77614903

CONTROL DATA CORPORATION

CONTROL DATA®
FLEXIBLE DISK DRIVE
MODEL 9406

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

MAGNETIC PERIPHERALS INC.
a subsidiary of
CONTROL DATA CORPORATION

HARDWARE MAINTENANCE MANUAL

REVISION RECORD

REV	DATE	TABLE OF CONTENTS SHEETS AFFECTED	MANUAL/SECTION REVISION STATUS 1	2	3	4	5	6	7	8	9	10	11	12	CHANGE AUTHORITY
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W	80 JM JUN 13	ii	T	T	V	T	V	T	B	J	T				PL 20442
X	80 TM JUL 24	ii	T	T	V	T	X	T	B	J	T				PL 20462
Y	80 AUG 5	ii	T	T	V	T	Y	T	B	J	T				PL 20464
Z	80 SW OCT 20	ii	T	T	V	T	Y	Z	B	K	T				PL 20482
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AF	81 AUG 13 S. Wise	ii	T	T	V	T	AE	AC	B	M	T				PL 20590
AG	81 SEP 23 S. Wise	ii	T	T	V	T	AE	AG	B	M	T				PL 20638
AH	81 Pub DEC 3	ii	T	T	V	T	AE	AG	B	N	T				PL 20672
AJ	81 Pub DEC 21	ii	T	AJ	V	T	AE	AG	B	N	T				PL 20684
AK	82 Pub Jan 26	ii	T	AJ	V	T	AE	AG	B	P	T				PL 20728
AL	82 MAY Pub 10	ii	T	AJ	V	T	AL	AL	B	P	T				PL 20753
AM	82 Pub JUN 8	ii	T	AJ	V	T	AL	AL	B	P	AM				PL 20764

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PREFACE

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

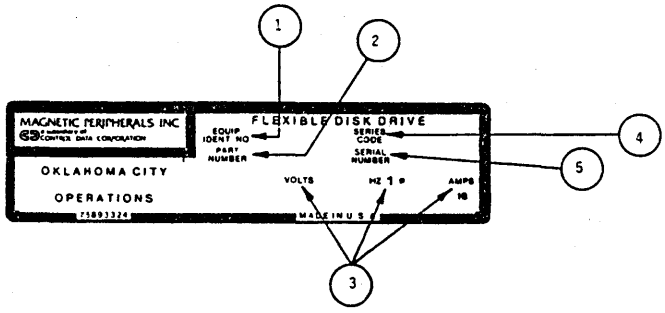
The total content of the manual is comprised of two publications, each having a unique publication number, and is contained in one volume. The Manual's publication number (77614903) is that of the front matter, sections one through seven, and section nine. This number should be used when making reference to the Flexible Disk Drive Hardware Reference Maintenance Manual.

This manual applies to several models of the FDD. A configurator sheet is provided on the following page which describes each FDD configuration that this manual will support. Refer to the equipment nameplate located on the right hand side of the unit (as viewed from the front) to determine the appropriate Hardware Product Configurator (HPC) and Equipment number. Then use the Configurator sheet as a starting point to establish the maintenance level for the device. Section VIII Parts Data is identified by the unique Publication number 75888344.

EMI NOTICE

NOTICE: This equipment has been designed as a component to high standards of design and construction. The product, however, must depend on receiving adequate power and environment from its host equipment in order to obtain optimum operation and to comply with applicable industry and governmental regulations. Special attention must be given by the host manufacturers in the areas of safety, power distribution, grounding, shielding, audible noise control, and temperature regulation of the device to insure specified performance and compliance with all applicable regulations. This equipment is a component supplied without its final enclosure and therefore is not subject to standards imposed by FCC Rules for Electro-Magnetic Interference (EMI). Federal Docket 20780/FCC 80-148 Part 15.

FLEXIBLE DISK DRIVE CONFIGURATOR SHEET



1. EQUIPMENT IDENTIFICATION NO./ HARDWARE PRODUCT CONFIGURATOR (HPC)
2. HARDWARE PRODUCT CONFIGURATOR (HPC)
3. AC POWER REQUIRED (ON UNITS LABELED 50/60 HZ, CHECK CONFIGURATION OF SPINDLE-MOTOR PULLEY FOR FREQUENCY).
4. EQUIPMENT STATUS NUMBER
5. UNIT SERIAL NUMBER

(Z204a)

		HPC 77618xxx																		
OPTION CHART		000	001	002	003	004	005	015	016	018	019	028	029	033	039	040	041	051	053	054
CIRCUIT BD. CONFIG. ⚠1		1	1	2	3	3	3	4	4	2	5	3	5	6	3	3	3	3	7	2
HOUR METER																				
WRITE PROTECT (INH WRT)					X	X	X					X			X	X	X	X	X	X
WRITE PROTECT (NOT INH WRT)		X	X	X				X	X	X	X		X	X						
DATA CLOCK SEPARATION																				
SECTOR SEPARATION																				
UNIT SELECT (HIGH)				X						X										
UNIT SELECT (LOW)		X	X					X	X		X		X	X						
READY		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DOOR UNLOCK (WITH POWER)																				
DOOR UNLOCK (WITHOUT POWER)								X	X					X						
WRITE FAULT		X	X	X	X	X	X			X	X	X	X		X	X	X	X	X	X
WRITE DATA INVERT																				
INDEX SINGLE SIDED		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DISKETTE IN PLACE																				
EXTERNAL ERASE ENABLE																				
HEAD LOAD WITH UNIT SELECT																				
ACTIVITY LED (UNIT SELECT)											X		X							
ACTIVITY LED (HEAD LOADED)					X	X	X					X			X	X	X	X	X	X
ACTIVITY LED (DOOR IS LOCKED)																				
ACTIVITY LED (DOOR IS UNLOCKED)																				
STEP IN/OUT																				
INTERFACE CONNECTOR TYPE ⚠2		A	A	A	C	C	C	A	A	A	A	C	A	A	C	C	C	C	C	C
WRITE PROTECT FAULT					X	X	X					X								
DAISY-CHAIN INTERFACE		X	X	X				X	X	X	X	X			X	X	X	X	X	X
STANDARD INTERFACE					X	X	X					X	X	X						
POWER REQ	VDC +5 & +24 AT J4 ⚠3	X	X	X				X	X	X	X		X	X						
	VDC +5 & +24 AT I/O J1 ⚠3				X	X	X					X			X	X	X	X	X	X
	VAC 240, 1Ø						X										X			
	VAC 220, 1Ø		X	X		X		X	X	X			X			X		X	X	
	VAC 120, 1Ø	X			X						X	X		X	X					X
	VAC 100, 1Ø																			

(FF005)

NOTES: ⚠1 CIRCUIT BOARD P/Ns ARE AS FOLLOWS:
1 = 77615301
2 = 77615352
3 = 77630751 or 77615401
4 = 77618931
5 = 77632401
6 = 77649151
7 = 77666400 or 77667400

⚠2 SEE FIGURE 5-3.
⚠3 SEE FIGURE 5-2.

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GENERAL DESCRIPTION

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 enclosed in a sealed jacket. The unit is capable of hard-sector or soft-sector operation.

1.3 PRODUCT DESCRIPTION

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

The options include Write Protect, Sector Separation, Unit Select, Ready, Door Unlock, Write Fault, and Hour Meter.

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 continously 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 kg).

1.3.2 ELECTRICAL DESCRIPTION

The electrical specifications for the equipment are as follows:

- DC Power Source (Supplied by Host Equipment)

  +24 volts (+10%) @ 0.1 A (average when deselected)
  1.4 A (average when seeking)

  + 5 volts (+ 5%) @ 1.1 A (average current quiesent state)

- AC Power Source - Refer to the FDD configurator or FDD nameplate to determine AC power requirements.

1.3.3 PERFORMANCE CHARACTERISTICS

The equipment specifications for the FDD are as follows:

- ACCESSING TIME

Maximum Access Time	248 ms
Maximum One-Track Access Time	23 ms
Average Access Time	96 ms

- RECORDING

Mode Density (nominal)	Double Frequency	MFM	Track
Head 0	1836 BPI (72 BPmm)	3672 BPI (145 BPmm)	Outer
	3268 BPI (129 BPmm)	6536 BPI (257 BPmm)	Inner
Head 1	1879 BPI (74 BPmm)	3758 BPI (148 BPmm)	Outer
	3408 BPI (134 BPmm)	6816 BPI (268 BPmm)	Inner
Data Transfer Rate	249, 984 bits/sec	499, 968 bits/sec	
Bits/Byte	8	8	
Bits/Track	41, 664	83, 328	
Tracks/Surface	77	77	
Sectors	Format Determined	Format Determined	

- DATA CAPACITY

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

- FLEXIBLE DISKETTE (Optional)

	CDC 421 Single-Sided, Single-Density
	CDC 423 Single-Sided, Double-Density
	CDC 425 Double-Sided, Double-Density
Diskette Dimensions	8 x 8 inches (203.2 x 203.2 mm) (including jacket)
Useable Diskette Recording Surfaces	2
Diskette Surface Diameter	7.88 in. (200.1 mm)
Recording Radii (Nominal)	
Head 0	Track 76 2.0290 in. (51.5 mm) Inner
	Track 00 3.6123 in. (91.8 mm) Outer
Head 1	Track 76 1.9457 in. (49.4 mm) Inner
	Track 00 3.5290 in. (89.6 mm) Outer
Diskette Surface Coating	Magnetic Oxide
Diskette Velocity	360 r/min

- READ/WRITE HEADS

Heads/Unit	2	
Track Width	0.013 in.	(0.33 mm)
Track Spacing	0.02083 in.	(0.529 mm)
Erase to Read/Write Gap	0.036 in.	(0.914 mm).

OPERATION

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 and sets the ejector mechanism.
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 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.

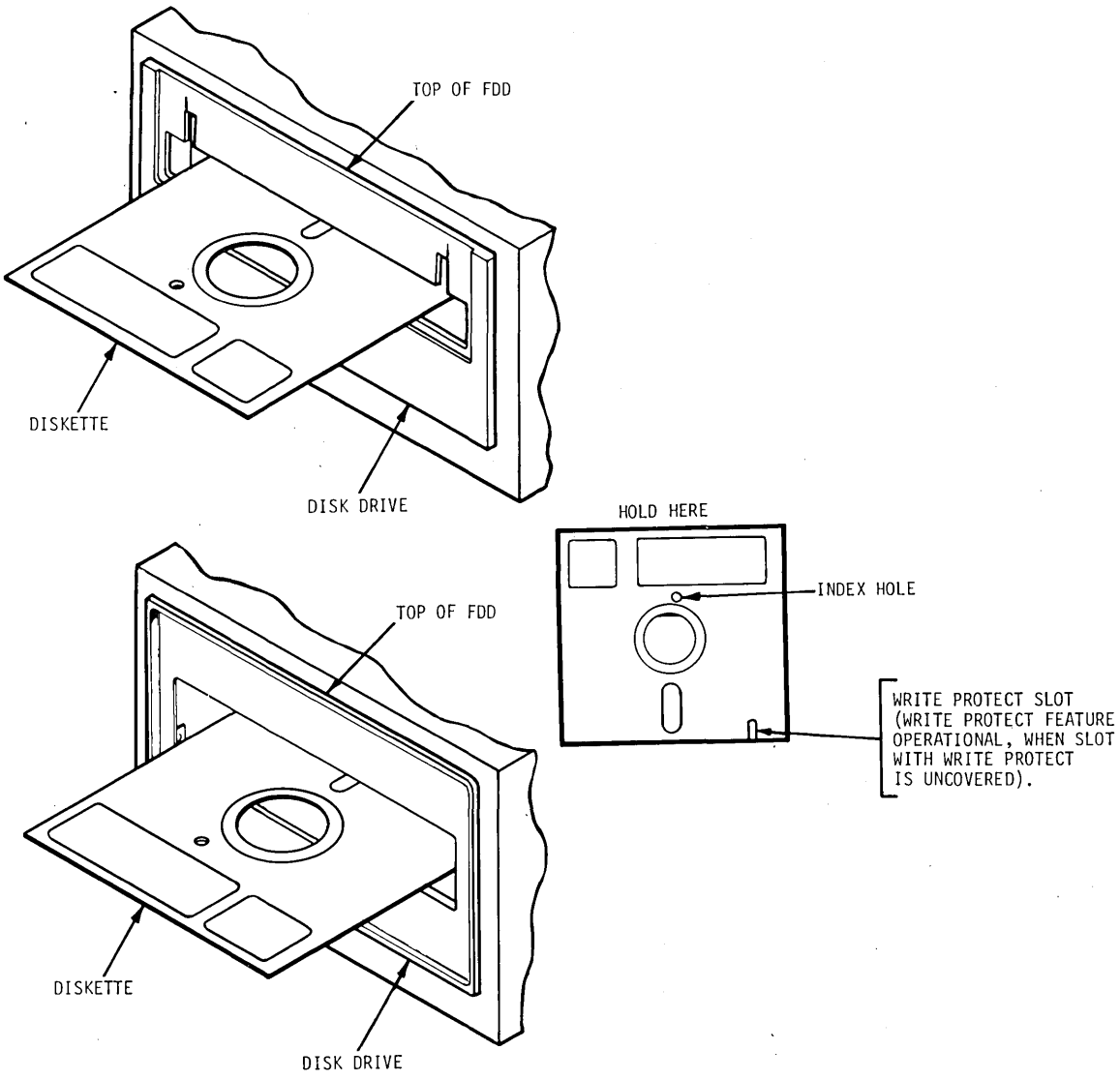


Figure 2-1. Diskette Installation

2.3.3 READ ERROR

In the event of a Read error, up to five attempts should be made to recover with re-reads. If after five attempts the data has not been recovered, retract the head to Track 00, reseek to the data track and attempt five additional rereads. 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.
j. Remove diskette before applying or removing power to the FDD.

INSTALLATION AND CHECKOUT

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. Remove blank head protective diskette from unit.

3.4 CABLING AND CONNECTIONS

Connect the AC cable, I/O cable, and DC cable if applicable between the FDD and host equipment. Adequate circuit protective devices must be provided by the host equipment to meet applicable safety standards.

3.4.1 INPUT-OUTPUT CABLE

The maximum cable length from connector to connector is 25 feet. The characteristic impedance typically is 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, 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-circuit board. Daisy-chain FDD models receive DC power (user-supplied) through a power cable which interfaces with its mating connector (J4) on the printed-circuit board. The pin assignments and line functions are shown on sheet 1 of the schematics, Figure 5-2. The mating connector is described in Figure 5-3.

3.4.3 AC POWER CONNECTION

The mating connector cable should consist 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 (6.6° 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).

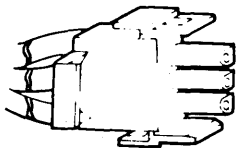
3.6 INITIAL CHECKOUT

This procedure should be used to determine that the 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. NOTE: Assure that the protective disk has been removed before applying power.
b. Apply DC power to unit.
c. For daisy-chain:
    1. Close one of the Unit Select switches (dipswitch position, 1, 2, 3, or 4) located on the circuit board.
    2. Close one of the Ready switches (dipswitch position 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 position 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 the command signals and power from the unit.
h. Remove diskette.

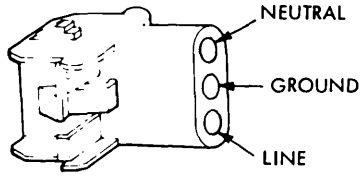
3.6.1 OPERATION FREQUENCY

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.



CABLE CONNECTOR
MATING PLUG

PLUG:
AMP PN 1-480700-0
MPI PN 83435302-1
CONTACTS: (SOCKET)
AMP PN 350536-1 (STRIP)
AMP PN 350550-1 (LOOSE)
MPI PN 83435507-5



RECEPTICLE ON
FDD ASSEMBLY

RECEPTICLE:
AMP PN 1-480701-0
MPI PN 83435402-8
CONTACTS: (PIN)
AMP PN 350547-1 (LOOSE)
AMP PN 350218-1 (STRIP)
MPI PN 83435501-8 (STRIP)

X259a

Figure 3-1. AC Cable Assembly

THEORY OF OPERATION

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 heads 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.

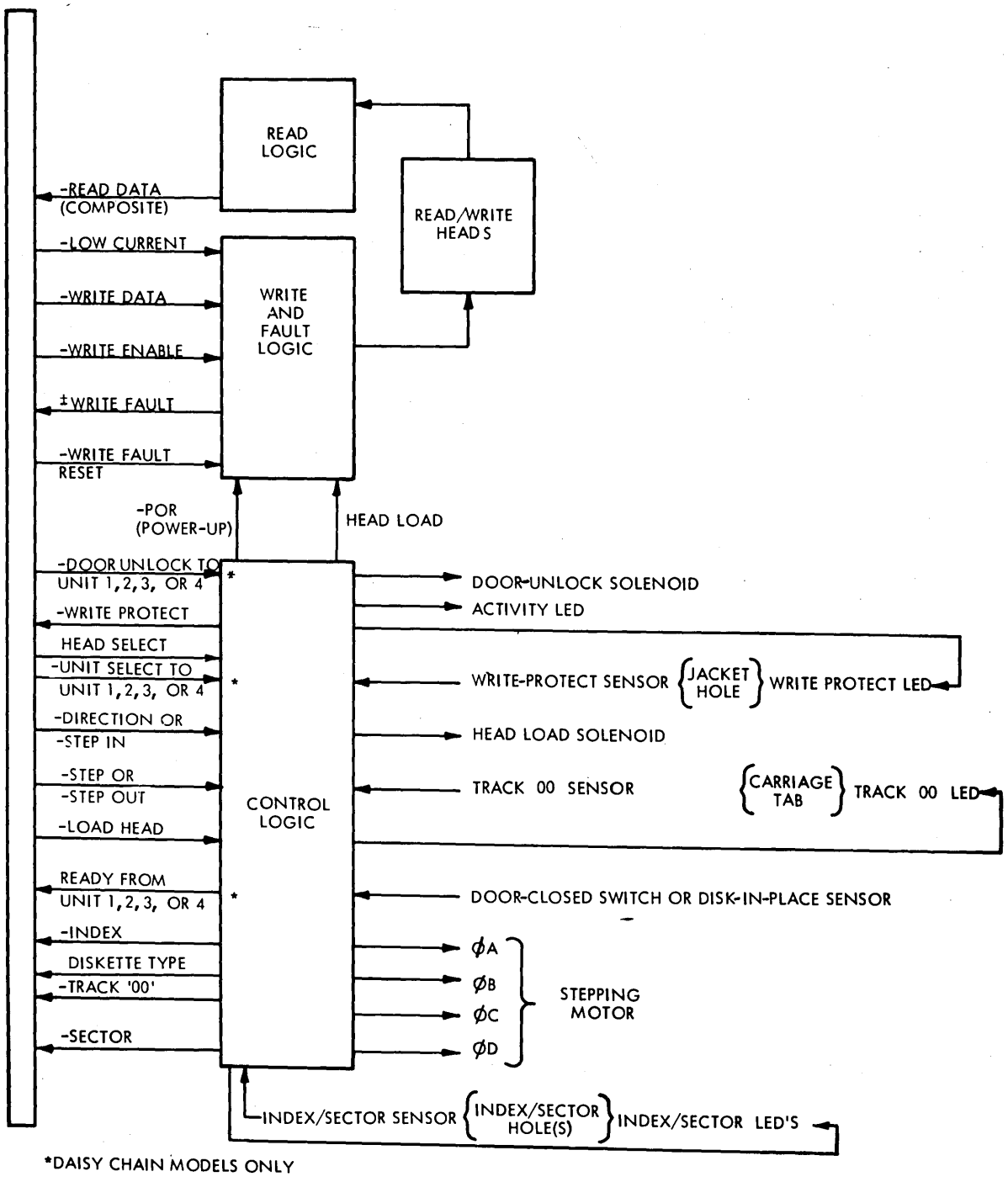
4.2 GENERAL DESCRIPTION

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 heads 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. 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 Head Select, Write Enable, 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 condition, the FDD will transmit Composite Read Data signals to the controller. Controller Step and Direction commands are received initiating a track-seek operation on a selected FDD. The FDD transmits Index and Sector pulses as long as it selected. Also, the selected FDD transmits a Track 00 signal to the controller whenever the Read/Write heads are at Track 00.

Positioning of the carriage-mounted Read/Write heads is accomplished by a band-driven stepper motor. Each step command from the user system increments the stepper motor which, in turn, moves the band. The band increments the Read/Write heads one track position for each step command.



X259b

Figure 4-1. Functional Block Diagram

A reading or writing operation begins by placing the Read/Write heads in contact with the diskette with a Head-Load command and at the desired track. To write on the diskette, 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 on the desired diskette 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 diskette, magnetized bits in the format of the pre-recorded data are sensed by the Read/Write heads. This signal is amplified, digitized and transmitted to the user system.

4.3 FUNCTIONAL DESCRIPTION

Refer to Figure 4-1, 5-1, and the Schematic Diagram (Section 5) for the following discussion.

The FDD is divided into the following major functional areas:

a. Control Logic
b. Write and Fault Logic
c. Stepper Control
d. Read Logic
e. Diskette Drive
f. Read/Write Head
g. Index
h. Door Unlock
i. Unit Select

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 heads in or out upon selection and command of the controller, (c) load the heads on the diskette for read/write operations, (d) protect the diskette 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-selected control lines, (h) unit selection of the FDD, (i) select head 0 or 1 for Read/Write operation.

a. The Ready signal is generated when the diskette comes up to proper operating speed. The Index pulses are used to re-trigger the multivibrator (U16 pin 10). 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 U16 pin 10. This logic function is used to control the R/S flip flop U20 to generate the Ready signal. Jumper W30 or DIP switch S2 (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 U10 and U20 are asynchronously reset through the action of comparator U4. At the instant the 5 V appears, U4 pin 7 will go high, forcing pins 11 and 10 of U13 low, and forcing output pins 7 and 9 of U10 high and pin 8 of U20 high. As capacitor C6 is charged, U4 pin 7 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.

c. Each step command received initiates a step sequence that controls the stepper motor. Either the logic level of the Direction signal or the use of the Step-In or Step-Out signals determine whether the phase sequence is stepping in or out per Table 4-1.

Table 4-1. Phase Sequence of Stepper Motor

Change the Active Ø		To Step One Track
From	To	
A	A+B	IN
A+B	B	
B	B+C	
B+C	C	
A	A+D	OUT
A+D	D	
D	C+D	
C+D	C	

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, C, and D is provided by logic-driven Darlington transistors Q2, 3, 4, and 5. Step information is decoded by the programmed ROM (Read-Only Memory) U24 and is used to control the driver transistors. The ROM is controlled by the start-stop sequence generator, U21 pin 7, U28 pin 8, U31 pin 6, U13 pin 12, U10 pin 12, U13 pin 4 and U15 pin 6. The circuit at U28 pin 8 produces a pulse for each trailing edge of U21 pin 6&7. The circuits at U13 pin 4 and U15 pin 6 produce a pulse for each edge change on the input. The sequence generator is started by step pulses from U5 pin 7. It is stopped after the proper sequence by U24 pin 5 shaped by U34 pin 10 and U36 pin 2. The timing of U21 pin 6 controls the speed of the sequence generator and is nominally set at 0.5 ms.

One-shot U25 pin 10 is continuously being retriggered by the step pulse and times out on the last pulse. One-shot U25 pin 10 controls how long +24 volts will be applied to the stepper motor. One-shot U29 pin 9 is triggered by the last step information and is used to control settling time. It triggers U25 pin 6 to reapply +24 volts to the stepper motor for position accuracy. One-shot U29 pin 6 determines

the duration of the reverse step damping. Power on reset will cause the stepper motor to sequence to ØA by resetting U10.

d. The Read/Write heads 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 arms to load the heads against the diskette surface.

   The head is loaded by energizing the solenoid through R83 which slows down the pull-in of the solenoid. After a delay, full current is applied to the solenoid through Q8.

e. 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 slot in the jacket of the diskette will cause pin 14 of comparator U32 to to be driven high. This signal is gated with Unit Select and Write Enable to inhibit writing on any diskette possessing a write-protect slot.

f. Track 00 signal is generated when the carriage assembly tab is sensed by the Track 00 optical switch. Closing this switch causes U32 pin 13 to switch low assisted by hysteresis. The output of U13 (pin 2) is gated with ØA, Unit Select, and Step Out direction to provide the Track 00 signal that is transmitted to the controller from U23 pin 3.

g. The beginning of each diskette track is indicated by an Index pulse. The diskette rotates between a light source (LED) and a sensor (photo transistor). When the Index hole in the diskette 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.

   The unit has two Index detectors, one for two-sided diskettes and one for single-sided diskettes. Latch U6 pin 3 and U6 pin 6 determine the type of diskette involved. U6 pin 6 is set low for a two-sided diskette and high for a single-sided diskette. This signal is gated with Unit Select and sent to the interface by U23 pin 6.

   Two-sided and single-sided Index is gated at U9 pins 1 and 2 and is provided to U5 pin 12 for shaping.

   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 U21. 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.

h. 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 gated with Unit Select. The four unlock positions of dipswitch S2 are 13, 14, 15, and 16.

i. 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 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 U11 pins 5 and 6), the Write-Data gate U33 pin 6, blocks the input to the read circuit by reverse-biasing diodes in U22, 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 R55 into the write current source. The current source U30 provides current to the emitters of the write transistors U30.

Head-Select signal when low selects head 0 by turning on U35 pin 14 causing its collector to be at +12 volts while U35 pin 8 is at ground. When the Head-Select signal goes high, it will cause U35 pin 14 to ground and U35 pin 8 to +12 volts selecting head 1. Q7 and U35 pin 7 control the +12 voltage with respect to loss of +5 control voltage.

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 U12. 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 heads are loaded on the diskette and Write Enable is not commanded. With Write Enable not commanded, the data blocking diodes U22 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 U18, filtered, differentiated by C22/R24 and C23/R25, amplified by U8, 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 C5. This results in a narrow negative pulse at U9 pin 11 which triggers a one microsecond retriggerable one-shot, U2 pin 9.

Flip flop U11 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 U2 pin 9. This appears as jitter in the clock for the flip flop whose data input, derived from redundant comparator U4 pin 12, has by that time stabilized.

Another slow-down capacitor, C27, causes a negative pulse to appear at the output of U9 pin 8 whenever the flip flop toggles. Although shifted in time by approximately the delay of one-shot U2 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 U9 pin 8, which is due to noise at the zero crossings, will not affect the 250-ns composite-data pulse width.

4.3.4 DISKETTE DRIVE

Diskette drive is accomplished by clamping the diskette between the cone assembly and a belt-driven spindle. The spindle is rotated at 360 r/min by the diskette drive motor. A dual pulley permits 50 or 60 Hz operation without a motor change.

4.3.5 READ/WRITE HEADS

The Read/Write heads are in direct contact with the diskette during read or write operation. Head load is achieved by a solenoid-actuated bail allowing the head arms to load the Read/Write heads against the diskette. The head surfaces are 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 intra-track area to improve off-track signal-to-noise ratio and permit diskette interchange between units.

4.4 CONTROL AND DATA LINE CHARACTERISTICS

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

4.4.1 LOGIC LEVELS

The following definitions will be used throughout this manual:

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

4.4.2 TRANSMITTER CHARACTERISTICS

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

4.4.3 LINE-RECEIVER CHARACTERISTICS

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

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.

SIGNAL	FUNCTION
INPUT LINES	
-STEP **	A 10 microsecond (minimum) logic 1 level pulse on this line causes the head to move one track as determinded by the direction line.
-DIRECTION **	A logic 1 level on this line and step pulse causes the head to move one track inward toward the center of the diskette. A logic 0 level on this line and step pulse causes the head to move one track outward from the center of the diskette.
-STEP IN **	A 10 microsecond (minimum) logic 1 level pulse on this line causes the head to move one track inward from the center of the diskette.
-STEP OUT **	A 10 microsecond (minimum) logic 1 level pulse on this line causes the head to move one track outward from the center of the diskette.
-HEAD LOAD	A logic 1 level on this line loads the heads against the diskette.

**Only one pair of signals per FDD.

Table 4-2. Input/Output Lines

Table 4-2. (continued)

SIGNAL	FUNCTION
INPUT LINES	
-WRITE ENABLE	To enable the FDD write driver, this line is held at a logic 1.
-WRITE FAULT RESET	A logic 1 level on this line clears the Write-Fault latch.
-WRITE DATA	This line contains the composite coded write clock and data information to the FDD. Information to be recorded on the diskette is derived from the transition of each pulse from logic 1 to logic 0 if W8 is present, or from logic 0 to logic 1 if W7 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 W24 and W26 present or a logic 0 level with W25 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.
HEAD SELECT	A high level on this line selects head 0 (lower diskette surface). A low selects head 1.
OUTPUT LINES	
-READY	A logic 1 level indicates that the door is closed and a diskette is rotating.
-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.

Table 4-2. (continued)

SIGNAL	FUNCTION
OUTPUT LINES	
-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.
+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.
-TRACK 00	A logic 1 level indicates that the head is positioned over Track 00.
-WRITE PROTECT	Logic 1 level indicates that the slot on the diskette is uncovered.
-READ DATA (Composite)	This line contains the unseparated data and clock information.
DISKETTE TYPE	This line is low for a two-sided diskette and high for a single-sided diskette.

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

			HPC 77618xxx																	
OPTION CHART			000	001	002	003	004	005	015	016	018	019	028	029	033	039	040	041	051	053	054
CIRCUIT BD. CONFIG. ⚠1			1	1	2	3	3	3	4	4	2	5	3	5	6	3	3	3	3	7	2
HOUR METER																					
WRITE PROTECT (INH WRT)						X	X	X	-				X			X	X	X	X	X	X
WRITE PROTECT (NOT INH WRT)			X	X	X				X	X	X	X		X	X						
DATA CLOCK SEPARATION																					
SECTOR SEPARATION																					
UNIT SELECT (HIGH)					X						X										
UNIT SELECT (LOW)			X	X					X	X		X		X	X						
READY			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DOOR UNLOCK (WITH POWER)																					
DOOR UNLOCK (WITHOUT POWER)									X	X					X						
WRITE FAULT			X	X	X	X	X	X			X	X	X	X		X	X	X	X	X	X
WRITE DATA INVERT																					
INDEX SINGLE SIDED			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DISKETTE IN PLACE																					
EXTERNAL ERASE ENABLE																					
HEAD LOAD WITH UNIT SELECT																					
ACTIVITY LED (UNIT SELECT)												X		X							
ACTIVITY LED (HEAD LOADED)						X	X	X					X			X	X	X	X	X	X
ACTIVITY LED (DOOR IS LOCKED)																					
ACTIVITY LED (DOOR IS UNLOCKED)																					
STEP IN/OUT																					
INTERFACE CONNECTOR TYPE ⚠2			A	A	A	C	C	C	A	A	A	A	C	A	A	C	C	C	C	C	C
WRITE PROTECT FAULT						X	X	X					X								
DAISY-CHAIN INTERFACE			X	X	X				X	X	X	X	X			X	X	X	X	X	X
STANDARD INTERFACE						X	X	X					X	X	X						
POWER REQ	VDC	+5 & +24 AT J4 ⚠3	X	X	X				X	X	X	X		X	X						
		+5 & +24 AT I/O J1 ⚠3				X	X	X					X			X	X	X	X	X	X
	VAC	240, 1Ø						X										X			
		220, 1Ø		X	X		X		X	X	X			X			X		X	X	
		120, 1Ø	X			X						X	X		X	X					X
		100, 1Ø																			

(FF005)

NOTES: ⚠1 CIRCUIT BOARD P/Ns ARE AS FOLLOWS:
1 = 77615301
2 = 77615352
3 = 77630751 or 77615401
4 = 77618931
5 = 77632401
6 = 77649151
7 = 77666400 or 77667400

⚠2 SEE FIGURE 5-3.

⚠3 SEE FIGURE 5-2.

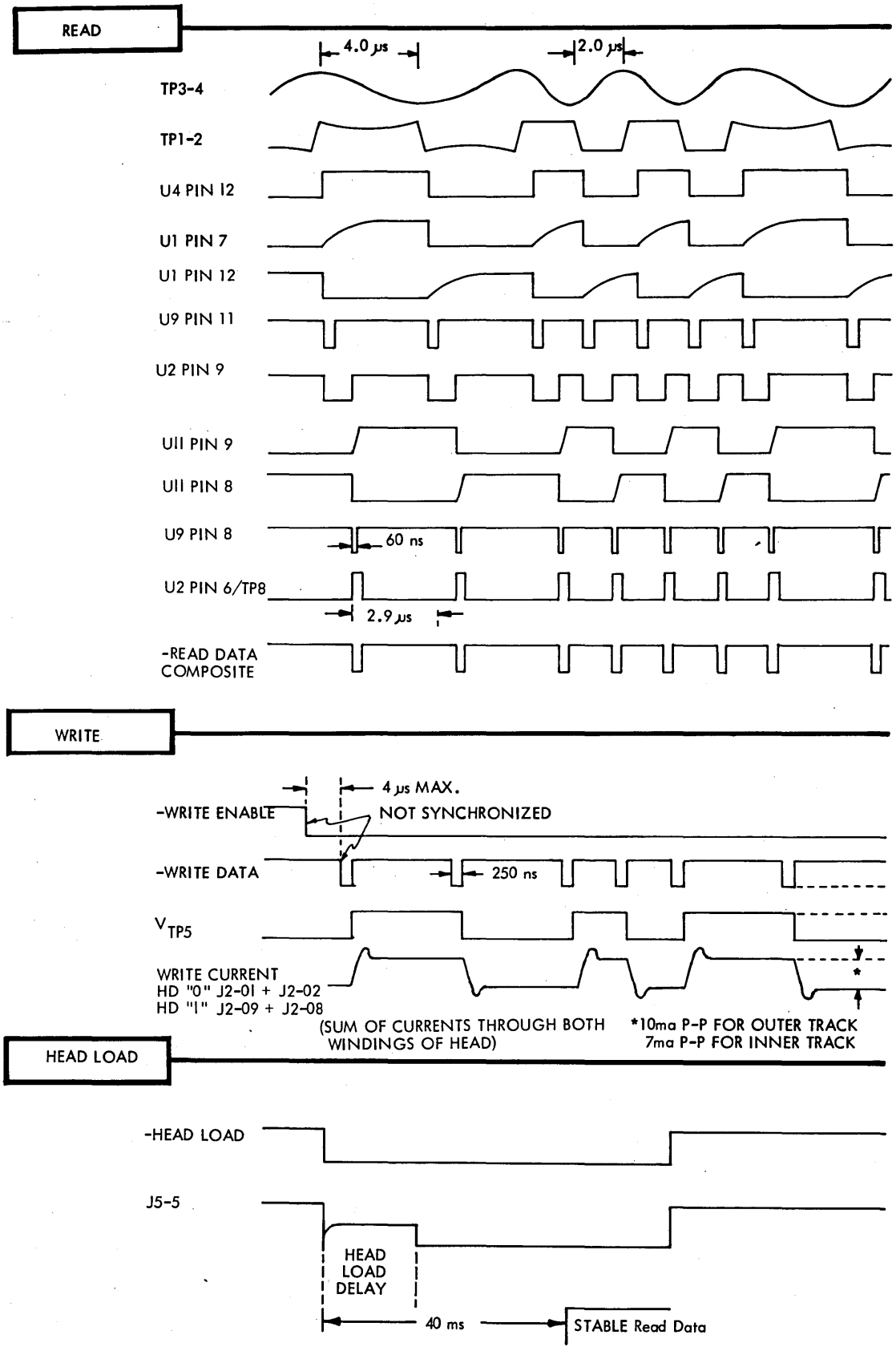
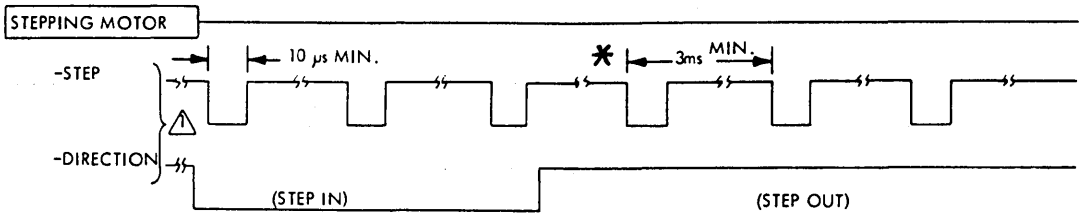


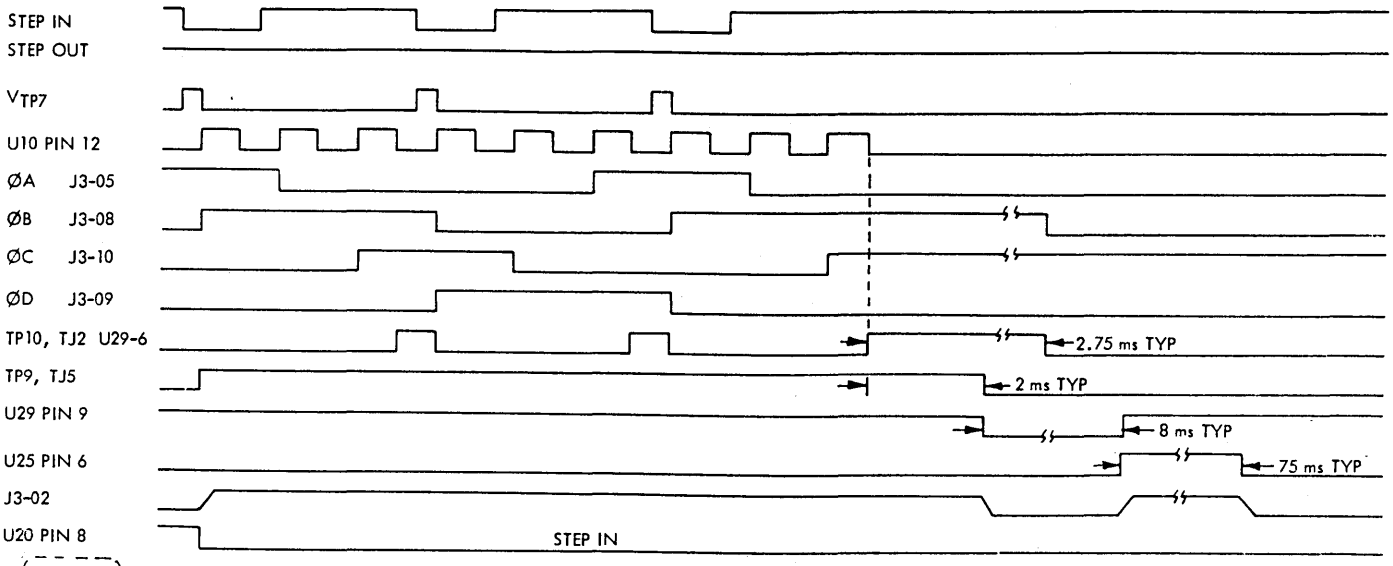
Figure 5-1a. Timing (Sheet 1 of 2)



*Change in direction time = settling time = 20 ms

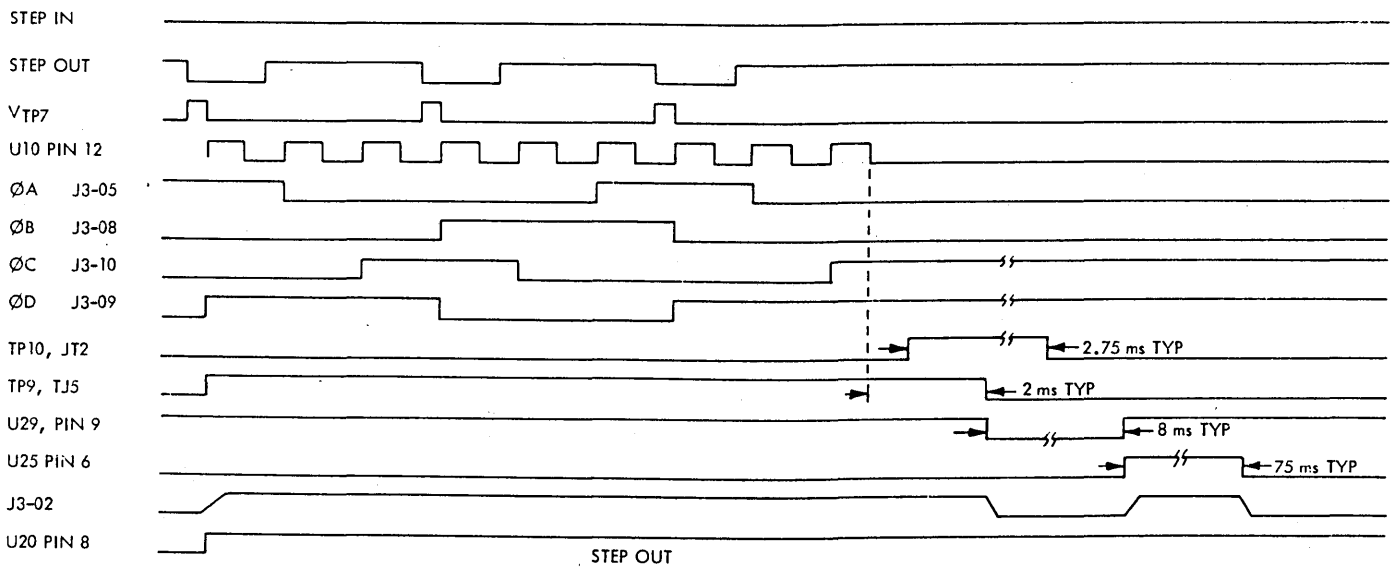
X258a

Figure 5-1b. Step/Direction Operation



XX183a

Figure 5-1c. Step-In Operation



XX183b

Figure 5-1d. Step-Out Operation (Sheet 2 of 2)

J1 PIN CONFIGURATION AND ASSEMBLY USAGE							
FUNCTION NAME	77615401 77630751	77615352 77618301 77632401	77618931 77649151	77667400 77666400			
- CLOCK SEPARATED	--	--	--	--			
- DIRECTION	38	14	14	14			
DISK TYPE	36	50	50	50			
DOOR UNLOCK - 1	--	--	--	42			
- DOOR UNLOCK - 2	--	--	--	48			
- DOOR UNLOCK - 3	--	--	--	--			
- DOOR UNLOCK - 4	--	--	--	--			
- ERASE ENABLE	--	--	--	--			
- HEAD LOAD	26	04	04	04			
HEAD SELECT	32	40	40	40			
- INDEX	28	08	08	08			
- LOW CURRENT	44	10	10	10			
- READ DATA COMPOSITE	34	02	02	02			
- READ DATA SEPARTED	--	--	--	--			
- READY - 1	12	28	28	28			
- READY - 2	--	30	30	30			
- READY - 3	--	32	32	32			
- READY - 4	--	34	34	34			
- SECTOR	--	--	--	--			
- STEP	46	12	12	12			
- TRACK 00	30	06	06	06			
- UNIT SELECT - 1	--	20	20	20			
- UNIT SELECT - 2	--	22	22	22			
- UNIT SELECT - 3	--	24	24	24			
- UNIT SELECT - 4	--	26	26	26			
- WRITE DATA	42	18	18	18			
- WRITE ENABLE	40	16	16	16			
- WRITE FAULT	--	44	44	44			
+ WRITE FAULT	50	--	--	--			
- WRITE FAULT RESET	48	46	46	46			
- WRITE PROTECT	24	36	36	36			
- STEP IN	--	--	--	--			
- STEP OUT	--	--	--	--			
2 - SIDED FDD	--	--	48	--			
GROUND	1-41 & 49ODD NO-ONLY EXC + 24V RET	1-41 & 49 ODD NO. ONLY	1-41 & 49 ODD NO. ONLY	1-41 & 49 ODD NO. ONLY			
+ 24 VOLT RETURN	17,19,21	--	--	--			
+ 24 VOLTS	18,20,22	--	--	--			
+ 5 VOLTS	2, 4, 6	--	--	--			

GG271

Figure 5-2. Schematics (Sheet 1 of 8)

ASSEMBLY NO.	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18
77615401				x				x	x		x	x		x	x	x		
77615352			x					x			x			x	x	x	x	x
77618301			x					x			x			x	x	x		x
77618931			x					x			x			x	x	x		x
77632401			x					x			x			x	x	x		x
77649151			x					x			x			x	x	x		x
77630751				x				x	x		x	x		x	x	x		
77666400			x		x			x			x			x	x	x		x
77667400			x		x			x			x			x	x	x		x

GG272a

ASSEMBLY NO.	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	
77615401				x	x		x		x			x			x	x		
77615352					x	x		x								x		
77618301					x		x									x		
77618931					x		x									x		
77632401		x			x		x									x		
77649151		x			x		x									x		
77630751				x	x		x		x			x			x	x		
77666400			x		x		x									x		
77667400			x		x		x									x		

GG272b

NOTES:

UNLESS OTHERWISE SPECIFIED:

1. RESISTOR VALUES ARE IN K-OHMS, 1/4W. 1%
2. CAPACITOR VALUES ARE IN MICRO-FARADS
3. SEE TABLE FOR J1 CONNECTOR PIN DESIGNATIONS ALL OTHER CONN NOS SHOWN IN BODY OF SCHEMATIC
4. DOTTED BOXES INDICATE OPTIONS
5. ONLY ONE (MECHANICAL OR OPTICAL) SWITCH IS USED PER FDD

Figure 5-2. Schematics (Sheet 2 of 8)

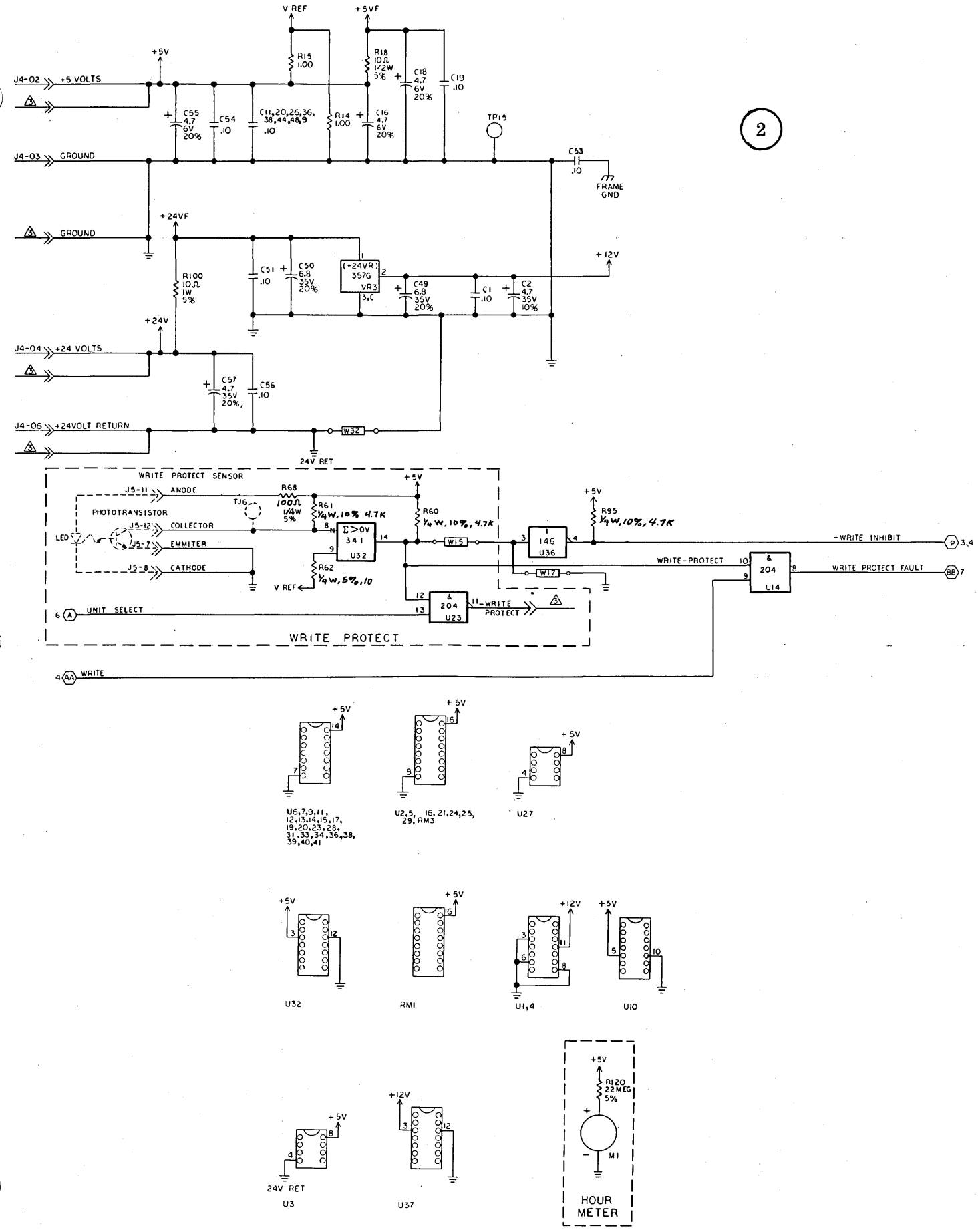


Figure 5-2. Schematics (Sheet 3 of 8)

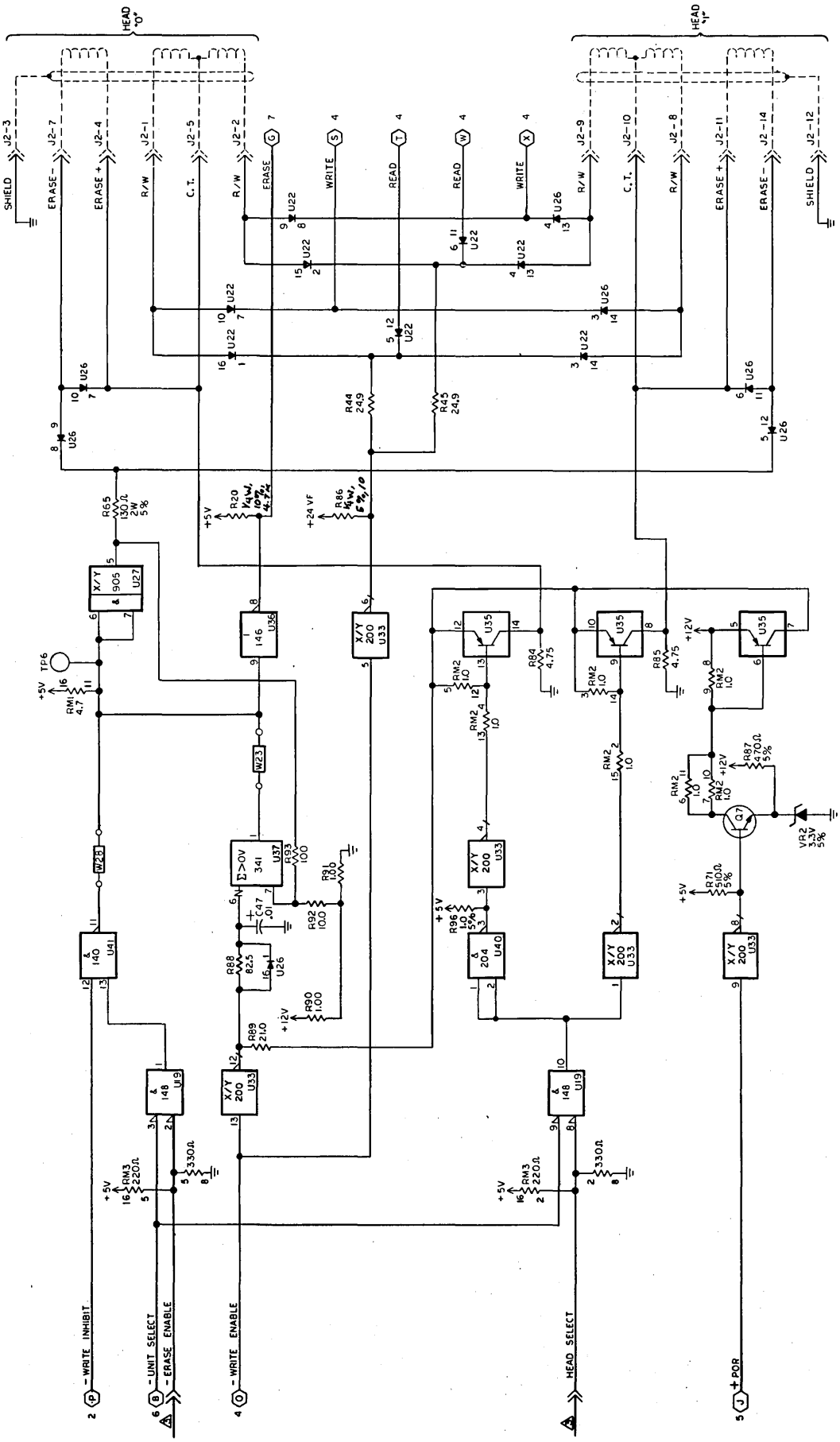


Figure 5-2. Schematics (Sheet 4 of 8)

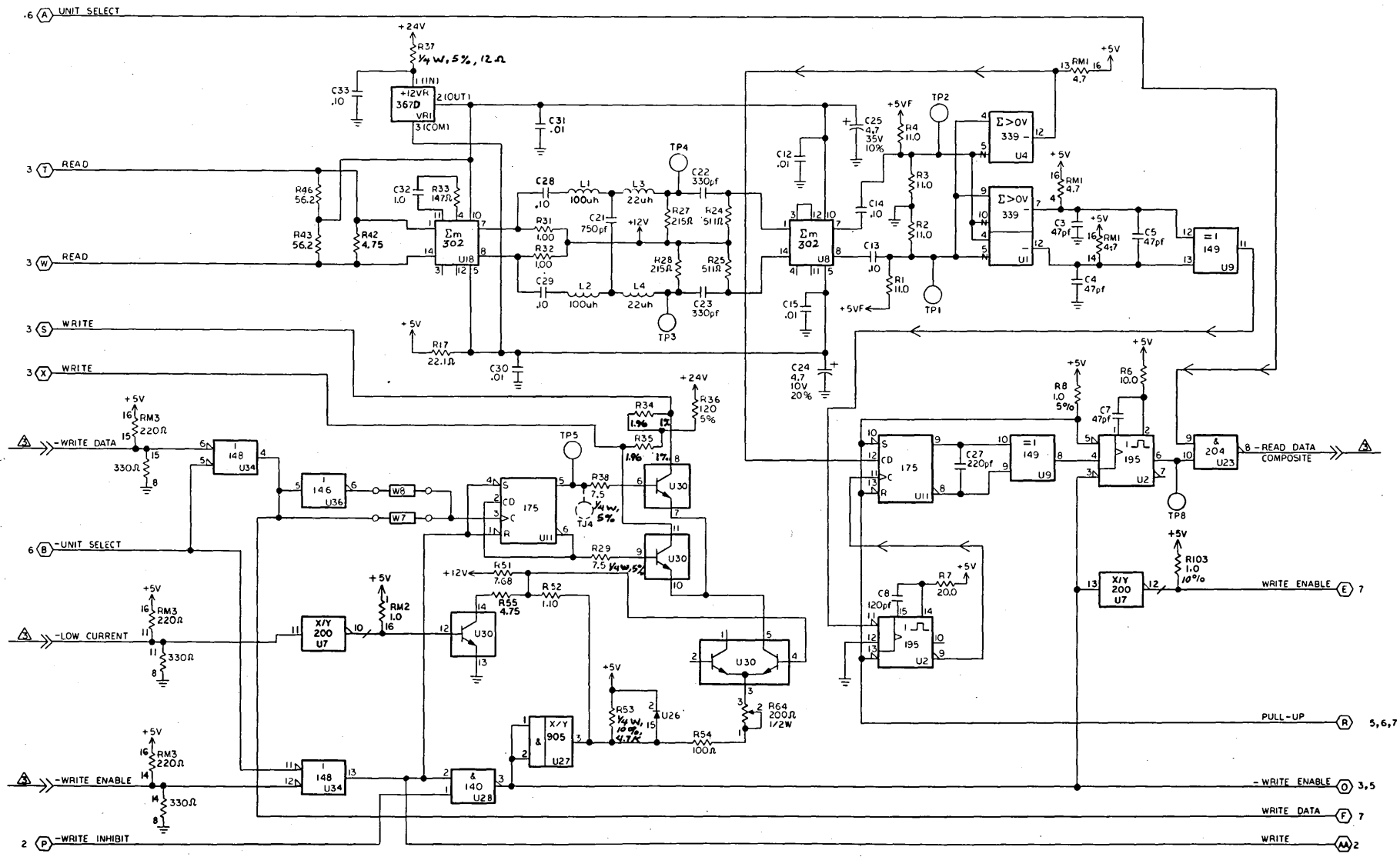


Figure 5-2. Schematics (Sheet 5 of 8)

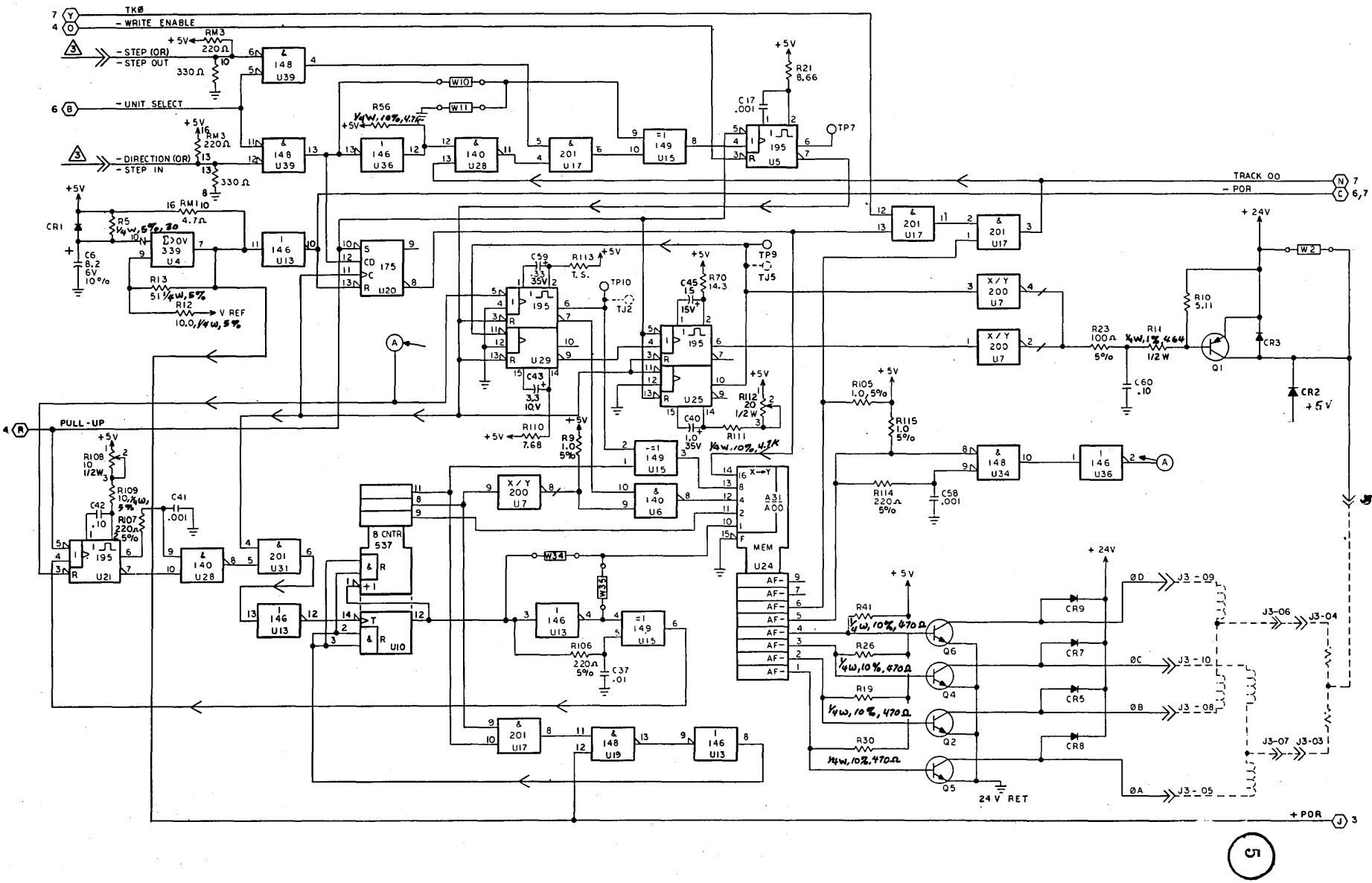


Figure 5-2. Schematics (Sheet 6 of 8)

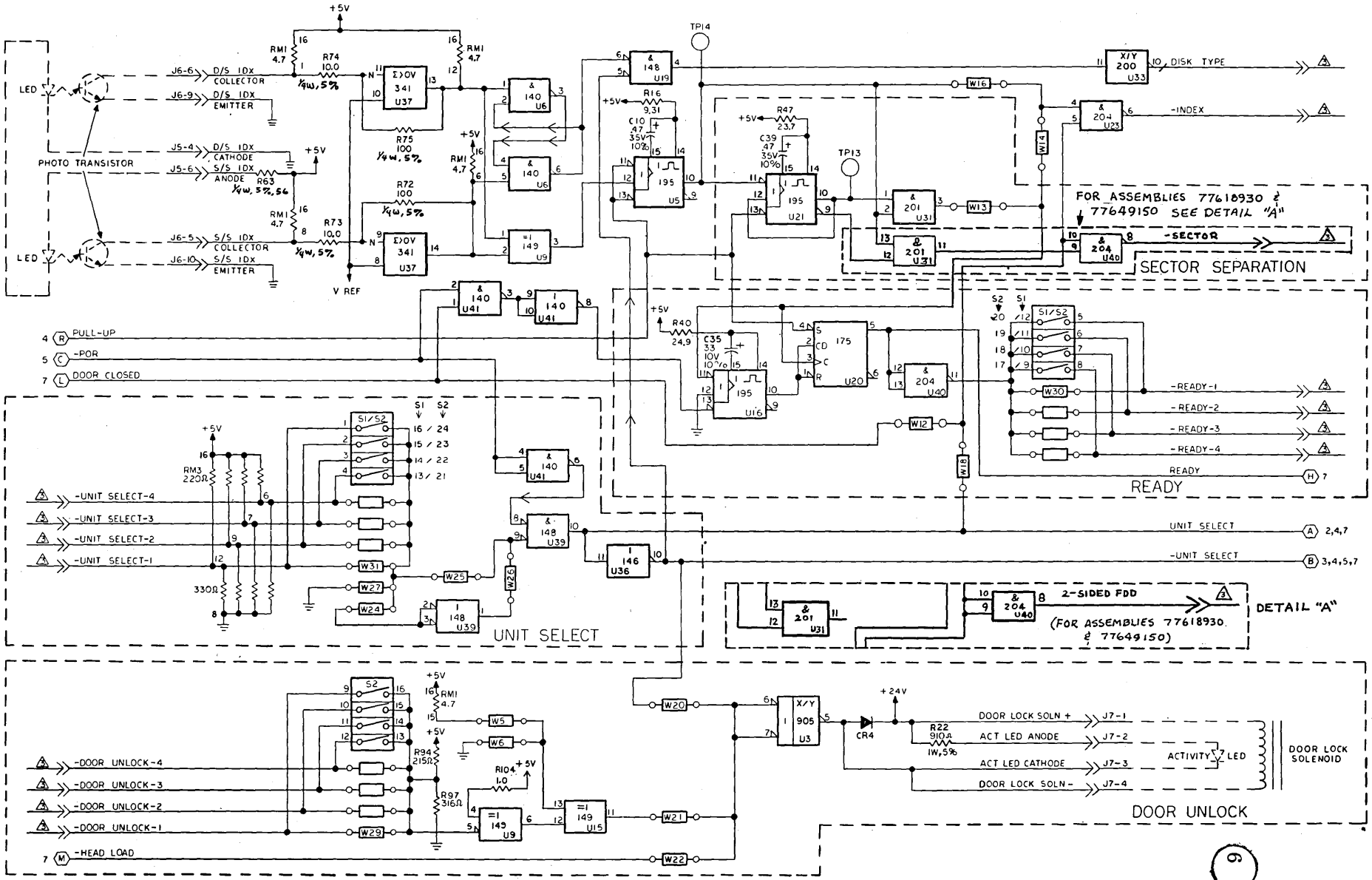


Figure 5-2. Schematics (Sheet 7 of 8)

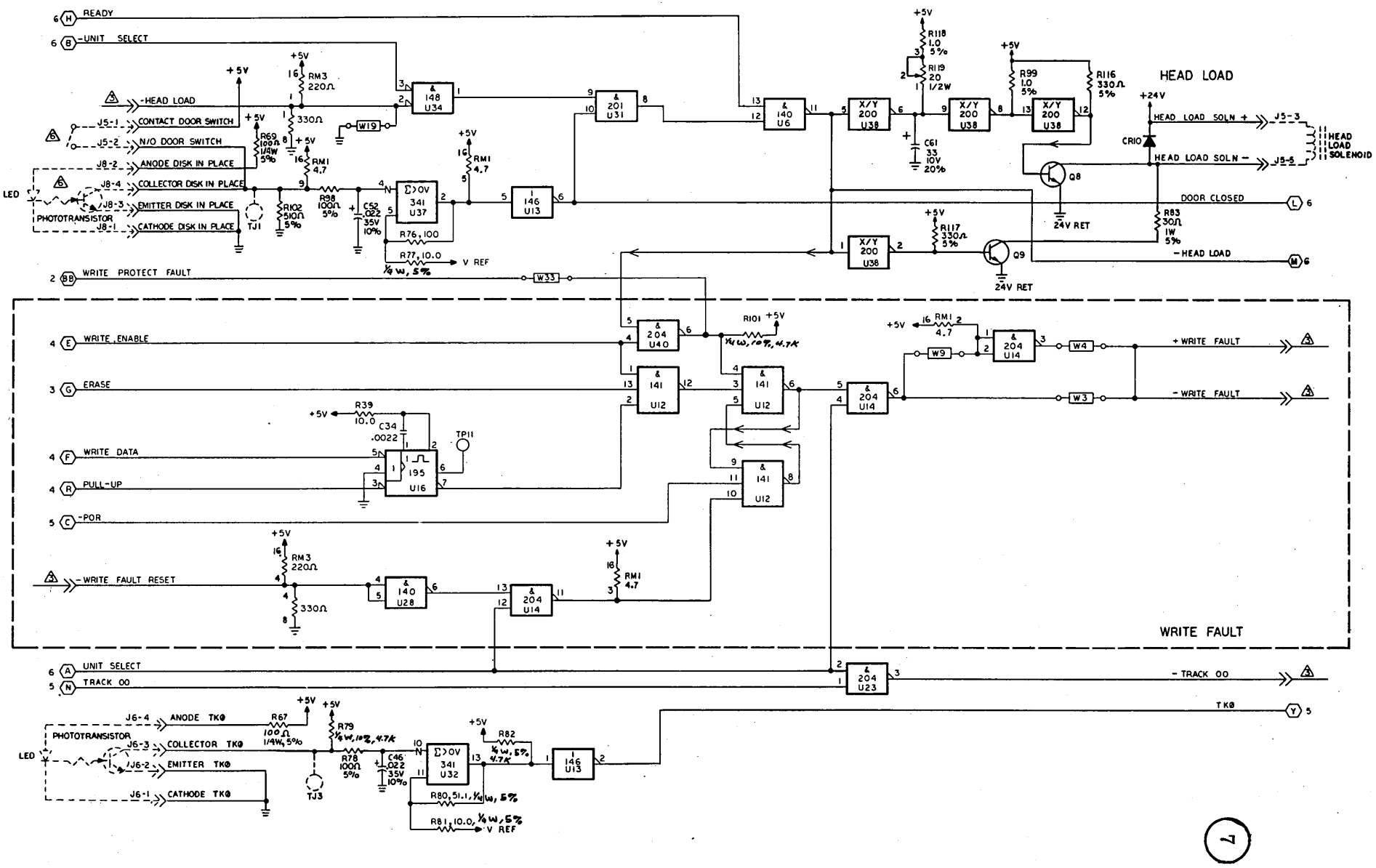
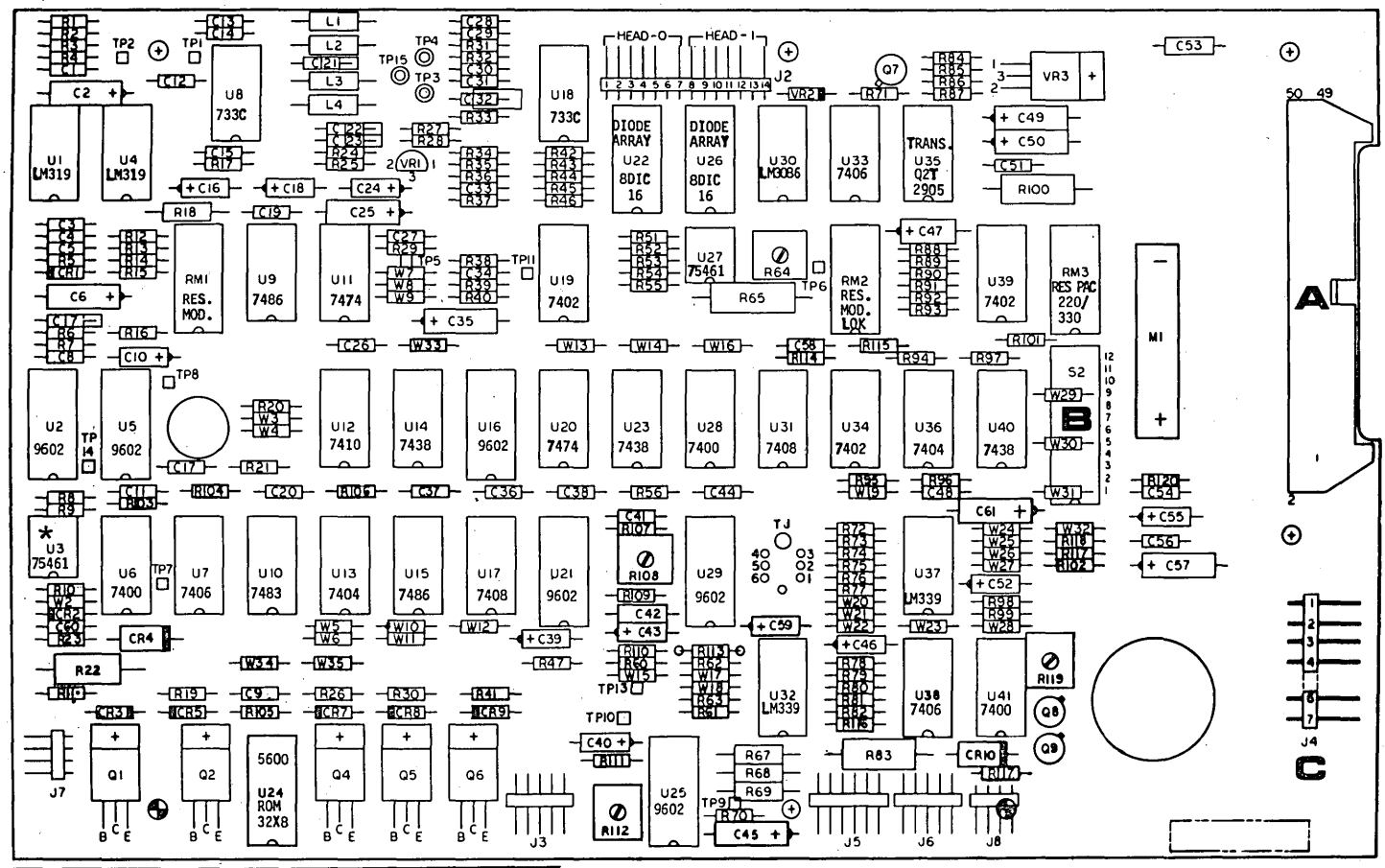


Figure 5-2. Schematics (Sheet 8 of 8)



INTERFACE CONNECTOR TYPE A

MATING CONN:
W/O STRAIN RELIEF
50 PIN 3M
P/N 3425-000
(CDC 95880003-9)
W STRAIN RELIEF
50 PIN 3M
P/N 3425-3000
ALTERNATE CONN
50 PIN AMP
P/N 86916-2

INTERFACE CONNECTOR TYPE C

MATING CONN:
HOUSING: AMP
1-583717-1
CONTACT: AMP
1-583649-4

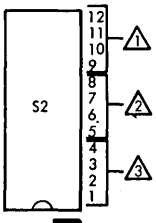
A A

TRANSISTORS:
Q1 - T1P125
Q2,Q4,Q5,Q6 - T1P120
Q7,Q8,Q9 - NPN

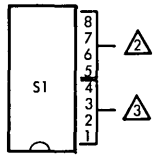
DIODES:
CR1 - 1N914A
CR2,CR3,CR5,CR7,CR8,
CR9,CR10 - 1N4001

*NOT USED ON SOME PWA CONFIGURATIONS.

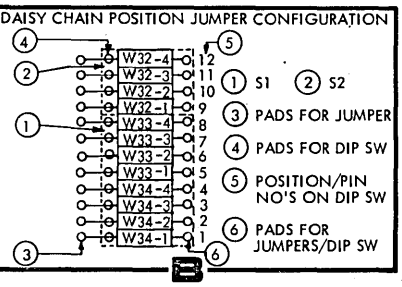
12 POSITION SWITCH



8 POSITION SWITCH



DAISY CHAIN POSITION JUMPER CONFIGURATION



B B B

MATING CONNECTOR:

- RECOMMENDED CONNECTOR
  AMP P/N 1-87270-1 HOUSING
  AMP P/N 87278-2 CONTACTS
- ALTERNATE CONNECTOR
  AMP P/N 3-87025-3
  HOUSING - (CDC 77830664-7)
  AMP P/N 87024-3
  CONTACTS - (CDC 77830663-9)
  AMP P/N 87116-1 KEYING
  POST - (CDC 77830660-5)

C

(ZZ265a)

1 UNLOCK
2 READY
3 UNIT SEL.

FIGURE 5-3. ASSEMBLY AND PARTS LIST (SHEET 1 OF 5)

MAINTENANCE

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:

DESCRIPTION	CDC MODEL NO.
Alignment Diskette (Single-Side, Optional)	421-51W
Alignment Diskette (Two-Sided)	425-51W

6.3 TROUBLESHOOTING

An improperly adjusted FDD may exhibit symptoms of one that has a malfunction; therefore, the Adjustment Procedures (paragraph 6.4) should be performed before assuming that the unit has failed. Before troubleshooting is started, check all DC supply voltages.

6.3.1 DC VOLTAGE AND SIGNAL CHECK

a. Input power should be +5VDC ±5% and +24VDC ±10% measured at the input to the FDD (refer to paragraph 3.4.2).

b. Test Points: The signals at the test points should conform to the various diagrams and waveforms as listed in Table 6-1.

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

Table 6-1. Test Points

Test Point No.	Refer to Fig. No.	Comments
1	5-1	Differentiated Analog
2	5-1	Read Data (Differential)
3	5-1, 6-2, 6-3	Analog Read Data
4	5-1, 6-2, 6-3	(Differential)
5	5-1, 6-4	Write flip flop
6	- - -	Not for Field Use*
7	5-1	Stepper One-Shot
8	5-1	+Composite Read Data
9	5-1	Stepper Steering Logic
10	5-1	Stepper Steering Logic
11	- - -	Not for Field Use**
12	- - -	Not Used
13	5-1	Sector One-Shot
14	5-1	Index/Sector
15		Ground

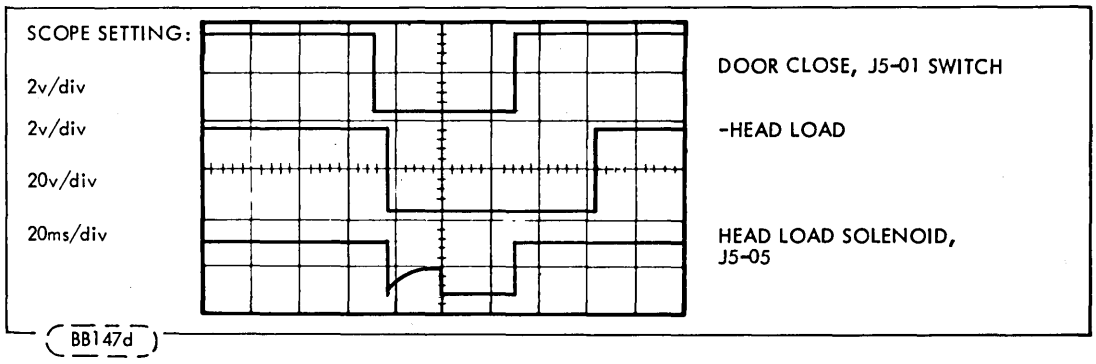


Figure 6-1. -Head-Load and Door-Close Switch

*Erase current should be 80mA 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.

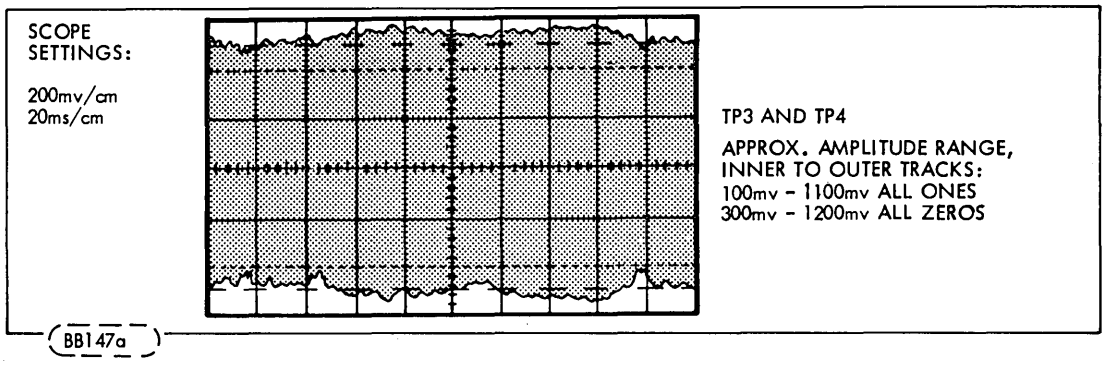


Figure 6-2. Differential Read Signal for Entire Track

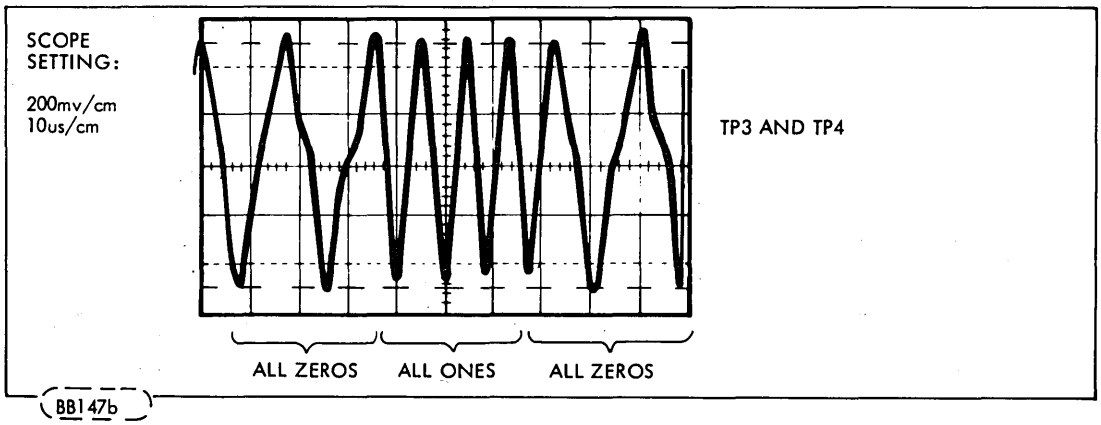


Figure 6-3. Differential Read Signal for Portion of Outer Track

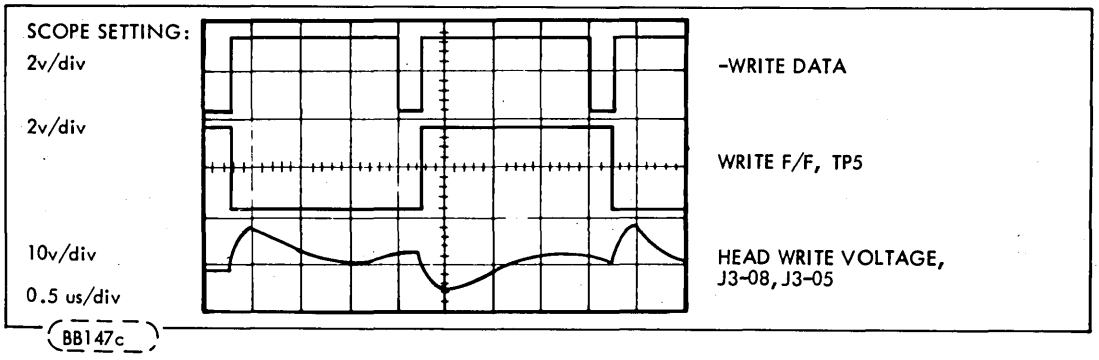


Figure 6-4. Write Data, Write F/F Output, and Head Write Voltage for Outer Track

6.4 ADJUSTMENT PROCEDURES

6.4.1 WRITE-SPLICE CHECK AND ADJUSTMENT

Alignment Diskette 421-51W and 425-51W are used to perform this procedure.

a. Precondition the alignment diskette 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 00, then seek to Track 01 and Read on head 0. (No data is recorded on Track 1.)

d. Connect Channel 2 of scope to TP3 on the PWA, Channel 1 to Index TP14 of the PWA. Set up the scope as follows:

Chan 2 Volt/Div to:	0.1 volt/div
Chan 1 Volt/Div to:	2 volt/div
Chan 2 voltage to:	AC
Chan 1 voltage to:	DC

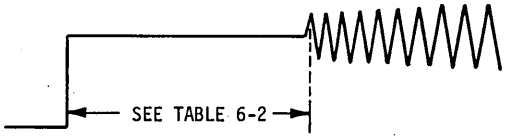
Vert. Mode to:	Add	Trig. Mode to:	Channel 1
Slope (Sync) to:	Pos.	Time Base to:	50 µs/div

e. Adjust the time of the write-splice bit until it measures per Table 6-3. Refer to Figure 6-5a to adjust the write Index-to-Burst time, loosen the single-sided sensor set screw holding the (single-sided-sensor) phototransistor located on the bottom of the chassis toward the front of the unit, (Figure 6-5b). Using the adjustment tab protruding through the casting, move the phototransistor until the specification is met. Tighten the set screw while observing the scope signal. Verify that the adjustment did not change.

f. 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 01 and perform a read. While observing the signal on the scope, remove and reinsert the diskette three times.

After each insertion, verify that the change in the time from Index to write splice is less than 50 µs.

Repeat Steps b through f using Alignment Diskette 425-51W for the two-sided sensor adjustment tab and its associated set screw, as required.



ZZ164a

Figure 6-5a1.

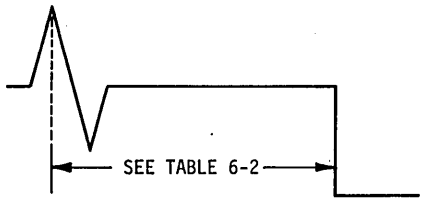


Figure 6-5a2.

Write-Splice Timing

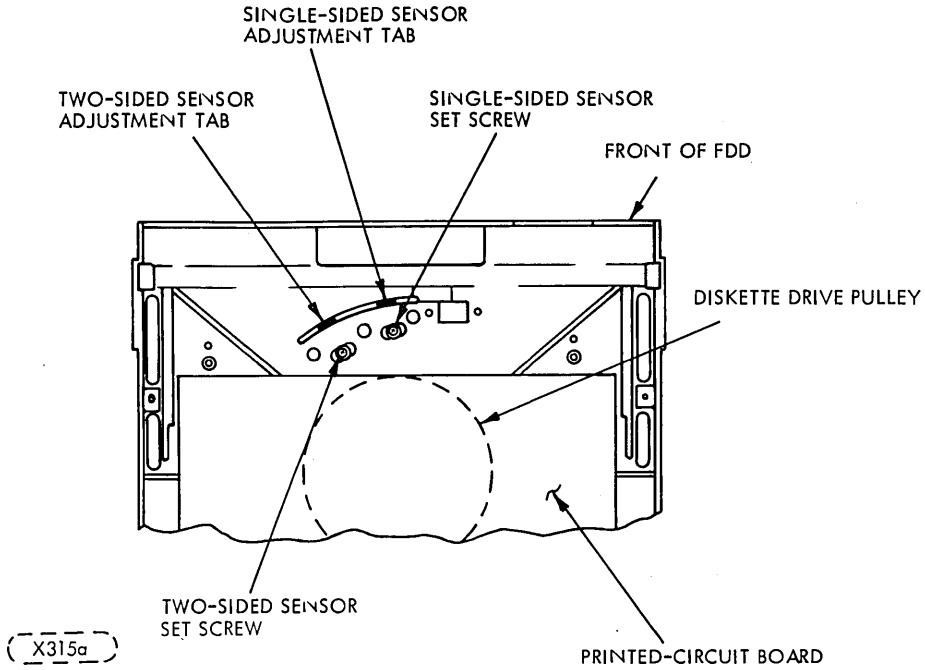


Figure 6-5b. Single- and Two-Sided Sensor Adjustment Means

Table 6-2. Write-Splice Adjustment

HPC. REF. NO.	WRITE SPLICE ADJ. (µs) 2 SIDED SENSOR		WRITE SPLICE ADJ. (µs) 1 SIDED SENSOR	
	Time	Figure	Time	Figure
77618003	200 ±100	6.5a1	450 ±100	6.5a2
77618004	200 ±100	6.5a1	450 ±100	6.5a2 I
77618005	200 ±100	6.5a1	450 ±100	6.5a2 I
ALL OTHERS	200 ±100	6.5a1	200 ±100	6.5a1

6.4.2 ACTUATOR ALIGNMENT (Diskette)

a. The alignment diskette 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 on head 0. (No data is recorded on Track 38. The tester or system requirements should be noted; refer to tester or system instructions for operation).

d. Connect Channel 1 of scope to TP3 on the PWA and Channel 2 to TP4 on the PWA.

e. Connect the external sync probe to index at TP14 on PWA.

f. Set up the scope as follows:

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

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

NOTE

Scope trace after trigger level is adjusted for repetitive trace should display an envelope of data "Cateyes" consisting of two lobes (refer to Figure 6-6A).

g. Change the volts/div of Channel 1 and Channel 2 to 0.02 volts/div. For an acceptable 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-adapter mounting screws and slowly rotate the stepper motor to adjust the amplitude until the amplitude of both lobes is the same. Small increments of motion can be easily achieved by placing the blade of a flat-blade screwdriver against the adapter main will at the locations shown in Figure 6-11, and then tapping lightly on the screwdriver handle.

CAUTION

Do not tap against the motor.

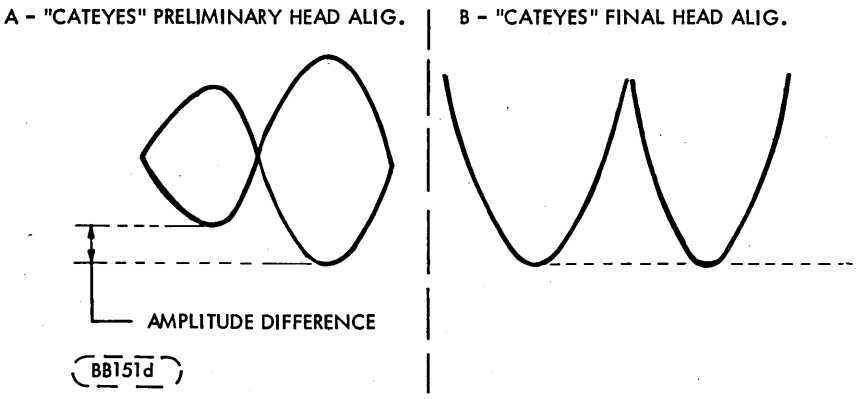


Figure 6-6. Head-Alignment Amplitude

i. Tighten the stepper-motor adapter screws. Return to Track 00, then seek back to Track 38. Verify that the 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 specification is met.

j. Remove alignment diskette.

k. Perform 6.4.4.

6.4.3 CLAMSHELL-CLOSED SWITCH ADJUSTMENT

Close the clamshell and check that it is latched. Turn the setscrew clockwise until the switch makes contact. Turn the setscrew one additional turn and a half. Open and close the clamshell several times while observing the door-closed signal.

6.4.4 TRACK 00 OPTICAL SENSOR ADJUSTMENT

Adjust the Track 00 optical sensor for the output in Figure 6-7 while the FDD alternately seeks at 3 ms ±0.1 ms per step between Track 00 and Track 03.

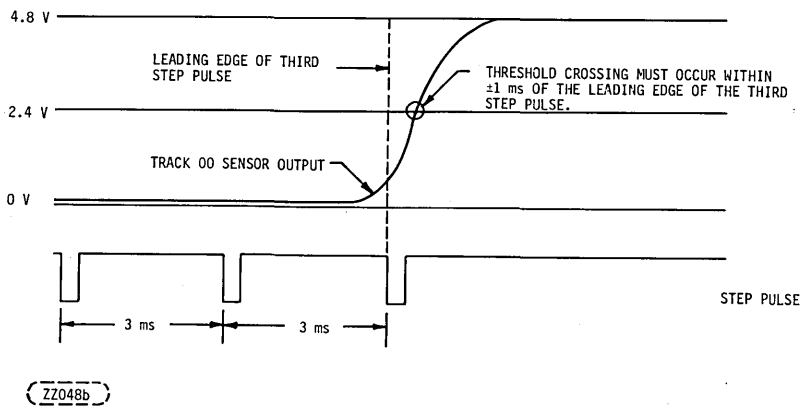


Figure 6-7. Track 00 Optical Sensor Output

6.4.5 DISKETTE EJECTOR

Insert a diskette fully and note a clicking noise as the ejector engages a pin on the clamshell.

While observing the ejector, latch and latch block (Figure 6-8 through the 1/2 in. (12.7 mm) hole in the sidewall, close the clamshell. Note that closing the clamshell moved the ejector further to the rear allowing the latch to rotate counterclockwise until the tip drops over the step in the latch block.

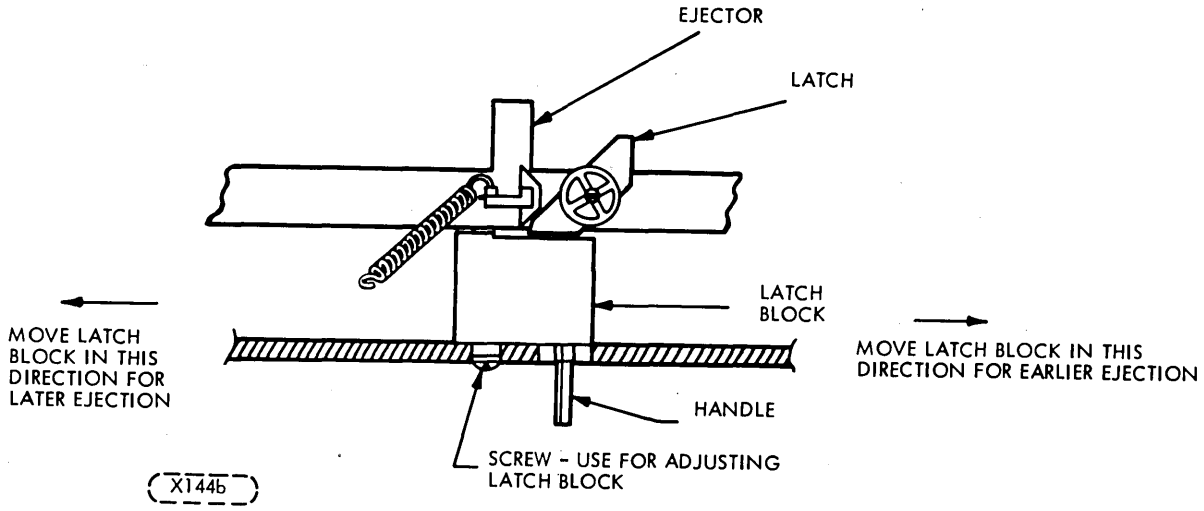


Figure 6-8. Ejector, Latch and Latch Block

With the clamshell closed, adjust the latch block (Figure 6-8) so the tip of the latch just clears the step.

Check by opening the clamshell slowly and observing the clamshell position when the diskette is ejected. To avoid damage, it is to be ejected when the clamshell is 1/4 in. (6.35 mm) max. from the fully opened position. If further adjustment is required, move the latch block as indicated by the arrows and instruction in Figure 6-8.

Operate several times and observe that the diskette ejection is within the 1/4 in. (6.35 mm) max. described above.

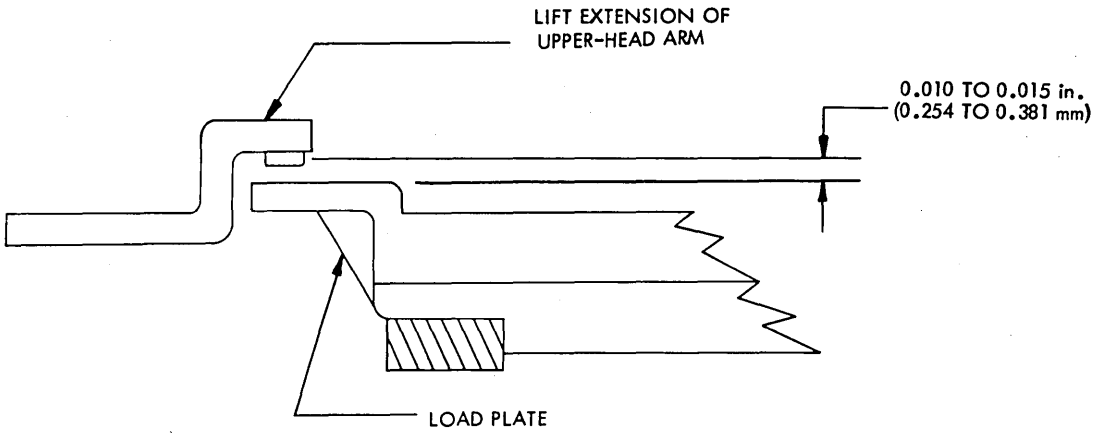
6.4.6 DISKETTE-LOAD-PAD ADJUSTMENT

a. Refer to Figure 6-9.

b. Energize Solenoid

c. Loosen Solenoid mounting screws (2x).

d. Move solenoid down on bracket to obtain a clearance of 0.010 to 0.015 in. (0.254 to 0.381 mm) between the load plate and the lift extension of the upper-head arm at the location of minimum clearance. Move the carriage through its full travel manually to determine the location of minimum clearance.

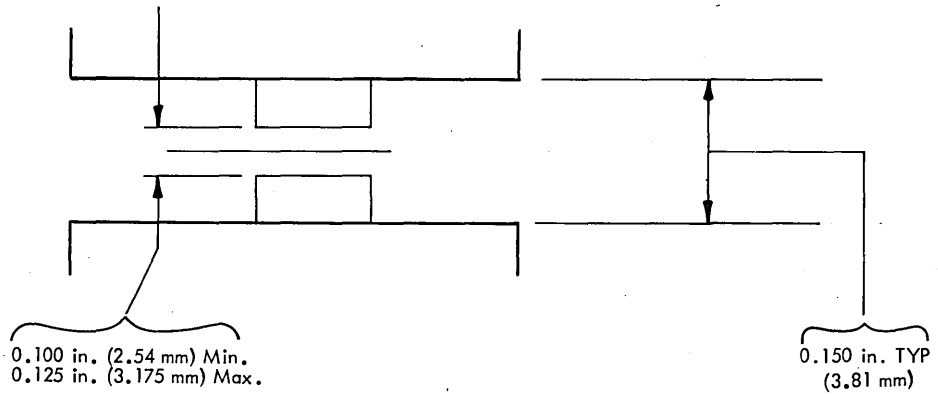


X267a

Figure 6-9. Load Pad Adjustment

6.4.7 HEAD-UNLOAD CLEARANCE

Adjust set screw on clamshell for 0.100 in. to 0.125 in. (2.54 to 3.175 mm) clearance per Figure 6-10 between flyer pads with head-load solenoid de-energized and clamshell closed.



X267c

Figure 6-10. Head Unload Clearance as Viewed from the Front of the Carriage

CAUTION

Do not use gauge for this adjustment. Estimate spacing by viewing with an inspection mirror.

6.4.8 BAND ALIGNMENT

Referring to Figure 6-12:

a. Attach band to carriage.
b. Loosen clamp screws on pulley, access through adapter slot.
c. Tension band and tighten idler mounting plate.
d. Move carriage by hand (full travel) several times to allow band to align.
e. Tighten pulley clamp screws.

f. Move carriage to check band alignment. Check for band kink near carriage mount over full range of carriage traverse.
g. Repeat procedure to eliminate kinking.
h. Perform 6.4.2.

CAUTION
Band edge is sharp.

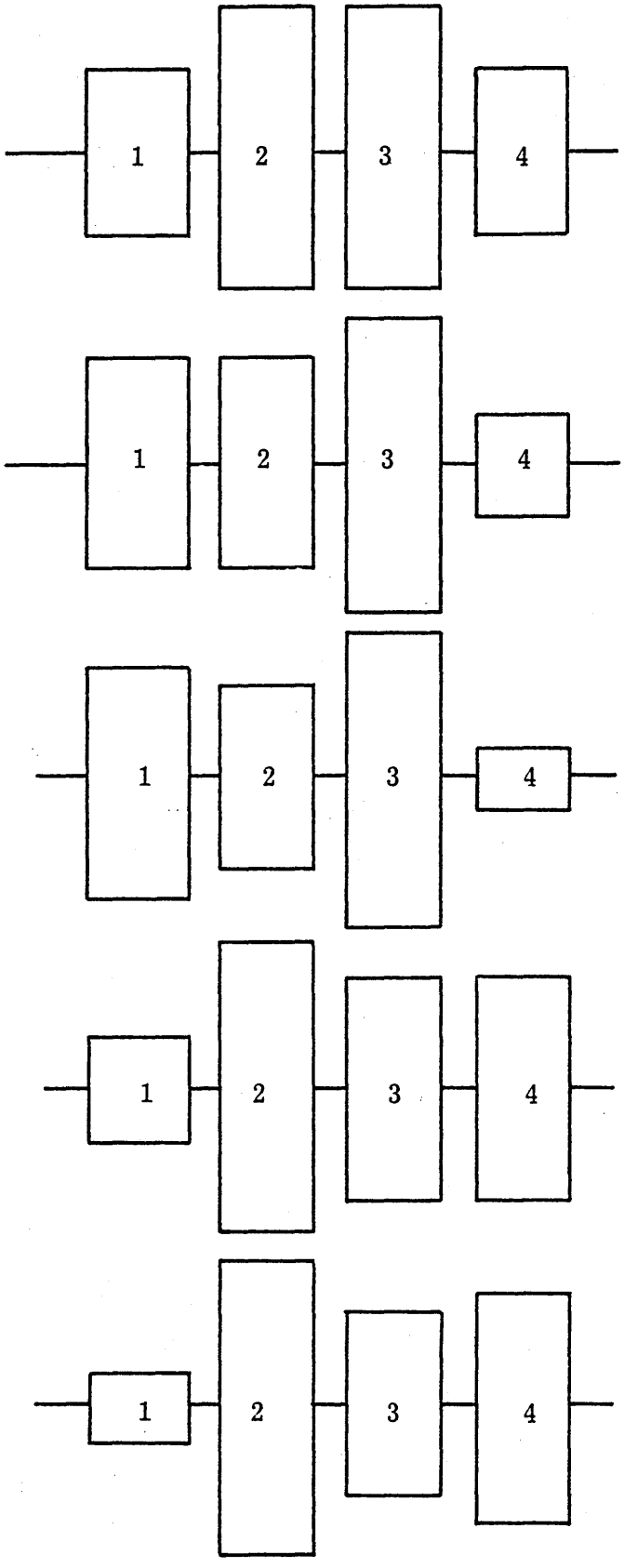
6.4.9 AZIMUTH ADJUSTMENT

Using an alignment diskette, seek to Track 76 and adjust azimuth by turning the azimuth set screw in the guide-rod boss The set screw should be adjusted in such a way that the azimuth pattern is optimized between head "0" and "1". See Figure 6-10.1 for optimum azimuth alignment.

The azimuth of both heads must be less than ±12 minutes from nominal.

6.5 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.



Depicts an optimum alignment of zero minutes of azimuth error. Note that bursts 1 and 4 are of equal amplitude, and 2 and 3 are of equal amplitude.

Depicts an alignment of exactly -12 minutes of azimuth error. Note that bursts 1 and 2 are of equal amplitude.

Depicts an alignment of -18 minutes of azimuth error. Note that burst 2 is of lower amplitude than burst 1.

Depicts an alignment of exactly +12 minutes of azimuth error. Note that bursts 3 and 4 are of equal amplitude.

Depicts an alignment of +18 minutes of azimuth error. Note that burst 3 is of lower amplitude than burst 4.

FIGURE 6-10.1. AZIMUTH PATTERNS

6.5.1 PRINTED-CIRCUIT BOARD (PWA)

a. Disconnect I/O Cable from J1 (refer to Figure 5-3).
b. Disconnect harnesses from connectors on printed-circuit board.
c. Remove two screws from printed-circuit board adjacent to connector J1.
d. Remove PWA by detaching it from the four push-in clips.
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 6.4.1.

6.5.2 HEAD REPLACEMENT

Referring to Figures 6-11 and 6-12.

a. Remove clamshell;
b. Disconnect head cables;
c. Loosen tension on idler;
d. Remove band retainer from carriage;
e. Remove band from carriage;

CAUTION

Band has sharp edges; don't kink or bend.

f. Remove cable guide;
g. Remove cable clamp;
h. Lift ejector mechanism to remove head cables from channel;
i. Remove clamp screws from carriage guide bar;
j. Slide carriage to rear to clear idler assembly and remove. Care must be taken to prevent head assemblies from snapping together.
k. Remove guide bar from carriage;
l. Reverse procedure to install new carriage. Care must be taken to get swing-arm lift tab above head-load plate.
m. Tighten screws on guide rod;
n. Route cable through ejector channel and install cable wire guide;
o. Thread cables through chassis and connect to circuit board;
p. Install cable clamp; go to 6.4.8, Band Alignment, and perform Steps a through h;
q. Install clamshell;
r. Perform 6.4.1 through 6.4.9.

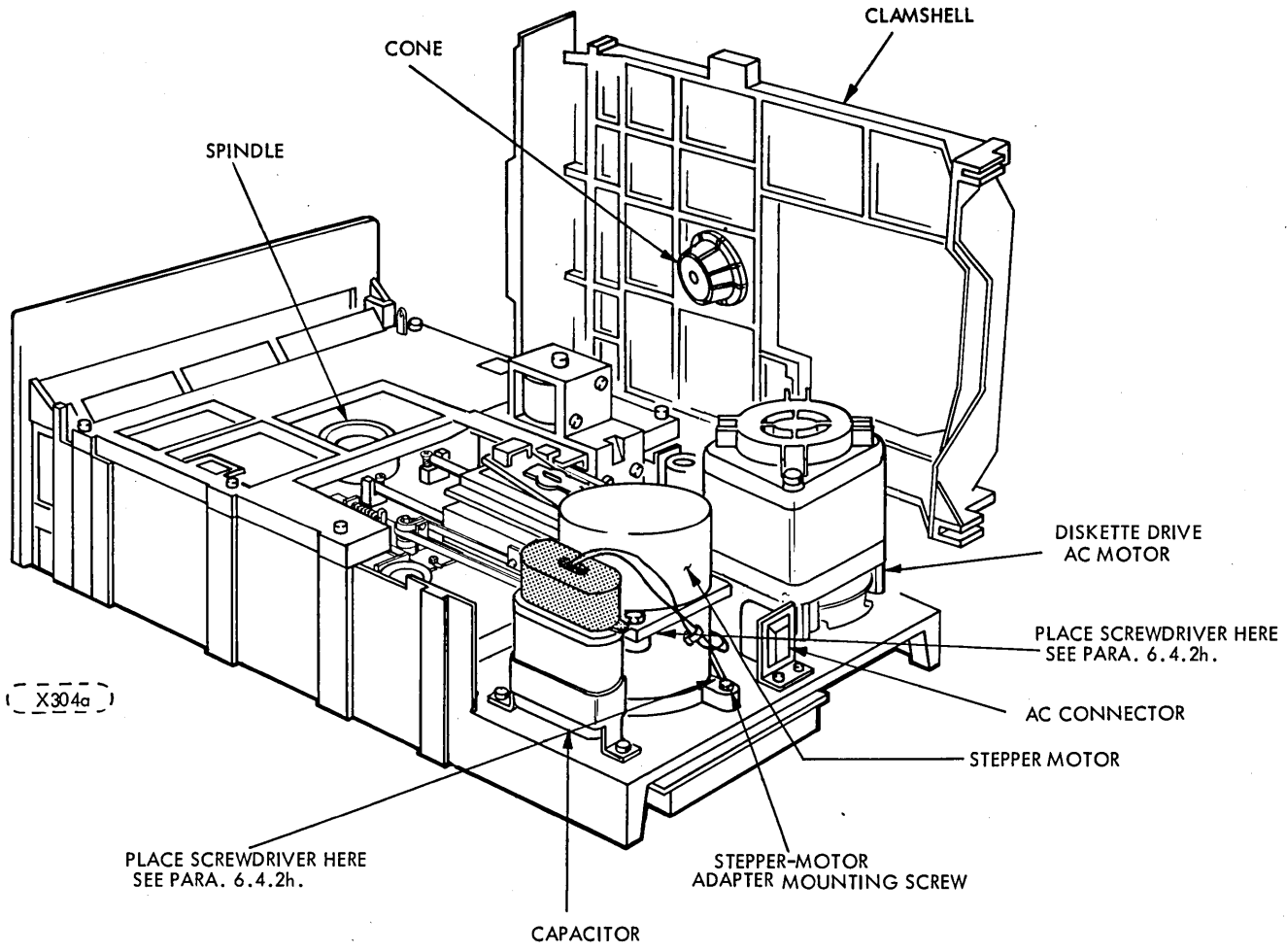


Figure 6-11. Positioning and Head-Load Mechanism, Clamshell Cover Raised.

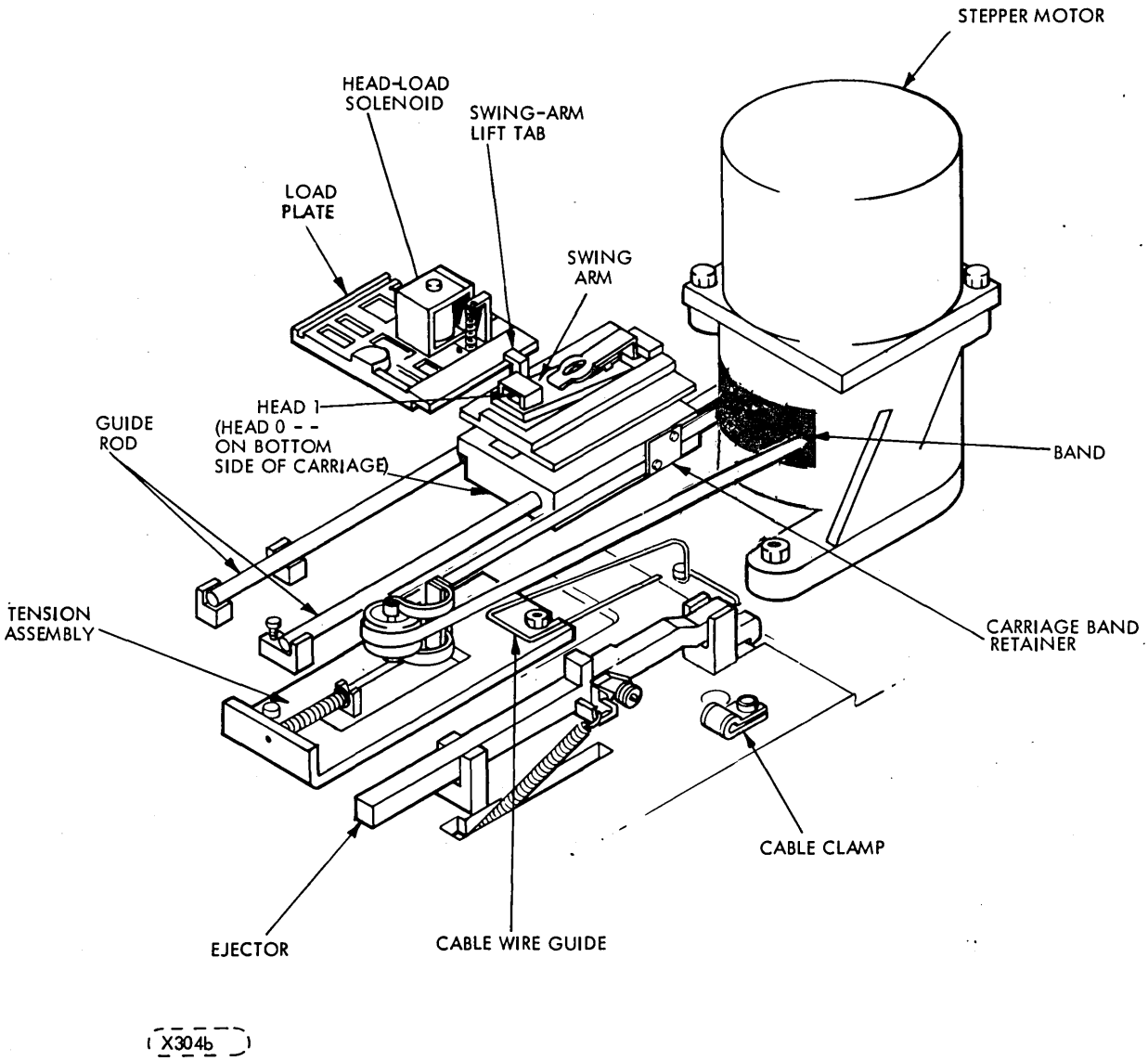


Figure 6-12. Head-Load Carriage and Stepper Motor Details.

6.5.3 DRIVE MOTOR ASSEMBLY

a. Perform removal procedure for printed-circuit board (paragraph 6.5.1).
b. Remove screws securing drive-motor cable clamps.
c. Remove AC connector from bracket.
d. Remove spindle drive belt.
e. Remove three (3) nuts or screws securing drive motor.
f. Remove drive-motor assembly (drive motor, capacitor, and AC connector).
g. To replace drive-motor assembly, reverse the above procedure.

6.5.4 ACTUATOR REPLACEMENT

a. Perform Steps a through e of paragraph 6.5.2
b. Remove pins J3-04, 03 and 02.
c. Loosen bottom 2x screws and remove stepper motor and band.
d. Reverse the above procedure to reassemble stepper motor and band drive to unit.
e. Perform 6.4.1 through 6.4.8.

6.6 FREQUENCY CONVERSION

6.6.1 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 using the following steps:

a. Remove AC power.
b. Remove printed-circuit board assembly per paragraph 6.5.1.
c. Remove the belt from the spindle-motor pulley. (Accessible from the under side of unit.)
d. Loosen setscrew and remove pulley.
e. Reverse pulley and replace on motor shaft.

f. Position pulley allowing tolerance of 0.039 in. (0.99 mm) ±0.10 in. (0.254 mm) between shoulder of motor mounting screws and pulley (Figure 6-13).
g. Tighten down setscrew.
h. 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.

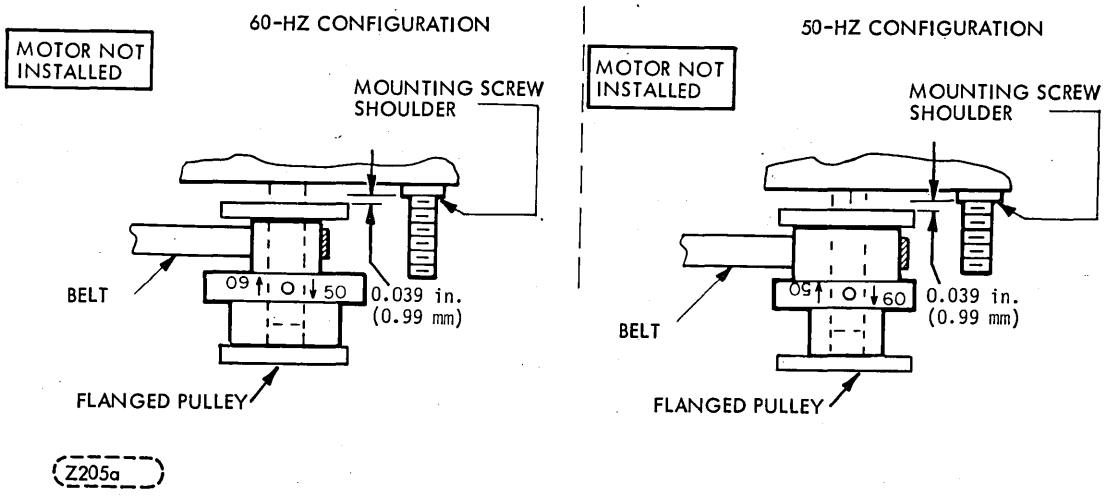


Figure 6-13. Drive-Pulley Reversal

MAINTENANCE AIDS

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.

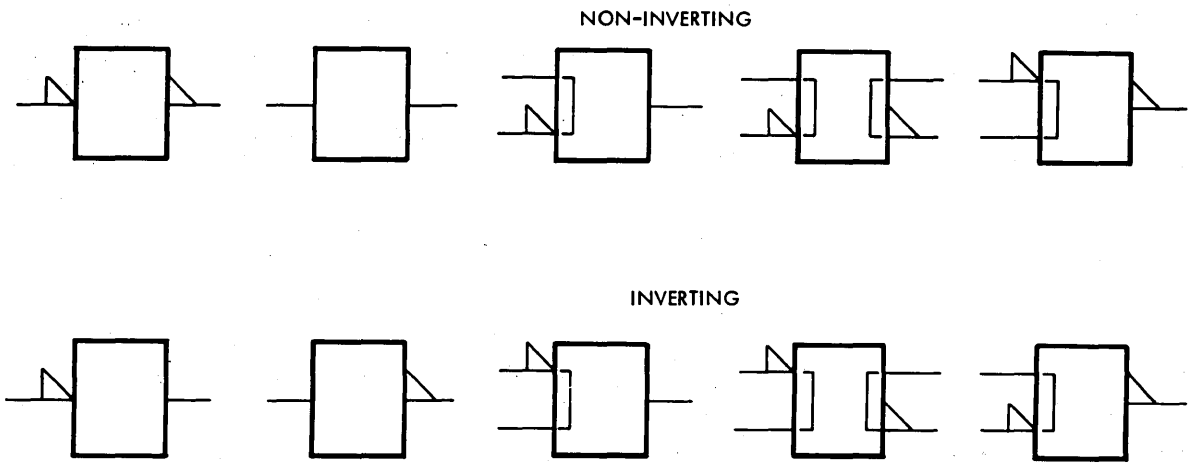
7.2 PHYSICAL DESCRIPTION (Logic)

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.



(AA042f)

Figure 7-1. Inversion Conventions

7.4 INTEGRATED CIRCUITS

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

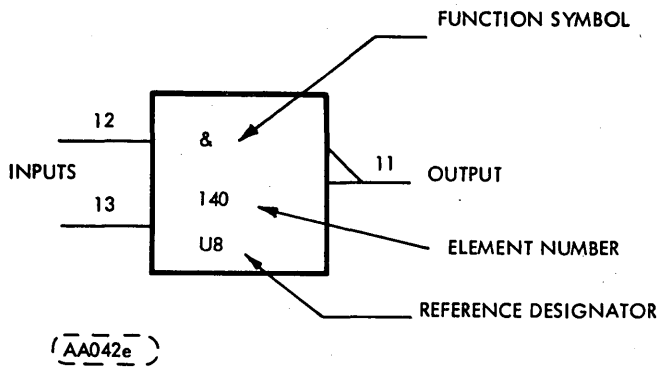


Figure 7-2. Integrated Circuit

FUNCTION SYMBOLS	
&	AND GATE OR INVERTER
1	OR GATE OR INVERTER
=1	EXCLUSIVE OR
1 ⎍	ONE SHOT
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
	INDICATES ANALOG SIGNAL
	TEST POINTS
	INHIBITING INPUT

BB151b

Figure 7-3. Schematic Symbols

PARTS DATA

8.1 INTRODUCTION

This section contains an illustrated parts breakdown that describes and illustrates all variations of the (band-driven) Model 9406 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 LIST

In addition to the accompaning 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 is given in para. 8.6.

8.4 PRODUCT CONFIGURATIONS

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 HARDWARE PRODUCT CONFIGURATOR (HPC)

To determine what parts are used on a particular model, find the applicable HPC number in Table 8-1. 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 to the HPC number will be identified with an 'X' ('0' means not applicable). NOTE: The HPC Number is identical to the Equip. Ident. No. shown on the label.

8.5 REPLACEMENT PARTS

When ordering replacement parts for the FDD, the inclusion of the following information for each part ordered will ensure positive identification:

1. Equip. Ident. No
2. Publication Number 75888344
3. Figure and Item Number
4. Identification Number and Description
5. Equipment Status Number

NOTE:
Before ordering parts however, refer to paragraph 8.5.1 Spare Parts.

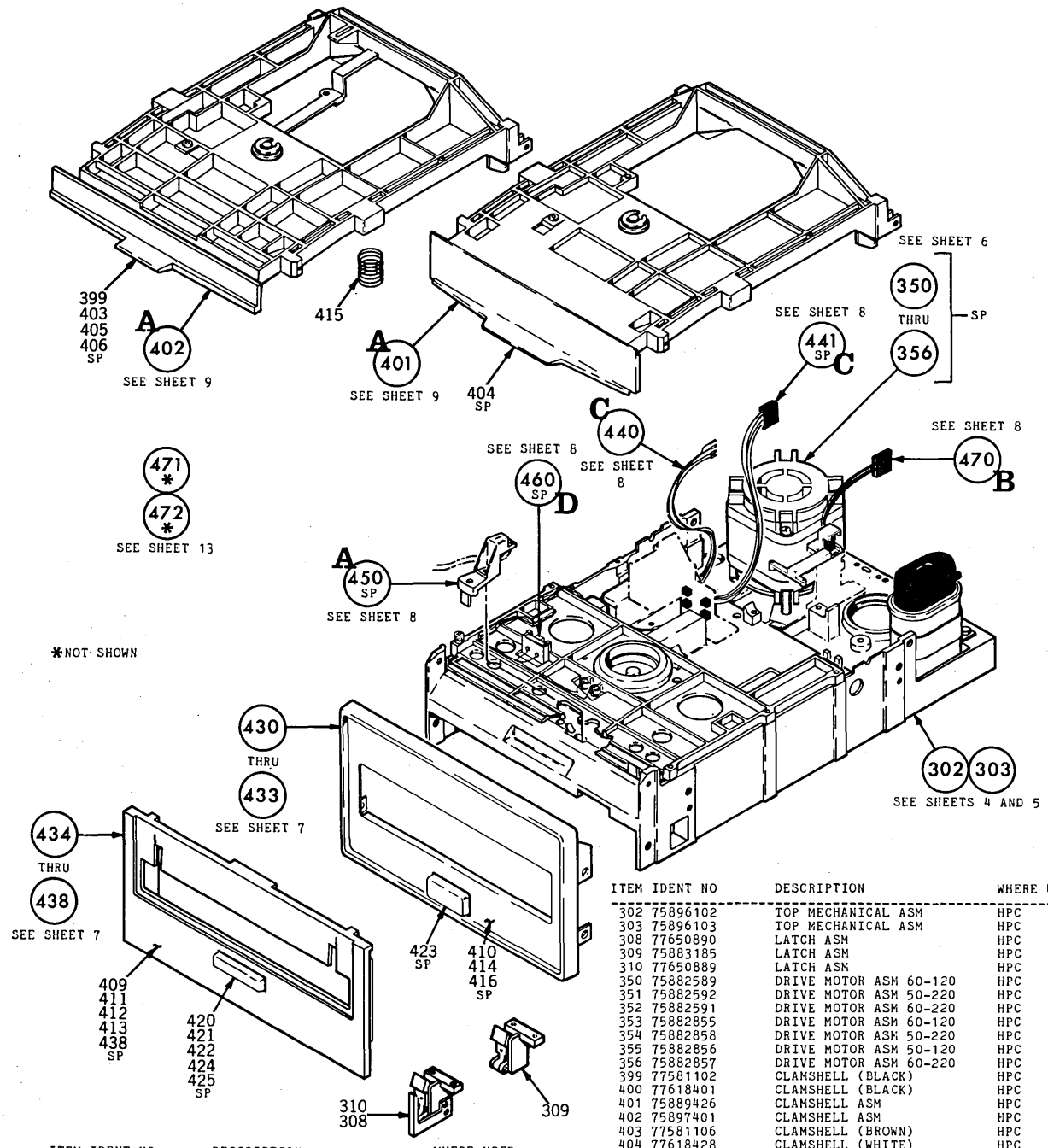
8.5.1 SPARE PARTS

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

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

TABLE 8-1. PRODUCT CONFIGURATION

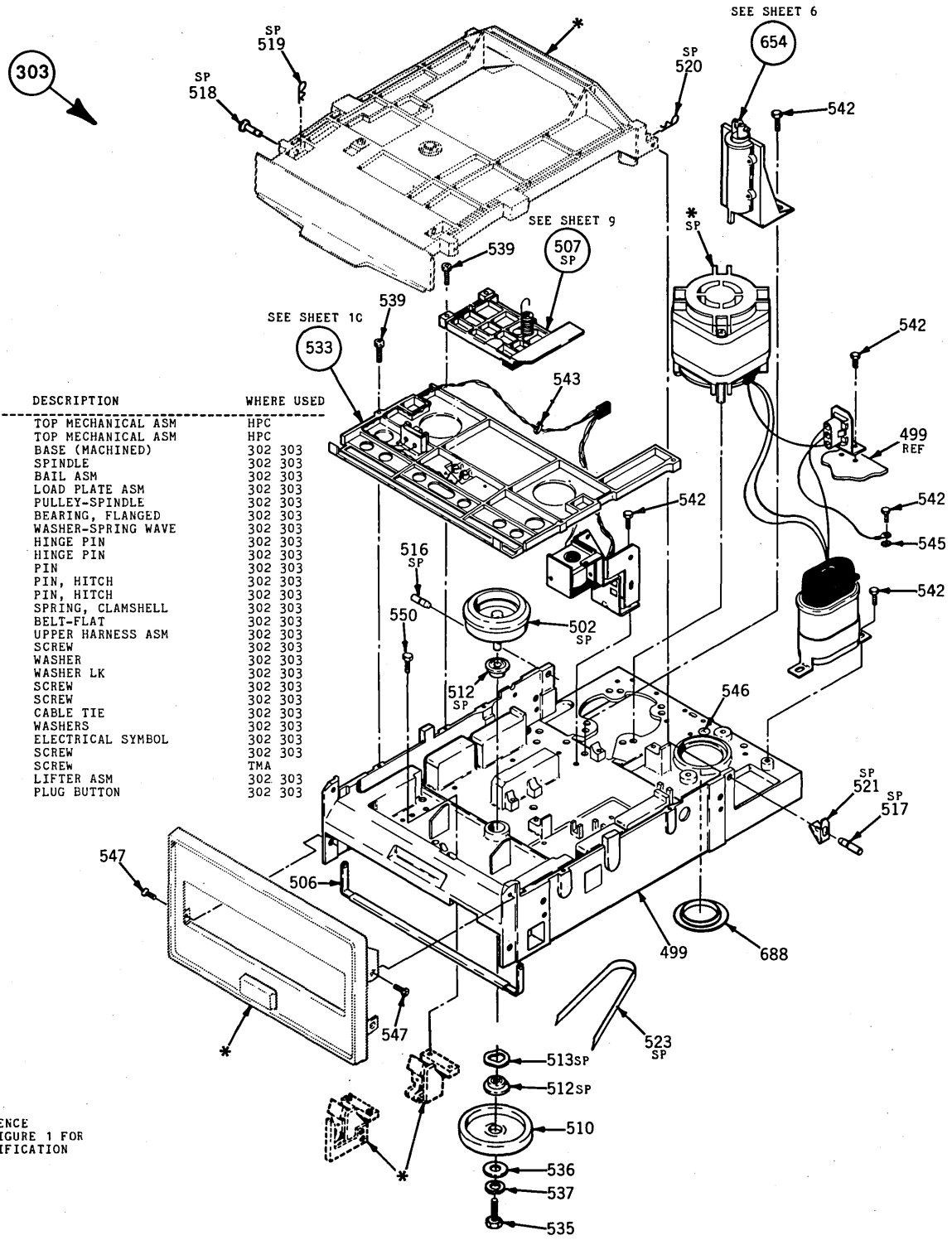
	ITEM NUMBERS						
	3333333333	3333333333	3444444444	4444444444	4444444444	4444444444	4444444444
	0000000001	5555555555	9000000000	0111111111	2222222222	3333333333	4455667777
HPC	1234567890	0123456789	9012345678	9012345678	0123456789	0123456789	0101010123
77618000	00X00000X0	X000000000	0XX0000000	0X0000X000	X000000000	X000000000	X0X0X00000
77618001	00X00000X0	0X00000000	0XX0000000	0X0000X000	X000000000	X000000000	X0X0X00000
77618002	00X00000X0	00X0000000	0XX0000000	0X0000X000	X000000000	X000000000	00X0X00000
77618003	00X00000X0	X000000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00000
77618004	00X00000X0	0X00000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00000
77618005	00X00000X0	0X00000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00000
77618006	00X00000X0	0X00000000	0XX0000000	0X0000X000	X000000000	X000000000	X0X0X00000
77618007	00X00000X0	000X000000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618008	00X00000X0	000X000000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618009	00X00000X0	0000X00000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618010	00X00000X0	0000X00000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618011	00X00000X0	000X000000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618012	00X00000X0	000X000000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618013	00X00000X0	0000X00000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618014	00X00000X0	0000X00000	0XX0000000	0X0000000	X000000000	0X00000000	X0X0X0X000
77618015	00X00000X0	00X0000000	0XX0000000	0X0000X000	X000000000	X000000000	X0X0X00000
77618016	00X00000X0	0X00000000	0XX0000000	0X0000X000	X000000000	X000000000	X0X0X00000
77618017	00X0000X00	0X00000000	0XX0000000	0X0000X000	X000000000	00X0000000	X0X0X00000
77618018	00X00000X0	X000000000	0XX0000000	0X0000X000	X000000000	X000000000	00X0X00000
77618019	00X00000X0	X000000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00000
77618020	00X000000X	000X000000	X00X000000	00X000X000	0X00000000	000000X000	X0X0X0XX00
77618021	00X000000X	0000X00000	X00X000000	00X000X000	0X00000000	000000X000	X0X0X0XX00
77618022	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X0X0X0
77618023	00X000000X	0000X00000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X0X0X0
77618024	00X000000X	000X000000	X00X000000	00X000X000	0X00000000	000000X000	X0X0X00X00
77618025	00X000000X	0000X00000	X00X000000	00X000X000	0X00000000	000000X000	X0X0X00X00
77618026	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X000X0
77618027	00X000000X	0000X00000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X000X0
77618028	00X00000X0	X000000000	0XX0000000	0X0000X000	X000000000	X000000000	X0X0X00000
77618029	00X00000X0	0X00000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00000
77618030	00X0000X00	000X000000	0XX0000000	0X0000X000	X000000000	000X000000	X0X0X00000
77618031	00X0000X00	0000X00000	0XX0000000	0X0000X000	X000000000	000X000000	X0X0X00000
77618032	00X0000X00	0000X00000	0XX0000000	0X0000X000	X000000000	000X000000	X0X0X00000
77618033	00X00000X0	X000000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00000
77618034	00X000000X	000X000000	000XX00000	0000X0X000	00X0000000	00000X0000	X0X0X000X0
77618035	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X0X0X0
77618036	00X000000X	0000X00000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X0X0X0
77618037	00X000000X	0000X00000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X0X0X0
77618038	00X000000X	0000X00000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X000X0
77618039	00X00000X0	X000000000	00X00X0000	00000XX000	000X000000	0X00000000	X0X0X00000
77618040	00X00000X0	0X00000000	00X00X0000	00000XX000	000X000000	0X00000000	X0X0X00000
77618041	00X00000X0	0X00000000	00X00X0000	00000XX000	000X000000	0X00000000	X0X0X00000
77618042	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X0X0X0
77618043	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X000X0
77618044	00X000000X	00000X0000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X000X0
77618045	00X000000X	0000X00000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X000X0
77618046	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	00000X0000	X0X0X000X0
77618047	00X000000X	00000X0000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X000X0
77618048	00X000000X	000X000000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X000X0
77618049	00X000000X	X000000000	0XX0000000	0X0000X000	X000000000	00X0000000	X0X0X00000
77618050	00X000000X	000000X000	X00X000000	000X00X000	0X00000000	0000000X00	X0X0X0X0X0
77618051	00X00000X0	0X00000000	00X000X000	X00000X000	0000X00000	0X00000000	X0X0X00000
77618052	00X00000X0	000X000000	0XX0000000	0X0000X000	X000000000	0X00000000	X0X0X00X00
77618053	00X0000X00	0X00000000	0XX0000000	0X0000X000	X000000000	00X0000000	X0X0X00000
77618054	0X000000X0	00X0000000	0000000X00	0X0000X000	00000X0000	X000000X0	00X0X00000



ITEM	IDENT NO	DESCRIPTION	WHERE USED
302	75896102	TOP MECHANICAL ASM	HPC
303	75896103	TOP MECHANICAL ASM	HPC
308	77650890	LATCH ASM	HPC
309	75883185	LATCH ASM	HPC
310	77650889	LATCH ASM	HPC
350	75882589	DRIVE MOTOR ASM 60-120	HPC
351	75882592	DRIVE MOTOR ASM 50-220	HPC
352	75882591	DRIVE MOTOR ASM 60-220	HPC
353	75882855	DRIVE MOTOR ASM 60-120	HPC
354	75882858	DRIVE MOTOR ASM 50-220	HPC
355	75882856	DRIVE MOTOR ASM 50-120	HPC
356	75882857	DRIVE MOTOR ASM 60-220	HPC
399	77581102	CLAMSHELL (BLACK)	HPC
400	77618401	CLAMSHELL (BLACK)	HPC
401	75889426	CLAMSHELL ASM	HPC
402	75897401	CLAMSHELL ASM	HPC
403	77581106	CLAMSHELL (BROWN)	HPC
404	77618428	CLAMSHELL (WHITE)	HPC
405	77618429	CLAMSHELL (BRONZE)	HPC
406	77618405	CLAMSHELL (GRAY)	HPC
409	77899329	FRONT PANEL	HPC
410	75899301	FRONT PANEL (BLACK)	HPC
411	77631302	FRONT PANEL (BLACK)	HPC
412	77631402	FRONT PANEL (BLACK)	HPC
413	77631406	FRONT PANEL (BROWN)	HPC
414	75889328	FRONT PANEL (WHITE)	HPC
415	75881578	SPRING	HPC
420	75889701	BUTTON (BLACK)	HPC
421	75897201	BUTTON (BLACK)	HPC
422	75897206	BUTTON (BROWN)	HPC
423	75889728	BUTTON (WHITE)	HPC
424	75889729	BUTTON	HPC
425	75889705	BUTTON (GRAY)	HPC
430	75882401	FRONT PANEL ASM	HPC
431	75882406	FRONT PANEL ASM	HPC

ITEM	IDENT NO	DESCRIPTION	WHERE USED
432	75882405	FRONT PANEL ASM	HPC
433	75882404	FRONT PANEL ASM	HPC
434	75897950	FRONT PANEL ASM	HPC
435	75897951	FRONT PANEL ASM	HPC
436	75897952	FRONT PANEL ASM	HPC
437	75897953	FRONT PANEL ASM	HPC
438	75899305	FRONT PANEL (GRAY)	HPC
440	75882037	WRITE PROTECT	HPC
441	75882036	DISK IN PLACE DET	HPC
450	75882185	INDEX DETECTOR KIT	HPC
460	75889979	DOOR INTERLOCK KIT	HPC
470	75883335	KIT, TK "43"	HPC
471	75883336	KIT, SIDE MTG	HPC
472	75894197	KIT, BOTTOM MTG	HPC

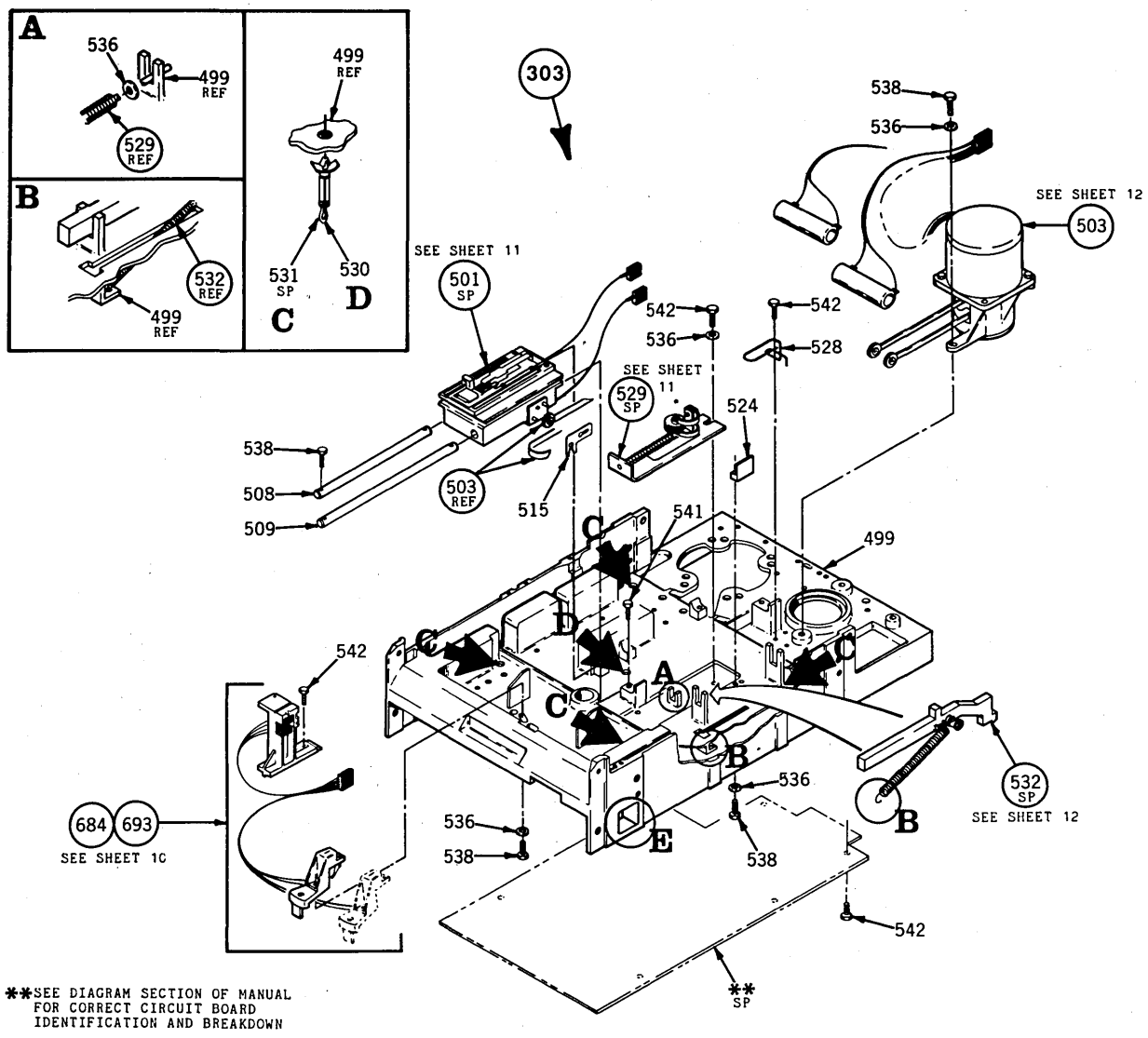
TABLE 8-1. PRODUCT CONFIGURATION



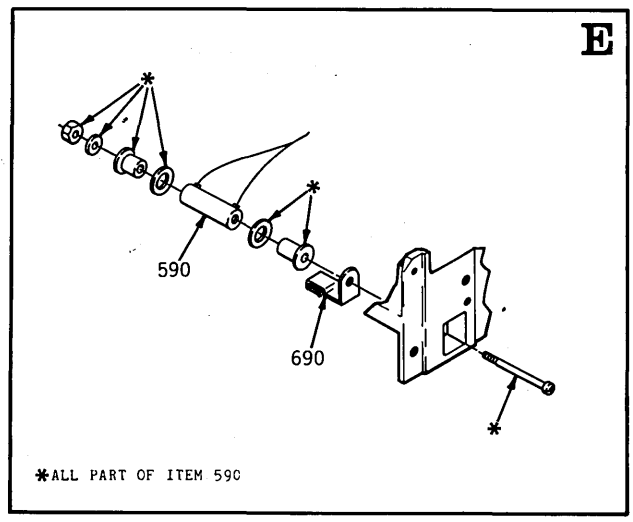
ITEM	IDENT NO	DESCRIPTION	WHERE USED
302	75896102	TOP MECHANICAL ASM	HPC
303	75896103	TOP MECHANICAL ASM	HPC
499	75883128	BASE (MACHINED)	302 303
502	75881591	SPINDLE	302 303
506	75888675	BAIL ASM	302 303
507	77647148	LOAD PLATE ASM	302 303
510	77646600	PULLEY-SPINDLE	302 303
512	77613697	BEARING, FLANGED	302 303
513	93529005	WASHER-SPRING WAVE	302 303
516	75888590	HINGE PIN	302 303
517	75888591	HINGE PIN	302 303
518	75888595	PIN	302 303
519	75890210	PIN, HITCH	302 303
520	75890211	PIN, HITCH	302 303
521	75888570	SPRING, CLAMSHELL	302 303
523	75293203	BELT-FLAT	302 303
533	75883330	UPPER HARNESS ASM	302 303
535	10127334	SCREW	302 303
536	10125605	WASHER	302 303
537	10125803	WASHER LK	302 303
539	17901504	SCREW	302 303
542	93592162	SCREW	302 303
543	94277400	CABLE TIE	302 303
545	10126401	WASHERS	302 303
546	75731302	ELECTRICAL SYMBOL	302 303
547	92012727	SCREW	302 303
550	10126219	SCREW	TMA
654	75882895	LIFTER ASM	302 303
688	51891120	PLUG BUTTON	302 303

*REFERENCE
SEE FIGURE 1 FOR
IDENTIFICATION

FIGURE 8-2. TOP MECHANICAL ASSEMBLY (Sheet 1 of 2)



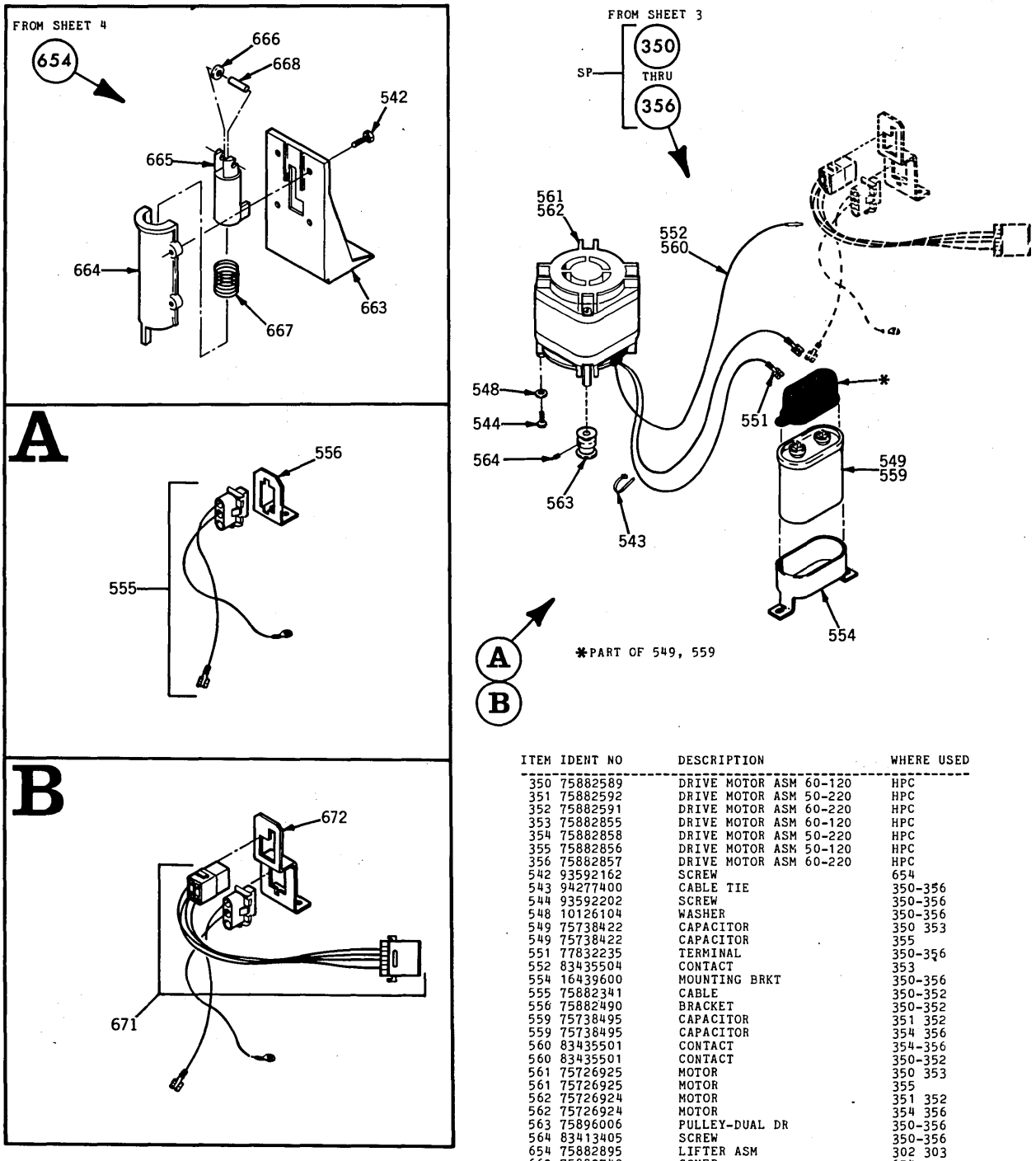
**SEE DIAGRAM SECTION OF MANUAL FOR CORRECT CIRCUIT BOARD IDENTIFICATION AND BREAKDOWN



*ALL PART OF ITEM 590

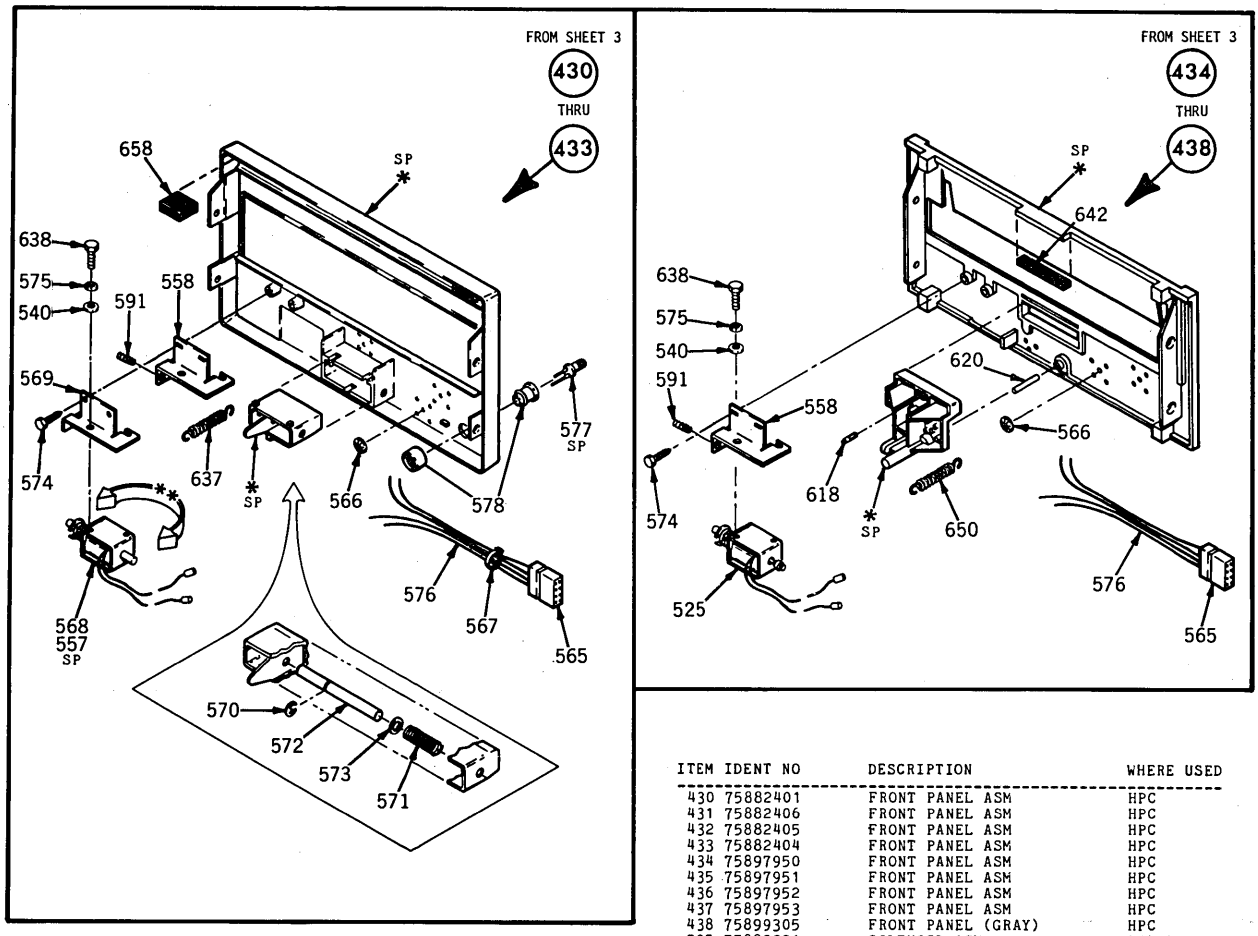
ITEM	IDENT NO	DESCRIPTION	WHERE USED
302	75896102	TOP MECHANICAL ASM	HPC
303	75896103	TOP MECHANICAL ASM	HPC
499	75883128	BASE (MACHINED)	302 303
501	75896122	CARRIAGE ASSEMBLY	302 303
503	75892007	ACTUATOR ASSEMBLY	302 303
508	75881326	GUIDE CARRIAGE	302 303
509	75881275	GUIDE ROD	302 303
515	75883017	RETAINER	302 303
524	75883240	LATCH BLOCK	302 303
528	75883095	GUARD, HEAD CABLE	302 303
529	75883215	TENSION ASSEMBLY	302 303
530	75774732	CLIP-PUSH IN	302 303
531	75774736	CLIP-PUSH IN	302 303
532	75889396	EJECTOR ASM	302 303
534	09023703	SCREW	302 303
536	10125605	WASHER	302 303
538	93592164	SCREW	302 303
541	18862916	SCREW	302 303
542	93592162	SCREW	302 303
684	75882177	LOWER HARNESS ASM	302
690	75897601	CABLE GUARD	302 303
693	77641815	LOWER HARNESS ASM	303

FIGURE 8-2. TOP MECHANICAL ASSEMBLY (Sheet 2 of 2)



ITEM	IDENT NO	DESCRIPTION	WHERE USED
350	75882589	DRIVE MOTOR ASM 60-120	HPC
351	75882592	DRIVE MOTOR ASM 50-220	HPC
352	75882591	DRIVE MOTOR ASM 60-220	HPC
353	75882855	DRIVE MOTOR ASM 60-120	HPC
354	75882858	DRIVE MOTOR ASM 50-220	HPC
355	75882856	DRIVE MOTOR ASM 50-120	HPC
356	75882857	DRIVE MOTOR ASM 60-220	HPC
542	93592162	SCREW	654
543	94277400	CABLE TIE	350-356
544	93592202	SCREW	350-356
548	10126104	WASHER	350-356
549	75738422	CAPACITOR	350 353
549	75738422	CAPACITOR	355
551	77832235	TERMINAL	350-356
552	83435504	CONTACT	353
554	16439600	MOUNTING BRKT	350-356
555	75882341	CABLE	350-352
556	75882490	BRACKET	350-352
559	75738495	CAPACITOR	351 352
559	75738495	CAPACITOR	354 356
560	83435501	CONTACT	354-356
560	83435501	CONTACT	350-352
561	75726925	MOTOR	350 353
561	75726925	MOTOR	355
562	75726924	MOTOR	351 352
562	75726924	MOTOR	354 356
563	75896006	PULLEY-DUAL DR	350-356
564	83413405	SCREW	350-356
654	75882895	LIFTER ASM	302 303
663	75882740	COVER	654
664	75882735	CYLINDER	654
665	77658915	PISTON	654
666	75882725	ROLLER	654
667	77658910	SPRING	654
668	92021009	PIN	654
671	75883023	CABLE	355
671	75883023	CABLE	353 354
672	75882890	BRACKET	355
672	75882890	BRACKET	353 354

FIGURE 8-3. DRIVE MOTOR AND LIFTER ASSEMBLIES

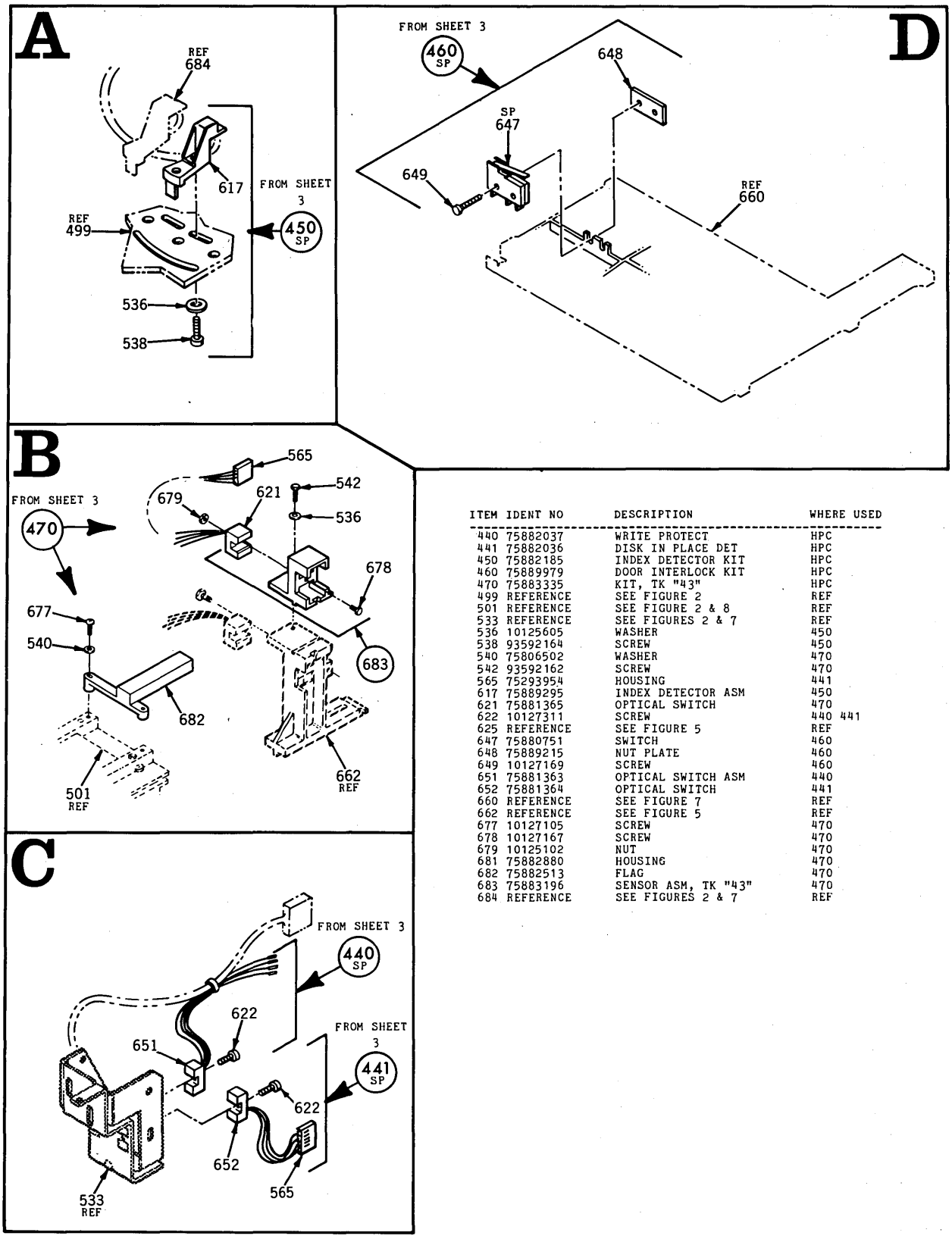


* REFERENCE
SEE FIGURE 1
FOR INFORMATION

** SHOWN IN LOCK WITH POWER ON POSITION, ROTATE 180° FOR LOCK WITH POWER OFF POSITION.

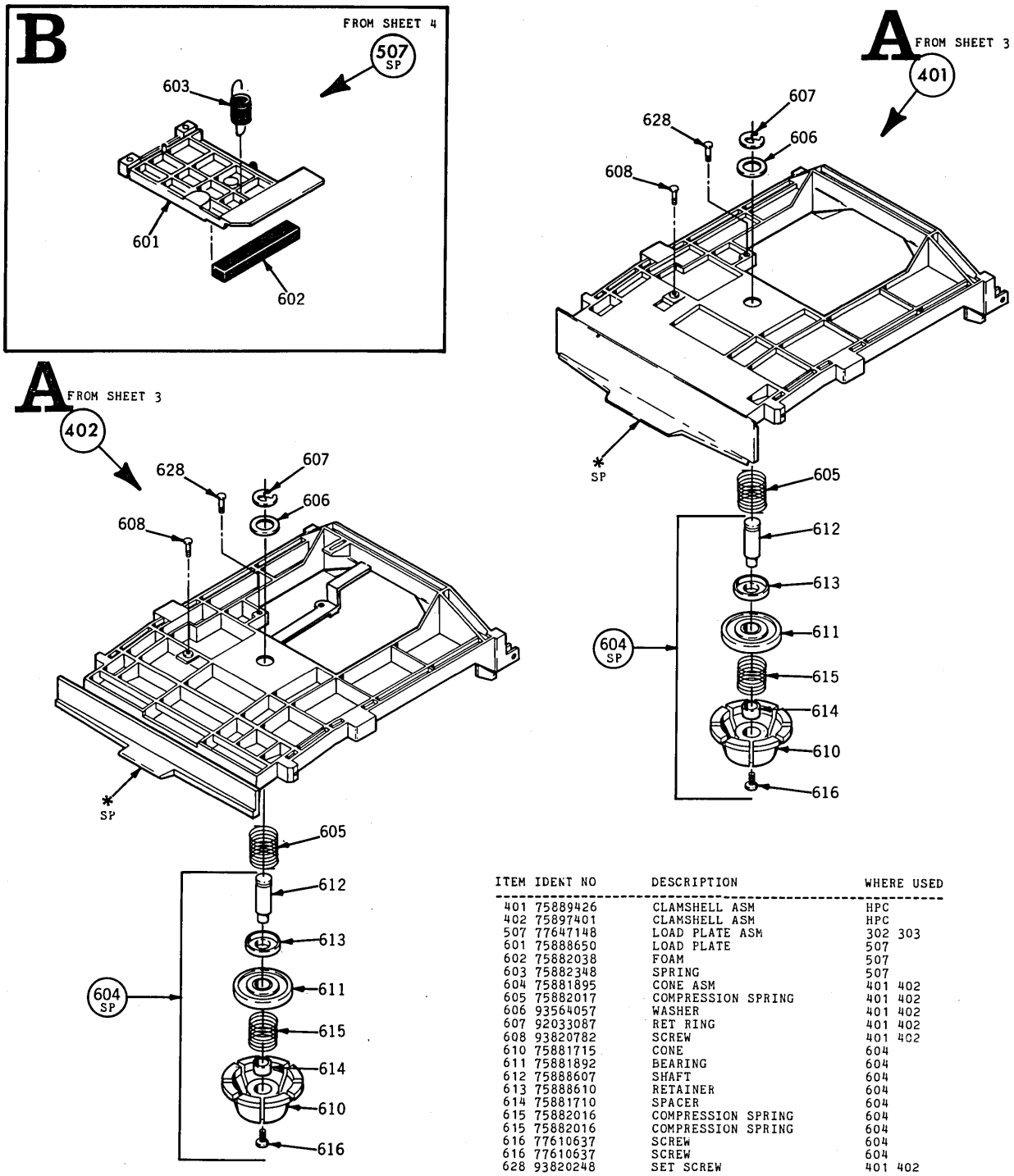
ITEM	IDENT NO	DESCRIPTION	WHERE USED
430	75882401	FRONT PANEL ASM	HPC
431	75882406	FRONT PANEL ASM	HPC
432	75882405	FRONT PANEL ASM	HPC
433	75882404	FRONT PANEL ASM	HPC
434	75897950	FRONT PANEL ASM	HPC
435	75897951	FRONT PANEL ASM	HPC
436	75897952	FRONT PANEL ASM	HPC
437	75897953	FRONT PANEL ASM	HPC
438	75899305	FRONT PANEL (GRAY)	HPC
525	75882331	SOLENOID ASM	434 435
540	75806502	WASHER	432-435
557	75882332	SOLENOID ASM	432
558	77636695	SOLENOID MOUNT	432 434
558	77636695	SOLENOID MOUNT	435
565	75293954	HOUSING	431-437
566	00848201	RET RING	431-437
567	94277400	CABLE TIE	431-433
568	75882330	SOLENOID ASM	433
569	77632960	SOLENOID MOUNT	433-435
570	75888600	SHAFT LOCK	432 433
571	75882035	SPRING	432 433
572	92033147	RET RING	432 433
573	75882107	WASHER	432 433
574	94376917	SCREW	432-435
575	10125801	WASHER	432-435
576	75882335	CABLE	431-437
577	75810701	LED	431-433
578	75810703	RET RING	431-433
591	93820166	SET SCREW	432 434
591	93820166	SET SCREW	435
618	77612981	LIGHT EMITTING DIODE	434-437
620	77610030	DOWEL PIN	434-437
637	75899167	SPRING	430-433
638	10127102	SCREW	432-435
642	77646804	BUMPER	434-437
650	75899166	SPRING	434-437
658	75883338	BUMPER	431-433

FIGURE 8-4. FRONT PANEL ASSEMBLY



ITEM	IDENT NO	DESCRIPTION	WHERE USED
440	75882037	WRITE PROTECT	HPC
441	75882036	DISK IN PLACE DET	HPC
450	75882185	INDEX DETECTOR KIT	HPC
460	75889979	DOOR INTERLOCK KIT	HPC
470	75883335	KIT, TK "43"	HPC
499	REFERENCE	SEE FIGURE 2	REF
501	REFERENCE	SEE FIGURE 2 & 8	REF
533	REFERENCE	SEE FIGURES 2 & 7	REF
536	10125605	WASHER	450
538	93592164	SCREW	450
540	75806502	WASHER	470
542	93592162	SCREW	470
565	75293954	HOUSING	441
617	75889295	INDEX DETECTOR ASM	450
621	75881365	OPTICAL SWITCH	470
622	10127311	SCREW	440 441
625	REFERENCE	SEE FIGURE 5	REF
647	75880751	SWITCH	460
648	75889215	NUT PLATE	460
649	10127169	SCREW	460
651	75881363	OPTICAL SWITCH ASM	440
652	75881364	OPTICAL SWITCH	441
660	REFERENCE	SEE FIGURE 7	REF
662	REFERENCE	SEE FIGURE 5	REF
677	10127105	SCREW	470
678	10127167	SCREW	470
679	10125102	NUT	470
681	75882880	HOUSING	470
682	75882513	FLAG	470
683	75883196	SENSOR ASM, TK "43"	470
684	REFERENCE	SEE FIGURES 2 & 7	REF

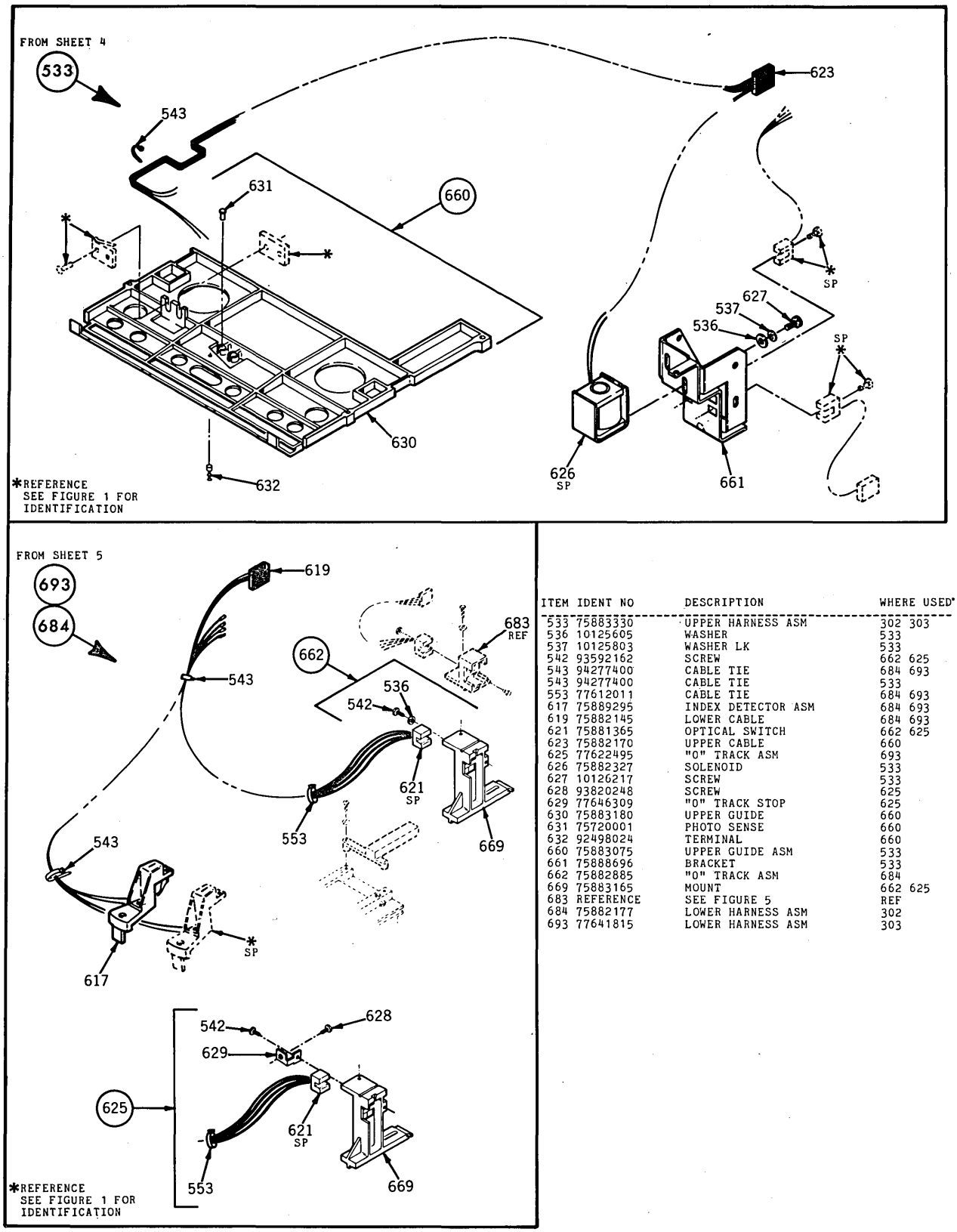
FIGURE 8-5. FEATURE KITS



ITEM	IDENT NO	DESCRIPTION	WHERE USED
401	75889426	CLAMSHELL ASM	HPC
402	75897401	CLAMSHELL ASM	HPC
507	77647148	LOAD PLATE ASM	302 303
601	75888650	LOAD PLATE	507
602	75882038	FOAM	507
603	75882348	SPRING	507
604	75881895	CONE ASM	401 402
605	75882017	COMPRESSION SPRING	401 402
606	93564057	WASHER	401 402
607	92033087	RET RING	401 402
608	93820782	SCREW	401 402
610	75881715	CONE	604
611	75881892	BEARING	604
612	75888607	SHAFT	604
613	75888610	RETAINER	604
614	75881710	SPACER	604
615	75882016	COMPRESSION SPRING	604
615	75882016	COMPRESSION SPRING	604
616	77610637	SCREW	604
616	77610637	SCREW	604
628	93820248	SET SCREW	401 402

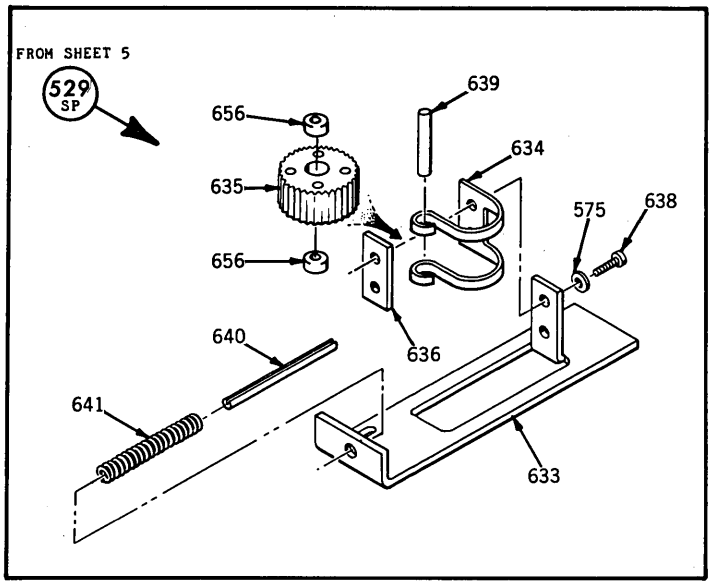
*REFERENCE
SEE FIGURE 1
FOR IDENTIFICATION

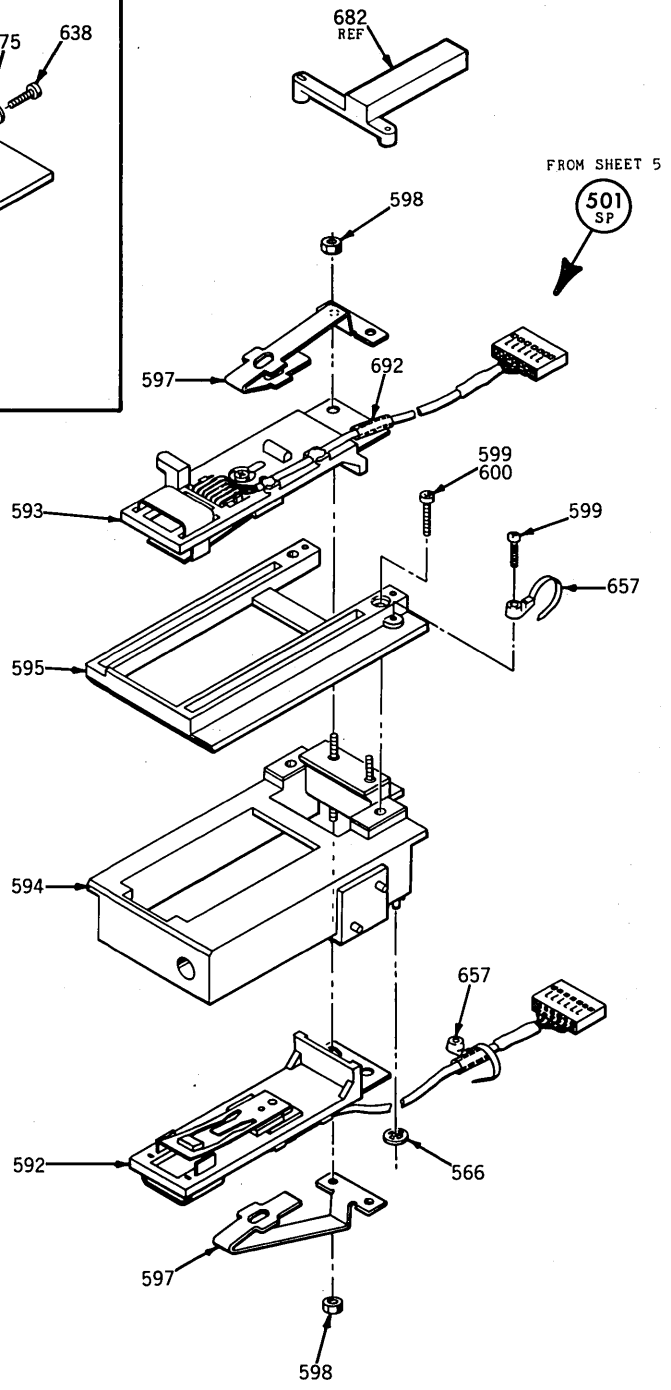
FIGURE 8-6. CLAMSHELL AND LOAD PLATE ASSEMBLIES



ITEM	IDENT NO	DESCRIPTION	WHERE USED*
533	75883330	UPPER HARNESS ASM	302 303
536	10125605	WASHER	533
537	10125803	WASHER LK	533
542	93592162	SCREW	662 625
543	94277400	CABLE TIE	684 693
543	94277400	CABLE TIE	533
553	77612011	CABLE TIE	684 693
617	75889295	INDEX DETECTOR ASM	684 693
619	75882145	LOWER CABLE	684 693
621	75881365	OPTICAL SWITCH	662 625
623	75882170	UPPER CABLE	660
625	77622495	"O" TRACK ASM	693
626	75882327	SOLENOID	533
627	10126217	SCREW	533
628	93820248	SCREW	625
629	77646309	"O" TRACK STOP	625
630	75883180	UPPER GUIDE	660
631	75720001	PHOTO SENSE	660
632	92498024	TERMINAL	660
660	75883075	UPPER GUIDE ASM	533
661	75888696	BRACKET	533
662	75882885	"O" TRACK ASM	684
669	75883165	MOUNT	662 625
683	REFERENCE	SEE FIGURE 5	REF
684	75882177	LOWER HARNESS ASM	302
693	77641815	LOWER HARNESS ASM	303

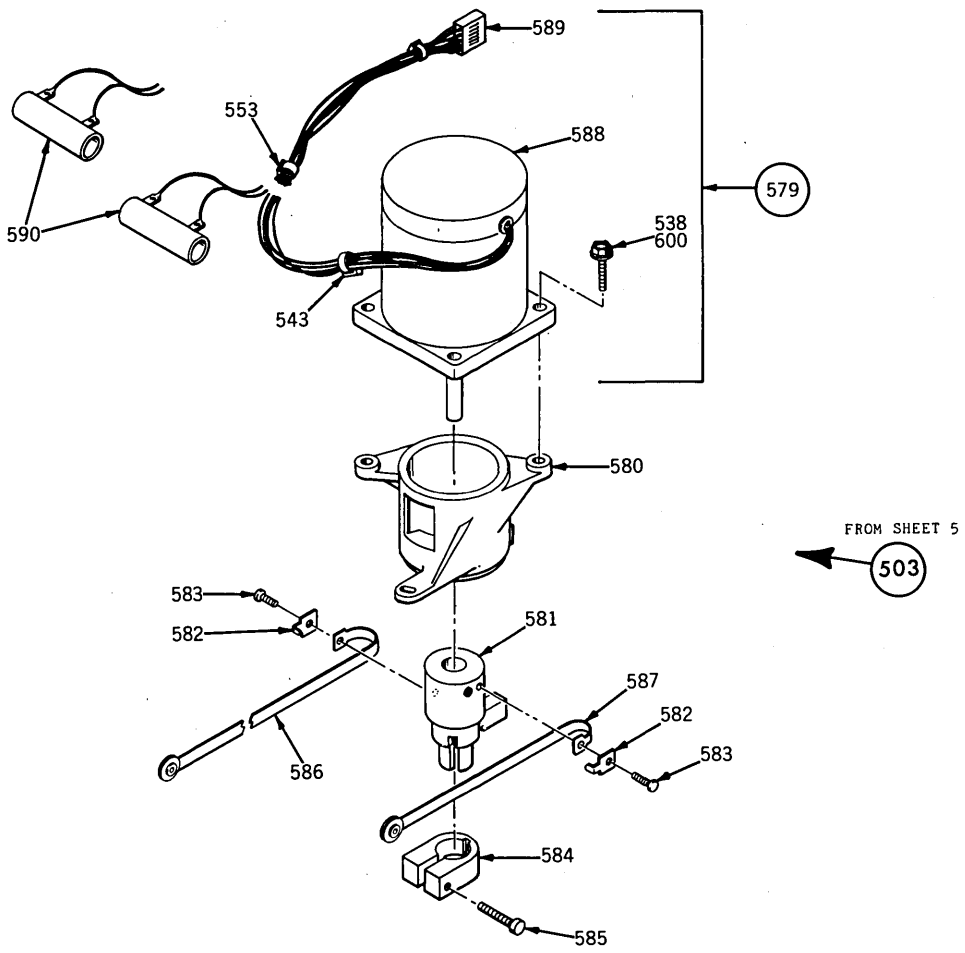
FIGURE 8-7. HARNESS ASSEMBLIES





ITEM	IDENT NO	DESCRIPTION	WHERE USED
501	75896122	CARRIAGE ASSEMBLY	302 303
529	75883215	TENSION ASSEMBLY	302 303
566	00848201	RET RING	501
575	10125801	WASHER	529
592	75889356	LOWER ARM ASM	501
593	75889366	UPPER ARM ASM	501
594	75883360	LOWER CARRIAGE	501
595	75880531	TOP COVER	501
597	75888785	ARM SRPING	501
598	10125103	NUT	501
599	10127104	SCREW	501
600	95102700	VARNISH	501
633	75881825	MOUNTING-PLATE	529
634	75882816	SPRING	529
635	75883150	IDLER	529
636	75881280	NUT PLATE	529
638	10127102	SCREW	529
639	75892888	DOWELL PIN	529
640	93533154	ROLL PIN	529
641	75882015	SPRING	529
656	92073074	BEARING	529
657	94277410	CABLE TIE	501
682	REFERENCE	SEE FIGURE 5	REF
692	83408631	PLASTIC TUBING	501

FIGURE 8-8. CARRIAGE AND TENSION ASSEMBLIES



ITEM	IDENT NO	DESCRIPTION	WHERE USED
503	75892007	ACTUATOR ASSEMBLY	302 303
532	75889396	EJECTOR ASM	302 303
538	93592164	SCREW	503
543	94277400	CABLE TIE	579
553	77612011	CABLE TIE	579
566	00848201	RET RING	532
566	00848201	RET RING	532
579	75881932	STEPPER MOTOR ASM	503
580	75881563	MOTOR ADAPTER	503
581	75881441	PULLEY	503
582	75881785	BAND RETAINER	503
583	75882026	SCREW	503
584	75881287	CLAMP	503
585	18862716	SCREW	503
586	75883120	BAND	503
587	75883121	BAND	503
588	75882150	STEPPER MOTOR	579
589	75883312	RESISTOR CABLE	579
590	77612491	RESISTOR	579
600	95102700	VARNISH	503
643	75890856	LATCH	532
644	75893550	SPRING	532
646	75881575	SPRING	532
659	75893269	EJECTOR	532

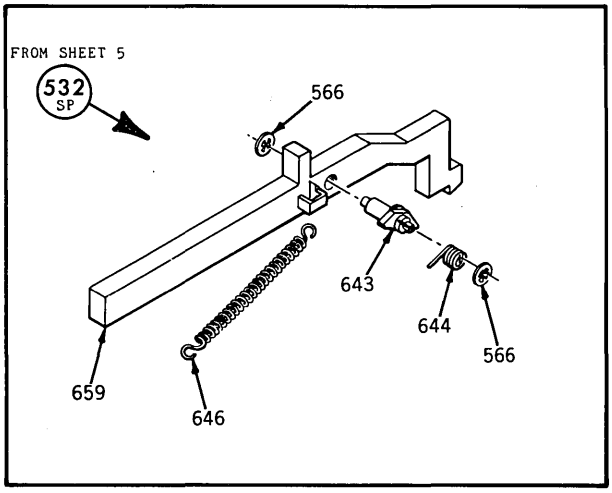
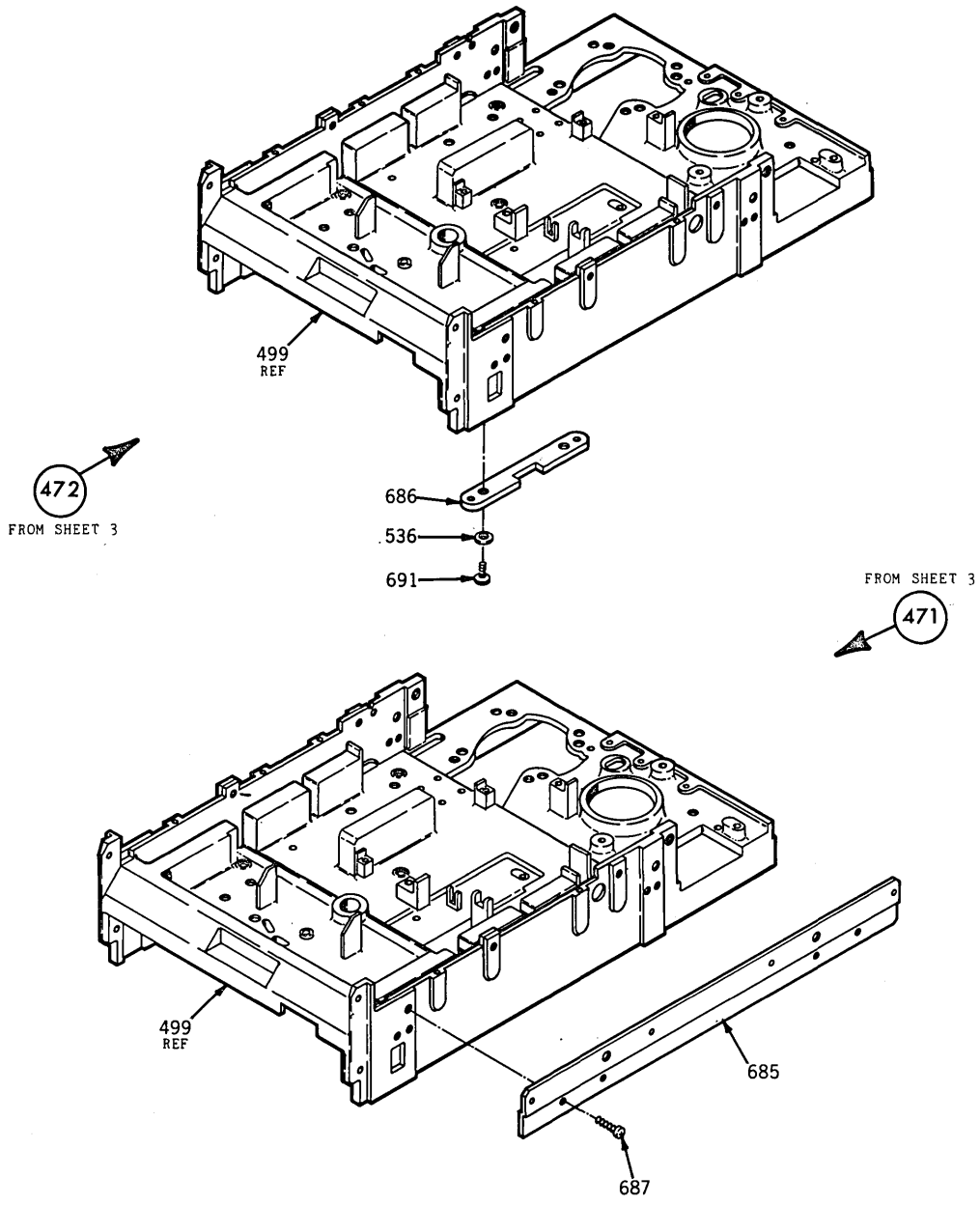


FIGURE 8-9. ACTUATOR AND EJECTOR ASSEMBLIES



ITEM	IDENT NO	DESCRIPTION	WHERE USED
471	75883336	KIT, SIDE MTG	HPC
472	75894197	KIT, BOTTOM MTG	HPC
499	REFERENCE	SEE FIGURE 2	REF
536	10125605	WASHER	472
685	10127122	SCREW	471
686	75881607	ADAPTER	472
687	75883001	ADAPTER	471
691	18862716	SCREW	472

FIGURE 8-10. FEATURE KITS

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 HPC 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

Items 300 through 499 will carry "HPC" in the "Where Used" column. Items shown for reference only will carry 'REF."

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 numbers referenced on 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.

TOP-DOWN ASSEMBLY/COMPONENT PART LIST

ITEM	IDENT NO	DESCRIPTION	WHERE USED	SHEET
302	75896102	TOP MECHANICAL ASM	HPC	S05
302	75896102	TOP MECHANICAL ASM	HPC	S04
302	75896102	TOP MECHANICAL ASM	HPC	S03
303	75896103	TOP MECHANICAL ASM	HPC	S03
303	75896103	TOP MECHANICAL ASM	HPC	S05
303	75896103	TOP MECHANICAL ASM	HPC	S04
308	77650890	LATCH ASM	HPC	S03
309	75883185	LATCH ASM	HPC	S03
310	77650889	LATCH ASM	HPC	S03
350	75882589	DRIVE MOTOR ASM 60-120	HPC	S03
350	75882589	DRIVE MOTOR ASM 60-120	HPC	S06
351	75882592	DRIVE MOTOR ASM 50-220	HPC	S03
351	75882592	DRIVE MOTOR ASM 50-220	HPC	S06
352	75882591	DRIVE MOTOR ASM 60-220	HPC	S03
352	75882591	DRIVE MOTOR ASM 60-220	HPC	S06
353	75882855	DRIVE MOTOR ASM 60-120	HPC	S06
353	75882855	DRIVE MOTOR ASM 60-120	HPC	S03
354	75882858	DRIVE MOTOR ASM 50-220	HPC	S03
354	75882858	DRIVE MOTOR ASM 50-220	HPC	S06
355	75882856	DRIVE MOTOR ASM 50-120	HPC	S03
355	75882856	DRIVE MOTOR ASM 50-120	HPC	S06
356	75882857	DRIVE MOTOR ASM 60-220	HPC	S03
356	75882857	DRIVE MOTOR ASM 60-220	HPC	S06
399	77581102	CLAMSHELL (BLACK)	HPC	S03
400	77618401	CLAMSHELL (BLACK)	HPC	S03
401	75889426	CLAMSHELL ASM	HPC	S03
401	75889426	CLAMSHELL ASM	HPC	S09
402	75897401	CLAMSHELL ASM	HPC	S09
402	75897401	CLAMSHELL ASM	HPC	S03
403	77581106	CLAMSHELL (BROWN)	HPC	S03
404	77618428	CLAMSHELL (WHITE)	HPC	S03
405	77618429	CLAMSHELL (BRONZE)	HPC	S03
406	77618405	CLAMSHELL (GRAY)	HPC	S03
409	77899329	FRONT PANEL	HPC	S03
410	75899301	FRONT PANEL (BLACK)	HPC	S03
411	77631302	FRONT PANEL (BLACK)	HPC	S03
412	77631402	FRONT PANEL (BLACK)	HPC	S03
413	77631406	FRONT PANEL (BROWN)	HPC	S03
414	75889328	FRONT PANEL (WHITE)	HPC	S03
415	75881578	SPRING	HPC	S03
420	75889701	BUTTON (BLACK)	HPC	S03
421	75897201	BUTTON (BLACK)	HPC	S03
422	75897206	BUTTON (BROWN)	HPC	S03
423	75889728	BUTTON (WHITE)	HPC	S03
424	75889729	BUTTON	HPC	S03
425	75889705	BUTTON (GRAY)	HPC	S03
430	75882401	FRONT PANEL ASM	HPC	S07
430	75882401	FRONT PANEL ASM	HPC	S03
431	75882406	FRONT PANEL ASM	HPC	S07
431	75882406	FRONT PANEL ASM	HPC	S03
432	75882405	FRONT PANEL ASM	HPC	S07
432	75882405	FRONT PANEL ASM	HPC	S03
433	75882404	FRONT PANEL ASM	HPC	S07
433	75882404	FRONT PANEL ASM	HPC	S03
434	75897950	FRONT PANEL ASM	HPC	S07
434	75897950	FRONT PANEL ASM	HPC	S03
435	75897951	FRONT PANEL ASM	HPC	S07
435	75897951	FRONT PANEL ASM	HPC	S03
436	75897952	FRONT PANEL ASM	HPC	S07
436	75897952	FRONT PANEL ASM	HPC	S03
437	75897953	FRONT PANEL ASM	HPC	S07
437	75897953	FRONT PANEL ASM	HPC	S03
438	75899305	FRONT PANEL (GRAY)	HPC	S03
438	75899305	FRONT PANEL (GRAY)	HPC	S07
440	75882037	WRITE PROTECT	HPC	S08
440	75882037	WRITE PROTECT	HPC	S03
441	75882036	DISK IN PLACE DET	HPC	S08
441	75882036	DISK IN PLACE DET	HPC	S03
450	75882185	INDEX DETECTOR KIT	HPC	S08
450	75882185	INDEX DETECTOR KIT	HPC	S03
460	75889979	DOOR INTERLOCK KIT	HPC	S03
460	75889979	DOOR INTERLOCK KIT	HPC	S08
470	75883335	KIT, TK "43"	HPC	S08
470	75883335	KIT, TK "43"	HPC	S03
471	75883336	KIT, SIDE MTG	HPC	S13
471	75883336	KIT, SIDE MTG	HPC	S03
472	75894197	KIT, BOTTOM MTG	HPC	S13
472	75894197	KIT, BOTTOM MTG	HPC	S03
499	REFERENCE	SEE FIGURE 2	REF	S13
499	REFERENCE	SEE FIGURE 2	REF	S08
499	75883128	BASE (MACHINED)	302 303	S05
499	75883128	BASE (MACHINED)	302 303	S04
501	REFERENCE	SEE FIGURE 2 & 8	REF	S08
501	75896122	CARRIAGE ASSEMBLY	302 303	S05
501	75896122	CARRIAGE ASSEMBLY	302 303	S11
502	75881591	SPINDLE	302 303	S04
503	75892007	ACTUATOR ASSEMBLY	302 303	S12
503	75892007	ACTUATOR ASSEMBLY	302 303	S05
506	75888675	BAIL ASM	302 303	S04
507	77647148	LOAD PLATE ASM	302 303	S04
507	77647148	LOAD PLATE ASM	302 303	S09
508	75881326	GUIDE CARRIAGE	302 303	S05
509	75881275	GUIDE ROD	302 303	S05
510	77646600	PULLEY-SPINDLE	302 303	S04
512	77613697	BEARING, FLANGED	302 303	S04
513	93529005	WASHER-SPRING WAVE	302 303	S04
515	75883017	RETAINER	302 303	S05
516	75888590	HINGE PIN	302 303	S04
517	75888591	HINGE PIN	302 303	S04
518	75888595	PIN	302 303	S04
519	75890210	PIN, HITCH	302 303	S04
520	75890211	PIN, HITCH	302 303	S04
521	75888570	SPRING, CLAMSHELL	302 303	S04
523	75293203	BELT-FLAT	302 303	S04
524	75883240	LATCH BLOCK	302 303	S05
525	75882331	SOLENOID ASM	434 435	S07
528	75883095	GUARD, HEAD CABLE	302 303	S05
529	75883215	TENSION ASSEMBLY	302 303	S11
529	75883215	TENSION ASSEMBLY	302 303	S05
530	75774732	CLIP-PUSH IN	302 303	S05
531	75774736	CLIP-PUSH IN	302 303	S05
532	75889396	EJECTOR ASM	302 303	S05
532	75889396	EJECTOR ASM	302 303	S12
533	REFERENCE	SEE FIGURES 2 & 7	REF	S08
533	75883330	UPPER HARNESS ASM	302 303	S04
533	75883330	UPPER HARNESS ASM	302 303	S10
534	09023703	SCREW	302 303	S05
535	10127334	SCREW	302 303	S04
536	10125605	WASHER	533	S10
536	10125605	WASHER	472	S13
536	10125605	WASHER	302 303	S05
536	10125605	WASHER	302 303	S04
536	10125605	WASHER	450	S08
537	10125803	WASHER LK	533	S10
537	10125803	WASHER LK	302 303	S04
538	93592164	SCREW	503	S12
538	93592164	SCREW	302 303	S05
538	93592164	SCREW	450	S08
539	17901504	SCREW	302 303	S04
540	75806502	WASHER	432-435	S07
540	75806502	WASHER	470	S08
541	18862916	SCREW	302 303	S05
542	93592162	SCREW	662 625	S10
542	93592162	SCREW	470	S08
542	93592162	SCREW	302 303	S04
542	93592162	SCREW	654	S06
542	93592162	SCREW	302 303	S05
543	94277400	CABLE TIE	302 303	S04
543	94277400	CABLE TIE	684 693	S10
543	94277400	CABLE TIE	579	S12
543	94277400	CABLE TIE	350-356	S06
543	94277400	CABLE TIE	533	S10
544	93592202	SCREW	350-356	S06
545	10126401	WASHERS	302 303	S04
546	75731302	ELECTRICAL SYMBOL	302 303	S04
547	92012727	SCREW	302 303	S04
548	10126104	WASHER	350-356	S06
549	75738422	CAPACITOR	350 353	S06
549	75738422	CAPACITOR	355	S06
550	10126219	SCREW	TMA	S04
551	77832235	TERMINAL	350-356	S06
552	83435504	CONTACT	353	S06
553	77612011	CABLE TIE	684 693	S10
553	77612011	CABLE TIE	579	S12
554	16439600	MOUNTING BRKT	350-356	S06
555	75882341	CABLE	350-352	S06
556	75882490	BRACKET	350-352	S06
557	75882332	SOLENOID ASM	432	S07
558	77636695	SOLENOID MOUNT	432 434	S07
558	77636695	SOLENOID MOUNT	435	S07
559	75738495	CAPACITOR	351 352	S06
559	75738495	CAPACITOR	354 356	S06
560	83435501	CONTACT	354-356	S06
560	83435501	CONTACT	350-352	S06
561	75726925	MOTOR	350 353	S06
561	75726925	MOTOR	355	S06
562	75726924	MOTOR	351 352	S06
562	75726924	MOTOR	354 356	S06
563	75896006	PULLEY-DUAL DR	350-356	S06
564	83413405	SCREW	350-356	S06
565	75293954	HOUSING	431-437	S07
565	75293954	HOUSING	441	S08
566	00848201	RET RING	431-437	S07
566	00848201	RET RING	532	S12
566	00848201	RET RING	532	S12
566	00848201	RET RING	501	S11
567	94277400	CABLE TIE	431-433	S07
568	75882330	SOLENOID ASM	433	S07
569	77632960	SOLENOID MOUNT	433-435	S07
570	75888600	SHAFT LOCK	432 433	S07
571	75882035	SPRING	432 433	S07
572	92033147	RET RING	432 433	S07
573	75882107	WASHER	432 433	S07
574	94376917	SCREW	432-435	S07
575	10125801	WASHER	432-435	S07
575	10125801	WASHER	529	S11
576	75882335	CABLE	431-437	S07
577	75810701	LED	431-433	S07
578	75810703	RET RING	431-433	S07
579	75881932	STEPPER MOTOR ASM	503	S12
580	75881563	MOTOR ADAPTER	503	S12
581	75881441	PULLEY	503	S12
582	75881785	BAND RETAINER	503	S12
583	75882026	SCREW	503	S12
584	75881287	CLAMP	503	S12
585	18862716	SCREW	503	S12
586	75883120	BAND	503	S12
587	75883121	BAND	503	S12
588	75882150	STEPPER MOTOR	579	S12
589	75883312	RESISTOR CABLE	579	S12
590	77612491	RESISTOR	579	S12
591	93820166	SET SCREW	432 434	S07
591	93820166	SET SCREW	435	S07
592	75889356	LOWER ARM ASM	501	S11

TOP-DOWN ASSEMBLY/COMPONENT PART LIST

ITEM	IDENT NO	DESCRIPTION	WHERE USED	SHEET
593	75889366	UPPER ARM ASM	501	S11
594	75883360	LOWER CARRIAGE	501	S11
595	75880531	TOP COVER	501	S11
597	75888785	ARM SRPING	501	S11
598	10125103	NUT	501	S11
599	10127104	SCREW	501	S11
600	95102700	VARNISH	503	S12
600	95102700	VARNISH	501	S11
601	75888650	LOAD PLATE	507	S09
602	75882038	FOAM	507	S09
603	75882348	SPRING	507	S09
604	75881895	CONE ASM	401 402	S09
605	75882017	COMPRESSION SPRING	401 402	S09
606	93564057	WASHER	401 402	S09
607	92033087	RET RING	401 402	S09
608	93820782	SCREW	401 402	S09
610	75881715	CONE	604	S09
611	75881892	BEARING	604	S09
612	75888607	SHAFT	604	S09
613	75888610	RETAINER	604	S09
614	75881710	SPACER	604	S09
615	75882016	COMPRESSION SPRING	604	S09
615	75882016	COMPRESSION SPRING	604	S09
616	77610637	SCREW	604	S09
616	77610637	SCREW	604	S09
617	75889295	INDEX DETECTOR ASM	450	S08
617	75889295	INDEX DETECTOR ASM	684 693	S10
618	77612981	LIGHT EMITTING DIODE	434-437	S07
619	75882145	LOWER CABLE	684 693	S10
620	77610030	DOWEL PIN	434-437	S07
621	75881365	OPTICAL SWITCH	662 625	S10
621	75881365	OPTICAL SWITCH	470	S08
622	10127311	SCREW	440 441	S08
623	75882170	UPPER CABLE	660	S10
625	77622495	"O" TRACK ASM	693	S10
625	REFERENCE	SEE FIGURE 5	REF	S08
626	75882327	SOLENOID	533	S10
627	10126217	SCREW	533	S10
628	93820248	SCREW	625	S10
628	93820248	SET SCREW	401 402	S09
629	77646309	"O" TRACK STOP	625	S10
630	75883180	UPPER GUIDE	660	S10
631	75720001	PHOTO SENSE	660	S10
632	92498024	TERMINAL	660	S10
633	75881825	MOUNTING-PLATE	529	S11
634	75882816	SPRING	529	S11
635	75883150	IDLER	529	S11
636	75881280	NUT PLATE	529	S11
637	75899167	SPRING	430-433	S07
638	10127102	SCREW	529	S11
638	10127102	SCREW	432-435	S07
639	75892888	DOWELL PIN	529	S11
640	93533154	ROLL PIN	529	S11
641	75882015	SPRING	529	S11
642	77646804	BUMPER	434-437	S07
643	75890856	LATCH	532	S12
644	75893550	SPRING	532	S12
646	75881575	SPRING	532	S12
647	75880751	SWITCH	460	S08
648	75889215	NUT PLATE	460	S08
649	10127169	SCREW	460	S08
650	75899166	SPRING	434-437	S07
651	75881363	OPTICAL SWITCH ASM	440	S08
652	75881364	OPTICAL SWITCH	441	S08
654	75882895	LIFTER ASM	302 303	S04
654	75882895	LIFTER ASM	302 303	S06
656	92073074	BEARING	529	S11
657	94277410	CABLE TIE	501	S11
658	75883338	BUMPER	431-433	S07
659	75893269	EJECTOR	532	S12
660	REFERENCE	SEE FIGURE 7	REF	S08
660	75883075	UPPER GUIDE ASM	533	S10
661	75888696	BRACKET	533	S10
662	REFERENCE	SEE FIGURE 5	REF	S08
662	75882885	"O" TRACK ASM	684	S10
663	75882740	COVER	654	S06
664	75882735	CYLINDER	654	S06
665	77658915	PISTON	654	S06
666	75882725	ROLLER	654	S06
667	77658910	SPRING	654	S06
668	92021009	PIN	654	S06
669	75883165	MOUNT	662 625	S10
671	75883023	CABLE	355	S06
671	75883023	CABLE	353 354	S06
672	75882890	BRACKET	355	S06
672	75882890	BRACKET	353 354	S06
677	10127105	SCREW	470	S08
678	10127167	SCREW	470	S08
679	10125102	NUT	470	S08
681	75882880	HOUSING	470	S08
682	75882513	FLAG	470	S08
682	REFERENCE	SEE FIGURE 5	REF	S11
683	75883196	SENSOR ASM, TK "43"	470	S08
683	REFERENCE	SEE FIGURE 5	REF	S10
684	REFERENCE	SEE FIGURES 2 & 7	REF	S08
684	75882177	LOWER HARNESS ASM	302	S05
684	75882177	LOWER HARNESS ASM	302	S10
685	10127122	SCREW	471	S13
686	75881607	ADAPTER	472	S13
687	75883001	ADAPTER	471	S13
688	51891120	PLUG BUTTON	302 303	S04
690	75897601	CABLE GUARD	302 303	S05
691	18862716	SCREW	472	S13
692	83408631	PLASTIC TUBING	501	S11
693	77641815	LOWER HARNESS ASM	303	S05
693	77641815	LOWER HARNESS ASM	303	S10

CROSS REFERENCE INDEX

ITEM	IDENT NO	SHEET
566	00848201	S12
566	00848201	S12
566	00848201	S07
566	00848201	S11
534	09023703	S05
679	10125102	S08
598	10125103	S11
536	10125605	S04
536	10125605	S05
536	10125605	S13
536	10125605	S10
536	10125605	S08
575	10125801	S07
575	10125801	S11
537	10125803	S10
537	10125803	S04
548	10126104	S06
627	10126217	S10
550	10126219	S04
545	10126401	S04
638	10127102	S11
638	10127102	S07
599	10127104	S11
677	10127105	S08
685	10127122	S13
678	10127167	S08
649	10127169	S08
622	10127311	S08
535	10127334	S04
554	16439600	S06
539	17901504	S04
691	18862716	S13
585	18862716	S12
541	18862916	S05
688	51891120	S04
523	75293203	S04
565	75293954	S07
565	75293954	S08
631	75720001	S10
562	75726924	S06
562	75726924	S06
561	75726925	S06
561	75726925	S06
546	75731302	S04
549	75738422	S06
549	75738422	S06
559	75738495	S06
559	75738495	S06
530	75774732	S05
531	75774736	S05
540	75806502	S08
540	75806502	S07
577	75810701	S07
578	75810703	S07
595	75880531	S11
647	75880751	S08
509	75881275	S05
636	75881280	S11
584	75881287	S12
508	75881326	S05
651	75881363	S08
652	75881364	S08
621	75881365	S08
621	75881365	S10
581	75881441	S12
580	75881563	S12
646	75881575	S12
415	75881578	S03
502	75881591	S04
686	75881607	S13
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ITEM	IDENT NO	SHEET
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499	REFERENCE	S08
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683	REFERENCE	S10
533	REFERENCE	S08
501	REFERENCE	S08
662	REFERENCE	S08
625	REFERENCE	S08
684	REFERENCE	S08

9.1 INTRODUCTION

The following paragraphs contain the following wire lists: Upper-Harness Assembly; Lower-Harness Assembly; Stepper Motor; Diskette in Place; Door-Lock-Solenoid Activity LED; Head Assemblies.

9.2 UPPER-HARNESS ASSEMBLY

Wire Color	Origin	Destination	Approximate Length, Inches
Violet	S/S Index Anode	J5-6	15 (381 mm)
Gray	D/S Index Cathode	J5-4	15 (381 mm)
Brown	Contact Door Switch	J5-1	15 (381 mm)
Yellow	N/O Door Switch	J5-2	15 (381 mm)
Orange	Head-Load Solenoid+	J5-3	9 (229 mm)
Black	Head-Load Solenoid-	J5-5	9 (229 mm)
Green	Write-Protect Anode	J5-11	9 (229 mm)
Red	Write-Protect Collector	J5-12	9 (229 mm)
Blue	Write-Protect Emitter	J5-7	9 (229 mm)
White	Write-Protect Cathode	J5-8	9 (229 mm)

9.3 LOWER-HARNESS ASSEMBLY

Wire Color	Origin	Destination	Approximate Length, Inches
Yellow	D/S Index Collector	J6-6	13 (330 mm)
Brown	D/S Index Emitter	J6-9	13 (330 mm)
Orange	S/S Index Collector	J6-5	13 (330 mm)
Black	S/S Index Emitter	J6-10	13 (330 mm)
Green	Anode Track 0	J6-4	9 (229 mm)
White	Cathode Track 0	J6-1	9 (229 mm)
Blue	Emitter Track 0	J6-2	9 (229 mm)
Red	Collector Track 0	J6-3	9 (229 mm)

9.4 STEPPER MOTOR

Wire Color	Origin	Destination	Approximate Length, Inches
Red/White	ØA	J3-5	12 (305 mm)
Green/White	ØB	J3-8	12 (305 mm)
Red	ØD	J3-10	12 (305 mm)
Green	ØC	J3-9	12 (305 mm)
Black	Motor Com (ØA & ØD)	J3-7	12 (305 mm)
White	Motor Com (ØB & ØC)	J3-6	12 (305 mm)
Orange	+R1	J3-3	21 (533 mm)
Yellow	-R1	J3-4	21 (533 mm)
Blue	R1 (Center Tap)	J3-2	20 (508 mm)

9.5 DISKETTE IN PLACE

Wire Color	Origin	Destination	Approximate Length, Inches
Green	Diskette-in-Place Anode	J8-2	15 (381 mm)
Red	Diskette-in-Place Collector	J8-4	15 (381 mm)
White	Diskette-in-Place Cathode	J8-1	15 (381 mm)
Blue	Diskette-in-Place Emitter	J8-3	15 (381 mm)

9.6 DOOR-LOCK-SOLENOID ACTIVITY LED

Wire Color	Origin	Destination	Approximate Length, Inches
Red	Door-Lock Solenoid+	J7-1	9 (229 mm)
Black	Door-Lock Solenoid-	J7-4	9 (229 mm)
Brown	Activity LED Anode	J7-2	9 (229 mm)
Blue	Activity LED Cathode	J7-3	9 (229 mm)

9.7 HEAD ASSEMBLIES

Applies to carriage serial numbers thru 8219XXXX.

HEAD 0

Wire Color	Origin	Destination
Black	Read/Write	J2-1
White	Read/Write	J2-2
White (large wire)	Shield	J2-3
Green	Erase+	J2-4
Red	Center Tap	J2-5
-	Key	J2-6
Yellow	Erase-	J2-7

HEAD 1

Wire Color	Origin	Destination
Black	Read/Write	J2-8
White	Read/Write	J2-9
Red	Center Tap	J2-10
Green	Erase+	J2-11
White (large wire)	Shield	J2-12
-	Key	J2-13
Yellow	Erase-	J2-14

Applies to carriage serial numbers from serial number 8219XXXX up.

HEAD 0

Wire Color	Origin	Destination
Black	Read/Write	J2-1
Yellow	Read/Write	J2-2
White (large wire)	Shield	J2-3
Green	Erase+	J2-4
Red	Center Tap	J2-5
-	Key	J2-6
White	Erase-	J2-7

HEAD 1

Wire Color	Origin	Destination
Black	Read/Write	J2-8
Yellow	Read/Write	J2-9
Red	Center Tap	J2-10
Green	Erase+	J2-11
White (large wire)	Shield	J2-12
-	Key	J2-13
White	Erase-	J2-14

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