

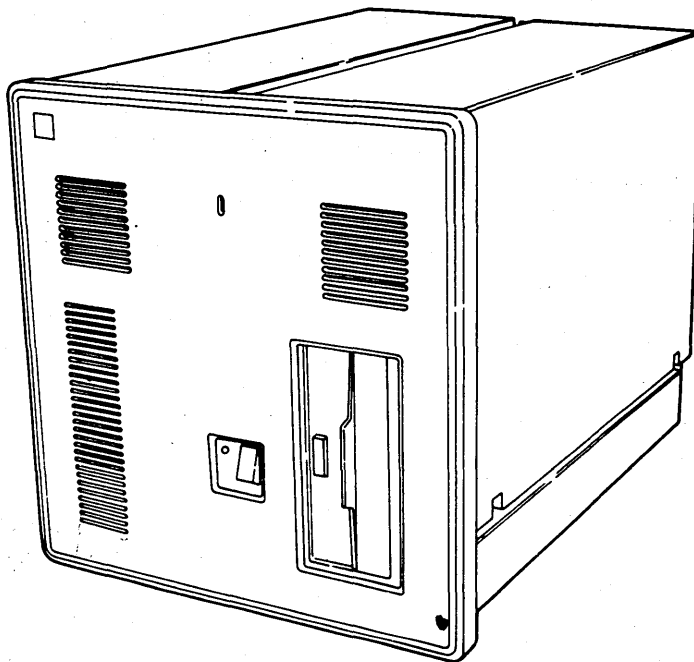
**Certainty® 230/231/240/241 Series
MMD Disk Storage Systems**



62947905

**CDC® 80230/80231/80240/80241
MINI MODULE DRIVE**

**HARDWARE MAINTENANCE MANUAL
(Site Information)**



80230/80231/80240/80241 HARDWARE MAINTENANCE

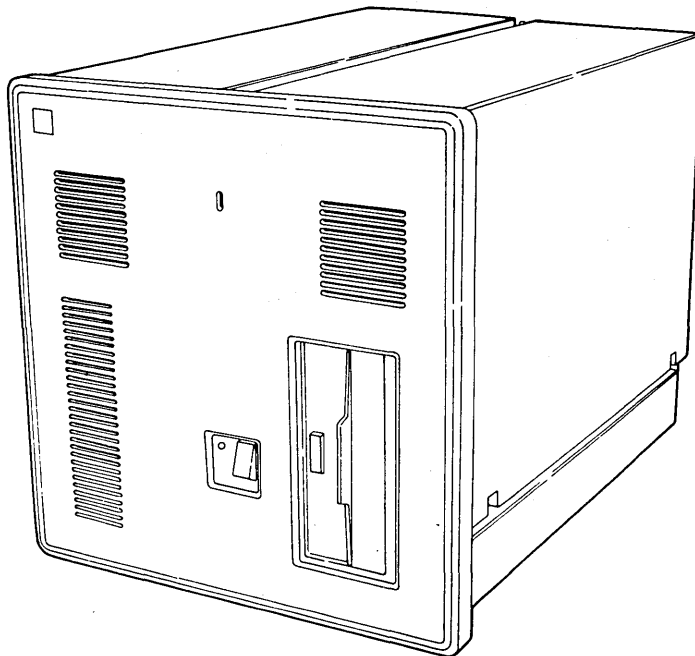
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REVISION RECORD

REVISION	DESCRIPTION
A	
(11-06-79)	Product verification and testing complete. SAMS reflect CDC P/N 66310700 (Version 4.0) of the MMD/FDD BASIC diagnostic diskette. Includes changes per ECO 13803.
B	
(12-19-79)	Manual revised because of changes to SAMS covering version 4.0 of FDD BASIC diagnostic diskette and clarification of step 10 on page 2-26. These are correction only changes (no ECOS involved).
C	
(05-10-80)	Manual revised due to corrections only changes (no ECOS involved). Changes were done to avoid redundancy and consist of deleting Flexible Disk Drive (FDD) material and restructuring the text. The deleted material can be found in the FDD Site Information Manual.
D	
(06-30-80)	Manual revised because of changes to MMD Product Numbers. Impact on manual consists of changes to front cover, front matter, and reinstating of Flexible Disk Drive (FDD) material which was previously deleted. Also included are changes caused by ECOS DQ 01092 and 01154.
E	
(08-15-80)	Manual revised to incorporate changes to the SAMS to reflect changes in the diagnostics. Manual consists of changes to front matter and restructuring of the 72XX SAMS. Affected pages include: ii, v/vi, xiv, 1-2, A-1, A-4, A-9 through A-16, A-24, NOTICE, SAM 7202-4/5, SAM 7203-1/3/4, SAM 7206, SAM 7209, SAM 7213-1/2, SAM 7214-1/2, SAM 7215-2, SAM 7216, SAM 7220-1 through 5, SAM 7221-1/2, SAM 7222, SAM 7223, SAM 7224, SAM 7225, SAM 7226, SAM 7227, SAM 7228, SAM 7230-1/2, SAM 7235, SAM 7240-1/2, SAM 7245-1/2, SAM 7250-1/2, SAM 7260, SAM 7261, SAM 7270-2/3, SAM 7281-1, SAM 7282, 72F1-1/2, SAM 72F2, SAM 72F3-1/2, NOTICE-1, NOTICE-2, and Comment Sheet.
F	
(12-05-80)	Manual revised to reflect changes to MMD product numbers. Changes also include incorporation of 120-V information for MMD and FDD units and ECOS 01175, 01198, 01056, 01092, 01182, 01222, and 01246. Affected pages include ii, iii/iv, v/vi, xi through xiv, xvi, 1-1, 1-2, 1-3, 1-3.1, 2-5, 2-6, 2-6.1, 2-6.2, 2-6.3, 2-6.4, 2-7, 2-8, 2-8.1, 2-8.2, 2-8.3, 2-8.4, 2-9, 3-2, 3-16, 3-17, 3-18, 3-19, 3-50, 4-1 through 4-9, 4-14, 4-15, A-21, and Comment Sheet.
Publication No. 62947905	

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

Address comments concerning this manual to:

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

or use Comment Sheet in the back of this manual.

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MANUAL TO EQUIPMENT LEVEL CORRELATION SHEET

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 ECO or 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. This correlation sheet also corresponds to the following manual(s) at their indicated revision levels:

Pub. No. _____ Rev. _____ Pub. No. _____ Rev. _____

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS
BG702-A	01	01178	ECOs 01178 and 01198 have common FCO (FCO 01178) which updates series code from 01 through 02 on equipments BG702-A, BG702-G, and BG702-L. Update by ECO 1342 (series code 03 to 04).
	02	01178	
	03	-	
	04	-	
	04	-	
BG702-G	01	01178	Update by ECO 1342 (series code 03 to 04).
	02	01178	
	03	-	
	04	-	
BG702-H	01	-	Update by ECO 01178 Update by ECO 1342 (series code 02 to 03).
	02	-	
	03	-	
BG702-L	01	01178	Update by ECO 1342 (series code 03 to 04).
	02	01178	
	03	-	
	04	-	
BG702-M	01	-	Update by ECO 01178. Update by ECO 1342 (series code 02 to 03).
	02	-	
	03	-	
BG703-A	01		
BG703-B	01		
BR812-A	01	01181	Update by ECO 01319.
	02	-	
	03	-	
BR812-B	01	01181	Update by ECO 01319.
	02	-	
	03	-	

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Pub. No. _____ Rev. _____ Pub. No. _____ Rev. _____

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS	
BT375-A	01			
BT375-E	01			
BT375-F	01			
BT375-G	01			
FA740-C	01	01092		
	02	01212		
	03	-	Update by ECO 1567.	
	04			
FA741-A	01	01096		
	02	01270		
	03	01270		
	04	-	Update by ECO 1352.	
	05			

LIST OF EFFECTIVE PAGES

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

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PREFACE

This manual provides information to aid in the installation, checkout, and on-site maintenance of the CDC® 80230/80240 and 80231/80241 Certainty® Series Mini Module Drive (MMD) disk storage systems. Each system contains a disk storage device, an attachment card (controller), and I/O cables necessary to connect to the I/O bus of an IBM* Series/1 computer. The formatted storage capacity of the various MMD models is as follows:

<u>Product Number</u>	<u>Movable Head Storage</u>	<u>Fixed Head Storage</u>
80230/240-10	9.3 MB	None
80230/240-10A	9.3 MB	None
80230/240-15	13.9 MB	None
80230/240-15A	13.9 MB	None
80230/240-30	63.2 MB	None
80230/240-30A	63.2 MB	None
80230/240-30G	63.2 MB	1.48 MB
80230/240-31G	63.2 MB	1.48 MB
80231/241-30	63.2 MB	None
80231/241-30A	63.2 MB	None
80231/241-60	126.4 MB	None
80231/241-60A	126.4 MB	None

Field installable options to the 80230-10, -10A, -15, and -15A (9.3 and 13.9 megabyte) models are available that will increase their capacity to the 80230-30 and 80230-30A (63.2 megabyte) model size. A field-installable option to the 80231-30 and 80231-30A (63.2 MB) is also available to increase its capacity

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to the 80231-60 and 80231-60A (126.4 MB) model size. These options are formatted as follows:

<u>Option Number</u>	<u>Converts Product Number</u>	<u>to</u>	<u>New Product Number</u>
80230-910	80230/240-10 and 80230/240-10A (9.3 megabyte)		80230/240-30 and 80230/240-30A (63.2 megabyte)
80230-915	80230/240-15 and 80230/240-15A (13.9 megabyte)		80230/240-30 and 80230/240-30A (63.2 megabyte)
80230-920	80231/241-30 and 80231/241-30A (63.2 megabyte)		80231/241-60 and 80231/241-60A (126.4 megabyte)

Organization of this manual is divided into four major sections plus two appendixes:

- Section 1 - General Description
- Section 2 - Installation and Checkout
- Section 3 - Maintenance
- Section 4 - Spare Parts Lists
- Appendix A - Diagnostic Aids
- Appendix B - FFD Diagnostic Aids

The structured analysis method (SAM) listings contained in the appendixes may be removed from this manual and inserted in the lefthand side of the associated IBM MAP/MIM maintenance logic manual (MLM) binder. The remaining sections of this manual may then be inserted in the righthand side of the same MLM. This allows for easy cross-referencing between the SAMs 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 MMD, FDD, and associated attachment cards are listed as follows:

<u>Title</u>	<u>Publication Number</u>
80230/80231/80240/80241 Mini Module Drive and Mini Module Drive Attachment Feature FA740-C Hardware Maintenance Manual (Support Information)	62947907
80210 Flexible Disk Drive and 80230/80231/80240/80241 Mini Module Drive Reference Manual	62947908
80210-10/80240 Flexible Disk Drive Hardware Maintenance Manual (Site Information)	62947909
Flexible Disk Drive Attachment Feature FA741-A, and 80210 Flexible Disk Drive Cabinet and 80210/80240 Flexible Disk Drive Power Supply Hardware Maintenance Manual (Support Information)	62947910
Flexible Disk Drive, Model 9406 Hardware Maintenance Manual (Support Information)	75888335
Certainty Series System Test and Freelance Reference Manual	62947920
Standalone Utilities Users Guide	62981800

All manuals may be ordered from:

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

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The mini module drive (MMD) is a peripheral storage device that provides from 9.3 to 126 megabytes of formatted fixed disk random access storage. The MMD is designed to interface to an IBM Series/1 computer via an associated attachment feature (controller). The MMD cabinet provides space for an associated flexible disk drive (FDD)*. Both of these units are housed inside the IBM Series/1 4997 Rack Enclosure. When only the MMD is used, a filler plate is inserted into the front panel in the space normally occupied by the FDD.

A fixed head option provides 96 fixed heads as part of the basic MMD assembly. The fixed heads provide additional (zero seek time) storage to that available with the movable heads alone. The 96 fixed head option adds 1.48 megabytes additional storage capacity to the basic configuration of the MMD. The fixed head option however, is not available on all MMD models (see preface for tabulation).

Equipment specifications of the MMD are listed in table 1-1. The remainder of this section provides a physical and functional description of the MMD.

MMD PHYSICAL DESCRIPTION

The MMD consists of four major assemblies:

- Mini Module
- Frame Assembly
- Logic Chassis
- Power Supply

Figure 1-1 indicates the location of the assemblies that make up the drive.

MINI MODULE ASSEMBLY

The mini module is an enclosed, sealed module, containing the spindle, disks, heads and actuator. It is nonremovable (except by field service personnel). The read/write cards are an integral part of the module, but are external to the sealed enclosure. They plug into the front of the module to allow access for maintenance.

*Information on the FDD is provided in the FDD site information manual. See Preface for publication number.

TABLE 1-1. MINI MODULE DRIVE SPECIFICATIONS

Characteristic	Specification	
<u>Size</u> Height Width Length Mass	19.25 in (489 mm) 18.6 in (472 mm) 27.75 in (704.9 mm) 175 lb (79.4 kg) or 200 lb (90.7 kg) with enclosed FDD	
<u>Recording, Physical</u> Number of disks Movable data heads Servo heads Tracks per inch Fixed data heads Physical heads per surface Logical cylinders per head/disk assy	<u>9, 13, 63 MB</u> 4 10 1 340 96 or none 2 823 maximum	<u>160 MB</u> 4 10 1 680 none 2 433 maximum
<u>Temperature</u> Storage Range Maximum change Transit Range Maximum change Nonoperating Range Maximum change Operating Range Maximum change	14°F to 122°F (-10°C to 50°C) 27°F (15°C) per hour -40°F to 158°F (-40.4°C to 70°C) 36°F (20°C) per hour 50°F to 104°F (10°C to 40°C) 18°F (10°C) per hour 50°F to 100°F (10°C to 37.8°C) 12°F (6.7°C) per hour	
<u>Humidity</u> Storage Transit Nonoperating Operating <u>Heat Output</u> Model 230/231 Model 240/241	10% to 90%, no condensation 5% to 95% RH, no condensation 20% to 80% RH, no condensation 10% per hour maximum change 10% to 90% RH, no condensation 10% per hour maximum change 498 Wh (1700 Btu/h) 703 Wh (2400 Btu/h)	

TABLE 1-1. MINI MODULE SPECIFICATIONS (CONTD)

Characteristic	Specification																												
<u>Barometric Pressure</u> <u>Standard Day</u> Storage/nonoperating Transit Operating	-980 feet to 8200 feet (-300 metres to 2500 metres) 31 in Hg to 21.9 in Hg (104.69 kPa to 73.96 kPa) -980 feet to 8200 feet (-300 metres to 2500 metres) 31 in Hg to 21.9 in Hg (104.69 kPa to 73.96 kPa) -980 feet to 6560 feet (-300 metres to 2000 metres) 31 in Hg to 21.9 in Hg (104.69 kPa to 73.96 kPa)																												
<u>Air Cleanliness</u> Storage/transit Nonoperating/operating	Same as operating with proper packing <table border="0"> <thead> <tr> <th><u>Particle Size (Microns)</u></th> <th><u>Particles/Metre³</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4×10^7</td> </tr> <tr> <td>1.5</td> <td>4×10^6</td> </tr> <tr> <td>5</td> <td>4×10^5</td> </tr> </tbody> </table> Sulphur dioxide: 0.14 parts per million maximum	<u>Particle Size (Microns)</u>	<u>Particles/Metre³</u>	1	4×10^7	1.5	4×10^6	5	4×10^5																				
<u>Particle Size (Microns)</u>	<u>Particles/Metre³</u>																												
1	4×10^7																												
1.5	4×10^6																												
5	4×10^5																												
<u>Power Requirements</u> BG702-G/L and BG703-A AC Power Input Power used with disks and carriage in motion Power used with disks and carriage at rest BG702-H/M and BG703-B AC Power Input Power used with disks and carriage in motion Power used with disks and carriage at rest	<table border="0"> <thead> <tr> <th><u>Voltage</u></th> <th><u>Frequency</u></th> <th><u>Phase</u></th> </tr> </thead> <tbody> <tr> <td>208 (+15,-25) V</td> <td>60 (+0.5,-1) Hz</td> <td>1</td> </tr> </tbody> </table> <table border="0"> <thead> <tr> <th><u>Power Input</u></th> <th><u>Max Line Current</u></th> </tr> </thead> <tbody> <tr> <td>208 V 487 W</td> <td>2.7 A (3.2 A with FDD)</td> </tr> </tbody> </table> <table border="0"> <thead> <tr> <th><u>Power Input</u></th> <th><u>Max Line Current</u></th> </tr> </thead> <tbody> <tr> <td>208 V 179 W</td> <td>0.67 A</td> </tr> </tbody> </table> <table border="0"> <thead> <tr> <th><u>Voltage</u></th> <th><u>Frequency</u></th> <th><u>Phase</u></th> </tr> </thead> <tbody> <tr> <td>120 (+7.0,-16) V</td> <td>60 (+0.6,-1.0) Hz</td> <td>1</td> </tr> </tbody> </table> <table border="0"> <thead> <tr> <th><u>Power Input</u></th> <th><u>Max Line Current</u></th> </tr> </thead> <tbody> <tr> <td>120 V 465 W</td> <td>4.7 A (5.7 A with FDD)</td> </tr> </tbody> </table> <table border="0"> <thead> <tr> <th><u>Power Input</u></th> <th><u>Max Line Current</u></th> </tr> </thead> <tbody> <tr> <td>120 V 151 W</td> <td>1.41 A</td> </tr> </tbody> </table>	<u>Voltage</u>	<u>Frequency</u>	<u>Phase</u>	208 (+15,-25) V	60 (+0.5,-1) Hz	1	<u>Power Input</u>	<u>Max Line Current</u>	208 V 487 W	2.7 A (3.2 A with FDD)	<u>Power Input</u>	<u>Max Line Current</u>	208 V 179 W	0.67 A	<u>Voltage</u>	<u>Frequency</u>	<u>Phase</u>	120 (+7.0,-16) V	60 (+0.6,-1.0) Hz	1	<u>Power Input</u>	<u>Max Line Current</u>	120 V 465 W	4.7 A (5.7 A with FDD)	<u>Power Input</u>	<u>Max Line Current</u>	120 V 151 W	1.41 A
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120 V 151 W	1.41 A																												



TABLE 1-1. MINI MODULE SPECIFICATIONS (CONTD)

Characteristic	Specification
<p><u>Power Consumption</u> BG702-G/L and BG703-A Power used with disks and carriage in motion</p> <p>Power used with disks and carriage at rest</p> <p>BG702-H/M and BG703-B Power used with disks and carriage in motion</p> <p>Power used with disks and carriage at rest</p>	<p><u>Btu/Hr</u> 1662</p> <p>611</p> <p>1590</p> <p>515</p>
<p><u>Performance</u> Transfer rate* Latency</p> <p>Average Maximum</p> <p>Recording Mode</p> <p>Density</p> <p>Seek time Full Average Single track Start/stop time</p>	<p>9.584 MHz (1 198 000 bytes/second)</p> <p>Latency is time to reach a particular track address after positioning is complete.</p> <p>8.33 milliseconds (disk rotation speed at 3600 r/min) 17.3 milliseconds (disk rotation speed at 3474 r/min)</p> <p>Modified frequency modulation (MFM) or Nonreturn to zero (NRZ)</p> <p>6417 bits per inch (inner track)</p> <p>55 milliseconds maximum 30 milliseconds maximum 10 milliseconds maximum 30 seconds maximum</p>
<p>*Disk speed at 3600 r/min.</p>	

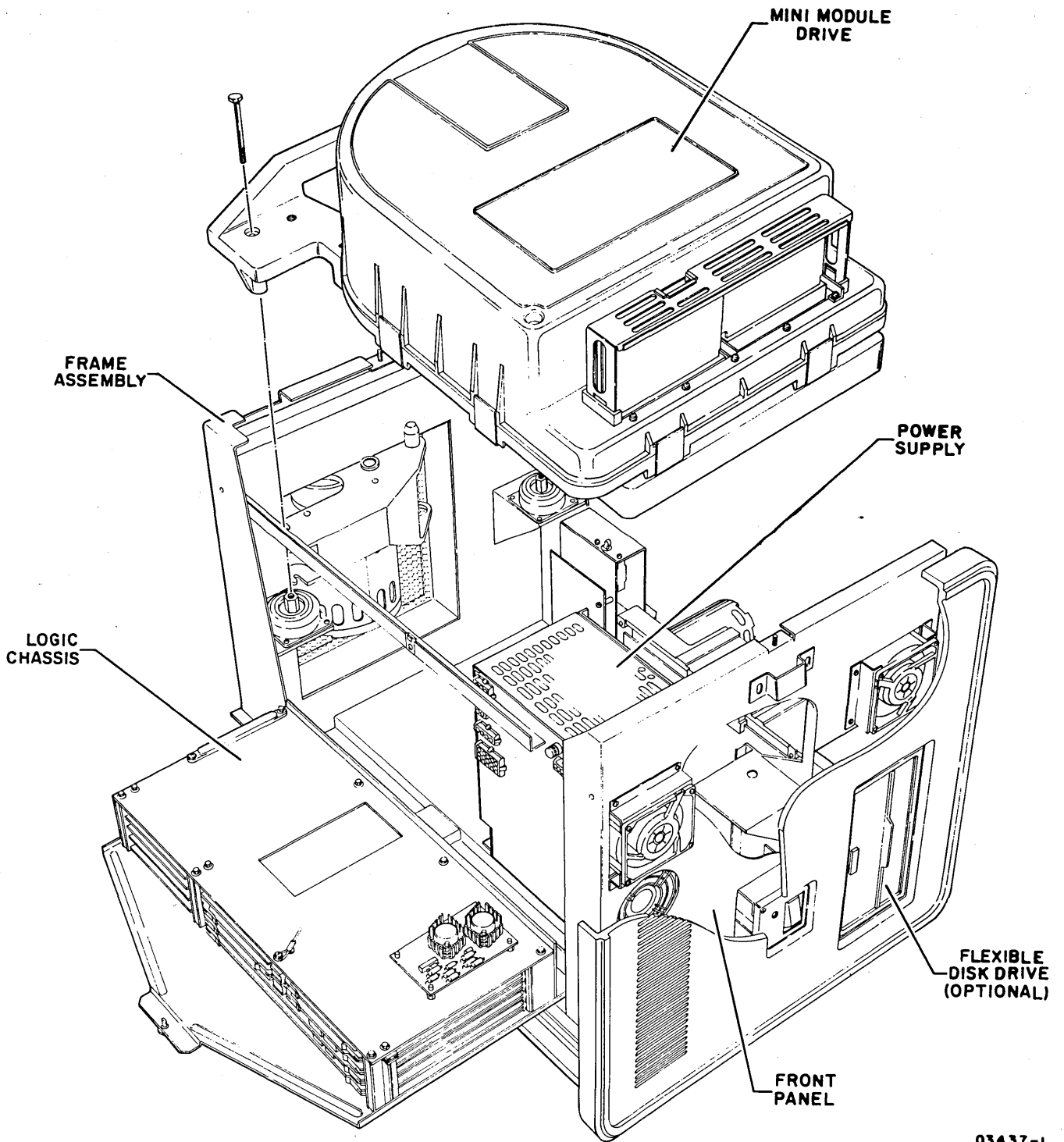


Figure 1-1. MMD Major Assemblies

Four 14-inch disks provide the recording medium for the drive. The recording surface of each disk is coated with a layer of magnetic oxide with related binders and adhesives.

The disks are center mounted on a spindle that rotates the disks. The drive motor provides the rotation via a drive belt that connects between the motor pulley and the spindle pulley that extends from the bottom of the mini module. Rotation of the spindle also acts as a fan to circulate air within the sealed module.

The actuator holds the heads and moves them over the rotating disks. The actuator is moved by a magnetic field controlled voice coil that moves the heads in an arc over the disk surfaces. The actuator holds only the moveable heads and the servo head. The fixed heads are fixed to the module base and use the bottom surface of the lowest disk for read/write operations. When the drive is not in use, the heads rest on the disk surface in the preassigned landing zone (the outer areas of the disk surface). When the drive is activated and the drive comes up to speed (nominally 3600 revolutions per minute), the heads fly on a cushion of air close to the disk surface.

FRAME ASSEMBLY

The frame assembly houses the various components and forms the mounting base for the drive. The drive motor, power supply, logic chassis, and fans are considered part of the frame assembly. The front surface of the frame assembly houses two of the four cooling fans, the primary air filter, Power On/Off switch and a red LED indicator that lights when power is applied.

LOGIC CHASSIS

The logic chassis houses and interconnects the logic cards. It is hinge mounted and folds down to a horizontal position to allow access to other components for maintenance. In the normal position, it stands vertically and is locked in that position with a fastener. The backpanel at the bottom of the logic chassis receives the dc power for distribution throughout the logic. The signal cables plug into the I/O cards at the top of the logic chassis. All other signals and interconnections are wirewrapped or plugged into the backpanel.

POWER SUPPLY

The MMD has its own self-contained power supply which receives its input from the site main power source. The power supply provides all the voltages necessary for drive operation.

MMD FUNCTIONAL DESCRIPTION

The MMD contains all the circuits and mechanical devices necessary to record data on and recover it from the disks. All drive functional operations are performed under direction of the attachment feature (controller). The controller communicates with the drive via separate Bus In and Bus Out cables that carry the necessary signals to and from the drive. All operations that are performed internally by the drive are related to data storage and recovery (writing and reading). The actual writing and reading is performed by electromagnetic heads that are positioned such that information is written in concentric tracks around the disk surfaces.

Before any read or write operation can be performed, the controller must instruct the drive to position the heads to the desired cylinder (same track position on all disk surfaces) and also to select only one head such that a single track on one disk surface is being specified. These functions are termed seeking and head selection respectively. The seek function is not required when a fixed head is being addressed by the controller; therefore, the access time is faster than that of the movable heads.

When the selected head is on the desired 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 accomplished 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.

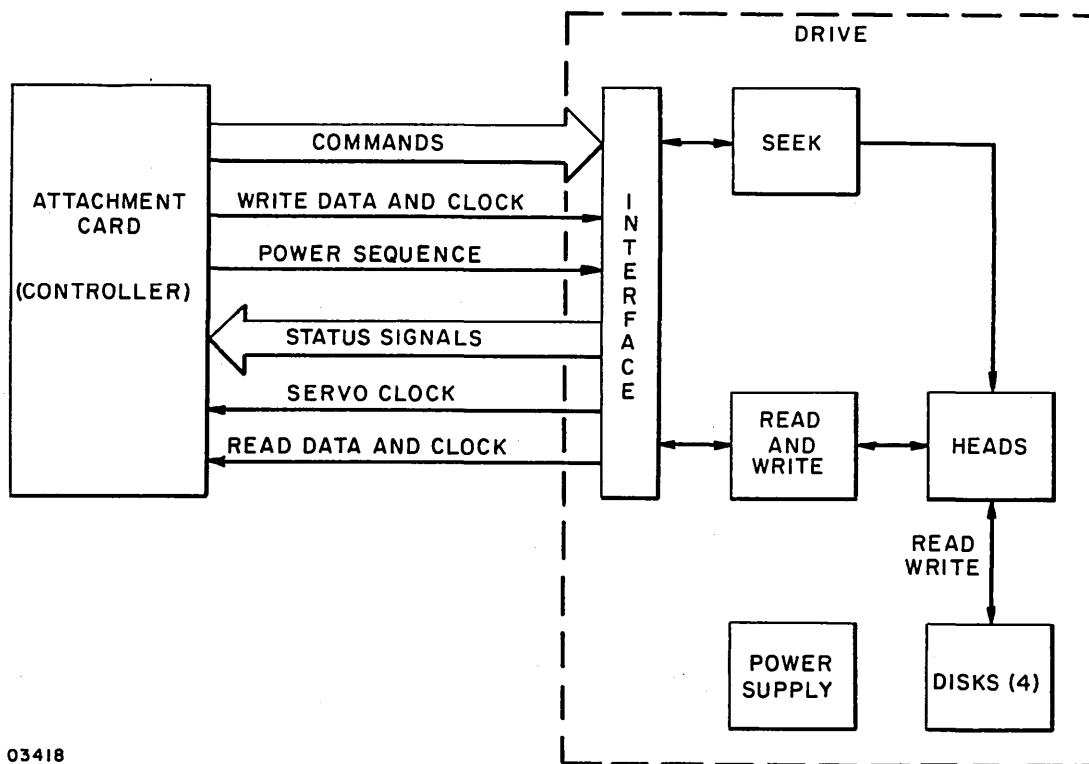
When the desired location is reached, the controller commands the drive to actually read or write the data. During a read operation, the drive recovers data from the disk and transmits it to the controller. During a write operation, the drive receives data from the controller, processes it, and writes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

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

The following paragraphs provide a brief description of the major functional areas of the MMD and associated attachment feature. These are illustrated in block diagram form in figure 1-2. Information is described under the following headings:

- Power Functions
- Electromechanical Functions
- Interface Functions
- Machine Clock Functions
- Seek Functions
- Head Selection
- Track Orientation
- Read/Write Functions
- Fault Detection
- Attachment Feature

Refer to Volume 2 of the Mini 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.



03418

Figure 1-2. MMD Basic Functional Diagram

POWER FUNCTIONS

The internal power supply of the MMD receives input power from the site ac power source and produces the dc voltages necessary for drive operation. Application of power initiates a power on sequence that causes the drive motor to start and the heads to be loaded to the home position (cylinder 0). Removal of power initiates a power off sequence that retracts the heads and turns off the drive motor.

If during operation there is a drive malfunction such as loss of spindle speed, drive motor thermal overload, or a loss of power, an emergency retract sequence is performed. This provides a means of retracting the heads from the data area of the disk to a landing zone before head crashes can occur.

ELECTROMECHANICAL FUNCTIONS

Certain drive functions are a result of the electromechanical devices operating under control of the logic circuits. These functions include disk rotation, head positioning, and drive cooling and ventilation.

Disk rotation is performed by the disk-rotation mechanism following a power-on application. The purpose of disk rotation is to enable the encoding of cylindrical data and to create a cushion of air on the disk surfaces to allow the heads to move over the disk surfaces without actually contacting them.

The heads are positioned over specific tracks on the disk surface by the actuator assembly (also called the head positioner). This mechanism is controlled by the servo circuits (refer to the discussion of seek functions).

Drive cooling and ventilation is provided by the air flow system that provides continuous air replacement and circulation to dissipate the heat generated by the drive. The mini module contains a closed-loop system that consists of a fan, a circulation filter, and a breather filter. This system maintains the pressure within the module equal to that of the surrounding atmosphere.

INTERFACE FUNCTIONS

All communication between the drive and controller (attachment card) 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.

MACHINE CLOCK FUNCTIONS

The machine clock circuits generate the clock signals necessary for drive operation. These circuits are divided into three areas: servo clock, write clock, and read clock.

The servo clock circuit generates 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 to synchronize the drive with the controller.

The write clock circuit receives the 9.67-MHz Write Clock signal from the controller and gates the NRZ data into the write data buffer of the drive. The 9.67-MHz clock along with the 19.34-MHz clock from the write PLO circuit are used to gate in data from the controller, for NRZ to MFM conversion and write compensation, during write operations.

The read clock circuit provides a 19.34-MHz and 9.67-MHz read clock. These clock signals provide clocking for the PLO. The 9.67-MHz read clock is also sent to the controller and is synchronous with the detected data. The controller uses this signal to clock in data to the controller.

SEEK FUNCTIONS

The drive must move the heads to the desired cylinder position on the disk before any read or write operation can be performed. This is done during seek functions and is performed by the drive's 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 servo surface is located on the underside of the third disk, counting from top to bottom. All heads are positioned simultaneously. The servo head reads information that has been prerecorded on the servo surface and transfers this information to the servo circuits. The servo circuits convert the electrical signals into electromechanical motions to position the read/write heads accurately on the disk surface.

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).

HEAD SELECTION

Information is recorded on and read from the disk by the read/write heads. The drive requires two read/write heads for each

data recording surface in the disk module as shown in figure 1-3. The 63-MB and 126-MB drive units require five recording surfaces, plus the servo surface. Therefore, 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.

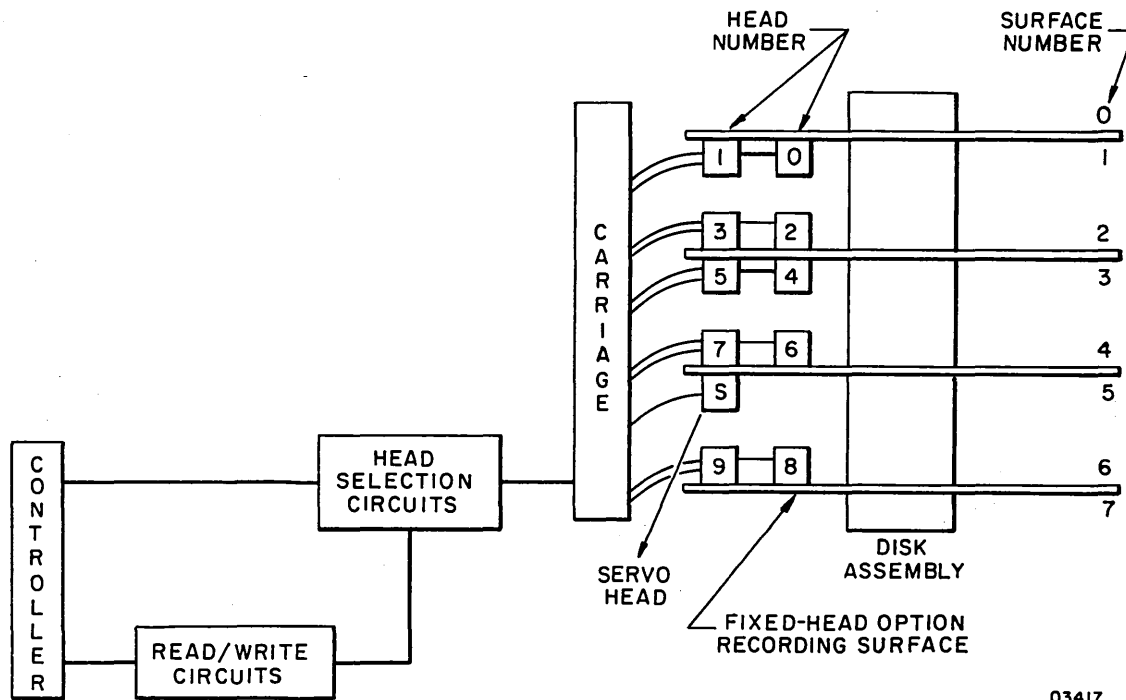


Figure 1-3. Head/Disk Surface Configuration

During selection of a movable head, the controller must first perform a cylinder select operation to move the heads to the desired cylinder. For fixed-head selection, no actuator movement is involved, so the cylinder and head select functions are essentially the same operation.

Head selection is initiated when the controller sends the drive a head select command and a head address on the Bus Out lines. The head select command then gates the address into the head address register. This address is then decoded to select the desired head.

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 disk track where the data is to be read or written. The controller accomplishes this by using the Index and Sector signals that 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 surface contains a series of recorded quadbits along with identify and sync bits. The sync bit generates the servo clock. A missing identify bit results in a missing servo clock. Patterns of missing clock pulses are recognized and decoded to identify index, inner guard band, and outer guard bands 1 and 2. The index pulse (2.5 microsecond) indicates to both the drive and the controller, the logical beginning of a track. The guard bands indicate to the drive and controller that the heads are located outside the normal data recording track area, and must be moved into this area before data recording can start.

Sector Detection

The sector detection circuit generates signals that are used by the drive 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 disks. The Sector pulses logically divide each disk into areas called sectors. The Sector pulses are generated by a sector counter that generates one pulse each time it reaches its maximum count (4095).

ADDRESS MAPPING

9.3, 13.9, 63 MB MMD

Mapping is not used on these units. The logical cylinder/head/sector is equal to the physical cylinder/head/sector address.

126 MB MMD

Address mapping is used on the 126 MB MMD to allow software emulation of a 240 MB SMD. The mapping allows a logical address structure of 433 cylinders of 19 tracks each plus 3 additional tracks. This corresponds to a physical structure of 823 cylinders of 10 tracks each.

The following algorithm should be used when translating a logical address to a physical address. This will be helpful when performing maintenance on a cylinder or head related problem.

$$\frac{(\text{Logical cyl no.}) \times 19 + (\text{Logical hd no.})}{10} = \underbrace{\text{Physical cyl no.}}_{\text{Quotient}} + \underbrace{\text{Physical hd no.}}_{\text{Remainder}}$$

Example: Logical Address - cyl 433, hd 2

$$\frac{433 \times 19 + 2}{10} = 822.9 = \text{cyl } 822, \text{ hd } 9$$

The logical CE track is cylinder 432, head 12 through cylinder 433, head 2 which corresponds to physical cylinder 822, head 0 through cylinder 822, head 9.

The logical area reserved for alternate sector assignment is cylinder 1, head 0 through cylinder 1, head 19 which corresponds to physical cylinder 1, head 9 through cylinder 3, head 7.

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 hand-shaking 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. The actual reading of data from or writing data onto the disk surface occurs as follows:

During a read operation, disk motion beneath the head causes the stored magnetic 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. Each flux reversal (caused by current polarity change while writing) generates a readback voltage pulse. Each voltage pulse represents a data bit.

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 stored on the disk.

FAULT DETECTION

The following describes those conditions that are interpreted by the drive as errors. All of these conditions send a signal to the controller indicating an error has occurred.

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

Errors Indicated by Fault Latch and Register

Certain errors set the drive Fault latch and also set separate fault register latches associated with the error condition. Setting the Fault latch does three things: enables the fault line to the controller, clears the drive Unit Ready signal, and inhibits the drive write and load circuits. 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 and individual fault latches are cleared by any of the following:

- Controller Fault Clear or Clear-Reset command from the controller.
- MAINT CLR switch on fault card
- Powering down the unit



All errors except the Low Speed and Seek Error set the Fault latch as well as the individual latch associated with the error condition. These latches provide a means of storing the error indication so that it may be referred to later for maintenance purposes.

The conditions causing the Fault latch and a related fault register latch to set are:

- 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 either of the following conditions exist:

- Low current input to write driver.
- No write data transitions when Write Gate is active.

Head-Select Fault

A head-select fault is generated when 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 signal.

Read and Write Fault

A read and write fault is generated when the drive receives a Read Gate and Write Gate simultaneously from the controller.

(Read or Write) and Off-Cylinder Fault

A (read or write) and off-cylinder 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

A voltage fault is generated whenever the +24 or +5 voltages are below satisfactory operating levels. A voltage fault disables the write circuits, generates a Write Protected status signal to the controller, and causes a retract of the heads.

Errors Not Indicated by Fault Latch and Register

Two error conditions, low speed and seek error, do not set the Fault latch or any of the register latches. However, they do cause the drive to give other error indications as explained in the following paragraphs.

(Low) Speed

The Speed fault signal goes true when the drive detects that the drive spindle speed is below 3000 r/min. When this is detected, the drive write circuits are disabled, the Write Protected status is sent to the controller, and a retract operation is initiated.

Seek Error

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

- On Cylinder was not obtained within 275 ms from the start of the seek (16 index counts on the Seek Time counter).
- Inner guard band end of travel (EOT) sensed.
- Maximum seek fault detected. Addressing beyond the maximum cylinder address generates a maximum seek fault (see para 3.16 for maximum cylinder addresses for the various MMD models).

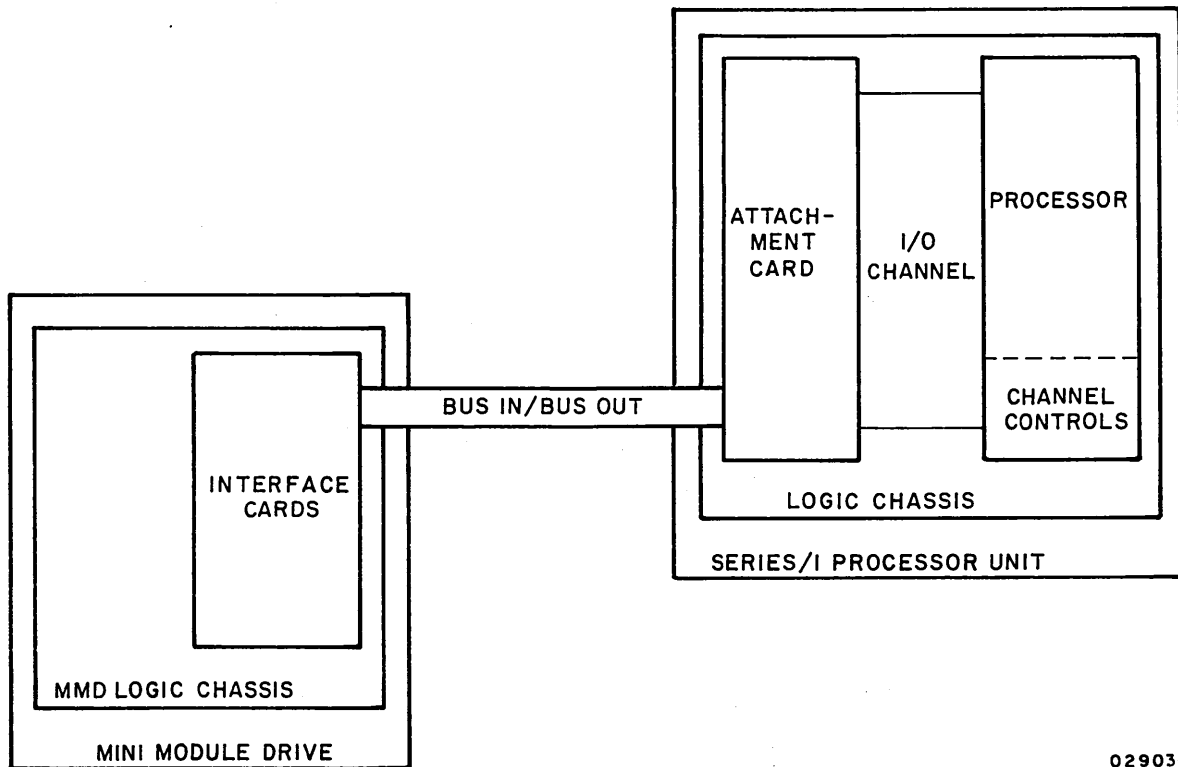
Setting the Seek Error latch generates a Seek Error signal to the controller and also inhibits the drive from performing another seek until the Seek Error latch is cleared. The latch is cleared by a Return-to-Zero Seek command.

ATTACHMENT FEATURE

The attachment feature (controller) consists of a LSI printed-circuit module and associated interconnecting cables. This feature provides the interface between the Series/1 input/output channel and the MMD. The attachment card is mounted in the Series/1 processor unit and plugs directly into a backpanel interface connector. Separate Bus In and Bus Out cables provide the physical interconnections to the MMD.

Figure 1-4 shows the relationship of the attachment feature to the Series/1 and MMD.

The attachment card 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 card sends an equivalent command and control signals to the MMD to initiate the specified I/O operation. Data transfers are handled on a high speed data path via a 1K by 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.



02903-2

Figure 1-4. Attachment Feature Configuration



This section provides information pertaining to the installation and checkout of the MMD. Reference is made to paragraph numbers in section 3 of this manual for detailed information and specific procedures to be performed. Information is presented under the following major headings.

- Packaging -- provides information regarding packaging of the MMD and associated PC cards for shipment.
- Installation -- provides instructions for installing the MMD and attachment card. Also covers installation of the FDD attachment card for units containing an FDD.
- Checkout -- provides instructions to checkout the MMD. Information for checkout of an enclosed FDD device is contained in the FDD site information manual (see preface for publication number).

PACKAGING

Packaging of the MMD consists of an outer container (made up of corrugated cardboard and wood) and internal blocking and holddown bolts. Carefully remove the outer container and set aside. Most packaging materials can be reused if it becomes necessary to reship the drive at some future date. Refer to the unpackaging instruction sheet provided with the drive for instructions on removal of the internal blocking and holddown bolts.

When the MMD is to be reshipped, it must be packaged as originally received from the factory.

To obtain packaging instructions and/or packaging materials if needed, contact:

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

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

CAUTION

Observe MOS circuit handling precautions (para 3.0.3) when packaging microprocessor logic card (location A2C04 of MMD) and attachment card.

When it is necessary to ship logic cards in for repair, package each card in a special padded 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

This subsection provides information necessary to install the MMD and attachment card. Information is also provided to install the attachment card and I/O cables of an FDD device when contained in the MMD cabinet. The installation information is described under the following headings.

- Installation Inspection
- MMD Installation
- Setting Sector Select Switches
- Attachment Card and I/O Cable Installation

INSTALLATION INSPECTION

Perform the following inspection prior to installing the MMD.

1. Inspect unit for possible shipping damage. Any claim for this type of damage should be filed promptly 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.
3. Verify that all connectors are firmly seated and that there are no broken or damaged wires.
4. Check entire unit for presence of foreign material that could cause an electrical short or impair operation.

NOTE

When unpacking an MMD, note the location of the following:

- The drive belt is packed on the inside of MMD skins.
- Rail mounting screws are packed with the rails.

MMD INSTALLATION

This procedure details the steps necessary to install the MMD in the Series/1 mainframe and prepare the drive for operation.

1. Remove front cover panel from Series/1 mainframe where MMD is to be installed.
2. Loosen front and rear recess bracket adjusting screws on slide assemblies (see figure 2-1).
3. Position front bracket so that end of bracket is flush with front of slide when closed and tighten adjusting screws.
4. Position rear bracket to fit depth of cabinet frame and tighten adjusting screws.
5. Mount slide assemblies in Series/1 cabinet as follows :
 - If MMD is to be mounted at bottom of cabinet, position slide assemblies to align with lowest possible holes in cabinet frame. Install and tighten mounting screws.
 - If MMD is to be installed in center of cabinet, position slide assemblies so that lowest slot of bracket aligns with hole number 35 counting from the bottom of cabinet frame. Install and tighten mounting screws.
 - If MMD is to be installed in a 1-meter cabinet, remove the innermost or second adjusting screw and nut from the rear recess bracket. See figure 2-1. This allows clearance that is needed to assemble the recess bracket to cabinet frame.
6. Ensure that slide assemblies within Series/1 mainframe are aligned properly and are securely mounted.
7. Pull both slide assemblies to their fully extended position. Make sure that full extension lock and inner slide lock on each slide assembly are locked (see figure 2-1).

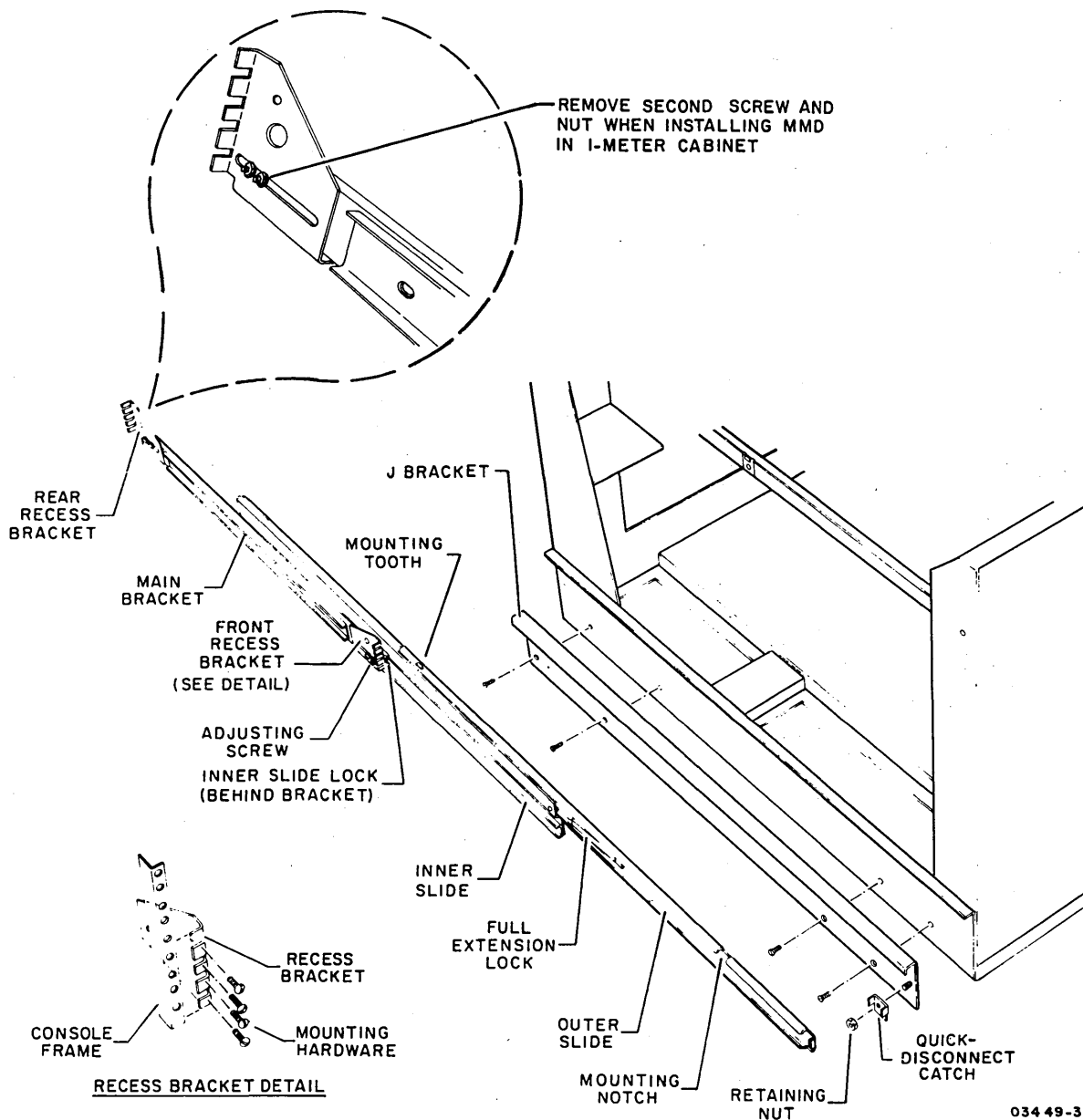


Figure 2-1. Slide Assembly Details

8. Loosen quick-disconnect catch at front of each J bracket on MMD.
9. Obtain sufficient help to lift MMD and place unit onto slide assemblies. Make certain that each J bracket slips under mounting tooth at rear of each outer slide. Also, maneuver quick-disconnect catches so that end with two 90-degree tabs faces up.
10. While keeping MMD J brackets securely under mounting tooth on each slide, push up on quick-disconnect catches and tighten retaining nuts. This secures MMD to outer slides.

11. Route MMD ac power cable through rear of Series/1 cabinet.
12. Press on full extension locks and slide MMD to closed position to check slide operation. Inner slide locks are automatically unlocked by outer slides during closing.
13. Slide MMD out to fully extended position and remove front panel and access covers (para 3.2).
14. Unlock drive motor per the following:
 - a. Remove nine mounting screws holding motor cover at rear of unit. Remove cover and set aside.
 - b. Use special spring removal tool (CDC part number 71493095) to compress constant force spring and remove spring tension from motor. Leave spring compressed until completion of step 15.
 - c. Loosen flathead screw at slotted opening of motor mount plate (see figure 2-2).
 - d. Back off threaded stud slightly so stud face is no longer contacting motor mount plate.
 - e. Push motor toward front of unit and hold in position while tightening flathead screw until flush with stud face.

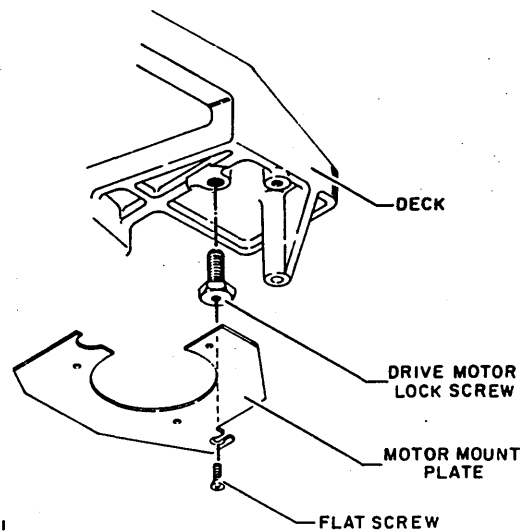
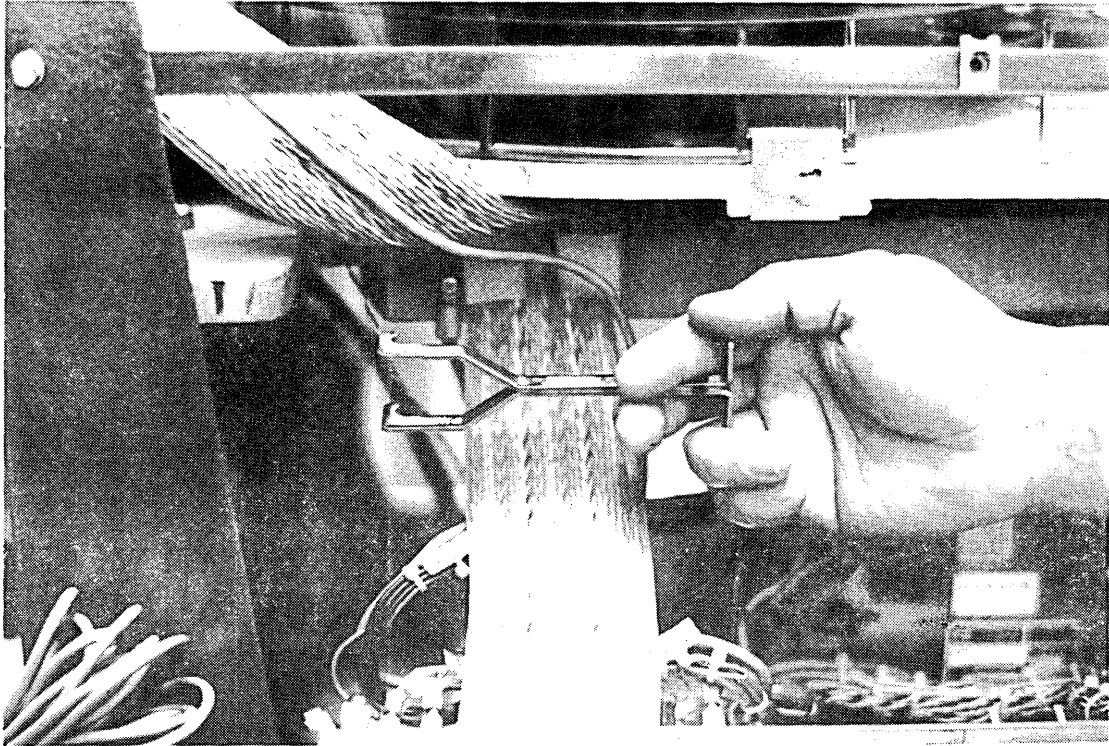


Figure 2-2. Drive Motor Lock Screw

CAUTION

Do not allow spindle pulley to turn counter-clockwise while installing drive belt. Head or disk surface damage may occur.



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Figure 2-2.1 Drive Belt Installation

15. Position replacement drive belt over spindle and drive motor pulleys. Ensure that drive belt rests near the center of each pulley and apply string tension back on motor by using spring removal tool to decompress constant force spring until motor returns to its resting position (see figure 2-2.1).
16. Unlock actuator by placing rotary positioner arm lock at underside of MMD module to OFF position as shown in figure 2-3.
17. Unlock spindle by loosening screws on spindle lock and ground spring as shown in figure 2-4. Slide spindle lock and ground spring back as far as possible and still allow ground spring cup to rest in middle of spindle shaft. Tighten screws.

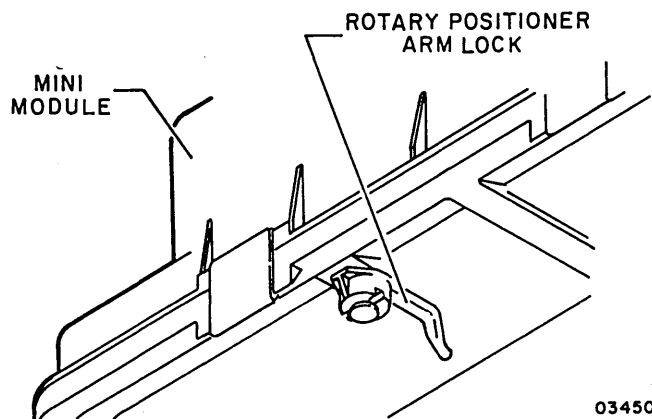


Figure 2-3. Rotary Positioner Arm Lock Location

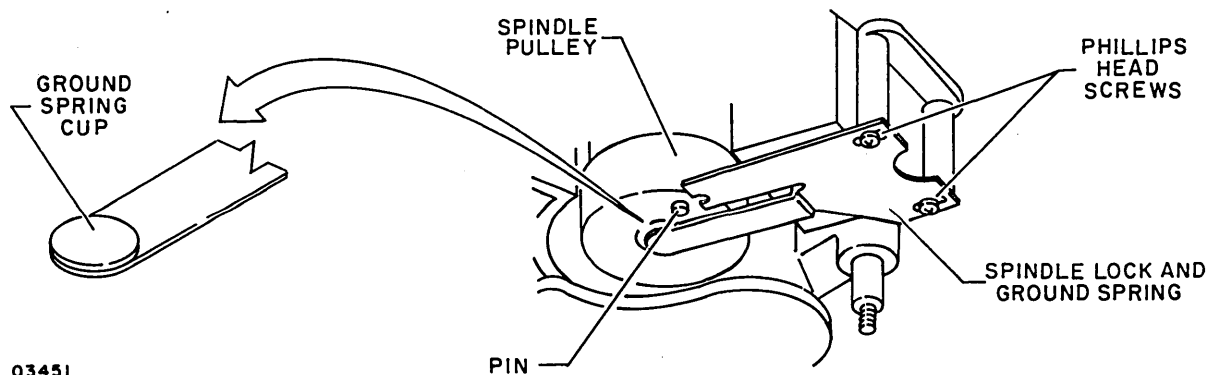


Figure 2-4. Spindle Lock and Ground Spring Location

18. If unit is rated for 120 V and no FDD is to be installed, go to step 20. See figure 2-4.1 for 120 V, 60 Hz programming plug configuration.
19. For 208 V or 230 V units, proceed as follows:
 - a. Measure ac source voltage at outlet to which MMD is to be connected.
 - b. If the source voltage is less than or equal to 220 V, then go to step 20. See figure 2-4.1 for 208 V, 60 Hz programming plug configuration.
 - c. If the source voltage is greater than 220 V, then the MMD programming plug at location J07 on the MMD power supply must be restrapped for 230 V, 60 Hz. Using a pin extractor (part number 51876100), restrap programming plug using figures 2-4.1 and 2-4.2 as references.

CAUTION

Differences in the MMD motor prevent field conversions from 120 V to 208/230 V units and vice versa.

NOTE

If MMD power supply programming plug is changed, then FDD power supply programming plug must be changed accordingly (see FDD installation).

(VIEWED FROM PIN INSERTION SIDE)

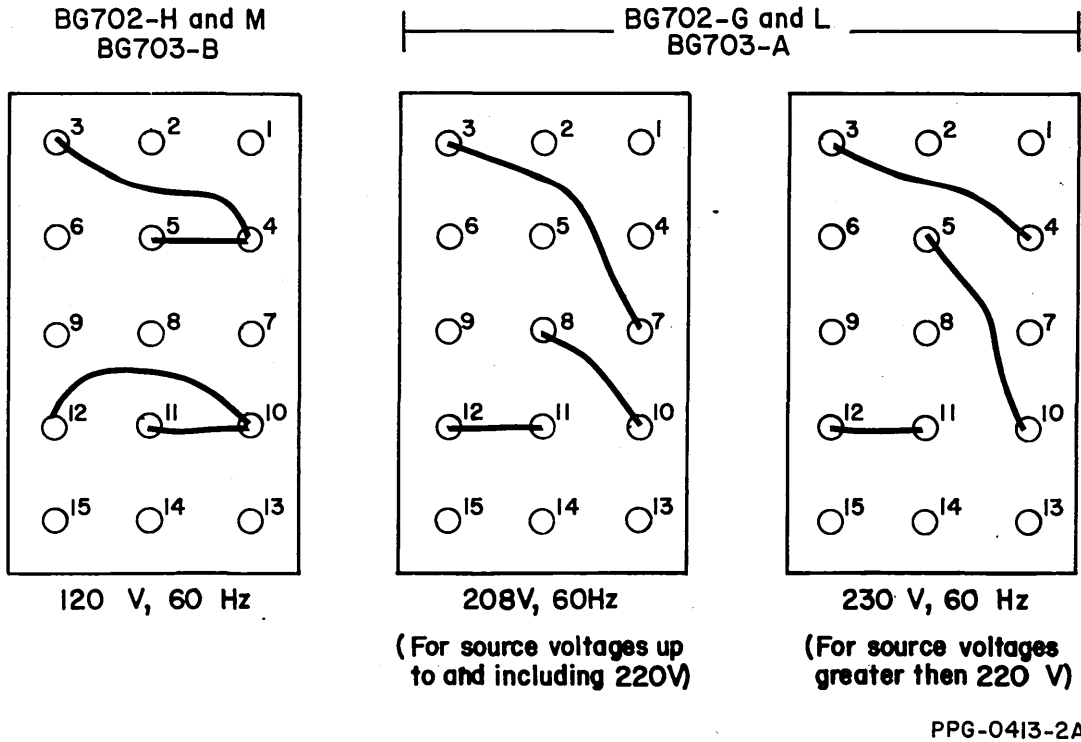
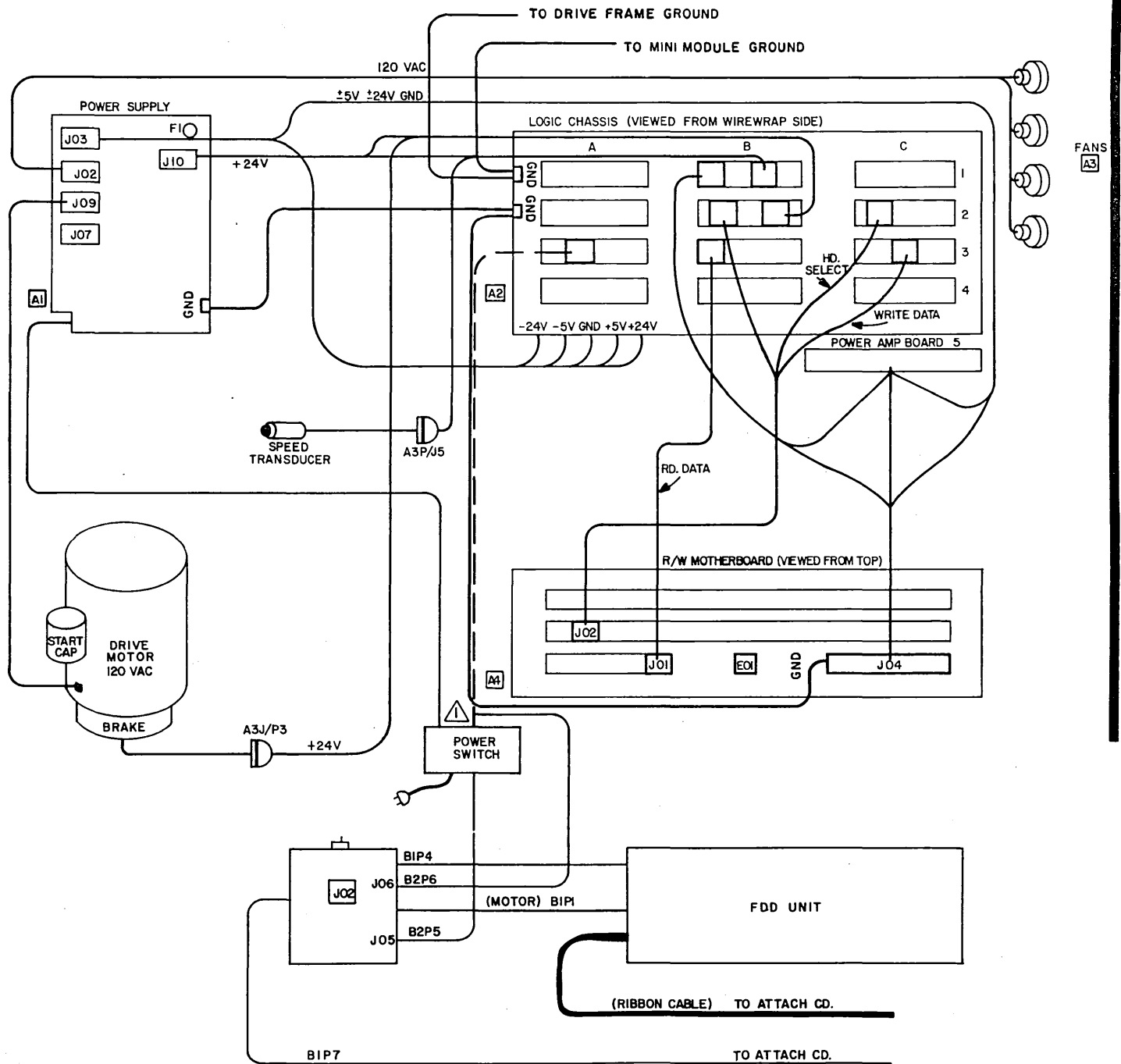


Figure 2-4.1 MMD Power Supply Programming Plug (J07)

20. Check that front panel Power On/Off switch is in Off position and plug ac power cord into ac power receptacle in Series/1 cabinet.
21. Set sector select switches and install attachment card and I/O cables per the following paragraphs.



⚠ IF UNIT IS A STAND-ALONE MMD THIS CABLE IS CONNECTED AT A3 AS INDICATED BY DOTTED LINE. IF UNIT IS MMD/FDD COMBO THIS CABLE IS CONNECTED AT J06 ON FDD POWER SUPPLY

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Figure 2-4.2 MMD/FDD Diagram with Jumper Location Codes

SETTING SECTOR SELECT SWITCHES

Sector select switches are provided on the -FGX logic card (A2B02/C02) to establish the number of sectors per disk revolution. The required number of sectors for Series/1 system operation is 60. Although the sector select switches are set at the factory, they should be checked for correct setting. They should be set as follows (refer to figure 2-5):

CAUTION

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

Set switch 0, 1, 2, 3, 4, 6, and 7 to closed position. Set remaining switches to open position.

This logic card also contains unit select switches, a LOC REM (local or remote) switch, and a WRT PROT (write protect) switch. The unit select switches and LOC REM switch are not used and their settings have no effect on the logic. Set the WRT PROT switch to Off (right) position to enable writing on disk.

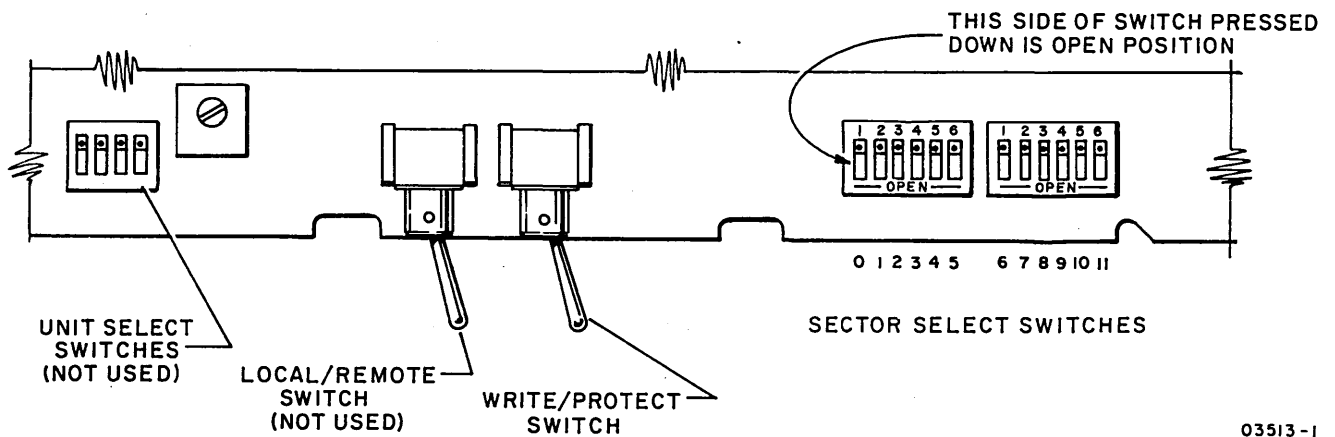
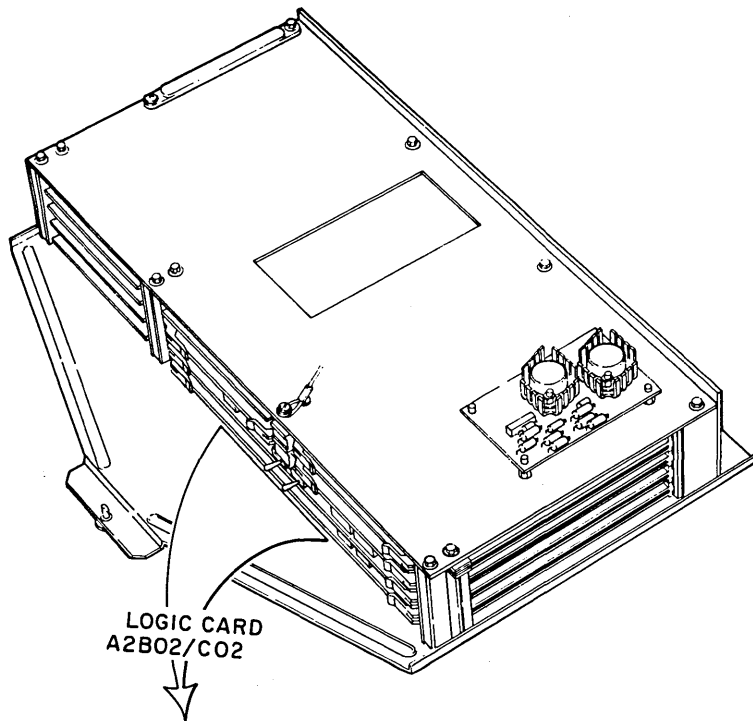


Figure 2-5. Sector Select Switches

FDD INSTALLATION

This procedure describes installation of the FDD in the MMD cabinet.

NOTE

Perform the following instructions only if the two units are not combined on shipment.

Refer to figure 2-5.1 for side view of the FDD.

1. Unpack FDD unit and visually inspect for shipping damage.
2. Slide FDD mounting frame into MMD.

CAUTION

Make sure that cables are free of MMD power supply.

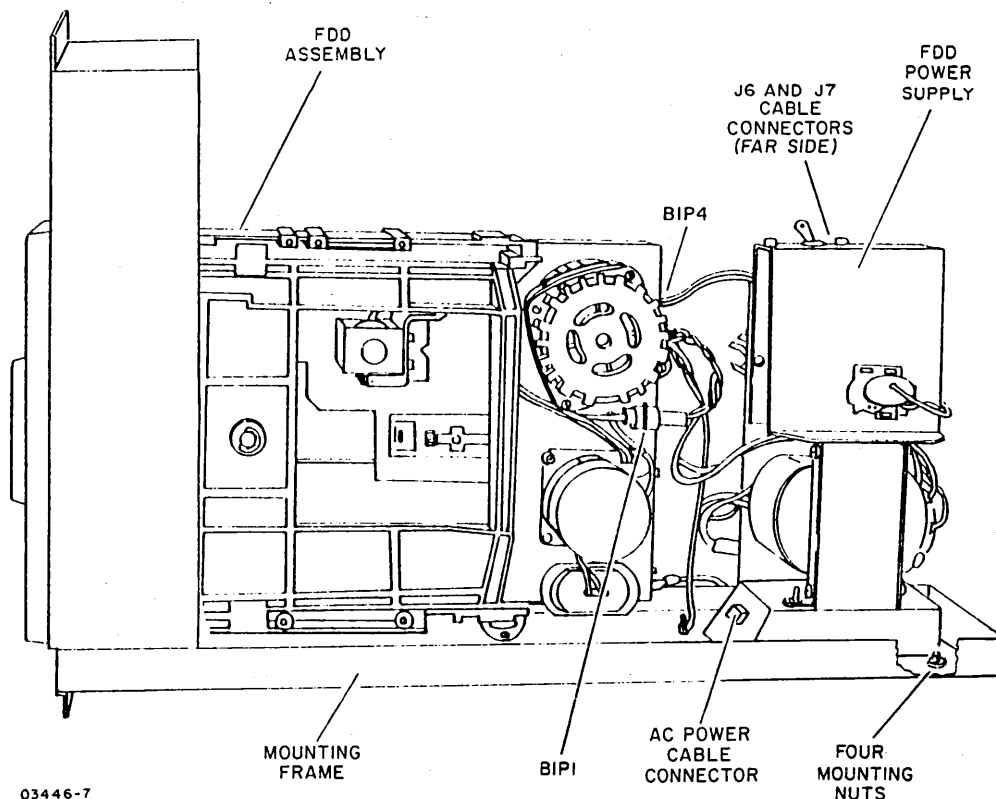


Figure 2-5.1 Side View of FDD Unit

3. Install the two supplied retaining screws on lower front of FDD mounting frame.
4. Connect attachment power cable on J7 of power supply board.
5. Remove red and black twisted LED cable (B2P6) from MMD chassis backplane A3-6 and 7B and connect to J6 on FDD power supply board. Pin 1 (white dot) of cable connector must mate with lower pin of J6.
6. The FDD must be strapped for the same voltage as the MMD. Refer back to figure 2-4.1 for MMD programming plug and figure 2-4.2 for MMD/FDD cabling diagrams with jumper location codes. Refer to figure 2-5.2 for FDD programming plug.
7. If strapping is necessary, use pin extractor (part number 51876100) and reprogram J02 on the FDD power supply to be the same voltage rating as the MMD.
8. Attach existing ac power cable B2P5 to J05 on front of FDD power supply.
9. Plug in MMD. Go to step 20 of MMD installation.

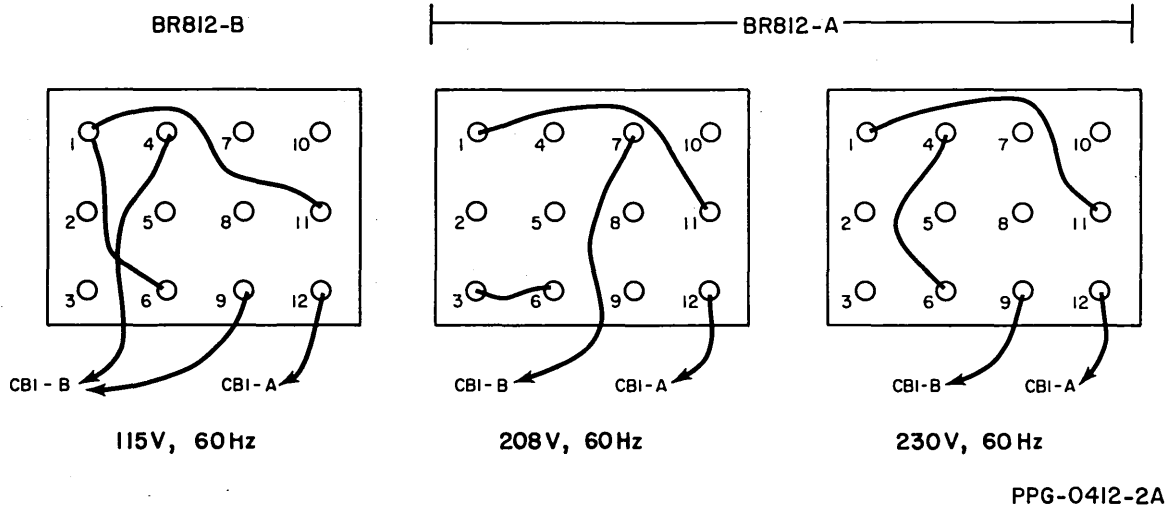


Figure 2-5.2 FDD Power Supply Programming Plug (J02)

ATTACHMENT CARD AND I/O CABLE INSTALLATION

The following procedure describes installation of the MMD attachment card and associated Bus In and Bus Out I/O cables. It also covers installation of the FDD attachment card, I/O cable, attachment power cable, and FDD switch settings for units containing a flexible disk drive.

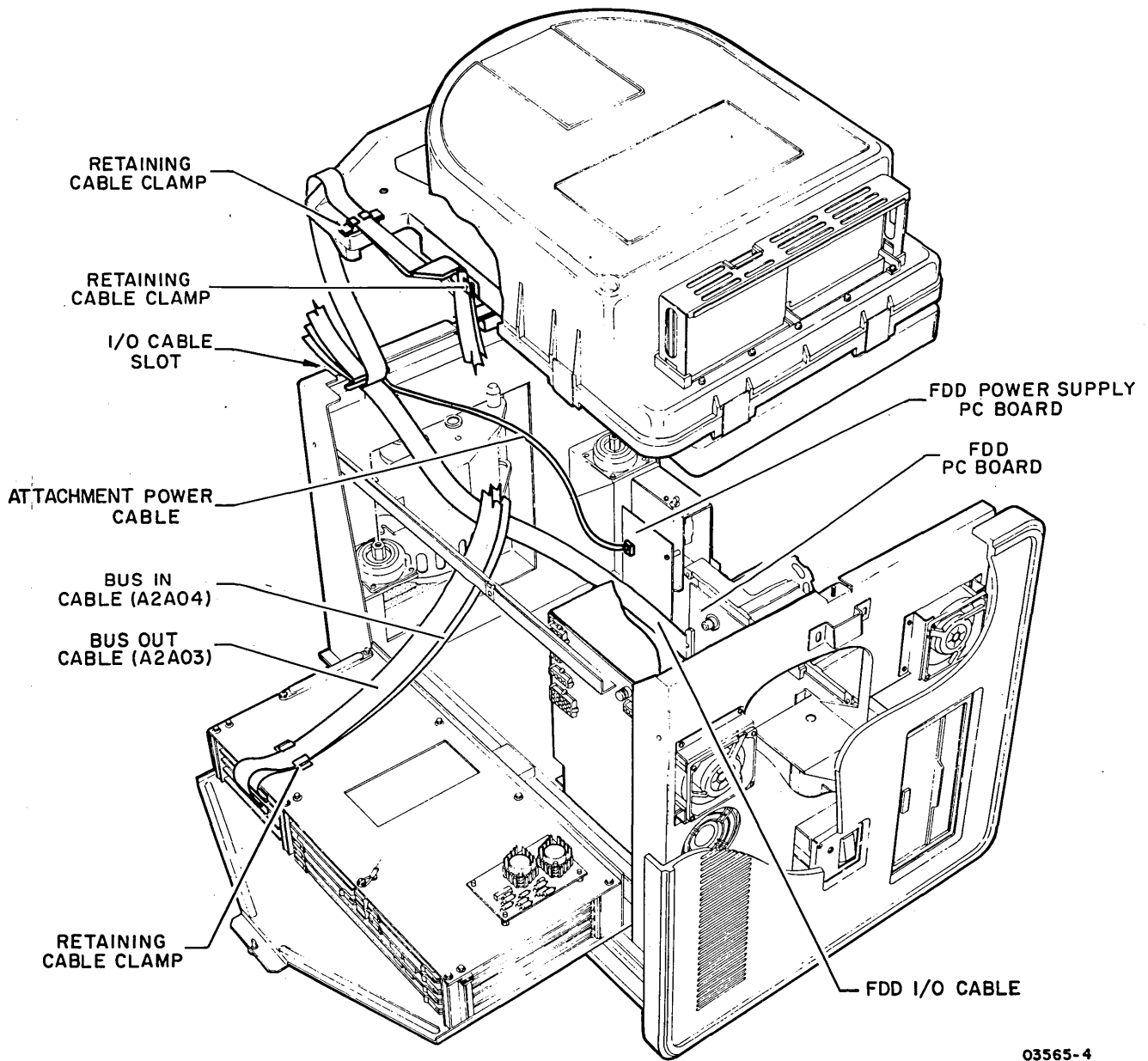
1. Unpackage attachment card and I/O cables and visually inspect for any shipping damage.
2. Route and install I/O cables in MMD cabinet as follows: (see figure 2-6 for an 80230/240 and figure 2-6.1 for an 80231/241 series drive).

NOTE

The MMD I/O cables have cable tags 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 on the I/O cable connector.

MMD I/O Cables

- a. Connect Bus Out cable to A2A03 logic card.
- b. Connect Bus In cable to A2A04 logic card.
- c. Place I/O cables in retaining clamps provided on logic chassis and frame of MMD.
- d. Route cables through cable slot at upper rear of MMD and fasten cable clamp. Check that installed cables do not restrict air flow of drive motor cage.
- e. 80231/241 cables must be grounded by attaching pigtail ground lugs on cables to the ground strip of the applicable unit, processor, or I/O expansion.



03565-4

Figure 2-6. I/O Cable Routing for 80230/240 MMD Series

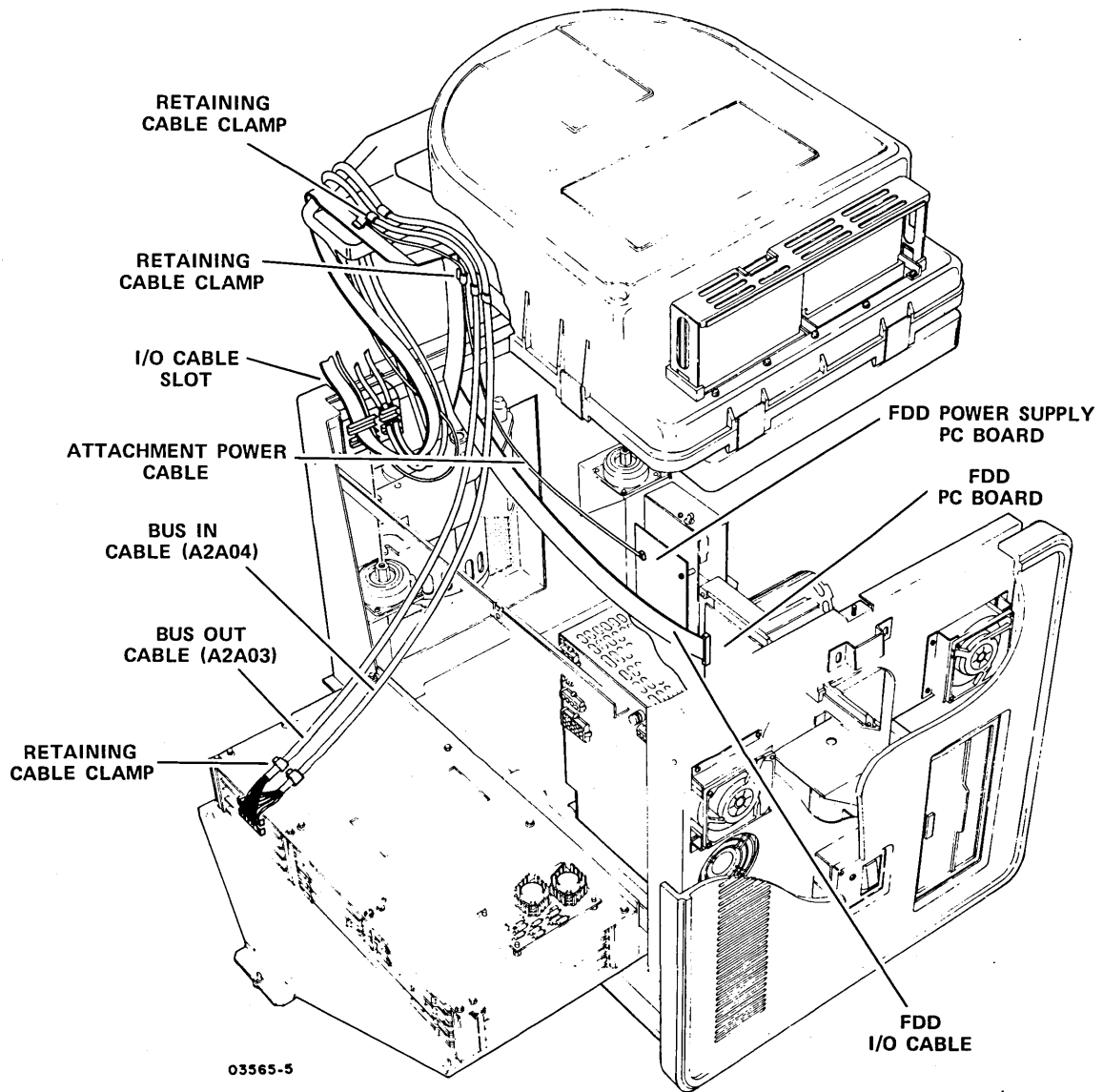
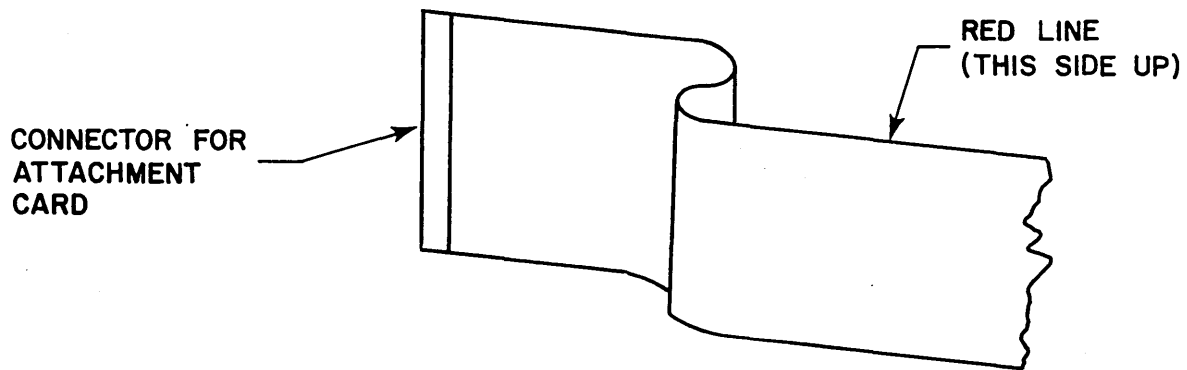


Figure 2-6.1. I/O Cable Routing for 80231/241 MMD Series

FDD I/O Cables, Attachment Power Cable, and Switch Settings

- a. Remove the existing ty-wrap. Route and fasten supplied ty-wrap cable under MMD flat cables and connect to FDD attachment card. Make sure that red line of cable is up. See figure 2-6.1.



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Figure 2-6.2. Ty-wrap Cable From FDD to MMD Attachment Card

- b. Connect attachment power cable to 3-pin connector at rear of FDD power supply PC board (polarity need not be observed).
- c. Route cables through cable slot at upper rear of MMD and fasten cable clamp.

CAUTION

Existing cables are marked with arrow pointing up when correctly installed. Newer cables are keyed to be installed one way only.



- d. Verify that switches on FDD PC board are set as follows:
- S1-1 (Unit Select) and S1-5 (Ready) to ON position (ON side of switch Pressed down).
 - S1-2, 3, 4, 6, 7, and 8 to OFF position (OFF side of switch pressed down)
3. Determine from customer the required location of attachment card in Series/1 (either in Processor unit or Input/Output Expansion unit), required device address, and whether MMD (or FDD if present) is to be assigned as a Primary or Alternate IPL device.

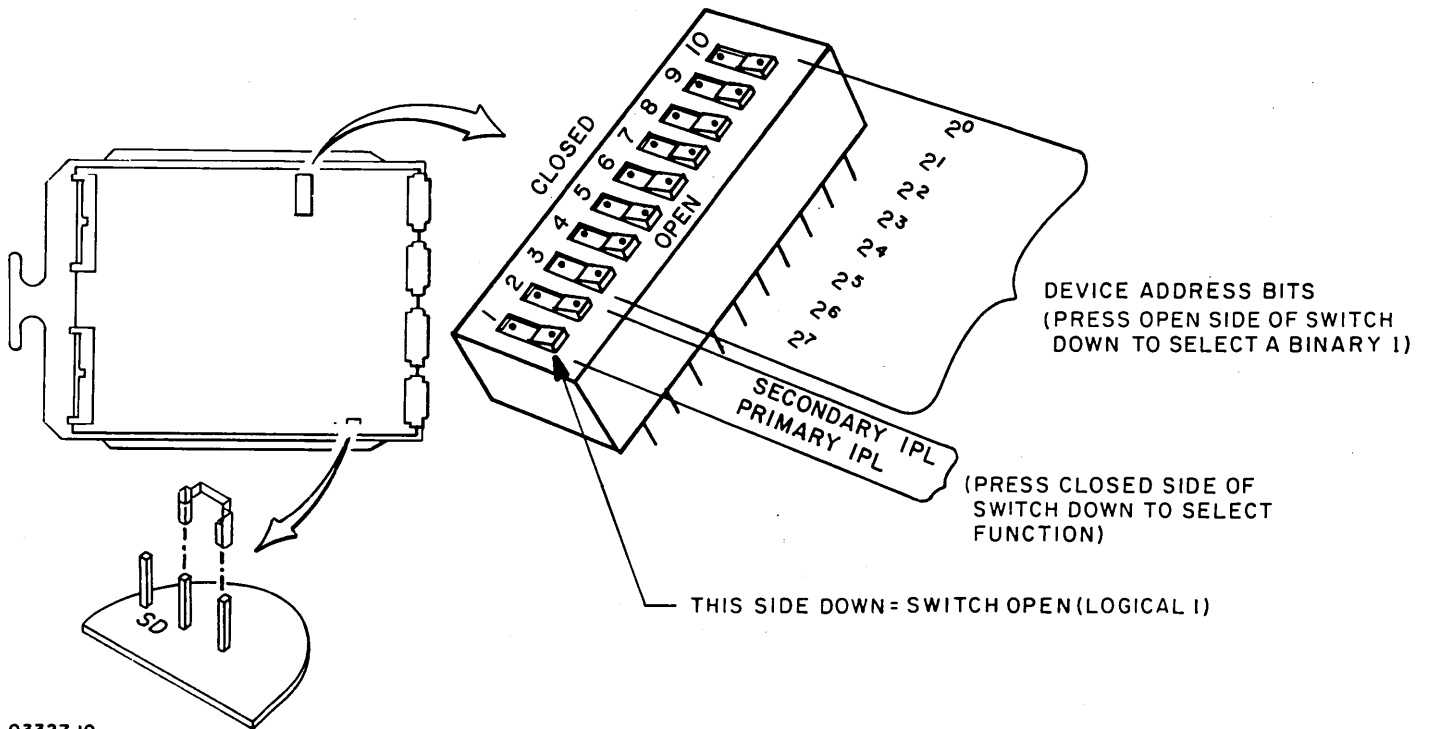
NOTE

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.

4. Set switches on attachment card(s) as required (figures 2-7, 2-7.1, and 2-7.2). For example, to select device address 13₁₆, set switches S1-6, S1-9, and S1-10 so that open/off side of switch is pressed down (logical 1), and set switches S1-3, S1-4, S1-5, S1-7, and S1-8 so that closed/on sides are pressed down (logical 0). To select attached device as Primary IPL source, set S1-1 to the closed/on position (logical 0) and set S1-2 to the open/off position (logical 1). If neither Primary nor Alternate IPL is to be selected, set both S1-1 and S1-2 to the open/off (logical 1) position.
5. Verify that SD (System Disk) jumper on MMD attachment card is jumpered as shown in figure 2-7.

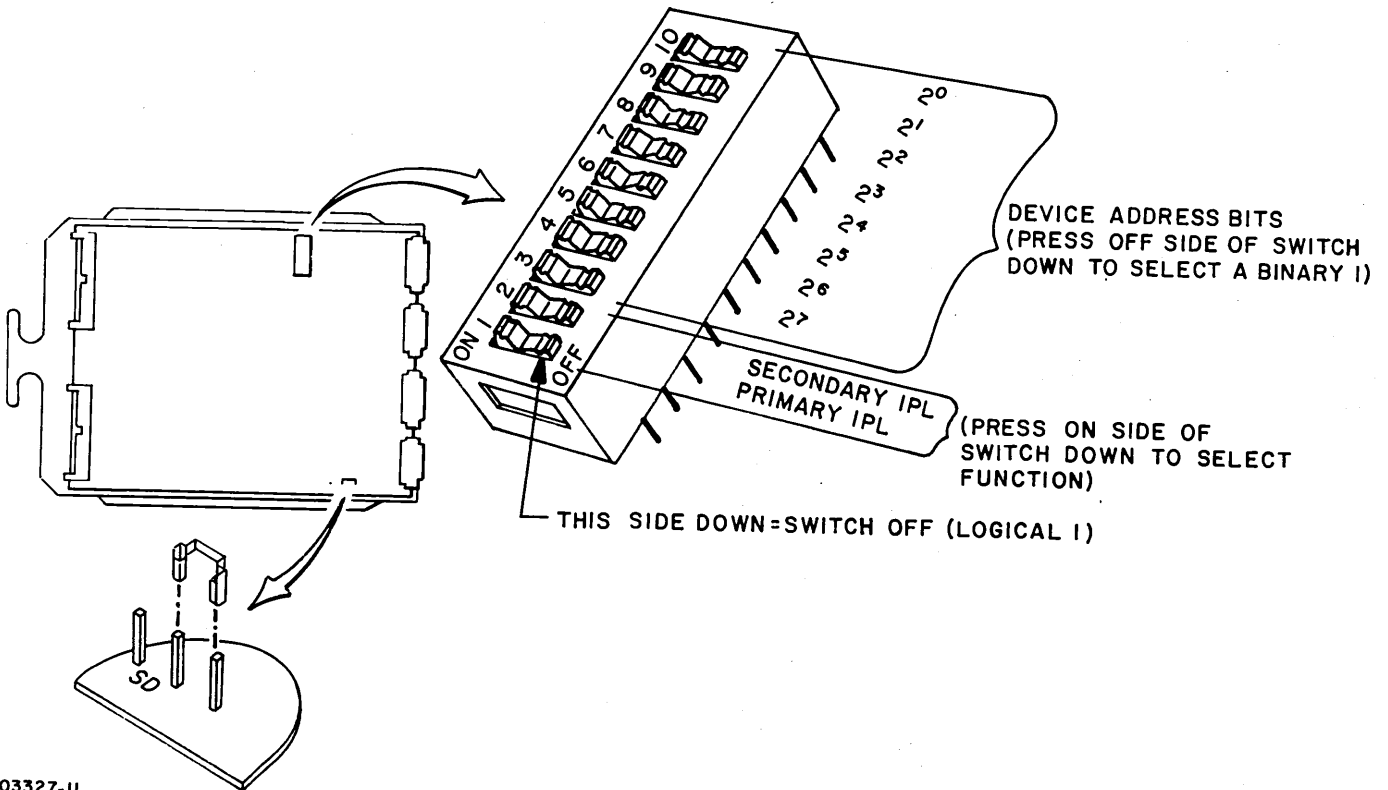
CAUTION

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



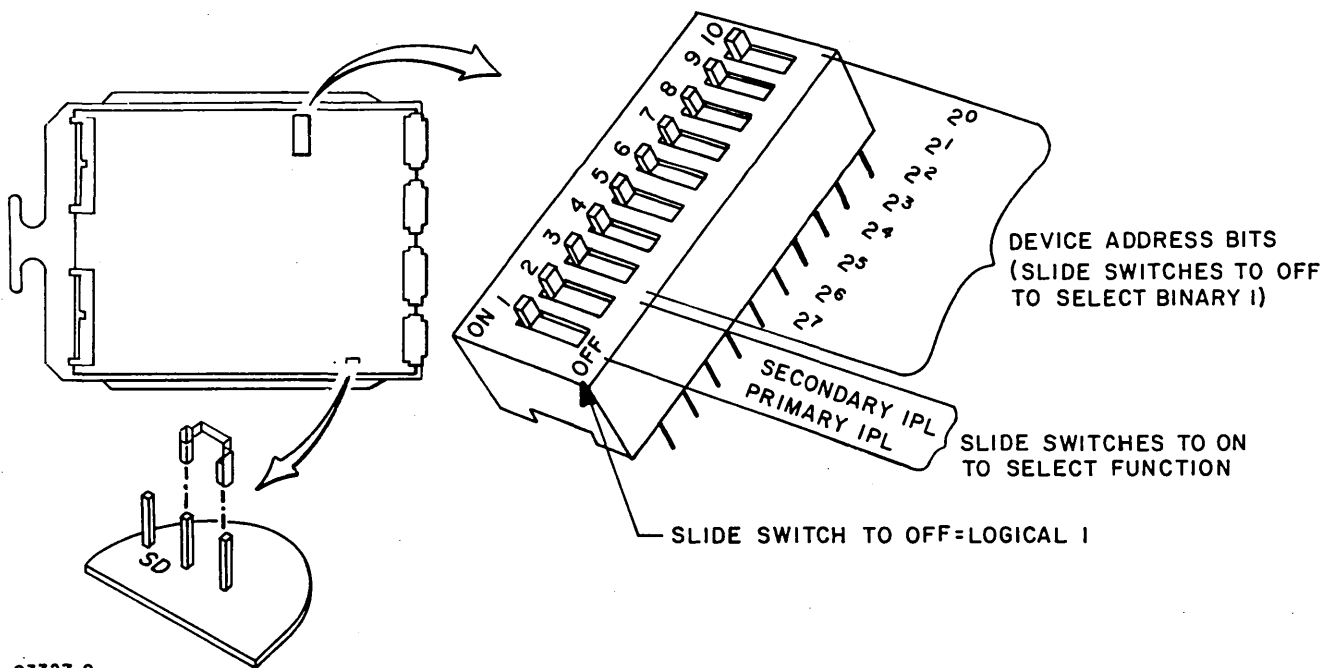
03327-10

Figure 2-7. Attachment Card Rocker Selection Switches (Labeled Open and Closed)



03327-11

Figure 2-7.1. Attachment Card Rocker Selection Switches (Labeled On and Off)



03327-9

Figure 2-7.2. Attachment Card Slider Selection Switches



6. If 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 and route I/O cables through retaining bracket to front of chassis. Allow enough cable to reach attachment card and retighten retaining bracket screws.

CAUTION

Avoid hitting or bumping the device address switch when installing the attachment card. This could cause switch settings to change.

9. Install attachment card in logic chassis not more than two card locations away from any existing card.

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.

10. Attach I/O cables to front of attachment card. MMD Bus In cable connects to top connector, Bus Out cable to bottom connector. Observe correct pin 1 alignment (see figure 2-8).
11. Refer to figure 2-8 and perform overcurrent protection adjustment per the following as applicable:

NOTE

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

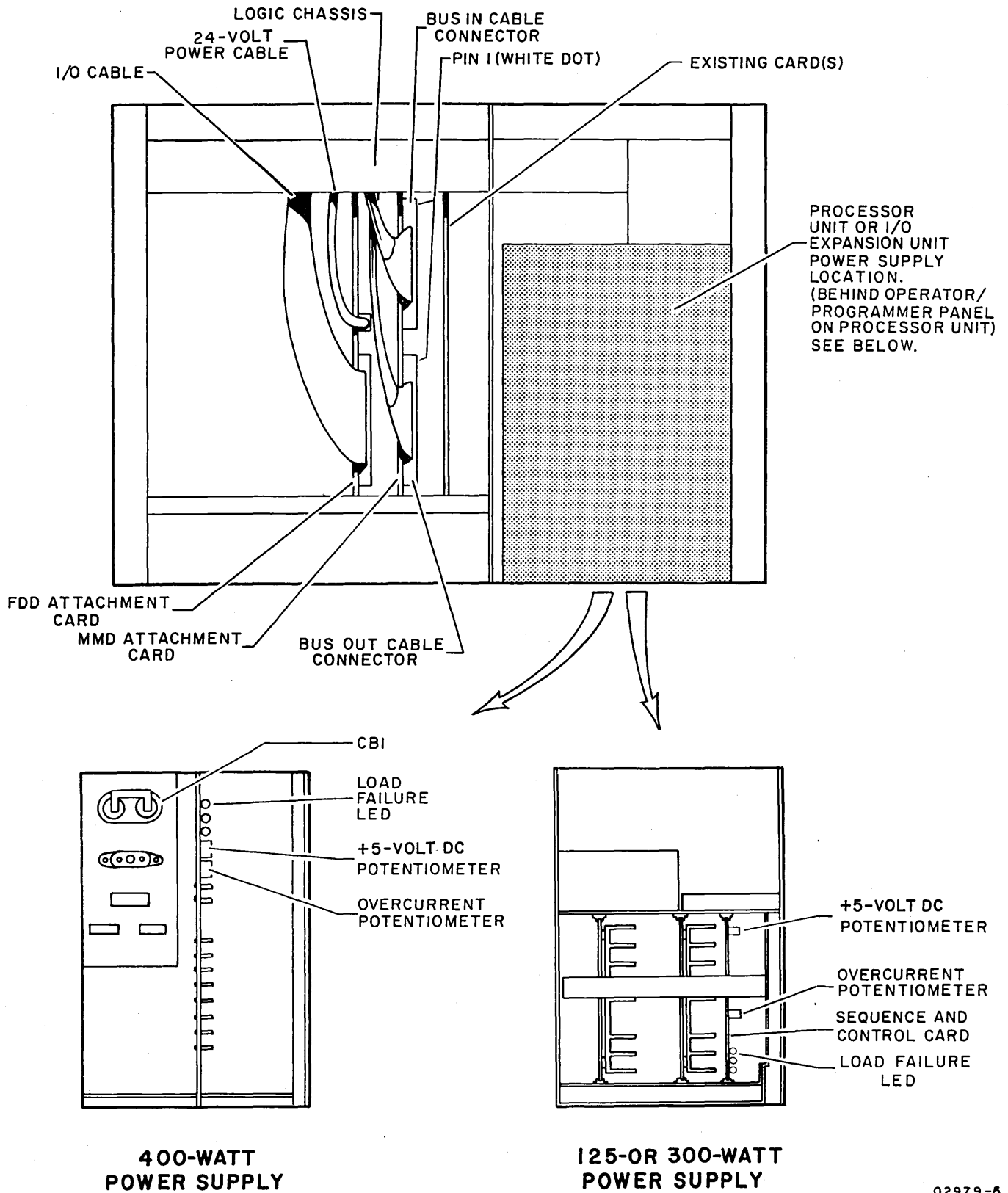


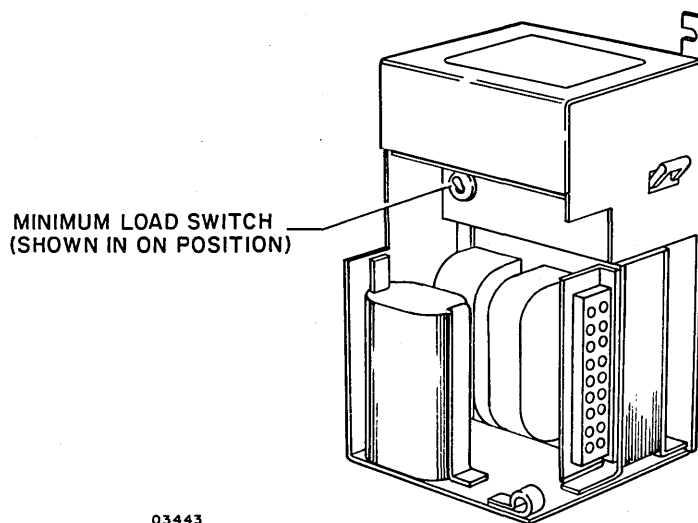
Figure 2-8. Overcurrent Potentiometer and Attachment Card Cable Locations

- a. Apply power to Series/1 Processor unit or Input/Output Expansion unit (whichever unit attachment card was 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 clockwise 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. If Check indicator on Series/1 operator/programmer panel lights following power application, it indicates that an error condition exists on the attachment card or a problem has developed in the Series/1. Replace attachment card and retry. If error persists, remove attachment card and retry to determine if problem is in the Series/1.
12. Verify correct setting of Minimum Load switch (4952-A units only) as follows:
 - Remove rear cover of power supply and lower hinged transformer box to view switch (see figure 2-9).
 - 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.



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

13. Check and adjust +5-V potentiometer on 4952, 4953, 4955 and 4959 units as follows (no adjustment is required on a 4952-A):

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 2-10 for backpanel pin configuration):
 - +5 V at A2D03
 - Ground at A2D08
- c. Apply power to Series/1 and adjust +5 V potentiometer (figure 2-8) 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.

17. Configure CDC BASIC diskette and verify correct operation of unit by performing items listed under Checkout heading.

CHECKOUT

This subsection provides information necessary to generate a system configurator table, or to add the MMD and FDD (when present) to the existing system configurator table of the CDC BASIC diagnostic diskette, and to perform the associated diagnostic checkout procedures.

CDC BASIC DISKETTE CONFIGURATION

The MMD, and FDD if present, 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 663107XX.

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).

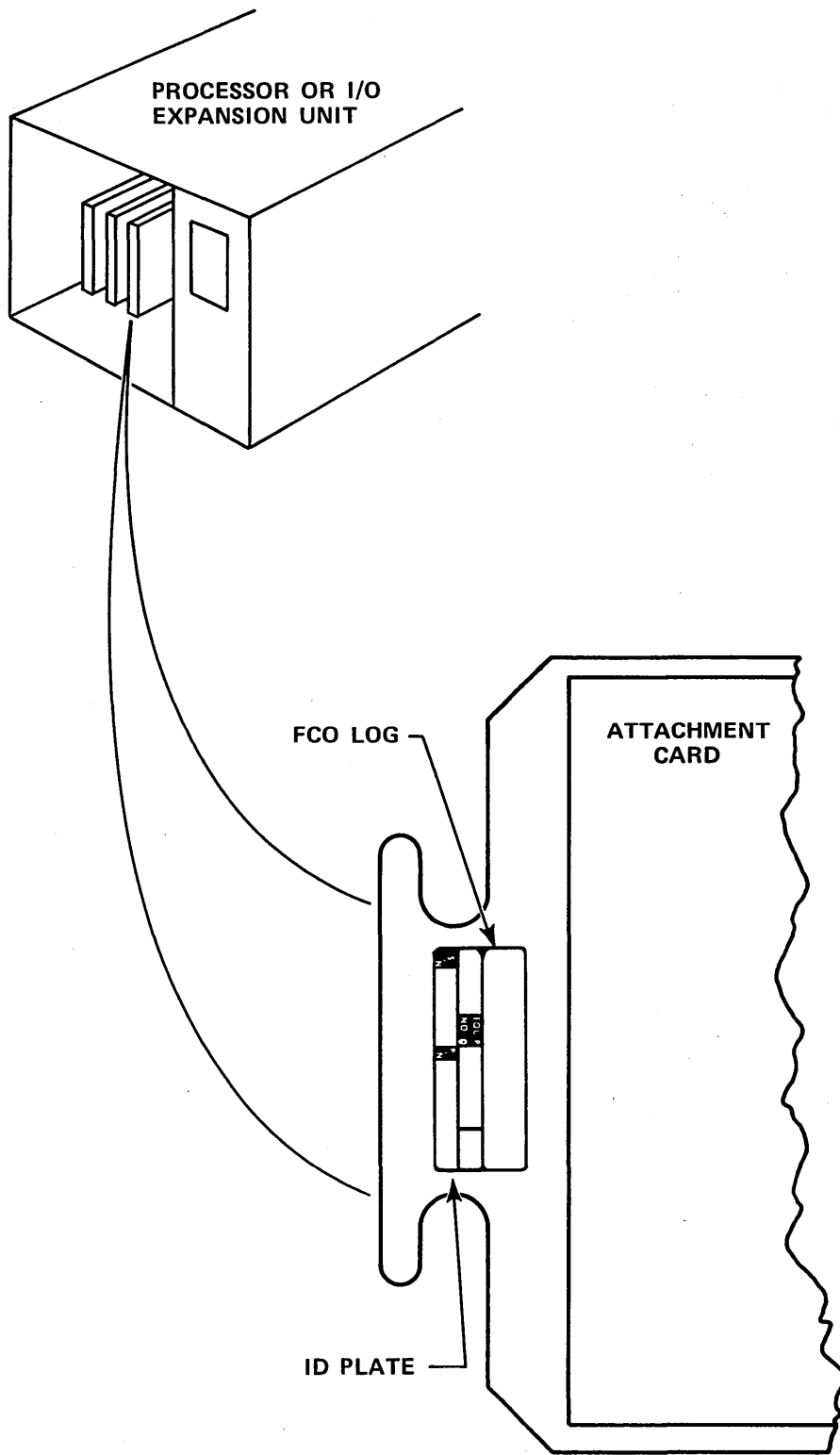
2. Place IPL Source switch on Series/1 operator/programmer panel to Alternate or Primary position as applicable to enable loading from diskette.

When replacing the attachment card with a spare attachment, it is suggested that the original card guide should be used on the spare if no damage is apparent. To do this, slide the card guides off each of the cards and slide the card guide with the ID plate onto the spare attachment that is to be used in the system. Observe the following note before removing the card frame from the attachment card.

NOTE

For the card frame removal procedure, carefully spread the rear edges of the card guide only enough to allow the PC board to clear and slide out of the guide. Pressure may be released as soon as the board begins to move. Slide the board out slowly to ensure that there is no damage to any wires on the solder side of the PC card.

If the card guide is not usable on the attachment card that is to be replaced, remove the ID plate from the card holder and affix it onto the taped area of the spare attachment card frame.



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Figure 2-11.1. Equipment Identification Plate and FCO Log Placement (Latest Method)

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 3.21 for list of error halt codes.
 - b. If a 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 change 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.
 81, E6, E8, E9, EA for IBM Communication attachments.

NOTE

Switch settings for IBM 3101 to run diagnostics from the alternate console.

A SUPPORTED ALTERNATE CONSOLE IS:		AA* TT**
1310 MULTIFUNCTION	@	E6
3101 DISPLAY	@	81
3101 DISPLAY ACCA SL	\$	E8
3101 DISPLAY ACCA ML	\$	E9
3101 DISPLAY FPMLC	@ &	EA
TTY ATTACHMENT	%	40

*AA = CONSOLE DEVICE ADDRESS

**TT = CONSOLE DEVICE TYPE

@ 3101 SWITCH SETTING CHECKLIST WHEN
 SUPPORTED BY FPMLC CURRENT INTERFACE,
 RFQ DQ2350 and 1310 MULTIFUNCTION.
 12345678 12345678 12345678 12345678
 X X X X X X
 X X X X XX

& 3101 SWITCH SETTING CHECKLIST WHEN
 SUPPORTED BY FPMLC WITH RS232C.
 12345678 12345678 12345678 12345678
 XXX X X X X X
 X X X XX

% 3101 SWITCH SETTING CHECKLIST WHEN
 SUPPORTED BY TTY WITH EIA INTERFACE.
 12345678 12345678 12345678 12345678
 X XX X X
 XX X X X XX

§ 3101 SWITCH SETTING CHECKLIST WHEN
 SUPPORTED BY TTY CURRENT INTERFACE.
 12345678 12345678 12345678 12345678
 X XX X X
 XXX X X X XX

\$ 3101 SWITCH SETTING CHECKLIST WHEN
 SUPPORTED BY ACCA SL - ML EIA RS232C
 12345678 12345678 12345678 12345678
 XXXX X X XXX
 X X XX X

X = SWITCH POSITION. DO NOT CHANGE THE
 POSITIONS THAT ARE BLANK. LEAVE THEM
 IN THE POSITION FOUND. WHEN DONE,
 RETURN MOVED SWITCHES TO ORIGINAL
 POSITION. 3101 BAUD RATE IS 9600 IN
 THE ABOVE.

- 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 3.19.1 to update configurator table manually, or to para 3.19.2 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 80270 or 80271 storage module drive having a read ID of 3007 is present in the configurator table, the device type must be changed from 72 to 70. 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.

FDD Parameters

F XX46 0000 0106 0000 0000 0000 0000 0106

Device Type

Device Address (use address that was established during FDD attachment card installation)

Read ID

Response to either input above 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

The following diagnostic checkout procedure is applicable to the MMD and its attachment card only. Diagnostic checkout information for the FDD, if present in the MMD enclosure, is contained in the FDD site information manual (see preface for publication number).

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 MMD has been written on to the CDC BASIC diagnostic diskette.

1. Apply power to MMD (para 3.1).

NOTE

The attachment card determines the number of cylinders/heads in the MMD only during a power on IPL (reads MMD 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 MMD before powering on the Series/1, or
- Series/1 power must be cycled off and then on again to reinitiate the IPL sequence.

2. Apply power to flexible disk drive unit and install CDC BASIC diagnostic diskette (P/N 663107XX).

NOTE

Power is applied to an enclosed FDD in the MMD cabinet during power application to the MMD.

3. Place IPL Source switch on Series/1 operator/programmer panel to Alternate or Primary position as applicable to enable loading from diskette.
4. Place Mode switch on Series/1 operator/programmer panel to Diagnostic position.
5. 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 are detected, IPL completes in approximately ten seconds. This is indicated by a RDY ENTER message being displayed on the crt screen of the alternate console (if used) and by a 3800₁₆ halt code being displayed in the register indicators of the operator/programmer panel. If the computer stops with any other code displayed, refer to para 3.21 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.

6. After successful completion of the IPL diagnostic, enter test number B7200 to select and execute MMD auto diagnostics per the following as applicable.

NOTE

If MMD disk is not correctly formatted, Read ID errors will occur during diagnostic test execution. Use disk initialization utility (DI) residing on the CDC Standalone Utilities diskette to format disk.

- a. Using alternate console display station, enter B7200 and press ENTER key (or CR key on TTY).
- b. Using operator/programmers panel (refer to para 3.20 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 7200 via register input switches to select MMD auto diagnostics.
- Press Console Interrupt switch twice (this executes all MMD auto diagnostics in succession).

NOTE

Execution time is approximately six 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 SAM (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, reseat/replace attachment card, I/O cables, Bus In (A2A04) and Bus Out (A2A03) cards one at a time until problem is corrected. Verify switch settings per attachment card installation procedure in this section.

7. Enter and execute the following manual MMD diagnostic tests per accompanying procedure.

- 7230 Write/Read Data Test
 - 7240 Correction Code Test
 - 7250 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).

*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.

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 SAM (same as test number) to determine if test completed OK or stopped on error.

8. Replace access covers and slide MMD into Series/1 cabinet (para 3.2).
9. Run CDC System Test and Freelance (diskette P/N 663092XX) to verify correct system operation.
10. Leave MMD/FDD reference manual for use by customer.

This section provides information necessary to perform on-site maintenance on the mini module drive. The maintenance information covers checks, adjustments, repair, and replacement of FRUs (Field Replaceable Units) as directed by the associated SAM (Structured Analysis Method) listings for the mini module drive. Similar information for the FDD is also contained in the FDD site information manual (see preface for publication number). The major paragraph groups in this section are:

- 3.0 General Maintenance Information -- Contains information that maintenance personnel should be familiar with before doing maintenance on the MMD.
- 3.1 through 3.13 -- Contain specific remove/replace/adjust/repair procedures for each FRU.
- 3.14 through 3.18 -- Contain procedures for power system, servo system, read/write system, and miscellaneous drive operation checks.
- 3.19 and groups thereafter -- Provide a summary of pertinent MAP 10 Diagnostic Service Guide information.

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 equipment damage and/or personal injury.

- Use care while working with the ac power distribution system and dc power supply, since line voltages are present.
- Do not attempt to disassemble the mini module assembly, it is not field repairable. Replace the entire mini module assembly if it is found to be defective.

- Do not operate the drive over an extended period of time with the access covers removed.
- Do not remove or install circuit cards while power is on.
- Always turn power off and disconnect ac power cord when removing/replacing FRUs.

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 are listed in the following tabulation along with the appropriate CDC part number. Note that the list only includes special tools. It is assumed that the service person has common maintenance tools available. 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
Card Extender (Full Size)	CDC 82318700		
Card Extender (1/2 Size)	CDC 82318800	Torque Wrench, 1/4 in	CDC 12263205
Chip Extender (Chip Clip)	CDC 12212196	Volt/ohmmeter	Ballantine 345 or equivalent digital voltmeter
Filter Coat	CDC 12210958		
Nonmetallic Feeler Gage 0.003 in	CDC 12205635	Wirewrap Removal Tool, 20 - 30 Gage	CDC 12259183
Oscilloscope, Dual Trace	Tektronix 454A or equivalent	Wirewrap Bit, 30 Gage	CDC 12218402
		Wirewrap Gun, Electric	CDC 12259111
Pin Straightener	CDC 87369400	Constant Force Spring Tool	CDC 71493095
Scope Probe Tip (Hatchet type)	CDC 12212885	Pin Extractor	CDC 12212759

3.0.3 Handling Electrostatic-Sensitive Devices

The attachment card and a logic card within the MMD contain metal-oxide semiconductor integrated circuits. These circuits require special handling procedures to prevent damage from static electricity. The MMD logic card containing metal-oxide semiconductor circuits is at location A2C04. The following precautions should be observed when handling these cards:

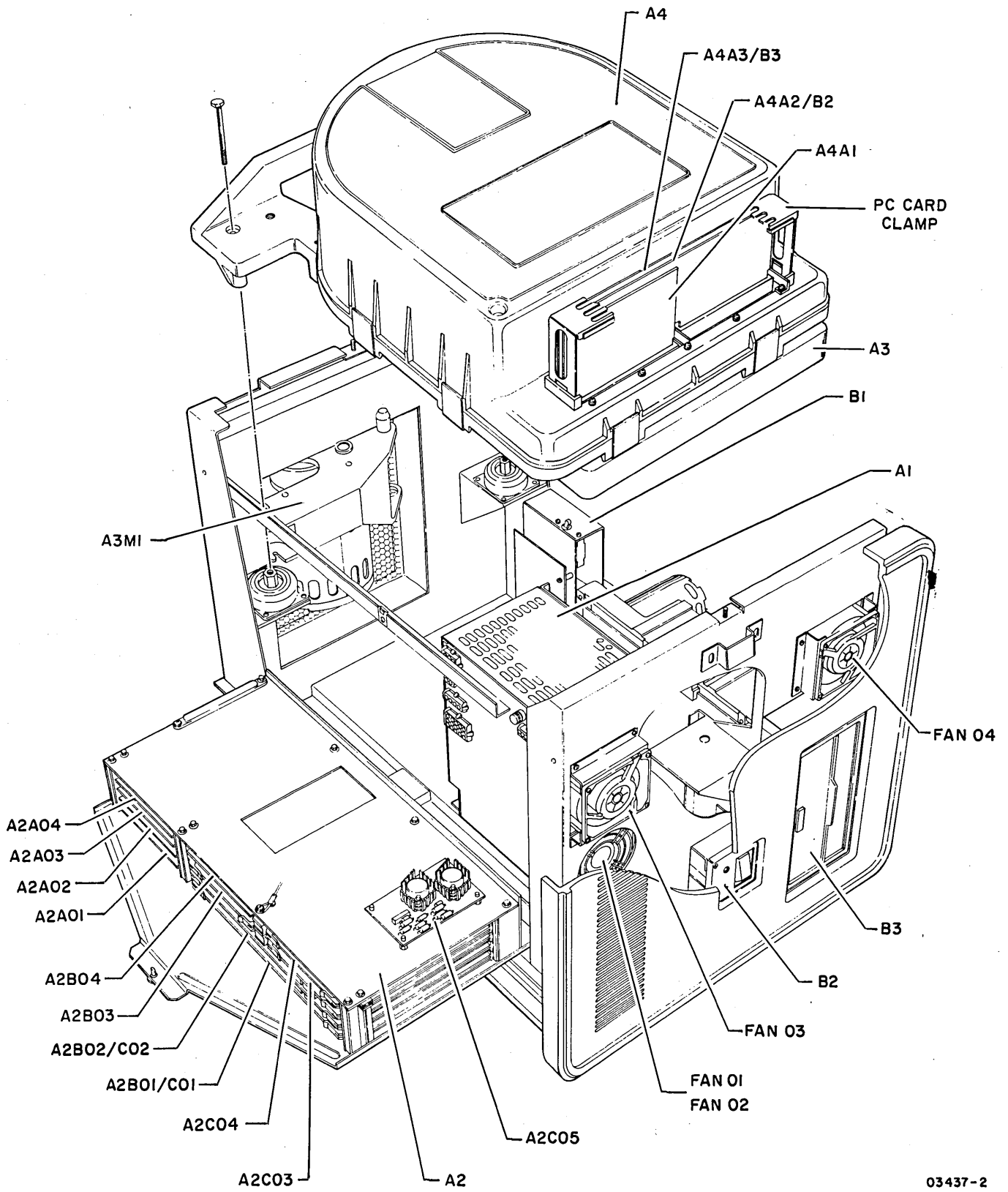
- Turn off power before removing and installing any logic card.
- Ensure that any item that comes in contact with logic card is electrically grounded.
- Touch logic chassis to bleed off any accumulated static charge before handling card and continue to touch chassis while removing or installing card.
- Handle card only by a noncircuit portion. Connector pins and circuit paths must not be touched
- Place logic card in a special conductive envelope whenever card is removed from logic chassis.

3.0.4 Maintenance Aids

There is no scheduled maintenance for the MMD and attachment card. In the event of failure, the primary maintenance aids are the diagnostic programs residing on the CDC BASIC diagnostic diskette (CDC P/N 663088XX) and the associated SAM listings contained in appendix A of this manual. These aids are structured to identify the failing FRU and to provide a paragraph number reference to the applicable maintenance procedure contained in section 3 of this manual.

3.0.5 Physical Location Code Assignments

The physical location codes assigned to the functional parts of the MMD are as shown in the accompanying illustration. An alphanumeric listing of these items by physical location code is contained in the accompanying table to identify the part names.



03437-2

Physical Location Codes

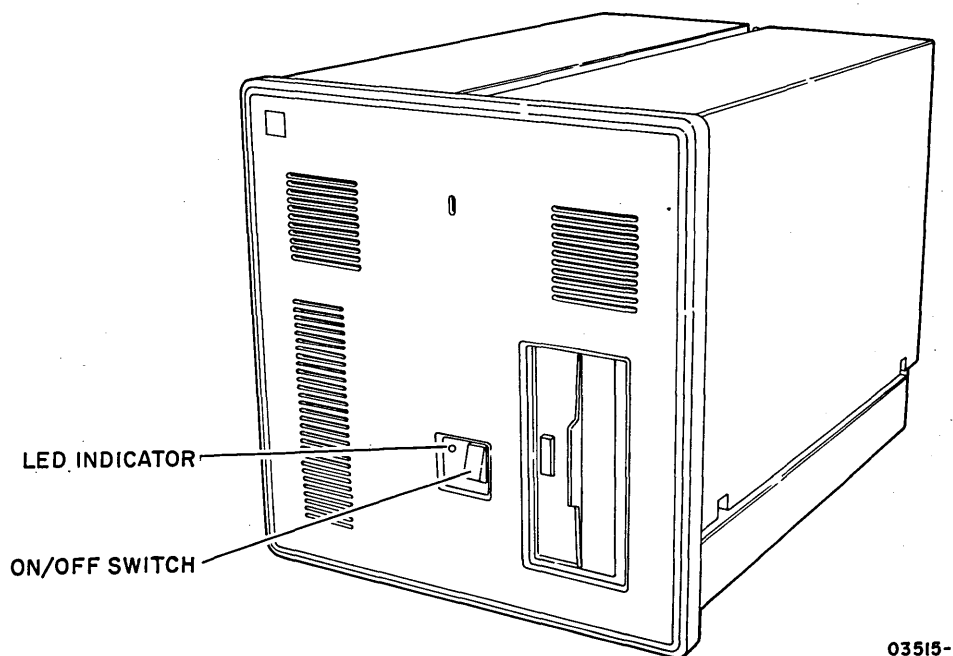
PHYSICAL LOCATION CODES TABULATION

PHYSICAL LOCATION CODE	TITLE
A1	Power Supply (MMD)
A2	Logic Chassis
A2A01	Read/Write Card
A2A02	Bit Ring Card
A2A03	Bus Out Card
A2A04	Bus In Card
A2B01/C01	Analog Servo Card
A2B02/C02	Fault/Control Card
A2B03	Read PLO Card
A2B04	ECC Card
A2C01	See A2B01
A2C02	See A2B02
A2C03	Write PLO Card
A2C04	Microprocessor Control Card
A2C05	Power Amp Card
A3	Deck Assembly
A3M1	Drive Motor Assembly
A4	Mini Module Assembly
A4A1	Digital Read Card
A4A2/B2	Writer and Select Card
A4A3/B3	Read Analog Card
Fan 01	Fan
Fan 02	Fan
Fan 03	Fan
Fan 04	Fan
B1	Power Supply (FDD)
B2	Switch Assembly
B3	Flexible Disk Drive

3.1 POWER ON/OFF PROCEDURE

This procedure assumes that the MMD power cord is plugged into a site ac outlet.

1. Apply power by pressing front panel On/Off switch to On position. Red LED indicator next to switch lights when power is applied.
2. Remove power by pressing On/Off switch to Off position.



03515-1

Power On/Off Switch and LED Location

3.2 ACCESSING DRIVE FOR MAINTENANCE

The following procedures explain details for accessing the drive for maintenance purposes.

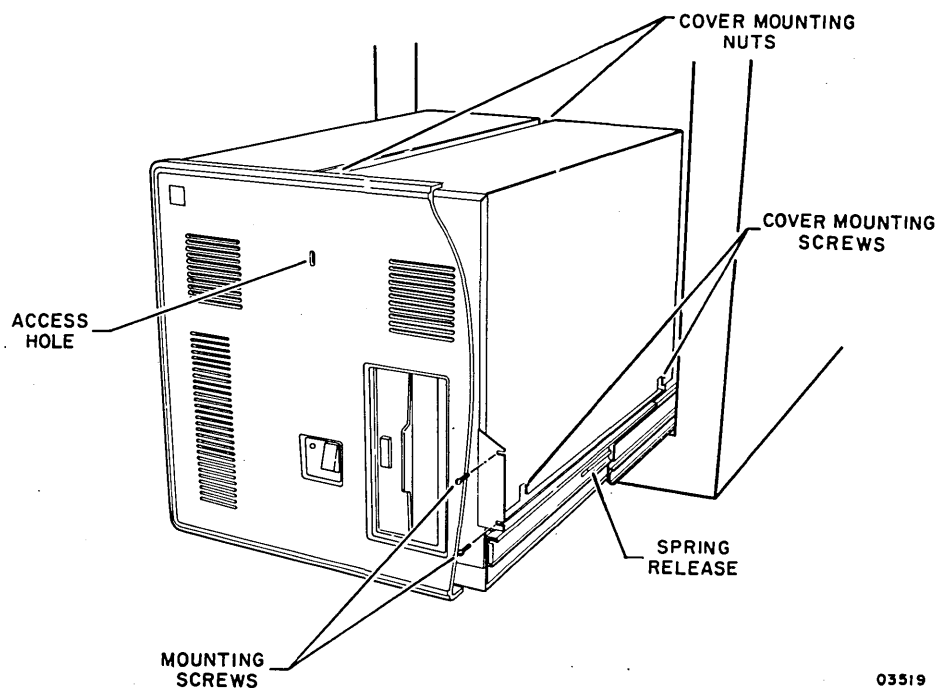
3.2.1 Gaining Access to Drive

1. Power off MMD (para 3.1).
2. Insert a hex-head wrench into access hole and turn to release front cover latch.
3. Swing front cover out and lift to remove.
4. Remove four mounting screws.
5. Slide MMD forward to full open position. Slide locks will engage.

NOTE

Spring release at each side of slide assembly must be pressed to disengage slide locks in order to slide unit back into Series/1 cabinet.

6. Remove mounting hardware from MMD covers and lift off of unit.

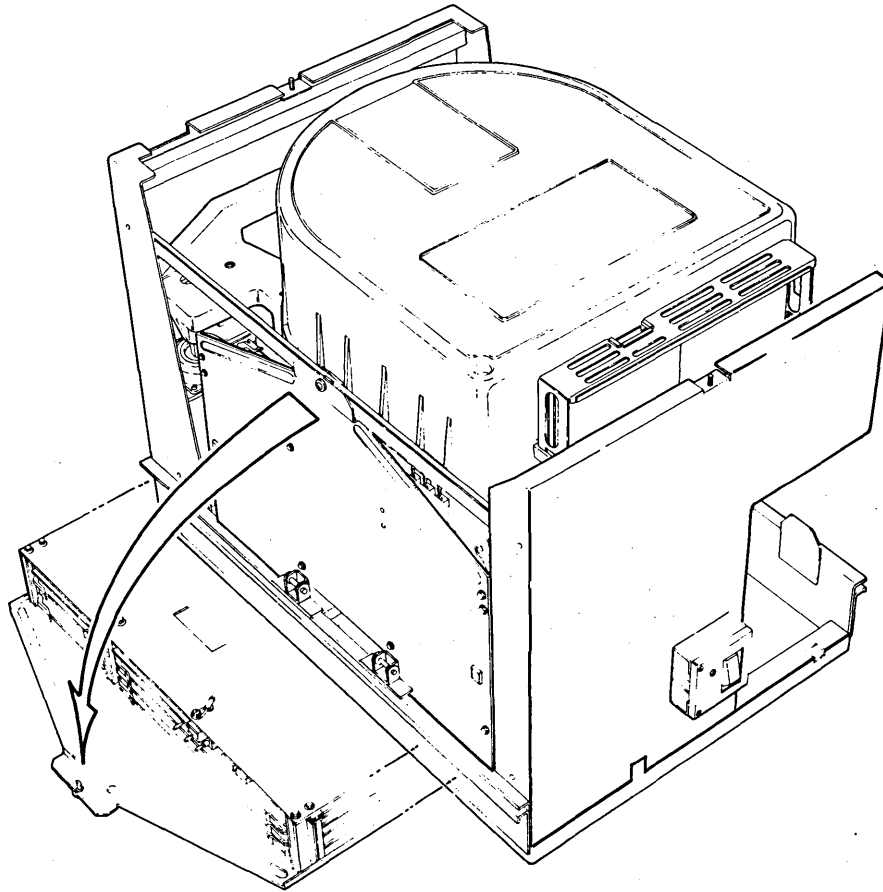


Accessing Drive Unit

03519

3.2.2 Opening and Closing Logic Chassis

1. Release 1/4-turn fastener securing logic chassis to drive frame assembly.
2. Lower logic chassis to horizontal position.



03456

Logic Chassis Maintenance Position

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3.3 FANS

3.3.1 Removal-Replacement

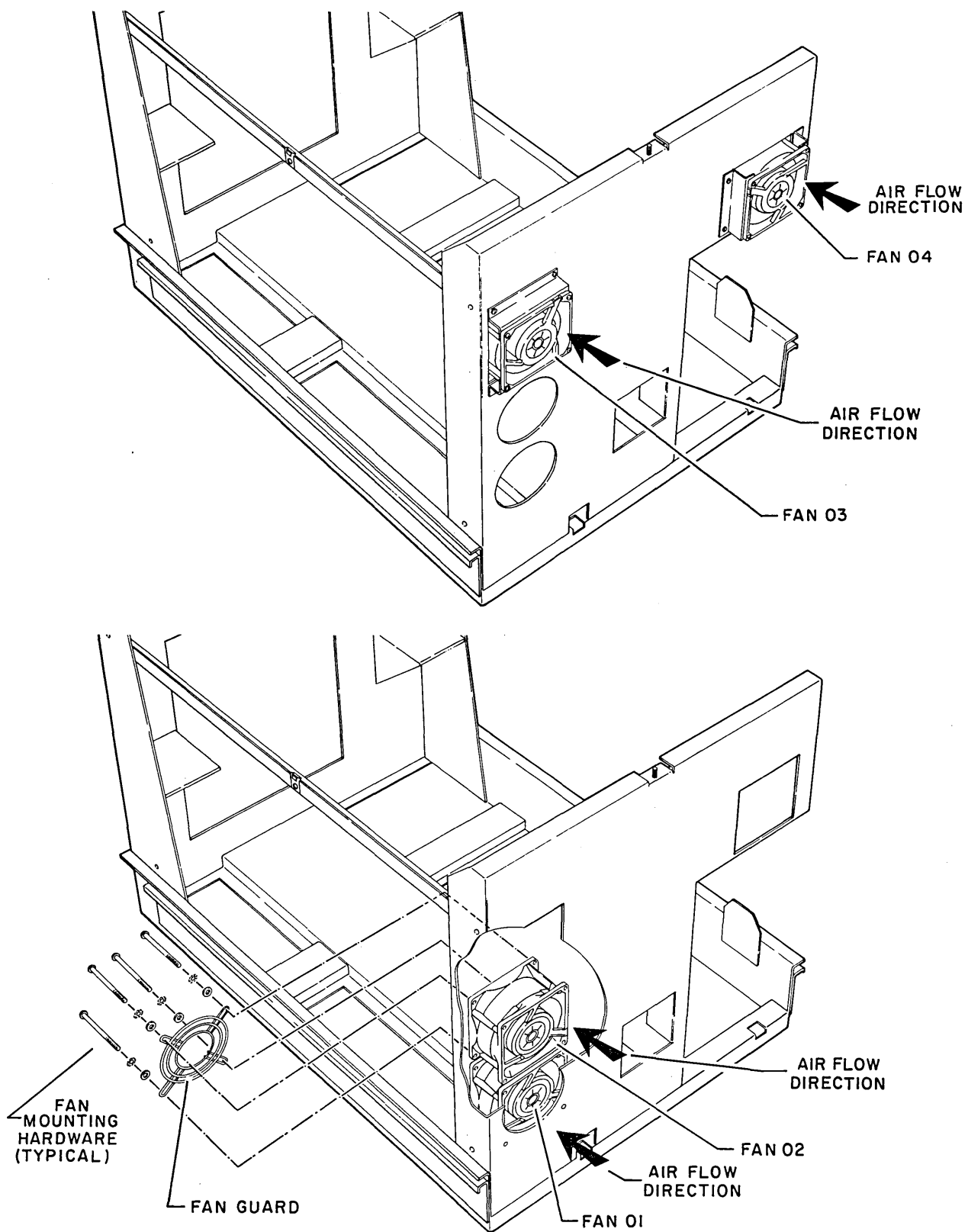
NOTE

Four fans are used. Two fans (01 and 02) are mounted directly on the front frame of the MMD. The remaining two fans (03 and 04) are mounted on brackets connected to the front frame. It is easier to first remove the bracket before removing one of these fans.

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).
3. Remove two cable connectors from defective fan.
4. Remove mounting hardware holding fan.
5. Install replacement fan (observe correct airflow direction) and reconnect cable connectors.

3.3.2 Repair-Adjustment

No repair or adjustment of fans is applicable. Replace if faulty and scrap faulty fan.



Fan Mounting Details

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3.4 MINI MODULE ASSEMBLY

3.4.1 Removal-Replacement

1. Turn drive power off (para 3.1) and unplug ac power cord.
2. Access drive and remove covers (para 3.2).
3. Remove FDD unit if installed (para 3.10).
4. Remove drive belt (para 3.5).
5. Place rotary positioner arm lock on underside of mini module to ON position. This locks actuator in retracted position.
6. Loosen but do not remove, two screws mounting spindle lock and ground spring to underside of mini module chassis. Rotate spindle pulley in direction of arrow and slide spindle lock and ground spring forward until pin on spindle pulley is engaged by notched portion of spindle lock and ground spring. Tighten mounting screws.
7. Disconnect speed transducer cable at connector A3P5.
8. Disconnect ground strap from underside of mini module.
9. Remove three nuts, lockwashers, insulator washers, and flat washers attaching mini module to drive frame.
10. Remove PC card clamp at top front of mini module by pressing in on each side of clamp (see para 3.0.5 for illustration).
11. Disconnect cable connectors A4P01 and A4P02 from logic cards.
12. Disconnect cable connector A4P04 and ground lead from logic card base assembly.
13. Remove three PC cards from logic card base assembly.

NOTE

Install the removed PC cards into the replacement mini module.

14. Remove mini module by lifting straight up until module clears drive.

15. Remove bushing insulators from faulty mini module and install back in drive frame.
16. Install replacement mini module (see following caution).

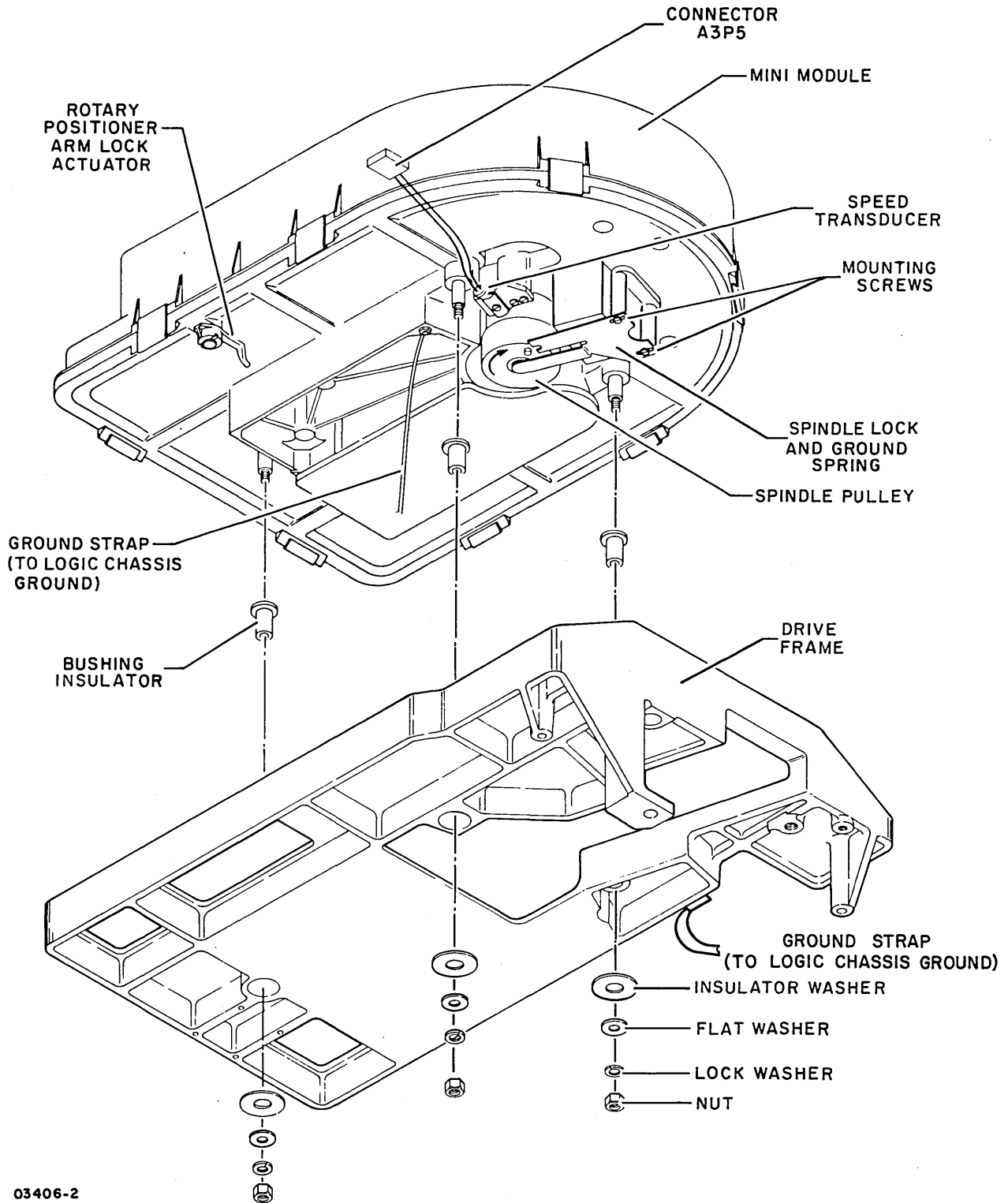
CAUTION

When reinstalling hardware removed in step 9, tighten nuts until snug, then back off 1/4 of a turn.

17. After replacing mini module assembly with a new unit, the module must be initialized using disk standalone initialization utility (DI) residing on the CDC standalone utilities diskette.

3.4.2 Repair-Adjustment

No repair or adjustment of the mini module is applicable. Replace entire assembly (excluding PC cards) if faulty and return for repair using packaging materials that spared assembly was shipped in.



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Mini Module Mounting Details

3.5 DRIVE BELT

The following procedure contains two different sets of instructions for replacing the drive belt. The first set of instructions uses a spring removal tool to assist in removing and replacing the drive belt. The second set of instructions does not use this removal tool.

3.5.1 Removal-Replacement (using Spring Removal Tool)

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).
3. Remove nine mounting screws holding motor cover at rear of unit. Remove cover and set aside.

NOTE

Use special spring removal tool (CDC part number 71493095) to compress constant force spring.

4. Use spring removal tool to compress constant force spring and remove spring tension from motor.
5. Move drive motor forward until drive belt falls off of mini module spindle pulley.

CAUTION

Do not allow spindle pulley to turn counterclockwise while installing drive belt. Head or disk surface damage may occur.

6. Position replacement drive belt over spindle and drive motor pulleys. Ensure that drive belt rests near the center of each pulley and apply spring tension back on motor by using spring removal tool to decompress constant force spring until motor returns to its resting position.

3.5.2 Removal-Replacement (Alternate Method, not using Spring Removal Tool)

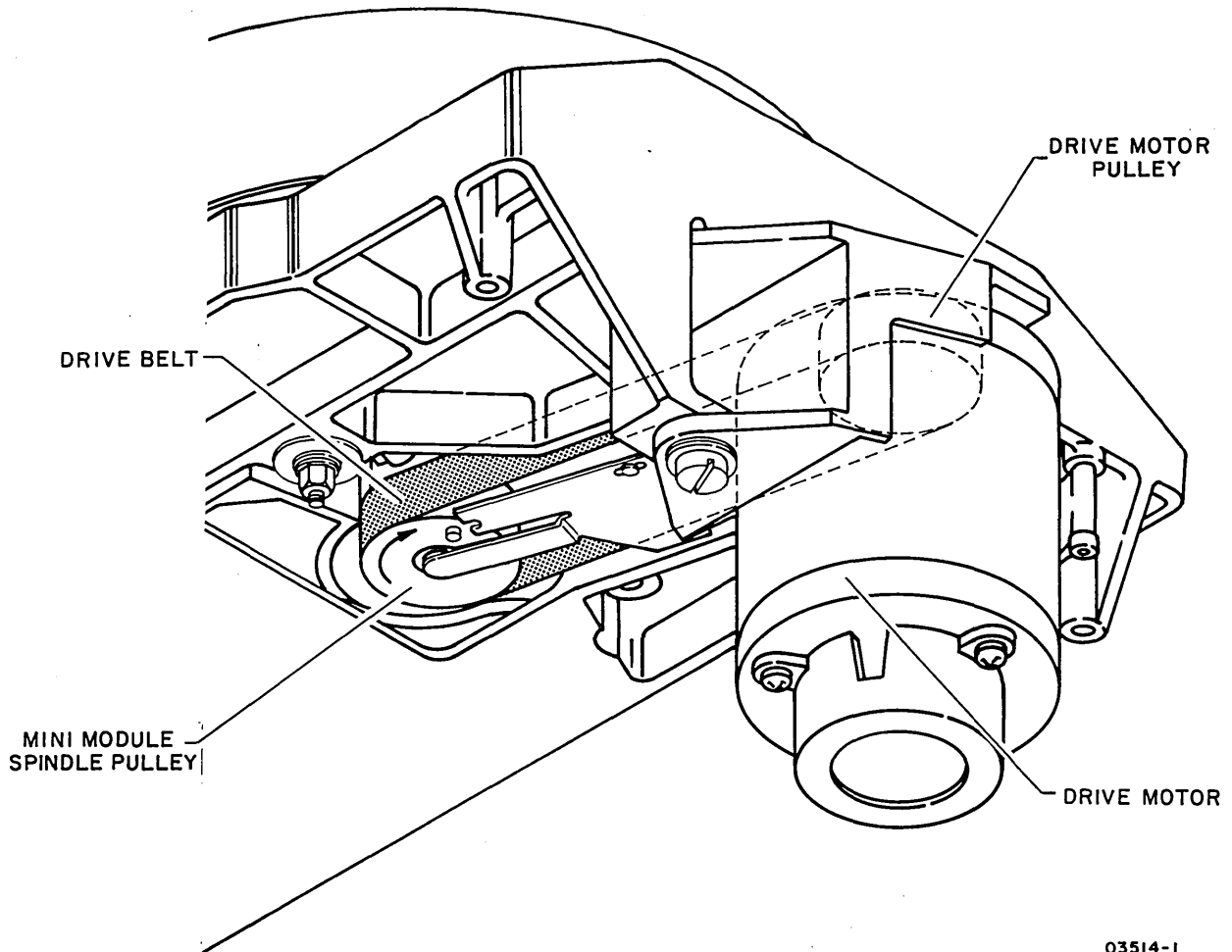
1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).

3. Remove nine mounting screws holding motor cover at rear of unit. Remove cover and set aside.
4. Push drive motor forward until drive belt falls off of mini module spindle pulley.

CAUTION

Do not allow spindle pulley to turn counterclockwise while installing drive belt. Head or disk surface damage may occur.

5. Loop a portion of replacement drive belt around motor pulley. Use one hand to hold belt against motor pulley and push drive motor forward while using other hand to position remainder of belt over spindle pulley. Ensure that drive belt rests near the center of each pulley and release pressure on drive motor for pulleys to engage belt.



03514-1

Drive Belt Installation Details

3.6 DRIVE MOTOR-BRACKET ASSEMBLY

3.6.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).
3. Remove nine mounting screws holding motor cover at rear of unit. Remove cover and set it aside.
4. Disconnect brake assembly cable connector A3J3.
5. Disconnect drive motor power cable connector ALP9 from power supply.

NOTE

The following step requires a special tool (CDC part number 71493095) to remove the constant force spring.

6. Use spring removal tool to compress constant-force spring and remove spring tension from motor.
7. Remove constant-force spring by placing special tool hooks on each side of spring and around plastic center piece of spring and pull off. Push motor forward while holding spring out of the way.
8. Remove nut, flat washer, and cotter key from pivot pin while supporting motor and remove motor-bracket assembly.

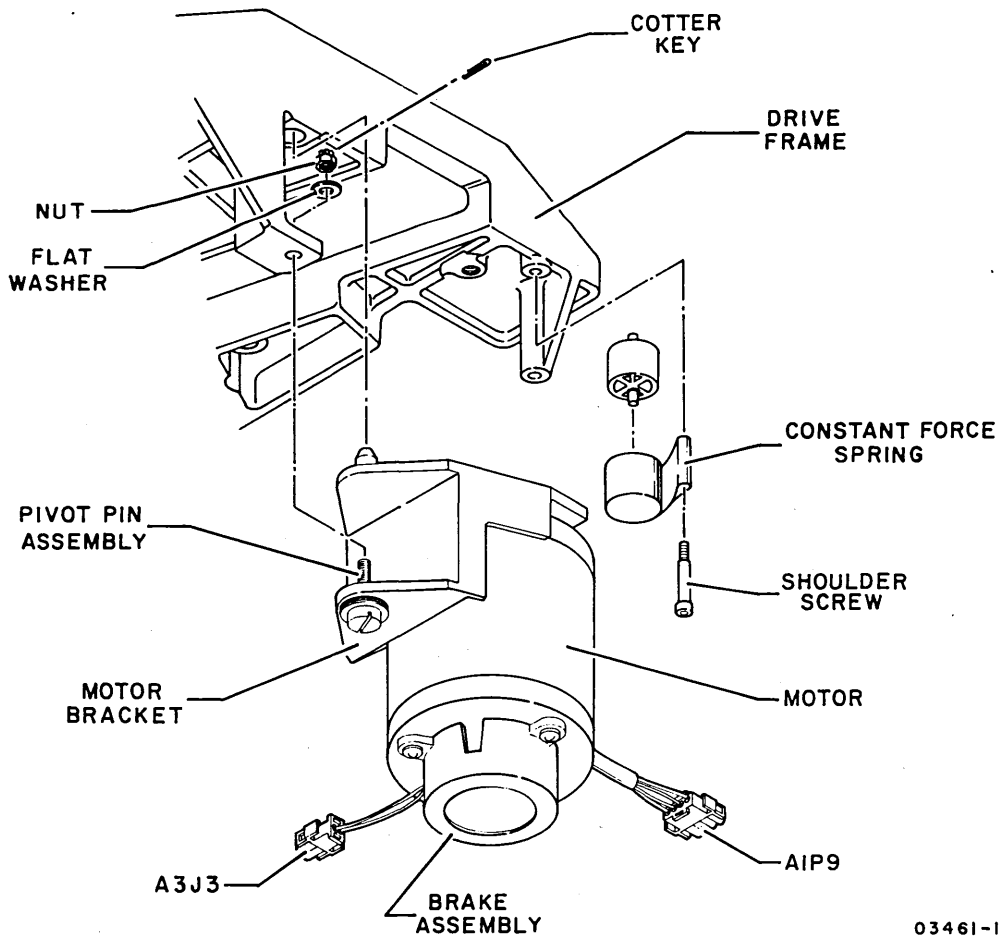
CAUTION

Lower motor straight down so as not to break pin on motor mount.

9. During replacement, do not overtighten nut removed in step 8 or motor will not pivot properly. Install drive belt last (para 3.5).

3.6.2 Repair-Adjustment

No repair or adjustment of motor-bracket assembly is applicable, except for replacement of brake assembly (para 3.13). If drive motor is faulty, replace entire assembly and return for repair using packaging materials that spared assembly was shipped in.



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Drive Motor-Bracket Assembly Mounting Details

3.7 MMD POWER SUPPLY ASSEMBLY

3.7.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).
3. Disconnect two ground leads from connector side of power supply by loosening screws.
4. Disconnect ac power cord and cable connectors J02, J03, J07, J09, J10 from power supply.

NOTE

Jumper plug J07 must be removed from faulty power supply and installed in replacement supply

5. Remove three mounting screws from base of power supply.

NOTE

A ground lead is fastened to frame by one of these screws. Make sure that it is reconnected during replacement.

6. Lift power supply out of unit.

3.7.2 Plus and Minus 5-Volt Checks

This procedure checks the output of the plus and minus 5-volt power supplies of the MMD power supply assembly at the logic chassis backpanel.

1. Turn drive power off (para 3.1).
2. Access drive and remove covers (para 3.2).
3. Connect digital multimeter between GND and +5 VDC Fastons on logic chassis backpanel.

4. Turn drive power on and check that measured value is $+5.10 \pm 0.05$ volts. If not, adjust per para 3.7.3.
5. Turn drive power off and connect multimeter leads between GND and -5 VDC Fastons on backpanel.
6. Turn drive power on and check that measured value is -5.10 ± 0.05 volts. If not, adjust per para 3.7.3.
7. Turn drive power off and disconnect multimeter leads.

3.7.3 Plus and Minus 5-Volt Adjustment

This procedure describes the method for accessing and adjusting the plus and minus 5-volt potentiometers on the MMD power supply.

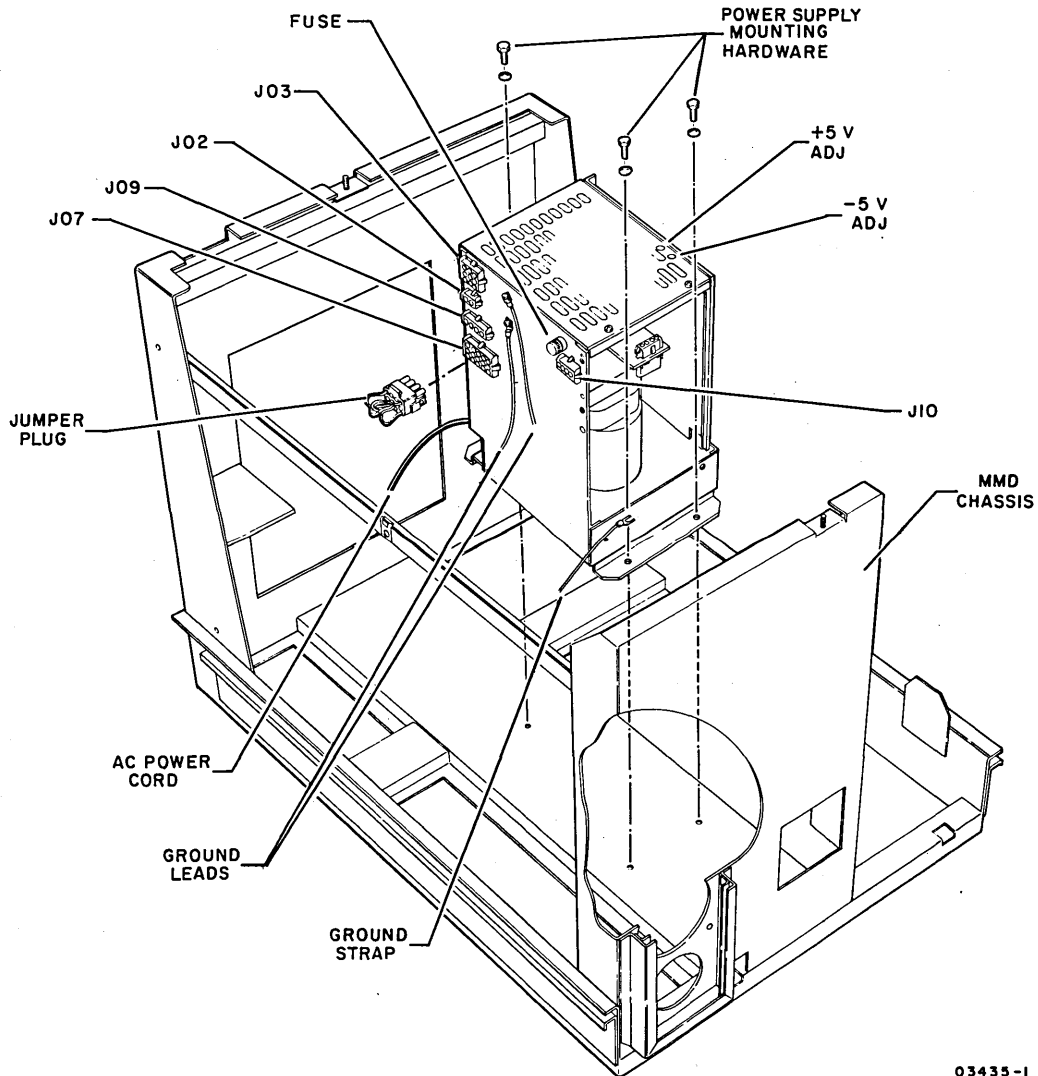
1. Turn drive power off (para 3.1).
2. Access drive and remove covers (para 3.2).
3. Remove FDD assembly if present (para 3.10).
4. Remove three mounting screws from base of power supply.

CAUTION

Make certain that transistor cases on side of power supply do not contact drive frame. They are at a dc potential of approximately 30 volts when power is applied. Use insulating material to provide necessary separation where necessary.

5. Tip Power supply away from logic chassis so that plus and minus 5-volt potentiometers can be reached with a small screwdriver (adjustment holes are provided on top cover of power supply). It may be necessary to cut cable tie holding ac power cables to drive frame to obtain sufficient cable clearance.
6. Use one of the power supply mounting screws and temporarily reconnect ground strap removed in step 4 to drive frame.
7. Connect a ground strap between power supply frame and drive frame to provide adequate grounding of power supply during adjustment.

8. Connect digital multimeter to backpanel Fastons and measure desired voltage
9. Turn power on and adjust appropriate potentiometer until voltage is within specification (para 3.7.2). If voltage cannot be adjusted within specified tolerance, replace power supply.

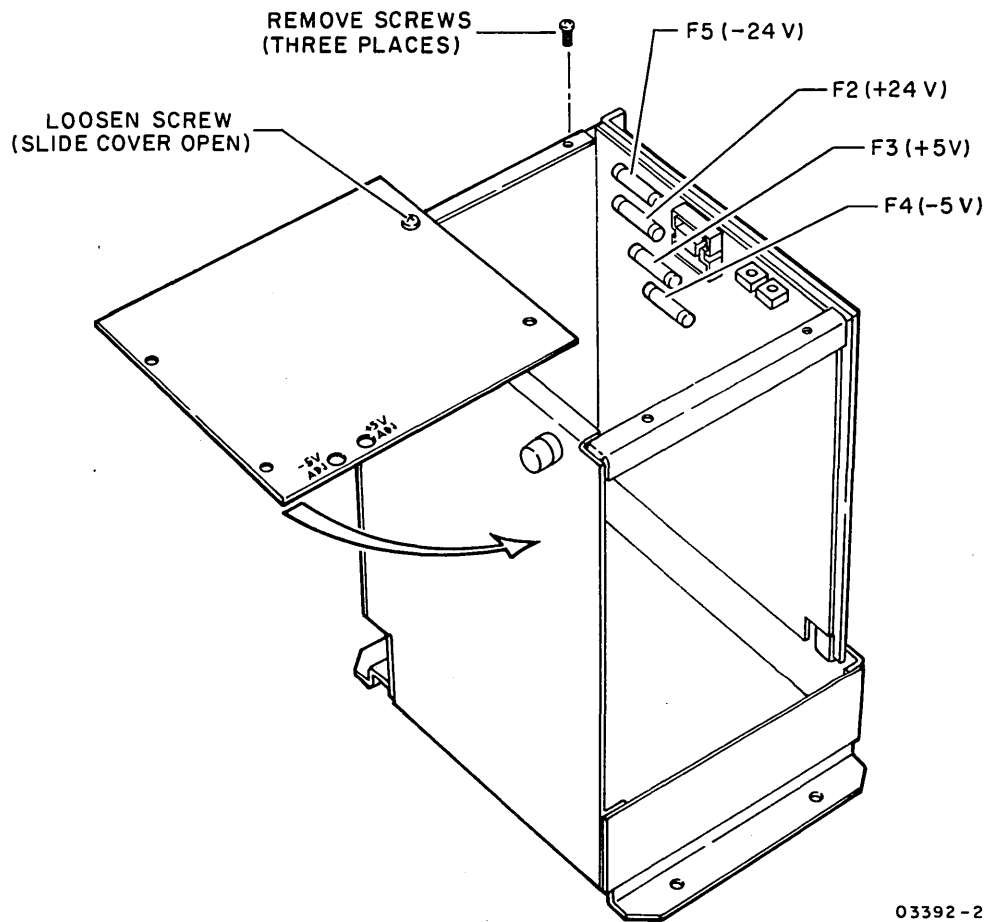


03435-1

Power Supply Assembly Details

3.7.4 Repair

No field repair of the power supply, except for fuse replacement (see accompanying illustration for fuse locations), is applicable. Return faulty supply using packaging materials that spared unit was shipped in.



Internal Fuse Locations, MMD Power Supply

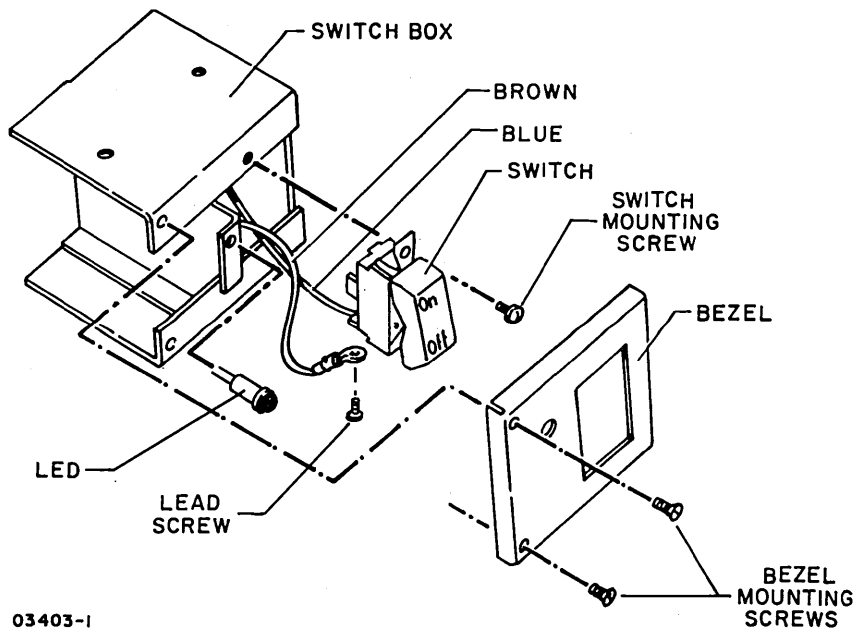
3.8 POWER ON/OFF SWITCH AND INDICATOR

3.8.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Remove front cover of MMD unit (para 3.2).
3. Remove two screws holding bezel to front of switch box.
4. To replace LED indicator:
 - a. Push LED forward to remove.
 - b. Cut leads from LED pins.
 - c. Place shrink wrap on leads and solder leads to pins of replacement LED.
 - d. Press LED into mounting hole.
5. To replace Power On/Off switch:
 - a. Remove two screws mounting switch and pull switch forward.
 - b. Tag and disconnect wires from switch.
 - c. Connect wires to replacement switch (see accompanying illustration). Wire colors shown are those of production units.
 - d. Reinstall switch.

3.8.2 Repair-Adjustment

No repair or adjustment of switch box components is applicable. Replace faulty component.



Switch Box Assembly Details

3.9 LOGIC CHASSIS ASSEMBLY

3.9.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive, remove covers, and lower logic chassis (para 3.2).
3. Disconnect I/O cables from logic cards (cut cable ties as necessary), remove cable clamp from cable going to card mounted on chassis frame, and unplug cable.

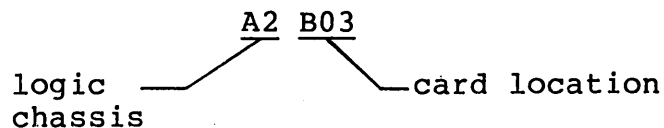
CAUTION

Observe MOS circuit handling precautions (para 3.0.3) when removing logic card A2B03.

4. Remove all logic cards.
5. Disconnect all power and ground leads from logic chassis wirewrap backpanel. Be careful not to bend backpanel pins.
6. Disconnect all logic cables from logic chassis wirewrap backpanel.

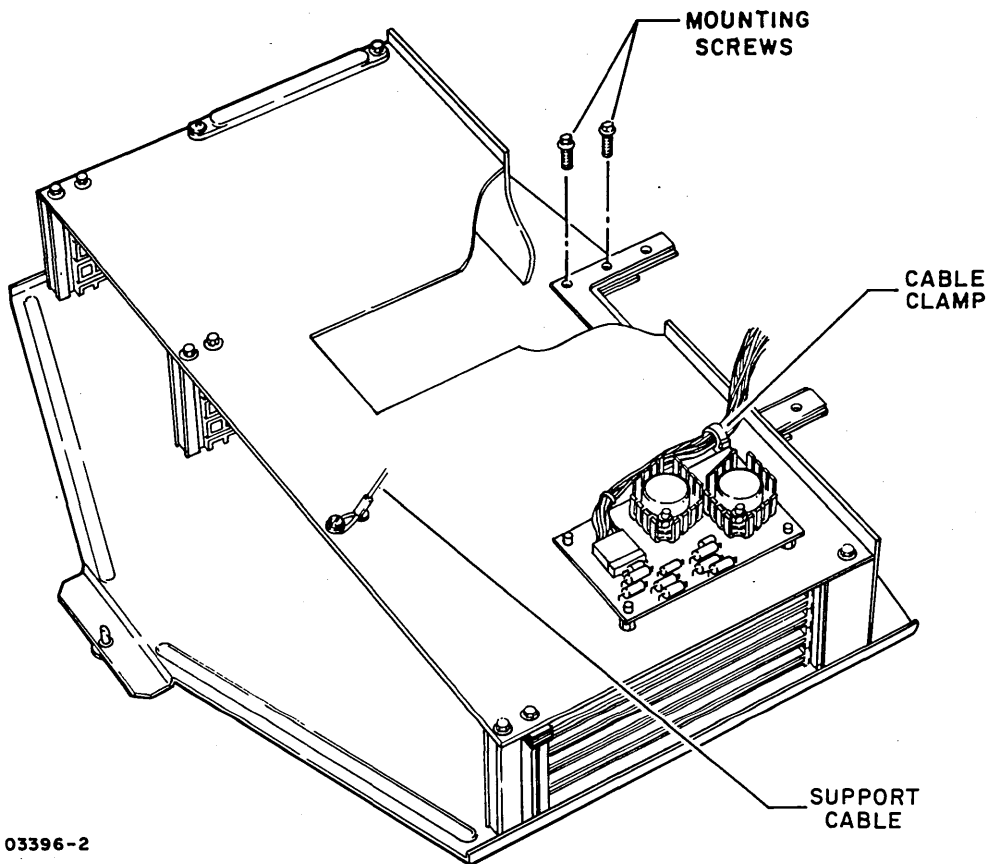
NOTE

All backpanel cables have a plastic identification tag indicating destination. Example:



The connectors on each cable have a pin strip showing pins to be mated. When properly attached, the pin strip on connector is visible (up).

7. Remove screw attaching support cable to logic chassis.
8. Support logic chassis and remove four screws mounting logic chassis to hinges. Lift logic chassis free of unit.



Logic Chassis Assembly Mounting Details

NOTE

When replacing logic chassis, remove jumper wire from the wire wrapped backpanel of the replacement at C1A30 and C1B30 if unit is a BG703.

9. Reverse the removal procedure when installing new logic chassis.
10. Perform the backpanel wire modifications as described in the instruction sheet enclosed with the replacement logic chassis.
11. If the chassis is being installed in a BG703 disk drive, remove the backpanel wire between location C1, pin A30 and C1-B30 if it has not already been removed. If the unit is a BG702, ensure that the wire is installed.

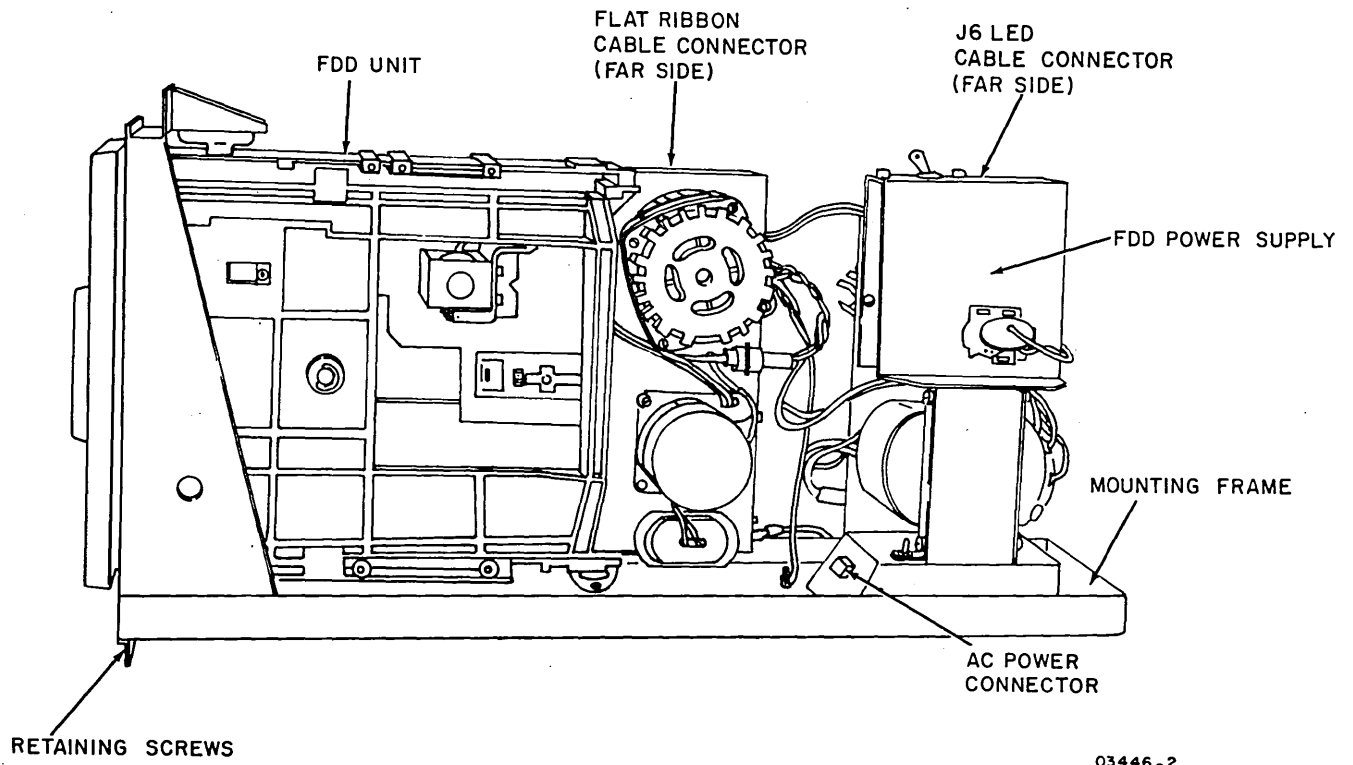
3.10 FDD UNIT

3.10.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).
3. Disconnect ac power cable from front of FDD power supply.
4. Disconnect LED power indicator cable from J6 of FDD power supply PC board. Pin 1 of cable connector (indicated by white dot) must mate with lower pin of J6 during reassembly.
5. Disconnect attachment card 3-pin power cable from power supply PC card. Polarity need not be observed during reassembly.
6. Disconnect flat ribbon cable from rear of FDD PC board.
7. Remove two retaining screws from lower front of FDD unit.
8. Check that cables do not snag against MMD power supply and slide FDD mounting frame forward to remove from MMD.

NOTE

When replacing FDD unit, verify correct setting of switches on FDD PC board (refer to section 2 of this manual).



03446-2

FDD Unit Mounting Details

INTENTIONALLY BLANK

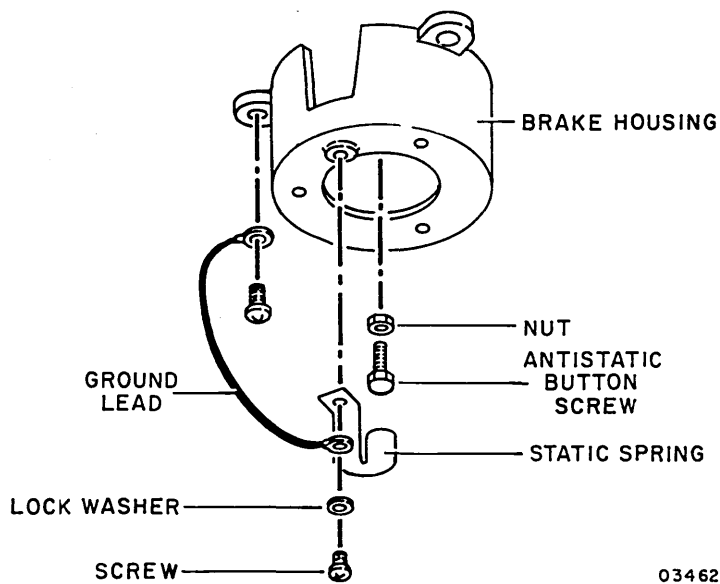
3.11 GROUND SPRINGS

3.11.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers.
3. To replace spindle lock and ground spring:
 - a. Remove two screws holding spindle lock and ground spring to mini module frame.
 - b. Slide replacement part back as far as possible and still allow ground spring cup to rest in middle of shaft. Verify that good contact is being made with spindle shaft.
4. To replace static ground spring:
 - a. Remove screw mounting static ground spring and ground lead.
 - b. Install replacement ground spring and verify that good contact is being made with antistatic button screw.

3.11.2 Repair-Adjustment

No repair of ground springs is applicable, replace if worn. Adjust for good contact with mating assembly.



03462

Ground Spring Mounting Details

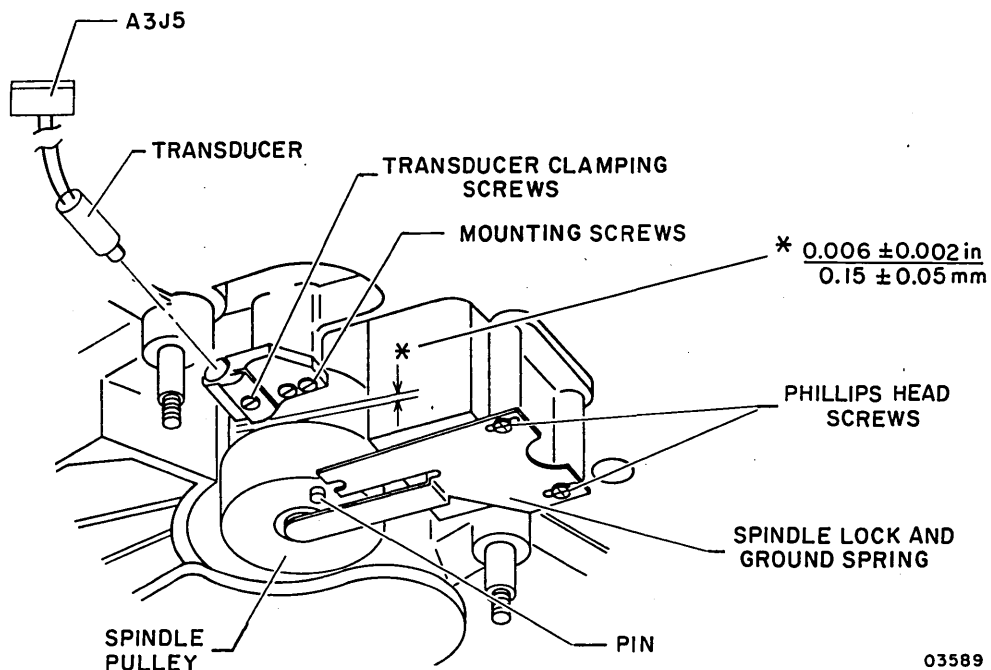
3.12 SPEED TRANSDUCER

3.12.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Access drive and remove covers (para 3.2).
3. Cut tie-wraps and disconnect transducer cable connector A3J5.
4. Remove two mounting screws from transducer bracket.
5. Loosen transducer clamping screw and remove transducer.
6. Install replacement transducer into clamp and adjust distance between transducer and spindle pulley as shown in accompanying illustration. Use two 0.003 in nonmetallic feeler gages, CDC P/N 12205635, for adjustment.
7. Reconnect transducer cable connector A3J5.

3.12.2 Repair-Adjustment

No repair of speed transducer is applicable, replace if faulty. Adjust for distance as shown in accompanying illustration.



03589

Speed Transducer Mounting Details

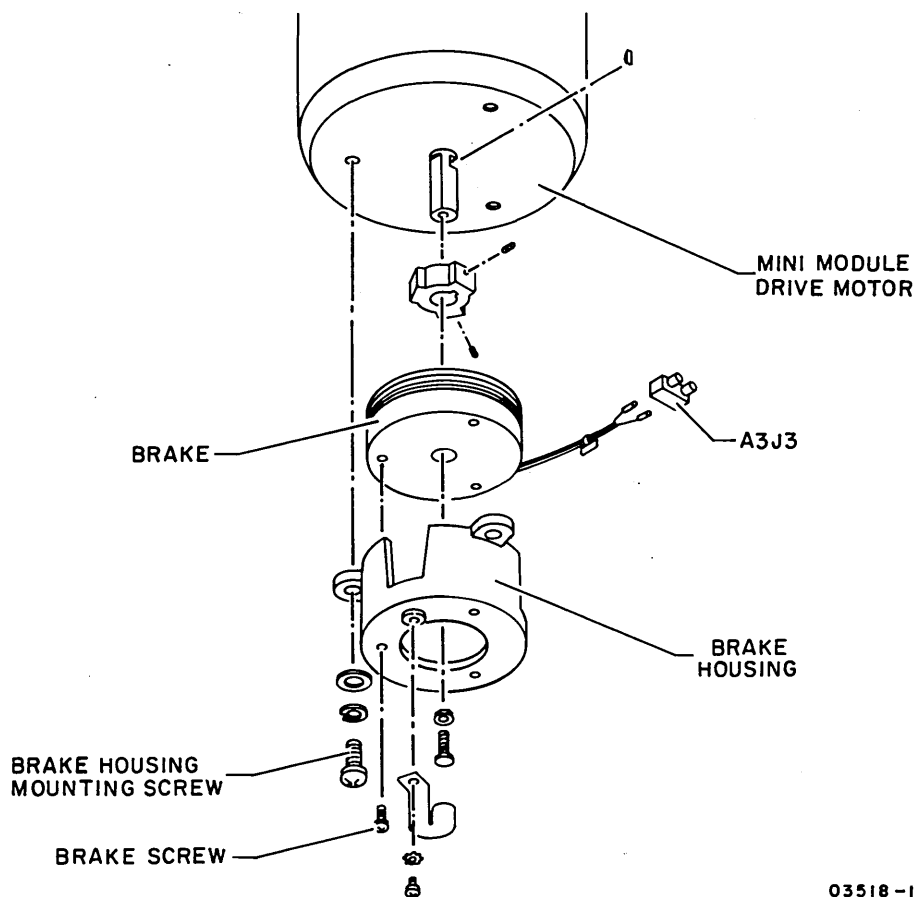
3.13 DRIVE MOTOR BRAKE ASSEMBLY

3.13.1 Removal-Replacement

1. Turn drive power off (para 3.1) and disconnect ac power cord.
2. Remove drive motor cover from rear of unit (nine screws).
3. Disconnect brake assembly cable connector A3J3.
4. Remove three brake housing mounting screws and lift assembly from shaft of drive motor.
5. Remove three screws mounting brake to brake housing and replace defective brake.

3.13.2 Repair-Adjustment

No repair or adjustment of brake assembly is applicable, replace if faulty.



Brake Assembly Mounting Details

03518-1

3.14 POWER SYSTEM CHECKS

This procedure checks the ac and dc voltages of the MMD. This includes all voltages except +5 volts and -5 volts. Checks and adjustments for these voltages are described in para 3.7.

1. If drive fails to provide distribution of ac power:
 - Check that circuit breaker (CBI) on power supply has not tripped. Reset if necessary.
 - Check fuse (F1) on side of power supply. If blown, replace with a fuse of the same type and amperage rating.
 - Thermo switch on power supply regulator card may have opened due to an overtemperature condition. Allow time for drive to cool down and reapply power. Check that fans are all operating. If not, replace per para 3.3.
2. If drive motor fails to start, check for tripped thermo overload breaker on drive motor. Reset if necessary.
3. Command repeat seeks between cylinder 0 and cylinder 302. Use CDC BASIC diagnostic test 7245 to perform repeat seeks
4. Measure voltages between GND terminal and indicated test point on logic chassis backpanel as follows:
 - +24.0 \pm 2.4 volts at +24 VDC Faston.
 - -24.0 \pm 2.4 volts at -24 VDC Faston.
 - -8.2 \pm 0.4 volts at A2B01-03A or -03B (-KBX card).
 - +15.0 \pm 0.75 volts at A2B01-TP3 (-KBX card).
 - -15.0 \pm 0.75 volts at A2B01-TP2 (-KBX card).

NOTE

The following voltages are checked at pins of logic cards on the mini module assembly. A card extender is required to check these voltages.

- +18.0 \pm 1.08 volts at A4B3-43A or -43B (-NRN card).
- -18.0 \pm 1.08 volts at A4A1-03A or -03B (-NSN card).
- +6.0 \pm 0.3 volts at A4B2-16A or -16B (-NQN card).
- -4.25 \pm 0.05 volts at A4A2-33A or -33B (-NQN card).

3.15 SERVO SYSTEM CHECKS

The following procedures test for proper functioning of the MMD servo logic circuits. Use CDC BASIC diagnostic test 7245 to perform cylinder addressing.

NOTE

The external sync probe used should be a 1:1 probe.

If unable to obtain servo system waveforms within the specified tolerances, replace the following logic cards in the order shown:

- A2B01/C01 (Analog Servo)
- A2B02/C02 (Fault/Control)
- A2C04 (Microprocessor)
- A2C05 (Power Amp)

3.15.1 Position Gain

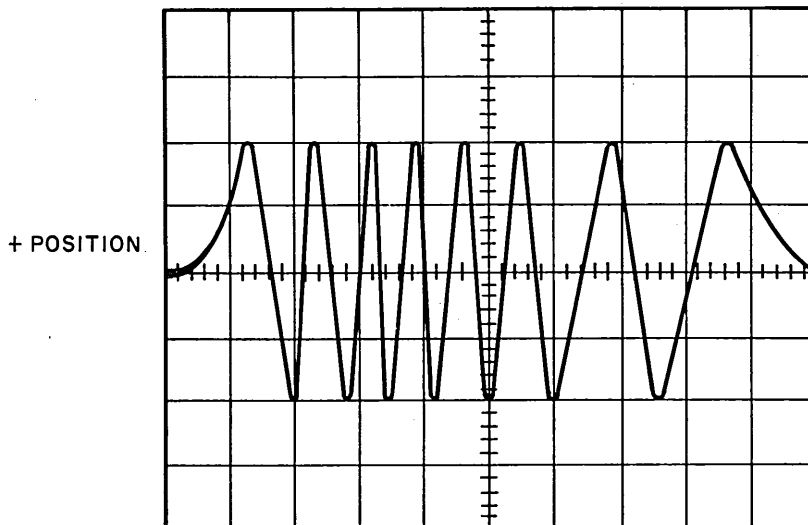
This procedure checks that the proper amplitude is available on the plus and minus Position signals.

1. Connect oscilloscope as follows:

- Trigger: EXT + at A2C04-24B (+Odd Slope)
- Volts/Division: 2.0
- Time/Division: 1.0 ms
- Channel 1: A2B01-TP17 (+Position).

2. Command a repeat seek to cylinder 30 (1E₁₆).

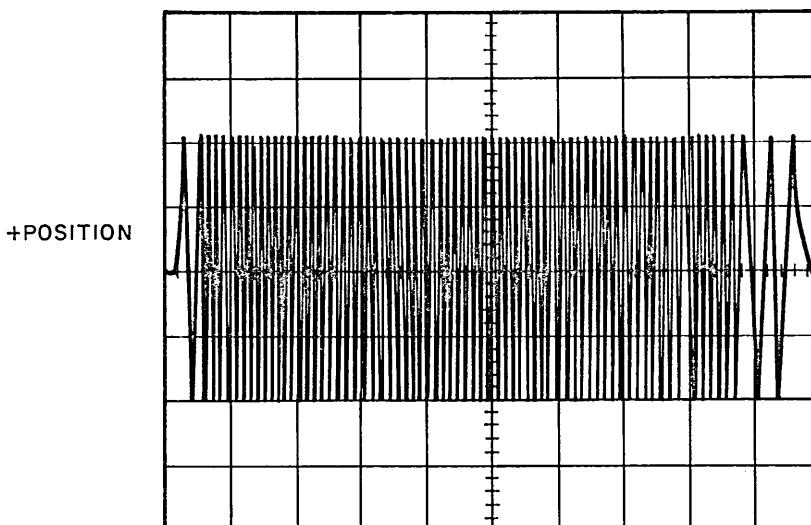
- ##### 3. Observe +Position signal and adjust Servo Gain potentiometer on A2B01 logic card (leftmost potentiometer) to obtain a signal amplitude of 8.0 ±0.1 volts peak-to-peak. See accompanying illustration.



03609-10

Plus Position Gain at 1.0 ms/Div

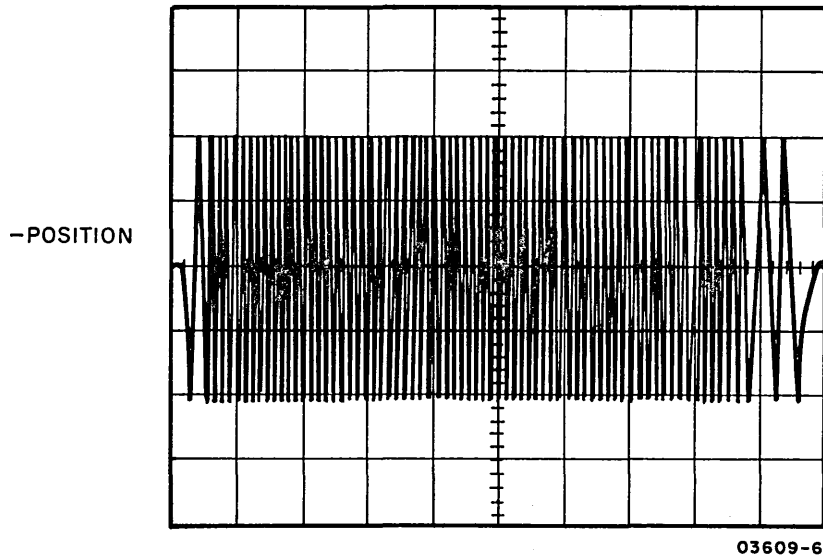
4. Change time scale to 5 ms per division.
5. Command a repeat seek to maximum cylinder address (see para 3.16). Peak-to-peak signal amplitude must be 8.0 +0.4, -0.2 volts during period of a complete seek. See accompanying illustration.



03609-6

Plus Position Signal at 5 ms/Div

6. Compare +Position signal (A2B01-TP17 as shown in previous illustration) to -Position signal (A2B01-TP16 as shown below). Signal amplitudes must track each other within ± 0.05 volts.

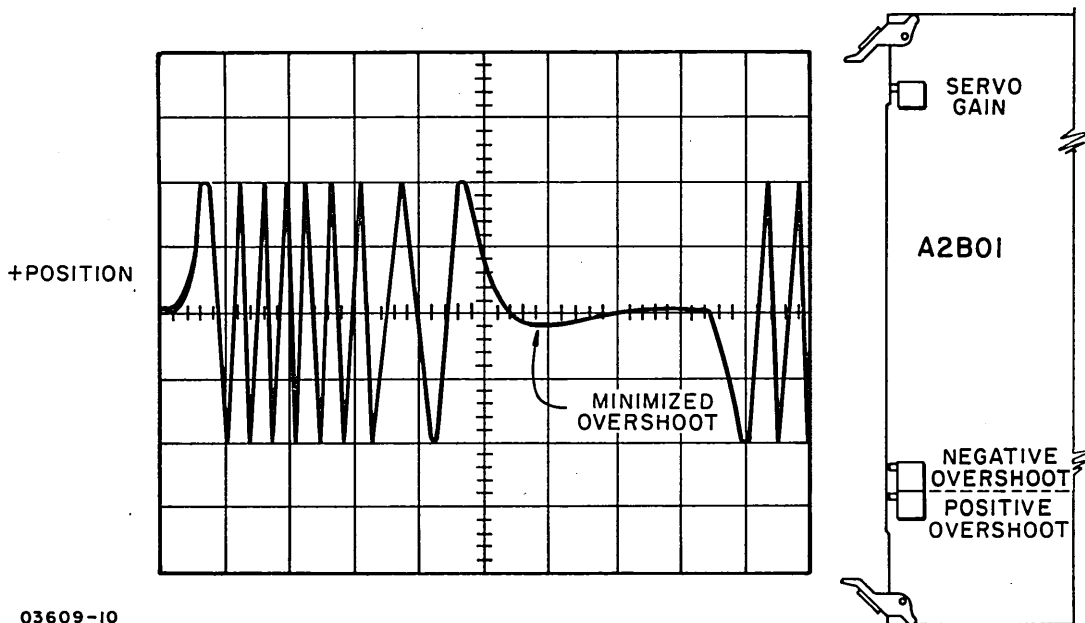


Negative Position Signal at 5 ms/Div

3.15.2 Velocity Overshoot

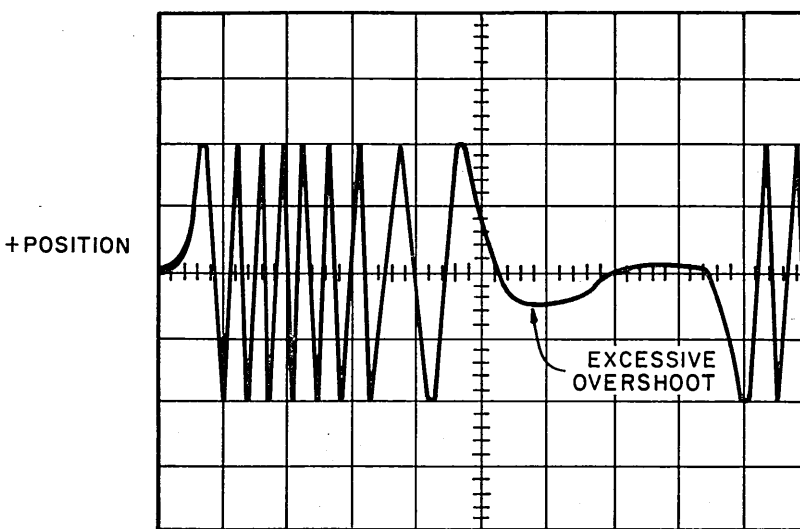
This procedure checks that the velocity damping is set for minimum overshoot.

1. Connect oscilloscope as follows:
 - Trigger: EXT+ at A2C04-24B (+Odd Slope)
 - Volts/Division: 2.0
 - Time/Division: 2 ms
 - Channel 1: A2B01-TP17 (+Position)
2. Command a repeat seek to cylinder 30 (1E16).
3. Observe +Position signal and adjust Negative Overshoot potentiometer on A2B01 logic card (second potentiometer from right) for minimum overshoot. See accompanying illustrations for acceptable and unacceptable examples.



03609-10

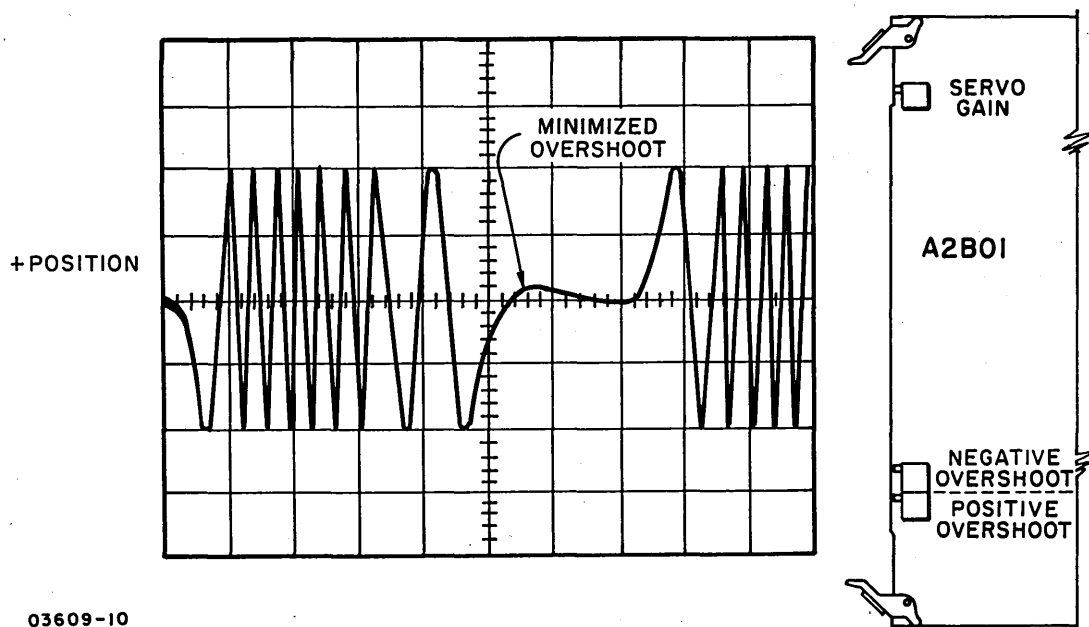
Acceptable Velocity Overshoot Waveform (Minimized) In Seek



03609-9

Unacceptable Velocity Overshoot Waveform (Misadjusted) In Seek

4. Readjust scope trigger level to sync on negative going signal).
5. Observe +Position signal and adjust Positive Overshoot potentiometer on A2B01 logic card (rightmost potentiometer) for minimum overshoot as shown in accompanying illustration.



03609-10

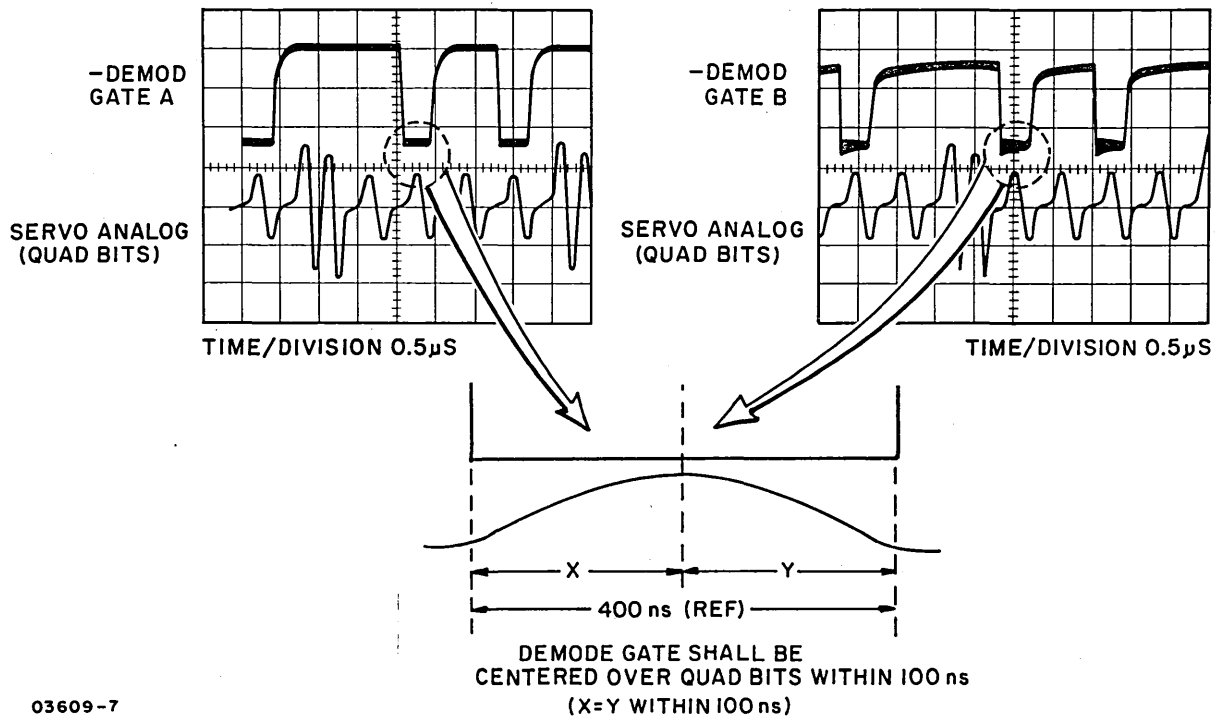
Acceptable Velocity Overshoot Waveform (Minimized) Out Seek

3.15.3 Position Demodulator Gating

This procedure checks that the proper gating occurs as the magnetic heads travel from odd to even or even to odd cylinders.

1. Connect oscilloscope as follows:
 - Trigger: EXT+ at A2B02-TP27 (Index).
 - Volts/Division: Channel 1 = 2.0 volts
Channel 2 = 1.0 volts
 - Channel 1: A2B01-32A (Demod Gate A)
 - Channel 2: A2B01-TP15 (Servo Analog)
2. Load heads to cylinder 0 by applying drive power.
3. Measure quadbit gate timing. -Demod gate A signal must be centered over quad bits within 100 ns as shown in accompanying demodulator gating illustration.
4. Connect channel 1 probe of oscilloscope to A2B01-34A (-Demod gate B).

5. Measure quadbit gate timing. -Demod gate B signal must be centered over quad bits within 100 ns as shown in accompanying illustration.

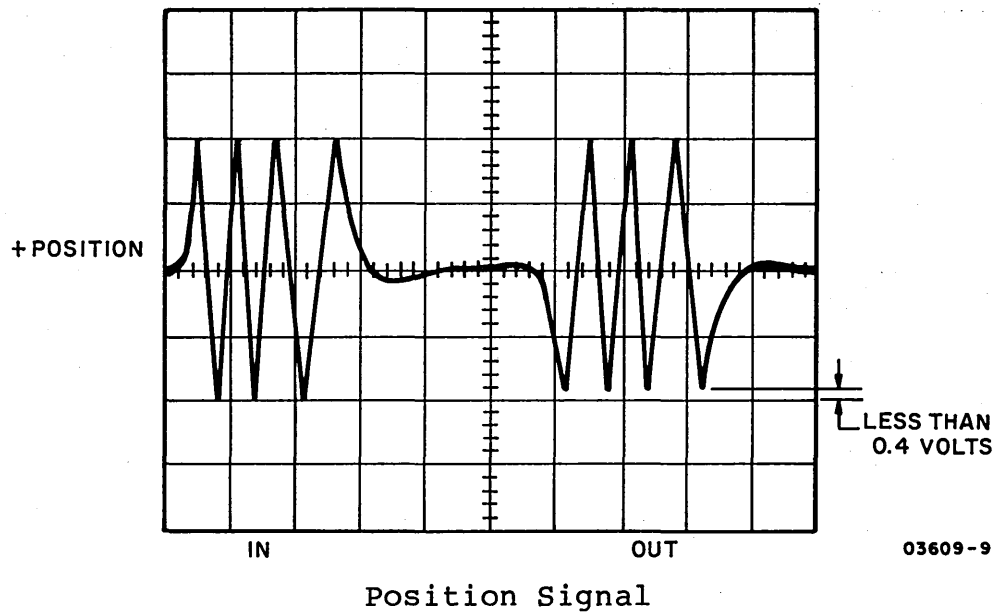


Demodulator Gating

3.15.4 Position Null

This procedure checks that the offset error of the position entered into the servo logic is within specified limits.

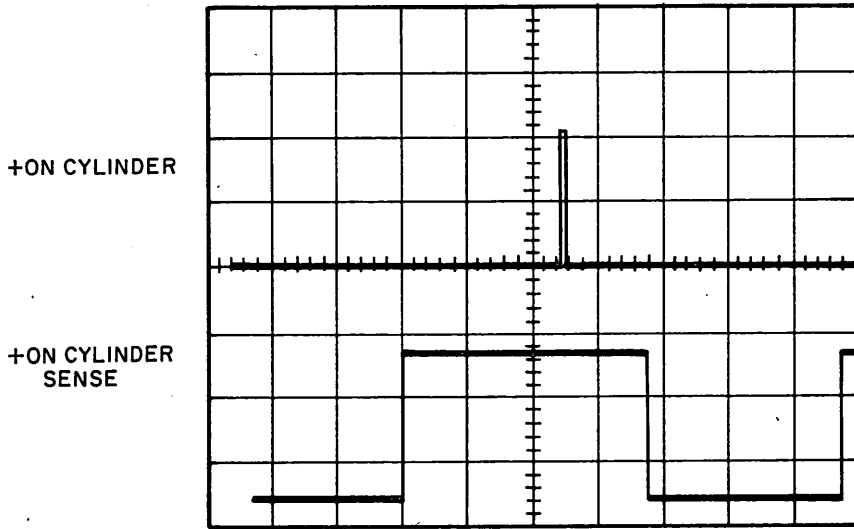
1. Connect oscilloscope as follows:
 - Trigger: EXT+ at A2C04-24B (+Odd Slope)
 - Volts/Division: 2.0
 - Time/Division: 2 ms
 - Channel 1: A2B01-TP17 (+Position)
2. Command a repeat seek to cylinder 14 (0E₁₆).
3. Observe negative peaks of +Position signal between out and in access periods. Negative peaks must be within 0.4 volts of each other as shown in accompanying Position Signal illustration.



3.15.5 Settled On-Track Delay

This procedure checks the on-track delay to make certain that the heads stay on track.

1. Connect oscilloscope as follows:
 - Trigger: INT- on Channel 2
 - Volts/Division: 2.0
 - Time/Division: 1.0 ms
 - Channel 1: A2C04-21B (+On Cylinder)
 - Channel 2: A2C01-42A (+On Cylinder Sense)
2. Command a repeat seek to cylinder 2 (one cylinder seek).
3. Observe that time interval between +On Cylinder Sense signal and +On Cylinder signal is 2.5 ± 0.25 ms. See accompanying illustration.



03609

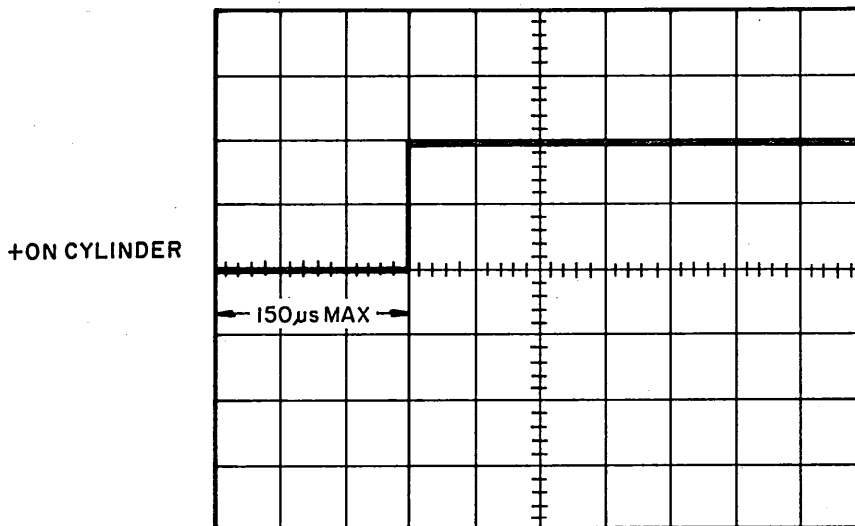
On Cylinder Sense/On Cylinder Time Interval

4. Connect oscilloscope as follows:

- Trigger: EXT- at A2B02-07A (+On Cylinder)
- Volts/Division: 2.0
- Time/Division: 50 usec
- Channel 1: A2C04-21B (+On Cylinder)

5. Command a repeat seek to cylinder 1 (zero cylinder seek).

6. Observe that negative pulse duration is 150 microseconds maximum. See accompanying illustration.



03609

Negative Pulse Duration.

3.15.6 Cylinder Pulse Width

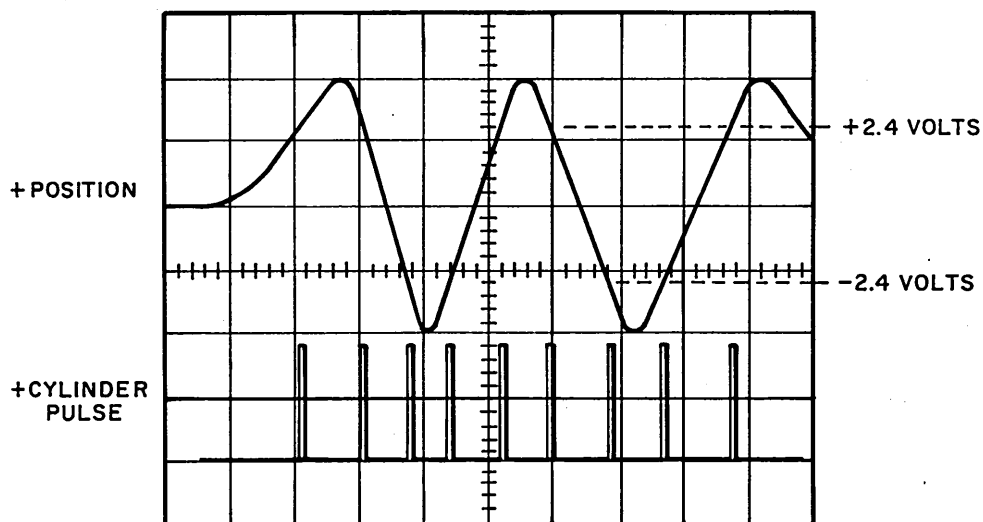
This procedure checks the delay on the one-shots to make certain that a cylinder-crossing pulse of sufficient width is generated.

1. Connect oscilloscope as follows:

- Trigger: EXT+ at A2C04-24B (+Odd Slope)
- Volts/Division: 2.0
- Time/Division: 0.5 ms
- Mode: Chopped
- Channel 1: A2B01-TP17 (+Position)
- Channel 2: A2C01-38A (+Cylinder Pulse)

2. Command a repeat seek to cylinder 10 (A₁₆) (five cylinder seek).

3. Observe that cylinder pulses occur during the linear portion of the Position signal at approximately +2.4 V and -2.4 V as shown in accompanying illustration.

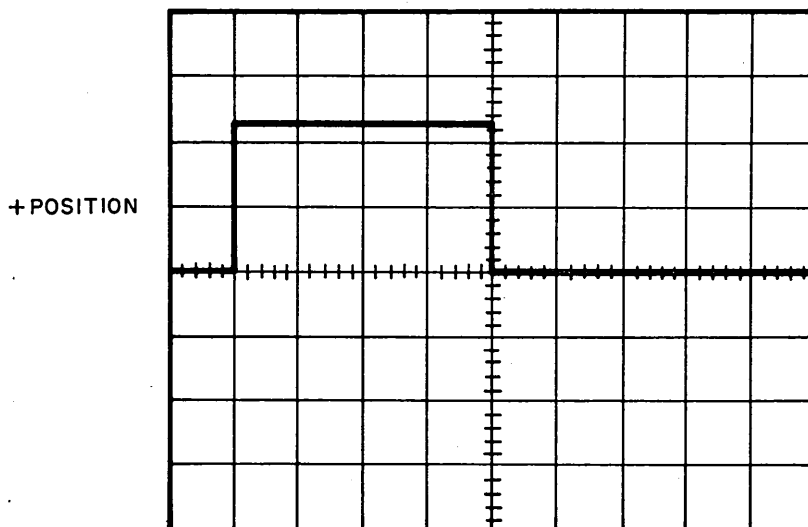


03609-9

Cylinder Pulses/Position Signal

4. Change time scale to 1 microsecond per division and verify that cylinder pulse width is 4 ± 1 microsecond as shown in accompanying illustration.

- Sync scope INT+ on channel 2.



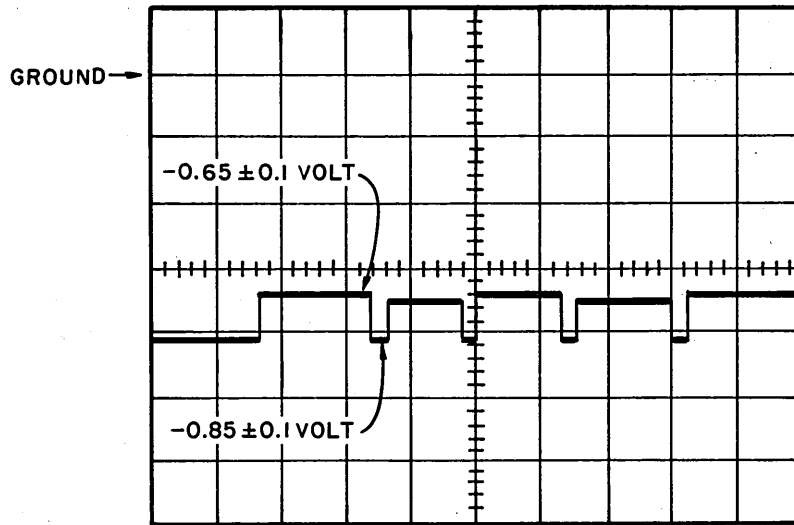
03609-3

Cylinder Pulse Width

3.15.7 On-Track Level Detector

This procedure checks that the on-track level detector switches at the proper voltage levels.

1. Connect oscilloscope as follows:
 - Trigger: EXT+ at A2C04-24B (+Odd Slope)
 - Volts/Division: 0.2
 - Time/Division: 0.5 ms
 - Channel 1: A2B01-TP19 (Level Detector)
2. Command a repeat seek to cylinder 10 (A₁₆) (five cylinder seek).
3. Check that track level detector switches at voltage levels indicated in accompanying illustration.



03609-11

On-Track Level Detector Switching Levels

3.15.8 Linear Slope Level Detector

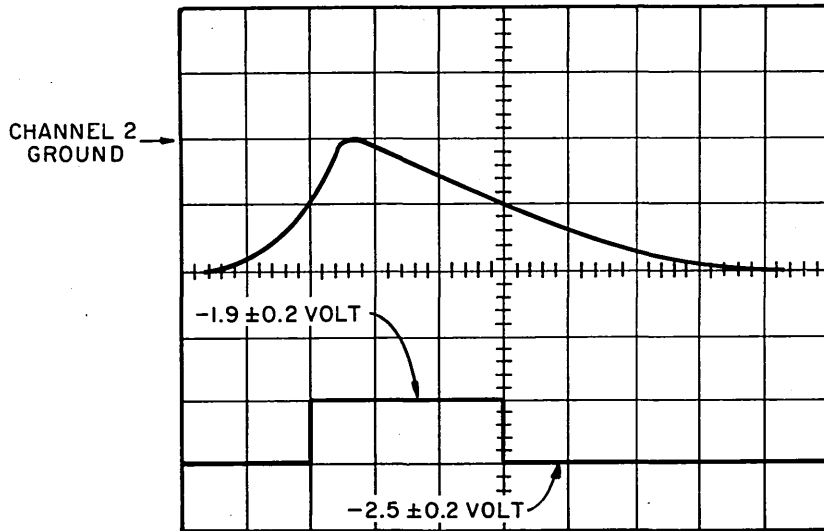
This procedure checks that the linear slope level detector switches at the proper voltage levels.

1. Connect oscilloscope as follows:

- Trigger: EXT+ at A2C04-24B (+Odd Slope)
- Volts/Division: Channel 1: 2.0
Channel 2: 0.5
- Time/Division: 0.5 ms
- Channel 1: A2B01-TP17 (+Position)
- Channel 2: A2B01-TP20 (Level Detector)
- Mode: Chopped

2. Command a repeat seek to cylinder 4 (two cylinder seek).

3. Check that level detector switches at voltage levels indicated in accompanying illustration:



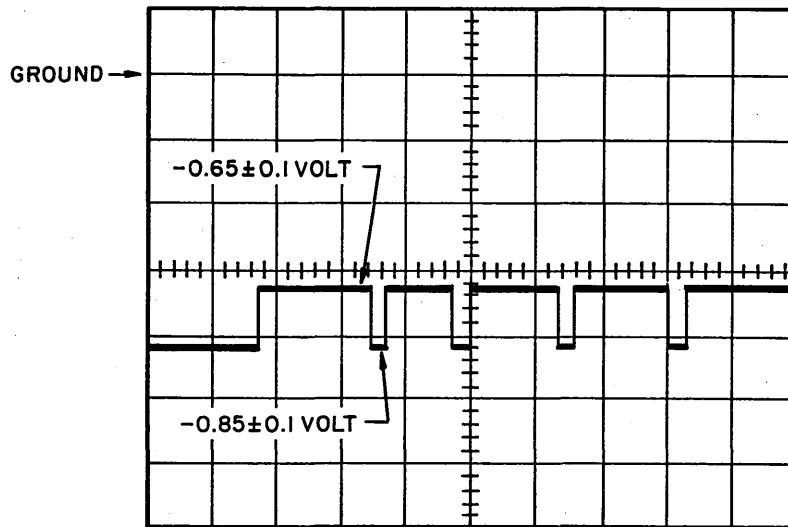
03609-11

Linear Slope Level Detector Waveform

3.15.9 Track-Crossing Level Detector

This procedure checks the track-crossing level detector to make certain that the detector turns on at the proper level to set the track crossing latch.

1. Connect oscilloscope as follows:
 - Trigger: EXT+ at A2C04-24B (+Odd Slope)
 - Volts/Division: 0.2
 - Time/Division: 0.5 ms
 - Channel 1: A2B01-TP27 (Level Detector)
2. Command a repeat seek to cylinder 10 (A₁₆) (five cylinder seek).
3. Check that track-crossing level detector switches at voltage levels indicated in accompanying illustration:



03609-11

Track-Crossing Level Detector Waveform

3.15.10 Current Sense Amplitude

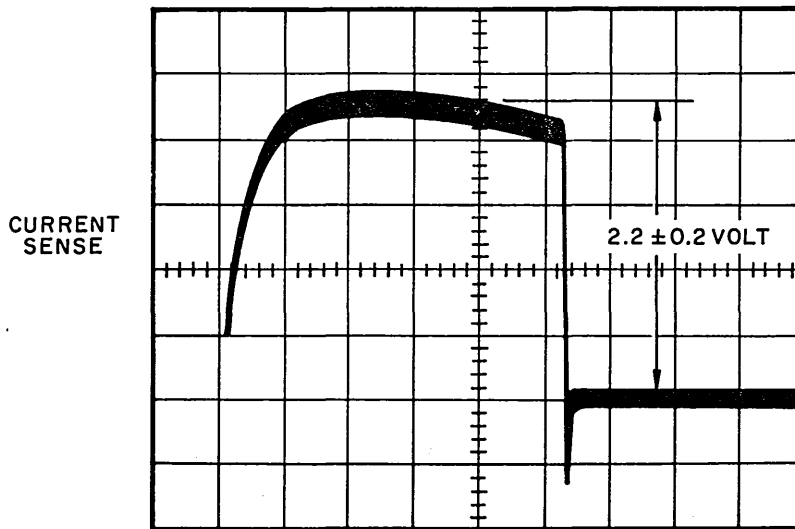
This procedure checks the current sense amplitude to make certain that the seek is completed in optimum time.

1. Connect oscilloscope as follows:

- Trigger: EXT+ at A2C04-24B (+Odd Slope)
- Volts/Division: 0.5
- Time/Division: 2.0 ms
- Channel 1: A2B01-TP18 (Current Sense)

2. Command a repeat seek to maximum cylinder address (para 3.16).

3. Measure the peak positive amplitude of Current Sense. It should be 2.2 ± 0.2 volts as shown in accompanying illustration.



Current Sense Amplitude Waveform 03609-1

3.15.11 Recalibrate Function Timing

This procedure checks the recalibrate function timing.

1. Connect oscilloscope as follows:

- Trigger: EXT+ at A2B02-09A (-RTZ)
- Volts/Division: 1.0
- Channel 1: A2B02-16B (-On Cylinder)

2. Command a seek to maximum cylinder address (para 3.16).

3. Command a return-to-zero seek and measure time elapsed from RTZ command to a low at A2C02-16B. Time duration should be no greater than specified in table of para 3.16.

3.16 MAXIMUM CYLINDER ADDRESS/RTZ TIMING

This paragraph provides a common reference point for determining the maximum cylinder address and associated RTZ seek timing of the various MMD products. References are made to this paragraph from the SAMs and related adjustment procedures.

Product Number	Maximum Cylinder Address	RTZ Seek Timing (ms)	
		Nominal	Maximum
80230/240-10/10A	303 (12F ₁₆)	270	420
80230/240-15H/5A	303 (12F ₁₆)	270	420
80230/240-30/30A	822 (336 ₁₆)	710	1100
80230/240-30G/31G	822 (336 ₁₆)	710	1100
80231/241-30/30A	822 (336 ₁₆)	710	1100
80231/241-60/60A	822 (336 ₁₆)	710	1100

3.17 READ/WRITE SYSTEM CHECKS

The following procedures test for proper functioning of the read/write logic circuits. Use CDC BASIC diagnostic tests 7227 to write, and 7226 to read specified data pattern.

3.17.1 Write Data Timing

This procedure checks the time relationship of the Write Clock to the Write Data.

NOTE

If unable to obtain specified tolerances of write data waveforms, replace the following logic cards in the order listed:

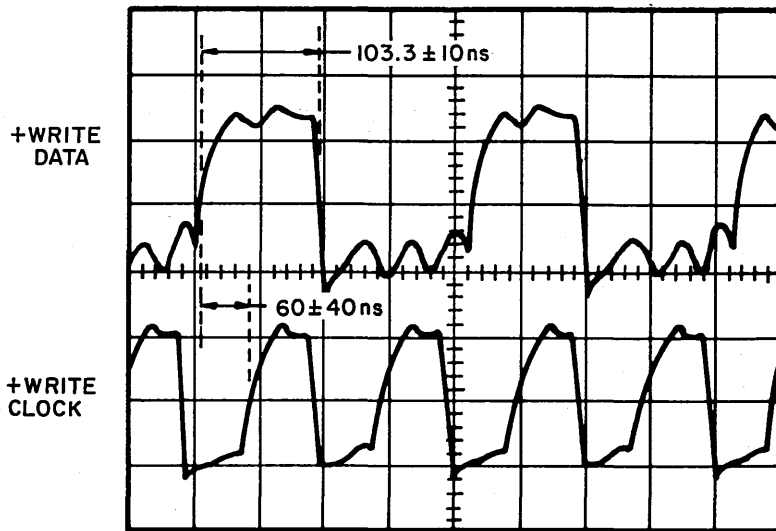
- A2A02 (Bit Ring)
- A2A03 (Bus Out)
- A2B04 (ECC)

1. Connect oscilloscope as follows:

- Trigger: INT+
- Volts/Division: 2.0
- Time/Division: 50 nsec
- Mode: Chopped
- Channel 1: A2C03-08B (+Write Data)
- Channel 2: A2C03-11B (+Write Clock)

2. Command drive to write an alternating 1010 (all A₁₆) pattern. Use CDC BASIC diagnostic test 7227 to write data pattern.

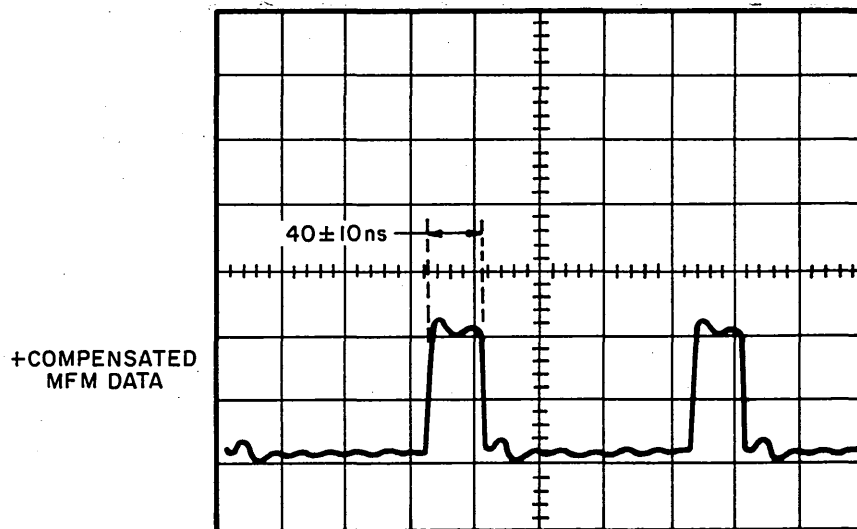
3. Observe that timing relationship is as shown in accompanying illustration.



03609-8

Write Data Timing, All A_{16} Pattern

4. Disconnect channel 2 probe and connect channel 1 probe to A2C03-35B (+Compensated MFM Data).
5. Sync scope INT+ on Channel 1.
6. Observe that +Compensated MFM Data pulses are of polarity and pulse width as shown in accompanying illustration.



03609-8

Compensated MFM Data Waveform

3.17.2 Read Data Timing

This procedure checks the time relationship of the Read Data and Read Clock signals. It assumes that an all A_{16} pattern has

been written on the disk per para 3.17.1.

NOTE

If unable to obtain specified tolerances of read data waveforms, replace the following logic cards in the order listed:

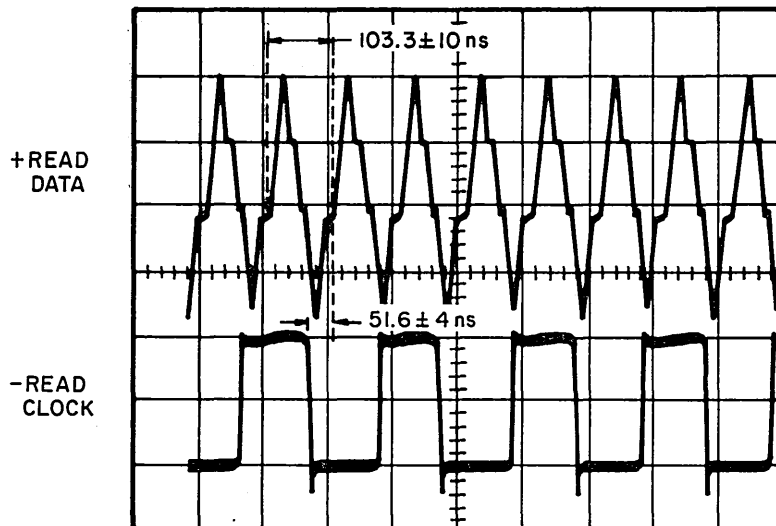
- A2A01 (Read/Write)
- A2B03 (Read PLO)
- A2A02 (Bit Ring)

1. Connect oscilloscope as follows:

- Trigger: INT+
- Volts/Division: 2.0
- Time/Division: 0.1 usec
- Mode: Chopped
- Channel 1: A2A03-28B (-Read Clock)
- Channel 2: A2A03-27B (+Read Data)

2. Command drive to read the all A_{16} pattern previously written in para 3.17.1. Use CDC BASIC diagnostic test 7226 to read data pattern.

3. Observe that timing relationship is as shown in accompanying illustration.



03609-8

Read Data Timing, All A_{16} Pattern

3.18 MISCELLANEOUS DRIVE CHECKS

The following procedures test miscellaneous drive functions for proper operation.

3.18.1 Speed Sensor Output

This procedure checks the speed sensor output at full speed of 3600 revolutions per minute.

1. Connect oscilloscope as follows:
 - Trigger: INT on Channel 1
 - Volts/Division: 1.0
 - Channel 1: A2C01-12A (-Speed Pulse)
 - Channel 2: A2B02-22B (+Speed OK)
2. Observe channel 1 pulses after channel 2 (+Speed OK) signal goes high. Channel 1 waveform should contain negative going pulses with a 16.67 (+0.4, -0.2) ms period.

3.18.2 Power-On Master Clear

This procedure checks the power-on master clear circuit timing.

1. Connect oscilloscope as follows:
 - Trigger: EXT+ at +5 VDC Faston of logic chassis backpanel.
 - Volts/Division: 1.0
 - Channel 1: A2C02-31B (-DC Master Clear)
2. Turn drive power off.
3. Turn drive power on and verify that -DC Master Clear signal is a low for 4.0 \pm 1.5 seconds.

3.18.3 Power-Off Retract

This procedure checks that the actuator retracts the movable heads to the landing zone during a loss of power.

1. Command a seek to maximum cylinder address (para 3.23).
2. Ground A2C01-11A (+Retract).
3. Turn drive power off and verify that actuator retracts to landing zone (outer radius of disk).
4. Remove ground from A2C01-11A.

3.19 CONFIGURATOR TABLE INFORMATION

NOTE

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

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

3.19.1 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 3.19.3 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.

3.19.2 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 3.21 for specific instructions pertaining to halt codes being displayed.
4. Continue entering appropriate parameters until a 3800 or 3805 halt code displays. This indicates that diskette configuration is complete. Diagnostic checkout can now be performed.

NOTE

Some IBM and CDC devices have the same read ID codes. These IBM devices are all assigned CDC device types in the configurator table and must be manually changed to the correct device ID before executing diagnostic tests. Also, if a CDC 80270 or 80271 storage module drive having a read ID of 3007 is present in the configurator table, the device type must be changed from 72 to 70. Refer to table under Checkout heading in section 2 of this manual for a listing of device types that have the same read IDs. To make changes, follow instructions in para 3.19.1.

3.19.3 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.

3.19.3.1 Entry 00 (System Entry)

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

<u>Byte</u>	<u>Definition</u>
00 and 01	Constant 00
02	Entry number of last entry in table
03	Configurator flags Bit 00 through 06 are reserved Bit 07 a 1 = diskette has been configured Bit 07 a 0 = diskette has not been configured
04	Not used
05	Processor type ① 22 = 4952 23 = 4953 25 = 4955
06 and 07	Storage word X Y Y Y ABBBBBBBBBBB A binary number indicating the number of 16K units of outer storage installed A=0 No address translator A=1 Address translator installed 3=16K of inner storage installed 7=32K of inner storage installed B=48K of inner storage installed F=64K of inner storage installed

NOTES

1. Storage word = F803 indicates 112K of total storage installed.
2. If BBBBBBBBBBBB is greater than 0, then A must equal 1 and address translator feature must be installed.
3. Inner storage can be addressed only by the storage address register.
4. Outer storage can be addressed only by the address translator feature.

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

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

3.19.3.2 Entries 01-XX (Device Entries)

<u>Byte</u>	<u>Definition</u>
00	Device address
01	Device type
02	Flag byte Bit 0 Used by DCP (in storage). Always 0 on disk. Bit 1=1 Indicates this entry chained to next entry. Bit 2=1 Indicates last entry in configurator table. Bit 3=1 Indicates last entry in this sector Bit 4 through 6 Reserved Bit 7 Last available entry in configurator table.

NOTES

1. Ignore bits 2, 3, and 7 when making adds or changes. The configurator program will set/reset them at sort time.
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.

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

3101 Communication Attachment Board

DA 81 00 00 00 00 00 00 00 00 00 00 00 00 00 2X 36

DA E6 00 00 00 00 00 00 00 00 00 00 00 00 00 3X 36

DA E8 00 00 00 00 00 00 00 00 00 00 00 00 00 10 0E

DA E9 00 00 00 00 00 00 00 00 00 00 00 00 00 2X 0E

DA EA 00 00 00 00 00 00 00 00 00 00 00 00 00 2X 16

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).

3.20 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.

3.20.1 Single Character Commands (No Data).

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

NOTE

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

<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 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.

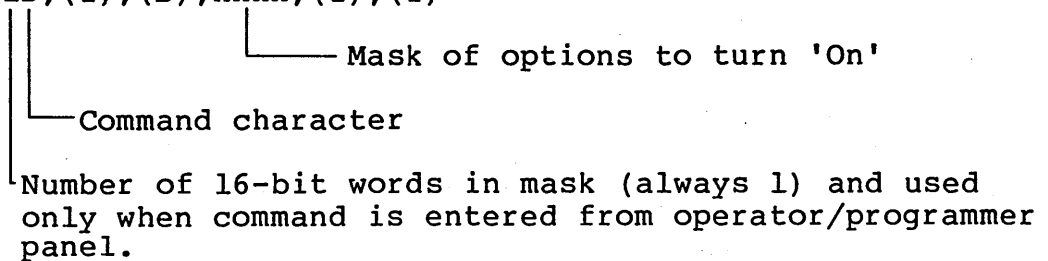
3.20.2 Commands that use a Program ID (Commands B and C).

These commands load a program. The program ID (XXXX) must be entered with one of the following commands:

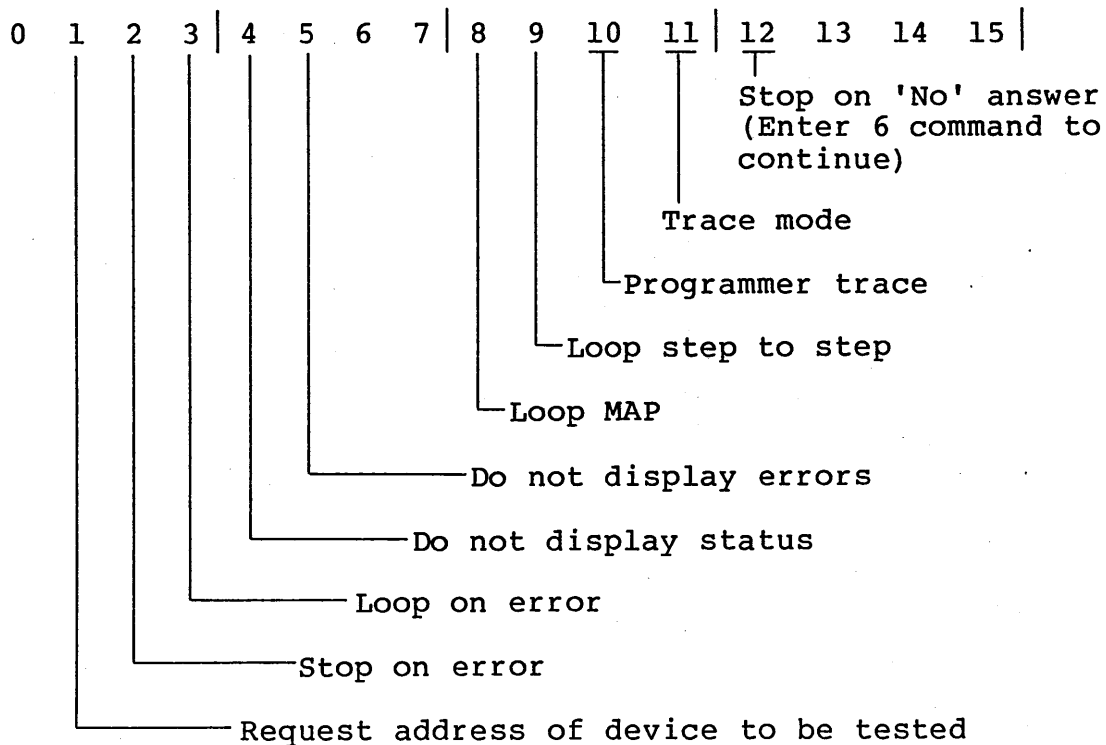
<u>Command</u>	<u>Key Sequence</u>	<u>Result</u>
B	(B), B, (I), (B), XXXX, (I), (I)	Program XXXX loads and goes
C	(B), C, (I), (B), XXXX, (I), (I)	Program XXXX loads and waits for option selection command 'D'.

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

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



Option bits are as follows:



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

3.20.4 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.

3.21 COMMON HALT LIST

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

3.21.1 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.

3.21.2 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.
- 3824 Select console.
00 = 3101 Display
01 = 7485 Model 53 Display
02 = 7485 Model 63 Display
03 = 4975 Model 01 Line Printer
04 = 4975 Model 02 Line Printer
- 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.
- 3828 Device Address or Type incorrectly entered. Enter correct parameter.
- 3829 No Device. Program did not find device entered. Make entry again. Enter the correct device address.
- 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 = Change
 04 = Alternate console*
 05 = Terminate
 06 = Processing unit 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 = Combine
 (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)

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

**CDC SMDs and MMDs must be powered on.

- 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)
- 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 - Cannot 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)
- 3839 Device Address of other equipment manufacture attachment card. Configuration program found other equipment manufacture attachment card installed. Enter the device address.
- 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.
- 386B Tape drive device address 00 = NRZ1, 01 = Dual FF = PE.
- 386C Multifunction attachment installed. See MAP 13.

3.21.3 MAP Diagnostic Integration (MDI) Halts

3C01 Enter address of device to be tested.

- From operator/programmer panel:
(B),1F,(I),(B),XX00,(I),(I)
- From alternate console: FXX

3C05 Enter starting step number for loop

- From operator/programmer panel:
(B),1F,(I),(B),XXXX,(I),(I)
- From alternate console: FXXXX

3C06 Enter ending step number for loop

- Same procedure as halt 3C05

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

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

3.22 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 as shown in the following format example:

```

      ABORT TEST
TEST  EXIT  DEV   CC     ISB   STEP
42A2  309E  0024  0703  0024  0001  4040  4040
DCB0  DCB1  DCB2  DCB3  DCB4  DCB5  DCB6  DCB7
0000  0000  0000  0000  0000  0000  0000  3694
CSS0  CSS1  CSS2  CSS3  CSS4  CSS5  CSS6  CSS7
36E3  0000  0000  0000  0000  0000  0000  0000
I3C00  MAP=4220  STEP=0001

```

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 = Device control block bytes.

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).

NOTE

If diagnostics end abnormally with no message or a meaningless abort message, retry the auto tests. If the problem persists, replace attachment card, I/O cables, Bus In (A2A04) and Bus Out (A2A03) cards one at a time until problem is corrected. Verify switch and jumper placement per attachment card installation procedure, section 2 of this manual

If using the Series/1 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.

Press Main Storage switch. Contents of memory address displays in LED indicators.




This section contains spare parts lists for the various configurations of the mini module drive, its attachment card and spare parts lists for the optional FDDs and their attachment cards.

NOTE

The spare parts lists apply to the following equipment numbers as indicated:

<u>Equipment No.</u>	<u>SPL No.</u>
BG702-A/G	66308076
BG702-B/L	66308075
BG702-D/H	66309080
BG702-F/M	66309082
BR812-A	66304591
BR812-B	66304592
FA740-C	66310646
FA741-A	66308078
BG702-C/BG702-J	66308074
BG703-A	22245485
BG703-B	22245484

DWN	R. Trautman	2-79	 CONTROL DATA CORPORATION	TITLE	SPARE PARTS LIST MMD	PREFIX	DOCUMENT NO.	REV.
CHKD	R. Trautman	10-11-79		FIRST USED ON	BG702A/BG702G	SPL	66308076	J
ENG	R. Trautman	10-11-79		CODE IDENT	52810	SHEET 1 of 3		
MFG	R. Trautman	10-11-79						
APPR	S. H. Rose	10-22-79						

SHEET REVISION STATUS										REVISION RECORD					
3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP							
A	A	A	A	13471-40	RELEASED CLASS "A"	/	10-24-79	JH							
B	B	B	B	13828	REVISED PER ECO	WJG	12-5-79	JH							
B	B	B	B	10117-74	TRANSFER TO PSG	/	11/1/79	JH							
C	B	C	C	1175	ADD FN 26	DyH	7-31-80	DyH							
D	D	D	D	01198	REVISED PER ECO	CAK	9-15-80	JH							
D	E	E	E	01056	REVISED PER ECO	CAK	10/19/80	CF							
D	F	F	F	1178	REVISED PER ECO	CAK	12-10-80	CF							
D	G	G	G	01314	UPDATE 3,18,19	CAK	2-17-81	JH							
D	H	H	H	01399	UPDATE F/N 3	CAK	9-24-81	JH							
D	J	J	J	01242	UPDATE F/N 9	11B	3-2-82	JH							

NOTES

EQUIPMENT CONFIGURATOR -----15631729/15632193

TOP LEVEL ASSEMBLY -----15631779/15632194

DETACHED LISTS


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CONTROL DATA			CODE IDENT	SHEET	DOCUMENT NO.	REV.
			52810	2 of 3	66308076	J
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL	
1	92314129	1		Drive Belt		
2	61408488	1		Motor Brake Assy		
3	82397104	1		Module Assy		
4	92009300	1		Brake Mag Friction		
5	61408457	1		Harness Assy		
6						
7	22245230	1		Power Supply Assy Modified		
8	61408181	1		Switch Box Assy		
9	22245584	1		Logic Chassis Assy		
10	90446056	1		BD Assy 9ABD		
11	90446059	1		BD Assy 9ACD		
12	90446062	1		BD Assy 9ADD		
13	90446065	1		BD Assy 9AED		
14	90446068	1		BD Assy 9AFD		
15	54286502	1		BD Power AMP CZSV		
16	76935102	1		BD Write PLO BFFX		
17	76734705	1		BD Read PLO EFEX		
18	76935523	1		BD Fault WFGX		
19	76962323	1		BD MPU YJGX		
20	76971905	1		BD Servo EKBX		

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DWN	R. Trautman	2-79	 CONTROL DATA CORPORATION CODE IDENT 52810	TITLE	SPARE PARTS LIST MMD	PREFIX	DOCUMENT NO.	REV.	
CHKD	E. Trautman	10-11-79		FIRST USED ON	8G702B / 8G702L	SPL	66308075	J	
ENG	J. J. Dineen	5-22-79		SHEET 1 of 3					
MFG	J. J. Dineen	10-16-79							
APPR	S. N. Howard	10-22-79							

SHEET REVISION STATUS				REVISION RECORD						
3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP		
	A	A	A	13471-44	RELEASED CLASS 'A'	/	10/20/79	McK		
	B	B	B	13828	REVISED PER ECO	WJG 12-7-79	12/7/79	McK		
	B	B	B	10117-69	TRANSFER TO PSG	/	11/1/79	McK		
	C	B	C	1175	ADD FN 26	OgH	7-31-80	OgH		
	D	D	D	01198	REVISED PER ECO	/	9-15-80	OgH		
	D	E	E	01056	REVISED PER ECO	CK	10/4/80	CF		
	D	F	F	01178	REVISED PER ECO	CK	12-10-80	CF		
	D	G	G	0314	UPDATE 3,18,19	CAY	2-17-81	McK		
	D	H	H	01399	UPDATE F/N 3	CHK	9-24-81	McK		
	D	J	J	01342	UPDATE F/N 9	HB	3-2-82	McK		

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NOTES
EQUIPMENT CONFIGURATOR -----15631731 /15632201
TOP LEVEL ASSEMBLY -----15631781 /15632202

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CONTROL DATA		CODE IDENT	SHEET	SPL	DOCUMENT NO	REV		
		52810	2 of 3		66308075	J		
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED				UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
1	92314129	1					Drive Belt	
2	61408488	1					Motor Brake Assy	
3	82397106	1					Module Assy	
4	92009300	1					Brake Mag Friction	
5	61408457	1					Harness Assy	
6								
7	22245230	1					Power Supply Assy Modified	
8	61408181	1					Switch Box Assy	
9	22245584	1					Logic Chassis Assy	
10	90446056	1					BD Assy 9ABD	
11	90446059	1					BD Assy 9ACD	
12	90446062	1					BD Assy 9ADD	
13	90446065	1					BD Assy 9AED	
14	90446068	1					BD Assy 9AFD	
15	54286502	1					BD Power AMP CZSV	
16	76935102	1					BD Write PLO BFFX	
17	76934705	1					BD Read PLO EFEX	
18	76935523	1					BD Fault WFGX	
19	76962323	1					BD MPU WJGX	
20	76971905	1					BD Servo EKBX	

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DWN	R. Trautman	10/77	CONTROL DATA	TITLE	PREFIX	DOCUMENT NO.	REV.
CHKD	R. Trautman	10-18-77		SPARE PARTS LIST MMD	SPL	66309080	H
ENG	S. H. H. H.	10-18-77		FIRST USED ON			
MFG	S. H. H. H.	10-18-77	CODE IDENT	52810			
APPR	S. H. H. H.	10-18-77		BG702D/BG702H		SHEET	1 OF 3

SHEET REVISION STATUS										REVISION RECORD				
3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP						
			A	A	A	13471-44	RELEASED CLASS A	/	10/29/79	M. G.				
			B	B	B	13828	REVISED PER ECO	WJG	12-9-79	WJG				
			B	B	B	10117-69	TRANSFER TO PSA	/	12/11/79	M. G.				
			C	C	C	01222	REVISED PER ECO	/	9/25/80	D. H.				
			C	D	D	01246	REVISED PER ECO	/	10-29-80	D. H.				
			C	E	E	01178	REVISED PER ECO	CAK	12-10-80	CF				
			C	F	F	01314	UPDATE 3,18,19	CAK	2-17-81	P. M.				
			C	G	G	01399	UPDATE F/N 3	CAK	9-25-81	P. M.				
			C	H	H	01342	UPDATE F/N 9	HB	3-2-82	P. M.				

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NOTES:
 EQUIPMENT CONFIGURATOR ----- 15631732 /15632195
 TOP LEVEL ASSEMBLY ----- 15631782 /15632196

DETACHED LISTS

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CONTROL DATA			CODE IDENT	SHEET	SPL	DOCUMENT NO.	REV.
			52810	2		66309080	H
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	92314129	1		Drive Belt			
2	66307649	1		Motor Brake Assy			
3	82397104	1		Module Assy			
4	92009300	1		Brake Mag Friction			
5	61408457	1		Harness Assy			
6		1					
7	22245232	1		Power Supply Assy 120V			
8	61408181	1		Switch Box Assy			
9	22245584	1		Logic Chassis Assy			
10	90446056	1		BD Assy 9ABD			
11	90446059	1		BD Assy 9ACD			
12	90446062	1		BD Assy 9ADD			
13	90446065	1		BD Assy 9AED			
14	90446068	1		BD Assy 9AFD			
15	54266502	1		BD Power AMP CZSV			
16	76935102	1		BD Write PLO BFFX			
17	76934705	1		BD Read PLO EFEX			
18	76935523	1		BD Fault MFGX			
19	76962323	1		BD MPU XJ BX			
20	76971905	1		BD Servo EKBX			

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DWN	R. Trautman	10/75	CONTROL DATA	TITLE	PREFIX	DOCUMENT NO.	REV
CHKD	R. Trautman	10/75		SPARE PARTS LIST MMD	SPL	66309082	H
ENG	R. Trautman	10/75		FIRST USED ON			
MFG	R. Trautman	10-10-75		BG702F / BG702M	SHEET		1 OF 3
APPR	R. Trautman	10-22-77	CODE IDENT 52810				

SHEET REVISION STATUS										REVISION RECORD				
3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP						
			A	A	A	13971-99	RELEASED CLASS 'A'	/	10/29/79	Mch				
			B	B	B	13828	REVISED PER ECO	W. J. 12-6-79	12/6/79	W. J.				
			B	B	B	10117-09	TRANSFER TO PSG	/	12/11/79	Mch				
			C	C	C	01222	REVISED PER ECO	/	9/25/80					
			C	D	D	01246	REVISED PER ECO	/	10-29-80	W. J.				
			C	E	E	01178	REVISED PER ECO	CAL	12-10-80	CF				
			C	F	F	01314	UPDATE NO. 3,18,19	CAL	2-17-81	W. J.				
			C	G	G	01399	UPDATE FIN 3	PK	9-25-81	W. J.				
			C	H	H	01342	UPDATE FIN 9	HB	3-2-82	W. J.				

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NOTES:
EQUIPMENT CONFIGURATOR -----15631734 / 15632203
TOP LEVEL ASSEMBLY-----15631784 / 15632204

DETACHED LISTS

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CONTROL DATA			CODE IDENT	SHEET	SPL	DOCUMENT NO.	REV
			52810	2		66309082	H
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	92314129	1		Drive Belt			
2	66307649	1		Motor Brake Assy			
3	82397106	1		Module Assy			
4	92009300	1		Brake Mag Friction			
5	61408467	1		Harness Assy			
6							
7	22245232	1		Power Supply Assy 120V			
8	61408181	1		Switch Box Assy			
9	22245584	1		Logic Chassis Assy			
10	90446056	1		BD Assy 9ABD			
11	90446059	1		BD Assy 9ACD			
12	90446062	1		BD Assy 9ADD			
13	90446065	1		BD Assy 9AED			
14	90446068	1		BD Assy 9AFD			
15	54286502	1		BD Power AMP CZSV			
16	76935102	1		BD Write PLO BFFX			
17	76934705	1		BD Read PLO FFEX			
18	76935523	1		BD Fault WFGX			
19	76962323	1		BD MPU YJBX			
20	76971905	1		BD Servo EKBX			

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DWN	R. Trautman	1/1/79	CONTROL DATA	TITLE	FDD COMBO 208V	PREFIX	DOCUMENT NO.	REV.
CHKD	R. Trautman	10/30/79		FIRST USED ON	BR812A	SPL	66304591	A
ENG	R. Trautman	2/2/79						
MFG								
APPR	E. M. Hae	11-2-79	CODE IDENT				SHEET	1 OF 2
C.E.	P. L. Kewag	11-2-79	15920					

SHEET REVISION STATUS										REVISION RECORD				
2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP							
A	A	A	13471-49	RELEASED CLASS A	/	11/5/79	Meh							
A	A	A	10117-65	TRANSFER TO PSG	/	12/10/79	MED							

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NOTES:
EQUIPMENT CONFIGURATOR - 15632308
TOP LEVEL ASSY - 61408325

DETACHED LISTS

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CONTROL DATA			CODE IDENT	SHEET	SPL	DOCUMENT NO.	REV.
			15920	2		66304591	A
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	77618000	1		FDD Assy MPI			
2	61408154	1		Power Supply			
3	75293203	1		Belt - Drive			

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DWN	R. Trautman	10/27/79	CONTROL DATA	TITLE	MMD ATTACHMENT CARD - SPL	PREFIX	DOCUMENT NO.	REV
CHKD	R. Trautman	10-15-79		FIRST USED ON	FA740C	SPL	66310646	F
ENG	D. Hume	11-1-79		CODE IDENT	52810	SHEET 1 OF 3		
MFG	D. Hume	11-1-79						
APPR	D. Hume	11-2-79						
C.T.E.	D. Hume	11-2-79						

SHEET REVISION STATUS										REVISION RECORD				
3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP						
			00	00	50004-1	RELEASED CLASS B	/	11/15/79	TR					
			A	A	13471-48	RELEASED CLASS B	/	11/17/79	TR					
			A	A	10117-68	TRANSFER TO PSG	/	12/17/79	TR					
			B	B	1092	TLA was 66308612	DR	5-7-80	TR					
			C	C	01212	UPDATE PER ECO	CAF	4-13-8	TR					
			D	D	1567	PH 22242071 WAS 22245101	HB	8-24-80	TR					
			E	E	1591	FIN 3 WAS 71492620	HB	10-18-82	TR					
			F	F	1671	TLA WAS 22242071 ADD FIN 4	HB	4-15-83	TR					

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NOTES:
EQUIPMENT CONFIGURATOR ----- 15631325
TOP LEVEL ASSEMBLY ----- 2224261A

DETACHED LISTS

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CONTROL DATA			CODE IDENT	52810	SHEET	2	SPL	DOCUMENT NO.	66310646	REV.	F
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL						
1	2224261A	1		MMD Module W/Firmware v4.0							
2	22242486	REF		Frame and Tape Assy							
3	61408507	REF		Cable, I/O, 20 ft.	USE WITH BG702 DISK ONLY						
4	22205056	REF		CABLE I/O 20 ft. FCC	USE WITH BG703 DISK ONLY						

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CODE IDENT
52810

SHEET 3

SPL

DOCUMENT NO.
66310646


REV.
F

DESCRIPTION	EQUIPMENT USED ON	PART NUMBER	REPLACEMENT PART NUMBER	NOTES
MODULE ASSY W/FIRMWARE	FA740C			
	S/C C01-C03	22245101	22242618	BG702 MMD only
	S/C C04	22242091	22242618	BG702 MMD only
	S/C C05	22242618	22242618	BG702 OR BG703 MMD

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DWN	R. Trautman	2-75	 CONTROL DATA CORPORATION	TITLE	SPARE PARTS LIST MMD	PREFIX	DOCUMENT NO.	REV.
CHKD	R. Trautman	10-11-79		FIRST USED ON	BG702C/BG702J	SPL	66308074	D
ENG	<i>[Signature]</i>	5-2-79		CODE IDENT	15920	SHEET 1 of 3		
MFG	<i>[Signature]</i>	10-11-79						
APPR	<i>[Signature]</i>	10-28-79						

SHEET REVISION STATUS				REVISION RECORD						
3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP		
			A	A	A	1347-44	RELEASED CLASS 'A'	10/27/79	Act	
			B	B	B	13828	REVISED PER ECO	12-7-79	WJG	
			B	B	B	1017-69	TRANSFERRED TO R55	12/1/79	WJG	
			C	B	C	01175	REVISED PER ECO	7/24/80	WJG	
			C	D	D	01056	REVISED PER ECO	10/1/80	VP	

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NOTES
 EQUIPMENT CONFIGURATOR ----- 15631730 / 15632197
 TOP LEVEL ASSEMBLY ----- 15631780 / 15632198

DETACHED LISTS

FIND NO.		PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
1	92314129	1			Drive Belt	
2	61408488	1			Motor Brake Assy	
3	73034602	1			Module Assy	
4	92009300	1			Brake Mag. Friction	
5	61480457	1			Harness Assy	
6						
7	61408445	1			Power Supply Assy	
8	61408181	1			Switch Box Assy	
9	61408453	1			Logic Chassis Assy	
10	90446056	1			BD Assy 9ABD	
11	90446059	1			BD Assy 9ACD	
12	90446062	1			BD Assy 9ADD	
13	90446065	1			BD Assy 9AED	
14	90446068	1			BD Assy 9AFD	
15	54286502	1			BD Power AMP CZSV	
16	76935102	1			BD Write PLO BFFX	
17	76934705	1			BD Read PLC EFEX	
18	76935518	1			BD Fault TFGX	
19	76962309	1			BD MPU JJBX	
20	76971905	1			BD Servo EKBX	

DWN CHKD ENG MFG APPR ORIG	H.B. DICKER 9-11-87 HILGERT 2-21-83 C. LATA 2-21-83 A.M. J. 4-5-83 [Signature]	CONTROL DATA CORPORATION	TITLE SPARE PARTS LIST MMD	PREFIX SPL	DOCUMENT NO. 22245485	REV. A	
CODE IDENT 52810		FIRST USED ON BG703A		SHEET 1 OF 3			
SHEET REVISION STATUS				REVISION RECORD			
				3 2 1 REV ECO	DESCRIPTION	DRFT DATE APP	
				01 01 01 01 --	RELEASE CLASS B	HB 2-21-83	✓
				DI 08 02 02 313E	EC WAS 22245465 FIN 5 WAS 2-10-85	HB 3-24-85	✓
				A A A A 1000-233	RELEASE CLASS A	HB 4-5-83	✓
NOTES: EQUIPMENT CONFIGURATOR ----- 22245471 TOP LEVEL ASSEMBLY ----- 22245471							
						DETACHED LISTS	

CONTROL DATA CORPORATION		CODE IDENT 52810	SHEET 2 of 3	SPL	DOCUMENT NO. 22245485	REV. A
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED		UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
1	92314129	1			Drive Belt	
2	61408488	1			Motor Brake Assy	
3	82397201	1			Module Assy	
4	92009300	1			Brake Mag Friction	
5	22205061	1			Harness Assy	
6						
7	22245230	1			Power Supply Assy Modified	
8	61408181	1			Switch Box Assy	
9	22245584	1			Logic Chassis Assy	
10	90446056	1			BD Assy 9ABD	
11	90446059	1			BD Assy 9ACD	
12	90446062	1			BD Assy 9ADD	
13	90446065	1			BD Assy 9AED	
14	90446068	1			BD Assy 9AFD	
15	54286502	1			BD Power AMP CZSV	
16	76935102	1			BD Write PLO BFFX	
17	76734705	1			BD Read PLO EFEX	

CONTROL DATA CORPORATION		CODE IDENT	SHEET 3 of 3				SPL	DOCUMENT NO.	REV.	
		52810						22245485	A	
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED						UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
18	76935524	1							BD Fault XFGX	
19	76962329	1							BD MPU AEJBX	
20	76971915	1							BD Servo QKBX	
21	70117607	1							PWR Selector Assy	
22	54086107	1							BD Read Anal. HNRN	
23	54085714	1							BD Write SEL RNQN	
24	54086502	1							BD Digit RD CNSN	
25	94861405	1							Fan, Cooling	
26	47361400	1							BKT MOTOR PIVOT	

DWN	JEKATONIA	2-11-83	CONTROL DATA CORPORATION	TITLE SPARE PARTS LIST MMD		PREFIX SPL	DOCUMENT NO. 22245484	REV. A					
CHKD	JEKATONIA	2-21-83		FIRST USED ON B6703B		SHEET 1 OF 3							
ENG	A. LATTI	2-21-83		CODE IDENT 52810									
MFG	A. M. & H.	4-5-83											
APPR	J.S. F.	4-5-83											
ORIG													
SHEET REVISION STATUS				REVISION RECORD									
					3	2	1	REV	ECO	DESCRIPTION	DRFT	DATE	APP
					01	01	01	01		RELEASE CLASS B	HB	2-21-83	X
					01	02	02	02	5132	222455232 THIS WAS 61408457	HB	4-5-83	X
					A	A	A	A	100-533	222455232 THIS WAS 61408457	HB	4-5-83	X
NOTES:													
EQUIPMENT CONFIGURATOR ----- 22245490													
TOP LEVEL ASSEMBLY ----- 22245470													
												DETACHED LISTS	

CONTROL DATA CORPORATION			CODE IDENT 52810	SHEET 2 of 3	SPL	DOCUMENT NO. 22245484	REV. A
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED			UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
1	92314129	1				Drive Belt	
2	66307649	1				Motor Brake Assy	
3	82397201	1				Module Assy	
4	92009300	1				Brake Mag Friction	
5	22205061	1				Harness Assy	
6							
7	22245232	1				Power Supply Assy 120V	
8	61408181	1				Switch Box Assy	
9	22245584	1				Logic Chassis Assy	
10	90446056	1				BD Assy 9ABD	
11	90446059	1				BD Assy 9ACD	
12	90446062	1				BD Assy 9ADD	
13	90446065	1				BD Assy 9AED	
14	90446068	1				BD Assy 9AFD	
15	54286502	1				BD Power AMP CZSV	
16	76935102	1				BD Write PLO BFFX	
17	76934705	1				BD Read PLO EFEX	

CONTROL DATA CORPORATION		CODE IDENT		SHEET 3 of 3		DOCUMENT NO.		REV.
		52810				22245484		A
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED				UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
18	76935524	1					BD Fault XFGX	
19	76962329	1					BD MPU AEJBX	
20	76971915	1					BD Servo QKBX	
21	70117600	1					PWR Selector Assy	
22	54086107	1					BD Read Anal. HNRN	
23	54085714	1					BD Write SEL RNQN	
24	54086502	1					BD Digit RD CNSN	
25	94861405	1					Fan, Cooling	
26	47361400	1					BKT MOTOR PIVOT	

This appendix contains troubleshooting information for the mini module drive. A Structured Analysis Method (SAM) format is used to document the diagnostic tests and associated paper-only maintenance activities for the MMD. SAM listings numbered 7200 through 7261 cover the MMD diagnostic tests residing on the CDC BASIC diagnostic diskette. MMD utilities on the diagnostic diskette are documented by SAMs 72F1 through 72F3. SAMs 7270 and up are paper-only listings that provide supplemental maintenance troubleshooting information. The numbering scheme used for identification of the SAMs is summarized as follows:

SAM XXYZ-x

Where: XX = 72 indicates a mini module drive SAM

Y = 0-6 indicates a diagnostic based SAM

Y = 7-9 indicates a paper-only SAM

Y = A-E is not used

Y = F indicates a utility procedure which is not a diagnostic

Z = used for sequencing each SAM

x = used for sequencing individual pages within each SAM

Examples: SAM 7200-1 is the first page of a MMD diagnostic based SAM. The number 7200 reflects the actual diagnostic test number. SAM 7270-1 is the first page of a paper-only SAM, etc.

This appendix also contains an explanation of the SAM format, a description of the MMD diagnostic tests and utilities, and cycle steal status words. Information is organized as follows:

- Explanation of SAM format -- Describes the format and method of reading the SAMs.
- Diagnostic Test Descriptions -- Describes briefly each of the MMD diagnostic tests and utilities contained on the CDC BASIC diagnostic diskette.
- Cycle Steal Status Words -- Describes the significance of each cycle steal status word.
- SAM Listings -- A tabulation of SAMs covering the diagnostic tests, utilities, and paper-only troubleshooting information.

EXPLANATION OF SAM FORMAT

A SAM listing is a specialized format used to document the flow of a diagnostic program and to present troubleshooting information in a logical manner. Each SAM provides a sequential listing of statements and/or questions that can be answered with a yes or no response. The response made to a particular question leads the user to either the next question to be answered, or to a specific action (or numerical sequence of actions) to be taken for maintenance purposes.

Two versions of the same basic format are used, one that depicts diagnostic program flow (figure A-1) and the other that lists troubleshooting information independent of a diagnostic program. The second version is referred to as a paper-only SAM and is shown in figure A-2. Any applicable assumptions or advisory information is provided in the header information of the SAM.

To read a SAM, start at the top of the page and determine the response for the question posed or condition being tested. Then follow down the dotted line beneath the appropriate Y or N response. Answer the next question, etc. until the action numbers are reached. Perform the action(s) listed in that column in numerical order to correct the problem.

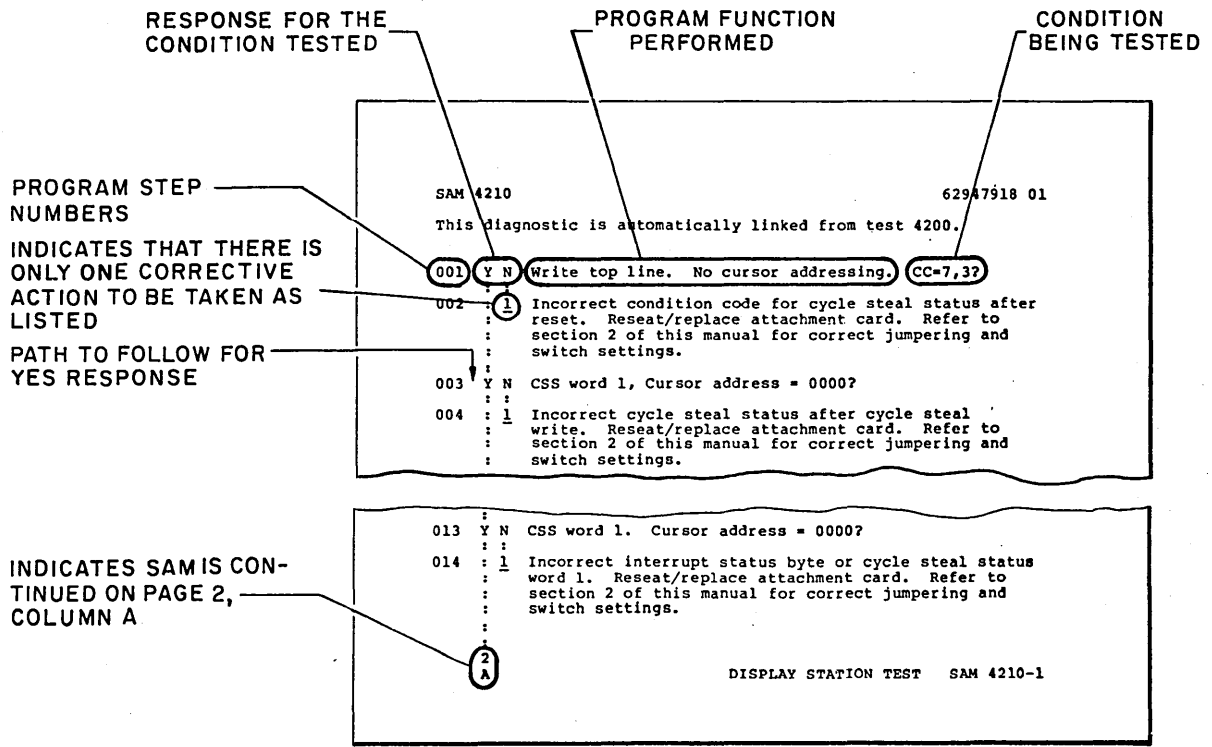


Figure A-1. Diagnostic Program SAM Example

When an error is detected by a diagnostic test, the failing program step number is identified. The corrective action to be taken is then determined by simply going directly to that step number of the appropriate SAM and performing the action(s) shown. All program steps preceding the failing step number have executed successfully.

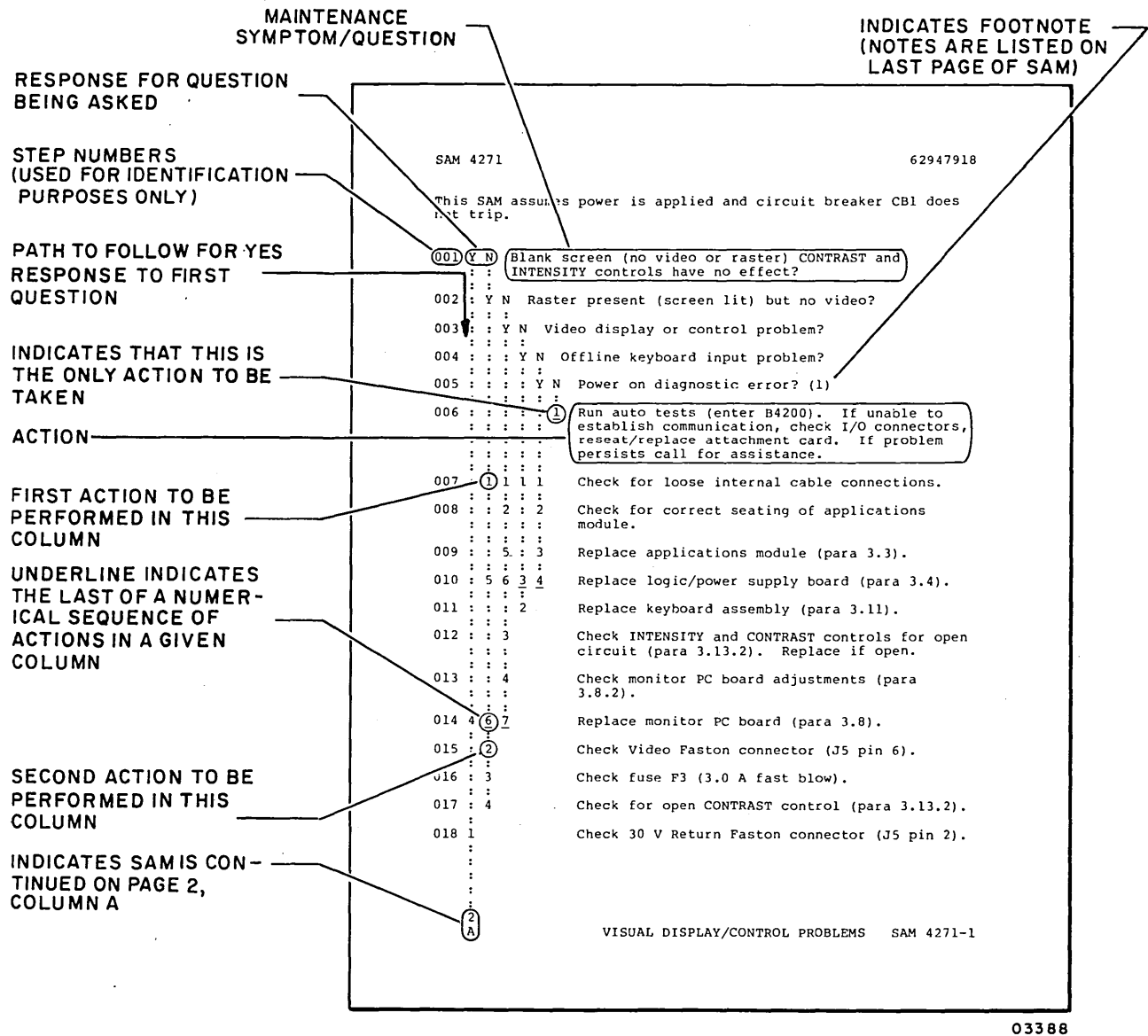


Figure A-2. Paper-Only SAM Example

MMD DIAGNOSTIC TEST DESCRIPTIONS

The following paragraphs provide a brief description of the MMD diagnostic tests residing on the CDC BASIC diagnostic 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, including utilities, require a separate entry for each test to be executed.

NOTE

Tests are initiated by entering a B or a C followed by the appropriate test number. Refer to the heading Diagnostic Checkout in section 2 of this manual for test initiation procedure.

AUTO TESTS

7200 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 7201.

7201 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 7220 is automatically executed to define the problem in greater detail. This test is automatically linked to test 7202.

7202 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 7203.

7203 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 7206.

7206 Wrap and RAM Test

This test consists of downline diagnostics that:

- Execute a wrap test from the attachment card to the MMD interface. This test verifies the correct operation of the bus and taglines 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 7207.

7207 Write/Read Sector ID, and Data 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 7208.

7208 Write/Read Data, and ID Skewed Test

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 7209.

7209 Diagnostic Read, Compare, and ECC Test

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 7210.

7210 Servo Test and RTZ

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

the following commands.

- Zero (0) track seek
- Illegal maximum seek (value depends on MMD model)

The RTZ test verifies the proper sequence of signals for an RTZ command. This test is automatically linked to test 7213.

7213 Read Sector ID Test

This test determines the MMD model with a read ID command and establishes the correct test cylinders to be used. The test then performs a seek to the first 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 test is repeated for the second test cylinder. 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 7220 for additional error isolation.

This test automatically links to test 7214.

7214 Incremental Seek Test

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

- Determining the MMD model and maximum cylinder with a read ID.
- 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 7215.

7215 Seek Tests (All Seeks)

This test determines the MMD model and maximum cylinder with a read ID command. The test then performs forward and reverse seeks (all seeks) between cylinders and verifies the cylinder address by:

- Issuing maximum seek forward (cylinder address depends on MMD model) and verifying cylinder address.
- Issuing maximum seek reverse -1, maximum seek forward -2, maximum seek reverse -3, etc and verifying cylinder address after each seek until seek difference equals 0.
- Then RTZ is issued and the sequence continues in the opposite direction beginning with maximum seek forward -1 etc until seek difference equals 0.

This test automatically links to test 7216.

7216 Seek Tests (Random)

This test determines the MMD model and maximum cylinder with a read ID command. The test then performs an RTZ and issues 2,000 random seeks. The cylinder address is verified after each seek. The range of cylinder addresses depends on the MMD model.

This test completes the automatically linked tests.

ERROR ANALYSIS TESTS

7220 Error Analysis Routine for ISB = 80 Hexadecimal

This error analysis routine is executed when an abnormal condition is detected in test 7201 or 7213. Test 7220 executes a cycle steal status command to 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 SAM for additional troubleshooting suggestions.

MANUAL TESTS

Some of the following manual tests have the capability of manually testing the MMDs fixed heads. These tests will require the operator to specify which fixed head to access. To address a fixed head, the operator must first add 80_{16} to the fixed head number (00_{16} through $5F_{16}$). Examples of this conversion procedure are as follows:

- To select fixed head 01_{16} add 80_{16} specify head number 81_{16}
- To select fixed head 10_{16} add 80_{16} specify head number 90_{16}
- To select fixed head $5F_{16}$ add 80_{16} specify head number DF_{16}

The cylinder associated with a fixed head is cylinder 00.

For operator convenience, the conversion procedure explained earlier has been completed for the 96 addresses included in the following address conversion chart. Each upper row in the chart contains the fixed head numbers and in the lower rows, the associated head addresses, which are the ones to specify and gain access to the desired fixed head.

ADDRESS CONVERSION CHART

NOTE

80_{16} has been added already to the fixed head addresses in chart.

HEAD NO.	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
ADDRESS	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
HEAD NO.	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
ADDRESS	90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
HEAD NO.	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
ADDRESS	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
HEAD NO.	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
ADDRESS	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
HEAD NO.	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
ADDRESS	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
HEAD NO.	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
ADDRESS	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF



7221 First Seek Test

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.

7222 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.

7223 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.

*This test has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

7224 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

7225 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.

7226 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. Note that this test cannot be run unless a alternate console is the assigned console.

7227 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.

*This test has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

7228 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

7230 Write/Read Data Test

This test verifies the ability of the MMD 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 CE 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.

7235 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.

7240 Error Correction Code Test

This test verifies the ability of the MMD and attachment feature to correct data errors up to four bits in length. 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, it also verifies that it will not correct

*This test has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

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.

7245 Servo Adjustment Routine*

This utility allows the customer engineer to perform servo adjustments to the MMD 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.

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.

7250 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.

7260 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

*This test has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

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

7261 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.

7266 Display Cycle Steal Status Routine

This routine obtains cycle steal status of the last operation on the alternate console.

UTILITIES

72F1 Disk Data Integrity Routine*

This utility performs read verify operations on a disk of unknown data. The program verifies all primary and alternate sectors. When 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 Level 3 registers:

- R3 = Halt Code
- R4 = Cylinder
- R5 = Head
- R6 = Sector
- R7 = Error Count

*This text has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

Upon restarting the CPU, the program continues verifying the remaining sectors on the disk. The utility can be selected to read verify the entire disk 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. The test program also verifies data on any fixed heads.

72F2 Data Strobe and Track Offset Routine*

This utility allows reading data from the CE cylinder (depends on MMD model) using selectable 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 Level 3 registers:

- R4 = Cylinder
- R5 = Head
- R6 = Sector
- R7 = Error Count

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

72F3 MMD IPL Logic Test

This utility can be used to verify the IPL logic on the MMD attachment card. This test requires that the MMD be set up properly as an IPL source and that the correct source is selected via the Series/1 PRIMARY/ALTERNATE IPL source switch. At this time, diagnostic IPL capabilities exist only on the 740B or FA740C (LSI) attachment cards. Use of this utility to verify the IPL logic of an equipment FA740A (MSI) attachment card will result in a false error indication.

*This text has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

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 3.22 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 16 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.

CYCLE STEAL STATUS WORD 3 (Error Number)

The first byte of word 3 provides a hexadecimal number that identifies the Device Feature code. The codes are: 1F = 9.3 MB, 1E = 13.9 MB, 12 = 63.2 MB with 1.48 MB FH, 1A = 63.2 MB, and 19 = 126.4 MB.

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.

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 8 are used to return error information found by the downline diagnostics. The content of these words is determined by the particular diagnostic being executed.

Cycle steal status word 9 through 11 are used to present MMD microprocessor fault codes to the Series/1. A maximum of 6 1-byte error codes will be presented in words 9 through 11.

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 bits are reset.

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

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 recover 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, a condition code of 7 was satisfactorily 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	
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	

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

ERROR NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
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	
21	NOT USED	AT THIS TIME	
22	NOT USED	AT THIS TIME	

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

ERROR. NO. (HEXADECIMAL)	ISB VALUE	ISB TYPE	EXPLANATION
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 MMD interface is presenting all ones. This is an indication that MMD power may be off or a cable connection problem exists.
2B	80	Device status available	The MMD interface is presenting all zeroes. This is an indication that a cable connection or power problem exists.
2C	80	Device status available	The MMD interface is not sending the proper information. This is an indication that either a cable connection or power problem exists. Possible cable problem.
2D	80	Device status available	The feature ID presented by the MMD is not an allowable ID. Possible cable problem.
2E	80	Device status available	The MMD was not ready and not on cylinder during a power on reset sequence.
2F	80	Device status available	The MMD was not ready and on cylinder during a power on reset sequence.
30	80	Device status available	The MMD 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 MMD.

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 transfer from the attachment to the MMD.
33	NOT USED AT THIS TIME		
34	80	Device status available	The MMD interface is presenting all zeroes. This is an indication that a cable connection or power problem exists.
35	80	Device status available	The MMD 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 microprocessor board, Bus In/Bus Out boards of MMD. 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	80	Device status available	Unit not ready or hardware error fault present following seek.
3C	80	Device status available	Seek error.
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 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 MMD 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 MMD 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, drive the positioner beyond cylinder 0336 ₁₆ or 12E ₁₆ if this is a AA 9.3-megabyte or CA 13.9-megabyte device type.
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 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 to 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	Hardware error. Look at Cycle steal status Word 1 error definitions.
FE	80	Device status available	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 MMD 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.

NOTICE

Before executing diagnostic tests, read and understand the following:

- Diagnostic test execution assumes that correct voltages are present within the MMD and Series/1. Refer to the paper-only SAMs for troubleshooting power faults in the MMD. 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 or without message) or a meaningless abort message, check device address switch on attachment card for correct switch settings, reseal attachment card and rerun tests. If the problem persists, replace attachment card, I/O cables, Bus In (A2A04) and Bus Out (A2A03) cards one at a time until problem is corrected. Attachment card replacement requires setting switches to select MMD device address (refer to attachment card installation instructions, section 2 of this manual).
- Diagnostic test halts -- When the halt code is a diagnostic test number, the Level 3 registers contain the following:
 - R0 = Step number
 - R1 = Device address and type code (AATT)
 - R2 = Unit address (if used)
 - R3 = Pointer to starting address in memory containing additional information (following an error abort only).
- If the diagnostics run but the customers 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).
- Always rerun auto diagnostics (enter B7200) to verify correct operation after performing maintenance on the MMD.
- This manual contains diagnostic based SAMs covering the presently released MMD BASIC diagnostic tests only. These are:

7200	7210	7223	7240
7201	7213	7224	7245
7202	7214	7225	7250
7203	7215	7226	7260
7206	7216	7227	7261
7207	7220	7228	72F1
7208	7221	7230	72F2
7209	7222	7235	72F3

The auto tests 7200 through 7216 do not write on the disk. If a problem is suspected in this area run manual tests 7230, 7228, 7227, and 7240.

A
 1
 :
 017 Y N Invalid command (02). CC=3?
 :
 :
 018 : 1 Not initial CC=3 after invalid IDCB. Reseat/replace
 : attachment card. (1) Check I/O cable connections,
 : replace cards A2A03, A2A04, A2B02 (2), replace I/O
 : cables.
 :
 019 Y N Invalid command (04). CC=3?
 :
 :
 020 : 1 Not initial CC=3 after invalid IDCB. Reseat/replace
 : attachment card. (1) Check I/O cable connections,
 : replace cards A2A03, A2A04, A2B02 (2), replace I/O
 : cables.
 :
 021 Y N Invalid command (08). CC=3?
 :
 :
 022 : 1 Not initial CC=3 after invalid IDCB. Reseat/replace
 : attachment card. (1) Check I/O cable connections,
 : replace cards A2A03, A2A04, A2B02 (2), replace I/O
 : cables.
 :
 023 Y N Invalid command (10). CC=3?
 :
 :
 024 : 1 Not initial CC=3 after invalid IDCB. Reseat/replace
 : attachment card. (1) Check I/O cable connections,
 : replace cards A2A03, A2A04, A2B02 (2), replace I/O
 : cables.
 :
 025 Y N Invalid command (42). CC=3?
 :
 :
 026 : 1 Not initial CC=3 after invalid IDCB. Reseat/replace
 : attachment card. (1) Check I/O cable connections,
 : replace cards A2A03, A2A04, A2B02 (2), replace I/O
 : cables.
 :
 027 Y N Invalid command (80). CC=3?
 :
 :
 028 : 1 Not initial CC=3 after invalid IDCB. Reseat/replace
 : attachment card. (1) Check I/O cable connections,
 : replace cards A2A03, A2A04, A2B02 (2), replace I/O
 : cables.
 :
 029 Y N Device reset command (6F) CC=7?
 :
 :
 030 : Y N CC=0?
 :
 :
 031 : : 1 Invalid CC after device reset command. Reseat/
 : : replace attachment card. (1) Rerun test.
 : :
 : :
 : :
 3 3
 A B

```

A B
2 2
:
:
032 : 1 CC=0 after device reset command. Reseat/replace
: attachment card. (1) Rerun test.
:
:
033 Y N Prepare command (60), I bit on. CC=7?
:
:
034 : Y N CC=5?
:
:
035 : : Y N CC=0?
:
:
036 : : : 1 Invalid CC after prepare command. Reseat/
: : : replace attachment card. Rerun test.
:
:
037 : 1 : CC=5 after prepare command. Reseat/replace
: : attachment card. (1)
:
:
038 : 1 CC=0 after prepare command. Reseat/replace
: attachment card. (1) Rerun test.
:
:
039 1 Branch to test 7201 (SAM 7201).

```

-
- (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 MMD interface logic and I/O connections.

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

- (2) Refer to Setting Sector Select Switches, section 2 of this manual for correct switch settings of A2B02.



A

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1
:
018 Y N Check cycle steal status words 1, 2, and 3. Result =
: : 0000?
:
019 : Y N Result not equal 0001?
:
020 : : 1 Cycle steal status word 1 is not zero. Reseat/
: : replace attachment card/cables. (1) Replace A2A04,
: : A2A03. If error persists, go to SAM 7282.
:
021 : Y N Result not equal 0002?
:
022 : : 1 Cycle steal status word 2 is not zero. Reseat/
: : replace attachment card/cables. (1) Replace A2A04,
: : A2A03. If error persists, go to SAM 7282.
:
023 : Y N Result not equal 0004?
:
024 : : 1 Cycle steal status word 3 is not 0042. Reseat/
: : replace attachment card/cables. (1) Replace A2A04,
: : A2A03. If error persists, go to SAM 7282.
:
025 : 1 Invalid error. Rerun auto tests. If error persists,
: : call for assistance.
:
026 1 Branch to test 7202 (SAM 7202).
:
030 Y N (From step 017). CC=0702?
:
031 : 1 CC not equal to 0703 or 0702 after cycle steal status.
: : Rerun auto tests. If error persists, go to SAM 7282.
:
032 Y N Result = 0001?
:
033 : 1 Cycle steal status CC=0702?, word 1, bit 15 off (not
: : ready or power off = 0). Rerun auto tests. If error
: : persists, go to SAM 7282.
:
034 1 Cycle steal status CC=0702, word 1, bit 15 on (not ready
: : or power off = 1). Rerun auto tests. If error per-
: : sists, go to SAM 7282.

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


```

A B
1 1
:
:
013 : Y N Did DS1 equal On Cylinder and Ready after disk reset
: : : command?
: : :
: : 1 Go to step 023.
: :
014 : Y N Did DS2 equal Start, Up to Speed, Heads Loaded, and
: : : Fine mode?
: : :
: : 1 Go to step 022.
: :
015 : Y N Did DS3 equal zero after disk reset command?
: : :
: : 1 Go to step 021.
: :
016 : Y N Did ECC Register 0 equal zero after disk reset
: : : command?
: : :
: : 1 Go to step 020.
: :
017 : Y N Did maskable interrupt register equal zero after
: : : disk reset command?
: : :
018 : 1 : Illogical error. Rerun test. If error persists,
: : : rerun CPU tests (press Load switch on Series/1).
: : :
019 : 1 Replace logic card A2A04.
:
020 : (From step 016). ECC Register 0 not equal to zero
: : after disk reset command. Replace logic cards A2B04,
: : A03, A04.
:
021 : (From step 015). DS3 not equal to zero after disk
: : reset command. Replace logic cards A2B04, B02, (2)
: : C04, A04, A01, A03.
:
022 : (From step 014). DS2 not equal to Start, Up to Speed,
: : Heads Loaded, and Fine mode. Replace logic card(s)
: : A2B04, C04, B02, (2) B01, (3) A04, A01, A03.
:
023 : (From step 013). DS1 not equal to On Cylinder and
: : Ready after disk reset command. Replace logic card(s)
: : A2B04, B02, (2) C04, B01, (3) A04, A01, A03.
:
024 : (From step 012). Read status not equal to zero after
: : disk reset command. Replace logic card A2A01, A04,
: : A03, B04.
:
025 : (From step 011). State register not equal to zero
: : after disk reset command. Replace logic card A2A01,
: : A04, A03, B04.

```

3

A

```

A
2
:
026 : (From step 010). Maskable interrupt register not equal
: to zero after disk reset command. Replace logic card
: A2A04, A03, B04, A01.
:
027 : (From step 009). Gap counter not equal to zero after
: disk reset command. Replace logic card A2A01, A2A03.
:
028 : (From step 008). Tri-state bus not equal to all ones
: after disk reset command. Replace logic card(s) A2A04,
: A2A01, A2B04, A2A03.
:
029 : (From step 007). Bus In not equal to zero after disk
: reset command. Replace logic card A2A01, A2A03.
:
030 : (From step 006). Wrap test using 873F failed. Replace
: logic card(s) A2A04, A2A03 and check I/O cables.
:
031 : (From step 005). Wrap test using 8700 failed. Replace
: logic card(s) A2A04, A2A03, replace attachment card (1),
: replace I/O cables.
:
032 : (From step 004). Test result not equal to 07028000.
: Unexpected status condition. Rerun test, if error per-
: sists, replace attachment card. (1)
:
033 Y N Run second downline. CC=0703?
:
034 : Y N CC=0702?
:
035 : : 1 Illogical error. Rerun test. If error persists,
: : rerun CPU tests (press Load switch on Series/1).
:
036 : Y N Did both Index and Sector reset after a disk reset
: : command?
: :
: : 1 Go to step 050.
:
037 : Y N Did Index set in time?
: :
: : 1 Go to step 049.
:
038 : Y N Did Index go low after detection?
: :
: : 1 Go to step 048.
:
039 : Y N Did Sector set in time?
: :
: : 1 Go to step 047.
:
:
:
4 4

```

```

A B
3 3
:
:
040 : Y N Did Sector go low after detection?
: :
: : 1 Go to step 046.
: :
041 : Y N Did Index raise after 59 sectors?
: :
: : 1 Go to step 045.
: :
042 : Y N Is the error intermittent?
: :
043 : : 1 Illogical error. Rerun CPU tests (press Load
: : switch on Series/1).
: :
044 : 1 Replace logic card(s) A2A04, A2A02, A2B02. (2)
:
045 : (From step 041). Index not present after 59 sectors.
: Verify switch settings on A2B02 (2), if correct, replace
: logic card. Loop step 033 to step 050 to scope.
:
046 : (From step 040). Sector did not go low after detec-
: tion. Replace logic card(s) A2A04, A2A02, A2B02. (2)
:
047 : (From step 039). Sector did not set in time. Verify
: switch settings on A2B02 (2), if correct replace logic
: card(s) A2A04, A02, B02, (2) B01, (3) C03.
:
048 : (From step 038). Index did not go low after detection.
: Replace logic card(s) A04, A02, B02. (2)
:
049 : (From step 037). Index did not set in time. Replace
: logic card(s) A2A04, A02, B02 (2), B01, (3) C03.
:
050 : (From step 036). Both Index and Sector did not reset
: after a disk reset command. Check Bus In/Bus Out cables
: replace attachment card. (1) Replace logic card(s)
: A2A04, A2A02, A2B02. (2) Replace I/O cables.
:
051 Y N Diagnostic read of REG 8701. CC=0703?
: :
052 : 1 Diagnostic read of REG 8701 failed. Restart at
: T7200. If error reoccurs replace MMD attachment
: card. (1)
:
053 Y N REG 8701=1F?
: :
054 : Y N REG 8701=1E?
: :
055 : : Y N REG 8701=1A?
: :
056 : : : Y N REG 8701=12?
: :
5 5 5 5 5
A B C D E ATTACHMENT/DISK INTERFACE TEST (CONTD) SAM 7202-4

```

A B C D E
4 4 4 4 4
: : : : :
057 : : : : Y N REG = 19?
:
058 : : : : : 1 Attachment/Disk interface test ran OK. Branch
to test 7203 (SAM 7203). 6294 7905 H

-
- (1) The attachment card contains switches to select MMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).
 - (2) Refer to Setting Sector Switches, section 2 of this manual for correct switch settings of A2B02.
 - (3) Check/adjust A2B01 per para 3.15.




```

A B
2 2
: :
036 : 1 DCB specification check not in ISB.  Replace MMD
      : attachment card.  (1)
      :
037 Y N Odd data address in read sector DCB parameter.
      : : CC=0702 and ISB bit 3 on?
      : :
038 : 1 DCB specification check not in ISB.  Replace MMD
      : attachment card.  (1)
      :
039 Y N Wrong byte count in read sector DCB parameter.
      : : CC=0702 and ISB bit 3 on?
      : :
040 : 1 DCB specification check not in ISB.  Replace MMD
      : attachment card.  (1)
      :
041 Y N Start cycle steal status command (7F).  CC=0703?
      : :
042 : 1 Possible pending device status outstanding.  Verify
      : device interface.  If correct, replace MMD attach-
      : ment card.  (1)
      :
043 Y N Start cycle steal status command (7F).  CC=0703?
      : :
044 : 1 Possible pending device status outstanding.  Verify
      : device interface.  If correct, replace MMD attach-
      : ment card.  (1)
      :
045 Y N Cycle steal status correct.
      : :
046 : Y N ISB bits 0 through 7 = 0?
      : :
047 : : 1 ISB bits 0 through 7 not zero.  Replace MMD
      : : attachment card.  (1)
      : :
048 : Y N Correct interrupt device address?
      : :
049 : : 1 Wrong interrupt device address.  Replace MMD
      : : attachment card.  (1)
      : :
050 : Y N Status word 1, bit 15 = 0?
      : :
051 : : 1 Not ready or power off status.  Replace MMD
      : : attachment card.  (1)
      : :
052 : Y N Status word 2 = 0?
      : :
053 : : 1 Status word 2 not zero.  Replace MMD attachment
      : : card.  (1)
      : :
      : :
      : :
4 4
A B

```

```

A B
3 3
:
:
054 : Y N Residual address OK?
:
:
055 : : 1 Residual address not correct. Replace MMD attach-
: : ment card. (1)
:
056 Y N Does REG 8701 agree with device ID?
:
:
057 : Y N Was an error encountered with read ID or read REG
: : : 8701?
:
:
058 : : 1 REG 8701 disagrees with read device ID. Replace MMD
: : attachment card. (1)
:
:
059 : 1 Unable to compare REG 8701 with device ID. Restart
: auto test at 7200. If same error, place MMD
: attachment card. (1).
:
060 Y N Do a cycle steal status. CC=0703?
:
:
061 : 1 Possible pending device status outstanding. Verify
: device interfacing, if correct replace MMD attachment
: card. (1)
:
:
062 Y N Is CSS W3 upper byte = 4016?
:
:
063 : 1 CSS word 3 invalid. Replace MMD attachment card. (1)
:
:
064 1 Branch to test 7206 (SAM 7206)

```

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

This test is automatically linked from test 7203.

- 001 Y N Did wrap test and diagnostic mode run correctly?
: :
002 : 1 Check Bus In and Bus Out cables. Check seating and/or
: replace A2A03, A2A04 cards. If this fails to fix
: problem, replace MMD attachment card. (1)
:
003 Y N Did Z80 RAM test (4080-43FF) run correctly?
: :
004 : 1 Replace MMD attachment card. (1)
:
005 Y N Did data buffer test (8800-8BFF) run correctly?
: :
006 : 1 Replace MMD attachment card. (1)
:
007 Y N Did ID compare/RAM test run correctly?
: :
008 : 1 Replace A2A03, A2A04 cards.
:
009 1 Branch to test 7207 (SAM 7207).

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



This test is automatically linked from test 7206.

001 Y N Did write sector ID test run OK?
: :
002 : 1 Replace A2A01, A2A02, A2A03 card(s).
: :
003 Y N Did read sector ID test run OK?
: :
004 : 1 Replace A2A01, A2A02, A2A03, A2B04 card(s).
: :
005 Y N Did sync check test run OK?
: :
006 : 1 Replace A2A01, A2A02, A2A03 card(s).
: :
007 1 Branch to test 7208 (SAM 7208).



This test is automatically linked from test 7207.

001 Y N Did write data test run OK?
: :
002 : 1 Replace A2A01, A2A02, A2A03 card(s).
: :
003 Y N Did read data test run OK?
: :
004 : 1 Replace A2A01, A2A02, A2A03 card(s).
: :
005 Y N Did write sector ID skewed test run OK?
: :
006 : 1 Replace A2A01, A2A02, A2A03 card(s).
: :
007 Y N Did read sector ID skewed test run OK?
: :
008 : 1 Replace A2A01, A2A02, A2A03 card(s).
: :
009 1 Branch to test 7209 (SAM 7209).



This test is automatically linked from test 7208.

001 Y N Did read diagnostic test run OK?
: :
002 : 1 Replace A2A03, A2A02, A2A01 card(s).
: :
003 Y N Did ECC test 1 run OK?
: :
004 : 1 Replace A2B04, A2A04 card(s).
: :
005 Y N Did ECC test 2 run OK?
: :
006 : 1 Replace A2B04, A2A04 card(s).
: :
007 Y N Did header compare test run OK?
: :
008 : 1 Replace A2A03, A2A02, A2A01 card(s).
: :
009 1 Branch to test 7210 (SAM 7210).



This test performs downline verification of the hardware during an offset recovery command and a controller RTZ seek.

- 001 Y N Issue offset downline test. CC=0703?
: :
002 : Y N CC=02?
: : :
003 : : 1 An illogical condition. Replace attachment card.
: : (1)
: :
004 : Y N Error code not equal 1?
: : :
005 : : 1 An offset command failed to cause On Cylinder
: : status to drop. Replace cards A2A01, A2A02,
: : A2B02/C02.
: :
006 : Y N Error code not equal 2?
: : :
007 : : 1 Seek End was not dropped in response to an offset
: : command. Replace cards A2A02, A2A04, A2B02/C02.
: :
008 : Y N Error code not equal 3?
: : :
009 : : 1 On Cylinder never came up following the offset
: : command. Replace cards A2A01, A2B02/C02.
: :
010 : Y N Error code not equal 4?
: : :
011 : : 1 Seek End never came up following the offset
: : command. Replace cards A2A01, A2A04, A2B02/C02.
: :
012 : Y N Error code not equal 5?
: : :
013 : : 1 Seek Error was up following offset command.
: : Replace cards A2B02/C02, A2C04.
: :
014 : 1 Illogical result. Replace attachment card. (1)
: :
015 Y N Issue RTZ downline test. CC=0703?
: :
016 : Y N CC=0702?
: : :
017 : : 1 Illogical result. Replace attachment card. (1)
: : :
018 : Y N Error code not equal 1?
: : :
019 : : 1 Disk not ready - turn drive power off and run T7221
: : (First Seek) test. If okay, retry T7210.
: :
: :
: :
2 2
A B

	A	B	
	1	1	
	:	:	
020	:	Y N	Error code not equal 2?
	:	:	
021	:	:	<u>1</u> On Cylinder failed to drop after RTZ command.
	:	:	Replace cards A2A01, A2A02, A2B02/C02.
	:	:	
022	:	Y N	Error code not equal 3?
	:	:	
023	:	:	<u>1</u> Seek End failed to drop after RTZ command. Replace
	:	:	cards A2A04, A2B02/C02, A2C04.
	:	:	
024	:	Y N	Error code not equal 4?
	:	:	
025	:	:	<u>1</u> Seek Error failed to drop after RTZ command.
	:	:	Replace cards A2A04, A2B02/C02, A2C04.
	:	:	
026	:	Y N	Error code not equal 5?
	:	:	
027	:	:	<u>1</u> Did not receive a Select Out signal after RTZ
	:	:	command. Replace cards A2B04, A2C04.
	:	:	
028	:	Y N	Error code not equal 6?
	:	:	
029	:	:	<u>1</u> Guard Band 1 was not detected during RTZ sequence.
	:	:	Replace cards A2B01/C01, A2B02/C02, A2C05.
	:	:	
030	:	Y N	Error code not equal 7?
	:	:	
031	:	:	<u>1</u> Did not receive a Select In signal during RTZ
	:	:	sequence. Replace cards A2B04, A2C04.
	:	:	
032	:	Y N	Error code not equal 8?
	:	:	
033	:	:	<u>1</u> Guard Band 1 was not detected during RTZ sequence.
	:	:	Replace cards A2B01/C01, A2B02/C02, A2C05.
	:	:	
034	:	Y N	Error code not equal 9?
	:	:	
035	:	:	<u>1</u> On Cylinder status never occurred during RTZ
	:	:	sequence. Replace cards A2A01, A2B01/C01,
	:	:	A2B02/C02.
036	:	<u>1</u>	Illogical status. Replace attachment card. (1)
	:	:	
037	:	<u>1</u>	Go to test 7213, no errors detected by 7210.

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

This test is automatically linked from test 7210.

```

001  Y N  Read device ID and register 8701.  Is result legal
      : :  for MMD?
      : :
002  : 1  The device ID is not valid.  Run tests 7200 through
      :   7203.  Replace attachment card (1) and A2A04 logic
      :   card.
      :
003  Y N  Read sector ID (0A) all heads.  Result = 0008?
      : :
      1 :  Go to step 029.
      :
004  Y N  Result bit 0 = off?
      : :
005  : 1  Read head XX unsafe status. (2)  Run test 7200.
      :
006  Y N  Result bit 1 = off?
      : :
007  : 1  Read head XX no record found status. (2)  Go to
      :   SAM 7282.
      :
008  Y N  Result bit 2 = off?
      : :
009  : 1  Sync check occurred on read sector ID command, and
      :   and attempt to read a skewed sector ID failed.  The
      :   cylinder, head, and logical sector in error will be
      :   displayed on the alternate console.  Tests T7224,
      :   T7225, T7260, and T7261 may isolate the problem.
      :
010  Y N  Result bit 3 = off?
      : :
011  : 1  Not ready or power off status.  Run test 7200.
      :
012  Y N  Result bit 4 = off?
      : :
013  : 1  A read sector ID error occurred.  The cylinder,
      :   head, and logical sector in error will be displayed
      :   on the alternate console.  Test T7224, T7225, T7260,
      :   and T7261 may isolate the problem.
      :
014  Y N  Result bit 5 = off?
      : :
015  : 1  Read head XX intermittent read sector ID compare
      :   errors. (2)  Run test 7250.
      :
016  Y N  Result bit 6 = off?
      : :
      : :
      : :
      2 2
      A B

```



```

A B
1 1
:
:
017 : 1 Read head XX solid read sector ID compare errors.
: Replace cards A2A04, A2B02/C02, A2C05, A4A2/B2 (2) (3)
: Run test 7250.
:
018 Y N Result bit 7 = off?
:
:
019 : 1 Read head XX ECC error. (2) Go to SAM 7282.
:
:
020 Y N Result bit 8 = off?
:
:
021 : 1 Unexpected status. Branch to test 7220.
:
:
022 Y N Result bit 9 = off?
:
:
023 : 1 CC=2 on a RTZ command. Replace the following logic
: cards one at a time and rerun test: A2B01 (3) and
: A2B02. (4)
:
:
024 Y N Result bit 10 = off?
:
:
025 : 1 CC=2 on a maximum cylinder seek. Replace the
: following logic cards one at a time and rerun test:
: A2B01 (3) and A2B02. (4)
:
:
026 Y N Result bit 11 = off?
:
:
027 : 1 CC=2 on a head select seek. Failing head=XX (2).
: Replace A2B02 logic card. Replace mini module
: assembly (para 3.4).
:
:
028 Y N Result bit 12 = off?
:
:
029 : 1 Test completed OK, branch to test 7214.
:
:
030 1 Branch to test 7220.

```

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

(2) If using operator/programmer panel only, failing head can be determined by running one pass of test 7222 on each head and verifying that the selected head number appears in R6.

(3) Check/adjust A2B01 logic card per para 3.15.

(4) Refer to Setting Sector Select Switches, section 2 of this manual for correct switch settings of A2B02.

This test is automatically linked from test 7213.

```

001 Y N Read device ID and register 8701. Is result legal for
    : : MMD?
    : :
002 : 1 Device ID not correct for MMD. Run tests 7200
    : through 7203. Replace attachment card, (1) replace
    : A2A04.
    :
003 Y N Run incremental seek test. Did test run without
    : : error?
    : :
    1 : Go to step 023.
    :
004 Y N Did recalibrate interrupt fail?
    : :
    : 1 Go to step 022.
    :
005 Y N Did seek forward interrupt fail?
    : :
    : 1 Go to step 021
    :
006 Y N Did read sector ID interrupt fail?
    : :
    : 1 Go to step 020.
    :
007 Y N Was sector flag not 00 or 01 and cylinder address
    : : not 001?
    : :
    : 1 Go to step 019.
    :
008 Y N Did cylinder read equal expected cylinder?
    : :
    : 1 Go to step 018.
    :
009 Y N Did reverse seek interrupt fail?
    : :
    : 1 Go to step 017.
    :
010 Y N Did read sector ID interrupt fail after reverse
    : : seek?
    : :
    : 1 Go to step 016.
    :
011 Y N Was sector flag not 00 or 01 and cylinder address
    : : not 001 after reverse seek?
    : :
    : 1 Go to step 015.
    :
    2
A

```

A

62947905 H

- 1
:
012 Y N Did cylinder read equal expected cylinder after
: : reverse seek?
: :
: 1 Go to step 014.
:
013 1 Illogical error, rerun CPU diagnostics (press Load
switch on operator/programmer panel).
- 014 (From step 012). Run test 7213. Replace cards A2B01, (2)
A2C04, or power amp A2C05.
- 015 (From step 011). Disk initialization problem. A sector
with a flag byte indicating something other than a primary
sector has been found on a cylinder other than cylinder 1.
This indicates that either an error exists in the
initialization of the disk, or initialization by a procedure
which employs nonstandard alternate sector assignment has
been performed.
- 016 (From step 010). Read sector ID was verified in a previous
test. Rerun test 7213.
- 017 (From step 009). Run test 7213. Replace cards A2B01, (2)
A2C04, or power amp A2C05.
- 018 (From step 008). Replace cards A2B01, (2) A2C04, or power
amp A2C05.
- 019 (From step 007). Suspect disk initialization. A sector
with a flag byte indicating something other than a primary
sector has been found on a cylinder other than cylinder 1.
This indicates that either an error exists in the
initialization of the disk, or initialization by a procedure
which employs nonstandard alternate sector assignment has
been performed.
- 020 (From step 006). No sector IDs readable on entire track.
Run auto tests 7200 -- if inconclusive, run 72F1.
- 021 (From step 005). Rerun test 7213 -- if inconclusive,
suspect servo alignment. See section 3.15 of this manual.
- 022 (From step 004). Recalibrate was verified in a previous
test. Rerun test 7210.
- 023 (From step 003). Branch to test 7215 (SAM 7215).

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

(2) Check/adjust A2B01 per para 3.15.

A B C D E F

62947905 H

```
1 1 1 1 1 1
: : : : : :
017 : : : : : 1 Cylinder read XXXX does not equal expected
: : : : : cylinder XXXX. Rerun tests 7213 and 7214.
: : : : : If inconclusive, suspect servo adjustments.
: : : : :
018 : : : : : 1 Interrupt error on seek command, this error was
: : : : : verified in test 7213. Rerun test 7213.
: : : : :
019 : : : : : 1 Following a recalibrate CMD, expected cylinder
: : : : : 0000, read cylinder XXXX. Run test 7213.
: : : : :
020 : : : 1 No sector IDs readable on an entire track XXXX.
: : : Run auto tests 7200 -- if inconclusive, run test
: : : 72F1.
: : :
021 : : 1 Recalibrate failed. Run test 7210 and 7213. This
: : error should have been detected previously.
: :
022 1 Branch to test 7216 (SAM 7216).
```

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

This test is automatically linked from test 7215.

```

001 Y N Read device ID and register 8701. Is result legal for
    : : MMD?
    : :
002 : 1 Device ID not correct for MMD. Run tests 7200 through
    : 7203. Replace attachment card, (1) replace A2A04.
    :
004 Y N Run random seek test. Did test run OK?
    : :
005 : Y N Did recalibrate fail on interrupt?
    : :
006 : : Y N Did read sector ID fail on interrupt?
    : :
007 : : : Y N Did seek command fail on interrupt?
    : : :
008 : : : : Y N Was cylinder read not equal to cylinder
    : : : : : expected?
    : : : : :
010 : : : : : 1 Illogical error. Rerun CPU diagnostics (IPL
    : : : : : the CDC BASIC diskette).
    : : : : :
012 : : : : : 1 Cylinder read XXXX is not equal to expected
    : : : : : cylinder XXXX. Reseat/replace A2B01, (2)
    : : : : : A2C04, A2C05.
    : : : : :
013 : : : : : 1 Interrupt error on seek command. Reseat/replace
    : : : : : cards A2B01 (2), A2C04, A2C05 one at a time.
    : : : : : Rerun test.
    : : : : :
014 : : : 1 No readable sector IDs on an entire track XXXX. Run
    : : : auto tests 7200 -- if inconclusive, run test 72F1.
    : : :
015 : 1 Interrupt error on recalibrate. Go back to test 7210.
    : This error should have been detected in prior tests.
    :
016 1 End of auto tests. Exit.

```

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

(2) Check/adjust A2B01 per para 3.15.



This test is an automatically executed error analysis routine for abnormal error conditions detected by test 7201 and 7213.

```

001 Y N Halt I/O command (F0). CC=7?
    :
002 : 1 Not CC=07 after halt I/O. Reseat/replace attachment
    : card/cables. (1) Rerun auto tests. If error per-
    : sists, go to SAM 7281.
    :
003 Y N Device reset command (6F). CC=7?
    :
004 : 1 Not CC=07 after device reset. Reseat/replace attach-
    : ment card/cables. (1) Rerun auto tests. If error
    : persists, go to SAM 7281.
    :
005 Y N Invalid DCB (all zeros). CC=0702?
    :
006 : Y N CC=0703?
    :
007 : : 1 Not CC=0702 or 0703 after SCS invalid DCB cmd.
    : : Reseat/replace attachment card/cables. (1) Rerun
    : : auto tests. If error persists, go to SAM 7281.
    : :
008 : 1 CC=0703 after SCS command containing invalid DCB.
    : Reseat/replace attachment card/cables. (1) Rerun
    : auto tests. If error persists, go to SAM 7281.
    :
009 Y N Cycle steal status command. CC=0703?
    :
010 : 1 Not CC=0703 on cycle steal command. Verify I/O
    : cable condition/connections. Reapply power to MMD.
    : Rerun auto tests. If error persists, go to SAM 7281.
    :
011 : This step displays MMD microprocessor error codes
    : before continuing. These codes are not examined by
    : the diagnostic test itself, but may prove helpful
    : in tracing problems not identified by cycle steal
    : status word 3, or further defining errors identified
    : in cycle steal status. A maximum of 22 MMD error
    : codes will be displayed. When using the programmer's
    : panel, error code displays are obtained during a halt
    : code of 7290, with the error code contained in R1,
    : level 3. A list of the MMD error code definitions
    : follows:
    :
    : 01 An MMD voltage fault has occurred. SAM 7270 may
    : isolate.
    : 02 A read or write was attempted and on cylinder was
    : not true. Suspect cards A2A01, A2A02, A2B02/C02.
    :
    2
A ERROR ANALYSIS ROUTINE FOR ISB = 8016 SAM 7220-1

```


A

1

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Y N

:

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1

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3

A

03 A write fault has occurred. Suspect cards A2A01, A2A02, A2B02/C02, A2B02, A2C03.

04 A head select fault has occurred. Suspect cards A4A02/B02, A2B02/C02.

05 A read and a write were attempted simultaneously. Suspect cards A2A02, A2A01.

06 A MMD microprocessor fault. A ROM or a RAM test failed. Suspect Card A2C04.

07 A MMD microprocessor I/O fault has occurred. Suspect card A2C04.

08 A settle-out or hold on cylinder problem occurred. Suspect cards A2B01/C01, A2B02/C02.

09 The drive drifted off cylinder. Suspect A2B01/C01, A2B02/C02.

10 The spindle required more than 15 seconds to get up to speed. Test 7221 may isolate this problem.

11 The brake was on for more than 500ns after being released. Suspect the brake assembly or card A2B02/C02.

12 A guard band was detected during a seek. Suspect cards A2B01/C01, A2B02/C02, A2A04.

13 A guard band was detected during a seek. Suspect cards A2B01/C01, A2B02/C02, A2A04.

14 The first seek failed an outer guard band was detected. Suspect cards A2B01/C01, A2B02/C02, A2C03. Test 7221 may isolate this problem.

15 An RTZ seek took too long to complete. Test 7210 may isolate this problem.

16 A seek to a nonexistent cylinder (greater than maximum allowable) was attempted. Suspect cards A2A04, A2B02/C02.

17 An RTZ seek did not complete. Test 7210 may isolate this problem.

18 Spindle speed dropped below 3000 RPM. Run test 7221, if inconclusive replace A4 speed transducer.

19 No cylinder pulses were detected during a seek operation. Suspect card A2B01/C01, A2B02/C02, A2C03.

20 No pick command was detected after spindle started.

21 No start command was detected.

22 No seek command has been detected. Suspect cards A2B01/C01, A2B02/C02, A2C03.

After displaying the error codes (if any), the test continues.

Result (cycle steal status word 3) = 000016?

Go to step 054.

```

A
2
:
012 Y N Result not equal 002A?
:
:
013 : 1 Cycle steal status word 3=2A, disk power off.
:
: Check drive power on indicator. If off, check that
: power switch is in On position. If power applied
: (LED lit), reseal I/O cables, reapply power to MMD,
: rerun test. If error persists, go to SAM 7281.
:
014 Y N Result not equal 002B?
:
:
015 : 1
: Cycle steal status word 3=2B, cable disconnected.
: Verify cable connections. Run test 7221. If incon-
: clusive, go to SAM 7281.
:
016 Y N Result not equal 002C?
:
:
017 : 1 Cycle steal status word 3=2C, Indeterminate cable
: parity. Reseat cables and rerun auto tests. Reapply
: power to MMD and rerun tests. If error persists, go
: to SAM 7281.
:
018 Y N Result not equal 0002D?
:
:
019 : 1 Cycle steal status word 3=2D, illegal feature ID. Go
: to SAM 7281.
:
:
020 Y N Result not equal 002E?
:
:
021 : 1 Cycle steal status word 3=2E, not ready and not on
: cylinder. Note error code presentation, step 011
: of this test. If no error codes were presented, run
: auto tests 7202. If inconclusive, go to SAM 7281.
:
:
022 Y N Result not equal 002F?
:
:
023 : 1 Cycle steal status word 3=2F, not ready and on
: cylinder. Note error code presentation, step 011
: of this test. If no error codes were presented, go
: to SAM 7281.
:
:
024 Y N Result not equal 0030?
:
:
025 : 1 Cycle steal status word 3=30, ready and not on
: cylinder. Run test 7202.
:
:
026 Y N Result not equal 0031?
:
:
027 : 1 Cycle steal status word 3=31, timer elapsed.
: Replace attachment card. (1)
:
:
4

```



```

A
4
:
044 Y N Result not equal 0003C?
:
:
045 : 1 Seek error. Reseat/replace logic cards A2B01/C01,
: A2B02/C02, A2C03.
:
:
046 Y N Result not equal 0044?
:
:
047 : 1 Cycle steal status word 3=44. Device not ready on a
: start command. Go to SAM 7281.
:
:
048 Y N Result not equal 004A?
:
:
049 : 1 Cycle steal status word 3=4A, hung during write sector
: ID. Replace attachment card. (1)
:
:
050 Y N Result not equal 00AA?
:
:
051 : 1 Cycle steal status word 3=AA, problem undefined.
: Possible power or cable problem. Check cables and
: rerun auto tests. If error persists, go to SAM 7281.
:
:
052 Y N Result not equal 00F3?
:
:
053 : 1 Cycle steal status word 3=F3, header error undefined.
: Replace attachment card. (1) Rerun auto tests. If
: error persists, go to SAM 7281.
:
:
054 Y N Result not equal 00F5?
:
:
055 : 1 Cycle steal status word 3=F5, header or data error
: undefined. Replace attachment card. (1) If error
: persists, go to SAM 7281.
:
:
:
:
056 1 None of expected codes appeared in cycle steal status 3.
: If no error codes were presented in step 011 of this
: test, and an MMD malfunction is still suspect, run auto
: tests 7206. If inconclusive, go to SAM 7281.

```

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



This is a manual test requiring operator interaction. Enter B7221 to initiate the test. This test monitors the actions of the MMD during a first seek operation. When the test is ready for power to be applied to the MMD, it will inform the operator via the alternate console. This prompt occurs during step 001 and coincides with a programmers panel display of 7272₁₆.

```

001  Y N  There are two messages which are displayed as follows:
      : :  1. (Halt code 72A1) This prompt is a request for the
      : :      CE to turn MMD power off --- when MMD power has
      : :      been turned off, respond to this prompt with a 1
      : :      response.
      : :
      : :  2. (Halt code 72A2) This is a request for the CE to
      : :      turn the MMD power on --- the test will then
      : :      proceed automatically. If no response occurs
      : :      within 60 seconds. Replace card A2A03, A2A04,
      : :      A2A02.
      : :
002  : Y N  CC=0702?
      : : :
003  : : 1  An illogical condition. Replace attachment card.
      : :      (1)
      : :
004  : Y N  Error code not equal 1?
      : : :
005  : : 1  Test was initiated with MMD power on.
      : : :
006  : Y N  Error code not equal 3?
      : : :
007  : : 1  Speed OK never set. If MMD motor started,
      : :      replace cards A2B01/C01, A2B02/C02, A3 speed
      : :      transducer. If MMD motor did not start, run
      : :      test 7220 noting microprocessor error code display,
      : :      step 011. If inconclusive or no codes displayed,
      : :      replace cards A2C04, A2B04.
      : :
008  : Y N  Error code not equal 4?
      : : :
009  : : 1  Guard Band 2 never detected. The possibility exists
      : :      that the heads were not fully retracted over Guard
      : :      Band 2. Retry this test. If same error, replace
      : :      cards A2B01/C01, A2B02/C02, A2B04, A2C04/A2C05.
      : :
010  : Y N  Error code not equal 5?
      : : :
011  : : 1  Select In signal never occurred to move heads off of
      : :      Guard Band 2. Replace cards A2B04, A2C04.
      : :
012  : Y N  Error code not equal 6?
      : : :
      : : :
      2 2 2
      A B C

```

	A	B	C	
	1	1	1	
	:	:	:	
013	:	:	<u>1</u>	Guard Band 1 was not detected or was not left during Select In. Replace cards A2B01/C01, A2B02/C02, A2C05.
	:	:	:	
014	:	Y	N	Error code not equal 7?
	:	:	:	
015	:	:	<u>1</u>	Select Out never occurred after Guard Band 1 left. Replace cards A2B04, A2C04.
	:	:	:	
016	:	Y	N	Error code not equal 8?
	:	:	:	
017	:	:	<u>1</u>	Guard Band 1 was not detected while retracting heads. Replace cards A2B01/C01, A2B02/C02.
	:	:	:	
018	:	Y	N	Error code not equal 9?
	:	:	:	
019	:	:	<u>1</u>	Select In did not set to move heads to cylinder 0. Replace card A2C04.
	:	:	:	
020	:	Y	N	Error code not equal A?
	:	:	:	
021	:	:	<u>1</u>	On Cylinder status never received. Replace cards A2A01, A2B01/C01, A2B02/C02.
	:	:	:	
022	:	Y	N	Error code not equal B?
	:	:	:	
023	:	:	<u>1</u>	Ready status never received. Replace card A2C04.
	:	:	:	
024	:	<u>1</u>		Illogical status. Replace the attachment card. (1)
	:	:	:	
025	:	<u>1</u>		First seek completed without any errors.

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

This is a manual test requiring operator interaction. Enter B7222 to initiate the test. This test can be used to loop on read sector ID commands for scoping. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

001 When operating without an alternate console, the halt is 722A. Enter cylinder, head, sector in the following hexadecimal form:

Fcccchss (2)

Where cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

002 Y N When operating without an alternate console, the halt
 : : code is 7222. Enter (B), 6, (I), (I) to continue.
 : : Program performs read sector IDs on the cylinder,
 : : head, and sector specified in step 001. If CPU is in
 : : diagnostic mode, the programs stops after each read
 : : sector ID and the level 3 registers contain the
 : : following data:
 : :
 : : R4, R5, R6 -- sector ID information
 : : R7 ----- I/O condition codes
 : :
 : : This sequence loops for scoping if the CPU is not in
 : : diagnostic mode.
 : :
 : : The sequence continues looping until a Yes or No
 : : response is made via the alternate console (or
 : : operator/programmer panel) the appropriate leg to
 : : this step is then followed.
 : :
 003 : 1 End of read sector ID scope loop.
 : :
 004 : 1 Go to step 001 above.



This is a manual test requiring operator interaction. Enter B7223 to initiate the test. This test can be used to loop on write sector ID commands for scoping. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

- 001 When operating without an alternate console, the halt code is 722A. Enter cylinder, head, sector in the following hexadecimal form:

Fcccchss (2)

Where cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

- 002 When operating without an alternate console, the halt code is 722B. Enter sector ID data in the following hexadecimal form:

Fffcccchss

Where ff is a 2-digit flag byte, cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

- 003 Y N When operating without an alternate console, the halt
 : : code is 7223. Enter (B), 6, (I), (I) to continue.
 : : Program performs write sector IDs as specified in
 : : steps 001 and 002. If the CPU is in diagnostic mode,
 : : the CPU will stop after each write sector ID error
 : : with the received condition codes in level 3, R7. If
 : : the CPU is not in diagnostic mode, the program loops
 : : until a Yes or No response is made, and then the ap-
 : : propriate leg to this step is taken.
 : :
 004 : 1 End of write sector ID scope loop.
 : :
 005 1 Go to step 001 above.



This is a manual test requiring operator interaction. Enter B7224 to initiate the test. This test performs a read sector ID on any given sector and displays the ID on the alternate console. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

001 When operating without an alternate console, the halt code is 722A. Enter cylinder, head, sector in the following hexadecimal form:

Fcccchss (2)

Where cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

002 Y N This step reads the sector ID and displays the
: : results. CC=0703?
: :
003 : 1 CC not equal 0703. Read sector ID did not properly
: execute. (1)
:
004 Y N Read another sector ID?
: :
1 : Go to step 001.
:
006 Y N Link to write sector ID?
: :
007 : 1 End of read sector ID test.
:
008 1 Go to external test 7225 step 001.

(1) If no alternate console is being used, Series/1 main storage contains the following information:

18C8 - I/O Condition Codes
18CA - Sector ID Information

(2) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0336H, HH = 00-09H, SS = 00-3BH



This is a manual test requiring operator interaction. Enter B7225 to initiate the test. This test allows a user to perform a sector ID write. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

- 001 When operating without an alternate console, the halt code is 722A. Enter cylinder, head, sector in the following hexadecimal form:

(2F)ccccchss (1)

Where 2Fcccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

- 002 When operating without an alternate console, the halt code is 722B. Enter sector ID data to be written in the following hexadecimal form:

(3F)ffcccchss (1)

Where 3Fff is a 2-digit flag byte, cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

- 003 Y N This step causes a write sector ID command to be
: : issued as specified in steps 001 and 002. CC=0703?
: :
004 : 1 CC not equal 0703. Write sector ID did not properly
: execute.
:
006 Y N Write another sector ID?
: :
1 : Go to step 001.
:
008 Y N Link to read sector ID?
: :
009 : 1 End or write sector ID test.
:
010 1 Go to external test 7224 step 001.

(1) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336H, HH = 00-09H, SS = 00-3BH.



This is a manual test requiring operator interaction. Enter B7226 to initiate the test. This test allows a user to read data from a given sector on the MMD. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

001 When operating without an alternate console, the halt code is 722B. Enter flag byte, cylinder, head, sector in the following hexadecimal form:

Fffcccchss (1)

Where ff is 2 digit flag byte, cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

002 Y N The request sector is read and displayed on the
 : : alternate console. CC=0703?
 : :
 003 : 1 CC not equal 0703? Read data did not properly
 : : execute.
 : :
 004 1 Successful end of the read data routine test.

(1) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336H, HH = 00-09H, SS = 00-3BH



This is a manual test requiring operator interaction. Enter B7227 to initiate the test. This test allows a user to write one sector with a data pattern. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

001 When operating without an alternate console, the halt code is 722B. Enter flag byte, cylinder, head, sector in the following hexadecimal form:

Fffcccchhss (1)

Where ff is 2 digit flag byte, cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

When operating without an alternate console, the halt code is 722C. Enter sector ID data to be written in the following hexadecimal form:

Fddddddd

Where dddddddd is 8 characters (4 bytes) of data that will be repeated and written on the indicator sector.

002 Y N The program performs the write. CC=0703?
 : :
 003 : 1 CC not equal 0703. Write data did not properly
 : execute.
 : :
 004 1 Successful end of the write data routine test.

(1) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336, HH = 00-09, SS = 00 3BH.



This is a manual test requiring operator interaction. Enter B7228 to initiate the test. This test writes a given data field on any desired sector, reads it back, and verifies the data read matches the data written. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

- 001 When operating without an alternate console, the halt code is 722B. Enter flag byte, cylinder, head, sector in the following hexadecimal form:

Fffcccchss (1)

Where ff is 2-digit flag byte, cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

When operating without an alternate console, the halt code is 722C. Enter data pattern to be used in the following hexadecimal form:

Fddddddd

Where dddddddd is 8 characters (4 bytes) of data that will be used.

When operating without an alternate console, the halt code is 722D. Enter 1 to write a complete sector, enter 0 to perform a partial sector write.

- 002 Y N CC=0703 on both read and write? This step expands the
 : : data pattern entered in step 001 to fill one sector.
 : : The sector is then written to the disk and read back.
 : : The data written, the data read, and a statement
 : : describing the comparison error (if any error exists)
 : : is displayed. Run auto test 7200 -- if inconclusive,
 : : replace card A2A03.
 : :
 003 : 1 CC not equal 0703 on read and/or write commands.
 : Read and/or write did not execute properly.
 : Replace card A4A2/B2.
 :
 004 1 Successful end of write/read/compare data routine.

(1) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336, HH = 00-09, SS = 00-3BH



This is a manual test requiring operator interaction. Enter B7230 to initiate test.

001 Y N Read device ID and register 8701. Is result legal
: : for MMD?
: :
002 : 1 Device ID not correct for MMD. Run tests 7200 through
: 7203. Reapply power to MMD. Replace attachment
: card (1). Replace A2A04 logic card.
: :
004, :
005 Y N When operating without an alternate console, halt code
: : is 7230. Do you want to write data? (Reply 1 = yes,
: : 0 = no)
: :
006 : 1 Write/read data test not executed due to no response
: of step 004, 005.
: :
007 Y N Write/read data pattern EB6D B6DB. Error code = 0000?
: :
008 : 1 Write/read data error. Go to step 018 this test.
: :
009 Y N Write/read data pattern 5555 5555. Error code = 0000?
: :
010 : 1 Write/read data error. Go to step 018 this test.
: :
011 Y N Write/read data pattern AAAA AAAA. Error code = 0000?
: :
012 : 1 Write/read data error. Go to step 018 this test.
: :
013 Y N Write/read data pattern 0000 0000. Error code = 0000?
: :
014 : 1 Write/read data error. Go to step 018 this test.
: :
015 Y N Write/read data pattern FFFF FFFF. Error code = 0000?
: :
016 : 1 Write/read data error. Go to step 018 this test.
: :
017 1 Write/read data test ran without any errors.
: :
018 Y N Error code not equal 4000?
: :
019 : 1 Unexpected error during write data. Hd = XX. Replace
: cards A2B04, A2A01, A2A02, A2C03.
: :
020 Y N Error code not equal 2000?
: :
021 : 1 Unexpected error during read data. Hd = XX. Replace
: cards A2B03, A2B04, A2A01, A2A02, A4A3/B3.
: :
2
A

```

A
1
:
022 Y N Error code not equal 1000?
:
023 : 1 File protect is on.
:
024 Y N Error code not equal 0800?
:
025 : 1 Hd = XX. Data compare error. Replace cards A2A03,
: A2C03.
:
026 Y N Error code not equal 0400?
:
027 : 1 Hd = XX. Write unsafe error. Replace cards A4A02,
: A2B02. Replace mini module (para 3.4).
:
028 Y N Error code not equal 0200?
:
029 : 1 Hd = XX. Read data ECC error. Replace cards A2B04,
: A2C03, A2A01, A2A02, A2A03, A4A3/B3.
:
030 Y N Error code not equal 0100?
:
031 : 1 Wrong device ID. Run test 7200, 7201, 7203.
:
032 Y N Error code not equal 0080?
:
033 : 1 Multiple head select error. Replace card A4A02.
: Replace mini module (para 3.4), or isolate to head
: using tests 7227, 7228, 7230.
:
034 Y N Error code not equal 0040?
:
035 : 1 PLO sync check on write operation. Replace cards
: A4A01, A4A03, A2B03, A2A02, A2A01.
:
036 Y N Error code not equal 0020?
:
037 : 1 Write gate check. Replace cards A2A01, A2A02,
: A2C03, or run tests 7227, 7228 for more data.
:
038 Y N Illogical error. IPL (press Load switch) to run CPU
: tests.

```

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

This is a manual test requiring operator interaction. Enter B7235 to initiate the test. This test checks the MMDs ability to properly chain DCBs.

001 Y N Issue device reset and operate-I/O to a recall
: : chained to a seek chained to another seek. No errors
: : encountered?
002 : 1 A chaining error occurred. Replace the attachment
: card. (1)
:
003 1 Normal end of the command sequence test.

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



This is a manual test requiring operator interaction. Enter B7240 to initiate the test. This test utilizes the read short to verify error detection/correction logic.

001 Issue prompt -- Do you want to write data?

002 Y N When operating without an alternate console, the halt
: : code is 7240. A Yes response will cause the program
: : to write on the CE track. A No will cause it to
: : terminate.

003 : 1 Test terminates without testing ECC.

004 Y N Force correctable error in the middle of the data
: : field and read short. Error corrected?

005 : 1 Correctable error in the data field not corrected.
: Replace the ECC cards A2B04, A2A04

006 Y N Force a second error in the middle of the data field
: : and read short. Error corrected?

007 : 1 Correctable error in the data field not corrected.
: Replace the cards A2B04, A2A01, A2A04

008 Y N Force a third correctable error in the middle of the
: : data field and read short. Error corrected?

009 : 1 Correctable error in the data field not corrected.
: Replace the ECC cards A2B04, A2A04.

010 Y N Force a fourth correctable error in the middle of the
: : data field and read short. Error corrected?

011 : 1 Correctable error in the data field not corrected.
: Replace the ECC cards A2B04, A2A04.

012 Y N Force correctable error on last data byte and read
: : short. Error corrected?

013 : 1 Correctable error in the data field not corrected.
: Replace the ECC cards A2B04, A2A04.

014 Y N Force a second correctable error on last byte of the
: : data field and read short. Error corrected?

015 : 1 Correctable error in data field not corrected.
: Replace the ECC cards A2B04, A2A04.

016 Y N Force correctable error in the first byte of the

: :
2 2
A B

	A	B	
	1	1	
	:	:	
	:	:	data field and read short. Error corrected?
	:	:	
017	:	<u>1</u>	Correctable ECC error in data field not corrected. Replace the ECC cards A2B04, A2A04.
	:	:	
018	Y	N	Force correctable error in the middle of ECC field and read short. Error corrected?
	:	:	
	:	:	
019	:	<u>1</u>	Correctable ECC error not corrected. Replace the ECC cards A2B04, A2A04.
	:	:	
020	Y	N	Force correctable error in the last ECC byte and read short. Error corrected?
	:	:	
	:	:	
021	:	<u>1</u>	Correctable ECC error not corrected. Replace the ECC cards A2B04, A2A04.
	:	:	
022	Y	N	Force uncorrectable error in the data field and read short. Error detected?
	:	:	
	:	:	
023	:	<u>1</u>	Uncorrectable data error not detected. Replace the ECC cards A2B04, A2A04.
	:	:	
024	Y	N	Force two data errors and read short. Error reported?
	:	:	
	:	:	
025	:	<u>1</u>	Uncorrectable data error not detected. Replace the ECC cards A2B04, A2A04.
	:	:	
	:	:	
026	Y	N	Force two ECC field errors and read short. Error reported?
	:	:	
	:	:	
027	:	<u>1</u>	Uncorrectable ECC error not detected. Replace the ECC cards A2B04, A2A04.
	:	:	
	:	:	
028	<u>1</u>		ECC test ran without any hardware malfunctions.

A B C

62947905 H

1 1 1
:
:
:
013 : : 1 End of repeat seek test.
:
:
:
:
:
:
014 1 Halt code is 722E. Reply Fcccchh where cccc₁₆ is the
: 4-digit cylinder number, and hh₁₆ is the 2-digit head
: number for the direct seek address. (2)
:
:
015 Y N When operating without an alternate console, the halt
: : code at this step is 7245. Enter a (B), 6, (I),
: : (I) to continue. The program performs direct seeks
: : to the specified address until a yes (1) or a no
: : (0) response received. A yes will restart the test
: : and a no will terminate test.
:
:
016 : 1 End of the direct seek test.
:
:
1 Go to step 001 of this test.

(1) Maximum usable cylinder address is as listed in paragraph 3.16 for various models of MMD.

(2) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336H, HH = 00-09H, SS = 00-3BH

This is a manual test requiring operator interaction. Enter B7250 to initiate the test. This test reads all sector IDs on the CE cylinder, rewrites with test patterns, and restores the original sector ID if all goes well.

```

001 Issue prompt -- Do you want to write sector ID?

002 Y N Halt code is 7250. A YES response allows the test to
   : : continue and a NO response will cause the test to
   : : terminate without writing on the disk.
   : :
003 : 1 Test terminates without writing on the disk.
   : :
004 Y N Read device ID to determine MMD size. Valid device
   : : ID?
   : :
005 : 1 Invalid MMD ID. Run auto tests 7200.
   : :
006 Y N Attempt to write sector ID to all sectors and to all
   : : heads on the CE cylinder. Error code = 0000?
   : :
007 : Y N Error bit 8000 off?
   : : :
008 : : 1 Could not read sector ID during step 006. Reini-
   : : tialize the MMD and run test 7213 to isolate the
   : : problem. Suspect head xx (xx will indicate failing
   : : head).
   : :
009 : Y N Error bit 4000 off?
   : : :
010 : : 1 Original sector ID could not be restored. Run tests
   : : T7224 and T7225 to isolate the problem. If incon-
   : : clusive, replace cards A03, A04, B01, A3A03, and/or
   : : A01.
   : :
011 : Y N Error bit 2000 off?
   : : :
012 : : 1 Read sector ID not equal to sector ID written.
   : : Run test 7213 to isolate the problem. Suspect head
   : : xx (xx will indicate failing head number).
   : :
013 : Y N Error bit 0800 off?
   : : :
   : : :
014 : : 1 Write gate check occurred. Replace cards A2B08,
   : : A2B03, A2B02. Tests 7224 and 7225 may provide more
   : : information by writing and reading sector IDs.
   : : Suspect head xx (xx indicates failing head number).
   : :
   : :
   : :
   : :
2 2
A B

```

A	B	
1	1	
:	:	
015	Y N	Error bit 0400 off?
:	:	
016	<u>1</u>	Unsafe status during sector ID. Replace cards A2B02, A2B01, A2A01, A3A03, A2A04. Tests 7224 and 7225 may provide more information by writing and reading sector IDs. Suspect head xx (xx indicates failing head number).
:	:	
017	Y N	Error bit 0200 off?
:	:	
018	<u>1</u>	Test ID read not equal to test ID written. Replace cards A03, A04, B01, A3A03, A01. Suspect head xx (xx indicates failing head number).
:	:	
019	Y N	Error bit 0100 off?
:	:	
020	<u>1</u>	Multiple head select error. Replace cards A3A02, A2A04. Head may be isolated by test 7225.
:	:	
021	Y N	Error bit 0080 off?
:	:	
022	<u>1</u>	PLO sync check occurred during write sector ID. Replace the disk pack, the servo preamp cards, the card A2A01, the servo head, and/or the other servo circuitry.
:	:	
023	Y N	Error bit 0040 off?
:	:	
024	<u>1</u>	Disk drive is file protected. If drive will not go unprotected by operating the file protect switch, replace cards A2A10 and A2B04, the operator control panel, or the control panel harness assembly.
:	:	
025	Y N	Error bit 0020 off?
:	:	
026	<u>1</u>	Illogical ending. Rerun this test if the error reoccurs, suspect SERIES/1 itself.
:	:	
027	<u>1</u> <u>1</u>	Successful completion of the write sector ID diagnostic.

This is a manual test requiring operator interaction. Enter B7260 to initiate the test. This test performs a read sector ID skewed on any given sector and displays the ID on the alternate console. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

001 When operating without an alternate console, the halt code is 722A. Enter cylinder, head, sector in the following hexadecimal form:

Fcccchss (2)

Where cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

002 Y N This step reads the sector ID skewed and displays the
 : : results. CC=0703?
 : :
 003 : 1 CC not equal 0703. Sector ID did not properly
 : execute. (1)
 :
 004 1 Successful end of the read sector ID skewed test. (1)

(1) If no alternate console is being used, Series/1 main storage contains the following information:

18C8 - I/O Condition Codes
 18CA - Sector ID Information

(2) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336H, HH = 00-09H, SS = 00-3BH



This is a manual test requiring operator interaction. Enter B7261 to initiate the test. This test allows a user to perform a sector ID skewed write. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads.

001 When operating without an alternate console, the halt code is 722A. Enter cylinder, head, sector in the following hexadecimal form:

Fcccchss (1)

Where cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

When operating without an alternate console, the halt code is 722B. Enter sector ID skewed data to be written in the following hexadecimal form:

Fffcccchss (1)

Where ff is a 2-digit flag byte, cccc is a 4-digit cylinder number, hh is a 2-digit head number, and ss is 2-digit logical sector number.

002 Y N This step causes a write sector ID skewed command to
 : : be issued as specified in steps 001 and 002. CC=0703?
 : :
 003 : 1 CC not equal 0703? Write sector ID skewed did not
 : : properly execute.
 : :
 004 1 Successful end of write sector ID test.

(1) If testing a 160 MB MMD, valid seek arguments are:

CCCC = 0000-0336H, HH = 00-09H, SS = 00-3BH



This is a manual test. Enter B7266 to initiate test. This test displays CCS on the alternate console.

```
001 Y N Prepare command CC = 7?
    : :
002 Y N Read device ID = 3007
    :
003 : Y N Read device ID = 3017
    : : :
004 : : Y N Read device ID = 3107
    : : : :
005 : : : Y N Read device ID = 00AA
    : : : : :
006 : : : Y N Read device ID = 00CA
    : : : : :
007 : : : : 1 Wrong device ID. Go to test 7200.
    : : : : :
008 Y N Cycle Steal Status CC = 0703
    : :
    : :
009 : 1 Start Cycle Steal Status Failed. Go to test 7200.
    : :
    : :
010 Y N Display Status.
    : :
011 : 1 STOP
```




```

A B
2 2
: :
: :
034 : 3 Replace fault/control card at A2B02/C02. (1)
: :
035 : 4 Replace drive motor (para 3.6).
: :
036 N Y Is problem being isolated a test 7220 step 021 (not
: : ready and not on cylinder) or step 023 (on cylinder
: : and not ready) error?
: :
037 : Y N Is -5 V present at -5 V logic chassis backpanel
: : : Faston?
: : :
038 : : 1 Check for blown -5 V fuse (F4) on power supply
: : regulator card and isolate fault using SAM 7271.
: :
039 : 1 Replace fault/control card at A2B02/C02. (1)
: :
040 : 2 Verify actuator lock is off.
: :
041 : 3 Replace write PLO card at A2C03.
: :
042 : 4 Replace microprocessor card at A2C04.
: :
043 : 5 Replace analog servo card at A2B01/C01. (2)
: :
044 : 6 Replace speed transducer (para 3.12).
: :
045 : 7 Replace mini module (para 3.4).
: :
046 Y N Is -24 V present at -24 V logic chassis backpanel
: : : Faston?
: : :
047 : 1 Check for blown -24 V fuse (F5) on power supply regu-
: : lator card and isolate fault using SAM 7272.
: :
048 1 Power up sequence is OK.

```

(1) Refer to Setting Sector Select Switches, section 2 of this manual for correct switch settings of A2B02/C02.

(2) Check/adjust A2B01 per para 3.15 following card replacement.



A B

1 1

: :

: 1 Problem is in R/W chassis. Try to isolate load fault
: : to a single R/W card. Replace each card one at a
: : time, apply power and check for blown F3 or F4.

: :

: 2 Replace mini module assembly (para 3.4).

: :

1 Problem is in logic chassis. Turn power off and replace
fuse(s). Try to isolate load fault to a single logic
card. Remove all logic cards. Reinstall one at a
time, apply power and check for blown fuse. Replace
faulty logic card.

	A	B	C	D	E	
	1	1	1	1	1	
	:	:	:	:	:	
005	:	:	:	:	Y N	Add R/W chassis to <u>+24</u> V load:
	:	:	:	:	:	
	:	:	:	:	:	a. Reconnect A4P3 to pins on R/W mother board.
	:	:	:	:	:	
	:	:	:	:	:	b. Apply power. Did F5 blow?
	:	:	:	:	:	
006	:	:	:	:	Y N	Add power amplifier to <u>+24</u> V load:
	:	:	:	:	:	
	:	:	:	:	:	a. Reconnect cable to A2C05 power amplifier card A2C05.
	:	:	:	:	:	
	:	:	:	:	:	b. Apply power. Did F2 or F5 blow?
	:	:	:	:	:	
007	:	:	:	:	:	<u>1</u> <u>+24</u> V loads are OK.
	:	:	:	:	:	
008	:	:	:	:	:	<u>1</u> Replace power amplifier card A2C05.
	:	:	:	:	:	
009	:	:	:	:	<u>1</u>	Try to isolate load fault to a single R/W card. Replace each card one at a time, apply power and check for blown F5.
	:	:	:	:	:	
010	:	:	:	:	<u>1</u>	Check Retract capacitor and cabling for shorts/grounds.
	:	:	:	:	:	
011	:	:	:	:	<u>1</u>	Check brake cable connector pins for shorts to ground. If faulty replace per para 3.13.
	:	:	:	:	:	
013	:	:	:	:	<u>1</u>	Replace power supply (para 3.7).
	:	:	:	:	:	
014	<u>1</u>					Problem is in logic chassis. Turn power off and replace fuse(s). Try to isolate load fault to a single logic card. Remove all logic cards. Reinstall one at a time, apply power and check for blown fuse. Replace faulty logic card.

This is a paper only SAM that provides additional troubleshooting information for errors identified by error analysis routine 7220. Test 7220 is automatically executed as a result of an error sensed by test 7201.

- 001 Y N Test 7220 step 002, 004, 007, or 008 error?
: :
- 002 : Y N Test 7220 step 010 or 019 error?
: :
- 003 : : Y N Test 7220 step 013 or 015 error?
: : :
- 004 : : : Y N Test 7220 step 017, 035, or 049 error?
: : : :
- 005 : : : : Y N Test 7220 step 021 error?
: : : : :
- 006 : : : : : Y N Test 7220 step 023 error?
: : : : : :
- 007 : : : : : : Y N Test 7220 step 033 error?
: : : : : : :
- 008 : : : : : : 1 : Verify Bus In and Bus Out cable connections.
: : : : : : :
- 009 : : : : : : 1 : Replace read/write control logic card A2A01.
: : : : : : :
- 010 : : : : : : 2 : Replace write driver logic card A4A02.
: : : : : : :
- 011 : : : : : : 1 : Verify ac power cord is plugged in and power applied to MMD.
: : : : : : :
- 012 : : : : : : 2 : Replace fault/control logic card, A2B02. (1)
: : : : : : :
- 013 : : : : : : 3 : Go to SAM 7270-1.
: : : : : : :
- 014 : 1 1 1 : : Reseat/replace attachment card. (2)
: : : : : : :
- 015 1 2 3 2 : : Replace Bus In logic card (A2A04).
: : : : : : :
- 016 2 3 2 3 : : Replace Bus Out logic card (A2A03).
: : : : : : :
- 017 3 : : : 4 3 : Problem not covered in manual, call for assistance.
: : : : : : :
- 018 : : : : : : 4 4 : Replace Bus In/Bus Out I/O cables.
: : : : : : :
- 019 : : : : : : 5 5 : Go to paper-only SAM 7270.
: : : : : : :

A
 1
 :
 020 Y N Test 7220 step 041 error?
 :
 021 : Y N Test 7220 step 045 error?
 :
 022 : : Y N Test 7220 step 051 or 053 error?
 :
 023 : : : Y N Test 7220 step 054 error?
 :
 024 : : 6 : 1 Problem not covered in manual, call for
 : : : : assistance.
 :
 025 1 : : 1 Replace attachment card. (2)
 :
 026 : : 1 Run write sector ID test 7250 (SAM 7250).
 :
 027 : : 2 Run write/read data test 7230 (SAM 7230).
 :
 028 : : 3 Run error correction code test 7240 (SAM 7240).
 :
 029 : : 4 Run data strobe and track offset routine 72F2
 : : : (SAM 72F2).
 :
 030 : : 5 Run disk data integrity routine 72F1 (SAM 72F1).
 :
 031 : 1 Run first seek test 7221 (SAM 7221).
 :
 032 2 Replace Bus In logic card A2A04.
 :
 033 3 Verify Bus In and Bus Out cable connection.
 :
 034 4 Replace Bus In/Bus Out I/O cables.

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

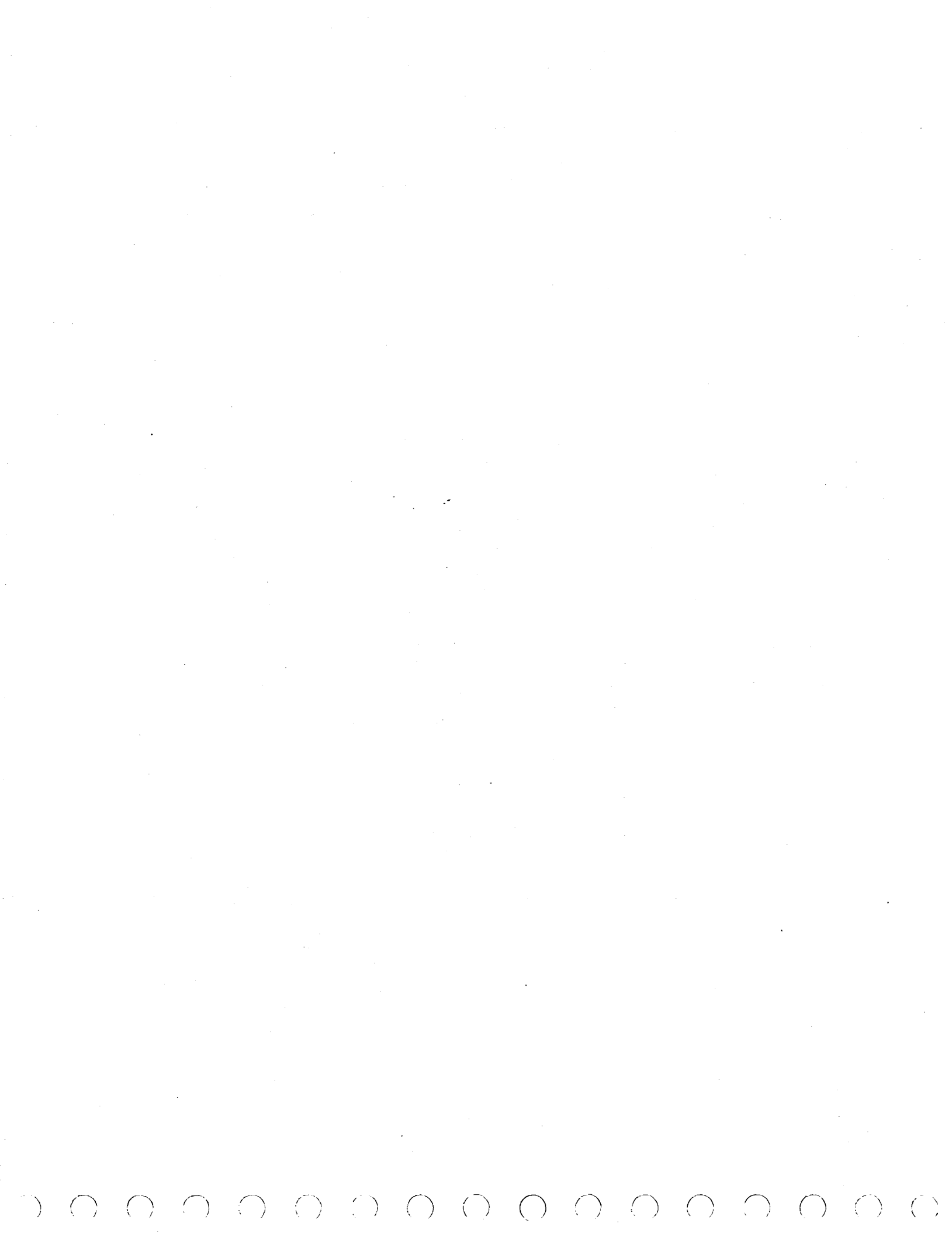
(2) The attachment card contains switches to select MMD device address (refer to Attachment Card and I/O Cable Installation, section 2 of this manual).

This is a paper only SAM that provides additional troubleshooting information for specific errors identified by test 7201 and 7213.

001 Y N Test 7201 step 002, 004, 007, 008, 011, 020, 022, 024,
 : : 031, 033, or 034?
 : :
 002 : Y N Test 7213 step 007 or 019? (2)
 : : :
 003 1 : : Using the cycle steal status as displayed in manual
 : : tests, refer to table A-2 (this appendix) for
 : : error definition.
 : :
 004 1 : Replace A2B03 (Read PLO) card.
 : :
 005 : 1 Problem not covered in manual, call for assistance.
 : :
 006 2 Replace A2A04 (Bus In) card.
 : :
 007 3 Replace logic card at location A2A02 (bit ring),
 : then A2A01 (read/write).
 : :
 008 4 Replace card A4A3/B3 (Read Digital Analog).
 : :
 009 5 Replace card A2B02/C02 (Fault/Control). (1)
 : :
 010 6 Replace A4A1.
 : :
 011 7 Replace A4A2/B2.

(1) Refer to Setting Sector Select Switches, section 2 of this manual for correct switch settings of A2B02/C02.

(2) 7213 step 007 is the first attempt to read data from the media (pack). If initialization is correct and manual test fails on all heads, it may be necessary to replace cards in the read chain per SAM 7282. If only one head fails, replace head select card, steps 009 and 011.



This is a manual test requiring operator interaction. Enter B72F1 to initiate the test. This utility performs read verify commands on the disk to verify primary and alternate sectors. The entire disk or any one track (2) can be selected for read verification. If the mode switch is in the Diagnostic position, the test will stop after each error. It has the capability of manually testing fixed heads. Reference text under Manual Tests for information on how to select correct addresses for heads. Following is a list of the halt codes associated with this utility:

HALT CODE

- 7261 Enter device address to start data integrity test. Reply FXX, where XX = device address.
- 7262 Do you want to verify all cylinders, heads and sectors? Reply 1 = yes, 0 = no.
- 7263 Enter cylinder and head in hex, FCCCHH for cylinder and head to be verified (2).
- 7264 CSS1 error on primary track. CCCC = XXXX, HH = XX, SS = XX. CSS1 = XXXX, error code = XX.
- 7265 Data ECC error on primary track, cylinder = XXXX, head = XX, sector = XX. (1)
- 7266 Device ID not for MMD (wrong device ID). Do you want to restart test? Reply 1 = yes (test restarts), reply 0 = no (program terminates).
- 7267 Enter loop count in hex, FXXXX = count, F0000 = infinite.
- 7268 Sector ID contains wrong cylinder, head, and/or sector, and the flag byte does not indicate a defective sector. Cylinder = XXXX, head = XX, sector = XX. (1)
- 7269 SYNC check error on data field on primary track. CCCC = XXXX, HH = XX, SS = XX (1).
- 726A Sector ID mismatch during alternate processing (3).
- Primary: CCCC = XXXX, HH = XX, SS = XX
- Alternate: CCCC = XXXX, HH = XX, SS = XX

- 726B Sync check error on data field of alternate track. CCCC = XXXX, HH = XX, SS = XX (1)
- 726C CSS1 error on alternate track. CCCC = XXXX, HH = XX, SS = XX. (1) CSS1 = XXXX error code = XX.
- 726D No readable primary sector ID exists, normal or skewed. (1)
- 72A3 Sync check on header field in alternate. CCCC = XXXX, HH = XX, SS = XX.
- 3805 Test completed. For other error codes refer to DCP halt list of para. 3.21.
- 72A2 ECC check on data field in alternate. CCCC = XXXX, HH = XX, SS = XX.
- 72A4 ECC check on header field in alternate. CCCC = XXXX, HH = XX, SS = XX.

(1) When the mode switch is in the diagnostic position and the CPU stops, error information is contained in the following Level 3 registers:

R3 = Halt code	R6 = Sector
R4 = Cylinder	R7 = Error count
R5 = Head	

For error code 7264, R5 = CSS1, R6 = firmware error code.

- (2) If testing a 160 MB MMD, valid seek arguments are:
CCCC = 0000-0336H, HH = 00-09H, SS = 00-3BH.
- (3) R1 = Primary Cyl R5 = Alternate Cyl
R2 = Primary Head R6 = Alternate Head
R3 = Error Code R7 = Alternate Sector
R4 = Primary Sector

This is a manual test requiring operator interaction. Enter B72F2 to initiate the test. This is a utility which reads and verifies the CE cylinder with user-specified data recovery options. If the mode switch is in the Diagnostic position, the test will stop after each error. The following is a list of console codes used and their meanings:

CONSOLE
CODE

72F2: 72B0 Enter device address for margins tests, FXX
72B1 Do you wish negative offset? (1 = Yes, 0 = No)
72B2 Do you wish positive offset? (1 = Yes, 0 = No)
72B3 Do you wish strobe late? (1 = Yes, 0 = No)
72B4 Do you wish strobe early? (1 = Yes, 0 = No)
72B5 No MMD at the requested device address in the
 configuration table/or not MMD device ID.
72B6 End of test.
72B7 Data error occurred. (1)
72B8 Do you wish to loop? (1 = Yes, 0 = No) If the
 loop on utility prompt is answered with a yes
 response, it becomes necessary to re-IPL to get
 out of the loop. For other error codes see DCP
 halt list, para. 3.21.
72B9 Sector ID error occurred. (1)

(1) When the mode switch is in the diagnostic position and the CPU stops, error information is contained in the following Level 3 registers:

R4 = Cylinder R6 = Sector
R5 = Head R7 = Error count



This is a manual test requiring operator interaction. Enter B72F3 to initiate the test. This is a utility which verifies the IPL logic on the MMD attachment card. This test requires that the MMD be set up properly as an IPL source and that the correct is selected via the Series/1 Primary/Alternate IPL source switch. At this time, diagnostic IPL capabilities exist only on the FA740B or FA740C (LSI) attachment cards. Use of this utility to verify the IPL logic of an equipment FA740A (MSI) attachment card will result in a false error indication. Following is a list of the halt codes associated with this utility:

HALT CODE

F300 Enter device address of the MMD to be tested.

F301 An error has occurred which makes it impossible to verify the IPL logic. Running the basic tests 7200 on this device should isolate the problem. Enter a 0 to terminate the utility or enter a 1 to restart the utility.

F302 The MMD has been placed in diagnostic IPL mode. Prior to IPLing the system, ensure that:

1. The MMD attachment card is properly designated as an IPL source and that no other device is configured to conflict with this.
2. The Series/1 Primary/Alternate IPL source switch is in the proper position to select this MMD.

IPL the Series/1 by operating the IPL button on the console. If the IPL is recognized by the MMD, a halt code of F303 or F304 will appear. Certain errors may occur that will cause the system to go to sleep. These include:

1. The precautions under halt code F302 were not followed.
2. The MMD in questions does not support diagnostic IPL capability.
3. The MMD attachment card is faulty. Replace it. See section 2 of this manual, Attachment Card and I/O Cable Installation.

HALT CODE

- F303 The IPL sequence was not correctly completed, replace the MMD attachment card. Enter a 0 to terminate the utility or enter a 1 to restart the utility.
- F304 The IPL sequence completed correctly. The IPL logic on the attachment card is good. Enter a 0 to terminate the utility or enter a 1 to restart the utility.

This appendix contains:

- Description of diagnostic tests -- Briefly describes each of the FDD diagnostic programs on the CDC BASIC diskette.
- Description of cycle steal status words -- Describes significance of the FDD cycle steal status words.
- SAMS covering the FDD diagnostic tests and paper-only troubleshooting. The SAMS are categorically numbered as follows:
 - SAMS 4600 through 4621 correspond to the FDD diagnostic tests on the CDC BASIC diskette. Each SAM and corresponding diagnostic program have the same number.
 - SAMS 4670 through 4673 are paper-only listings that supplement the diagnostic program SAMS.

DESCRIPTION OF DIAGNOSTIC TESTS

The following paragraphs describe the FDD auto-diagnostic tests and FDD manual diagnostic tests that are on the CDC BASIC diskette.

FDD AUTO-DIAGNOSTIC TESTS

The following FDD auto-diagnostic tests 4600 through 4603 are linked together. Execution starts with the test that is called-up. Each following test then executes in succession until last test 4603 finishes or an error occurs.

4600 Channel Interface Test

Test 4600 checks the operation of the attachment card under direct program control (DPC) using all legal DCP commands and various illegal command codes. Condition codes returned are checked for command acceptance or rejection as applicable. The test then issues a start diagnostic 1 command and verifies that:

- The read-only memory (ROM) on attachment card outputs the correct checksum.
- The diskette in the FDD is rotating at the correct speed.
- The attachment card and FDD are ready.

If an incorrect speed or not ready condition exists, the test reads cycle steal status and an automatic branch to routine 4620 occurs to define the problem.

This test automatically branches to test 4601.

4601 Attachment Test

Test 4601 checks if the attachment card responds properly to illegal device control blocks (DCBs). After verifying that no preset error condition exists, the test issues various invalid DCBs in cycle steal mode. For each DCB issued, the test checks that the attachment card:

- Returns an interrupt condition code of unit exception.
- Sets bit 3 of the interrupt status byte for DCB specification check.
- Indicates the proper error condition in the error-log byte (second byte) of cycle steal status word 4.

If a preset error condition is present at the beginning of the test, an automatic branch to routine 4620 occurs to define the problem.

This test automatically branches to test 4602.

4602 Seek and Read Sector ID Test

Test 4602 checks if the FDD and attachment card can do seek and read sector ID operations correctly. The seek instructions issued by the test cause the following head movement sequence:

- Recalibration seek (heads to cylinder 00).
- One-track incremental seeks from cylinder 00 to cylinder 74, followed by one-track decremental seeks back to cylinder 00 using head 0.
- Repeat of one-track incremental/decremental seeks using head 1.
- Forward and reverse seeks starting from cylinder 00 to cylinder 74 using head 0, then to cylinder 01, cylinder 73, cylinder 02, cylinder 72, etc until cylinder 26 is reached.
- Repeat of forward/reverse seeks using head 1.

To verify that the selected head is on the correct cylinder, the test chains each seek with a read sector ID and samples the cylinder number of the ID field that is read. If a seek and read sector ID operation is not completed, the test reads cycle steal status and an automatic branch to routine 4620 occurs to define the problem.

This test automatically branches to test 4603.

4603 Seek and Read Data Test

This last auto-test expands on the seek and read sector ID testing done in test 4602. In addition to seeking and read sector ID, this test checks if the FDD and attachment card can execute read data instructions. After seeking to the designated cylinder and verifying the position of the selected head, the test issues a DCB containing read data instructions. The test then checks that the returned interrupt condition code is device end (successful completion). If a seek, read sector ID, or read data operation is not completed, the test reads cycle steal status and an automatic branch to routine 4620 occurs to define the problem.

The data fields in the following diskette locations are read by both heads during the test:

- Sectors 01 and 15 of cylinder 74.
- Sector 01 of cylinders 01, 73, 02, 72, 03, and 71.

FDD MANUAL DIAGNOSTIC TESTS

Descriptions of the FDD manual diagnostic tests follow. These tests fall into two categories:

- Tests 4610 and 4611 -- not linked together and each requires operator interaction.
- Tests 4620 and 4621 -- linked tests that do not require operator interaction.

4610 Write Sector ID and Data Test

Test 4610 checks if the FDD and attachment card can format sectors and write data correctly. If the test is run on a CDC diskette (the BASIC diskette or a scratch diskette), the write-protect slot of the diskette jacket must be covered with a piece of opaque tape. The writing done in the test occurs on cylinders 01, 02, 03, 74, 75, and 76. On the BASIC diskette, these cylinders are allotted for scratch use (CE cylinders).

The sequence of the test is as follows:

- A recalibration seek is done to place the heads at cylinder 00.
- A seek is made to cylinder 01 using head 0 and a read sector ID performed to verify head position.
- Cylinder 01 is formatted into 15 sectors using head 0 and words of 5555₁₆ are written in each data field. The sector IDs and data that has been written is then read verified by the attachment card.

- The data field in sector 01 of the newly formatted track is read back and the 5555₁₆ words verified by the test.
- Head 1 is selected and that track of the cylinder is formatted and verified the same.
- The test then continues to cylinder 02 and the process is repeated. At the end of the test, cylinders 01, 02, 03, 74, 75, and 76 are all reformatted.

If the formatting/read verifying of a track is not completed, the test reads cycle steal status and an automatic branch to routine 4620 occurs to define the problem.

4611 Write/Read Address Marker Test

This test checks if the FDD and attachment card can write data-address markers and control-address markers in data fields correctly, and if the attachment card reacts correctly when the markers are read back in a read data operation. The sequence of the test is similar to test 4610, except that:

- Instead of writing sector format and 5555₁₆ data words, the test writes random data and either a data-address marker or a control-address marker in the first sector of the cylinders that are CE cylinders on the BASIC diskette. Data-address markers are written on cylinders 01, 03, and 75 and control-address markers on cylinders 02, 74, and 76.
- Instead of reading back written data for verification, the test does a read data following each write to check attachment card reaction to the address marker. On cylinders that a data-address marker is written, the test checks that an interrupt condition code of device end is returned and that the interrupt status byte equals 00₁₆. On cylinders that a control-address marker is written, the test checks that an interrupt condition code of unit exception is returned and that the interrupt status byte equals 80₁₆ (device status available).
- Following each read data, the test reads cycle steal status to check status word 1. On cylinders with a data-address marker, the test checks that word 1 equals 0000₁₆. On cylinders with a control-address marker, the test checks that word 1 equals 1000₁₆ (control-address marker found).

After the test is completed, test 4610 must be run to delete the control-address markers that have been written on the diskette. Otherwise, later use of that diskette will cause error stoppage in auto-test 4603.

4620 Cycle Steal Status Analysis Routine

This routine analyzes cycle steal status word 5 and the error-log byte of word 4 that has been read from the attachment card. (These and the other status words are defined in the Description of Cycle Steal Status Words that follows.) The start cycle steal status command that transfers this information from the attachment card is issued in the auto-test or manual test that was in process before this routine. That test may either stop and instruct the running of this routine or enter it automatically through branching.

Sequentially, the routine:

- Displays the six cycle steal status words in hexadecimal on the assigned alternate console.
- Analyzes the FDD health parameters given in status word 5 and if a failure is recorded, the routine stops and indicates the failure.
- If no failure is recorded in status word 5, the routine continues and decodes the error-log byte of status word 4 and indicates the result. If necessary, an automatic branch to routine 4621 occurs to complete the decoding.

4621 Continuation of Cycle Steal Status Analysis

This routine only executes when the decoding of the error-log byte cannot be completed by routine 4620.

DESCRIPTION OF CYCLE STEAL STATUS WORDS

A start cycle steal status command transfers status words to the Series/1 processor. The significance of the six status words for the FDD is described in the following paragraphs.

CYCLE STEAL STATUS WORD 0 (Residual Address)

When a cycle steal transfer is halted, the processor storage address where the last cycle steal of data occurred remains in the address counter of the attachment card. This is the residual

address and is accessible as cycle steal status word 0. If the last attempted transfer was a word, the residual address is the address of the odd byte of the word. Execution of a start cycle steal status command does not affect this address.

CYCLE STEAL STATUS WORD 1 (FDD Status)

This word provides the status at the time of the terminating interrupt of the last start command. See table B-1.

TABLE B-1. CYCLE STEAL STATUS WORD 1 DEFINITION

BIT	TITLE	SIGNIFICANCE
0	Not used	
1	No data field found	Set to 1 if the sector specified in a read data or read verify operation was located, but not the associated data field.
2	Overrun	Set to 1 if the processor did not service the cycle steal request within 48 microseconds during a cycle steal transfer operation. This occurs when demands for I/O activity exceeds the capability of the system channel.
3	Control-address marker found	Set to 1 if a control-address marker was found in front of the specified data field. The read data operation ends after the sector data field containing the control-address marker has been transferred into processor storage. (No check for control-address markers is made during a read verify operation.)
4	File not ready	Set to 1 if the FDD is not ready to execute or drops ready while executing a seek, recalibration seek, write data, read data, read verify, read sector ID, or format track operation.

TABLE B-1. CYCLE STEAL STATUS WORD 1 DEFINITION (CONTD)

BIT	TITLE	SIGNIFICANCE
5	No record found	Set to 1 if the sector specified in the operation was not found after at least one revolution of the diskette. If the bit is set after a read sector ID operation, the FDD did not find any sector IDs on the track (suspect an unformatted or defective track).
6	End of track	Set to 1 if the last logical sector on track is detected before completing a multiple-sector operation.
7	File data check	Set to 1 if a data error is detected on diskette. Cyclic redundancy check bytes are recorded at the end of each sector ID and data field to provide error detection.
8	Index pulse at incorrect time	Set to 1 if diskette speed differs more than 3.5 percent from 360-rpm nominal speed.
9	Invalid diskette side selected	Set to 1 if head 1 is selected for a seek operation on a single-sided diskette.
10	Not used	
11	Not used	
12	Not used	
13	Not used	
14	Not used	
15	Not used	

CYCLE STEAL STATUS WORDS 2 AND 3 (Search Argument)

If a read data, write data, or read verify operation preceded the reading of status, words 2 and 3 contain the search argument used in that operation. If the operation was not completed, the words indicate the sector location that was being accessed when the operation ended. This information is useful if the operation failed because of a data error (bit 7 of status word 1 set). The words indicate the search argument as follows:

- Word 2 -- the first byte (bits 0 through 7) indicates the sector length (00₁₆ for 128-byte sector, 01₁₆ for 256-byte sector, or 02₁₆ for 512-byte sector), the second byte (bits 8 through 15) indicates the cylinder number (00 through 4C₁₆).
- Word 3 -- the first byte indicates the selected head (00₁₆ for head 0, 01₁₆ for head 1), the second byte indicates the sector number (01 through 1A₁₆ for 128-byte sectors, 00 through 0F₁₆ for 256-byte sectors, or 00 through 08₁₆ for 512-byte sectors).

CYCLE STEAL STATUS WORD 4 (Additional FDD Status and Error Log)

Bits 0 through 7 of word 4 supplement the FDD status given in word 1. The significance of these bits is defined in table B-2.

Bits 8 through 15 of word 4 contain a code that indicates the type of error encountered during execution of the last command. This code is defined in table B-3.

TABLE B-2. CYCLE STEAL STATUS WORD 4, BYTE 1 DEFINITION

BIT	TITLE	SIGNIFICANCE
0	Index	Index pulse was detected when cycle steal status words were updated.
1	Write protect active	The diskette in FDD has the write-protect slot in its jacket uncovered activating write protect.
2	Heads engaged	Attachment card has instructed the FDD to load heads.
3	Seek error	The attachment card was unable to verify that the desired cylinder was reached in seek.
4	Write fault	A fault caused data to be improperly written on diskette. Possible faults are: <ul style="list-style-type: none"> • Write enabled without heads loaded • Write enabled without write data • Write enabled without erase current

TABLE B-2. CYCLE STEAL STATUS WORD 4, BYTE 1 DEFINITION (CONTD)

BIT	TITLE	SIGNIFICANCE
5	Track 00	The FDD heads are positioned at cylinder 00.
6	DRQ	Data request is active on attachment card indicating FDD is still attempting to transfer data.
7	FDC busy	The FDD controller chip on attachment card was executing a command when cycle steal status words were updated.

TABLE B-3. CYCLE STEAL STATUS WORD 4, BYTE 2 DEFINITION

HEXADECIMAL ERROR CODE	SIGNIFICANCE
00	No error occurred.
01	DCB input flag set in output operation.
02	DCB input flag not set in input operation.
03	Illegal control word modifier contained in DCB.
04	FDD was not ready when command was issued.
05	A forward seek was specified beyond cylinder 76.
06	A backward seek was specified beyond cylinder 00.
07	DCB byte count not equal to 4 in a read sector ID instruction.
08	A read or write was attempted beyond end of track.
09	The sector register in FDD controller chip on attachment card did not load correctly.
0A	The data register in FDD controller chip on attachment card did not load correctly.
0B	The head-select register on attachment card is incorrect.
0C	Invalid diskette side specified in DCB.
0D	FDD dropped ready during execution of last command.
0E	A FDD write fault occurred.

TABLE B-3. CYCLE STEAL STATUS WORD 4, BYTE 2 DEFINITION (CONTD)

HEXADECIMAL ERROR CODE	SIGNIFICANCE
0F	A FDD seek error occurred.
10	No sector ID field was found.
11	No data field was found.
12	A CRC error occurred.
13	Data was lost in FDD controller chip on attachment card due to overrun.
14	The starting sector in DCB was out of range.
15	The starting storage address in DCB was odd.
16	The byte count in DCB was odd.
17	The sector length in DCB was greater than 02 ₁₆ .
18	A write was attempted on a write-protected diskette.
19	An invalid format data word was given in DCB word 2.
1A	An invalid N byte (sector length) was given in DCB word 3 of a format track instruction.
1B	An invalid C byte (cylinder number) was given in DCB word 3 of a format track instruction.
1C	A command was received from the processor during a FDD malfunction. The problem is identified in cycle steal status word 5.
1D	The DCB head byte differs from the head that is selected.
1E	The track register in FDD controller chip on attachment card did not load correctly.
1F	The diskette-initialize latch on attachment card failed to set for a format track operation.
20	Index was detected before a format track operation was completed on track.
21	The FDD write-enable latch on attachment card failed to set for a write operation.

TABLE B-3. CYCLE STEAL STATUS WORD 4, BYTE 2 DEFINITION (CONTD)

HEXADECIMAL ERROR CODE	SIGNIFICANCE
22	The FDD write-enable latch on attachment card failed to clear after a write operation.
23	The last command was not executed within 1.5 seconds and attachment card aborted the operation.
24 to 80	Not used.
81	The processor issued an interface data check to attachment card.
82	Protect check. The storage-access key given in DCB is invalid.
83	Invalid storage address given in DCB.
84	Storage data check. Data accessed from processor memory was out of parity.
85	Not used.
86	DPC command not accepted by attachment card.
87	Not used.
88	Not used.
89	The attachment card issued an interface data check to the processor.
8A	Not used.
8B	Odd DCB address given in IDCB for a start command (70XX).
8C	Odd chaining address given in DCB for a start command (70XX).
8D to 8F	Not used.
90	Odd DCB address given in IDCB for a start diagnostic 1 command (7DXX).
91	Not used.
92	DCB input flag not set in a start diagnostic 1 command (7DXX).
93	Odd byte count given in DCB for a start diagnostic 1 command (7DXX).

TABLE B-3. CYCLE STEAL STATUS WORD 4, BYTE 2 DEFINITION (CONTD)

HEXADECIMAL ERROR CODE	SIGNIFICANCE
94	Excessive byte count given in DCB for a start diagnostic 1 command (7DXX).
95	Odd storage address given in DCB for a start diagnostic 1 command (7DXX).
96	Odd DCB address given in IDCB for a start diagnostic 2 command (7EXX).
97	Not used.
98	DCB input flag was set in a start diagnostic 2 command (7EXX).
99	Odd byte count given in DCB for a start diagnostic 2 command (7EXX).
9A	Excessive byte count given in DCB for a start diagnostic 2 command (7EXX).
9B	Odd data address given in DCB for a start diagnostic 2 command (7EXX).
9C to A2	Not used.
A3	Odd DCB address given in IDCB for a start cycle steal status command (7FXX).
A4	Not used.
A5	DCB input flag not set in a start cycle steal status command (7FXX).
A6	Odd byte count given in DCB for a start cycle steal status command (7FXX).
A7	Excessive byte count given in DCB for a start cycle steal status command (7FXX).
A8	Odd storage address given in DCB for a start cycle steal status command (7FXX).

CYCLE STEAL STATUS WORD 5 (FDD Health Parameters)

Word 5 contains a record of the FDD health parameters that are monitored by the attachment card when no commands are being executed. See table B-4.

TABLE B-4. CYCLE STEAL STATUS WORD 5 DEFINITION

BIT	SIGNIFICANCE
0	Set to 1 if FDD is not ready -- door open, power not on, or diskette speed 70 percent below nominal 360 rpm.
1	Not used.
2	Set to 1 if FDD I/O cable is disconnected or open.
3	Set to 1 if diskette speed is too high -- speed exceeds nominal 360 rpm by more than 3.5 percent.
4	Set to 1 if diskette speed is too low -- speed below nominal 360 rpm by more than 3.5 percent.
5	Set to 1 if FDD write-fault latch is stuck on.
6	Set to 1 if +20 V from FDD power supply is low.
7	Set to 1 if attachment card 12-V power supply is low.
8	Set to 1 if attachment card reset latch is stuck on.
9	Set to 1 if attachment card test-mode latch is stuck on.
10	Set to 1 if attachment card diskette-initialize latch is stuck on.
11	Set to 1 if attachment card write-fault reset latch is stuck on.
12	Set to 1 if attachment card write-enable latch is stuck on.
13	Set to 1 if attachment card write-enable latch is stuck clear.
14	Set to 1 if attachment card write-request latch is stuck on.
15	Set to 1 if attachment card read-request latch is stuck on.

NOTICE

Before executing the FDD diagnostic tests, read and understand the following:

- If diagnostics are being loaded from a FDD unit other than the one to be tested, the guidelines are:
 - The scratch diskette in test unit must be two-sided and formatted. If contents of the scratch diskette are unknown or it is a new CDC diskette, format the diskette before running diagnostics. To do this:
 - a. IPL the CDC BASIC diskette from alternate FDD.
 - b. Enter B38F9 to call-up general utility program. Then enter F0A to select format routine.
 - c. Replace BASIC diskette in alternate FDD with diskette that is to be formatted.
 - d. Enter F1 to start format routine. After completion, enter F09 to exit from utility program and return BASIC diskette to alternate unit and install scratch diskette in test unit.
 - If diagnostic tests end abnormally (with or without a message) or with a meaningless abort message, check device address switch on attachment card for correct switch settings, reseal the attachment card of the test unit and rerun tests. If the problem persists, replace attachment card and I/O cable one at a time until problem is corrected. Attachment card replacement requires setting switches to select FDD device address and IPL assignment (refer to Attachment Card and I/O Cable Installation, section 2).
- If diagnostics are being loaded from the FDD to be tested, the guidelines are:
 - A scratch diskette cannot be substituted for the BASIC diskette after IPL. Each diagnostic test is read off the BASIC diskette as it is called-up or branched to by the program.
 - If IPL cannot be accomplished from the test unit, go to paper-only SAM 4670 (Power-On and IPL Problems) for troubleshooting information.

- If diagnostic tests do not execute, end abnormally (with or without a message), or end with a meaningless abort message, go to paper-only SAM 4672 (Not Ready Status).
- Diagnostic tests assume that the Series/1 I/O bus is providing +5 +0.5 V to attachment card. To verify voltage is correct, refer to Attachment Card and I/O Cable Installation, section 2.
 - Diagnostic test halts -- when the halt code is a diagnostic test number, level 3 registers contain the following:
 - R0 -- Step number
 - R1 -- Device address and type code (AATT)
 - R3 -- If an abort, pointer to starting address in memory containing additional information
 - Always turn off power to equipment when reseating/replacing attachment card or I/O cable.
 - Rerun diagnostic tests after troubleshooting to verify proper operation.

This is the first of the linked FDD auto-diagnostics on the CDC BASIC diskette. If an improper FDD condition is detected in step 060 or step 064 of this test, a start cycle steal status command is issued. If the attachment card accepts the command, an automatic branch to routine 4620 (SAM 4620) occurs to define the problem.

If the diagnostics are being loaded from a FDD unit other than the one being tested, install a two-sided, formatted diskette in the test unit, enter C4600, and specify the device address of the FDD to be tested using the bit 1 option of command D (para 3.20.3). Otherwise, enter B4600 to run test.

```

001  Y N  System reset.  CC = 7?
      :  :
002  :  1  Unexpected condition code returned.  Replace attach-
      :    ment card. (1)
      :
003  1  Delay for reset to end.
      :
004  Y N  Read device ID command.  CC = 7?
      :  :
      :  1  Go to step 008.
      :
005  Y N  ID = 0106?
      :  :
006  :  1  Incorrect device ID.  Replace attachment card. (1)
      :
007  Y N  Device reset command.  CC = 7?
      :  :
008  :  Y N  Other than CC = 5?
      :  :  :
009  :  :  1  Interface data check.  Replace attachment card. (1)
      :  :
010  :  Y N  Other than CC = 3?
      :  :  :
011  :  :  1  Device reset command rejected.  Replace attachment
      :  :    card. (1)
      :  :
012  :  Y N  Other than CC = 0?
      :  :  :
013  :  :  1  Device not attached.  Reseat attachment card and
      :  :    check that the device address specified by attach-
      :  :    ment card switches match the FDD device address in
      :  :    configurator table.  Enter B38F0 to call-up con-
      :  :    figurator table and refer to Attachment Card and
      :  :    I/O Cable Installation, section 2, for switch
      :  :    assignments.  If error persists, replace attachment
      :  :    card. (1)
      :  :
      2 2
      A B

```



```

A B
1 1
: :
014 : Y N CC = 1?
: :
015 : : 1 Device hung busy. Reseat/replace attachment
: : card. (1)
: :
: : 1 Go to step 016.
: :
016 1 Delay for reset to end.
: :
017 Y N Prepare command. CC = 7?
: :
018 : Y N Other than CC = 5?
: :
019 : : 1 Interface data check. Replace attachment card. (1)
: :
020 : Y N Other than CC = 3?
: :
021 : : 1 Prepare command rejected. Replace attachment
: : card. (1)
: :
022 : Y N Other than CC = 2?
: :
023 : : 1 Device hung busy after reset. Replace attachment
: : card. (1)
: :
024 : Y N Other than CC = 0?
: :
025 : : 1 Device not attached. Reseat attachment card and
: : check that the device address specified by attach-
: : ment card switches match the FDD device address in
: : configurator table. Enter B38F0 to call-up con-
: : figurator table and refer to Attachment Card and
: : I/O Cable Installation, section 2, for switch
: : assignments. If error persists, replace attach-
: : ment card. (1)
: :
026 : Y N Other than CC = 1?
: :
027 : : 1 Device hung busy. Reseat/replace attachment
: : card. (1)
: :
028 : 1 Unexpected condition code returned. If front panel
: : LED for FDD has extinguished, go to paper-only
: : SAM 4670 (Power-On and IPL problems). Otherwise,
: : access drive (para 3.2) and check power cable
: : connections at J7 on FDD power supply board and at
: : attachment card. If connections are secure, verify
: : that +20 +2.4 V is present between return J7-2 and
: : J7-1 and J7-3 on power supply board. If voltage is
: : OK, replace attachment card (1); if voltage is bad,
: : go to paper-only SAM 4673 (Bad Power Supply Voltages).
: :
3

```

```

A
2
:
029 Y N Prepare command, level 3.  CC = 7?
:
: 1 Go to step 034.
:
030 Y N Prepare command, level 2.  CC = 7?
:
: 1 Go to step 034
:
031 Y N Prepare command, level 1.  CC = 7?
:
: 1 Go to step 034.
:
032 Y N Prepare command, level 0.  CC = 7?
:
: 1 Go to step 034.
:
033 Y N Prepare command with odd parity.  CC = 7?
:
034 : Y N Other than CC = 5?
:
035 : : 1 Interface data check.  Replace attachment card. (1)
:
036 : Y N Other than CC = 3?
:
037 : : 1 Prepare command rejected.  Replace attachment
: : card. (1)
:
038 : Y N Other than CC = 2?
:
039 : : 1 Device hung busy after reset.  Replace attachment
: : card. (1)
:
040 : Y N Other than CC = 0?
:
041 : : 1 Device not attached.  Reseat attachment card and
: : check that the device address specified by attach-
: : ment card switches match the FDD device address in
: : configurator table.  Enter B38F0 to call-up con-
: : figurator table and refer to Attachment Card and
: : I/O Cable Installation, section 2, for switch
: : assignments.  If error persists, replace attach-
: : ment card. (1)
:
042 : Y N Other than CC = 1?
:
043 : : 1 Device hung busy.  Reseat/replace attachment
: : card. (1)
:
:
:
4 4
A B

```

```

A B
3 3
:
:
044 : 1 Unexpected condition code returned. If front panel LED
: for FDD has extinguished, go to paper-only SAM 4670
: (Power-On and IPL problems). Otherwise, access drive
: (para 3.2) and check power cable connections at J7 on
: FDD power supply board and at attachment card. If
: connections are secure, verify that +20 +2.4 V is
: present between return J7-2 and J7-1 and J7-3 on
: power supply board. If voltage is OK, replace attach-
: ment card (1); if voltage is bad, go to paper-only
: SAM 4673 (Bad Power Supply Voltages).
:
045 Y N Illegal command 00. CC = 3?
:
:
046 : 1 Unexpected condition code returned. If front panel LED
: for FDD has extinguished, go to paper-only SAM 4670
: (Power-On and IPL problems). Otherwise, access drive
: (para 3.2) and check power cable connections at J7 on
: FDD power supply board and at attachment card. If
: connections are secure, verify that +20 +2.4 V is
: present between return J7-2 and J7-1 and J7-3 on
: power supply board. If voltage is OK, replace attach-
: ment card (1); if voltage is bad, go to paper-only
: SAM 4673 (Bad Power Supply Voltages).
:
047 Y N Illegal command 10. CC = 3?
:
:
048 : 1 Unexpected condition code returned. If front panel LED
: for FDD has extinguished, go to paper-only SAM 4670
: (Power-On and IPL problems). Otherwise, access drive
: (para 3.2) and check power cable connections at J7 on
: FDD power supply board and at attachment card. If
: connections are secure, verify that +20 +2.4 V is
: present between return J7-2 and J7-1 and J7-3 on
: power supply board. If voltage is OK, replace attach-
: ment card (1); if voltage is bad, go to paper-only
: SAM 4673 (Bad Power Supply Voltages).
:
049 Y N Illegal command 3F. CC = 3?
:
:
050 : 1 Unexpected condition code returned. If front panel LED
: for FDD has extinguished, go to paper-only SAM 4670
: (Power-On and IPL problems). Otherwise, access drive
: (para 3.2) and check power cable connections at J7 on
: FDD power supply board and at attachment card. If
: connections are secure, verify that +20 +2.4 V is
: present between return J7-2 and J7-1 and J7-3 on
: power supply board. If voltage is OK, replace attach-
: ment card (1); if voltage is bad, go to paper-only
: SAM 4673 (Bad Power Supply Voltages).
:
051 Y N Device reset command. CC = 7?
:
:
5 5
A B

```


A
5
:
064 Y N Word 6 other than 0040 (not ready status) in diag-
: : nostic 1 response?
:
065 : Y N Start cycle steal status command. CC = 0703?
:
066 : : 1 Cycle steal status failed. replace attachment
: : card. (1)
:
067 : 1 Branch to test 4620 (SAM 4620).
:
068 Y N Word 7 = 6E00 in diagnostic 1 response?
:
069 : 1 Word 7 incorrect. Replace attachment card. (1)
:
070 1 Branch to test 4601 (SAM 4601).

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).

This test links from test 4600 (SAM 4600). If cycle steal status word 4 or 5 indicates an improper FDD condition in step 008 of this test, an automatic branch to routine 4620 (SAM 4620) occurs to define the problem.

```

001  1  Start command with DCB specifying a recalibration seek
      :  to reset cycle steal status word 1.
      :
002  Y N  Start cycle steal status command.  CC = 0703?
      :  :
003  :  1  Incorrect condition code for cycle steal status after
      :  reset.  Replace attachment card.  (1)
      :
004  Y N  ISB = 0000?
      :  :
005  :  1  Incorrect interrupt status byte.  Replace attachment
      :  card.  (1)
      :
006  Y N  Cycle steal status word 1 = 0000?
      :  :
007  :  1  Incorrect cycle steal status word 1.  Replace attach-
      :  ment card.  (1)
      :
008  Y N  Cycle steal status word 4 = XX00 and word 5 = 0000?
      :  :
009  :  1  Branch to test 4620 (SAM 4620).
      :
010  Y N  Start cycle steal status command with input flag bit
      :  :  off in DCB.  CC = 0702 and ISB bit on for DCB specifi-
      :  :  cation check?
      :  :
011  :  1  Incorrect condition code or interrupt status byte.
      :  Replace attachment card.  (1)
      :
012  Y N  Cycle steal status word 4 = XXA5?
      :  :
013  :  1  Incorrect cycle steal status word 4.  Run test 4620
      :  (SAM 4620) to decode status.
      :
014  Y N  Start cycle steal status command with odd byte count
      :  :  in DCB.  CC = 0702 and ISB bit on for DCB specifica-
      :  :  tion check?
      :  :
015  :  1  Incorrect condition code or interrupt status byte.
      :  Replace attachment card.  (1)
      :
016  Y N  Cycle steal status word 4 = XXA6?
      :  :
017  :  1  Incorrect cycle steal status word 4.  Run test 4620
      :  (SAM 4620) to decode status.

```

2

A

```

A
1
:
018 Y N Start cycle steal status command with too large a byte
: : count in DCB. CC = 0702 and ISB bit on for DCB
: : specification check?
: :
019 : 1 Incorrect condition code or interrupt status byte.
: Replace attachment card. (1)
:
020 Y N Cycle steal status word 4 = XXA7?
: :
021 : 1 Incorrect cycle steal status word 4. Run test 4620
: (SAM 4620) to decode status.
:
022 Y N Start cycle steal status command with odd data address
: : in DCB. CC = 0702 and ISB bit on for DCB specifica-
: : tion check?
: :
023 : 1 Incorrect condition code or interrupt status byte.
: Replace attachment card. (1)
:
024 Y N Cycle steal status word 4 = XXA8?
: :
025 : 1 Incorrect cycle steal status word 4. Run test 4620
: (SAM 4620) to decode status.
:
026 Y N Start diagnostic 1 command with input flag bit off in
: : DCB. CC = 0702 and ISB bit on for DCB specification
: : check?
: :
027 : 1 Incorrect condition code or interrupt status byte.
: Replace attachment card. (1)
:
028 Y N Start cycle steal status command. Cycle steal status
: : word 4 = XX92?
: :
029 : 1 Incorrect cycle steal status word 4. Run test 4620
: (SAM 4620) to decode status..
:
030 Y N Start diagnostic 1 command with odd byte count in DCB.
: : CC = 0702 and ISB bit on for DCB specification check?
: :
031 : 1 Incorrect condition code or interrupt status byte.
: Replace attachment card. (1)
:
032 Y N Start cycle steal status command. Cycle steal status
: : word 4 = XX94?
: :
033 : 1 Incorrect cycle steal status word 4. Run test 4620
: (SAM 4620) to decode status.
:
:
3
A

```


A
3
:
048 Y N Start cycle steal status command. Cycle steal status
: : word 4 = XX99?
: :
049 : 1 Incorrect cycle steal status word 4. Run test 4620
: : (SAM 4620) to decode status.
:
050 Y N Start diagnostic 2 command with too large a byte count
: : in DCB. CC = 0702 and ISB bit on for DCB specifica-
: : tion check?
: :
051 : 1 Incorrect condition code or interrupt status byte.
: : Replace attachment card. (1)
:
052 Y N Start cycle steal status command. Cycle steal status
: : word 4 = XX9A?
: :
053 : 1 Incorrect cycle steal status word 4. Run test 4620
: : (SAM 4620) to decode status.
:
054 Y N Start diagnostic 2 command with odd data address in
: : DCB. CC = 0702 and ISB bit on for DCB specification
: : check?
: :
055 : 1 Incorrect condition code or interrupt status byte.
: : Replace attachment card. (1)
:
056 Y N Start cycle steal status command. Cycle steal status
: : word 4 = XX9B?
: :
057 : 1 Incorrect cycle steal status word 4. Run test 4620
: : (SAM 4620) to define status.
:
058 Y N Start command with illegal control word modifier in
: : DCB. CC = 0702 and ISB bit on for DCB specification
: : check?
: :
059 : 1 Incorrect condition code or interrupt status byte.
: : Replace attachment card. (1)
:
060 Y N Start cycle steal status command. Cycle steal status
: : word 4 = XX03?
: :
061 : 1 Incorrect cycle steal status word 4. Run test 4620
: : (SAM 4620) to define status.
:
062 Y N Start command with DCB specifying a read sector ID
: : with byte count other than 4. CC = 0702 and ISB bit
: : on for DCB specification check?
: :
: :
5 5

A B

```

A B
4 4
: :
063 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
064 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX07?
      : :
065 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
066 Y N Start command with DCB specifying too high a sector
      : : number. CC = 0702 and ISB bit on for DCB specifica-
      : : tion check?
      : :
067 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
068 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX14?
      : :
069 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
070 Y N Start command with odd data address in DCB. CC = 0702
      : : and ISB bit on for DCB specification check?
      : :
071 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
072 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX15?
      : :
073 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
074 Y N Start command with odd byte count in DCB. CC = 0702
      : : and ISB bit on for DCB specification check?
      : :
075 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
076 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX16?
      : :
077 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
078 Y N Start command with illegal sector length in DCB.
      : : CC = 0702 and ISB bit on for DCB specification check?
      : :
      : :
6 6
A B

```

```

A B
5 5
:
:
079 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
080 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX17?
      : :
081 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
082 Y N Start command with odd data address in DCB. CC = 0702
      : : and ISB bit on for DCB specification check?
      : :
083 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
084 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX8B?
      : :
085 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
086 Y N Start command with odd chain address in DCB. CC = 0702
      : : and ISB bit on for DCB specification check?
      : :
087 : 1 Incorrect condition code or interrupt status byte.
      : Replace attachment card. (1)
      :
088 Y N Start cycle steal status command. Cycle steal status
      : : word 4 = XX8C?
      : :
089 : 1 Incorrect cycle steal status word 4. Run test 4620
      : (SAM 4620) to decode status.
      :
090 1 Branch to test 4602 (SAM 4602).

```

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).

This test links from test 4601 (SAM 4601). If a seek/read-sector-ID operation fails in the test, a start cycle steal status command is issued. If the attachment card accepts the command, an automatic branch to routine 4620 (SAM 4620) occurs to define the problem.

```

001  Y N  Start command with DCB specifying recalibration seek
      : :  (head 0 to cylinder 00).  CC = 0703 and ISB = 00?
      : :
002  : Y N  Start cycle steal status command.  CC = 0703?
      : : :
003  : : 1  Cycle steal status failed.  Replace attachment
      : :  card. (1)
      : :
004  : Y N  Cycle steal status word 4 = XX00 and word 5 = 0000?
      : : :
005  : : 1  Branch to test 4620 (SAM 4620).
      : :
006  : 1  Recalibration seek failed.  Replace attachment
      :  card. (1)
      :
007  1  Delay for seek to end.
      :
008  Y N  Start command with DCB specifying read sector ID.
      : :  CC = 0703 and ISB = 00?
      : :
009  : Y N  Start cycle steal status command.  CC = 0703 and
      : : :  ISB = 00?
      : : :
010  : : 1  Cycle steal status failed.  Test aborted.  Replace
      : :  attachment card. (1)
      : :
011  : Y N  Cycle steal status word 4 = XX00 and word 5 = 0000?
      : : :
012  : : 1  Branch to test 4620 (SAM 4620).
      : :
013  : 1  Read sector ID failed.  Replace attachment card. (1)
      :
014  Y N  Head 0 at cylinder 00 following recalibration seek?
      : :
015  : 1  Wrong cylinder location for head 0 following recalibration
      :  seek.  Go to paper-only SAM 4672 (Not Ready
      :  Status).
      :
016  Y N  Start command with chained DCBs specifying one-track
      : :  seeks to cylinder 74 using head 0, followed by one-
      : :  track seeks back to cylinder 00.  A read sector ID is
      : :  done between each seek.  Final CC = 0703?
      : :
      2 2
      A B

```

```

A B
1 1
: :
017 : Y N Start cycle steal status command. CC = 0703?
: :
018 : : 1 Cycle steal status failed. Test aborted. Replace
: : attachment card. (1)
: :
019 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: :
020 : : 1 Branch to test 4620 (SAM 4620).
: :
021 : 1 Incremental/decremental seeks with head 0 failed.
: : Replace attachment card. (1)
: :
022 Y N Head 0 at cylinder 00 following incremental/
: : decremental seeks?
: :
023 : 1 Head 0 on wrong cylinder after seeks. Go to paper-
: : only SAM 4672 (Not Ready Status).
: :
024 Y N Start command with chained DCBs specifying one-track
: : seeks to cylinder 74 using head 1, followed by one-
: : track seeks back to cylinder 00. A read sector ID is
: : done between each seek. Final CC = 0703?
: :
025 : Y N Start cycle steal status command. CC = 0703?
: :
026 : : 1 Cycle steal status failed. Test aborted. Replace
: : attachment card. (1)
: :
027 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: :
028 : : 1 Branch to test 4620 (SAM 4620).
: :
029 : 1 Incremental/decremental seeks with head 1 failed.
: : Replace attachment card. (1)
: :
030 Y N Head 1 at cylinder 00 following incremental/decremental
: : seeks?
: :
031 : 1 Head 1 on wrong cylinder after seeks. Replace FDD
: : assembly (para 3.10).
: :
032 Y N Start command with chained DCBs specifying forward and
: : reverse seeks using head 0. Final CC = 0703?
: :
033 : Y N Start cycle steal status command. CC = 0703?
: :
034 : : 1 Cycle steal status failed. Test aborted. Replace
: : attachment card. (1)
: :
3 3
A B SEEK AND READ SECTOR ID TEST (CONTD) SAM 4602-2

```

```

A B
2 2
: :
035 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: :
036 : : 1 Branch to test 4620 (SAM 4620).
: :
037 : 1 Forward/reverse seeks with head 0 failed. Replace
: attachment card. (1)
:
038 Y N Head 0 at cylinder 26 following forward/reverse seeks?
: :
039 : 1 Head 0 on wrong cylinder after seeks. Replace FDD
: assembly (para 3.10).
:
040 Y N Start command with chained DCBs specifying forward and
: : reverse seeks using head 1. Final CC = 0703?
: :
041 : Y N Start cycle steal status command. CC = 0703?
: :
042 : : 1 Cycle steal status failed. Test aborted. Replace
: : attachment card. (1)
: :
043 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: :
044 : : 1 Branch to test 4620 (SAM 4620).
: :
045 : 1 Forward/reverse seeks with head 1 failed. Replace
: attachment card. (1)
:
046 Y N Head 1 at cylinder 26 following forward/reverse seeks?
: :
047 : 1 Head 1 on wrong cylinder after seeks. Replace FDD
: assembly (para 3.10).
:
048 1 Branch to test 4603 (SAM 4603).

```

62947905 D

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).




```

A
1
:
:
017 Y N Head 0 at cylinder 74?
:
:
018 : 1 Cylinder does not match previous seek. Replace FDD
: assembly (para 3.10).
:
:
019 Y N Start command with DCB specifying read data from
: : cylinder 74, sector 01. CC = 0703?
:
:
: 1 Go to step 067.
:
:
020 Y N Start command with DCB specifying read data from
: : cylinder 74, sector 15. CC = 0703?
:
:
: 1 Go to step 067.
:
:
021 Y N Start command with DCB selecting head 1. CC = 0703?
:
:
: 1 Go to step 061.
:
:
022 Y N Head 1 at cylinder 74?
:
:
023 : 1 Cylinder does not match previous seek. Replace FDD
: assembly (para 3.10).
:
:
024 Y N Start command with DCB specifying read data from
: : cylinder 74, sector 01. CC = 0703?
:
:
: 1 Go to step 067.
:
:
025 Y N Start command with DCB specifying read data from
: : cylinder 74, sector 15. CC = 0703?
:
:
: 1 Go to step 067.
:
:
026 Y N Start command with DCB specifying seek to cylinder 01
: : using head 0. CC = 0703?
:
:
: 1 Go to step 061.
:
:
027 Y N Head 0 at cylinder 01?
:
:
028 : 1 Cylinder does not match previous seek. Replace FDD
: assembly (para 3.10).
:
:
029 Y N Start command with DCB specifying read data from
: : cylinder 01, sector 01. CC = 0703?
:
:
: 1 Go to step 067.
:
:
:
:
3
A

```

A
 2
 :
 030 Y N Start command with DCB selecting head 1. CC = 0703?
 :
 : 1 Go to step 061.
 :
 031 Y N Start command with DCB specifying read data from
 : : cylinder 01, sector 01.
 : :
 : 1 Go to step 067.
 :
 032 Y N Start command with DCB specifying seek to cylinder 73
 : : using head 0. CC = 0703?
 : :
 : 1 Go to step 061.
 :
 033 Y N Head 0 at cylinder 73?
 : :
 034 : 1 Cylinder does not match previous seek. Replace FDD
 : : assembly (para 3.10).
 : :
 035 Y N Start command with DCB specifying read data from
 : : cylinder 73, sector 01. CC = 0703?
 : :
 : 1 Go to step 067.
 :
 036 Y N Start command with DCB selecting head 1. CC = 0703?
 : :
 : 1 Go to step 061.
 :
 037 Y N Start command with DCB specifying read data from
 : : cylinder 73, sector 01. CC = 0703?
 : :
 : 1 Go to step 067.
 :
 038 Y N Start command with DCB specifying seek to cylinder 02
 : : using head 0. CC = 0703?
 : :
 : 1 Go to step 061.
 :
 039 Y N Head 0 at cylinder 02?
 : :
 040 : 1 Cylinder does not match previous seek. Replace FDD
 : : assembly (para 3.10).
 : :
 041 Y N Start command with DCB specifying read data from
 : : cylinder 02, sector 01.
 : :
 : 1 Go to step 067.
 :
 :
 :
 4
 A

```

A
3
:
042 Y N Start command with DCB selecting head 1.  CC = 0703?
:
: 1 Go to step 061.
:
043 Y N Start command with DCB specifying read data from
: : cylinder 02, sector 01.  CC = 0703?
:
: 1 Go to step 067.
:
044 Y N Start command with DCB specifying seek to cylinder 72
: : using head 0.  CC = 0703?
:
: 1 Go to step 061.
:
045 Y N Head 0 at cylinder 72?
:
046 : 1 Cylinder does not match previous seek.  Replace FDD
: : assembly (para 3.10).
:
047 Y N Start command with DCB specifying read data from
: : cylinder 74, sector 01.  CC = 0703?
:
: 1 Go to step 067.
:
048 Y N Start command with DCB selecting head 1.  CC = 0703?
:
: 1 Go to step 061.
:
049 Y N Start command with DCB specifying read data from
: : cylinder 72, sector 01.  CC = 0703?
:
: 1 Go to step 067.
:
050 Y N Start command with DCB specifying seek to cylinder 03
: : using head 0.  CC = 0703?
:
: 1 Go to step 061.
:
051 Y N Head 0 at cylinder 03?
:
052 : 1 Cylinder does not match previous seek.  Replace FDD
: : assembly (para 3.10).
:
053 Y N Start command with DCB specifying read data from
: : cylinder 03, sector 01.  CC = 0703?
:
: 1 Go to step 067.
:
:
:
:
5
A

```



```

A B
5 5
: :
069 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: : :
070 : : 1 Branch to test 4620 (SAM 4620).
: : :
071 : Y N Cycle steal status word 1 = 1000?
: : :
072 : : 1 Incorrect condition code returned for read data.
: : Replace attachment card. (1)
: : :
073 : 1 Control address marker encountered in read data
: operation. This occurs if diskette in FDD was used
: in a prior running of manual test 4611 (write/read
: address marker test). Run test 4610 (SAM 4610) to
: delete the control address markers that test 4611 has
: written on diskette. Then rerun this auto test.
: :
074 : 1 Auto-tests completed successfully.

```

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).

This FDD manual diagnostic test formats cylinders 01, 02, 03, 74, 75, and 76 into 15 sectors per track, writes words of 5555₁₆ in sector data fields, has the attachment card read verify the written cylinders, and reads the data back and checks for errors. If the recalibration seek in step 004 or the formatting/read verifying of a track fails, the test issues a start cycle steal command. If status indicates an improper FDD condition, an automatic branch to routine 4620 occurs to define the problem.

The guidelines for running the test are:

- If the diagnostics are being loaded from a FDD unit other than the one to be tested, the scratch diskette in the test unit must be two-sided, formatted, and if its a CDC diskette, the write-protect slot in the jacket must be covered with opaque tape. Call-up the test by entering C4610 and specify the device address of the FDD to be tested using the bit 1 option of command D (para 3.20.3).
- If the diagnostics are being loaded from the FDD to be tested, observe the following caution note and run the test on the BASIC diskette (writing done in test occurs on the CE cylinders). Entering B4610 calls-up the test. After the test is loaded, remove the diskette and cover the write-protect slot in jacket with opaque tape. Reinstall the diskette and begin the test.

CAUTION

If this test is run on the BASIC diskette, a malfunction may destroy program data. For a safeguard, do not run the test unless auto-tests 4600, 4601, and 4602 have completed successfully or the faulty module has been replaced.

```
001,002  Y N  Wish to run this test and write on CE cylinders of
          : :  diskette?  If so, remove diskette, cover write-
          : :  protect slot, and reinstall before answering.
          : :  Enter 1 for yes, 0 for no.
          : :
003      : 1  No write commands were executed.  Test 4610
          :    terminated.
          :
          2
          A
```


A
3
:
032 Y N Start command with DCB selecting head 1. CC = 0703?
:
:
033 : 1 Incorrect condition code for head-reselection seek.
: Run auto-tests starting with test 4600 (SAM 4600).
:
:
034 Y N Start command with chained DCBs specifying write
: : format on cylinder 02 with words of 5555 in data
: : fields and then read verify. CC = 0703?
:
:
: 1 Go to step 091.
:
035 Y N Start command with chained DCBs specifying read data
: : from cylinder 02. CC = 0703?
:
:
036 : 1 Incorrect condition code for read data. Run auto-
: test 4603 (SAM 4603) or if already run, replace
: attachment card. (1)
:
:
037 Y N Data words read = 5555?
:
:
038 : 1 Incorrect data read from formatted track. Replace
: attachment card (1) and I/O cable one at a time
: (refer to Attachment Card and I/O Cable Installation,
: section 2, for cable routing).
:
:
039 Y N Start command with DCB specifying seek to cylinder 03
: : using head 0. CC = 0703?
:
:
040 : 1 Incorrect condition code for seek. Run auto-tests
: starting with test 4600 (SAM 4600).
:
:
041 Y N Start command with chained DCBs specifying write
: : format on cylinder 03 with words of 5555 in data
: : fields and then read verify. CC = 0703?
:
:
: 1 Go to step 091.
:
042 Y N Start command with chained DCBs specifying read data
: : from cylinder 03. CC = 0703?
:
:
043 : 1 Incorrect condition code for read data. Run auto-
: test 4603 (SAM 4603) or if already run, replace
: attachment card. (1)
:
:
044 Y N Data words read = 5555?
:
:
:
:
:
5 5
A B WRITE SECTOR ID AND DATA TEST (CONTD) SAM 4610-4

A
6
:
071 : 1 Incorrect condition code for read data. Run auto-
: test 4603 (SAM 4603) or if already run, replace
: attachment card. (1)
:
072 Y N Data words read = 5555?
:
073 : 1 Incorrect data read from formatted track. Replace
: attachment card (1) and I/O cable one at a time
: (refer to Attachment Card and I/O Cable Installation,
: section 2, for cable routing).
:
074 Y N Start command with DCB selecting head 1. CC = 0703?
:
075 : 1 Incorrect condition code for head-reselection seek.
: Run auto-tests starting with test 4600 (SAM 4600).
:
076 Y N Start command with chained DCBs specifying write
: : format on cylinder 75 with words of 5555 in data
: : fields and then read verify. CC = 0703?
:
: 1 Go to step 091.
:
077 Y N Start command with chained DCBs specifying read data
: : from cylinder 75. CC = 0703?
:
078 : 1 Incorrect condition code for read data. Run auto-
: test 4603 (SAM 4603) or if already run, replace
: attachment card. (1)
:
079 Y N Data words read = 5555?
:
080 : 1 Incorrect data read from formatted track. Replace
: attachment card (1) and I/O cable one at a time
: (refer to Attachment Card and I/O Cable Installation,
: section 2, for cable routing).
:
081 Y N Start command with DCB specifying seek to cylinder 76
: : using head 0. CC = 0703?
:
082 : 1 Incorrect condition code for seek. Run auto-tests
: starting with test 4600 (SAM 4600).
:
083 Y N Start command with chained DCBs specifying write
: : format on cylinder 76 with words of 5555 in data
: : fields and then read verify. CC = 0703?
:
: 1 Go to step 091.
:
:
:
:
8
A

```

A
7
:
084 Y N Start command with chained DCBs specifying read data
: : from cylinder 76. CC = 0703?
: :
085 : 1 Incorrect condition code for read data. Run auto-
: : test 4603 (SAM 4603) or if already run, replace
: : attachment card. (1)
: :
086 Y N Data words read = 5555?
: :
087 : 1 Incorrect data read from formatted track. Replace
: : attachment card (1) and I/O cable one at a time
: : (refer to Attachment Card and I/O Cable Installation,
: : section 2, for cable routing).
: :
088 Y N Start command with DCB selecting head 1. CC = 0703?
: :
089 : 1 Incorrect condition code for head-reselection seek.
: : Run auto-tests starting with test 4600 (SAM 4600).
: :
090 Y N Start command with chained DCBs specifying write
: : format on cylinder 76 with words of 5555 in data
: : fields and then read verify. CC = 0703?
: :
091 : Y N Start cycle steal status command. CC = 0703?
: : :
092 : : 1 Cycle steal status failed. Test aborted. Replace
: : : attachment card. (1)
: : :
093 : Y N Cycle steal status word 4 = XX00 and word = 0000?
: : :
094 : : 1 Branch to test 4620 (SAM 4620).
: : :
095 : 1 Incorrect condition code for write format/read verify
: : operation. Replace attachment card (1) and I/O cable
: : one at a time (refer to Attachment Card and I/O Cable
: : Installation, section 2, for cable routing).
: :
096 Y N Start command with chained DCBs specifying read data
: : from cylinder 76. CC = 0703?
: :
097 : 1 Incorrect condition code for read data. Run auto-
: : test 4603 (SAM 4603) or if already run, replace
: : attachment card. (1)
: :
098 Y N Data words read = 5555?
: :
: :
: :
: :
9 9
A B WRITE SECTOR ID AND DATA TEST (CONTD) SAM 4610-8

```

A B
8 8
:
:
099 : 1 Incorrect data read from formatted track. Replace
: attachment card (1) and I/O cable one at a time
: (refer to Attachment Card and I/O Cable Installation,
: section 2, for cable routing).
:
100 1 End of test. No error occurred.

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).



This FDD manual diagnostic test writes random data with data-address markers and control-address markers, has the attachment card read verify what is written, and checks if the attachment card reacts correctly when the address markers are read back in a data read. Cylinders 01, 02, 03, 74, 75, and 76 are used in the test. If the recalibration seek in step 004 or a write/read verify fails, the test issues a start cycle steal command. If status indicates an improper FDD condition, an automatic branch to routine 4620 occurs to define the problem.

The guidelines for running the test are:

- If the diagnostics are being loaded from a FDD unit other than the one to be tested, the scratch diskette in the test unit must be two-sided, formatted, and if its a CDC diskette, the write-protect slot in the jacket must be covered with opaque tape. Call-up the test by entering C4611 and specify the device address of the FDD to be tested using the bit 1 option of command D (para 3.20.3).
- If the diagnostics are being loaded from the FDD to be tested, observe the following caution note and run the test on the BASIC diskette (writing done in test occurs on the CE cylinders). Entering B4611 calls-up the test. After the test is loaded, remove the diskette and cover the write-protect slot in jacket with opaque tape. Reinstall the diskette and begin the test.
- After the test is completed, run test 4610 (SAM 4610) to delete the control-address markers that have been written on the diskette. Otherwise, later use of the diskette will cause error stoppage in auto-test 4603.

CAUTION

If this test is run on the BASIC diskette, a malfunction may destroy program data. For a safeguard, do not run the test until the FDD auto-tests have completed successfully.

```
001,002  Y N  Wish to run this test and write on CE cylinders of
          : :  diskette?  If so, remove diskette, cover write-
          : :  protect slot, and reinstall before answering.
          : :  Enter 1 for yes, 0 for no.
          : :
          2 2
          A B      WRITE/READ ADDRESS MARKER TEST      SAM 4611-1
```



```

A B
1 1
:
:
003 : 1 No write commands were executed. Test 4611
: terminated.
:
004 Y N Start command with DCB specifying recalibration
: : seek (head 0 to cylinder 00). CC = 0703 and
: : ISB = 00?
:
005 : Y N Start cycle steal status command. CC = 0703
: : : and ISB = 00?
: : :
006 : : 1 Cycle steal status failed. Test aborted. Replace
: : attachment card. (1)
:
007 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: :
008 : : 1 Branch to test 4620 (SAM 4620).
:
009 : 1 Incorrect condition code or interrupt status byte for
: : recalibration seek. Replace attachment card. (1)
:
010 1 Delay for seek to end.
:
011 Y N Start command with chained DCBs specifying seek to
: : cylinder 01 using head 0 and read sector ID.
: : CC = 0703, ISB = 00, and cylinder = 01?
:
012 : 1 Incorrect condition code, interrupt status byte, or
: : cylinder for seek and read sector ID. Run auto-
: : test 4600 (SAM 4600).
:
013 Y N Start command with chained DCBs specifying write data
: : (random data) and data-address markers on cylinder 01
: : and then read verify. CC = 0703 and ISB = 00?
:
: 1 Go to step 091.
:
014 Y N Start command with DCB specifying read data from
: : cylinder 01. CC = 0703 and ISB = 00?
:
015 : 1 Incorrect condition code or interrupt status byte for
: : read data of fields with data-address markers.
: : Replace attachment card (1) and I/O cable one at a
: : time (refer to Attachment Card and I/O Cable Installa-
: : tion, section 2, for cable routing).
:
016 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 0000?
:
:
:
3 3
A B WRITE/READ ADDRESS MARKER TEST (CONTD) SAM 4611-2

```

```

A B
2 2
: :
017 : 1 Incorrect cycle steal status word 1. Replace attach-
      : ment card. (1)
      :
018 Y N Start command with chained DCBs selecting head 1 and
      : specifying read sector ID. CC = 0703, ISB = 00, and
      : cylinder = 01?
      :
019 : 1 Incorrect condition code, interrupt status byte, or
      : cylinder for seek and read sector ID. Run auto-
      : test 4600 (SAM 4600).
      :
020 Y N Start command with chained DCBs specifying write data
      : (random data) and data-address markers on cylinder 01
      : and then read verify. CC = 0703 and ISB = 00?
      :
      : 1 Go to step 091.
      :
021 Y N Start command with DCB specifying read data from
      : cylinder 01. CC = 0703 and ISB = 00?
      :
022 : 1 Incorrect condition code or interrupt status byte for
      : read data of fields with data-address markers.
      : Replace attachment card (1) and I/O cable one at a
      : time (refer to Attachment Card and I/O Cable Installa-
      : tion, section 2, for cable routing).
      :
023 Y N Start cycle steal status command. CC = 0703,
      : ISB = 00, and cycle steal status word 1 = 0000?
      :
024 : 1 Incorrect cycle steal status word 1. Replace attach-
      : ment card. (1)
      :
025 Y N Start command with chained DCBs specifying seek to
      : cylinder 02 using head 0 and read sector ID.
      : CC = 0703, ISB = 00, and cylinder = 02?
      :
026 : 1 Incorrect condition code, interrupt status byte, or
      : cylinder for seek and read sector ID. Run auto-
      : test 4600 (SAM 4600).
      :
027 Y N Start command with chained DCBs specifying write data
      : (random data) and control-address markers on cylin-
      : der 02 and then read verify. CC = 0703 and ISB = 00?
      :
      : 1 Go to step 091.
      :
028 Y N Start command with DCB specifying read data from
      : cylinder 02. CC = 0702 and ISB = 80?
      :
      :
4 4
A B WRITE/READ ADDRESS MARKER TEST (CONTD) SAM 4611-3

```



```

A
4
:
041 Y N Start command with chained DCBs specifying write data
: : (random data) and data-address markers on cylinder 03
: : and then read verify. CC = 0703 and ISB = 00?
: :
: : 1 Go to step 091.
:
042 Y N Start command with DCB specifying read data from
: : cylinder 03. CC = 0703 and ISB = 00?
: :
043 : 1 Incorrect condition code or interrupt status byte for
: : read data of fields with data-address markers.
: : Replace attachment card (1) and I/O cable one at a
: : time (refer to Attachment Card and I/O Cable Installa-
: : tion, section 2, for cable routing).
:
044 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 0000?
: :
045 : 1 Incorrect cycle steal status word 1. Replace attach-
: : ment card. (1)
:
046 Y N Start command with chained DCBs selecting head 1 and
: : specifying read sector ID. CC = 0703, ISB = 00, and
: : cylinder = 03?
: :
047 : 1 Incorrect condition code, interrupt status byte, or
: : cylinder for seek and read sector ID. Run auto-
: : test 4600 (SAM 4600).
:
048 Y N Start command with chained DCBs specifying write data
: : (random data) and data-address markers on cylinder 03
: : and then read verify. CC = 0703 and ISB = 00?
: :
: : 1 Go to step 091.
:
049 Y N Start command with DCB specifying read data from
: : cylinder 03. CC = 0703 and ISB = 00?
: :
050 : 1 Incorrect condition code or interrupt status byte for
: : read data of fields with data-address markers.
: : Replace attachment card (1) and I/O cable one at a
: : time (refer to Attachment Card and I/O Cable Installa-
: : tion, section 2, for cable routing).
:
051 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 0000?
: :
052 : 1 Incorrect cycle steal status word 1. Replace attach-
: : ment card. (1)

```



```

A B
6 6
:
:
064 : 1 Incorrect condition code or interrupt status byte for
: read data of fields with control-address markers.
: Replace attachment card (1) and I/O cable one at a
: time (refer to Attachment Card and I/O Cable Installa-
: tion, section 2, for cable routing).
:
065 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 1000?
: :
066 : 1 Incorrect cycle steal status word 1. Replace attach-
: ment card. (1)
:
067 Y N Start command with chained DCBs specifying seek to
: : cylinder 75 using head 0 and read sector ID.
: : CC = 0703, ISB = 00, and cylinder = 75?
: :
068 : 1 Incorrect condition code, interrupt status byte, or
: cylinder for seek and read sector ID. Run auto-
: test 4600 (SAM 4600).
:
069 Y N Start command with chained DCBs specifying write data
: : (random data) and data-address markers on cylinder 75
: : and then read verify. CC = 0703 and ISB = 00?
: :
: 1 Go to step 091.
:
070 Y N Start command with DCB specifying read data from
: : cylinder 75. CC = 0703 and ISB = 00?
: :
071 : 1 Incorrect condition code or interrupt status byte for
: read data of fields with data-address markers.
: Replace attachment card (1) and I/O cable one at a
: time (refer to Attachment Card and I/O Cable Installa-
: tion, section 2, for cable routing).
:
072 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 0000?
: :
073 : 1 Incorrect cycle steal status word 1. Replace attach-
: ment card. (1)
:
074 Y N Start command with chained DCBs selecting head 1 and
: : specifying read sector ID. CC = 0703, ISB = 00, and
: : cylinder = 75?
: :
075 : 1 Incorrect condition code, interrupt status byte, or
: cylinder for seek and read sector ID. Run auto-
: test 4600 (SAM 4600).
:
:
:
:

```

A
7
:
076 Y N Start command with chained DCBs specifying write data
: : (random data) and data-address markers on cylinder 75
: : and then read verify. CC = 0703 and ISB = 00?
: :
: 1 Go to step 091.
:
077 Y N Start command with DCB specifying read data from
: : cylinder 75. CC = 0703 and ISB = 00?
: :
078 : 1 Incorrect condition code or interrupt status byte for
: : read data of fields with data-address markers.
: : Replace attachment card (1) and I/O cable one at a
: : time (refer to Attachment Card and I/O Cable Installa-
: : tion, section 2, for cable routing).
:
079 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 0000?
: :
080 : 1 Incorrect cycle steal status word 1. Replace attach-
: : ment card. (1)
:
081 Y N Start command with chained DCBs specifying seek to
: : cylinder 76 using head 0 and read sector ID.
: : CC = 0703, ISB = 00, and cylinder = 76?
: :
082 : 1 Incorrect condition code, interrupt status byte, or
: : cylinder for seek and read sector ID. Run auto-
: : test 4600 (SAM 4600).
:
083 Y N Start command with chained DCBs specifying write data
: : (random data) and control-address markers on cylin-
: : der 76 and then read verify. CC = 0703 and ISB = 00?
: :
: 1 Go to step 091.
:
084 Y N Start command with DCB specifying read data from
: : cylinder 76. CC = 0702 and ISB = 80?
: :
085 : 1 Incorrect condition code or interrupt status byte for
: : read data of fields with control-address markers.
: : Replace attachment card (1) and I/O cable one at a
: : time (refer to Attachment Card and I/O Cable Installa-
: : tion, section 2, for cable routing).
:
086 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 1000?
: :
087 : 1 Incorrect cycle steal status word 1. Replace attach-
: : ment card. (1)

9
A

```

A
8
:
088 Y N Start command with chained DCBs selecting head 1 and
: : specifying read sector ID. CC = 0703, ISB = 00, and
: : cylinder = 76?
: :
089 : 1 Incorrect condition code, interrupt status byte, or
: : cylinder for seek and read sector ID. Run auto-
: : test 4600 (SAM 4600).
: :
090 Y N Start command with chained DCBs specifying write data
: : (random data) and control-address markers on cylin-
: : der 76 and then read verify. CC = 0703 and ISB = 00?
: :
091 : Y N Start cycle steal status command. CC = 0703 and
: : : ISB = 00?
: : :
092 : : 1 Cycle steal status failed. Test aborted. Replace
: : attachment card. (1)
: :
093 : Y N Cycle steal status word 4 = XX00 and word 5 = 0000?
: : :
094 : : 1 Branch to test 4620 (SAM 4620).
: : :
095 : 1 Incorrect condition code or interrupt status byte for
: : write data/read verify operation. Replace attachment
: : card (1) and I/O cable one at a time (refer to Attach-
: : ment Card and I/O Cable Installation, section 2, for
: : cable routing).
: :
096 Y N Start command with DCB specifying read data from
: : cylinder 76. CC = 0702 and ISB = 80?
: : :
097 : 1 Incorrect condition code or interrupt status byte for
: : read data of fields with control-address markers.
: : Replace attachment card (1) and I/O cable one at a
: : time (refer to Attachment Card and I/O Cable Installa-
: : tion, section 2, for cable routing).
: :
098 Y N Start cycle steal status command. CC = 0703,
: : ISB = 00, and cycle steal status word 1 = 1000?
: : :
099 : 1 Incorrect cycle steal status word 1. Replace attach-
: : ment card. (1)
: :
100 1 End of test. No error occurred.

```

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).



This routine automatically executes when an improper condition is detected in the FDD auto-tests or in manual tests 4610 or 4611. If the previous test instructed that this routine be run, initiate routine manually by entering B4620. Sequentially, the routine:

- Displays (on assigned alternate console) the six cycle steal status words that were read from the attachment card during the previous test.
- Analyzes the FDD health parameters given in word 5 and if a failure is recorded, the routine stops and indicates the failure.
- If no failure is recorded in word 5, the routine continues and decodes the error-log byte (second byte) of word 4 and indicates the result. If necessary, an automatic branch to routine 4621 (SAM 4621) occurs to complete the decoding.

```

001  1  Display cycle steal status words on assigned alternate
      :  console.
      :
002  Y N  Mask word 5 with 8000.  Bit 0 = 0?
      :  :
003  :  1  FDD not ready -- door open, power not on, or diskette
      :  speed 70 percent below normal.  If FDD power is turned
      :  on and door is closed, go to paper-only SAM 4672 (Not
      :  Ready Status).
      :
004  Y N  Mask word 5 with 2000.  Bit 2 = 0?
      :  :
005  :  1  FDD I/O cable disconnected or open.  Access drive
      :  (para 3.2) and check I/O cable connection on FDD PC
      :  board and attachment card.  If connections are OK,
      :  replace I/O cable (refer to Attachment Card and I/O
      :  Cable Installation, section 2, for cable routing).
      :
006  Y N  Mask word 5 with 0200.  Bit 6 = 0?
      :  :
007  :  1  +20 V from FDD power supply is low.  Access drive
      :  (para 3.2).  Check power cable connections at J7 on
      :  FDD power supply board and at attachment card.  If
      :  connections are OK, go to paper-only SAM 4673 (Bad
      :  Power Supply Voltages).
      :
008  Y N  Mask word 5 with 0100.  Bit 7 = 0?
      :  :
      2 2
      A B          CYCLE STEAL STATUS ANALYSIS ROUTINE      SAM 4620-1

```

```

A B
1 1
:
:
009 : 1 Attachment card +12-V power supply low. Replace
      : attachment card. (1)
      :
010 Y N Mask word 5 with 0800. Bit 4 = 0?
      :
011 : 1 Diskette speed too low. Access drive (para 3.2) and
      : check that 104 to 127 V ac is present between brown
      : and blue (neutral) wires of B1P1 connector at right-
      : rear of FDD. If voltage is OK, replace FDD assembly
      : (para 3.10); if voltage is bad, replace FDD power
      : supply (para 3.10).
      :
012 Y N Mask word 5 with 1000. Bit 3 = 0?
      :
013 : 1 Diskette speed too high. Replace FDD assembly
      : (para 3.10).
      :
014 Y N Mask word 5 with 0400. Bit 5 = 0?
      :
015 : 1 FDD write-fault latch stuck on. Replace FDD assembly
      : (para 3.10) and I/O cable one at a time (refer to
      : Attachment Card and I/O Cable Installation, section 2,
      : for cable routing). After replacement, run test 4610
      : (SAM 4610) to delete any garbled or erased fields that
      : may have been placed on diskette by the malfunction.
      : Otherwise, invalid read errors of data or sector ID
      : may occur in auto-tests when verifying operation.
      :
016 Y N Mask word 5 with 0080. Bit 8 = 0?
      :
017 : 1 Attachment card reset latch stuck on. Replace attach-
      : ment card (1) and I/O cable one at a time (refer to
      : Attachment Card and I/O Cable Installation, section 2,
      : for cable routing).
      :
018 Y N Mask word 5 with 0040. Bit 9 = 0?
      :
019 : 1 Attachment card test-mode latch stuck on. Replace
      : attachment card. (1)
      :
020 Y N Mask word 5 with 0020. Bit 10 = 0?
      :
021 : 1 Attachment card disk-initialize latch stuck on.
      : Replace attachment card. (1)
      :
022 Y N Mask word 5 with 0010. Bit 11 = 0?
      :
023 : 1 Attachment card write-fault reset latch stuck on.
      : Replace attachment card. (1)

```

3

```

A
2
:
024 Y N Mask word 5 with 0002. Bit 14 = 0?
:
025 : 1 Attachment card write-request latch stuck on. Replace
: attachment card. (1)
:
026 Y N Mask word 5 with 0001. Bit 15 = 0?
:
027 : 1 Attachment card read-request latch stuck on. Replace
: attachment card. (1)
:
028 Y N Mask error-log byte with FF. Byte other than 00?
:
: 1 Go to step 077.
:
029 Y N Error-log byte other than 04?
:
030 : 1 FDD went not ready when last command was issued --
: door open, power not on, or diskette speed 70 percent
: below normal. If FDD power is turned on and door is
: closed, go to paper-only SAM 4672 (Not Ready Status).
:
031 Y N Error-log byte other than 09?
:
032 : 1 Sector register in FDD controller chip on attachment
: card did not load correctly. Replace attachment
: card. (1)
:
033 Y N Error-log byte other than 0A?
:
034 : 1 Data register in FDD controller chip on attachment
: card did not load correctly. Replace attachment
: card. (1)
:
035 Y N Error-log byte other than 0B?
:
036 : 1 Head-select register on attachment card is incorrect.
: Replace attachment card. (1)
:
037 Y N Error-log byte other than 0D?
:
038 : 1 FDD went not ready during execution of last command --
: door open, power not on, or diskette speed 70 percent
: below normal. If FDD power is on and door is closed,
: go to paper-only SAM 4672 (Not Ready Status).
:
039 Y N Error-log byte other than 0E?
:
:
:
:
4 4
A B CYCLE STEAL STATUS ANALYSIS ROUTINE (CONTD) SAM 4620-3

```



```

A B
5 5
:
:
064 : 1 Attachment card write-enable latch failed to clear
: after write operation. Replace attachment card. (1)
: After replacement, run test 4610 (SAM 4610) to delete
: any garbled or erased fields that may have been
: placed on diskette by the malfunction. Otherwise,
: invalid read errors of data or sector ID may occur in
: auto-tests when verifying operation.
:
065 Y N Error-log byte other than 81?
:
:
066 : 1 Interface data check from Series/1 processor to
: attachment card. Replace attachment card. (1)
:
:
067 Y N Error-log byte other than 82?
:
:
068 : 1 Protect check for storage-access key given in DCB.
: Replace attachment card. (1)
:
:
069 Y N Error-log byte other than 83?
:
:
070 : 1 Invalid storage address thought to be given in DCB.
: Replace attachment card. (1)
:
:
071 Y N Error-log byte other than 84?
:
:
072 : 1 Storage data check. Data accessed from Series/1
: memory thought to be out of parity. Replace attach-
: ment card. (1) If condition persists, problem is in
: Series/1.
:
:
073 Y N Error-log byte other than 89?
:
:
074 : 1 Interface data check from attachment card to Series/1
: processor. Attachment card believes a parity error
: occurred on Series/1 I/O bus. Replace attachment
: card. (1) If condition persists, some other device
: attachment card is bad or problem is in Series/1.
:
:
075 Y N Error-log byte other than 23?
:
:
076 : 1 Last command was aborted by attachment card after
: 1.5-second timeout. Go to paper-only SAM 4672 (Not
: Ready Status).
:
:
077 1 Branch to routine 4621 (SAM 4621).

```

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).

A B
 1 1
 :
 :
 017 : 1 Invalid diskette side specified. If a scratch diskette is installed in the FDD being tested, verify that diskette is two-sided. If scratch diskette is OK or BASIC diskette is installed, DCB was decoded incorrectly or FDD is sensing the wrong diskette type. Replace attachment card (1), FDD assembly (para 3.11), and I/O cable one at a time (refer to Attachment Card and I/O Cable Installation, section 2, for cable routing).
 :
 :
 018 Y N Error-log byte other than 14?
 :
 :
 019 : 1 Specified sector is not in range of track formatting. DCB decoded incorrectly. Replace attachment card. (1)
 :
 :
 020 Y N Error-log byte other than 15?
 :
 :
 021 : 1 Starting address for storage accessing is illegal. DCB decoded incorrectly. Replace attachment card. (1)
 :
 :
 022 Y N Error-log byte other than 16?
 :
 :
 023 : 1 Byte count for storage accessing is illegal. DCB decoded incorrectly. Replace attachment card. (1)
 :
 :
 024 Y N Error-log byte other than 17?
 :
 :
 025 : 1 Illegal sector length specified. DCB decoded incorrectly. Replace attachment card. (1)
 :
 :
 026 Y N Error-log byte other than 18?
 :
 :
 027 : 1 Write attempted on write-protected diskette. If test 4610 or 4611 was being run, remove diskette and place a piece of opaque tape over write-protect slot in jacket. Install diskette in FDD and restart test that was in process. If condition persists, replace FDD assembly (para 3.11) and I/O cable one at a time (refer to Attachment Card and I/O Cable Installation, section 2, for cable routing). If any other tests were being run, replace attachment card. (1)
 :
 :
 028 Y N Error-log byte other than 19?
 :
 :
 029 : 1 Invalid format data word. DCB decoded incorrectly. Replace attachment card. (1)
 :
 :
 030 Y N Error-log byte other than 1A?
 :
 :
 :
 3 3
 A B

```

A B
2 2
:
:
031 : 1 Invalid sector length specified for write-format
      : operation. DCB decoded incorrectly. Replace attach-
      : ment card. (1)
      :
032 Y N Error-log byte other than 1B?
      :
033 : 1 Invalid cylinder number specified for write-format
      : operation. DCB decoded incorrectly. Replace attach-
      : ment card. (1)
      :
034 Y N Error-log byte other than 86?
      :
035 : 1 Command under direct program control not accepted by
      : attachment card. DCB decoded incorrectly. Replace
      : attachment card. (1)
      :
036 Y N Error-log byte other than 8B?
      :
037 : 1 Odd DCB address in IDCB for start command. IDCB
      : decoded incorrectly. Replace attachment card. (1)
      :
038 Y N Error-log byte other than 8C?
      :
039 : 1 Odd chain address in DCB for start command. DCB
      : decoded incorrectly. Replace attachment card. (1)
      :
040 Y N Error-log byte other than 90?
      :
041 : 1 Odd DCB address in IDCB for start diagnostic 1
      : command. IDCB decoded incorrectly. Replace attach-
      : ment card. (1)
      :
042 Y N Error-log byte other than 92?
      :
043 : 1 Input flag bit not set in start diagnostic 1 command.
      : DCB decoded incorrectly. Replace attachment card. (1)
      :
044 Y N Error-log byte other than 93?
      :
045 : 1 Odd byte count in DCB for start diagnostic 1 command.
      : DCB decoded incorrectly. Replace attachment card. (1)
      :
046 Y N Error-log byte other than 94?
      :
047 : 1 Excessive byte count in DCB for start diagnostic 1
      : command. DCB decoded incorrectly. Replace attach-
      : ment card. (1)
      :
      :
      :

```

A
3
:
:
048 Y N Error-log byte other than 95?
:
:
049 : 1 Odd storage address in DCB for start diagnostic 1
: command. DCB decoded incorrectly. Replace attachment
: card. (1)
:
:
050 Y N Error-log byte other than 96?
:
:
051 : 1 Odd DCB address in IDCB for start diagnostic 2
: command. IDCB decoded incorrectly. Replace attach-
: ment card. (1)
:
:
052 Y N Error-log byte other than 98?
:
:
053 : 1 Input flag bit set in start diagnostic 2 command. DCB
: decoded incorrectly. Replace attachment card. (1)
:
:
054 Y N Error-log byte other than 99?
:
:
055 : 1 Odd byte count in DCB for start diagnostic 2 command.
: DCB decoded incorrectly. Replace attachment card. (1)
:
:
056 Y N Error-log byte other than 9A?
:
:
057 : 1 Excessive byte count in DCB for start diagnostic 2
: command. DCB decoded incorrectly. Replace attachment
: card. (1)
:
:
058 Y N Error-log byte other than 9B?
:
:
059 : 1 Odd storage address in DCB for start diagnostic 2
: command. DCB decoded incorrectly. Replace attachment
: card. (1)
:
:
060 Y N Error-log byte other than A3?
:
:
061 : 1 Odd DCB address in IDCB for start cycle steal status
: command. IDCB decoded incorrectly. Replace attach-
: ment card. (1)
:
:
062 Y N Error-log byte other than A5?
:
:
063 : 1 Input flag bit not set in start cycle steal status
: command. DCB decoded incorrectly. Replace attachment
: card. (1)
:
:
064 Y N Error-log byte other than A6?
:
:
:
:
:
5 5

A B

CONTINUATION OF CYCLE STEAL
STATUS ANALYSIS (CONTD)

SAM 4621-4

A	B	
4	4	
:	:	
065	<u>1</u>	Odd byte count in DCB for start cycle steal status command. DCB decoded incorrectly. Replace attachment card. (1)
:	:	
066	Y N	Error-log byte other than A7?
:	:	
067	<u>1</u>	Excessive byte count in DCB for start cycle steal status command. DCB decoded incorrectly. Replace attachment card. (1)
:	:	
068	Y N	Error-log byte other than A8?
:	:	
069	<u>1</u>	Odd storage address in DCB for start cycle steal status command. DCB decoded incorrectly. Replace attachment card. (1)
:	:	
070	<u>1</u>	No error or failure reported in cycle steal status. Rerun previous test that was in process. If condition persists, replace attachment card. (1)

(1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).



C D E F

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1 1 1 1
: : : :
009 : : : 2 Problem may be a bad diskette. Replace BASIC
: : : : diskette and try to IPL again.
: : : :
010 : : : 3 Replace attachment card (1) and try to IPL again.
: : : :
011 : : : 4 Replace FDD assembly (para 3.10) and I/O cable one
: : : : at a time (refer to Attachment Card and I/O Cable
: : : : Installation, section 2, for cable routing).
: : : :
012 : : : 5 Problem is in Series/1.
: : : :
013 : : : 1 Go to paper-only SAM 4671 (IPL Fault Isolation).
: : : :
014 : 1 Open FDD door and turn off FDD and Series/1. Reseat
: : attachment card and check that primary/alternate
: : setting of IPL-selection switches on attachment card
: : match setting of IPL Source switch (refer to Attach-
: : ment Card and I/O Cable Installation, section 2, for
: : attachment card switch assignments). Try to IPL
: : again. If condition occurs again, replace attachment
: : card. (1)
: : :
015 : 2 Probable problem in Series/1 I/O bus or operator/
: programmer panel.
: :
016 1 Check that red LED on attachment card is extinguished.
: If LED is lit, replace attachment card. (1)
: :
017 2 If system contains another IPL device, open FDD door,
: turn off Series/1 and other IPL device, and disconnect
: that device attachment card from Series/1. Try to IPL
: again. If IPL is successful, other device either has
: same primary/alternate IPL assignment as FDD or attach-
: ment card for that device is bad.
: :
018 3 Check that +5 ± 0.5 V is present on Series/1 I/O bus
: (Attachment Card and I/O Cable Installation, sec-
: tion 2). If voltage is bad and cannot be adjusted,
: check voltage with attachment card removed. If
: voltage is OK with attachment card removed, replace
: attachment card (1); if voltage remains bad with
: attachment card removed, problem is in Series/1.
: :
019 4 Probable problem in Series/1 processor or operator/
: programmer panel. If not already done, replace
: attachment card (1) to verify problem is in Series/1.

- A B
- 1 1
- : :
- 020 : 1 If spindle motor (top motor on FDD) is running, drive
: : belt is off spindle. Reinstall or replace drive belt
: : (para 3.10).
- : :
- 021 : 2 Check that 104 to 127 V ac is present between brown and
: : blue (neutral) wires of B1P1 connector at right-rear of
: : FDD. If voltage is bad, replace power supply (para 3.10).
- : :
- 022 : 3 Replace FDD assembly (para 3.10).
- : :
- 023 1 Check if circuit breaker on FDD power supply is tripped.
: If so, leave breaker off and disconnect following
: connectors:
- : :
- : • 3-pin B1P1 from right side of FDD
 - : • 7-pin B1P4 from FDD PC board
 - : • 3-pin attachment power cable from J7 on power supply
: board
 - : • 2-pin LED power cable from J6 on FDD power supply
: board
- : :
- : Identify short through following steps:

Steps	Replace if Breaker Trips
a. Turn breaker on.	FDD power supply (para 3.10).
b. Turn breaker off. Connect B1P1 and B1P4 connectors. Turn breaker on.	FDD assembly (para 3.10)
c. Turn breaker off. Connect LED power cable to J6. Turn breaker on.	Switch box assembly (para 3.8)
d. Turn breaker off. Connect attachment power cable to J7. Turn breaker on.	Sequentially: attachment card (1), attachment power cable

- 024 2 Check for +1.5 V between J6-1 and return J6-2 on FDD
: power supply board. If voltage is present, replace
: LED (para 3.8).
- : :
- : :
- 4

This paper-only SAM is to be used when instructed by a diagnostic test or when the diagnostics do not load or execute correctly. The SAM assumes that FDD power was turned on and door was closed when the diagnostics were in process.

Instructions: Open FDD door, access drive, and remove covers (para 3.2).

- 001 Y N Turn on power. LED on front panel light and spindle
 : : motor run?
 : :
 002 : 1 Circuit breaker on FDD power supply is tripped. Leave
 : : breaker off and disconnect following connectors:
 : :
 : : • 3-pin B1P1 from right side of FDD
 : :
 : : • 7-pin B1P4 from FDD PC board
 : :
 : : • 3-pin attachment power cable from J7 on power
 : : supply board
 : :
 : : • 2-pin LED power cable from J6 on FDD power
 : : supply board

Identify short through following steps:

Steps	Replace if Breaker Trips
a. Turn breaker on.	FDD power supply (para 3.10)
b. Turn breaker off. Connect B1P1 and B1P4 connectors. Turn breaker on.	FDD assembly (para 3.10)
c. Turn breaker off. Connect LED power cable to J6. Turn breaker on.	Switch box assembly para 3.8)
d. Turn breaker off. Connect attachment power cable to J7. Turn breaker on.	Sequentially: attachment card (1), attachment power cable

Assumption: Entry from paper-only SAM 4671 or 4672, or low +20 V detected during diagnostic tests.

Instructions: Open FDD door, access drive, and remove covers (para 3.2).

- 001 N Y 104 to 127 V ac present between brown and blue
: : (neutral) wires of B1P1 connector at right-rear of
: : FDD?
: :
002 : N Y +5 +0.25 V present between J4-2 and return J4-3 on
: : : FDD PC board?
: : :
003 : : N Y +24 +2.4 V present between J4-4 and return J4-6
: : : : on FDD PC board?
: : : :
004 : : : N Y +20 +2.4 V present between return J7-2 and
: : : : : J7-1 and J7-3 on FDD power supply board?
: : : : :
005 : : : : 1 Power supply voltages are OK. If low +20 V
: : : : : was reason for entry, check continuity of
: : : : : attachment power cable and replace if open
: : : : : (refer to Attachment Card and I/O Cable
: : : : : Installation, section 2, for cable routing).
: : : : : If continuity is OK, replace attachment
: : : : : card. (1)
: : : : :
006 : : : : 1 Replace power supply (para 3.10).
: : : : :
007 1 1 1 Check that following wires are secure in 12-pin
: : : : : B1P2 connector on right side of FDD power supply.
: : : : :
: : : : : ● 120-V ac unit -- brown circuit breaker wires
: : : : : in pins 4, 9, and 12; blue jumper wires in
: : : : : pin 1 to pin 11 and pin 11 to pin 6.
: : : : :
: : : : : ● 208-V ac unit -- brown circuit breaker wires
: : : : : in pins 7 and 12; blue jumper wires in pin 1
: : : : : to pin 11 and pin 3 to pin 6.
: : : : :
008 : 2 2 If voltage was higher than specified tolerance,
: : : : : replace power supply (para 3.10).
: : : : :
009 2 : : : Replace power supply (para 3.10).
: : : : :
: : : : :
: : : : :
: : : : :
: : : : :
2 2
A B

A B
 1 1
 : :
 010 : 3 Determine whether power supply or a load fault is
 : : causing low +24 V:
 : :
 : : a. Turn power off and disconnect following cables:
 : :
 : : ● 7-pin B1P4 from J4 on FDD PC board
 : :
 : : ● 2-pin LED power cable from J6 on power supply
 : : board
 : :
 : : ● 3-pin attachment power cable from J7 on power
 : : supply board
 : :
 : : b. Turn power on and remeasure for +24 \pm 2.4 V
 : : between pin 4 and return pin 6 of B1P4 connec-
 : : tor. If voltage is still low, replace power
 : : supply (para 3.10).

011 : 4 Isolate load fault -- turn power off and reconnect
 : : cables in following order until +24 V between B1P4-4
 : : and B1P4-6 goes low. Turn power off while making
 : : connections.

Connect	Replace if +24 V Goes Low
Attachment power cable	Attachment card (1)
LED power cable	Switch box assembly (para 3.8).
Not applicable	FDD assembly (para 3.10).

012 3 Determine whether power supply or a load fault is
 : : causing low +5 V:
 : :
 : : a. Turn power off. Disconnect 7-pin B1P4 connector
 : : from J4 on FDD PC board and 2-pin LED power cable
 : : from J6 on power supply board.
 : :
 : : b. Turn power on and remeasure for +5 \pm 0.25 V
 : : between pin 2 and return pin 3 of B1P4 connector.
 : : If voltage is still low, replace power supply
 : : (para 3.10).

A
2013 4 Isolate load fault:

- a. Turn power off and reconnect LED power cable to J6 on power supply board.
- b. Turn power on and check if +5 V between B1P4-2 and B1P4-3 went low. If so, replace switch box assembly (para 3.8); if voltage is still OK, replace FDD assembly (para 3.10).

-
- (1) Set switches on new attachment card for FDD device address and IPL assignment (Attachment Card and I/O Cable Installation, section 2).



COMMENT SHEET

CDC® 80230/80231/80240/80241 Mini Module
MANUAL TITLE: Drive, Hardware Maintenance Manual (Site
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PUBLICATION NO.: 62947905

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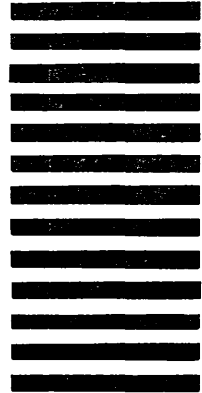
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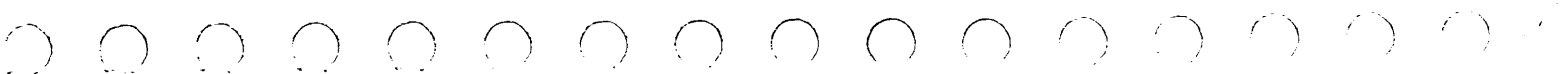
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