

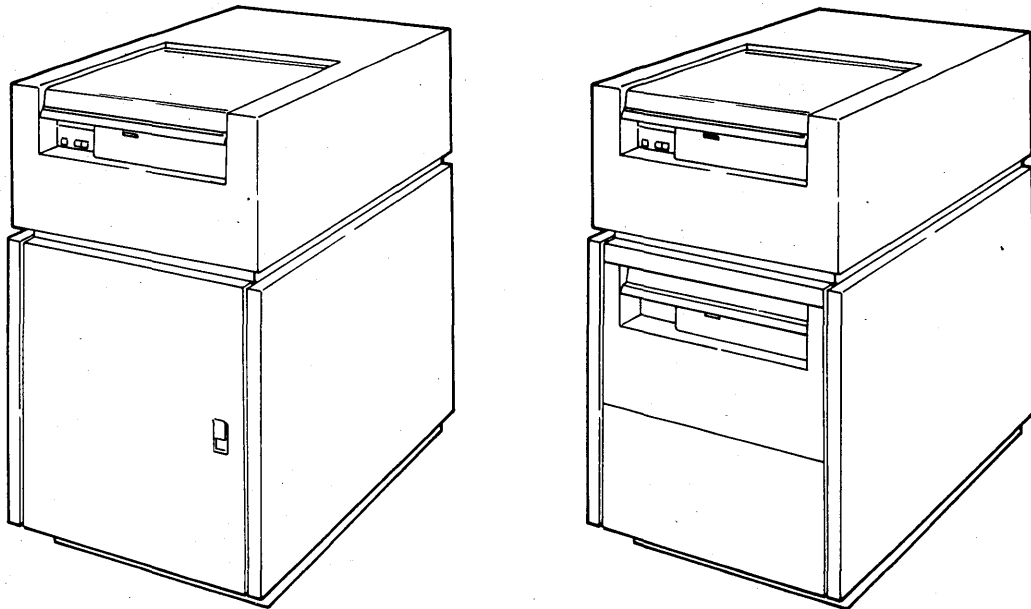
**Certainty[®] 270 Series
SMD Disk Storage Systems**



62947901

**CDC[®] 80270-10, 80270-20 AND 80271-10
STORAGE MODULE DRIVE**

**HARDWARE MAINTENANCE MANUAL
Site Information**



80270-10, 80270-20 AND 80271-10 HARDWARE MAINTENANCE

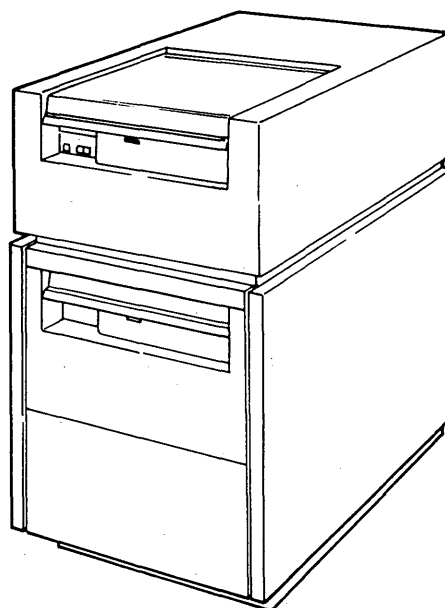
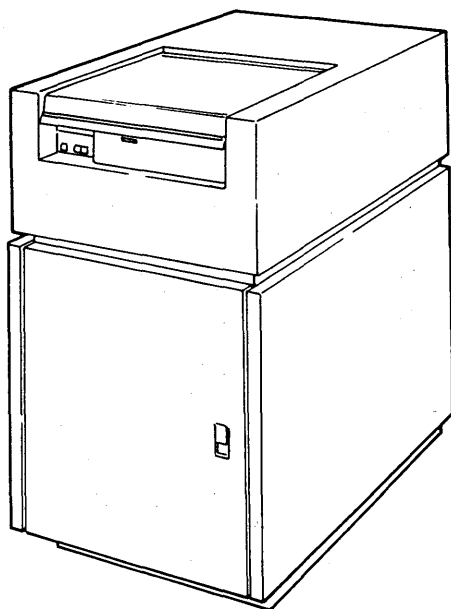
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MANUAL TO EQUIPMENT LEVEL CORRELATION

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
BK501-A	20	-	
	21	-	
	22	55311	
	23	-	
	24	55462	
	25		
BK501-B	20	-	
	21	-	
	22	-	
	23	-	
	24	55462	
	25		
BK502-A	20	-	
	21	-	
	22	-	
	23	-	
	24	55462	
	25		

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MANUAL TO EQUIPMENT LEVEL CORRELATION (CONTD)

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS
BK502-B	20	-	
	21	-	
	22	-	
	23	-	
	24	55462	
	25		
BT313-A	01	13215	
	02	13294	
	03	13370	
	04		
FA740-A	01	13211	
	02	13273	
	03	13411	
	04	01012	
	05		
FA740-B	01	01091	
	02		
SPO89270-1			

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	D	3-1	A	3-57	A	3-116	A		
	D	3-2	A	3-58	A	3-117	A	DLT 7001-1	A
		3-3	A	3-59	D	3-118	A	DLT 7001-2	A
		3-4	A	3-60	A	3-119	A	DLT 7001-3	A
viii-b	D			3-61	A	3-120	B	DLT 7002-1	A
ix	B	3-5	A	3-62	A	3-121	B	DLT 7002-2	B
x	B	3-6	A	3-63	A	3-122	B	DLT 7002-3	A
x.	A	3-7	A	3-64	A	3-123	B	DLT 7003-1	A
xii	B	3-8	A	3-65	B	3-124	B	DLT 7003-2	B
xiii	D	3-9	A	3-66	B	3-125	B	DLT 7003-3	A
xiv	B	3-10	A	3-67	A	3-126	B	DLT 7006	B
xv	B	3-11	A	3-68	A	3-127	B	DLT 7007	C
		3-12	A	3-79	A	3-128	B	DLT 7008	C
1-1	B	3-13	A	3-70	A	3-129	B	DLT 7009	C
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1-7	A	3-19	A	3-76	A	3-135	B	DLT 7013-1	B
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MANUAL TO EQUIPMENT LEVEL CORRELATION (CONTD)

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS
BK502-B	20	-	
	21	-	
	22	-	
	23	-	
	24	55462	
	25		
BT313-A	01	13215	
	02	13294	
	03	13370	
	04		
FA740-A	01	13211	
	02	13273	
	03	13411	
	04	01012	
	05		
FA740-B	01	01091	
	02		
SPO89270-1			

PREFACE

This manual provides information to aid in the installation, checkout, and on-site maintenance of the CDC 80270-10, 80270-20 and 80271-10 Storage Module Drives. Product and associated equipment number correlation is as follows:

<u>Product Number</u>	<u>Equipment Number</u>	<u>Description</u>
80270-10	BK501-A/B* BT313-A FA740-A or FA740-B	63 MB Storage Module Drive SMD Interface Kit MSI Disk Attachment Card Assy LSI Disk Attachment Card Assy
80270-20	BK502-A BT313-A FA740-B	63 MB Storage Module Drive, Drawer model SMD Interface Kit LSI Disk Attachment Card Assy

NOTE

The 80270-20 is a drawer-mounted storage module drive that upgrades an installed 80270-10 to the functional equivalent of a 80271-10 SMD. Instructions converting to a 80270-20 drawer-mount are contained in the following documents:

- Field Installation Instructions, Document Number 22245372
- Drawer Installations Kit-Modification, Document Number 22245373

80271-10	BK502-A/B** BT313-A FA740-A or FA740-B	Dual 63 MB Storage Module SMD Interface Kit (2 required) MSI Disk Attachment Card Assy (2 required) LSI Disk Attachment Card Assy (2 required)
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*BK501-A 120 V ac, 60 Hz unit; BK501-B 220/240 V ac, 50 Hz unit.
**BK502-A Dual 120 V ac, 60 Hz units; BK502-B Dual 220/240 V ac, 50 Hz units.

Organization of this manual is divided into four major 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. The remaining sections 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 cards and interface kit) are listed as follows: These manuals may be ordered from:

Control Data Corporation
Literature and Distribution Center
304 North Dale Street
St. Paul, Minnesota 55103

<u>Title</u>	<u>Publication Number</u>
80270-10, 80270-20, 80271-10 Storage Module Drive Hardware Maintenance Manual (Support Information)	62947903
80270-10, 80270-20, 80271-10, 80270-30 Storage Module Drive Reference Manual	62947900
Certainty® Series System Test and Freelance Reference Manual	62947920
Standalone Utilities Users Guide	62981800

NOTE

Exceptions to the IBM* Diagnostic Service guide MAP 0010 are summarized as follows:

- Device Type identifier assigned to the CDC 63 MB SMD is 70.
- Device ID for the CDC 63 MB SMD is 3007.
- No paper-only or diagnostic MAPs are used for this device. DLTs are used instead, having the following number significance:

DLT XXYZ

Where: XX = 70 indicating 63 MB SMD
Y = 0-6 indicating diagnostic DLTs
Y = 7-9 indicating paper-only DLTs
Y = F indicating utility DLTs
Z = used for sequencing only

*IBM is a registered trademark of International Business Machines Corporation.

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	A-2 Cycle Steal Status Word 3 Error Definitions	A-18

The storage module drive is a high speed, random access digital storage device that is designed to interface to an IBM Series/1 computer via an associated attachment feature (controller). The SMD uses removable disk packs as the storage medium with a data capacity of 63 megabytes. The mounting configurations for the drive unit(s) are shown in figure 1-1. The cabinet provides acoustic isolation and encloses the drive electronics to prevent dust and dirt from entering the disk pack area. An additional drive unit can be mounted in the cabinet on slide rails.

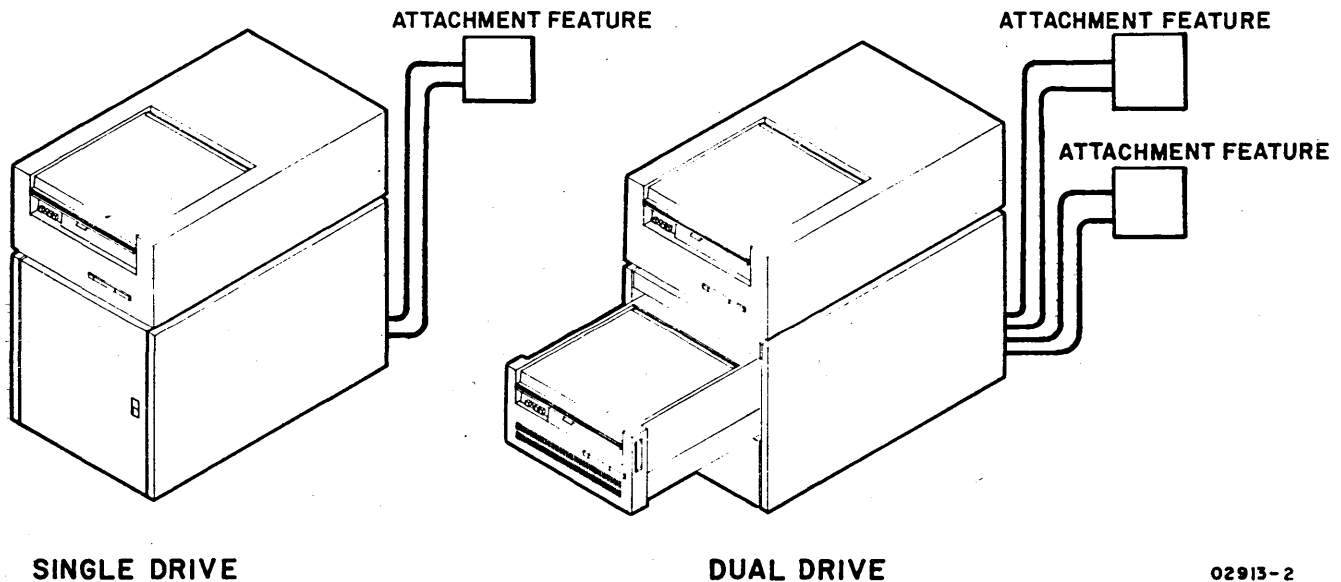


Figure 1-1. Drive Mounting Configurations

02913-2

Equipment specifications of the SMD are listed in table 1-1. The remainder of this section provides a description of the major elements of the SMD. These are divided into the following areas:

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

TABLE 1-1. EQUIPMENT SPECIFICATIONS

Specification	Value
Size	
Length	36.0 in (914.4 mm)
Width	22.0 in (812.8 mm)
Height	36.2 in (919.4 mm)
Mass	
Acoustic Cabinet	340 lb (155 kg)
Acoustic Cabinet With Drawer	567 lb (258 kg)
Temperature	
Operating	50° F (10° C) to 100° F (37.8° C)
Operating Change/Hr	12° F (6.6° C) per hr
Transit (packed for shipment)	-40° F (-40.4° C) to 158° F (70.0° C)
Non-Operating Change/Hr	36° F (20° C) per hr
Relative Humidity	
Operating	20% to 40% No Condensation
Transit (packed for shipment)	5% to 95%
Heat Output	
63 Megabyte SMD	760W (2580 Btu/h)
126 Megabyte SMD	1510W (5160 Btu/h)
Altitude	
Operating	-1000 ft (305 m) to 6500 ft (2000 m)
Transit (packed for shipment)	-1000 ft (305 m) to 15,000 ft (4572 m)
Disk Pack	
Type	877
Disks/Pack	3 (Top and bottom disks are for protection only.)
Data Surfaces	5
Servo Surfaces	1
Usable Tracks/Surface	823
Tracks/Inch	384
Track Spacing (center to center)	0.0026 (0.66 mm)
Coating	Magnetic Oxide
Data Capacity*	
Bytes/Track	15 360
Bytes/Cylinder	76 800
Bytes/Spindle	63 206 400
Cylinders/Spindle	823
Recording Characteristics	
Mode	Modified Frequency Modulation (MFM)
Density (nominal)	
Outer Track	4038 bits/in (1590 bits/cm)
Inner Track	6038 bits/in (2377 bits/cm)
Rate (nominal)	9.67 MHz (1 209 600 bytes/sec)
Heads	
Read/Write	5
Servo	1
Read/Write Width	0.002 in (0.51 mm)
Seek Characteristics	
Mechanism	Voice Coil, Drive By Servo Loop
Max Seek Time (411 or 823 Tracks)	55 ms
Max Track Seek Time	6 ms
Average Seek Time	30 ms
Latency**	
Average	8.33 ms (at 3600 r/min)
Maximum	17.3 ms (at 3474 r/min)
Spindle Speed	3600 r/min
Power Requirements (Nominal)	
BK501-A/BK502-A	120 V ac, 60 Hz, at 8.2 A max.
BK501-B/BK502-B	220 V ac, 50 Hz, at 4.2 A max, or 240 V ac, 50 Hz, at 5.0 A max
*Based on 8 bit bytes.	
**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, consisting of five 14-inch disks, center mounted on a hub (see figure 1-2). The disk pack is portable and interchangeable between equivalent drives.

The disk pack has a total of six usable surfaces, each coated with a layer of magnetic oxide and related binders and adhesives. 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 five surfaces can be used by the system for data storage and are referred to as data surfaces.

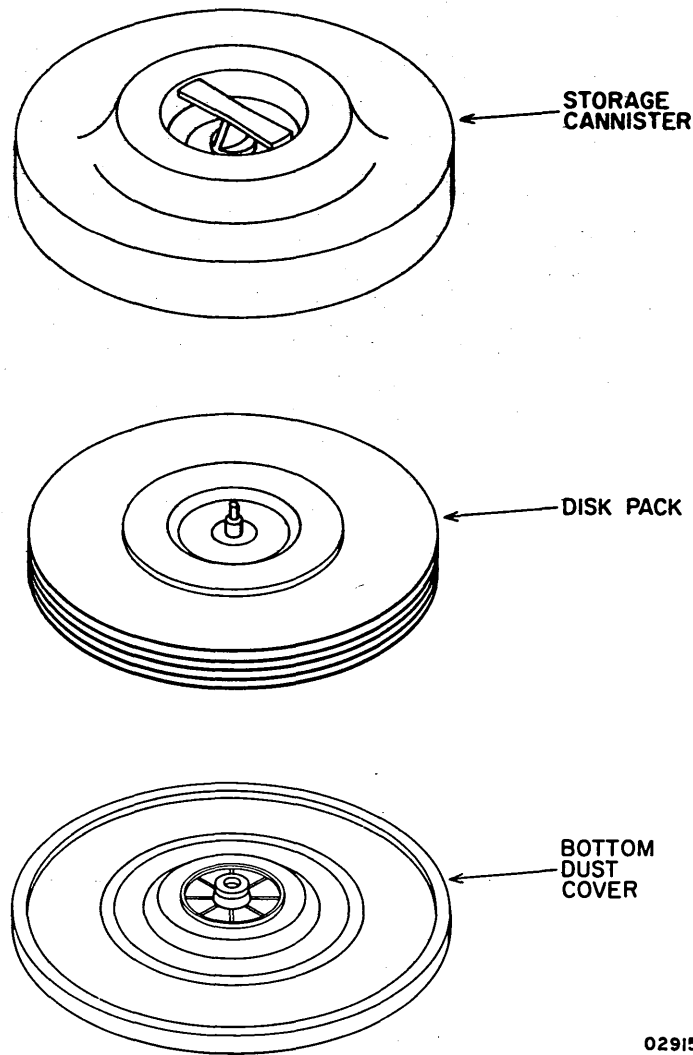


Figure 1-2. Disk Pack

DRIVE PHYSICAL DESCRIPTION

The following describes the major assemblies of the drive electronics package. These are, the base assembly, the logic chassis assembly, and the deck assembly.

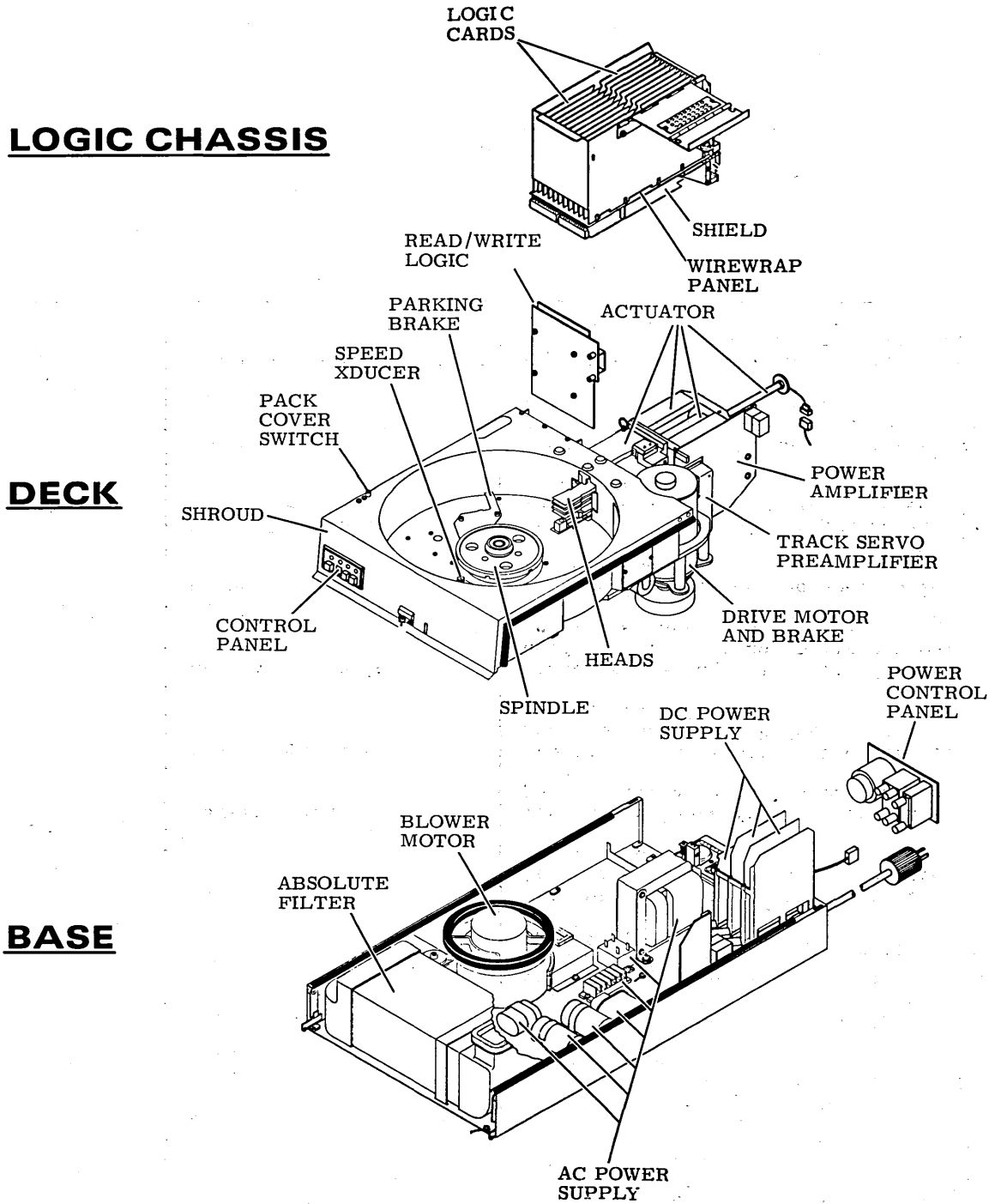
Figure 1-3 illustrates these major assemblies as well as the subassemblies contained within each of them. Table 1-2 defines each of the subassemblies. The base assembly provides a means of mounting the drive electronics package to the exterior cabinet. It also contains the hinge plate to which the deck is attached. The deck can then be raised and lowered to provide maintenance access to the various elements contained within the base or on the underside of the deck. The logic chassis is attached to the deck by a hinged bracket on the top of the magnet assembly. In this way, the logic chassis can be raised or lowered to provide access to the wirewrap panel for maintenance purposes.

TABLE 1-2. DRIVE ELECTRONICS PACKAGE ASSEMBLIES

Assembly	Subassembly	Purpose
Base	Absolute Filter	Removes contaminants from air before it is forced into pack area.
	AC Power Supply	Filters and controls ac power and provides power to drive and blower motors and to dc power supply.
	Blower Motor	Blows clean air into pack area and cooling air into logic chassis.
	DC Power Supply	Rectifies ac power and provides seven dc output voltages as well as emergency retract control.
	Power Control	Controls application of ac and dc power. Panel contains an elapsed time meter and circuit breakers.
Logic Chassis	I/O Cards	Interfaces I/O cable with backpanel.
	Logic Cards	Contain the majority of the integrated and discrete circuitry which makeup functional logic on machine.
	Wirewrap Panel	Contains all wiring which interconnects logic cards, I/O cards, and miscellaneous cables attached to logic chassis.
Deck	Actuator	Used to position servo and read/write heads. Made up of rail bracket, rails, carriage and coil assembly, magnet assembly, and also contains velocity transducer.

TABLE 1-2. DRIVE ELECTRONICS PACKAGE ASSEMBLIES (Contd)

Assembly	Subassembly	Purpose
Deck (Contd)	Control Panel	Used by operator to control operation of drive. Contains three switches and four indicators.
	Drive Motor and Brake	Drive motor drives spindle which in turn drives disk pack. Brake is used to decelerate pack after drive motor is turned off.
	Heads	Servo head reads data from disk pack servo surface to control actuator positioning. Read/write heads used to record and read back data on disk pack data surfaces.
	Pack Cover Switch	Prevents drive motor start sequence from being initiated when pack access cover is opened.
	Parking Brake	Prevents spindle from turning while pack is being installed or removed.
	Power Amplifier	Provides final amplification of servo positioning signal before it is applied to voice coil.
	Read/Write Logic	Contains the logic associated with head selection, read amplification, and write data signal shaping.
	Shroud	Provides protection and ventilation for disk pack.
	Speed Transducer	Magnetic pickup which provides information to logic on relative speed of disk pack.
	Spindle	Provides surface to secure disk pack and means of transmitting drive motor rotational motion to pack.
Track Servo Preamplifier	Provides first stage of amplification for track servo signal which is read from disk pack by servo head.	



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Figure 1-3. Drive Electronics Package

DRIVE FUNCTIONAL DESCRIPTION

The drive contains all the circuits and mechanical devices necessary to record data on and recover it from the disk pack (see figure 1-4). The necessary power for this is provided by the drive's power supply, which receives its input power from the site main power source.

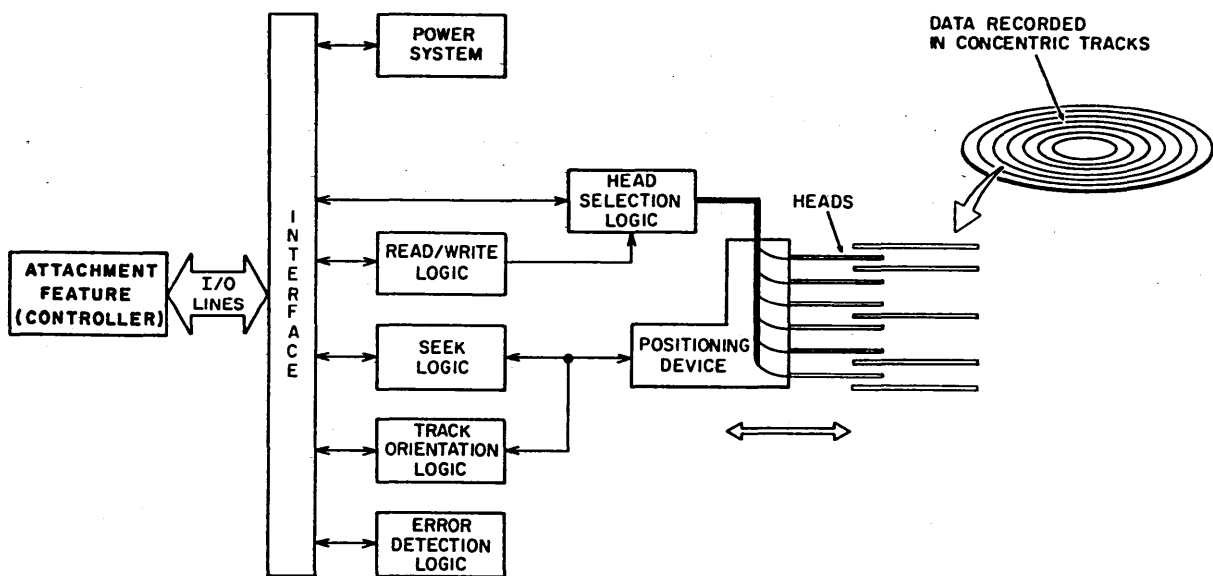


Figure 1-4. Drive Functional Blocks

All functions performed by the drive are done under direction of the attachment feature (controller). The controller communicates with the drive via the interface which consists of a number of I/O lines carrying the necessary signals to and from the drive.

All operations performed by the drive are related to data storage and recovery (normally referred to as writing and reading). The actual reading and writing is performed by electromagnetic devices called 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 in such a way that data is written in concentric tracks around the disk surfaces (see figure 1-4).

Before any read or write operation can be performed the controller must instruct the drive to position the heads over the desired track (called seeking) and also to use the head located over the surface (head selection) where the operation is to be performed.

After selecting a head and arriving at the data track, the controller still must locate that portion of the track on which the data is to be written or read. This is called track orientation and is done by using the Index and Sector signals generated by the drive. The Index signal indicates the logical beginning of each track and the Sector signals are used by the controller to determine the position of the head on the track with respect to Index. In a read/write data transfer, the desired track location (Sector ID) is loaded into the interface logic and compared to the Sector ID read from that track.

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

The drive is also capable of recognizing certain errors that may occur during its operation. When an error is detected, it is indicated either by a signal to the controller or by a maintenance indicator on the drive itself.

Refer to Volume 2 of the 63 MB Storage Module Drive manual for a detailed description of the various drive functions and related theory of operation information. The publication number is contained in the preface of this manual. The following paragraphs provide a brief description of the major functional areas of the SMD and associated attachment cards. These are illustrated in block diagram form in figure 1-5 and consist of the following:

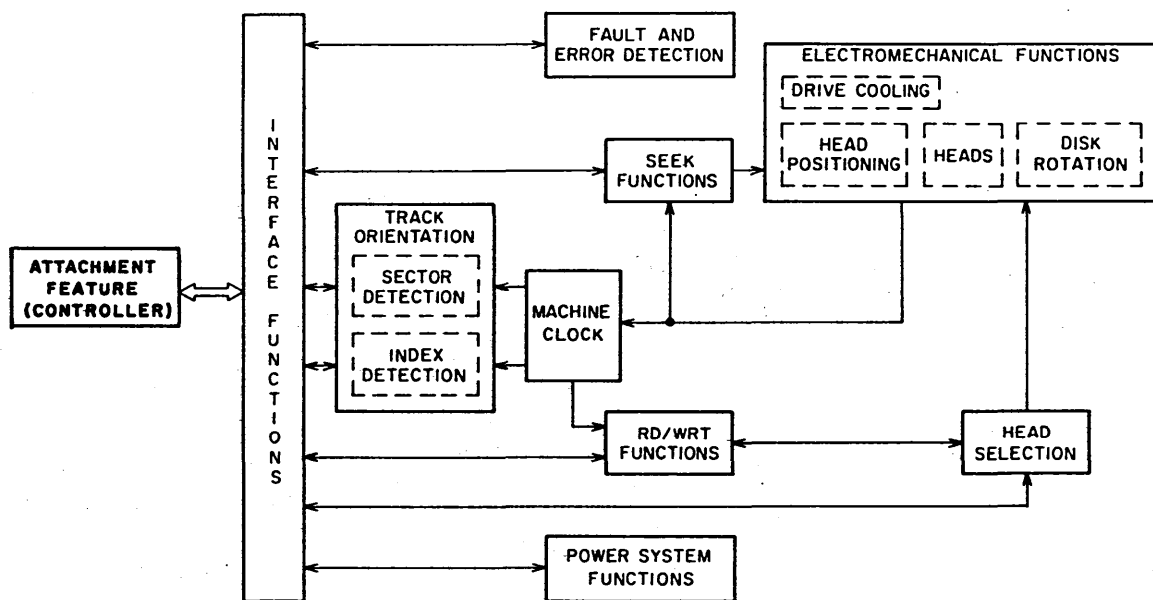
- Power System Functions
- Electromechanical Functions
- Interface Functions
- Seek Functions
- Machine Clock
- Head Operation and Selection
- Track Orientation
- Read/Write Functions
- Fault and Error Conditions
- Attachment Feature

POWER SYSTEM FUNCTIONS

The major element in the drives power system is the power supply. The power supply receives its input from the site ac power source and uses it to produce the ac and dc voltages necessary for drive operation. These voltages are distributed to the drive circuitry via circuit breakers.

The drive motor is started and heads load function initiated during the power on sequence. The power off sequence unloads the heads and stops the drive motor.

If during operation a voltage fault or a not up to speed condition is detected, an emergency retract sequence is performed. This provides a means of retracting the heads before head crashes can occur. The emergency retract relay (ALK2) connects -42 volts to the voice coil and causes the heads to retract.



02918-1

Figure 1-5. Drive Functional Block Diagram

ELECTROMECHANICAL FUNCTIONS

Certain drive functions are a result of the electromechanical devices working under the control of logical circuitry. These functions include disk pack rotation, head positioning, and drive cooling and ventilation.

Disk pack rotation is performed by the disk pack rotation mechanism, which is controlled by the power system. The purpose of disk pack rotation is to create a cushion of air on the disk surfaces. The cushion of air allows the heads (which read and write the data) to move over the disk surfaces without actually contacting them.

The heads are positioned over specific data tracks on the disk surface by the head positioning mechanism. The mechanism is controlled by the servo circuits (refer to discussion of Seek Functions) and the power system.

Drive cooling and ventilation is provided by the air flow system. The main element in this system is the blower motor which receives its power from the power system.

INTERFACE FUNCTIONS

All communications between drive and controller must 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 input and output signals are digital and use a TTL 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 any read or write operation can be performed. This is done during seek functions and is performed by the drives servo circuits.

The servo circuits form a closed loop servo system that controls movement by comparing the present position of the heads to the desired future position and generating a position control signal proportional to the difference between them.

The major elements in the servo loop are the position control circuits, position signal amplifiers, head positioning mechanism, 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 circuits generate clock pulses used by the sector detection, Index detection and the Read PLO circuits. It also generates the 9.67 MHz Servo Clock signal that is sent to the controller.

The write clock frequency multiplier circuit generates the 19.34 MHz and 9.67 MHz signals used during write operations.

HEAD OPERATION AND SELECTION

Information is recorded on and read from the disk by the read-write heads. The drive has five read-write heads, one for each data recording surface on the disk pack. For this reason, before a read or write operation can be performed, the controller must command the drive to select the head located over the disk surface where the 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 operation, 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 cylinder and selecting a head, the controller still may not read or write data until it determines the head is over that part of the drive track where the data is to be read or written. The controller accomplishes this by using the Index and Sector signals which are generated by the drive and by comparing the Sector ID information read from the track. The following describes index and sector detection.

Index Detection

Each track on the servo disk contains a pattern of missing dibits referred to as the index pattern. The drives index detection circuits use this pattern to generate a 2.5 us Index signal. The purpose of the Index signal is to indicate both to the drive and the controller, the logical beginning of a track.

Sector Detection

The sector detection circuits generate signals that are used to determine the angular position of the heads with respect to the index location. These signals are called Sector pulses and a specific number of them are generated during each revolution of the disk pack. The Sector pulses logically divide the disk into areas called sectors.

READ/WRITE FUNCTIONS

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

During a read operation, 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. Whether in a read data transfer or a write data transfer, the Data Strobe Out signal is used as a handshaking signal in response to the Data Strobe In signal for each byte transferred. A total of 256 bytes are transferred during each read or write operation.

During a write operation, 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 of the 256 bytes transferred.

FAULT AND ERROR CONDITIONS

The following describes those conditions which are interpreted by the drive as errors. All of these conditions either light an indicator at the drive and/or send a signal to the controller indicating an error has occurred.

These errors are divided into two categories: (1) those indicated by a Fault latch (2) those not indicated by a Fault latch. Both are explained in the following.

Errors Indicated by Fault Latch

Certain errors set the drives Fault latches associated with the error condition.

Setting the Fault latch does four things (1) enables the fault line to the controller (2) lights the FAULT indicator on the drives control panel (3) clears the drives Unit Ready signal (4) inhibits the drives write and load circuitry. These events prevent further drive operations from being performed until the error is corrected and the Fault latch is cleared.

Providing the error condition or conditions no longer exist, the Fault latch is cleared by any of the following:

- FAULT switch on operator panel.
- Controller Fault Clear or Clear-Reset signal from the controller.
- Maintenance Fault Clear switch on Fault card.
- Powering down the unit.

Whenever an error occurs that sets the Fault latch, it also sets an individual latch associated with that error. These latches provide a means of storing the error indication so it can be referred to later for maintenance purposes. The fault latches are cleared only by powering down the drive, or by the Maintenance Fault Clear switch on the fault card, or by a controller Clear-Reset signal.

The following describes each of the conditions causing the Fault latches to be set.

- Write Fault
- Head Select Fault
- Read and Write Fault
- (Read or Write) and Off-Cylinder Fault
- Voltage Fault

Write Fault

A write fault is indicated if any of the following conditions exist.

- Low output from write driver indicating it may not be operating properly.
- Low current input to write driver.
- Low +22 volts to write driver.
- No write data transitions when Write Gate is active.

Head Select Fault

This fault is generated whenever more than one head is selected. The outputs of the head select circuits are monitored by summing

and voltage comparator circuits. If more than one head is selected, the circuit generates a Multiple Select Fault.

Read and Write Fault

This fault is generated whenever the drive receives a Read gate and Write gate simultaneously from the controller.

(Read or Write) and Off-Cylinder Fault

This fault is generated if the drive is in an Off Cylinder condition and it receives a Read or Write gate from the controller.

Voltage Fault

This fault is generated whenever the +42, +5 or +20 voltages are below satisfactory operating level.

Errors Not Indicated by Fault Latch

The following errors are detected by the drive but are not stored in the fault latches. However, they do cause the drive to give other error indications and this is explained in the following paragraphs.

- Low Speed or Voltage Fault
- No Servo Tracks Fault
- Seek Error

Low Speed or Voltage Fault

The Speed or Voltage Fault signal goes true when the drive detects either a low voltage condition or that drive spindle speed is below 3000 r/min. When either of these are detected, the drive write circuits are disabled and the Write Protect signal is sent to the controller. These also result in an emergency retract of the heads (refer to discussion on emergency retract contained in the Power System Functions description).

No Servo Tracks Fault

If dibits are not detected within 350 ms after the load seek sequence begins, the No Servo Tracks latch is set. This lights the FAULT indicator on the drive operator control panel and also enables the Return to Zero Seek (RTZS) logic. Enabling the RTZS logic causes the heads to unload. Another load cannot be started until the No Servo Tracks latch is cleared. The No Servo Tracks latch is cleared in the same manner as the Fault latch.

Seek Error

The Seek Error latch is set by any of the following error conditions:

- On Cylinder was not obtained within 500 ms from the start of the seek.
- Forward or reverse end of travel (EOT) sensed.
- Drive is commanded to seek to a cylinder address greater than 822.

Setting the Seek Error latch enables the Seek Error line to the controller and also inhibits the drive from performing another seek until the Seek Error latch is cleared. The latch is cleared by a Return to Zero Seek command.

ATTACHMENT FEATURE

The attachment feature (controller) consists of either an MSI version with two printed circuit cards (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 SMD. 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 SMD. Figure 1-6 shows the relationship of the attachment feature to the Series/1 and SMD.

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 SMD 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.

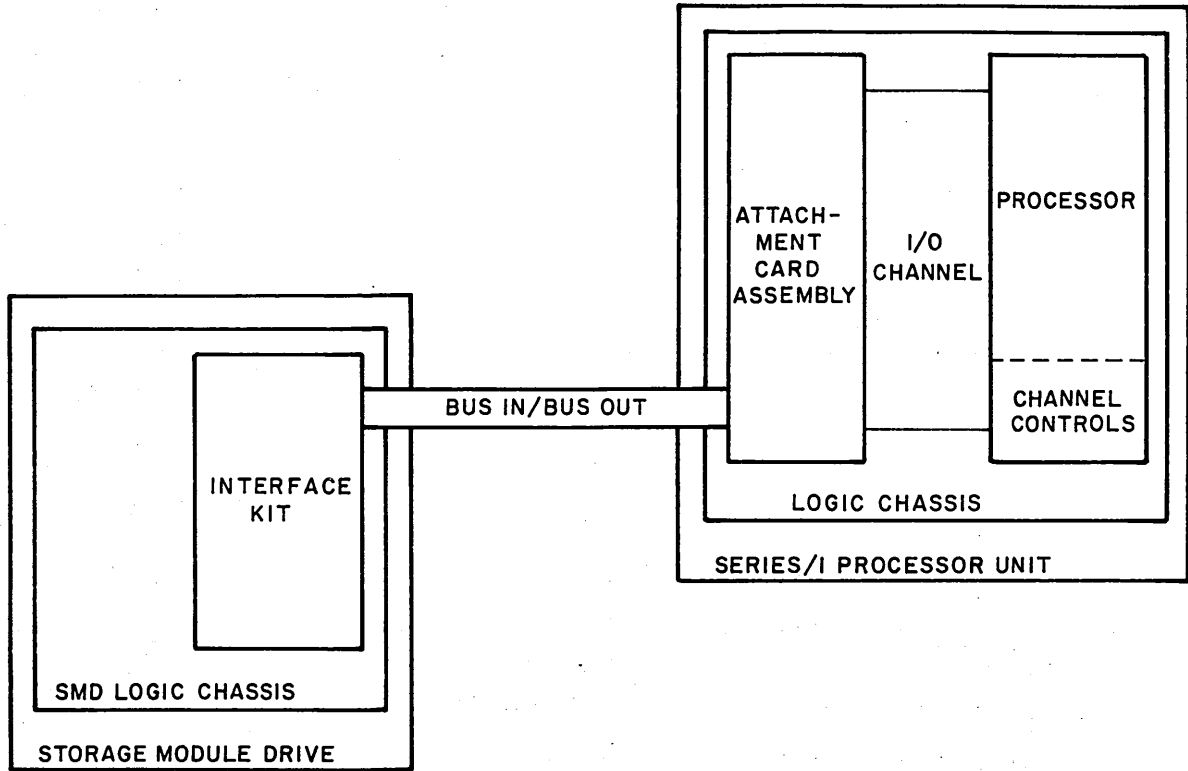


Figure 1-6. Attachment Feature Configuration

This section provides information pertaining to the installation and checkout of the storage module drive.

The information in this section is divided into the following major areas:

- Packaging - provides information regarding shipment of the drive.
- Installation - provides instructions on the installation of the drive and associated attachment cards.
- Checkout - provides instructions to ensure that the drive is functional.

PACKAGING

Packaging of the drive consists of an outer container (made up of corrugated cardboard and wood) and internal blocking and holddown bolts. Carefully remove the outer container. Set aside the packing material for use during reshipment of the drive. Refer to the unpacking instruction slip, which is inside the pack shroud area, for instructions on removal of the internal blocking and holddown bolts.

When the drive is to be shipped, it must be packaged as it was originally received from the factory.

If it is necessary to reship the drive, obtain packaging instructions and/or packaging materials from:

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

When ordering, specify the equipment number (BK501 or BK502) and series code of the drive as shown on the equipment identification label.

When necessary to ship printed circuit modules in for repair, package each module in a special envelope designed for shipping circuit cards. When more than one circuit card is to be shipped, package each in a separate envelope and place the envelopes in a shipping carton. Use sufficient filler material around the envelopes to prevent movement when the carton is sealed.

INSTALLATION

Installation instructions are provided to enable performing all necessary steps in the installation process. Within this section, reference is made to the opening and closing of various parts of the drive. Specific instructions as to how to do these procedures are given in section 3, Maintenance. The following installation procedures are described.

- Installation Inspection
- Input AC Power Matching and Power Plug Installation (220/240 V ac 50 Hz Units)
- Cabinet Leveling
- Setting Sector Switches
- Attachment Card and I/O Cable Installation

INSTALLATION INSPECTION

Perform the following inspection prior to installing the drive.

1. Inspect drive for possible shipping damage. File promptly any claim for this type of damage with the transporter involved. If a claim is filed, save the original shipping materials.
2. Verify that all logic cards are firmly seated in logic chassis and power supply.
3. Verify that control panel is firmly seated in shroud.
4. Verify that all connectors are firmly seated.
5. Raise deck and verify that all cabling is intact and that there are no broken or damaged wires.
6. Check entire drive for presence of foreign material which could cause an electrical short.
7. Check actuator and pack area for presence of material that could obstruct movement of carriage and heads.
8. Ensure that carriage locking pin and ring assembly is moved from SHIPPING LOCK hole to PIN STORAGE hole (refer to paragraph 3.17.1.3 in maintenance section of this manual for illustration).
9. Ensure that shipping bolts (2) are removed from center hole at rear of deck casting and from right side of unit.

INPUT AC POWER MATCHING AND POWER PLUG INSTALLATION (220/240 V AC, 50 HZ UNITS)

Install a 50 Hz ac power plug on the power cord (green wire of power cord to ground, and the other two wires phase to phase or phase to neutral).

Verify that the input ac power connections to ALTBl (input to power transformer Alt1) are configured correctly for the site ac voltage available per the following:

1. Use a voltmeter and check ac line voltage at power outlet.
2. Refer to table 2-1 and check that ALTBl is wired correctly for voltage measured in step 1. ALTBl is accessed by raising deck to maintenance position (see paragraph 3.2.3 in maintenance section of this manual).

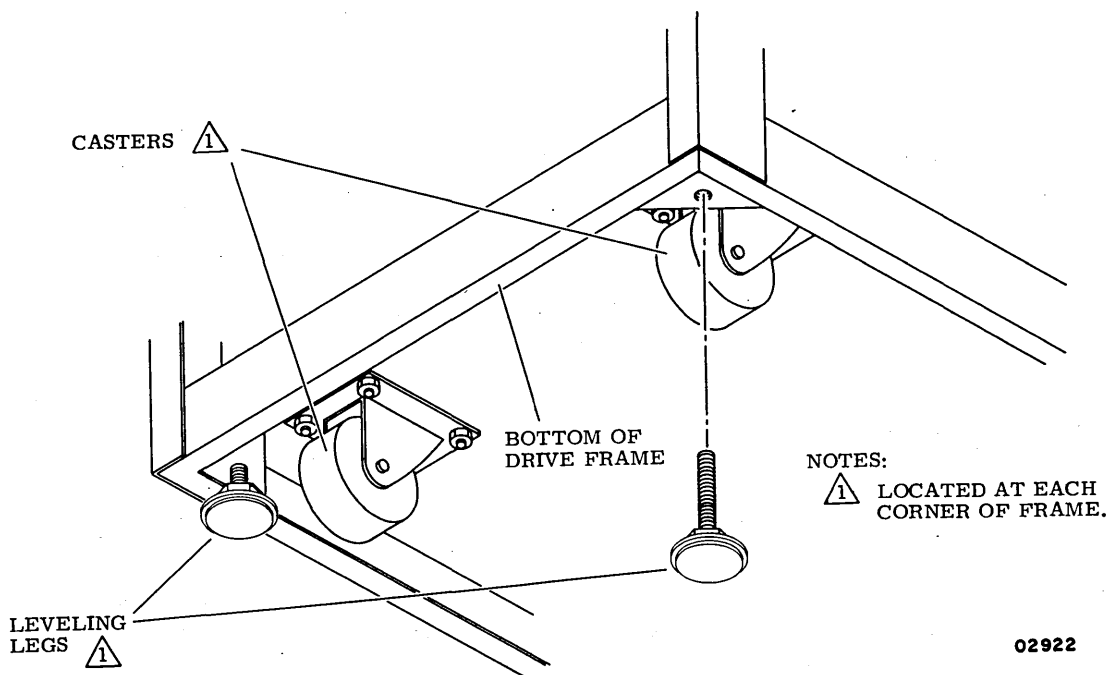
TABLE 2-1. ALTBl INPUT WIRING

NOMINAL VOLTAGE	INPUT (YELLOW) WIRES TO ALTBl	JUMPER (16AWG) BETWEEN ALTBl
220 V ac	Pin 1 and 5	Pin 2 and 3
240 V ac	Pin 1 and 6	Pin 2 and 3

CABINET LEVELING

Do not level cabinet until drive is in final location and there is no further necessity to move it. It may be advantageous to install leveling pads prior to the connection of cabling.

1. Install a leveling pad at each corner of cabinet frame (see figure 2-5) by raising corner of cabinet and threading leveler into welded nut on frame.
2. Locate drive in final position.
3. Turn leveling pads down until they support drive's weight and weight is off casters.
4. Adjust leveling pads until drive is aligned with adjacent equipment.
5. Place spirit level on drive case assembly and adjust leveling pads until drive is level.

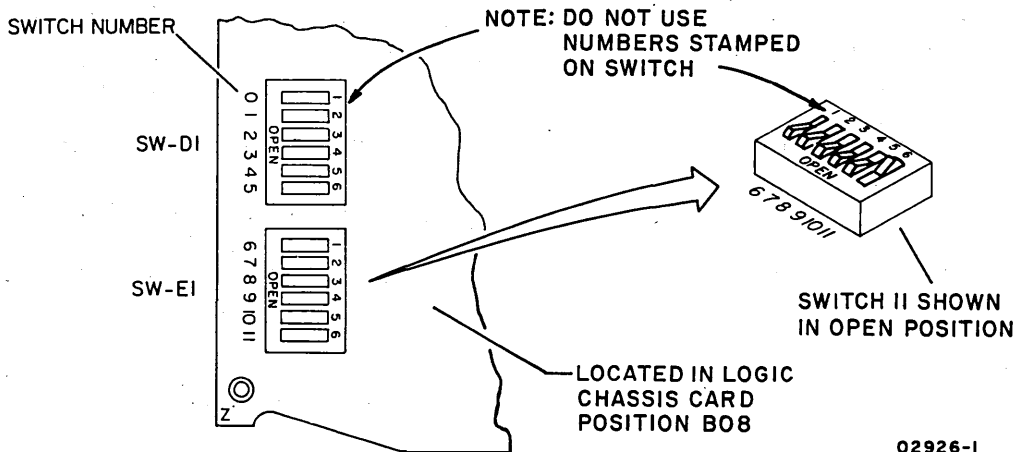


02922

Figure 2-1. Leveling Pad Installation

SETTING SECTOR SWITCHES

The drive provides the capability of setting the number of sectors per disk revolution. The required number of sectors for Series/1 system operation is 60. Therefore from the formulas provided, the following switch settings are required (refer to figure 2-2). Switch 5, 8, 9, 10, and 11 are set to the open position. Remove the PC board from location B08 of logic chassis to gain access to the switches.



02926-1

Figure 2-2. Sector Switch Positioning

The procedure from which these switch settings are derived is as follows:

1. Determine the length of each sector from the formula:

$$SL = 13440/RS$$

Where: SL = sector length in dibits

13440 = total dibits per revolution

RS = required number of sectors (60)

$$\text{Therefore: } 13440/60 = 224$$

2. Determine preset value from formula:

$$PV = 4096 - SL$$

Where: PV = preset value

4096 = count by which sector counter divides

SL = sector length in dibits (determined in step 1)

$$\text{Therefore: } 4096-224 = 3872$$

3. Using table 2-2, determine which switches to set to the open position. For this example, the sum of switches 5, 8, 9, 10, and 11 = 3872.

CAUTION

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

4. Use a ball-point pen to set switches located on edge of card in logic chassis position B08 as determined in step 3.

TABLE 2-2. SECTOR SWITCH VALUES

Switch No.	Binary Value*	Decimal Value*
0	2 ⁰	1
1	2 ¹	2
2	2 ²	4
3	2 ³	8
4	2 ⁴	16
5	2 ⁵	32
6	2 ⁶	64
7	2 ⁷	128
8	2 ⁸	256
9	2 ⁹	512
10	2 ¹⁰	1024
11	2 ¹¹	2048
*Value when switch is set in open position.		

ATTACHMENT CARD AND I/O CABLE INSTALLATION

The following procedure describes installation of the attachment card(s) and associated I/O cables. The attachment card(s) and I/O cables are packaged separately from the SMD and consist of the following items as applicable:

- MSI Microprocessor card (8ATD or 8BZD)
 - MSI channel card (8ASD or 8BYD)
 - LSI Attachment Card (8AUD)
 - Two I/O cables, P/N 61408084, 20 ft
61408085, 30 ft
61408086, 40 ft
61408087, 50 ft
 - MSI Identification plate (FA740A) and FCO log
 - LSI Identification Plate (FA740-B) and FCO log
1. Unpackage attachment card(s) and I/O cables and visually inspect for any shipping damage.
 2. Route and install I/O cables (Bus In and Bus Out) to bottom of SMD I/O connector panel (figure 2-3).

- a. Bus Out cable connects to bottom of JA82.
- b. Bus In cable connects to bottom of JA83.

NOTE

The I/O cables have cable ties that should be marked to identify one as the Bus In and the other as the Bus Out cable. A white dot indicates pin 1 of the I/O cable connector. Align this with pin 1 of connectors JA82 and JA83.

- 3. Fasten I/O cables to SMD cable mounting bracket using metal cable clamps provided. These must firmly contact cable shield to provide proper grounding (figure 2-3).
- 4. Verify that Bus In and Bus Out jumper cables between top of SMD connector panel and associated logic cards are connected correctly (figure 2-3).
 - a. Bus In cable jumper (P/N 61408077) connects between JA83 and logic card B03.
 - b. Bus Out cable jumper (P/N 61408076) connects between JA82 and logic card B01.

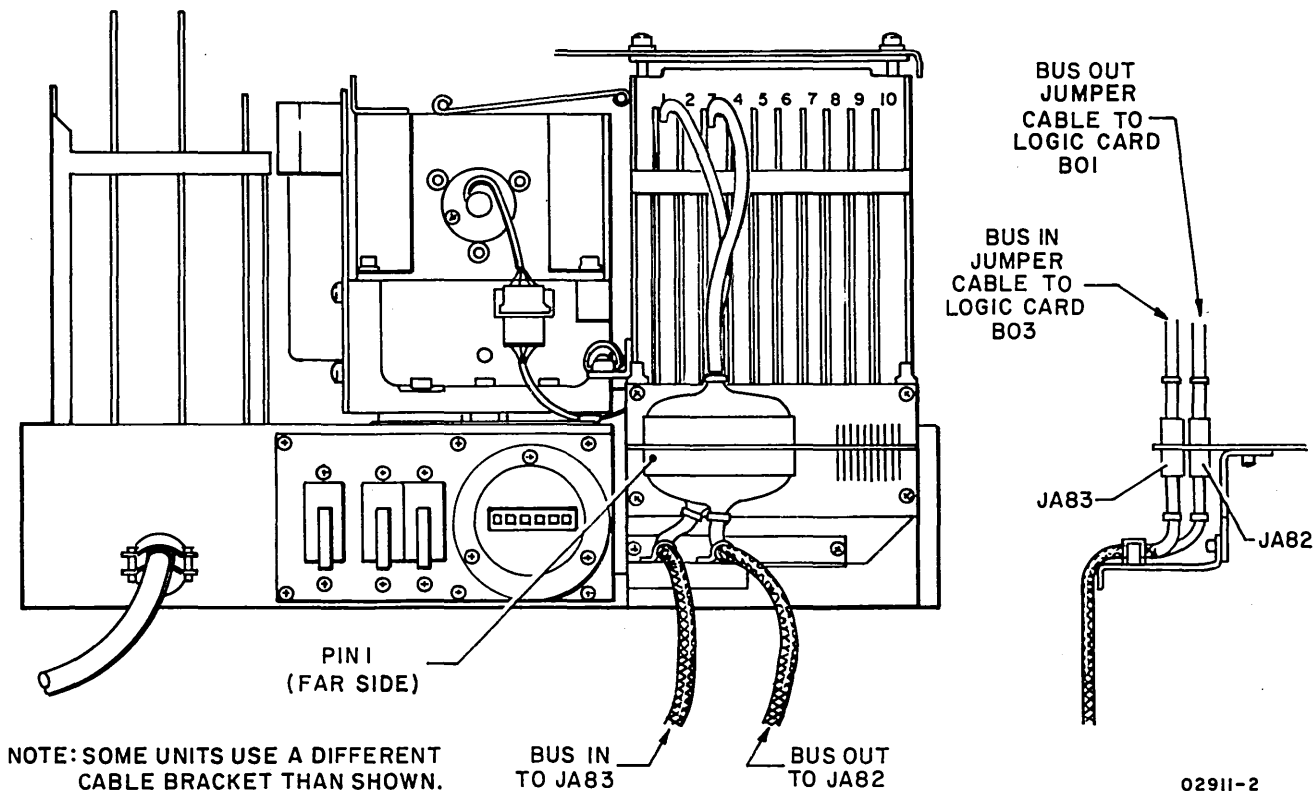


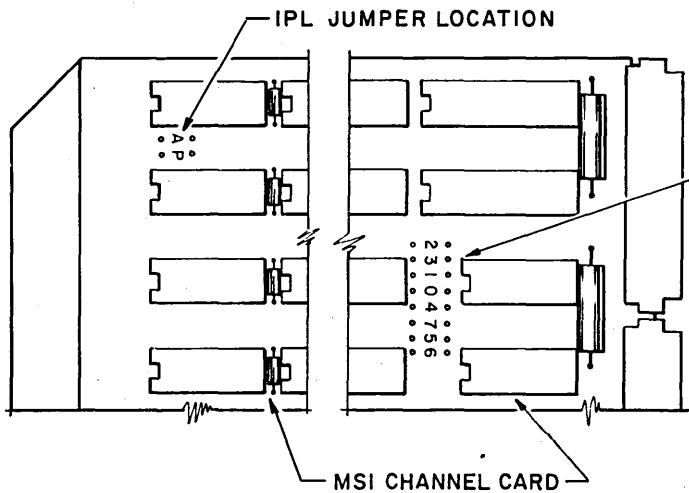
Figure 2-3. Cable Installation - Parts Location View

5. Determine from customer the required location of attachment card(s) in the Series/1 (either Processor unit or Input/Output Expansion unit), required device address, and whether SMD is to be assigned as a Primary, Alternate, or none IPL device.

NOTE

Priority is established in order of placement from right to left within each chassis. The Processor unit has higher priority than the I/O Expansion unit. MSI attachment cards must not be installed with more than one blank card location between them.

6. If the Series/1 is currently being used for system operations, check with customer before turning off power. Then, power off Processor unit or I/O Expansion unit, as applicable, by pressing the associated Power On/Off switch.
7. Remove snap-on cover from front of Processor unit or I/O Expansion unit as applicable and loosen I/O cable retaining bracket at top of unit.
8. Open rear access door of Series/1 cabinet.
9. Route I/O cables through rear bottom of cabinet and clamp shields of cables to vertical side bracket of Series/1 frame using metal cable clamps provided. These must firmly contact cable shield to provide proper grounding.
10. Attach pigtail ground lugs of each cable to ground strip located at top front of Processor unit or I/O expansion unit as applicable. Ground strip can be accessed from front of Series/1 cabinet if necessary, by removing mounting screws at front of unit and sliding unit forward.
11. From front of cabinet, loosen I/O cable retaining bracket located at top of Processor unit or I/O Expansion unit as applicable and route I/O cable connectors to front of chassis. Retighten retaining bracket screws.
12. MSI Attachment Cards - The MSI channel card is prewired for address 13₁₆. Install jumpers to select device address as required. Elsewhere on the channel card are jumper selections (A for alternate and P for primary) for IPL (Initial Program Load). Refer to figure 2-4 for jumper placement.



DEVICE ADDRESS JUMPER LOCATIONS (IF SWITCHES ARE USED INSTEAD OF JUMPERS, CLOSED SIDE DOWN=1)	BIT NUMBER								DEVICE ADDRESS
	7	6	5	4	3	2	1	0	
-	-	-	-	-	-	-	-	-	00
-	-	-	-	-	-	-	-	X	01
-	-	-	-	-	-	X	-	-	02
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
-	-	-	X	-	-	X	X	-	13
-	-	-	X	-	X	-	-	-	14
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
X	X	X	X	X	X	X	X	X	FF

X=JUMPER INSTALLED
--=NO JUMPER

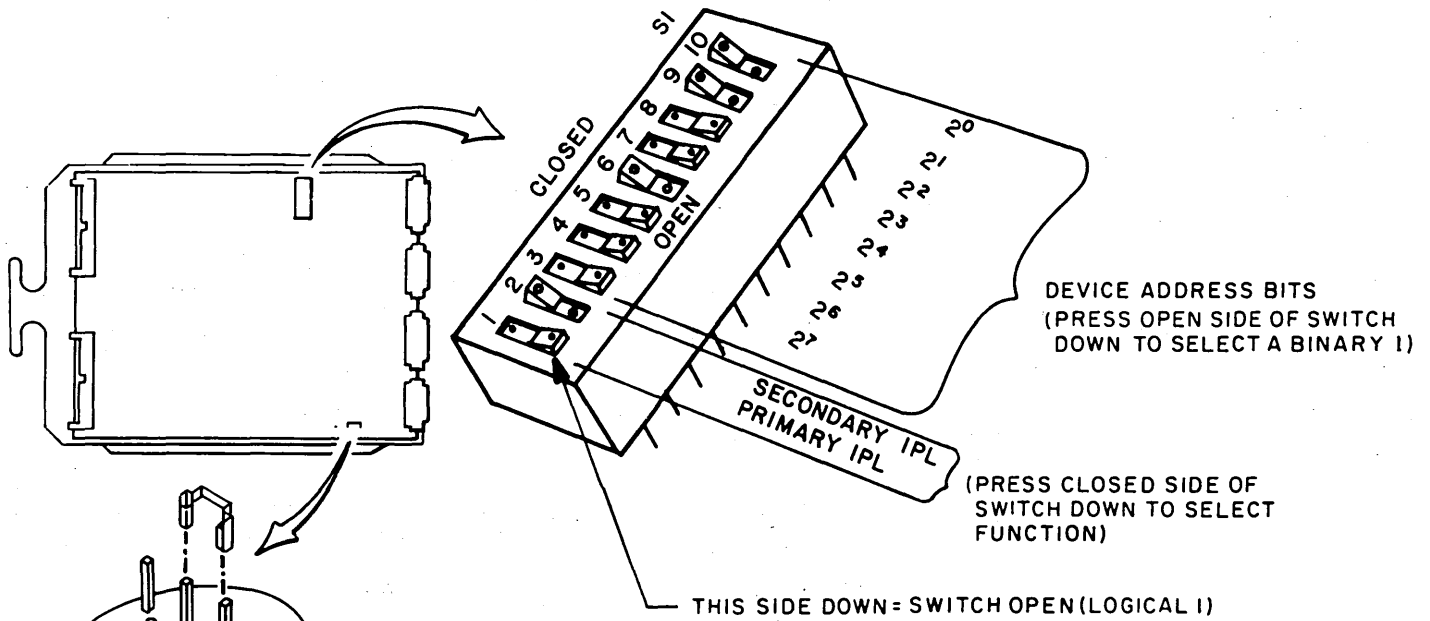
02981-1

Figure 2-4. MSI Attachment Card Jumpers

- a. Install MSI attachment cards in chassis with channel card being to the right of processor card as viewed from front. Cards cannot be separated by more than one open card slot unless poll jumpers are installed. (See note 13a).
 - b. Attach board interconnect cable from processor card to MSI channel card.
 - c. Attach Bus In cable to A connector of processor card (see figure 2-6).
 - d. Attach Bus Out cable to B connector of processor card (see figure 2-6).
13. LSI Attachment Card - Set switches on attachment card as required (figures 2-4.1 and 2-5). For example, to select device address 13₁₆ set switches S1-6, S1-9, and S1-10 to logical 1, and set switches S1-3, S1-4, S1-5, S1-7, and S1-8 to logical 0. To select attached device as Primary IPL source, set S1-1 to logical 0 and set S1-2 to logical 1. If neither Primary or Alternate IPL is to be selected, set both S1-1 and S1-2 to logical 1 position.

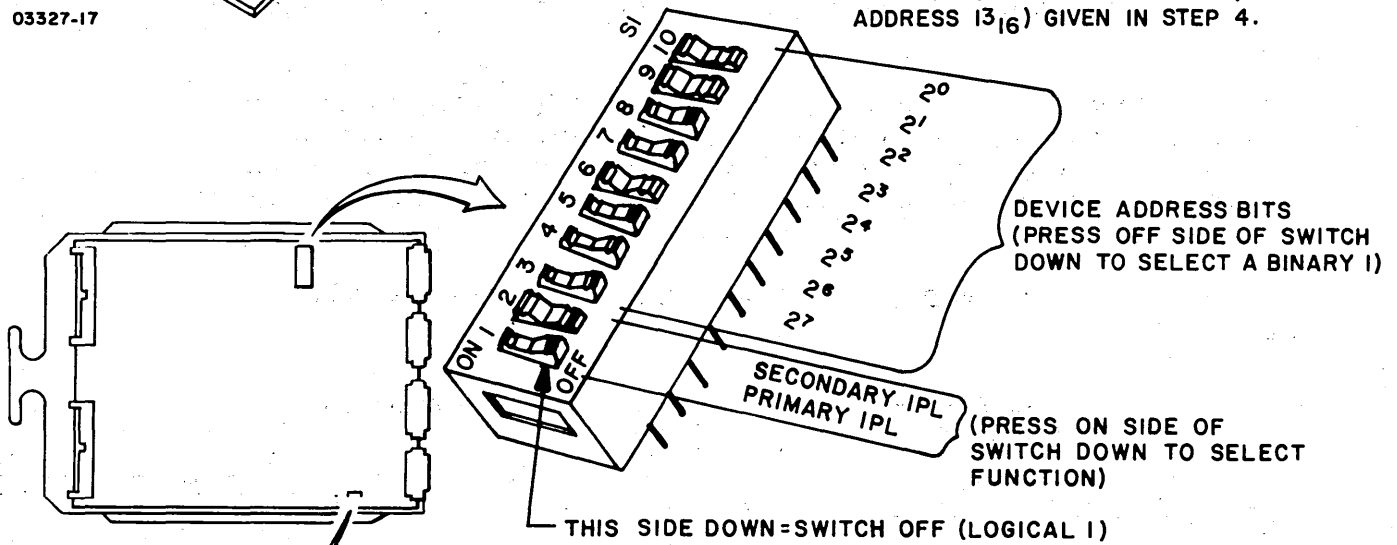
Verify that SD (System Disk) jumper is installed as shown in figure 2-5.

- a. Install attachment card in logic chassis.



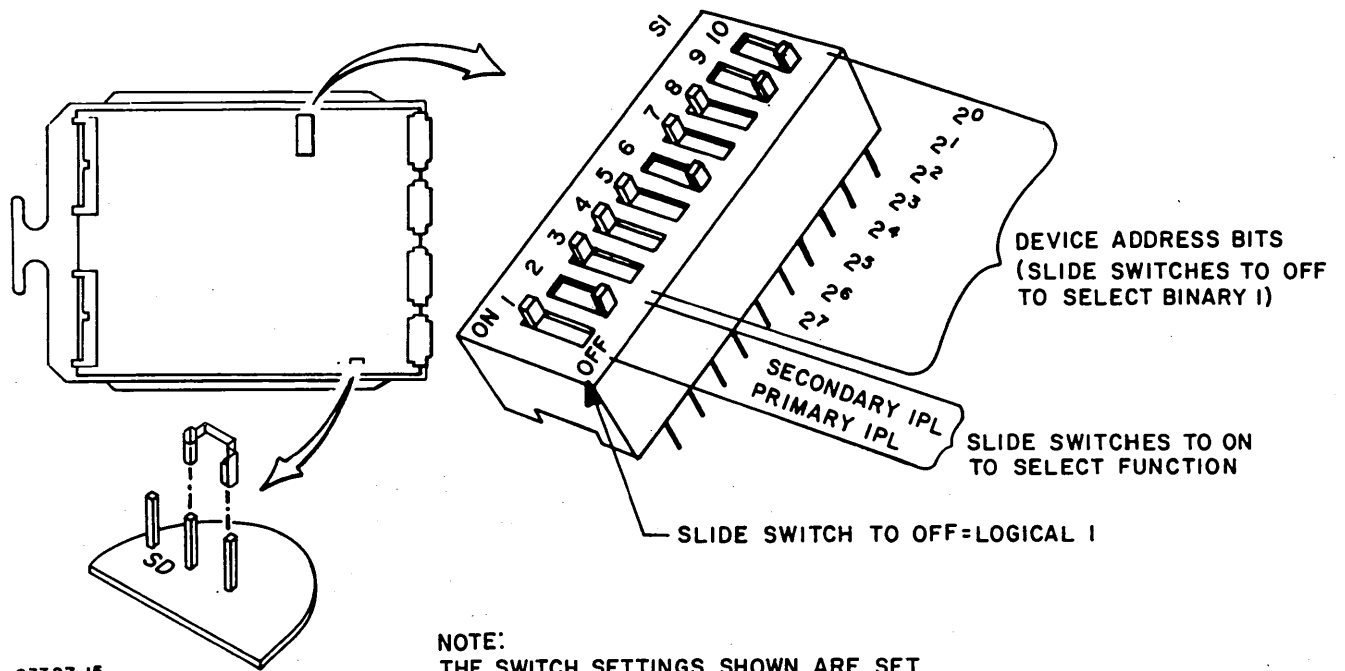
03327-17

NOTE:
THE SWITCH SETTINGS SHOWN ARE SET
ACCORDING TO THE EXAMPLE (DEVICE
ADDRESS 13₁₆) GIVEN IN STEP 4.



03327-16

Figure 2-4.1. LSI Attachment Card Rocker Selection Switches



03327-15

NOTE:
 THE SWITCH SETTINGS SHOWN ARE SET
 ACCORDING TO THE EXAMPLE (DEVICE
 ADDRESS 13_{16}) GIVEN IN STEP 4.

Figure 2-5. LSI Attachment Card Slider Selection Switches

NOTE

If installing attachment card between existing cards in either the processor or I/O expansion chassis that are separated by more than one open card slot, remove the Poll Propagate jumper (backpanel pins M11 and M12) from the location where the attachment card is to be installed. In some units, Poll Propagate jumpers may be installed even though an expansion chassis is not present. Refer to Poll Propagate Wiring in the applicable processor theory manual for additional information.

- b. Attach I/O cables to front of attachment card. SMD Bus In cable connects to top connector, Bus Out cable to bottom connector. Observe correct pin 1 alignment (see figure 2-6).
14. Refer to figure 2-6 and perform overcurrent protection adjustment per the following as applicable:

NOTE

No overcurrent adjustment is required when installing attachment card in an IBM 4952-A.

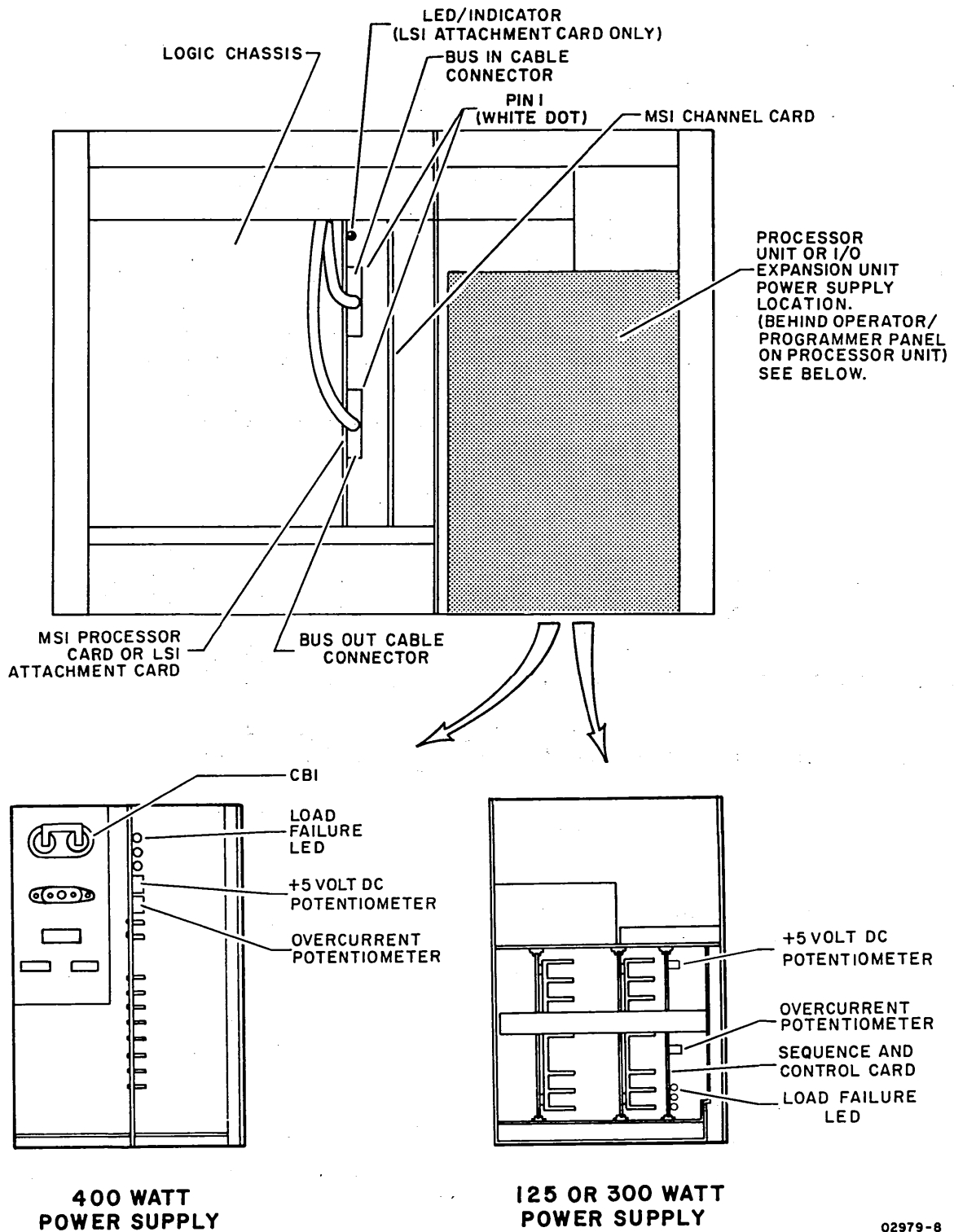


Figure 2-6. Adjustment Potentiometers and Attachment Card Cable Locations

- a. Apply power to Series/1 Processor unit or Input/Output Expansion unit (whichever unit attachment card(s) were added).

NOTE

If power does not come up; turn over current adjustment potentiometer clockwise one full turn, press unit Power On/Off switch to Off position then to On position. Keep repeating the clockwise adjustment and power sequencing until power comes up. When power is up, proceed to step b.

- b. Turn overcurrent potentiometer slowly counterclockwise until power goes off. Then turn overcurrent 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 position, then to On position. This completes the overcurrent protection adjustment.

NOTE

If Check indicator on Series/1 operator/programmers panel lights following power application, it indicates that an error condition exists on the attachment card(s) or a 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 the Series/1.

15. 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 2-6) for +5 \pm 0.5 V. Adjust as close to nominal as possible.

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 2-7 for backpanel pin configuration):

+5 V at A2D03
Ground at A2D08
 - c. Apply power to Series/1 and adjust +5 V potentiometer (figure 2-6) 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.
16. Verify that red LED on attachment card is not lit (applies to LSI attachment card only). Indicator stays on if power-on diagnostic error occurs. Replace attachment card if indicator remains lit.

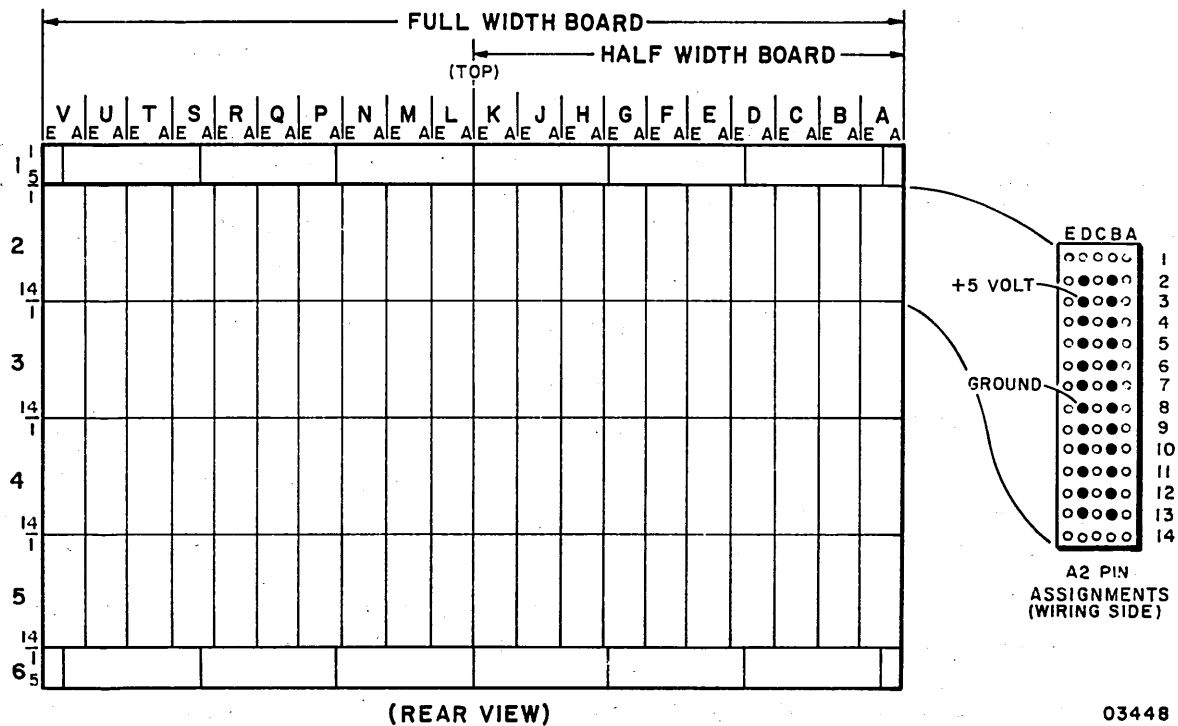
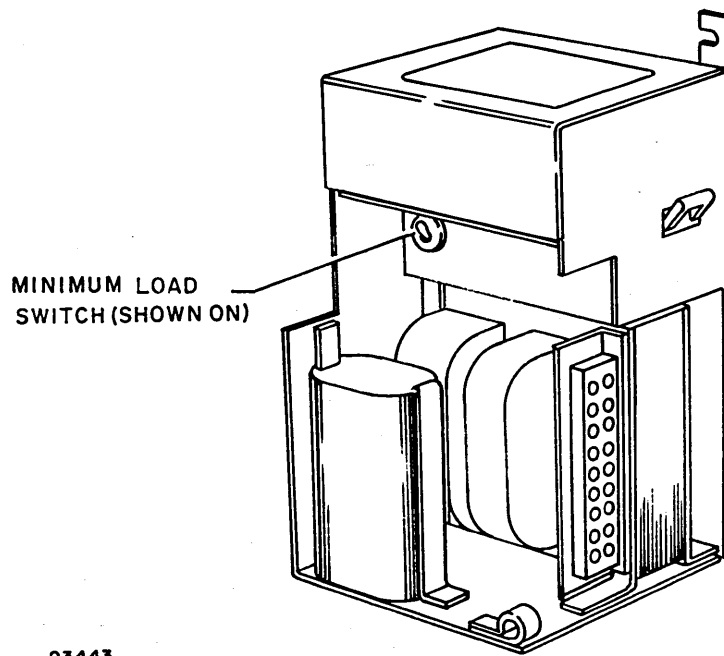


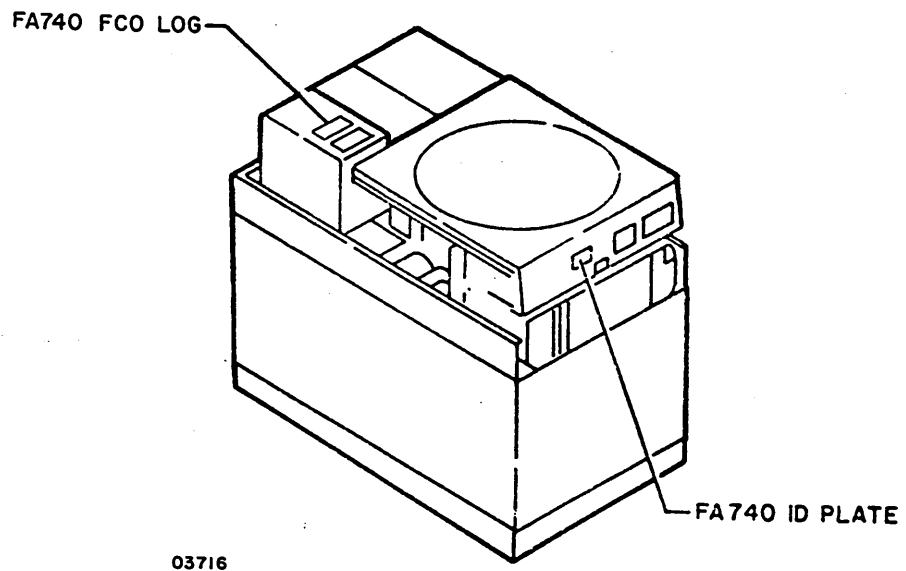
Figure 2-7. Backpanel Pin Configuration

17. Verify correct setting of Minimum Load Switch (4952-A units only) per the following (see figure 2-8):
 - a. Remove rear cover of power supply and lower hinged transformer box to view switch.
 - b. If four PC cards or less are installed in logic chassis, switch must be set to ON (up) position. If five or more PC cards are installed, switch must be set to OFF (down) position.
18. Replace front snap-on panel on Series/1 cabinet and close rear access door.
19. Attach equipment identification plate and FCO log to SMD per figure 2-9.
20. Configure CDC BASIC diskette and verify correct operation of unit by performing all items listed under Checkout heading.



03443

Figure 2-8. Minimum Load Switch



03716

Figure 2-9. Equipment Identification Plate and FCO Log Placement

CHECKOUT

When installation of the drive is complete, perform the General Cleaning (paragraph 3.1.1) and the Clean Shroud and Spindle (paragraph 3.1.4) procedures contained in the maintenance section of this manual. After the cleaning procedures are complete, perform the following BASIC diskette configuration and diagnostic checkout procedures.

CDC BASIC DISKETTE CONFIGURATION

This subsection provides information necessary to generate a system configurator table, or to add the SMD 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 3.28 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 indicates system is ready for any valid input. Go to para 3.27.1 to update configurator table manually, or to para 3.27.2 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 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. 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.

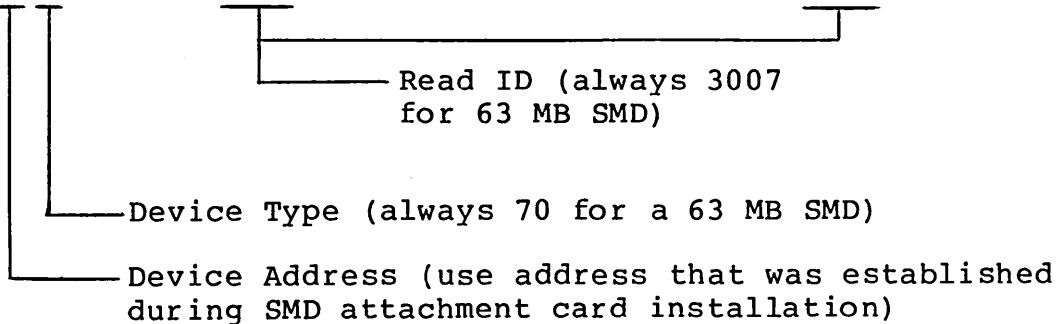
12. Enter F01 to display configurator table.
13. Enter F03 to select modify option.
14. Enter correct device type for each table entry to be modified by following the prompts on alternate console. Refer to table 2-3 for device type assignments.
15. Go to step 19.
16. Enter F01 to display configurator 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 2-3. IBM/CDC DEVICE TYPE ASSIGNMENTS

READ ID	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 and press ENTER key.

F XX70 0000 3007 0000 0000 0000 0000 3007



Response to preceding input is:

FUNCTION
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.

DIAGNOSTIC CHECKOUT

Perform the following steps to checkout the SMD and attachment feature.

NOTE

This procedure assumes that a flexible disk drive and Series/1 operator/programmer panel, are attached to the system. It also assumes that the system configuration information including the SMD has been written on to the BASIC diagnostic diskette.

1. Apply power to storage module drive (SMD). Reference paragraph 3.0.5.1 for power-on procedure.

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. Install a formatted scratch disk pack in the SMD. Reference paragraph 3.0.6.2 for disk pack installation procedure.

NOTE

A scratch disk pack can be formatted for diagnostic checkout through use of the Disk Format utility, U70F0. Refer to paragraph 3.25 (section 3 of this manual) for initialization procedure.

3. Apply power to flexible disk drive unit and install CDC BASIC diagnostic diskette.
4. Place IPL Source switch on Series/1 operator/programmer panel to Alternate or Primary position as applicable to enable loading from diskette.
5. Place Mode switch on Series/1 operator/programmer panel to Diagnostic position.
6. Press Load switch on Series/1 operator/programmer panel.

NOTE

This causes execution of the IPL diagnostic residing on the diagnostic diskette. Assuming no errors detected, IPL completes in approximately 10 seconds. This is indicated by a RDY ENTER message being displayed on the crt screen of the display unit (if used) and by a 3800₁₆ code being displayed in the register indicators of the operator/programmer panel. If the computer stops with any other code displayed, refer to para 3.28 (section 3 of this manual) for corrective action.

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.

7. After successful completion of the IPL diagnostic, enter test number B7000 to select and execute SMD auto diagnostics per the following as applicable.

NOTE

If SMD disk is not correctly formatted, Read ID errors will occur during diagnostic test execution. Use disk initialization utility 70F0 to format disk for diagnostic check-out purposes. Refer to para 3.25.

- a. Using alternate console display station, enter B7000 and press ENTER key (or CR key on TTY).
- b. Using operator/programmer panel (refer to para 3.29 for additional information on command entries).

- Press Data Buffer switch.
- Enter B via register input switches.
- Press Console Interrupt switch.
- Press Data Buffer switch.
- Enter 7000 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 3805₁₆ 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, Bus In (A2B03) and Bus Out (A2B01) cards one at a time until problem is corrected. Verify switch settings per attachment card installation procedure in this section.

*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.

8. Enter and execute the following manual SMD diagnostic tests per accompanying procedure.
 - 7030 Write/Read Data Test
 - 7040 ECC Pattern Test
 - 7050 Write Sector ID Test
- a. 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).
- b. 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.

9. Remove scratch disk pack from SMD (reference para 3.0.6.3 for disk removal procedure).
10. Install a CE disk pack in SMD (reference para 3.0.6.2 for disk installation procedure).

11. Perform servo checks and read/write head checks of all heads to verify correct alignment per head alignment procedure, para 3.17. If necessary to align any heads, rerun the SMD diagnostics to verify correct operation (steps 2 through 8).
12. Install applicable unit number lens per customer requirements beneath READY indicator on operator control panel of SMD.
13. Close all access panels and run CDC System Test and Freelance (diskette P/N 663092XX) to verify correct system operation.
14. Start CDC disk initialization utility to format disk for customer use before leaving site.

NOTE

A disk initialized by utility 70F0 is not satisfactorily formatted for customer use. Information pertaining to disk initialization for customer use is contained in the Standalone Utilities Users Guide, see preface for publication number.

15. Leave SMD reference manual for use by customer.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

It is essential to ensure that all data is entered correctly and that the system is regularly updated. This helps in identifying any discrepancies or errors in the data.

The second part of the document focuses on the security of the data. It is crucial to implement strong security measures to protect the information from unauthorized access.

Regular backups should be performed to ensure that the data is safe in case of a system failure. Additionally, user access should be restricted to only those who need it, and all users should be trained on proper data handling procedures.

The final part of the document provides a summary of the key points discussed. It emphasizes the need for a proactive approach to data management and the importance of continuous monitoring and improvement of the system.



This section provides information necessary to perform on-site maintenance of the 63 MB Storage Module Drive. The maintenance information covers adjustment, repair, and replacement of FRUs (Field Replaceable Units) as directed by the associated DLTs (Decision Logic Tables) for the Storage Module Drive. The major paragraph groups are:

- 3.0 General Maintenance Information -- Contains information that maintenance personnel should be familiar with before doing maintenance.
- 3.1 Preventive Maintenance -- Contains a preventive maintenance index followed by associated procedures.
- 3.2 Accessing Drive for Maintenance -- Gives instructions for opening/closing parts of drive cabinet.
- 3.3 through 3.24 -- Contain specific remove/replace/adjust/repair procedures for each FRU.
- 3.25 and groups thereafter -- Provide a summary of pertinent MAP10 Diagnostic Service Guide information as it applies to the SMD.

3.0 GENERAL MAINTENANCE INFORMATION

3.0.1 Safety Precautions

WARNING

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

- Use care while working with power supply. Line voltages are present inside the base (A1) in the area of the ac power supply.
- Keep hands away from actuator during seek operations and when reconnecting leads to voice coil. Under certain conditions, 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 immediately if they are touched. Refer to para. 3.17.3.2.
- Keep pack access cover closed unless it must be open for maintenance. This prevents entrance of dust into pack area. Do not open pack access cover while disk is spinning or attempt to slow disks by hand.

- Keep all watches, disk packs, meters, and other test equipment at least two feet away from voice coil magnet.
- Do not remove or install circuit cards while power is on. Circuit cards are easily damaged by transient voltage spikes which may be generated by removing or installing cards when power is on.
- Ensure that logic chassis is in normal operating position before raising deck. On rail mounted configurations, the logic chassis will be damaged by collision with the cabinet or frame. Also, since logic chassis cannot be secured in maintenance position, it may fall and be damaged as deck is raised.
- Do not open acoustic top case when drawer mounted drive has logic chassis in maintenance position. The top case and drawer unit's logic chassis will collide and damage will occur.
- Do not use customer disk pack for testing purposes, (see para. 3.0.5.)
- Do not use CE alignment disk pack unless specifically directed to do so. These packs contain prerecorded alignment data that can be destroyed if test procedure requires drive to write. This alignment data cannot be generated in the field.
- If drive fails to power down when START switch is pressed (to turn off indicator) disconnect voice coil leadwire (see paragraph 3.0.7 on manual carriage positioning) and manually retract heads before troubleshooting malfunction.
- Make certain that heads are retracted before turning off power.
- If power to drive motor is lost while heads are loaded and not under servo control (during manual carriage positioning), immediately retract carriage. Otherwise heads will crash when disk speed is insufficient to enable heads to fly.
- Keep all metal tools away from flex leads while power is applied in order to prevent damage to the power amplifier.
- If a data 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 have been copied to another storage device.

3.0.2 Maintenance Tools and Materials

The maintenance procedures described in this section require the use of certain special tools, test equipment, and materials. These tools and test equipment are listed in the following tabulation along with the appropriate source part number. Note that the

list only includes special tools. It is assumed that the user has at his disposal all the common hand tools such as wrenches, screw drivers, and the like.

Most of the items listed in the table require no explanation. The items listed in the table are called out in the specific procedures in which they are required.

MAINTENANCE TOOLS AND MATERIALS

Description	CDC Part Number	Description	CDC Part Number
Adapter (3/16 Hex to 1/4 Sq)	CDC* 12262582	Non-Metalic Feeler Gage, 0.005 inch	CDC 12205633
Card Extender	CDC 54109701	Oscilloscope, Dual Trace	Tektronix 454A or equivalent
Card Extraction Tool	CDC 87399200	Pin Straightener	CDC 87369400
Carriage Alignment Arm	CDC 75018400	Push-Pull Gage	CDC 12210797
Chip Extender (chipclip)	CDC 12212196	RTV Adhesive Sealant	CDC 95045700
Computer Card Stock	5084 or equiv.	Rubber Silicone Sealant	CDC 95023500
Disk Pack, CE (80 MB)	CDC 70438700 (877-51)	Wirewrap Removal Tool, 20-30 Gage	CDC 12259183
Disk Pack, Data (80 MB)	CDC 70438000 (877)	Scope Probe Tip (Hatchet Type)	CDC 12212885
Dust Remover, Spray Dry	CDC 95047800	Sprayable Adhesive	CDC 95018602
Filter Coat	CDC 12210958	Torque Screwdriver**	CDC 12218425
Gauze, Lint Free	CDC 12209713	Torque Screwdriver Bit**	CDC 87016701
Grease, Dielectric	CDC 95533600	Torque Wrench, 1/4 inch	CDC 122632k05
Head Adjustment Tool	CDC 75018803	Volt/ohmmeter	Ballantine 345 or equivalent digital voltmeter
I/O Pin Removal Tool	CDC 12215759	Wire Wrap Bit, 30 Gage	CDC 12218402
Loctite, Grade C	Loctite Corp.	Wire Wrap Gun, Electric	CDC 12259111
Loctite Primer, Grade T	Loctite Corp.	Wire Wrap Sleeve, 30 Gage	CDC 12218403
Lubricant Paste	CDC 95016101	Speed Sensor Go-No-Go Gauge	CDC 87052600
Media Cleaning Solution	CDC 95033502	Differential Pressure Gauge Kit	CDC 73040100
Card Extender (Attach- ment Card)	CDC 61408349	Head Alignment Kit	CDC 77440500
Cable Assy (Attachment Card Extender)	CDC 61408350		

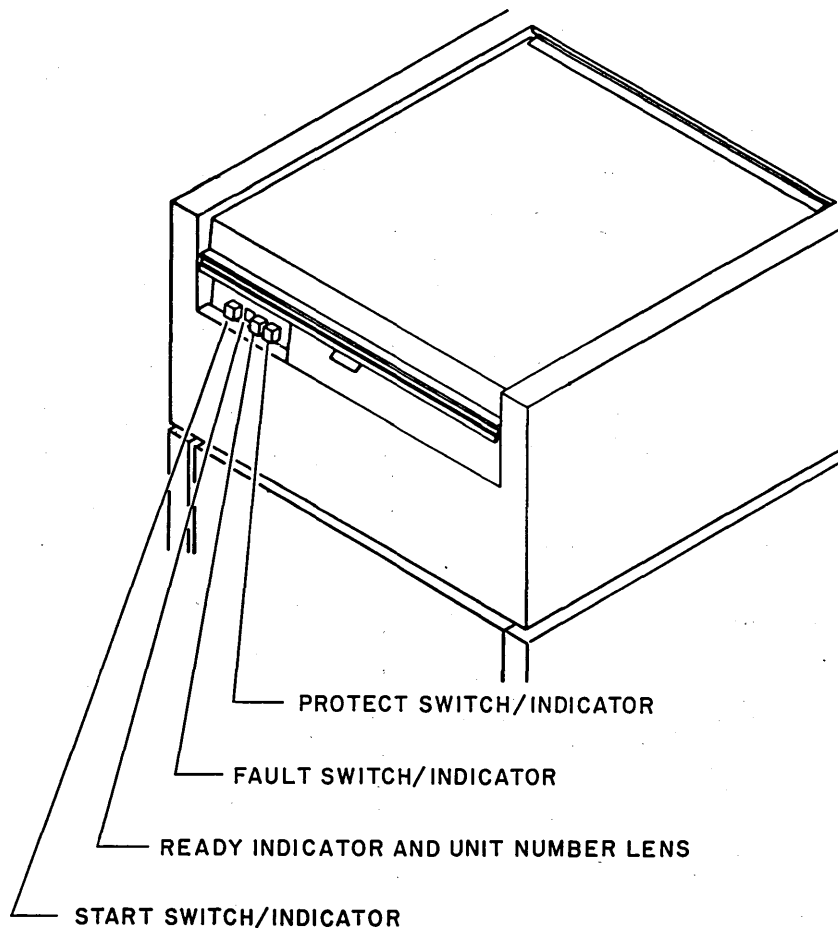
*CDC is a registered trademark of Control Data Corporation.
**Torque screwdriver and bit are used for torquing head clamping hardware.

3.0.3 Controls, Indicators, and Test Points

The following paragraphs describe the normal operating controls and indicators located on the operator control panel and the power control panel. In addition, the controls used primarily for maintenance are described as well as associated test points. These are located on the edges of cards in the logic chassis.

3.0.3.1 Operator Control Panel

The operator control panel is located on the front of the shroud, just below the edge of the pack access cover. The panel contains the switches and indicators required to control and monitor the basic operation of the drive. The switch/indicator functions are listed in the accompanying tabulation.



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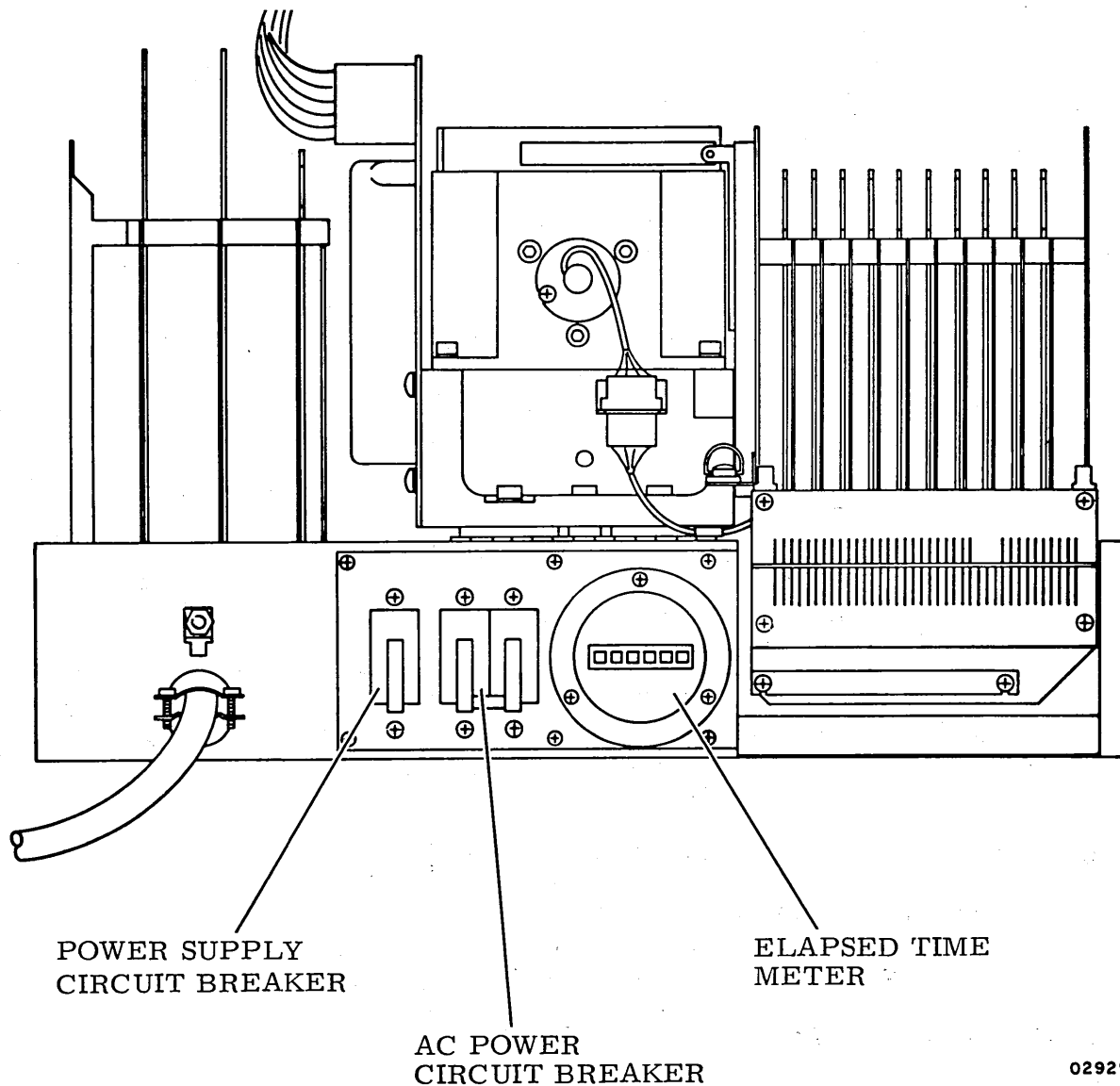
Operator Control Panel Switches and Indicators

OPERATOR CONTROL PANEL FUNCTIONS

Switch/Indicator	Function
START Switch/Indicator	<p>Pressing switch when drive is in power off condition (disk pack not spinning) lights indicator and starts power on sequence, provided following conditions are met.</p> <ul style="list-style-type: none"> ● Deck interlock switch is closed ● Disk pack is installed ● Pack access cover is closed ● All power supply circuit breakers are on <p>Pressing switch when in power on condition initiates power off sequence and removes power from drive.</p>
READY Indicator	<p>Lights continuously when unit is up to speed, heads are loaded, and no fault condition exists. Blinks during power on/off sequence.</p>
Unit Number Lens	<p>Indicates assigned unit number (0 through 15) of SMD.</p>
FAULT Switch/Indicator	<p>Lights if a fault condition exists within drive. It is extinguished by any of the following if fault condition no longer exists.</p> <ul style="list-style-type: none"> ● Pressing FAULT switch on operator control panel ● Fault Clear signal from controller ● Maintenance Fault Clear switch on fault card in logic chassis location A04. <p>Conditions causing fault are described under heading of Fault and Error Conditions in section 1 of this manual.</p>
Write (PROTECT) Switch/Indicator	<p>Pressing switch to light indicator, disables drives write circuits and prevents it from writing data on pack.</p> <p>Pressing switch to extinguish indicator, removes disable from write circuits.</p>

3.0.3.2 Power Control Panel

The power control panel is located at the rear of the base assembly. It is necessary to raise the case assembly in order to access this panel (reference para 3.2.2). The panel contains an elapsed time meter and the power control circuit breakers. The accompanying tabulation lists their functions.



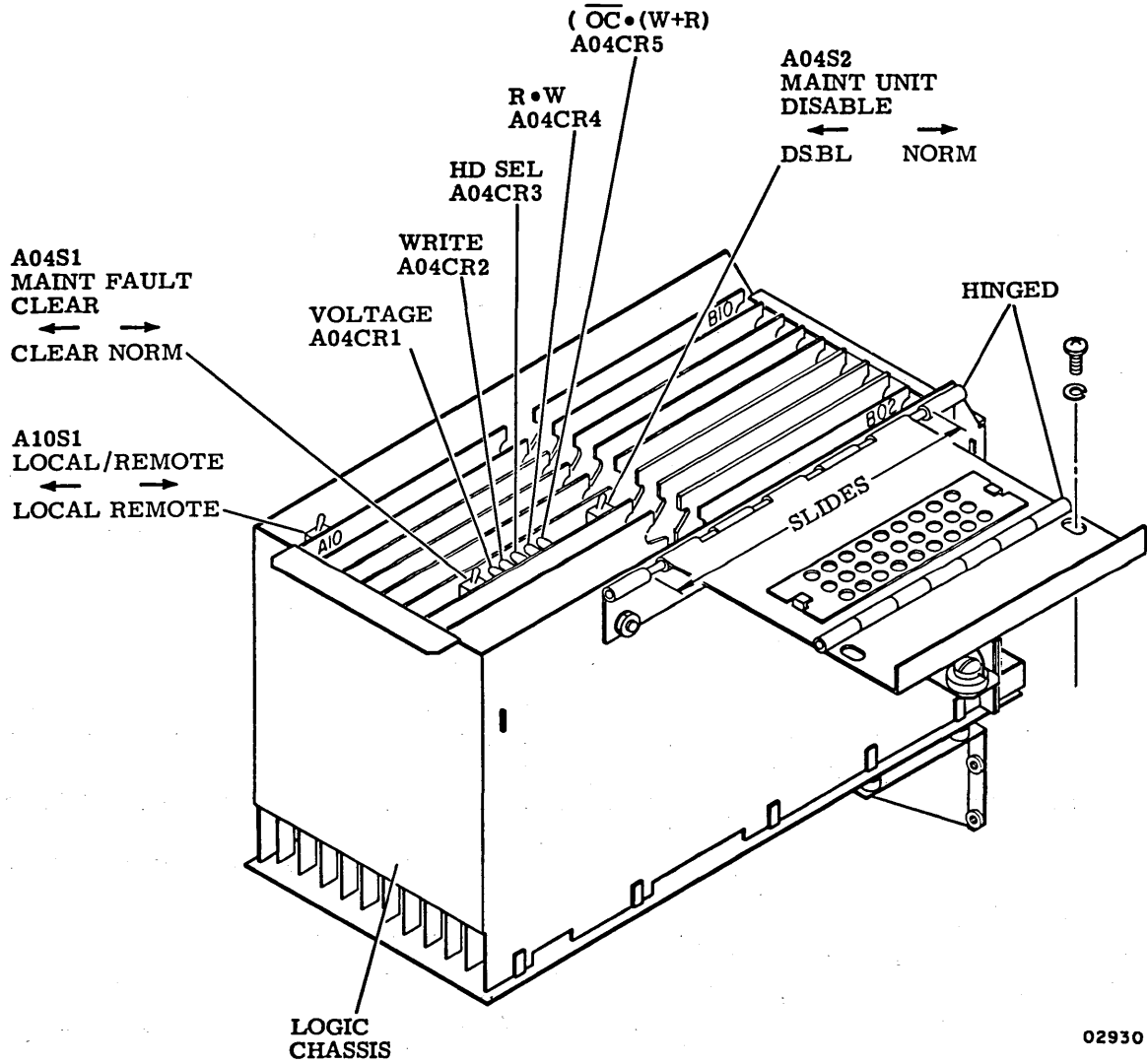
Power Control Panel Switches and Indicators

POWER CONTROL PANEL FUNCTIONS

Control/Indicator	Function
POWER SUPPLY Circuit Breaker	Applies ac power to transformer that enables dc power supplies.
AC POWER Circuit Breaker	Applies ac power to POWER SUPPLY circuit breaker, blower motor, and to rear door fans. Also provides power for drive motor; however, operator control panel START switch must be pressed to enable start sequence for motor.
Elapsed Time Meter	Records accumulated ac power-on time. Meter starts when AC POWER circuit breaker is set to ON.

3.0.3.3 Maintenance Controls

The drive has a number of controls used primarily for maintenance. All these controls are located on the edges of cards in the logic chassis as shown in the following illustration. The accompanying tabulation describes the function of each control.



Maintenance Switches and Indicators.

MAINTENANCE SWITCHES AND INDICATORS

Physical Location Code	Name	Description
A04CR1	Voltage	Lights to indicate a below normal voltage existed.
A04CR2	Write	Lights to indicate a write fault existed.
A04CR3	HD SEL	Lights to indicate a multiple head select occurred.
A04CR4	R·W	Lights to indicate that both write and read were selected simultaneously.
A04CR5	$\overline{OC} \cdot (W + R)$	Lights to indicate that a write or read was selected during a seek operation (not on cylinder).
A04S1	Maint Fault Clear (Clear/Norm)	<p>Clear position of this spring loaded switch clears out Fault Latch and five Fault Status Latches. When switch is actuated, Fault indicators on edge of this card go out and remain out unless condition causing fault still exists.</p> <p>Norm is normal operating position for switch and position to which it returns when released.</p>
A04S2	Maint Unit Disable (DSBL/NORM)	DSBL position is not used. Switch must be in the NORM position to enable the Fault indicators.
A10S1	LOCAL/REMOTE	<p>LOCAL position allows the drive to be powered on and off by START switch assuming circuit breakers are set to On.</p> <p>REMOTE position is not used. Switch must be in the LOCAL position to power on drive.</p>

3.0.3.4 Test Points

Throughout the drive there are a number of test points which are used in the various stages of maintenance. The following tabulation lists these test points. The table is arranged in alphanumeric order by physical location codes of the cards (refer to paragraph 3.0.4).

Test points "A" and "Z" on all cards (except as otherwise indicated) are always ground and are therefore not listed in the table. The test points are listed alphabetically for each card type. The alphabetical identification for the test point also appears next to the test point on the card. The table identifies those test points which are on the card edge and can be reached while the card is in the logic chassis. The remainder of the test points can only be accessed with the card on a card extender.

TEST POINTS

Physical Location Code/Card Type	Test Point	Title
A2A01/CLSV	T	+ 9.67 MHz Clock
	U	- Dibit Strobe Pulse
	V	- Dibit OSC Window
	W	+ Write Clock Strobe
	X	+ Write Clock Window
	Y	+ 19.34 MHz Clock
A2A03/HFRV	E	+ Sensing Dibits
	F	+ CYL Detect A
	G	+ CYL Detect B
	H	+ Track Servo Signal
	J	- Analog Servo Detect
	K	- Attenuator Output
	L	+ Analog Servo Detect
	M	+ Attenuator Output
	N	+ 14 V
	P	- 14 V
	Q	+ AGC
	R	- Peak Detector
	S	+ Peak Detector
	T	+ AGCed Servo Signal
	U	- AGCed Servo Signal
	V	- Trigger
W	+ 50% Detector	
X	- 50% Detector	
Y	+ Timer	

TEST POINTS (CONTD)

Physical Location Code/Card Type	Test Point	Title
A2A04/FKPV	B *	+ Up To Speed
	C *	Not Used
	D *	Not Used
A2A05/HLRV	B *	+ Strobe Pulse
	C *	+ Missing Address (ECL)
	D *	+ Data Window
	E *	- AM Disable
	F *	+ Missing Address (TTL)
	G *	- Lock to Data + AM Pulse
	H *	- Missing Address Pulse
	J *	+ Read Gate
	X	+ Low Frequency Filter Output
	Y	- Low Frequency Filter Output
A2A06/BLZV	W	+ VCO Input
	X	+ Data Window Divide By 2
	Y	+ Data Strobe
A2A07/JLQV	B *	+ INTEG Velocity
	C *	+ Coarse Position Error
	D *	+ Desired Velocity
	E *	+ Summing AMP Output
	F *	+ Velocity
	T	+ Buffered Velocity
	U	- D/A Bits 0 - 5
	V	+ D/A Bits 0 - 7
	W	- Coarse Position Error
	X	- D/A Bits 6, 7
Y	+ Summing Amp Notch Amplifier	
A2A08/ELUV	B *	- EOT Integrator Clamp
	C *	+ EOT Integrated Velocity
	D *	Offset Analog
	E *	+ Fine Position Notch Amplifier
	E *	FWD + REV Offset Analog
	F *	+ Fine Position Analog
A2A09/FLPV	W	- Fine Position Analog
	X	- Summing Amplifier
	Y	+ Power AMP Driver

TEST POINTS (CONTD)

Physical Location Code/Card Type	Test Point	Title
A2A10/6SGV	B * C * D * E * F *	Speed Analog + Remote Start - Speed Pulses + Up To Speed Enable + Delayed Up To Speed Enable
A2B07/ELXV	B * C * D * E *	+ Strobe Data - Uncompensated MFM Data + Write Gate + Data Buffer
A2B08/FLTV	B * C *	+ Reverse EOT Pulse +Index
A2B09/MLVV	B * C * D *	- Seek Pulse - Start Seek - Power Up Delay
A2B10/FLWV	B *	- Carry Interrupt
A3A02/NZJN	A B E * F * G * H H0 H1 H2 H3 H4 J K L M N P Q R S	Read Preamplifier Read Preamplifier + AGC REF Voltage AGC Output AGC Output - 6 Volts Head Select 0 Head Select 1 Head Select 2 Head Select 3 Head Select 4 + Read Enable + 6 Volts Rectifier Output + Missing Address + Read Address Mark Enable + Address Mark Detect + Multiple Head Select Fault - Analog Data + Analog Data

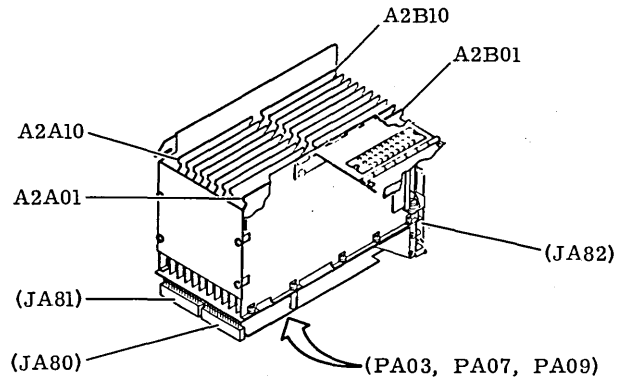
TEST POINTS (CONTD)

Physical Location Code/Card Type	Test Point	Title
A3A03/EZKN	A	- MFM Data Pulses
	B	Write Voltage Sense Reference
	C	Write Data Voltage Translator Output
	D	Write Data Voltage Translator Output
	E *	- Write Data
	F *	- AC Write Fault
	G	+ Write Protect Clamp
	H	Write Current
	J	Write Current Fault Reference
	K	- Write Turn Off Fault
	L *	- Write Current Fault
	M *	- Turn On Fault Inhibit Delay
	N *	- Turn Off Fault Inhibit Delay
	P	+ Write Gate
	Q	Write Current D/A Output
R	Write Voltage Regulator Output	
A1A03/_SHV	- 5V	- 5 Volt (Unregulated)
	+ 5V	+ 5 Volt (Unregulated)
*Test point on edge of card		

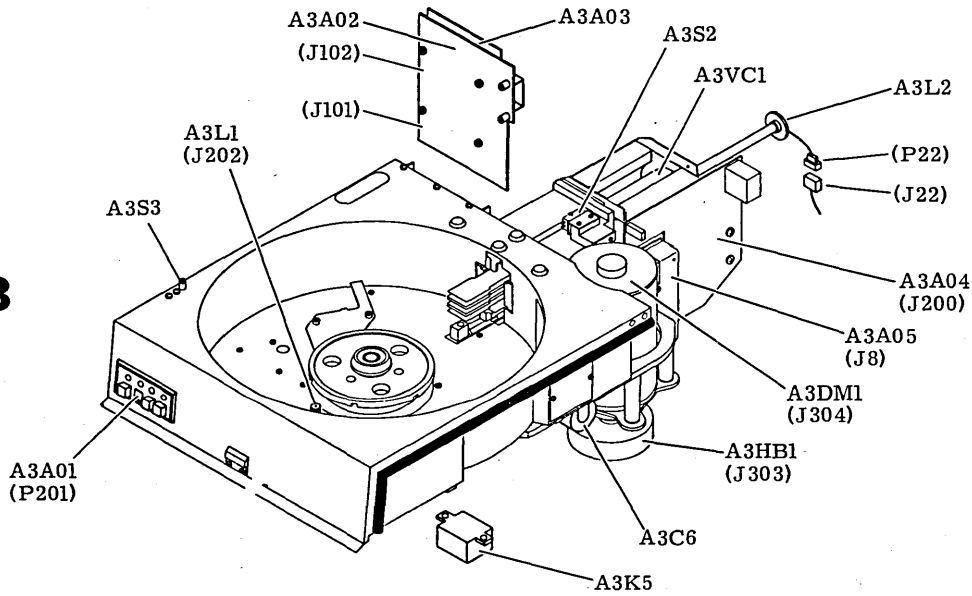
3.0.4 Physical Location Code Assignments

The physical location codes assigned to the functional electronics of the drive are as shown in the accompanying illustration. Some of the location codes also contain another identifier in parenthesis. This indicates the corresponding mating connector associated with that item. The accompanying table provides an alpha-numeric listing of each item by physical location code and identifies its title.

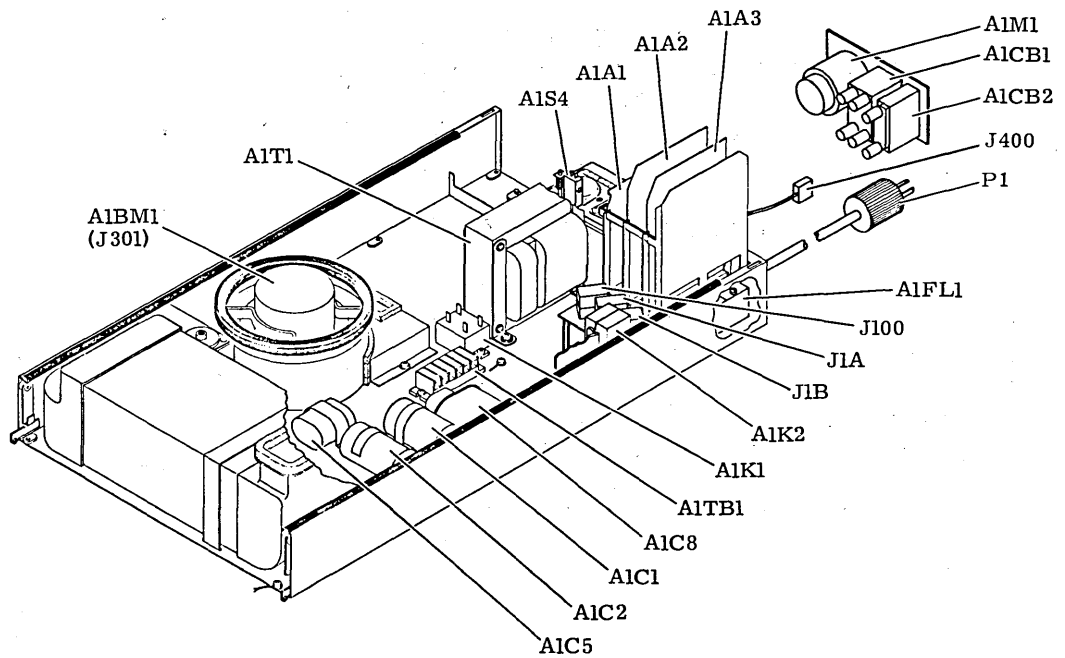
A2



A3



A1



Physical Location Codes

PHYSICAL LOCATION CODES

PHYSICAL LOCATION CODE	TITLE
A1	Base Assembly (AC Power System)
A1A1	Plus and Minus 42V Supply and Emergency Retract
A1A2	Plus and Minus 20V, Plus and Minus 12V Supplies
A1A3	Plus and Minus 5V Supply
A1BM1	Blower Motor
A1C1	Servo Capacitor (+)
A1C2	Servo Capacitor (-)
A1C5	Blower Motor Start Capacitor
A1C8	Transformer Tuning Capacitor
A1CB1	AC Power Circuit Breaker
A1CB2	Power Supply Circuit Breaker
A1FL1	Line Filter
A1K1	Run Triac
A1K2	Emergency Retract Relay
A1M1	Elapsed Time Meter
A1S4	Deck Interlock Switch
A1T1	AC Power Transformer
A1TB1	Terminal Board
A1J1A	Power Supply Connector
A1J1B	Power Supply Connector
A1J100	Power Supply Connector
A1J400	Fan Connector (Acoustic Top Mount Only)
A1P1	AC Power Connector

PHYSICAL LOCATION CODES (CONTD)

PHYSICAL LOCATION CODE	TITLE
A2XXX	Logic Chassis and associated cards.
A3	Deck Assembly
A3A01	Control Panel
A3A02	Head Select and Read Amplifier
A3A03	Writer
A3A04	Power Amplifier
A3A05	Track Servo Preamplifier
A3C6	Drive Motor Capacitor
A3DM1	Drive Motor
A3HB1	Hysteresis Brake
A3K5	Start Triac
A3L1	Speed Transducer
A3L2	Velocity Transducer
A3S2	Heads Loaded Switch
A3S3	Pack Cover Switch
A3VC1	Voice Coil

3.0.5 Power Application

Power application is divided into two areas: Power On Procedure, and Power Off Procedure. These procedures assume that the drive is connected to an ac power source and that the LOCAL/REMOTE switch located on card A10 in the logic chassis, is set to LOCAL.

3.0.5.1 Power On Procedure

1. Gain access to power control panel and set AC POWER and POWER SUPPLY CIRCUIT breakers to ON. Ensure that blower starts. Wait for two minutes minimum before proceeding.

CAUTION

Failure to allow blower to operate for two minute period before installing disk pack will not allow sufficient purge time and may cause damage to disk pack or heads.

2. Install disk pack (para. 3.0.6.2).
3. Press START switch on control panel and ensure that START indicator lights. Drive should start, and while drive is coming up to speed, the READY indicator blinks. Within 30 seconds, the READY indicator should light continuously indicating that drive is up to speed and ready for operation.

3.0.5.2 Power Off Procedure

1. Press START switch on control panel to turn off START indicator. READY indicator blinks until drive motor completely stops, then READY indicator goes out.
2. Remove disk pack (para. 3.0.6.3).

3. Gain access to power control panel and set AC POWER and POWER SUPPLY circuit breakers to OFF.

NOTE

For operations, such as changing packs, it is not necessary to turn off the circuit breakers. It is only necessary to stop the drive motor by pressing the START switch (indicator not lighted).

3.0.6 Disk Packs

The maintenance procedures refer to three types of disk packs: (1) customer, (2) scratch, and (3) CE. All three are physically identical, but are used for different purposes.

A customer disk pack refers to a pack used by the customer for data storage during normal online operations.

A scratch pack is simply a disk pack that does not contain customer or other information that must not be destroyed. Therefore, a scratch pack can be used in maintenance procedures where a possibility exists that the pack could be damaged or its information altered.

The CE pack contains special prerecorded information used during maintenance. Use care to ensure that this data is not destroyed or altered.

3.0.6.1 Disk Pack Operating Precautions

Because it is possible for a damaged disk pack to cause damage to the heads of a drive, or to have damaged heads cause damage to a disk pack, it is important that the following be observed.

- Be aware of a sudden increase in error rate related to a specific drive or pack.
- Be aware of any unusual noise, such as screeching or pinging while heads are loaded on a pack.
- Be aware of a burning odor coming from a drive.
- Be alert to the possibility of contamination such as dust, dirt, grease, oil, or smoke that could accumulate on the pack or heads.

CAUTION

Do not attempt to operate the media on another drive until full assurance is made that no damage or contamination has occurred to the media.

Do not attempt to operate the drive with another media until full assurance is made that no damage or contamination has occurred to the drive heads or to the shroud area.

3.0.6.2 Disk Pack Installation

The disk pack must be installed prior to performing any drive operation. Disk pack installation consists of setting the pack on the drive's spindle and locking the pack in place.

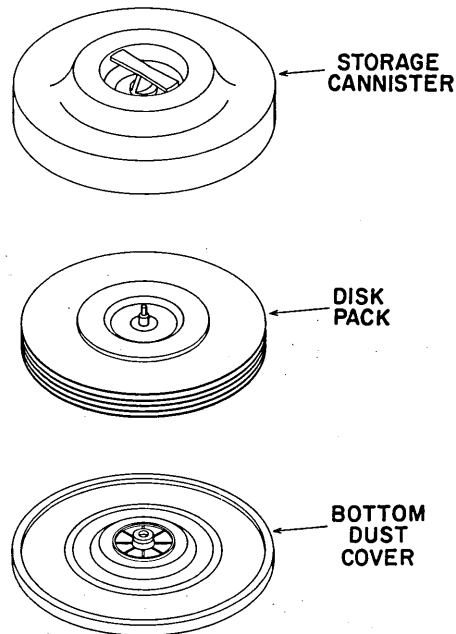
CAUTION

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

1. Set AC POWER circuit breaker to ON and allow blower to operate for two minutes minimum (to purge blower and shroud) before installing pack.
2. Disengage bottom dust cover from pack storage canister by lifting disk pack and pressing spring loaded release located at center of bottom dust cover.

CAUTION

Non-fully retracted heads indicate a problem in the drive's servo, and may result in damage to the pack or heads during pack installation or removal. If heads are not fully retracted, refer to paragraph 3.16. DO NOT push on heads.



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Disk Pack Assembly

3. Raise pack access cover and ensure that heads are fully retracted.
4. Carefully set disk pack on spindle, avoiding abusive contact between pack and spindle. Rotate storage canister handle clockwise until it stops turning. Then, give gentle snugging twist to handle and lift storage canister off pack.
5. Set storage canister into bottom dust cover and set aside for later use.
6. Close pack access cover to prevent entry of dust and contamination.

3.0.6.3 Disk Pack Removal

Disk pack removal consists of replacing the storage canister and lifting pack off spindle.

1. Press START switch to stop drive motor and unload heads.

CAUTION

Non-fully retracted heads indicate a problem in the drive's servo, and may result in damage to the pack or heads during pack installation or removal. If heads are not fully retracted, refer to paragraph 3.16. DO NOT push on heads.

2. When disk pack has stopped turning (indicated by READY indicator being off), open pack access cover and ensure that heads are fully retracted.
3. Place storage canister over disk pack so post protruding from center of disk pack is received into storage canister handle.
4. Rotate storage canister handle counterclockwise until pack is free of spindle.

CAUTION

Avoid abusive contact between disk pack and spindle or one or the other may be damaged.

5. Lift disk pack out of drive by canister handle and close pack access cover.
6. Place pack canister on bottom dust cover and press firmly to engage retaining mechanism.

3.0.6.4 Disk Pack Inspection and Cleaning

In some cases, the user may attempt to inspect and clean the disk pack rather than return it to the vendor. This task must be performed by properly trained personnel only, using the following procedure.

NOTE

Inspection and cleaning of disk packs in the field can cause additional problems for the following reasons:

- Exposure of the pack to non-cleanroom conditions during inspection and cleaning may additionally contaminate the pack.
- Disk surfaces may be scratched by using contaminated or improper cleaning equipment.
- The pack may be damaged while the covers are removed.
- Deposits of cleaning solution residue may be left on disk surface if improperly cleaned or if commercial grade solutions are used.

CAUTION

Disk pack cleaning should never be attempted with the pack mounted on the drive, since this setup can introduce contamination into the drive itself.

1. Mount pack on a commercially available pack inspection fixture.
2. Dampen, but do not soak, a lint-free swab-paddle with media cleaning solution (CDC 95033502), or with a solution of 91% reagent grade isopropyl alcohol and 9% deionized water by volume.
3. Use a sweeping motion and insert the damp swab-paddle between disks and manually rotate pack while applying swab-paddle lightly to disk surface to be cleaned.
4. After swab-paddle has been applied for one full cleaning rotation, withdraw it with a sweeping motion while maintaining contact with disk surface (do not lift swab-paddle from surface).

5. If oxide or contaminants are observed on swab-paddle, repeat steps 2, 3, and 4, using a clean swab-paddle for each pass, until no oxide or contaminants are observed on the swab-paddle.
6. Repeat steps 3 and 4 using a dry swab-paddle to remove all cleaning solution residue.
7. Repeat steps 2 through 6 for each surface.

3.0.7 Manual Carriage Positioning

Certain tests require manual positioning of the carriage and coil assembly. This procedure should only be performed as required by specific tests later in this section, or as a trouble shooting procedure when the drive does not respond under normal logic control. It should be noted that improper carriage positioning causes servo fault conditions. Typical examples of improper carriage positioning are such things as: loading heads too slowly, hitting forward stop with carriage, or positioning carriage in loading zone. If a servo fault does occur, unload heads, clear the fault, and repeat the operation being performed.

1. Press START switch to stop drive motor and unload heads. Set POWER SUPPLY circuit breaker to OFF.
2. Disconnect yellow voice coil leadwire from Faston on edge of power amplifier assembly.
3. Set POWER SUPPLY circuit breaker to ON and press START switch to start drive motor.
4. Remove magnet cover by snapping it out of place.

CAUTION

Wait 30 seconds for drive motor to come up to speed then load heads. Avoid having heads in partially loaded condition.

5. Carefully grasp voice coil and load heads. Use care not to apply a downward force. Move carriage at approximately same speed it moves under logic control.
6. Position carriage as required to accomplish test being performed.
7. When tests are completed, manually unload heads to fully retracted position.
8. Press START switch to stop drive motor and set POWER SUPPLY circuit breaker to OFF.

WARNING

Be certain fingers are clear of positioner before connecting voice coil leadwire.

9. Reconnect yellow leadwire to Faston on power amplifier assembly.

3.0.8 Head Alignment Kit

The head alignment kit contains the head alignment card, the head alignment cable, and the associated null meter (refer to illustration). The head alignment card develops an output voltage that is derived from the output of the servo and read/write preamplifiers. When a CE disk pack is installed in the drive, this output voltage will be proportional to the distance a selected head is offset from the track centerline. The head alignment card plugs into card location A02 in the logic chassis.

The following toggle switches, located on the card edge control the cards operation:

- S1 - Changes polarity of alignment signal and is used in aligning both servo and read/write heads.
- S2 - When switch is in S position, card selects servo head as an input to card. When switch is in R/W position it selects data head input to card.

S3 - Changes sensitivity of card. When in X.1 position, the card's sensitivity is reduced by a factor of 10. When in X1 position, the card's sensitivity is not reduced. This switch must be in X1 position when making measurements for use in calculating head alignment error.

Four indicators are provided as monitors to ensure the card is operating properly and is receiving the proper data. These indicators are as follows:

Power - When lighted, it indicates power is applied to card.

Input - When lighted, it indicates the input signals are too low for the alignment card circuits to operate.

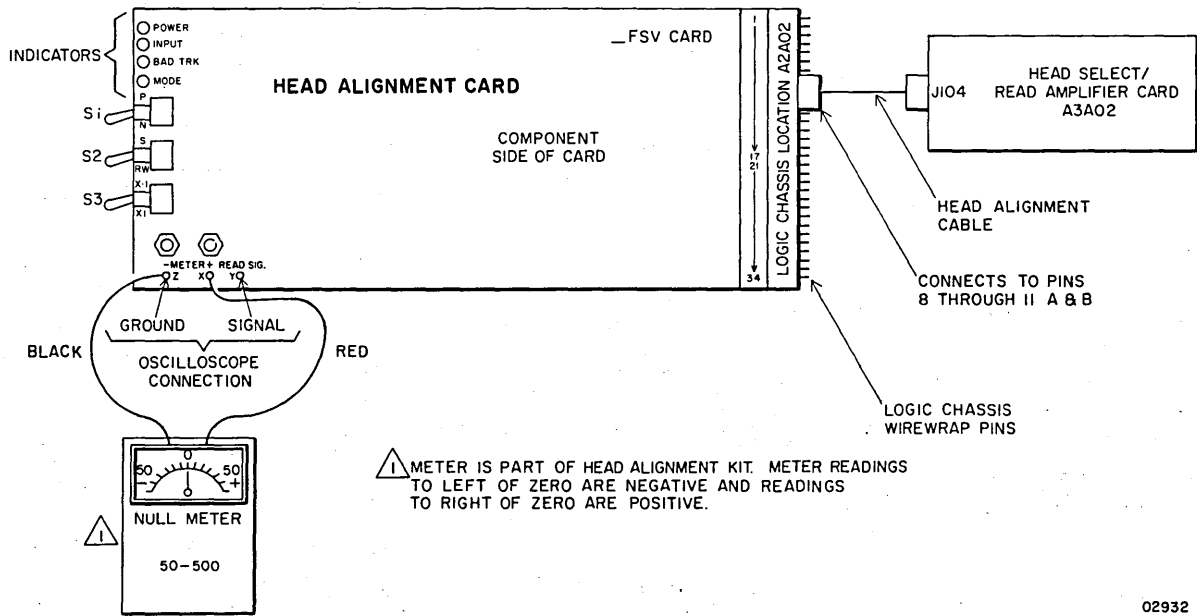
Bad Track - When lighted, it indicates a short duration loss of input. A one shot maintains the lighted condition for at least four seconds. Note that this indicator lights when the position of switch S1 is changed.

Mode - When lighted it indicates that either S2 is in the S (servo) position or S3 is in the X.1 position. When either of these conditions exists, read/write head alignment error cannot be measured.

The card receives its inputs through the connector in logic chassis card position A02. The Servo Dibits signal is wirewrapped to this connector. The ground and Head Alignment Output signals are provided through the head alignment cable that is part of the head alignment kit. This cable connects between card slot A2 (pins 08 through 11) on the wirewrap side of the logic chassis, and connector J104 located on the head select/read amplifier card A3A02.

The output voltage of the card is measured by a null meter which connects through test leads to test points X and Z on the card. This meter is part of the head alignment kit.

The switch on the meter's front panel changes the sensitivity of the meter. When in the 50 position, the meter reads 50mV full scale. When the switch is in the 500 position, the meter reads 500mV full scale. The switch must be in the 50 position when making measurements for use in calculating head alignment error.



⚠ METER IS PART OF HEAD ALIGNMENT KIT. METER READINGS TO LEFT OF ZERO ARE NEGATIVE AND READINGS TO RIGHT OF ZERO ARE POSITIVE.

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Head Alignment Kit

3.1 PREVENTIVE MAINTENANCE

This subsection provides all information necessary to perform the required preventive maintenance on a drive in the field. Proper performance of the drive is dependent on adequate and timely execution of preventive maintenance routines. Many potential drive problems can be identified and corrected by strict adherence to the preventive maintenance schedule. Items should be performed as indicated in the following tabulation when performing corrective maintenance.

PREVENTIVE MAINTENANCE INDEX

Level	Est Time (Minutes)	Procedure
3	10	General Cleaning (para 3.1.1)
3	5	Clean Primary Filter (para 3.1.2)
3	5	Filter-Flow Pressure Measurement (para 3.1.3)
3	1	Clean Shroud and Spindle (para 3.1.4)
3	2	Clean and Lubricate Lockshaft (para 3.1.5)
4	2	Check Power Supply Outputs (para 3.1.6)
6	5	Inspect and Clean Rails and Bearings (para 3.1.7)
6	20	Replace Absolute Filter (para 3.1.8)

NOTES: The following preventive maintenance levels are based on a calendar period or hours of operation, whichever comes first. However if the site is other than a computer room environment, the maintenance schedule must be adjusted accordingly.

Level 3 - Quarterly or 1500 hours

Level 4 - Semiannually or 3000 hours

Level 6 - Biennially or 9000 hours

3.1.1 General Cleaning

To ensure proper operation it is essential that the drive be kept clean.

1. Remove power from drive (para. 3.0.5.2).
2. Carefully vacuum interior of cabinet and case, paying particular attention to flat surfaces where dust accumulates.
3. With deck in normal operating position, vacuum exterior surfaces of electronic assembly. Use a soft cloth dampened in a mild detergent solution to remove any greasy residue.
4. Raise deck to maintenance position (para 3.2.3) and vacuum underside of deck and base assembly. Use a dampened cloth to remove any residue.
5. Inspect cables and connections for any sign of damage and correct as necessary.
6. Inspect drive belt for signs of fraying or cracking. Replace belt as necessary.
7. Return deck to normal operating position and close case and door assemblies.
8. Using a soft cloth dampened in a mild detergent solution, carefully wipe all cabinet surfaces. Use care not to allow moisture to run into drive.

3.1.2 Clean Primary Filter

If the filter cannot be cleaned by the following procedure, it must be replaced.

1. Remove power from drive (para. 3.0.5.2).
2. Remove primary filter located at front bottom of cabinet.
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 12210958) or suitable substitute.
6. Replace filter in drive.

3.1.3 Filter-Flow Pressure Measurement

Absolute filter-flow pressure is checked using a differential pressure gauge kit (CDC 73040100). This procedure assumes that the primary filter has been cleaned to ensure maximum air flow.

1. Remove power from drive (para 3.0.5.2).
2. Gain access to absolute filter, remove plastic plug and insert tubing attached to pressure gauge (refer to illustration of para 3.1.8).
3. Install a scratch disk pack (para 3.0.6.2), apply power to drive (para 3.0.5.1), and press START switch to load heads.
4. Observe pressure reading. If pressure is 0.5 inch-water or less, replace absolute filter (para 3.1.8). If pressure is above 0.5 inch-water, filter need not be replaced at this time.
5. Remove tubing and insert plastic plug.

3.1.4 Clean Shroud and Spindle

To prevent head-to-disk contact, it is imperative that the pack area be kept clean.

1. Remove power from drive (para. 3.0.5.2).
2. Remove disk pack from spindle (para. 3.0.6.3).
3. Carefully vacuum entire pack area.
4. Use a wad of adhesive tape to remove any particles not removed during vacuuming.
5. Use lint-free gauze dampened in media cleaning solution and wipe all surfaces of the shroud. Remove all smudges and dirt. Carefully clean all surfaces of spindle.
6. Close pack access cover immediately after cleaning to ensure that dust does not enter pack area.

3.1.5 Clean and Lubricate Lockshaft

In order to prevent damage to the lockshaft and the disk pack it is necessary to keep the threads in the top of the lockshaft clean.

1. Remove power from drive (para. 3.0.5.2).
2. Remove disk pack from spindle (para. 3.0.6.3).
3. Use a stiff brush or a sharp pointed instrument and remove old lubricant paste from threads in lockshaft.
4. Use lint-free gauze dampened in media cleaning solution and wipe all surfaces of spindle to remove traces of lubricant paste.
5. Apply a thin coat of new lubricant paste to threads of lockshaft.

3.1.6 Check Power Supply Output

Perform the plus and minus 5 volt adjustment procedure (para 3.8.2).

3.1.7 Inspect and Clean Rails and Bearings

Any obstruction to free movement of the carriage may cause cylinder address errors.

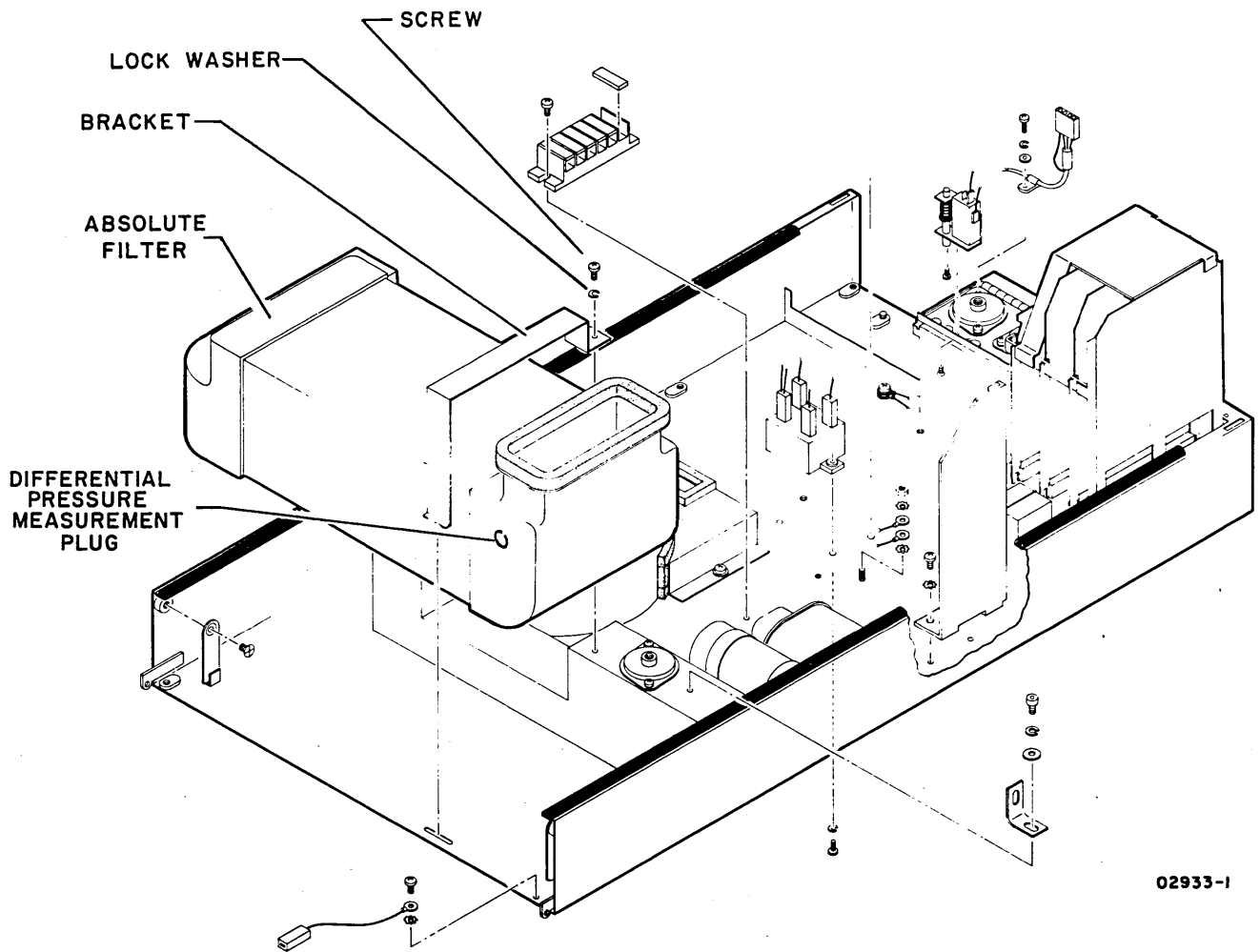
1. Remove power from drive (para. 3.0.5.2).
2. Remove disk pack from spindle (para. 3.0.6.3).
3. Remove magnet cover by grasping edge of cover and snapping it out of place.
4. Grasp coil through opening in top of magnet assembly. Carefully and slowly push coil forward to extend heads.
5. Once head arms have cleared cams, gently slide carriage and coil assembly back and forth along full length of rails. While moving coil, be aware of any possible irregularity (bumps or jerks) in movement. A sudden irregularity indicates dirt on rails or bearings. Do not confuse pressure of flex leads and head leads with a sudden irregularity in motion. Pressure from leads is a smooth change.
6. If a sudden irregularity in motion was noted in previous step proceed to next step. If no sudden irregularity in motion was noted, cleaning is not required. Terminate procedure by returning carriage to heads-unloaded position (fully retracted) and replace magnet cover.

3.1.8 Replace Absolute Filter

An adequate supply of clean air to the pack area is essential to proper operation of the drive. Need for the replacement of the absolute filter is determined by the differential pressure measurement of paragraph 3.1.3.

1. Remove power from drive (para. 3.0.5.2).
2. Raise deck to maintenance position (para 3.2.3).
3. Remove screw and lockwasher securing filter retaining bracket (see accompanying illustration).
4. Remove bracket by pivoting it toward front of drive and disengaging flange on bracket from slot in base pan.
5. Remove absolute filter by pulling it toward front of drive. It may be necessary to jiggle filter to disengage it from blower motor outlet.
6. Wipe base pan clean in area under absolute filter and around blower motor outlet.
7. Install new filter by sliding it in from front of drive and engaging it in blower motor outlet.
8. Install filter retaining bracket and secure with screw and lockwasher.
9. Return deck to normal operating position.

7. Use a cotton swab dampened (not soaked) in media cleaning solution and clean rail and bearing surfaces. Gain access to front portion of lower rail from interior of pack area. Gain access to rear position of lower rail and all of top rail from sides of actuator. Raise logic chassis (para 3.2.4) as required to gain access from left side of actuator. Move carriage back and forth while cleaning to ensure all surfaces are reached.
8. When rail and bearing cleaning is completed, repeat step 3 to ensure that carriage moves freely without sudden irregularities in its motion. If carriage now moves smoothly throughout its travel, proceed to step 7. If sudden irregularities persist, visually inspect rails and bearings using a strong 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.
9. Return carriage to heads-unloaded position (fully retracted) and replace magnet cover.



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Absolute Filter Replacement

3.2 ACCESSING DRIVE FOR MAINTENANCE

The following procedures explain details for opening and closing the various parts of the drive and cabinet which are not obvious in themselves or by looking at associated illustrations.

3.2.1 Pack Access Cover

The pack access cover should only be opened to change packs or perform a maintenance procedure. Do not allow the cover to stand open more than necessary. The open cover allows dust to enter the pack area, and the dust is potentially damaging to the disk pack and heads. Never open the pack access cover while the disks are turning.

1. To open, lift up on release latch at front of pack access cover.
2. To close, press down on pack access cover to engage latch.

3.2.2 Case Assembly Opening and Closing

3.2.2.1 Top Mounted Unit

To Open:

1. Place disk access cover in closed position.
2. Open rear door assembly and use hex head wrench to release fastener securing case assembly to frame (upper center of rear frame).
3. Lift case assembly up from rear until support rod reaches end of travel.
4. Allow case assembly to lower a few inches so that support rod drops down against stop. Leave case assembly resting on support rod.

To Close:

1. Push case assembly forward slightly, removing weight from support rod.
2. Lift up on support rod until it clears stop, then carefully lower case assembly to closed position. Insure that fastener has latched.
3. Close rear door assembly.

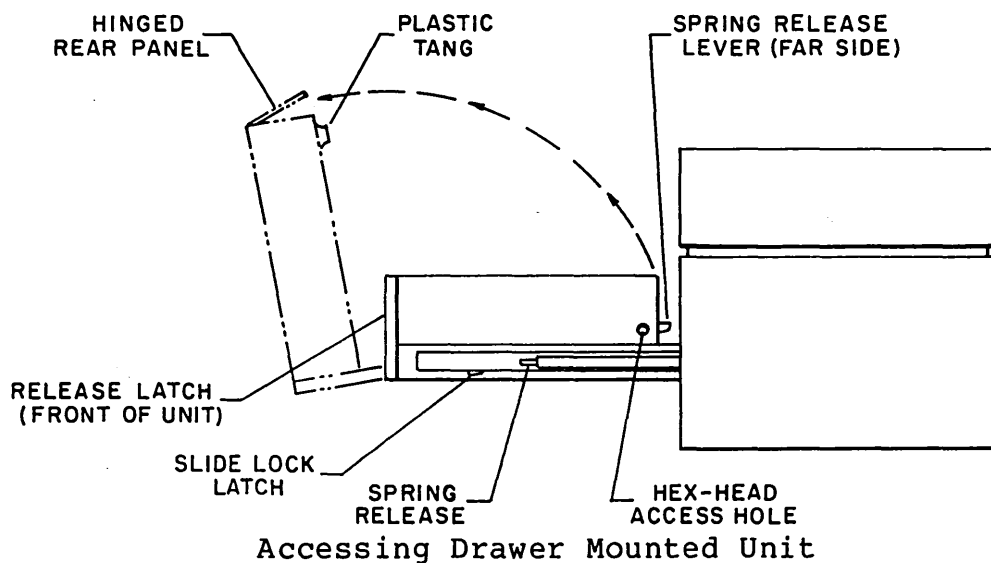
3.2.2.2 Drawer Mounted Unit

To Open:

1. Lift up on release latch through slots at front of unit and slide SMD forward until first pair of slide locks engage.
2. Release slide locks by raising slide lock latches at each side of unit and slide SMD forward to the full open position.
3. Insert a 7/32-in hex-head wrench into slot at lower right side of case assembly and turn clockwise. At the same time, press down on spring release lever at lower left side of case assembly and lift to the maintenance position.

To Close:

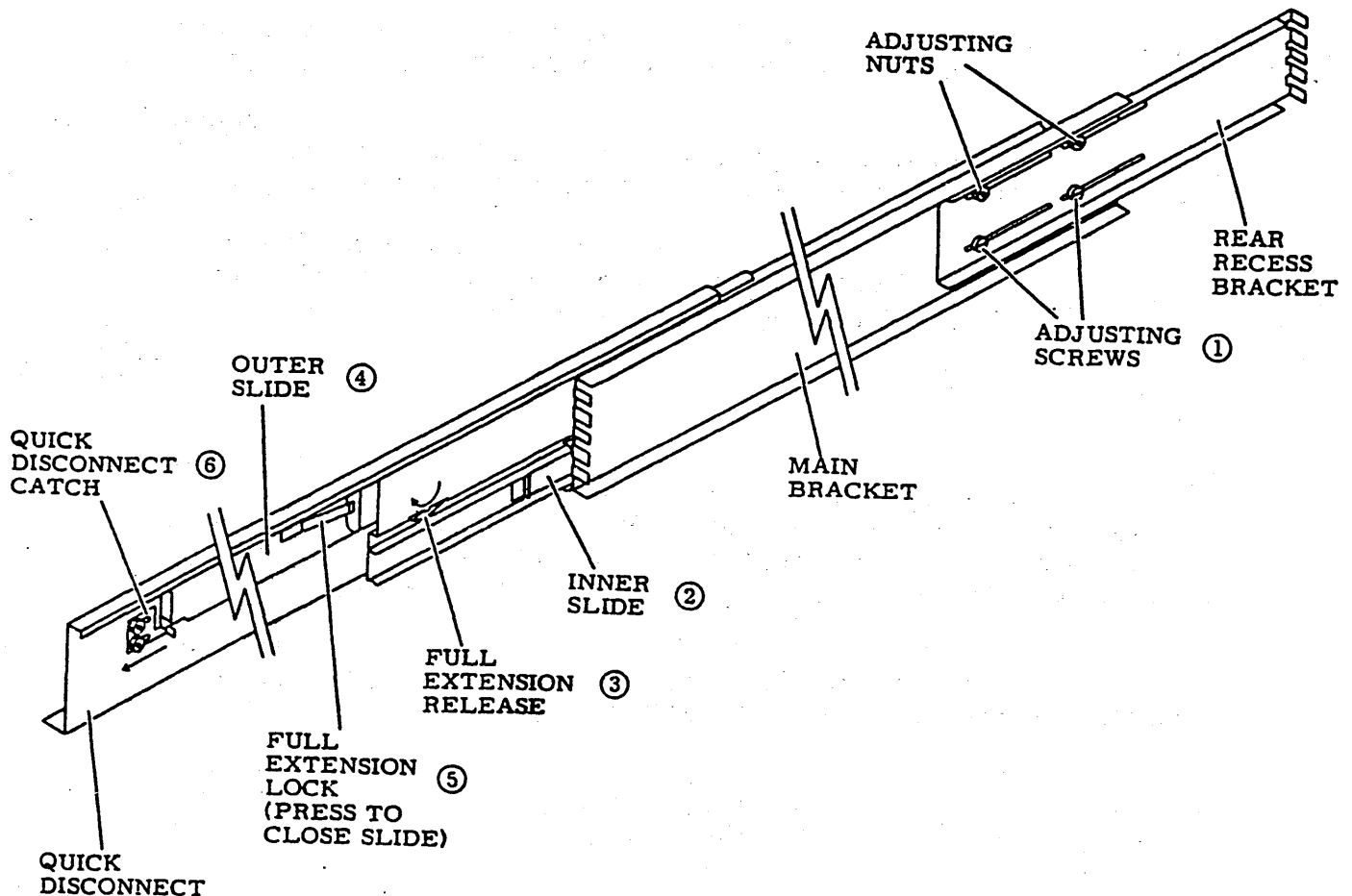
1. Swing case assembly to rear of unit while lifting rear hinged panel slightly up to clear rear portion of deck assembly and logic chassis.
2. Position rear hinged panel so that hole in bottom center of panel will engage stud mounted on top of power control panel.
3. Check that plastic tangs at lower rear sides of case assembly fit within frame and press down on case assembly to latch.
4. Press spring release at each side of slide assembly to disengage slide locks and slide SMD back into cabinet. Press on front of unit to engage retaining latch.



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Slide Assembly Details:

1. Adjusting Screws - Loosen to allow adjustment of rear recess bracket.
2. Inner Slide - Slides freely from its closed to fully extended position. Locks in the extended position only.
3. Full Extension Release - Is pressed to extend outer slide.
4. Outer Slide - To extend, press full extension release. The full extension lock snaps out when slide is fully extended.
5. Full Extension Lock - Locks both outer and inner slides when fully extended. Press to release and close slides.
6. Quick Disconnect Catch - Loosen nuts to allow catch to move in direction of arrow. This allows quick disconnect to be removed.



Slide Assembly (Right Side of Drive)

3.2.3 Raising and Lowering Deck

There are two positions the deck can be in: (1) normal operating and (2) maintenance. In the normal operating position the deck is secured to the shock mounts on the base by two holddown screws inside the shroud and next to the spindle. While in this position, the rear deck holddown screw (center of three screws at rear of deck casting) and associated spacer are stored in the keeper hole at the rear of the deck casting. This procedure describes raising the deck to the maintenance position. Returning the deck to the normal operating position is performed in the reverse order.

1. Remove power from drive (para. 3.0.5.2).
2. Remove disk pack from spindle (para 3.0.6.3).
3. With case assembly closed, open pack access cover and remove (and set aside for future use) deck holddown screws from inside shroud (refer to illustration).
4. Close pack access cover, open case assembly and remove rear deck holddown screw and spacer from keeper hole on back of deck casting.
5. Insert spacer between deck and base hinge. Insert rear deck holddown screw through deck and spacer and secure to base hinge.

CAUTION

To prevent I/O cable bracket from bending when deck is raised, it is necessary to first remove cable bracket from logic chassis.

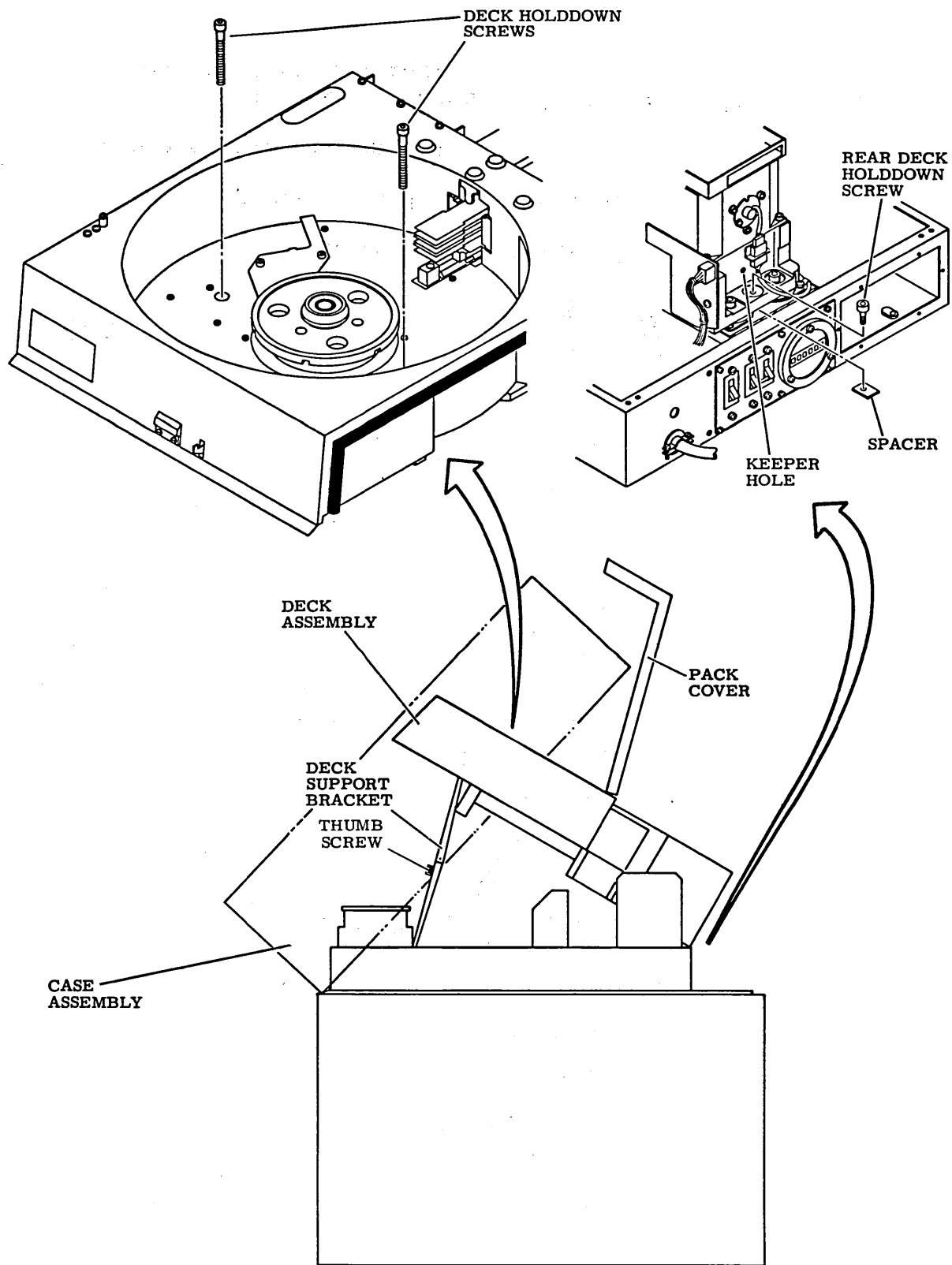
6. Lift up deck from front of drive until deck support bracket is completely extended. Carefully lower deck until support bracket slides into locking position (hinge in center of bracket should point slightly toward rear of drive). Remove thumb screw from storage hole of bracket and place in locking hole.

WARNING

Thumb screw must be secured in locking hole of support bracket whenever deck is in a raised position.

CAUTION

With deck raised at the maintenance position, inspect wiring harness at bottom of base area. Harness should lay flat, close to bottom of base. If not, dress wiring and tie so armature of brake cannot come in contact with wiring.

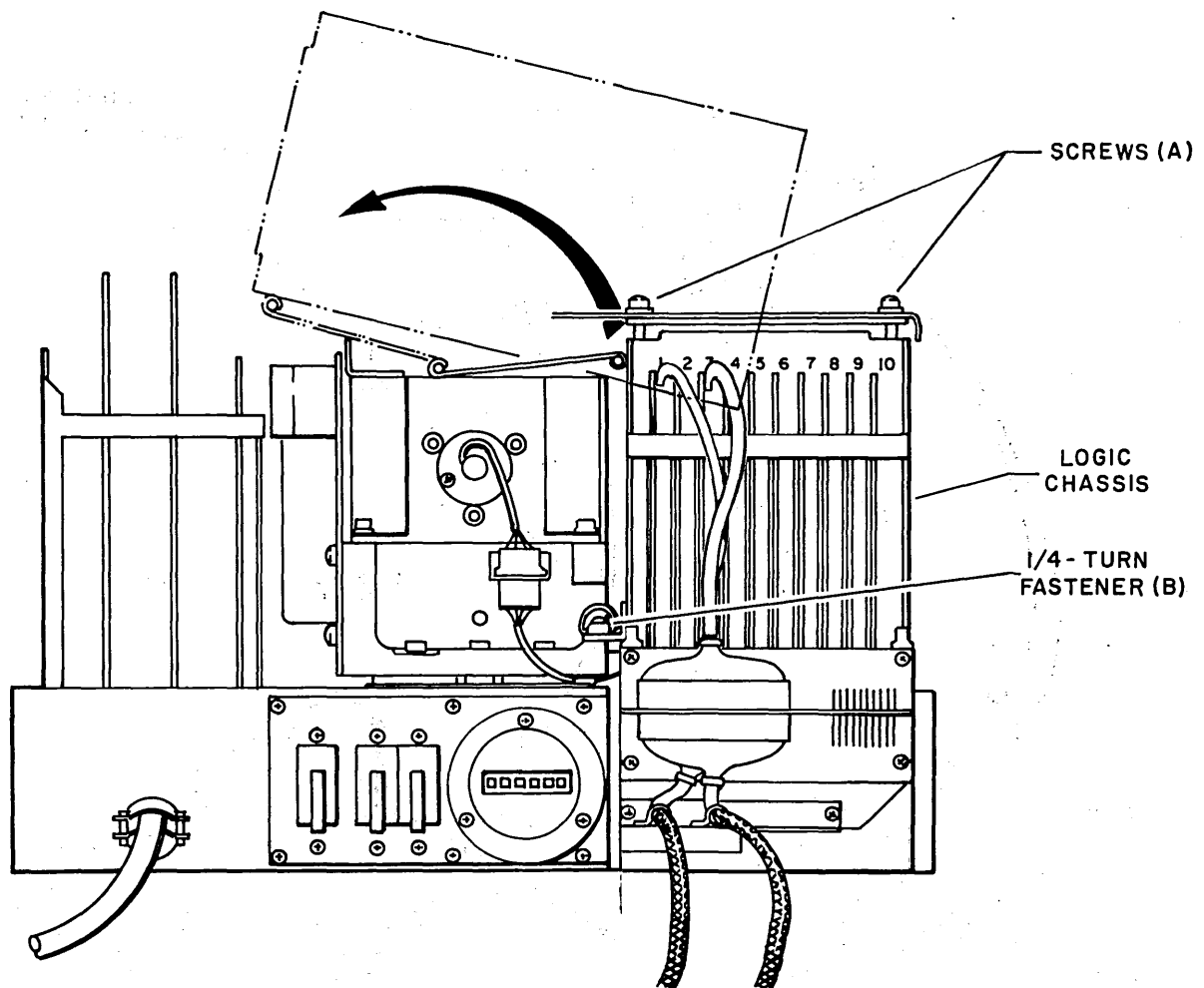


Deck Maintenance Position

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3.2.4 Raising and Lowering Logic Chassis

There are two positions for the logic chassis; (1) normal operating and (2) maintenance. In the normal operating position the logic chassis sits alongside the actuator and the 1/4-turn fastener at the rear is secured to the deck casting. The following procedure describes raising the logic chassis to the maintenance position. It also describes removal of the logic chassis protective panel covering the back panel. Returning the logic chassis to the normal operating position is performed in the reverse order.



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Logic Chassis Positions

1. Remove power from drive (para. 3.0.5.2).
2. Loosen two screws (A).
3. Release 1/4-turn fastener (B) securing logic chassis to rear of deck casting.

4. Lift up rear of logic chassis slightly to disengage 1/4-turn fastener and slide logic chassis toward rear of drive to disengage chassis ears from logic chassis support bracket.
5. Lift up logic chassis, pivot chassis 90 degrees and slide it over top of magnet assembly.

CAUTION

Use care not to damage cables or connectors when removing logic chassis cover.

6. Remove attaching hardware securing logic chassis protective panel.
7. Carefully slide logic chassis protective panel toward front of drive enough to disengage rear of panel from slot. Carefully slide panel along cables far enough to access backpanel.

3.3 BLOWER MOTOR ASSEMBLY (AlBm1)

3.3.1 Removal-Replacement

1. Remove power from drive (para. 3.0.5.2).
2. Remove absolute filter (para. 3.1.8).
3. Remove logic chassis air plenum (para. 3.24).
4. Remove blower motor.

NOTE

If the square shoulder grommets between the base and the blower motor are removed or need to be replaced, ensure that the wide shoulder on the grommet is installed toward the blower. The foam tape gasket between the blower and the logic chassis air plenum is not part of the blower motor assembly. Refer to Repair for the replacement of the gasket.

3.3.2 Adjustment

There is no adjustment applicable to the blower motor.

3.3.3 Repair

Repair of the blower motor assembly is limited to the replacement of connectors, pins, quick connect terminals, insulating pods, and the foam gasket next to the logic chassis air plenum.

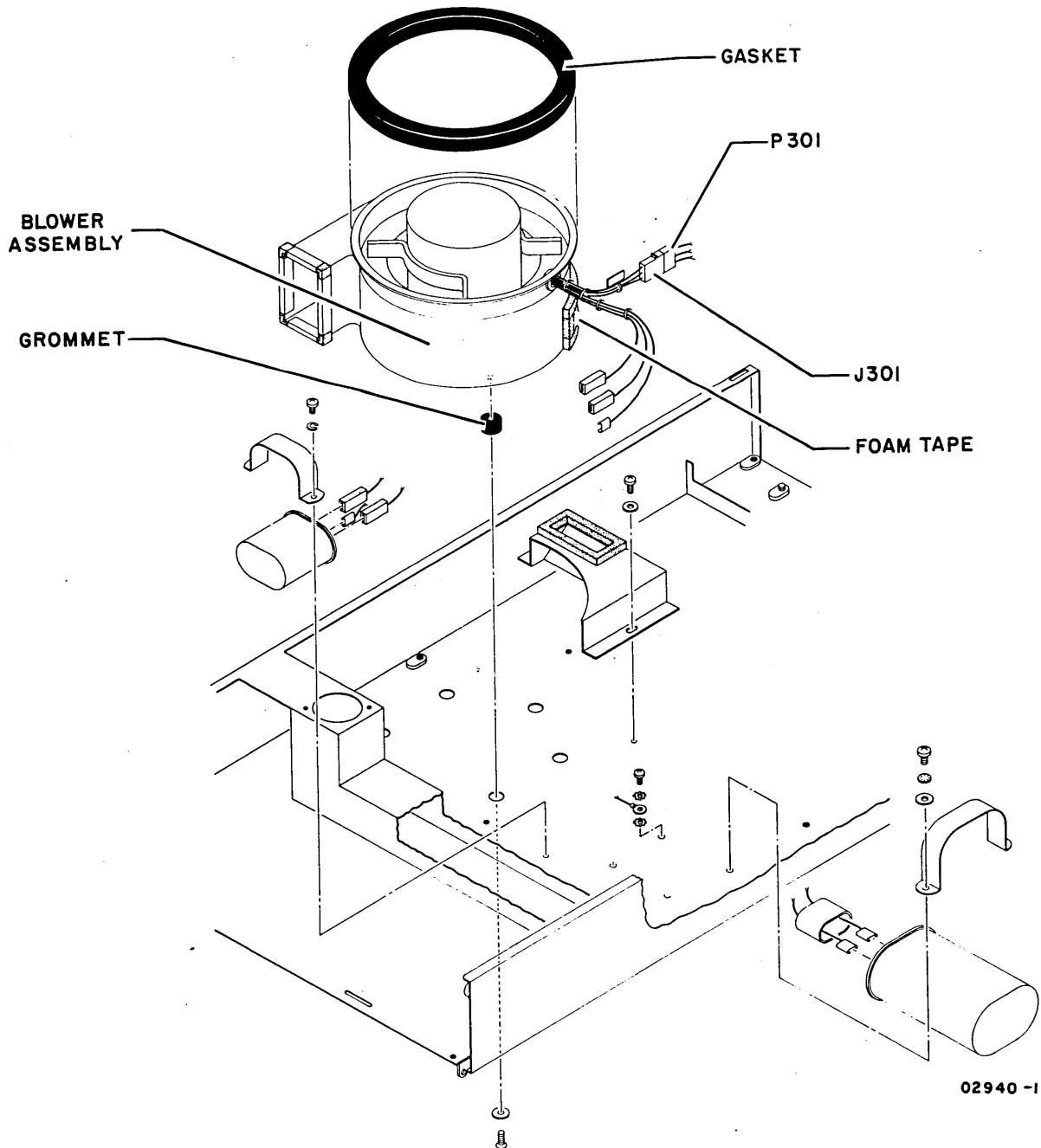
Gasket replacement requires approximately 12 to 13 inches (305 to 330 mm) of foam tape.

1. Cut two lengths of foam tape, each 5-1/2 inches (139.7 mm) long.
2. Place logic chassis air plenum on base next to blower motor and align holddown holes. Mark position of each end of plenum on blower motor with a pencil.
3. Remove backing from one 5-1/2 inch (139.7 mm) length of tape to expose adhesive. Position edge of tape against base (to seal space under blower) and center around two marks made on blower motor. Press tape firmly into position against blower and base.
4. Remove backing from second length of foam tape to expose adhesive. Position tape above upper edge of cutout in blower, edge of tape must be even with edge of cutout. Align ends of tape with first piece of tape and press into

5. Cut two lengths of foam tape to length required to fill space between two lengths of tape already installed. Remove backing from tape and position with outer edges of tape even with ends of installed tape. Press into position.

CAUTION

Use care not to damage gasket when installing logic chassis air plenum.



Blower Motor Assembly

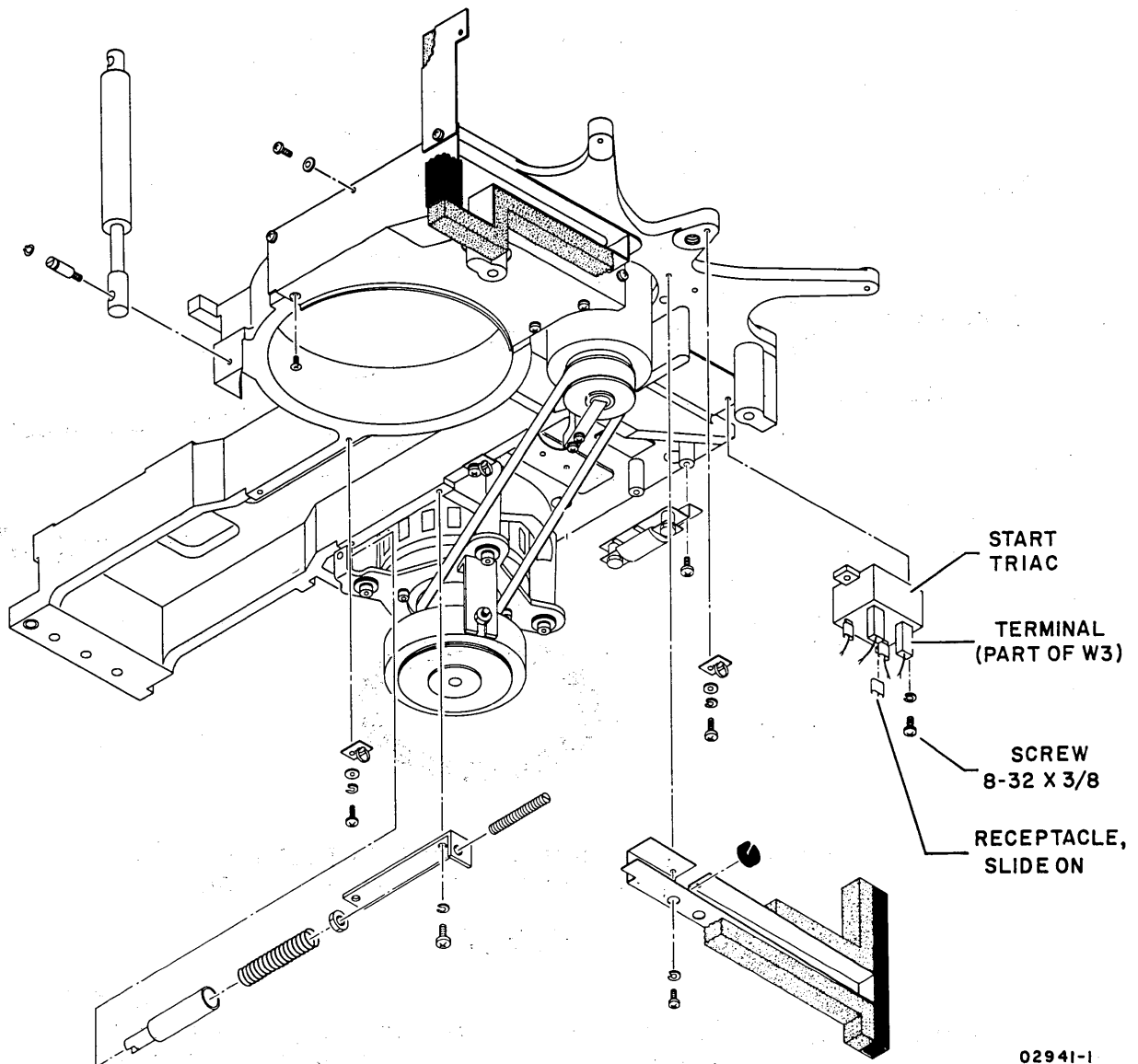
3.4 START TRIAC (A3K5)

3.4.1 Removal-Replacement

1. Remove power from drive (para. 3.0.5.2).
2. Tag each wire connected to the start triac before removal to ensure correct reconnection.
3. Apply a light coat of dielectric grease to the base of the triac when replacing the start triac.

3.4.2 Repair-Adjustment

There is no repair or adjustment applicable to the start triac. If the triac fails it must be replaced.



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Start Triac Location

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3.5 POWER AMPLIFIER ASSEMBLY (A3A04)

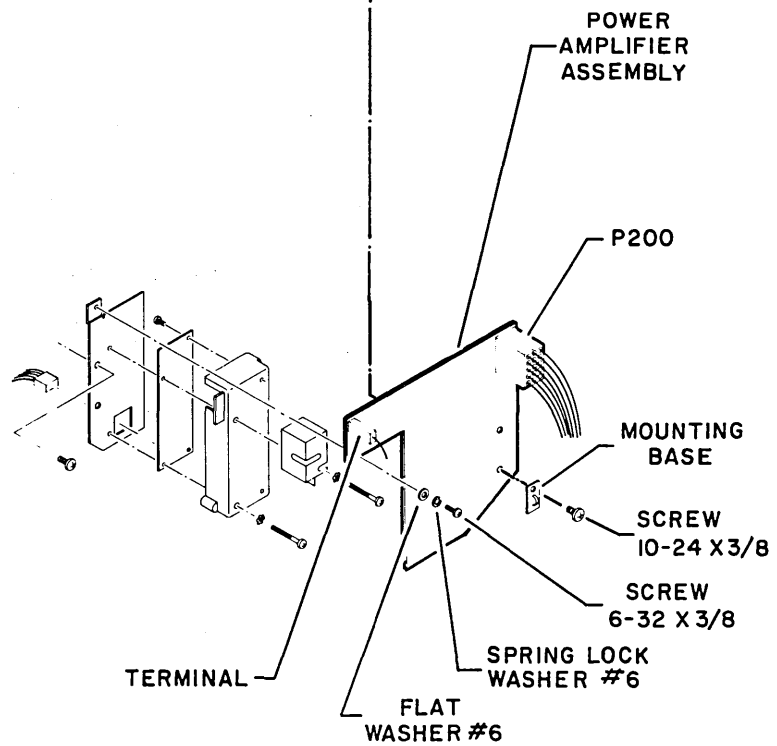
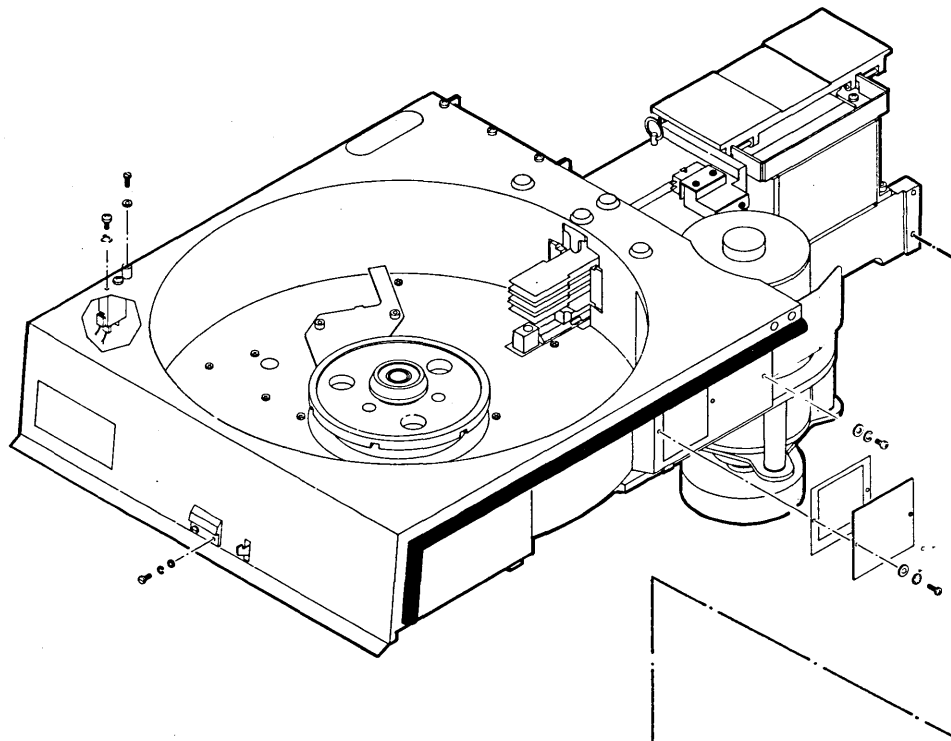
3.5.1 Removal-Replacement

The following procedure removes the power amplifier from the drive. Replacement is performed by reversing the order of removal.

1. Remove power from drive (para. 3.0.5.2).
2. Remove quick connect terminal (yellow leadwire) from Faston on upper left hand corner of assembly.
3. Loosen attaching hardware securing upper left hand corner so that assembly can later be removed.
4. Raise deck to maintenance position (para 3.2.3).
5. Remove connector P200. It may be necessary to use a tool to pry apart two halves of connector.
6. Remove two sets of attaching hardware securing assembly to deck casting.
7. Carefully lift assembly from behind attaching hardware loosened in step 2.

3.5.2 Repair-Adjustment

There are no on-site repair or adjustments applicable to the power amplifier assembly.



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Power Amplifier Assembly

3.6 42 VOLT SUPPLY/EMERGENCY RETRACT ASSEMBLY (A1A1)

3.6.1 Removal-Replacement

1. Remove power from drive (para. 3.0.5.2).
2. Open case assembly (para 3.2.2).
3. Remove power supply cover and lift card straight out of power supply chassis.

3.6.2 Repair-Adjustment

There are no on-site repair or adjustments applicable to the 42 volt power supply. If the output does not meet specification, replace the card.

3.7 12 AND 20 VOLT SUPPLY (A1A2)

3.7.1 Removal-Replacement

1. Remove power from drive (para 3.0.5.2).
2. Open case assembly (para 3.2.2).
3. Remove power supply cover and lift card straight out of power supply chassis.

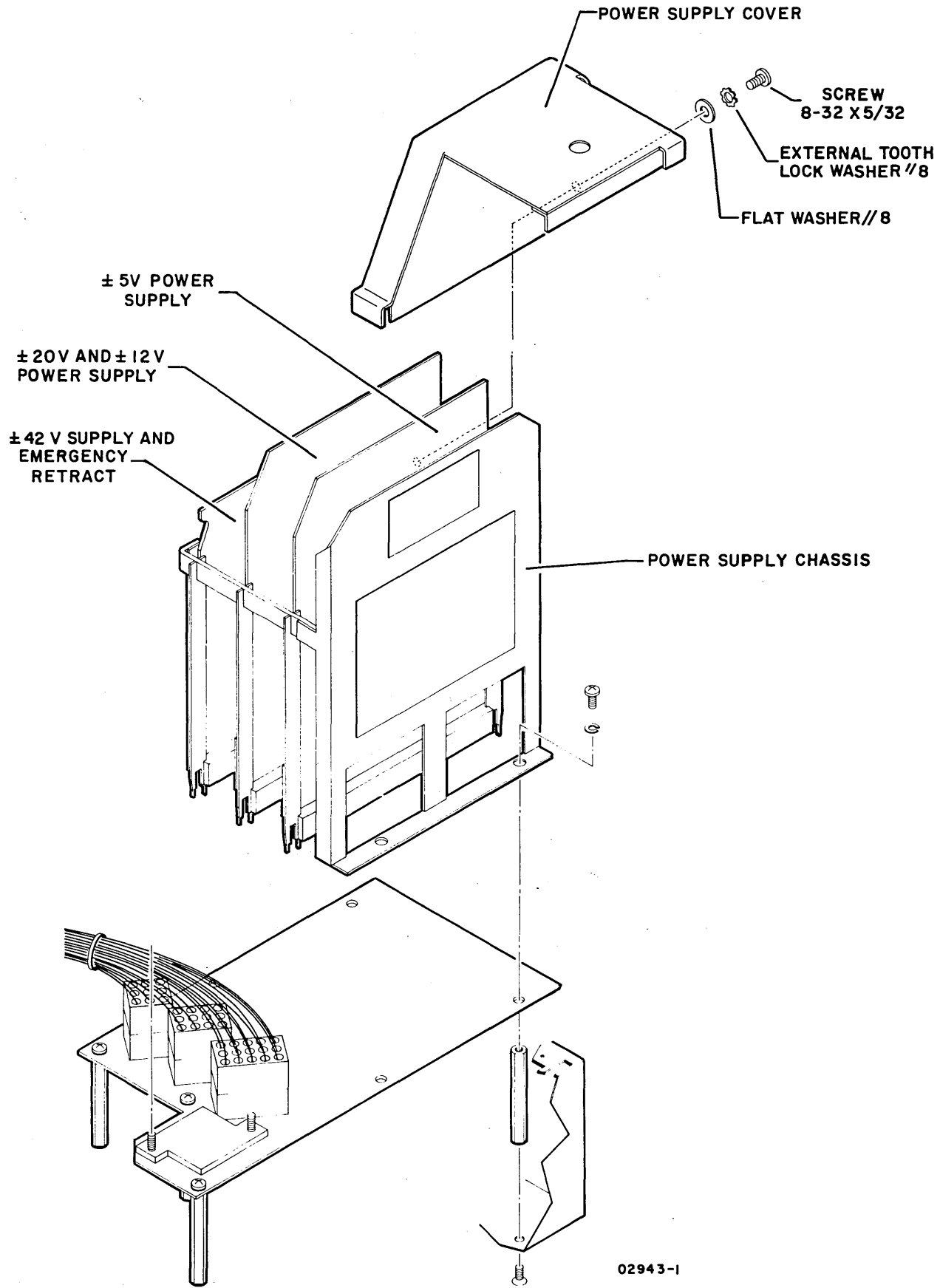
3.7.2 Repair-Adjustment

There are no on-site repair or adjustments applicable to the 12 and 20 volt power supply. If the output does not meet specification, replace the card.

3.8 5 VOLT SUPPLY (A1A3)

3.8.1 Removal-Replacement

1. Remove power from drive (para. 3.0.5.2).
2. Open case assembly (para 3.2.2).
3. Remove power supply cover and lift card straight out of power supply chassis.



Power Supply Locations

3.8.2 Adjustment

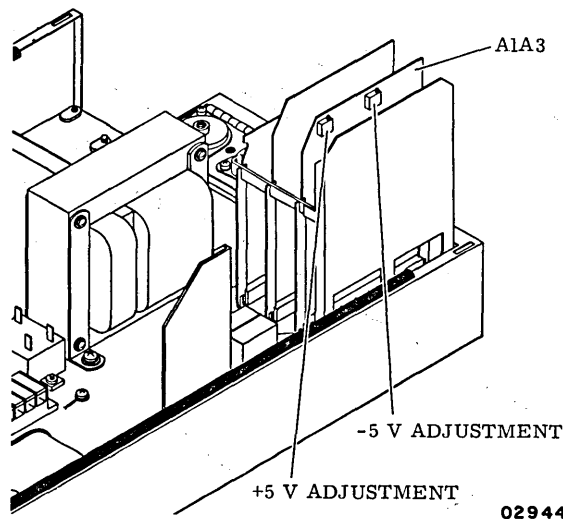
This procedure checks the output of the plus and minus 5-volt power supplies while the drive is doing repeat seeks. Power supply outputs are checked at the logic chassis backpanel. Therefore, the supplies are being checked in a manner to account for both line loss and loading.

1. Install scratch pack in drive (para. 3.0.6.2).
2. Apply power to drive (para. 3.0.5.1).

CAUTION

Drive should not be operated for extended period with logic chassis in maintenance position. Loss of cooling air (when logic chassis is raised) could cause drive to over-heat.

3. Raise logic chassis to maintenance position (para 3.2.4).
4. Connect digital volt/ohmmeter between GND and +5 V Fastons on logic chassis backpanel.
5. Command drive to do repeat seeks between cylinders 0 and 32 (use test T7045).
6. Plus 5-volt output should be $+5.10 \pm 0.05$ volts. If not, adjust +5 V potentiometer on card A1A3 until output is within specification.



Power Supply Adjustment Locations

7. Move volt/ohmmeter leads to -5 V Faston. Minus 5-volt output should be -5.10 ± 0.05 volts. If not, adjust -5 V potentiometer on card A1A3 until output is within specification.
8. If any adjustment was necessary in preceding steps, recheck both outputs.
9. When both power supply outputs are within specification, restore drive to normal operation.

3.8.3 Repair

There is no on-site repair applicable to the 5 volt power supply. If the output cannot be adjusted to specification, replace the card.

3.9 TRACK SERVO PREAMPLIFIER (A3A05)

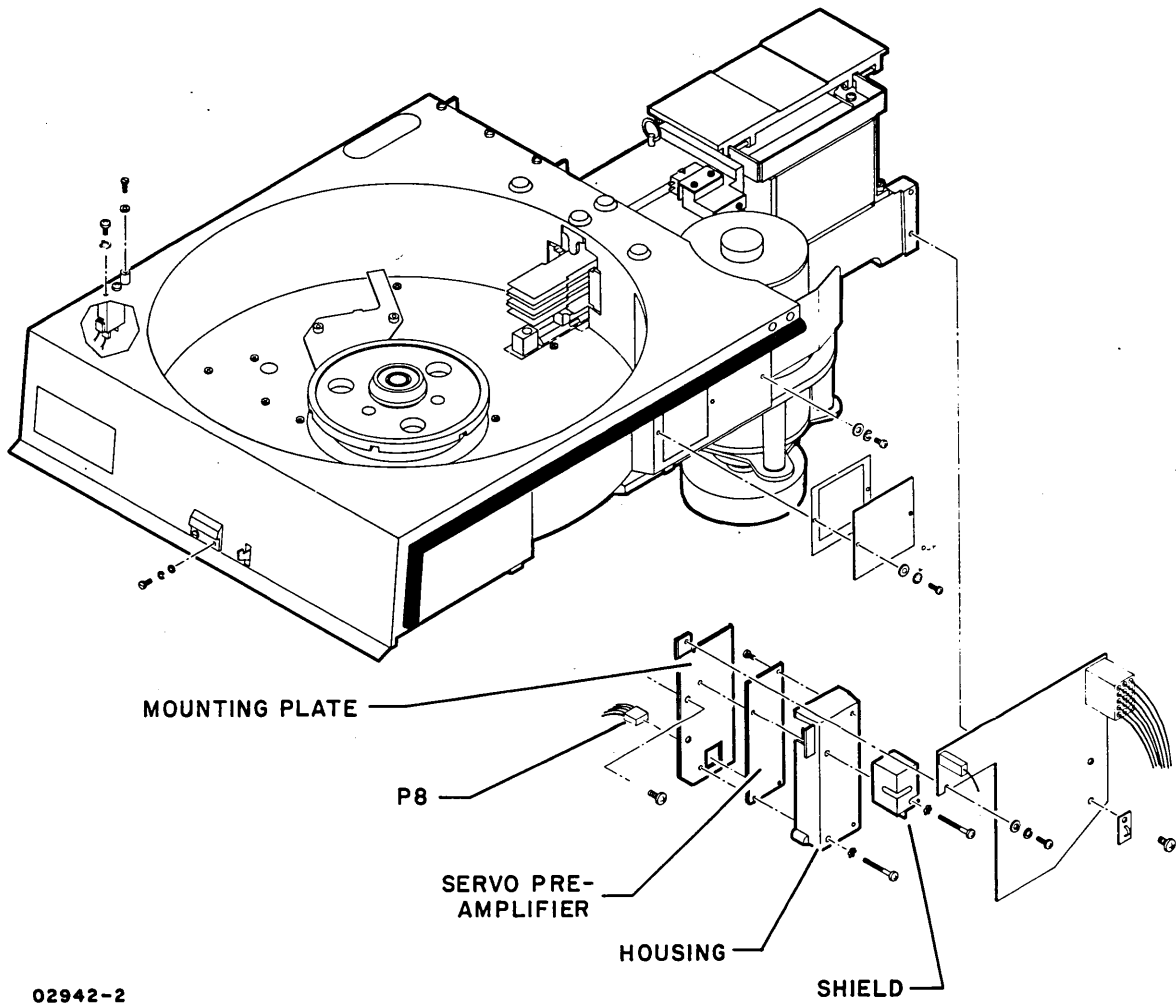
3.9.1 Removal-Replacement

The following procedure covers removal of the servo preamplifier assembly from the mounting plate and leaves the mounting plate secured to the deck. Replacement is performed by reversing the order of removal.

1. Remove power from drive (para. 3.0.5.2).
2. Remove attaching hardware on upper left hand corner of assembly. Carefully slide servo preamplifier shield from behind attaching hardware and leave it hanging on servo head cable.
3. Raise deck to maintenance position (para 3.2.3).
4. Reach behind servo preamplifier from under deck and disconnect connector P8. It may be necessary to cut and remove cable tie strap.
5. Remove attaching hardware securing servo preamplifier housing to mounting plate. It may be necessary to remove deck support bracket and move deck up or down to have clear access to attaching hardware. It is easier to have one person manipulate deck into position and have a second person remove attaching hardware.
6. Unplug servo head connector from servo preamplifier board. Carefully remove preamplifier housing (containing board) from between deck and power supply. It may be easier to remove preamplifier housing if deck is lowered to normal operating position.
7. Remove attaching hardware securing servo amplifier board to housing.

3.9.2 Repair-Adjustment

There is no repair or adjustment of the servo preamplifier possible at the field level. If the board is malfunctioning it must be replaced.



Servo Preamplifier Assembly Mounting

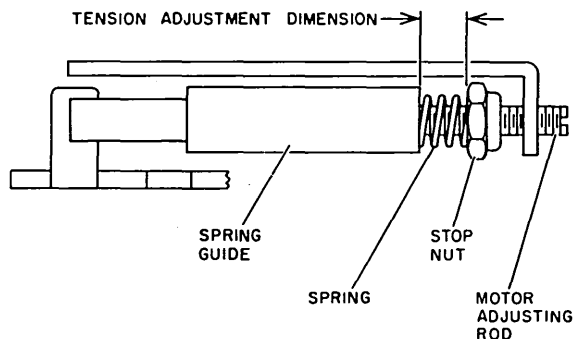
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3.10 DRIVE BELT

3.10.1 Adjustment

Before performing adjustment, check the belt for any signs of damage: fraying, cracking, or checking of belt surface. If any of these signs exist, replace the belt before performing adjustment (para. 3.10.2).

1. Remove power from drive (para. 3.0.5.2).
2. Raise deck to maintenance position (para 3.2.3).
3. Measure distance between spring guide and stop nut.
Distance must be:
 - 0.40 \pm 0.05 inch (10.16 \pm 1.27 mm) for 50 Hz drives.
 - 0.25 \pm 0.05 inch (6.35 \pm 1.27 mm) for 60 Hz drives.



4. If dimension is not correct, turn motor adjusting rod until it meets specification.
5. Open pack access cover and rotate spindle while checking drive belt tracking. Belt must run true on both motor pulley and spindle pulley. Belt not tracking properly indicates pulley misalignment.
6. When belt is tracking properly, close pack access cover and return deck to normal operating position.

Apply power to drive (para. 3.0.5.1). and press START switch to start drive motor. Again watch drive belt and see that it is tracking properly.

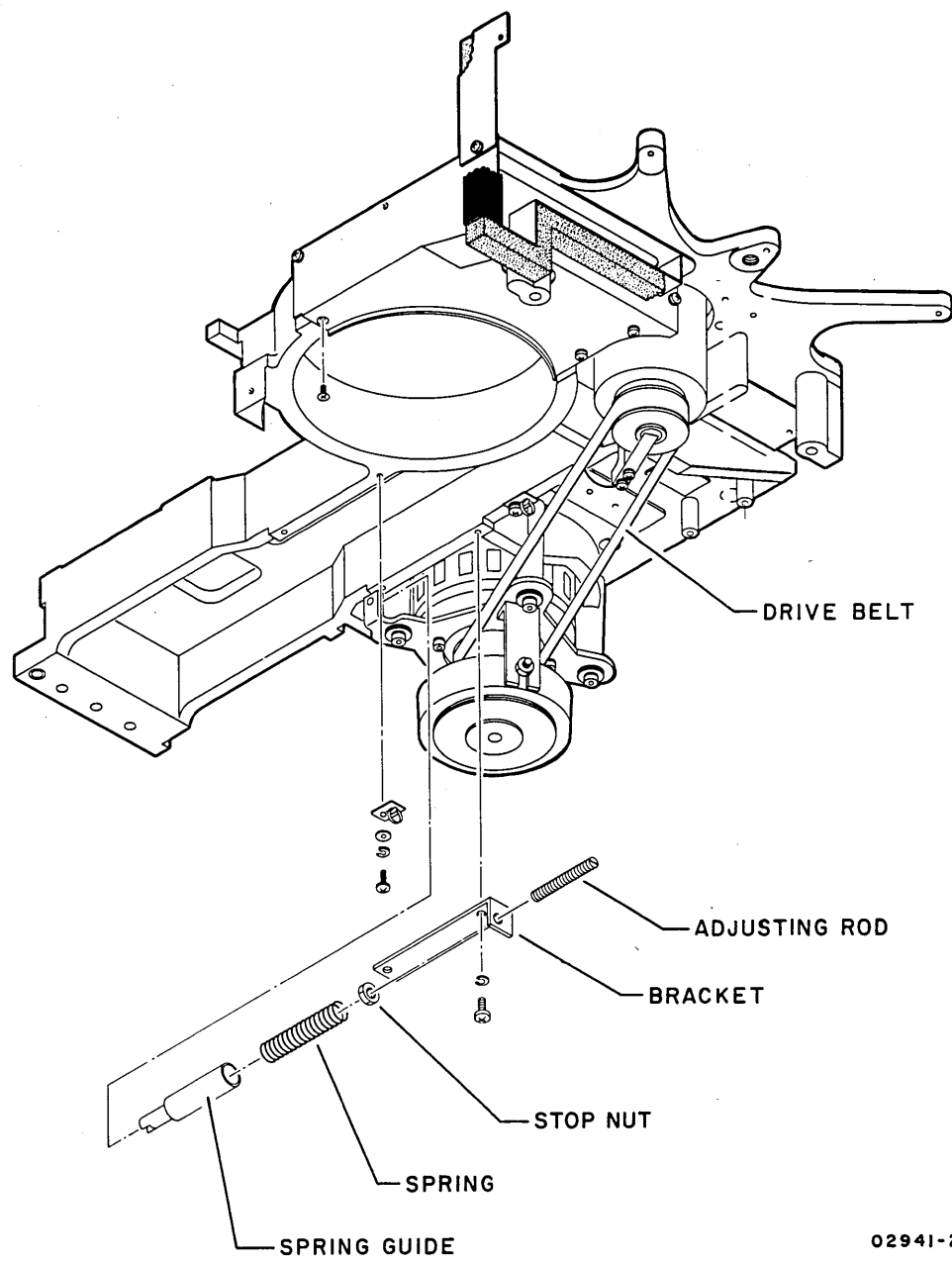
3.10.2 Removal-Replacement

1. Remove power from drive (para. 3.0.5.2).
2. Raise deck to maintenance position (para 3.2.3).

CAUTION

Failure to relieve pressure on compression spring may cause the motor shaft to be bent.

3. Turn motor adjusting rod out until pressure on compression spring is fully relieved.
4. Remove drive belt from motor by rolling belt off motor pulley while rotating pulley. Disengage belt from spindle pulley and slip it out from around brake.
5. To install drive belt, slip belt up over brake and then engage other end of belt in groove on spindle pulley. Apply tension to belt and guide it on to motor pulley while manually rotating drive belt and drive motor pulley.
6. Manually rotate drive motor pulley several times to make certain that drive belt is tracking properly.
7. Perform Adjustment procedure (para 3.10.1).



Drive Belt Location/Adjustment

3.11 DRIVE MOTOR AND BRAKE ASSEMBLIES (A3DM1, A3HB1)

3.11.1 Adjustment

There are two adjustments pertaining to the drive motor and brake assemblies 1) drive belt adjustment and 2) brake adjustment. The drive belt adjustment procedure is provided in paragraph 3.10. The brake adjustment is performed during the replacement. Refer to paragraph 3.11.2.1.

3.11.2 Removal-Replacement

The brake assembly may be removed and replaced separately, or the drive motor and brake assemblies may be removed and replaced as a unit. When removing the drive motor, the brake must also be removed. Removal and replacement of either the brake or drive motor and brake is self evident when using the accompanying illustration. Before beginning any work on the drive motor and brake assemblies, perform the drive belt removal procedure (para 3.10.2). The following information presents details of the reassembly procedures which are not obvious. Be thoroughly familiar with this information before attempting replacement.

The ungrounded (floating) brake assembly can cause intermittent read errors. To correct this condition, install a ground wire on the brake assembly as shown in the drive motor and brake assemblies illustration. Some units will already have this installed while others will not. To provide for both situations, the illustration shows the brake assembly with and without a ground wire installed.

3.11.2.1 Brake Replacement - Use following procedure whenever a brake is installed on the drive motor shaft.

CAUTION

To prevent damage to drive motor shaft, brake replacement must be performed in the order specified.

1. Loosely install brake mounting bracket on motor mounting plate.
2. Install brake shaft collar (with ridge of collar facing away from drive motor) and then brake on drive motor shaft.

3. Slide brake on motor shaft so that collar slides on split shaft of brake armature and so that stud on brake strikes end of slot in brake mounting bracket. Tighten nut securing brake to brake mounting bracket.

CAUTION

In following step, be certain that brake is centered around drive motor shaft. If brake is miscentered, it could cause damage to, or breaking of, drive motor shaft.

4. Support brake to maintain centering on motor shaft while tightening screw securing brake mounting bracket to motor mounting plate.
5. While holding motor pulley to prevent shaft from turning, rotate hysteresis brake armature several turns to eliminate any binding between drive motor shaft and brake armature.
6. With brake shaft collar resting on brake, tighten hex head socket screw in collar as follows:
 - Use a 9/64-inch hex wrench and tighten screw to a torque of 30 \pm 2 lbf·in (3.4 \pm 0.2 N·m).

NOTE

Replacement brakes are supplied with extension cabling (required on older units); discard it.

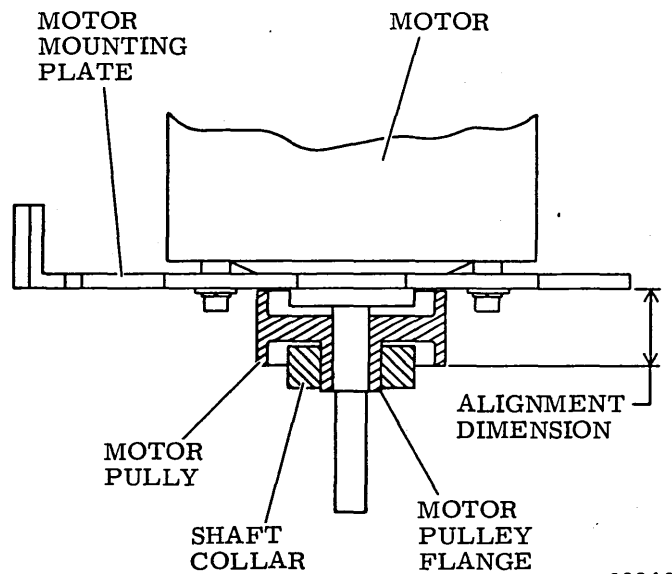
7. Connect brake leadwires.
8. Replace cable ties, being certain that all wires are secured so they will not be rubbed by drive belt.

3.11.2.2 Drive Motor Replacement -

NOTE

If it is necessary to replace drive motor assembly because of an electrical failure of the motor, also replace capacitor A3C6. It is likely that this capacitor is associated with failure.

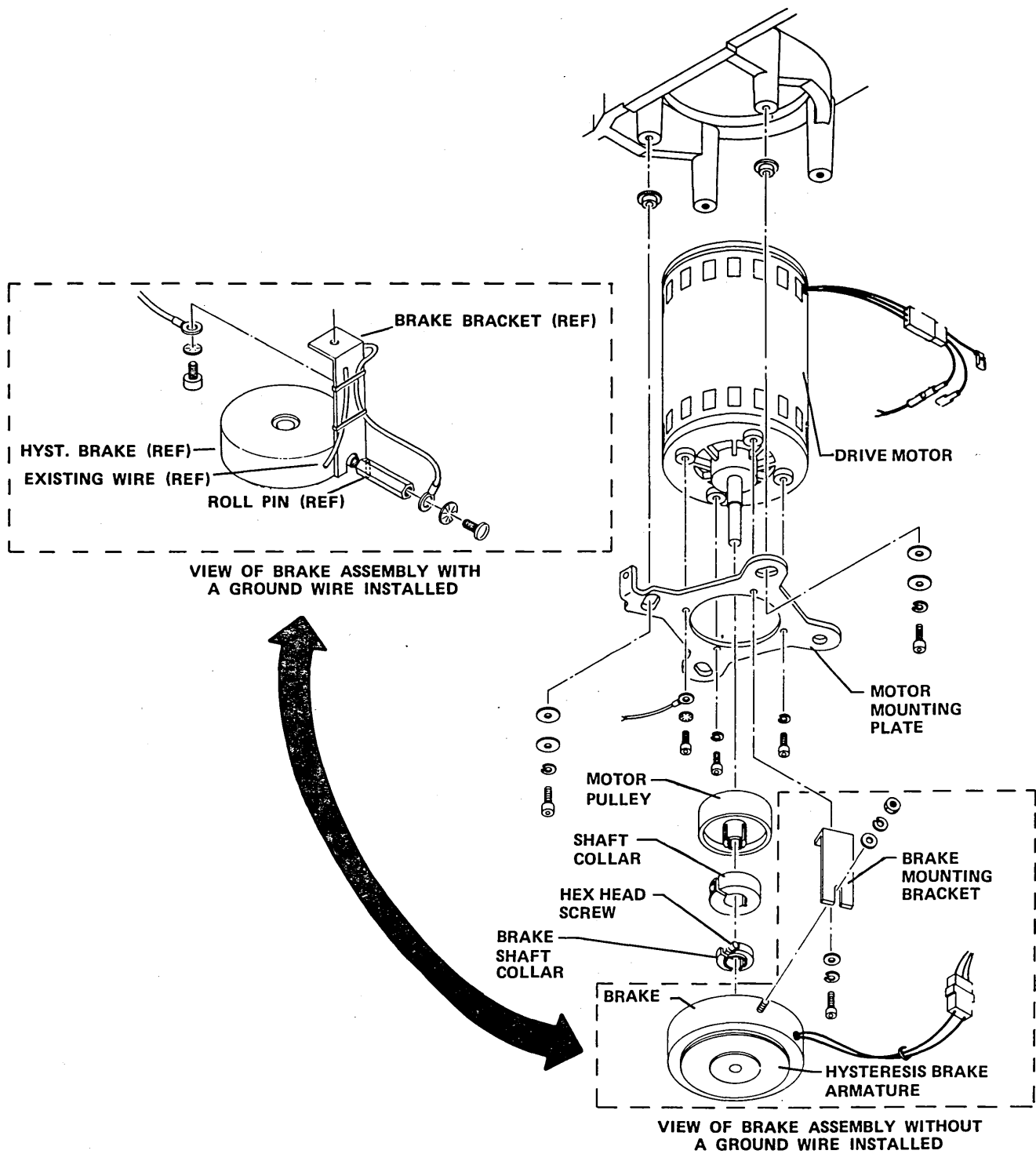
1. With motor mounted on motor mounting plate, position pulley on drive motor shaft so that alignment dimension shown is $13/16 \pm 1/32$ inch (20.7 ± 0.8 mm).



2. Ensure that motor pulley flange protrudes slightly through shaft collar.
3. Tighten set screw in shaft collar to a torque of 65 ± 5 lbf·in (7.3 ± 0.6 N·m).

3.11.3 Repair

On-site repair of the drive motor and brake assemblies is not applicable.



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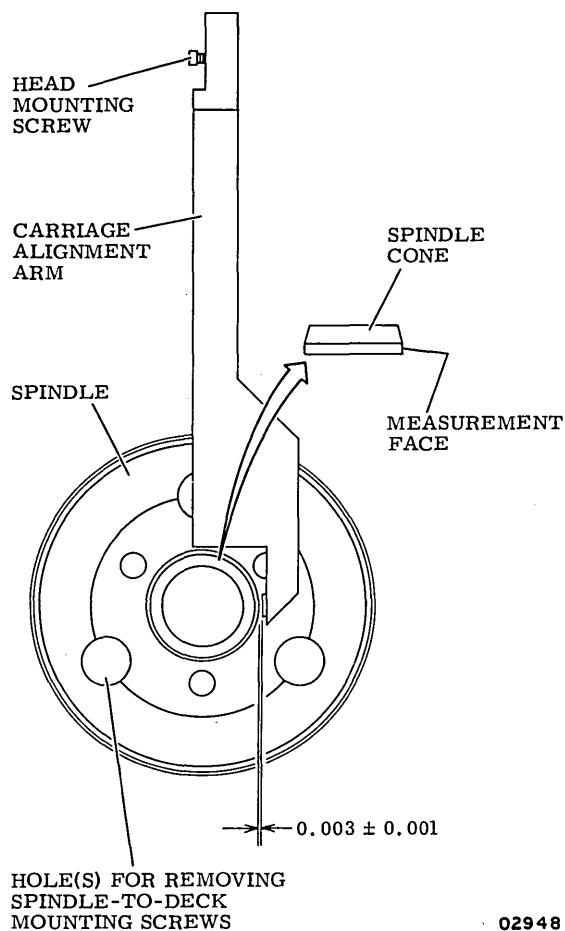
Drive Motor and Brake Assemblies

3.12 SPINDLE ASSEMBLY

3.12.1 Adjustment

Spindle adjustment must be performed any time the attaching hardware securing the spindle to the deck has been loosened.

1. Remove power from drive (para. 3.0.5.2).
2. Remove head arm assemblies (para 3.17.2) number 3 (second from bottom) and number 4 (bottom).
3. Install carriage alignment arm in slot on carriage just vacated by head arm assembly number 3. Secure alignment arm to carriage and tighten attaching hardware until torque is $4 \pm 1/2$ lb·in (0.5 ± 0.06 N·m).
4. Extend carriage until alignment arm is aligned as shown in illustration.
5. Using feeler gauge, check that distance between alignment arm and spindle is as specified. If adjustment is required, go to step 6. If specification is met go to step 12.
6. Retract carriage and rotate spindle until holes in top of spindle align with mounting hardware.
7. Remove screws and washers securing spindle to deck. Install screws (without washers) and just snug screws tight.
8. Extend carriage until alignment arm is positioned as shown.
9. Using a plastic-faced hammer, gently tap spindle until dimension between alignment arm and spindle is as specified.
10. Tighten one screw at a time and check dimension after tightening each screw.
11. When last screw is tightened in step 10, remove first screw tightened and install washer on it. Then reinstall screw, tighten it, and recheck dimensional requirement. Repeat this procedure for the second and third screws.
12. Remove alignment arm and install head arm assemblies in slots number 3 and 4 in carriage.
13. Perform static ground spring adjustment (para 3.13.1).
14. Perform head arm alignment procedures (para 3.17.1).



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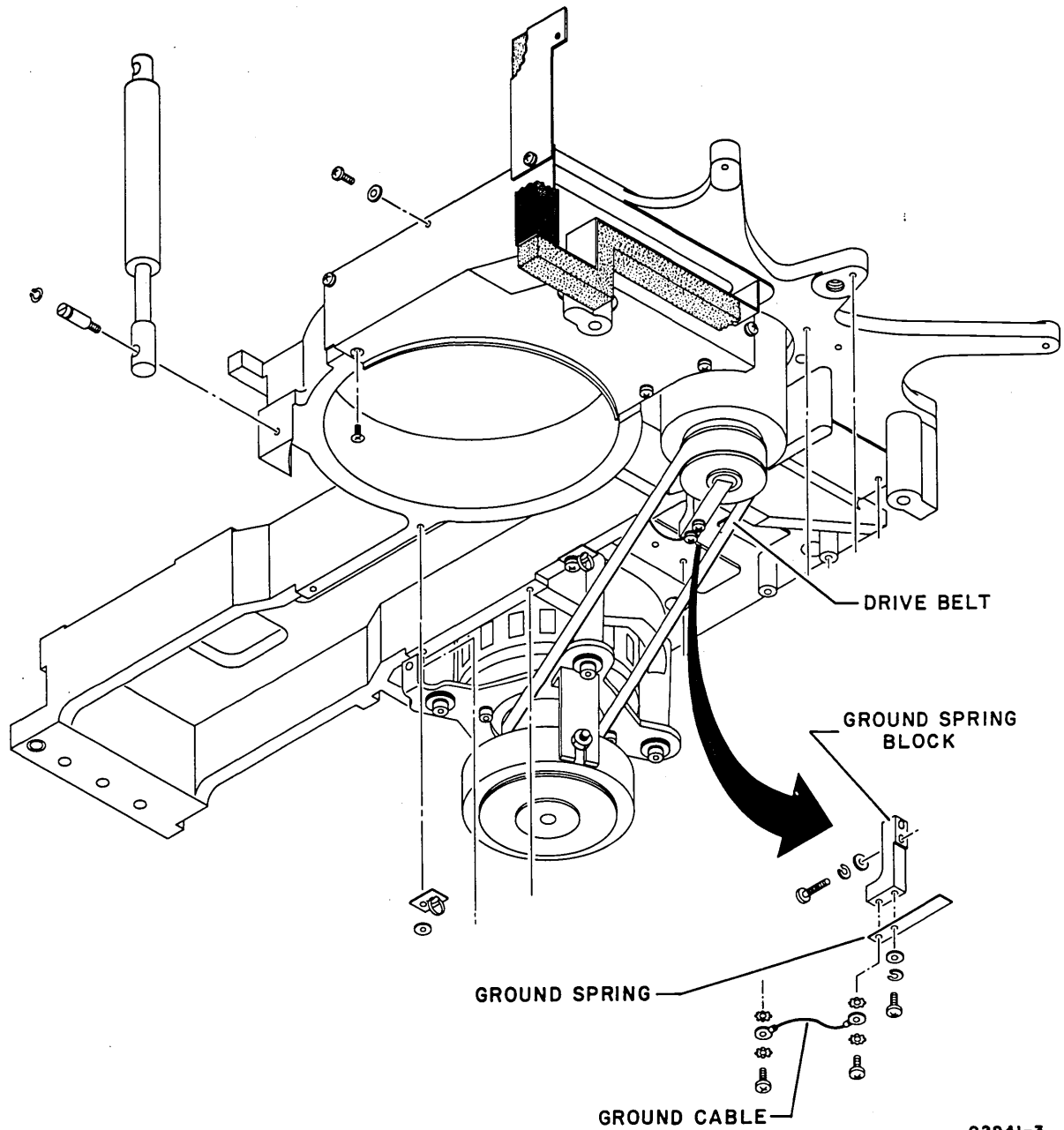
3.12.2 Removal-Replacement

The following procedure covers removing and replacing the entire spindle assembly. It is not necessary to remove the spindle to perform lockshaft replacement. Refer to Repair for information concerning lockshaft replacement.

CAUTION

When spindle assembly is removed from drive or shipping container, do not allow it to rest on pulley end of assembly. When it must be set down, lay it on its side or on spindle face plate. Improper handling of spindle assembly may cause damage to spindle bearings which could result in premature failure of spindle or even damage to disks and heads.

1. Remove power from drive (para. 3.0.5.2).
2. Raise deck to maintenance position (para 3.2.3).
3. Remove attaching hardware securing ground cable to static ground spring block.
4. Remove drive belt and set it aside (para 3.10.2).
5. Lower deck to normal operating position.
6. Rotate spindle until holes in top of spindle align with mounting hardware.
7. Remove attaching hardware securing spindle assembly to deck.
8. Lift spindle assembly from deck, being careful to avoid damage to static ground spring.
9. Remove attaching hardware securing static ground spring mounting block to spindle assembly. Remove static ground spring assembly and install it on replacement spindle assembly.
10. Carefully lower replacement spindle assembly through deck opening in shroud. Orient spindle assembly so that ground spring mounting block faces drive motor.
11. Temporarily secure spindle assembly to deck using screws only. Lock washers are installed during Adjustment procedure.
12. Perform Spindle Assembly Adjustment procedure (para 3.12.1).
13. Raise deck to maintenance position.
14. Install ground cable to static ground spring mounting block, then perform Spindle Assembly Adjustment procedure (para 3.12.1).
15. Install drive belt (para 3.10.2).
16. Perform Drive Belt Adjustment procedure (para 3.10.1). Following drive belt adjustment, check speed sensor adjustment (para 3.14.1).



02941-3

Ground Cable/Ground Spring Block Hardware

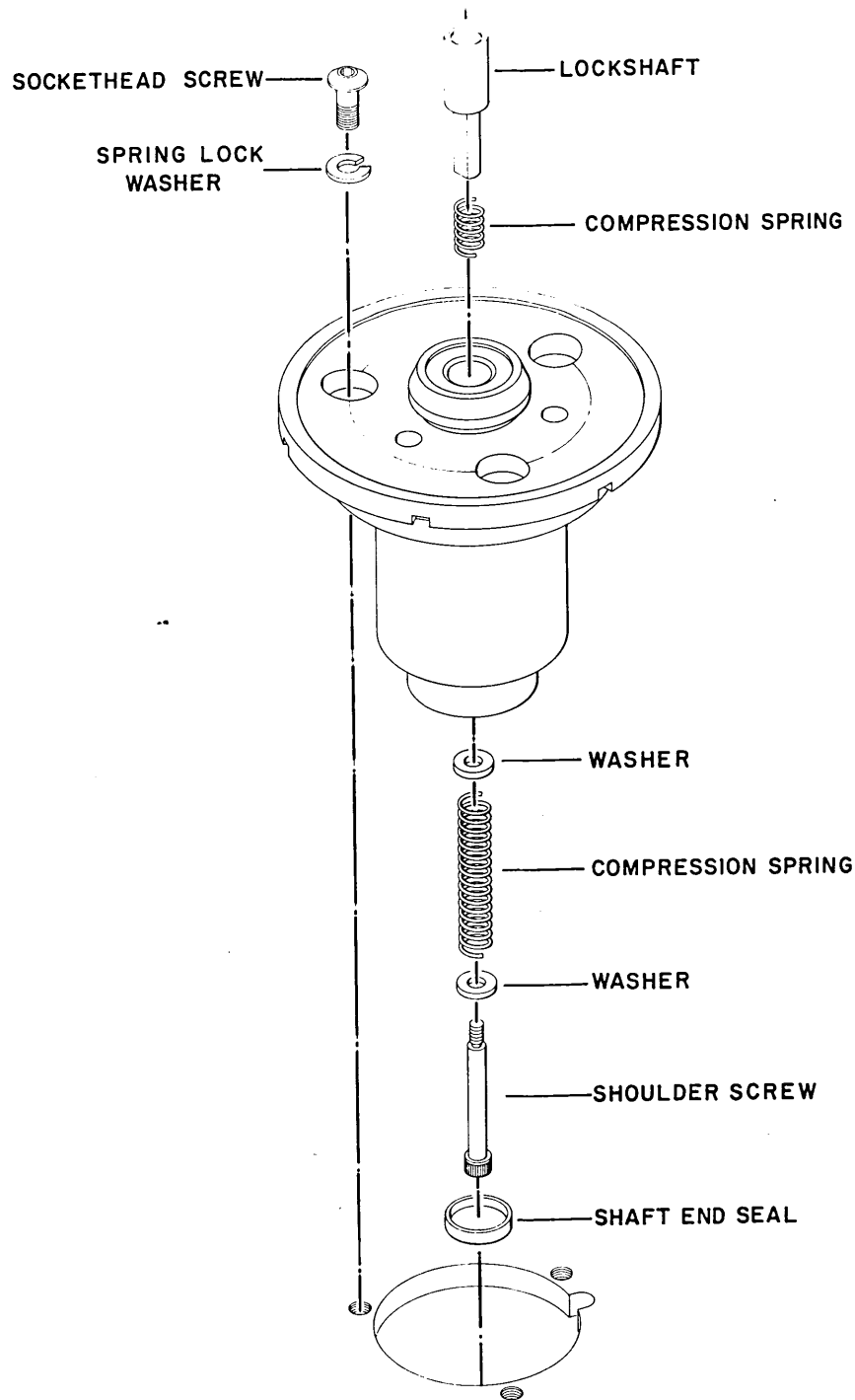
3.12.3 Repair

Repair of the spindle assembly is limited to removal and replacement of the lockshaft and associated hardware as indicated in the accompanying illustration and described by the following procedure.

1. Remove power from drive (para. 3.0.5.2).
2. Raise deck to maintenance position (para 3.2.3).
3. Remove attaching hardware securing ground cable to static ground spring block.
4. Remove static ground spring from mounting block.
5. Remove shaft end seal by prying down with a pair of opposing screwdrivers.
6. Reaching in from bottom of spindle, remove shoulder screw and associated washers and spring. Spindle may be locked in position during shoulder screw removal, by pressing down on end of brake plate.
7. Lift lockshaft out from top of spindle.
8. Install replacement lockshaft, sliding it in from top of spindle. If smaller compression spring came out with old lockshaft, assemble it on new lockshaft before assembly.
9. Assemble two washers and compression spring on shoulder screw. Apply a thin coat of Loctite primer, grade T, to last four threads of shoulder screw; being careful not to get any primer on spring or washers.
10. Allow Loctite primer to air-dry for approximately 5 minutes.
11. When Loctite primer is dry apply a thin coat of Loctite, grade C, to last four threads of shoulder screw. Parts must be assembled within three minutes of Loctite application.
12. Assemble should screw and hardware into bottom of lockshaft. Tighten shoulder screw to a torque of 40 ± 5 lbf·in (4.5 ± 0.6 N·m).
13. Press shaft end seal into position on bottom of spindle assembly. Lower deck to normal operation position and allow Loctite to air-dry for approximately three hours.
14. Following Loctite cure, raise deck to maintenance position and assemble static ground spring and associated ground cable.

15. Perform Clean and Lubricate Lockshaft procedure (para 3.1.2).

16. Perform Static Ground Spring Adjustment procedure (para 3.13.1).



02949-1

Spindle Assembly

3.13 STATIC GROUND SPRING

3.13.1 Adjustment

The ground spring adjustment procedure must be performed any time the screws securing the spring or mounting block have been loosened.

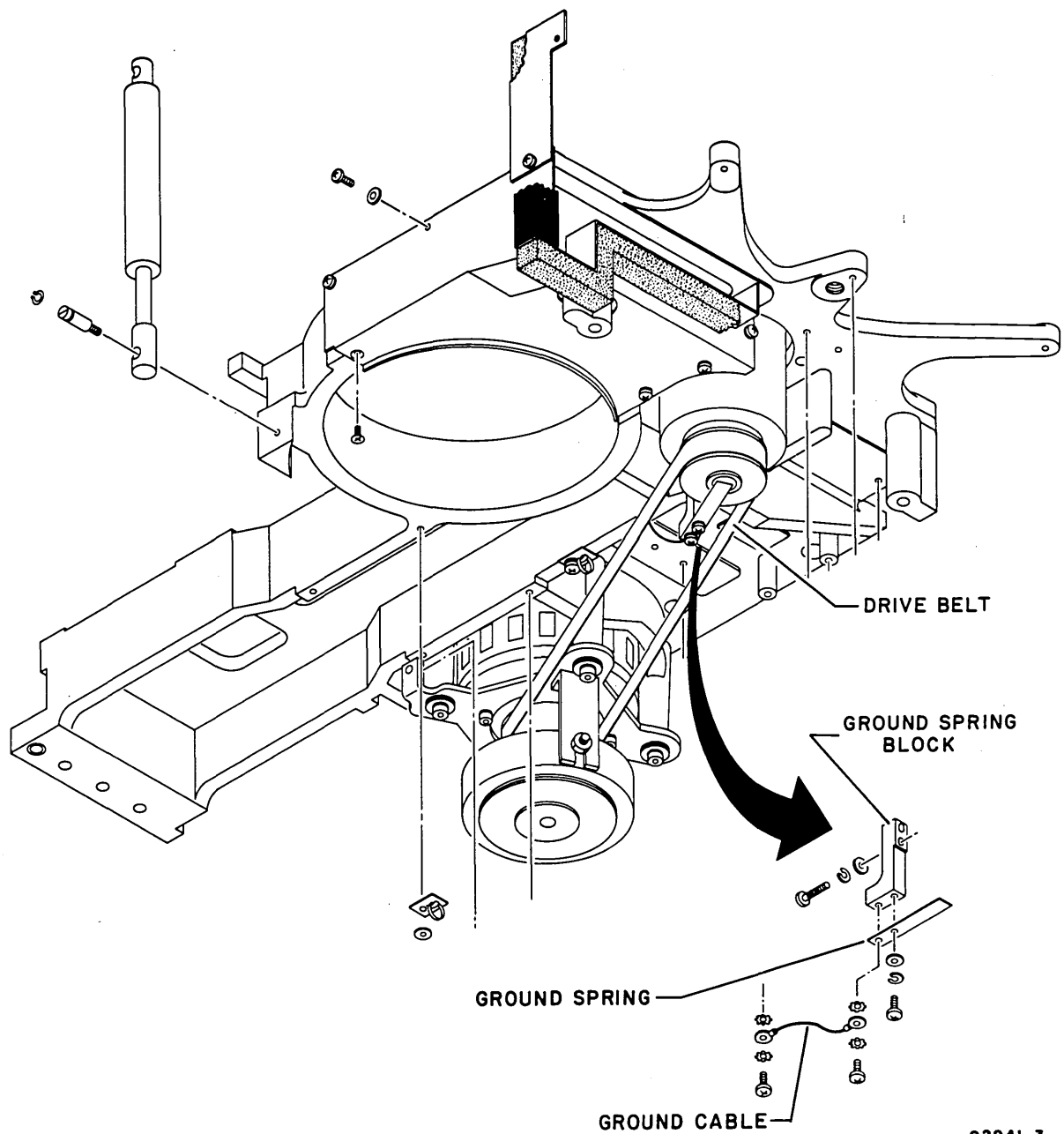
1. Remove power from drive (para. 3.0.5.2).
2. Raise deck to maintenance position (para. 3.2.3).
3. Connect push-pull gauge to outer end of ground spring.
4. Use force in-line with lockshaft and pull down on push-pull gauge. Force required to pull ground spring free of spindle end seal must be 90 \pm 10 grams.
5. If force is within specification, go to step 8. If force is not within specification, loosen attaching hardware securing ground spring mounting block to side of spindle assembly.
6. Adjust spring tension by sliding mounting block toward deck (to increase tension) or away from deck (to decrease tension) and retightening attaching hardware.
7. Repeat force measurement and adjustment steps until specifications are met. If specifications cannot be met, replace ground spring.
8. Remove attaching hardware securing ground cable to ground spring mounting block and disconnect ground cable.
9. Connect multimeter (set to RX1) between ground cable and ground spring. Meter should indicate zero ohms. If specification is met, go to step 11; if it is not met, go to step 10.
10. Clean bottom of shaft end seal (on bottom of spindle) using a piece of gauze slightly dampened with media cleaning solution. Repeat step 9. If specification is not met, replace ground spring.
11. Disconnect multimeter and connect ground cable to ground spring mounting block.
12. Lower deck to normal operating position.

3.13.2 Removal-Replacement

Perform the removal-replacement in accordance with the information in the accompanying illustration.

3.13.3 Repair

No repair of the static ground spring is possible. If any of the parts fail, they must be replaced.



Ground Spring Mounting

02941-3

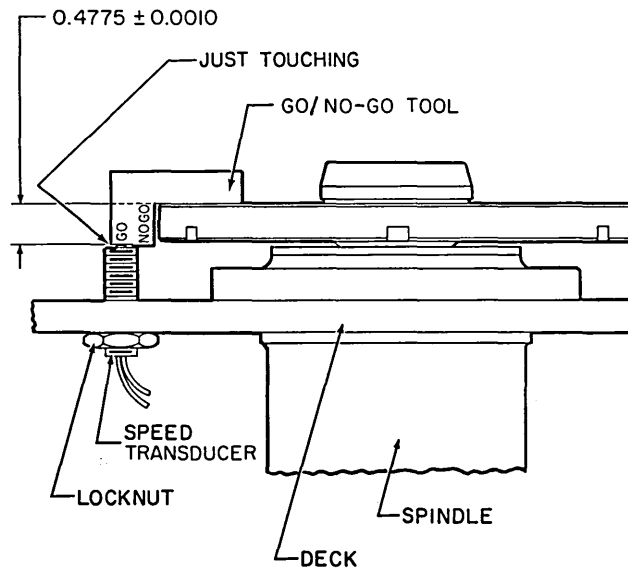
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3.14 SPEED TRANSDUCER (A3L1)

3.14.1 Adjustment

Speed transducer adjustment is required whenever the relative position of the spindle and the speed transducer has been changed.

1. Remove power from drive (para. 3.0.5.2).
2. Inside pack area, place Go/No-Go Tool across top of spindle face plate so that gage extends out over top of speed transducer.
3. Check dimension from top of speed transducer to top of spindle face plate. Dimension is as specified in illustration. If adjustment is required, proceed to step 4. If no adjustment is required, verify correct output of speed transducer by performing steps 8 through 11.



4. Raise deck to maintenance position (para 3.2.3).
5. Loosen locknut on bottom of speed transducer. Disconnect connector J202 so that leads are free to turn during adjustment.

CAUTION

Exceeding specified torque on locknut damages speed transducer.

6. Rotate speed transducer until top of transducer makes contact with Go surface of Go/No-Go tool. Torque locknut to 5 ± 1 lbf·in (0.6 ± 0.1 N·m). Recheck dimension with Go-NoGo Tool.

7. When dimension is correct and locknut is tightened, install connector J202.
8. Lower deck to normal operating position.
9. Install scratch pack (para. 3.0.6.2).
10. With drive powered up and heads loaded, connect oscilloscope to back panel pin A10-27A (Speed Transducer Output). Sync negative internal. Calibrate scope trace to ground.
11. Observe waveform on oscilloscope. Signal should reach at least -1.0 vdc on negative swing, and at least +1.0 vdc on positive swing. If oscilloscope reading is not within tolerance, power down drive and replace transducer (para 3.14.2). If oscilloscope reading is within tolerance, stop procedure.

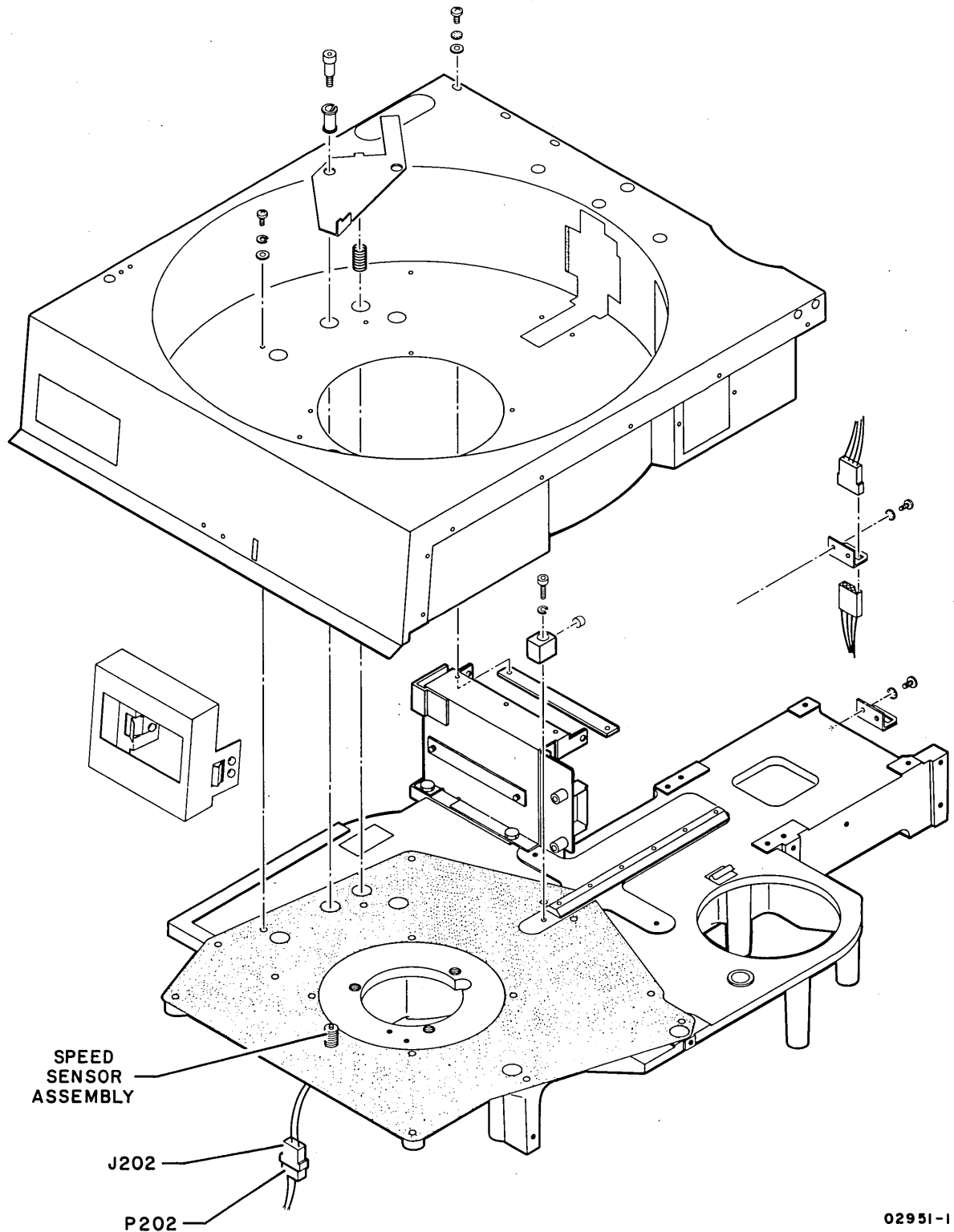
3.14.2 Removal-Replacement

There are no special procedures for the removal or replacement of the speed transducer.

Remove power from the drive (para. 3.0.5.2) and gain access to speed transducer from the bottom side of the deck assembly. When replacement is completed, perform the adjustment procedure, para. 3.14.1.

3.14.3 Repair

Repair of the speed transducer is limited to the replacement of the connector and pins.



SPEED
SENSOR
ASSEMBLY

J202

P202

02951-1

Speed Sensor Assembly

3.14.2 - 3.14.3

62947901 A 3-71

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3.15 VELOCITY TRANSDUCER (A3L2)

3.15.1 Removal-Replacement-Adjustment

The velocity transducer assembly consists of a transducer coil (complete with housing and connector), a transducer core, and an extension rod. When ever it is necessary to change any part of the transducer assembly, all parts of the assembly must be changed.

NOTE

When ordering the velocity transducer assembly, also order the extension rod.

The following procedure first covers replacement of the transducer coil, aligning it to the old transducer core. It then covers replacement of the core.

1. Remove attaching hardware securing transducer coil to rear of magnet assembly. Unplug connector P22.
2. Carefully remove transducer coil, sliding it straight out rear of magnet assembly.
3. Slowly and carefully slide replacement transducer coil into rear of magnet assembly.
4. Align one of three slots on back of transducer coil with mounting hole in magnet. Manually extend heads and slide carriage back and forth. Be aware of any drag or of any rubbing sound. Rotate coil and move carriage again for each of remaining two slots on back of remaining two slots on back of transducer coil.
5. Select mounting slot that produced minimum drag and minimum rubbing. Orient this slot to mounting hole and install and tighten attaching hardware.
6. Connect connector P22. Extend heads and move carriage back and forth to verify alignment of transducer coil.
7. Reach in from logic chassis side of drive and disconnect extension rod from rear of carriage assembly using a 1/8-inch open-end wrench.
8. Push extension rod and transducer core through coil and out rear of magnet assembly.

9. Apply light coat of Loctite grade C to threads of new extension rod and screw rod into end of replacement transducer core. Wipe off excessive Loctite.

NOTE

Do not apply Loctite to remaining end of extension rod until completing next step.

10. Slowly and carefully slide replacement transducer core and extension rod through coil from rear.

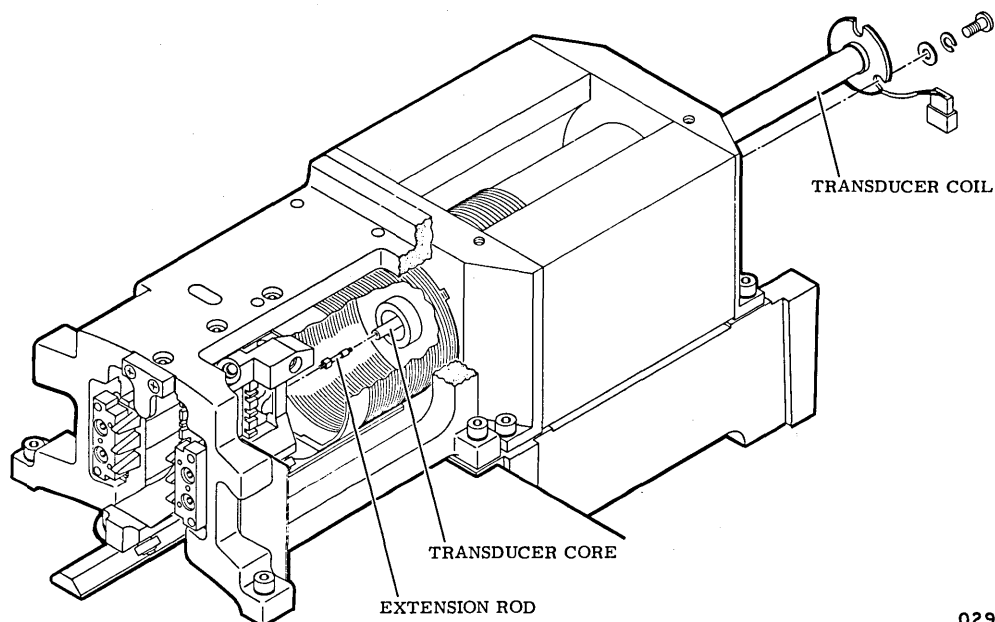
CAUTION

Use extreme care not to allow Loctite to get on carriage rails or bearings.

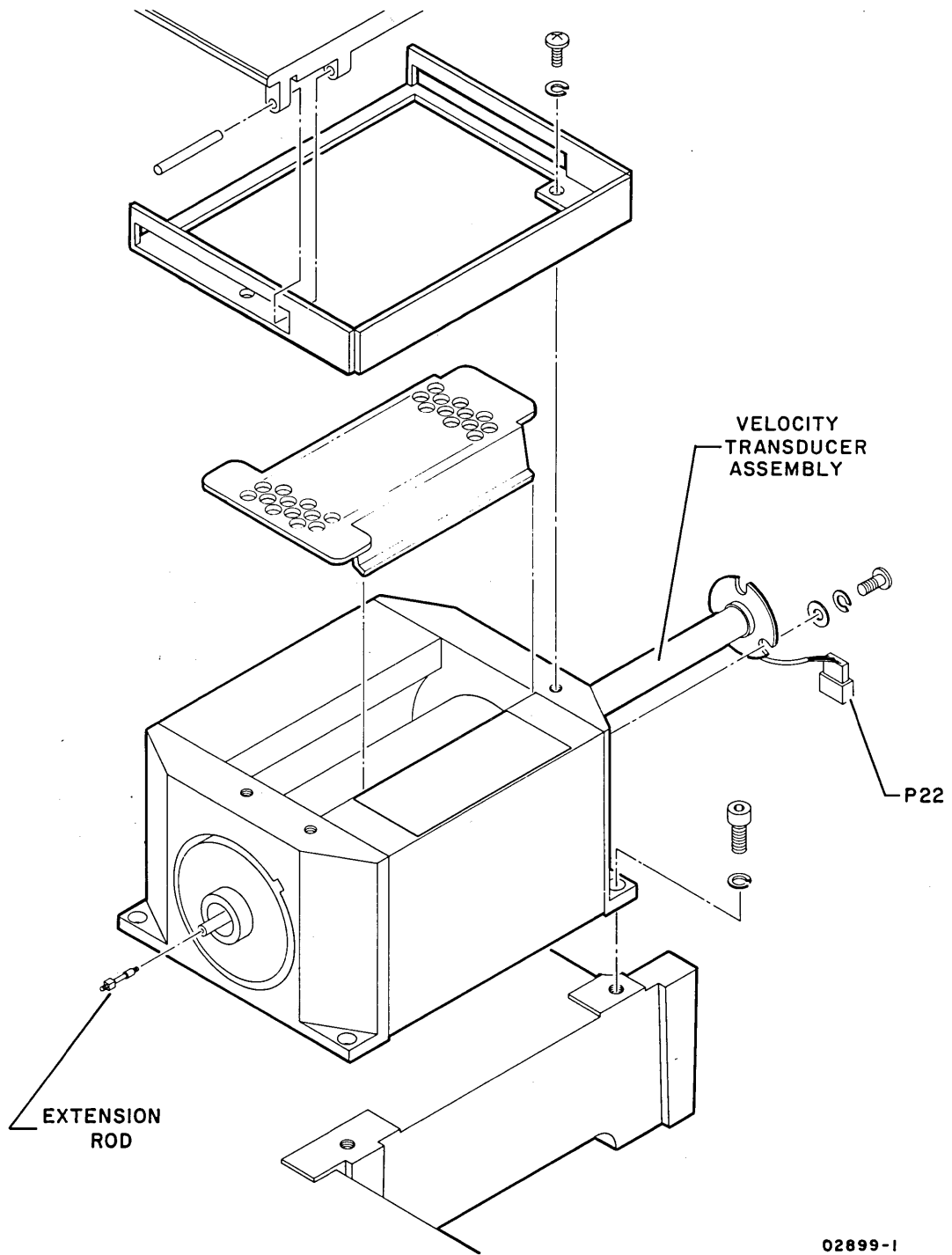
11. Very carefully apply a light coat of Loctite grade C to threads on end of extension rod. Thread extension rod into rear of carriage and lightly tighten. Wipe away excessive Loctite.
12. Manually extend heads and move carriage back and forth to verify that carriage moves freely and there is no excessive drag.

3.15.2 Repair

Repair of the velocity transducer assembly is limited to removing and replacing the connector and pins.



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VELOCITY
TRANSDUCER
ASSEMBLY

P22

EXTENSION
ROD

Magnet Assembly

02899-1

3.16 HEADS LOADED SWITCH (A3S2)

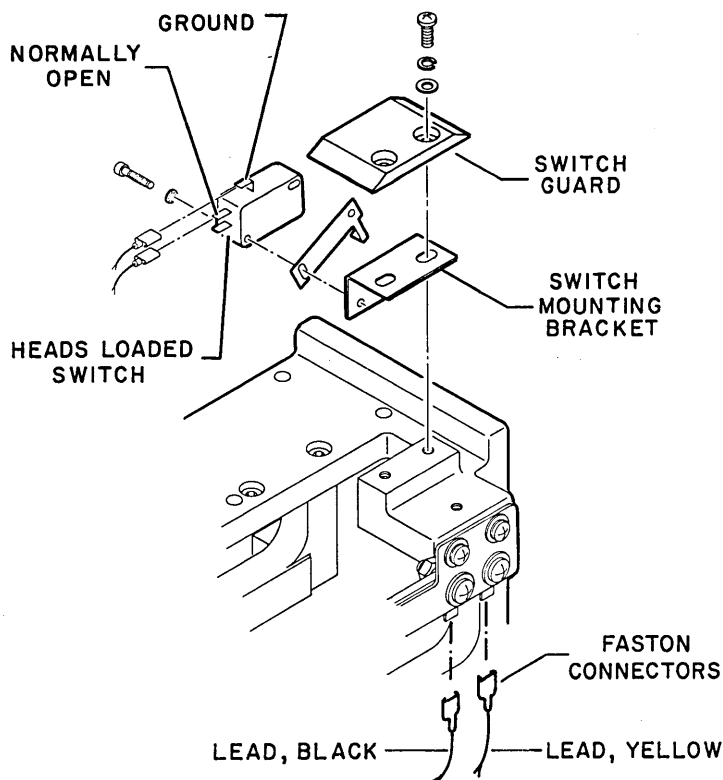
3.16.1 Adjustment

Perform the heads-loaded switch adjustment under any of the following conditions:

- Heads do not fully retract when drive is powered down
 - Unknown cause of a power amplifier or power amplifier fuse failure.
 - Heads-loaded switch is changed or in any way moved
 - Instructed to do so by another procedure
1. Disconnect leadwires from heads-loaded switch, taking note of leadwire placement.
 2. Connect multimeter (set to RX1 scale) between ground contact and normally open contact as shown in accompanying illustration. With carriage fully retracted, multimeter should indicate zero ohms.

NOTE

Measure carriage travel between rear edge of voice coil and inside back edge of magnet assembly.



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Heads Loaded Switch

3. Note measurement from rear of voice coil to inside back edge of magnet assembly with carriage retracted. Manually extend heads very slowly, while observing multimeter. Measure carriage travel at point that multimeter switches from zero ohms to infinity. Difference between fully retracted measurement and heads extended measurement should be 0.125 ± 0.035 in (3.175 ± 0.889 mm).
4. If switch does not transfer within specified measurement, loosen hardware securing switch mounting bracket to rail bracket assembly and adjust switch position.
5. When adjustment is complete recheck carriage travel per step 3. Assuming adjustment is correct, reconnect lead-wires to heads loaded switch.

3.16.2 Removal-Replacement

No special procedures are required for replacement of the heads-loaded switch.

3.16.3 Repair

No repair of the heads-loaded switch is possible. If the switch fails, it must be replaced.

3.17 HEAD ALIGNMENT

Check alignment of the heads under the following conditions:

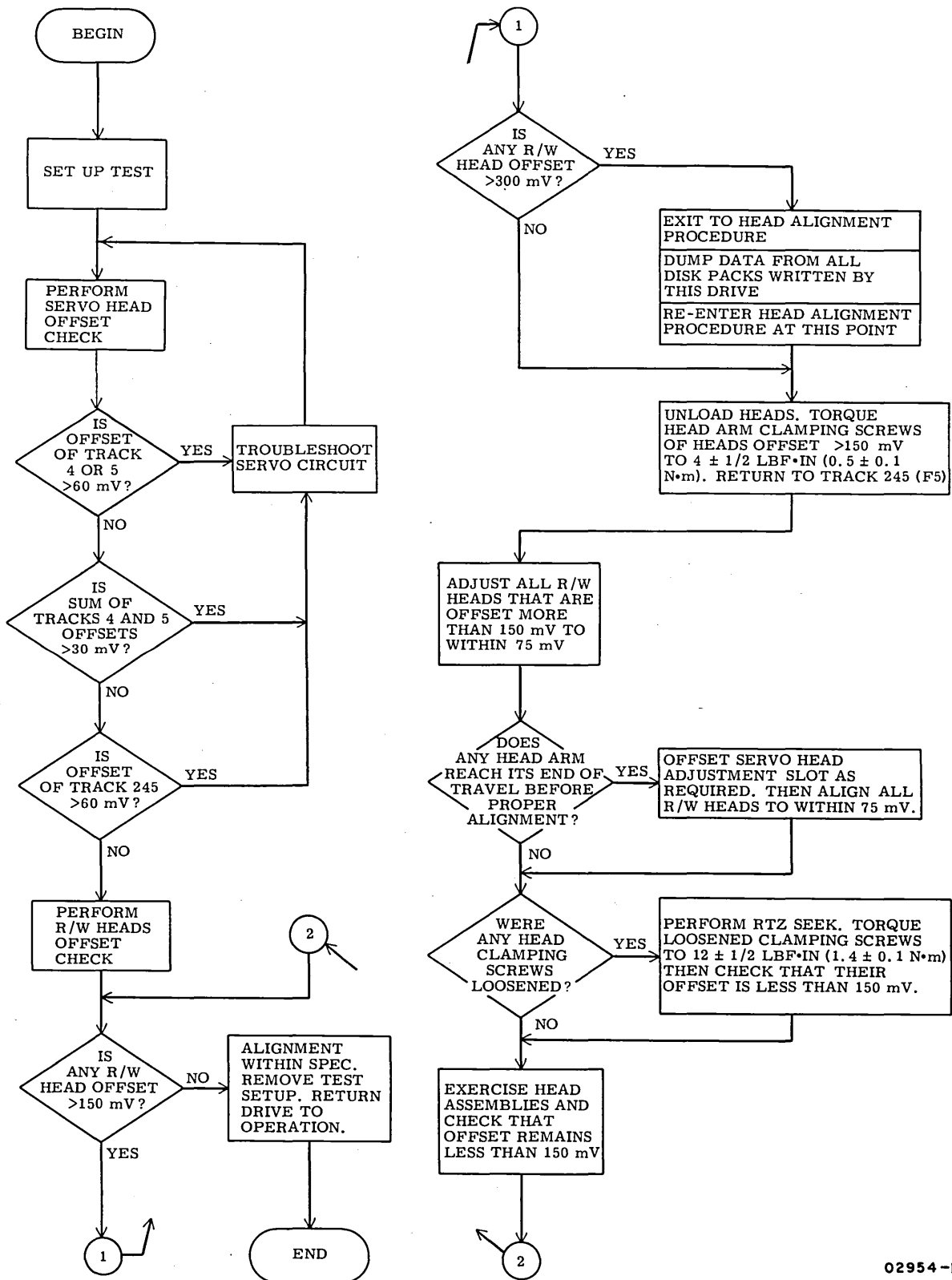
1. During initial installation of the drive.
2. After replacing one or more head arm assemblies.
3. When misalignment of one or more heads is suspected (for example, inability to read a pack written on another drive).

If it is determined that a head is misaligned, the head arm is adjusted to bring the alignment of the head within specifications. The accompanying flowchart summarizes the basic functions of the head alignment check and adjustment procedure.

Head alignment is performed by using a CDC BASIC diagnostic diskette, head alignment card and null meter. Although the null meter method is preferred, the adjustment procedure may be performed with an oscilloscope if the null meter is not available. This procedure assumes use of a flexible disk drive unit, IBM Series/1 operator/programmer panel, and an associated crt display terminal. If a crt display terminal is not part of the system configuration, refer to para 3.29 for information on entering the required parameters using the operator/programmer panel.

Thermal Stabilization - To ensure accuracy during head alignment, it is important that the drive and CE pack be at their normal operating temperature. This requires that they be connected and allowed to operate (pack turning and heads loaded to cylinder zero) for a minimum of 60 minutes. If head alignment is being performed on more than one drive, and provided that the pack was taken immediately from a previous drive, and provided that the drive under test has been operating with heads loaded for a minimum of 60 minutes preceding tests -- then the CE pack only requires a 15-minute stabilization time.

Alignment Tool - Use only a CDC 75018803 head alignment tool. Use of a different tool may cause damage to head arm or carriage. Always inspect the adjustment end of tool prior to use. Tool must be free of nicks and scratches and must have a polished surface where it enters the carriage alignment hole. If any aluminum deposits are present, polish tool surface with crocus cloth. Any other polishing medium will damage the tool. Do not use a defective tool; repair or replace tool if damage exists. When using tool, position it so that pin in end of tool engages alignment slot in head arm. The tool should slip easily through the alignment hole in the carriage and into the alignment slot in the head arm. If anything more than a small amount of force is required to adjust the head, the tool is probably binding in the hole of the carriage. Ensure that alignment tool is kept perpendicular to hole in carriage at all times.



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Basic Head Alignment Check and Adjustment Procedure Flowchart

Carriage Locking - During the alignment procedure (when the heads are over the alignment track) the carriage locking pin and ring assembly must be installed in the ALIGN TRACK LOCK hole in the rail bracket assembly. This locks the carriage in place.

WARNING

Failure to install the pin and ring assembly would allow the carriage to retract if any emergency retract signal were generated. Since your hands are in the actuator during the head alignment procedure, the retract could be dangerous.

CAUTION

Should an emergency retract condition be generated when the locking pin is in the ALIGN TRACK LOCK hole, the following results may occur:

- Blown fuses,
- Tripped dc circuit breaker,
- Blown power amplifier transistors, and
- Unretracted heads on a stationary CE pack. To prevent this condition which results in head crashes, remove the locking pin and manually retract carriage during power down (approximately 10 seconds) after loss of power.

Carefully observe the instructions regarding installation and removal of the carriage locking pin and ring assembly.

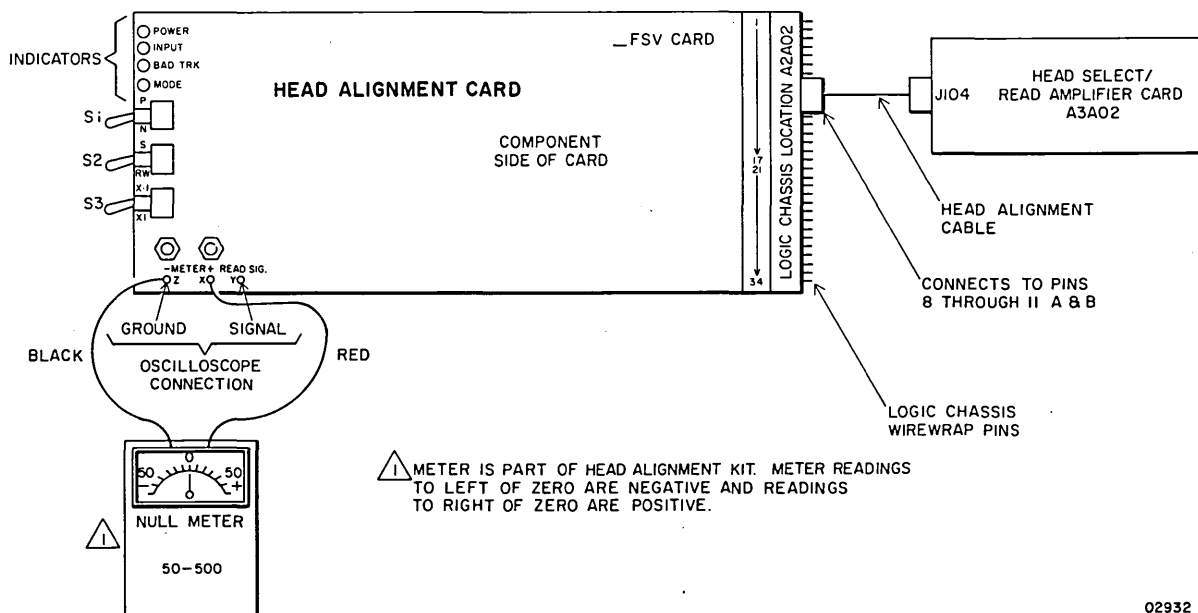
3.17.1 Adjustment

Before performing this adjustment procedure, read and understand the preceding information.

3.17.1.1 Initial Setup

1. Install CE disk pack (para. 3.0.6.2) and perform thermal stabilization.

2. Raise case assembly to maintenance position (para. 3.2.2).
3. Press START switch to stop unit then set AC POWER and POWER SUPPLY circuit breakers to OFF.
4. Install head alignment card into location A2A02.
5. Remove voice coil cover to gain access to carriage should a manual retract become necessary (see caution above).
6. Raise logic chassis (para. 3.2.4).
7. Connect meter cables between head alignment card and the null meter as shown in the head alignment setup. If the null meter is not available a scope may be substituted. Connect the oscilloscope to test point Z (ground) and test point Y (dibit) on the head alignment card.



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Head Alignment Setup

8. Install head alignment cable between A2A02 pins 8 through 11 A and B and A3A02 J104.
9. Set AC POWER and POWER SUPPLY circuit breakers to ON.
10. Press START switch to start drive motor and load heads.

CAUTION

The CE disk pack has odd-even dib-its on tracks 000 through 330 only. Do not attempt to access beyond cylinder 330.

3.17.1.2 Servo Head Check

1. Set S/RW switch on head alignment card to S, and set X.1/Xl switch to X.1.
2. Command a repeat seek between cylinders 240 (F0) and 245 (F5) for a minimum of 30 seconds per the following:

NOTE

Numbers in parenthesis are the hexadecimal values of the cylinder addresses.

- a. Install CDC BASIC diagnostic diskette in flexible disk drive unit.
- b. Place IPL Source switch on Series/l operator/programmer panel to Alternate or Primary position as applicable to enable loading from diskette.
- c. Place Mode switch on Series/l operator/programmer panel to Diagnostic position.
- d. Press Load switch on Series/l operator/programmer panel. IPL portion of diagnostic executes (approximately 30-second execution time). Successful completion is indicated by a RDY ENTER message displayed on the associated display terminal.
- e. Enter B7045 and press ENTER key to call up the track/servo head alignment test.
- f. First prompt to appear is:

DIRECT SEEK? 1=Y 0=N

Enter 0 and press ENTER key.
- g. Next prompt to appear is:

REPEAT SEEK? 1=Y 0=N

Enter 1 and press ENTER key.

h. Next prompt to appear is:

REPLY - FCCCCHH//CCCCHH - IN HEX C=CYL, H=HD

Enter F00F000//00F500 and press ENTER key. Repeat seeks occur between cylinders 240 (F0) and 245 (F5).

i. To stop repeat seeks, enter a 1 and press ENTER key. The DIRECT SEEK? prompt reappears on crt.

3. Command a direct seek to cylinder 004 (4) per the following:

a. Reply to the DIRECT SEEK? 1=Y 0=N prompt as follows:

Enter 1 and press ENTER key.

b. Next prompt to appear is:

REPLY - FCCCCHH - IN HEX C=CYL, H=HD

Enter F000400 and press ENTER key.

c. Enter 1 and press ENTER key. This causes heads to remain at cylinder 004.

4. Observe dibit pattern on oscilloscope (if used). It should be balanced similar to the following scope pattern:

OSCILLOSCOPE SETTINGS

LOGIC GND TO SCOPE GND

VOLTS/DIV

CH 1: 0.2V

CH 2: NOT USED

TIME/DIV

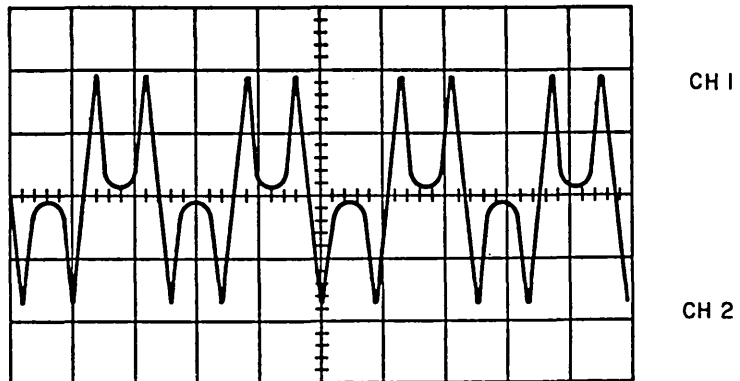
A: 2 uSEC

B: NOT USED

TRIGGERING

A: INTERNAL POSITIVE

B: NOT USED



PROBE CONNECTIONS (USE X10 PROBE)

CH 1: TO DIBITS TEST POINT Y ON HD ALIGN CARD

CH 2: NOT USED

02955

Balanced Dibit Pattern

5. Toggle P/N switch and observe null meter. If both P and N readings are less than 50 mV, the X.1/X1 switch can be set to the X1 position for greater accuracy.

6. Calculate head offset by the following formula:

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

P is meter reading with P/N switch in P position. N is meter reading with P/N switch in N position. Meter readings to right of zero are positive. Meter readings to left of zero are negative.

Example 1: $P = +20, N = +15;$
 $(P) - (N) = (20) - (15) = 5$

Example 2: $P = +20, N = -15;$
 $(P) - (N) = (20) - (-15) = 35$

Example 3: $P = -20, N = +15;$
 $(P) - (N) = (-20) - (+15) = -35$

7. Servo head offset must be within 0 +60 mV. If offset is greater than 60 mV, troubleshoot servo circuit replace A2A03, servo preamp board, or servo head).
8. Make note of offset calculated in step 6.
9. Command a direct seek to cylinder 005 (5) per the following:
- The DIRECT SEEK? 1=Y 0=N prompt remains on crt:
 Enter 1 and press ENTER key.
 - Next prompt to appear is:
 REPLY - FCCCCHH - IN HEX C=CYL, H=HD
 Enter F000500 and press ENTER key.
 - Enter 1 and press ENTER key. This causes heads to remain at cylinder 005.
10. Repeat steps 4 through 7. Individual offsets at track 004 (4) and track 005 (5) must not exceed 60 mV. However, the sum of readings at track 004 (4) and 005 (5) must be less than 30 mV.

Example 1:

$$P_4 = -20, N_4 = +30;$$
$$(P) - (N) = (-20) - (+30) = -50 \text{ mV}$$

$$P_5 = +30, N_5 = -20;$$
$$(P) - (N) = (+30) - (-20) = +50 \text{ mV}$$

$$(P_4 - N_4) + (P_5 - N_5) = (-50) + (+50) = 0 \text{ mV}$$

Therefore, servo head offset in example 1 is within specification.

Example 2:

$$P_4 = -10, N_4 = +30;$$
$$(P) - (N) = (-10) - (+30) = -40 \text{ mV}$$

$$P_5 = +20, N_5 = +30;$$
$$(P) - (N) = (+20) - (+30) = -10 \text{ mV}$$

$$(P_4 - N_4) + (P_5 - N_5) = (-40) + (-10) = -50 \text{ mV}$$

Therefore, servo head offset in example 2 is out of specification and troubleshooting of servo system must be performed (replace A2A03, servo preamp board, or servo head).

11. Command a direct seek to cylinder 245 (F5) per the following:
 - a. Reply to the DIRECT SEEK? 1=Y 0=N prompt as follows:
Enter 1 and press ENTER key.
 - b. Next prompt to appear is:
REPLY - FCCCCHH - IN HEX C=CYL, H+HD
Enter F00F500 and press ENTER key.
 - c. Enter 1 and press ENTER key. This causes heads to remain at cylinder 245.
12. Perform steps 4 through 7.
13. Return switch on head alignment card to X.1 position and continue with Read/Write Head checks of para 3.17.1.3.

3.17.1.3 Read/Write Heads Check and Adjustment

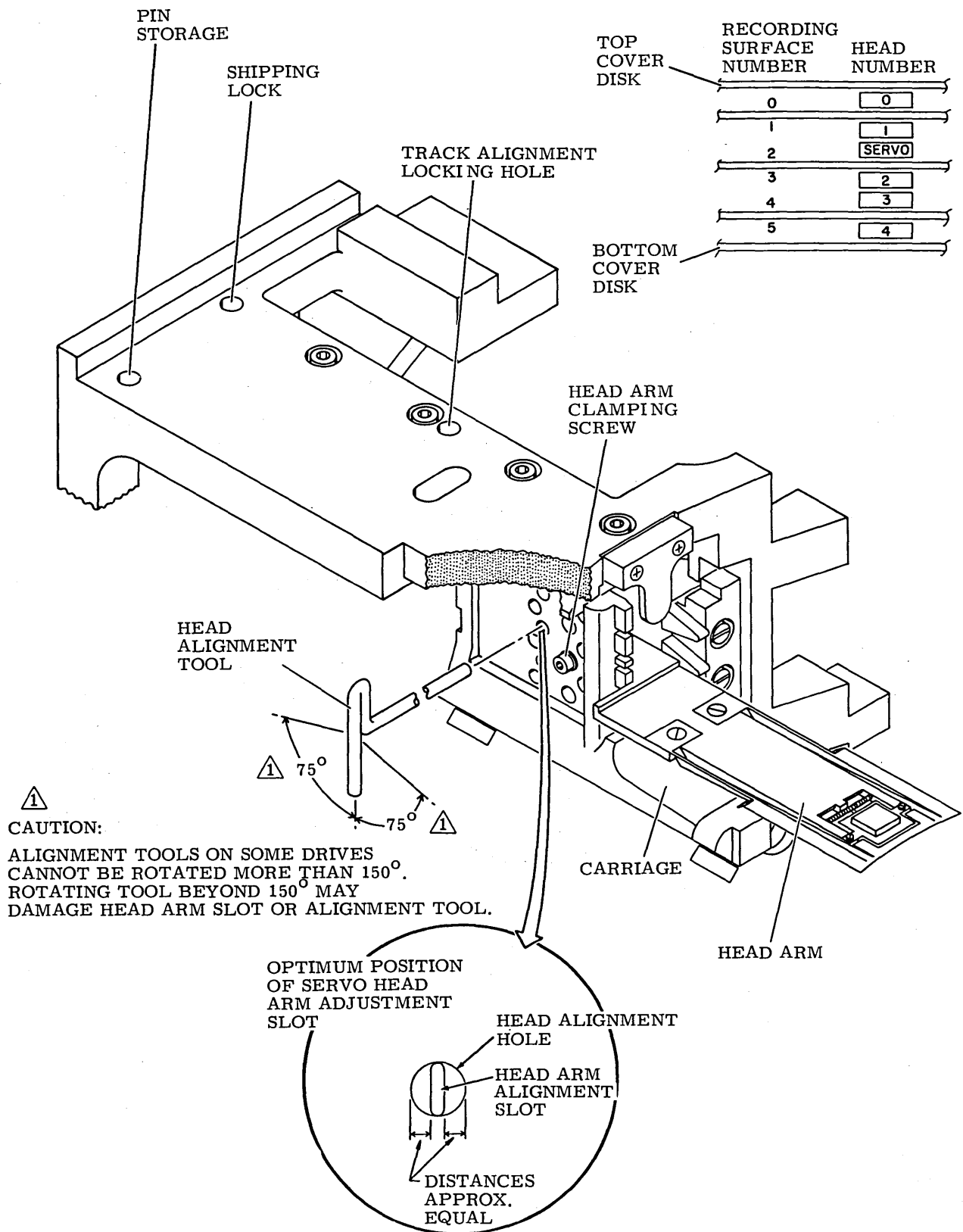
1. Set S/RW switch on head alignment card to RW position. Observe that dibit pattern is similar to that shown in balanced dibit pattern example of 3.17.1.2 (this is signal detected by head 0 previously selected).
2. Calculate head offset of all read/write heads (0 through 4) as described in steps 5 and 6 of 3.17.1.2. Use following procedure to select each head.
 - a. Reply to the DIRECT SEEK? 1=Y 0=N prompt by entering 1 and pressing ENTER key.
 - b. Reply to the REPLY-FCCCCHH-IN HEX C=CYL, H=HD prompt by entering F00F501 (for head 1), or F00F502 (for head 2 etc) as applicable and press ENTER key.
 - c. Enter 1 and press ENTER key. This causes selected R/W head to remain at track 245 (F5).
 - d. Repeat steps a, b, and c until all head offsets have been calculated.
3. If all read/write head offsets are less than 150 mV, then head alignment is within specifications, and drive can be restored to on-line operation as described in steps 18 through 25. If one or more heads is offset more than 150 mV, then proceed to next step.
4. If any read/write head exceeded 300 mV offset, excessive misalignment exists. All packs written with these misaligned heads must have their data transferred to other storage before doing head alignment. Transfer data if required and proceed to next step.
5. If any read/write head offsets were more than 150 mV, then perform this step for those heads to loosen their head clamping screws. It is not necessary to perform this step for head offsets less than 150 mV.
 - a. Press START switch to stop drive motor and unload heads.
 - b. Remove connector support bracket (refer to para 3.17.2). This prevents possible electrical contact between alignment tool and bracket. Contact could cause a short circuit which would damage power amplifier.

- c. Loosen head arm clamping screws securing read/write heads having an offset more than 150 mV, and torque these loosened screws to $4 \pm \frac{1}{2}$ lbf·in (0.5 ± 0.06 N·m).
 - d. Press START switch to start drive motor and load heads.
 - e. Use head alignment routine of DLT 7045 to position heads at cylinder 245 (F5) and select applicable read/write head to be aligned. Cylinder 245 (F5) and head 00 are automatically selected. Respond to prompts to sequentially advance head number as required.
6. Install carriage locking pin in track alignment locking hole (refer to accompanying head arm alignment illustration).

CAUTION

CE disk pack contains specially written data tracks. Although installation of head alignment card automatically activates write protection circuits in the drive, extreme care must be taken when installing or removing head alignment tool and torque wrench to prevent short-circuit contact with write driver board.

7. Install head alignment tool so that tool pin engages head arm alignment slot.
8. Observe oscilloscope and adjust head position for balanced dibit pattern. (Refer to balanced dibit pattern example para 3.17.1.2.)
9. Adjust head until offset is less than 75 mV. Offset is calculated as described in steps 5 and 6 of Servo Head Check (para 3.17.1.2).
10. If head cannot be aligned (null meter reading, in either P or N position, does not pass through zero while alignment is being performed), head may be at its end travel. Check alignment slot of servo head arm (see head arm alignment illustration). Recenter servo head arm alignment slot if necessary, or offset it slightly to allow P or N reading on read/write heads to pass through zero. Perform alignment procedure on all read/write heads if servo head is moved. Servo head arm clamping screw torque specification is $12 \pm \frac{1}{2}$ lbf·in (1.4 ± 0.06 N·m).



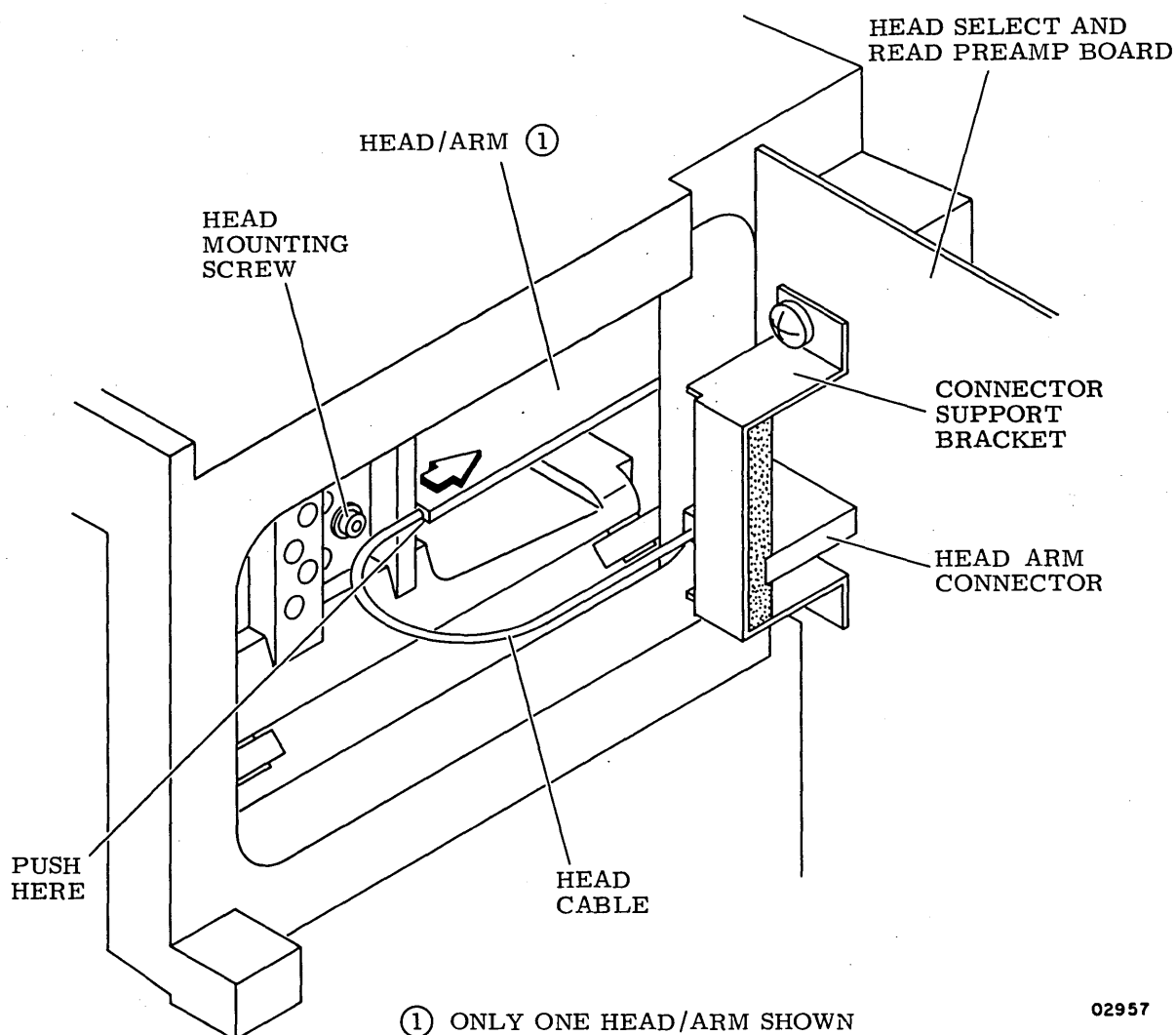
Head Arm Alignment

11. Select next head to be aligned (refer to DLT 7045 for procedure) and repeat steps 3c through 6 of Servo Head Check (para 3.17.1.2) for each head to be aligned.
12. Remove carriage locking pin and install in storage hole.
13. If any head arm clamping screws were loosened to $4 \pm \frac{1}{2}$ lbf·in (0.5 ± 0.1 N·m), perform this step for these heads. Otherwise proceed directly to step 14.
 - a. Press START switch to stop drive motor and unload heads.
 - b. Torque head arm clamping screws to $12 \pm \frac{1}{2}$ lbf·in (1.4 ± 0.1 N·m).
 - c. Press START switch to start drive motor and load heads.
 - d. Command a direct seek to cylinder 245 (F5). Refer to step 2 for procedure, and check alignment of each head that had head clamping screw tightened. If calculated offset exceeds 150 mV return to step 4.
14. Command a continuous seek between cylinders 240 (F0) and 245 (F5) for a minimum of 30 seconds (refer to step 2 of para 3.17.1.2 for procedure).
15. Stop continuous seek by entering a 1 and pressing ENTER key.
16. Unload and load heads (using START switch) a minimum of two times.
17. Perform a direct seek to cylinder 245 (F5), and check the alignment of each head that needed adjustment (refer to step 2 for procedure). If calculated offset exceeds 150 mV, return to step 5.
18. Press START switch to stop drive motor.
19. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
20. Disconnect test setup and remove alignment card.
21. Replace connector support bracket (refer to para 3.17.2).
22. Lower logic chassis to normal operation position.
23. Lower case assembly.

24. Remove CE disk pack.
25. Restore drive to on-line operation.

3.17.2 Removal-Replacement

The following procedure covers removal and replacement of either the servo head or the read/write heads. Remove heads from the carriage only to perform head inspection and cleaning, or as directed by other procedures in this manual. When removing the servo head also remove read/write head number two. This allows room for the head cable and connectors to pass between the adjacent head arms with a lessened chance of doing damage.



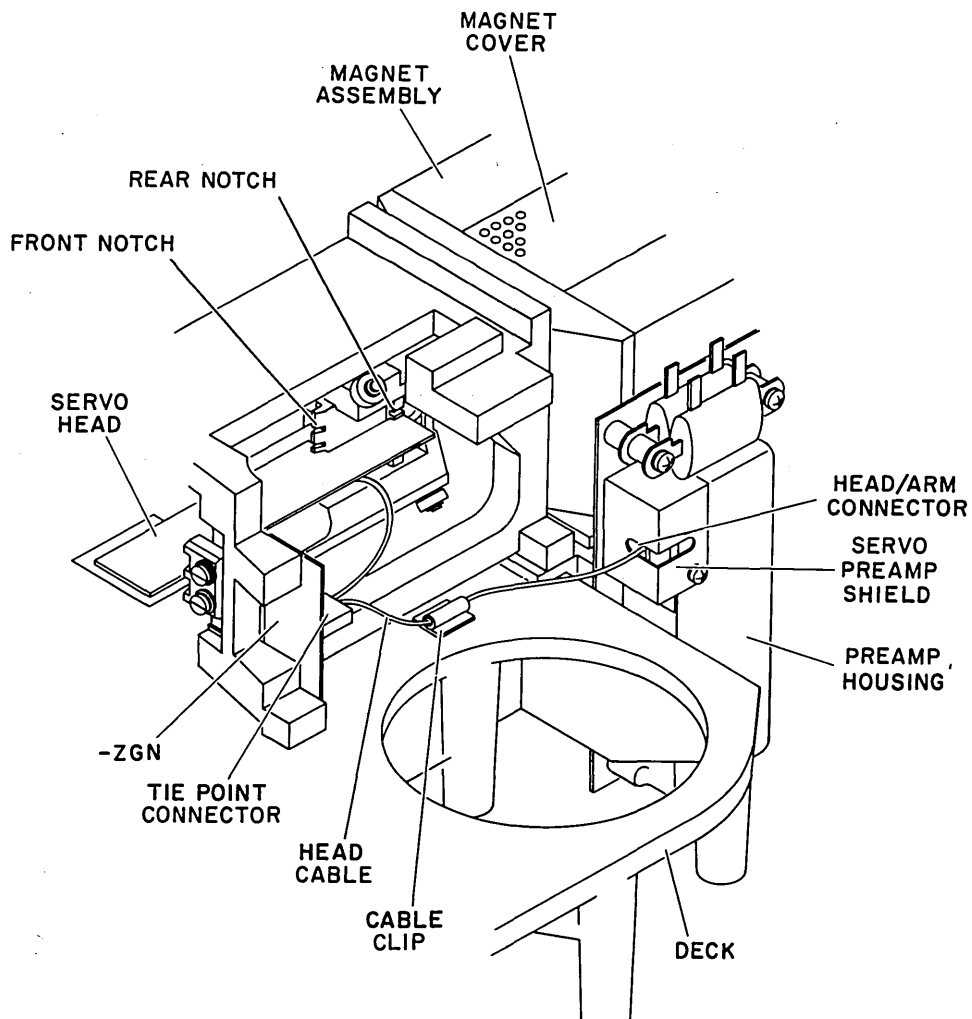
Head Replacement - Left Side View

1. Remove connector support bracket or servo pre-amplifier shield and disconnect head arm connector for subject head (for servo head, also remove head cable from cable slip and disconnect tie point connector).

2. Remove head mounting screw and associated hardware.
3. Manually extend heads far enough to be able to grasp front of head arm from inside pack area.

CAUTION

Head pads and gimbal springs are extremely delicate and easily damaged. Grasp head arms carefully and only by edges of head arm. If head pad is touched, perform head cleaning procedure (para. 3.17.3.2).



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Head Replacement - Right Side View

4. Carefully grasp subject head arm at front and also push gently on rear of head arm as shown. Guide head arm and connector(s) through adjacent head arms and into pack area.
5. Perform required maintenance procedure.
6. Install head arm assembly by fully extending heads into pack area, and guiding head arm connector between adjacent head arms. Use care not to damage adjacent heads.
7. Seat head arm in both front and rear notches on carriage.
8. Carefully position head arm as required in order to insert head mounting screw. Support head arm from opposite side when inserting head mounting screw or forward pressure of wrench may dislodge head arm.
9. Ensure that head arm assembly is aligned in relation to remainder of heads where they protrude into pack area.
10. Tighten screw, securing head arm assembly to carriage, until torque is $12 \pm \frac{1}{2}$ lbf·in (1.4 ± 0.06 N·m).
11. Carefully reconnect head arm connector and replace related hardware removed in step 1.
12. Install a scratch pack and load heads to ascertain that no head crash occurs.
13. Perform head adjustment (para 3.17.1) or for servo head, refer to Head Arm Alignment illustration of para 3.17.1.3 for optimum position of servo head and then check per para 3.17.1.2.

3.17.3 Repair

Repair of the head arm assemblies is limited to inspection and cleaning.

The drive has a positive pressure filtration system that eliminates the need for periodic inspection and cleaning of heads. The heads should be inspected for the following reasons only:

- A problem is traced to a specific head or heads; for example, excessive data errors.
- Head to disk contact is suspected. This may be indicated by an audible ping, scratching noise, or a burning odor when the heads are over the disk area.
- Concentric scratches are observed on the disk surfaces.

- Contamination of pack is suspected (possibly due to improper storage of the pack).
- The pack has been physically damaged (possibly due to dropping or bumping).

CAUTION

Do not attempt to operate the media on another drive until full assurance is made that no damage or contamination has occurred to the media.

Do not attempt to operate the drive with another media until full assurance is made that no damage or contamination has occurred to the drive heads or to the shroud area.

3.17.3.1 Head Inspection

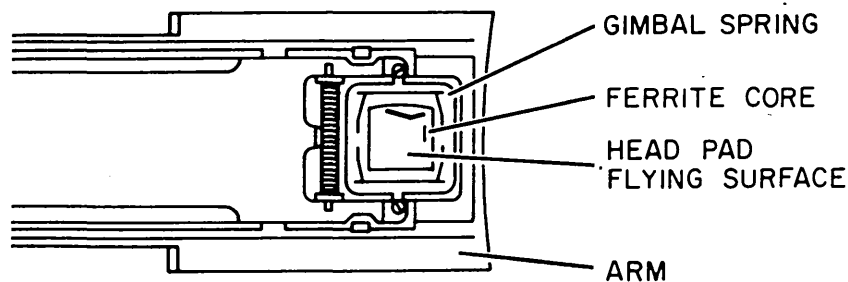
CAUTION

Do not smoke when inspecting or cleaning heads. Use extreme care not to damage the head.

Do not touch the head pad or gimbal spring with fingers or tools.

If head must be laid down, do not allow the head pad or gimbal spring to touch anything.

Remove suspected head as described in para 3.17.2. Refer to the accompanying illustration, observe the head/arm, and perform the suggested remedy as follows:



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Typical Head/Arm Components

1. If reddish-brown oxide deposits exist on head, replace or clean head/arm assembly.
2. If head appears scratched, replace or clean head/arm assembly.
3. If head appears damaged, replace head/arm assembly.
4. If gimbal spring (it holds head pad to arm) is bent or damaged, replace head/arm assembly.

3.17.3.2 Head Cleaning

CAUTION

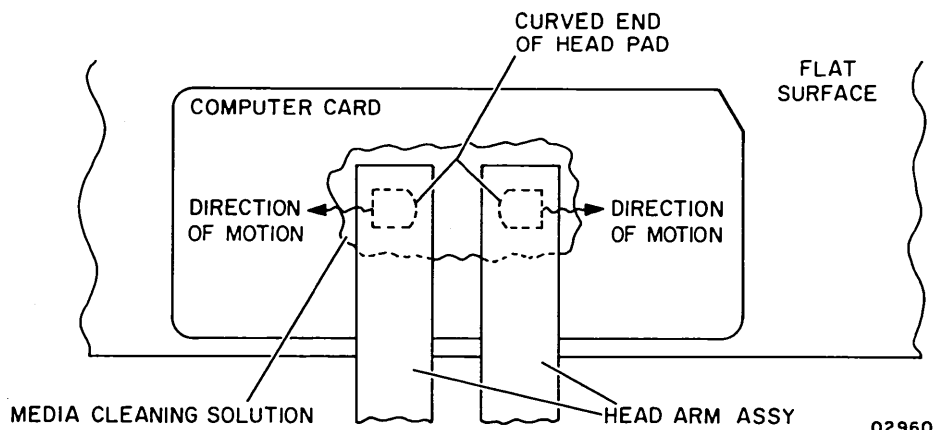
Head cleaning is a delicate procedure that is not recommended. Do not undertake it unless it is absolutely necessary and then only if properly trained.

Refer to Head Cleaning Motion illustration if head cleaning is required and perform following procedure. Use care not to damage any part of head arm assembly.

CAUTION

In the following step, hold the can of dust remover upright (vertical). If the can is not held upright, liquid propellant sprays on the head.

1. Use spray dry dust remover (CDC 95047800) to blow off all loose particles from head pad (flying surface), from the edge of head pad, and from holes in head pad. Hold nozzle one-fourth to one-half inch (6 to 12 mm) from head pad. Spray with a back and forth motion across head pad, making certain to hold can only in a vertical position.
2. Clean a smooth, flat working surface, for example, a glass or formica table top.



Head Cleaning Motion

3. Place a new, unpunched, clean computer card with back side up (printing down) on clean, flat working surface as shown in Head Cleaning Motion illustration.

CAUTION

Inspect the media cleaning solution for contamination, rust, dirt, etc. Do not use contaminated solution. Take care to avoid using excessive cleaning solution. Excessive solution on the head cable may remove the plasticizer and make the cable stiff. A stiff cable reduces the flexibility of the head pad and could cause broken wires.

4. Moisten a small area in center of card with media cleaning solution (CDC 95033502).
5. Very carefully place head pad flying surface on moistened area and move head pad from moistened area to dry area in a zig-zag motion. Move head in a direction away from curved end of head pad. If it is moved in opposite direction, sharp edge of curved end cuts into computer card and prevents movement and proper cleaning.

6. Blow off head again using spray dry dust remover as in step 1.

NOTE

Discoloration of media cleaning solution and computer card indicate that oxide particles are being removed from head pad flying surface.

7. Repeat steps 3, 4, and 5 using a clean computer card and clean media cleaning solution each time until no discoloration on card is present.
8. After discoloration has ceased, inspect head to determine that oxide deposits were removed. If deposits remain but show signs of being removed repeat cleaning procedure until deposits are removed.
9. If oxide deposits cannot be removed, replace head/arm assembly.
10. If oxide deposits were removed and head passes inspection according to Head/Arm Replacement Criteria (para 3.17.3.3), reinstall head.
11. Follow Read/Write or Servo/Head Arm Replacement procedure (para 3.17.2) to install cleaned head or replacement head as required.

3.17.3.3 Head/Arm Replacement Criteria

A head/arm assembly requires replacement if any of the following conditions exist:

1. Consistent oxide buildup on same head, indicating repeated head-to-disk contact.
2. Appreciable oxide buildup that cannot be removed.
3. Scratches on head flying surface.
4. Imbedded particles in head pad flying surface.
5. Bent or damaged gimbal spring.
6. Any apparent physical damage to head/arm assembly.

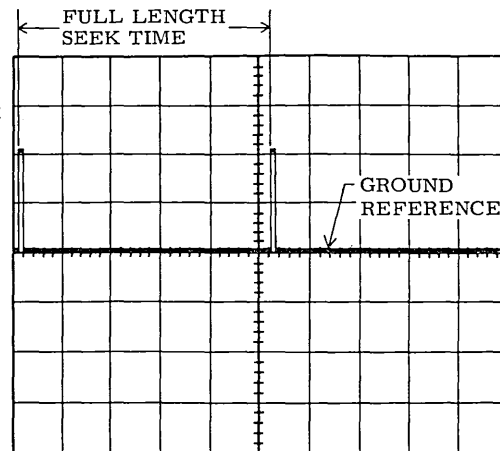
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3.18 VELOCITY GAIN ADJUSTMENT

This procedure provides information for checking and, if necessary, adjusting the servo system velocity signal. If the adjustment cannot be completed satisfactorily, the procedure must be stopped. If this happens, perform trouble analysis.

1. Install scratch pack (para. 3.0.6.2).
2. With drive case closed, run test T7018 to command random seeks for 10 minutes minimum to thermally stabilize drive.
3. Stop random seeks and set up oscilloscope as indicated. Oscilloscope ground references must be as shown.

OSCILLOSCOPE SETUP			
	VOLTS / DIV	TEST POINT	SIGNAL NAME
CH 1 - (USE X 10 PROBE)	0.2 V	A2B09 03A	+ ON CYLINDER
CH 2 - (USE X PROBE)	NOT USED		
	SLOPE / SOURCE	TEST POINT	SIGNAL NAME
TRIGGER A - (USE X 10 PROBE)	+ / EXT	A2B09 07A	- FORWARD SEEK
TRIGGER B - (USE X PROBE)	NOT USED		
TIME / DIV: 10 ms		MODE TRIGGER: CH 1	



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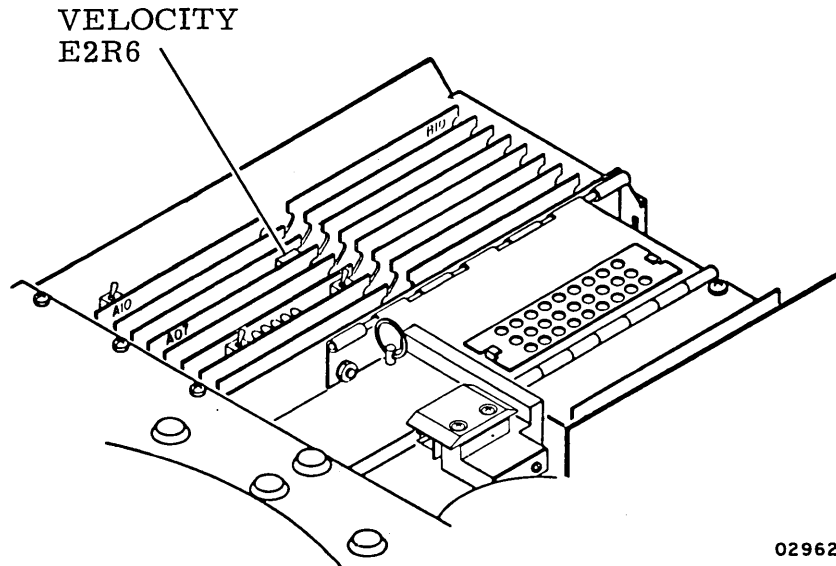
ADDITIONAL SETTINGS: NONE

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Velocity Gain Waveform

4. Load test T7045 and command a repeat seek to cylinder 822 (336₁₆) and adjust oscilloscope trigger level to obtain waveform shown.

5. Measure full-length seek time. Time between On Cylinder pulses should be 52 to 54 milliseconds.
6. If full-length seek time is not as specified, perform velocity gain adjustment. On card A2A07, adjust velocity gain potentiometer E2R6 until time between leading edges of On Cylinder pulses is 52 to 54 milliseconds.



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Velocity Gain Adjustment Location

7. Return drive to normal operation.

3.19 CHECKING DC VOLTAGES

This procedure defines the voltage checkpoints for normal-load and no-load checks of the power supply boards. It also provides a tabulation of common failure symptoms in power supplies. Because spare parts for the components on the supply boards are not provided, no field repair is performed, the board is simply replaced.

NOTE

Output voltage from the +5 V regulated supply falls to 0 volts when the 5 V loads are removed.

VOLTAGE CHECKPOINTS/TOLERANCES

Voltage To Be Checked	Volt-Ohmmeter Connections				Voltage Readings
	Normal Load - P/J1A Mated P/J1B Mated		No Load - P/J1A Separated P/J1B Separated		
	+ Probe	- Probe	+ Probe	- Probe	
+5 *	+5 Faston	GND Faston	Cannot be checked		+5.1 (<u>+0.05</u>)
-5 *	GND Faston	-5 Faston	Cannot be checked		-5.1 (<u>+0.05</u>)
+12 **	A1A02-27A	A1A02-01A	A1A02-27A	A1A02-01A	+12.0 (<u>+0.3</u>)
-12 **	A1A02-01A	A1A02-08A	A1A02-01A	A1A02-08A	-12.0 (<u>+0.3</u>)
+20	+20 Fuse	GND Faston	+20 Fuse	GND Faston	+20.0 (<u>+1.0</u>)
-20	GND Faston	-20 Fuse	GND Faston	-20 Fuse	-20.0 (<u>+1.0</u>)
+42	+42 Fuse	GND Faston	+42 Fuse	GND Faston	+42.0 (<u>+2.0</u>)
-42	GND Faston	-42 Fuse	GND Faston	-42 Fuse	-42.0 (<u>+2.0</u>)

* The +5 and -5 voltages must be measured at the fastons on the backpanel of logic chassis A2.

** Power supply board A1A02 (+12 V) must be fitted to a card extender to permit access to the pins. All other connections are accessible when the logic chassis (A2) is raised to the maintenance position.

COMMON FAILURE SYMPTOMS IN POWER SUPPLIES

Symptom	Probable Cause
1. Noticeable ripple at output (checked with oscilloscope)	Open diode or open filter capacitor
2. Less than specified output (ac input OK)	Shorted diode or shorted filter capacitor
3. Output decreases significantly when load is connected	Open bleeder resistor

3.19.1 Normal-Load Test

1. Turn off POWER SUPPLY breaker.
2. Raise logic chassis (assembly A2) to maintenance position.
3. Remove spanner bar from card extender to gain clearance for components on power supply boards.
4. Remove +20 V p.s. board (AlA02) from assembly A1 and install in card extender. (The +12 voltages cannot be checked under load except at power supply board itself.)
5. Insert extender (and +20 V p.s. board) into slot AlA02.
6. Turn on POWER SUPPLY breaker.
7. Using probe connections from NORMAL LOAD columns of table, check each supply voltage.

3.19.2 No-Load Test

8. Turn off POWER SUPPLY breaker.
9. Separate connectors P/J1B and P/J1A, located at front of A1 motherboard: Press in on plastic locking tabs with fingers of one hand while pulling up on connector with other hand.
10. Turn on POWER SUPPLY breaker.
11. Using probe connections shown in NO LOAD columns of table, check +12 and +20 voltages. (Note that +5 voltages cannot be checked without load.)
12. Turn off POWER SUPPLY breaker.

13. Remove card extender with +20 V power supply board from slot A1A02, and remove the +42 V power supply board from slot A1A01.
14. Remove +20 V power supply board from card extender.
15. Install +42 V power supply board in card extender and insert in slot A1A01.

NOTE

Remaining steps will be easier if you do not install the +20 V power supply board in A1A02 at this time.

16. Turn on POWER SUPPLY breaker.
17. Check +42 voltages, using probe connections shown in NO LOAD portion of table.
18. Turn off POWER SUPPLY breaker.
19. Remove card extender and reinstall +20 V and +42 V power supply boards in A1.
20. Reconnect P/J1A and P/J1B.
21. Refer to DLT 7071 for corrective action.

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3.20 CHECKING AC INPUTS TO POWER SUPPLY BOARDS

This procedure verifies that a given secondary winding of ferroresonant transformer T1 has the requisite voltage to drive its associated power supply board. The procedure should also be performed after a power supply board has been repaired or replaced, and before that board is reinserted in assembly A1, to ensure that the previously malfunctioning supply did not damage the transformer.

NOTE

The three power supply boards constitute the load for transformer T1 and its tuning capacitor, A1C8. When using this procedure to check the ac input to these boards, do not remove more than two boards at any one time. To do so, causes T1 to go into oscillation, producing meaningless readings.

The accompanying table shows the oscilloscope connections for monitoring the ac input to each supply board. The illustration shows the square-wave input and specified voltages, the latter also given in the table.

NOTE

The card pins are numbered 34 through 21, and 17 through 01; pins 20, 19, and 18 are omitted. The pins are given as they appear, left to right, in the card extender that is installed in the appropriate slot in assembly A1 in order to give easy access to the motherboard.

1. Turn off POWER SUPPLY breaker.
2. Determine which power supply board is to have its ac input checked, and remove that board from power supply assembly A1.
3. Insert card extender in A1 slot vacated by removed board.
4. Plug in test scope and set trigger control to LINE. Turn on scope and when horizontal trace becomes visible, center it on graticule.

5. Connect scope's ground probe to appropriate pin given in table.

AC INPUT CHECK POINTS*

Supply To Be Checked for AC Input	Scope Connections		AC Input Voltages (+5%)
	+ Probe (AC Input)	GND Probe (Center Tap)	
<u>+5 V</u>	AlA03-17A AlA03-15A	AlA03-28A	11 V
<u>+20 V</u>	AlA02-23A AlA02-21A	AlA02-01A	22 V
<u>+42 V</u>	AlA01-14A AlA01-12A	AlA01-01A	44 V

*Use card extender for easy access to motherboard pins listed in table

6. Turn on POWER SUPPLY breaker.
7. Connect scope's + probe (Ch1 or Ch2, depending upon scope set-up) to either of the AC INPUT pins given in table.
8. Adjust scope's TIME/DIV control for a stable squarewave trace (see illustration on next page).
9. Adjust scope's VOLTS/DIV control to allow easy mental calculations of voltage represented by trace, as shown against graticule lines.
10. Record voltage from ground reference line on graticule to top and bottom of trace (two readings) as indicated by "E" in illustration.
11. Repeat step 10 with + probe connected to other ac input pin.
12. If both steps 10 and 11 show a symmetrical waveshape (that is, all four voltage readings are the same), and are within 5% tolerance specified in table, T1 windings for that particular supply are OK. If you wish to check no-load dc voltages of supply as outlined in para 3.19, turn off POWER SUPPLY breaker and insert a good power supply board in card extender. Otherwise, remove extender and insert good power supply board in motherboard (assembly A1).

OSCILLOSCOPE SETTINGS

SCOPE GND TO LOGIC GND

VOLTS/DIV

CH 1 - ①
CH 2 - NA

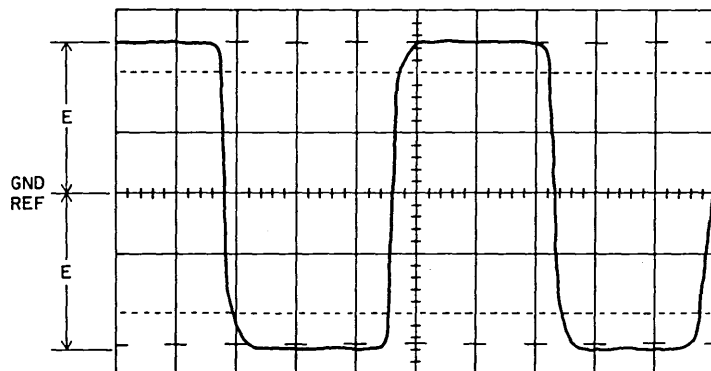
TIME/DIV

A - VARY FOR CONVENIENT TRACE
B - NA

TRIGGERING

A (USE X1 PROBE) - LINE
B (USE X PROBE) - NA

PROBE CONNECTIONS

CH 1 (USE X1 PROBE) - ②
CH 2 (USE X PROBE) - NA① ±5 V: E=11 V
±20 V: E=22 V
±42 V: E=44 V

② SEE TABLE

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T1 Input to Power Supplies

13. If voltage readings obtained in steps 10 and 11 are not the same, (within 5% tolerance), problem is a shorted winding in T1. Replace T1 per step 14.

WARNING

Tuning capacitor AlC8 is charged with 440 volts.

14. Replace T1: Turn off AC POWER and POWER SUPPLY breakers; discharge AlC8 and remove leads connecting it to T1; separate P/J100 (it is necessary first to separate connectors P/J1B and P/J1A); note position of two T1 leads connected to TB1 and remove those leads from TB1. Install new transformer by reversing this process.
15. Check new transformer by repeating steps 5 through 11.

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3.21 TROUBLE SHOOTING HEAT-GENERATED PROBLEMS

CAUTION

If the heads perform an unscheduled retract and the START and FAULT lights are both off, immediately turn off the POWER SUPPLY breaker. This indicates a loss of +5 V and can result in burning up the voice coil. Only after shutting off dc power should you check if the power-down resulted from a failure on the ac line (check if blower is still running).

Heat-related problems are easy to diagnose: they occur only when the drive gets hot, and they disappear when the drive has had a chance to cool off. If you suspect a problem is heat-related, let the drive cool down, then reapply power and attempt to identify the cause of failure as the drive warms up.

Often the troubleshooting period can be shortened by applying artificial heat to the suspected area (a hair dryer is useful here). After diagnosing the problem, correct it in the same manner as any other malfunction.

Heat problems may originate in the power supplies or in one of the various loads. Should a load fault blow a 20 V or 42 V fuse, refer to the applicable "load faults" DLT. If the problem does not blow a fuse, but instead causes a FAULT indicator to light, replace logic cards per the following:

NOTE

If the +5 V supply fails, the FAULT indicators won't work.

<u>FAULT</u>	<u>PROBLEM RELATED TO</u>
Voltage (except +5 V)	A03, A04, A09
On Cyl•(W+R)	A03, B02, B09
Write	A03, A04, B01, A3A03 (Write Driver board)
W•R	A04, B02
Hd Sel	A02, A04, A3A02 (Hd Sel/Rd Amp board)

Losing ± 5 V can be bothersome because those supplies maintain a uniform output voltage right up to their current limit, and then drop to 0 V when that limit is exceeded. Should this happen, check to see if the supply itself is at fault by disconnecting the 5 V load. If the voltage returns to 5 V, the fault lies in the load, not the supply.

3.22 ISOLATING VOLTAGE FAULTS IN THE LOGIC CHASSIS

Use this procedure to isolate +5 V, +20 V, and +42 V faults to cards in the logic chassis or in the logic chassis backpanel wiring (there is no +12 V load in the logic chassis). This test is made by adding cards in the logic chassis one at a time, therefore it is more efficient to check all three loads on a given card at one time (some cards, of course, do not have all three voltage loads).

1. Check that conditions 1 and 2 of DLT 7076-1 are tested satisfactorily before proceeding to step 2. Condition 1 checks servo capacitors; Condition 2, power amplifier.
2. Turn off POWER SUPPLY breaker.
3. Ensure that all three power supply boards are properly seated in power-supply motherboard.
4. Separate PA80 and PA81 from their jacks on logic chassis.
5. Ensure that all other connectors are properly mated.
6. Remove all cards from logic chassis.

NOTE

Only +5 V is used on every card.
If this is not a +5 V problem, only the cards using the faulted voltage(s) need be removed.

7. Turn on POWER SUPPLY breaker. A short in logic chassis backpanel voltage paths blows a fuse. If a fuse blows, raise logic chassis to maintenance position (para 3.2.4) and check backpanel for shorts caused by bent pins etc.
8. Turn off POWER SUPPLY breaker. Start putting cards back in logic chassis one at a time, checking for faults after each has been inserted.
9. Before inserting a card, examine both sides for evidence of arcing across foil. Often, carbon residue around an arc area can be removed with an alcohol swab.
10. Insert selected card properly.
11. Turn on POWER SUPPLY breaker.

12. Use accompanying table to determine which voltages are present on card and check applicable fuses.
13. If step 12 shows a blown fuse, turn off POWER SUPPLY breaker, replace card just installed with a spare and try test again.
14. If step 12 shows that fuses are OK, turn off POWER SUPPLY breaker and, selecting another card, repeat steps 9 through 14.
15. If all cards check good, go to the applicable "load fault" DLT and continue dc-load checkout on associated assemblies.

DC VOLTAGES USED BY LOGIC CARDS

LOCATION A2-	+5	-5	+20	-20	+42	-42
A01	X	X	X	X		
A02	X	X	X	X		
A03	X	X	X	X		
A04	X	X	X	X	X	X
A05	X	X	X	X		
A06	X	X	X	X		
A07	X		X	X		
A08	X	X	X	X		
A09	X	X	X	X	X	X
A10	X	X	X		X	
B01	X					
B02	X					
B03	X					
B04	X					
B05	X					
B06	X					
B07	X	X				
B08	X					
B09	X					
B10	X	X				

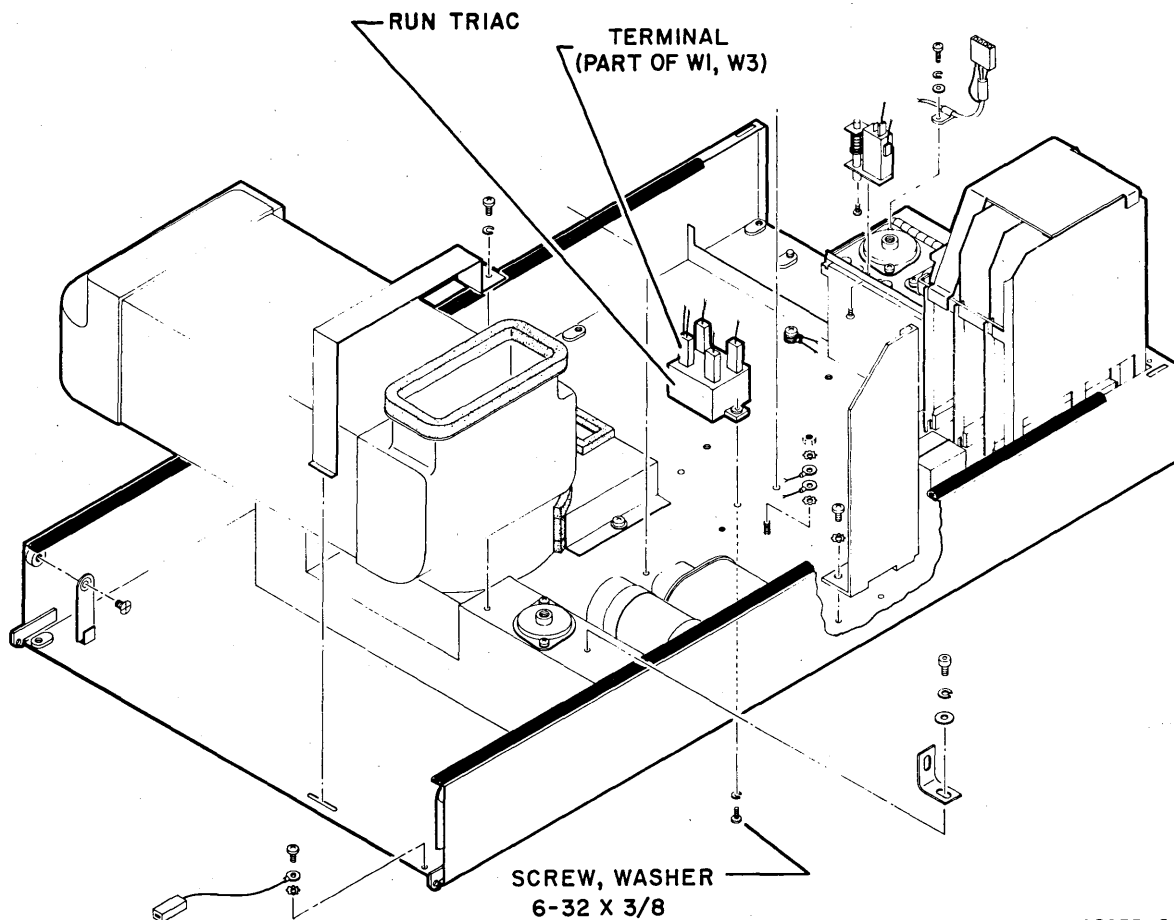
3.23 RUN TRIAC (A1K1)

3.23.1 Removal-Replacement

Tag each wire connected to the run triac before removal to ensure correct reconnection. When replacing the run triac, apply a light coat of dielectric grease to the base of the triac.

3.23.2 Repair-Adjustment

There is no repair or adjustment applicable to the run triac. If the triac fails, it must be replaced.



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Run Triac Location

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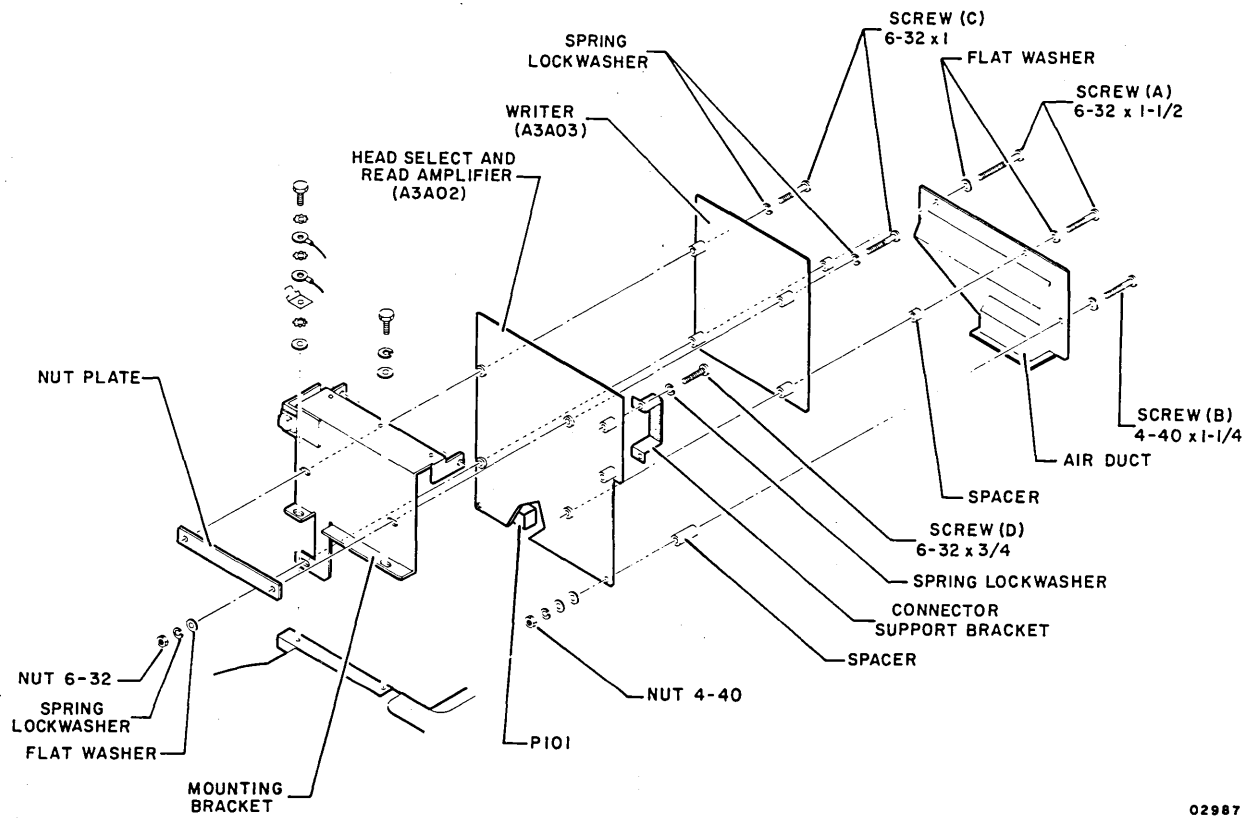
3.24 Head Select and Read Amplifier (A3A02) and Writer (A3A03)

3.24.1 Removal-Replacement

1. Remove power from drive (para. 3.0.5.2).
2. Open case assembly (para 3.2.2).
3. Raise logic chassis to maintenance position (para. 3.2.3).
4. Remove three screws (A and B) mounting air duct to A3A03 and A3A02.
5. Remove screws (C) mounting A3A03 and A3A02 to bracket. Writer assembly (A3A03) can now be replaced. If A3A02 is to be replaced, continue with next step.
6. Disconnect connector J101 from P101 at bottom of A3A03.
7. Remove screws (D) mounting connector support bracket.
8. Disconnect cable leads from this connector going to read/write heads.
9. A3A02 can now be replaced.
10. Perform reverse of this procedure to reinstall these assemblies.

3.24.2 Repair-Adjustment

There is no repair or adjustment of the A3A02 and A3A03 assemblies at the field level. If an assembly is malfunctioning, it must be replaced.



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Head Select and Read Amplifier (A3A02) and Writer (A3A03) Assemblies

3.25 DISK INITIALIZATION PROCEDURE

This procedure describes use of the disk format utility, U70F0 to initialize a scratch disk pack for SMD diagnostic checkout purposes.

NOTE

This version of the utility does not assign alternate sectors.

1. Apply power to storage module drive (SMD). Reference paragraph 3.0.5.1 for power-on procedure.
2. Install a scratch disk pack in SMD to be formatted. Reference paragraph 3.0.6.2 for disk pack installation procedure.
3. Apply power to flexible disk drive unit and install CDC BASIC diagnostic diskette.
4. Place IPL Source switch on Series/1 operator/programmer panel to Alternate or Primary position as applicable to enable loading from diskette.
5. Place Mode switch on Series/1 operator/programmer panel to Diagnostic position to stop on errors, or to Normal position to bypass error stops as desired.

NOTE

If Diagnostic position is selected to stop on error, the Start switch on the operator/programmers panel must be pressed following a detected error in order to continue with the initialization routine.

6. Press Load switch on Series/1 operator/programmer panel. In approximately 30 seconds a RDY ENTER message should display on the crt indicating successful completion of the CPU diagnostics.
7. Enter B70F0 and press ENTER key. The disk format utility will load and request parameter input via operator messages on the crt or via halt codes in the indicators of operator/programmer panel if no crt is present. Refer to DLT 70F0 for parameter input being requested by the halt codes.

8. Following parameter input, the program executes as follows: If Normal mode was selected in step 5, program runs until completion indicated by the following crt message: SMD Sector ID Basic Initialization Complete. Errors are displayed on the crt as detected but the program does not stop. If Diagnostic mode was selected in step 5, program stops on each detected error and requires pressing Start switch to continue with initialization program. Log any sector ID compare errors for future reference.

NOTE

Any sector ID compare error of any cylinder will cause an error stop on associated SMD diagnostics (for example, a sector ID compare error using head 0, sector 0 will affect the read sector ID, incremental, and random seek tests).

<u>Expected Data</u>	<u>Received Data</u>	<u>Register Contents</u>
R0	R4	Flag and sync bytes (FS)
R1	R5	Cylinder bytes (CC)
R2	R6	Head and sector bytes (HS)

The Device ID not 3007 (halt code 70E5) error is selected for detection at all times. The remaining errors cause a program stop only if the Mode switch on the Series/1 programmer panel is in the Diagnostic position. The halt codes are displayed in the indicators of the operator/programmer panel.

3.26 ERROR ABORT MESSAGE

When a diagnostic is aborted, an error abort message is generated. If a display station is assigned as the 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 = Test unit ID of the routine 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 Cycle Steal Status, Appendix A of this manual for significance of the various 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 binary number from 000 to 336₁₆. The first six bits of DCB word 3 are always set to zero.
- DCB Word 4 (Head Selection and Sector Number) -- The two bytes of DCB Word 4 have separate significance. The first, called head selection, is used only with a Start command seek operation. To accomplish a head selection without changing cylinders, bits 6 through 15 of the seek control word are set to zero. The second byte provides the sector number. It consists of a binary number, 00 to 003B₁₆.

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

1. Press Stop switch, Stop indicator lights.
2. Press Level 3 switch.
3. Press R3 register switch. LED indicators will contain starting memory address of the error abort message.

NOTE

The first word at this address contains the test unit ID. The other 23 words shown in the error abort message example 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 in LED indicators.

3.27 CONFIGURATOR TABLE INFORMATION

NOTE

The following conventions are used for operator/programmer panel input:
 (B) = Data Buffer switch
 (I) = Console Interrupt switch

3.27.1 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 para 3.27.3 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),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.

3.27.2 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 3.28 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 Checkout heading in section 2 of this manual for a listing of device types that have the same IDs. To make changes, follow instructions in para 3.27.1.

3.27.3 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.

Byte	Definition
	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.
08 and 09	Alternate console address and type (AATT)
0A through 0E	Not used
0F	Release level of this configuration record

3.27.3.2 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> <p>Bit 2=1 Indicates last entry in configurator table.</p> <p>Bit 3=1 Indicates last entry in this sector</p> <p>Bit 4 through 6 Reserved</p> <p>Bit 7 Last available entry in configurator table.</p> <p style="text-align: center;">NOTES</p> <p>1. Ignore bits 2, 3, and 7 when making adds or changes. The configurator program will set/reset them at sort time.</p> <p>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.</p>
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 00 10

4979 Display Station*

DA 42 00 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 00 04 0E

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).

3.28 COMMON HALT LIST

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

3.28.1 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.

3.28.2 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), 1F, (I), (B), XX00, (I), (I) where: XX = table entry number.
- 383B Enter the Desired Entry. Format is:
AATT, (I), (B), 0000, (I), (B), IDID, (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), 1F, (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), 1F, (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.

3.28.3 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), lF, (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.

3.29 COMMANDS

The commands are described here as they would be entered from the 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 the ENTER key (Carriage Return key on TTY). No commas are required.

3.29.1 Single Character Commands (No Data)

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

<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.

*Commands '0' and '1' apply to test program responses only. Use the 'F' command to answer yes or no to a question in a utility program, for example: F1=yes, F0=no.

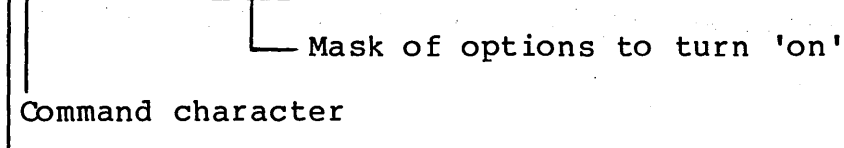
3.29.2 Commands that use a Program ID (Commands B and C).

These commands will load a program. The program ID (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'.

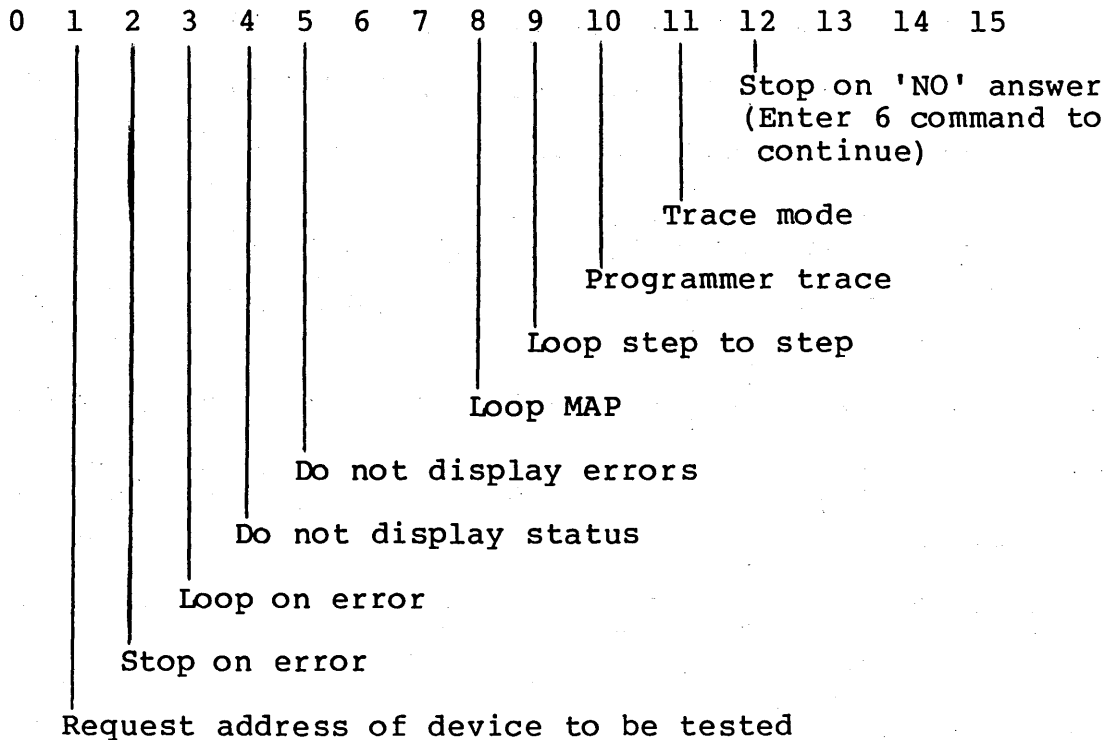
3.29.3 Command to set Option Bits 'On' (Command D)..

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



Number of 16-bit words in mask (always 1) and used only when command is entered from operator/programmer panel.

Option bits are as follows:



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

3.29.4 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 the entry

Enter up to 15 words of data

First word of entry - if less than four
characters they must be in the lower bits.

Number of 16-bit words in this entry must use a value
between 1 and F. Used only when F command is entered
from the operator/programmer panel.



This section contains spare parts lists for the SMD attachment cards and interface kit, and card placement information for all logic cards in the SMD. Refer to the applicable ORMIC spares listing for storage module drive spare parts. For an illustration of the appearance and/or location of these spare parts, refer to the SMD Support Information manual (see preface for publication number).

DWN	R. Trautman	7/78	CONTROL DATA	TITLE	SPARE PARTS LIST		PREFIX	DOCUMENT NO.	REV
CHKD	<i>B. Trautman</i>	7/78		SPL	66306430		F		
ENG	<i>G. K. Kopp</i>	7/78		FIRST USED ON	FA740A		SHEET	1 of 2	
MFG	<i>E. S. Paul</i>	9/78		CODE IDENT	15920				
APPR	<i>E. S. Paul</i>	9/78							

SHEET REVISION STATUS										REVISION RECORD				
2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP							
-	-	-	50001-99	RELEASED CLASS B	-	7/27/78	JAL							
O	O	O	50254	REVISED FIN 1 2 3 4	UJG	11-1-78	DWB							
A	A	A	12757-24	RELEASED CLASS A	/	7/27/78	JAL							
E	F	E	13211	FIN 1 WAS 90445962 FIN 2 WAS 66306912	UJG	11-1-78	DWB							
C	C	C	13273	FIN 1 WAS 90445962 FIN 2 WAS 66306912	UJG	1-27-78	DWB							
D	D	D	13341	FIN 2 WAS 66307637	UJG	4-24-79	DWB							
E	E	E	13411	FIN 1 WAS 66307624	B	5-10-79	DWB							
E	E	E	10117-67	TRANSFER TO ASG	/	12/10/79	DWB							
F	F	F	1012	REVISED PER 1012	/	7/2/78	JAL							

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NOTES: Equipment Configurator.....15631319
Top Level Assembly.....15631320

DETACHED LISTS

CONTROL DATA			CODE IDENT	SHEET	SPL	DOCUMENT NO.	REV
			15920	2	SPL	66306430	F
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	22245094	1	PC	MOD ASSY W/FPLA'S			
2	22245035	1	PC	MODULE ASSY W/FW SMD - MSI V2.0			
3	61408349	REF	PC	CARD EXTENDER ASSY			
4	61408350	REF	PC	CABLE ASSY-CARD EXTENDER			
5	71492620	REF	PC	FRAME - CARD			

DWN	R. Trautman	7/78	CONTROL DATA	TITLE	PREFIX	DOCUMENT NO.	REV.
CHKD	<i>[Signature]</i>	7/78		SPARE PARTS LIST	SPL	66306432	B
ENG	<i>[Signature]</i>	7/78		FIRST USED ON			
MFG	<i>[Signature]</i>	7/78	CODE IDENT	BT313A		SHEET	1 of 2
APPR	<i>[Signature]</i>	7/78	15920				
CF	<i>[Signature]</i>	7/78					

SHEET REVISION STATUS				REVISION RECORD					
REV	ECO	DESCRIPTION	DRFT	DATE	APP				
-	-	5000-99	-	7/27/78	JLH				
A	A	12154-21	1	9/27/78	JLH				
B	B	13232	EE	11-29-78	JAB				

NOTES: Equipment Configurator.....15631329
Top Level Assembly.....15631379

DETACHED LISTS

CONTROL DATA			CODE IDENT	SHEET	PREFIX	DOCUMENT NO.	REV.
			15920	2	SPL	66306432	B
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	90445894	1	PC	CD ASSY 8BAD ECC			
2	90445897	1	PC	CD ASSY 8BBD I/O IN			
3	90445900	1	PC	CD ASSY 8BCD I/O OUT			
4	90445903	1	PC	CD ASSY 8BDD R/W CONTROL			
5	90445906	1	PC	CD ASSY 8BED SERDES			
6	90445909	1	PC	CD ASSY 8BFD COUNTER			
7	61408076	REF	PC	I/O CABLE ASSY-HARNESS			
8	61408077	REF	PC	I/O CABLE ASSY-HARNESS			
9	61408416	REF	PC	PLUG, CONN ASSY PS-1			



This appendix contains decision logic tables (DLTs) for the 63-MB storage module drive. DLTs numbered in the range of 7000 through 7069 are applicable to the diagnostic tests residing on the BASIC diagnostic diskette. Utilities contained on the diagnostic diskette are indicated by DLT numbers 70F0 through 70F3. DLTs 7070 and up are paper-only tables used to supplement the diagnostic test DLTs.

This appendix also contains an explanation of DLT usage, a description of the diagnostic tests and utilities contained on the CDC BASIC diskette, and a description of the cycle steal status words.

Information is organized as follows:

- Explanation of Decision Logic Tables - Describes the format and method of reading the DLTs.
- SMD Diagnostic Test Descriptions - Describes briefly each of the diagnostic tests and utilities residing on the CDC BASIC diskette.
- Cycle Steal Status Words - Describes the significance of each cycle steal status word.
- Decision Logic Tables - Contains a tabulation of DLTs covering the diagnostic tests, utilities and paper-only maintenance information.

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?				-	-	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

02385-1

POWER SUPPLY CHECKS DLT XXYZ

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 READ DLTs

The following is an explanation of how to read and use the DLTs contained in this appendix. First determine the applicable table that applies to your troubleshooting situation and verify the assumptions stated in the upper block of the DLT. The DLT is valid only if all of the stated assumptions are true. The tables are identified by both a title indicating a description of the information contained, and by a specific DLT number.

Two types of DLTs are used. Although both use the same general format, one type is nondiagnostic-program-based or simply referred to as a paper-only type of DLT, the other is based on an associated diagnostic program. The numbering scheme used for identification of the DLTs is summarized as follows:

DLT XXYZ-x

Where: XX = 70 indicates a 63-MB SMD DLT
Y = 0-6 indicates a diagnostic based DLT
Y = 7-9 indicates a paper-only DLT
Z = used for sequencing each DLT
x = used for sequencing individual pages within each DLT

Example: DLT 7000-1 is the first page of a 63-MB SMD diagnostic DLT. The number 7000 reflects the actual test diagnostic number. DLT 7070-1 is the first page of a paper-only DLT, etc.

Paper-Only DLTs

Paper-only 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 preceding DLT table example (figure A-1) shows that two conditions (shaded area) are used to define situation number 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 to be performed would be to replace the power distribution assembly, and if this did not fix the problem, then check for faulty cables etc.

Diagnostic-Based DLTs

Diagnostic-based DLTs are structured to present the actual program flow of the associated diagnostic in the same manner as that of a flowchart. The tables are constructed in a bifurcated format and contain provisions for entry into the table via the actions quadrant in addition to the normal DLT entry method from the conditions quadrant.

Conditions Quadrant Entry

Although these tables can be read in the same manner as described for the paper-only DLTs, the bifurcation process simplifies the method of 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, the response to the first condition specifies one of the situation columns (reading from left to right) that contains a Y or N response. Move down one step in this column and answer the next condition beginning at this point and again reading from left to right in the same manner. Continue this method until the last condition has been answered. This then will be the applicable column to use in performing the action sequence. This may at first appear to be a more cumbersome method of reading a DLT but upon examination, it becomes apparent that only a number of checks equal to the number of conditions in the table is necessary in order to find the applicable action sequence column. For example, a bifurcated table having four conditions would require that only four checks be made in determining the applicable action sequence column. In a nonbifurcated table, a maximum total of 16 checks may have to be made to determine the action sequence column for the same four conditions.

Action Quadrant Entry

The diagnostic based DLTs contain a step number for each item listed in the conditions and actions quadrants. This step number equates to the program step number of the associated diagnostic test. For example, when running a diagnostic test and a detected error is found, 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 action 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 read to the

right until the column is found with an X. Follow this column up into the situations quadrant and observe the various Y and N responses in this column. These then identify each of program test conditions that have preceded the current error stop and the associated response to each test condition performed.

SMD DIAGNOSTIC TEST DESCRIPTIONS

The following paragraphs provide a brief description of the SMD diagnostic tests residing on the CDC BASIC diskette. The first 13 tests are automatically linked together (auto tests) and the remaining tests require operator interaction (manual tests). The auto tests execute consecutively beginning with the test number entered and progressing until the last auto test has been executed or until the first test error is detected. The manual tests require a separate entry for each test to be executed.

NOTE

Tests are initiated by entering a B followed by the appropriate test number. Refer to the heading SMD and Attachment Card Checkout in section 2 of this manual for test initiation procedure.

AUTO TESTS

7000 Channel Interface Test

This test 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 7001.

7001 Attachment/Series 1 Interface Test

This test verifies that proper cycle steal communications can be successfully completed and correct status returned before any valid commands are issued. An invalid (all zeros) DCB is issued expecting the interrupt condition code to be 'unit exception'. If unit exception is received the 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 of the above results are not correct an error message is displayed containing suggested corrective actions, or test 7020 is automatically executed to define the problem in greater detail. This test is automatically linked to test 7002.

7002 Attachment/Disk Interface Test

This downline diagnostic contains two separate tests:

- A wrap and disk reset command test that verifies the capability of the interface to transmit and receive data under both diagnostic commands (8700 and 873F). The test then verifies the disk reset (8404) function.
- A sector/index test that verifies the 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 7003.

7003 Attachment Test

This test verifies that the prepare command can allow 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. It will force an invalid sector and invalid data address and verify the results. This test is automatically linked to test 7006.

7006 Wrap and RAM Test

This test consists of downline diagnostic that:

- Execute a wrap test from the attachment card to the SMD interface. This test verifies the correct operation of the bus and tag lines to and from the drive.
- Execute a Z80 RAM test that verifies the correct operation of the Z80 RAM (addresses 4080 - 43FF) located on the attachment card.
- Execute a buffer memory test that verifies the correct operation of the data buffer (addresses 8800 - 8BFF) located on the attachment card.
- Execute an internal RAM test that verifies the correct operation of the ID RAM used for ID compare operations. This test is automatically linked to test 7007.

7007 SERDES Test, Sector ID and Sync Check

This test consists of downline diagnostics that use a simulated data stream to verify the correct operation of:

- The write sector ID sequence.
- The read sector ID sequence.
- The sync check in a data field sequence.

This test is automatically linked to test 7008.

7008 SERDES Test, Data and ID Skewed

This test consists of downline diagnostics that use a simulated data stream to verify the correct operation of:

- The write data sequence.
- The read data sequence.
- The write sector ID skewed sequence.
- The read sector ID skewed sequence.

This test is automatically linked to test 7009.

7009 SERDES Test, Diagnostic ECC Checks

This test consists of downline diagnostics that use a simulated data stream to verify the correct operation of:

- The read diagnostic sequence.
- The ECC detection circuits.
- The header compare tests.

This test is automatically linked to test 7010.

7010 Servo Test, RTZ and Offset

This test consists of downline diagnostics that verify the offset command and RTZ command. The offset test verifies the proper sequence of signals for the following commands.

- Forward offset
- Reverse offset

- Zero (0) track seek
- Illegal maximum seek (337X)

The RTZ test verifies the proper sequence of signals for an RTZ command. This test is automatically linked to test 7013.

7013 Read Sector ID Test

This test performs a seek to a test cylinder and reads the sector ID. The flag byte is tested for zero. If it is zero, the test will continue reading sector IDs for the complete track and the complete cylinder. An error count is recorded and at the end of the test a check is made for solid and intermittent read errors, single or multiple head failures, or any other type of failures. The results of the above tests may direct the customer engineer to do additional testing. Abnormal errors detected by this test cause an automatic branch to error analysis routine 7020 for additional error isolation.

This test automatically links to test 7014.

7014 Incremental Seek Test

This diagnostic tests the drives capability to perform incremental seeks by:

- Issuing RTZ and verifying the address with the read sector ID.
- Issuing one track seeks until the maximum cylinder is reached. All seeks are verified by read sector ID commands.
- At maximum cylinder address, the direction is reversed and one track seeks are issued until cylinder 0 is reached. All seeks are verified by read sector ID commands.

This test is automatically linked to test 7015.

7015 Seek Tests (All Seeks)

This test performs forward and reverse seeks (all seeks) between cylinders and verifies the cylinder address by:

- Issuing maximum seek forward to cylinder 0336₁₆ and verifying cylinder address.
- Issuing maximum seek reverse -1, maximum seek forward -2, maximum seek reverse -3, etc and verifying cylinder after each seek until seek difference = 0.

- Then RTZ is issued and the sequence continues in the opposite direction beginning with maximum seek forward -1 etc until seek difference = 0.

This test automatically links to test 7016.

7016 Seek Tests (Random)

This test performs seeks starting at RTZ and issuing 2,000 random seeks. The cylinder address is verified after each seek.

This test completes the automatically linked tests.

ERROR ANALYSIS TESTS

7020 Error Analysis Routine for ISB = 8016

This error analysis routine is executed when an abnormal condition is detected in test 7001. 7020 will do a cycle steal status and determine which error code is contained in status word 3. A message is then displayed containing the error code and probable causes of error. If the solutions suggested do not correct the error condition, reference is usually made to a paper only DLT for additional troubleshooting suggestions.

7021 First Seek

This is a downline loaded diagnostic that verifies the correct operation of the first seek (power up), heads load operation. This is not a simulated operation. This test requires operator response.

7022 Read Sector ID Scope Loop Routine

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

R4 = Sync and flag bytes

R5 = Cylinder bytes

R6 = Head and sector bytes

R7 = Condition codes received after the read sector ID command

The program can be restarted by pressing the Start switch on the operator/programmer panel. If the Mode switch is in the Normal position, the program will continue to loop until a one or zero is entered via the assigned console. Entering a one causes a return to the beginning of the program for new parameter input. Entering a zero terminates the program.

7023 Write Sector ID Scope Loop Routine

This error analysis routine provides a diagnostic scope loop while writing a selected sector ID. If the Mode switch on the operator/programmer panel is in the Diagnostic position, the program will stop on error with the condition code in Register 7, Level 3. If no error occurs, program will loop until a one or zero is entered. When the Mode switch is in the Normal position, the program continues to loop (errors are ignored) until a one or zero is entered via the assigned console. Entering a one causes a return to the beginning of the program for new parameter input. Entering a zero terminates the program.

7024 Read Sector ID Routine

This error analysis routine reads a selected sector ID, displays the ID data on the console, and stores the ID data beginning at a fixed memory location called TURESUL (18C8₁₆). The information contained 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

7025 Write Sector ID Routine

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

7026 Read Data Routine

This error analysis routine reads one sector of data from the selected cylinder, head, and sector address specified by the input parameters. The sector data is then displayed on the assigned console. If an error is encountered while reading data, the error information is displayed on the assigned console.

7027 Write Data Routine

This error analysis routine writes one sector of data at the selected cylinder, head, and sector address specified by the input parameters. The data written is displayed on the assigned console. If an error is encountered while writing data, the error information is displayed on the assigned console.

7028 Write/Read Compare Data Routine

This error analysis routine writes one sector of data using the data pattern selected via the input parameters. The sector data is then read back into a second buffer. The write and read buffers are then compared. If the buffer data is not equal, an error is displayed on the assigned console. The data buffer contents are displayed on the assigned console at the completion of this test.

READ/WRITE/HEAD SELECT ROUTINES

7030 Write/Read Data Test

This test verifies the ability of the SMD to write and read various data patterns in the data field correctly. The CE is asked to respond yes or no to the question "do you want to write on this disk pack". If the response is no, the test terminates. If the response is yes, the test seeks to the 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 all bits compare, the testing operation is repeated for all heads of the test cylinder. If an error is detected, an error message is generated indicating the failing head, whether the error was during write or read, type of failure, and data pattern being used. Error information may direct the CE to specific error analysis routines for more definition of the problem. This test requires operator response.

7035 Command and Sequence Test

This test issues a sequence of chained commands. The sequence is: recalibrate, seek, seek head. After the chain is completed the ending condition code is examined for correct results. If it is not correct, an error message is displayed containing suggested corrective actions to be performed. This test checks the firmwares capability to chain DCB's.

7040 Error Correction Code Test

This test verifies the ability of the SMD and attachment feature to correct data errors up to four bits in length. It also verifies that it will not correct errors greater than four bits in length. The errors are created in various areas of the data and ECC fields. Errors are tested using both single and multiple sectors. The data is read back by issuing a read short command and status is checked for valid contents. The errors are generated using first one bit bad and increasing to five bad bits. This test requires operator response.

7045 Servo Adjustment and Head Alignment Routine

This utility allows the customer engineer to perform servo and head alignment adjustments to the SMD through the use of software looping. The various software loops provided are:

- Direct seek with recalibrate back to cylinder 0.
- Repeat seeks between any two cylinders.
- Incremental seeks, forward and reverse.
- Head alignment-positions selected head to the test cylinder.

No read sector ID is done after any seeks, and error checking is bypassed. The CE is asked to input all seek values and the loops will continue to run until the CE responds with a 1 to stop the loop or a 0 to terminate the test. During the head alignment routine, all CE responses must be entered as F01 for yes, or F00 for no. This routine tests for recalibrate errors, seek to test cylinder errors, and head seek errors. If no errors are detected, the routine automatically selects head 00. The head number may then be incremented sequentially to any desired head.

7050 Write Sector ID Test

This test verifies the write sector ID command results. The test will seek to a test cylinder and asks the CE if a write sector ID can be allowed on the disk pack. If not, the test ends. If yes, the 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 data bytes, each containing data patterns of first FF, then AA, 55, and 00. These patterns are read back and verified. This procedure is repeated for all heads in the test cylinder. An error count is totaled during the test. At the end of testing, it is determined if errors occurred on one or multiple heads, and if the errors are solid or intermittent. The original sector ID data is then rewritten to the original sector. This test requires operator response.

7060 Read Sector ID Skewed Routine

This program can be used to read a selected sector ID skewed and display the ID data on the alternate console. The ID data is stored in a fixed memory location called TURESUL (18C8₁₆). The information in TURESUL 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

7061 Write Sector ID Skewed Routine

This program can be used to write a selected sector ID skewed with a selected ID data pattern. The written ID data pattern is then displayed on the alternate console. This routine can be used for changing the sector ID when a defective sector is found.

UTILITIES

70F0 Disk Initialization Routine

This utility performs basic disk pack initialization necessary for diagnostic checkout purposes only and does not format pack for customer use. The 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, the program will generate a prompt for the ID data that is to be written on the disk pack. If an error condition occurs during a write or read operation, an appropriate message will accompany 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, the expected ID data is stored in R0, R1, and R2 and the received ID data is stored in R4, R5, and R6. Upon restarting the CPU, the program will continue to verify the 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 the Normal position). Refer to para 3.25 for operating instructions.

70F1 Disk Data Integrity Routine

This utility performs read verify operations on a disk pack of unknown data. The program verifies all primary and alternate sectors. The following cycle steal status word 1 errors are identified; no record found (bit 3), sync check (bit 1), and CRC error (bit 8). Absence of these status bits is indicated by error stop 706C and the error status is reported in the error abort message. When ECC errors are detected, the cylinder, head, and sector containing the error is displayed on the assigned alternate console. With the Mode switch in the Diagnostic position, the program will stop after each error. Error information is then contained in the following registers:

- R4 = Cylinder
- R5 = Head
- R6 = Sector
- R7 = Error (ECC) count

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

70F2 Data Strobe and Track Offset Routine

This utility allows reading data from cylinder 0336₁₆ using the following selectable margins:

- Forward or reverse offsets
- Early or late data strobes

The device address is selected by the operator at program initiation. The read verify command is used to read the data. With the Mode switch in the Diagnostic position, the program will stop after each error. Error information is then contained in the following registers:

- R4 = Cylinder
- R5 = Head
- R6 = Sector
- R7 = Error (ECC) count

Upon restarting the CPU, the program continues reading the data from cylinder 0336₁₆.

70F3 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. It is selected via the Series/1 primary/alternate IPL source switch. Presently, diagnostic IPL capabilities exist only on the FA740-B (LSI) attachment card. Use of this utility to verify the IPL logic of an FA 740-A (MSI) equipment will result in a false error condition.

CYCLE STEAL STATUS WORDS

A Start Cycle Steal Status command transfers status information to the Series/1 processor. Significance of the various status words is described in the following paragraphs. Refer to para 3.26 for the procedure to be used to obtain the cycle steal status words during an error abort when using the operator/programmer panel as the alternate console.

CYCLE STEAL STATUS WORD 0 (Residual Address)

When a read operation is halted, the processor storage address where the last cycle steal of data occurred remains in the address counter of the attachment card (controller). 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 the disk unit attempted to read or write during a data operation that ended early due to an error. Bits 0 through 9 of the word are set to zero and bits 10 through 15 are set to the sector number. The exception condition code, 010 is presented at interrupt service time. If the 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 the 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 sectors 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 found*	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 listed 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 ¹³ 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 ₁₆ .
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 ¹³ 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 ₁₆ .
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 ¹³ 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 ₁₆ .
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 ₁₆ . 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 ₁₆ .
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 ₁₆ .
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 ₁₆ .
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 ₁₆ .
5D	10	DCB specification check	The physical sector count expressed in byte 0, word 2 of a read immediate DCB is greater than 003B ₁₆ .
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 ₁₆ .
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. These are reserved for future diagnostics use.

NOTICE

Before executing diagnostic tests, read and understand the following:

- Diagnostic test execution assumes that correct voltages are present within the SMD and Series/1. Refer to the paper-only DLTs for troubleshooting power faults in the SMD. Refer to Installation and Checkout, section 2 of this manual, 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 the SMD device address (refer to attachment card installation instructions, section 2 of this manual).
- 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 16K of memory).
- 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 head alignment procedure 3.17.

This is the first of a series of auto diagnostic tests. Initiation is performed by entering B7000 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 ₁₆ . 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 ₁₆ . CC=7?	-	-	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 011 Prepare cmd (60), I bit off with FFFE ₁₆ . 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 7000-2.	-	-	-	-	-	-	-	-	-	-	-	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 (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).

This is a continuation of DLT 7000-1.

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								
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 T7001 (DLT 7001).	-	-	-	-	-	-	-	-	X
<p>① Before replacing card, disconnect Bus In and Bus Out cables from attachment card and again rerun test. If test error still occurs, replace attachment card. If test runs OK, troubleshoot SMD interface logic and I/O connections.</p> <p style="text-align: center;">NOTE</p> <p>The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p>									

This test is automatically linked from test 7000. Some errors cause an automatic branch to error analysis routine 7020 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 7000. If error persists, go to DLT 7081.	X	-	-	-	-	-	-
Step 004 Not CC=07 after device reset. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7081.	-	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 7081.	-	-	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 7081.	-	-	-	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 7081.	-	-	-	-	X	-	-
Step 012 Branch to test 7020 (DLT 7020).	-	-	-	-	-	X	-
Go to DLT 7001-2.	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).							

This is a continuation of DLT 7001-1.

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 7001-3).	X	-	-	-	-	-
Step 020 Cycle steal status word 1 is not zero. Reseat/replace attachment cables/card. ① Run test 7000. If error persists, go to DLT 7081.	-	X	-	-	-	-
Step 022 Cycle steal status word 2 is not zero. Reseat/replace attachment cables/card. ① Run test 7000. If error persists, go to DLT 7081.	-	-	X	-	-	-
Step 024 Cycle steal status word 3 is not 0042. Reseat/replace attachment cables/card. ① Run test 7000. If error persists, go to DLT 7081.	-	-	-	X	-	-
Step 025 Invalid error. Rerun auto tests. If error persists, call for assistance.	-	-	-	-	X	-
Step 026 Branch to test 7002 (DLT 7002).	-	-	-	-	-	X
<p>① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p>						



This test is automatically linked from test T7001.

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 7002-3.	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 card(s) A2B01, A2B03 and check I/O cables.	-	-	-	X	-	-	-	-	-	-	-	-
Step 030 Do action listed for step 031.	-	-	-	-	X	-	-	-	-	-	-	-
Step 029 Replace logic card A2B03.	-	-	-	-	-	X	-	-	-	-	-	-
Step 028 Replace logic card(s) A2B03, A2B05, A2B06, A2B04.	-	-	-	-	-	-	X	-	-	-	-	-
Step 027 Replace logic card A2B04.	-	-	-	-	-	-	-	X	-	-	-	-
Step 026 Replace logic card A2B03.	-	-	-	-	-	-	-	-	X	-	-	-
Step 025 Replace logic card A2B04.	-	-	-	-	-	-	-	-	-	X	-	-
Step 024 Replace logic card A2B04.	-	-	-	-	-	-	-	-	-	-	X	-
Go to DLT 7002-2.	-	-	-	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual)												

This is a continuation of DLT 7002-1.

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 card(s) A2B04, A2A10, A2B09, A2A08, A2A04.	X	-	-	-	-	-
Step 022 Replace logic card(s) A2B06, A2A04, A2B09, A2B03.	-	X	-	-	-	-
Step 021 Do action listed for step 022.	-	-	X	-	-	-
Step 020 Replace logic cards A2B06, A2B01, A2B03.	-	-	-	X	-	-
Step 019 Replace logic card A2B03, A2B05. ①	-	-	-	-	X	-
Step 018 Illogical error. Rerun test. If error persists, rerun CPU tests (press Load switch on Series/1).	-	-	-	-	-	X
<p>① Check to see that P.C. card in position B05 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 7002-2.

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 T7003 (DLT 7003).	X	-	-	-	-	-	-	-	-	-
Step 035 Illogical error. Rerun test. If error persists, rerun CPU tests (press Load switch on Series/1).	-	X	-	-	-	-	-	-	-	-
Step 050 Check Bus In/Bus Out cables, replace attachment card ①. Replace logic card(s) A2B03, A2B02, A2B08. ②	-	-	X	-	-	-	-	-	-	-
Step 049 Replace logic card(s) A2B03, A2B02, A2B08 ②, A2A01, A2A08.	-	-	-	X	-	-	-	-	-	-
Step 048 Replace logic card(s) A2B03, A2B02, A2B08 ②.	-	-	-	-	X	-	-	-	-	-
Step 047 Verify switch settings on A2B08 ②, if correct replace logic card(s) A2B03, A2B02, A2B08 ②, A2A01, A2A08.	-	-	-	-	-	X	-	-	-	-
Step 046 Replace logic card(s) A2B03, A2B02, A2B08 ②.	-	-	-	-	-	-	X	-	-	-
Step 045 Verify switch settings on A2B08 ②, if correct, replace logic card.	-	-	-	-	-	-	-	X	-	-
Step 044 Replace logic card(s) A2B03, A2B02, A2B08 ②.	-	-	-	-	-	-	-	-	-	X
Step 043 Illogical error. Rerun CPU tests (press Load switch on Series/1).	-	-	-	-	-	-	-	-	X	-
<p>① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p> <p>② Refer to Setting Sector Switches, section 2 of this manual for correct switch settings of A2B08.</p>										



This test is automatically linked from test 7002.

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 7000.	-	X	-	-	-	-	-	-	-
Step 009 Attention interrupt after command 7F. Rerun test 7003. 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 7000. If same error, replace SMD attachment card. ①	-	-	-	-	X	-	-	-	-
Step 015 Exception interrupt after command 7F. Go to DLT 7000. If same error, replace SMD attachment card. ①	-	-	-	-	-	X	-	-	-
Step 017 DCB specification check after command 7F. Go to DLT 7000. If same error, replace SMD attachment card. ①	-	-	-	-	-	-	X	-	-
Step 018 Delayed reject on command 7F. Go to DLT 7000. If same error, replace SMD attachment card. ①	-	-	-	-	-	-	-	X	-
Go to DLT 7003-2.	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).									

This is a continuation of DLT 7003-1.

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 7000.	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 7000.	-	-	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 7003-3.	-	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).										

This is a continuation of DLT 7003-2.

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 T7006 (DLT 7006).	-	-	-	-	-	-	-	-	-	X	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).											

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This test automatically linked from T7003.

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				
	1	2	3	4	5
Step 002 Check Bus In and Bus Out cables. Check seating and/or replace Bus In (A2B03), Bus Out (A2B01), Bit Ring Counter (A2B04) 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 SERDES (A2B05), Bus In (A2B03), Bus Out (A2B01) cards.	-	-	-	X	-
Step 009 Branch to test T7007 (DLT 7007).	-	-	-	-	X

① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).





This test automatically linked from T7007.

CONDITIONS	SITUATIONS				
	1	2	3	4	5
Step 001 Did write data test run OK?	N	Y	Y	Y	Y
Step 003 Did read data test run OK?	-	N	Y	Y	Y
Step 005 Did write sector ID skewed test run OK?	-	-	N	Y	Y
Step 007 Did read sector ID skewed test run OK?	-	-	-	N	Y
ACTIONS	SEQUENCE				
Step 002 Replace A2B02, A2B05, A2B04 card(s).	X	-	-	-	-
Step 004 Replace A2B02, A2B05, A2B04 card(s):	-	X	-	-	-
Step 006 Replace A2B02, A2B05 card(s).	-	-	X	-	-
Step 008 Replace A2B02, A2B05, card(s).	-	-	-	X	-
Step 009 Branch to test T7009 (DLT 7009).	-	-	-	-	X





This test is automatically linked from test 7009.

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										
	1	2	3	4	5	6	7	8	9	10	11
Go to step 029 (DLT 7010-2).	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 T7021 to isolate Not Ready problem.	-	-	-	X	-	-	-	-	-	-	-
Step 027 RTZ command not executed. Replace the following logic cards one at a time and rerun test: A2B06, A2B09, A2B08, A2B02.	-	-	-	-	X	-	-	-	-	-	-
Step 026 Seek End failed to drop. Replace the following logic cards one at a time and rerun test: A2B03, A2B09.	-	-	-	-	-	X	-	-	-	-	-
Step 025 On Cylinder failed to drop. Replace the following logic cards one at a time and rerun test: A2B06, A2B09.	-	-	-	-	-	-	X	-	-	-	-
Step 024 Fine not active after 400 ms. Replace the following logic cards one at a time and rerun test: A2B06, A2B09, A2B08 ①, A2A08, A2B10.	-	-	-	-	-	-	-	X	-	-	-
Step 023 Slope not down on RTZ. Replace the following logic cards one at a time and rerun test: A2B09, A2B10, A2B06.	-	-	-	-	-	-	-	-	X	-	-
Step 022 Seek End failed to rise after 25 ms. Replace the following logic cards one at a time and rerun test: A2B03, A2B09, A2A09, A2A08, A2A03.	-	-	-	-	-	-	-	-	-	X	-
Go to step 013 (DLT 7010-2).	-	-	-	-	-	-	-	-	-	-	X

① Refer to Setting Sector Switches, section 2 of this manual for correct switch settings of A2B08.

This is a continuation of DLT 7010-1.

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 the following logic cards one at a time and rerun test: A2B09, A2A09, A2A08, A2A03, A3A05 (servo preamp).	X	-	-	-	-	-	-	-	-	-	-
Step 020 RTZ not up. Replace the following logic cards one at a time and rerun test: A2B09, A2B08. ①	-	X	-	-	-	-	-	-	-	-	-
Step 019 Load and RTZ failed to drop. Replace the following logic cards one at a time and rerun test: A2B09, A2B08 ①, A2A02, A2A08.	-	-	X	-	-	-	-	-	-	-	-
Step 018 Seek End failed to raise during 10 ms delay. Replace the following logic cards one at a time and rerun test: A2B03, A2B09, A2A09, A2A08, A2A03.	-	-	-	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 T7021 for further isolation.	-	-	-	-	-	-	-	X	-	-	-
Step 083 Branch to test T7013 (DLT 7013).	-	-	-	-	-	X	-	-	-	-	-
Step 082 Diag. Mode not set. Verify drive is up and ready, if yes, replace the following logic cards one at a time and rerun test: A2B03, A2B02, A2B01, attachment card ②.	-	-	-	-	-	-	-	-	X	-	-
Step 081 Offset Active not high after offset command issued. Replace the following logic cards one at a time and rerun test: A2B04, A2B02, A2A08.	-	-	-	-	-	-	-	-	-	X	-
Go to step 036 (DLT 7010-3).	-	-	-	-	-	-	-	-	-	-	X
<p>① Refer to Setting Sector Switches, section 2 of this manual for correct switch settings of A2B08.</p> <p>② The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p>											

This is a continuation of DLT 7010-2.

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 the following logic cards one at a time and rerun test: A2B09, A2A09, A2A08.	X	-	-	-	-	-	-	-
Step 079 Seek End failed to drop after offset. Replace logic card A2B09 and rerun test.	-	X	-	-	-	-	-	-
Step 078 On Cylinder didn't rise after 3.1 ms delay. Replace the following logic cards one at a time and rerun test: A2A09, A2A08, A2B10.	-	-	X	-	-	-	-	-
Step 077 Offset Active dropped during offset. Replace the following logic cards one at a time and rerun test: A2B04, A2A08.	-	-	-	X	-	-	-	-
Step 076 Seek End not on after 3.1 ms delay. Replace the following logic cards one at a time and rerun test: A2A09, A2B03.	-	-	-	-	X	-	-	-
Step 075 Offset Active high after offset command dropped. Replace the following cards one at a time and rerun test: A2A08, A2A09, A2B04.	-	-	-	-	-	X	-	-
Step 074 Offset Active not up after reverse offset command. Replace the following logic cards one at a time and rerun test: A2B02, A2A08.	-	-	-	-	-	-	X	-
Go to step 043 (DLT 7010-4).	-	-	-	-	-	-	-	X

This is a continuation of DLT 7010-3.

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							
Step 073 On Cylinder failed to drop after offset issued. Replace the following logic cards one at a time and rerun test: A2B09, A2A09, A2A08.	X	-	-	-	-	-	-	-
Step 072 Seek End failed to drop after offset. Replace logic card A2B09 and rerun test.	-	X	-	-	-	-	-	-
Step 071 On Cylinder failed to rise after 3.1 ms delay. Replace the following logic cards one at a time and rerun test: A2A09, A2A08.	-	-	X	-	-	-	-	-
Step 070 Offset Active dropped during offset. Replace the following logic cards one at a time and rerun test: A2B04, A2A08.	-	-	-	X	-	-	-	-
Step 069 Seek End not on after 3.1 ms delay. Replace the following logic cards one at a time and rerun test: A2A09, A2B03.	-	-	-	-	X	-	-	-
Step 068 Offset Active remains high after offset command dropped. Replace the following logic cards one at a time and rerun test: A2A08, A2A09, A2B04.	-	-	-	-	-	X	-	-
Step 067 Offset Active on after zero track seek. Replace the following logic cards one at a time and rerun test: A2B04, A2A08, A2A09.	-	-	-	-	-	-	X	-
Go to step 050 (DLT 7010-5).	-	-	-	-	-	-	-	X

This is a continuation of DLT 7010-4.

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 the following logic cards one at a time and rerun test: A2B09, A2A09.	X	-	-	-	-	-	-	-	-
Step 065 Seek End failed to drop on zero track seek. Replace the following logic cards one at a time and rerun test: A2B10, A2B03.	-	X	-	-	-	-	-	-	-
Step 064 Seek End not up after 40 us delay. Replace logic card A2B09 and rerun test.	-	-	X	-	-	-	-	-	-
Step 063 Offset Active dropped during offset. Replace the following logic cards one at a time and rerun test: A2B04, A2A08.	-	-	-	X	-	-	-	-	-
Step 062 Offset Active failed to drop after RTZ command. Replace the following logic cards one at a time and rerun test: A2A08, A2A09, A2B04.	-	-	-	-	X	-	-	-	-
Step 061 On Cylinder failed to drop after max seek +1. Replace the following logic cards one at a time and rerun test: A2B08 ①, A2B09, A2B10, A2B03.	-	-	-	-	-	X	-	-	-
Step 060 Seek End failed to drop after max seek +1. Replace logic card A2B09 and rerun test.	-	-	-	-	-	-	X	-	-
Step 059 Seek End not up after 40 us delay. Replace logic card at A2B09 and rerun test.	-	-	-	-	-	-	-	-	X
Step 058 Unexpected attention interrupt. Rerun this test. If this error persists, then run T7021 for further isolation.	-	-	-	-	-	-	-	X	-
① Refer to Setting Sector Switches, section 2 of this manual for correct switch settings of A2B08.									



This test is automatically linked from T7010.

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 7000.	X	-	-	-	-	-	-	-	-	-	-	-
Step 005 Read head XX unsafe status. ① Run test 7000.	-	X	-	-	-	-	-	-	-	-	-	-
Step 007 Read head XX no record found status. ① Go to DLT 7081.	-	-	X	-	-	-	-	-	-	-	-	-
Step 009 Read head XX sync check. ① Possible bad sector ID, reinitialize disk pack (para 3.25) and rerun test.	-	-	-	X	-	-	-	-	-	-	-	-
Step 011 Not ready or power off status. Run test 7000.	-	-	-	-	X	-	-	-	-	-	-	-
Step 013 Read head XX read sector ID error. ① Reinitialize disk pack (para 3.25) and rerun test.	-	-	-	-	-	X	-	-	-	-	-	-
Step 015 Read head XX intermittent read sector ID compare errors. ① Run test 7050.	-	-	-	-	-	-	X	-	-	-	-	-
Step 017 Read head XX solid read sector ID compare errors. ① Run test 7050.	-	-	-	-	-	-	-	X	-	-	-	-
Step 019 Read head XX ECC error. ① Go to DLT 7081.	-	-	-	-	-	-	-	-	X	-	-	-
Step 021 Unexpected status. Branch to test 7020.	-	-	-	-	-	-	-	-	-	X	-	-
Go to step 022 (DLT 7013-2).	-	-	-	-	-	-	-	-	-	-	X	-
Go to step 030 (DLT 7013-2).	-	-	-	-	-	-	-	-	-	-	-	X
① If using operator/programmer panel only, failing head can be determined by running one pass of test 7022 on each head and verifying that the selected head number appears in R6.												

This is a continuation of DLT 7013-1

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				
Step 023 CC=2 on a RTZ command. Replace the following logic cards one at a time and rerun test: A2A03, A2B09, A2B10.	X	-	-	-	-
Step 025 CC=2 on a maximum cylinder seek. Replace the following logic cards one at a time and rerun test: A2A03, A2B09, A2B10.	-	X	-	-	-
Step 027 CC=2 on a head select seek. Failing head=XX ^① . Replace head select card A3A02 (para 3.24), and/or failing head (para 3.17.2).	-	-	X	-	-
Step 029 Test completed OK, branch to test 7014.	-	-	-	X	-
Step 030 Branch to test 7020.	-	-	-	-	X
<p>① If using operator/programmer panel only, failing head can be determined by running one pass of test 7022 on each head and verifying that the selected head number appears in R6.</p>					

This test automatically linked from test T7013.

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 tests T7010 and T7013.	X	-	-	-	-	-	-	-	-
Step 019 (Error 2) This command has been previously tested. If this is first time here, go back to test T7013. If inconclusive, go to U70F1.		X	-	-	-	-	-	-	-
Step 018 (Error 3) Error interrupt on read sector ID command. This function was verified prior to this test. Go back to test 7013. If inconclusive, go to U70F1.			X	-	-	-	-	-	-
Step 017 (Error 4) Flag = 03 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 velocity gain adjustment, para 3.18. If OK replace the following logic cards one at a time and rerun test: A2B10, A2A09, A2A07 (requires adjustment per para 3.18), A2B09, A2A03.	-	-	-	-	X	X	-	-	-
Increment cylinder address and go back to Step 003.	-	-	-	-	-	-	X	-	-
Step 015 (Error 6) Ending status of reverse seek is bad. Check velocity gain adjustment, para 3.18. If OK replace the following logic cards one at a time and rerun test: A2B10, A2A09, A2A07 (requires adjustment per para 3.18), A2B09, A2A03.	-	-	-	-	-	-	-	X	-
Go to DLT 7014-2.	-	-	-	-	-	-	-	-	X

This is a continuation of DLT 7014-1.

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 velocity gain adjustment, para 3.18. If OK replace the following logic cards one at a time and rerun test: A2B10, A2A09, A2A07 (requires adjustment per para 3.18), A2B09, A2A03.	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 velocity gain adjustment, para 3.18. If OK replace the following logic cards one at a time and rerun test: A2B10, A2A09, A2A07 (requires adjustment per para 3.18), A2B09, A2A03.	-	-	X	-	-
Go back to Step 002.	-	-	-	X	-
Incremental seek test ran OK. Branch to test T7015 (DLT 7015).	-	-	-	-	X

This test is automatically linked from T7014.										
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?	-	-	-	-	-	-	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 T7016 (DLT 7016).	X	-	-	-	-	-	-	-	-	-
Step 018 go back to T7013. This error should have been detected in prior tests. Rerun T7010 and T7013.	-	X	-	-	-	-	-	-	-	-
Step 017 go back to Read Sector ID Test T7013. If inconclusive, go to U70F1.	-	-	X	-	-	-	-	-	-	-
Step 016 go back to Read Sector ID Tests T7013 and T7014. If inconclusive, go to U70F1.	-	-	-	X	-	-	-	-	-	-
Step 015 Check velocity gain adjustment, para 3.18. If OK replace the following logic cards one at a time and rerun test: A2B10, A2A09, A2A07 (requires adjustment per para 3.18), A2B09, A2A03.	-	-	-	-	X	-	-	-	-	-
Step 014 This error should have been found by T7014. Run T7014 if not done already. If test ran OK, perform actions of step 015.	-	-	-	-	-	X	-	-	-	-
Step 013 This error should have been found by T7014. Rerun T7014.	-	-	-	-	-	-	X	-	-	-
Step 012 This error should have been found by T7014. Rerun 7014.	-	-	-	-	-	-	-	X	-	-
Step 011 This error should have been found by T7014. Run T7014 if not done already. If test ran OK, replace logic cards listed in step 015.	-	-	-	-	-	-	-	-	X	-
Step 010 Illogical error. Rerun CPU diagnostics (IPL the CDC BASIC diskette).	-	-	-	-	-	-	-	-	-	X



This test is automatically linked from T7015.

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						
	1	2	3	4	5	6	7
Step 013 End of auto tests. Exit.	X	-	-	-	-	-	-
Step 012 Go back to T7010 and T7013. This error should have been detected in prior tests.	-	X	-	-	-	-	-
Step 011 Go back to Read Sector ID Test T7013. This error should have been detected before. If inconclusive, go to U70F1.	-	-	X	-	-	-	-
Step 010 Replace the following logic cards one at a time and rerun test: A2B10, A2A09, A2A07 ①, A2B09, A2A03.	-	-	-	X	-	-	-
Step 009 Go back to Read Sector ID Test T7013. 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 Requires adjustment per para 3.18.



This is an automatically executed error analysis routine for abnormal error conditions detected by test 7001 and 7013.

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 ₁₆ ?	-	-	-	-	-	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 7080.	X	-	-	-	-	-	-
Step 004 Not CC=07 after device reset. Reseat/replace attachment cables/card. ① Rerun auto tests. If error persists, go to DLT 7080.	-	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 7080.	-	-	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 7080.	-	-	-	X	-	-	-
Step 010 Not CC=0703 on cycle steal cmd. Verify I/O cable condition/connections. Reapply power to SMD. Rerun auto tests. If error persists, go to DLT 7080.	-	-	-	-	X	-	-
Go to DLT 7020-2.	-	-	-	-	-	X	-
Step 054 None of the expected codes in word 3 of cycle steal status. Go to DLT 7080.	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).							

This is a continuation of DLT 7020-1

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 7080.	X	-	-	-	-	-	-	-	-
Step 015 Cycle steal status word 3=2B, cable not connected. Verify proper cable connections and rerun auto tests. Reapply power to SMD and rerun tests. If error persists; go to DLT 7080.	-	X	-	-	-	-	-	-	-
Step 017 Cycle steal status word 3=2C, Indeterminate cable parity. Reseat cables and rerun auto tests. Reapply power to SMD and rerun tests. If error persists, go to DLT 7080.	-	-	X	-	-	-	-	-	-
Step 019 Cycle steal status word 3=2D, illegal feature ID. Not a 63 disk. Go to DLT 7080.	-	-	-	X	-	-	-	-	-
Step 021 Cycle steal status word 3=2E, not ready or not on cylinder. Verify pack mounted and/or disk drive is ready. If error persists, go to DLT 7080.	-	-	-	-	X	-	-	-	-
Step 023 Cycle steal status word 3=2F, not on cylinder. Run test 7010.	-	-	-	-	-	X	-	-	-
Step 025 Cycle steal status word 3=30, not ready. Go to DLT 7077.	-	-	-	-	-	-	X	-	-
Step 027 Cycle steal status word 3=31, timer elapsed. Replace attachment card. ①	-	-	-	-	-	-	-	X	-
Go to DLT 7020-3.	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).									

This is a continuation of DLT 7020-2.										
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/out cable connections, replace A2B01 and A2B03, attachment cards. ①	X	-	-	-	-	-	-	-	-	-
Step 031 Cycle steal status word 3=34, cables disconnected. Check for correct cable connections.	-	X	-	-	-	-	-	-	-	-
Step 033 Cycle steal status word 3=35, disk power is not correct. Go to DLT 7080.	-	-	X	-	-	-	-	-	-	-
Step 035 Cycle steal status word 3=36, indeterminate cable parity errors. Verify cable condition/connection. Reapply power to SMD and rerun auto tests. If error persists, go to DLT 7080.	-	-	-	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 card A2B06. Rerun auto tests, if error persists, go to DLT 7080.	-	-	-	-	-	-	X	-	-	-
Step 045 Cycle steal status word 3=44. Device not ready on a start cmd. Go to DLT 7080.	-	-	-	-	-	-	-	X	-	-
Step 047 Cycle steal status word 3=4A, hung during write sector ID. Replace attachment card. ①	-	-	-	-	-	-	-	-	X	-
Go to DLT 7020-4.	-	-	-	-	-	-	-	-	-	X
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Card Installation, section 2 of this manual).										

This is a continuation of DLT 7020-3.

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 7080.	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 7080.	-	X	-	-
Step 053 Cycle steal status word 3=F5, header or data error undefined. Replace attachment card. ① If error persists, go to DLT 7080.	-	-	X	-
Step 054 None of expected codes in word 3 of cycle steal status. Go to DLT 7080.	-	-	-	X
<p>① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p>				

This is a manual test that checks the First Seek capability of the SMD. The drive must initially be in a stopped condition to initiate the test.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Step 001 Are you ready to start the drive? If so, enter 1 (yes) and then press the START switch on the 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								
	1	2	3	4	5	6	7	8	9
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 I/O cables. Replace attachment card ②, A2B01, A2B02, A2B03.	-	-	X	-	-	-	-	-	-
Step 007 Unexpected attention interrupt. Rerun test. If this error persists, replace attachment card ②, A2B03, A2A04, A2B09.	-	-	-	X	-	-	-	-	-
Step 028 Replace logic card(s) A2A10, A2B06. If this fails to correct problem, go to DLT 7070-2.	-	-	-	-	X	-	-	-	-
Step 027 Do action listed for Step 028.	-	-	-	-	-	X	-	-	-
Step 026 Replace logic card(s) A2B09, A2A10, A2B06. If this fails to correct problem go to DLT 7070-2.	-	-	-	-	-	-	X	-	-
Step 025 Replace logic card(s) A2A10, A2B09, A2A07 ③, A2A09, A3A04 (power amplifier, para 3.5).	-	-	-	-	-	-	-	X	-
Go to DLT 7021-2.	-	-	-	-	-	-	-	-	X

① A one minute time limit is allowed for this response.

② The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).

③ Requires adjustment per para 3.18.

This is a continuation of DLT 7021-1

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 card A2B06.	X	-	-	-	-	-	-
Step 023 Replace logic card(s) A2B09, A2B06, A2B08 ①, A2A08, A2A07 ②.	-	X	-	-	-	-	-
Step 022 Replace logic card(s) A2B09, A2B06. If this fails to correct problem, go to DLT 7070-2.	-	-	X	-	-	-	-
Step 021 Replace logic card(s) A2A09, A2A08, A2B09, A2B06. If this fails to correct problem, go to DLT 7070-2.	-	-	-	X	-	-	-
Step 020 Replace logic card(s) A2B09, A2A04, A2B06. If this fails to correct problem, go to DLT 7070-2.	-	-	-	-	X	-	-
Step 019 Replace card(s) A2B09, A2B06. If this fails to correct problem, go to DLT 7070-2.	-	-	-	-	-	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 of this manual for required switch settings of A2B08.</p> <p>② A2A07 requires adjustment per para 3.18.</p>							

This is a manual error analysis routine that provides a diagnostic scope loop while reading a selected sector ID. ① If the Mode switch is in the Diagnostic position, a single pass is made. If the Mode switch is in the Normal position, the program loops until terminated.

CONDITIONS	SITUATIONS								
	1	2	3	4	5				
Step 001 To input read sector ID, enter FCCCCHSS 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 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 style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">For Entry</td> <td style="width: 50%; border: none;">Programmer Panel LEDs Indicate</td> </tr> <tr> <td style="border: none;"><u>FCCCCHSS</u></td> <td style="border: none;"><u>702A</u></td> </tr> </table>						For Entry	Programmer Panel LEDs Indicate	<u>FCCCCHSS</u>	<u>702A</u>
For Entry	Programmer Panel LEDs Indicate								
<u>FCCCCHSS</u>	<u>702A</u>								



This is a manual error analysis routine that provides a diagnostic scope loop while writing a selected sector ID. If the Mode switch is in the Diagnostic position, program will loop until terminated or an error is detected. The error stop condition code will be in Register 7, ② Level 3. If the Mode switch is in the Normal position, the program loops until terminated, errors are ignored.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 To input write sector ID, enter FCCCHSS 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>00₁₆ = Primary sector good 01₁₆ = Alternate sector good 10₁₆ = Primary sector defective 11₁₆ = Alternate sector defective</p> <p>② R7 register contains condition codes</p> <p>③ When entering data via the programmers panel:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">For Entry</th> <th style="text-align: left; border-bottom: 1px solid black;">Programmer Panel LEDs Indicate</th> </tr> </thead> <tbody> <tr> <td>FCCCHSS</td> <td>702A</td> </tr> <tr> <td>FFFCCCHSS</td> <td>702B</td> </tr> </tbody> </table>					For Entry	Programmer Panel LEDs Indicate	FCCCHSS	702A	FFFCCCHSS	702B
For Entry	Programmer Panel LEDs Indicate									
FCCCHSS	702A									
FFFCCCHSS	702B									



This is a manual error analysis routine that reads a sector ID, displays the ID data on the console and stores the data in memory locations starting at 18C8. ①

CONDITIONS	SITUATIONS						
	1	2	3				
Step 001 To input read sector ID, enter FCCCHSS 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. Terminate.		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 style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>For Entry</u></td> <td style="width: 50%; border: none;"><u>Programmer Panel LEDs Indicate</u></td> </tr> <tr> <td style="border: none;">FCCCHSS</td> <td style="border: none;">702A</td> </tr> </table>				<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>	FCCCHSS	702A
<u>For Entry</u>	<u>Programmer Panel LEDs Indicate</u>						
FCCCHSS	702A						



This is a manual error analysis routine that writes a selected sector ID with a selected ID data pattern.

CONDITIONS	SITUATIONS											
	1	2	3	4								
Step 001 To input write sector ID, enter FCCCHSS 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. Parameters entered?	-	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. Terminate.	-	-	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>00₁₆ = Primary sector good 01₁₆ = Alternate sector good 02₁₆ = Primary sector defective 03₁₆ = Alternate sector defective</p> <p>② When entering data via the programmers panel:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%; text-align: center;">Programmer Panel LEDs Indicate</td> </tr> <tr> <td style="border-top: 1px solid black; border-bottom: 1px solid black;">For Entry</td> <td style="border-top: 1px solid black; border-bottom: 1px solid black;"></td> </tr> <tr> <td>FCCCHSS</td> <td style="text-align: center;">702A</td> </tr> <tr> <td>FFCCCHSS</td> <td style="text-align: center;">702B</td> </tr> </table>						Programmer Panel LEDs Indicate	For Entry		FCCCHSS	702A	FFCCCHSS	702B
	Programmer Panel LEDs Indicate											
For Entry												
FCCCHSS	702A											
FFCCCHSS	702B											



This is a manual error analysis routine that reads one sector of data per selected input parameters. Error information is displayed.

CONDITIONS	SITUATIONS						
	1	2	3				
Step 001 To input read data, enter FFFCCCCHSS 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. Terminate.	-	X	-				
Step 004 End of read data command.	-	-	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 When entering data via the programmers panel:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">For Entry</td> <td style="width: 50%; border: none;">Programmer Panel LEDs Indicate</td> </tr> <tr> <td style="border: none;"><u>FFCCHSS</u></td> <td style="border: none;"><u>702B</u></td> </tr> </table>				For Entry	Programmer Panel LEDs Indicate	<u>FFCCHSS</u>	<u>702B</u>
For Entry	Programmer Panel LEDs Indicate						
<u>FFCCHSS</u>	<u>702B</u>						



This is a manual error analysis routine that writes one sector of data per selected input parameters. Error information is displayed.

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
Step 002 Write Data. CC=0703?	-	-	N	Y

ACTIONS	SEQUENCE			
	X	-	-	-
Enter parameters per step 001.	X	-	-	-
Enter data pattern per step 001.	-	X	-	-
Step 003 Not CC=0703 on write data command. Terminate.	-	-	X	-
Step 004 End of write data command.	-	-	-	X

(1) Flag bits FF indicate condition of sector disk surface as follows:

- 00₁₆ = Primary sector good
- 01₁₆ = Alternate sector good
- 02₁₆ = Primary sector defective
- 03₁₆ = Alternate sector defective

(2) When entering data via the programmers panel:

For Entry	Programmer Panel LEDs Indicate
FFFCCCCHSS	702B
FDDDDDDDD	702C



This is a manual error analysis routine that writes one sector of data and compares it with the data read. Error information is displayed.

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. To select full/partial sector write, enter 1=full, 0=partial. (2) Parameters entered?	-	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. Terminate.	-	-	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>00₁₆ = Primary sector good 01₁₆ = Alternate sector good 02₁₆ = Primary sector defective 03₁₆ = Alternate sector defective</p> <p>(2) When entering data via the programmers panel:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">For Entry</th> <th style="text-align: left; border-bottom: 1px solid black;">Programmer Panel LEDs Indicate</th> </tr> </thead> <tbody> <tr> <td>FFFCCCCHSS</td> <td>702B</td> </tr> <tr> <td>FDDDDDDDD</td> <td>702C</td> </tr> <tr> <td>1=full, 0=partial sector</td> <td></td> </tr> </tbody> </table>					For Entry	Programmer Panel LEDs Indicate	FFFCCCCHSS	702B	FDDDDDDDD	702C	1=full, 0=partial sector	
For Entry	Programmer Panel LEDs Indicate											
FFFCCCCHSS	702B											
FDDDDDDDD	702C											
1=full, 0=partial sector												



This is a manual test requiring operator response. Enter B7030 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 7030-2).	-	X	-	-	-	-	-
Step 007 Write/read data error. Go to step 015 this test (DLT 7030-2).	-	-	X	-	-	-	-
Step 009 Write/read data error. Go to step 015 this test (DLT 7030-2).	-	-	-	X	-	-	-
Step 011 Write/read data error. Go to step 015 this test (DLT 7030-2).	-	-	-	-	X	-	-
Step 013 Write/read data error. Go to step 015 this test (DLT 7030-2).	-	-	-	-	-	X	-
Step 014 Write/read data test ran without any errors.	-	-	-	-	-	-	X

This is a continuation of DLT 7030-1.

CONDITIONS	SITUATIONS							
	1	2	3	4	5	6	7	8
Step 015 Result not equal to 4000?	N	Y	Y	Y	Y	Y	Y	Y
Step 017 Result not equal to 2000?	-	N	Y	Y	Y	Y	Y	Y
Step 019 Result not equal to 1000?	-	-	N	Y	Y	Y	Y	Y
Step 021 Result not equal to 0800?	-	-	-	N	Y	Y	Y	Y
Step 023 Result not equal to 0400?	-	-	-	-	N	Y	Y	Y
Step 025 Result not equal to 0200?	-	-	-	-	-	N	Y	Y
Step 027 Result not equal to 0100?	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE							
Step 016 Unexpected error during write data. Hd=xx. ① Run tests 7050, 7027, 7028 for error data.	X	-	-	-	-	-	-	-
Step 018 Unexpected error during read data. Hd=xx. ① Run tests 7013, 7026, 7028 for error data.	-	X	-	-	-	-	-	-
Step 020 File protect is on.	-	-	X	-	-	-	-	-
Step 022 Hd=xx. ① Data compare error. Run tests 7026, 7027, 7028 to determine if write or read error.	-	-	-	X	-	-	-	-
Step 024 Hd=xx. ① Write unsafe, replace logic cards A2B02, A2B07, A2A01, A3A03, A2A04, or run tests 7027, 7028, 7050 for error data.	-	-	-	-	X	-	-	-
Step 026 Hd=xx. ① Read data ECC error. Run tests 7040, 7026, 7028 for additional error data.	-	-	-	-	-	X	-	-
Step 028 Wrong device ID. Run tests 7000, 7001, 7003.	-	-	-	-	-	-	X	-
Go to step 29 (DLT 7030-3).	-	-	-	-	-	-	-	X
① To determine failing head, run test 7028 on each head.								

This is a continuation of DLT 7030-2

CONDITIONS	SITUATIONS			
	1	2	3	4
Step 029 Result not equal to 0080?	N	Y	Y	Y
Step 031 Result not equal to 0040?	-	N	Y	Y
Step 033 Result not equal to 0020?	-	-	N	Y
ACTIONS	SEQUENCE			
Step 30 Multiple head select error. Replace cards A3A02, A2A04, or isolate to head using test(s) 7027, 7028, 7030.	X	-	-	-
Step 32 PLO sync check on write data command. Replace disk pack, servo preamp (A3A05), then A2A01.	-	X	-	-
Step 34 Write gate check. Replace logic cards A2B08, ① A2B03, A2B02, or run test(s) 7027, 7028 for more error information.	-	-	X	-
Step 35 Unidentified error. Run 7000 auto tests.	-	-	-	X
① Refer to setting Sector Switches, section 2 of this manual for correct switch settings of A2B08.				



This is a manual test. Enter B7035 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 (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).



This is a manual test requiring operator response. Enter B7040 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 ECC card (A2B06).	-	X	-	-	-	-	-	-	-
Step 007 Correctable error not corrected in data file. Replace ECC card (A2B06).	-	-	X	-	-	-	-	-	-
Step 009 Correctable error not corrected in data file. Replace ECC card (A2B06).	-	-	-	X	-	-	-	-	-
Step 011 Correctable error not corrected in data file. Replace ECC card (A2B06).	-	-	-	-	X	-	-	-	-
Step 013 Correctable error not corrected in data file. Replace ECC card (A2B06).	-	-	-	-	-	X	-	-	-
Step 015 Correctable error not corrected in data file. Replace ECC card (A2B06).	-	-	-	-	-	-	X	-	-
Step 017 Uncorrectable error not reported in simulated field. Replace ECC card (A2B06).	-	-	-	-	-	-	-	X	-
Go to DLT 7040-2.	-	-	-	-	-	-	-	-	X

This is a continuation of DLT 7040-1.

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 ECC card (A2B06).	X	-	-	-	-	-
Step 021 Uncorrectable error not reported in simulated field. Replace ECC card (A2B06).	-	X	-	-	-	-
Step 023 Uncorrectable error not reported in data field. Replace ECC card (A2B06).	-	-	X	-	-	-
Step 025 Uncorrectable error not reported in data field. Replace ECC card (A2B06).	-	-	-	X	-	-
Step 027 Uncorrectable error not reported in simulated ECC field. Replace ECC card (A2B06).	-	-	-	-	X	-
Step 028 End of test.	-	-	-	-	-	X

This is a manual test requiring operator interaction. Enter B7045 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 7045-2.	-	-	-	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 0336₁₆, however if CE pack is being used, observe the following:</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>The CE disk pack has odd-even dibits on track 000 through 14B only. Do not attempt to access beyond cylinder 014B₁₆.</p> <p>(3) When entering data via the programmers panel:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">For Entry</td> <td style="text-align: center;">Programmer Panel LEDs Indicate</td> </tr> <tr> <td style="text-align: center;">FCCCCHH</td> <td style="text-align: center;">702E</td> </tr> <tr> <td style="text-align: center;">FCCCCHH/CCCCHH</td> <td style="text-align: center;">702F</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>					For Entry	Programmer Panel LEDs Indicate	FCCCCHH	702E	FCCCCHH/CCCCHH	702F
For Entry	Programmer Panel LEDs Indicate									
FCCCCHH	702E									
FCCCCHH/CCCCHH	702F									

This is a continuation of DLT 7045-1.

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 00F5 ₁₆ until a F01 (yes) response is entered. This causes an advance to the next sequential head number.	-	X	-	-	-	-	-
Step 065 Recalibrate error, go to DLT 7010.	-	-	X	-	-	-	-
Step 066 Seek to alignment cylinder error, go to step 001 DLT 7045-1 and do direct seek to cylinder 00F5 ₁₆ using failing head.	-	-	-	X	-	-	-
Step 067 Head seek error, go to step 001 DLT 7045-1 and do direct seek to cylinder 00F5 ₁₆ using failing head.	-	-	-	-	X	-	-
Step 064 Unexpected error. Reload BASIC diagnostic diskette.	-	-	-	-	-	X	-
Step 009 You did not select any of the above, go back to step 001 DLT 7045-1.	-	-	-	-	-	-	X

This is a manual test requiring operator response. Enter B7050 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 8000?	-	-	N	Y	Y	Y	Y	Y	Y	Y
Step 009 Result not equal 4000?	-	-	-	N	Y	Y	Y	Y	Y	Y
Step 011 Result not equal 2000?	-	-	-	-	N	Y	Y	Y	Y	Y
Step 013 Result not equal 1000?	-	-	-	-	-	N	Y	Y	Y	Y
Step 015 Result not equal 0800?	-	-	-	-	-	-	N	Y	Y	Y
Step 017 Result not equal 0400?	-	-	-	-	-	-	-	N	Y	Y
Step 019 Result not equal 0200?	-	-	-	-	-	-	-	-	N	Y
ACTIONS	SEQUENCE									
Step 003 Write sector ID test not executed.	X	-	-	-	-	-	-	-	-	-
Step 005 Device ID is not 3007. Run test 7000.	-	X	-	-	-	-	-	-	-	-
Step 008 All sectors caused errors during initial read. Run read sector ID test 7013. Read head XX problem. ①	-	-	X	-	-	-	-	-	-	-
Step 010 Could not restore sector ID error. Re- initialize disk pack (para 3.25) and run write data test 7030. Read head XX problem. ①	-	-	-	X	-	-	-	-	-	-
Step 012 Error during read sector ID. Reinitialize disk pack (para 3.25 and run read sector ID test 7013. Read head XX problem. ①	-	-	-	-	X	-	-	-	-	-
Step 014 Read sector ID error after write. Re- initialize disk pack (para 3.25) and run read sector ID test 7013. Read head XX problem. ①	-	-	-	-	-	X	-	-	-	-
Step 016 Write gate check. Replace cards A2B08 ②, A2B03, A2B02, else run tests 7024 and 7025 for additional error information.	-	-	-	-	-	-	X	-	-	-
Step 018 Unsafe status during write sector ID. Replace cards A2B02, A2B01, A2A01, A3A03, A2A04, else run tests 7024 and 7025 for additional error information. Read head XX problem. ①	-	-	-	-	-	-	-	X	-	-
Step 020 Sector ID test pattern read compare error. Reseat/ replace write logic cards A2A01, A2A03, A2A04, A2B01, A3A03 (write driver). Read head XX problem. ①	-	-	-	-	-	-	-	-	X	-
Go to step 21 (DLT 7050-2).	-	-	-	-	-	-	-	-	-	X
① If using operator/programmer panel only, failing head can be determined by running one pass of test 7023 on each head and examining condition codes contained in R7.										
② Refer to Setting Sector Switches, section 2 of this manual for required switch settings of A2B08.										

This routine reads a sector ID skewed. The sector ID data is displayed on the crt and stored in memory location 18C8₁₆.

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 para 3.26.</p> <p>(2) Sector ID data is stored in memory location 18C8₁₆ as follows:</p> <p>1st word = Initial and interrupt condition codes</p> <p>2nd word = Sync and flag bytes read</p> <p>3rd word = Two cylinder bytes read</p> <p>4th word = Head and sector bytes read</p> <p>(3) When entering data via the programmers panel:</p> <table style="margin-left: 40px;"> <tr> <td style="border-bottom: 1px solid black;">For Entry</td> <td style="border-bottom: 1px solid black;">Programmer Panel LEDs Indicate</td> </tr> <tr> <td>FCCCCHSS</td> <td>702A</td> </tr> </table>				For Entry	Programmer Panel LEDs Indicate	FCCCCHSS	702A
For Entry	Programmer Panel LEDs Indicate						
FCCCCHSS	702A						



This routine writes a selected sector ID skewed with a selected ID data pattern. The written ID data is displayed on the assigned console.

CONDITIONS	SITUATIONS									
	1	2	3	4						
Step 001 Write sector ID skewed. Enter cylinder, head, sector - FCCCCHSS ② in hex -. Parameters entered?	N	Y	Y	Y						
Step 002 Enter sector ID data - FFFCCHSS ② in hex -. 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. ①	-	-	X	-						
Step 005 End of write sector ID skewed. Write SID flag = Cylinder = Head = Sector = .	-	-	-	X						
<p>① R3 register (Level 3) contains starting address of error abort message. Refer to para 3.26.</p> <p>② When entering data via the programmers panel:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">For Entry</td> <td style="text-align: center;">Programmer Panel LEDs Indicate</td> </tr> <tr> <td style="text-align: center;">FFFCCHSS</td> <td style="text-align: center;">702B</td> </tr> <tr> <td style="text-align: center;">FCCCHSS</td> <td style="text-align: center;">702A</td> </tr> </table>					For Entry	Programmer Panel LEDs Indicate	FFFCCHSS	702B	FCCCHSS	702A
For Entry	Programmer Panel LEDs Indicate									
FFFCCHSS	702B									
FCCCHSS	702A									



ASSUME									
1. Drive connected to ac power. 2. Disk pack installed. 3. Attempt to power up and start drive from SMD panel.									
CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
AC POWER (AC) breaker trips when actuated?	N	Y	N	N	N	N	N	-	
Blower motor starts when AC breaker is actuated?	Y	-	N	N	Y	-	-	-	O
Door fans start when AC breaker is actuated?	Y	-	N	Y	N	-	-	-	T
POWER SUPPLY (PS) breaker trips when actuated?	N	-	-	-	-	Y	-	-	H
AC or drive motor thermal breaker trips when PS breaker is actuated?	N	-	-	-	-	-	Y	-	E
Smell of burning insulation is detected after actuating PS breaker?	N	-	-	-	-	-	-	Y	R
ACTIONS	SEQUENCE								
Go to sheet 2 of this DLT.	X	-	-	-	-	-	-	-	-
If power plug customer-provided, check phase and ground connections (refer to section 2 of this manual)	-	1	1	-	-	-	-	-	-
Disconnect blower -- separate J/P301; if trouble persists, blower is OK. If not, replace per para. 3.3.	-	2	-	-	-	-	-	-	-
Disconnect time meter, then try again to verify. Remove six screws mounting power control panel to gain access to time meter.	-	3	-	-	-	-	-	-	-
Disconnect door fans -- separate J/P400, then try again to verify.	-	4	-	-	-	-	-	-	-
Check for ac output from line filter (A1FL1). Measure at ac circuit breakers of power control panel. Remove six screws mounting power control panel to gain access to circuit breakers.	-	-	2	-	-	-	-	-	-
Check for open blower capacitor (A1C5), or open in blower motor or cable.	-	-	-	1	-	-	-	-	-
Check AC breaker for continuity.	-	5	3	-	-	-	-	-	-
Check continuity of door fans and cabling.	-	-	-	-	1	-	-	-	-
Check for shorted tuning capacitor (A1C8). WARNING - THIS CAPACITOR IS CHARGED TO 440 VOLTS.	-	-	-	-	-	1	-	-	-
Go to DLT 7071. Trouble may be a shorted power supply board, a short in T1 wiring, or a short in T1.	-	-	-	-	-	2	-	-	-
Replace logic card at location A10.	-	-	-	-	-	-	1	-	-
Check Run triac (A1K1) for shorted LOAD contacts (Terminals 1 and 2).	-	-	-	-	-	-	2	-	-
If AC breaker trips, check drive motor (A3DM1). Disconnect J/P304 and retry. If now OK, replace drive motor, per para 3.11.	-	-	-	-	-	-	3	-	-
You have lost +5 V power. WARNING - IMMEDIATELY TURN OFF THE POWER SUPPLY BREAKER TO PREVENT BURNING UP THE VOICE COIL. Go to DLT 7071 to check cause of voltage loss.	-	-	-	-	-	-	-	X	-
Problem not covered in manual. Call for assistance.	-	6	4	2	2	3	4	-	-

ASSUME										
Checks of DLT 7070-1 completed OK.										
CONDITIONS	SITUATIONS									
	1	2	3	4	5	6	7	8	9	
AC breaker on motor thermal breaker trips when START switch is pressed.	N	Y	N	N	N	N	N	N	N	O T H E R
START indicator lights when START switch is pressed?	Y	-	N	N	Y	Y	Y	Y		
Drive motor starts when START switch is pressed?	Y	-	Y	N	N	Y	Y	Y		
Drive motor comes up to speed?	Y	-	-	-	-	-	Y	Y		
Heads load? (READY indicator lights)	Y	-	-	-	-	-	N	Y		
Drive motor cuts out after 15-second timeout?	N	-	-	-	-	Y	-	-		
PS breaker trips after drive has been operating satisfactorily?	N	-	-	-	-	-	-	Y		
ACTIONS	SEQUENCE									
Power up completed OK. Go to DLT 7077 (First Seek).	X	-	-	-	-	-	-	-	-	
Check for open heads loaded switch (A3S2) para 3.16.	-	1	-	-	-	-	-	-	-	
Replace logic card at location A10.	-	-	-	-	4	3	-	-	-	
Replace Run triac (A1K1) para 3.23.	-	-	-	-	5	1	-	-	-	
Replace Start triac (A3K5) para 3.4.	-	2	-	-	6	-	-	-	-	
Check operator control panel connections.	-	-	-	-	7	-	-	-	-	
Replace drive motor Start capacitor (A3C6).	-	3	-	-	8	-	-	-	-	
Check for open Start winding on drive motor (A3DM1). ① Ref para 3.11 for replacement.	-	4	-	-	10	-	-	-	-	
Replace START switch/indicator.	-	-	1	-	-	-	-	-	-	
Check for open T1 primary wiring.	-	-	-	1	-	-	-	-	-	
Check pack cover (A3S3) and deck interlock (A1S4) switches.	-	-	-	2	3	-	-	-	-	
Check for presence of +5 V (para 3.19).	-	-	-	3	-	-	-	-	-	
Check that LOCAL/REMOTE switch (card A10) is in LOCAL position.	-	-	-	-	1	-	-	-	-	
Check for tripped drive motor thermal breaker (A3DM1) -- reset and check cause.	-	-	-	-	2	-	-	-	-	
Check hysteresis brake (A3HB1) for mechanical binding (pull on drive belt). Reference para 3.11 for replacement.	-	-	-	-	9	2	-	-	-	
Check speed transducer (para 3.14).	-	-	-	-	-	4	-	-	-	
Check for open Run winding on drive motor (A3DM1). ② Reference para 3.11 for replacement.	-	-	-	-	11	-	-	-	-	
Go to DLT 7077 (First Seek).	-	-	-	-	-	-	X	-	-	
Check for a heat generated problem (para 3.21).	-	-	-	-	-	-	-	1	-	
Problem not covered in manual. Call for assistance.	-	5	2	4	12	5	-	2	X	
① Check pins 1 and 3 of J304. Normal resistance is approximately 40 ohms. ② Check pins 2 and 3 of J304. Normal resistance is approximately 25 ohms.										

ASSUME											
DC voltages checked per para 3.19.											
CONDITIONS	SITUATIONS										
	1	2	3	4	5	6	7	8	9	10	11
+5 voltages OK?	Y	N	N	N	-	-	-	-	-	-	
+12, +20, +42 voltages significantly low?	N	Y	N	N	-	-	-	-	-	-	
Are either of the 9.2 V fuses on the +5 V p.s. board (A1A3) blown? ①	-	-	Y	N	-	-	-	-	-	-	O
+20 voltages OK.	Y	-	-	-	N	N	Y	Y	-	-	T
Are either of the 20 V fuses on the +20 V p.s. board (A1A2) blown? ①	-	-	-	-	Y	N	-	-	-	-	H
+12 voltages OK with load connected?	Y	-	-	-	-	-	N	N	-	-	E
+12 voltages OK with load disconnected (P/J1A and P/J1B separated)?	-	-	-	-	-	-	Y	N	-	-	R
+42 voltages OK?	Y	-	-	-	-	-	-	-	N	N	
Are either of the 42 V fuses on the +42 V p.s. board (A1A1) blown? ①	-	-	-	-	-	-	-	-	Y	N	
ACTIONS	SEQUENCE										
Go to DLT 7070-2.	X	-	-	-	-	-	-	-	-	-	-
Replace transformer tuning capacitor (A1C8) WARNING -- CAPACITOR A1C8 IS CHARGED TO 440 VOLTS.	-	1	-	-	-	-	-	-	-	-	-
Problem may be on the +5 V p.s. board or in the +5 V loads. Go to DLT 7072.	-	-	X	-	-	-	-	-	-	-	-
Problem in power supply or T1 winding. Check AC inputs per para 3.20.	-	-	-	1	-	1	-	-	-	1	-
Problem is in the +20 V loads. Go to DLT 7074.	-	-	-	-	X	-	-	-	-	-	-
Replace +20 V p.s. board (A1A2) per para 3.7.	-	-	-	-	-	-	-	1	-	-	-
Problem is in the +12 V loads. Go to DLT 7075.	-	-	-	-	-	-	X	-	-	-	-
Problem is in the +42 V loads. Go to DLT 7076.	-	-	-	-	-	-	-	-	X	-	-
Problem not covered in manual. Call for assistance.	-	2	-	2	-	2	-	2	-	2	-
① Check with VOM between ground and each side of fuse. If supply voltage appears on only one side, fuse is bad.											



ASSUME

No +5 V, other voltages are present. Fuse(s) on +5 V p.s. board (A1A3) blown, indicating a problem either in the loads or in the supply itself.

CONDITIONS	SITUATIONS			
	1	2	3	4
1. Check out unregulated portion of +5 V p.s. board: a) Turn off AC breaker; reset PS breaker if tripped. b) Remove fuses F1 and F2. c) Disconnect loads by separating connectors P/J1B and P/J1A. d) Remove +20 V p.s. board (A1A2). e) Remove +42 V p.s. board (A1A1). f) Turn on AC breaker. Does PS breaker trip?	N	Y	-	-
2. Check out regulated portion of +5 V p.s. board: a) Turn off PS breaker. b) Replace F1 and F2. (Use good fuses!) c) Turn on PS breaker. Does either F1 or F2 blow?	-	-	N	Y
ACTIONS	SEQUENCE			
Unregulated portion is OK. Go to Condition 2 above.	X	-	-	-
Turn off PS breaker and replace +5 V p.s. board, then reinstall +42 V and +20 V p.s. boards.	-	X	-	X
+5 V board is OK, so problem must be in the load. Turn off the PS breaker, rejoin connectors P/J1A and P/J1B, then go to DLT 7073-1.	-	-	X	-



ASSUME

PlA and PlB (on power supply motherboard) have been reconnected so as to provide a load to the +5 V supply.

CONDITIONS	SITUATIONS			
	1	2	3	4
<p>1. Check out logic chassis (assembly A2):</p> <p>a) Turn off PS breaker. b) Ensure that connectors P/J1A and P/J1B are properly mated. c) Remove <u>+20</u> V and <u>+42</u> V p.s. boards from assembly A1. d) Separate P/JA80 (<u>+5</u> V to control panel). e) Separate P/JA81 (<u>+5</u> V to Hd Sel/Rd Amp and Writer. f) Turn on PS breaker. Does either F1 or F2 blow? (Check for <u>+9</u> V at fuse-holders.)</p>	N	Y	-	-
<p>2. Add Control Panel (A3A01) to <u>+5</u> V load:</p> <p>a) Turn off PS breaker. b) Reconnect P/JA80. c) Turn on PS breaker. Does <u>+5</u> V fuse (F1) blow? (Check for <u>+9</u> V at fuse-holder.)</p>	-	-	N	Y
ACTIONS	SEQUENCE			
<u>+5</u> V to logic chassis is OK. Go to Condition 2 above.	X	-	-	-
<u>+5</u> V fault is in logic chassis. To isolate, go to para 3.22.	-	X	-	-
<u>+5</u> V to control panel is OK. Go to Condition 3, DLT 7073-2.	-	-	X	-
Replace control panel (A3A01).	-	-	-	X

ASSUME				
Conditions 1 and 2 of DLT 7C73-1 checked out OK.				
CONDITIONS	SITUATIONS			
	1	2	3	4
3. Add Hd Sel/Rd Amp (A3A02) and Writer (A3A03) to <u>+5</u> V load: a) Turn off PS breaker. b) Reconnect P/JA81. c) Turn on PS breaker. Does F1 or F2 blow? (Check for <u>+9</u> V at fuseholder.)	N	Y	-	-
4. Isolate fault to A3A02 or A3A03: a) Turn off PS breaker. b) Separate piggy-back Writer card (A3A03) from A3A02). c) Turn on PS breaker. Does F1 or F2 blow? (Check for <u>+9</u> V at fuseholders.)	-	-	N	Y
ACTIONS	SEQUENCE			
<u>+5</u> V distribution is OK. Fault may be a shorted Start or Run triac. To confirm, try bringing the drive motor up to speed.	1	-	-	-
Fault is in A3A02 or A3A03. To pin-point, go to Condition 4 above.	-	X	-	-
Replace Writer assy (A3A03), para 3.24.	-	-	X	-
Replace Hd Sel/Rd Amp Assy (A3A02), para 3.24.	-	-	-	X
Problem not covered in manual. Call for assistance.	2	-	-	-

ASSUME

+20 V power supply board (A1A2) installed in power supply assembly; +5 V (A1A3) and +42 V (A1A1) boards removed. P/J1A and P/J1B connected.

CONDITIONS	SITUATIONS			
	1	2	3	4
1. Restrict <u>+20 V</u> load to logic chassis: a) Turn off PS breaker. b) Separate P/JA81 on logic chassis. ① c) Turn on PS breaker. Does either 20 V fuse blow? ②	N	Y	-	-
2. Add A3A02 (Hd Sel/Rd Amp) to <u>+20 V</u> load: a) Turn off PS breaker. b) Reconnect P/JA81. c) Turn on PS breaker. Does <u>+20 V</u> fuse blow? ②	-	-	N	Y
ACTIONS	SEQUENCE			
<u>+20 V</u> loads in logic chassis are OK. Go to Condition 2 above.	X	-	-	-
Go to para 3.22 to check logic chassis.	-	X	-	-
<u>+20 V</u> power distribution is OK. ③	-	-	1	-
Replace A3A02.	-	-	-	1
Problem not covered in manual. Call for assistance.	-	-	2	2
① This arrangement retains the <u>+12 V</u> power (unfused) to the servo preamp, assembly A3A05. Current-limiting resistors in the 12 V circuits prevent damage to the supply or components if the 12 V loads are faulty. See DLT 7075 to check the 12 V loads. ② Test fuses by using a VOM between ground and each side of the fuseholder. If there is no voltage on the load side of the fuse, the fuse has blown. ③ If a problem still exists, chances are that the fault appears when the logic connects the emergency retract relay coil (A1K2) or the hysteresis brake (A3HB1) to <u>+20 V</u> . Most probable cause is a shorted or grounded coil in one of these components.				



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ASSUME

+5 V, +12 V, +20 V distribution has been checked out and found OK. The +42 V power supply board (A1A1) has been installed in the power supply assembly. P/J1A and P/J1B connected.

CONDITIONS	SITUATIONS			
	1	2	3	4
1. Restrict +42 V load to the two capacitors: a) Turn off PS breaker. b) Separate P/J200 (on Pwr Amp ass'y A3A04). c) Turn on PS breaker. Does either fuse blow? ①	N	Y	-	-
2. Add power amp (A3A04) to the +42 V load: a) Turn off PC breaker. b) Remove PA09 from location A09 of the logic chassis backpanel. c) Reconnect P/J200 (on power amp). d) Turn on PS breaker. Does either fuse blow? ①	-	-	N	Y
ACTIONS	SEQUENCE			
Servo capacitors are OK. Go to Condition 2 above.	X	-	-	-
Servo capacitor shorted. A1C1 is +42, A1C2 is -42. Blown fuse tells which.	-	1	-	-
Power amp is OK. Go to Condition 3 on DLT 7076-2.	-	-	X	-
Replace power amp A3A04 (para 3.5).	-	-	-	1
Problem not covered in manual. Call for assistance.	-	2	-	2
① Test fuses with a VOM between ground and each side of the fuseholder. No voltage on the load side of the fuse means the fuse is blown.				

ASSUME

Checks of DLT 7076-1 completed OK.

CONDITIONS	SITUATIONS			
	1	2	3	4
3. Add logic chassis to the +42 V load: a) Turn off PS breaker. b) Reconnect PA09 to location A09 of logic chassis backpanel. c) Separate P/JA81 (on logic chassis). d) Turn on PS breaker. Does either fuse blow? ①	N	Y	-	-
4. Add writer (A3A03) to +42 V load: a) Turn on PS breaker. b) Reconnect P/JA81 (on logic chassis). c) Turn on PS breaker. Does +42 V fuse (F1) blow? ①	-	-	N	Y
ACTIONS	SEQUENCE			
+42 V loads in logic chassis are OK. Go to Condition 4 above.	X	-	-	-
+42 V load fault in logic chassis. Go to para 3.22.	-	1	-	-
+42 V loads check OK.	-	-	X	-
Replace writer (A3A03), para 3.24.	-	-	-	1
Problem not covered in manual. Call for assistance.	-	2	-	2
① Test fuses with a VOM between ground and each side of the fuseholder. No voltage on the load side of the fuse means the fuse has blown.				

ASSUME						
START indicator is lit, drive is coming up to speed.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
READY light comes on, signifying successful First Seek?	Y	N	N	N	N	
First Seek attempted?	-	N	N	N	Y	
Check that Heads Loaded switch (A3S2) is transferring: a) Press START sw 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? (Yes means A3S2 is OK.)	-	N	Y	Y	N	O T H E R
Check for forward drive to voice coil: a) Disconnect faston connector (black lead) from voice coil. ① b) Attach + probe of VOM to black wire, common probe to logic gnd. c) Press START switch/indicator. d) Wait 15-20 sec for up-to-speed time out to expire, then check VOM. Does VOM read approximately +40 V?	-	-	N	Y	-	
ACTIONS	SEQUENCE					
First Seek OK.	X	-	-	-	-	-
Check leads to and/or replace emergency retract relay AlK2.	-	1	-	-	-	-
Check for open voice coil.	-	2	-	-	-	-
Replace Heads Loaded switch A3S2 (para 3.16).	-	3	-	-	X	-
Replace power amp ass'y A3A04 (para 3.5).	-	4	6	-	-	-
Replace card A09 (pwr amp control).	-	-	1	-	-	-
Replace card B09 (direction control).	-	-	2	-	-	-
Suspect card A07 (summing amp).	-	-	3	-	-	-
Suspect card B10 (difference generator).	-	-	4	-	-	-
Suspect card A10 (speed control).	-	-	5	-	-	-
Voice coil should attempt First Seek upon expiration of up-to-speed timeout. Go to DLT 7077-2.	-	-	-	X	-	-
Problem not covered in manual. Call for assistance.	-	5	7	-	-	X
① Located next to drive motor (A3DM1) beneath Heads Loaded switch (A3S2). Refer to para 3.16 for illustration.						

ASSUME							
START indicator is lit, drive attempts First Seek, READY indicator remains unlit.							
CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Drive attempts First Seek, then unloads?	Y	Y	Y	-	-	-	
Servo preamp input to card A03 OK? ①	N	Y	Y	-	-	-	O
Track Servo signal present at A03-09B?	-	N	Y	-	-	-	T
Drive seeks to forward mechanical stop, FAULT light comes on (+42 V fuse blows) but heads don't unload - unit can't power down?	-	-	-	Y		-	H E
Drive seeks to forward mechanical stop, waits for FAULT light (+42 V fuse blows), then retracts?	-	-	-	-	Y	-	R
Drive loads heads, hesitates, then creeps to forward end-of-travel?	-	-	-	-		Y	
ACTIONS	SEQUENCE						
Check for continuity and grounds in servo preamp cable (input to A03).	1	-	-	-	-	-	-
Replace servo preamp A3A05 (para 3.9).	2	-	-	-	-	-	-
Replace and align servo head (para 3.17).	3	-	-	-	-	-	-
Replace logic card A03.	-	1	-	-	-	-	-
Replace logic cards A08, A07, A09, B09. Retry after each card is replaced.	-	-	1	-	-	-	-
Replace power amp assembly (para 3.5).	-	-	-	2	2	-	-
Replace velocity transducer (para 3.15).	-	-	-	3	3	-	-
Replace logic cards A08, B09, A09. Retry after each card is replaced.	-	-	-	1	-	1	-
Replace logic cards A03, A07, A09. Retry after each card is replaced.	-	-	-	-	1	2	-
Problem not covered in manual. Call for assistance.	4	2	2	4	4	3	X
① Check servo preamp input to card A03 pin 23B (+dibits) and A03-25B (-dibits). Use the following scope settings. Volts/Div: 2 V Time/Div: 2 usec Triggering: Internal positive Logic gnd to scope gnd							

ASSUME

Press START sw on SMD panel to extinguish START light and power down the drive.

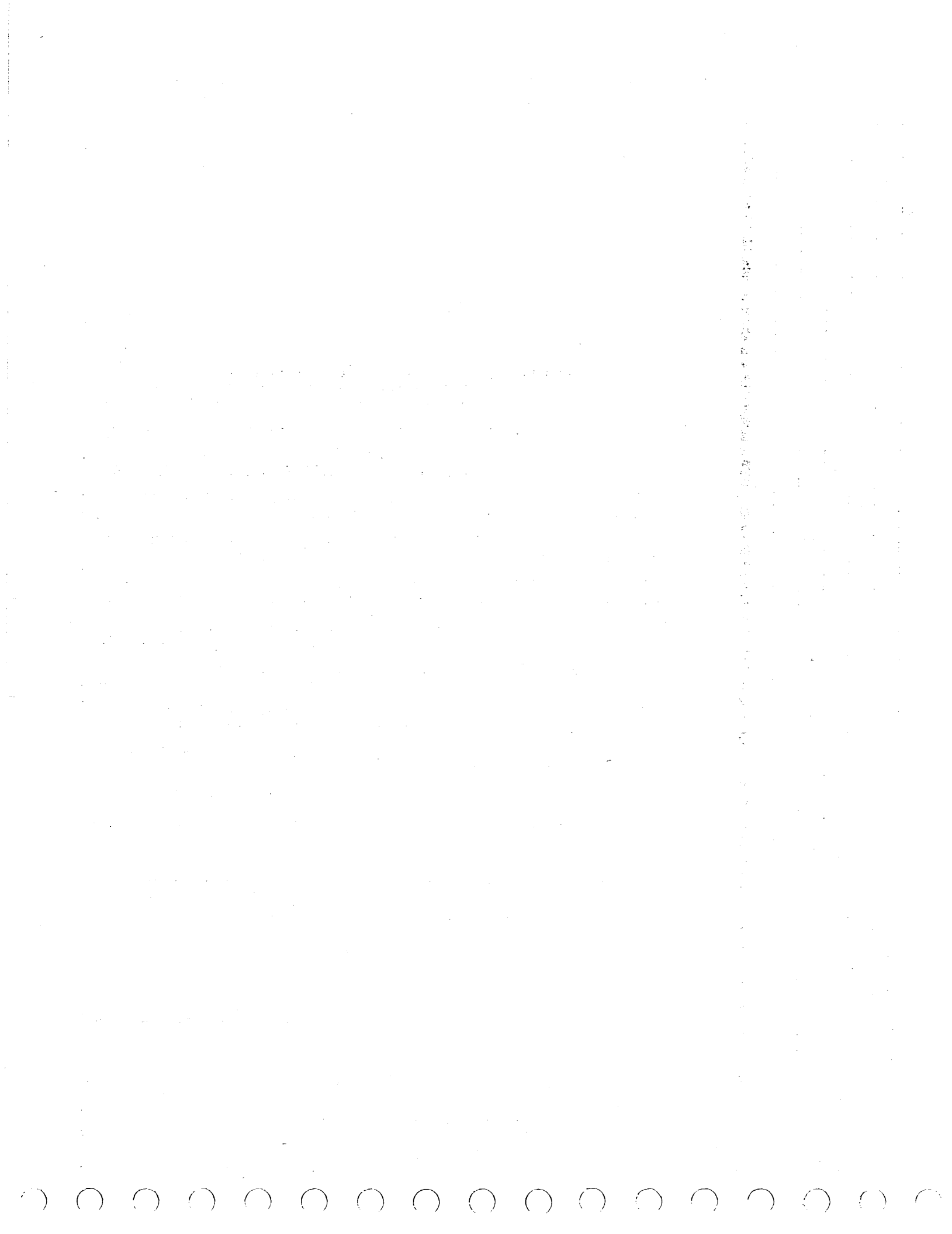
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
START light goes out?	Y	Y	Y	Y	N	O T H E R
Heads unload?	Y	Y	Y	N	-	
Drive motor brakes to a stop?	Y	N	N	-	-	
Drive motor coasts to a stop?	N	N	Y	-	-	
ACTIONS	SEQUENCE					
Power down sequence has completed satisfactorily.	X	-	-	-	-	-
Check deck interlock switch (A1A4), or wiring, for grounds.	-	1	-	-	-	-
Check that Heads Loaded sw (A3S2) has transferred. A10-30B should be at ground level.	-	2	-	-	-	-
Check hysteresis brake (A3HB1) and intervening connectors (JA80, J303).	-	-	1	-	-	-
Replace card A10 (Start, Braking Control).	-	3	2	-	-	-
Replace card B09 (RTZ Latch).	-	-	-	1	-	-
Replace card A07 (Summing Amp).	-	-	-	2	-	-
Replace card A09 (Pwr Amp Control).	-	-	-	3	-	-
Replace START switch.	-	-	-	-	1	-
Problem not covered in manual. Call for assistance.	-	4	3	4	2	X



ASSUME

FAULT indicator on control panel lit, and one or more internal Fault indicators lit.

CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Observe Fault indicators on logic card A2A04 ①. Is Voltage Fault indicator lit?	Y	-	-	-	-	N
Is Write Fault indicator lit?	-	Y	-	-	-	N
Is HD SEL Fault indicator lit?	-	-	Y	-	-	N
Is R·W Fault indicator lit?	-	-	-	Y	-	N
Is $\overline{OC} \cdot (W+R)$ Fault indicator lit?	-	-	-	-	Y	N
ACTIONS	SEQUENCE					
Press and release Maintenance Fault Clear switch on A2A04. If Fault indicator extinguishes, the fault condition no longer exists. If indicator still lights, continue with next action.	1	1	1	1	1	-
Check power supply fuses and normal-load dc voltages per para 3.19. Isolate voltage problems using DLT 7071.	2	-	-	-	-	-
Replace logic cards at A2A03, A2A04, A2A09, and SMD attachment card ②. Retry after each card is replaced.	3	-	-	-	-	-
Replace logic cards at A2A03, A2A04, A2B01, SMD attachment card ②, and A3A03 (write driver). Retry after each card is replaced.	-	2	-	-	-	-
Replace logic cards at A2A02, A2A04, SMD attachment card ②, and A3A02 (head select/read amp). Retry after each card is replaced.	-	-	2	-	-	-
Replace logic cards at A2A04, A2B02, and SMD attachment card ②. Retry after each card is replaced.	-	-	-	2	-	-
Replace logic cards at A2A03, A2A04, A2B09, and SMD attachment card ②. Retry after each card is replaced.	-	-	-	-	2	-
Check position of Maintenance Unit Disable switch on A2A04. It must be in NORM position to enable Fault indicators.	-	-	-	-	-	X
Problem not covered in manual. Call for assistance.	4	3	3	3	3	-
<p>① Fault indicator will not light if +5 V power fails.</p> <p>② The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p>						



This is a paper only DLT that provides additional troubleshooting information for errors identified by error analysis routine 7020. Test 7020 is automatically executed as a result of an error sensed by test 7001.

CONDITIONS	SITUATIONS								
	1	2	3	4	5	6	7	8	9
Test 7020 step 002, 004, 007, or 008 error?	Y	N	N	N	N	N	N	N	N
Test 7020 step 010 or 019 error?	-	Y	N	N	N	N	N	N	N
Test 7020 step 013 or 015 error?	-	-	Y	N	N	N	N	N	N
Test 7020 step 017, 035, or 049 error?	-	-	-	Y	N	N	N	N	N
Test 7020 step 021 error?	-	-	-	-	Y	Y	Y	Y	N
Front panel START indicator lit?	Y	Y	Y	Y	Y	Y	Y	N	-
Front panel READY indicator blinking?	N	N	N	N	Y	-	-	-	-
Front panel FAULT indicator lit?	N	N	N	N	N	Y	Y	-	-
Internal Voltage Fault indicator lit on logic card A2A04?	-	-	-	-	-	N	Y	-	-
ACTIONS	SEQUENCE								
Replace Bus In logic card (A2B03).	1	2	-	2	-	-	-	-	-
Replace Bus Out logic card (A2B01).	2	3	2	-	-	-	-	-	-
Reseat/replace attachment card. Replace I/O cables. ①	3	1	1	1	-	-	-	-	-
Replace Fine Servo Decode logic card (A2A03).	-	-	-	-	-	1	-	-	-
Go to DLT 7077.	-	-	-	-	-	2	-	-	-
Replace Index/Sector Decode logic card (A2B08). ②	-	-	-	-	1	-	-	-	-
Run First Seek Test 7021 (DLT 7021).	-	-	-	-	2	-	-	-	-
Replace Speed and Interlock logic card (A2A10).	-	-	-	-	3	-	-	-	-
Go to DLT 7079.	-	-	-	-	-	-	X	-	-
Try to make drive ready by pressing START switch.	-	-	-	-	-	-	-	1	-
Verify ac power cord is plugged in and POWER SUPPLY circuit breaker is ON.	-	-	-	-	-	-	-	2	-
Go to DLT 7070-1.	-	-	-	-	-	-	-	3	-
Go to DLT 7080-2.	-	-	-	-	-	-	-	-	X
Problem not covered in manual. Call for assistance.	4	4	3	3	4	-	-	-	-
<p>① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).</p> <p>② Refer to Setting Sector Switches, section 2 of this manual for correct switch settings.</p>									

This is a continuation of DLT 7080-1. Conditions assume front panel START indicator lit and error step identified by Test 7020.

CONDITIONS	SITUATIONS						
	1	2	3	4	5	6	7
Test 7020 step 023 error?	Y	N	N	N	N	N	N
Test 7020 step 033 error?	-	Y	N	N	N	N	N
Test 7020 step 041 error?	-	-	Y	N	N	N	N
Test 7020 step 045 error?	-	-	-	Y	N	N	N
Test 7020 step 051 or 053 error?	-	-	-	-	Y	N	N
Test 7020 step 054 error?	-	-	-	-	-	Y	N
Front panel READY indicator blinking?	N	-	N	-	-	-	-
Front panel FAULT indicator lit?	N	-	N	-	-	-	-
ACTIONS	SEQUENCE						
Replace Read/Write Control logic card (A2B04).	1	-	-	-	-	-	-
Replace Write Driver logic card (A3A03).	2	-	-	-	-	-	-
Verify Bus In and Bus Out cable connections.	-	1	3	-	-	-	-
Go to DLT 7071.	-	2	-	-	-	-	-
Run First Seek Test 7021 (DLT 7021).	-	-	-	X	-	-	-
Run Write Sector ID Test 7050 (DLT 7050).	-	-	-	-	1	-	-
Run Write/Read Data Test 7030 (DLT 7030).	-	-	-	-	2	-	-
Run Error Correction Code Test 7040 (DLT 7040).	-	-	-	-	3	-	-
Run Margins Test 70F2 (DLT 70F2).	-	-	-	-	4	-	-
Run Data Integrity Test 70F1 (DLT 70F1).	-	-	-	-	5	-	-
Replace attachment card. ①	-	-	1	-	-	X	-
Problem not covered in manual. Call for assistance.	3	-	-	-	6	-	X
Replace Bus In logic card (A2B03).	-	-	2	-	-	-	-
① The attachment card contains switches or jumpers to select SMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).							

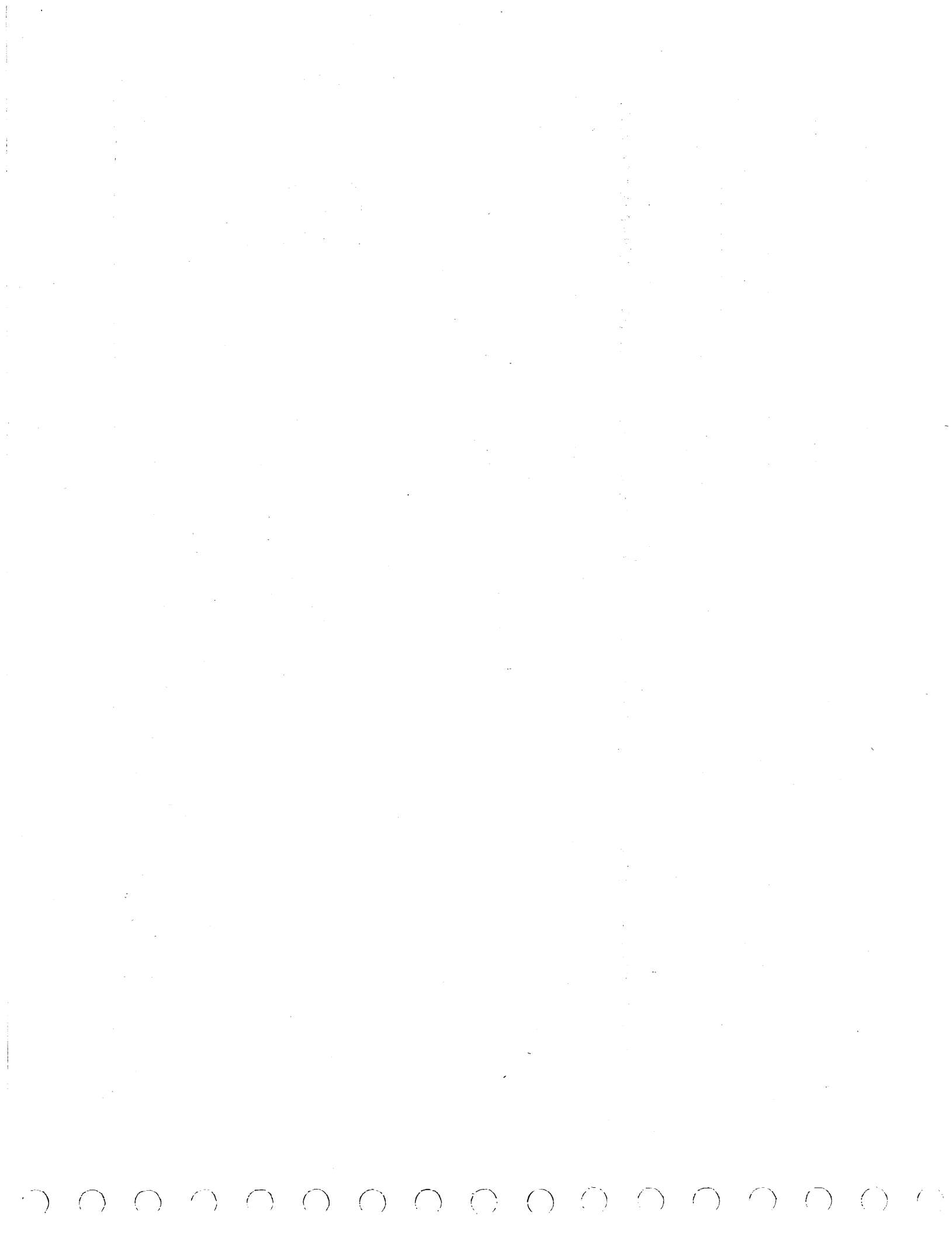
This is a paper only DLT that provides additional troubleshooting information for specific errors identified by test 7001 and 7013.

CONDITIONS	SITUATIONS	
	1	2
Test 7001 step 002, 004, 007, 008, 011, 020, 022, 024, 031, 033, or 034?	Y	-
Test 7013 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 card at location A2A06. If error persists, check head alignment (para 3.17).	-	X
① Operating instructions are contained in the CDC System Test and Freelance Reference manual. Refer to preface of this manual for publication number.		



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 para 3.25 for operating procedure. Halt codes indicate program stops occurring on operator/programming panel. Execution time is approximately 4 1/2 minutes. FFFF is displayed in the indicators during execution.

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 FCCCHSS.	-	-	X	-	-	-	-	-	-	-
Enter sector ID data in hex. Format is FFFCCCHSS. F=flag, C=cylinder, H=head, S=sector.	-	-	-	X	-	-	-	-	-	-
Device ID not 3007 (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 para 3.26.	-	-	-	-	-	X	-	-	-	-
Error interrupt condition code is not 3 after read sector ID. Examine cycle steal status words for additional status information. Refer to para 3.26.	-	-	-	-	-	-	X	-	-	-
Sector ID compare error between expected and received data. ①	-	-	-	-	-	-	-	X	-	-
SMD sector ID initialization complete.	-	-	-	-	-	-	-	-	X	-
Refer to DCP halt list of para 3.27.	-	-	-	-	-	-	-	-	-	X
<p>① Expected and received data bytes are contained in the Level 3 registers in the following format:</p> <pre> Expected = R0 R1 R2 SF CC HS Received = R4 R5 R6 SF CC HS Flag Cylinder Sector Sync Head </pre>										



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 the mode switch is in the Diagnostic position, the test will stop after each error.

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 3007 (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 para 3.28.	-	-	-	-	-	-	-	-	-	-	-	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, R3 (Level 3) register contains starting address of error abort message. Refer to para 3.26.												



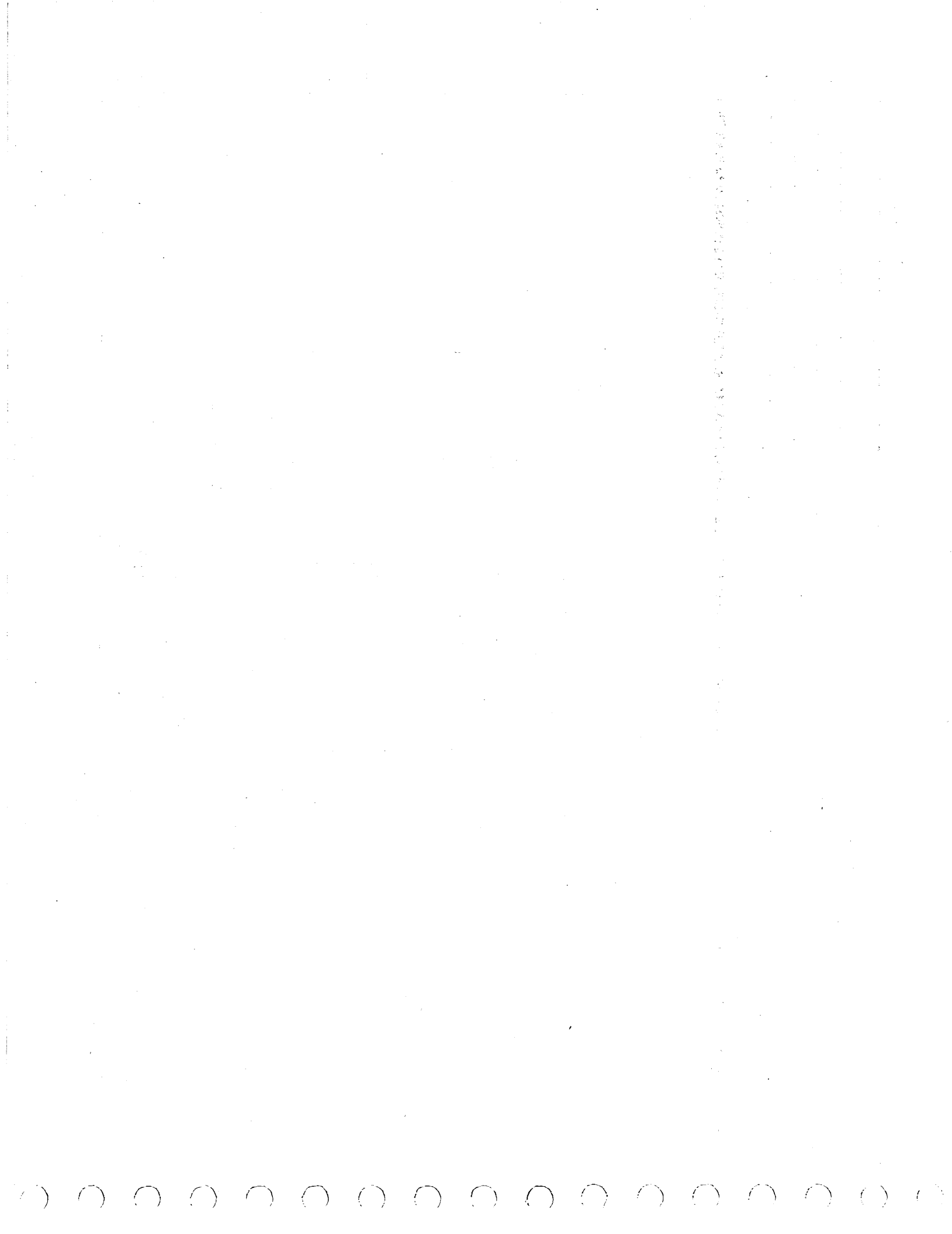
This utility reads data from cylinder 336 using operator selectable margins for forward or reverse offsets, and early or late data strobes. If the Mode switch is in the Diagnostic position, the program will stop after each error.

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 3007 (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 para 3.28.	-	-	-	-	-	-	-	-	-	-	-	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, the test will abort after this message. 2. During an error abort, R3 (Level 3) register contains starting address of error abort message. Refer to para 3.26.												



This utility verifies the IPL logic on the FA740B (LSI) attachment card only. Use of this utility on an FA740A (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 7300?	Y	N	N	N	N	N
Halt code 7301?	-	Y	N	N	N	N
Halt code 7302?	-	-	Y	N	N	N
Halt code 7303?	-	-	-	Y	N	N
Halt code 7304?	-	-	-	-	Y	N
ACTIONS	SEQUENCE					
Enter device address of SMD to be tested.	X	-	-	-	-	-
An error has occurred which makes it impossible to verify the IPL logic. Run BASIC tests 7000 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 , ensures 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/Alternative 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	-
<p>① Certain errors will cause the system to hang:</p> <p>a. The preconditions of halt F302 have not been satisfied.</p> <p>b. The SMD under test does not support diagnostic IPL capability.</p> <p>c. The SMD attachment card is faulty. Replace it. See section 2 of this manual.</p>						



COMMENT SHEET

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