75897464

CONTROL DATA CORPORATION

# CONTROL DATA®
# FLEXIBLE DISK DRIVE
## MODEL 9404-B

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

MAGNETIC PERIPHERALS INC.
a subsidiary of
CONTROL DATA CORPORATION

## HARDWARE MAINTENANCE MANUAL

# PREFACE

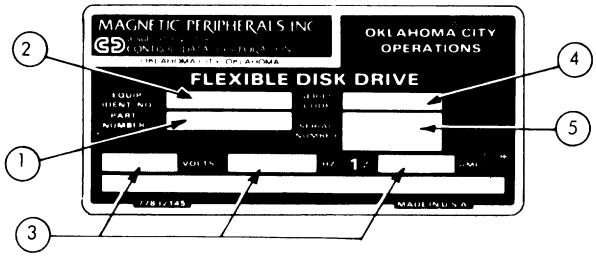
This Special Equipment Documentation publication when used with the Control Data Corporation Model 9404B Hardware Maintenance Manual 75897465, will support the following special configurations of the Model 9404 FDD

| TOP MECHANICAL | EQUIPMENT NO. | PRINTED WIRING ASSEMBLY NO. |
|---|---|---|
| 75744064 | BR8A5J | 77636248 |
| 75744064 | BR8A5J | 77636249 |
| 75744064 | BR8A5J | 77636200 |
| 75744082 | BR8A5H | 77643200 |

The data contained in this Special Equipment Documentation is unique to the above configurations. Section and paragraph designations are keyed to those of the basic Model 9404B Hardware Maintenance Manual for ease of reference and use.

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

# FLEXIBLE DISK DRIVE CONFIGURATOR SHEET




1. TOP MECHANICAL ASSEMBLY NO. (TMA)
2. MODEL NO. (BR8XXX)
3. AC POWER REQUIRED.
4. EQUIPMENT STATUS NUMBER
5. UNIT SERIAL NO.

| POWER REQMTS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VDC | +5 & +24 AT J7 | | | | | | | | | | | |
| | +5 & +24 AT J10 | | | | | | | | | | | |
| VAC | 120, 1Ø | | | | | | | | | | | |
| WRITE PROTECT | | | | | | | | | | | | |
| DAISY-CHAIN INTERFACE | | | | | | | | | | | | |
| TMA NO. | TYPE NO. | PWA NO. | | | | | | | | | | |
| 75744064 | BR8A5J | 77636200 | X | X | | X | | | | X | | |
| 75744064 | BR8A5J | 77636248 | X | X | | X | | | | X | | |
| 75744064 | BR8A5J | 77636249 | X | X | | X | | | | X | | |
| 75744082 | BR8A5H | 77643200 | X | X | | X | | | X | X | | |

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MAINTENANCE



WIRE LISTS



**Page Numbers refer to 75897464, all others refer to 75897465.

SECTION PAGE*

PARTS DATA



*Page Numbers refer to Section 8 9404B Manual.

# LIST OF ILLUSTRATIONS



# LIST OF TABLES



**Page numbers refer to 75897464, all others refer to 75897465.

# GENERAL DESCRIPTION 1

Refer to Section 1 of 75897465.

# OPERATION 2

Refer to Section 2 of 75897465.

# INSTALLATION AND CHECKOUT 3

## 3.4.1 INPUT-OUTPUT CABLE

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

The information relative to the I/O connector (J1) and pin/signal assignments are defined in Figures 5-2 and 5-4.

The recommended mating connectors for Tab 82 are:

| TYPE OF CABLE | MANUFACTURER | CONN. P/N | CONTACT P/N |
|---|---|---|---|
| Twisted Pair, #26 (crimp or solder) | AMP | 1-583717-1 | 583616-5 (crimp)<br>583854-3 (solder) |
| Twisted Pair #26 (solder term.) | VIKING | 3VH25/1JN-5 | NA |
| Flat Cable | 3M "Scotchflex" | 3415-0001 | NA |

The recommended mating connector for Tab 64 is AMP P/N 86916-2.

On models configured for daisy-chain operation, the terminating resistor module 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 multiple-drive daisy-chain operation the resistor modules of all but the end unit must be removed from their sockets. Addresses of the FDD's are established by punching-out all but the desired shunt which corresponds to the drives' addresses (refer to Figure 5-3). For Unit 1 leave shunt 1, for Unit 2 leave shunt 2, etc.

## 3.4.2 DC POWER CONNECTION

DC power (user-supplied) comes through a stranded wire, 18 AWG minimum cable which interfaces with its mating connector on the printed-circuit board. The pin assignments are shown on Sheet 1 of the schematic Figure 5-2 and on Figure 5-4.

Mating connector:
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| MANUFACTURER | CONNECTOR P/N | CONTACT P/N |
|---|---|---|
| AMP | 1-87270-1 | 87278-2 |

Tab 082

| MANUFACTURER | CONNECTOR P/N | CONTACT P/N |
|---|---|---|
| AMP | 1-480270-0 | 60619-1 |

## THEORY OF OPERATION 4

Refer to Section 4 of 75897465.

## DIAGRAMS 5

NOTE

PWA and Schematic diagrams for TMA Tab No. 64 units replacing their counterparts in Section 5 of the standard 9404B manual, are shown as Figure 5-2 and 5-3a of this package.

The PWA for the TMA Tab 82 unit replacing the Section 5 PWA in the standard manual is shown as Figure 5-3b here. The Tab 82 schematic is identical to that contained in the standard manual.

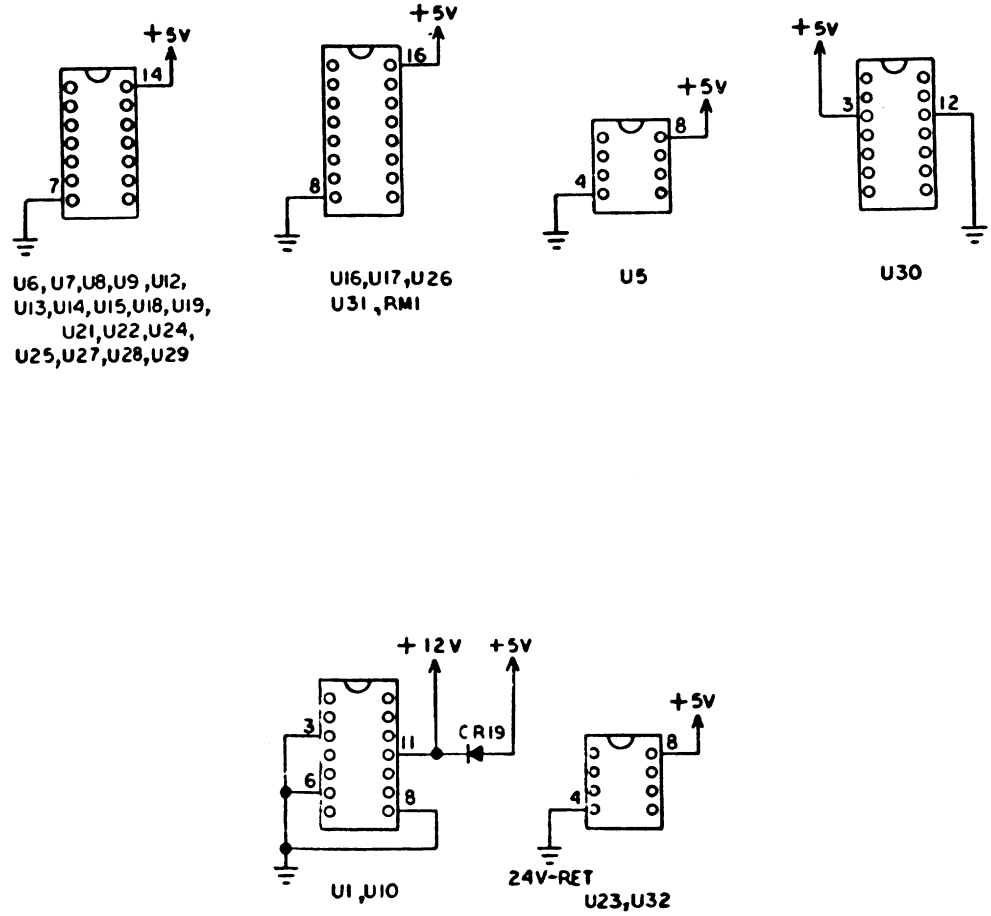



FIGURE 5-2. SCHEMATIC, MOD-T (SHEET 1 OF 6)

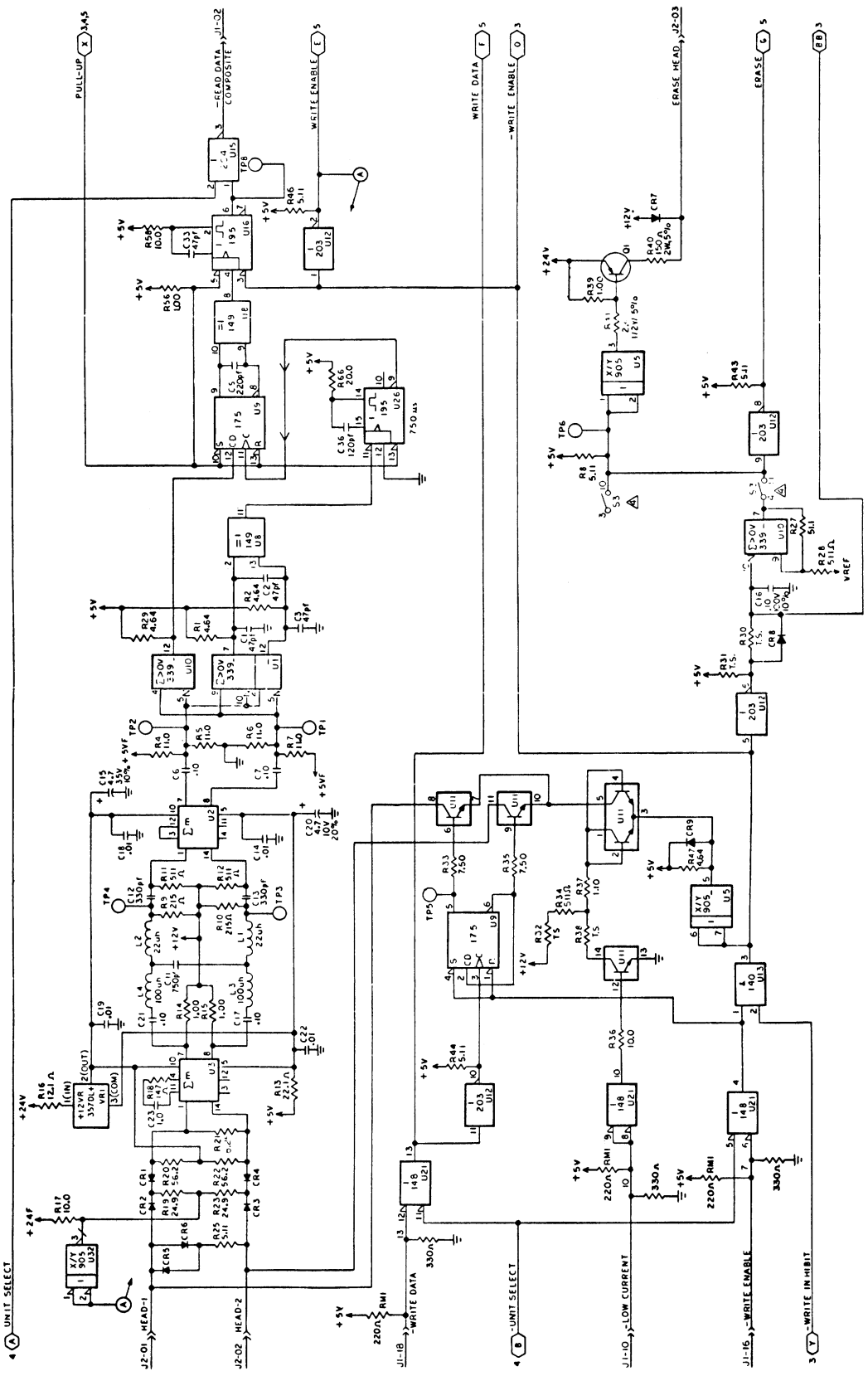



FIGURE 5-2. SCHEMATIC, MOD-T (SHEET 2 OF 6)

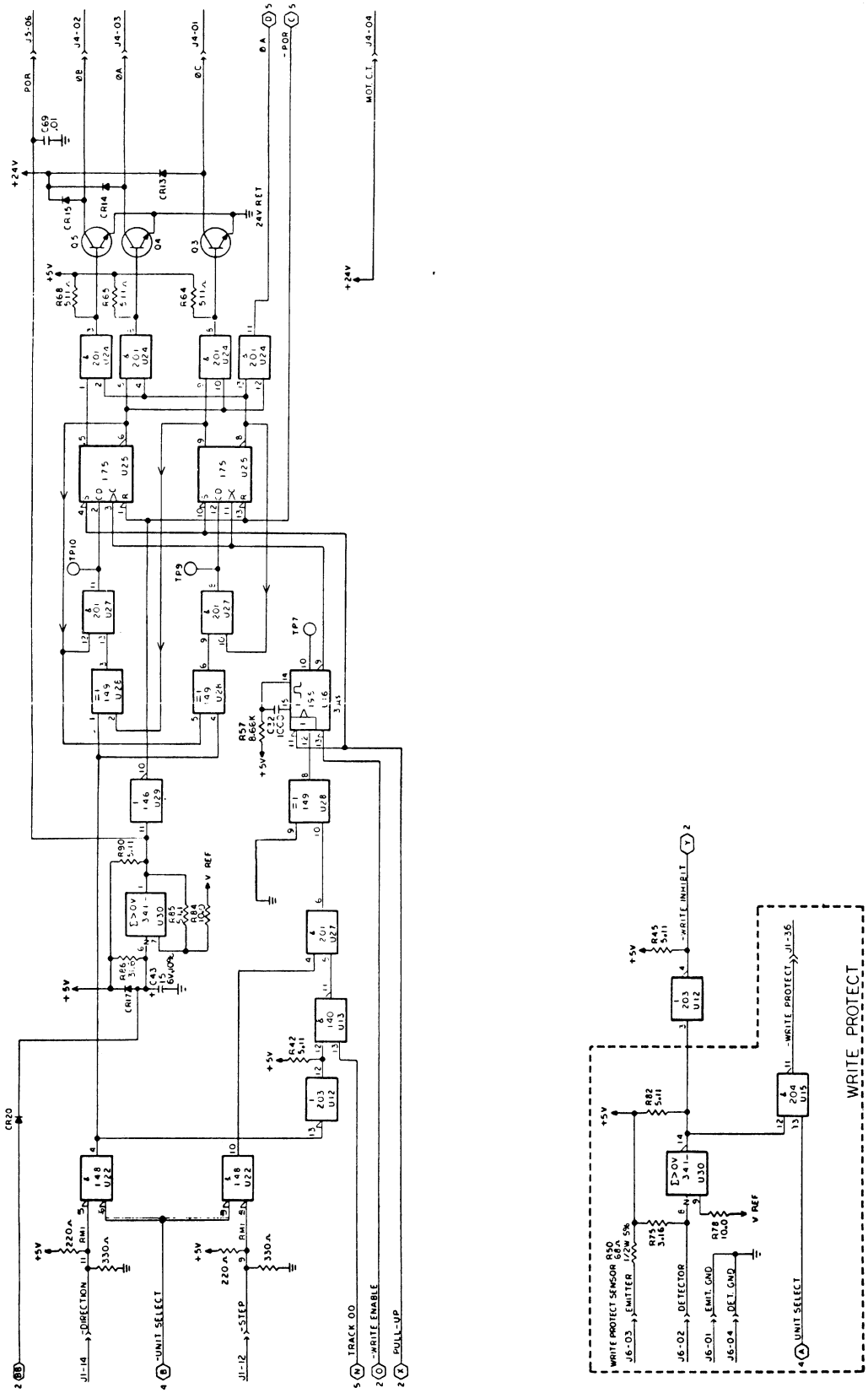



FIGURE 5-2. SCHEMATIC, MOD-T (SHEET 3 OF 6)

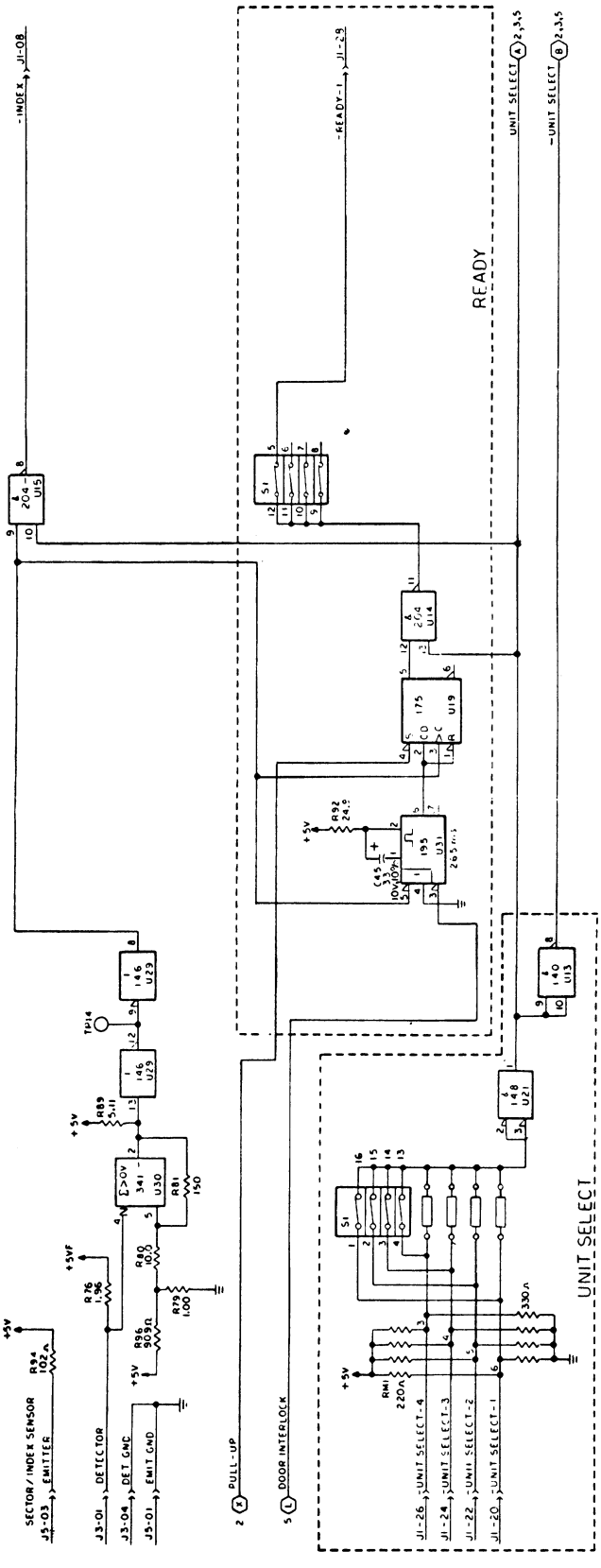



FIGURE 5-2. SCHEMATIC, MOD-T (SHEET 4 OF 6)

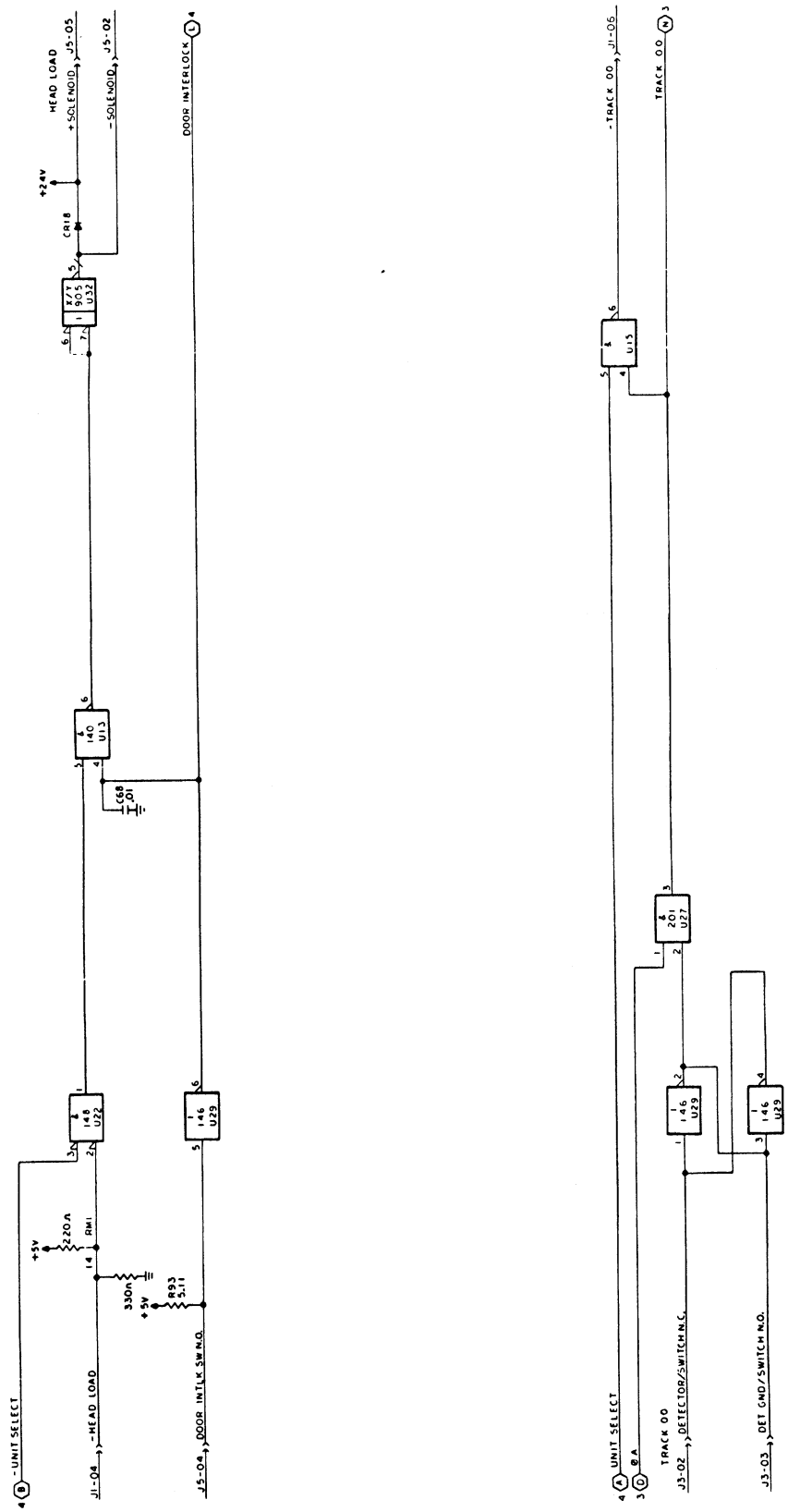



FIGURE 5-2. SCHEMATIC, MOD-T (SHEET 5 OF 6)

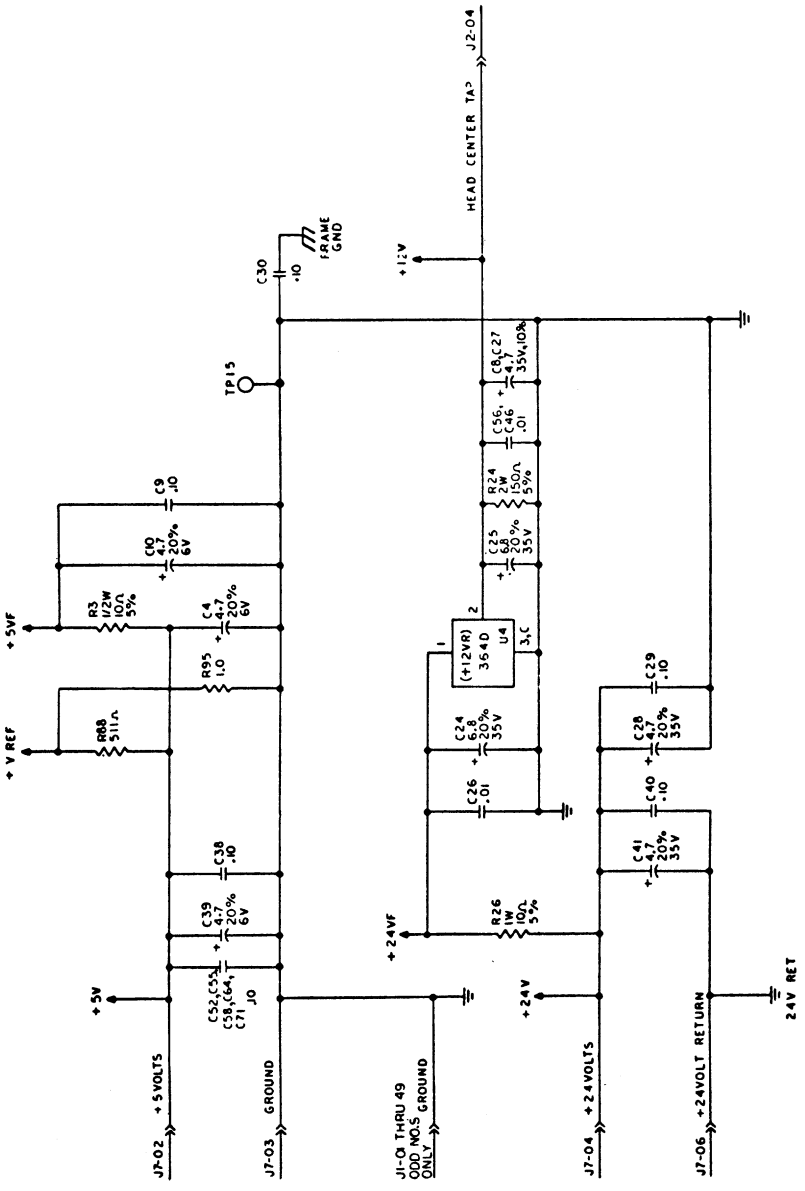



FIGURE 5-2. SCHEMATIC, MOD-T (SHEET 6 OF 6)

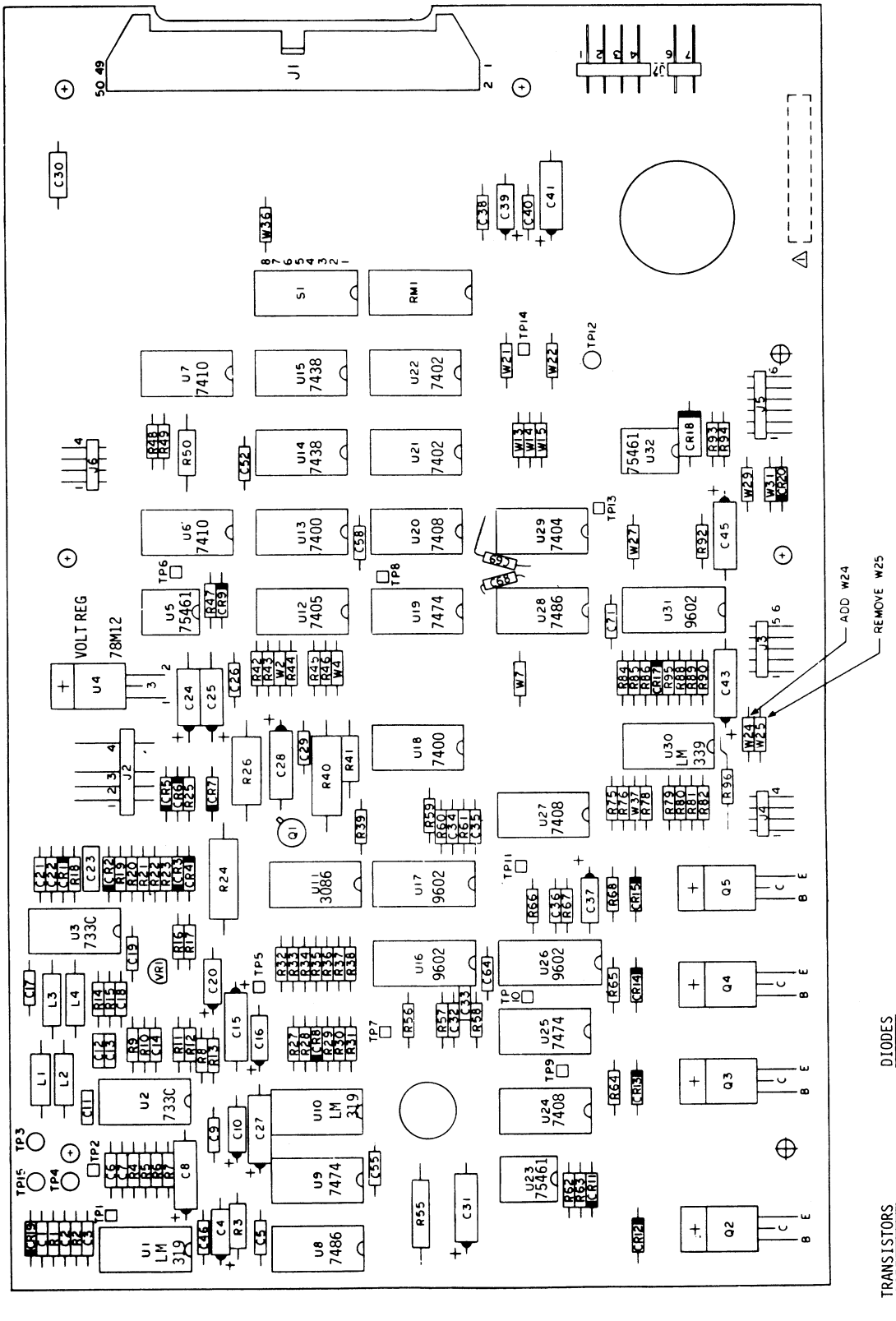



FIGURE 5-3A. ASSEMBLY (SHEET 1 OF 3)
PWA MOD-T (CONV. -I)

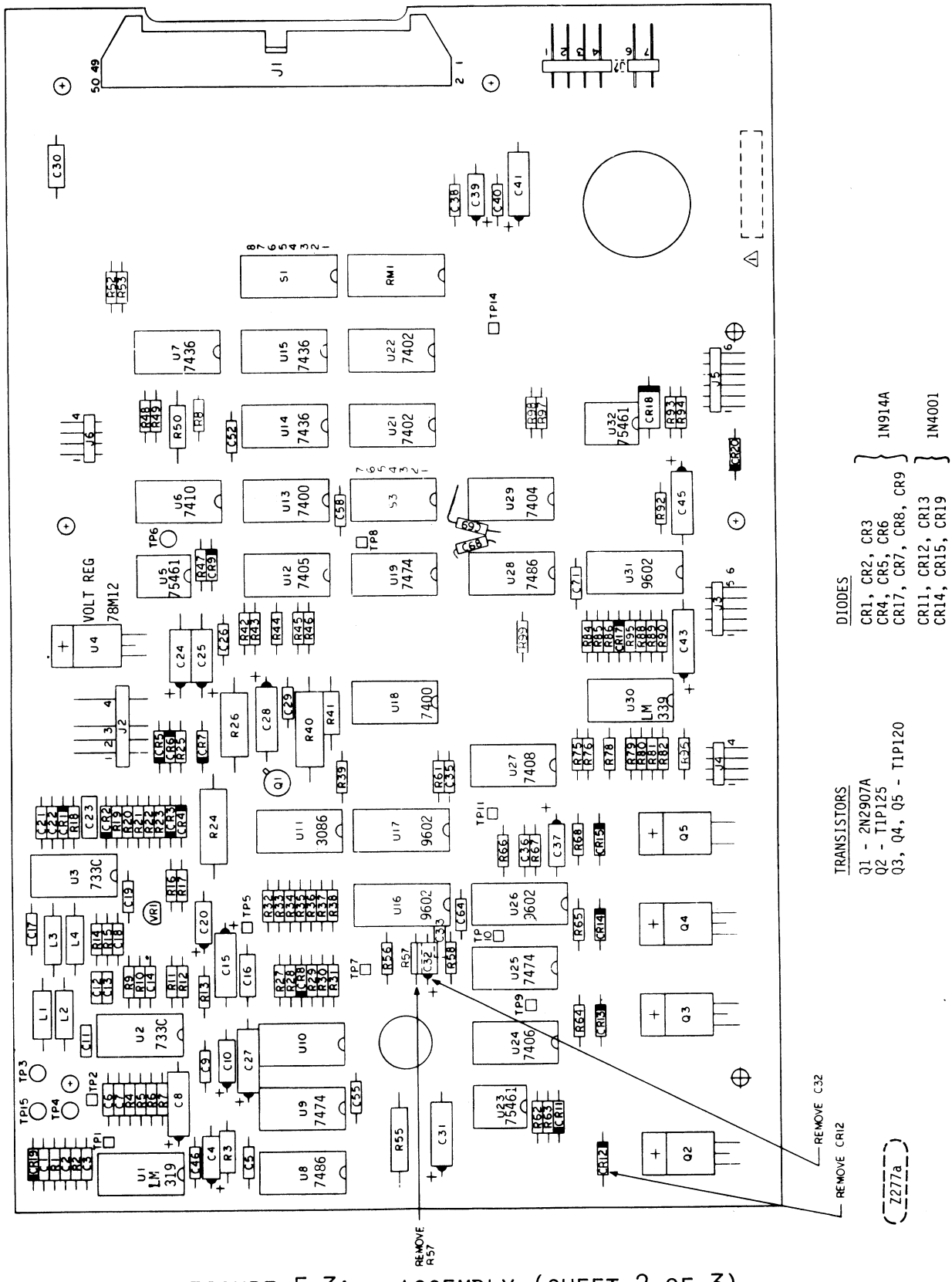



FIGURE 5-3A. ASSEMBLY (SHEET 2 OF 3)
PWA MOD-T (CONV -P-G)

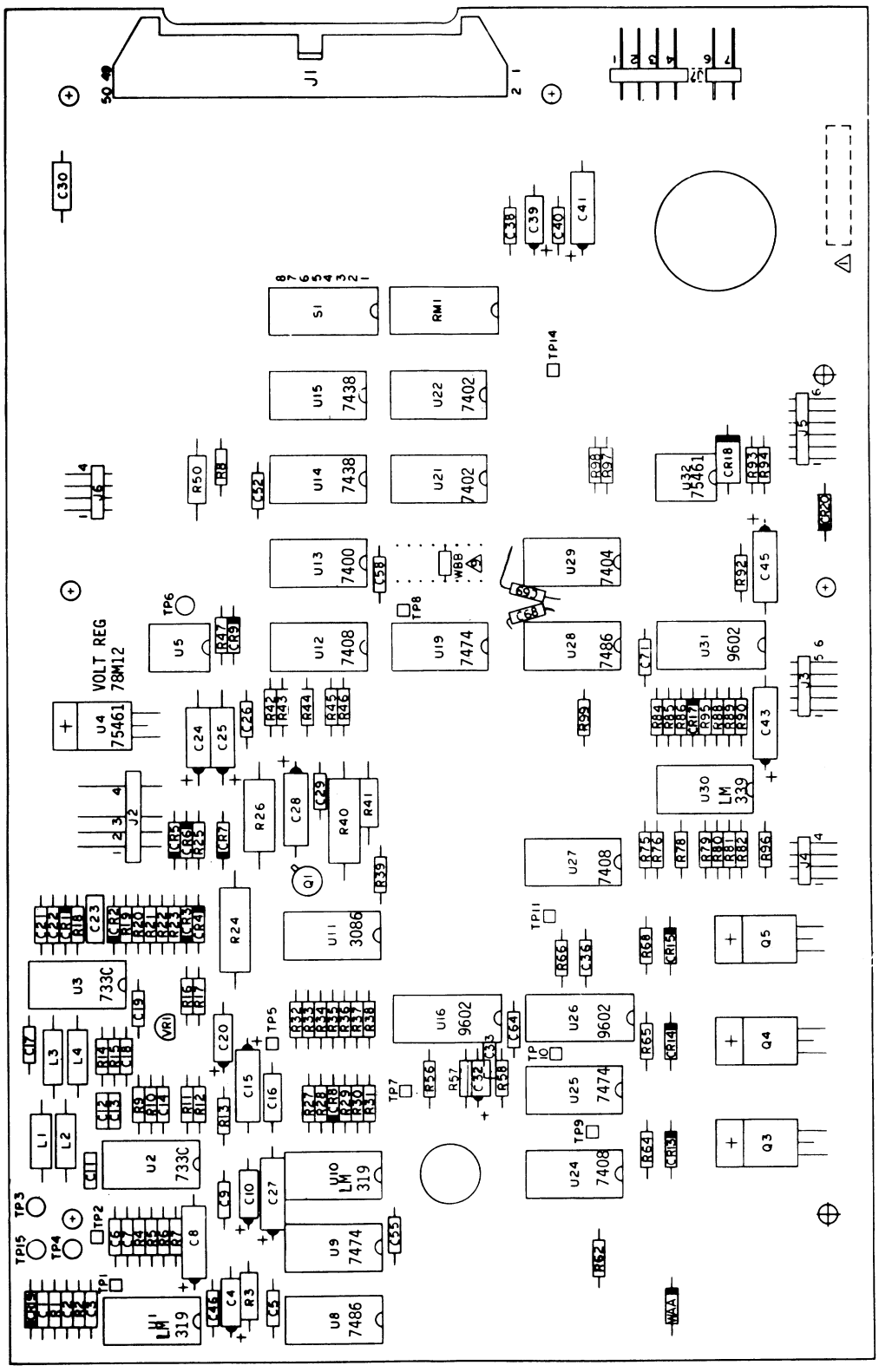
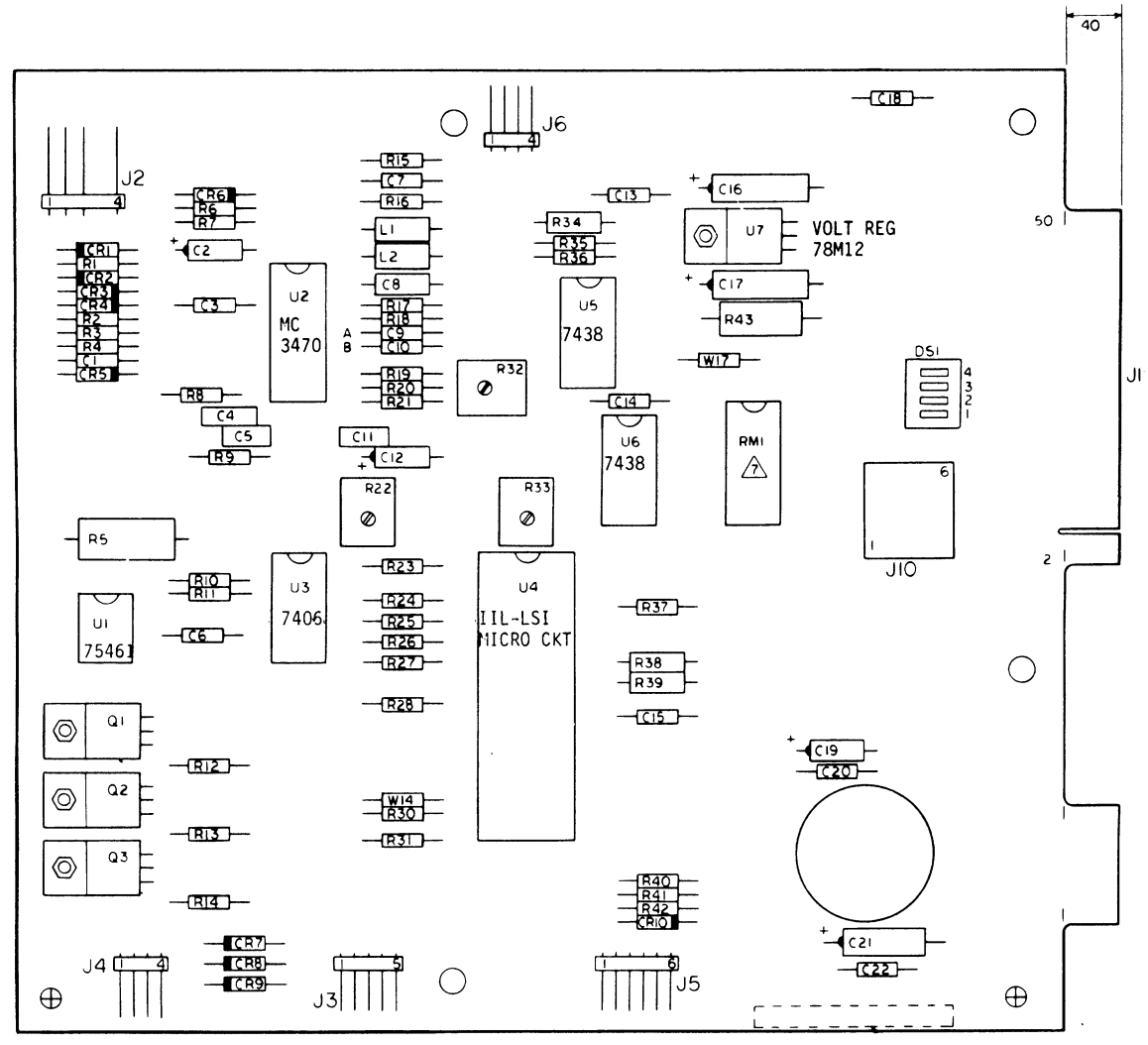



FIGURE 5-3A. ASSEMBLY (SHEET 3 OF 3)
PWA MOD-T




TRANSISTORS

Q1, Q2, Q3 - T1P120

DIODES

CR1, CR2, CR3, CR4, CR5 } 1N914A

CR6, CR7, CR8, CR9, CR10 } 1N4001

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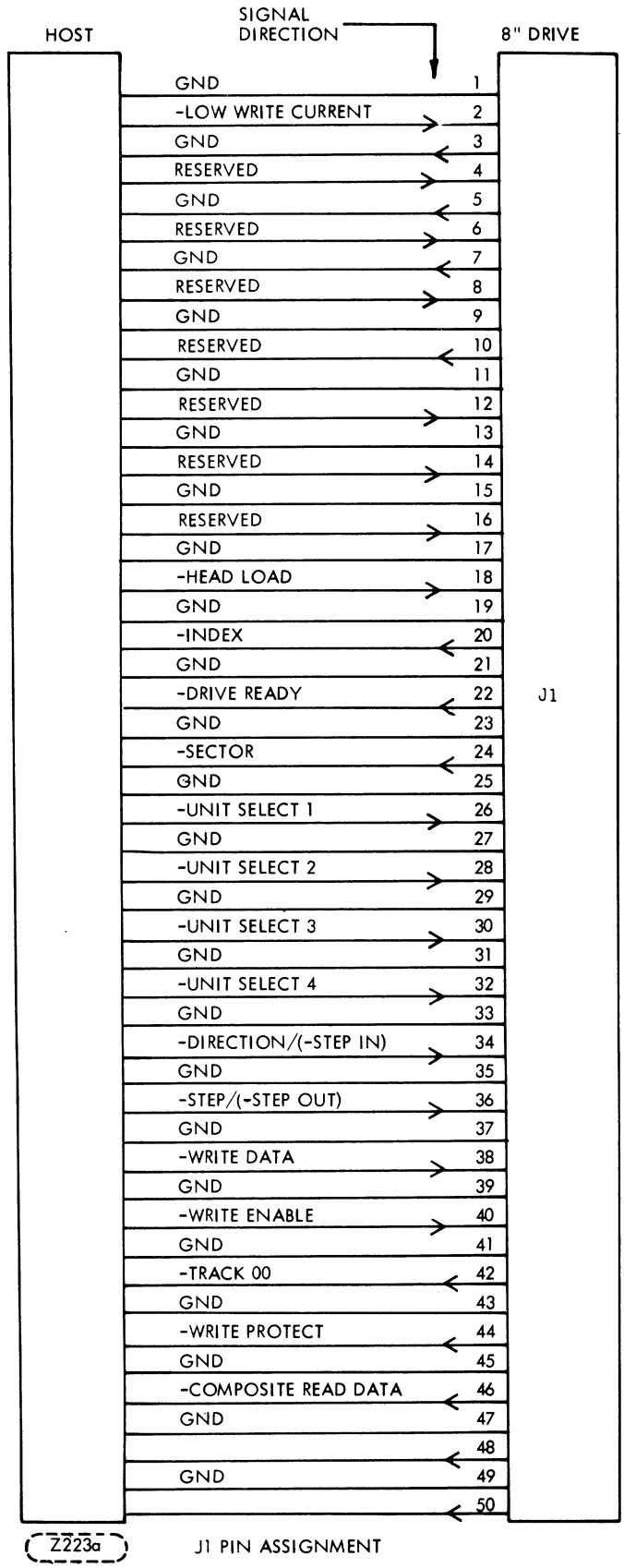
FIGURE 5-3B. PWA 1X-FDD-LSI-T



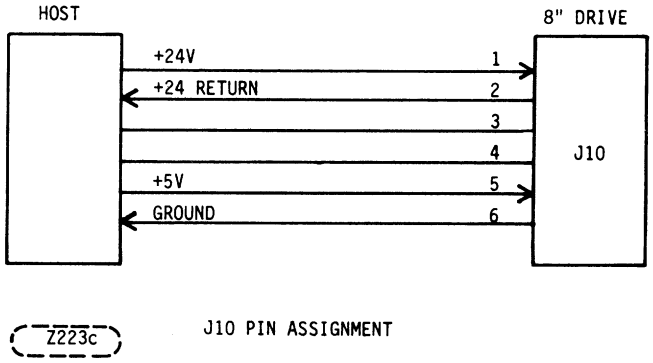




FIGURE 5-4. J1 AND J10 PIN ASSIGNMENTS

NOTE

(For TMA 75744064)

Throughout Section 6, when certain parameters are discussed, make the following substitutions:
use Test Point 3 instead of TPA;
use Test Point 4 instead of TPB;
use J1-08 instead of J1-20.

## 6.6.8 WRITE PROTECT ASSEMBLY ADJUSTMENT (WHERE APPLICABLE)

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

a. With a Write Protected diskette installed in the unit (Write Protect slot uncovered), monitor U30 pin 14/R82-East for the WRITE PROTECT signal. A continuous logically high signal will be present whenever the Write Protect assembly is properly adjusted. A logically low signal will appear if not properly adjusted.

b. To adjust, loosen the two hex-head screws holding the sensor mount in place. With the front panel door open, push down on the disk load arm (Figure 6-9) to insure that the disk is in the loaded position (Figure 6-10). At the same time, grasp the end of the envelope and move from side-to-side, and forward and backward while observing the WRITE PROTECT signal at pin U30 pin 14/ R82-East. Adjust the mount until the WRITE PROTECT signal is present for any position of the envelope.

c. Tighten the mount screws, and re-check to verify signal under all conditions of envelope position.

## 6.7.1 PRINTED CIRCUIT BOARD (PWA)

Tab 064

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

Tab 082 same as 9404B.

## WIRE LIST 7

Refer to Section 7 of 75897465.

## PARTS DATA 8

Parts data for Tabs 64 and 82 are as defined in Section 8 of the 9404B manual. The Parts Data section however, has a unique publication number (77834771) which is included as an integral part of the 9404B manual 75897465.

Before using the Parts Data, read the instructions carefully to ensure its proper use.

75897465

CONTROL DATA CORPORATION

# CONTROL DATA®
# FLEXIBLE DISK DRIVE
## MODEL 9404-B

GENERAL DESCRIPTION
OPERATION
INSTALLATION AND CHECKOUT
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PARTS DATA

MAGNETIC PERIPHERALS INC.
a subsidiary of
CONTROL DATA CORPORATION

## HARDWARE MAINTENANCE MANUAL

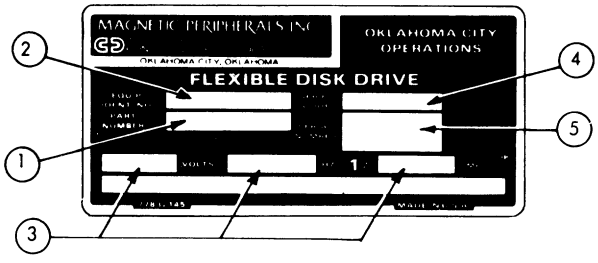
# PREFACE

This manual provides the information needed to install, operate and maintain the Control Data Corporation Model 9404B 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 (75897465) is that of the front matter, Sections 1 (one) through 7 (seven). This number should be used when making reference to the 9404B Flexible Disk Drive Hardware Maintenance Manual. Section 8 (eight), Parts Data, is identified by the unique publication number 77834771.

A configurator sheet is provided on the following page which describes FDD configurations supported by this manual. Refer to the equipment nameplate located on the right-hand side of the unit (viewed from the front) to determine the appropriate Top Mechanical Assembly (TMA) and equipment (BR) identification numbers. Then use the Configurator sheet as a starting point to establish the maintenance level for the device.

# FLEXIBLE DISK DRIVE CONFIGURATOR SHEET




1. TOP MECHANICAL ASSEMBLY NO. (TMA)
2. MARKETING IDENTIFICATION NO. (MKTG ID)
3. AC POWER REQUIRED.
4. EQUIPMENT STATUS NUMBER
5. UNIT SERIAL NO.

POWER REQ

| VDC | VAC | WRITE PROTECT | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| +5, +24 AT J7 | 120, 1Ø | TMA NO. | EQUIP. NO. | | | | | | |
| | | 75744080 | BR8A5F | X | | X | | | X |
| | | 75744081 | BR8A5G | | | X | | | X |

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## 1.1 INTRODUCTION

The Model 9404B single-sided LSI Flexible Disk Drive (FDD) is a compact, portable, random access, data storage device that interfaces with a central processor via a control unit. Input/Output data and control signals are transmitted by means of an I/O cable.

## 1.2 PURPOSE AND USE OF EQUIPMENT

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

## 1.3 PRODUCT DESCRIPTION

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

A write-protect option is offered.

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

Star- versus Daisy-Chain-Connected Configurations - Throughout this manual certain features and operations of the Flexible Disk Drive are described in terms of the manner in which the FDD is configured for connection to its controller, either star or daisy chain.

Star-configured devices 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. Star units are always in a ready state for reading or writing operation after initial preparation and turn on.

Daisy-chain-configured devices allow one to four FDD units to be connected serially to a common controller. The controller monitors the operational readiness of any selected FDD in its chain and commands and controls the reading and writing operation.

## 1.3.1 PHYSICAL DESCRIPTION

The physical dimensions for the equipment are as follows:

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

## 1.3.2 ELECTRICAL DESCRIPTION

The electrical specifications for the equipment are as follows:

- DC Power Source (Supplied by Host Equipment)

  +24 Volts (±10%) @ 1.3 A Typical
  +5 Volts (±5%) @ 0.7 A Typical

- AC Power Source - Refer to the FDD configurator or 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 | 775 ms |
| Maximum One-Track Access Time | 25 ms |
| Average Access Time | 268 ms |

- RECORDING

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

- DATA CAPACITY

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

| | |
|---|---|
| • FLEXIBLE DISKETTE | CDC 421-60W, Single Density, or Equiv.<br>CDC 423-60W, Double Density, or Equiv. |
| Diskette Dimensions | 8 x 8 inches (203.2 x 203.2 mm)<br>(including jacket) |
| Usable Diskette Recording Surfaces | 1 |
| Diskette Surface Diameter | 7.88 in. (200.1 mm) |
| Recording Radii | Track 76 (inner) 2.0290 in. (515 mm) nominal<br>Track 00 (outer) 3.6123 in. (918 mm) nominal |
| Diskette Surface Coating | Magnetic Oxide |
| Diskette Velocity | 360 r/min |
| • READ/WRITE HEAD | |
| Head Unit | 1 |
| Track Width | 0.013 in. (0.33 mm) |
| Track Spacing | 0.02083 in. (0.529 mm) |
| Erase to Read/Write Gap | 0.035 in. (0.889 mm) |

## 2.1 INTRODUCTION

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

## 2.2 OPERATING INSTRUCTIONS

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

### 2.2.1 FLEXIBLE DISKETTE LOADING

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

### 2.2.2 FLEXIBLE DISKETTE REMOVAL

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

## 2.3 ERROR RECOVERY

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

### 2.3.1 SEEK ERROR

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

### 2.3.2 WRITE ERROR

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

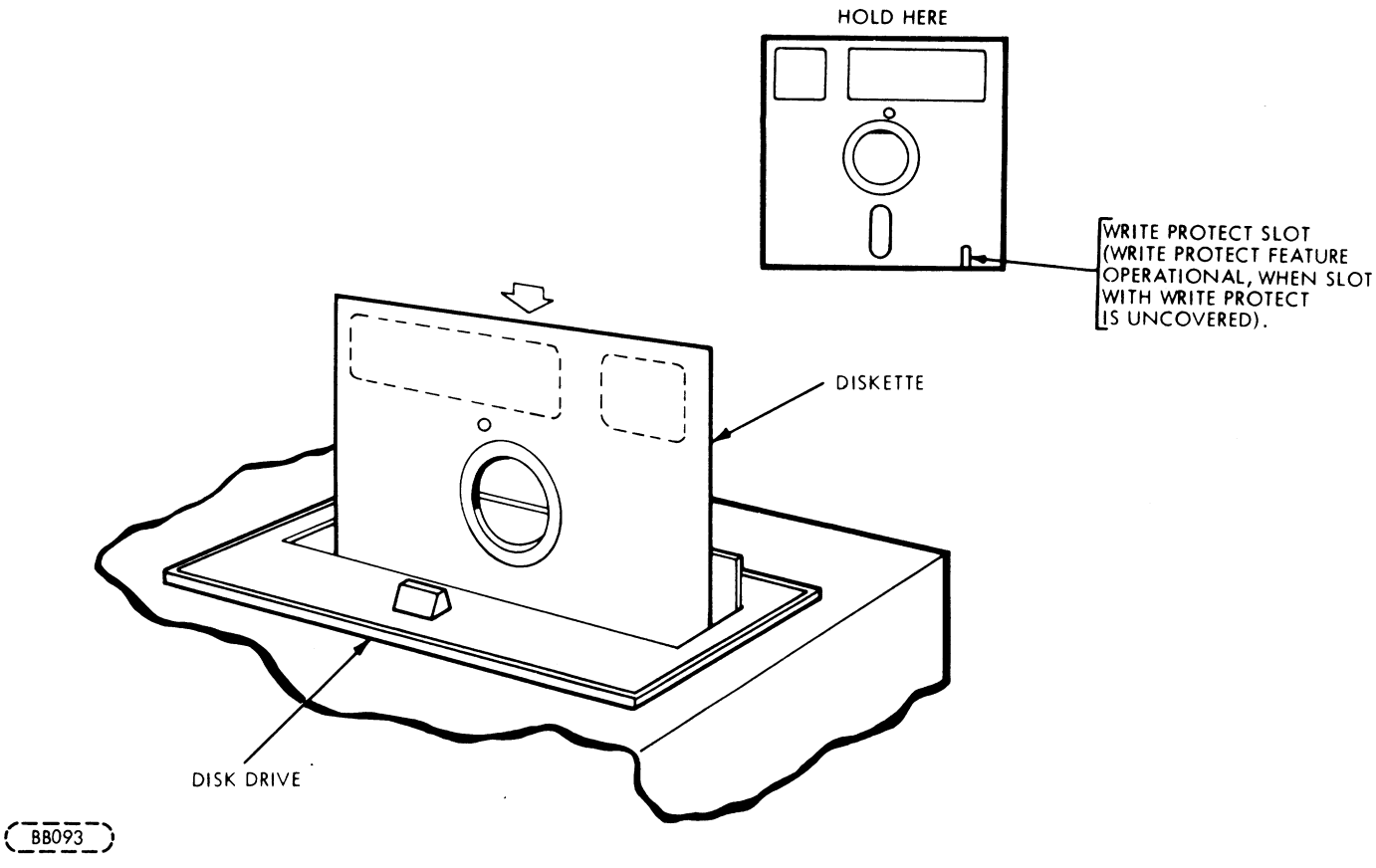



FIGURE 2-1. DISKETTE INSTALLATION

### 2.3.3 READ ERROR

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

## 2.4 DISKETTE HANDLING RECOMMENDATIONS

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

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

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

| | |
|---|---|
| Temperature: | 50° to 125°F (10° to 56.1°C) |
| Relative Humidity: | 8% to 80% |
| Maximum Wet Bulb: | 85°F (29.4°C) |

i. Diskettes should be stored in a box or cabinet when not in use.
j. Remove diskette before applying or removing power to the FDD.

## 3.1 INTRODUCTION

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

## 3.2 UNPACKING

Unpack FDD as follows:

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

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

## 3.3 INSTALLATION

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

## 3.4 CABLING AND CONNECTIONS

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

### 3.4.1 INPUT-OUTPUT CABLE

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

The information relative to the I/O connector (J1) and pin/signal assignments are defined in Figures 5-2 and 5-4.

The following mating connectors are recommended:

| TYPE OF CABLE | MANUFACTURER | CONN. P/N | CONTACT P/N |
|---|---|---|---|
| Twisted Pair, #26 (crimp or solder) | AMP | 1-583717-1 | 583616-5 (crimp)<br>583854-3 (solder) |
| Twisted Pair #26 (solder term.) | VIKING | 3VH25/1JN-5 | NA |
| Flat Cable | 3M "Scotchflex" | 3415-0001 | NA |

On models configured for daisy-chain operation, the terminating resistor module RM1 (see Figure 5-3) is 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 multiple-drive daisy-chain operation, the resistor modules of all but the end unit must be removed. The addresses of additional FDD's are established by moving W1 to the W2 position for Unit 2 address, W3 for Unit 3 address, and W4 for Unit 4 address.

### 3.4.2 DC POWER CONNECTION

DC power (user-supplied) comes through a stranded wire, 18 AWG minimum cable which interfaces with its mating connector on the printed-circuit board. The pin assignments are on Sheet 1 of the schematic, Figure 5-2, and on Figure 5-4. Mating connectors:

| MANUFACTURER | CONN. P/N | CONTACT P/N |
|---|---|---|
| AMP | 583873-1 | 583649-6 (Crimp)<br>583854-3 (Solder) |
| VIKING | 3VH6/ICN-12 | NA |

### 3.4.3 AC POWER CONNECTION

The AC Power Cable consists of stranded wire, 18 AWG minimum with center pin connection utilized as frame ground. Mating connector:

PLUG:

AMP PN 1-480700-0

CONTACTS: (SOCKET)

AMP PN 350536-1 (STRIP)
AMP PN 350550-1 (LOOSE)

## 3.5 ENVIRONMENT

Operating and storage environments of the FDD are as follows:

Operating: 55° to 100°F (13° to 38°C) 12°F (6.7°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.
b. Apply DC power to unit.
c. Insert diskette as described in Section 2.
d. 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.
e. Apply a stepping-command signal to the unit and check that the actuator steps the head as commanded.
f. Remove diskette.
g. Remove the command signals and power from the unit.

## 4.1 INTRODUCTION

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

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

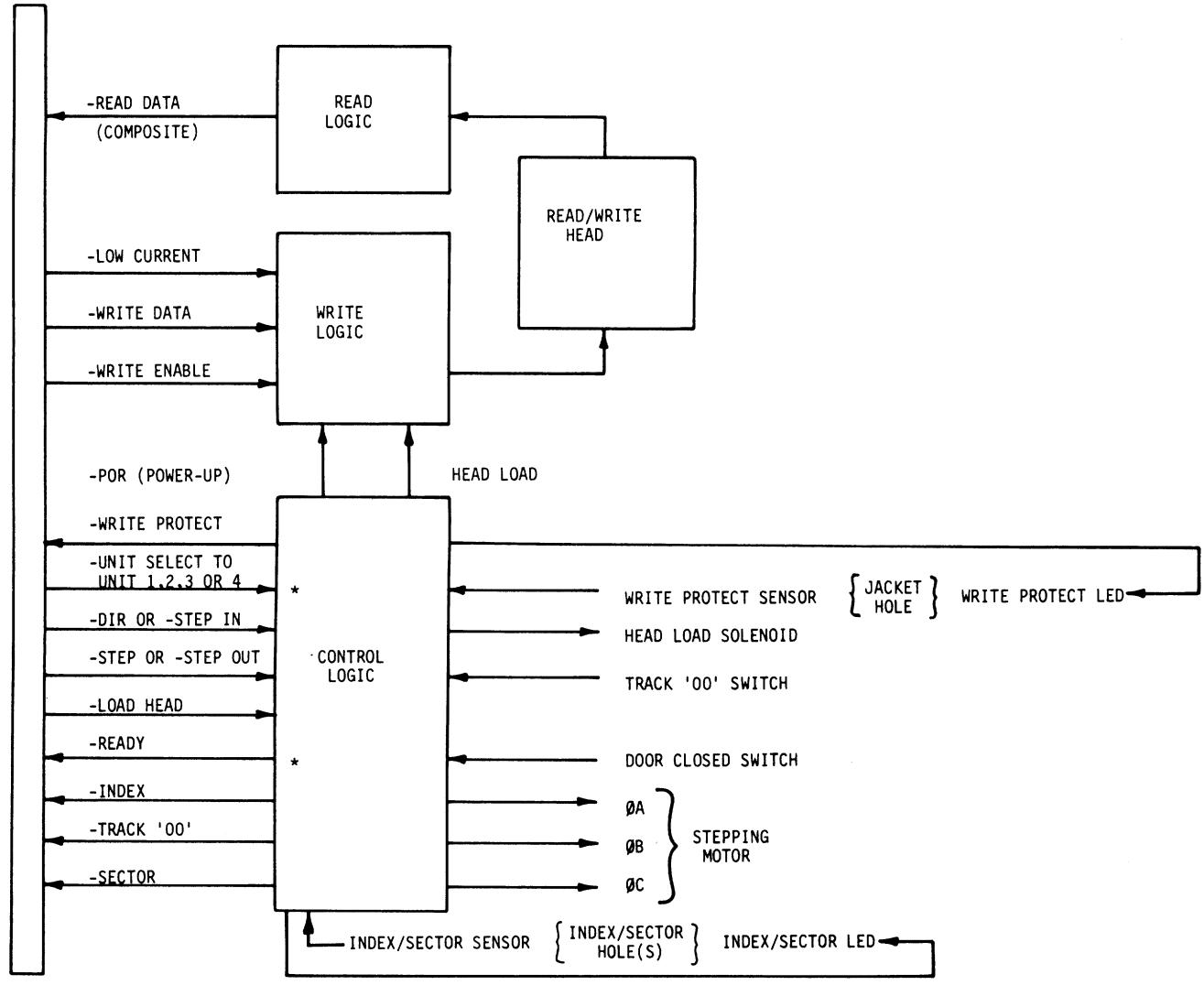
## 4.2 GENERAL DESCRIPTION

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

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

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

Positioning of the carriage-mounted Read/Write head is accomplished by a lead screw driven by a stepper motor. Each step command from the user system increments the stepper motor which, in turn, rotates the lead screw 15 degrees. Each 15 degree rotation of the lead screw moves the Read/Write head one track position.

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* DAISY-CHAIN CONFIGURATION ONLY

FIGURE 4-1. FUNCTIONAL BLOCK DIAGRAM

A reading or writing operation begins by placing the Read/Write head 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, the data and clock bits which are induced 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 diskette interchangeability.

To read from the diskette, magnetized bits in the format of the prerecorded data are sensed by the Read/Write head. This signal is amplified, digitized, and transmitted to the user system as composite clock and data information.

The FDD utilizes an LSI control chip fabricated from "current-injection logic" ($I^2L$) technology. The LSI circuit contains an internal oscillator-generated clock. This synchronous logic design controls all timing functions. Another LSI (read) chip performs the analog-to-digital conversion within the device.

## 4.3 FUNCTIONAL DESCRIPTION

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

The FDD is divided into the following major functional areas:

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

### 4.3.1 CONTROL LOGIC

The functions of the control logic are to generate the signals that (a) establish the ready status of the FDD, (b) step the Read/Write head in or out upon selection and command of the controller, (c) load the head on the disk for read/write operations, (d) protect the disk from writing if the write-protect slot 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, and (g) provide unit selection of the FDD.

a. The Ready signal is generated when the diskette comes up to proper operating speed. The Index pulses are used to determine operating speed within LSI control chip U4. The Ready signal is present only when the FDD is selected.

b. At initial voltage application, ØA of the stepper motor is energized. Each step command received sequentially energizes one of the three phases of the stepper motor. Either the logic level of the direction signal or the use of Step In or Step Out signals determines whether the phase sequence is ØA, ØB, ØC, ØA.....or ØA, ØC, ØB, and ØA.

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, ØA, ØB, and ØC, is provided by logic-driven Darlington transistors Q1, Q2, and Q3.

The phase sequence through which the stepper motor is driven (see Table 4-1) is controlled by U4 pins 30, 31, and 32. During a phase change, the previously active phase from U4 remains on (or overlaps) 4.5 ms after the next (or new) phase is activated. Refer to Figure 5-1.

TABLE 4-1. PHASE SEQUENCE OF STEPPER MOTOR

| Change the Active Phase Ø | | To Step |
|---|---|---|
| From | To | |
| A | B | IN |
| B | C | |
| C | A | |
| A | C | OUT |
| B | A | |
| C | B | |

c. The Read/Write head of a selected FDD can be loaded when the diskette is fully installed and the front panel door is closed. Closing the front-panel door actuates the door-interlock switch which enables the circuit to the head-load solenoid. When the controller sends a Head Load signal, the head-load solenoid is energized causing the armature bail to actuate. The actuation of the bail permits the head-load arm and its pressure pad, under tension, to hold the diskette surface against the Read/Write head. To operate without the head-load signal from the controller, add jumper W15.

d. The Write Protect function is accomplished through use of an LED (light-emitting diode) and a photo-transistor. These are mounted such that the presence of a write protect slot in the jacket of the diskette will cause pins 1 and 2 of gate U5 to be driven low. This signal is gated with Unit Select at the interface. Write Protect will inhibit writing on any diskette possessing a write-protect slot by shunting write current from the write-current injection pin (8) of U4.

e. The Track 00 signal is generated when the carriage assembly closes the Track 00 switch. Closing this switch sets the latch formed by the two gates of U3 pin 3 and U3 pin 5. The output of this latch (pin 5) is gated with ØA and Unit Select in U4 to provide the Track 00 signal that is transmitted to the controller from U4 pin 27.

f. 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.

   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 23 of U4. Adding jumper W8 provides the separated index and sector signals.

g. The unit select function inhibits all command and status signals. The position of the FDD in the daisy-chain configuration is determined by the presence of the jumper W1, W2, W3, or W4. The FDD, as shipped, has W1 installed. Jumper W5 may be installed to cause the FDD to always be unit selected. This customer-installed jumper is useful for star configurations.

### 4.3.2 WRITE 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 within U4 (pins 9 and 10), turns on head center-tap drivers in U4 (pins 5 and 7) causing the center tap to go to approximately +12 volts, blocks the input to the read circuit by reverse-biasing diodes CR1 and CR2, 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 shunt resistor R28 into the write-current source. The source is contained within U4 and is factory-adjusted at R33.

### 4.3.3 READ LOGIC

Read operation is enabled when the Read/Write head is loaded on the diskette and Write Enable is inactive. With Write Enable inactive, the data-blocking diodes CR1 and CR2 are forwarded-biased by parallel 1K resistors in U4 (pins 5 and 7) pulling the head center tap to ground, and data sensed by the Read/Write head is fed to the LSI read-data circuit U2. The read signal from the diskette is in the form of a sine wave.

This analog signal is amplified within U2, filtered by R15, R16, L1, L2, C7, and C8 comprising a passive constant-phase filter, differentiated by R20 and C11 in conjunction with U2's active differentiator, and coupled to a comparator/logic circuit within U2 (a time-domain filter) to detect zero crossings and reject noise in the differentiated read signal. R8 and C4 are the timing components for a 1-us one-shot used in the time-domain filter. R9 and C5 are the timing components for the one-shot which establishes data pulse width. DC balance of the active differentiator by adjusting R32 allows symmetry of the read data to be optimized.

### 4.3.4 DISK DRIVE

Disk drive is accomplished by clamping the diskette between the cone assembly and a belt-driven spindle. The spindle is rotated at 360 r/min by the disk-drive motor.

### 4.3.5 READ/WRITE HEAD

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

## 4.4 CONTROL AND DATA LINE CHARACTERISTICS

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

### 4.4.1 LOGIC LEVELS

The following definitions will be used throughout this manual:

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

### 4.4.2 TRANSMITTER CHARACTERISTICS

The FDD uses the TTL7438 (quad 2-input buffer or driver) and LSI controller U4 to transmit all control and data signals. Each is capable of sinking a current of 25 mA with an output voltage of 0.4 volt.

### 4.4.3 LINE RECEIVER CHARACTERISTICS

The FDD uses the SN7400 family gates and their equivalent in the LSI controller IC U4 for line receivers. The input of each receiver is terminated in 120 ohms.

### 4.4.4 CONTROL AND DATA LINE FUNCTIONS

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

TABLE 4-2. INPUT/OUTPUT LINES

| SIGNAL | FUNCTION |
|---|---|
| INPUT LINES | |
| -STEP * | A 10-microsecond minimum, 3-millisecond maximum logic 1 level pulse on this line causes the head to move one track as determined by the direction line. |
| -DIRECTION * | A logic 1 level on this line and step pulse causes the head to move one track inward toward the center of the diskette. A logic 0 level on this line and step pulse causes the head to move one track outward from the center of the diskette. |
| -STEP IN * | A 10-microsecond minimum, 3-millisecond maximum logic 1 level pulse on this line causes the head to move one track inward toward the center of the diskette. |
| -STEP OUT * | A 10-microsecond minimum, 3-millisecond maximum logic 1 level pulse on this line causes the head to move one track outward from the center of the diskette. |
| -HEAD LOAD | A logic 1 level on this line loads the diskette against the head through the use of a pressure pad on the opposing side of the diskette. The logic 1 level must be initiated 60 milliseconds prior to initiating a read or write operation to allow for head load settling time.<br><br>For increased head and media life, this signal should be at a logic 0 whenever a data transfer operation is not in process or pending. |
| -WRITE ENABLE | To enable the FDD write driver, this line is held at a logic 1.<br><br>To disable the FDD write driver and enable the FDD read circuitry, this line is held at logic 0. 850 microseconds minimum is required after a write operation before read data is stable. |

* As a customer-installed option, the STEP and DIRECTION lines--as the FDD is supplied from the factory--may be converted to STEP IN and STEP OUT by the installation of jumper W12.

TABLE 4-2. INPUT/OUTPUT LINES (CONT'D)

| SIGNAL | FUNCTION |
|---|---|
| INPUT LINES | |
| -WRITE DATA | This line contains the composite double frequency coded write clock and data information to the FDD. The write clock and data pulses must be 250 nanoseconds ±20% in length and are true at the logic 1 level. Information to be recorded on the diskette is derived from the transition of each pulse from logic 1 to logic 0. |
| -LOW CURRENT | This line reduces write current for tracks 43 or greater. A logic 1 level reduces write current. |
| -UNIT SELECT | On this line a logic 1 level with W1, W2, W3, or W4 present enables the FDD interface. |
| OUTPUT LINES | |
| -READY | A logic 1 level indicates that the door is closed, a diskette is rotating, and that the FDD is selected. |
| -INDEX | This line gives an indication of the rotational position of the diskette by outputting a logic 1 pulse for every index hole of the diskette. The 1-millisecond pulse is generated by sensing the index hole in the diskette using a photo-optical technique. |
| -SECTOR | This line gives an indication of the rotational position of the hard-sector diskette by outputting a logic 1 pulse for every sector hole of the diskette. The 1-millisecond pulse is generated by sensing the sector holes with the same photo-optical assembly used for index. (W8 must be present.) |
| -TRACK 00 | A logic 1 level indicates that the head is positioned over Track 00. |
| -WRITE PROTECT | Logic 1 level indicates that the write-protect slot on diskette is uncovered. |
| -READ DATA COMPOSITE | This line contains the unseparated data and clock information. A logic 1 level pulse of 250 ns corresponds to a data or clock bit read from the diskette. |

## 5.1 DIAGRAMS

This section contains the printed circuit board documentation and related timing diagrams.

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 schematic, and Figure 5-3 contains the assembly drawing.

## 5.2 MAINTENANCE AIDS

### 5.2.1 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.

### 5.2.2 PHYSICAL DESCRIPTION (LOGIC)

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

### 5.2.3 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 1 logic level on that line is needed to satisfy the function. The absence of the triangle indicates a logical 0 is needed to satisfy the function.

The relative level indicator depicts the occurrence of inversion. Figure 5-4 shows some representative examples of the relative level indicator being used in this manner.

### 5.2.4 INTEGRATED CIRCUITS

Figure 5-5 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 5-6 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.

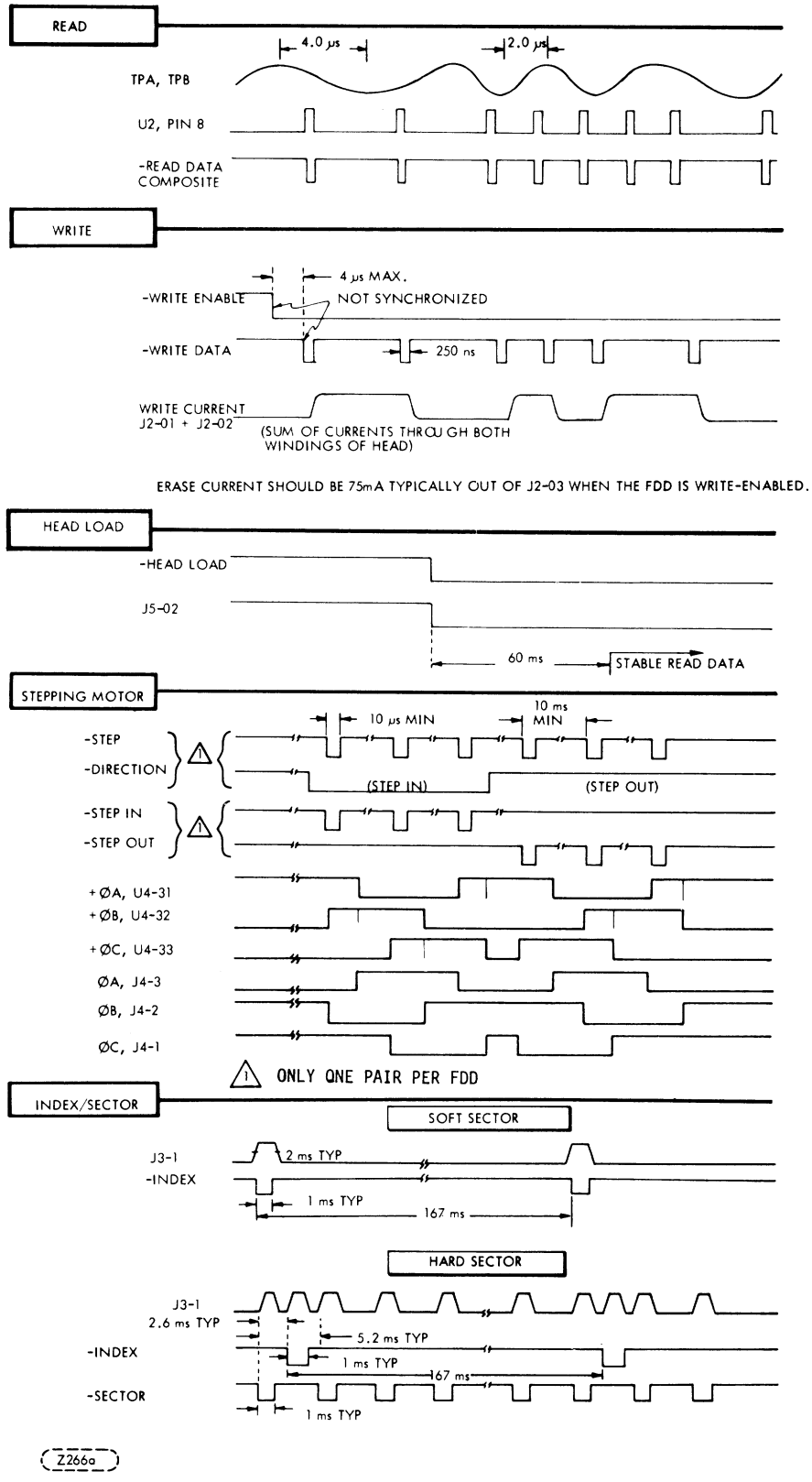
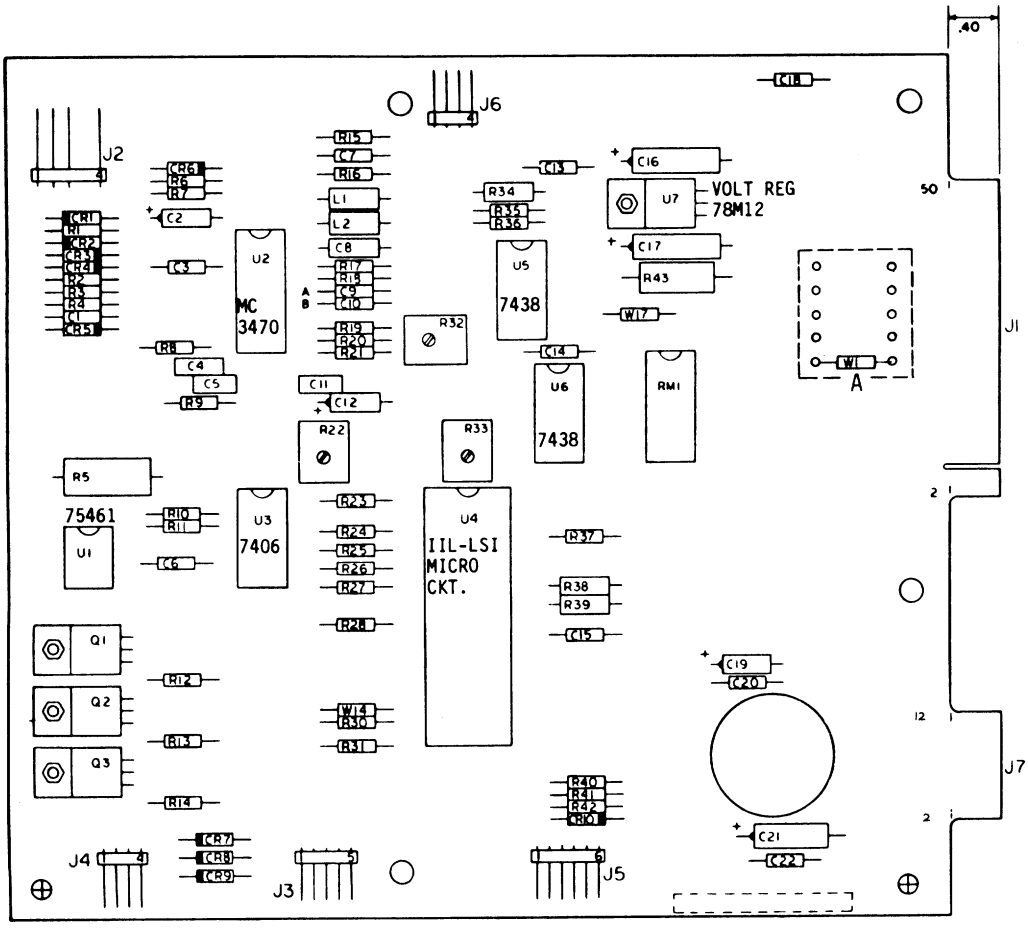



FIGURE 5-1. TIMING



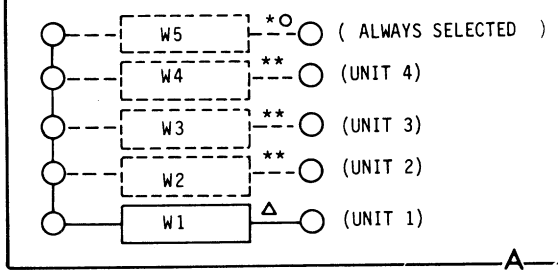

TRANSISTORS

Q1, Q2, Q3 - T1P120

DIODES

CR1, CR2, CR3, CR4, CR5 - 1N914A

CR6, CR7, CR8, CR9, CR10 - 1N4001




△ UNITS SHIPPED WITH W1 INSTALLED.

* REMOVE W1 AND ADD DESIRED JUMPER FOR UNIT 2, 3, or 4

○ W5 FOR STAR CONFIGURATION ONLY

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FIGURE 5-3. ASSEMBLY AND PARTS LIST

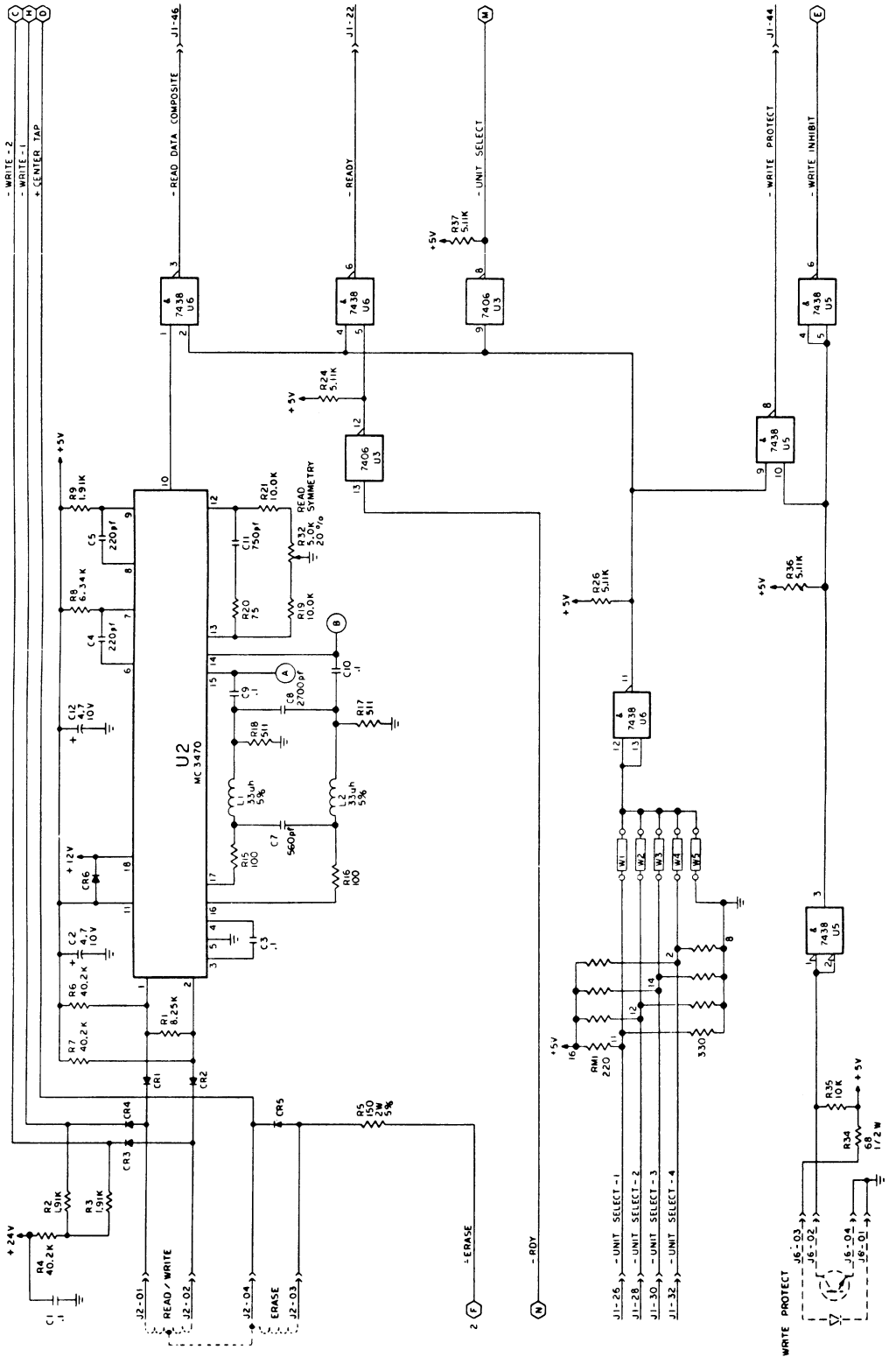
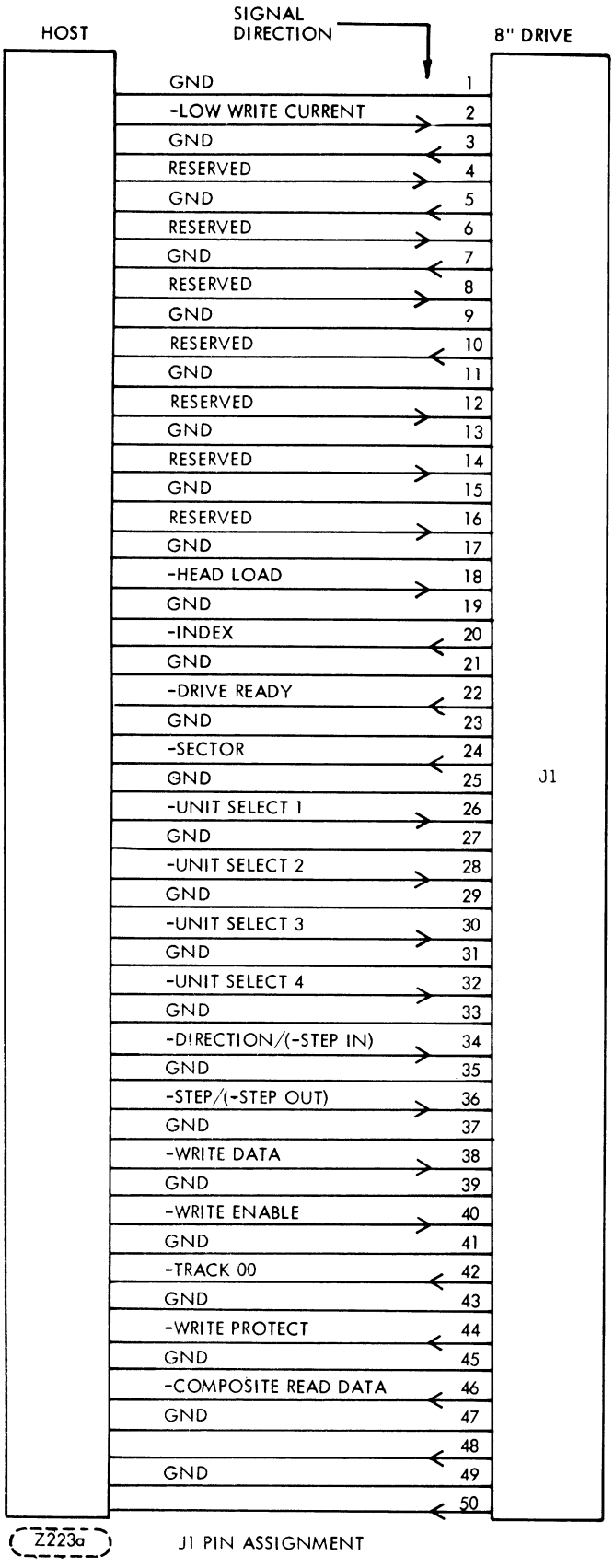
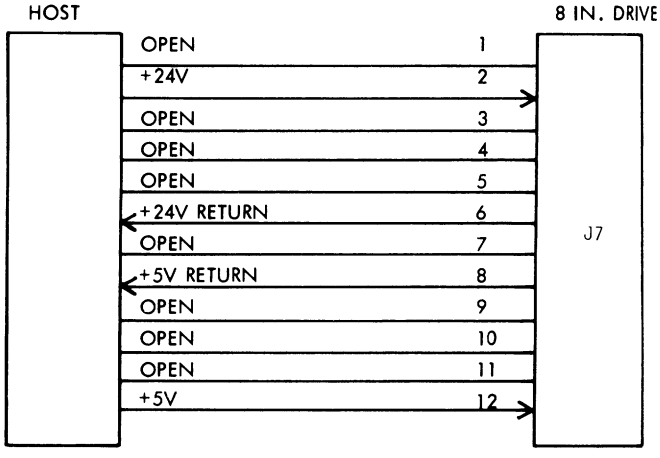



FIGURE 5-2. SCHEMATIC (SHEET 2 OF 2)




J1 PIN ASSIGNMENT




J7 PIN ASSIGNMENT

FIGURE 5-4. J1 AND J7 PIN ASSIGNMENTS

## 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 PART NUMBER |
|---|---|
| Alignment Diskette (Optional) | Model 421-51W |

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

- Socket Wrenches
  Sizes: 5/16" (7.94mm), 1/4" (6.35mm), 3/16" (4.76mm), 11/32" (8.73mm)
- Allen Wrenches
  Sizes: 0.050" (1.27mm), 1/16" (1.59mm), 5/64" (1.98mm), 7/64" (2.78mm)
- Oscilloscope, Tektronix 335, or equivalent.
- Feeler Gauges, wire
  Sizes: 0.030" (0.762mm), 0.058" (1.47mm), 0.060" (1.52mm), 0.062" (1.58mm), 0.079" (2.01mm)
- Feeler Gauge, Shim: 0.072" (1.83 mm), 0.020" (0.508 mm) 0.010" (0.254 mm), 0.005" (0.127 mm)

## 6.3 PREVENTIVE MAINTENANCE

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

## 6.4 HEAD CLEANING

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

**CAUTION**

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

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

a. Use lint-free cloth to lightly drybuff head surface. Cleaning is completed if deposits are removed.

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

## 6.5 TROUBLESHOOTING

An improperly adjusted FDD may exhibit symptoms of one that has a malfunction; therefore, the Adjustment Procedures (paragraph 6.6) should be performed before assuming that the unit has failed. Refer to Figure 6-1 for test points to be used in further troubleshooting. Before troubleshooting is started, check all DC supply voltages.

### 6.5.1 DC VOLTAGE AND SIGNAL

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

b. The signals should conform to the various diagrams and waveforms as shown in Figures 5-1, 6-1, 6-2, 6-3 and 6-4.

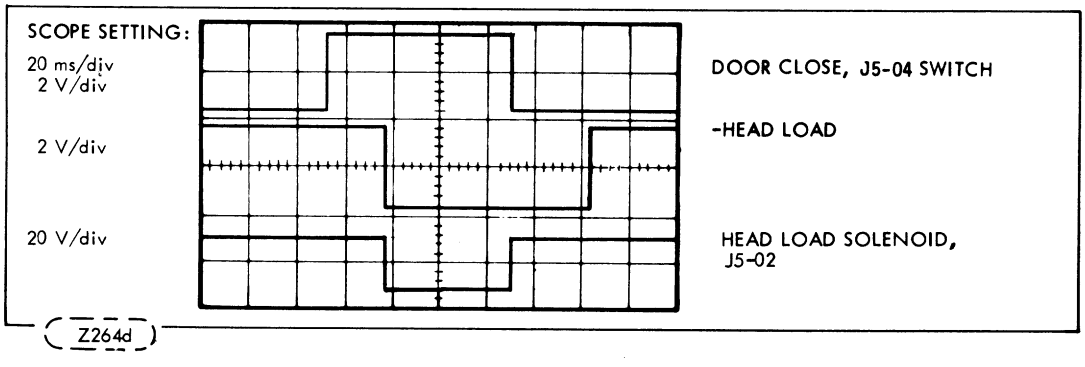



FIGURE 6-1. -HEAD LOAD AND DOOR INTERLOCK SWITCH

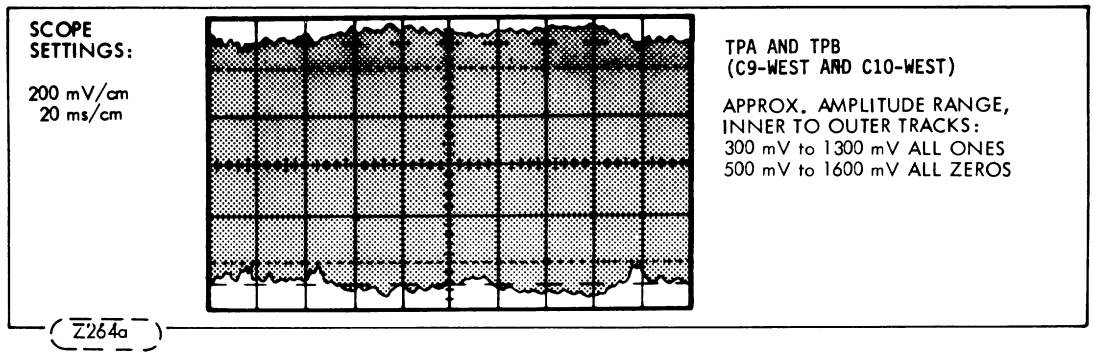



FIGURE 6-2. DIFFERENTIAL READ SIGNAL FOR ENTIRE TRACK

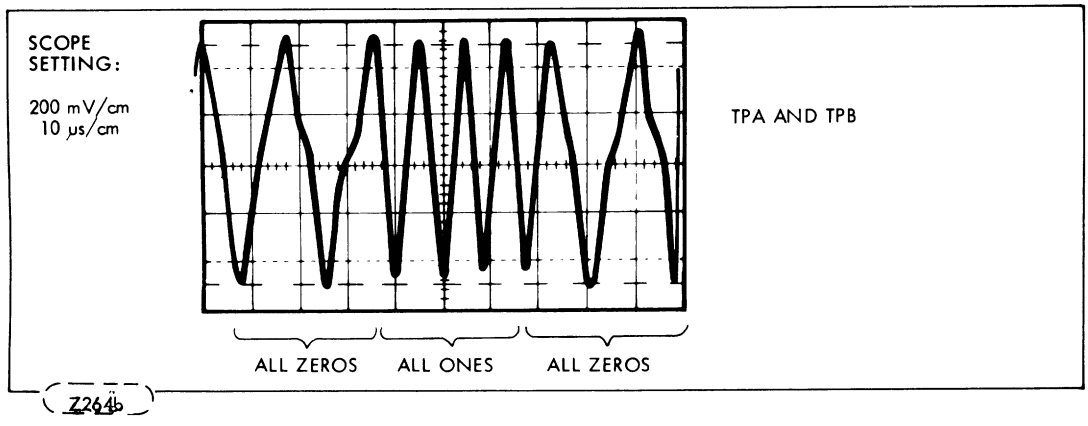



FIGURE 6-3. DIFFERENTIAL READ SIGNAL FOR PORTION OF OUTER TRACK

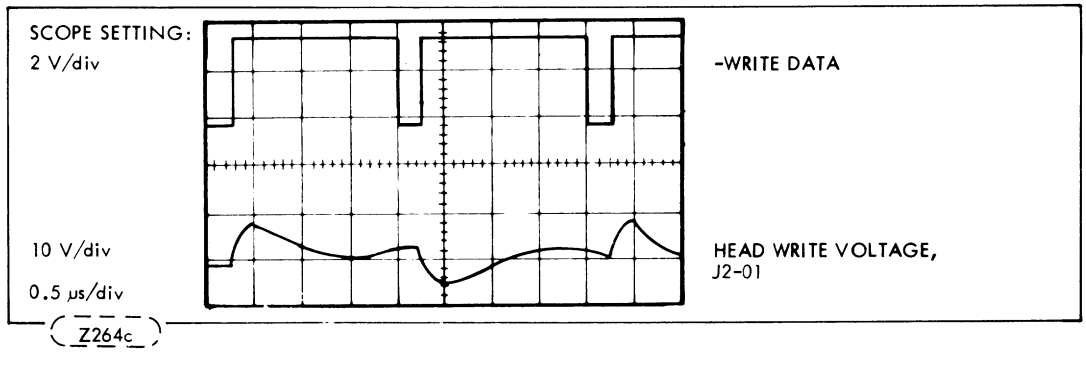



FIGURE 6-4. WRITE DATA AND HEAD WRITE VOLTAGE FOR OUTER TRACK

## 6.6 ADJUSTMENT PROCEDURES

### 6.6.1 CARRIAGE-STOP ADJUSTMENT

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

a. As shown in Figure 6-6, using a 0.020-inch (0.508 mm) shim, adjust outer (rear) stop clearance beyond track 00 and tighten rear screw, torque to 8-10 inch-lbs.

b. Rotate the motor shaft manually to check for interference.

### 6.6.2 BURST TO INDEX CHECK AND ADJUSTMENT

The Alignment Diskette is used to perform this procedure.

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

b. Install the alignment diskette.

**CAUTION**

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

c. Seek to Track Zero, then seek to Track One and Read. (No data is recorded on Track One.)

d. Connect Channel 1 of scope to TPA on the PWA, Channel 2 to Index J1-20 of the the PWA. Set up the scope as follows:

Chan 1 Volt/Div to: 0/1 volt/div
Chan 2 Volt/Div to: 2 volt/div.

Chan 1 voltage to: AC Source to: Chan 1
Chan 2 voltage to: AC Coupling to: Low Freq.
(Hi Freq. Reject)

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

e. Adjust the time from write splice bit to the leading edge of the index pulse until it measures 450 ±100 µs. (Refer to Figure 6-7) To adjust the write splice to index time, loosen the Allen head screw holding the phototransistor located on bottom of chassis toward the front of the unit. Using the adjustment handle protruding through the casting, move the phototransistor until the specification is met. Tighten the Allen screw while observing the scope signal. Verify that the adjustment did not change. If the adjustment cannot be achieved, it may be necessary to adjust the LED sensor located on the top plate assembly.

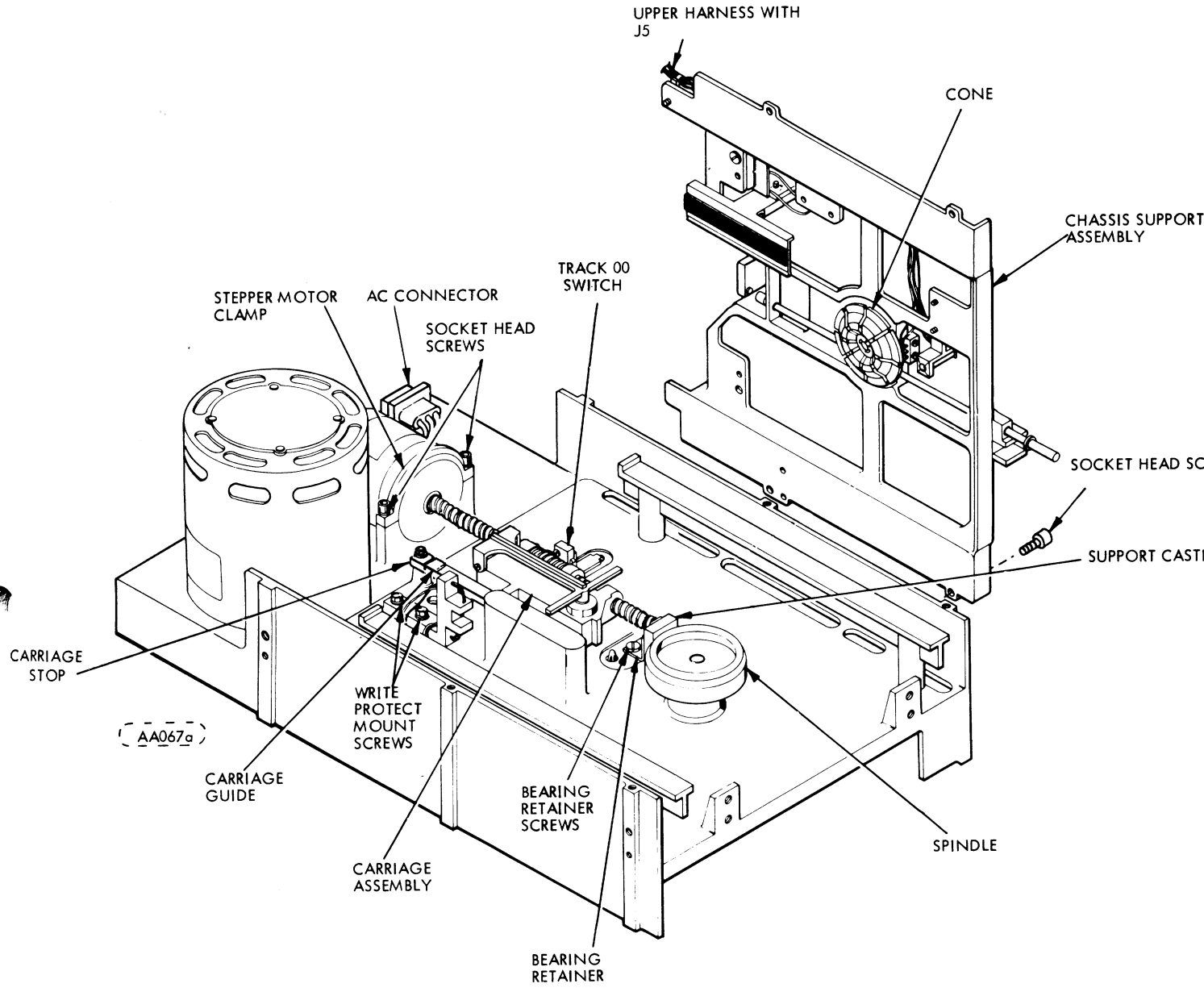
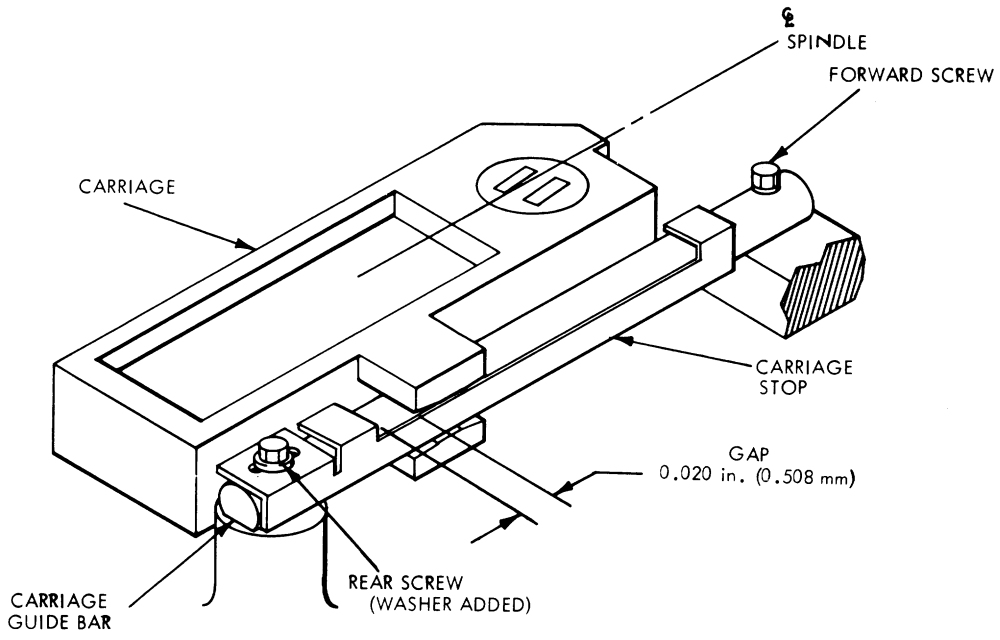



FIGURE 6-5. BASE AND CHASSIS SUPPORT ASSEMBLY

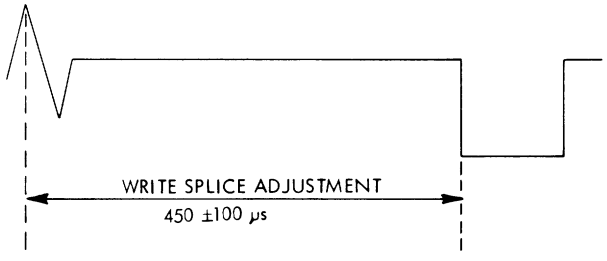



X327a

FIGURE 6-6. CARRIAGE-STOP ADJUSTMENT

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

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




AA036c

FIGURE 6-7. WRITE SPLICE BIT TO INDEX TIMING

## 6.6.3 ACTUATOR ALIGNMENT (DISKETTE)

The Alignment Diskette is used to perform this procedure.

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

b. Install the alignment diskette.

**CAUTION**

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

c. Step to track 38 and perform a read. (No data is recorded on track 38. The tester or system requirements should be noted; refer to tester or system instructions for operation.)

d. Connect Channel 1 of scope to TPA on the PWA and Channel 2 to TPB on the PWA.

e. Connect the external sync probe to index at Index, J1-20 on PWA.

f. Set up the scope as follows:

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

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

NOTE

Scope trace after trigger level is adjusted for repetitive trace should display an ervelope of data "Cateyes" consisting of two lobes (refer to Figure 6-8). If no such pattern can be displayed, manually turn the stepper motor shaft extending from the rear of the stepper motor one-quarter turn either way to locate pattern. The amplitude of the smaller lobe must exceed 200 mV p-p. Then proceed to step "h".

g. Change the volts/div of Channel 1 and Channel 2 to 0.02 volts/div. Move the trace on the scope (Position Knob) up until the bottom of the two lobes are setting approximately on the base line (refer to Figure 6-8). For an acceptably aligned unit, the voltage ratio of the smaller lobe to the larger lobe should exceed 80%.

h. If not in alignment, loosen the stepper motor clamp mounting screws to where a gap exists between the clamp and casting (see Figure 6-9) and slowly rotate the stepper motor to adjust the amplitude until the amplitude of both lobes is the same, that is, the difference between the bottoms of both lobes is less than 5 mV.

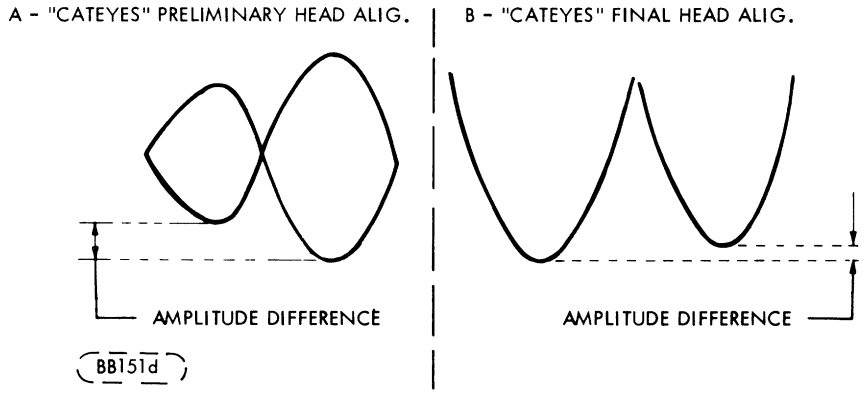



FIGURE 6-8. HEAD ALIGNMENT AMPLITUDE

i. Tighten the stepper motor clamp. Return to track 00, then seek back to track 38. Verify that the 5 mV specification is still met. If the specification is not met, readjust the stepper motor, return to zero and seek back to track 38. Repeat the adjustment until the 5 mV specification is met.

j. Remove alignment diskette.

k. Perform Track 00 Switch Adjustment Paragraph 6.6.9.

l. Perform Stop Gauge Adjustment per Paragraph 6.6.1.

m. Recheck all adjustments made in this procedure and repeat all steps having out-of-tolerance indications.

## 6.6.4 PUSH-ROD TRAVEL ADJUSTMENT

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

a. With front panel door closed, verify that a gap exists between the retaining ring and the disk load bushing of approximately 0.030 inch (0.762 mm) (refer to Figure 6-9). Perform steps b and c if out of adjustment.

b. Back-off the Door Interlock Switch Adjustment set screw.

c. Adjust disk load arm set screw (Figure 6-9 ) until gap is approximately 0.030 in. (0.762 mm), with door closed.

d. Proceed to Door Interlock Switch Adjustment (paragraph 6.6.5)

## 6.6.5 DOOR-INTERLOCK SWITCH ADJUSTMENT

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

a. Verify that interlock switch closes (when closing the door) prior to the door latching. Perform step (b) if switch and door are out of sync.

b. With door closed, adjust set-screw at end of disk load arm (Figure 6-9) while holding door closed against metal stop. Adjust set-screw until micro-switch is almost adjusted flush to top of switch case. This ensures that as the nylon tips on the push-rod wear down, the switch will still close.

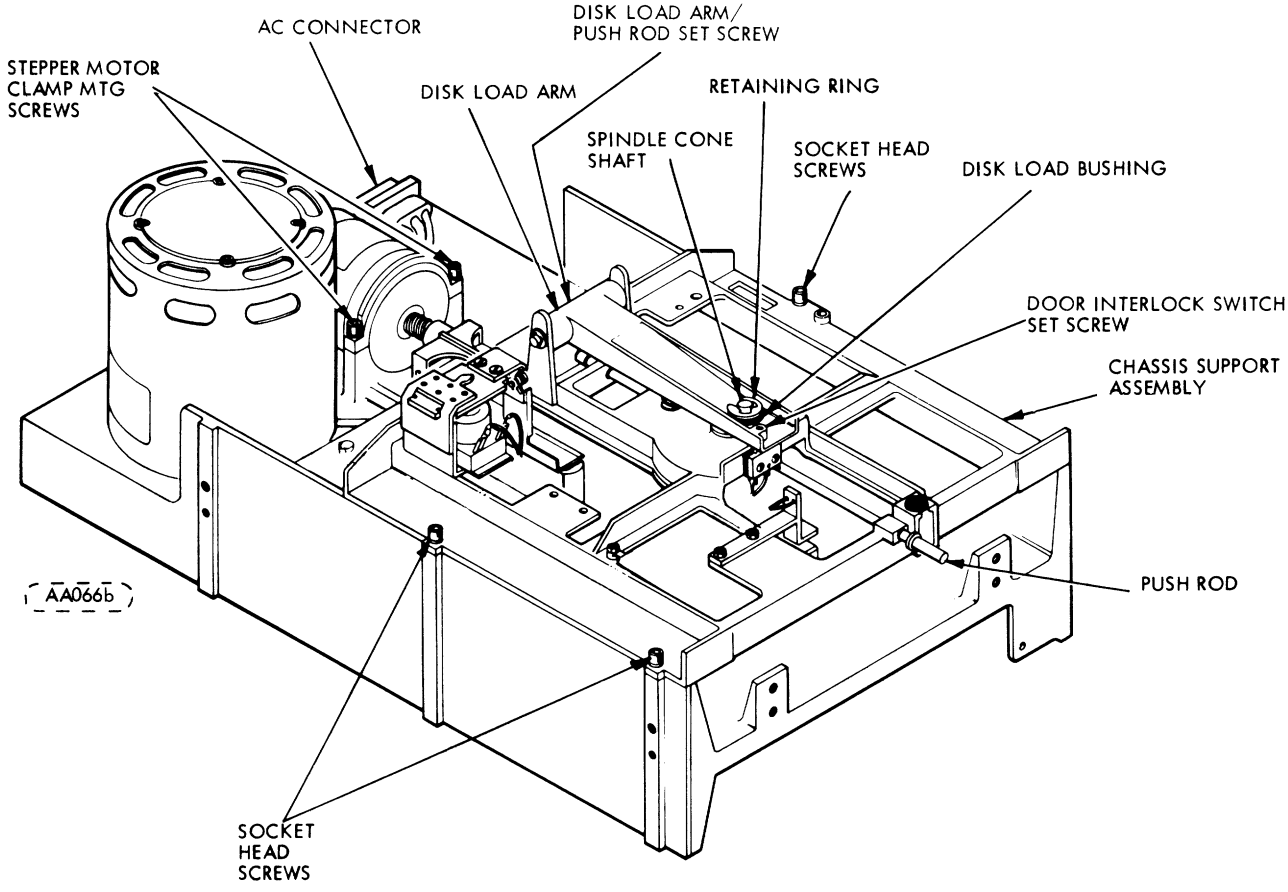



FIGURE 6-9. CHASSIS BASE ASSEMBLY

## 6.6.6 DISK-LOAD BAIL ADJUSTMENT

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

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

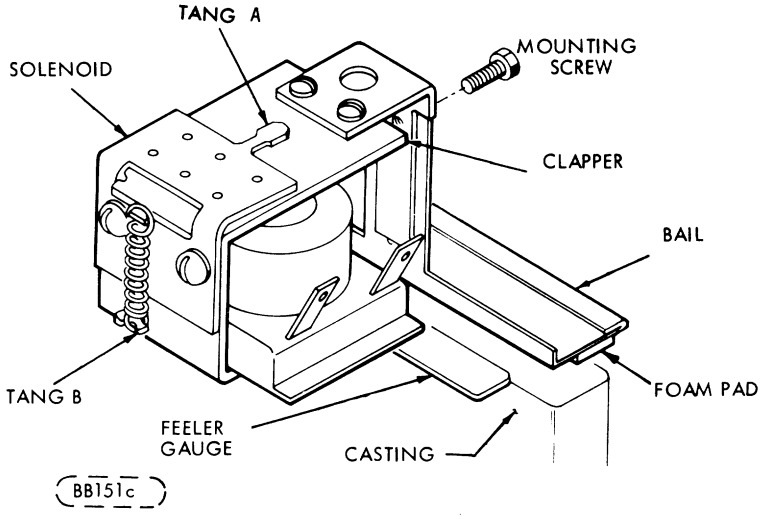



FIGURE 6-10. DISK LOAD SOLENOID

## 6.6.7 SPINDLE AND CONE ADJUSTMENT

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

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

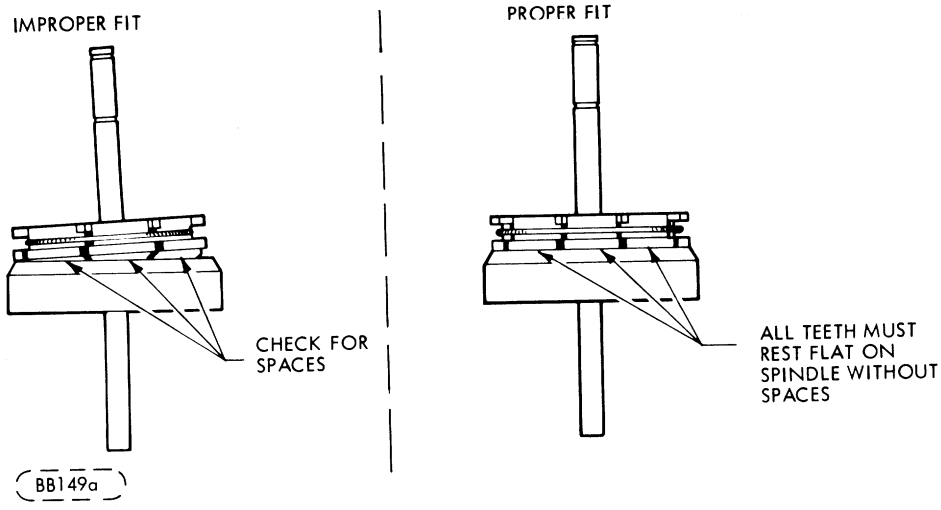



FIGURE 6-11. SPINDLE AND CONE

## 6.6.8 WRITE PROTECT ASSEMBLY ADJUSTMENT (WHERE APPLICABLE)

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

a. With a Write-Protected diskette installed in the unit (Write-Protect slot uncovered), monitor U5 pin 4/R36-East for the WRITE PROTECT signal. A continuous logically high signal will be present whenever the Write-Protect assembly is properly adjusted. A logically low signal will appear if not properly adjusted.

b. To adjust, loosen the two hex-head screws holding the sensor mount in place. With the front panel door open, push down on the disk load arm (Figure 6-9) to insure that the disk is in the loaded position (Figure 6-10). At the same time, grasp the end of the envelope and move from side-to-side, and forward and backward while observing the WRITE-PROTECT signal at U5 pin 4/R36-East. Adjust the mount until the WRITE-PROTECT signal is present for any position of the envelope.

c. Tighten the mount screws, and re-check to verify signal under all conditions of envelope position.

## 6.6.9 TRACK '00' SWITCH ADJUSTMENT

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

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

## 6.7 REMOVAL AND REPLACEMENT PROCEDURES

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

## 6.7.1 PRINTED CIRCUIT BOARD (PWA)

a. Disconnect I/O Cable from J1.
b. Disconnect DC power cable from J7, and AC power from FDD.
c. Disconnect harnesses from connectors on printed-circuit board.
d. Remove two screws from printed-circuit board adjacent to connector J1 (Figure 6-12).
e. Remove PWA by detaching it from the two push-in clips shown in Figure 6-12.
f. To replace printed-circuit board, push clips through printed-circuit board.
g. Replace two screws adjacent to connector J1.
h. Reconnect harnesses, I/O cable, DC power cable, and AC power cable.
i. Perform Burst-to-Index Check and adjust if necessary (paragraph 6.6.2).

## 6.7.2 ACTUATOR ASSEMBLY

a. Open front-panel door.
b. Disconnect harness from J2 and J4 on printed-circuit board (see Figure 6-1).
c. Remove four (4) socket-head screws securing chassis support (Figure 6-9).
d. Slide chassis support back far enough to clear push rod (Figure 6-9) of front panel and lift support clear of chassis.
e. Remove two (2) screws securing bearing retainer (Figure 6-5).
f. Remove stepper-motor clamp by removing two socket-head screws (Figure 6-5). Remove Cable Clamp.
g. Carefully slide actuator assembly (stepper motor, actuator, and bearings at the end of stepper shaft) straight out toward the rear of the FDD until unit is clear of the casting.
h. To replace actuator assembly, slip bearings into support casting, Figure 6-5. (Assure carriage assembly is fitted on carriage guide.)

**CAUTION**

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

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

**CAUTION**

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

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

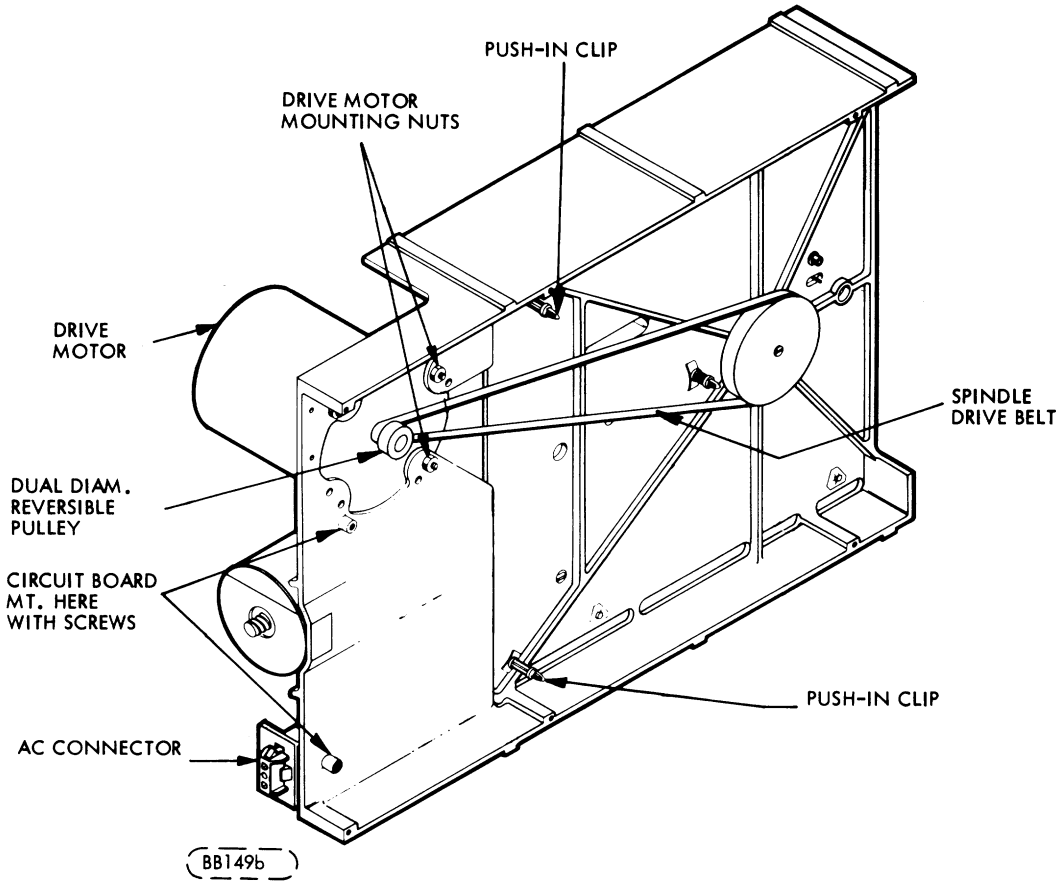



FIGURE 6-12. BASE CASTING ASSEMBLY

## 6.7.3 DRIVE-MOTOR ASSEMBLY

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

## 6.7.4 HEAD-LOAD-PAD REPLACEMENT

**CAUTION**

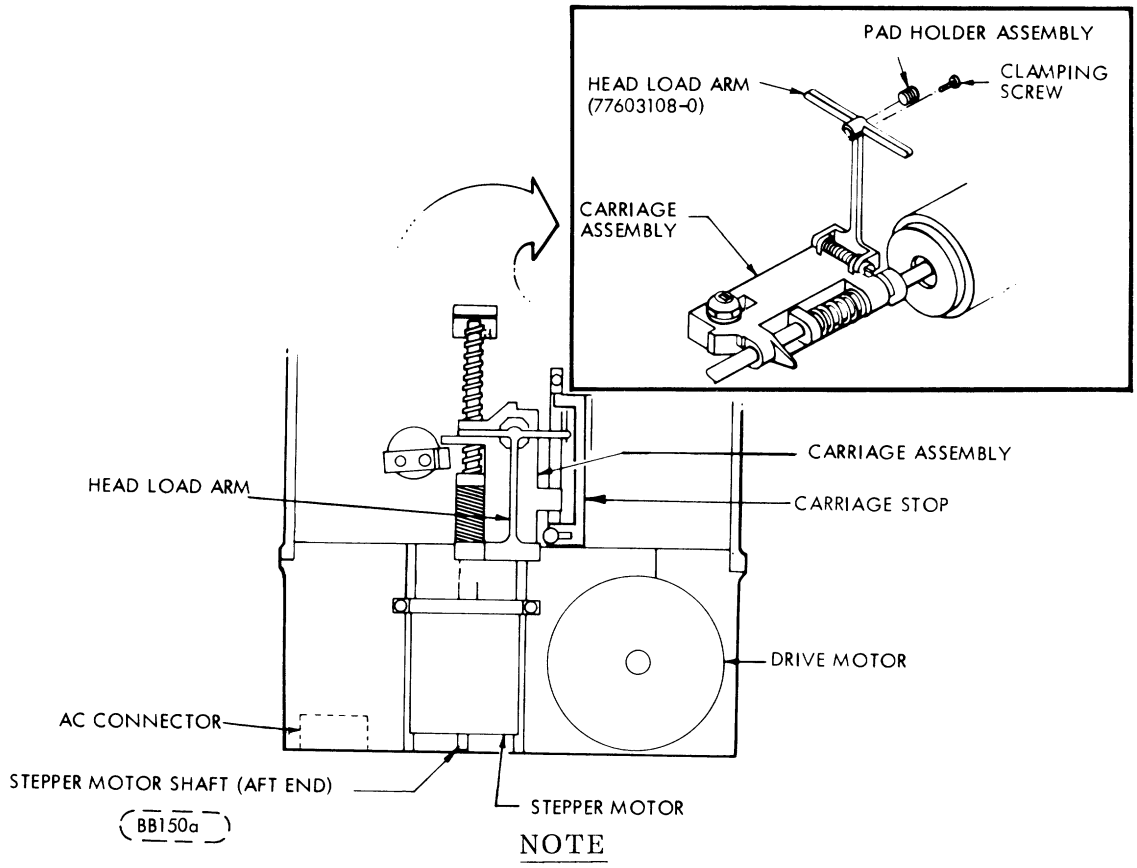
Do not raise the head-load arm to the 90-degree position and then release it; damage to the load-arm spring and/or to the head (core and ceramics) could result.

a. Remove power from the unit.
b. Move the carriage assembly to its rear most position (toward the stepper motor) by turning the aft part of the stepper motor shaft (Figure 6-13). This will provide clearance for lifting the head load arm.
c. Lift the head load arm until the head load pad is visible (see Figure 6-13).
d. Loosen clamping screw holding rim of head-load pad.
e. Insert screw driver and rotate head-load pad so flattened side will clear clamping screw.
f. Remove Pad Holder Assembly.
g. Insert new Assembly, with flat side toward clamping screw.
h. Assuring that head load pad is fully seated, rotate pad 180 degrees.
i. Tighten clamping screw to hold pad in place.
j. Lower arm gently onto head.

## 6.7.5 SOLENOID REPLACEMENT AND TANG ADJUSTMENT

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

a. Place the tapered end of a flat-head screw driver between Tang A and solenoid clapper. (See Figure 6-10.)
b. Gently bend the tang upward with the screwdriver.
c. Using a 0.060-in. (1.52 mm) wire feeler gauge, insert the feeler gauge in the gap between the underside of the clapper and the coil core. (See Figure 6-14.)
d. If unable to insert 0.060-in. (1.52 mm) wire feeler gauge, continue to gently bend tang upward until feeler gauge can be inserted.
e. Next, attempt to insert a 0.062-in. (1.58 mm) wire feeler gauge between the underside of the clapper and the coil.
f. If this gauge can be inserted, bend tang down until a 0.062-in. (1.58 mm) feeler gauge will not insert in the gap between the clapper and the coil core.




NOTE

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

FIGURE 6-13. HEAD-LOAD-PAD REPLACEMENT ILLUSTRATION

g. Insert a 0.058-in. (1.47 mm) wire feeler gauge in the gap between the underside of the clapper and the coil core.
h. If 0.058-in. (1.47 mm) feeler gauge will not fit, bend the tang up slightly.
i. Continue checking with the 0.062-in. (1.58 mm) wire gauge feeler and 0.058-in. (1.47 mm) wire gauge until the following condition is achieved:

   1. 0.062-in. (1.58 mm) feeler gauge will not pass between tang and clapper;
   2. 0.058-in. (1.47 mm) feeler gauge passes freely between tang and clapper.

j. Check the spring adjustment by gently pressing down on the clapper until the 0.060 in. (1.52 mm) ±0.002-in. (0.051 mm) gap is closed.
k. Allow the clapper to rise slowly and release.
l. The clapper should be in contact with the tang.
m. If not, bend the lower tang B, Figure 6-10, downward gently.
n. Recheck that the clapper rises and perform Step "m" until the clapper and tang make contact.
o. Check the bail adjustment per paragraph 6.6.6.

## 6.7.6 CARRIAGE AND/OR STEPPER MOTOR REPLACEMENT

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

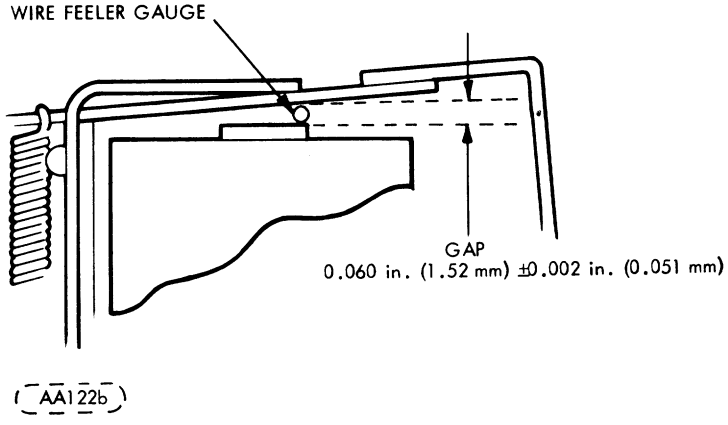



FIGURE 6-14. SOLENOID ADJUSTMENT

## 7.1 INTRODUCTION

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

## 7.2 UPPER HARNESS ASSEMBLIES

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

## 7.3 LOWER HARNESS ASSEMBLY

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

## 7.4 STEPPER MOTOR

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

## 7.5 WRITE PROTECT

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

## 8.1 INTRODUCTION

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

## 8.2 ILLUSTRATIONS

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

## 8.3 PARTS LISTS

In addition to the 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 in paragraph 8.6.

## 8.4 TOP MECHANICAL AND ASSEMBLY LOCATION

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

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

### 8.4.1 TOP MECHANICAL ASSEMBLY (TMA)

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

## 8.5 REPLACEMENT PARTS

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

NOTE

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

## Table 8-1. Top Mechanical Assembly Configurator

| MODELS | I T M A | ITEM NUMBERS 1111111111 0000000001 1234567890 | 1111111111 1111111112 1234567890 | 1111111111 2222222223 1234567890 | 1111111111 3333333334 1234567890 | 1111111111 4444444445 1234567890 | 1111111111 5555555556 1234567890 | 1111111111 6666666667 1234567890 |
|---|---|---|---|---|---|---|---|---|
| BR803A | 001 | XX00000000 | 0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803B | 002 | X0X0000000 | 0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803C | 003 | X00X000000 | 0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803D | 004 | X000X00000 | 0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803E | 005 | X0000000000 | X0000000000 | 0X000X0000 | 00X000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803F | 006 | X00000X000 | 0000000000 | 0X000X0000 | 00X000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803G | 007 | X0000000000 | X0000000000 | 0X000X0000 | 000X00X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803H | 008 | X0X0000000 | 0000000000 | 0X000X0000 | 000X00X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR805A | 009 | XX00000000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR805B | 010 | X0X0000000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR805C | 011 | X00X000000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR805D | 012 | X000X00000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR803N | 013 | XX00000000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR803P | 014 | X0X0000000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR803R | 015 | X000X00000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR803S | 016 | X00X000000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR803J | 017 | X000000X00 | 0000X00000 | 0X000X0000 | 00X000X000 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR803K | 018 | X000000X00 | 0000X00000 | 0X000X0000 | 000X00X000 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR803L | 019 | X0000000000 | 0000000000 | 0X000X000X | 00000XX000 | XX000XX0X0 | 0000X00000 | 0000000000 |
| BR803M | 020 | X0000000000 | 0000000000 | 0X000X00X0 | 00000XX000 | XX000XX0X0 | 0000X00000 | 0000000000 |
| BR8A3C | 021 | X000000X00 | 0000000000 | 0X000X0000 | 00X000X000 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A3D | 022 | X0000000X0 | 0000000000 | 0X000X0000 | 00X000X000 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A3E | 023 | X000000X00 | 0000000000 | 0X000X0000 | 000X00X000 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A3F | 024 | X0000000X0 | 0000000000 | 0X000X0000 | 000X00X000 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A2A | 025 | XX00000000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803T | 026 | X0000X0000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR805E | 027 | X0000X0000 | 0000000000 | 0X00XX0000 | 0000X0X000 | XX0X0XXX00 | 0000X00000 | 0000000000 |
| BR8A3A | 028 | X0000000000 | X0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A3B | 029 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 00000X0000 | 0000000000 | 0000000000 |
| BR8A2B | 030 | X0X0000000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2C | 031 | X00X000000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2D | 032 | X0000X0000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2E | 033 | X000X00000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2F | 034 | X0000000000 | 00X0000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2G | 035 | XX0000000000 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX000 | 0000X00000 | 000000000X |
| BR8A2H | 036 | X0000000000 | 0000000000 | 0X0X0X0000 | 0X00000X00 | XX00XXX000 | 0000X00000 | 0000000000 |
| BR8A2J | 037 | XX00000000 | 0000000000 | 0X000X0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2K | 038 | X0000000000 | 00X0000000 | 0X000X0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2L | 039 | X00000X000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2M | 040 | X000000X00 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX0X0 | 0000X00000 | 0X00000000 |
| BR8A2N | 041 | X000X00000 | 0000000000 | 0X000X0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2P | 042 | 00000000X0 | 0000X00000 | 0X000X0000 | X00000X00X | 00XX0X00X0 | 0000X0000X | 000X000X00 |
| BR8A2R | 043 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| BR8A4A | 044 | 0000000000 | 0000X00000 | 0X000XXX00 | X00000X00X | 00X00X00X0 | 0X00XXXX00 | 000X0000X0 |
| BR8A4B | 045 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 | 0000000000 |
| BR8A7A | 046 | 00000000X0 | 0000X00000 | 0X000X0000 | X00000X00X | 00XX0X00X0 | 0000X00000 | 000X0000X0 |
| BR8A5A | 047 | X0000000X0 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX0X0 | 0000X00000 | XX00000000 |
| BR8A5B | 048 | X000000X00 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX0X0 | 0000X00000 | XX00000000 |
| BR8A2W | 049 | X00000X000 | 0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2Y | 050 | X0000000000 | 00X0000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A6B | 051 | X0X0000000 | 0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR803U | 052 | X0000000000 | X0000000000 | 0X000X0000 | 0X0000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2S | 053 | X000000X00 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A2T | 054 | X000000X00 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A2U | 055 | X0000000000 | X0000000000 | 0X000X0000 | 00X000X000 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2V | 056 | X0000000000 | 00X0000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A2Z | 057 | X00000000X0 | 0000000000 | 0X000X0000 | 0X00000X00 | XX0X0XX0X0 | 0000X00000 | 0000000000 |
| BR8A3G | 058 | XX0000000000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A3H | 059 | X0X0000000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| | 060 | X0000000000 | 00X0000000 | 0X000X0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000X00000 |
| BR8A5C | 061 | X000000X00 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX0X0 | 0000X00000 | XX00000000 |
| BR8A5D | 062 | X000000X00 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX0X0 | 0000X00000 | XX00000000 |
| BR8A5E | 063 | XX00000000 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX00X | 0000X00000 | 0000000000 |
| BR8A5J | 064 | XX00000000 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX000 | X000X00000 | 0000000000 |
| BR8A5F | 080 | XX00000000 | 0000000000 | 0X00XX0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A5G | 081 | XX00000000 | 0000000000 | 0X000X0000 | 0X00000X00 | XX0X0XX000 | 0000X00000 | 0000000000 |
| BR8A5H | 082 | XX00000000 | 0000000000 | 0X00XX0000 | 0000000X00 | XX0X0XX000 | X000X00000 | 0000000000 |
| BRXXXX | 099 | OEM ENGINEERING UNIT | | | | | | |

| ITEM | IDENT NO | DESCRIPTION | WHERE USED |
|---|---|---|---|
| 101 | 83458201 | CHASSIS ASM-COMMON PARTS | TMA |
| 102 | 75291920 | DRIVE MOTOR ASM 60 HZ | TMA |
| 103 | 75291923 | DRIVE MOTOR ASM 50 HZ | TMA |
| 104 | 75291926 | DRIVE MOTOR ASM 60 HZ | TMA |
| 105 | 75291927 | DRIVE MOTOR ASM 50 HZ | TMA |
| 106 | 75291928 | DRIVE MOTOR ASM 50 HZ | TMA |
| 107 | 75291925 | DRIVE MOTOR ASM 50 HZ | TMA |
| 108 | 75881778 | DRIVE MOTOR ASM 50 HZ | TMA |
| 109 | 75881775 | DRIVE MOTOR ASM 60 HZ | TMA |
| 111 | 75291921 | DRIVE MOTOR ASM 60 HZ | TMA |
| 113 | 75291924 | DRIVE MOTOR ASM 60 HZ | TMA |
| 115 | 75891480 | CHASSIS ASM-COMMON PARTS | TMA |
| 122 | 94277416 | STRAP, CABLE TIE | TMA |
| 124 | 75291902 | DRIVE MOTOR ASM 50 HZ | TMA |
| 125 | 83427801 | WRITE PROTECT ASM | TMA |
| 126 | 92602001 | CLAMP | TMA |
| 127 | 77830690 | DISKETTE DETECT ASM | TMA |
| 128 | 75881779 | DRIVE MOTOR ASM 60 HZ | TMA |
| 129 | 75881780 | DRIVE MOTOR ASM 50 HZ | TMA |
| 130 | 75881781 | DRIVE MOTOR ASM 60 HZ | TMA |
| 131 | 83401806 | FRONT PANEL ASM | TMA |
| 132 | 83401801 | FRONT PANEL ASM | TMA |
| 133 | 83401802 | FRONT PANEL ASM | TMA |
| 134 | 83401803 | FRONT PANEL ASM | TMA |
| 135 | 83401804 | FRONT PANEL ASM | TMA |
| 136 | 83401805 | FRONT PANEL ASM | TMA |
| 137 | 75791510 | ACTUATOR ASM | TMA |
| 138 | 75791511 | ACTUATOR ASM | TMA |
| 140 | 77830685 | UPPER HARNESS ASM | TMA |
| 141 | 75747301 | UPPER HARNESS ASM | TMA |
| 142 | 83403502 | LOWER HARNES ASM | TMA |
| 143 | 83403503 | LOWER HARNESS ASM | TMA |
| 144 | 83403700 | CONNECTOR BRACKET | TMA |

| ITEM | IDENT NO | DESCRIPTION | WHERE USED |
|---|---|---|---|
| 145 | 75272300 | CONNECTOR BRACKET | TMA |
| 146 | 77830538 | CSA LABEL | TMA |
| 147 | 77594901 | TRACK SWITCH ASM | TMA |
| 148 | 83460101 | AMP CONN KIT | TMA |
| 149 | 75746702 | CAPACITOR BRACKET | TMA |
| 150 | 75898080 | FRONT PANEL ASM | TMA |
| 151 | 83401809 | FRONT PANEL ASM | TMA |
| 152 | 77832691 | MOUNTING KIT | TMA |
| 155 | 93592240 | SCREW-WASHER | TMA |
| 156 | 77830641 | AC CONN & RELAY ASM | TMA |
| 157 | 77830995 | COVER | TMA |
| 158 | 17901508 | SCREW | TMA |
| 160 | 77834336 | LABEL, FCO | TMA |
| 161 | 77834543 | FRONT PANEL ASSY | TMA |
| 162 | 75746701 | CAPACITOR BRACKET | TMA |
| 164 | 77836055 | LABEL | TMA |
| 168 | 77594704 | OPT TRACK SENSE ASSY | TMA |
| 169 | 77594705 | OPT TRACK SENSE ASSY | TMA |
| 170 | 83401808 | FRONT PANEL ASSY | TMA |
| 336 | 93592160 | SCREW, SELF TAP | TMA |

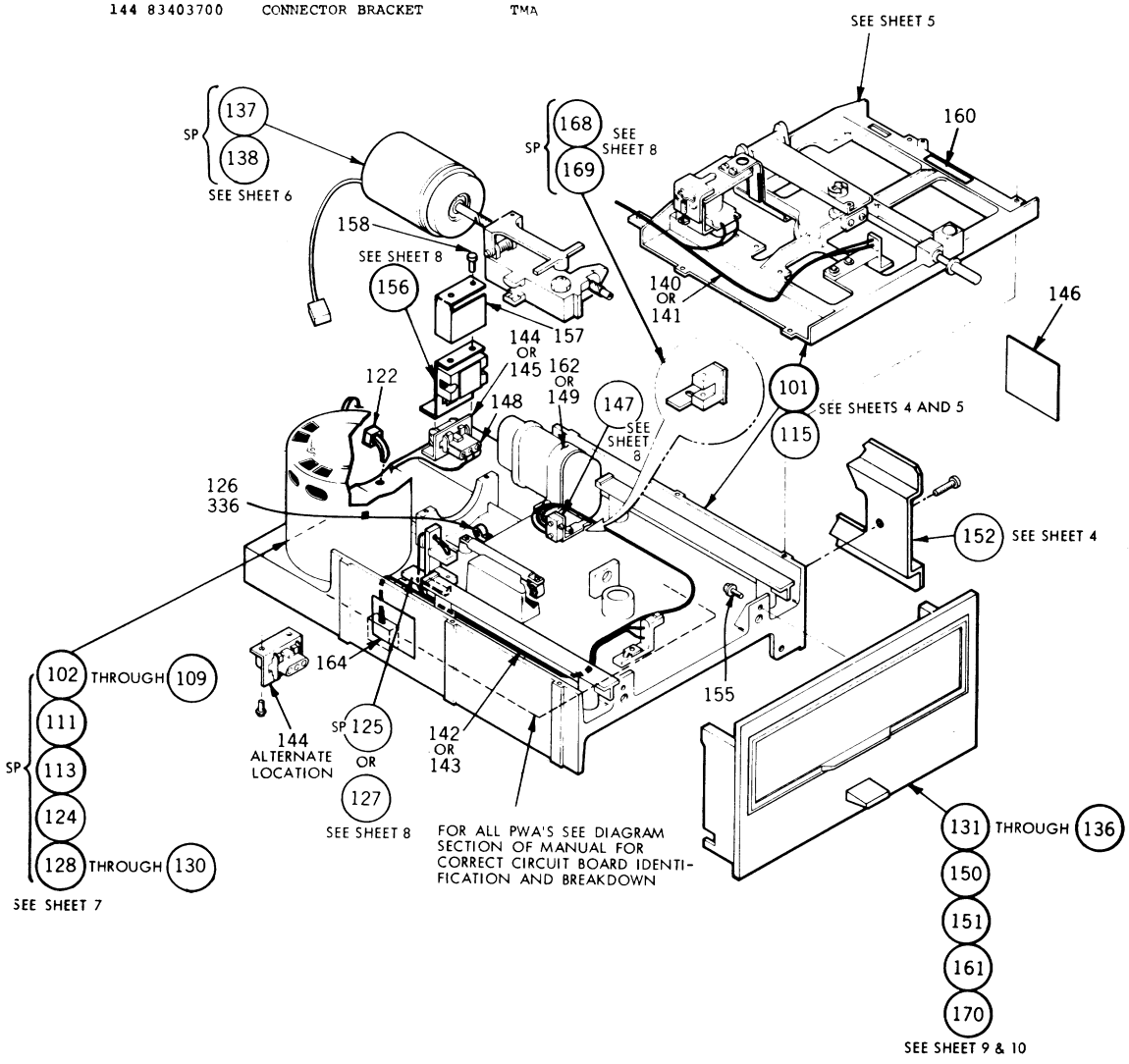
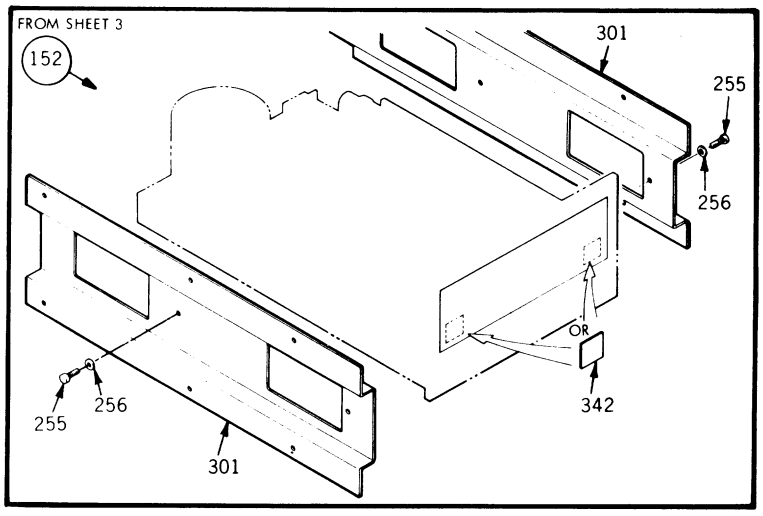



Figure 8-1. Top Mechanical Assembly

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



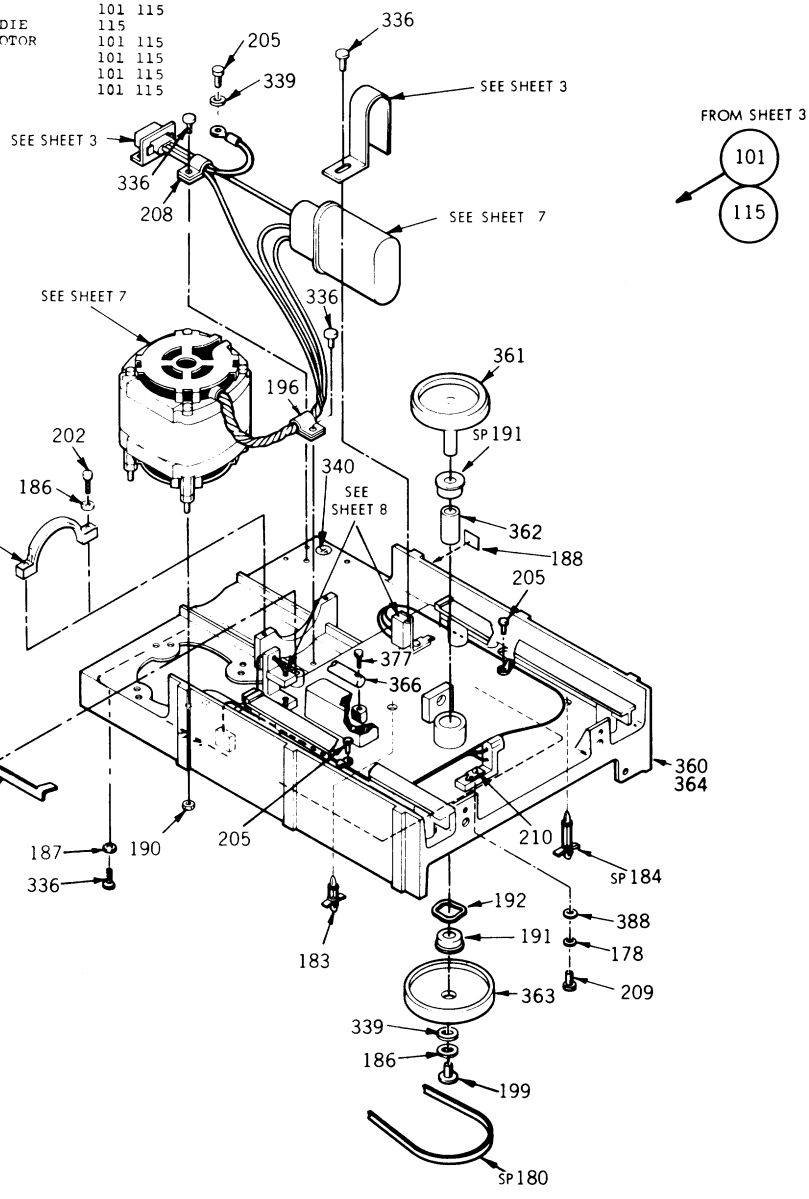
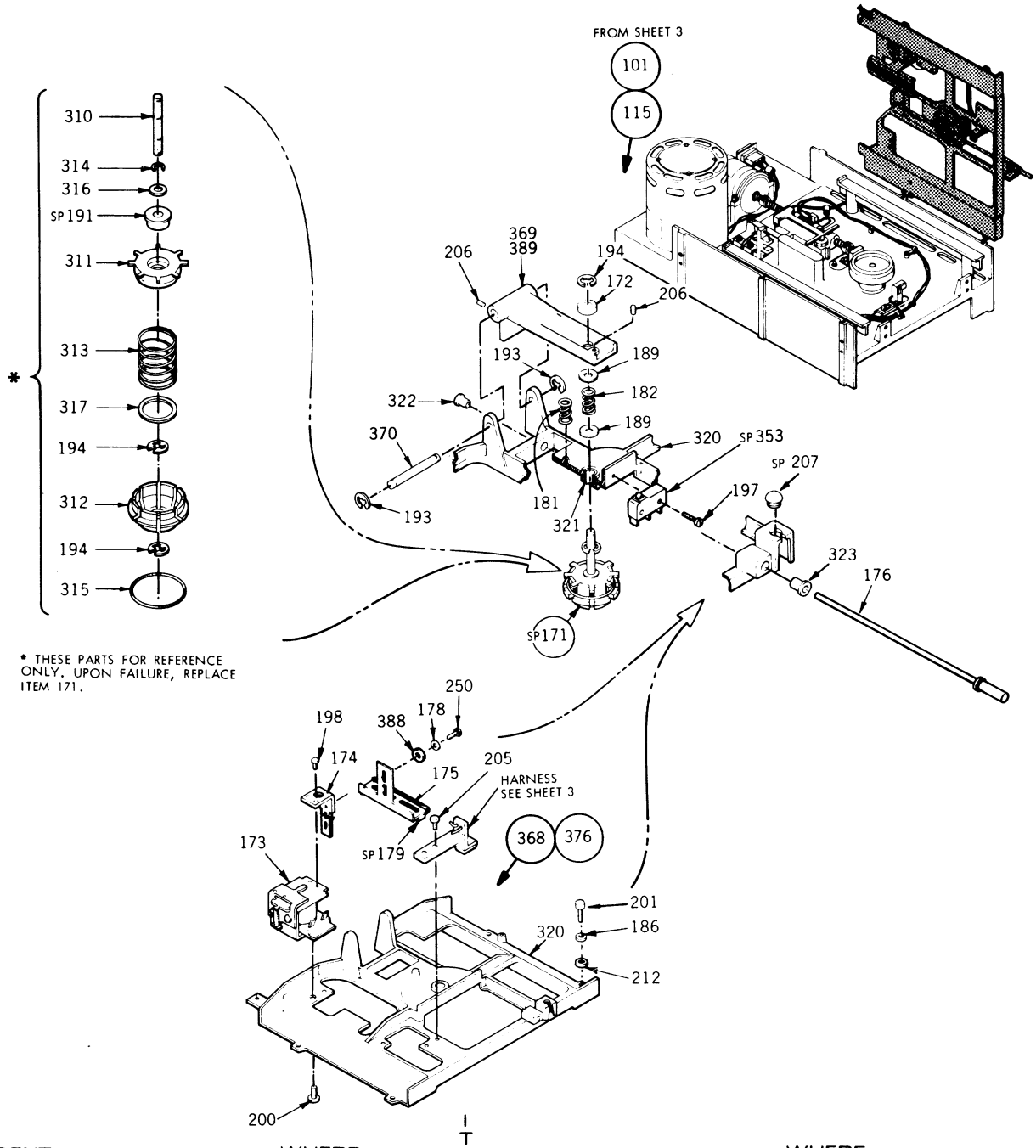



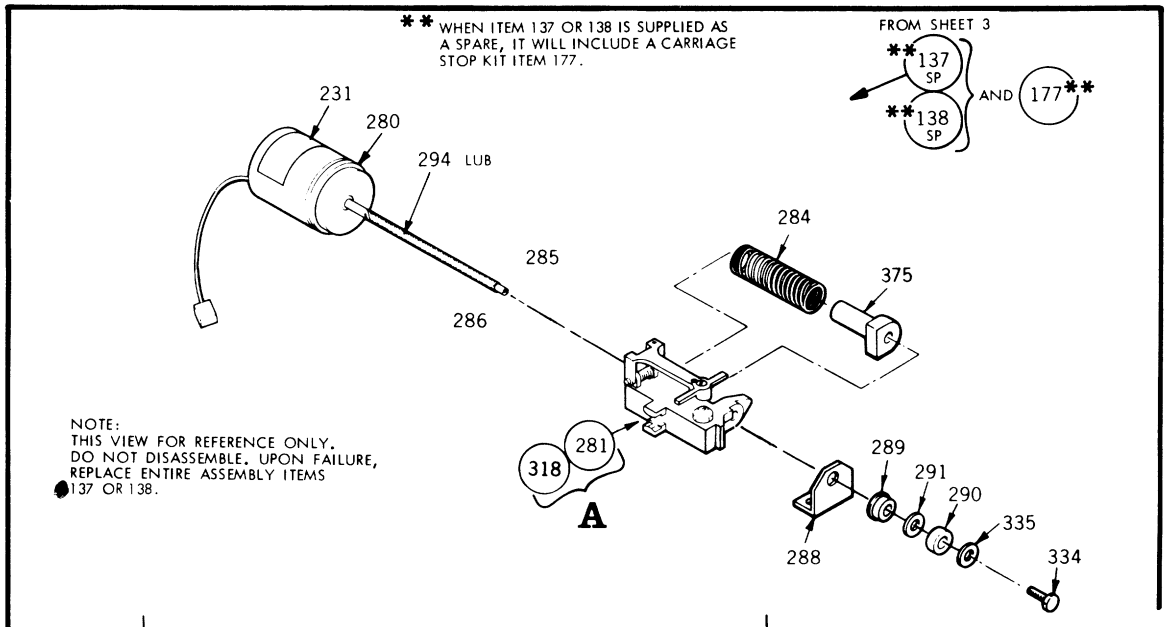

Figure 8-2. FDD Common Parts (Sheet 1 of 2)




| ITEM | IDENT NO | DESCRIPTION | WHERE USED |
|---|---|---|---|
| 101 | 83458201 | CHASSIS ASM-COMMON PARTS | TMA |
| 115 | 75891480 | CHASSIS ASM-COMMON PARTS | TMA |
| 171 | 83402101 | CONE ASM | 101 115 |
| 172 | 75273200 | BUSHING | 101 115 |
| 173 | 75747202 | SOLENOID | 101 115 |
| 174 | 77834331 | EXTENSION ARMATURE | 101 115 |
| 175 | 77834326 | BAIL ARMATURE | 101 115 |
| 176 | 75885163 | PUSH ROD ASSY | 101 115 |
| 178 | 10125801 | WASHERS SPR LOCK | 101 115 |
| 179 | 77830732 | FOAM PAD | 101 115 |
| 181 | 75292609 | SPRING-COMPRESSION | 101 115 |
| 182 | 75292617 | SPRING-COMPRESSION | 101 115 |
| 186 | 10125803 | WASHERS SPR LOCK | 101 115 |
| 189 | 77835200 | WASHER, NYLON | 101 115 |
| 191 | 92073022 | BEARING FLANGED | 171 |
| 193 | 92033037 | RING RETAINING | 101 115 |
| 194 | 92033038 | RETAINING RING | 101 171 |
| 194 | 92033038 | RETAINING RING | 115 |
| 197 | 09000005 | SCREW BIND HEAD | 101 115 |
| 198 | 09000202 | SCREW BIND HEAD | 101 115 |
| 200 | 09000504 | SCREW BIND HEAD | 101 115 |
| 201 | 10126219 | SCR HEX SOC HD CAP | 101 115 |
| 205 | 93592086 | SCR HEX SELF TAP | 101 115 |

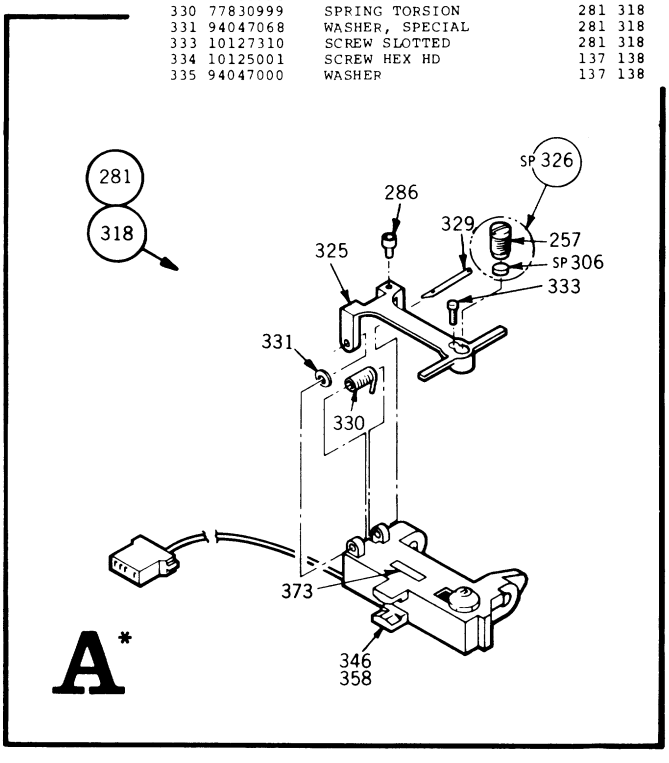
| ITEM | IDENT NO | DESCRIPTION | WHERE USED |
|---|---|---|---|
| 206 | 83413408 | SCREW-SELF LOCKING | 101 115 |
| 207 | 83411202 | BUMPER DOOR | 101 115 |
| 212 | 94279109 | FLAT WASHER | 101 115 |
| 250 | 93592482 | SCR HEX HD | 101 115 |
| 310 | 75790803 | SHAFT | 171 |
| 311 | 83426400 | EXPANDER-CONE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

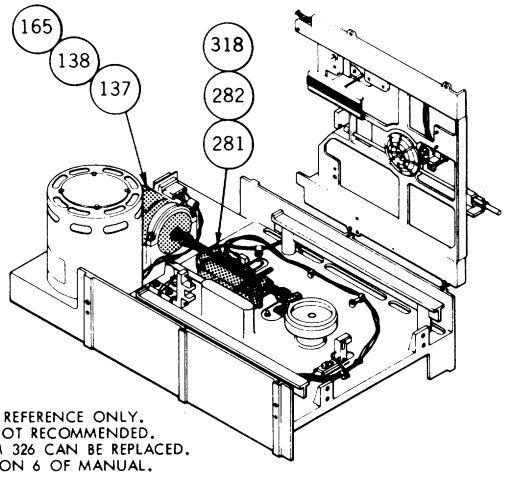
Figure 8-2. FDD Common Parts (Sheet 2 of 2)




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

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

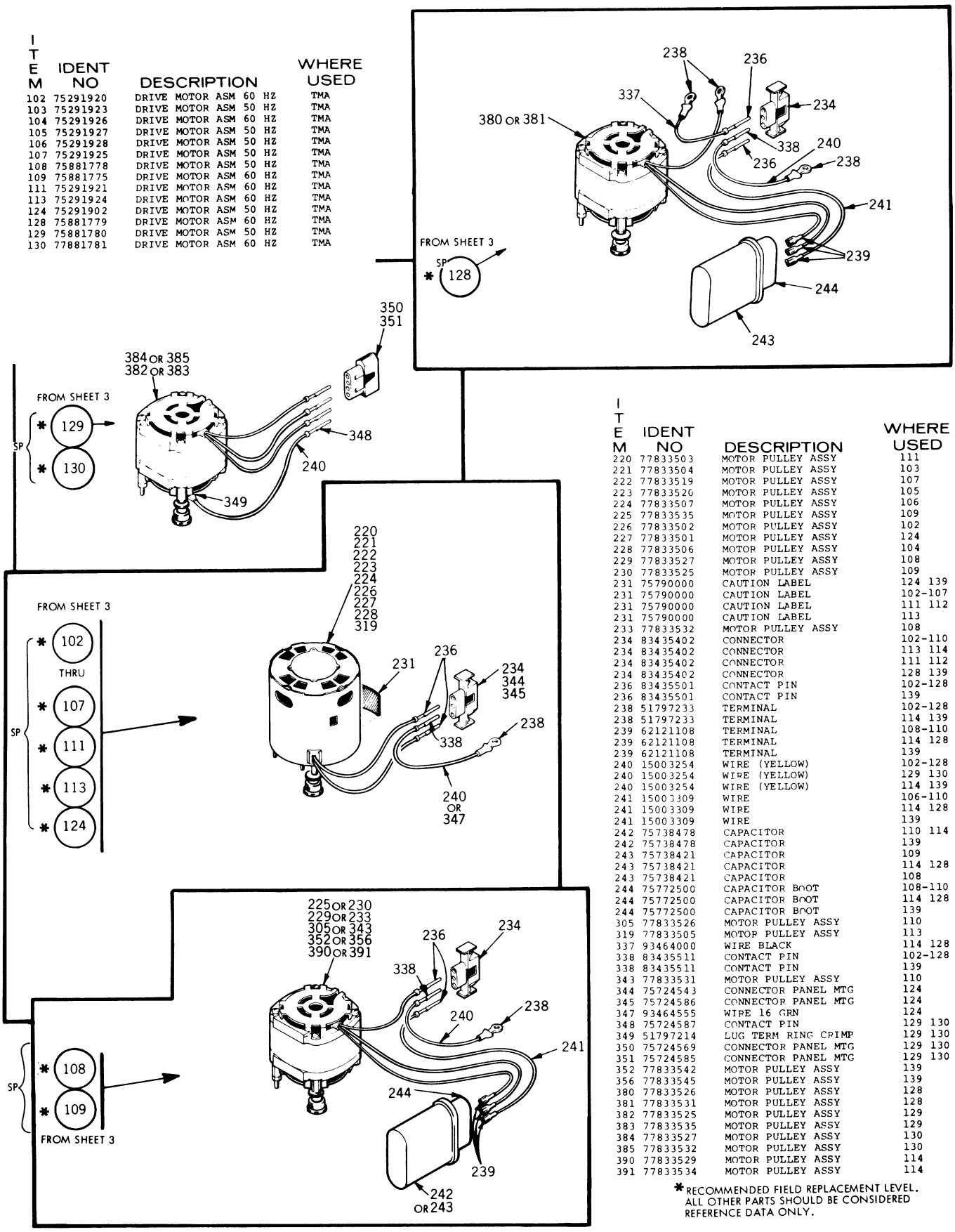



* THIS VIEW FOR REFERENCE ONLY. DISASSEMBLY NOT RECOMMENDED. HOWEVER, ITEM 326 CAN BE REPLACED. REFER TO SECTION 6 OF MANUAL.

Figure 8-3. Actuator and Carriage Assemblies

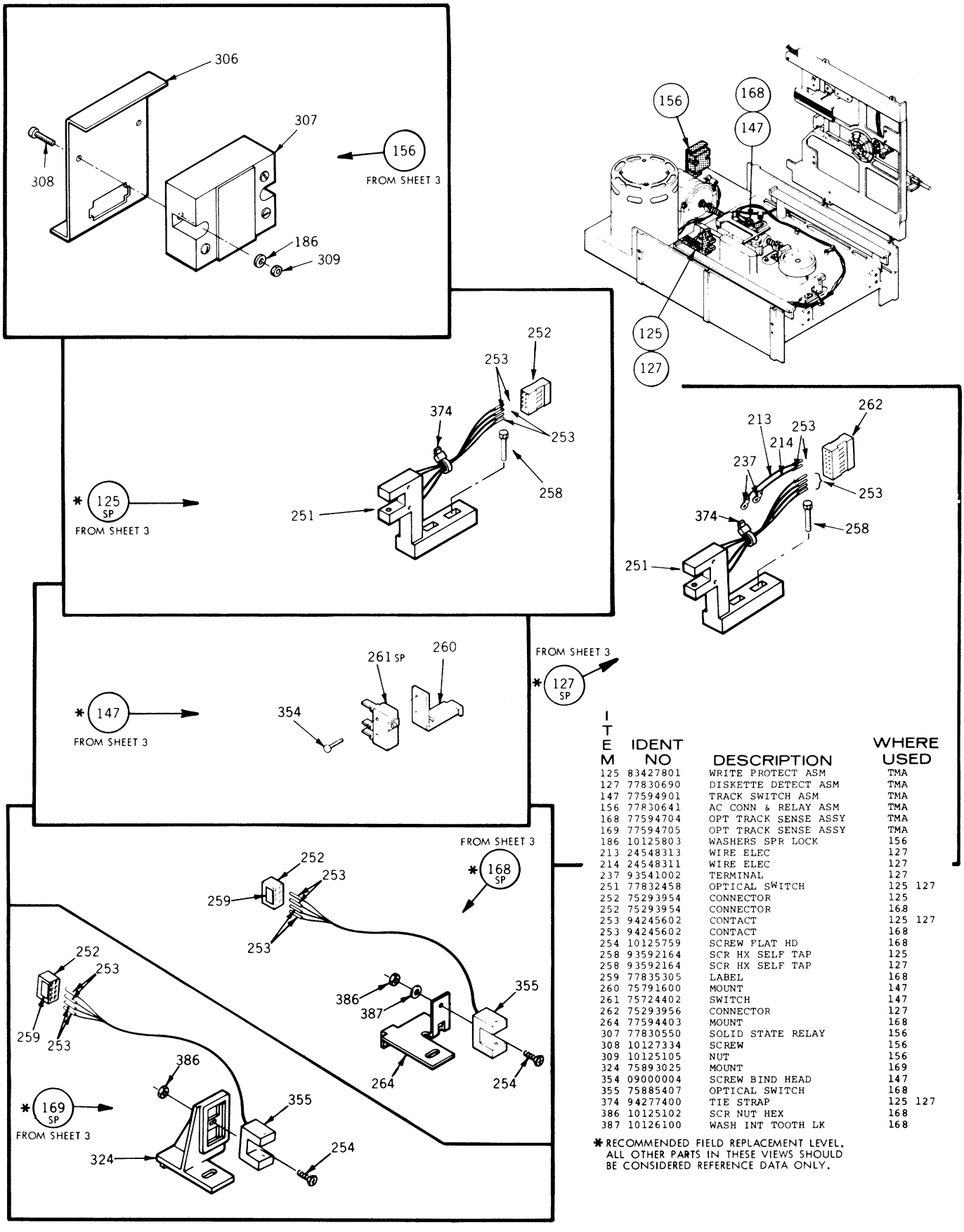
| ITEM | IDENT NO | DESCRIPTION | WHERE USED |
|---|---|---|---|
| 102 | 75291920 | DRIVE MOTOR ASM 60 HZ | TMA |
| 103 | 75291923 | DRIVE MOTOR ASM 50 HZ | TMA |
| 104 | 75291926 | DRIVE MOTOR ASM 60 HZ | TMA |
| 105 | 75291927 | DRIVE MOTOR ASM 50 HZ | TMA |
| 106 | 75291928 | DRIVE MOTOR ASM 50 HZ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




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

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

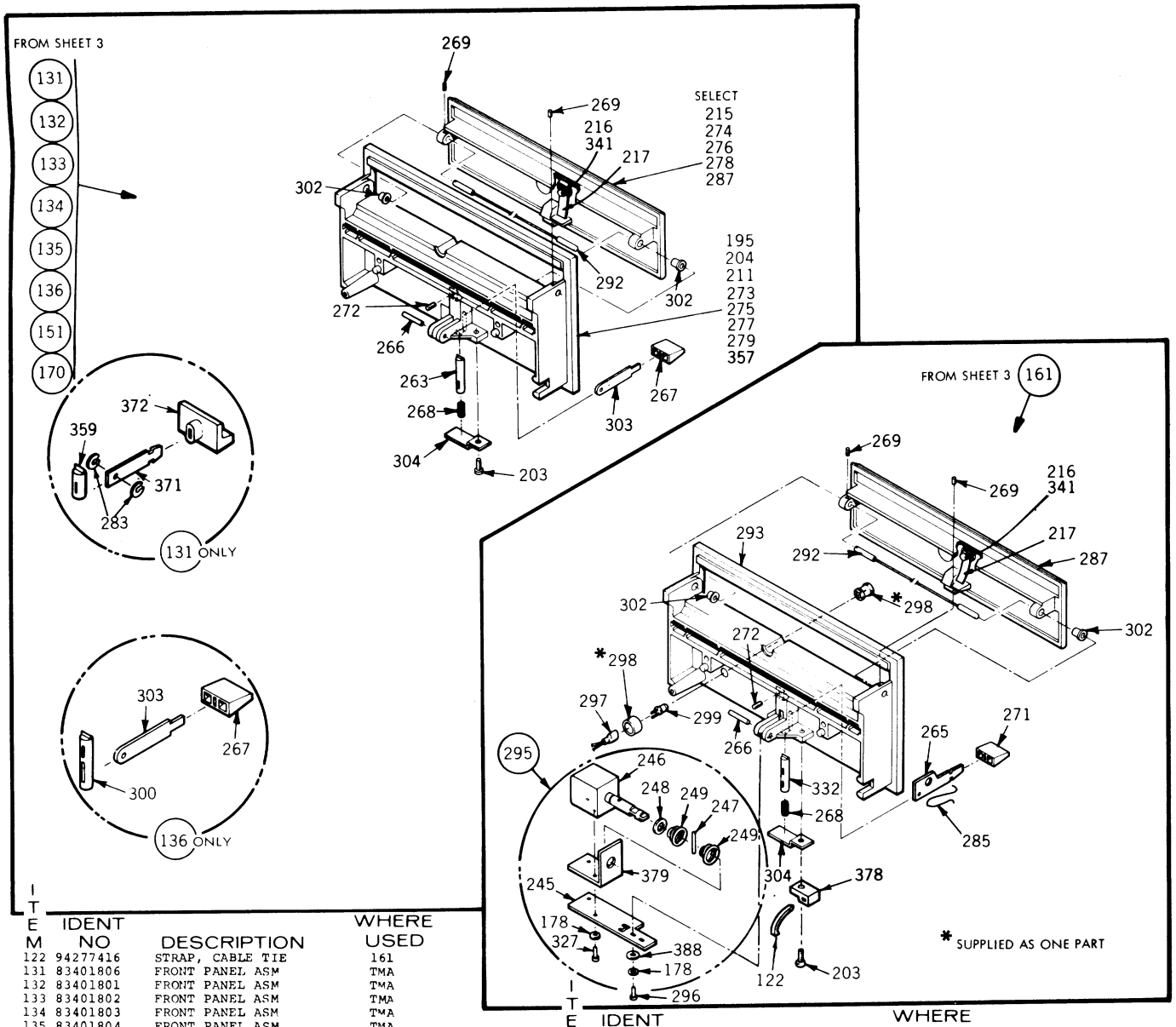
Figure 8-4. Drive Motor Assembly




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

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

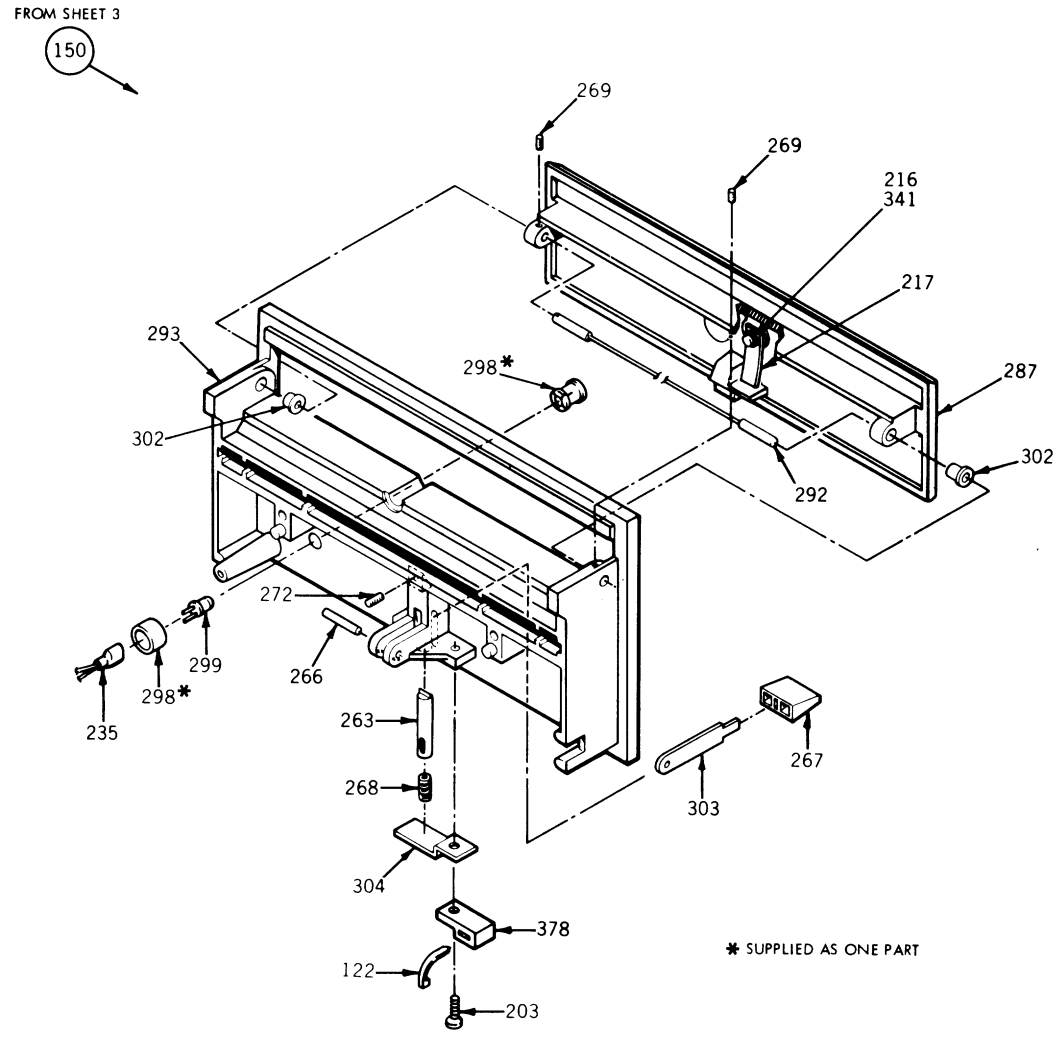
Figure 8-5. Miscellaneous Sub-Assemblies




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

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

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




| ITEM | IDENT NO | DESCRIPTION | WHERE USED |
|---|---|---|---|
| 122 | 94277416 | STRAP, CABLE TIE | 150 |
| 150 | 75898080 | FRONT PANEL ASM | TM |
| 203 | 93592162 | SCR HX WASHER SLF TA | 150 |
| 216 | 93592080 | SCR HEX WSR HD | 150 |
| 217 | 75884657 | LEAF SPRING | 150 |
| 235 | 75898086 | HARNESS | 150 |
| 263 | 83402301 | LATCH-DOOR INJEC MOL | 150 |
| 266 | 92096099 | PIN-GROOVED | 150 |
| 267 | 75292700 | KNOB-LEVER | 150 |
| 268 | 83401200 | SPRING-LATCH | 150 |
| 269 | 83413406 | SCR SET SOC HD 6-32 | 150 |
| 272 | 83413404 | SCREW-SELF LOCKING | 150 |
| 287 | 75812124 | DOOR FINISHED BLACK | 150 |
| 292 | 83403202 | BAR TORSION DOOR | 150 |
| 293 | 83461111 | FRONT PANEL | 150 |
| 298 | 75810703 | RETAINING RING | 150 |
| 299 | 75810701 | DIODE LIGHT | 150 |
| 302 | 83401500 | BUSHING-DOOR INJECT | 150 |
| 303 | 75746000 | LEVER-DOOR | 150 |
| 304 | 75746800 | BRACKET LATCH | 150 |
| 341 | 10126400 | WASH EXT TOOTH LK | 150 |
| 378 | 95862300 | ANCHOR CABLE TIE | 150 |

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

## 8.6 PARTS LIST INSTRUCTIONS

### 8.6.1 ILLUSTRATION PARTS LISTS

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

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

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

NOTE

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

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

NOTE

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

### 8.6.3 CROSS REFERENCE INDEX

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

### 8.6.4 SHEET NUMBER REFERENCING

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

## 8.7 SPARE PARTS (SP)

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

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

# Top-Down Assembly/Component Parts List

| ITEM | IDENT NO | DESCRIPTION | WHERE USED | SH |
|---|---|---|---|---|
| 101 | 83458201 | CHASSIS ASM-COMMON PARTS | TMA | S3 |
| 101 | 83458201 | CHASSIS ASM-COMMON PARTS | TMA | S4 |
| 101 | 83458201 | CHASSIS ASM-COMMON PARTS | TMA | S5 |
| 102 | 75291920 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 102 | 75291920 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 103 | 75291923 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 103 | 75291923 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 104 | 75291926 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 104 | 75291926 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 105 | 75291927 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 105 | 75291927 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 106 | 75291928 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 106 | 75291928 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 107 | 75291925 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 107 | 75291925 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 108 | 75881778 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 108 | 75881778 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 109 | 75881775 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 109 | 75881775 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 111 | 75291921 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 111 | 75291921 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 113 | 75291924 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 113 | 75291924 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 115 | 75891480 | CHASSIS ASM-COMMON PARTS | TMA | S3 |
| 115 | 75891480 | CHASSIS ASM-COMMON PARTS | TMA | S4 |
| 115 | 75891480 | CHASSIS ASM-COMMON PARTS | TMA | S5 |
| 122 | 94277416 | STRAP, CABLE TIE | TMA | S3 |
| 122 | 94277416 | STRAP, CABLE TIE | 161 | S9 |
| 122 | 94277416 | STRAP, CABLE TIE | 150 | S10 |
| 124 | 75291902 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 124 | 75291902 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 125 | 83427801 | WRITE PROTECT ASM | TMA | S3 |
| 125 | 83427801 | WRITE PROTECT ASM | TMA | S8 |
| 126 | 92602001 | CLAMP | TMA | S3 |
| 127 | 77830690 | DISKETTE DETECT ASM | TMA | S3 |
| 127 | 77830690 | DISKETTE DETECT ASM | TMA | S8 |
| 128 | 75881779 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 128 | 75881779 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 129 | 75881780 | DRIVE MOTOR ASM 50 HZ | TMA | S3 |
| 129 | 75881780 | DRIVE MOTOR ASM 50 HZ | TMA | S7 |
| 130 | 75881781 | DRIVE MOTOR ASM 60 HZ | TMA | S3 |
| 130 | 77881781 | DRIVE MOTOR ASM 60 HZ | TMA | S7 |
| 131 | 83401806 | FRONT PANEL ASM | TMA | S3 |
| 131 | 83401806 | FRONT PANEL ASM | TMA | S9 |
| 132 | 83401801 | FRONT PANEL ASM | TMA | S3 |
| 132 | 83401801 | FRONT PANEL ASM | TMA | S9 |
| 133 | 83401802 | FRONT PANEL ASM | TMA | S3 |
| 133 | 83401802 | FRONT PANEL ASM | TMA | S9 |
| 134 | 83401803 | FRONT PANEL ASM | TMA | S3 |
| 134 | 83401803 | FRONT PANEL ASM | TMA | S9 |
| 135 | 83401804 | FRONT PANEL ASM | TMA | S3 |
| 135 | 83401804 | FRONT PANEL ASM | TMA | S9 |
| 136 | 83401805 | FRONT PANEL ASM | TMA | S3 |
| 136 | 83401805 | FRONT PANEL ASM | TMA | S9 |
| 137 | 75791510 | ACTUATOR ASM | TMA | S3 |
| 137 | 75791510 | ACTUATOR ASM | TMA | S6 |
| 138 | 75791511 | ACTUATOR ASM | TMA | S3 |
| 138 | 75791511 | ACTUATOR ASM | TMA | S6 |
| 140 | 77830685 | UPPER HARNESS ASM | TMA | S3 |
| 141 | 75747301 | UPPER HARNESS ASM | TMA | S3 |
| 142 | 83403502 | LOWER HARNES ASM | TMA | S3 |
| 143 | 83403503 | LOWER HARNESS ASM | TMA | S3 |
| 144 | 83403700 | CONNECTOR BRACKET | TMA | S3 |
| 145 | 75272300 | CONNECTOR BRACKET | TMA | S3 |
| 146 | 77830538 | CSA LABEL | TMA | S3 |
| 147 | 77594901 | TRACK SWITCH ASM | TMA | S3 |
| 147 | 77594901 | TRACK SWITCH ASM | TMA | S8 |
| 148 | 83460101 | AMP CONN KIT | TMA | S3 |
| 149 | 75746702 | CAPACITOR BRACKET | TMA | S3 |
| 150 | 75898080 | FRONT PANEL ASM | TMA | S3 |
| 150 | 75898080 | FRONT PANEL ASM | TMA | S10 |
| 151 | 83401809 | FRONT PANEL ASM | TMA | S3 |
| 151 | 83401809 | FRONT PANEL ASM | TMA | S9 |
| 152 | 77832691 | MOUNTING KIT | TMA | S3 |
| 152 | 77832691 | MOUNTING KIT | TMA | S4 |
| 155 | 93592240 | SCREW-WASHER | TMA | S3 |
| 156 | 77830641 | AC CONN & RELAY ASM | TMA | S3 |
| 156 | 77830641 | AC CONN & RELAY ASM | TMA | S8 |
| 157 | 77830995 | COVER | TMA | S3 |
| 158 | 17901508 | SCREW | TMA | S3 |
| 160 | 77834336 | LABEL, FCO | TMA | S3 |
| 161 | 77834543 | FRONT PANEL ASSY | TMA | S3 |
| 161 | 77834543 | FRONT PANEL ASSY | TMA | S9 |
| 162 | 75746701 | CAPACITOR BRACKET | TMA | S3 |
| 164 | 77836055 | LABEL | TMA | S3 |
| 168 | 77594704 | OPT TRACK SENSE ASSY | TMA | S3 |
| 168 | 77594704 | OPT TRACK SENSE ASSY | TMA | S8 |
| 169 | 77594705 | OPT TRACK SENSE ASSY | TMA | S3 |
| 169 | 77594705 | OPT TRACK SENSE ASSY | TMA | S8 |
| 170 | 83401808 | FRONT PANEL ASSY | TMA | S3 |
| 170 | 83401808 | FRONT PANEL ASSY | TMA | S9 |
| 171 | 83402101 | CONE ASM | 101 115 | S5 |
| 172 | 75273200 | BUSHING | 101 115 | S5 |
| 173 | 75747202 | SOLENOID | 101 115 | S5 |
| 174 | 77834331 | EXTENSION ARMATURE | 101 115 | S5 |
| 175 | 77834326 | BAIL ARMATURE | 101 115 | S5 |
| 176 | 75885163 | PUSH ROD ASSY | 101 115 | S5 |
| 177 | 75882711 | CARRIAGE STOP KIT | 137 138 | S6 |
| 178 | 10125801 | WASHERS SPR LOCK | 101 115 | S4 |
| 178 | 10125801 | WASHERS SPR LOCK | 101 115 | S5 |

| ITEM | IDENT NO | DESCRIPTION | WHERE USED | SH |
|---|---|---|---|---|
| 179 | 77830732 | FOAM PAD | 101 115 | S5 |
| 180 | 75293203 | BELT-FLAT | 101 115 | S4 |
| 181 | 75292609 | SPRING-COMPRESSION | 101 115 | S5 |
| 182 | 75292617 | SPRING-COMPRESSION | 101 115 | S5 |
| 183 | 75774732 | CLIP-PUSH IN | 101 115 | S4 |
| 184 | 75774736 | CLIP-PUSH IN | 101 115 | S4 |
| 186 | 10125803 | WASHERS SPR LOCK | 101 115 | S4 |
| 186 | 10125803 | WASHERS SPR LOCK | 101 115 | S5 |
| 186 | 10125803 | WASHERS SPR LOCK | 156 | S8 |
| 187 | 10125605 | WASHERS PLAIN | 101 115 | S4 |
| 188 | 77832145 | LABEL IDENT | 101 115 | S4 |
| 189 | 77835200 | WASHER, NYLON | 101 115 | S5 |
| 190 | 94217702 | NUT-SELF LOCK, STL 8 | 101 115 | S4 |
| 191 | 92073022 | BEARING FLANGED | 101 115 | S4 |
| 191 | 92073022 | BEARING FLANGED | 171 | S5 |
| 192 | 93529005 | WASHER-SPRING WAVE | 101 115 | S4 |
| 193 | 92033037 | RING RETAINING | 101 115 | S5 |
| 194 | 92033038 | RETAINING RING | 101 171 | S5 |
| 194 | 92033038 | RETAINING RING | 115 | S5 |
| 195 | 83426624 | PANEL FRONT FIN BLK | 132 | S9 |
| 196 | 16402506 | CLAMP CABLE | 101 115 | S4 |
| 197 | 09000005 | SCREW BIND HEAD | 101 115 | S5 |
| 198 | 09000202 | SCREW BIND HEAD | 101 115 | S5 |
| 199 | 09000403 | SCREW BIND HEAD | 101 115 | S4 |
| 200 | 09000504 | SCREW BIND HEAD | 101 115 | S5 |
| 201 | 10126219 | SCR HEX SOC HD CAP | 101 115 | S5 |
| 202 | 10126222 | SCREW HEX SOC HD | 101 115 | S4 |
| 203 | 93592162 | SCR HX WASHER SLF TA | 131-136 | S9 |
| 203 | 93592162 | SCR HX WASHER SLF TA | 161 170 | S9 |
| 203 | 93592162 | SCR HX WASHER SLF TA | 150 | S10 |
| 204 | 75898043 | PANEL, FRONT, FIN BLK | 151 | S9 |
| 205 | 93592086 | SCR HEX SELF TAP | 101 115 | S4 |
| 205 | 93592086 | SCR HEX SELF TAP | 101 115 | S5 |
| 206 | 83413408 | SCREW-SELF LOCKING | 101 115 | S5 |
| 207 | 83411202 | BUMPER DOOR | 101 115 | S5 |
| 208 | 92602003 | CLAMP, CABLE-NYLON | 101 115 | S4 |
| 209 | 10126214 | SCR HEX SOC HD CAP | 101 115 | S4 |
| 210 | 83427900 | PLATE-NUT | 101 115 | S4 |
| 211 | 83426626 | PANEL FRONT FIN BLU | 170 | S9 |
| 212 | 94279109 | FLAT WASHER | 101 115 | S5 |
| 213 | 24548313 | WIRE ELEC | 127 | S8 |
| 214 | 24548311 | WIRE ELEC | 127 | S8 |
| 215 | 75812126 | DOOR FINISHED BLU | 170 | S9 |
| 216 | 93592080 | SCR HEX WSR HD | 131-136 | S9 |
| 216 | 93592080 | SCR HEX WSR HD | 161 170 | S9 |
| 216 | 93592080 | SCR HEX WSR HD | 150 | S10 |
| 217 | 75884657 | LEAF SPRING | 131-136 | S9 |
| 217 | 75884657 | LEAF SPRING | 161 170 | S9 |
| 217 | 75884657 | LEAF SPRING | 150 | S10 |
| 218 | 75882450 | CARRIAGE STOP | 101,115 | S4 |
| 219 | 93592488 | SCREW | 101,115 | S4 |
| 220 | 77833503 | MOTOR PULLEY ASSY | 111 | S7 |
| 221 | 77833504 | MOTOR PULLEY ASSY | 103 | S7 |
| 222 | 77833519 | MOTOR PULLEY ASSY | 107 | S7 |
| 223 | 77833520 | MOTOR PULLEY ASSY | 105 | S7 |
| 224 | 77833507 | MOTOR PULLEY ASSY | 106 | S7 |
| 225 | 77833535 | MOTOR PULLEY ASSY | 109 | S7 |
| 226 | 77833502 | MOTOR PULLEY ASSY | 102 | S7 |
| 227 | 77833501 | MOTOR PULLEY ASSY | 124 | S7 |
| 228 | 77833506 | MOTOR PULLEY ASSY | 104 | S7 |
| 229 | 77833527 | MOTOR PULLEY ASSY | 108 | S7 |
| 230 | 77833525 | MOTOR PULLEY ASSY | 109 | S7 |
| 231 | 75790000 | CAUTION LABEL | 137 138 | S6 |
| 231 | 75790000 | CAUTION LABEL | 124 139 | S7 |
| 231 | 75790000 | CAUTION LABEL | 102-107 | S7 |
| 231 | 75790000 | CAUTION LABEL | 111 112 | S7 |
| 231 | 75790000 | CAUTION LABEL | 113 | S7 |
| 233 | 77833532 | MOTOR PULLEY ASSY | 108 | S7 |
| 234 | 83435402 | CONNECTOR | 102-110 | S7 |
| 234 | 83435402 | CONNECTOR | 113 114 | S7 |
| 234 | 83435402 | CONNECTOR | 111 112 | S7 |
| 234 | 83435402 | CONNECTOR | 128 139 | S7 |
| 235 | 75898086 | HARNESS | 150 | S10 |
| 236 | 83435501 | CONTACT PIN | 102-128 | S7 |
| 236 | 83435501 | CONTACT PIN | 139 | S7 |
| 237 | 93541002 | TERMINAL | 127 | S8 |
| 238 | 51797233 | TERMINAL | 102-128 | S7 |
| 238 | 51797233 | TERMINAL | 114 139 | S7 |
| 239 | 62121108 | TERMINAL | 108-110 | S7 |
| 239 | 62121108 | TERMINAL | 114 128 | S7 |
| 239 | 62121108 | TERMINAL | 139 | S7 |
| 240 | 15003254 | WIRE (YELLOW) | 102-128 | S7 |
| 240 | 15003254 | WIRE (YELLOW) | 129 130 | S7 |
| 240 | 15003254 | WIRE (YELLOW) | 114 139 | S7 |
| 241 | 15003309 | WIRE | 106-110 | S7 |
| 241 | 15003309 | WIRE | 114 128 | S7 |
| 241 | 15003309 | WIRE | 139 | S7 |
| 242 | 75738478 | CAPACITOR | 110 114 | S7 |
| 242 | 75738478 | CAPACITOR | 139 | S7 |
| 243 | 75738421 | CAPACITOR | 109 | S7 |
| 243 | 75738421 | CAPACITOR | 114 128 | S7 |
| 243 | 75738421 | CAPACITOR | 108 | S7 |
| 244 | 75772500 | CAPACITOR BOOT | 108-110 | S7 |
| 244 | 75772500 | CAPACITOR BOOT | 114 128 | S7 |
| 244 | 75772500 | CAPACITOR BOOT | 139 | S7 |
| 245 | 77835131 | SOLENOID BRKT | 295 | S9 |
| 246 | 77834212 | SOLENOID | 295 | S9 |
| 247 | 93530103 | PIN ROLL | 295 | S9 |
| 248 | 75806507 | WASHER | 295 | S9 |
| 249 | 77834323 | SPRING | 295 | S9 |

| ITEM | IDENT NO | DESCRIPTION | WHERE USED | SH |
|---|---|---|---|---|
| 250 | 93592482 | SCR HEX HD | 101 115 | S5 |
| 251 | 77832458 | OPTICAL SWITCH | 125 127 | S8 |
| 252 | 75293954 | CONNECTOR | 125 | S8 |
| 252 | 75293954 | CONNECTOR | 168 | S8 |
| 253 | 94245602 | CONTACT | 125 127 | S8 |
| 253 | 94245602 | CONTACT | 168 | S8 |
| 254 | 10125759 | SCREW FLAT HD | 168 | S8 |
| 255 | 10127131 | SCREW | 152 | S4 |
| 256 | 10125805 | LOCK WASHER | 152 | S4 |
| 257 | 83460400 | HOLDER PAD | 326 | S6 |
| 258 | 93592164 | SCR HX SELF TAP | 125 | S8 |
| 258 | 93592164 | SCR HX SELF TAP | 127 | S8 |
| 259 | 77835305 | LABEL | 168 | S8 |
| 260 | 75791600 | MOUNT | 147 | S8 |
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| 331 | 94047068 | S6 |
| 316 | 94047069 | S5 |
| 317 | 94047070 | S5 |
| 290 | 94217207 | S6 |
| 190 | 94217702 | S4 |
| 253 | 94245602 | S8 |
| 253 | 94245602 | S8 |
| 374 | 94277400 | S8 |
| 122 | 94277416 | S3 |
| 122 | 94277416 | S9 |
| 122 | 94277416 | S10 |
| 212 | 94279109 | S5 |
| 378 | 95862300 | S9 |
| 378 | 95862300 | S10 |