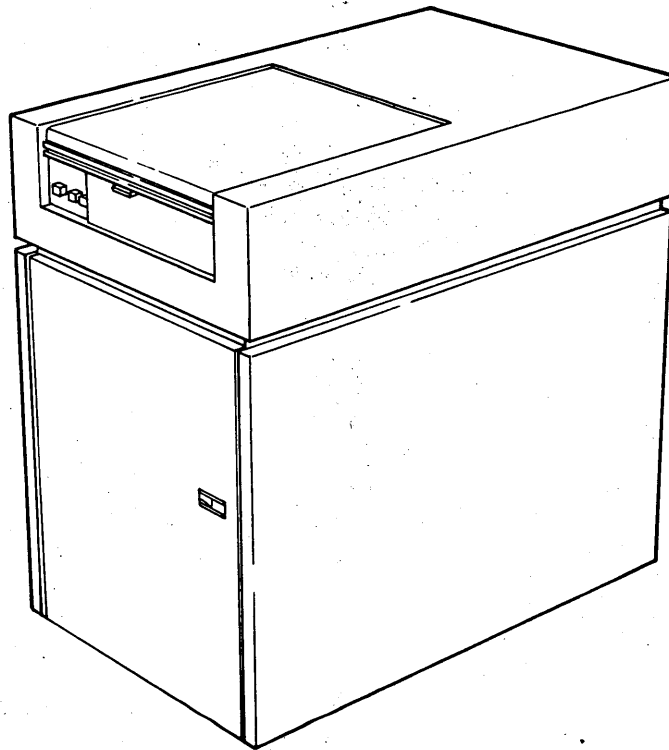


**Certainty® 270 Series  
SMD Disk Storage Systems**



62947902

**CDC® 80270-30  
STORAGE MODULE DRIVE  
HARDWARE MAINTENANCE MANUAL  
Site Information**



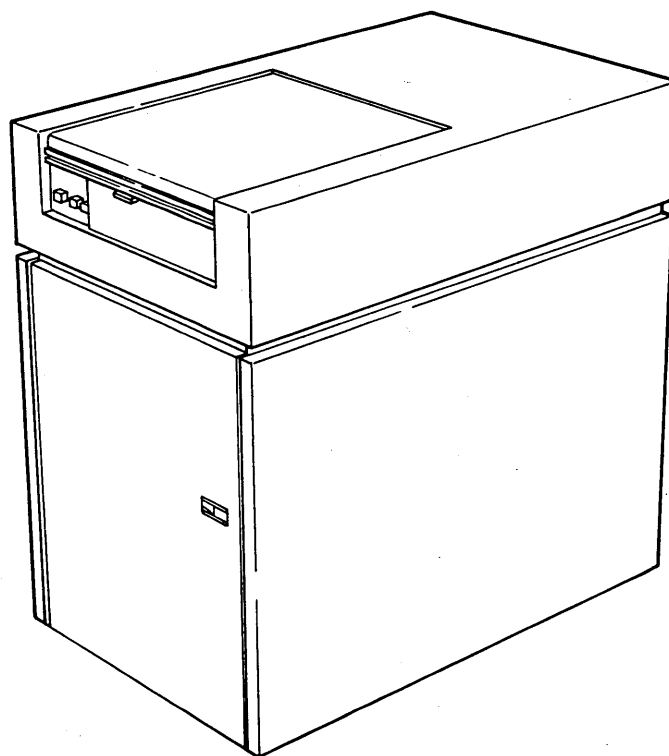
80270-30 HARDWARE MAINTENANCE

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Site Information**



80270-30 HARDWARE MAINTENANCE

<b>REVISION RECORD</b>	
<b>REVISION</b>	<b>DESCRIPTION</b>
01 (09-29-78)	Preliminary release.
02 (11-16-78)	Makes various technical changes and additions. Repaginates section 3, maintenance. Adds spare parts lists and DLT 7180. This edition obsoletes all previous editions.
03 (04-20-79)	Revised reprint. Incorporates product verification changes and ECOs: 13211, 13216, 13232, 13273, 13294, 13317, 13341, 13411; and FCOs: 13211, 13216, 13273, 13317, 13411. Reflects CDC part number 66308762 (V3.0) SMD diagnostics. This edition obsoletes all previous editions.
A (08-28-79)	Final release. Incorporates ECO 13634 change and LSI version of attachment card.
B (12-11-79)	Revised to reflect DCP and diagnostic changes per version 4.0 of SMD BASIC diskette (CDC P/N 66306705). Incorporates ECO 50908.
C (11-28-80)	Revised to reflect diagnostic changes per Version 5.0 of SMD BASIC diskette (CDC part number 66306706) and to incorporate changes caused by technical memorandums and ECOs 01012, 01091, and 01211. Pages affected are: ii, iv, v/vi, 2-11, 2-12, 3-36, 3-37, 4-2, 4-3, A-1, A-10 thru A-12, Notice, DLTs 7114-1, 7115, 7116, 7120-3, 7122 thru 7128, 7145-1, 7160, 7161, 71F0, and Comment Sheet. New page added is DLT 71F3.
Publication No.  62947902	01989-2

REVISION LETTERS I, O, Q AND X ARE NOT USED

Address comments concerning this manual to:

Control Data Corporation  
Publications and Graphics Division  
2200 Berkshire Lane North  
Plymouth, Minnesota 55441

or use Comment Sheet in the back of this manual.

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# MANUAL TO EQUIPMENT LEVEL CORRELATION

This manual reflects the equipment configurations listed below.

**EXPLANATION:** Locate the equipment type and series number, as shown on the equipment FCO log, in the list below. Immediately to the right of the series number is an FCO number. If that number and all of the numbers underneath it match all of the numbers on the equipment FCO log, then this manual accurately reflects the equipment.

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS
BK701-A	10 11 12 13 14 15 16 17	None None None None None None None	
BK701-B	10 11 12 13 14 15 16 17	None None None None None None None	

01987-2





# LIST OF EFFECTIVE PAGES

New features, as well as changes, deletions, and additions to information in this manual are indicated by bars in the margins or by a dot near the page number if the entire page is affected. A bar by the page number indicates pagination rather than content has changed.

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## PREFACE

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This manual provides information to aid in the installation, checkout, and on-site maintenance of the CDC 80270-30 Storage Module Drive. Product and associated equipment number correlation is as follows:

<u>Product Number</u>	<u>Equipment Number</u>	<u>Description</u>
80270-30	BK701-A/B*	240 Megabyte Storage Module Drive
	BT314-A	Drive Interface Kit
	FA740-A/B	Disk Attachment Card Assy.

Organization of this manual is divided into four sections plus an appendix.

- Section 1 - General Description
- Section 2 - Installation and Checkout
- Section 3 - Maintenance
- Section 4 - Spare Parts Lists/Card Placement
- Appendix A - Diagnostic Aids

The decision logic tables (DLTs) contained in appendix A may be removed from this manual and inserted in the left hand side of the associated IBM\*\* MAP/MIM maintenance logic manual (MLM) binder. Remainder of this manual may then be inserted in the right side of the same MLM. This allows for easy cross-referencing between the DLTs and associated procedures contained in section 3 of this manual when performing maintenance tasks.

Additional manuals providing reference and component level hardware maintenance information on the storage module drive (including attachment and interface kit) are listed on the following page. These manuals may be ordered directly from:

Control Data Corporation  
Literature and Distribution Services  
304 North Dale Street  
St. Paul, Minnesota 55103  
Mail Stop STP005

---

\*BK701-A is 208/230 V ac, 60 Hz unit; BK701-B is 220/240 V ac, 50 Hz unit.

\*\*Registered trademark of International Business Machines Corp.

<u>Title</u>	<u>Publication Number</u>
80270-30 Storage Module Drive Hardware Maintenance Manual, Support Information	62947904
80270-10, 80271-10, 80270-30 Storage Module Drive Reference Manual	62947900
Certainty Series System Test and Freelance Reference Manual	62947920
Standalone Utilities Users Guide	62981800

Exceptions to the IBM Diagnostic Service Guide MAP 0010 for the CDC 240 Megabyte Storage Module Drive are:

- Device Type assigned to storage module drive is 71.
- Device ID for storage module drive is 3107.
- No paper-only or diagnostic MAPs are used for this device. Before mentioned DLTs are used instead.

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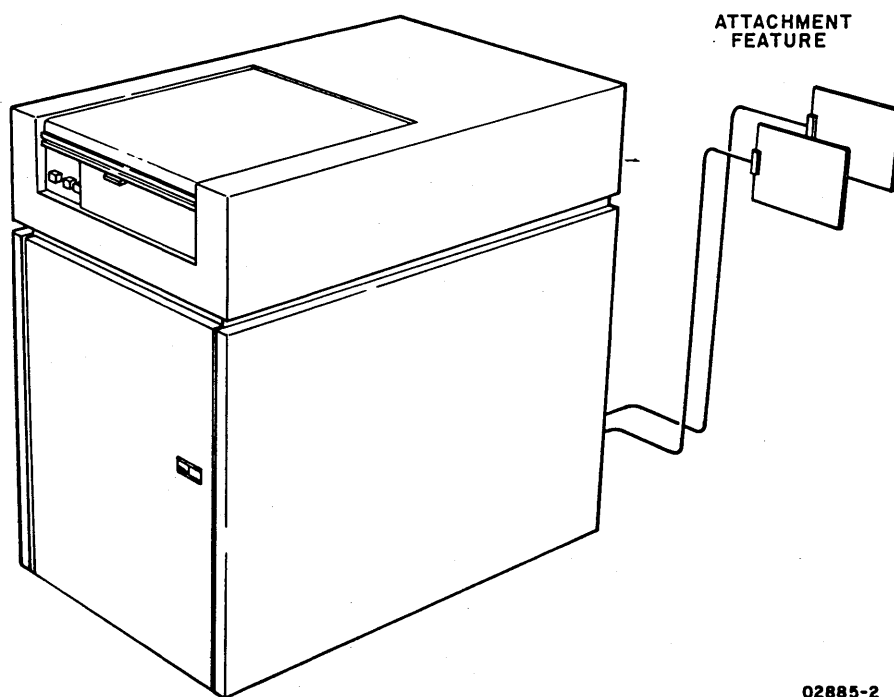
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The storage module drive (figure 1-1) is a high speed, random access digital storage device that interfaces with an IBM Series/1 computer via an associated attachment feature (controller). The drive uses removable disk packs as storage medium with a data capacity of 240 megabytes. The cabinet provides acoustic isolation and encloses the drive electronics to prevent dust and dirt from entering the disk pack area.

Equipment specifications of the drive are listed in table 1-1. The remainder of this section is divided into the following areas:

- Data Storage Medium
- Drive Physical Description
- Drive Functional Description



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Figure 1-1. Drive and Attachment Feature

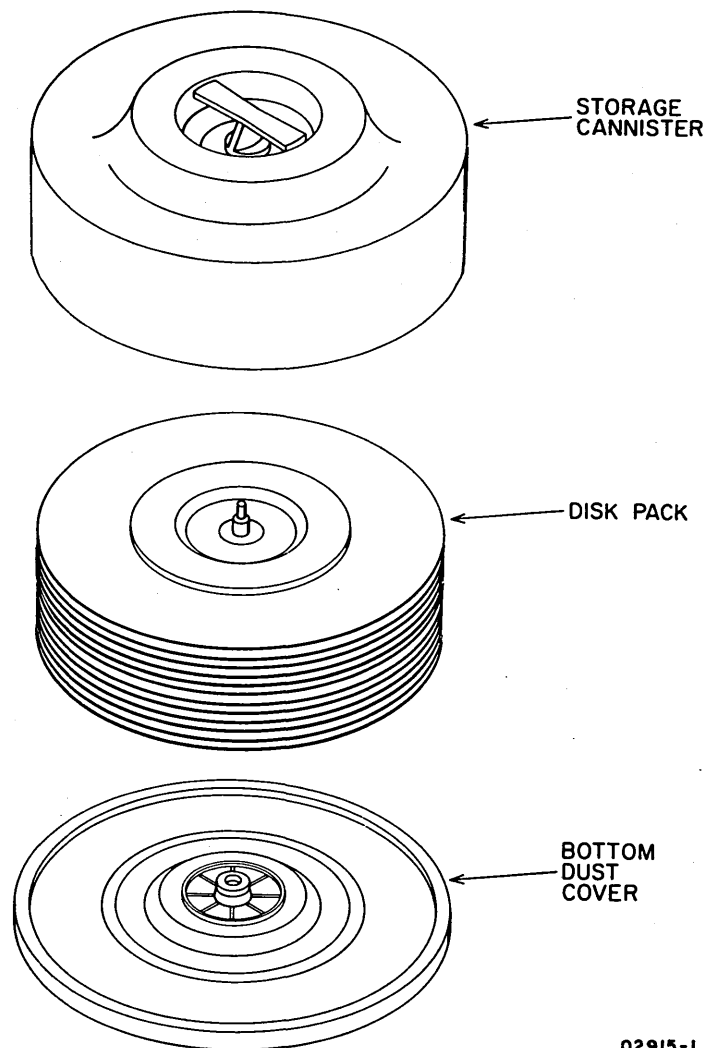
TABLE 1-1. EQUIPMENT SPECIFICATIONS

SPECIFICATION	VALUE
<u>Size</u> Height Width Depth Weight	36.2 in (920 mm) 23 in (584 mm) 36 in (914 mm) 550 lb (252 kg)
<u>Temperature</u> Operating Operating change/hr Transit (packed for shipment) Nonoperating change/hr	50° to 100°F (10° to 37.8°C) 12°F (6.6°C) per hr -40° to 158°F (-40.4° to 70.0°C) 36°F (20°C) per hr
<u>Relative humidity</u> Operating Transit (packed for shipment)	10% to 90% 5% to 95% } No condensation
<u>Altitude</u> Operating Transit (packed for shipment)	-1000 to 6500 ft (-305 to 2000 m) -1000 to 15,000 ft (-305 to 4572 m)
<u>Disk pack</u> Type Disks/pack Data Surfaces Servo Surfaces Usable tracks/surface Tracks/inch Track spacing (center to center) Coating	883-91 12 (Top and bottom disks are for protection only.) 19 1 823 384 .0026 (.066 mm) Magnetic oxide
<u>Data capacity</u> Bytes/track Bytes/cylinder Bytes/spindle Cylinders/spindle	15,360 291,840 240,184,320 823
<u>Recording characteristics</u> Mode Density (nominal) Outer track Inner track Rate (nominal)	Modified frequency modulation (MFM)  4038 bits/in (1590 bits/cm) 6038 bits/in (2377 bits/cm) 9.67 MHz (1,209,600 bytes/sec)
<u>Heads</u> Read/write Servo Read/write width	19 1 0.002 in (0.051 mm)
<u>Seek characteristics</u> Mechanism Max seek time (823 Tracks) Mas track seek time Average seek time	Voice coil, driven by servo loop 55 ms 6 ms 30 ms
<u>Latency*</u> Average Maximum	8.33 ms (at 3600 r/min) 17.3 ms (at 3474 r/min)
<u>Spindle speed</u>	3600 r/min
<u>Input voltage</u> 60-Hz unit 50-Hz unit	208 (+14.6, -29) V ac; 60 (+0.6, -1) Hz 230 (+14.5, -32) V ac; 60 (+0.6, -1) Hz 220 (+15, -25) V ac; 50 (+0.5, -1) Hz 240 (+17, -27) V ac; 50 (+0.5, -1) Hz
*Latency is time required to reach specific track location after drive is on cylinder.	

## DATA STORAGE MEDIUM

The data storage medium for the drive is a disk pack (figure 1-2), consisting of twelve 14-inch disks, center mounted on a hub. The disk pack is portable and interchangeable between equivalent drives.

The disk pack has a total of twenty usable surfaces, each coated with a layer of magnetic oxide. One of these surfaces, referred to as the servo surface, contains information prerecorded at the factory. This surface is used by the drive to generate position information and various timing signals. The remaining nineteen surfaces are used for data storage.



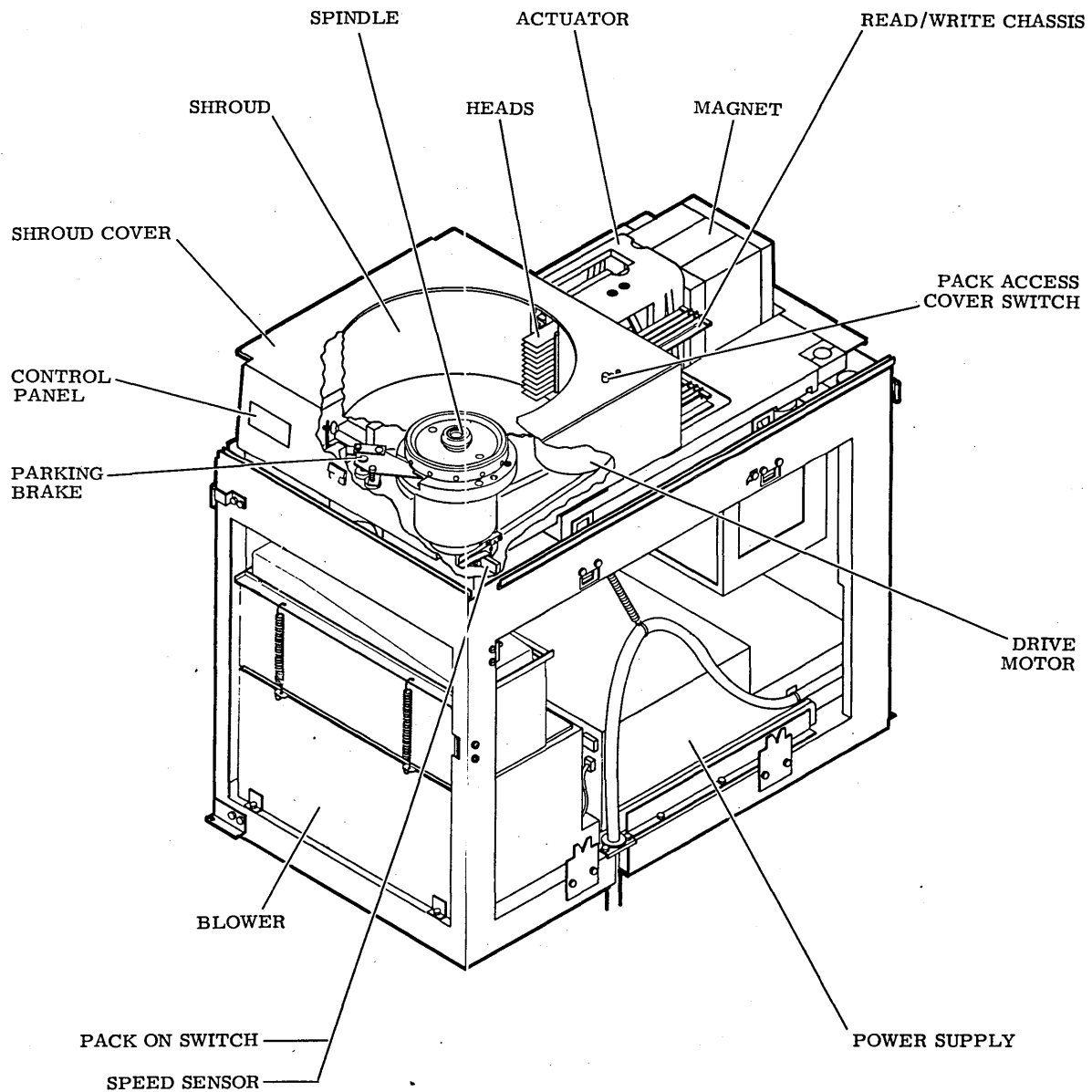
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Figure 1-2. Disk Pack



DRIVE PHYSICAL DESCRIPTION

The major drive assemblies are shown in figure 1-3 and described in table 1-2.



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Figure 1-3. Drive Assemblies

TABLE 1-2. DRIVE ASSEMBLIES

ASSEMBLY	DESCRIPTION
Actuator	Contains voice coil and carriage. This assembly positions the heads over the disk pack. When carriage moves, all heads move together.
Blower	Contains a blower motor that circulates cooling air for drive.
Drive motor	Provides rotation that turns spindle and disk pack.
Heads	Drive has twenty heads, one for each usable disk pack surface. Of the twenty, nineteen are read/write heads and one a servo head. The read/write heads detect data transitions on pack when drive is reading; record data transitions on pack when drive is writing. The servo head reads the information recorded on the servo disk. This information tells the drive servo circuits the area of the pack that the heads are over.
Logic chassis	Contains logic cards that control operation of drive.
Magnet	Provides permanent magnetic field that in conjunction with voice coil moves carriage and heads.
Operator control panel	Contains switches and indicators that control and monitor basic operation of drive.
Pack access cover switch	Interlock that deenergizes drive motor if pack access cover is opened while pack is spinning. It also prevents motor from starting unless cover is closed.
Pack on switch	Interlock that prevents drive motor from starting when pack is not installed.
Speed sensor	Monitors spindle speed to determine when disk pack is rotating fast enough for heads to fly.
Parking brake	Holds spindle while disk pack is being installed and removed.
Power supply	Furnishes all necessary voltages for drive operation.
Read/write chassis	Contains cards that are essential to drive read/write operations.
Shroud and shroud cover	Provides protection and ventilation for disk pack.
Spindle and lockshaft	Provides mounting surface for disk pack. Lockshaft secures disk pack to spindle. Drive motor rotates spindle via drive belt thereby rotating disk pack.

DRIVE FUNCTIONAL DESCRIPTION

The drive contains all the circuits and mechanical devices necessary to record data on and recover data from disk pack (figure 1-4). The necessary power for this is provided by the drive power supply.

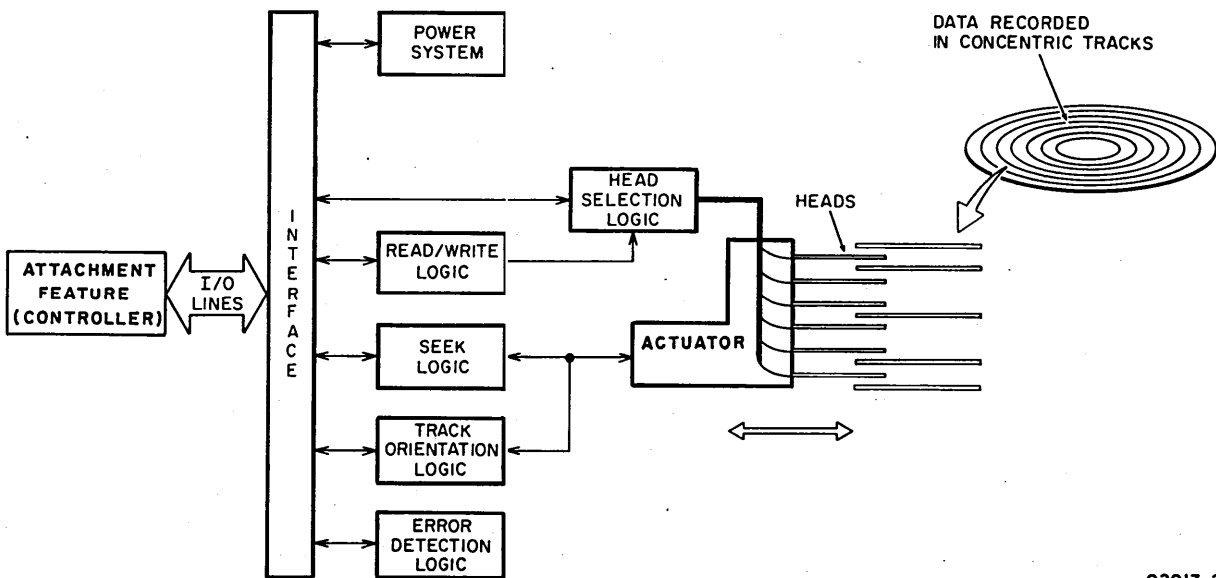


Figure 1-4. Drive Functional Blocks

All functions performed by the drive are done under direction of the attachment feature (controller). The controller communicates with the drive over I/O lines that carry the necessary signals to and from the drive.

All operations performed by the drive are related to data storage and recovery (writing and reading). The reading and writing is performed by electromagnetic heads that are positioned over the recording surfaces of the rotating disk pack. There is a separate head for each surface in the pack and the heads are positioned so that data is written in concentric tracks around the disk surfaces (figure 1-4).

Before performing a read or write, the controller must instruct the drive to position the heads over the desired track (called seeking) and select the head that is to do the read or write.

After selecting a head and arriving at the proper track, the controller still must locate that portion of the track on which the data is to be read or written. This is called track orientation and is done by using the index and sector information generated by the drive.

When the desired location is reached, the controller commands the drive to read or write the data. During a read, the drive recovers data from the pack and transmits it to the controller. During a write, the drive receives data from the controller, processes it and writes it on the pack.

The drive also recognizes certain errors that may occur during operation. When an error is detected, it is indicated to the controller. With most errors, the drive also lights its control panel FAULT indicator.

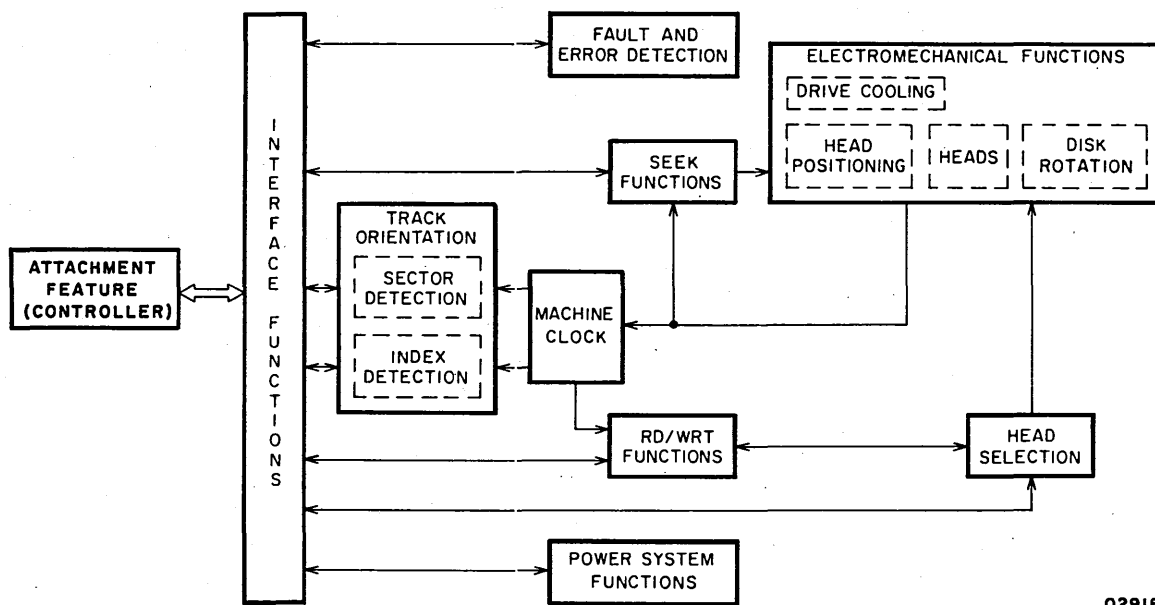
The following paragraphs describe the major functional areas of the drive and its associated attachment feature. These are shown in block diagram form in figure 1-5 and consist of:

- Power system functions
- Electromechanical functions
- Interface functions
- Seek functions
- Machine clock
- Head operation and selection
- Track orientation
- Read/write functions
- Error (fault) conditions
- Attachment feature functions

#### POWER SYSTEM FUNCTIONS

The major element in the drive power system is the power supply. The power supply uses site ac power to produce the dc voltages necessary for drive operation.

The power supply also distributes site ac power to the blower and drive motor. Power to drive motor, however, is only distributed when disk pack rotation is to occur. This is when a disk pack is installed, pack access cover is closed, and the control panel START switch is pressed.



02918-1

Figure 1-5. Drive Functional Block Diagram

### ELECTROMECHANICAL FUNCTIONS

Certain drive functions are a result of electromechanical devices working under control of logic circuitry. These functions include disk pack rotation and head positioning.

Disk pack rotation performed by drive motor and spindle is controlled by power system circuits. Rotation of disk pack creates a cushion of air on the disk surfaces. The cushion of air allows the heads to move over the disk surfaces without actually contacting them.

The heads are positioned over specific data tracks on the disk surface by the actuator. As further described under Seek Functions, the actuator is controlled by servo circuits.

## INTERFACE FUNCTIONS

All communications between drive and controller pass through the interface. This communication includes all commands, status, control signals and read/write data transmitted and received by the drive.

The interface is based on a register structure that handles both data and control information as addressable registers. The interface contains an address bus to select the desired register, a bus out cable to provide information to the register, and a bus in cable to return information from the register to the controller. All I/O signals are digital and use a transmission system that is terminated and unidirectional. No external terminators are required as terminating resistors are contained on the transmitter/receiver cards.

## SEEK FUNCTIONS

The drive must move the heads to the desired position over the disk pack before a read or write can occur. These seek functions are performed by drive servo circuits.

The servo circuits form a closed loop servo system. The system controls actuator movement by comparing the present position of the servo head to the desired future position, and generating a position control signal proportional to the difference.

The major elements in the servo loop are the position control circuits, position signal amplifiers, head positioning actuator, and feedback circuits (both velocity and position).

## MACHINE CLOCK

The machine clock circuits generate the clock signals necessary for drive operation. These circuits are divided into two areas, a servo clock multiplier and a write clock multiplier.

The servo clock multiplier circuit generates clock pulses used by the sector detection and index detection circuits. It also generates the 9.67 MHz Servo Clock signal that is sent to the controller.

The write clock frequency multiplier circuit generates 19.34 MHz and 9.67 MHz signals for use during write operations.

## HEAD OPERATION AND SELECTION

Information is recorded on and read from the disk by the read/write heads. The drive has nineteen read/write heads, one for each data recording surface on the disk pack. For this reason, the controller must select the head that is over the disk surface where data is to be read or written.

Head selection starts when the controller sends the drive a head select command and a head address on the bus out lines. The head select command gates the address into the head address register. This address is then decoded to a Head Enable signal. This signal then enables the selected head drive current and allows the head to conduct.

Data is then written by passing a current through a read/write coil within the selected head. This generates a flux field across the gap in the head and magnetizes the iron oxide particles bound to the disk surface.

Erasing stored data is accomplished by writing over any data that may already be on the disk.

During a read, disk motion beneath the head causes the stored flux to induce a voltage in the head windings. This voltage is analyzed by the read circuit to define the data recorded on the disk.

## TRACK ORIENTATION

After finding the proper track and selecting head, the controller still must determine whether the head is over that part of the track where data is to be read or written. The controller accomplishes this by using the index and sector information that is generated by the drive. Following paragraphs describe index and sector detection.

### Index Detection

Tracks on servo disk are bordered on each side by dibits (dipole bits). Positive dibits are on one side, negative dibits on the other. On each track is an area of missing dibits called the index pattern. The drive index detection circuit generates a 2.5  $\mu$ s Index signal each time the servo head encounters the pattern. The Index signal indicates the logical beginning of a track.

## Sector Detection

The sector detection circuits generate signals that determine the angular position of the heads with respect to the index location. These signals are called Sector pulses and the number generated during each revolution of the disk pack is governed by drive Sector switches. The Sector pulses logically divide the disk into areas called sectors. With disk format being used, the internal Sector switches are set for 60 sectors.

## READ/WRITE FUNCTIONS

When the drive is on the proper track, has a head selected, and has progressed to the proper sector, it is ready to perform a read or write. The transfer of data is initiated and controlled by the Data Strobe In signal from the interface logic of the drive.

During a read, the drive recovers data from the disk and generates a Data Strobe In signal, indicating that the data read is stable on the bus in lines. The controller accepts the data and responds with a Data Strobe Out signal, indicating the byte was received.

During a write, the drive receives data from the controller and records it on the disk. When the drive is ready to receive data it generates a Data Strobe In signal. The controller then responds to the Data Strobe In request by sending a Data Strobe Out signal along with an accompanying byte of data. This process continues for each byte to be written.

## ERROR (FAULT) CONDITIONS

Error conditions recognized by the drive fall into two categories:

- Errors that light FAULT indicator
- Errors that do not light FAULT indicator

### Errors That Light FAULT Indicator

There are six types of error conditions that light the FAULT indicator on the drive control panel. With the FAULT indicator lit, the drive assumes a not ready status (READY indicator on drive control panel blinks). Further drive operations cannot be performed until the error condition is corrected and FAULT indicator extinguished. Five of the six error conditions that light FAULT also light indicators in the drive logic chassis. These internal fault indicators provide the means of identifying which error condition occurred.

Providing the error condition no longer exists, any of the following actions extinguish the FAULT indicator:



- Pressing FAULT switch on drive control panel.
- Receipt of a clear fault, reset, or error-recovery clear command from the controller.
- Powering-off/powering-on drive.
- Pressing Maintenance Fault Clear switch in drive logic chassis.

Table 1-3 describes the six error conditions that light the FAULT indicator.

TABLE 1-3. ERROR CONDITIONS THAT LIGHT FAULT INDICATOR

CONDITION	DESCRIPTION
Voltage fault*	Voltage fault exists when +46, +20, or +5 voltages are below normal level. If +5 V is extremely low or lost completely, no fault indication will be given as +5 V powers all indicators.
Write fault*	Write fault exists when write driver circuit experiences any of the following: <ul style="list-style-type: none"> <li>● Low +22 V power input.</li> <li>● Low output to read/write heads during a write.</li> <li>● Low current input during a write.</li> <li>● No data transition input during a write.</li> </ul>
Head select fault*	Head select fault occurs when more than one head is selected to do a read or write.
Write and read fault*	Write and read fault occurs when a write and read are commanded simultaneously.
Off cylinder and write or read fault*	This fault occurs when a write or read is commanded before seeking is completed.
No servo tracks fault	No servo tracks fault occurs when servo circuits fail to detect dibits on servo disk for a period of 350 milliseconds. This may be due to a servo malfunction or to absence of servo information on the installed pack. The fault results in the heads being retracted to the unloaded position.
*These five error conditions also light indicators in drive logic chassis.	

## Errors That Do Not Light FAULT Indicator

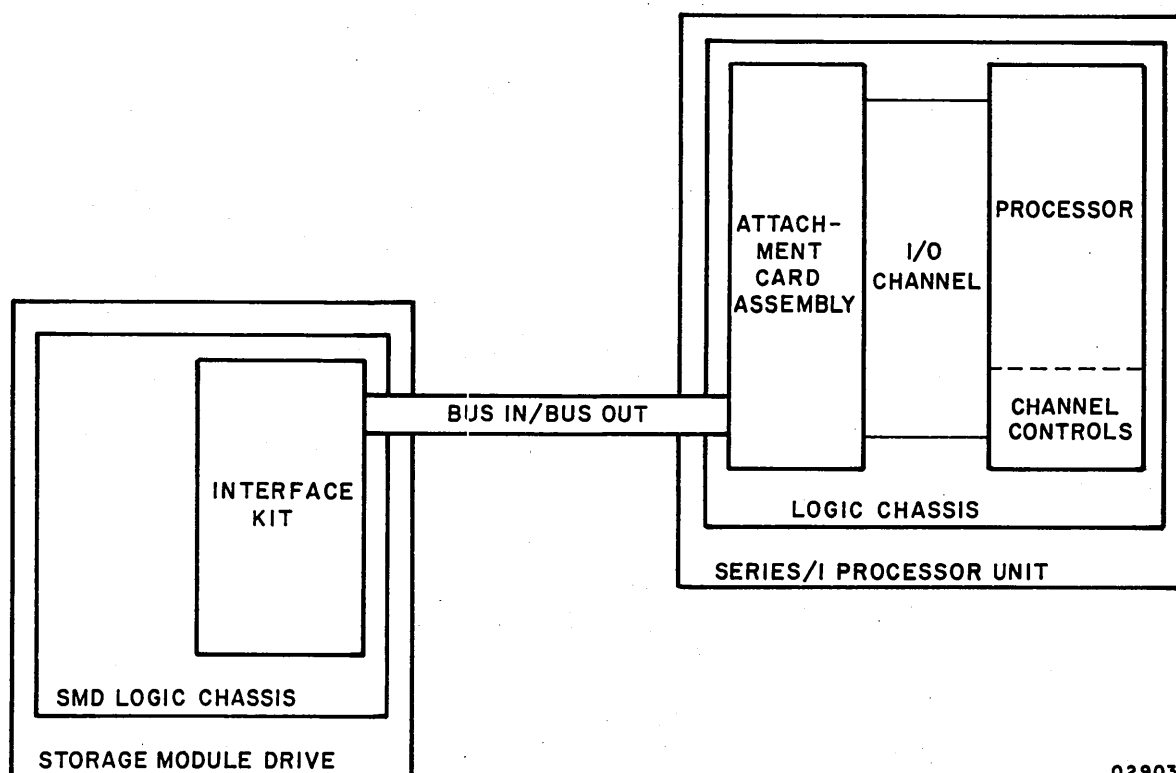
Error conditions that do not light FAULT indicator are described in table 1-4. The table also describes the effects that the conditions have on drive operation.

TABLE 1-4. ERROR CONDITIONS THAT DO NOT LIGHT FAULT INDICATOR

CONDITION	DESCRIPTION	EFFECT
Low spindle speed	<p>This condition occurs when spindle speed falls below 2700 r/min. Cause may be:</p> <ul style="list-style-type: none"> <li>● Drive motor thermal breaker tripping.</li> <li>● MOTOR circuit breaker tripping.</li> <li>● Faulty drive motor.</li> </ul>	Heads do an emergency retract to unloaded position and drive assumes a not ready status.
Loss of +20 V, +9.7 V, or -16 V	<p>Loosing any of these voltages may be due to:</p> <ul style="list-style-type: none"> <li>● An associated circuit breaker tripping.</li> <li>● Malfunction in power supply.</li> <li>● Loss of ac power to drive.</li> </ul>	Same as above.
Seek error	<p>A seek error exists when:</p> <ul style="list-style-type: none"> <li>● On cylinder (on track) was not obtained within 500 milliseconds from starting seek.</li> <li>● Forward or reverse end of travel sensed while seeking.</li> <li>● Commanded seek is beyond cylinder 822<sub>10</sub> (336<sub>16</sub>).</li> </ul>	Further drive operations are inhibited until drive is commanded to recalibrate back to cylinder 000.

## ATTACHMENT FEATURE FUNCTIONS

The attachment feature (controller) consists of either an MSI version with two logic cards (a microprocessor module and a channel module), or a single card LSI version and associated interconnecting cables. This feature provides the interface between the Series/1 input/output channel and the drive. The attachment cards are mounted in the Series/1 processor unit and plug directly into back panel interface connectors. Separate Bus In and Bus Out cables provide the physical interconnections to the drive. Figure 1-6 shows the relationship of the attachment feature to the Series/1 and drive.



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Figure 1-6. Attachment Feature Configuration

The attachment card feature receives commands and channel error information from the Series/1 processor and responds with condition codes, interrupt information, and status words. Upon receiving a Start command from the processor, the attachment feature sends an equivalent command and control signals to the drive to initiate the specified I/O operation. Data transfers are handled on a high speed data path via a 1K x 9 bit buffer that temporarily stores the data being transferred from the disk to the Series/1 and from the Series/1 to the disk. Direct memory access transfers between the disk and buffer can occur concurrently with transfers between the buffer and the Series/1 computer.

---

This section contains packaging, installation, and checkout information for the drive.

### PACKAGING

Instructions for unpackaging drive come with packing slip on top of drive shipping container. The attachment cards and cables are packaged separately from drive and no unpackaging Instructions for them are necessary.

Save packaging materials for in the event that drive is reshipped. To guard against shipping damage, drive must be packaged as it was at factory. Packing instructions and/or material may be obtained from:

Packaging Engineer  
Material Services Dept.  
Normandale Division, MPI  
7801 Computer Ave.  
Minneapolis, Mn. 55435

When ordering packaging instructions, specify the exact equipment number and series code of drive as shown on its equipment identification label.

### INSTALLATION

Installation of drive sequentially involves:

- Preliminary inspection
- AC power wiring
- Routing power cord
- Setting Sector switches
- Connecting attachment cables
- Installing attachment in Series/1
- Leveling cabinet

## PRELIMINARY INSPECTION

Do following preliminary inspection:

1. Inspect drive and attachment items for shipping damage. File promptly any claim for damage with the transporter involved. If a claim is filed, save the original packaging materials.
2. Ensure that all items of the unpacking instructions received with drive have been done.
3. Check that cards in logic chassis and read/write chassis are firmly seated.
4. Verify that control panel is firmly seated in shroud.
5. Verify that all cabling is intact and that there are no damaged wires.
6. Check entire drive for presence of foreign material.

## AC POWER WIRING

Drive can be powered by either of two nominal voltages:

- With 60-Hz unit -- 208 V ac or 230 V ac
- With 50-Hz unit -- 220 V ac or 240 v ac

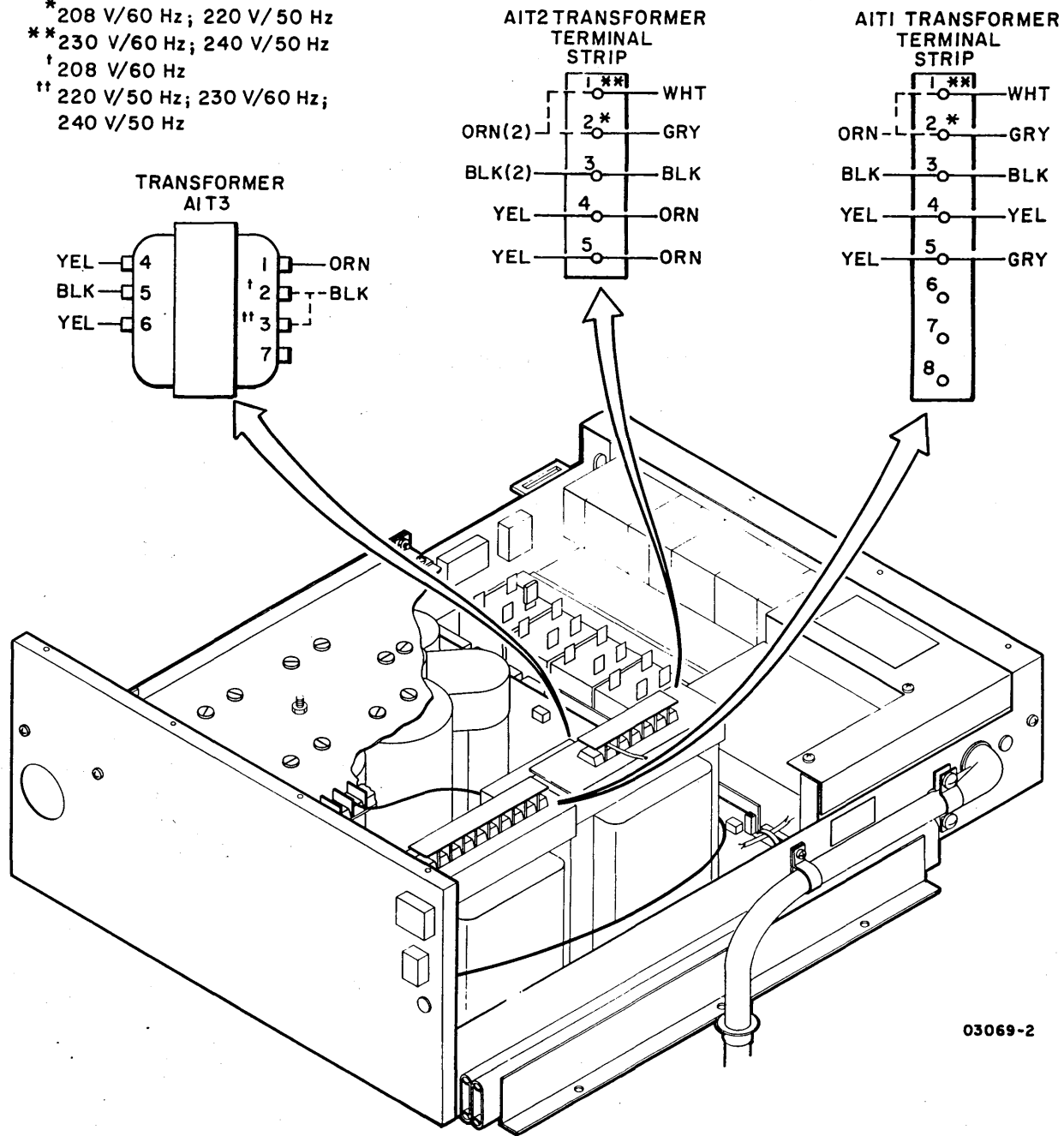
Range of nominal voltages are:

Unit	Nominal V ac	V ac Range
60-Hz	208	179 to 222.6
	230	198 to 244.5
50-Hz	220	195 to 235
	240	213 to 257

As drive comes from factory, 60-Hz unit is wired for 208 V ac; 50-Hz unit for 220 V ac. If this nominal voltage is appropriate for site power, go to Routing Power Cord; if not, do following:

1. Open rear door and swing out logic chassis.
2. Slide out power supply and remove power supply top cover (paragraph 3.2.6 in maintenance section).
3. Remove fiber covers from terminal strips on top of transformers AlT1 and AlT2 (figure 2-1).

- \* 208 V/60 Hz; 220 V/50 Hz
- \*\* 230 V/60 Hz; 240 V/50 Hz
- † 208 V/60 Hz
- †† 220 V/50 Hz; 230 V/60 Hz; 240 V/50 Hz



03069-2

Figure 2-1. AC Power Wiring

4. Move orange wires from terminal 2 to terminal 1 on both terminal strips.
5. Replace fiber covers on terminal strips.
6. If drive is 60-Hz unit, also move black wire from clip 2 on transformer ALT3 to clip 3.
7. Replace power supply top cover and slide power supply back in cabinet.

#### ROUTING POWER CORD

Route power cord as follows:

1. Remove right side panel.
2. Remove two screws securing cable guide to frame and remove cable guide (figure 2-2).
3. Place power cord in frame opening with bushing on cord above frame.
4. Position cable guide around cord and secure to frame with two screws.
5. Slide bushing down cord and snap into cable guide.
6. Connect support spring to power cord.
7. If drive is 50-Hz unit, install an appropriate 50-Hz power plug on cord. Connect:
  - Green wire to safety ground
  - Brown wire to hot
  - Blue wire to neutral

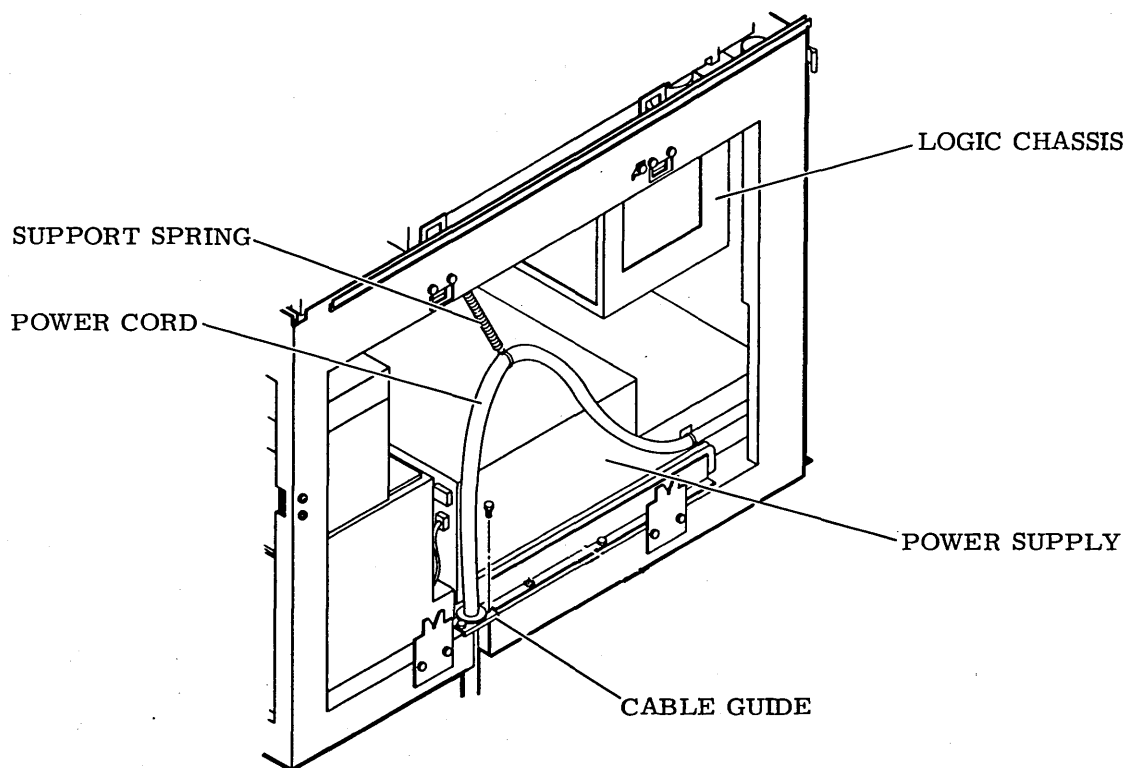


Figure 2-2. Routing Power Cord

#### SETTING SECTOR SWITCHES

Set Sector switches as follows:

1. Swing out logic chassis, turn thumbscrew and remove card cage cover.
2. Remove logic card from A09.

#### CAUTION

Do not use a "lead" pencil to set rocker switches. Graphite dust from pencil can cause an equipment malfunction.

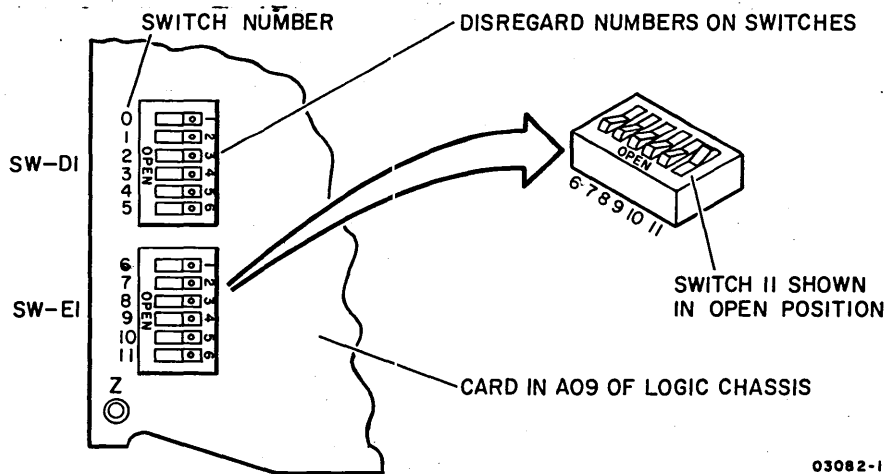


3. Use a ball-point pen and set Sector switches (figure 2-3) to following:

Switch Number	Setting*
0	closed
1	closed
2	closed
3	closed
4	closed
5	open
6	closed
7	closed
8	open
9	open
10	open
11	open

\*Selects 60 sectors

4. Return card to A09.



03082-1

Figure 2-3. Sector Switches

## CONNECTING ATTACHMENT CABLES

Connect attachment cables to drive as follows:

1. Remove left side panel.
2. Remove two screws securing I/O cable guide (figure 2-4) and remove guide.
3. Route the two attachment cables (Bus In and Bus Out) to card-side of logic chassis.

### NOTE

White dot on attachment cable connector identifies pin 1. Align this with pin 1 at top of card-edge connector during steps 4 and 5.

4. Connect Bus Out cable to connector on edge of card in A01.
5. Connect Bus In cable to connector on edge of card in A03.
6. Fasten attachment cables to side of logic chassis with metal cable clamps. Clamps must firmly contact cable shielding to provide proper grounding.
7. Replace card cage cover and close logic chassis.
8. Position I/O cable guide around attachment cables and secure with two screws.

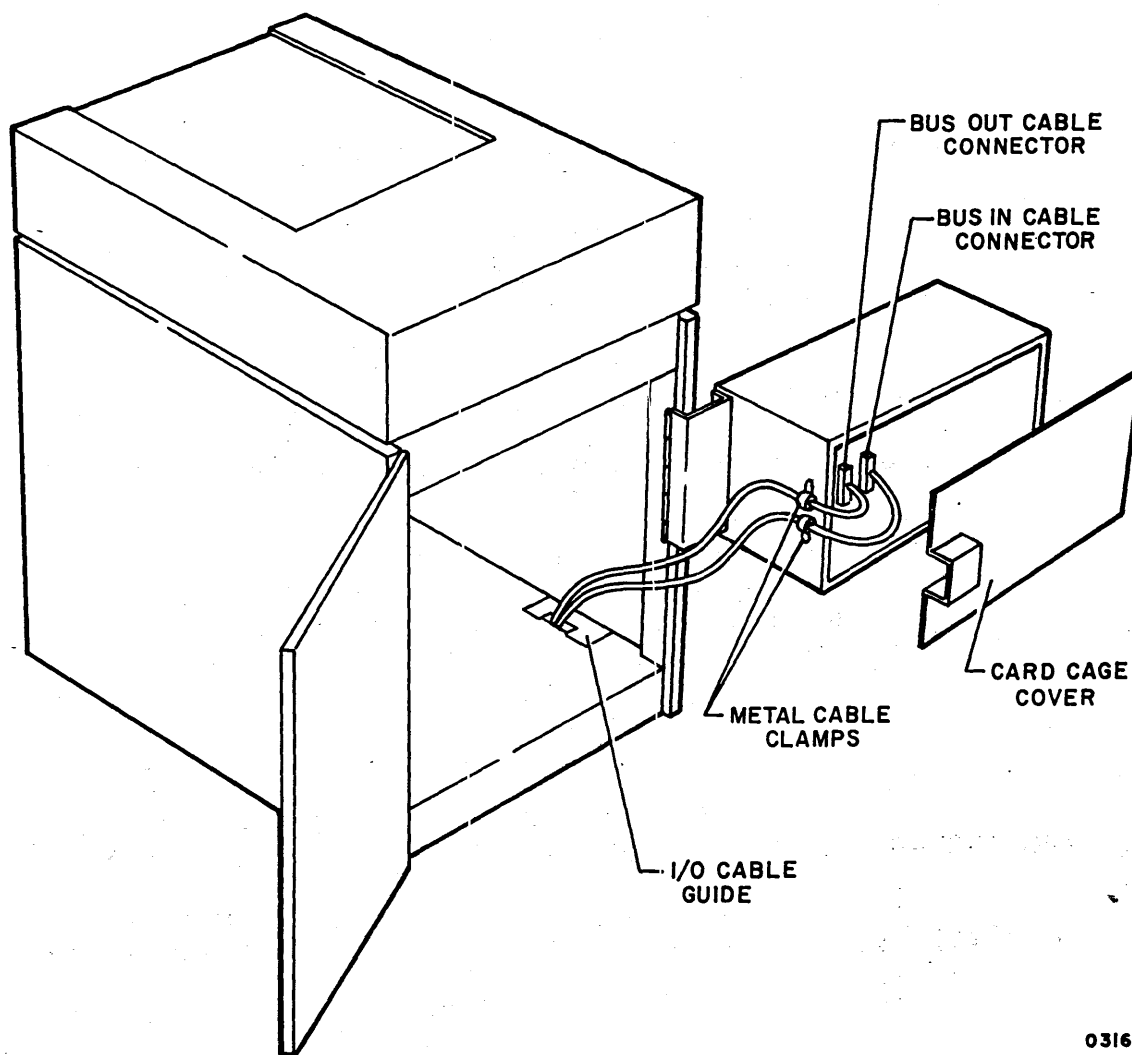


Figure 2-4. Attachment Cable Routing on Drive

## INSTALLING ATTACHMENT IN SERIES/1

Install attachment card(s) (MSI/LSI) and cables in Series/1 as follows:

1. Confer with customer to determine:
  - The required location of drive attachment cards in Series/1 (either processor unit or I/O expansion unit).

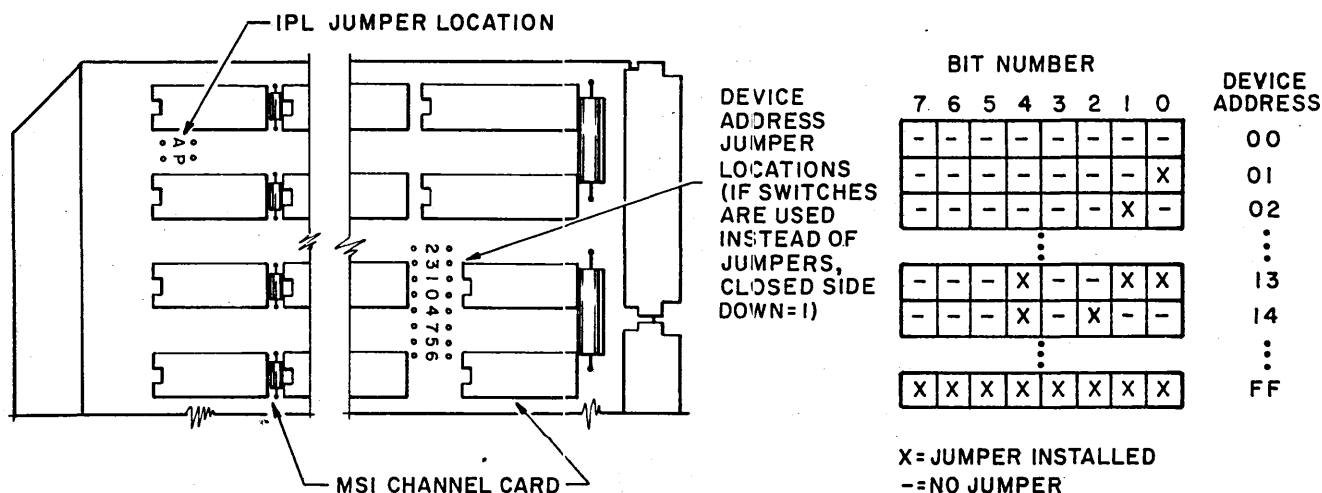
### NOTE

Priority is established in order of placement from right to left within each unit chassis. Processor unit has higher priority than I/O expansion unit. Attachment cards must not be installed with more than one empty card slot between them.

- The drive device address required for system configuration.
  - Whether drive is to be alternate or primary IPL (Initial Program Load) device or neither.
2. Power-off processor unit or I/O expansion unit, as applicable, by pressing associated Power On/Off switch.
  3. Remove snap-on cover from front of processor or I/O expansion unit as applicable.
  4. Open rear door of Series/1 cabinet.
  5. Route attachment cables through rear-bottom of cabinet and clamp cables to vertical side bracket of Series/1 frame using metal cable clamps. Clamps must firmly contact cable shielding to provide proper grounding.
  6. Attach pigtail ground-lugs on cables to ground strip at top-front of applicable unit, processor or I/O expansion. If necessary, ground strip can be accessed from front of cabinet. This is done by removing mounting screws at front of unit and sliding unit forward.
  7. From front of cabinet, loosen I/O cable retaining bracket at top of applicable unit. Route attachment cable connectors to front of chassis and retighten retaining bracket.

## 8. Installing MSI attachment card(s):

- a. Jumper MSI channel card for required device address and IPL assignment (figure 2-5). Card is prejumped for address 13<sub>16</sub>. IPL jumpers are A (alternate) and P (primary). Remove/install jumpers as required.



02981-1

Figure 2-5. Device Address Jumpers

- b. From front of cabinet, install attachment cards in unit chassis with MSI channel card to the right of microprocessor card. Cards cannot be separated by more than one empty card slot unless poll jumpers are installed.

## NOTE

If attachment cards are to be installed more than one open card slot away from existing cards, a poll propagate jumper must be added between pins M11 and M12 of each open card slot. If attachment cards are to be installed in slots already containing poll jumpers, they must be removed.

- c. Connect interconnecting cable from microprocessor card to MSI channel card.

## NOTE

White dot on attachment cable connectors identify pin 1. Align this with pin 1 at top of connectors A and B.

d. Connect attachment cables (figure 2-7):

- Bus In cable to A connector on microprocessor card.
- Bus Out cable to B connector on microprocessor card.

9. Installing LSI attachment card:

CAUTION

Do not use a "lead" pencil to set rocker switches. Graphite dust from pencil can cause an equipment malfunction.

a. Set attachment card switches as required (figure 2-6) with a ball point pen. For example, to select device address 13<sub>16</sub>, set switches S1-6, S1-9, and S1-10 so that open side of switch is pressed down (logical 1), and set switches S1-3, S1-4, S1-5, S1-7, and S1-8 so that closed sides are pressed down (logical 0). To select attached device as Primary IPL source, set S1-2 to the open position (logical 1) and set S1-1 to the closed position (logical 0). If neither Primary or Alternate IPL is to be selected, set both S1-1 and S1-2 to the open (logical 1) position.

Verify that SD (System Disk) jumper is jumpered as shown in figure 2-6.

b. Install attachment card in unit chassis.

NOTE

If attachment card is to be installed more than one open card slot away from existing cards, a poll propagate jumper must be added between pins M11 and M12 of each open card slot. If attachment cards are to be installed in slots already containing poll jumpers, they must be removed.

c. Connect attachment cables (figure 2-7) as follows:

- Bus In cable to attachment card connector (top).
- Bus Out cable to attachment card connector (bottom).

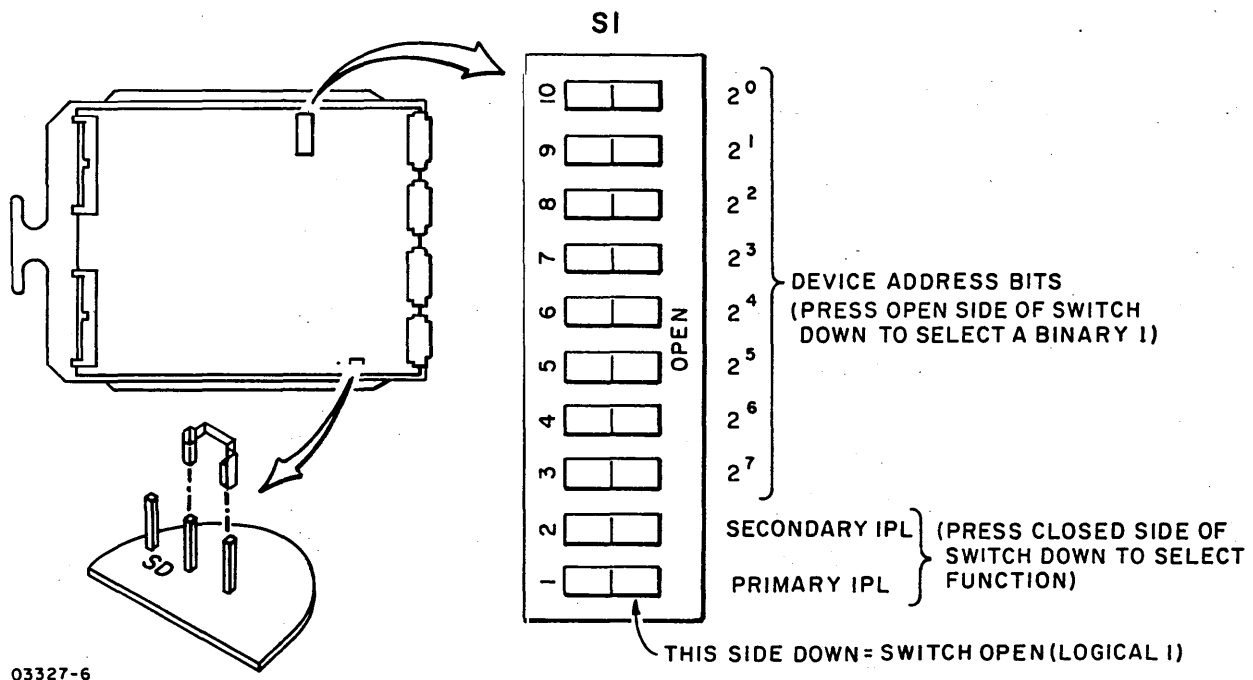


Figure 2-6. Attachment Card Selection Switches (LSI)

10. If attachment is being installed in a 4952-A, skip the following and go to step 12. For all other models, adjust overcurrent potentiometer as follows:

a. Apply power to unit that attachment is installed.

NOTE

If chassis power does not come up, turn overcurrent potentiometer (figure 2-7) clockwise one full turn; press unit power On/Off switch to OFF, then to ON. Keep repeating this clockwise adjustment and power sequencing until power comes up.

b. Turn Overcurrent Potentiometer slowly counterclockwise until power goes off. Then turn potentiometer as follows:

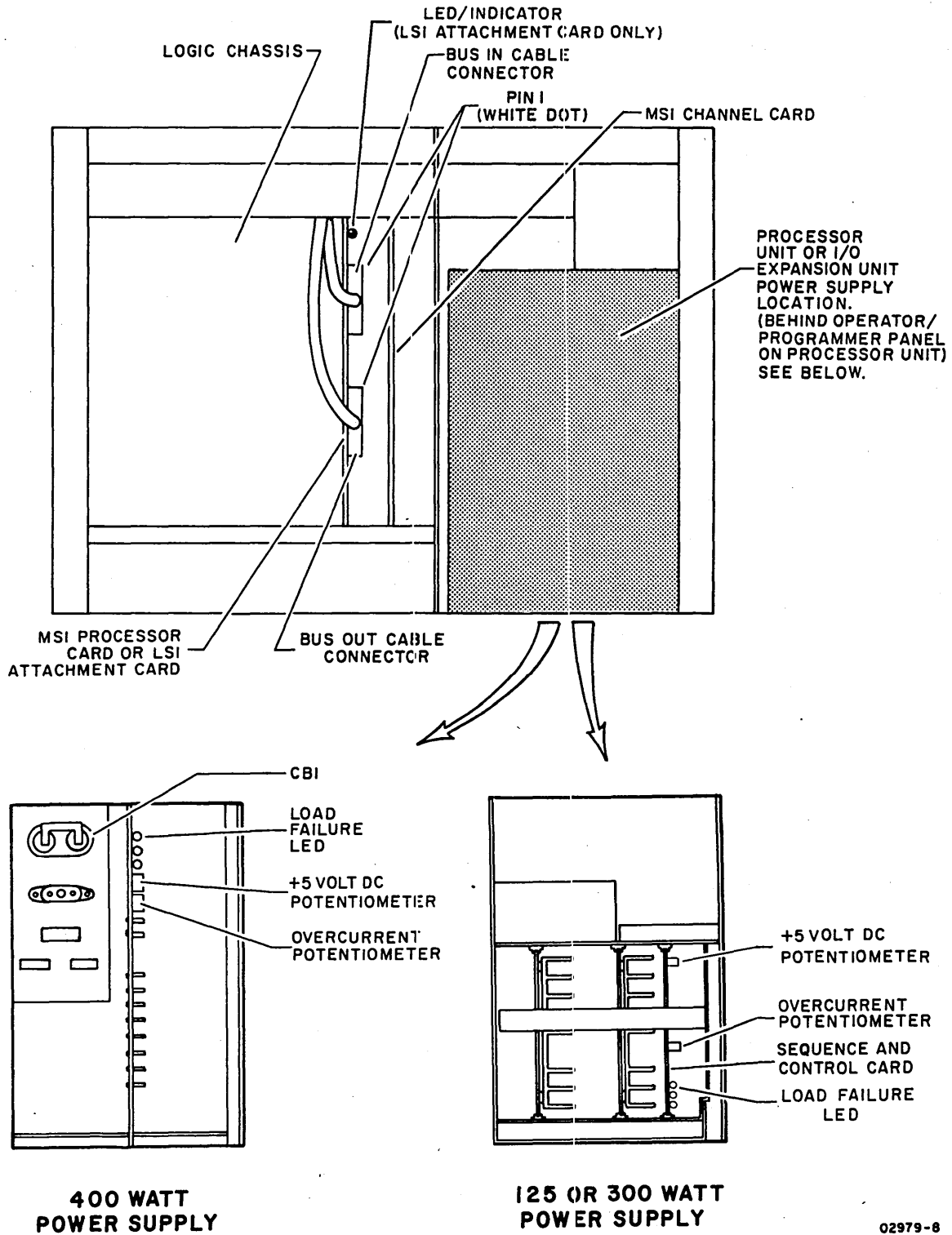
- 4953-A/C (125 watt supply) - eight-full turns clockwise.

- 4953-B/D, 4955-A/B/C/D, and 4959 (300 watt supply) - four-full turns clockwise.
  - 4952-B, 4955-E (400 watt supply) - seven-full turns clockwise.
- c. Press Power On/Off switch to OFF, then to ON. If check indicator on Series/1 operator/programmer panel lights following power application, an electrical malfunction exists on attachment or problem has developed in the series/1. Replace attachment card(s) and retry. If error persists, remove attachment card(s) and retry to determine if problem is in Series/1.
11. Check and adjust +5 V potentiometer on 4952, 4953, 4955, and 4959 units as follows (no adjustment is required on a 4952-A).

For MSI Attachment Cards

- a. Measure for +5 V dc at an accessible integrated circuit (IC) chip on either of the installed attachment cards. On 14-pin ICs, pin 14 = +5 V and Pin 7 = ground; on 16-pin ICs, pin 16 = +5 V and pin 8 = ground. IC pin numbering goes in counterclockwise direction from notch.
- b. Adjust +5 V potentiometer (figure 2-7) for +5  $\pm$ 0.5 V Adjust as close to nominal as possible.





02979-8

Figure 2-7. Adjustment Potentiometers and Attachment Cables

For LSI Attachment Card

CAUTION

If probe tip touches a signal and voltage pin at the same time with power applied, a logic card will be damaged.

- a. Turn Series/1 power off and remove backpanel cover.
- b. Connect voltmeter to backpanel pins as follows (see figure 2-8 for backpanel pin configuration):
  - +5 V at A2D03
  - Ground at A2D08
- c. Apply power to Series/1 and adjust +5 V potentiometer (figure 2-7) for +5  $\pm$ 0.5 V. Adjust as close to nominal as possible.
- d. Turn Series/1 power off, disconnect voltmeter, and replace backpanel cover.
- e. Reapply Series/1 power.

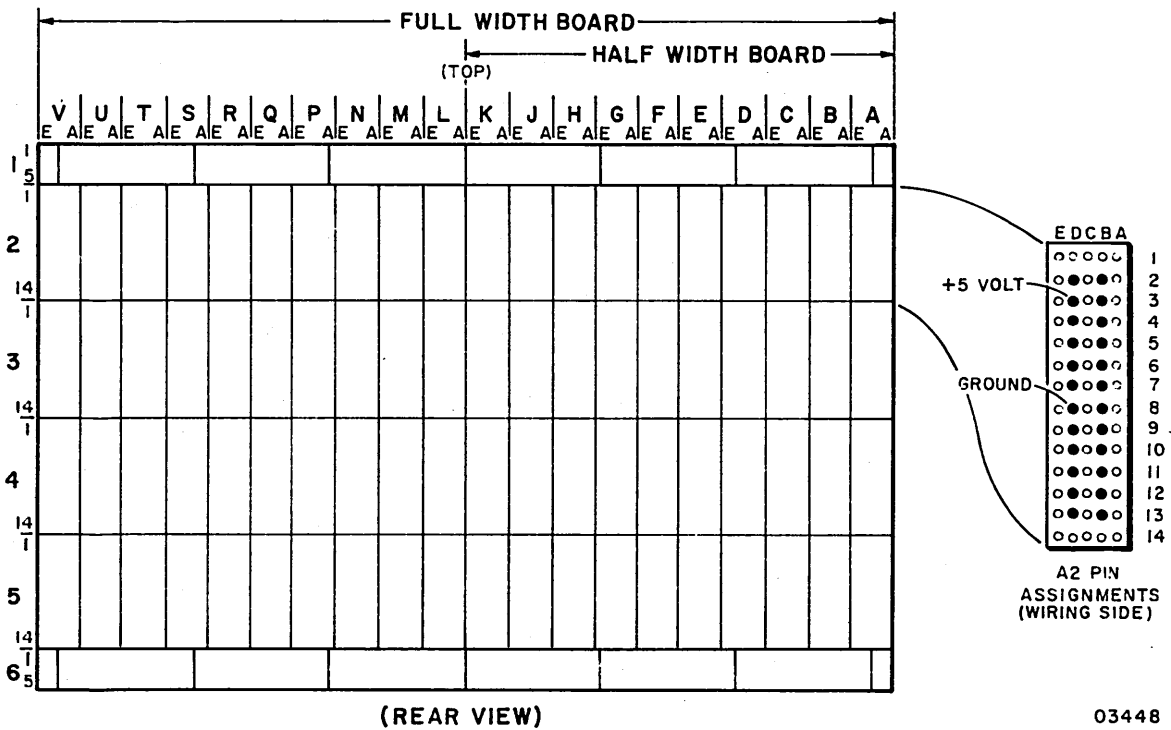


Figure 2-8. Backpanel Pin Configuration

12. Verify that red LED on attachment card (LSI attachment card only), is not lit (LED stays on if self-test error occurs). Replace attachment card if LED remains lit.
  - a. Remove rear cover of power supply and lower hinged transformer box to view switch (figure 2-9).
  - b. If four cards or less are installed in logic chassis, set switch to On (up) position. If five or more cards are installed, set switch to Off (down) position.
  - c. Place transformer box up and replace cover.
  - d. Press Power On/Off switch to ON. If Check indicator on Series/1 operator/programmer panel lights following power application, an electrical malfunction exists on attachment or problem has developed in the Series/1. Replace attachment card(s) and retry. If error persists, remove attachment card(s) and retry to determine if problem is in Series/1.

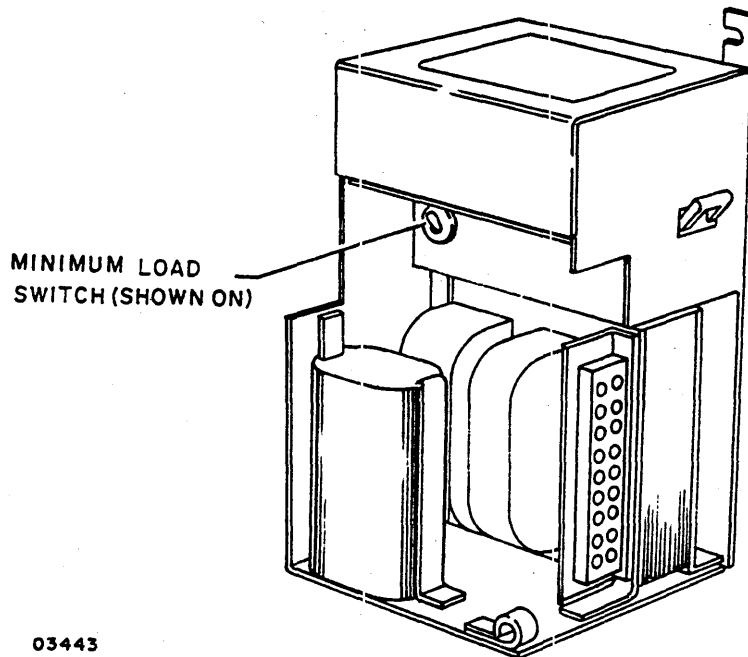
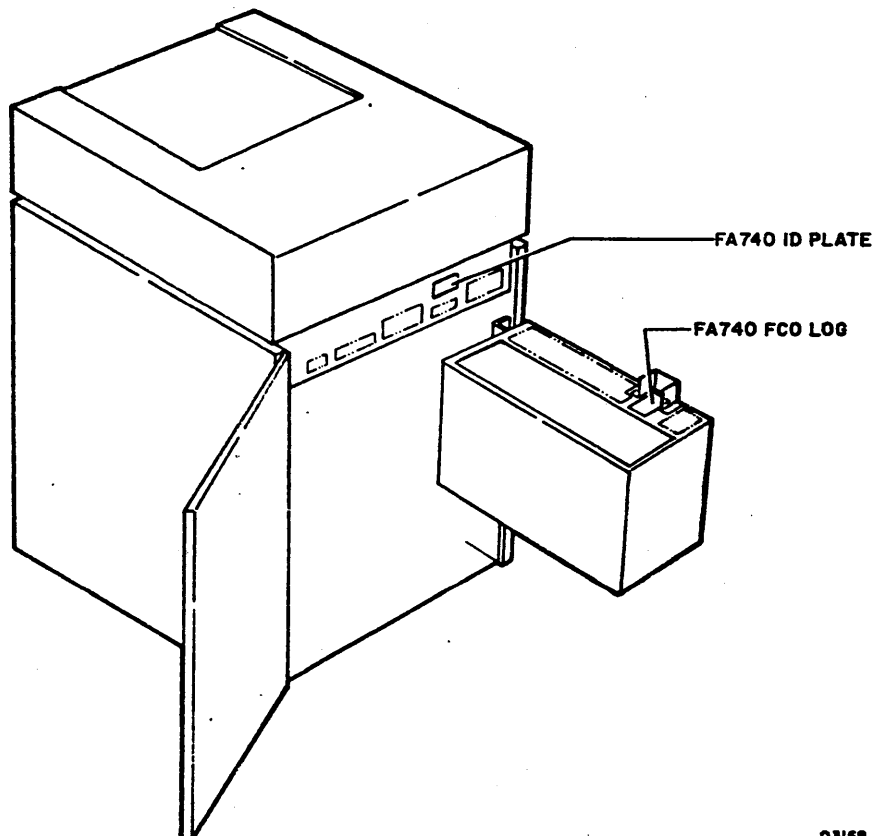


Figure 2-9. Minimum Load Switch (4952-A)

13. The following applies only to 4952-A model. Verify Minimum Load switch is set correctly:

14. Replace front snap-on panel and close rear door of Series/1 cabinet.
15. Attach equipment identification plate and FCO log to SMD per figure 2-10.



03168

Figure 2-10. Equipment ID Plate and FCO Log Placement

## LEVELING CABINET

Level drive cabinet as follows:

1. Install jam nut on each leveling pad and install a leveling pad at each corner of cabinet frame (figure 2-11).
2. Locate drive in final position.
3. Turn leveling pads down until they support weight of drive.
4. Place spirit level on drive top cover and adjust leveling pads until drive is level within three angular degrees both front to back and side to side.
5. When drive is level in both directions, tighten jam nuts against bottom of frame.

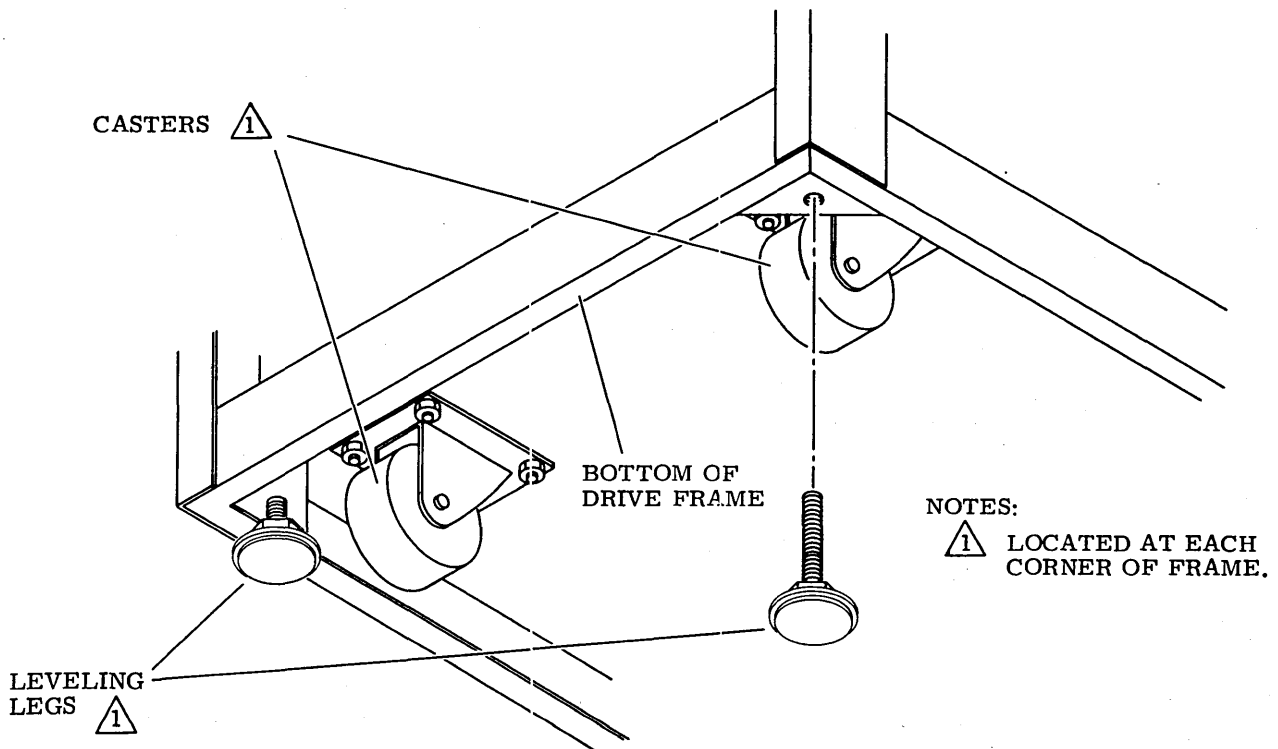


Figure 2-11. Leveling Pad Installation

## CHECKOUT

Checkout of drive involves:

- CDC Basic Diskette Configuration
- Configurator Table Information
- Initial Power-On
- Drive and Attachment Checkout

### CDC BASIC DISKETTE CONFIGURATION

This subsection provides information necessary to generate a system configurator table, or to add the SMD (when present) to the existing system configurator table of the CDC BASIC diagnostic diskette.

The SMD must be added to the system configurator table on the applicable CDC BASIC diagnostic diskette. The configurator table on each diskette must as a minimum contain the configuration information for all devices to be tested by that diskette. The following procedure describes the steps to be used for updating the configurator table by either adding the devices individually, or by performing the configure system option (0C).

#### NOTE

The configurators on IBM diskettes do not recognize CDC devices. Therefore, do not attempt to use an IBM configurator to construct the configurator table on a CDC BASIC diskette. All CDC devices will be configured wrong in the table.

1. Apply power to flexible disk drive unit and install CDC BASIC diagnostic diskette CDC P/N 663067XX.

#### NOTE

The CDC BASIC diagnostic diskette has a preassigned alternate console selected for either a CDC 80610 display or an IBM 4979 display (AATT = 0442).

2. Place IPL Source switch on Series/1 operator/programmer panel to Alternate or Primary position as applicable to enable loading from diskette.

3. Place Mode switch on Series/1 operator/programmer panel to Diagnostic position.
4. Press Load switch on Series/1 operator/programmer panel. This causes execution of IPL diagnostic residing on diagnostic diskette (execution time is approximately ten seconds). Go to step 4a, 4b, 4c, or 4d as applicable.
  - a. If an alternate console is assigned per the pre-configured diskette (see note of step 1), all messages should appear on assigned alternate console and on operator/programmer panel if present.
    - If a configurator error message appears on screen of crt (3822 on operator/programmer panel), this signifies that configurator table does not match system configuration. Go to step 5 to update table.
    - If a secure customer interface message appears on screen of crt (382A on operator/programmer panel), go to step 11.
    - If any other message appears on crt screen (38XX on operator/programmer panel), this error must be corrected before continuing. Refer to para 3.25 for list of error halt codes.
  - b. If either a 80610, 4978, 4979, or TTY display device is present, but no message appears on crt screen, and an operator/programmer panel is not available, do the following to assign an alternate console:
    - Install an existing diskette (IBM or CDC) that has an alternate console assigned correctly.
    - Press Load switch to IPL diskette.
    - When IPL is complete, message appears on crt screen. Remove diskette and install new diskette to be configured.
    - Enter B38F9 (menu will appear on screen).
    - Enter F02 to select patch program option.
    - Enter F38F1 (data set name).
    - Enter F3008 (start address).
    - Enter F0001 (word count).
    - Enter device address and device type of desired alternate console using format of FAATT where:  
AA = device address.

TT = device type of alternate console as follows:  
40 for a TTY device.  
42 for either a CDC 80610 or an IBM 4979 display.  
45 for an IBM 4978 display.

- A patch complete message indicates that the new alternate console assignment has been written on diskette.
  - Press Load switch. After IPL is complete, all messages should now appear on assigned alternate console. Go to step 5 to update configurator table.
- c. If a display or TTY is present, and a 3801 halt code appears in the register indicators of operator/programmer panel, but no message appears on crt screen, do the following to assign an alternate console:
- Enter (B),6,(I),(I) to continue.
  - Next halt code will be a 382A (secure customer interface), a 3822 (configuration errors on system), or a 382E (option table available for entry).
    - If a 382A halt code, secure customer interface and enter:  
(B),6,(I),(I) to advance to 3822 or 382E.
    - If a 3822 halt code, enter:  
(B),1F,(I),(B),0300,(I),(I) to advance to 382E.
    - If a 382E halt code, enter:  
(B),1F,(I),(B),0400,(I),(I) to select alternate console option.
  - Next halt code will be a 3821 (enter alternate console device address and device type), enter:  
(B),1F,(I),(B),AATT,(I),(I) where: AA = device address, and TT = device type. If a 3829 (no device) halt occurs, an entry error has been made. Enter: (B),6,(I),(I) to continue and reselect alternate console option.
  - Next halt code will be a 382E (option table is available for entry), enter:  
(B),1F,(I),(B),0D00,(I),(I) to write new alternate console assignment on diskette.
  - Next halt code will be a 382C (copy configurator table to another diskette?), enter:  
(B),1F,(I),(B),0500,(I),(I) to terminate.



- A 3800 or 3805 halt code indicates completion of program terminate function.
  - Press Load switch to re-IPL. All messages should now appear on crt screen of assigned alternate console. Go to step 5 to update configurator table.
- d. If no alternate display or TTY console is present, and a 3801 halt code appears in indicators of operator/programmer panel, perform the following steps to change configurator table manually or through use of configure system option (0C) via the operator/programmer panel:
- Enter (B),6,(I),(I) to continue.
  - Next halt code will be a 382A (secure customer interface), a 3822 (configuration errors on system) or a 382E (option table available for entry).
    - If a 382A halt code, secure customer interface and enter:  
(B),6,(I),(I) to advance to 3822 or 382E.
    - If a 3822 halt code, enter:  
(B),1F,(I),(B),0300,(I),(I) to advance to 382E.
    - If a 382E halt code, enter:  
(B),1F,(I),(B),0400,(I),(I) to select assign alternate console option.
  - Next halt code will be a 3821 (enter alternate console device address and device type), enter:  
(B),1F,(I),(B),0000,(I),(I) to assign operator/programmer panel as alternate console.
  - Next halt code will be a 3832 (operator/programmer panel is the assigned alternate console).
  - Enter (B),6,(I),(I) to continue.
  - Next halt code will be a 382E (option table is available for entry), enter:  
(B),1F,(I),(B),0D00,(I),(I) to write new alternate console assignment on diskette.
  - Next halt code will be a 382C (copy configurator table to another diskette?), enter:  
(B),1F,(I),(B),0500,(I),(I) to terminate.

- A 3800 (ready) halt code indicate system is ready for any valid input. Go to Changing Configurator Table Using Operator/Programmer Panel to update configurator table manually, or to Configure System (Option 0C) Using Operator/Programmer Panel to perform configure system option (0C).
- 5. Enter F03 and press ENTER key on keyboard of assigned alternate console to display option table.
- 6. Enter F0B to bypass option table display.
- 7. Skip steps 8 through 15 if configurator table is to be updated manually and go directly to step 16.
- 8. Enter F0C to select configure system option and follow series of prompts on alternate console display. The new configurator table will automatically be written onto the diskette.
- 9. An option to write the configurator table on another diskette or to terminate then appears on the crt screen. Terminate by entering F05. A PT RDY ENTER then displays on the crt screen.
- 10. Enter B38F0 to display option table.
- 11. Enter F0B to bypass option table display.

#### NOTE

Some CDC and IBM devices have the same device read ID codes assigned. The configure system option assigns CDC device types to all IBM devices that have the same read ID code as the CDC devices. These IBM devices must be manually changed in the configurator table. Also, if a CDC 80230 or 80240 minimodule drive having a read ID of 3007 is present in the configurator table, the device type must be changed from 70 to 72. To determine which device types in the table require changing, enter F09 (Print System Equipment) to display all system devices contained. Compare this listing with customer equipment list to determine which device types to change.

12. Enter F01 to display configurator table.
13. Enter F03 to select modify option.
14. Enter correct device type for each table entry to be modified by following the prompts on alternate console. Refer to table 2-1 for device type assignments.
15. Go to step 19.
16. Enter F01 to display configurator table.
17. Enter F0A (add option), F02 (delete option), F03 (modify option), or any other desired option from option table as applicable to make changes or additions to configurator table.

TABLE 2-1. IBM/CDC DEVICE TYPE ASSIGNMENTS

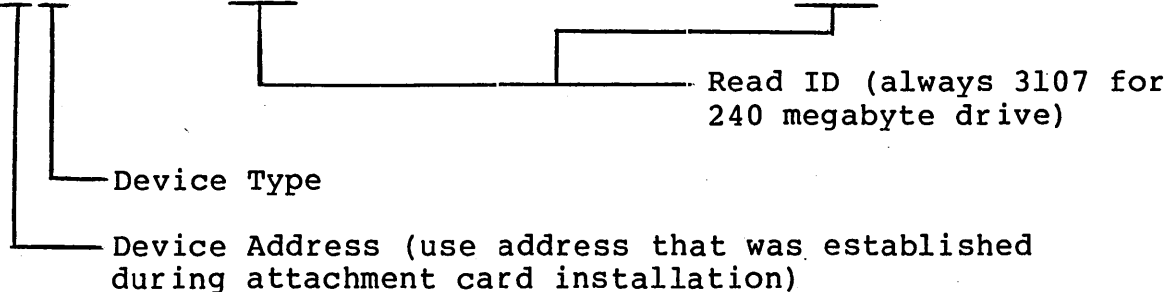
ID READ	IBM PRODUCT/DEVICE TYPE		CDC PRODUCT/DEVICE TYPE	
0406	4979	44	80610	42
0206	4974	64	80420	62
0106	4964	48	80210	46
00AA	4962	78	80230	72
00CA	4962	78	80230	72
0306	4973	68	80450	66

18. Enter SMD device parameters per the following format as applicable and press ENTER key.

```

AATT 0203 0405 0607 0809 0000 0000 IDID (Dummy entry)
F  XX71 0000 3107 0000 0000 0000 0000 3107

```



Response to the above input is:

```

ENTER FUN
ENTER

```

NOTE

Configuration information for all other CDC devices contained in the system may be entered at this time. Refer to the applicable site maintenance information manual for individual device entry parameters.

19. Enter F01 and press ENTER key to display configuration table. Verify that these parameters were correctly entered.
20. Enter F0D and press ENTER key to write the new configuration information on diskette. If additional diskettes are to be written, install diskette and repeat this step for each diskette.
21. Enter F05 to terminate program. A PT ENTER message indicates that terminate function has completed.

Configurator Table Entries

The configurator record contains system information (Entry 00), and one entry for each device address used (Entries 01-XX). The formats used for the system entry and the device entries are as follows:

## NOTE

The configurators on IBM diskettes do not recognize CDC devices. Therefore, do not attempt to use an IBM configurator to construct the configuration table on a CDC BASIC diskette. All CDC devices will be configured wrong in the table.

## Entry 00 (System Entry)

Change only Entry 00 bytes 05 through 09 (functions 04, 06, 08) all other information is entered by the configurator program.

Byte	Definition
00 and 01	Constant 00
02	Entry number of last entry in table
03	Configurator flags Bit 00 through 06 are reserved Bit 07 a 1 = diskette has been configured Bit 07 a 0 = diskette has not been configured
04	Not used
05	Processor type ① 22 = 4952 23 = 4953 25 = 4955

① Several device MAPs measure time. Instruction execution time is indicated to the MAPs by processor type. The wrong processor type code will cause MAP failures.

Byte	Definition
06 and 07	<p>Storage word</p> <p>X Y Y Y</p> <p>ABBBBBBBBBBB</p> <p>A binary number indicating the number of 16K units of outer storage installed</p> <p>A=0 No address translator A=1 Address translator installed</p> <p>3=16K of inner storage installed 7=32K of inner storage installed B=48K of inner storage installed F=64K of inner storage installed</p> <p>NOTES</p> <ol style="list-style-type: none"> <li>1. Storage word = F803 indicates 112K of total storage installed.</li> <li>2. If BBBBBBBBBBBB is greater than 0, then A must equal 1 and address translator feature must be installed.</li> <li>3. Inner storage can be addressed only by the storage address register.</li> <li>4. Outer storage can be addressed only by the address translator feature.</li> <li>5. Storage word = 7802 indicates one 32K card or two 16K cards installed as inner storage, one 32K card or two 16K cards installed as outer storage, and the address translator installed.</li> </ol>
08 and 09 0A through 0E 0F	<p>Alternate console address and type (AATT)</p> <p>Not used</p> <p>Release level of this configuration record</p>

Entries 01-XX (Device Entries)

Byte	Definition
00	Device address
01	Device type
02	<p>Flag byte</p> <p>Bit 0 Used by DCP (in storage). Always 0 on disk.</p> <p>Bit 1=1 Indicates this entry chained to next entry.</p>

<u>Byte</u>	<u>Definition</u>
	<p>Bit 2=1 Indicates last entry in configurator table.            Bit 3=1 Indicates last entry in this sector            Bit 4 through 6 Reserved            Bit 7 Last available entry in configurator table.</p> <p style="text-align: center;">NOTES</p> <ol style="list-style-type: none"> <li>1. Ignore bits 2, 3, and 7 when making adds or changes. The configurator program will set/reset them at sort time.</li> <li>2. Chain bit (byte 02 bit 1) is used to pass two or more entries to a MAP program or diagnostic. Wrong use of the chain bit can cause MAP failures. For example: a missing chain bit causes needed information not to be available to the MAP. Extra chain bits can cause MAPs to be bypassed during an auto run.</li> </ol>
03 through 09	Device-dependent data. Describes the device to its associated MAPs/diagnostics. If it is wrong, failures will occur. The auto verify performed when the configurator loads does not check device-dependent data.
0A through 0D	Reserved
0E through 0F	Device ID word

Alternate Console Devices:

TTY Console

DA 40 00 00 00 00 00 00 00 00 00 00 00 00 00 10

4979 Display Station\*

DA 42 00 00 00 00 00 00 00 00 00 00 00 00 04 06

4978 Display Station

DA 45 00 00 00 00 00 00 00 00 00 00 00 00 04 0E

---

\*Device type 44 must be used when configuring an IBM diskette.

4974 Matrix Printer\*\*

DA 62 00 00 00 00 00 00 00 00 00 00 00 00 00 02 06

80610 Display Station\*

DA 42 00 00 00 00 00 00 00 00 00 00 00 00 00 04 06

80420 Matrix Printer\*\*

DA 62 00 00 00 00 00 00 00 00 00 00 00 00 00 02 06

80450 Band Printer

DA 66 00 00 00 00 00 00 00 00 00 00 00 00 00 03 06

Load Devices

4964 Diskette

DA 48 00 00 00 00 00 00 00 00 00 00 00 00 00 01 06

80210 Flexible Disk Drive\*\*\*

DA 46 00 00 00 00 00 00 00 00 00 00 00 00 00 01 06

---

\*Device type 44 must be used when configuring an IBM diskette.

\*\*Device type 64 must be used when configuring an IBM diskette.

\*\*\*Format also applies to 80240 series MMDs (contains an FDD packaged in the MMD enclosure).



## CONFIGURATOR TABLE INFORMATION

## NOTE

The following conventions are used for operator/programmer panel input:

- (B) = Data Buffer switch
- (I) = Console Interrupt switch

Changing Configurator Table Using Operator/Programmer Panel

To change the configurator table through use of the operator/programmer panel, perform the following steps:

1. Press Load switch to load configurator program.
2. View and record contents of configurator table per the following:
  - Press Stop switch.
  - Press SAR (Storage Address Register) switch.
  - Enter 3000 via data register input switches.
  - Press Store switch.
  - Press Main Storage switch to display first word of entry 00 in configurator table. Record contents.
  - Continue pressing Main Storage switch to view and record each word of entry.

## NOTE

Each configurator table entry consists of eight words. Refer to CDC Basic Diskette Configuration for entry format. Entry 00 is the system entry and entries 01 through XX are the device entries. The last entry in the table will contain a 1 bit in the bit 2 position of byte 0203 as follows:

02
03  
0010 0000
0000 0000

- Continue logging information from configurator table until complete.

3. Press Load switch. Either a 382A (secure customer interface), a 3822 (configuration errors on system), or a 382E (option table available for entry) halt will occur.
  - If a 382A halt code, enter:  
(B),6,(I),(I) to advance to halt 3822 or 382E.
  - If a 3822 halt code, enter:  
(B),1F,(I),(B),0300,(I),(I) to advance to halt 382E.
  - If a 382E halt code, go to step 4.
4. Enter one of the following options as applicable:
  - (B),1F,(I),(B),0200,(I),(I) to delete entire entry from configurator table.
  - (B),1F,(I),(B),0300,(I),(I) to change any portion of an entry in configurator table.
  - (B),1F,(I),(B),0A00,(I),(I) to add a new entry in configurator table.
5. If a 383A halt code occurs (signifying that an 02 or 03 option was selected), enter table number as follows:  
(B),1F,(I),(B),XX00,(I),(I) where XX = entry number.
6. If a 383B or 3846 halt code occurs (signifying that an 03 or 0A option was selected), enter new configurator table data for table entries 01 through XX as follows:  
(B),8F,(I),(B),AATT,(I),(B),0000,(I),(B),IDID,(I),(B),0000,(I),(B),0000,(I),(B),0000,(I),(B),IDID,(I),(I)  
where: AA = device address  
TT = device type  
IDID = device read ID
7. Repeat steps 4 through 6 until all additions, deletions, and corrections are complete.
8. Write new configurator table on diskette when complete (halt code 382E), enter:  
(B),1F,(I),(B),0D00,(I),(I)
9. Next halt code will be a 382C (copy table to another diskette?)..Terminate program by entering:  
(B),1F,(I),(B),0500,(I),(I)
10. Successful termination of configurator program is indicated by a 3800 (ready) halt code.
11. Diskette is now configured and ready for diagnostic checkout.

Configure System (Option 0C) Using Operator/Programmer Panel

To configure the system automatically (using option 0C) from the operator/programmer panel, perform the following steps:

1. Enter (B),B,(I),(B),38F0,(I),(I) to load configurator program. When loaded, a 38XX halt code displays in output indicators of operator/programmer panel. If a 382A halt code occurs, enter: (B),6,(I),(I)
2. If a 3822 halt code occurs, enter:  
(B),1F,(I),(B),0300,(I),(I)  
A 382E halt will then occur to allow option selection.
3. Enter (B),1F,(I),(B),0C00,(I),(I) to select configure system option 0C. Refer to para 3.21 for specific instructions pertaining to halt codes being displayed.
4. Continue entering appropriate parameters until a 3800 or 3805 halt code displays. This indicates that diskette configuration is complete. Diagnostic checkout can now be performed.

## NOTE

Some IBM and CDC devices have the same read ID codes. These IBM devices are all assigned CDC device types in the configurator table and must be manually changed to the correct device ID before executing diagnostic tests. Also, if a CDC 80230 or 80240 mini module drive having a read ID of 3007 is present in the configurator table, the device type must be changed from 70 to 72. Refer to table under Check-out heading in section 2 of this manual for a listing of device types that have the same read IDs. To make changes, follow instructions in para Changing Configurator Table Using Operator/Programmer Panel.

## INITIAL POWER-ON

Do initial power-on as follows:

1. Clean shroud and spindle (para 3.1.3 in maintenance section).

2. Open rear door of drive and set LOCAL/REMOTE switch to LOCAL.
3. Place all circuit breakers up except MAIN AC.
4. Connect drive power cord to outlet.

NOTE

Attachment card(s) read the status bits for SMD device type only during a Series/1 power-on application. Therefore, AC power to the SMD must be applied first before applying power to the attachment card, or attachment power may be turned to OFF and then to ON to obtain the correct status. Incorrect status results in callups for 63 MB instead of 240 MB diagnostic tests.

5. Place MAIN AC circuit breaker up to start blower. Wait 10 minutes for blower to purge air system before proceeding.
6. Install a formatted scratch disk pack (para 3.0.7.2).

NOTE

A scratch disk pack can be formatted for diagnostic checkout through disk initialization utility U71F0 (paragraph 3.23).

7. Press START switch. START indicator lights and drive motor starts rotating disk pack. After approximately 30 seconds READY indicator lights to show that heads are loaded and that drive is ready for operation.

#### DRIVE AND ATTACHMENT CHECKOUT

Check out drive and attachment as follows:

NOTE

If alternate console is located far from drive, alternate console can be disabled and diagnostics run via Series/1 operator/programmer panel. Refer to Commands, paragraph 3.26 in maintenance section.

1. Run SMD auto diagnostics on BASIC diskette (para 3.0.10.2).

2. Perform following SMD manual diagnostic tests (para 3.0.10.3):
  - 7130 -- write/read data
  - 7140 -- ECC pattern
  - 7150 -- write sector ID
3. Remove scratch disk pack (para 3.0.7.3).
4. Prepare for head alignment check (para 3.19.1).
5. Check head alignment (para 3.19.2).
6. If any head required alignment adjustment, install scratch disk pack and repeat steps 1 through 3.
7. Install applicable Unit Number lens per customer requirements beneath READY indicator on drive control panel.
8. Run Certainty Series System Test and Freelance Diskette (diskette, part number 663092XX) to verify correct system operation. Publication number of system test reference manual is listed in preface.

CAUTION

A disk pack initialized by utility U71F0 is not satisfactorily formatted for customer use and will not provide accurate storage. Instructions for initializing customer disk pack are contained in the SMD Reference manual, see preface for publication number.

Configurator Table Layout (shown as stored in Memory)

Use this blank table to assemble a configurator table for your system.

<u>Entry No.</u>	<u>Storage Address</u>	<u>Byte</u>															
		<u>00</u>	<u>01</u>	<u>02</u>	<u>03</u>	<u>04</u>	<u>05</u>	<u>06</u>	<u>07</u>	<u>08</u>	<u>09</u>	<u>0A</u>	<u>0B</u>	<u>0C</u>	<u>0D</u>	<u>0E</u>	<u>0F</u>
00	3000																
01	3010																
02	3020																
03	3030																
04	3040																
05	3050																
06	3060																
07	3070																
08	3080																
09	3090																
0A	30A0																
0B	30B0																
0C	30C0																
0D	30D0																
0E	30E0																
0F	30F0																



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## INTRODUCTION

This section provides on-site maintenance information for the drive. This information is divided into the following major paragraph groups:

- 3.0 General Maintenance Information — Contains information that maintenance personnel should be familiar with before doing maintenance: precautions for safety and equipment (3.0.1); maintenance tools and materials (3.0.2); controls and indicators (3.0.3); test points (3.0.4); physical location codes (3.0.5); power application (3.0.6); disk packs (3.0.7); manual retraction of heads (3.0.8); troubleshooting philosophy (3.0.9); BASIC diskette diagnostics (3.0.10); head alignment kit (3.0.11).
- 3.1 Preventive Maintenance — Contains a preventive maintenance index followed by associated procedures. The preventive maintenance index indicates how often these procedures are to be done and the approximate time it takes to do them.
- 3.2 Accessing Drive for Maintenance — Gives instructions for opening/removing parts of drive cabinet.
- 3.3 through 3.22 — Contain check, adjustment removal, and replacement procedures for field replaceable parts. These procedures are associated with the decision logic tables (DLTs) that are provided with this manual as an appendix. When troubleshooting drive, the DLTs indicate the appropriate procedure to be performed.
- 3.23 Disk Pack Initialization — Gives instructions for initializing a scratch disk pack for drive checkout.
- 3.24 and groups thereafter — Provide a summary of pertinent MAP 0010 Diagnostic Service Guide information as it applies to the drive.



### 3.0 GENERAL MAINTENANCE INFORMATION

#### 3.0.1 Precautions for Safety and Equipment

##### WARNING

Observe the following precautions at all times. Failure to do so may cause damage and/or personal injury.

- Use care when working with power supply. Line voltages are present inside power supply.
- Keep hands out of actuator during seek operations. Emergency retract voltage may be present causing sudden reverse motion and head unloading.
- Use caution while working near heads. If heads are touched, fingerprints can damage them. Clean heads (para 3.19.5) immediately if touched.
- Keep pack access cover closed unless it must be open for maintenance. This prevents entrance of dust into shroud area. Do not open pack access cover while disk is spinning.
- Keep watches, disk packs, and test equipment at least two feet away from voice coil magnet when deck cover is off.
- Do not remove/install logic cards while power is on. Logic cards are damaged by transient voltage spikes that may be generated under these conditions.
- Do not use customer disk pack for test purposes, use scratch disk pack instead (para. 3.0.7.1).
- Do not use CE disk pack unless specifically directed to do so. These packs contain prerecorded alignment data that will be destroyed if drive performs a write.
- If disk rotation does not stop when START switch is pressed, disconnect yellow wire to voice coil and manually retract heads (para. 3.0.8) before troubleshooting malfunction.
- Make sure heads are fully retracted before installing/removing disk pack.
- If a read/write head is found to be excessively out of alignment (greater than 300 mv offset), do not realign until all disk packs written by that drive are copied on another storage device.

- If head crash or use of contaminated disk pack is suspected, immediately remove pack and inspect heads for damage (para 3.19.4).

### 3.0.2 Maintenance Tools and Materials

Besides usual hand tools (screw drivers, wrenches, etc.), drive maintenance requires the items listed in following table.

MAINTENANCE TOOLS AND MATERIALS

DESCRIPTION	PART NUMBER	DESCRIPTION	PART NUMBER
Adapter (3/16 hex to 1/4 sq)	CDC 12262582	Media cleaning solution	CDC 95033502
Ball end hex driver (3/16 hex)	CDC 12263201	Nonmetallic feeler gage, 0.005 inch	CDC 12205633
Card extender	CDC 54109701	Oscilloscope, dual trace	Tektronix 454 or equivalent
Card extraction tool	CDC 87399200	Oscilloscope hood	Tektronix 016-0083-00
Carriage alignment arm	CDC 75018400	Pin straightener	CDC 87369400
Chip extender	CDC 12212196	Push-pull gage	CDC 12210797
Computer card no. 5084	None	Wire wrap removal tool (20-30 gage)	CDC 12259183
Disk pack, CE	CDC 70430003	Scope probe tip (hatchet type)	CDC 12212885
Disk pack, regular	CDC 70430505	Torque screwdriver	CDC 12218425
Dust remover	CDC 95047800	Torque screwdriver bit	CDC 87016701
Filter coat	CDC 12210958	Torque wrench, 1/4 inch	CDC 12263205
Gauze, lint free	CDC 12209713	Volt/ohmmeter	Ballatine 345 or equivalent digital volt-meter
Grease, Silicone	CDC 95109000	Wire wrap bit, 30 gage	CDC 12218402
Head adjustment tool	CDC 75018800	Wire wrap gun, electric	CDC 12259111
Head alignment kit	CDC 77440500	Wire wrap sleeve, 30 gage	CDC 12218403
I/O pin removal	CDC 12212759	Card extender*	CDC 61408349
Loctite, grade C	Loctite Corp.	Card extender cable*	CDC 61408350
Loctite primer, grade N	Loctite Corp.		
Lubricant Paste	CDC 95016101		

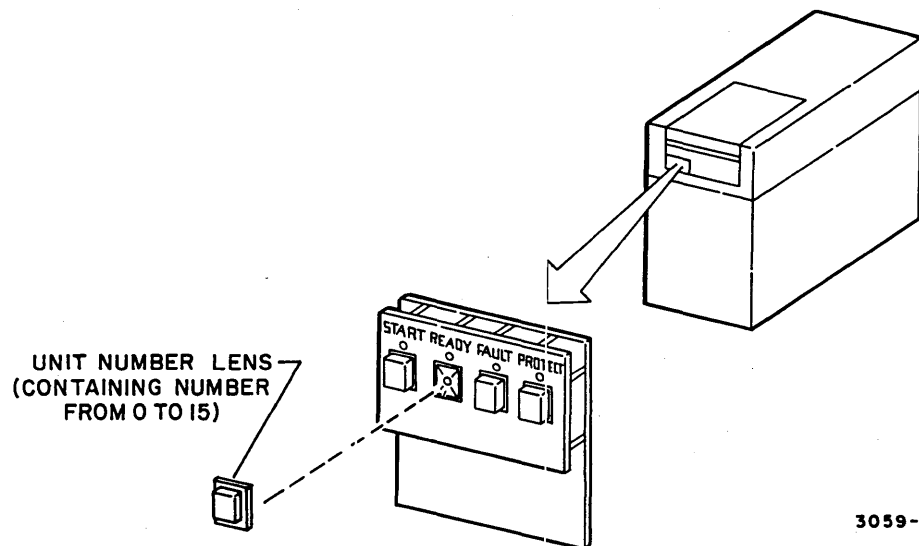
\*For use with drive attachment cards.

### 3.0.3 Controls and Indicators

The following paragraphs describe the controls and indicators on the operator control panel, power supply control panel, and logic chassis.

#### 3.0.3.1 Operator Control Panel

The operator control panel contains the switches and indicators that control and monitor overall operation of the drive. The following table explains their function.

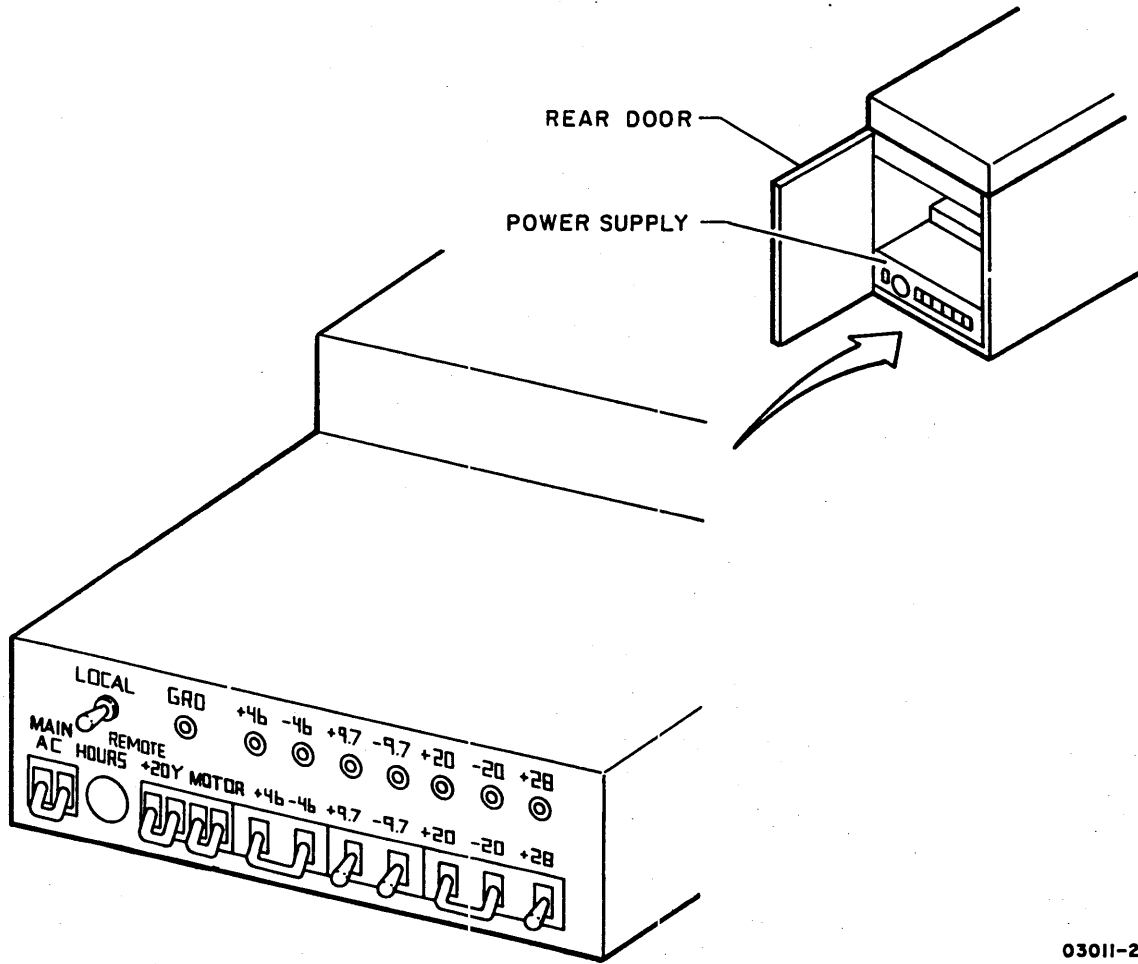


## OPERATOR CONTROL PANEL FUNCTIONS

SWITCH/INDICATOR	FUNCTIONS
START switch/indicator	<p>If following conditions are present, first pressing of START switch lights START indicator and starts disk pack rotation.</p> <ul style="list-style-type: none"> <li>● Disk pack is installed</li> <li>● Pack access cover is closed</li> <li>● Power supply control panel LOCAL/REMOTE switch set to LOCAL</li> <li>● All power supply circuit breakers are up</li> </ul> <p>Second pressing of START switch extinguishes START indicator and stops disk pack rotation.</p>
READY indicator	<p>READY lights when disk pack is up to speed, heads are loaded, and no fault condition exists.</p>
Unit Number Lens	<p>Separate numbered lens that show unit identity number assigned by customer.</p>
FAULT switch/indicator	<p>FAULT indicator lights when a fault condition exists within drive. If reason for fault is no longer present, any of the following extinguishes FAULT indicator.</p> <ul style="list-style-type: none"> <li>● Pressing FAULT switch</li> <li>● Receipt of a clear fault, reset, or error-recovery command from attachment assembly</li> <li>● Pressing Maintenance Fault Clear switch on logic card in A17 of logic chassis.</li> </ul> <p>Conditions that light FAULT indicator are described in section 1, General Description.</p>
PROTECT switch/indicator	<p>First pressing of PROTECT switch lights PROTECT indicator and disables data from being written on disk pack.</p> <p>Second pressing of PROTECT switch extinguishes PROTECT indicator and enables writing on disk pack.</p>

### 3.0.3.2 Power Supply Control Panel

Power supply control panel is accessed by opening rear door of drive. The panel contains a time meter, selection switch, and circuit breakers. The following table describes their function.

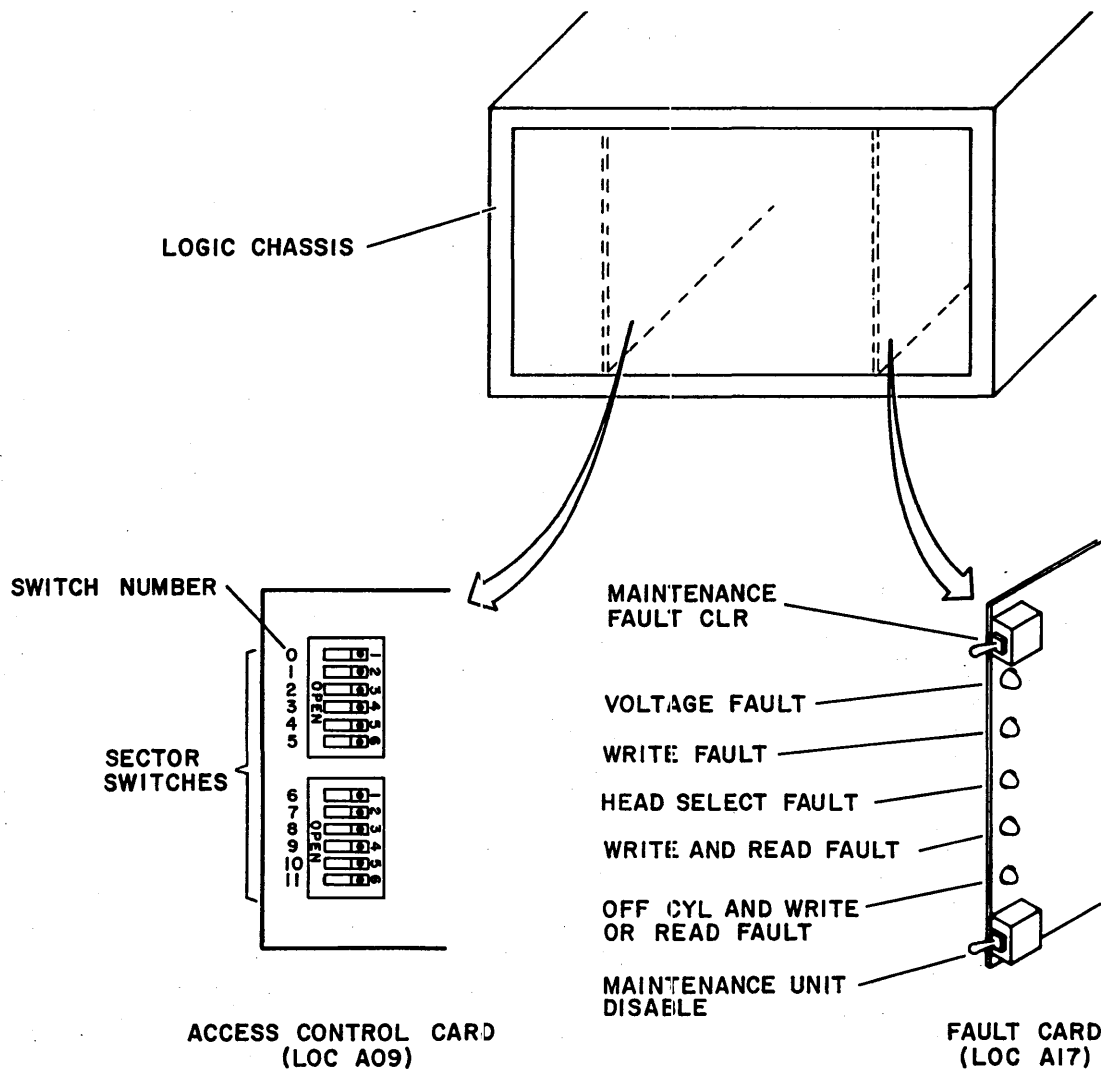


POWER SUPPLY CONTROL PANEL FUNCTIONS

CONTROL/INDICATOR	FUNCTION
MAIN AC circuit breaker	Controls application of ac power to drive. Placing this breaker up applies power to blower and elapsed time meter.
HOURS elapsed time meter	Records accumulated ac power-on time. Meter starts when MAIN AC circuit breaker is placed up.
LOCAL/REMOTE switch	LOCAL/REMOTE switch must be set to LOCAL for disk pack rotation to occur.
+20Y, +46/-46, +9.7, -9.7, +20/-20, +28 circuit breakers	These circuit breakers control the distribution of respective dc voltages within drive. All must be placed up for drive to power-on.
MOTOR circuit breaker	MOTOR circuit breaker governs flow of ac power to drive motor control circuits. MOTOR circuit breaker must be placed up for drive to power-on. Control circuit triacs pass ac power from MOTOR breaker to drive motor when disk pack rotation is to occur.

### 3.0.3.3 Logic Chassis

The logic chassis contains two logic cards that have switches and indicators, the cards in A09 and A17. The following table explains the function of each logic card switch/indicator.



## LOGIC CARD SWITCH/INDICATOR FUNCTIONS

SWITCH/INDICATOR	FUNCTION
Maintenance Fault Clear switch	<p>If reason for fault is no longer present, pressing Maintenance Fault Clear switch extinguishes:</p> <ul style="list-style-type: none"> <li>● FAULT indicator on operator control panel (same as control panel FAULT switch)</li> <li>● Indicator for fault on A17 logic card (there is no indicator on A17 card for no servo tracks fault)</li> </ul>
Voltage Fault indicator	Lights when +46, +20, or +5 voltages are below normal level. If +5 V is extremely low or lost completely, no fault indication will be given as +5 V powers all indicators.
Write Fault indicator	Lights when a write fault exists.
Head Select Fault indicator	Lights when a multiple head select has occurred.
Write and Read Fault indicator	Lights when a write and read are commanded simultaneously.
Off Cylinder and Write or Read Fault indicator	Lights when a write or read is commanded during seeking.
Maintenance Unit Disable switch	DSBL position of Maintenance Unit Disable switch is not used. Switch must be set to NORM for A17 card fault indicators to be operational.
Sector switches	The twelve Sector switches determine the number of sectors that a disk pack is to be divided. With disk format being used, this is 60 sectors. For 60 sectors — switches 0, 1, 2, 3, 4, 6, and 7 are closed; switches 5, 8, 9, 10, and 11 are open (pushed down toward OPEN marking). This is the only way that these switches are to be set.

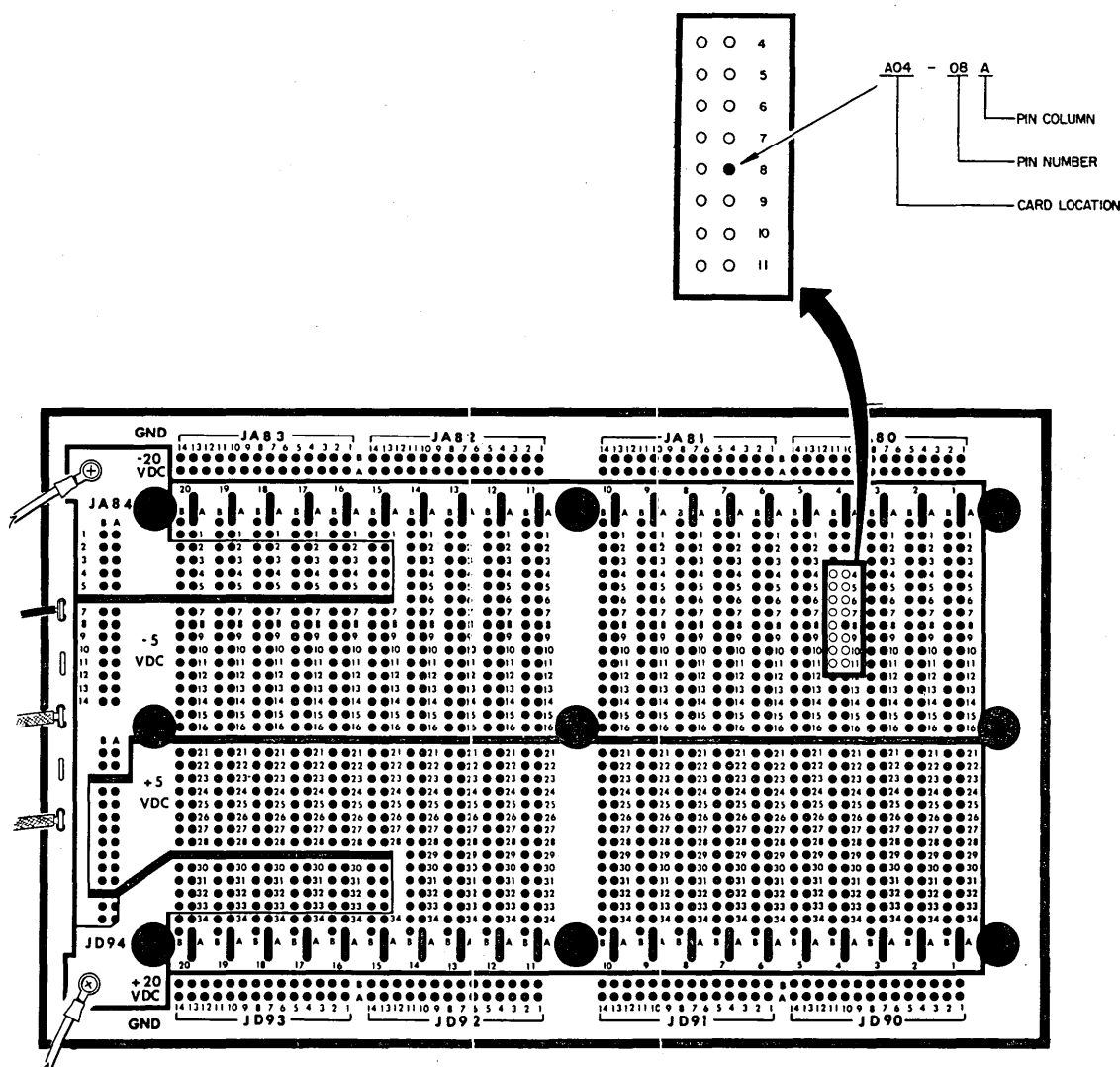


### 3.0.4 Test Points

The following paragraphs describe the three categories of drive test points: logic chassis backpanel pins, logic card test points, and power supply test points.

#### 3.0.4.1 Logic Chassis Backpanel Pins

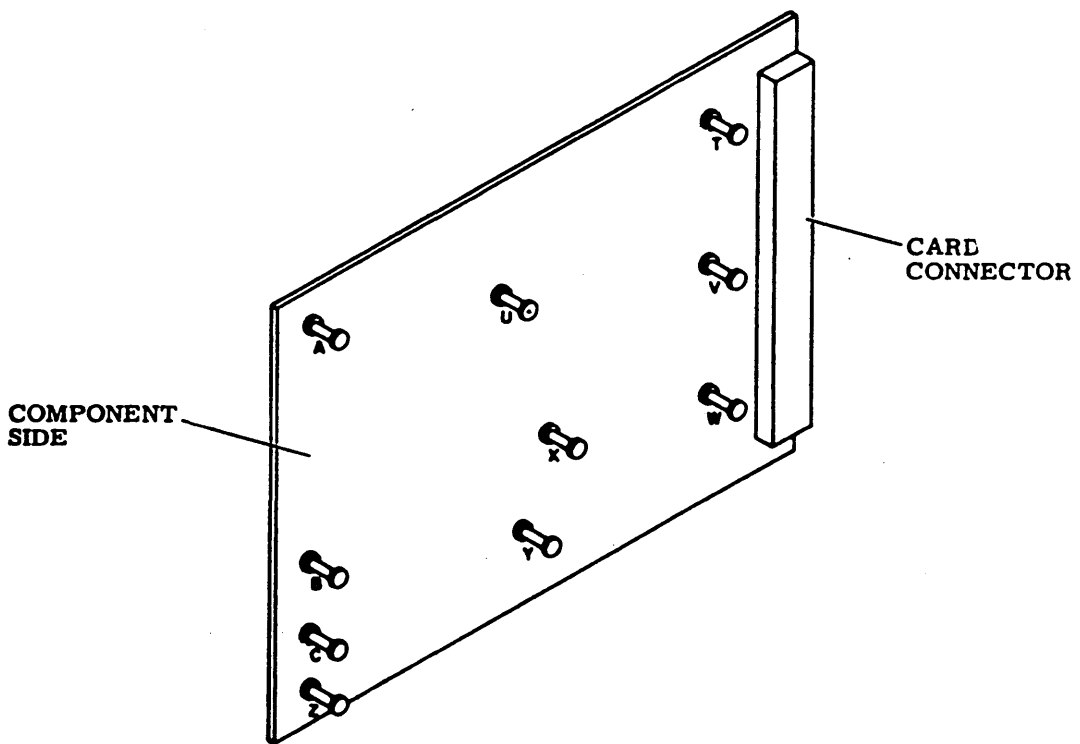
Logic chassis backpanel pins are identified by card location, pin row, and pin column. For example, with A04-08A (see following illustration): A04 identifies card location 04 (A prefix insignificant); 08 identifies horizontal pin row within card location; A identifies vertical pin column within card location.



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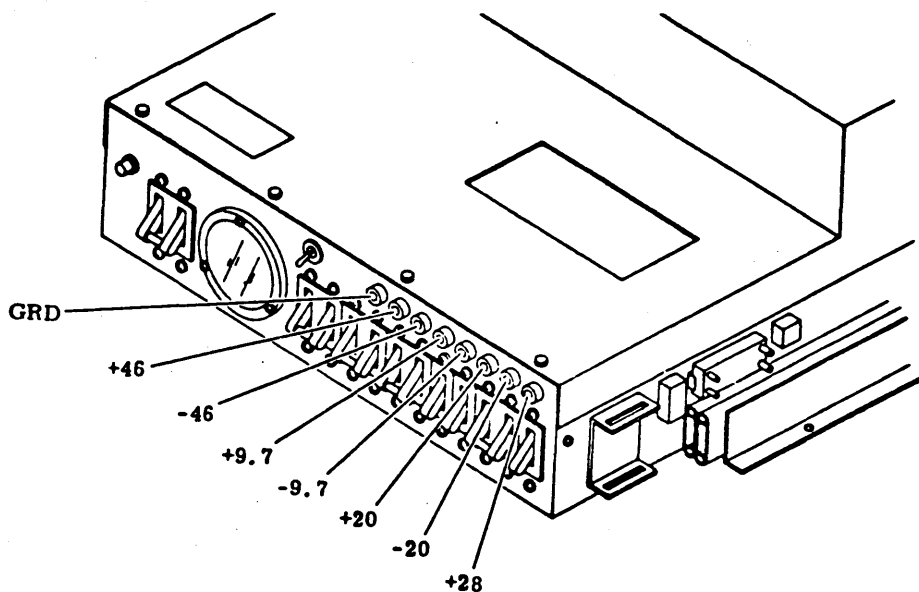
#### 3.0.4.2 Logic Card Test Points

Test points on logic chassis and read/write chassis logic cards consist of studs on component side of cards. As following illustration shows, these test points are identified by the letter that appears adjacent to them on the card.



### 3.0.4.3 Power Supply Test Points

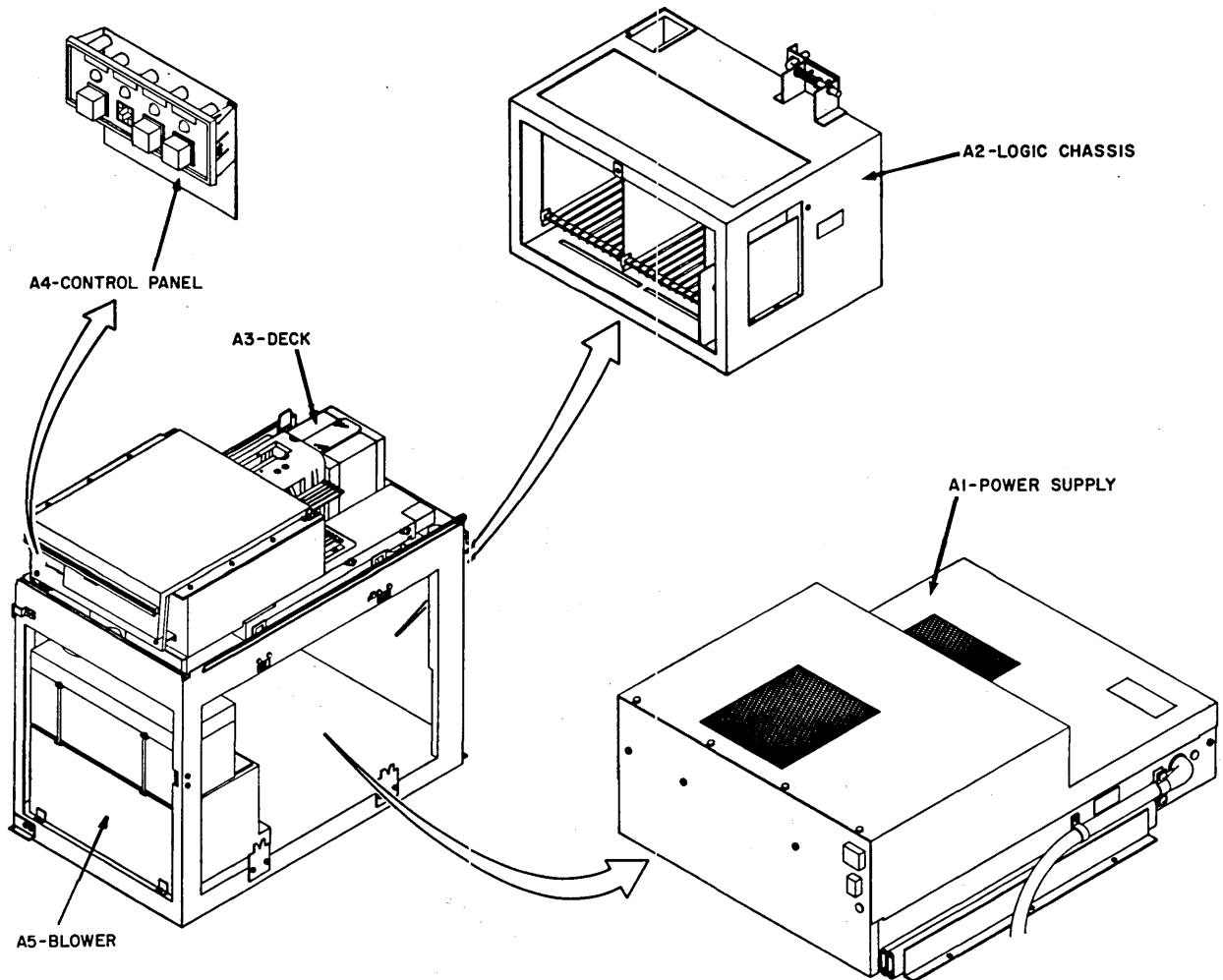
Test points for monitoring dc voltages are on the power supply control panel.



### 3.0.5 Physical Location Codes

Physical location codes are used in this manual to indicate the vicinity of drive parts. The codes are:

- A1 — power supply
- A2 — logic chassis
- A3 — deck
- A4 — control panel
- A5 — blower



### 3.0.6 Power Application

The following paragraphs describe powering on drive and powering off drive.

#### 3.0.6.1 Powering On Drive

1. Open rear door and verify that LOCAL/REMOTE switch is set to LOCAL.
2. Place all power supply circuit breakers up. Let blower operate for at least two minutes before proceeding.

#### CAUTION

Failure to allow blower two minutes purge time before installing disk pack may cause damage to pack or heads.

3. Install disk pack (para 3.0.7.2).

#### NOTE

Attachment card(s) read the status bits for SMD device type only during a Series/1 power-on application. Therefore, AC power to the SMD must be applied first before applying power to the attachment card, or attachment power may be turned to OFF and then to ON to obtain the correct status. Incorrect status results in callups for 63 MB instead of 240 MB diagnostic tests.

4. Press START switch. START indicator lights and drive motor starts rotating disk pack. After approximately 30 seconds, READY indicator lights to show that heads are loaded and that drive is ready for operation.

#### 3.0.6.2 Powering Off Drive

1. Press START switch. START indicator extinguishes. As heads begin unloading READY indicator extinguishes. Approximately 20 seconds after pressing START disk pack is stopped.
2. Remove disk pack (para 3.0.7.3).
3. Open rear door and place MAIN AC circuit breaker down.

### 3.0.7 Disk Packs

The following paragraphs describe types of disk packs, disk pack installation, and disk pack removal.

#### 3.0.7.1 Types of Disk Packs

Three types of disk packs are encountered during maintenance:

- Customer disk pack — never to be used for maintenance testing.
- Scratch disk pack — a disk pack that does not contain any wanted information.
- CE disk pack — a disk pack containing prerecorded alignment information.

#### 3.0.7.2 Disk Pack Installation

Disk pack installation is done with power on and START indicator extinguished. If drive was just powered-on, two minutes must be allowed for blower to purge air system before installing disk pack.

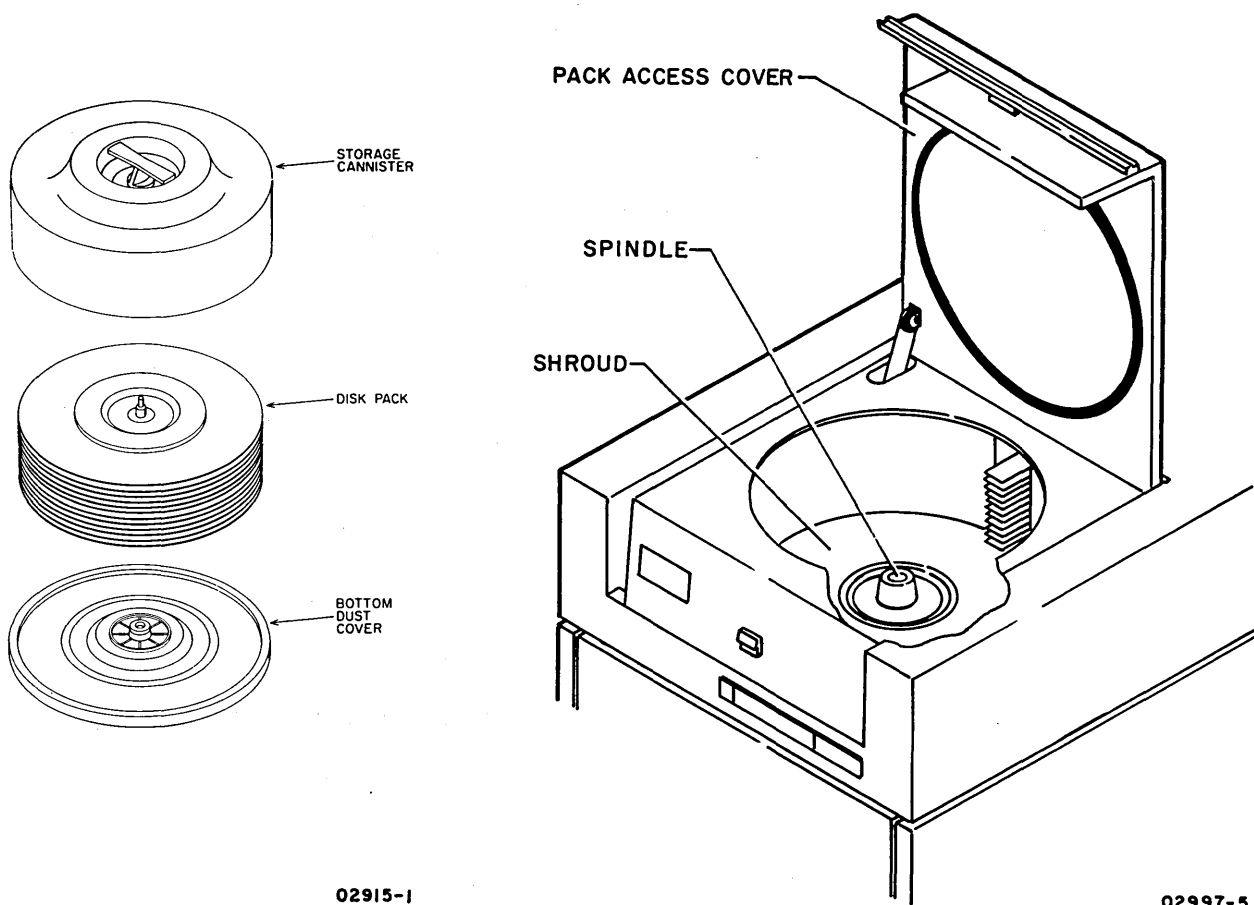
#### CAUTION

Failure to ensure cleanliness of pack or shroud area, or failure to purge air system may cause damage to pack or heads.

1. Open pack access cover (para 3.2.1).
2. Squeeze two levers on bottom dust cover and remove bottom dust cover from disk pack.
3. Using canister handle, carefully set disk pack on spindle. Turn storage canister handle clockwise until snug.
4. Lift storage canister off disk pack.
5. Place storage canister on bottom dust cover and set aside for later use.
6. Close pack access cover.

### 3.0.7.3 Disk Pack Removal

1. Press START switch to stop drive motor and unload heads.
2. Wait approximately 20 seconds for disk pack to stop turning, then open pack access cover.
3. Place storage canister over disk pack so post protruding from disk pack goes into storage canister handle.
4. Turn storage canister handle counterclockwise until pack is free of spindle.
5. Lift disk pack out of drive by canister handle and close pack access cover.
6. Install bottom dust cover on disk pack.



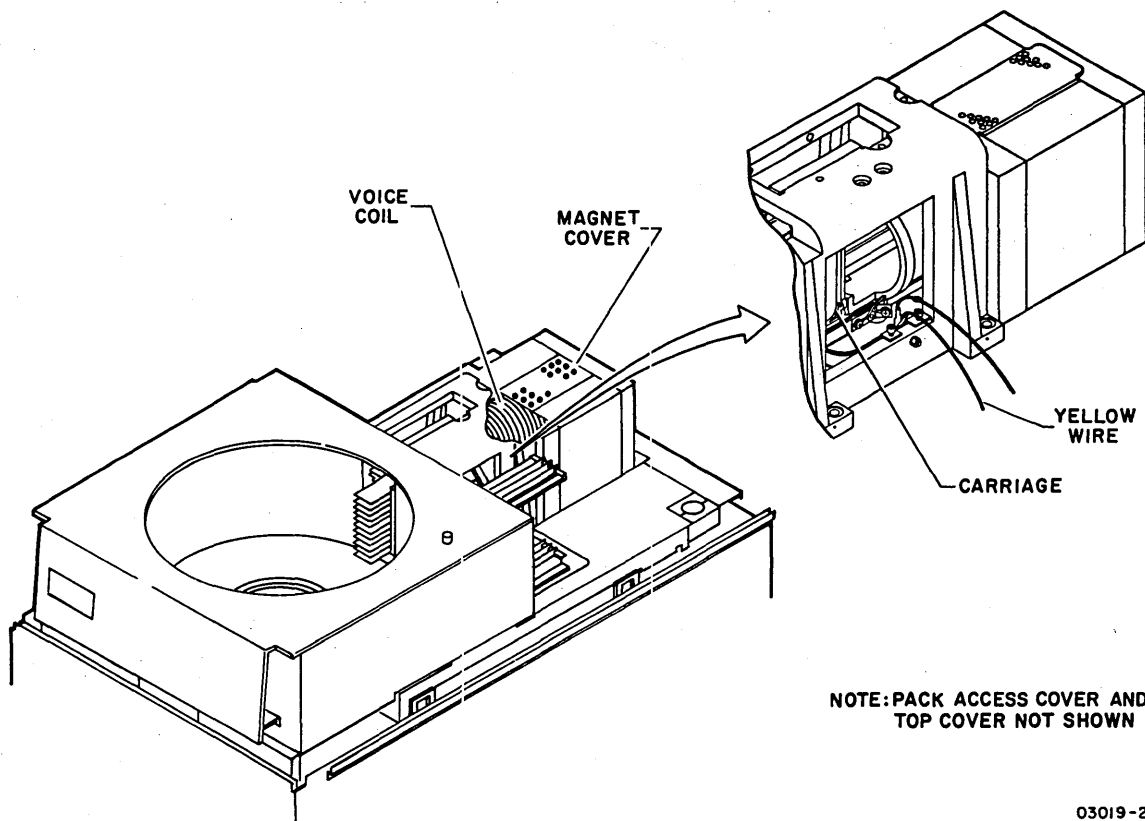
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### 3.0.8 Manual Retraction of Heads

Manual retraction of heads is only done when a malfunction makes it necessary.

1. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
2. Disconnect yellow wire to voice coil.
3. Remove magnet cover.
4. Grasp voice coil through magnet opening and pull coil back until carriage is fully retracted.
5. Press START switch to stop disk pack rotation. If inoperative and rotation continues, place MAIN AC circuit breaker down.



### 3.0.9 Troubleshooting Philosophy

Unless cause of malfunction is apparent, starting point for troubleshooting is to run BASIC diskette SMD auto diagnostics (para 3.0.10.2). If drive and attachment cards pass SMD auto diagnostics successfully, then run SMD manual intervention diagnostics (para 3.0.10.3).

When an error occurs during a SMD diagnostic (auto and manual intervention), BASIC program indicates the number of the DLT and step that describes applicable corrective action. In most cases, corrective action involves performing one of the check, adjust, or removal procedures contained later in this section.

Regardless of the troubleshooting method, use appropriate diagnostic tests after corrective action to verify that malfunction is corrected.



### 3.0.10 BASIC Diskette Diagnostics

The following paragraphs describe running CDC BASIC diskette:

- IPL (initial program load) diagnostic
- SMD auto diagnostics
- SMD manual intervention diagnostics

#### 3.0.10.1 IPL Diagnostic

IPL diagnostic must successfully complete before SMD auto diagnostics or SMD manual diagnostics can be run. BASIC diskette must contain correct system configuration information as described under CDC Basic Diskette Configuration in section 2.

To run IPL diagnostic, do following:

1. Power-on drive (para 3.0.6.1) and install scratch disk pack (para 3.0.7.2).

#### NOTE

The attachment card determines the number of cylinders/heads in the SMD only during a power on IPL (reads SMD status register). This information is required by the CDC BASIC diagnostic programs to establish correct parameters during test execution; therefore,

- Power must first be applied to the SMD before powering on the Series/1, or
  - Series/1 power must be cycled off and then on again to reinitiate the IPL sequence.
2. Apply power to flexible disk unit and install BASIC diskette (CDC part number 663067XX).
  3. Place Series/1 operator/programmer panel switches as follows:
    - IPL Source switch to Alternate or Primary as applicable to enable loading from diskette
    - Mode switch to Diagnostic

4. Press Series/1 operator/programmer panel Load switch. This starts execution of IPL diagnostic. Assuming no error is detected, IPL completes in approximately 30 seconds with:

- RDY ENTER displayed by display/keyboard (if part of system).
- 3800<sub>16</sub> displayed on operator/programmer panel 0 through 15 indicators.

If Series/1 stops with any other display, refer to common halt list (para 3.25) for meaning and appropriate action. Once the preceding indications are obtained, either SMD auto diagnostics (para 3.0.10.2) or SMD manual diagnostics (para 3.0.10.3) may be performed.

#### NOTE

If a combination of both IBM and CDC devices having identical ID codes are configured on the same BASIC diagnostic diskette (either an IBM or CDC diskette), the following configuration error will occur:

- On display screen: CONFIG ERROR -  
TABLE DEVICE TYPE VS TABLE READ ID
- On operator/programmer panel:  
Halt code 3842 (configuration error)

This error should be ignored. It is the result of both the IBM and CDC devices having the same Read ID code.

#### 3.0.10.2 SMD Auto Diagnostics

Following table lists the SMD auto diagnostic tests, their purpose, and call-up code. Tests are listed in the order of execution when all are run. Test execution starts with the test that is called-up. Each following test then executes in succession until last test 7116 finishes or an error occurs.

## NOTE

If SMD disk is not correctly formatted, Read ID errors will occur during diagnostic test execution. Use disk initialization utility 71F0 to format disk for diagnostic check-out purposes. Refer to para 3.23.

## SMD AUTO DIAGNOSTIC TESTS

TEST	TITLE AND PURPOSE*	CALL-UP CODE
7100	Channel interface -- checks attachment Series/1 interface.	B7100
7101	Attachment-Series/1 interface	B7101
7120	Error analysis routine -- executes only when test 7101 or test 7113 detects an abnormal error requiring further analysis.	-----
7102	Attachment-drive interface	B7102
7103	Attachment -- checks overall attachment operation.	B7103
7106	Wrap and RAM -- checks attachment-drive interface and attachment data buffer.	B7106
7107	SERDES test, sector ID and sync	B7107
7108	SERDES test, data and ID skewed	B7108
7109	SERDES test, diagnostic ECC	B7109
	} drive interface circuits	
7110	Servo test, RTZ and offset -- checks drive response to RTZ and offset commands.	B7110
7113	Read sector ID -- checks drive tracking and reading capabilities.	B7113
7114	Incremental seek	B7114
7115	Seek, all types	B7115
7116	Seek, random	B7116
	} checks drive servo system	
*Appendix A contains more detailed test description.		

To run SMD auto diagnostics, do following:

1. Using alternate console display station, enter B7100 and press ENTER key (or CR key on TTY).
2. Using operator/programmers panel (refer to para 3.26 for additional information on command entries).
  - Press Data Buffer switch.
  - Enter B via register input switches.
  - Press Data Buffer switch.
  - Enter 7100 via register input switches to select SMD auto diagnostics.
  - Press Console Interrupt switch twice (this executes all SMD auto diagnostics in succession).

#### NOTE

Execution time is approximately 6 1/2 minutes. During test execution, Run indicator lights, and test number displays on alternate console crt and in register indicators of operator/programmer panel. Successful completion is indicated by code 3805<sub>16</sub> being displayed in the indicators and PT ENTER on the alternate console crt. If diagnostics stop with any other code being displayed, refer to failing step number of applicable DLT (same as test number) indicated in error message (or indicators\*) for corrective action.

If diagnostics end abnormally with no message or a meaningless abort message, retry the auto tests. If the problem persists, reseal/replace attachment card, I/O cables, and A01 and A03 logic chassis cards one at a time until problem is corrected. Verify switch settings per attachment card installation procedure, section 2.

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\*Indicators show test number. If using operator/programmer panel only (no crt), press Stop switch, Level 3 switch, then R0 register switch to display step number in indicators.

## 3.0.10.3 SMD Manual Intervention Diagnostics

Following table lists the SMD manual diagnostic tests, their purpose, and call-up code. Manual tests are not linked. Each must be called-up for it to run.

SMD MANUAL DIAGNOSTIC TESTS

TEST	TITLE AND PURPOSE*	CALL-UP CODE
7121	First seek -- checks loading of heads.	B7121
7122	Read sector ID scope loop -- reads selected sector ID and loops or stops as selected.	B7122
7123**	Write sector ID scope loop -- writes selected sector ID and loops.	B7123
7124	Read sector ID -- reads selected sector ID and displays ID data.	B7124
7125**	Write sector ID -- writes selected sector ID and displays written ID data.	B7125
7126	Read data -- reads data from selected sector and displays data and any errors encountered.	B7126
7127**	Write data -- writes data at selected sector and displays written data and any errors encountered.	B7127
7128**	Write/read compare data -- writes chosen data at selected sector, then reads data back and compares for errors. Written data is displayed plus any errors encountered.	B7128
7130**	Write/read data -- writes five different data patterns at test cylinder with each head. Data is read back and any errors in write/read are displayed.	B7130
7135	Command and sequence -- issues recalibrate, seek, and seek head sequence and checks the result.	B7135
7140**	Error correction code (ECC) -- writes data containing errors on test cylinder and reads data back to check if errors were corrected.	B7140

SMD MANUAL DIAGNOSTIC TESTS (CONTD)

TEST	TITLE AND PURPOSE*	CALL-UP CODE
7145	Servo adjustment and head alignment -- allows direct, repeat, and incremental seeks to be performed for making adjustments.	B7145
7150**	Write sector ID -- writes ID data on test cylinder with each head. Data is read back and checked for errors. Then original sector ID data is rewritten.	B7150
7160	Read sector ID skewed -- allows ID data to be read from a skewed sector and be displayed.	B7160
7161**	Write sector ID skewed -- allows ID data of a skewed sector to be changed.	B7161

\*Appendix A contains more detailed test description.

**\*\*CAUTION**

These tests write on disk pack. Do not run them if customer or CE pack is installed.

To run a SMD manual test, do following:

1. Using alternate console display station, enter B followed by desired test number and press ENTER key (message on crt indicates test number in progress, successful completion, or detected error).
2. Using operator/programmers panel.
  - Press Data Buffer switch.
  - Enter B via register input switches.
  - Press Console Interrupt switch.
  - Press Data Buffer switch.
  - Enter desired manual test number via register input switches.
  - Press Console Interrupt switch twice (test number should appear in register indicators).
  - Press Data Buffer switch.

- Enter 1 via register input switches (allows test to write on disk, FFFF appears in indicators).
- Press Console Interrupt switch twice (initiates test execution).

Test number displays in indicators at completion of test or during a detected diagnostic error. To interpret, press Stop switch, Level 3 switch, then R0 register switch to display step number. Refer to the step number of the applicable DLT same as test number) to determine if test completed OK or stopped on error.

3. Refer to DLT for that test. DLT shows program flow of test and describes required responses. Enter responses as follows:

- With display/keyboard --

<u>Response</u>	<u>Keying Sequence*</u>
Yes**	1, ENTER
No**	0, ENTER
Variable data	F, hex data, ENTER

- With operator/programmer panel --

<u>Response</u>	<u>Switch Pressing Sequence*</u>
Yes**	Data Buffer, 1, Console Interrupt twice
No**	Data Buffer, 0, Console Interrupt twice
Variable data	Data Buffer X <sub>16</sub> -- number of words in entry F Console Interrupt Data Buffer XXXX <sub>16</sub> -- first word of entry; if less than four characters, enter leading zero(s) Console Interrupt Data Buffer XXXX <sub>16</sub> -- second word of entry; up to 15 words can be sequenced in entry Console Interrupt twice -- two consecutive interrupts terminate entry

\*Commas not part of sequence.

\*\*Exception to entering yes or no through given sequence exists in head alignment routine of test 7145. In that routine, a 'F' and '0' must precede the '1' for yes or '0' for no.

4. Results of the SMD manual test are as follows:

- Display/keyboard displaying --  
NO ERROR--TEST COMPLETED SUCCESSFULLY PT ENTER
- Operator/programmer panel 0 through 15 indicators displaying 3805<sub>16</sub>

Error stoppage of tests is indicated by:

- Display/keyboard displaying --  
IXXXX MAP=71XX STEP=XXXX  
(Followed by specific error message for test and step)
- Operator/programmer panel 0 through 15 indicators displaying number of failing test



### 3.0.11 Head Alignment Kit

Head alignment kit (CDC part number 77440500) consists of a head alignment card, head alignment cable, and null meter. Following illustration shows the setup of these items when doing head alignment check or adjustment. The head alignment card goes in location A16 of drive logic chassis. The head alignment cable connects between card location A16 (pins 08 through 11 A and B) on logic chassis backpanel and J1 on E03 card in read/write chassis.

With CE disk pack installed, the head alignment card outputs voltage proportional to the distance that a head is away from track centerline. This output voltage is measured by the null meter which connects to test points X and Z on the card. The null meter contains a 50/500 switch that controls meter sensitivity. In the 50 position, meter reads 50 mV full scale; in the 500 position, meter reads 500 mV full scale.

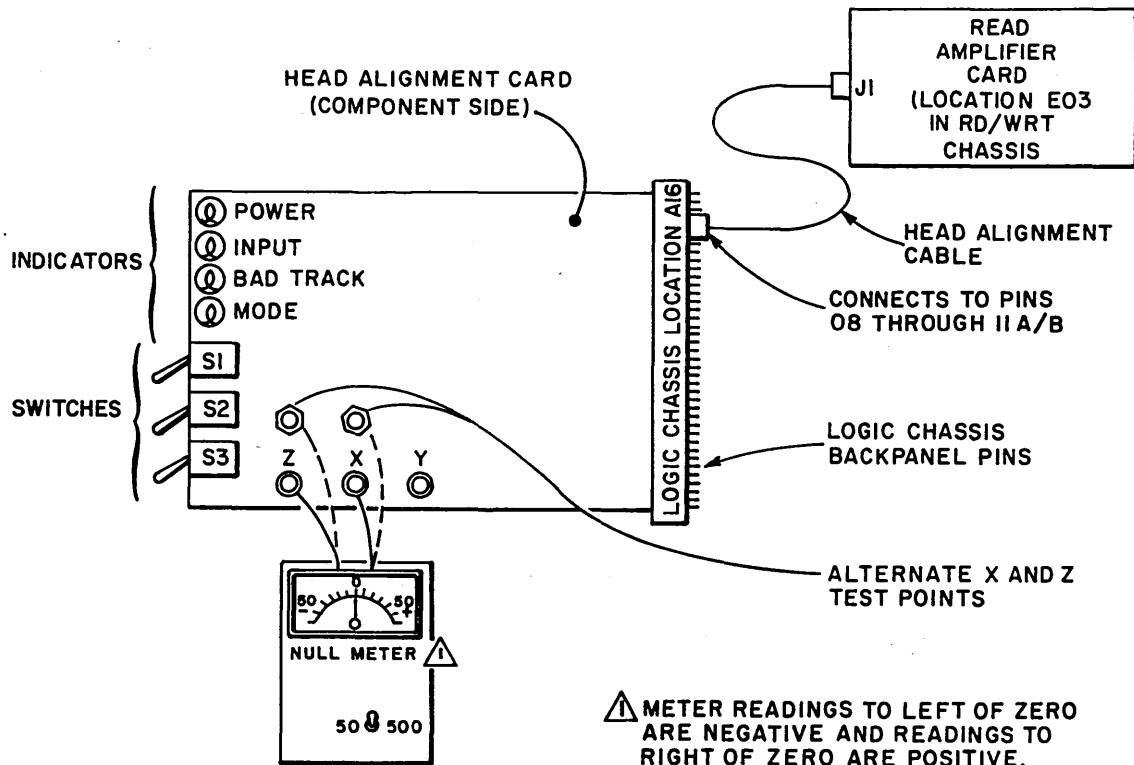
The following table describes function of the switches and indicators on head alignment card.

HEAD ALIGNMENT CARD SWITCH/INDICATOR FUNCTIONS

SWITCH/INDICATOR	FUNCTION
S1 switch	Has P/N (positive/negative) positions for changing polarity of output voltage.
S2 switch	When S2 switch is set to S, output voltage is for servo head; when switch is set to R/W, output voltage is for selected read/write head.
S3 switch	S3 switch controls sensitivity of card. In X.1 position, output voltage is reduced by 10 percent; in X1 position, output voltage is not reduced.
Power indicator	Lights to indicate that card is receiving power.
Input indicator	Lights when input signals are too low for alignment card to operate.
Bad Track indicator	When lit, indicates card experienced a short duration loss of input. A one shot maintains the lit condition for at least four seconds. This indicator also lights when position of S1 switch is changed.

## HEAD ALIGNMENT CARD SWITCH/INDICATOR FUNCTIONS (CONTD)

SWITCH/INDICATOR	FUNCTION
Mode indicator	Lights to indicate that with current switch-settings read/write head alignment error cannot be measured. This is when either switch S2 is set to S or switch S3 is set to X.1.



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### 3.1 PREVENTIVE MAINTENANCE

The preventive maintenance index lists the procedures that must be performed to maintain proper drive operation. These procedures are to be done on a regular basis at the intervals specified in index.

#### PREVENTIVE MAINTENANCE INDEX

LEVEL (See Note 1)	TIME MINUTES	PROCEDURE	PARAGRAPH
3	10	Clean primary air filter	3.1.1
3	2	Clean and lubricate lock-shaft	3.1.2
3	1	Clean shroud and spindle	3.1.3
4	2	Check +5 V and -5 V outputs	3.1.4
6	5	Clean carriage rails and bearings	3.1.5
6	20	Replace absolute air filter	3.1.6

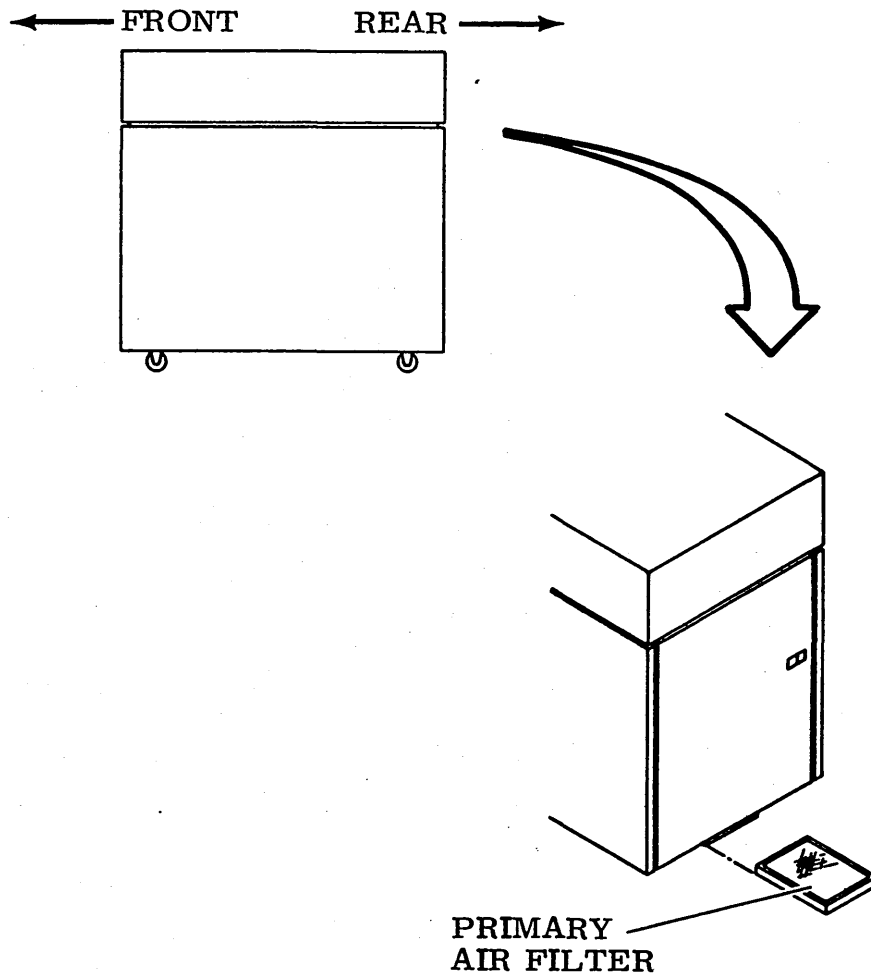
#### Notes:

1. Following level intervals are based on calendar period or hours of operation, whichever comes first. However, if site is abnormally dusty, the intervals must be shortened.

- Level 3—quarterly or 1500 hours
- Level 4—semiannually or 3000 hours
- Level 6—biennially or 9000 hours

### 3.1.1 Clean Primary Air Filter

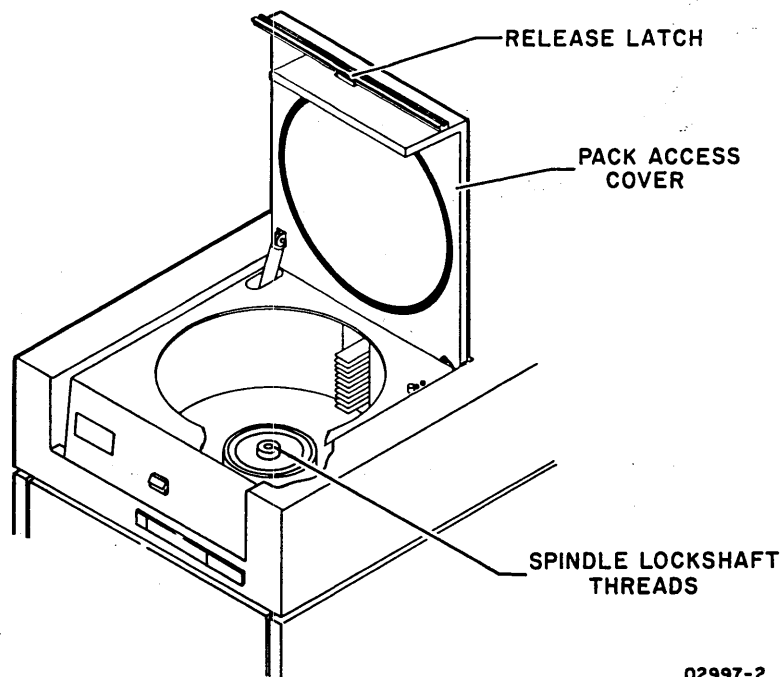
1. Power-off drive (para 3.0.6.2).
2. Pull primary filter out from bottom-rear of drive.
3. Clean filter by agitating in mild detergent solution.
4. Rinse thoroughly in clean running water. Shake vigorously to remove excess water and allow to dry.
5. Spray filter thoroughly with filter coat (CDC part number 12210958).
6. Slide filter in drive.
7. Clean and lubricate lockshaft (para 3.1.2).



03001

### 3.1.2 Clean and Lubricate Lockshaft

1. Open pack access cover (para 3.2.1).
2. Remove disk pack (para 3.0.7.3) and leave pack access cover open.
3. Using dry lint free gauze (CDC part number 12209713) and a brush or sharp instrument, clean spindle lockshaft threads (threads that mate with disk pack).
4. Apply a thin coat of lubricant paste (CDC part number 95016101) to threads.
5. Check spindle lockshaft for free movement by depressing it and verifying that it returns to its original position. If lockshaft does not depress or stays depressed, replace lockshaft (para 3.16.1).
6. Clean shroud and spindle (para 3.1.3).



02997-2

### 3.1.3 Clean Shroud and Spindle

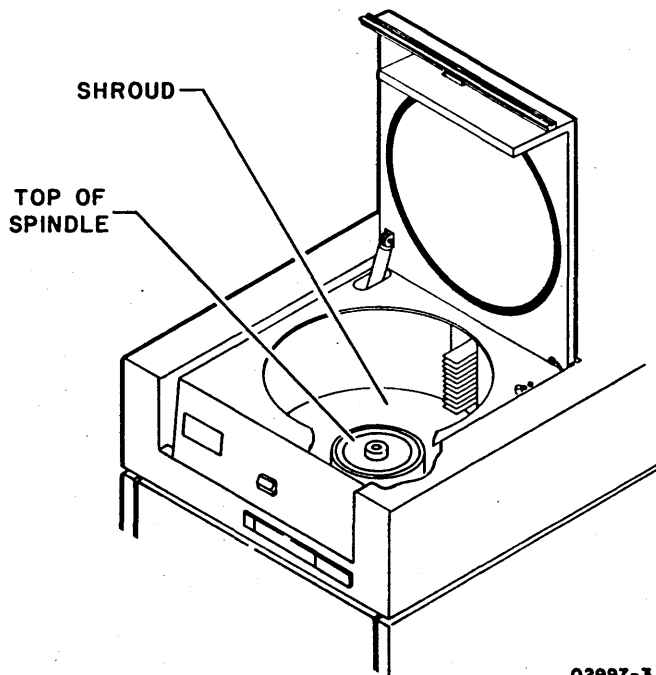
#### CAUTION

Do not allow media cleaning solution to run down spindle as bearing damage can occur.

1. Using lint free gauze (CDC part number 12209713) slightly dampened with media cleaning solution (CDC part number 95033502), remove all dirt and smudges from shroud and top of spindle.
2. Inspect shroud and spindle for any particles not picked up by gauze. Remove particles with a wad of adhesive tape.
3. Close pack access cover.

### 3.1.4 Check +5 V and -5 V Outputs

Adjust +5 V regulator card (para 3.13.1).

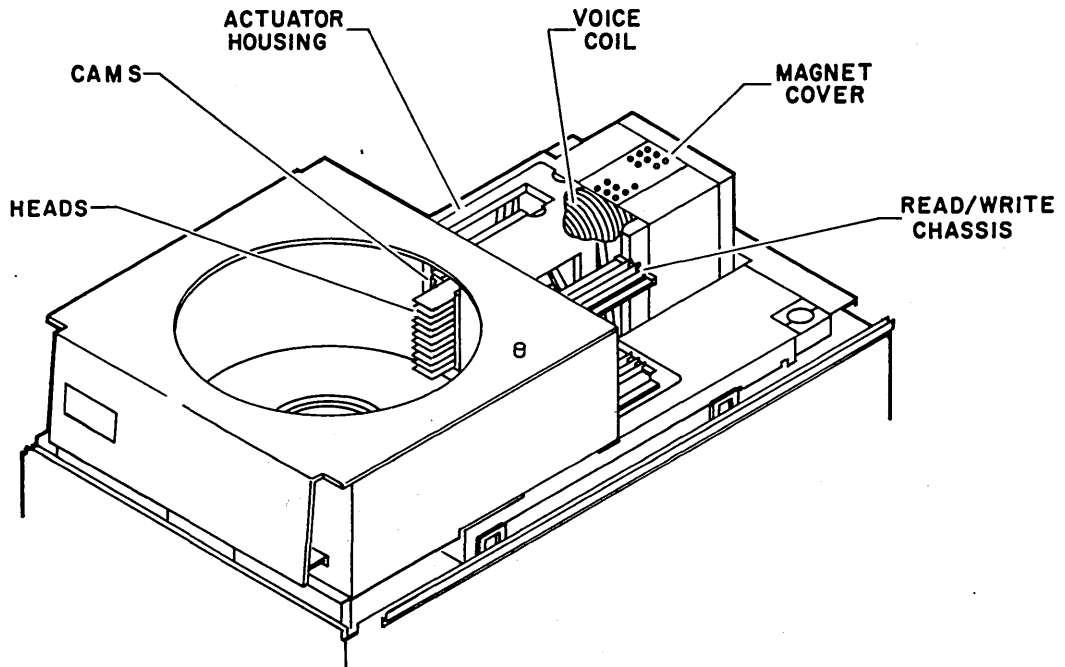


02997-3

### 3.1.5 Clean Carriage Rails and Bearings

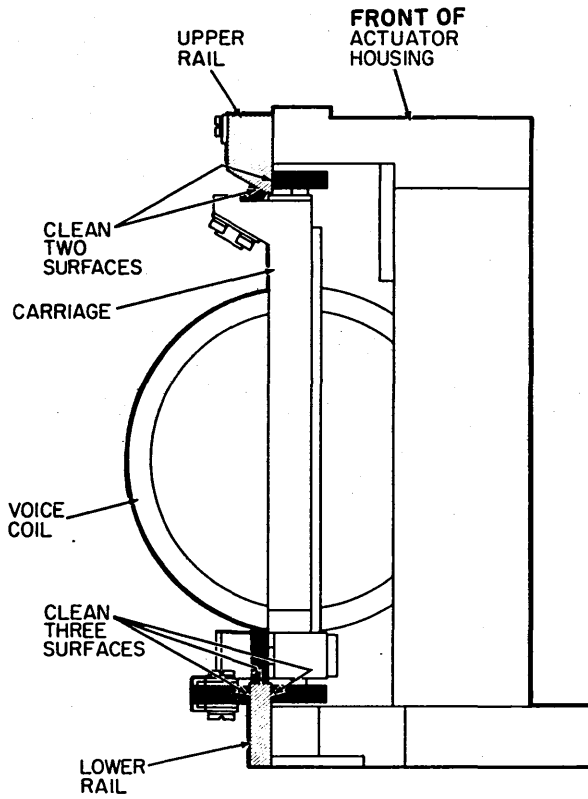
Power-off drive (para 3:0.6.2).

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Close pack access cover and lift top cover open. Reopen pack access cover as far as possible.
4. Release four latches on deck cover and remove cover.
5. Remove magnet cover.
6. Grasp voice coil through magnet opening and carefully push coil forward to extend heads.
7. Once head arms have cleared cams, gently slide coil and carriage back and forth along full length of rails. While moving coil, feel for irregularities (bumps or jerks) in movement. A sudden irregularity indicates dirt on rails or bearings.
8. If an irregularity is felt, proceed to next step; if not, go to step 11.
9. Using cotton swab dampened (not soaked) in media cleaning solution (CDC part number 95033502), clean surfaces shown in illustration. Move carriage back and forth during cleaning to ensure all surfaces are reached.
10. Repeat step 7. If carriage movement is smooth, proceed to step 11. If irregularity is still present, visually inspect rails and bearings using a bright light. Look for deterioration of rail or bearing surfaces. Surface deterioration requires replacement of defective parts. Since neither carriage nor rails are field replaceable, contact factory maintenance representative.
11. Return carriage to fully retracted position and replace magnet cover.
12. Close pack access cover and replace deck cover. Then lower top cover.
13. Replace absolute air filter (para 3.1.6).



NOTE: PACK ACCESS COVER AND TOP COVER NOT SHOWN

03019-3



02999



### 3.1.6 Replacing Absolute Air Filter

1. Open front door.
2. Loosen clamp on deck hose at top of blower assembly. Slide clamp up on hose and remove hose from blower assembly.
3. Remove two screws mounting blower assembly to cabinet.

#### CAUTION

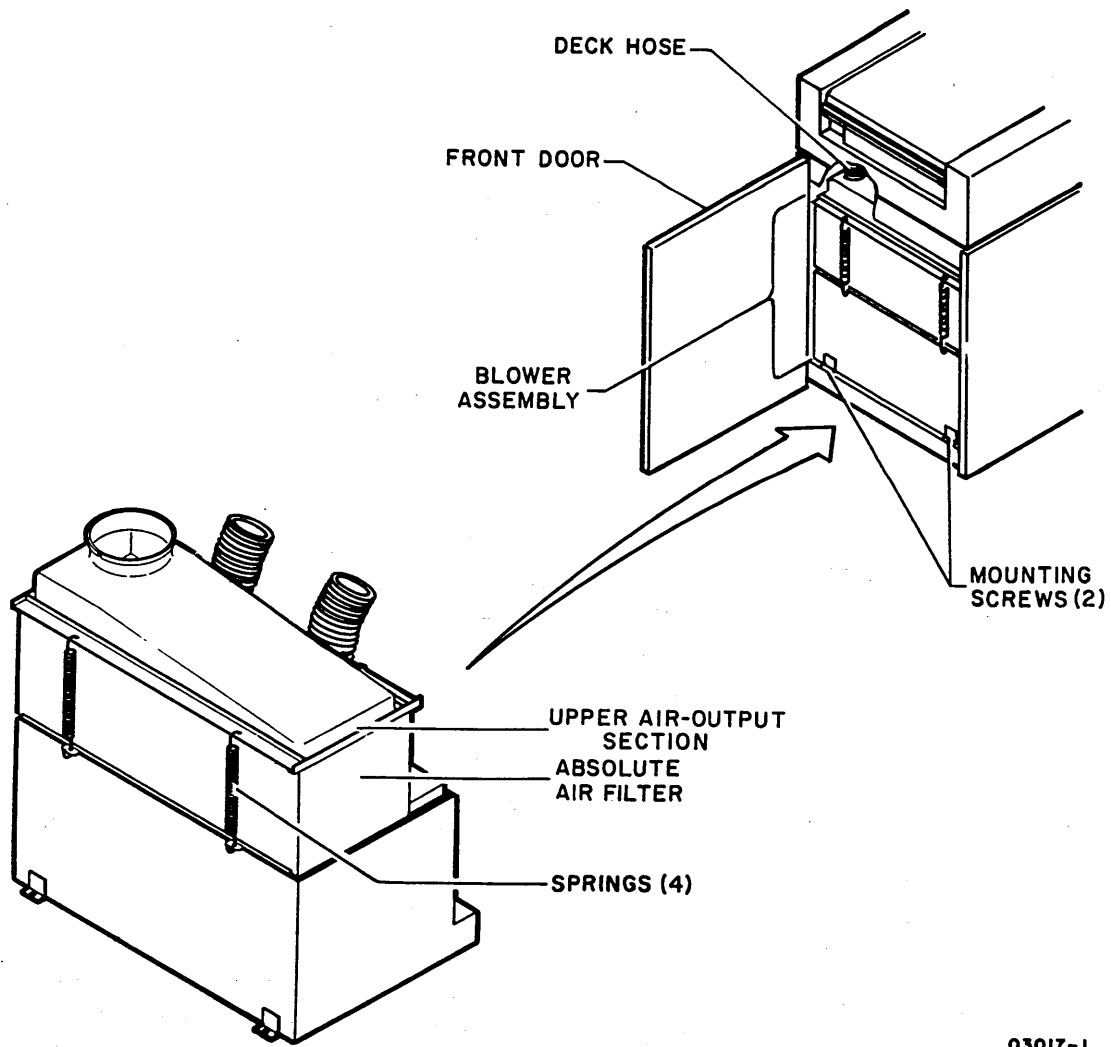
Watch slack of air hoses and wiring at back of blower assembly during next step.

4. Slide blower assembly out front of drive and set on floor.
5. Unhook four springs from upper air-output section.
6. Lift upper air-output section and absolute air filter off assembly.
7. Position new absolute filter in place with arrows on filter pointing up.
8. Set upper air-output section on top of filter and rehook springs.

#### CAUTION

Be sure wiring does not fall between blower assembly and channel in next step.

9. Slide blower assembly back in cabinet until lip on bottom-rear of assembly slips into channel on cabinet. Secure with two mounting screws.
10. Attach deck hose to blower assembly with clamp.



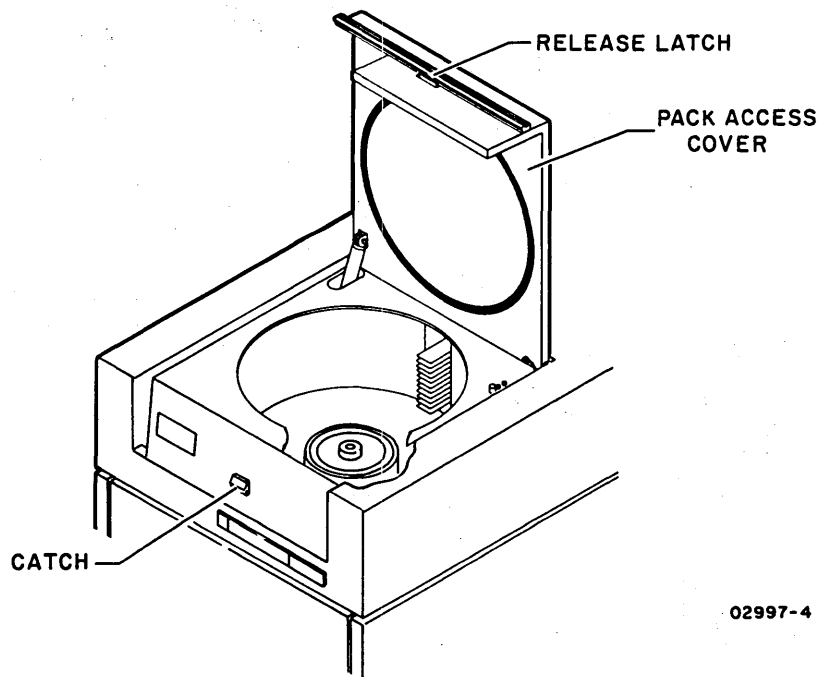
03017-1

### 3.2 ACCESSING DRIVE FOR MAINTENANCE

#### 3.2.1 Opening/Closing Pack Access Cover

Pack access cover is only opened to change packs or perform maintenance. An open cover allows dust to enter pack area which is potentially damaging to disk pack and heads. Never open cover while pack is turning. Cover must be closed for drive motor to run.

1. To open, lift release latch and raise cover.
2. To close, press cover down until latch engages catch.



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#### 3.2.2 Opening/Closing Top Cover

Top cover cannot be opened without first closing pack access cover. Once top cover is open, pack access cover may then be reopened, but not fully.

1. To open, grasp rear of top cover and lift until support rod locks into place.
2. To close, raise rear of top cover slightly to remove weight from support rod and lower cover to cabinet.

### 3.2.3 Removing/Replacing Deck Cover

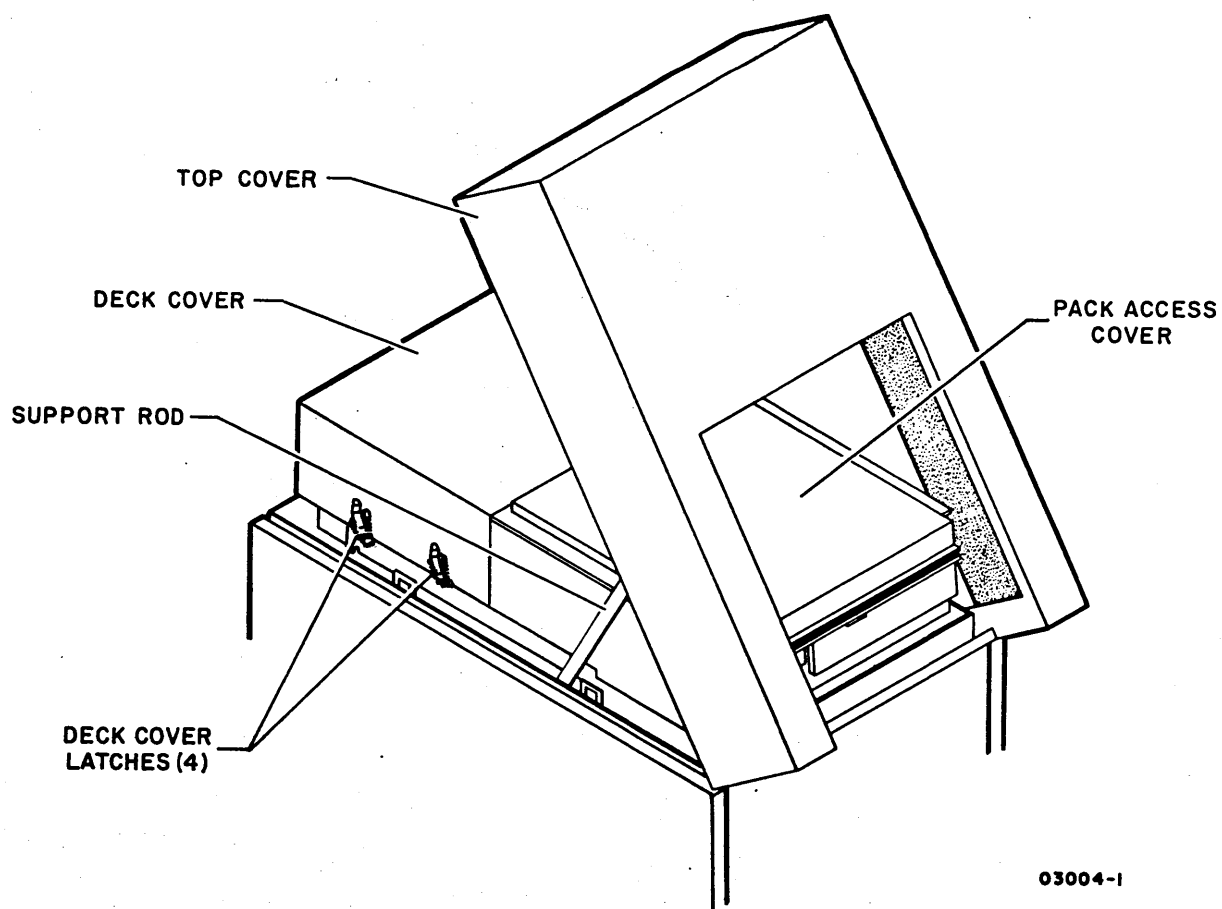
To remove deck cover, top cover must be open.

1. To remove, release four latches on deck cover and lift cover from drive.

#### CAUTION

Before replacing cover, inspect wiring harness at bottom of base area. Harness should lay flat and close to the bottom of base. If not, dress wiring and tie so armature of brake cannot come in contact with wiring.

2. To replace, position cover on drive and close latches.

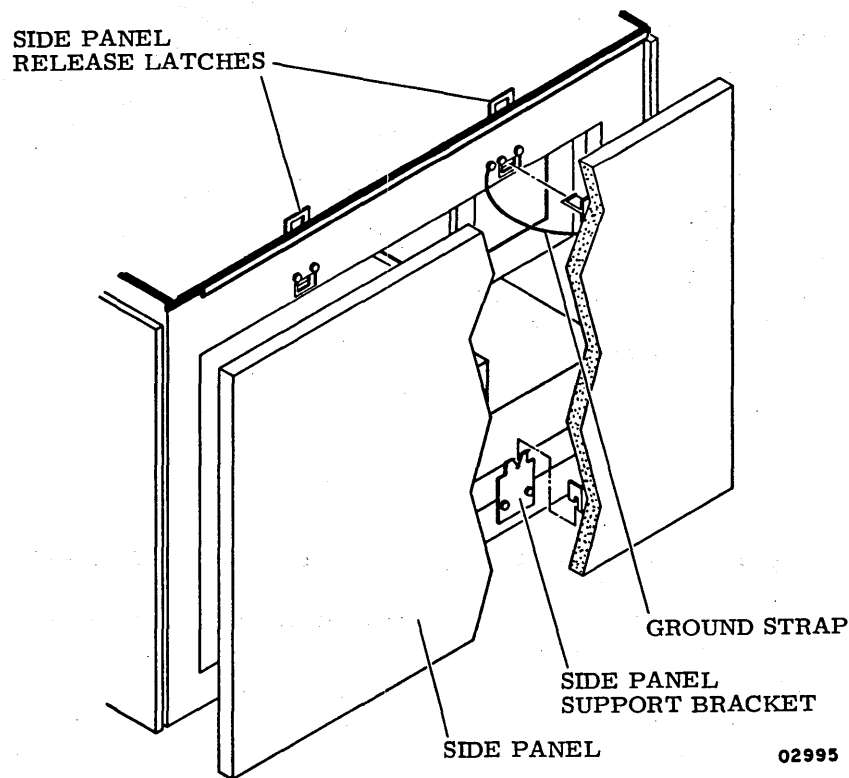


### 3.2.4 Removing/Replacing Side Panels

To remove either side panel:

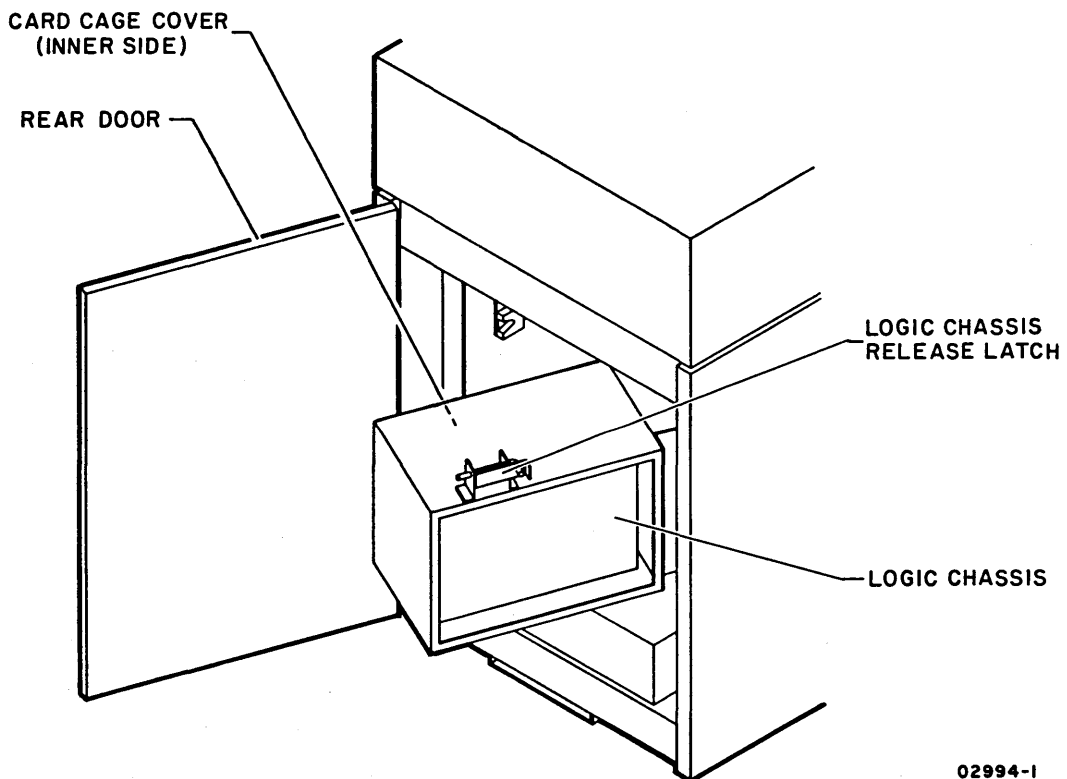
1. Open top cover (para 3.2.2) and lift two panel release latches.
2. Swing top of panel away from drive and disconnect ground strap.
3. Lift panel off support bracket.

To replace either side panel, do steps in reverse.



### 3.2.5 Swinging Out Logic Chassis

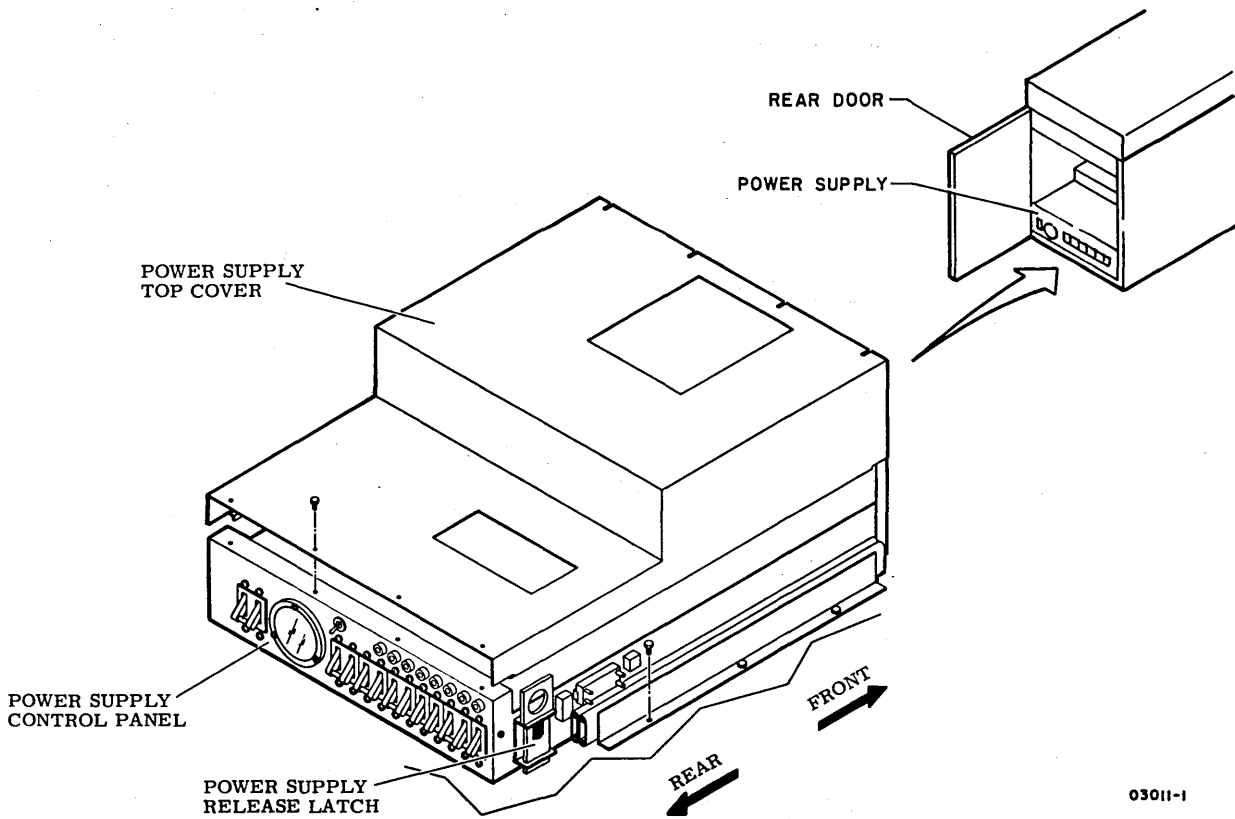
1. Open rear door.
2. Pull logic chassis release latch to right and swing out logic chassis.
3. If cards in chassis are being accessed, turn thumbscrew on inner side of chassis and remove card cage cover.



02994-1

### 3.2.6 Sliding Out Power Supply

1. Open rear door and swing out logic chassis (para 3.2.5).
2. Lift power supply release latch and slide supply out from cabinet.
3. If inside of supply is being accessed, remove power supply top cover as follows:
  - a. Remove four screws at rear of cover.
  - b. Loosen four screws at front of cover and slide cover off supply.
4. If back of power supply control panel is being accessed, do following:
  - a. Remove power supply top cover (step 3).
  - b. Remove screw at each side of power supply control panel and lower control panel.





### 3.3 BLOWER MOTOR (A5)

#### 3.3.1 Removal

1. Power-off drive (para 3.0.6.2) and open front door.
2. Loosen clamp on deck hose at top of blower assembly. Slide clamp up on hose and remove hose from blower assembly.
3. Remove two screws mounting blower assembly to cabinet.

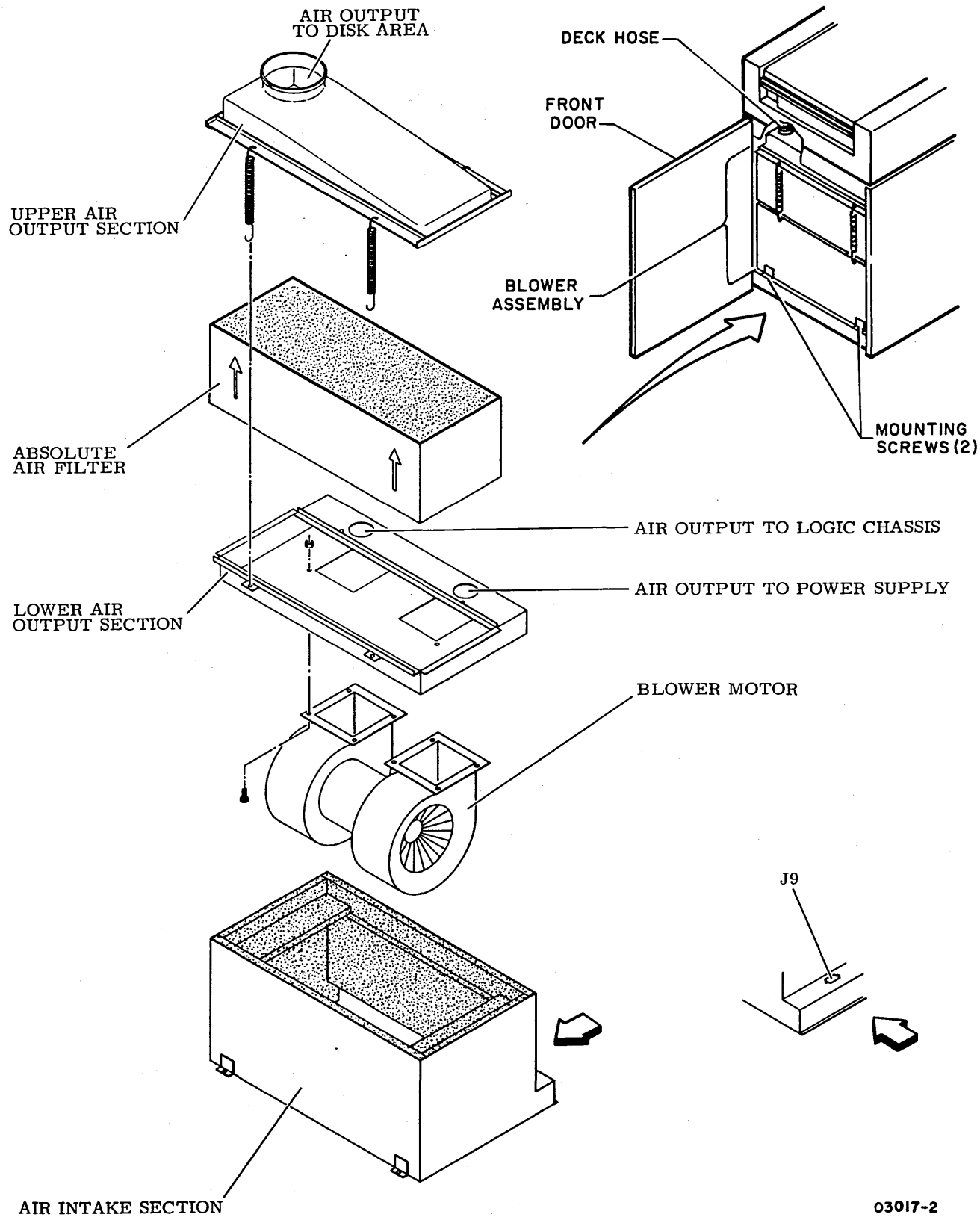
#### CAUTION

Watch slack of air hoses and wiring at back of blower assembly during next step.

4. Slide blower assembly out front of drive and set on floor.
5. Remove two hoses from back of blower assembly by turning hoses clockwise until free.
6. Disconnect cable plug P9 from J9 connector on blower assembly.
7. Snap J9 connector out of its position on air intake section.
8. Disconnect ground strap from air intake section.
9. Unhook four springs and lift off upper air-output section and absolute air filter.
10. Lift lower air-output section, containing blower motor, off air intake section.
11. Remove six screws and nuts securing blower motor to lower air-input section and remove motor.

#### 3.3.2 Replacement

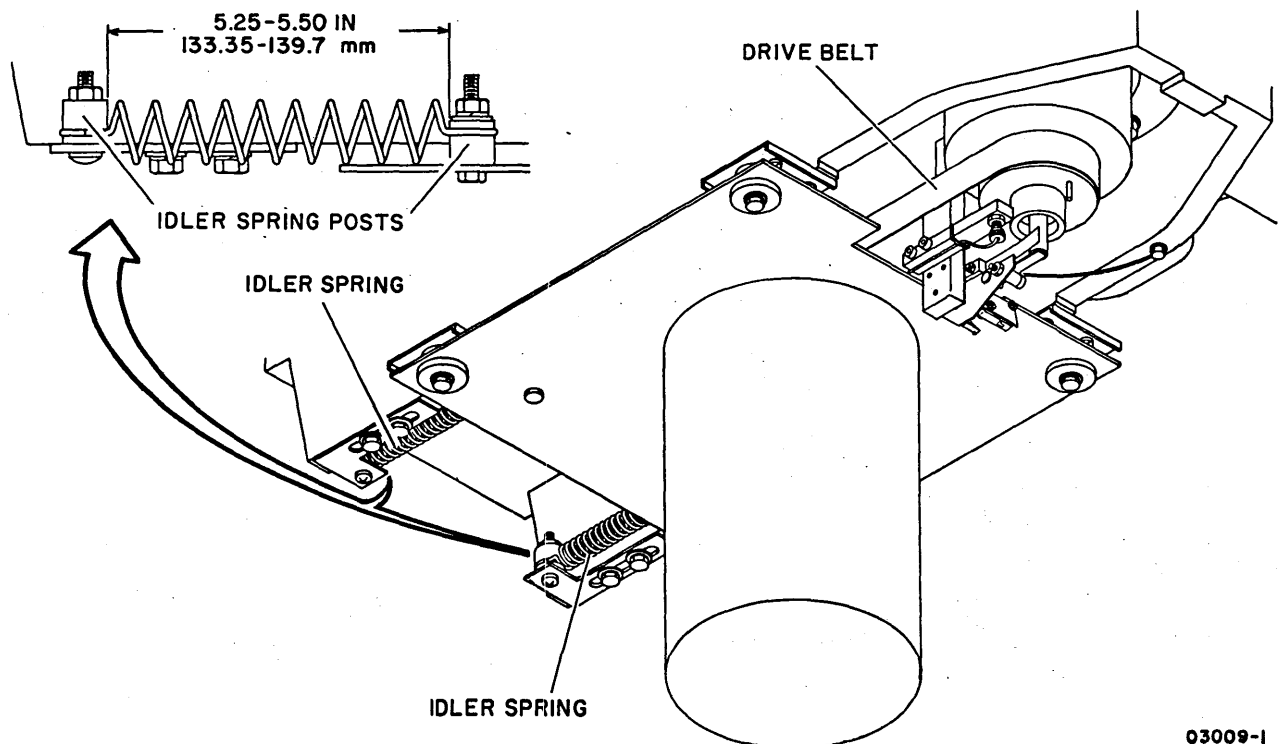
1. To replace blower motor, do steps of removal procedure in reverse order and action. During replacement, make sure:
  - When reassembling blower, that arrows on absolute filter are pointing up.
  - When installing blower assembly back in cabinet, that wiring is free from mounting area and that lip on bottom-rear of assembly is engaged in channel on cabinet floor.



### 3.4 DRIVE BELT (A3)

#### 3.4.1 Check

1. Power-off drive (para 3.0.6.2).
2. Remove side panels (para 3.2.4).
3. Open rear door and swing out logic chassis (para 3.2.5).
4. Inspect drive belt for cracks or worn spots. If required, replace belt (para 3.4.3) before proceeding to next step.
5. Check for proper belt tension by measuring distance between idler spring posts. As illustration shows, this distance should be from 5.25 to 5.5 in (133.35 to 139.7 mm) on both sets of posts. If distance on either set is not within these limits, adjust belt (para 3.4.2).
6. Close logic chassis and rear door.
7. Replace side panels.

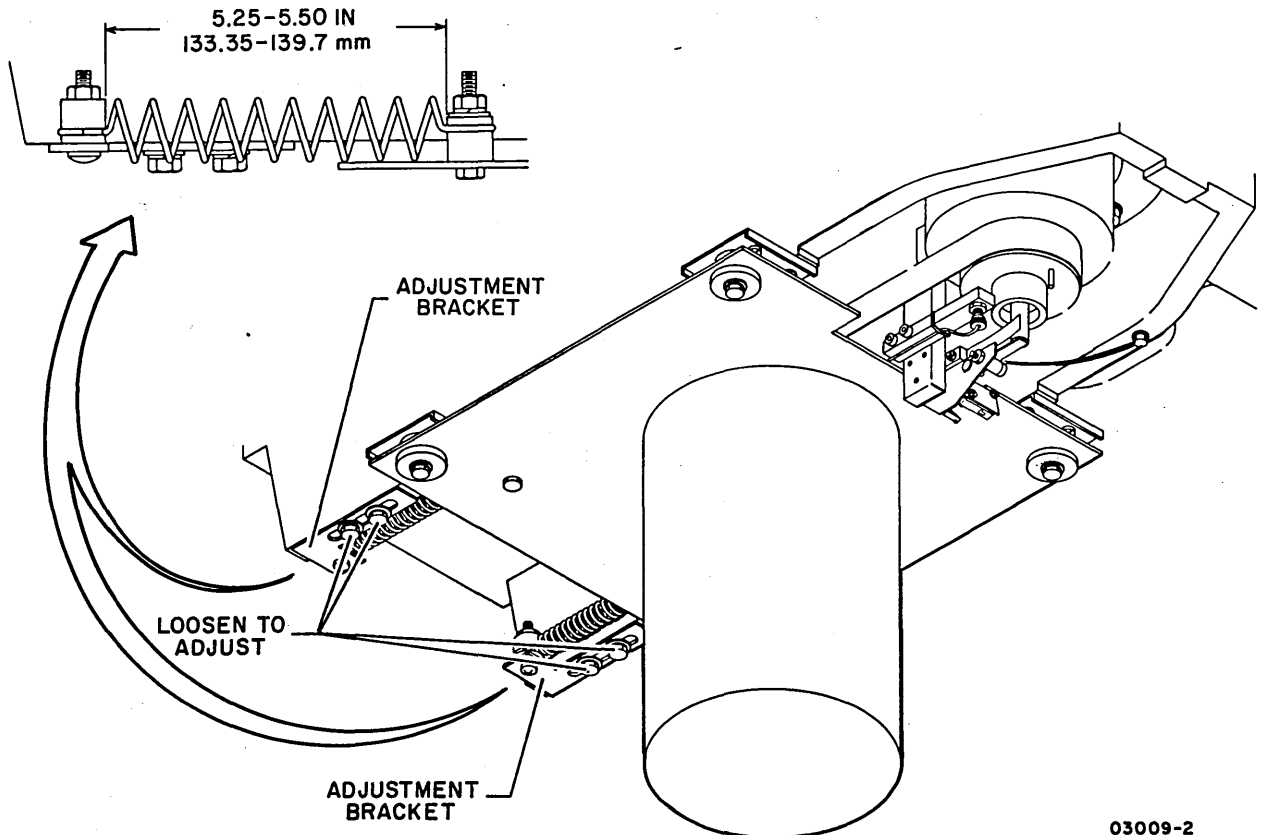


### 3.4.2 Adjustment

#### NOTE

The two idler springs that maintain drive belt tension are adjusted one at a time. If post-to-post measurements of neither spring are within the 5.25 to 5.5 inch (133.35 to 139.7 mm) limit, adjust spring farthest from limit first.

1. Unfasten misadjusted idler spring from post on adjustment bracket.
2. Loosen two screws securing adjustment bracket and reposition bracket to bring post-to-post distance within specified limit.
3. Tighten screws securing adjustment bracket.
4. Replace idler spring on post.
5. Recheck post-to-post measurements of springs. Repeat preceding steps as necessary until both springs are within limit.



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### 3.4.3 Removal

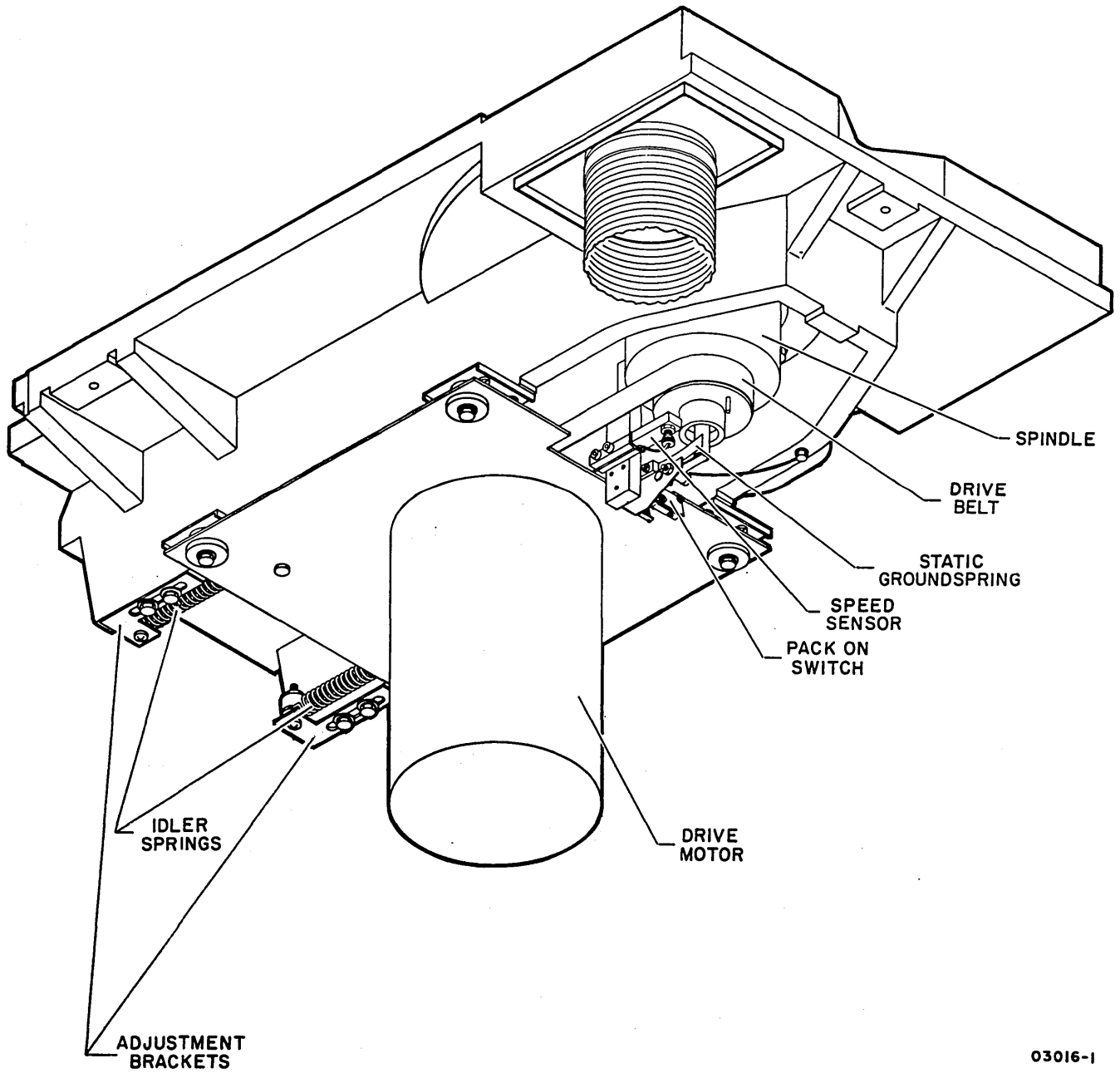
1. Remove blower assembly from drive (para 3.3.1, steps 1 through 6).
2. Remove ground wire from static ground spring.
3. Disconnect speed sensor cable plug A3P3.
4. Note connections and disconnect wires from pack-on switch.
5. Unfasten the two idler springs from their adjustment brackets.
6. Push drive motor toward spindle and slip belt off pulleys.

### 3.4.4 Replacement

#### NOTE

Smooth surface of belt goes against pulleys.

1. Position belt around drive motor pulley.
2. Push drive motor toward spindle and slip belt around spindle pulley.
3. Fasten idler springs to adjustment brackets.
4. Manually rotate spindle to align drive belt on pulleys.
5. Connect cable plug A3P3 to speed sensor and ground wire to static ground spring.
6. Connect wires to pack-on switch.
7. Replace blower assembly (para 3.3.2).
8. Close front door.
9. Check drive belt tension (para 3.4.1).



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### 3.5 DRIVE MOTOR (A3)

#### 3.5.1 Removal

1. Power-off drive (para 3.0.6.2).
2. Remove side panels (para 3.2.4).
3. Open rear door and swing out logic chassis (para 3.2.5).
4. Remove drive belt (para 3.4.3).
5. Disconnect drive motor cable plug from power supply.

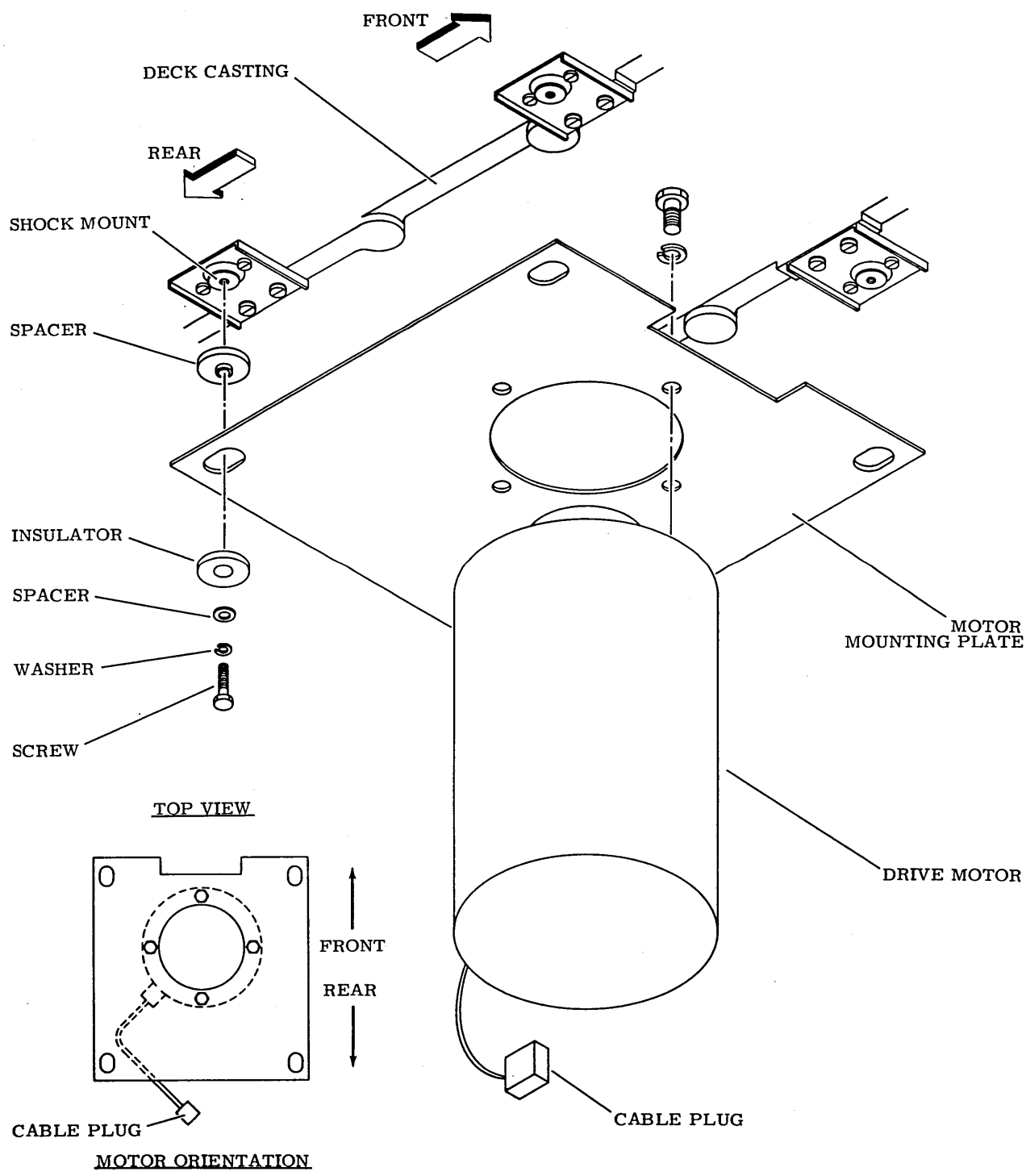
#### CAUTION

Drive motor and mounting plate require support from beneath to prevent them from being dropped during next step.

6. Remove hardware securing motor mounting plate to deck casting and remove mounting plate and drive motor from cabinet.
7. Unfasten motor from mounting plate by removing four screws.

#### 3.5.2 Replacement

1. Position drive motor on mounting plate as shown, and secure with four screws.
2. Apply a drop of Grade C Loctite to screw threads and fasten mounting plate to deck casting with hardware. Do not overtighten.
3. Check that mounting plate is free to move forward and backward between spacers. If not, loosen screws and retighten so plate is free to move.
4. Replace drive belt (para 3.4.4).
5. Connect drive motor cable plug to J7 on power supply.
6. Close logic chassis and rear door.
7. Replace side panels.



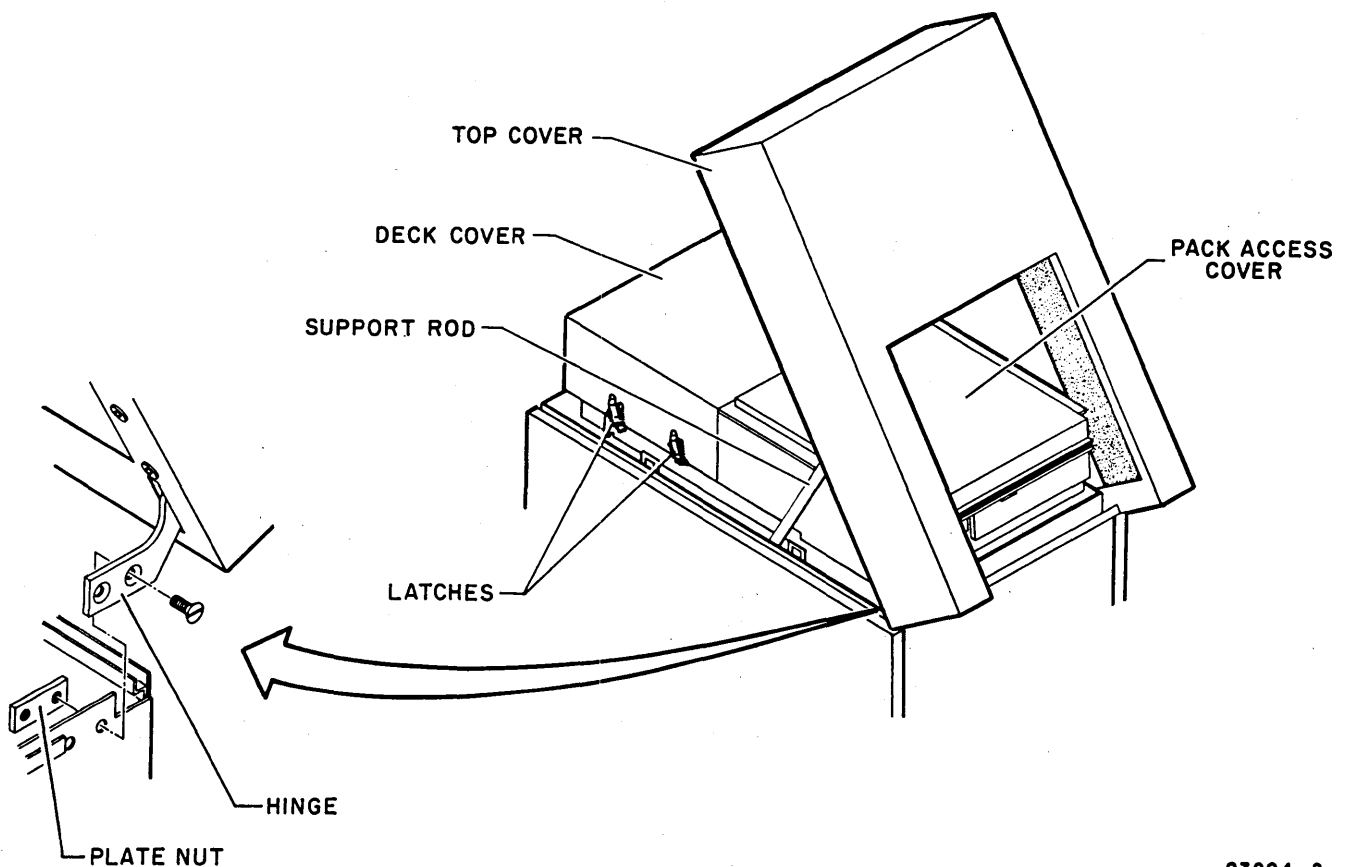
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### 3.6 HEAD CAMS (A3)

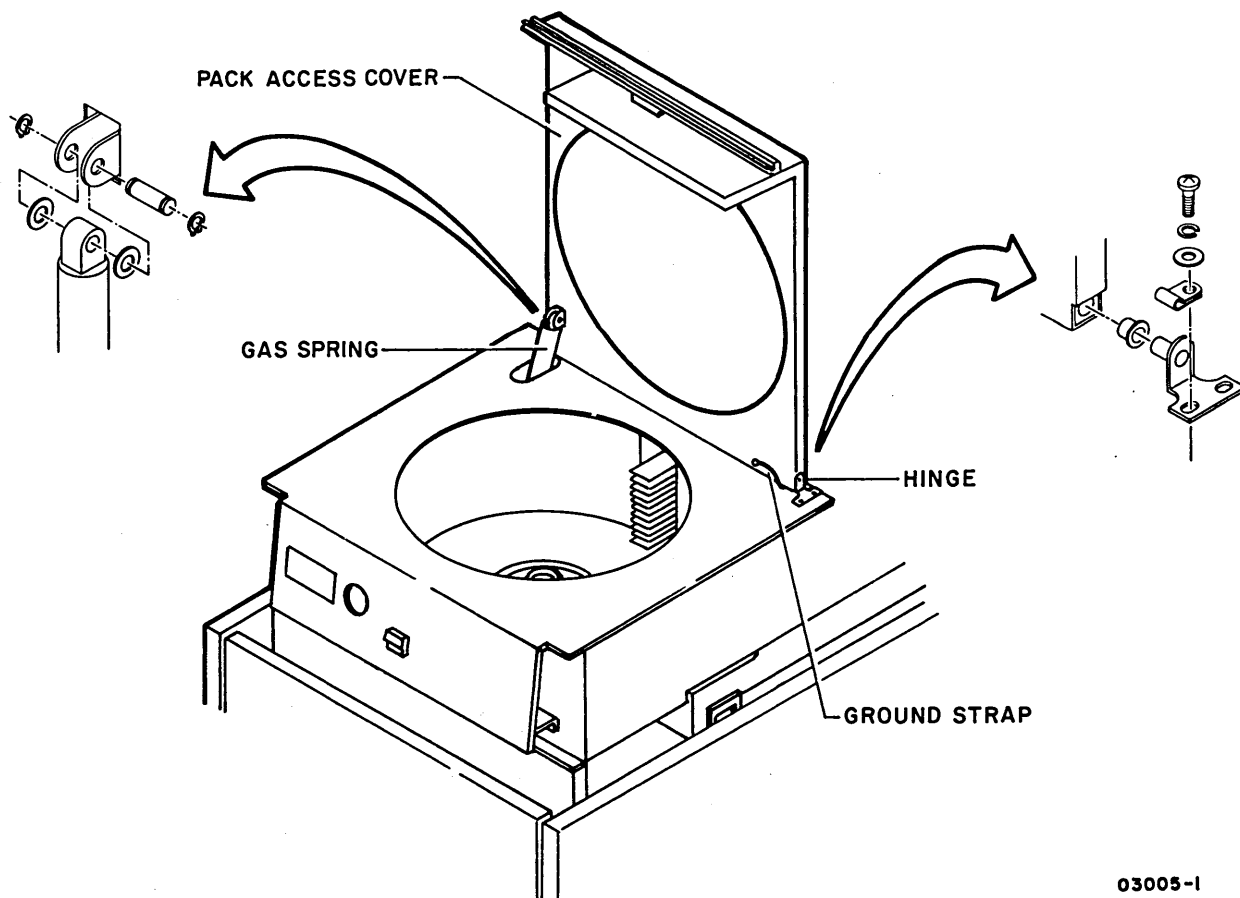
#### 3.6.1 Removal

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Remove top cover and deck cover:
  - a. Raise rear of top cover until support rod locks into place.
  - b. Release four latches and remove deck cover.
  - c. Remove plate nuts from hinge screws on both sides of cabinet but leave screws in hinges so top cover will remain raised.
  - d. Disconnect ground strap leading to top cover.
  - e. Remove retaining ring securing support rod to top cover, then lower support rod and top cover to closed position.
  - f. Remove screws from hinges and remove top cover.



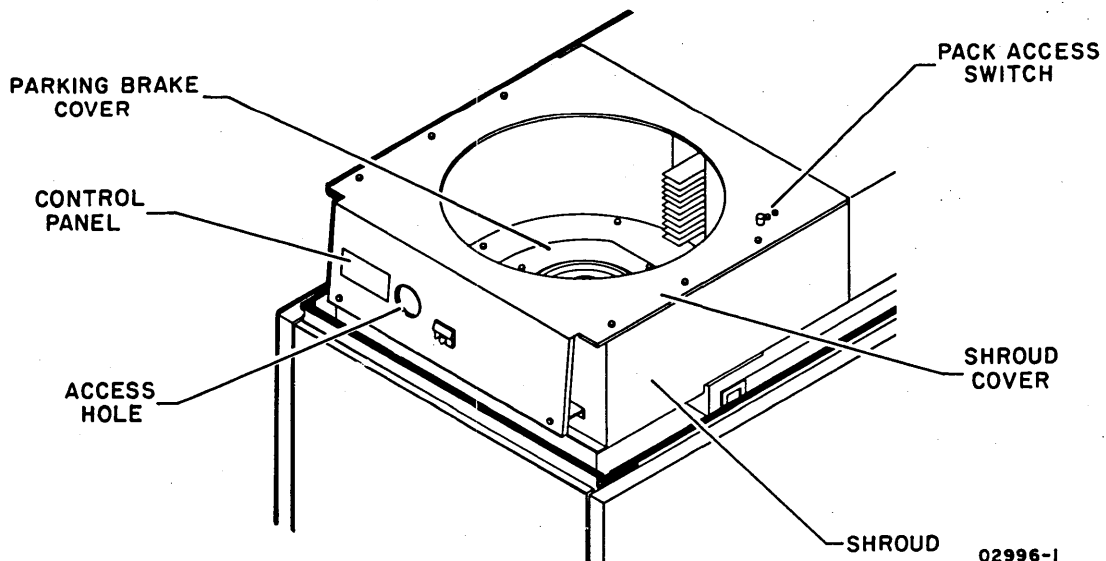
4. Remove pack access cover:

- a. Open pack access cover.
- b. Remove retaining rings, spacers, and pin securing pack access cover to gas spring.
- c. Disconnect ground strap from pack access cover.
- d. Unfasten screws securing pack access cover hinges and remove hinge items and cover.

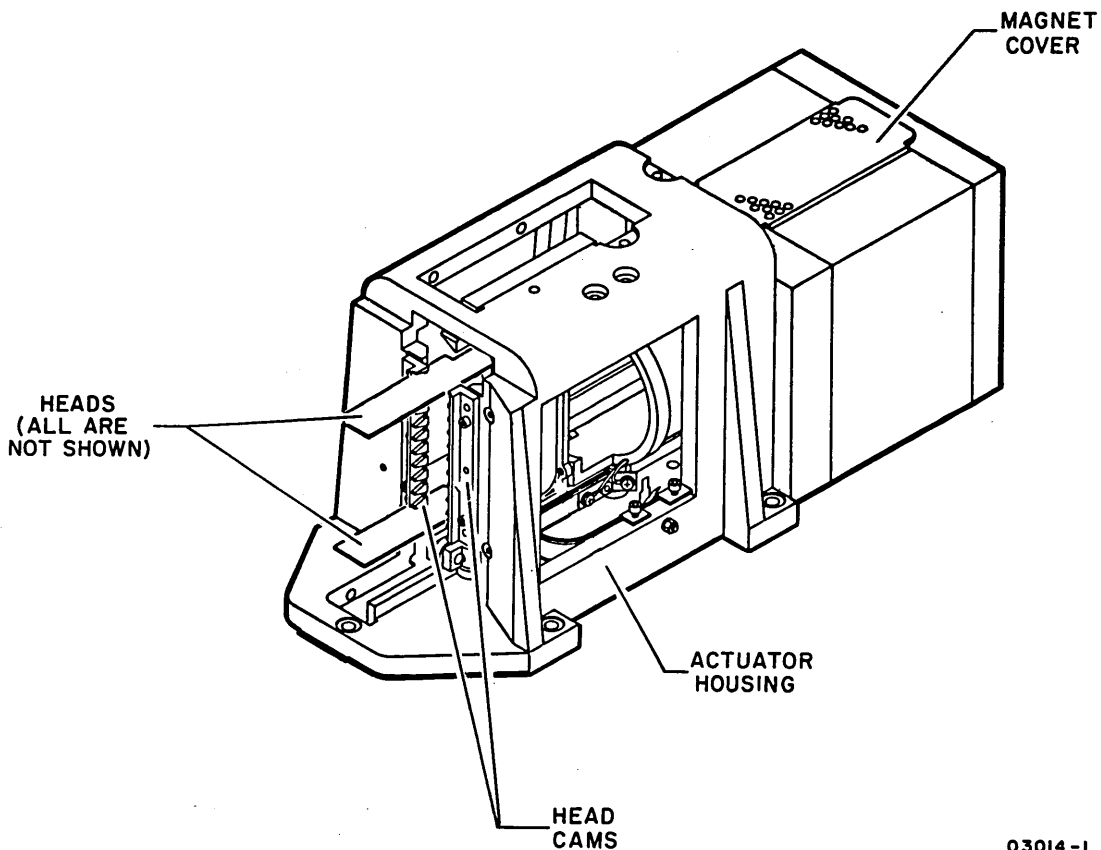


03005-1

5. Remove shroud cover and shroud:
  - a. Unfasten pack access switch by removing two screws securing it to shroud cover, and let hang from wires.
  - b. Remove plug from access hole in shroud cover.
  - c. Use access hole and release control panel from shroud cover, disconnect control panel cable plug, then snap control panel back in place.
  - d. Remove twelve screws securing shroud cover to shroud and remove shroud cover.
  - e. Remove six screws from parking brake cover and remove parking brake cover.
  - f. Remove nine screws securing shroud to deck and remove shroud.



6. Remove magnet cover. Grasp coil through magnet opening and push coil forward until heads are in loaded position.
7. Remove two screws securing each head cam to actuator housing. Pull cams off dowel pins on actuator housing.



03014-1

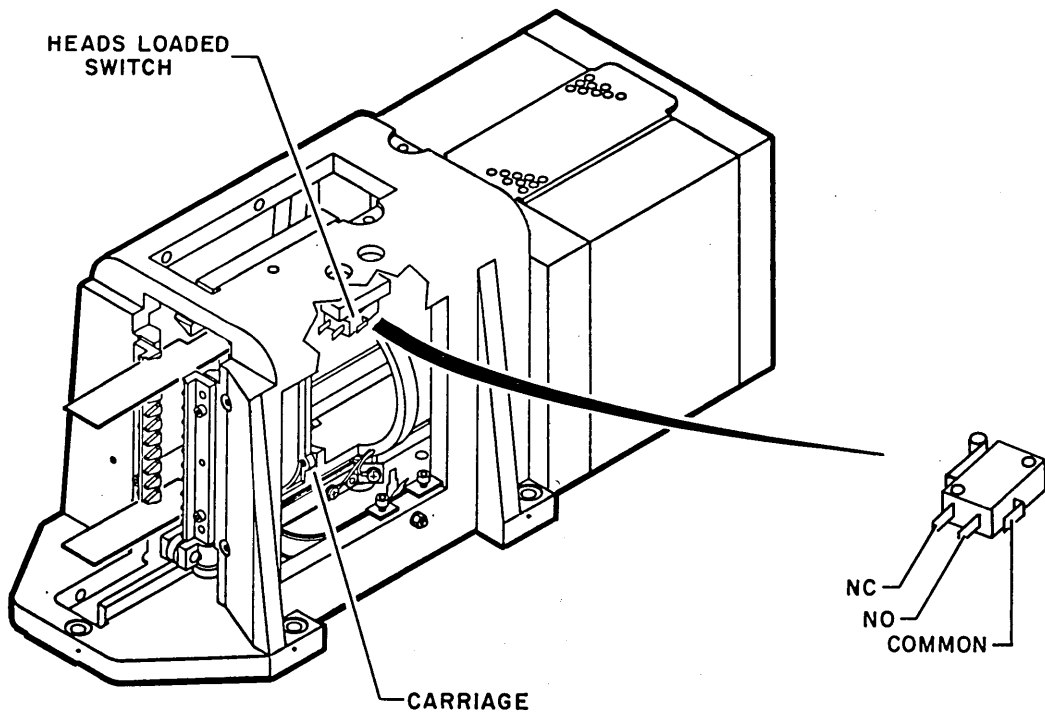
### 3.6.2 Replacement

1. Fit replacement head cams over dowel pins on actuator housing so they are flush against housing.
2. Install screws and torque to  $4 \pm 1/2$  lbf·in ( $0.5 \pm 0.1$  N·m).
3. Return heads to unloaded position and replace magnet cover.
4. Reinstall cabinet covers by reversing the order and action of steps 3, 4, and 5 of removal procedure.
5. Check that air seal exists between pack access cover and shroud cover. This is done by noting drag on a sheet of paper while pulling it from between closed pack access cover and shroud cover. If necessary, move catch on shroud cover until pack access cover latches tight enough to provide air seal.

### 3.7 HEADS LOADED SWITCH (A3)

#### 3.7.1 Check

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Open top cover (para 3.2.2).
4. Remove deck cover (para 3.2.3).
5. Disconnect cable connectors from A3E01, A3E02, and A3E03 read/write chassis cards and remove cards.
6. Note connections and disconnect three wires from heads loaded switch.
7. Set ohmmeter to RX1 scale and connect probes to common and NO terminals of switch.
8. With carriage fully retracted, meter should show continuity (0 ohm). If meter does, proceed to step 9; if not, do following:
  - a. Slide carriage forward out of way and manually open/close switch.
  - b. If meter does not show infinity/continuity during toggling, disconnect meter and replace switch (para 3.7.3); if infinity/continuity is shown, adjust switch (para 3.7.2).
9. Watch meter and slowly slide carriage forward, from the fully retracted position, until meter shows infinity. Measure distance that carriage traveled. If distance is between 0.1 to 0.2 in (2.54 to 5.08 mm), disconnect meter, return carriage to fully retracted position, and reassemble drive by doing steps 3 through 6 in reverse. If distance is not within these limits, adjust switch (para 3.7.2).



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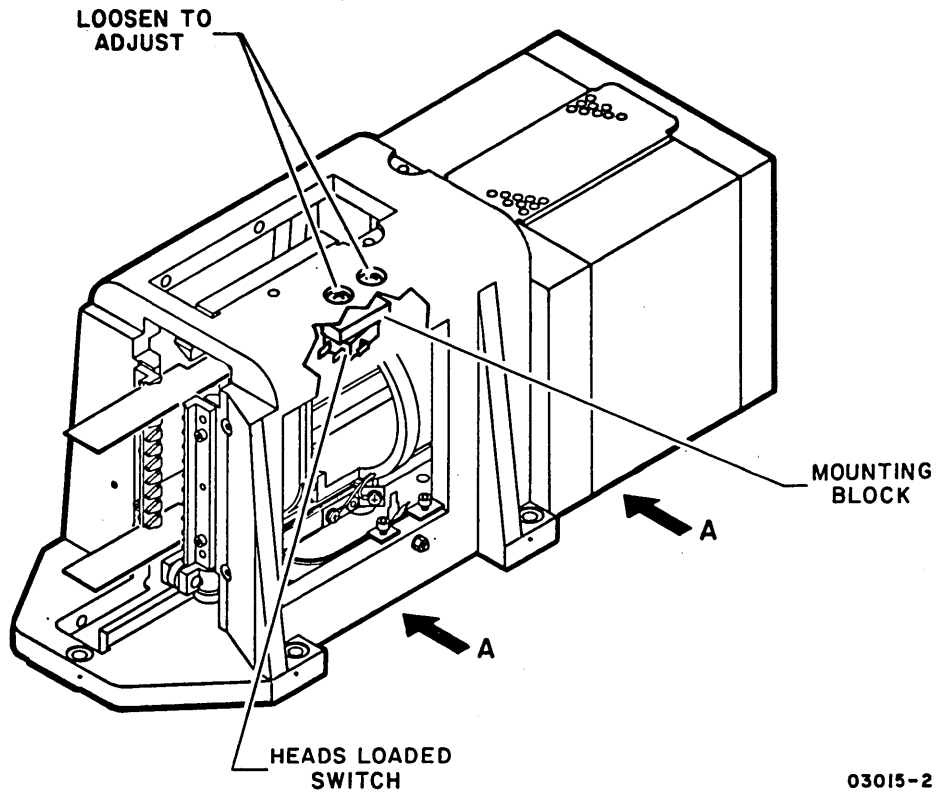
### 3.7.2 Adjustment

1. Loosen two screws securing switch mounting block to actuator housing. Move block and heads loaded switch as far back as possible toward magnet. Meter now indicates continuity.

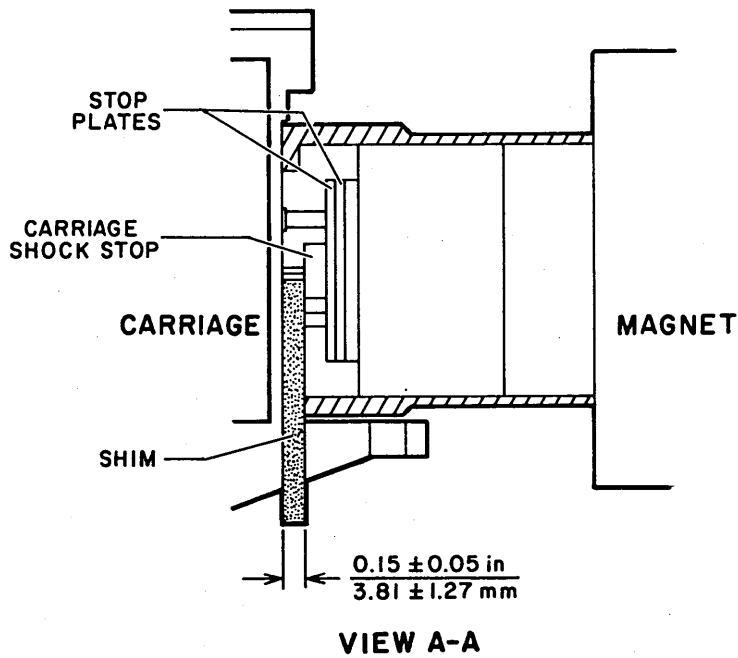
#### NOTE

In next step, a suitable shim is constructed by taping a number of feeler gages together until their combined thickness is  $0.15 \pm 0.05$  in ( $3.81 \pm 1.27$  mm).

2. Insert  $0.15 \pm 0.05$  in ( $3.81 \pm 1.27$  mm) shim between stop on magnet and shock stop on carriage.
3. Verify that meter still indicates continuity when carriage is moved back against shim.
4. Hold carriage against shim and move heads loaded switch forward away from magnet until meter indicates infinity. Tighten screws securing switch and mounting block to actuator housing, taking care not to disturb their position.
5. Remove shim and move carriage back to fully retracted position.
6. Move carriage forward and check that change in reading from continuity to infinity occurs between 0.1 to 0.2 in ( $2.54$  to  $5.08$  mm) from retracted position.
7. If requirements of step 6 are not met, repeat preceding steps until adjustment is correct.
8. Disconnect meter and return carriage to fully retracted position.
9. Reconnect wires to heads loaded switch.
10. Replace A3E01, A3E02, and A3E03 cards in read/write chassis and reconnect cable connectors.
11. Replace deck cover and close top cover.



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03006-1

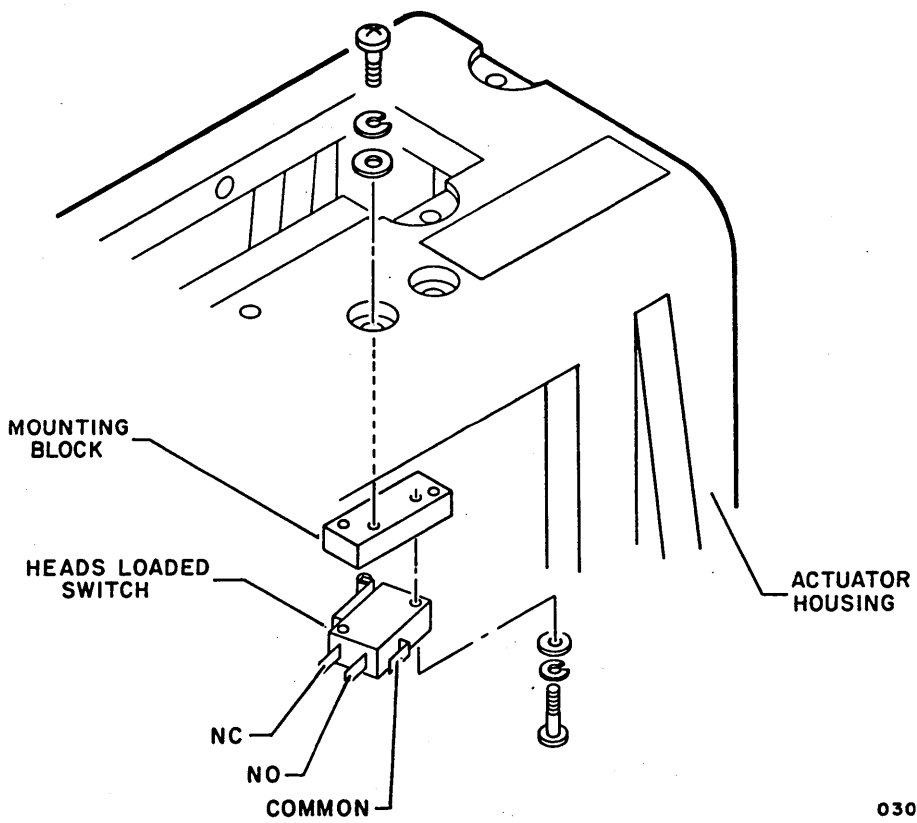


### 3.7.3 Removal

1. Remove two screws and washers securing heads loaded switch mounting block to actuator housing. Remove mounting block and switch from housing.
2. Remove two screws and washers securing switch to mounting block and remove switch.

### 3.7.4 Replacement

1. Fasten replacement switch on mounting block with screws and washers.
2. Install mounting block on actuator housing, leaving screws loose.
3. Connect ohmmeter probes to common and NO terminals of switch. Set meter to RX1 scale and adjust switch (para 3.7.2).



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### 3.8 PACK ACCESS COVER SWITCH (A3)

#### 3.8.1 Check

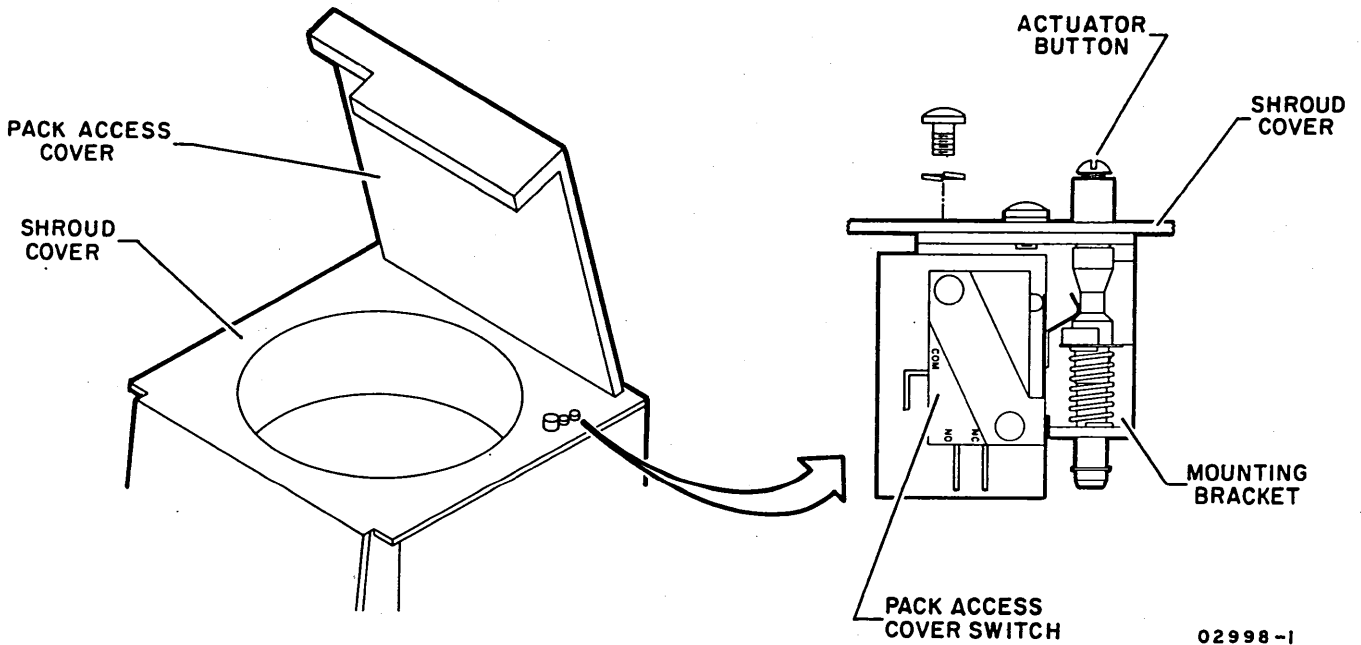
1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
4. Open pack access cover as far as possible.
5. Connect ohmmeter to common and NO terminals of pack access cover switch (two switch terminals with wires connected).
6. Check that meter shows continuity when actuator button is pressed down and infinity when button is released.
7. Disconnect meter. If conditions of step 6 were met, return covers to normal position; if not met, replace switch (para 3.8.2).

#### 3.8.2 Removal

1. Remove two screws and washers securing mounting bracket and pack access cover switch to shroud cover. Remove bracket and switch from beneath shroud cover.
2. Note connections and remove two wires from switch.

#### 3.8.3 Replacement

1. Connect wires to switch terminals.
2. Position switch and mounting bracket under shroud cover and secure with two screws and washers.
3. Close pack access cover.
4. Replace deck cover and close top cover.



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### 3.9 PACK SENSOR ASSEMBLY (A3)

The field replacable parts of the pack sensor assembly are the pack on switch and static groundspring, or the entire pack sensor assembly. If check/adjustment of either the pack on switch or static groundspring proves part replacement is required, refer to appropriate removal procedure for parts that are on hand (pack sensor component or entire assembly).

#### 3.9.1 Pack On Switch Check/Adjustment

1. Power-off drive (para 3.0.6.2).
2. Open pack access cover and install scratch disk pack (para 3.0.7.2).
3. Remove right side panel (para 3.2.4).
4. Check distance between actuator arm and lockshaft with feeler gage. If distance is  $0.025 \pm 0.005$  in ( $0.64 \pm 0.13$  mm), go to step 5; if not, do following:
  - a. Loosen two screws securing switch base to spindle.
  - b. Position switch base so distance is within limit and tighten screws.
5. Set ohmmeter to RX1 scale and connect probes to common and NO terminals of pack on switch (two switch terminals with wires connected).
6. Check following:
  - a. That switch is closed (meter showing continuity).
  - b. Insert 0.011 in feeler gage between actuator arm and stop pin.
  - c. Check that switch is now open (meter showing infinity).
7. If requirements of step 6 were met, disconnect meter and go to step 8; if not, do following:
  - a. Loosen two pack on switch adjustment screws.
  - b. Reposition switch so it closes and opens as specified in step 6. If switch does not close or open at all, replace switch (para 3.9.2) or entire pack sensor assembly (para 3.9.7).
  - c. Tighten screws and disconnect meter.

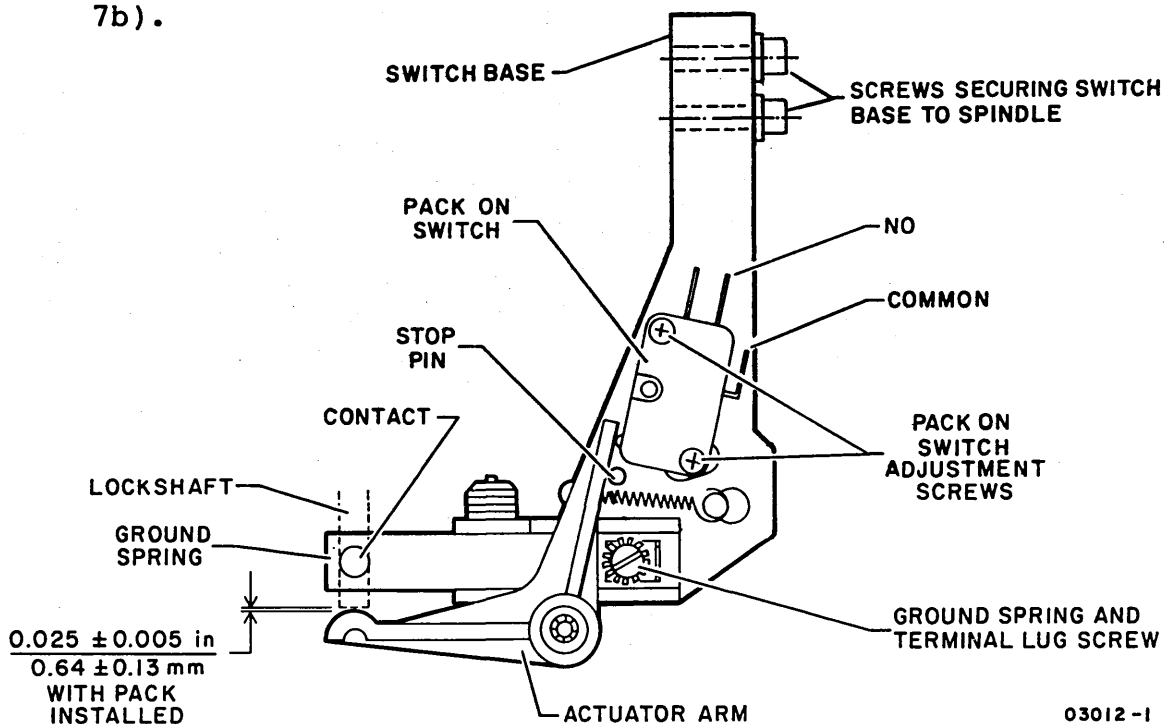
8. If switch base was repositioned in step 4, do following:
  - a. Visually check that contact on groundspring is centered on lockshaft. If not centered, loosen screw securing groundspring and terminal lug to switch base. Move groundspring horizontally as required and tighten screw.
  - b. Adjust speed sensor (para 3.10.2).
9. Replace side panel.

### 3.9.2 Pack On Switch Removal

1. Disconnect ohmmeter probes from terminals of pack on switch.
2. Note connections and remove two wires from switch.
3. Remove two pack on switch adjustment screws (lower screw fastened with nut) and remove switch.

### 3.9.3 Pack On Switch Replacement

1. Using two adjustment screws and nut, fasten new pack on switch to switch base. Do not tighten.
2. Reconnect wires to switch.
3. Connect ohmmeter probes to common and NO terminals of switch and adjust switch (para 3.9.1, starting with step 7b).



### 3.9.4 Static Groundspring Check/Adjustment

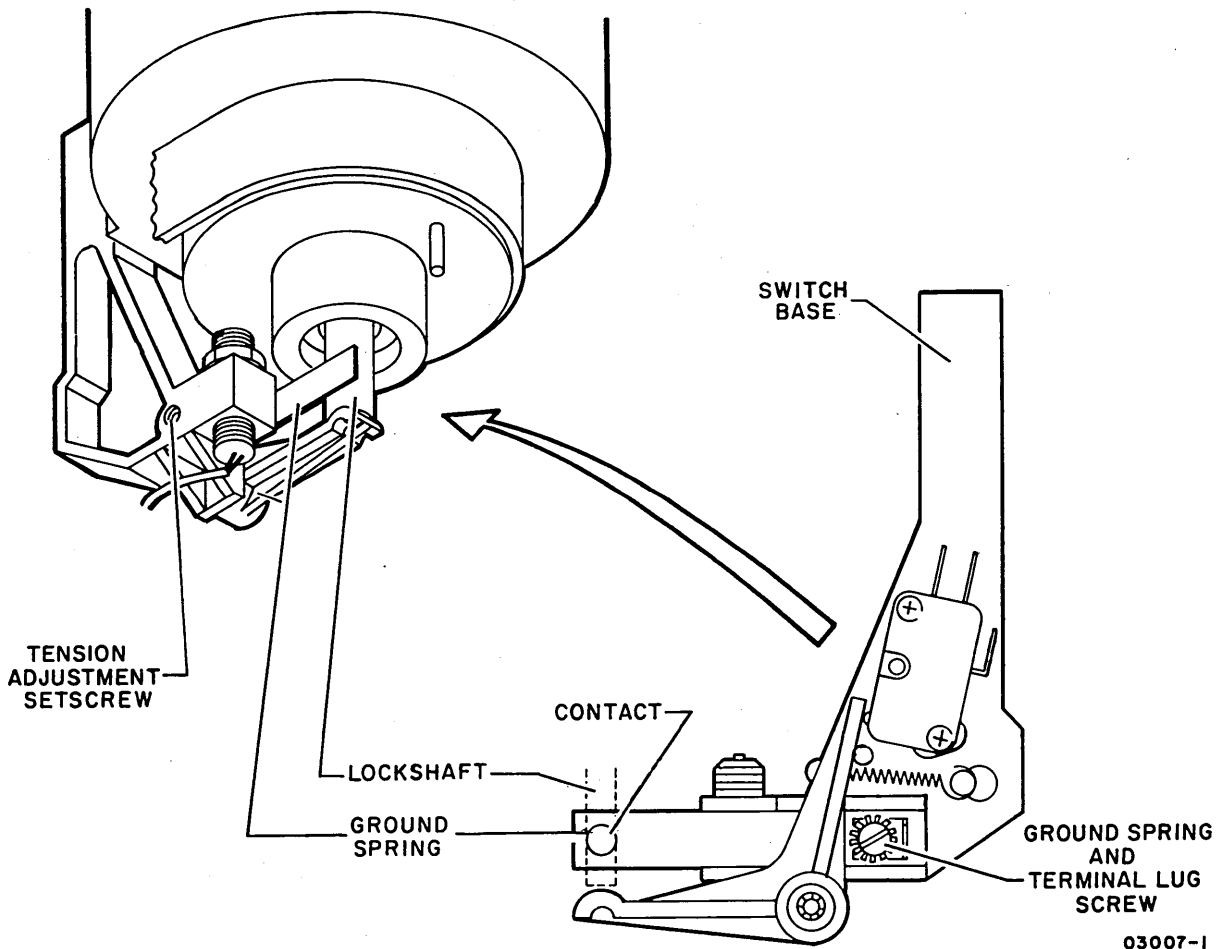
1. Power-off drive (para 3.0.6.2).
2. Remove right and left side panels (para 3.2.4).
3. Visually check that contact on groundspring is centered on lockshaft and that contact is not excessively worn or spring bent. If worn or bent, replace groundspring (para 3.9.5) or entire pack sensor assembly (para 3.9.7).
4. If centering is required, loosen screw securing groundspring and terminal lug to switch base. Move groundspring horizontally as required and tighten screws.
5. Place a 0.019  $\pm$ 0.003 in feeler gage between groundspring and lockshaft.
6. From left side of drive, hook a push-pull gage to outer end of groundspring.
7. Watch scale and pull on push-pull gage until feeler gage falls free. With proper spring tension, this takes 125  $\pm$ 25 grams of force.
8. If force exerted was not within limit, adjust setscrew in switch base for proper spring tension. Turning setscrew clockwise increases spring tension; turning setscrew counterclockwise decreases spring tension.
9. Replace side panels.

### 3.9.5 Static Groundspring Removal

1. Disconnect ground wire from groundspring terminal lug.
2. Remove screw securing groundspring and terminal lug to switch base and remove lug and spring.

### 3.9.6 Static Groundspring Replacement

1. Position new groundspring on switch base with contact centered on lockshaft. Secure spring and terminal lug with screw.
2. Connect ground wire to terminal lug.
3. Adjust groundspring for proper tension (para 3.9.4, starting with step 5).



03007-1

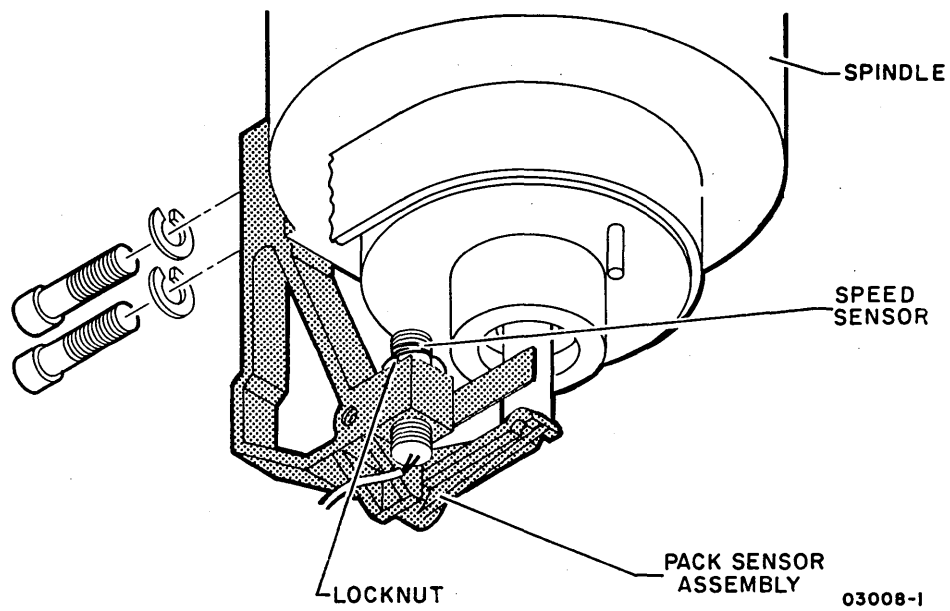


### 3.9.7 Pack Sensor Assembly Removal

1. Disconnect ground wire from groundspring terminal lug.
2. Note connections and remove two wires from pack on switch. Cut cable tie securing these wires to switch base.
3. Disconnect speed sensor cable plug A3P3.
4. Remove two screws securing pack sensor assembly to spindle and remove pack sensor assembly.
5. Remove speed sensor from pack sensor assembly for transfer to replacement assembly:
  - a. Remove locknut from speed sensor.
  - b. Unscrew speed sensor from switch base.

### 3.9.8 Pack Sensor Assembly Replacement

1. Install speed sensor on new pack sensor assembly:
  - a. Screw speed sensor far enough in switch base to allow locknut to be installed on top.
  - b. Install locknut, but do not tighten.
2. Using two screws, loosely fasten pack sensor assembly to spindle.
3. Connect wires to pack on switch and ground wire to static groundspring. Leave cable plug A3P3 disconnected.
4. Install cable tie around pack on switch wires and hole in switch base.
5. Perform following adjustments:
  - a. Pack on switch adjustment (para 3.9.1).
  - b. Static groundspring adjustment (para 3.9.4).
  - c. Speed sensor adjustment (para 3.10.2).



### 3.10 SPEED SENSOR (A3)

#### 3.10.1 Check

1. Power-off drive (para 3.0.6.2).
2. Open rear door and connect oscilloscope ground probe to logic chassis backpanel pin A17-17B and channel 1 probe to backpanel pin A17-17A (speed sensor output). (Pin row 17 is the unmarked row between 16 and 21.)
3. Install scratch disk pack (para 3.0.7.2) and power-on drive (para 3.0.6.1).
4. Set scope triggering for positive internal and calibrate trace to ground.
5. Check that peak-to-peak amplitude of trace is at least 1.2 V.
6. If conditions of step 5 are met, speed sensor is not cause of fault. Power-off drive and disconnect scope.
7. If conditions of step 5 are not met, do following:
  - a. Adjust speed sensor (para 3.10.2).
  - b. Repeat this check procedure.
  - c. If amplitude of speed sensor output is still low, replace speed sensor (para 3.10.3).

#### 3.10.2 Adjustment

1. Power-off drive (para 3.0.6.2).
2. Remove left side panel (para 3.2.4).

#### CAUTION

Do not allow speed sensor and steel pin on pulley to come in contact or damage to these items will result.

3. Rotate spindle pulley until pin on bottom of pulley is over speed sensor.
4. Check gap between pin and speed sensor with nonmetallic feeler gage. If gap is not  $0.019 \pm 0.003$  in ( $0.48 \pm 0.08$  mm), go to step 5. If gap is within limit, replace side panel as adjustment is not required.
5. Loosen locknut on speed sensor.

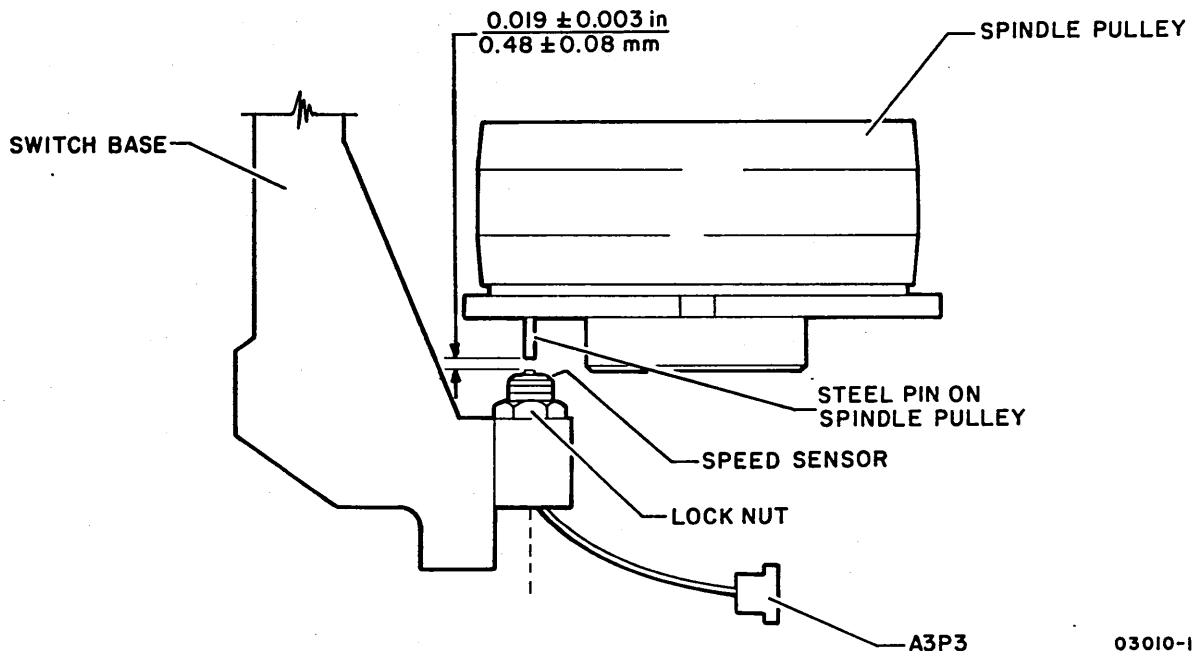
6. Disconnect cable plug A3P3 so speed sensor wires will not kink during next step.
7. Turn speed sensor until gap is within specified limit. Turning sensor counterclockwise narrows gap; turning sensor clockwise widens gap.
8. Tighten locknut to  $5 \pm 1$  lbf·in ( $0.57 \pm 0.1$  N·m).
9. Reconnect cable plug A3P3 and replace side panel.

### 3.10.3 Removal

1. Power-off drive (para 3.0.6.2).
2. Remove left side panel (para 3.2.4).
3. Disconnect speed sensor cable plug A3P3.
4. Remove locknut from speed sensor.
5. Unscrew speed sensor from switch base.

### 3.10.4 Replacement

1. Screw new speed sensor far enough in switch base to allow locknut to be installed on top.
2. Install locknut, but do not tighten.
3. Leave cable plug A3P3 disconnected and adjust speed sensor (para 3.10.2).



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### 3.11 PARKING BRAKE (A3)

#### 3.11.1 Removal

1. Open pack access cover and remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Remove six screws securing parking brake cover and remove cover from shroud area.
4. Remove two screws mounting parking brake to deck and remove brake.

#### 3.11.2 Replacement

1. Apply Grade N (primer) and Grade C Loctite to both parking brake mounting screws.
2. Fasten parking brake to deck with two prepared screws.
3. Adjust parking brake (para 3.11.3).

#### 3.11.3 Adjustment

##### NOTE

Adjustment of parking brake ensures that it only engages spindle when disk pack is being removed or installed.

1. Using feeler gage, check that clearance between brake tooth and underside of spindle is 0.005 to 0.020 in (0.13 to 0.51 mm). If clearance is within limit, go to step 2; if not, do following:
  - a. Loosen locknut on brake tooth adjustment screw.
  - b. Turn adjustment screw until clearance between tooth and underside of spindle is within limit. Turning screw clockwise narrows clearance; counterclockwise widens clearance.
  - c. Tighten locknut.

2. Install scratch disk pack (para 3.0.7.2).

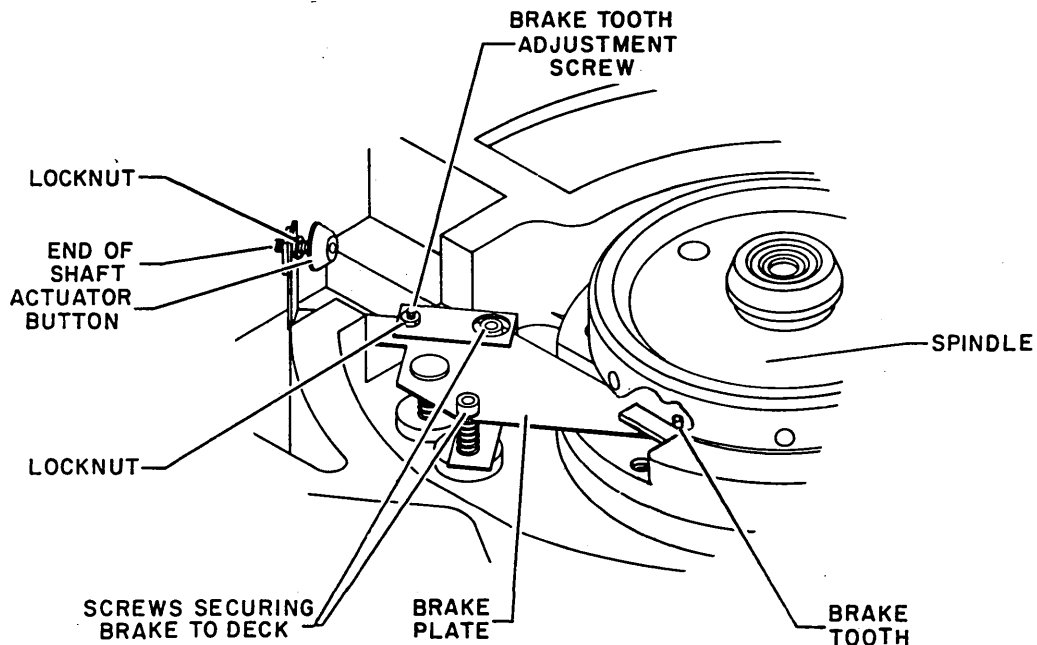
NOTE

To make measurement in step 3, tape feeler gage to a long object such as a screw driver.

3. Check that clearance between actuator button and edge of bottom disk is 0.010 to 0.020 in (0.25 to 0.51 mm). If clearance is within limit, remove disk pack and go to step 4; if not, do following:

- a. Refer to paragraph 3.6.1, step 3, and remove top cover.
- b. Remove eight screws securing access plate to left side of shroud and remove plate.
- c. Reinstall scratch disk pack.
- d. Loosen locknut on actuator button shaft.
- e. Turn end of shaft until clearance between actuator button and bottom disk is within limit. Turning end of shaft clockwise narrows clearance; counterclockwise widens clearance.
- f. Tighten locknut.
- g. Remove disk pack.
- h. Replace access plate and top cover.

4. Replace parking brake cover and close pack access cover.



### 3.12 POWER SUPPLY ASSEMBLY (A1)

The procedures that follow deal with the following field replaceable parts of the power supply assembly: transformers AlT1, AlT2, and AlT3; the capacitor/rectifier board; the power amplifier board; the relay board; triacs AlQ1 through AlQ5; and tuning capacitors AlC1 and AlC2. In addition, since the power supply assembly is field replaceable, removal/replacement procedures for the entire assembly are included. When parts replacement is required, refer to appropriate removal procedure for parts that are on hand (power supply component or entire assembly).

#### 3.12.1 Transformer Output Check

1. Open rear door and place MAIN AC circuit breaker down.
2. Slide out power supply and remove power supply top cover (para 3.2.6).
3. Reconnect any power supply wiring that has been disconnected during troubleshooting.
4. Using following table, see which power supply transformer is associated with dc voltage that is below normal. This denotes the transformer to be checked. In accordance, set power supply circuit breakers as follows:
  - Transformer AlT1 or AlT2 to be checked — +20Y, +9.7, and -9.7 breakers up, all others down.
  - Transformer AlT3 to be checked — +20Y breaker up, all others down.

ASSOCIATED V dc	XFMR	SCOPE CONNECTIONS (Vac)		ACCEPTABLE Vac RANGE (E in following waveform illustration)
		+Probe (Check Both)	-Probe (Gnd)	
+16 V	AlT1	AlTB1-4*, 5*	AlTB1-3	17.0 ± 0.85
+46 V		AlTB1-7, 8	AlTB1-3	46.5 ± 2.33
+9.7 V	AlT2	AlTB1-17, 18	AlTB1-14	11.1 ± 0.56
+20 V		AlTB1-15, 16	AlTB1-14	22.7 ± 1.14
+28 V		AlTB1-19, 20	AlTB1-14	29.4 ± 1.47
+20 Y	AlT3	AlTB2-9, 10	AlTB1-12	25.0 ± 1.25

\*TB1-4 and 5 each contain two wires. Only the pair coming from T1 are to be removed when checked.

5. If transformer ALT1 or ALT2 is to be checked, verify that corresponding tuning capacitor is not open or shorted (para 3.12.14) before proceeding. Tuning capacitor ALC1 for ALT1; ALC2 for ALT2.)

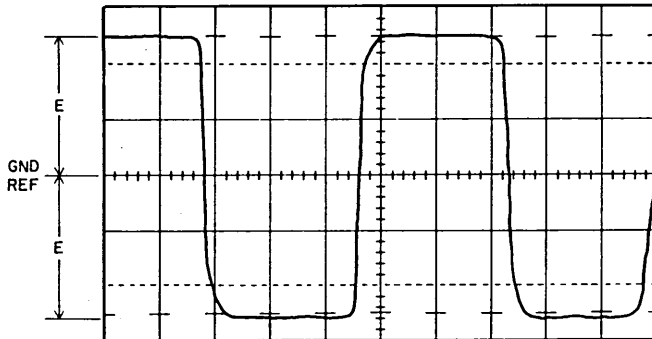
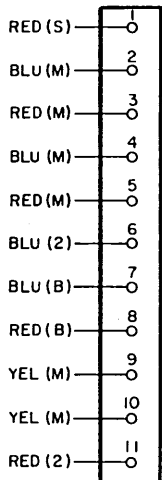
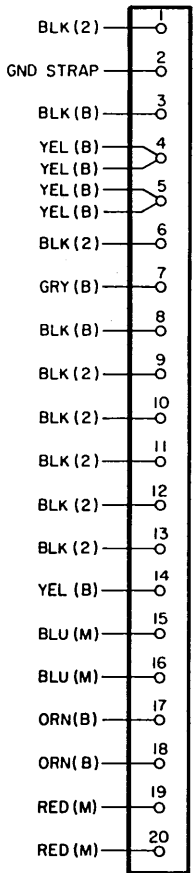
NOTE

ALT1 and ALT2 are ferroresonant transformers. If more than a pair of their outputs are disconnected at a time, oscillation will occur and voltage measurements will be meaningless.

6. Disconnect wires from appropriate two terminals given in +Probe column of table. Leave all other connections intact.
7. Turn on oscilloscope and set Trigger control to LINE. Center horizontal line on graticule.
8. Connect ground probe to appropriate terminal given in table -Probe column.
9. Place MAIN AC circuit breaker up.
10. Using X1 probe, connect Channel 1 probe to either of the wires disconnected in step 6.
11. Make following scope adjustments:
  - a. Vary Channel A TIME/DIV for stable trace.
  - b. Set Channel 1 VOLTS/DIV to read voltage given in Acceptable V ac Range column of table.
12. Record two E readings from ground reference line to top and bottom of trace.
13. Move Channel 1 probe to other wire disconnected in step 6 and repeat step 12.
14. If both steps 12 and 13 show a symmetrical waveshape about ground reference (that is, all four E readings are the same), and are within acceptable V ac range of table, transformer output for associated dc voltage is proper. Go to step 16.
15. If four E readings are not the same, or if they are the same but not within acceptable V ac range of table, disconnect scope and replace the respective transformer (para 3.12.2 for ALT1 or ALT2; para 3.12.4 for ALT3).

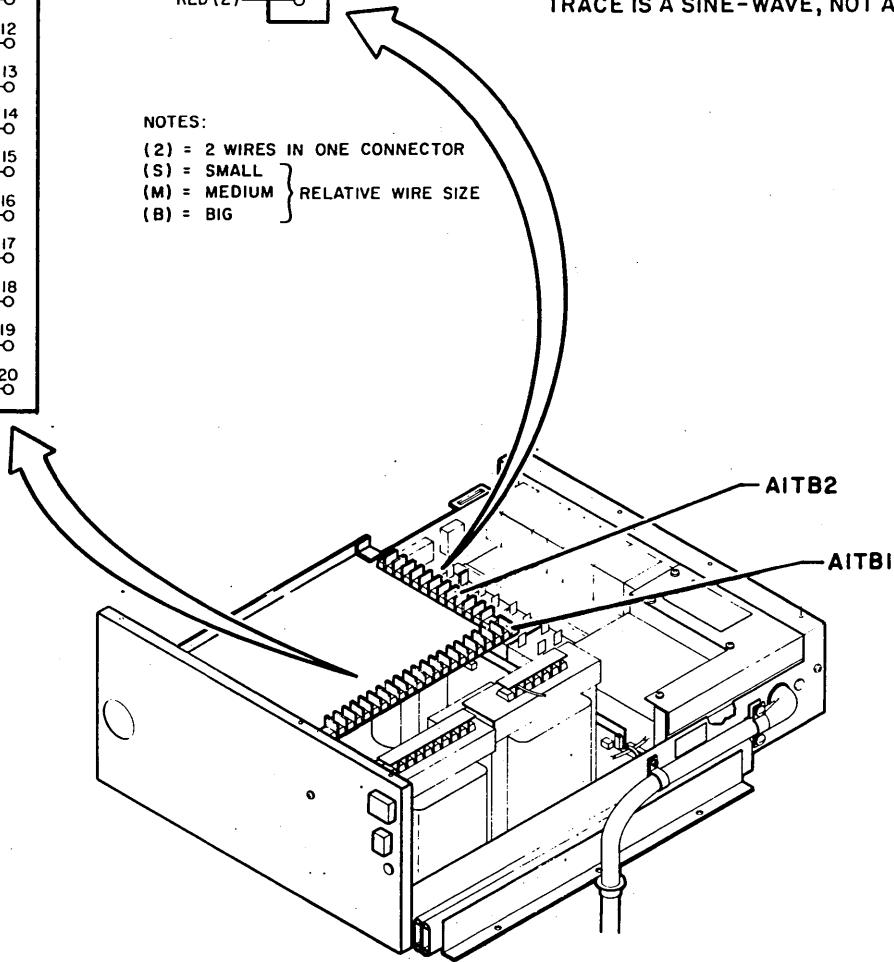


16. Place MAIN AC circuit breaker down and return all other power supply breakers to up position.
17. Disconnect scope and reconnect pair of wires used in check.



**NOTE:**  
TRACE SHOWN DEPICTS OUTPUT OF FERRO-  
RESONANT TRANSFORMERS AIT1 OR AIT2.  
WITH CONVENTIONAL TRANSFORMER AIT3,  
TRACE IS A SINE-WAVE, NOT A SQUARE-WAVE.

**NOTES:**  
(2) = 2 WIRES IN ONE CONNECTOR  
(S) = SMALL  
(M) = MEDIUM  
(B) = BIG } RELATIVE WIRE SIZE



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### 3.12.2 Alt1/Alt2 Transformer Removal

1. Open rear door and place MAIN AC circuit breaker down.
2. Disconnect ac power cord.
3. Slide out power supply and remove power supply top cover (para 3.2.6).

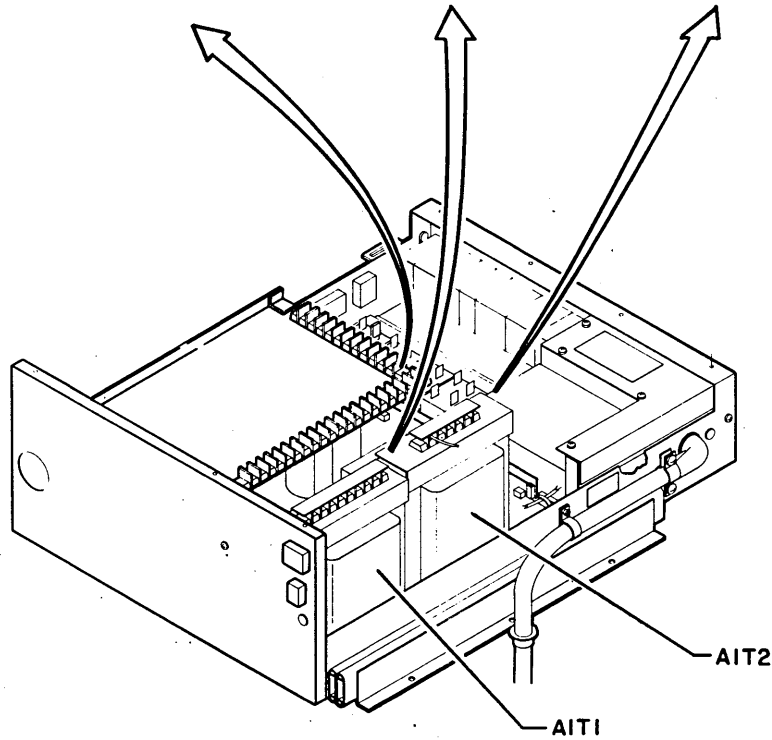
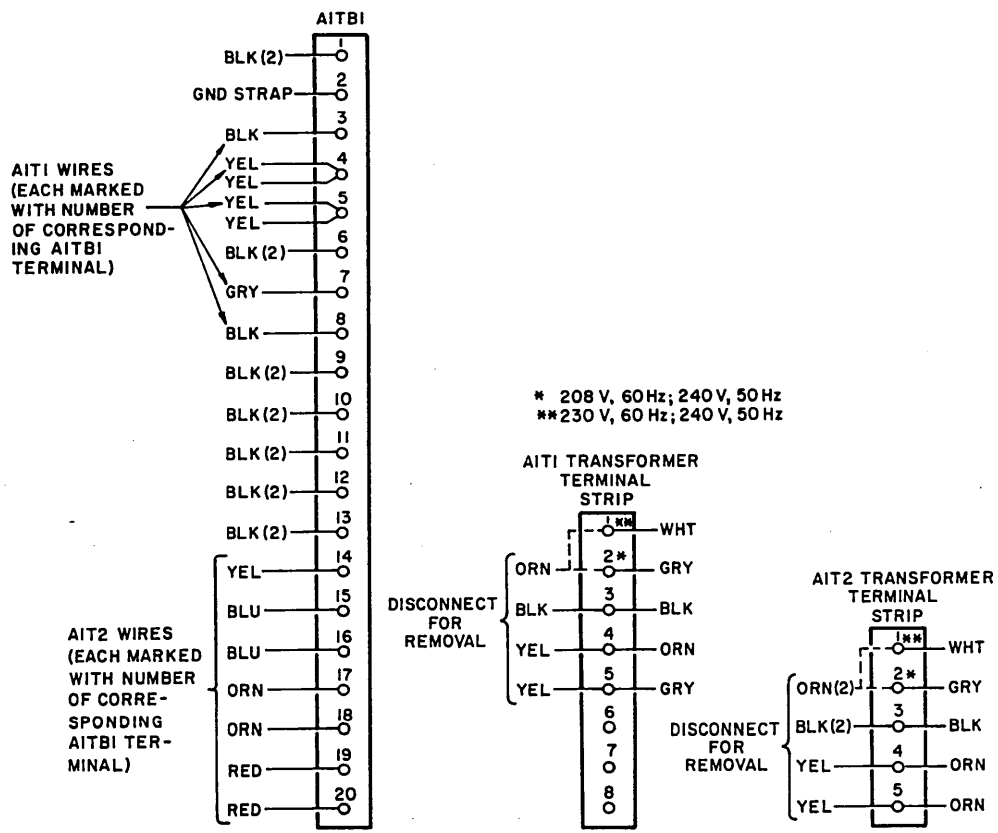
#### WARNING

Tuning capacitor connected to transformer terminal strip is charged with 500 volts.

4. Remove fiber cover from terminal strip on top of transformer.
5. Using insulated pliers, short terminals 4 and 5 on transformer terminal strip to discharge tuning capacitor.
6. Tag the two yellow wires on left side of transformer terminal strip with their corresponding terminal number.
7. Disconnect all wires from left side of transformer terminal strip.
8. Disconnect following transformer wires from Alt1:
  - For transformer Alt1 removal — TBl-3, TBl-4, TBl-5, TBl-7, and TBl-8.
  - For transformer Alt2 removal — TBl-14 through TBl-20.
9. Remove three nuts securing transformer to power supply base and lift out transformer.

### 3.12.3 Alt1/Alt2 Transformer Replacement

1. To replace transformer, do steps of removal procedure in reverse order and action. Be sure to make terminal connections as shown below.



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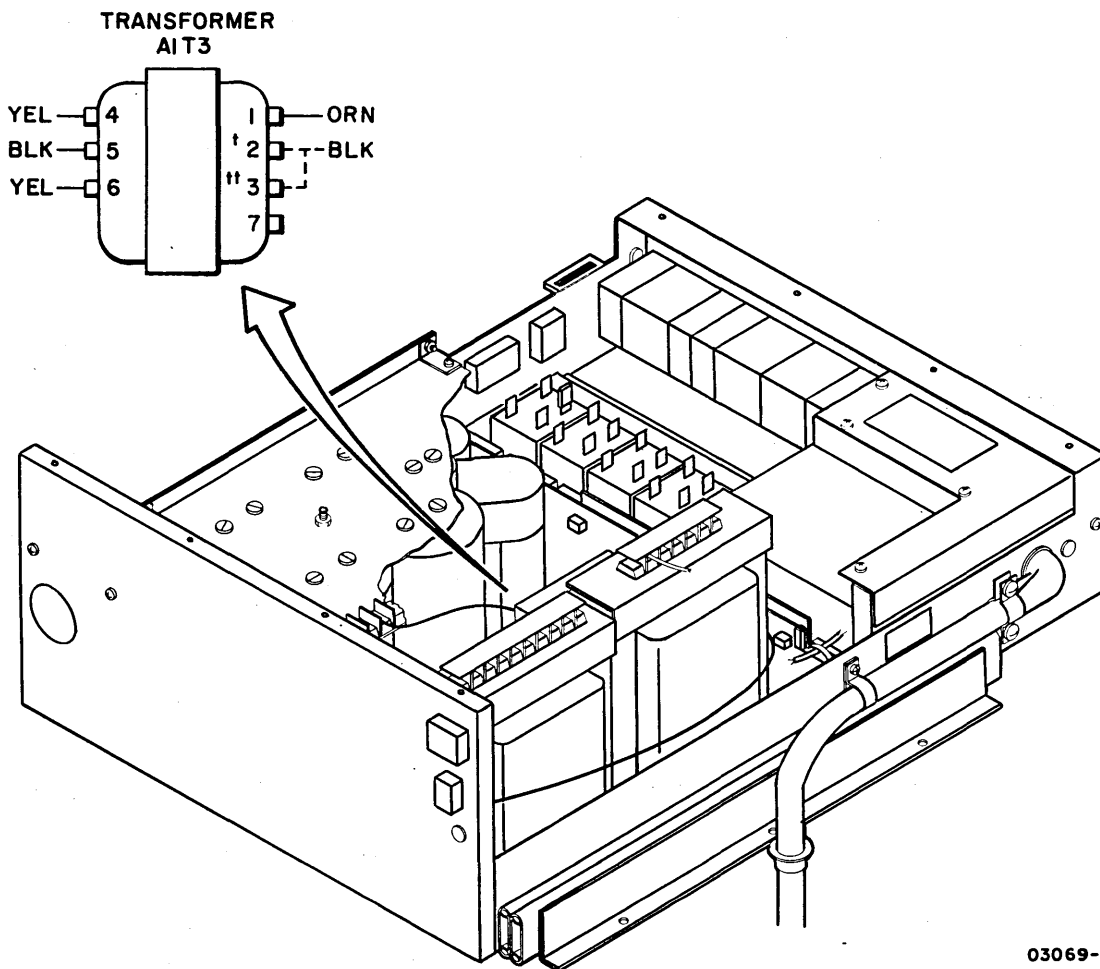
### 3.12.4 ALT3 Transformer Removal

1. Remove capacitor/rectifier board (para 3.12.6).
2. Tag five wires going to transformer with their corresponding transformer terminal number.
3. Disconnect five wire fastons from clips on transformer.
4. Remove four screws securing transformer to power supply base lift out transformer.

### 3.12.5 ALT3 Transformer Replacement

1. Do steps of removal procedure in reverse order and action.

† 208 V/60 Hz  
†† 220 V/50 Hz; 230 V/60 Hz;  
240 V/50 Hz



### 3.12.6 Capacitor/Rectifier Board Removal

1. Open rear door and place MAIN AC circuit breaker down.
2. Disconnect ac power cord.
3. Slide out power supply and remove power supply top cover (para 3.2.6).
4. Unfasten capacitor/rectifier board from power amplifier board:
  - a. Remove two screws and nuts securing power amplifier board to two angle brackets.
  - b. Remove spring clip from rear angle bracket.
5. Tag each wire with its corresponding terminal number and disconnect wires from terminal strips ALTb1 and ALTb2.
6. Using insulated pliers, short the five pair of capacitor leads (five pair of screw heads) on top of capacitor/rectifier board.
7. Remove ten screws securing board to capacitors.
8. Remove nut from stud and lift off board.

### 3.12.7 Capacitor/Rectifier Board Replacement

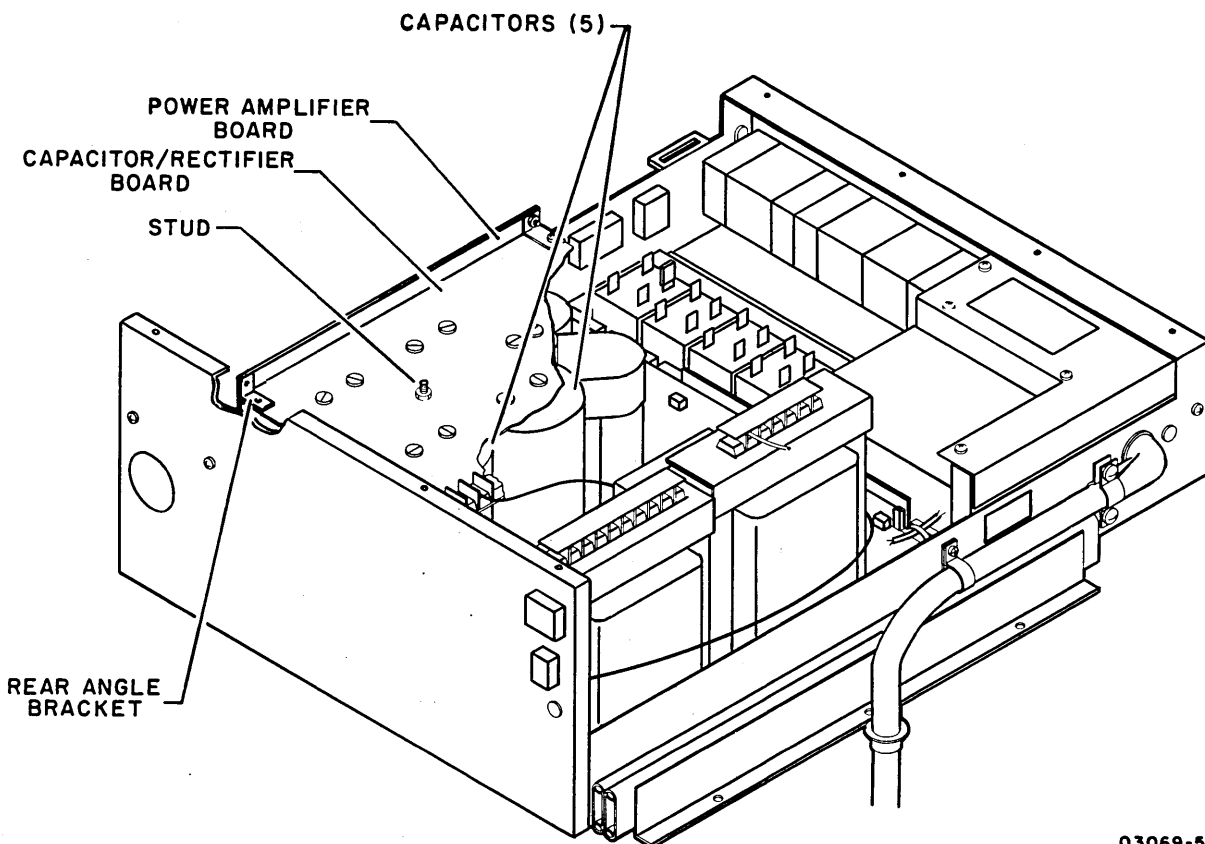
1. Unfasten two angle brackets from old capacitor/rectifier board and attach on new board.
2. Install new board by reversing order and action of removal procedure.
3. Adjust +5 V regulator card (para 3.13.1).

### 3.12.8 Power Amplifier Board Removal

1. Open rear door and place MAIN AC circuit breaker down.
2. Disconnect ac power cord.
3. Slide out power supply and remove power supply top cover (para 3.2.6).
4. Tag each wire with its corresponding terminal and disconnect wires from two power amplifier board terminal strips.
5. Remove two screws and nuts securing power amplifier board to two angle brackets.
6. Slip off spring clip from rear angle bracket and remove board.

### 3.12.9 Power Amplifier Board Replacement

1. Install new power amplifier board by reversing the order and action of steps in removal procedure.



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### 3.12.10 Relay Board Removal

1. Open rear door and place MAIN AC circuit breaker down.
2. Disconnect ac power cord.
3. Slide out power supply and remove power supply top cover (para 3.2.6).
4. Disconnect two connectors from relay board.
5. Carefully pry relay board off three mounting pegs and remove board.

### 3.12.11 Relay Board Replacement

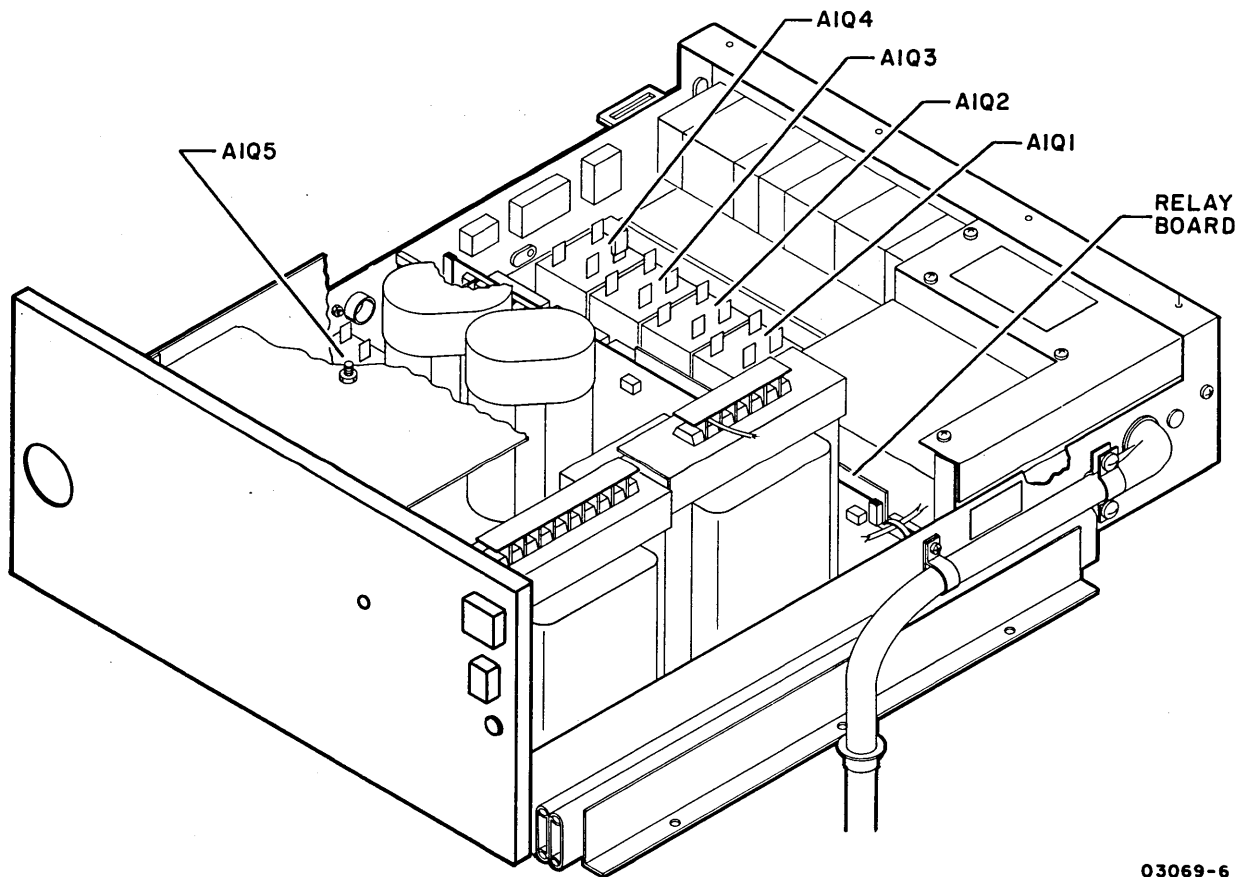
1. To replace relay board, do steps of removal procedure in reverse order and action.

### 3.12.12 AlQ1 - AlQ5 Triac Removal

1. Open rear door and place MAIN AC circuit breaker down.
2. Disconnect ac power cord.
3. Slide out power supply and remove power supply top cover (para 3.2.6).
4. Tag each wire with its corresponding triac terminal number and disconnect wires from triac.
5. Remove two fasteners securing triac to power supply base and remove triac.

### 3.12.13 AIQ1 - AIQ5 Triac Replacement

1. Apply silicone grease (CDC part number 95109000) to mating surfaces of triac and power supply base.
2. Install new triac by reversing order and action of removal procedure.



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### 3.12.14 AlC1/AlC2 Tuning Capacitor Check

1. Open rear door and place MAIN AC circuit breaker down.
2. Slide out power supply and remove power supply top cover (para 3.2.6).

#### WARNING

Tuning capacitors connected to transformer terminal strips are charged with 500 volts.

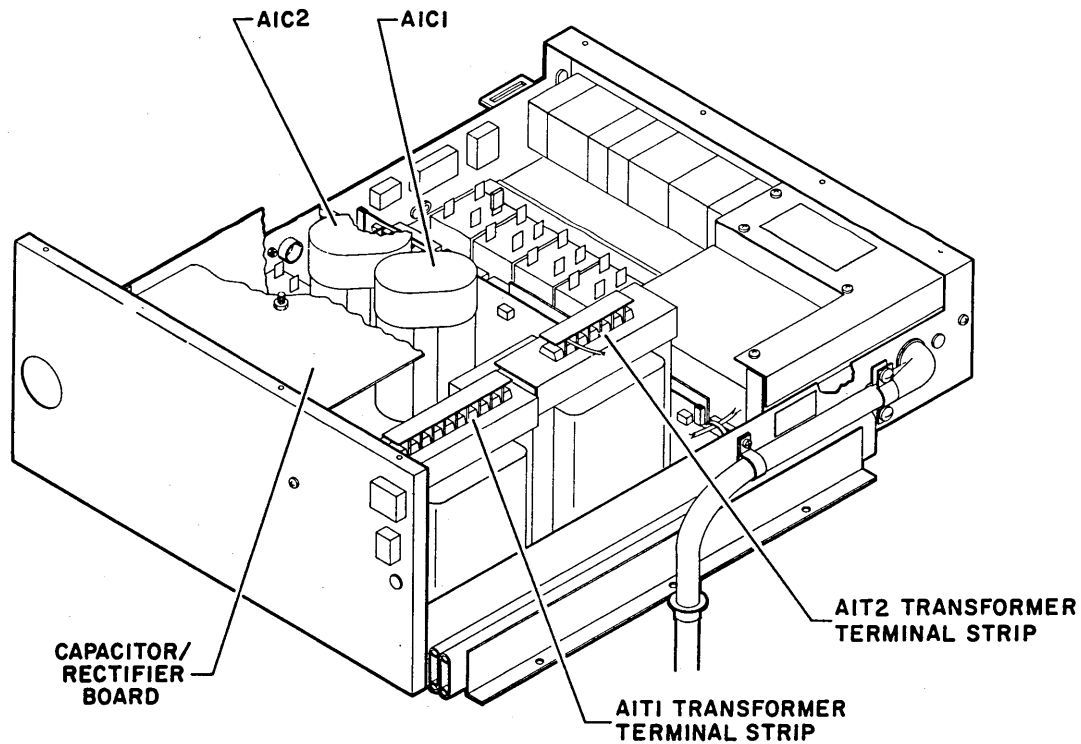
3. Remove fiber cover from appropriate transformer terminal strip:
  - For checking capacitor AlC1 — terminal strip on transformer AlT1.
  - For checking capacitor AlC2 — terminal strip on transformer AlT2.
4. Using insulated pliers, short the two terminals containing yellow wires to discharge tuning capacitor.
5. Disconnect one of the yellow wires from its terminal.
6. Set ohmmeter to X1000 scale and connect probes to yellow wires.
7. Check that needle goes rapidly to 0 ohm, then slowly regresses to infinity.
8. Disconnect meter and return wire and cover to terminal strip.
9. If conditions of step 7 were met, capacitor is OK; if not met, replace capacitor (para 3.12.15).

### 3.12.15 AlC1/AlC2 Tuning Capacitor Removal

1. Remove capacitor/rectifier board (para 3.12.6).
2. Pry rubber boot from top of capacitor.
3. Note connections and remove two wires from capacitor.
4. Loosen two clamp screws and remove capacitor.

### 3.12.16 AlC1/AlC2 Tuning Capacitor Replacement

1. Install new tuning capacitor by reversing order and action of removal procedure.



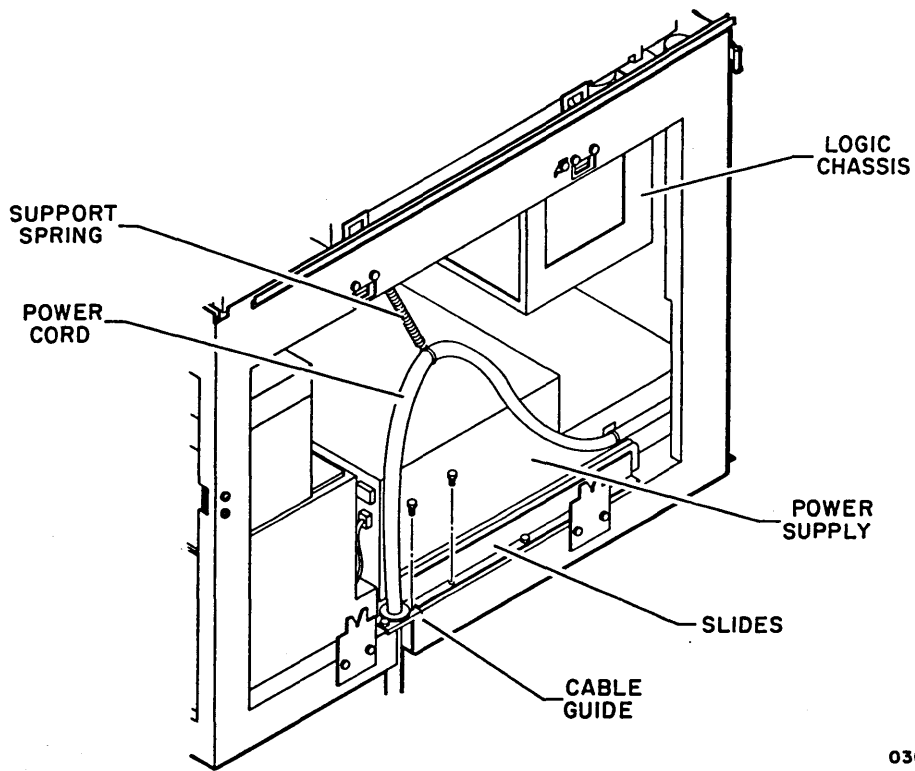
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### 3.12.17 Power Supply Assembly Removal

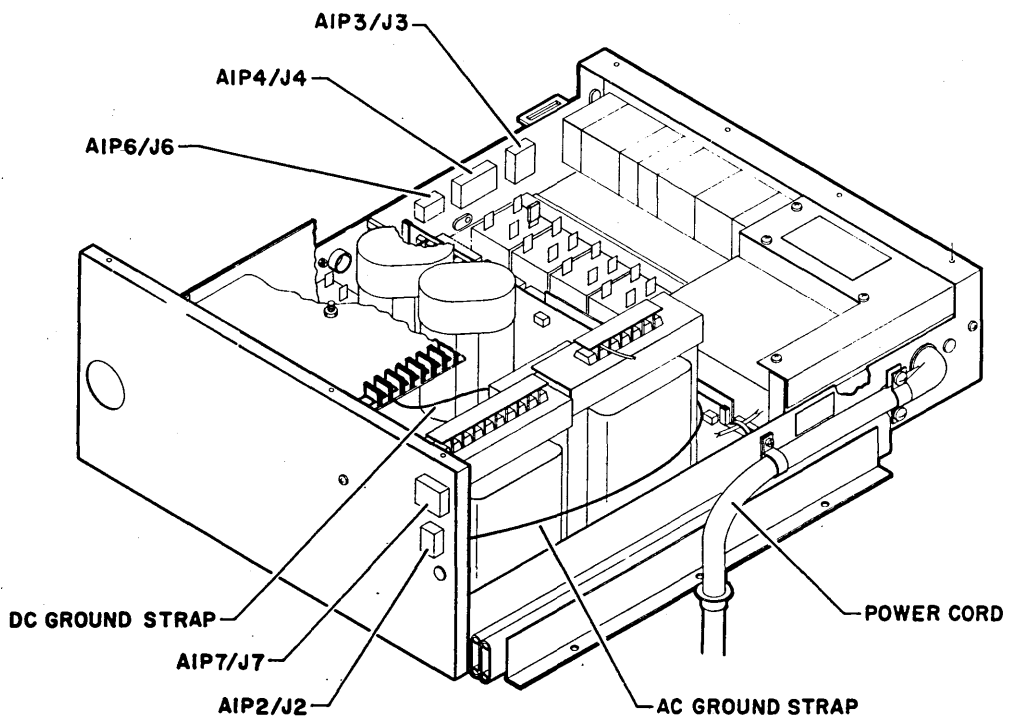
1. Open rear door and place MAIN AC circuit breaker down.
2. Disconnect ac power cord.
3. Remove side panels (para 3.2.4).
4. Remove two screws securing cable guide around power cord and remove guide.
5. Unhook support spring from power cord.
6. Disconnect ALP2, ALP3, ALP4, ALP6, and ALP7 cable connectors from power supply.
7. Disconnect air hose from power supply by turning hose counterclockwise until free.
8. Slide out power supply and remove power supply top cover (para 3.2.6).
9. Disconnect ac and dc ground straps from power supply.
10. Replace power supply top cover and slide supply back in cabinet.
11. Remove six screws securing power supply slides to floor of cabinet and withdraw power supply out rear of cabinet.

### 3.12.18 Power Supply Assembly Replacement

1. Lift new power supply in cabinet and secure slides to cabinet floor with six screws.
2. Remove power supply top cover and connect ac and dc ground straps.
3. Refer to ac power wiring instructions in section 2, installation and checkout, and check whether transformer wiring requires changing.
4. Do steps 3 through 8 of removal procedure in reverse order and action.
5. Connect ac power cord and place all circuit breakers up.
6. Adjust  $\pm 5$  V regulator card (para 3.13.1).



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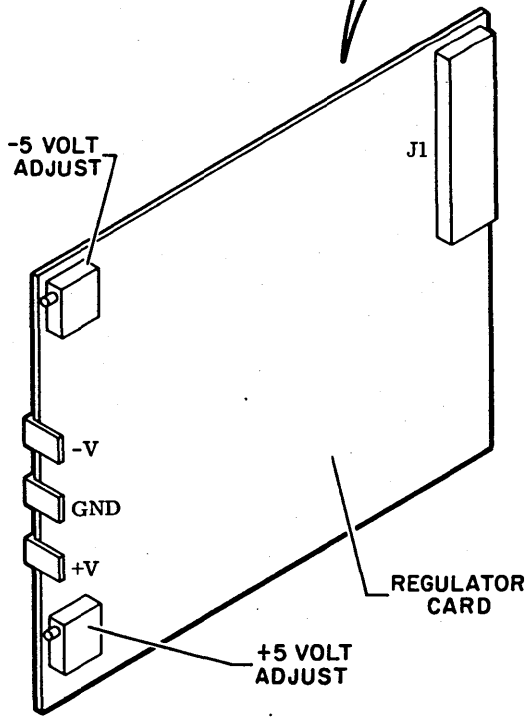
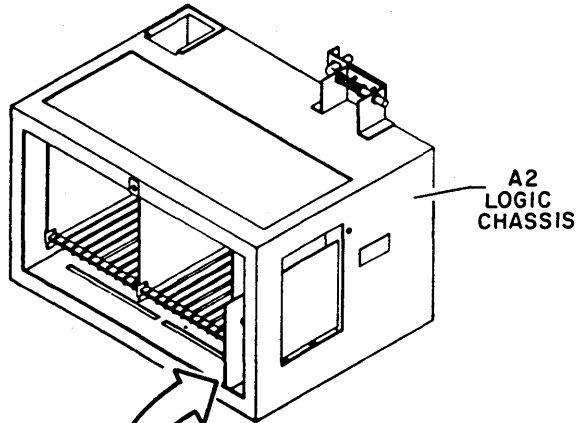


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### 3.13 +5 V REGULATOR CARD (A2PD94)

#### 3.13.1 Adjustment

1. Install scratch disk pack (para 3.0.7.2) and press START switch.
2. Run BASIC diskette IPL diagnostic (para 3.0.10.1).
3. Enter SMD manual diagnostic test 7145 (para 3.0.10.3).
4. Select repeat seek between cylinders 000<sub>16</sub> and 080<sub>16</sub> and head 00<sub>16</sub>.
5. Open rear door. Swing out logic chassis and remove card cage cover (para 3.2.5).
6. Set voltmeter to measure +5 V dc.
7. Measure between ground terminal on front of regulator card and pin JD94-04A on logic chassis backpanel.
8. Adjust bottom potentiometer on regulator card edge for  $+5.1 \pm 0.05$  V.
9. Disconnect meter and set it to measure -5 V dc.
10. Measure between ground terminal on front of regulator card and pin JD94-01A on backpanel.
11. Adjust top potentiometer on regulator card edge for  $-5.1 \pm 0.05$  V.
12. Replace card cage cover and close logic chassis.



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### 3.14 READ/WRITE CHASSIS ASSEMBLY (A3E01-A3E05)

Following procedures cover removal and replacement of read/write chassis A3E05 head select board and A3E04 mother board. No such procedures are given for the three read/write chassis logic cards (A3E01, A3E02, A3E03) because they simply slide in and out of chassis slots.

#### 3.14.1 A3E05 Head Select Board Removal

1. Power-off drive (para 3.0.6.2).
2. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
3. Remove read/write chassis from deck:
  - a. Disconnect A3PE1, A3PE2, A3PE3, and A3PE5 cable connectors from read/write chassis cards.
  - b. Disconnect head cable plugs from head select board.
  - c. Remove four screws securing read/write chassis to deck and remove chassis.
4. Remove four nuts securing head select board to mother board.
5. Carefully pull head select board off pins on mother board.

#### 3.14.2 A3E05 Head Select Board Replacement

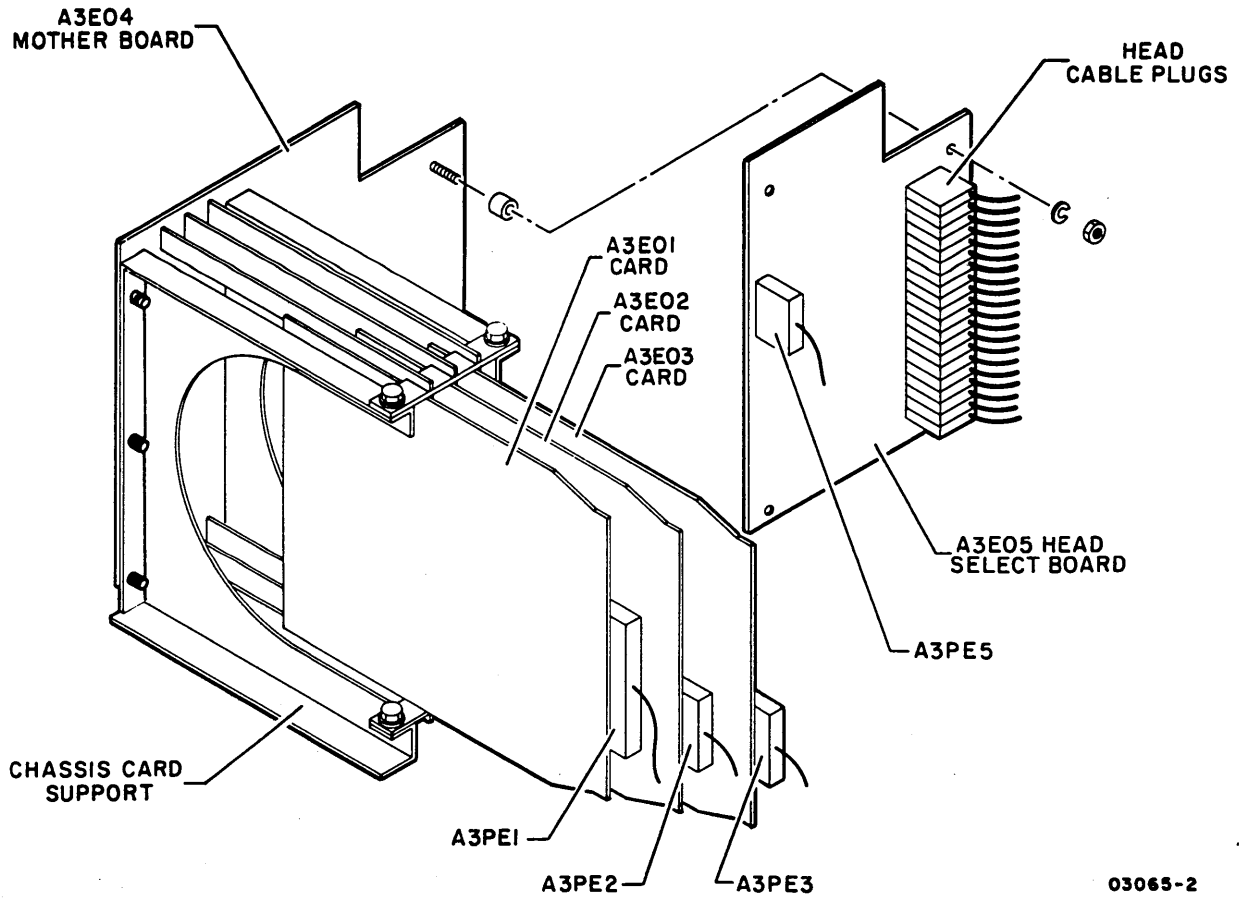
1. Do steps of removal procedure in reverse order and action. Ensure that wires between head arms and plugs are not twisted or kinked when reconnecting head cable plugs.

#### 3.14.3 A3E04 Mother Board Removal

1. Remove A3E05 head select board (para 3.14.1).
2. Tag A3E01, A3E02, and A3E03 cards and remove cards from chassis.
3. Remove six screws securing chassis card support to mother board and remove support.

### 3.14.4 A3E04 Mother Board Replacement

1. Do steps of removal procedure in reverse order and action.



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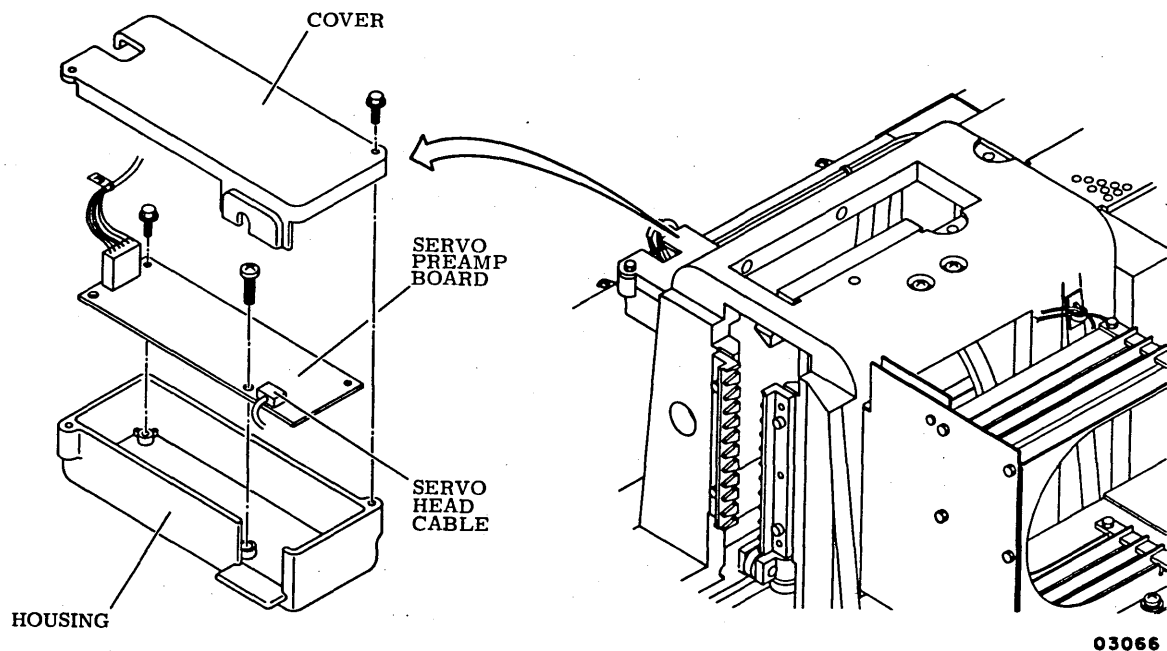
### 3.15 SERVO PREAMPLIFIER BOARD (A3)

#### 3.15.1 Removal

1. Power-off drive (para 3.0.6.2).
2. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
3. Remove two screws securing servo preamplifier cover to housing and remove cover.
4. Disconnect servo head cable plug and A3P8 output plug from servo preamplifier board.
5. Remove two pan head screws securing board and housing to deck.
6. Remove two hexagon head screws securing board to housing and remove board.

#### 3.15.2 Replacement

1. Do steps of removal procedure in reverse order and action.



### 3.16 SPINDLE LOCKSHAFT (A3)

#### 3.16.1 Removal

1. Power-off drive (para 3.0.6.2).
2. Remove side panels (para 3.2.4).
3. Remove disk pack (para 3.0.7.3) and leave pack access cover open.
4. Remove pack sensor assembly (para 3.9.7, steps 1 through 4).

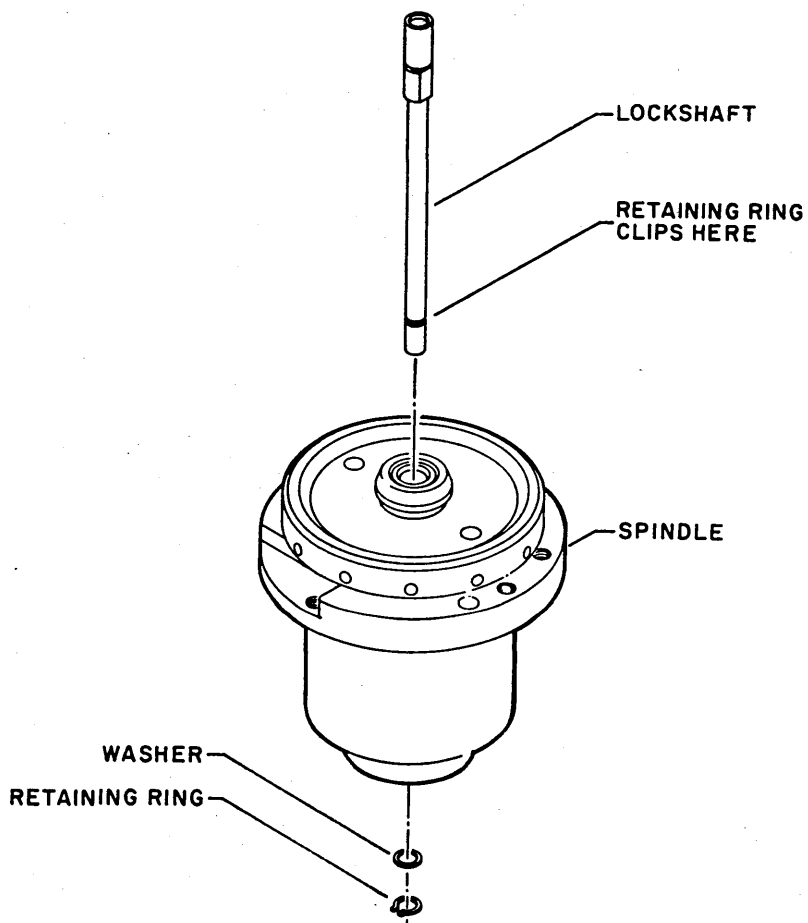
#### NOTE

Next step requires two people.

5. Push top of lockshaft down and remove retaining ring and flat washer from lower part of lockshaft.
6. Carefully raise lockshaft out top of spindle.

#### 3.16.2 Replacement

1. Do steps 5 and 6 of removal procedure in reverse order and action.
2. Replace pack sensor assembly (para 3.9.8, steps 2 through 5).



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### 3.17 VELOCITY TRANSDUCER (A3)

#### 3.17.1 Removal

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
4. Remove magnet cover.
5. Grasp voice coil through magnet opening and extend carriage to access extension rod.
6. Unscrew extension rod from carriage.
7. Disconnect velocity transducer connector A3P4.
8. Remove two screws securing end cap to magnet and remove end cap and spring.
9. Carefully slide coil housing and core (connected to extension rod) from magnet and set on a nonferrous surface.

#### 3.17.2 Replacement

##### CAUTION

Transducer core may be rendered unusable if it comes in contact with magnet.

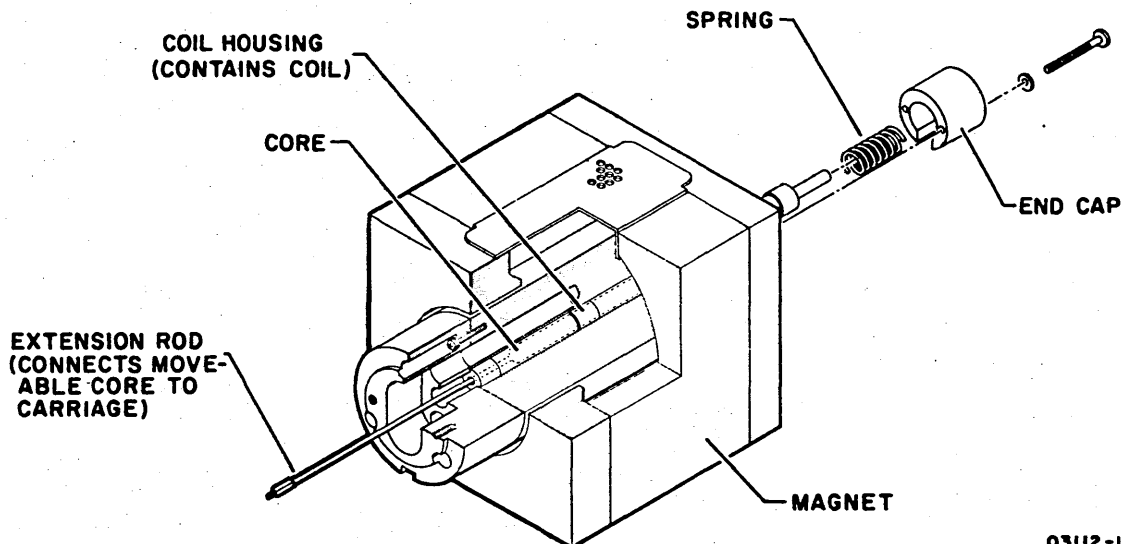
1. Remove replacement coil housing and core from shipping container and set on a nonferrous surface.

##### CAUTION

Replacement core should have red marking on the north pole end of core. The unmarked end (south pole) connects to the extension rod. Whether core has a marked end or not, check replacement core per step 2 to verify polarity. If polarity is incorrect, heads may crash.

2. Place end of replacement core (end without red marking) next to end of defective core that is connected to extension rod. If cores repel each other, that end connects to extension rod; if cores attract each other, opposite end connects to extension rod.

3. Carefully unscrew extension rod from defective core.
4. Apply one drop of Grade C Loctite on threads and screw extension rod into correct end of replacement core. Wipe off excess Loctite.
5. Insert replacement core into replacement coil housing until core is completely contained in housing.
6. Insert housing, core, and extension rod into magnet.
7. Position end cap and spring on magnet and secure with two screws.
8. Apply one drop of Grade C Loctite to threads and screw extension rod into carriage.
9. Connect velocity transducer connector A3P4.
10. Move carriage to fully retracted position and replace magnet cover.
11. Replace deck cover and close top cover.
12. Perform servo adjustments (para 3.20).



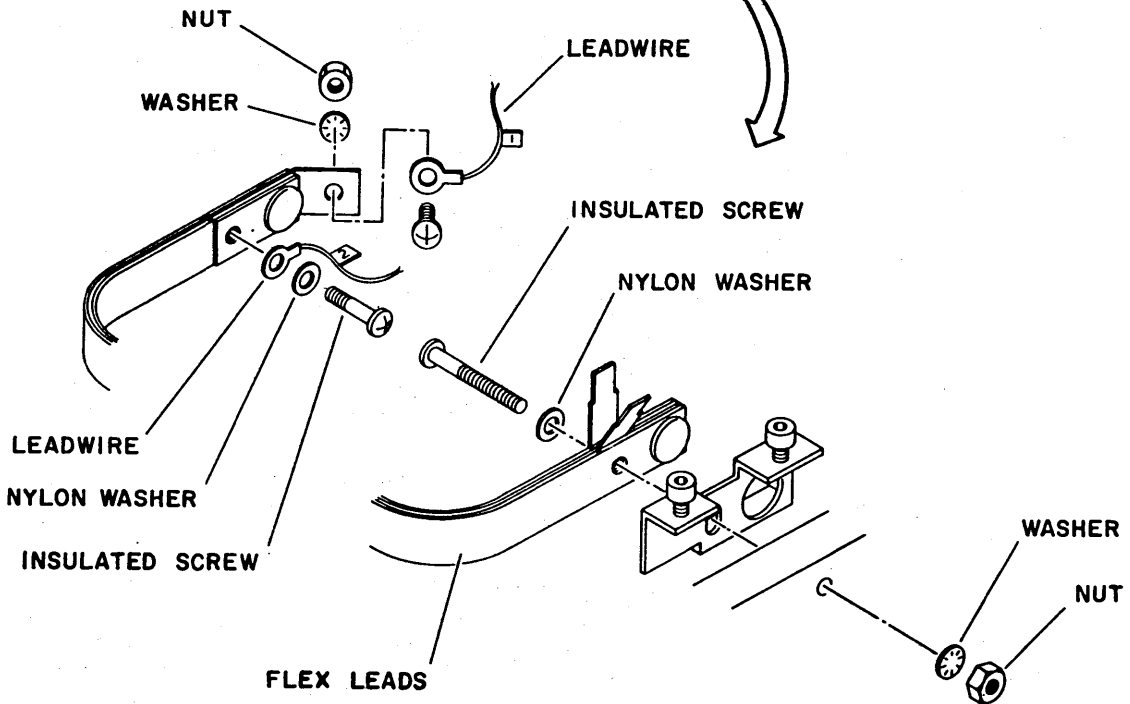
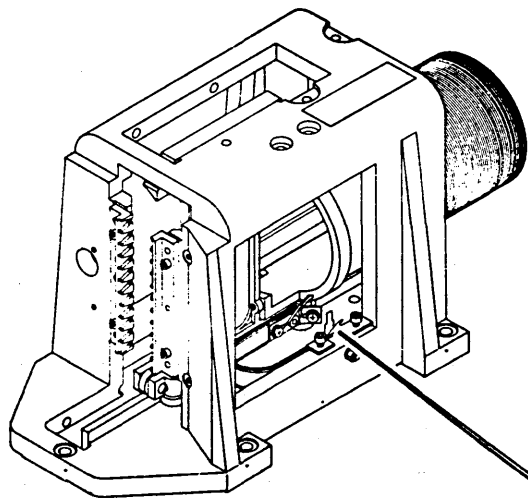
03112-1



### 3.18 VOICE COIL FLEX LEADS (A3)

#### 3.18.1 Removal

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
4. Disconnect cable connectors from A3E01, A3E02, and A3E03 read/write chassis cards and remove cards.
5. Disconnect two connectors from flex lead tabs.
6. Remove nut and insulated screw securing flex leads and mounting bracket to actuator housing.
7. Separate flex leads from mounting bracket and position free end of leads outside actuator.
8. Remove magnet cover.
9. Grasp voice coil through magnet opening and extend carriage so other end of flex leads can be accessed.
10. Remove screw and nut securing leadwire 1 to flex lead.
11. Remove insulated screw securing flex leads and leadwire 2 to carriage and remove flex leads.



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### 3.18.2 Replacement

#### CAUTION

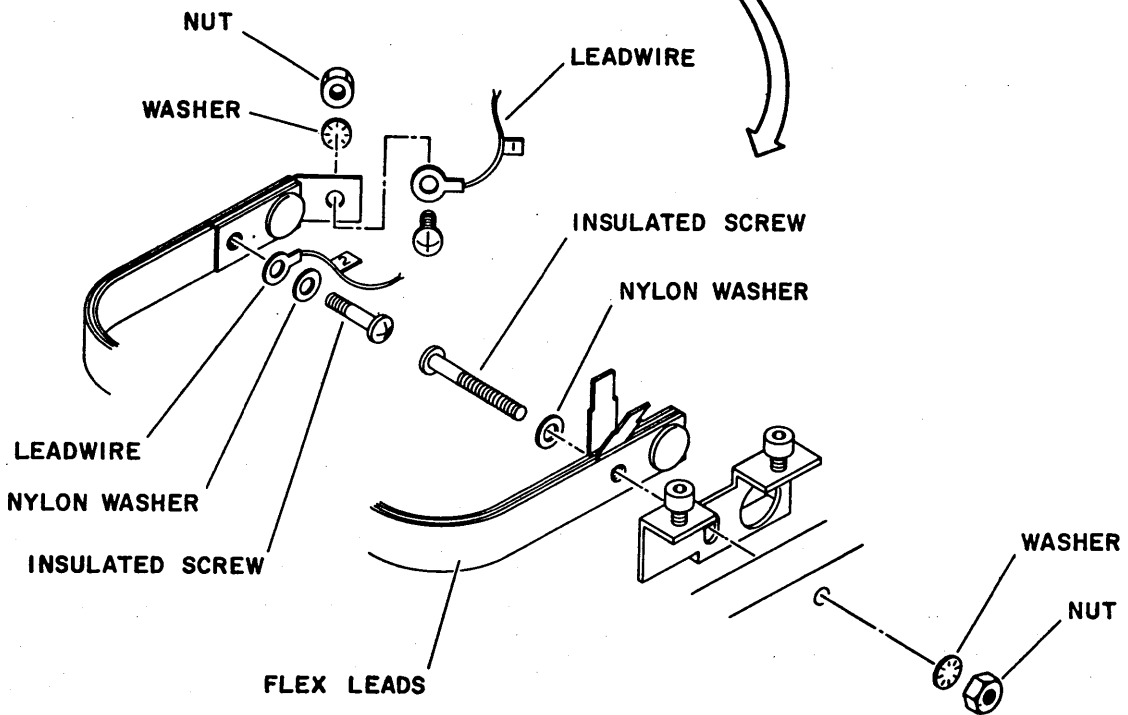
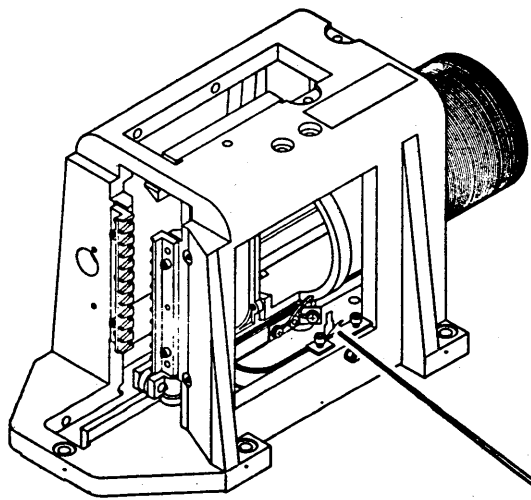
Handle replacement flex leads carefully, do not twist them.

1. Position flex leads inside actuator.

#### NOTE

Apply one drop of Grade C Loctite to screws in steps 2, 3, and 4.

2. Secure flex lead and leadwire 2 to carriage with insulated screw.
3. Secure leadwire 1 to flex lead with screw and nut.
4. Secure flex lead and mounting bracket to actuator with insulated screw and nut.
5. Ensure that outer flex lead does not touch carriage. If necessary, carefully bend lead until it does not touch.
6. Ensure that flex leads are parallel. If necessary, loosen all screws and adjust leads until parallel.
7. Slide carriage back and forth full length of rails. If flex leads interfere with carriage movement, adjust mounting bracket and/or leads as necessary.
8. Connect yellow wire connector to outer flex lead tab; brown wire connector to inner flex lead tab.
9. Replace A3E01, A3E02, and A3E03 cards in read/write chassis and reconnect cable connectors.
10. Move carriage to fully retracted position and replace magnet cover.
11. Replace deck cover and close top cover.



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### 3.19 SERVO AND READ/WRITE HEADS (A3)

#### 3.19.1 Preparation for Alignment Check

##### NOTE

CE disk pack, head alignment card, and drive must be in the same temperature environment for at least 60 minutes preceding this procedure. During this procedure, CE pack must then be purged for 30 minutes before performing head alignment check. If alignment check is being performed on more than one drive, CE pack needs only a 15 minute purge per drive after first alignment check has been performed.

1. Power-off drive (para 3.0.6.2).
2. Swing out logic chassis and remove card cage cover (para 3.2.5).

##### NOTE

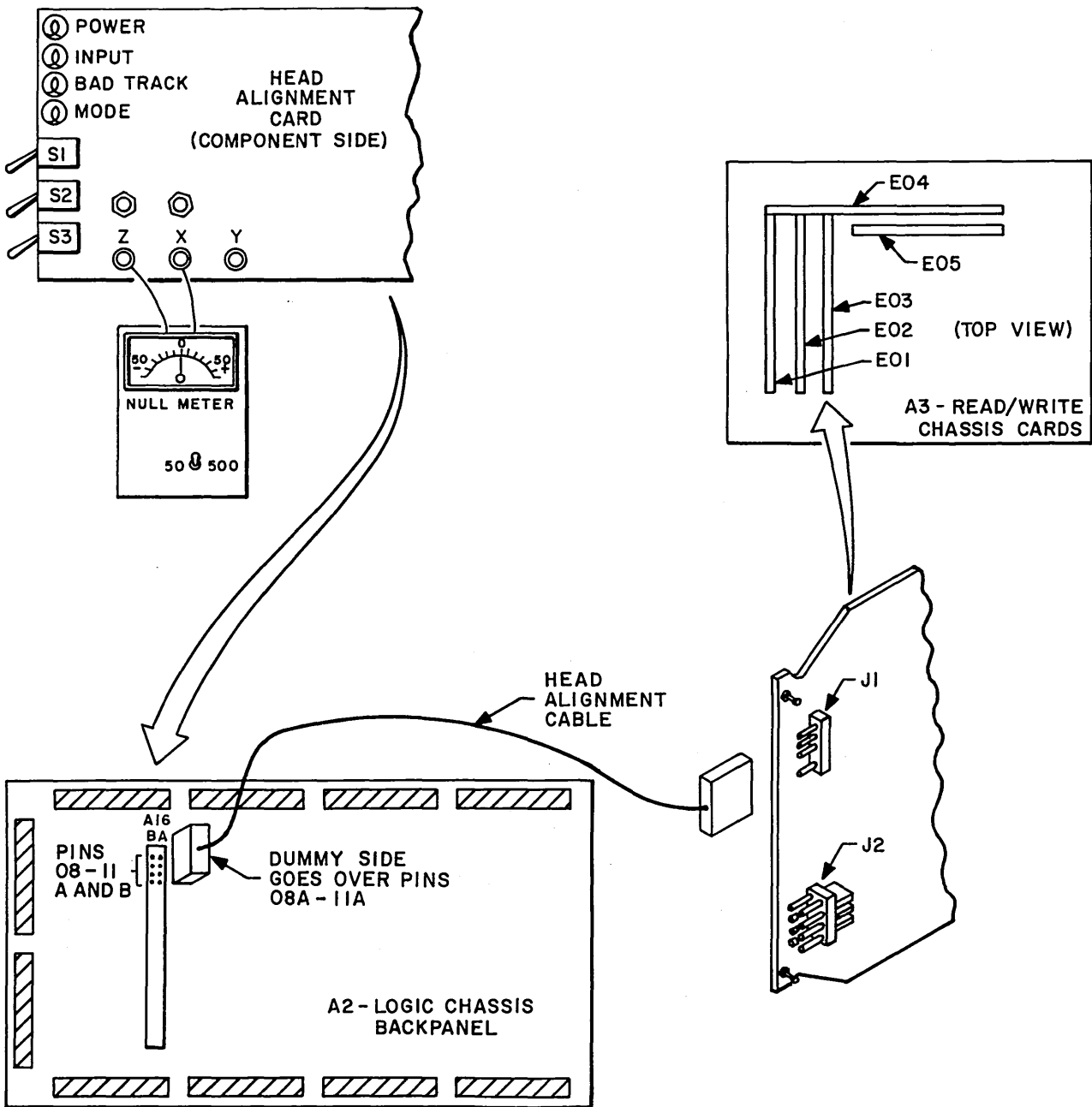
Installing head alignment card disables writing on disk pack.

3. Install head alignment card\* in A16 of logic chassis.
4. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
5. Connect head alignment cable\* between logic chassis back-panel and J1 on E03 read/write chassis card as shown in following illustration.
6. Connect null meter\* to head alignment card:
  - Black (negative) probe to test point Z
  - Red (positive) probe to test point X

---

\*Item of head alignment kit (CDC part number 77440500; para 3.0.11)

7. Place MAIN AC circuit breaker up.
8. Install CE disk pack (CDC part number 70430003; para 3.0.7.2) and press START switch.
9. Allow CE pack to purge for 30 minutes (15 minutes if pack was just taken from another drive) before proceeding with head alignment check (para 3.19.2).



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## 3.19.2 Alignment Check

## NOTE

Alignment of servo head, which this procedure checks first, is not physically adjustable like read/write heads. If servo head is not tracking accurately (servo head offset not within limits), problem is either in servo system electronics or a bad servo head. Servo head offset must be within limits before read/write head alignment is checked.

1. Set switches to check offset of servo head:
  - Head alignment card S2 switch to S (servo head).
  - Head alignment card S3 switch to X1.
  - Null meter 50/500 switch to 500 (500 mV scale).
2. Run BASIC diskette IPL diagnostic (para 3.0.10.1).
3. Enter SMD manual diagnostic test 7145 (para 3.0.10.3).
4. Select repeat seek between cylinders  $0F0_{16}$  and  $0F5_{16}$  and head  $00_{16}$ . Allow seeking to occur for 30 seconds.
5. Select direct seek to cylinder  $004_{16}$  and head  $00_{16}$ , then end recalibration.
6. Toggle alignment card S1 switch and observe null meter. If both positive and negative deflections are less than 50 mV, set 50/500 switch to 50 (50 mV scale).

## NOTE

Null meter readings right of zero are positive; left of zero, negative.

7. Check head offset:
  - a. Set S1 switch to P (positive) and record meter reading.
  - b. Set S1 switch to N (negative) and record meter reading.

c. Calculate head offset by using formula:

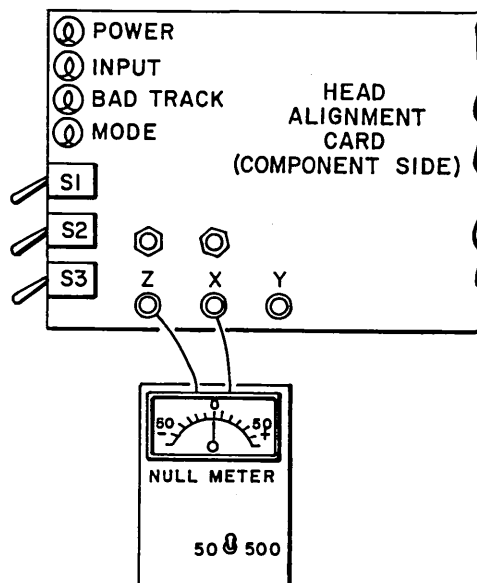
$$(P) - (N) = \text{Offset}$$

Example 1:  $P = +20, N = +15;$   
 $(P) - (N) = (20) - (15) = +5 \text{ mV}$

Example 2:  $P = +20, N = -15;$   
 $(P) - (N) = (20) - (-15) = +35 \text{ mV}$

Example 3:  $P = -20, N = +15;$   
 $(P) - (N) = (-20) - (+15) = -35 \text{ mV}$

8. Servo head offset (either positive or negative) must not exceed 60 mV. If offset is greater than 60 mV, sequentially do following until servo head offset is within limit:
  - a. Replace logic chassis card at A18
  - b. Replace servo preamplifier board (para 3.15.1)
  - c. Replace servo head (para 3.19.6)
9. Record offset calculated in step 7.
10. Select direct seek to cylinder 005<sub>16</sub> and head 00<sub>16</sub>, then end recalibration.
11. Repeat steps 6 through 9.



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12. Calculate sum of servo head offset between cylinders 004 and 005. Besides the 60 mV offset limit per cylinder, the sum of offset at cylinders 004 and 005 must not exceed 30 mV.

Example 1: Offset at 004 = -50 mV  
Offset at 005 = +50 mV  
 $(-50) + (+50) = 0$  mV

Example 2: Offset at 004 = -40 mV  
Offset at 005 = -10 mV  
 $(-40) + (-10) = -50$  mV

Offset sum of example 1 is within limit; sum of example 2 is not. If sum (either positive or negative) is greater than 30 mV, take corrective action given in step 8.

13. Select direct seek to cylinder  $320_{16}$  ( $800_{10}$ ) and head  $00_{16}$ . End recalibration.
14. Repeat steps 6 through 8.
15. Enter head alignment routine of test 7145. Routine automatically positions heads on alignment cylinder  $1EB_{16}$  ( $491_{10}$ ) and selects head  $00_{16}$ .
16. Repeat steps 6 through 8.
17. Set switches to check offset of read/write heads:
  - Head alignment card S2 switch to R/W.
  - Head alignment card S3 switch to X1.
  - Null meter 50/500 switch to 500.
18. Check offset of each read/write head at cylinder  $1EB_{16}$  (cylinder that heads are at presently) by doing following:
  - a. Select head to be checked, 00 through  $12_{16}$  (00 through  $18_{10}$ ). At present, head  $00_{16}$  is selected. After checking head  $00_{16}$ , increment head number to select head  $01_{16}$ . Repeat head increment until all heads are checked.
  - b. Check offset of selected head per step 7.
  - c. Make note of any head having an offset (either positive or negative) greater than 150 mV. Offsets greater than 150 mV require adjustment.

CAUTION

A read/write head offset that exceeds 300 mV is excessively misaligned. All pack data written with that head must be transferred to other storage before alignment adjustment or data may be lost.

19. If offset of any read/write head was greater than 150 mV, adjust alignment of that head (para 3.19.3). If no offset exceeded 150 mV, disconnect setup:
  - a. End diagnostic test 7145.
  - b. Press START switch and remove CE disk pack.
  - c. Place MAIN AC circuit breaker down.
  - d. Disconnect null meter and remove head alignment card.
  - e. Disconnect head alignment cable.
  - f. Replace card cage cover and close logic chassis.
  - g. Replace deck cover and close top cover.

### 3.19.3 Read/Write Head Alignment Adjustment

1. Press START switch to stop CE pack and unload heads.
2. Using following illustration, locate heads requiring alignment adjustment.

#### NOTE

If head 10<sub>16</sub>, 11<sub>16</sub>, or 12<sub>16</sub> require adjustment, manually extend carriage far enough to do next step. Then return carriage to retracted position.

3. Loosen clamping screw of each head requiring adjustment, then retighten these clamping screws to 4  $\pm$  1/2 lbf·in (0.5  $\pm$  0.1 N·m ).
4. Connect oscilloscope to head alignment card:
  - Ground probe to test point Z
  - Using X10 probe, Channel 1 to test point Y (dibits)
5. Set oscilloscope:
  - Channel 1 VOLTS/DIV for 20 mV/cm
  - Channel A TIME/DIV for 1 us/cm
  - Channel A Triggering for positive INTERNAL
6. Press START switch.
7. Enter head alignment routine of test 7145 to position heads on alignment cylinder 1EB<sub>16</sub> (491<sub>10</sub>). Head 00<sub>16</sub> automatically is selected. If not adjusting that head, increment head number to first sequential head requiring adjustment.

#### WARNING

Failure to place carriage locking pin in ALIGN TRACK LOCK hole allows carriage to retract while hands are in actuator.

#### CAUTION

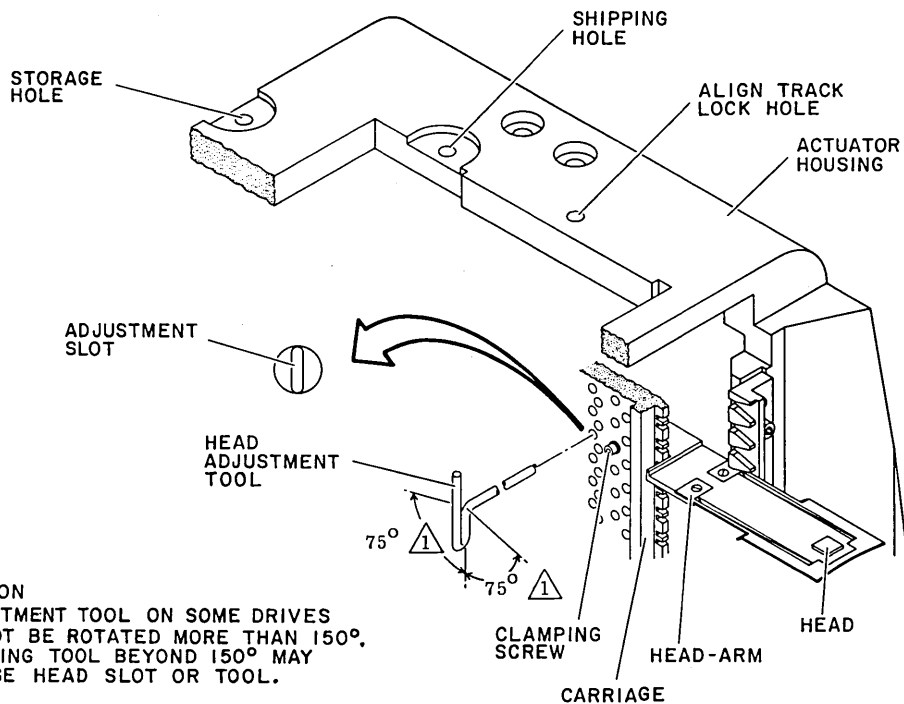
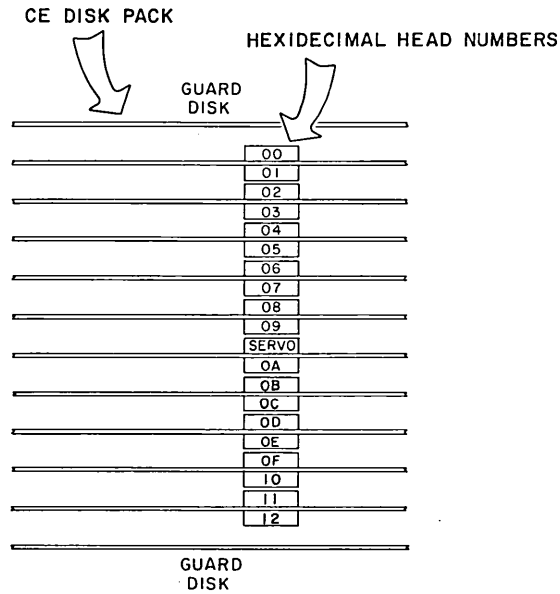
With locking pin in ALIGN TRACK LOCK hole, drive and pack are susceptible to damage. If an emergency retract condition occurs, such as loss of ac power, power amplifier transistors may blow and heads will crash on stationary CE pack.

8. Place carriage locking pin in ALIGN TRACK LOCK hole of actuator.

## CAUTION

Ensure end of head adjustment tool is clean and polished. Keep tool perpendicular to adjustment slot at all times.

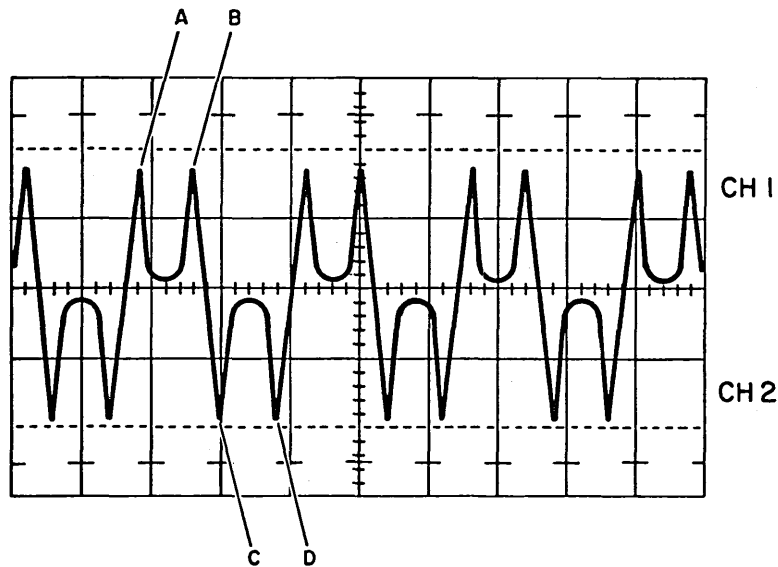
9. Insert head adjustment tool (CDC part number 75018800) in adjustment slot of head being adjusted.



- ⚠ CAUTION  
ADJUSTMENT TOOL ON SOME DRIVES  
CANNOT BE ROTATED MORE THAN 150°.  
ROTATING TOOL BEYOND 150° MAY  
DAMAGE HEAD SLOT OR TOOL.

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10. Observe oscilloscope and rotate head adjustment tool for balanced dibit pattern. Pattern is balanced when point A amplitude equals point B and point C equals point D.



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11. If end of adjustment travel occurs before step 10 can be achieved, correct as follows:
- a. Move carriage locking pin to STORAGE hole and end head alignment routine.
  - b. Press START switch and loosen clamping screw of servo head.
  - c. Using head adjustment tool, center servo head adjustment slot within its carriage hole.
  - d. Tighten servo head clamping screw to  $12 \pm 1/2$  lbf·in ( $1.4 \pm 0.1$  N·m).
  - e. Start procedure over again and adjust alignment of all read/write heads.
12. Check offset of adjusted head with null meter (step 7, para 3.19.2). If offset exceeds 75 mV, repeat step 10 until offset is less than 75 mV.

13. Increment head number to next sequential head requiring adjustment and repeat steps 9 through 12.

CAUTION

Carriage locking pin must be removed  
from ALIGN TRACK LOCK hole before  
ending head alignment routine.

14. When head adjustment is complete, move carriage locking pin to STORAGE hole and end head alignment routine.
15. Press START switch and carefully tighten clamping screw of each adjusted head to  $12 \pm 1/2$  lbf·in ( $1.4 \pm 0.1$  N·m).
16. Press START switch.
17. Reenter test 7145 head alignment routine and check offset of each adjusted head (step 7, para 3.19.2). A head having an offset greater than 150 mV must be readjusted.
18. End head alignment routine. Enter test 7145 again and select repeat seek between cylinders 0F0<sub>16</sub> and 0F5<sub>16</sub> and any head. Allow seeking to occur for 30 seconds.
19. End seek. Unload and load heads (using START switch) a minimum of two times.
20. Repeat step 17.
21. Disconnect setup:
  - a. End diagnostic test 7145.
  - b. Press START switch and remove CE disk pack.
  - c. Place MAIN AC circuit breaker down.
  - d. Disconnect null meter and oscilloscope.
  - e. Remove head alignment card.
  - f. Disconnect head alignment cable.
  - g. Replace card cage cover and close logic chassis.
  - h. Replace deck cover and close top cover.

### 3.19.4 Head Inspection

#### CAUTION

Any of the following conditions require head inspection. Immediately remove pack from drive. Do not use pack or drive until assured that pack and heads are not damaged.

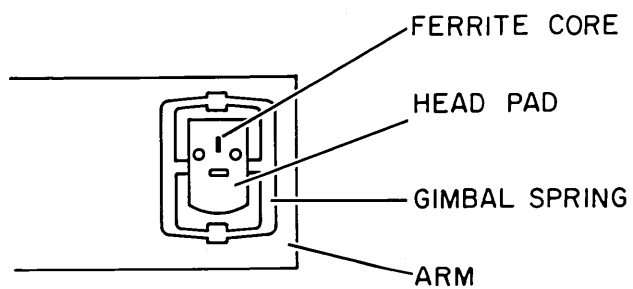
- A head experienced excessive data errors.
  - Head crash suspected: audible ping, scratching noise, or burning odor present during operation.
  - A disk pack contaminated with dust or oil was used in drive.
1. Remove disk pack (para 3.0.7.3).
  2. Open rear door and place MAIN AC circuit breaker down.
  3. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
  4. Remove all heads that require inspection (para 3.19.6).

#### CAUTION

Do not smoke while inspecting heads. Do not touch head pad or gimbal spring with fingers or tools. If laying down head arm, place head-pad side up.

5. Visually inspect each head to determine whether it requires replacement. Replacement is necessary if any of the following exists:
  - Repeated reddish-brown oxide buildup on same head.
  - Appreciable oxide buildup that cannot be removed by cleaning.
  - Scratches on head pad.
  - Imbedded particles in head pad.

- Bent gimbal spring.
  - Damaged head arm.
6. If a head has slight oxide buildup and is good otherwise, clean the head (para 3.19.5, starting with step 4).
  7. Install replacement or determined good heads in vacant head locations (para 3.19.7).



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### 3.19.5 Head Cleaning

#### CAUTION

Head cleaning is a delicate procedure that will damage head if done incorrectly. Cleaning is only done when determined necessary through head inspection (para 3.19.4) or when a head has been accidentally touched.

1. Power-off drive (para 3.0.6.2).
2. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
3. Remove head that requires cleaning (para 3.19.6).

#### CAUTION

In following step, hold can of dust remover upright (vertical). If not held upright, liquid propellant will spray on head. Do not smoke during cleaning.

4. Using spray dry dust remover (CDC part number 95047800), blow off all loose particles from head pad area. Hold nozzle 1/4 to 1/2 in (6 to 12 mm) from head pad. Spray back and forth across head pad, making certain to hold can upright.
5. Place an unpunched, clean computer card with backside up (printing down) on a clean and flat working surface.

#### CAUTION

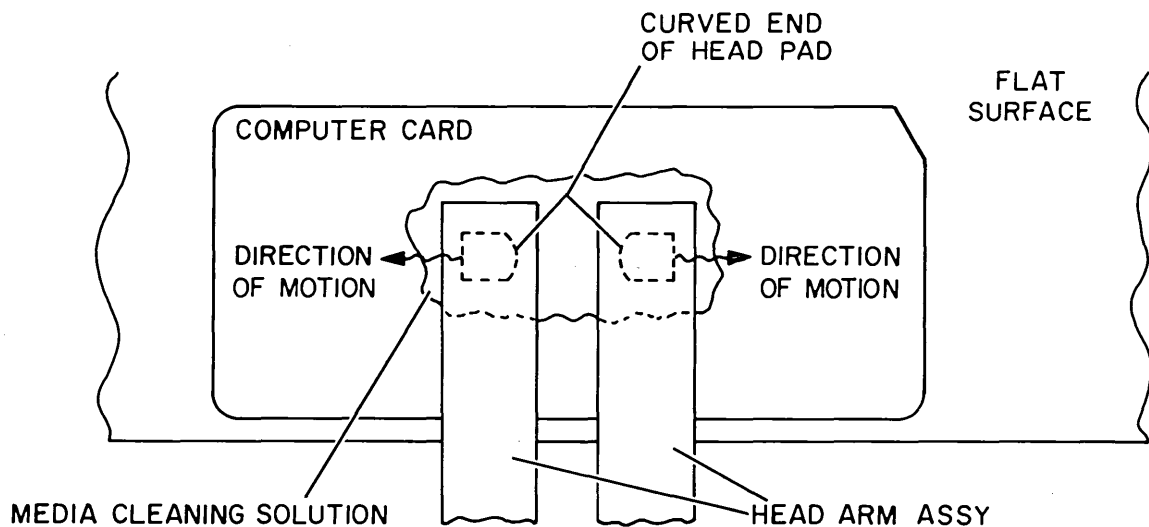
Avoid using excess cleaning solution. Excess solution on head cable will stiffen cable and subsequently cause wires to break.

6. Moisten a small area in center of card with media cleaning solution (CDC part number 95033502).

CAUTION

Inspect media cleaning solution for rust and dirt. Do not use contaminated solution.

7. Carefully place head pad on moistened area and move pad from moistened area to dry area in a zig-zag motion as shown in illustration. Direction of motion must be away from curved end of head pad or computer card will tear.
8. If solution and card become discolored, repeat steps 5 through 7 using clean card and solution until no discoloration occurs.
9. Inspect head. If all oxide deposits are removed, reinstall head (para 3.19.7); if not, install a replacement head (para 3.19.7).



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### 3.19.6 Head Removal

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
4. Open pack access cover as far as possible.
5. Using following illustration, locate head that is to be removed.
6. If removing a read/write head, disconnect its cable plug from read/write chassis.
7. If removing servo head, do following:
  - a. Disconnect servo head jumper plug from connector on actuator housing.
  - b. Remove two screws securing servo preamplifier cover and remove cover.
  - c. Disconnect servo head cable plug from servo preamplifier board.

#### NOTE

If removing head 10<sub>16</sub>, 11<sub>16</sub>, or 12<sub>16</sub>, manually extend carriage to access clamping screw during next step.

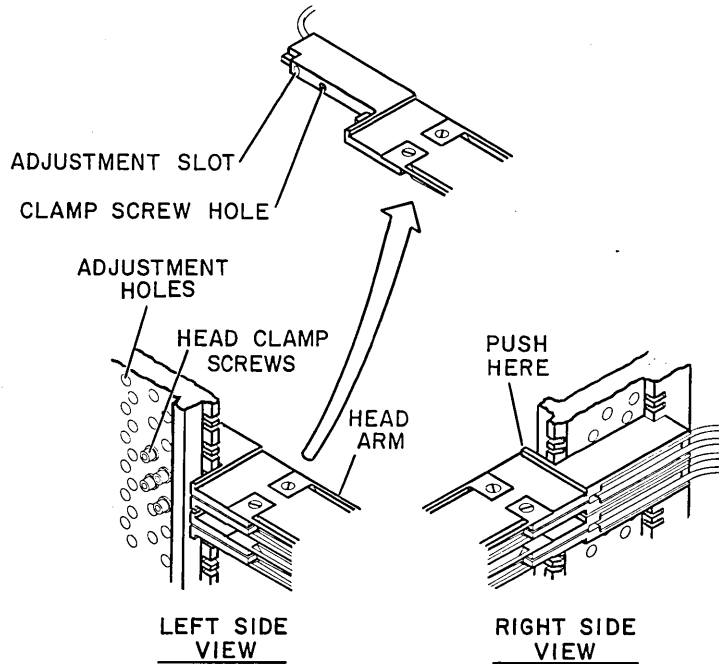
8. Remove clamping screw securing head to carriage.
9. Remove magnet cover.
10. Grasp voice coil through magnet opening and carefully extend carriage all the way forward.

#### CAUTION

Head pads and gimbal springs are extremely delicate and easily damaged. Grasp head carefully and only by edges of head arm. Clean head (para 3.19.5) if head pad is touched.

11. Carefully grasp edges of head arm from front and gently push rear of head arm as shown. Guide cable plug(s) and carefully withdraw head arm and cable out front of carriage.
12. Retract carriage and repeat steps 5 through 11 for each head to be removed.

DISK SURFACE NUMBER	HEXIDECIMAL HEAD NUMBERS
GUARD DISK	
0	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
10	SERVO
11	0A
12	0B
13	0C
14	0D
15	0E
16	0F
17	10
18	11
19	12
GUARD DISK	



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### 3.19.7 Head Replacement

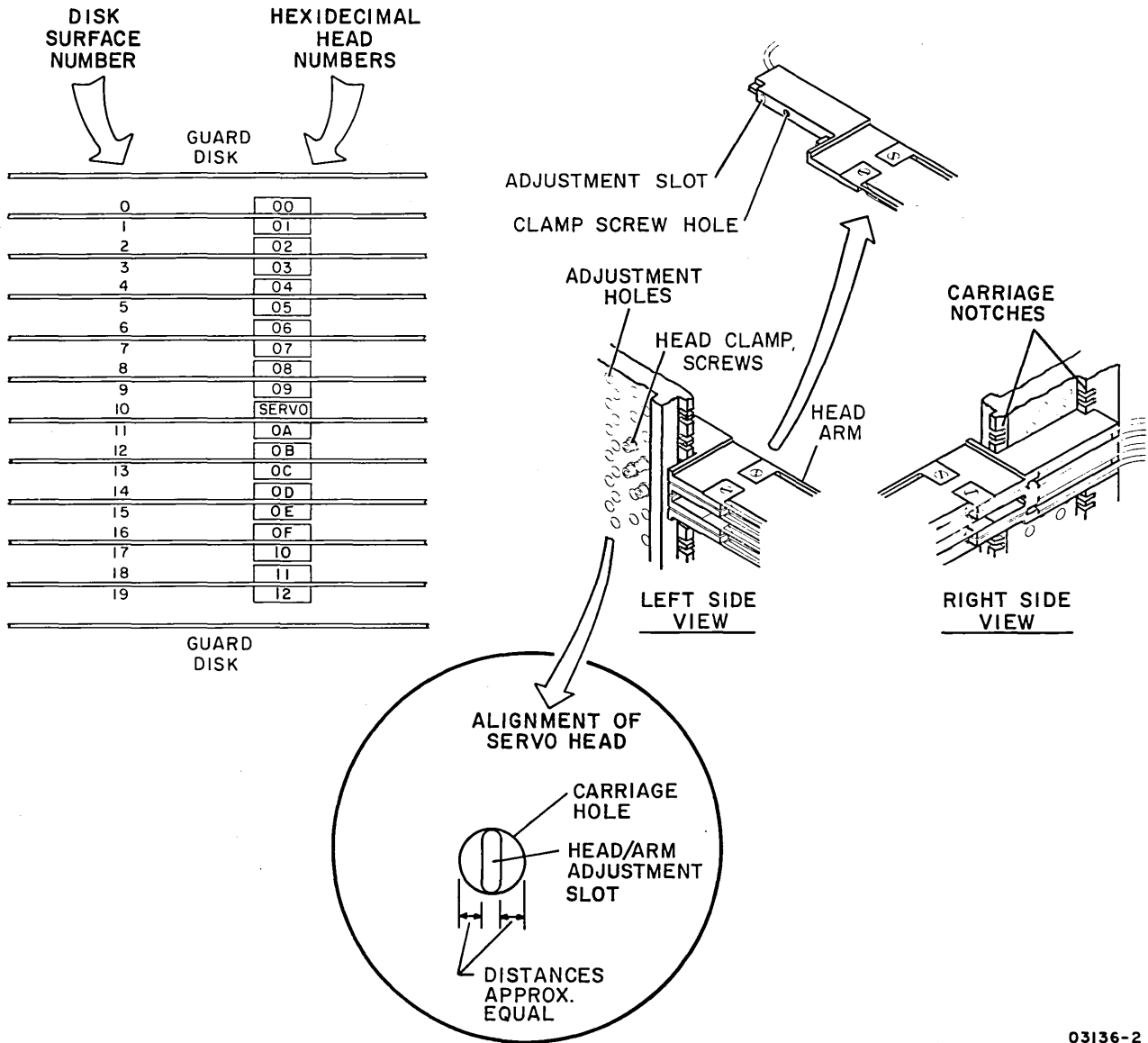
1. Grasp voice coil through magnet opening and extend carriage all the way forward.

#### CAUTION

Ensure that plug and cable do not contact head pads on adjacent heads or these heads may be damaged.

2. Carefully guide head cable plug between front of adjacent heads.
3. Seat head arm in both front and rear notches on carriage.
4. Install clamping screw as follows:
  - a. Retract carriage enough to access clamping screw hole in carriage.
  - b. Hold head arm from opposite side and install clamping screw.
  - c. If installing read/write head, tighten clamping screw to  $4 \pm 1/2$  lbf·in ( $0.5 \pm 0.1$  N·m).
  - d. If installing servo head, insert head adjustment tool (CDC part number 75018800) into servo head adjustment slot. Appropriately turn adjustment tool until adjustment slot is centered within adjustment hole as shown in illustration. Use care not to disturb this alignment and tighten clamping screw to  $12 \pm 1/2$  lbf·in ( $1.4 \pm 0.1$  N·m).
5. Retract carriage.
6. If installing read/write head, connect head cable plug to corresponding connector on read/write chassis.
7. If installing servo head, do following:
  - a. Connect servo head jumper plug to connector on actuator housing.
  - b. Connect servo head cable plug to servo preamplifier board.
  - c. Replace servo preamplifier cover and secure with two screws.
8. Repeat steps 1 through 7 for each head to be installed.

9. Replace magnet cover.
10. If head(s) installed did not include servo head, perform:
  - a. Preparation for alignment check (para 3.19.1).
  - b. Alignment adjustment (para 3.19.3) on those heads which have been installed.
11. If head(s) installed did include servo head, perform:
  - a. Preparation for alignment check (para 3.19.1).
  - b. Alignment check (para 3.19.2) on all heads.
  - c. Alignment adjustment (para 3.19.3) on heads that fail alignment check.



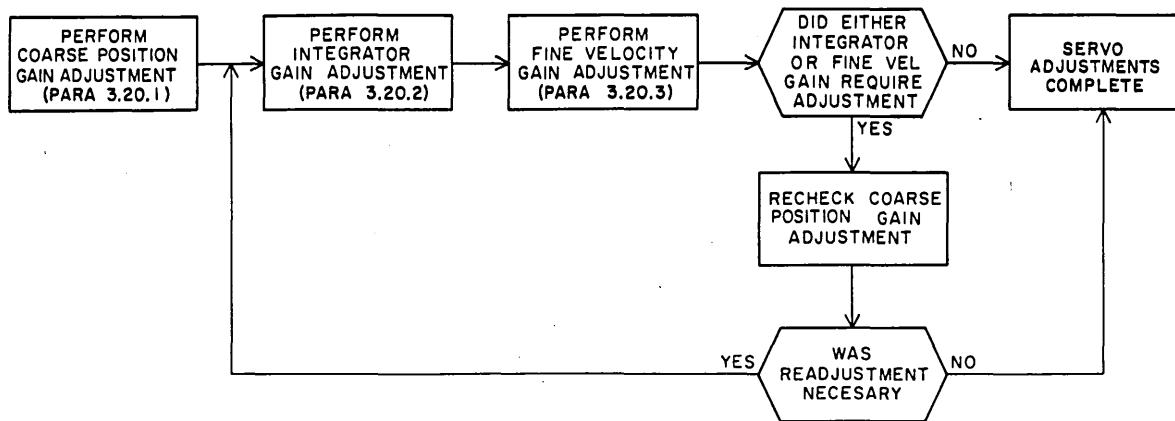
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### 3.20 SERVO ADJUSTMENTS

Servo adjustments include:

- Coarse position gain adjustment (para 3.20.1)
- Integrator gain adjustment (para 3.20.2)
- Fine velocity gain adjustment (para 3.20.3)

Collectively, these adjustments allow fast seek response without overshoot (going past the desired track or cylinder). The adjustments are interacting and must be done in the sequence shown in following flowchart.

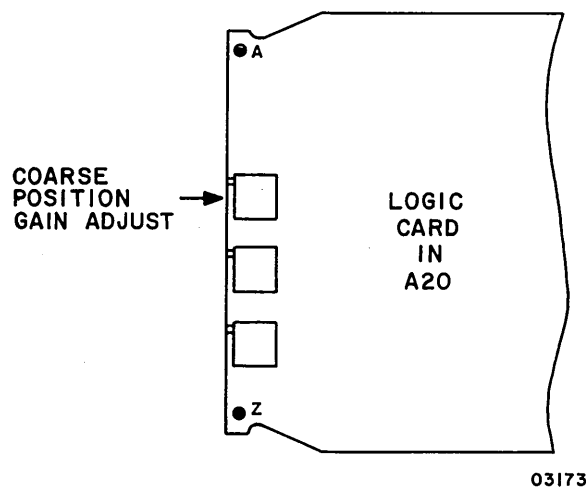


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#### 3.20.1 Coarse Position Gain Adjustment

1. Power-off drive (para 3.0.6.2).
2. Swing out logic chassis and remove card cage cover (para 3.2.5).
3. Connect oscilloscope to following logic chassis backpanel pins:
  - Ground probe to A07-01A
  - Using X10 probe, Channel 1 to A07-03A (On Cylinder)

- Triggering probe to A07-07A (Forward Seek)
4. Set oscilloscope:
    - Channel 1 VOLTS/DIV for 2.0 V/cm
    - Channel A TIME/DIV for 20 ms/cm
    - Channel A Triggering for negative External
  5. Place MAIN AC circuit breaker up.
  6. Install scratch disk pack (para 3.0.7.2) and press START switch.
  7. Run BASIC diskette IPL diagnostic (para 3.0.10.1).
  8. Enter SMD manual diagnostic test 7145 (para 3.0.10.3).
  9. Select repeat seek between cylinders 000<sub>16</sub> and 336<sub>16</sub> (822<sub>10</sub>) and head 00<sub>16</sub>.
  10. Check that period between positive On Cylinder pulses is 50 to 54 ms. If not within limit, adjust top potentiometer on logic chassis card A20 until limit is met.
  11. Perform integrator gain adjustment (para 3.20.2).





### 3.20.2 Integrator Gain Adjustment

#### 1. Relocate oscilloscope connections:

- Channel 1 probe to backpanel pin A20-02A (Desired Velocity)
- Triggering probe to backpanel pin A12-17B ( $T \leq 7$ ); (Pin row 17 is the unmarked row between 16 and 21)

#### 2. Set oscilloscope:

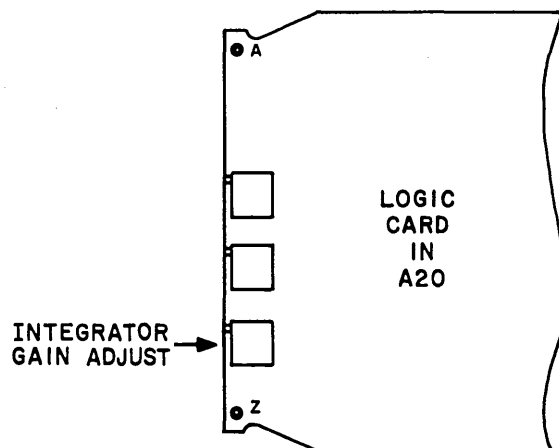
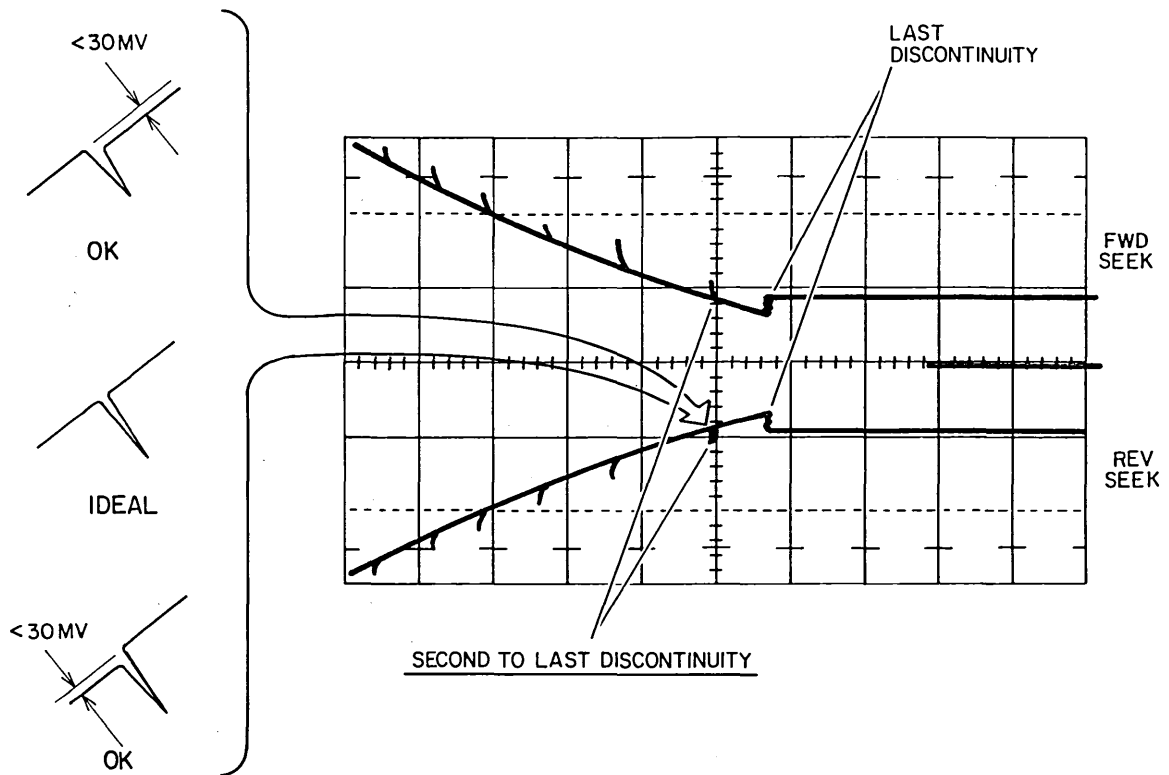
- Channel 1 VOLTS/DIV for 0.5 V/cm
- Channel A TIME/DIV for 0.5 ms/cm
- Channel A Triggering for positive External

#### 3. Select repeat seek between cylinders $000_{16}$ and $080_{16}$ ( $128_{10}$ ) and head $00_{16}$ .

#### 4. Adjust oscilloscope to obtain illustrated waveform pattern. Then set VOLTS/DIV and TIME/DIV controls for higher magnification so second-to-last discontinuity spikes appear in detail.

#### 5. Measure voltage difference between second-to-last discontinuity on each side of spike (see illustrated examples). If difference is greater than 30 mV, adjust bottom potentiometer on logic card A20 until 30 mV or less.

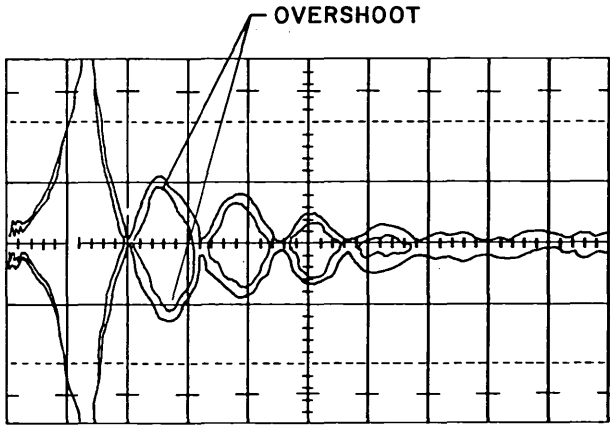
#### 6. Perform fine velocity gain adjustment (para 3.20.3).



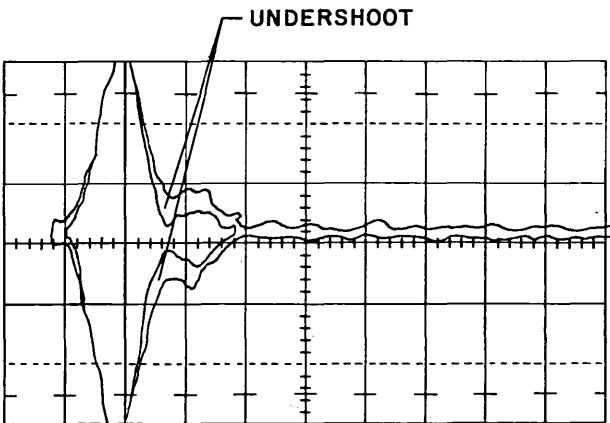
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### 3.20.3 Fine Velocity Gain Adjustment

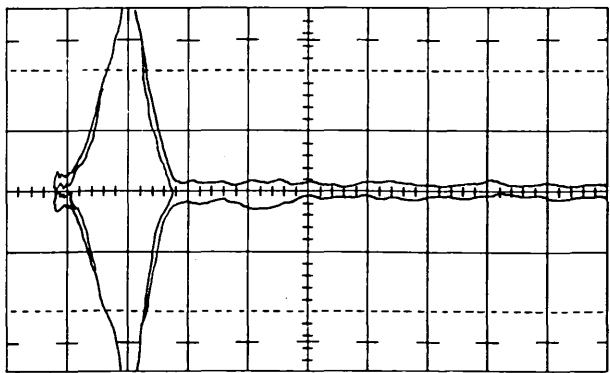
1. Relocate oscilloscope connections:
  - Channel 1 probe to backpanel pin A19-22A (Fine Position Analog)
  - Triggering probe to backpanel pin A07-30A (Seek)
2. Set oscilloscope:
  - Channel 1 VOLTS/DIV for 0.5 V/cm
  - Channel A TIME/DIV for 1 ms/cm
  - Channel A Triggering for negative External
3. Select repeat seek between cylinders  $000_{16}$  and  $001_{16}$  and head  $00_{16}$ .
4. Compare waveform with illustrated examples A, B, and C. Waveform must not have overshoot exceeding 0.5 V or show undershoot. If necessary, adjust middle potentiometer on logic card A20 until these requirements are met. For overshoot, turn potentiometer clockwise; for undershoot, counterclockwise.
5. Select incremental seek to cylinder  $336_{16}$  ( $822_{10}$ ) and head  $00_{16}$ .
6. Check that waveform at each cylinder is like example D, with no overshoot exceeding 0.5 V. If necessary, adjust middle potentiometer on A20 card until within limit.
7. If adjustment was necessary in either this procedure or in preceding integrator gain procedure (para 3.20.2), recheck coarse position gain adjustment (para 3.20.1). If not, return drive to normal operation:
  - a. End diagnostic test 7145.
  - b. Press START switch and remove scratch disk pack.
  - c. Disconnect oscilloscope.
  - d. Replace card cage cover and close logic chassis.



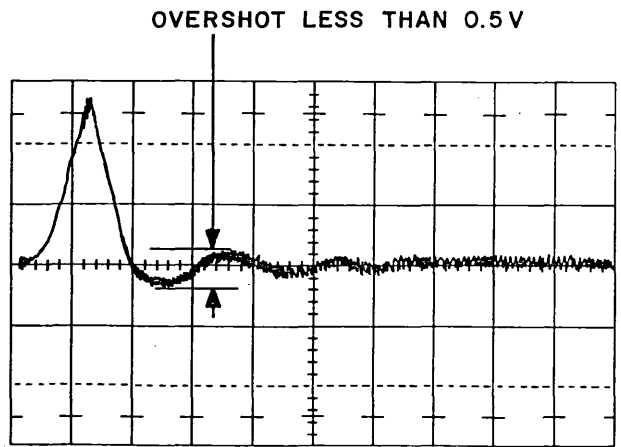
EXAMPLE A - OVERSHOOT



EXAMPLE B - UNDERSHOOT

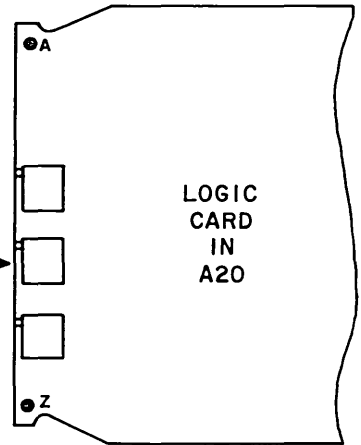


EXAMPLE C - NO OVERSHOOT/UNDERSHOOT



EXAMPLE D - OVERSHOOT OK

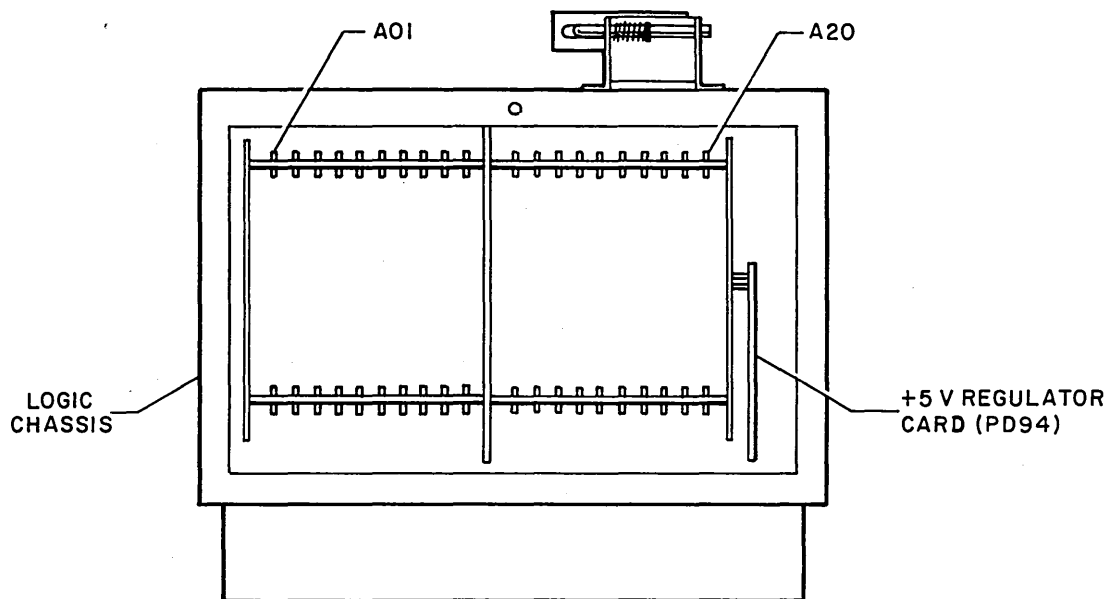
FINE  
VELOCITY  
GAIN ADJUST



### 3.21 ISOLATING VOLTAGE FAULTS

#### 3.21.1 Isolating Logic Chassis Voltage Fault

1. Open rear door and place circuit breakers as follows:
  - +20Y down (kills all dc voltages)
  - All other breakers up, including MAIN AC
2. Swing out logic chassis and remove card cage cover (para 3.2.5).
3. Remove following cards from logic chassis:
  - For isolating +9.7 V fault — all cards except +5 V regulator.
  - For isolating +20 V fault — A10, A14, A15, and A17 through A20.
4. Place +20Y breaker up. If a breaker trips, examine logic chassis backpanel for a short.
5. Place +20Y breaker down.
6. Refer to card placement listing in section 4 and install one of the removed cards. Component side of all cards face right in chassis.
7. Place +20Y breaker up. If a breaker trips:
  - a. Place +20Y breaker down.
  - b. Replace card installed in step 6 with new one.
  - c. Reset tripped breaker.
  - d. Place +20Y breaker up and verify that breaker does not trip again.
8. Repeat steps 5 through 7 for each card that is removed.
9. Replace card cage cover and close logic chassis.

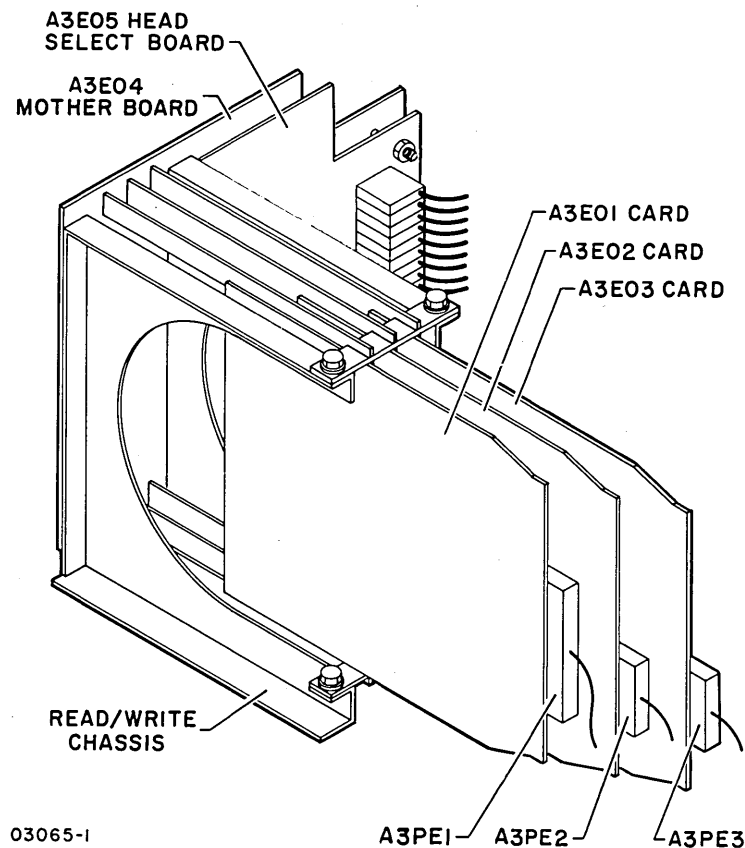


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### 3.21.2 Isolating Read/Write Chassis Voltage Fault

1. Open rear door and place circuit breakers as follows:
  - +20Y down (kills all dc voltages)
  - All other breakers up, including MAIN AC
2. Open top cover (para 3.2.2) and remove deck cover (para 3.2.3).
3. If isolating +9.7 V fault:
  - a. Remove E05 head select board from E04 mother board (para 3.14.1).
  - b. Remove E02 and E03 cards from read/write chassis.
  - c. Temporarily secure read/write chassis to deck with two screws until E05 board is installed.
  - d. Reconnect A3PE1 connector to E01 card.
4. If isolating +20 V or +28 V fault:
  - a. Disconnect A3PE2 and A3PE3 cable connectors from cards.
  - b. Remove E02 and E03 cards from read/write chassis.
5. Place +20Y breaker up. If a breaker trips:
  - a. Place +20Y breaker down.
  - b. Replace E01 card with new one and reconnect A3PE1.
  - c. Reset tripped breaker.
  - d. Place +20Y breaker up.
  - e. If breaker trips again, place +20Y breaker down and remove E01 card.
  - f. Replace E04 mother board with new one (para 3.14.3).
  - g. Install original E01 card and reconnect A3PE1.
  - h. Repeat steps c and d to verify that breaker does not trip.
6. Place +20Y breaker down.
7. Install E02 card.

8. Place +20Y breaker up. If a breaker trips:
  - a. Place +20Y breaker down.
  - b. Replace card installed in step 7 with new one.
  - c. Reset tripped breaker.
  - d. Place +20Y breaker up and verify that breaker does not trip again.
9. Repeat steps 6 through 8 for E03 card and if removed, then for E05 board.
10. If E05 board was removed, secure read/write chassis to deck with four screws.
11. Reconnect all read/write chassis cable connections.
12. Replace deck cover and close top cover.





## 3.21.3 Isolating Below-Normal Voltage Fault

1. With all circuit breakers up, use probe connections listed in Normal Load column of following table and measure the listed voltages.

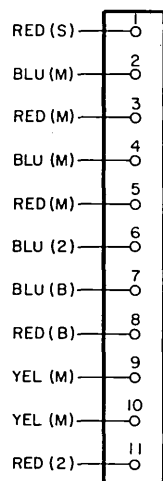
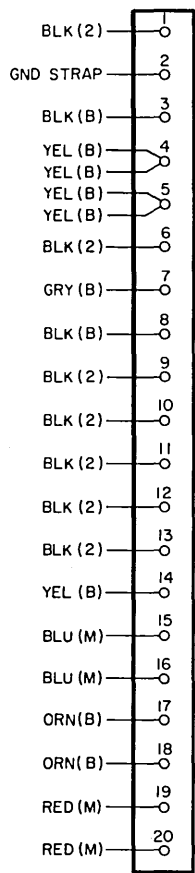
V dc	VOLTMETER CONNECTIONS				ACCEPTABLE V dc RANGE
	NORMAL LOAD (Circuit Breakers Closed)		NO LOAD (Circuit Breakers Open)		
	+PROBE	-PROBE	+PROBE	-PROBE	
+46	+46 Test jack	GND Test jack	AlTB2-8	AlTB1-14	+44 to +51
-46	GND Test jack	-46 Test jack	AlTB1-14	AlTB2-7	-44 to -51
+9.7	+9.7 Test jack	GND Test jack	AlTB2-3	AlTB1-14	+8.7 to +10.7
-9.7	GND Test jack	-9.7 Test jack	AlTB1-14	AlTB2-2	-8.7 to -10.7
+20	+20 Test jack	GND Test jack	AlTB2-5	AlTB1-14	+18 to +24
-20	GND Test jack	-20 Test jack	AlTB1-14	AlTB2-4	-18 to -24
+5	JD94-04A on logic backpanel	GND Terminal on front of +5 V regulator card	—	—	+5.05 to +5.15
-5	GND terminal on front of +5 V regulator card	JD94-01A on logic backpanel	—	—	-5.05 to -5.15

2. If voltages are above acceptable limit, Al7 logic chassis card is indicating false voltage fault. Place MAIN AC breaker down and replace Al7 card. Be sure to set Maintenance Unit Disable switch on new Al7 card to NORM.

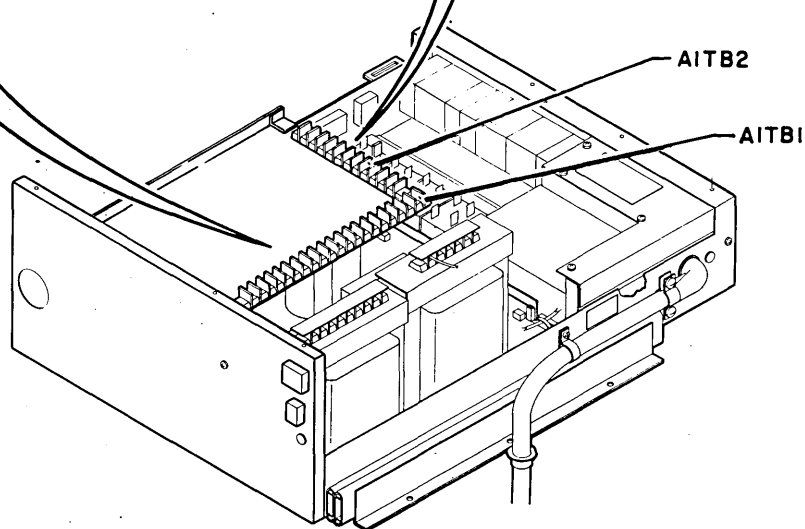
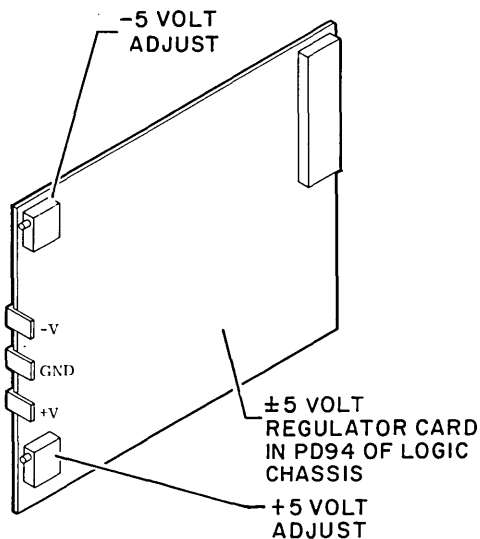
## NOTE

+5 V is derived from +9.7 V; -5 V is derived from -9.7 V. Correcting below normal +9.7 V per step 3 should subsequently correct the respective +5 V.

3. If a voltage other than +5 V or -5 V is below acceptable limit:
  - a. Place circuit breaker for that voltage down to remove load.
  - b. Remove power supply top cover (para 3.2.6).
  - c. Use probe connections listed in No Load column of table and remeasure below-normal voltage.



NOTES:  
 (2) = 2 WIRES IN ONE CONNECTOR  
 (S) = SMALL  
 (M) = MEDIUM  
 (B) = BIG } RELATIVE WIRE SIZE



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- If voltage is now higher, replace capacitor/rectifier board (para 3.12.6).
  - If not higher, check transformer output associated with below-normal voltage (para 3.12.1). If transformer output is OK, replace capacitor/rectifier board (para 3.12.6).
4. If only +5 V or -5 V is below acceptable limit:
- a. Observe meter and adjust the +5 V regulator card potentiometer for the voltage until within acceptable limit. Then press Maintenance Fault Clear switch on A17 logic card to clear Voltage Fault indicator.
  - b. If unable to adjust, place MAIN AC breaker down and replace the +5 V regulator card.
  - c. Adjust +5 V regulator card with drive operating (para 3.13.1).

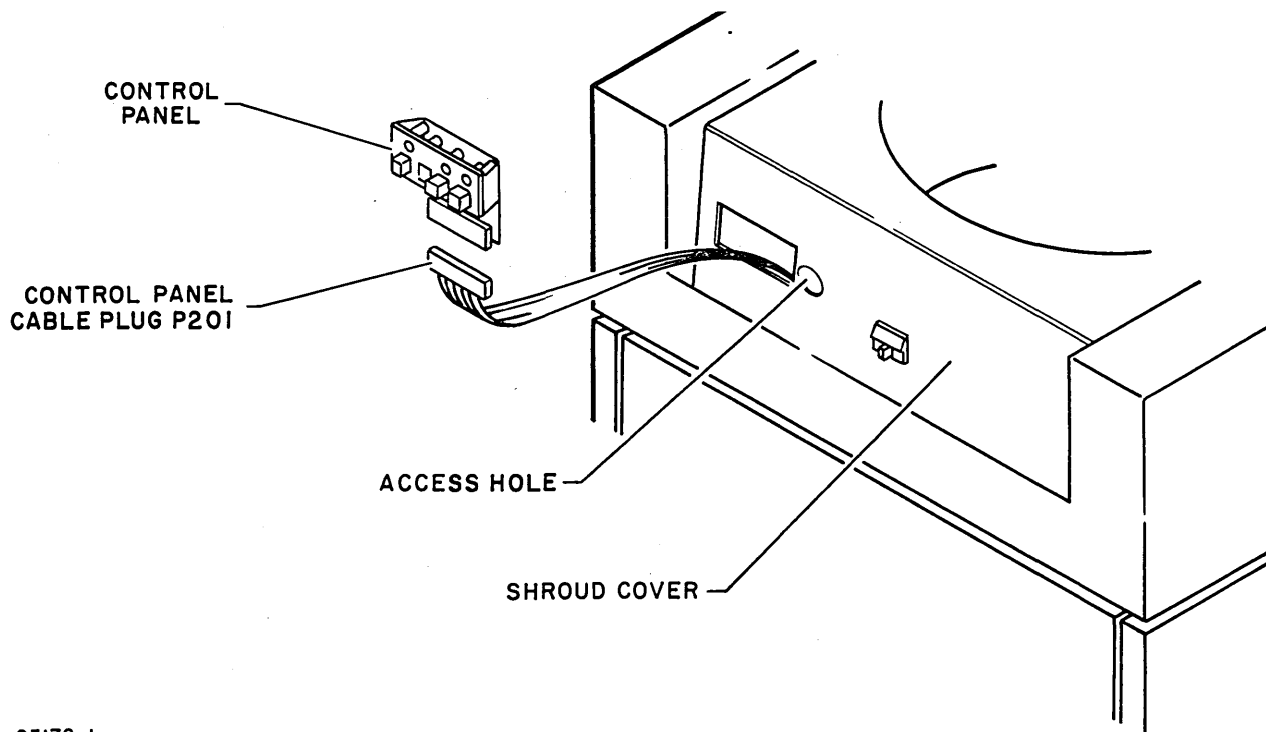
### 3.22 CONTROL PANEL (A4)

#### 3.22.1 Removal

1. Remove disk pack (para 3.0.7.3).
2. Open rear door and place MAIN AC circuit breaker down.
3. Refer to paragraph 3.6.1, step 3, and remove top cover.
4. Open pack access cover.
5. Remove plug from access hole in shroud cover.
6. Use access hole and release control panel from shroud cover.
7. Disconnect control panel cable plug A4P201 and remove control panel.
8. Remove Unit Number lens (beneath READY indicator) for transfer to new control panel.

#### 3.22.2 Replacement

1. Do steps of removal procedure in reverse order and action.



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### 3.23 DISK PACK INITIALIZATION

The following procedure describes use of CDC BASIC diskette utility U71F0 to initialize a scratch disk pack for drive checkout.

#### NOTE

Utility U71F0 does not assign alternate sectors. If sector ID compare errors occur, record errors for future reference.

#### 3.23.1 Operating Instructions

1. Power-on drive (para 3.0.6.1) and install scratch disk pack to be initialized (para 3.0.7.2).
2. Apply power to flexible disk unit and install BASIC diskette (CDC part number 663067XX).
3. Place IPL Source switch on Series/1 operator/programmer panel to Alternate or Primary as applicable to enable loading from diskette.
4. Set Mode switch on operator/programmer panel to Diagnostic position to stop on ID compare errors, or to Normal position to bypass error stops as desired. In Diagnostic position, Start switch on operator/programmer panel must be pressed to continue utility after error stop. If operator/programmer panel is being used as alternate console, set switch to Diagnostic.
5. Press Series/1 operator/programmer panel Load switch. This starts execution of IPL diagnostic. Assuming no error is detected, IPL completes in approximately 30 seconds with:
  - RDY ENTER displayed by display/keyboard (if part of system).
  - 3800<sub>16</sub> displayed on operator/programmer panel 0 through 15 indicators.

If Series/1 stops with any other display, refer to common halt list (para 3.25) for meaning and appropriate action.

6. Enter call-up code for utility:

- Using display/keyboard —

NOTE

Equivalent of display/keyboard ENTER key on a TTY console is the Carriage Return key.

- a. Enter B71F0 and press ENTER key

- Using operator/programmer panel —

- a. Press Data Buffer switch
- b. Press input switch B
- c. Press Console Interrupt switch
- d. Press Data Buffer switch
- e. Enter 71F0 via input switches
- f. Press Console Interrupt switch twice

Utility U71F0 loads and displays requested parameter inputs. If no alternate console is present, parameter inputs are requested via halt codes on operator/programmer panel indicators. Refer to DLT 71F0 for parameter input being requested.

7. Input responses and parameters as follows:

- Using display/keyboard —

Input	Keying Sequence*
Yes	F, 1, ENTER
No	F, 0, ENTER
Variable data	F, hex data, ENTER

\*Commas not part of sequence

INTENTIONALLY BLANK

- Using operator/programmer panel --

Input	Switch Pressing Sequence*
Yes	Data Buffer, F, 1, Console Interrupt twice
No	Data Buffer, F, 0, Console Interrupt twice
Variable data	Data Buffer
	X <sub>16</sub> -- number of words in entry
	F
	Console Interrupt
	Data Buffer
	XXXX <sub>16</sub> -- first word of entry; if less than four characters, enter leading zero(s)
	Console Interrupt
	Data Buffer
	XXXX <sub>16</sub> -- second word of entry; up to 15 words can be sequenced in entry
	Console Interrupt twice -- two consecutive interrupts terminate entry

\*Commas not part of sequence

Following parameter input, utility program executes. Execution time for initializing a pack is approximately 18 minutes. If in normal mode, program runs until completion and ID compare errors are displayed while program continues. If in diagnostic mode, program stops on each ID compare error and Start switch must be pressed to restart program. DLT 71F0 gives the registers that are to be read from during error stop if using operator/programmer panel. Record ID compare errors for future reference.

#### NOTE

Depending on their location, sector ID compare errors may cause error stops during SMD diagnostics. For example, an ID compare error on head 00, sector 00 of any cylinder will result in an error stop in incremental seek test 7114.

Completion of utility is indicated by:

- Display/keyboard displaying --

SMD SECTOR ID BASIC INITIALIZATION COMPLETE PT ENTER

- Operator/programmer panel indicators displaying 3805<sub>16</sub>



## 3.24 ERROR ABORT MESSAGE

When a diagnostic is aborted, an error abort message is generated. If a display/keyboard is assigned as alternate console, the abort message is displayed in the following format:

ABORT TEST							
TEST	EXIT	DEV	CC	ISB	STEP		
70C2	2A36	0013	0700	0013	0002	4040	4040
DCB0	DCB1	DCB2	DCB3	DCB4	DCB5	DCB6	DCB7
0007	0000	0000	0000	0000	0000	0000	0000
CSS0	CSS1	CSS2	CSS3	CSS4	CSS5	CSS6	CSS7
2E17	0000	0000	0000	0000	0000	0000	0000
I3C01	MAP=7028		STEP=0002				

Where:

TEST = Number of the test executing at time of abort.

EXIT = Exit address (last address entered in R6 by a branch and link instruction).

DEV = Device address.

CC = Condition code.

ISB = Interrupt status byte returned, if any.

STEP = Step number being executed at time of abort.

DCB0 - DCB7 = Diagnostic control bytes. ①

CSS0 - CSS7 = Cycle steal status bytes if available (refer to Description of Cycle Steal Status, appendix A, for significance of the cycle steal status words).

① Error definitions for DCB words 3 and 4 are as follows:

- DCB Word 3 (Cylinder Address) — DCB word 3 provides the cylinder address of the required sector. The word corresponds to the second and third bytes in the sector ID. The cylinder address consists of a value from 000 to 336<sub>16</sub> (822<sub>10</sub>).
- DCB Word 4 (Head Selection and Sector Number) — The two bytes of DCB Word 4 have separate significance. The upper byte specifies the number of the selected head, 00 to 12<sub>16</sub> (18<sub>10</sub>). The lower byte provides the sector number, 00 to 3B<sub>16</sub> (59<sub>10</sub>).

If using operator/programmer panel as assigned alternate console, the abort message can be read from memory as follows:

1. Press Stop switch, Stop indicator lights.
2. Press Level 3 switch.
3. Press R3 switch. This displays starting memory address of abort message on 0 through 15 indicators.

NOTE

The first word at this address contains the test number. The other 23 words shown in the example message follow in sequence.

4. Press SAR switch.
5. Enter memory address via input switches.
6. Press Store switch.
7. Press Main Storage switch. Contents of memory address displays on indicators.

### 3.25 COMMON HALT LIST

Halts are identified by the Wait indicator on the operator/programmer panel being lit.

#### 3.25.1 Diagnostic Control Program (DCP) Halts

- 3800 Ready -- enter any valid command.
- 3801 Bad condition code received from alternate console.  
Enter continue command (B),6,(I),(I)
- 3802 Program check -- see MAP 3871.
- 3803 Machine check -- see MAP 3871.
- 3804 Power thermal warning.
- 3805 Program terminated -- enter any valid command.
- 3806 Invalid request -- enter any valid command.
- 3807 Alternate console is off during testing.
- 3808 Alternate console is on and test is complete.
- 3809 Unexpected interrupt -- R0 level 3 contains the interrupt status byte. Location 180A contains the MAP number.
- 380A Start -- the program has started.
- 380B Diskette error -- IPL and try again. If it still fails, try a different diskette.
- 380C Program not found -- there is no VTOC entry for the requested program.
- 3810 Was not expecting reply (F command) data.
- 3813 Received a command sequence -- to execute, press the console Interrupt switch.  
To delete the command, change the buffer contents and press the console Interrupt switch. Halt 3814 will be displayed and the command can be entered again.
- 3814 Enter data.
- 3815 Cannot continue execution -- IPL and try again. If it still fails call for assistance.

- 3816 Change keyboard definition for 4978 display. Press any key within 15 seconds and halt 3817 will be displayed.
- 3817 Press the key requested for keyboard definition.
- FFFF Command or reply has been accepted.

### 3.25.2 Configurator Halts

- 3820 This diskette has not been configured before. Enter continue command. (B),6,(I),(I)
- 3821 Enter alternate console device address and device type.  
Example:  
(B),1F,(I),(B),0040,(I),(I) to assign TTY as alternate console or:  
(B),1F,(I),(B),0000,(I),(I) to assign programmer panel as alternate console
- 3822 Configuration Error(s) on System. Reply with one of the following:  
01 = Terminate  
02 = Print all errors  
03 = Print options  
04 = Bypass TCS errors  
(B),1F,(I),(B),XX00,(I),(I) where XX = chosen option.
- 3823 Invalid Entry. Enter the correct entry.
- 3826 Changes Not Saved. Enter 0D to save the configuration table: (B),1F,(I),0D00,(I),(I) Enter 05 to terminate (changes made will be lost): (B),1F,(I),0500,(I),(I)
- 3827 Enter Correct Processor Type.  
22 = 4952 processor  
23 = 4953 processor  
25 = 4955 processor  
(B),1F,(I),(B),XX00,(I),(I) where XX = processor type.
- 3829 Device Address or Type incorrectly entered. Enter correct parameter.
- 382A Secure the Customer Interface. Enter continue command when customer interface is secure. (B),6,(I),(I)
- 382B Is an OEMI Card Installed? Reply 00 = no, 01 = yes.  
(B),1F,(I),(B),0000 or 0100,(I),(I)
- 382C Copy Configuration Table to Another Diskette? Reply 0D to copy table or 05 to terminate.  
(B),1F,(I),(B),0D00 or 0500,(I),(I)
- 382D Is Floating Point Feature Installed? Reply 00 = no, 01 = yes. (B),1F,(I),(B),0000 or 0100,(I),(I)

- 382E Option Table is Available for Entry. Enter option table information per the following:  
 01 = Print table  
 02 = Delete  
 03 = Modify  
 04 = Alternate console\*  
 05 = Terminate  
 06 = Processor type  
 07 = Two channel switch  
 08 = Storage size  
 09 = Print system equipment  
 0A = Add  
 0B = Bypass option table  
 0C = Configure system\*  
 0D = Diskette write\*  
 0E = OEMI  
 0F = Floating point  
 10 = Merge  
 (B),1F,(I),(B),XX00,(I),(I) where XX = chosen option.
- 382F Initial Auto Configuration. The diskette has an alternate console assigned. The initial auto configuration must be completed. Enter 6 to continue.  
 (B),6,(I),(I)
- 3831 Enter Station Address ID = XY. X = cable address (0 - 3), Y = station address (0 - 3).
- 3832 Programmer or CE Console is the Assigned Alternate Console. Enter 6 to continue. (B),6,(I),(I)
- 3833 OIO (Operator I/O) Condition Code. R3 = condition code, R4 = AATT where: AA = device address and TT = device type
- 3834 Error - More than one two-channel switch disappeared after a select switch was changed. If there is no alternate console, enter 6 to continue.  
 (B),6,(I),(I)
- 3835 Interrupt Condition Code. R3 = interrupt condition code, R4 = AATT where: AA = device address and TT = Device type
- 3836 Is Customer Using Common I/O? Reply 00 = no, 01 = yes.  
 (B),1F,(I),(B),0000 or 0100,(I),(I)
- 3837 Error - A two-channel switch did not disappear after a select switch was changed. If there is no alternate console, enter 6 to continue. (B),6,(I),(I)

---

\*A new alternate console definition or system configuration must be followed by a diskette write to save the new information on the diskette.

- 3838 RPQ Diagnostics are Installed on System.
- 383A Select Entry Number in Configurator Table to be Altered. Enter (B),lF,(I),(B),XX00,(I),(I) where: XX = table entry number.
- 383B Enter the Desired Entry. Format is:  
AATT,(I),(B),0000,(I),(B),0000,(I),(B),0000(I),(B),0000,  
(I),(B),0000,(I),(B),0000,(I),(B),IDID  
where: AA = device address, TT = device type, IDID =  
device read ID code.  
(B),8F,(I),(B),entry per above,(I),(I)
- 383C Error - Cant find reflected two-channel switch. If there is no alternate console, enter 6 to continue.  
(B),6,(I),(I)
- 383D Insert the FROM Diskette. Used with the merge function (10) and the print configuration function (20). Insert the FROM diskette in the disk unit and answer 01 when complete. (B),lF,(I),(B),0100,(I),(I)
- 383E Insert the BASIC Diskette. Used with the merge function (10) and the print configuration function (20). Remove the FROM diskette, insert the BASIC diskette and answer 01 when complete. (B),lF,(I),(B),0100,(I),(I)
- 3840 Error - A device is in the hardware, but not in the configuration table. Level 3, R3 contains the address (AA00). Level 3, R4 contains the ID word. Record the contents of R3 and R4. Enter the continue command.  
(B),6,(I),(I).
- 3841 Error - A device is in the table, but not in the hardware. Level 3, R3 contains the device address and configuration table entry number (AAEE). Record the contents of R3 and enter the continue command.  
(B),6,(I),(I).
- 3842 Error - The ID word received does not match the ID word stored in the configurator table for this address. Level 3, R3 contains the device address and configuration table entry number (AAEE). Level 3, R4 contains the ID word received. Record the contents of R3 and R4. Enter continue command. (B),6,(I),(I).
- 3843 Error - An entry in the configurator table has a device type and device ID that do not match. Level 3, R3 contains the device address and configuration table entry number (AAEE). Record the contents of R3 and enter continue command.  
(B),6,(I),(I).

- 3844 Error - Received a bad condition code in response to a Read ID command.  
Level 3, R3 contains the device address and condition code (AACC).  
Record the contents of R3 and enter continue command:  
(B),6,(I),(I).
- 3845 Error - Two-channel switch was in the wrong position.  
If there is no alternate console, enter 6 to continue.  
(B),6,(I),(I)
- 3846 Enter New Configurator Table Data:  
(B),8F,(I),(B),0001,(I),(B),0203,(I),(B),0405,(I),(B),0607,(I),(B),0809,(I),(B),0A0B,(I),(B),0C0D,(I),(B),0E0F,(I),(I)
- 3848 Error - Entries do not agree. R1 = entry address of FROM table, R2 = Entry address of TO table.
- 3849 Alternate Console Error. The response from the alternate console to a Read ID command does not match that of a supported console device.  
Level 3, R3 contains the device address and type read from the configurator table (AATT).  
R4 contains the response from the read ID command.  
Record R3 and R4.  
Enter continue command: (B),6,(I),(I)  
Halt 382E will be displayed.  
If R3 has the correct device address and type for the alternate console, the console is returning a bad ID.  
Enter: (B),1F,(I),(B),0500,(I),(I), the configurator then terminates at halt 3800.  
Enter the assign programmer console command:  
(B),0005,(I),(I), this disables the alternate console.  
If R3 does not contain the correct information, change the alternate console bytes at address 3008 and 3009 to the address and type for the console device.  
To write the record to the diskette, enter:  
(B),1F,(I),(B),0100,(I),(I)
- 384A Configuration Table is Full.
- 384B Configurator Chain (Byte 02 Bit 1) is Too Long. See MAP 3880.
- 384C Configuration Display Message. See alternate console display for message.
- 384D The VTOC Does Not Contain a Configurator Table (U38F1).  
Load the general utility program (38F9) and copy 38F1 from another diskette.

- 384F Duplicate Address AA, Entry EE and EE. There is a duplicate address in the configuration table. If there is no alternate console assigned, Level 3 R2 has the device address, R3 and R4 have the table entry numbers. Enter 6 to continue. (B),6,(I),(I)
- 3850 Enter Inner Storage Size.  
03 = 16K  
07 = 32K  
0B = 48K  
0F = 64K  
(B),1F,(I),(B),XX00,(I),(I) where XX = 03,07,0B, or 0F
- 3851 Is Address Translator Installed? Reply 01 = yes,  
00 = no. (B),1F,(I),(B),0000 or 0100,(I),(I)
- 3852 Enter Outer Storage Size. 0XXX = decimal number of 16K  
outer storage blocks.  
(B),1F,(I),(B),0XXX,(I),(I)
- 3853 ACCA SL Installed (Async Control Comm Adapter, Single  
Line). See MAP 13.
- 3854 AACA ML Installed (Async Control Comm Adapter, Multi-  
line) See MAP 13
- 3855 BSCA SL Installed (Bi-Sync Comm Adapter, Single  
Line). See MAP 13.
- 3856 BSCA ML Installed (Bi-Sync Comm Adapter, Multi-  
line). See MAP 13.
- 3857 SDLC Installed (Synchronous Data Link Control).  
See MAP 13.
- 3858 Error - The specify code entered is not correct.
- 3859 Error - The specify code entered is correct but does  
not match the card.
- 385A Remote IPL? Reply 00 = no, 01 = yes.  
(B),1F,(I),(B),0000 or 0100,(I),(I)
- 385B Error - A multiline controller has an address domain.  
See MAP 13.
- 385C Error - No interrupt. See MAP 13.
- 385D Two-Channel Switch Console Message. Change the select  
switch to the processor you are using. See MAP 13.
- 385E Two-Channel Switch Console Message. There is more than  
one two-channel switch console installed. See MAP 13.



- 385F Two-Channel Switch Console Message. There is at least one two-channel switch console installed. See MAP 13.
- 3860 Programmable Communications Subsystem Error Message. See MAP 13.
- 3861 Programmable Communications Subsystem Error Message. See MAP 13.
- 3862 Programmable Communications Subsystem Entry. See MAP 13.
- 3863 Is Alternate Console Being Used Installed as Common I/O? Reply 00 = no, 01 = yes.  
(B), 1F, (I), (B), 0000 or 0100, (I), (I)
- 3864 Is a Programmer or CE Console Installed on the Processor Being Used? Reply 00 = no, 01 = yes.  
(B), 1F, (I), (B), 0000 or 0100, (I), (I)
- 3865 Is Alternate Console Being Used Installed in Farthest Common I/O? Reply 00 = no, 01 = yes.  
(B), 1F, (I), (B), 0000 or 0100, (I), (I)
- 3866 The Alternate Console Disappeared After the Two-Channel Switch was Changed. See MAP 13.
- 3867 The Alternate Console Did Not Appear After the Two-Channel Switch was Changed. See MAP 13.
- 3868 The Alternate Console Did Not Disappear After the Two-Channel Switch was Changed. See MAP 13.
- 3869 Obtain a Programmer or CE Console. The configuration program needs a programmer or CE console to continue. The configuration program has been terminated.
- 386A ML COMM Installed (Multiline Communication). See MAP 13.

### 3.25.3 MAP Diagnostic Integration (MDI) Halts

- 3C01 Enter address of device to be tested.
- From operator/programmer panel:  
(B), 1F, (I), (B), XX00, (I), (I)
  - From alternate console: FXX
- 3C05 Enter starting step number for loop
- From operator/programmer panel:  
(B), 1F, (I), (B), XXXX, (I), (I)
  - From alternate console: FXXXX

3C06 Enter ending step number for loop

- Same procedure as halt 3C05

3C08 Device at address entered in halt 3C01 is not the type address tested by the requested program. Enter the correct address.

3C0E No device of that type was found in the configurator table, or the MAP executed and attempted to load a MAP not in VTOC.

### 3.26 COMMANDS

The following commands are described as they are entered from Series/1 operator/programmer panel. These same commands can be entered from an alternate console by keying in the command character followed by data, where applicable, and pressing ENTER key (Carriage Return key on TTY). No commas are required.

#### 3.26.1 Single Character Commands (No Data)

Enter as follows: (B) = Data Buffer switch, (I) = Console Interrupt switch.

<u>Command</u>	<u>Key Sequence</u>	<u>Result</u>
5	(B),5,(I),(I)	Disable alternate console and assign operator/programmer panel
6	(B),6,(I),(I)	Continue program execution
9	(B),9,(I),(I)	Terminate program
A	(B),A,(I),(I)	Start execution
0*	(B),0,(I),(I)	Answer question 'no'
1*	(B),1,(I),(I)	Answer question 'yes'

Commands must be entered in bits 12 through 15 of the data buffer.

\*Singly, Commands '0' and '1' are for test programs only. To answer yes or no to a question in a utility program, precede the '0' or '1' with an 'F' command. Another exception exists in the head alignment routine of SMD manual test 7145. With that routine, a 'F' and '0' must precede the '1' for yes or '0' for no.

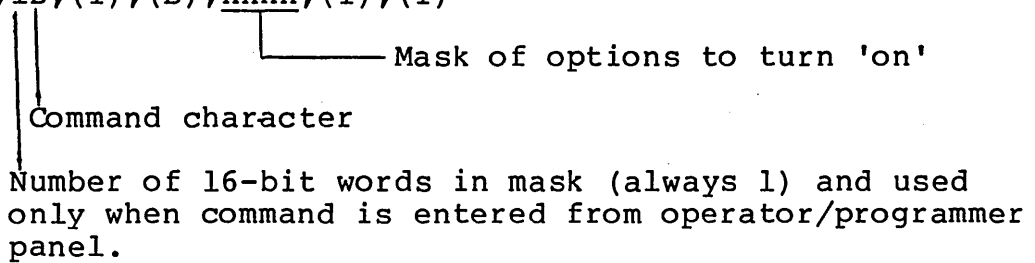
3.26.2 Commands that use a Program Number (Commands B and C)

These commands will load a program. The program number (XXXX) must be entered with the command character as follows:

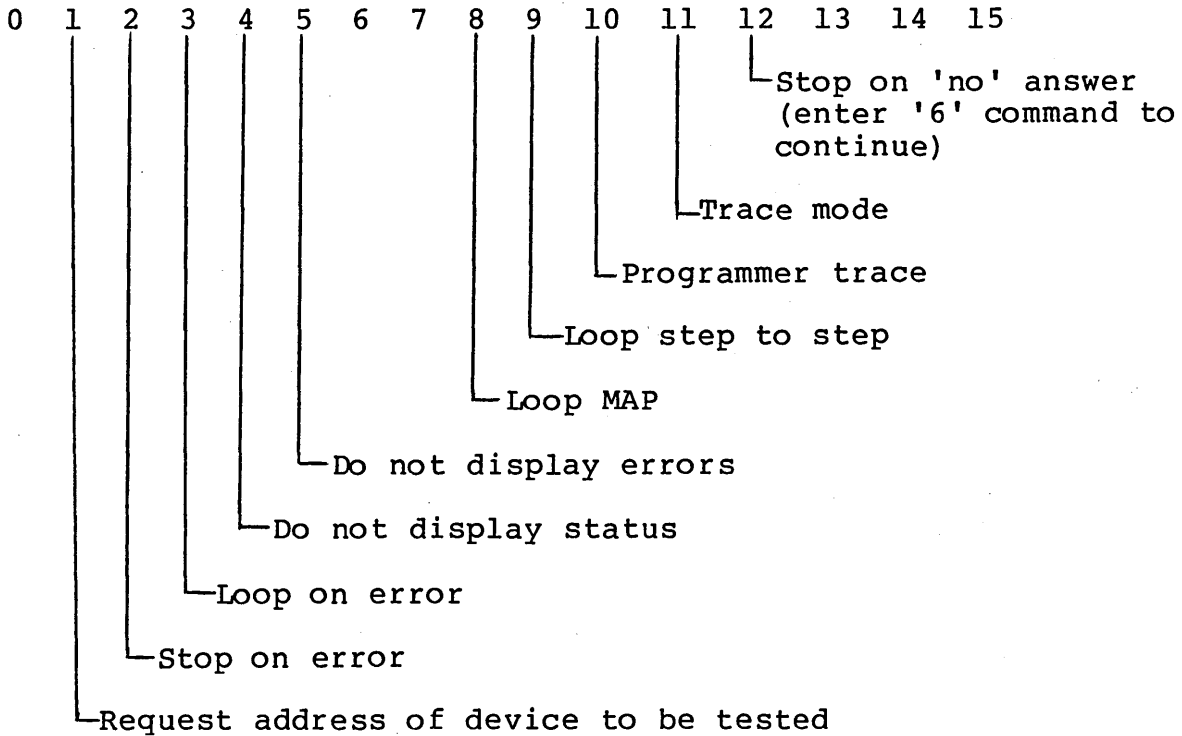
<u>Command</u>	<u>Key Sequence</u>	<u>Result</u>
B	(B),B,(I),(B),XXXX,(I),(I)	Program XXXX will load and go
C	(B),C,(I),(B),XXXX,(I),(I)	Program XXXX will load and wait for option selection command 'D'.

3.26.3 Command to Set Option Bits 'On' (Command D).

Enter: (B),1D,(I),(B),XXXX,(I),(I)



Option bits are as follows:



This command must be followed by the 'A' command to start execution of program.

3.26.4 Command to Enter Variable Data (Reply to a Program, Command F).

Enter: (B),XF,(I),(B),XXXX,(I),(B),XXXX,(I),(I)

Second consecutive interrupt terminates entry

Enter up to 15 words of data

First word of entry -- if less than four characters, enter leading zero(s).

Number of 4-character words in this entry (must be a value between 1 and F). Used only when 'F' command is entered from operator/programmer panel.



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This section contains:

- Spare parts list for drive attachment feature.
- Spare parts list for drive interface kit.
- Card placement listing of drive logic chassis cards.

For further parts information, refer to:

- ORMIC spares listing for drive spare parts.
- Storage Module Drive Hardware Maintenance Manual, Support Information (see preface for publication number), for illustrated parts breakdown of the drive, drive attachment feature, and drive interface kit.







DWN	W Glaser	7/78	CONTROL DATA	TITLE	PREFIX	DOCUMENT NO.	REV.
CHKD	<i>[Signature]</i>	2/2/78		CARD PLACEMENT	A	61408343	A
ENG	<i>[Signature]</i>	2-2-78		FIRST USED ON	NHA		
MFG	<i>[Signature]</i>	2-2-78			15631879	SHEET	1 of 2
APPR	S. H. M.	2-26-78	CODE IDENT	BT314A			
			15920				

SHEET REVISION STATUS										REVISION RECORD			
2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP						
-	-	-	50001-97	Released Class B	-	7/4/78	<i>[Signature]</i>						
01	01	01	50384	REVISED PER ECO	WSG	9-17-78	<i>[Signature]</i>						
A	A	A	12759-24	RELEASED (CLASS 'A')	/	9/27/78	<i>[Signature]</i>						

NOTES:  
 ⚠ These cards supplied by M.P.I. as a part of S.M.D. unit.  
 2. For Find No. identification, see APL 15631879.

DETACHED LISTS

AA3180 REV. 8-71 PRINTED IN U.S.A.

CONTROL DATA				CODE IDENT	SHEET	CP	DOCUMENT NO.	REV.					
				15920	2		61408343	A					
LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.	LOCATION	LOGIC CARD TYPE	A	B	C	D	FIND NO.
A1	BBCD					6							
A2	BBFD					10							
A3	BBBD					7							
A4	BBDD					9							
A5	BBED					8							
A6	BBAD					11							
A7	LVV					⚠							
A8	QPV					⚠							
A9	LTV					⚠							
A10	LSV					⚠							
A11													
A12	LWV					⚠							
A13	LXV					⚠							
A14	LRV					⚠							
A15	LZV					⚠							
A16													
A17	KFV					⚠							
A18	FRV					⚠							
A19	KGV					⚠							
A20	MSV					⚠							

AA3182 PRINTED IN U.S.A.

DWN	R. Trautman	7/78	CONTROL DATA	TITLE	SPARE PARTS LIST	PREFIX	DOCUMENT NO.	REV.
CHKD	R. Trautman	7/78		FIRST USED ON	BT314A	SPL	66306431	B
ENG	C. Kralovec	7/78						
MFG	J. Kane	9/78						
APPR	E. M. [unclear]	9-26-78	CODE IDENT				SHEET 1 of 2	
CE	Kaulbach	9/78	15920					

SHEET REVISION STATUS				REVISION RECORD					
REV	ECO	DESCRIPTION	DRFT	DATE	APP				
-	-	50001-99	-	7/78	Jett				
A	A	1A759-29	/	9-27-78	kkf				
B	B	13232	EE	11-29-78	swf				

NOTES:  
 Equipment Configurator.....15631829  
 Top Level Assembly.....15631879

DETACHED LISTS

CONTROL DATA			CODE IDENT	SHEET	SPL	DOCUMENT NO.	REV.
			15920	2		66306431	B
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	90445894	1	PC	CD ASSY BBAD ECC			
2	90445897	1	PC	CD ASSY BBBD I/O IN			
3	90445900	1	PC	CD ASSY BBBD I/O OUT			
4	90445903	1	PC	CD ASSY BBDD R/W CONTROL			
5	90445906	1	PC	CD ASSY BBED SERDES			
6	90445909	1	PC	CD ASSY BBFD COUNTER			
7	61408416	REF	PC	PLUG, CONN ASY PS-1			



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This appendix contains:

- Description of SMD diagnostic tests and utilities
- Description of cycle steal status words
- Explanation of decision logic tables (DLTs)
- DLTs for drive that are categorically numbered as follows:
  - DLT 7100 to DLT 7161 correspond to the SMD diagnostic tests on CDC BASIC diskette for the 240 megabyte drive. Each DLT and corresponding diagnostic test have the same number.
  - DLT 7170 to DLT 7182 are paper-only tables that supplement the diagnostic test DLTs.
  - DLTs 71F0, 71F1, 71F2, and 71F3 correspond to the BASIC diskette SMD utility programs for the 240 megabyte drive. Each DLT and corresponding utility have the same number.

#### DESCRIPTION OF SMD DIAGNOSTIC TESTS AND UTILITIES

The following paragraphs describe CDC BASIC diskette:

- SMD auto diagnostic tests
- SMD manual diagnostic tests
- SMD utilities

For description of running the diagnostic tests, refer to paragraph 3.0.10 in maintenance section.

#### SMD AO DIAGNOSTIC TESTS

The following SMD auto diagnostic tests are linked together. Test execution starts with the test that is called-up. Each following test then executes in succession until the last test finishes or an error occurs.

### 7100 Channel Interface Test

Test 7100 checks for correct operation of direct program control (DPC) commands such as device reset, read device ID, and prepare. Verifies valid and invalid command status, tests for interface data check and device not attached status. This test is automatically linked to test 7101.

### 7101 Attachment-Series/1 Interface Test

Test 7101 verifies that cycle steal communications are successfully completed and correct status returned before any valid commands are issued. An invalid device control block (DCB) is issued expecting interrupt condition code to be unit exception. If unit exception is received, interrupt status byte (ISB), bit 3, is examined for an on condition (DCB specification check). A cycle steal status command is issued and words one, two, and three are checked for proper content. If any results are not correct, an error message is displayed containing suggested corrective actions, or test 7120 is automatically executed to define the problem in greater detail. This test is automatically linked to test 7102.

### 7102 Attachment-Drive Interface Test

This downline diagnostic contains two separate tests:

- A wrap and disk reset command test that verifies capability of interface to transmit and receive data under both diagnostic commands (8700 and 873F). Test then verifies the disk reset (8404) function.
- A sector/index test that verifies presence of sector and index pulses, and verifies that index, followed by 59 sectors, followed by an index pulse occurs.

This test is automatically linked to test 7103.

### 7103 Attachment Test

Test 7103 verifies that prepare command allows interrupts on all levels. It also tests the cycle steal status command and results obtained for correct contents; such as: interrupt status byte (ISB), not ready and power off status bits, word 3 of cycle steal status is zero, device control block (DCB) specification check, residual address word, and storage protect if available. Test forces an invalid sector and invalid data address and verifies the results. This test is automatically linked to test 7106.

### 7106 Wrap and RAM Test

This test consists of downline diagnostics that execute:

- A wrap test from attachment card to SMD interface. This verifies correct operation of the bus and tag lines to and from drive.
- A random-access memory (RAM) test that verifies correct operation of the Z80 RAM (addresses 4080 - 43FF<sub>16</sub>) on attachment card.
- A buffer memory test that verifies correct operation of the data buffer (addresses 8800 - 8BFF<sub>16</sub>) on attachment card.
- An internal RAM test that verifies correct operation of ID RAM used for ID compare operations.

This test is automatically linked to test 7107.

### 7107 SERDES Test, Sector ID and Sync Check

Test 7107 consists of downline diagnostics that use a simulated data stream to verify correct operation of:

- Write sector ID sequence.
- Read sector ID sequence.
- Sync check in data field sequence.

This test is automatically linked to test 7108.

### 7108 SERDES Test, Data and ID Skewed

Test 7108 consists of downline diagnostics that use a simulated data stream to verify correct operation of:

- Write data sequence.
- Read data sequence.
- Write sector ID skewed sequence.
- Read sector ID skewed sequence.

This test is automatically linked to test 7109.

### 7109 SERDES Test, Diagnostic ECC Checks

Test 7109 consists of downline diagnostics that use a simulated data stream to verify correct operation of:

- Read diagnostic sequence.
- ECC detection circuits.
- Header compare operations.

This test is automatically linked to test 7110.

### 7110 Servo Test, RTZ and Offset

Test 7110 consists of downline diagnostics that verify offset and RTZ commands. Offset test verifies proper sequence of signals for the following commands.

- Forward offset
- Reverse offset
- Zero (0) track seek
- Illegal maximum seek (cylinder 337<sub>16</sub>)

RTZ test verifies proper sequence of signals for an RTZ command. This test is automatically linked to test 7113.

### 7113 Read Sector ID Test

Test 7113 performs a seek to a test cylinder and reads sector ID. The flag byte is tested for zero. If it is zero, test continues reading sector IDs for the complete track and cylinder. An error count is recorded and at end of test a check is made for solid and intermittent read errors, single or multiple head failures, and other related failures. Results of test may direct the customer engineer to do additional testing. Abnormal errors detected by this test cause an automatic branch to error analysis routine 7120 for additional error isolation.

This test automatically links to test 7114.

### 7114 Incremental Seek Test

Test 7114 checks capability of drive to perform incremental seeks by:

- Issuing RTZ and verifying address with read sector ID.

- Issuing one track seeks until maximum cylinder 336<sub>16</sub> is reached. All seeks are verified by reading sector ID.
- At maximum cylinder, direction is reversed and one track seeks are issued until cylinder 000 is reached. All seeks are verified by reading sector ID.

This test is automatically linked to test 7115.

#### 7115 Seek Tests (All Seeks)

Test 7115 performs forward and reverse seeks between all cylinders by:

- Issuing maximum seek forward to cylinder 336<sub>16</sub>; followed by maximum seek reverse -1, maximum seek forward -2, maximum seek reverse -3, etc until seek difference = 0.
- Then RTZ is issued and sequence starts in opposite direction with maximum seek forward -1.

All seeks are verified by reading sector ID. This test automatically links to test 7116.

#### 7116 Seek Tests (Random)

Test 7116 performs 2,000 random seeks and verifies each by reading sector ID.

This test is the last automatically linked test.

#### 7120 Error Analysis Routine for ISB = 80<sub>16</sub>

This error analysis routine only executes when an abnormal condition is detected in test 7101 or 7113. The routine does a cycle steal status and determines which error code is contained in status word 3. A message is then displayed containing the error code and probable cause. If suggested solutions do not correct the error condition, reference is made to a paper-only DLT for additional troubleshooting.

#### SMD MANUAL DIAGNOSTIC TESTS

The following SMD manual diagnostic tests require operator interaction and must individually be called-up.



7121 First Seek Test

Test 7121 is a downline loaded diagnostic that checks if heads-load (power-up) sequence occurs successfully. This is not a simulated operation.

7122 Read Sector ID Scope Loop Routine

This error analysis routine provides a diagnostic scope loop while reading a selected sector ID. If Mode switch on operator/programmer panel is in Diagnostic position, program stops after each read sector ID command and stores ID data in following registers:

R4 = sync and flag bytes

R5 = cylinder bytes

R6 = head and sector bytes

R7 = condition codes received after read sector ID command

Pressing Start switch on operator/programmer panel restarts program. If Mode switch is in Normal position, program continues to loop until a 1 or 0 is entered via alternate console. Entering a 1 returns program to the beginning for new parameter input. Entering a 0 terminates program.

7123 Write Sector ID Scope Loop Routine

Routine 7123 provides a diagnostic scope loop while writing a selected sector ID. If Mode switch on operator/programmer panel is in Diagnostic position, program stops on error with condition code in register R7, level 3. If no error occurs, program loops until a 1 or 0 is entered. When Mode switch is in Normal position, program continues to loop (errors are ignored) until a 1 or 0 is entered. Entering a 1 returns program to the beginning for new parameter input. Entering a 0 terminates program.

7124 Read Sector ID Routine

This error analysis routine reads a selected sector ID, displays ID data on alternate console, and stores the ID data beginning at a fixed memory location called TURESUL (18C8<sub>16</sub>). Information stored is as follows:

18C8 (1st word) = initial and interrupt condition codes

18CA (2nd word) = sync and flag bytes read

18CC (3rd word) = two cylinder bytes read

18CE (4th word) = head and sector bytes read

#### 7125 Write Sector ID Routine

Routine 7125 writes a selected sector ID data pattern. The written ID data is then displayed on the assigned console. This routine can be used for changing the sector ID when a defective sector is encountered.

#### 7126 Read Data Routine

This error analysis routine reads one sector of data from a selected sector. The data is then displayed on alternate console. If an error is encountered while reading data, error information is displayed.

#### 7127 Write Data Routine

Routine 7127 writes one sector of an entered data pattern at a selected sector. Data written is displayed on alternate console. If an error is encountered while writing data, error information is displayed.

#### 7128 Write/Read Compare Data Routine

Routine 7128 writes one sector of data using an entered data pattern. Sector data is then read back and write and read buffers compared. Buffer contents are displayed on alternate console and if not equal, an error is displayed.

#### 7130 Write/Read Data Test

Test 7130 verifies ability of drive to write and read various data patterns correctly. Customer engineer is asked to respond yes or no to the question "do you want to write on this disk pack". If response is no, test terminates. If response is yes, test seeks to a test cylinder and uses each head to write and read five data patterns. The data patterns are EB6DB6DB (worst case pattern), alternating ones and zeros, alternating zeros and ones, all zeros, and all ones. Each data pattern is read back and compared bit by bit. If an error is detected, error information is displayed indicating failing head, whether error was during write or read, type of failure, and data pattern being used. Error information may direct that a specific error analysis routine be run for more definition of problem.

### 7135 Command and Sequence Test

This test issues a recalibrate, seek, seek head sequence of chained commands. After chain is completed, ending condition code is examined for correct results. If not correct, an error message is displayed.

### 7140 Error Correction Code Test

Test 7140 verifies ability of drive and attachment to correct data errors up to four bits in length. It also verifies that errors greater than four bits in length are not corrected. Errors are created in various areas of data and ECC fields. Errors are tested using both single and multiple sectors. Data is read back by read short commands and status is checked for valid contents.

### 7145 Servo Adjustment and Head Alignment Routine

This routine allows customer engineer to perform servo and head alignment adjustments on drive using software looping. Software loops provided are:

- Direct seek with recalibrate back to cylinder 000.
- Repeat seeks between any two cylinders.
- Incremental seeks, forward and reverse.
- Head alignment routine that automatically positions heads on alignment cylinder 1EB<sub>16</sub> (491<sub>10</sub>) of CE pack.

In seek loops, no read sector ID or error checking is done. Customer engineer is asked to input all seek values and looping continues until a 1 is entered to stop the loop or a 0 is entered to terminate program. In head alignment routine, all responses must be entered as F01 for yes, or F00 for no. The routine tests for recalibrate error, seek to alignment cylinder error, and head seek errors. If no errors are detected, routine automatically positions heads on alignment cylinder 1EB<sub>16</sub> and selects head 00. Head number may then be incremented to select any head while staying on alignment cylinder.

### 7150 Write Sector ID Test

Test 7150 verifies write sector ID command results. Test seeks to a test cylinder and asks if a sector ID can be written on disk pack. If not, test ends. If yes, test reads sector IDs until one is found with a flag byte equal to zero. Then a write sector ID command is issued with six FF<sub>16</sub> test bytes. The bytes are read back and verified. Three more write/read sector ID sequences are performed in succession at the sector, using AA<sub>16</sub>, 55<sub>16</sub>, and 00

as test bytes. This operation is repeated for each head. An error count is kept during test. At the end of test it is determined if errors occurred on one or multiple heads, and if the errors are solid or intermittent. Original sector ID data is then rewritten at the sectors.

#### 7160 Read Sector ID Skewed Routine

Routine 7160 reads sector ID from selected skewed sector and displays ID data on alternate console. The ID data is also stored in a fixed memory location called TURESUL (18C8<sub>16</sub>). Information stored is as follows:

- First word = initial and interrupt condition codes
- Second word = sync and flag bytes read
- Third word = two cylinder bytes read
- Fourth word = head and sector bytes read

#### 7161 Write Sector ID Skewed Routine

Routine 7161 writes entered ID data at a selected skewed sector. The written ID data is displayed on alternate console. This routine can be used for changing sector ID when a defective sector is found.

#### SMD UTILITIES

The following SMD utilities require operator interaction and must individually be called-up.

#### 71F0 Disk Initialization Routine

Utility 71F0 performs basic disk pack initialization necessary for diagnostic checkout only and does not format pack for customer use. Utility can be used to write, read, and verify primary sector IDs on an entire disk pack or a selected address. If a selected address is used, program generates a prompt for the ID data that is to be written. If an error condition occurs during write or read, an appropriate message accompanies the cycle steal status words of the error abort message. This accompanying message is not accessible if using only the operator/programmer panel. If an error occurs during the ID verify, a message containing expected and received data is displayed. When using only the operator/programmer panel, expected ID data is stored in registers R0, R1, and R2 and received ID data is stored in R4, R5, and R6. Upon restarting, program continues to verify remaining sector ID data. The utility can be selected to stop on each detected error (Mode switch in Diagnostic position) or to

display and bypass errors (Mode switch in Normal position). Refer to paragraph 3.23 in maintenance section for operating instructions.

### 71F1 Disk Data Integrity Routine

Utility 71F1 read verifies a disk pack of unknown data. Program verifies all primary and alternate sectors. Program identifies cycle steal status word 1 errors: no record found, sync check, and file data check (ECC). Any other cycle steal status word 1 errors result in error stop 706C with error status reported in abort message. When ECC errors are detected, the cylinder, head, and sector containing the error is displayed on alternate console. With the Mode switch in Diagnostic position, program stops after each error. Error information is then contained in following registers:

- R4 = cylinder
- R5 = head
- R6 = sector
- R7 = error (ECC) count

Upon restarting, program continues verifying remaining sectors on disk pack. The utility can be selected to read verify entire disk pack or any one track. If one track is selected, the number of times to loop on read verification can be specified. Loop count can vary from one to infinite. Error recording and display remains the same as previously described.

### 71F2 Data Strobe and Track Offset Routine

This utility allows reading data from cylinder 336<sub>16</sub> using following selectable margins:

- Forward or reverse offsets
- Early or late data strobes

Read verify command is used to read the data. With Mode switch in Diagnostic position, program stops after each error. Error information is then contained in following registers:

- R4 = cylinder
- R5 = head
- R6 = sector
- R7 = error (ECC) count

Upon restarting, program continues reading data from cylinder 336<sub>16</sub>.

## 71F3 IPL Verification Utility

This utility verifies the IPL logic on the SMD attachment card. This test requires that the SMD be set up properly as an IPL source, and that it is selected via the Series/1 Primary/Alternate IPL source switch. At present, diagnostic IPL capabilities exist only on the FA740-B (LSI) attachment card. Use of this utility to verify the IPL logic of an FA740-A (MSI) equipment will result in a false error condition.

### DESCRIPTION OF CYCLE STEAL STATUS WORDS

A start cycle steal status command transfers status information to the Series/1 processor. Significance of the status words is described in the following paragraphs. Refer to paragraph 3.24 in maintenance section for procedure to obtain cycle steal status words during an error abort when using operator/programmer panel.

#### CYCLE STEAL STATUS WORD 0 (Residual Address)

When a read operation is halted, the processor storage address where last cycle steal of data occurred remains in the address counter of attachment card. This is the residual address and is accessible as cycle steal status word 0. On write operations, the residual address may be up to four sectors in advance of the disk sector being written; cycle steal status word 2 identifies the last sector successfully written plus one. (See Cycle Steal Status Word 2.)

#### CYCLE STEAL STATUS WORD 1 (Device Status)

Cycle steal status word 1 provides sixteen possible reasons why the previous start command did not end normally (table A-1).

#### CYCLE STEAL STATUS WORD 2 (Last Sector Written)

Cycle steal status word 2 contains the address of the last sector that drive attempted to read or write when a data operation ends early due to an error. Bits 0 through 9 of the word are set to 0 and bits 10 through 15 are set to the sector number. The exception condition code 010 is presented at interrupt service time. If write operation ended normally, the number in bits 10 through 15 of cycle steal status word 2 is one greater than the last sector written on disk.

TABLE A-1. CYCLE STEAL STATUS WORD 1 ERROR DEFINITIONS

BIT	TITLE	SIGNIFICANCE
0	End of track*	This bit is set to 1 when at least one but not all of the sectors in a multiple sector operation has been transferred and the end of the last sector on the track is detected. The detection of end of track does not result in an automatic head change. However, this bit may be used to transfer the available sectors and indicate the number of sector remaining to be transferred by using a second DCB with a new head number.
1	Sync check*	This bit is set to 1 when an unequal comparison for the sync byte at the beginning of either an ID field or data field occurs. Bit 3 of cycle steal status word 1 is also set to 1 if an ID field caused the error.
2	Not Used	
3	No record fund*	This bit is set to 1 if, after at least one rotation of the disk, the disk unit has not found a sector ID that compares equal to the sector information provided in the DCB.
4	Write gate check*	This bit is set to 1 when a sector or index pulse is detected while a write signal is active.
5	Serializer/deserializer check*	This bit becomes 1 if a bit is either lost or gained when the parallel channel data is converted to serial data during a write operation.
6	Phase locked oscillator (PLO) out of sync check*	This bit becomes a 1 when the servo PLO in the disk unit is not synchronized.
7	Unsafe**	This bit is set to 1 if a malfunction results in an unsafe condition. If this bit is set, one or more of the unsafe conditions indicated by bits 11 and 12 are present. An unsafe condition inhibits read/write and seek operations.
8	File data check*	This bit is set to 1 if the ECC bytes that validate each sector ID and data field are in error. The ECC is used only to validate the ID and does not attempt to correct the ID if an error occurs.
9	Seek error*	This bit is set to 1 if a seek operation fails to complete successfully in approximately 500 milliseconds.
10	Not used	
11	Write fault**	A 1 here indicates no write transitions were detected for a write operation, or write was detected but write was not selected.
12	Multiple head select**	A 1 here indicates more than one head was selected for a read or write operation.
13	Servo unsafe	A 1 here indicates a write operation selected and either the read/write heads were not on track, or the PLO was out of synchronization.
14	Not used	
15	Not ready or power-off**	This bit is set to 1 when power-up is incomplete or the disk unit 1) is not up to rotational speed, 2) failed to recalibrate after power-up, or 3) is unsafe.

\*If the response to the next start command is satisfactory (condition code 111), these bit are reset.

\*\*Bits 7, 11, 12, and 13, and bit 15 (unless 15 is set to 1 by a power-on delay) can be reset by a stem reset, power-on reset, device reset command, or halt I/O signal.

CYCLE STEAL STATUS WORD 3 (Error Number)

The second byte of word 3 provides a hexadecimal number that indicates a firmware detected error. Descriptions of these error codes are given in table A-2.

TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
1	01	Interface data check	Bad parity has been detected on a cycle steal data transfer from the attachment to Series/1.
2	02	Protect check	On a cycle steal transfer the processor has detected a mismatch between the address key presented by the attachment and that of the storage location addressed.
3	04	Invalid storage address	The address presented by the attachment on a cycle steal data transfer is outside the range of the CPU's memory.
4	08	Storage data check	Bad parity has been detected on data being read from Series/1 memory.
5	10	DCB Specification check	An illegal recovery parameter has been specified by the recovery command (DCB) control word (0004).
6	40	Delayed command reject	A DPC command has been issued to the attachment which is not a 20XX, 60XX, 6FXX, 70XX, 7DXX, 7EXX, or 7FXX. At DPC presentation time condition code of 7 satisfactory was issued.
7	NOT USED AT THIS TIME		
8	NOT USED AT THIS TIME		
9	01	Interface data	Bad parity has been detected on a data transfer from the Series/1 to the attachment.
A	NOT USED AT THIS TIME		
B	40	Delayed command reject	The DCB address specified in the modifier field of a start cycle steal immediate device control block is odd and therefore inaccessible to the attachment.
C	10	Odd chain address	The last DCB issued to the attachment specifies chaining and the chain address presented is odd.
D	NOT USED AT THIS TIME		
E	NOT USED AT THIS TIME		
F	NOT USED AT THIS TIME		



TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS (CONTD)

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
10	40	Delayed command reject	The DCB address specified in the modifier field of a start diagnostic immediate device control block is odd and therefore inaccessible to the attachment.
11	NOT USED	AT THIS TIME	
12	10	DCB specification check	The input flag, bit 2 <sup>13</sup> in word 0, of a start diagnostic DCB is in the wrong phase. It should be a one.
13	10	DCB specification check	The byte count specified by word 6 of a start diagnostic DCB is odd.
14	10	DCB specification check	The byte count presented in word 6 of the current DCB is greater than that allowed for a start diagnostic operation. Byte count greater than 0400 <sub>16</sub> .
15	10	DCB specification check	The data address in word 7 of a start diagnostic DCB is odd and therefore inaccessible to the attachment.
16	40	Delayed command reject	The DCB address specified in the modifier field of a downline loaded diagnostic immediate device control block is odd and therefore inaccessible to the attachment.
17	NOT USED	AT THIS TIME	
18	10	DCB specification check	The input flag, bit 2 <sup>13</sup> in word 0, of a downline loaded diagnostic DCB is in the wrong phase. It should be a zero.
19	10	DCB specification check	The byte count presented in word 6 of a downline loaded diagnostic DCB is odd.
1A	10	DCB specification check	The byte count specified by DCB word 6 is too large for an downline loaded diagnostic command. Byte count equal to or greater than 0300 <sub>16</sub> .
1B	10	DCB specification check	The data address in word 7 of an downline loaded diagnostic DCB is odd and therefore inaccessible to the attachment.
1C	NOT USED	AT THIS TIME	
1D	NOT USED	AT THIS TIME	
1E	NOT USED	AT THIS TIME	
1F	NOT USED	AT THIS TIME	
20	NOT USED	AT THIS TIME	

TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS (CONTD)

ERROR. NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
21	NOT USED AT THIS TIME		
22	NOT USED AT THIS TIME		
23	40	Delayed command reject	The DCB address presented in the modifier field of a start cycle steal status immediate device control block is odd and therefore inaccessible to the attachment.
24	NOT USED AT THIS TIME		
25	10	DCB specification check	The input flag, bit 2 <sup>13</sup> in word 0, of a start cycle steal status DCB is in the wrong phase. It should be a one.
26	10	DCB specification check	The byte count specified in word 6 of a start cycle steal status DCB is odd.
27	10	DCB specification check	The byte count presented in DCB word 6 is excessive for a start cycle steal status command, byte count greater than 0018 <sub>16</sub> .
28	10	DCB specification check	The data address in word 7 of a start cycle steal status DCB is odd and therefore inaccessible to the attachment.
29	NOT USED AT THIS TIME		
2A	80	Device status available	The SMD interface is presenting all ones. This is an indication that SMD power may be off or a cable connection problem exists.
2B	80	Device status available	The SMD interface is presenting all zeroes. This is an indication that a cable connection or power problem exists.
2C	80	Device status available	The SMD interface is not sending the proper information. This is an indication that either a cable connection or power problem exists.
2D	80	Device status available	The feature ID presented by the SMD is not an allowable ID. Possible cable problem.
2E	80	Device status available	The SMD was not ready and not on cylinder during a power on reset sequence.
2F	80	Device status available	The SMD was ready and on cylinder during a power on reset sequence.
30	80	Device status available	The SMD was ready and not on cylinder during a power on reset sequence. Possible cable problem.
31	80	Device status available	The seek requested took longer than 130 ms to complete. No seek end or seek error interrupt was received from the SMD.

TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS (CONTD)

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
32	80	Device status available	A parity error occurred on a transfer from the attachment to the SMD.
33	NOT USED	AT THIS TIME	
34	80	Device status available	The SMD interface is presenting all zeroes. An indication that a cable connection or power problem exists.
35	80	Device status available	The SMD interface is presenting all ones. This is an indication that a cable connection or power problem exists.
36	80	Device status available	Possible parity error. Replace processor board, Bus In/ and Bus Out boards of SMD. Check Cable Connections.
37	NOT USED	AT THIS TIME	
38	80	Device status available	A sync or ECC* error occurred in a read diagnostic operation.
39	80	Device status available	An ID sync error or an ID CRC error occurred in a read diagnostic operation.
3A	80	Device status available	Sector counting operation.
3B	NOT USED	AT THIS TIME	
3C	NOT USED	AT THIS TIME	
3D	NOT USED	AT THIS TIME	
3E	NOT USED	AT THIS TIME	
3F	NOT USED	AT THIS TIME	
40	10	DCB specification check	An odd byte count has been presented in DCB word 6 of a byte counting DCB.
41	10	DCB specification check	An odd data address has been specified by DCB word 7 of a byte counting DCB.
42	10	DCB specification check	An illegal modifier has been presented in DCB word 0 of a start cycle steal DCB.
43	10	DCB specification check	The phase of the input flag, bit 13 of DCB word 0, is inappropriate for the modifier specified in that word.
44	80	Device status available	The SMD is not ready or not on cylinder at the beginning of a start cycle steal command.

TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS (CONTD)

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
45	80	Device status available	Write PROTECT switch on SMD must be disabled during write tests.
46	NOT USED	AT THIS TIME	
47	NOT USED	AT THIS TIME	
48	10	DCB specification check	The byte count specified in word 6 of the current write sector ID or write sector skewed DCB is other than 6.
49	10	DCB specification check	The physical sector count specified in word 2 of a write sector ID or write sector ID skewed DCB is greater than 003B <sub>16</sub> . The maximum count allowable.
4A	80	Device status available	A write sector ID or write sector ID skewed operation has run beyond the time required for completion and has yet to terminate.
4B	NOT USED	AT THIS TIME	
4C	10	DCB specification check	The head requested in word 4 of a seek DCB is outside the addressable range of this device.
4D	10	DCB specification check	The relative number of cylinders expressed in word 1 of a seek DCB would if added to the current cylinder address would drive the positioner beyond cylinder 0336 <sub>16</sub> .
4E	NOT USED	AT THIS TIME	
4F	NOT USED	AT THIS TIME	
50	10	DCB specification check	The byte count specified in word 6 of the current write immediate DCB is other than 6.
51	10	DCB specification check	The physical sector count specified in word 2 of a write immediate DCB is greater than 003B <sub>16</sub> .
52	NOT USED	AT THIS TIME	
53	NOT USED	AT THIS TIME	
54	10	DCB specification check	The byte count expressed in word 6 of a read sector ID or read sector ID skewed DCB is other than 6.
55	10	DCB specification check	The physical sector count specified by byte 0, word 2 of a read sector ID or read sector ID skewed DCB is greater than 0003.
56	80	Device status available	A read sector ID or read sector ID skewed operation has run beyond the time required for completion and has yet to terminate.

TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS (CONTD)

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
57	NOT USED	AT THIS TIME	
58	10	DCB specification check	The byte count expressed in word 6 of a read immediate DCB is not equal to 6.
59	10	DCB specification check	The physical sector count presented in byte 0, word 2 of a read immediate DCB is greater than 003B <sub>16</sub> .
5A	NOT USED	AT THIS TIME	
5B	NOT USED	AT THIS TIME	
5C	10	DCB specification check	The byte count specified in word 6 of a read diagnostic DCB is not equal to 0100 <sub>16</sub> .
5D	10	DCB specification check	The physical sector count expressed in byte 0, word 2 of a read immediate DCB is greater than 003B <sub>16</sub> .
5E	80	Device status available	A read diagnostic operation has run beyond the time required for completion and has yet to terminate.
EF	80	Device status available	A read or read verify operation has taken longer than necessary reach completion.
F0	10	DCB specification check	The sector number specified in Byte 1, word 4 of a write, read, or read verify DCB is greater than 003B <sub>16</sub> .
F1	80	Device status available	The disk was not ready at the beginning of a write, read, or read verify operation.
F2	80	Device status available	A data field ECC register parity error occurred on a write data operation.
F3	80	Device status available	A header error of indeterminate nature occurred during the current operation.
F4	80	Device status available	The sync byte in the current header field was not found.
F5	80	Device status available	A header or data error occurred and the firmware was unable to determine the cause.
F6	80	Device status available	The sync byte in the current data field was not found.
F7	80	Device status available	A header ECC* error occurred on the current write data operation.
F8	80	Device status available	The ID argument specified by the DCB could not be found in one revolution of the disk.

TABLE A-2. CYCLE STEAL STATUS WORD 3 ERROR DEFINITIONS (CONTD)

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
F9	80	Device status available	A header ECC* error occurred on the current read data operation.
FA	80	Device status available	The end of the track has been reached and the number of bytes to be transferred as specified in DCB word 6 has not been reached. The number of sectors transferred will be reported and remaining sectors or bytes will be transferred with an additional DCB.
FB	NOT USED AT THIS TIME		
FC	NOT USED AT THIS TIME		
FD	80	Device status available	A read, write, or read verify transfer has completed without a read/write end interrupt.
FE	80	Device status	A ECC* error occurred in an ID field during a read or write operation.
FF	80	Device status available	An ECC* error occurred in a data field during a read operation.
AA	80	Device status available	The SMD interface is not presenting the correct information. This is an indication that the SMD has either a power or cable problem.

\*The ECC is used only to validate the ID and does not attempt to correct the ID if an error occurs.

CYCLE STEAL STATUS WORD 4 (ECC Correction Count)

Cycle steal status word 4 is set to zero at power-on and the number of ECC corrections made while power is on is accumulated.

CYCLE STEAL STATUS WORDS 5 THROUGH 9

Cycle steal status words 5 through 9 are presently not used and are reserved for future diagnostic use.

EXPLANATION OF DECISION LOGIC TABLES

The following paragraphs describe the basic DLT format and how to read DLTs.

BASIC DLT FORMAT

A decision logic table (DLT) is a specialized format that presents troubleshooting information in a logical manner. The DLT provides a tabular listing of conditions that can be answered with a yes or no response. The various combinations of condition responses are structured to identify a unique situation column for the conditions being observed. This column lists a recommended sequence of actions to be taken to correct the particular malfunction.

The DLT includes any assumptions essential to interpreting the information contained and the table is arranged in four sections or quadrants. These quadrants are labeled Conditions, Situations, Actions, and Sequence as shown in figure A-1.

ASSUME									
Power cord is inserted in ac outlet.									
CONDITIONS				SITUATIONS					
				1	2	3	4	5	6
Does Power Indicator switch illuminate when pressed?				Y	N	N	N	N	O T H E R
Has red circuit breaker CB2 tripped?				-	N	Y	Y	Y	
Will CB2 stay in when pressed?				-	N	Y	N	N	
Turn power off; disconnect plug in J1. Turn power on, will CB2 now stay set?				-	-	-	Y	N	
ACTIONS				SEQUENCE					
Go to table 6-__.				X	-	X	-	-	-
Replace power distribution assembly.				-	1	-	-	3	-
Check for faulty cables.				-	2	-	-	1	-
Replace power supply switch assembly.				-	3	-	-	2	-
Replace power supply (procedure __).				-	4	-	X	-	-
Problem not covered in manual. Call for assistance.				-	-	-	-	-	X

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POWER SUPPLY CHECKS DLT XYZ

Figure A-1. Decision Logic Table Example

## Conditions

The upper-left quadrant contains the conditions to be observed during troubleshooting. Conditions are presented in the form of questions that can be answered with a yes (Y) or a no (N). In cases where the response is irrelevant\* to a particular situation, a hyphen (-) is used instead. A condition may be prefixed by specific procedures that must be performed in order to observe the stated condition.

## Situations

The upper-right quadrant contains the situations columns (numbered 1 to 6 in the example). These vertical columns contain unique combinations of responses to the questions posed in the conditions quadrant. The column having "other" as the response implies that a particular situation other than those listed can occur, but is beyond the normal level of field support.

## Actions

The lower-left quadrant lists the operations to be performed in the process of troubleshooting the various situations covered by the table. The actual sequence of actions and which actions to be performed is as indicated by the sequence quadrant.

## Sequence

The lower-right quadrant lists the sequence of actions to be performed for each situation covered in the situations quadrant. These are listed in numerical order and reflect the probability that the indicated sequence of actions will correct the malfunction in the most efficient manner. If more than one action has the same probability of correcting the existing situation, the one that is easiest to perform is listed first. If there is only one action for a given situation, an X is used instead of a number. Hyphens indicate those actions that are not used in the sequence.

---

\*Irrelevant in this application means that the condition is not a factor in determining the corrective action for the given situation.



## HOW TO USE DLTs

The following explains how to use the DLTs contained in this appendix. First determine what table applies to your troubleshooting situation and verify that the assumptions stated in the DLT are true. A DLT is valid only if all stated assumptions are true. The tables are identified by both a title indicating the malfunction covered, and by specific DLT number.

Two types of DLTs are used. Although both are structured in the same basic format, one type is based on an associated BASIC diagnostic or utility, and the other is not and thus called a paper-only DLT. The numbering scheme used to identify each DLT is as follows:

DLT XXYZ-x

Where: XX = 71 indicating a 240 megabyte SMD DLT  
 Y = 0-6 indicating a diagnostic based DLT  
 Y = 7-9 indicating a paper-only DLT  
 Y = F indicating a utility based DLT  
 Z = used for sequencing each DLT  
 x = used for sequencing individual pages within each DLT

Therefore: DLT 7100-1 is the first page of a diagnostic DLT. The number 7100 reflects the actual diagnostic test number. DLT 7170-1 is the first page of a paper-only DLT, etc.

The paragraphs that follow further explain the differences between paper-only DLTs and diagnostic/utility based DLTs.

### Paper-Only DLTs

Paper-only DLTs deal with malfunctions that the BASIC SMD diagnostic programs cannot isolate. These DLTs are interpreted in the conventional manner that applies to a non-bifurcated table. That is, each situation column must be examined in sequence from left to right until a column is found with responses that identically match the conditions being observed. Follow this column down to the Sequence quadrant and perform the recommended actions in the sequence indicated.

The example DLT in figure A-1 shows that two conditions (shaded area) are used to define situation 2. That is, the power indicator/switch does not illuminate when pressed, and red circuit breaker CB2 has not tripped. Assuming that these are the conditions observed, then this column would be followed (down) to determine the recommended sequence of actions. In this case, the first action would be to replace the power distribution assembly, and if this did not correct the problem, then check for faulty cables, etc.

## Diagnostic/Utility Based DLTs

Diagnostic/utility based DLTs present the actual program flow of the associated diagnostic or utility in the same manner as a flowchart. These DLTs are bifurcated and can be entered via the Conditions quadrant (normal entry quadrant) or the Actions quadrant.

### Conditions Quadrant Entry

Although diagnostic/utility based DLTs can be read the same as described for paper-only DLTs, bifurcation simplifies entry as follows: A nonbifurcated DLT requires examining each Situation column in sequence from left to right until an exact match of all condition responses is found. This then specifies the applicable column to be used in performing the action sequence. In a bifurcated DLT, it is only necessary to examine one condition at a time to obtain the same result. That is, answer the first condition and reading left to right, stop at the first Situations column that contains the correct Y or N response. Move down this Situations column and answer the second condition. Again reading left to right, stop at the first Situations column that contains the correct response for that condition. Continue this process until the last condition is answered. The last Situations column stopped at will contain the applicable action sequence.

### Actions Quadrant Entry

The diagnostic/utility based DLTs contain a step number for each item in the Conditions and Actions quadrants. This step number equates to the program step number of the associated diagnostic test or utility. For example, when running a diagnostic test and an error is detected, the test number and program step number of the test is indicated on the display or can be interpreted from the Series/1 operator/programmer panel. The test number is the same as the associated DLT number to facilitate easy cross referencing. Find the corresponding DLT and enter the table at the indicated step number. This will be one of the actions listed in the Actions quadrant and will specify the appropriate corrective action to be performed. To determine the portion of the diagnostic test that has completed successfully prior to the error, simply go to the right until a column is found with an X. Follow that column up into the Situations quadrant. The Y responses in that column identify the program steps that successfully preceded the error stop.



### NOTICE

Before executing diagnostic tests, read and understand the following:

- Diagnostic test execution assumes that correct voltages are present within SMD and Series/1. Refer to paper-only DLTs for troubleshooting power faults in SMD. Refer to Installing Attachment in Series/1, section 2, to verify correct Series/1 I/O bus voltage.
- If diagnostic tests end abnormally with no message or a meaningless abort message, reseal/replace attachment card and rerun tests. Attachment card replacement requires jumpering to select an SMD device address (refer to Installing Attachment in Series/1, section 2).
- If all diagnostics run without error and there are excessive retries on reads, the head alignment should be suspected. This problem may appear as graceful degradation (that is, slowly deteriorating times to read/recover file data or increasing amounts of error faults reported by the user's operating system). If any of these symptoms occur, immediately suspect head alignment, and refer to alignment procedures 3.19.1 through 3.19.3 in section 3, Maintenance.
- If the diagnostics run but the customer's software aborts or results in incorrect data, check/replace the attachment card. (This condition can result because the diagnostics are restricted to using only the lower 16 K of memory.)



This is the first of a series of auto diagnostic tests. Initiation is performed by entering B7100 at the Alternate or Primary console as applicable to enable loading from the CDC BASIC diskette.

CONDITIONS	SITUATIONS											
	1	2	3	4	5	6	7	8	9	10	11	12
Step 001 Halt I/O cmd (F0). CC=7?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 003 Prepare cmd (60), I bit off with 0000 <sub>16</sub> . CC=7?	-	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 004 CC=5?	-	N	N	Y	-	-	-	-	-	-	-	-
Step 005 CC=0?	-	N	Y	-	-	-	-	-	-	-	-	-
Step 009 Prepare cmd (60), I bit off with 2222 <sub>16</sub> . CC=7?	-	-	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 011 Prepare cmd (60), I bit off with FFFE <sub>16</sub> . CC=7?	-	-	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 013 Invalid cmd (00). CC=3?	-	-	-	-	-	-	N	Y	Y	Y	Y	Y
Step 015 Invalid cmd (01). CC=3?	-	-	-	-	-	-	-	N	Y	Y	Y	Y
Step 017 Invalid cmd (02). CC=3?	-	-	-	-	-	-	-	-	N	Y	Y	Y
Step 019 Invalid cmd (04). CC=3?	-	-	-	-	-	-	-	-	-	N	Y	Y
Step 021 Invalid cmd (08). CC=3?	-	-	-	-	-	-	-	-	-	-	N	Y

ACTIONS	SEQUENCE											
	1	2	3	4	5	6	7	8	9	10	11	12
Step 002 Reseat/replace attachment card. ①	X	-	-	-	-	-	-	-	-	-	-	-
Step 006 Invalid initial CC. Reseat/replace attachment card. ①	-	X	-	-	-	-	-	-	-	-	-	-
Step 007 CC=0 after prepare cmd. Reseat/replace attachment card. ①	-	-	X	-	-	-	-	-	-	-	-	-
Step 008 CC=5 after prepare cmd. Reseat/replace attachment card. ①	-	-	-	X	-	-	-	-	-	-	-	-
Step 010 Go to step 004 above.	-	-	-	-	X	-	-	-	-	-	-	-
Step 012 Go to step 004 above.	-	-	-	-	-	X	-	-	-	-	-	-
Step 014 Not initial CC=3 after start cycle steal cmd. Reapply power to SMD. Reseat/replace attachment card. ① Check I/O cable connections/condition.	-	-	-	-	-	-	X	-	-	-	-	-
Step 016 Do action listed for step 014.	-	-	-	-	-	-	-	X	-	-	-	-
Step 018 Do action listed for step 014.	-	-	-	-	-	-	-	-	X	-	-	-
Step 020 Do action listed for step 014.	-	-	-	-	-	-	-	-	-	X	-	-
Step 022 Do action listed for step 014.	-	-	-	-	-	-	-	-	-	-	X	-
Go to DLT 7100-2.	-	-	-	-	-	-	-	-	-	-	-	X

① Before replacing card, disconnect bus in and bus out cables from attachment card and rerun test. If test error still occurs, replace attachment card. If test runs OK, troubleshoot SMD interface logic and I/O connections.

NOTE

The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).

This is a continuation of DLT 7100-1.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 023 Invalid cmd (10). CC=3?	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 025 Invalid cmd (42). CC=3?	-	N	Y	Y	Y	Y	Y	Y	Y
Step 027 Invalid cmd (80). CC=3?	-	-	N	Y	Y	Y	Y	Y	Y
Step 029 Device reset cmd (6F) CC=7?	-	-	-	N	N	Y	Y	Y	Y
Step 030 CC=0?	-	-	-	N	Y	-	-	-	-
Step 033 Prepare cmd (60), I bit on. CC=7?	-	-	-	-	-	N	N	N	Y
Step 034 CC=5?	-	-	-	-	-	N	N	Y	-
Step 035 CC=0?	-	-	-	-	-	N	Y	-	-

ACTIONS	SEQUENCE								
	1	2	3	4	5	6	7	8	9
Step 024 Not initial CC=3 after start cycle steal cmd. Reapply power to Series/1. Reseat/replace attachment card. ① Check I/O cable connections/condition. Rerun test.	X	-	-	-	-	-	-	-	-
Step 026 Do action listed for step 024.	-	X	-	-	-	-	-	-	-
Step 028 Do action listed for step 024.	-	-	X	-	-	-	-	-	-
Step 031 Invalid CC after device reset cmd. Reseat/replace attachment card. ① Rerun test.	-	-	-	X	-	-	-	-	-
Step 032 CC=0 after device reset cmd. Reseat/replace attachment card. ① Rerun test.	-	-	-	-	X	-	-	-	-
Step 036 Invalid CC after prepare cmd. Reseat/replace attachment card. Rerun test.	-	-	-	-	-	X	-	-	-
Step 037 CC=5 after prepare cmd. Reseat/replace attachment card. ①	-	-	-	-	-	-	-	X	-
Step 038 CC=0 after prepare cmd. Reseat/replace attachment card. ① Rerun test.	-	-	-	-	-	-	X	-	-
Step 039 Branch to test T7101 (DLT 7101).	-	-	-	-	-	-	-	-	X

① Before replacing card, disconnect bus in and bus out cables from attachment card and rerun test. If test error still occurs, replace attachment card. If test runs OK, troubleshoot SMD interface logic and I/O connections.

NOTE

The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).

This test is automatically linked from test 7100. Some errors cause an automatic branch to error analysis routine 7120 for additional isolation.

CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Step 001 Halt I/O cmd (F0). CC=7?	N	Y	Y	Y	Y	Y	Y
Step 003 Device reset cmd (6F). CC=7?	-	N	Y	Y	Y	Y	Y
Step 005 Invalid DCB (all zeroes). CC=0702?	-	-	N	N	Y	Y	Y
Step 006 CC=0703?	-	-	N	Y	-	-	-
Step 009 ISB bit 3 = on?	-	-	-	-	N	N	Y
Step 010 ISB bit 0 = on?	-	-	-	-	N	Y	-
ACTIONS	SEQUENCE						
Step 002 Not CC=07 after halt I/O. Reseat/replace attachment cables/card. ① Run test 7100. If error persists, go to DLT 7182.	X	-	-	-	-	-	-
Step 004 Not CC=07 after device reset. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7182.	-	X	-	-	-	-	-
Step 007 Not CC=0702 or 0703 after start cycle steal invalid DCB cmd. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7182.	-	-	X	-	-	-	-
Step 008 CC=0703 after start cycle steal cmd containing invalid DCB. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7182.	-	-	-	X	-	-	-
Step 011 ISB bits 0 or 3 not on after invalid DCB. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7182.	-	-	-	-	X	-	-
Step 012 Branch to test 7120 (DLT 7120).	-	-	-	-	-	X	-
Go to DLT 7101-2.	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).							



This is a continuation of DLT 7101-1.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Step 016 Cycle steal status. CC=0703?	N	Y	Y	Y	Y	Y
Step 018 Check cycle steal status words 1, 2, and 3. Result = 0000?	-	N	N	N	N	Y
Step 019 Result not equal 0001?	-	N	Y	Y	Y	-
Step 021 Result not equal 0002?	-	-	N	Y	Y	-
Step 023 Result not equal 0004?	-	-	-	N	Y	-
ACTIONS	SEQUENCE					
Step 017 Go to step 030 this test (DLT 7101-3).	X	-	-	-	-	-
Step 020 Cycle steal status word 1 is not zero. Reseat/replace attachment cables/card. ① Run test 7100. If error persists, go to DLT 7182.	-	X	-	-	-	-
Step 022 Cycle steal status word 2 is not zero. Reseat/replace attachment cables/card. ① Run test 7100. If error persists, go to DLT 7182.	-	-	X	-	-	-
Step 024 Cycle steal status word 3 is not 0042. Reseat/replace attachment cables/card. ① Run test 7100. If error persists, go to DLT 7182.	-	-	-	X	-	-
Step 025 Invalid error. Rerun auto tests. If error persists, call for assistance.	-	-	-	-	X	-
Step 026 Branch to test 7102 (DLT 7102).	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).						



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This test is automatically linked from test T7101.

CONDITIONS	SITUATIONS											
	1	2	3	4	5	6	7	8	9	10	11	12
Step 001 Run first downline. CC=0703?	Y	N	N	N	N	N	N	N	N	N	N	N
Step 002 CC=0702?	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 004 Does test result = 07028000?	-	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 005 Did wrap test run OK using 8700?	-	-	-	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 006 Did wrap test run OK using 873F?	-	-	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 007 Did Bus In equal zero after disk reset cmd?	-	-	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 008 Did tri-state bus equal all ones after disk reset cmd?	-	-	-	-	-	-	N	Y	Y	Y	Y	Y
Step 009 Did gap counter equal zero after disk reset cmd?	-	-	-	-	-	-	-	N	Y	Y	Y	Y
Step 010 Did maskable interrupt register equal zero after disk reset?	-	-	-	-	-	-	-	-	N	Y	Y	Y
Step 011 Did state register equal zero after disk reset cmd?	-	-	-	-	-	-	-	-	-	N	Y	Y
Step 012 Did read status equal zero after disk reset cmd?	-	-	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE											
Go to step 033, DLT 7102-3.	X	-	-	-	-	-	-	-	-	-	-	-
Step 003 Unexpected status condition. Replace attachment card. ①	-	X	-	-	-	-	-	-	-	-	-	-
Step 032 Unexpected status condition. Rerun test, if error persists, replace attachment card. ①	-	-	X	-	-	-	-	-	-	-	-	-
Step 031 Replace logic chassis card(s) A03, A01 and check bus in and bus out cables.	-	-	-	X	-	-	-	-	-	-	-	-
Step 030 Do action listed for step 031.	-	-	-	-	X	-	-	-	-	-	-	-
Step 029 Replace logic chassis card A03.	-	-	-	-	-	X	-	-	-	-	-	-
Step 028 Replace logic chassis card(s) A03, A05, A06, A04.	-	-	-	-	-	-	X	-	-	-	-	-
Step 027 Replace logic chassis card A04.	-	-	-	-	-	-	-	X	-	-	-	-
Step 026 Replace logic chassis card A03.	-	-	-	-	-	-	-	-	X	-	-	-
Step 025 Replace logic chassis card A04.	-	-	-	-	-	-	-	-	-	X	-	-
Step 024 Replace logic chassis card A04.	-	-	-	-	-	-	-	-	-	-	X	-
Go to DLT 7102-2.	-	-	-	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).												

This is a continuation of DLT 7102-1.

CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Step 013 Did DS1 equal On Cylinder and Ready after disk reset cmd?	N	Y	Y	Y	Y	Y
Step 014 Did DS2 equal Start, Up to Speed, Heads Loaded, and Fine mode?	-	N	Y	Y	Y	Y
Step 015 Did DS3 equal zero after disk reset cmd?	-	-	N	Y	Y	Y
Step 016 Did ECC Register 0 equal zero after disk reset cmd?	-	-	-	N	Y	Y
Step 017 Did maskable interrupt register equal zero after disk reset cmd?	-	-	-	-	N	Y
ACTIONS	SEQUENCE					
Step 023 Replace logic chassis card(s) A04, A14, A07, A03, A17 ①.	X	-	-	-	-	-
Step 022 Replace logic chassis card(s) A06, A12, A17 ①, A07.	-	X	-	-	-	-
Step 021 Do action listed for step 022.	-	-	X	-	-	-
Step 020 Replace logic chassis cards A06, A01, A03.	-	-	-	X	-	-
Step 019 Replace logic chassis card A03, A05 ②	-	-	-	-	X	-
Step 018 Illogical error. Rerun test. If error persists, rerun CPU tests (press Load switch on Series/1).	-	-	-	-	-	X
<p>① Set Maintenance Unit Disable switch on new A17 card to NORM.</p> <p>② Check to see that P.C. card in position A05 has a dummy plug installed in the top connector of the board and that the dummy plug has pins 47 and 48 jumpered together. Note that the connector is not keyed. Pins 47 and 48 of the dummy plug must match pins 47 and 48 of the P.C. connector.</p>						

This is a continuation of DLT 7102-2.

CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Step 033 Run second downline. CC=0703?	Y	N	N	N	N	N	N	N	N	N
Step 034 CC=0702	-	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 036 Did both Index and Sector reset after a disk reset cmd?	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 037 Did Index set in time?	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 038 Did Index go low after detection?	-	-	-	-	N	Y	Y	Y	Y	Y
Step 039 Did Sector set in time?	-	-	-	-	-	N	Y	Y	Y	Y
Step 040 Did Sector go low after detection?	-	-	-	-	-	-	N	Y	Y	Y
Step 041 Did Index raise after 59 sectors?	-	-	-	-	-	-	-	N	Y	Y
Step 042 Is the error intermittent?	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE									
Step 051 Attachment/Disk interface test ran OK. Branch to test T7103 (DLT 7103).	X	-	-	-	-	-	-	-	-	-
Step 035 Illogical error. Rerun test. If error persists, rerun CPU tests (press Load switch on Series/1).	-	X	-	-	-	-	-	-	-	-
Step 050 Check I/O cable connections/condition. If OK, replace logic chassis card(s) A03, A02, A09 ①, attachment card ②.	-	-	X	-	-	-	-	-	-	-
Step 049 Replace logic chassis card(s) A03, A02, A09 ①, A10, A18.	-	-	-	X	-	-	-	-	-	-
Step 048 Replace logic chassis card(s) A03, A02, A09 ①.	-	-	-	-	X	-	-	-	-	-
Step 047 Verify switch settings on logic chassis card A09 ①. If correct, replace logic chassis card(s) A03, A02, A09 ①, A18.	-	-	-	-	-	X	-	-	-	-
Step 046 Replace logic chassis card(s) A03, A02, A09 ①.	-	-	-	-	-	-	X	-	-	-
Step 045 Verify switch settings on logic chassis A09 ① card. If correct, replace card(s) A09 ①, A10.	-	-	-	-	-	-	-	X	-	-
Step 044 Replace logic chassis card(s) A03, A02, A09 ①.	-	-	-	-	-	-	-	-	-	X
Step 043 Illogical error. Rerun CPU tests (press Load switch on Series/1).	-	-	-	-	-	-	-	-	X	-
① Refer to Setting Sector Switches, section 2, for correct switch settings of A09 card. ② The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).										



This test is automatically linked from test 7102.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 001 Halt I/O cmd (F0). CC=07?	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 003 Prepare cmd (60 DA) 0001. CC=07?	-	N	Y	Y	Y	Y	Y	Y	Y
Step 007 Start cycle steal status cmd (7F). CC=0703?	-	-	N	N	N	N	N	N	Y
Step 008 CC#0704?	-	-	N	Y	Y	Y	Y	Y	-
Step 010 CC=0702?	-	-		N	Y	Y	Y	Y	-
Step 012 ISB > 0F00?	-	-	-	-	N	Y	Y	Y	-
Step 014 ISB bit 0 off?	-	-	-	-	-	N	Y	Y	-
Step 016 ISB bit 1 on?	-	-	-	-	-	-	N	Y	-
ACTIONS	SEQUENCE								
Step 002 Go to IBM MAP 0070. Some attachment is holding down CC lines.	X	-	-	-	-	-	-	-	-
Step 004 Prepare cmd reject. Go to DLT 7100.	-	X	-	-	-	-	-	-	-
Step 009 Attention interrupt after command 7F. Rerun test 7103. If same error, replace SMD attachment card. ①	-	-	X	-	-	-	-	-	-
Step 011 Possible pending device status outstanding. Verify device interface. If correct, replace SMD attachment card. ①	-	-	-	X	-	-	-	-	-
Step 013 Channel status error on interrupt after command 7F. Go to DLT 7100. If same error, replace SMD attachment card. ①	-	-	-	-	X	-	-	-	-
Step 015 Exception interrupt after command 7F. Go to DLT 7100. If same error, replace SMD attachment card. ①	-	-	-	-	-	X	-	-	-
Step 017 DCB specification check after command 7F. Go to DLT 7100. If same error, replace SMD attachment card. ①	-	-	-	-	-	-	X	-	-
Step 018 Delayed reject on command 7F. Go to DLT 7100. If same error, replace SMD attachment card. ①	-	-	-	-	-	-	-	X	-
Go to DLT 7103-2.	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).									



This is a continuation of DLT 7103-1.										
CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Step 019 Prepare cmd (60DA) 003. CC=07?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 021 Start cycle steal status cmd (7F). CC=07?	-	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 023 Prepare cmd (60DA) 0001. CC=0703?	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 025 Start cycle steal status cmd (7F). CC=07?	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 027 Prepare cmd (60DA) 0001. CC=07?	-	-	-	-	N	Y	Y	Y	Y	Y
Step 029 Invalid cmd in DCB (0D). CC=0702?	-	-	-	-	-	N	Y	Y	Y	Y
Step 031 ISB bit 3 on?	-	-	-	-	-	-	N	Y	Y	Y
Step 033 Invalid sector in read data DCB (3C). CC=0702 and ISB bit 3 on?	-	-	-	-	-	-	-	N	Y	Y
Step 035 Invalid sector in read sector ID DCB (3C). CC=0702 and ISB bit 3 on?	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE									
Step 020 Prepare cmd reject. Go to DLT 7100.	X	-	-	-	-	-	-	-	-	-
Step 022 Possible pending device status outstanding. Verify device interface. If correct, replace SMD attachment card. ①	-	X	-	-	-	-	-	-	-	-
Step 024 Prepare cmd reject. Go to DLT 7100.	-	-	X	-	-	-	-	-	-	-
Step 026 Possible pending device status outstanding. Verify device interface. If correct, replace SMD attachment card. ①	-	-	-	X	-	-	-	-	-	-
Step 028 Possible pending device status outstanding. Verify device interface. If correct, replace SMD attachment card. ①	-	-	-	-	X	-	-	-	-	-
Step 030 Invalid modifier in start DCB did not cause interrupt CC-0702. Replace SMD attachment card. ①	-	-	-	-	-	X	-	-	-	-
Step 032 DCB specification check not in ISB. Replace SMD attachment card. ①	-	-	-	-	-	-	X	-	-	-
Step 034 DCB specification check not in ISB. Replace SMD attachment card. ①	-	-	-	-	-	-	-	X	-	-
Step 036 DCB specification check not in ISB. Replace SMD attachment card. ①	-	-	-	-	-	-	-	-	X	-
Go to DLT 7103-3.	-	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).										

This is a continuation of DLT 7103-2.

CONDITIONS	SITUATIONS										
	1	2	3	4	5	6	7	8	9	10	11
Step 037 Odd data address in read sector DCB parameter. CC=0702 and ISB bit 3 on?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 039 Wrong byte count in read sector DCB parameter. CC=0702 and ISB bit 3 on?	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 041 Start cycle steal status cmd (7F). CC=0703?	-	-	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 043 Start cycle steal status cmd (7F). CC=0703?	-	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 045 Cycle steal status correct.	-	-	-	-	N	N	N	N	N	N	Y
Step 046 ISB bits 0 through 7 = 0?	-	-	-	-	N	Y	Y	Y	Y	Y	-
Step 048 Correct interrupt device address?	-	-	-	-	-	N	Y	Y	Y	Y	-
Step 050 Status word 1, bit 15 = 0?	-	-	-	-	-	-	N	Y	Y	Y	-
Step 052 Status word 2 = 0?	-	-	-	-	-	-	-	N	Y	Y	-
Step 054 Residual address OK?	-	-	-	-	-	-	-	-	N	Y	-
ACTIONS	SEQUENCE										
Step 038 DCB specification check not in ISB. Replace SMD attachment card. ①	X	-	-	-	-	-	-	-	-	-	-
Step 040 DCB specification check not in ISB. Replace SMD attachment card. ①	-	X	-	-	-	-	-	-	-	-	-
Step 042 Possible pending device status outstanding. Verify device interface. If correct, replace SMD attachment card. ①	-	-	X	-	-	-	-	-	-	-	-
Step 044 Possible pending device status outstanding. Verify device interface. If correct, replace SMD attachment card. ①	-	-	-	X	-	-	-	-	-	-	-
Step 047 ISB bits 0 through 7 not zero. Replace SMD attachment card. ①	-	-	-	-	X	-	-	-	-	-	-
Step 049 Wrong interrupt device address. Replace SMD attachment card. ①	-	-	-	-	-	X	-	-	-	-	-
Step 051 Not ready or power off status. Replace SMD attachment card. ①	-	-	-	-	-	-	X	-	-	-	-
Step 053 Status word 2 not zero. Replace SMD attachment card. ①	-	-	-	-	-	-	-	X	-	-	-
Step 055 Residual address not correct. Replace SMD attachment card. ①	-	-	-	-	-	-	-	-	X	-	-
Step 056 Branch to test T7106 (DLT 7106).	-	-	-	-	-	-	-	-	-	X	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).											



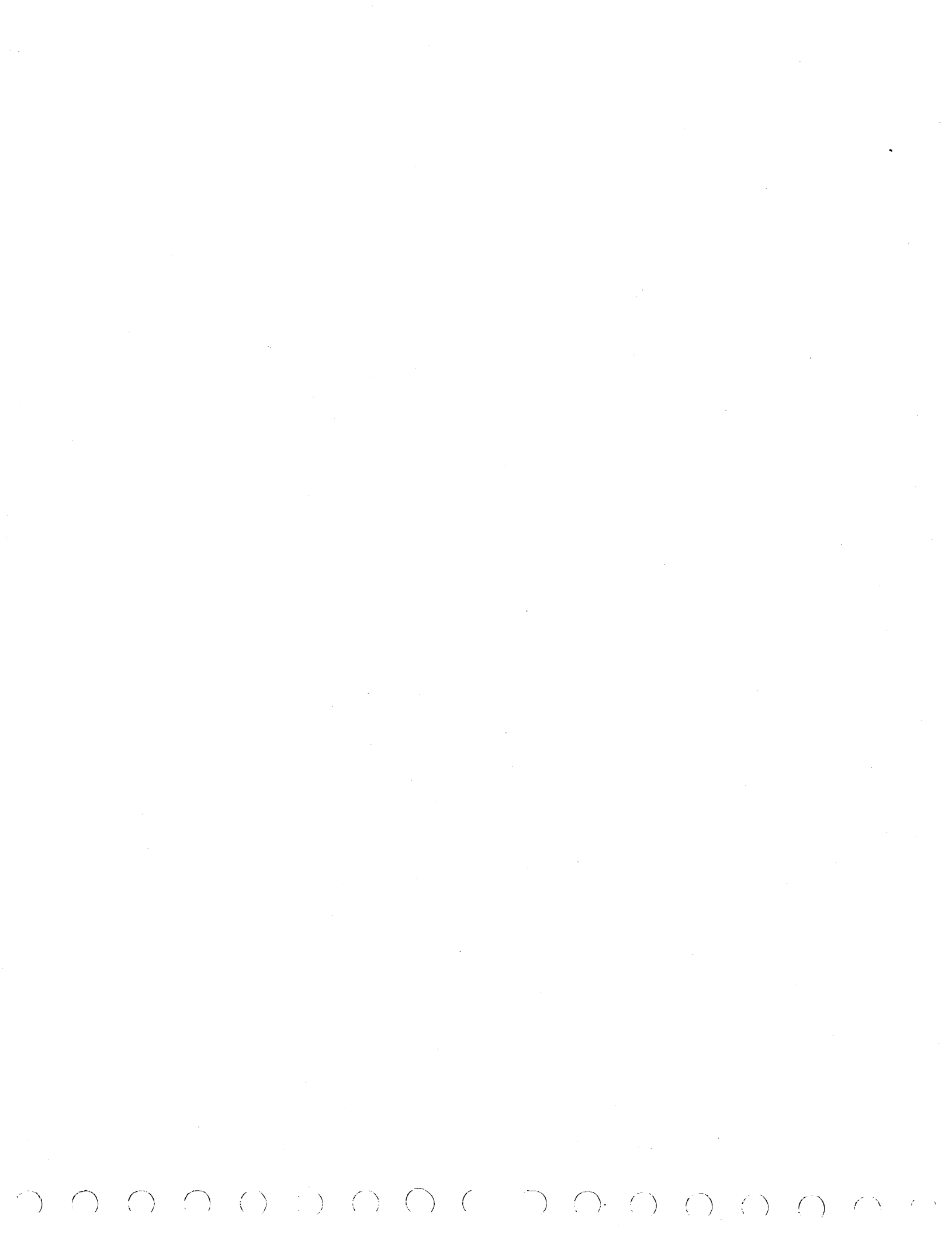
This test automatically linked from T7103.

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Step 001 Did wrap test and diagnostic mode run correctly?	N	Y	Y	Y	Y
Step 003 Did Z80 RAM test (4080-43FF) run correctly?	-	N	Y	Y	Y
Step 005 Did data buffer test (8800-8BFF) run correctly?	-	-	N	Y	Y
Step 007 Did ID compare/RAM test run correctly?	-	-	-	N	Y
ACTIONS	SEQUENCE				
Step 002 Replace A01, A02, A03 logic chassis cards. If this fails to fix problem, replace SMD attachment card. ①	X	-	-	-	-
Step 004 Replace SMD attachment card. ①	-	X	-	-	-
Step 006 Replace SMD attachment card. Replace I/O cables. ①	-	-	X	-	-
Step 008 Replace A01, A03, A05 logic chassis cards.	-	-	-	X	-
Step 009 Branch to test T7107 (DLT 7107).	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).					



This test automatically linked from T7106.

CONDITIONS	SITUATIONS			
	1	2	3	4
Step 001 Did write sector ID test run OK?	N	Y	Y	Y
Step 003 Did read sector ID test run OK?	-	N	Y	Y
Step 005 Did sync check test run OK?	-	-	N	Y
ACTIONS	SEQUENCE			
Step 002 Replace A02, A04, A05 logic chassis cards.	X	-	-	-
Step 004 Replace A04, A05, A02 logic chassis cards.	-	X	-	-
Step 006 Replace A02, A04, A05 logic chassis cards.	-	-	X	-
Step 007 Branch to test T7108 (DLT 7108).	-	-	-	X









This test automatically linked from T7108.

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Step 001 Did read diagnostic test run OK?	N	Y	Y	Y	Y
Step 003 Did ECC test 1 run OK?	-	N	Y	Y	Y
Step 005 Did ECC test 2 run OK?	-	-	N	Y	Y
Step 007 Did header compare test run OK?	-	-	-	N	Y
ACTIONS	SEQUENCE				
Step 002 Replace logic chassis card(s) A04, A05.	X	-	-	-	-
Step 004 Replace logic chassis card(s) A04, A05.	-	X	-	-	-
Step 006 Replace logic chassis card(s) A04, A05.	-	-	X	-	-
Step 008 Replace logic chassis card A05.	-	-	-	X	-
Step 009 Branch to test T7110 (DLT 7110).	-	-	-	-	X



This test is automatically linked from test 7109.

CONDITIONS	SITUATIONS										
	1	2	3	4	5	6	7	8	9	10	11
Step 001 Did RTZ test run to normal completion?	Y	N	N	N	N	N	N	N	N	N	N
Step 002 Did RTZ test fail with interrupt CC = 02?	-	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 003 Did RTZ test fail with interrupt CC = 04?	-	N	Y	-	-	-	-	-	-	-	-
Step 006 Is Unit Ready active?	-	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 007 Did RTZ latch set after RTZ was issued?	-	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 008 Did Seek End go low after RTZ was issued?	-	-	-	-	-	N	Y	Y	Y	Y	Y
Step 009 Did On Cylinder go low after RTZ was issued?	-	-	-	-	-	-	N	Y	Y	Y	Y
Step 010 Did Fine go high within 400 ms?	-	-	-	-	-	-	-	N	Y	Y	Y
Step 011 Did Slope go low after RTZ command and 400 ms delay?	-	-	-	-	-	-	-	-	N	Y	Y
Step 012 Did Seek End go high after 25 ms delay?	-	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE										
Go to step 029 (DLT 7110-2).	X	-	-	-	-	-	-	-	-	-	-
Step 004 Illogical error exit. Rerun CPU tests via IPL.	-	X	-	-	-	-	-	-	-	-	-
Step 005 Unexpected Attention Interrupt. Rerun this test.	-	-	X	-	-	-	-	-	-	-	-
Step 028 Unit is Not Ready. Run test T7121 to isolate Not Ready problem.	-	-	-	X	-	-	-	-	-	-	-
Step 027 RTZ command not executed. Replace following logic chassis cards one at a time and rerun test: A06, A07, A09 ①, A02.	-	-	-	-	X	-	-	-	-	-	-
Step 026 Seek End failed to drop. Replace following logic chassis cards one at a time and rerun test: A03, A07.	-	-	-	-	-	X	-	-	-	-	-
Step 025 On Cylinder failed to drop. Replace following logic chassis cards one at a time and rerun test: A06, A07.	-	-	-	-	-	-	X	-	-	-	-
Step 024 Fine not active after 400 ms. Replace following logic chassis cards one at a time and rerun test: A06, A07, A09 ①, A19, A12.	-	-	-	-	-	-	-	X	-	-	-
Step 023 Slope not down on RTZ. Replace following logic chassis cards one at a time and rerun test: A07, A12, A06.	-	-	-	-	-	-	-	-	X	-	-
Step 022 Seek End failed to rise after 25 ms. Replace following logic chassis cards one at a time and rerun test: A18, A07, A20 ②, A19.	-	-	-	-	-	-	-	-	-	X	-
Go to step 013 (DLT 7110-2).	-	-	-	-	-	-	-	-	-	-	X
① Refer to Setting Sector Switches, section 2, for correct switch settings of A09 card.											
② New A20 card will require servo adjustment (paragraph 3.20).											

This is a continuation of DLT 7110-1.											
CONDITIONS	SITUATIONS										
	1	2	3	4	5	6	7	8	9	10	11
Step 013 Did Seek End remain low during 7 ms delay?	N	Y	Y	Y	Y	-	-	-	-	-	-
Step 014 Was RTZ command accepted?	-	N	Y	Y	Y	-	-	-	-	-	-
Step 015 Did Load and RTZ go low after RTZ?	-	-	N	Y	Y	-	-	-	-	-	-
Step 016 Did Seek End go high within 10 ms?	-	-	-	N	Y	-	-	-	-	-	-
Step 029 Did offset test run to normal completion?	-	-	-	-	-	Y	N	N	N	N	N
Step 030 Did offset test fail with interrupt CC = 02?	-	-	-	-	-	-	N	N	Y	Y	Y
Step 031 Did offset test fail with interrupt CC = 04?	-	-	-	-	-	-	N	Y	-	-	-
Step 034 Did Diag Mode set?	-	-	-	-	-	-	-	-	N	Y	Y
Step 035 Did Offset Active set on forward offset command?	-	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE										
Step 021 Seek End failed to stay low 7 ms. Replace following logic chassis cards one at a time and rerun test: A07, A20 <sup>②</sup> , A19, A18, and servo preamp (paragraph 3.15.1).	X	-	-	-	-	-	-	-	-	-	-
Step 020 RTZ not up. Replace following logic chassis cards one at a time and rerun test: A07, A09 <sup>③</sup> .	-	X	-	-	-	-	-	-	-	-	-
Step 019 Load and RTZ failed to drop. Replace following logic chassis cards one at a time and rerun test: A07, A09 <sup>③</sup> , A02, A19.	-	-	X	-	-	-	-	-	-	-	-
Step 018 Seek End failed to raise during 10 ms delay. Replace following logic chassis cards one at a time and rerun test: A18, A07, A20 <sup>②</sup> , A19.	-	-	-	X	-	-	-	-	-	-	-
Step 017 Illogical error exit. Rerun CPU tests via IPL.	-	-	-	-	X	-	-	-	-	-	-
Step 032 Illogical error exit. Rerun CPU tests via IPL.	-	-	-	-	-	-	X	-	-	-	-
Step 033 Unexpected Attention Interrupt. Rerun this test and if error persists, then run test T7121 for further isolation.	-	-	-	-	-	-	-	X	-	-	-
Step 083 Branch to test T7113 (DLT 7113).	-	-	-	-	-	X	-	-	-	-	-
Step 082 Diag. Mode not set. Verify drive is up and ready, if yes, replace following logic chassis cards one at a time and rerun test: A03, A02, A01, and attachment card <sup>①</sup> .	-	-	-	-	-	-	-	-	X	-	-
Step 081 Offset Active not high after offset command issued. Replace following logic chassis cards one at a time and rerun test: A04, A02, A19.	-	-	-	-	-	-	-	-	-	X	-
Go to step 036 (DLT 7110-3).	-	-	-	-	-	-	-	-	-	-	X
<p>① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).</p> <p>② New A20 card will require servo adjustment (paragraph 3.20).</p> <p>③ Refer to Setting Sector Switches, section 2, for correct switch settings of A09 card.</p>											

## SERVO TESTS, RTZ AND OFFSET (CONTD)

This is a continuation of DLT 7110-2.

CONDITIONS	SITUATIONS							
	1	2	3	4	5	6	7	8
Step 036 Did On Cylinder go low after reset?	N	Y	Y	Y	Y	Y	Y	Y
Step 037 Did Seek End go low after forward offset?	-	N	Y	Y	Y	Y	Y	Y
Step 038 Did On Cylinder rise after 3.1 ms delay?	-	-	N	Y	Y	Y	Y	Y
Step 039 Did Offset Active go high after 3.1 ms delay?	-	-	-	N	Y	Y	Y	Y
Step 040 Did Seek End go high after 3.1 ms delay?	-	-	-	-	N	Y	Y	Y
Step 041 Did Offset Active fail to go low after offset command dropped?	-	-	-	-	-	N	Y	Y
Step 042 Did Offset Active rise after reverse offset command?	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE							
Step 080 On Cylinder failed to drop after offset issued. Replace following logic chassis cards one at a time and rerun test: A07, A20 ①, A19.	X	-	-	-	-	-	-	-
Step 079 Seek End failed to drop after offset. Replace logic chassis card A07 and rerun test.	-	X	-	-	-	-	-	-
Step 078 On Cylinder didn't rise after 3.1 ms delay. Replace following logic chassis cards one at a time and rerun test: A12, A20 ①, A19.	-	-	X	-	-	-	-	-
Step 077 Offset Active dropped during offset. Replace following logic chassis cards one at a time and rerun test: A04, A19.	-	-	-	X	-	-	-	-
Step 076 Seek End not on after 3.1 ms delay. Replace following logic chassis cards one at a time and rerun test: A09, A03.	-	-	-	-	X	-	-	-
Step 075 Offset Active high after offset command dropped. Replace following logic chassis cards one at a time and rerun test: A19, A20 ①, A04.	-	-	-	-	-	X	-	-
Step 074 Offset Active not up after reverse offset command. Replace following logic chassis cards one at a time and rerun test: A02, A19.	-	-	-	-	-	-	X	-
Go to step 043 (DLT 7110-4).	-	-	-	-	-	-	-	X
① New A20 card will require servo adjustment (paragraph 3.20).								

This is a continuation of DLT 7110-3.

CONDITIONS	SITUATIONS							
	1	2	3	4	5	6	7	8
Step 043 Did On Cylinder go low after reverse offset command was issued?	N	Y	Y	Y	Y	Y	Y	Y
Step 044 Did Seek End go low after reverse offset command was issued?	-	N	Y	Y	Y	Y	Y	Y
Step 045 Did On Cylinder rise after 3.1 ms delay?	-	-	N	Y	Y	Y	Y	Y
Step 046 Did Offset Active rise after reverse offset command was issued?	-	-	-	N	Y	Y	Y	Y
Step 047 Did Seek End rise following delay after reverse offset command?	-	-	-	-	N	Y	Y	Y
Step 048 Did Offset Active go low after offset command was dropped?	-	-	-	-	-	N	Y	Y
Step 049 Did Offset Active go low after zero track seek?	-	-	-	-	-	-	N	Y

ACTIONS	SEQUENCE							
	1	2	3	4	5	6	7	8
Step 073 On Cylinder failed to drop after offset issued. Replace following logic chassis cards one at a time and rerun test: A07, A20 <sup>①</sup> , A19.	X	-	-	-	-	-	-	-
Step 072 Seek End failed to drop after offset. Replace logic chassis card A07 and rerun test.	-	X	-	-	-	-	-	-
Step 071 On Cylinder failed to rise after 3.1 ms delay. Replace following logic chassis cards one at a time and rerun test: A20 <sup>①</sup> , A19.	-	-	X	-	-	-	-	-
Step 070 Offset Active dropped during offset. Replace following logic chassis cards one at a time and rerun test: A04, A19.	-	-	-	X	-	-	-	-
Step 069 Seek End not on after 3.1 ms delay. Replace following logic chassis cards one at a time and rerun test: A09 <sup>②</sup> , A03.	-	-	-	-	X	-	-	-
Step 068 Offset Active remains high after offset command dropped. Replace following logic chassis cards one at a time and rerun test: A19, A20 <sup>①</sup> , A04.	-	-	-	-	-	X	-	-
Step 067 Offset Active on after zero track seek. Replace following logic chassis cards one at a time and rerun test: A04, A19, A20 <sup>①</sup> .	-	-	-	-	-	-	X	-
Go to step 050 (DLT 7110-5).	-	-	-	-	-	-	-	X

① New A20 card will require servo adjustment (paragraph 3.20).

② Refer to Setting Sector Switches, section 2, for correct switch settings of A09 card.

This is a continuation of DLT 7110-4.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 050 Did On Cylinder go low after zero track seek?	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 051 Did Seek End go low after zero track seek.	-	N	Y	Y	Y	Y	Y	Y	Y
Step 052 Did Seek End rise after 40 us delay?	-	-	N	Y	Y	Y	Y	Y	Y
Step 053 Did Offset Active rise after forward offset command following zero track seek?	-	-	-	N	Y	Y	Y	Y	Y
Step 054 Did Offset Active go low after RTZ command was issued?	-	-	-	-	N	Y	Y	Y	Y
Step 055 Did On Cylinder go low after maximum seek +1?	-	-	-	-	-	N	Y	Y	Y
Step 056 Did Seek End go low after maximum seek +1?	-	-	-	-	-	-	N	Y	Y
Step 057 Did Seek End rise after maximum seek +1?	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE								
Step 066 On Cylinder failed to drop after zero track seek. Replace following logic chassis cards one at a time and rerun test: A07, A09 ①.	X	-	-	-	-	-	-	-	-
Step 065 Seek End failed to drop on zero track seek. Replace following logic chassis cards one at a time and rerun test: A12, A03.	-	X	-	-	-	-	-	-	-
Step 064 Seek End not up after 40 us delay. Replace logic chassis card A07 and rerun test.	-	-	X	-	-	-	-	-	-
Step 063 Offset Active dropped during offset. Replace following logic chassis cards one at a time and rerun test: A04, A02, A19.	-	-	-	X	-	-	-	-	-
Step 062 Offset Active failed to drop after RTZ command. Replace following logic chassis cards one at a time and rerun test: A19, A20 ②, A04.	-	-	-	-	X	-	-	-	-
Step 061 On Cylinder failed to drop after max seek +1. Replace following logic chassis cards one at a time and rerun test: A09 ①, A07, A12, A03.	-	-	-	-	-	X	-	-	-
Step 060 Seek End failed to drop after max seek +1. Replace logic chassis card A07 and rerun test.	-	-	-	-	-	-	X	-	-
Step 059 Seek End not up after 40 us delay. Replace logic chassis card at A07 and rerun test.	-	-	-	-	-	-	-	-	X
Step 058 Unexpected attention interrupt. Rerun this test. If this error persists, then run T7121 for further isolation.	-	-	-	-	-	-	-	X	-
① Refer to Setting Sector Switches, section 2, for correct switch settings of A09 card. ② New A20 card will require servo adjustment (paragraph 3.20).									





This test is automatically linked from T7110. Some errors cause an automatic branch to error analysis routine 7120 for additional isolation.

CONDITIONS	SITUATIONS											
	1	2	3	4	5	6	7	8	9	10	11	12
Step 001 Read device ID (20). Result = 0000?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 003 Read sector ID (0A) all heads. Result = 0000?	-	N	N	N	N	N	N	N	N	N	N	Y
Step 004 Result bit 0 = off?	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	-
Step 006 Result bit 1 = off?	-	-	N	Y	Y	Y	Y	Y	Y	Y	Y	-
Step 008 Result bit 2 = off?	-	-	-	N	Y	Y	Y	Y	Y	Y	Y	-
Step 010 Result bit 3 = off?	-	-	-	-	N	Y	Y	Y	Y	Y	Y	-
Step 012 Result bit 4 = off?	-	-	-	-	-	N	Y	Y	Y	Y	Y	-
Step 014 Result bit 5 = off?	-	-	-	-	-	-	N	Y	Y	Y	Y	-
Step 016 Result bit 6 = off?	-	-	-	-	-	-	-	N	Y	Y	Y	-
Step 018 Result bit 7 = off?	-	-	-	-	-	-	-	-	N	Y	Y	-
Step 020 Result bit 8 = off?	-	-	-	-	-	-	-	-	-	N	Y	-
ACTIONS	SEQUENCE											
Step 002 The device ID is not valid. Run test 7100.	X	-	-	-	-	-	-	-	-	-	-	-
Step 005 Read head XX unsafe status. ① Run test 7100.	-	X	-	-	-	-	-	-	-	-	-	-
Step 007 Read head XX no record found status. ① Go to DLT 7182.	-	-	X	-	-	-	-	-	-	-	-	-
Step 009 Read head XX sync check. ① Possible bad sector ID, reinitialize disk pack (paragraph 3.23) and rerun test.	-	-	-	X	-	-	-	-	-	-	-	-
Step 011 Not ready or power off status. Run test 7100.	-	-	-	-	X	-	-	-	-	-	-	-
Step 013 Read head XX read sector ID error. ① Reinitialize disk pack (paragraph 3.23) and rerun test.	-	-	-	-	-	X	-	-	-	-	-	-
Step 015 Read head XX intermittent read sector ID compare errors. ① Run test 7150.	-	-	-	-	-	-	X	-	-	-	-	-
Step 017 Read head XX solid read sector ID compare errors. ① Run test 7150.	-	-	-	-	-	-	-	X	-	-	-	-
Step 019 Read head XX ECC error. ① Go to DLT 7182.	-	-	-	-	-	-	-	-	X	-	-	-
Step 021 Unexpected status. Branch to test 7120.	-	-	-	-	-	-	-	-	-	X	-	-
Go to step 022 (DLT 7113-2).	-	-	-	-	-	-	-	-	-	-	X	-
Go to step 030 (DLT 7113-2).	-	-	-	-	-	-	-	-	-	-	-	X
① If using operator/programmer panel only, failing head can be determined by running one pass of test 7122 on each head and verifying that the selected head number appears in R6.												

This is a continuation of DLT 7113-1

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Step 022 Result bit 9 = off?	N	Y	Y	Y	Y
Step 024 Result bit 10 = off?	-	N	Y	Y	Y
Step 026 Result bit 11 = off?	-	-	N	Y	Y
Step 028 Result bit 12 = off?	-	-	-	N	Y

ACTIONS	SEQUENCE				
	1	2	3	4	5
Step 023 CC=2 on a RTZ command. Replace following logic chassis cards one at a time and rerun test: A12, A18, A07.	X	-	-	-	-
Step 025 CC=2 on a maximum cylinder seek. Replace following logic chassis cards one at a time and rerun test: A12, A18, A07.	-	X	-	-	-
Step 027 CC=2 on a head select seek. Failing head=XX ①. Replace read/write chassis head select board (paragraph 3.14.1) and/or failing head (paragraph 3.19.6).	-	-	X	-	-
Step 029 Test completed OK, branch to test 7114.	-	-	-	X	-
Step 030 Branch to test 7120.	-	-	-	-	X

① If using operator/programmer panel only, failing head can be determined by running one pass of test 7122 on each head and verifying that the selected head number appears in R6.

This test automatically linked from test T7113.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 002 Issue recalibrate cmd. Ending status OK?	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 003 Issue seek cmd. Ending status OK?	-	N	Y	Y	Y	Y	Y	Y	Y
Step 004 Issue read sector ID cmd. Ending status OK?	-	-	N	Y	Y	Y	Y	Y	Y
Step 005 Test if flag = 0.	-	-	-	N	N	Y	Y	Y	Y
Test if expected cylinder = 01.	-	-	-	N	Y	-	-	-	-
Step 006 Test if expected cylinder = received cylinder.	-	-	-	-	N	N	Y	Y	Y
Test if at maximum cylinder.	-	-	-	-	-	-	N	Y	Y
Step 007 Issue reverse seek. Ending status OK?	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE								
Step 020 (Error 1) This command has been previously tested. If this is first time here, go back to test T7110 and 7113.	X	-	-	-	-	-	-	-	-
Step 019 (Error 2) This command has been previously tested. If this is first time here, go back to test T7113.		X	-	-	-	-	-	-	-
Step 018 (Error 3) Error interrupt on read sector ID command. This function was verified prior to this test. Go back to test 7113. If inconclusive, go to U71F1.			X	-	-	-	-	-	-
Step 017 (Error 4) Flag = 3 and cylinder ≠ 01. Suspect pack initialization.	-	-	-	X	-	-	-	-	-
Step 016 (Error 5) Expected cylinder ≠ received cylinder. Possible malfunction of seek circuits or pack not initialized properly. Check servo adjustment (paragraph 3.20). If OK, replace following logic chassis cards one at a time and rerun test: A12, A20 ①, A07, and power amplifier (paragraph 3.12.8).	-	-	-	-	X	X	-	-	-
Increment cylinder address and go back to Step 003.	-	-	-	-	-	-	X	-	-
Step 015 (Error 6) Ending status of reverse seek is bad. Check servo adjustment (paragraph 3.20). If OK, replace following logic chassis cards one at a time and rerun test: A12, A20 ①, A07, and power amplifier (paragraph (3.12.8).	-	-	-	-	-	-	-	X	-
Go to DLT 7114-2.	-	-	-	-	-	-	-	-	X
① New A20 card will require servo adjustment (paragraph 3.20).									

This is a continuation of DLT 7114-1.					
CONDITIONS	SITUATIONS				
	1	2	3	4	5
Step 008 Issue read sector. Ending status OK?	N	Y	Y	Y	Y
Test if flag = 0.	-	N	N	Y	Y
Step 009 Test if expected cylinder = 01.	-	N	Y	-	-
Step 010 Test if expected cylinder = received cylinder.	-	-	N	Y	Y
Step 001 Test if cylinder = 00.	-	-	-	N	Y
ACTIONS	SEQUENCE				
Step 014 (Error 7) Ending status or read sector ID is bad. Note: This same record was read during the forward incremental pass. Suspect drive going off cylinder after seek completes. Check servo adjustment (paragraph 3.20). If OK, replace following logic chassis cards one at a time and rerun test: A12, A20 ①, A07, and power amplifier (paragraph 3.12.8).	X	-	-	-	-
Step 013 (Error 8) This cylinder address has previously been read successfully during the forward pass. Suspect pack initialization.	-	X	-	-	-
Step 012 (Error 9) Expected cylinder ≠ received cylinder, a seek error occurs since the same sector ID was read successfully in the forward pass. Check servo adjustment (paragraph 3.20). If OK, replace following logic chassis cards one at a time and rerun test: A12, A20 ①, A07, and power amplifier (paragraph 3.12.8).	-	-	X	-	-
Go back to Step 002.	-	-	-	X	-
Incremental seek test ran OK. Branch to test T7115 (DLT 7115).	-	-	-	-	X
① New A20 card will require servo adjustment (paragraph 3.20).					

INCREMENTAL SEEK TEST (CONTD)

This test is automatically linked from T7114.										
CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Step 001 Did test run OK?	Y	N	N	N	N	N	N	N	N	N
Step 002 Did recalibrate fail on interrupt?	-	Y	N	N	N	N	N	N	N	N
Step 003 Did read sector ID fail on interrupt?	-	-	Y	N	N	N	N	N	N	N
Step 004 Is cylinder read ≠ to 0 after read?	-	-	-	Y	N	N	N	N	N	N
Step 005 Did seek command fail on interrupt?	-	-	-	-	Y	N	N	N	N	N
Step 006 Is cylinder received ≠ to expected cylinder and flag = 0?	-	-	-	-	-	Y	N	N	N	N
Step 007 Is cylinder received ≠ to expected cylinder and flag ≠ 0, 1, 2, and 3?	-	-	-	-	-	-	Y	N	N	N
Step 008 Is cylinder received ≠ to expected cylinder and cylinder = 1 and flag ≠ to alternate?	-	-	-	-	-	-	-	Y	N	N
Step 009 Is cylinder received ≠ to maximum cylinder after maximum cylinder seek?	-	-	-	-	-	-	-	-	Y	N
ACTIONS	SEQUENCE									
Step 019 Branch to test T7116 (DLT 7116).	X	-	-	-	-	-	-	-	-	-
Step 018 go back to T7113. This error should have been detected in prior tests. Rerun 7110 and 7113.	-	X	-	-	-	-	-	-	-	-
Step 017 go back to Read Sector ID Test T7113. If inconclusive, go to U71F1.	-	-	X	-	-	-	-	-	-	-
Step 016 go back to Read Sector ID Tests T7113 and 7114. If inconclusive, go to U71F1.	-	-	-	X	-	-	-	-	-	-
Step 015 Check servo adjustment (paragraph 3.20). If OK, replace following logic chassis cards one at a time and rerun test: A12, A20 (1), A07, and power amplifier paragraph 3.12.8).	-	-	-	-	X	-	-	-	-	-
Step 014 This error should have been found by T7114. Run T7114 if not done already. If test ran OK, perform actions of step 015.	-	-	-	-	-	X	-	-	-	-
Step 013 This error should have been found by T7114. Rerun T7114.	-	-	-	-	-	-	X	-	-	-
Step 012 This error should have been found by T7114. Rerun 7114.	-	-	-	-	-	-	-	X	-	-
Step 011 This error should have been found by T7114. Run T7114 if not done already. If test ran OK, perform actions of step 015.	-	-	-	-	-	-	-	-	X	-
Step 010 Illogical error. Rerun CPU diagnostics (IPL the CDC BASIC diskette).	-	-	-	-	-	-	-	-	-	X
(1) New A20 card will require servo adjustment (paragraph 3.20).										



This test is automatically linked from T7115.

CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Step 001 Did test run OK?	Y	N	N	N	N	N	N
Step 002 Did recalibrate fail on interrupt?	-	Y	N	N	N	N	N
Step 003 Did read sector ID fail on interrupt?	-	-	Y	N	N	N	N
Step 004 Did seek command fail on interrupt?	-	-	-	Y	N	N	N
Step 005 Did read sector ID fail on interrupt?	-	-	-	-	Y	N	N
Step 006 Is cylinder received ≠ to expected?	-	-	-	-	-	Y	N
ACTIONS	SEQUENCE						
Step 013 End of auto tests. Exit.	X	-	-	-	-	-	-
Step 012 Go back to T7114. This error should have been detected in prior tests T110 and T113.	-	X	-	-	-	-	-
Step 011 Go back to Read Sector ID Test T7113. This error should have been detected before. If inconclusive, go to U71F1.	-	-	X	-	-	-	-
Step 010 Replace the following logic chassis cards one at a time and rerun test: A12, A20 ①, A07, and power amplifier (paragraph 3.12.8).	-	-	-	X	-	-	-
Step 009 Go back to Read Sector ID Test T7113. This error should have been detected before.	-	-	-	-	X	-	-
Step 008 Perform same actions of step 010.	-	-	-	-	-	X	-
Step 007 Illogical error. Rerun CPU diagnostics (IPL the CDC BASIC diskette).	-	-	-	-	-	-	X
① New A20 card will require servo adjustment (paragraph 3.20).							





This is an automatically executed error analysis routine for abnormal error conditions detected by test 7101 or test 7113.

CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Step 001 Halt I/O cmd (F0). CC=7?	N	Y	Y	Y	Y	Y	Y
Step 003 Device reset cmd (6F). CC=7?	-	N	Y	Y	Y	Y	Y
Step 005 Invalid DCB (all zeros). CC=0702?	-	-	N	N	Y	Y	Y
Step 006 CC=0703?	-	-	N	Y	-	-	-
Step 009 Cycle steal status cmd. CC=0703?	-	-	-	-	N	Y	Y
Step 011 Result = 0000 <sub>16</sub> ?	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE						
Step 002 Not CC=07 after halt I/O. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7181.	X	-	-	-	-	-	-
Step 004 Not CC=07 after device reset. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7181.	-	X	-	-	-	-	-
Step 007 Not CC=0702 or 0703 after SCS invalid DCB cmd. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7181.	-	-	X	-	-	-	-
Step 008 CC=0703 after SCS cmd containing invalid DCB. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7181.	-	-	-	X	-	-	-
Step 010 Not CC=0703 on cycle steal cmd. Verify bus in and bus out cable condition/connections. Reapply power to SMD. Rerun auto tests. If error persists, go to DLT 7181.	-	-	-	-	X	-	-
Go to DLT 7120-2.	-	-	-	-	-	X	-
Step 054 None of the expected codes in word 3 of cycle steal status. Go to DLT 7181.	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).							

This is a continuation of DLT 7120-1									
CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 012 Result # 002A?	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 014 Result # 002B?	-	N	Y	Y	Y	Y	Y	Y	Y
Step 016 Result # 002C?	-	-	N	Y	Y	Y	Y	Y	Y
Step 018 Result # 002D?	-	-	-	N	Y	Y	Y	Y	Y
Step 020 Result # 002E?	-	-	-	-	N	Y	Y	Y	Y
Step 022 Result # 002F?	-	-	-	-	-	N	Y	Y	Y
Step 024 Result # 0030?	-	-	-	-	-	-	N	Y	Y
Step 026 Result # 0031?	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE								
Step 013 Cycle steal status word 3=2A, disk power off. Check drive circuit breakers. Reseat bus out cable. Reapply power to SMD. Rerun auto tests. If error persists, go to DLT 7181.	X	-	-	-	-	-	-	-	-
Step 015 Cycle steal status word 3=2B, cable not connected. Verify proper bus in/bus out cable connections and rerun auto tests. Reapply power to SMD and rerun tests. If error persists; go to DLT 7181.	-	X	-	-	-	-	-	-	-
Step 017 Cycle steal status word 3=2C, Indeterminate bus in cable parity. Reseat cable and rerun auto tests. Reapply power to SMD and rerun tests. If error persists, go to DLT 7181.	-	-	X	-	-	-	-	-	-
Step 019 Cycle steal status word 3=2D, illegal feature ID. Not a 240 SMD. Go to DLT 7181.	-	-	-	X	-	-	-	-	-
Step 021 Cycle steal status word 3=2E, not ready or not on cylinder. Verify pack mounted and/or drive is ready. If error persists, go to DLT 7181.	-	-	-	-	X	-	-	-	-
Step 023 Cycle steal status word 3=2F, not on cylinder. Run test 7110.	-	-	-	-	-	X	-	-	-
Step 025 Cycle steal status word 3=30, not ready. Go to DLT 7178.	-	-	-	-	-	-	X	-	-
Step 027 Cycle steal status word 3=31, timer elapsed. Replace attachment card. ①	-	-	-	-	-	-	-	X	-
Go to DLT 7120-3.	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).									

This is a continuation of DLT 7120-2

CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Step 028 Result ≠ 0021?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 030 Result ≠ 0034?	-	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 032 Result ≠ 0035?	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 034 Result ≠ 0036?	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 036 Result ≠ 0038?	-	-	-	-	N	Y	Y	Y	Y	Y
Step 038 Result ≠ 0039?	-	-	-	-	-	N	Y	Y	Y	Y
Step 040 Result ≠ 003A?	-	-	-	-	-	-	N	Y	Y	Y
Step 044 Result ≠ 0044?	-	-	-	-	-	-	-	N	Y	Y
Step 046 Result ≠ 004A?	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE									
Step 029 Cycle steal status word 3=32, DMA parity. Check bus in cable connections; replace A03, A01 logic chassis card(s), attachment card ①.	X	-	-	-	-	-	-	-	-	-
Step 031 Cycle steal status word 3=34, cable disconnected. Check for correct bus in/bus out cable connections.	-	X	-	-	-	-	-	-	-	-
Step 033 Cycle steal status word 3=35, SMD power not correct Go to DLT 7181.	-	-	X	-	-	-	-	-	-	-
Step 035 Cycle steal status word 3=36, indeterminate cable parity errors. Verify bus in/bus out cable condition/connection. Reapply power to SMD and rerun auto tests. If error persists, go to DLT 7181.	-	-	-	X	-	-	-	-	-	-
Step 037 Cycle steal status word 3=38, data error. Replace attachment card. ①	-	-	-	-	X	-	-	-	-	-
Step 039 Cycle steal status word 3=39, ID error. Replace attachment card. ①	-	-	-	-	-	X	-	-	-	-
Step 041 Cycle steal status word 3=3A, disk error. Reseat logic chassis card A06. Rerun auto tests, if error persists, go to DLT 7181.	-	-	-	-	-	-	X	-	-	-
Step 045 Cycle steal status word 3=44. Device not ready on a start cmd. Go to DLT 7181.	-	-	-	-	-	-	-	X	-	-
Step 047 Cycle steal status word 3=4A, hung during write sector ID. Replace attachment card. ①	-	-	-	-	-	-	-	-	X	-
Go to DLT 7120-4.	-	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).										

This is a continuation of DLT 7120-3.

CONDITIONS	SITUATIONS			
	1	2	3	4
Step 048 Result ≠ 00AA?	N	Y	Y	Y
Step 050 Result ≠ 00F3?	-	N	Y	Y
Step 052 Result ≠ 00F5?	-	-	N	Y
ACTIONS	SEQUENCE			
Step 049 Cycle steal status word 3=AA, problem undefined. Possible power or cable problem. Check cables and rerun auto tests. If error persists, go to DLT 7181.	X	-	-	-
Step 051 Cycle steal status word 3=F3, header error undefined. Replace attachment card. ① Rerun auto tests. If error persists, go to DLT 7181.	-	X	-	-
Step 053 Cycle steal status word 3=F5, header or data error undefined. Replace attachment card. ① If error persists, go to DLT 7181.	-	-	X	-
Step 054 None of expected codes in word 3 of cycle steal status. Go to DLT 7181.	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).				

This is a manual test that checks the first seek capability of the SMD. The drive must be in stopped condition to initiate the test. Enter B7121 to initiate test.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 001 Are you ready to start drive? If so, enter 1 (yes) and then press START switch on drive; if not, enter 0 (no). ①	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 003 CC=0703?	-	Y	N	N	N	N	N	N	N
Step 004 CC=0702?	-	-	N	N	Y	Y	Y	Y	Y
Step 005 CC=0704?	-	-	N	Y	-	-	-	-	-
Step 008 Was Start signal received in time?	-	-	-	-	N	Y	Y	Y	Y
Step 009 Was Up to Speed received in time?	-	-	-	-	-	N	Y	Y	Y
Step 010 Did Load latch set in time?	-	-	-	-	-	-	N	Y	Y
Step 011 Was Heads Loaded signal received in time?	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE								
Step 002 Press START switch and wait for disk pack to stop. Restart test when you are ready (Step 001).	X	-	-	-	-	-	-	-	-
Step 029 Test ran without errors. Rerun calling test.	-	X	-	-	-	-	-	-	-
Step 006 Illegal condition code received. Check bus in/bus out cables. Replace attachment card ②, A01, A02, A03 logic chassis cards.	-	-	X	-	-	-	-	-	-
Step 007 Unexpected attention interrupt. Rerun test. If this error persists, replace attachment card ②, A03, A17 ③, A07 logic chassis cards.	-	-	-	X	-	-	-	-	-
Step 028 Replace logic chassis card(s) A08, A06. If this fails to correct problem, go to DLT 7170.	-	-	-	-	X	-	-	-	-
Step 027 Do action listed for Step 028.	-	-	-	-	-	X	-	-	-
Step 026 Replace logic chassis card(s) A07, A08, A06. If this fails to correct problem, go to DLT 7170.	-	-	-	-	-	-	X	-	-
Step 025 Replace logic chassis card(s) A08, A07, A12, A20 ④, and power amplifier (paragraph 3.12.8).	-	-	-	-	-	-	-	X	-
Go to DLT 7121-2.	-	-	-	-	-	-	-	-	X
<p>① A one minute time limit is allowed for this response.</p> <p>② The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).</p> <p>③ Set Maintenance Unit Disable switch on new A17 card to NORM.</p> <p>④ When drive can do first seek, new A20 card will require servo adjustment (paragraph 3.20).</p>									

This is a continuation of DLT 7121-1

CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Step 012 Did Load latch set in time?	N	Y	Y	Y	Y	Y	Y
Step 013 Did Fine Mode latch set in time?	-	N	Y	Y	Y	Y	Y
Step 014 Did Slope latch reset?	-	-	N	Y	Y	Y	Y
Step 015 Did On Cylinder set in time?	-	-	-	N	Y	Y	Y
Step 016 Did Unit Ready set?	-	-	-	-	N	Y	Y
Step 017 Did Seek End set?	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE						
Step 024 Replace logic chassis card A06.	X	-	-	-	-	-	-
Step 023 Replace logic chassis card(s) A07, A06, A09 <sup>①</sup> , A19, A12.	-	X	-	-	-	-	-
Step 022 Replace logic chassis card(s) A07, A06. If this fails to correct problem, go to DLT 7170.	-	-	X	-	-	-	-
Step 021 Replace logic chassis card(s) A20 <sup>②</sup> , A19, A07, A06. If this fails to correct problem, go to DLT 7170.	-	-	-	X	-	-	-
Step 020 Replace logic chassis card(s) A07, A17 <sup>③</sup> , A06. If this fails to correct problem, go to DLT 7170.	-	-	-	-	X	-	-
Step 019 Replace logic chassis card(s) A07, A06. If this fails to correct problem, go to DLT 7170.	-	-	-	-	-	X	-
Step 018 Illogical error exit. Rerun this test. If this error persists, rerun CPU tests (press Load switch on Series/1).	-	-	-	-	-	-	X
<p>① Refer to Setting Sector Switches, section 2, for required switch settings of A09 card.</p> <p>② When drive can do first seek, new A20 card will require servo adjustment (paragraph 3.20).</p> <p>③ Set Maintenance Unit Disable switch on new A17 card to NORM.</p>							

This is a routine that provides a diagnostic scope loop while reading a selected sector ID. ①  
 If Series/1 Mode switch is in Diagnostic position, a single pass is made. If Mode switch is in Normal position, the program loops until terminated. Enter B7122 to initiate routine.

CONDITIONS	SITUATIONS								
	1	2	3	4	5				
Step 001 To input read sector ID, enter FCCCHSS ③ in hex. C=cylinder, H=head, S=sector. Parameters entered?	N	Y	Y	Y	Y				
Step 002 Read sector ID. Mode switch in Diagnostic position?	-	N	N	N	Y				
Response = 0? ②	-	N	N	Y	-				
Response = 1? ②	-	N	Y	-	-				
ACTIONS	SEQUENCE								
Enter parameters per step 001 or terminate routine by entering a zero.	X	-	-	-	-				
Program continues to loop until a 1 or 0 is entered (see above).	-	X	-	-	-				
Program returns to step 001.	-	-	X	-	-				
Step 003 Terminate read sector ID scope loop routine.	-	-	-	X	-				
Program stops after each read sector ID command. Restart by pressing Series/1 Start switch.	-	-	-	-	X				
<p>① Sector ID data is contained in the following Level 3 registers:</p> <p>R4 = Sync and flag bytes            R5 = Cylinder bytes            R6 = Head and sector bytes            R7 = Condition codes received after the read sector ID command.</p> <p>② Mode switch must be in Normal position for response to be accepted.</p> <p>③ When entering data via the programmers panel:</p> <table border="0"> <tr> <td><u>For Entry</u></td> <td><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FCCCHSS</td> <td>712A</td> </tr> </table>						<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCHSS	712A
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>								
FCCCHSS	712A								





This is a manual routine that provides a diagnostic scope loop while writing a selected sector ID. If Series/1 Mode switch is in Diagnostic position, program loops until terminated or an error is detected. Error stop condition code will be in register R7, level 3. If Mode switch is in Normal position, program loops until terminated and errors are ignored. Enter B7123 to initiate routine.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 To input write sector ID, enter FCCCCHSS ③ in hex. C=cylinder, H=head, S=sector. Parameters entered?	N	Y	Y	Y						
Step 002 To input sector ID data, enter FFFCCCHSS ③ in hex ①. Parameters entered?	-	N	Y	Y						
Step 003 Write sector ID. Program loops until a 1 or 0 is entered, or an error is detected if Mode switch is in Diagnostic position. Response = 1 or 0?	-	-	N	Y						
ACTIONS	SEQUENCE									
Enter parameters per step 001 or terminate routine by entering a zero.	X	-	-	-						
Enter parameters per step 002 or terminate routine by entering a zero.	-	X	-	-						
Program continues to loop until a 1 or 0 is entered.	-	-	X	-						
Step 004 Terminate write sector ID scope loop routine.	-	-	-	X						
<p>① Flag bits FF indicate condition of sector disk surface as follows:</p> <p>00<sub>16</sub> = Primary sector good  01<sub>16</sub> = Alternate sector good  02<sub>16</sub> = Primary sector defective  03<sub>16</sub> = Alternate sector defective</p> <p>2. R7 register contains condition codes</p> <p>③ When entering data via the programmers panel:</p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: left;"><u>For Entry</u></td> <td style="text-align: right;"><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FCCCCHSS</td> <td style="text-align: right;">712A</td> </tr> <tr> <td>FFCCCHSS</td> <td style="text-align: right;">712B</td> </tr> </table>					<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCCHSS	712A	FFCCCHSS	712B
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>									
FCCCCHSS	712A									
FFCCCHSS	712B									



This is a manual routine that reads a selected sector ID, displays the ID data on console, and stores the data in memory locations starting at 18C8. ① Enter B7124 to initiate routine

CONDITIONS	SITUATIONS						
	1	2	3				
Step 001 To input read sector ID, enter FCCCCHSS ② in hex. C=cylinder, H=head, S=sector. Parameters entered?	N	Y	Y				
Step 002 Read sector ID. CC=0703?	-	N	Y				
ACTIONS	SEQUENCE						
Enter parameters per step 001.	X	-	-				
Step 003 Not CC=0703 on read sector ID command. Abort.	-	X	-				
Step 004 End of read sector ID command. Read sector ID, Sync=XX, Flag=XX, Cylinder=XX, Head=XX, Sector=XX.	-	-	X				
<p>① Sector ID data is contained in memory as follows:</p> <p>18C8 (1st word) = Initial and interrupt condition codes            18CA (2nd word) = Sync and flag bytes read            18CC (3rd word) = Two cylinder bytes read            18CE (4th word) = Head and sector bytes read</p> <p>② When entering data via the programmers panel:</p> <table border="0"> <tr> <td><u>For Entry</u></td> <td><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FCCCCHSS</td> <td>712A</td> </tr> </table>				<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCCHSS	712A
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>						
FCCCCHSS	712A						



This is a manual routine that writes a selected sector ID with selected ID data. Enter B7125 to initiate routine.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 To input write sector ID, enter FCCCCHSS (2) in hex. C=cylinder, H=head, S=sector. Parameters entered?	N	Y	-	-						
Step 002 To input sector ID data, enter FFFCCCHSS (2) in hex (1).	-	N	Y	-						
Step 003 Write sector ID. CC=0703?	-	-	N	Y						
ACTIONS	SEQUENCE									
Enter parameters per step 001.	X	-	-	-						
Enter parameters per step 002.	-	X	-	-						
Step 004 Not CC=0703 on write sector ID command. Abort.	-	-	X	-						
Step 005 End of write sector ID command. Write sector ID flag=XX, Cylinder=XX, Head=XX, Sector=XX.	-	-	-	X						
<p>(1) Flag bits FF indicate condition of sector disk surface as follows:</p> <p>00<sub>16</sub> = Primary sector good            01<sub>16</sub> = Alternate sector good            02<sub>16</sub> = Primary sector defective            03<sub>16</sub> = Alternate sector defective</p> <p>(2) When entering data via the programmers panel:</p> <table border="0"> <tr> <td><u>For Entry</u></td> <td><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FCCCCHSS</td> <td>712A</td> </tr> <tr> <td>FFFCCCHSS</td> <td>712B</td> </tr> </table>					<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCCHSS	712A	FFFCCCHSS	712B
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>									
FCCCCHSS	712A									
FFFCCCHSS	712B									



This is a manual routine that reads one sector of data per selected input parameters. Error information is displayed. Enter B7126 to initiate routine.

CONDITIONS	SITUATIONS						
	1	2	3				
Step 001 To input read data, enter FFFCCCHSS (2) in hex. C=cylinder, H=head, S=sector (1). Parameters entered?	N	Y	Y				
Step 002 Read data. CC=0703?	-	N	Y				
ACTIONS	SEQUENCE						
Enter parameters per step 001.	X	-	-				
Step 003 Not CC=0703 on read data command. Abort.	-	X	-				
Step 004 End of read data command.	-	-	X				
<p>(1) Flag bits FF indicate condition of sector disk surface as follows:</p> <p>00<sub>16</sub> = Primary sector good            01<sub>16</sub> = Alternate sector good            02<sub>16</sub> = Primary sector defective            03<sub>16</sub> = Alternate sector defective</p> <p>(2) When entering data via the programmers panel:</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: left;"><u>For Entry</u></td> <td style="text-align: right;"><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FFFCCCHSS</td> <td style="text-align: right;">712B</td> </tr> </table>				<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FFFCCCHSS	712B
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>						
FFFCCCHSS	712B						





This is a manual routine that writes one sector of data per selected input parameters. Error information is displayed. Enter B7127 to initiate routine.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 To input write data, enter FFFCCCHSS ② in hex. C=cylinder, H=head, S=sector ①. Parameters entered?	N	Y	Y	Y						
To input data pattern, enter FDDDDDDDD ② in hex. Parameters entered?	-	N	Y	Y						
Step 002 Write Data. CC=0703?	-	-	N	Y						
ACTIONS	SEQUENCE									
Enter parameters per step 001.	X	-	-	-						
Enter data pattern per step 001.	-	X	-	-						
Step 003 Not CC=0703 on write data command. Abort.	-	-	X	-						
Step 004 End of write data command.	-	-	-	X						
<p>① Flag bits FF indicate condition of sector disk surface as follows:</p> <p>00<sub>16</sub> = Primary sector good            01<sub>16</sub> = Alternate sector good            02<sub>16</sub> = Primary sector defective            03<sub>16</sub> = Alternate sector defective</p> <p>② When entering data via the programmers panel:</p> <table border="0"> <tr> <td><u>For Entry</u></td> <td><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FFFCCCHSS</td> <td>712B</td> </tr> <tr> <td>FDDDDDDDD</td> <td>712C</td> </tr> </table>					<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FFFCCCHSS	712B	FDDDDDDDD	712C
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>									
FFFCCCHSS	712B									
FDDDDDDDD	712C									



This is a manual routine that writes one sector of data and compares it with the data read. Error information is displayed. Enter B7128 to initiate routine.

CONDITIONS	SITUATIONS											
	1	2	3	4								
Step 001 To input write data, enter FFFCCCCHSS ② in hex. C=cylinder, H=head, S=sector ①. Parameters entered?	N	Y	Y	Y								
To input data pattern, enter FDDDDDDDD ② in hex. Parameters entered?	-	N	Y	Y								
To select full/partial sector write, enter l=full, 0=partial ②	-	N	Y	Y								
Step 002 Write data/read data. Does data compare?	-	-	N	Y								
ACTIONS	SEQUENCE											
Enter parameters per step 001.	X	-	-	-								
Enter data pattern per step 001.	-	X	-	-								
Step 003 Not CC=0703 on write data command. Abort.	-	-	X	-								
Step 004 End of write/read data command.	-	-	-	X								
<p>① Flag bits FF indicate condition of sector disk surface as follows:</p> <p>00<sub>16</sub> = Primary sector good            01<sub>16</sub> = Alternate sector good            02<sub>16</sub> = Primary sector defective            03<sub>16</sub> = Alternate sector defective</p> <p>② When entering data via the programmers panel:</p> <table border="0"> <thead> <tr> <th><u>For Entry</u></th> <th><u>Programmer Panel LEDs Indicate</u></th> </tr> </thead> <tbody> <tr> <td>FFCCCCHSS</td> <td>712B</td> </tr> <tr> <td>FDDDDDDDD</td> <td>712C</td> </tr> <tr> <td>l=full, 0=partial sector write</td> <td>712D</td> </tr> </tbody> </table>					<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FFCCCCHSS	712B	FDDDDDDDD	712C	l=full, 0=partial sector write	712D
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>											
FFCCCCHSS	712B											
FDDDDDDDD	712C											
l=full, 0=partial sector write	712D											



This is a manual test requiring operator response. Enter B7130 to initiate test.

CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Steps 001 and 002 Do you want to write data? Reply 1=yes, 0=no.	N	Y	Y	Y	Y	Y	Y
Step 004 Write/read data pattern EB6D B6DB. Result = 0000?	-	N	Y	Y	Y	Y	Y
Step 006 Write/read data pattern 5555 5555. Result = 0000?	-	-	N	Y	Y	Y	Y
Step 008 Write/read data pattern AAAA AAAA. Result = 0000?	-	-	-	N	Y	Y	Y
Step 010 Write/read data pattern 0000 0000. Result = 0000?	-	-	-	-	N	Y	Y
Step 012 Write/read data pattern FFFF FFFF. Result = 0000?	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE						
Step 003 SMD write/read data test not run.	X	-	-	-	-	-	-
Step 005 Write/read data error. Go to step 015 this test (DLT 7130-2).	-	X	-	-	-	-	-
Step 007 Write/read data error. Go to step 015 this test (DLT 7130-2).	-	-	X	-	-	-	-
Step 009 Write/read data error. Go to step 015 this test (DLT 7130-2).	-	-	-	X	-	-	-
Step 011 Write/read data error. Go to step 015 this test (DLT 7130-2).	-	-	-	-	X	-	-
Step 013 Write/read data error. Go to step 015 this test (DLT 7130-2).	-	-	-	-	-	X	-
Step 014 Write/read data test ran without any errors.	-	-	-	-	-	-	X

This is a continuation of DLT 7130-1.

CONDITIONS	SITUATIONS							
	1	2	3	4	5	6	7	8
Step 015 Result ≠ 4000?	N	Y	Y	Y	Y	Y	Y	Y
Step 017 Result ≠ 2000?	-	N	Y	Y	Y	Y	Y	Y
Step 019 Result ≠ 1000?	-	-	N	Y	Y	Y	Y	Y
Step 021 Result ≠ 0800?	-	-	-	N	Y	Y	Y	Y
Step 023 Result ≠ 0400?	-	-	-	-	N	Y	Y	Y
Step 025 Result ≠ 0200?	-	-	-	-	-	N	Y	Y
Step 027 Result ≠ 0100?	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE							
Step 016 Unexpected error during write data. Hd=xx. ① Run tests 7150, 7127, 7128 for error data.	X	-	-	-	-	-	-	-
Step 018 Unexpected error during read data. Hd=xx. ① Run tests 7113, 7126, 7128 for error data.	-	X	-	-	-	-	-	-
Step 020 File protect is on.	-	-	X	-	-	-	-	-
Step 022 Hd=xx. ① Data compare error. Run tests 7126, 7127, 7128 to determine if write or read error.	-	-	-	X	-	-	-	-
Step 024 Hd=xx. ① Write error. Run tests 7127, 7128, 7150 for error data.	-	-	-	-	X	-	-	-
Step 026 Hd=xx. ① Read data ECC error. Run tests 7140, 7126, 7128 for additional error data.	-	-	-	-	-	X	-	-
Step 028 Wrong device ID. Run tests 7100, 7101, 7103.	-	-	-	-	-	-	X	-
Step 029 Unidentified error. Run all SMD auto tests.	-	-	-	-	-	-	-	X
① To determine failing head, run test 7128 on each head.								

WRITE/READ DATA TEST (CONTD)

This is a manual test. Enter B7135 to initiate test.

CONDITIONS	SITUATIONS	
	1	2
Step 001 Execute chained commands. Result = 0000?	N	Y
ACTIONS	SEQUENCE	
Step 002 Replace attachment card. ①	X	-
Step 003 Command and sequence test completed successfully.	-	X

① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).





This is a manual test requiring operator response. Enter B7140 to initiate test.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Steps 001 and 002 Do you want to write? Reply 1=yes, 0=no.	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 004 Force 1-bit error in data field. Read data cmd (09). Result OK?	-	N	Y	Y	Y	Y	Y	Y	Y
Step 006 Force 2-bit error in data field. Read data cmd (09). Result OK?	-	-	N	Y	Y	Y	Y	Y	Y
Step 008 Force 3-bit error in data field. Read data cmd (09). Result OK?	-	-	-	N	Y	Y	Y	Y	Y
Step 010 Force 4-bit error in data field. Read data cmd (09). Result OK?	-	-	-	-	N	Y	Y	Y	Y
Step 012 Force 4-bit error in data field. Read data cmd (09). Result OK?	-	-	-	-	-	N	Y	Y	Y
Step 014 Force 4-bit error in data field. Read data cmd (09). Result OK?	-	-	-	-	-	-	N	Y	Y
Step 016 Force correctable error in ECC field. Read data cmd (09). Result OK?	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE								
Step 003 SMD ECC test not run.	X	-	-	-	-	-	-	-	-
Step 005 Correctable error not corrected in data file. Replace A06 logic chassis card.	-	X	-	-	-	-	-	-	-
Step 007 Correctable error not corrected in data file. Replace A06 logic chassis card.	-	-	X	-	-	-	-	-	-
Step 009 Correctable error not corrected in data file. Replace A06 logic chassis card.	-	-	-	X	-	-	-	-	-
Step 011 Correctable error not corrected in data file. Replace A06 logic chassis card.	-	-	-	-	X	-	-	-	-
Step 013 Correctable error not corrected in data file. Replace A06 logic chassis card.	-	-	-	-	-	X	-	-	-
Step 015 Correctable error not corrected in data file. Replace A06 logic chassis card.	-	-	-	-	-	-	X	-	-
Step 017 Uncorrectable error not reported in simulated field. Replace A06 logic chassis card.	-	-	-	-	-	-	-	X	-
Go to DLT 7140-2.	-	-	-	-	-	-	-	-	X

This is a continuation of DLT 7140-1.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Step 018 Force correctable error in ECC field. Read data cmd (09). Result OK?	N	Y	Y	Y	Y	Y
Step 020 Force correctable error in ECC field. Read data cmd (09). Result OK?	-	N	Y	Y	Y	Y
Step 022 Force uncorrectable error in data field. Read data cmd (09). Result OK?	-	-	N	Y	Y	Y
Step 024 Force uncorrectable error in data field. Read data cmd (09). Result OK?	-	-	-	N	Y	Y
Step 026 Force uncorrectable error in ECC field. Read data cmd (09). Result OK?	-	-	-	-	N	Y
ACTIONS	SEQUENCE					
Step 019 Uncorrectable error not reported in simulated field. Replace A06 logic chassis card.	X	-	-	-	-	-
Step 021 Uncorrectable error not reported in simulated field. Replace A06 logic chassis card.	-	X	-	-	-	-
Step 023 Uncorrectable error not reported in data field. Replace A06 logic chassis card.	-	-	X	-	-	-
Step 025 Uncorrectable error not reported in data field. Replace A06 logic chassis card.	-	-	-	X	-	-
Step 027 Uncorrectable error not reported in simulated ECC field. Replace A06 logic chassis card.	-	-	-	-	X	-
Step 028 End of test.	-	-	-	-	-	X

This is a manual test requiring operator interaction. Enter B7145 to initiate test.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 Direct seek? Reply 1=yes, 0=no.	-	-	-	-						
Step 002 Reply = 1?	Y	N	N	N						
Step 003 Repeat seek? Reply 1=yes, 0=no.	-	-	-	-						
Step 004 Reply = 1?	-	Y	N	N						
Step 005 One track incremental? Reply 1=yes, 0=no.	-	-	-	-						
Step 006 Reply = 1?	-	-	Y	N						
ACTIONS	SEQUENCE									
Step 020 Reply FCCCCHH (3) in hex, C=cylinder, H=head, then go to step 021.	X	-	-	-						
Step 021 Test does direct seeks until a reply is made (4). Reply = 1 go back to step 001 (1), reply = 0 go to step 022.	X	-	-	-						
Step 022 End of direct seek loop test. Program terminate.	X	-	-	-						
Step 030 Reply FCCCCHH/CCCCHH (3) in hex, C=cylinder, H=head, then to step 031.	-	X	-	-						
Step 031 Test does repeat seeks until a reply is made (4). Reply = 1 go back to step 001, reply = 0 go to step 032.	-	X	-	-						
Step 032 End of repeat seek test loop. Program terminate.	-	X	-	-						
Step 040 Reply FCCCCHH (3) in hex for maximum cylinder address (2), then go to step 041.	-	-	X	-						
Step 041 Test does incremental seeks until a reply is made (4). Reply = 1 go back to step 001, reply = 0 go to step 042.	-	-	X	-						
Step 042 End of incremental seek test loop. Program terminate.	-	-	X	-						
Go to DLT 7145-2.	-	-	-	X						
<p>(1) This entry stops the recalibrate portion of test loop causing heads to remain at selected cylinder address.</p> <p>(2) Maximum cylinder address is 0336<sub>16</sub>.</p> <p>(3) When entering data via the programmers panel:</p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: left;"><u>For Entry</u></td> <td style="text-align: right;"><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FCCCCHH</td> <td style="text-align: right;">712E</td> </tr> <tr> <td>FCCCCHH/FCCCCHH</td> <td style="text-align: right;">712F</td> </tr> </table> <p>(4) When executing the test from the programmers panel, a command of 6 must be entered to start the diagnostic execution.</p>					<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCCHH	712E	FCCCCHH/FCCCCHH	712F
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>									
FCCCCHH	712E									
FCCCCHH/FCCCCHH	712F									

This is a continuation of DLT 7145-1.							
CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Step 007 Head alignment? Reply F01=yes, F00=no.	-	-	-	-	-	-	-
Step 008 Reply = F01?	Y	Y	Y	Y	Y	Y	N
Step 060 Head alignment diagnostic routine completed OK?	Y	Y	N	N	N	N	-
Do you wish to increment head? Reply F01=yes, F00=no.	-	-	-	-	-	-	-
Reply = F01?	Y	N	-	-	-	-	-
Step 061 Error on recalibrate?	-	-	Y	N	N	N	-
Step 062 Error on seek to alignment cylinder?	-	-	-	Y	N	N	-
Step 063 Error on head seek?	-	-	-	-	Y	N	-
ACTIONS	SEQUENCE						
Head number is incremented to next sequential number. This sequence is repeated until a no response is detected or last head number is exceeded. A no response outputs a "Head XX Selected" message. Exceeding last head number causes an exit from test (step 068).	X	-	-	-	-	-	-
Message "Head XX Selected. Do you wish to increment head" appears on crt. Head remains at cylinder 01EB <sub>16</sub> until a F01 (yes) response is entered. This causes an advance to the next sequential head number.	-	X	-	-	-	-	-
Step 065 Recalibrate error. Replace CE pack with scratch pack and run test 7110.	-	-	X	-	-	-	-
Step 066 Seek to alignment cylinder error, go to step 001 DLT 7145-1 and do direct seek to cylinder 01EB <sub>16</sub> using failing head.	-	-	-	X	-	-	-
Step 067 Head seek error, go to step 001 DLT 7145-1 and do direct seek to cylinder 01EB <sub>16</sub> using failing head.	-	-	-	-	X	-	-
Step 064 Unexpected error. Reload BASIC diskette.	-	-	-	-	-	X	-
Step 009 You did not select any of the above, go back to step 001 DLT 7145-1.	-	-	-	-	-	-	X

This is a manual test requiring operator response. Enter B7150 to initiate test.										
CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Step 001 Do you want to write sector ID? Reply 1=yes, 0=no.	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step 004 Read device ID (20). Result = 0000?	-	N	Y	Y	Y	Y	Y	Y	Y	Y
Step 006 Write sector ID (02) with pattern = A B C D. Result = 0000?	-	-	N	N	N	N	N	N	N	N
Step 007 Result not equal to 8000?	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 009 Result not equal to 4000?	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 011 Result not equal to 2000?	-	-	-	-	N	Y	Y	Y	Y	Y
Step 013 Result not equal to 1000?	-	-	-	-	-	N	Y	Y	Y	Y
Step 015 Result not equal to 0800?	-	-	-	-	-	-	N	Y	Y	Y
Step 017 Result not equal to 0400?	-	-	-	-	-	-	-	N	Y	Y
Step 019 Result not equal to 0200?	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE									
Step 003 Write sector ID test not executed.	X	-	-	-	-	-	-	-	-	-
Step 005 Device ID is not 3007 or 3107. Run test 7100.	-	X	-	-	-	-	-	-	-	-
Step 008 All sectors caused errors during initial read. Run read sector ID test 7113. Read head XX problem. ①	-	-	X	-	-	-	-	-	-	-
Step 010 Could not restore sector ID error. Reinitialize disk pack (paragraph 3.23) and run write data test 7130. Read head XX problem. ①	-	-	-	X	-	-	-	-	-	-
Step 012 Error during read sector ID. Reinitialize disk pack (paragraph 3.23) and run read sector ID test 7113. Read head XX problem ①	-	-	-	-	X	-	-	-	-	-
Step 014 Read sector ID error after write. Reinitialize disk pack (paragraph 3.23) and run read sector ID test 7113. Read head XX problem. ①	-	-	-	-	-	X	-	-	-	-
Step 016 Write gate check. Replace logic chassis cards A09, A03, A02 or run test(s) 7124, 7125 for more error information. Read head XX.	-	-	-	-	-	-	X	-	-	-
Step 018 Unsafe status while writing sector ID. Replace logic chassis cards A10, A13, A02, A17 ②, read/write chassis card E02, or run test(s) 7124, 7125, for further error information. Read head XX problem. ①	-	-	-	-	-	-	-	X	-	-
Step 020 Sector ID test pattern read compare error. Reseat/replace logic chassis cards A05, A06, A13, A01, A02, A03, A17 2, and read/write chassis cards E02, E01. Read head XX problem. ①	-	-	-	-	-	-	-	-	X	-
Go to step 21 (DLT 7150-2)	-	-	-	-	-	-	-	-	-	X
① If using operator/programmer panel only, failing head can be determined by running one pass of test 7123 on each head and examining condition codes contained in R7 register.										
② Set Maintenance Unit Disable switch on new A17 card to NORM.										

This is a continuation of DLT 7150-1.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Step 001 Do you want to write sector ID? Reply 1=yes, 0=no.	Y	Y	Y	Y	Y	Y
Step 004 Read device ID (20). Result = 0000?	Y	Y	Y	Y	Y	Y
Step 006 Write sector ID (02) with pattern = A B C D. Result = 0000?	N	N	N	N	N	Y
Step 021 Result not equal to 0100?	N	Y	Y	Y	Y	-
Step 023 Result not equal to 0080?	-	N	Y	Y	Y	-
Step 025 Result not equal to 0040?	-	-	N	Y	Y	-
Step 027 Result not equal to 0020?	-	-	-	N	Y	-
ACTIONS	SEQUENCE					
Step 022 Multiple head select error. Replace read/write chassis cards E04 (para 3.14.3), E05 (para 3.14.1), E01, logic chassis card A17 ①, or isolate to head using test 7125.	X	-	-	-	-	X
Step 024 PLO sync check on write sector ID command. Replace disk pack or servo preamp (para. 3.15.1), logic chassis cards A02, A10, A13, servo head (para 3.19.7).	-	X	-	-	-	-
Step 026 Disk drive is write protected. If PROTECT indicator is lit, press PROTECT switch and rerun test. Otherwise replace logic chassis cards A19, A04, control panel (para 3.22.1), or control panel harness.	-	-	X	-	-	-
Step 028 Abnormal ending, rerun test.	-	-	-	X	-	-
Step 029 Write sector ID test ran successfully.	-	-	-	-	X	-
① Set Maintenance Unit Disable switch on new A17 card to NORM.						

WRITE SECTOR ID TEST (CONTD)

This manual routine reads a sector ID skewed. Sector ID data is displayed on crt and stored in memory location 18C8<sub>16</sub>. Enter B7160 to initiate.

CONDITIONS	SITUATIONS						
	1	2	3				
Step 001 Read sector ID skewed. Enter cylinder, head, sector - FCCCCHSS (3) in hex -. Parameters entered?	N	Y	Y				
Step 002 Read sector ID skewed. CC=0703?	-	N	Y				
ACTIONS	SEQUENCE						
Enter parameters per step 001.	X	-	-				
Step 003 Not CC=0703 on read sector ID skewed, abort. (1)	-	X	-				
Step 004 End of read sector ID skewed. Read SID sync =            Flag = Cylinder =            Head =            Sector =            . (2)	-	-	X				
<p>(1) R3 register (Level 3) contains starting address of error abort message. Refer to paragraph 3.24.</p> <p>(2) Sector ID data is stored in memory location 18C8<sub>16</sub> as follows:  1st word = Initial and interrupt condition codes  2nd word = Sync and flag bytes read  3rd word = Two cylinder bytes read  4th word = Head and sector bytes read</p> <p>(3) When entering data via the programmers panel:</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: left;"><u>For Entry</u></td> <td style="text-align: right;"><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td style="text-align: left;">FCCCCHSS</td> <td style="text-align: right;">702A</td> </tr> </table>				<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCCHSS	702A
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>						
FCCCCHSS	702A						





This manual routine writes a selected sector ID skewed with selected ID data pattern. Written ID data is displayed on the assigned console. Enter B7161 to initiate.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 Write sector ID skewed. Enter cylinder, head, sector - FCCCHHSS (3) in hex. Parameters entered?	N	Y	Y	Y						
Step 002 Enter sector ID data - FFFCCCHHSS (3) in hex (1) . Parameters entered?	-	N	Y	Y						
Step 003 Write sector ID. CC=0703?	-	-	N	Y						
ACTIONS	SEQUENCE									
Enter parameters per step 001.	X	-	-	-						
Enter parameters per step 002.	-	X	-	-						
Step 004 Not CC=0703 on write sector ID data skewed, abort. (2)	-	-	X	-						
Step 005 End of write sector ID skewed. Write SID flag = Cylinder = Head = Sector =	-	-	-	X						
<p>(1) Flag bits FF indicate condition of sector disk surface as follows:</p> <p>0016 = Primary sector good            0116 = Alternate sector good            0216 = Primary sector defective            0316 = Alternate sector defective</p> <p>(2) R3 register (Level 3) contains starting address of error abort message. Refer to paragraph 3.24.</p> <p>(3) When entering data via the programmers panel:</p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: left;"><u>For Entry</u></td> <td style="text-align: left;"><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td>FFFCCHHSS</td> <td>712B</td> </tr> <tr> <td>FCCCHHSS</td> <td>712A</td> </tr> </table>					<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FFFCCHHSS	712B	FCCCHHSS	712A
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>									
FFFCCHHSS	712B									
FCCCHHSS	712A									



ASSUME									
1. Drive connected to site power. 2. Disk pack installed and pack access cover closed. 3. MAIN AC circuit breaker OFF, all others ON.									
CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Turn on MAIN AC breaker (CB1). Does blower motor start?	Y	N	-	-	-	-	-	-	
Do any circuit breakers trip?	N	-	Y	-	-	-	-	-	O
Press START switch. Does START indicator light and READY indicator flash at 1-second intervals?	Y	-	-	N	-	-	-	-	
Does drive motor start?	Y	-	-	-	N	-	-	-	H
Does drive motor come up to speed? (Internal centrifugal switch clicks.)	Y	-	-	-	-	N	-	-	E
Does drive motor cut out when 10-second timeout expires?	N	-	-	-	-	-	Y	-	
Is first seek successful? (Heads load and READY indicator stays lit.)	Y	-	-	-	-	-	-	N	R
ACTIONS	SEQUENCE								
Power-up completed OK.	X	-	-	-	-	-	-	-	-
If elapsed-time meter is running, check line filters and blower cable connector. If time meter is not running; a) check if site power is present, b) check for ac at LINE inputs to CB1, c) check for correct phasing at power plug.	-	1	-	-	-	-	-	-	-
Determine which breaker tripped and go to indicated DLT: Main AC (CB1) - go to DLT 7170-2. +20Y (CB2) - go to DLT 7171 MOTOR (CB3) or thermal breaker - go to DLT 7172. +9.7 V (CB5, CB6) - to to DLT 7175-1. +20 V (CB7), +28 V (CB8) - go to DLT 7176. +46 V (CB4) - go to DLT 7177.	-	-	X	-	-	-	-	-	-
Check that all circuit breakers are ON.	-	-	-	1	-	-	-	-	-
Check dc test jacks on power supply panel; a) any dc voltage means +20 Y control voltage is OK, b) if no dc voltages, go to DLT 7171 c) if some voltages missing, check transformer outputs per paragraph 3.12.1 and if OK, replace dc capacitor/rectifier board per paragraph 3.12.6.	-	-	-	2	-	-	-	-	-
Check that A1P/J4 is properly mated.	-	-	-	3	-	-	-	-	-
Check A2P/JD93, A2P/JA80, A4P/J201 for proper mating.	-	-	-	4	-	-	-	-	-
Replace logic chassis cards A08, A17 <sup>①</sup> , and retry after each card is replaced.	-	-	-	5	-	-	1	-	-
Go to DLT 7172 (Drive Motor).	-	-	-	-	X	X	-	-	-
Go to DLT 7178-1 (First Seek).	-	-	-	-	-	-	-	X	-
Check speed sensor (paragraph 3.10.1).	-	-	-	-	-	-	2	-	-
Problem not covered in manual. Call for assistance.	-	2	-	6	-	-	3	-	X
① Set Maintenance Unit Disable switch on new A17 card to NORM.									

ASSUME						
CB1 (MAIN AC) circuit breaker trips when turned ON. All other circuit breakers are ON as a precondition for power-up.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Turn off CB2 (+20 Y) and reset CB1. Does CB1 still trip?	Y	N	N	N	N	
Turn off CB1. Disconnect wire from AlQ1-2 (AC PWR triac) to kill input to T1 and T2. Turn on CB2 and reset CB1. Does CB1 trip?	-	Y	N	N	N	O T
Turn off CB1. Replace wire on AlQ1-2; remove wire from AlQ5-1 (this enables input to T2 with T1 disabled). Turn on CB1. Does CB1 trip?	-	-	Y	N	N	H E
Turn off CB1. Replace wire on AlQ5-1; remove wire from AlQ5-1 (this checks for grounded LOAD contacts of AlQ5). Turn on CB1. Does CB1 trip?	-	-	-	Y	N	R
ACTIONS	SEQUENCE					
Disconnect AlP/J2 to blower motor and retry. If CB1 still trips, blower is OK. Reconnect and go to next recommended action.	1	-	-	-	-	-
Disconnect elapsed time meter and retry. If CB1 still trips, meter is OK. Reconnect and go to next recommended action.	2	-	-	-	-	-
Check for shorts/grounds in wiring to LINE side of CB2.	3	-	-	-	-	-
Replace AC PWR triac, AlQ1 (paragraph 3.12.12).	-	1	-	-	-	-
Check wiring to T2 for shorts/grounds.	-	-	1	-	-	-
Check for shorted tuning capacitor AlC2 (paragraph 3.12.14).	-	-	2	-	-	-
Go to DLT 7173-1 (Fault in T2 Network).	-	-	3	-	-	-
Replace T1 enable triac, AlQ5 (paragraph 3.12.12).	-	-	-	1	-	-
Check wiring to T1 for shorts/grounds.	-	-	-	-	1	-
Check for shorted tuning capacitor AlC1 (paragraph 3.12.14).	-	-	-	-	2	-
Go to DLT 7174-1 (Fault in T1 Network).	-	-	-	-	3	-
Problem not covered in manual. Call for assistance.	4	2	4	2	-	X

ASSUME												
1. No dc voltages at test jacks on power supply panel, or 2. Drive motor stops; all indicators off, blower still on.												
CONDITIONS	SITUATIONS											
	1	2	3	4	5	6	7	8	9	10	11	
1. Has +20 Y circuit breaker (CB2) tripped?	Y	N	-	-	-	-	-	-	-	-	-	O T H E R
2. Check for short in control circuit of AlQ5: a) Remove Faston from AlQ5-3. b) Reset CB2 and try again. Does CB2 still trip?	-	-	Y	N	-	-	-	-	-	-		
3. Check for short in control circuit of AlQ1: a) Remove Faston from AlQ1-3. b) Reset CB2 and try again. Does CB2 still trip?	-	-	-	-	Y	N	-	-	-	-		
4. Check for shorted T3: a) Remove Fastons from AlTB2-9 and AlTB2-10 (isolates T3 from +20 Y rectifier). b) Reset CB2 and try again. Does CB2 still trip?	-	-	-	-	-	-	Y	N	-	-		
5. Turn on CB2 and check for +20 volts at AlTB2-11 (+20 Y output). Is +20 Y present?	-	-	-	-	-	-	-	-	Y	N		
ACTIONS	SEQUENCE											
Go to condition 2 above.	X	-	-	-	-	-	-	-	-	-	-	
Go to condition 5 above.	-	X	-	-	-	-	-	-	-	-	-	
Reconnect Faston to AlQ5-3 and then go to condition 3 above.	-	-	X	-	-	-	-	-	-	-	-	
Replace AlQ5 (paragraph 3.12.12).	-	-	-	1	-	-	-	-	-	-	-	
Replace AlQ1 (paragraph 3.12.12).	-	-	-	-	-	1	-	-	-	-	-	
Problem in generating +20 Y. Reconnect Faston to AlQ1-3 and then go to condition 4 above.	-	-	-	-	X	-	-	-	-	-	-	
Check for shorts in wiring to/from T3.	-	-	-	-	-	-	1	-	-	-	-	
Replace T3 (paragraph 3.12.4). Reconnect Fastons to AlTB2-9 and -10, then go to condition 5 above.	-	-	-	-	-	-	2	-	-	-	-	
Replace capacitor/rectifier board (paragraph 3.12.6) then go to condition 5 above.	-	-	-	-	-	-	-	X	-	-	-	
If this DLT was entered because of Assumption 1, the problem has been corrected. If this DLT was entered because of Assumption 2, check for +20 Y continuity: a) At AlP5-12, AlP5-13 (cable to relay board), and at AlQ1-3. b) If +20 Y OK at AlQ1-3, replace AlQ1 (paragraph 3.12.12) AlQ1 controls the generation of all logic voltages.	-	-	-	-	-	-	-	-	1	-	-	
Check T3 output to +20 Y rectifier: a) Test for approximately 20 V ac between AlTB1-12 (ground) and AlTB2 pins 9 and 10. b) If not present, check wiring from T3; if OK, replace T3 (paragraph 3.12.4). c) If voltage present, replace capacitor/rectifier board (paragraph 3.12.6).	-	-	-	-	-	-	-	-	-	1	-	
Problem not covered in manual. Call for assistance.	-	-	-	2	-	2	3	-	2	2	X	



ASSUME

1. Drive motor fails to start, or starts prematurely, or does not come up to speed; or
2. Drive motor shuts down after a period of running properly.

CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Does MOTOR breaker (CB3) trip when MAIN AC (CB1) is actuated?	N	N	N	N	N	N	N	N	Y	
Does drive motor start as soon as CB1 is actuated?	N	N	N	N	N	N	N	Y	-	
Does drive motor start when START switch is pressed?	Y	Y	Y	Y	N	N	N	-	-	
Does CB3 or motor thermal breaker trip as soon as START is pressed?	N	N	N	Y	-	-	-	-	-	O
Does CB3 or motor thermal breaker trip before motor is up to speed?	N	Y	Y	-	-	-	-	-	-	T
Is squealing heard when motor starts to run?	N	N	Y	-	-	-	-	-	-	H
Is +20 V present at pin 3 of triacs AlQ2, AlQ3, AlQ4 upon pressing START switch?	-	-	-	-	Y	Y	N	-	-	E
Is 208 V ac (line voltage) present at pin 2 of AlQ2, AlQ3, AlQ4 upon pressing START switch?	-	-	-	-	Y	N	-	-	-	R
ACTIONS	SEQUENCE									
If READY indicator continues to blink after motor starts, go to DLT 7178-1. If READY indicator lights steady it indicates a successful First Seek.	X	-	-	-	-	-	-	-	-	-
Check drive belt and tension (paragraph 3.4.1).	-	1	2	-	-	-	-	-	-	-
Check that parking brake has released spindle.	-	-	1	1	-	-	-	-	-	-
Check integrity of power wiring (AlP/J7) to drive motor.	-	-	-	-	1	-	-	-	-	-
Replace drive motor (paragraph 3.5.1).	-	-	-	-	2	-	-	-	-	-
Check for +9.7 V at test jack on power supply panel. If present, go to next recommended Action. If not present, go to DLT 7173-1.	-	-	-	-	-	-	1	-	-	-
Replace triac(s) not containing 208 V ac on their pin 2 (paragraph 3.12.12).	-	-	-	-	-	1	-	-	-	-
Replace logic chassis card A08.	-	-	-	-	-	-	2	1	-	-
Replace relay board (paragraph 3.12.10).	-	-	-	-	-	-	3	2	-	-
Check for short on LOAD side of CB3. Replace CB3 if required.	-	-	-	-	-	-	-	-	1	-
Problem not covered in manual. Call for assistance.	-	2	3	2	3	2	4	3	2	X





ASSUME

CBl trips due to fault in T2 network, or problem in generation/distribution of +9.7, +20, and +28 voltages.

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Check out Alt2: a) Remove Faston from AlQ5-1 or AlQ5-2 (prevents energizing T1). b) Disconnect AlC2. ① WARNING - CAPACITOR AlC2 IS CHARGED TO 500 VOLTS. c) Disconnect Fastons from terminals 14 through 20 of AltB1. d) Turn on CBl. Does CBl trip?	Y	N	N	N	N
Check out +9.7 V rectifier. a) Turn off CBl and reconnect AlC2. b) Separate connector Alp/J3 (removes load from rectifier). c) Reconnect Fastons to terminals 14 (gnd), 17, and 18 of AltB1. d) Turn on CBl. Does CBl trip?	-	Y	N	N	N
Check out +20 V rectifier: a) Turn off CBl and CB7 (+20 V breaker). b) Reconnect Fastons to terminals 15 and 16 of AltB1. c) Turn on CBl. Does CBl trip?	-	-	Y	N	N
Check out +28 V rectifier: a) Turn off CBl and CB8 (+20 breaker). b) Reconnect Fastons to terminals 19 and 20 of AltB1. c) Turn on CBl. Does CBl trip?	-	-	-	Y	N
ACTIONS	SEQUENCE				
Replace Alt2 (paragraph 3.12.2), then restore all connections and try again.	1	-	-	-	-
Replace capacitor/rectifier board (paragraph 3.12.6), then restore all connections and try again.	-	1	1	1	-
No shorts on capacitor/rectifier board. Continue with checks listed on DLT 7173-2.	-	-	-	-	X
Problem not covered in manual. Call for assistance.	2	2	2	2	-
① To disconnect AlC2, remove two yellow wires from terminal strip on Alt2 transformer. Short the yellow wires before removing them.					

ASSUME							
Checks of DLT 7173-1 completed.							
CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Check <u>+9.7</u> voltage: a) Turn off CB1. b) Ensure that CB5 and CB6 are ON, and that AlP/J3 is separated. c) Turn on CB1. Are <u>+9.7</u> V present at panel test jacks? ①	N	Y	Y	Y	Y	Y	Y
Check <u>+9.7</u> V loads: a) Turn off CB1 and CB7 ( <u>+20</u> V breaker). b) Reconnect AlP/J3 to restore <u>+9.7</u> V load. c) Turn on CB1. Does either CB5 or CB6 trip?	-	Y	N	N	N	N	N
With CB1 ON and CB7 still OFF, check for <u>+20</u> V at terminals 5 and 4, respectively, of AlTB2. (Ground probe on AlTB1-14.) Are voltages present? ①	-	-	N	Y	Y	Y	Y
Check <u>+20</u> V loads by turning on CB7. Does CB7 trip?	-	-	-	Y	N	N	N
With CB1 ON and CB8 ( <u>+28</u> V breaker) OFF, check for <u>+28</u> V at AlTB2-1 (gnd probe on AlTB1-14). Is <u>+28</u> V present? ①	-	-	-	-	N	Y	Y
Check <u>+28</u> V load by turning CB8 ON. Does CB8 trip?	-	-	-	-	-	Y	N
ACTIONS	SEQUENCE						
Replace capacitor/rectifier board (paragraph 3.12.6).	1	-	1	-	1	-	-
Problem in <u>+9.7</u> V loads. Go to DLT 7175-1.	-	X	-	-	-	-	-
Problem in <u>+20</u> V loads. Go to DLT 7176.	-	-	-	X	-	-	-
Problem in <u>+28</u> V loads. Go to DLT 7176.	-	-	-	-	-	X	-
T2 network is OK. Reconnect Faston to AlQ5.	-	-	-	-	-	-	X
Problem not covered in manual. Call for assistance.	2	-	2	-	2	-	-
① If voltages are present, but 10% or more below nominal, check ac input to capacitor/rectifier board (paragraph 3.12.1).							

ASSUME

CBl trips due to fault in T1 network, or problem in generation/distribution of +16 and +46 voltages.

CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Check out AlT1: a) Turn off CBl. b) Disconnect AlC1. ② WARNING - AlC1 IS CHARGED TO 500 VOLTS. c) Disconnect T1 output Fastons from AlTBl terminals 4, 5 (2 Fastons each terminal) and 3, 7, 8 (one Faston each). d) Turn on CBl. Does CBl trip?	Y	N	N	N	N	N
Check out +46 V rectifier: a) Turn off CBl and CB4 (+46 V breaker). b) Reconnect AlC1. c) Reconnect Fastons to terminals 3, 7, 8 of AlTBl. d) Turn on CBl. Does CBl trip?	-	Y	N	N	N	N
Turn on CB4. Does CB4 trip?	-	-	Y	N	N	N
Is +46 V present at panel test jacks? ①	-	-	-	N	Y	Y
Check out -16 V retract power rectifier: a) Turn off CBl. b) Reconnect the two yellow-wire Fastons coming from AlT1 to terminals 4 and 5 of AlTBl. c) Turn on CBl. Is -16 V present at AlTBl-6? (AlTBl-3 is gnd.) ①	-	-	-	-	N	Y
ACTIONS	SEQUENCE					
Replace AlT1 (paragraph 3.12.2), then restore all connections and try again.	1	-	-	-	-	-
Replace capacitor/rectifier board (paragraph 3.12.6), then restore all connections and try again.	-	1	-	1	1	-
Problem in +46 V loads. Go to DLT 7177.	-	-	X	-	-	-
-16 V rectifier is OK. Continue with checks listed on DLT 7174-2.	-	-	-	-	-	X
Problem not covered in manual. Call for assistance.	2	2	-	2	2	-
① If dc voltages are 10% or more below nominal, check ac input to capacitor/rectifier board (paragraph 3.12.1).  ② To disconnect AlC1, remove two yellow wires from terminal strip on AlT1 transformer. Short the yellow wires before removing them.						

ASSUME			
Checks of DLT 7174-1 completed.			
CONDITIONS			SITUATIONS
			1 2 3
Check out the brake-current rectifier:			
a) Turn off CBl.			
b) Reconnect the two remaining yellow-wire Fastons from AlCR1-4 to terminals 4 and 5 of AlTBl.			
c) Turn on CBl. Does CBl trip?			Y N N
Is 32 V dc present between terminals 3 and 10 of brake relay AlK8? (Connect minus VOM probe to terminal 3.) ①			- Y N
ACTIONS			SEQUENCE
Replace bridge rectifier AlCR1-4 (located on front wall of power supply chassis).			1 - 1
Tl rectifiers checkout OK.			- X -
Problem not covered in manual. Call for assistance.			2 - 2
① If dc voltages are 10% or more below nominal, check ac input to capacitor/rectifier board (paragraph 3.12.1).			

ASSUME

1. ALP/J3 and ALP/J5 connected to provide loads to the +9.7 V power circuits.
2. CB5 (+9.7 V) and/or CB6 (-9.7 V) trip when CB1 is turned ON.

CONDITIONS	SITUATIONS			
	1	2	3	4
Limit +9.7 load to relay board: a) Turn off CB1 and CB4 (+46 V). b) Separate ALP/J3 (on side of power supply cabinet). c) Turn on CB5 and CB6, then turn on CB1. Does either CB5 or CB6 trip?	Y	N	N	N
Add servo preamp board to +9.7 V loads: a) Turn off CB1 (CB4 still off). b) Reconnect ALP/J3. c) Remove the three Fastons from the +5 V regulator card in PD94 of logic chassis. Be sure the Fastons don't touch each other or short to ground. d) Turn on CB1. Does either CB5 or CB6 trip?	-	Y	N	N
Add +5 V regulator card to +9.7 V loads: a) Turn off CB1 (CB4 still off). b) Reconnect Fastons to +5 V regulator card, then remove this card from logic chassis. Lay card on insulated surface (a folded dry rag, for example). c) Turn on CB1. Does either CB5 or CB6 trip?	-	-	Y	N
ACTIONS	SEQUENCE			
Verify that ALP5 is properly mated to ALJ5 on relay board.	1	-	-	-
Check ALP5 cable for shorts/grounds (+9.7 V wire is on pin 15).	2	-	-	-
Replace relay board (paragraph 3.12.10).	3	-	-	-
Check wires from +5 V regulator card Fastons to servo preamp for shorts/grounds.	-	1	-	-
Replace servo preamp (paragraph 3.15.1).	-	2	-	-
Replace +5 V regulator card, then adjust new regulator card (paragraph 3.13.1).	-	-	1	-
Continue with checks listed on DLT 7175-2.	-	-	-	X
Problem not covered in manual. Call for assistance.	4	3	2	-

ASSUME				
Checks of DLT 7175-1 completed.				
CONDITIONS	SITUATIONS			
	1	2	3	4
Add logic chassis to <u>+9.7 V</u> loads: a) Turn off CBl. b) Reinstall +5 V regulator card (with Fastons connected) in logic chassis. c) Separate A2P/JA80 and A2P/JA82 on logic chassis backpanel. d) Turn on CBl. Does either CB5 or CB6 trip?	Y	N	N	N
Add control panel to <u>+9.7 V</u> load: a) Turn off CBl. b) Reconnect A2P/JA80. c) Turn on CBl. Does either CB5 or CB6 trip?	-	Y	N	N
Add R/W chassis to complete <u>+9.7 V</u> loads: a) Turn off CBl. CB4 ( <u>+46 V</u> ) may be turned on now if desired. b) Reconnect A2P/JA82. c) Turn on CBl. Does either CB5 or CB6 trip?	-	-	Y	N
ACTIONS	SEQUENCE			
Problem is in the logic chassis. To isolate, go to paragraph 3.21.1. Reconnect A2P/JA80 and A2P/JA82 when finished.	1	-	-	-
Reconnect A2P/JA82 and replace control panel (paragraph 3.22.1).	-	1	-	-
Problem is in the R/W chassis. To isolate, go to paragraph 3.21.2.	-	-	1	-
<u>+9.7 V</u> loads are OK.	-	-	-	X
Problem not covered in manual. Call for assistance.	2	2	2	-

ASSUME

CB7 or CB8 tripped.

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Has CB7 tripped? ( $\pm 20$ V load fault).	Y	Y	Y	N	-
Has CB8 tripped? (+28 V load fault).	N	N	N	Y	-
Restrict +20 V load to logic chassis: a) Turn off CB1. b) Separate A2P/JA82. c) Reset CB7, then turn on CB1. Does CB7 still trip?	Y	N	N	-	-
Add R/W chassis to +20 V load: a) Turn off CB1 (CB7 still on). b) Reconnect A2P/JA82. c) Turn on CB1. Does CB7 trip?	-	Y	N	-	-
Remove +28 V from R/W chassis: a) Turn off CB1. b) Disconnect A2P/JA82. c) Reset CB8, then turn on CB1. Does CB8 still trip?	-	-	-	Y	N
ACTIONS	SEQUENCE				
Go to paragraph 3.21.1 to isolate $\pm 20$ V fault in logic chassis. Reconnect A2P/JA82 when finished.	1	-	-	-	-
Go to paragraph 3.21.2 to isolate $\pm 20$ V fault in R/W chassis.	-	1	-	-	-
$\pm 20$ V and +28 V loads OK.	-	-	X	-	-
Check for +28 V short in logic chassis backpanel wiring between A2PD93-01A and A2JA82-12B. Reconnect A2P/JA82 when finished.	-	-	-	1	-
Reconnect A2P/JA82 and go to paragraph 3.21.2 to isolate +28 V fault in R/W chassis.	-	-	-	-	1
Problem not covered in manual. Call for assistance.	2	2	-	2	2



ASSUME

CB4 tripped.

CONDITIONS	SITUATIONS			
	1	2	3	4
Limit +46 V load to power amp: a) Turn off CB1, then reset CB4 (+46 V). b) Separate A1P/J4 on side of power supply. c) Ensure all other breakers (CB2-CB8) are ON, then turn on CB1. Does CB4 still trip?	Y	N	N	N
Add logic chassis to +46 V load: a) Turn off CB1. b) Reconnect A1P/J4. c) Turn on CB1. Does CB4 trip?	-	Y	Y	N
Restrict +46 V load in logic chassis to backpanel wiring: a) Turn off CB1. b) Remove card from location A17. c) Reset CB4, then turn on CB1. Does CB4 still trip?	-	Y	N	-
ACTIONS	SEQUENCE			
Replace power amplifier board (paragraph 3.12.8).	1	-	-	-
Check logic chassis backpanel wiring between A2JD93-12A and chassis location A17-32B (+46 V), and between A2JD93-12B and chassis location A17-03B (-46 V).	-	1	-	-
Replace logic chassis card A17. ①	-	-	1	-
+46 V loads are OK.	-	-	-	X
Problem not covered in manual. Call for assistance.	2	2	2	-
① Set Maintenance Unit Disable switch on new A17 card to NORM.				

ASSUME

1. START indicator is lit.
2. Drive is up to speed.
3. First seek not yet completed (indicated by READY indicator blinking).

CONDITIONS	SITUATIONS		
	1	2	3
Check that heads loaded switch is transferring: a) Press START switch to stop disk. Do not turn off breakers. b) Manually push voice coil forward to move heads off unloading ramp. Does voice coil resist forward movement?	N	Y	Y
Check for forward drive to voice coil: a) Disconnect brown wire from voice coil (A3TBl-2). b) Attach + lead of VOM to this wire. - lead to logic ground. c) Press START switch. d) Wait 15 to 20 seconds for up-to-speed timeout to expire, then check voltage. Does VOM read approximately +40 V?	-	N	Y
ACTIONS	SEQUENCE		
Check leads to emergency retract relay AlK7 (mounted inside power supply).	1	-	-
Replace emergency retract relay.	2	-	-
Check for open voice coil. Note, voice coil is not a field replaceable item.	3	-	-
Check heads loaded switch (paragraph 3.7.1).	4	-	-
Replace power amplifier board (paragraph 3.12.8).	5	5	-
Replace logic chassis card A20. ①	-	1	-
Replace logic chassis card A07.	-	2	-
Replace logic chassis card Al2.	-	3	-
Replace logic chassis cards A08 and Al7 ②. Retry after each card is replaced.	-	4	-
Reconnect brown voice coil lead and go to DLT 7178-2.	-	-	X
Problem not covered in manual. Call for assistance.	6	6	-
<p>① When drive can do first seek, new A20 logic card will require servo adjustment (paragraph 3.20).</p> <p>② Set Maintenance Unit Disable switch on new Al7 card to NORM.</p>			

ASSUME							
Checks of DLT 7178-1 completed.							
CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Drive attempts first seek, then unloads?	Y	Y	Y	-	-	-	
Servo preamp input to logic chassis card A18 OK? ①	N	Y	Y	-	-	-	O
Track Servo signal present at A18-09B (output pin)? ②	-	N	Y	-	-	-	T
Drive seeks to forward mechanical stop, FAULT indicator lights (+46 V breaker trips), and heads do not unload?	-	-	-	Y	-	-	H
Drive seeks to forward mechanical stop, FAULT indicator lights (+46 V breaker trips), heads then retract?	-	-	-	-	Y	-	E
Drive loads heads, hesitates, then creeps to forward end-of-travel?	-	-	-	-	-	Y	R
ACTIONS	SEQUENCE						
Check for continuity and grounds in servo preamp cable (input to A18).	1	-	-	-	-	-	-
Replace servo preamp (paragraph 3.15.1).	2	-	-	-	-	-	-
Replace servo head (paragraph 3.19.6).	3	-	-	-	-	-	-
Replace logic chassis card A18.	-	1	-	-	-	-	-
Replace logic chassis cards A07, A09 ④, A17 ⑤, A19, A20 ③. Retry after each card is replaced.	-	-	1	-	-	-	-
Replace power amp board (paragraph 3.12.8).	-	-	-	3	2	-	-
Replace velocity transducer (paragraph 3.17.1).	-	-	-	2	-	-	-
Replace logic chassis cards A09 ④, A19. Retry after each card is replaced.	-	-	-	1	-	1	-
Replace logic chassis cards A17 ⑤, A20 ③. Retry after each card is replaced.	-	-	-	-	1	2	-
Problem not covered in manual. Call for assistance.	4	2	2	4	3	3	X
<p>① Check servo preamp input to card A18-23B (+dibits) and A18-25B (-dibits). Use the following scope settings.                      Volts/Div: 2 V                      Time/Div: 2 usec                      Triggering: Internal position                      Logic gnd to scope gnd                      Press FAULT switch on control panel to reinitiate operation in order to view signal.</p> <p>② Use same scope settings as above. Press FAULT switch to view signal.</p> <p>③ When drive can do first seek, new A20 logic card will require servo adjustment (paragraph 3.20).</p> <p>④ Set Sector switches on new A09 card for 60 sectors (see Setting Sector Switches, section 2).</p> <p>⑤ Set Maintenance Unit Disable switch on new A17 card to NORM.</p>							

ASSUME

Pressing START switch does not stop disk pack rotation and unload heads.

CAUTION

If heads have not unloaded (READY indicator lit), manually retract heads (paragraph 3.0.8) before troubleshooting.

CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
START indicator goes out?	Y	Y	Y	Y	N	O T H E R
Heads unload?	Y	Y	Y	N	-	
Drive motor breaks to a stop? (Stops in about 20 seconds.)	Y	N	N	-	-	
Drive motor coasts to a stop?	N	N	Y	-	-	
ACTIONS	SEQUENCE					
Power down completed satisfactorily.	X	-	-	-	-	-
Turn MAIN AC circuit breaker OFF and check heads loaded switch (paragraph 3.7.1).	-	1	-	-	-	-
Turn MAIN AC circuit breaker OFF and check for open thermal resistor in MOTOR (CB3) circuit breaker (terminals C and D).	-	-	3	-	-	-
Check connections of AlK8 relay.	-	-	2	-	-	-
Replace AlK8 relay.	-	-	4	-	-	-
Check for 32 V dc between terminals 10 and 3 of AlK8 relay (terminal 10 is -16 V). If absent, replace ±16 V bridge rectifier AlCR1-4.	-	-	1	-	-	-
Replace logic chassis card A07.	-	-	-	1	-	-
Replace logic chassis card A20. ①	-	-	-	2	-	-
Replace control panel (paragraph 3.22.1).	-	-	-	-	1	-
Problem not covered in manual. Call for assistance.	-	2	5	3	2	X
<p>① Once drive can be powered-down properly, new A20 logic card will require servo adjustment (paragraph 3.20).</p>						



ASSUME

Unable to extinguish control panel FAULT indicator. A17 logic chassis card Maintenance Unit Disable switch set to NORM.

CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Observe fault indicators on A17 logic chassis card. Is Voltage Fault indicator lit?	Y	-	-	-	-	N
Is Write Fault indicator lit?	-	Y	-	-	-	N
Is Head Select Fault indicator lit?	-	-	Y	-	-	N
Is Write and Read Fault indicator lit?	-	-	-	Y	-	N
Is Off Cylinder and Write or Read Fault indicator lit?	-	-	-	-	Y	N
ACTIONS	SEQUENCE					
Press Maintenance Fault Clear switch on A17 card. If indicator for fault extinguishes, fault condition no longer exists. If indicator still lights, continue with next action.	1	1	1	1	1	-
Check if a circuit breaker is tripped. If so, go to indicated DLT: +20 V -- DLT 7176, +46 V -- DLT 7177.	2	-	-	-	-	-
Isolate below-normal voltage fault (paragraph 3.21.3).	3	-	-	-	-	-
Check if +28 V circuit breaker is tripped. If so, go to DLT 7176.	-	2	-	-	-	-
Check that at least +26 V is present at power supply panel +28 V test jack. If OK, continue with next action; if not OK: a) Check transformer output associated with +28 V (paragraph 3.12.1). b) If transformer output is OK, replace capacitor/rectifier board (paragraph 3.12.6).	-	3	-	-	-	-
Replace logic chassis card A17 ① and read/write chassis cards E02, E01. Retry after each card is replaced.	-	4	-	-	-	-
Replace logic chassis card A17 ① and read/write chassis card E01. Retry after each card is replaced.	-	-	2	-	-	-
Replace logic chassis cards A17 ①, A02, A04, A06. Retry after each card is replaced.	-	-	-	2	-	-
Replace logic chassis cards A17 ①, A07, A02, A12. Retry after each card is replaced.	-	-	-	-	2	-
Replace logic chassis cards A07, A09 ②, A17 ①. Retry after each card is replaced.	-	-	-	-	-	1
Problem not covered manual. Call for assistance.	4	5	3	3	3	2
<p>① Set Maintenance Unit Disable switch on new A17 card to NORM.</p> <p>② Set sector switches on new A09 card for 60 sectors (see Setting Sector Switches, section 2).</p>						



This paper-only DLT provides additional troubleshooting information for specific errors identified by error analysis routine 7120.

CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	10
Test 7120 step 002, 004, 007, or 008 error?	Y	N	N	N	N	N	N	N	N	N
Test 7120 step 010 or 019 error?	-	Y	N	N	N	N	N	N	N	N
Test 7120 step 013 or 015 error?	-	-	Y	N	N	N	N	N	N	N
Test 7120 step 017, 035, or 049 error?	-	-	-	Y	N	N	N	N	N	N
Test 7120 step 021 error?	-	-	-	-	Y	Y	Y	Y	N	N
Test 7120 step 041 error?	-	-	-	-	-	-	-	-	Y	N
Front panel START indicator lit?	Y	Y	Y	Y	Y	Y	Y	N	Y	-
Front panel READY indicator blinking?	N	N	N	N	Y	-	-	-	N	-
Front panel FAULT indicator lit?	N	N	N	N	N	Y	Y	-	N	-
Voltage Fault indicator lit on logic chassis card A17?	-	-	-	-	-	N	Y	-	-	-
ACTIONS	SEQUENCE									
Replace logic chassis card A03.	1	2	-	2	-	-	-	-	2	-
Replace logic chassis card A01.	2	3	2	-	-	-	-	-	-	-
Reseat/replace attachment card, ① replace I/O cables.	3	1	1	1	-	-	-	-	1	-
Replace logic chassis card A18.	-	-	-	-	-	1	-	-	-	-
Go to DLT 7178.	-	-	-	-	-	2	-	-	-	-
Replace logic chassis card A09. ②	-	-	-	-	1	-	-	-	-	-
Run first seek test 7121 (DLT 7121).	-	-	-	-	2	-	-	-	-	-
Go to DLT 7180.	-	-	-	-	-	-	X	-	-	-
Try to make drive ready by pressing START switch.	-	-	-	-	-	-	-	1	-	-
Verify that all circuit breakers are on.	-	-	-	-	-	-	-	2	-	-
Verify bus in and bus out cable connections.	-	-	-	-	-	-	-	-	3	-
Go to DLT 7170-1.	-	-	-	-	-	-	-	3	-	-
Go to DLT 7181-2.	-	-	-	-	-	-	-	-	-	X
Problem not covered in manual. Call for assistance.	4	4	3	3	4	-	-	-	4	-
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).										
② Refer to Setting Sector Switches, section 2, for correct switch settings of A09 card.										



This is a continuation of DLT 7181-1. Conditions assume front panel START indicator is lit.

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Test 7120 step 033 error?	Y	N	N	N	N
Test 7120 step 045 error?	-	Y	N	N	N
Test 7120 step 051 or 053 error?	-	-	Y	N	N
Test 7120 step 054 error?	-	-	-	Y	N
ACTIONS	SEQUENCE				
Verify bus in and bus out cable connections.	1	-	-	-	-
Go to DLT 7170-1.	2	-	-	-	-
Run first seek test 7121 (DLT 7121).	-	X	-	-	-
Run write sector ID test 7150 (DLT 7150).	-	-	1	-	-
Run write/read data test 7130 (DLT 7130).	-	-	2	-	-
Run error correction code test 7140 (DLT 7140).	-	-	3	-	-
Run margins test 71F2 (DLT 71F2).	-	-	4	-	-
Run data integrity test 71F1 (DLT 71F1).	-	-	5	-	-
Replace attachment card. ①	-	-	-	X	-
Problem not covered in manual. Call for assistance.	-	-	6	-	X
① The attachment card contains switches or jumpers to select SMD device address (see Installing Attachment in Series/1, section 2).					

This paper-only DLT provides additional troubleshooting information for specific errors identified by test 7101 and 7113.

CONDITIONS	SITUATIONS	
	1	2
Test 7101 step 002, 004, 007, 008, 011, 020, 022, 024, 031, 033, or 034?	Y	-
Test 7113 step 007 or 019?	-	Y
ACTIONS	SEQUENCE	
Run system test and freelance diskette (CDC P/N 663092XX) ① using device address of SMD (it is not necessary to test other system devices). If a failure occurs with Cycle Steal Status Word 3 present, refer to table A-2 (this appendix) for error definition.	X	-
Replace logic chassis card A15. If error persists, prepare and check head alignment (paragraphs 3.19.1, 3.19.2).	-	X
<p>① Operating instructions are contained in the CDC System Test and Freelance Reference manual. Refer to preface of this manual for publication number.</p>		



This utility partially initializes a disk pack for diagnostic checkout purposes. Do not use for customer pack initialization or on an existing customer pack. Refer to paragraph 3.23 for operating procedure. Halt codes indicate program stops occurring on Series/1 operator/programmer panel. Execution time is approximately 18 minutes. FFFF is displayed in the indicators during execution. To initiate, enter B71F0.

CONDITIONS	SITUATIONS																							
	1	2	3	4	5	6	7	8	9	10														
Halt code 70E1?	Y	N	N	N	N	N	N	N	N	N														
Halt code 70E2?	-	Y	N	N	N	N	N	N	N	N														
Halt code 70E3?	-	-	Y	N	N	N	N	N	N	N														
Halt code 70E4?	-	-	-	Y	N	N	N	N	N	N														
Halt code 70E5?	-	-	-	-	Y	N	N	N	N	N														
Halt code 70E6?	-	-	-	-	-	Y	N	N	N	N														
Halt code 70E7?	-	-	-	-	-	-	Y	N	N	N														
Halt code 70E8?	-	-	-	-	-	-	-	Y	N	N														
Halt code 3805?	-	-	-	-	-	-	-	-	Y	N														
ACTIONS	SEQUENCE																							
SMD initialization, enter device address. Reply FXX, where XX=device address.	X	-	-	-	-	-	-	-	-	-														
Do you want to initialize all cylinders, heads, and sectors? Reply F1=yes, F0=no.	-	X	-	-	-	-	-	-	-	-														
Enter cylinder, head, and sector in hex. Format is FCCCHHSS.	-	-	X	-	-	-	-	-	-	-														
Enter sector ID data in hex. Format is FFFCCCHHSS. F=flag, C=cylinder, H=head, S=sector.	-	-	-	X	-	-	-	-	-	-														
Device ID not 3107 (wrong device ID). Do you want to restart test? Reply F1=yes (test restarts), reply F0=no (program terminates).	-	-	-	-	X	-	-	-	-	-														
Error interrupt condition code is not 3 after write sector ID. Examine cycle steal status words for additional status information. Refer to paragraph 3.24.	-	-	-	-	-	X	-	-	-	-														
Error interrupt condition code is not 3 after read sector ID. Examine cycle steal status words for additional status information. Refer to paragraph 3.24.	-	-	-	-	-	-	X	-	-	-														
Sector ID compare error between expected and received data. ①	-	-	-	-	-	-	-	X	-	-														
SMD sector ID initialization complete.	-	-	-	-	-	-	-	-	X	-														
Refer to DCP halt list of paragraph 3.25.	-	-	-	-	-	-	-	-	-	X														
<p>① Expected and received data bytes are contained in the Level 3 registers in the following format:</p> <p>Expected = <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>R0</td><td>R1</td><td>R2</td></tr> <tr><td>SF</td><td>CC</td><td>HS</td></tr> </table></p> <p>Received = <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>R4</td><td>R5</td><td>R6</td><td>SF</td></tr> <tr><td>SF</td><td>CC</td><td>HS</td><td></td></tr> </table></p> <p style="margin-left: 40px;"> <span style="margin-right: 20px;">Sync</span> <span style="margin-right: 20px;">Cylinder</span> <span style="margin-right: 20px;">Sector</span>  <span style="margin-left: 20px;">Flag</span> <span style="margin-left: 20px;">Head</span> </p>											R0	R1	R2	SF	CC	HS	R4	R5	R6	SF	SF	CC	HS	
R0	R1	R2																						
SF	CC	HS																						
R4	R5	R6	SF																					
SF	CC	HS																						



This utility performs read verify commands on a disk pack to verify primary and alternate sectors. The entire disk pack or any one track can be selected for read verification. If Series/1 Mode switch is in Diagnostic position, utility stops after each error. To initiate, enter B71F1.

CONDITIONS	SITUATIONS											
	1	2	3	4	5	6	7	8	9	10	11	12
Halt code 7061?	Y	N	N	N	N	N	N	N	N	N	N	N
Halt code 7062?	-	Y	N	N	N	N	N	N	N	N	N	N
Halt code 7063?	-	-	Y	N	N	N	N	N	N	N	N	N
Halt code 7065?	-	-	-	Y	N	N	N	N	N	N	N	N
Halt code 7066?	-	-	-	-	Y	N	N	N	N	N	N	N
Halt code 7067?	-	-	-	-	-	Y	N	N	N	N	N	N
Halt code 7068?	-	-	-	-	-	-	Y	N	N	N	N	N
Halt code 706A?	-	-	-	-	-	-	-	Y	N	N	N	N
Halt code 706B?	-	-	-	-	-	-	-	-	Y	N	N	N
Halt code 706C?	-	-	-	-	-	-	-	-	-	Y	N	N
Halt code 3805?	-	-	-	-	-	-	-	-	-	-	Y	N
ACTIONS	SEQUENCE											
Enter device address to start data integrity test. Reply FXX, where XX = device address.	X	-	-	-	-	-	-	-	-	-	-	-
Do you want to verify all cylinders, heads and sectors? Reply F1=yes, F0=no.	-	X	-	-	-	-	-	-	-	-	-	-
Enter cylinder and head in hex, FCCCHH for cylinder and head to be verified.	-	-	X	-	-	-	-	-	-	-	-	-
Data error, cylinder=XXXX, head=XX, sector=XX. ①	-	-	-	X	-	-	-	-	-	-	-	-
Device ID not 3107 (wrong device ID). Do you want to restart test? Reply F1=yes (test restarts), reply F0=no (program terminates).	-	-	-	-	X	-	-	-	-	-	-	-
Enter loop count in hex, FXXXX = count, F0000 = infinite.	-	-	-	-	-	X	-	-	-	-	-	-
Flag not defective after successful read ID (defective flag bit not set). Cylinder=XXXX, head=XX, sector=XX. ①	-	-	-	-	-	-	X	-	-	-	-	-
No record found on alternate track.	-	-	-	-	-	-	-	X	-	-	-	-
Sync check error on data field of alternate track.	-	-	-	-	-	-	-	-	X	-	-	-
Cycle steal status word 1 error on alternate track. See error abort message for cause of error. ②	-	-	-	-	-	-	-	-	-	X	-	-
Test completed.	-	-	-	-	-	-	-	-	-	-	X	-
Refer to DCP halt list of paragraph 3.25.	-	-	-	-	-	-	-	-	-	-	-	X
① Error information is contained in the following level 3 registers:  R4 = Cylinder                      R6 = Sector R5 = Head                            R7 = Error (ECC) count												
② During an error abort, register R3 (level 3) contains starting address of error abort message. Refer to paragraph 3.24.												



This utility reads data from cylinder 336<sub>16</sub> using selectable margins for forward or reverse offsets, and early or late data strobes. If Series/1 Mode switch is in Diagnostic position, program stops after each error. To initiate, enter B71F2.

CONDITIONS	SITUATIONS											
	1	2	3	4	5	6	7	8	9	10	11	12
Halt code 70B0?	Y	N	N	N	N	N	N	N	N	N	N	N
Halt code 70B1?	-	Y	N	N	N	N	N	N	N	N	N	N
Halt code 70B2?	-	-	Y	N	N	N	N	N	N	N	N	N
Halt code 70B3?	-	-	-	Y	N	N	N	N	N	N	N	N
Halt code 70B4?	-	-	-	-	Y	N	N	N	N	N	N	N
Halt code 70B5?	-	-	-	-	-	Y	N	N	N	N	N	N
Halt code 70B7?	-	-	-	-	-	-	Y	N	N	N	N	N
Halt code 70B8?	-	-	-	-	-	-	-	Y	N	N	N	N
Halt code 70B9?	-	-	-	-	-	-	-	-	Y	N	N	N
Halt code 70BA?	-	-	-	-	-	-	-	-	-	Y	N	N
Halt code 3805?	-	-	-	-	-	-	-	-	-	-	Y	N
ACTIONS	SEQUENCE											
Enter device address to start routine. Reply FXX, where XX = device address.	X	-	-	-	-	-	-	-	-	-	-	-
Do you want to run margins using negative offset? Reply F1=yes, F0=no.	-	X	-	-	-	-	-	-	-	-	-	-
Do you want to run margins using positive offset? Reply F1=yes, F0=no.	-	-	X	-	-	-	-	-	-	-	-	-
Do you want to run margins using late strobe? Reply F1=yes, F0=no.	-	-	-	X	-	-	-	-	-	-	-	-
Do you want to run margins using early strobe? Reply F1=yes, F0=no.	-	-	-	-	X	-	-	-	-	-	-	-
Device ID not 3107 (wrong device ID). Do you want to restart test? Reply F1=yes (test restarts), reply F0=no (program terminates)?	-	-	-	-	-	X	-	-	-	-	-	-
Data error, Cylinder=XXXX, Head=XX, Sector=XX. ①	-	-	-	-	-	-	X	-	-	-	-	-
Do you want to loop on utility? Reply F1=yes, F0=no.	-	-	-	-	-	-	-	X	-	-	-	-
Device not assigned. Check for correct device address.	-	-	-	-	-	-	-	-	X	-	-	-
Read sector ID error. Cylinder=XXXX, Head=XX, Sector=XX. ①	-	-	-	-	-	-	-	-	-	X	-	-
Test completed.	-	-	-	-	-	-	-	-	-	-	X	-
Refer to DCP halt list of paragraph 3.25.	-	-	-	-	-	-	-	-	-	-	-	X
① Error information is contained in the following level 3 registers:  R4 = Cylinder                      R6 = Sector R5 = Head                            R7 = Error (ECC) count  If this is a irrecoverable error, test aborts after this message.  2. During an error abort, register R3 (level 3) contains starting address of error abort message. Refer to paragraph 3.24.												





This utility verifies the IPL logic on the FA740-B (LSI) attachment card only. Use of this utility on FA740-A (MSI) attachment card will result in false errors. Ensure the SMD is set up properly as an IPL source and is selected via the Series/1 Primary/Alternate IPL source switch.

CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Halt code F300?	Y	N	N	N	N	N
Halt code F301?	-	Y	N	N	N	N
Halt code F302?	-	-	Y	N	N	N
Halt code F303?	-	-	-	Y	N	N
Halt code F304?	-	-	-	-	Y	N
ACTIONS	SEQUENCE					
Enter device address SMD to be tested.	X	-	-	-	-	-
An error has occurred which makes it impossible to verify the IPL logic. Run BASIC tests 7100 to isolate problem. Reply: 0=Terminate; 1=Restart	-	X	-	-	-	-
The SMD is in the diagnostic IPL mode. Prior to IPLing the system, by pressing the LOAD button ① ensure that:  1. The SMD attachment card is properly designated as an IPL source and no other device is configured to conflict with it.  2. The Series/1 Primary/Alternate switch is in the proper position to select this SMD.	-	-	X	-	-	-
The IPL sequence was not correctly completed. Replace the SMD attachment card. See section 2 of this manual. Reply: 0=Terminate; 1=Restart.	-	-	-	X	-	-
The IPL sequence completed correctly. The IPL logic on the attachment card is good. Reply: 0=Terminate; 1=Restart	-	-	-	-	X	-
① Certain errors will cause the system to hang:  <ul style="list-style-type: none"> <li>• The preconditions of halt F302 have not been satisfied.</li> <li>• The SMD under test does not support diagnostic IPL capability.</li> <li>• The SMD attachment card is faulty. Replace it. See section 2 of this manual.</li> </ul>						



# COMMENT SHEET

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Hardware Maintenance Manual, Site Information

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