

WANG

3104

**CONTROL DATA CORPORATION
CARTRIDGE DISK DRIVE
MODEL 9427H**

**Customer Engineering Reprint
Product Maintenance Manual**

729-0884-A

Second Edition (July 1983)

This Manual obsoletes 729-0884 and incorporates CDC addendum (75735900) and 729-0189. Updates and/or changes to this document will be published as Product Service Notices (PSN's) or subsequent editions.

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PREFACE

This manual provides the information needed to install, operate and maintain the Cartridge Disk Drive (Model 9427H) and is intended to be used as a guide by customer engineers and operators who require detailed information about the Cartridge Disk Drive's operations.

It is written to reflect the recommended service-replacement level of subassemblies and printed-circuit-board level by trained qualified customer engineers.

Certain adjustments must be made under dynamic conditions. If the Field Test Exerciser is not utilized for the adjustments appropriate provisions must be made in the computer system for such dynamic alignments.

Oscilloscope trace representations are typical waveforms. Some minor variations may be observed on individual units in actual practice.

The total content of the Manual is comprised of nine sections each having a unique publication number, and is contained in one volume. The manual's publication number is that of the Table of Contents and front matter (77653495). This number, along with the unit HPC number, should be used when making reference to the Cartridge Disk Drive Product Manual.

The following table identifies the content of each volume:

	<u>SECTION NUMBER/TITLE</u>	<u>PUBLICATION NUMBER</u>
1	General Description	77614951
2	Operation	77614952
3	Installation & Checkout	77614953
4	Theory of Operation	77614954
5	Diagrams*	77653381
6	Maintenance	77641952
7	Maintenance Aids	77614957
8	Parts Manual	77653386
9	Wire Lists	77614959

*The I/O board documentation, device specifications and option switch settings are contained in the Hardware Product Configuration (HPC) documentation package. The package is located in front of the product manual.

OPERATOR SAFETY INSTRUCTIONS

1. The power cord must be plugged into a power outlet. This outlet must be readily accessible to the operator in case of emergency.
2. To operate this unit, the operator must depress the start/stop pushbutton switch located at the front of the disk unit.
3. This unit must be serviced only by qualified technical personnel after removing power cord from outlet.
4. In case of emergency, operator must remove power cord from outlet and contact the proper technical service office.

SICHERHEITS - GEBRAUCHSANWEISUNG

1. Das Anschlusskabel ist in die Steckdose, die in der naehe des Geraetes montiert ist, einzustecken. Der Netzstecker muss leicht und gefahrlos zugaenglich sein.
2. Zur Inbetriebnahme, sowie zum Ausschalten des Geraetes, wird der Start-Stop Druck Schalter an der Vorderseite betaetigt.
3. Das Geraet darf nur von Fachpersonal nachdem Ziehen des Netzsteckers geoeffnet werden.
4. Im Falle eines technischen Defektes, ist der Netzstecker zu ziehen und der Technische Dienst zu verstaendigen.

EMI NOTICE, CABINET VERSION (9427H-C)

WARNING: This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A peripheral computing device pursuant to Subpart J of Part 15 of the FCC Rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expenses, will be likely to cause interference in which case the user, at his own expenses, will be required to take whatever measures may be required to correct the interference.

EMI NOTICE, RACK-MOUNT VERSION (9427H-R)

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

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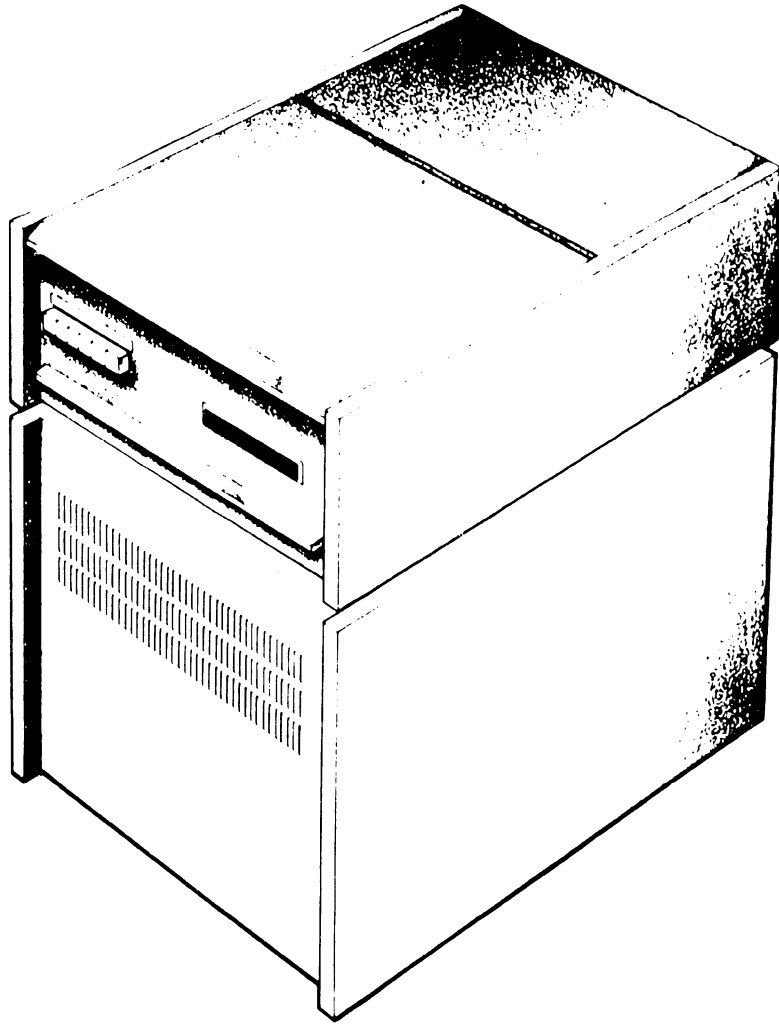


FIGURE 1-1. MODEL 9427 CARTRIDGE DISK DRIVE (CABINET MOUNT)

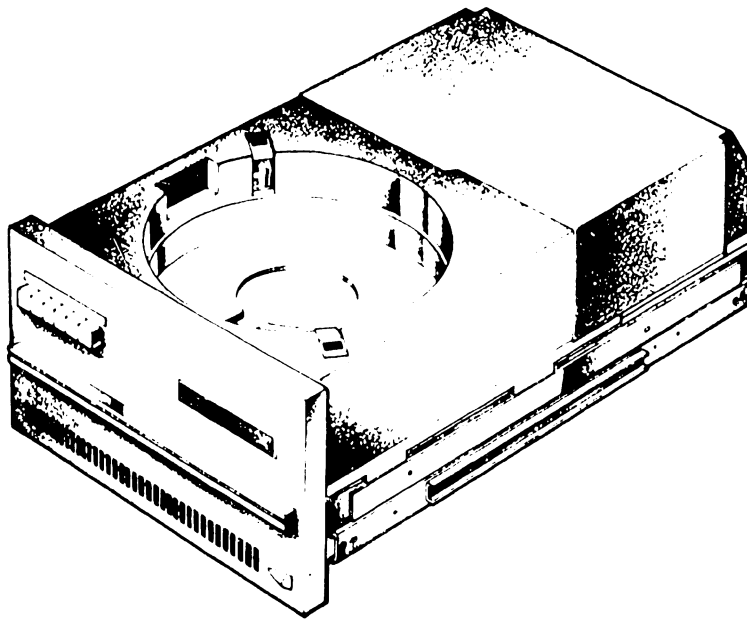


FIGURE 1-2. MODEL 9427 CARTRIDGE DISK DRIVE (RACK MOUNT)

SECTION

1

GENERAL

1.1 INTRODUCTION

This manual applies to the CONTROL DATA MODEL 9427H Cartridge Disk Drive.

The 9427H Cartridge Disk Drive is designed to interface with and provide peripheral storage capabilities for data processing systems.

1.2 PURPOSE AND USE OF EQUIPMENT

The baseline 9427H is a voice coil actuated cartridge disk drive unit that directs the read/write heads to a desired location on a spinning disk surface, data is written or retrieved by selection of an appropriate head and activating the read/write control circuitry. 9427H uses a single removable disk cartridge, CDC 848 type, and a fixed disk which doubles the data storage capacity.

The 9427H is suitable for mounting in a standard 19-inch (482.6 mm) rack with 10-1/2-inch (266.7 mm) panel space and is also available in a cabinet. The deck contains the voice coil, analog and digital circuit boards in the interface card cage, the power supply power amplifier, the cartridge receiver, the spindle and drive motor, filter, air blower and cooling system.

The 9427H can be configured to utilize single sectored or multisectored cartridges. The read recovery circuitry will allow operation with or without missing clock patterns, frequently found in variable sector formats.

1.3 EQUIPMENT CONFIGURATION

The equipment consists of the Baseline unit and its options.

1.3.1 BASELINE CONFIGURATION

The baseline 9427H includes the following features:

- Power supply, 60/50 Hz 100-250 VAC
- Multiple (hard) sectors or soft sector (missing Clock electronic sectoring) capability
- Sector addressing
- 200 tracks per inch
- Write protection
- Daisy chain interface
- Variable interface
- 2400 r/min spindle speed
- Straddle-erase heads
- Elco I/O cable connector

1.3.2 OPTIONS

The options available for the 9427H are as follows:

- Rack mounting
- Cabinet mounting
- 100 tracks per inch
- Fixed disk
- 1500 r/min spindle speed
- Fault (maintenance) board
- Pre-erase heads
- Elco, 3M, Winchester, and Amp I/O cable connector
- Brake Option

1.3.3 DISK FEATURES

- Cartridge Configuration

9427H uses a CDC 848 cartridge or any equivalent cartridge certified for 200 tpi operation or a CDC 847 or any approved equivalent IBM 5440 cartridge for 100 tpi heads.

- Disk Configuration

In addition to the removable cartridge, the standard 9427H also employs a fixed disk; thereby providing for storage of up to 12 million bytes unformatted and providing a total of 4 recording surfaces.

1.3.4 OPERATIONAL CHARACTERISTICS

Operational characteristics of the 9427H are listed in Table 1-1.

TABLE 1-1. OPERATIONAL CHARACTERISTICS

Characteristics	Values
TRACK DENSITY	100 tpi or 200 tpi
ACCESSING TIME	
Maximum access time	60 ms
Track-to-track access time	7.5 ms
Average access time	35 ms
SPINDLE SPEED	2400 r/min or 1500 r/min (+48 -67 r/min or +30 -42 r/min with input frequency +0.5 -1.0 Hz and input voltage +10% -15%)
LATENCY TIME	12.5 ms (at 2400 r/min) (20 ms at 1500 r/min)
RECORDING	
Mode	Double Frequency
Density (nominal)	1530 bpi (outer track) 2200 bpi (inner track)
Bit rate (nominal)	2.50 MHz (1.56 MHz at 1500 r/min)
Tracks per cylinder	2 (4 with fixed-disk option)
Cylinders per unit (200 TPI)	406 (numbered 0 through 405) 408 (numbered 0 through 407, optional)
Cylinder per unit (100 TPI)	203 (numbered 0 through 202) 204 (numbered 0 through 203, optional)
Sectors	1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 25, 29, 30, 32, 40, 48, 50, 60, 64 hard or missing-clock soft sectoring
Units per controller I/O channel	*4 maximum, in daisy-chain configuration

TABLE 1-1. OPERATIONAL CHARACTERISTICS (CONTINUED)

Characteristics	Values
DATA CAPACITY	
Bits per track	62,500 nominal
Bits per cylinder	125,000 nominal (250,000 with fixed-disk option)
Bits per unit	50,000,000 nominal (1,000,000,000 with fixed-disk option)
CARTRIDGE DISK	
Disk per cartridge	1
Usable recording surfaces per disk cartridge	2
Disk surface diameter	14 inches
Recording diameters	Track 407 (inner), 9.067 in (230.3 mm) Track 0 (outer), 13.137 in (333.7 mm)
Disk surface coating	Magnetic oxide
READ/WRITE HEADS	(Standard CDC ramp-loading straddle erase and pre-erase available)
PHYSICAL (RACK-MOUNTED UNIT)	
Panel height	10.31 in (261.9 mm) (mounts on 10.5 in (266.7 mm) centers in relay rack)
Panel width	18.94 in (481.1 mm) (for 19-inch (482.6 mm) rack)
Depth	30.63 in (778 mm) (see section 3 for required rack depth)
Weight	140-175 lbs (63.5-79.4 kg)
Shipping Weight	190-225 lbs (86.2-102.1 kg)
PHYSICAL (CABINET MOUNTED UNIT)	
Height	34 in (863.6 mm)
Width	18.5 in (469.9 mm)
Depth	29.75 in (755.7 mm)
Weight	220-255 lbs (99.8-115.7 kg)
Shipping Weight	250-285 lbs (113.4-129.3 kg)
AIR FILTER	0.3 Micron 99%
ELECTRICAL	
Input power source	
60-Hz units	100-250 Volts rms in 10-Volt increments (+10%, -15%, 59-60.6 Hz, single phase)
50-Hz units	100-250 Volts rms in 10-Volt increments (+10%, -15%), 49-50.5 Hz, single phase

TABLE 1-1. OPERATIONAL CHARACTERISTICS (CONTINUED)

Characteristics	Values																																		
ELECTRICAL (cont'd)																																			
Input Current	<p>The following current readings are made at 50 Hz and nominal line voltage with accessor performing worst-case (maximum power) repeat seeks.</p> <table border="1"> <thead> <tr> <th><u>Volts</u></th> <th><u>Amps</u></th> </tr> </thead> <tbody> <tr><td>100</td><td>5.6</td></tr> <tr><td>110</td><td>5.0</td></tr> <tr><td>120</td><td>4.6</td></tr> <tr><td>130</td><td>4.3</td></tr> <tr><td>140</td><td>4.0</td></tr> <tr><td>150</td><td>3.8</td></tr> <tr><td>160</td><td>3.6</td></tr> <tr><td>170</td><td>3.3</td></tr> <tr><td>180</td><td>3.2</td></tr> <tr><td>190</td><td>3.0</td></tr> <tr><td>200</td><td>2.9</td></tr> <tr><td>210</td><td>2.7</td></tr> <tr><td>220</td><td>2.6</td></tr> <tr><td>230</td><td>2.5</td></tr> <tr><td>240</td><td>2.4</td></tr> <tr><td>250</td><td>2.3</td></tr> </tbody> </table> <p>Surge current during spindle start is 2.6 times the above value and lasts 5 seconds.</p>	<u>Volts</u>	<u>Amps</u>	100	5.6	110	5.0	120	4.6	130	4.3	140	4.0	150	3.8	160	3.6	170	3.3	180	3.2	190	3.0	200	2.9	210	2.7	220	2.6	230	2.5	240	2.4	250	2.3
<u>Volts</u>	<u>Amps</u>																																		
100	5.6																																		
110	5.0																																		
120	4.6																																		
130	4.3																																		
140	4.0																																		
150	3.8																																		
160	3.6																																		
170	3.3																																		
180	3.2																																		
190	3.0																																		
200	2.9																																		
210	2.7																																		
220	2.6																																		
230	2.5																																		
240	2.4																																		
250	2.3																																		
Power Factor	0.8																																		
Power (Nominal)	310 Watts, 1050 BTU/hr.																																		
Power (Maximum)	465 Watts, 1590 BTU/hr.																																		
INPUT/OUTPUT CONNECTIONS	<p>Two connectors on the I/O panel at the rear of the unit. Refer to applicable I/O board schematic in HPC Configuration for the pin assignments. A terminator is required if the unit is the last (or only) unit connected to the controller. The terminator consists of DIP-packaged register networks which plug into the I/O board or an optional plug-in terminator.</p>																																		
ENVIRONMENTAL (Operating)	<p>Temperature: 60 to 90°F (15.6 to 32.2° C) with 12°F/hr maximum rate of change Humidity: 10 to 80% (no condensation) Altitude: Zero to 10,000 feet (3048 m)</p>																																		

SECTION

2

OPERA-

TION

2.1 INTRODUCTION

This section provides the instructions and information required to operate the Model 9427H unit.

2.2 CONTROLS AND INDICATORS

Figure 2-1 depicts the locations of the controls and indicators. All switches and indicators are preassembled on a printed circuit board and mounted behind the control panel assembly. The control panel contains separate write protect switches and indicators for fixed and removable disks. ACTIVE (seeking, reading or writing) and READY indicators are also mounted on this panel. A functional description of the controls and indicators is given in Table 2-1.

2.3 OPERATING PRECAUTIONS

The following precautions and practices should be observed while operating unit to obtain best performance and reliability of the equipment:

1. Keep the access door closed to prevent unnecessary entry of atmospheric dust.
2. If a pinging or scratching sound (caused by head-to-disk contact) is heard and persists, stop the unit by using the Stop and Power Down procedure of this section and then call the customer service engineer.

NOTE: Appropriate steps should be taken to safeguard valuable data until the head-to-disk contact can be remedied. Such steps may include leaving the unit powered down, replacing the data cartridge with a scratch cartridge, and/or immediate transfer of the data that is on the fixed disk.

3. To prevent damage and/or data loss, follow the Disk Cartridge Installation procedure of this section.
4. The operator should not attempt to override any interlocks in the system.

2.3.1 POWER UP FOR ON-LINE OPERATION

NOTE: Steps 1, 2, 3, & 5 to be performed by maintenance personnel only.

1. Using a 5/32 Allen driver, place tool into holes of front and rear end panels and remove panels by loosening hardware.
2. Verify connection of all power and I/O cables.
3. Verify installation of properly jumpered voltage adjust plug, P12 (see Section III for jumper information).
4. Verify that START/STOP switch is in STOP position (out).
5. Using Figure 6-11, actuate DC circuit breakers CB2 and CB3. Actuate circuit breaker CB1 and verify operation of blower motor.
6. Depress START/STOP switch and verify START/STOP indicator illuminates.
7. Verify that FAULT indicator remains off.

NOTE: If FAULT indicator illuminates perform step 1 through 3 of Fault Operating Instruction Paragraph 2.4.

8. Approximately 65 seconds after START/STOP switch is depressed, READY is sent to the controller and the READY indicator illuminates. Disk drive is now ready to receive Seek, Read, Write and Erase commands from controller.

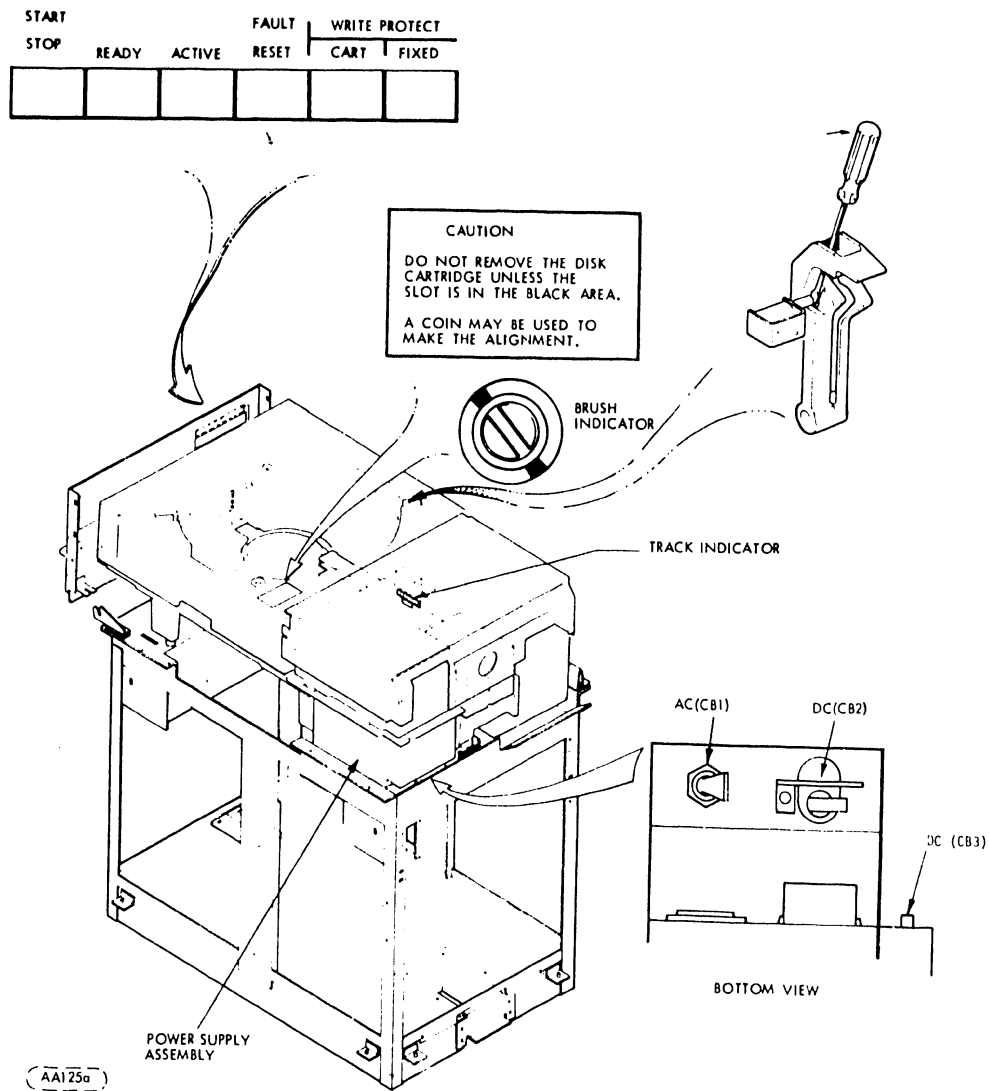


FIGURE 2-1. CONTROLS AND INDICATORS

2.3.2 WRITE PROTECT

Write protection can be initiated either by the operator or controller.

- a. Operator Initiated Write Protect - Depress desired W/PROT switch (W/PROT CART or W/PROT FIXED) and verify that appropriate W/PROT lamp illuminated. Selected disk is now protected against controller Write or Erase command.
- b. Controller Initiated Write Protect (optional) - A disk may be protected by the controller itself providing that the Unit Select and Write Protect lines are active. Whichever disk is selected by the high-order Head Select line will then be protected from Write or Erase commands.

TABLE 2-1. CONTROLS AND INDICATORS

Control or Indicator	Function
Power Assembly	
AC circuit breaker (CB1)	Provides AC power circuit protection, and main power switching.
DC circuit breaker (CB2)	Provides ± 35 VDC circuit protection along with thermal protection for all DC circuits.
DC circuit breaker (CB3)	Provides + 11 VDC logic circuit protection.
Power receptacles	Provides connection for input power
Voltage Adjust Plug, P12 (Refer to Installation and Checkout Section for adjustment connections)	Provides a means of selecting input voltage to transformer in power supply.
Control Panel	
START/STOP indicator/switch	<p>Start switch energizes spindle motor and initiates the first seek mode provided the following conditions are met:</p> <ol style="list-style-type: none"> 1. Circuit breakers are ON. 2. Disk cartridge cover properly installed. 3. Cartridge hold-down switches are closed. <p>Depressing the alternate action START/STOP switch at any time after the start cycle is initiated will cause the machine to stop unless a Stop Override signal is present from the controller. In this case, the machine will continue to run until the Stop Override signal is removed. (This is to prevent stopping during a read, write, or seek operation.)</p> <p>When the switch is depressed to stop machine, the indicator light remains illuminated until the disk rotation has stopped.</p>

TABLE 2-1. CONTROLS AND INDICATORS (CONTINUED)

Control or Indicator	Function
Control Panel	
	<p>The interlock solenoids energize at this time to permit access to the cartridge.</p>
	NOTE
	<p>The first seek mode is completely automatic and requires approximately 65 seconds to complete. The unit can be reset at any time after initiation of the start sequencing. In the event of a potentially damaging fault during this mode, the heads will automatically go into emergency retract and the machine will stop.</p>
READY indicator	<p>Illuminates when the unit is up to speed, the heads are loaded and the unit is ready for use. Extinguished during any fault, emergency retract, or stop operation.</p>
ACTIVE indicator	<p>Illuminates when the unit is actively engaged in any mode, i. e., direct (forward or reverse) seek, return to zero seek or read/write/erase.</p>
FAULT indicator/switch	<p>Indicator illuminates when any fault exists with the exception of a line power failure. In the event of a momentary line power drop, the unit heads will go into an emergency retract and the unit will stop. However, the unit will restart automatically when the power returns to normal. In the event of a non-damaging fault, i. e., more than one head selected, simultaneous read and write and etc., the fault indicator will be illuminated and the unit will report the condition to the controller.</p>

TABLE 2-1. CONTROLS AND INDICATORS (CONTINUED)

Control or Indicator	Function
Control Panel	
FAULT indicator/switch (continued)	A Return-To-Zero-Seek command will reset the fault latch and extinguish the fault indicator. The unit can be reset by the FAULT switch if a momentary non-damaging fault has occurred. Pressing the FAULT switch clears the fault logic and extinguishes the indicator. A persistent fault, however, will not permit a reset.
W/PROT CART indicator/switch	This alternate-action switch remains slightly depressed, and is lit when on. When on, writing and erasing of data on the cartridge disk is inhibited.
W/PROT FIXED indicator/switch	This alternate-action switch remains slightly depressed and is lit when on. When on, writing and erasing of data on the fixed disk is inhibited.
Cartridge Receiver	
Brush indicator	<p>Indicates the position of the brush motor.</p> <div style="text-align: center; border: 1px dashed black; padding: 5px; width: fit-content; margin: 10px auto;"> CAUTION </div> <p>Do not remove the disk cartridge unless the slot is in the black area.</p> <p>A coin may be used to make the alignment.</p>
Carriage Assembly	
Track indicator	Vernier scale located on the side of the carriage over read/write heads (see Figure 2-1). Readable only when electronics cover is removed. Movable zero mark identifies hundreds and tens digits of track number. The coincident moveable vernier identifies the units digit of the track number.

2.3.3 STOP AND POWER DOWN

Disk drive can be stopped by front panel switches provided STOP OVERRIDE is not commanded by controller.

NOTE: In the event STOP OVERRIDE is commanded when the START/STOP switch is depressed to STOP, the disk drive will continue operating. When STOP OVERRIDE is dropped by the controller, the unit will execute a normal stop sequence.

1. Depress START/STOP switch and verify the following actions occur:
 - a. READY lamp extinguishes and controller Ready goes off.
 - b. START indicator extinguishes and pack locks open after spindle stops rotating.
2. Remove Cartridge (if desired) in accordance with Disk Cartridge Removal (Normal) procedure.

NOTE: Step 3 to be performed by maintenance personnel only.

3. Set main circuit breaker CB1 of "off,"

2.4 FAULT OPERATING INSTRUCTION

If FAULT indicator illuminates during operation or power up proceed as follows:

1. Depress FAULT switch. If lamp extinguishes, normal operation can be resumed. If FAULT lamp remains illuminated, proceed to step 2.
2. Depress START/STOP switch to STOP and allow spindle to stop rotating, then depress START/STOP switch to START. If FAULT lamp extinguishes, normal operation can be resumed. If lamp remains illuminated proceed to step 3.
3. Power down equipment in accordance with Stop and Power Down procedure. Call customer service engineer.

2.5 INPUT/OUTPUT LINES

Complete operations of the disk drive with the exception of power up, power down and start/stop can be performed by the controller. Input/Output signals exchanged between disk drive and controller and their functions are explained in Table 2-2.

2.6 DISK CARTRIDGE HANDLING AND STORAGE

The following practices should be observed when handling or storing disk cartridges. Refer to the manufacturer's instructions for more detailed maintenance and cleaning instructions, or refer to section 6 of this manual.

1. The cartridge dust cover should be on the cartridge while it is out of the disk receiver. This will insure a positive dust seal and immobilize the disk inside.
2. Cartridges can be stored flat or on the edge. Several can be stacked on top of one another. However, undue heavy loading should be avoided.

TABLE 2-2. INPUT/OUTPUT LINES

Signal	Function
Input Lines	
CYL STR (Cylinder Strobe)	Gates the cylinder address into the unit. The contents of the cylinder address lines are valid only when the Cylinder Strobe is true.
CYL AD/0 - CYL AD/8 (Cylinder Address Bits $2^0 - 2^8$)	Nine lines that carry the cylinder address to the track address when gated by the Cylinder Strobe.
RTZS (Return to Zero Seek)	Causes carriage to return to cylinder 000.
HS/0 - HS/1 (Head Select)	Selects one of the two recording heads (two lines for four heads with fixed disk option). The line(s) contain the binary address of the desired head and must be held constant during a read or write operation.
Wr (Write Data/Clock)	Transmits double frequency encoded data and clock signals to the unit.
Write Gate	Enables write current during a write operation.
Erase Gate	Enables the erase current during a write operation.
Read Gate	Enables read data and clock information during a read operation.
Unit Select	Four select lines (one per unit) are used to select a unit to be accessed. The appropriate lines must remain active during any exchange with the controller, except when monitoring interrupts such as seek complete or seek error lines. A unit may be continuously selected for test purposes by actuating the desired Unit Select switch (SW1-1 through SW1-4) on the I/O board.
Wr Prot (Write Protect)	Prevents accidental destruction of previously written data by never allowing write or erase current to be on when write protect line is true.

TABLE 2-2. INPUT/OUTPUT LINES (CONTINUED)

Signal	Function
Input Lines	
Stop Ov (Stop Overri de)	After the unit has been started, a STOP OVERRIDE command along with UNIT SELECT will maintain the unit in a selected ON-LINE condition until the UNIT SELECT falls, even if the front panel START/STOP switch is set to STOP.
Output Lines	
On Cyl (On Cylinder)	Indicates that heads have reached the desired address. The On Cylinder condition will also be indicated when a seek error occurs.
Rd Data (Read Data)	Transmits digital information read from the disk to controller.
Rd Clk (Read Clock)	Carries clock signals read from the disk.
Index	Provides a sector 0 reference pulse from the unit to the controller. This pulse occurs once for each revolution of the disk.
Sector	The gated sector is from the cartridge if heads 0 or 1 are selected and is from the fixed disk (if installed) when heads 2 or 3 are selected. Two separate sector transducers are used as in the case of index and only one driver is used.
Skerr (Seek Error)	Indicates that the unit was unable to complete a seek operation. A RTZS command from the controller clears the Seek Error condition and returns the heads to cylinder 00.
Ad Int. (Address Interlock)	Indicates that illegal address has been sent.
Ad Ack (Address Acknowledge)	Indicates that address received is legal.

TABLE 2-2. INPUT/OUTPUT LINES (CONTINUED)

Signal	Function
Output Lines	
Fault	<p>Indicates that the unit has one or more fault conditions. Write and erase currents are inhibited by the presence of any of the following conditions:</p> <ol style="list-style-type: none"> 1. More than one head selected. 2. Read and Write gates true at the same time. 3. Read and Erase gates true at the same time. 4. Erase and no write driver on. 5. Write and no erase driver on. 6. Write, or erase gate and not On Cylinder. 7. Low voltage situation that could cause a loss in control of write and erase currents. 8. Fixed disk heads are selected with no fixed disk option installed. 9. Emergency retract condition.
Ready	<p>Present if the disk cartridge is installed, spindle motor speed, heads loaded, DC voltages within margin, no fault condition exists, unit selected, and terminator is present and has power.</p>
Wr Stat	<p>Indicates the unit is inhibited from writing on the Disk. This signal is present whenever the control panel WRITE PROTECT switch is on and the associated disk is selected, or when the controller Write protect is true.</p>
SA/0 - SA/5 (Sector Address)	<p>Six lines that carry the sector address for the selected disk.</p>
Density (optional)	<p>When negative true, the unit is operating in a 200 tpi mode; when not, unit is operating in 100 tpi mode.</p>

2.7 DISK CARTRIDGE INSTALLATION

The disk cartridge must be stored in the same environment as the Model 9427H for 60 minutes immediately preceding its use. Make certain disk cartridge has been cleaned and maintained in accordance with accepted preventive maintenance procedures. Refer to Figure 2-2 for the following procedure.

1. Raise cartridge access door on cabinet.

NOTE: Power must be on and START/STOP lamp must be off to release lock on hold-down arms.

2. Pull back hold-down arms.
3. To separate dust cover from the disk cartridge, hold cover release button to left while lifting cartridge handle.
4. Disengage dust cover from disk cartridge. Set cover aside.

Do not make abusive contact between the disk cartridge and the spindle.

CAUTION

Make certain that the read/write heads are fully retracted and the disk cleaning brushes are completely out of the cartridge area. Remove any dust from magnetic chuck.

5. Place disk cartridge onto spindle hub (ensure head opening is toward read of machine).
6. Rotate cartridge slowly back and forth until cartridge detents.
7. Push handle down to seat cartridge.
8. Place dust cover (removed in step 4) open end down over cartridge.
9. Position hold-down arms over cartridge and dust cover.
10. Close cartridge access door.
11. Press START/STOP switch to apply power to spindle motor.

NOTE: If the spindle motor will not rotate, disk cartridge is not installed properly.

2.8 DISK CARTRIDGE REMOVAL

2.8.1 NORMAL REMOVAL

Refer to Figure 2-2 for the following procedure.

1. Depress START/STOP switch to STOP (in).
2. Raise cartridge access door after START/STOP indicator extinguishes.

CAUTION

If START/STOP lamp is still illuminated after 2 1/2 minutes and brushes are not fully retracted (brush indicator not retracted position) contact the Customer Engineer.

3. Pull back hold-down arms (arms will not move until cartridge is stopped).
4. Remove cartridge dust cover.
5. Push and hold cover release button to left with thumb and lift cartridge handle.
6. Lift cartridge clear of spindle.
7. Place dust cover in position on cartridge and fold over top handle.

NOTE: The handle may be swung out to carry the cartridge, but do not push the cover release button.

8. Close access door if another cartridge is not to be installed.

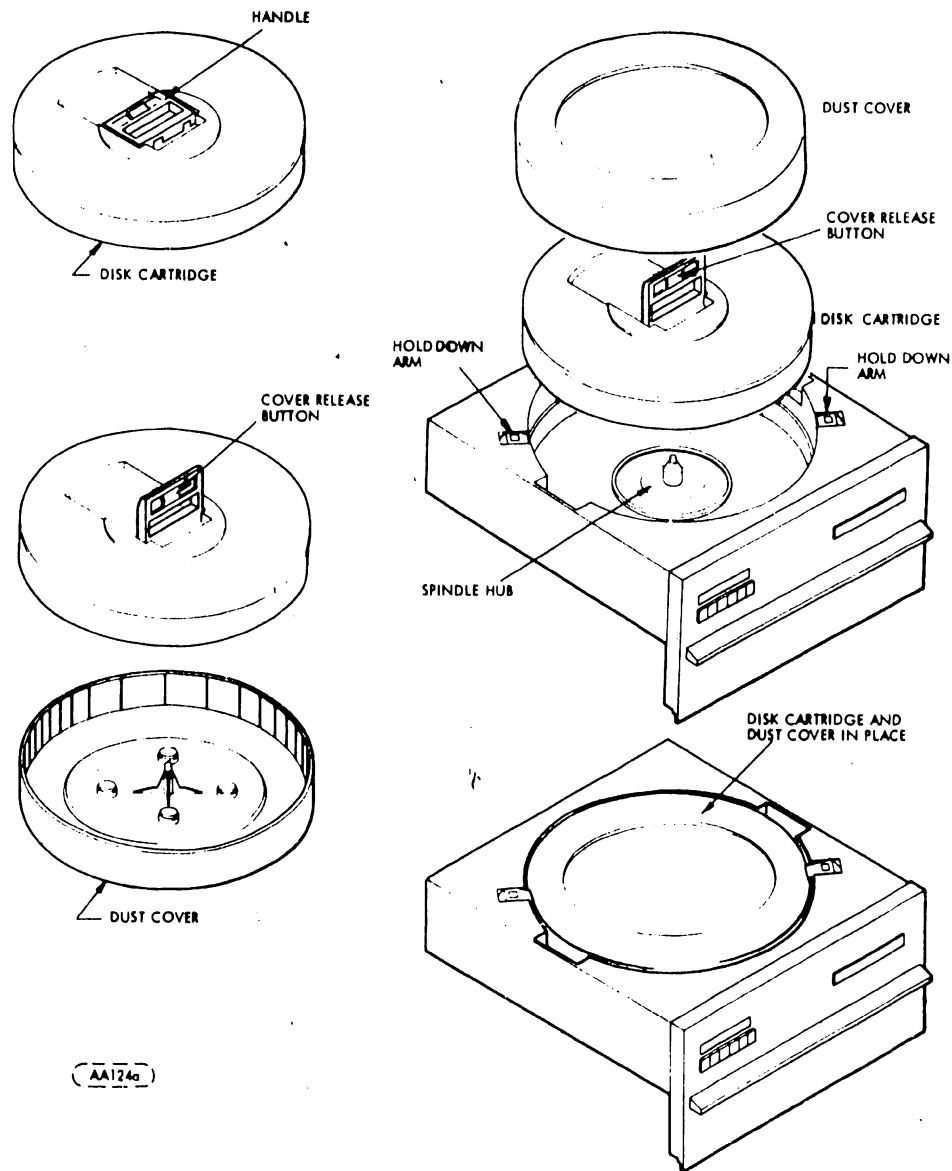


FIGURE 2-2. DISK CARTRIDGE INSTALLATION

2.9 POWER FAILURE OR EMERGENCY STOP REMOVAL

Refer to Figure 2-2 for the following procedure.

NOTE: This procedure to be performed only by the Customer Engineer.

1. Wait approximately 3 minutes for cartridge to stop spinning.
2. Raise cartridge access cover.

CAUTION If START/STOP lamp is not extinguished after waiting 3 minutes and brushes are not fully retracted, open top cover, and manually retract heads and brushes.

3. Release pack locks by inserting a flat head screwdriver (or similar object) into hole on top of pack lock. Press solenoid plunger into solenoid and tilt pack lock, (see Figure 2-1).

4. Remove cartridge dust cover.
5. Push and hold cover release button with thumb and lift cartridge handle.
6. Lift cartridge clear of spindle.
7. Place dust cover in position on cartridge and fold over top handle.

NOTE: The handle may be swung out to carry the cartridge but do not push the cover release button.

8. Close the access door if another cartridge is not to be installed.

SECTION

3

INSTAL-

LATION

AND

CHECKOUT

3.1 INTRODUCTION

This section provides the information and procedures necessary to install and check-out the 9427H disk drive.

CAUTION

The circuit assemblies contained in this equipment can be degraded or destroyed by ELECTRO-STATIC DISCHARGE (ESD).

Static electrical charges can accumulate quickly on personnel, clothing, and synthetic materials. When brought in close proximity to or, in contact with delicate components, ELECTRO-STATIC DISCHARGE or FIELDS can cause damage to these parts. This damage may result in degraded reliability or immediate failure of the affected component or assembly.

To insure optimum/reliable equipment operation, it is required that technical support personnel discharge themselves by periodically touching the chassis ground prior to and during the handling of ESD susceptible assemblies. This procedure is very important when handling Printed Circuit Boards.

Printed Circuit Boards should be handled or transported in electrically conductive plastic bags to insure optimum protection against potential ESD damage.

3.2 UNPACKING

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

After the drive is unpacked perform the following procedure:

1. Clean the unit thoroughly.

CAUTION

While performing the following steps, do not position the carriage manually. Such action could cause the Read/Write heads to load, causing damage to the heads and disk. Do not subject plastic cartridge receiver to any unnecessary forces or pressures. Such as, moving disk unit by pushing or pulling on cartridge receiver or laying rack mounted units on their sides. This may cause movement of the cartridge sensor and also cause the index-to-burst period to become out of specification. If there is any doubt, see Section 6 for Index-To-Burst Check and Adjustment.

2. Remove four shipping brackets (5 pieces), cabinet mount only.
3. Remove three mounting bolts securing unit to flywood base, rack mount units only.
4. For those units that required AC and DC ground connected during shipping but separate during operation, remove green jumper wire on rear of unit. Jumper wire is connected between AC ground on power supply and electronics cover below velocity transducer cap.
5. Remove electronics cover.
6. Remove the carriage lock pin and store it on the magnet as shown in Figure 3-1.
7. Re-install electronic cover.

3.3 SPACE ALLOCATION

Figure 3-2 and 3-3 show base cabinet and rack mount unit overall dimensions for determining space allocation.

3.4 LEVELING AND ALIGNING BASE CABINET UNIT

Position the cabinet in its operational location and level as follows:

1. Install jack screws provided in plastic container.
2. Lower jack screws in base cabinet until casters no longer contact floor.
3. Adjust jack screws as necessary until unit is level.

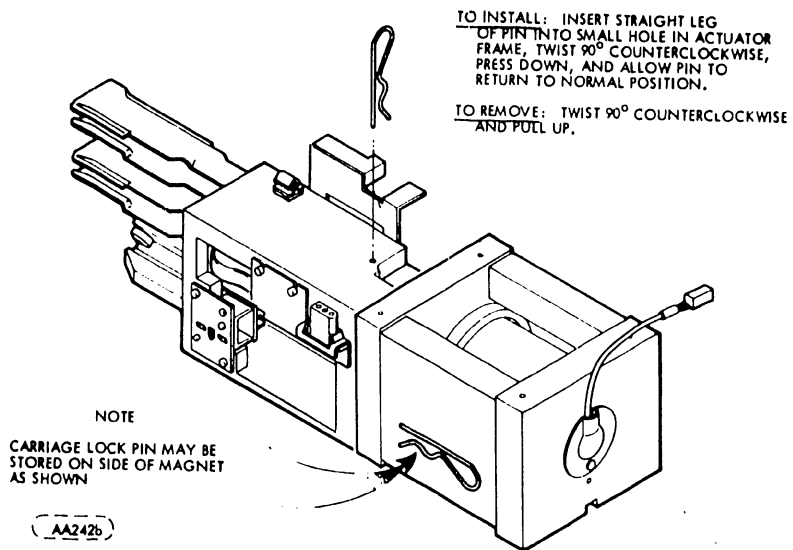


FIGURE 3-1. CARRIAGE LOCK PIN LOCATION

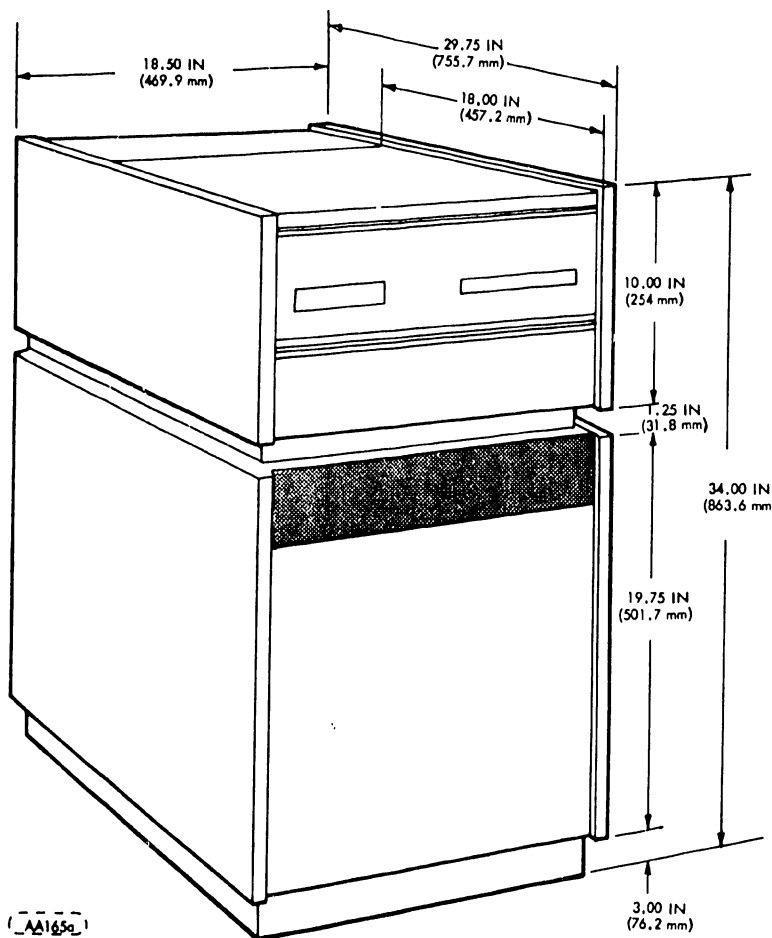


FIGURE 3-2. BASE CABINET DIMENSIONS

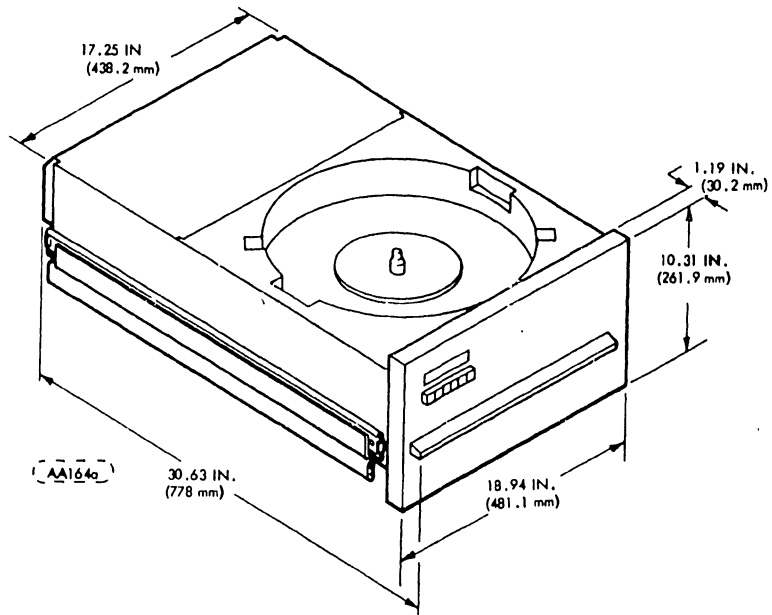
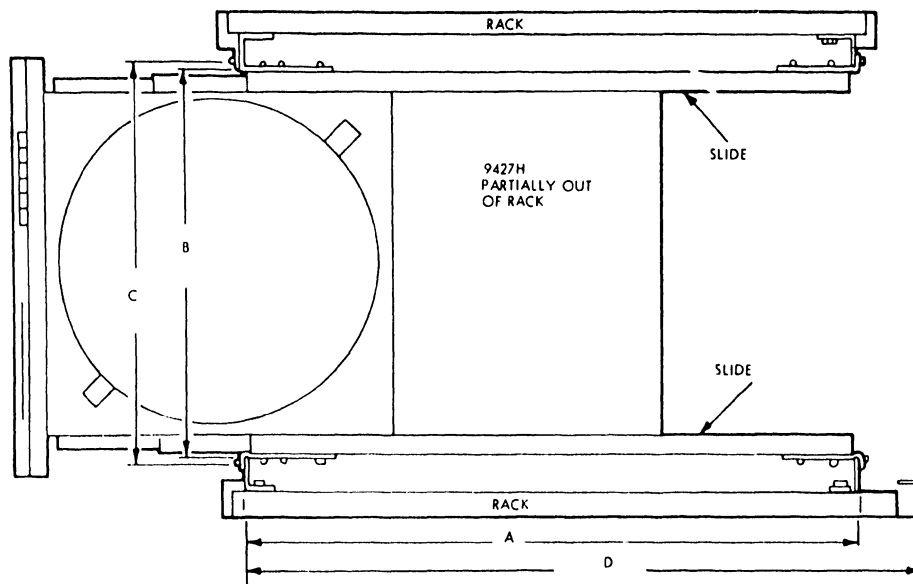


FIGURE 3-3. RACK MOUNT UNIT OVERALL DIMENSIONS



	ACCURIDE SLIDES
A. DISTANCE FROM FRONT MOUNTING RAILS TO REAR MOUNTING RAILS	21.25 - 22.12 OR 27.50 - 28.50 IN. (547-562 OR 699-724 mm) *
B. MINIMUM CLEARANCE BETWEEN MOUNTING RAILS (FRONT AND REAR)	17.625 IN. (447.7 mm)
C. DISTANCE BETWEEN MOUNTING HOLES (FRONT AND REAR)	17.86 - 18.56 IN. (454-471 mm)
D. MINIMUM LENGTH OF CABINET FROM FRONT MOUNTING RAILS (CABLE AND CONNECTOR CLEARANCE)	30.10 IN. (765 mm)

*These limits may be increased by 1.00 IN. (25.4 mm) on the high ends, but the slide extension will be correspondingly reduced.

AA167a

FIGURE 3-4. RACK MOUNT SLIDES DIMENSIONS

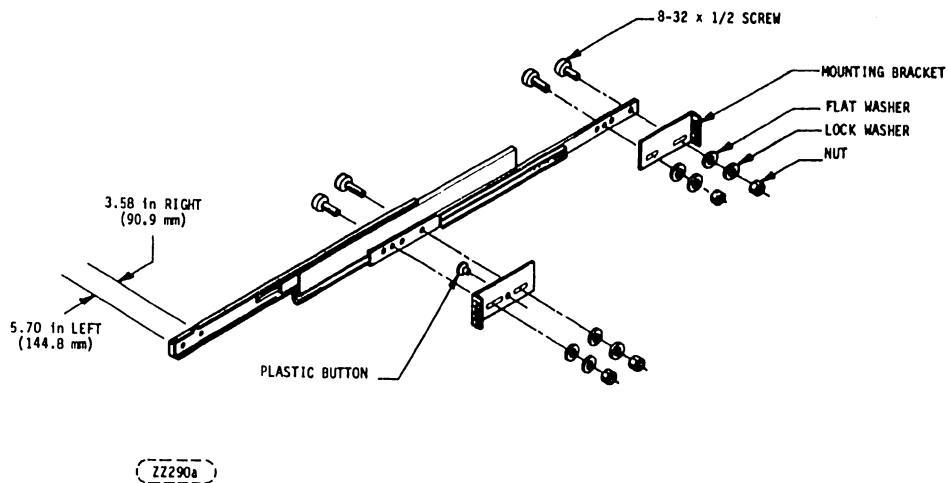


FIGURE 3-5. SLIDE AND BRACKET ASSEMBLY

3.5 INSTALLATION OF RACK MOUNT SYSTEM WITH ACCURIDE SLIDES

The Accuride slides are constructed of three longitudinal members forming two pairs of telescoping channels, one pair above the other. The intermediate member is a vertically double channel, such that it constitutes the moving member of the lower pair of channels as well as the stationary member of the upper pair. The slides and brackets plus attaching hardware and loose unit parts mentioned in the following steps make up an installation kit that is shipped with the unit. The installation kit for units equipped with Accuride slides includes a triangular or wedged shaped knob that must be added to the unit as a means of releasing the latch mechanism that secures the unit into the rack. Read and understand these instructions before attempting assembly. Also verify that all hardware is included in the kit.

1. Install plastic slide mounts item (18) and plastic keyed slide mounts item (19) at the sides of the unit as shown in Figure 3-6. Mounting hardware for each of these items consists of two 8-32 x 5/8 inch (31.8 mm) pan head machine screws (4) and two No. 8 internal tooth lock washers (8). Place item (26) on ribbon cable directly behind keyed slide-mount on unit's left side.

NOTE

For correct orientation of the unkeyed mounts, the V Groove channels in the mounts should open downward. The flat side of the keyed mounts should be inboard and pointing downward, see Figure 3-6.

2. Install plastic stabilizers item (20) at the sides of the unit as shown in Figure 3-6. Mounting hardware for each of these items consists of two 8-32 x 1/2 in. (12.7 mm) pan head machine screws (24), two No. 8 internal tooth lock washers (8), and two No. 8 flat washers (17).

NOTE

The stabilizers should be mounted with their key extended downward. Leave the stabilizers slightly loose at this time.

3. Adjust then rack so that the dimensions correspond to those shown in Figure 3-4.
4. Accompanying each slide member is a bag of hardware consisting of two mounting brackets, four flat washers, four nuts and four binding-head slotted 8-32 x 1/2 screws. Using Figure 3-5, install mounting brackets to each slide. Slides can be identified by the distance from the front of the slide to the edge of the slot (Figure 3-5).
5. Adjust and secure the front mounting brackets such that the front of the flange of the bracket is flush with the front end of the slide.

NOTE

If necessary, the flanges may be located as much as one inch (25.4 mm) ahead of the slide ends in order to accomodate certain rack dimensions. Maximum extension of the unit out of the rack will be correspondingly reduced, however.

6. If necessary to meet cabinet dimensions, reverse the orientation of the rear mounting brackets of the slides. Adjust and secure the rear mounting brackets to agree with dimension "A" as set up in Step 3. In all cases, make sure that the white plastic button in each front bracket is inserted in one of the two holes provided that will be on top when bracket installation is complete. (The plastic button acts as a bearing between the stationary and moving parts of the slide. If necessary, remove buttons from incorrect holes and insert into the proper holes.)
7. Install the slides into the rack cabinet at the desired location (see Figure 3-4), making sure the slides are horizontal and equidistant from the base of the cabinet. Position the slides in the rack so that the distance between the insides of the uppermost sections of the slides is 16.45 ± 0.303 inches (418 ± 0.76 mm).

NOTE

The correct mounting hardware for the above step is twelve 10-32 x 5/8 inch (15.9 mm) pan head screws (6), twelve No. 10 flat washers (7), twelve 10-32 hex machine nuts (1), and twelve lock washers (21). Install the screws through the brackets and washers into the vertical rails, and then install nuts and lockwashers on the other side of the rails.

8. Pull the slides out to their full extension, approximately 29 inches (737 mm). The intermediate catch at 18 inches (457 mm) must be released on both slides. The slides will again lock at full extension.
9. Set the 9427H on top of the slides, making sure all four plastic mounts are resting on the uppermost edge of the slides and that the keys of the front mounts engage the notches in the slides.
10. Place Loctite (Grade C) on 8-32 x 5/16 (7.94 mm) pan head screws (12) and install through each slide into keyed mount-slide.
11. Adjust the stabilizers, installed in Step 2, as required to prevent wobbling and provide smooth operation of slides. Tighten the stabilizers securely.
12. Install knob assembly item (3) and latch assembly item (16) together and in the unit as shown in Figure 3-6.

NOTE

Hardware used to attach the knob assembly to the latch assembly consists of one each 8-32 x 5/8 inch (15.9 mm) pan head machine screw (4), No. 8 internal tooth lock washer (14), 8-32 x 1/4 inch (6.4 mm) spacer (9), and 8-32 hex machine nut (10). Reference: Figure 3-6.

Hardware for installation of the latch assembly in the unit consists of two 8-32 x 5/8 inch (15.9) pan head machine screws (4), two No. 8 lock washers (14), and two No. 8 flat washers (17). These screws should be left slightly loose at this time.

13. Adjust the latch so that it catches the front rail of the rack, securely holding the unit in the retracted position, when the drive is pushed completely into the rack, and so that the latch-releases easily when the knob is pushed to the left.

NOTE

By loosening the proper pair of screws on the latch assembly, the latch can be moved either for and aft or left and right to meet this requirement.

14. Determine whether the installation requires use of a cable fender (13) at the rear of the unit. This fender is for the purpose of holding cables away from the ventilation outlet opening in the power supply and is not required if no cables threaten to encroach on the opening.

15. If required, install the fender of Step 14 using two 8-32 x 5/16 inch (7.9 mm) pan head machine screws (5), two No. 8 spring lock washers (14), and two 8-32 type U speed nuts (15) (attached to the electronics cover on either side of the power supply ventilation outlet).

CAUTION

The cable fender must not be used as a handle. It will break off!

3.6 SECTOR OPTION CONVERSION PROCEDURE

Adjust sensor mount for required sector option as follows:

1. Depress Start/Stop switch to Stop (out) and wait for spindle to stop rotating (Start/Stop lamp extinguished).
2. Set main circuit breaker to Off position.
3. Remove front door panel (base cabinet only).
4. Remove module bottom cover.
5. Loosen the sensor mount screw (see Figure 3-7).
6. Lift rear of sensor mount and place the guide pin in the sensor mount hole selected in Table 3-1.
7. Tighten the sensor mount screw.
8. Perform the fixed-disk Index/Sector Transducer Check and Adjustment in Section 6 of Maintenance Manual.
9. Install module bottom cover.
10. Install front door panel (base cabinet only).
11. Open top cover (base cabinet only).
12. Remove electronics cover.
13. Remove clamp and card cage cover.
14. Using card extractor, remove sector PWA.
15. Locate sector PWA diagram on Sheet 2 of your device specification and switch selections located in your HPC document package 83449XXX.
16. Using sector PWA diagram and Table 3-1, determine present setting of S4 switch. Press present switch setting to Off position and press switch setting for new requirement to On position. Only one switch of S4 one through six can be in the On position.
17. Change switch positions on sector PWA diagram.
18. Carefully install sector PWA insuring that all pins are engaged.
19. Install card cage cover and clamp.
20. Install electronics cover.
21. Close top cover (base cabinet only).
22. Place unit on-line and verify operation with system software.

TABLE 3-1. SECTOR OPTION CONVERSION

SECTORS REQUIRED						SENSOR MOUNT	RING
						HOLE #	HOLES
29 or SOFT SECTOR						1	29
40	20	10	5			2	40
48	24	12	6	3		3	48
50	25					4	50
60	30	15				5	60
64	32	16	8	4	2	6	64
56	28	14	7			7	56
72	36	18	9			8	72
÷1	÷2	÷4	÷8	÷16	÷32	DIVISION COUNT	
1	6	5	4	3	2	PWA SW4 SWITCH SETTING	

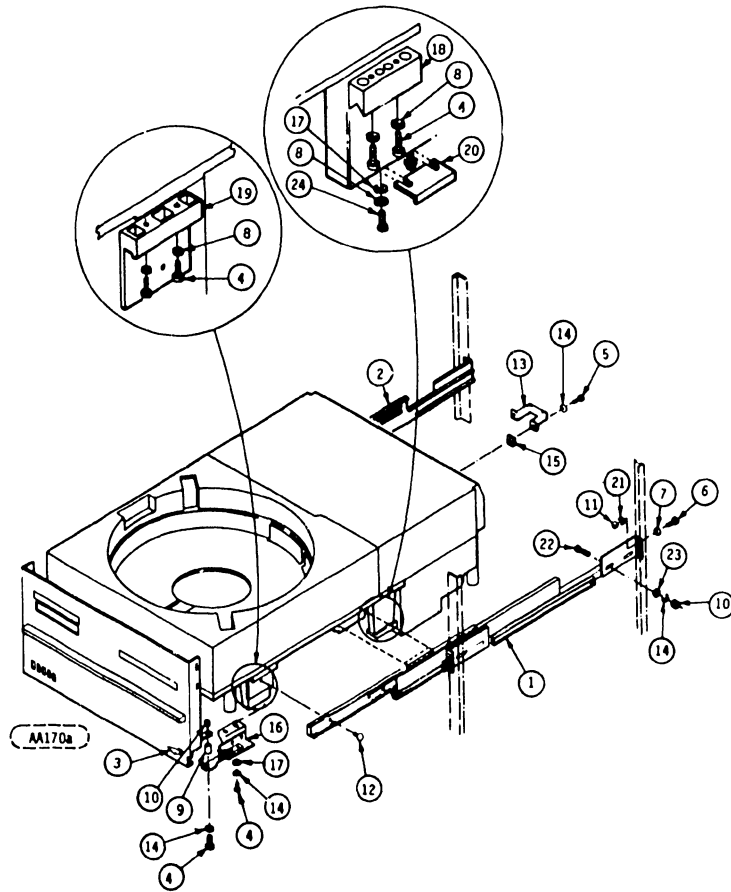


FIGURE 3-6. RACK ASSEMBLY MOUNTING

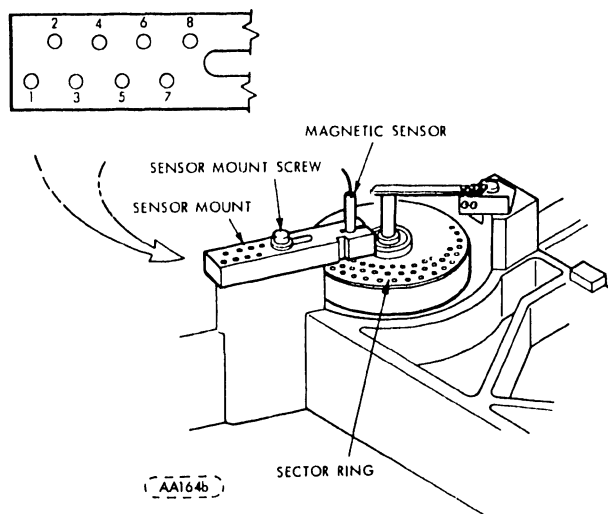


FIGURE 3-7. SECTOR OPTION CONVERSION

3.7 HZ-R/MIN CONVERSION

If Hz-r/min conversions are desired, they are available in standard option kits from the manufacturer. Depending on the specific conversion. Some or all of the following modifications may be required.

- a. Physical change of Drive Pulley and Belt.
- b. Physical change of R/W/E Board
- c. Physical change of Head Option Components.
- d. Physical relocation of jumpers in voltage adjust plug.

If Hertz conversion is required, refer to Table 3-2 for appropriate belt and pulley for desired Hertz. Refer to Maintenance Section 6.6.23 for conversion procedure.

TABLE 3-2. HZ CONVERSION PULLEY AND BELT CONFIGURATION

Hz	r/min	PULLEY NO.	PULLEY DIA.	BELT NO.	BELT LENGTH
50	2400	77599705	2.881 in. (73.2 mm)	75722940	30.375 in. (772 mm)
60	2400	77599706	2.404 in. (61.1 mm)	75722930	29.625 in. (753 mm)
50	1500	77599707	1.761 in. (44.7 mm)	75722920	28.625 in. (727 mm)
60	1500	77599708	1.479 in. (37.6 mm)	75722910	28.125 in. (714 mm)

3.8 CABLING ANC CONNECTION

Unit Intracabling - Inspect the cabling in the cabinet for agreement with Figure 3-2. Check for proper seating of connectors and logic cards.

3.8.1 INPUT/OUTPUT CABLES

All input/output cables exit at the rear of the disk drive. Refer to applicable I/O board schematic in HPC package located in front of manual for connector pin/signal assignments for these cables. If an external terminator assembly is used in A2J2, the DIP terminators must be removed from the I/O board. If daisy chaining is used, the terminator is installed in A2J2 or the DIP terminators are installed in the last unit of the chain. Refer to Figure 3-9. for a typical daisy chain configuration. The function of each signal name is described in Section 2, Table 2-2.

CAUTION

Refer to I/O option diagrams in HPC package located in front of manual for assignments of I/O signals to each terminal on the I/O board connector. Be sure the terminals on the I/O cable from the controller and/or daisy-chained unit have the correct configuration and the correct assignments. BE ESPECIALLY CAREFUL WHEN UTILIZING 3M TYPE I/O CABLES, SINCE THERE IS NO MECHANICAL "KEY" TO PREVENT PLUGGING THE CONNECTOR IN 180 DEGREES FROM THE PROPER POSITION, WHICH WILL RESULT IN DAMAGE TO THE CIRCUITRY. Check to make sure that the I/O cable lead terminating at terminal (1) on a 3M I/O board is a ground lead from the controller and/or daisy-chained unit. Terminal (1) on all 3M I/O board connectors is a ground lead, and is located as shown in Figure 3-10. Utilize the same precautions when relocating adapter boards for 3M to Elco, to 3M to Winchester connectors. Adapter boards with the blue strip lead are marked for proper connection into the 3M connectors on the I/O board. The connector designation and pin sequence is marked on one side of each connector.

3.8.2 GROUNDING OPTION

The disk drive is shipped with logic (DC) ground and chassis (AC) ground connected together--see Figure 3-11 (A)--at the front left hand corner of the power supply. If the system configuration requires the separation of these grounds, perform the following procedures.

1. Open top cover (base cabinet only).
2. Remove electronics cover.
3. Open power supply cover assembly.
4. Rearrange spacers to configuration shown in Figure 3-11(B).
5. Close power supply cover.
6. Install electronics cover.
7. Close top cover.

3.8.3 POWER CABLES

The AC power cable plugs into the bottom of the power supply assembly. On cabinet units, the power cable should exit the unit through the AC entry plate located on the bottom front area of the frame (see Figure 3-13).

3.9 INPUT POWER REQUIREMENTS

Refer to the equipment specification in HPC package listed in front of manual. Ascertain that P12 is jumpered according to Figure 3-12.

CAUTION

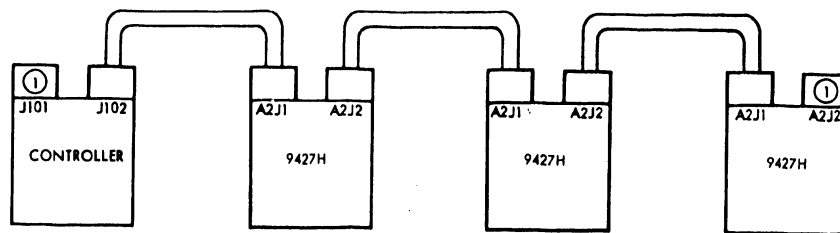
When units are field configured for any line voltage other than 120 V, 60 Hz, 4.6 Amp or 120/240 V, 60 Hz, 16 Amp, the CSA monogram must be removed because unit no longer complies with requirements of the Canadian Standards Association.

3.10 ENVIRONMENT

Operating and storage environment of the unit is as follows:

Operating status - 60 to 90°F (15.6 to 32.2°C) (12°F/hr maximum fluctuation)
10 to 80% relative humidity (provided there is no condensation)

Non-operating status - -30 to +150°F (-34.4 to 65.6°C)
5 to 95% relative humidity (providing there is no condensation)



AA226c

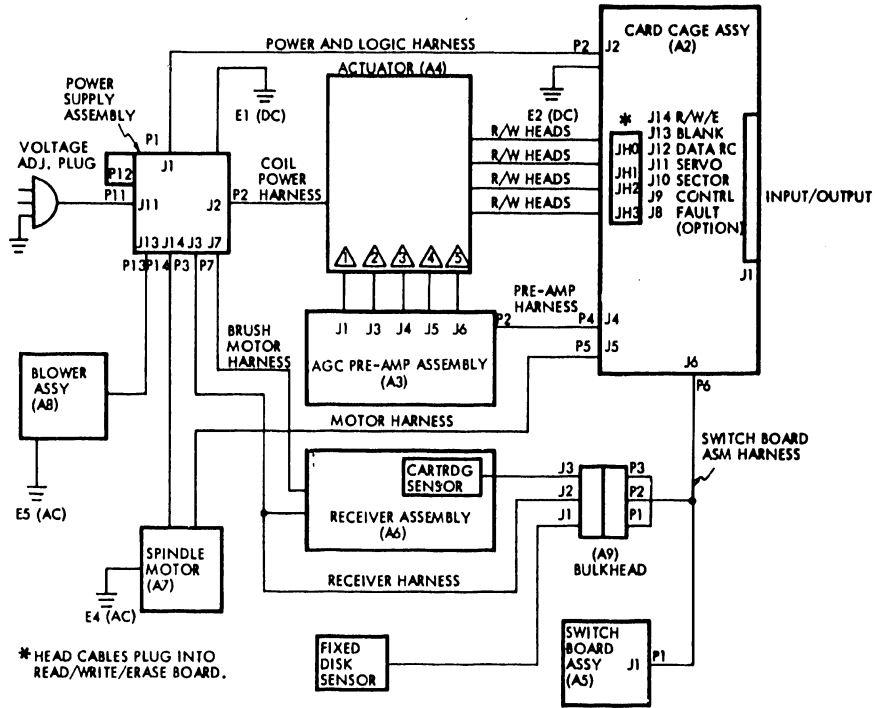
NOTES: 1 TERMINATOR.

2. MAXIMUM OF FOUR UNITS.

3. MAXIMUM CABLE LENGTH FROM CONTROLLER TO LAST UNIT IS 50 FEET (15.24 M)

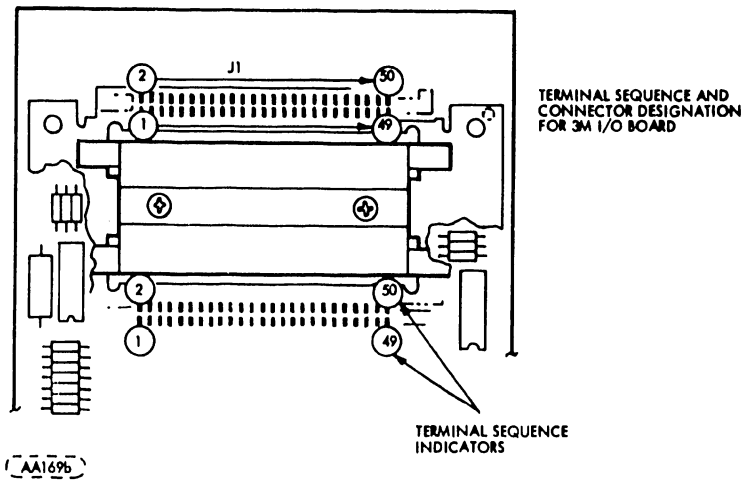
FIGURE 3-8. DAISY CHAIN CONFIGURATION

- ▲ EOT ASSEMBLY
- ▲ RETRACT
- ▲ POSITION XDCR SLIDER
- ▲ VELOCITY XDCR
- ▲ POSITION XDCR SCALE



AA232a

FIGURE 3-9. SIMPLIFIED INTRACABLING DIAGRAM



AA169b

FIGURE 3-10. 3M I/O BOARD CONNECTOR TERMINAL ASSIGNMENTS

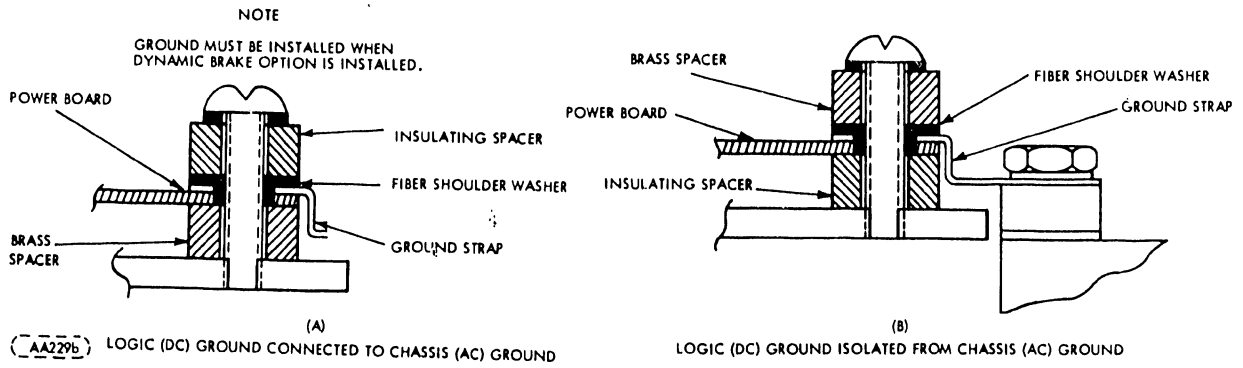
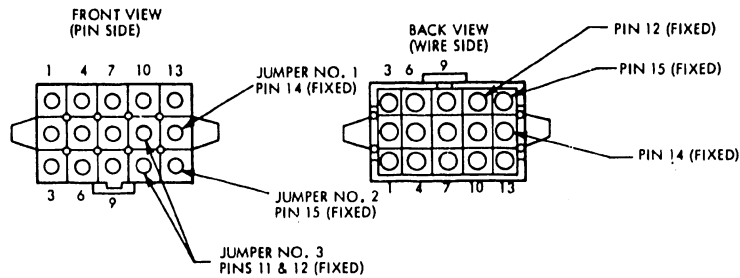


FIGURE 3-11. GROUNDING OPTION



NOTE: For proper pin configuration use above illustration. Ignore pin numbering on connector.

VOLTAGE	JUMPER #1		JUMPER #2	
	FIXED PIN	MOVEABLE PIN	FIXED PIN	MOVEABLE PIN
100	14	4	15	7
110	14	3	15	7
120	14	2	15	7
130	14	1	15	7
140	14	6	15	8
150	14	5	15	8
160	14	4	15	8
170	14	3	15	8
180	14	2	15	8
190	14	1	15	8
200	14	6	15	9
210	14	5	15	9
220	14	4	15	9
230	14	3	15	9
240	14	2	15	9
250	14	1	15	9

AA231a

FIGURE 3-12. VOLTAGE ADJUSTMENT PLUG P12 AND ADJUSTMENT TABLE

3.11 OPTION SWITCHES

Various modes of operation are made possible by option switches located on the Sector, Data Recovery, Control and I/O boards. These switches are factory set to customer requirements.

The unique settings of the switches (and their locations) are shown in the switch specifications in the HPC package located in the front of the manual.

3.12 INITIAL CHECKOUT AND STARTUP PROCEDURE

This procedure should be used to make the first power application to the unit. The procedure assumes that the preceding procedures and requirements of this section have been performed and satisfied.

1. Check that the power supply assembly circuit breakers is OFF.
2. Open top cover.
3. Grasp and turn spindle. Spindle should rotate with little resistance.
4. Wipe spindle surface and hub clean using gauze dampened with media cleaning solution.

CAUTION

Do not position the carriage manually. Such action could cause the read/write heads to load and be damaged.

5. Use a vacuum cleaner to remove any dust or dirt from interior of cartridge receiver.
6. Check that START/STOP switch is off.
7. Make certain that input power cable is connected to correct external AC power source, and P12 jumper plug is correctly jumpered and in place. (See Figure 3-12 for Jumper Installation information.)

NOTE

When units have a daisy chain configuration for AC power, prior to connecting the AC cable the proper phasing should be verified at device end for each device.

8. If external AC power to the unit is protected by circuit breaker, set circuit breaker to ON position.
9. Set power supply assembly circuit breakers to ON position and check that blower starts.
10. Pull back cartridge hold-down arms.
11. Install disk cartridge (refer to Disk Cartridge Installation procedure in Section 2).
12. Inspect and clean disk cartridge as specified in Preventative Maintenance portion of Section 6.
13. Press START switch to apply power to spindle motor.
14. Spindle drive motor and disk cleaner brush motor starts.
15. Assure READY light is illuminated in a maximum of 70 seconds.
16. Allow device and pack to reach thermal stabilization (20 minutes).
17. Run diagnostics.
18. If diagnostics or applications program fails upon placing units into service at customer installations, it may be necessary to perform Index-To-Burst Check and Adjustment (see Section 6 for all Check and Adjustment procedures and Section 7 for Maintenance Aids).
19. Installation complete.

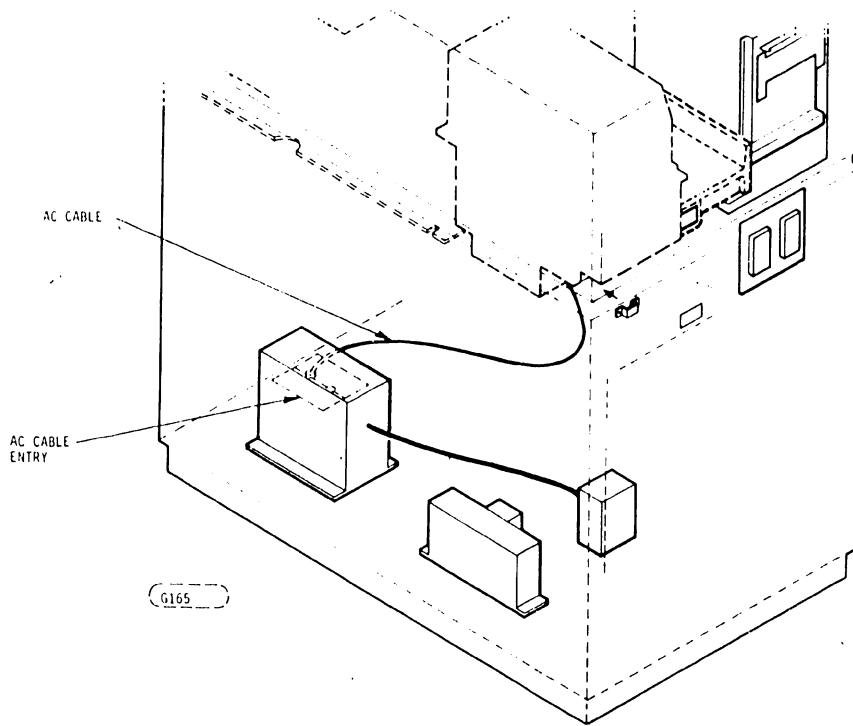


FIGURE 3-13. AC POWER CABLE EXIT

SECTION

4

THEORY

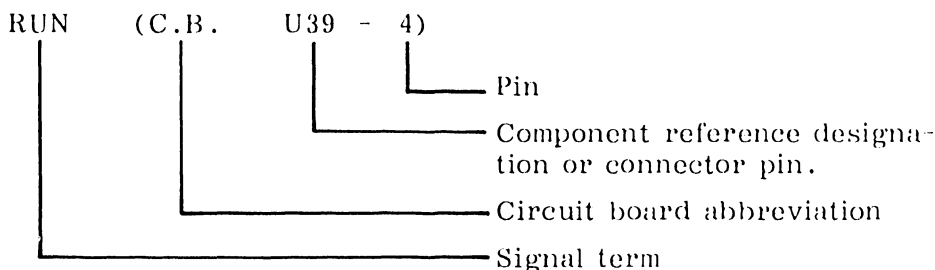
OF

OPERA-

TION

4.1 INTRODUCTION

The theory of operation is described in terms of the major junctions that the disk drive performs during normal and emergency operation and the circuitry and hardware involved in the performance of these functions. Signal origins and destinations and component locations are shown in parenthesis. For example, if the signal term RUN is referred to, it would appear as follows:



Circuit board abbreviations used in this description are as follows:

C.B. = Control Board	S.B. = Servo Board
S.C. = Sector Board	R/W/E = Read/Write/Erase Board
D.R. = Data Recovery Board	I.P. = Inductosyn Preamplifier Board
P.B. = Power Board	

4.1.1 DISK DRIVE

Disk drive is achieved through a belt driven spindle. The spindle is rotated at 1500 or 2400 r/min (depending on r/min option installed) by the disk drive motor.

4.1.2 ACTUATOR

The actuator consists of the carriage, carriage track, magnet assembly, and cam mount. The actuator is the device that supports and moves the read/write heads. Lateral forward and reverse movement of the carriage on the carriage track is controlled by the servo signal. (P.B. J2-1, J2-2) The basic signal is developed in the servo board and processed by a power amplifying stage mounted on the power amplifier board (power supply). The power amplifier output current is applied to the voice coil positioner (part of carriage). The signal causes an electric field about the voice coil positioner. This electric field interacts with the permanent magnetic field of the magnet assembly, which moves the voice coil either into or out of the permanent magnetic field. Current polarity to the voice coil determines the direction of motion, while current amplitude determines the acceleration and velocity of the motion.

The voice coil positioner is a bobbin-wound coil that is free to slide in and out of the forward face of the magnet assembly. Fastened to the positioner is a head/arm receiver which holds the two (four with fixed disk option) read/write heads. The head/arm receiver mounts on the carriage and bearing assembly that moves along the carriage track on ball bearing rollers. Movement of the positioner in or out of the magnet causes the same motion to be imparted to the entire carriage assembly. This linear motion is the basis for positioning the read/write heads to particular cylinder of tracks on the disk. (Refer to paragraph 4.6 for detailed information on read/write head loading and unloading.)

The actuator contains a optical switch for detecting each end of travel. A negative-going pulse is generated by these optical switches at forward and reverse end of travel.

4.1.3 HEAD/ARM ASSEMBLIES

Two head/arm assemblies (four with fixed disk option) are mounted on the carriage. A head/arm assembly consists of a read/write and erase coil package (head assembly) mounted at the end of a supporting arm structure. The head assembly, which includes a cable and plug, is mounted on a gimbal ring which in turn is mounted on a floating arm. This method of mounting allows the head assembly to pivot (independent of the arm) tangentially and radially relative to a data track on the disk surface. Such motion is required to compensate for possible irregularities in the disk surface.

The arm structure consists of a floating arm secured to a heavier fixed arm. The end of the fixed arm opposite the head installs in the carriage assembly. The floating arm is the mounting point for the head and is necessarily flexible so that it can respond during loading and unloading.

The freedom and mobility of the head are necessary elements to insure proper functioning with interchangeable disk cartridges. Vertical motion by a disk surface (due to warpage or imperfection) is countered by a move in the opposite direction by the gimballed head and/or floating arm. As a result, flight height remains nearly constant.

4.2 OPERATIONS

Refer to the applicable schematic, block diagram, intercabling diagram flow chart and timing charts for the following discussion.

4.2.1 POWER UP/FIRST SEEK

When the main circuit breaker, CL1 (power supply) is actuated, an initial reset, CLEAR (C.B. U39-12) is generated which clears all latches. After approximately 60 ms (+5 V supply settling time) CLEAR disappears. At this time, provided the pack lock, are closed and no faults exist, the disk drive can be started by depressing the START/STOP push button.

Actuating the START/STOP pushbutton generates RUN (C.B. U39-4) which, in turn, energizes the spindle motor and start relay, starts the brush cycle, initiates the spindle moto. start delay, illuminates the start indicator, and latches the disk cartridge in place. After approximately 4 seconds the start motor relay is de-energized and the start capacitor is removed from the motor start winding.

During the brush cycle, the disk brushes are passed across the entire surface of the disk to remove any foreign particles. When the brushes reach the end of travel, the motor is mechanically reversed and the brushes move outboard until they reach the home position, at which time the brush motor is de-energized by the closure of a SPDT switch (Cartridge Receiver A6SW3). The closure of this switch generates BRUSH CYCLE COMPLETE (C.B. U32-12). BRUSH CYCLE COMPLETE clocks K1 flip-flop control (C.B. U18) provided spindle speed is within 20% of nominal value.

The completion of the brush cycle is followed by a 50 second servo delay, after which Servo Enable (C.B. A10) initiates the operation called first seek. The function of first seek is to calibrate the disk cylinders or tracks with the track counter (S.B. U11, U12, U13). This is accomplished by driving the read/write heads inboard until they reach forward end of travel (FEOT) then out-board until the first even-numbered cylinder is crossed. The first even-numbered cylinder encountered is identified as track 408 and each succeeding track crossed decrements the track counter until track 000 is reached, at which time, ON CYL (S.B. B20) is generated. ON CYL initiates READY (C.B. A8) and assuming the unit is selected (reference daisy chain configuration) the controller is notified that first seek is complete.

4.2.2 OPERATIONAL SEEK

Refer to Figure 4-2 for the following discussion.

If, at the completion of first seek, data is to be read from or written on the disk, an operational seek is performed. To initiate an operational seek, the address of the desired track is strobed into the disk drive of nine (9) lines (S.B. B2-B10).

The number of tracks that the read/write head has to travel from its present track to the selected track is determined by calculating the difference between the track address (S.B. U4, U5, U6, U15) and the track counter (S.B. U18, U19, U20). The absolute value of this digital difference is applied to a D/A converter (S.B. U39) whose output provides an analog signal to the voice coil for movement of the read/write head to the desired track. Voice coil movement, hence read/write head movement during an operational seek consists of two modes: (1) coarse and (2) fine. During the coarse mode the voice coil is driven at a velocity determined by the number of tracks remaining in the seek.

The fine mode is employed to bring the carriage to a stop without overshoot when the desired cylinder is reached. Figure 4-3 shows the D/A converter output and the velocity profile for a typical long seek. During the first part of the seek the carriage is accelerated by the maximum output of amplifier AR4 (S.B.) until it reaches maximum velocity. From this point on, the carriage is driven at a constant velocity (coast) until it is 128 cylinders from the desired destination at which time it decelerates uniformly until it reaches the last track. Upon reaching the last track the system switches to the fine mode and the position signal from the encoder is utilized to bring the carriage to the center of the track. Approximately 2 ms after the head has settled within 200 microinches of the selected track center, ON CYL (S.B. B20) is generated. SKER (S.B. B16) is generated if the carriage goes beyond either end of travel (FEOT or REOT) or if ON CYL is not present 0.5 seconds after the initiation of SERVO EN, C.A. STROBE or RTZS. A SERVO INH automatically removes power from the voice coil by forcing an inhibit on the servo output multiplexer (S.B. U42).

4.2.3 RETURN-TO-ZERO SEEK (RTZS)

When RTZS is commanded by the controller, the track counter (S.B. U18, U19, U20) is set to 408 and the address register (S.B. U4, U5, U6, U15) is reset to zero. However, the invert line (U6 3) to the address register is set for non-inverting operation. As a result the address register indicates a cylinder address of 424. Consequently the difference between the track counter and address register is 16 (424 - 408). Since counting by the track counter and address register

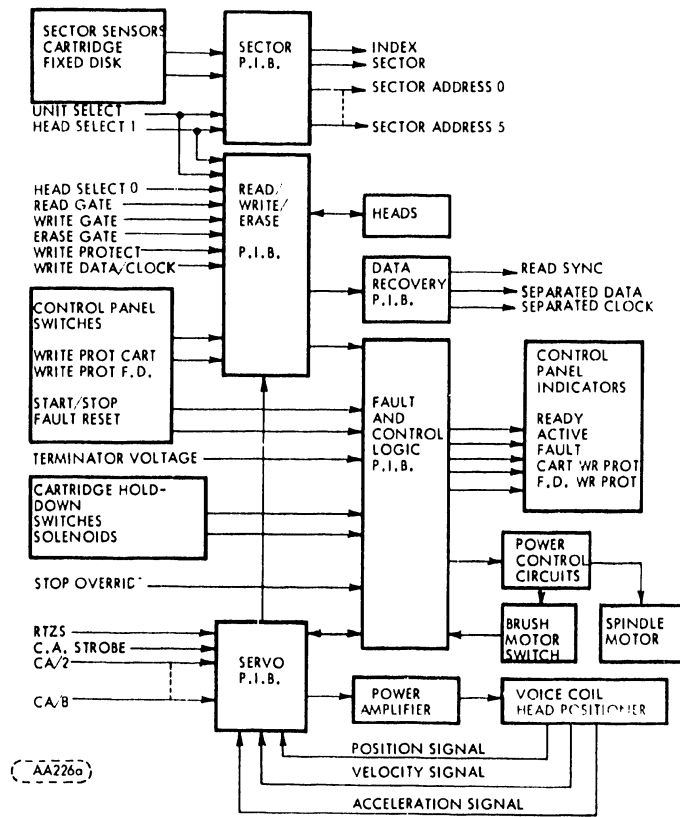


FIGURE 4-1. MODEL 9427H BLOCK DIAGRAM

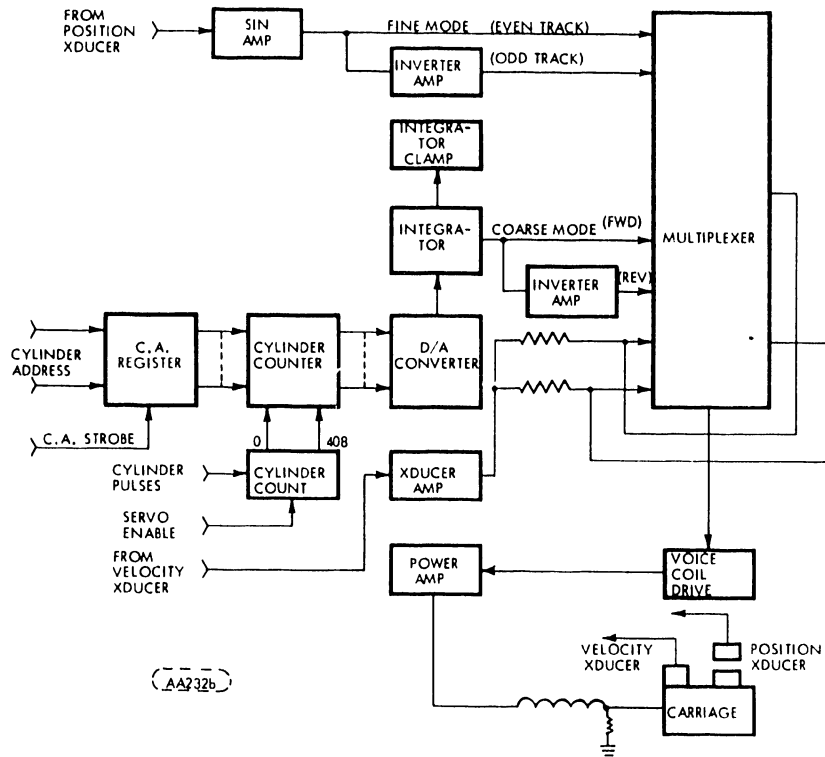
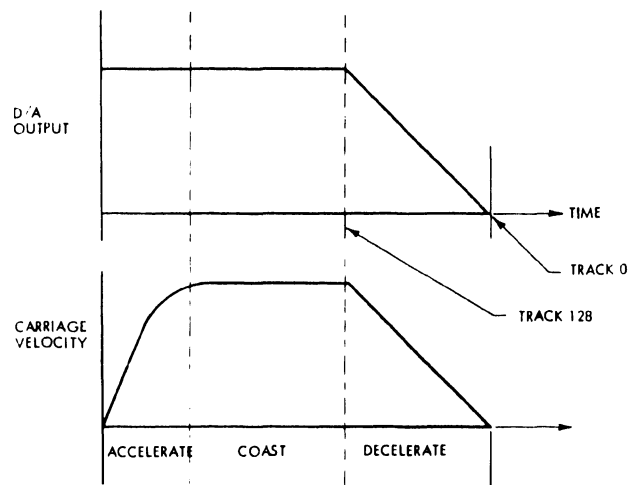


FIGURE 4-2. SERVO SYSTEM BLOCK DIAGRAM



(AA226b)

FIGURE 4-3. SEEK VELOCITY PROFILE

is inhibited, the difference is held constant, resulting in the carriage being driven at a constant speed of approximately 16 ips (406 mm/sec). When the forward end of travel (FEOT) is reached, the address register is shifted back to the normal inverter mode thereby establishing an address of 000. This causes the carriage to reverse direction and as soon as the first even-numbered track is encountered the count inhibit signal is removed from the track counter, allowing it to count down normally from 408 to 000 as described in First Seek.

4.2.4 WRITE/ERASE DATA

Writing on any one of four recording surface (2 cartridge and 2 fixed disk) requires that the disk drive be able to select the desired read/write head. Selections of the heads is accomplished by means of two input lines termed HS/0 and HS/1 (Head Select 0 and 1). The logic condition of HS1 determines whether the cartridge or fixed disk is selected while the logic condition of line HS0 determines whether the upper or lower surface of the disk is selected.

Once the disk surface and read/write head has been selected, a write function is initiated by the controller commanding UNIT SELECT and WRITE GATE. These two controller inputs generate a write line term W/E INA (R/W/E B4) and a write enable term WR EN (R/W/E B2). With the logic thus conditioned by these signals, WR DATA and CLOCK applied to the disk drive (R/W/E A3) then can be recorded. With WR EN at a high level, incoming data and clock pulses (R/W/E A3) will clock the write data flip-flop (R/W/E U10). As a result the outputs of the flip-flop will be a composite of frequency encoded data and clock which alternately switch a voltage dependent current source (R59-R70) through two power transistors (R/W/E Q6, Q7). The outputs of these transistors drive write current through one half of the head winding then the other via head select circuits (R/W/E U14, U16).

Recording on tracks 256 or greater requires a reduction in write current due to bit density. When the read/write head is moved to track 256 or greater for purposes of writing, ZONE (S.B. A20) is generated, causing (R/W/E U11-2) to go to ground thereby reducing the current to the read/write heads.

An erase function is initiated by the controller commanding a UNIT SELECT (C.B. B9) and ERASE GATE (C.B. A12). These two controller commands generate terms ER EN (C.B. B26) and W/E/INH (C.B. A24). Term ER EN turns on a transistor switch (R/W/E U11) in series with the selected erase winding via erase diodes (R/W/E U17 Diode matrix) and the +15 V center tap voltage.

4.2.5 READ DATA

To initiate a read operation, READ GATE and UNIT SELECT are commanded by the controller. The read head output is processed by differentiation of the recorded flux reversals as follows: The signal is amplified by a linear low noise differential amplifier (R/W/E AR2) and differentiated by AR1 (R/W/E). The resulting differentiated signal simultaneously drives a cross-over detector (R/W/E U2) and isolation stage (R/W/E Q12, Q13) which provides a monitor for the differentiated analog signal at the I/O connector.

Cross-over detection is achieved by a dual differential receiver (R/W/E U2) which digitizes the differentiated signal by generating positive and negative edges for each analog zero cross-over point. This digitized double frequency information (R/W/E A6) is coupled to the data recovery circuitry where phase and frequency tracking is established.

Phase and frequency tracking of the double frequency data is accomplished by means of a digital phase lock loop (Figure 4-4). The loop is comprised of a comparator, current pump, voltage controlled oscillator, data window generator, reference signal generator and acquisition detector.

Initially, the comparator (D.R. U27) derives a phase error signal between the pulsed data (double frequency data) and the out-of-lock reference signal. This TTL signal is applied to the current pump (D.R. Q1, 2, 3, 10, 11, 12) where it is integrated to develop a DC level (V_c).

V_c passes the AC component which is controlled by the value of R38 and the current from the bidirectional pump (D.R. Q10, Q11). The resultant voltage, V_{re} , corresponds to the input data frequency and the superimposed square waveform is utilized for phase synchronism.

The current pump output corrects the VCO (D.R. Q4-Q9) bringing its output to a nominal 5 MHz for a 2.5 MHz data rate (2400 r/min disk speed). Since the phase locked oscillator is a closed loop, the current pump drives the DC level (V_c) to reach a steady state when the signal at the comparator is a square waveform. Frequency synchronism is achieved at this point. When the loop is locked at its center frequency, the component of V_c is symmetrical.

At the beginning of the lock procedure, the disparity between the data window (D.R. U23-2) and pulsed data (D.R. U23-1) triggers a fixed time out signal, FT TRACK (D.R. B23) which increases the current available in the current pump, thereby increasing the rate of VCO correction.

After frequency and phase synchronization have been achieved the double frequency pulse data is decoded into SEP DATA (D.R. A4, B4, A5, B5) and SEP CLOCK (D.R. A3, B3, A2, B2).

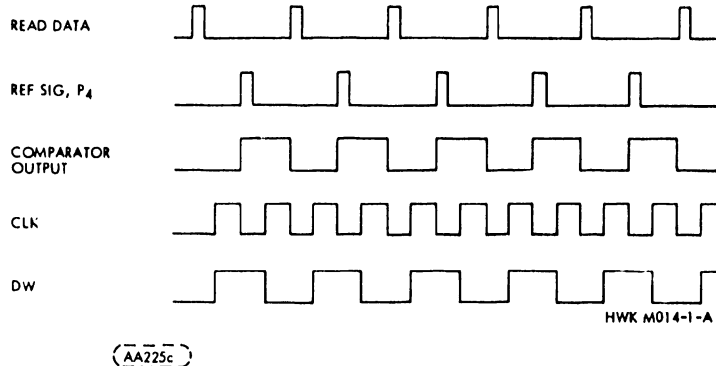
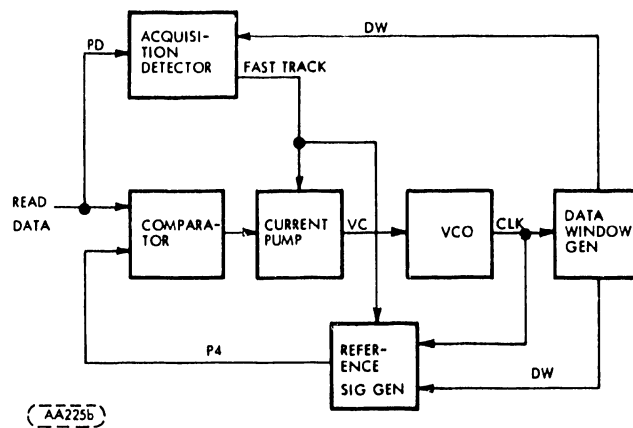


FIGURE 4-4. DIGITAL PHASE - LOCK LOOP AND TIMING DIAGRAM

4.3 SECTORING

The sectoring system is capable of producing all standard sectoring formats. This is accomplished by moving the sensor over the desired row of holes on the sector ring and selecting the desired prescaling factor using S3 (S.C.). Refer to Section 2 (Operation) for switch setting and resulting prescaling factor.

Refer to Figure 4-5 for the following discussion.

Monitoring the position of the disk comes under the function known as sectoring. Position information is derived from pulse trains generated by two magnetic sensors. One sensor (for reading cartridge sectors) is mounted in the receiver area and senses notches on the disk armature plate. The other sensor (for reading fixed disk sectors) is mounted beneath the drive motor pulley and senses chemically milled holes in the sector ring. Both sensors generate negative-going pulses which indicate the center of the notch or hole. The pulse trains generated by these two sensors are separated into index and sector pulses by the sector board.

4.3.1 FIXED DISK

Index pulses are separated from sector pulses by two NOR gates (S.C. U26-3 U26-4) and a one-shot multivibrator (S.C. U32). The separated pulses drive the prescaling counter (S.C. U33) and the sector address counter (S.C. U17). The counters are reset by receiving an index pulse and incremented by receiving a sector pulse. The count of the sector pulses is utilized to generate a six-bit sector address field (S.C. B2, B3, B6, B8, B11, B14). The sector address and index pulses are outputted upon command of the controller.

The index pulse can be transmitted at one of two times depending on the setting of SW1-1 and 2 (S.C.). If both switches are open, the index pulse output will appear simultaneously with the next sector pulse (DELAYED INDEX). If both switches are closed, the index pulse will appear at the output simultaneously with the input (DIRECT INDEX).

4.3.2 CARTRIDGE DISK

Cartridge disk index and sector pulse processing is handled, with minor exceptions, in the same manner as described for the fixed disk. Index and sector pulses are sensed from the Cartridge armature plate by the index/sector transducer and fed to the Sector board at A22. Index pulses are separated from sector pulses by two NOR gates (S.C. U19-3, U19-4) and a one-shot multivibrator (S.C. U25). The separated pulses drive the prescaling counter (S.C. U14) which divides the separated sector pulses by 32, 16, 8, 4, 2 or 1. The count of the sector pulses is utilized to generate a six-bit sector address field (S.C. B2, B3, B6, B8, B11, B14). The sector address and index pulses are output upon command of the controller. Delayed and direct index pulses are provided for the cartridge disk the same as the fixed disk.

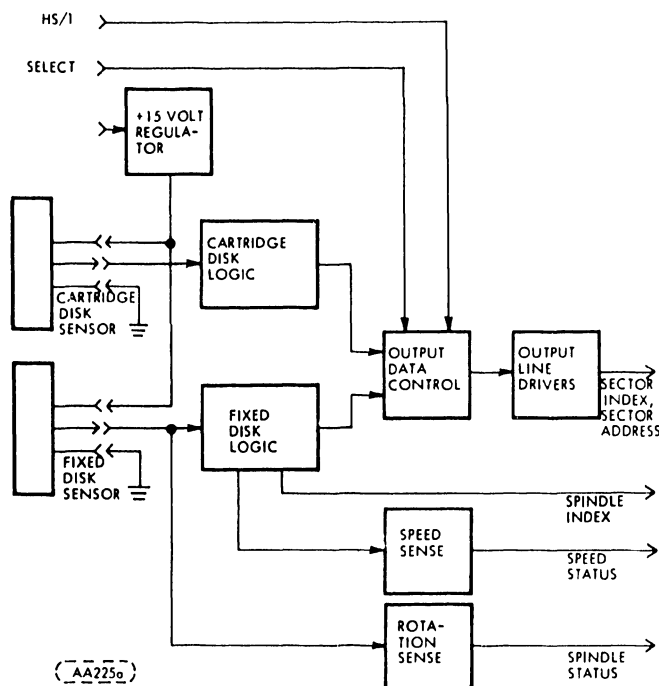


FIGURE 4-5. SECTOR SYSTEM BLOCK DIAGRAM

4.3.3 SOFT SECTOR

Under certain circumstances it is desirable to operate the disk drive with only a single sector. This mode of operation is called soft sector. Cartridges used for soft sector have only a single notch to be detected by the sensor. The single pulse generated each revolution by this notch will always be interpreted by the sector board as a sector pulse. The configuration of two switches SW1-2 and SW2-7 (S.C.) effectively substitutes this sector pulse for the missing index pulse.

Data received from the controller in the soft sector mode will be in a format containing a unique 8-bit pattern for identification of the start of a sector address.

4.4 FAULT DETECTION

Fault conditions in the disk drive are divided into two classes:

- (1) damaging and
- (2) non-damaging.

4.4.1 DAMAGING FAULTS

Damaging faults are those which will cause damage to the read/write head or to disk surfaces. These faults will occur as a result of subnormal spindle speed or supply voltage failure on the servo or inductosyn pre-amp boards.

To provide protection for the heads and media, the spindle speed (C.B. B8, U11-8) and the servo board supply voltages (C.B. A27, A30, B27, B30, U11-13) are continuously monitored. Any reduction in spindle speed below the set tolerance level or the occurrence of any non-transient voltage fault will set the emergency retract latch causes the disk drive to generate the term FAULT (C.B. U35-13, U14-10) illuminate the fault lamp (C.B. U15-6), retract the heads via K1 relay and switch the unit out of the run mode (C.B. U24-6, U31-9). The emergency retract latch can only be reset after the fault condition is cleared and the START/STOP switch is returned to the STOP position or with a power up clear (C.B. U18-10).

4.4.2 NON-DAMAGING FAULTS

Non-damaging faults are those that are not dangerous from the point of equipment safety but are those that will lead to degraded operation (i.e., read and write failures). These non-damaging faults are read/write head current faults, command faults and voltage failures.

A current fault (R/W/E B7) will occur under one of the following conditions:

1. Write current but no erase current
2. Erase current but no write current
3. More than one head selected for a write/erase operation
4. Excessive current leakage on the write driver output line during a read.

A current fault sets the fault latch (C.B. B20, U35-13). The fault latch will also set, if an attempt to write is made when the heads are not on cylinder or an attempt is made to read at the same time write or erase is enabled. Other conditions that will generate Fault signals are attempting to select heads 2 or 3 when there is no fixed disk or when there is a voltage failure in the read/write, data recovery or sectoring circuitry. The term, FAULT, generated by any of the above fault condition inhibits write and erase and disables the READY line (optional) to the controller. A FAULT will also illuminate a front panel indicator and enables a fault line to the controller. Non-damaging faults can be reset by the front panel FAULT RESET pushbutton, or by the controller RTZS command (option).

4.5 WRITE PROTECTION

Data on the cartridge or fixed disk may be protected by depressing the appropriate front panel WRITE PROTECT switch. The signal developed by WRITE PROTECT switch is gated with HS/1 (C.B. A20, U7-5, 6 or U7-1, 2) and assuming that the protected head is selected, write protected status (C.B. U21-6) will be enabled. This status will occur whether or not the unit is selected (reference daisy chain configurations). If the unit is selected (C.B. U43 6) PROT STAT (C.B. B21) will be transmitted to the controller.

The controller can initiate write protection by commanding Unit Select and WR PROT (C.B. B23, U7-13). These signals condition the write protect logic and illuminate the appropriate WRITE PROTECT indicator. The indicator will remain illuminated as long as the unit is selected, the appropriate heads are selected and the controller initiated WR PROT is in effect.

4.6 HEAD LOADING

The read/write heads must be loaded to the disk surfaces before exchanging data with the controller. The heads must be retracted from load position and driven clear of the disk when power is removed from the unit or the disk velocity falls below a predetermined r/min.

Head loading amounts to allowing spring pressure of the floating arm (part of head/arm assembly) to move the aerodynamically shaped head face toward the disk surface. When the cushion of air caused by the spinning disk is encountered, it resists any further approach by the head. Spring pressure is designed to just equal the opposing cushion pressure (function of disk r/min) at the required height. As a result, the head flies. However, if the spring pressure exceeds the cushion pressure, which would happen if the disk cartridge lost enough speed, the head stops flying and contacts the disk surface, causing damage to the head and the disk surface.

The floating arm is designed to maintain a constant loading force. While the heads are retracted, head cams on the cam mount bear against the floating arm cam surfaces. The cams counter the loading force and force the heads to the unloaded position. As the carriage moves forward, the cam surface rides off the cam just after the read/write head moves out over the disk surface. The loading force now moves the head face toward the air layer on the surface of the spinning disk until the opposing forces achieve a state of equilibrium. The heads are thus loaded and the carriage is forced to continue toward the spindle until the forward end of travel (FEOT) signal occurs.

4.7 HEAD RETRACT

Two situations will cause the read/write heads to be moved back past the loading ramp. These two situations are normal and emergency retract.

4.7.1 NORMAL RETRACT

Normal retract will occur when the START/STOP switch is returned to the STOP position. This causes the disabling of SERVO EN (C.B. A10). When SERVO EN goes to zero, the address register (S.B. U4, U5, U6, U15) is set to 424 as in RTZS. However, the track counter (S.B. U18, U19, U20) is set to 440. Since counting is inhibited under this circumstance, the carriage will move outboard at a constant

rate of 16 ips (406 mm/sec). When the carriage contacts the reverse stop micro-switch, (A4SW1), REV STOP (P.A. J2-12) is generated. One-half second after the occurrence of REV STOP the power amplifier is disabled.

4.7.2 EMERGENCY RETRACT

In the event of a damaging power failure or the spindle motor velocity drops below the tolerance limit, an emergency retract is initiated. Either of these conditions de-energizes the voice coil relay (P.B. K1). The openings of K1 initiates a 0.5 second delay which allows the carriage, by means of spring loaded effect of the voice coil connections to move to a position away from the unloading ramp. After the delay, triac, Q5 (P.B.) discharges a 100,000 Uf Capacitor (P.B.) through the voice coil thus unloading and retracting the heads.

4.8 CYLINDER LOCATING AND POSITIONING

The system for locating and counting tracks (cylinders) on the disk is comprised of a position encoder or transducer and an up/down counters.

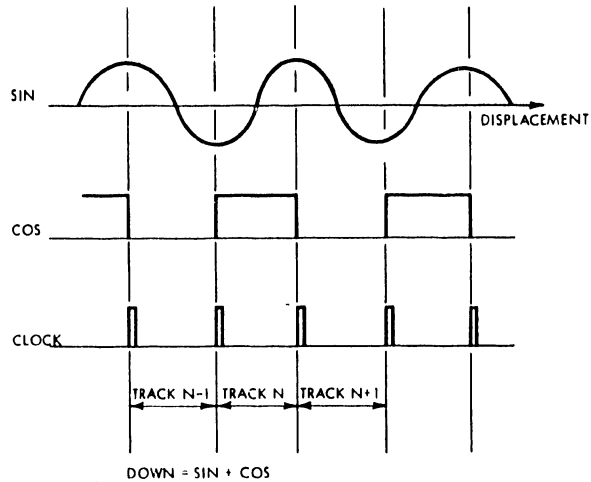
4.8.1 CYLINDER LOCATIONS

Cylinder locations are determined by counting the zero crossings of the COS signal from a reference point using an up/down counter system (S.B. U18, U19, U20). A cylinder is defined as the space between two transitions of COS. Whenever the transitions occur a clock pulse (S.B. U32-11 & 6) is generated, causing the cylinder counter to count up or down depending on the state of the up/down signal (S.B. U30-5 & 6). The state of the up/down signal is determined by the logical levels of SIN and COS just prior to the clock pulse. By examining the wave forms in Figure 4-6, it can be seen that whenever the expression SIN COS is true, the count will be down and whenever the expression is false, the count will be up. An odd numbered cylinder is defined as one where the slope of SIN signal is positive displacement and an even numbered track is one where the slope of SIN is negative for positive displacement. Initial location of the track is established during FIRST SEEK.

4.8.2 CYLINDER POSITIONING

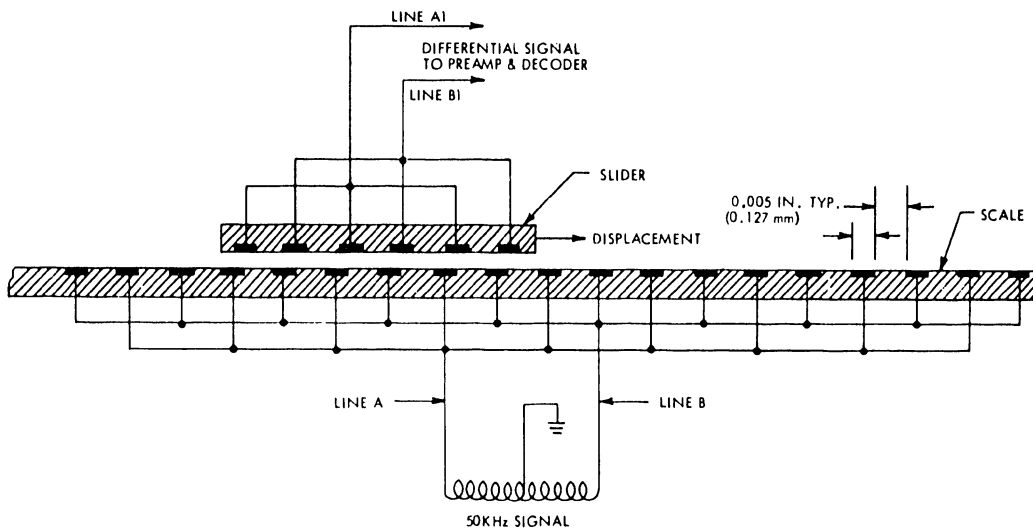
The position encoder or transducer, schematically depicted in Figure 4-7 is a capacitively coupled linear displacement transducer. The encoder has two elements. One element (the scale) is rigidly mounted while the other element (the slider) is attached to the carriage-assembly and moves parallel to the scale as the read/write heads are moved in and out. Both the scale and the slider has 0.005 in (0.127 mm) strips of copper, spaced 0.005 in (0.127 mm) apart, which function as plates of a capacitor. The voltage is applied to the copper strips on the scale so that the voltage on adjacent strips is 180° out of phase.

As the slider moves parallel to the scale a sinusoidally 50 kHz signal is coupled to the slider. The amplitude of the sinusoid at any given point is a function of distance of the slider strips with respect to the scale strips with zero crossings occurring every 0.005 in (0.127 mm) (see Figure 4-8). This signal is phase demodulated and peak detected on the I.P. Board. The SIN & COS signal is used to generate clock pulses for counting tracks. The phase relationship of these signals determine the direction of travel of the carriage. The zero crossings of the SIN signal are aligned to coincide with the center of the cylinder locations on the disk.



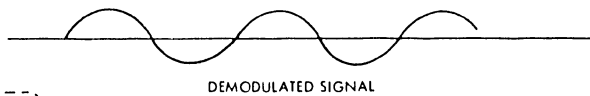
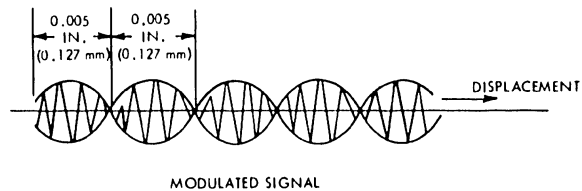
AA227b

FIGURE 4-6. COUNTING LOGIC



AA229a

FIGURE 4-7. CAPACITIVELY COUPLED LINEAR DISPLACEMENT TRANSDUCER



AA228b

FIGURE 4-8. POSITION TRANSDUCER SIGNAL

SECTION

5

DIAGRAMS

5.1 INTRODUCTION

This section contains the intracabling diagram, a key to the logic diagram symbology, a Table of commonly used Integrated Circuits, Printed Circuit Board documentation, and electrical schematics.

Input/Output (I/O) Board documentation is included in the Hardware Product Configurator (HPC) Document Package located in front of the manual. It may be desirable to insert the I/O Board portion in front of this Section.

Also included in the HPC package is a "Device Specification" which defines the correct switch settings for the option selection switches which are located on circuit boards and the terminator resistor values on the I/O Board. The value specified determines the Resistor Module (RM) installed on the I/O Board. The RM Part Numbers are listed in parts Data, Section 8. In addition, documentation describing Special Options, Special Printed Circuit Boards, and other customer unique features is included in the HPC package.

5.2 INTRACABLING DIAGRAM

The intracabling diagram (Figure 5-1) details the cable connection between each major assembly and the mother board. Sheet 2 of Figure 5-1 is to be used when tracing signals between the Fault Isolation Retention Module (FIRM) and the unit.

5.3 CIRCUIT BOARD DOCUMENTATION

Each of the following circuit board figures consists of an assembly drawing and parts list, a connector diagram, and a schematic diagram.

<u>CIRCUIT BOARD TITLE</u>	<u>BOARD IDENT. NO.</u>	<u>FIGURE NO.</u>
Control Board Assembly	75885452	5-15
Control Board Assembly	75297509	5-15
Sector Board Assembly	77622951	5-16
Sector Board Assembly	75883202	5-16
Servo Board Assembly	77657501	5-17
Data Recovery Board Asm.	75297105	5-18
Read/Write Erase (2400 r/min)	75891100	5-19
Read/Write Erase (1500 r/min)	75880500	5-19
AGC Servo Preamp Bd Asm	77658600	5-20
Power Supply Board No. 1	77830321	5-21
Power Supply Board No. 2	77830330	5-22
Spindle Motor Brake Asm	75866206	5-23
Switch Board Assembly	75299103	5-24
Switch Board Assembly	75299102	5-24
Component Board - Mother	75870203	(For reference only 5-1)
Component Board - Mother	75870204	(For reference only, 5-1)

5.3.1 CONNECTION DIAGRAMS

Logic signals can be traced throughout the unit by using the circuit board connector diagrams. Each diagram lists the sheet number(s) of the accompanying schematic and the next connector diagram(s) figure number on which the signal can be found.

5.2 INTRACABLING DIAGRAM

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<u>CIRCUIT BOARD TITLE</u>	<u>BOARD IDENT. NO.</u>	<u>FIGURE NO.</u>
Control Board Assembly	75885452	5-15
Control Board Assembly	75297509	5-15
Sector Board Assembly	77622950	5-16
Sector Board Assembly	75883201	5-16
Servo Board Assembly	77831401	5-17
Data Recovery Board Asm.	75297105	5-18
Read/Write Erase (2400 r/min)	75891100	5-19
Read/Write Erase (1500 r/min)	75880500	5-19
AGC Servo Preamp Bd Asm	77658600	5-20
Power Supply Board No. 1	77830321	5-21
Power Supply Board No. 2	77830330	5-22
Spindle Motor Brake Asm	75866206	5-23
Switch Board Assembly	75299103	5-24
Switch Board Assembly	75299102	5-24
Component Board - Mother	75870203	(For reference only 5-1)
Component Board - Mother	75870204	(For reference only, 5-1)

5.3.1 CONNECTION DIAGRAMS

Logic signals can be traced throughout the unit by using the circuit board connector diagrams. Each diagram lists the sheet number(s) of the accompanying schematic and the next connector diagram(s) figure number on which the signal can be found.

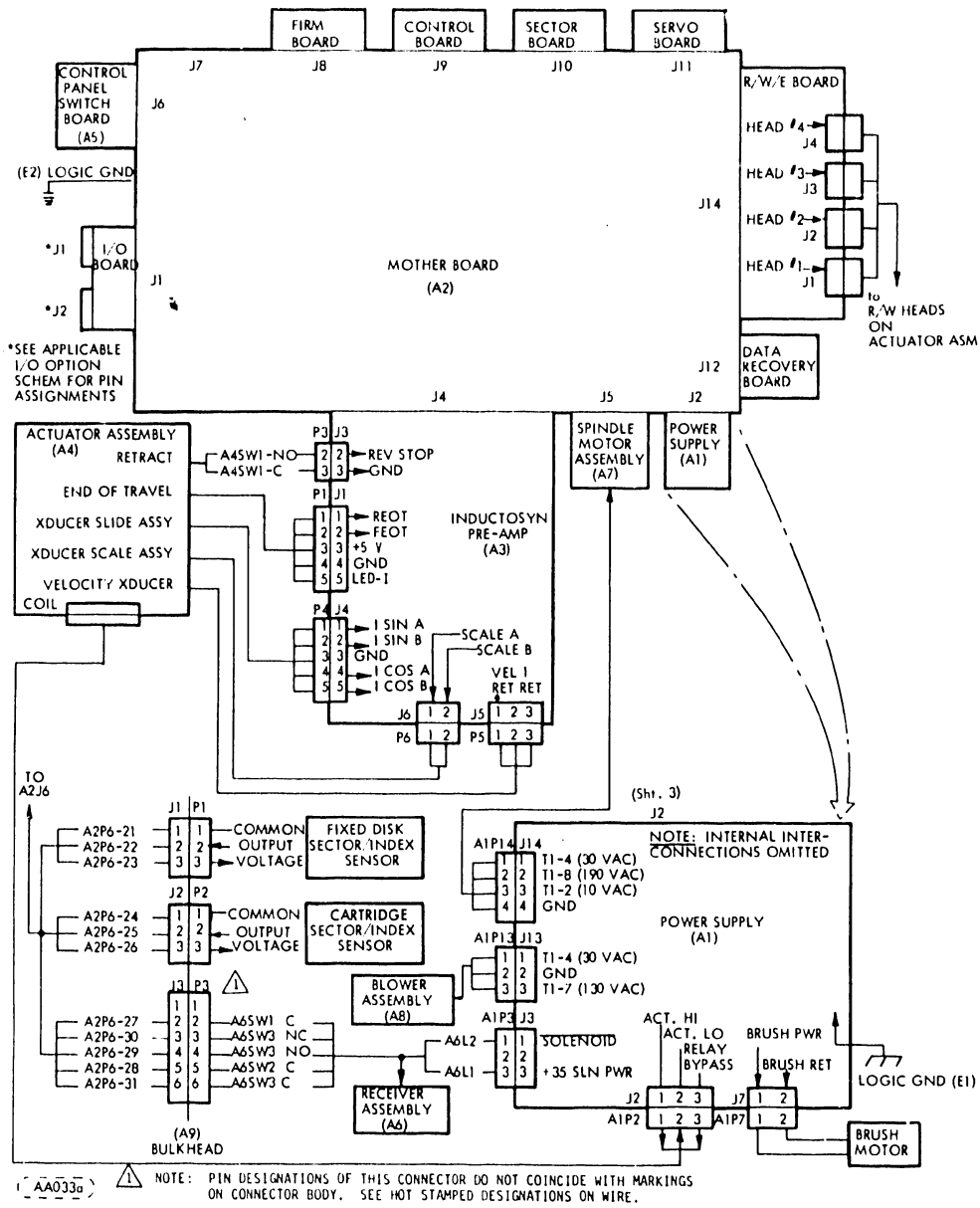
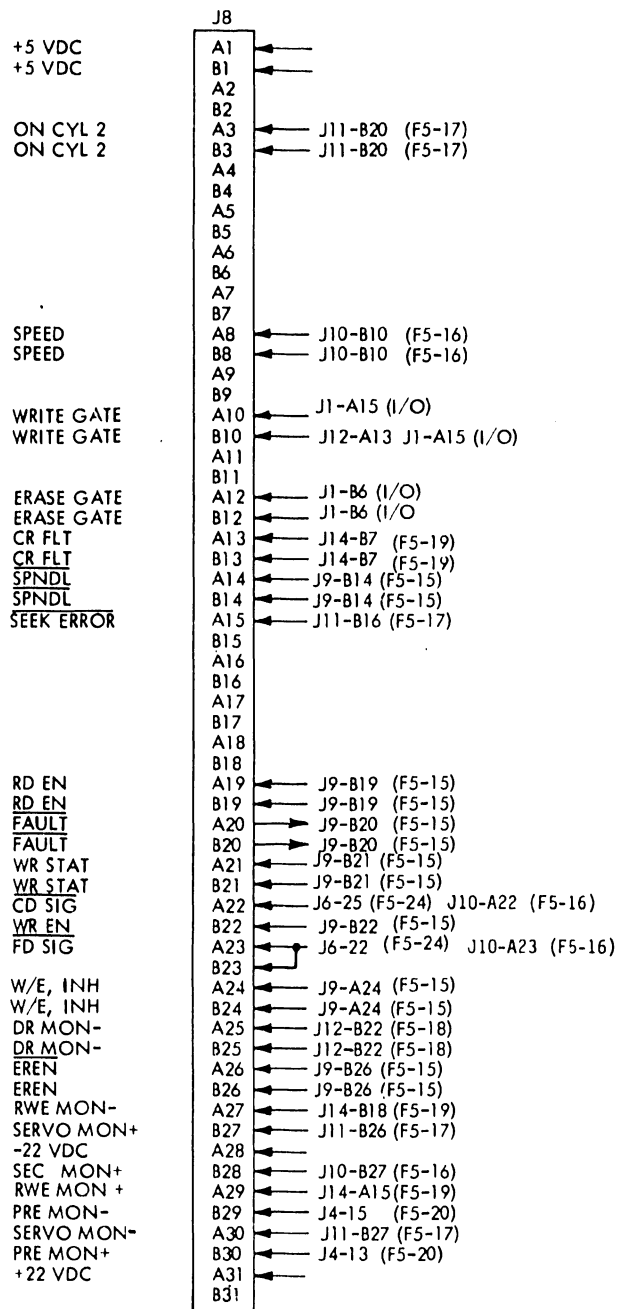


FIGURE 5-1. DETAILED INTRACABLING DIAGRAM (SHEET 1 OF 2)

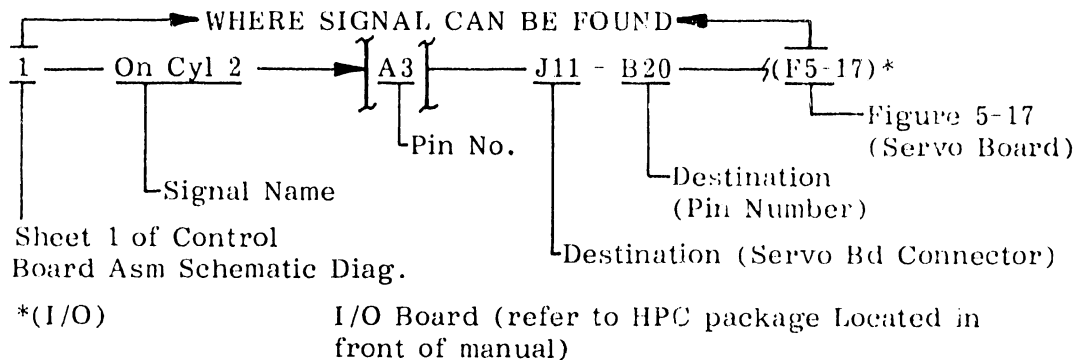
FIRM BOARD



(AA053a)

FIGURE 5-1. DETAILED INTRACABLING DIAGRAM (SHEET 2 OF 2)

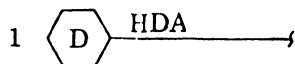
EXAMPLE: Figure 5-15 Control Board Assembly



5.3.2 SCHEMATIC DIAGRAMS

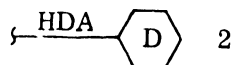
Multiple sheet (SET of pages) circuit board schematics are sequentially numbered (1,2,3 etc) in the upper right-hand corner of each schematic sheet. Symbology for sheet to sheet connections and board to board connections are as follows:

- Sheet to Sheet ON PAGE example:



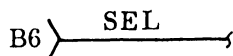
1 = Signal "from" sheet 1 of SET
 D = ON sheet reference (from sht 1 of set)
 HDA = Signal name (from sh 1 of set, location $\text{\textcircled{D}}$)

- Sheet to Sheet OFF PAGE example:



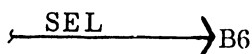
2 = Signal "to" sheet 2 of SET
 D = OFF sheet reference (to sheet 2 of set)
 HDA = Signal name (to sheet 2 of set, location $\text{\textcircled{D}}$)

- Board to Board ON PAGE example:



B6 = Pin Location of board connector (Ref Para. 5.3.1)
 SEL = Signal name (Ref Para. 5.3.1)

- Board to Board OFF PAGE example:



B6 = Pin location of board connector (Ref para. 5.3.1)
 SEL = Signal name (Ref para. 5.3.1)

5.4 MAJOR ELECTRICAL DIAGRAMS

Figure Title	Figure Number
AC-DC Power Distribution:	
● Without Dynamic Brake	5-25
● With Dynamic Brake	5-26
● Without Dynamic Brake and Special RFI Filters	5-27
● Without Dynamic Brake and with Filters & Power Input Assembly	5-28
● With Dynamic Brake and Spl RFI Filters	5-29
Baseplate Electronics	5-30

5.5 LOGIC DIAGRAM SYMBOLOGY

5.5.1 GENERAL INFORMATION

Logic symbols are drawn with inputs on the left and outputs on the right whenever space and layout permit.

Power supply connections, discrete timing components, etc, may be shown connected to the top or bottom of the symbol. Unused pins and unused elements need not be shown. Figure 5-2 illustrates functionally equivalent symbols.

5.5.2 GENERAL SIGNAL ANNOTATION

S = Set input to bistable device

R = Reset (Clear) input to bistable device

G = Gate input has no direct action on circuit, but must be present before inputs (and/or outputs) are able to function. If more than one gate is used a numeric suffix is added (G1, G2, etc.)

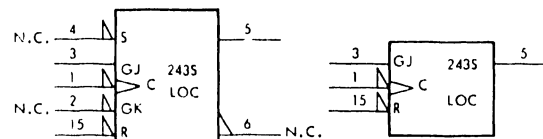
D = Identifies a signal which requires the presence of another signal to perform its function.

C = Strobe pulse. Usually used to gate "D" inputs into a bistable device.

T = Toggle input. Bistable device changes state each time "T" assumes its specified state.

J = J output conditioned by leading edge of dynamic toggle (G).

K = K output conditioned by leading edge of dynamic toggle (G).



BOTH SYMBOLS REPRESENT A BI-STABLE JK FF CIRCUIT WITH SOME OF THE PINS UNUSED. (N.C. INDICATES "NOT CONNECTED")

(AA142u)

FIGURE 5-2. FUNCTIONALLY EQUIVALENT SYMBOLS

5.5.3 SYMBOLOGY

Logic Symbols are described in Table 5-1.

TABLE 5-1. LOGIC SYMBOLOGY

	INDICATES NON-STANDARD LOGIC LEVELS		INDICATES NON-LOGIC (ANALOG) SIGNALS		A HIGH LEVEL ON THE LOWER INPUT "INHIBITS" THE BLOCK OUTPUT FROM ASSUMING ITS ACTIVE STATE
	TEST POINT		A LOW LEVEL ON THE LOWER INPUT "INHIBITS" THE BLOCK OUTPUT FROM ASSUMING ITS ACTIVE STATE		INPUTS TO THE COMMON CONTROL BLOCK AFFECT EVERY TERM IN THE ARRAY. INPUTS TO EACH TERM AFFECT ONLY THAT TERM.
	INDICATES TWO OR MORE LINES WHICH CARRY THE SAME INFORMATION (USUALLY DIFFERENTIALLY)		WIRED "AND" CIRCUIT		DYNAMIC INPUT ACTIVE DURING THE TRANSITION FROM LOW TO HIGH STATE
	DYNAMIC INPUT ACTIVE DURING THE TRANSITION FROM HIGH TO LOW STATE		LIGHT EMITTING DIODE		TRIAC

(AAI42c)

5.5.4 FUNCTION SYMBOLOGY

Function symbols are as described in Table 5-2.

TABLE 5-2. FUNCTION SYMBOLS

	GATE INPUT		OSCILLATOR		DECODER
	AMPLIFIER		DIGITAL TO ANALOG CONVERTER		VOLTAGE REGULATOR OUTPUT VALUE "m"
	"AND" GATE		MULTIPLEXER		SHIFT REGISTER
	"OR" GATE		COUNTER		ARITHMETIC LOGIC UNIT
	"EXCLUSIVE OR"		RECEIVER		ANNOTATION RESTRICTING THE NUMBER OF COINCIDENT INPUTS OR OUTPUTS GROUPED BELOW IT ACCORDING TO M. EXAMPLE: (≤ 1) MEANS ONLY ONE OR LESS COINCIDENT INPUT OR OUTPUT BELOW ALLOWED.
	FUNCTION GENERATOR		LEVEL CONVERSION		
	SCHMITT TRIGGER		SINGLE SHOT		
	SUMMING CIRCUIT		THRESHOLD (ANALOG OUTPUT) OR COMPARATOR (BINARY OUTPUT) PRODUCES A CHANGE IN THE OUTPUT SIGNAL WHEN INPUT EXCEEDS A PREDETERMINED LEVEL "m".		
	DATA INPUT				
	CONTROL or CLOCK INPUT				

(AAI42d)

5.5.5 ABBREVIATIONS

ADR = ADDRESS
AMP = AMPLIFIER
CART = CARTRIDGE
CNT = COUNT
COM = COMMON
CUR = CURRENT
CYL = CYLINDER
DIFF = DIFFERENCE
E = ERASE
EN = ENABLE
EOT = END OF TRAVEL
FWD = FORWARD
HD = HEAD
LD = LOAD
NC = NORMALLY CLOSED
NO = NORMALLY OPEN
PWR = POWER
R = READ
REV = REVERSE
RTZS = RETURN TO ZERO SEEK
SEL = SELECT
T = TRACK
T.A. = TRACK ADDRESS
VEL = VELOCITY
W = WRITE

5.5.6 IC INDEX AND CROSS REFERENCE

Refer to Table 5-3 for a cross-reference between CDC element number and manufacturer type.

TABLE 5-3. INTEGRATED CIRCUIT INDEX & CROSS REFERENCE

CDC DESIGNATION		MANUFACTURING DESIGNATION	
ELEMENT	PART NUMBER	TYPE	FUNCTION
4001	15135000	4001	CMOS QUAD 2 INPUT NOR
4002	15133000	4002	CMOS DUAL 4 INPUT NOR
4008	15133100	4008	CMOS 4 BIT ADDER
4011	15133200	4011	CMOS QUAD 2 INPUT NAND
4012	15133300	4012	CMOS DUAL 4 INPUT NAND
4013	15133400	4013	CMOS DUAL "D" FLIPFLOP
4019	15133500	4019	CMOS QUAD AND-OR-SELECT
4023	15133700	4023	CMOS TRIPLE 3 INPUT NAND
4024	15133800	4024	CMOS 7 STAGE BINARY COUNTER
4029	15134100	4029	CMOS PRESETTABLE UP-DOWN COUNTER
4030	15134200	4030	CMOS QUAD EXCLUSIVE OR
4035	15134300	4035	CMOS SHIFT REGISTER
4047	15134600	4047	CMOS RESETTABLE RETRIGGERABLE ONE-SHOT
4049	15134700	4049	CMOS HEX INVERTER BUFFER
4050	15134800	4050	CMOS HEX BUFFER
4053	15135100	4053	CMOS BIDIRECTIONAL ANALOG MUX
4528	15135400	4528	CMOS DUAL RESETTABLE RETRIGGERABLE ONE-SHOT
195	15104300	9602	TTL DUAL RETRIGGERABLE ONE-SHOT
175	15104800	7474	TTL DUAL "D" FLIPFLOP
146S	15109200	74504	TTL HEX INVERTER
243S	15109400	745112	TTL DUAL J-K FLIPFLOP
175S	1519700	74574	TTL DUAL "D" FLIPFLOP
140L	15112300	74L00	TTL QUAD 2 INPUT NAND
146L	15112700	74L04	TTL HEX INVERTER
341	15126600	LM339	QUAD COMPARATOR
327	15132600	MC1468	DUAL 15 VOLT REGULATOR
195L	15130700	96L02	TTL DUAL RETRIGGERABLE ONE-SHOT
146	36187100	7404 9016	TTL HEX INVERTER
209	36187900	7453	TTL 4 WIDE 2 INPUT AND-OR-INVERT
140H	36188700	74H00	TTL QUAD 2 INPUT NAND
141	50250700	7410 9003	TTL TRIPLE 3 INPUT NAND
173H	50251700	3004	TTL QUAD 2 INPUT NAND
149H	50251800	3021	TTL QUAD EXCLUSIVE OR
140S	50254600	74500	TTL QUAD 2 INPUT NAND
141S	50254700	74510	TTL TRIPLE 3 INPUT NAND
208S	50254900	74520	TTL DUAL 4 INPUT NAND
140	51651900	7400 9002	TTL QUAD 2 INPUT NAND
146	51701800	7404 9016	TTL HEX INVERTER
158	51761500	74161 9316	TTL 4 BIT BINARY COUNTER

(AA156a)

5.5.7 CIRCUIT TYPES AND WAVEFORMS

Figure 5-3 illustrates a typical integrated circuit. Figures 5-4 through 5-14 illustrates the various types of circuits and associated waveforms.

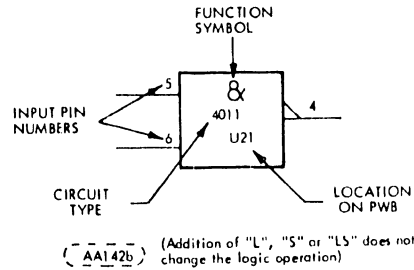


FIGURE 5-3. TYPICAL INTEGRATED CIRCUIT

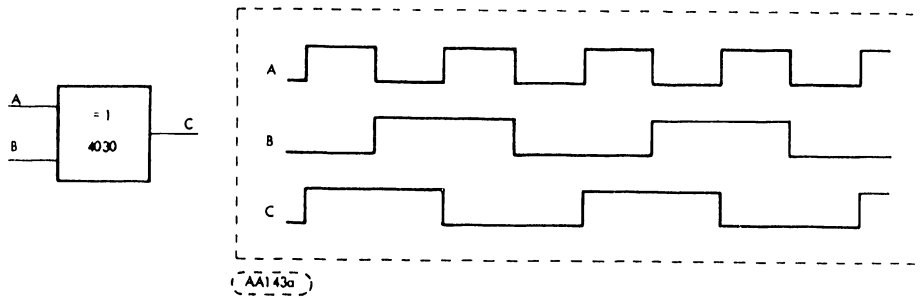


FIGURE 5-4. EXCLUSIVE OR

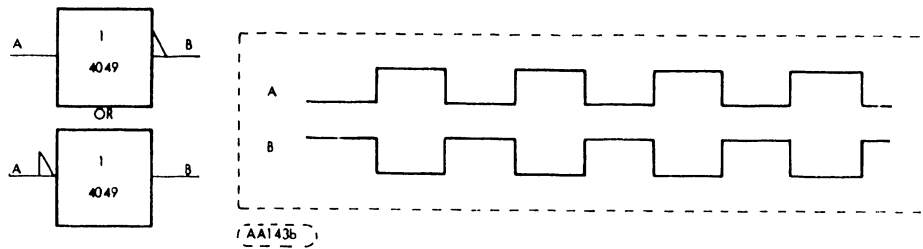


FIGURE 5-5. INVERT

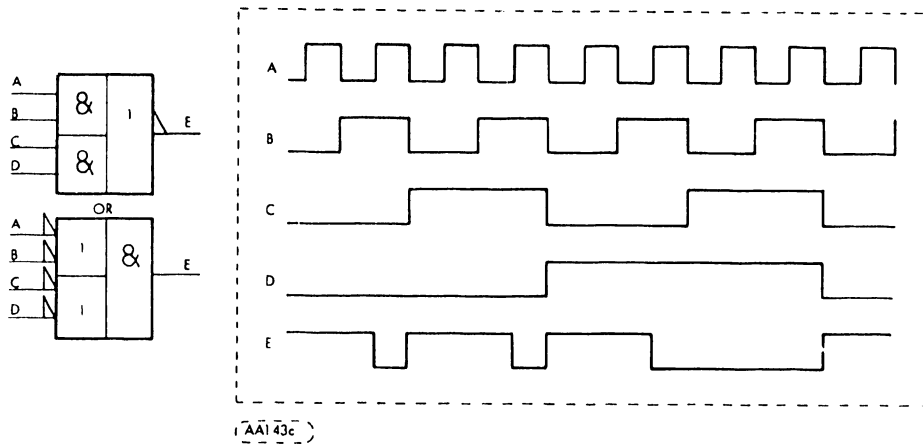


FIGURE 5-6. AND-OR-INVERT

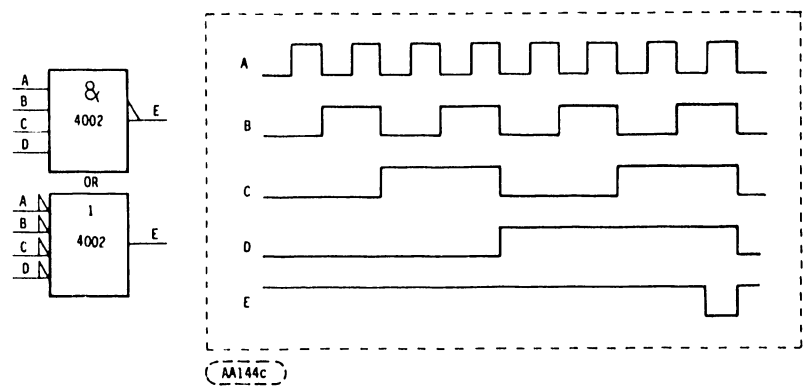
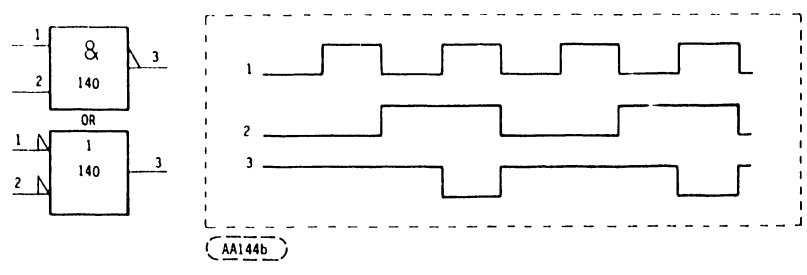
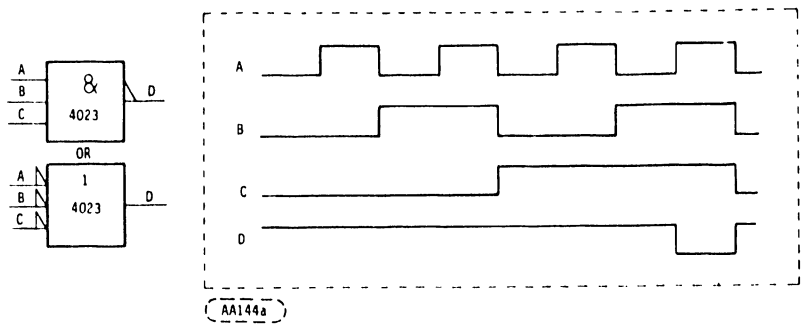


FIGURE 5-7 POSITIVE NAND NEGATIVE NOR

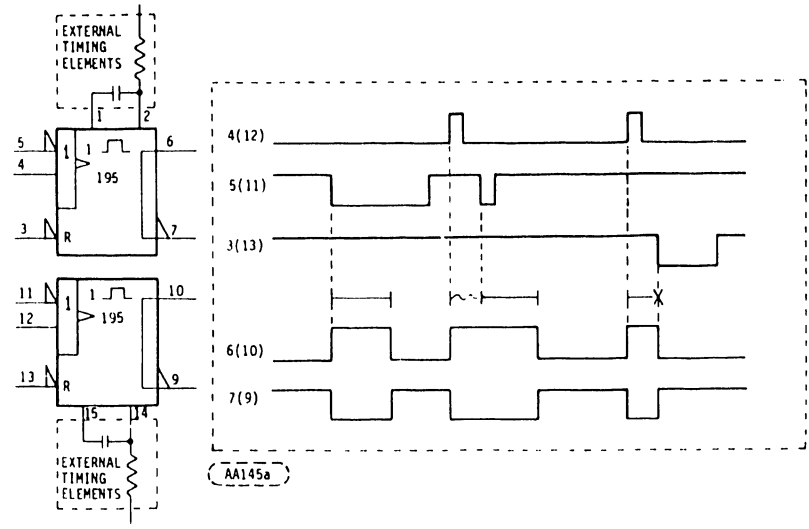


FIGURE 5-8. RETRIGGERABLE, RESETTABLE, MONOSTABLE MULTIVIBRATOR (ONE SHOT)

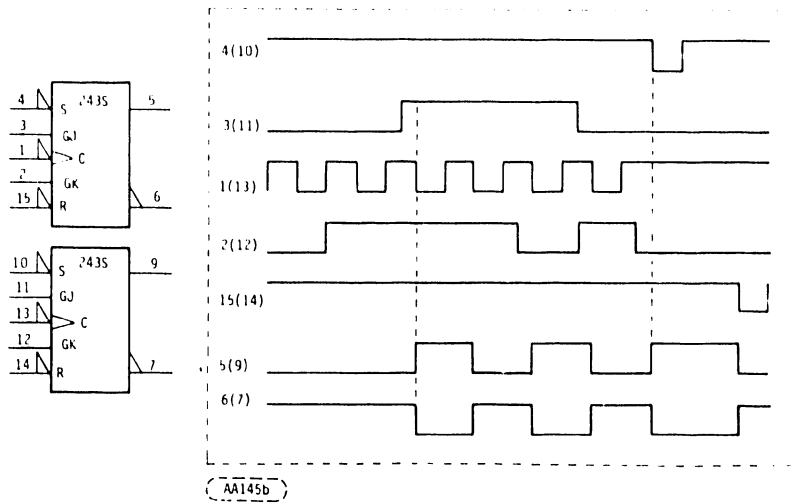


FIGURE 5-9. 'JK' TYPE F/F

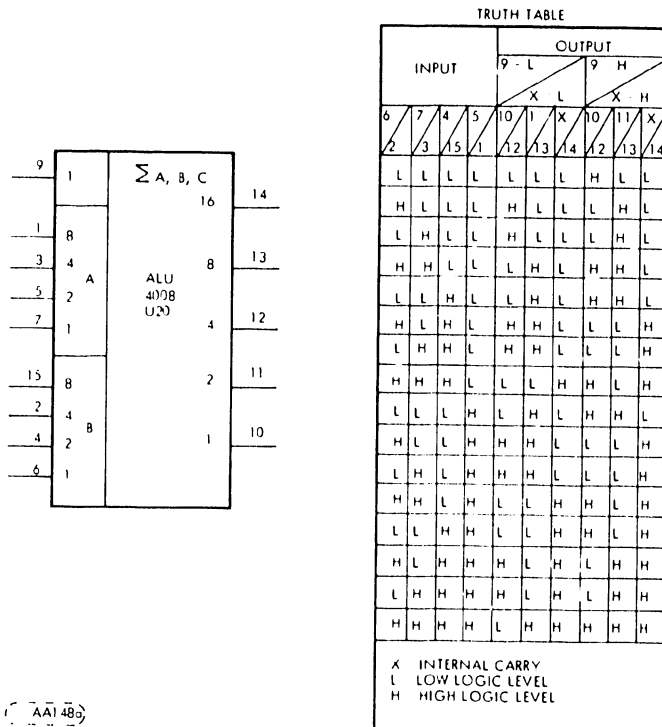


FIGURE 5-10. ADDER

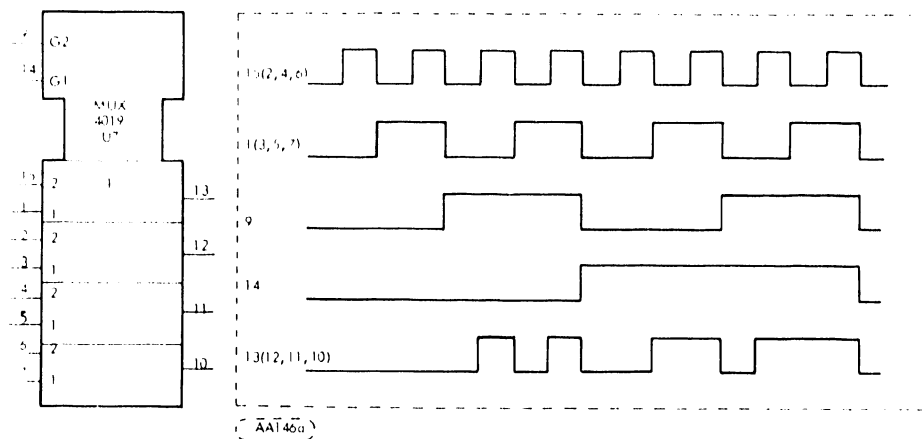


FIGURE 5-11. QUAD 2 X 1 MULTIPLEXER

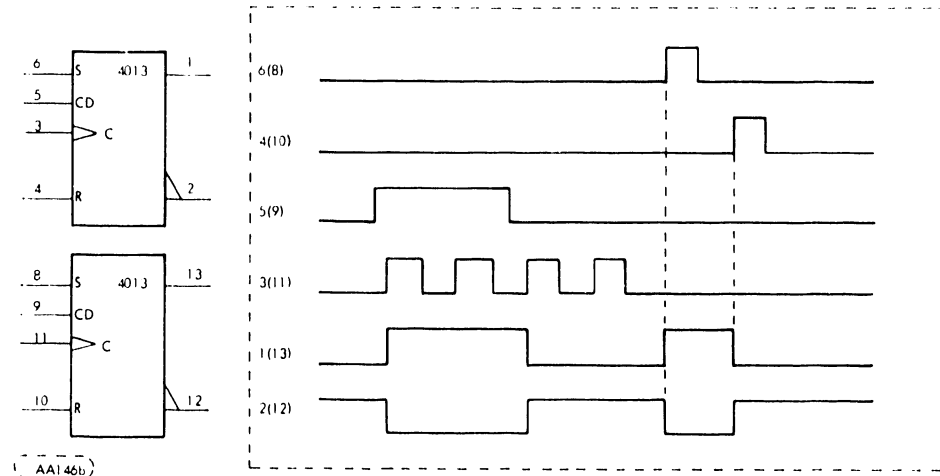
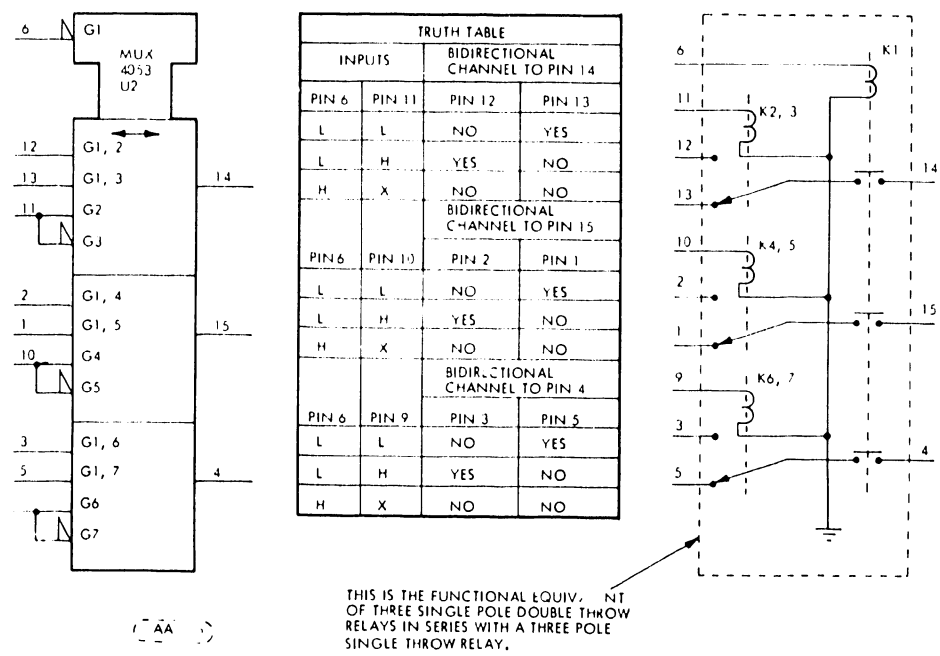
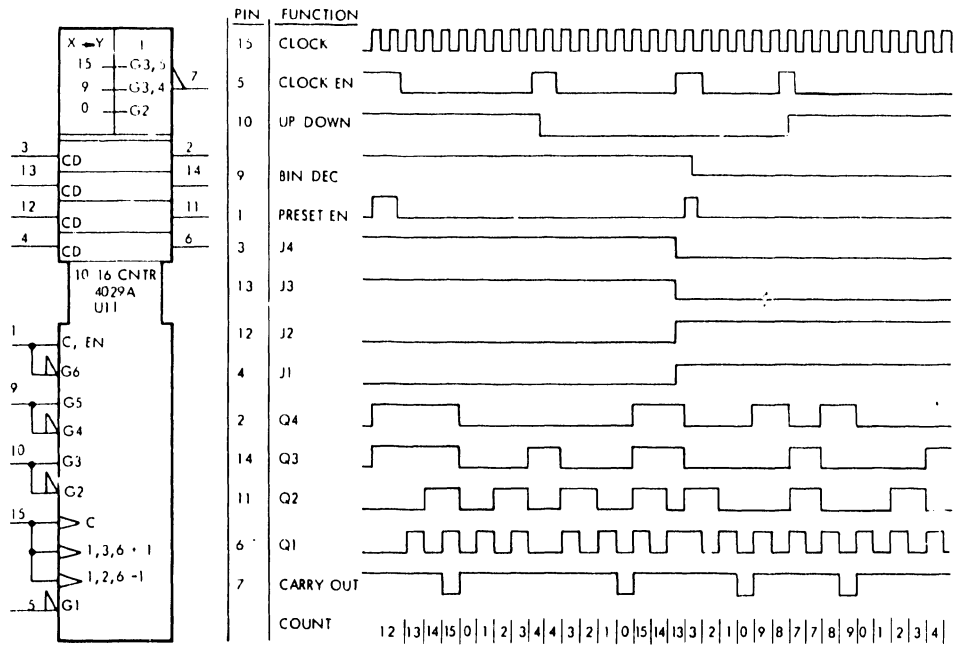


FIGURE 5-12. 'D' TYPE F/F



THIS IS THE FUNCTIONAL EQUIV. NT OF THREE SINGLE POLE DOUBLE THROW RELAYS IN SERIES WITH A THREE POLE SINGLE THROW RELAY.

FIGURE 5-13. BIDIRECTIONAL ANALOG MULTIPLEXER

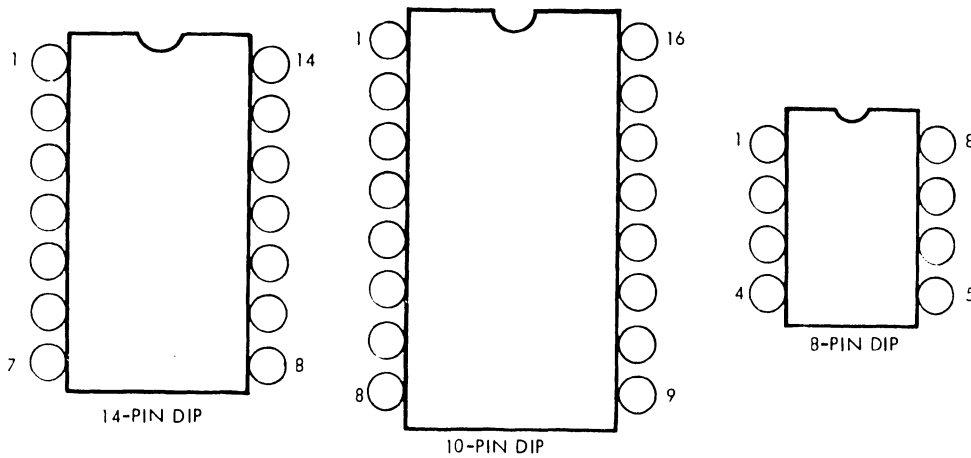


(AA149b)

FIGURE 5-14. DECIMAL/BINARY UP/DOWN PRESETTABLE COUNTER

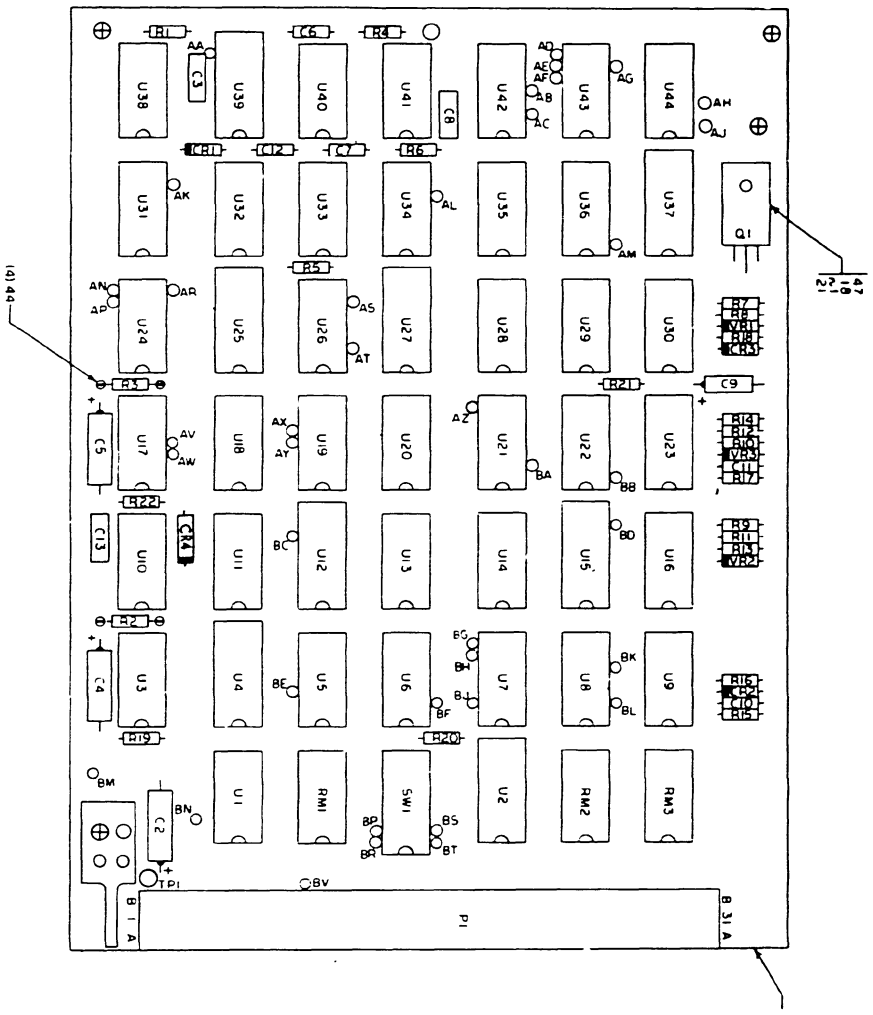
5.5.8 IC PACKAGE LAYOUT

The pin locations for typical Integrated Circuit (IC) packages are shown below.



(TOP VIEW)

(BB009a)



CAP	PL ITEM
C1	—
C2	32
C3	36
C4	32
C5	32
C6	37
C7	37
C8	36
C9	33
C10	34
C11	34
C12	35
C13	36
C14	46
C15	—
C16	—

REG	PL ITEM
VR1	16
VR2	17
VR3	17

TSTR	PL ITEM
Q1	18

RES	PL ITEM
R1	28
R2	43
R3	45
R4	30
R5	30
R6	31
R7	22
R8	22
R9	23
R10	23
R11	26
R12	26
R13	24
R14	24
R15	27
R16	29
R17	27
R18	29
R19	25
R20	25
R21	25
R22	38
R23	—
R24	—

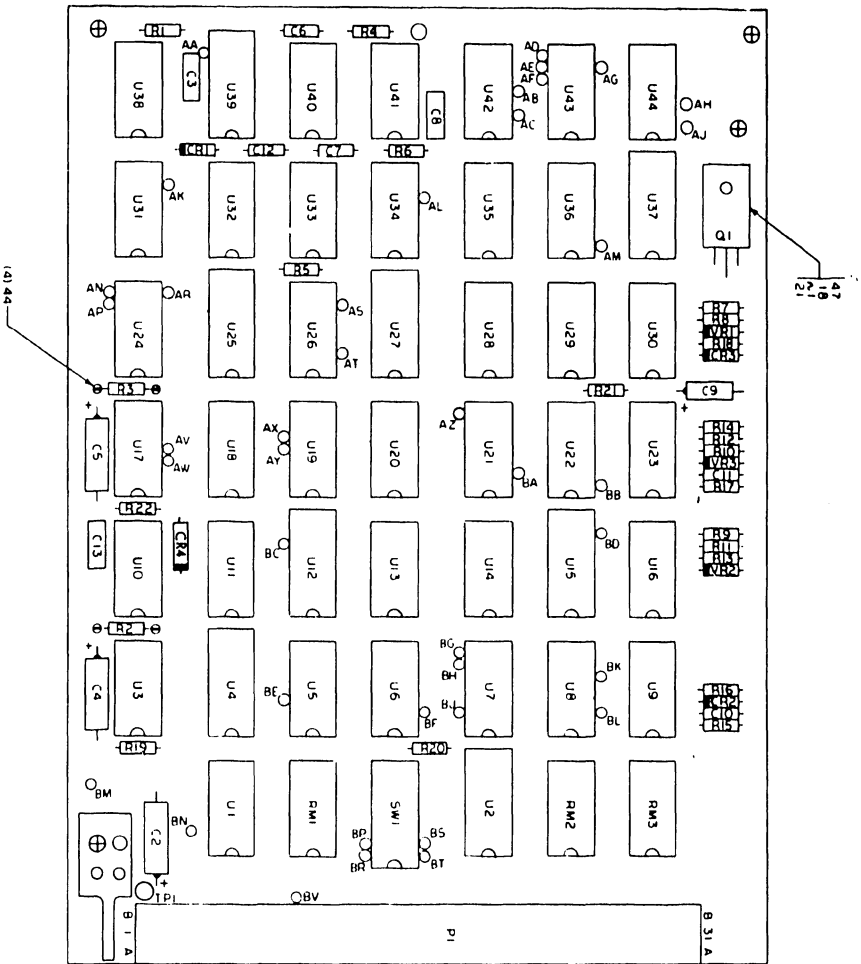
DIODE	PL ITEM
CR1	13
CR2	13
CR3	13
CR4	20
CR5	8

IC	PL ITEM
U1	10
U2	3
U3	9
U4	4
U5	9
U6	9
U7	10
U8	9
U9	8
U10	5
U11	10
U12	3
U13	9
U14	9
U15	3
U16	8
U17	6
U18	1
U19	7
U20	11
U21	6
U22	10
U23	8
U24	5
U25	3
U26	10
U27	3
U28	10
U29	9
U30	8
U31	10
U32	11
U33	6
U34	6
U35	7
U36	10
U37	4
U38	11
U39	3
U40	5
U41	12
U42	7
U43	10
U44	10

RES MOD	PL ITEM
RM1	15
RM2	15
RM3	14

(5132a)

FIGURE 5-15. CONTROL BOARD ASSEMBLY (SHEET 1 OF 7)



CAP	PL ITEM
C1	—
C2	32
C3	36
C4	32
C5	32
C6	37
C7	37
C8	36
C9	33
C10	34
C11	34
C12	35
C13	36
C14	46
C15	—
C16	—

REG	PL ITEM
VR1	16
VR2	17
VR3	17

TSTR	PL ITEM
Q 1	18

RES	PL ITEM
R1	28
R2	43
R3	45
R4	30
R5	30
R6	31
R7	22
R8	22
R9	23
R10	23
R11	26
R12	26
R13	24
R14	24
R15	27
R16	29
R17	27
R18	29
R19	25
R20	25
R21	25
R22	38
R23	—
R24	—

DIODE	PL ITEM
CR1	13
CR2	13
CR3	13
CR4	20
CR5	20

IC	PL ITEM
U1	10
U2	3
U3	9
U4	4
U5	9
U6	9
U7	10
U8	9
U9	8
U10	5
U11	10
U12	3
U13	9
U14	9
U15	3
U16	8
U17	6
U18	11
U19	7
U20	11
U21	6
U22	10
U23	8
U24	5
U25	3
U26	10
U27	3
U28	10
U29	9
U30	8
U31	10
U32	11
U33	6
U34	6
U35	7
U36	10
U37	4
U38	11
U39	3
U40	5
U41	12
U42	7
U43	10
U44	10

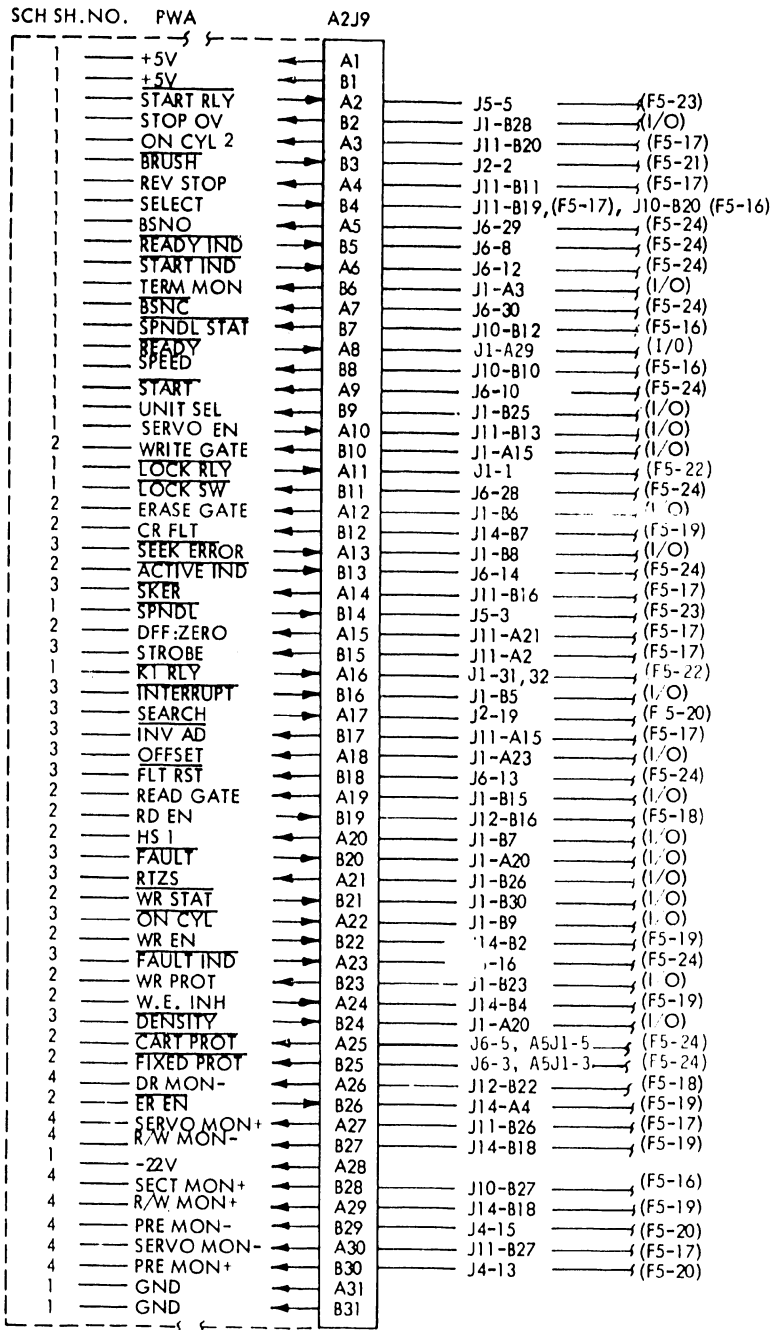
RES MOD	PL ITEM
RM1	15
RM2	15
RM3	14

G132a

FIGURE 5-15. CONTROL BOARD ASSEMBLY (SHEET 1 OF 7)

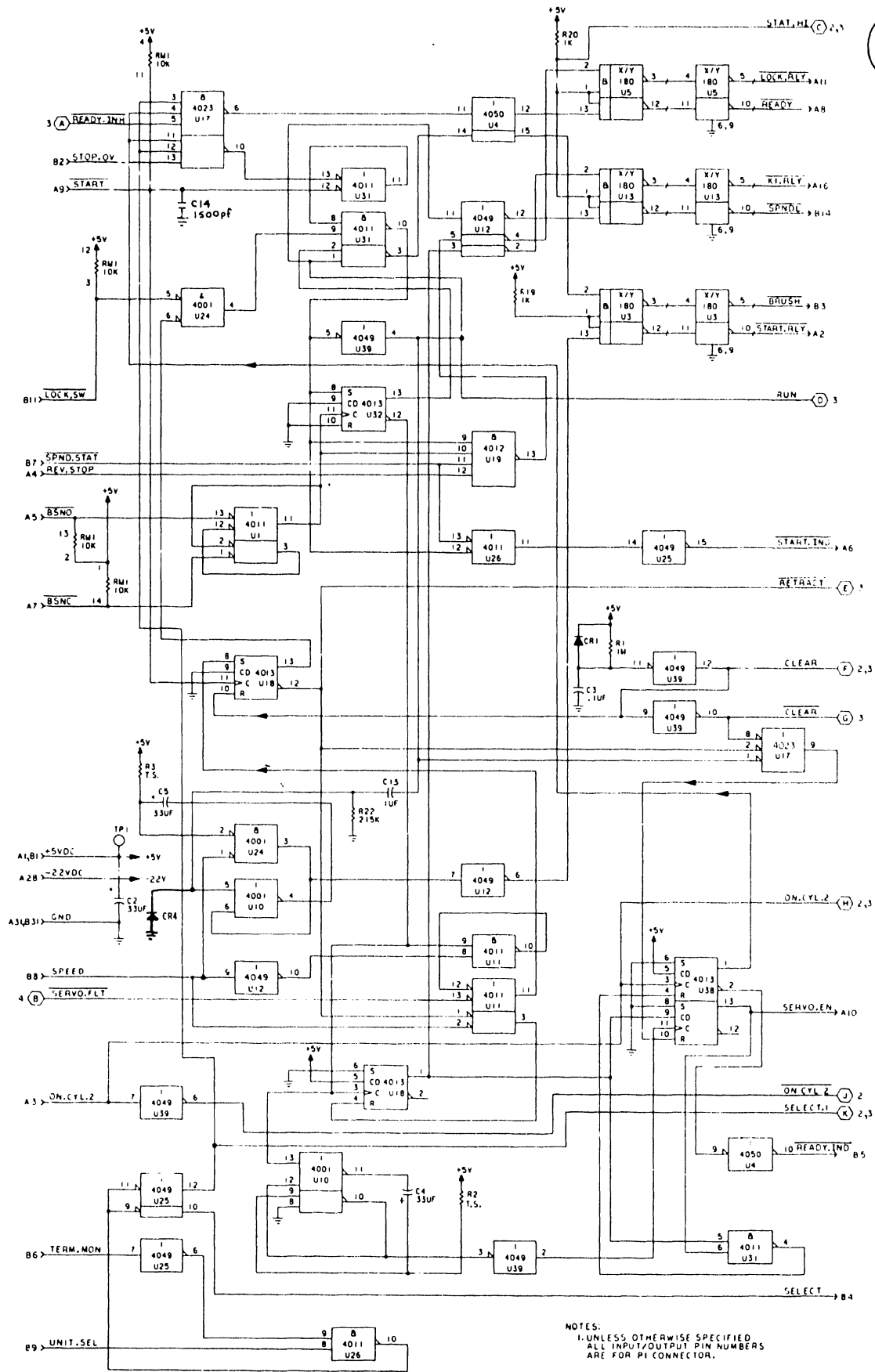
<u>ITEM NO.</u>	<u>IDENTIFICATION NUMBER</u>	<u>DRAWING TITLE</u>
	75885452	PWA, Control Board
	75297509	PWA, Control Board . . .Intch
1	75892420	PWB, Control Board
2	77836070	PWB Socket Connector
3	15134700	IC CMOS 4049B
4	15134800	IC CMOS 4050B
5	15135000	IC CMOS 4001B
6	15133700	IC CMOS 4023B
7	15133300	IC CMOS 4012B
8	95794600-7	IC LM339
8	15126600	IC LM339. Intch
9	51768200	IC Dual
10	15133200	CMOS 4011B
11	15133400	CMOS 4013B
12	15134600	IC 4047 CMOS 1 Shot
13	51736700	Diode 1N914A
14	75009901	Res Pac 2% 1.0K (13)
15	75009993	Res Pac 2% 10K (7)
16	50240107	Volt Reg 5.6 V 5%
17	50240101	Diode Zener 3.3V
18	75752400	Transistor Power
19	83452205	Switch-8 Position
20	50241403	Diode 1N6263
21	93640012	Stud-Self Clinching
22	94360344	Res 1/4W 1% 2.87K
23	94360187	Res 1/4W 1% 80.6
24	94360287	Res 1/4W 1% 806
25	94360300	Res 1/4W 1% 1.00K
26	94360317	Res 1/4W 1% 1.50K
27	94360346	Res 1/4W 1% 3.01K
28	94360596	Res 1/4W 1% 1.00 Meg
29	94360500	Res 1/4W 1% 100K
30	94360457	Res 1/4W 1% 39.2K
31	92512629	Res 2.2M Ohm 1/4W 1
32	24504353	Cap 10V 20% 33UF
33	24504329	Cap 35V 20% 1.0UF
34	75808533	Cap 100V 10% 4700
35	94361400	Cap 50V + 80 - 20% 0.1 uf.
36	92496046	Capacitor .1UF .50V
37	92496219	Capacitor 2200 PF
38	94360532	Res 1/4W 1% 215K
39	92498021	Terminal, Swaged
40	83479901	Key, Inject. Mold
41	10125703	Scr Flat Hd
42	75312701	Spec-Adhesive, Epoxy
43	92512000	Resistor Test Sel.
44	77612165	Terminal, Slotted
44	75732602	Pin-Wire Wrap-Intch
45	94357500	Resistor Test Sel
46	92496217	Cap 100V 20% 1500
47	92583002	Nut Lock

CONTROL BOARD



AA092a

FIGURE 5-15. CONTROL BOARD (SHEET 3 OF 7)



NOTES:
1. UNLESS OTHERWISE SPECIFIED,
ALL INPUT/OUTPUT PIN NUMBERS
ARE FOR PI CONNECTOR.

FIGURE 5-15. CONTROL BOARD ASSEMBLY (SHEET 4 OF 7)

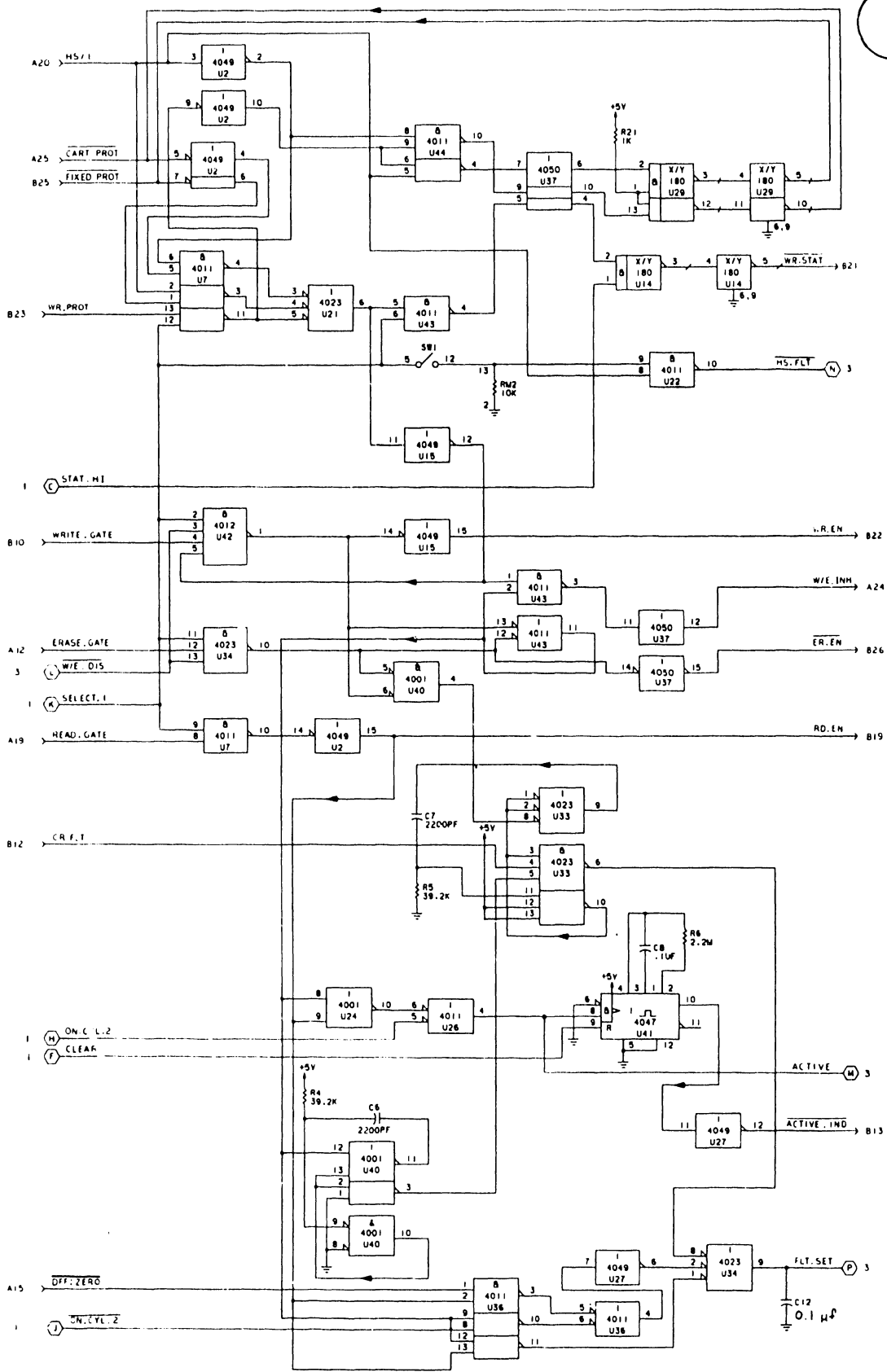


FIGURE 5-15. CONTROL BOARD ASSEMBLY (SHEET 5 OF 7)

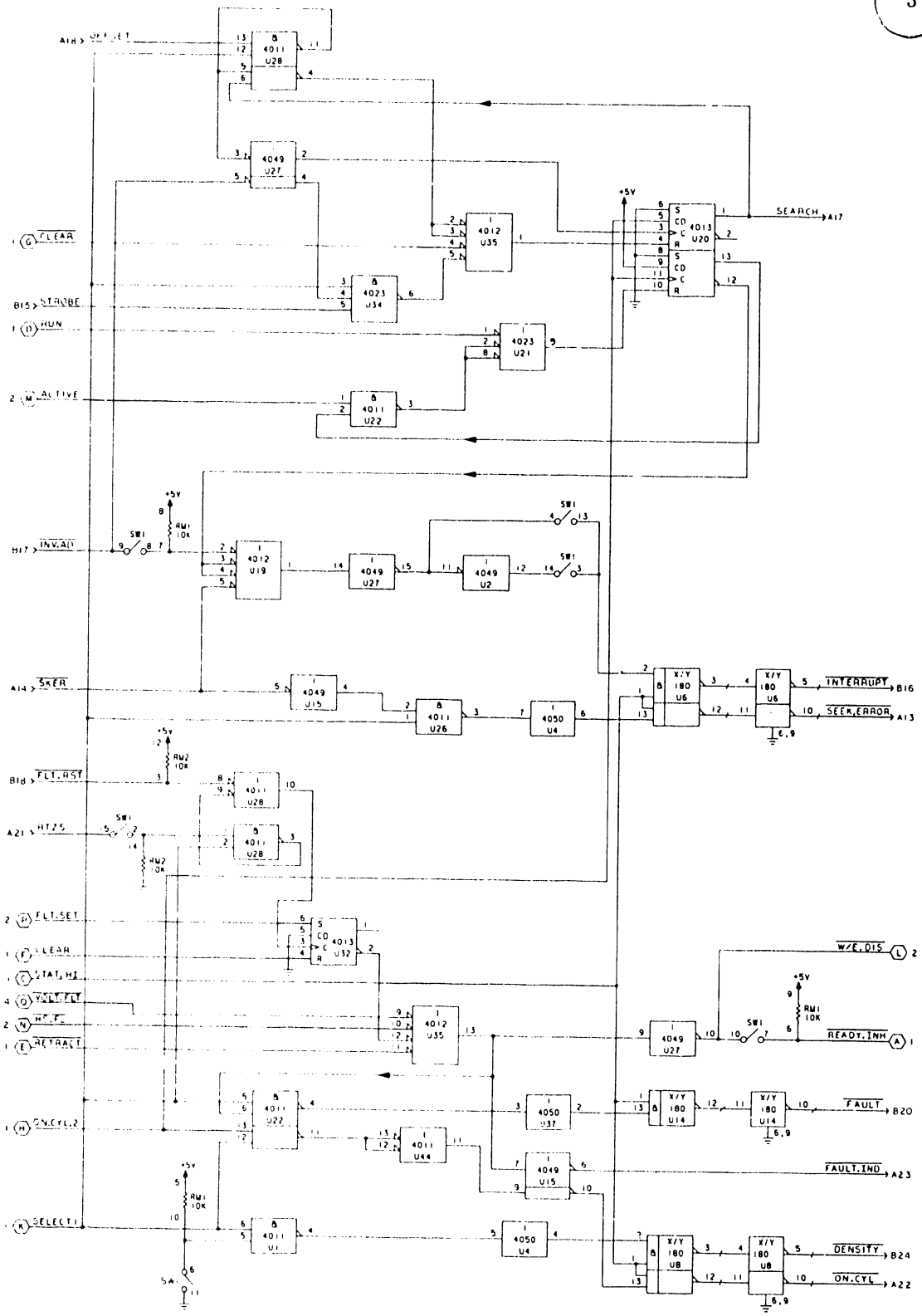


FIGURE 5-15. CONTROL BOARD ASSEMBLY (SHEET 6 OF 7)

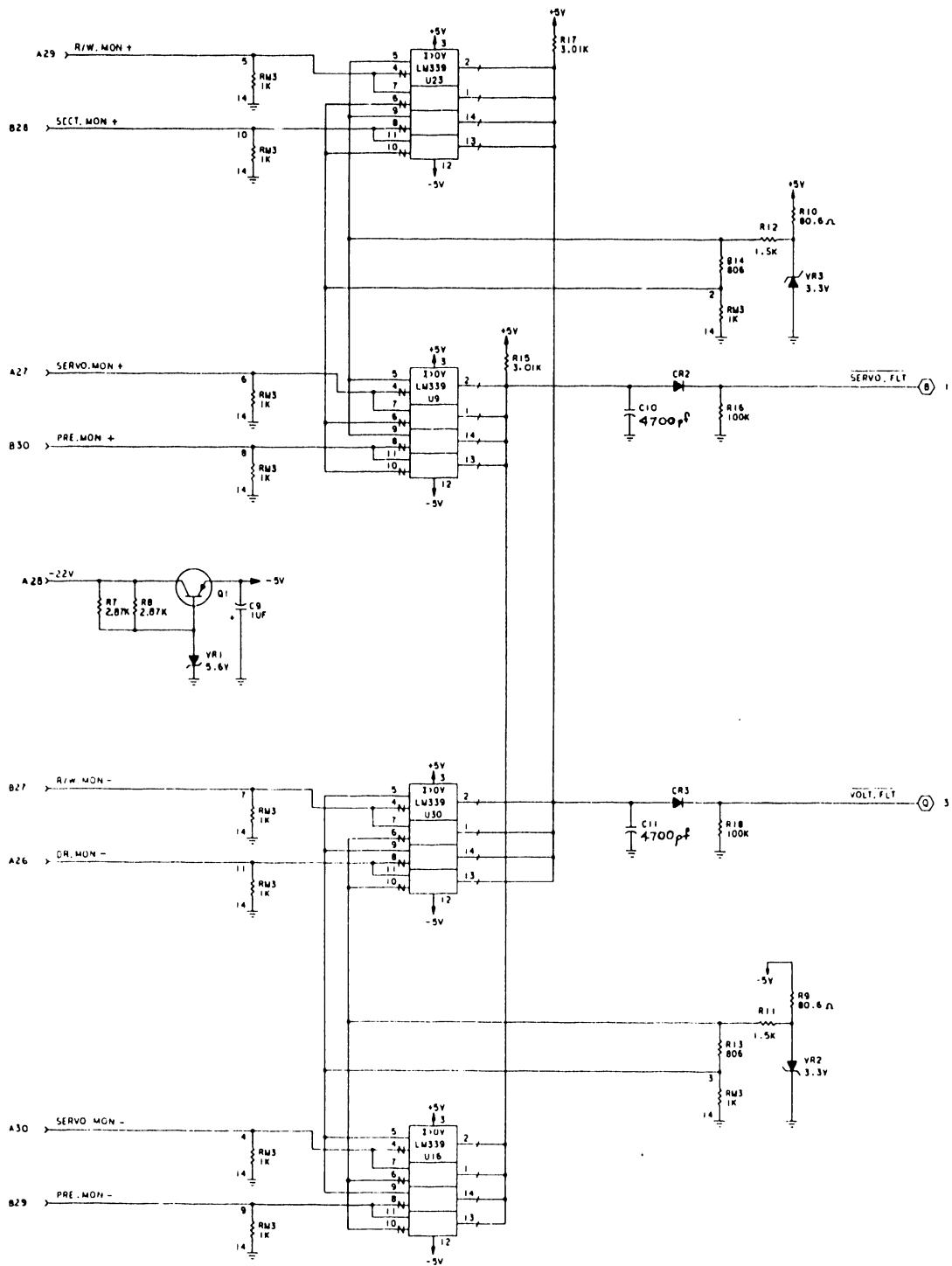
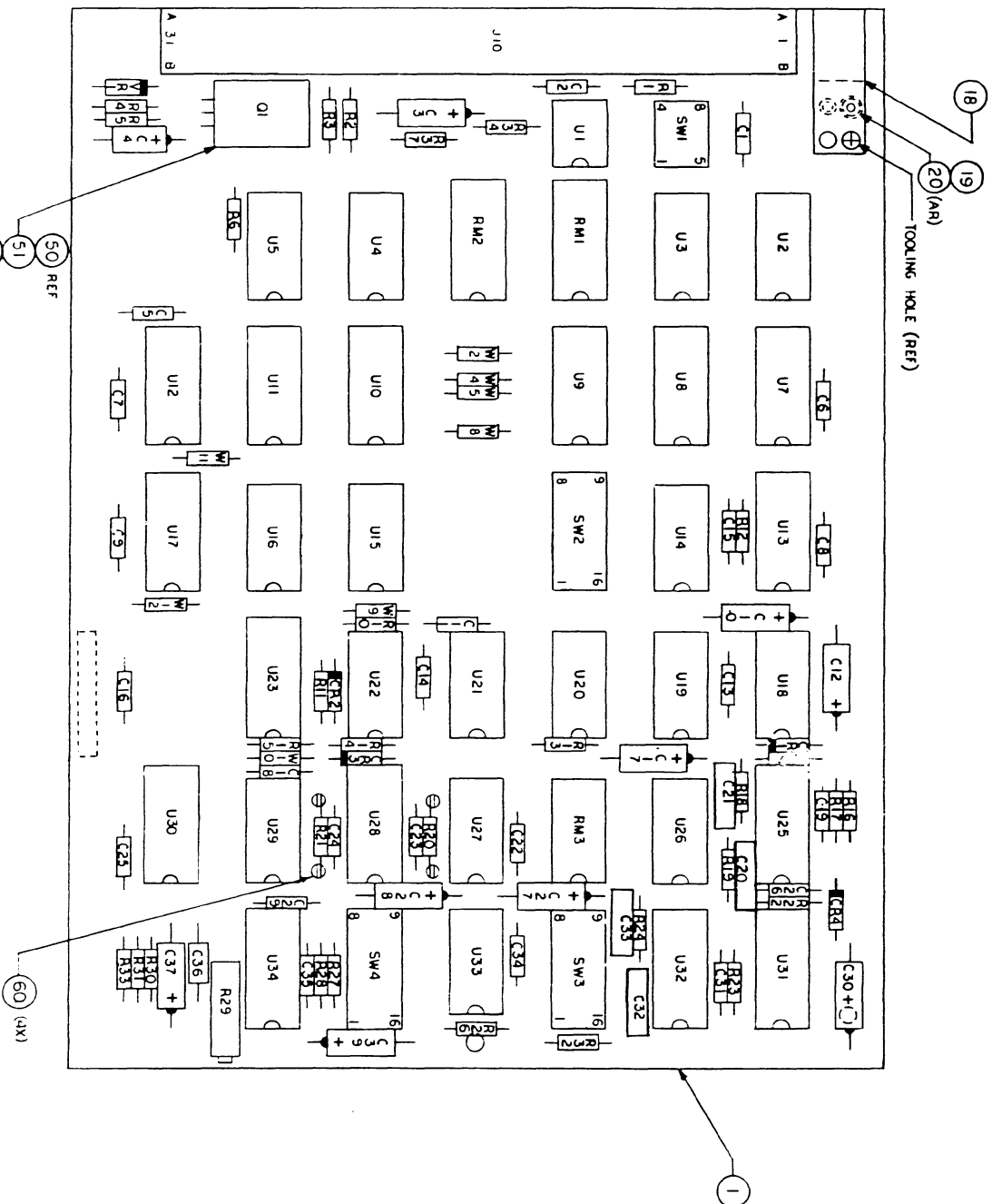


FIGURE 5-15. CONTROL BOARD ASSEMBLY (SHEET 7 OF 7)



JUMP	PL ITEM
W 1	52
W 2	52
W 3	52
W 4	52
W 5	52
W 6	52
W 7	52
W 8	52
W 9	52
W 10	52
W 11	52
W 12	52
W 13	52
W 14	52

CONN	PL ITEM
J10	2

DIO	PL ITEM
CR1	22
CR2	22
CR3	22
CR4	22

VOLT REG	PL ITEM
VRI	21

TSTR	PL ITEM
Q1	50

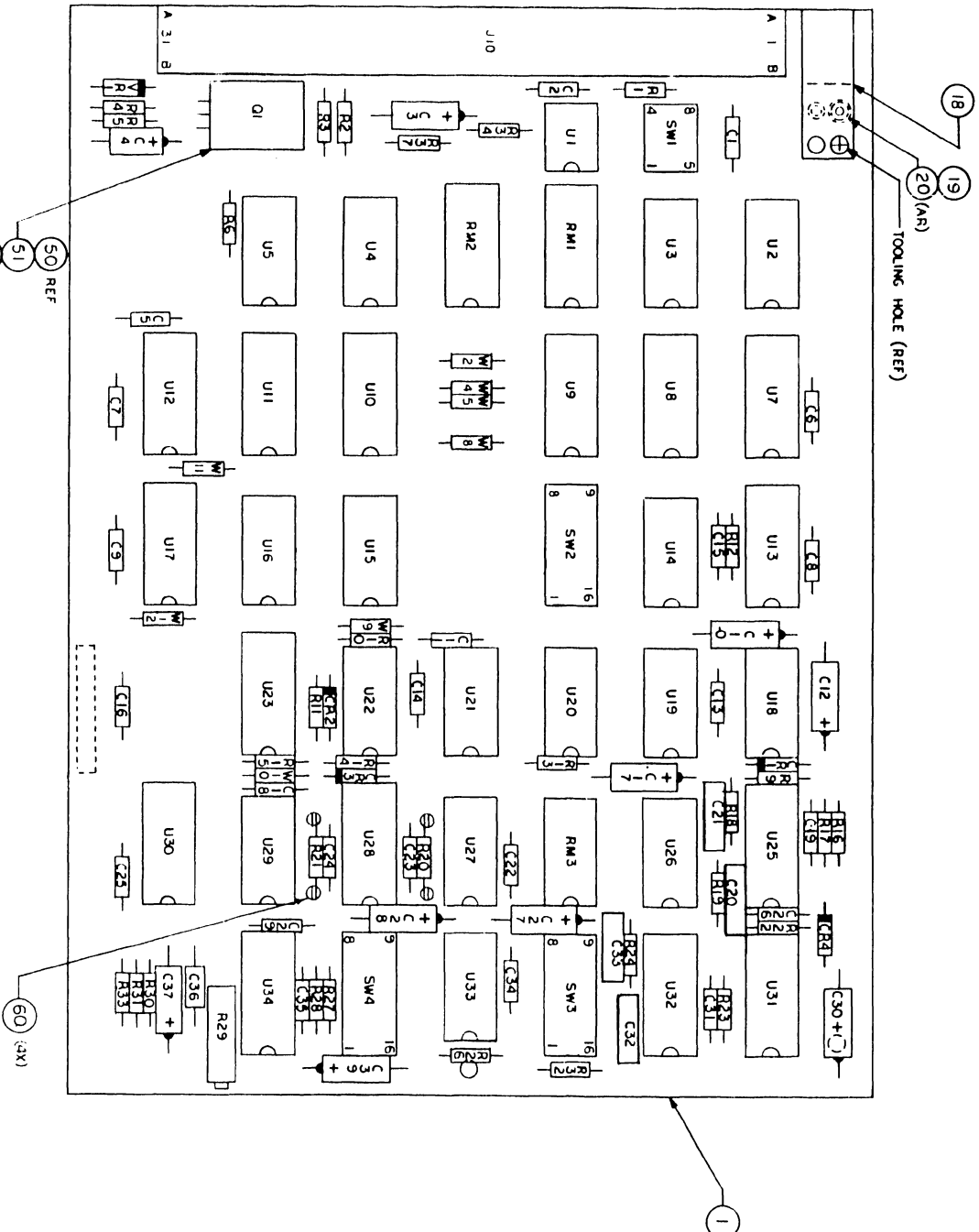
RES MOD	PL ITEM
RM1	15
RM2	15
RM3	14

SW	PL ITEM
SW1	16
SW2	17
SW3	17
SW4	17

IC	PL ITEM
U1	13
U2	11
U3	11
U4	11
U5	11
U6	11
U7	10
U8	7
U9	9
U10	9
U11	7
U12	10
U13	10
U14	3
U15	6
U16	8
U17	10
U18	5
U19	5
U20	6
U21	8
U22	5
U23	9
U24	1
U25	4
U26	5
U27	6
U28	4
U29	5
U30	9
U31	9
U32	4
U33	3
U34	12
U35	1

RES	PL ITEM
R1	47
R2	33
R3	33
R4	44
R5	44
R6	38
R7	1
R8	1
R9	34
R10	36
R11	45
R12	45
R13	48
R14	45
R15	36
R16	34
R17	46
R18	42
R19	42
R20	57
R21	57
R22	45
R23	43
R24	39
R25	1
R26	35
R27	38
R28	49
R29	41
R30	40
R31	38
R32	37
R33	38
R34	38
R35	1
R36	1
R37	46

CAP	PL ITEM
C1	30
C2	30
C3	23
C4	27
C5	30
C6	30
C7	30
C8	30
C9	30
C10	23
C11	29
C12	31
C13	30
C14	28
C15	29
C16	30
C17	31
C18	29
C19	55
C20	24
C21	25
C22	30
C23	56
C24	56
C25	30
C26	29
C27	31
C28	23
C29	26
C30	31
C31	32
C32	24
C33	25
C34	30
C35	29
C36	26
C37	31
C38	1
C39	31
C40	1
C41	1



JUMP	PL ITEM
W 1	-
W 2	52
W 3	-
W 4	52
W 5	52
W 6	-
W 7	-
W 8	52
W 9	52
W 10	52
W 11	52
W 12	52
W 13	-
W 14	-

CONN	PL ITEM
J10	2

DIO	PL ITEM
CR1	22
CR2	22
CR3	22
CR4	22

VOLT REG	PL ITEM
VRI	21

TSTR	PL ITEM
Q1	50

RES MOD	PL ITEM
RM1	15
RM2	15
RM3	14

SW	PL ITEM
SW1	16
SW2	17
SW3	17
SW4	17

IC	PL ITEM
U1	13
U2	11
U3	11
U4	11
U5	11
U6	-
U7	10
U8	7
U9	9
U10	9
U11	7
U12	10
U13	10
U14	3
U15	6
U16	8
U17	10
U18	8
U19	5
U20	6
U21	8
U22	5
U23	9
U24	-
U25	4
U26	5
U27	6
U28	4
U29	5
U30	9
U31	9
U32	4
U33	3
U34	12
U35	-

RES	PL ITEM
R1	47
R2	33
R3	33
R4	44
R5	44
R6	38
R7	-
R8	-
R9	34
R10	36
R11	45
R12	45
R13	48
R14	45
R15	36
R16	34
R17	46
R18	42
R19	42
R20	52
R21	52
R22	45
R23	43
R24	39
R25	-
R26	35
R27	38
R28	49
R29	41
R30	40
R31	38
R32	37
R33	38
R34	38
R35	-
R36	-
R37	46

CAP	PL ITEM
C1	30
C2	30
C3	23
C4	27
C5	30
C6	30
C7	30
C8	30
C9	30
C10	23
C11	29
C12	31
C13	30
C14	28
C15	29
C16	30
C17	31
C18	29
C19	55
C20	24
C21	25
C22	30
C23	56
C24	56
C25	30
C26	29
C27	31
C28	23
C29	28
C30	31
C31	32
C32	24
C33	25
C34	30
C35	29
C36	26
C37	31
C38	-
C39	31
C40	-
C41	-

FIGURE 5-16. SECTOR BOARD ASSEMBLY (SHEET 1 OF 8)

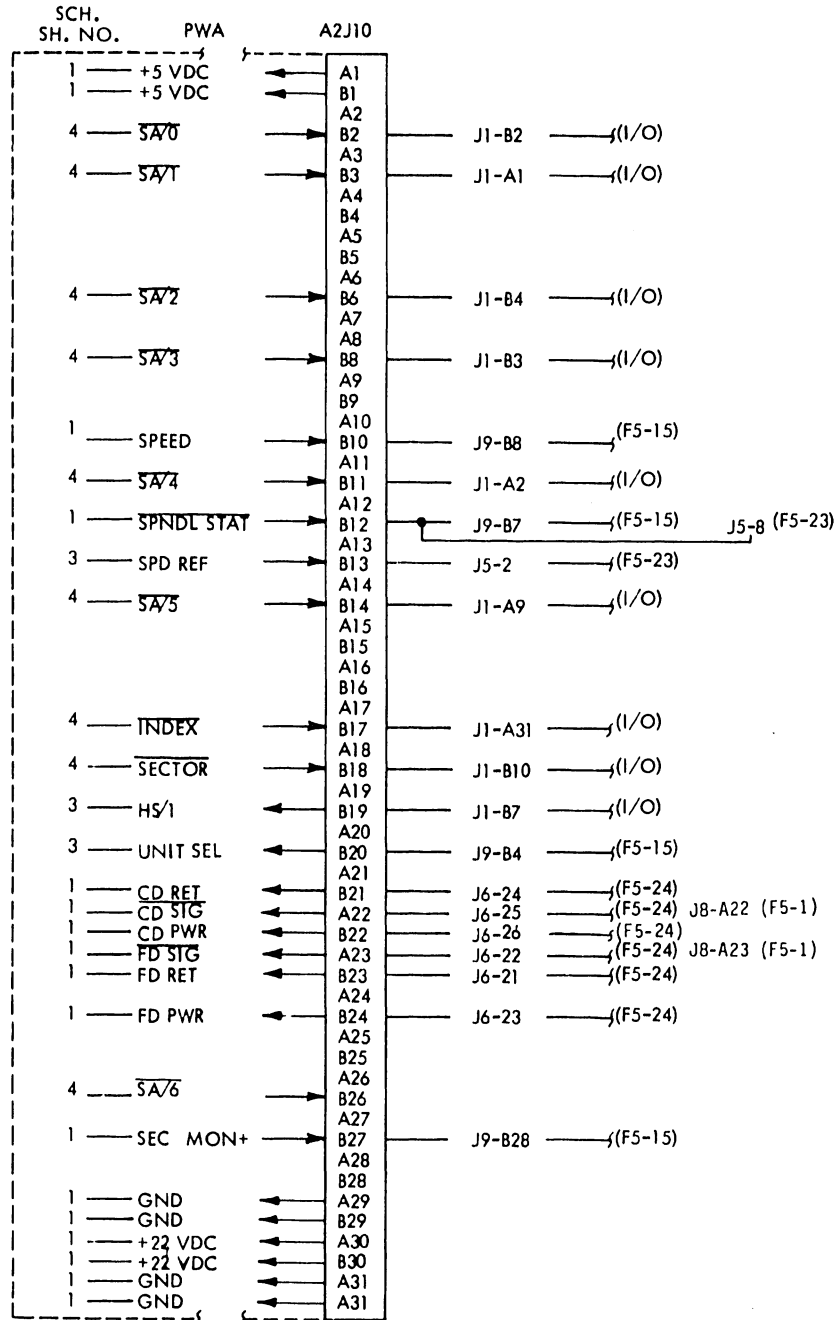
<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
	77622951-0	PWA, Hard Sector
	75883202	PWA, Sector Level 3 . . . Intch
1	77622970-0	PWB Sector Level 3
2	77836070-1	PWB Socket Connector
3	15133800-1	IC CMOS 4024B
4	15164435-8	IC 4538B
5	15135000-6	IC CMOS 4001B
6	15133400-0	IC CMOS 4013B
7	15133500-7	IC CMOS 4019B
8	15133200-4	IC CMOS 4011B
9	15134700-2	IC CMOS 4049B
10	15134100-5	IC CMOS 4029B
11	51768200-1	IC Dual
12	15150700-1	IC, 96L02
13	15112100-1	IC NE555
14	75009993-9	Res Pac 2% 10K (7)
15	75738605-7	Resistor Module 150
16	83452201-3	Switch-4 Position
17	83452205-4	Switch-3 Position
18	83479701-1	Key, Inject Mold
19	10125703-8	Scr Flat Hd
20	75312701-8	Spec-Epoxy Adhesive
21	50240118-5	Diode Zener 16V
22	51736700-9	Diode 1N914A
23	24504353-4	Cap 10V 20% 33UF
24	94227261-8	Cap 500V 2% 3300
25	94227256-8	Cap 500V 2% 2000
26	15164040-6	Cap 4700
27	24504329-4	Cap 35V 20% 1.0 UF
28	92496205-3	Cap 100V 10% 100
29	92496215-2	Cap 100V 10% 1000
30	92496227-7	Cap 100V 20% .01UF
31	92427039-0	Cap Electro 6.8MF 35
32	17706704-8	Cap 10V 10% 2.2UF
33	94360328-2	Res 1/4W 1% 1.96K
34	94360224-3	Res 1/4W 1% 178
35	94360534-5	Res 1/4W 1% 226K
36	94360416-5	Res 1/4W 1% 14.7K
37	17705946-6	Res 1/4W 5% 2.7Meg
38	24500067-4	Res 1/4W 5% 1.5K
39	94360486-8	Res 1/4W 1% 78.7K
40	94360420-7	Res 1/4W 1% 16.2K
41	77612042-0	Res VAR 3/4W 10% 100K

FIGURE 5-16. SECTOR BOARD ASSEMBLY (SHEET 2 OF 8)

<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
42	94360487-6	Res 1/4W 1% 80.6K
43	94360400-9	Res 1/4W 1% 10.0K
44	94360300-1	Res 1/4W 1% 1.00K
45	94360454-6	Res 1/4W 1% 36.5K
46	94360400-9	Res 1/4W 1% 10.0K
47	94360100-5	Res 1/4W 1% 10.0
48	17705936-7	Res 1/4W 5% 1.0 Meg
49	94360468-6	Res 1/4W 1% 51.1K
50	75752300-6	Transistor Power
51	95683502-3	Stud, Press
52	94357500-1	Res Test Select
53	92583002-8	Nut Lock
55	94240429-4	Cap 50V 10% 820
56	77612395-2	Cap 50V 5% 1000
58	77612165-9	Terminal, Slotted
60	77612165-9	Terminal, Slotted

FIGURE 5-16. SECTOR BOARD ASSEMBLY (SHEET 3 OF 8)

SECTOR BOARD



(AA091b)

FIGURE 5-16. SECTOR BOARD ASSEMBLY (SHEET 4 OF 8)

FIGURE 5-16. SECTOR BOARD ASSEMBLY (SHEET 5 OF 8)

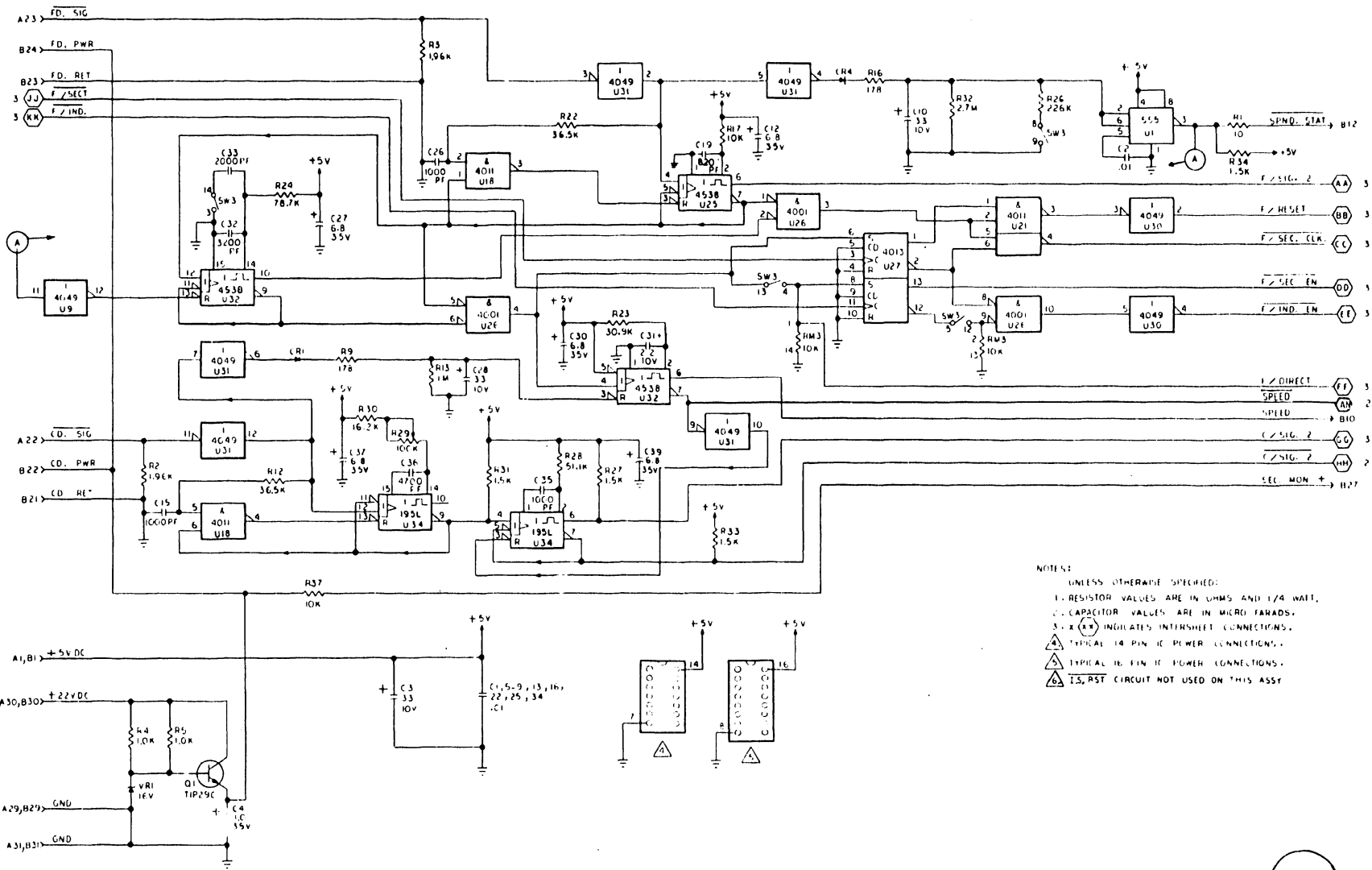
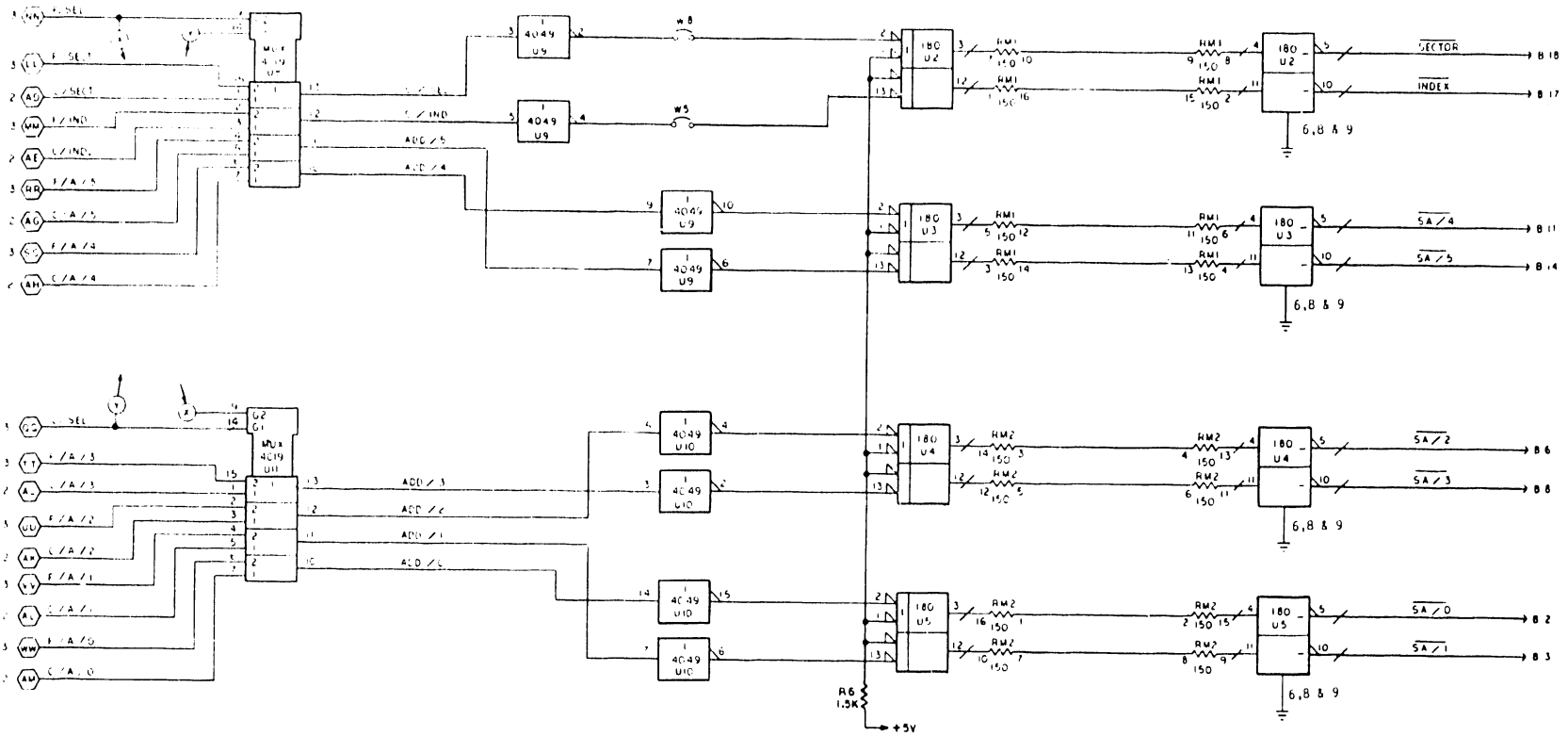
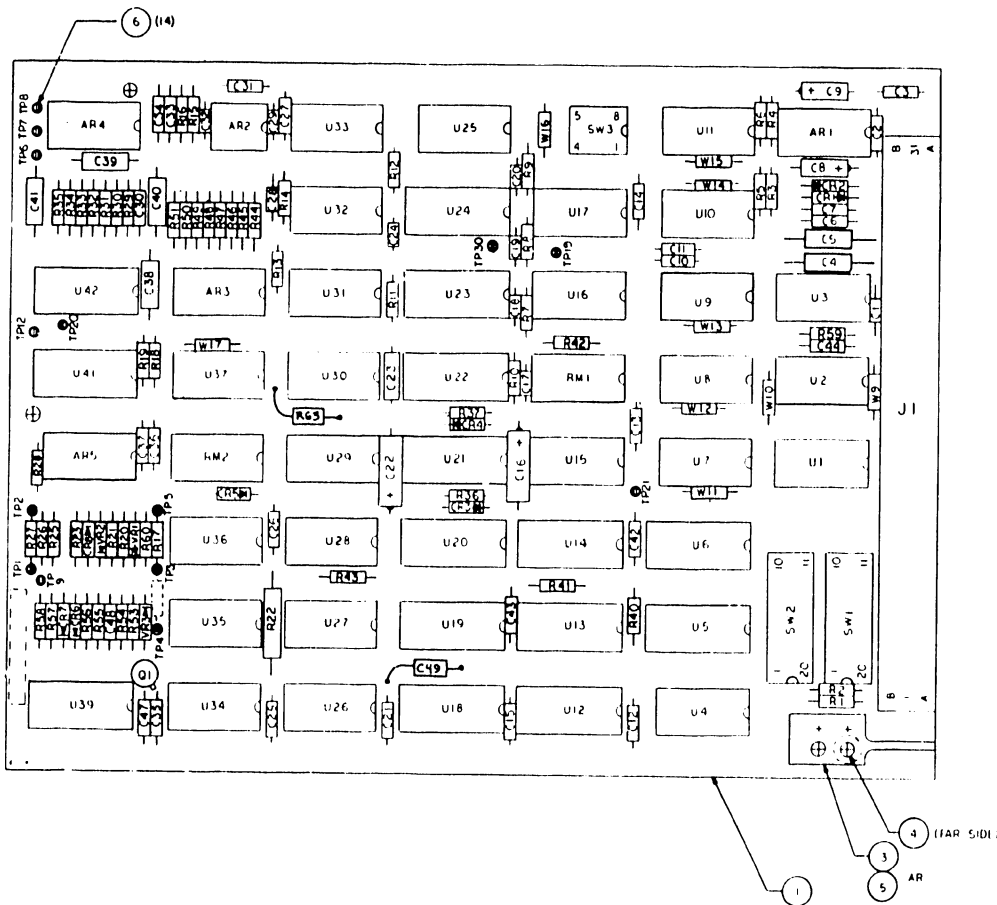


FIGURE 5-16. SECTOR BOARD ASSEMBLY (SHEET 8 OF 8)





RES	PL ITEM
R1	52
R2	52
R3	51
R4	51
R5	50
R6	50
R7	48
R8	47
R9	39
R10	49
R11	47
R12	39
R13	39
R14	43
R15	41
R16	44
R17	31
R18	42
R19	40
R20	37
R21	38
R22	32
R23	33
R24	---
R25	76
R26	34
R27	31
R28	33
R29	39
R30	46

RES	PL ITEM
R31	46
R32	46
R33	33
R34	33
R35	45
R36	49
R37	49
R38	---
R39	---
R40	43
R41	73
R42	52
R43	43
R44	43
R45	43
R46	36
R47	43
R48	76
R49	36
R50	43
R51	43
R52	---
R53	48
R54	35
R55	37
R56	34
R57	43
R58	43
R59	75
R60	73
R61	---
R62	---
R63	73

CAP	PL ITEM
C1	70
C2	53
C3	53
C4	65
C5	65
C6	64
C7	64
C8	66
C9	66
C10	53
C11	53
C12	53
C13	53
C14	53
C15	53
C16	62
C17	61
C18	61
C19	63
C20	60
C21	53
C22	62
C23	59
C24	60
C25	53
C26	53
C27	53
C28	70
C29	55
C30	56

CAP	PL ITEM
C31	53
C32	54
C33	53
C34	53
C35	53
C36	53
C37	53
C38	57
C39	58
C40	58
C41	58
C42	53
C43	72
C44	53
C45	---
C46	---
C47	72
C48	70
C49	72

TSTR	PL ITEM
Q1	25

IC	PL ITEM
U1	7
U2	8
U3	26
U4	10
U5	14
U6	14
U7	11
U8	19
U9	27
U10	10
U11	10
U12	16
U13	16
U14	16
U15	12
U16	12
U17	9
U18	15
U19	15
U20	15
U21	20
U22	20
U23	20
U24	20
U25	7
U26	13
U27	13
U28	13
U29	11
U30	9

IC	PL ITEM
U31	12
U32	7
U33	8
U34	8
U35	10
U36	7
U37	12
U38	---
U39	23
U40	---
U41	22
U42	22

AMP REG	PL ITEM
AR1	24
AR2	21
AR3	18
AR4	17
AR5	17

DIO	PL ITEM
CR1	67
CR2	67
CR3	67
CR4	71
CR5	67
CR6	67
CR7	67
CR8	67

VOLT REG	PL ITEM
VR1	69
VR2	68
VR3	77

CONN	PL ITEM
J1	2

JUMP	PL ITEM
W1	---
W2	---
W3	---
W4	---
W5	---
W6	---
W7	---
W8	---
W9	78
W10	↑
W11	---
W12	---
W13	---
W14	---
W15	---
W16	↓
W17	78

RES MOD	PL ITEM
RMI	28
RW2	28

SW	PL ITEM
SW1	29
SW2	29
SW3	30

F007

FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 1 OF 10)

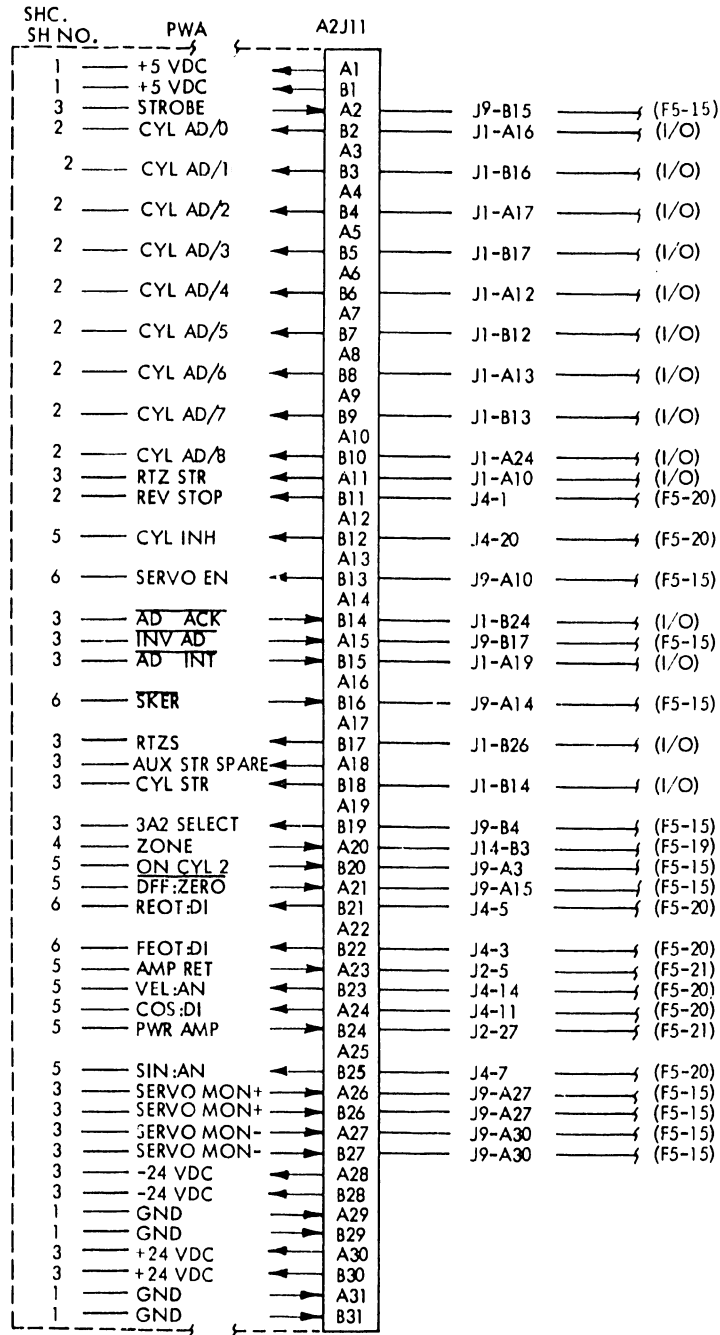
<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
	77657501	PWA Servo
1	77657520-1	PWB Servo
2	77836070-1	PWB Socket Connector
3	83479901-7	Key, Inject Mold
4	10125702-0	Scr Flat Hd
6	77612165-9	Terminal, Slotted
7	15144900-6	IC 74LS00
8	15145000-4	IC 74LS02
9	15145100-2	IC 74LS04
10	15145400-6	IC 74LS08
11	15145600-1	IC 74LS1C
12	15146300-7	IC 74LS74
13	15146400-5	IC 74LS86
14	15146900-4	IC 74LS175
15	15147000-2	IC 74LS193
16	15148200-7	IC 74LS283PC
17	51812800-4	IC DualUA747
18	50252900-1	IC 75107
19	51768200-1	IC Dual
20	15150700-1	IC 96L02
21	15156600-7	IC 201A
22	15129400-6	IC AH5012
23	15164442-4	IC 1408L-8
24	15132600-6	IC Volt Regulator
25	77835186-6	2N2907A Transistor
26	15148500-0	IC 74LS14
27	15161700-8	IC 74LS132
28	75009935-0	Res Pac 2% 5.1K (13)
29	83452207-0	Switch-10 Position
30	83452201-3	Switch-4 Position
31	94357500-1	Resistor Test Select
32	92577253-5	Res 1/2W 1% 357
33	94360384-5	Res 1/4W 1% 7.50K
34	94360443-9	Res 1/4W 1% 28.0K
35	94360472-8	Res 1/4W 1% 56.2K
36	94360468-6	Res 1/4W 1% 51.1K
37	94360482-7	Res 1/4W 1% 71.5K
38	94360284-7	Res 1/4W 1% 750
39	94360476-9	Res 1/4W 1% 61.9K
40	94360362-1	Res 1/4W 1% 4.42K
41	94360536-0	Res 1/4W 1% 237K
42	94360386-0	Res 1/4W 1% 7.87K
43	94360368-8	Res 1/4W 1% 5.11K
44	94360344-9	Res 1/4W 1% 2.87K
45	94360492-6	Res 1/4W 1% 90.9K
46	94360464-5	Res 1/4W 1% 46.4K
47	94360528-7	Res 1/4W 1% 196K

FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 2 OF 10)

<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
48	94360480-1	Res 1/4W 1% 68.1K
49	94360520-4	Res 1/4W 1% 162K
50	94402104-7	Res 1/4W 5% 6.8
51	94360400-9	Res 1/4W 1% 10.0K
52	94360300-1	Res 1/4W 1% 1.00K
53	75808537-7	Cap 100V 10% 0.01UF
54	75808520-3	Cap 100V 10% 390
55	94240416-1	Cap 50V 10% 27
56	15164261-8	Cap, CER, AXIAL, NPO
57	15164279-0	Cap 50V 2% 750
58	15164268-3	Cap, CER, AXIAL, NPO
59	94240444-3	Cap 50V 10% 0.047UF
60	75808513-8	Cap 100V 10% 100
61	75808516-1	Cap 100V 10% 180
62	24504369-0	Cap 15V 20% 10UF
63	75808518-7	Cap 100V 10% 270
64	94240409-6	Cap 50V 10% 1500
65	75890977-4	Cap 100V 0.10UF
66	24504329-4	Cap 35V 20% 1.0UF
67	51736700-9	Diode 1N914A
68	50240105-2	Diode, Silicon
69	50240106-0	Diode, Sil Zener 5.1V
70	75808533-6	Cap 100V 10% 4700
71	50241403-0	Diode, Silicon
71	50241400-6	Diode Special . . . Intch
72	94240425-2	Cap 50V 10% 270
73	94360200-3	Res 1/4W 1% 100
75	94360250-8	Res 1/4W 1% 332
76	94360339-9	Res 1/4W 1% 2.55K
77	50240104-5	Diode Zener 4W 4.3V
78	94358500-0	Jmpr Wire, Molded

FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 3 OF 10)

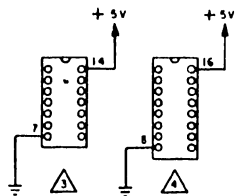
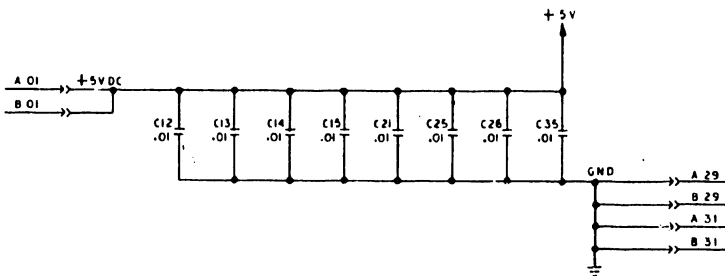
SERVO BOARD



AA091a

FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 4 OF 10)

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- NOTES:
UNLESS OTHERWISE SPECIFIED
1. RESISTOR VALUES ARE IN OHMS, 1/4 W, 1%.
 2. CAPACITOR VALUES ARE IN MICROFARADS.
- △ TYPICAL POWER CONNECTIONS FOR 14 PIN DIPS.
 - △ TYPICAL POWER CONNECTIONS FOR 16 PIN DIPS.
5. XXX ○ INDICATES INTERSHEET CONNECTION BY SHEET NUMBER, ZONE AND SIGNAL IDENTIFIER.
- △ G. QUIET GROUND

FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 5 OF 10)

FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 6 OF 10)

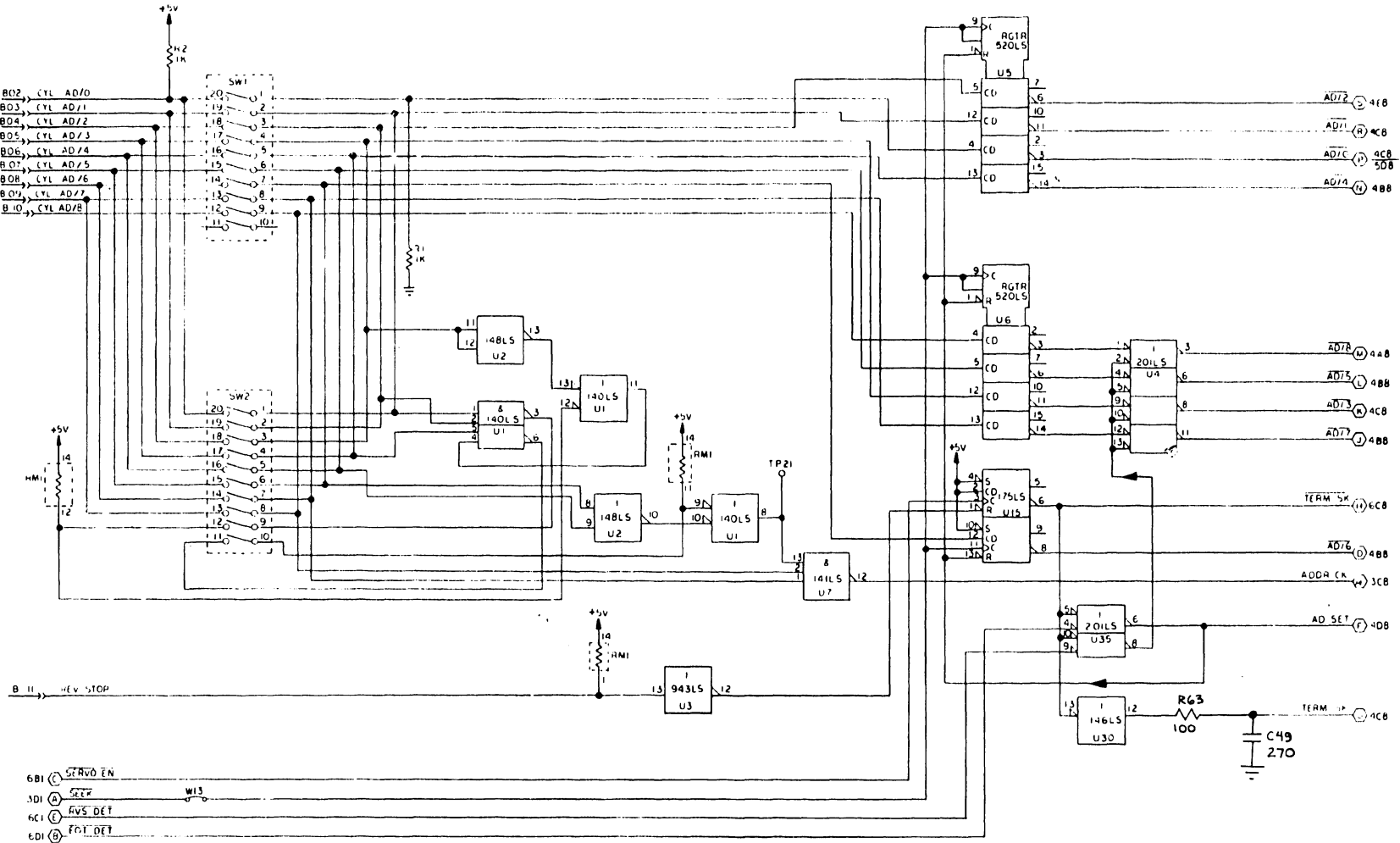


FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 7 OF 10)

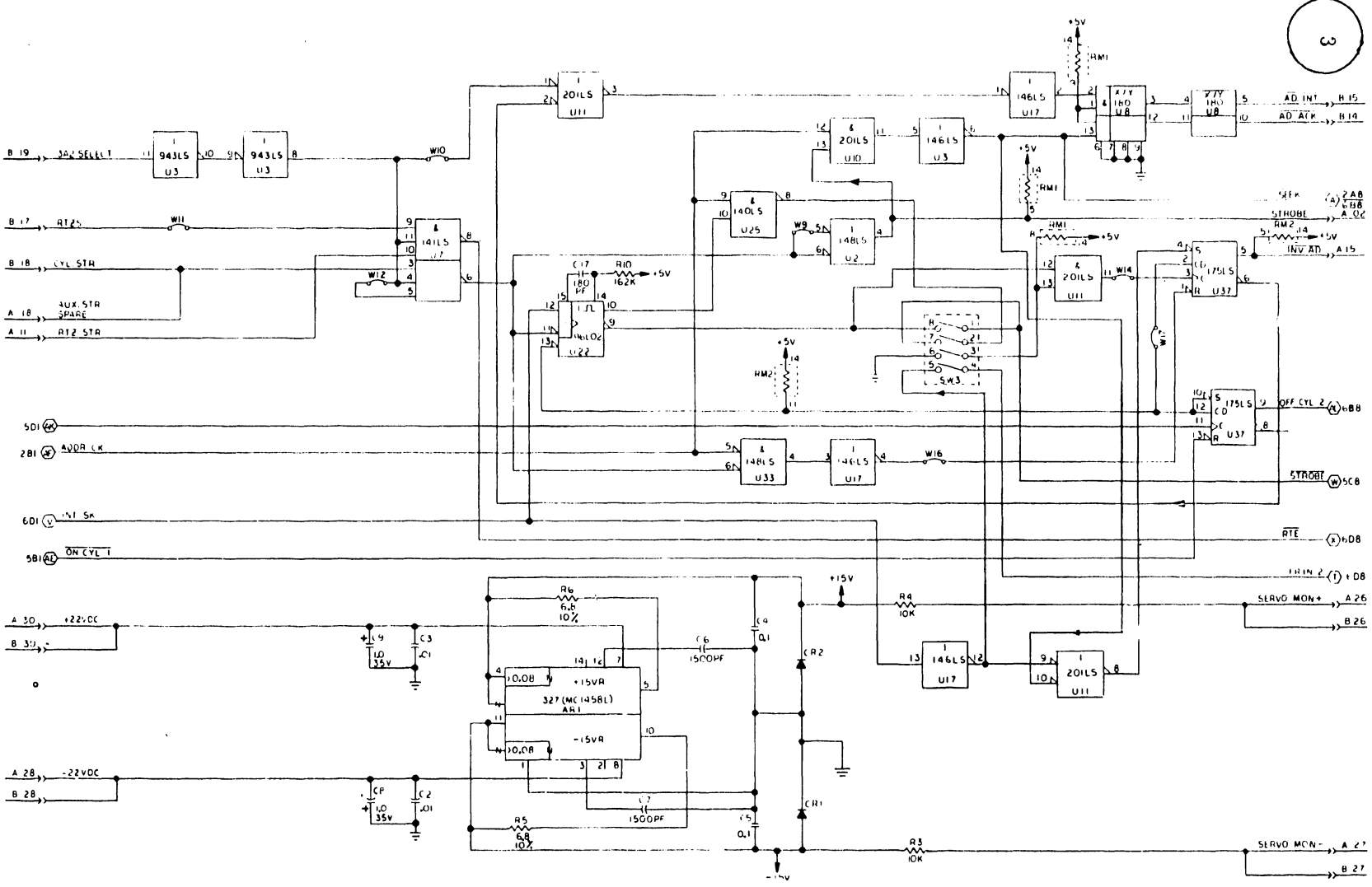


FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 8 OF 10)

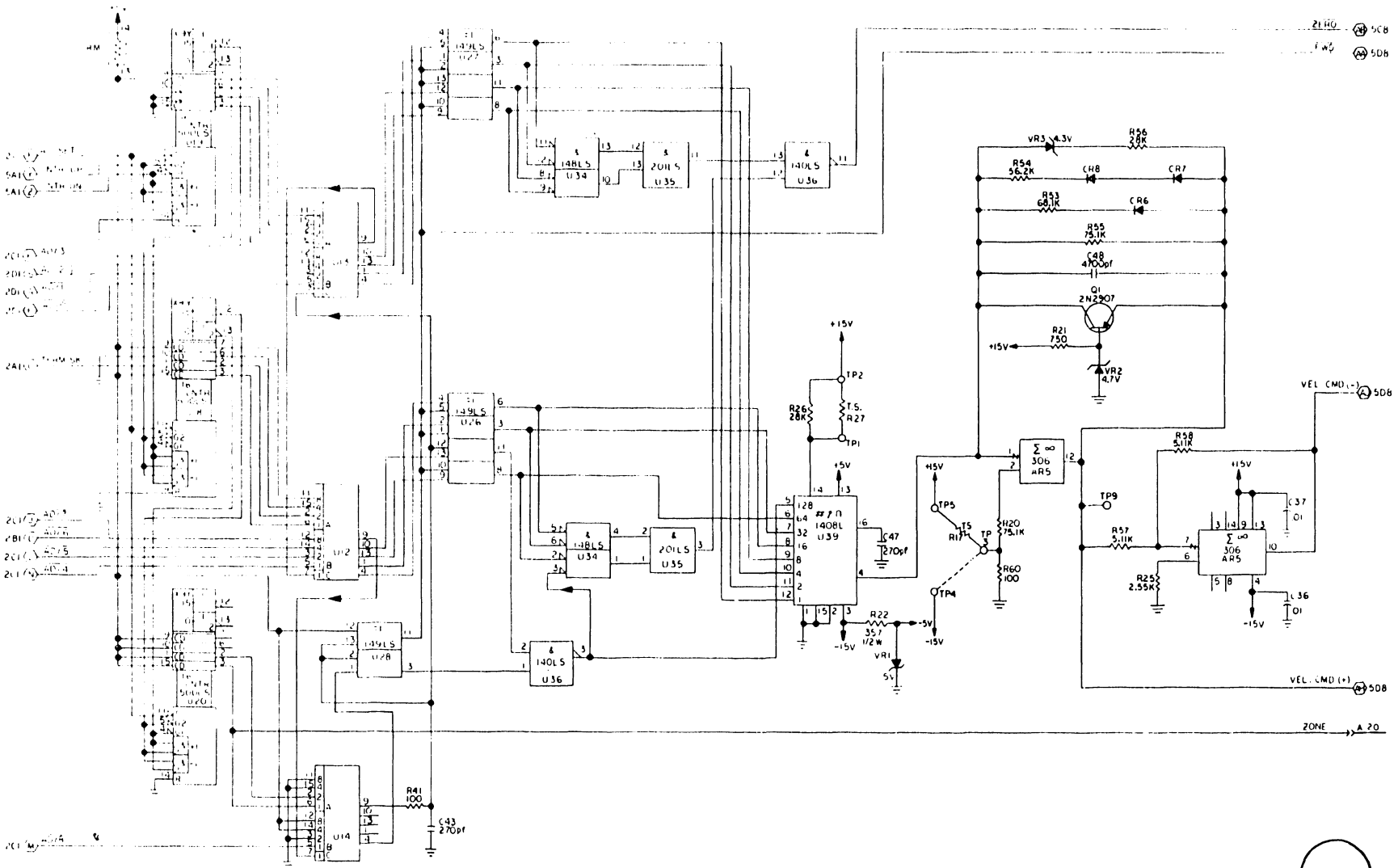
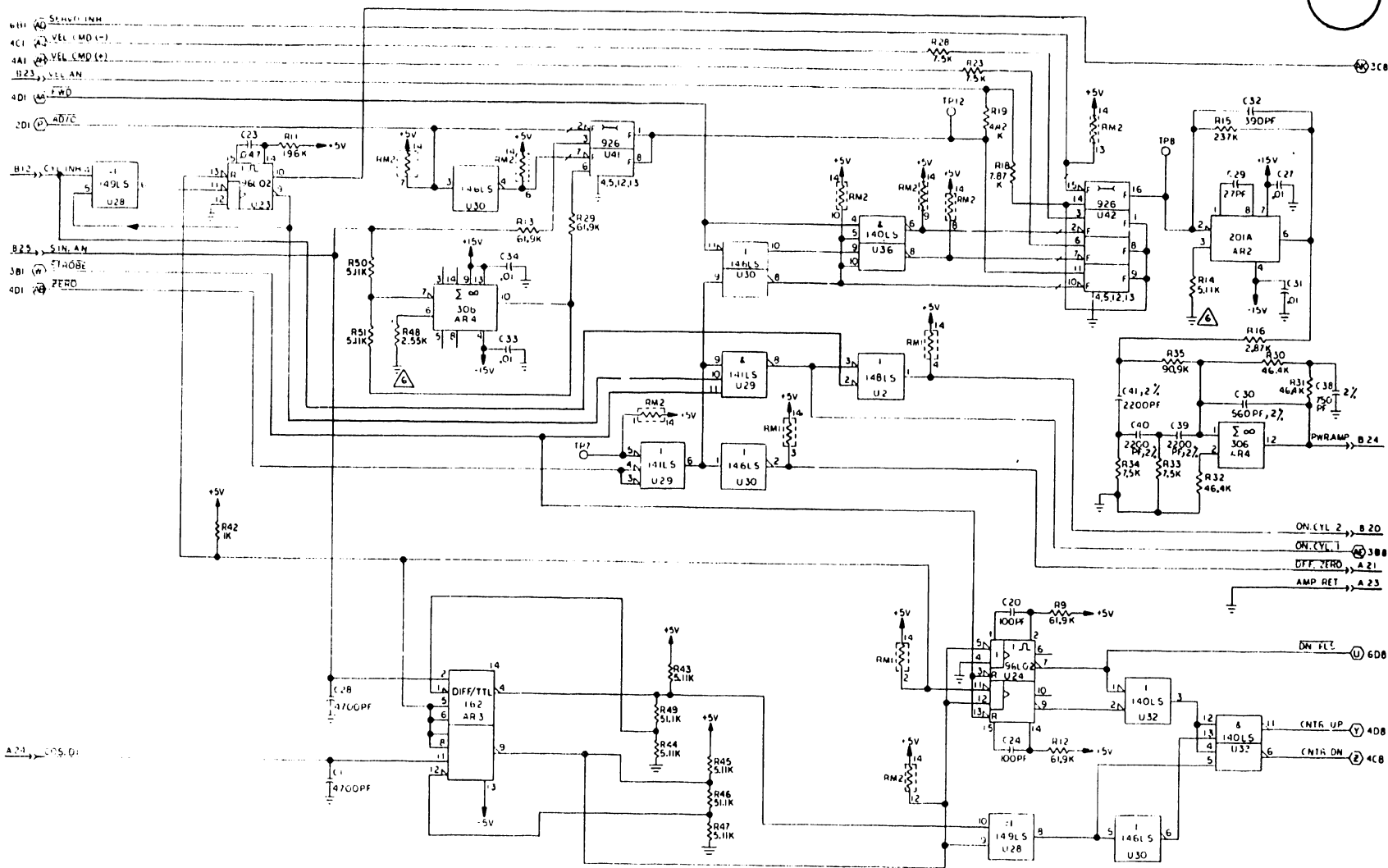
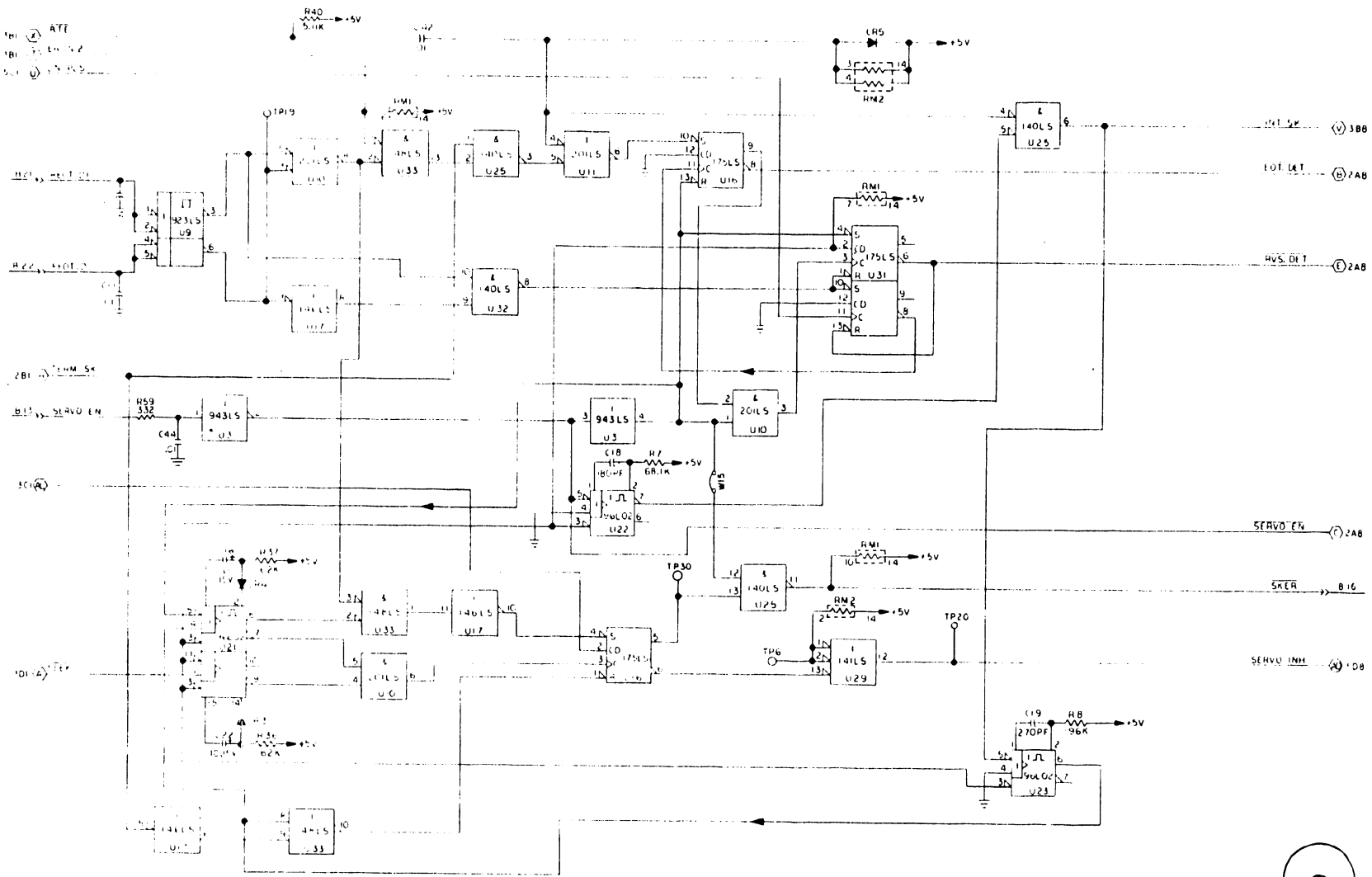


FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 9 OF 10)



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FIGURE 5-17. SERVO BOARD ASSEMBLY (SHEET 10 OF 10)



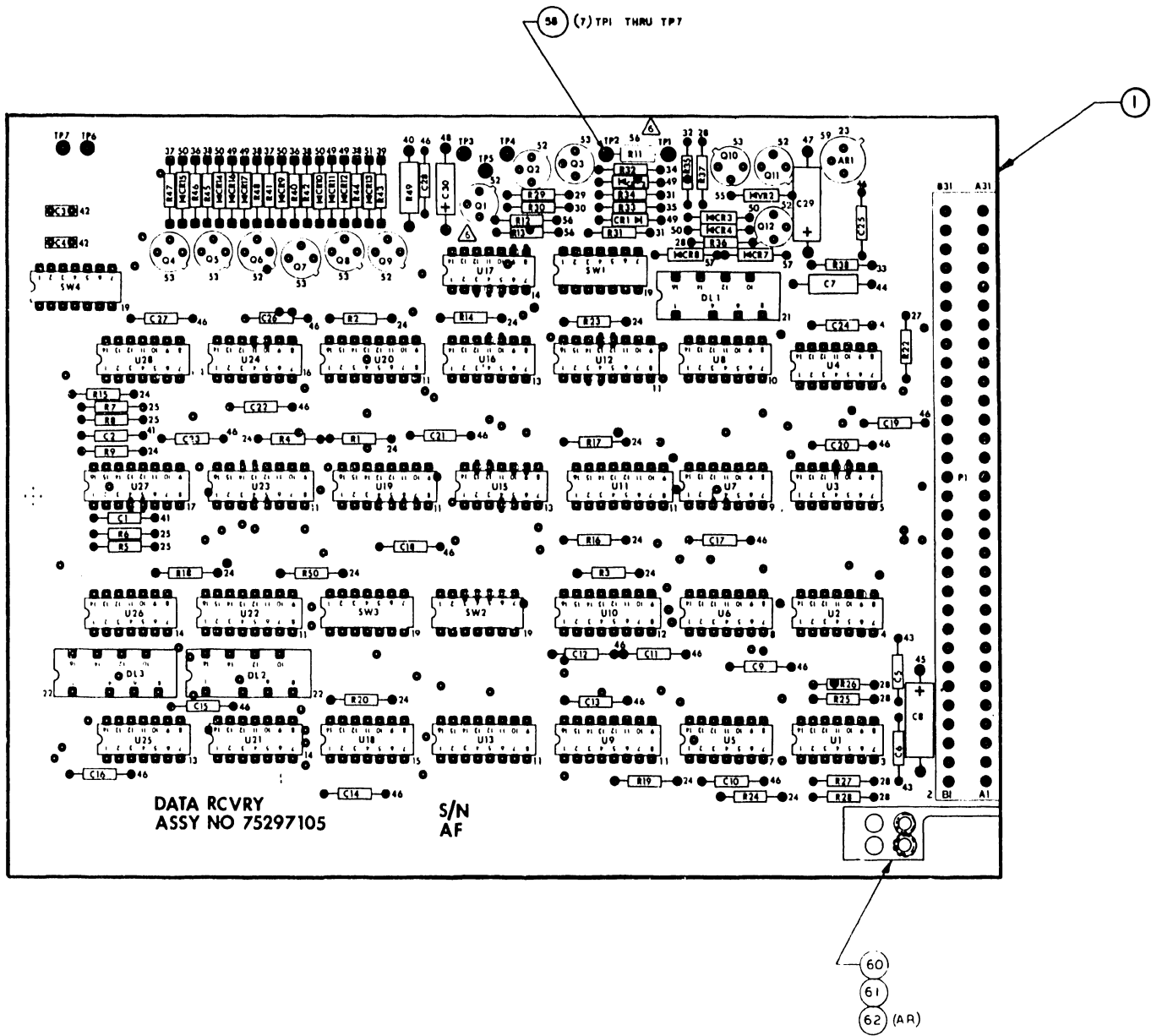


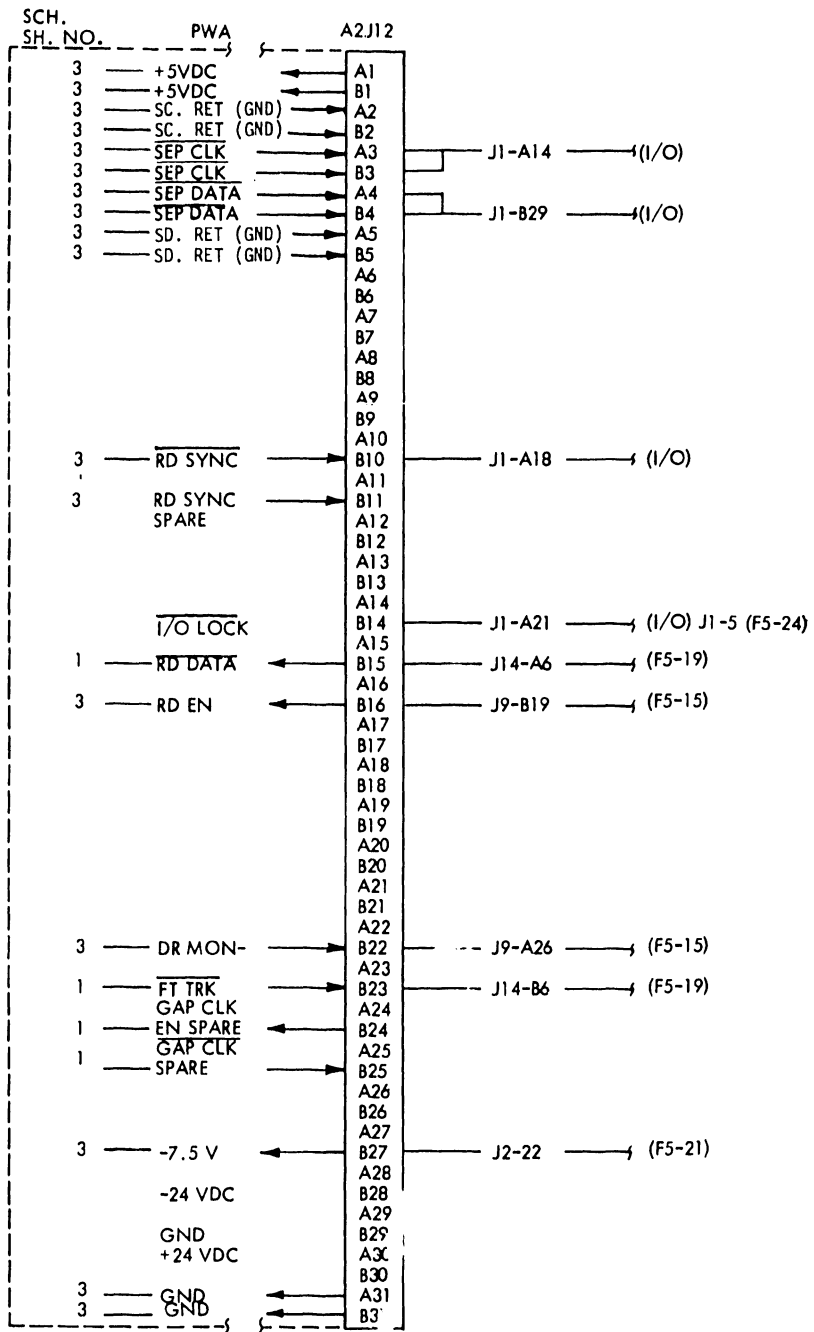
FIGURE 5-18. DATA RECOVERY BOARD ASM (SHEET 1 OF 7)

<u>ITEM NO.</u>	<u>IDENTIFICATION NUMBER</u>	<u>DRAWING TITLE</u>
	75297105	PWA Data Recovery
1	75297005	Board PC Data - Recovery
2	77836070	PWB Socket Connector
3	51768200	IC Dual
4	36187900	IC 7453
5	15112700	IC 75L04
6	15158700	IC 74S140
6	00005070	IC 500 HM Dual, Intch
7	15161700	IC 74LS132
8	96744156	IC 7474
8	15104800	IC 7474, Intch
9	88882100	IC 74H00
9	36188700	IC CA 74H00 HS Quad, Intch
10	88885300	IC 74S20
10	50254900	IC Dual 4, Intch
11	15158600	IC 74S112
11	15109400	IC 74S112, Intch
12	15160600	IC 93L16...Intch
12	15146800	IC 74LS161
13	88884500	IC 74 S00
13	50254600	IC 74S00, Intch
14	88883700	IC 74S04
14	15109200	IC 74S04, Intch
15	88923000	IC 74S74
15	15109700	IC Dual D Flip-Flop, Intch
16	88884200	IC 74S10
16	50254700	IC Triple 3, Intch
17	15104301	IC 9602, Intch
17	88886500	IC 9602
18	88924500	IC 7404, Intch
18	36187100	IC 7404, Intch
19	83452204	Switch, 7 Position
21	83406502	Delay Line 100 NS
22	83406501	Delay Line 50 NS
23	15130400	Volt Regulator
24	94360300	Res 1/4W 1% 1.00K
25	94360430	Res 1/4W 1% 20.5K
27	94360335	Res 1/4W 1% 2.32K
28	94360224	Res 1/4W 1% 178
29	94360220	Res 1/4W 1% 162
30	94360359	Res 1/4W 1% 4.12K
31	94360232	Res 1/4W 1% 215
32	94360316	Res 1/4W 1% 1.47K
33	94360200	Res 1/4W 1% 100
34	94360257	Res 1/4W 1% 392
35	94360280	Res 1/4W 1% 681
36	94360163	Res 1/4W 1% 51.1
37	94360165	Res 1/4W 1% 47.5
38	94360264	Res 1/4W 1% 464
39	94360272	Res 1/4W 1% 562

FIGURE 5-18. DATA RECOVERY BOARD ASM (SHEET 2 OF 7)

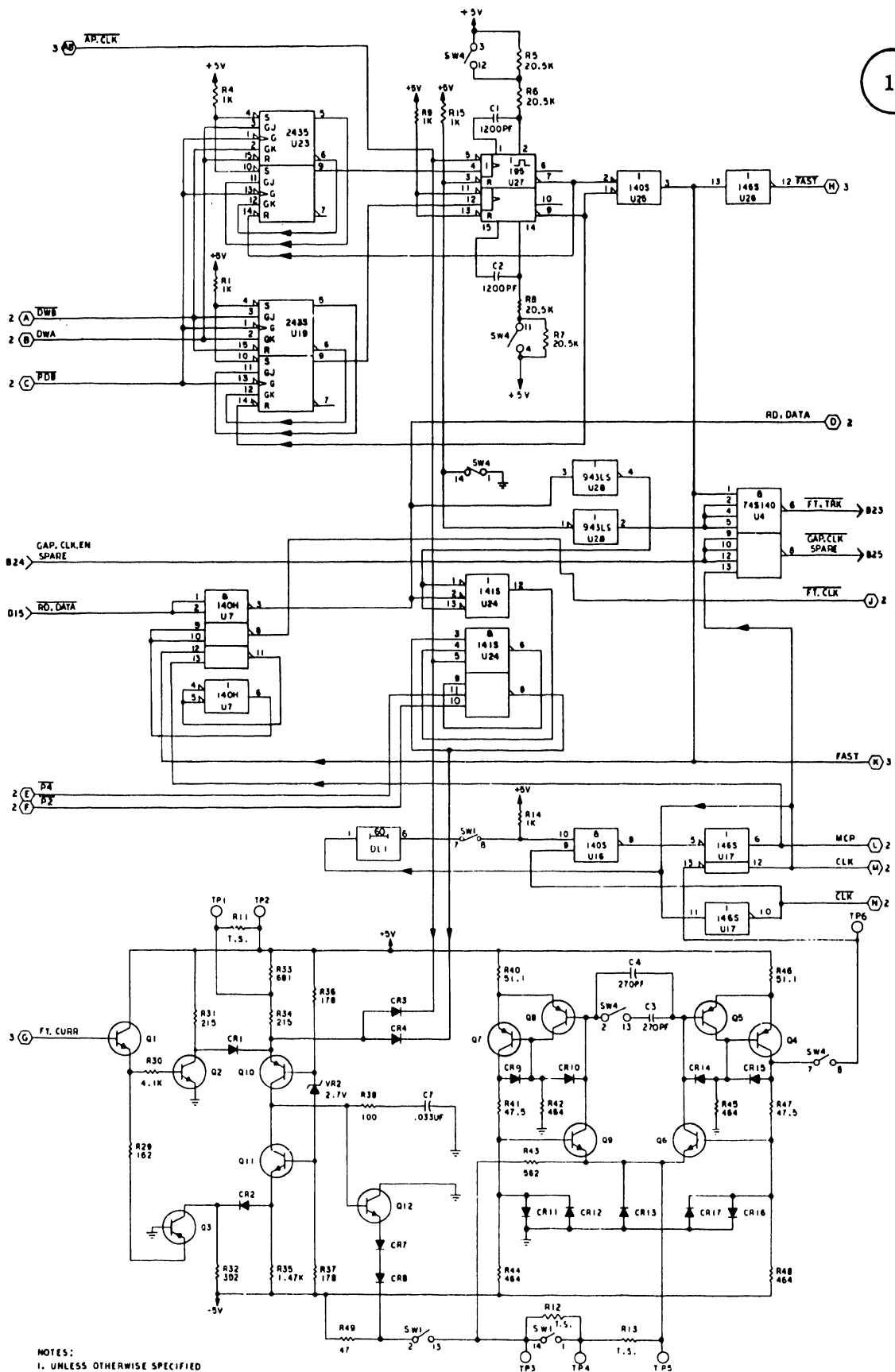
<u>ITEM NO.</u>	<u>IDENTIFICATION NUMBER</u>	<u>DRAWING TITLE</u>
40	24500131	Res 1/2W 5% 47
41	92496147	Cap 200V 10% 1200
42	94227236	Cap 300V 2% 270
43	92496267	Cap Non 200V 10% 220
44	92496393	Cap Non 80V 10% 0.033 UF
45	24504353	Cap 10V 20% 33 UF
46	92496227	Cap 100V 20% 0.01 UF
47	24504339	Cap 35V 20% 6.8 UF
48	24504329	Cap 35V 20% 1.0 UF
49	51736700	Diode 1N914A
50	50241403	Diode Special
50	50241400	Diode Special.....Intch
51	11801200	Spec Diode Germanium
52	50210310	TSTR, SNPN, 15V NN3646
53	50211510	TSTR, 2N4258 SPNP 12V
55	50240146	Diode Silicon
57	24553500	Diode Silicon Planar
58	92498021	Terminal, Swaged
59	94335900	Pad-Transistor Mtg
60	83479801	Key, Inject, Mold
61	10125703	Scr Flat Hd
62	75312701	Spec-Epoxy Adhesive
64	15148500	IC 74LS14

FIGURE 5-18. DATA RECOVERY BOARD ASSEMBLY (SHEET 3 OF 7)



AA089c

FIGURE 5-18. DATA RECOVERY BOARD ASM (SHEET 4 OF 7)



NOTES:
 1. UNLESS OTHERWISE SPECIFIED
 ALL INPUT/OUTPUT PIN NUMBERS
 ARE FOR PI CONNECTOR.

FIGURE 5-18. DATA RECOVERY BOARD ASM (SHEET 5 OF 7)

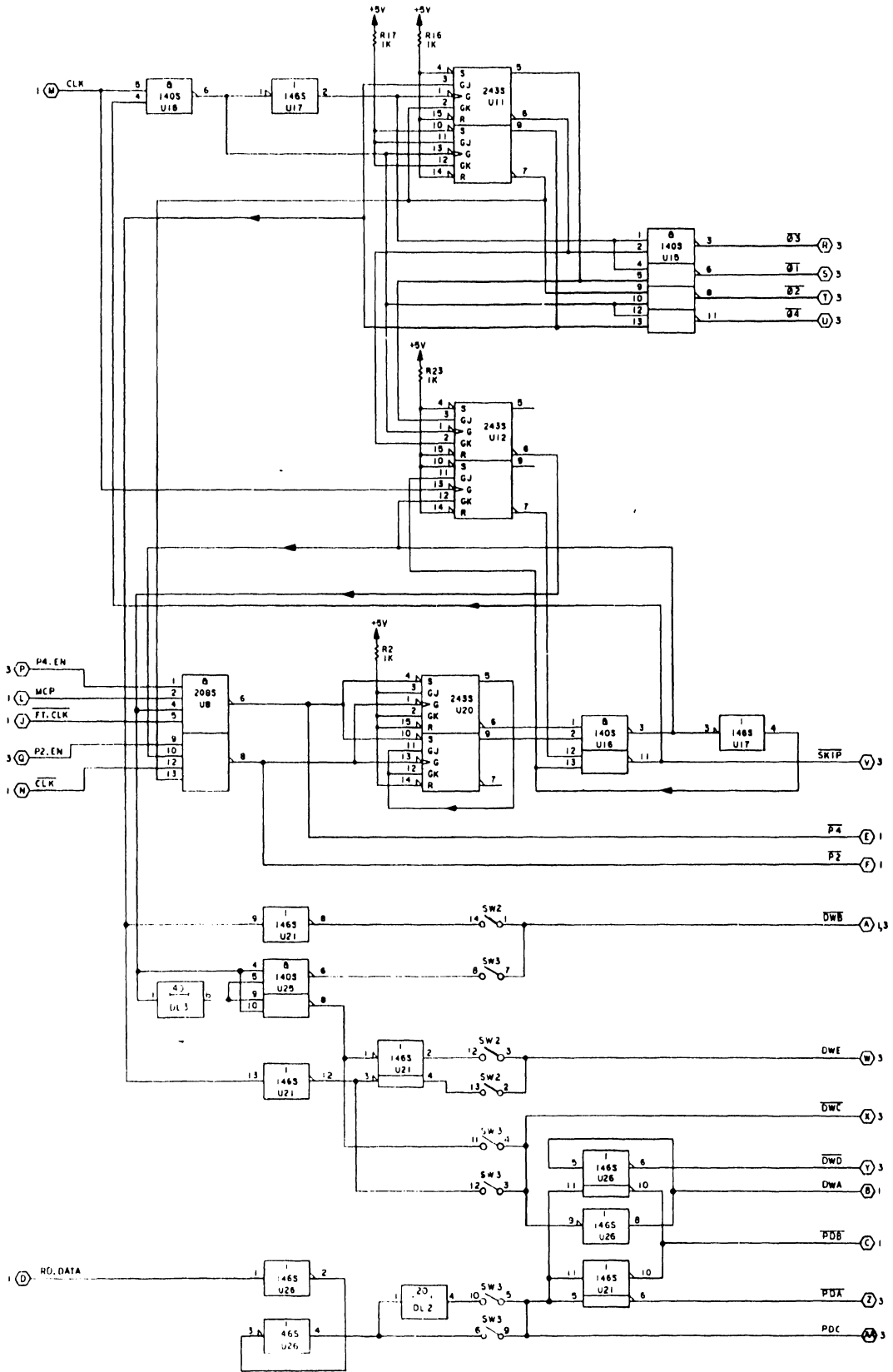


FIGURE 5-18. DATA RECOVERY BOARD ASM (SHEET 6 OF 7)

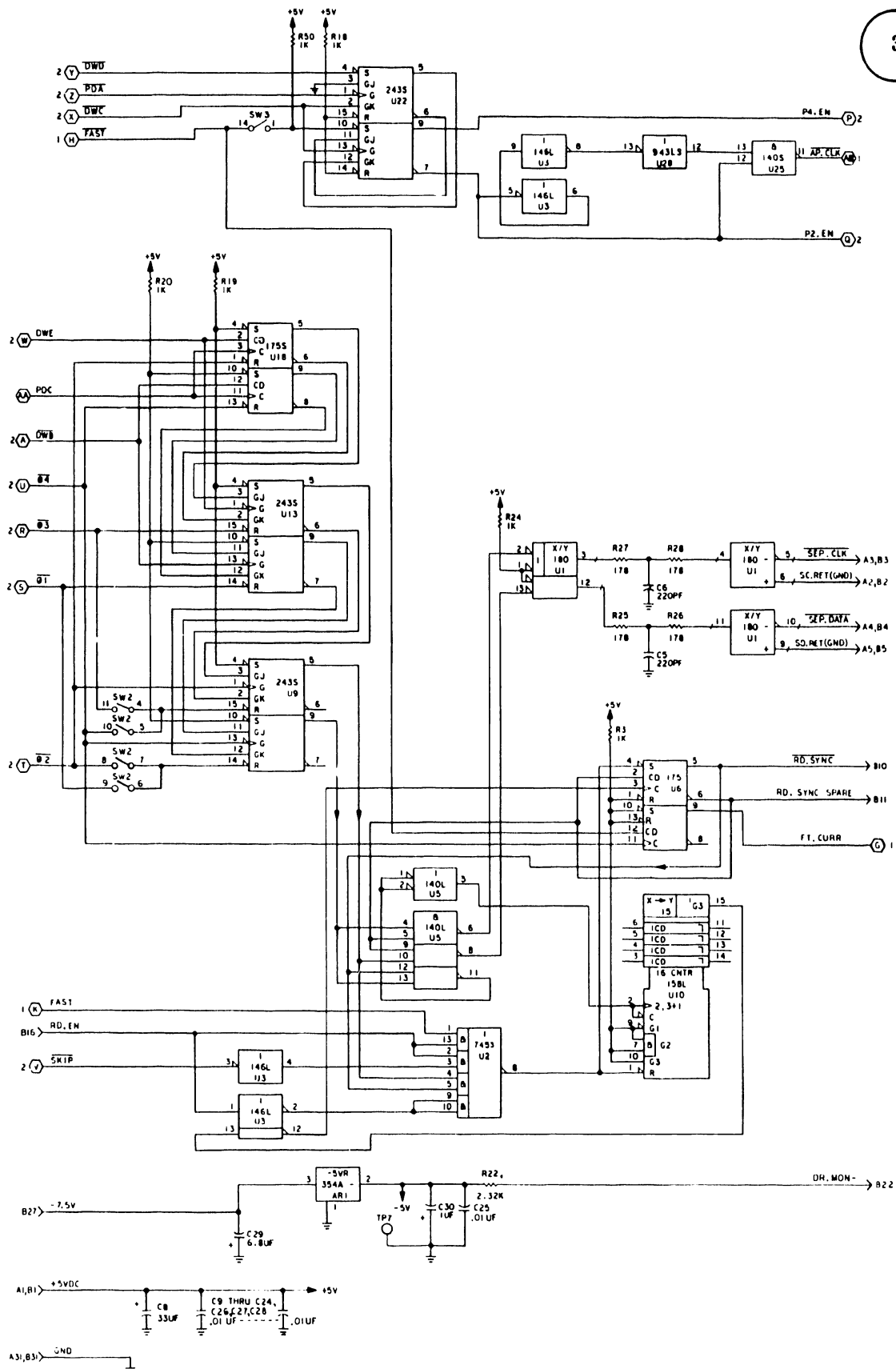
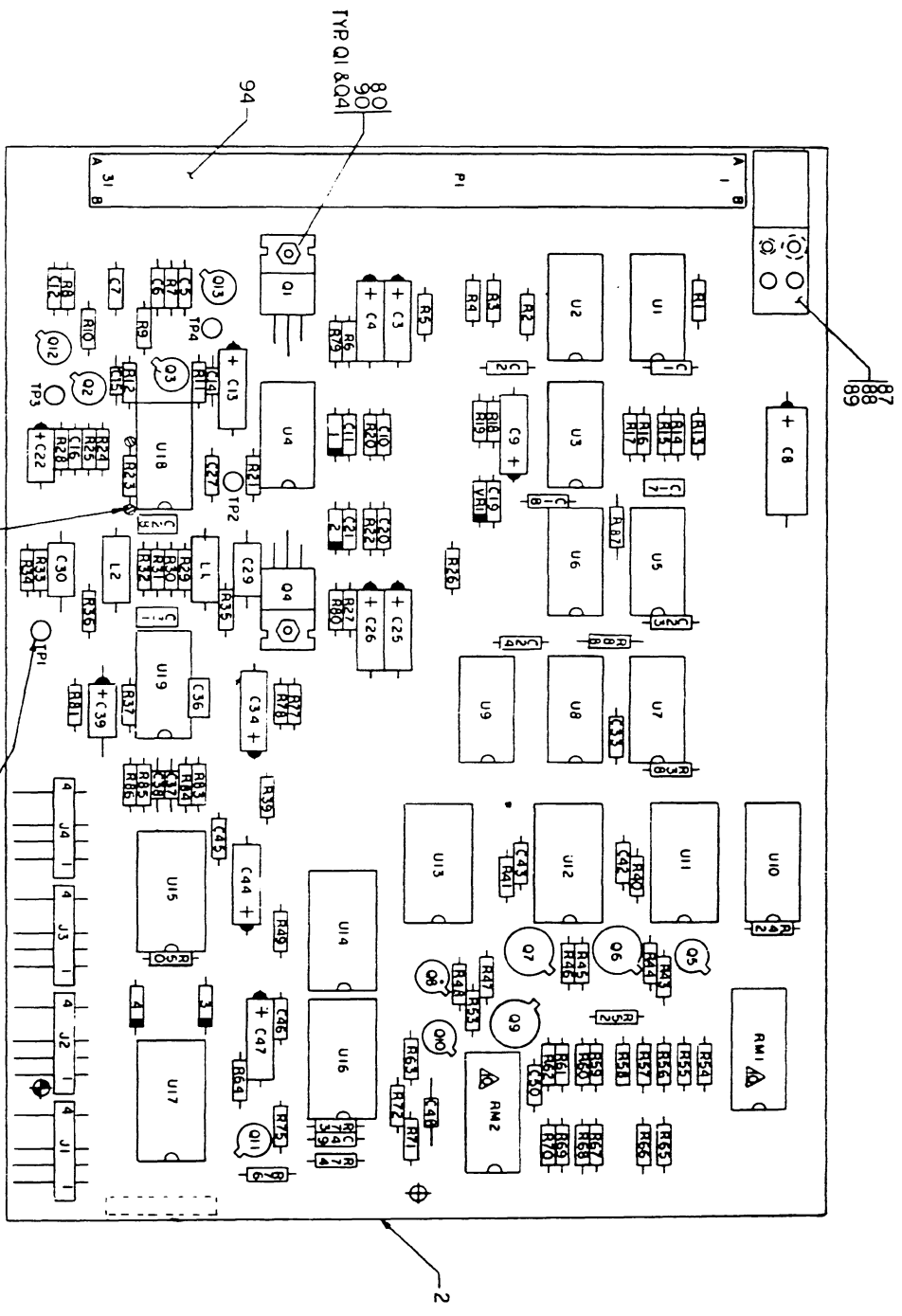


FIGURE 5-18. DATA RECOVERY BOARD ASM (SHEET 7 OF 7)



DIO	PL ITEM
CR1	25
CR2	25
CR3	26
CR4	26

REG	PL ITEM
VRI	27

CONN	PL ITEM
J1	93
J2	93
J3	93
J4	93
PI	94

TERM BD	PL ITEM
TP1	81
TP2	81
TP3	81
TP4	81

IND	PL ITEM
L1	95
L2	95

TSTR	PL ITEM
Q1	20
Q2	22
Q3	22
Q4	21
Q5	22
Q6	23
Q7	23
Q8	22
Q9	24
Q10	22
Q11	22
Q12	22
Q13	22

IC	PL ITEM
U1	13
U2	14
U3	15
U4	16
U5	17
U6	97
U7	19
U8	96
U9	18
U10	12
U11	7
U12	9
U13	8
U14	10
U15	5
U16	10
U17	6
U18	11
U19	11

RES MOD	PL ITEM
RM1	92
RM2	92

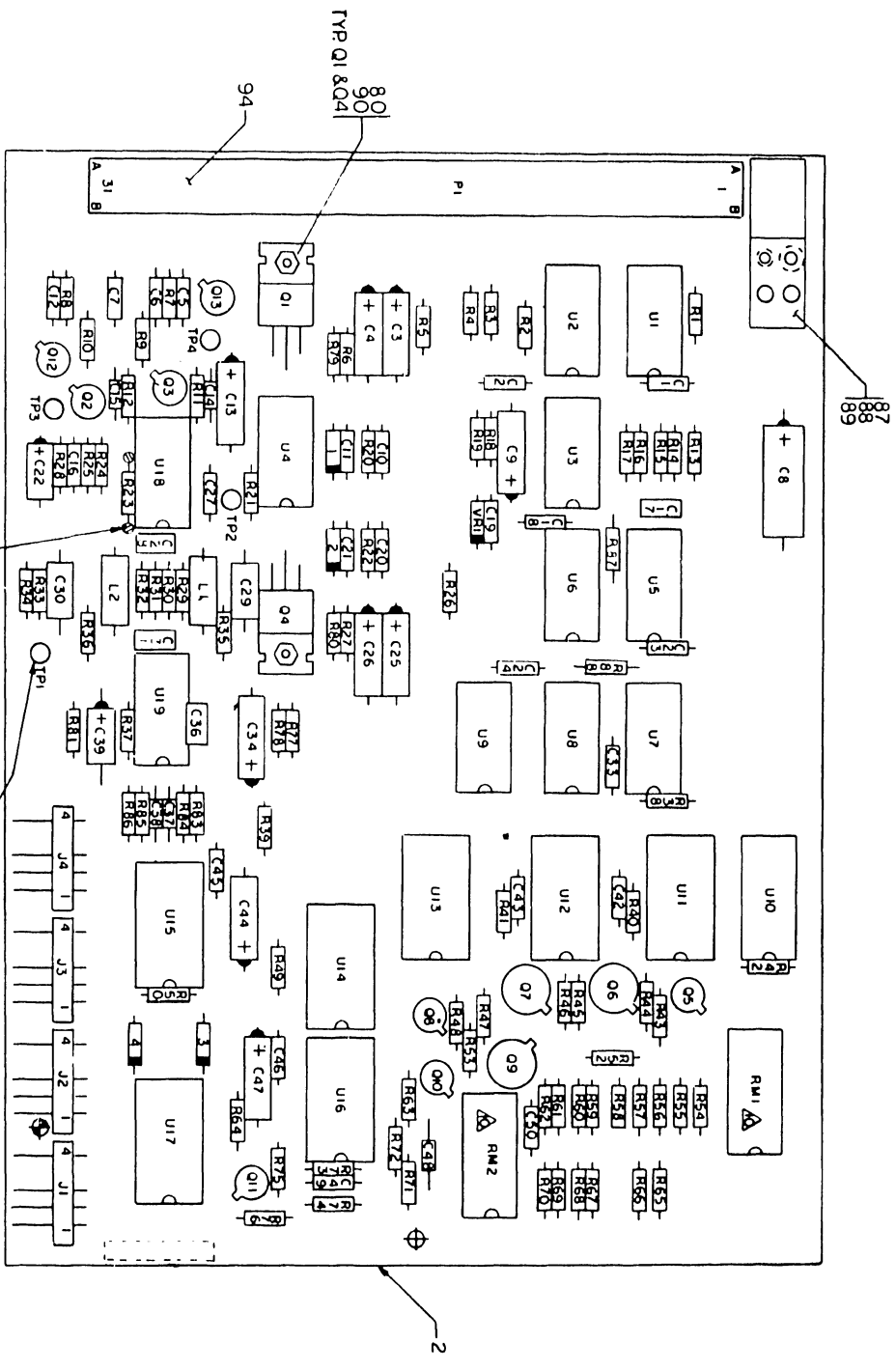
CAP	PL ITEM
C1	69
C2	69
C3	63
C4	63
C5	85
C6	68
C7	68
C8	60
C9	62
C10	69
C11	69
C12	65
C13	64
C14	66
C15	66
C16	67
C17	70
C18	-
C19	69
C20	69
C21	69
C22	65
C23	69
C24	69
C25	63
C26	63
C27	68
C28	71
C29	74
C30	74
C31	72
C32	-
C33	69
C34	64
C35	-
C36	73
C37	99
C38	99
C39	65
C40	-
C41	-
C42	85
C43	85
C44	61
C45	69
C46	69
C47	61
C48	76
C49	69
C50	85

RES	PL ITEM
R56	34
R57	34
R58	38
R59	33
R60	33
R61	33
R62	33
R63	51
R64	43
R65	34
R66	34
R67	32
R68	33
R69	32
R70	33
R71	44
R72	47
R73	29
R74	40
R75	38
R76	47
R77	32
R78	50
R79	91
R80	91
R81	50
R82	-
R83	51
R84	31
R85	31
R86	51
R87	44
R88	44

RES	PL ITEM
R1	39
R2	39
R3	35
R4	35
R5	47
R6	49
R7	47
R8	47
R9	37
R10	37
R11	31
R12	31
R13	34
R14	34
R15	34
R16	47
R17	47
R18	31
R19	31
R20	30
R21	50
R22	30
R23	29
R24	40
R25	40
R26	47
R27	49
R28	41
R29	31
R30	46
R31	31
R32	46
R33	50
R34	41
R35	31
R36	31
R37	48
R38	36
R39	31
R40	38
R41	38
R42	39
R43	42
R44	47
R45	36
R46	86
R47	44
R48	39
R49	31
R50	45
R51	-
R52	44
R53	44
R54	33
R55	33

G110a

FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 1 OF 7)



DIO	PL ITEM
CR1	25
CR2	25
CR3	26
CR4	26

REG	PL ITEM
VRI	27

CONN	PL ITEM
J1	93
J2	93
J3	93
J4	93
P1	94

TERM BD	PL ITEM
TP1	81
TP2	81
TP3	81
TP4	81

IND	PL ITEM
L1	95
L2	95

TSTR	PL ITEM
Q1	20
Q2	22
Q3	22
Q4	21
Q5	22
Q6	23
Q7	23
Q8	22
Q9	24
Q10	22
Q11	22
Q12	22
Q13	22

IC	PL ITEM
U1	13
U2	14
U3	15
U4	16
U5	17
U6	97
U7	19
U8	98
U9	18
U10	12
U11	7
U12	9
U13	8
U14	10
U15	5
U16	10
U17	6
U18	11
U19	11

RES MOD	PL ITEM
RM1	92
RM2	92

CAP	PL ITEM
C1	69
C2	69
C3	63
C4	63
C5	85
C6	68
C7	68
C8	60
C9	62
C10	69
C11	69
C12	85
C13	64
C14	66
C15	66
C16	67
C17	70
C18	67
C19	69
C20	69
C21	69
C22	65
C23	69
C24	69
C25	63
C26	63
C27	68
C28	71
C29	74
C30	74
C31	72
C32	-
C33	69
C34	64
C35	-
C36	73
C37	99
C38	99
C39	65
C40	-
C41	-
C42	85
C43	85
C44	61
C45	69
C46	69
C47	61
C48	76
C49	69
C50	85

RES	PL ITEM
R56	34
R57	34
R58	38
R59	33
R60	33
R61	33
R62	33
R63	51
R64	43
R65	34
R66	34
R67	33
R68	33
R69	33
R70	33
R71	44
R72	47
R73	39
R74	40
R75	38
R76	47
R77	32
R78	50
R79	91
R80	91
R81	50
R82	-
R83	51
R84	31
R85	31
R86	51
R87	44
R88	44

RES	PL ITEM
R1	39
R2	39
R3	35
R4	35
R5	47
R6	49
R7	47
R8	47
R9	37
R10	37
R11	31
R12	31
R13	34
R14	34
R15	34
R16	47
R17	47
R18	31
R19	31
R20	30
R21	50
R22	30
R23	29
R24	40
R25	40
R26	47
R27	49
R28	41
R29	31
R30	46
R31	31
R32	46
R33	50
R34	41
R35	31
R36	31
R37	48
R38	36
R39	31
R40	38
R41	38
R42	39
R43	42
R44	47
R45	36
R46	86
R47	44
R48	39
R49	31
R50	45
R51	-
R52	44
R53	44
R54	33
R55	33

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FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 1 OF 7)

<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
	75891100	PWA - R/W/E (2400 r/min)
	75880500	PWA - R/W/E (1500 r/min)
2	75891120	PWB R/W/E
5	75300300	ID Read Matrix Special
6	75300400	Diode Matrix Special
7	75300500	Current Zone Special
8	75300600	ID R/W Fault Special
9	75300700	Write Switch Special
10	75300800	IC Head Select Special
11	15126900	IC 733C Video Amp
12	15158600	IC 74S112
13	88898200	IC 7410
14	50252900	IC 75107
15	88882200	IC 74HD1
16	15132600	IC Volt Regulator
17	15146400	IC 74LS86
18	88924400	IC 7400
19	39389700	IC 7404
19	51701800	IC 7404, Intch
20	75752300	Transistor Power
21	75752400	Transistor Power
22	50210310	TSTR, SNPN, 15V NN3646
23	75722201	Transistor NPN 2N2219A
24	50211210	TSTR, SPNP, 60V NN3645
25	50241001	Diode Silicon
26	50241403	Diode Special
26	50241400	Diode Special.....Intch
27	50240106	Diode, Sil Zener 5.1V
30	94360168	Res 1/4W 1% 51.1
31	94360216	Res 1/4W 1% 147
32	94360210	Res 1/4W 1% 127
33	94360240	Res 1/4W 1% 261
34	94360243	Res 1/4W 1% 280
35	94360252	Res 1/4W 1% 348
36	94360268	Res 1/4W 1% 511
37	94360288	Res 1/4W 1% 825
38	94360300	Res 1/4W 1% 1.00K
39	94360316	Res 1/4W 1% 1.47K
40	94360332	Res 1/4W 1% 2.15K
41	94360340	Res 1/4W 1% 2.61K
42	94360348	Res 1/4W 1% 3.16K
43	94360360	Res 1/4W 1% 4.22K
44	94360368	Res 1/4W 1% 5.11K
45	94360375	Res 1/4W 1% 6.04K
46	94360220	Res 1/4W 1% 162
47	94360400	Res 1/4W 1% 10.0K

FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 2 OF 7)

<u>ITEM NO.</u>	<u>IDENTIFICATION NUMBER</u>	<u>DRAWING TITLE</u>
48	94360160	Res 1/4W 1% 42.2
49	92512464	Resistor 3.3 Ohm 1/4
50	24500015	Res 1/4W 5% 10
51	94360329	Res 1/4W 1% 2000K
60	24504374	Cap 15V 20% 68UF
61	24504383	Cap 20V 20% 15UF
62	24504371	Cap 15V 20% 22UF
63	24504339	Cap 25V 20% 6.8 UF
64	24504379	Cap 20V 20% 3.3UF
65	24504346	Cap 10V 20% 4.7UF
66	94240433	Cap 50V 10% 3300 Used on 75891100 Only
67	94240401	Cap 50V 10% 1000 Used on 75891100 Only
67	94240409	Cap 50V 10% 1500 Used on 75880500 Only
68	94240411	Cap 50V 10% 0.01UF
69	92496227	Cap 100V 20% 0.01UF
70	94227218	Cap 500V +/-PF 47
71	94227236	Cap 300V 2% 270
71	94227241	Cap 100V 2% 430 Used on 75880500 Only
72	94227226	Cap 300V 2% 100
72	94227230	Cap 500V 2% 150 Used on 75880500 Only
73	94227252	Cap 100V 2% 1200
74	94240448	Cap 50V 10% 0.10 UF
75	94227248	Cap 100V 2% 820 Used on 75891100 Only
76	94240435	Cap 50V 10% 5600
80	95683502	Stud, Press
81	92498021	Terminal, Swaged
82	94335900	Pad-Transistor Mtg
85	94240400	Cap 50V 10% 470
86	94360344	Res 1/4W 1% 2.87
87	83479701	Key, Inject. Mold
88	10125703	Scr Flat Hd
89	75312701	Spec-Epoxy Adhesive
90	92583002	Nut, Lock
91	24500006	Res 1/4W 5% 4.3
92	94260301	Socket 16 Pin
93	75772401	Header 4 Pin Rt Angle
94	77836070	PWB Socket Connector
95	94356324	Inductor 10UH Used on 75891100 Only
95	94356326	Inductor 15UH Used on 75880500 Only
96	77612165	Terminal, Slotted
97	15145200	74LS03
98	88883700	IC 74S04
99	15164270	Cap 50V 2% 3300

FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 3 OF 7)

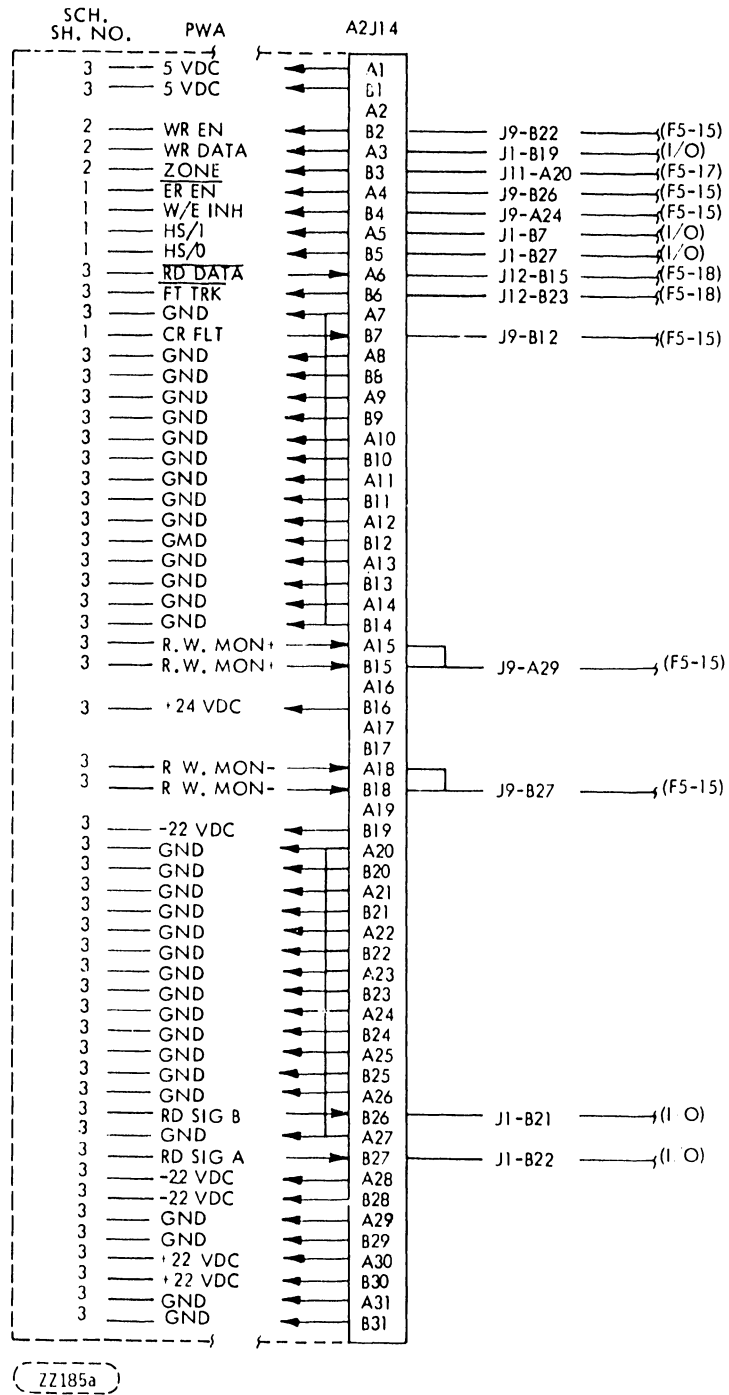
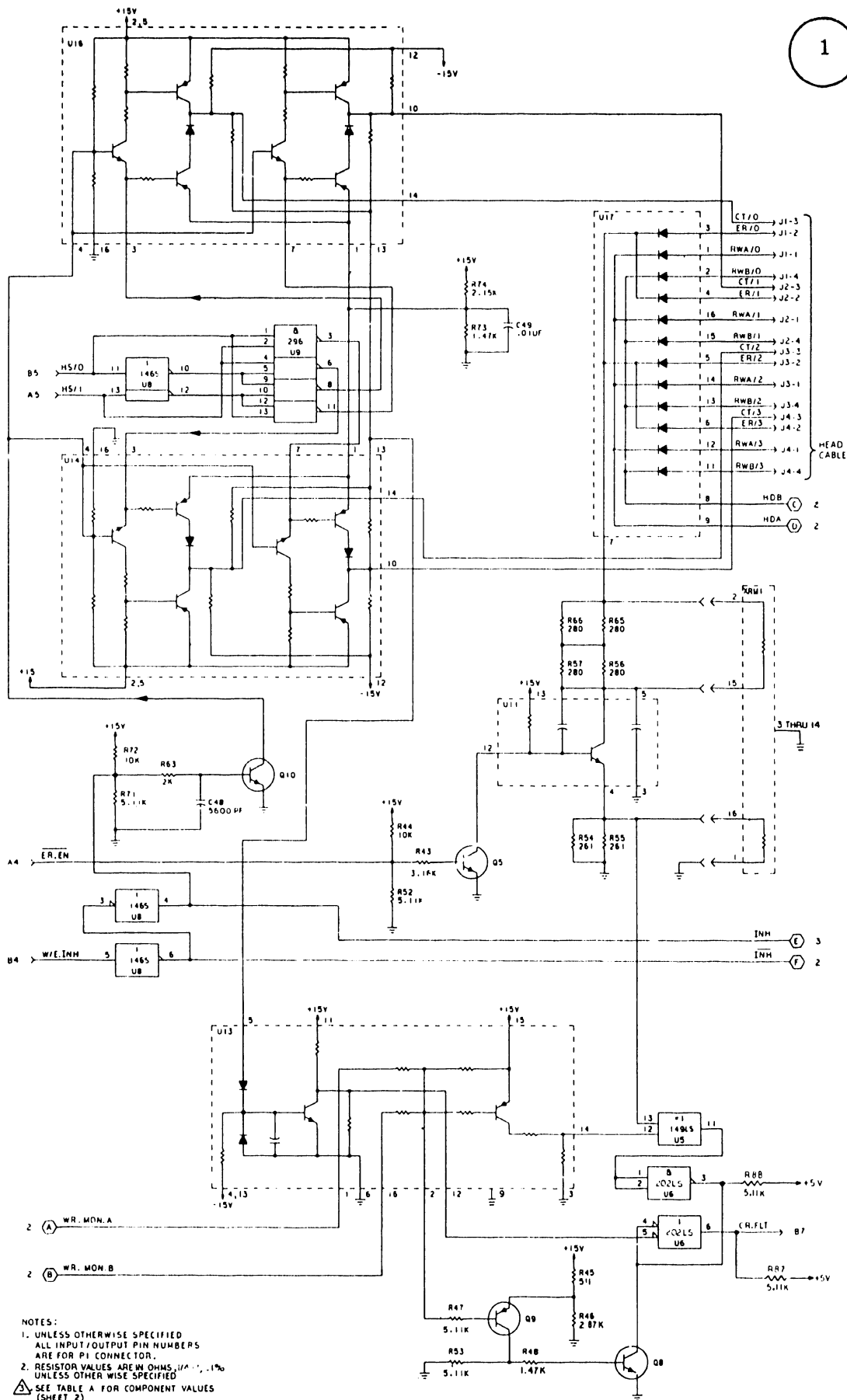


FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 4 OF 7)



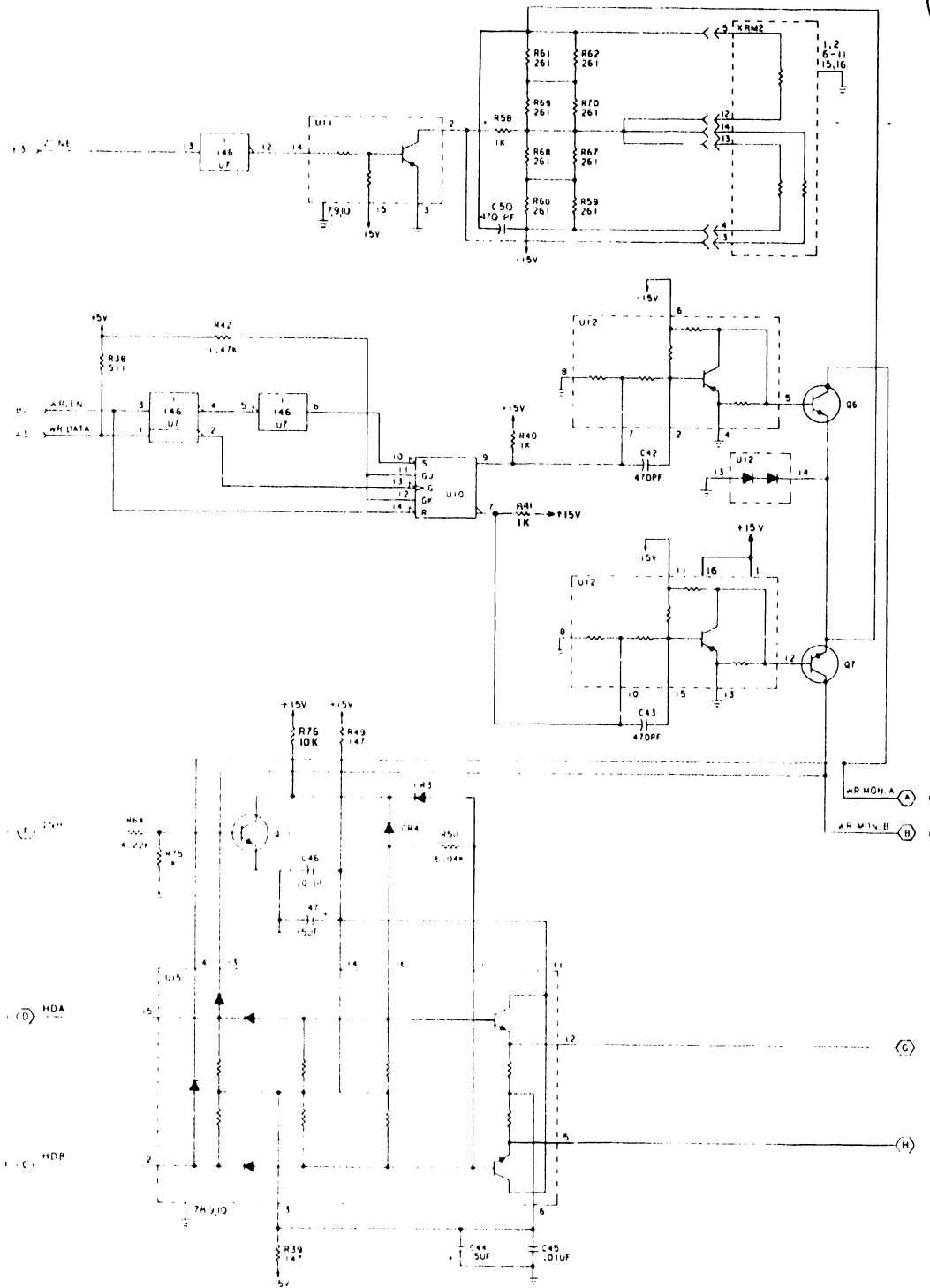


TABLE A

ASM NO.	C38	C37	C35	L2	L1	C28	C31	C15	C14	R23
1582100	5600pf	5600pf	820pf	15uh	15uh	430pf	150pf	5600pf	5600pf	1%
1582100	3300pf	3300pf	—	10uh	10uh	270pf	100pf	3300pf	3300pf	1%

FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 6 OF 7)

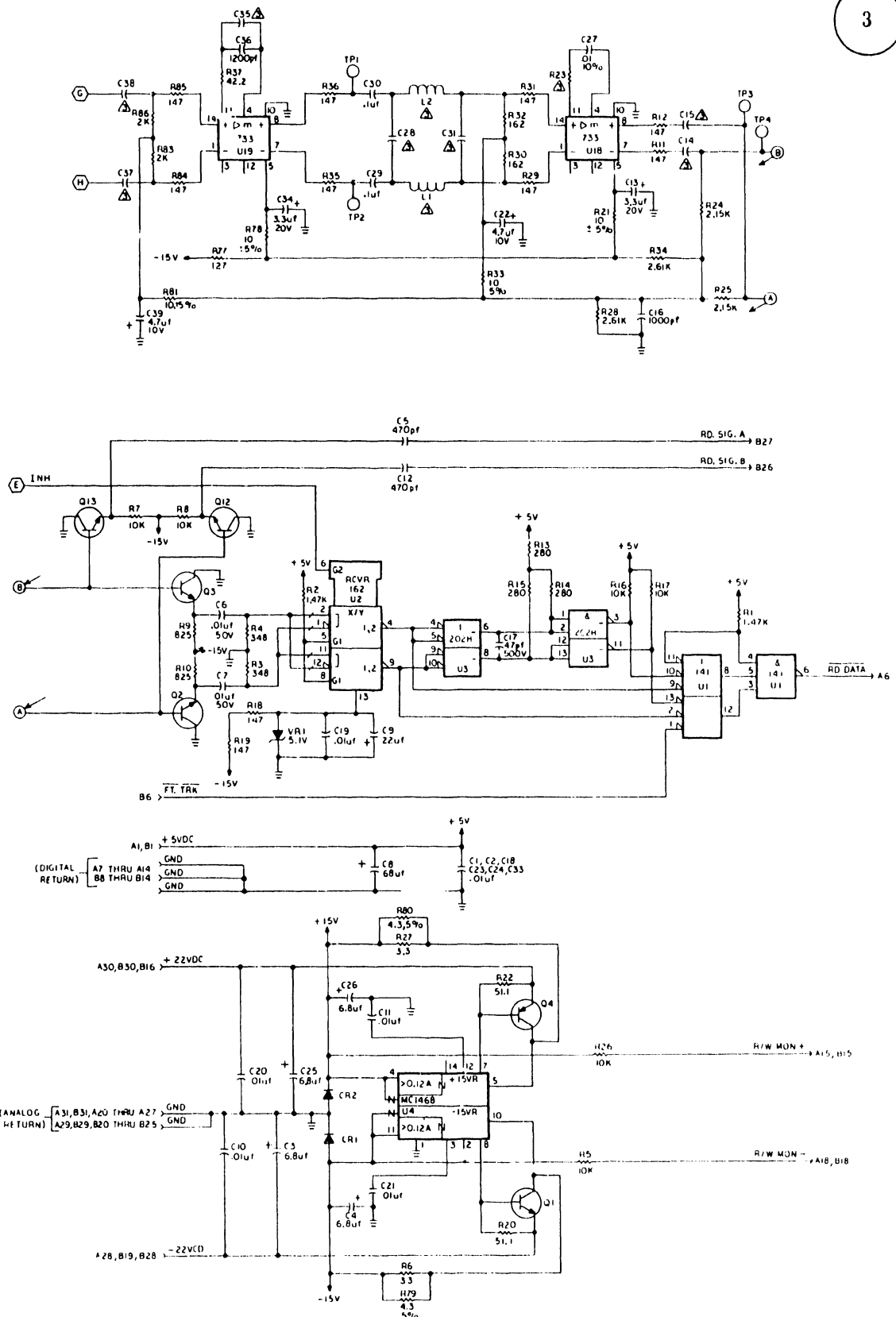
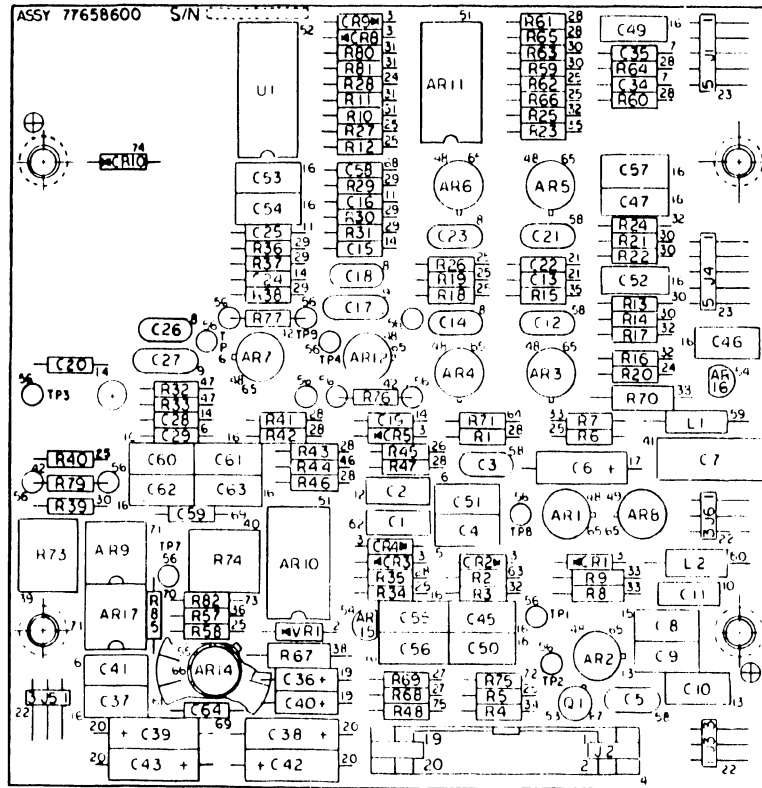


FIGURE 5-19. READ/WRITE/ERASE BD ASM (SHEET 7 OF 7)



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FIGURE 5-20. AGC SERVO PREAMP BD ASM (SHEET 1 OF 6)

<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
	77658600-0	PWA , AGC Servo Preamp
	77658620	PC Bd, AGC Pre Amp
1	77831221	PC Bd, AGC Pre Amp (ITCH)
2	50240115-1	Diode Silicon
3	51736700-9	Diode 1N914A
4	94359510-8	Connector 3M 20 Pin
5	83453805-0	Cap 100V 10% 0.047 UF
6	5808526-0	Cap 100V 10% 1200
7	92496205-3	Cap 100V 10% 100
8	95593012-8	Capacitor 150 PF 1000
9	95593008-6	Capacitor Disk 1000V
10	94227244-4	Cap 100V 2% 560
11	92496215-2	Cap 100V 10% 1000
12	94227250-1	Cap 100V 2% 1000
13	83465070-7	Cap 600V 2% 0.0022UF
14	75808531-0	Cap 100V 10% 3300
15	93453801-9	Cap 100V 10% 0.022UF
16	83453835-7	Cap 200V 10% 0.010UF
17	24504382-3	Cap 20V 20% 10UF
19	24504329-4	Cap 35V 20% 1.0UF
20	24504339-3	Cap 35V 20% 6.8UF
21	92496227-7	Cap 100V 20% 0.01 UF
22	75743703-3	Header-Right Angle
23	75743705-8	Header-Right Angle
24	94360336-5	Res 1/4W 1% 2.37K
25	94360368-8	Res 1/4W 1% 5.11K
26	94360204-5	Res 1/4W 1% 110
27	94360384-5	Res 1/4W 1% 7.50K
28	94360400-9	Res 1/4W 1% 10.0K
29	94360429-8	Res 1/4W 1% 20.0K
30	94360468-6	Res 1/4W 1% 51.1K
31	94360500-6	Res 1/4W 1% 100K
32	94360529-5	Res 1/4W 1% 200K
33	94360596-4	Res 1/4W 1% 1.00Meg
34	94360328-2	Res 1/4W 1% 1.96K
35	17705946-6	Res 1/4W 5% 2.7 Meg
36	94360446-2	Res 1/4W 1% 30.1K
38	24500153-2	Res 1/2W 5% 390
39	94372604-2	Res Vari 20% 2.0K
40	94372606-7	Res Vari 20% 10K
41	83453809-2	Cap 100V 10% 0.10 UF
46	94360300-1	Res 1/4W 1% 1.00K
47	94360329-0	Res 1/4W 1% 2.00K
48	83452801-0	IC CA3150T
49	83452804-4	IC CA3080T
51	15126600-4	IC LM339
52	15135100-4	IC 4053B
53	16547200-2	Trans PNP 2N2907A
54	83452805-1	Volt Reg 78L12 AWC

FIGURE 5-20. AGC SERVO PREAMP BD ASM (SHEET 2 OF 6)

<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
55	83452806-9	Volt Reg 79M05
56	92498021-2	Terminal, Swaged
57	75738867-3	Spacer-Standoff
58	95593011-0	Capacitor 56 PF
59	94356358-5	Inductor 6800UH
60	94356356-9	Inductor 4700UH
61	51853102-5	Heatsink
62	94227240-2	Capacitor MICA 390 P
63	94360452-0	Res 1/4W 1% 34.8K
64	94360388-6	Res 1/4W 1% 8.25K
65	94335903-4	Pad-Transistor Mount
66	94335900-0	Pad-Transistor Mtg
67	94335901-8	Pad-Transistor Mount
68	75808504-7	Cap 100V 10% 18
69	75808506-2	Cap 100V 10% 27
70	17705953-2	Res 1/4W 5% 5.1 Meg
71	15156600-7	IC 201A
72	94360274-8	Res 1/4W 1% 590
73	17705944-1	Res 1/4W 5% 2.2 Meg
74	50241403-0	Diode Special
74	50241400-6	Diode Special.....Intch
75	94360361-3	Res 1/4W 4.32K 1%

FIGURE 5-20. AGC SERVO PREAMP BD ASM (SHEET 3 OF 6)

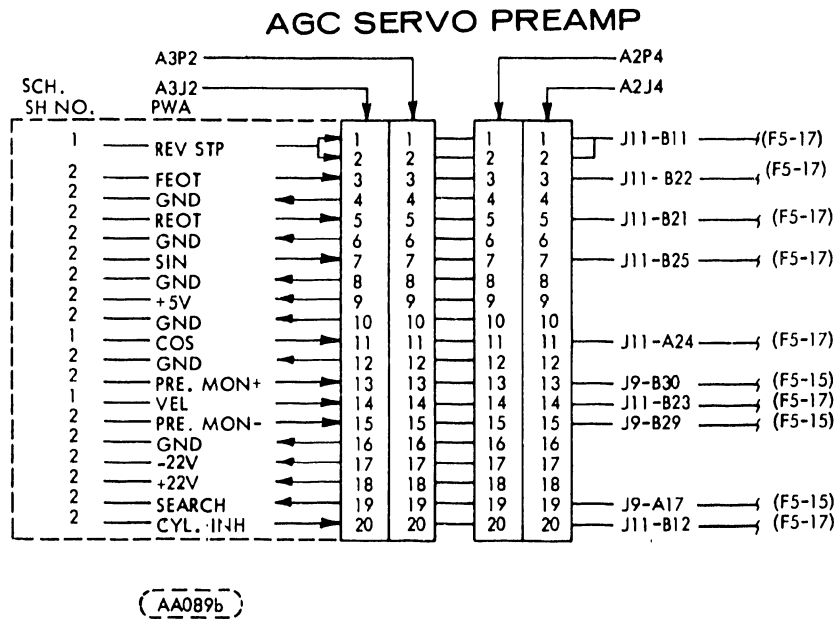


FIGURE 5-20. AGC SERVO PREAMP BD ASM (SHEET 4 OF 6)

FIGURE 5-20. AGC SERVO PREAMP BD ASM (SHEET 5 OF 6)

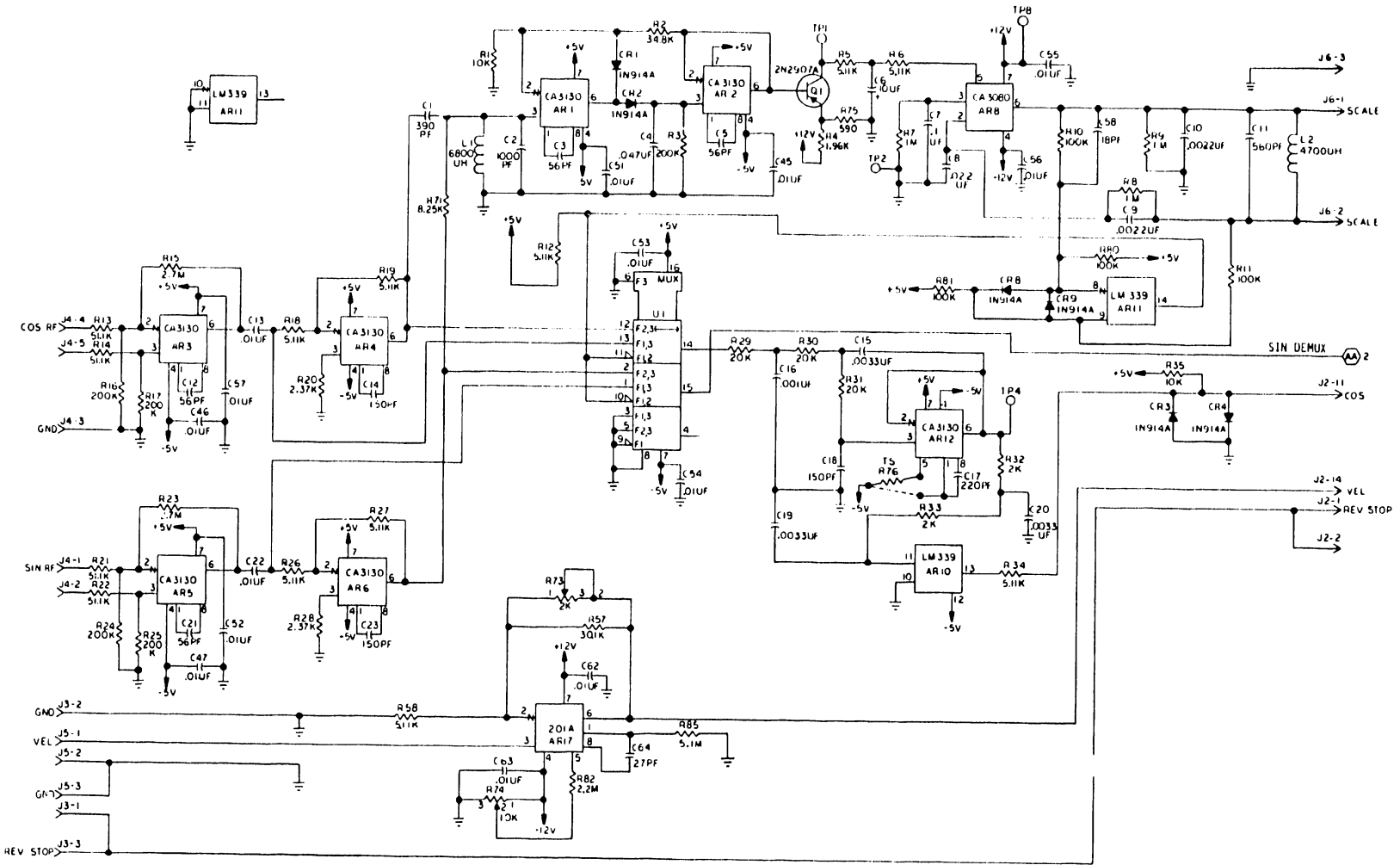
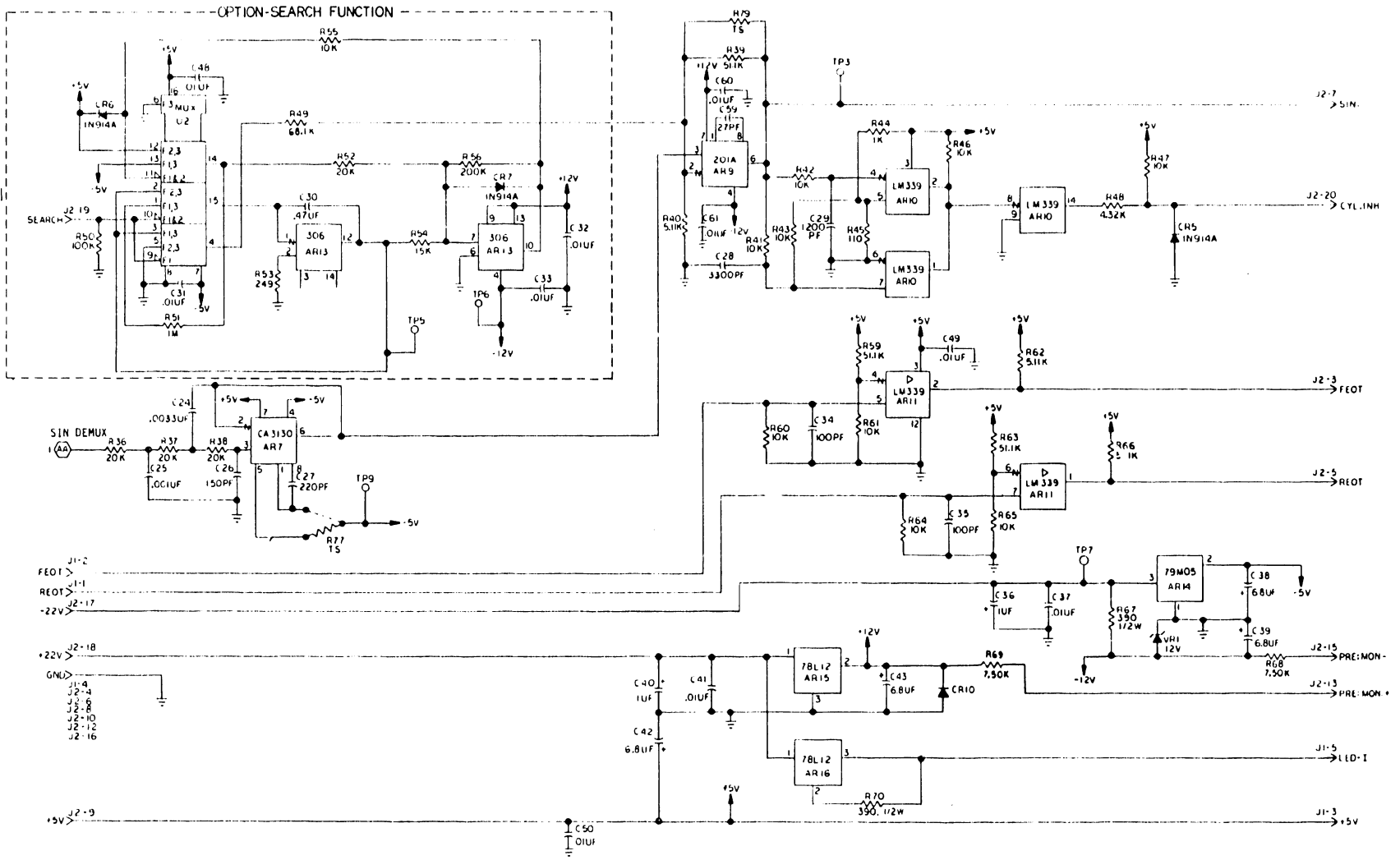
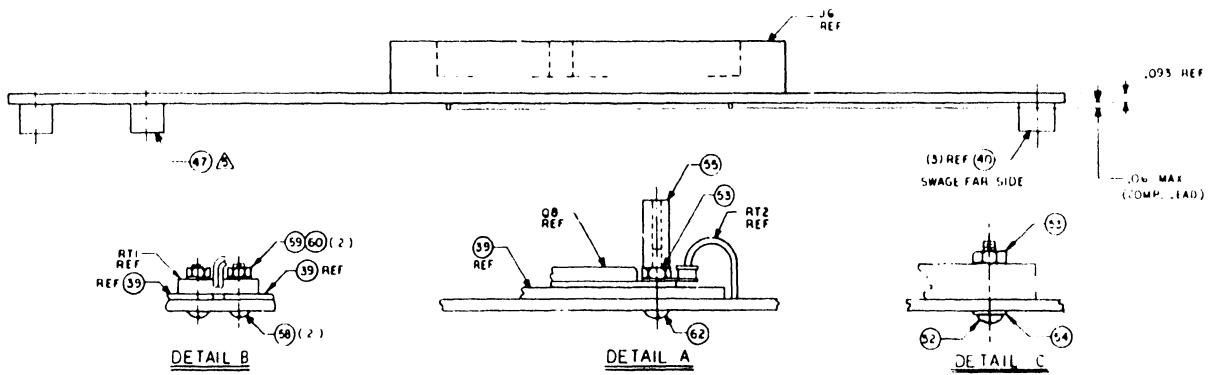
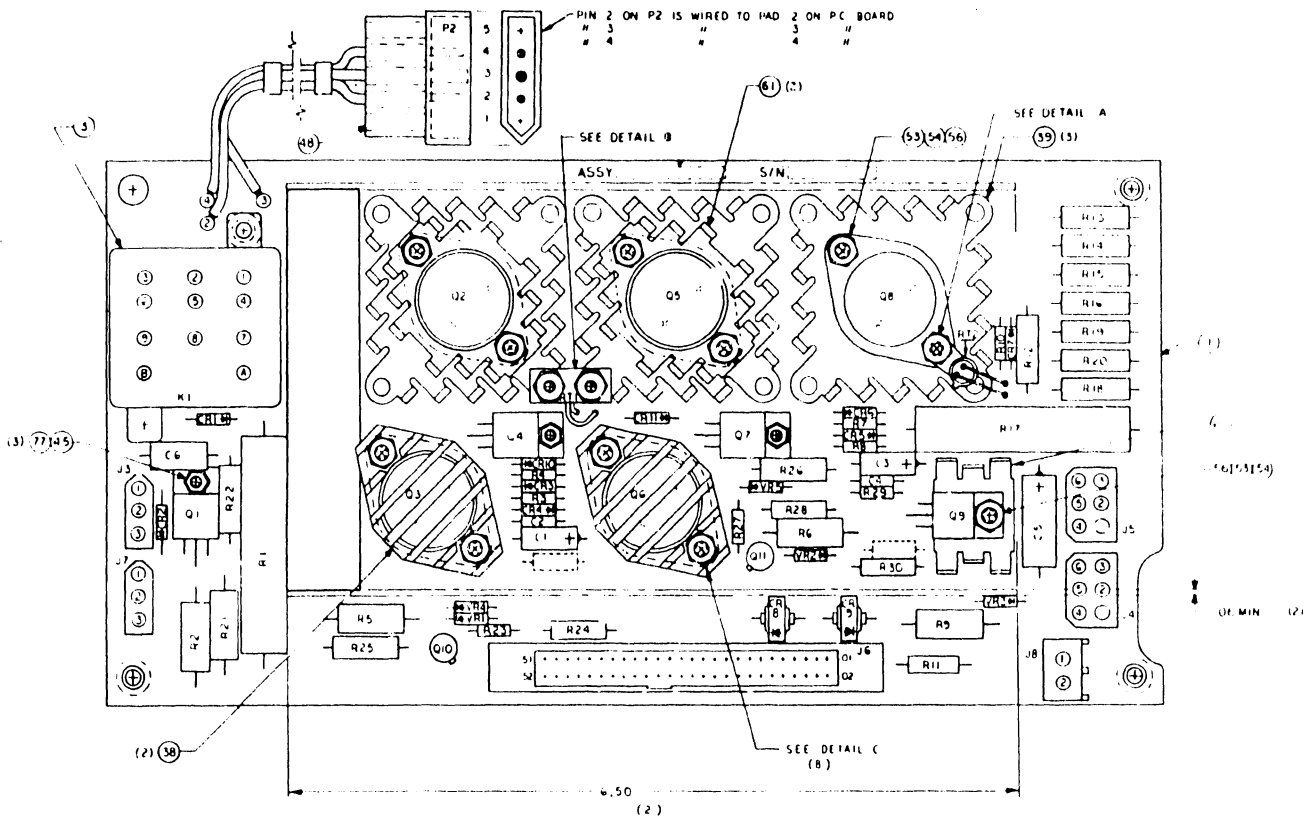


FIGURE 5-20. AGC SERVO PREAMP BD ASM (SHEET 6 OF 6)





CODE	ITEM
CA1	9
CA2	9
CA3	10
CA4	9
CA5	10
CA6	9
CA7	18
CA8	12
CA9	9
CA10	9
CA11	9

CONN	ITEM
J3	31
J4	36
J5	35
J6	37
J7	32
J8	44

RELAY	ITEM
K1	2

VOLT REG	ITEM
VR1	11
VR2	11
VR3	46
VR4	27
VR5	27

THMS	ITEM
RT1	35
RT2	32

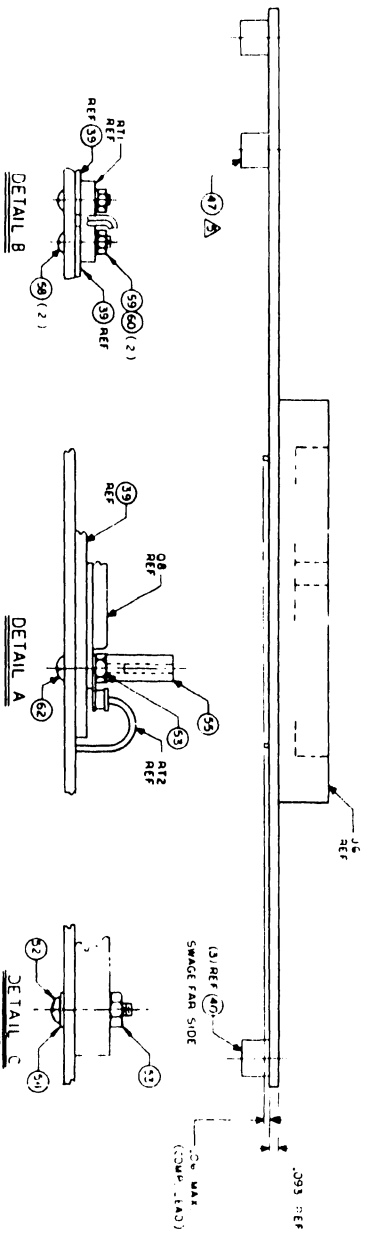
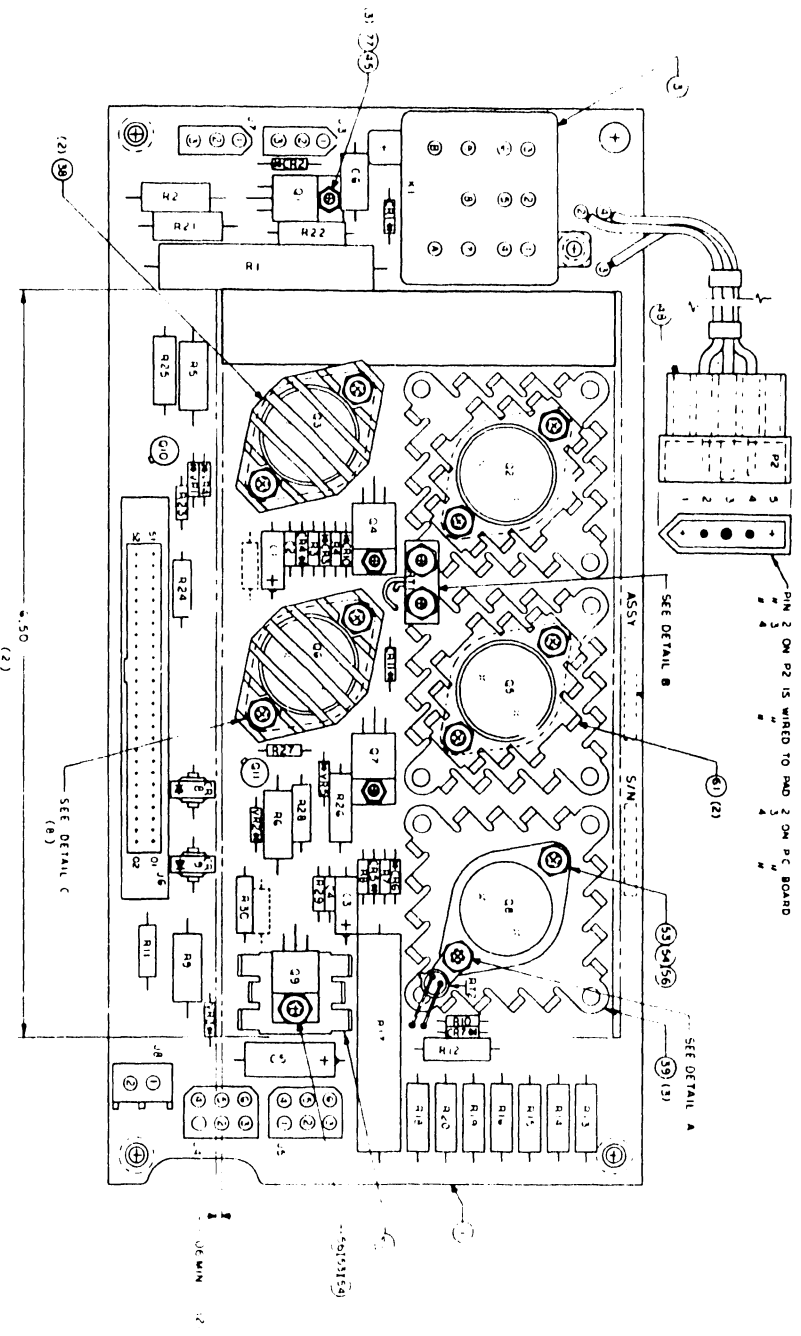
RES	ITEM
R1	28
R2	22
R3	18
R4	17
R5	23
R6	23
R7	18
R8	17
R9	49
R10	31
R11	19
R12	21
R13	27
R14	27
R15	27
R16	27
R17	29
R18	25
R19	26
R20	26
R21	24
R22	44
R23	70
R24	69
R25	68
R26	68
R27	70
R28	69
R29	65
R30	17

TSTR	ITEM
Q1	4
Q2	42
Q3	25
Q4	5
Q5	43
Q6	42
Q7	76
Q8	7
Q9	8
Q10	66
Q11	65

CAP	ITEM
C1	5
C2	14
C3	15
C4	14
C5	16
C6	4

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FIGURE 5-21. POWER SUPPLY BD NO. 1 (SHEET 1 OF 15)



DIODE	ITEM
CR1	9
CR2	9
CR3	10
CR4	9
CR5	10
CR6	9
CR7	74
CR8	12
CR9	12
CR10	9
CR11	9

CONN	ITEM
J3	53
J4	36
J5	35
J6	37
J7	32
J8	64

RELAY	ITEM
K1	2

VOLT REG	ITEM
VR1	11
VR2	11
VR3	46
VR4	67
VR5	67

THMS	ITEM
RT1	30
RT2	13

RES	ITEM
R1	28
R2	22
R3	18
R4	17
R5	23
R6	23
R7	18
R8	17
R9	49
R10	31
R11	19
R12	21
R13	27
R14	27
R15	27
R16	27
R17	29
R18	25
R19	26
R20	26
R21	24
R22	44
R23	70
R24	69
R25	68
R26	68
R27	70
R28	69
R29	80
R30	17

TSTR	ITEM
Q1	4
Q2	42
Q3	75
Q4	5
Q5	43
Q6	42
Q7	76
Q8	7
Q9	8
Q10	66
Q11	65

CAP	ITEM
C1	15
C2	14
C3	15
C4	14
C5	16
C6	41

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FIGURE 5-21. POWER SUPPLY BD NO. 1 (SHEET 1 OF 15)

<u>ITEM NO.</u>	<u>IDENTIFICATION NO.</u>	<u>DRAWING TITLE</u>
	77830321-4	PWA Pwr Sup #1
1	77830323-0	PWB Pwr Sup #1
2	22940804-2	Relay Gen Purp 3PDT
3	22940901-6	Relay Socket
4	75752300-6	Transistor Power
5	75752402-0	Transistor Power
7	50221700-3	Transistor MJ 4502
8	15151500-4	Volt Regulator
9	50241001-2	Diode Silicon
10	51736700-9	Diode 1N914A
11	50240920-4	Diode Zener
12	77832208-1	Diode Silicon
13	77612612-0	Thermistor Probe
13	83465304-0	Therm Sensor Switch-Intch
14	92496227-7	Cap 100V 20% .01 UF
15	17706043-1	Cap 50V 20% 4.7UF
16	24504386-4	Cap 20V 20% 47UF
17	94360236-7	Res 1/4W 1% 237
18	94360200-3	Res 1/4W 1% 100
19	24500139-1	Res 1/2W 5% 100
21	94318601-5	Resistor WW 3W 1.5
22	24507118-8	Res 1W 5% 51
23	24507139-4	Res 1W 5% 390
24	24507170-9	Res 1W 5% 2.0K
25	94318632-0	Resistor WW 3W 100
26	94318661-9	Resistor WW 3W 1000
27	94318697-3	Resistor WW 3W 0.5
28	62065805-4	Resistor
29	95594151-3	Res Fxd Wire WD 10W
30	77613025-4	Thermistor
31	94360100-5	Res 1/4W 1% 10.0
32	75808402-4	Conn Wafer 3-Pin
33	75808403-2	Conn Wafer 3-Pin MFM
35	75808448-7	Conn Wafer 6-Pin
36	75808451-1	Conn Wafer 6-Pin
37	97109269-7	Conn 32 Pin Male
38	75811802-0	Heatsink
39	95596205-5	Heatsink
40	75738874-9	Standoff
41	94240452-6	Cap 50V 10% 0.22MF
42	77830635-7	Motorola Tran 2N6030
43	94646506-0	Motorola Tran 2N5630
44	94318625-4	Res Wire WD 3W 50 OH
45	93650012-6	Stud-Self Clinching
46	50240108-6	Volt Reg 6.2V 5%
47	75738858-2	Standoff
48	83456701-8	Pwr Bd Harness Assy
49	92512399-4	Res 1W 1.2K 10
52	92743168-4	Screw SS Pan Hd 6-32

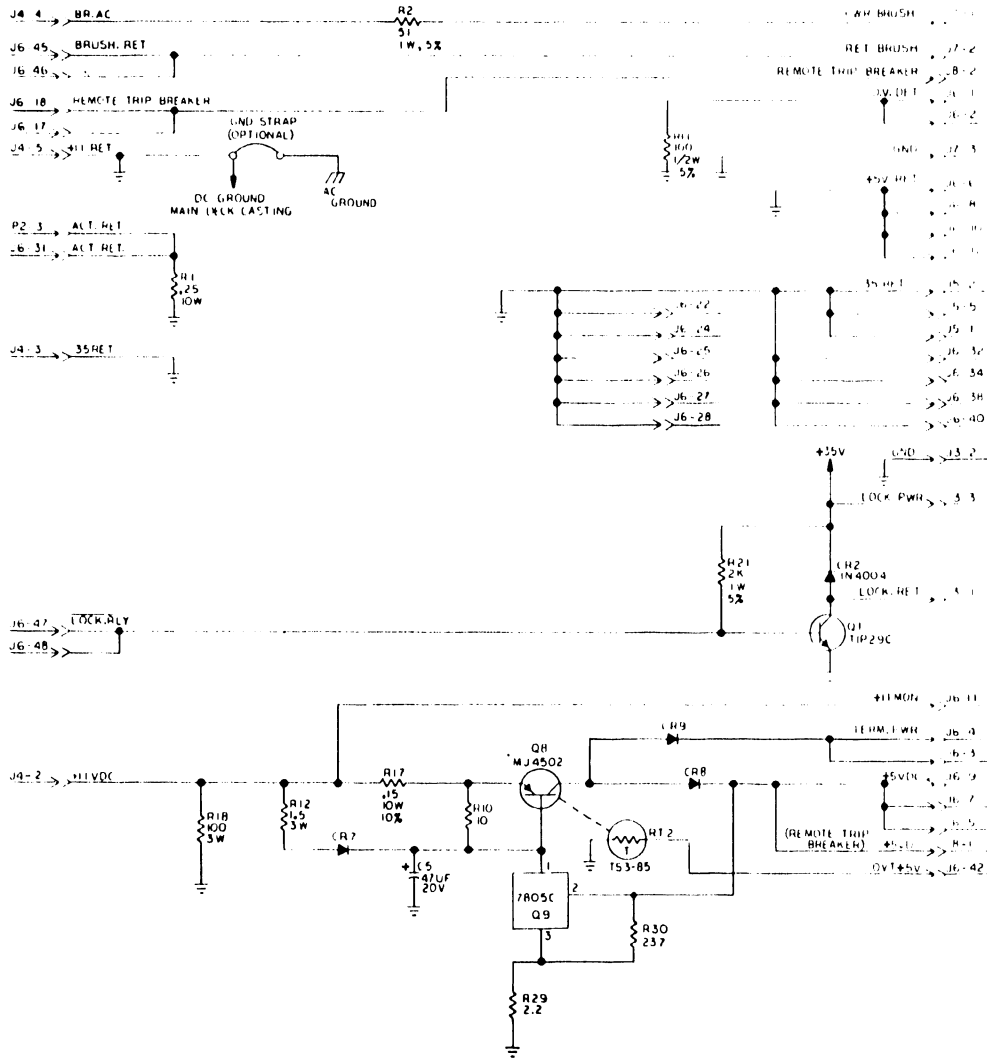
FIGURE 5-21. POWER SUPPLY BD NO. 1 (SHEET 2 OF 5)

ITEM NO.	IDENTIFICATION NO.	DRAWING TITLE
53	95510026-8	Nut Hex Mach Screw
54	10126103-0	Wash Int Tooth LK #6
55	83475701-5	Std Off-Wind Tunnel
56	92743164-3	Screw SS Pan Hd 6-32
58	92743088-4	Screw-Mach Hd SS 4-4
59	10126101-4	Wash Int Tooth Lock
60	10125103-1	Scr Nut-Hex Mach 4-4
61	77830638-1	Heat Dissipator
62	92743166-8	Screw- Pan Hd 6-32X5
63	94778801-4	Heatsink
64	95882700-8	Connector
65	75722200-5	Transistor NPN
66	16547200-2	Trans PNP 2N2907A
67	50240102-9	Diode-Zener 3.6V
68	94318604-9	Resistor 3 3W
69	24500174-8	Res 1/2W 5% 3.0K
70	94360368-8	Res 1/4W 1% 5.11K
74	83452901-8	Diode A14B
75	92162069-6	Transistor 2N3055
76	75752302-2	Transistor Power
77	92583002-8	Nut Lock
80	15164522-3	Res 1/4W 5% 2.2

CONNECTOR	DESTINATION (SCH)
J3	F5-31, BASEPLATE ELECTRONICS
J4 & J5	F5-26, F5-27, F5-28, F5-29 or F5-30, AC-DC POWER DISTRIBUTION.
J6	F5-22, POWER SUPPLY BD NO. 2
J7 & J8	F5-31, BASEPLATE ELECTRONICS
P2	DESTINATION NOT SHOWN - SIGNAL USED WHEN ADJUSTING HEADS TO BYPASS RELAY K1.

(AA291c)

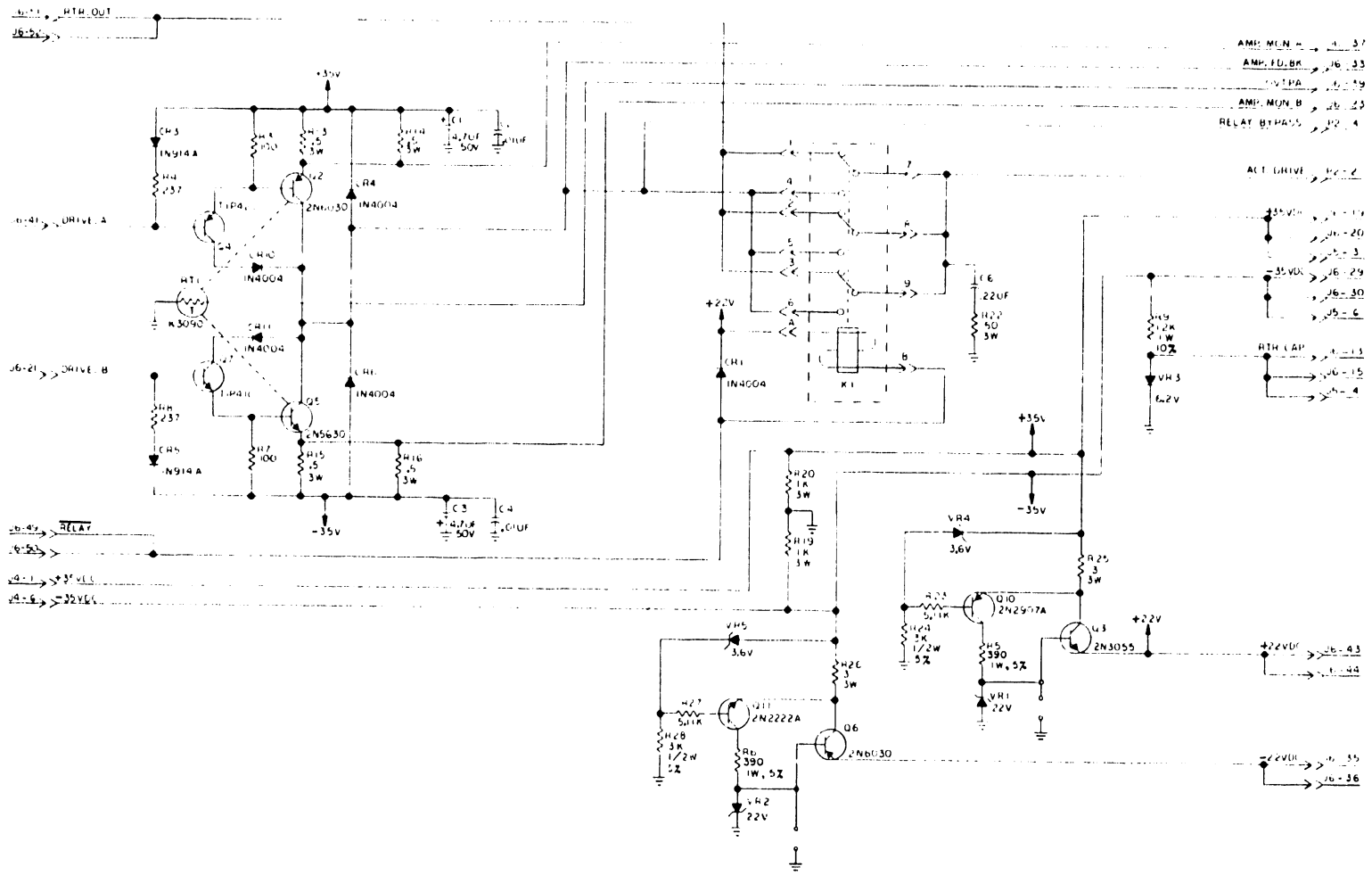
FIGURE 5-21. POWER SUPPLY BD NO. 1 (SHEET 3 OF 5)



NOTES: UNLESS OTHERWISE SPECIFIED
 1. RESISTANCE VALUES ARE IN OHMS,
 1/4W, 1%

FIGURE 5-21. POWER SUPPLY BD NO. 1 (SHEET 4 OF 5)

FIGURE 5-21. POWER SUPPLY BD NO. 1 (SHEET 5 OF 5)



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FIGURE 5-22. POWER SUPPLY BD NO. 2 (SHEET 1 OF 5)

RES	PL ITEM
R1	22
R2	32
R3	22
R4	26
R5	27
R6	31
R7	30
R8	43
R9	43
R10	43
R11	23
R12	24
R13	23
R14	23
R15	23
R16	33
R17	27
R18	22
R19	22
R20	28
R21	29
R22	25
R23	25
R24	29
R25	42
R26	24
R27	26
R28	62
R29	—
R30	41

RES	PL ITEM
R31	30
R32	28
R33	28
R34	35
R35	28
R36	28
R37	24
R38	49
R39	50
R40	57
R41	24
R42	47
R43	51
R44	51
R45	54
R46	31
R47	58
R48	58
R49	58
R50	58
R51	61
R52	22

CAP	PL ITEM
C1	18
C2	21
C3	17
C4	19
C5	19
C6	60
C7	56
C8	60

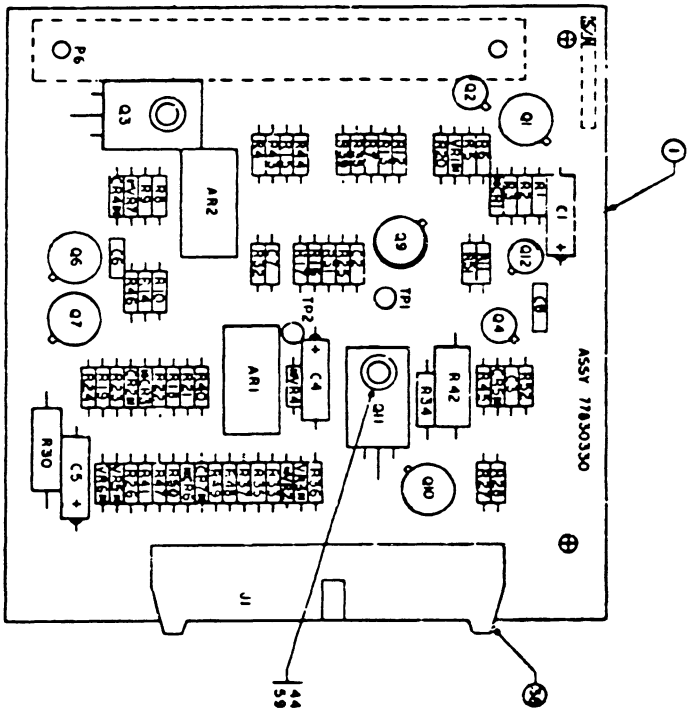
VOLT REG	PL ITEM
VR1	14
VR2	13
VR3	13
VR4	15
VR5	63
VR6	16
VR7	52

TSTR	PL ITEM
Q1	8,45
Q2	5
Q3	36
Q4	6
Q5	—
Q6	7,45
Q7	4,45
Q8	—
Q9	9,45
Q10	20,45
Q11	2
Q12	3

DIO	PL ITEM
CR1	12
CR2	12
CR3	12
CR4	11
CR5	12
CR6	12
CR7	12

TERM	PL ITEM
TP1	40
TP2	40

IC	PL ITEM
AR1	10
AR2	55



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FIGURE 5-22. POWER SUPPLY BD NO. 2 (SHEET 1 OF 5)

RES	PL ITEM
R1	22
R2	32
R3	22
R4	26
R5	27
R6	31
R7	30
R8	43
R9	43
R10	43
R11	23
R12	24
R13	23
R14	23
R15	23
R16	33
R17	27
R18	22
R19	22
R20	28
R21	29
R22	25
R23	25
R24	29
R25	42
R26	24
R27	26
R28	62
R29	—
R30	41

RES	PL ITEM
R31	30
R32	28
R33	28
R34	35
R35	28
R36	28
R37	24
R38	49
R39	50
R40	57
R41	24
R42	47
R43	51
R44	51
R45	54
R46	31
R47	58
R48	58
R49	58
R50	58
R51	61
R52	22

CAP	PL ITEM
C1	18
C2	21
C3	17
C4	19
C5	19
C6	60
C7	56
C8	60

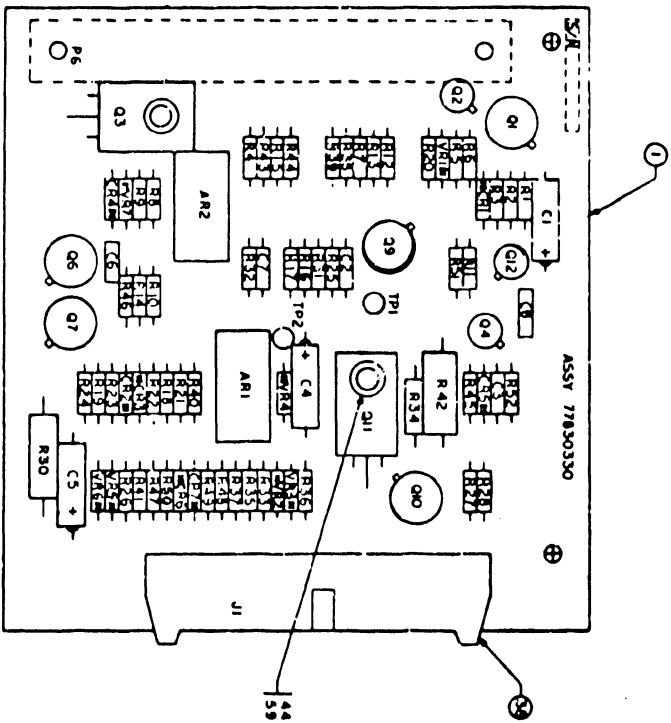
VOLT REG	PL ITEM
VR1	14
VR2	13
VR3	13
VR4	15
VR5	63
VR6	16
VR7	52

TSTR	PL ITEM
Q1	8,45
Q2	5
Q3	36
Q4	6
Q5	—
Q6	7,45
Q7	4,45
Q8	—
Q9	9,45
Q10	20,45
Q11	2
Q12	3

DIO	PL ITEM
CR1	12
CR2	12
CR3	12
CR4	11
CR5	12
CR6	12
CR7	12

TERM	PL ITEM
TP1	40
TP2	40

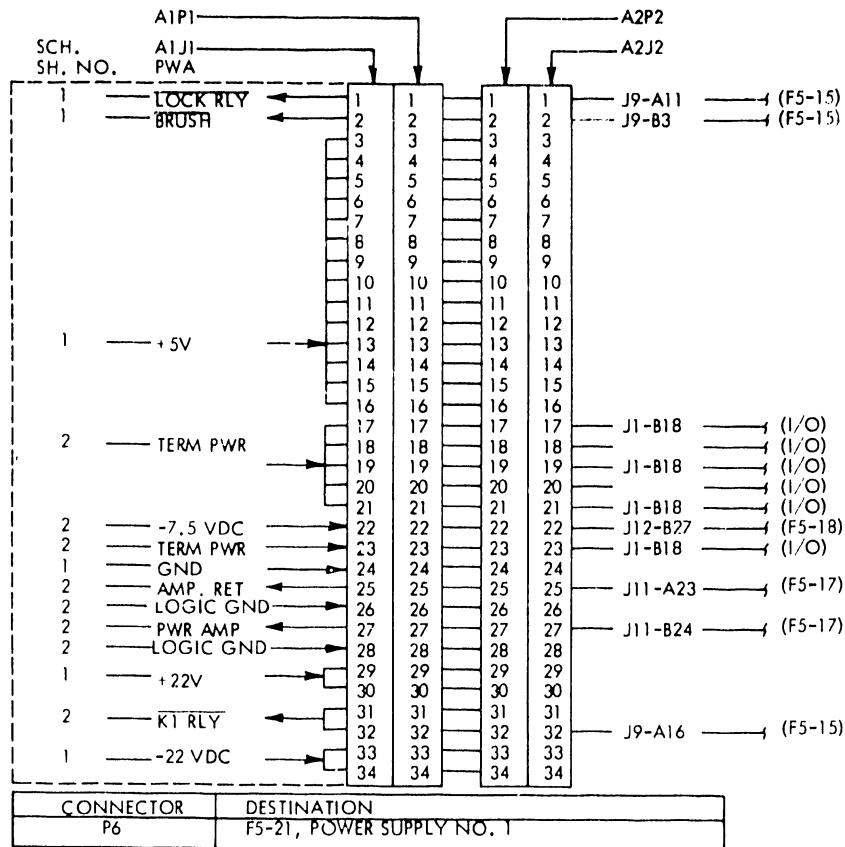
IC	PL ITEM
ARI	10
AR2	55



ITEM NO.	IDENTIFICATION NO.	DRAWING TITLE
1	77830330-5	PWA Pwr Sup #2
1	77830334-7	PWB Pwr Sup #2
1	77830333-0	PWB Pwr Sup #2, Intch
2	75752300-6	Transistor Power
3	50219900-3	Transistor-Unijunction
4	95592700-9	Transistor 2N2905
5	75722200-5	Transistor NPN
6	16547200-2	Trans PNP 2N2907A
7	75722201-3	Transistor NPN 2N2219A
8	95327201-0	Silicon Triac
9	83464203-5	Sensitive Gate Triac
10	51812800-4	IC Dual UA 747
11	50241001-2	Diode Silicon
12	51736700-9	Diode 1N914A
13	50240102-9	Diode-Zener 3.6V
14	50240109-4	Diode Silicon
15	50240117-7	Diode Zener
16	50240110-2	Diode Silicon
17	92496227-7	Cap 100V 20% .01UF
18	24504337-7	Cap 35V 20% 4.7UF
19	24504339-3	Cap 35V 20% 6.8UF
20	83464202-7	IC
21	75808533-6	Cap 100V 10% 4700
22	94360200-3	Res 1/4W 1% 100
23	94360236-7	Res 1/4W 1% 237
24	94360280-5	Res 1/4W 1% 681
25	94360284-7	Res 1/4W 1% 750
26	94360300-1	Res 1/4W 1% 1.00K
27	94360329-0	Res 1/4W 1% 2.00K
28	94360368-8	Res 1/4W 1% 5.11K
29	94360380-3	Res 1/4W 1% 6.81K
30	94360385-2	Res 1/4W 1% 7.68K
31	94360400-9	Res 1/4W 1% 10.0K
32	94360448-8	Res 1/4W 1% 31.6K
33	94360568-3	Res 1/4W 1% 511K
35	24500170-6	Res 1/2W 5% 2.0K
36	75885251-1	Diode, Silicon Control
38	94359502-5	Header Flat Cable
39	97113325-1	Connector Header
40	92498021-2	Terminal, Swaged
41	94318633-8	Resistor WW 3W 110
42	94360550-1	Res 1/4W 1% 332K
43	94360240-9	Res 1/4W 1% 261
44	93640012-6	Stud-Self Clinching
45	94335900-0	Pad-Transistor Mtg
46	95694204-9	Spacer
47	24507118-8	Res 1W 5% 51
49	94360400-9	Res 1/4W 1% 10.0K

FIGURE 5-22. POWER SUPPLY ED NO. 2 (SHEET 2 OF 5)

ITEM NO.	IDENTIFICATION NO.	DRAWING TITLE
50	94360355-5	Res 1/4W 1% 3.74K
51	94360384-5	Res 1/4W 1% 7.50K
52	50240106-0	Diode Silicon, Zener, 5.1V
54	94360373-8	Res 1/4W 1% 5.76K
55	95794600-7	IC LM339. Intch
55	15126600-4	IC LM339
56	75808537-7	Cap 100V 10% 0.01 UF
57	94360311-8	Res 1/4W 1% 1.30K
58	94360325-8	Res 1/4W 1% 1.82K
59	92583002-8	Nut Lock
60	94354832-1	Capacitor Ceramic
61	94360304-3	Res 1/4W 1% 1.10K
62	94360429-8	Res 1/4W 1% 20.0K
63	50241601-9	Diode Zener 1%



AA089a

FIGURE 5-22. POWER SUPPLY BD NO. 2 (SHEET 3 OF 5)

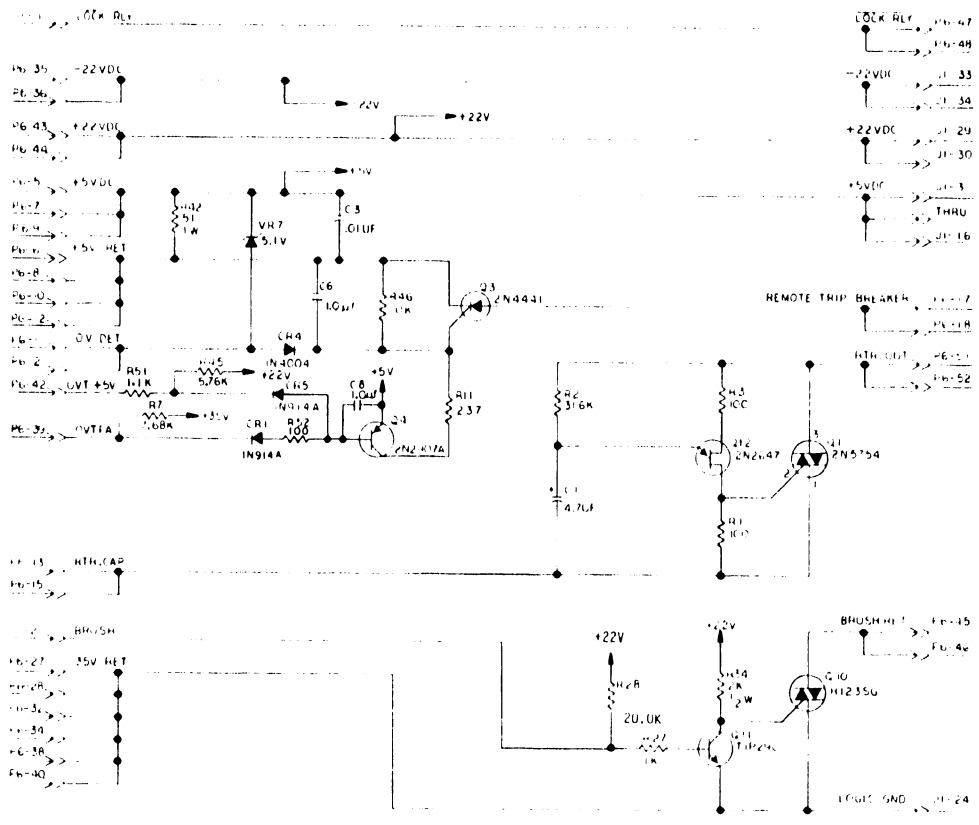
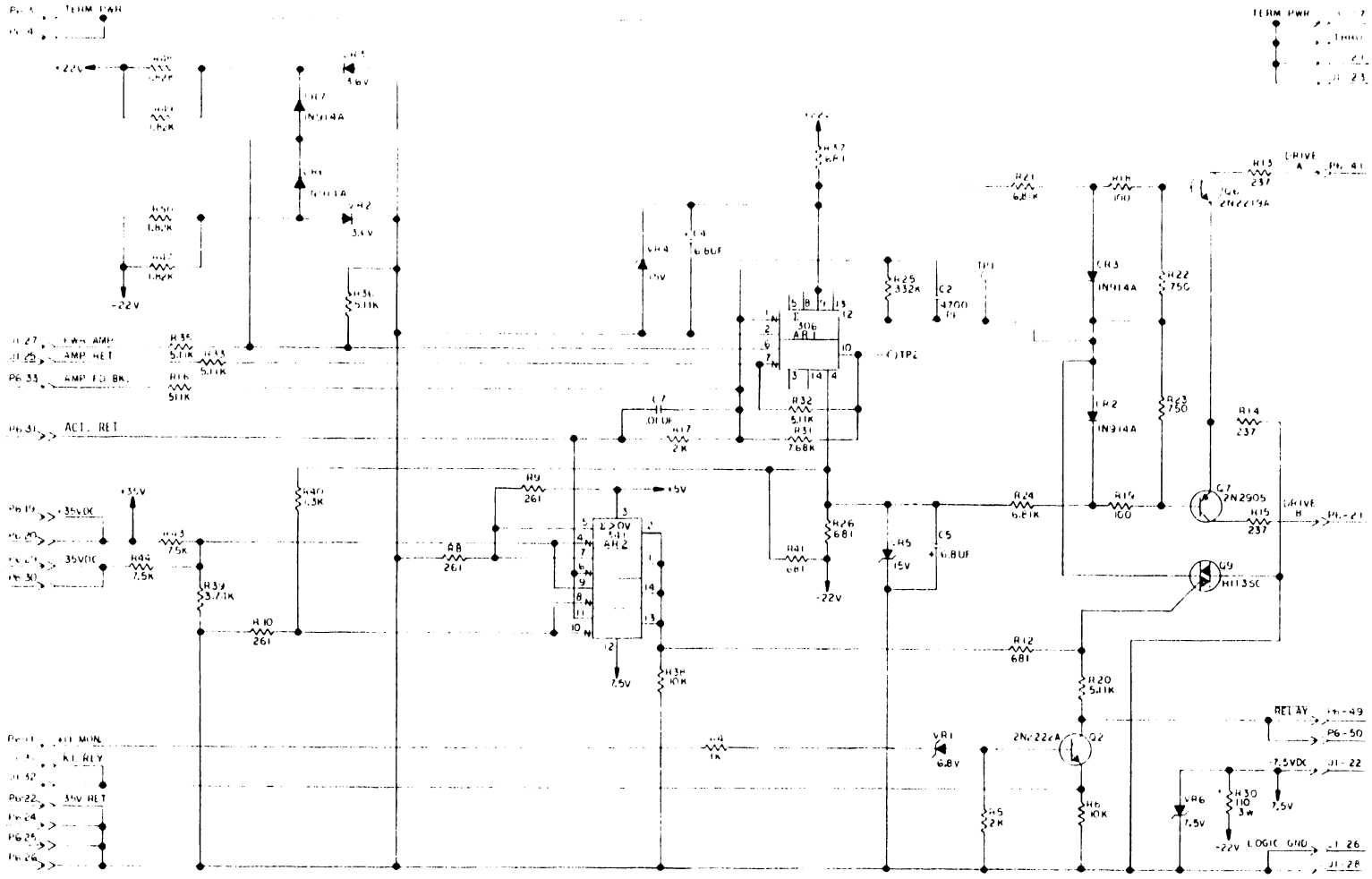
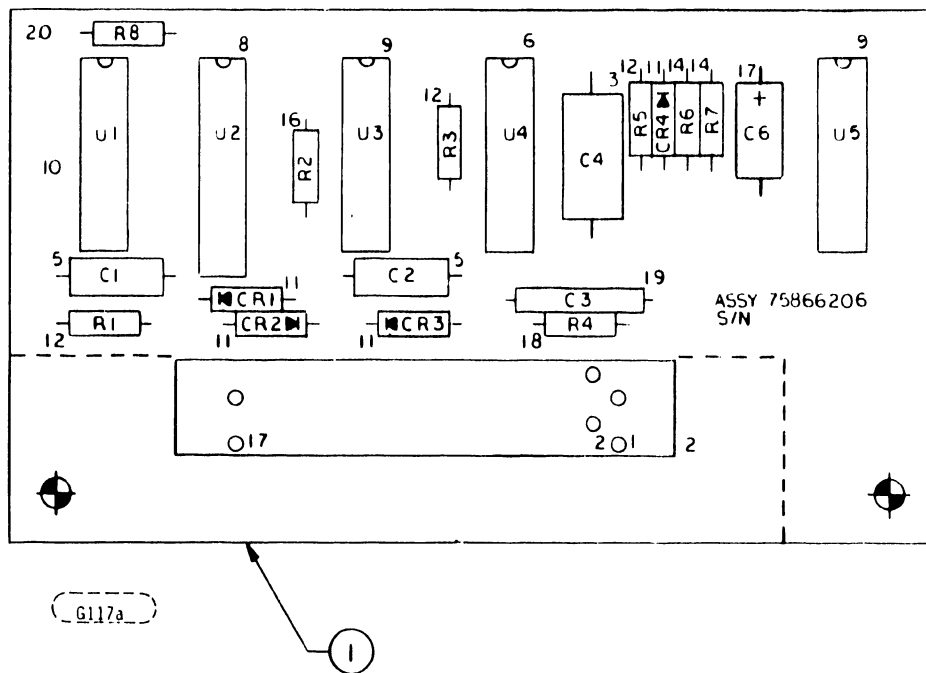


FIGURE 5-22. POWER SUPPLY BD NO. 2 (SHEET 4 OF 5)

FIGURE 5-22. POWER SUPPLY BD NO. 2 (SHEET 5 OF 5)





<u>ITEM NO.</u>	<u>IDENTIFICATION NUMBER</u>	<u>DRAWING TITLE</u>
1	75866206	PWA, Spindle Mtr Brake
2	75866107	PWB, Spindle Mtr Brke
2	75885581	Connector PWB
2	00005184	Connector PR017579, Intch
3	94240452	Cap 50V 10% 0.22 MF
5	94240448	Cap 50V 10% 0.10 UF
6	15133200	IC CMOS 4011B
8	15134700	IC CMOS 4049B
9	15135000	IC CMOS 4001B
10	51768200	IC Dual
11	51736700	Diode 1N914A
12	17705953	Res 1/4W 5% 5.1Meg
14	24500087	Res 1/4W 5% 10K
16	94360500	Res 1/4W 1% 100K
17	24504346	Cap 10V 20% 4.7UF
18	17705951	Res 1/4W 5% 4.3Meg
19	83452013	Cap 100V 10% 0.22 UF
20	94360357	Res 1/4W 1% 3.92K

FIGURE 5-23. SPINDLE MOTOR BRAKE ASM (SHEET 1 OF 3)

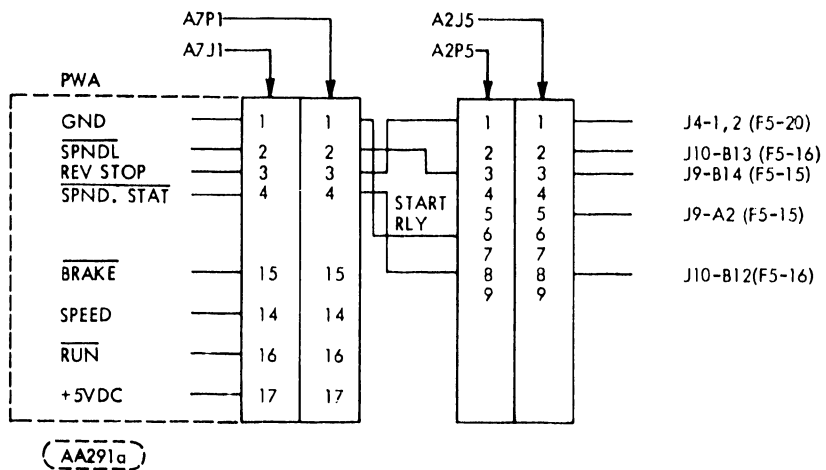


FIGURE 5-23. SPINDLE MOTOR BRAKE ASM (SHEET 2 OF 3)

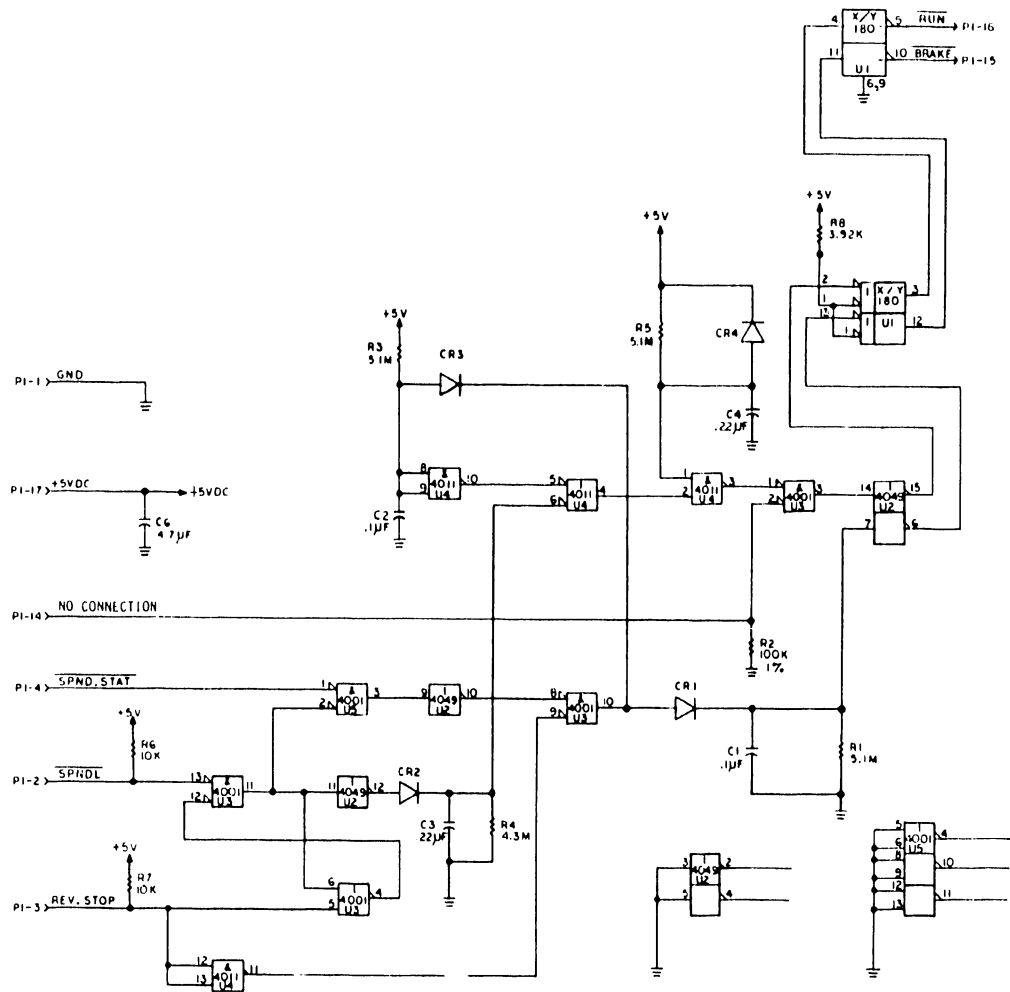


FIGURE 5-23. SPINDLE MOTOR BRAKE ASM (SHEET 3 OF 3)

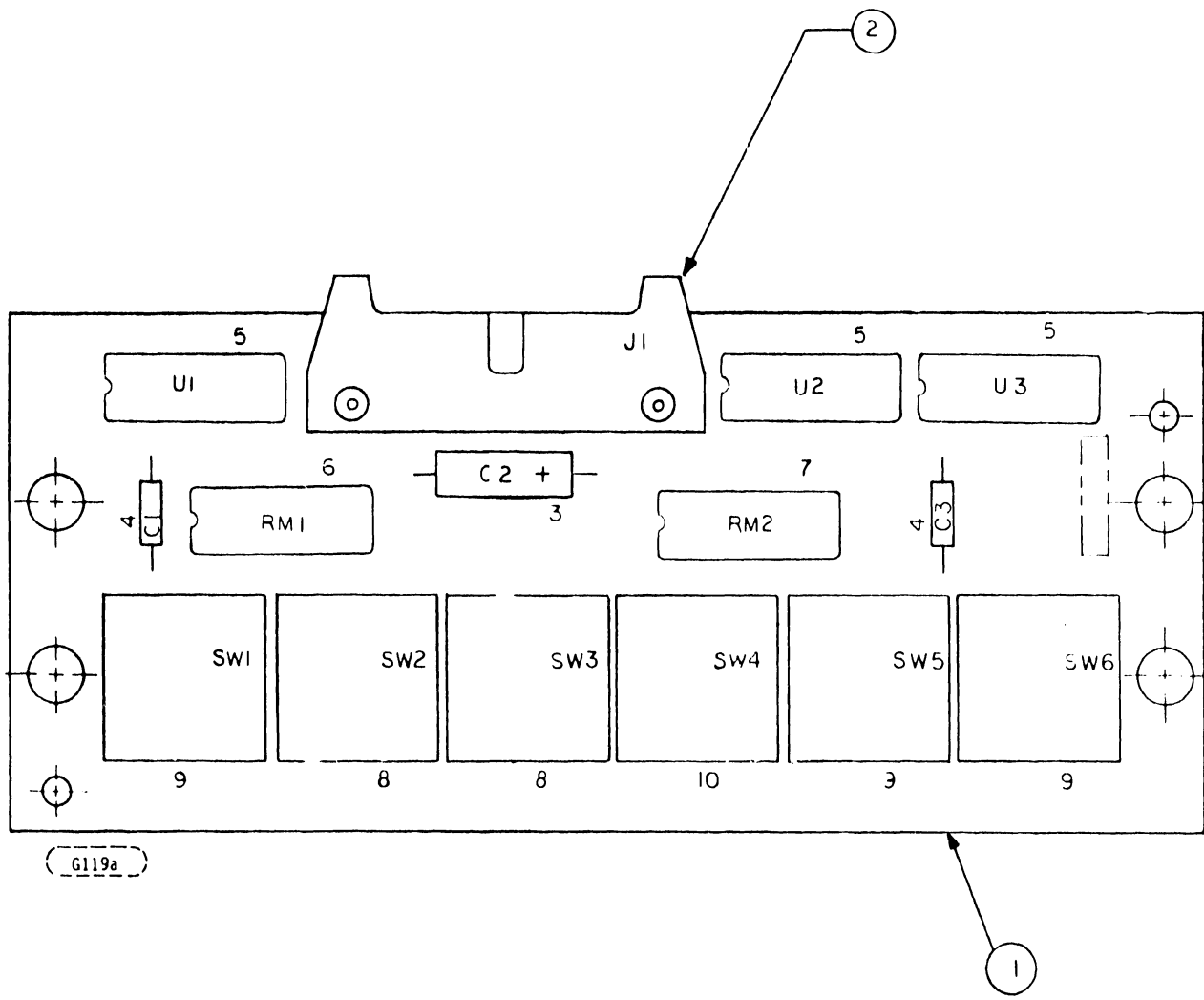
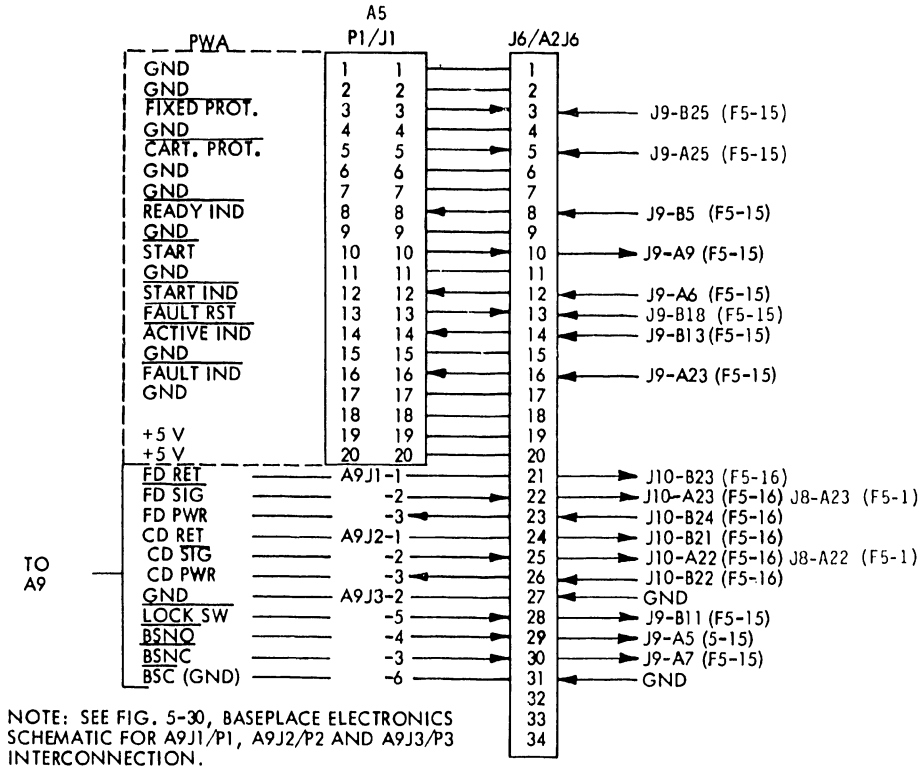


FIGURE 5-24. SWITCH BD ASM (SHEET 1 OF 3)

<u>ITEM NO.</u>	<u>IDENT NO.</u>	<u>DRAWING TITLE</u>
1	75299102	PWA Switch Board
2	75299001	PC Board, Switch
3	94359505	Header-Flat Cable
4	24504353	Cap 10V 20% 33UF
5	92496227	Cap 100V 20% .01UF
6	51768200	IC Dual
7	75009976	Res Pac 2% 2.0K (7)
8	75009955	Res Pac 2% 100 (7)
9	75299600	Switch Assy
10	75299700	Switch Assy
11	75299800	Switch Assy
11	83490700	Button-Switch Assy (on 75299103 only)
11	75299900	Button-Switch Assy (on 75299102 only)



(AA057c)

FIGURE 5-24. SWITCH BD ASM (SHEET 2 OF 3)

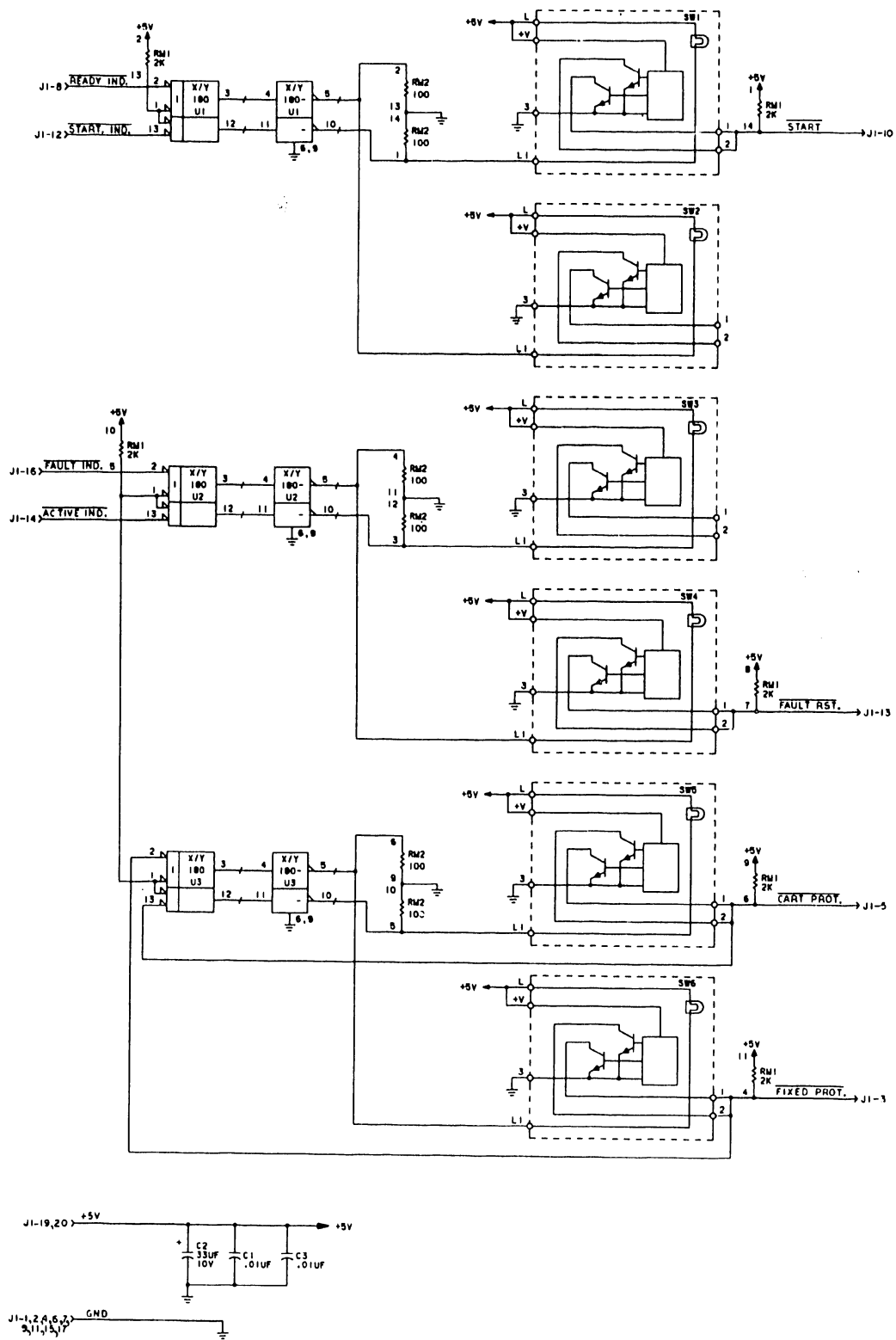


FIGURE 5-24. SWITCH BD ASM (SHEET 3 OF 3)

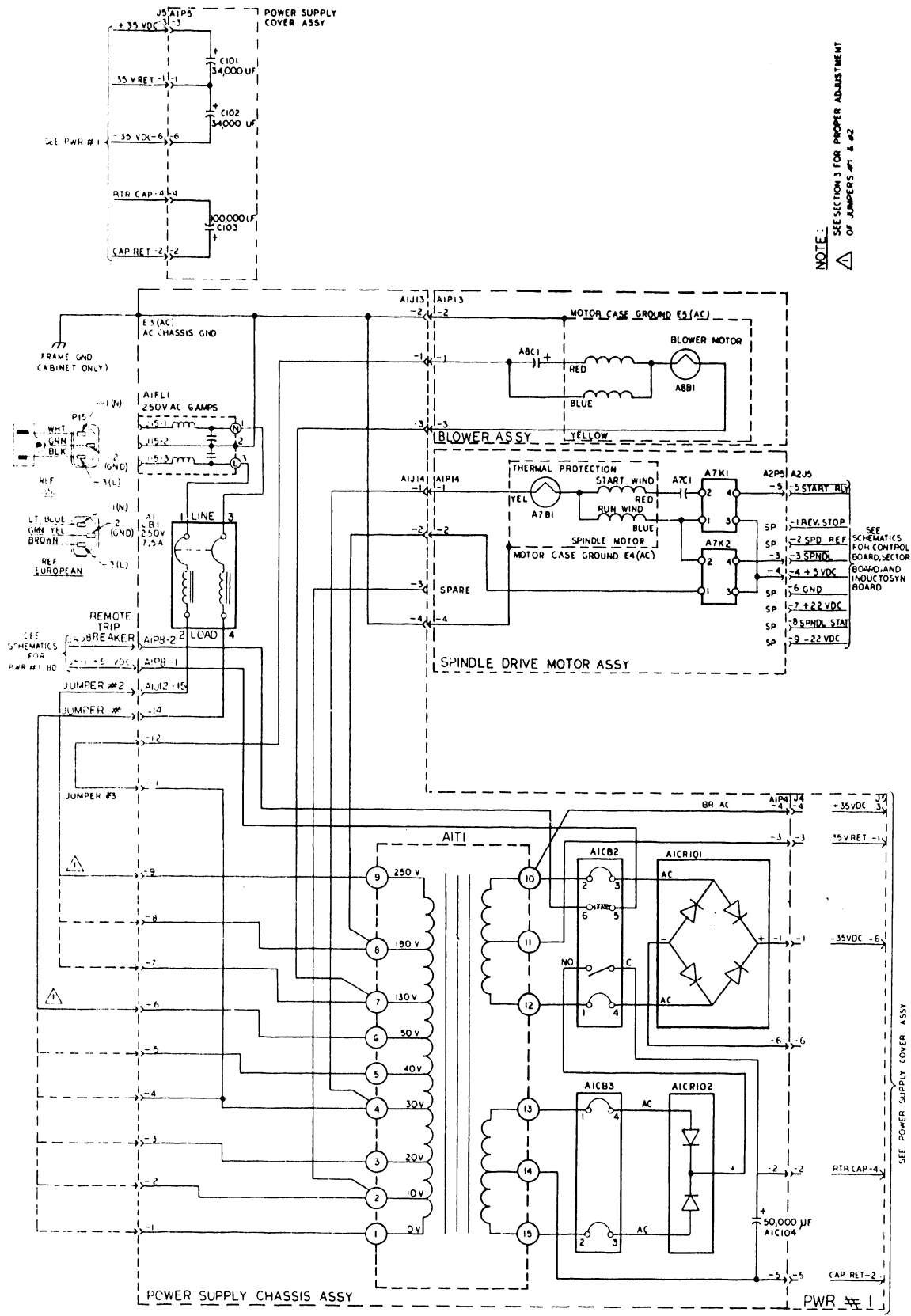


FIGURE 5-25. AC-DC WITHOUT DYNAMIC BRAKE

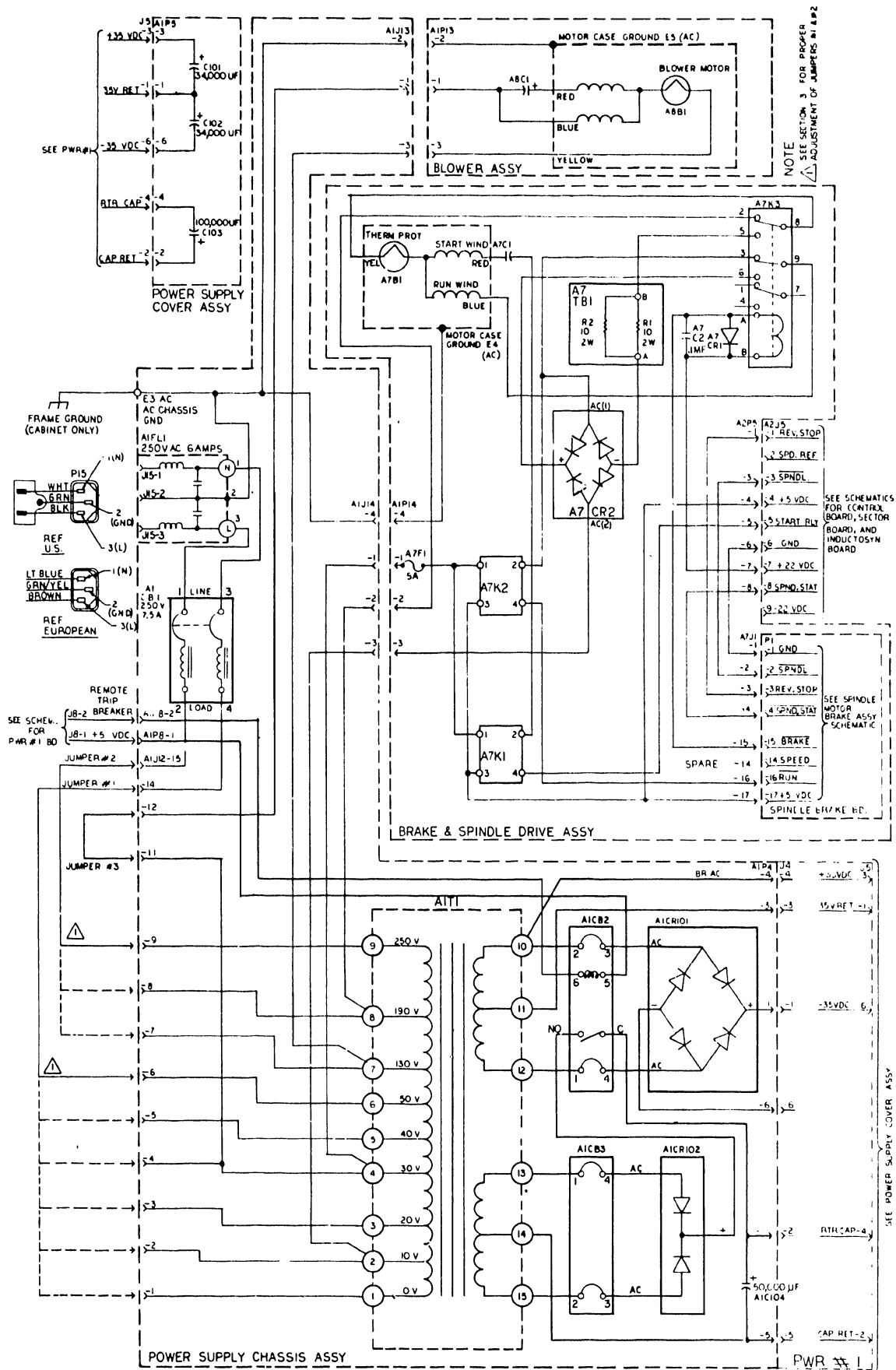


FIGURE 5-26. AC-DC WITH DYNAMIC BRAKE

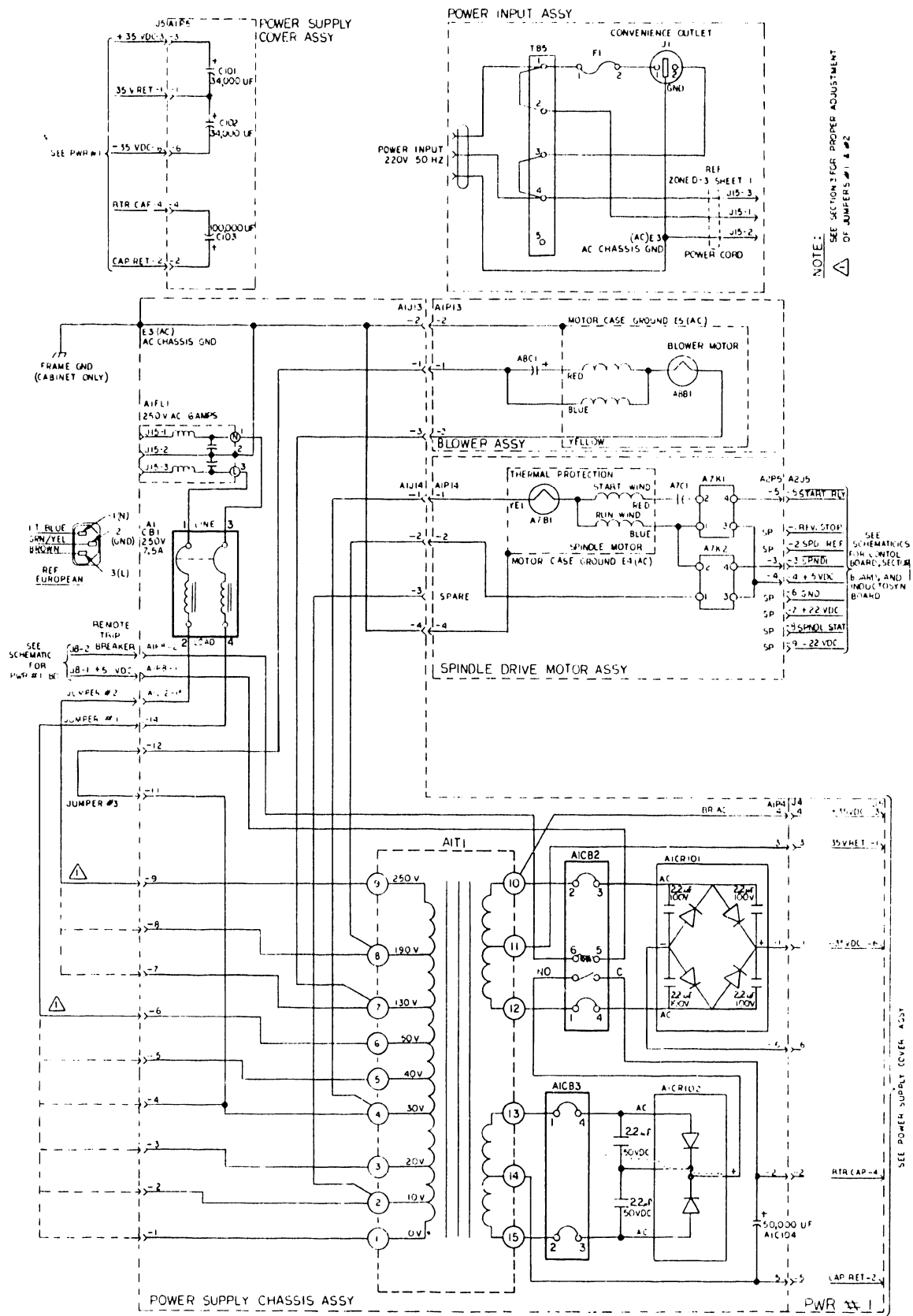
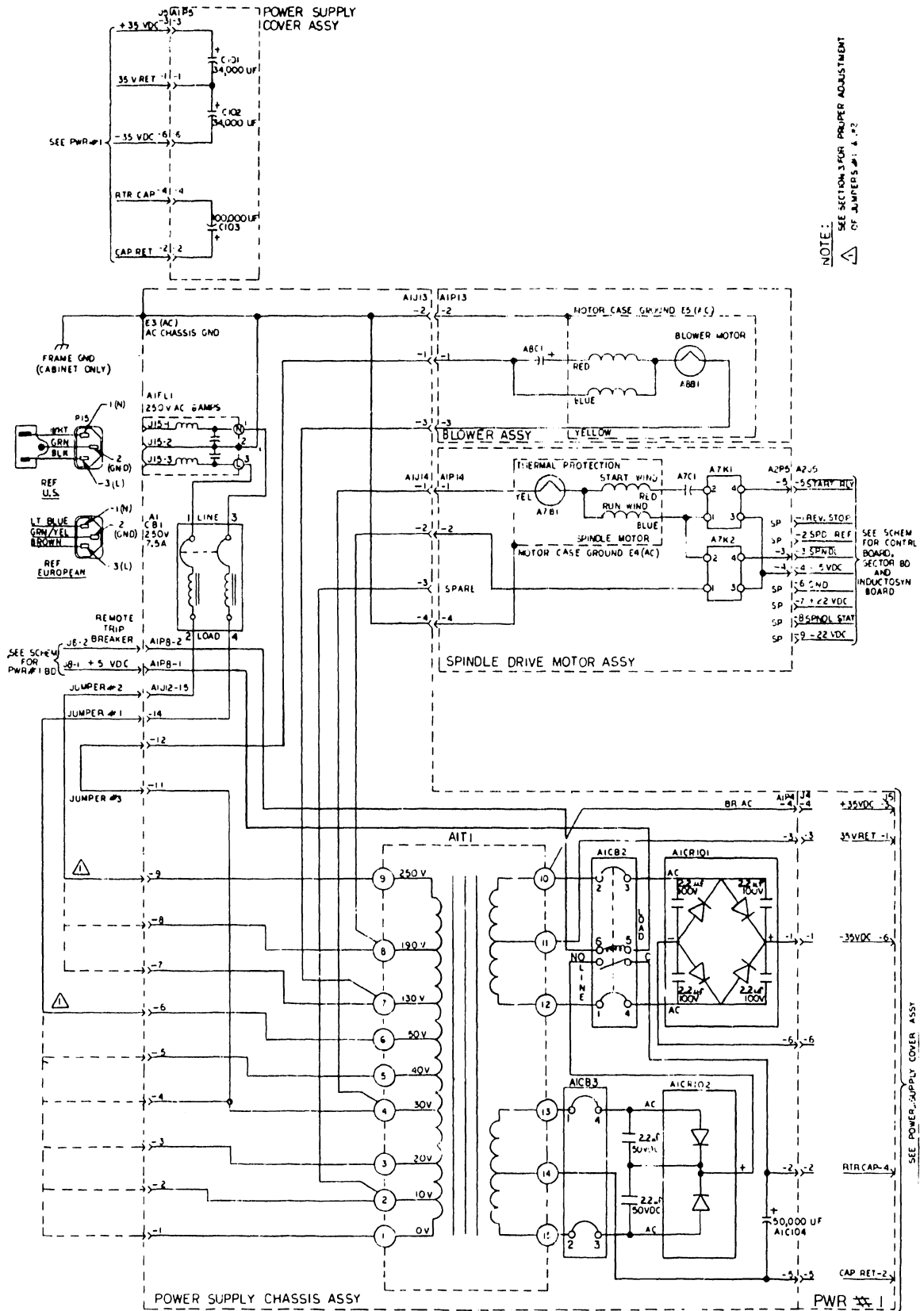


FIGURE 5-27. AC-DC WITHOUT BRAKE AND WITH FILTERS AND POWER INPUT ASSEMBLY



NOTE: SEE SECTION FOR PROPER ADJUSTMENT OF JUMPERS #1, A, & 2.

SEE SCHEM FOR CONTROL BOARD, SECTION B0 AND INDUCTOSYN BOARD

SEE POWER SUPPLY COVER ASSY

FIGURE 5-28. AC-DC WITHOUT DYNAMIC BRAKE - WITH FILTERS

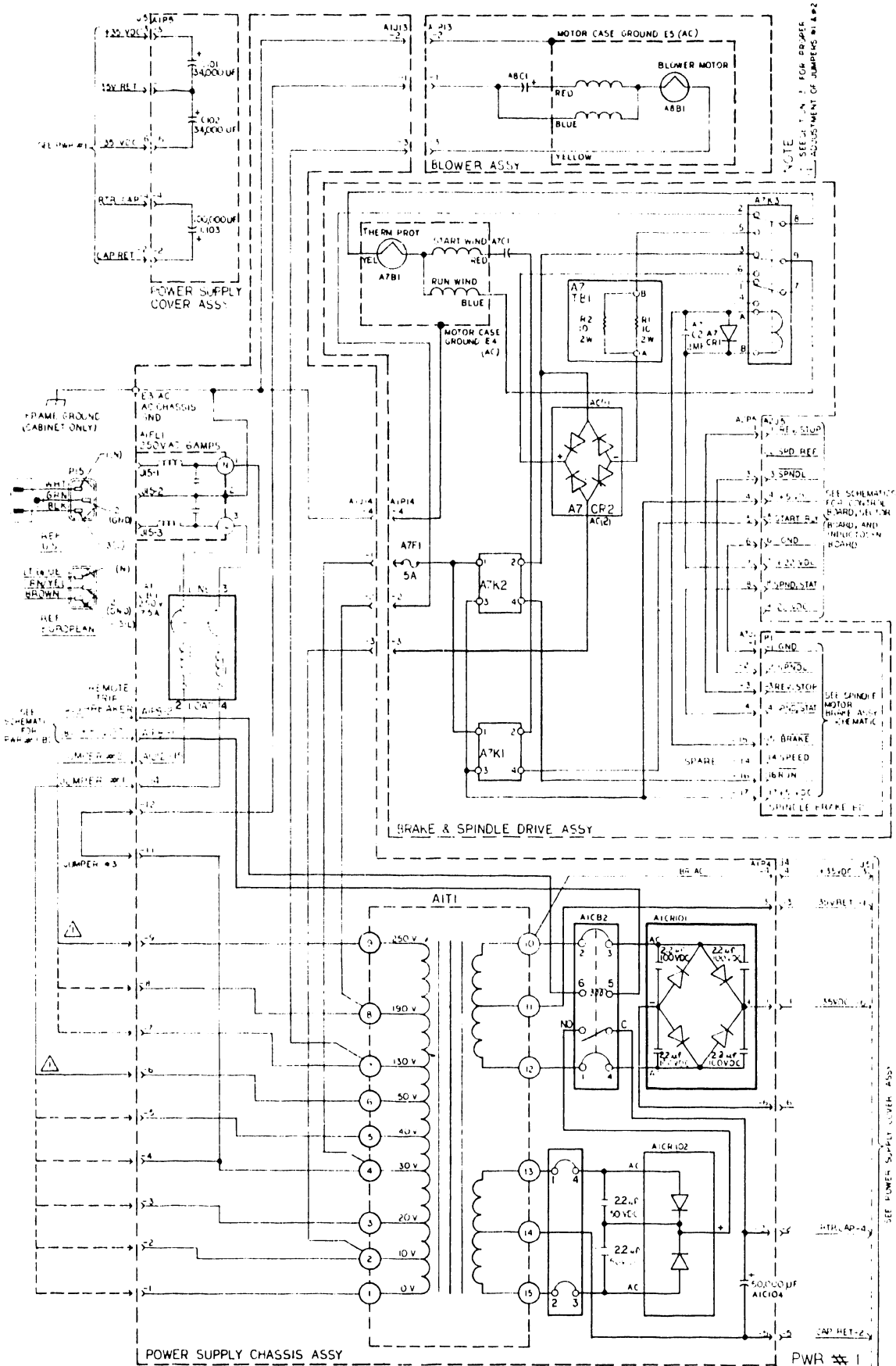


FIGURE 5-29. AC-DC WITH BRAKE AND FILTERS

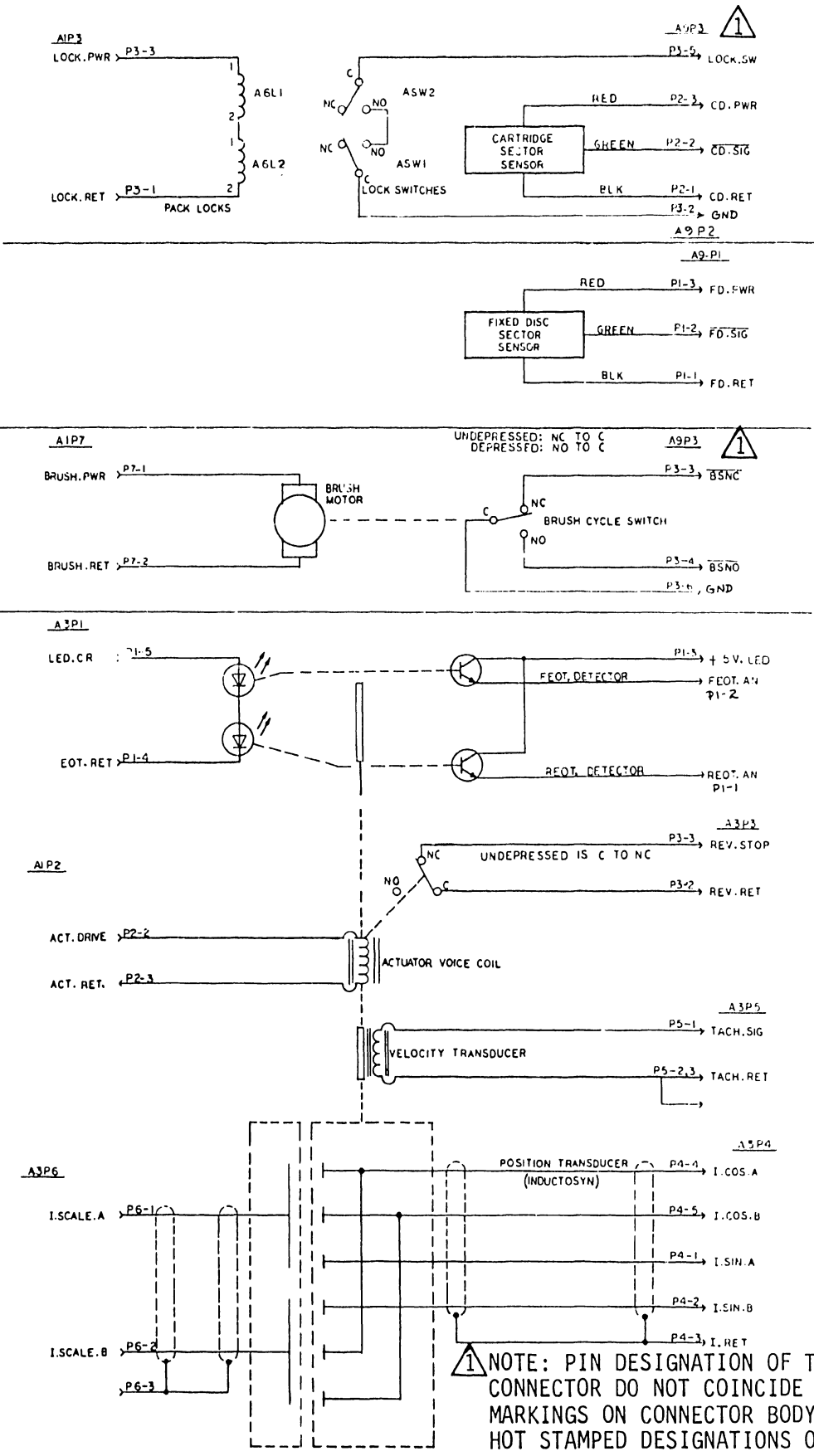
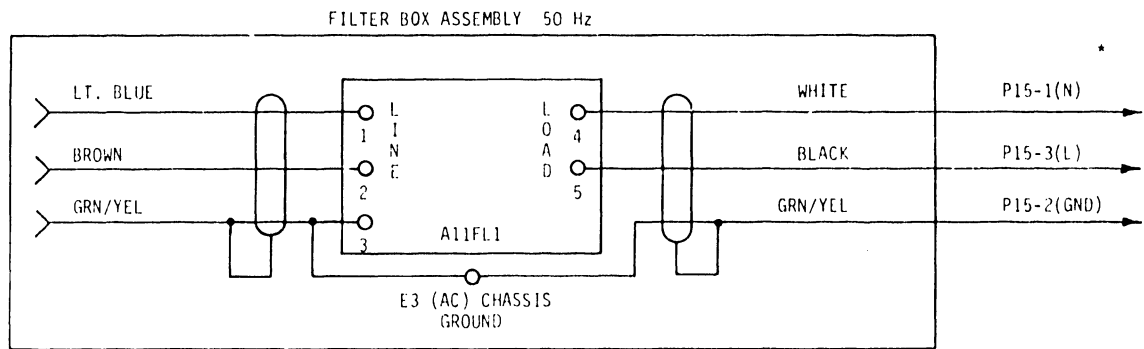


FIGURE 5-30. BASEPLATE ELECTRONICS



77-01a

* INTERCONNECTS WITH J15, AC-DC POWER SUPPLY

FIGURE 5-31. FILTER BOX SCHEMATIC

SECTION

6

MAIN-

TENANCE

6.1 INTRODUCTION

This section contains the instructions required to maintain the Model 9427H Disk Drive. The information is provided in the form of preventive maintenance and corrective maintenance. All maintenance should be performed by qualified and trained service personnel, using procedures specified in this section.

6.2 MAINTENANCE TOOLS

The special tools required to maintain the disk drive are listed in Table 6-1.

6.3 MAINTENANCE MATERIALS

The materials used in the procedures of this section are listed in Table 6-2.

TABLE 6-1. MAINTENANCE TOOLS

DESCRIPTION	CDC PART NUMBER
Plastic Feeler Gauges	Commercially available plastic shim
Head Alignment Tool	75797900
Force Gauges, 0-200 Grams and 0 to 10 lbf-in**	Commercially Available
Multimeter, Simpson 260 (or equivalent)	
Oscilloscope, Dual-Trace, Tektronix 453 (or equivalent)	
Ball Allen Drivers (1/16, 0.050, 9/64, 5/32, 3/32)	
CE Disk Cartridge Model 847-51	89296000
Card Extender	75861504
Card Extractor	83485801 (or equivalent)*
Fault Board Kit, including:	83457801
Fault Board	75863204
Instruction Manual	75535900
Armature Plate Simulator	83455500
Pin Extractor for Voltage Plug A1P12	
Molex Products Corp.	
HT-2038 Extractor	
OEM Field Tester	77833135
Torque Screwdrivers 1-30 lbf-in	
1-100 lbf-in with Hex Bit Adapter and Phillips Adapter	Commercially available
Bulb Removal Tool	83439200
* WARNING	Exercise care to avoid damage to cards or to attached components, when using card extraction tool. PWA's can be damaged by static electricity if not properly handled. See Removal and Replacement Procedure for PWAs Section 6.6.17.

**International Standard units for torque: poundsforce-inches (lbf-in).

TABLE 6-2. MAINTENANCE MATERIALS

MATERIAL	SOURCE
Gauze, Lint-Free	Control Data 12209713
Media Cleaning Solution	Control Data 82365800
Loctite, Grade C or #242	Loctite Corporation
Loctite Primer, Grade N	Loctite Corporation
Tongue Depressors	Commercially available
Tape, Masking	Commercially available
Duco Cement (or Equivalent)	Commercially available
Adhesive (RTV 108)	Commercially available

6.4 MAINTENANCE INDEX AND SCHEDULE

The Model 9427H is designed to require minimal preventive maintenance. The preventive maintenance index provided in Table 6-3 is meant to be used only as a general guideline. The preventive maintenance index consists of seven levels based on a calendar period or on hours of operation (whichever comes first).

The corrective maintenance procedures listed in Table 6-3 are included to facilitate the replacement of malfunctioning assemblies. Adjustment procedures are provided to adjust the unit to the published specifications. Maintenance personnel should read the entire procedure prior to performing any of the steps. Steps of these procedures should be performed in sequence.

The check and adjustments procedures listed in Table 6-3 may be used to check for malfunctioning parts, to determine whether the disk drive is operating within published specifications, or to adjust the disk drive for proper operations.

6.5 PREVENTIVE MAINTENANCE PROCEDURES

6.5.1 CONTROL PANEL LAMP REPLACEMENT

CAUTION

Do not remove buttons from alternate action switches when they are in the depressed position or internal damage to the switch will occur.

1. Remove the Switch Button from the switch assembly by pulling the button outward from the switch. Note Orientation of metal bracket inside pushbutton cover for re-installation during Step 4.
2. Using the bulb removal tool, remove the lamp from the socket. (Do not turn the lamp since it is a plug-in device).
3. Install new lamp.
4. Re-install Switch Button. Care must be taken that the metal tabs on the pushbutton bracket do not come in contact with the metal clamps supplying voltage to the lamp or damage to the switch logic will occur.

6.5.2 INSPECT AND CLEAN READ/WRITE HEADS

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP light extinguished).
2. Open top cover.
3. Set main circuit breaker to off position.
4. Remove electronics cover.

TABLE 6-3. MAINTENANCE INDEX AND SCHEDULE

PREVENTIVE MAINTENANCE	<u>Schedule</u>
Control Panel Lamp Replacement	6
Inspect and Clean Read/Write Heads	3
Disk Cartridge Inspection and Cleaning	3
Fixed Disk Inspection and Cleaning	3
Absolute Filter Removal and Replacement (Office or Industrial Environment)	4
Absolute Filter Removal and Replacement (Compute Room Environment)	5
Pre-Filter Cleaning (Base Cabinet)	3
Pre-Filter Cleaning (Rack Mount Unit only)	3
Disk Brush-Check and Replacement	5
Inspect and Dry Magnetic Chuck	0
DEFINITION OF SCHEDULE	
Level 0 - Daily, depending on condition state Level 1 - Weekly or 150 hours (no preventive maintenance scheduled) Level 2 - Monthly or 500 hours (no preventive maintenance scheduled) Level 3 - Quarterly or 1500 hours Level 4 - Semi-annually or 3000 hours (no preventive maintenace scheduled) Level 5 - Annually or 6000 hours Level 6 - 15,000 hours	
CORRECTIVE MAINTENACE	
REMOVAL AND REPLACEMENT PROCEDURES (R&R)	
<u>Title</u>	<u>Paragraph No.</u>
Actuator Assembly R & R	6.6.1
Head R & R	6.6.2
EOT Assembly R & R	6.6.3
Fixed Disk R & R	6.6.4
Position Transducer Scale R & R	6.6.5
Velocity Transducer R & R	6.6.6
Velocity Transducer Magnet R & R	6.6.7
Spindle Assembly R & R	6.6.8
Cartridge Disk Index/Sector Transducer R & R	6.6.9
Fixed Disk Index/Sector Transducer R & R	6.6.10
Static Eliminator R & R	6.6.11
Sector Ring R & R	6.6.12
Cartridge On Switch R & R	6.6.13
Disk Brush Assembly R & R	6.6.14
Brush Motor R & R	6.6.15
Spindle Drive Motor Assembly R & R	6.6.16

TABLE 6-3. MAINTENANCE INDEX AND SCHEDULE (CONTINUED)

CORRECTIVE MAINTENANCE	
REMOVAL AND REPLACEMENT PROCEDURES (R&R) cont'd	
<u>Title</u>	<u>Paragraph No.</u>
Card Cage Printed Circuit Board R & R	6.6.17
Power Supply R & R	6.6.18
Piggyback Power Board R & R	6.6.19
Card Cage/Mother Board R & R	6.6.20
Blower Motor Assembly R & R (Base Cabinet)	6.6.21
Blower Motor Assembly R & R	6.6.22
Drive Motor and Belt R & R	6.6.23
Idler Motor and Belt R & R	6.6.24
Pack Lock Assembly or Pack Lock Solenoid R & R	6.6.25
CHECK AND ADJUSTMENT PROCEDURES (C&A)	
<u>Title</u>	<u>Paragraph No.</u>
Temperature Stabilization Check and Adjustment	6.7.1
AGC Servo Preamplifier and Inductosyn C & A	6.7.2
FEOT Check and Adjustment	6.7.3
Head Alignment Check and Adjustment	6.7.4
Head Skew and Index-to-Burst Period Check and Adjustment	6.7.5
Track Indicator Check and Adjustment	6.7.6
Cartridge-On Switch Check and Adjustment	6.7.7
Static Eliminator Check	6.7.8
Disk Brush Switch Check and Adjustment	6.7.9
Cartridge Index/Sector Transducer C & A	6.7.10
Fixed Disk Index/Sector Transducer C & A	6.7.11

5. Upper heads can be cleaned and removed without removal of actuator. To clean and remove lower heads, perform removal steps 1 through 21 of the actuator assembly removal and replacement procedure.

CAUTION Do not smoke while cleaning heads. Do not touch head face. When cleaning or buffing, always move tongue depressor perpendicular to length of head/arm assembly. Do not leave residue or lint on head faces.

6. Inspect heads for dirt on head face. Clean heads, if required, as follows:
- Use lint-free gauze on a tongue depressor to lightly dry buff head face.
 - If dry buffing does not remove dirt, dampen (do not soak) gauze to lightly buff head face.
7. Install actuator by performing replacement steps 1 through 22 of Actuator Removal and Replacement procedure, if lower heads were cleaned.

6.5.3 DISK CARTRIDGE INSPECTION AND CLEANING

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove disk cartridge.
3. Using a bright, directional light, inspect both sides of disk. If disk is dirty, have disk cartridge cleaned.
4. If disk surface is scratched, cartridge should be replaced.

6.5.4 FIXED DISK INSPECTION AND CLEANING

Cleaning of fixed disk will not normally be necessary, if disk area is kept covered. Clean disk by performing the following procedure.

1. Perform removal steps 1 through 11 of fixed disk removal and replacement procedures.
2. Inspect fixed disk brushes for dust. If brushes are dirty and show excessive wear, replace all brushes.
3. Slowly rotate spindle by hand and inspect both sides of disk. If scratches are found, replace disk.
4. To clean disk, wrap a piece of lint free gauze around tongue depressor and dampen (do not soak) with media cleaning solution.
5. While rotating spindle by hand, move tip of spatula (applying moderate pressure) across disk to outer edge.
6. Repeat step 5 for both disk surfaces until gauze comes away clean from disk surface.
7. Wrap a clean, dry piece of gauze around spatula and repeat step 5 to remove any residue left by cleaning solution.
8. To complete installation, perform replacement steps 4 through 9 of fixed disk removal and replacement procedure.

6.5.5 ABSOLUTE FILTER R & R

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Open top cover (base cabinet only).
3. Set main circuit breaker to off position.
4. Using a 5/32 Allen driver, place tool into holes on end panels and remove front and rear end panels by loosening hardware base cabinet only).
5. Remove left side panel of unit (when received from rear of unit, base cabinet only).
6. Loosen filter clamp (Figure 6-1) and swing clamp clear of filter.
7. Remove filter expander bracket.
8. Slide blower expander forward until filter is free.
9. Remove filter.
10. Remove pre-filter (Rack Mount Units only).
11. Clean pre-filter (Rack Mount Units only).
12. Secure pre-filter to new absolute filter by applying Duco cement at the four corners. Use old filter as a reference making sure pre-filter does not block unfiltered side of absolute filter (rack-mount units only).
13. Install replacement absolute filter and pre-filter.

NOTE: Insure that foam gasket between absolute filter and power supply are properly aligned. If not properly aligned, air flow can be restricted causing damage to power supply.

14. Install filter expander.

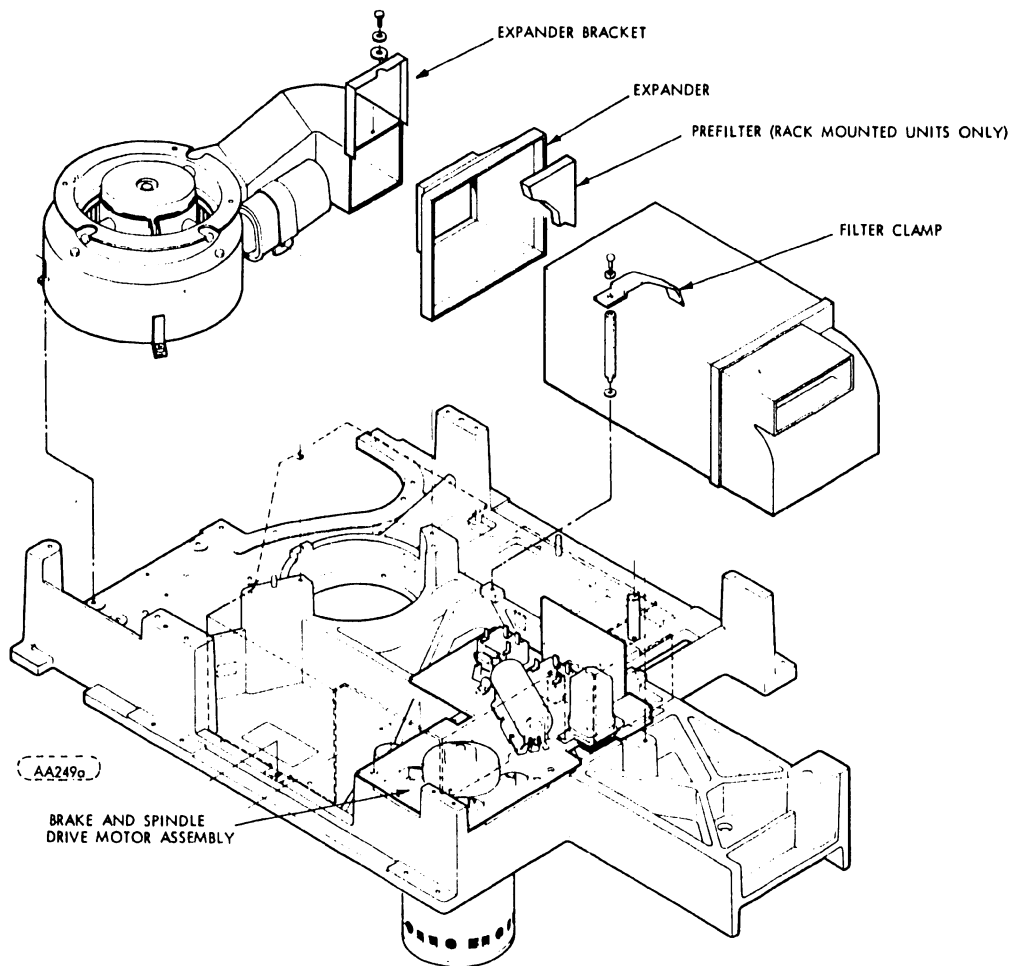


FIGURE 6-1. FILTER MOUNTING

15. Install expander bracket.
16. Install filter clamp.
17. Install cabinet side skin.
18. Close top cover.
19. Install front and rear end panels (base cabinet only).

6.5.6 PRE-FILTER CLEANING (BASE CABINET)

1. Using a 5/32 Allen driver, place tool into hole on front end panel and remove panel by loosening hardware.
2. Remove pre-filter from cabinet.
3. Remove pre-filter element from aluminum frame and clean by washing in warm water and soap.
4. Rinse and dry filter element and install in aluminum frame.
5. Install filter in cabinet. Insure that expanded metal screen is up.
6. Install front end panel.

6.5.7 PRE-FILTER CLEANING (RACK MOUNT UNIT ONLY)

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Loosen filter clamp (Figure 6-1) and swing clamp clear of filter.
4. Remove filter expander bracket.
5. Slide blower expander forward until filter is free.
6. Remove pre-filter.
7. Clean pre-filter by washing in warm water and soap.
8. Rinse and dry pre-filter.
9. Install pre-filter to absolute filter by applying Duco cement at the four corners, making sure pre-filter does not block unfiltered side of absolute filter.

NOTE: Insure that foam gasket between absolute filter and power supply is properly aligned. If not properly aligned, air flow can be restricted causing damage to power supply.

10. Install filter expander.
11. Install expander bracket.
12. Install filter clamp.

6.5.8 DISK BRUSH CHECK AND REPLACEMENT

1. Perform removal steps 1 through 11 of disk brush assembly R&R procedure.
2. If disk brushes are dirty and show excessive wear, replace all brushes. Pull brush horizontally to remove from holding bracket. The new brush snaps into place when seated properly.
3. Perform replacement steps 3 through 11 of disk brush assembly removal and replacement procedure.

6.5.9 INSPECT AND DRY MAGNETIC CHUCK

This procedure should be performed at least once each day, if device goes through dewpoint daily.

NOTE: If the Drive is stored or operated in environmental conditions outside the envelope in the Product Specification, condensation will form in the Drive. In order to prevent corrosion, use a soft absorbent cotton cloth and wipe dry the surface of the Chuck.

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove disk cartridge.
3. Inspect Magnetic Chuck for condensation.
4. If condensation is present use a soft absorbent cotton cloth and wipe dry.

6.6 CORRECTIVE MAINTENANCE PROCEDURES (R & R)

6.6.1 ACTUATOR ASSEMBLY R & R

The actuator assembly must be removed to clean or replace lower read/write heads.

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).

2. Remove Disk Cartridge.
3. Remove top cover by lifting cover straight up (base cabinet only).
4. Set main circuit breaker to off position.
5. Remove electronics cover from card cage.
6. Using a 5/32 Allen driver, place tool into hole on rear end panel and remove panel by loosening hardware (base cabinet only).
7. Remove power supply cover and disconnect A1P5.
8. Disconnect A3P1, A3P2, A3P3, A3P4, A3P5 and A3P6 from AGC Preamplifier.
9. Remove the four screws securing the AGC preamplifier to the magnet and remove preamplifier.
10. Between the two sets of upper and lower heads, and approximately half way along the length of the head arm assembly, insert a 1/16 inch (1.59 mm) thick, 1/2 inch (12.7 mm) wide rolled up masking tape (or similar spacer) to prevent the head pads from touching when actuator is removed.
11. Remove card cage, by performing removal Steps 1 through 13 of card cage removal and replacement procedure.
12. Loosen velocity transducer set screw through hole in pre-amp and magnet assembly. Remove velocity transducer end cap and velocity transducer (see Figure 6-2 and 6-10).
13. Remove two screws that fasten the magnet to the main deck. Screws are located underneath the base casting, one screw in back of magnet and one in front (see Figure 6-3).
14. Move carriage and voice coil assembly forward.
15. Lift magnet slightly and very carefully slide the magnet assembly out from the voice coil. Extreme care must be taken to avoid any bending stress to the velocity transducer magnet.
16. Unplug A1P2 (see Figure 6-13) connecting the voice coil flexible lead to the power supply.
17. Unlace A3P6 located on top of actuator frame.
18. Remove head harness clip for heads 3 and 4 located on front of voice coil.
19. Using 9/64 ball Allen driver, remove the three mounting bolts from the actuator frame securing the actuator to the deck (see Figure 6-3).
20. Lift rear of actuator frame to clear guide pin then pull actuator frame slightly back from eccentric screw located at front of actuator frame then lift actuator clear of unit.

CAUTION Extreme care must be exercised to avoid damage to fixed disk, position transducer scale and position transducer slider.

21. Heads, velocity transducer magnet and EOT assembly can be replaced at this time, if required. When actuator is removed the heads should be cleaned.

● REPLACEMENT

1. To install new actuator assembly, align slot at front of actuator frame with eccentric screw and slide frame forward while clearing guide pin until holes for mounting screws are aligned.

CAUTION Extreme care must be exercised to avoid damage to fixed disk, position transducer scale and position transducer slider.

2. Using 9/64 ball Allen drive, install the three mounting bolts securing the actuator to the deck (see Figure 6-3).
3. Install head harness clip for heads 3 and 4.
4. Replace A3P6 across top of actuator frame.

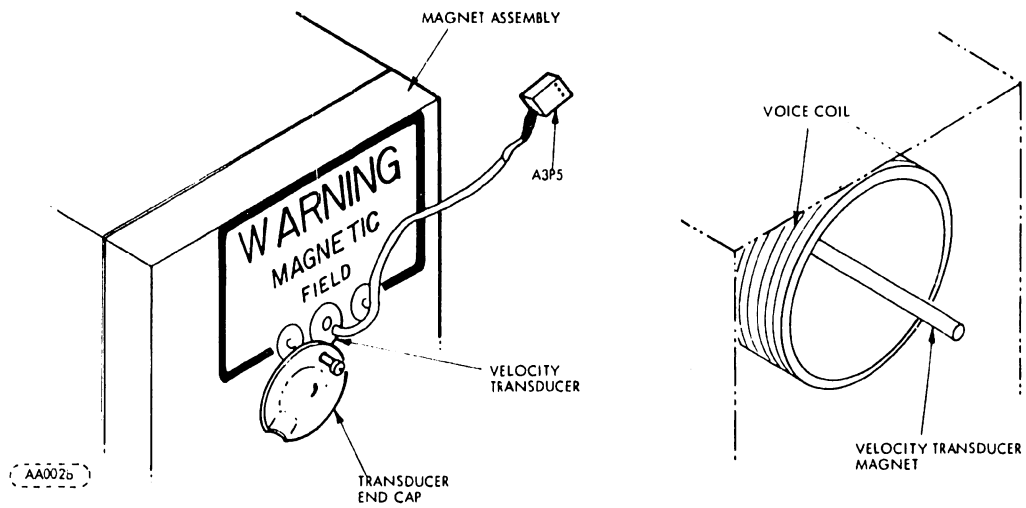


FIGURE 6-2. VELOCITY TRANSDUCER LOCATION

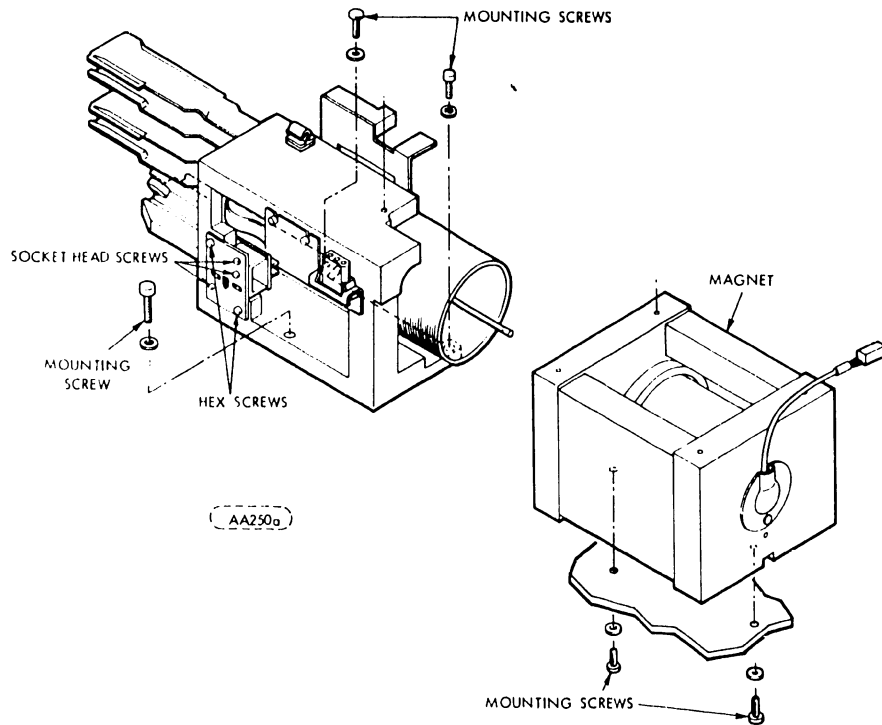


FIGURE 6-3. ACTUATOR, MAGNET AND EOT MOUNTING

5. Connect A1P2 (see Figure 6-13) connecting the voice coil flexible head to the power supply.
6. Very carefully slide magnet assembly onto the two guide pins. Extreme care must be taken to avoid any bending stress to the velocity transducer magnet.
7. Fasten magnet to the main deck with the two mounting screws (see Figure 6-3).
8. Install velocity transducer and velocity transducer end cap and tighten set-screw through hole in preamp PWA (see Figure 6-2).
9. Install card cage by performing replacements Steps 3 through 9 of card cage removal and replacement procedure.
10. Remove spacers from between heads.
11. Install AGC servo preamplifier to the top of magnet with the four mounting screws.
12. Connect A3P1, A3P2, A3P3, A3P4, A3P5.
13. Connect A1P5 and install power supply cover.
14. Install rear end panel (base cabinet only).
15. Connect field tester/exerciser to unit.
16. Perform AGC Servo Preamplifier and Inductosyn Check and Adjustment.
17. Perform FEOT Check and Adjustment.
18. Perform Head Alignment Check and Adjustment.
19. Perform Index-to-Burst Check and Adjustment.
20. Perform Track Indicator Check and Adjustment.
21. Install electronics cover.
22. Install top cover (Base Cabinet only).

6.6.2 HEAD R & R

● REMOVAL

a. Upper Heads

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP Lamp extinguished).
2. Remove top cover by lifting cover straightup (base cabinet only).
3. Remove disk cartridge.
4. Set main circuit breaker to off position.
5. Remove electronics cover. Remove cover from card cage.
6. Remove head harness clamp (Figure 6-4).
7. Remove quadraclip between head plugs and card cage.
8. Remove clip holding head lead springs to carriage assembly.
9. Remove power supply cover assembly.
10. Loosen upper head clamps (Figures 6-5 and 6-6).

CAUTION

Extreme care should be exercised when removing heads. Do not touch head face with fingers. Do not allow head to bang against anything.

11. Remove Head #0 or #1.

● REPLACEMENT

1. Install replacement head.
2. Tighten head clamps. (Note Torque Requirement during Head Alignment).
3. Install power supply cover assembly.

4. Install clip holding head lead springs to carriage assembly.
5. Install quadraclip.

CAUTION

Insure head cables are dressed such that the voice coil does not touch any cable when heads are loaded and extended to cylinder 405. This can be verified when doing head alignment check and adjustment.

6. Install head harness clamp.
7. Install card cage cover.
8. Install CE Disk Cartridge.
9. Perform Head Alignment Check and Adjustment.
10. Perform Index to Burst Check and Adjustment.
11. Install electronics cover.

● REMOVAL

b. Lower Heads

1. Perform Removal Steps 1 through 21 of Actuator Assembly Removal and Replacement procedure.
2. Loosen lower head clamps (Figures 6-5 and 6-6).

CAUTION

Extreme care should be exercised when removing heads. Do not touch head face with fingers. Do not allow head to bang against anything.

3. Remove Head #2 or #3.

● REPLACEMENT

1. Install replacement head.
2. Tighten head clamps. (Not Torque Requirement during Head Alignment).
3. Install spacer between heads.
4. Perform replacement Steps 1 through 22 of Actuator Assembly Removal and Replacement procedure.

6.6.3 EOT ASSEMBLY R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished). Remove cartridge.
2. Open top cover (base cabinet only).
3. Set main circuit breaker to off position.
4. Remove electronics cover.
5. Remove power supply cover and disconnect A1P5.
6. Remove Relay K1 from power supply board.
7. On EOT assembly bracket remove top and bottom mounting hex screws (see Figure 6-3).
8. Remove EOT assembly.

● REPLACEMENT

1. Install new EOT assembly.

CAUTION

Insure the EOT scale on carriage assembly does not rub against EOT assembly.

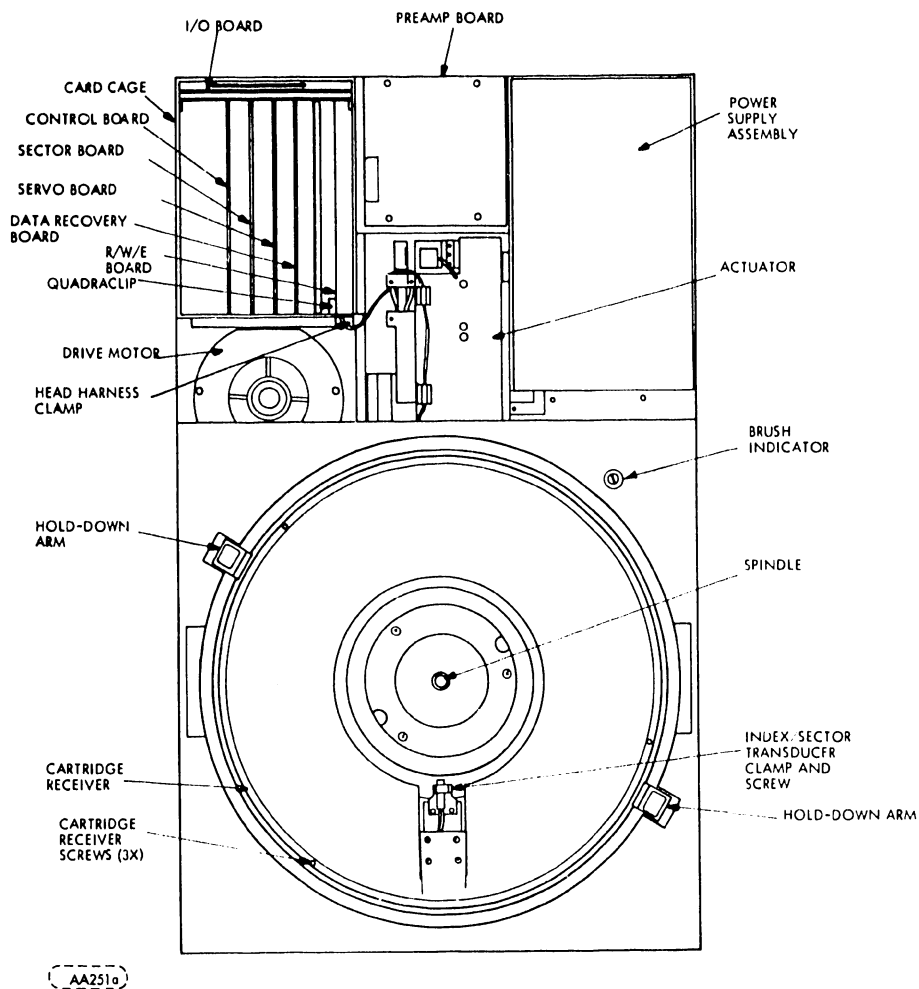


FIGURE 6-4. MODULE LOCATION (ABOVE DECK)

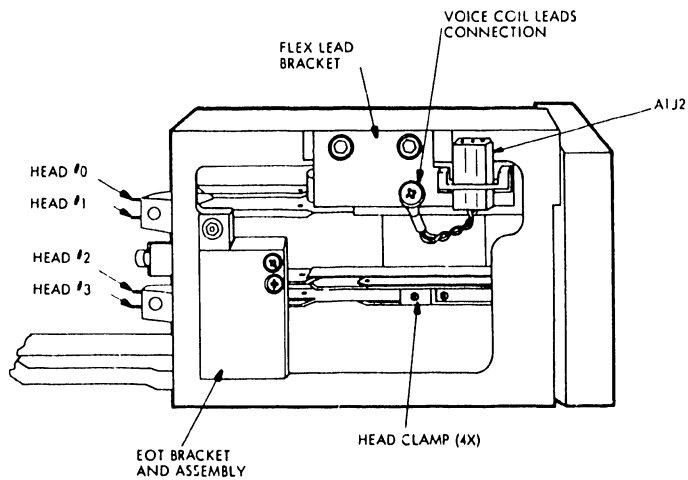


FIGURE 6-5. ACTUATOR ASSEMBLY-HEADS INSTALLED

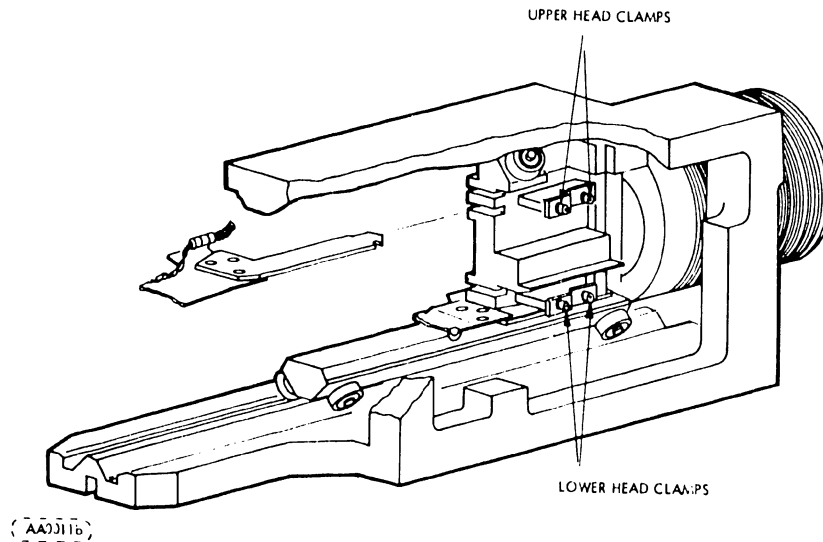


FIGURE 6-6. HEAD REMOVAL AND REPLACEMENT

2. Install relay K1.
3. Install power supply cover and connect A1P5.
4. Perform FEOT Check and Adjustment.
5. Perform Head Alignment Check and Adjustment.
6. Perform Index to Burst Period Check and Adjustment.
7. Perform Track Indicator Check and Adjustment.
8. Install electronics cover.
9. Close top cover (base cabinet only).

6.6.4 FIXED DISK R & R

- REMOVAL (See Figure 6-10)
 1. Depress START/STOP pushbutton to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
 2. Remove top cover by lifting cover straight up (base cabinet only).
 3. Remove disk cartridge.
 4. Set main circuit breaker to off position.
 5. Remove electronics cover.
 6. Remove power supply cover and disconnect A1P5.
 7. On rack mounted units with Accuride slides, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
 8. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units is present).
 9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
 10. Remove the three screws from inside cartridge receiver.
 11. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

12. Remove fixed disk clamp (see Figure 6-8).
13. Remove fixed disk.

● REPLACEMENT

1. Inspect replacement disk for defects, replace if required.
2. Orient disk so that control number (inner ring of disk) is on the top side.
3. Install fixed disk and insure proper seating.
4. Install disk clamp and screws finger tight.

CAUTION While installing cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

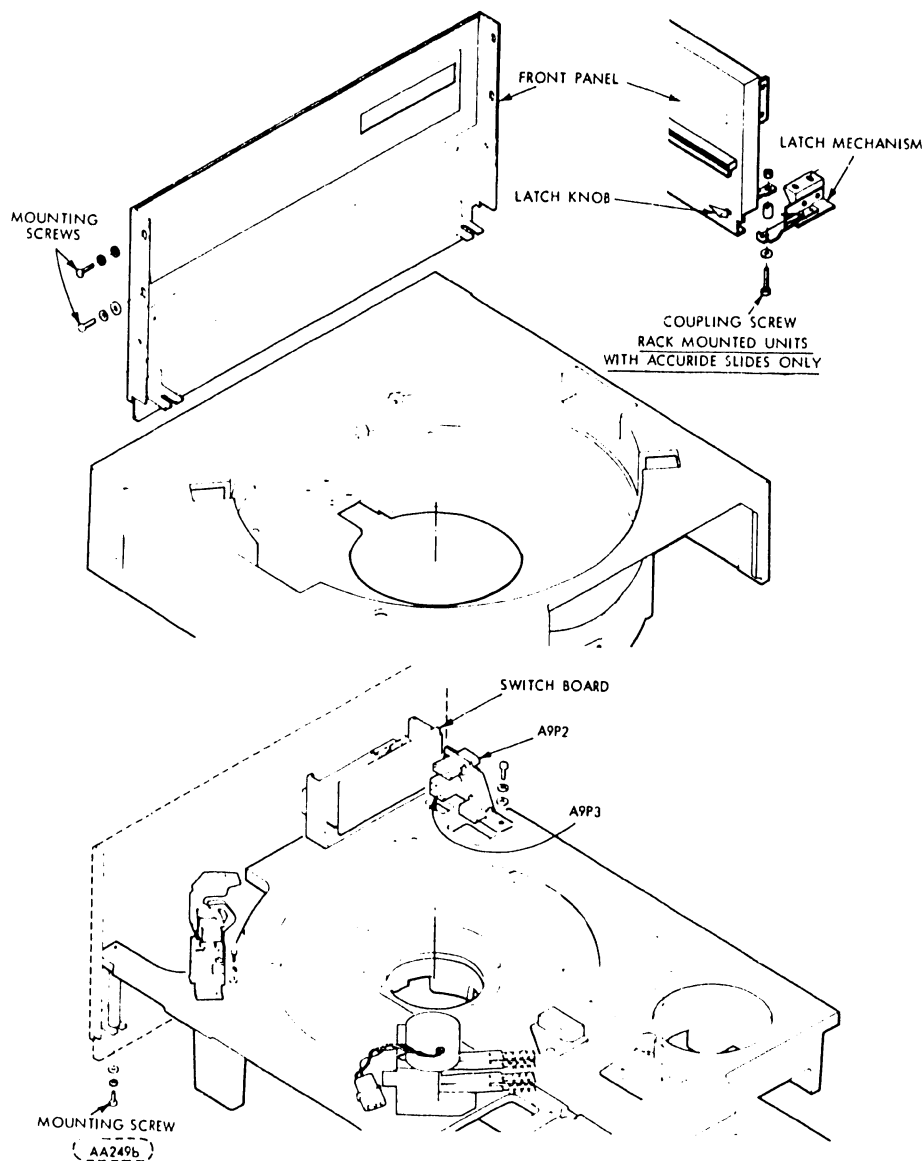


FIGURE 6-7. FRONT PANEL REMOVAL

5. Torque screws, in a Star Pattern, to 12 lbf-in.
6. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.
7. Fasten cartridge receiver with three screws and torque to 12 lbf-in.
8. Install front panel and ground straps. Insure that insulating strips are still mounted to front panel and there is electrical isolation between front panel and deck.
9. Install latch assembly or knob as required.
10. Perform index to burst period check and adjustment procedure.
11. Install electronics cover.
12. Install top cover (Base Cabinet Only).

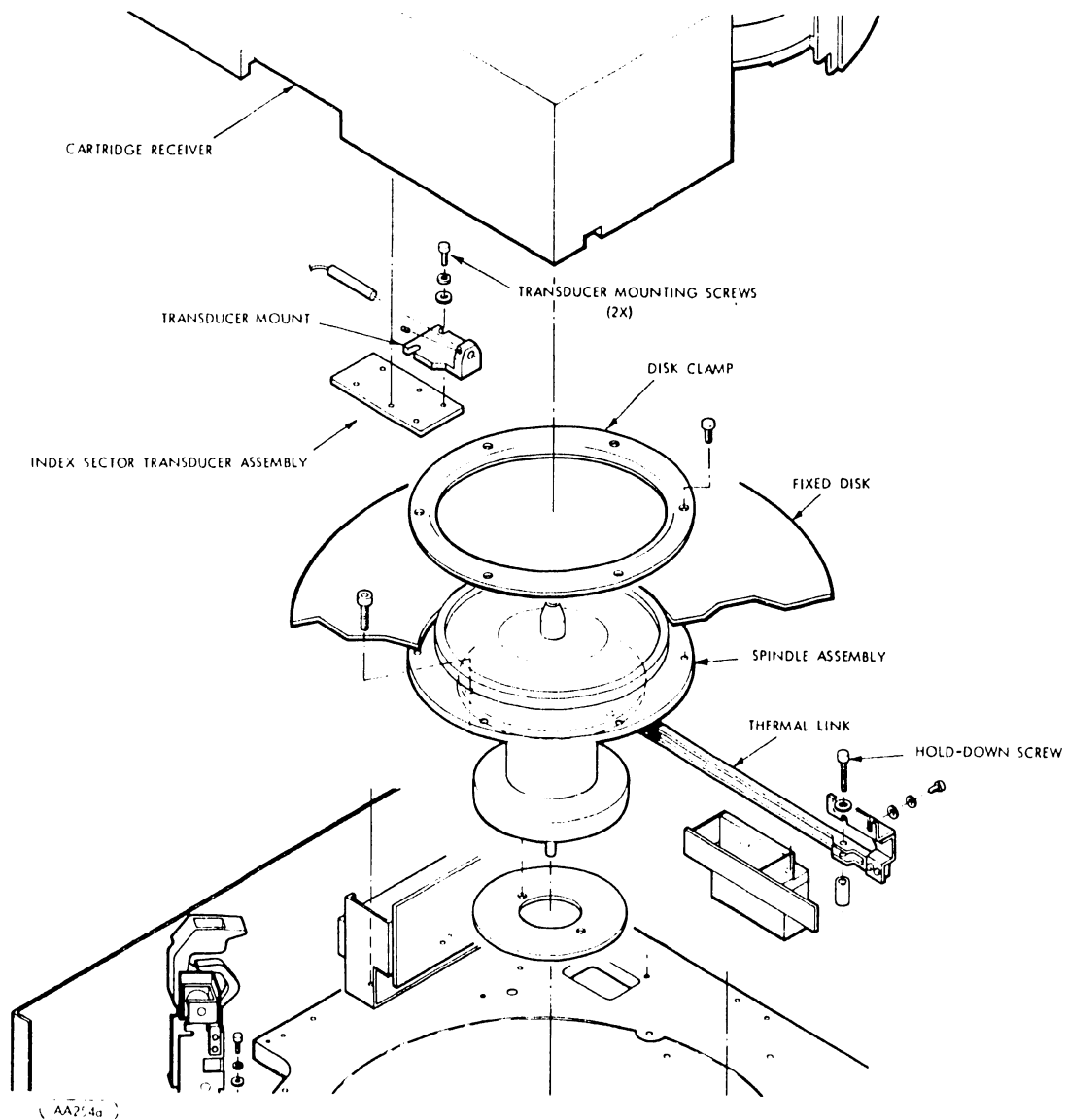


FIGURE 6-8. FIXED DISK REMOVAL

6.6.5 POSITION TRANSDUCER SCALE R & R

● REMOVAL

1. Depress START/STOP pushbutton to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straight up (base cabinet only).
3. Remove disk cartridge.
4. Set main circuit breaker to OFF position.
5. Remove electronics cover.
6. Remove power supply cover and disconnect A1P5.
7. On rack mounted units with Accuride slides, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
8. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units).
9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
10. Remove the three screws from inside cartridge receiver.
11. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

12. Perform removal Steps 1 through 11 of upper head removal and replacement procedure.
13. Loosen two screws (B) in thermal link bracket (Figure 6-9).
14. Disconnect A3P6 from AGC preamp Board and unlace from actuator frame.
15. Remove transducer scale assembly by removing the two mounting screws (Item 3, Figure 6-10), which hold position transducer mount block to deck.

CAUTION Extreme care must be exercised in preventing face of transducer from coming in contact with other parts.

● REPLACEMENT

1. Install replacement transducer scale assembly.
2. Insure that scale assembly does not rub against transducer slider.
3. Loosen the two upper bracket (with slots) mounting screws (B) and move bracket flush against the scale assembly.
4. Tighten the two thermal link mounting screws (C) securing the upper bracket to the scale assembly.
5. Tighten the two screws (B) loosened in step 3 securing the upper bracket to the fixed lower bracket.
6. Lace A3P6 over top of actuator frame and connect to AGC preamp board.
7. Perform Steps 1 through 8 of upper heads replacement procedure.
8. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION While installing cartridge receiver be extremely careful to avoid damage to fixed disk.

9. Fasten cartridge receiver with three screws.
10. Install front panel and ground straps.
11. Install latch assembly or knob as required.
12. Perform AGC Servo Preamplifier and Inductosyn Check and Adjustment.
13. Perform FEOT Check and Adjustment.

14. Perform Head Alignment Check and Adjustment.
15. Perform Index-to-Burst Check and Adjustment.
16. Perform Track Indicator Check and Adjustment.
17. Install electronics cover.
18. Install top cover (base cabinet only).

6.6.6 VELOCITY TRANSDUCER R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP Lamp extinguished).
2. Open top cover (base cabinet).
3. Set main circuit breaker to OFF position.
4. Remove electronics cover.
5. Disconnect connector A3P5 from Preamp Board.
6. Remove transducer end cap from magnet assembly (Figure 6-2).
7. Loosen velocity transducer set screw (Figure 6-10) through hole in preamp and magnet assembly.
8. Remove transducer through rear of magnet assembly.

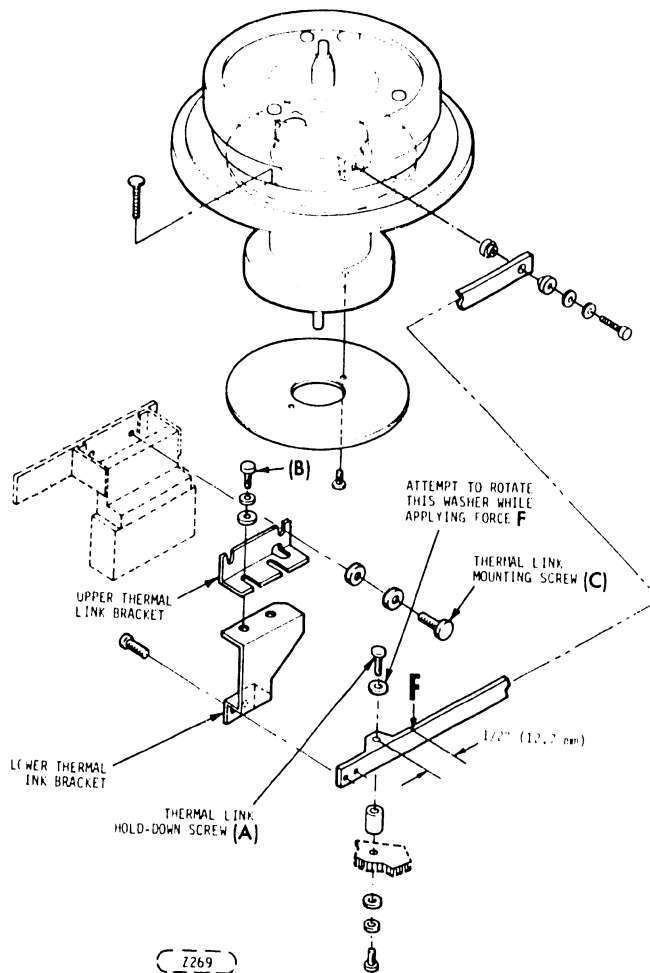
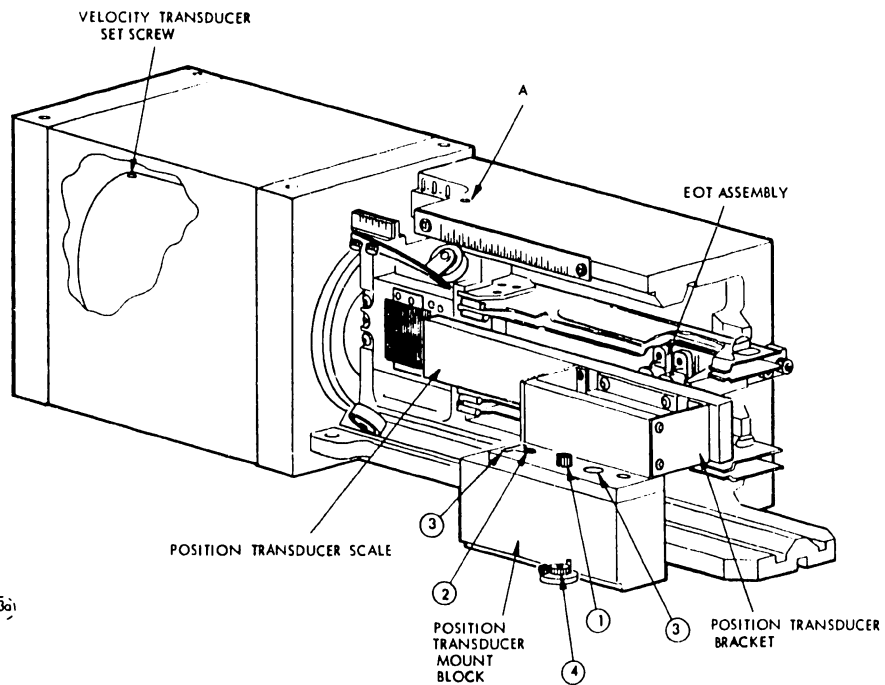
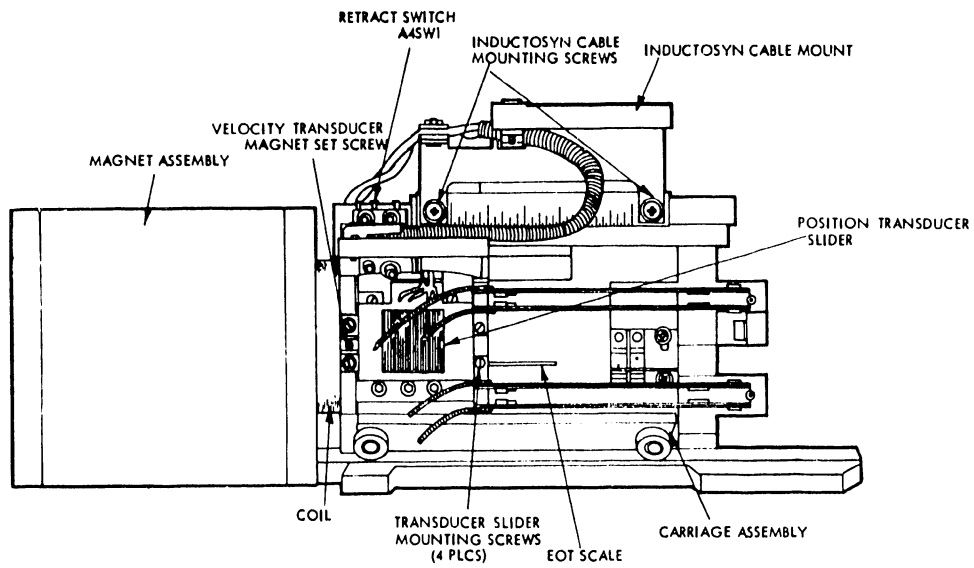


FIGURE 6-9, THERMAL LINK R & R



AA00136i

FIGURE 6-10. ACTUATOR ASSEMBLY

REPLACEMENT

1. Insert replacement transducer into magnet assembly until flush with end of magnet.
2. Tighten set screw through hole in preamp Board.
3. Install velocity transducer end cap.
4. Connector A3P5 to preamp Board.
5. Connect Field Tester/Exerciser to Unit.
6. Install disk cartridge.
7. Remove A1P2 from the actuator and power up drive for normal operation. Insure that K1 has energized.
8. Manually load heads.
9. Move carriage by hand insuring that the velocity transducer magnet is not rubbing against velocity transducer. If rubbing occurs, unload heads, power down unit and reposition transducer or transducer magnet.
10. Push carriage forward so that carriage is at forward stop position.
CAUTION While performing Steps 11 and 12 keep hands clear of carriage.
11. Reconnect A1P2.
12. Execute RTZ command from field tester.
13. Perform temperature stabilization procedure.
14. Perform alternate seek between cylinders 293 and 405 (146 and 202 for 100 TPI units).
15. Monitor "on cylinder" signal from field tester and adjust velocity gain potentiometer (see Figure 6-14) for a seek time of 35 ± 1 milliseconds. (See Fig. 6-17b).
16. Install electronics cover.
17. Close top cover.

6.6.7 VELOCITY TRANSDUCER MAGNET R & R

REMOVAL

CAUTION

Keep replacement transducer magnet in its shipping container until ready for installation since contact between magnet and metal objects is harmful to magnet.

1. Depress Start/Stop switch to stop rotating (Start/Stop lamp extinguished).
2. Remove disk cartridge.
3. Open top cover.
4. Set main circuit breaker to off position.
5. Remove electronics cover.
6. Using a 5/32 Allen driver, place tool into hole on rear end panel and remove panel by loosening hardware (base cabinet only).
7. Remove power supply cover and disconnect A1P5.
8. Disconnect A3P1, A3P2, A3P3, A3P4, A3P5 and A3P6 from AGC Servo Preamplifier.
9. Remove AGC Servo Preamplifier.
10. Remove velocity transducer end cap and velocity transducer (see Figure 6-2).
11. Remove two screws that fasten the magnet to the main deck. Screws are located underneath the base casting (see Figure 6-3).
12. Lift the magnet slightly and very carefully slide the magnet assembly out from the voice coil. Extreme care must be taken to avoid any bending stress to the velocity transducer magnet.
13. Remove card cage by performing removal Steps 1 through 13 of card Cage removal and replacement procedure.
14. Loosen velocity transducer magnet set screw (Fig. 6-10) and remove magnet.

● REPLACEMENT

1. Install replacement velocity transducer magnet and tighten set screw.
 2. Very carefully slide magnet assembly onto the two guide pins. Extreme care must be taken to avoid any bending stress to the velocity transducer magnet.
 3. Fasten magnet to the main deck with the two mounting screws (see Figure 6-3).
 4. Install card cage by performing Steps 3 through 9 of Card Cage removal and replacement procedure.
 5. Install velocity transducer and velocity transducer end cap.
 6. Install AGC Servo Preamplifier.
 7. Connect A3P1, A3P2, A3P3, A3P4, A3P5 and A3P6 to AGC Servo Preamplifier.
 8. Install power supply cover and connect A1P5.
 9. Install rear door panel (base cabinet only).
 10. Install disk cartridge.
 11. Remove A1P2 from the actuator and power up drive for normal operation. Insure that K1 has energized.
 12. Manually load heads.
 13. Move carriage by hand insuring that the velocity transducer magnet is not rubbing against velocity transducer. If rubbing occurs, unload heads, power down unit and reposition transducer or transducer magnet.
 14. Push carriage forward so that carriage is at forward stop position.
- CAUTION** While performing Steps 11 and 12 keep hands clear of carriage.
15. Reconnect A1P2.
 16. Execute RTZ command from field tester.
 17. Perform temperature stabilization procedure.
 18. Perform alternate seek between cylinders 293 and 405 (146 and 202 for 100 TPI units).
 19. Monitor "on cylinder" signal from field tester and adjust velocity gain potentiometer (see Figure 6-14) for a seek time of 35 ± 1 milliseconds.
 20. Install electronics cover.
 21. Close top cover.

6.6.8 SPINDLE ASSEMBLY R & R

● REMOVAL

1. Depress START/STOP pushbutton to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straight up (base cabinet only).
3. Remove disk cartridge.
4. Set main circuit breaker to off position.
5. Remove electronics cover.
6. Remove power supply cover and disconnect A1P5.
7. On rack mounted units with Accuride slides, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
8. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units if present).
9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
10. Remove the three screws from inside cartridge receiver.
11. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

12. Remove fixed disk clamp.
13. Remove fixed disk, carefully avoiding contact with recording surfaces. Place disk on soft clean surface.
14. Remove mounting screws (C) from thermal link bracket (Figure 6-9).

CAUTION Do not perform Step 15 until Step 14 has been performed.

15. Remove thermal link hold-down screw (A, Figure 6-9).
16. Using a 5/32 Allen driver, place tool into hole on front end panel and remove panel by loosening hardware.
17. Remove cabinet panels from both sides (base cabinet only).
18. Remove Module bottom cover.
19. Unplug connector A9P1.
20. Perform removal Steps 1 through 6 of the sector ring removal and replacement procedure.
21. Remove spindle drive belt (Figure 6-11), by applying pressure to edge of drive-motor plate near A7TB1.
22. Rotate spindle to positions where spindle mounting bolts are visible through access hole and remove bolts through access hole.
23. Carefully lift spindle slightly.
24. Detach thermal link from spindle. Note sequence of fiber washers mounting bolt (Figure 6-9). Swing thermal link out of the way.
25. Remove spindle assembly.

● REPLACEMENT

1. Attach thermal link to replacement spindle.
2. Install spindle with the mounting bolts.
3. Rotate spindle and verify that thermal link is not contacting spindle flange.
4. Install thermal link hold-down screw (A) and washer and tighten screw in accordance with the following criteria: (Refer to Figure 6-9.) With a force gauge plunger, apply a force F of 2 to 3 1/2 lbf (8.9 - 15.6 N) at a point 1/2" (12.7 mm) from center line of hold down screw (A). Tighten the hold down screw while at the same time rotating the washer with something such as a screw driver blade. When the washer can no longer be rotated, back off the hold down screw until the washer can barely be rotated. Force F as given above should be continually maintained during this adjustment.
5. Loosen the two upper bracket (with slots) mounting screws (B) and move bracket flush against the scale assembly.
6. Tighten the two thermal link mounting screws (C) securing the upper bracket to the scale assembly.
7. Tighten the two screws (B) securing the upper bracket to the fixed lower bracket.
8. Install spindle drive belt (Figure 6-11) by applying pressure to edge of drive motor plate near A7TB1.
9. Install sector ring.
10. Install transducer mount assembly by performing replacement Steps 7 through 12 of the sector ring removal and replacement procedure.
11. Reconnect A9P1.

12. Clean spindle rim area with media cleaning solution.
13. Prior to installing fixed disk, inspect disk for scratches or defects. If disk is unacceptable, replace with new one.
14. Clean disk surface with lint-free gauze, dampened (not soaked) with media cleaning solution.
15. Install fixed disk and insure proper seating.
16. Install disk clamp. Torque screws to 12 lbf-in (1.3 Nm).
17. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION

While cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

18. Fasten cartridge receiver with three screws.
19. Install front panel and ground straps. Insure that insulating strips are still mounted to front panel and there is electrical isolation between front panel and deck.

18. Install latch assembly or knob as required.
19. Perform Fixed Disk Index/Sector Transducer Check and Adjustment.
20. Perform Static Eliminator Check.
21. Perform Cartridge Index/Sector Transducer Check and Adjustment.
22. Perform AGC Servo Preamplifier and Inductosyn Check and Adjustment.
23. Perform EOT Check and Adjustment.
24. Perform Head Alignment Check and Adjustment.
25. Perform Index to Burst Period Check and Adjustment procedure.
26. Install module bottom cover.
27. Install side panels (base cabinet only).
28. Install front end panel (base cabinet only).
29. Install electronics cover.
30. Install top cover (base cabinet only).

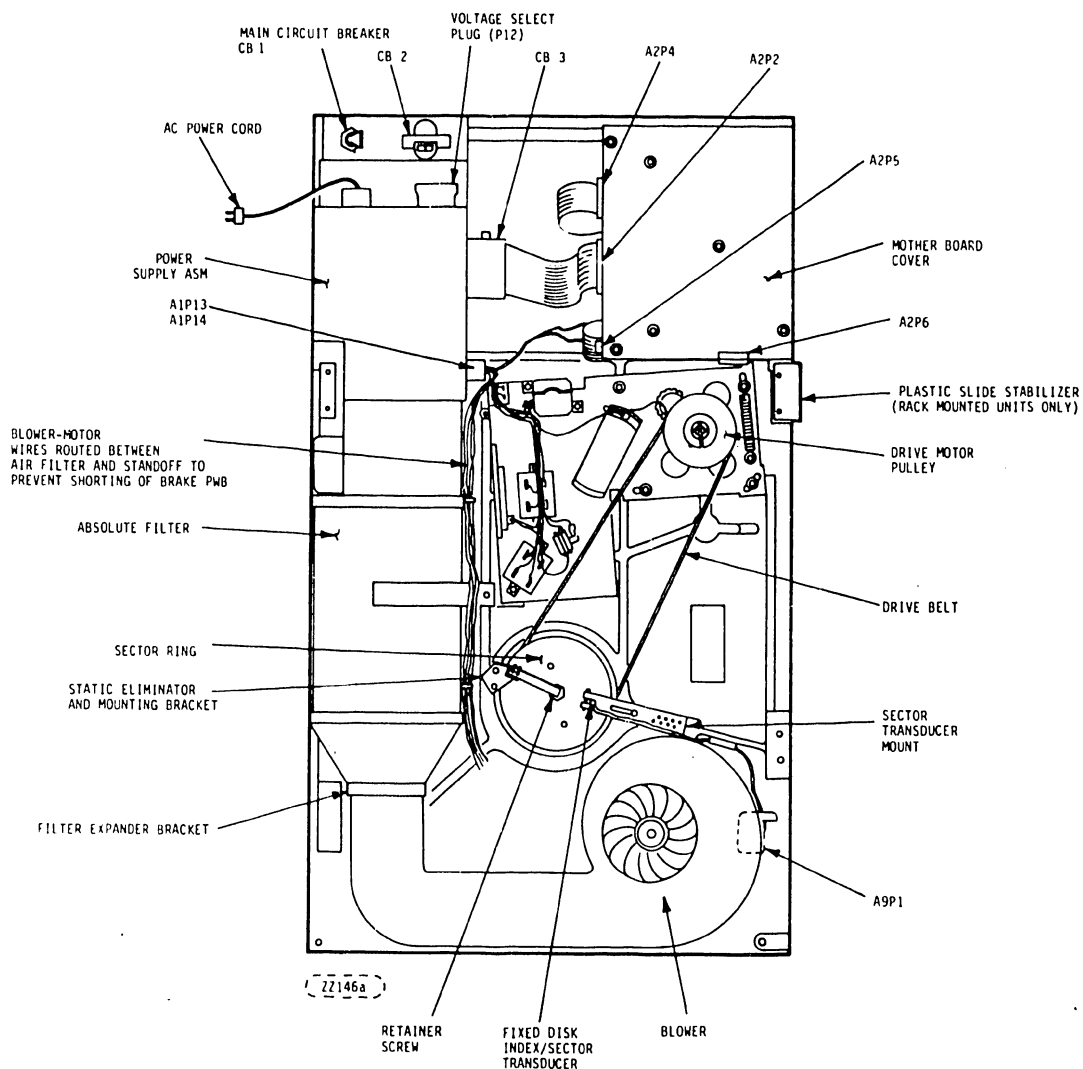


FIGURE 6-11. MODULE LOCATOR (BELOW DECK)

6.6.9 CARTRIDGE DISK INDEX/SECTOR TRANSDUCER R & R

• REMOVAL

1. Depress START/STOP pushbutton to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straightup (base cabinet only).
3. Remove disk cartridge.
4. Set main circuit breaker to off position.
5. Remove electronics cover.
6. Remove power supply cover and disconnect A1P5.
7. On rack mounted units with Accuride slides remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
8. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units if present).
9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
10. Remove the three screws from inside cartridge receiver.
11. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

12. Remove transducer assembly from receiver by removing 4 screws (Figure 6-8).
13. Remove transducer from mount by loosening clamp Allen set screw.

• REPLACEMENT

1. Install new transducer into mount. Tighten Allen screw.
2. Install transducer assembly on receiver with four mounting screws making sure harness lies in groove.
3. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION While installing cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

4. Fasten cartridge receiver with three screws.
5. Install front panel and ground straps. Insure that insulating strips are still mounted to front panel and there is electrical isolation between front panel and deck.
6. Install latch assembly or knob as required.
7. Perform Cartridge Index/Sector Transducer Check and Adjustment.
8. Perform Index-to-Burst period check and adjustment.
9. Install electronics cover.
10. Install top cover (base cabinet only).

6.6.10 FIXED DISK INDEX/SECTOR TRANSDUCER R & R

• REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straightup (base cabinet only).
3. Remove disk cartridge.

4. Set main circuit breaker to off position.
5. Using a 5/32 Allen driver, place tool into hole on front end panel and remove panel by loosening hardware.
6. Remove right side panel (when viewed from rear of unit, base cabinet only).
7. Remove module bottom cover.
8. On rack mounted units with Accuride slides, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
9. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units is present).
10. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
11. Remove electronics cover.
12. Remove the three screws from inside cartridge receiver.
13. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

14. Disconnect A9P1 and unlace harness from around blower motor assembly.
15. Loosen index sector transducer clamp screw.
16. Remove transducer from mount.

● REPLACEMENT

1. Install new transducer in mount.
2. Connect A9P1 and lace harness around blower motor assembly.
3. Perform fixed disk index/sector transducer check and adjustment procedure.
4. Replace cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION While installing cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

5. Fasten cartridge receiver with three screws.
6. Install front panel and ground straps. Insure that insulating strips are still mounted to front panel and there is electrical isolation between front panel and deck.
7. Install latch assembly or knob as required.
8. Install electronics cover.
9. Install module bottom cover.
10. Install cabinet side panel.
11. Install front end panel (base cabinet only).
12. Install top cover.

6.6.11 STATIC ELEMINATOR AND RETAINER SCREW R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove disk cartridge.
3. Set main circuit breaker to off position.
4. Using a 5/32 Allen driver, place tool into hole on front panel and remove panel by loosening hardware.
5. Remove right side panel (when viewed from rear of unit, base cabinet only).
6. Remove module bottom cover.
7. Remove static eliminator (Figure 6-11) by removing one screw.
8. At the cartridge receiver side, align one of the holes in the spindle assembly with one of the Allen head screws which mounts the spindle to the base deck. Insert the proper size wrench into the screw head. This will prevent the spindle turning while removing the retainer screw.
9. Remove retainer screw (Figure 6-11).

- REPLACEMENT

1. Apply Loctite to threads of replacement retainer screw and install.
2. Install replacement static eliminator.
3. Adjust static eliminator for contact with spindle shaft (retainer screw) to a spring deflection of approximately 100-150 Grams.
4. Perform Static Eliminator Check procedure.
5. Install module bottom cover.
6. Install cabinet side panel.
7. Install front end panel (base cabinet only).

6.6.12 SECTOR RING R & R

- REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Using a 5/32 Allen driver, place tool into holes on front end panel by loosening hardware.
4. Remove right side panel (when viewed from rear of unit, base cabinet only) and remove module bottom cover.
5. Remove transducer assembly mount (see Figure 6-11) by removing one screw (note orientation of sector option).
6. Remove static eliminator and its mounting bracket (see Figure 6-11).
7. Remove sector ring (see Figure 6-11) by removing two screws.

- REPLACEMENT

1. Install replacement sector ring.
2. Install static eliminator and bracket.
3. Install transducer and mount.
4. Perform Fixed Disk Index/Sector Transducer Adjustment Procedure.
5. Adjust static eliminator for contact with spindle shaft.
6. Perform Static Eliminator Check.
7. Install module bottom cover.
8. Install cabinet side panel.
9. Install front end panel (base cabinet only).

6.6.13 CARTRIDGE ON SWITCH R & R

- REMOVAL

1. Depress START/STOP pushbutton to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straightup (base cabinet only).
3. Remove disk cartridge.
4. Set main circuit breaker to off position.
5. Remove electronics cover.
6. Remove power supply cover and disconnect A1P5.
7. On rack mounted units with Accuride slides, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
8. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units if present).
9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
10. Remove the three screws from inside cartridge receiver.

11. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

12. Disconnect wires from cartridge on switch.
13. Remove two screws, washers and nuts securing switch assembly to hold-down arm and remove switch. (Reference Figure 6-12).

● REPLACEMENT

1. Install replacement switch.
2. Close hold-down arms.
3. Check switch status with multimeter set on RX1 scale. Indication should be zero ohms.
4. With disk cartridge installed, check switch status with multimeter set to RX1 scale. Meter should indicate zero ohms.
5. If switch does not read zero ohms, adjust as follows:
 - a. Loosen hold-down arm adjustment screws (Figure 6-12).
 - b. Adjust hold-down arm for contact with cartridge disk cover.
 - c. Tighten adjustment screws.
6. Check switch status with multimeter for zero ohms. If switch does not indicate zero ohms, replace switch.
7. Connect wires to switch.
8. Override solenoid (see Figure 2-1) and open hold-down arms.
9. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION While installing cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

10. Fasten cartridge receiver with three screws.
11. Install front panel and ground straps. Insure that insulating strips are still mounted to front panel and there is electrical isolation between front panel and deck.
12. Install latch assembly or knob as required.
13. Perform index to burst period check and adjustment procedure.
14. Install electronics cover.
15. Install top cover (base cabinet only).

6.6.14 DISK BRUSH ASSEMBLY R & R

● REMOVAL

1. Depress START/STOP pushbutton to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straight up. (Base cabinet only)
3. Remove disk cartridge.
4. Set main circuit breaker to off position.
5. Remove electronics cover.
6. Remove power supply cover and disconnect A1P5.
7. On rack mounted units with Accuride slides, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
8. Disconnect ground straps from front panel (one on rack mounted units, two on base cabinet units).

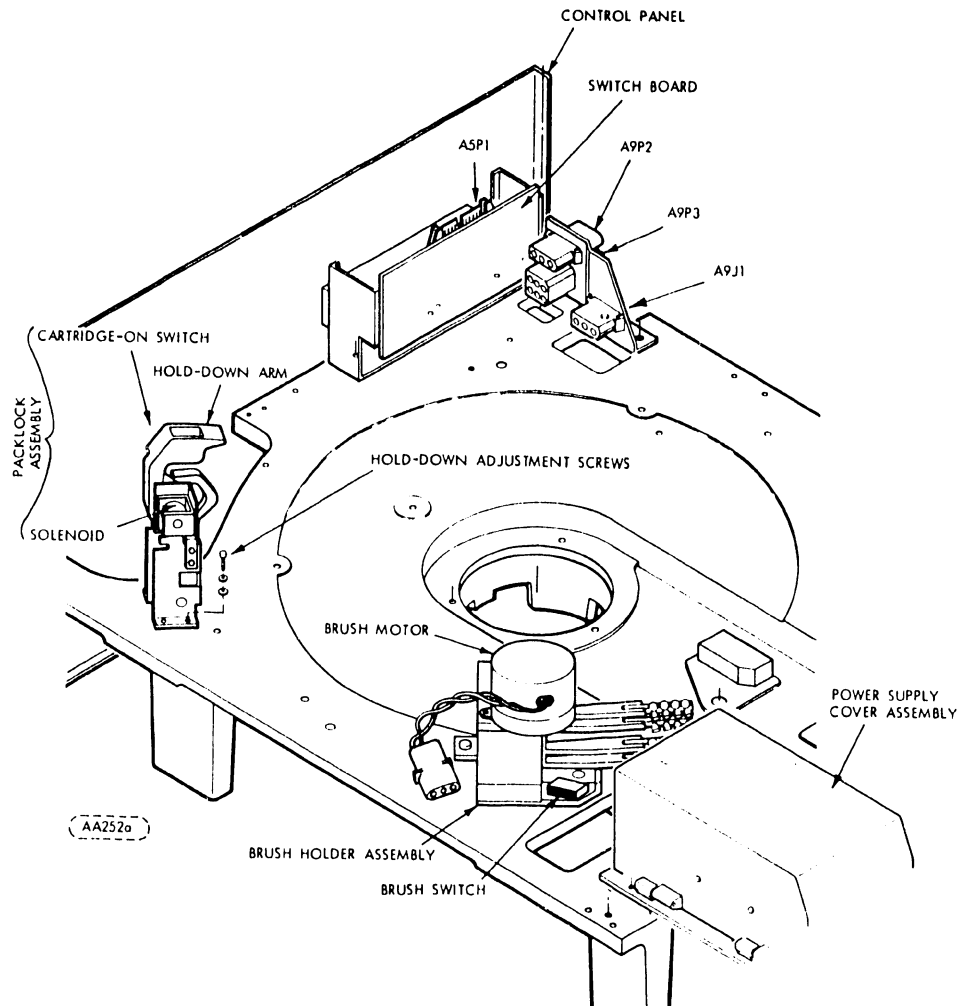


FIGURE 6-12. PACKLOCK AND BRUSH ASSEMBLIES

9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of unit holding front panel to cartridge receiver (see Figure 6-7).
10. Remove the three screws from inside cartridge receiver.
11. Lift the cartridge receiver up until connector A9P2 can be unplugged (see Figure 6-7). After A9P2 is unplugged further remove cartridge receiver.

CAUTION While lifting cartridge receiver, be extremely careful to avoid damage to the fixed disk.

12. Disconnect A1P3 and A1P7.
13. Disconnect wires from brush retract switch (see Figure 6-12).
14. Remove three mounting screws from the brush assembly. One screw is countersunk.
15. Remove brush assembly.

● REPLACEMENT

1. Install new brush assembly with the 3 mounting screws.

NOTE: Verify that brushes are full retracted for the following check.

2. With a multimeter set on RX1 scale check that switch actuates when brushes are clear of disk area.
3. If switch actuation does not occur as indicated in previous step, replace switch.
4. Reconnect wires to brush retract switch.
5. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION While installing cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

6. Fasten cartridge receiver with three screws.
7. Install front panel and ground straps. Insure that insulating strips are still mounted to front panel and there is electrical isolation between front panel and deck.
8. Install latch assembly or knob as required.
9. Connect A1P3 and A1P7.
10. Install power supply cover and reconnect A1P5.
11. Perform Index to Burst Period Check and Adjustment procedure.
12. Install electronics cover.
13. If necessary mark up label on cartridge receiver showing brush alignment when full retracted.
14. Install top cover (base cabinet only).

6.6.15 BRUSH MOTOR R & R

● REMOVAL

1. Perform removal Steps 1 through 12 of Disk brush removal procedure.
2. Remove the two mounting screws from the motor.
3. Remove brush motor.

● REPLACEMENT

1. Install new brush motor. Insure brushes are fully retracted. Turn motor as necessary until mounting holes are aligned and brushes are fully retracted. Brush indicator should align with indicator on cartridge receiver.
2. Perform replacement Steps 3 through 11 of Disk brush removal and replacement procedure to complete installation.

6.6.16 SPINDLE DRIVE MOTOR ASSEMBLY R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Disconnect unit from main power source.

CAUTION Failure to disconnect or turn off main power source may result in injury to service personnel.

4. Using a 5/32 Allen driver, place tool into holes on end panels and remove front and rear end panels by loosening hardware (base cabinet only).
5. Remove both cabinet side panels (base cabinet only).
6. Remove module bottom cover.
7. Disconnect A2P5, A1P13 and A1P14 (Figure 6-11) from power supply.
8. Remove plastic slide stabilizer (rack mount unit only).

9. Remove spindle drive (Figure 6-11) by applying pressure to edge of drive-motor plate near A7TB1.
10. Remove nut and washers from stud of post-motor A (Figure 6-13.1).
11. Remove spring from post-motor A. Then remove post-motor and flat washers from stud.
12. Support motor assembly to prevent it from falling and remove the four mounting screws.

Note hardware buildup on mounting screws: also be careful not to lose the four shoulder washers between motor plate and base deck.

13. Carefully lower drive-motor assembly out of unit.
14. Remove locking collar on drive-motor pulley and remove pulley from shaft.

● REPLACEMENT

1. Install pulley on replacement drive-motor assembly. Insure that Woodruff key is still installed on motor shaft. Install locking collar and torque to 70 lbf-in. Pulley must be 0.031 ± 0.010 in. (0.79 ± 0.25 mm) above motor plate.
2. Place the four shoulder washers in the one mounting hole and three slots between the motor plate and base deck (Figure 6-11 and 6-13.1).
3. Install the assembly to the base deck. Tighten the four mounting screws far enough to hold the assembly so the other end of the spring can be installed.
4. Using Figure 6-13.1, place washers and post-motor A onto the stud.
5. Mount the spring into the post-motor slot.
6. Install washers and nut.
7. Torque the four mounting screws to 15 lbf-in. Insure that the motor plate moves freely on the Delrin washers.
8. Install the belt on the pulley.
9. Turn the pulley and belt by hand and verify that the belt and pulleys have proper clearance and the belt tracks properly.
10. Install the plastic slide stabilizer (rack mount only).
11. Connect A2P5, A1P13 and A1P14 (Figure 6-11).
12. Check the resistance between the drive-motor plate and the module casting. If DC ground is connected to AC ground, the resistance should be less than one ohm. If DC ground is isolated from AC ground, the resistance should be greater than 1000 ohms.
13. Install the module bottom cover.
14. Install the cabinet side panels.
15. Install front and rear end panels (base cabinet only).
16. Connect the unit to the main power source.

6.6.17 CARD CAGE PRINTED CIRCUIT BOARD R & R

CAUTION

The circuit assemblies contained in this equipment can be degraded or destroyed by ELECTRO-STATIC DISCHARGE (ESD).

Static electrical charges can accumulate quickly on personnel, clothing, and synthetic materials. When brought in close proximity to or, in contact with delicate components, ELECTRO-STATIC DISCHARGE or FIELDS can cause damage to these parts. This damage may result in degraded reliability or immediate failure of the affected component or assembly.

To insure optimum/reliable equipment operation, it is required that technical support personnel discharge themselves by periodically touching the chassis ground prior to and during the handling of ESD susceptible assemblies. This procedure is very important when handling Printed Circuit Boards.

Printed Circuit Boards should be handled or transported in electrically conductive plastic bags to insure optimum protection against potential ESD damage.

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Open top cover (base cabinet only).
4. Remove electronics cover.
5. Remove clamp from card cage cover.
6. Remove card cage cover.
7. Using card extractor remove required circuit board. Not setting of any option switches (I/O Control, Sector and Data Recovery board). Set option switches on replacement board to same setting.

NOTE: If I/O Board is to be replaced, remove four board mounting screws. Also Terminator modules, if required, must be removed from old board and installed in new one.

NOTE: If R/W/E Board is replaced, head connectors must be disconnected and two resistor modules must be removed from old board and installed in new one.

CAUTION

Insure head cables are dressed such that the voice coil does not touch any cable when heads are loaded and extended to cylinder 405.

8. Carefully install replacement board, insuring that all pins are engaged before completely installing board.
9. If the following circuit boards are replaced, the designated checks and adjustments must be performed.
 - A. Servo Preamp
 1. AGC Servo Preamplifier and Inductosyn Check and Adjustment.
 2. FEOT Check and Adjustment.
 3. Head Alignment.
 4. Index-to-Burst Period Check and Adjustment.
 - B. Servo Board
 1. Connect Field Tester/Exerciser to unit.
 2. Perform Temperature Stabilization.
 3. Perform Steps 19 through 27 of AGC Servo Preamplifier and Inductosyn Check and Adjustment.
 - C. Sector Board
 1. Index-to-Burst Period Check and Adjustment.
10. Install card cage cover and clamp.
11. Install electronics cover.

6.6.18 POWER SUPPLY R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Open top cover (base cabinet only).
3. Set main circuit breaker to OFF position.
4. Disconnect unit from main power source.

CAUTION Failure to disconnect or turn off main power source may result in injury to service personnel.

5. Using a 5/32 Allen driver, place tool into hole on rear end panel and remove panel by loosening hardware (base cabinet only).
6. Remove electronics cover.
7. Remove AC line cord and bracket (see Figure 6-11).
8. Open power supply cover assembly, disconnect A1P5 and remove cover.
9. Disconnect A1P2, A1P3 and A1P7 (see Figure 6-13).
10. Disconnect A1P13 and A1P14 (see Figure 6-11).
11. Disconnect ribbon cable A2P2 from mother board (see Figure 6-11).
12. At rear of power supply, disconnect AC ground cable connected to base or rack frame.
13. Disconnect DC ground strap on deck plate (see paragraph 3.9.2 and note below).
14. Remove three screws holding power supply in place.
15. Remove power supply being very careful not to lose nylon isolation washers between power supply and deck plate.

● REPLACEMENT

NOTE: Power supply is shipped with logic (DC) ground and chassis (AC) ground connected together. Verify needed configuration from removed power supply or see paragraph 3.9.2 (Grounding Option) if Installation instructions.

1. Install new power supply so tht mounting holes are aligned.

CAUTION

Insure gasket between power supply and absolute filter is properly aligned. If not properly aligned, air flow can be restricted causing damage to power supply.

2. Reverse removal procedure to complete installation.

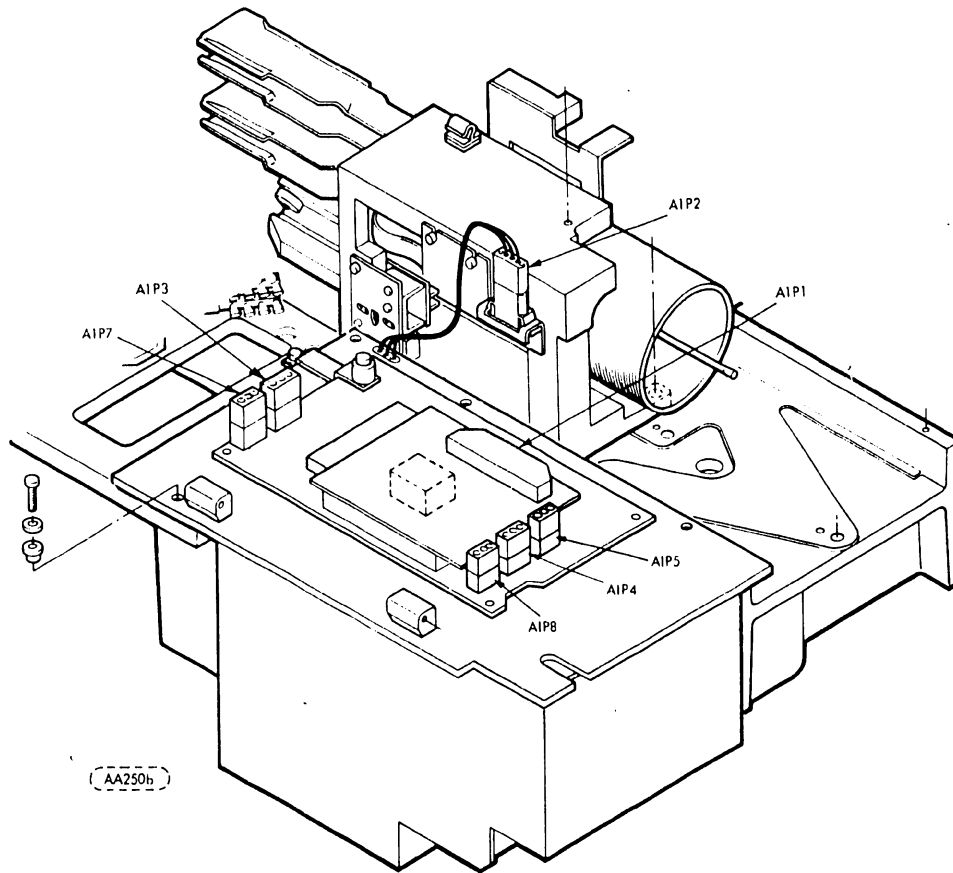


FIGURE 6-13. POWER SUPPLY ASSEMBLY

6.6.19 PIGGYBACK POWER BOARD R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Open top cover (base cabinet only).
3. Set main current breaker to off position.
4. Disconnect unit from main power source.

CAUTION

Failure to disconnect or turn off main power source may result in injury to service personnel.

5. Remove electronics cover.
6. Open power supply cover assembly.
7. Disconnect AIP5 and remove power supply cover.

8. Disconnect A1P1, A1P2, A1P3, A1P4, A1P7 and A1P8 (see Figure 6-13).
9. Remove DC grounding screw noting assembly configuration.
10. Remove screw and insulating washer from wind tunnel located between relay K1 and power board #2.
11. Remove board assembly being careful not to lose spacers located under ground option (corner of board assembly).

● REPLACEMENT

1. Install new board assembly
2. Reverse removal procedure to complete installation.

6.6.20 CARD CAGE/MOTHER BOARD R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Open top cover (base cabinet only).
3. Set main circuit breaker to off position.
4. Disconnect unit from main power source.

Failure to disconnect or turn off main power source may result in injury to service personnel.

5. Remove electronics cover.
6. Disconnect I/O connector ribbon cables.
7. Remove four screws holding I/O Board to card cage and remove Board. Disregard this step if card cage is only removed to facilitate other removal and replacement procedures.
8. Remove card page cover and clamp and quadraclip from head connectors on R/W/E board (see Figure 6-4).
9. Disconnect head connectors.
10. Using a 5/32 Allen driver, place tool into hole on rear end panel and remove panel by loosening hardware (base cabinet only).
11. Disconnect A2P2, A2P4, A2P5 and A2P6 from mother board (see Figure 6-11).
12. Disconnect ground strap from deck plate.
13. Remove three screws securing card cage and remove card cage.
14. Using card extractor, remove all boards.
15. Remove the 5 screws holding the mother cover and board together. Watch for fiber washer.
16. Separate mother cover and board from card cage. Do not lose star washers.

● REPLACEMENT

1. Attach mother cover and board to card cage assembly. Be careful not to over-tighten, plastic bracket strips out easily.
2. Install all circuit boards.
3. Install card cage with three mounting screws.
4. Install connectors removed in Steps 9 and 11.

Insure head cables are dressed such that the voice coil does not touch any cable when heads are loaded and extended to cylinder 405.

5. Install quadraclip and head cable clamp.
6. Replace I/O Board if removed in Step 7. (Removal procedures).
7. Reconnect I/O Ribbon Cables.
8. Install ground strap.
9. Install carc cover and clamp.
10. Install electronics cover.
11. Install rear end panel (base cabinet only).
12. Connect unit to main power source.
13. Close top cover (base cabinet only).

6.6.21 BLOWER MOTOR ASSEMBLY R & R (BASE CABINET)

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Remove top cover by lifting cover straight up (base cabinet only).
4. Using a 5/32 Allen driver, place tool into holes on end panels and remove front and rear end panels by loosening hardware (base cabinet only).
5. Disconnect ground straps from front panel if present.
6. Remove both cabinet side panels (base cabinet only).
7. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of panel (see Figure 6-7).
8. Remove the pre-filter and disconnect A1P13 (Figure 6-11) from power supply assembly.
9. Remove filter expander bracket and absolute filter (Figure 6-1).
10. Remove nuts from studs that secure module to base frame (two nuts are in pre-filter area and one nut is below actuator magnet).
11. Unlace motor harness.
12. Support blower assembly to prevent it from falling and remove three screws securing blower assembly.
13. Remove blower assembly.

● REPLACEMENT

1. Install replacement blower motor assembly.
2. Reverse the removal procedure to complete the installation.

NOTE:

Slightly tighten the three screws securing the blower motor then align the air chute with the absolute filter. Finish tightening the blower motor screws (do not over compress rubber washes on the three screws).

6.6.22 BLOWER MOTOR ASSEMBLY R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Unlatch the latch assembly securing the unit in the cabinet.
4. Remove the front panel by loosening two screws at the bottom of the panel and removing two screws on each side of the panel (see Figure 6-7).
5. Disconnect plug A1P13 from power supply (see Figure 6-11).
6. Remove filter, expander, bracket and absolute filter (see Figure 6-1).
7. Unlace the motor harness from side of main deck.
8. Remove the air inlet cover (held in place by three screws).
9. Remove the three screws holding the blower motor in place and remove blower motor.

● REPLACEMENT

1. Install blower motor assembly.
2. Reverse the removal procedure to complete the installation.

NOTE:

Slightly tighten the three screws securing the blower motor then align the air chute with the absolute filter. Finish tightening the blower motor screws (do not over compress rubber washers on the three screws).

6.6.23 DRIVE MOTOR PULLEY AND BELT R. & R

o REMOVAL

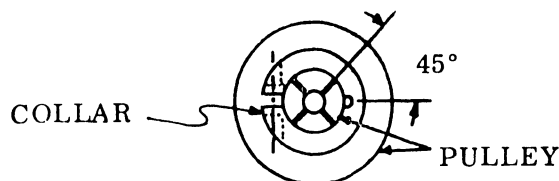
1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to OFF position.
3. Disconnect unit from main power source.

CAUTION Failure to disconnect or turn off main power source may result in injury to service personnel.

4. Using a 5/32 Allen driver, place tool into holes on end panels and remove front and rear end panels by loosening hardware (base cabinet only).
5. Remove right side panel (when viewed from rear of unit, cabinet only).
6. Extend unit to its fully extended position (rack only).
7. Remove module bottom cover.
8. Remove mounting screw from fixed disk index sensor mount. Note hole orientation of dowel pin for sector option (see Figure 3-11).
9. Remove spindle drive belt (Figure 6-11) by applying pressure to edge of drive-motor plate near A7TB1.
10. Remove belt by guiding belt between static eliminator and retainer screw (see Figure 6-11).
11. Remove locking collar on drive motor pulley.
12. Remove drive motor pulley. Be careful not to lose Woodruff key.

● REPLACEMENT

1. Place Woodruff key into drive motor keyway.
2. Install new drive motor pulley. Insure that Woodruff key is properly placed in keyway.



3. Install locking collar per figure above and tighten to 70 lbf-in. Gap between drive motor plate and top of pulley must be 0.031 ± 0.01 in. (0.79 ± 0.25 mm).
4. Guide new drive belt between static eliminator and retainer screw.
5. Install spindle drive belt (Figure 6-11) by applying pressure to edge of drive-motor plate near A7TB1.
6. Replace fixed disk sensor mount.
7. Perform Fixed Disk Index/Sector Transducer Check and Adjustment.
8. Install module bottom cover.
9. Install side panel (base cabinet only).
10. Connect unit to main power source.
11. Install rear end panel (base cabinet only).

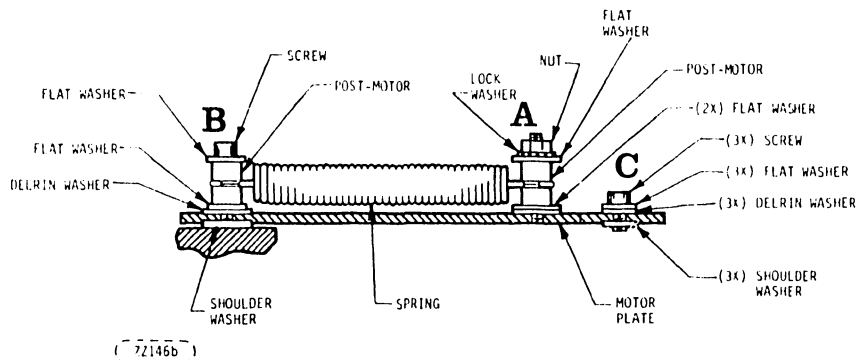


FIGURE 6-13.1. HARDWARE BUILDUP

6.6.24 PACK LOCK ASSEMBLY OR PACK LOCK SOLENOID R & R

● REMOVAL

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove top cover by lifting cover straight up (base cabinet only).
3. Extend unit to its fully extended position (rack only).
4. Remove disk cartridge.
5. Set main circuit breaker to Off position.
6. Remove electronics cover.
7. On rack mounted units, remove coupling screw securing latch knob to latch mechanism (see Figure 6-7).
8. Disconnect ground straps from front panel (one on rack-mounted units, two on base cabinet units if present).
9. Remove front panel by loosening two screws at bottom of panel and removing two screws on each side of unit holding front panel to cartridge receiver (see Figure 6-7).
10. Remove the three screws from inside cartridge receiver.
11. Lift the cartridge receiver up until connector A9P2 can be disconnected. After A9P2 is disconnected, further remove cartridge receiver.

CAUTION

While lifting cartridge receiver be extremely careful to avoid damage to the fixed disk.

12. If not replacing solenoid only, proceed to Step 18. Remove solenoid from pack lock assembly and receiver harness.
13. Loosely install replacement solenoid on pack lock assembly.
14. With the pack lock in an open position, place a 0.015 in. (0.38 mm) shim between pack lock and solenoid plunger. Push solenoid toward pack lock as far as it will go (plunger touching rear of solenoid).
15. Tighten solenoid screws and remove shim.
16. Using a small screwdriver, push back plunger and verify clearance.

17. Reconnect receiver harness to solenoids. Proceed to Step 3 of Replacement Procedure.
18. Using a pencil, outline the outside edges of the bracket legs on the pack lock assembly to be removed.
19. Note orientation of the wires connected to the pack lock switch.
20. Disconnect receiver harness terminals connected to pack lock switch and pack lock solenoid.
21. Remove pack lock assembly from deck.

● REPLACEMENT

1. Install new pack lock assembly within outline on deck.
2. Connect receiver harness terminals to pack lock switch and pack lock solenoid.
3. Install cartridge receiver by aligning it on the two small pins on the deck and connecting A9P2.

CAUTION

While installing cartridge receiver be extremely careful to avoid damage to fixed disk and receiver harness.

4. Fasten cartridge receiver with three screws.
5. Install front panel to cartridge receiver. Insure that insulating strips are still mounted to brackets on front panel and there is electrical isolation between front panel and deck.
6. Connect ground straps.
7. Install latch assembly (rack only).
8. Perform Index to Burst Period Check and Adjustment.
9. Install electronics cover.
10. Install top cover (base cabinet only).

6.7 CHECK AND ADJUSTMENT PROCEDURES

This section contains procedures that may be used to check for malfunctioning parts, to determine whether disk drive is operating within published specifications, or to adjust disk drive for proper operations. Before any electronics checks or adjustment are performed, the disk drive must go through a temperature stabilization process.

6.7.1 TEMPERATURE STABILIZATION CHECK AND ADJUSTMENT

1. If disk unit has not been operating, or a CE disk cartridge has been installed, allow unit to exercise for twenty minutes. For an additional ten minutes, allow unit to sit in a heads loaded, unit ready condition. Perform this with electronic cover on. Perform needed checks and adjustments or;
2. If disk unit has been operating, allow unit to sit in a heads loaded, unit ready condition, for ten minutes (with electronic cover on), before proceeding with checks and adjustments.

6.7.2 AGC SERVO PREAMPLIFIER AND INDUCTOSYN CHECK AND ADJUSTMENT

NOTE 1: Prior to performing this adjustment perform Steps 12, 13 and 14. If Step 14 is within spec proceed with Step 15, if not, start with Step 1.

NOTE 2: Portions of the Inductosyn alignment must be made under dynamic conditions. If the Field Test Exerciser is not utilized appropriate provisions must be made in the computer system to cover these conditions.

CAUTION

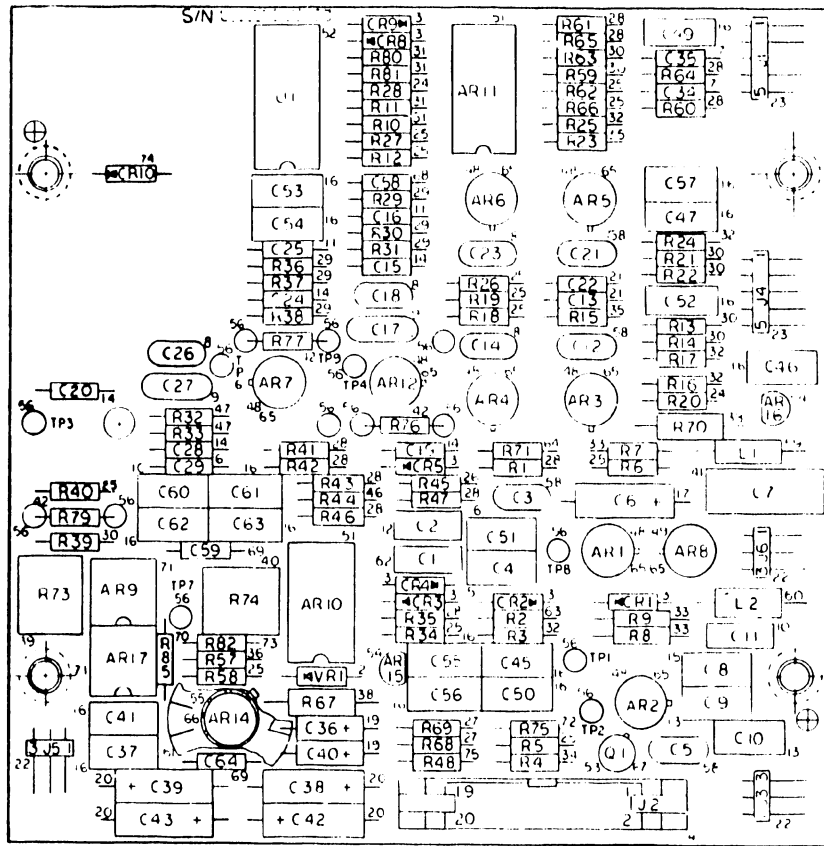
In performing this procedure, care must be exercised to prevent severe and extended contact between position transducer and slider.

1. If position transducer, AGC preamp, or Servo Board has been replaced, insure that all connectors are plugged into their respective receptacles.
2. Connect field tester/exerciser to unit.
3. Remove A1P2 from the actuator and power up drive for normal operation. It is necessary that a disk cartridge is installed in the drive and relay K1 on power board #1 has energized.
4. Install a jumper from TP1 to -5 V supply (TP9). See Figure 6-14.
5. Connect oscilloscope to C24 (point A of Figure 6-14). Set scope for internal trigger and auto sync.
6. Move carriage by hand, back and forth between cylinders 000 and 405 (000 and 202 for 100 TPI units) and observe waveform on oscilloscope.
7. If amplitude of waveform is 1.0 ± 0.05 volts peak to peak (see Figure 6-15), do not make any adjustment and proceed to Step 9, if not proceed to Step 8.
8. If waveform is not within above stated tolerances, loosen transducer mount block forward-most screw (right item 3, Figure 6-10), and adjust cam (item 4, Figure 6-10) for proper amplitude. If this adjustment is not sufficient, loosen transducer scale mounting screw (item 1, Figure 6-10). It may be necessary to make sequential adjustments of the cam and eccentric screw to obtain proper amplitude tolerances.
9. Tighten transducer scale mounting screw (item 1, Figure 6-10) to 18 lbf-in.
10. Verify the waveform amplitude is still 1.0 ± 0.05 volts peak to peak between cylinders 000 and 405 (000 and 202 for 100 TPI units).
11. Remove jumper from TP1 and TP9.
12. Connect oscilloscope to TP3.
13. Move carriage by hand back and forth between cylinders 000 and 405 (000 and 202 for 100 TPI units) and observe waveform on oscilloscope.
14. Amplitude of waveform must be $5 \pm 0.6, -0.2$ volts peak to peak. If not, repeat Steps 4 through 10 again. If adjustment cannot be performed, replace AGC preamp. Waveform will be similar to Figure 6-15 except for difference in amplitude.
15. Push carriage forward so that carriage is at forward stop position.

CAUTION

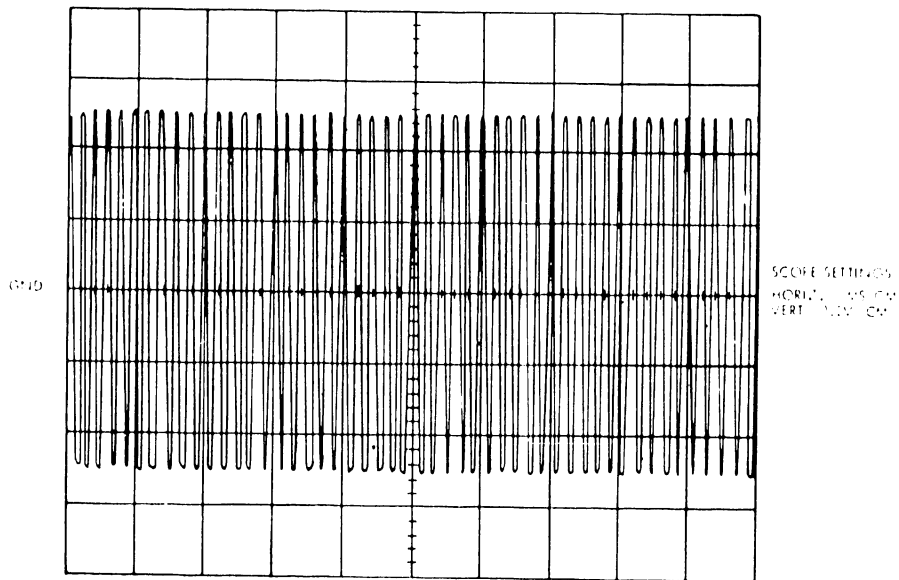
While performing Steps 16 and 17, keep hands clear of carriage.

16. Reconnect A1P2.
17. Execute RTZ Command from field tester.
18. Perform temperature stabilization procedure.
19. Perform alternate seek between cylinders 293 and 405 (146 and 202 for 100 TPI units).
20. Monitor "On Cylinder" signal from field tester and adjust velocity gain potentiometer R73 (see Figure 6-14) for a seek time of 35 ± 1 milliseconds (see Figure 6-17b). Adjust sync to get correct waveform.



G115a

FIGURE 6-14. PREAMP BOARD ADJUSTMENT LOCATION



(AA106)

FIGURE 6-15. POSITION TRANSDUCER WAVEFORM

21. Perform an alternate seek from cylinder 200 to 201 (100 to 101 for 100 TPI units). Sync oscilloscope with "On Cylinder" signal on exerciser. Monitor TP3 and adjust potentiometer R74 on preamp board (see Figure 6-14) so that the amplitudes are balanced (in relationship to each other) within ± 100 mV of logic ground. Figure 6-16a shows waveforms unbalanced and Figure 6-16b shows them balanced.
22. This adjustment should be repeated whenever the drive exceeds ± 150 mV from logic ground.
23. Verify the adjustment, seeking from cylinder 000 to 001, and from 400 to 401 (000 to 001 and 200 to 201 for 100 TPI units). It may be necessary to adjust R74 to bring all three locations into adjustment.
24. Verify the adjustment again seeking from cylinder 000 to 002 and 400 to 402 (000 to 002 and 200 to 202 for 100 TPI units). It may be necessary to adjust R74 to bring both locations into adjustment (see Figure 6-16c).
25. Perform alternate seek between cylinders 293 and 405 (146 and 202 for 100 TPI units).
26. Monitor waveform at TP3. The peak to peak amplitude of the last full sinewave before "On Cylinder" goes negative must be 5 ± 0.5 volts (see Figure 6-17). Figure 6-17 shows a forward seek.
27. By resyncing oscilloscope obtain a reverse seek waveform (see Figure 6-17b). The peak to peak amplitude of the last full sinewave before "On Cylinder" goes negative must be 5 ± 0.5 volts.
28. Perform EOT Check and Adjustment Procedure.
29. Perform Head Alignment Check and Adjustment Procedure.
30. Perform Index-to-Burst Check and Adjustment Procedure.

6.7.3 FEOT CHECK AND ADJUSTMENT

EOT adjustments must be made under dynamic conditions. Alternate seek to cylinder address 410 and 408 (205 and 204 on 100 TPI units) and cycle restarts and required to perform this adjustment.

NOTE:

Appropriate provisions must be made in the computer system for these conditions if the Field Test Exerciser is not utilized.

1. Set main circuit breaker to off position.
2. Connect Field Tester/Exerciser to unit.
3. Install servo board on card extender.
4. Set main circuit breaker to on position.
5. Depress START/STOP switch to START (in) and wait for completion of first seek.
6. Perform temperature stabilization procedure.
7. Unplug A1P2 on actuator.
8. On Servo Board, ground TP20 and TP21.
9. Set Actuator at forward stop and reconnect A1P2.
10. Perform RTZ function on Field/Tester Exerciser.
11. Insure that error halt switch is down on Field Tester/Exerciser.
12. Monitor TP19 on Servo board with channel A of oscilloscope and sync negative on this signal. Monitor TP3 (Figure 6-14) on AGC Preamp board with channel B of oscilloscope. Place channel B in uncalibrated vertical position and adjust until waveform is five centimeters in amplitude.

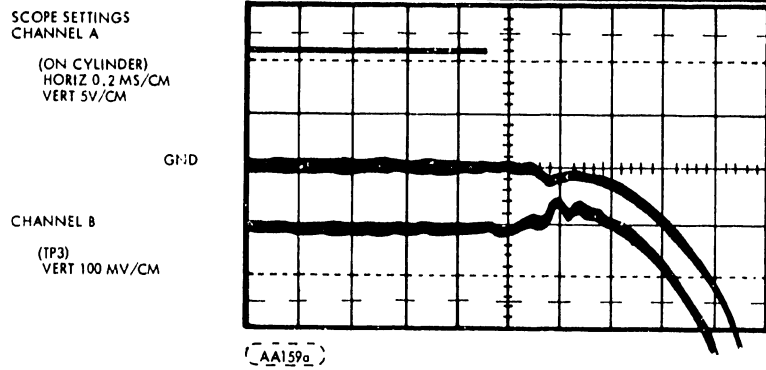


FIGURE 6-16A. ONE TRACK SEEK UNBALANCED

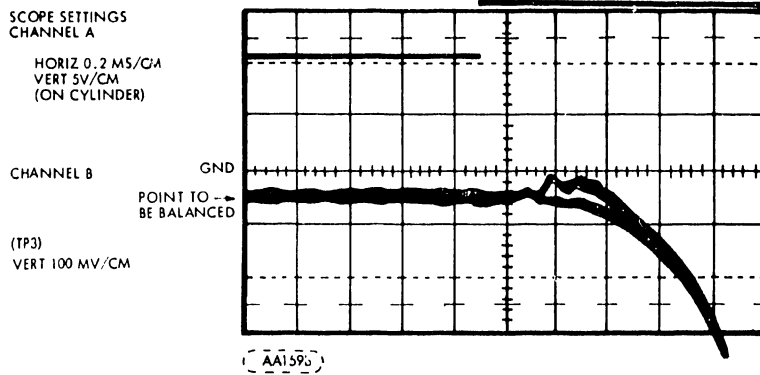


FIGURE 6-16B. ONE TRACK SEEK BALANCED

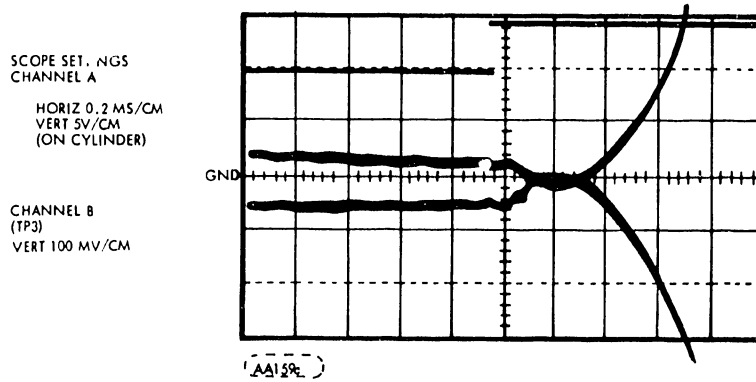


FIGURE 6-16C. TWO TRACK SEEK WITHIN TOLERANCE

13. Perform alternate seek in the access mode between cylinders 408 and 410 (204 - 205 for 100 TP1). Alternate seek in the access mode is defined as movement of the heads back and forth between cylinders without performing a read operation.

NOTE: Horizontal sweep time of Figure 6-18a and 6-18b depends upon switch settings on the I/O board.

14. Adjust oscilloscope until waveform looks similar to Figure 6-18a or 6-18b. Place crossover of signals A and B in middle of screen and place horizontal sweep time to 10X. Waveform should be similar to Figure 6-18c depending on sweep time.
15. If waveform is not within limits shown in Figure 6-18c, slightly loosen two socket head screws (Phillips on early units) on EOT Detector (Figure 6-3). Place screw driver in slot and adjust detector horizontally to limits shown in Figure 6-18c.

NOTE: Limits are defined as signal A must go Positive within ± 1 vertical centimeter of signal B ground along slope of signal B.

16. Tighten screws and verify that adjustment has not changed.
17. Unplug A1P2 on actuator.
18. On Servo Board, remove grounds from TP20 and TP21.
19. Set actuator at forward stop and reconnect A1P2.
20. Perform RTZ function on Field/Tester Exerciser.
21. Perform Head Alignment Check and Adjustment.
22. Perform Index to Burst Period Check and Adjustment procedure.

6.7.4 HEAD ALIGNMENT CHECK AND ADJUSTMENT

NOTE: Refer to HPC package located in front of manual for option switch and terminator locations.

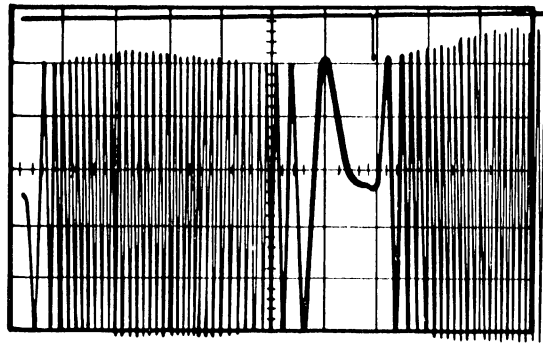
1. Depress START/STOP switch to STOP and wait for spindle to stop rotating (START/STOP LAMP extinguished).
2. Remove disk cartridge and install CE disk cartridge. Refer to disk cartridge removal and installation procedure in section 2.
3. Open top cover (base cabinet only).
4. Set main circuit breaker to off position.
5. Remove electronics cover.
6. Record setting of all switches on I/O board.
7. Verify that resistor modules are installed on I/O board. If not, install terminator plug in I/O board connector J1 if required.
8. Install OEM field tester. If no OEM field tester or system is available to perform the required functions refer to HPC package to star select unit and terminator power.

CAUTION

K1 should not be removed until main circuit breaker is in off position. With K1 removed, emergency retract is disabled. Consequently, heads must be manually retracted if spindle slows down below tolerance limit.

9. Open power supply cover and remove relay K1 to provide access to heads.
10. Disconnect A1P2 (Note Orientation).
11. Set main circuit breaker to on position.
12. Depress W/PROT CART and W/PROT FIXED switches to ON (in).

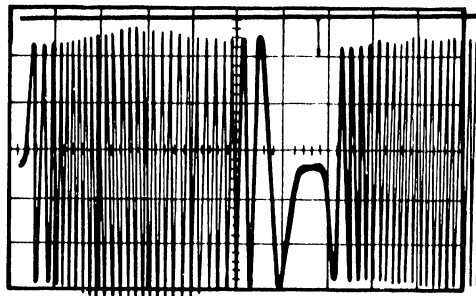
SCOPE SETTINGS
 CHANNEL A
 ON CYLINDER
 HORIZ 5MS/CM
 VERT 5V/CM
 CHANNEL B
 TP3
 VERT 1V/CM



(AA180a) A. FWD SEEK

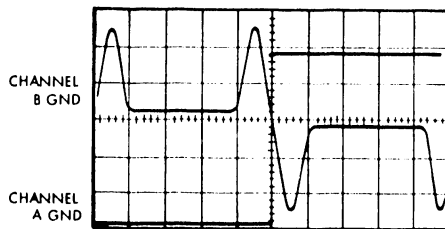
FIGURE 6-17A. FORWARD SEEK

SCOPE SETTINGS
 CHANNEL A
 ON CYLINDER
 HORIZ 5MS/CM
 VERT 1V/CM
 CHANNEL B
 TP3
 VERT 1V/CM



(AA180b) B. RVS SEEK

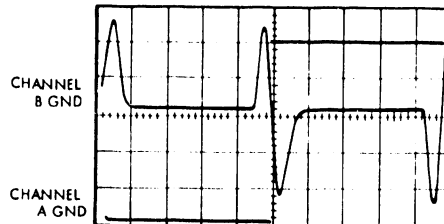
FIGURE 6-17B. REVERSE SEEK



SCOPE SETTINGS:
 HORIZ 2MS/CM
 VERT "B" UNCAL-
 ADJUST FOR
 5 CM HIGH
 VERT "A" 1V/CM

(BB036)

FIGURE 6-18A. EOT WAVEFORMS



SCOPE SETTINGS
 HORIZ 5MS/CM
 VERT "B" UNCAL
 ADJUST FOR
 5 CM HIGH
 VERT "A" 1V/CM

(BB036)

FIGURE 6-18B. EOT WAVEFORMS

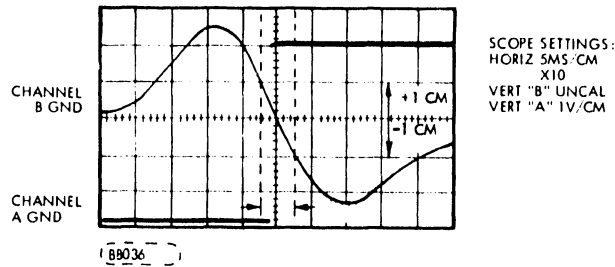


FIGURE 6-18C. EOT WAVEFORMS

13. Depress START/STOP switch to start (in) and allow spindle to attain operating speed.
14. Reconnect A1P2, but reverse orientation as noted in Step 10, immediately upon completion of brush cycle.
15. Perform temperature stabilization procedure.
16. Select upper head of disk cartridge and command unit to seek to cyl 146₁₀ (73₁₀ for 100 TPI units). For units without OEM tester proceed to Step 17. For other units proceed to Step 19.
17. If no OEM field tester or system is available to perform required functions. Refer to HPC package for proper switch settings.
18. After switches have been set to select head and cylinder desired, momentarily toggle cylinder address strobe switch on then off. This must be performed quickly or a seek error might occur.
19. Actuator should move to cylinder #146 (#73 for 100 TPI units).
20. Place oscilloscope external sync on Sector (P1-B10 on I/O Board for multi-sector units, index (P1-A31 I/O Board) for single-sector units without field tester and index (on field tester) for single-sector units with field tester.
21. Also monitor this signal and set up oscilloscope to indicate one complete revolution. Horizontal setting will be 2 ms/cm uncalibrated (see Figure 6-19A).
22. Monitor TP1 and TP2 on I/O board with channels A and B of the oscilloscope.
23. Set Oscilloscope to add signals and invert one channel.

This alignment procedure must be performed entirely with the oscilloscope calibrated for a sweep of 10 divisions equals one spindle revolution. (See Step 21 of this procedure.)

NOTE: Ideal head alignment occurs when the length of a single "cat eye" pattern equals one half of a spindle revolution or 5.0 oscilloscope divisions when calibrated to Step 21. Pattern crossover points are not necessarily coincident with the sweep start (index) and the position of these points relative to the index has no effect on proper head alignment. Pattern amplitude relationships are of no importance and should not be considered when aligning the heads.

24. Using the horizontal position control, move the display so that an accurate measurement between two consecutive crossover points can be obtained. (See Figure 6-19b.) The head is in alignment if this measurement does not exceed 5 ± 0.8 divisions. If this head meets the alignment requirements proceed to Step 28 and repeat this procedure. If not aligned to specification, continue.
25. Loosen upper head clamp if adjustment is required. (See Figure 6-6).
26. Using head alignment tool (CDC #75797900) adjust head to 5 ± 0.5 divisions. (See Figure 6-19b.)
27. Tighten upper head clamp and torque to 6 ± 0.5 lbf-in. Verify head alignment meets 5 ± 0.5 divisions after tightening.
28. Select lower head of disk cartridge. If no OEM field tester and no system is available to perform selection, refer to the HPC package for proper switch

- setting. After head selection follow the procedure outlines in Step 24.
29. Loosen lower head clamp if adjustment is required.
 30. Using head alignment tool (CDC #75797900) adjust head to 5 ± 0.5 divisions. (See Figure 6-19b.)
 31. Tighten lower head clamp and torque to 6 ± 0.5 lbf-in. Verify head alignment meets 5 ± 0.5 divisions after tightening.
 32. If new heads have been installed or actuator has been removed, proceed to Step 16 of index-to-burst period check and adjustment. Otherwise continue procedure.
 33. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
 34. Remove CE disk cartridge.
 35. Set main circuit breaker to off position.
 36. Disconnect A1P2, reverse plug, and reconnect.
 37. Install K1 and close power supply cover.
 38. Set all switches on I/O board back to original positions noted in Step 6.
 39. Disconnect oscilloscope.
 40. Install electronics cover.
 41. Close top cover (base cabinet only).

6.7.5 HEAD SKEW AND INDEX-TO-BURST PERIOD CHECK AND ADJUSTMENT

NOTE: Refer to HPC package located in front of manual for option switch and terminator locations.

1. Depress START/STOP switch to STOP and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove disk cartridge and install CE disk cartridge. Refer to disk cartridge removal and installation procedure in section 2.
3. Set main circuit breaker to off position.
4. Open top cover.
5. Remove electronics cover.
6. Record setting of all switches on I/O board.
7. Verify that resistor modules are installed on I/O board. If not, install terminator plug in I/O board connector J1 if required.
8. Install OEM field tester. If no OEM field tester or system is available to perform the required functions refer to HPC package to star select unit and terminator power.

CAUTION K1 should not be removed until main circuit breaker is in off position. With K1 removed, emergency retract is disabled. Consequently, heads must be manually retracted if spindle slows down below tolerance limit.

9. Open power supply cover and remove relay K1 to provide access to heads.
10. Disconnect A1P2 (note orientation).
11. Set main circuit breaker to on position.
12. Depress W/PROT CART and W/PROT FIXED switches to on (in).
13. Depress START/STOP switch to start (in) and allow spindle to attain operating speed.
14. Reconnect A1P2, but reverse orientation as noted in Step 10, immediately upon completion of brush cycle.
15. Perform temperature stabilization procedure.
16. Select upper head of disk cartridge and command unit to seek to cyl 10₁₀ (5₁₀ for 100 TPI units). For units without OEM tester proceed to Step 17. For other units proceed to Step 19.
17. If no OEM field tester or system is available to perform required functions, refer to HPC package for proper switch settings.
18. After switches have been set to select head and cylinder desired, momentarily toggle cylinder address strobe switches on then off. This must be performed quickly or a seek error might occur.

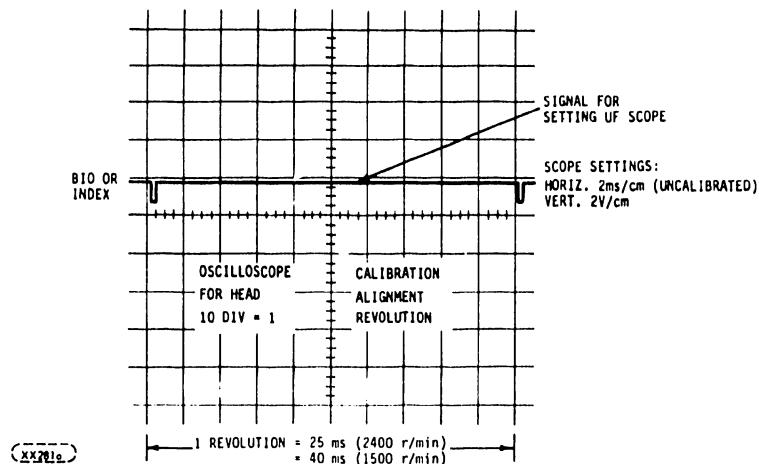


FIGURE 6-19A. HEAD ALIGNMENT SCOPE SETTING

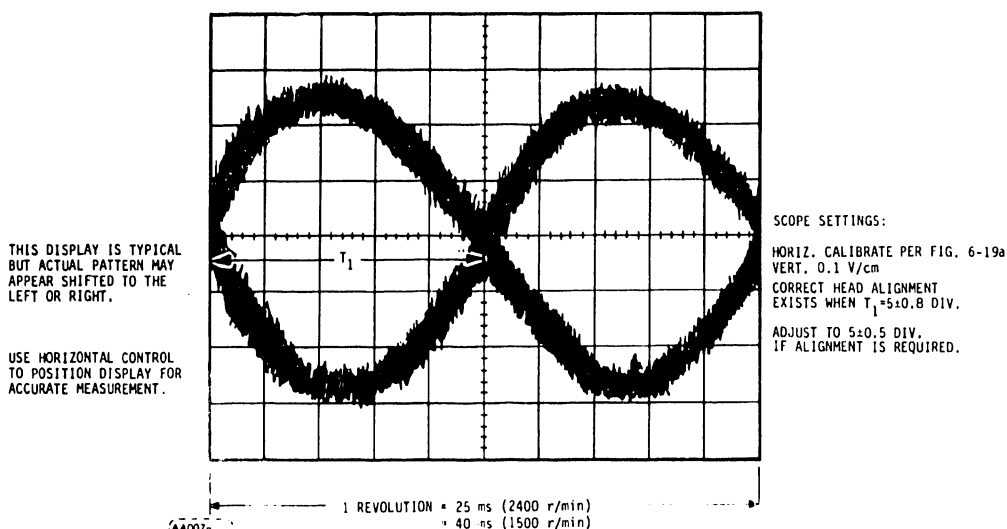


FIGURE 6-19B. HEAD ALIGNMENT WAVEFORM

19. Actuator should move to cylinder #10 (#5 for 100 TPI units).
20. Place oscilloscope external sync and channel A on sector (P1-B10 on I/O Board) for multi-sector units, index (P1-A31 I/O board) for single-sector units without field tester and index (on field tester) for single-sector units with field tester (see Figure 20).
21. Connect oscilloscope channel B to TPI on I/O Board.

Head-skew check (Steps 22 through 24) should only be performed if a head has been replaced. If the check fails specification, keep replacing that head until the check passes specification. All measurements are to be made on the peak of the leading pulse derived by the CE pack regardless of polarity. To measure head skew with reliable accuracy, the index-to-data burst should be observed on a delayed sweep having a time base of 1 μ s per division for straddle-erase heads and 5 μ s per division for pre-erase heads. An alternate procedure is to change the index-to-burst timing so the pulse can be centered on the scope screen having the above horizontal time base (Figure 6-20b).

NOTE:

22. With the upper head of the disk cartridge selected, place the burst pulse in the center of the scope (Figure 6-20b).
23. Next select the lower head of the disk cartridge. If no OEM field tester or system is available to perform the selection, refer to the HPC package for the proper switch settings.

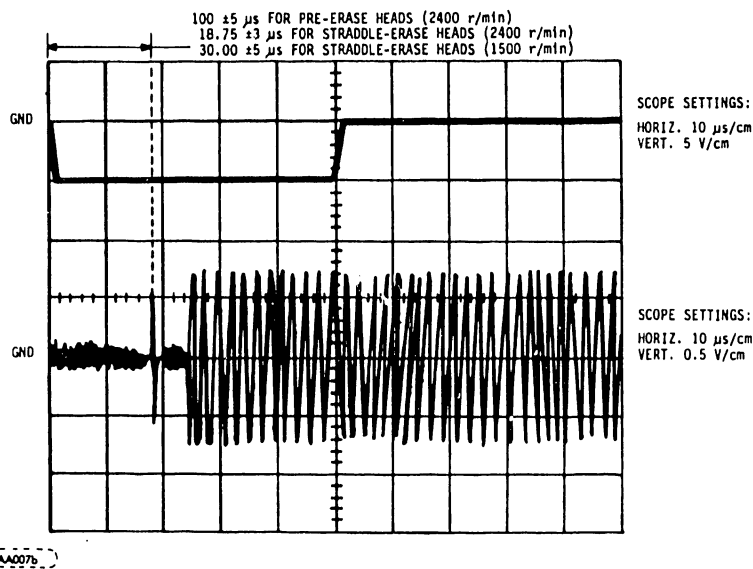
24. With the lower head of the disk cartridge selected, measure the difference between the burst point of the upper head to the burst point of the lower head. The head to head difference must be within the following limits:
 - 3 μ s maximum for straddle-erase heads (2400 r/min)
 - 4 μ s maximum for straddle-erase heads (1500 r/min)
 - 4 μ s maximum for pre-erase heads (2400 r/min)
25. Select the upper head of the disk cartridge. If no OEM field tester or system is available to perform the required functions, refer to the HPC package for the proper switch settings.
26. Check and record the index-to-burst period as shown in Figure 6-20a.
27. Select the lower head of the disk cartridge. If no OEM field tester or system is available to perform the selection, refer to the HPC package for the proper switch settings.
28. Check and record the index-to-burst period as shown in Figure 6-20a.
29. Determine which head has the lowest index-to-burst period and verify that it meets the following limits:
 - 100.0 \pm 5 μ s for pre-erase heads (2400 r/min)
 - 18.8 \pm 3 μ s for straddle-erase heads (2400 r/min)
 - 30.0 \pm 5 μ s for straddle-erase heads (1500 r/min)

If the check meets the above limits, go to Step 31, if not, continue procedure.
30. If the head with the lowest index-to-burst period does not fall within the above limits, select that head and adjust the potentiometer on the sector board to the following:
 - 100.0 \pm 1 μ s for pre-erase heads (2400 r/min)
 - 18.8 \pm 0.1 μ s for straddle-erase heads (2400 r/min)
 - 30.0 \pm 0.5 μ s for straddle-erase heads (1500 r/min)

If the potentiometer is not present or if the adjustment range of the potentiometer does not reach far enough, depress the START/STOP pushbutton to STOP and perform the cartridge index/sector transducer check and adjustment. Then repeat Steps 26 through 30.
31. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
32. Remove CE disk cartridge.
33. Set main circuit breaker to Off position.
34. Disconnect A1P2, reverse plug, and reconnect.
35. Install K1 and close power supply cover.
36. Set all switches on I/O board back to original positions noted in step 6.
37. Disconnect oscilloscope.
38. Install electronics cover.
39. Close top cover (base cabinet only).

6.7.6 TRACK INDICATOR CHECK AND ADJUSTMENT

1. Open top cover (base cabinet only).
2. Remove electronics cover.
3. Set main circuit breaker to on position.
4. Install disk cartridge.
5. Depress START/STOP switch to START (in) and wait for unit to complete FIRST SEEK.



NOTE: Measurement to be made at the peak of the leading pulse regardless of polarity. Some CE modes produce pulses inverted to pulse shown in Figure.

FIGURE 6-20A. INDEX-TO-BURST PERIOD WAVEFORMS

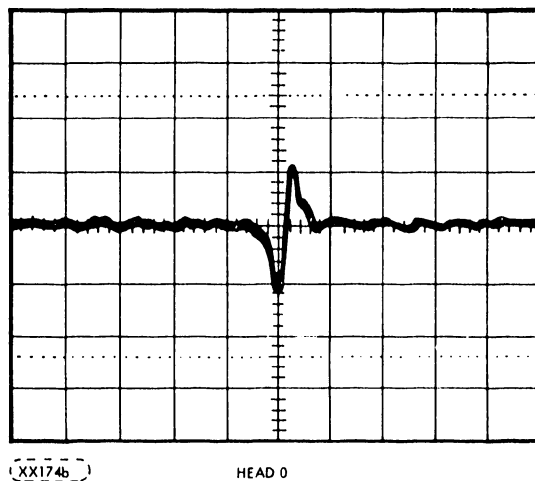


FIGURE 6-20B. INDEX-TO-BURST WAVEFORMS

6. Check that zero marks on fixed and movable sections of track indicators (Figure 6-21) are lined up.
7. If marks are not aligned, loosen fixed section of track indicator and position for alignment with movable section.
8. Check that gap between the fixed and movable sections of track indicator is 0.1 to 0.3 inches (2.54 to 7.62 mm).
9. Install electronics cover.

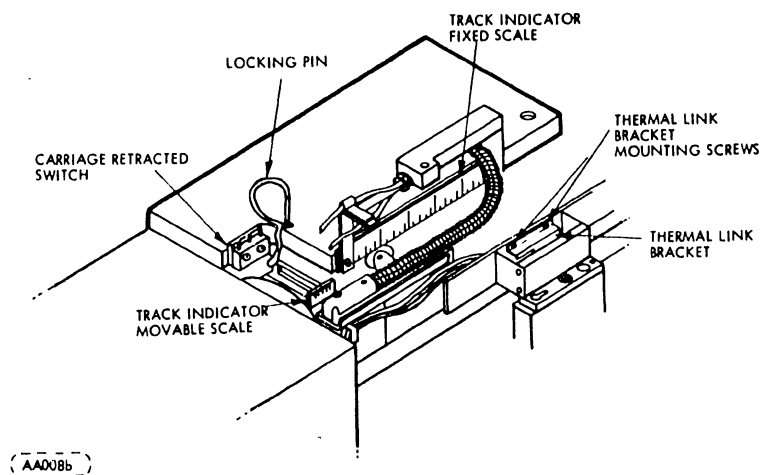


FIGURE 6-21. TRACK INDICATOR

6.7.7 CARTRIDGE-ON SWITCH CHECK AND ADJUSTMENT

There are two cartridge-on switches, one on each Hold-Down arm.

NOTE:

Perform cartridge-on switch removal and replacement procedure except for actual removal of switches.

6.7.8 STATIC ELIMINATOR CHECK

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Remove disk cartridge.
3. Open top cover (base cabinet only).
4. Set main circuit breaker to off position.
5. Using multimeter check for five ohms or less between module ground and side of rotating spindle cone while turning spindle by hand.
6. If resistance is above five ohms clean static eliminator and perform Step 5 again.
7. If multimeter indicates no continuity or high resistance after cleaning replace static eliminator by following Static Eliminator Removal and Replacement procedure.

6.7.9 DISK BRUSH SWITCH CHECK AND ADJUSTMENT

Perform disk brush assembly removal and replacement procedure except for actual removal of brush assembly.

6.7.10 CARTRIDGE INDEX/SECTOR TRANSDUCER CHECK AND ADJUSTMENT

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Open top cover (base cabinet only).
3. Remove disk cartridge.

4. Set main circuit breaker to OFF position.
5. Install armature plate simulator onto spindle as shown in Figure 6-22.
6. Using plastic shim stock, adjust clearance A to 0.030 ± 0.005 inch (0.76 ± 0.13 mm) for 2400 r/min units and $0.018 \pm 0.005, -0.000$ inch ($0.46 \pm 0.13, -0.00$ mm) for 1500 r/min units. The adjustment is made by loosening the clamp screw and sliding the transducer in or out for proper clearance. Tighten the clamp screw.
7. After the transducer is properly adjusted, perform the Index to Burst Period Check and Adjustment procedure.

NOTE

If the adjustment range of the potentiometer on the sector PWA does not reach far enough, loosen the two screws of the upper sensor holder and adjust holder position to where potentiometer range allows proper adjustment. Clearance "A" set in step 6 must be readjusted if upper sensor holder is moved.

6.7.11 FIXED DISK INDEX/SECTOR TRANSDUCER CHECK AND ADJUSTMENT

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguish).
2. Set main circuit breaker to OFF position.
3. Using a 5/32 Allen driver, place tool into hole on front end panel and remove panel by loosening hardware (base cabinet only).
4. Remove left side panel (when viewed from rear of unit, cabinet only).
5. Remove module bottom cover.
6. Using plastic shim stock, check clearance A (Figure 6-23). Clearance should be between $0.010 + 0.003, -0.000$ inch ($0.25 + 0.076, -0.000$ mm). If clearance is out of tolerance, loosen transducer clamp and slide transducer in or out to adjust for proper clearance.
7. Tighten transducer clamp.
8. Install module bottom cover.
9. Install side panel (base cabinet only).
10. Install rear end panel (base cabinet only).

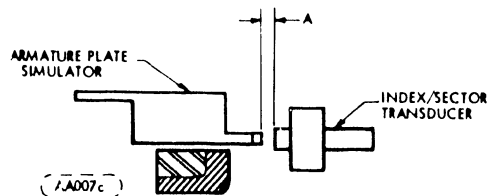


FIGURE 6-22. INDEX/SECTOR TRANSDUCER ADJUSTMENT

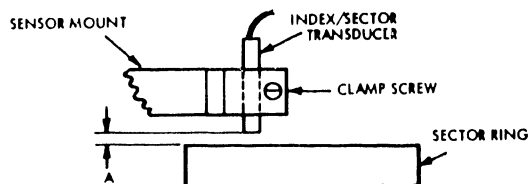


FIGURE 6-23. FIXED DISK INDEX/SECTOR TRANSDUCER ADJUSTMENT

SECTION

7

**MAINT-
ENANCE**

AIDS

7.1 GENERAL

This section contains information useful for maintaining the 9427H Disk Drive.

7.2 CIRCUIT BOARD DESCRIPTION

All disk drive electronics is contained on printed circuit boards. Six of the boards (R/W/E, Data Recovery, Sector, Servo, Control & I/O) measure 6 in. X 8 in. (152 X 203 mm) and are plugged into the card cage assembly mother board. The Inductosyn Pre-amp board measures 5 in. X 8 in. (127 X 203 mm) and is mounted on top of the magnet assembly. The Power board measures 4.75 in. X 7.50 in. (121 X 191 mm) and is part of the power supply assembly. Both integrated and discrete circuit are used on the boards.

7.3 CIRCUIT BOARD LOCATIONS

The Printed Circuit Boards are located in the Card Cage as shown in Figure 7-1.

SPARE	(J7)	I/O BOARD (J1)
FAULT BOARD (OPTION)	(J8)	
CONTROL BOARD	(J9)	
SECTOR BOARD	(J10)	
SERVO BOARD	(J11)	
DATA RECOVERY BOARD	(J12)	
SHIELD		
R W E BOARD	(J14)	

AA149a

FIGURE 7-1. CIRCUIT BOARD LOCATION

7.4 TROUBLESHOOTING DIAGRAMS

The following diagrams are intended to guide service personnel to the probable cause of malfunctions in the 9427H disk drive.

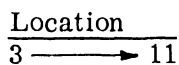
The first series of diagrams illustrate the normal sequence of events when everything is functioning properly. However, at certain intervals during the normal sequential flow, service personnel are directed to specific flow chart locations if a malfunction does occur (refer to paragraph 7.5).

NOTE: In the flowcharts, imperative instructions (e.g. replace control board) are intended only to suggest a possible cause of the malfunction and the recommended solution.

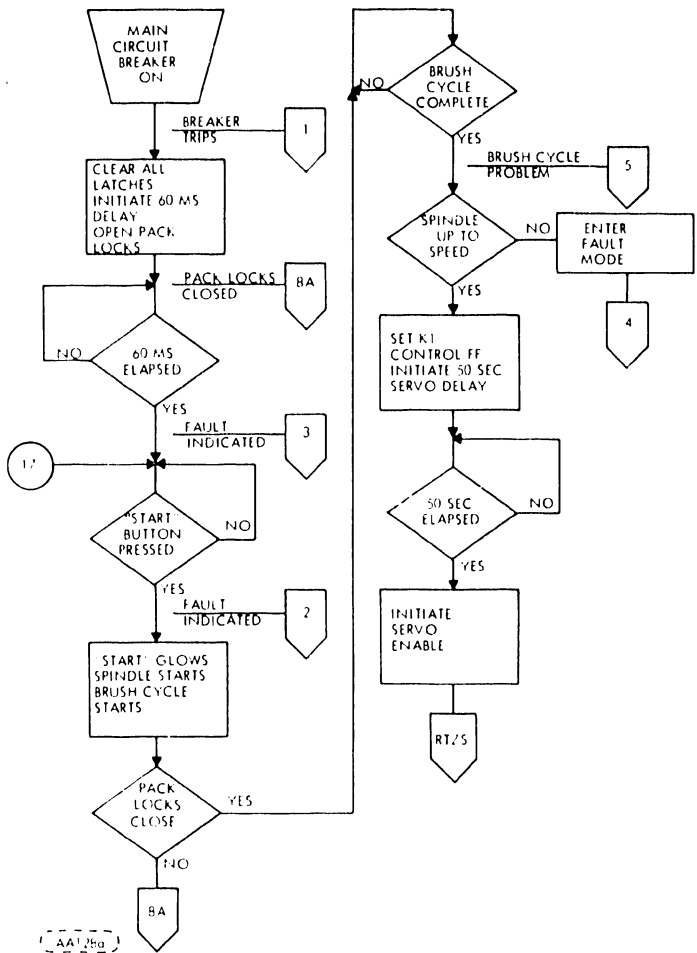
7.5 FLOW DIAGRAM REFERENCES

Each diagram page is sequentially page numbered in the upper right-hand corner of the page. When the diagram flow is interrupted (3), the page location, where the flow will be continued is referenced in the lower right-hand corner of the page.

EXAMPLE:

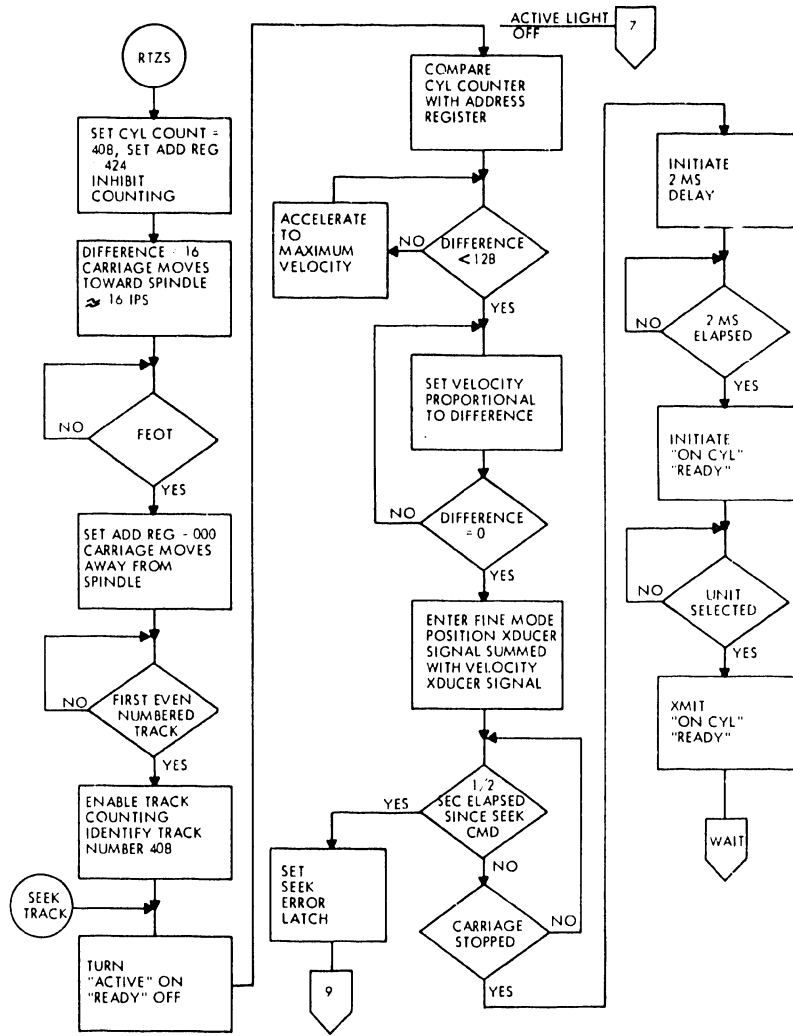


This indicates that the flow will continue on another page or a Fault has occurred, and on page 11 the flow will start at 3 .



LOCATION

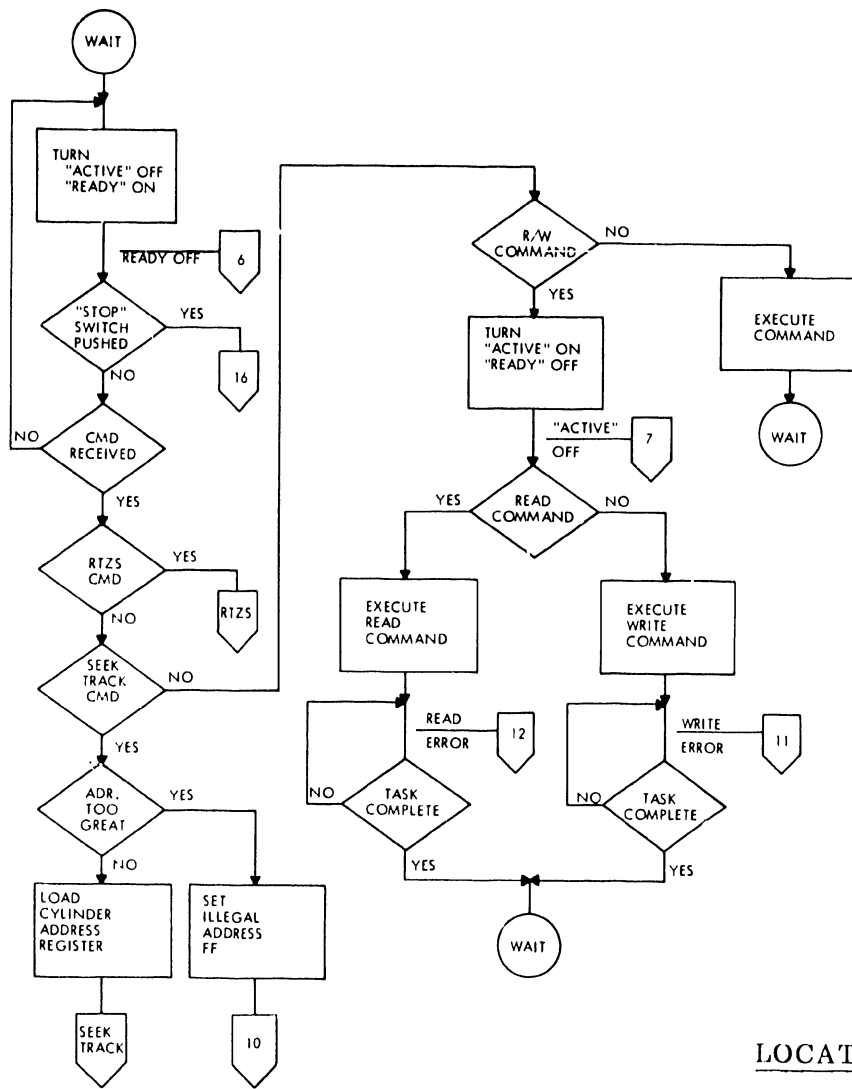
- 1 → 7
- 2 → 11 or 7
- 3 → 11
- 4 → 11
- 5 → 8
- 8A → 5
- RTZS → 2



(AA128b)

LOCATION

- 7 → 4
- 9 → 14
- WAIT → 3



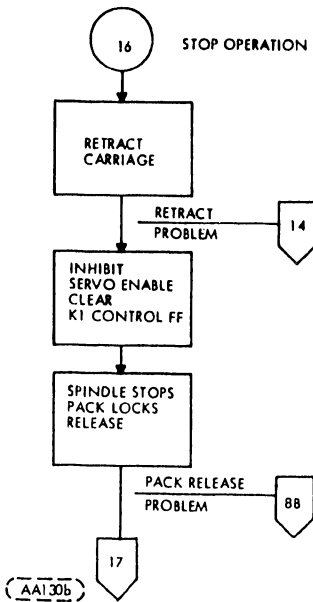
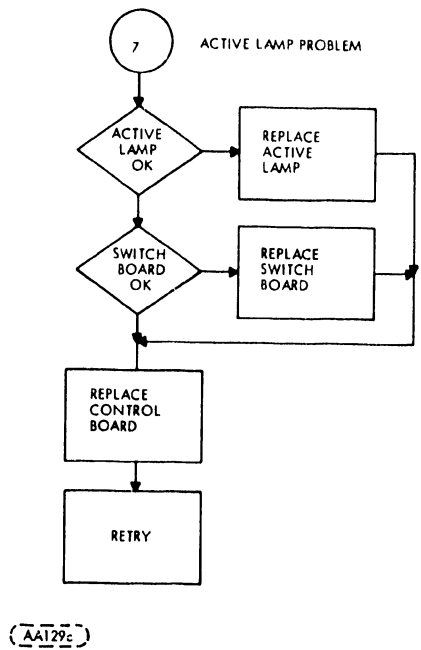
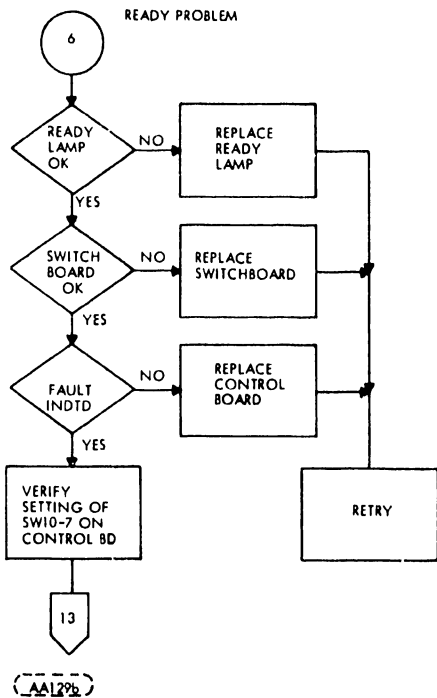
(AA129a)

LOCATION

- 6 → 4
- 7 → 4
- 10 → 10
- 11 → 6
- 12 → 6
- 16 → 4

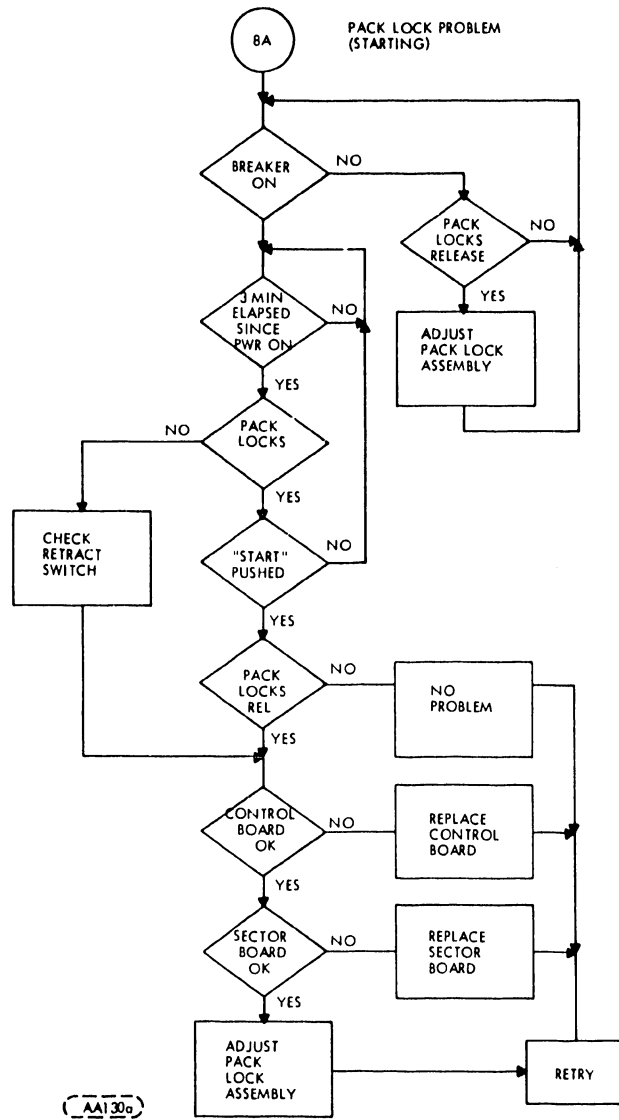
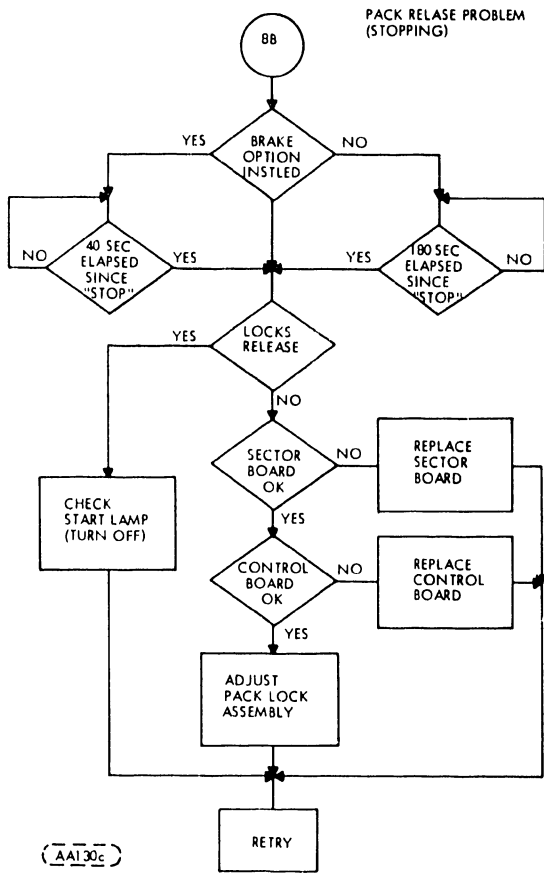
SEEK TRACK → 2

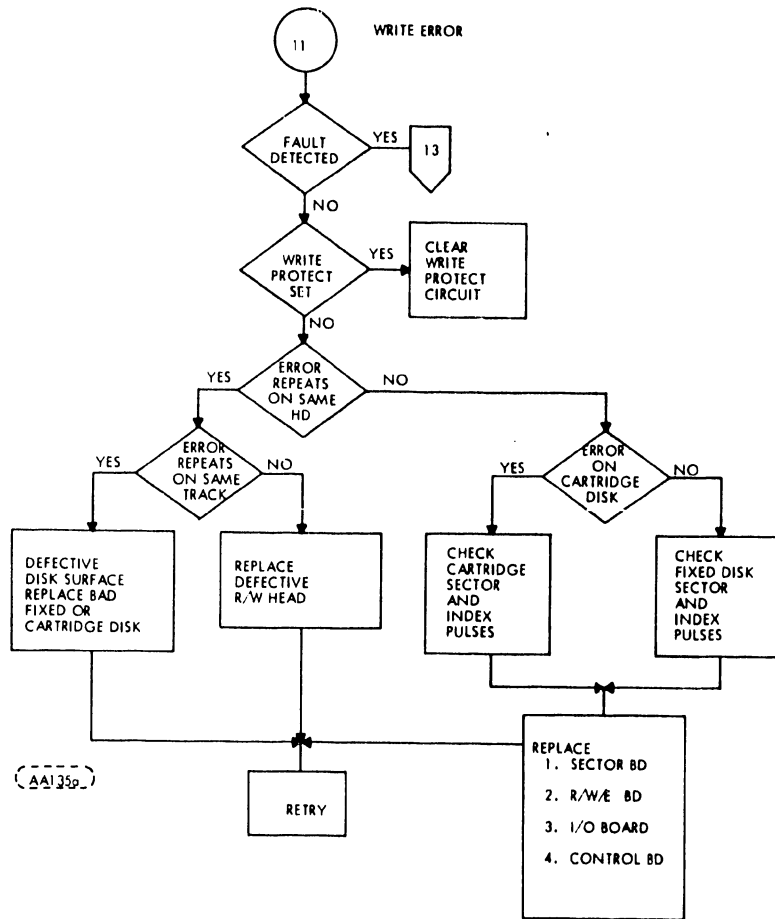
RTZS → 2



LOCATION

- 8B → 5
- 13 → 12
- 14 → 11
- 17 → 1





LOCATION

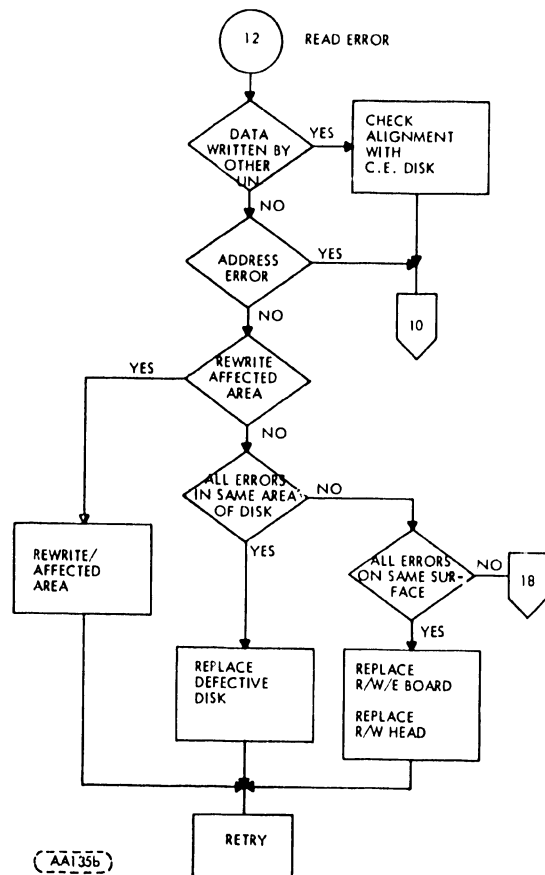
13 → 12

AA135p

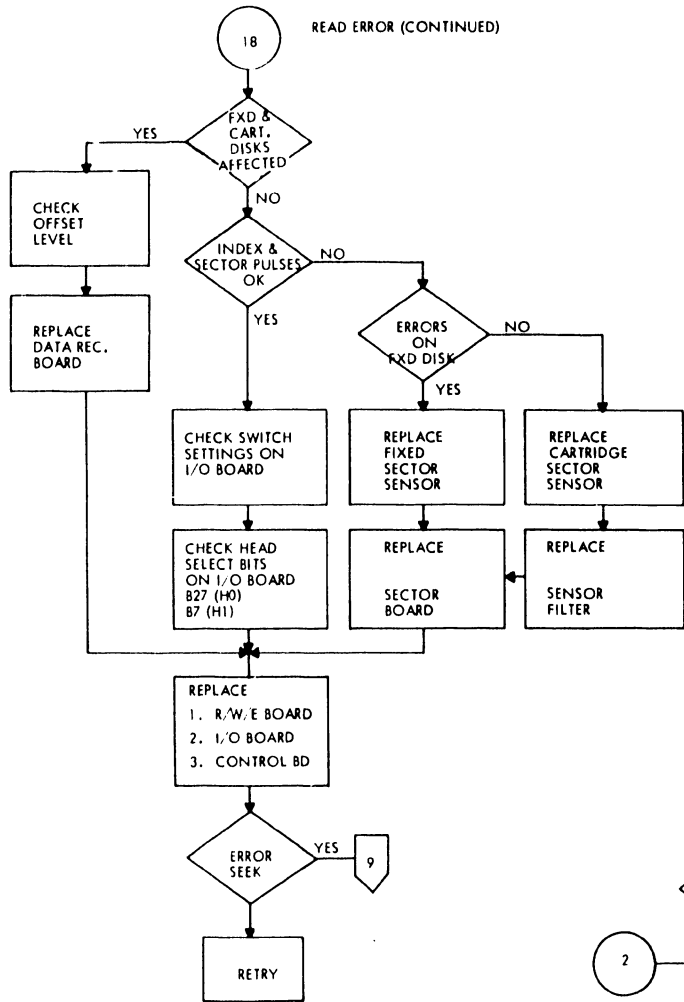
LOCATION

10 → 10

18 → 7



AA135b



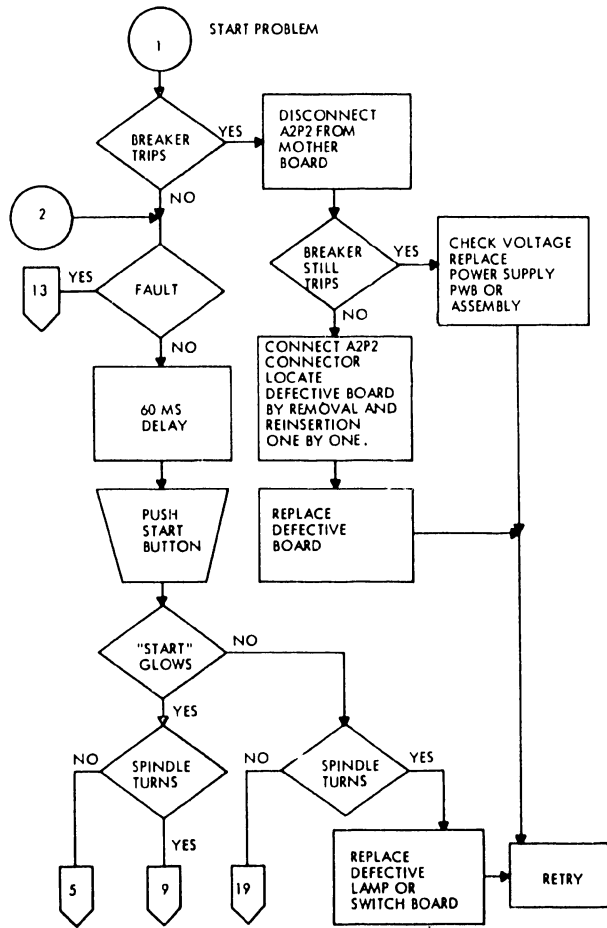
LOCATION

9 → 14

(AA1 36a)

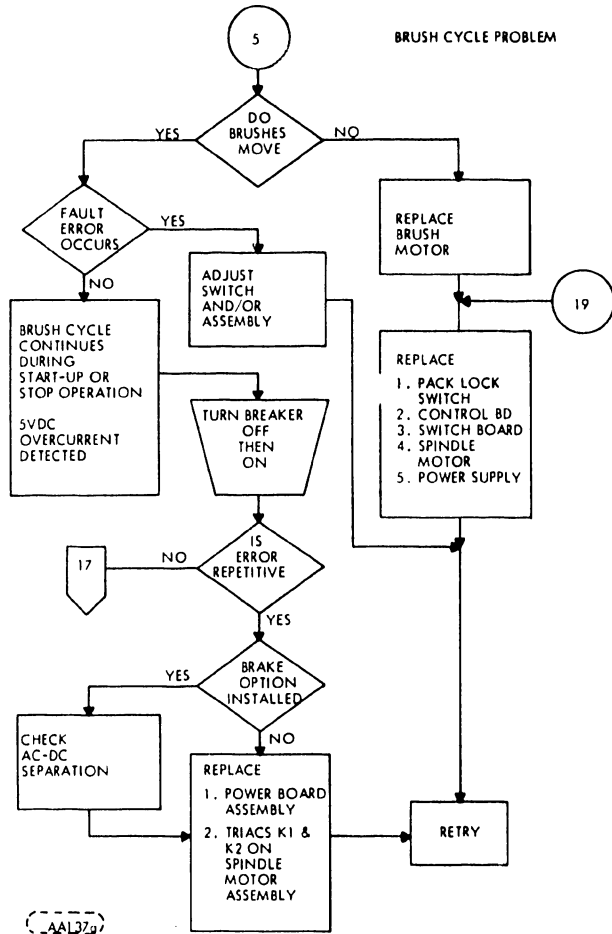
LOCATION

5 → 8
 9 → 14
 13 → 12
 19 → 8



(AA1 36b)

BRUSH CYCLE PROBLEM



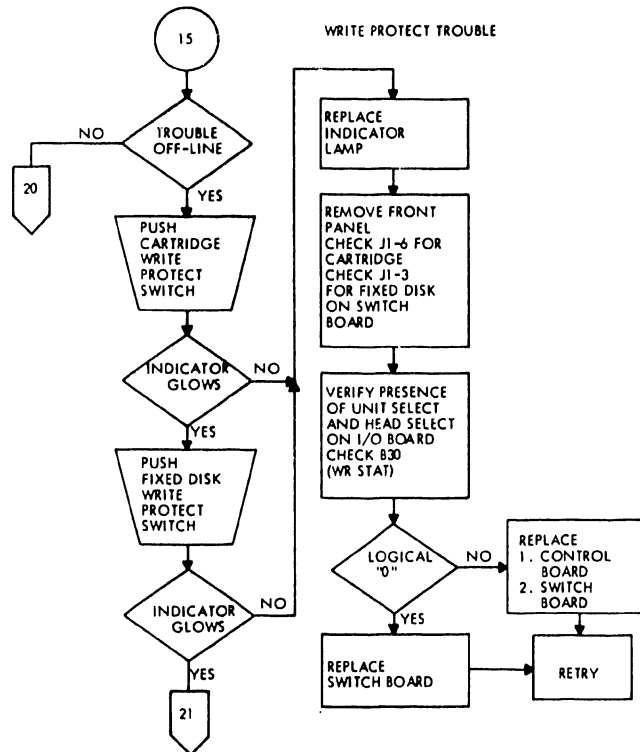
LOCATION

17 → 1

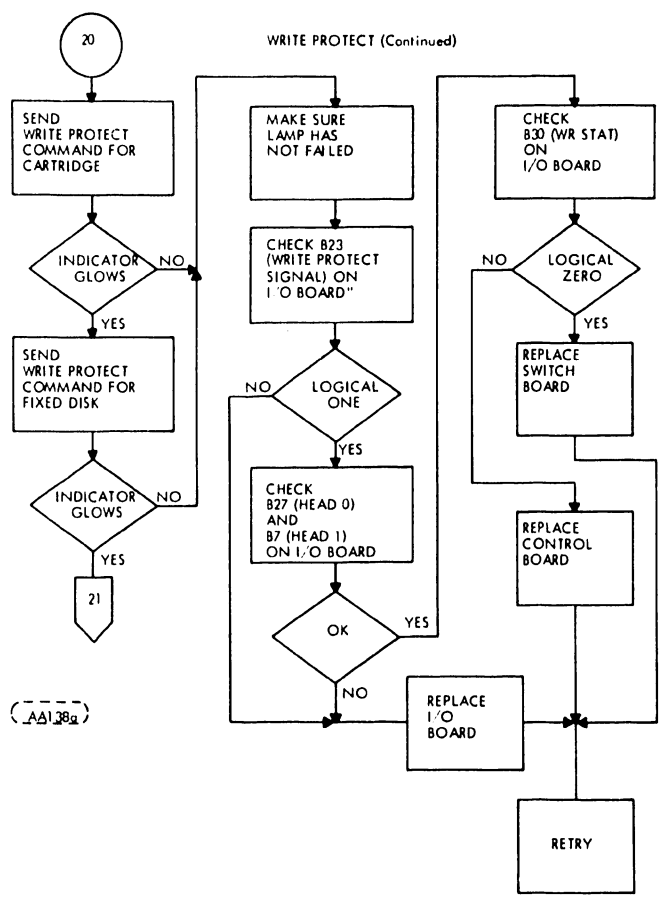
(AAL32a)

LOCATION

21 → 9



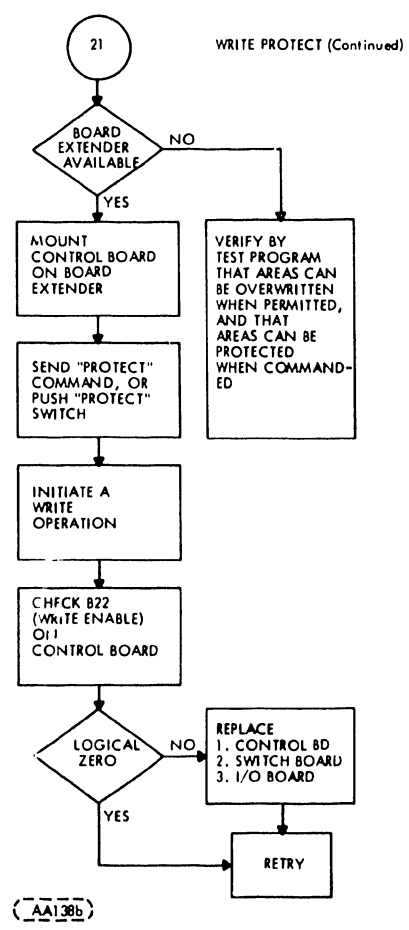
(AAL32b)



AA1.38a

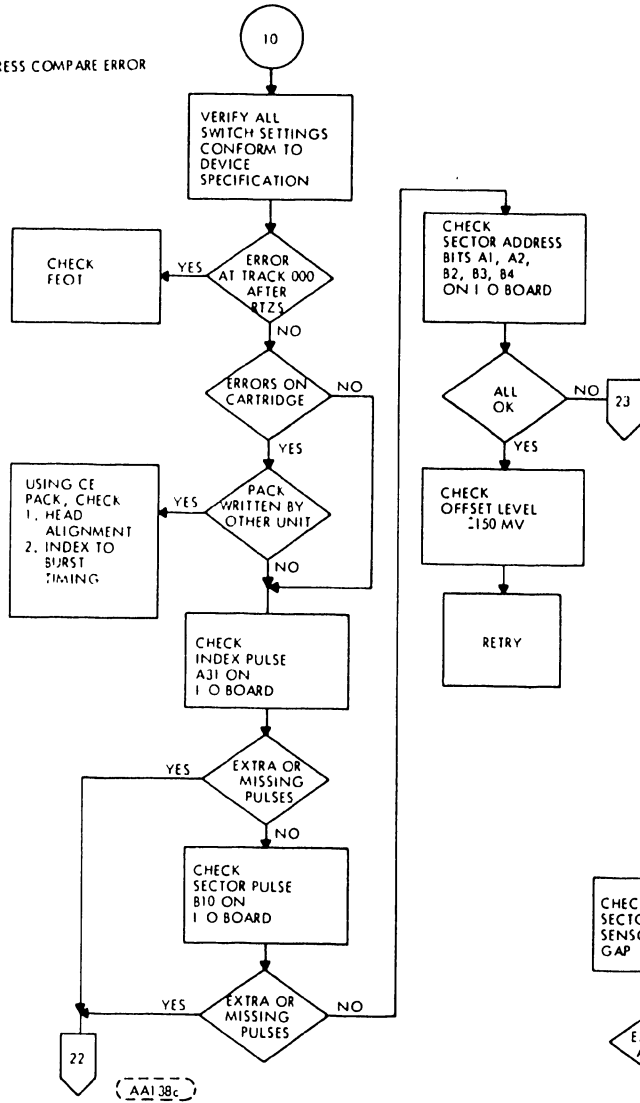
LOCATION

21 → 9



AA1.38b

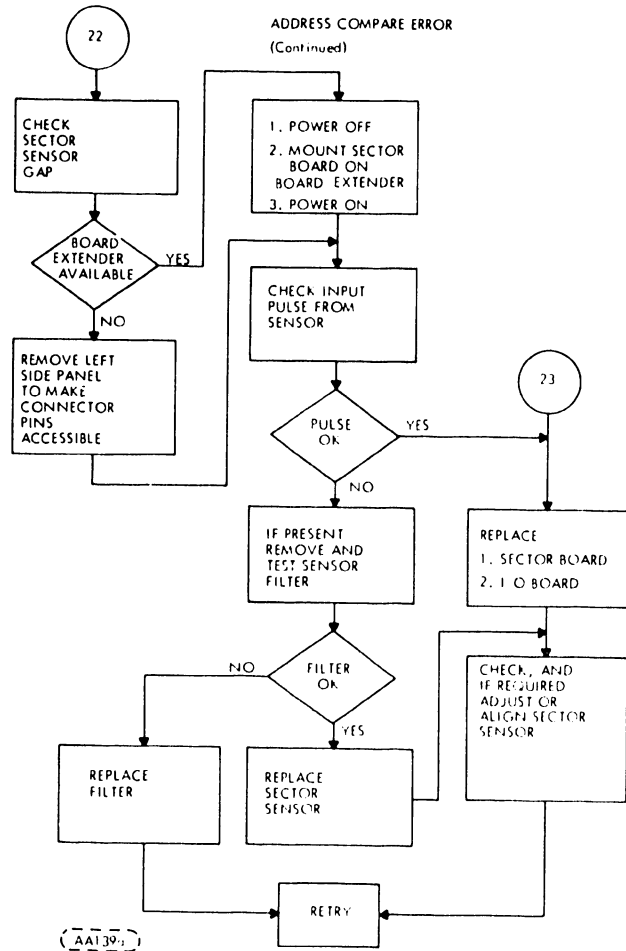
ADDRESS COMPARE ERROR



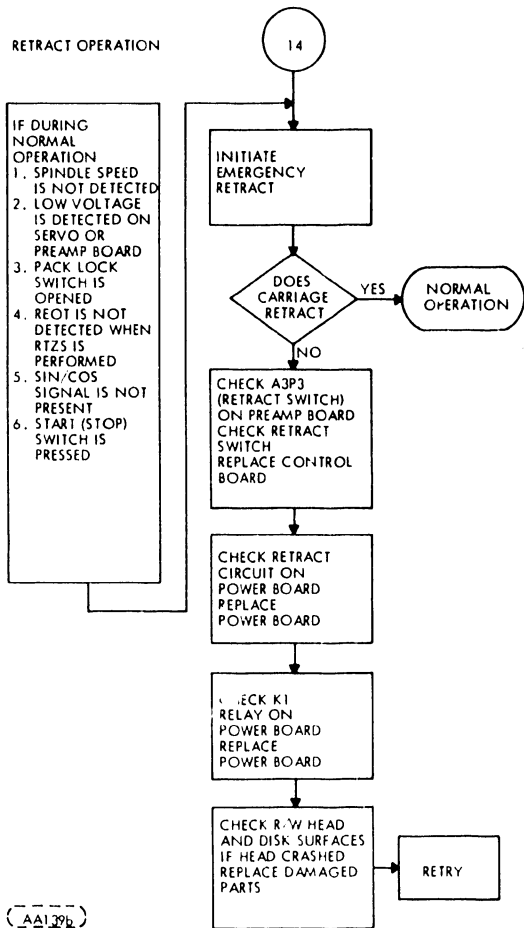
LOCATION

22 → 10
23 → 14

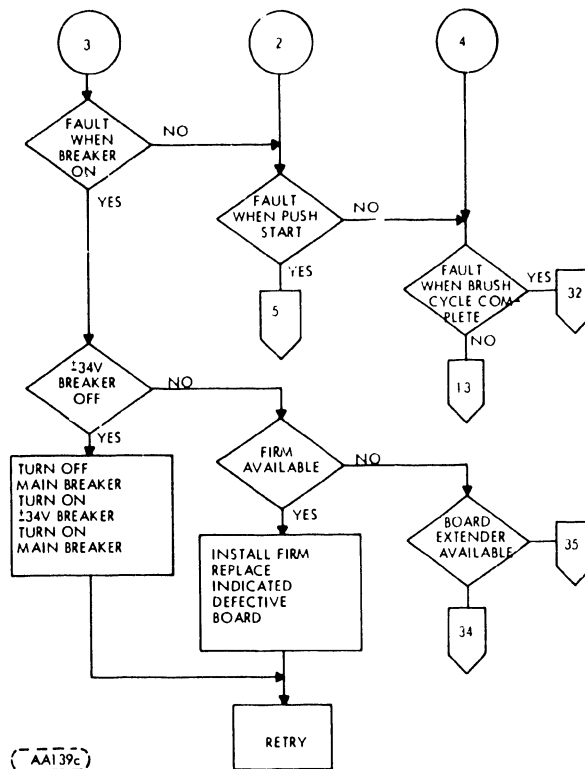
ADDRESS COMPARE ERROR (Continued)



RETRACT OPERATION

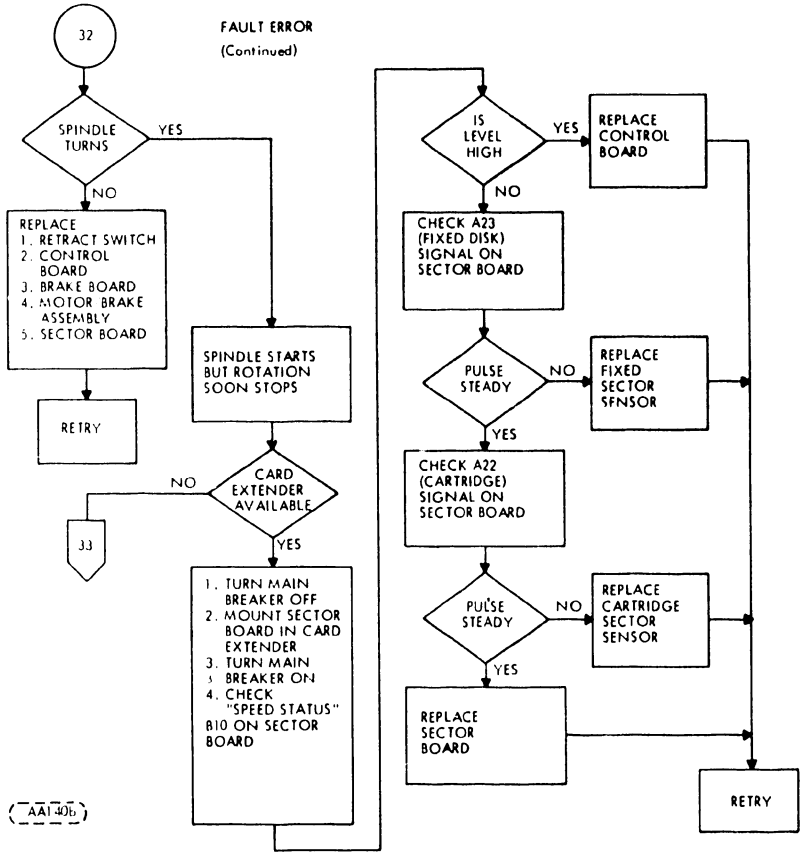
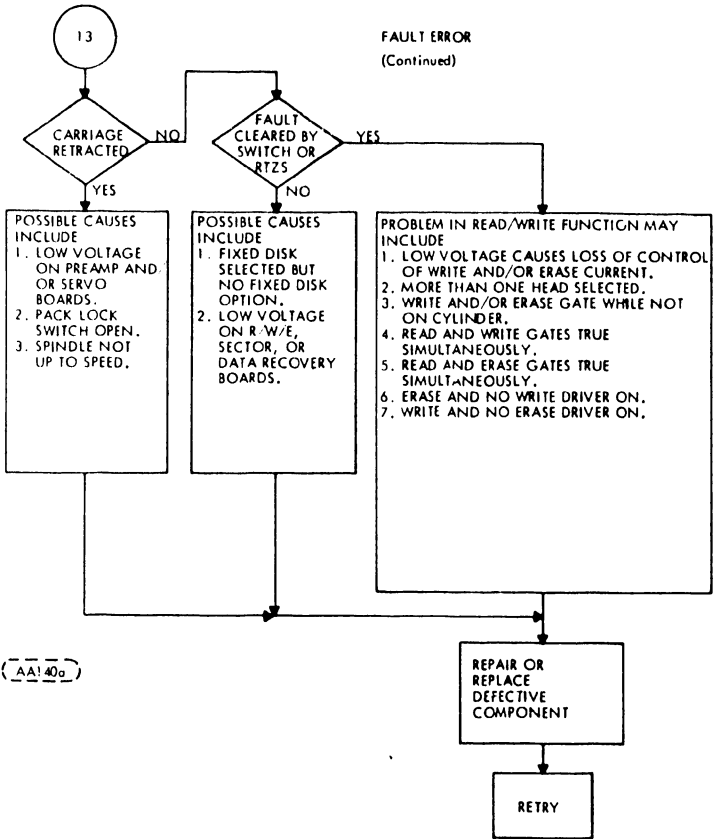


FAULT ERROR



LOCATION

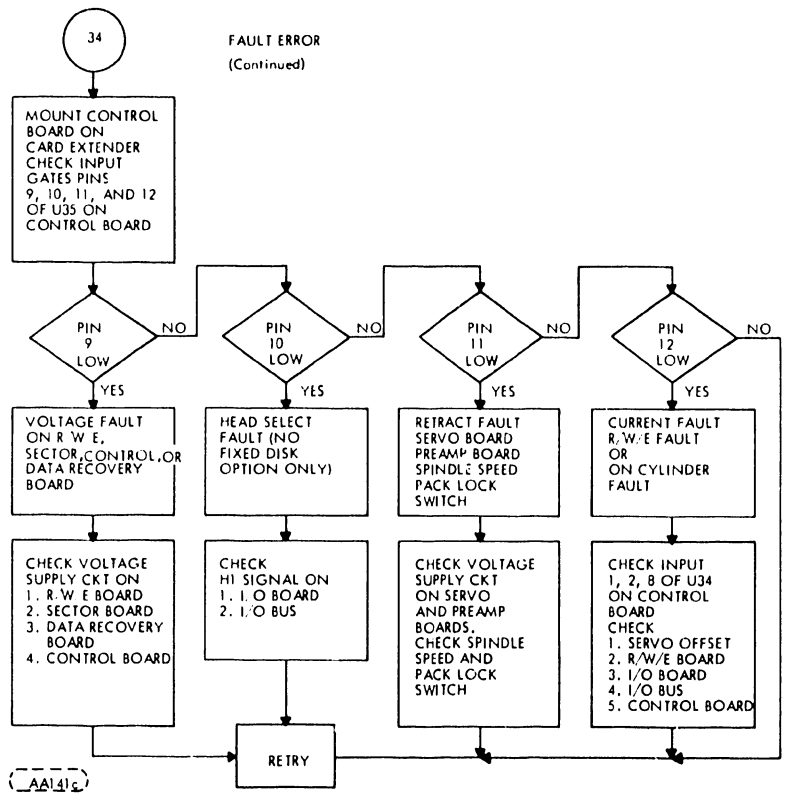
- 5 → 8
- 13 → 12
- 32 → 12
- 34 → 13
- 35 → 13



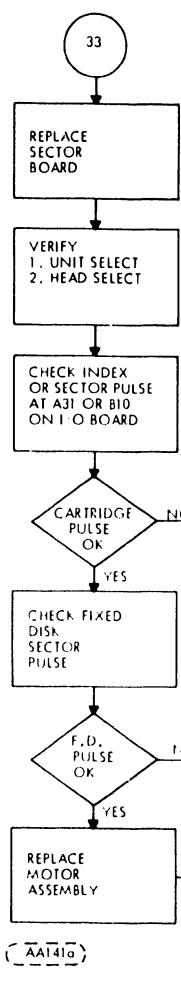
LOCATION

33 → 13

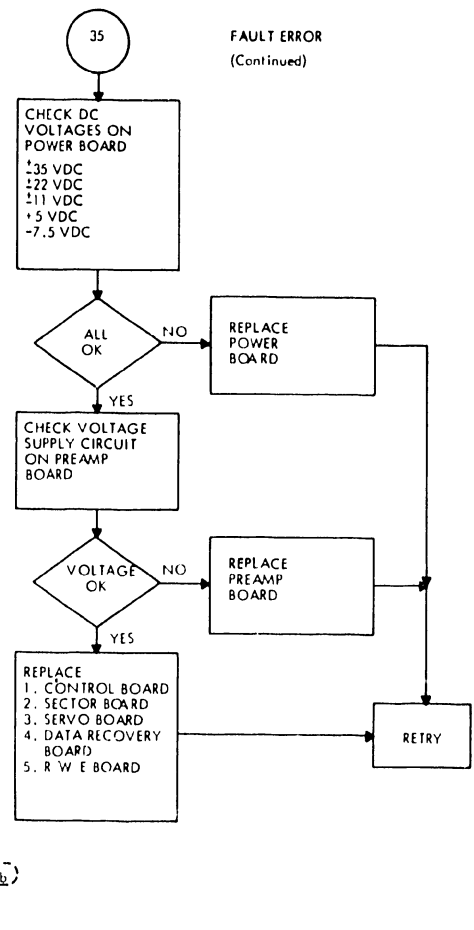
FAULT ERROR
(Continued)

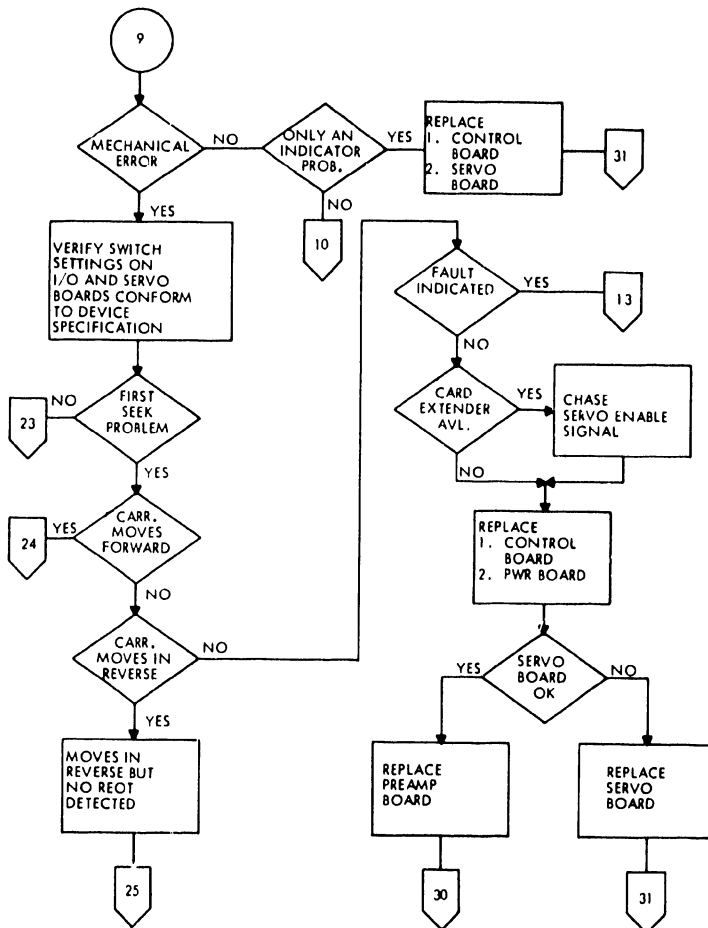


FAULT ERROR
(Continued)



FAULT ERROR
(Continued)

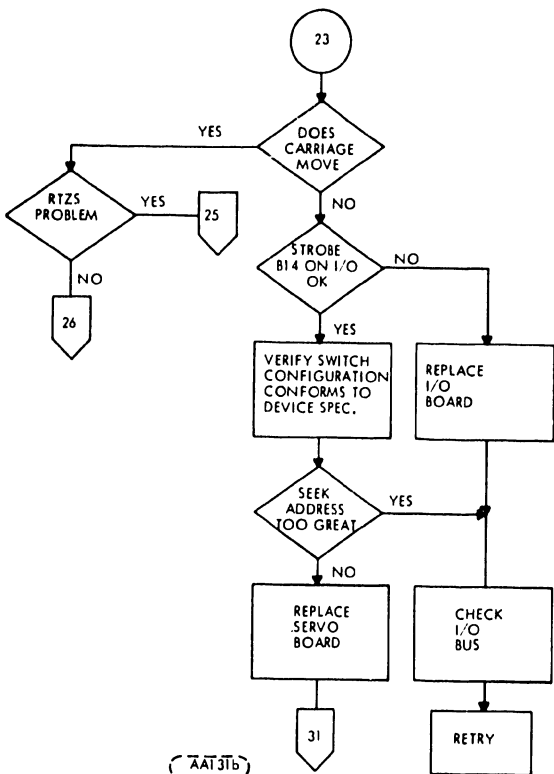




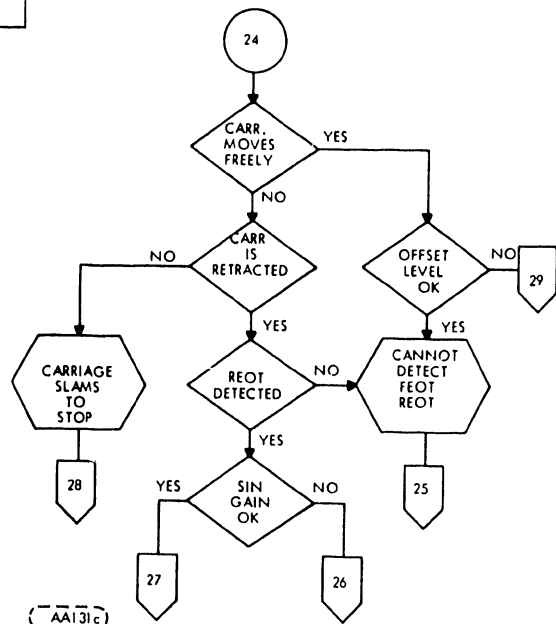
LOCATION

- 10 → 10
- 13 → 12
- 23 → 14
- 24 → 14
- 25 → 15
- 30 → 18
- 31 → 19

AAI31a



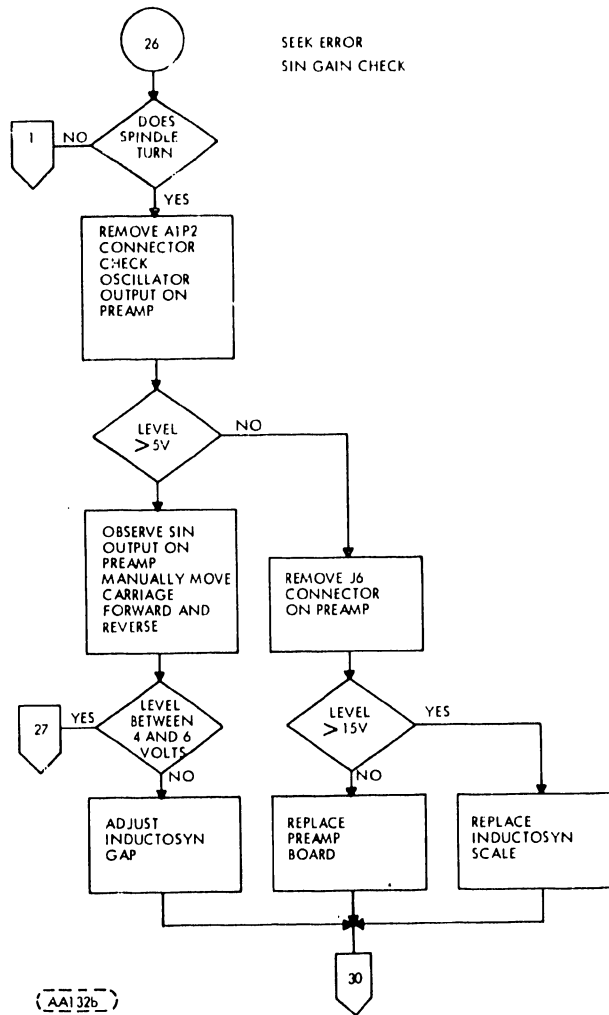
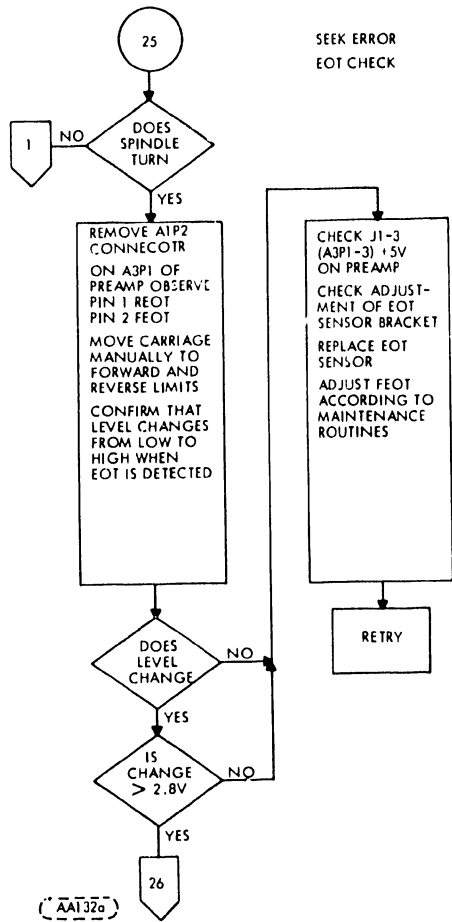
AAT31b



AAI31c

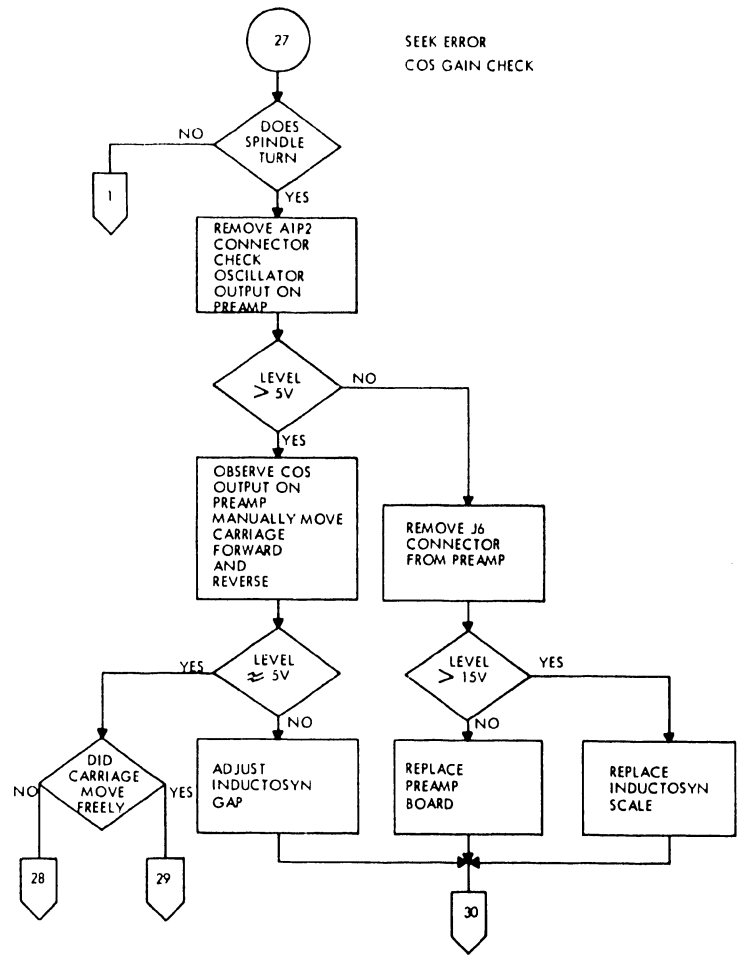
LOCATION

- 25 → 15
- 26 → 15
- 27 → 16
- 28 → 16
- 29 → 17
- 31 → 19



LOCATION

- 1 —————> 7
- 26 —————> 15
- 27 —————> 16
- 30 —————> 18

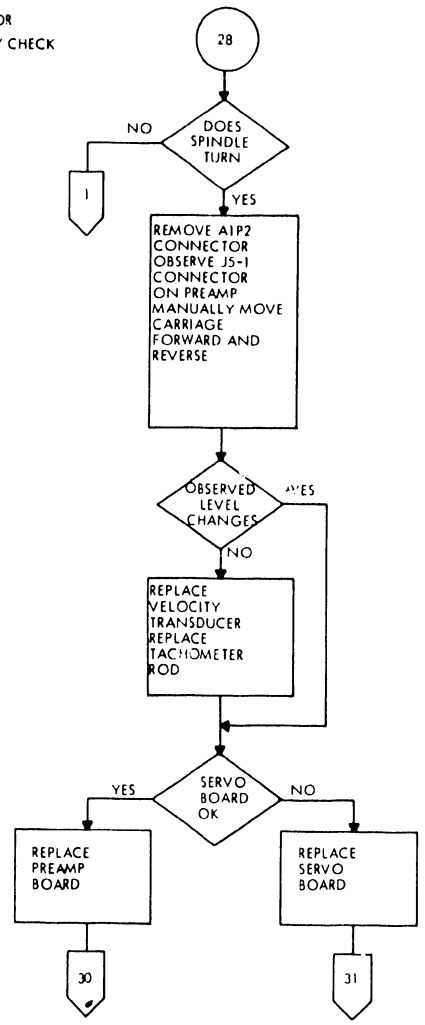


(AA132c)

LOCATION

- 1 —————> 7
- 28 —————> 16
- 29 —————> 17
- 30 —————> 18

SEEK ERROR
VELOCITY CHECK

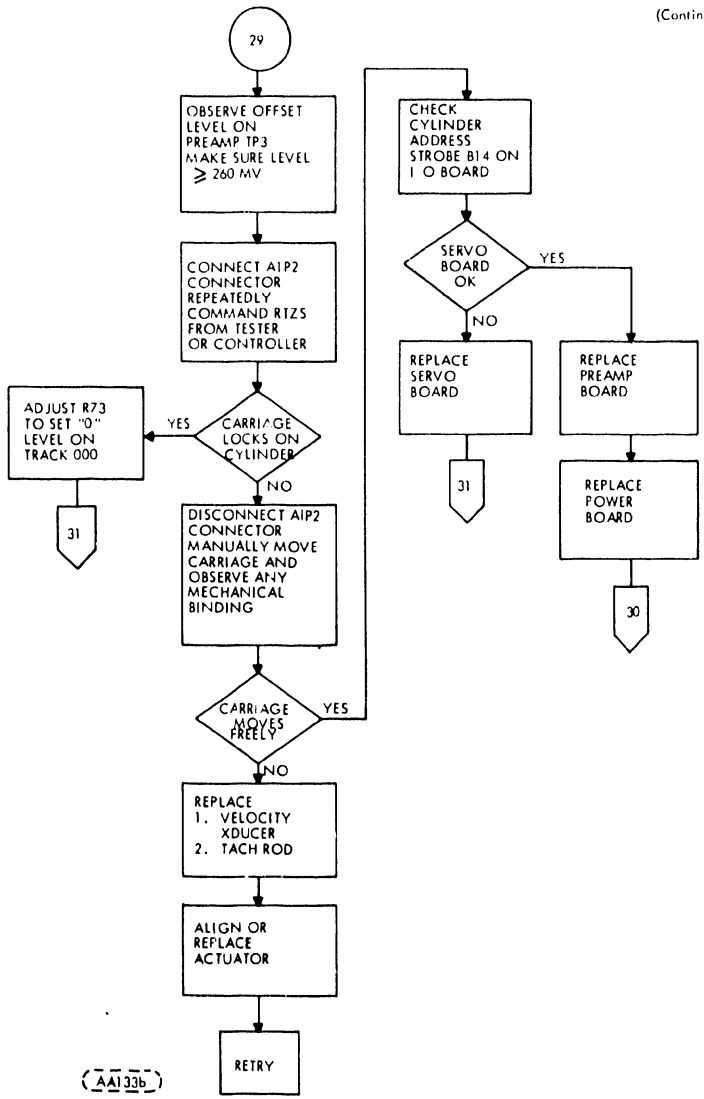


(AA133a)

LOCATION

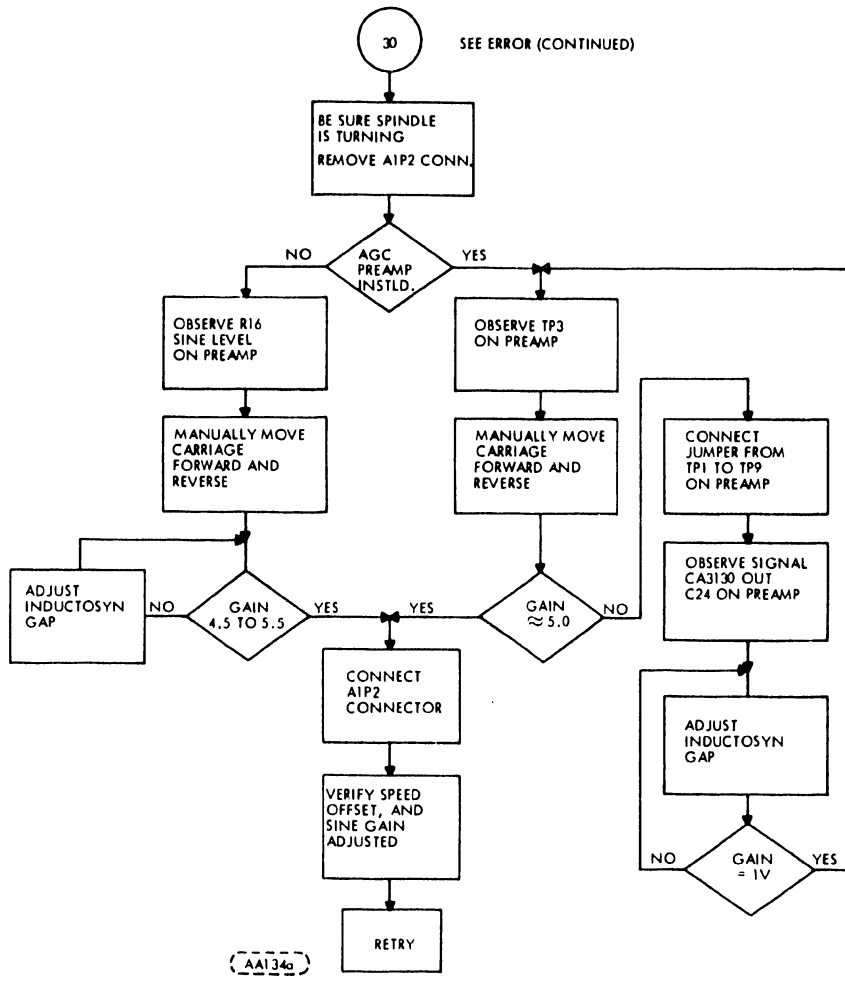
- 1 —————> 7
- 30 —————> 18
- 31 —————> 19

SEE ERROR
(Continued)

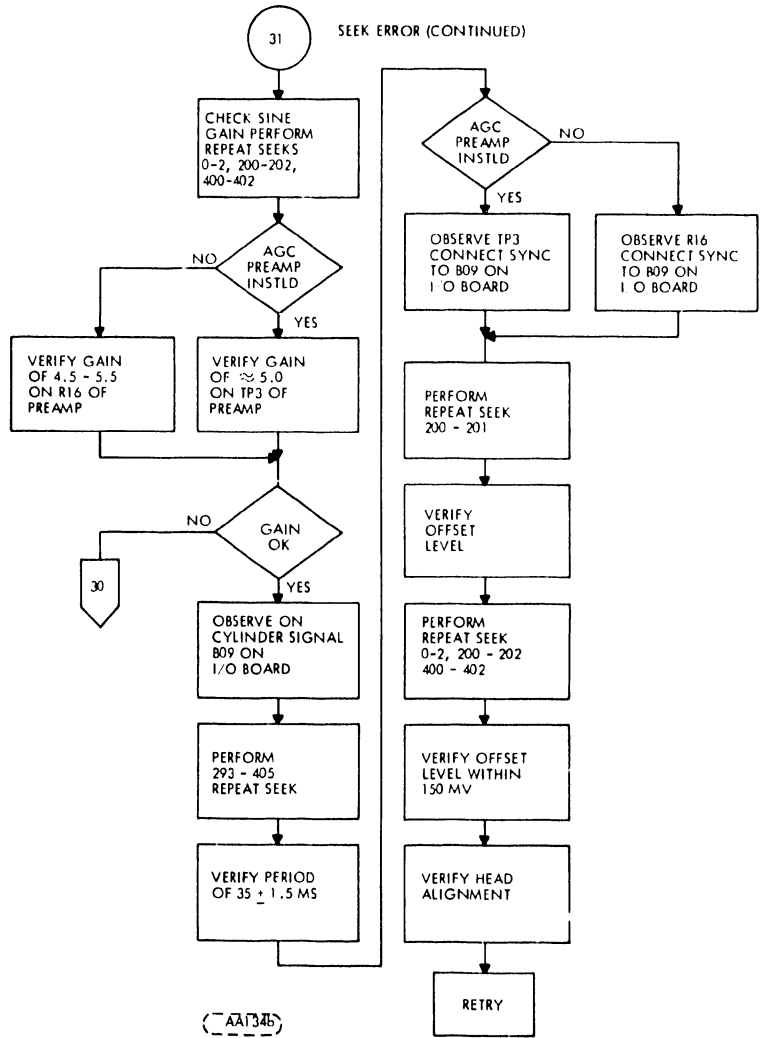


LOCATION

- 30 ———> 18
- 31 ———> 19



AA134a



(AA1345)

LOCATION

30 → 18

SECTION

8

PARTS

MANUAL

8.1 INTRODUCTION

This section contains an illustrated parts breakdown that details the different variations of the Model 9427H Disk Storage Drive. In general, parts are in dis-assembly of parts in the field.

8.2 GENERAL INSTRUCTIONS

8.2.1 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.

8.2.2 PARTS LISTS

In addition to the accompanying parts list on each illustration, two additional Parts Lists are available; the Top-Down Assembly/Component Parts List and the Cross Reference Index. Instruction for the use of all parts lists in paragraph 8.3.

8.2.3 ASSEMBLY LOCATOR

Figure 8-1 depicts and identifies the major assemblies within the device and references, by sheet number, where each assembly is broken down.

8.2.4 TOP MECHANICAL ASSEMBLY

The content of all 9427H variations are depicted and listed in Figure 8-2. To determine the Top Mechanical Assembly (TMA) and applicable parts and assemblies, refer to the Hardware Product Configurator document package (Parts Data Configurator) located in front of the manual. Instructions for its use are included. The TMA number referenced in the Parts Data configuration table represents the last three digits in TMA number 75741???.

NOTE

It may be desirable to insert the Parts Data Configurator in front of this section.

8.2.5 MODULE ASSEMBLY

The Content of each Module Assembly configuration is depicted and listed in Figure 8-3. Refer to the Parts Data Configurator for Module Assembly part number and applicable parts.

8.2.6 NOTES

Special instructions clarifying parts breakdown, replacement, references, unique parts usage, etc, are included on each sheet, as required, throughout this section.

8.2.7 PART REPLACEMENT

When ordering replacement parts for the 9427H, the inclusion of the following information for each part ordered will ensure positive identification:

- * {
 1. Device Serial Number
 2. TMA# (75741???)
 3. Parts Data # and Rev. Status (77653386-?)
 4. Figure #
 5. Item #
 6. Part Identification #
 7. Part Description}

8.3 PARTS LIST INSTRUCTIONS

8.3.1 ILLUSTRATION PARTS LIST

The parts list for each illustration is an extract from the Master Top-Down Assembly/Component Parts List, and contains only the parts depicted.

8.3.2 TOP-DOWN ASSEMBLY/COMPONENT PARTS LIST

- Starts at TMA level and lists all parts in Item Number sequence.
- Correlates Item numbers with part Identification numbers and the Description of each.
- 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 Figures 8-2 and 8-3 are labeled TMA and MOD respectively. Refer to Parts Data Configuration for correct application of parts (ref paragraphs 8.2.4 and 8.2.5).

- 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.

*Before ordering replacement parts refer to paragraph 8.4.

8.3.3 CROSS REFERENCE INDEX

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

8.3.4 SHEET NUMBER REFERENCES

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

8.4 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.

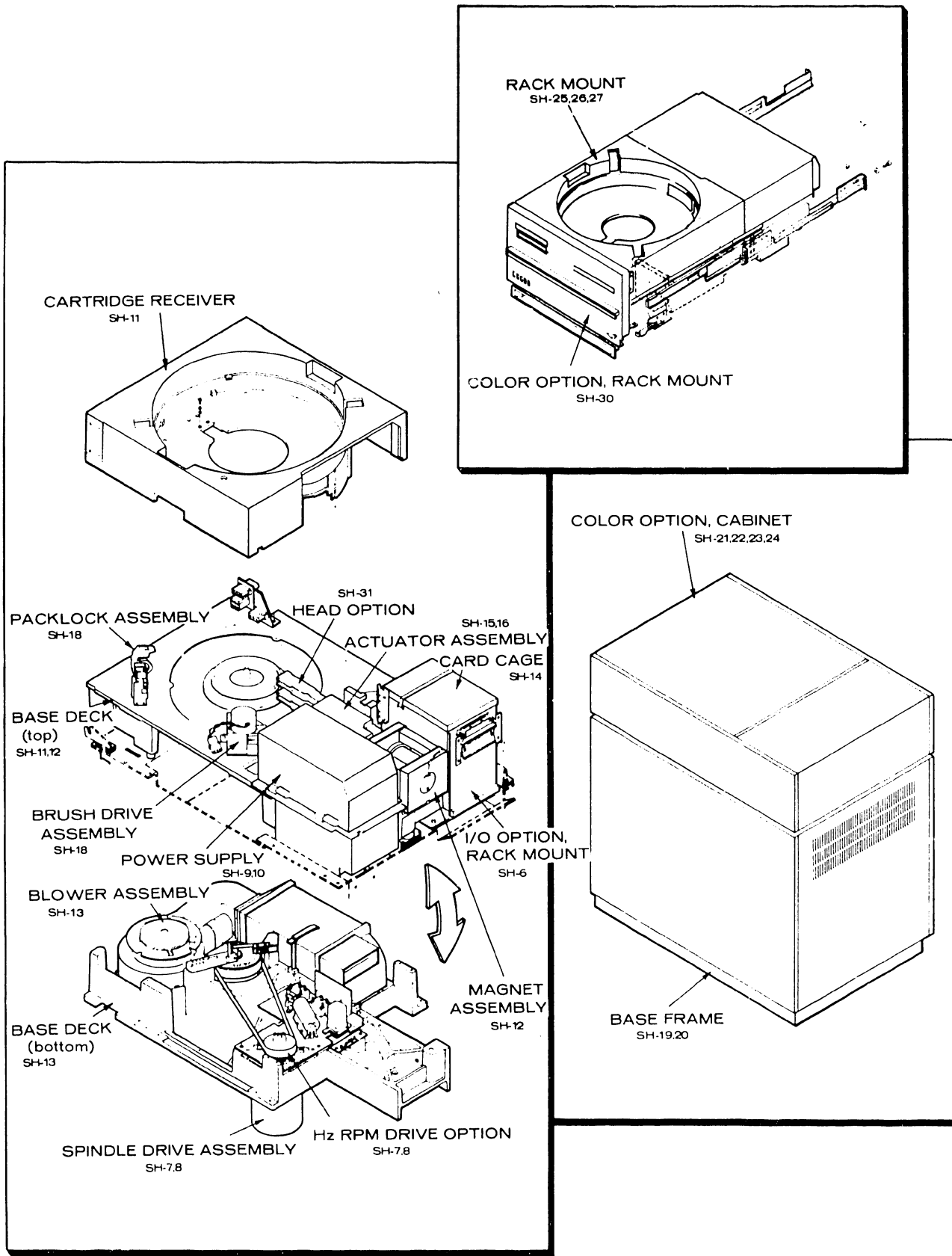
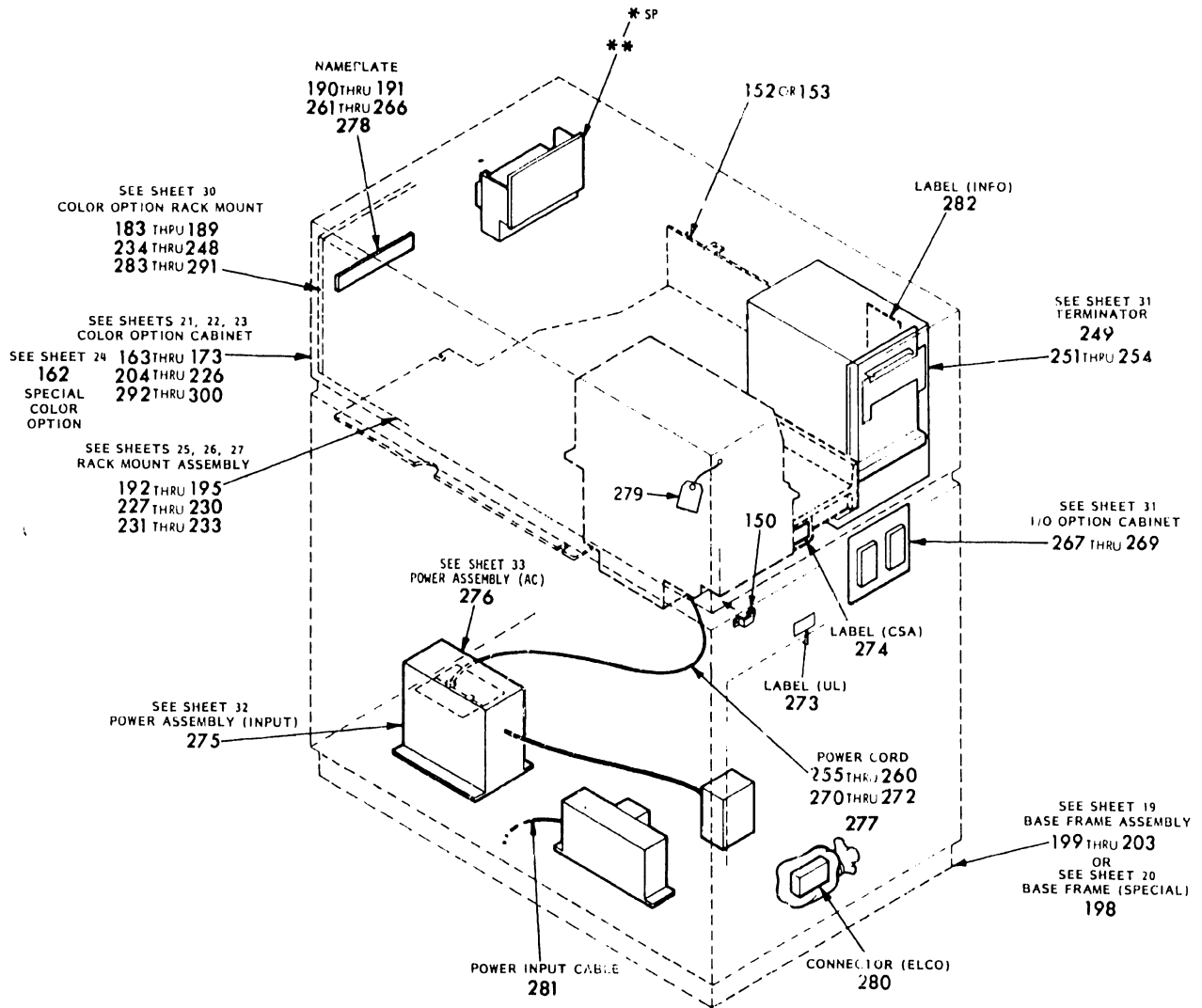


FIGURE 8-1. ASSEMBLY LOCATORS

* FOR ALL PWA'S SEE DIAGRAM SECTION OF MANUAL FOR CORRECT CIRCUIT BOARD IDENTIFICATION AND BREAKDOWN.

** SEE SHEET 34 FOR SPARE PARTS PROVISIONING.

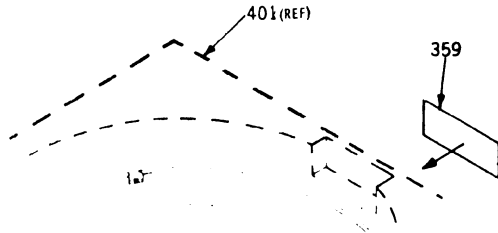
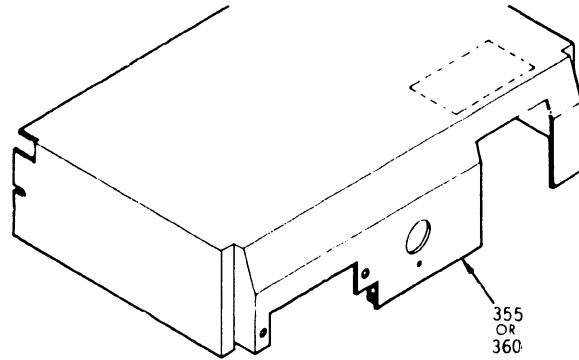
NOTE: REFER TO PARTS DATA CONFIGURATOR (SHEET PA-1), LOCATED IN HPC DOCUMENT PACKAGE FOR TMA NUMBER AND APPLICABLE PARTS.



ITEM IDENT NO	DESCRIPTION	WHERE USED
0150 75306101	TETHER LINE	TMA

FIGURE 8-2. TOP MECHANICAL ASSEMBLY

ITEM IDENT NO	DESCRIPTION	WHERE USED
0301 83429802	HAWK COMMON PARTS	MOD
0307 75740123	HEAD OPTION	MOD
0308 75740119	HEAD OPTION	MOD
0309 75740115	HEAD OPTION	MOD
0310 75740113	HEAD OPTION	MOD
0311 75740121	HEAD OPTION	MOD
0312 75740124	HEAD OPTION	MOD
0313 75740117	HEAD OPTION	MOD
0314 75740118	HEAD OPTION	MOD
0315 75740114	HEAD OPTION	MOD

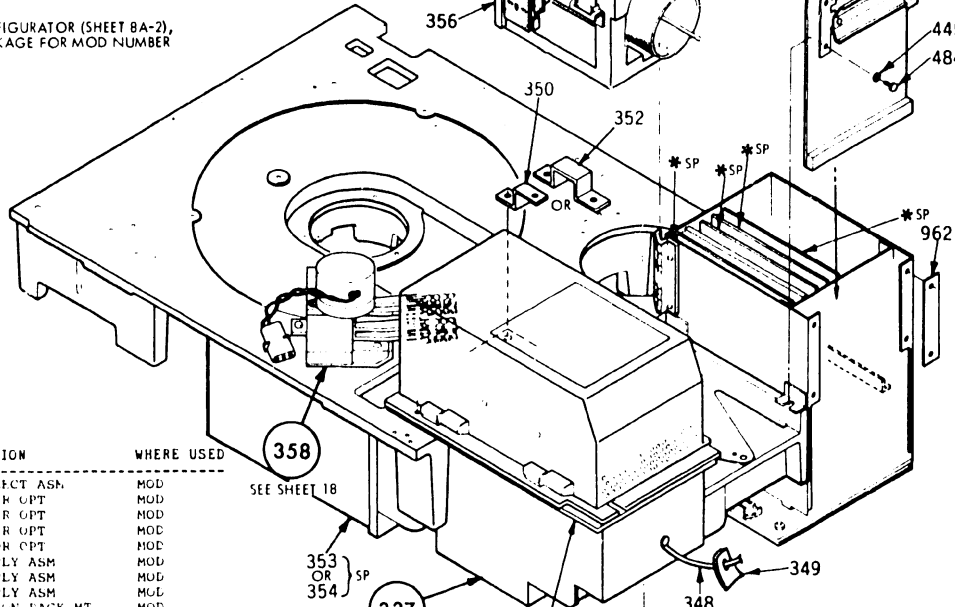
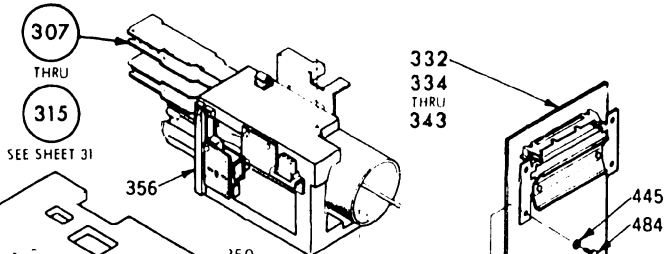


*FOR ALL PWA'S SEE DIAGRAM SECTION J OF MANUAL FOR CORRECT CIRCUIT BOARD IDENTIFICATION AND BREAKDOWN

NOTE: REFER TO PARTS DATA CONFIGURATOR (SHEET BA-2), LOCATED IN HPC DOCUMENT PACKAGE FOR MOD NUMBER AND APPLICABLE PARTS.

301

SEE SHEET 11 THRU 13



ITEM IDENT NO	DESCRIPTION	WHERE USED
0319 77834644	COVER ELECT ASM	MOD
0320 75740606	HZ RPM DR OPT	MOD
0321 75740601	HZ RPM ER OPT	MOD
0322 75740602	HZ RPM LR OPT	MOD
0323 75740605	HZ RPM DR OPT	MOD
0328 77655004	PWR SUPPLY ASM	MOD
0328 77655004	PWR SUPPLY ASM	MOD
0329 77655002	PWR SUPPLY ASM	MOD
0332 75795214	I-C OPTION RACK MT	MOD
0334 75795216	I-C OPTION RACK MT	MOD
0335 75795215	I-C OPTION RACK MT	MOD
0336 75795217	I-C OPTION RACK MT	MOD
0337 75795219	I-C OPTION RACK MT	MOD
0338 75795218	I-C OPTION RACK MT	MOD
0339 75795221	I-C OPTION RACK MT	MOD
0340 75795223	I-C OPTION RACK MT	MOD
0341 75795213	I-C OPTION RACK MT	MOD
0342 75795222	I-C OPTION RACK MT	MOD
0343 75795224	I-C OPTION RACK MT	MOD
0344 83444404	SPINDLE DR	MOD
0345 83444405	SPINDLE DRIVE ASM	MOD
0346 83474909	BRAKE & SPINDLE DR	MOD
0347 83474908	BRAKE & SPINDLE DR	MOD
0348 75729017	CABLE JUMPER	MOD
0349 94236967	LABEL CAUTION	MOD
0350 83451700	GROUND STRAP	MOD
0351 77646531	GASKET LOWER	MOD
0352 75864876	GROUND STRAP	MOD
0353 83437400	FILTER-AIR	MOD
0354 83437401	FILTER-AIR	MOD
0355 75898480	COVER ELECTRONICS	MOD
0356 83410562	GASKET STRIP	MOD
0358 83466001	BRUSH DRIVE ASM	MOD
0359 75866347	IDENT PLATE	MOD
0360 77834644	COVER ELECTRONICS	MOD
0445 10125004	WASHERS SPR LOCK	332 334-343
0464 10127122	SCREW PAN HD MACH	332 334-343
0962 75287200	STRIP-PUT	332 334-343

SEE SHEET 18

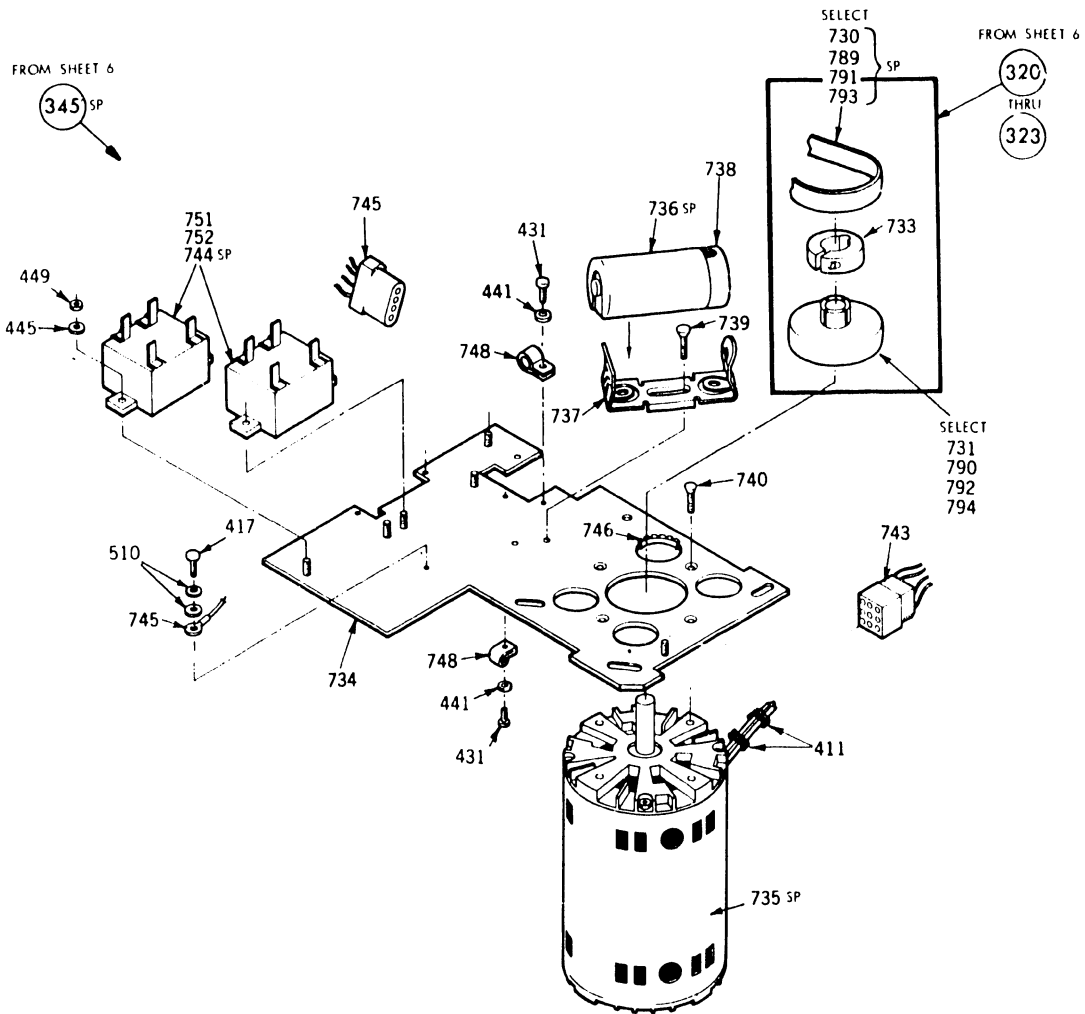
SEE SHEETS 9 AND 10

345 SEE SHEET 7
OR
346 SEE SHEET 8 } SP

320
THRU
323

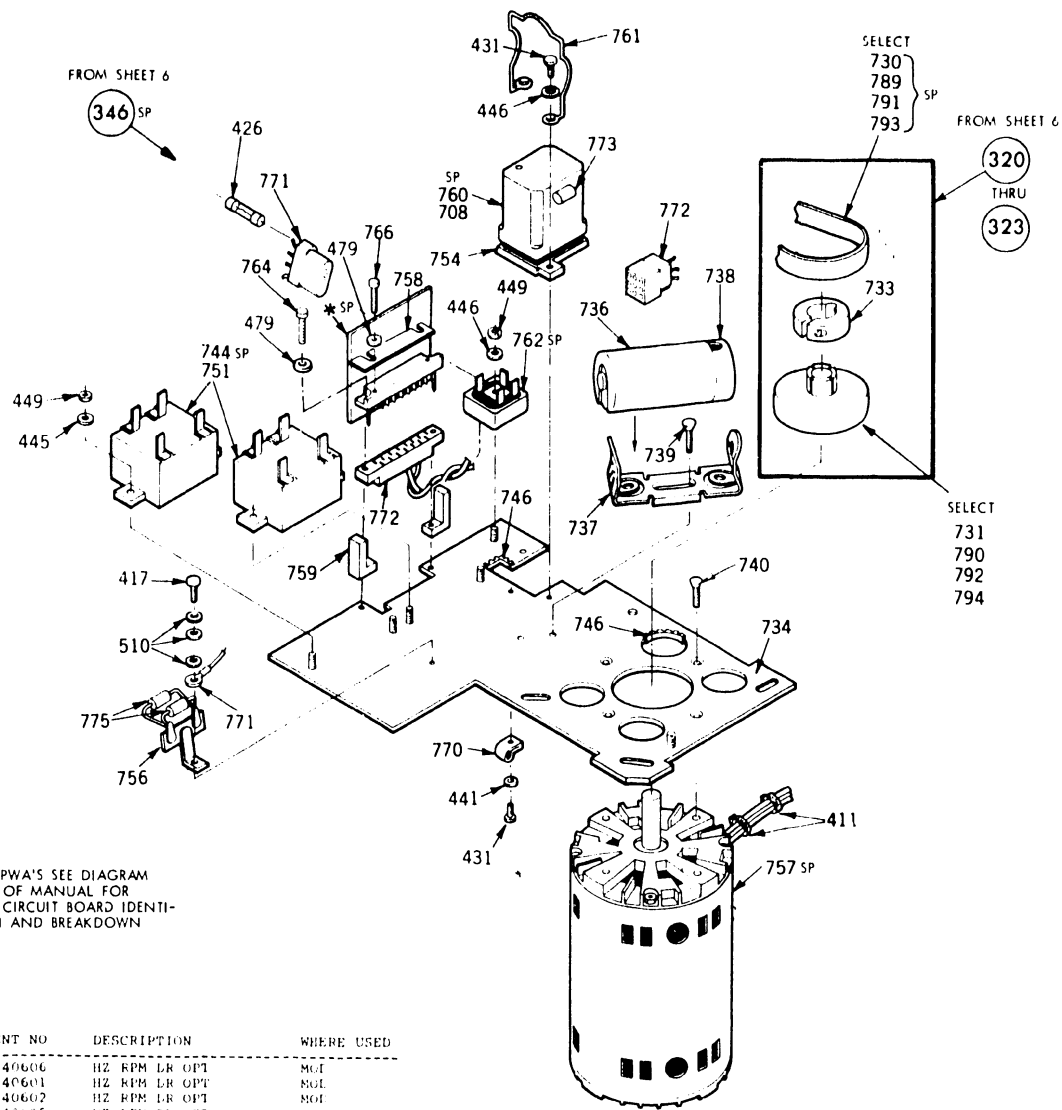
FOR DETAIL
SEE SHEETS 7 & 8

FIGURE 8-3. MODULE ASSEMBLY



ITEM IDENT NO	DESCRIPTION	WHERE USED	ITEM IDENT NO	DESCRIPTION	WHERE USED
0320 75740600	HC RPM DR OPT	MOD	0737 94260500	ACCESSORIES-CAPACITOR	345
0321 75740601	HC RPM DR OPT	MOD	0738 94260503	ACCESSORIES-CAPACITOR	345
0322 75740602	HC RPM FR OPT	MOD	0739 10125747	SCR FLAT HD	345
0323 75740605	HC RPM FR OPT	MOD	0740 10125725	SCR FLAT HD	345
0045 83444405	SPINDLE DRIVE ASM	MOD	0743 83457401	DC SPINDLE HARN ASM	345
0411 94277400	TIE WRAP	345	0744 77612677	SW SOLID STATE	345
0417 10127112	SCREW PAN HL MACH	345	0745 83457601	AC SPINDLE HARN ASM	345
0431 10127113	SCREW PAN HD MACH	345	0746 00645503	GROMMET-CATERPILLAR	345
0441 10125605	WASHERS PLAIN	345	0748 92602002	CLAMP, CABLE-BUNDLE	345
0445 10125804	WASHERS SPR LOCK	345	0751 94309802	POF, TERMINAL INSULAT	345
0449 10125105	NUT HEX MACH	345	0752 9315494E	TUBING, SHRINKING	345
0510 10126401	WASH EXT TOOTH LO	345	0789 75722930	BELT-DRIVE NEOPRENE	321
0730 75722910	BELT-DRIVE NEOPRENE	323	0790 77599706	PULLEY-DRIVE MOTOR	321
0731 77599708	PULLEY-DRIVE MOTOR	323	0791 75722940	BELT-DRIVE NEOPRENE	322
0733 77613625	COLLAR-MOTOR PULLEY	320-323	0792 77599705	PULLEY-DRIVE MOTOR	322
0734 75891472	FLATE-DYNAMIC MOTOR	345	0793 75722920	BELT-DRIVE NEOPRENE	320
0735 83456001	DRIVE MTR HARNESS AS	345	0794 77599707	PULLEY-DRIVE MOTOR	320
0736 94255105	CAPACITOR-MOTOR AC 2	345			

FIGURE 8-4. SPINDLE DRIVE ASSEMBLY

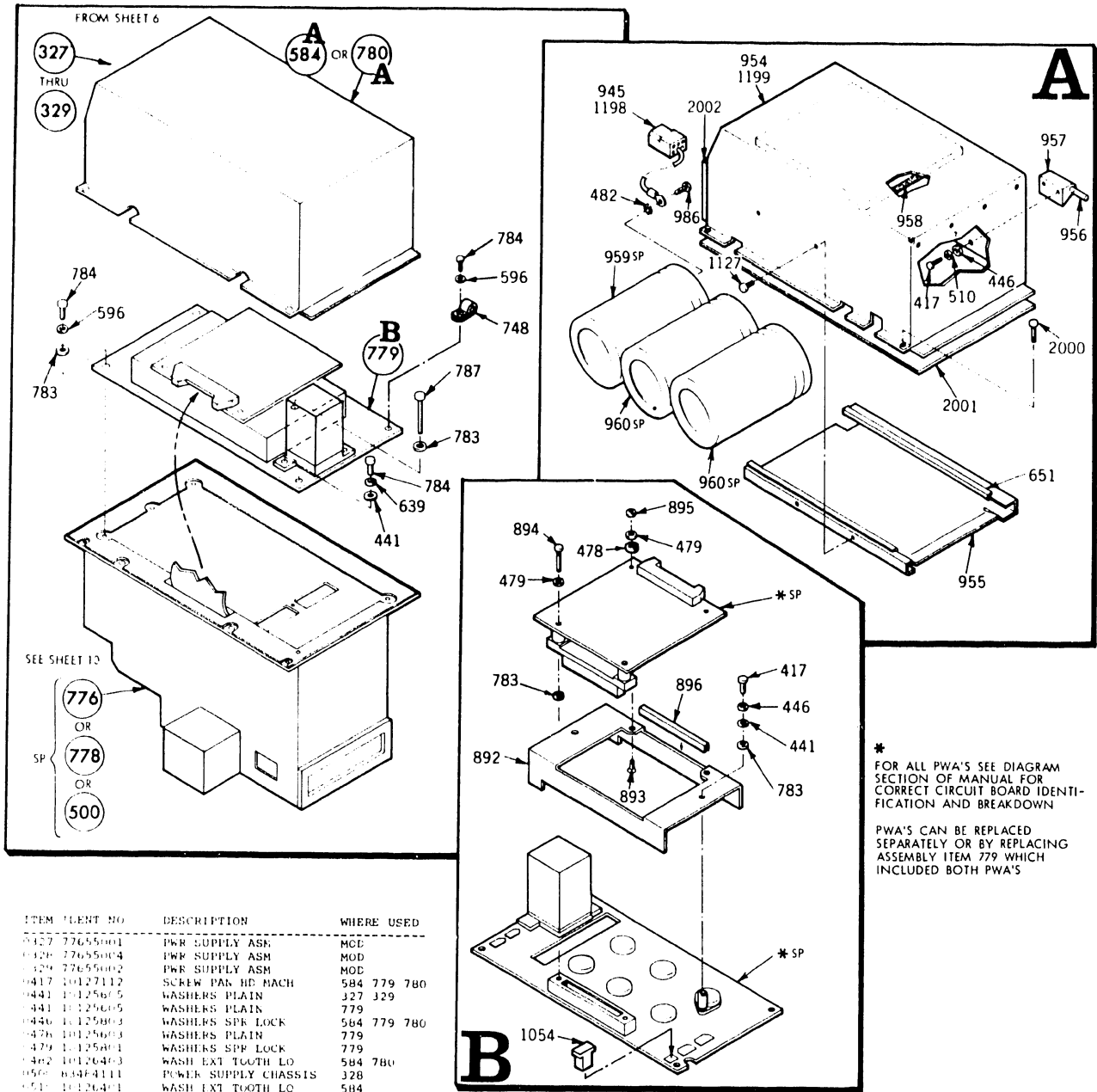


* FOR ALL PWA'S SEE DIAGRAM SECTION OF MANUAL FOR CORRECT CIRCUIT BOARD IDENTIFICATION AND BREAKDOWN

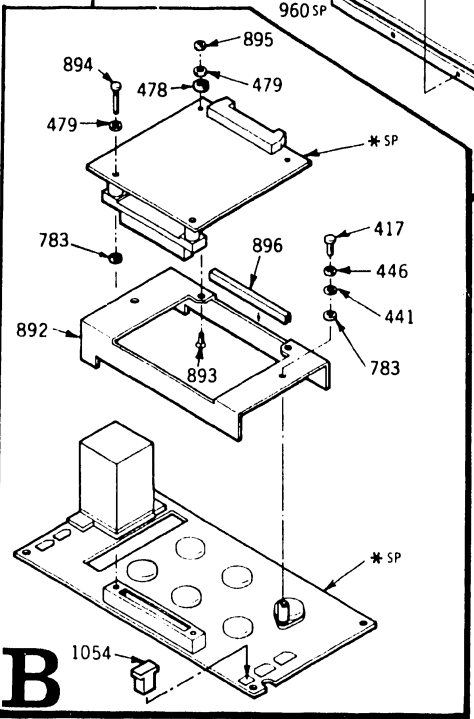
ITEM IDENT NO	DESCRIPTION	WHERE USED
0320 75740600	HZ RPM LR OPT	M01
0321 75740601	HZ RPM LR OPT	M01
0322 75740602	HZ RPM LR OPT	M01
0323 75740605	HZ RPM IR OPT	M01
0346 83474909	BRAKE & SPINDLE DR	M02
0411 94277400	TIE WRAP	346
0417 10127112	SCREW PAN HL MACH	346
0426 75885069	FUSE	346
0431 10127113	SCREW PAN HL MACH	346
0441 10125605	WASHERS PLAIN	346
0445 10125804	WASHERS SPR LOCK	346
0446 10125803	WASHERS SPR LOCK	346
0449 10125105	NUT HEX MACH	346
0479 10125801	WASHERS SPR LOCK	346
0510 10126401	WASH EXT TOOTH LO	346
0708 24534799	SLEEVE	346
0730 75722910	BELT-DRIVE NEOPRENE	321
0731 77599708	PULLEY-DRIVE MOTOR	321
0733 77613625	COLLAR-MOTOR PULLEY	320-323
0734 75891472	PLATE-DYNAMIC MOTOR	346
0736 94255105	CAPACITOR-MOTOR AC 2	346
0737 94260500	ACCESSORIES-CAPACITOR	346
0738 94260503	ACCESSORIES-CAPACITOR	346
0739 10125747	SCR FLAT HD	346
0740 10125725	SCR FLAT HD	346
0744 77612677	SW SOLID STATE	346
0746 00945503	GROMMET-CATERPILLAR	346
0751 94309802	POD, TERMINAL INSULAT	346

ITEM IDENT NO	DESCRIPTION	WHERE USED
0754 22940902	RELAY SOCKET	346
0756 84686903	TERMINAL STRIP	346
0757 83467401	BRAKE MOTOR ASM	346
0758 83474702	BAR-LOCKING	346
0759 83474800	BLOCK-SPACER	346
0760 77612660	RELAY	346
0761 22940903	SPRING-RETAINER SOCK	346
0762 95582007	RECT BRIDGE	346
0764 10127106	SCREW PAN HL MACH	346
0766 95655503	SCREW	346
0770 92602003	CLAMP, CABLE-NYLON	346
0771 83467502	A.C. BRAKE HARNESS	346
0772 83467701	D.C. BRAKE HARNESS	346
0773 84853604	DIODE SILICON	346
0775 92512142	RESISTOR	346
0789 75722930	BELT-DRIVE NEOPRENE	321
0790 77599706	PULLEY-DRIVE MOTOR	321
0791 75722940	BELT-DRIVE NEOPRENE	322
0792 77599705	PULLEY-DRIVE MOTOR	322
0793 75722920	BELT-DRIVE NEOPRENE	320
0794 77599707	PULLEY-DRIVE MOTOR	320

FIGURE 8-5. BRAKE AND SPINDLE DRIVE ASSEMBLY



ITEM IDENT NO	DESCRIPTION	WHERE USED
0327 77655001	PWR SUPPLY ASM	MOD
0328 77655004	PWR SUPPLY ASM	MOD
0329 77655002	PWR SUPPLY ASM	MOD
0417 10127112	SCREW PAN HD MACH	584 779 780
0441 10125605	WASHERS PLAIN	327 329
0441 10125605	WASHERS PLAIN	779
0450 10125603	WASHERS SPR LOCK	584 779 780
0476 10125603	WASHERS PLAIN	779
0479 10125601	WASHERS SPR LOCK	779
0482 10126403	WASH EXT TOOTH LO	584 780
0500 83484111	POWER SUPPLY CHASSIS	328
0511 10126401	WASH EXT TOOTH LO	584
0584 83484003	PWR SUPPLY COVER ASM	328
0596 75806503	WASHER	327 329
0639 10126103	WASH INT TOOTH LK	327 329
0651 94862902	GROMMET STRIP	584 780
0748 92662002	CLAMP, CABLE-NYLON	327 329
0776 83484110	POWER SUPPLY CHASSIS A	329
0778 83484109	POWER SUPPLY CHASSIS A	327
0779 83475105	PWR HD ASM PLYGBACK	327 329
0780 83484002	PWR SUPPLY COVER ASM	327 329
0783 82980003	WASHER, FIBER	327 329
0783 82980003	WASHER, FIBER	779
0784 10127115	SCREW PAN HD MACH	327 329
0787 92742176	SCREW M-C PAN HD	327 329
0892 83495300	TURREL WIND	779
0893 10125704	SCR FLT HD	779
0894 10127108	SCR PH HD MACH	779
0895 10125103	SCR ROT HEX TUB	779
0896 94862901	GROMMET STR	779
0945 75799001	CAP HARNESS	780
0954 83485101	COVER PWR SPLY	780



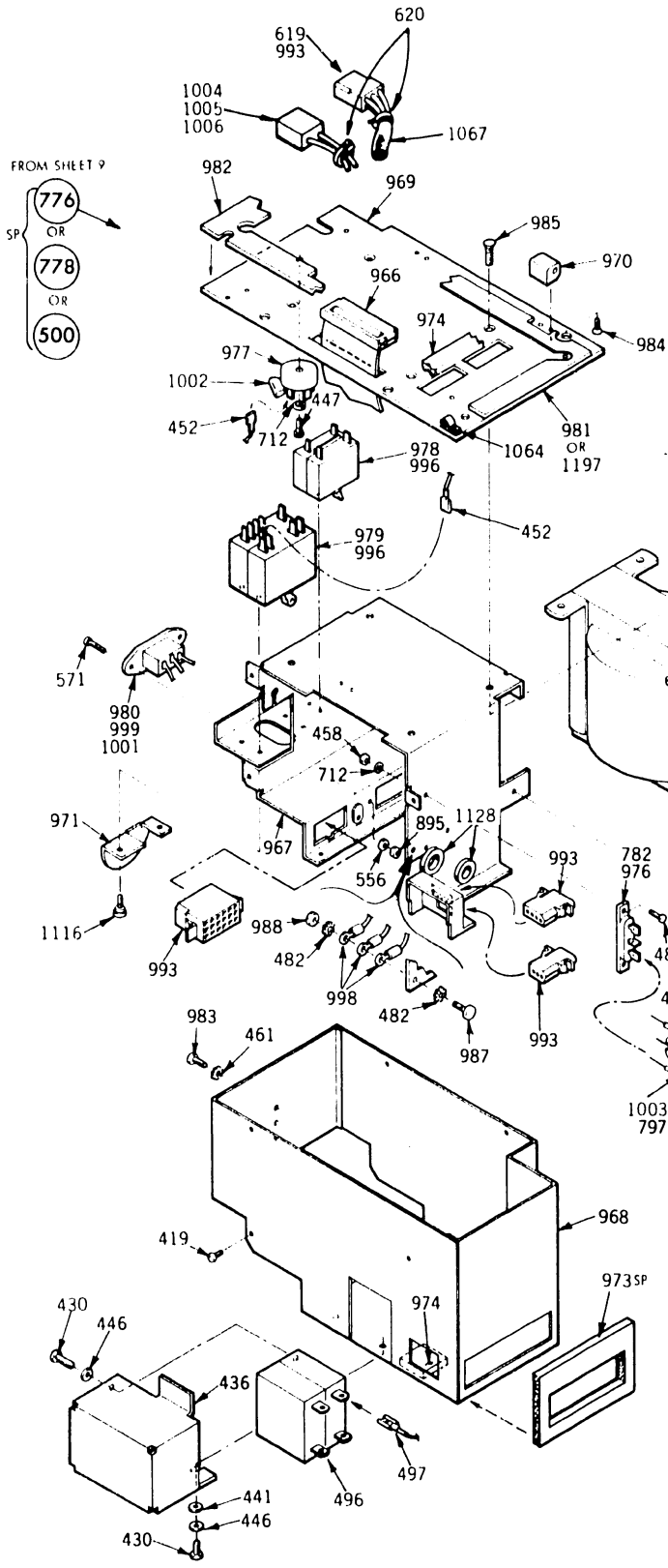
ITEM IDENT NO	DESCRIPTION	WHERE USED
0955 83495200	HRKT	584 780
0956 83495500	PIN HNG	584 780
0957 83495600	HRG CVR	584 780
0958 75798800	PAC CAPACITOR	584 780
0959 75774400	CAPACITOR	584 780
0960 75774466	CAPACITOR	584 780
0986 10127141	SCR PH MACH	584 780
1054 75884153	JUMPER PLUG	779
1127 17901501	SCREW THREAT FORM	584 780
1198 75799002	CAPACITOR HARN	584
1199 77638543	COVER PWR SPLY	584
2000 75887326	SCREW CAPTIVE	584 780
2001 77638540	TOP CVR GASKET	584
2002 77638537	GASKET OUTLET	584

* FOR ALL PWA'S SEE DIAGRAM SECTION OF MANUAL FOR CORRECT CIRCUIT BOARD IDENTIFICATION AND BREAKDOWN

PWA'S CAN BE REPLACED SEPARATELY OR BY REPLACING ASSEMBLY ITEM 779 WHICH INCLUDED BOTH PWA'S

FIGURE 8-6. POWER SUPPLY (SHEET 1 of 2)

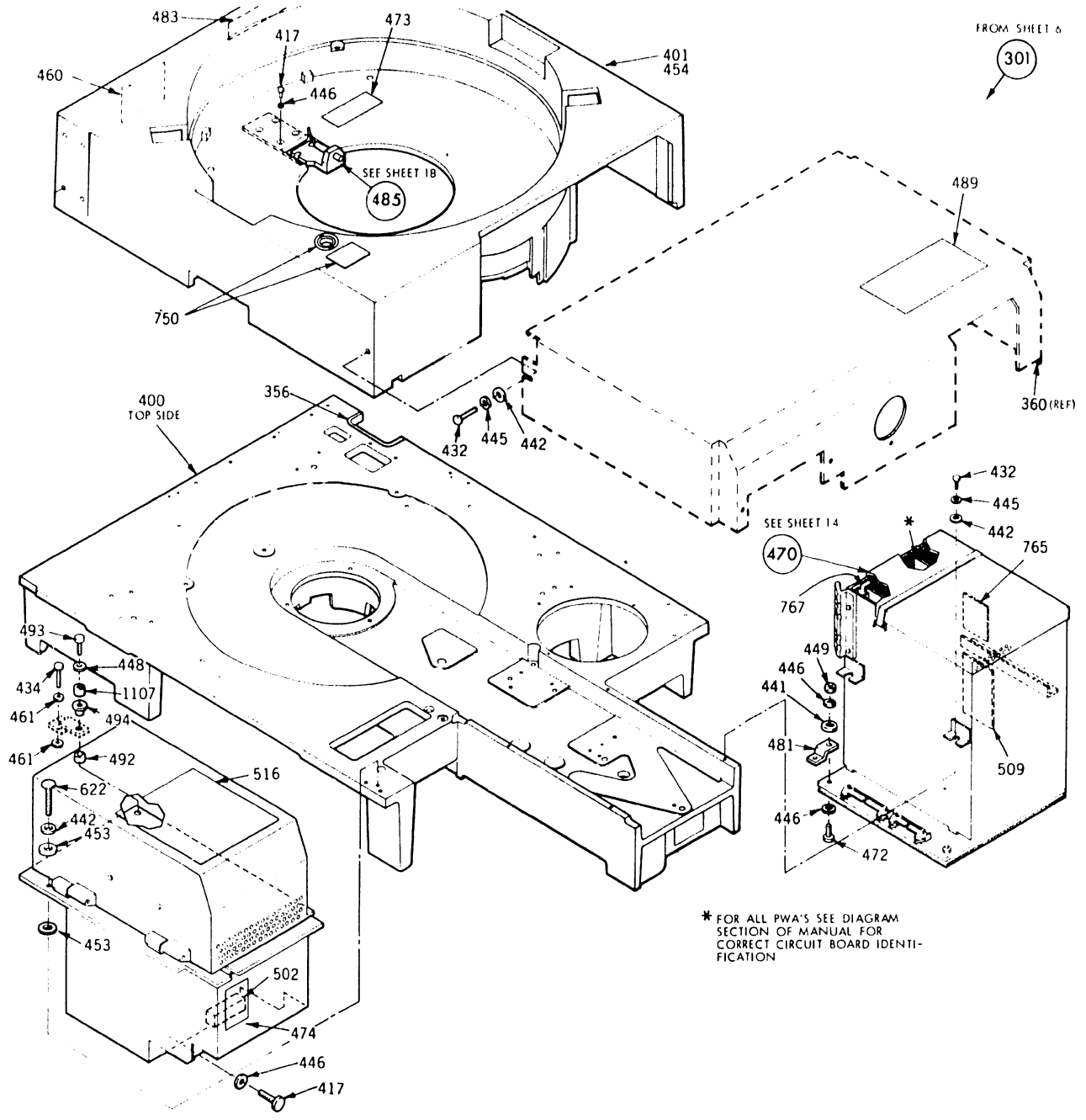
DISASSEMBLY NOT RECOMMENDED
HOWEVER, ITEMS 973, 978, 979, 1002
& 1003 ARE REPLACEABLE AS SEPARATE
PARTS



ITEM IDENT NO	DESCRIPTION	WHERE USED	
0419	93592002	SCREW	500 776 778
0420	10127111	SCREW PAR HL MACH	500 776 778
0430	77657175	CIRCUIT BRKR BOX	500 776 778
0441	10125605	WASHERS PLAIN	500 776 778
0443	10125607	WASHERS PLAIN	500 776 778
0446	10125803	WASHERS SPR LOCK	500 776 778
0447	10126221	SCR HEX SOC HL	500 776 778
0452	95043248	TERM INSULATOR	500 776 778
0458	10125106	NUT HEX MACH	500 776 778
0461	10126402	WASH EXT TOOTH LO	500 776 778
0462	10126403	WASH EXT TOOTH LO	500 776 778
0484	10127122	SCREW PAR HL MACH	500 776 778
0496	63433510	CIRCUIT BRKR	500 776 778
0497	95643203	CORRECTOR	500 776 778
0500	83484111	POWER SUPPLY CHASSIS	328
0556	10126101	WASH INT TOOTH LE	500 776 778
0571	10127105	SCREW PAR HL MACH	500 776 778
0619	15003309	WIRE 18 WHITE	500 776 778
0620	17620324	CABLE TIE	500 776 778
0712	10126104	WASH INT TOOTH LK	500 776 778
0776	63484110	POWER SUPPLY CHASSIS A	329
0778	83484109	POWER SUPPLY CHASSIS A	327
0782	93747025	RECEPTACLE, SLIDE GR	500 776 778
0797	95660403	TAP	500 776 778
0895	10125103	SCR BUT-HEX MACH	500 776 778
0965	70107900	TRIAL-STOP-PR-AUTO	500 776 778
0966	83493302	PR LOCK HARGESS	500 776 778
0967	83494902	CHASSIS-AC	776 778
0968	77657370	COVER-BOTTOM	500 776 778
0969	83495402	PLATE-CHASSIS	500 776 778
0970	83495700	HINGE-POWER SUPPLY	500 776 778
0971	83475000	PLATE	500 776 778
0972	75769200	CLAMP-CAPACITOR	500 776 778
0973	75794902	GASKET-SUPPLY DIVERT	500 776 778
0974	83410504	GASKET STRIP	776 778
0975	75774419	CAPACITOR	500 776 778
0976	95583505	RECTIFIER BLOCK	500 776 778
0977	83432101	BRIDGE, RECTIFIER	500 776 778

ITEM IDENT NO	DESCRIPTION	WHERE USED	
0978	15165896	CIRCUIT BREAKER	500 776 778
0979	83433508	CIRCUIT BREAKER	500 776 778
0980	83404002	FILTER	500 776 778
0981	83475200	GASKET-PWR SPLY	776 778
0982	83475300	GASKET	776 778
0983	92743198	SCREW PAR HL MACH	500 776 778
0984	10125713	SCREW	500 776 778
0985	10125726	SCREW	500 776 778
0986	10127141	SCR PH MACH	500 776 778
0987	92743240	SCREW PAR HL MACH	500 776 778
0988	10125107	SCR BUT-HEX MACH	500 776 778
0993	75724590	CONNECTOR-PANEL MTG	500 776 778
0996	95643212	CORRECTOR	500 776 778
0998	95604019	CORN, FING TONGUE	500 776 778
0999	93154107	TUBING, HEAT SHRINK	500 776 778
1001	15003305	WIRE-GRN	500 776 778
1002	77830595	CAP 100V	776
1003	77830583	CAP 50V	776
1004	94846005	CONNECTOR, 2 PIN	500 776 778
1005	15003409	WIRE WHT	500 776 778
1006	93943001	CONTACT, SOCKET	500 776 778
1064	51853015	CLAMP CABLE	776 778
1067	24549006	CBL WRAP	500 776 778
1116	93749157	SCREW	500 776 778
1128	95596600	BUSHING	500 776 778
1197	77638534	GASKET	500

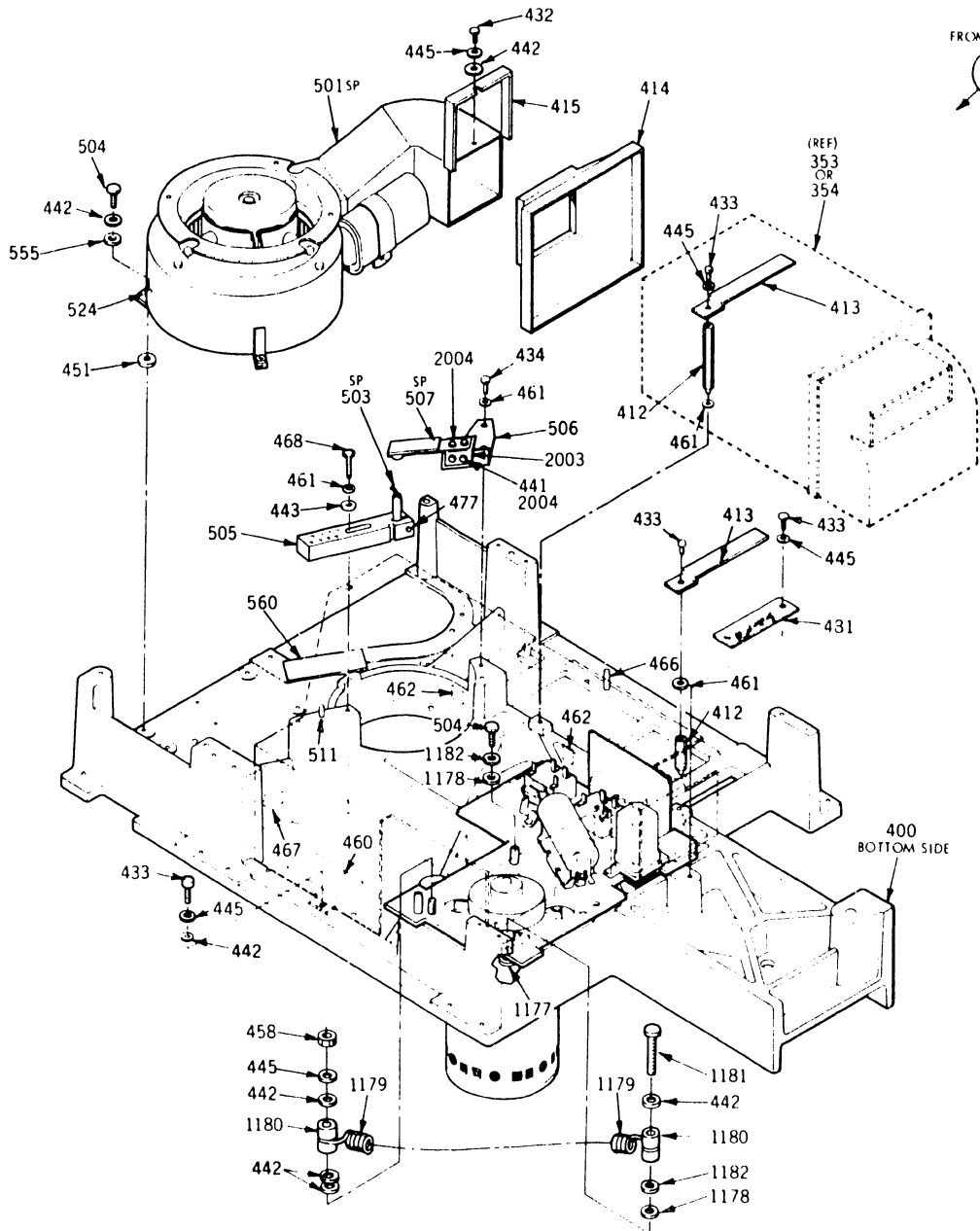
FIGURE 8-6. POWER SUPPLY (SHEET 2 of 2)



ITEM IDENT NO	DESCRIPTION	WHERE USED
0301 83429802	RAWF COMMON PARTS	MOI
0356 83410562	GASKET STRIP	301
0400 83456592	BASE DECK-MACHINED	301
0401 83451403	CARTIDGE REC	301
0417 10127112	SCREW PAN HD MACH	301
0432 10127121	SCREW PAN HD MACH	301
0434 10127123	SCREW PAN HD MACH	301
0441 10125605	WASHERS PLAIN	301
0442 10125606	WASHERS PLAIN	301
0445 10125804	WASHERS SPR LOCK	301
0446 10125803	WASHERS SPR LOCK	301
0448 10125805	WASHERS SPR LOCK	301
0449 10125105	BUT HEX MACH	301
0453 51566605	WASHER	301
0454 92742222	SCREW PH HD MACH	301
0460 24547502	PLATE, WARNING	301
0461 10126402	WASH EXT TOOTH LO	301
0470 75308612	CARD CAGE ASM	301

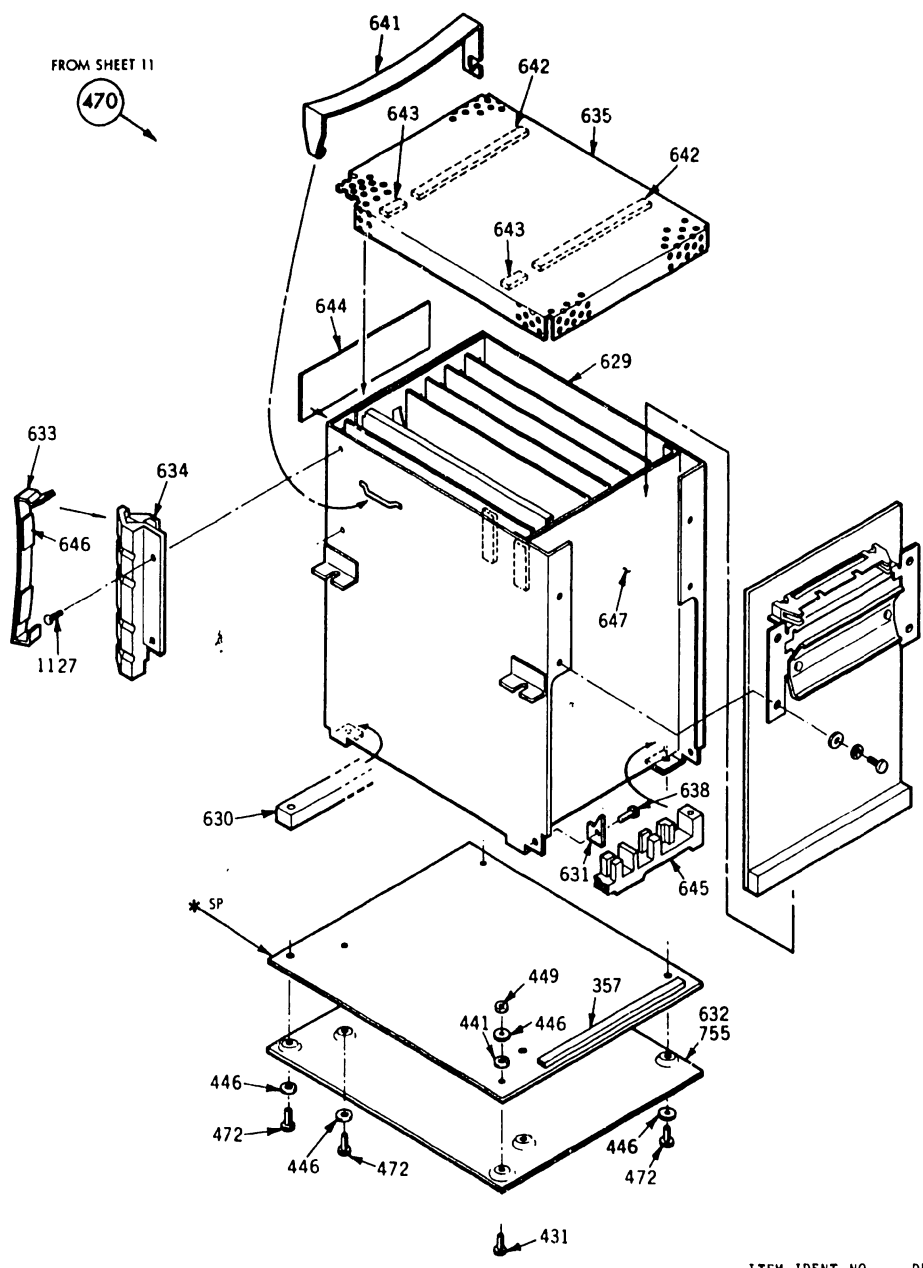
ITEM IDENT NO	DESCRIPTION	WHERE USED
0472 10127114	SCREW PAN HD	301
0473 46334400	LABEL-CAUTION	301
0474 77658252	PLATE-INL PWR SUP	301
0481 77835140	GROUND STRAP	301
0483 75769100	LABEL-SWITCH	301
0485 83451603	MAGNETIC SENSOR ASM	301
0489 83415607	LABEL	301
0492 95694202	SPACER-BEAGS	301
0494 92615012	WASHER-SHOULDER FIBR	301
0502 75802302	VOLTAGE ADJUST PLUG	301
0509 73669601	LABEL-CORFIG	301
0516 72959300	LABEL-FIELD CHANGE L	301
0622 77610636	SCREW SELF LK	301
0750 77830734	LABEL-SWITCH	301
0765 77834781	WARNING LABEL	301
0767 83484400	QUADCLIP	301
1107 95694206	SPACER	301

FIGURE 8-7. COMMON PARTS (SHEET 1 of 3)



ITEM IDENT NO	DESCRIPTION	WHERE USED	ITEM IDENT NO	DESCRIPTION	WHERE USED
0301 03429802	HAWK COMMON PARTS	MOD	0477 10126215	SCREW CAP 504 HD	301
0400 01456502	BASE LOCK-MACHINED	301	0481 77815140	GROUND STRAP	301
0412 75749009	STARTOFF CLAMP	301	0501 03457101	BLWKR ASM	301
0413 75748903	CLAMP FILTER	301	0503 75791803	SENSOR CABLE ASM	301
0414 75368100	EXPANDER-BLWKR	301	0504 01115283	SCREW PAN	301
0415 75749201	BRACKET-EXPANDER	301	0505 01445800	INSUL-THEROP	301
0432 10127121	SCREW PAN HI MACH	301	0506 77661196	BRACKET-STATIC SHIELD	301
0433 92742201	SCREW PAN HD MACH	301	0507 77669810	SPRING-STATIC SHIELD	301
0434 10127123	SCREW PAN HI MACH	301	0510 10126401	WASH EXT TOOTH LG	301
0441 10125005	WASHERS PLAIN	301	0511 92021001	PIN-DOWEL 1/2X 1/8	301
0442 10125006	WASHERS PLAIN	301	0524 75649726	GROMMET-BLWKR MET	301
0443 10125607	WASHERS PLAIN	301	0555 75887562	SPACER	301
0445 10125007	WASHERS SPR LOCK	301	0560 03451810	INSULATOR	301
0451 7500	WASHER-REDUCED	301	1177 75892866	WASHER-SHOULDER	301
0460 2454	PLATE, WARNING	301	1178 75062400	WASHER FLAT	301
0461 10126402	WASH EXT TOOTH LG	301	1179 75889099	SPRING	301
0462 51853006	CLAMP, CABLE ADHESIVE	301	1180 75881508	ECST. MOTOR	301
0466 92021004	PIN, DOWEL	301	1181 93115291	SCREW	301
0467 51853005	CLAMP	301	1182 77810612	WASHER FLAT	301
0468 10127125	SCREW PAN HI MACH	301	2003 77661194	BRET ANGLE	301
0472 10127114	SCR PAN HD	301	2004 93592158	SCREW	301

FIGURE 8-7. COMMON PARTS (SHEET 3 of 3)

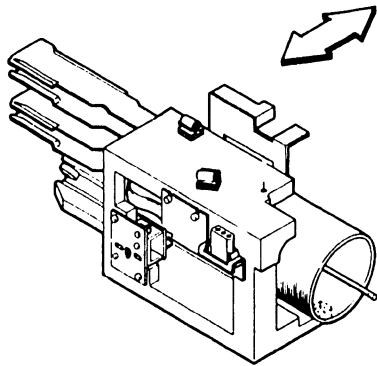
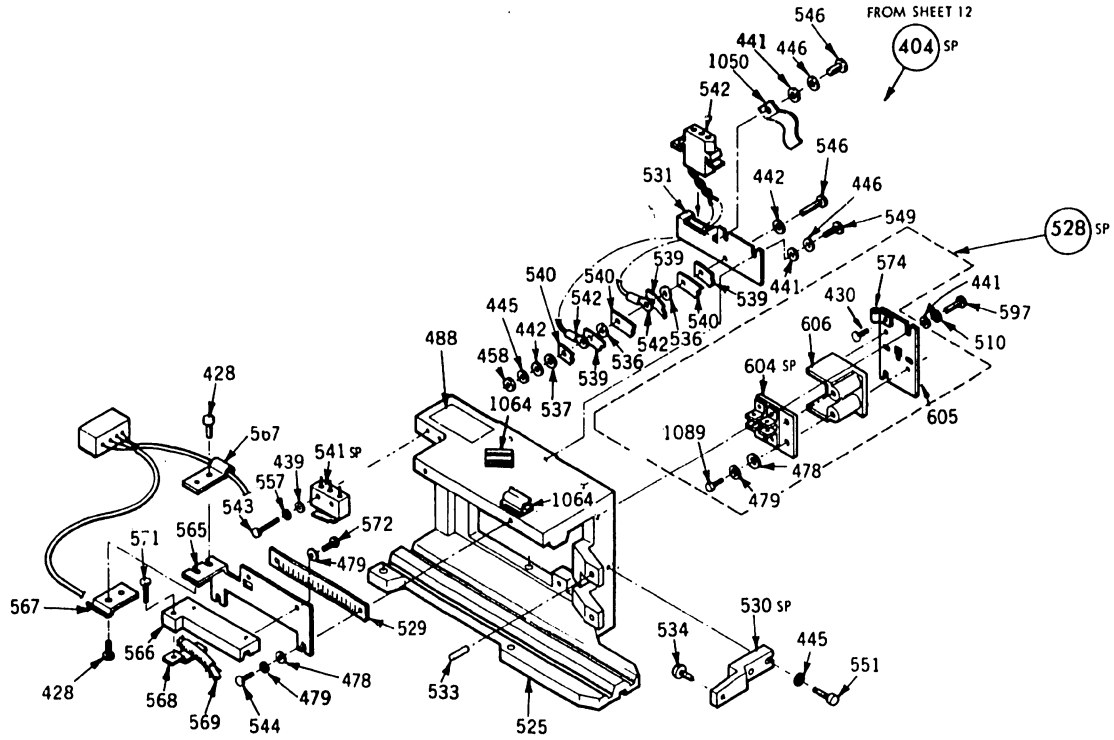


* FOR ALL PWA'S SEE DIAGRAM SECTION OF MANUAL FOR CORRECT CIRCUIT BOARD IDENTIFICATION AND BREAKDOWN.

ITEM IDENT NO	DESCRIPTION	WHERE USED
0357 77619697	GASKET	470
0431 10127113	SCREW PAN HD MACH	470
0441 10125605	WASHERS PLAIN	470
0446 10125803	WASHERS SPR LOCK	470
0449 10125105	NUT HEX MACH	470
0470 75308012	CARD CAGE ASM	301
0472 10127114	SCR PAN HD	470
0629 75303204	CARD CAGE	470
0630 75740002	STOP-CIRCUIT BOARD	470
0631 75751801	GUIDE-CIRCUIT	470
0632 75792602	COVER MOTHER	470
0633 75799402	CLAMP-HEAD CABLE, QUAL	470
0634 83445400	GUIDE WIRE	470
0635 75739900	COVER-CARD CAGE	470
0638 95655500	SCREW SHEET METAL	470
0641 75803301	CLAMP-CAGE COVER	470
0642 75803500	STRIP-CORK RUBBER	470
0643 75803501	STRIP-CORK RUBBER	470
0644 75802700	LABEL-CARD LOCATION	470
0645 83479600	STOP-KEYED INJ HOLD	470
0646 75803503	STRIP-PRESSURE	470
0647 83451814	INSULATOR	470
0755 83455800	INSULATOR MOTHER COV	470
1127 17901501	SCREW THREAD FORM	470

FIGURE 8-8. CARD CAGE ASSEMBLY

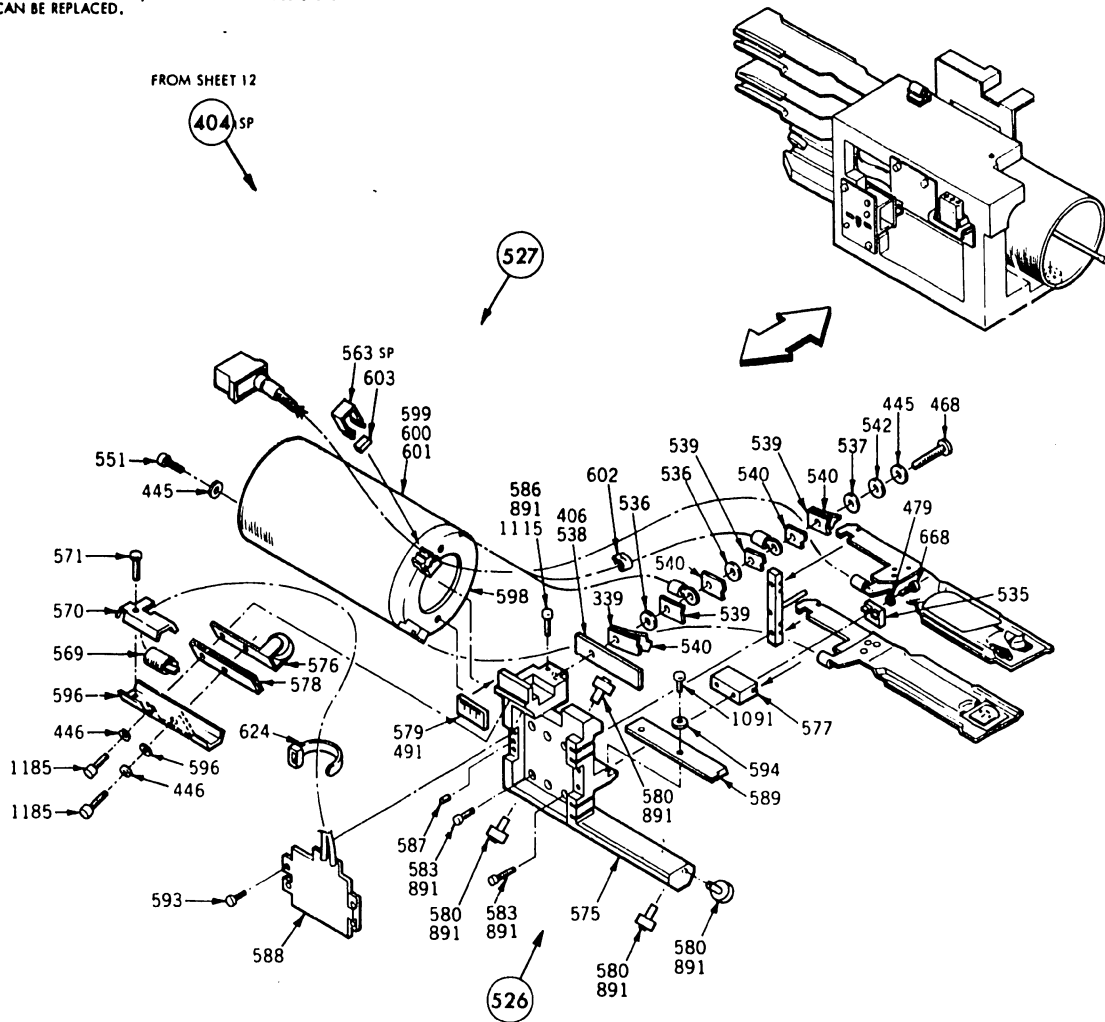
THIS VIEW FOR REFERENCE ONLY.
DISASSEMBLY NOT RECOMMENDED.
HOWEVER ITEMS 528, 530, & 541
CAN BE REPLACED.



ITEM	IDENT NO	DESCRIPTION	WHERE USED
0404	75316008	ACTUATOR ASM	301
0428	92815096	SCREW CAP SOC F.D	404
0430	10127111	SCREW PAN HD MACH	528
0439	10175602	WASHERS PLAIN	404
0441	10125605	WASHERS PLAIN	404
0442	10125606	WASHERS PLAIN	404
0445	10125804	WASHERS SPR LOCK	404
0446	10125803	WASHERS SPR LOCK	404
0456	10125106	NUT HEX MACH	404
0478	10125603	WASHERS PLAIN	404
0478	10125603	WASHERS PLAIN	528
0479	10125801	WASHERS SPR LOCK	528
0479	10125801	WASHERS SPR LOCK	404
0488	03415603	LABEL	404
0510	10126401	WASH EXT TOOTH LC	404
0525	75316104	FRAME-ACTUATOR MACH	404
0528	83447302	DETECTOR ASM-ENG TH	404
0529	75317900	SCALE-VERNIER FIXE	404
0530	75797400	BRACKET-BUFFER, CAST	404
0531	75317501	STRIP-BACKUP ACTUATOR	404
0533	75317200	CAN-HEAD ARM	404
0534	93623000	BUMPER, RUBBER	404
0536	75296101	WASHER PHENOLIC	404
0537	75296201	SPACER PHENOLIC	404
0539	75797500	LEAD-FLEX COIL PR	404
0540	73555101	INSULATOR-FLEX LEAD	404
0541	77598502	SW SUBMINIATURE	404
0542	75800502	COIL POWER HARNESS	404
0543	10127169	SCREW PAN HD MACH	404
0544	10126213	SCREW PAN HD MACH	404
0546	10127124	SCREW PAN HD MACH	404
0549	92815160	SCREW CAP SOC HD	404
0551	92815195	SCREW CAP SOC HD	404
0557	10126100	WASH INT TOOTH LK	404
0565	83493900	BRACKET-CHANNEL	404
0566	83493800	CHANNEL-UPPER	404
0567	83494200	CLAMP-WIRE	404
0568	83494001	CLAMP-SPIRAL GUIDE	404
0569	83454400	STIFFNER	404
0571	10127105	SCREW PAN HD MACH	404
0572	10127102	SCREW PAN HD	404
0574	00863701	CLAMP CABLE	528
059	10125015	SCR PAN HD	404
0604	77612607	OPTICAL SWITCH ASM	528
0605	83447401	PLATE-DETECTOR MTG	528
0606	83447500	ADAPTER-HORIZ POS	528
1050	77613869	CLIP	404
1064	51653015	CLAMP CABLE	404
1089	10126212	SCREW HEX	528

FIGURE 8-9. ACTUATOR WITH DETECTOR ASSEMBLY

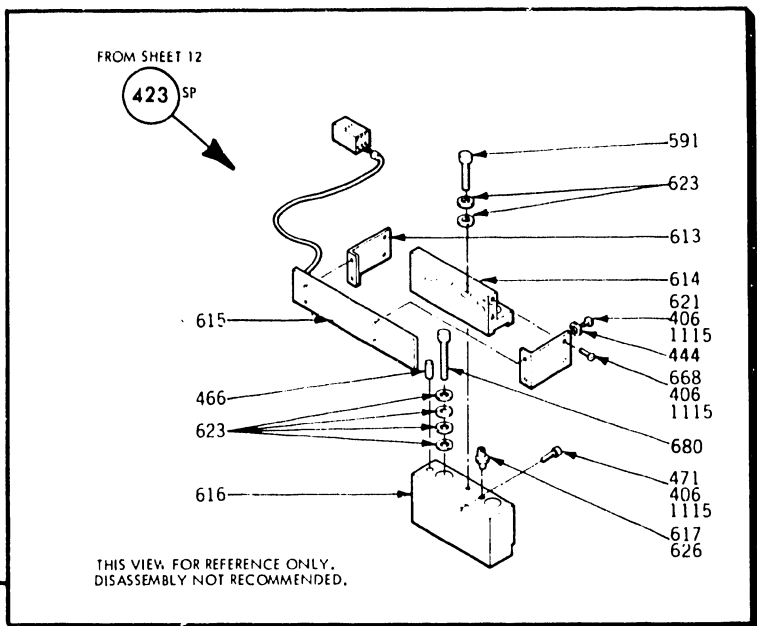
THIS VIEW FOR REFERENCE ONLY. DISASSEMBLY NOT RECOMMENDED, HOWEVER ITEMS 535 & 563 CAN BE REPLACED.



ITEM IDENT NO	DESCRIPTION	WHERE USED	ITEM IDENT NO	DESCRIPTION	WHERE USED
0404 75316008	ACTUATOR ASM	301	0579 75317701	SCALE-VERNIER MOVING	526
0406 95125324	LOCTITE	404	0580 94359306	BALL BEARING	526
0442 10125606	WASHERS PLAIN	404	0583 92815097	SCREW CAP SOC HD	526
0445 10125804	WASHERS SPR LOCK	404	0586 93344096	SCREW NYLON	526
0446 10125803	WASHERS SPR LOCK	526	0587 92006032	SCREW SET SOC HD	526
0468 10127125	SCREW PAN HD MACH	404	0588 83475401	POS TRANSDUCER SL-CO	526
0479 10125801	WASHERS SPR LOCK	404	0589 75314202	SCALE-END	526
0526 83475501	CARRIAGE ASM	404	0593 93773006	SCREW SLOTTED	526
0527 75319603	COIL ASM	404	0594 75806501	WASHER-REDUCED O.L.	526
0535 73228200	PLATE-ARM CLAMP	404	0595 83494400	CHANNEL-MODULE	526
0536 75296101	WASHER PHEROLIC	404	0596 75806503	WASHER	526
0537 75296201	SPACER PHEROLIC	404	0598 83441700	CAP-COIL MACHINE	527
0538 73555300	STRIP-BACKUP	404	0599 94258205	WIRE-MAGNET	527
0539 75797500	LEAD-FLEX COIL PR	404	0600 95280500	EPOXY, IMPREGNATING	527
0540 73555101	INSULATOR-FLEX LEAD	404	0601 75786000	INSULATION MAT	527
0551 92815195	SCREW CAP SOC HD	405	0602 93355001	MARKER, WIRE NUMBER 1	527
0563 83490600	CLIP-CLAMP	404	0603 75803502	STRIP-PRESSURE	527
0569 83454400	STIFFNER	404	0624 94277416	TIE WRAP	404
0570 83494500	CLAMP-CHANNEL	404	0668 10126212	SCR HEX SOC HD CAP	404
0571 10127105	SCREW PAN HD MACH	404	0891 95125322	LOCTITE	526
0575 75316601	CARRIAGE ACTUATOR	526	0891 95125322	LOCTITE	404
0576 73197400	SPR-BEARING ASM	526	1091 10127310	SCREW SLOTTED	526
0577 73584400	BASE-ARM CLAMP	526	1115 95125311	LOCTITE PRIMER	404
0578 73197000	SPRING BEARING	526	1185 92815161	SCREW	526

FIGURE 8-10. ACTUATOR W'ITH CARRIAGE AND COIL ASSEMBLIES

ITEM IDENT NO	DESCRIPTION	WHERE USED	
0406	95125324	LOCTITE	423
0423	75315405	TRANSDUCER SCALE ASM	301
0424	75276203	SPACER NYLON	301
0425	75797701	BAR-EXPANSION MACHINE	301
0427	10126209	SCR-SOC HP CAP	301
0428	92815096	SCREW CAP SOC HD	301
0429	93788086	SCREW SELF LOCKING 4	301
0435	10126255	SCR SOC HD	301
0437	92815197	SCREW CAP SOC HD	301
0439	10125602	WASHERS PLAIN	301
0444	10125800	WASHERS SPR	301
0444	10125800	WASHERS SPR	423
0445	10125804	WASHERS SPR LOCK	301
0447	10126228	SCR HEX SOC HD	301
0450	75792800	IDLER	416
0451	75806504	WASHER-REDUCED	301
0459	92054227	CR BEARING BALL	416
0466	92021004	PIN, DOWEL	423
0469	95125305	LOCTITE GRADE C	301
0471	92824097	SCREW CAP	423
0476	75797100	STAND OFF	301
0477	10126215	SCREW CAP SOC HP	301
0478	10125603	WASHERS PLAIN	301
0479	10125801	WASHERS SPR LOCK	301
0490	77611358	ADHESIVE	301
0495	83482430	SECTOR RING ASM B	301
0517	75886381	LUBRICANT	301
0581	93115168	SCR HEX SOC HD	301
0591	77617072	SCREW CAP	423
0613	75315501	SCALE-FLEX MOUNT	423
0614	75315600	MOUNT-TRANSDUCER	423
0615	75315901	POS TRANS SCALE	423
0616	75797001	BASE TRANSDUCER MOUNT	423
0617	75797200	PIN XDUCE ALIGNMENT	423
0621	10126208	SCR LW BUTTON HD	423
0623	93651029	WASHER, BELLEVILLE	423
0626	95010890	GREASE-LUBRIPLATE	423
0628	77832201	COMP BRKT	301
0637	77832202	BRACKET	301
0668	10126212	SCR HEX SOC HD CAP	423
0680	77616079	SCREW CAP	423
0891	95125322	LOCTITE	301
1061	95125317	LOCTITE PRIMER	301
1076	10125608	WASHER	301
1115	95125311	LOCTITE PRIMER	423



THERMAL LINKAGE MOUNTING

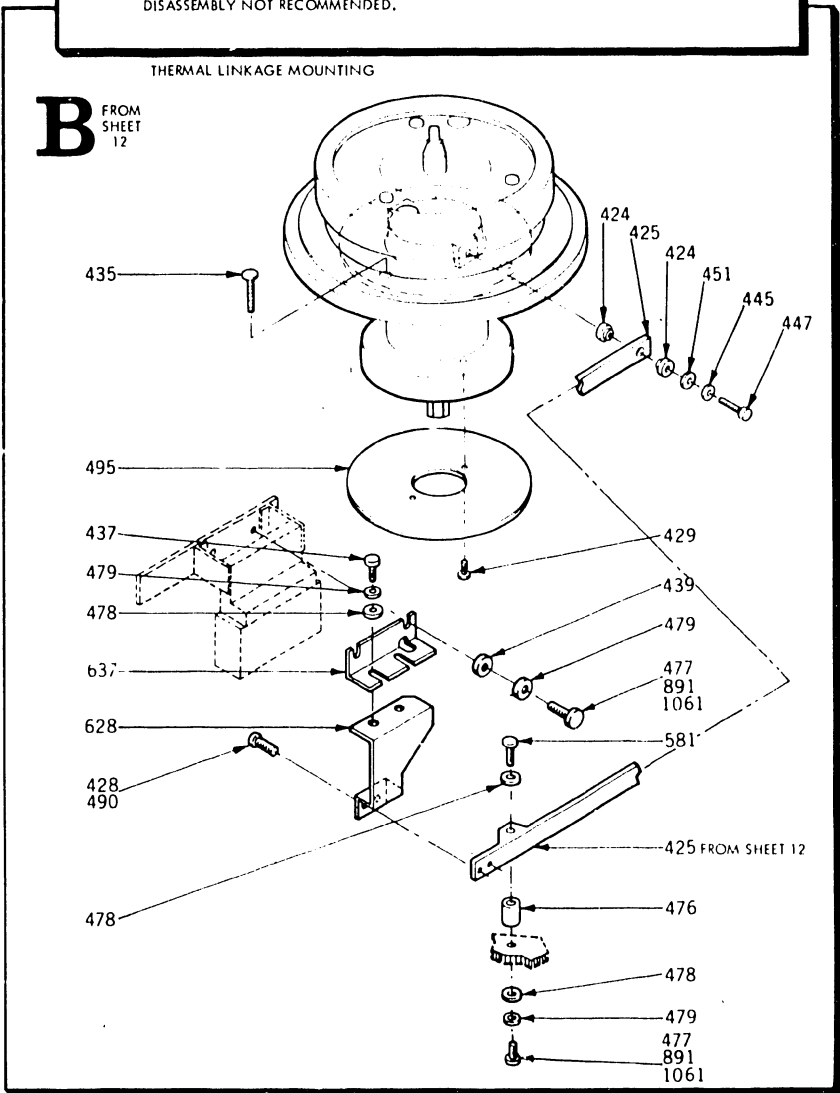
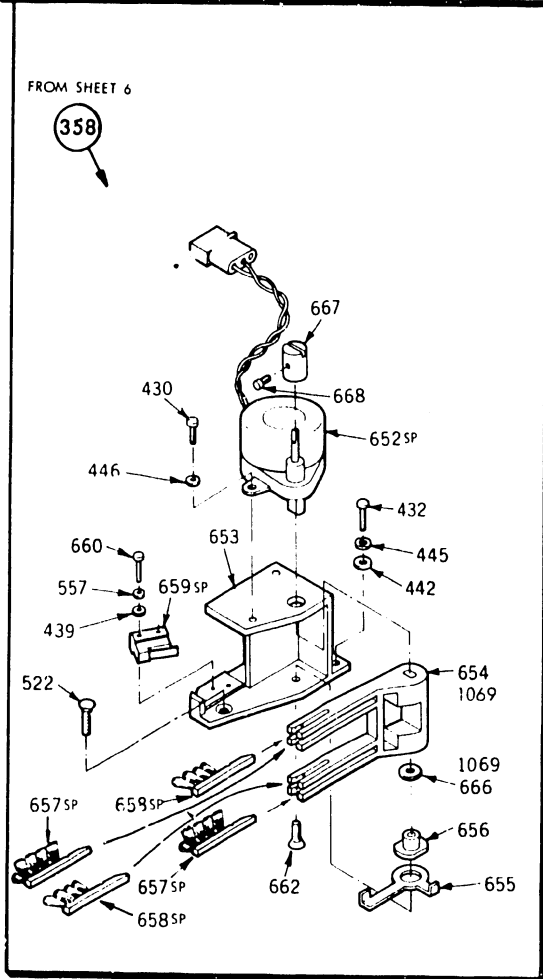
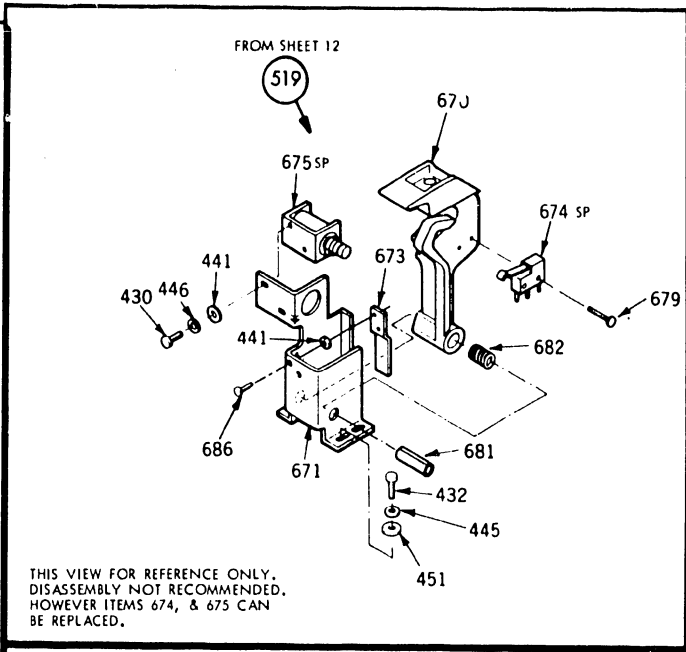
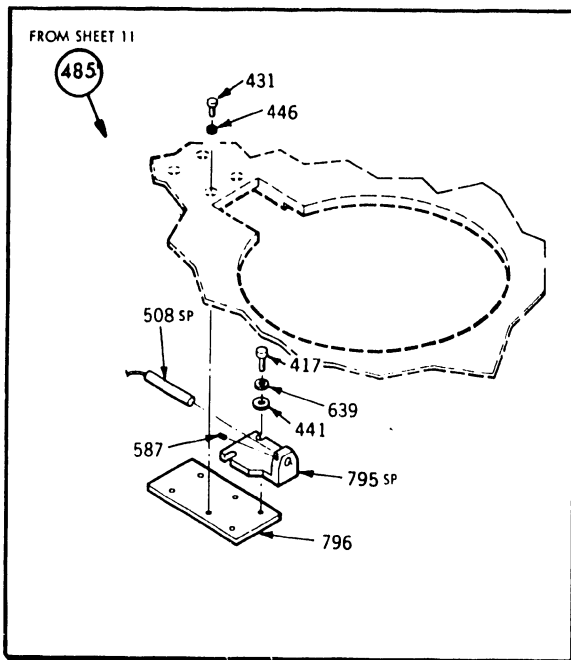


FIGURE 8-11. COMMON PARTS SUB ASSEMBLIES (SHEET 1 of 2)

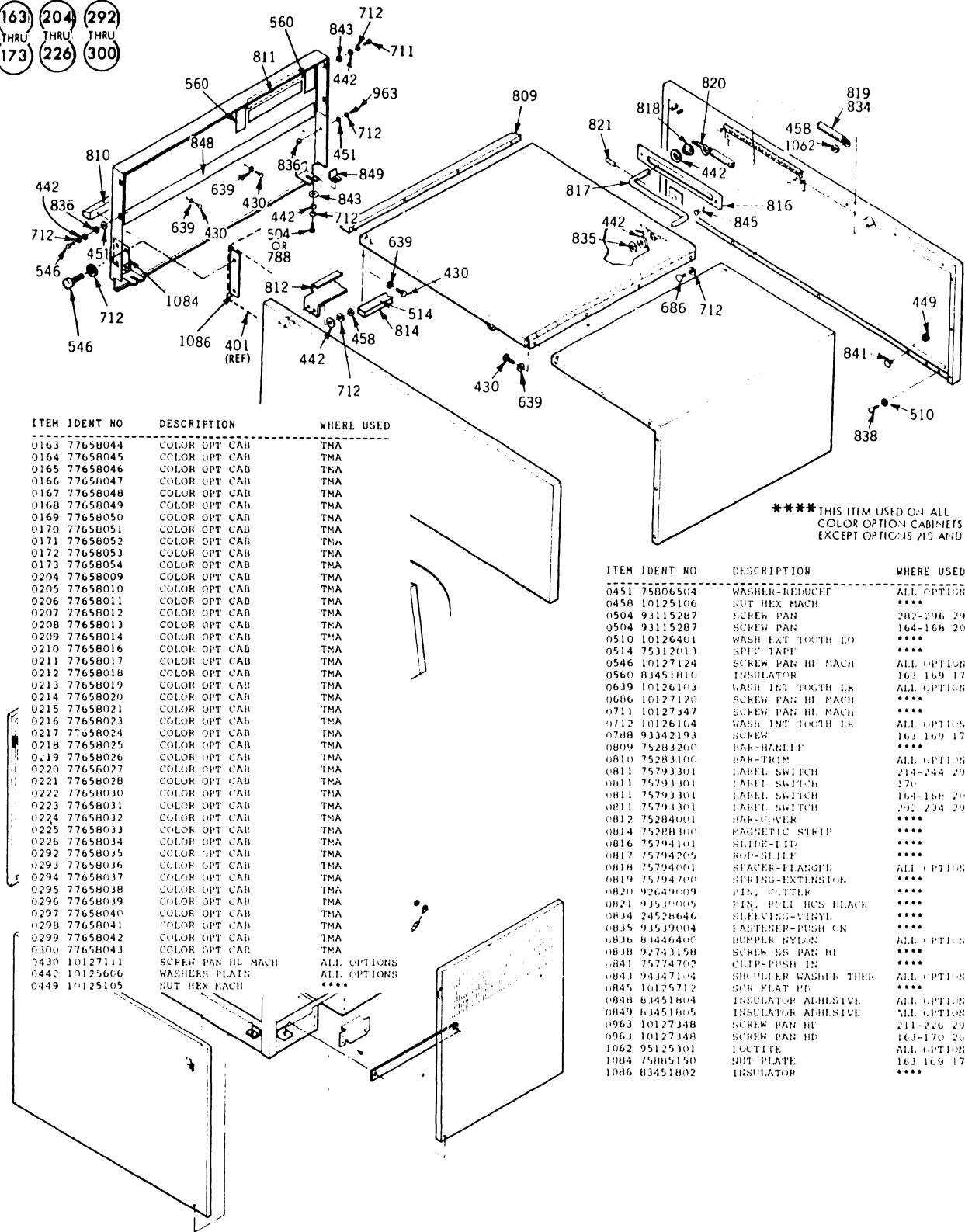


ITEM	IDENT NO	DESCRIPTION	WHERE USED
0358	83466001	BRUSH DRIVE ASM	MOD
0417	10127112	SCREW PAN HD MACH	485
0430	10127111	SCREW PAN HD MACH	358 519
0431	10127113	SCREW PAN HD MACH	301
0432	10127121	SCREW PAN HE EACH	301
0432	10127121	SCREW PAN HE MACH	519
0439	10125602	WASHERS PLAIN	358
0441	10125605	WASHERS PLAIN	485
0441	10125605	WASHERS PLAIN	519
0442	10125606	WASHERS PLAIN	301
0445	10125804	WASHERS SPR LOCK	301
0446	10125803	WASHERS SPR LOCK	358 519
0451	75806504	WASHER REDUCED	519
0485	83451603	MAGNETIC SENSOR ASM	301
0508	75793802	SENSOR CABLE ASM	485
0519	83457902	PACKLOCK ASM	301
0522	10125920	SCREW FL HD	301
0557	10126100	WASH INT TOOTH LK	358
0587	93071163	SCREW SET SEC HL	485
0639	10126103	WASH INT TOOTH LK	485
0652	75740701	BRUSH MOTOR ASM	358
0653	83466100	BRUSH DRIVE MOUNT	358
0654	83466200	BRUSH HOLDER	358
0655	83466300	DELAY ARM	358
0656	83466400	BRUSH HOLDER STUD	358
0657	40024501	BRUSH, DISK	358
0658	40024502	BRUSH, DISK	358
0659	36159609	SWITCH-PIVOT LEVER	358
0660	92742011	SCREW E-C PAD HD	358
0662	10125919	SCREW FLAT HD	358
0666	93529003	WASHER, SPRING WAVE	358
0667	83467100	BRUSH INDICATOR	358
0668	10126212	SCR HEX SOC HD CAP	358
0670	83457203	ARM LOCK HOLDER	519
0671	83457302	PACK LOCK BEACFET	519
0673	77598701	SPRING ARM	519
0674	77598501	SWITCH SUBMINIATURE	519
0675	94357804	SOLEROID IC	519
0679	18607916	SCREW THIN CUTTING	519
0681	93530436	ROLL PIN	519
0682	75779867	SPRING	519
0686	10127120	SCREW PAN HE EACH	519
0795	83451104	UPPER SENSOR HOLDER	485
0796	83450001	PLATE-SENSOR MTG	485
1069	95016100	LUBRICANT	358

FIGURE 8-11. COMMON PARTS SUB ASSEMBLIES (SHEET 2 of 2)

FROM SHEET 5
SELECT

(163) (204) (292)
THRU THRU THRU
(173) (226) (300)

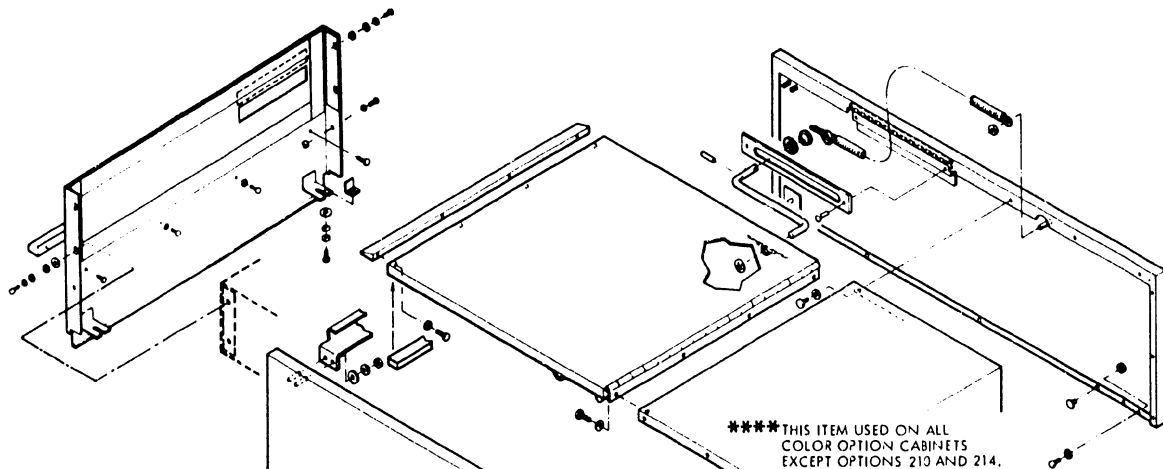


**** THIS ITEM USED ON ALL
COLOR OPTION CABINETS
EXCEPT OPTIONS 210 AND 214.

ITEM IDENT NO	DESCRIPTION	WHERE USED
0163 77658044	COLOR OPT CAB	TMA
0164 77658045	COLOR OPT CAB	TMA
0165 77658046	COLOR OPT CAB	TMA
0166 77658047	COLOR OPT CAB	TMA
0167 77658048	COLOR OPT CAB	TMA
0168 77658049	COLOR OPT CAB	TMA
0169 77658050	COLOR OPT CAB	TMA
0170 77658051	COLOR OPT CAB	TMA
0171 77658052	COLOR OPT CAB	TMA
0172 77658053	COLOR OPT CAB	TMA
0173 77658054	COLOR OPT CAB	TMA
0204 77658009	COLOR OPT CAB	TMA
0205 77658010	COLOR OPT CAB	TMA
0206 77658011	COLOR OPT CAB	TMA
0207 77658012	COLOR OPT CAB	TMA
0208 77658013	COLOR OPT CAB	TMA
0209 77658014	COLOR OPT CAB	TMA
0210 77658016	COLOR OPT CAB	TMA
0211 77658017	COLOR OPT CAB	TMA
0212 77658018	COLOR OPT CAB	TMA
0213 77658019	COLOR OPT CAB	TMA
0214 77658020	COLOR OPT CAB	TMA
0215 77658021	COLOR OPT CAB	TMA
0216 77658023	COLOR OPT CAB	TMA
0217 77658024	COLOR OPT CAB	TMA
0218 77658025	COLOR OPT CAB	TMA
0219 77658026	COLOR OPT CAB	TMA
0220 77658027	COLOR OPT CAB	TMA
0221 77658028	COLOR OPT CAB	TMA
0222 77658030	COLOR OPT CAB	TMA
0223 77658031	COLOR OPT CAB	TMA
0224 77658032	COLOR OPT CAB	TMA
0225 77658033	COLOR OPT CAB	TMA
0226 77658034	COLOR OPT CAB	TMA
0227 77658035	COLOR OPT CAB	TMA
0228 77658036	COLOR OPT CAB	TMA
0229 77658037	COLOR OPT CAB	TMA
0229 77658038	COLOR OPT CAB	TMA
0229 77658039	COLOR OPT CAB	TMA
0229 77658040	COLOR OPT CAB	TMA
0229 77658041	COLOR OPT CAB	TMA
0229 77658042	COLOR OPT CAB	TMA
0300 77658043	COLOR OPT CAB	TMA
0430 10127111	SCREW PAN HL MACH	ALL OPTIONS
0442 10125666	WASHERS PLAIN	ALL OPTIONS
0449 10125105	NUT HEX MACH	****

ITEM IDENT NO	DESCRIPTION	WHERE USED
0451 75806504	WASHER-FLUORET	ALL OPTIONS
0458 10125106	NUT HEX MACH	****
0504 93115287	SCREW PAN	282-296 298-300
0504 93115287	SCREW PAN	164-166 204-226
0510 10126401	WASH EXT TOOTH LO	****
0514 75312013	SPIC TAPE	****
0546 10127124	SCREW PAN HD MACH	ALL OPTIONS
0560 83451810	INSULATOR	163 169 170 297
0639 10126103	WASH INT TOOTH LK	ALL OPTIONS
0686 10127120	TMA	****
0711 10127347	SCREW PAN HL MACH	****
0712 10126104	WASH INT TOOTH LK	ALL OPTIONS
0788 93342193	SCREW	163 169 170 297
0809 75283200	BAR-BARBLE	****
0810 75283100	BAR-TRIM	ALL OPTIONS
0811 75793301	LABEL SWITCH	214-244 296-300
0811 75793301	LABEL SWITCH	170
0811 75793301	LABEL SWITCH	164-166 204-212
0811 75793301	LABEL SWITCH	297 294 296-300
0812 75284001	BAR-COVER	****
0814 75288300	MAGNETIC STRIP	****
0816 75794101	SLIDE-LID	****
0817 75794205	ROF-SLIDE	****
0818 75794001	SPACER-FLANGE	ALL OPTIONS
0819 75794700	SPRING-EXTENSION	****
0820 92649009	PIB CUTTER	****
0821 93530005	PIB POLI HCS BLACK	****
0834 24576646	SLIDING-VINYL	****
0835 93539004	FASTENER-PUSH ON	****
0836 83446400	BURPLE NYLON	****
0848 92743158	SCREW SS PAN HI	ALL OPTIONS
0841 75774702	CLIP-PUSH IN	****
0843 93447104	SHOULDER WASHER THER	ALL OPTIONS
0845 10125712	SCR FLAT HD	****
0848 83451804	INSULATOR ADHESIVE	ALL OPTIONS
0849 83451805	INSULATOR ADHESIVE	ALL OPTIONS
0963 10127348	SCREW PAN HI	211-226 292-300
0963 10127348	SCREW PAN HI	163-170 204-209
1062 95125301	LOCTITE	ALL OPTIONS
1084 758065150	NUT PLATE	163 169 170 297
1086 83451802	INSULATOR	****

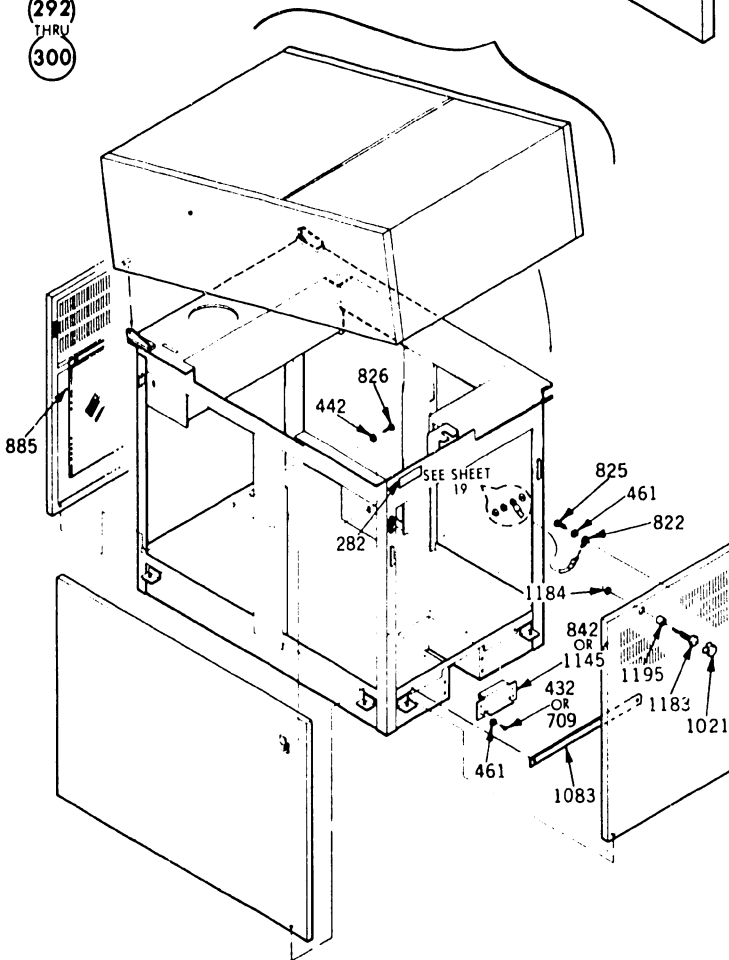
FIGURE 8-14. COLOR OPTION CABINET (SHEET 1 of 3)



FROM SHEET 5

SELECT

- (163) (204)
- THRU THRU
- (173) (226)
- (292)
- THRU
- (300)



ITEM IDENT NO	DESCRIPTION	WHERE USED
0163 77658044	COLOR OPT CAB	TMA
0164 77658045	COLOR OPT CAB	TMA
0165 77658046	COLOR OPT CAB	TMA
0166 77658047	COLOR OPT CAB	TMA
0167 77658048	COLOR OPT CAB	TMA
0168 77658049	COLOR OPT CAB	TMA
0169 77658050	COLOR OPT CAB	TMA
0170 77658051	COLOR OPT CAB	TMA
0171 77658052	COLOR OPT CAB	TMA
0172 77658053	COLOR OPT CAB	TMA
0173 77658054	COLOR OPT CAB	TMA
0204 77658009	COLOR OPT CAB	TMA
0205 77658010	COLOR OPT CAB	TMA
0206 77658011	COLOR OPT CAB	TMA
0207 77658012	COLOR OPT CAB	TMA
0208 77658013	COLOR OPT CAB	TMA
0209 77658014	COLOR OPT CAB	TMA
0210 77658016	COLOR OPT CAB	TMA
0211 77658017	COLOR OPT CAB	TMA
0212 77658018	COLOR OPT CAB	TMA
0213 77658019	COLOR OPT CAB	TMA
0214 77658020	COLOR OPT CAB	TMA
0215 77658021	COLOR OPT CAB	TMA
0216 77658023	COLOR OPT CAB	TMA
0217 77658024	COLOR OPT CAB	TMA
0218 77658025	COLOR OPT CAB	TMA
0219 77658026	COLOR OPT CAB	TMA
0220 77658027	COLOR OPT CAB	TMA
0221 77658028	COLOR OPT CAB	TMA
0222 77658030	COLOR OPT CAB	TMA
0223 77658031	COLOR OPT CAB	TMA
0224 77658032	COLOR OPT CAB	TMA
0225 77658033	COLOR OPT CAB	TMA
0226 77658034	COLOR OPT CAB	TMA
0282 94224651	LABEL-INFO	209
0292 77658035	COLOR OPT CAB	TMA
0293 77658036	COLOR OPT CAB	TMA
0294 77658037	COLOR OPT CAB	TMA
0295 77658038	COLOR OPT CAB	TMA
0296 77658039	COLOR OPT CAB	TMA
0297 77658040	COLOR OPT CAB	TMA
0298 77658041	COLOR OPT CAB	TMA
0299 77658042	COLOR OPT CAB	TMA
0300 77658043	COLOR OPT CAB	TMA
0432 10127121	SCREW PAN HD MACH	163 169
0442 10125606	WASHERS PLAIN	ALL OPTIONS
0461 10126402	WASH EXT TOOTH LO	****
0709 92723234	SCREW BUTTON SOC HD	164-168 204-209
0709 92723234	SCREW BUTTON SOC HD	170 292-300
0709 92723234	SCREW BUTTON SOC HD	211-213 215-226
0822 51669410	TERMINAL	****
0825 17901516	SCR THD ROLL	****
0826 92743202	SCR MCH PAN PHL B	****
0842 83492000	BRACKET, CABLE, FRAME	298-300
0842 83492000	BRACKET, CABLE, FRAME	164-168 204-209
0842 83492000	BRACKET, CABLE, FRAME	211-213 215-296
0885 7511905	HOLDER JOB TICKET	169 170 297
1021 15012402	BUSHING SHAP IN	ALL OPTIONS
1083 83450300	CLOSURE FRAME	297
1145 83492001	CLOSURE FRAME	169
1183 77658045	SCREW	ALL OPTIONS
1184 92074137	O-RING	ALL OPTIONS
1195 95694205	SPACER	ALL OPTIONS

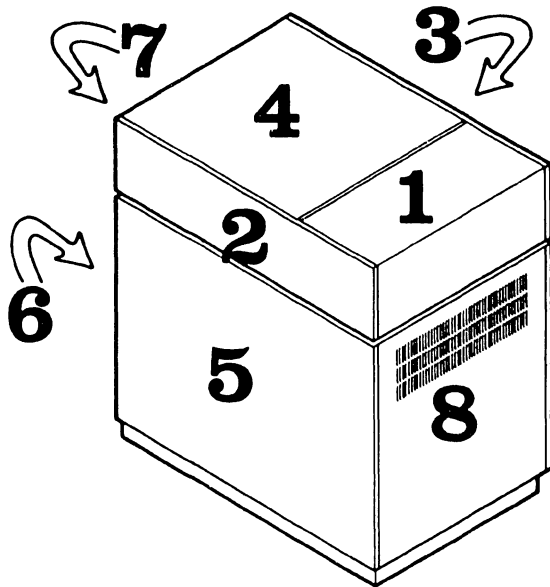
FIGURE 8-14. COLOR OPTION CABINET (SHEET 2 of 3)

FROM SHEET 5
SELECT

163
THRU
173

204
THRU
226

292
THRU
300



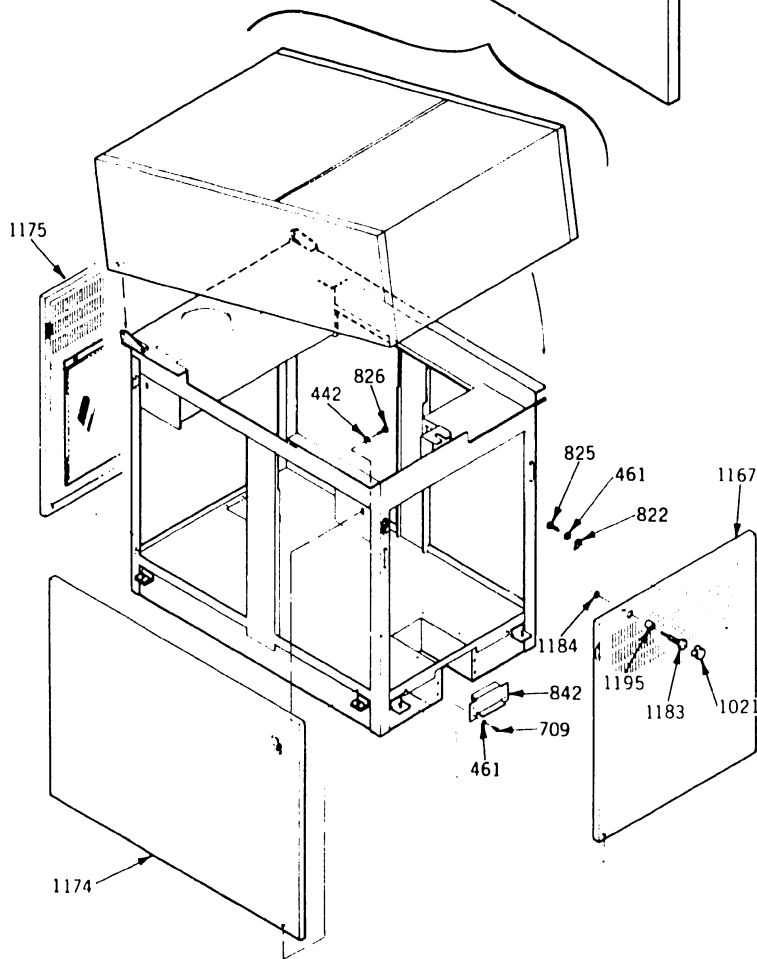
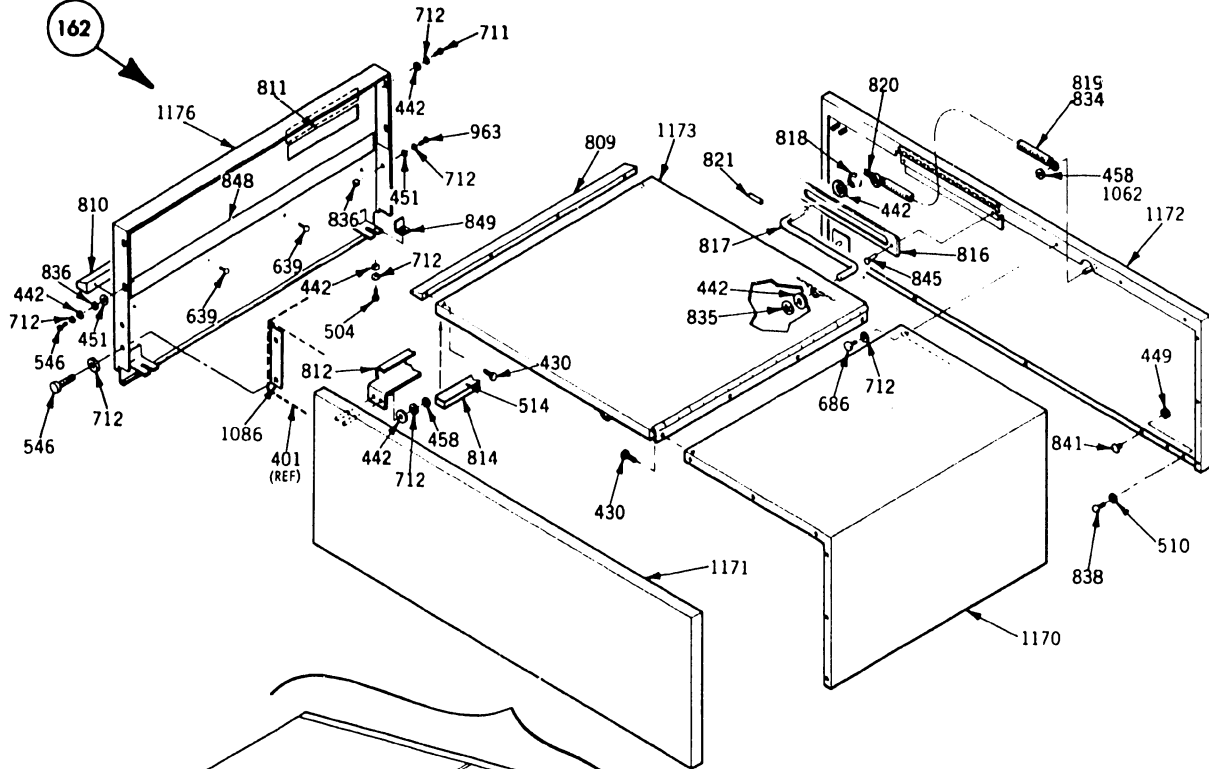
NOTE: REFER TO ASSEMBLY - COMPONENT PARTS LIST
FOR PANEL IDENTIFICATION.

COLOR OPTION DESCRIPTION TABLE

COLOR OPT ITEM NO.	#1 TOP COVER REAR	#2 TOP COVER R.H.	#3 TOP COVER L.H.	#4 DOOR AC-CESS	#5 PANEL SIDE PTD	#6 PANEL END FRONT	#7 PANEL CON-TROL	#8 PANEL END REAR
163	1147	989	990	991	992	997	1143	1144
164	1156	1157	1158	1159	1160	1161	1162	
165	1148	1149	1150	1151	1152	1153	1154	1155
166	1163	803	1165	1166	806	1168	1169	
167	1156	1157	1158	1159	1160		1162	1161
168	1163	1164	804	1166	806	1168	512	
169	1189	1190	1191	991	1192	997	1143	
170	695	697	699	721	732	747	777	878
171	1087	1112	1114	1136	1137	1138	1139	1000
172	1087	1112	1114	1136	1137	1138	1139	636
173	2005	2006	2007	2008	2009	2010	2011	
204	802	803	804	805	806	807	808	
205	1058	852	853	854	855	856	857	
206	858	803	804	859	806	860	861	
207	862	863	864	865	866	867	868	
208	869	870	871	872	873	874	875	
209	802	803	804	805	806	807	808	
210							808	
211	898	899	900	901	902	903	904	
212	905	906	907	908	909	910	911	
213	912	913	914	915	906	917	918	
214							861	
215	919	920	921	922	923	924	925	
216	851	934	935	936	937	953	876	
217	938	939	940	941	942	943	944	
218	946	947	948	949	950	951	952	
219	862	863	864	865	866	867	868	
220	926	927	928	929	930	931	932	1113
221	1057	886	887	888	933	1078	1079	
222	548	552	554	683	700	753	890	
223	1093	1094	1095	1096	1097	1098	1099	
224	802	803	804	805	806		808	807
225	1100	1101	1102	1103	1104		1105	1106
226	858	803	804	859	806		861	860
227	964	1008	1030	1059	1109	1110	1111	
293	1057	886	887	888	933		1079	1078
294	1117	1118	1119	1120	1121		861	807
295	1117	1122	1123	1120	1124		1125	1126
296	1129	1130	1131	1132	1133		1134	1142
297	877	769	781	880	785	882	786	884
298	1058	799	800	854	801	833	844	846
299	1058	799	800	854	801	846	857	
300	1087	1112	1114	1136	1137	1138	1139	

FIGURE 8-14. COLOR OPTION CABINET (SHEET 3 of 3)

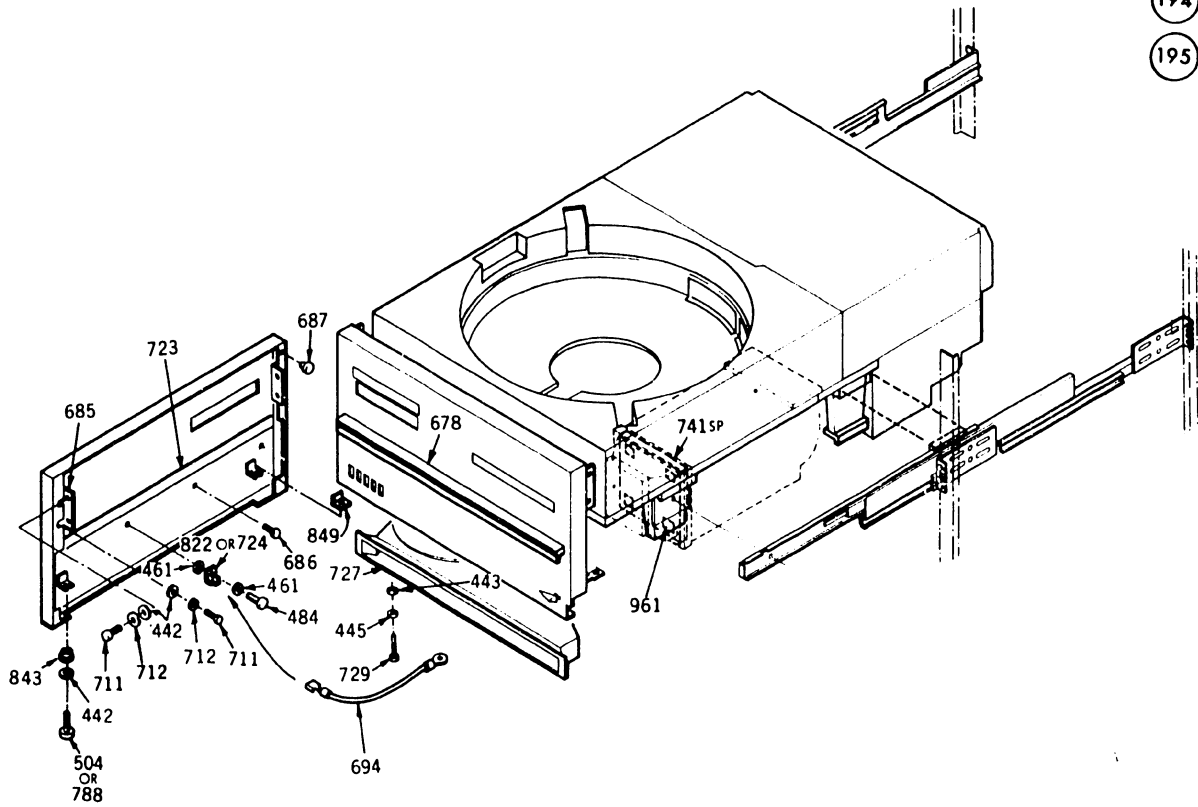
FROM SHEET 5



ITEM	IDENT NO	DESCRIPTION	WHERE USED
0162	77661246	COLOR OPT CAB	TMA
0430	10127111	SCREW PAN HL MACH	162
0442	10125606	WASHERS PLAIN	162
0449	10125105	NUT HEX MACH	162
0451	75806504	WASHER-REDUCED	162
0458	10125106	NUT HEX MACH	162
0461	10126402	WASH EXT TOOTH LO	162
0504	93115287	SCREW PAN	162
0510	10126401	WASH EXT TOOTH LO	162
0514	75312013	SPEC TAPE	162
0546	10127124	SCREW PAN HL MACH	162
0606	10127120	SCREW PAN HL MACH	162
0709	92723234	SCREW BUTTON SOC HL	162
0711	10127347	SCREW PAN HL MACH	162
0712	10126104	WASH INT TOOTH LF	162
0809	75283200	BAR-HANDLE	162
0810	75283100	BAR-TIE	162
0811	75793301	LABEL SWITCH	162
0812	75284001	BAR-COVER	162
0814	75288300	MAGNETIC STRIP	162
0816	75794101	SLIDE-LIFE	162
0817	75794205	ROD-SLIDE	162
0818	75794001	SPACER-FLANGHT	162
0819	75794700	SPRING-EXTENSION	162
0820	92649009	PIN, CUTTER	162
0821	95300005	PIN, ROLL HCS-BLACK	162
0822	51669410	TERMINAL	162
0825	17901516	SCR THD ROLL	162
0826	92743202	SCR MCH PAN PHL B	162
0834	24528646	SLEEVING-VINYL	162
0835	93539004	FASTENER-PUSH IN	162
0836	83446400	BUMPER EYEG	162
0838	92743158	SCREW SS PAN HL	162
0841	75774702	CLIP-PUSH IN	162
0842	83492000	BRACKET, CABLE, FRAME	162
0845	10125712	SCF FLAT HL	162
0848	83451804	INSULATOR ADHESIVE	162
0849	83451805	INSULATOR ADHESIVE	162
0963	10127348	SCREW PAN HL	162
1021	15012402	BUSHING SNAP IN	162
1062	95125301	LOCTITE	162
1082	75884876	GP FLEXIBLE	162
1167	77657728	PNL END FRONT	162
1170	77657428	PANEL TOP COVER REAR	162
1171	83443728	PNL TOP CVR RL	162
1172	83443828	PNL TOP CVR LH	162
1173	77657128	DOOR ACCESS	162
1174	77657228	PANEL SIDE	162
1175	77657729	PNL END FRONT	162
1176	83425629	PNL CONTROL CAB	162
1183	77830405	SCREW	162
1184	92074137	O-RING	162
1195	95694205	SPACER	162

FIGURE 8-15. COLOR OPTION CABINET (SPECIAL)

194 229
195 231
THRU
233



RACK MOUNT ASSY ITEM#	INSTALLATION KIT	
	ITEM#	DETAIL
194	564	SHEET 29
195	713	SHEET 28
229	713	SHEET 28
231	713	SHEET 28
232	NONE	
233	713	SHEET 28

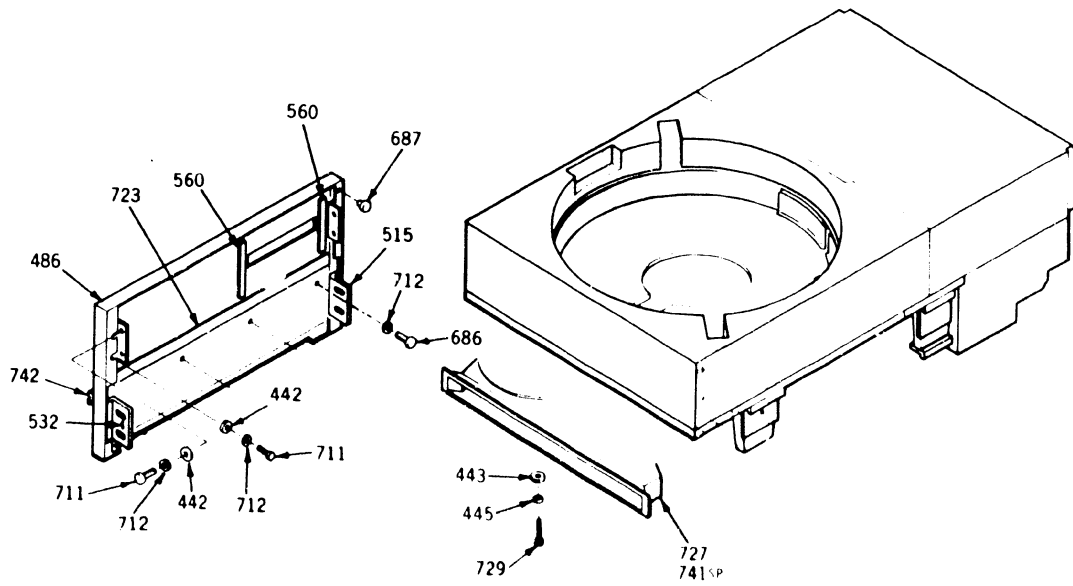
ITEM IDENT NO	DESCRIPTION	WHERE USED
0194 83443513	RACK MT ASM	TMA
0195 83443514	RACK MT ASM	TMA
0229 83443504	RACK MT ASM	TMA
0231 83443506	RACK MT ASM	TMA
0232 83443507	RACK MT ASM	TMA
0233 83443509	RACK MT ASM	TMA
0442 10125606	WASHERS PLAIN	194 195 229
0443 10125607	WASHERS PLAIN	194 195 229 233
0445 10125804	WASHERS SPR LOCK	194 195
0445 10125804	WASHERS SPR LOCK	229 231-233
0461 10126402	WASH EXT TOOTH LO	194 229 231 232
0484 10127122	SCREW PAN HD MACH	194 229 231 232
0504 93115287	SCREW PAN	194 229 231 232
0546 10127124	SCREW PAN HI MACH	229 231 232
0564 83447808	INSTLN KIT-RACK MT	194
0678 75284701	HANDLE-PULL RACK	229 231 232
0678 75284701	HANDLE-PULL RACK	194 195
0685 83444200	ANGLE-FRT PANEL	194 195
0685 83444200	ANGLE-FRT PANEL	229 231 232
0686 10127120	SCREW PAN HI MACH	194 195
0686 10127120	SCREW PAN HI MACH	229 231 232
0687 92172000	BUMPER RUBBER	194 195
0687 92172000	BUMPER RUBBER	229 231 232
0694 75730805	CABLE ASM GROUND	194 229 231 232
0711 10127147	SCREW PAN HI MACH	194 195 229
0711 10127147	SCREW PAN HI MACH	231 232
0712 10126104	WASH INT TOOTH LK	229 231 232
0712 10126104	WASH INT TOOTH LK	194 195
0713 83447805	INSTLN KIT-RACK MT	195 229 231 233
0723 83451806	INSULATOR ADHESIVE	229 231 232
0723 83451806	INSULATOR ADHESIVE	194 195
0724 51669404	TERMINAL	231
0727 83457002	AIR INTAKE	194 195 229 233
0729 10127128	PAN HD MACH SCR	194 195 229 233
0741 77604000	PRE-FILTER-FILTER	194 195
0741 77604000	PRE-FILTER-FILTER	229 231 233
0788 93342193	SCREW	195
0822 51669410	TERMINAL	194 229
0843 94347104	SHOULDER WASHER THIF	194 195
0843 94347104	SHOULDER WASHER THIF	229 231 232
0849 83451805	INSULATOR ADHESIVE	229 231 232
0849 83451805	INSULATOR ADHESIVE	194 195
0961 77611443	CEMENT	194 195
0961 77611443	CEMENT	229 231 233

FIGURE 8-16. RACK MOUNT ASSEMBLY (SHEET 1 of 3)

FROM SHEET 5



RACK MOUNT ASSY ITEM #	INSTALLATION KIT	
	ITEM #	DETAIL
228	749	SHEET 2B
230	749	SHEET 2B



ITEM	QTY	DESCRIPTION	REF. DETAIL
228	1	RACK MOUNT ASSEMBLY	FIG. 8-16
230	1	RACK MOUNT ASSEMBLY	FIG. 8-16
442	2	WASHER	FIG. 8-16
443	2	WASHER	FIG. 8-16
445	2	WASHER	FIG. 8-16
711	2	SCREW	FIG. 8-16
712	4	SCREW	FIG. 8-16
723	1	BRACKET	FIG. 8-16
727	1	BRACKET	FIG. 8-16
729	1	BRACKET	FIG. 8-16
741SP	1	BRACKET	FIG. 8-16

FIGURE 8-16. RACK MOUNT ASSEMBLY (SHEET 2 OF 3)

FROM SHEET 5

192

193

227

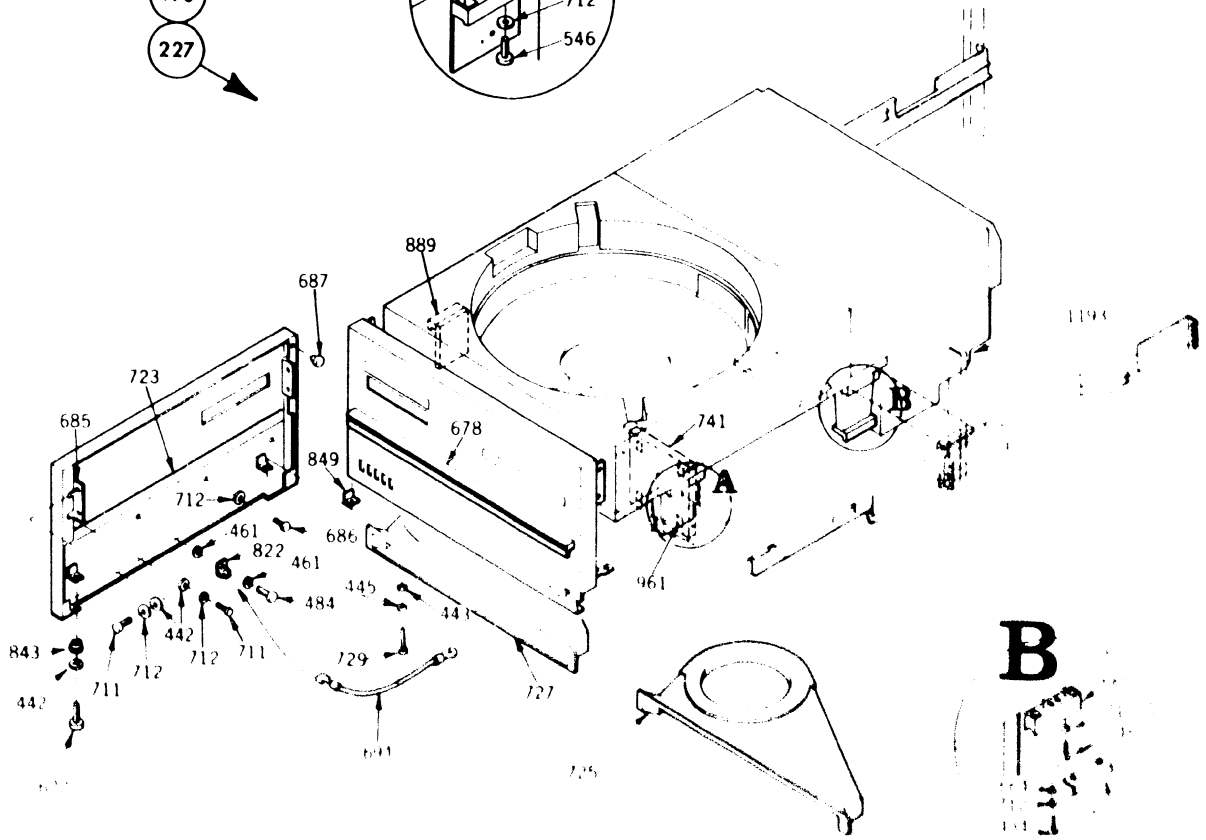
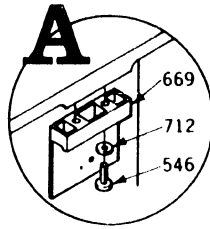
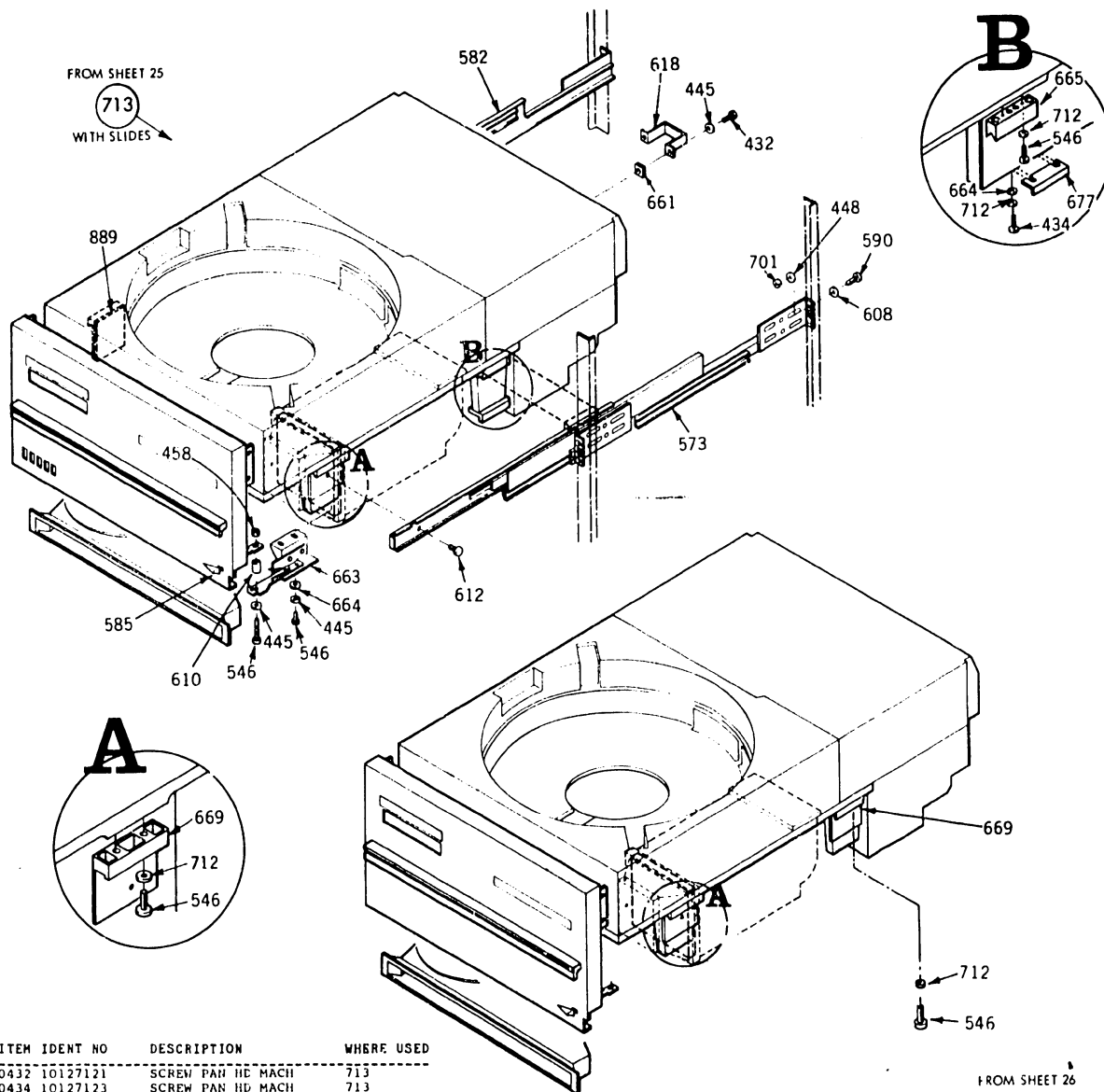


FIGURE 5-10 BACK PANEL ASSEMBLY (SHEET 5 OF 5)



ITEM	IDENT NO	DESCRIPTION	WHERE USED
0432	10127121	SCREW PAN HD MACH	713
0434	10127123	SCREW PAN HD MACH	713
0445	10125004	WASHERS SPR LOCK	713
0448	10125805	WASHERS SPR LOCK	713
0458	10125106	NUT HEX MACH	713
0546	10127124	SCREW PAN HD MACH	713
0546	10127124	SCREW PAN HD MACH	749
0573	83478303	SLIDE ASM RH	713
0582	83478304	SLIDE ASM LH	713
0585	83443601	KNOB ASM	713
0590	10127144	SCREW PAN HD	713
0608	93211009	WASHER PLAIN 10	713
0610	93109322	SPACER	713
0612	10127346	SCREW	713
0618	83436601	FENDER CABLE	713
0661	92196007	NUT-SPEED	713
0663	83479501	LATCH ASM	713
0664	93211008	WASHER	713
0665	83484500	MOUNT-SLIDE	713
0669	83484602	MOUNT-SLIDE KEYED	749
0669	83484602	MOUNT-SLIDE KEYED	713
0677	83485700	STABILIZER	713
0701	10125108	NUT HEX MACH	713
0712	10126104	WASH INT TOOTH LK	749
0712	10126104	WASH INT TOOTH LK	713
0713	83447805	INSTLN KIT-RACK MT	229 231
0749	83447806	INSTLN KIT-RACK MT	228 230
0809	77830705	INSULATOR	713

FIGURE 8-17. INSTALLATION KIT (SHEET 1 of 2)

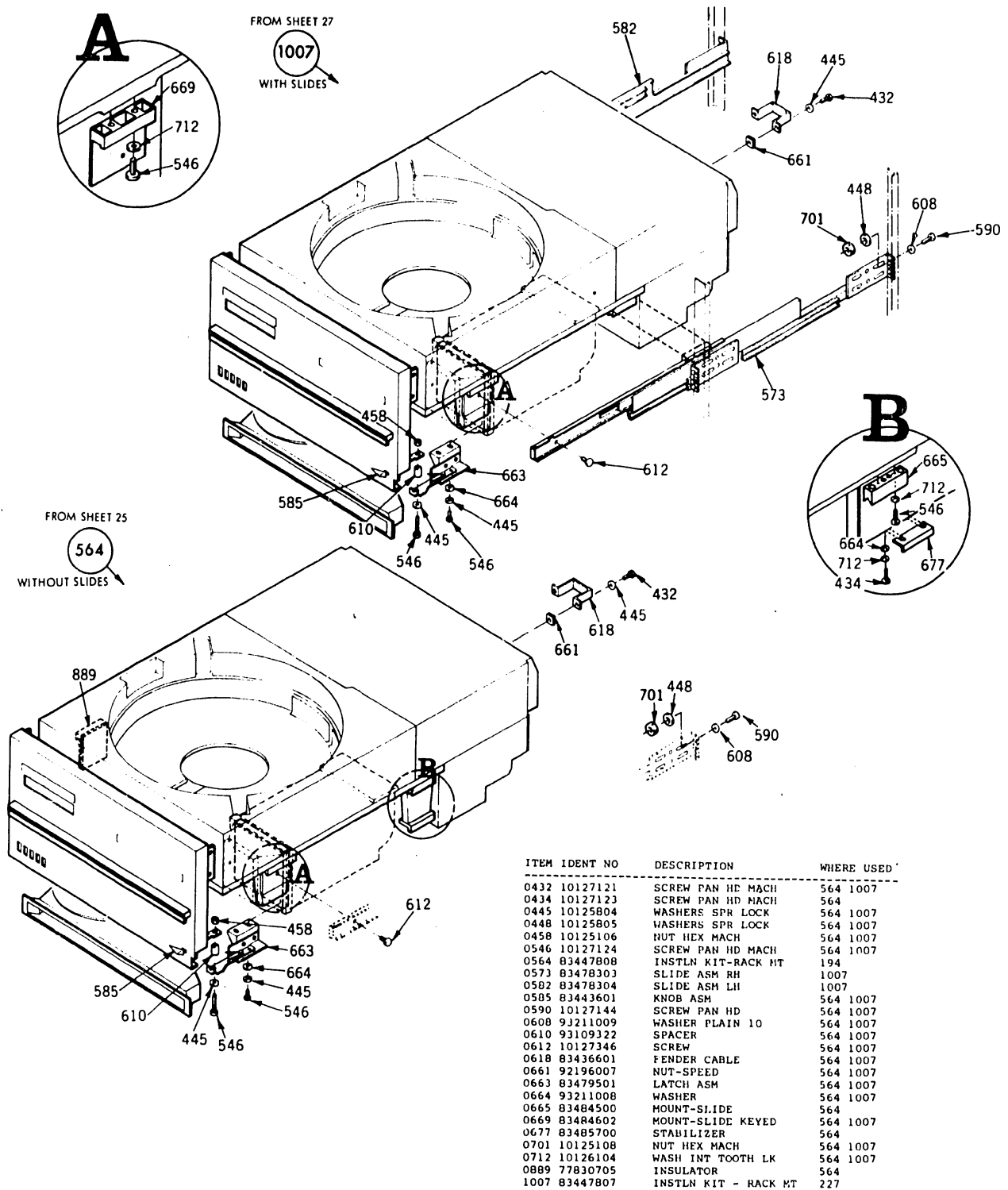
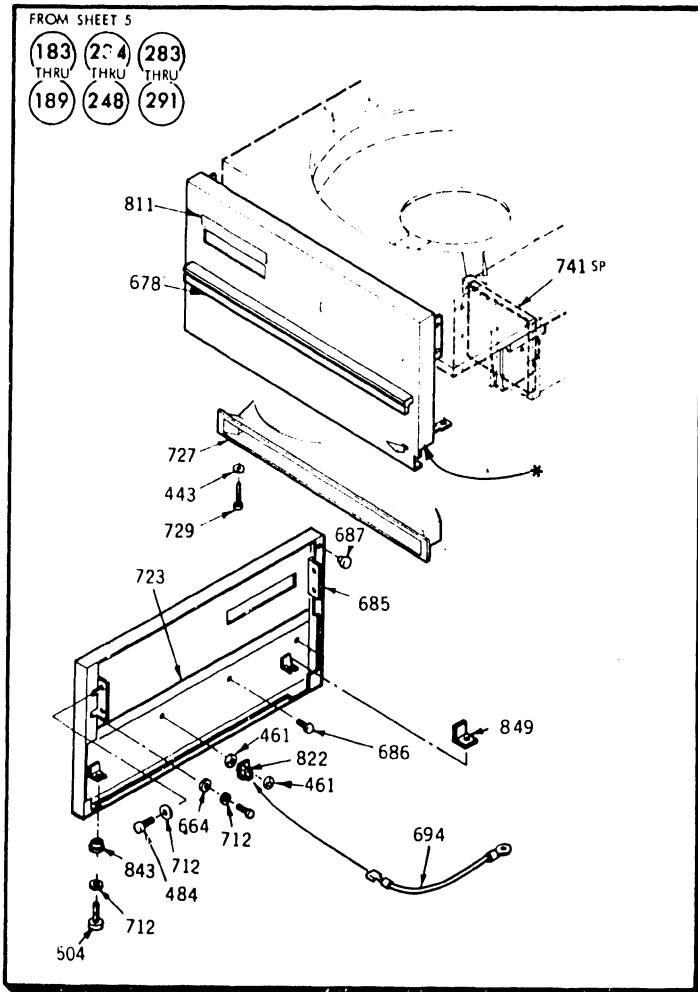


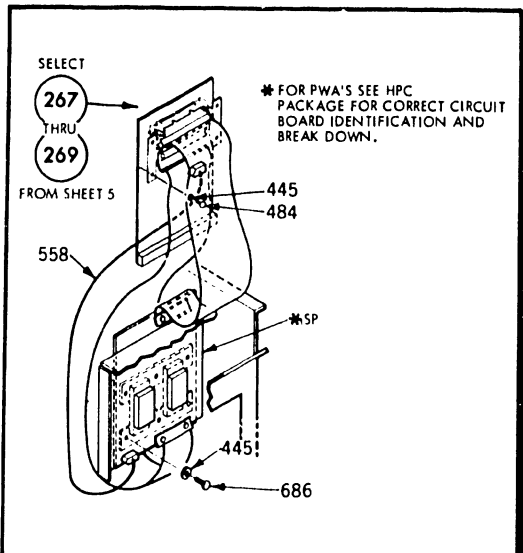
FIGURE 8-17. INSTALLATION KIT (SHEET 2 of 2)



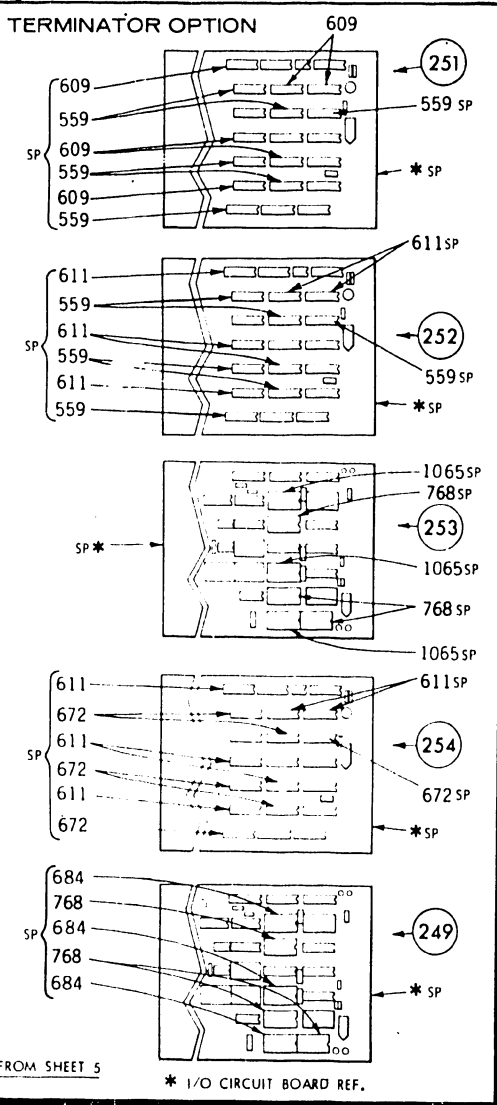
* IDENTIFICATION OF COLOR OF EACH RACK MOUNT OPTION IS PROVIDED BY AN ITEM NUMBER WHICH APPEARS IN PARENTHESES IN THE "DESCRIPTION" COLUMN ON THIS SHEET. REFER TO ASSEMBLY COMPONENT PARTS LIST, SHEETS 35 THRU 42, USING THIS ITEM NUMBER, TO DETERMINE IDENTIFICATION NUMBER OF PANEL PAINT.

ITEM	PART NO.	DESCRIPTION	WHERE USED
0183	83442534	COLOR OPT FE MT (1026)	TMA
0184	83442533	COLOR OPT FE MT (1048)	TMA
0185	83442532	COLOR OPT FE MT (0592)	TMA
0186	83442531	COLOR OPT FE MT (0440)	TMA
0187	83442530	COLOR OPT FE MT (1148)	TMA
0188	83442529	COLOR OPT FE MT (0416)	TMA
0189	83442528	COLOR OPT FE MT (0409)	TMA
0234	83442501	COLOR OPT FE MT(1066)	TMA
0235	83442502	COLOR OPT FE MT(0545)	TMA
0236	83442503	COLOR OPT FE MT(0547)	TMA
0237	83442505	COLOR OPT FE MT(0547)	TMA
0238	83442506	COLOR OPT FE MT(0625)	TMA
0239	83442507	COLOR OPT FE MT(0627)	TMA
0240	83442508	COLOR OPT FE MT(0561)	TMA
0241	83442509	COLOR OPT FE MT(0649)	TMA
0242	83442510	COLOR OPT FE MT(0650)	TMA
0243	83442511	COLOR OPT FE MT(0545)	TMA
0244	83442527	COLOR OPT FE MT(0847)	TMA
0245	83442513	COLOR OPT FE MT(0562)	TMA
0246	83442514	COLOR OPT FE MT(1063)	TMA
0247	83442504	COLOR OPT FE MT(0418)	TMA
0248	83442516	COLOR OPT FE MT(1086)	TMA
0263	83442525	COLOR OPT FE MT(0994)	TMA
0284	83442524	COLOR OPT FE MT(0995)	TMA
0285	83442517	COLOR OPT FE MT(1092)	TMA
0286	83442518	COLOR OPT FE MT(1108)	TMA
0287	83442526	COLOR OPT FE MT(0897)	TMA
0288	83442521	COLOR OPT FE MT(1141)	TMA
0289	83442520	COLOR OPT FE MT(0607)	TMA
0290	83442522	COLOR OPT FE MT(1140)	TMA
0291	83442523	COLOR OPT FE MT(0547)	TMA
0409	83440314	FRONT PNL RACK PAINT	189
0416	83442121	FRONT PNL RACK PAINT	188
0418	83442103	FRONT PNL RACK	247
0440	83442129	FRONT PANEL RACK PAINT	186
0443	10125607	WASHERS PLAIN	237 243
0461	10126402	WASH EXT TOOTH LC	237 243
0484	10127122	SCREW PAN HD MACH	237 243
0504	93115287	SCREW PAN	237 243
0545	83442106	FRONT PNL RACK PAINT	235 243
0547	83442109	FRONT PNL RACK PAINT	236 237 291
0561	83442143	FRONT PNL RACK PAINT	240
0562	770J4340	FRONT PNL RACK PAINT	245
0592	77581454	FRONT PANEL RACK PAINT	185
0607	83442178	FRONT PNL RACK PAINT	289
0625	83466801	PNL CTRL RACK SLKSCN	238
0627	83442123	FRONT PNL RACK PAINT	239
0648	77582940	FRONT PANEL RACK PAINT	184
0649	83442166	FRONT PNL RACK PAINT	241
0650	83442154	FRONT PNL RACK PAINT	242
0678	75284701	HANDLE PULL RACK	237 243
0685	83444200	ANGLE-FRT PANEL	237 243
0686	10127120	SCREW PAN HD MACH	237 243 247
0687	92172000	BUMPER RUBBER	237 243
0694	75730805	CABLE ASM GROUND	237 243
0712	10126104	WASH INT TOOTH LC	237 243
0723	83451806	INSULATOR ADHESIVE	237 243
0727	83457002	AIR INTAKE	237 243
0729	10127128	PAN HD MACH SCR	237 243
0741	77604000	PRE-FILTER-FILTER	237 243
0811	75793301	LABEL SWITCH	287-290 295
0811	75793301	LABEL SWITCH	183 184 186
0811	75793301	LABEL SWITCH	234-237 239-245
0811	75793301	LABEL SWITCH	187 188 248 285
0822	51669410	TERMINAL	237
0843	94347104	SHOULDER WASHER THIN	237 243
0847	83442108	FRONT PNL RACK	244
0849	83451805	INSULATOR ADHESIVE	237 243
0897	83442110	FRONT PNL RACK	287
0994	83442197	FRONT PNL RACK PAINT	028J
0995	83442198	FRONT PNL RACK PAINT	0284
1028	83442124	FRONT PNL RACK PAINT	183
1063	83442165	FRT PNL RCK PNT	246
1066	83442104	FRONT PNL RACK PAINT	234
1088	83442136	FRONT PNL RACK PAINT	248
1092	83442172	FRONT PNL RACK PAINT	285
1108	83442170	FRONT PNL RACK PAINT	286
1140	83442190	FRONT PNL	290
1141	83442189	FRONT PNL RACK	288
1188	83442157	FRONT PANEL RACK PAINT	187

FIGURE 8-18. TOP MECHANICAL ASSEMBLY OPTIONS



ITEM	IDENT NO	DESCRIPTION	WHERE USED
0249	75305707	TERMINATOR	TMA
0251	75305703	TERMINATOR	TMA
0252	75305704	TERMINATOR	TMA
0253	75305706	TERMINATOR	TMA
0254	75305705	TERMINATOR	TMA
0267	75795309	I-O OPT CAB	TMA
0266	75795307	I-O OPT CAB	TMA
0269	75795308	I-O OPT CAB	TMA
0307	75740123	HEAD OPTION	MOD
0308	75740119	HEAD OPTION	MOD
0309	75740115	HEAD OPTION	MOD
0310	75740113	HEAD OPTION	MOD
0311	75740121	HEAD OPTION	MOD
0312	75740124	HEAD OPTION	MOD
0313	75740117	HEAD OPTION	MOD
0314	75740118	HEAD OPTION	MOD
0315	75740114	HEAD OPTION	MOD
0445	10125004	WASHERS SPR LOCK	267-269
0445	10125004	WASHERS SPR LOCK	267-269
0558	83444701	JUMPER ASM	267-269
0559	75738604	RESISTOR MODULE 110	251 252
0609	75738610	RESISTOR MODULE 1K	251
0611	75738607	RESISTOR MODULE 330	252 254
0672	75738608	RESISTOR MODULE	254
0684	75738654	RESISTOR MODULE 220	249
0686	10127120	SCREW TAP HD MACH	267-269
0760	75738655	RESISTOR MODULE 330	249 253
0815	75037504	HEAD ASM (LOWER)	307 312 314
0823	75037505	HEAD ASM (UPPER)	307 312
0824	75300200	RESISTOR MODULE	307 311 312
0827	70590208	HEAD ASM (LOWER)	308
0828	70590209	HEAD ASM (UPPER)	308
0829	75300100	RESISTOR MODULE	308-310 313-315
0830	70590306	HEAD ASM (LOWER)	309
0831	70590307	HEAD ASM (UPPER)	309
0832	73460700	CARRIAGE HEIGHT	312 314 315
1065	75738652	RESISTOR MODULE	253
1070	75037506	HEAD ASM (LOWER)	311
1071	75037507	HEAD ASM (UPPER)	311
1072	70590304	HEAD ASM (LOWER)	313 314
1073	70590305	HEAD ASM (UPPER)	313 314
1074	70590206	HEAD ASM (LOWER)	310 315
1075	70590207	HEAD ASM (UPPER)	310 315



HEAD OPTION

FROM SHEET 6

307	308	309	310	311	312	313	314	315
815	827	829	829	824	815	1072	1072	829
823	828	830	1074	1070	823	1073	1073	1074
824	829	831	1075	1071	824	829	829	1075
					832		832	832

** REFER TO R/W/E BOARD LOCATED IN HPC DOCUMENT PACKAGE. (SHEET 55-7)

** 824
829

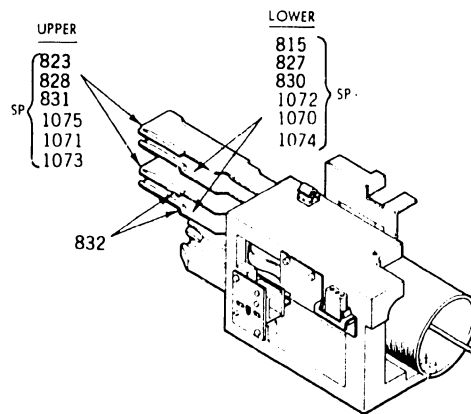
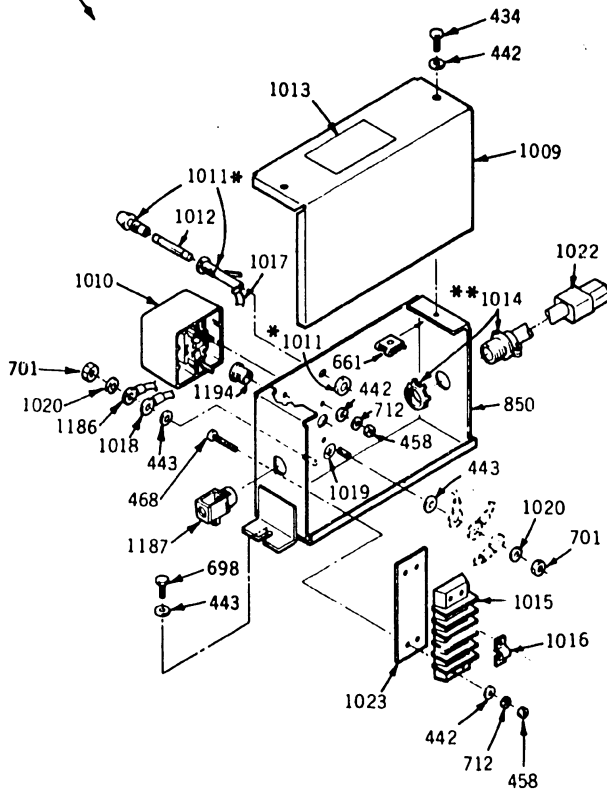


FIGURE 8-19. OPTIONS

FROM SHEET 5

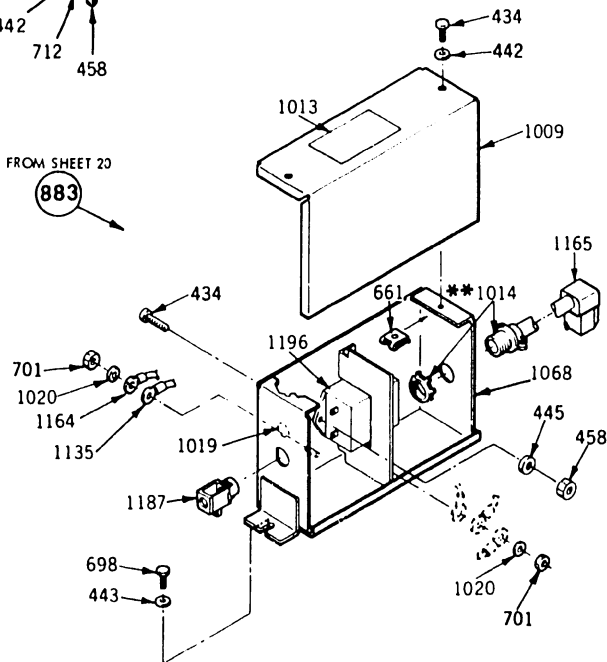
275



* SUPPLIED AS ONE PART
 ** SUPPLIED AS ONE PART

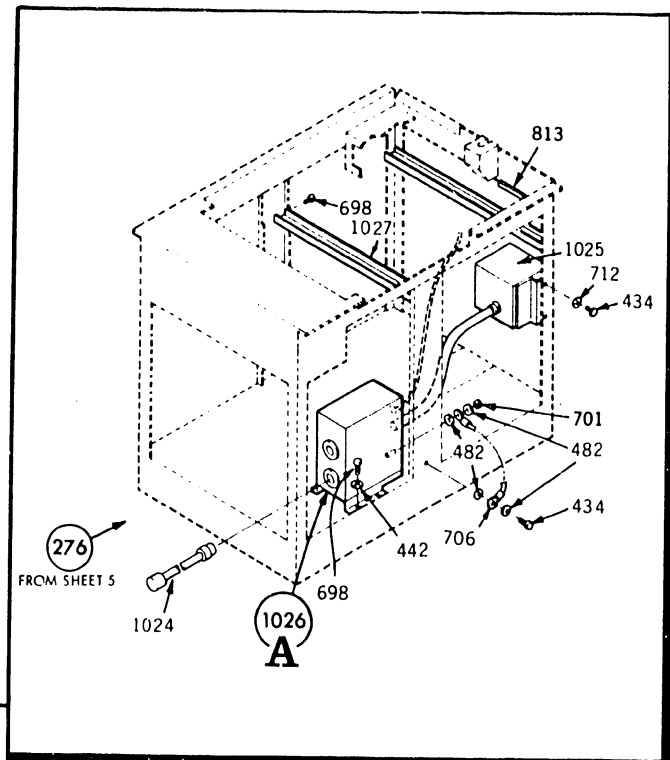
FROM SHEET 20

883

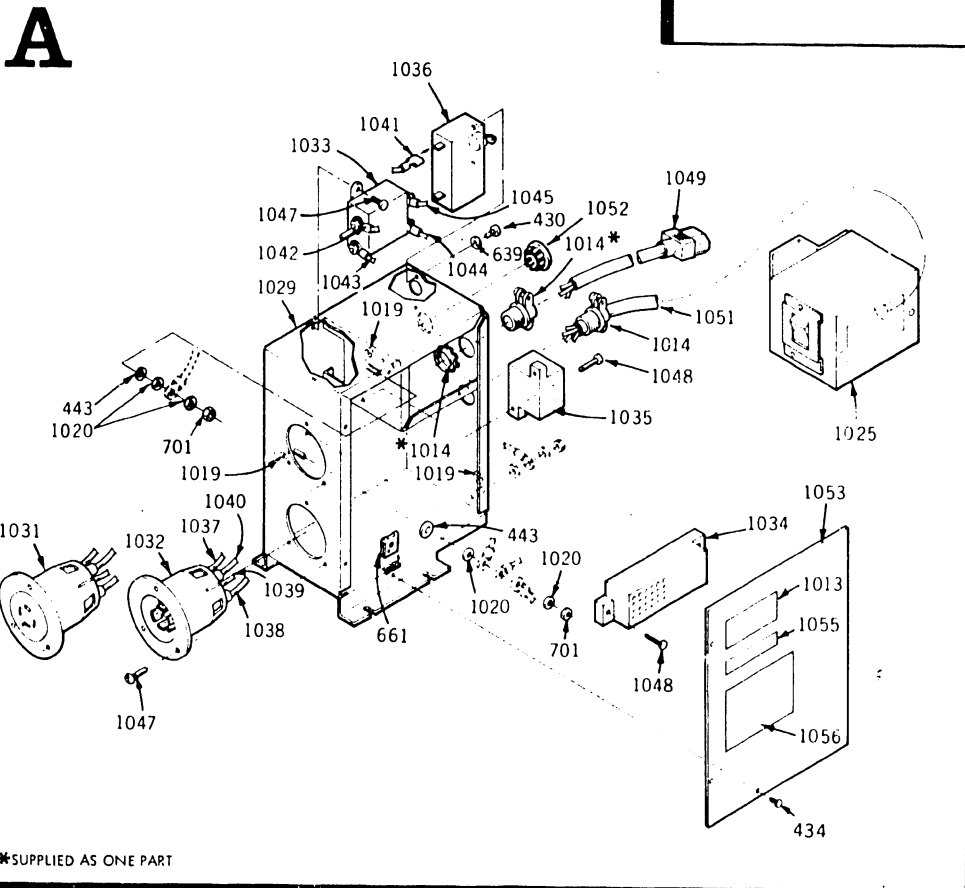


ITEM IDENT NO	DESCRIPTION	WHERE USED
0275	77599402	PWR ASM (INPUT) TMA
0434	10127123	SCREW PAN HD MACH 275 883
0442	10125606	WASHERS PLAIN 275 883
0443	10125607	WASHERS PLAIN 275
0445	10125004	WASHERS SPR LOCK 883
0458	10125106	NUT HEX MACH 275 883
046P	10127125	SCREW PAN HD MACH 275
0661	92196007	NUT-SPEED 275 883
0698	93592200	SCR TPG HEX PNL 275
0701	10125108	NUT HEX MACH 275 883
0712	10126104	WASH INT TOOTH LK 275
0850	75730603	CHASSIS AC BOX 220V 275
1009	75730701	CVR CHASSIS AC INP 275 883
1010	75731001	CONVENIENCE OUTLET 275
1011	92411002	FUSE HOLDER 275
1012	92371016	FUSE OK ACTING 5 AMP 275
1013	77610304	PLATE, WARNING 275 883
1014	92801001	CLAMP, CABLE 275 883
1015	93041205	STRIP TERMINAL 275
1016	93067003	JUMPER, BARRIER ST 275
1017	75731104	CABLE-JUMPER BLACK 275
1018	75730806	CABLE ASM GRND 275
1019	75731301	SYMBOL GRND (DECAL) 275 883
1020	10126105	WASH INT TOOTH LK 275 883
1022	77599501	POWER CORD ASM 275
1023	93105305	MARKER STRIP 275
1068	75730602	CHASSIS PWR INPUT 883
1135	75730808	CABLE ASM GND 883
1164	75729021	CABLE JMPR 883
1165	77644628	PWR CORD ASM 883
1186	75730807	CABLE GND 275
1187	92491020	STRAIN RELIEF 275 883
1196	15164374	FILTER 883

FIGURE 8-20. POWER INPUT AND FILTER BOX



ITEM	IDENT NO	DESCRIPTION	WHERE USED
0276	83492901	PWR ASM (A.C. OPT)	TMA
0430	10127111	SCREW PAN HD MACH	1026
0434	10127123	SCREW PAN HD MACH	276
0434	10127123	SCREW PAN HD MACH	1026
0442	10125606	WASHERS PLAIN	276
0443	10125607	WASHERS PLAIN	1026
0482	10126403	WASH EXT TOOTH LO	276
0639	10126103	WASH INT TOOTH LF	1026
0661	92196007	HUT-SPEED	1026
0698	93592200	SCR TPC HEX PNL	276
0701	10125108	HUT HEX MACH	276 1026
0706	94281426	BR CABLE GROUND	276
0712	10126104	WASH INT TOOTH LK	276
0813	75287700	GASKET - DOOR	276
1013	77610304	PLATE, WARNING	1026
1014	92801001	CLAMP, CABLE	1026
1019	75731301	SYMBOL GRNC (DECAL)	1026
1020	10126105	WASH INT TOOTH LF	1026
1024	83415900	POWER CORD	276
1025	83492701	AC SWCH BX ASM NCR	276
1026	83428902	AC DISTR BX COMMON	276
1027	83442800	CHANNEL-CONTRL NCR	276
1029	83428601	CHASSIS-AC DISTR BX	1026
1031	94806900	RECEPTACLE FEMALE	1026
1032	94807000	RECEPTACLE MALE	1026
1033	62071534	FILTER RT	1026
1034	7572661 J	TERMINAL BLOCK	1026
1035	7572661 J	TERMINAL BLOCK	1026
1036	94241102	CKT BRK-OVERCURRENT	1026
1017	75729011	CABLE-JUMPER GREEN	1026
1018	75729007	CABLE-JUMPER BLACK	1026
1039	75729003	CABLE-JUMPER WHITE	1026
1040	75729001	CABLE-JUMPER YELLOW	1026
1041	75729012	CABLE-JUMPER BLACK	1026
1042	75729022	CABLE-JUMPER WHITE	1026
1043	75729023	CABLE-JUMPER BLACK	1026
1044	75729024	CABLE-JUMPER BLACK	1026
1045	75729025	CABLE-JUMPER WHITE	1026
1047	17901515	SCR THD ROLL	1026
1048	17901519	SCR THD ROLL PAN HD	1026
1049	83478002	LINECORD MODULE STD	1026
1051	75752203	CABLE-CIRCUIT BRKR	1026
1052	93522009	PLUG-SNAP BUTTON	1026
1053	83428700	COVER-CHASSIS	1026
1055	83407505	LABEL, SELF ADHERING	1026
1056	83407518	LABEL, SELF ADHERING	1026



*SUPPLIED AS ONE PART

FIGURE 8-21. POWER ASSEMBLY (AC OPTION)

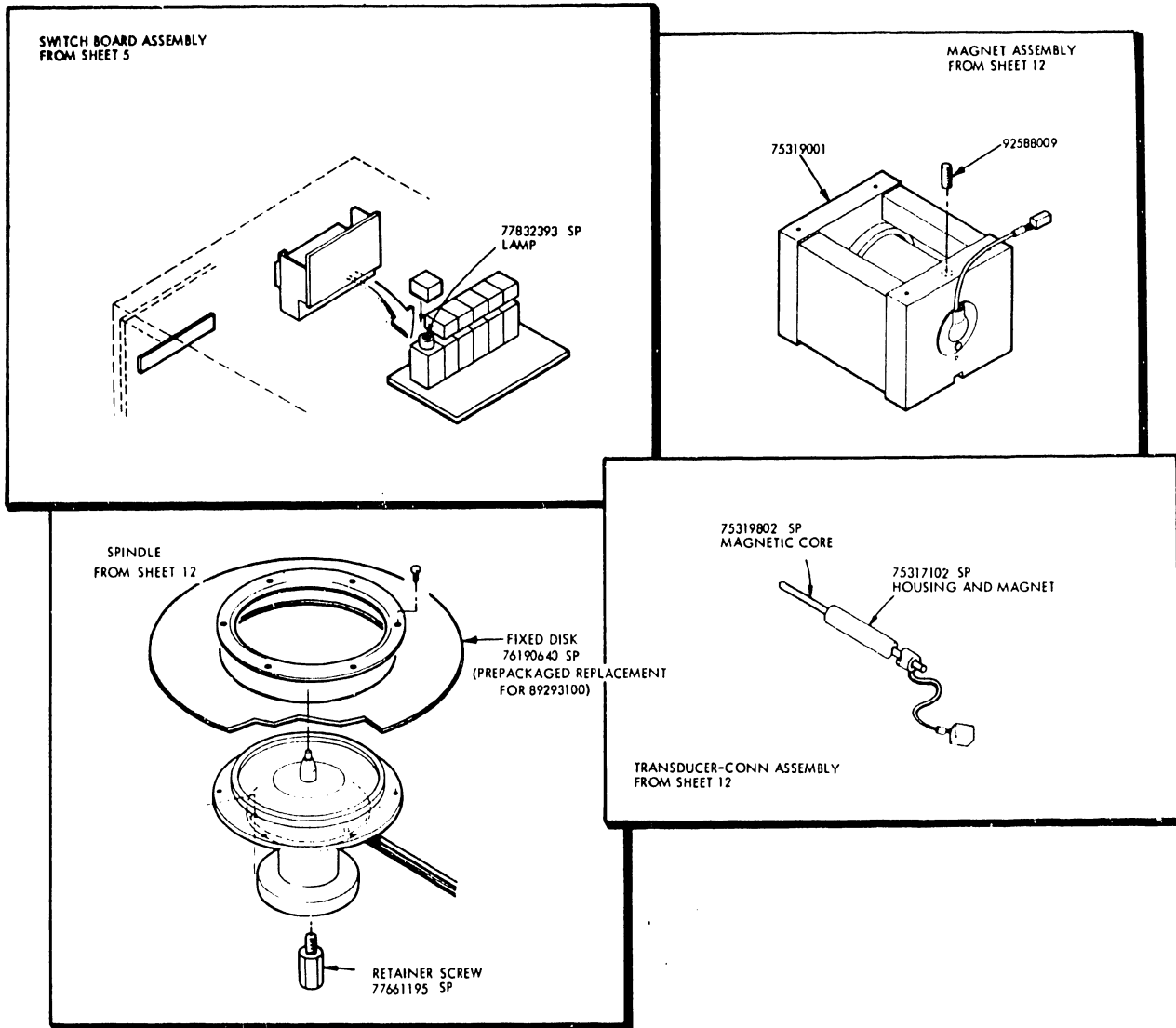


FIGURE 8-22. SPARE PARTS PROVISIONING

ASSEMBLY - COMPONENT PARTS LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET
0150 77658010	WHEEL COVER ASM	TMA	S5	0208 77658013	COLOR OPT CAB	TMA	S23
0152 77658011	WHEEL COVER ASM	TMA	S5	0208 77658014	COLOR OPT CAB	TMA	S21
0153 77658012	WHEEL COVER ASM	TMA	S5	0209 77658014	COLOR OPT CAB	TMA	S21
0162 77661246	COLOR OPT CAB	TMA	S24	0209 77658014	COLOR OPT CAB	TMA	S21
0162 77661246	COLOR OPT CAB	TMA	S5	0209 77658014	COLOR OPT CAB	TMA	S21
0163 77658044	COLOR OPT CAB	TMA	S22	0210 77658014	COLOR OPT CAB	TMA	S21
0163 77658044	COLOR OPT CAB	TMA	S5	0210 77658016	COLOR OPT CAB	TMA	S22
0163 77658044	COLOR OPT CAB	TMA	S21	0210 77658016	COLOR OPT CAB	TMA	S5
0164 77658045	COLOR OPT CAB	TMA	S22	0210 77658016	COLOR OPT CAB	TMA	S21
0164 77658045	COLOR OPT CAB	TMA	S5	0211 77658017	COLOR OPT CAB	TMA	S22
0164 77658045	COLOR OPT CAB	TMA	S21	0211 77658017	COLOR OPT CAB	TMA	S5
0165 77658046	COLOR OPT CAB	TMA	S22	0211 77658017	COLOR OPT CAB	TMA	S21
0165 77658046	COLOR OPT CAB	TMA	S5	0212 77658018	COLOR OPT CAB	TMA	S22
0165 77658046	COLOR OPT CAB	TMA	S21	0212 77658018	COLOR OPT CAB	TMA	S5
0165 77658046	COLOR OPT CAB	TMA	S22	0212 77658018	COLOR OPT CAB	TMA	S21
0166 77658047	COLOR OPT CAB	TMA	S22	0212 77658018	COLOR OPT CAB	TMA	S5
0166 77658047	COLOR OPT CAB	TMA	S5	0213 77658019	COLOR OPT CAB	TMA	S21
0166 77658047	COLOR OPT CAB	TMA	S21	0213 77658019	COLOR OPT CAB	TMA	S5
0167 77658048	COLOR OPT CAB	TMA	S22	0213 77658019	COLOR OPT CAB	TMA	S21
0167 77658048	COLOR OPT CAB	TMA	S5	0214 77658020	COLOR OPT CAB	TMA	S22
0167 77658048	COLOR OPT CAB	TMA	S21	0214 77658020	COLOR OPT CAB	TMA	S5
0168 77658049	COLOR OPT CAB	TMA	S21	0214 77658020	COLOR OPT CAB	TMA	S21
0168 77658049	COLOR OPT CAB	TMA	S5	0214 77658021	COLOR OPT CAB	TMA	S21
0168 77658049	COLOR OPT CAB	TMA	S21	0215 77658021	COLOR OPT CAB	TMA	S22
0168 77658049	COLOR OPT CAB	TMA	S5	0215 77658021	COLOR OPT CAB	TMA	S21
0169 77658050	COLOR OPT CAB	TMA	S22	0215 77658021	COLOR OPT CAB	TMA	S21
0169 77658050	COLOR OPT CAB	TMA	S5	0216 77658022	COLOR OPT CAB	TMA	S22
0169 77658050	COLOR OPT CAB	TMA	S21	0216 77658022	COLOR OPT CAB	TMA	S5
0169 77658050	COLOR OPT CAB	TMA	S22	0216 77658023	COLOR OPT CAB	TMA	S21
0170 77658051	COLOR OPT CAB	TMA	S21	0216 77658023	COLOR OPT CAB	TMA	S5
0170 77658051	COLOR OPT CAB	TMA	S5	0217 77658024	COLOR OPT CAB	TMA	S21
0170 77658051	COLOR OPT CAB	TMA	S21	0217 77658024	COLOR OPT CAB	TMA	S5
0171 77658052	COLOR OPT CAB	TMA	S5	0217 77658024	COLOR OPT CAB	TMA	S21
0171 77658052	COLOR OPT CAB	TMA	S21	0218 77658025	COLOR OPT CAB	TMA	S22
0171 77658052	COLOR OPT CAB	TMA	S22	0218 77658025	COLOR OPT CAB	TMA	S5
0172 77658053	COLOR OPT CAB	TMA	S23	0218 77658025	COLOR OPT CAB	TMA	S21
0172 77658053	COLOR OPT CAB	TMA	S5	0218 77658025	COLOR OPT CAB	TMA	S22
0172 77658053	COLOR OPT CAB	TMA	S21	0219 77658026	COLOR OPT CAB	TMA	S5
0172 77658053	COLOR OPT CAB	TMA	S22	0219 77658026	COLOR OPT CAB	TMA	S21
0173 77658054	COLOR OPT CAB	TMA	S23	0219 77658026	COLOR OPT CAB	TMA	S22
0173 77658054	COLOR OPT CAB	TMA	S05	0220 77658027	COLOR OPT CAB	TMA	S5
0173 77658054	COLOR OPT CAB	TMA	S21	0220 77658027	COLOR OPT CAB	TMA	S21
0183 83442534	COLOR OPT RR MT (1020)	TMA	S30	0220 77658027	COLOR OPT CAB	TMA	S22
0183 83442534	COLOR OPT RR MT (1020)	TMA	S5	0220 77658027	COLOR OPT CAB	TMA	S21
0184 83442535	COLOR OPT RR MT (0648)	TMA	S30	0220 77658027	COLOR OPT CAB	TMA	S22
0184 83442535	COLOR OPT RR MT (0648)	TMA	S5	0221 77658028	COLOR OPT CAB	TMA	S5
0184 83442535	COLOR OPT RR MT (0648)	TMA	S21	0221 77658028	COLOR OPT CAB	TMA	S21
0185 83442536	COLOR OPT RR MT (0592)	TMA	S30	0221 77658028	COLOR OPT CAB	TMA	S22
0185 83442536	COLOR OPT RR MT (0592)	TMA	S5	0222 77658030	COLOR OPT CAB	TMA	S5
0186 83442537	COLOR OPT RR MT (0440)	TMA	S30	0222 77658030	COLOR OPT CAB	TMA	S21
0186 83442537	COLOR OPT RR MT (0440)	TMA	S5	0222 77658030	COLOR OPT CAB	TMA	S22
0187 83442538	COLOR OPT RR MT (1188)	TMA	S30	0223 77658031	COLOR OPT CAB	TMA	S5
0187 83442538	COLOR OPT RR MT (1188)	TMA	S5	0223 77658031	COLOR OPT CAB	TMA	S21
0188 83442529	COLOR OPT RR MT (0416)	TMA	S30	0223 77658031	COLOR OPT CAB	TMA	S22
0188 83442529	COLOR OPT RR MT (0416)	TMA	S5	0224 77658032	COLOR OPT CAB	TMA	S5
0189 83442526	COLOR OPT RR MT (0409)	TMA	S30	0224 77658032	COLOR OPT CAB	TMA	S21
0189 83442526	COLOR OPT RR MT (0409)	TMA	S5	0224 77658032	COLOR OPT CAB	TMA	S22
0190 7580915	NAMEPLATE	TMA	S5	0224 77658032	COLOR OPT CAB	TMA	S21
0191 77611483	NAMEPLATE	TMA	S5	0224 77658032	COLOR OPT CAB	TMA	S22
0192 83443511	RACK MT ASM	TMA	S27	0224 77658032	COLOR OPT CAB	TMA	S21
0192 83443511	RACK MT ASM	TMA	S5	0225 77658033	COLOR OPT CAB	TMA	S22
0193 83443512	RACK MT ASM	TMA	S27	0225 77658033	COLOR OPT CAB	TMA	S5
0193 83443512	RACK MT ASM	TMA	S5	0225 77658033	COLOR OPT CAB	TMA	S21
0194 83443513	RACK MT ASM	TMA	S5	0225 77658033	COLOR OPT CAB	TMA	S22
0194 83443513	RACK MT ASM	TMA	S25	0226 77658034	COLOR OPT CAB	TMA	S5
0195 83443514	RACK MT ASM	TMA	S5	0226 77658034	COLOR OPT CAB	TMA	S21
0195 83443514	RACK MT ASM	TMA	S25	0226 77658034	COLOR OPT CAB	TMA	S22
0198 77657303	BASE FRAME (SPECIAL)	TMA	S29	0226 77658034	COLOR OPT CAB	TMA	S5
0198 77657303	BASE FRAME (SPECIAL)	TMA	S5	0227 83443510	RACK MT ASM	TMA	S21
0199 83442309	BASE FR ASM	TMA	S19	0227 83443510	RACK MT ASM	TMA	S27
0199 83442309	BASE FR ASM	TMA	S5	0227 83443510	RACK MT ASM	TMA	S5
0200 83442310	BASE FR ASM	TMA	S19	0228 75804907	RACK MT ASM	TMA	S26
0200 83442310	BASE FR ASM	TMA	S5	0228 75804907	RACK MT ASM	TMA	S5
0201 83442311	BASE FR ASM	TMA	S19	0229 83443504	RACK MT ASM	TMA	S25
0201 83442311	BASE FR ASM	TMA	S5	0229 83443504	RACK MT ASM	TMA	S5
0202 83442312	BASE FR ASM	TMA	S19	0230 75804908	RACK MT ASM	TMA	S26
0202 83442312	BASE FR ASM	TMA	S5	0230 75804908	RACK MT ASM	TMA	S5
0203 83442313	BASE FR ASM	TMA	S19	0231 83443506	RACK MT ASM	TMA	S25
0203 83442313	BASE FR ASM	TMA	S5	0231 83443506	RACK MT ASM	TMA	S5
0204 77658009	COLOR OPT CAB	TMA	S22	0232 83443507	RACK MT ASM	TMA	S25
0204 77658009	COLOR OPT CAB	TMA	S5	0232 83443507	RACK MT ASM	TMA	S5
0204 77658009	COLOR OPT CAB	TMA	S23	0233 83443509	RACK MT ASM	TMA	S25
0204 77658009	COLOR OPT CAB	TMA	S5	0233 83443509	RACK MT ASM	TMA	S5
0205 77658010	COLOR OPT CAB	TMA	S22	0234 83442501	COLOR OPT RR MT(1066)	TMA	S30
0205 77658010	COLOR OPT CAB	TMA	S5	0234 83442501	COLOR OPT RR MT(1066)	TMA	S5
0205 77658010	COLOR OPT CAB	TMA	S21	0235 83442502	COLOR OPT RR MT(0545)	TMA	S30
0205 77658010	COLOR OPT CAB	TMA	S21	0235 83442502	COLOR OPT RR MT(0545)	TMA	S5
0206 77658011	COLOR OPT CAB	TMA	S22	0236 83442503	COLOR OPT RR MT(0547)	TMA	S30
0206 77658011	COLOR OPT CAB	TMA	S5	0236 83442503	COLOR OPT RR MT(0547)	TMA	S5
0206 77658011	COLOR OPT CAB	TMA	S21	0237 83442505	COLOR OPT RR MT(0547)	TMA	S30
0206 77658011	COLOR OPT CAB	TMA	S21	0237 83442505	COLOR OPT RR MT(0547)	TMA	S5
0207 77658012	COLOR OPT CAB	TMA	S22	0238 83442506	COLOR OPT RR MT(0625)	TMA	S30
0207 77658012	COLOR OPT CAB	TMA	S5	0238 83442506	COLOR OPT RR MT(0625)	TMA	S5
0207 77658012	COLOR OPT CAB	TMA	S23	0239 83442507	COLOR OPT RR MT(0627)	TMA	S30
0207 77658012	COLOR OPT CAB	TMA	S21	0239 83442507	COLOR OPT RR MT(0627)	TMA	S5
0208 77658013	COLOR OPT CAB	TMA	S22	0240 83442508	COLOR OPT RR MT(0561)	TMA	S30
0208 77658013	COLOR OPT CAB	TMA	S5	0240 83442508	COLOR OPT RR MT(0561)	TMA	S5

ASSEMBLY - COMPONENT PARTS LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET
0241	83442509	COLOR OPT RE MT(0649)	TMA	0298	77658041	COLOR OPT CAB	TMA
0241	83442509	COLOR OPT RK MT(0649)	TMA	0298	77658041	COLOR OPT CAB	TMA
0242	83442510	COLOR OPT RK MT(0650)	TMA	0298	77658041	COLOR OPT CAB	TMA
0242	83442510	COLOR OPT RK MT(0650)	TMA	0298	77658041	COLOR OPT CAB	TMA
0243	83442511	COLOR OPT RK MT(0545)	TMA	0299	77658042	COLOR OPT CAB	TMA
0243	83442511	COLOR OPT RK MT(0545)	TMA	0299	77658042	COLOR OPT CAB	TMA
0244	83442527	COLOR OPT RE MT(0E47)	TMA	0299	77658042	COLOR OPT CAB	TMA
0244	83442527	COLOR OPT RK MT(0E47)	TMA	0299	77658042	COLOR OPT CAB	TMA
0245	83442513	COLOR OPT RK MT(05E2)	TMA	0300	77658043	COLOR OPT CAB	TMA
0245	83442513	COLOR OPT RK MT(05E2)	TMA	0300	77658043	COLOR OPT CAB	TMA
0246	83442514	COLOR OPT RK MT(1063)	TMA	0300	77658043	COLOR OPT CAB	TMA
0246	83442514	COLOR OPT RK MT(1063)	TMA	0300	77658043	COLOR OPT CAB	TMA
0247	83442504	COLOR OPT RE MT(0418)	TMA	0301	83429802	HAWK CORNER PARTS	MOI
0247	83442504	COLOR OPT RK MT(0418)	TMA	0301	83429802	HAWK CORNER PARTS	MOI
0248	83442516	COLOR OPT RE MT(10BB)	TMA	0301	83429802	HAWK CORNER PARTS	MOI
0248	83442516	COLOR OPT RK MT(10BB)	TMA	0301	83429802	HAWK CORNER PARTS	MOI
0249	75305707	TERMINATOR	TMA	0307	75740123	HEAD OPTICR	MOI
0249	75305707	TERMINATOR	TMA	0307	75740123	HEAD OPTICR	MOI
0251	75305703	TERMINATOR	TMA	0308	75740119	HEAD OPTICR	MOI
0251	75305703	TERMINATOR	TMA	0308	75740119	HEAD OPTICR	MOI
0252	75305704	TERMINATOR	TMA	0309	75740115	HEAD OPTICR	MOI
0252	75305704	TERMINATOR	TMA	0309	75740115	HEAD OPTICR	MOI
0253	75305706	TERMINATOR	TMA	0310	75740113	HEAD OPTICR	MOI
0253	75305706	TERMINATOR	TMA	0310	75740113	HEAD OPTICR	MOI
0254	75305705	TERMINATOR	TMA	0311	75740121	HEAD OPTICR	MOI
0254	75305705	TERMINATOR	TMA	0311	75740121	HEAD OPTICR	MOI
0255	75778701	LIMLOCK	TMA	0312	75740124	HEAD OPTICR	MOI
0256	75778705	LIMLOCK	TMA	0312	75740124	HEAD OPTICR	MOI
0257	75778710	LIMLOCK	TMA	0313	75740117	HEAD OPTICR	MOI
0258	75778721	LIMLOCK	TMA	0313	75740117	HEAD OPTICR	MOI
0259	75692986	LIMLOCK	TMA	0314	75740116	HEAD OPTICR	MOI
0260	75778717	POWER CTRL	TMA	0314	75740116	HEAD OPTICR	MOI
0261	75795401	NAMPLATE (942-H)	TMA	0315	75740114	HEAD OPTICR	MOI
0262	75795402	NAMPLATE (95NK)	TMA	0315	75740114	HEAD OPTICR	MOI
0263	75795404	NAMPLATE (ASB)	TMA	0319	77834644	COVER ELECT ASM	MOI
0264	75795405	NAMPLATE (ASB)	TMA	0320	75740606	HZ RPM IR OPT	MOI
0265	75795406	NAMPLATE	TMA	0320	75740606	HZ RPM IR OPT	MOI
0266	75795406	NAMPLATE	TMA	0320	75740606	HZ RPM IR OPT	MOI
0267	75795309	1-C OPT CAB	TMA	0321	75740601	HZ RPM IR OPT	MOI
0267	75795309	1-C OPT CAB	TMA	0321	75740601	HZ RPM IR OPT	MOI
0268	75795307	1-C OPT CAB	TMA	0321	75740601	HZ RPM IR OPT	MOI
0268	75795307	1-C OPT CAB	TMA	0322	75740602	HZ RPM IR OPT	MOI
0269	75795308	1-C OPT CAB	TMA	0322	75740602	HZ RPM IR OPT	MOI
0269	75795308	1-C OPT CAB	TMA	0322	75740602	HZ RPM IR OPT	MOI
0270	75697977	POWER CTRL	TMA	0323	75740605	HZ RPM IR OPT	MOI
0271	75697971	POWER CTRL	TMA	0323	75740605	HZ RPM IR OPT	MOI
0272	75778724	LIMLOCK	TMA	0323	75740605	HZ RPM IR OPT	MOI
0273	77830537	CL LABEL	TMA	0327	77655001	PWR SUPPLY ASM	MOI
0274	77830538	LABEL - CSA	TMA	0327	77655001	PWR SUPPLY ASM	MOI
0275	77599402	PWR ASM (INPUT)	TMA	0328	77655004	PWR SUPPLY ASM	MOI
0275	77599402	PWR ASM (INPUT)	TMA	0328	77655004	PWR SUPPLY ASM	MOI
0276	83492901	PWR ASM (A.C. OPT)	TMA	0329	77655002	PWR SUPPLY ASM	MOI
0276	83492901	PWR ASM (A.C. OPT)	TMA	0329	77655002	PWR SUPPLY ASM	MOI
0277	15165427	POWER CAL	TMA	0332	75795214	1-C OPTICR RACK RT	MOI
0278	75897155	NAMPLATE	TMA	0334	75795216	1-C OPTICR RACK RT	MOI
0279	94238913	LABEL CSA	TMA	0335	75795215	1-C OPTICR RACK RT	MOI
0280	77660374	LICO CORR OPT	TMA	0336	75795217	1-C OPTICR RACK RT	MOI
0281	77644633	PWR INPUT CHL KIT	TMA	0337	75795218	1-C OPTICR RACK RT	MOI
0282	94224651	LABEL - INFO	TMA	0338	75795219	1-C OPTICR RACK RT	MOI
0282	94224651	LABEL-INFO	209	0339	75795221	1-C OPTICR RACK RT	MOI
0283	83442525	COLOR OPT RK MT(0994)	TMA	0340	75795223	1-C OPTICR RACK RT	MOI
0283	83442525	COLOR OPT RE MT(0994)	TMA	0341	75795213	1-C OPTICR RACK RT	MOI
0284	83442524	COLOR OPT RE MT(0995)	TMA	0342	75795222	1-C OPTICR RACK RT	MOI
0284	83442524	COLOR OPT RE MT(0995)	TMA	0343	75795224	1-C OPTICR RACK RT	MOI
0285	83442517	COLOR OPT RE MT(1092)	TMA	0344	83444404	SPINDLE DR	MOI
0285	83442517	COLOR OPT RK MT(1092)	TMA	0345	83444405	SPINDLE DRIVE ASM	MOI
0286	83442518	COLOR OPT RK MT(1106)	TMA	0346	83474909	BRAKE & SPINDLE DR	MOI
0286	83442518	COLOR OPT RK MT(1106)	TMA	0346	83474909	BRAKE & SPINDLE DR	MOI
0287	83442526	COLOR OPT RK MT(0897)	TMA	0347	83474908	BRAKE & SPINDLE DR	MOI
0287	83442526	COLOR OPT RE MT(0897)	TMA	0348	94279017	CABLE JUMPER	MOI
0288	83442521	COLOR OPT RK MT(1141)	TMA	0349	94238907	LABEL CAUTION	MOI
0288	83442521	COLOR OPT RK MT(1141)	TMA	0350	63451700	GROUND STRAP	MOI
0289	83442520	COLOR OPT RE MT(0607)	TMA	0351	77638531	GASKET LOWER	MOI
0289	83442520	COLOR OPT RE MT(0607)	TMA	0352	75684878	GROUND STRAP	MOI
0290	83442522	COLOR OPT RK MT(1140)	TMA	0353	83437400	FILTER-AIR	MOI
0290	83442522	COLOR OPT RK MT(1140)	TMA	0354	83437401	FILTER-AIR	MOI
0291	83442523	COLOR OPT RE MT(0547)	TMA	0355	75896480	COVER ELECTRONICS	MOI
0292	77658035	COLOR OPT CAB	TMA	0356	83410562	GASKET STRIP	MOI
0292	77658035	COLOR OPT CAB	TMA	0356	83410562	GASKET STRIP	MOI
0292	77658035	COLOR OPT CAB	TMA	0357	77619697	GASKET	MOI
0293	77658036	COLOR OPT CAB	TMA	0358	83466001	BRUSH DRIVE ASM	MOI
0293	77658036	COLOR OPT CAB	TMA	0359	75886347	IDENT PLATE	MOI
0293	77658036	COLOR OPT CAB	TMA	0360	77834644	COVER ELECTRONICS	MOI
0294	77658037	COLOR OPT CAB	TMA	0400	83456502	BASE LOCK-MACHINED	MOI
0294	77658037	COLOR OPT CAB	TMA	0400	83456502	BASE LOCK-MACHINED	MOI
0295	77658038	COLOR OPT CAB	TMA	0401	83451403	CARTRIDGE RLC	MOI
0295	77658038	COLOR OPT CAB	TMA	0402	83494802	PLATE-AC CARTR	MOI
0295	77658038	COLOR OPT CAB	TMA	0403	75286702	SPINDLE	MOI
0296	77658039	COLOR OPT CAB	TMA	0404	75316008	ACTUATOR ASM	MOI
0296	77658039	COLOR OPT CAB	TMA	0404	75316008	ACTUATOR ASM	MOI
0296	77658039	COLOR OPT CAB	TMA	0405	75319001	MAGNET ASM	MOI
0296	77658039	COLOR OPT CAB	TMA	0406	95125324	LOCTITE	MOI
0297	77658040	COLOR OPT CAB	TMA	0406	95125324	LOCTITE	MOI
0297	77658040	COLOR OPT CAB	TMA	0407	75317102	TRANSDUCER-CORN ASM	MOI
0297	77658040	COLOR OPT CAB	TMA	0408	46317900	CAP-TRANSDUCER ERD	MOI
0297	77658040	COLOR OPT CAB	TMA	0409	83440314	FRONT PNL RACK PAINT	MOI

ASSEMBLY - COMPONENT PARTS LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET
0410 7759000	BRACKET-CONNECTOR	301	S12	0443 10125607	WASHERS PLAIN	500 776 778	S10
0411 94277400	TIE WRAP	346	S8	0444 10125600	WASHERS SPR	301	S17
0411 94277400	TIE WRAP	345	S7	0444 10125600	WASHERS SPR	423	S17
0412 75749000	STANDOFF CLAMP	301	S13	0445 10125604	WASHERS SPR LOCK	345	S7
0413 75748903	CLAMP FILTER	301	S13	0445 10125604	WASHERS SPR LOCK	564 1007	S29
0414 75008100	EXPANDER-BLOWER	301	S13	0445 10125604	WASHERS SPR LOCK	194 195	S25
0415 75749201	EXPANDER-EXPANDER	301	S13	0445 10125604	WASHERS SPR LOCK	229 231-233	S25
0416 00442121	FRONT PNL RACK PAINT	186	S0	0445 10125604	WASHERS SPR LOCK	227	S27
0417 10127112	SCREW PAN HD MACH	564 779 780	S9	0445 10125604	WASHERS SPR LOCK	301	S16
0417 10127112	SCREW PAN HD MACH	301	S11	0445 10125604	WASHERS SPR LOCK	519	S19
0417 10127112	SCREW PAN HD MACH	485	S18	0445 10125604	WASHERS SPR LOCK	464	S15
0417 10127112	SCREW PAN HD MACH	346	S8	0445 10125604	WASHERS SPR LOCK	003	S12
0417 10127112	SCREW PAN HD MACH	345	S7	0445 10125604	WASHERS SPR LOCK	464	S16
0418 00442103	FRONT PNL RACK	247	S30	0445 10125604	WASHERS SPR LOCK	713	S26
0419 00592002	SCREW	500 776 778	S10	0445 10125604	WASHERS SPR LOCK	267-269	S31
0420 89291100	DISK FIXEL, RECORDING	301	S12	0445 10125604	WASHERS SPR LOCK	228 230	S26
0421 75266900	CLAMP - FISC	301	S12	0445 10125604	WASHERS SPR LOCK	132 134-143	S6
0422 75292301	TRANSDUCER CAM ASM	301	S12	0445 10125604	WASHERS SPR LOCK	267-269	S31
0423 75315405	TRANSDUCER SCALE ASM	301	S17	0445 10125604	WASHERS SPR LOCK	346	S8
0424 75315405	TRANSDUCER SCALE ASM	301	S12	0445 10125604	WASHERS SPR LOCK	301	S11
0424 75276203	SPACER RYLER	301	S17	0445 10125604	WASHERS SPR LOCK	011	S12
0425 75292701	BAR EXPANSION MACHINE	301	S12	0445 10125604	WASHERS SPR LOCK	301	S13
0425 75292701	BAR EXPANSION MACHINE	301	S17	0445 10125604	WASHERS SPR LOCK	301	S17
0426 75285069	FUSE	346	S6	0446 10125603	WASHERS SPR LOCK	301	S11
0427 10126209	SCR-SOC HP CAP	301	S17	0446 10125603	WASHERS SPR LOCK	470	S14
0428 92015096	SCREW CAP SOC HP	301	S17	0446 10125603	WASHERS SPR LOCK	526	S16
0428 92015096	SCREW CAP SOC HL	404	S12	0446 10125603	WASHERS SPR LOCK	564 779 780	S9
0429 00815096	SCREW SELF LOCKING 4	301	S12	0446 10125603	WASHERS SPR LOCK	346	S8
0429 00815096	SCREW SELF LOCKING 4	301	S17	0446 10125603	WASHERS SPR LOCK	301	S12
0429 00815096	SCREW SELF LOCKING 4	301	S12	0446 10125603	WASHERS SPR LOCK	358 519	S18
0430 10127111	SCREW PAN HD MACH	500 519	S18	0446 10125603	WASHERS SPR LOCK	500 776 778	S10
0430 10127111	SCREW PAN HD MACH	ALL OPTIONS	S21	0446 10125603	WASHERS SPR LOCK	404	S15
0430 10127111	SCREW PAN HD MACH	1026	S13	0446 10125603	WASHERS SPR LOCK	301	S17
0430 10127111	SCREW PAN HD MACH	301	S12	0447 10126228	SCR HEX SOC HL	301	S10
0430 10127111	SCREW PAN HD MACH	162	S24	0447 10126228	SCR HEX SOC HL	500 776 778	S10
0430 10127111	SCREW PAN HD MACH	500 776 778	S10	0448 10125805	WASHERS SPR LOCK	713	S28
0430 10127111	SCREW PAN HD MACH	528	S15	0448 10125805	WASHERS SPR LOCK	564 1007	S29
0431 10127113	SCREW PAN HD MACH	301	S12	0448 10125805	WASHERS SPR LOCK	301	S11
0431 10127113	SCREW PAN HD MACH	470	S14	0448 10125805	WASHERS SPR LOCK	301	S12
0431 10127113	SCREW PAN HD MACH	345	S15	0449 10125105	NUT HEX MACH	346	S8
0431 10127113	SCREW PAN HD MACH	346	S6	0449 10125105	NUT HEX MACH	199-203	S19
0431 10127113	SCREW PAN HD MACH	301	S18	0449 10125105	NUT HEX MACH	301	S21
0432 10127121	SCREW PAN HD MACH	301	S18	0449 10125105	NUT HEX MACH	****	S11
0432 10127121	SCREW PAN HD MACH	713	S28	0449 10125105	NUT HEX MACH	470	S14
0432 10127121	SCREW PAN HD MACH	519	S16	0449 10125105	NUT HEX MACH	345	S7
0432 10127121	SCREW PAN HD MACH	564 1007	S29	0449 10125105	NUT HEX MACH	198	S20
0432 10127121	SCREW PAN HD MACH	301	S11	0449 10125105	NUT HEX MACH	162	S24
0432 10127121	SCREW PAN HD MACH	163 169	S22	0450 75792600	TRIMP	416	S17
0432 10127121	SCREW PAN HD MACH	301	S12	0451 75806504	WASHER-REDUCT	ALL OPTIONS	S21
0432 10127121	SCREW PAN HD MACH	301	S13	0451 75806504	WASHER-REDUCT	162	S24
0433 92742201	SCREW PAN HD MACH	301	S13	0451 75806504	WASHER-REDUCT	301	S17
0434 10127123	SCREW PAN HD MACH	713	S28	0451 75806504	WASHER-REDUCT	519	S16
0434 10127123	SCREW PAN HD MACH	301	S13	0451 75806504	WASHER-REDUCT	301	S13
0434 10127123	SCREW PAN HD MACH	301	S11	0452 95043248	TRMP INSULATOR	500 776 778	S10
0434 10127123	SCREW PAN HD MACH	564	S29	0453 51568605	WASHER	301	S11
0434 10127123	SCREW PAN HD MACH	227	S27	0454 92742222	SCREW PH HL MACH	301	S11
0434 10127123	SCREW PAN HD MACH	276	S33	0455 75796902	TAPPER-CSCILLATION	301	S12
0434 10127123	SCREW PAN HD MACH	1626	S35	0456 75313921	ALUMINUM RUBBER PASE	301	S12
0434 10127123	SCREW PAN HD MACH	275 863	S32	0457 75800400	PIE-ACTUATOR ALIGNMENT	301	S12
0435 10126255	SCR SOC HL	301	S17	0458 10125106	NUT HEX MACH	564 1007	S29
0435 10126255	SCR SOC HL	301	S12	0458 10125106	NUT HEX MACH	162	S24
0436 77657475	CIRCUIT BRKR BOX	500 776 778	S10	0458 10125106	NUT HEX MACH	275 863	S32
0437 92015197	SCREW CAP SOC HL	301	S12	0458 10125106	NUT HEX MACH	****	S21
0437 92015197	SCREW CAP SOC HD	301	S17	0458 10125106	NUT HEX MACH	500 776 778	S10
0438 92015229	SCREW CAP SOC HD	301	S12	0458 10125106	NUT HEX MACH	713	S28
0439 10125602	WASHERS PLAIN	301	S17	0458 10125106	NUT HEX MACH	404	S15
0439 10125602	WASHERS PLAIN	404	S15	0459 92054227	CR BAKING BALL	416	S17
0439 10125602	WASHERS PLAIN	358	S18	0460 24547502	PLATE, WARNING	301	S11
0440 00442129	FRONT PANEEL RACK PAINT	186	S30	0460 24547502	PLATE, WARNING	301	S13
0441 10125605	WASHERS PLAIN	500 776 778	S10	0461 10126402	WASH EXT TOOTH LO	301	S13
0441 10125605	WASHERS PLAIN	301	S11	0461 10126402	WASH EXT TOOTH LO	237 243	S30
0441 10125605	WASHERS PLAIN	345	S7	0461 10126402	WASH EXT TOOTH LO	194 229 231 232	S25
0441 10125605	WASHERS PLAIN	346	S8	0461 10126402	WASH EXT TOOTH LO	500 776 778	S10
0441 10125605	WASHERS PLAIN	327 329	S9	0461 10126402	WASH EXT TOOTH LO	227	S27
0441 10125605	WASHERS PLAIN	779	S9	0461 10126402	WASH EXT TOOTH LO	199 200 202 203	S19
0441 10125605	WASHERS PLAIN	485	S18	0461 10126402	WASH EXT TOOTH LO	****	S22
0441 10125605	WASHERS PLAIN	470	S14	0461 10126402	WASH EXT TOOTH LO	198	S20
0441 10125605	WASHERS PLAIN	301	S12	0461 10126402	WASH EXT TOOTH LO	162	S24
0441 10125605	WASHERS PLAIN	404	S15	0461 10126402	WASH EXT TOOTH LO	301	S11
0441 10125605	WASHERS PLAIN	519	S18	0462 51853006	CLAMP, CABLE ADHESIVE	301	S13
0441 10125605	WASHERS PLAIN	301	S13	0462 51853006	CLAMP, CABLE ADHESIVE	301	S12
0442 10125606	WASHERS PLAIN	301	S11	0463 75800602	RETRACT HARNLESS ASM	301	S12
0442 10125606	WASHERS PLAIN	276	S13	0464 75739501	FRE-AMP HARNLESS ASM	301	S12
0442 10125606	WASHERS PLAIN	162	S24	0465 75739701	SWITCH BOARD HARNLESS	301	S12
0442 10125606	WASHERS PLAIN	275 863	S32	0466 92021004	PIR, DOWEL	301	S12
0442 10125606	WASHERS PLAIN	194 195 229	S25	0466 92021004	PIR, DOWEL	301	S13
0442 10125606	WASHERS PLAIN	226	S26	0466 92021004	PIR, DOWEL	423	S17
0442 10125606	WASHERS PLAIN	ALL OPTIONS	S22	0467 51853005	CLAMP	301	S12
0442 10125606	WASHERS PLAIN	193 227	S27	0467 51853005	CLAMP	301	S13
0442 10125606	WASHERS PLAIN	301	S18	0468 10127125	SCREW PAN HD MACH	301	S13
0442 10125606	WASHERS PLAIN	404	S15	0468 10127125	SCREW PAN HD MACH	494	S16
0442 10125606	WASHERS PLAIN	404	S16	0468 10127125	SCREW PAN HD MACH	267 275	S32
0442 10125606	WASHERS PLAIN	ALL OPTIONS	S21	0468 10127125	SCREW PAN HD MACH	262 203	S19
0443 10125607	WASHERS PLAIN	194 195 229 233	S25	0469 95125305	LOCTITE GRADL C	301	S17
0443 10125607	WASHERS PLAIN	275	S32	0469 95125305	LOCTITE GRADL C	301	S12
0443 10125607	WASHERS PLAIN	1026	S33	0470 75308012	CARD CAGE ASM, C	301	S11
0443 10125607	WASHERS PLAIN	228 230	S26	0470 75308012	CARD CAGE ASM	301	S14
0443 10125607	WASHERS PLAIN	193 227	S27	0471 92824097	SCREW CAP	423	S17
0443 10125607	WASHERS PLAIN	301	S13	0472 10127114	SCR PAN HD	301	S12
0443 10125607	WASHERS PLAIN	301	S12	0472 10127114	SCR PAN HD	470	S14
0443 10125607	WASHERS PLAIN	202 203	S19	0472 10127114	SCR PAN HD	301	S11
0443 10125607	WASHERS PLAIN	237 243	S30	0472 10127114	SCR PAN HD	301	S13

ASSEMBLY - COMPONENT PARTS LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET
0473 46334400	LABEL-CAUTION	301	S11	0534 93623000	BUMPER, RUBBER	199-203	S19
0474 77658252	PLATE-IND PWR SUP	301	S11	0535 73228200	PLATE-ARM CLAMP	404	S16
0475 77840539	IDENT PLATE-PRODUCT	301	S12	0536 75296101	WASHER PHENOLIC	404	S16
0476 75797100	STAND OFF	301	S17	0536 75296101	WASHER PHENOLIC	404	S16
0477 10126215	SCREW CAP SOC HD	301	S17	0537 75296201	SPACER PHENOLIC	404	S16
0478 10125603	WASHERS PLAIN	404	S15	0537 75296201	SPACER PHENOLIC	404	S16
0478 10125603	WASHERS PLAIN	528	S15	0538 73555300	STRIP-BACKUP	404	S16
0478 10125603	WASHERS PLAIN	301	S17	0539 75797500	LEAD-FLEX COLL PK	404	S15
0478 10125603	WASHERS PLAIN	779	S9	0539 75797500	LEAD-FLEX COLL PK	404	S15
0479 10125801	WASHERS SPR LOCK	404	S16	0540 73555101	INSULATOR-FLEX LEAD	404	S15
0479 10125801	WASHERS SPR LOCK	528	S15	0540 73555101	INSULATOR-FLEX LEAD	404	S15
0479 10125801	WASHERS SPR LOCK	346	S8	0541 75980502	SW SUBMINIATURE	404	S15
0479 10125801	WASHERS SPR LOCK	404	S15	0542 75800502	CELL POWER HARNESS	404	S15
0479 10125801	WASHERS SPR LOCK	779	S9	0543 10127169	SCREW PAN HD MACH	404	S15
0479 10125801	WASHERS SPR LOCK	301	S17	0544 10126213	SCREW PAN HI MACH	404	S15
0480 12211011	LUBRPLATE J0-AA	301	S12	0545 83442106	FRONT PNL RACK PAINT	235 243	S29
0481 77635140	GROUND STRAP	301	S11	0546 10127124	SCREW PAN HI MACH	162	S24
0481 77635140	GROUND STRAP	301	S13	0546 10127124	SCREW PAN HI MACH	564 1007	S29
0482 10126403	WASH EXT TOOTH LG	564 780	S9	0546 10127124	SCREW PAN HI MACH	227	S27
0482 10126403	WASH EXT TOOTH LG	301	S12	0546 10127124	SCREW PAN HI MACH	229 231 232	S25
0482 10126403	WASH EXT TOOTH LG	199-203	S19	0546 10127124	SCREW PAN HI MACH	301	S12
0482 10126403	WASH EXT TOOTH LG	196	S20	0546 10127124	SCREW PAN HI MACH	404	S15
0482 10126403	WASH EXT TOOTH LG	500 776 778	S10	0546 10127124	SCREW PAN HI MACH	ALL OPTIONS	S21
0482 10126403	WASH EXT TOOTH LG	276	S33	0546 10127124	SCREW PAN HI MACH	749	S26
0483 75769100	LABEL-SWITCH	301	S11	0546 10127124	SCREW PAN HI MACH	236 237 291	S30
0484 10127122	SCREW PAN HI MACH	500 776 778	S10	0547 83442109	FRONT PNL RACK PAINT	227	S23
0484 10127122	SCREW PAN HI MACH	727	S27	0548 83442143	PNL TOP CYS BEAK	404	S15
0484 10127122	SCREW PAN HI MACH	237 243	S20	0549 92015100	SCREW CAP SOC HD	404	S15
0484 10127122	SCREW PAN HI MACH	332 334-343	S6	0551 92015105	SCREW CAP SOC HD	404	S15
0484 10127122	SCREW PAN HI MACH	199 229 231 232	S25	0551 92015105	SCREW CAP SOC HD	404	S15
0485 83451003	MAGNETIC SENSOR ASS	301	S18	0552 83443743	PNL TOP CYS BE	227	S23
0486 83451003	MAGNETIC SENSOR ASS	301	S11	0554 83443844	PNL TOP CYS LH	227	S23
0486 75800261	FRONT PANEL	228	S26	0555 75807562	SPACER	01	S13
0487 94655401	PIV. FITCH	301	S12	0556 10126101	WASH INT TOOTH LF	500 776 778	S15
0488 83415003	LABEL	404	S15	0557 10126100	WASH INT TOOTH LF	156	S18
0489 83415007	LABEL	301	S11	0557 10126100	WASH INT TOOTH LF	404	S15
0489 83415007	LABEL	301	S12	0558 83444714	JUMPER ASM	267-269	S31
0490 77611458	ADHESIVE	301	S17	0559 75736604	RESISTOR MODULE 1K	251 252	S31
0492 95069402	SPACER-BASS	01	S11	0560 83451810	INSULATOR	228	S26
0493 10127140	SCREW PAN HI MACH	301	S12	0560 83451810	INSULATOR	163 169 170 297	S21
0494 92015012	WASHER-SHOULDER FIBR	301	S11	0560 83451810	INSULATOR	001	S13
0495 83462400	SECTOR RING ASM B	301	S12	0561 83442143	FRONT PNL RACK PAINT	240	S30
0495 83462400	SECTOR RING ASM B	301	S17	0562 77834340	FRONT PNL RACK PAINT	245	S30
0496 83422510	CIRCUIT BRK	500 776 778	S10	0563 83490600	CLIP-CLAMP	404	S16
0497 95643203	CONNECTOR	500 776 778	S10	0564 83447806	INSTLN KIT-RACK BT	194	S29
0498 95996604	BUSHING	198	S20	0564 83447806	INSTLN KIT-RACK MT	194	S29
0498 95996604	BUSHING	199-203	S19	0565 83493900	BRACKET-CHANNEL	404	S15
0499 95996601	BUSHING	201	S19	0566 83493800	CHANNEL-UPPER	404	S15
0500 83464111	POWER SUPPLY CHASSIS	328	S9	0567 83494200	CLAMP-WIRE	404	S15
0500 83464111	POWER SUPPLY CHASSIS	328	S10	0568 83494001	CLAMP-SPIRAL GUIT	404	S15
0501 83457101	ELGWER ASM	301	S16	0569 83454400	STIFFENER	404	S16
0502 75802302	VOLTAGE ADJUST PLUG	301	S11	0569 83454400	STIFFENER	434	S15
0503 75733803	SENSOR CABLR ASM	301	S11	0570 83494500	CLAMP-CHANNEL	404	S16
0504 93115287	SCREW PAN	282-296 296-300	S21	0571 10127105	SCREW PAN HI MACH	404	S16
0504 93115287	SCREW PAN	194 229 231 232	S25	0571 10127105	SCREW PAN HI MACH	500 776 778	S10
0504 93115287	SCREW PAN	164-168 204-226	S21	0571 10127105	SCREW PAN HI MACH	404	S15
0504 93115287	SCREW PAN	237 243	S30	0572 10127102	SCREW PAN HI	404	S15
0504 93115287	SCREW PAN	162	S24	0573 83478303	SLICE ASM RH	713	S29
0504 93115287	SCREW PAN	301	S13	0574 00863701	CLAMP CAHIF	528	S15
0505 83445800	HOIST-SENSOR	301	S13	0575 75316601	CARRIAGE ACTUATOR	526	S16
0506 77661196	BRACKET-STATIC GRND	301	S10	0576 73197400	SPR-BEARING ASM	526	S16
0507 77669810	SPRING STATIC GROUHD	301	S13	0577 73584400	BASE-ARM CLAMP	526	S16
0508 75793802	SENSOR CABLR ASM	405	S18	0578 73197000	SPRING BEARING	526	S16
0509 77669601	LABEL-COREIG	301	S11	0579 75317701	SCALE-VERNIER MOVING	526	S16
0510 10126401	WASH EXT TOOTH LG	345	S7	0580 94359306	BALL BEARING	526	S16
0510 10126401	WASH EXT TOOTH LG	301	S13	0581 93115168	SCR HEX SOC HI	301	S17
0510 10126401	WASH EXT TOOTH LG	564	S9	0582 83478304	SLIDE ASM LH	713	S28
0510 10126401	WASH EXT TOOTH LG	162	S24	0582 83478304	SLIDE ASM LH	1007	S29
0510 10126401	WASH EXT TOOTH LG	198	S20	0583 92815097	SCREW CAP SOC HL	526	S16
0510 10126401	WASH EXT TOOTH LG	404	S15	0584 83484003	PWR SUPPLY COVER ASM	328	S9
0510 10126401	WASH EXT TOOTH LG	346	S8	0585 83443601	KNOB ASM	564 1007	S29
0510 10126401	WASH EXT TOOTH LG	***	S21	0585 83443601	KNOB ASM	713	S28
0510 10126401	WASH EXT TOOTH LG	199-203	S19	0586 93344096	SCREW NYLON	526	S16
0511 92021001	PIN-FOWEL .125X .J8	301	S13	0587 92006032	SCREW SET SOC HD	526	S16
0512 83425622	PANLL-CONTROL CAB	168	S23	0587 93071163	SCREW SET SOC HI	485	S18
0513 92021093	PIN-DOWEL	301	S12	0588 83475401	POS TRANSDUCER SL-CO	526	S16
0514 75312013	SPEC TAPE	162	S24	0589 75314202	SCALE-END	526	S16
0514 75312013	SPEC TAPE	301	S12	0590 10127144	SCREW PAN HD	713	S28
0514 75312013	SPEC TAPE	***	S21	0590 10127144	SCREW PAN HL	564 1007	S29
0515 75884887	BRKT ASM L.H.	228	S26	0591 77617072	SCREW CAP	423	S17
0516 72959300	LABEL-FIELD CHARGE L	301	S11	0592 77581454	FRONT PANEL RACK PAINT	185	S30
0517 75886361	LUBRICANT	301	S17	0593 93773006	SCREW SOCKET	526	S16
0518 10125030	SCREW HEX HD	199-203	S19	0594 75800501	WASHER-REINUCE C.F.	526	S16
0519 83457902	PACKLOCK ASM	301	S12	0595 83494400	CHANNEL-HOLE	526	S16
0519 83457902	PACKLOCK ASM	301	S18	0596 75800503	WASHER	327 329	S9
0520 75739105	RECEIVER HARNESS ASM	301	S12	0596 75800503	WASHER	526	S16
0521 84450500	BRACKET-SWITCH HD	301	S12	0597 10125015	SCR PAN HI	404	S15
0522 10125920	SCREW EL HI	301	S18	0598 83441700	CAP-CELL MACHINED	527	S16
0523 92196031	ELT-SPEER	301	S12	0599 94258205	WIRE-MAGNET	527	S16
0524 95649726	GRUHMFLT-BLOWER MTG	301	S11	0600 95280500	EPOXY, IMPREGNATING	527	S16
0525 75316104	FRAME-ACTUATOR MACH	404	S15	0601 75786000	INSULATION MAT	527	S16
0526 83475501	CARRIAGE ASM	404	S16	0602 93355001	MARPER, WIRE NUMBER 1	527	S16
0527 75319003	CELL ASM	404	S16	0603 75803502	STRIP-PRESSURE	527	S16
0528 83447302	DETECTOR ASM-END TR	404	S15	0604 77612607	OPTICAL SWITCH ASM	528	S15
0529 75317900	SCALE-VERNIER FIXED	404	S15	0605 83447401	PLATE-DETECTOR MTG	528	S15
0530 75797400	BRACKET-BUMPER, CAST	404	S15	0606 83447500	ADAPTER-HORIZ POS	528	S15
0531 75317501	STRIP-BACKUP ACTUATOR	404	S15	0607 83442178	FRONT PNL RACK PAINT	289	S30
0532 75864902	BRKT ASM R.H.	228	S26	0608 93211009	WASHER PLAIN 10	564 1007	S29
0533 75317200	CAM-HEAC ARM	404	S15	0608 93211009	WASHER PLAIN 10	713	S28
0534 93623000	BUMPER, RUBBER	198	S20	0609 75738610	RESISTOR MODULE 1K	251	S31
0534 93623000	BUMPER, RUBBER	404	S15	0610 93109322	SPACER	713	S28

ASSEMBLY - COMPONENT PARTS LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET
0610 93109322	SPACER	564 1007	S29	0685 83444200	ANGLE-FRT PANEL	229 231 232	S25
0611 75738607	RESISTOR MODULE 330	252 254	S31	0685 83444200	ANGLE-FRT PNL	227	S27
0612 10127346	SCREW	564 1007	S29	0686 10127120	SCREW PAN HD MACH	167	S24
0612 10127346	SCREW	713	S28	0686 10127120	SCREW PAN HD MACH	267-269	S31
0613 75315501	SCALE-FLEX MOUNT	423	S17	0686 10127120	SCREW PAN HD MACH	237 243 247	S39
0614 75315600	MOUNT-TRANSDUCER	423	S17	0686 10127120	SCREW PAN HD MACH	*****	S21
0615 75315901	POS TRANS SCALE	423	S17	0686 10127120	SCREW PAN HD MACH	194 195	S25
0616 75797001	BASE TRANSDUCER MOUNT	423	S17	0686 10127120	SCREW PAN HD MACH	226	S26
0617 75797200	PIN XDCER ALIGNMENT	423	S17	0686 10127120	SCREW PAN HD MACH	227	S27
0618 83436601	FENDER CABLE	564 1007	S29	0686 10127120	SCREW PAN HD MACH	229 231 232	S25
0618 83436601	FENDER CABLE	713	S28	0686 10127120	SCREW PAN HD MACH	519	S19
0619 15003309	WIRE 18 WHITE	500 776 778	S10	0687 92172000	BUMPER, RUBBER	227	S27
0620 17620324	CABLE TIE	500 776 778	S10	0687 92172000	BUMPER RUBBER	194 195	S25
0621 10176208	SCREW BUTTON HD	423	S17	0687 92172000	BUMPER RUBBER	237 243	S30
0622 77610636	SCREW SELF LK	301	S11	0687 92172000	BUMPER RUBBER	229 231 232	S25
0622 77610636	SCREW, MACH, SELF-LOCK	227	S27	0687 92172000	BUMPER, RUBBER	227	S27
0623 93651029	WASHER, BELLEVILLE	423	S17	0687 92172000	BUMPER, RUBBER	194 195	S25
0624 94277416	TIE WRAP	474	S16	0689 75804516	SHOCK MOUNT-LODR	199 200	S19
0625 83466881	PNL CNTL RACK SLKSCN	238	S30	0689 75804516	SHOCK MOUNT-LODR	199 200	S19
0626 95010890	GREASE-LUBRPLATE	423	S17	0690 73469100	PIVOT-COVER	198	S26
0627 84442123	FRONT PNL RACK PAINT	239	S30	0690 73469100	PIVOT-COVER	199 200	S19
0628 77842201	COMP BRKT	301	S17	0691 73469101	PIVOT-COVER	198	S26
0629 75304204	CARD CAGE	470	S14	0691 73469101	PIVOT-COVER	199 200	S19
0630 75740002	STOP-CIRCUIT BOARD	470	S14	0692 93697013	LEVELER	198	S26
0631 75751801	GUIDE-CIRCUIT	470	S14	0692 93697013	LEVELER	199 200	S19
0632 75792602	COVER KOTHER	470	S14	0693 93006033	NUT JAM HEX	198	S26
0633 75799402	CLIP-HEAT CABLE, QUAL	470	S14	0693 93006033	NUT JAM HEX	199 200	S19
0634 63445400	GUIDE WIRE	470	S14	0694 75730805	CABLE ASM GROUND	198	S26
0635 75739900	COVER-CARD CAGE	470	S14	0694 75730805	CABLE ASM GROUND	237 243	S30
0636 77657903	PANEL-ENT FRONT	172	S23	0694 75730805	CABLE ASM GROUND	194 229 231 232	S25
0637 77832202	BRACKET	301	S17	0694 75730805	CABLE ASM GROUND	192 193 227	S27
0638 95655500	SCREW SHEET METAL	470	S14	0694 75730805	CABLE ASM GROUND	199 200	S19
0639 10126103	WASH INT TOOTH LK	327 329	S19	0695 63425146	PANEL-TOP COVER REAR	170	S23
0639 10126103	WASH INT TOOTH LK	485	S9	0696 83444100	GROUND WIPER	199 200	S19
0639 10126103	WASH INT TOOTH LK	ALL OPTICNS	S23	0696 83444100	GROUND WIPER	198	S26
0639 10126103	WASH INT TOOTH LK	1026	S11	0697 83443745	PNL TOP COVER RH	171	S23
0641 75803501	CLAMP-CAGE COVER	470	S14	0698 93592200	SCR TPG HEX PNL	276	S33
0642 75803500	STRIP-CORK RUBBER	470	S14	0698 93592200	SCR TPG HEX PNL	275	S32
0643 75803501	STRIP-CORK RUBBER	470	S14	0698 93592200	SCR TPG HEX PNL	198	S26
0644 75802700	LABEL-CARD LOCATION	470	S14	0698 93592200	SCR TPG HEX PNL	199 200	S19
0645 83479600	STOP-KEYED INJ MOLD	470	S14	0699 83443845	PNL TOP COVER LH	170	S23
0646 75803503	STRIP-PRESSURE	470	S14	0700 83478643	PNL STRIP	222	S27
0647 83451814	INSULATOR	470	S14	0701 10125108	NUT HEX MACH	198	S26
0648 75529400	FRONT PNL RACK PAINT	184	S30	0701 10125108	NUT HEX MACH	199 200	S19
0649 83442166	FRONT PNL RACK PAINT	241	S30	0701 10125108	NUT HEX MACH	276 1 26	S34
0650 83442154	FRONT PNL RACK PAINT	242	S30	0701 10125108	NUT HEX MACH	275 863	S32
0651 94862902	GROMMET STRIP	584 780	S9	0701 10125108	NUT HEX MACH	743	S28
0652 75740701	BRUSH MOTOR ASM	358	S18	0701 10125108	NUT HEX MACH	564 1 17	S29
0653 83466100	BRUSH DRIVE MOUNT	358	S18	0702 10125103	NUT HEXAGON	199 200	S19
0654 83466200	BRUSH HOLDER	358	S18	0702 10125103	NUT HEXAGON	135	S20
0655 83466300	RELAY ARM	358	S18	0703 75804517	SHOCK MOUNT-LODR	199 200	S19
0656 83466400	BRUSH HOLDER STUD	358	S18	0703 75804517	SHOCK MOUNT-LODR	198	S26
0657 40024501	BRUSH, FISK	358	S18	0704 10125101	NUT HEXAGON	199 200	S19
0658 40024502	BRUSH, FISK	358	S18	0704 10125101	NUT HEXAGON	198	S26
0659 66159809	SWITCH-PIVOT LEVER	358	S18	0706 94281426	RR CABLE GROUND	276	S33
0660 92742011	SCREW M-C PAN HD	358	S18	0706 94281426	RR CABLE GROUND	199 200	S19
0661 92196007	NUT-SPEED	713	S28	0706 94281426	RR CABLE GROUND	198	S26
0661 92196007	NUT-SPEED	1026	S13	0707 83474601	FIRE-STOP, REAR	198	S26
0661 92196007	NUT-SPEED	275 863	S32	0707 83474601	FIRE-STOP, REAR	199 200	S19
0661 92196007	NUT-SPEED	564 1007	S29	0708 24547079	SLEEVEING	446	S20
0662 10125919	SCREW FLAT HD	358	S18	0709 92273234	SCREW BUTTON SOC HI	164-168 294-299	S22
0663 83479501	LATCH ASM	564 1007	S29	0709 92273234	SCREW BUTTON SOC HI	170 242-300	S22
0663 83479501	LATCH ASM	713	S28	0709 92273234	SCREW BUTTON SOC HI	162	S24
0664 93211006	WASHER	564 1007	S29	0709 92273234	SCREW BUTTON SOC HI	211-213 215 226	S22
0664 93211006	WASHER	713	S28	0710 77831951	FIRE-STOP, FRONT	199 200	S19
0665 83484500	MOUNT-SLIDE	227	S27	0710 77831951	FIRE-STOP, FRONT	198	S26
0665 83484500	MOUNT-SLIDE	227	S27	0711 10127347	SCREW PAN HI MACH	162	S24
0665 83484500	MOUNT-SLIDE	564 1007	S29	0711 10127347	SCREW PAN HI MACH	228	S28
0666 93529003	WASHER, SPRING WAVE	358	S18	0711 10127347	SCREW PAN HI MACH	*****	S21
0667 83467100	BRUSH INDICATOR	358	S18	0711 10127347	SCREW PAN HI MACH	227	S27
0668 10126212	SCR HEX SOC HD CAP	358	S18	0711 10127347	SCREW PAN HI MACH	194 195 229	S25
0668 10126212	SCR HEX SOC HD CAP	404	S16	0711 10127347	SCREW PAN HI MACH	241 243	S25
0668 10126212	SCR HEX SOC HD CAP	423	S17	0712 10126104	WASH INT TOOTH LF	511 511 65	S31
0669 83484602	MOUNT-SLIDE KEYED	564 1007	S29	0712 10126104	WASH INT TOOTH LF	75	S32
0669 83484602	MOUNT-SLIDE KEYED	749	S28	0712 10126104	WASH INT TOOTH LF	229 231 232	S25
0669 83484602	MOUNT-SLIDE KEYED	713	S28	0712 10126104	WASH INT TOOTH LF	500 776 778	S10
0669 83484602	MOUNT-SLIDE KEYED	227	S27	0712 10126104	WASH INT TOOTH LF	194 195	S25
0670 84572203	ARM LOCK MOLEDR	519	S18	0712 10126104	WASH INT TOOTH LF	276	S33
0671 84573002	FACE LOCK BRACKET	519	S18	0712 10126104	WASH INT TOOTH LF	278	S34
0672 75738608	RESISTOR MODULE	254	S31	0712 10126104	WASH INT TOOTH LF	564 1007	S29
0673 77598701	SIRING ARM	519	S18	0712 10126104	WASH INT TOOTH LF	227	S27
0674 77598501	SWITCH SUBMINIATURE	519	S18	0712 10126104	WASH INT TOOTH LF	162	S24
0675 94357804	SOLENOID PC	519	S18	0712 10126104	WASH INT TOOTH LF	749	S28
0676 21987646	LABEL	199-203	S19	0712 10126104	WASH INT TOOTH LF	713	S28
0676 21987646	LABEL	198	S20	0712 10126104	WASH INT TOOTH LF	227 243	S27
0677 83485700	STABILIZER	227	S27	0713 83447805	INSTN FIT-PACK NI	229 231	S25
0677 83485700	STABILIZER	713	S28	0713 83447805	INSTN FIT-PACK NI	229 231 241 243	S25
0677 83485700	STABILIZER	564	S29	0714 75804800	AIR FILTER	199 200	S19
0678 75284701	HANDLE-PULL BACK	237 243	S30	0714 75804800	AIR FILTER	198	S26
0678 75284701	HANDLE-PULL BACK	229 231 232	S25	0715 77599600	GASKET HE-WER CAB	199 200	S19
0678 75284701	HANDLE-PULL BACK	227	S27	0715 77599600	GASKET HE-WER CAB	198	S26
0678 75284701	HANDLE-PULL BACK	194 195	S25	0716 83478200	COVER	199 200	S19
0679 18607916	SCREW THD CUTTING	519	S18	0716 83478200	COVER	198	S26
0680 77617079	SCREW CAP	301	S12	0717 83478700	CLAMP	199 200	S19
0680 77616079	SCREW CAP	423	S17	0717 83478700	CLAMP	227 243	S27
0681 93530436	BOLL PIN	519	S18	0718 63478701	CLAMP	229 231	S25
0682 75779867	SPRING	519	S18	0719 83494801	PLATE, AC CABLE	198	S26
0683 83425343	FOUR ACC	222	S23	0719 83494801	PLATE, AC CABLE	199 200	S19
0684 75738654	RESISTOR MODULE 220	249	S31	0720 93522008	PLUG-SNAP BUTTN	198	S26
0685 83444200	ANGLE-FRT PANEL	237 243	S30	0720 93522008	PLUG-SNAP BUTTN	199 200	S19
0685 83444200	ANGLE-FRT PANEL	194 195	S25	0721 83425346	LOCK ACCESS	170	S23
				0722 92912206	SCR FLAT HD ENT	194 200	S19

ASSEMBLY COMPONENT PARTS LIST

ASSEMBLY - COMPONENT PARTS LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	SHEET
1024 83415900	POWER CORD	276	533	1115 95125311	LOCTITE PRIMER	423	S17
1025 83492701	AC SNCH BX ASM NCR	276	533	1116 93749157	SCREW	500 776 778	S10
1026 83428902	AC DISTR BX COMMON	276	533	1117 83425104	PANEL TOP CVR REAR	294 295	S23
1027 83442800	CHANNEL-CONTRL NCR	276	533	1118 83443784	PANEL TOP CVR RH	294	S23
1028 83442124	FRONT PNL RACK PAINT	183	530	1119 83443884	PANEL TOP CVR LH	294	S23
1029 83428601	CHASSIS-AC DISTR BX	1026	533	1120 83425384	DOOR ACCESS	294 295	S23
1030 83443877	PNL TOP CVR LH	292	523	1121 83478606	PANEL SIDE	294	S23
1031 94806900	RECEPTACLE FEMALE	1026	533	1122 83443786	PANEL TOP CVR RH	295	S23
1032 94807000	RECEPTACLE MALE	1026	533	1123 83443886	PANEL TOP CVR LH	295	S23
1033 62071534	FILTER RFI	1026	533	1124 83478606	PANEL SIDE	295	S23
1034 75726813	TERMINAL BLOCK	1026	533	1125 83425685	PANEL CONTROL CAB	295	S23
1035 75726812	TERMINAL BLOCK	1026	533	1126 77657786	PANEL END FRONT	295	S23
1036 94241102	CKT BKR-OVERCURRENT	1026	533	1127 17901501	SCREW THREAD FORM	584 780	S9
1037 75729011	CABLE-JUMPER GREEN	1026	533	1127 17901501	SCREW THREAD FORM	470	S14
1038 75729007	CABLE-JUMPER BLACK	1026	533	1128 95596600	BUSHING	500 776 778	S10
1039 75729003	CABLE-JUMPER WHITE	1026	533	1129 83425198	PANEL TOP CVR REAR	296	S23
1040 75729001	CABLE-JUMPER YELLOW	1026	533	1130 83443798	PANEL TOP CVR RH	296	S23
1041 75729012	CABLE-JUMPER BLACK	1026	533	1131 83443898	PANEL TOP CVR LH	296	S23
1042 75729022	CABLE-JUMPER WHITE	1026	533	1132 83425399	DOOR ACCESS	296	S23
1043 75729023	CABLE-JUMPER BLACK	1026	533	1133 83478698	PANEL SIDE	296	S23
1044 75729024	CABLE-JUMPER BLACK	1026	533	1134 83425698	PANEL CONTROL CAB	296	S23
1045 75729025	CABLE-JUMPER WHITE	1026	533	1135 75730808	CABLE ASM GND	883	S32
1046 51853011	CLAMP CABLE ADHESIVE	301	512	1136 83425308	DOOR ACCESS	300	S23
1047 17901515	SCR THD ROLL	1026	533	1137 83478608	PNL SIDE	300	S23
1048 17901519	SCR THD ROLL PAN HD	199-203	519	1138 77657711	PANEL END FRONT	300	S23
1048 17901519	SCR THD ROLL PAN HD	1026	533	1139 77644811	PANEL CONTROL CAB	300	S23
1048 17901519	SCR THD ROLL PAN HD	198	520	1140 83442190	FRONT PNL	290	S30
1049 83478002	LINECORD MODULE STD	1026	533	1141 83442189	FRONT PNL RACK	288	S30
1050 77613869	CLIP	404	515	1142 77657795	PANEL-END FRONT	296	S23
1051 75752203	CABLE-CIRCUIT BRKR	1026	533	1143 77644814	PANEL-CONTROL CAB	169	S23
1052 93522009	PLUG-SNAP BUTTON	201	519	1143 77644814	PANEL-CONTROL CAB	163	S23
1052 93522009	PLUG-SNAP BUTTON	1026	533	1144 77657715	PNL END REAR	163	S23
1053 83428700	COVER-CHASSIS	1026	533	1145 83492001	CLOSURE FRAME	169	S22
1054 75884153	JUMPER PLUG	779	59	1146 83445711	FRAME CABINET	202 203	S19
1055 83407505	LABEL, SELF ADHERING	1026	533	1147 83425115	PANEL-TOP COVER REAR	163	S23
1056 83407518	LABEL, SELF ADHERING	1026	533	1148 83425178	PANEL-TOP CVR RLAR	165	S23
1057 83425168	PNL TOP CVR REAR	221 293	S23	1149 83443728	PNL TOP CVR RH	165	S23
1058 83425104	PNL TOP CVR REAR	205 298 299	S23	1150 83443828	PNL TOP CVR LH	165	S23
1059 83425376	DOOR ACCESS	292	S23	1151 83425326	DOOR ACCESS	165	S23
1060 77658250	LABEL, RATING	199 200 202 203	519	1152 83478629	PNL SIDE	165	S23
1060 77658250	LABEL, RATING	198	S20	1153 77657729	PANEL END FRONT	165	S23
1061 95125317	LOCTITE PRIMER	301	517	1154 83425629	PANEL CONTROL CAB	165	S23
1062 95125301	LOCTITE	ALL OPTIONS	S21	1155 77657728	PNL END REAR	165	S23
1062 95125301	LOCTITE	162	S24	1156 83425119	PANEL-TOP CVR REAR	164 167	S23
1063 83442165	FRT PNL RCK PNT	246	530	1157 83443720	PNL TOP CVR RH	164 167	S23
1064 51853015	CLAMP CABLE	404	515	1158 83443820	PNL TOP CVR LH	164 167	S23
1064 51853015	CLAMP CABLE	776 778	S10	1158 83425319	DOOR ACCESS	164 167	S23
1065 75738652	RESISTOR MODULE	253	S31	1160 83478620	PNL SIDE	164 167	S23
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0713 03447805	S25	0916 03478648	S23	0433 92742201	S13	0843 94347104	S27
0713 03447805	S26	0937 03478653	S23	0454 92742222	S11	0843 94347104	S20
0749 03447806	S26	0785 03478654	S23	0838 92743158	S21	0843 94347104	S30
0749 03447806	S26	0909 03478655	S23	0838 92743158	S24	0675 94357804	S16
1067 03447807	S27	0950 03478658	S23	0983 92743158	S10	0580 94359336	S16
1067 03447807	S29	0930 03478663	S23	0826 92743202	S24	0581 94374900	S20
0564 03447808	S25	2009 03478665	S23	0826 92743202	S22	0487 94655401	S12
0564 03447808	S29	0933 03478668	S23	0967 92743240	S10	1031 94806900	S33
0796 03450001	S18	1104 03478669	S23	1014 92801001	S32	1332 94807000	S33
1083 03450100	S22	1097 03478672	S23	1014 92801001	S32	1004 94846005	S10
0521 03450500	S12	1109 03478677	S23	1014 92801001	S33	0773 94853604	S8
0795 03451104	S18	1124 03478666	S23	0428 92815096	S15	0896 94862901	S9
0401 03451403	S11	1133 03478696	S23	0428 92815096	S16	0651 94862902	S9
0485 03451603	S18	0717 03478700	S20	0563 92815097	S15	0626 95010890	S17
0485 03451603	S11	0717 03478700	S19	0549 92815100	S15	1069 95016100	S18
0350 03451700	S6	0718 03478701	S19	1185 92815161	S16	1062 95125301	S21
1086 03451802	S21	0663 03479501	S29	0551 92815195	S15	1062 95125301	S24
0848 03451804	S24	0663 03479501	S28	0437 92815197	S12	0469 95125305	S17
0848 03451804	S21	0645 03479600	S14	0437 92815197	S12	0469 95125305	S12
0849 03451805	S25	0495 03482400	S12	0438 92815229	S12	1115 95125311	S17
0849 03451805	S25	0495 03482400	S17	0471 92824097	S17	1115 95125311	S16
0849 03451805	S21	0780 03484002	S19	0722 92932206	S20	1061 95125317	S17
0849 03451805	S19	0584 03484003	S9	0722 92932206	S19	0891 95125322	S16
0849 03451805	S27	0778 03484109	S19	0783 92980003	S9	0891 95125322	S17
0849 03451805	S24	0778 03484109	S10	0783 92980003	S9	0891 95125322	S16
0849 03451805	S27	0776 03484110	S10	0693 93006033	S20	0406 95125324	S17
0723 03451806	S25	0776 03484110	S19	0693 93006033	S19	0406 95125324	S17
0723 03451806	S27	0500 03484111	S10	1015 93041205	S32	0600 95280500	S16
0723 03451806	S26	0500 03484111	S11	1015 93067003	S32	0762 95582007	S8
0723 03451806	S26	0767 03485400	S11	0587 93071163	S16	0976 95583505	S19
0660 03451810	S10	0665 03484500	S29	1023 93105305	S32	1128 95596600	S10
0660 03451810	S13	0665 03484500	S27	0610 93109322	S28	0499 95596601	S19
0660 03451810	S21	0665 03484500	S27	0610 93109322	S29	0498 95596604	S19
0647 03451814	S14	0669 03484602	S29	0561 93115168	S17	0498 95596604	S20
0564 03454400	S16	0669 03484602	S28	0504 93115287	S21	0998 95604019	S10
0564 03454400	S15	0669 03484602	S26	0504 93115287	S25	0497 95643203	S10
0755 03455800	S14	0677 03485700	S27	0504 93115287	S13	0996 95643212	S10
0735 03456001	S7	0677 03485700	S28	0504 93115287	S24	0452 95643248	S10
0400 03456002	S12	0677 03485700	S29	0504 93115287	S30	0524 95649726	S13
0400 03456002	S11	0563 03490600	S16	1181 93115291	S13	0638 95655500	S14
0460 03456002	S13	0842 03492000	S24	0999 93154107	S10	0766 95655503	S8
0725 03456000	S27	0842 03492000	S22	0752 93154948	S7	0797 95660403	S10
0727 03457002	S26	0842 03492000	S22	0624 93211008	S27	0492 95694202	S11
0727 03457002	S25	1145 03492001	S27	0664 93211008	S28	1195 95694205	S22
0727 03457002	S27	1025 03492701	S33	0664 93211008	S29	1195 95694205	S24
0501 03457101	S13	0276 03492901	S33	0608 93211009	S28	1107 95694206	S11
0676 03457203	S18	0276 03492901	S5	0608 93211009	S29		
0671 03457302	S10	0966 03493302	S10	0780 93343193	S25		
0743 03457401	S7	0566 03493800	S15	0788 93342193	S21		
0745 03457601	S7	0565 03493900	S15	0586 93344096	S16		
0519 03457902	S12	0568 03494001	S15	0602 93355001	S16		
0519 03457902	S18	0567 03494200	S15	0720 93522008	S20		
0358 03466001	S6	0595 03494400	S16	0720 93522008	S19		
0358 03466001	S18	0570 03494500	S16	1052 93522009	S19		

SECTION

9

WIRE

LISTS

WIRE LISTS

9.1 INTRODUCTION

The following paragraphs contain the Harness Assembly wire lists for the Disk Cartridge Drive Model 9427H.

9.2 PRE AMP

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>	<u>Remarks</u>
Red	A2P4-1	A3P2-1	11	
Gray	-2	-2		
	-3	-3		
	-4	-4		
	-5	-5		
	-6	-6		
	-7	-7		
	-8	-8		
	-9	-9		
	-10	-10		
	-11	-11		
	-12	-12		
	-13	-13		
	-14	-14		
	-15	-15		
	-16	-16		
	-17	-17		
	-18	-18		
	-19	-19		
Gray	A2P4-20	A3P2-20	11	

9.3 RECEIVER

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>	<u>Remarks</u>
White	A9P3-6	A6SW-3	26.2	Closed
	A9P3-5	A6SW-2	16.8	Closed
	A9P3-4	A6SW-3	27.8	Normally Open
	A9P3-3	A5SW-3	27.8	Normally Closed
	A9P3-2	A5SW-1	17.5	Closed
	A9P3-1	-	-	Not Used
	A6SW-1	A6SW-2	32.5	Normally Open
	A6L1-1	A6L2-1	30.5	
	A1P3-1	A6L2-2	20.3	
	A1P3-3	A6L1-2	45.0	
White	A1P3-2	-	-	Not Used

9.4 RETRACT

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>	<u>*Remarks</u>
White	A3P3-3	A4SW1	6	Normally Open Closed
White	A3P3-2	A4SW1	6	

*Twisted Pair

9.5 CAPACITOR

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>	<u>Remarks</u>
White ↑ ↓	A1C101-(+)	A1P5-3	13 1/2	
	A1C101-(-)	A1C102-(+)	7.8	
	A1C102-(+)	A1P5-1	10.8	
	A1C102-(-)	A1P5-6	10.8	
	A1C103-(+)	A1P5-2	8	
	A1C103-(-)	A1P5-4	8	

9.6 SWITCH BOARD

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>	<u>Remarks</u>
Red ↑ ↓ Gray	A2P6-1	A5P1-1	36	Switch Board ↑ ↓ Switch Board
	A2P6-2	A5P1-2		
	-3	-3		
	-4	-4		
	-5	-5		
	-6	-6		
	-7	-7		
	-8	-8		
	-9	-9		
	-10	-10		
	-11	-11		
	-12	-12		
	-13	-13		
	-14	-14		
	-15	-15		
	-16	-16		
	-17	-17		
	-18	-18		
	-19	-19		
	Gray	A2P6-20		

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length Inches</u>	<u>Remarks</u>
Gray	A2P6-21	A9J1-1	36	Lower Sensor
	-22	A9J1-2		Lower Sensor
	-23	A9J1-3		Lower Sensor
	-24	A9J2-1		Upper Sensor
	-25	A9J2-2		Upper Sensor
	-26	A9J2-3		Upper Sensor
	-27	A9J3-2		Receiver Harness
	-28	A9J3-5		Receiver Harness
	-29	A9J3-4		Receiver Harness
	-30	A9J3-3		Receiver Harness
	-31	A9J3-6		Receiver Harness
	-32			Not Used
	-33			Not Used
Gray	A2P6-34		36	Not Used

9.7 DC SPINDLE (NO BRAKE)

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
White	A2P5-3	A7K2-4	13.5	
	A2P5-4	A7K1-3	10.7	
	A7K1-3	A7K2-3	5.0	
	A2P5-5	A7K1-4	11.4	
	A2P5-6			Not Used
	A2P5-7			Not Used
	A2P5-8			Not Used
	A2P5-1			Not Used

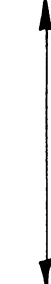


9.8 AC SPINDLE (NO BRAKE)

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
White	A1P14-2	A7K2-1	9.5	
Green	A1P1-4	E4AC (GND)	10.0	
White	A7K1-2	A7C1-TOP	7.5	
White	A7K1-1	A7K2-2	5.3	

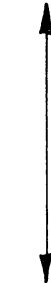

9.9 DRIVE MOTOR AND CONNECTOR (NO BRAKE)

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
Red	A7B1	A7C1-B	10 1/2	
Blue	A7B1	A7K2-2	10 1/2	
Yellow	A7B1	A1P14-1	14 1/2	
White	A1P14-2	A7K2-1	6	
	A1P14-3			Spare
Green	A1P14-4	E4 (AC)	5 1/2	Mot Plate - GND

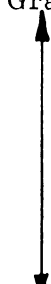
9.10 AC BRAKE

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
White  Green White	A7TB1-A	A7CR2-NG	8.8	 Same Terminal  Same Terminal
	A7K3-6	A7CR2-PS	6.5	
	A7K3-3	A7CR2-AC1	6.5	
	A7K2-2	A7CR2-AC1	8.8	
	A7TB1-B	A7K3-5	10.2	
	A7K1-2	A7C1-TOP	6.5	
	A7F01-2	A7K1-1	2.0	
	A7K2-1	A7K1-1	4.5	
	A1P14-2	A7K3-2	7.5	
	A1P14-3	A7CR2-AC2	4.2	
	A1P14-4	E4 (AC GND)	10.2	
	A1P14-1	A7FO1-1	3.2	

9.11 DC BRAKE

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
White  White	A2P5-1	A7J1-3	8.8	 Same Terminal
	A2P5-3	A7K1-2	8.8	
	A2P5-4	A7K1-3	14.5	
	A7K2-3	A7K1-3	3.8	
	A7K2-3	A7K1-17	4.3	
	A2P5-5	A7K1-4	13.5	
	A2P5-6	A7K1-1	8.8	
	A2P5-7	A7K3-B	6.5	
	A2P5-8	A7H1-4	8.8	
	A7J1-15	A7K3-A	6.5	
	A6J1-16	A7K2-4	5.3	

9.12 POWER AND LOGIC

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
Red (Stripe) Gray  Gray	A1P1-1	A2P2-1	12	
	-2	-2		
	-3	-3		
	-4	-4		
	-5	-5		
	-6	-6		
	-7	-7		
	-8	-8		
	-9	-9		
	-10	-1		
	-11	-11		
	A1P1-12	A2P2-12	12	

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
Gray	A1P1-13	A2P2-13	12	
	↑ -14	↑ -14		
	↑ -15	↑ -15		
	↑ -16	↑ -16		
	↑ -17	↑ -17		
	↑ -18	↑ -18		
	↑ -19	↑ -19		
	↑ -20	↑ -20		
	↑ -21	↑ -21		
	↑ -22	↑ -22		
	↑ -23	↑ -23		
	↑ -24	↑ -24		
	↑ -25	↑ -25		
	↑ -26	↑ -26		
	↑ -27	↑ -27		
	↑ -28	↑ -28		
	↑ -29	↑ -29		
	↑ -30	↑ -30		
	↑ -31	↑ -31		
	↑ -32	↑ -32		
	↑ -33	↑ -33		
Gray	A1P1-34	A2P2-34	12	

9.13 POWER SUPPLY CHASSIS II

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
Brown	A1T1-1	A1J12-1	9	
Red	A1T1-2	A1J12-2	8 1/2	
Red	A1T1-2	A1J14-3	10	
Orange	↑ -3	A1J12-3	8	
Yellow	↑ -4	A1J12-4	7 3/4	
Yellow	↑ -4	A1J12-11	6 1/2	
Yellow	↑ -4	A1J14-1	7 1/2	
Green	↑ -5	A1J12-5	7 1/2	
Blue	↑ -6	A1J12-6	7	
Violet	↑ -7	A1J12-7	6	
Violet	↑ -7	A1J13-3	6	
Gray	↑ -8	A1J12-8	6 1/2	
Gray	↑ -8	A1J14-2	5 3/4	
White	↑ -9	A1J12-9	7 3/4	
White	↑ -9	Not Used	7	Not Used
W/Black	↑ -10	A1CB2-2	10	
W/Black	↑ -10	A1P4-4	15	
W/Brown	↑ -11	A1P4-3	14	
W/Red	↑ -12	A1CB2-1	10	
W/Orange	↑ -13	A1CB3-1	3 1/2	
W/Yellow	↑ -14	A1C104-(-)	6	

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length (Inch)</u>	<u>Remarks</u>
W/Green	A1T1-15	A1CB3-2	5 1/2	
White	A1CB1-2	A1J12-14	15	
	A1CB1-4	A1J12-15	14	
	A1CR101-AC	A1CB2-3	4	
	A1CR101-AC	A1CB2-4	4 1/2	
	A1CR101-(+)	A1P4-1	7 1/2	
	A1CR101-(-)	A1P4-6	7 1/2	
	A1J12-12	A1J13-1	11	
	A1C104-(+)	A1P4-2	18 1/4	
White	A1C104-(-)	A1P4-5	18 1/2	
Green	A1J13-2	E3 (AC)	6 1/2	
Green	A1J14-4	E3 (AC)	6 1/2	
Green	A1FL1-2	E3 (AC)	9	
White	A1FK1-3	A1CB1-1	12 3/4	
White	A1FL1-1	A1CB1-2	13 1/2	
White	A1CB2-5	A1P8-1	8 1/2	
White	A1CB2-6	A1P8-2	8 1/2	
White	A1CB3-4	A1CR102-AC	12	
White	A1CB3-3	A1CR102-AC	12	
White	A1CR102-(+)	A1CB2-AUX NO.	15	
White	A1CB2-AUX	A1C104-(+)	14 1/2	


FIRM MANUAL



**CONTROL DATA®
FAULT ISOLATION & RETENTION MODULE
(FIRM)**

GENERAL DESCRIPTION
FUNCTIONAL OPERATION
INSTALLATION & ACTIVATION
INTERPRETATION OF RESULTS
DIAGRAMS
PARTS DATA

MAGNETIC PERIPHERALS INC.

 a subsidiary of
CONTROL DATA CORPORATION

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SERIAL NUMBER _____

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NOTES

PREFACE

This Manual provides the information needed to install, operate and maintain the Magnetic Peripheral Inc. Fault Isolation and Retention Module (FIRM) and is intended to serve customer engineers and operators who require detailed information about the FIRM.

This product is intended for use only as described in this document. Magnetic Peripherals Inc. cannot be responsible for the proper functioning of undescribed features or undefined parameters.

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1.0 GENERAL DESCRIPTION

The Fault Isolation and Retention Module (FIRM) is a self-contained, passive, fault detection and storage device, intended for use with Model 9427H HAWK Cartridge Disk Drive.

FIRM can continuously monitor HAWK performance reporting detected faults on LED indicators.

2.0 FUNCTIONAL OPERATION

FIRM circuitry includes two functional sections: Fault Detection and Fault storage and display.

Support circuitry for these sections includes positive and negative 5 volt power supplies and rechargeable Nickel-Cadmium batteries which permit retention of fault information under certain supply voltage or AC line failures.

To keep the batteries charged on the FIRM board, leave the board installed in a disk drive during normal operation with switches (DISPLAY, LEAR, ARM and TRAP) in the down or center position.

2.1 FAULT DETECTION

FIRM Fault Detection Circuitry includes analog voltage comparators and digital logic.

Multiple Voltage Comparators (U7, U13, U19, U26 U31, U35, and associated discrete components) monitor voltage levels in the HAWK. Reference levels for these comparators are derived from Zener Diode Sources VR1 and VR2.

Logical fault monitoring is performed by a number of independent CMOS circuits which check:

1. Control Faults (failure of Controller or HAWK to properly control READ/ WRITE/ERASE functions) U1 through U6.
2. Servo Drift (failure of Servo to hold heads on track during READ or WRITE operation) U11, U12.
3. Sector Sensor/Speed detect failure (errors of Fixed Disk Sector Sensor, Cartridge Sector Sensor, Speed detection circuitry, or Spindle drive system) U8, U9.

Both analog and logical sections of the Fault Detection Circuitry drive Fault Storage and display circuitry.

2.2 FAULT STORAGE AND DISPLAY

Associated with each of twenty conditions monitored by the Fault Detection Circuitry is a storage cell (Latch) and a LED indicator. Latches (U15, U16, U17, U24 U34) and LED's (DS1 through DS20) are controlled by four switches:

- DISPLAY - (Up Position) Enables the LED's to indicate the state of each associated Latch. May be turned OFF to reduce current drain of FIRM.
- ARM - (Up Position) Enables a Fault Signal to set a corresponding Latch which will remain set until cleared.
- CLEAR - (Up Position) Prevents storage of data. Fault Signals can cause corresponding LED's to glow only as long as Fault Signal persists.
- TRAP - (Up Position) Overrides ARM switch as soon as one Fault is detected. Storage of additional Fault Signals is prevented. Used to indicate the first of multiple faults.

3.0 INSTALLATION AND ACTIVATION

In the HAWK Card Cage, the second slot from the end (J8, next to the Control Board) is reserved for FIRM. Make sure power is turned OFF.

Orient FIRM the same as the other boards, solder side nearest the Actuator, and insert it firmly into place.

With power on, turn CLEAR Switch ON then OFF to remove any transient induced fault information which may be stored. FIRM is ready for operation, turn ARM Switch ON.

3.1 PASSIVE FAULT MONITORING

With ARM ON, and CLEAR, DISPLAY, and TRAP all OFF, FIRM will monitor and store any detected Fault for as long as may be desired. At the end of the monitoring period HAWK is stopped (without removing power to the HAWK), the Card Cage is opened and the ARM Switch turned OFF. DISPLAY may be turned ON and the contents of the Fault latches examined.

This mode represents the first level of diagnostic activity using FIRM.

3.2 INTERPRETATIVE FAULT MONITORING

Multiple or transient Fault Conditions may require a more sophisticated level of diagnostic activity. FIRM may be used in conjunction with a HAWK Minitester or other Exerciser.

If it is desired to watch the LED indicators the DISPLAY Switch is left ON.

At the conclusion of each Diagnostic step the Fault Latches may be reset with the CLEAR Switch.

Apparently simultaneous Faults may often be separated by turning the TRAP Switch ON. The first Fault to occur will be stored and may be displayed, all other Faults will be prevented from setting the Fault Latches.

A visual indication of the duration of transient Faults (Voltage fluctuations, etc.) may be displayed if the CLEAR Switch is left ON. Each Fault will be displayed as long as it persists, but there will be no storage. After each step of a Diagnostic Test the CLEAR Switch should be turned OFF, then ON again, to reset Fault detection logic.

4.0 INTERPRETATION OF INDICATIONS

This section details the meaning of the twenty indicators. Once the FIRM has been installed, cleared, and armed, fault indicators are reliable through START/STOP and RUN cycling. Any A. C. power interruption long enough to cause an Emergency Retract, however, will invalidate all FIRM results (except #9, 10, and 11) as described in the following table.

INDICA- TOR NO	MNEMONIC	INTERPRETATION
1	SERVO VOLT	The positive or negative 15 volt regulator on the Servo Board has exceeded the range 10 to 20 volts; replace this Board. HAWK should have performed an Emergency Retract; if not, replace Control Board.
2	PRE. VOLT	The positive or negative 15 volt regulator on the Servo Preamp Board has exceeded the range 10 to 20 volts; replace this Board. HAWK should have performed an Emergency Retract; if not, replace Control Board.
3	RWE. VOLT	The positive or negative 15 volt regulator on the Read/Write/Erase Board has exceeded the range 10 to 20 volts; replace this board. There should not have been a retract.

- 4 SECT. VOLT The positive 15 volt regulator on the Sector Board has exceeded the range 10 to 20 volts; replace this board. Sector sensors are driven by this voltage and may have sustained electrical damage; check them.
- 5 CMD. ERR The Control Board has commanded the Data Recovery Board to read or the Read/Write/Erase Board to write or erase during a seek (not on cylinder). Replace Control Board and check again to insure that it is not a controller error.
- 6 RD. DRIFT The actuator has drifted off cylinder during a read operation. This condition will not cause a HAWK fault state until the heads move a full cylinder away. Thus a RD. DRIFT without a HAWK front panel FAULT indication suggests drift or overshoot rather than outright failure.
- 7 WR. DRIFT The actuator has drifted off cylinder during a write or erase operation. If controller integrity is assured and there are no voltage faults, the Servo Board Servo Preamp, and Power Amplifier are all suspect.
- 8 DR. VOLT The Data Recovery Board negative 5 volt regulator has exceeded the range 3.0 to 6 volts. Before replacing this board, measure the -7.5 volt line from the Power Board to the Data Recovery Board (J12-B27). If it is too high, the regulator (AR1) on the Data Recovery Board may be damaged.
- 9 POS. 5. VOLT The HAWK positive 5 volt supply has exceeded the range 3.0 to 6 volts; if there are no other system supply voltage faults (#10 #11), replace the Power Board. There may be extensive electrical damage to HAWK if the 5 volt overvoltage protection circuit (OVP) on the Power Board has failed.
- 10 POS. 22. VOLT The HAWK positive 22 volt supply has exceeded the range 15 to 30 volts. Replace the Power Board. Damage to individual positive 15 volt regulators on the other boards may have been sustained.

- 11 NEG. 24. VOLT As #10 except negative 24 volts.

NOTE

If #9, 10, and 11 are all on, there has been an A. C. power interruption, and all other fault indicators are invalid.

- 12 WR. PROT. FLT The Control Board has commanded a write or failed to inhibit a write or erase to the Read/Write/Erase Board under Write Protect status. Replace the Control Board (no controller error could cause this fault).
- 13 CR. FLT. DET The Read/Write/Erase Board current fault circuitry indicates one of the following conditions:
- a. Head write current without erase current.
 - b. Head erase current without write current.
 - c. More than one head selected for write/erase.
 - d. Excessive current leakage on write driver output during a read operation.
- FIRM, like the Control Board, blanks the current fault condition for 60 usec after a change in write or erase commands to allow for pre-erase head operation.
- 14 SEEK. ERROR A Seek Error has been detected by the Servo Board.
- 15 WR. CONT. FLT The Control Board has issued one of the following faulty commands to the Read/Write/Erase Board:
- a. Spurious Write Enable (no Write Gate present from controller).
 - b. Spurious Erase Enable (no Erase Gate present from controller).
 - c. Write or Erase Enable present with Write/Erase Inhibit (may be accompanied by #12).
 - d. Write or Erase Enable present during HAWK FAULT state.

Controller error is not a possible cause for any of these conditions.

- 16 RD. AND. WR The Control Board has issued a Write or Erase Enable during a read operation. Controller may also be at fault.
- 17 FD. FLT The fixed disk sector sensor is not generating pulses. Check sensor adjustment, replace if necessary. There should have been an Emergency Retract. If not, replace Control Board.
- 18 CD. FLT The cartridge disk sector sensor is not generating pulses. Check sensor adjustment, replace if necessary. There should have been an Emergency Retract if the condition persisted for more than a few seconds.
- 19 DRIVE. FLT No pulses are received from either sector sensor, but the 15 volt sensor supply is good (#4) and the HAWK is in RUN state. Thus the spindle is not turning because of motor, motor control, or drive belt failure. However the possibility that both sector sensors have failed should be examined, particularly if the Sector Board has to be replaced for overvoltage.
- 20 SPD. DET. FLT The Sector Board speed detector, while receiving valid sector pulses, has failed to produce an up-to-speed signal. Replace the Sector Board and, if there was no Emergency Retract, the Control Board.

5.0 DIAGRAMS

This section contains diagrams that describe the Fault Component Board Assembly in terms of the functions it performs.

Figure 5-1 is the Printed Circuit Board Schematics and Figure 5-2 contains the Assembly Drawing and Parts List.

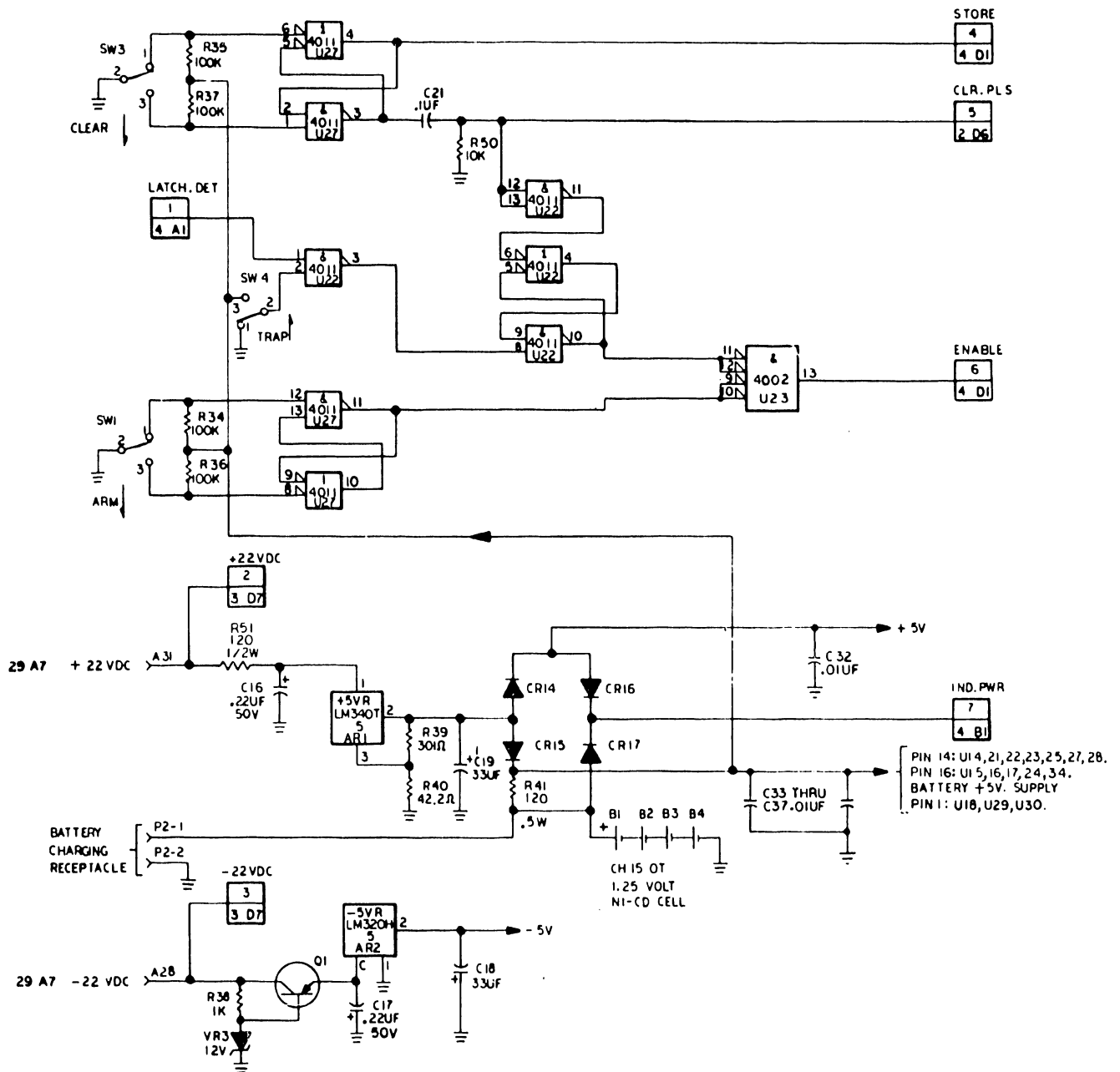


Figure 5-1. Schematics (sheet 1 of 4)

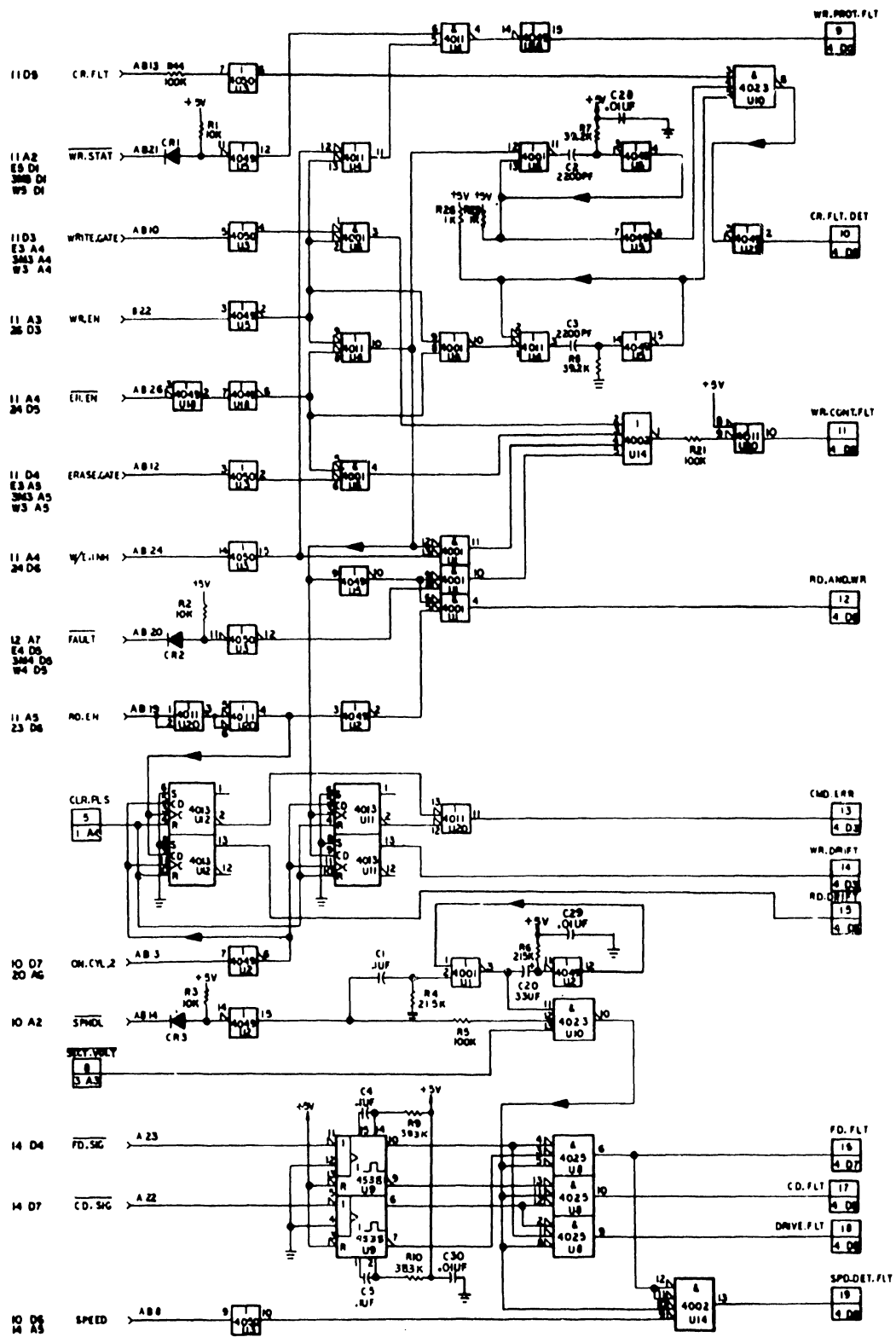


FIGURE 5-1. SCHEMATICS (SHEET 2 OF 4)

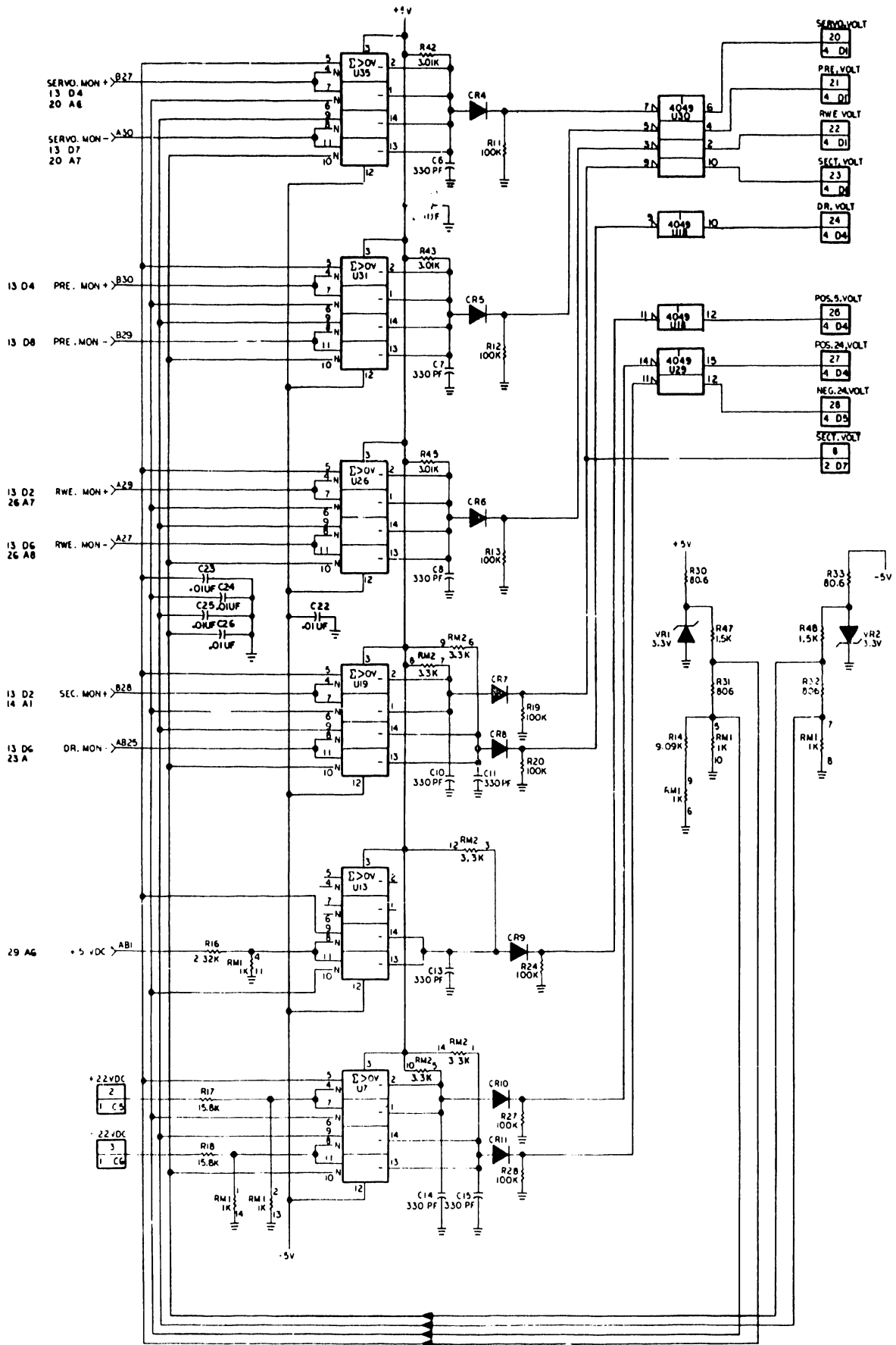


Figure 5-1. Schematics (sheet 3 of 4)

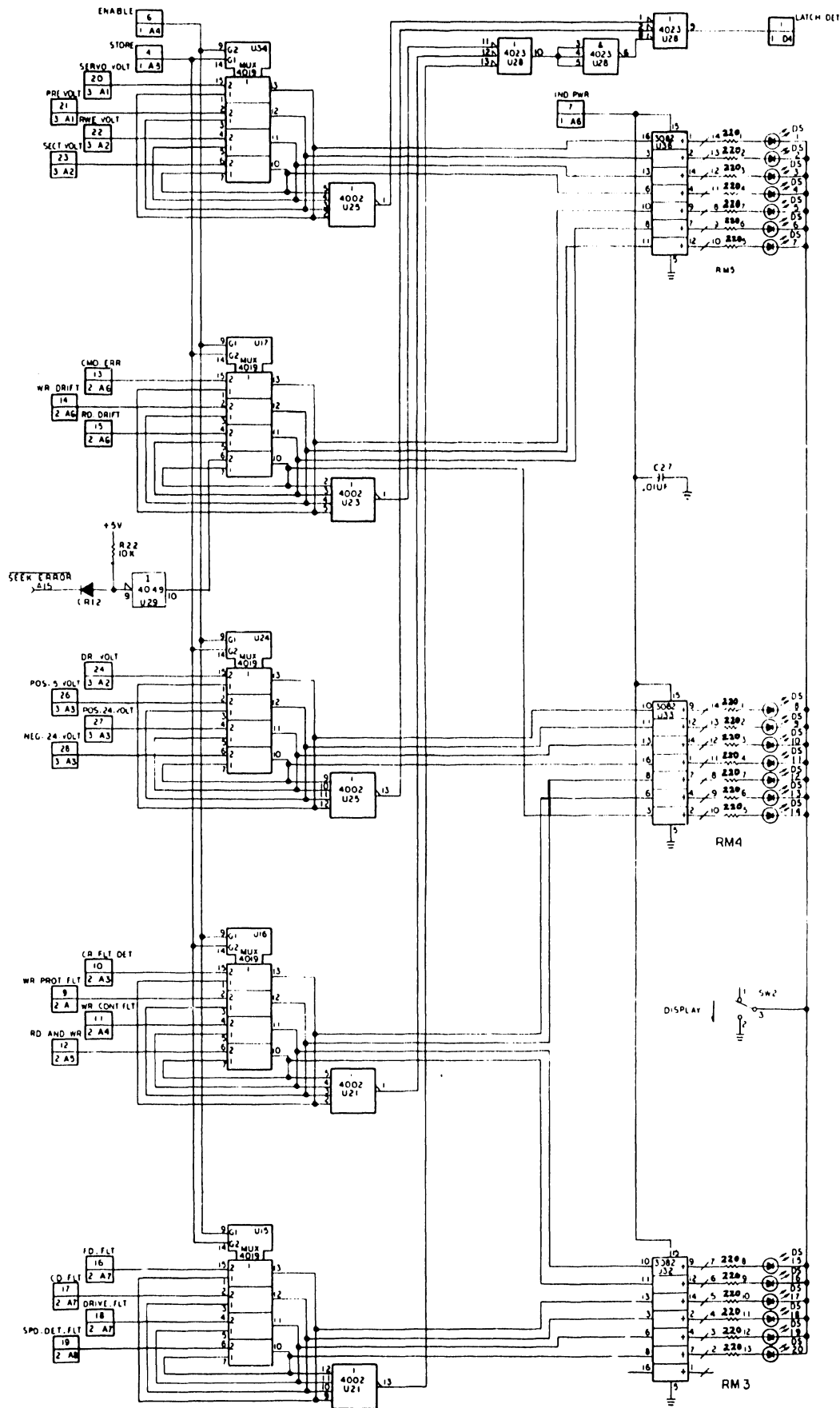
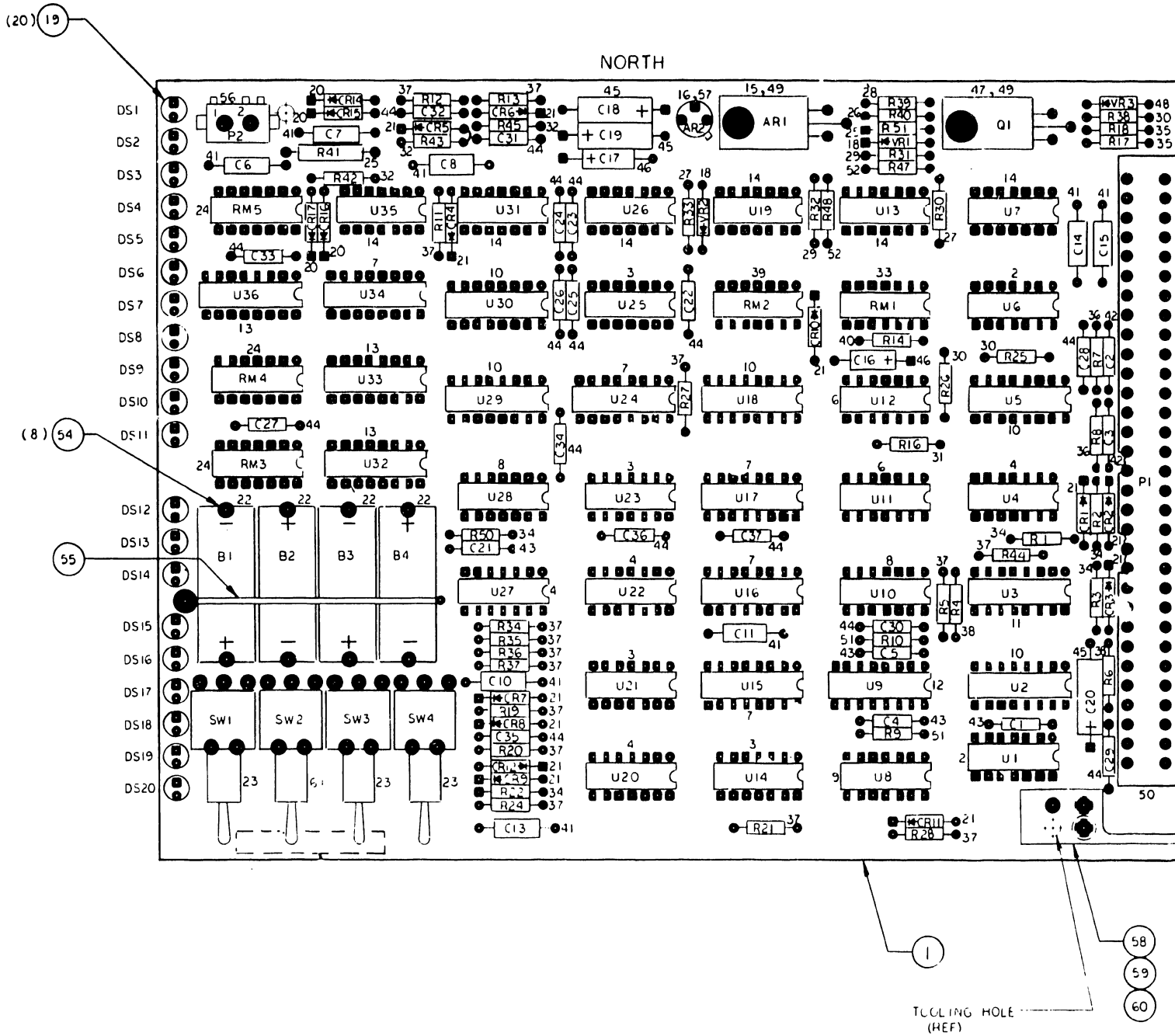


Figure 5-1. Schematics (sheet 4 of 4)

Figure 5-2 Assembly Drawing and Parts List (sheet 1 of 3)



ITEM NO.	IDENTIFICATION NUMBER	DRAWING TITLE	REMARKS
1	75863204-0	Component Bd. Asm.	
2	75863103-0	Board P. C. - Fault	
3	15135000-6	CMOS 4001 Quad 2 Inp	
4	15133000-8	CMOS 400 Dual 4 Inpu	
6	15133200-4	CMOS Quad 2 Input Na	
7	15133400-0	CMOS 4013 D Type F/F	
8	15133500-7	CMOS 4019 And/or Sel	
9	15133700-3	CMOS 4023 Triple 3	
10	15133900-9	CMOS 4025 Triple 3	
11	15134700-2	CMOS 4049 Hex Invert	
12	15134800-0	CMOS 4050 Hex Buffer	
13	15164435-8	IC 4538	
14	15129200-0	Transistor	
15	15126600-4	I. C. LM339	
16	15151500-4	Voltage Reg.	
18	15130400-3	Volt Regulator	
19	50240101-1	Volt Reg 5.1V 1N751A	
20	94372500-2	Light Emit Diode	
21	50241001-2	Diode Silicon	
22	51736700-9	Diode 1N914A	
23	75884149-8	Battery NICAD, 1.25 V	
24	94263907-1	Toggle Switch	
25	75009903-8	Res Pac 2% 220 (13)	
26	24500141-7	Res, Fixed Comp 1/2 W 5% 120	
27	94360160-9	Res 1/4W 1% 42.2	
28	94360187-2	Res 1/4W 1% 80.6	
29	94360246-6	Res 1/4W 1% 301	
30	94360287-0	Res 1/4W 1% 806	
31	94360300-1	Res 1/4W 1% 1.00K	
32	94360335-7	Res 1/4W 1% 2.32K	
33	94360346-4	Res 1/4W 1% 3.01K	
34	75009969-9	Res Pac 2% 1.0K (7)	
35	94360400-9	Res 1/4W 1% 10.0K	
36	94360419-9	Res 1/4W 1% 15.8K	
37	94360457-9	Res 1/4W 1% 39.2K	
38	94360500-6	Res 1/4W 1% 100K	
39	94360532-9	Res 1/4W 1% 215K	
40	75009981-4	Res Pac 2% 3 3K (7)	
41	94360392-8	Res 1/4W 1% 9.09K	
42	92496271-5	Capacitor 330PF	
43	92496219-4	Capacitor 2200 PF	
44	51798249-2	Cap Fxd Ceramic 50V	
45	92496227-7	Cap 100 V 20% .01 UF	
46	24504353-4	Cap 10V 20% 33UF	
47	17706035-7	Cap 50V 20% .22UF	
48	75752400-4	Transistor	
49	50240115-1	Diode Silicon	
50	75738302-1	Rivet	
	94243400-2	Conn-Card Mtd 62SOCK	

FIGURE 5-2. ASSEMBLY DRAWING AND PARTS LIST (SHEET 2 OF 3)
1-12 75735900-F

ITEM NO.	IDENTIFICATION NUMBER	DRAWING TITLE	REMARKS
51	94360556-8	Res 1/4W 5% 383K	
52	94360317-5	Res 1/4W 1% 1.50K	
54	94245412-5	Post-Wire Wrap	
55	83450800-4	Strap Battery Hldown	
56	95882700-8	Connector	
57	94335900-0	Pad-Transistor Mtg	
58	83479801-9	Key, Inject, Mold	
59	10125703-8	Scr Flat Hd	
60	75312701-8	Adhesive, Epoxy	
61	94263909-7	Sw Toggle, PC	

**SERVICE
BULLETIN
NO. 88**

EDITED BY CUSTOMER ENGINEERING DIVISION

CDC HAWK DISK DRIVE INSTALLATION AND ADJUSTMENTS (2200 SYSTEM COMPATIBILITY)

This bulletin describes the installation and adjustments procedures for the CDC Model 9427H (Hawk) Disk Drive when used in the 2200 system. For more detailed information on the Hawk, refer to Field Level Maintenance Guide (03-0072).

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1. GENERAL

1.1 Specifications

TABLE 1-1

Track Density	200 TPI
Access Times	
Maximum	60 ms
Track to Track	7.5 ms
Average	35 ms \pm 1ms
Spindle Speed	2400 rpm
Recording	
Mode	Double Frequency
Density	2200 BPI (Inner most Track)
Transfer Rate	2,500,000 BPS
Cylinders	408
Sectors	24
Storage Medium	type 5440 Cartridge
Read/Write Heads	CDC ramp-loading with straddle erase.
Environmental (Operating)	
Temperature	60 ^o F to 90 ^o F
Temp. Change Rate	12 ^o F per hour
Humidity	10 to 80% (non condensing)
Altitude	0 to 10,000 Ft. (3,048M)

SERVICE BULLETIN NO. 88

Electrical

Input Power

60 Hz units

100-250 volts rms in 10
volt increments (+10% -
15%), 59-60.6 Hz single
phase.

50 Hz units

100-250 volts rms in 10
volt increments (+10% -
15%), 49-50.5 Hz single
phase.

Power (Nominal)

310 Watts, 1050 BTU/hr

1.2 Compatibility

The Hawk disk drive will be compatible with 2260C or 2260B systems provided that R3 proms or above are installed in the 2260C/BC. The Hawk disk must never be installed on a 2260B system. A Hawk drive on 2260C/BC, with R3 proms will be able to read a pack generated on a 2260B. A pack generated by a Hawk on a 2260C/BC (with R3 proms) will be able to be read by a 2260B.

2. INSTALLATION

2.1 Unpacking

- A) Upon arrival at the installation site, inspect shipping cartons for possible damage. If severe damage is suspected, the carrier must be notified.
- B) The Hawk Drive may be packed with or without the lower furniture.
- C) The most common packing method is detailed in Figure 2-1. Reference this figure and remove the drive from packing container. The packing material should be retained for possible future use.
- D) Clean the unit thoroughly. Small particles of packing dust should be removed, especially from the cartridge receiver area. Rolled up masking tape can be used for this purpose.

2.2 Inspection Checklist

Before applying AC power to the drive, check the following:

- A) Remove the electronics cover by loosening the two screws on the sides and removing one screw in back. Inspect unit for damage or loose hardware.

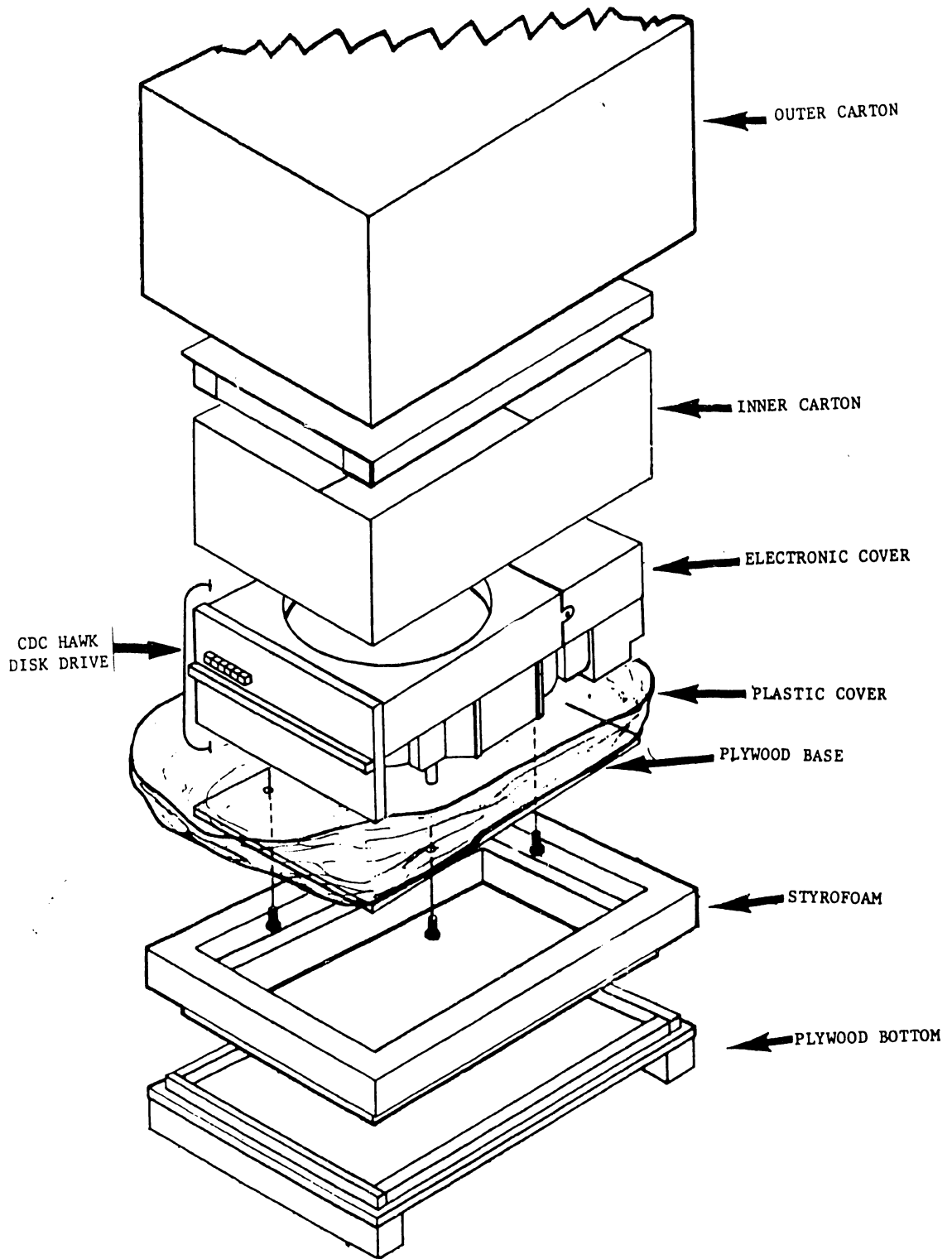


FIGURE 2-1 PACKAGING FOR HAWK DISK DRIVE (Without Lower Furniture Assembly)

- B) Remove carriage lock pin (Ref. Figure 2-2) and store on side of magnet as shown.
- C) Remove all PCB's and check option select switches per Section 2.3 of this bulletin. (See Figure 2-2A)
- D) Check for mandatory ECN's as per Section 6 of this bulletin.
- E) Ensure that the Wang disk I/O cable(s) is connected to the Hawk.

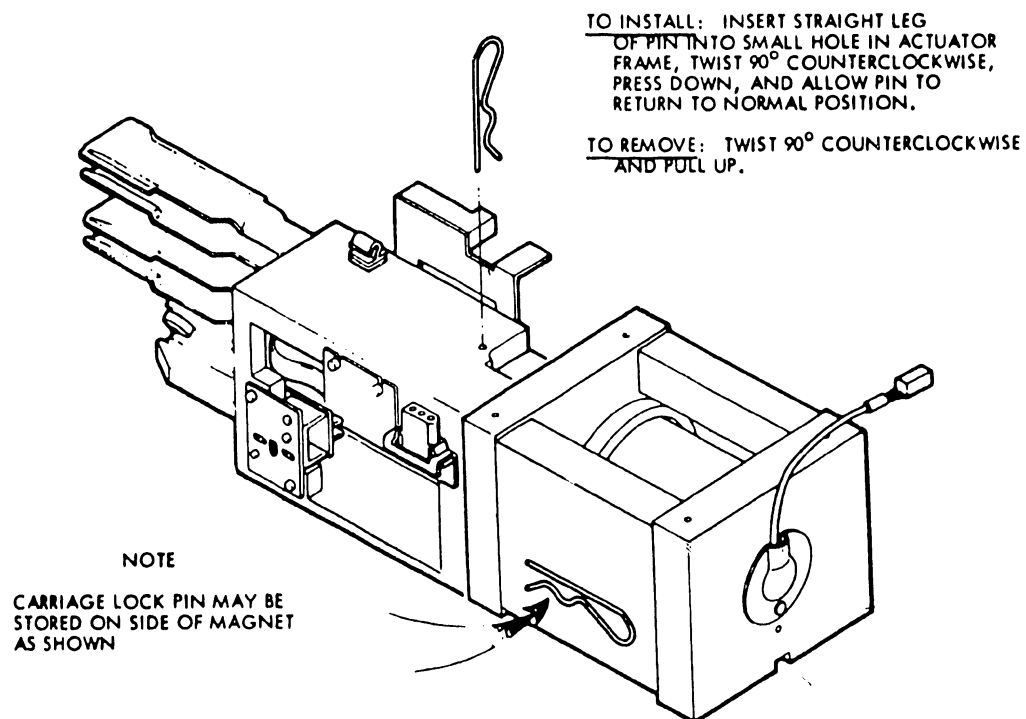


FIGURE 2-2 CARRIAGE LOCK PIN - (Removal & Storage)

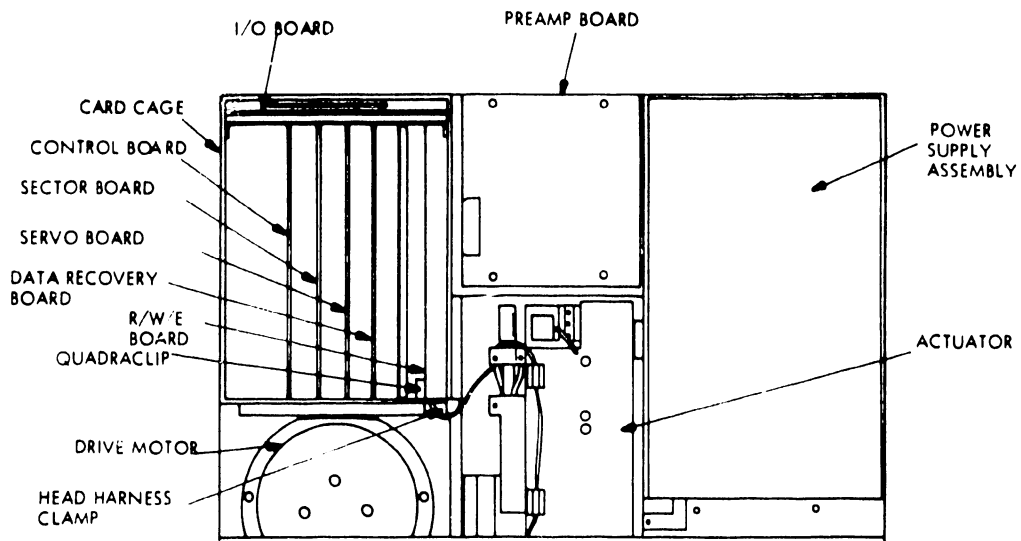
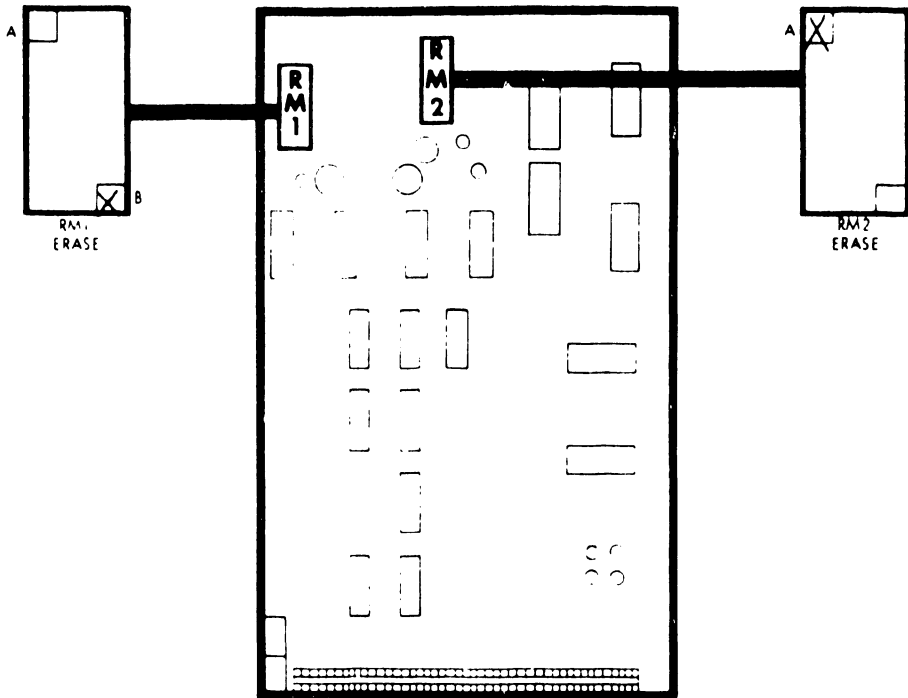


FIGURE 2-2A P.C.B. LOCATIONS (Above Deck)

2.3 Switch Setting

In Figure 2-3 thru 2-8 are shown the option select switch settings for the Hawk disk when used on a Wang 2200 System.

☒ INDICATES LOCATION OF PIN 1



	DESCRIPTION	RM1 - (ERASE)	RM2 - (WRITE)
*	TP1 ERASE TYPE	MOD. TYPE	PIN 1
	100 PRE-ERASE	NONE	B
	100 STRADDLE ERASE	NONE	A
	200 PRE-ERASE	NONE	A
X	200 STRADDLE ERASE	NONE	B

FIGURE 2-3 READ/WRITE/ERASE BOARD ASSEMBLY - SWITCH SETTINGS

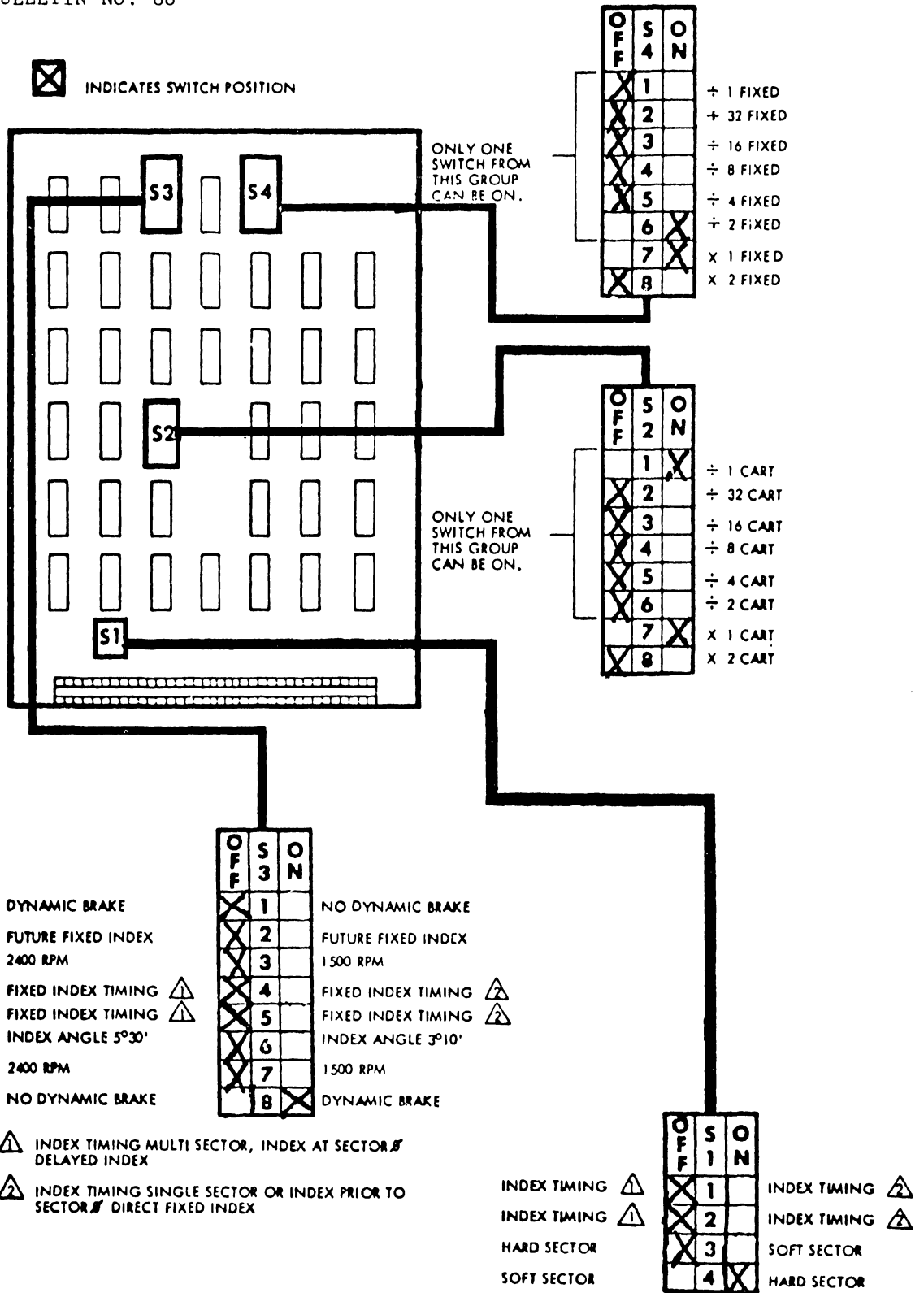
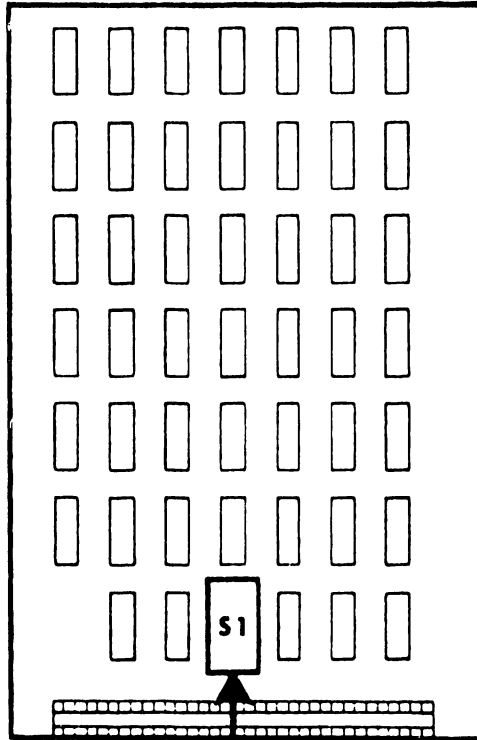


FIGURE 2-4 SECTOR BOARD (Synchronous Sector Counter)
ASSEMBLY - SWITCH SETTINGS

CONTROL BOARD



INDICATES SWITCH POSITION



INVALID CYL. ADD. INTERRUPT
 DROP READY WITH FAULT
 (DENSITY STATUS) 100 TPI
 NO FIXED DISC
 ACTIVE LOW INTERRUPT
 ACTIVE HIGH INTERRUPT
 R.T.Z.S. RESETS FAULT
 SPARE

0	S	0
N	1	F
	8	X
X	7	
	6	X
	5	X
X	4	
	3	X
X	2	
	1	X

READY STAYS TRUE
 DURING FAULT CONDITION
 200 TPI
 FIXED DISC
 ACTIVE HIGH INTERRUPT
 ACTIVE LOW INTERRUPT
 R.T.Z.S. DOESN'T RESET FAULT
 SPARE

FIGURE 2-5 CONTROL ASSEMBLY - SWITCH SETTINGS

DATA RECOVERY BOARD

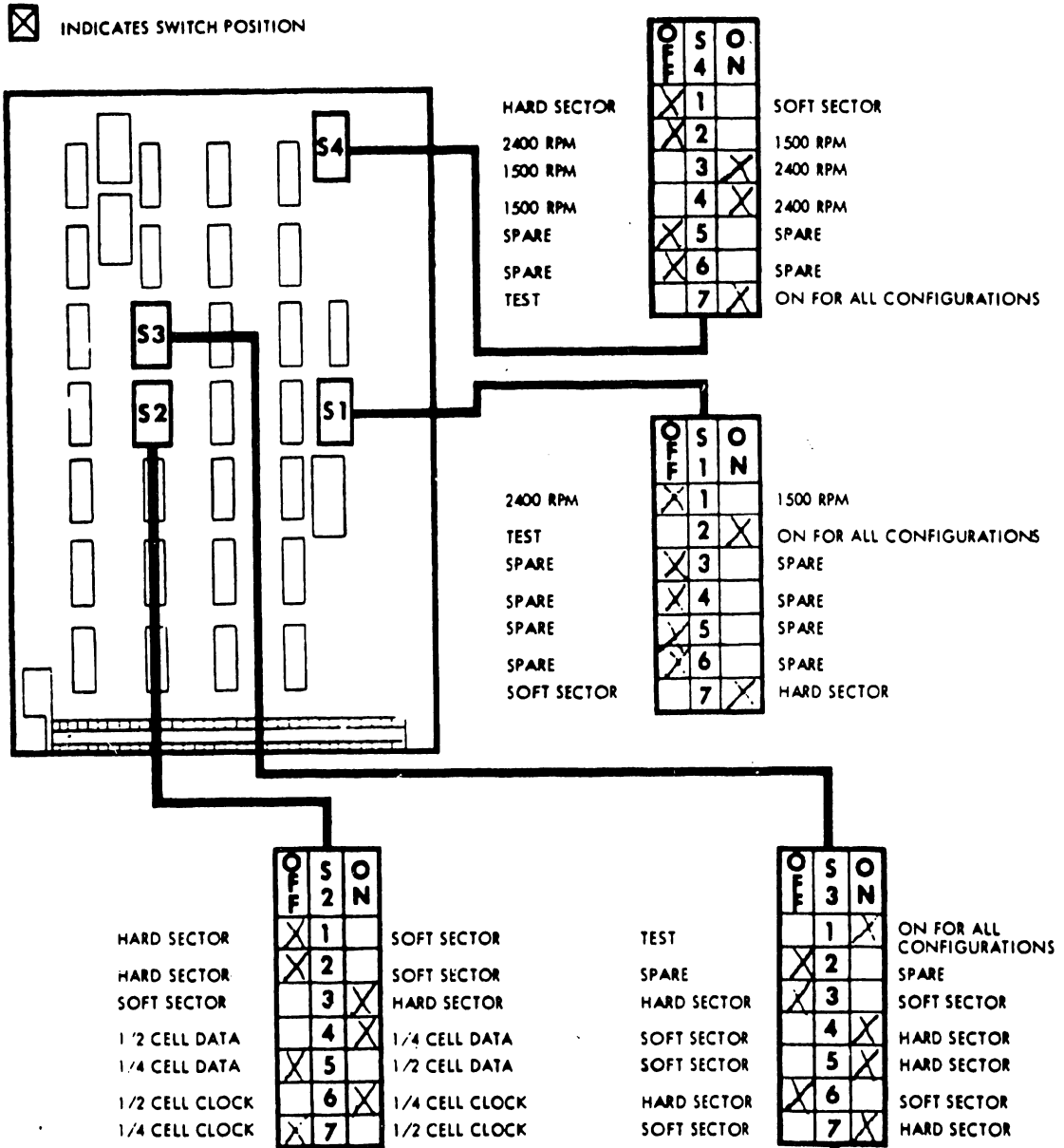


FIGURE 2-7 DATA RECOVERY BOARD ASSEMBLY - SWITCH SETTINGS

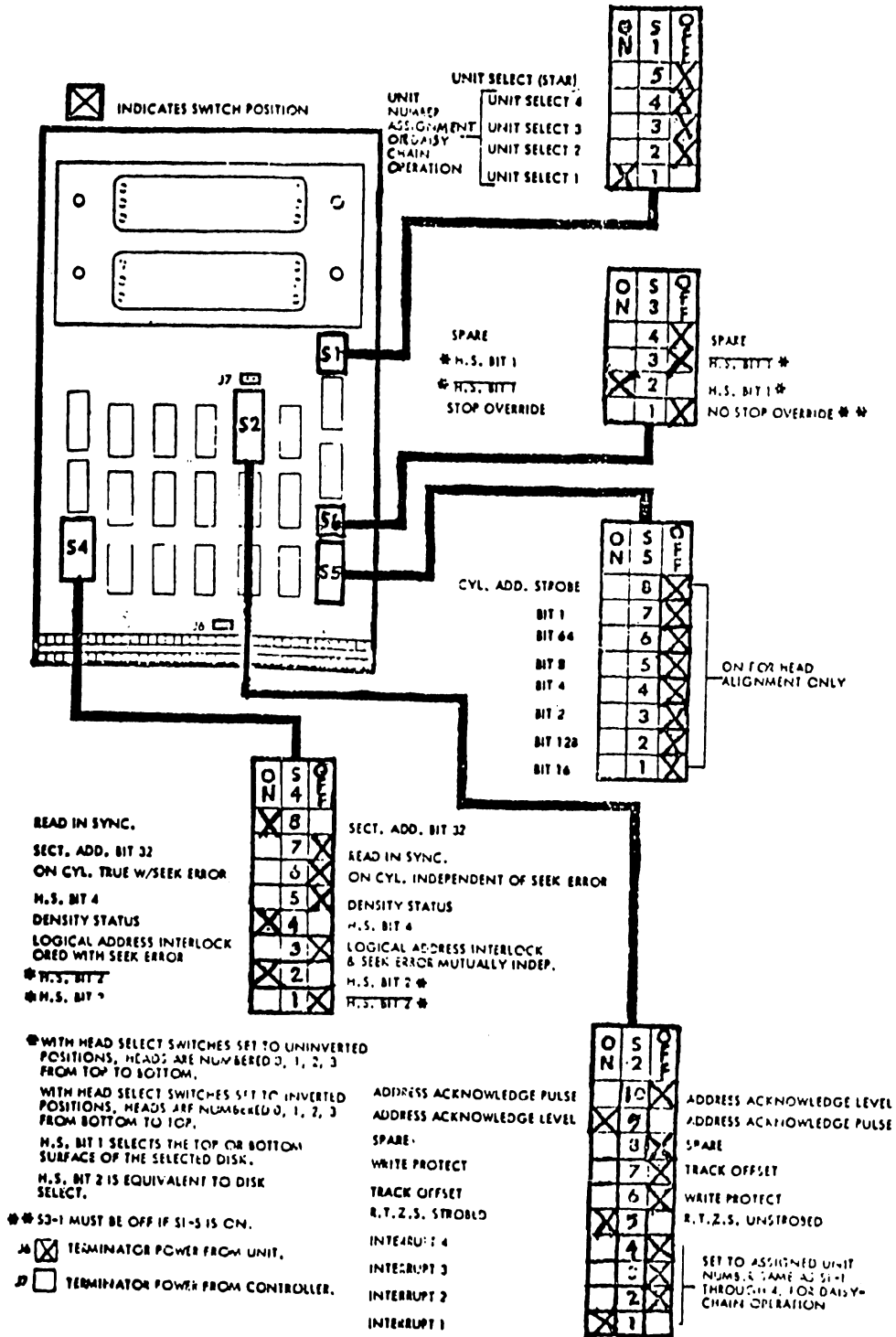


FIGURE 2-8 WINCHESTER I/O BOARD ASSEMBLY - SWITCH SETTINGS

2.4 Controls and Indicators

Figure 2-9 depicts the locations of the control and indicators. All switches and indicators are pre-assembled on a printed circuit board and mounted behind the control panel assembly. The control panel contains separate write protect switches and indicators for the fixed and removable disks. When used on the 2200 system, these switches should be disabled by using a nylon spacer (WL #452-0104), supplied to prevent the operator from using this feature of the drive. A functional description of the controls and indicators are as follows:

POWER SUPPLY ASSEMBLY

AC Circuit Breaker (CB1)	Provides AC power circuit protection, and main power switching.
DC Circuit Breaker (CB2)	Provides Logic (DC) circuit protection.

CONTROL PANEL

Start/Stop Indicator/Switch	Start switch energizes spindle motor and initiates the first seek provided the following conditions are met: <ol style="list-style-type: none"> 1. Circuit breakers are on. 2. Disk cartridge and cover properly installed. 3. Cartridge hold-down clamps are closed.
-----------------------------	--

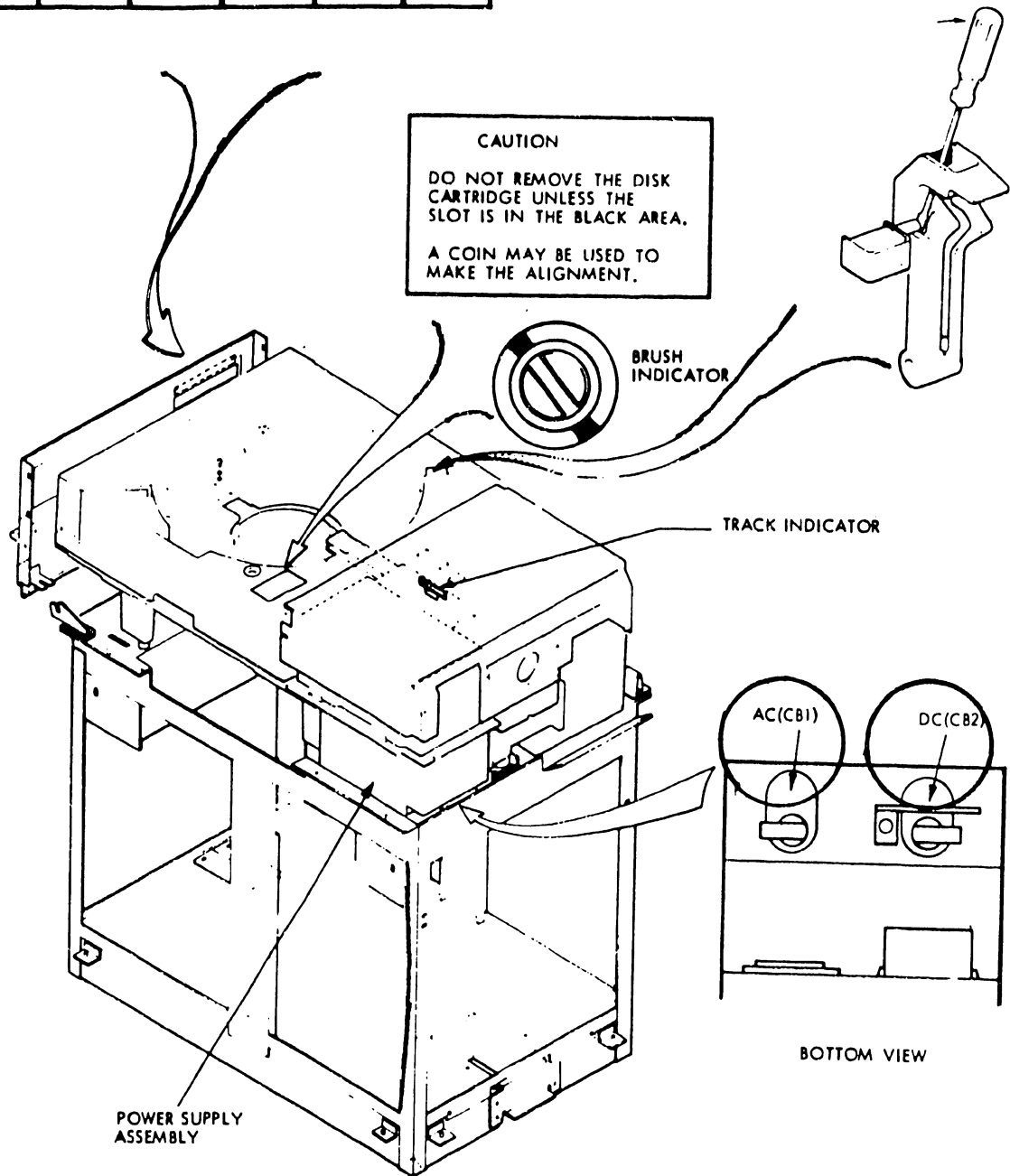
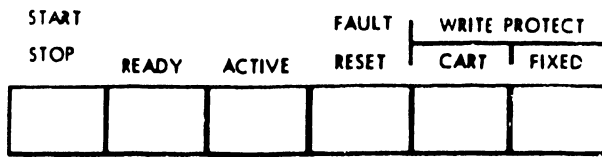


FIGURE 2-9 CONTROLS AND INDICATORS

Start/Stop Indicator/
Switch (cont'd)

Depressing the alternate action Start-
/Stop switch at any time after the
start cycle is initiated will cause
the machine to stop. When the switch
is depressed to stop machine, the
indicator light remains illuminated
until disk rotation has stopped. The
interlock solenoids energize at this
time to permit access to cartridge.

Ready Indicator

Illuminates when the unit is up to
speed, the heads are loaded and the
unit is ready for use. Extinguishes
during any fault, emergency retract,
or stop operation.

Active Indicator

Illuminates when the unit is actively
engaged in any mode, i.e., direct
seek (forward or reverse), return to
zero seek or read/write/erase.

Fault Indicator/Switch

Indicator illuminates when any fault
exists with the exception of a line
power failure. In the event of a
momentary line power drop, the heads
will go into an emergency retract and
the unit will stop. However, the
unit will restart automatically when
the power returns to normal. In the
even of a non-damaging fault (see
Section 7), the fault indicator will
be illuminated but can be reset by
either a return to zero command or by
pressing the fault switch.

W/Protect Cart.

This alternate-action switch remains slightly depressed, and is lit when on. When on, writing and erasing of data on the cartridge disk is inhibited.

W/Protect Fixed

This alternate-action switch remains slightly depressed, and is lit when on. When on, writing and erasing of data on the cartridge disk is inhibited.

2.5 Power Up Sequence

- A. Verify connection of all power and I/O cables. AC power may be supplied from the lower furniture depending upon the assembly supplied.

CAUTION

A fault will occur on power up if a cable with terminating resistors is not installed on the drive. This is a command fault and will occur because of improper signal termination.

- B. Verify the Start/Stop switch is in STOP position (out).
- C. Actuate DC breaker, CB2 (rear of power supply reference Figure 2-9). Actuate AC breaker CB1 and verify operation of blower motor.

NOTE:

The AC breaker will not lock in the ON position unless the DC breaker is also in the ON position.

- D. Open the pack locks and install a disk cartridge.
- E. Depress Start/Stop switch and verify Start/Stop indicator illuminates.
- F. Verify that the Fault indicator remains off.
- G. Approximately 65 seconds after the Start/Stop switch is depressed, the heads should load and the Ready indicator will illuminate. The disk is now ready to receive Seek, Write, and Read commands from the controller.
- H. Check adjustments per Section 3 of this bulletin to ensure compatibility.

3. ADJUSTMENTS

The following items are necessary to complete the adjustments:

- . Tri-Bit Alignment Pack
- . 465 Oscilloscope (or equivalent)
- . Hawk R/W/E Head Alignment Tool
- . Hawk PCB Extender
- . 7213 Disk Exerciser or 7013 Disk Exerciser

NOTE:

These adjustments should be performed
in order as shown in this bulletin.

Temperature Stabilization:

1. If disk unit has not been operating, allow unit to exercise for twenty minutes. For an additional ten minutes, allow unit to sit in a heads loaded, unit ready condition. Perform this with electronic cover on.
2. If disk has been operating, allow unit to sit in a heads loaded, unit ready condition, for ten minutes (with electronic cover on), before proceeding with adjustments.

3.1 7213 DISK EXERCISER OPERATION

The 7213 Hard Disk Exerciser board is a testing device that allows the user to operate the Diablo Models 43, 44B and the CDC Hawk Disk drives independently of a CPU. The 7213 is useful in performing disk drive alignments and general disk drive testing.

7213 OPERATIONAL DESCRIPTION

A. Switches and Indicators

The 7213 tester has two rows of switches, 6 cables, and 5 test points. Their labels and functions are as follows:

- 1) TK1 through TK256 (switch #'s 2 through 10 in Figure 3-1) - These are the track address switches. A track address is selected by setting the appropriate track address switches to ON. When the SEEK button is then pressed, the heads will move to the selected track. If the LOAD button is pressed, the selected track address will be loaded into the multiplexer of the exerciser board.
- 2) DS - DISK UPPER/LOWER (switch #11 in Figure 3-1) - When ON, the upper (removable) disk is selected; when OFF, the lower (fixed) disk is selected.
- 3) HS - HEAD UPPER/LOWER (switch #12 in Figure 3-1) - When ON, the upper (removable) disk is selected; when OFF, the lower head is selected.
- 4) RND - RANDOM TRACK GENERATOR (switch #13 in Figure 3-1) - When ON, a random track pattern is generated; when OFF, the random track generator is off.
- 5) ALTERNATE SEEK (switch #14 in Figure 3-1) - When ON, the head positioner will continuously seek between two addresses: the address set on switches TK1 through TK256, and the address previously loaded into the multiplexer of the exerciser board (by a LOAD operation).
- 6) SEEK (switch #15 in Figure 3-1) - Pressing this momentary contact switch will move the heads to the address set on switches TK1 through TK256.

- 7) RST - RESTORE (switch #16 in Figure 3-1) - Pressing this momentary contact switch will position the heads at track zero.
- 8) CONT. RST. (switch #17 in Figure 3-1) - When ON, the head are repeatedly positioned to track zero.

NOTE:

RST or CONT. RST will override the RND and ALTERNATE SEEK switches.

- 9) RESET (switches #18 in Figure 3-1) - This momentary contact switch resets the exerciser.
- 10) DISP - DISABLE (switch #19 in Figure 3-1) - When ON, the track address is disabled. The head will remain positioned wherever it is when the DISP switch is turned on.
- 11) LOAD (switch #20 in Figure 3-1) - This momentary contact switch loads the track address (selected by switches TK1 through TK256) into the multiplexer of the exerciser.
- 12) UNIT SELECT (switch #1 in Figure 3-1) - This 5-bank rocker switch has the following functions:
 - A. SW1 - Selects 100 TPI or 200 TPI for the random generator. During the random mode, switch 1 of rocker switch has control of the random generator. If SW1 is ON, the random address generated at any time will not be greater than 128. If SW1 is OFF, the random address can be greater than 128. This switch is active only when the RANDOM switch is on.
 - B. SW2 - Selects Unit 1.
 - C. SW3 - Selects Unit 2.
 - D. SW4 - SW5 not used.

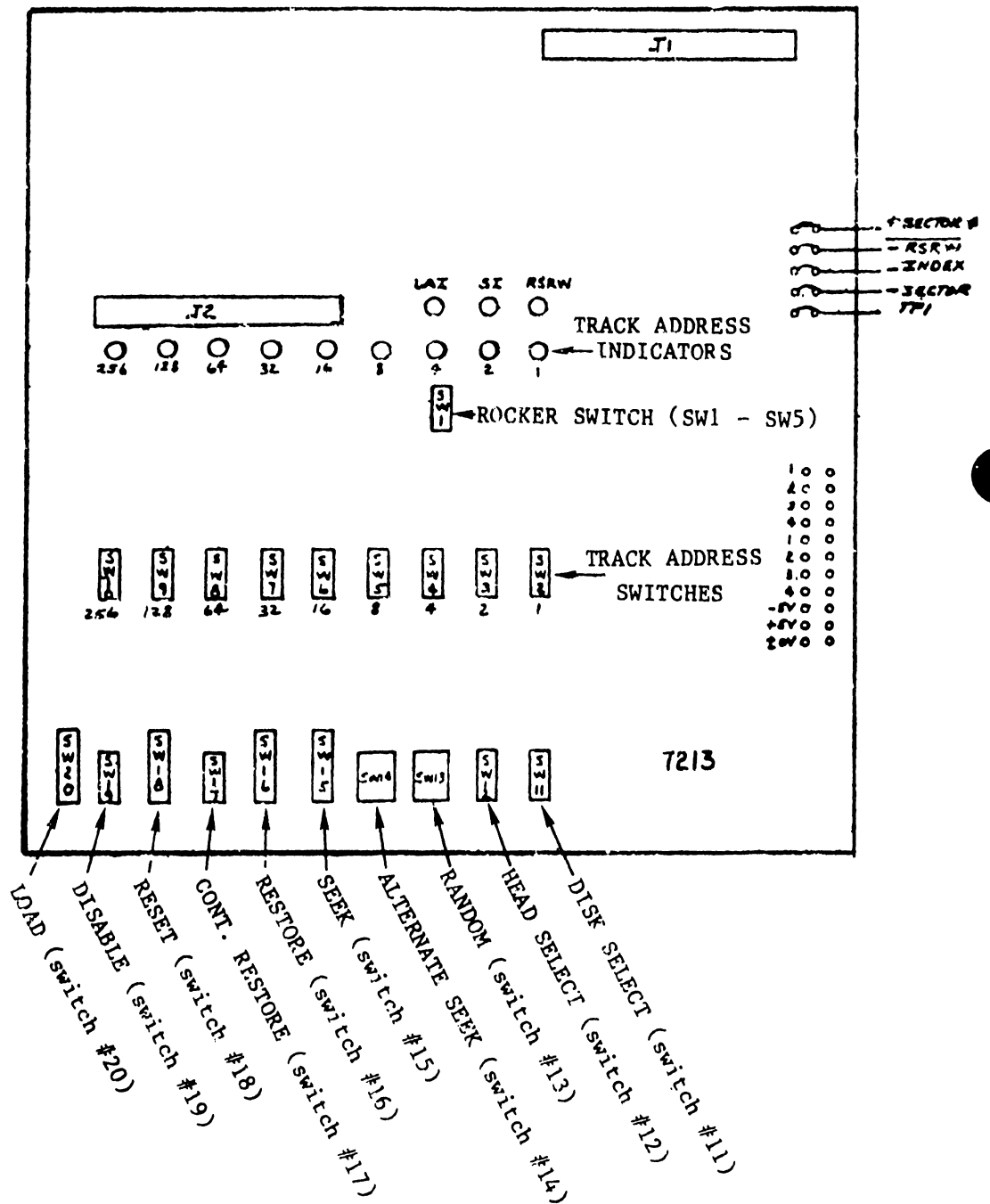


FIGURE 3-1 7213 DISK EXERCISER BOARD (Older Revision)

The 7213 board has 12 LED indicators; nine of these LEDs indicate the selected track address (1 through 256). The remaining indicators are described below.

- 13) LAI - LOGICAL ADDRESS INTERLOCK - When ON, it indicates that an illegal track address has been selected. The maximum legal address for the Model 43 and 203. For the Models 44A/44B and CDC Hawk, the maximum legal address is 407.
- 14) SI - SEEK INCOMPLETE - If ON, it indicates that the heads did not move to the selected track address.
- 15) RSRW - READY/SEEK/READ/WRITE - When ON, it indicates that the disk drive is ready to do another Seek, Read, or Write operation.

B. Test Points

The 7213 has five test points.

1. "+ SECTOR" -- Time from Index to first sector, used to obtain index to sector compatibility.
2. "RSR" -- Monitors Drive Ready (this is the "ON CYLINDER" signal from the Hawk).
3. INDEX" -- Index Mark coming from the disk.
4. "- SECTOR" -- Monitors Drive Sector marks.
5. "TP 1" -- this is the output of the Amplifier on the 7213 that is used with the head cables.

CONNECTING THE 7213 TO THE HAWK

- A. Disk Cables - The J1 and J2 connectors are used to connect the ribbon cables from the disk drive. For the 2200VS and 2260C/BC, a special set of connectors are provided. To test a disk drive, simply unplug the cables from the system and plug them into appropriate connectors of the 7213 exerciser board.
- B. +5V Cables - The 7213 has two +5 volt cables: one with an E-Z hook connector and the other with a single pin Molex connector.
- The single pin Molex connector is used with the CDC Hawk disk drives. On the Winchester I/O board, connect the cable to the center pin of the three-pin connector (J6) as shown in Figure 3-2.
- C. -5V Cables - On the CDC Hawk drives connect the -5V cable to TP9 on the AGC Servo Preamp Board. See Figure 3-3.
- D. Head Cables - The large head cable connector plugs into the upper or lower head cables of the disk drive:
- E. GND Cable - Connect the GND cable to logical +0V for all models. (Card cage chassis for the Hawk)

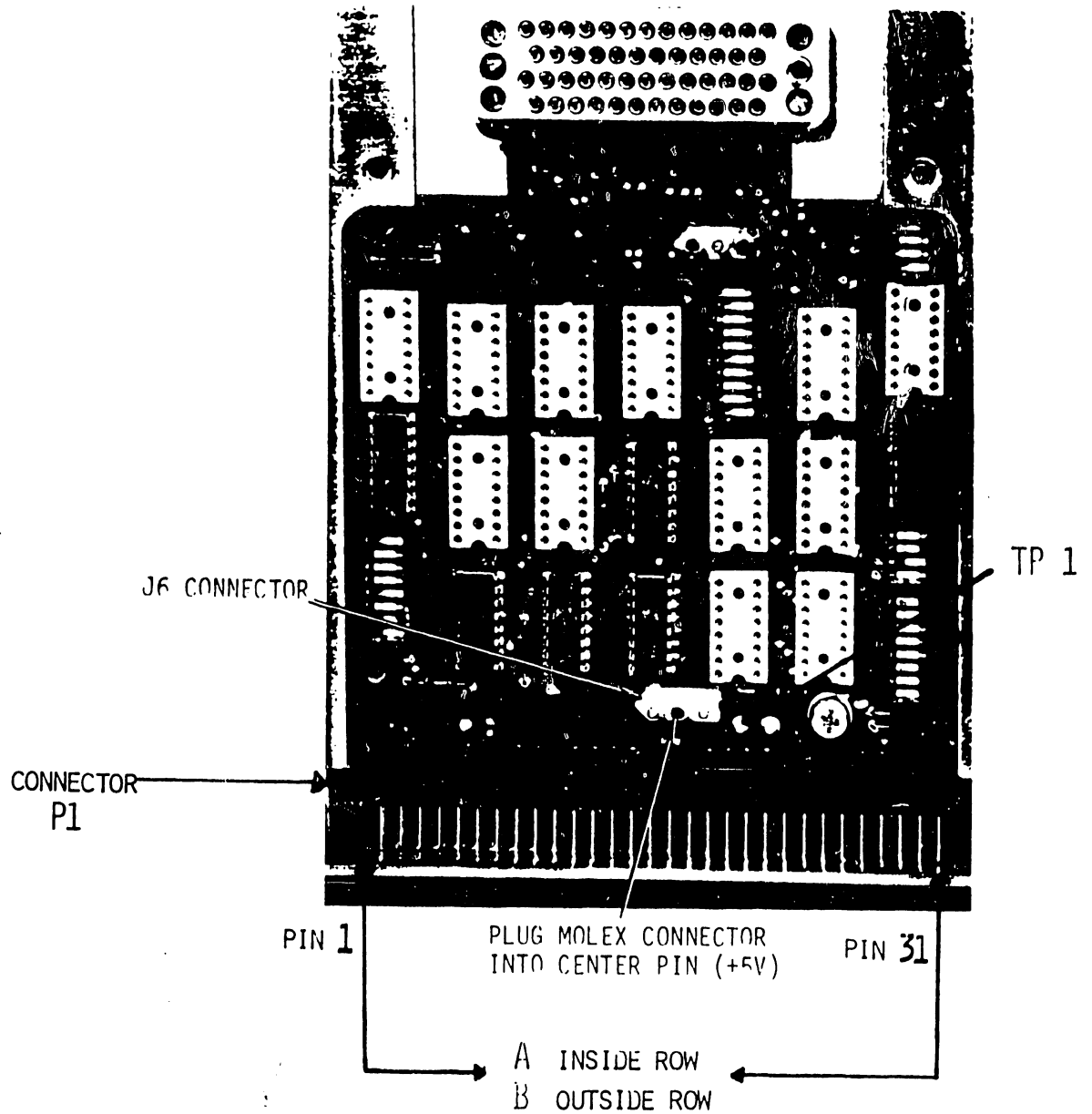


FIGURE 3-2 WINCHESTER I/O BOARD TEST POINT LOCATIONS

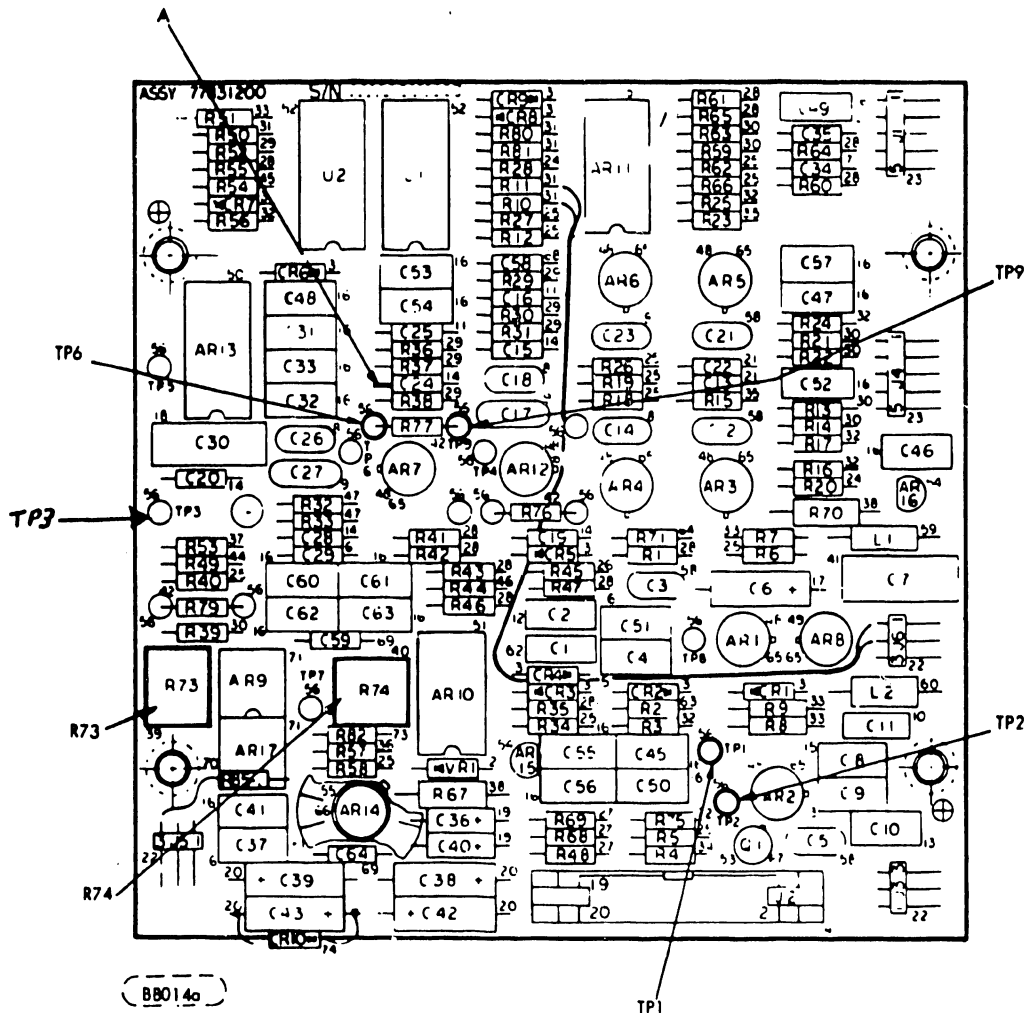


FIGURE 3-3 SERVO PREAMP BOARD

OPERATION OF THE 7213 EXERCISER

Set all switches to the OFF position.

Power on the drive; when the drive loads the heads, the READY light (RSRW) will turn on.

The exerciser is now ready for operation.

A. Seek Operation

1. Reset the exerciser.
2. Press the RST button (switch #16 in Figure 3-1) to restore the head positioner to track zero.
3. Set the Seek Address with address switches TK1 through TK256 and note address in address LED Display.
4. Press the SEEK switch (switch #15 in Figure 3-1).

The drive should now seek to the address specified.

B. Alternate Seek

1. Reset the exerciser.
2. Press the RST button (switch #16 on in Figure 3-1) to restore the head positioner to track zero.
3. Select one seek address with switches TK1 through TK256.
4. Press the LOAD switch (switch #11 in Figure 3-1) to load this seek address into the multiplexer.
5. Select the other seek address with switches TK1 through TK256.
6. Turn the Alternate Seek switch ON (switch #14 in Figure 3-1).

The drive should now be seeking to randomly selected track addresses.

C. Random Seek

1. Reset the exerciser.
2. Press the RST button (switch #16 on in Figure 3-1) to restore the head positioner to track zero.
3. Turn the RND switch ON (switch #13 in Figure 3-1) to select the Random Mode.

NOTE:

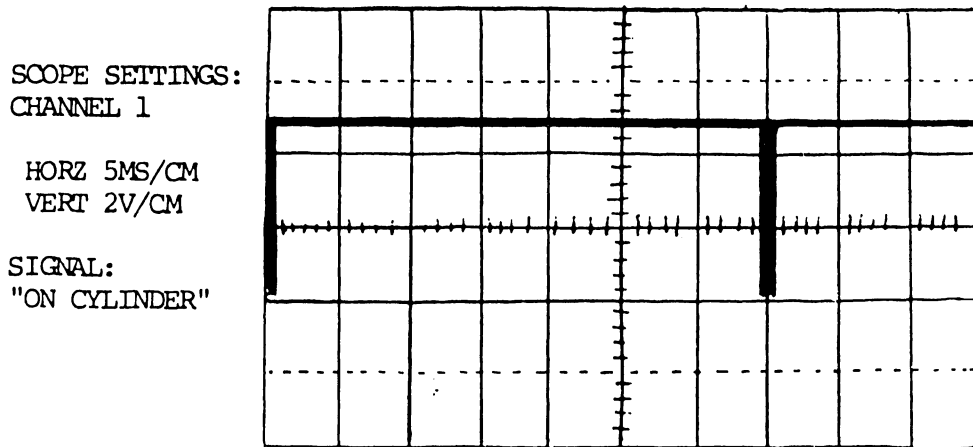
The drive should now be seeking to randomly selected track addresses.

3.2 Average Seek

Steps:

1. Power down disk and install 7213 exerciser as indicated in paragraph 3.1.
2. Remove Electronic cover/card cage cover.
3. Power up drive and bring to ready state.
4. Perform temperature stabilization procedure (See paragraph 3.0).
5. Set channel 1 at 2 volts per division, DC coupling.
6. Set time base at 5 milliseconds per division.
7. Set scope trigger to internal, channel 1, negative slope.
8. Connect channel 1 to "On Cylinder", pin B9 of Winchester I/O board. (Ref. Figure 3-2)
9. Perform alternate seek between tracks 293 and 405.

10. Adjust trigger level and observe waveform on channel 1.
11. Adjust vertical/horizontal position controls to obtain the waveform in the sketch below.



12. Adjust potentiometer R73 on Servo Pre-Amp board (Ref. Figure 3-3) so that there are 35 (+1) milliseconds between the "On Cylinder" pulses as pictured in the sketch.

3.3 Servo Balance

NOTE:

This adjustment must be performed if the SERVO PRE-AMP OR SERVO P.C.B.'s have been changed/adjusted or the ACTUATOR has been changed.

CAUTION:

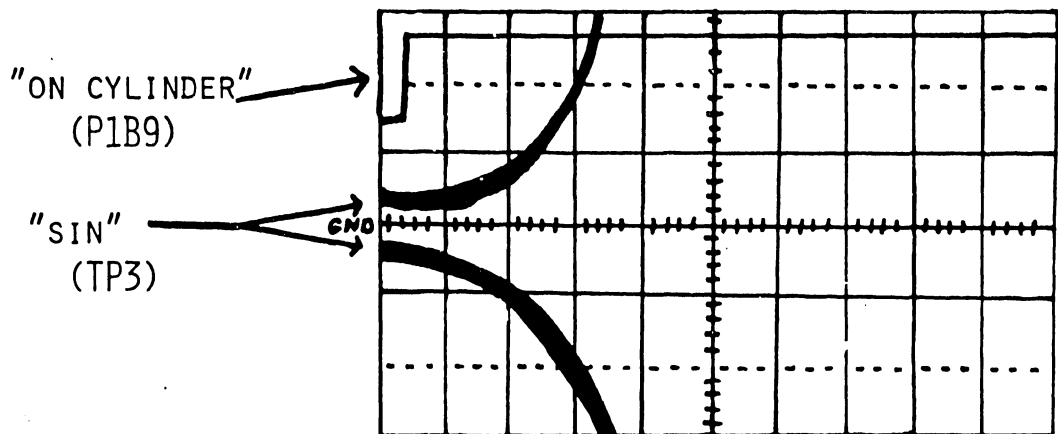
if the servo balance adjustment is altered, the following adjustments must be checked; R/W/E Head Alignment, Index to Burst, FEOT.

Steps:

1. Power down disk and install 7213 exerciser.
2. Remove Electronics cover/card cage cover.
3. Power up drive and bring to ready state.
4. Perform temperature stabilization procedure. (See paragraph 3.0)
5. Set time base to .2 milliseconds per division.
6. Set channel 1 to 5 volts per division, DC coupling.
7. Set channel 2 to .1 volts per division, DC coupling.
8. Set for chopped sweep (alternate if using T932 scope).
9. Set trigger to channel 1, internal, negative slope.
10. Connect channel 1 to P1 pin B9 of Winchester I/O Board (On Cylinder).
11. Connect channel 2 to TP 3 on Servo Pre-Amp board. (Ref. Figure 3-3).
12. Perform alternate seeks between tracks 0 and 2.
13. Adjust vertical/horizontal position, trigger level and trigger slope controls to obtain waveform similar to the figure below.
14. Establish ground reference for channel 2 on center line of the scope.

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15. Adjust potentiometer R74 on Servo Pre-Amp board (Ref. Figure 3-3) so that the channel 2 signals are balanced above and below the ground reference as shown in the sketch below.
16. Perform alternate seeks between tracks 400 and 402.
17. If channel 2 waveforms are not balanced around ground, alternate adjustments between tracks 0-2 and 400-402 will be necessary to bring both as close as possible.



NOTE:

If the servo balance adjustment was altered, proceed directly to the FEOT adjustment step #1.

3.4 Forward End of Travel

NOTE:

The following adjustments must be correct before proceeding.

Servo Balance
Average Seek

Steps:

1. Power down disk and install 7213 exerciser.
2. Remove electronics cover/card cage cover.
3. Loosen the two screws on the power supply cover and tilt cover back.

CAUTION:

In the following steps, relay K1 is removed because its physical location hampers the adjustment process. K1 must not be removed with power on. With K1 removed and AlP2 reversed, an emergency retract is not possible. Consequently, the heads must be manually unloaded should loss of spindle motion occurs.

4. Remove relay K1 (large relay on forward end of power supply board 1).
5. Unplug AlP2 noting orientation according to label on casting (Ref. Figure 3-4).
6. Remove Servo P.C.B., place on extender board and insert extender into Servo P.C.B. slot in card cage.

7. Set switch 2-10 on Servo board to OFF position (Ref. Figure 3-5).

CAUTION:

Ensure that all switches on the extender board are in the ON position.

8. Apply power to disk.
9. Depress Start/Stop switch to START (in).
10. Upon completion of the brush cycle, connect AlP2; but reverse orientation according to label on casting.
11. Verify head loads and ready light illuminates then install the following jumpers on the Servo board; (Ref. Figure 3-5).
 - A. TP 20 to +0 volts (card cage chassis).
 - B. TP 21 to +0 volts (card cage chassis).

These jumpers prevent the occurrence of a seek error when F.E.O.T. is sensed during this adjustment.

CAUTION:

These jumpers must be removed if it becomes necessary to retract heads. The jumpers must not be installed unless the heads are loaded and the ready light is on

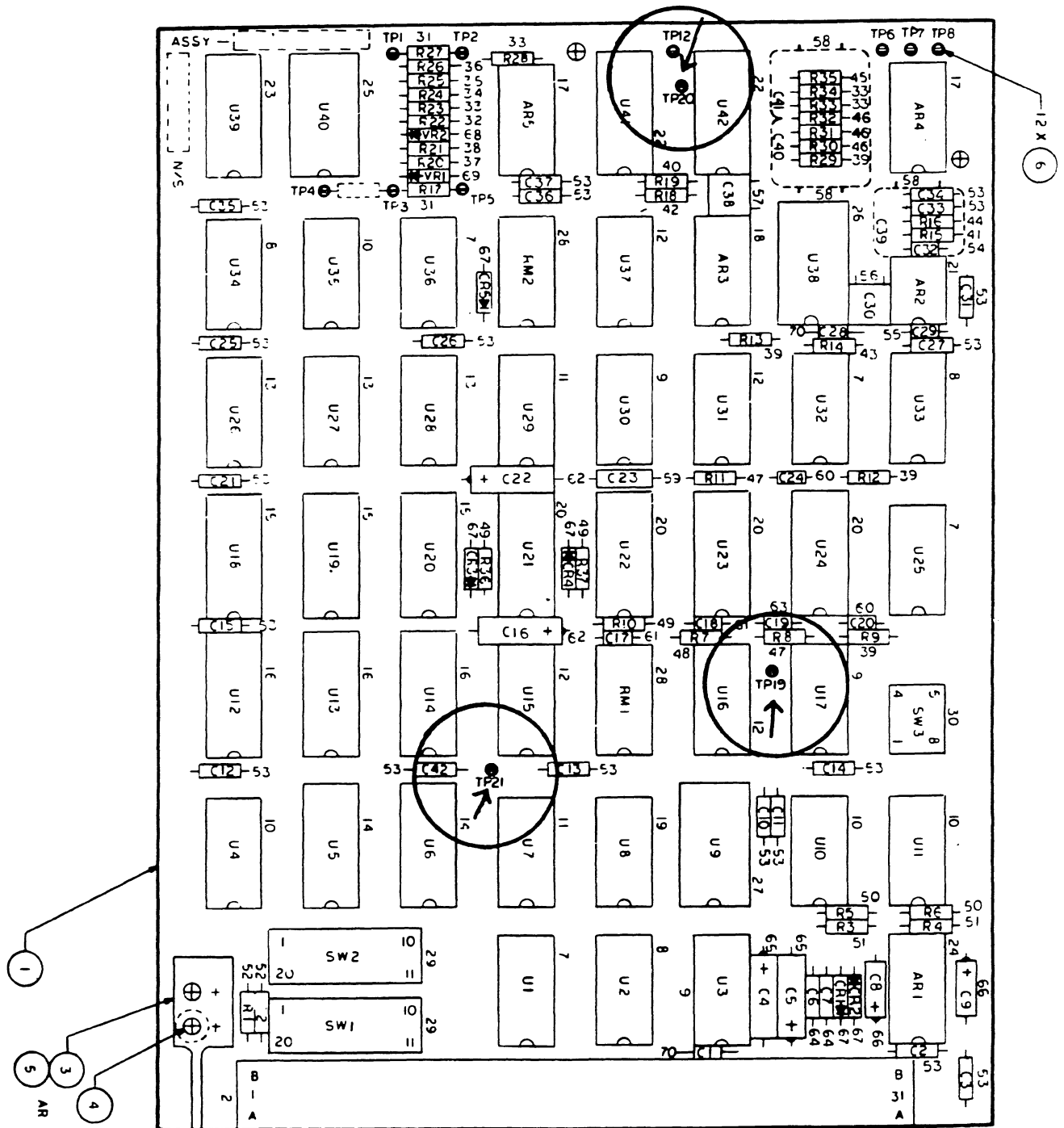


FIGURE 3-5 SERVO BOARD TEST POINT LOCATIONS

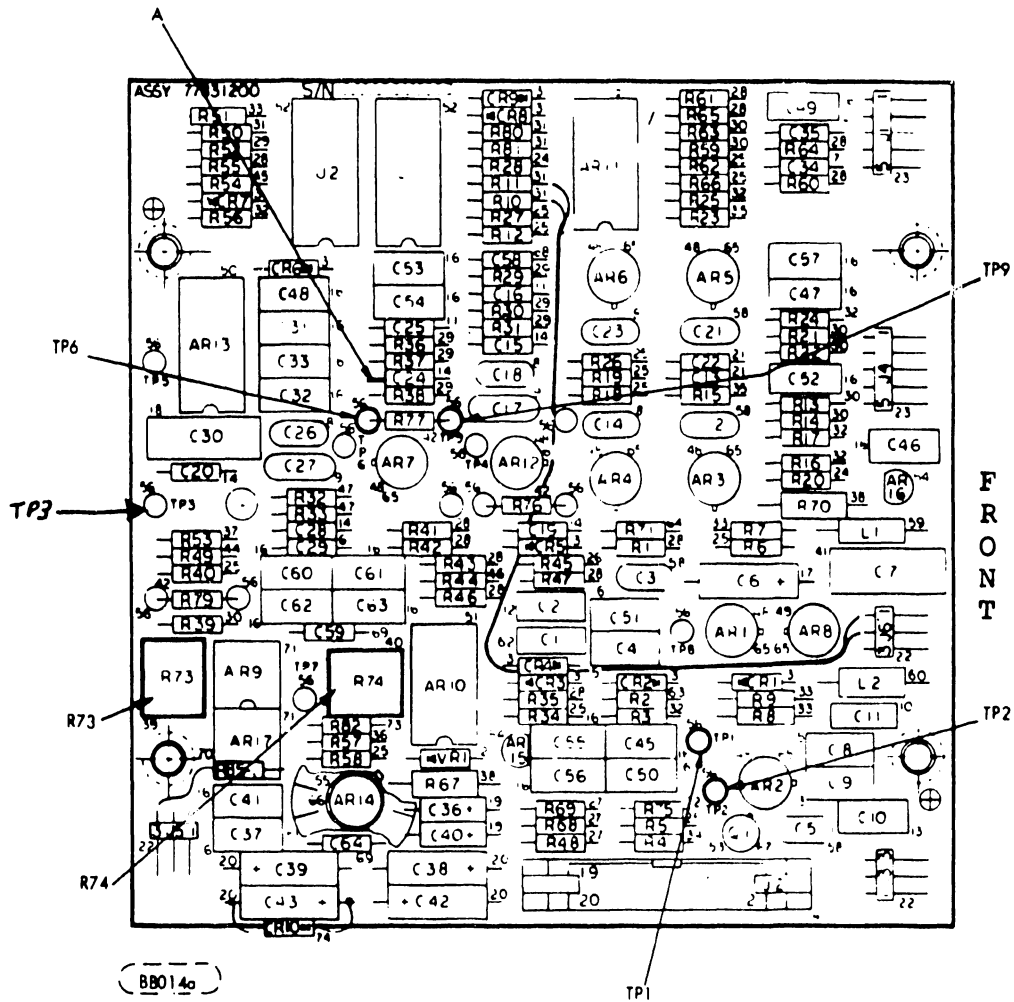


FIGURE 3-6 SERVO PREAMP TEST POINT LOCATIONS

12. Perform temperature stabilization procedure. (See paragraph 3.0)
13. Set time base at 2 milliseconds per division.
14. Set channel 1 and channel 2 at 1 volt per division, DC coupling.
15. Set trigger to channel 1, internal, normal, negative slope.
16. Set for alternate sweep.
17. Connect channel 1 of oscilloscope to TP 19 of Servo board (Ref. Figure 3-5). Test point is not labeled on board.
18. Connect channel 2 of oscilloscope to TP3 of Servo Pre Amp board (Ref. Figure 3-6).
19. Perform alternate seeks between 408 and 410.

NOTE:

If a square wave is not present on channel 1, the scope does not have a trigger and the pictured waveform will not be attainable. If this is the case, adjust the F.E.O.T. assembly as in step 26 and 27 to obtain a square wave on channel 1. Then proceed to step 20.

20. Uncalibrate channel 2 volts per division to bring the sine wave to a full 5 divisions.
21. If necessary, uncalibrate channel 1 volts per division to ensure that it is a full 5 divisions.

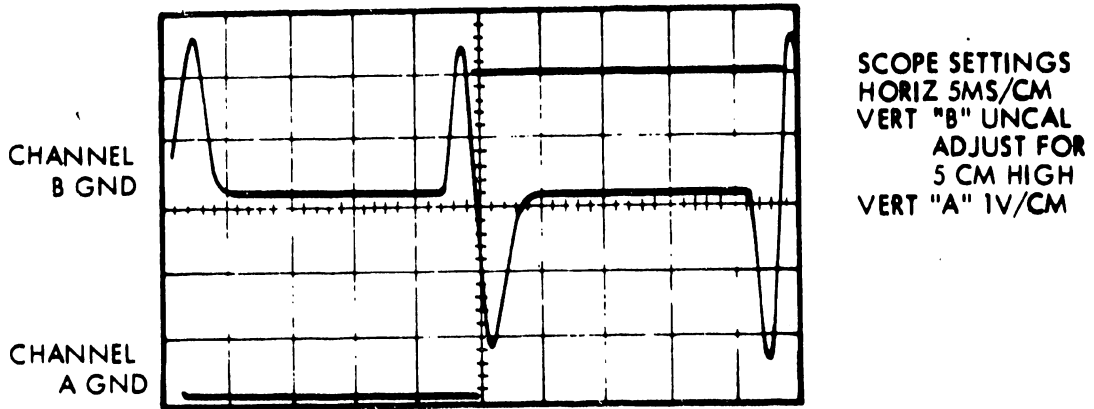


FIGURE 3-7 TYPICAL F.E.O.T. WAVEFORM

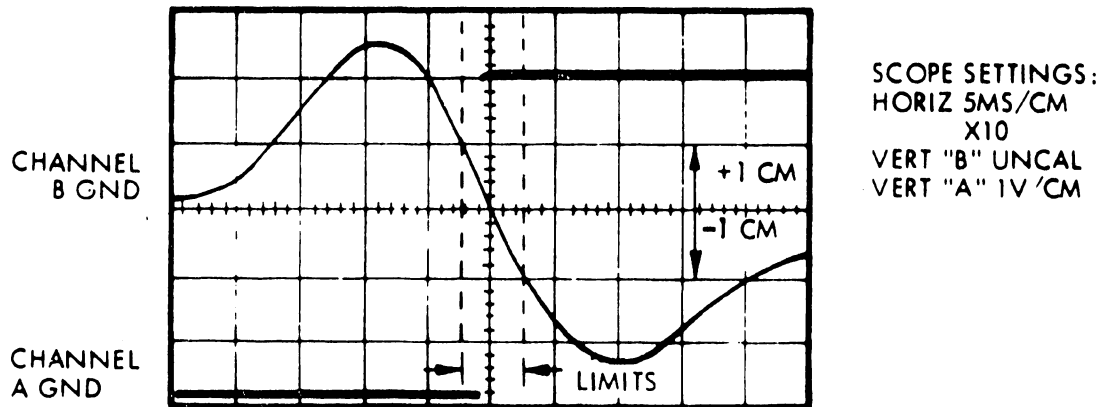


FIGURE 3-8 TYPICAL F.E.O.T. WAVEFORM

22. Use vertical position controls (both channels) to place waveforms on top of each other (Ref. Figure 3-7).
23. Expand time base (X10) until a waveform similar to Figure 3-8 is obtained.
24. Loosen the screws that secure the FEOT assembly, (Figure 3-4) and place a wide blade screwdriver in the slot.
25. Using the screwdriver, move the assembly forward or reverse until the FEOT signal, channel 1, goes positive in the center of the channel 2 signal. The limits are shown in Figure 3-8.
26. Tighten the FEOT assembly securing screws and verify that the adjustment does not change.

CAUTION:

If the FEOT adjustment was altered
the Head Alignment will change.
Proceed directly to Read/Write
Head Alignment.

27. Remove the jumpers from servo board.
28. Bring drive to load position, power OFF and correct A1P1.

3.5 Read/Write Head Alignment

NOTE:

This alignment must be checked if the Servo or Servo Pre-Amp boards are exchanged.

The following adjustments must be correct before proceeding:

Servo Balance
Average Seek
Forward End of Travel

Steps:

1. Power down disk, turn off AC power and remove electronics/card cage covers.
2. Loosen the two screws on the power supply cover and tilt back.

CAUTION:

In the following step, relay K1 is removed because its physical location hampers the adjustment process. K1 must not be removed with power on. With K1 removed and ALP2 reversed, an emergency retract is not possible. Consequently, the heads must be manually unloaded should loss of spindle motion occur.

3. Remove Relay K1 (large relay on forward end of power supply).

4. Unplug A1P2 (Ref. Figure 3-7) noting orientation according to label on casting.
5. Unplug the upper head from the R/W/E board and connect it to the 7213 head cable plug.
6. Bring the disk drive to "LOAD" position by applying AC power.
7. Remove disk platter.
8. Install tri-bit alignment cartridge.
9. Depress Start/Stop switch to START (in).
10. Upon completion of the brush cycle, reconnect A1P2 but reverse orientation as described by label. This bypasses the now removed K1 and allows the servo system to operate properly.

CAUTION:

If AC power were applied with A1P2 reversed, the servo system will not have settled and a head load and crash could result. Therefore, never reverse A1P2 until the brush cycle has been completed.

11. Perform temperature stabilization procedure. (See paragraph 3.0)
12. Set scope time base to 1 microseconds per division.
13. Set channel 1 at .2 volts per division, AC coupling.
14. Trigger scope internally on channel 1, negative slope.

15. Place channel 1 on TP1 of the 7213 exerciser.
16. Perform a direct seek to cylinder 146. The heads should now be positioned at cylinder 146. Check track indicator mounted on actuator.
17. Adjust trigger level and observe waveform on channel 1. Compare with Figures 3-9 and 3-10.
18. If the head is within one track of proper alignment, a waveform similar to Figure 3-10 will be obtained.
19. If pattern is not identical to Figure 3-9, adjust upper head as follows:
 - a) Loosen the appropriate head clamp (Figure 3-11).
 - b) Insert Hawk alignment tool with the pin in the appropriate head slot.
 - c) Using this tool, move head forward or reverse very slowly until a waveform similar to Figure 3-9 is obtained.

CAUTION:

If the end of head adjustment travel is reached in either direction, the F.E.O.T. adjustment is incorrect. Alternate adjustments of both may be necessary to obtain the proper adjustment.

20. Set a ground reference line at the bottom of the scope. (Figure 3-9)

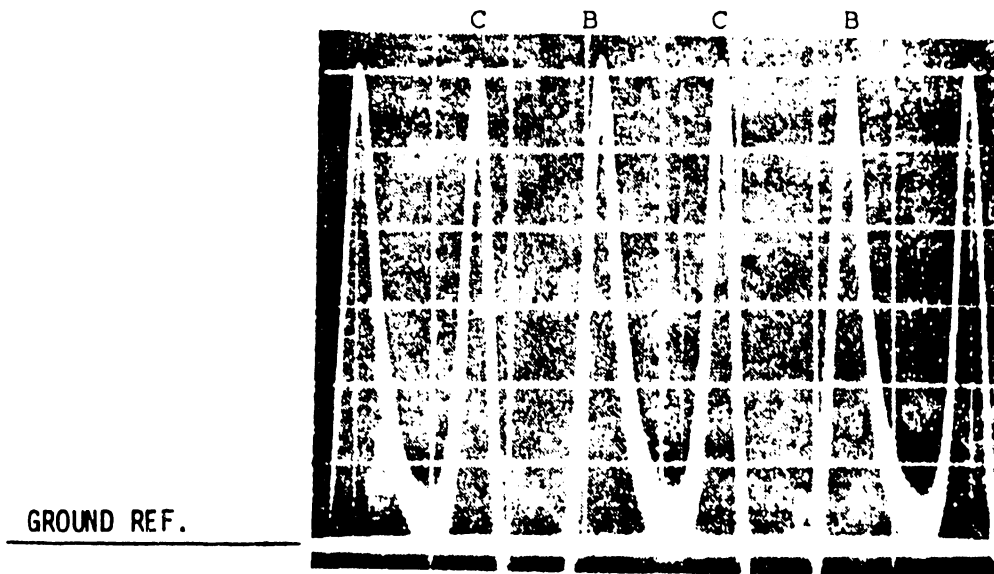


FIGURE 3-9 HEAD ALIGNMENT WAVEFORM - (Head Aligned)

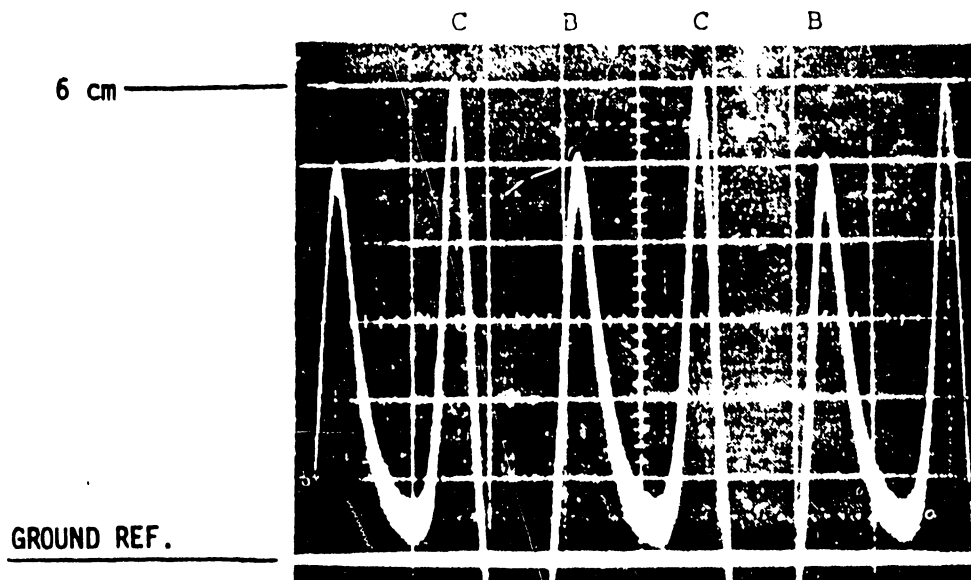


FIGURE 3-10 HEAD ALIGNMENT WAVEFORM - (Head Within One Track)

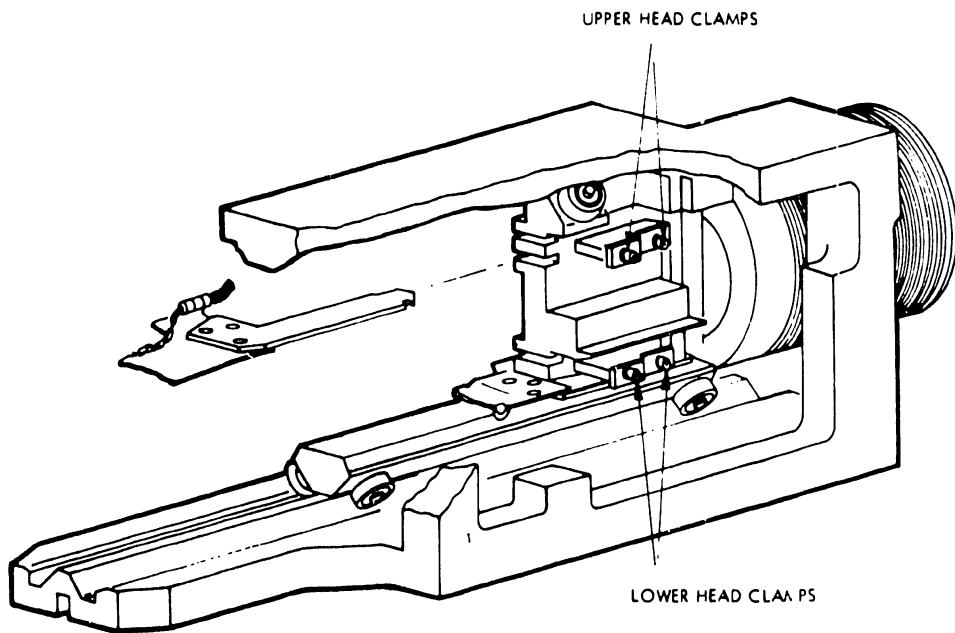


FIGURE 3-11 HEAD CLAMP LOCATIONS

21. Adjust the volts per division, and its variable control, for a vertical deflection of six divisions (three divisions if using T932 scope) from the ground reference line to the highest peak.
22. If the difference between the two peaks is more than $1/2$ of a division, adjust the head as described in step 19.
23. When the proper adjustment is obtained, tighten the head clamp while observing the waveform. Alternate adjustments may be necessary.
24. Unplug the lower head from the R/W/E board and connect it to the 7213 head cable plug and return to step 18 to align the lower head.

NOTE:

When both heads are aligned, proceed directly to Index to Data alignment, step #7.

3.5 Index To Data Alignment

The following adjustments must be correct before proceeding:

Servo Balance
Average Seek
Forward End of Travel
Read/Write Head Alignment

Steps:

1. Power down if necessary, turn AC power off and remove electronic/card cage covers.
2. Bring the disk drive to the "LOAD" position by applying AC power.
3. Remove disk platter.
4. Install tri-bit alignment cartridge.
5. Depress Start/Stop switch to START (in).
6. Perform temperature stabilization procedure. (See Section 3)
7. Perform a seek to cylinder 10. The heads should now be positioned at cylinder 10. Check track indicator mounted on actuator assembly.
8. Place channel 1 on "-Sector" test point on 7213. DO NOT use "+ Sector".
9. Set time base to 10 microseconds per division.
10. Set channel 1 at 2 volts per division, DC coupling.
11. Set channel 2 at .5 volts per division, DC coupling.
12. Trigger scope internally on channel 1, negative slope.
13. Adjust trigger level and observe waveform on channel 1.
14. The index waveform on channel 1 should be a 40 microsecond pulse (+3 microseconds).

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15. Plug the upper head into 7213 head cable plug.
16. Connect channel 2 to TP 1 of exerciser.
17. Set oscilloscope for alternate sweep.
18. By adjusting horizontal and vertical position controls, obtain waveforms similar to Figure 3-12.
19. Verify that the Index to Data burst is 19 microseconds (+3 microseconds).
20. If waveform is out of stated tolerance, adjust potentiometer on sector board to obtain proper adjustment.
21. Plug the lower head into exerciser. Check the Index to Burst period.
22. Alternate adjustments, using both heads, may be necessary to bring both within the stated tolerance.

CAUTION:

Plus differences between the two heads shall not exceed 6.25 microseconds. If this tolerance is exceeded, the heads must be reseated in their mounts and realigned.

23. If alignment is correct, perform the following:

CAUTION:

DO NOT unplug ALP2 until heads
are retracted.

- a) Depress Start/Stop switch (out).
- b) Remove Tri-Bit cartridge when drive is in "LOAD" mode.
- c) Remove AC power.
- d) Unplug ALP2 and return to normal position as indicated by label on casting.
- e) Replace power supply cover.
- f) Remove Servo board from extender.
- g) Return Switch 2-10 on Servo board to ON position.
- h) Remove jumpers from Servo board and replace board into card cage.
- i) Install card cage cover.
- j) Inspect unit for the following:
 - 1) All screws tight.
 - 2) All connectors secure.
 - 3) All cables routed so as not to obstruct moving parts.
- k) Replace electronic cover.
- l) run associated diagnostics.

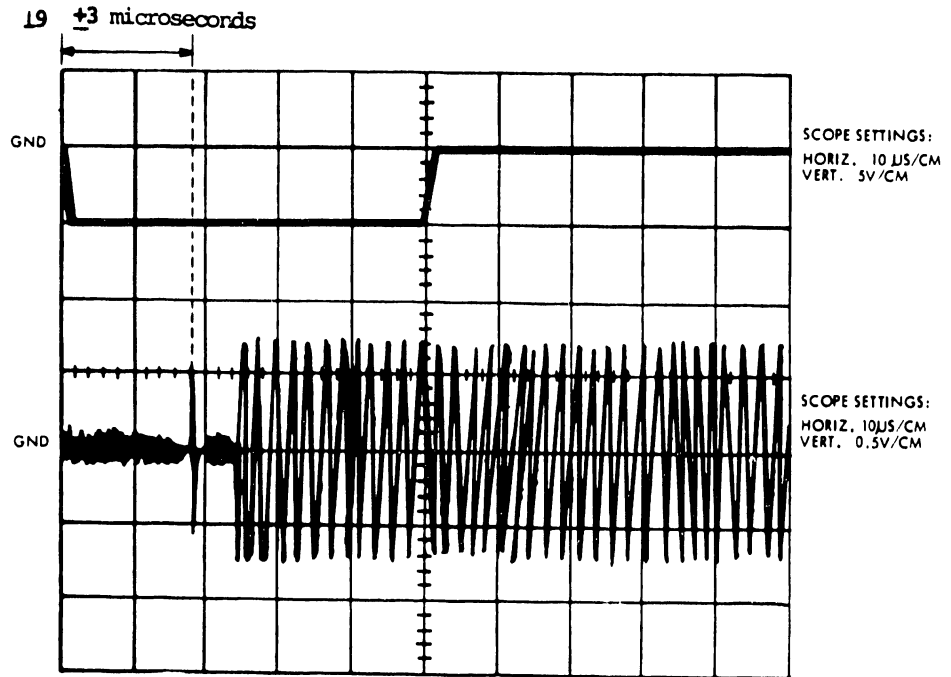


FIGURE 3-12 INDEX AND INDEX-TO-BURST WAVEFORM

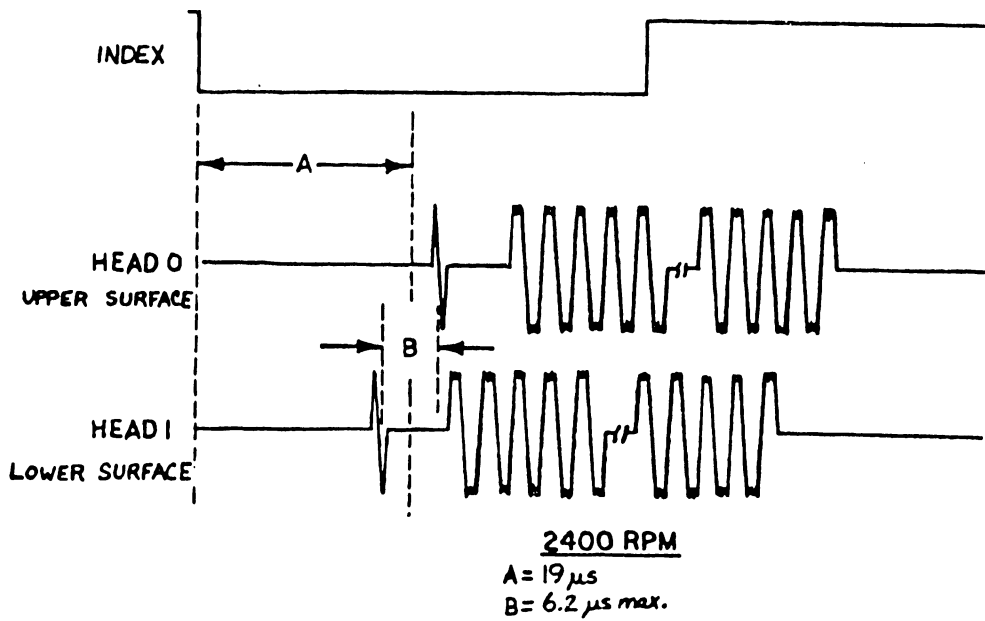


FIGURE 3-13 TOLERANCE BETWEEN HEADS

4. PREVENTIVE MAINTENANCE

The preventive maintenance schedule is as follows:

Pre Filter	Quarterly or 1500 Hours
Absolute Filter (Computer Room Environment)	Annually or 6000 Hours
Absolute Filter (Office or Industrial Environment)	Quarterly or 1500 Hours
Inspect and Clean R/W Heads	Quarterly or 1500 Hours
Inspect and Clean Spindle Magnetic Chuck	Daily
Disk Brush Check and Replacement	Annually or 6000 Hours

5. PRB FUNCTIONS

A. Servo Pre-Amp

Location: On top of Servo Magnet

Circuitry: Analog

Primary Inputs:

- (1) Head Positioner Transducer
- (2) Velocity Transducer
- (3) FEOT/REOT Assembly
- (4) Reverse Detect Switch

Primary Outputs: All outputs are to the Servo board and are used to:

- (1) Establish the present position of the R/W heads.
- (2) Move the actuator at the correct speed.
- (3) Establish a detect position for all cylinders.

Adjustments:

- (1) Servo Balance
- (2) Average seek (actuator speed).

Required Adjustments

If Exchanged

Servo Balance
Average Seek
FEOT
R/W Head and Index Alignments

B. Servo

Location: Card cage

Circuitry: Analog/Digital

Primary Inputs:

- (1) The demanded cylinder address from controller.
- (2) Pluses from Servo Pre-Amp to keep count of actuator present positions.
- (3) Signals used to determine direction of actuator travel.
- (4) "Servo Enable" used to perform initial seek.

Primary Outputs:

The outputs of this board is an analog signal supplied to the voice coil power amp in the power supply. This signal will switch positive or negative depending upon which direction the heads are commanded to move. The amplitude of this signal determines the speed of the actuator and is controlled by the velocity transducer input from the Servo Pre-Amp.

Adjustments: None

Required Adjustments

If Exchanged

Servo Balance
Average Seek
R/W Head
Index to Data

C. Control

<u>Location:</u>	Card cage
<u>Circuitry:</u>	Digital
<u>Primary Inputs:</u>	(1) Control Panel Switches (2) Brush Switch (3) Spindle Speed Information (4) R/W/E commands from controller (5) DC Power from other P.C.B.'s for fault monitoring (6) Pack lock switches
<u>Primary Outputs:</u>	(1) Control power-up and power-down sequences (2) Control timing of Read/Write/Erase operations (3) Monitor spindle speed (4) Perform emergency retract (5) Produce necessary voltages, speed and command faults
<u>Adjustments:</u>	None
<u>Required Adjustments</u>	
<u>If Exchanged:</u>	None

D. Sector

Location: Card cage

Circuitry: Digital

Primary Inputs: Sector Transducer Signals

Primary Outputs:

- (1) Sector Counter output to controller
- (2) Index and sector pulses from the selected disk
- (3) Fixed disk sector pulses to the Control Board (used to monitor spindle speed)

Adjustments: Index to Data Burst

Required Adjustments

If Exchanged: Index to Data Burst

E. Read/Write/Erase

<u>Location:</u>	Card cage
<u>Circuitry:</u>	Analog
<u>Primary Inputs:</u>	(1) Signals from 4 R/W/E heads (2) Head select signals from controller via I/O and control P.C.B.'s (3) Write Data from controller via I/O card (4) W/E enable from control board.
<u>Primary Outputs:</u>	(1) Multiplexed data and clock pulses to the Data Recovery board during a Read operation (2) Write Data and Clock pulses to heads during a Write operation (3) R/W/E head center tap biasing (-8V deselected, +1V selected for read, +15 selected for write)
<u>Adjustments:</u>	None
<u>Required Adjustments</u>	
<u>If Exchanged:</u>	None

F. Data Recovery

Location: Card cage

Circuitry: Digital

Primary Inputs: Multiplexed Data and Clock pulses from the R/W/E board during a Read operation

Primary Outputs: Separated Data and Clock pulses to the controller via the I/O board

Adjustments: None

Required Adjustments
If Exchanged: None

G. I/O P.C.B.

Location: Card cage

Circuitry: Digital

Primary Inputs: (1) Gate all signals between the controller and the Disk.
(2) Monitor the terminating voltage to see that it is within acceptable levels

Adjustments: None

Required Adjustments
If Exchanged: None

6. ECN'S

The following changes should be checked upon installation to verify that they have been incorporated.

Sector Board Update

- A. This board must have been updated as identified below. When a Sector board has been updated, the Wang part number changes from 726-5615 to 726-5694. There should be no 726-5615 sector boards in field units.

NOTE:

This is merely how to identify an updated board. This update should not be attempted in the field.

- 1) IC U15 should be removed (Ref. Figure 6-1).
- 2) The following jumpers should be on the board:

<u>From</u>	<u>To</u>
U17-15	U29-10
U12-15	U22-10
U16-11	U15-13
U16-10	U15-1
U16-3	U16-12
U16-4	U16-8
U29-11	U13-1
U22-11	U19-1

- 3) The index pulse width from the drive should be 40 ± 5 microseconds. This is accomplished by test selection of components on the Sector board.

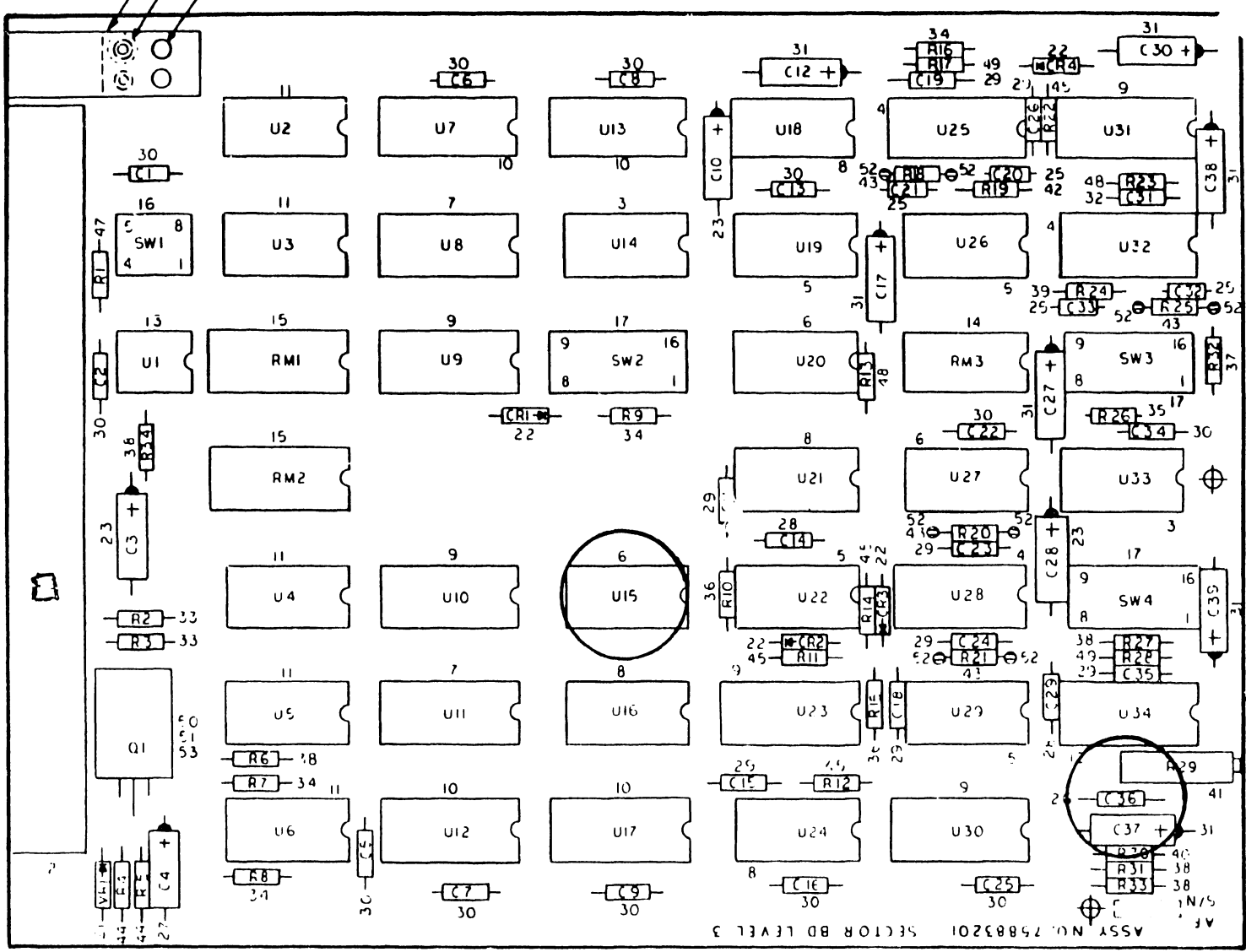


FIGURE 6-1 SECTOR BOARD UPDATE IDENTIFICATION

Additional Change

It has been discovered that the Index to Data Burst alignment will change with temperature variations. To prevent this from occurring, a capacitor on the 726-5694 Sector board has been changed. C36 (Ref. Figure 6-1) should be changed from a 4700 PF Tantalum to a 4700 PF Mica (Wang #30G-1910).

Control Board Update

A diode (Wang #380-1001) should be installed on the control board from pin B5 to pin B11 to disable the pack lock switches when the drive is ready. (Ref. Figure 6-2).

This will prevent intermittent retract during normal operation.

2200 Micro Processor (2260C/BC) Changes

The proms on the 2260C must be at least R3 for the Hawk to operate on a 2260C/BC controller.

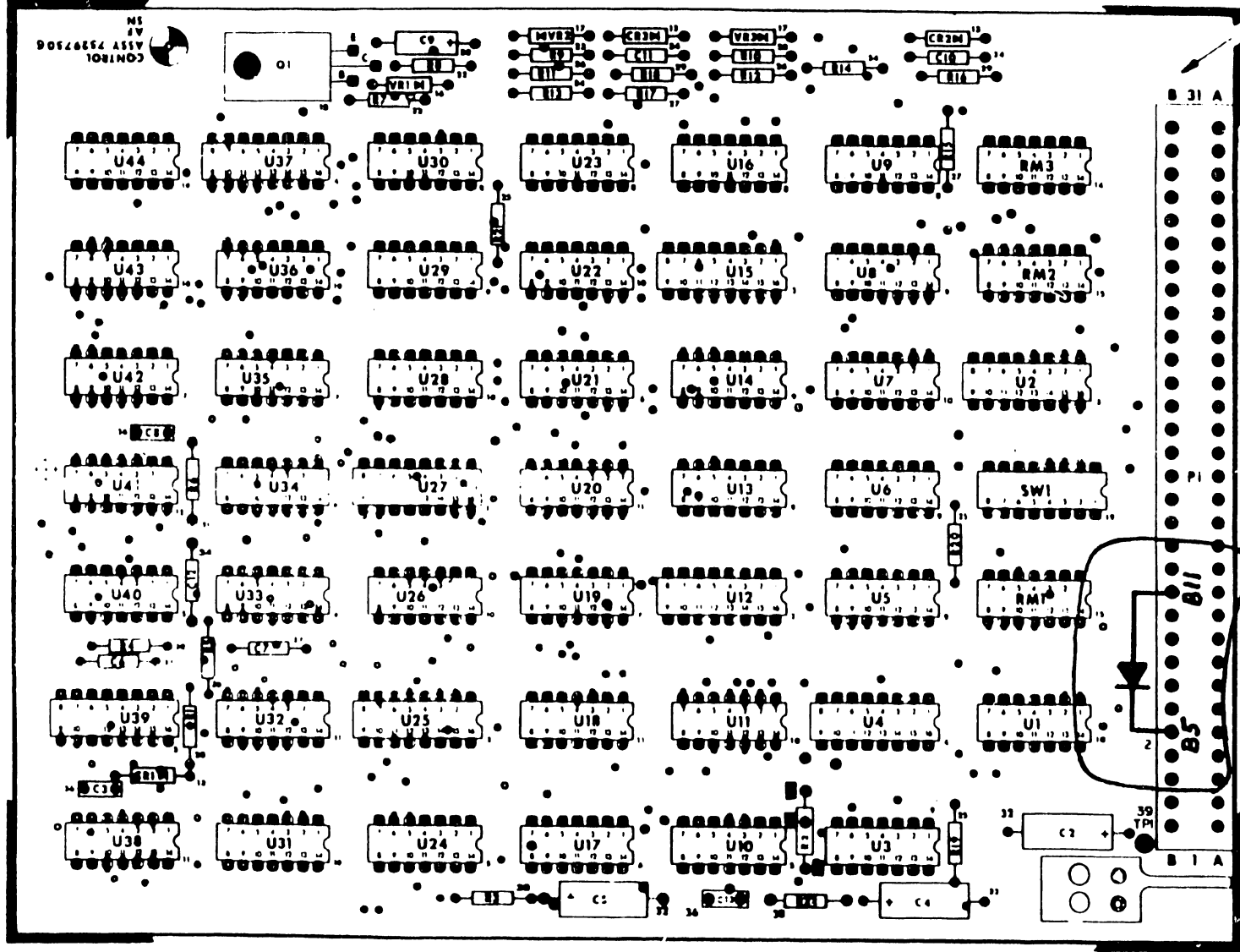


FIGURE 6-2 CONTROL BOARD UPDATE LOCATION

7. FAULTS

Fault conditions that may occur in the disk drive can be divided into two classes:

- | | |
|-------------------------|---|
| A) Damaging Faults: | Emergency |
| B) Non-Damaging Faults: | Resettable & Non Resettable (No
Emergency Retract) |

Damaging Faults

Damaging faults are those which will cause damage to the R/W/E heads or the disk surface if operation were allowed to continue. Loss of spindle speed is classified as one of the sources for damaging fault conditions. Voltage faults on "Servo Pre-Amp" or Servo" boards are the other sources for damaging fault conditions.

In order to receive an early warning for the above mentioned fault conditions, spindle speed and servo voltages are continuously monitored. If any damaging fault conditions are detected, an emergency retract operation will be performed and the Fault light will be illuminated.

In order to proceed after an emergency retract condition, the fault condition must be removed and the "Emergency Retract Latch" should be cleared by power up or by initiating the Start/Stop sequence.

Non-Damaging Faults

Non-Damaging faults are faults which will not cause any damage to the disk drive or the recording media. However, the data exchange integrity will be degraded.

The non-damaging faults may be divided into three groups:

- A) Read/Write Head Current Faults
- B) Command Faults (From Controller or Processor)
- C) Logic voltage faults on cards other than Servo or Servo-Pre-Amp

Summary

The following should be considered regarding the fault detection:

- A) Fault latch is set by damaging fault conditions as well as non-damaging fault conditions. Both will illuminate the fault indicator.
- B) Damaging fault conditions will result in "Emergency Retract" operations, while a non-damaging condition will not reposition the heads in any way.
- C) There are many possible reasons for a fault light. A fault board which is installed in the drive is available from area offices to help determine the actual cause of a fault.

END