 115	S4	
366	75292400	GUIDE-CARRIAGE	101	S5	
368	75812021	SUPPORT-ASSEMBLED	101	S5	
369	83402803	ARM-DISK LOAD	101 115	S5	
370	75273000	PIN DISK LOAD ARM	131	S10	
371	75881370	LEVER DOOR	131	S10	
372	77832119	BUTTON LATCH	324 358	S6	
373	77835304	LABEL	101	S4	
374	94277400	TIE STRAP	125 127	S9	
374	94277400	TIE STRAP	137 138	S6	
375	83427303	NUT CARRIAGE	115	S4	
376	75812022	SUPPORT-ASSEMBLED	101 115	S4	
377	93592486	SCREW	161	S10	
378	95862300	ANCHOR CABLE TIE	150	S11	
378	95862300	ANCHOR CABLE TIE	295	S10	
379	77835132	SPACER BKT	168	S9	
386	10125102	SCR NUT HEX	168	S9	
387	10126100	WASH INT TOOTH LK	101 115	S4	
388	10125603	WASHER	101 115	S5	
388	10125603	WASHER	115	S5	
389	83402804	ARM-DISK LOAD			

CROSS REFERENCE LIST

ITEM IDENT NO	SHEET	ITEM IDENT NO	SHEET	ITEM IDENT NO	SHEET	ITEM IDENT NO	SHEET
354 09000004	S9	304 75746800	S10	330 77830999	S6	236 83435501	S7
197 09000005	S5	304 75746800	S11	372 77832119	S10	338 83435511	S8
198 09000202	S5	304 75746800	S10	188 77832145	S4	338 83435511	S7
199 09000403	S4	362 75747000	S4	357 77832410	S10	101 83458201	S3
200 09000504	S5	173 75747202	S5	294 77832456	S6	101 83458201	S5
334 10125001	S6	141 75747301	S3	251 77832458	S9	101 83458201	S4
386 10125102	S9	280 75747801	S6	152 77832691	S4	148 83460101	S3
309 10125105	S9	244 75772500	S7	152 77832691	S3	257 83460400	S6
388 10125603	S5	244 75772500	S8	227 77833501	S7	306 83460701	S6
388 10125603	S4	183 75774732	S4	226 77833502	S7	279 83461110	S10
187 10125605	S4	139 75774736	S3	220 77833503	S7	293 83461111	S10
270 10125606	S8	231 75790000	S7	221 77833504	S7	293 83461111	S11
254 10125759	S9	231 75790000	S7	232 77833505	S7	300 83461200	S10
178 10125801	S5	231 75790000	S7	319 77833505	S7	365 83461800	S4
178 10125801	S4	231 75790000	S7	228 77833506	S7	296 91976207	S10
186 10125803	S9	231 75790000	S6	224 77833507	S7	193 92033037	S5
186 10125803	S5	310 75790803	S5	222 77833519	S7	194 92033038	S5
186 10125803	S4	137 75791510	S6	223 77833520	S7	194 92033038	S5
305 10125804	S8	137 75791510	S3	297 77833702	S10	289 92073020	S6
256 10125805	S4	138 75791511	S6	246 77834212	S10	191 92073070	S5
387 10126100	S9	138 75791511	S3	265 77834318	S10	191 92073070	S4
286 10126209	S6	260 75791600	S9	249 77834323	S10	266 92096099	S10
209 10126214	S4	248 75806507	S10	175 77834326	S5	266 92096099	S11
201 10126219	S5	299 75810701	S11	174 77834331	S5	266 92096099	S10
202 10126222	S4	299 75810701	S10	160 77834336	S3	153 92602001	S4
339 10126401	S4	298 75810703	S11	161 77834543	S3	208 92602003	S4
185 10127123	S8	298 75810703	S10	161 77834543	S10	337 93464000	S7
255 10127131	S4	320 75812011	S5	245 77835131	S10	347 93464555	S7
333 10127310	S6	368 75812021	S5	379 77835132	S10	291 93529001	S6
327 10127321	S10	376 75812022	S5	295 77835133	S10	192 93529005	S4
308 10127334	S9	274 75812121	S10	189 77835200	S5	247 93530103	S10
240 15003254	S8	276 75812122	S10	373 77835304	S6	237 93541002	S9
240 15003254	S7	278 75812123	S10	259 77835305	S9	205 93592086	S4
240 15003254	S7	287 75812124	S10	164 77836055	S3	205 93592086	S5
241 15003309	S8	287 75812124	S11	318 77839901	S6	336 93592160	S4
241 15003309	S7	287 75812124	S10	291 77839902	S6	203 93592162	S10
241 15003309	S7	215 75812126	S10	268 83401200	S10	203 93592162	S11
196 16402506	S4	288 75813000	S6	268 83401200	S11	203 93592162	S10
158 17901508	S3	322 75813201	S5	268 83401200	S10	258 93592164	S9
214 24548311	S9	323 75813202	S5	302 83401500	S11	258 93592164	S9
213 24548313	S9	371 75881370	S10	302 83401500	S10	155 93592240	S3
349 51797214	S8	283 75881371	S10	302 83401500	S10	250 93592482	S5
349 51797214	S7	225 75881760	S7	132 83401801	S10	377 93592486	S4
238 51797233	S8	225 75881760	S7	132 83401801	S3	219 93592488	S4
238 51797233	S7	230 75881762	S8	133 83401802	S10	206 93820248	S5
239 62121108	S7	229 75881768	S8	133 83401802	S3	335 94047000	S6
239 62121108	S8	109 75881775	S7	134 83401803	S10	331 94047068	S6
145 75272300	S3	109 75881775	S3	134 83401803	S3	316 94047069	S5
370 75273000	S5	128 75881779	S7	135 83401804	S10	317 94047070	S5
172 75273200	S5	128 75881779	S3	135 83401804	S3	290 94217207	S6
124 75291902	S7	129 75881780	S7	136 83401805	S10	190 94217702	S7
124 75291902	S3	129 75881780	S3	136 83401805	S3	253 94245602	S9
102 75291920	S7	218 75882450	S4	131 83401806	S10	253 94245602	S9
102 75291920	S3	177 75882711	S6	131 83401806	S3	374 94277400	S4
111 75291921	S7	175 75885163	S5	170 83401808	S3	374 94277400	S9
111 75291921	S3	355 75885407	S9	170 83401808	S10	122 94277416	S11
103 75291923	S7	360 75886086	S4	151 83401809	S10	122 94277416	S10
103 75291923	S3	364 75886087	S4	151 83401809	S3	122 94277416	S3
113 75291924	S7	108 75888178	S7	171 83402101	S5	212 94279109	S5
113 75291924	S3	108 75888178	S3	313 83402200	S5	378 95862300	S11
107 75291925	S7	130 75888181	S7	263 83402301	S11	378 95862300	S10
107 75291925	S3	130 75888181	S3	263 83402301	S10		
104 75291926	S7	332 75888916	S10	263 83402301	S10		
104 75291926	S3	181 75891000	S5	369 83402803	S5		
105 75291927	S7	115 75891480	S5	389 83402804	S5		
105 75291927	S3	115 75891480	S4	292 83403202	S10		
106 75291928	S7	115 75891480	S3	292 83403202	S10		
106 75291928	S3	324 75893025	S9	292 83403202	S11		
366 75292400	S4	285 75896352	S10	143 83403503	S3		
182 75292617	S5	204 75898043	S10	142 83403504	S3		
267 75292700	S11	150 75898080	S11	361 83403601	S4		
267 75292700	S10	150 75898080	S3	144 83403700	S3		
267 75292700	S10	235 75898086	S11	315 83409701	S5		
271 75292701	S10	284 77594003	S9	207 83411202	S5		
321 75292807	S5	264 77594704	S3	272 83413404	S10		
180 75293203	S4	168 77594704	S9	272 83413404	S11		
252 75293954	S9	168 77594704	S9	272 83413404	S10		
252 75293954	S9	169 77594705	S9	269 83413406	S11		
262 75293956	S9	169 77594705	S9	269 83413406	S10		
353 75724401	S5	342 77594800	S4	269 83413406	S10		
261 75724402	S9	147 77594901	S9	346 83426204	S6		
344 75724543	S7	147 77594901	S3	358 83426205	S6		
350 75724569	S8	325 77603100	S6	311 83426400	S5		
350 75724569	S7	312 77830481	S5	273 83426621	S10		
351 75724585	S8	326 77830482	S6	275 83426622	S10		
345 75724586	S7	146 77830538	S3	277 83426623	S10		
348 75724587	S7	307 77830550	S9	195 83426624	S10		
348 75724587	S8	156 77830641	S9	211 83426626	S10		
340 75731302	S4	156 77830641	S3	375 83427303	S6		
243 75738405	S7	140 77830685	S3	125 83427801	S9		
242 75738480	S8	127 77830690	S9	125 83427801	S3		
363 75745200	S4	127 77830690	S3	210 83427900	S4		
303 75746000	S10	179 77830732	S5	234 83435402	S7		
303 75746000	S11	301 77830975	S4	234 83435402	S7		
303 75746000	S10	359 77830977	S10	234 83435402	S7		
162 75746701	S3	157 77830995	S3	234 83435402	S8		
149 75746702	S3	329 77830998	S6	236 83435501	S8		



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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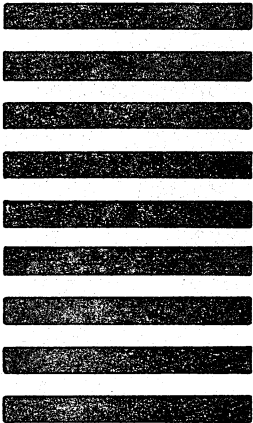
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