

StorageTek

4220 Cartridge Tape Subsystem

**MAINTENANCE
MANUAL**

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CHANGE PAGE

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Various	Incorporated Engineering Changes since last iteration. Added ICRC feature.

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StorageTek®

4220 Cartridge Tape Subsystem

Chapter 1

LOCATIONS

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1. Controller and Drive Locations

1.1. Controller and Drive Overview

The StorageTek 4220 Cartridge Tape Subsystem (Figure 1-1) consists of

- An integrated controller that contains the hardware to
 - Read data
 - Write data
 - Correct data
 - Control data paths
 - Buffer data
 - Control some channel operations
- A microprocessor that manages the data buffer and performs error recovery procedures, and another microprocessor that controls all operations of the tape transport
- A compact, self-threading drive for magnetic tape cartridges. The drive contains
 - A transport: a mechanical assembly that moves and threads tape
 - Electronic circuitry that reads and writes data
 - A microprocessor that controls tape motion
 - Servo electronics
 - Pneumatics
 - An operator control panel

The drive may be on the right side of the unit, as viewed from the front (right-hand mount) or on the left side (left-hand mount).

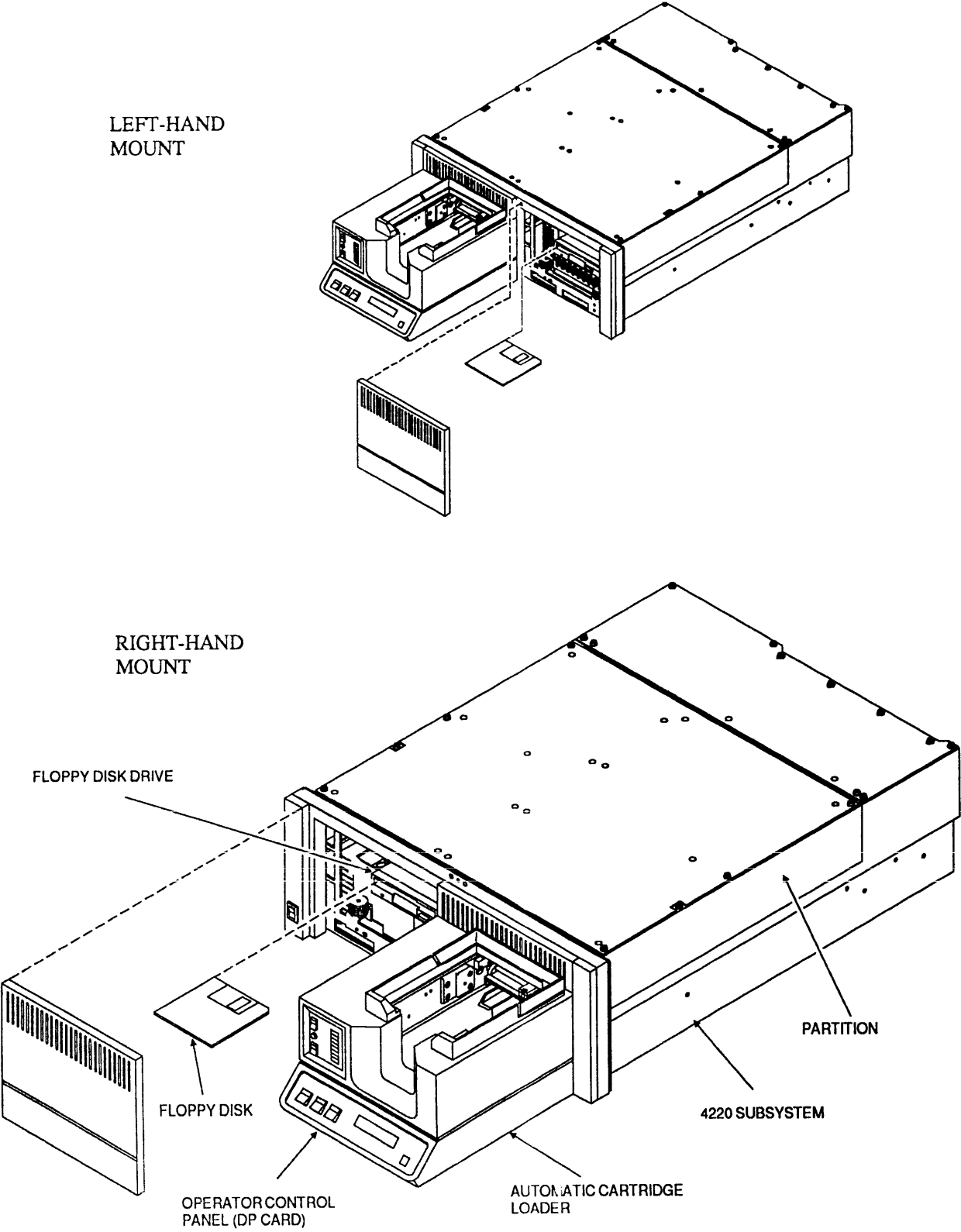


Figure 1 - 1
4220 Cartridge Tape Subsystem

1. 2. Operator Control Panel

An operator control panel (Figure 1-2) contains four momentary push button switches, a 16-character display, and an Alert LED.

This panel is an integral part of the Display (DP) card. Refer to the 4220 operator's manual for a detailed description of the display and switches on this panel

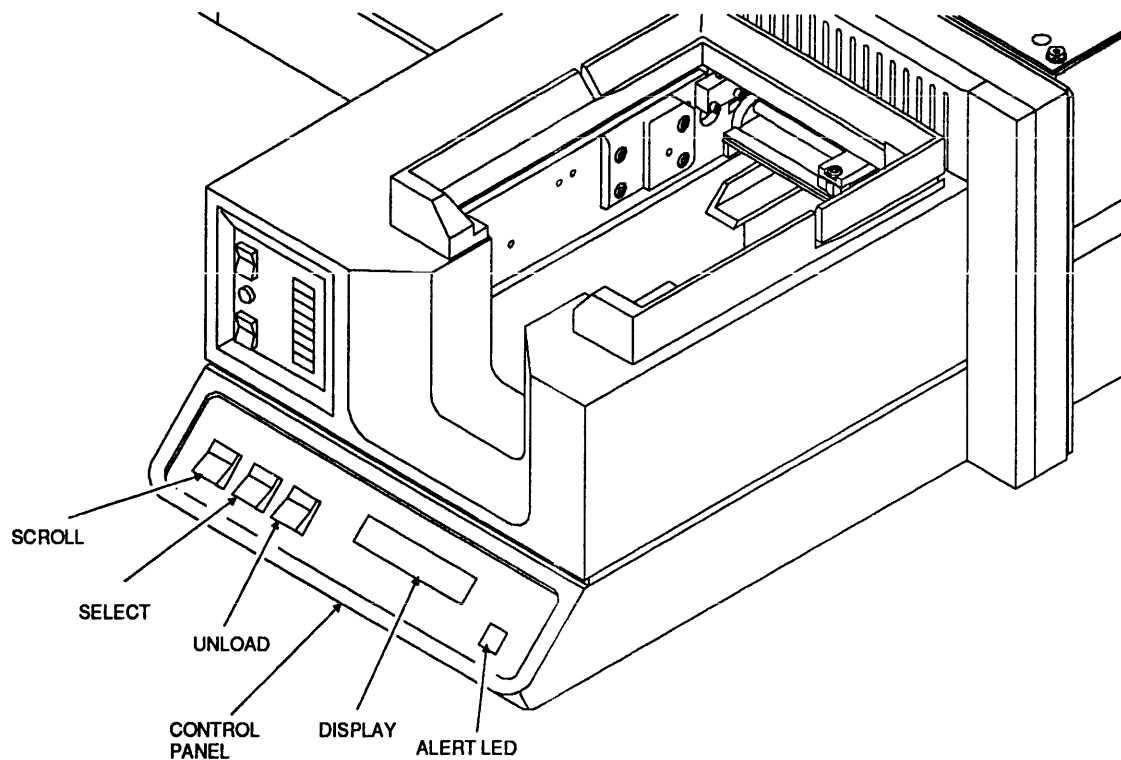


Figure 1 - 2
Control Panel

1. 2. 1. Scroll Button

(Figure 1-2) This button advances the operator control display through a menu list on one level.

1. 2. 2. Select Button

(Figure 1-2) This button either selects or executes a given function or branches the operator display to a lower menu list.

1. 2. 3. Unload Button

(Figure 1-2) Pressing and releasing this button unloads and releases a loaded tape.

1. 2. 4. Operator Display

(Figure 1-2) A one-line, 16-character display posts various drive messages, error codes, and menu items.

1. 2. 5. Alert LED

(Figure 1-2) This LED flashes whenever an operator's attention is required, either when a permanent error or hardware fault has occurred, or when the Alert LED has been directed by the Load Display command to flash for a cartridge mount-message.

1.3. FRU Description

The following FRU's may be replaced by a customer service representative:

- Manual Loader (ML) Card
- Cooling Fans
- Display (DP) Card
- Floppy Drive
- Head Air Valve
- Head Interface (HI) Card
- Servo Transition (ST) Card
- Supply Cartridge Motor with Tach
- System (SB) Card
- Take-Up Reel Motor with Sensor
- Thread Arm Cam with Sensor
- Thread Arm Motor Assembly
- Shorting (SH) Card
- Data Compression (DCI) Card
- Power Interface (PI) Card
- Power Supply
- Read Interface (RI) Card
- Read/Write Head Assembly
- Servo Motion/Servo Power Card (SM/SP FRU Kit)
- Host Interface (SZ) Card
- Input Filter
- Leader Block Locator with Sensor
- Manual Loader
- Output Filter
- Pneumatics Assembly
- Pressure Transducer
- Automatic Cartridge Loader
- Capacitor (CP) Card

1.3.1. Power Supply

(Figure 1-3) Converts ac power to dc and distributes it to controller and transport; contains a cooling fan.

1.3.2. Cooling Fans

(Figure 1-3) Two fans that cool internal components of the subsystem.

1.3.3. Floppy Drive

(Figure 1-3) Reads the floppy disk that contains functional and diagnostic programs.

1.3.4. System (SB or SBI) Card

(Figure 1-6) This card contains the 68010 microprocessor that controls the subsystem's operation, the data buffer, and circuitry that reads and writes data.

1. 3. 5. Read (RI) Interface Card

(Figure 1-6) This card converts the analog signals from the HI card to digital signals; recovers correct timing position of data.

1. 3. 6. Bottom Card

This is an interconnect card; it contains no active components; it is not a FRU.

1. 3. 7. Power Interface (PI) Card

This card regulates the dc voltages for the R/W circuitry and provides pneumatic pump control and drivers. It is inside the power supply.

1. 3. 8. Host Interface Card

(Figure 1-7) This card adapts the protocol of a host channel to the subsystem.

1. 3. 9. Display (DP) Card

This card contains the operator panel and associated electronics.

1. 3. 10. Servo Motion/Servo Power (SM/SP) Card

(Figure 1-6) This card controls movement of cartridge and tape, based on feedback from sensors. This card provides power to the mechanisms that move the cartridge and tape. These cards are available as the SM/SP FRU Kit.

1. 3. 11. Head Interface (HI) Card

(Figure 1-3) This card contains circuitry that amplifies the signals from the read head, the drivers for signals to the write head, and the loop-write-to-read circuitry.

1. 3. 12. Pneumatics Assembly

(Figure 1-3) This assembly supplies air to the bearings and head, to reduce direct contact with the tape.

1. 3. 13. Output Filter

(Figure 1-3) This filters the air leaving the air pump.

1. 3. 14. Input Filter

(Figure 1-3) This filters the air entering the intake of the air pump.

1. 3. 15. Manual Loader

(Figure 1-3) This assembly loads and unloads a cartridge inserted directly by an operator.

1. 3. 16. Read/Write Head Assembly

(Figure 1-4) This is a magnetic pick-up that reads from and writes on tape.

1. 3. 17. Supply Cartridge Motor With Tach

(Figure 1-5) This is the motor that turns the reel inside the cartridge, with the tachometer that measures the speed of this motor.

1. 3. 18. Take-Up Reel Motor With Sensor

The take-up reel motor turns the take-up reel in the transport. It contains the sensor that determines when the leader block is positioned in the leader block locator. The take-up reel is under the locator leader block, and the motor is under the reel.

1. 3. 19. Locator Leader Block With Sensor

(Figure 1-5) The locator block accepts the leader block pin and holds it in place until the take-up reel engages the leader block and tape. The sensor mounted on the locator block detects the leader block in the locator block.

1. 3. 20. Thread Arm Motor Assembly

(Figure 1-4) This assembly draws the leader block and, therefore, the tape, out of the cartridge and moves the leader block to the locator block, thereby threading the tape over the tape path.

1. 3. 21. Head Air Valve

(Figure 1-5) This is an electrically actuated valve that supplies air to lift the tape from the head when the tape stops, and during a locate and rewind.

1. 3. 22. Thread Arm Cam With Sensor

(Figure 1-4) This cam guides the leader block pin properly into the locator block. Attached to the cam is the Thread Arm at Home (TAH) sensor.

1. 3. 23. Pressure Transducer

(Figure 1-5) Senses air pressure being generated by the pneumatic assembly.

1. 3. 24. Servo Transition (ST) Card

(Figure 1-5) An interconnect card for many signals. It enhances serviceability by supplanting many wires between the deck and the servo card.

1. 3. 25. Manual Loader (ML) Card

Contains sensors and switches that monitor load cartridge operations by a manual loader. This card is attached to rear of manual loader.

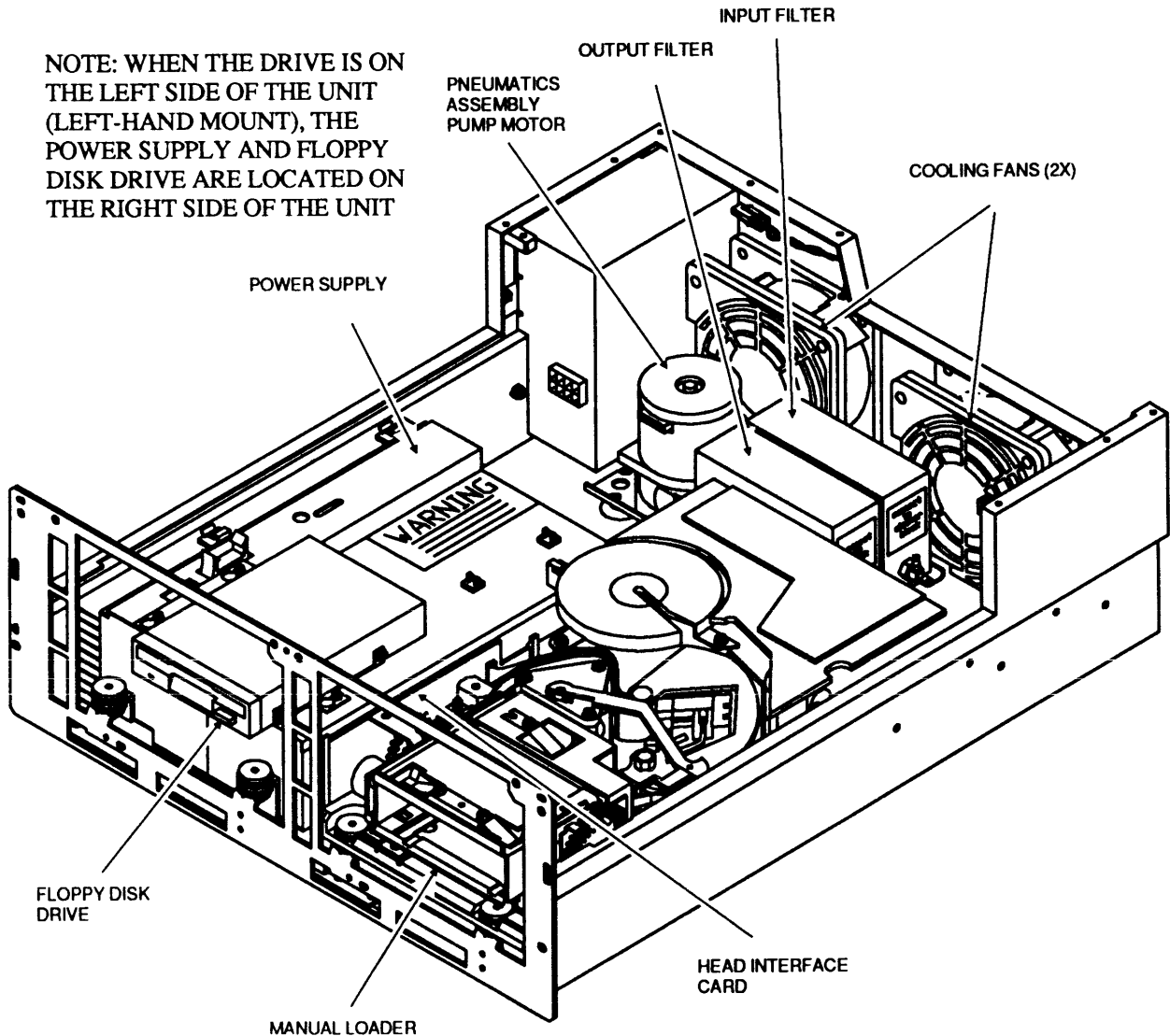


Figure 1 - 3
4220 Drive Module FRUs (Right-hand Mount)

1. 3. 26. Capacitor (CP) Card

(Figure 1-6) This card is current source for servo tensioning system and 24V power supply filter.

1. 3. 27. Automatic Cartridge Loader

(Figure 1-1) A device that loads and unloads, sequentially, as many as ten cartridges that have been stored in a magazine.

1. 3. 28. Data Compression (DCI) Card

(Figure 1-6) Contains circuits which perform ICRC format data compression. This card is optional on ICRC-ready machines, but is included in ICRC-capable machines from the factory.

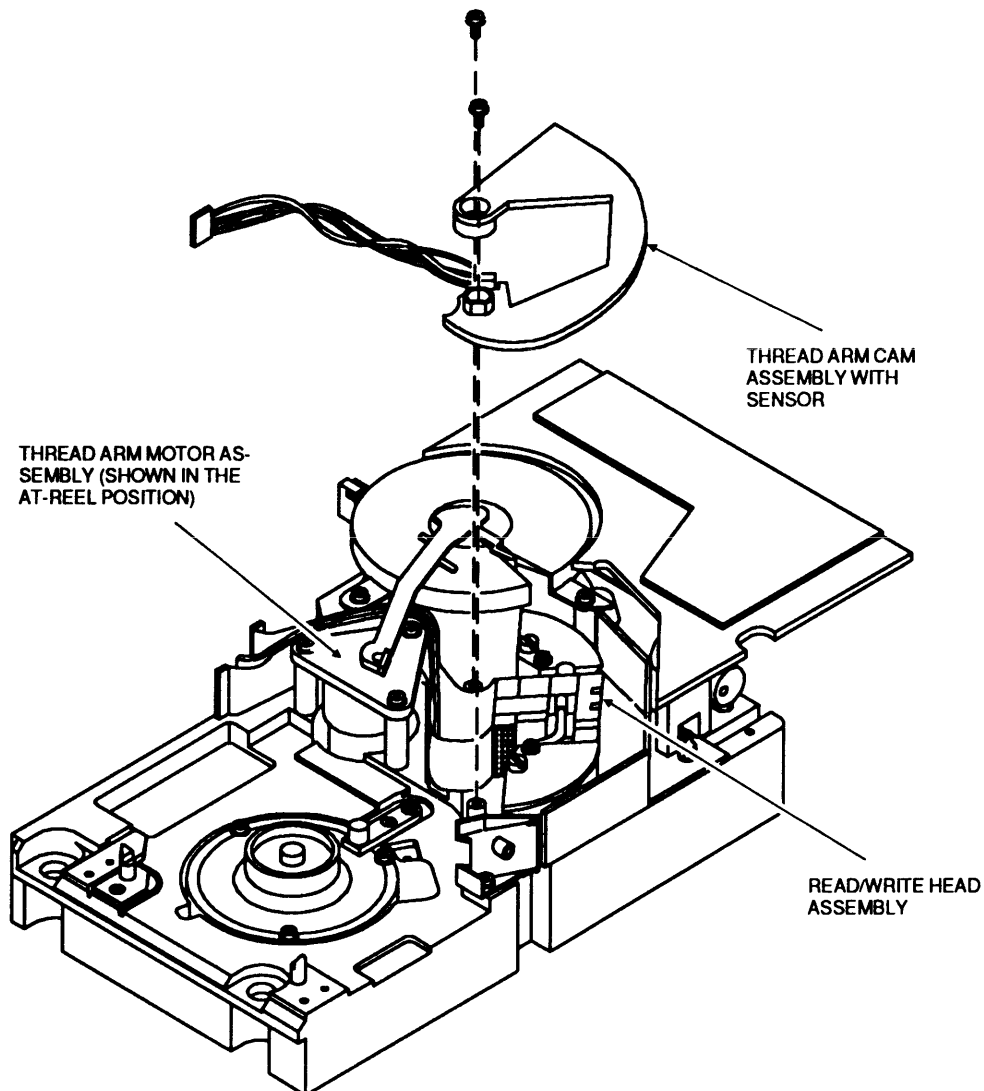


Figure 1 - 4
4220 Deck FRUs

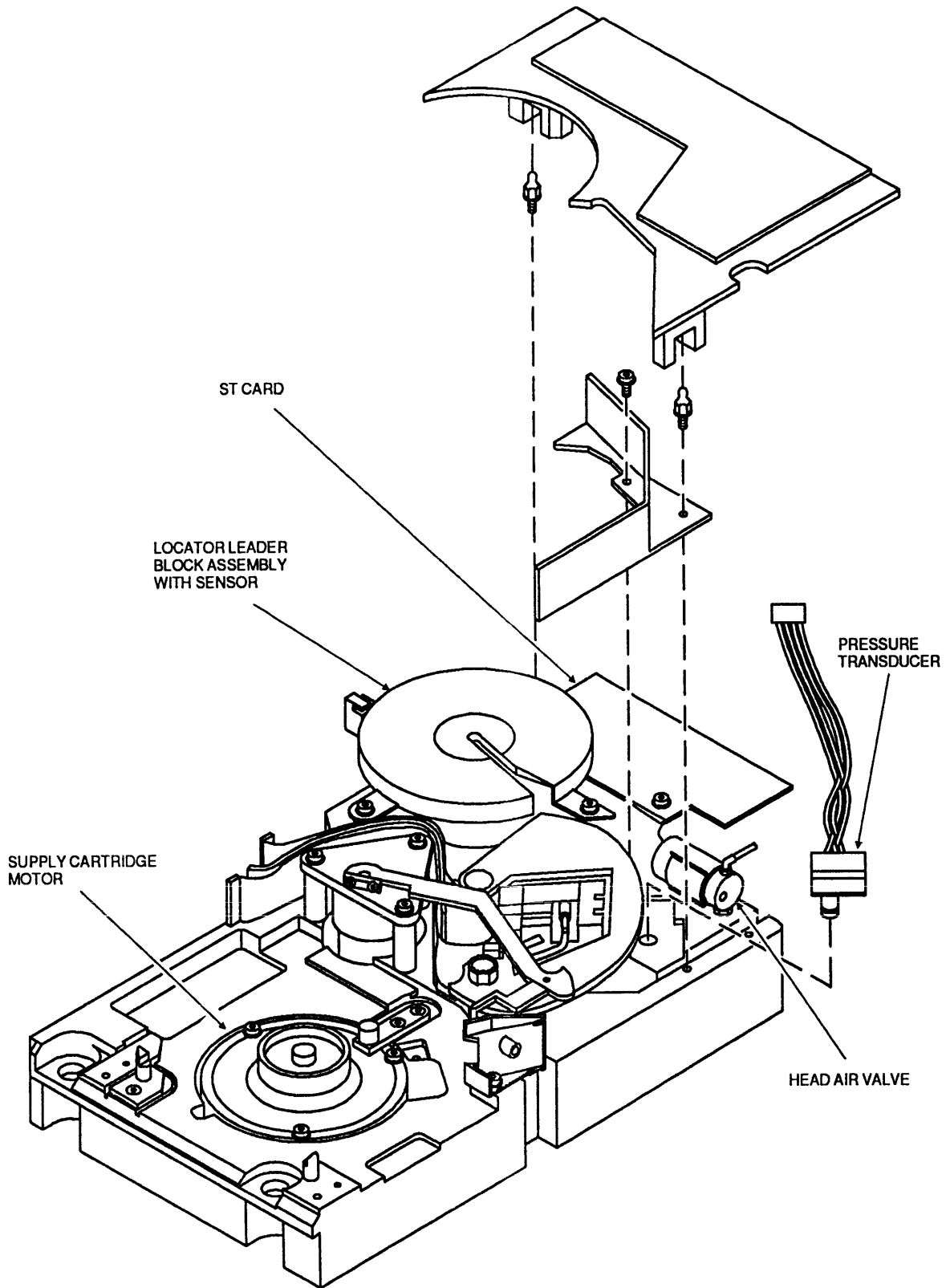


Figure 1 - 5
4220 Deck FRUs (contd.)

NOTE: WHEN THE DRIVE IS ON THE LEFT SIDE OF THE UNIT (LEFT-HAND MOUNT), THE LOCATIONS OF THE CP AND SP/SM CARDS ARE TRANSPOSED FROM THEIR POSITIONS SHOWN IN THIS FIGURE.

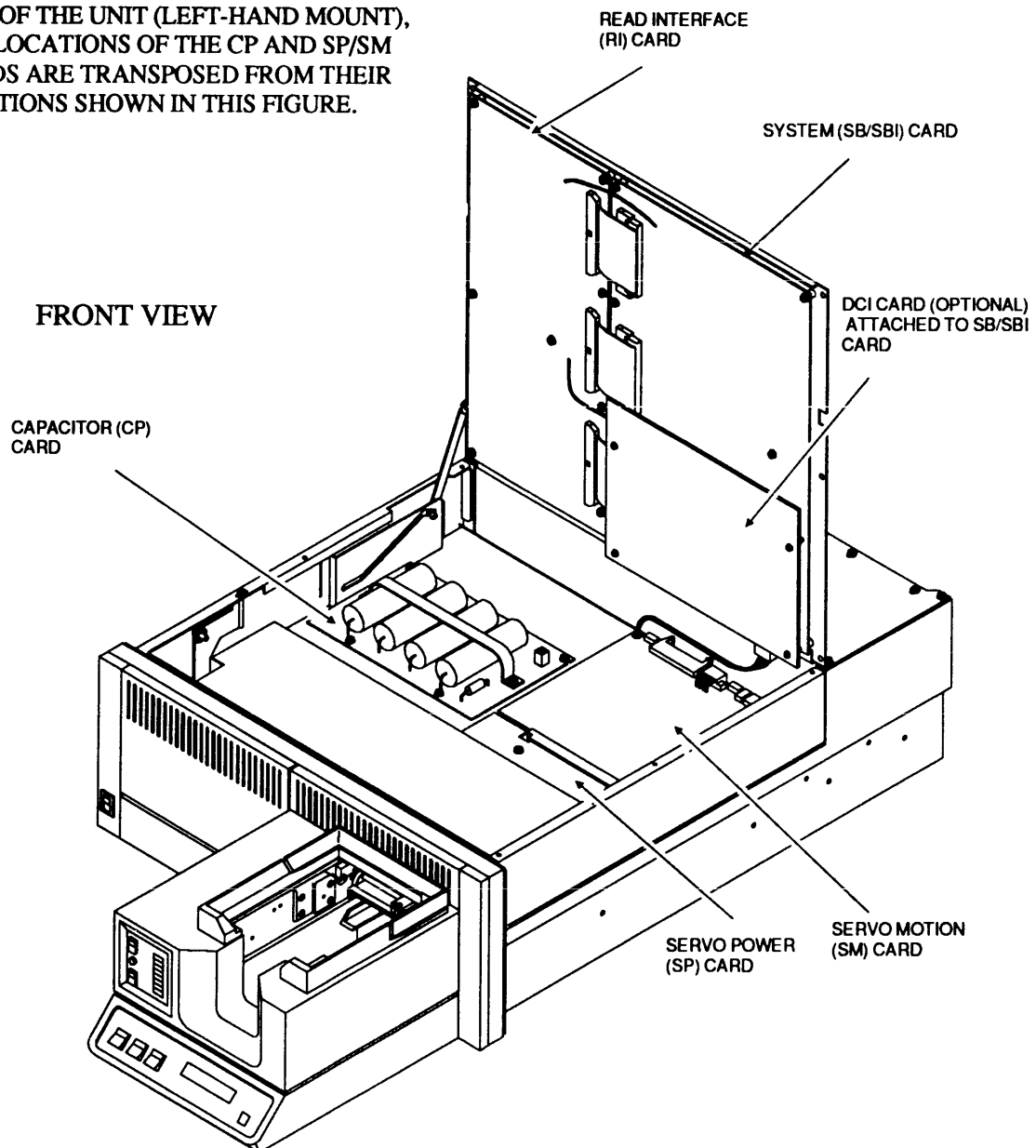


Figure 1 - 6
4220 Front Controller Module FRUs

REAR VIEW

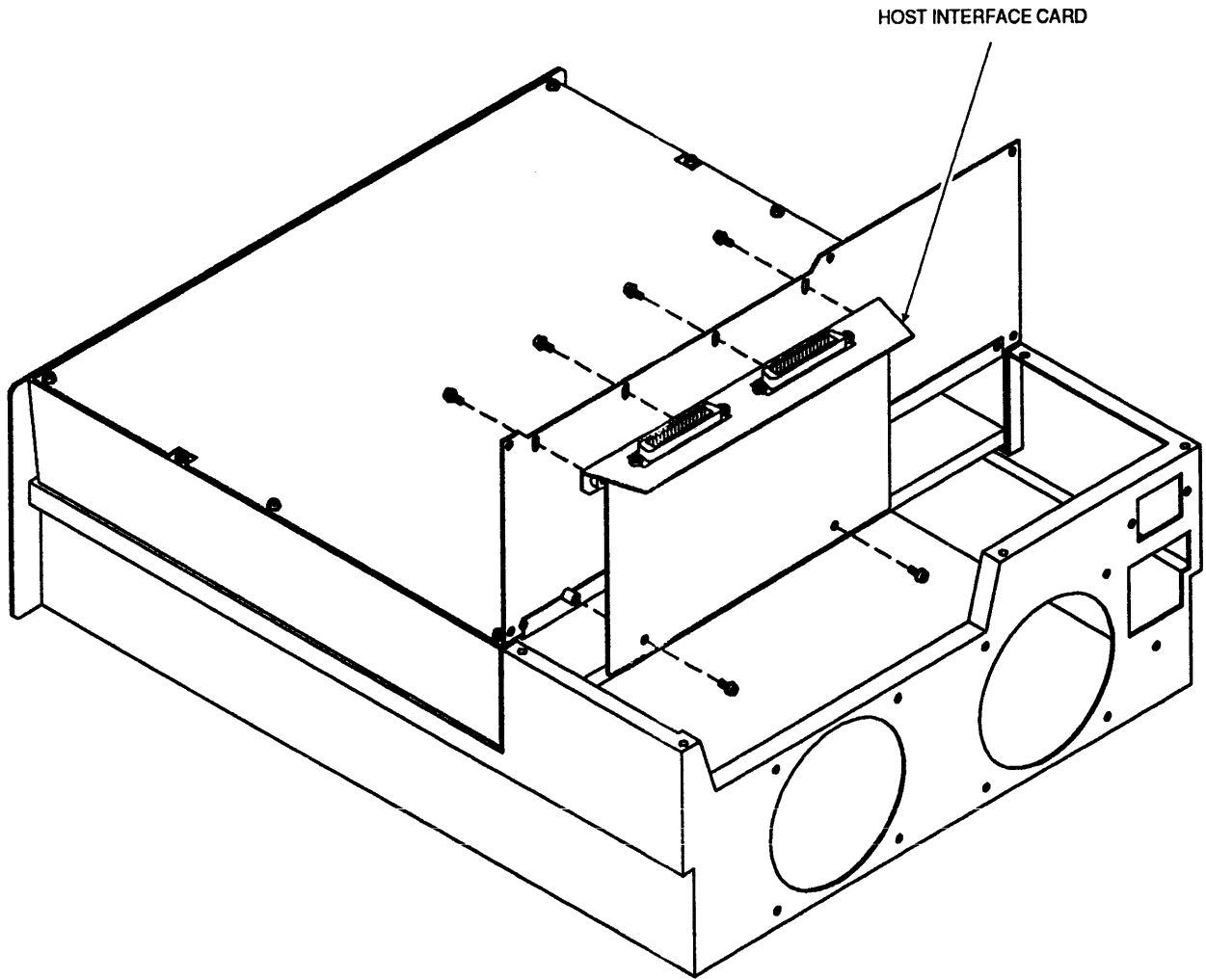


Figure 1 - 7
4220 Rear Controller Module FRUs

2. Autoloader Locations

2.1. Autoloader Overview

The Automatic Cartridge Loader (Autoloader) feature lets you automatically load and unload cartridges on the 4220. The Autoloader uses removable magazines that hold up to ten 3480 cartridges. Each magazine can store more than two gigabytes of data. (Refer to Figure 1-8.)

The following are considered FRUs. That is, they may be replaced by customer service representatives.

AC Card	Roller Guide Block Assembly
AS Card	Vertical Transmission Assembly
FS Card	Lead Screw Drive Motor
SS Card	Magazine Guide Assembly
CS Card	Vertical Motor Shut-off Switch
RS Card	Cleaning Cartridge Sensor Flag
Vertical Drive Motor	Horizontal Magazine Sensor
Pulley Timing Belt	Magazine Index Sensor
	Chassis Assembly

2.2. The Magazine

You can use the magazine to premount as many as ten cartridges in the Autoloader or as a convenient device to store cartridges. Each magazine has a handle, which lets you carry it easily to and from the Autoloader, and a protective window for viewing the volume serial numbers on the cartridges. (Refer to Figure 1-8.)

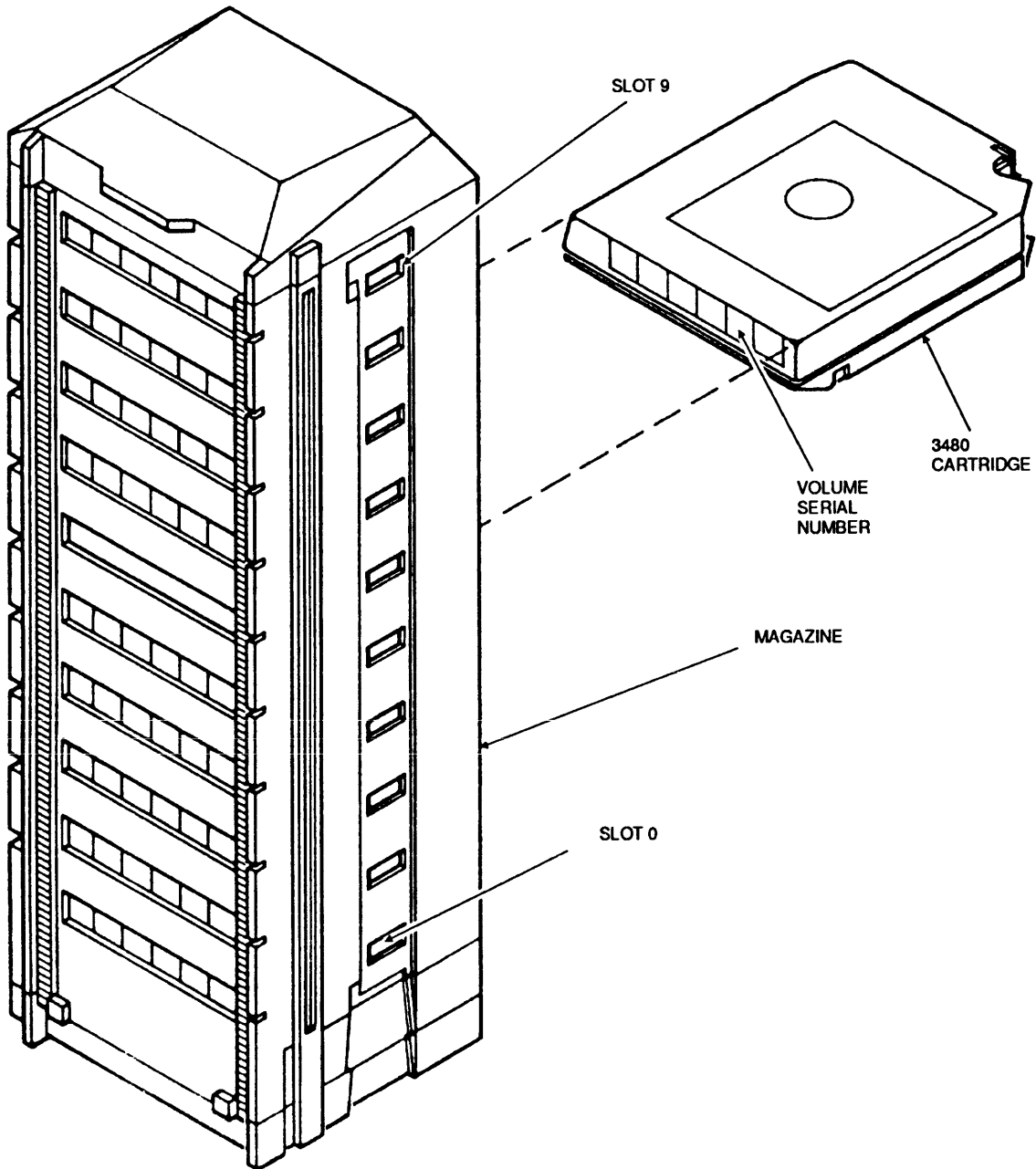


Figure 1 - 8.
Autoloader Magazine

2. 3. Autoloader Operator Panel

The Autoloader has a separate operator panel, also known as the AS card. It contains three switches and ten LEDs. The three switches are the Mode Selection Switch, the Load Button, and the Eject/Down Switch. (Refer to Figure 1-9.)

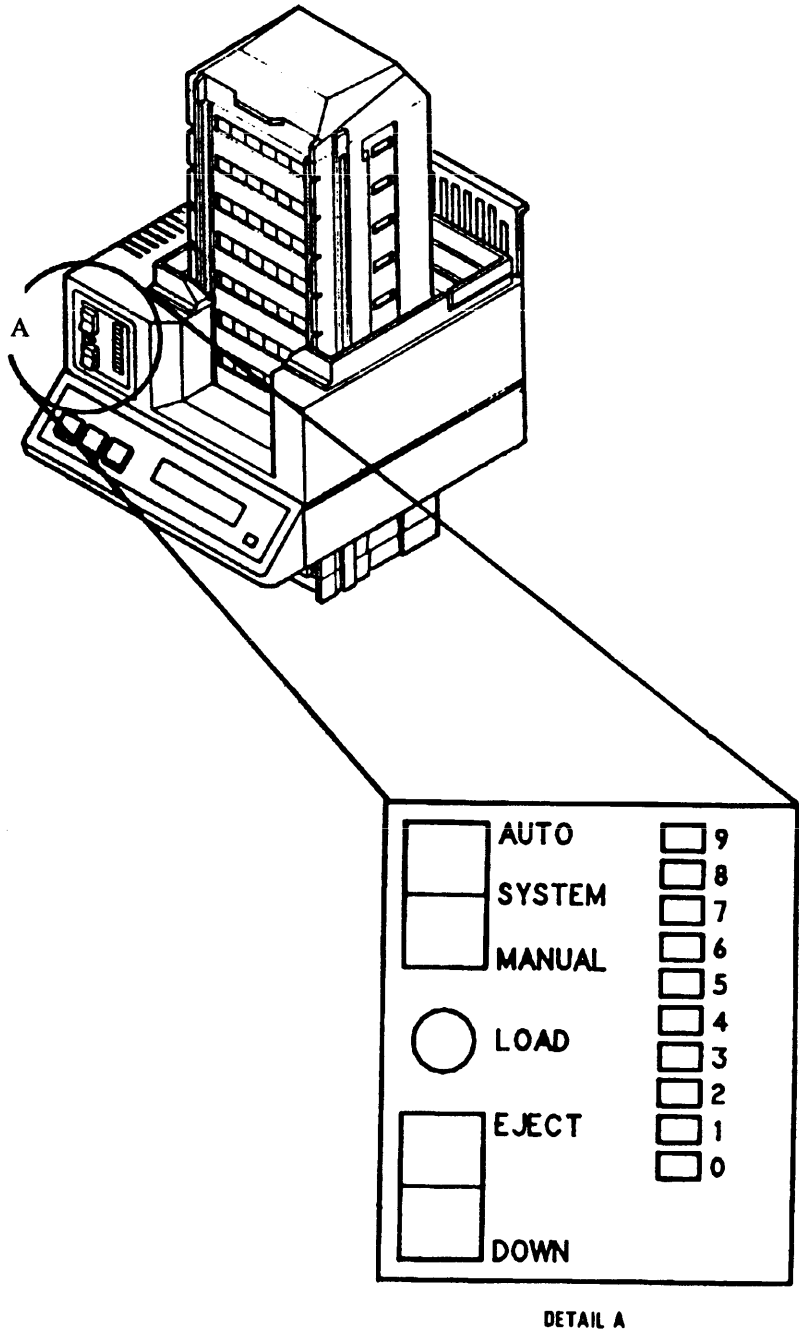


Figure 1 - 9.
Operator Panel

2. 3. 1. Mode Selection Switch

(Refer to Figure 1-10.) This three-position switch controls the mode in which the Autoloader operates. The three modes are Automatic, System, and Manual. Automatic and Manual modes will run on any operating system that supports the 3480 subsystem.

Automatic Mode

Automatic Mode allows you to premount up to ten cartridges--a full magazine--which are automatically loaded on the transport. All ten cartridges load automatically until cell position 9 is reached. (Refer to Figure 1-8.) After the cartridge in position 9 is unloaded, the magazine rises until it sits on the load cams; you can then remove it from the Autoloader.

System Mode

System Mode allows the Autoloader to accept mount commands directly from the system. An Automatic Load Request is passed from the system by the Load Display (LDD) Command.

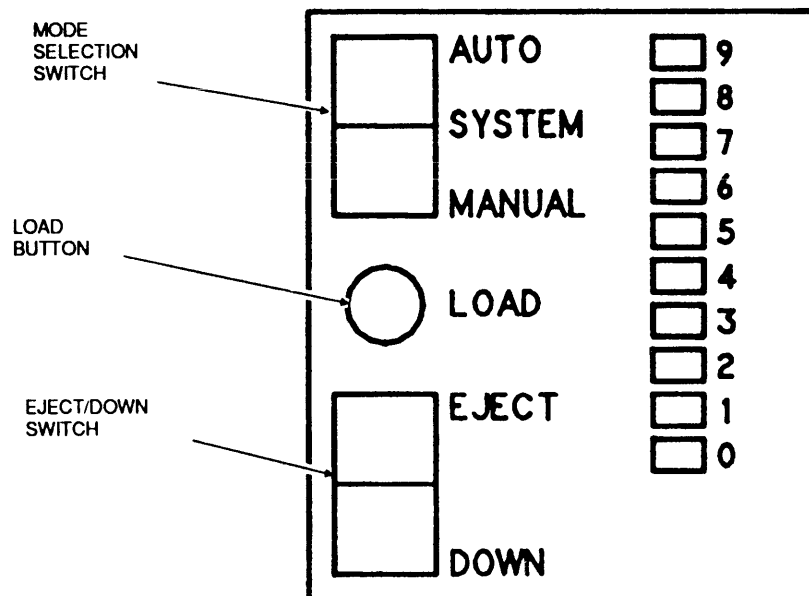


Figure 1 - 10.
Operator Panel Switches

Manual Mode

Manual mode lets you insert and remove one cartridge at a time with a magazine in the Autoloader. In this mode, the magazine cycles down to the next tape, but does not load unless the Load button is depressed.

2. 3. 2. Load Button

(Refer to Figure 1-10.) When you press the Load button, several things can happen:

- If a cartridge is aligned with the load station, it is loaded into the transport.
- If a magazine is positioned on the load cams, it descends to the first slot containing a cartridge (usually slot 0), and the cartridge is loaded into the transport.
- If you just changed modes, an operation starts.

NOTE:

If the Autoloader is in System Mode and you press the Load button, loading is delayed until the host issues a mount request.

2. 3. 3. Eject/Down Switch

(Refer to Figure 1-10.)

NOTE:

"Eject" means to raise the magazine until it rests on the load cams in the Autoloader, from which it can be lifted.

The Eject/Down switch is a dual purpose, momentary switch. Pressing Eject (up) causes the magazine to travel to slot location 0 (refer to Figure 1-8) and eject. You can then remove the magazine from the Autoloader or lower it with the Down switch, to any desired cell location.

Ejection occurs only if no cartridge is loaded. If you press the Eject switch while a cartridge is loaded, the eject function occurs at the end of the next unload sequence.

Pressing the Down switch lowers the magazine one slot location. When cell location 9 is reached, pressing Down once more ejects the magazine. If a cartridge is loaded when the Down switch is pressed, the switch is ignored.

2. 3. 4. LEDs

There are ten LEDs representing the ten cell locations of the magazine. They are numbered 0-9, with 0 corresponding to the lowest cell location. (Refer to Figure 1-11.)

The following LED conditions exist:

<u>LEDs Active</u>	<u>Condition</u>
One LED	The magazine is locked and at the indicated cell location.
No LEDs	No magazine is present or no magazine slot is in front of the drive cartridge slot.
All LEDs	Reset is in progress; switches are ignored.

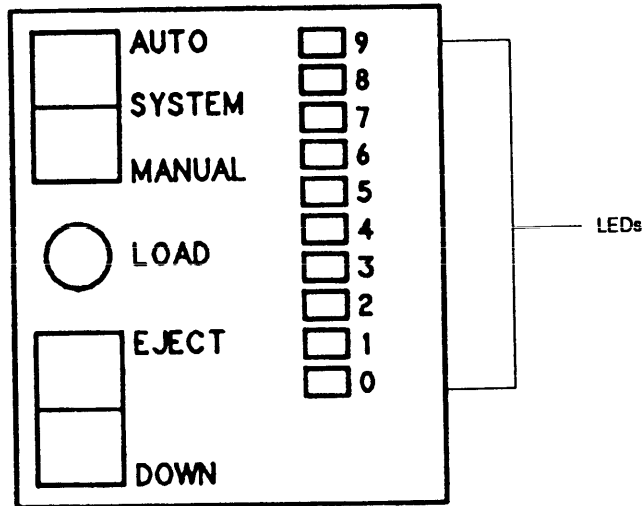


Figure 1 - 11.
LED's

2. 4. Field Replaceable Unit (FRU) Description

(Refer to Figure 1-12.)

2. 4. 1. AC Card: Autoloader Control Card

Contains microprocessor and control logic for the Autoloader.

2. 4. 2. AS Card: Autoloader Switch Card

Contains Autoloader operator panel.

2. 4. 3. FS Card: Feeder Sensor Card

Contains sensors and switches monitored by the AC card. The following are on the FS card:

Cartridge Present Sensor	Detects a cartridge in the carrier.
Drive Up/Down Sensor	Indicates if the carrier is up or down (in the loaded position).
Cleaning-Cartridge Sensor	Indicates the presence of a cleaning cartridge.
File Protect Switch	A mechanical switch that indicates when a tape is write-protected.

2. 4. 4. SS Card: Slot Sensor Card

An optical sensor that detects the slot position of the magazine.

2. 4. 5. CS Card: Cartridge Sensor Card

An optical sensor that detects both a cartridge in the magazine and the correct positioning of the magazine.

2. 4. 6. RS Card: Rotational Sensor Card

The RS card distributes power to the Horizontal-At-Magazine Sensor, the Magazine-at-Index Sensor, the SS card, and the CS card. The RS card contains the optical sensor that monitors the rotation of the axle, which raises and lowers the magazine.

2. 4. 7. Vertical Motor

A motor mounted on the chassis that drives the vertical mechanism. The Vertical Motor shaft goes through the gear box and drives the axle. This in turn drives the magazine up or down.

2. 4. 8. Pulley Timing Belt

A belt that keeps the two cams synchronized.

2. 4. 9. Roller Guide Block Assembly

An assembly that guides the magazine as it travels up and down.

2. 4. 10. Vertical Transmission Assembly

An assembly that drives the magazine up and down. It is powered by the vertical motor.

2. 4. 11. Lead Screw Drive Motor

A motor mounted on the chassis that drives the lead screw, which moves the caliper, which, in turn, loads a cartridge into the carrier.

2. 4. 12. Lead Screw Assembly

An assembly containing the lead screw. It moves the cartridge into the carrier.

2. 4. 13. Vertical Motor Shut-off Switch

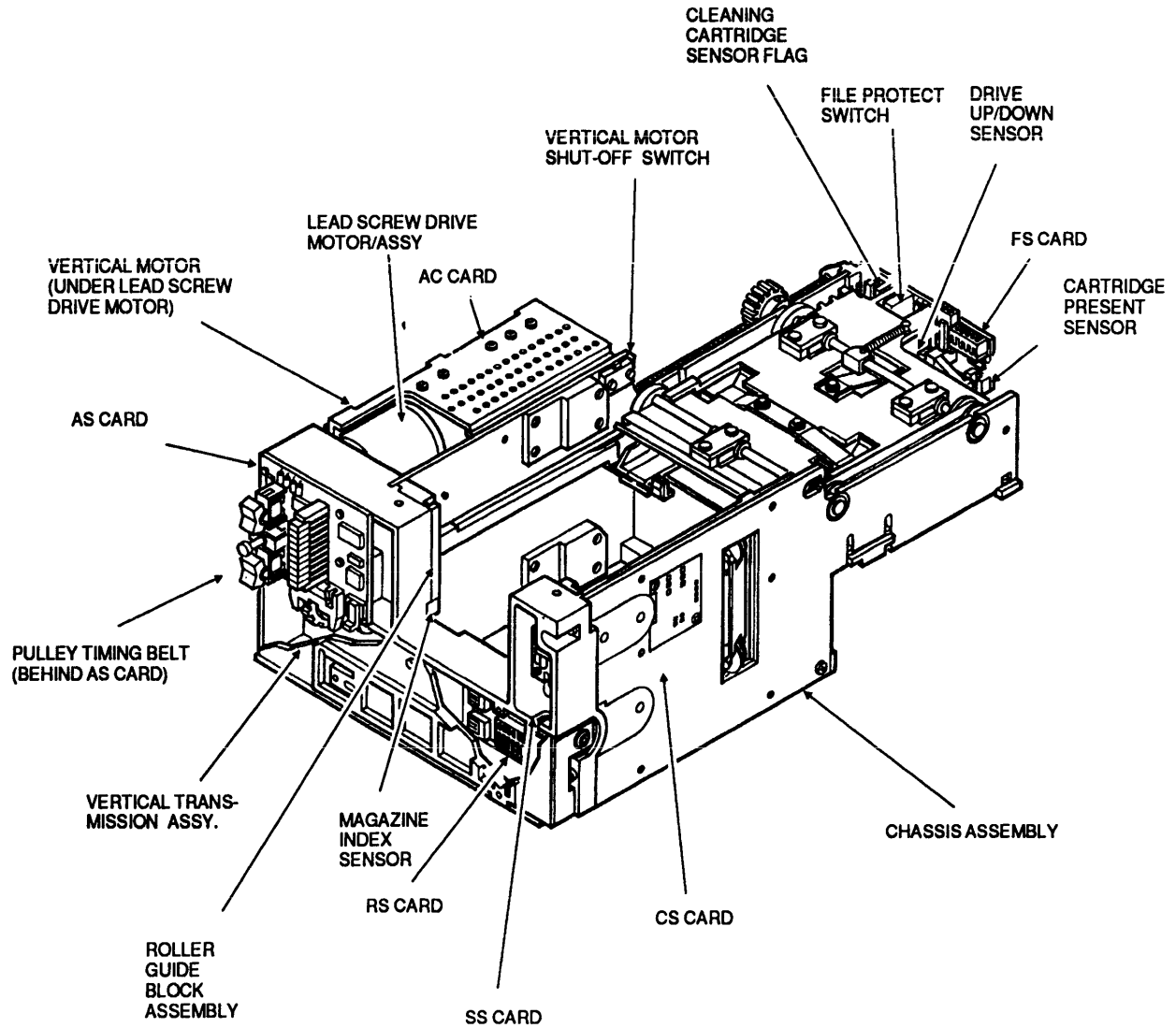
A switch that activates when the magazine reaches the end of its vertical travel.

2. 4. 14. Cleaning Cartridge Sensor Flag

A sensor that detects the presence of a cleaner cartridge in the carrier.

2. 4. 15. Chassis Assembly

The frames and cartridge carrier portions of the Autoloader.



NOTES;

1. AUTOLOADER IS SHOWN WITH COVERS REMOVED.
2. AUTOLOADER POWER CABLE AND INTERCONNECT CABLE ARE NOT SHOWN.
3. NOT ALL SENSORS ARE FRUS; THEY ARE SHOWN HERE FOR REFERENCE ONLY.

Figure 1 - 12.
Autoloader FRU's

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StorageTek.

4220 Cartridge Tape Subsystem

Chapter 2

START

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Start

This chapter contains a series of decision-making flowcharts that help a field engineer identify and resolve problems with the StorageTek 4220 Cartridge Tape Subsystem.

Error Code Dictionary

Sometimes a flowchart refers the reader to the error code dictionary, Chapter 3 of this manual. The error code dictionary defines error codes and their sources, and lists steps to solve the problem. Suggested actions include references to the diagnostic and FRU replacement guide sections.

Error codes are either displayed on the operator control panel display or returned to the host in the form of sense bytes for the cartridge tape subsystem. All error codes are displayed on the operator control panel in the form "XXXX" where XXXX is a hexadecimal number.

FRU Replacement Guide

Refer to chapter 5, the FRU (field replaceable unit) Replacement Guide for procedures for replacing FRUs. Go to this section after you diagnose an error. All field replaceable parts are listed with step-by-step instructions for replacing them. Refer to the diagnostic section to test the subsystem after you replace a FRU.

Diagnostics

Chapter 4, the diagnostic chapter, lists the internally run programs that make sure the StorageTek 4220 is operating properly and diagnose errors that occur.

All diagnostics are invoked through the operator control panel display menu using the SCROLL and SELECT buttons. If a diagnostic fails, an error code is displayed as a four-character hexadecimal number, which is explained in the error code dictionary.

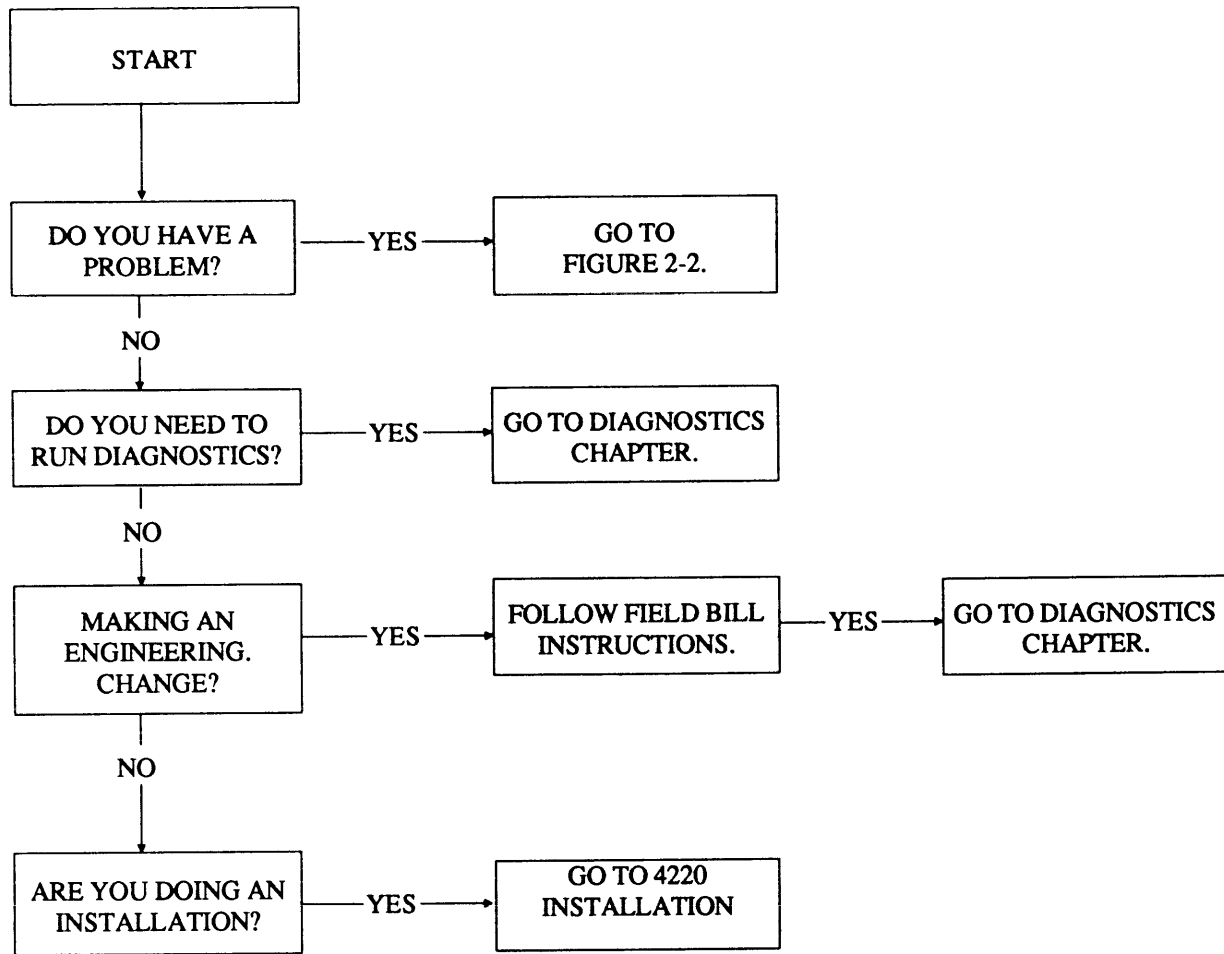


Figure 2 - 1
4220 Maintenance START

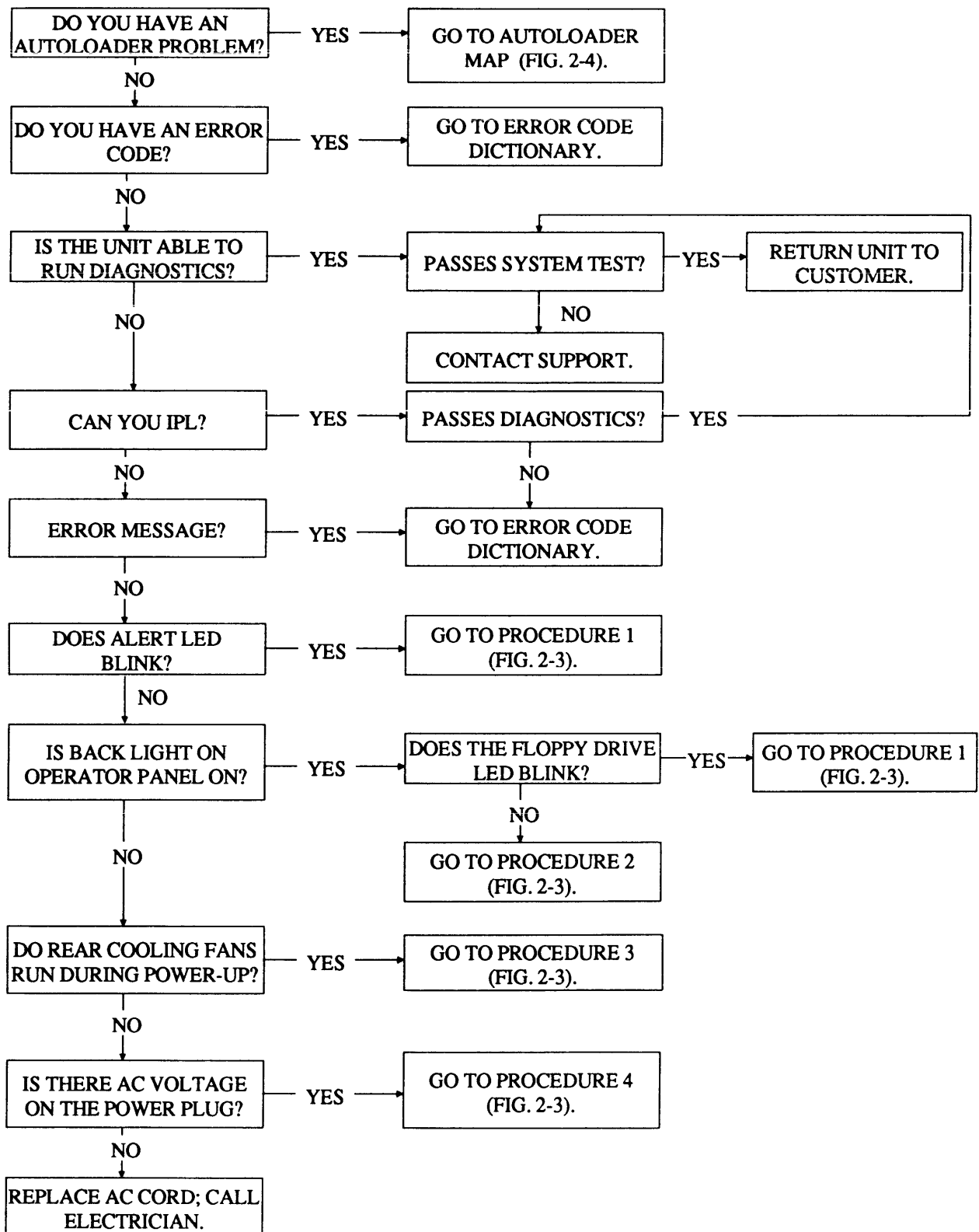


Figure 2 - 2
4220 MAP - Control Unit

PROCEDURE 1

CHECK AND, IF NECESSARY, REPLACE

1. BUS CABLE BETWEEN DISPLAY CARD AND BOTTOM (BT) CARD.
2. BUS/FLOPPY CABLE BETWEEN THE SYSTEM (SBI) CARD AND THE BOTTOM (BT) CARD.
3. DISPLAY (DP) CARD.
4. SYSTEM (SB/SBI) CARD.
5. BOTTOM (BT) CARD.

PROCEDURE 2

CHECK AND, IF NECESSARY, REPLACE

1. BUS/FLOPPY CABLE BETWEEN THE SYSTEM (SB/SBI) CARD AND THE BOTTOM (BT) CARD.
2. THE POWER CABLE FROM THE POWER SUPPLY TO THE SYSTEM (SB/SBI) CARD.
3. SYSTEM (SB/SBI) CARD.
4. FLOPPY CABLE BETWEEN BT AND FLOPPY DRIVE.
5. POWER CABLE FROM POWER SUPPLY TO FLOPPY DRIVE.

PROCEDURE 3

CHECK AND, IF NECESSARY, REPLACE

1. POWER CABLE FROM THE POWER SUPPLY TO THE DISPLAY CARDS AND OPTIONAL AUTOLOADERS.
2. ANY POWER CABLE OR BOARD THAT USES +5VDC THAT MIGHT BE SHORTED.
3. DC POWER SUPPLY.

PROCEDURE 4

CHECK AND, IF NECESSARY, REPLACE

1. THE FRONT POWER ON/OFF SWITCH AND CABLE CONNECTING IT TO THE DC POWER SUPPLY.
2. DC POWER SUPPLY.

Figure 2 - 3
Procedures

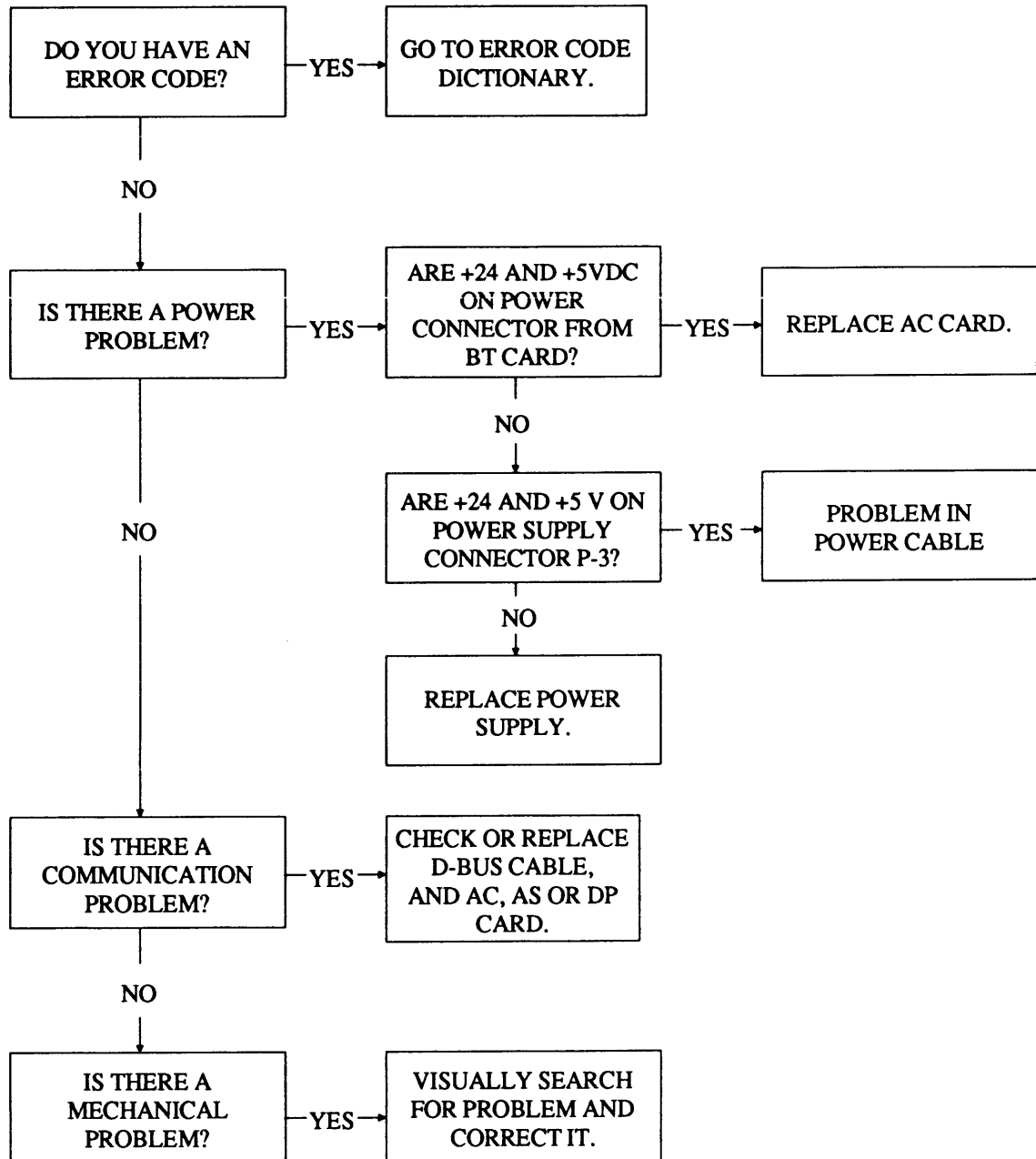


Figure 2 - 4
Autoloader MAP

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StorageTek.

4220 Cartridge Tape Subsystem

Chapter 3

ERROR CODE DICTIONARY

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1. Introduction

You have referred to this section to determine the definition of an error code and its source. This chapter is currently divided into three sections:

NOTE:

If ">32c" appears in the LCD display of the unit, and the ALERT indicator blinks, an overtemperature condition has occurred. Check the air flow (is the fan operating on the machine?) and the air conditioning in the room.

Section 1. Introduction

Section 2. ERR XXXX (four-digit error codes)

Four digit error codes are displayed as ERR XXXX on the operator control panel LCD display after a diagnostic or online failure. Some of these codes indicate status only, not an error, and may be displayed due to the way the host system is using the drive.

Section 3. SBI Card DIAGNOSTIC Error Codes

These error codes are displayed on the SBI card display after a failure in a diagnostic test.

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2. ERR XXXX Codes

ERROR CODE	CAUSE	FAILING COMPONENT
3300	Build sense after interface disconnect	Status Only
3341	Host card detected bus out parity error from channel	I/F Card
3342	Host card detected data overrun	I/F Card
3343	Host zero byte write, command reject	I/F Card
3344	Host tag count mismatch, overrun	I/F Card
3345	770 ms data transfer timeout	SBI
3347	Received host command with parity error	I/F Card
33E0	Illegal bits active in mode set	Status Only
33E1	Illegal mode set	Status Only
33E2	Mode set inhibits supervisor command	Status Only
33E3	Mode set inhibits supervisor command	Status Only
33E4	Mode set inhibits supervisor command	Status Only
33E5	Invalid command received from host	Status Only
33E6	Data security erase not preceded with erase gap	Status Only
33E7	The drive is not online	HF, RI
33E8	The addressed drive is not ready	DP,DPC
33E9	The addressed drive is file protected on write operation	File Protect Switch, HI
33EB	The addressed drive is file protected by the Perform Subsystem Function command and a write command was received from the host.	Status Only
33EC	Assigned elsewhere (zero argument)	I/F Card
33ED	Mode set inhibits supervisor command	Status Only
33EE	Drive assigned elsewhere	Status Only
33EF	Received ID not part of any group	Status Only
3411	A mode set command requesting ICRC mode has been received and the ICRC feature is installed but not enabled.	Status Only
3412	The data format is changing between non-ICRC and ICRC while writing a tape. This error is given only once per tape and only affects performance.	Status Only

ERROR CODE	CAUSE	FAILING COMPONENT
34E0	Incorrect byte count	Status Only
3B21	Set path ID illegal group code	Status Only
3C60	An incorrect byte count was detected during a host to control unit command.	Host Software
3C80	Assign argument <> 11 bytes	Status Only
3C81	Control access argument <> 12 bytes	Status Only
3C82	Load display argument <> 17 bytes	Status Only
3C83	Locate argument less than 4 bytes	Status Only
3C84	Set path ID argument <> 12 bytes	Status Only
3C85	Mode set inhibits supervisor command	Status Only
3C86	Invalid mode of use	Status Only
3C87	Set path ID group all zero	Status Only
3C88	Assign argument <> 11 BYTES	Status Only
3C89	Chaining violation	Host Software
3C8A	Set password and drive not assigned	Host Software
3C8B	Password all zeros	Host Software
3C8C	Passwords don't match	Host Software
3D11	A Read Backard has been received and the tape is in ICRC format. Read Backward is not supported in ICRC mode.	Status Only
3F13	Buffer offload pending	Status Only
3F14	No available partition for read/write	SBI
3F15	Wrong command/device/chain on reconnect from host	Status Only
3FEE	The drive is at physical end of tape and a command that requires forward motion has been received.	Status Only
4200	An invalid tape format bit combination was detected in the Mode Set command.	Host Software
4202	Either bit 5 or bit 6 in the Mode Set command was not 0.	Host Software
4204	A Mode Set command specifying the Improved Cartridge Recording Capability (ICRC) format (bit 4) was issued to a control unit that does not support that function.	Hos: Software

ERROR CODE	CAUSE	FAILING COMPONENT
4260	The path group ID received as the argument to the Assign Command is not part of any group.	Host Software
46C0	Either bit 6 or 7 of the Load Display Command control byte were not 0 for a drive without the Automatic Cartridge Loader feature OR bit 6 of the Load Display command control byte was not zero for drives with the Automatic Cartridge Loader feature.	Host Software
4812	A Rewind Unload command has been received. A read buffered log command has been requested via ERPA code 51.	Status Only
4B22	The path group ID received as the argument to the Set Path Group ID Command does not match.	Host Software
4D75	Generalized unassign but not assigned	Host Software
4D80	A Perform Subsystem Function command has been received with either an invalid function or parameter byte.	Host Software
4D82	A Perform Subsystem Function command requesting "Data Compaction Default" has been received and the ICRC feature is not installed or enabled.	Status Only
4D85	A Perform Subsystem Function command has been received that attempts to pin this control unit to a non-existent control unit.	Host Software
706B	DCI card interrupt timeout after packet transfer	DCI
706C	DCI error after data and trailer transfer	DCI
706D	DCI card not idle after "complete trailer"	DCI
706E	DCI card interrupt timeout after "write new PID"	DCI
706F	DCI error after PID transfer	DCI, SBI
7070	No EOD at input FIFO after PID	DCI, SBI
7071	No EOD at buffer input after PID	DCI, SBI
7072	CU CRC miscompare	DCI
7073	Missing "Packet ID Ready" interrupt	DCI, SBI
7074	Missing "Packet ID Ready"	DCI, SBI
7075	DCI card error register not 0	DCI, SBI

ERROR CODE	CAUSE	FAILING COMPONENT
7076	Missing interrupt at end of "Read Packet"	DCI, SBI
7077	DCI card interrupt error	DCI, SBI
7078	DCI card error register not 0 at end of read	DCI
7079	Packet CU CRC error on read	DCI
707C	DCI card error during revise packet	DCI, SBI
70C1	Block ID miscompare on write operation.	HI, RW Head Assy
70C2	Block ID miscompare on read forward	HI, RW Head Assy
70C3	Block ID miscompare on read backward	HI, RW Head Assy
70C4	ICRC bits non-zero	Media not supported
70C5	Physical locate failed	HI, RW Head Assy
70C6	Logical locate failed	HI, RW Head Assy
70D1	Bit 0 of byte 0 of the block ID just read was not 0.	Media - Unsupported Format
70D2	Block ID miscompare on read forward command in ICRC mode	HI, RW Head Assy
70D4	Microcode detected error. Take trace	Save trace information
70D5	Block ID format error. Missing FCR2	HI, RW Head Assy
70D6	Block ID miscompare on buffered data	HI, RW Head Assy
70D7	Block ID format error. The tape is in ICRC mode and the feature is not installed	Media not supported
70D9	Block ID format error. Missing FCR1	HI, RW Head Assy
70DB	Block ID format error. Unexpected FCR1	HI, RW Head Assy
70DC	Block ID format error. Unexpected FCR2	HI, RW Head Assy
70DF	Block ID format error. The tape is in ICRC	Status Only
7161	ID burst error - not capable	Media - Blank tape
7600	Use fault symptom codes in bytes 12	See Byte 12
7C02	Tape unit-control unit communication error during motion commands	RI, SBI, HI
7C03	Illegal tape unit alert	Status Only
7C04	Tape unit-control unit communication error during motion, all commands	RI, SBI
7C05	Tape unit detected BOT going backward	Status Only
7C06	Control unit detected BOT going backward	Status Only
7C07	Error detected, but no error code	Save trace information

ERROR CODE	CAUSE	FAILING COMPONENT
7C08	Host initiated erase gap failure, read back of write	SBI, RI
7C09	Buffer error, read back of write	SBI, Cartridge
7C0A	Data path error, all commands	SBI, RI
7C0C	Data path error, all commands	SBI, RI
7C0D	RD Type command did not stop sequence in time after last blk	SM
7C0E	Data path error, read back of write command	SBI, RI
7C0F	Buffer error, write type commands	SBI
7C10	Write TM pending bit not active	Save trace information
7C11	Late write cmd: IBG already done	Save trace information
7C12	Illegal command	Save trace information
7C13	Buffer parity error, read back of write, read record or loop write to read	SBI
7C14	Buffer overrun error, read back of write, read record or loop write to read	SBI
7C15	Write pending bit not active when physical code given a wrt command	Status Only
7C16	Read pending bit not active	Save trace information
7C17	Read sequencer error	SBI
7C18	Code locked out waiting for GAP-IN	Save trace information
7C19	Code locked out writing ID	Save trace information
7C1A	Illegal ERP code	Save trace information
7C1B	Read sequencer error	SBI
7C1C	No BOT status at end of rewind	Status Only
7C1D	No EOT status at end of data security erase	Status Only
7C1E	Data path error, read back of write	SBI
7C1F	Data path error, read type commands	SBI
7C20	Write sequencer detected error in data path	SBI
7C21	Write sequencer detected error in data path	SBI, RI
7C22	Write sequencer detected error in data path	SBI
7C23	Write sequencer detected error in data path	SBI
7C24	Write sequencer detected error in data path	SBI
7C25	Write sequencer detected error in data path	SBI

ERROR CODE	CAUSE	FAILING COMPONENT
7C26	Write sequencer detected error in data path	SBI
7C27	Write sequencer detected error in data path	SBI
7C28	Write sequencer detected error in data path	SBI
7C29	Write sequencer detected error in data path	SBI
7C2A	Write sequencer detected error in data path	SBI
7C2B	Write sequencer detected error in data path	SBI
7C2C	Write sequencer detected error in data path	SBI
7C2D	Write sequencer detected error in data path	SBI
7C2E	Write sequencer detected error in data path	SBI
7C2F	Write sequencer detected error in data path	SBI
7C30	Data path error, read back of write command	RI, SBI
7C31	Read sequencer error	SBI
7C32	Data path error, read back of write command	RI, SBI
7C33	Data path error, read back of write command	RI, SBI
7C34	Data path error, read back of write type commands	RI, SBI
7C35	ERP positioning error for write type commands	RI, SBI
7C36	Microcode detected error	Status Only
7C37	Write ID failure, couldn't qualify ID	RI, SBI
7C38	Error recovery procedure read or write	RI, SBI, Read Flex Cable, RI, HI, Head Cable to HI
7C39	Attempted selection to a device that is re-positioning	Save Trace Information
7C3A	Selection attempted during rewind	Save Trace Information
7C3B	Selection attempted during DSE	Save Trace Information
7C3C	Control unit detected unit check from tape unit during tape unit alert processing	Status Only
7C3D	Write operation to write protect tape unit	Status Only
7C3E	Forward command at physical EOT	Status Only
7C3F	Read backward at load point	Status Only
7C40	Tape unit not ready	Status Only

ERROR CODE	CAUSE	FAILING COMPONENT
7C41	Control unit detected unit check from tape unit	Status Only
7C42	Rewind at BOT	Status Only
7C43	Control unit detected unit check from tape unit	Status Only
7C44	Tape unit doesn't exist	Status Only
7C45	Tape unit control unit communication error while writing ID	RI, SBI
7C46	Improper status from tape unit	RI, SBI
7C47	Error recovery procedure positioning error for write type command; block ID miscompare	RI, SBI, PI
7C48	Illegal tape unit alert	RI, SBI
7C49	Improper status from tape unit for disconnected commands	RI, SBI
7C4A	Error recovery procedure erase gap retries expired	RI, SBI, Write Flex Cable
7C4B	Control unit detected unit check from tape unit during tape unit initiated final status	Status Only
7C4C	Error recovery procedures FS retries expired	RI, SBI, R/W Head, HI
7C4D	Error recovery procedures BSB retries expired	RI, SBI, HI, R/W Head
7C4E	Write sequencer detected parity error	SBI
7C4F	Write sequencer detected underrun error	SBI
7C50	Tape unit-control unit communication error during initial selection	RI, SBI
7C51	Tape unit control unit address mismatch during initial selection	RI, SBI
7C52	Tape unit control unit address parity error during initial selection	RI, SBI
7C53	Tape unit control unit protocol error during initial selection	RI, SBI
7C54	Tape unit control unit protocol error during initial selection	RI, SBI
7C55	Tape unit-control unit status byte parity error during initial selection	RI, SBI
7C56	Tape unit-control unit protocol error during initial selection	RI, SBI

ERROR CODE	CAUSE	FAILING COMPONENT
7C57	Tape unit-control unit status byte parity error during initial selection	RI, SBI
7C58	Tape unit-control unit protocol error during initial selection	RI, SBI
7C59	Tape unit-control unit protocol error during initial selection	RI, SBI
7C5A	Autoloader DE, but no in-progress bits	Save trace information
7C5B	Tape unit-control unit protocol error during tape unit alert processing	RI, SBI
7C5C	Tape unit-control unit address mismatch during tape unit alert processing	RI, SBI
7C5D	Tape unit-control unit address parity error during tape unit alert processing	RI, SBI
7C5E	Tape unit-control unit protocol error during tape unit alert processing	RI, SBI
7C5F	Tape unit control unit protocol error during tape unit alert processing	RI, SBI
7C60	Tape unit-control unit status byte parity error during tape unit alert processing	RI, SBI
7C61	Tape unit control unit protocol error during tape unit alert processing	RI, SBI
7C62	Tape unit-control unit status byte parity error during tape unit alert processing	RI, SBI
7C63	Tape unit control unit protocol error during tape unit alert processing	RI, SBI
7C64	Tape unit control-unit protocol error during tape unit alert processing	RI, SBI
7C65	Error recovery procedure block ID check, read backward	RI, SBI
7C66	Tape unit-control unit sense byte parity error	RI, SBI
7C67	Tape unit control unit run configuration error	RI, SBI
7C68	Temporary error but error recovery procedure inhibited, all commands	RI, SBI
7C69	Error recovery procedure positioning	RI, SBI
7C6A	More than 65K erase gaps or tape marks on tape	Status Only
7C6B	Error recovery procedure positioning error	RI, SBI

ERROR CODE	CAUSE	FAILING COMPONENT
7C6C	Block size exceeded (600ms), read type commands	RI, SBI
7C6D	Error recovery procedure backward space block or forward space block positioning error	RI, SBI
7C6F	Error recovery procedure locate error	RI, SBI
7C70	Void detected	RI, SBI
7C71	Velocity check, write type commands	SBI
7C72	Tape unit-control unit protocol error during control unit initiated final status	RI, SBI
7C73	Tape unit-control unit status byte parity error during control unit initiated final status	RI, SBI
7C74	Tape unit unloaded	Status only
7C75	Protocol error during control unit initiated final status	RI, SBI
7C76	Tape unit-control unit status byte parity error during control unit initiated final status	RI, SBI
7C78	Protocol error during control unit initiated final status	RI, SBI
7C79	Tape unit-control unit protocol error during control unit initiated final status	RI, SBI
7C7A	Tape unit-control unit protocol error during patch command	RI, SBI
7C7B	Tape unit-control unit protocol error during patch command	RI, SBI
7C7C	Buffer overrun during read forward or read backward	SBI
7C7D	Tape unit-control unit protocol error during sense transfer	RI, SBI
7C7E	Tape unit-control unit protocol error during sense transfer	RI, SBI
7C7F	Tape unit-control unit protocol error during locate command	RI, SBI
7C80	Tape unit-control unit protocol error during load display command	RI, SBI
7C81	Tape unit-control unit protocol error during load display command	RI, SBI
7C82	Tape unit-control unit protocol error during autoloading command	RI, SBI

ERROR CODE	CAUSE	FAILING COMPONENT
7C83	Tape unit-control unit protocol error during tape unit initiated final status	RI, SBI
7C84	Tape unit-control unit status byte parity error during tape unit initiated final status	RI, SBI
7C85	Tape unit-control unit protocol error during tape unit initiated final status	RI, SBI
7C86	Tape unit-control unit status byte parity error during tape unit initiated final status	RI, SBI
7C87	Tape unit-control unit protocol error during tape unit initiated final status	RI, SBI
7C88	Tape unit-control unit protocol error during tape unit initiated final status	RI, SBI
7C89	Unsuccessful tape unit configuration	RI, SBI
7C8A	Unsuccessful tape unit configuration	RI, SBI
7C8B	Unsuccessful tape unit configuration	RI, SBI
7C8C	Unsuccessful tape unit configuration	RI, SBI
7C8D	Unsuccessful tape unit configuration	RI, SBI
7C8E	Unsuccessful tape unit configuration	RI, SBI
7C8F	Tape unit-control unit protocol error during locate command	RI, SBI
7C90	Autoload command error	Status Only
7C91	Short interblock gap at start of block, write type commands	Media
7C92	Long interblock gap at start of block, write type commands	Media
7C93	No sync at start of block, write type commands	Media
7C94	Backward command followed by write type	Status Only
7C95	Locate error; went past the expected block ID	Media
7C96	Read back of write error	Media
7C97	Read error at beginning of block	Media
7C98	Data check error, read back of write type commands	Media
7C99	Data check error, read back of write type commands	Media

ERROR CODE	CAUSE	FAILING COMPONENT
7C9A	Data check error, read back of write type commands	Media
7C9B	Couldn't qualify density ID, write type commands	Media, HI
7C9C	Void detected, write type operations	Media
7C9D	Multiple tracks corrected; write type operation	Media
7C9E	Buffer overrun during transfer; read forward or read backward	Status Only
7C9F	Void detected. read type operations	Media
7CA0	Autoload timeout, drive 0	RI, SBI
7CA1	Autoload timeout, drive 1	RI,SBI
7CAF	Microcode error - positioning error	RST, save trace, IPL, and report incident.
7CB0	Couldn't qualify density ID, read type commands	No ID Label, media
7CB1	Uncorrectable ECC error; read forward, read backward	Media
7CB2	Block ID miscompare; read forward or read backward	Media
7CB3	Short ID separator, read back of write	Media
7CB4	Long ID separator, read back of write	Media
7CB5	Error at beginning of record, write type operation	Media
7CB6	Error at beginning of record, read type operation	Media
7CB7	Error at end of record, write operation	Media, RI, R/W head
7CB8	Error at end of record, read type operation	Media
7CB9	60ms timeout while looking for data	Media
7CBA	Missed record, read operation	Media
7CBB	No data detected 1ms after gap in; read	Media
7CBC	No data detected 1ms after gap in; write	Media
7CBD	Block ID miscompare; write	Media
7CBE	CRC error; read forward, read backward or read back check of write.	Media, HI
7CBF	Detected ID reading backwards	Status Only
7CC(X)	Locate timeout, drive X (X=0-7)	RI,SBI

ERROR CODE	CAUSE	FAILING COMPONENT
7CC8	Autoloader communication failure - send format byte - CLK B not active	Save trace information
7CC9	Autoloader communication failure - send format byte - CLK B still active	Save trace information
7CCA	Autoloader communication failure - send data byte - CLK B not active	Save trace information
7CCB	Autoloader communication failure - send data byte - CLK B still active	Save trace information
7CCC	Autoload failure	RI,SBI
7CCD	Microcode detected error	RI,SBI
7CCE	35 seconds error recovery procedure time-out (S/38 only)	RI,SBI
7CCF	DSE and not in write status	Save trace information
7CD(X)	Rewind timeout, drive X (X=0-7)	RI,SBI
7CD8	Tape unit-control unit parity error during autoload command	RI,SBI
7CD9	Tape unit-control unit protocol error during autoload command	RI,SBI
7CDA	Previously unconfigured tape unit came on-line	N/A
7CDB	Short preamble at beginning of record, wrt type	N/A
7CDC	Read type command followed by Write type	SBI, SM
7CDD	Reposition timeout retry	Status Only
7CDE	CU CRC error	Save trace information
7CDF	Failed to read a BID	Save trace information
7CE(X)	Data security erase timeout, drive X (X=0-7)	RI,SBI
7CE8	Selective reset terminated pending command	N/A
7CE9	System RST terminated pending command	N/A
7CEA	Can't configure previously unconfigured tape unit	RI, SBI
7CF(X)	Reposition timeout, drive X (X=0-7)	RI, SBI
8202	The unload switch was pressed.	Status Only
8E05	Back space operation at load point	Status Only

ERROR CODE	CAUSE	FAILING COMPONENT
8E06	Read backwards at load point	Status Only
8E07	Manual rewind unload and buffer not empty	Status Only
8E08	Not-ready-to-ready and buffer not empty	Status Only
8E09	Unit check in device status	Status Only
9B00	Indicates file LOAD.MAP on floppy.	Reference only
9B01	Indicates file BOOTRAM.BIN on floppy.	Reference only
9B02	Indicates file BP_CODE.BIN on floppy.	Reference only
9B03	Indicates file BP_DATA.BIN on floppy.	Reference only
9B04	Indicates file RF_CODE.BIN on floppy.	Reference only
9B05	Indicates file RF_CODE1.BIN on floppy.	Reference only
9B06	Indicates file FUNCTION.BIN on floppy.	Reference only
9B07	Indicates file DMA CTRL.BIN on floppy.	Reference only
9B08	Indicates file SP_CODE.BIN on floppy.	Reference only
9B09	Indicates file ML_CODE.BIN on floppy.	Reference only
9B10	Indicates file AL_CODE.BIN on floppy.	Reference only
9B11	Indicates file TCL VM.BIN on floppy.	Reference only
9B12	Indicates file ENGLISH.BIN on floppy.	Reference only
9B13	Indicates file FRENCH.BIN on floppy.	Reference only
9B14	Indicates file GERMAN.BIN on floppy.	Reference only
9B15	Indicates file ITALIAN.BIN on floppy.	Reference only
9B16	Indicates file SPANISH.BIN on floppy.	Reference only
9B17	Indicates file TRACE.BIN on floppy.	Reference only
9B18	Indicates file TABLE.BIN on floppy.	Reference only
9B19	Indicates file BPTRACE.BIN on floppy.	Reference only
9B20	Indicates file SPTRACE0.BIN on floppy.	Reference only
9B21	Indicates file SPTRACE1.BIN on floppy.	Reference only
9B22	Indicates file ALTRACE0.BIN on floppy.	Reference only
9B23	Indicates file ALTRACE1.BIN on floppy.	Reference only
9B24	Indicates file MLTRACE0.BIN on floppy.	Reference only
9B25	Indicates file MLTRACE1.BIN on floppy.	Reference only
9B26	Indicates file ERROR.LOG on floppy.	Reference only
9B27	Indicates file SENSE.LOG on floppy.	Reference only

ERROR CODE	CAUSE	FAILING COMPONENT
9B28	Indicates file STATS.LOG on floppy.	Reference only
9B29	Indicates file STATS1.LOG on floppy.	Reference only
9B30	Indicates file BFR_DIAG.BIN on floppy.	Reference only
9B31	Indicates file DMA_DIAG.BIN on floppy.	Reference only
9B32	Indicates file WF_DIAG.BIN on floppy.	Reference only
9B33	Indicates file LWR_DIAG.BIN on floppy.	Reference only
9B34	Indicates file RF1_DIAG.BIN on floppy.	Reference only
9B35	Indicates file RF2_DIAG.BIN on floppy.	Reference only
9B36	Indicates file RF3_DIAG.BIN on floppy.	Reference only
9B37	Indicates file RF4_DIAG.BIN on floppy.	Reference only
9B38	Indicates file RF5_DIAG.BIN on floppy.	Reference only
9B39	Indicates file RF6_DIAG.BIN on floppy.	Reference only
9B40	Indicates file RF7_DIAG.BIN on floppy.	Reference only
9B41	Indicates file HD_DIAG.BIN on floppy.	Reference only
9B42	Indicates file TCL1.BIN on floppy.	Reference only
9B43	Indicates file TCL2.BIN on floppy.	Reference only
9B44	Indicates file TCL3.BIN on floppy.	Reference only
9B45	Indicates file TCL4.BIN on floppy.	Reference only
9B46	Indicates file TCL5.BIN on floppy.	Reference only
9B47	Indicates file TCL6.BIN on floppy.	Reference only
9B48	Indicates file TCL7.BIN on floppy.	Reference only
9B49	Indicates file TCL8.BIN on floppy.	Reference only
9B50	Indicates file ANLGPNTR.BIN on floppy.	Reference only

ERROR CODE	CAUSE	FAILING COMPONENT
A000	IPL, command from bp never received	SBI
A001	IPL, command received, not receive status	SBI
A002	IPL, NMI_COMP bit not on	SBI
A003	IPL, NMI_ERROR bit is on	SBI
A004	IPL, interrupt from bp never received	SBI
A010	RST, command from bp never received	SBI
A011	RST, command received, not receive status	SBI
A012	RST, IPL_COMP bit not on	SBI
A013	RST, IPL_ERROR bit is on	SBI
A014	RST, interrupt from bp never received	SBI
A021	Invalid branch condition	SBI
A022	Invalid opcode	(Microcode) IPL and report incident to next level of support.
A023	FOR nesting overflow	(Microcode) IPL and report incident to next level of support.
A024	NEXT without FOR	(Microcode) IPL and report incident to next level of support.
A025	Nested JSR	(Microcode) IPL and report incident to next level of support.
A026	RET without JSR	(Microcode) IPL and report incident to next level of support.
A027	Invalid drive number	(Microcode) IPL and report incident to next level of support.
A028	WRT without BLK	(Microcode) IPL and report incident to next level of support.
A029	Block size exceeds data buffer	(Microcode) IPL and report incident to next level of support.
A030	Non 7Cxx error from tcl_vm	SBI
A033	Bringup, EPROM, disk error trying to read floppy FAT	Status Only
A034	EPROM, disk error trying to read floppy MAP	Diskette, Floppy Drive
A035	EPROM, disk error trying to read BOOTRAM.BIN	Diskette, Floppy Drive
A036	RAM, disk error trying to read floppy FAT	SBI
A037	RAM, disk error trying to read floppy MAP	SBI

ERROR CODE	CAUSE	FAILING COMPONENT
A038	Disk error while parking the head of the floppy drive	Diskette, Floppy Drive
✓ A039	Bringup, int. error, Program Counter, AAXX = vector	Status Only
A03A	Dead error, two word address follows	Status Only
A03B	Parity error interrupt	SBI
A040	Miscellaneous error from tcl_vm	SBI
A041	Timeout waiting for acknowledged from MD	Status Only
A042	Timeout retrying message to MD	Status Only
A050	Detected more than 48 WRT corrections. Additional AAXX error codes indicate track number XX with more than 16 WRT corrections.	Run TEST 1, HI, BT, cable between RI and BTI. See note on last page of this chapter. Media and R/W head
A051	Detected more than 48 RDF corrections. Additional AAXX error codes indicate track number XX with more than 16 RDF corrections.	Run TEST 1, HI, BT, cable between RI and BTI. See note on last page of this chapter. Media and R/W head
A052	Detected more than 48 RDB corrections. Additional AAXX error codes indicate track number XX with more than 16 RDB corrections.	Run TEST 1, HI, BT, cable between RI and BTI. See note on last page of this chapter. Media and R/W head
A055	VHF diagnostic has detected greater than 48 WRT corrections. Additional TIEXXXXX error codes indicate tracks in error with more than 16 corrections. The TIEXXXXX message contain bit significant track in error information. The tracks are identified as follows: 1,2,3,4/5,6,7,8/9,10,11,12/13,14,15,16/17, 18; EX: Tracks 8 and 15 in error would display: TIE01020	Run test 1, HI, BT, cable between RI and BT. Media, R/W head.
A056	VHF diagnostic has detected greater than 48 RDF corrections. Additional TIEXXXXX error codes indicate tracks in error with more than 16 corrections. The TIEXXXXX message contain bit significant track in error information. The tracks are identified as follows: 1,2,3,4/5,6,7,8/9,10,11,12/13,14,15,16/17, 18; EX: Tracks 17 and 18 in error would display: TIE0000C	Run test 1, HI, BT, cable between RI and BT. Media, R/W head.

ERROR CODE	CAUSE	FAILING COMPONENT
A057	VHF diagnostic has detected greater than 48 RBD corrections. Additional TIEXXXXX error codes indicate tracks in error with more than 16 corrections. The TIEXXXXX message contain bit significant track in error information. The tracks are identified as follows: 1,2,3,4/5,6,7,8/9,10,11,12/13,14,15,16/17, 18; EX: Tracks 1 and 18 in error would display: TIE80004	Run test 1, HI, BT, cable between RI and BT. Media, R/W head.
A058	VHF diagnostic has detected greater than 255 WRT corrections. Additional TIEXXXXX error codes indicate tracks in error with more than 16 corrections. The TIEXXXXX message contain bit significant track in error information. The tracks are identified as follows: 1,2,3,4/5,6,7,8/9,10,11,12/13,14,15,16/17, 18 EX: Tracks 10 in error would display: TIE00400	Run test 1, HI, BT, cable between RI and BT. Media, R/W head.
A059	VHF diagnostic has detected greater than 255 RDF corrections. Additional TIEXXXXX error codes indicate tracks in error with more than 16 corrections. The TIEXXXXX message contain bit significant track in error information. The tracks are identified as follows: 1,2,3,4/5,6,7,8/9,10,11,12/13,14,15,16/17, 18; EX: Tracks 8 and 15 in error would display: TIE08000	Run test 1, HI, BT, cable between RI and BT. Media, R/W head.
A05A	VHF diagnostic has detected greater than 255 RDB corrections. Additional TIEXXXXX error codes indicate tracks in error lwiht more than 16 corrections. The TIEXXXXX message contain bit significant track in error information. The tracks are identified as follows: 1,2,3,4/5,6,7,8/9,10,11,12/13,14,15,16/17, 18; EX: Tracks 8 and 15 in error would display: TIE00100	Run test 1, HI, BT, cable between RI and BT. Media, R/W head.
A060	Unsupported diagnostic command	(Microcode) IPL and report incident to next level of support.
A061	TO waiting for cmd from bp after int	SBI
A062	Cmd should be receive bp status	SBI
A063	Terminate diag bit should have been set	SBI

ERROR CODE	CAUSE	FAILING COMPONENT
A064	5100/5200, lock to data init failed	SBI
A065	Wrong interface for diagnostic command, Channel A	Status Only
A066	Wrong interface for diagnostic command, Channel B	Status Only
A067	No STK interface data rate	Status Only
A068	No FIPS interface data rate	Status Only
A069	Can't set old STK card from front panel	1. Change configuration 2. Replace interface card.
A06A	Host diagnostic mismatched with interface.	Interface configuration, verify correct microcode version, Host Adapter PWA
A06B	Host adapter hardware did not respond, msg. taken	Interface card, Interface card to SBI card cable
A06C	Host adapter hardware did not respond with int.	Interface card, Interface card to SBI card cable
A06D	Host adapter hardware is not capable of 4.5 Mb data rate	Level of interface card
A06E	Previous message not taken, same as func E245	Interface card, Interface card to SBI card cable
A070	Unsupported type of save trace command	SBI
A071	Write protect error writing floppy	SBI
A080	Invalid nmi interrupt	SBI
A081	Ram nmi detected a parity error	SBI
A082	Prom nmi detected a parity error	SBI
A083	2nd parity error detected	SBI
A084	Prom nmi after a parity error	SBI
A085	Invalid prom nmi interrupt	SBI
A088	Timeout waiting for rest of RS-232 message	Status Only
A089	Timeout waiting for SIO to become ready	Status Only
A091	TO waiting for cmd from bp after int	SBI
A092	Cmd should be receive bp status	SBI
A093	Terminate diag bit should have been set	SBI
A094	Tcl_vm.bin failed to load from floppy	Diskette, Floppy Drive
A095	Tcl?.bin failed to load from floppy	Diskette, Floppy Drive
A0A0	Rf code not found on floppy or in load map	Diskette, Floppy Drive

ERROR CODE	CAUSE	FAILING COMPONENT
A0A1	Disk error while loading bp code	Diskette, Floppy Drive
A0A2	Load of rf SRAM failed	SBI
A0A3	Stuck bit in fr SRAM	SBI
A0A4	Load of rf sequencer failed	SBI
A0A5	Disk error during general code load	Diskette, Floppy Drive
A0A8	Disk error during initializing stats.log	Diskette, Floppy Drive
A0A9	Disk error during initializing error.log	Diskette, Floppy Drive
A0B0	Clock B not active	SBI
A0B1	Clock B still active	SBI
A0B2	ADR IN not active	SBI
A0B3	TU Address didn't match	SBI
A0B4	ADDRESS IN still on	SBI
A0B5	Fdc int expected but not generated	SBI
A0B6	Seek error on restore w/verify	SBI
A0B7	Seek error	SBI
A0B8	Not ready error on restore w/verify	SBI
A0B9	Incorrect bootprom checksum	SBI
A0BA	Stuck address bit	SBI
A0BB	Stuck data bit	SBI
A0BC	Refresh failure	SBI
A0BD	Row-col both even/odd, <=7F	SBI
A0BE	Row-col neither both even/odd, <=7F	SBI
A0BF	Row-col both even/odd, >=7F	SBI
A0C0	Row-col neither both even/odd >=7F	SBI
A0C1	Parity error expected, not generated	SBI
A0C2	Unexpected parity error generated	SBI
A0C3	Out active before starting counter	SBI
A0C4	Count value not decreasing	SBI
A0C5	Count expired prematurely	SBI
A0C6	Miscompare in	SBI
A0C7	RXRDY not active in	SBI
A0C8	Cntr 2 interrupt expected, not generated	SBI
A0C9	BootRAM not found or in load map	Diskette

ERROR CODE	CAUSE	FAILING COMPONENT
A0CA	BP reported an error after jump table use	SBI
A0CB	BP_CODE.BIN exceeds size limit	Status Only
A0CC	RF_CODE.BIN exceeds size limit	Status Only
A0CD	ML_CODE.BIN exceeds size limit	Status Only
A0CE	AL_CODE.BIN exceeds size limit	Status Only
A0CF	SP_CODE.BIN exceeds size limit	Status Only
A0D0	FUNCTION.BIN exceeds size limit	Status Only
A0D6	Device address is neither 0 or 1	Status Only
A0D7	Illegal partition size from config.bin	Status Only
A0E0	Out of range test number for host invoked diag	(Microcode) IPL and report incident to next level of support.
A0E1	Logical drive address doesn't exist	(Microcode) IPL and report incident to next level of support.
A0E2	User manually terminated diagnostic	Status Only
A0E3	Time out waiting for BP to run script	(Microcode) IPL and report incident to next level of support.
A100	NO_ERROR	Status Only
A101	READY_ERROR	Diskette, Floppy Drive
A102	TRK0_ERR	Diskette, Floppy Drive
A103	SEEK_ERROR	Diskette, Floppy Drive
A104	READ_ERR	Diskette, Floppy Drive
A105	WRITE_ERR	Diskette, Floppy Drive
A106	FLOPPY_TO (TO = Time Out)	Diskette, Floppy Drive
A107	NO_FILE	Diskette, Floppy Drive
A108	CHKSUM_ERR	Diskette, Floppy Drive
A109	NO_PATCH	Diskette, Floppy Drive
A10A	EOF	SBI
A10B	Diskette is write protected.	Status Only
A10C	No diskette detected in floppy drive.	Status Only
A10D	Read/Write miscommunication with floppy disk controller.	(Microcode) IPL and report incident to next level of support.
A10E	Read/Write miscommunication with floppy disk controller	(Microcode) IPL and report incident to next level of support.
A10F	Detcted floppy density change	Status only
A110	EQUIP_CHK status bit active	SBI

ERROR CODE	CAUSE	FAILING COMPONENT
A111	File not specified in LOAD.MAP	Diskette, floppy drive
A112	Floppy drive head over wrong track	Diskette, floppy drive
A130	Input FIFO overrun	SBI
A131	Input FIFO parity error	SBI
A132	Output FIFO underflow	SBI
A133	CRC was never non-zero	SBI
A134	CRC non-zero	SBI
A135	Output FIFO parity error	SBI
A136	Queue management error	SBI
A137	No buffer EOD on host write	SBI
A138	Record too large for buffer	SBI
A139	Fatal error in DMA GSR register	SBI
A13A	Missing host EOD on write	SBI
A13B	Missing buffer EOD on write	SBI
A13C	Buffer input error, bad mod14 count	SBI
A13D	DMA Channel 3 failed to start	SBI
A13E	Pointers not equal after sync	SBI
A1AA	Filename of failing diagnostic not supported in microcode.	(Microcode) IPL and report incident to next level of support.
A245	Host adapter trace error	Status Only
A300	Bus processor does not respond	SBI
A301	Timeout:CLKB-IN didn't assert in 5 ms	SBI
A302	CMD not done yet	SBI/SBI
A303	OFFLINE CMD issued: CU online	SBI
A304	OFFLINE CMD issued: CU online	SBI
A305	Illegal ONLINE CMD	SBI
A306	1st command not tag diag	SBI
A307	2nd command not bp code load	SBI
A308	Timeout: CLKB-IN didn't negate in 5 ms	SBI
A309	Illegal OFFLINE CMD	SBI
A30A	Bp code not found on floppy or in load map	SBI
A30B	Disk error while loading bp code	SBI
A30C	3rd. Command not bp data load	Status Only

ERROR CODE	CAUSE	FAILING COMPONENT
A310	Timeout: ADR-IN didn't assert in 5 ms	SBI
A311	Timeout: ADR-IN didn't negate in 5 ms	SBI
A312	Timeout: STA-IN didn't assert in 5 ms	SBI
A313	Didn't get 55 on BUS-IN	SBI
A314	Timeout: STA-IN didn't negate in 5 ms	SBI
A315	Timeout: ALERT didn't assert in 5 ms.	SBI
A316	Didn't get AA on BUS-IN	SBI
A317	Timeout: ALERT didn't negate in 5 ms.	SBI
A320	ADR-IN didn't assert in 5 ms.	SBI
A321	ADR-IN didn't negate in 5 ms.	SBI
A322	Load: CLKB-IN didn't assert in 5 ms.	SBI
A323	Load: CLKB-IN didn't negate in 5 ms.	SBI
A324	Load: CLKB-IN didn't assert in 5 ms for last byte.	SBI
A325	Load: CLKB-IN didn't negate in 5 ms for last byte.	SBI
A326	RDBK: CLKB-IN didn't assert in 5 ms.	SBI
A327	Read back check has too many bytes.	SBI
A328	Miscompare during readback check	SBI
A329	RDBK:CLKB-IN didn't negate in 5 ms.	SBI
A32A	RDBK: CLKB-IN didn't negate in 5 ms for STA byte.	SBI
A32B	RDBK: STA-IN asserted but byte count not zero	SBI
A341	Clock B still active	SBI
A345	Clock B not active	SBI
A347	ADR IN not active	SBI
A348	TU address didn't match.	SBI
A349	ADDRESS IN still on	SBI
A401	Too many bits set in specify language data byte	Status Only
A402	No bits set in specify language data byte	Status Only
A600	REW command-logical drive address does not exist.	IPL and report incident to next level of support.

ERROR CODE	CAUSE	FAILING COMPONENT
A700	Readywrt, timeout waiting for fdc controller to come ready	SBI
A701	Cntl expecting read when should be write	SBI
A702	Read_loopn, cntl expecting write when should be read	SBI
A703	Read_loopn, timeout waiting for fdc controller to come ready	SBI
A704	Writ_loopn, timeout waiting for fdc controller to come ready	SBI
A706	Unexpected result phase data for a sns int cmd	SBI
A707	Writ_loopn, cntl expecting write when should be read	SBI
A708	Incorrect status after a read data command	SBI
A720	Eprom, initial FDC communication failed	SBI
A730	RAM5 diag, AAAA not read as expected	SBI
A731	RAM5 diag 5555 not read as expected	SBI
AAXX	(XX indicates which track is in error.)	Reference Only
C000	Microcode detected error	Take trace.
C00X	Microcode detected error	Take trace.
D001	TU configuration error	HI, RI
D002	No response to 'request configuration' from H.A.	I/F, SK
D003	No response to 'go online' from HA	I/F
D004	Host adapter rejected patches sent.	Floppy Disk, I/F
D005	Functional code is wrong level for RF card.	Floppy Disk, I/F
D006	I/F card code is downlevel or wrong type.	Level of Interface Card or Functional Code
D007	MP card EPROM code is down level (below revision 85).	SBI
D008	BOOTRAM code is downlevel (below revision 95).	SBI
D009	Reset or online request encountered after unsuccessful IPL (must IPL again).	N/A
D00A	Invalid partition size in CONFIG.BIN	Software Error
D00B	Insufficient memory for partiton size req.	Check configurations; SBI
D00C	Too many drives for partitioning mode	Check configurations

ERROR CODE	CAUSE	FAILING COMPONENT
D00E	Wrong interface card installed for floppy	Change configuration; Replace intf. card
D00F	Interface card not responding	Check I/F card, connections
D010	Online request after TCL active	IPL control unit.
D011	EOD interrupt active all the time	SBI
D012	Miscompare on BID register	SBI
D013	Miscompate on control register	SBI, DCI
D014	Mode register won't reset.	SBI
D015	ICRC diagnostic failure during bringups	SBI
D016	Tried to load ICRC code on non-ICRC hardware	SBI, DCI
D017	Tried to load non-ICRC code on ICRC hardware	SBI, DCI
DEAD	Overtemp condition detected on SBI card	Check for proper airflow.
DF50	A buffered log overflow has occurred. A read buffered log command has been re-requested via ERPA code 50.	Status Only
DF51	A Read Buffered Log command has been requested but not granted. The buffered log data has been lost.	Status only
DF52	A Rewind Unload command has completed.	Status Only
E000	NO Errors	Status Only
E001	Slot sensor was very noisy.	SS, RS
E002	External RAM error	AC
E003	Vertical Motion control timed out.	Cartridge, FS, AC
E004	Horiz. Motion timed out on way to drive.	Cartridge, FS, AC
E005	Horiz. Motion timed out parking on drive side.	Cartridge, FS, AC
E007	Absolute position command	Status Only
E008	Vertical timeout during EJECT or Axle index not found	Cartridge, RX, Vert. Motor
E009	Invalid slot ints.	SS, Magazine
E00A	Retries exceeded parking at magazine side (UNLOAD:).	Cartridge, AC
E00B	Serial I/O int. occurred. (Ser. I/O Not Used)	AC
E00C	Magazine Index sensor was noisy.	Mag. @ Index Sensor RS
E00D	Cart in Mag. sensor was noisy.	CS, RS

ERROR CODE	CAUSE	FAILING COMPONENT
E00E	Drv_Up_Dn sensor occurred before Cart_In_Drv.	Cartridge, FS, Carrier Belt Misaligned
E00F	Horiz. Motion timed out on way to magazine.	Cartridge, Horizontal @ Mag Sensor, RS; also check +24V
E010	Invalid Cart_In_Drv sensor before LOAD started	FS, Cable
E011	Invalid Drv_Up_Dn sensor before LOAD started	FS, Horizontal Belt
E012	Noisy Cart_In_Drv sensor	FS, Horizontal Belt
E013	Noisy Drv_Up_Dn sensor	FS, FS Cable
E014	Timeout unparking horiz. at drive	FS, FS Cable, AC
E015	Noisy Axle_Index sensor	RS, RS Cable
E016	Noisy Horiz. at Mag. sensor	Horizontal @ Mag. Sensor, RS
E017	Horiz. motion timed out parking on mag. side, Cartridge, Horizontal @ Mag. Sensor, RS	
E018	Vertical timeout looking for slot 1	SS, RS
E019	Noisy Clean Cartridge sensor	FS, FS Cable
E01A	No Mag.Index sensor during eject.	Mag. Index Sensor, RS
E01B	Invalid Mag. Index sensor after Mag. load.	Mag. Index Sensor, RS
E01C	Invalid sensor before unload. CART_IN_DRV_HORIZ_AT_MAG	FS, Horizontal @ Mag., RS
E01D	Unable to communicate with HP chip.	AC
E01E	Vertical disconnect detected	Deadman Switch, AC
E060	Load from empty slot	FS, AC
E061	Already load	FS, AC
E062	Unload to full slot	Vert. Motor, SS, AC
E063	Already unloaded	CS, AC
E064	No magazine	RS, AC
E065	Move magazine beyond limits	Vert. Motor, AC
E068	Move magazine when cartridge loaded	RS, AC
E069	Status not possible situation, may be bad sensor	FS, RS, CS, SS, Sensors
E06A	Unload required error	Status Only
E06B	Up before index	AC

ERROR CODE	CAUSE	FAILING COMPONENT
E06C	Shuttle was not at mag before load command.	Status Only
E06D	Cartridge is in drive, but magazine is not in autoloader.	Push unload button and catch tape.
E06E	Load tape when another already in drive	FS
E06F	Scan command received when tape is loaded	Operator error
E070	Tape unloads without magazine present.	Operator error
E071	Magazine alignment failure	Magazine in incorrectly, SCC
E080	External RAM error	AC
E081	Bad ROM error	AC
E0B0	Error due to unimplementation	AC
E0C0	Timeout not-command-ready	AC
E0C1	Timeout command-ready	AC
E0C2	Timeout not-stat-ack	AC
E0C3	Timeout stat-ack	AC
E0D1	Illegal length	AC
E0D2	Unknown command	AC
E0D3	Illegal master interrupt format	AC
E0D4	Illegal master interrupt format	AC
E0D5	55 on data port was expected.	AC
E0D6	AA on data port was expected.	AC
E0D7	Inappropriate header	AC
E0D8	Broken vector	AC
E0D9	Cmdrdy tag expected	AC
E0DA	Revision imcompatible	AC
E0FF	2 byte length command	AC
E110	SRAM failure	SBI
E111	SRAM failure	SBI
E112	SRAM failure	SBI
E113	SRAM failure	SBI
E114	NVRAM failure	SBI
E120	68K/BP diag req seq: timeout: sel/cmd/adr-out didn't assert in 30 sec	Defective or missing diskette, SBI

ERROR CODE	CAUSE	FAILING COMPONENT
E121	68K/BP diag req seq, timeout: CLKA-OUT didn't assert.	SBI
E122	68K/BP diag req seq, timeout: CLKA-OUT didn't negate.	SBI
E123	68K/BP diag req seq, timeout: CMD-OUT, adr-out, sel-out didn't negate.	SBI
E124	68K/BP diag req seq: got nonzero sta from 68k	SBI
E125	68K/BP diag seq: timeout: sel/CMD-OUT didn't assert in 5 ms for cmd.	SBI
E126	68K/BP diag seq: wrong cmd from 68k (should be code load)	SBI
E127	68K/BP diag seq, timeout: 68k didn't drop CMD-OUT after ADR-IN.	SBI
E128	68K/BP diag seq, timeout: CMD-OUT didn't assert 2nd time.	SBI
E129	68K/BP diag seq: didn't get '55' from 68k	SBI
E12A	68K/BP diag seq, timeout: CMD-OUT didn't negate after STA-IN.	SBI
E12B	68K/BP diag seq, timeout: CMD-OUT didn't assert 3rd time.	SBI
E12C	68K/BP diag seq: didn't get 'AA' from 68k.	SBI
E12D	68K/BP diag seq, timeout: CMD-OUT, sel-out didn't drop after TU-alert.	SBI
E131	Servo A diag: no response from servo A	SM
E133	Servo A diag timeout: servo A didn't drop intr/CMD-ACK/STA-RDY.	SM
E134	Servo A diag timeout: servo A didn't respond to AA with CMD-ACK.	SM
E135	Servo A diag timeout: servo A didn't drop CMD-ACK in 5 ms.	SM
E137	Servo A diag: expected 55 from servo A: didn't get it	SM
E139	Servo A diag timeout: servo A didn't drop STA-RDY in 5 ms.	SM
E13B	Servo A diag timeout: servo A didn't assert CMD-ACK & STA-RDY.	SM
E13D	Servo A diag: expected AA from servo A: didn't get it	SM

ERROR CODE	CAUSE	FAILING COMPONENT
E13F	Servo A diag timeout: servo A didn't negate STA-RDY & CMD-ACK.	SM
E180	Diag timeout SV A: dev didn't drop intr/CMD-ACK/STA-RDY.	SM
E181	Diag timeout SV A: dev didn't respond to AA with slav intr.	SM
E182	Diag timeout SV A: dev didn't drop CMD-ACK in 5 ms.	SM
E183	Diag, expected 55 from SV A: didn't get it	SM
E184	Diag timeout SV A: dev didn't drop STA-RDY in 5 ms.	SM
E185	Diag timeout SV A: dev didn't assert CMD-ACK & STA-RDY.	SM
E186	Diag, expected AA from SV A: didn't get it	SM
E187	Diag timeout SV A: dev didn't negate STA-RDY & CMD-ACK.	SM
E188	Detected Autoloader B or intelligent manldr B but not servo B	SM
E189	68K didn't complete IPL sequence.	SM
E18A	Diag timeout SV A: dev didn't assert STA-RDY in 5 ms.	SM
E18B	68K detected IPL error.	SM
E18C	68K didn't complete reset sequence.	SM
E18D	Detected prev IPL error during RST sequence	IPL and report incident to next level of support.
E18E	Detected prev RST error during RST sequence	IPL and report incident to next level of support.
E18F	Code not compatible with SBI	Replace SBI or change code.
E190	Display A or B stayed busy too long.	DP
E191	Detected autoloader A or intelligent manual loader A, but not servo A	SM
E19E	Detected prev RST error during RST sequence	IPL and report incident to next level of support.
E1A0	Display A and/or B stayed busy too long.	DP
E1F0	Servo A feature not detected	SM
E1FF	Servo A feature not detected	SBI
E200	No error code set, microcode error	Microcode

ERROR CODE	CAUSE	FAILING COMPONENT
E201	Host bus parity error	SZ/SZI
E202	Timeout, internal controller error	Microcode
E203	Initiator detected error, retries exhausted	SZ/SZI
E205	Buffer parity error	SBI
E206 (SCSI Intf)	ATN presented (reset)	Status only
E206 (STK/FIPS Intf)	Host adapter message byte count low	Interface card, SBI
E207 (SCSI Intf)	ATN presented (mode parameters changed)	Status only
E207 (STK/FIPS Intf)	Channel adapter code hung; this error generally results in IFCC.	Status Only; IPL may be required, and take trace after reset and before IPL.
E208 (SCSI Intf)	ATN presented (not ready to ready)	Status only
E208 (STK/FIPS Intf)	Host adapter FIFO not empty	Interface card, SBI
E209	Illegal length request	Status only
E20A	Input FIFO overrun	SBI
E20B	Input FIFO parity error	SBI
E20C	Output FIFO underflow	SBI
E20D	CRC was never non-zero	SBI
E20E	CRC non-zero	SBI
E20F	Output FIFO parity error	SBI
E210	Queue management error	Microcode
E211	No buffer EOD on host write	SBI
E212	Data Check, data transfered	SBI
E213	Record too large for buffer	Status only
E214	Fatal error in DMA GSR register	SBI
E215	Missing Host EOD on write	SBI/SZI
E216	Missing Buffer EOD on write	SBI/SZI
E217	No available partition for read/write	Microcode
E218	Permanent error on previous read ahead	Media
E219	Permanent error on previous read behind	Media
E21A	Read backwards at load point	Status only
E21B	Back space operation at load point	Status only

ERROR CODE	CAUSE	FAILING COMPONENT
E21C	Physical side crashed load point	Status only
E21D (SCSI Intf)	Retransmit write data for DC card data overflow	Status only
E21D (STK/FIPS Intf)	Wrong channel or drive or command received from the host on a reconnection	Status Only
E21E	Shared memory contention error	Microcode
E21F	Parameter list length error	Status only
E220 (SCSI Intf)	Control unit ERP failed	Media
E220 (STK/FIPS Intf)	Send RAM load intr, timeout: sel/cmd/adr-out didn't assert in 30 sec.	SBI
E221 (SCSI Intf)	Permanent error on read forward	Media
E221 (STK/FIPS Intf)	Send RAM load intr, timeout: CLKA-OUT didn't assert.	SBI
E222 (SCSI Intf)	Block ID miscompare on read forward	Media
E222 (STK/FIPS Intf)	Send RAM load intr, timeout: CLKA-OUT didn't negate.	SBI
E223 (SCSI Intf)	Invalid block ID on read forward	Media
E223 (STK/FIPS Intf)	Send RAM load intr, timeout: CMD-OUT, adr-out, sel-out didn't negate.	SBI
E224 (SCSI Intf)	Permanent error on read backward	Media
E224 (STK/FIPS Intf)	Send RAM load intr: got non-zero status from 68K	SBI
E225	Block ID miscompare on read backward	Media
E226	Invalid block ID on read backward	Media
E227	Block ID miscompare on buffered write	Media/Microcode
E228	Block ID miscompare on immediate write	Media/microcode
E229	Permanent error on buffered write	Media
E22A	Permanent error on immediate write	Media
E22B	Permanent error on write tape mark	Media
E22C	Physical locate failed	Status only
E22D	Logical locate failed	Status only
E22E	Logical EOT encountered	Status only

ERROR CODE	CAUSE	FAILING COMPONENT
E22F	Blank check, media void encountered	Status only
E230	Not ready to ready, buffer not empty	Status only
E231	Manual unload, buffer not empty	Status only
E232	Unit check, drive reported error	Status only
E233	Illegal field in parameter list	Status only
E234	Invalid field in CDB	Status only
E235	TM found	Status only
E236	Fixed bit set in variable mode	Status only
E237	Fixed bit clear in fixed mode	Status only
E238	Illegal length requested	Status only
E239	Reserved field used	Status only
E23A	Invalid message error	Status only
E23B	Data phase error, command aborted	SZI/interface cable
E23C	Timeout waiting for WD chip ready	SZI, interface cable
E23D	Interface parity error	Status only
E23E	No data in buffer (EOM bit returned)	Status only
E23F	Overlapped commands	Status only
E240	Drive not online	Status only
E241	Drive not ready (tape not loaded)	Status only
E242	Drive file protected on write operation	Status only
E243	Can't offload buffered data	Media
E244	Illegal CDB	Status only
E245	Unexpected interrupt	SZI
E246	Illegal status from WD SCSI chip	SZI
E247	Invalid field in parameter list	Status only
E248	Space encountered PEOT	Status only
E249	Read encountered PEOT	Status only
E24A	Write encountered PEOT	Status only
E24B	Invalid operation code in command from host	Status only
E24C	Logical side detected backwards at BOT	Status only
E24D	Retry exhausted (get CMD)	SZI, interface cable
E24E	Invalid message error	Status only

ERROR CODE	CAUSE	FAILING COMPONENT
E24F	Media load or eject failed, load check	Status only
E250	Buffered log overflow	Status only
E251 (SCSI Intf)	Buffered log overflow, rewind unload	Status only
E251 (STK/FIPS Intf)	RAM load timeout: sel/CMD-OUT didn't assert in 5 ms for cmd.	SBI
E252 (SCSI Intf)	Buffered log overflow, read buffered log	Status only
E252 (STK/FIPS Intf)	RAM load: wrong cmd from 68K	SBI
E253 (SCSI Intf)	Invalid bits in ID message	Status only
E253 (STK/FIPS Intf)	Ram load timeout: 68K didn't drop CMD-OUT at start of load.	SBI
E254 (SCSI Intf)	Microcode error: unexpected IP message	Microcode
E254 (STK/FIPS Intf)	Ram load timeout: CLKA-OUT didn't assert for byte count.	SBI
E255 (SCSI Intf)	Sense command without check condition	Status only
E255 (STK/FIPS Intf)	Ram load timeout: CLKA-OUT didn't negate for byte count.	SBI
E256 (SCSI Intf)	Temporary read error	Media
E256 (STK/FIPS Intf)	Ram load timeout: CLKA-OUT/CMD-OUT didn't assert, data xfer.	SBI
E257	Temporary write error	Media
E258 (STK/SCSI Intf)	Illegal length, too large	Media
E258 (FIPS Intf)	Ram load timeout: CLKA-OUT/CMD-OUT didn't negate, data xfer.	SBI
E259 (STK/SCSI Intf)	Buffer input error, bad mod14 count	SBI
E259 (STK/FIPS Intf)	Ram load: data xfer done: byte count not zero	SBI
E25A	Fixed and SILI bits both set	Status only
E25C	Incompatible media format, ICRC tape?	Media

ERROR CODE	CAUSE	FAILING COMPONENT
E25D	DMA channel 3 failed to start	SBI
E25F	INIT detect error retry fail	Status only
E260 (STK/FIPS Intf)	Ram load timeout: CLKA-OUT/CMD-OUT didn't assert readback.	SBI
261 (STK/FIPS Intf)	Ram load timeout: CLKA-OUT/CMD-OUT didn't negate, readback.	SBI
E262 (SCSI Intf)	Invalid block ID detected on read	Media
E262 (STK/FIPS Intf)	Ram load timeout: CMD-OUT didn't assert in 5 ms.	SBI
E263	Erase fault	SBI, RI
E264	Read formatter card error	RF
E265 (STK/SCSI Intf)	ADMA error detected by physical side	SBI
E265 (STK/FIPS Intf)	Ram load: err in status byte from 68K	SBI
E266	Microcode error	Microcode
E267 (STK/FIPS Intf)	Ram load timeout: CMD-OUT, sel-out didn't drop.	SBI
E26A	Compressed to non-compressed mode change in an open file	Status only
E26B	Write density ID failed	Media
E26C	Read density ID failed, unknown format	Media
E26F	Reposition error during ERP for write type command	RI, SBI
E270	ERP positioning error, crashed BOT	RI, SBI
E271	Multiple tracks corrected; write type operation	Media, HI
E273	Missing packet ID ready interrupt	DC
E274	Packet ID ready not present on read	DC
E275	DC card interrupt status indicated error on read	DC
E277	Saving parameters not supported	Status only
E278	Self-test failed	SZI
E27A	CSL not present	Status only
E27B	Invalid CSL position requested	Status only

ERROR CODE	CAUSE	FAILING COMPONENT
E27C	CSL not ready (no cartridge)	Status only
E27D	Load command received, load in progress	Status only
E27E	Drive not ready, rewinding	Status only
E27F	Blank check, read retries expired	Status only
E280	Permanent error on immediate write	Media
E281	Timeout waiting for offline accepted from IP	SZI
E284	ICRC record, feature not installed	Status only
E286	No interrupt at end of read packet	DC
E287	End of operation interrupt expected from DC card	DC
E288	DC error status at end of read	DC
E289	Packet CU CRC error	DC
E28A	BID miscompare on ICRC read	Microcode
E290	Read backward ICRC tape	Status only
E291	Error during revise packet, see sense bytes	DC
E295 (STK/FIPS Intf)	Host adapter FIFO empty before byte count expires	Interface card, SBI
E296	Request ICRC and not enabled	Status only
E2A6	DC indicated bad interrupt status	DC
E2AB	DC interrupt time out after packet data	DC
E2AC	DC error after data and trailer transfer	DC
E2AD	DC not idle after "complete trailer"	DC
E2AE	DC interrupt time out after "write new PID"	DC
E2AF	DC error after packet ID transfer	DC
E2B0	No EOD at input FIFO after packet ID	DC, SBI
E2B1	No EOD at buffer input after packet ID	DC, SBI
E2B2	CU CRC miscompare: DC CRC/CU CRCA	DC, SBI
E2B3	SZI CRC miscompare: DC CRC/SZI CRC	DC, SZI
E2F1 (STK/FIPS Intf)	VHF (inline) communication failure - no message after Trap 0.	Save Trace.
E2F2 (STK/FIPS Intf)	VHF (inline) communication failure - can't decode message type	Save Trace.

ERROR CODE	CAUSE	FAILING COMPONENT
E2F3 (STK/FIPS Intf)	VHF (inline) communication failure - can't decode status type	Save Trace.
E2F4 (STK/FIPS Intf)	VHF (inline) communication failure - can't decode command type	Save Trace.
E2F5 (STK/FIPS Intf)	VHF (inline) communication failure - unexpected Unit Exception Status	Save Trace.
E2FE	Block ID not in FIFO	RI, SBI
E2FF	Odd address access	Microcode
E380	Diag timeout ML A: dev didn't drop intr/CMD-ACK/STA-RDY.	DP
E381	Diag timeout ML A: dev didn't respond to AA with slav intr.	DP
E382	Diag timeout ML A: dev didn't drop CMD-ACK in 5 ms after.	DP
E383	Diag, expected 55 from ML A: didn't get it	DP
E384	Diag timeout ML A: dev didn't drop STA-RDY in 5 ms.	DP
E385	Diag timeout ML A: dev didn't assert CMD-ACK & STA-RDY.	DP
E386	Diag, expected AA from ML A: didn't get it	DP
E387	Diag timeout ML A: dev didnt't negate STA-RDY & CMD-ACK.	DP
E38A	Diag timeout ML A: dev didn't assert STA-RDY in 5 ms.	DP
E480	Diag timeout ML B: dev didn't drop intr/CMD-ACK/STA-RDY.	DP
E481	Diag timeout ML B: dev didn't respond to AA with slav intr.	DP
E482	Diag timeout ML B: dev didn't drop CMD-ACK in 5 ms after.	DP
E483	Diag, expected 55 from ML B: didn't get it	DP
E484	Diag timeout ML B: dev didn't drop STA-RDY in 5 ms.	DP
E485	Diag timeout ML B: dev didn't assert CMD-ACK & STA-RDY.	DP
E486	Diag, expected AA from ML B: didn't get it	DP
E487	Diag timeout ML B: dev didnt't negate STA-RDY & CMD-ACK.	DP

ERROR CODE	CAUSE	FAILING COMPONENT
E48A	Diag timeout ML B: dev didn't assert STA-RDY in 5 ms.	DP
E4FF	Manual loader B feature not detected	DP
E500	Invalid Autoloader cmd from 68K	(Microcode) IPL and report incident to next level of support.
E501	Invalid cmd from 68K	(Microcode) IPL and report incident to next level of support.
E502	New cmd from 68K: previous cmd still stacked	(Microcode) IPL and report incident to next level of support.
E503	New cmd from 68K: byte count exceeds 32	(Microcode) IPL and report incident to next level of support.
E504	Diag cmd from 68K: not in execution phase when issued	(Microcode) IPL and report incident to next level of support.
E505	Update LCD from 68K: not in execution phase or ipl when issued	(Microcode) IPL and report incident to next level of support.
E506	Invalid update display subcommand from 68K	(Microcode) IPL and report incident to next level of support.
E507	Man ldr cmd prev stacked during ipl but not code download	(Microcode) IPL and report incident to next level of support.
E509	Sta cmd from 68K, diag complete: nothing executing. Trace point only	(Microcode) IPL and report incident to next level of support.
E50A	Sta cmd from 68K, ipl complete: ipl in progress not active	(Microcode) IPL and report incident to next level of support.
E50C	Srvo cmd prev stacked but not A intf	(Microcode) IPL and report incident to next level of support.
E50D	Srvo cmd prev stacked during ipl but not code download	(Microcode) IPL and report incident to next level of support.
E50E	Diag cmd to 68K: byte count exceeds 32	(Microcode) IPL and report incident to next level of support.
E50F	68K update 8 char LCD: not allowed for this sequence	(Microcode) IPL and report incident to next level of support.
E510	Autoloader cmd prev stacked during ipl but not code download	(Microcode) IPL and report incident to next level of support.
E511	Global stack flag on but individual stack flags off	(Microcode) IPL and report incident to next level of support.
E520	SV or AL code load: 0 byte cnt	(Microcode) IPL and report incident to next level of support.
E521	WRT, RDF, RDB: already busy with REW, DSE or locate	(Microcode) IPL and report incident to next level of support.

ERROR CODE	CAUSE	FAILING COMPONENT
E581	Get 68K cmd: adr-out or CMD-OUT not on at start of 68k seq	SBI
E582	Get 68K cmd: invalid adr: something other than 0 or 1	(Microcode) IPL and report incident to next level of support.
E583	Get 68K cmd: CMD-OUT didn't assert in 5 ms.	SBI
E588	Get 68K data: CLKA-OUT didn't assert in 5 ms.	(Microcode) IPL and report incident to next level of support.
E589	Get 68K data: CLKA-OUT didn't negate in 5 ms.	(Microcode) IPL and report incident to next level of support.
E58A	Send 68K data: CLKA-OUT didn't assert in 5 ms.	(Microcode) IPL and report incident to next level of support.
E58B	Send 68K data: CLKA-OUT didn't negate in 5 ms.	(Microcode) IPL and report incident to next level of support.
E58C	Send 68K data: CMD-.OUT didn't assert in 5 ms for last byte.	(Microcode) IPL and report incident to next level of support.
E58D	Send 68K data: CMD-OUT on before all bytes transferred	(Microcode) IPL and report incident to next level of support.
E590	Send 68K status: CLKA-OUT didn't assert in 5 ms.	(Microcode) IPL and report incident to next level of support.
E591	Send 68K status: CLKA-OUT didn't negate in 5 ms.	(Microcode) IPL and report incident to next level of support.
E592	Send 68K status: CMD-OUT didn't negate in 5 ms.	SBI
E593	68K interrupt seq: CMD-OUT didn't assert in 5 ms.	SBI
E594	68K interrupt seq: CMD-OUT didn't negate in 5 ms.	SBI
E595	68K interrupt seq: cmd/sel/adr-out didn't negate in 5 ms.	SBI
E596	Send 68K byte count: CLKA-OUT didn't assert in 5 ms.	SBI
E597	Send 68K byte count: CLKA-OUT didn't negate in 5 ms.	SBI
E598	Send last byte: CLKA-OUT didn't assert in 5 ms.	SBI
E599	Send last byte: CLKA-OUT didn't negate in 5 ms.	SBI
E59A	Send last byte: CMD-OUT didn't negate in 5 ms.	SBI

ERROR CODE	CAUSE	FAILING COMPONENT
E59B	68K interrupt seq: intr not active	(Microcode) IPL and report incident to next level of support.
E680	Diag timeout SV B: dev didn't drop intr/CMD-ACK/STA-RDY.	SM
E681	Diag timeout SV B: dev didn't respond to AA with slav intr.	SM
E682	Diag timeout SV B: dev didn't drop CMD-ACK in 5 ms after.	SM
E683	Diag, expected 55 from SV B: didn't get it	SM
E684	Diag timeout SV B: dev didn't drop STA-RDY in 5 ms.	SM
E685	Diag timeout SV B: dev didn't assert CMD-ACK & STA-RDY.	SM
E686	Diag, expected AA from SV B: didn't get it	SM
E687	Diag timeout SV B: dev didnt't negate STA-RDY & CMD-ACK.	SM
E68A	Diag timeout SV B: dev didn't assert STA-RDY in 5 ms.	SM
E780	Diag timeout AL A: dev didn't drop intr/CMD-ACK/STA-RDY.	AC
E781	Diag timeout AL A: dev didn't respond to AA with slav intr.	AC
E782	Diag timeout AL A: dev didn't drop CMD-ACK in 5 ms.	AC
E783	Diag, expected 55 from AL A: didn't get it	AC
E784	Diag timeout AL A: dev didn't drop STA-RDY in 5 ms.	AC
E785	Diag timeout AL A: dev didn't assert CMD-ACK & STA-RDY.	AC
E786	Diag, expected AA from AL A: didn't get it	AC
E787	Diag timeout AL A: dev didnt't negate STA-RDY & CMD-ACK.	AC
E78A	Diag timeout AL A: dev didn't assert STA-RDY in 5 ms.	AC
E7FF	Autoloader A feature not detected	AC
E880	Diag timeout AL B: dev didn't drop intr/CMD-ACK/STA-RDY.	AC
E881	Diag timeout AL B: dev didn't respond to AA with slav intr.	AC

ERROR CODE	CAUSE	FAILING COMPONENT
E882	Diag timeout AL B: dev didn't drop CMD-ACK in 5 ms.	AC
E883	Diag, expected 55 from AL B: didn't get it	AC
E884	Diag timeout AL B: dev didn't drop STA-RDY in 5 ms.	AC
E885	Diag timeout AL B: dev didn't assert CMD-ACK & STA-RDY.	AC
E886	Diag, expected AA from AL B: didn't get it	AC
E887	Diag timeout AL B: dev didn't negate STA-RDY & CMD-ACK.	AC
E88A	Diag timeout AL B: dev didn't assert STA-RDY in 5 ms.	AC
E907	Stack man loader A cmd: prev cmd already stacked	(Microcode) IPL and report incident to next level of support.
E908	Stack man loader B cmd: prev cmd already stacked	(Microcode) IPL and report incident to next level of support.
E90B	Stack servo A cmd: prev cmd already stacked	(Microcode) IPL and report incident to next level of support.
E90C	Stack servo B cmd: prev cmd already stacked	(Microcode) IPL and report incident to next level of support.
E90D	Stack Autoloader A cmd: prev cmd already stacked	(Microcode) IPL and report incident to next level of support.
E90E	Stack Autoloader B cmd: prev cmd already stacked	(Microcode) IPL and report incident to next level of support.
E983	Too many passes thru interrupt for 68K	(Microcode) IPL and report incident to next level of support.
E984	INTR on A, but not configured for A	SBI
E990	Servo A cmd timeout	SBI
E991	Servo B cmd timeout	SM
E992	Autoloader A cmd timeout	AC
E993	Autoloader B cmd timeout	AC
E994	Man loader A cmd timeout	DP
E995	Man loader B cmd timeout	DP
EA01	Send SV cmd, timeout stx: CMD-ACK didn't assert in 40 ms.	SM
EA02	Send SV cmd, timeout stx: CMD-ACK didn't negate in 5 ms.	SM

ERROR CODE	CAUSE	FAILING COMPONENT
EA03	Send SV cmd, timeout byte cnt: CMD-ACK didn't assert in 5 ms.	SM
EA04	Send SV cmd, timeout byte cnt: CMD-ACK didn't negate in 5 ms.	SM
EA05	Send SV cmd, timeout data: CMD-ACK didn't assert in 5 ms.	SM
EA06	Send SV cmd, timeout data: CMD-ACK didn't negate in 5 ms.	SM
EA07	Send SV data, timeout: CMD-ACK didn't assert in 5 ms.	SM
EA08	Send SV data, timeout: CMD-ACK didn't negate in 5 ms.	SM
EA09	Stack SV cmd, timeout stx: CMD-ACK didn't assert in 5 ms.	SM
EA0A	Stack SV cmd, timeout stx: CMD-ACK didn't negate in 5 ms.	SM
EA11	SV cmd, timeout send stx: CMD-ACK didn't assert in 5 ms.	SM
EA12	SV cmd, timeout send stx: CMD-ACK didn't negate in 5 ms.	SM
EA13	SV cmd, timeout rcv stx: CMD-ACK didn't assert in 5 ms.	SM
EA14	SV cmd, timeout rcv stx: wrong stx from device	SM
EA15	SV cmd, timeout rcv stx: STA-RDY didn't negate in 5 ms.	SM
EA16	SV cmd, timeout rcv byte cnt: STA-RDY didn't assert in 5 ms.	SM
EA19	SV cmd, timeout rcv byte cnt: STA-RDY didn't negate in 5 ms.	SM
EA1B	SV cmd, timeout rcv cmd: STA-RDY didn't assert in 5 ms.	SM
EA1C	SV cmd, timeout rcv cmd: STA-RDY didn't negate in 5 ms.	SM
EA21	SV cmd, timeout rcv data: STA-RDY didn't assert in 5 ms.	SM
EA22	SV cmd, timeout rcv data: STA-RDY didn't negate in 5 ms.	SM
EA30	Snd SV data, timeout, last byte: CMD-ACK didn't assert in 5 ms.	SM

ERROR CODE	CAUSE	FAILING COMPONENT
EA31	Snd SV data, timeout, last byte: CMD-ACK didn't negate in 5 ms.	SM
EA41	SV cmd, timeout rcv sta: STA-RDY didn't assert in 5 ms.	SM
EA42	SV cmd, timeout rcv sta: STA-RDY didn't negate in 5 ms.	SM
EB01	Send AL cmd, timeout stx: CMD-ACK didn't assert in 40 ms.	AC
EB02	Send AL cmd, timeout stx: CMD-ACK didn't negate in 5 ms.	AC
EB03	Send AL cmd, timeout byte cnt: CMD-ACK didn't assert in 5 ms.	AC
EB04	Send AL cmd, timeout byte cnt: CMD-ACK didn't negate in 5 ms.	AC
EB05	Send AL cmd, timeout data: CMD-ACK didn't assert in 5 ms.	AC
EB06	Send AL cmd, timeout data: CMD-ACK didn't negate in 5 ms.	AC
EB07	Send AL data, timeout: CMD-ACK didn't assert in 5 ms.	AC
EB08	Send AL data, timeout: CMD-ACK didn't negate in 5 ms.	AC
EB09	Stack AL cmd, timeout stx: CMD-ACK didn't assert in 5 ms.	AC
EB0A	Stack AL cmd, timeout stx: CMD-ACK didn't negate in 5 ms.	AC
EB11	AL cmd, timeout send stx: CMD-ACK didn't assert in 5 ms.	AC
EB12	AL cmd, timeout send stx: CMD-ACK didn't negate in 5 ms.	AC
EB13	AL cmd, timeout rcv stx: CMD-ACK didn't assert in 5 ms.	AC
EB14	AL cmd, timeout rcv stx: wrong stx from device	AC
EB15	AL cmd, timeout rcv stx: STA-RDY didn't negate in 5 ms.	AC
EB16	AL cmd, timeout rcv byte cnt: STA-RDY didn't assert in 5 ms.	AC
EB19	AL cmd, timeout rcv byte cnt: STA-RDY didn't negate in 5 ms.	AC

ERROR CODE	CAUSE	FAILING COMPONENT
EB1B	AL cmd, timeout rcv cmd: STA-RDY didn't assert in 5 ms.	AC
EB1C	AL cmd, timeout rcv cmd: STA-RDY didn't negate in 5 ms.	AC
EB21	AL cmd, timeout rcv data: STA-RDY didn't assert in 5 ms.	AC
EB22	AL cmd, timeout rcv data: STA-RDY didn't negate in 5 ms.	AC
EC24	Cannot adjust tension offset	Head FRU, SM, transducer cable
EC25	Cannot adjust air pressure offset	Pressure transducer, SM, transducer cable
EB30	Snd AL data, timeout, last byte: CMD-ACK didn't assert in 5 ms.....	AC
EB31	Snd AL data, timeout, last byte: CMD-ACK didn't negate in 5 ms.	AC
EB41	AL cmd, timeout rcv sta: STA-RDY didn't assert in 5 ms.	AC
EB42	AL cmd, timeout rcv sta: STA-RDY didn't negate in 5 ms.	AC
EC11	Servo boot system failed: 5 sec timeout.	SM
EC14	Too many loose wraps in the tape cartridge	Status Only (try again.), broken tape
EC21	Both thread arm sensors are active.	TAR Sensor, TAH Sensor, ST, SM
EC22	TA sensors are bad.	TAR Sensor, TAH Sensor, ST, SM
EC23	Deck motor stalled	SM
EC24	Cannot adjust tension offset	Head FRU, SM, transducer cable
EC25	Cannot adjust air pressure offset	Pressure transducer, SM, transducer cable
EC28	Motion command without tape in the drive	(Microcode) IPL and report incident to next level of support.
EC34	Received Load Tape command while there was tape in the drive	(Microcode) IPL and report incident to next level of support.
EC35	Unload command received when there was no tape in the drive	(Microcode) IPL and report incident to next level of support.
EC3D	Illegal GAPOUT	SBI
EC3E	Timed out on tape unloading	SM
EC3F	Illegal ABORT command	(Microcode) IPL and report incident to next level of support.
EC40	BP requested to search an illegal sector number	SBI

ERROR CODE	CAUSE	FAILING COMPONENT
EC41	Illegal DSE command at R_EOT	Status Only
EC46	Servo Load Failure 1.) BP sent a Load Normal Tape command, but the Servo could not establish tension. 2.) BP sent a Load Cleaning Tape command, but the Servo detected incorrect status.	Damaged Tape, Cleaning Cartridge Sensor, SM
EC50	Read forward command at R_EOT	(Microcode) IPL and report incident to next level of support.
EC51	Read forward command at S_EOT	(Microcode) IPL and report incident to next level of support.
EC52	Write command at R_EOT	(Microcode) IPL and report incident to next level of support.
EC53	Write command at W_EOT	(Microcode) IPL and report incident to next level of support.
EC54	Write command at S_EOT	(Microcode) IPL and report incident to next level of support.
EC55	Read backward command at BOT	(Microcode) IPL and report incident to next level of support.
EC56	Invalid command	(Microcode) IPL and report incident to next level of support.
EC57	Too many stop commands	(Microcode) IPL and report incident to next level of support.
EC58	Please retry. Press unload again.	SM
EC59	Please retry. Press unload again.	SM
EC5A	Tachometer may be faulty.	SM
EC5B	Deck motor stalled	SM
EC5C	No current feedback of the cartridge motor was detected.	SM
EC5D	No current feedback of the deck motor was detected.	SM
EC60	Data length too long for receive	(Microcode) IPL and report incident to next level of support.
EC61	Bad STX	SM
EC62	Timed out on unload	SM
EC63	Tension offset was too high	Damaged tape, cleaning cartridge sensor, SM card, head FRU, motors, tension offset out of adjustment
EC7E	Tach was not detected during load	SM

ERROR CODE	CAUSE	FAILING COMPONENT
EC7F	Air pressure fault	Clogged filter or airline, pressure transducer, pneumatic assy, plenum gasket, SM, transducer cable, ST
EC80	Power fault	SM
EC81	Tension fault	Damaged tape, SM, head FRU, transducer, cable
EC82	Cart hall fault	Supply Motor, SM
EC83	Deck hall fault	Reel Motor, SM
EC84	Cart motor moved in the wrong direction	Supply Motor, SM
EC85	Cart motor was stalled during steady state velocity control mode	Supply Motor, SM
EC86	Hall probe counter was faulty.	SM
EC87	Couldn't reset stoplock interrupt	SM
EC88	Couldn't reset radius interrupt	SM
EC89	Couldn't reset ADC interrupt	SM
EC8A	Couldn't reset Forward Hall interrupt	SM
EC8B	Couldn't reset Reverse Hall interrupt	SM
EC8C	Couldn't reset Gapout interrupt	SM
EC8D	Waiting for ADC to respond	SM
EC90	Device Bus error	SM
ECAA	Stack overflown	SM
ECDE	Timed out for stoplock interrupt	SM
ECDF	Timed out waiting for stoplock interrupt in the backward direction	SM
ECE0	Last stop command was invalid: Software problem.	(Microcode) IPL and report incident to next level of support.
ECE1	Illegal stoplock command	(Microcode) IPL and report incident to next level of support.
ECE2	Timed out on Start/Stop	SM
ECE3	Stoplock counter was faulty.	SM
ECE4	Wrong radius measurement	SM
ECE5	Backward Hall interrupt detected while moving forward	SM
ECE6	Forward Hall interrupt detected while moving backward	SM

ERROR CODE	CAUSE	FAILING COMPONENT
ECE7	Excessive tape in the tape path during SOS unload; the tape PUCK may not be attached to the thread arm.	Repeat Unload.
ECE8	Timed out waiting for tape moving in SOS	SM
ECE9	Couldn't pull the PUCK out of the Deck reel	Thread Motor, SM
ECEA	Couldn't push PUCK back in the tape cartridge	TAH Sensor, Thread Motor, Supply Motor
ECEB	Couldn't pull the PUCK out of the tape cartridge	Thread Motor
ECEC	Timed out waiting for the thread arm to be moved to the Deck reel	Thread Motor Thread Arm Obstructed
ECED	Timed out waiting for the thread arm to be moved to the Cart reel	Thread Motor Thread Arm Obstructed
ECEE	Timed out waiting for calibration to be done	SM
ECEF	Math calculation overflow	SM
ECF0	Couldn't set tension reference voltage.	SM
ECF1	Timed out on tape loading	SM
ECF2	No download code	IPL, SM
ECF3	Ram test failed	SM
ECF4	Check sum calculation did not compare.	SM
ECF5	IRPL has received an unknown command.	IPL
ECFE	No index mark found for puck positioning	SM
ECFF	Stack overflow	SM
ED01	Display timeout: display stayed busy for 5 ms.	DP
ED10	Bad status from Servo during IPL or RST	(Microcode) IPL and report incident to next level of support.
ED11	Unexpected status cmd from servo: in prog bit not on	(Microcode) IPL and report incident to next level of support.
ED12	Unexpected sense 1 cmd from servo: in prog bit not on	(Microcode) IPL and report incident to next level of support.
ED14	Autoloader: sense 2 not done yet	(Microcode) IPL and report incident to next level of support.
ED15	Autoloader: wrong byte count for sense 1 cmd	(Microcode) IPL and report incident to next level of support.
ED18	Autoloader: illegal cmd	(Microcode) IPL and report incident to next level of support.

ERROR CODE	CAUSE	FAILING COMPONENT
ED19	Servo: cmd stacked but not position down	(Microcode) IPL and report incident to next level of support.
ED20	Unexpected sense 1 cmd from Autoloader: in prog bit not on	(Microcode) IPL and report incident to next level of support.
ED21	Status cmd from Autoloader: in prog bit not on	(Microcode) IPL and report incident to next level of support.
ED22	Autoloader: got status cmd but expected something else	(Microcode) IPL and report incident to next level of support.
ED23	Autoloader: got sense 1 cmd but expected something else	(Microcode) IPL and report incident to next level of support.
ED24	Servo status, tape moving bit on, but shouldn't be	(Microcode) IPL and report incident to next level of support.
ED25	Change cart. slot status after scan-system made	Operator
ED26	Unsolicited status cmd from Autoloader: in prog bit on	(Microcode) IPL and report incident to next level of support.
ED27	Magazine inserted or removed but cart present in servo	SP, Microcode; report incident to next level of support.
ED28	No Index from Autoloader after Eject.	Slot Sensor
ED29	Autoloader status reported cartridge present in magazine and in autoloader	Cartridge present sensor.
ED30	Autoloader: cmd stacked but not pos, load, EJECT, index	(Microcode) IPL and report incident to next level of support.
ED31	Servo: cmd stacked but not rew, dse, locate, unload	(Microcode) IPL and report incident to next level of support.
ED32	Servo: wrong byte count for sense 1 cmd	(Microcode) IPL and report incident to next level of support.
ED33	Servo: trace upload not done	(Microcode) IPL and report incident to next level of support.
ED34	Servo: sense 2 not done yet	(Microcode) IPL and report incident to next level of support.
ED35	Servo: illegal cmd	(Microcode) IPL and report incident to next level of support.
ED36	Sw transition from Autoloader but feature not detected	Autoloader hardware
ED37	Autoloader status reported cartridge present in autoloader after position command to magazine	artridge present sensor
ED38	Servo: got status cmd but expected something else	(Microcode) IPL and report incident to next level of support.

ERROR CODE	CAUSE	FAILING COMPONENT
ED39	Servo: got sense 1 cmd but expected something else	(Microcode) IPL and report incident to next level of support.
ED3A	Servo: unload in prog. but tape loaded status still active.	(Microcode) IPL and report incident to next level of support.
ED3B	Autoloader status reported cartridge present in magazine and in autoloader at index	artridge present sensor
ED44	Man ldr: sense 2 not done yet	(Microcode) IPL and report incident to next level of support.
ED45	Man ldr: wrong byte count for sense 1 cmd	(Microcode) IPL and report incident to next level of support.
ED48	Man ldr: illegal cmd	(Microcode) IPL and report incident to next level of support.
ED50	Unexpected sense 1 cmd from man ldr: in prog bit not on	(Microcode) IPL and report incident to next level of support.
ED51	Status cmd from man ldr: in prog bit not on	(Microcode) IPL and report incident to next level of support.
ED52	Man ldr: got status cmd but expected something else	(Microcode) IPL and report incident to next level of support.
ED53	Man ldr: got sense 1 cmd but expected something else	(Microcode) IPL and report incident to next level of support.
ED54	Man Ldr: got Load cmd but tape is in servo	(Microcode) IPL and report incident to next level of support.
ED60	Device Bus A Intr. - Nobody there	AC
ED61	Device Bus B Intr. - Nobody there	AC
ED62	Device Busintr B but not configured for B side	AC
ED63	"Hot" interrupts detected on Device Bus "A"; Bus "A" fenced	AS/AS Cable Connector Power to AS
ED64	"Hot" interrupts detected on Device Bus "B"; Bus "B" fenced	AS/AS Cable Connector Power to AS
ED70	Set clean count cmd: illegal value	(Microcode) IPL and report incident to next level of support.
ED74	Maint function cmd timeout with 68K	(Microcode) IPL and report incident to next level of support.
EDDD	Man load A: initialization failed	Manual Loader
EDF0	Srvo/Autoloader A stack cmds: not done yet	(Microcode) IPL and report incident to next level of support.
EDF1	Srvo/Autoloader B stack cmds: not done yet	(Microcode) IPL and report incident to next level of support.

ERROR CODE	CAUSE	FAILING COMPONENT
EDF4	Cmd to servo B: not supported	(Microcode) IPL and report incident to next level of support.
EDF5	Cmd to Autoloader B: not supported	(Microcode) IPL and report incident to next level of support.
EE01	Send MN cmd, timeout stx: CMD-ACK didn't assert in 40 ms.	BT Cables
EE02	Send MN cmd, timeout stx: CMD-ACK didn't negate in 5 ms.	BT Cables
EE03	Send MN cmd, timeout byte cnt: CMD-ACK didn't assert in 5 ms.	BT Cables
EE04	Send MN cmd timeout byte cnt: CMD-ACK didn't negate in 5 ms.	BT Cables
EE05	Send MN cmd timeout data: CMD-ACK didn't assert in 5 ms.	BT Cables
EE06	Send MN cmd timeout data: CMD-ACK didn't negate in 5 ms.	BT Cables
EE07	Send MN data, timeout: CMD-ACK didn't assert in 5 ms.	BT Cables
EE08	Send MN data, timeout: CMD-ACK didn't negate in 5 ms.	BT Cables
EE09	Stack MN cmd, timeout stx: CMD-ACK didn't assert in 5 ms.	BT Cables,SBI
EE0A	Stack MN cmd, timeout stx: CMD-ACK didn't negate in 5 ms.	BT Cables
EE11	MN cmd timeout send stx: CMD-ACK didn't assert in 5 ms.	BT Cables
EE12	MN cmd timeout send stx: CMD-ACK didn't negate in 5 ms.	BT Cables
EE13	MN cmd timeout rcv stx: CMD-ACK didn't assert in 5 ms.	BT Cables
EE14	MN cmd timeout rcv stx: wrong stx from device	BT Cables
EE15	MN cmd timeout rcv stx: STA-RDY didn't negate in 5 ms.	BT Cables
EE16	MN cmd timeout rcv byte cnt: STA-RDY didn't ssert in 5 ms.	BT Cables
EE19	MN cmd, timeout rcv byte cnt: STA-RDY didn't negate in 5 ms.	BT Cables
EE1B	MN cmd, timeout rcv cmd: STA-RDY didn't assert in 5 ms.	BT Cables

ERROR CODE	CAUSE	FAILING COMPONENT
EE1C	MN cmd timeout rcv cmd: STA-RDY didn't negate in 5 ms.	BT Cables
EE21	MN cmd timeout rcv data: STA-RDY didn't assert in 5 ms.	BT Cables
EE22	MN cmd timeout rcv data: STA-RDY didn't negate in 5 ms.	BT Cables
EE30	Snd MN data, timeout last byte: CMD-ACK didn't assert in 5 ms.	BT Cables
EE31	Snd MN data timeout, last byte: CMD-ACK didn't negate in 5 ms.	BT Cables
EE41	MN cmd timeout rcv sta: STA-RDY didn't assert in 5 ms.	BT Cables
EE42	MN cmd timeout rcv sta: STA-RDY didn't negate in 5 ms.	
EF01	Manual load called without tape present	DP
EF02	Test down failure in load sequence	Manual loader, ML, DP
EF03	Move down failure in load sequence	Manual loader, ML, DP
EF04	Can't move ejector out	Manual loader, ML, DP
EF05	Can't move ejector in	Manual loader, ML, DP
EF07	Vertical sensor not blocked while moving up	Manual loader, ML, DP
EF08	Vertical sensor didn't see slot while moving up.	Manual loader, ML, DP
EF09	Vertical motion error in unload sequence	Manual loader, ML, DP
EF0A	Tape still in after unload attempt	Manual loader, ML, DP
EF0B	No light sensed by vertical sensor <Diagnostic>	Manual loader, ML, DP
EF0C	No dark sensed by vertical sensor. <Diagnostic>	Manual loader, ML, DP
EF0D	Move up or eject failed	Manual loader, ML, DP
EF0F	No light or dark sensed when expected <Diagnostic>	Manual loader, ML, DP
EF10	Tape still in after move out <Diagnostic>	Manual loader, ML, DP
EF11	No light on test down <Diagnostic>	Manual loader, ML, DP
EF12	No light on test up <Diagnostic>	Manual loader, ML, DP
EF13	No tape-in sensed <Diagnostic>	Manual loader, ML, DP

ERROR CODE	CAUSE	FAILING COMPONENT
EF15	Vertical sensor didn't see slot.	Manual loader, ML, DP
EF20	Expired timeout expecting upper dark sensor <Diagnostic>	Manual loader, ML, DP
EF21	Can't move tape out more than 15 steps	Manual loader, ML, DP
EF22	Up and down sensors blocked before load	MLS, DSM, ML cables
EF23	Down sensors blocked, up sensor open before load	MLS, SM, ML cables
EF24	Up and down sensors both open before load	MLS, SM, ML cables
EF25	Up sensor stayed blocked while moving down.	MLS, SM, ML cables
EF26	Up sensor not blocked while moving up	MLS, SM, ML cables
EF27	Down sensor stayed blocked while moving up.	MLS, SM, ML cables
EF28	Down sensor not blocked while moving down	MLS, SM, ML cables
EF29	Thread arm not at home position	Thread arm position, TAH Sensor
EF30	Tape in but no dark sensed during downward motion	Manual loader, ML, DP
EF31	Failure during calibration	Manual loader, ML, DP
EF33	Eject error	Manual loader, ML, DP
EF60	Sensor(s) unstable	ML, DP
EF6F	ULRDY (Unload Ready) not active	DP
EF80	External RAM test failed	DP
EF81	ROM checksum failure	DP
EF82	RAM codeload checksum failure	DP
EFC0	Timeout waiting for /CMD_RDY (Command Ready) to negate	DP
EFC1	Timeout waiting for /CMD_RDY to assert	DP
EFC2	Timeout waiting for /STA_ACK (Status Ack) to negate	DP
EFC3	Timeout waiting for /STA_ACK to assert	DP
EFCF	Timeout waiting for /IRQ acknowledge	DP
EFD1	Illegal command length	DP
EFD2	Unknown command	DP
EFD3	Illegal master interrupt format	DP
EFD4	Illegal master interrupt format	DP

ERROR CODE	CAUSE	FAILING COMPONENT
EFD5	55 on data port was expected.	DP
EFD6	AA on data port was expected.	DP
EFD7	Inappropriate command header	DP
EFD8	Broken vector in jump table	DP
EFDA	Firmware incompatible (ROM level)	DP
EFDB	Error not cleared, command ignored	DP
EFDC	2 byte length command not allowed	DP

3. SBI Card Diagnostic Error Codes

ERROR CODE	CAUSE	CORRECTIVE ACTION
BFR_DIAG 0101	Stuck data address	SB/SBI
BFR_DIAG 0102	Stuck data bit	SB/SBI
BFR_DIAG 0103	Stuck EOD address	SB/SBI
BFR_DIAG 0104	Stuck EOD bit	SB/SBI
BFR_DIAG 0201	Data error in refresh test	SB/SBI
BFR_DIAG 0202	EOD error in refresh test	SB/SBI
BFR_DIAG 0301	Parity error expected but not generated	SB/SBI
BFR_DIAG 0302	Unexpected parity error generated	SBI
BFR_DIAG 0401	EOD miscompare after memory write	SBI
BFR_DIAG 0402	Memory miscompare after memory write	SBI
BFR_DIAG 0403	Memory miscompare after memory write	SBI
BFR_DIAG 0404	EOD miscompare after EOD write	SBI
DMA_DIAG 0101	DMA controller status incorrect after transfer	SBI
DMA_DIAG 0102	Output FIFO data miscompare	SBI
DMA_DIAG 0103	Output FIFO parity error	SBI
DMA_DIAG 0104	CRC never changed from 0	SBI
DMA_DIAG 0105	Output FIFO underflow	SBI
DMA_DIAG 0106	CRC not equal to 0	SBI
DMA_DIAG 0107	Incorrect ADMA byte count	SBI
DMA_DIAG 0108	Output FIFO underflow expected but not generated	SBI
DMA_DIAG 0201	DMA controller status incorrect after transfer	SBI
DMA_DIAG 0202	Data miscompare	SBI
DMA_DIAG 0301	DMA controller status incorrect after transfer	SBI
DMA_DIAG 0302	Data miscompare	SBI
DMA_DIAG 0303	Generated CRC incorrect	SBI
DMA_DIAG 0304	Input FIFO overflow	CD control signal high

ERROR CODE	CAUSE	CORRECTIVE ACTION
DMA_DIAG 0307	Incorrect ADMA byte count	SBI
DMA_DIAG 0308	MOD 14 count miscompare	SBI
DMA_DIAG 0309	Input FIFO overrun expected but not generated	SBI
DMA_DIAG 0401	Channel 1 parity error expected but not generated	SBI
DMA_DIAG 0402	Channel 3 parity error expected but not generated	SBI
DMA_DIAG 0501	No timer E interrupt	SBI
DMA_DIAG 0502	Incorrect timer E status after 4K block transfer	SBI
DMA_DIAG 0503	Incorrect timer E count after 4K block transfer	SBI
HD_DIAG 0101	Bit test of counter register.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0102	Count did not decrement to zero, 1H count.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0103	OED bit did not clear at end of count, 1H count.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0104	Count did not decrement to zero, 100H count.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0105	EOD bit did not clear at end of count, 100H count.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0106	Count did not decrement to zero, 10000H count.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0107	EOD bit did not clear at end of count, 10000H count.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0201	Timeout waiting for interrupt from WD chip after hardware reset.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0202	Timeout waiting for interrupt from WD chip after software reset.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0203	Status after software reset is neither 00 for old or 01 for new SCSI chip.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0204	A register was nnot cleared after software reset.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0205	Timeout waiting for interrupt from WD chip after software reset, new SCSI chip with advanced features turned off.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
HD_DIAG 0206	Status after software reset was not 00 for new SCSI chip with advanced features bit turned off.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0207	Read back after write of own ID register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0208	Read back after write of control register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0209	Read back after write of 12 CBD register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 020A	Read back after write of TLUN register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 020B	Read back after write of CMDPHS register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 020C	Read back after write of SYNXFER register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 020D	Read back after write of XFER CNT2 register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 020E	Read back after write of XFER CNT1 register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 020F	Read back after write of XFER CNT0 register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HD_DIAG 0210	Read back after write of DES_ID register miscompare.	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0101	FIFO'S not initially empty	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0102	HF interrupt failed to occur	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0103	Message type incorrect	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0104	Message byte count incorrect	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0105	HF local diagnostic failed	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0106	Sequencer error on reset	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_DIAG 0107	FIFO'S not empty following message	Host Adapter PWA, Cbl between Host Adapter PWA and SBI
HIF_WRAP 000X	Error loading file from floppy	Disk, Floppy Reader
HIF_WRAP 0101	Host FIFO's not originally empty	SFS

ERROR CODE	CAUSE	CORRECTIVE ACTION
HIF_WRAP 0102	Channel A Host Adapter interrupt failed to occur	SFS
HIF_WRAP 0202	Channel B Host Adapter interrupt failed to occur	SFS
HIF_WRAP 0103	Channel A Host message invalid	SFS
HIF_WRAP 0203	Channel B Host message invalid	SFS
HIF_WRAP 0104	Channel A Host message byte count incorrect	SFS
HIF_WRAP 0204	Channel B Host message byte count incorrect	SFS
HIF_WRAP 0105	Wrap Diag failed on channel A	SFS, CWS or CWS not installed properly
HIF_WRAP 0205	Wrap Diag failed on channel B	SFS, CWS or CWS not installed properly
HIF_WRAP 0106	Channel A Internal sequencer error	SFS
HIF_WRAP 0206	Channel B Internal sequencer error	SFS
HIF_WRAP 0107	Channel A FIFO failure to go empty	SFS
HIF_WRAP 0207	Channel B FIFO failure to go empty	SFS
ICRCDIAG 0101	Error, register cmd_reg FFC040	DCI
ICRCDIAG 0102	Error, register mode_reg FFC042	DCI
ICRCDIAG 0103	Error, register int_reg FFC044	DCI
ICRCDIAG 0104	Error, register datareg FFC04A	DCI
ICRCDIAG 0105	Error, register trail_reg FFC04C	DCI
ICRCDIAG 0106	Error, register diag_reg FFC052	DCI
ICRCDIAG 0107	Error, register pramp_reg FFC054	DCI
ICRCDIAG 0108	Error, register pramd_reg FFC056	DCI
ICRCDIAG 0109	Error, register b2cum_reg FFC058	DCI
ICRCDIAG 010A	Error, register b1cum_reg FFC05A	DCI
ICRCDIAG 010B	Error, register b0cum_reg FFC05C	DCI
ICRCDIAG 010C	Error, register b1dat_reg FFC06A	DCI
ICRCDIAG 010D	Error, register b0dat_reg FFC06C	DCI
ICRCDIAG 010E	Error, register cucrc_reg FFC070	DCI
ICRCDIAG 010F	Error, register culrc_reg FFC072	DCI
ICRCDIAG 0110	Error, register crca_reg FFC074	DCI
ICRCDIAG 0111	Error, register crcf_reg FFC076	DCI

ERROR CODE	CAUSE	CORRECTIVE ACTION
ICRCDIAG 0112	Error, register crcb_reg FFC078	DCI
ICRCDIAG 0113	Error, register 1rca_reg FFC07A	DCI
ICRCDIAG 0114	Error, register 1rcb_reg FFC07C	DCI
ICRCDIAG 0115	Error, register crcy_reg FFC07E	DCI
ICRCDIAG 0160	Error, no DC card or DC card fault	DCI
ICRCDIAG 0162	System Board is not ICRC capable	SBI
ICRCDIAG 0164	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0224	Input FIFO parity error	SBI
ICRCDIAG 0225	Output FIFO parity error	SBI
ICRCDIAG 0228	Diagnostic write bypass fail	SBI
ICRCDIAG 0229	Diagnostic read bypass fail	SBI
ICRCDIAG 0240	Interrupt status reg error bit	SBI
ICRCDIAG 0260	Error	No DCI card or DCI card fault
ICRCDIAG 0262	System Board is not ICRC capable	SBI
ICRCDIAG 0264	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 032E	Packet ram data miscompare	DCI
ICRCDIAG 0360	Error	No DCI card or DCI card fault
ICRCDIAG 0362	System Board is not ICRC capable	SBI
ICRCDIAG 0364	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 042F	DTC data ram miscompare	DCI
ICRCDIAG 0460	Error	No DCI card or DCI card fault
ICRCDIAG 0462	System Board is not ICRC capable	SBI
ICRCDIAG 0464	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0524	Input FIFO parity error	SBI
ICRCDIAG 0525	Output FIFO parity error	SBI
ICRCDIAG 0530	Buffer data ram miscompare	DCI
ICRCDIAG 0540	Interrupt status reg error bit	SBI
ICRCDIAG 0542	No buffer status EOD stop bit	SBI
ICRCDIAG 0560	Error	No DCI card or DCI card fault
ICRCDIAG 0562	System Board is not ICRC capable	SBI
ICRCDIAG 0564	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0631	Encoder statistic table miscompare	DCI
ICRCDIAG 0660	Error	No DCI card or DCI card fault

ERROR CODE	CAUSE	CORRECTIVE ACTION
ICRCDIAG 0662	System Board is not ICRC capable	SBI
ICRCDIAG 0664	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0732	Decoder statistic table miscompare	DCI
ICRCDIAG 0760	Error	No DCI card or DCI card fault
ICRCDIAG 0762	System Board is not ICRC capable	SBI
ICRCDIAG 0764	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0824	Input FIFO parity error	SBI
ICRCDIAG 0825	Output FIFO parity error	SBI
ICRCDIAG 0833	No input FIFO parity error	SBI
ICRCDIAG 0834	No output FIFO parity error	SBI
ICRCDIAG 0835	No ICRC encoder parity error	DCI
ICRCDIAG 0836	No ICRC decoder parity error	DCI
ICRCDIAG 0837	Unexpected end of operation int	SBI
ICRCDIAG 0838	No PID CRC error	DCI
ICRCDIAG 0839	No PID doesn't start w/80 error	DCI
ICRCDIAG 083A	No CRCY error	DCI
ICRCDIAG 0840	Interrupt status reg error bit	SBI
ICRCDIAG 0841	No end of operation interrupt	SBI
ICRCDIAG 0860	Error	No DCI card or DCI card fault
ICRCDIAG 0862	System Board is not ICRC capable	SBI
ICRCDIAG 0864	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0924	Input FIFO parity error	SBI
ICRCDIAG 0925	Output FIFO parity error	SBI
ICRCDIAG 0940	Interrupt status reg error bit	SBI
ICRCDIAG 0941	No end of operation interrupt	SBI
ICRCDIAG 0945	Write data path error DCI	SBI
ICRCDIAG 0949	Incorrect crc on write DCI	SBI
ICRCDIAG 0960	Error	No DCI card or DCI card fault
ICRCDIAG 0962	System Board is not ICRC capable	SBI
ICRCDIAG 0964	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0A24	Input FIFO parity error	SBI
ICRCDIAG 0A25	Output FIFO parity error	SBI
ICRCDIAG 0A40	Interrupt status reg error bit	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
ICRCDIAG 0A41	No end of operation interrupt	SBI
ICRCDIAG 0A46	Write data path error	DCI
ICRCDIAG 0A49	Incorrect crc on write	DCI
ICRCDIAG 0A60	Error	No DCI card or DCI card fault
ICRCDIAG 0A62	System Board is not ICRC capable	SBI
ICRCDIAG 0A64	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0B0E	CUCRC register error	DCI
ICRCDIAG 0B0F	CULRC register error	DCI
ICRCDIAG 0B10	CRCA register error	DCI
ICRCDIAG 0B11	CRCF register error	DCI
ICRCDIAG 0B12	CRCB register error	DCI
ICRCDIAG 0B13	LRCA register error	DCI
ICRCDIAG 0B14	LRCB register error	DCI
ICRCDIAG 0B24	Input FIFO parity error	SBI
ICRCDIAG 0B25	Output FIFO parity error	SBI
ICRCDIAG 0B40	Interrupt status reg error bit	SBI
ICRCDIAG 0B41	No end of operation interrupt	SBI
ICRCDIAG 0B47	Read data path error	DCI
ICRCDIAG 0B4A	Missing PID ready interrupt	DCI
ICRCDIAG 0B60	Error	No DCI card or DCI card fault
ICRCDIAG 0B62	System Board is not ICRC capable	SBI
ICRCDIAG 0B64	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0C24	Input FIFO parity error	SBI
ICRCDIAG 0C25	Output FIFO parity error	SBI
ICRCDIAG 0C40	Interrupt status reg error bit	SBI
ICRCDIAG 0C41	No end of operation interrupt	SBI
ICRCDIAG 0C48	Read data path error	DCI
ICRCDIAG 0C4A	Missing PID ready interrupt	DCI
ICRCDIAG 0C60	Error	No DCI card or DCI card fault
ICRCDIAG 0C62	System Board is not ICRC capable	SBI
ICRCDIAG 0C64	8259 level 3 interrupt is hot (on)	SBI
ICRCDIAG 0D4B	ICRC command busy did not drop	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
ICRCDIAG 0D5B	Decompressed CUCRC != host CUCRC	DCI, SBI
ICRCDIAG 0D5C	CUCRC' != wf CUCRC	DCI
LWR_DIAG 0101	RF status byte not "short IBG"	SBI, RI
LWR_DIAG 0102	RF status byte not "EOB detected"	SBI, RI
LWR_DIAG 0103	Unexpected corrections in set A	SBI, RI
LWR_DIAG 0104	Unexpected corrections in set B	SBI, RI
LWR_DIAG 0105	Unexpected CRC error	SBI, RI
LWR_DIAG 0106	RF interrupt failed to occur	SBI, RI
LWR_DIAG 0107	Received data miscompare	SBI, RI
LWR_DIAG 010B	DMA channel 1 did not start	SBI, RI
LWR_DIAG 010C	DMA channel 3 did not start	SBI, RI
LWR_DIAG 0201	RF status byte 1 not "short interblock gap"	SBI, RI
LWR_DIAG 0202	RF status byte 2 not "EOB detected"	SBI, RI
LWR_DIAG 0203	Unexpected corrections in set A	SBI, RI
LWR_DIAG 0204	Unexpected corrections in set B	SBI, RI
LWR_DIAG 0205	Unexpected CRC error uncorrectable errors	SBI, RI
LWR_DIAG 0206	RF interrupt failed to occur	SBI, RI
LWR_DIAG 0207	Received data miscompare	SBI, RI
LWR_DIAG 020B	DMA channel 1 did not start	SBI, RI
LWR_DIAG 020C	DMA channel 3 did not start	SBI, RI
LWR_DIAG 0301	RF status byte 1 not "short interblock gap"	SBI, RI
LWR_DIAG 0302	RF status byte 2 not "EOB detected"	SBI, RI
LWR_DIAG 0303	Unexpected corrections in set A	SBI, RI
LWR_DIAG 0304	Unexpected corrections in set B	SBI, RI
LWR_DIAG 0305	xpected CRC error not generated	SBI, RI
LWR_DIAG 0306	RF interrupt failed to occur	SBI, RI
LWR_DIAG 0307	Received data miscompare	SBI, RI
LWR_DIAG 030B	DMA channel 1 did not start	SBI, RI
LWR_DIAG 030C	DMA channel 3 did not start	SBI, RI
LWR_DIAG 0401	RF status byte not "short IBG"	SBI, RI

ERROR CODE	CAUSE	CORRECTIVE ACTION
LWR_DIAG 0402	RF status byte not "EOB detected"	SBI, RI
LWR_DIAG 0403	Unexpected corrections in set A	SBI, RI
LWR_DIAG 0404	Unexpected corrections in set B	SBI, RI
LWR_DIAG 0405	expected CRC error	SBI, RI
LWR_DIAG 0406	RF interrupt failed to occur	SBI, RI
LWR_DIAG 0407	Received data miscompare	SBI, RI
LWR_DIAG 0501	RF status byte not "short IBG	SBI, RI
LWR_DIAG 0502	RF status byte not "EOB detected"	SBI, RI
LWR_DIAG 0503	Unexpected corrections in set A	SBI, RI
LWR_DIAG 0504	Unexpected corrections in set B	SBI, RI
LWR_DIAG 0505	Unexpected CRC error	SBI, RI
LWR_DIAG 0506	RF interrupt failed to occur	SBI, RI
LWR_DIAG 0601	RF status byte not "short IBG"	SBI, RI
LWR_DIAG 0602	RF status byte not "EOB detected"	SBI, RI
LWR_DIAG 0603	Unexpected corrections in set A	SBI, RI
LWR_DIAG 0604	Unexpected corrections in set B	SBI, RI
LWR_DIAG 0605	Unexpected CRC error	SBI, RI
LWR_DIAG 0606	RF interrupt failed to occur	SBI, RI
LWR_DIAG 0708	Analog test RF codeload miscompare	SBI, RI
LWR_DIAG 0757	No detected start bit	RI
LWR_DIAG 0758	No detected preamble	Ensure correct diagnostic level; RI
LWR_DIAG 0759	No detected majority sync	RI
LWR_DIAG 075A	No detected all-sync	RI
LWR_DIAG 075B	No detected stop bit	RI
LWR_DIAG 0808	Analog test RF codeload miscompare	SBI
LWR_DIAG 080E	No drive responded to TIO command	SBI
LWR_DIAG 080F	Wrong bus in response to TIO cmd.	SBI
LWR_DIAG 0857	No detected start bit on SLOT A drive	HI
LWR_DIAG 0858	No detected preamble on SLOT A drive	HI
LWR_DIAG 0867	No detected start bit on SLOT B drive	HI
LWR_DIAG 0868	No detected preamble on SLOT B drive	HI
RF1_DIAG 0101	8255 port failure	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
RF1_DIAG 0103	Mark decode bit(s) incorrect	SBI
RF1_DIAG 0202	8536 port failure	SBI
RF1_DIAG 0303	8259 IRR set after initialization	SBI
RF1_DIAG 0304	8259 IRR not set after interrupt	SBI
RF1_DIAG 0305	Unable to reset RF card interrupt with interrupt reset	SBI
RF1_DIAG 0313	8259 interrupt request register set after initialization	SBI
RF1_DIAG 0314	8259 interrupt request register not set after interrupt	SBI
RF1_DIAG 0323	Unable to reset RF card interrupt with RF card reset	SBI
RF1_DIAG 0325	Unable to reset RF card interrupt with "check" reset	SBI
RF1_DIAG 0403	8259 interrupt request register set after initialization	SBI
RF1_DIAG 0426	RF card interrupt occurred unexpectedly	SBI
RF1_DIAG0427	No RF card interrupt was detected	SBI
RF1_DIAG 0428	8259 interrupt request register set after interrupt acknowledge sequence	SBI
RF1_DIAG 0429	8259 interrupt request register is not set after interrupt acknowledge sequence	SBI
RF1_DIAG 042A	8259 interrupt request register is set after specific EOI command	SBI
RF1_DIAG 0501	Timer not counting	SBI
RF1_DIAG 0502	Timer countdown never reached 0	SBI
RF2_DIAG 0101	WF card interrupt did not occur	SBI
RF2_DIAG 0202	Incorrect WF card status	SBI
RF2_DIAG 0303	Mark decode incorrect	SBI
RF2_DIAG 0304	WF card interrupt occurred too early	SBI
RF3_DIAG 0101	WF card interrupt did not occur	SBI
RF3_DIAG 0102	RF card interrupt did not occur	SBI
RF3_DIAG 0103	Only DB card EOB interrupt occurred	SBI
RF3_DIAG 0104	DB card EOB interrupt did not occur	SBI
RF3_DIAG 0105	Only RF card interrupt occurred	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
RF3_DIAG 0107	None of expected 3 interrupts occurred	SBI
RF3_DIAG 0108	First RF card status byte not 01	SBI
RF3_DIAG 0109	Error in tie bits	SBI
RF3_DIAG 010A	Error in miscellaneous status byte	SBI
RF3_DIAG 0201	WF card interrupt did not occur	SBI
RF3_DIAG 0202	RF card interrupt did not occur	SBI
RF3_DIAG 0203	Only DB card EOB interrupt occurred	SBI
RF3_DIAG 0204	DB card EOB interrupt did not occur	SBI
RF3_DIAG 0205	Only RF card interrupt occurred	SBI
RF3_DIAG 0206	Only WF card interrupt occurred	SBI
RF3_DIAG 0207	None of expected 3 interrupts occurred	SBI
RF3_DIAG 0208	First RF card status byte not 01	SBI
RF3_DIAG 0209	Error in tie bits	SBI
RF3_DIAG 020A	Error in misc status byte	SBI
RF4_DIAG 0101	WF card interrupt did not occur	SBI
RF4_DIAG 0102	RF card interrupt did not occur	SBI
RF4_DIAG 0103	Only DB card EOB interrupt occurred	SBI
RF4_DIAG 0104	DB card EOB interrupt did not occur	SBI
RF4_DIAG 0105	Only RF card interrupt occurred	SBI
RF4_DIAG 0106	Only WF card interrupt occurred	SBI
RF4_DIAG 0107	None of 3 expected interrupts occurred	SBI
RF4_DIAG 0108	First RF card status byte is not 01	SBI
RF4_DIAG 0109	A set correction byte not 00	SBI
RF4_DIAG 010A	B set correction byte not 00	SBI
RF4_DIAG 010B	Error in misc status byte	SBI
RF4_DIAG 0201	WF card interrupt did not occur	SBI
RF4_DIAG 0202	RF card interrupt did not occur	SBI
RF4_DIAG 0203	Only DB card EOB interrupt occurred	SBI
RF4_DIAG 0204	DB card EOB interrupt did not occur	SBI
RF4_DIAG 0205	Only RF card interrupt occurred	SBI
RF4_DIAG 0206	Only WF card interrupt occurred	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
RF4_DIAG 0207	None of 3 expected interrupts occurred	SBI
RF4_DIAG 0208	Second RF card status byte is not 01	SBI
RF4_DIAG 0209	A set correction byte not 00	SBI
RF4_DIAG 020A	B set correction byte not 00	SBI
RF4_DIAG 020B	Error in miscellaneous status byte	SBI
RF4_DIAG 020C	First RF card status byte is not 7F (short interblock gap)	SBI
RF4_DIAG 0301	WF card interrupt did not occur	SBI
RF4_DIAG 0302	RF card interrupt did not occur	SBI
RF4_DIAG 0303	Only DB card EOB interrupt occurred	SBI
RF4_DIAG 0304	DB card EOB interrupt did not occur	SBI
RF4_DIAG 0305	Only RF card interrupt occurred	SBI
RF4_DIAG 0306	Only WF card interrupt occurred	SBI
RF4_DIAG 0307	None of 3 expected interrupts occurred	SBI
RF4_DIAG 0308	First RF card status byte is not 01	SBI
RF4_DIAG 0309	A set correction byte not 00	SBI
RF4_DIAG 030A	B set correction byte not 00	SBI
RF4_DIAG 030B	Error in miscellaneous status byte	SBI
RF5_DIAG 0101	WF card interrupt did not occur	SBI
RF5_DIAG 0102	RF card interrupt did not occur	SBI
RF5_DIAG 0103	Only DB card EOB interrupt occurred	SBI
RF5_DIAG 0104	DB card EOB interrupt did not occur	SBI
RF5_DIAG 0105	Only RF card interrupt occurred	SBI
RF5_DIAG 0106	Only WF card interrupt occurred	SBI
RF5_DIAG 0107	None of 3 expected interrupts occurred	SBI
RF5_DIAG 0108	First RF card status byte is not 01	SBI
RF5_DIAG 0109	A set correction byte not 00	SBI
RF5_DIAG 010A	B set correction byte not 00	SBI
RF5_DIAG 010B	Error in misc status bytes	SBI
RF5_DIAG 010C	First RF card status byte incorrect	SBI
RF5_DIAG 0201	WF card interrupt did not occur	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
RF5_DIAG 0202	RF card interrupt did not occur	SBI
RF5_DIAG 0203	Only DB card EOB interrupt occurred	SBI
RF5_DIAG 0204	DB card EOB interrupt did not occur	SBI
RF5_DIAG 0205	Only RF card interrupt occurred	SBI
RF5_DIAG 0206	Only WF card interrupt occurred	SBI
RF5_DIAG 0207	None of 3 expected interrupts occurred	SBI
RF5_DIAG 0208	First RF card status byte is not 01	SBI
RF5_DIAG 0209	Error in A set correction byte	SBI
RF5_DIAG 020A	Error in B set correction byte	SBI
RF5_DIAG 020B	Error in misc status byte	SBI
RF5_DIAG 020C	First RF card status byte incorrect	SBI
RF5_DIAG 0301	WF card interrupt did not occur	SBI
RF5_DIAG 0302	RF card interrupt did not occur	SBI
RF5_DIAG 0303	Only DB card EOB interrupt occurred	SBI
RF5_DIAG 0304	DB card EOB interrupt did not occur	SBI
RF5_DIAG 0305	Only RF card interrupt occurred	SBI
RF5_DIAG 0306	Only WF card interrupt occurred	SBI
RF5_DIAG 0307	None of 3 expected interrupts occurred	SBI
RF5_DIAG 0308	First RF card status byte is not 01	SBI
RF5_DIAG 0309	Error in A set correction byte	SBI
RF5_DIAG 030A	Error in B set correction byte	SBI
RF5_DIAG 030B	Error in miscellaneous status byte	SBI
RF5_DIAG 040C	First RF card status byte incorrect	SBI
RF5_DIAG 0401	WF card interrupt did not occur	SBI
RF5_DIAG 0402	RF card interrupt did not occur	SBI
RF5_DIAG 0403	Only DB card EOB interrupt occurred	SBI
RF5_DIAG 0404	DB card EOB interrupt did not occur	SBI
RF5_DIAG 0405	Only RF card interrupt occurred	SBI
RF5_DIAG 0406	Only WF card interrupt occurred	SBI
RF5_DIAG 0407	None of 3 expected interrupts occurred	SBI
RF5_DIAG 0408	First RF card status byte is not 01	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
RF5_DIAG 0409	Error in A set correction byte	SBI
RF5_DIAG 040A	Error in B set correction byte	SBI
RF5_DIAG 040B	Error in miscellaneous status byte	SBI
RF5_DIAG 040C	First RF card status byte incorrect	SBI
RF6_DIAG 0101	RF status byte 1 not 'EOB detected'	SBI
RF6_DIAG 0102	Unexpected corrections in set A	SBI
RF6_DIAG 0103	Unexpected corrections in set B	SBI
RF6_DIAG 0104	Unexpected CRC or uncorrectable results	SBI
RF6_DIAG 0105	WF interrupt failed to occur	SBI
RF6_DIAG 0201	RF status byte 1 not 'EOB detected'	SBI
RF6_DIAG 0202	Unexpected corrections in set A	SBI
RF6_DIAG 0203	Unexpected corrections in set B	SBI
RF6_DIAG 0204	Unexpected CRC or uncorrectable results	SBI
RF6_DIAG 0205	WF interrupt failed to occur	SBI
RF6_DIAG 0301	RF status byte 1 not 'EOB detected'	SBI
RF6_DIAG 0302	Unexpected corrections in set A	SBI
RF6_DIAG 0303	Unexpected corrections in set B	SBI
RF6_DIAG 0304	Unexpected CRC or uncorrectable results	SBI
RF6_DIAG 0305	WF interrupt failed to occur	SBI
RF6_DIAG 0306	RF status byte 25 not 'NO Interblock Gap After EOB'	SBI
SZI_DIAG 0121	Page register read fail at status port	SZI
SZI_DIAG 0122	Shared memory read fail	SZI
SZI_DIAG 0123	Shared memory contention error	SZI
SZI_DIAG 0200	Unknown diagnostic requested	SZI
SZI_DIAG 0201	Input FIFO not ready	SZI
SZI_DIAG 0202	Timeout waiting for a data byte ACK	SZI
SZI_DIAG 0203	Data miscompare on read	SZI
SZI_DIAG 0204	Output FIFO not ready	SZI
SZI_DIAG 0205	Parity error detected	SZI
SZI_DIAG 0206	Read overrun set	SZI

ERROR CODE	CAUSE	CORRECTIVE ACTION
SZI_DIAG 0207	Write overrun set	SZI
SZI_DIAG 0224	Timeout waiting for 68K->SZI interrupt	SZI
SZI_DIAG 0225	Timeout waiting for data avail from IP	SZI
SZI_DIAG 0226	Timeout waiting for SAI->68K interrupt	SZI
SZI_DIAG 0227	Failed to receive DIAG COMPLETE msg	SZI
SZI_DIAG 0228	Data transfer error between AZI and SBI	SZI
SZI_DIAG 0229	SZI codeload failed	SZI
SZI_DIAG 022A	DMA channel 3 failed to start	SBI
SZI_DIAG 022B	Timeout waiting for EOD interrupt	SBI
SZI_DIAG 022C	Data buffer input FIFO parity error	SBI
SZI_DIAG 022D	Failed to receive LOAD CONFIG message	SZI
SZI_DIAG 022E	Failed to receive buffer status EOD	SBI
SZI_DIAG 032F	Error reading the SZI FRU ID chip	SZI
TRLRDIAG 0116	Register test OFFC030 failed	SBI
TRLRDIAG 0124	Input FIFO parity error	SBI
TRLRDIAG 0125	Output FIFO parity error	SBI
TRLRDIAG 0140	Interrupt status reg error bit	SBI
TRLRDIAG 0151	BID RAM data miscompare	SBI
TRLRDIAG 0152	Missing WF interrupt	SBI
TRLRDIAG 0153	Missing RF interrupt	SBI
TRLRDIAG 0154	BID RAM counter / adder error	SBI
TRLRDIAG 015A	WF status error	SBI
TRLRDIAG 0162	System board is not ICRC capable	SBI
TRLRDIAG 0164	8259 level 3 interrupt is hot (on)	SBI
TRLRDIAG 0224	Input FIFO parity error	SBI
TRLRDIAG 0225	Output FIFO parity error	SBI
TRLRDIAG 0240	Interrupt status reg error bit	SBI
TRLRDIAG 0251	BID RAM dta mirascompare	SBI
TRLRDIAG 0252	Missing WF interrupt	SBI

ERROR CODE	CAUSE	CORRECTIVE ACTION
TRLRDIAG 0253	Missing RF interrupt	SBI
TRLRDIAG 0254	Bid Ram counter / adder error	SBI
TRLRDIAG 025A	WF status error	SBI
TRLRDIAG 0262	System board is not ICRC capable	SBI
TRLRDIAG 0264	8259 level 3 interrupt is hot (on)	SBI
TRLRDIAG 0356	Trailer register miscompare error	SBI
TRLRDIAG 035A	WF status error	SBI
TRLRDIAG 0362	System board is not ICRC capable	SBI
TRLRDIAG 0364	8259 level 3 interrupt is hot (on)	SBI
TRLRDIAG 0424	Input FIFO parity error	SBI
TRLRDIAG 0425	Output FIFO parity error	SBI
TRLRDIAG 0426	Write formatter status error	SBI
TRLRDIAG 0440	Interrupt status reg error bit	SBI
TRLRDIAG 0452	Missing WF interrupt	SBI
TRLRDIAG 0453	Missing RF interrupt	SBI
TRLRDIAG 0457	Trailer data miscompare error	SBI
TRLRDIAG 045A	WF status error	SBI
TRLRDIAG 0462	System board is not ICRC capable	SBI
TRLRDIAG 0464	8259 level 3 interrupt is hot (on)	SBI
TRLRDIAG 054B	ICRC command busy did not drop	SBI
TRLRDIAG 0558	Host side cu crc error	SBI
TRLRDIAG 0559	WF side cucrc error	SBI
WF_DIAG 0101	WF CIO register not 0	SB/SBI
WF_DIAG 0201	WF interrupt failed to occur	SB/SBI
WF_DIAG 0202	WF or checking circuit malfunction	SB/SBI
WF_DIAG 0301	WF interrupt failed to occur	SB/SBI
WF_DIAG 0302	WF data path error	SBI
WF_DIAG 0401	Interrupt failed to occur (bypass mode)	SBI
WF_DIAG 0402	WF bypass data path error (bypass mode)	SBI

Note for Error Codes A050, A051, and A052

Tests 3, 4, 5, and 6 are tests that perform R/W functions. They require a test tape of good quality, essentially defect-free. If a failure code of A050, A051, or A052 is encountered, note the AAXX code which will be alternately displayed. Since the test monitors errors on a per-track basis, the AAXX code may be of use when trying to troubleshoot a failure. The XX portion is the track number of a failing track and should be noted for comparison to failures posted when running the same tests with a different tape. If different tapes fail with the same track indications, then the drive is mostly at fault. If not, then the tapes must be considered as suspect or the drive should be cleaned before attempting to troubleshoot the transport.

StorageTek

4220 CARTRIDGE TAPE SUBSYSTEM

Chapter 4

DIAGNOSTICS

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1. Introduction To Diagnostics

This section describes diagnostics available with the 4220 Cartridge Tape Subsystem, and tells you how to run them. It does not describe the circumstances under which you should run a particular diagnostic. Refer to the chapter entitled "Error Code Dictionary" in this manual for a list of error codes and ways to isolate the cause of a particular error message. Return to this section when you want to run the diagnostics recommended in the error code dictionary in this manual or in the installation procedures described in the 4220 installation manual.

There are four kinds of diagnostics that test the 4220:

- Hardcore Power-On Reset Diagnostics
- Floppy-resident Power-On Reset Diagnostics
- Offline Diagnostics
- Inline Diagnostics

When the subsystem is powered up or you start an initial program load (IPL), hardcore diagnostics are executed automatically. Depending on the "SET DIAGS" menu setting, certain floppy-resident diagnostics are executed automatically. Offline and inline diagnostics are called up by an operator.

1.1. Power Up/IPL Diagnostics

When you power up the subsystem or start an initial program load, resident microcode initializes the subsystem. During this time, power-on-reset diagnostics are executed, and all volatile storage is reloaded with information stored on the floppy diskette. IPL progress can be monitored by observing the drive display/SBI display.

If a failure occurs, a 3- or 4-digit error code appears in the display. If this happens, refer to the error code listing in the error code dictionary in this manual.

When power up-diagnostics finish successfully, the subsystem is ready for the next diagnostic operation, offline diagnostics.

The two kinds of Power-Up/IPL diagnostics are

- **Hardcore Power-On Reset Diagnostics** -- These diagnostics are resident in EPROMs or non-volatile memory, and test the control unit when the subsystem is powered up or when an initial program load is started. These tests are described in Section 2 of this manual.
- **Floppy-Resident Power-On Reset Diagnostics** -- These diagnostic tests reside on the subsystem functional/diagnostic floppy diskette and test the CU when the subsystem is powered up or when an initial program load is started. These diagnostics are described in Section 3 of this manual.

1.2. Controller Offline Diagnostics

These diagnostics are resident on the functional/diagnostic diskette, are menu-driven, and are called up and executed through the operator control panel. Section 4 of this manual describes these tests and Section 5 tells you how to run them.

2. Hardcore Power-On Reset Diagnostics

Hardcore diagnostics test the various components of the microprocessor subsystem. They are resident in non-volatile, battery-backed-up memory or EPROMs, and are run when the control unit is powered on or when reset by an initial program load. Hardcore diagnostic messages are listed below in the order in which the diagnostics are run, followed by a short description of the function of each diagnostic.

- | | | |
|-----|------|---|
| 1. | ROM | Validates bootprom checksum |
| 2. | RAM1 | RAM stuck bit test |
| 3. | RAM2 | RAM refresh test |
| 4. | RAM3 | RAM stress test |
| 5. | RAM4 | RAM parity test |
| 6. | PIT | Intel 8254 test |
| 7. | SIO | Signetics 2681 test |
| 8. | PIC | Intel 8259 test |
| 9. | FDC | Western Digital 2797/National 8473 test |
| 10. | FAT | Load the floppy allocation table |
| 11. | MAP | Load the floppy load map file |

If a hardcore diagnostic fails, an error message appears on the control panel display. See the chapter entitled "Error Code Dictionary" in this manual for a explanation of these error messages.

3. Floppy Resident POR Diagnostics

This section contains a brief description of each Floppy Resident Power-On Reset (FRPOR) diagnostic that resides on the functional/diagnostics diskette.

When the subsystem is powered up or an IPL Reset is performed,

1. Hardcore Power-on Reset Diagnostics run (refer to Section 2).
2. One of three things happens, depending on which option has been selected previously through the Set Diags program. Refer to the appropriate "4220 Operator Display Menu" in this chapter:
 - * (NONE) No further diagnostics automatically run.
 - * (NORM) The first four FRPOR diagnostics run .
 - * (EXTENDED) All FRPOR diagnostics (BFR_DIAG through HD_DIAG) run automatically.

If an error is detected by one of the diagnostics, the filename and one or two error bytes are scrolled continuously through the alphanumeric display. The first error byte is the number of the failing test within the named error suite, and the second byte is an error code that identifies the error event.

The suites which comprise the FRPOR diagnostics are listed below, followed by a brief description of their function and content.

BFR_DIAG	Data buffer memory tests, including parity
DMA_DIAG	DMA tests, including the I/O FIFOs
WF_DIAG	Write formatter tests, including several wraps
LWR_DIAG	Loop-write-to-read tests, including PLL tests
TRLR_DIAG	Trailer hardware test (only if ICRC feature is installed).
ICRC_DIAG	DC Card test (only if card is present and ICRC feature is enabled)
RF1_DIAG through RF7_DIAG	Read formatter test - verifies card present. (Runs only if extended test option is set.)
HD_DIAG	Run interface card internal diagnostics (run only if extended test option is set)

NOTE:

To terminate diagnostics during IPL and continue the IPL sequence, press the three buttons (SCROLL, SELECT, and UNLOAD) on the control panel simultaneously as if you were resetting the machine (hold down the three buttons less than three seconds).

3.1. BFR_DIAG

BFR_DIAG test 1

Checks for both data and address bits which are stuck either high or low. The EOD bits are tested as well as the data bytes.

BFR_DIAG test 2

Attempts to detect a failure in the data buffer refresh circuit. The EOD bits are tested as well as the data bytes.

BFR_DIAG test 3

The parity bit generation/check circuit is tested as well as the parity bits themselves. Since the microprocessor does not have direct access to the parity bits, they must be checked indirectly.

3.2. DMA_DIAG

DMA_DIAG test 1

Uses DMA channel 1 to transfer a block of 28 data bytes from the data buffer into the output FIFO, as would occur during a typical read or write operation.

Uses DMA channel 3 to perform a data transfer from the input FIFO to the data buffer, as would occur during a normal read or write operation.

DMA_DIAG test 2

Uses DMA channel 2 to perform a memory data transfer. (Note: this DMA channel is not currently used by the functional code.)

DMA_DIAG test 4

Parity Error Detect. This test forces channel 1 and 3 parity errors and checks to see that the status buffer detects them.

DMA_DIAG test 5

Checks the timer counter by writing four 4K-blocks from one location in the buffer to another through the input FIFO, using DMA channel 3.

3.3. WF_DIAG

WF_DIAG test 1

Zero is written to a set of the write formatter CIO registers. The registers are then read back and checked for a value of 0.

WF_DIAG test 2

Zero is written to a small set of the tape drive CIO registers. The registers are then read back and checked for a value of 0.

WF_DIAG test 3

A "one" is walked through each of the 8 bits of the parallel port and verified.

WF_DIAG test 4

A small set of data patterns is written to the serial port. After pausing briefly for a data pattern to be serialized and then deserialized, the serial port is read and the data pattern is checked for correct value and parity.

WF_DIAG test 5

This test verifies that the write formatter can detect and report bad parity, a mispositioned EOD bit, and an output FIFO overrun.

WF_DIAG test 6

This test performs a pseudo-wrap test from the data buffer through the entire data path in the write formatter.

3.4. LWR_DIAG**LWR_DIAG test 1**

This test performs a loop-write-to-read from the data buffer through the write formatter to the PL cards and read formatter and back into the data buffer using a good block of normal data. The inhibit ECC bit is set so that any hardware-caused dead track will not be corrected, but will be reported as an error.

LWR_DIAG test 2

This test performs a loop-write-to-read from the data buffer through the write formatter to the PLL ICs on the RI card and read formatter and back into the data buffer using a good block of normal data.

LWR_DIAG test 3

This test performs a loop-write-to-read from the data buffer through the write formatter to the PLL ICs on the RI card and read formatter and back into the data buffer using a block of normal data with a corrupted data byte.

LWR_DIAG test 4

This test performs a loop-write-to-read from the data buffer through the write formatter to the PLL ICs on the RI card and read formatter using a block of bypass data in order to test the ECC portion of the read formatter.

LWR_DIAG test 5

This test performs a loop-write-to-read from the data buffer through the write formatter to the PLL ICs on the RI card and read formatter using a block of bypass data in order to test the ability of the PLL ICs to perform acquisition.

LWR_DIAG test 6

This test performs a loop-write-to-read from the data buffer through the write formatter to the PLL ICs on the RI card and read formatter using a block of bypass data in order to test the ability of the PLL ICs to hold lock during data drop outs.

LWR_DIAG test 7

This test performs a loop-write-to-read by injecting the write data into one side of the RI differential input. It isolates input filter, AGC, and peak detect failures of the RI card. Special read sequencer code is loaded for this test. Normal RF code is reloaded when the test is completed. (If the RI card is PN 29291106 or below, the Diag EC Level must be set to 0 in the menu item labeled [Diag: EC Lvl:X])

LWR_DIAG test 8

This test performs a loop-write-to-read by injecting the write data into the HI card preamp section. It isolates HI analog channel failures. Special read sequencer code is loaded for this test. Normal FR code is reloaded when the test is completed. Note that this test will run on each configured TU regardless of drive address. (If the RI card is PN 29291106 or below, the Diag EC Level must be set to 0 in the menu item labeled [Diag: EC Lvl:X])

3.5. TRLR_DIAG**NOTE:**

These diagnostics run only if the ICRC Feature is installed.

TRLR_DIAG test 1

This diagnostic test, ICRC_BID, checks BID RAM using 55 and AA patterns.

TRLR_DIAG test 2

This diagnostic test, ICRC_BCNT, checks BID RAM controls (direction and counting functions) by passing data to the data buffer, then transferring the data by LWR to the BID RAM.

TRLR_DIAG test 3

This diagnostic test, ICRC_TRALREG, checks trailer hardware registers using a walking-one pattern.

TRLR_DIAG test 4

This diagnostic test, ICRC_TMUX, uses the LWR path and "Trailer Mode" to test that the proper trailer sequence is generated for a block of data.

TRLR_DIAG test 5

This diagnostic test, ICRC_CUCRC, uses the LWR path and "Trailer Mode" to test that the proper trailer sequence is generated for a block of data.

3.6. ICRC_DIAG**NOTE:**

These diagnostics run only if the ICRC feature is installed.

ICRCDIAG test 1

This test, ICRC_REGTST, tests external command and mode registers using a walking-one pattern.

ICRCDIAG test 2

This test, BYPASS_PATH, tests the non-ICRC (bypass) data path by passing data into and out of the data buffer using the diagnostic data port.

ICRCDIAG test 3

This test, ICRC_PACKET, tests the ICRC blocking packet RAM using incrementing and decrementing data patterns.

ICRCDIAG test 4

This test, ICRC_DTCRAM, tests the ICRC DTC data RAM using incrementing and decrementing data patterns.

ICRCDIAG test 5

This test, ICRC_BUFRAM, tests the ICRC buffer data RAM using incrementing and decrementing data patterns.

ICRCDIAG test 6

This test, ICRC_ENCSTA, tests the ICRC encoder static tables using incrementing and decrementing data patterns.

ICRCDIAG test 7

This test, ICRC_DECSTA, tests the ICRC decoder static tables using incrementing and decrementing data patterns.

ICRCDIAG test 8

This test, ICRC_ERROR, forces DTC interface bus parity errors, DTC RAM input parity errors, buffer data RAM output parity errors, CRC(y) errors, header and trailer errors.

ICRCDIAG test 9

This test, ICRC_WRTNON, writes a three-packet super block to the buffer in non-compressed mode.

ICRCDIAG test 10

This test, ICRC_WRTCOM, writes a three-packet super block to the buffer in compressed mode.

ICRCDIAG test 11

This test, ICRC_RDNON, reads a three-packet super block from the buffer in non-compressed mode.

ICRCDIAG test 12

This test, ICRC_RDCOM, reads a three-packet super block from the buffer in compressed mode.

ICRCDIAG test 13

This test, ICRC_CUCRC, uses 512 to 4096 byte incrementing data patterns in compressed mode to test HOST CUCRC vs DC CUCRC and DC CUCRC' vs WF CUCRC.

3.7. RF1_DIAG

RF1_DIAG test 1

This diagnostic tests the RF Control IC. Port A is configured to be an input port. Ports B and C are configured to be output ports. It writes all combinations to port B and C (bits 1-7) and reads back the results. Between the write and read an additional read of port A is done.

RF1_DIAG test 2

This diagnostic tests the RF Control IC. This test checks port A (bits 0-6) of the timer function by writing all combinations to it and verifying the results are correctly read back.

RF1_DIAG test 3

This diagnostic tests that the RF interrupt can be set, that the path to the interrupt chip works, and that reading the 8259 interrupt request latch indicates the interrupt is present. It also tests that the interrupt latch can be reset.

RF1_DIAG test 4

This diagnostic tests that the interrupt sequence works properly and that the specific end-of-interrupt command works. It also tests that the 8259 interrupt request latch and in-service latch are read throughout the sequence and checked for correct function.

RF1_DIAG test 5

This diagnostic tests the timer functions of the RF Control IC. Ports B and C are used to control and test the three internal timers.

3.8. RF2_DIAG

RF2_DIAG test 1

This test generates the five special marks (IBG, PRE, TM, ERG, Dens ID) and monitors the mark decode hardware.

3.9. RF3_DIAG

RF3_DIAG test 1

This test generates a block of data in bypass mode. One byte in the block is then corrupted. The block is then looped from the WF card to the RF card. Status is checked to verify the block was corrected and the corresponding TIE flag is set. The sequence is repeated for all corruption patterns (512 total).

RF3_DIAG test 2

This test generates a block of data in bypass mode. It is different from the above test in that the entire block has '00' data (except for BID, residual and CRC). This is done to verify that an illegal translate sets a pointer.

3.10. RF4_DIAG**RF4_DIAG test 1**

This test verifies that the various block lengths are read successfully in the forward direction. It is run using bypass mode. The intent is to exclude the WF card from the test as much as possible. A failure in this test indicates that the RF card is faulty.

RF4_DIAG test 2

This test does the same as the previous test except that bypass mode is not used. This means that the write card supplies the ECC data and inserts SYNC and RE-SYNC fields. If the above test passes and this test fails, the failure is most likely in the WF.

RF4_DIAG test 3

This test verifies that the various block lengths are read successfully in the backward direction. It is run using bypass mode. Since write backwards does not occur in the functional case, the purpose of the test is to verify successful RF card functioning.

3.11. RF5_DIAG**RF5_DIAG test 1**

This test verifies that the persistence counter functions correctly when resetting the pointer.

RF5_DIAG test 2

Verifies that a DEAD TRACK latch sets if sync is not detected.

RF5_DIAG test 3

Verifies that a track which was forced to DEAD TRACK will reset DEAD TRACK when a resync frame occurs.

RF5_DIAG test 4

Verifies that DEAD TRACK sets correctly due to persistent correction.

RF5_DIAG test 5

Verifies that a corrupted resync field will not cause the excess correction bit to set.

RF5_DIAG test 6

This test verifies that DEAD TRACK will set if correction is required for eight consecutive frames.

RF5_DIAG test 7

This test verifies that if finding an internal pointer is in progress, the resetting of a pointer due to no correction activity is delayed.

RF5_DIAG test 8

This test verifies that the correct (opposite) DEAD TRACK latch will set if a backwards read occurs.

3.12. RF6_DIAG**RF6_DIAG test 1**

This test simply writes a good block of bypass data in LWR mode. The RF status is then checked to make sure that there were no problems.

RF6_DIAG test 2

This test also writes a block of bypass data in LWR mode, but one track of the leading IBG is corrupted, which should not cause an error.

RF6_DIAG test 3

This test also writes a block of bypass data in LWR mode, but one track of the trailing IBG is corrupted. This should cause an error status to be reported by the RF status FIFO after the EOB is detected.

3.13. RF7_DIAG**RF7_DIAG TEST1**

This test exercises the control registers used to load the RF sequencer with functional code.

RF7_DIAG TEST2

This test looks for stuck-high and stuck-low bits in the read sequencers SRAM.

RF7_DIAG TEST3

This test loads the functional code into the read sequencer, verifies the load by reading back and comparing, and then starts the sequencer.

3.14. HD DIAG

These tests invoke the host interface tests. The microprocessor on the interface card performs all the diagnostics locally.

4. Control Unit Diagnostics

4.1. Offline Diagnostics

If the ICRC feature is not installed, offline diagnostics consist of

- Tests 1 through 7
- Diag: Loop
- Loader Sensors
- Display Tension))
- Diag:Load/Unload
- Test Disp
- Display Pressure

If the ICRC feature is installed, offline diagnostics consist of

- Tests 1 and 7.
- Diag: Loop
- Loader Sensors
- Display Tension
- Diag:Load/Unload
- Test Disp
- Display Pressure

4.2. Inline Diagnostics

If the ICRC feature and microcode are installed, the following tests are available as inline diagnostics

- Tests 2, 3, 4, 5, 6, 8, 9
- Diag: Loop
- Loader Sensors
- Display Tension
- Diag:Load/Unload
- Test Disp
- Display Pressure

4.3. Description of Diagnostic Tests

4.3.1. TEST 1 - Basic Logic

NOTE:

Always IPL the unit after you run Test 1.

This test runs the following POR diagnostics described in the previous section.

1. BFR_DIAG
2. DMA_DIAG
3. WF_DIAG
4. LWR_DIAG
5. TRLR_DIAG (if ICRC feature is installed)

6. ICRC_DIAG (if ICRC feature is installed)
7. RF1_DIAG
8. RF2_DIAG
9. RF3_DIAG
10. RF4_DIAG
11. RF5_DIAG
12. RF6_DIAG
13. RF7_DIAG
14. HD_DIAG

4.3.2. TEST 2 - Basic Tape Motion With Read And Write

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). It consists of the following test sections:

- **LDD - Load Display Command Test**
Executes load display a command.
- **BASICCMD - Basic Command Test**
Executes various tape commands
- **MOTION - Motion Test**
Writes various block and file sizes, then, using the space commands, causes tape motions of various lengths to occur.
- **SMPLWRRD - Simple Write And Read Test**
Performs some quick and simple writing and reading of small data blocks
- **CHRW - Chained Read And Write Test**
Writes 1500 blocks of 3C3C data patterns, then back spaces over the blocks, then reads forward to the end of data. This test runs approximately 2.25 minutes.

4.3.3. TEST 3 - Write Reliability (QUAL2)

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). Writes 3000 64K blocks of C9C9 data pattern to EOT. Rewinds and reads forward to EOT, then reads backward to BOT. This test runs for approximately 45 minutes

4.3.4. TEST 4 - Read Reliability (QUAL2 RD)

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). Using a good tape created from Test 3, reads forward to EOT, then reads backward to BOT. No writing occurs. This test runs approximately 34 minutes.

4.3.5. TEST 5 - Quick Dead Track Write Reliability (QUAL3)

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). This test writes 1000 one-KB blocks of AA55 data pattern, rewinds, and then reads forward and then backward. If it encounters a permanent error or too many blocks corrected, the test posts an error. It requires a loaded, ready and unprotected tape. This test runs for approximately 35 seconds.

4.3.6. TEST 6 - Quick Dead Track Read Reliability (QUAL3 RD)**NOTE**

You must run Test 5 before you can run Test 6

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). Using a good tape created from Test 5, this test reads forward until a tape mark is detected, then reads backward. No writing occurs. This test runs approximately 22 seconds.

Its chief purpose is primarily a test to debug and isolate defective FRUs in the read/write electronics path.

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7).

If a manual loader is installed

Loads and unloads a tape until stopped by a signal from the panel. If no cartridge is present, prompts operator to load one.

If autoloader is present

Loads cartridge (includes threading tape onto take-up reel) that is in position to be loaded. Unloads cartridge and moves magazine so that next occupied slot is in position to be loaded. Loads and unloads that cartridge. Continues loading and unloading until last occupied slot in magazine is loaded and unloaded. Repeats this cycle until halted by the operator.

4.3.7. Test 7 - Read-Write RI/SBI Scan Test.

You must re-IPL the subsystem after running this test, because it corrupts memory.

4.3.8. TEST 8 - ICRC Write/Read Reliability (IDRCQUAL)

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). This test writes 2500 8K-ICRC records of AA55 data pattern, rewinds, and then reads the records forward. This test runs approximately 2.5 minutes.

4.3.9. TEST 9 - ICRC Read Reliability (IDRC RD)**NOTE:**

You must run Test 8 before you can run Test 9.

(If the ICRC feature is installed, this test is an inline test--See Sections 6 and 7). Using the tape created from Test 8, this test reads forward 2500 ICRC records. No writing occurs. This test runs approximately 1.1 minutes.

4.3.10. Diag Loop

Displays the number of loops you wish all subsequent tests to sequence through. The numbers displayed are 1, 10, 100, and 0(continuous). This loop count setting does not apply to the autoloader Load/Unld test.

4.3.11. Test Disp

This test causes all of the available characters to be displayed on the 16-character display.

4.3.12. Load Sensors

If an autoloader is installed, the display indicates the status of nine sensors in the autoloader. These sensors are

- Cartridge-in-drive sensor
- Carrier-up/down sensor
- Horizontal shuttle-at-magazine sensor
- Cleaning cartridge sensor
- Vertical axle rotational sensor
- Magazine index sensor
- Magazine slot sensor
- Cartridge-in-magazine sensor
- Vertical dead-man switch

4.3.13. Display Pressure

This displays a hex number proportional to the air pressure in the transport deck plenum sensed by the pressure transducer.

4.3.14. Display Tension

This displays a hex number proportional to the air pressure in the right-hand air bearing sensed by the tension transducer.

5. How To Run Offline Diagnostics

Do the following to run offline diagnostics. See the chapter entitled "Locations" in this manual for a description of the switches used in the diagnostic procedures. Refer to Section 12.3 of this manual for more information about running offline diagnostics.

1. Take the transport offline from the host. Refer to the 4220 operator's guide.
2. If a cartridge is in the transport, unload it. Refer to the operator's guide.
3. Load a good scratch cartridge into the transport and make sure the functional diagnostic floppy diskette is in the floppy diskette drive.
4. When "XX:DIAG: READY U" appears in the display on the control panel, press and release the SCROLL button until the word "DIAGNOSTICS" appears.
5. Press the SELECT button. "DIAG: TEST 1" should appear in the display.
6.
 - a) If you want to run Test 1, go to step 8 of this procedure.
 - b) If you want to run a different test, go to step 7.

NOTE:

You must run Test 5 before you can run Test 6.

NOTE:

If you run test 7, you must, IPL, then go through steps 1 through 6.b. and proceed to the other tests.

7. Press and release the SCROLL button until "# DIAG TEST X" appears in the display, where "X" is the number of the test you want to run. Test 3 must be run before test 4, and test 5 must be run before test 6.
 8. Press the SELECT button. The display should blink.
 9.
 - a) If you decide not to run this test, but another test, go to step 7 of this procedure.
 - b) If you decide to run this test, press the SELECT button. The display should exhibit:

# TEST X: BUSY	while the test is running
# TEST X: PASS	when the test finishes without an error
# TEST X: XXXX	if an error is encountered,
- where XXXX = an error code
10.
 - a. If you want to run this test again, press the SELECT button.
 - b. If you want to run a different test, go to step 7.
 - c. If you want to exit diagnostics, press the SCROLL button until "EXIT" appears in the display. Then press the SELECT button.

11. If you have finished running diagnostics, remember to put the drive back online:
 - a. Press the SCROLL button until [Exit] appears in the display.
 - b. Press SELECT, then SCROLL; [+SUBSYS STATUS] should show in the display.
 - c. Press Select; [Online Request] should appear in the display.
 - d. Press SELECT; the display should blink.
 - e. Press SELECT again; the tape should unload (if a tape is loaded) and [XX: IDLE *] should appear in the display.

6. Inline Diagnostics

NOTE:

Inline diagnostics can be run only if the ICRC feature is installed.

Inline diagnostics consist of Tests 2, 3, 4, 5, 6, 8, and 9, which are described in section 4.

6.1. How To Run Inline Diagnostics

Perform the following steps to run Inline diagnostics.

NOTE:

To run Tests 2, 3, 4, 5, 6, and 8, you must load a cartridge with write protect OFF.

1. Make sure the control unit is online. The status display should display [XX: IDLE *]. If this is the case, go to step 3. If the status display shows [OF: DIAG], the control unit is offline. In this case
 - a. Press and release the SCROLL button; [+SUBSYS STATUS] should appear in the display.
 - b. Press the SELECT button and [Online Request] should appear in the display.
 - c. Press the SELECT button again and the message will blink.
 - d. Press the SELECT button once more and the control unit should go online and the display should change to [XX: IDLE].
3.
 - a. Press and release the SCROLL button; [+SUBSYS STATUS] should appear in the display.
 - b. Press and release the SELECT button; [Offline Request] should appear in the display. **Do not** execute this function.
 - c. Press the SCROLL button; [Drive Offl Req] should appear in the display.
 - d. Press the SELECT button; the message should blink.
 - e. Press the SELECT button again; [FE: IDLE] should appear.
4. Press the SCROLL button; [+DIAGNOSTICS] should appear in the display.
5. Press the SELECT button; [*DIAG: Test 2] should appear in the display.
6.
 - a. If you want to run test 2, go to Step 8 of this procedure.
 - b. If you want to run a different test, go to the next step.
7. Press the SCROLL button until the test you want to run is displayed.
8. Press the SELECT button. The test will be "armed" (the display will blink).
 - a. If you decide not to run this test, but to run another test, go to step 7.

- b. If you decide to run this test, press the select button again. The display should show

#Test X:	BUSY/TEST NAME	(while the test is running)
#Test X:	PASS	(if the test runs error-free)
#Test X: ERR	XXXX	(if an error is encountered)

where X = the test number, and
xxxx = an error code.

9. a. If you want to run this test again, press the SELECT button.
b. If you want to run another test, go to step 7.
c. If you want to exit diagnostics, press the SCROLL button until [EXIT] shows in the display, and press the SELECT button. The display should now show [FE: IDLE].
10. If you have finished running diagnostics, remember to put the drive back online:
a. Press the SCROLL button; [+SUBSYS STATUS] should show in the display.
b. Press SELECT; [Drive Onl Req] should appear in the display.
c. Press SELECT; the display should blink.
d. Press SELECT again; the tape should unload (if a tape is loaded) and the display should show [XX: IDLE].

7. 4220 Operator Display Menus

7.1. Configuring the Unit - (Offline Menu)

In order to be configured, a unit must be at the beginning of the offline menu. The easiest way to do this when the program is loaded, is to reset by holding down the SCROLL, SELECT, and UNLOAD buttons for less than two seconds. The unit will unload any tape in the drive, then present

[OF:DIAG: *]	Press SCROLL to pass to the next menu entry.
[+SUBSYS STATUS]	Press SCROLL to pass to the next menu entry.
[+SET OR DISPLAY]	Press SELECT to pass to the next menu entry.
[**Configuration]	Press SELECT and UNLOAD at the same time to pass to the next menu entry.

By default, this menu is not passkey protected, but passkey protection can be enabled through this submenu, and is remembered in NVRAM.

If passkey protection is enabled, the following key sequence is required when the flashing [Enter Passkey !] message is displayed.

1. Press and release SCROLL
2. Press and release SCROLL and SELECT together.
3. Press and release SCROLL and UNLOAD together.

The key sequence must be entered within a five-second window.

If you have entered the passkey sequence, when the [**Configuration] display returns press and release SELECT and UNLOAD together to pass to the next menu entry.

[>>Set Diags: None]	This allows different modes of automatic diagnostics (Normal, None, and Extended) at IPL. Press and release SELECT and UNLOAD to display Norm, None, or Extd, then press SELECT twice to set the desired mode. Extended diagnostics are equivalent to Test 1, and Normal is a subset of Test 1. Approximate IPL times for a 1 x 2 for None, Norm, and Extd modes are 1:20, 3:15, and 11:10 minutes, respectively. Press SCROLL to pass to the next menu entry.
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- [>>Diag EC Lvl: 0] This setting determines whether certain diagnostics can be run. Press and release SELECT and UNLOAD together to sequence through eight values (0-7). Only settings of 0, 1, and 2 are supported by the diagnostics. Press SELECT twice to set the value into NVRAM. Units that have RI boards of PN 29291200 and higher support an extended Loop-Write-to-Read diagnostic. With these units, a setting of 1 or 2 allows WR_DIAG subtests as a part of diagnostic test 1. The extended LWR_DIAG subtests do not run at IPL time. A setting of 2 allows you to run diagnostic test 7 (RI/SBI card scan).
- Press SCROLL to pass to the next menu entry.
- [>>Set Host: SCSI] If "SCSI" does not appear in your display, you must press and release SELECT and UNLOAD until SCSI appears, then press SELECT twice to set this host type. If you do not set the proper host type, the menus will be different from what you see here. If you set (or re-set or change) the host type, a re-IPL will occur and you will have to start over at the beginning of this menu.
- Press SCROLL to pass to the next menu entry.
- [Lang: English] This menu option allows the user to select English, Français (French), Deutsch (German), Italiano (Italian), or Español (Spanish) for the messages displayed on the operators panel. Press SELECT and UNLOAD until the desired language setting comes up. Then press SELECT twice to set.
- Press Scroll to pass to the next menu entry.
- [>>Set Part: Auto] (The program skips this step if the ICRC feature--indicated by a DCI card--is installed.)
- Press and release SELECT and UNLOAD until the partition size you want appears, then press SELECT twice to set that value. Buffer sizes of 0.5, 1.0, and 2.0 MB partitions per drive are supported. "Auto" automatically uses 2.0 MB for a 1 x 1, and 1.0 MB for a 1 x 2.
- Press SCROLL to pass to the next menu entry.

- [>>Set Sync TM: 2] There are three values available: 1, 2, and 3. This number signifies the number of sequential tape marks required before the buffer partition is synchronized to the tape. Press SELECT twice to set the value you want to select.
- Press SCROLL to pass to the next menu entry.
- [>>Passkey: Disab] The passkey function can be enabled and disabled through this display. Press SELECT and UNLOAD simultaneously to display the status you want (Enab or Disab), then press SELECT twice to set it. The status of the passkey protection is saved in NVRAM, which survives a reset, IPL, or power off and on. Refer to the "configuration" submenu for the passkey sequence.
- Press SCROLL to pass to the next menu entry.
- [>>Sync Nego: Enab] The menu first indicates whether target-initiated synchronous negotiations are enabled or disabled, by an "Enab" or "Dsab" message. To change the setting, press and release SELECT and UNLOAD, then press SELECT twice to set the displayed mode.
- Press SCROLL to pass to the next menu entry.
- [>>Emulate: None] If you want to emulate an IBM 2440 or IBM 9348, press select and unload simultaneously until the desired mode appears in the display, then press SELECT twice to set that mode.
- Note:** If you have been setting the BRN option on previous code releases to a non-zero value, set the EMULATE menu to Opt(n), where (n) is the setting used for BRN, i.e., set EMULATE to Opt1 if you previously set the BRN menu to 1.
- Press SCROLL to pass to the next menu entry.
- [>Exit] Press SELECT once to exit to the next submenu.
- [*Set SCSI ID: 0] Press SELECT and UNLOAD to increment the ID number. Press SELECT twice to set the SCSI ID to the indicated value. The ID is stored in nonvolatile memory.
- Press SCROLL to pass to the next menu entry.

- [**Set LUN: 0] Press SELECT and UNLOAD to increment the LUN value. Values 0-7 are supported. Press SELECT twice to set the indicated value. The LUN is stored in nonvolatile memory. The default LUN settings for the left and right hand drives (set at the factory) are 0 and 1, respectively.
- Press SCROLL to pass to the next menu entry.
- [**Set Clean:16K] Press SELECT twice to set the threshold at which the Clean message occurs. Press SELECT and UNLOAD together to sequence through 0, 8K, 12K, and 16K. The value 0 clears the clean counter.
- Press SCROLL to pass to the next menu entry.
- [*Exit] Press SCROLL and SELECT simultaneously twice to pass to the beginning of the offline menu ([OF:DIAG:xxxxxx])

7.2. Running Offline Diagnostics - Menu

You can run offline diagnostics immediately after configuring the unit. Otherwise, if the program is loaded, reset the unit by holding down the SCROLL, SELECT, and UNLOAD buttons for less than two seconds. The unit will unload any tape in the drive, then present the first entry of the Offline Menu.

Note: If the ICRC feature is installed, after test 1 the program skips tests 2 through 6 and goes directly to test 7.

[OF:DIAG: *]	Press SCROLL to pass to the next menu entry.
[+SUBSYS STATUS]	Press SCROLL to pass to the next menu entry.
[+SET OR DISPLAY]	Press SCROLL to pass to the next menu entry.
[+DIAGNOSTICS]	Press SELECT to access the offline tests sub-menu:
[*Diag: Test 1]	Press SELECT twice to execute. This test, which runs hardware diagnostics that test the SB, RI, and the SZ boards, runs for approximately 10 minutes. (Any attempt to go online after running Test 1 will cause an IPL.)
	Press SCROLL to pass to the next test.
[*Diag: Test 2]	(If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press SELECT twice to execute. This test runs basic tape motion and write/read diagnostics. It requires a loaded, ready and unprotected tape.
	Press SCROLL to pass to the next test.
[*Diag: Test 3]	(If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press SELECT twice to execute. This test runs an extended write/read reliability test. It executes a write pass from BOT to EOT, a read forward pass BOT to EOT, and then a read backward pass EOT to BOT. If the unit encounters a permanent error or too many blocks are ECC corrected, the test posts an error. It requires a loaded, ready and unprotected tape and runs for about 20 minutes.
	Press SCROLL to pass to the next test.

- [*Diag: Test 4] (If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press SELECT twice to execute. This is a read reliability test, equivalent to the read passes of test 3. Primarily for testing read interchange between units, it requires a tape written successfully by test 3 loaded and ready.
- Press SCROLL to pass to the next test.
- [*Diag: Test 5] (If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press Select twice to execute. This is a write reliability test that checks ECCs on writes, equivalent to QUAL3-WRT.
- Press SCROLL to pass to the next test.
- [*Diag: Test 6] (If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press Select twice to execute. This is a read reliability test that reads the tape generated by test 5 and checks read ECCs. It is equivalent to QUAL3-RD.
- Press SCROLL to pass to the next test.
- [*Diag: Test 7] (This test can be run only if Diag EC lvl is set to 2.) Press SELECT twice to execute. This is a read/write, RI/SBI card scan diagnostic. (If you run this test you must IPL the control unit. If you then want to continue diagnostics, you must scroll from the offline menu to this point in the program. This is necessary because this test corrupts memory.)
- Press SCROLL to pass to the next test.
- [*Diag: Load/Unld] If you have a manual loader, press SELECT twice to repeatedly load and unload a tape without ejecting it. The test runs until you press SCROLL or SELECT, or a hardware error is encountered. If a tape is not loaded, you receive a prompt with a message to load one. If you have an autoloader, press SELECT twice to start a Load/Unload cycle that runs until an error occurs or you press SCROLL or SELECT.
- Press SCROLL to pass to the next test.

[*Diag: Loop 1]

Press SELECT and UNLOAD to display the number of loops you wish all subsequent tests to go through. The numbers displayed are 1, 10, 100, and 0. Select '0' to set a continuous looping. Press SELECT twice to set the loop count that you select. (If an error occurs when 1, 10, or 100 has been set, the test stops; if an error occurs when 0 has been set, the test continues.)

Note: This loop count setting does not apply to the autoloader Load/Unld test.

Press SCROLL to pass to the next test.

[*Diag: Test Disp]

Press SELECT twice to execute. This test causes all of the available characters to be displayed on the 16-character display. It does not end unless SELECT or SCROLL is pressed again.

Press SCROLL to pass to the next test.

[*Loader Sensor]

Press SELECT twice to execute. If a manual loader is present, "Done" is displayed. If an autoloader is installed, the display indicates the status of nine sensors in the autoloader.

Each of the first nine positions on the display corresponds to a sensor. If a "1" is displayed, the corresponding sensor is active; if a 0 is displayed, the sensor is inactive. The following table relates the display position to a sensor (position 1 is the leftmost position in the display).

<u>Position</u>	<u>Sensor</u>
1	Cartridge-in-drive sensor
2	Carrier-up/down sensor
3	Horizontal shuttle-at-magazine sensor
4	Cleaning cartridge sensor
5	Vertical axle rotational sensor
6	Magazine index sensor
7	Magazine slot sensor
8	Cartridge-in-magazine sensor
9	Vertical dead-man switch

Press SCROLL to pass to the next test.

[*Display Pressure] Press SELECT twice to execute. If a tape is inserted, a hex number proportional to the air pressure in the transport deck plenum sensed by the pressure transducer is displayed. Allowable and nominal values (in hex) are:

High error limit	90
Nominal	70 ±10
Low error limit	50

If no tape is present, the value displayed should be 0.

Press SCROLL or SELECT once to terminate this test.

Press SCROLL to pass to the next menu entry.

[*Display Tension] Press SELECT twice to execute. This displays a hex number proportional to the air pressure in the right-hand air bearing sensed by the tension transducer. Allowable and nominal values (in hex) are:

High error limit:	A0
Nominal (moving, 8 oz)	70 ±10
Nominal (stopped, 6 oz)	54 ±10
Low error limit	38

If no tape is present, the value displayed should be 0.

Press SCROLL or SELECT once to terminate this test.

Press SCROLL to pass to the next test.

[*Exit] Press SCROLL once to return to test one,
or
press SELECT once to pass to the beginning of the offline program.

7.3. Running Inline Diagnostics - Menu

NOTE: This menu is available only if the ICRC microcode is installed.

To run inline diagnostics, the unit must be in inline mode. The first menu entry for the inline mode is (1) below. If you find yourself at an earlier entry, scroll through to the inline menu.

When you reset the unit, the program displays

[OF:Diag: xxxx]	Press SCROLL to pass to the next menu item.
[+SUBSYS STATUS]	Press SELECT to pass to the next menu item.
[*Online Request]	Press SELECT twice to pass to the next menu display.
[XX:IDLE: xxxx]	Press SCROLL to pass to the next menu item.
[+SUBSY STATUS]	Press SELECT to pass to the next menu item.
[*Offline Request]	Press SCROLL to pass to the next menu item.
[*Drive Offl Req]	Press SELECT twice to pass to the next menu item.
(1) [FE:IDLE:xxxxxx]	(This is the beginning of the inline menu.) Press SCROLL to pass to the next menu item.
[SUBSYS STATUS]	Press SCROLL to pass to the next menu item.
[+SET OR DISPLAY]	Press SCROLL to pass to the next menu item.
[DIAGNOSTICS]	Press SELECT to pass to the next menu item.
[*Diag: Test 2]	Press SELECT twice to execute. This test runs basic tape motion and write/read diagnostics. It requires a loaded, ready and unprotected tape. Press SCROLL to pass to the next test.
[*Diag: Test 3]	Press SELECT twice to execute. This test runs an extended write/read reliability test. It executes a write pass from BOT to EOT, a read forward pass BOT to EOT, and then a read backward pass EOT to BOT. If the unit encounters a permanent error or too many blocks are ECC corrected, the test posts an error. It re-

quires a loaded, ready and unprotected tape.
Test 3 runs for about 20 minutes.

Press SCROLL to pass to the next test.

[*Diag: Test 4]

Press SELECT twice to execute. This is a read reliability test, which is equivalent to the read passes of test 3. It testss primarily read interchange between units. It requires that a tape be written successfully by test 3 and that it is loaded and ready.

Press SCROLL to pass to the next test.

[*Diag: Test 5]

Press SELECT twice to execute. This is a write reliability test that checks ECCs on writes; it is equivalent to QUAL3-WRT.

Press SCROLL to pass to the next test.

[*Diag: Test 6]

Press SELECT twice to execute. This is a read reliability test. It reads the tape generated by test 5 and checks read ECCs. This test is equivalent to QUAL3-RD.

Press SCROLL to pass to the next test.

[*Diag: Test 8]

(This write ICRC reliability test can be run only if the ICRC code is loaded and the feature is installed and enabled.) Together with test 9, it checks ECCS on writes. It is equivalent to UAL5 - WRT.

Press SCROLL to pass to the next test.

[*Diag: Test 9]

(This read ICRC reliability test can be run only if the ICRC code is loaded and the feature is installed and enabled.) It reads the tape generated in test 8 to check read ECCs. It is equivalent to QUAL5 - RD.

Press SCROLL to pass to the next test.

[*Diag: Load/Unld]

If you have a manual loader, press SELECT twice to continually load and unload a tape without ejecting it. The test runs until you stop it by pressing SCROLL or SELECT, or a hardware error is encountered. If a tape is not loaded first, you receive a prompt with a message to load a tape.

If you have an autoloader, press SELECT twice to start a Load/Unload cycle that runs until an error occurs or you press SCROLL or SELECT.

Press SCROLL to pass to the next test.

[*Diag: Loop 1]

Press SELECT and UNLOAD to display the number of loops you wish all subsequent tests to go through. The numbers displayed are 1, 10, 100, and 0. '0' sets a repeating loop. (If an error occurs when 1, 10, or 100 is set, the test stops; if an error occurs when 0 is set, the test continues.) Press SELECT twice to set the loop count that you select. This loop count setting does not apply to the autoloader Load/Unld test.

Press SCROLL to pass to the next test.

[*Diag: Test Disp]

Press SELECT twice to start. This test causes all of the available characters to be displayed on the 16-character display. It does not end unless SCROLL or SELECT is pressed again.

Press SCROLL to pass to the next test.

[*Loader Sensor]

Press SELECT twice to execute. If a manual loader is present, "Done" is displayed. If an autoloader is installed, the display indicates the status of nine sensors in the autoloader.

Each of the first nine positions on the display corresponds to a sensor. If a "1" is displayed, the corresponding sensor is active; if a 0 is displayed, the sensor is inactive. The following table relates the display position to a sensor (position 1 is the leftmost position in the display).

<u>Position</u>	<u>Sensor</u>
1	Cartridge-in-drive sensor
2	Carrier-up/down sensor
3	Horizontal shuttle-at-magazine sensor
4	Cleaning cartridge sensor
5	Vertical axle rotational sensor
6	Magazine index sensor
7	Magazine slot sensor
8	Cartridge-in-magazine sensor
9	Vertical dead-man switch

Press SCROLL to pass to the next test.

[*Display Pressure] Press SELECT twice to execute. If a tape is inserted, a hex number proportional to the air pressure in the transport deck plenum sensed by the pressure transducer is displayed. Allowable and nominal values (in hex) are

High error limit	90
Nominal	70 ±10
Low error limit	50

If no tape is present, the value in the display should be 0.

Press SCROLL or SELECT once to terminate this test.

Press SCROLL to pass to the next test.

[*Display Tension] Press SELECT twice to execute. If a tape is inserted, a hex number proportional to the air pressure in the right-hand air bearing sensed by the tension transducer is displayed. Allowable and nominal values (in hex) are:

High error limit:	A0
Nominal (moving, 8 oz)	70 ±10
Nominal (stopped, 6 oz)	54 ±10
Low error limit	38

If no tape is present, the value in the display should be 0.

Press SCROLL or SELECT once to terminate this test.

Press SCROLL to pass to the next program entry.

[*Exit] Press SCROLL and SELECT simultaneously twice to return to the beginning of the inline display: [FE:IDLE: *] If you then wish to put the unit online, press SCROLL once, then SELECT twice.

7.4. Online display

The first entry of the online program is (1) below. If you find yourself at an earlier entry, start there and scroll to (1), the beginning of the online program.

[OF:DIAG: *]	Press Scroll to pass to the next menu entry.
[+SUBSYS STATUS]	Press Select to pass to the next menu entry.
[Online Request]	Press Select twice to pass to the beginning of the Online menu.
(1) [ON:IDLE: *]	(This is the Online Status Display, the beginning of the online program.) Press SCROLL to pass to the following menu entry.
[+SUBSYS STATUS]	Press SCROLL once if you wish to pass to the operator display for machine generated messages, and SCROLL once more to return to the Online Status Display. (Refer to <u>Operator Display</u> on the next page.) or Press SELECT to access the following submenu.
[*Offline Request]	Press SELECT twice if you wish to take the unit offline. The subsystem remains offline until the Online Request is executed. Press SCROLL to pass to the following menu entry.
[*Drive Offl Req]	(This entry appears only if the ICRC code is installed.) Press SELECT twice to pass to the inline program, or press SCROLL to pass to the following menu entry.
[*Special Sw Mode]	This menu entry is available only if the unit has a Micro interface. It enables or disables switches to the host.. Press SELECT twice to change the setting from enable to disable and vice versa. Press Scroll to pass to the following menu entry.

[*Exit]

Press SELECT to return to the Online Status
Display:[ON:IDLE: *]. (1)

Operator Display

There is a window in the online menu program known as the "Operator Display". It consists of sixteen positions and displays information about the status of the drive. To access this window, start at the Online Status Display ([xx:IDLE: xxxx] and press SCROLL twice. To return to the Online Status Display, press SCROLL once.

The entries that appear in this window and their significance are

*	No tape loaded
READY U	Device ready and inactive, not file protected
READY U - BOT	Device ready and inactive at logical EOT, not file protected
READY U - LEOT	Device ready and inactive at logical EOT, not file protected
READY U - PEOT	Device ready and inactive at physical EOT, not file protected
READY F	Device ready and inactive, file protected
READY F - BOT	Device ready and inactive at BOT, file protected
READY F - LEOT	Device ready and inactive at logical EOT, file protected
READY F - PEOT	Device ready and inactive at physical EOT, file protected
TAPE MOVING	Drive active moving tape
TAPE MOVING-LEOT	Drive active moving tape in logical EOT region
TAPE REWINDING	Tape rewinding
TAPE LOCATING	Tape locating
TAPE LOADING	Tape loading
TAPE UNLOADING	Tape unloading
EJECTING	Ejecting magazine from autoloader
POSITIONING UP	Magazine positioning up to next slot
POSITIONING DOWN	Magazine positioning down to next slot
POSITION TO INDEX	Magazine positioning to slot position 0
TAPE ERASING	Drive performing DSE
SCANNING	Scanning magazine for cartridges
TAPE TENSIONING	Performing tape tensioning
CLEAN ME *	No tape loaded: drive requires cleaning
TAPE CLEANING	Displayed when cleaning cartridge installed
NO CARTRIDGE	Load failed: no cartridge in current magazine position
ERR-UNLOAD TAPE	Permanent error: must abort job
LOAD FAILURE	Tape failed to load properly in tape path
ERR:IPLorRST RQD	Any error detected that requires a RESET, IPL, or FE intervention

StorageTek®

4220 Cartridge Tape Subsystem

Chapter 5

FRU REPLACEMENT

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1. Introduction

This chapter tells you how to replace field replaceable units (FRU's) on the 4220 Cartridge Tape Subsystem. The chapter contains illustrations showing the locations of the FRU's. Be sure to read each procedure carefully and follow it strictly when you replace a component.



NOTE:

If you have a table top model, you must remove the table top model cover before you work on the 4220, and replace the cover after you finish repairs/replacements.

Section 2 of this chapter tells you how to remove and replace the table top cover.

NOTE:

Unless otherwise noted, the instructions in this chapter refer to both right-hand mounted (drive is on the right side of unit as viewed from the front) and left-hand mounted units.

NOTE:

Wear an electrostatic device when replacing FRU's.

CAUTION:

When the upper front partition of the 4220 is raised, the partition arm must be seated in the slot of the slide rails to prevent injury to the operator.

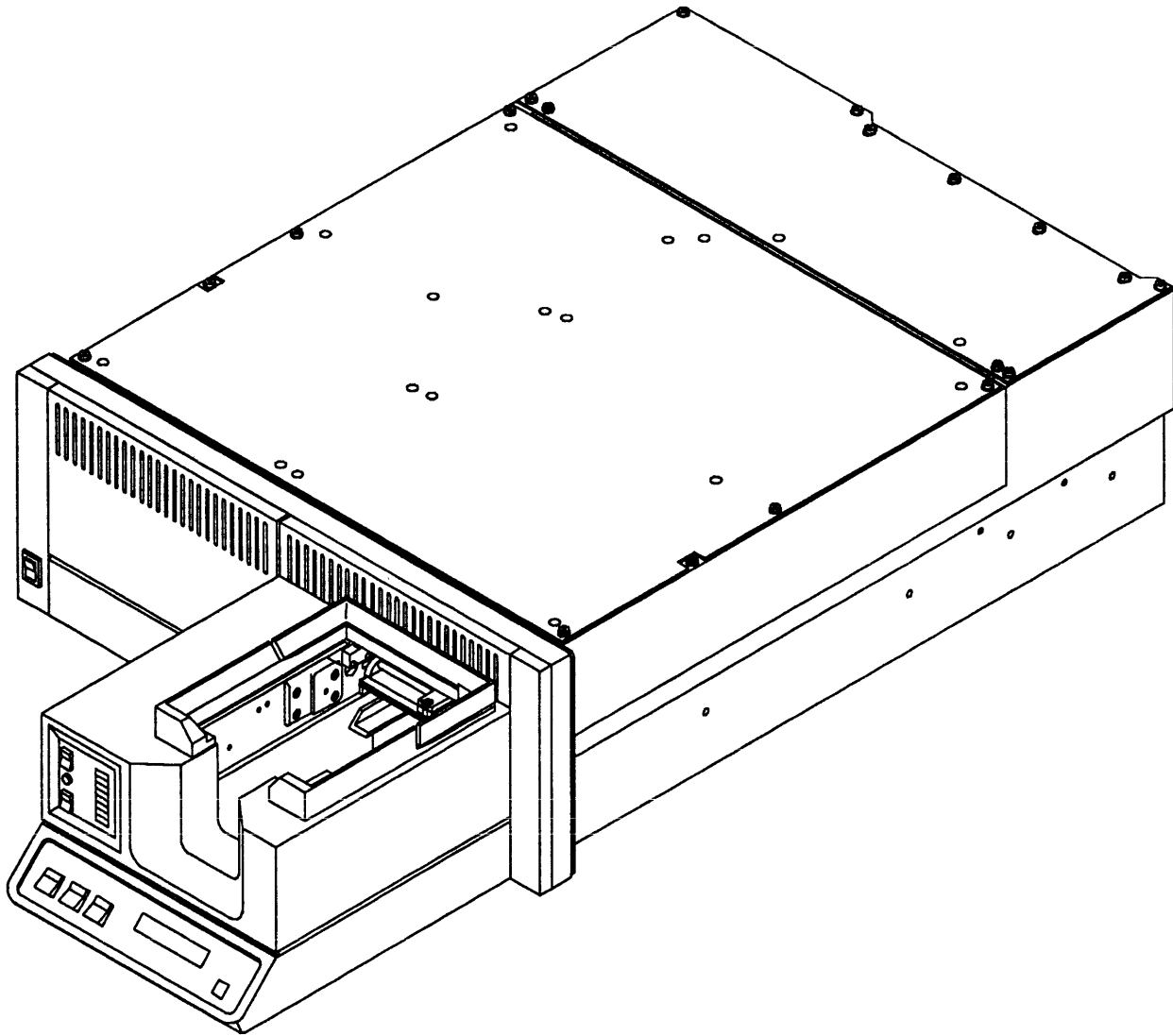


Figure 5 - 1.
4220 with Autoloader (Right-hand Mount)

2. Replace the Table Top Cover

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Cover

(Refer to Figure 5-2.)



1. Grasp the table top cover with both hands at the front, lower corners. Gently lift front of cover upward, letting the cover pivot at the rear. Continue until the cover is completely off.

Installing the Cover

1. With the wider flanges to the rear, slide the table top cover on the unit from the back.

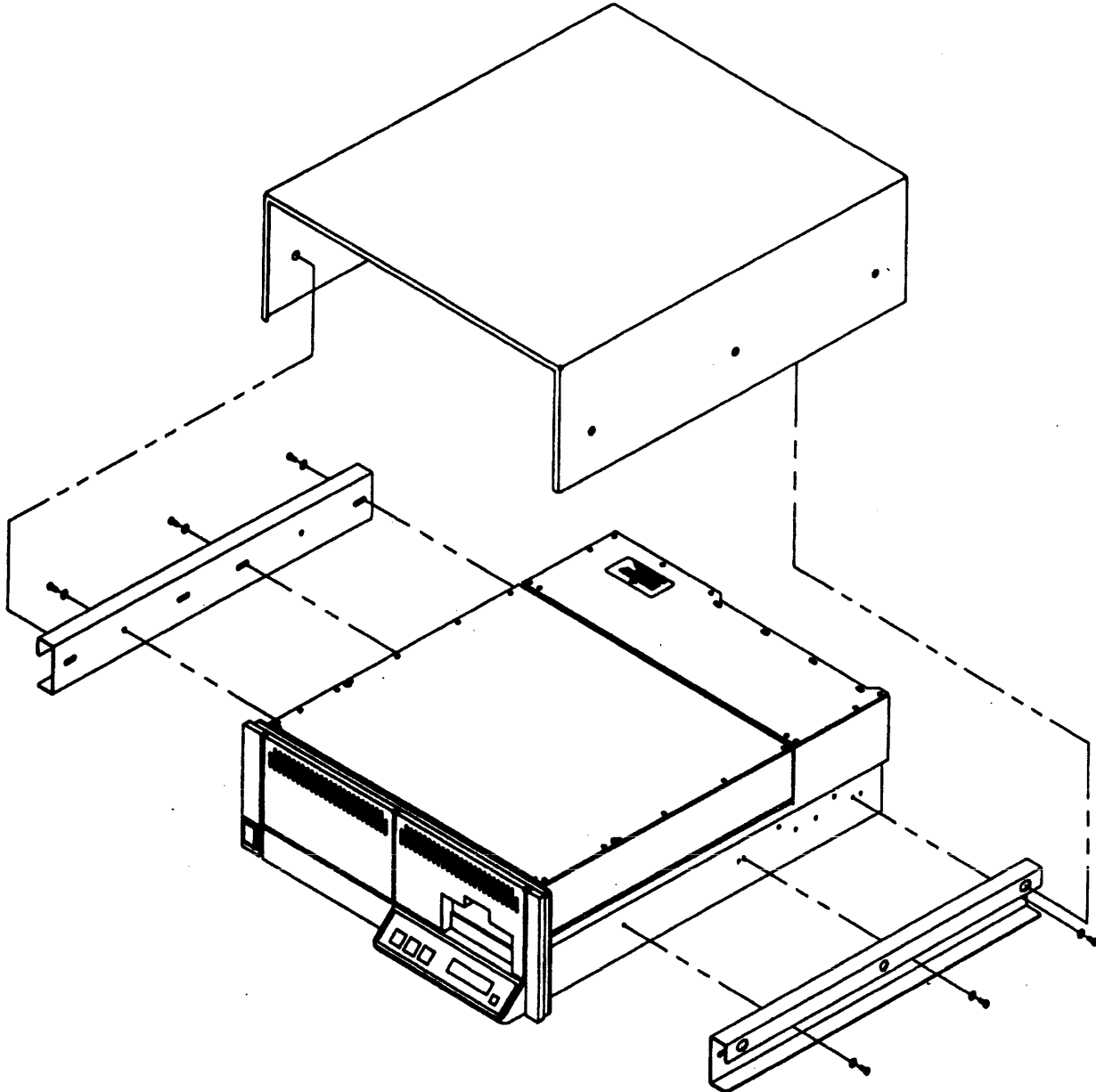


Figure 5 - 2.
Table Top Cover

3. Replace the Latch

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.



NOTE:

There is a latch on both sides of the 4220.

Removing the Latch

(Refer to Figure 5-2.)

1. Remove the host interface cable(s) from the rear of the 4220.
2. Extend the 4220 unit from the cabinet.
3. Remove the ten screws securing the top front cover to partition.
4. Raise top front cover to expose the latch and secure the cover with the support prop.
5. Remove the cover release screw.
6. Pry off the internal star washer which secures the latch to the partition.
This internal star washer is no longer usable.
7. Remove the latch.

Installing the Latch

1. Place the hook of the latch through the lower hole in the partition and insert latch over the partition stud. The point of the latch's hook should point to the rear of the 4220.
2. Place a new internal star washer over the partition stud to secure the latch.
3. Insert cover release screw through the opening in the top of the partition and into the threads of the latch, but do not tighten down.
4. Lower the partition and tighten two cover release screws.
5. Slide 4220 back into cabinet.
6. Install the host interface cable(s) to rear of 4220.
7. Install ac power cable to rear of 4220. Power up unit.

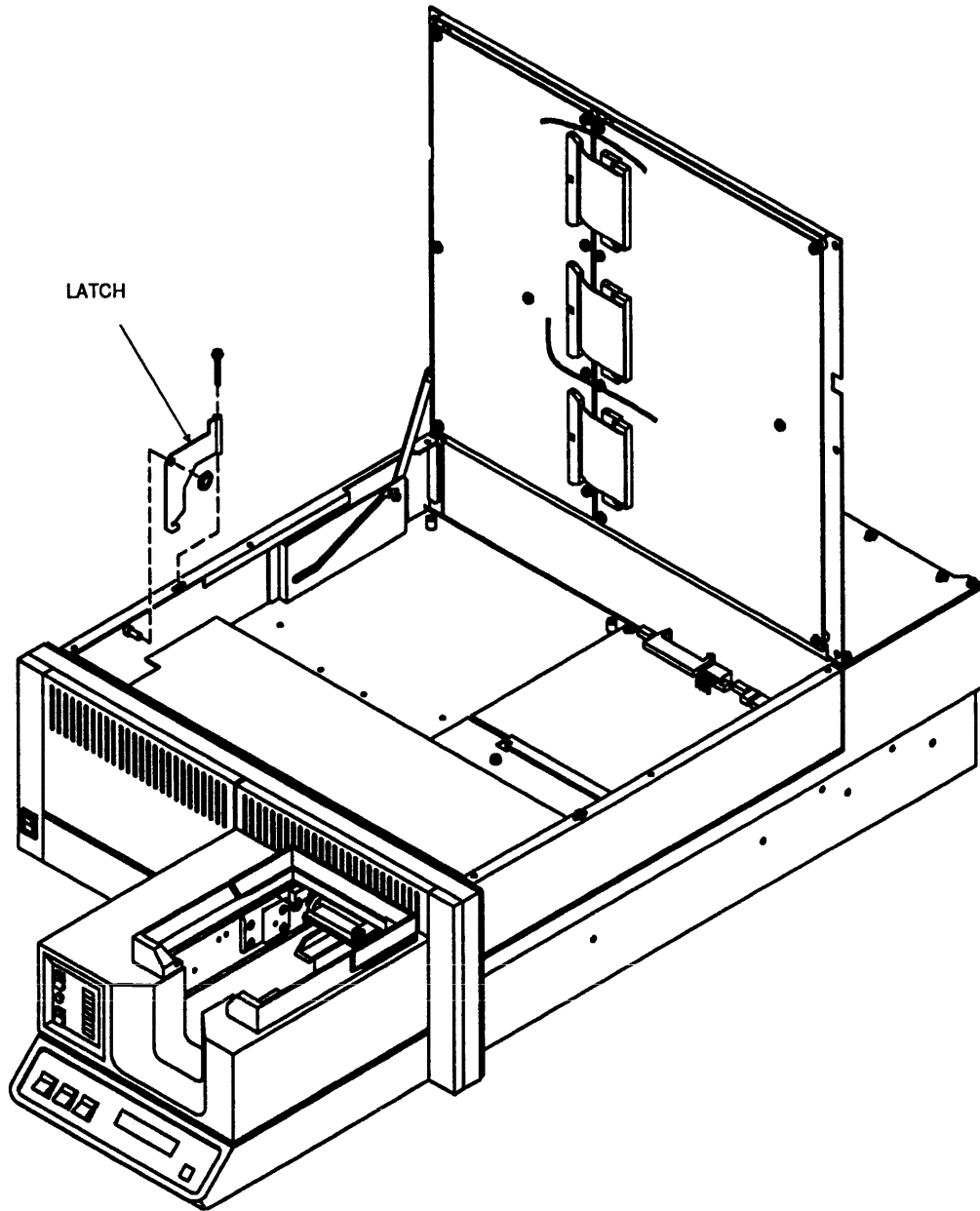


Figure 5 - 3.
Latch

4. Replace the Data Compression (DCI) Card

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the DCI Card (Refer to Figure 5-4.)



1. Remove the host interface cable(s) from the rear of the 4220.
2. Extend the 4220 unit from the cabinet.
3. Remove the six screws securing the top front cover to the partition.
4. Raise the top front cover to expose the system card and secure the cover with the support prop.
5. Remove the four screws that secure the DCI card to the stand-off on the SBI card.
6. The DCI card is still connected to the SBI card by a 50-pin card-to-card connector. Disconnect the DCI card from the SBI card:
 - a. Hold the DCI card with one hand.
 - b. Insert two fingers of the other hand between the DCI and SBI cards, in the vicinity of the 50-pin connector, and spread these two fingers of the connector apart.
7. Remove the 2-wire connector (labeled "P2") from the DCI card.

Installing the DCI Card

1. Connect the 2-wire connector (labeled "P2") to the corresponding connector on the DCI card.
2. Insert the 50-pin connector on the DCI card into the corresponding connector on the SBI card. Press the two connectors together by pushing the cards together with your thumb and index finger.
3. Secure the DCI card to the stand-off on the SBI card with the four screws you removed in step 3 of the removal procedure.
4. Lower the top front cover and install the six screws that secure it to the partition
5. Slide the 4220 back into the cabinet.
6. Install the host interface cable(s) to the rear of the 4220.

7. Install the ac power cable to the rear of the 4220.
8. Power up the unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

5. Replace the System (SB/SBI) Card

You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the SB/SBI Card (Refer to Figure 5-4.)



1. Remove the host interface cable(s) from the rear of the 4220.
2. Extend the 4220 unit from the cabinet.
3. Remove the six screws securing the top front cover to the partition.
4. Raise the top front cover to expose the system card and secure the cover with the support prop.
5. If the DCI card is installed, remove it. (Refer to Section 4.)
6. Disconnect the power cable connector (P20) from the SB/SBI card.
7. Disconnect the two ground cables from the SB/SBI card.
8. Disconnect two flat cable connectors (P27 and P21) from the SB/SBI card.
9. Remove the four screws (seven screws if the DCI card was not installed) securing the SB/SBI card to the top cover.
10. Disconnect three short flat cable connectors (P24, P23, P22) from the SB/SBI card.

Installing the SB/SBI Card

1. Connect three short flat cable connectors (P24, P23, P22) to the SB/SBI card.
2. Hold SB/SBI card against top cover and install the four screws (seven screws if the DCI was not installed) that secure the SB/SBI card to the top cover.
3. Connect two flat cable connectors (P27 and P21) to the SB/SBI card.
4. Connect the two ground cables to the SB/SBI card.
5. Connect the power cable connector (P20) to the SB/SBI card.
6. If you removed the DCI card in step 5 of the removal procedure, replace it. (Refer to Section 4.)

7. Lower the top front cover and install the six screws that secure it to the partition.
8. Slide the 4220 back into the cabinet.
9. Install the host interface cable(s) to the rear of the 4220.
10. Install the ac power cable to the rear of the 4220. Power up the unit.

Re-initializing and Testing

1. Re-initialize and test the SB/SBI card. Perform the steps listed on the following page.

6. Re-Initialize and Test the SB/SBI Card

1. When the unit is completely powered up, the display will show "OF:DIAG: *". Scroll to the "*** Configuration" frame.
2. Press SELECT and UNLOAD simultaneously, then scroll to the ">>SET HOST: SCSI" frame.
3. Press select twice. The machine automatically IPLs.
4. When the display shows "OF:DIAG *", scroll to the "***CONFIGURATION" frame, then scroll through the following frames, setting them to appropriate values: "SET DIAGS", "DIAG EC LVL".
5. Continue to scroll through the following menus, setting appropriate values:

SCSI

SET SYNC TM

SET PASSKEY
(optional)

SET SYNC

EXIT

SET SCSI ID

SET LUN

SET CLEAN

EXIT

6. Run offline diagnostics. (See Chapter 4, Section 5.)
7. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

7. Replace the Read Interface (RI) Card

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the RI Card

(Refer to Figure 5-4.)



1. Remove the host interface cable(s) from the rear of the 4220.
2. Extend the 4220 unit from cabinet.
3. Remove the six screws securing the top front cover to partition.
4. Raise top front cover to expose read interface card and secure the cover with the support prop.
5. Disconnect power cable connector (P40) from RI card.
6. Disconnect the two ground cables from the RI card.
7. Disconnect flat cable connector (P41) from RI card.
8. Remove eight screws securing RI card to the top cover.
9. Disconnect three short flat cable connectors (P44, P43, P42) from the RI card.

Installing the RI Card

1. Connect three short flat cable connectors (P44, P43, P42) to the RI card.
2. Hold RI card against top cover and install the eight screws that secure the RI card to the top cover.
3. Connect flat cable connector (P41) to RI card.
4. Connect the two ground cables to the RI card.
5. Connect power cable connector (P40) to RI card.
6. Lower top front cover and install the six screws that secure it to the partition.
7. Slide 4220 back into cabinet.
8. Install the host interface cable(s) to the rear of the 4220.
9. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

NOTE: THERE IS A LEFT-HAND MOUNTED UNIT IN FIGURE 5-5.

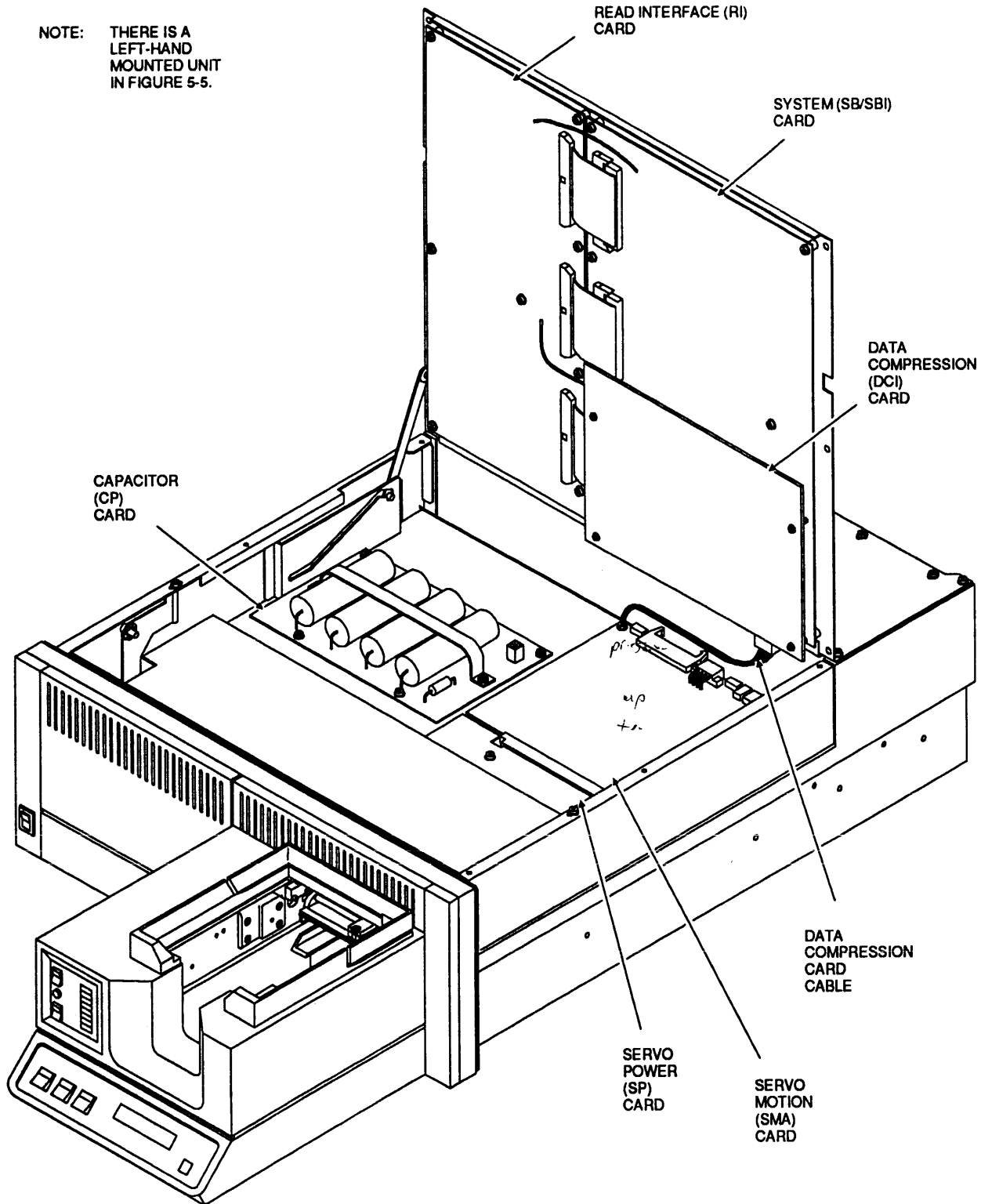


Figure 5 - 4.
4220 Controller Module FRU's (Right-hand Mount)

NOTE: THERE IS A
RIGHT-HAND
MOUNTED UNIT IN
FIGURE 5-4.

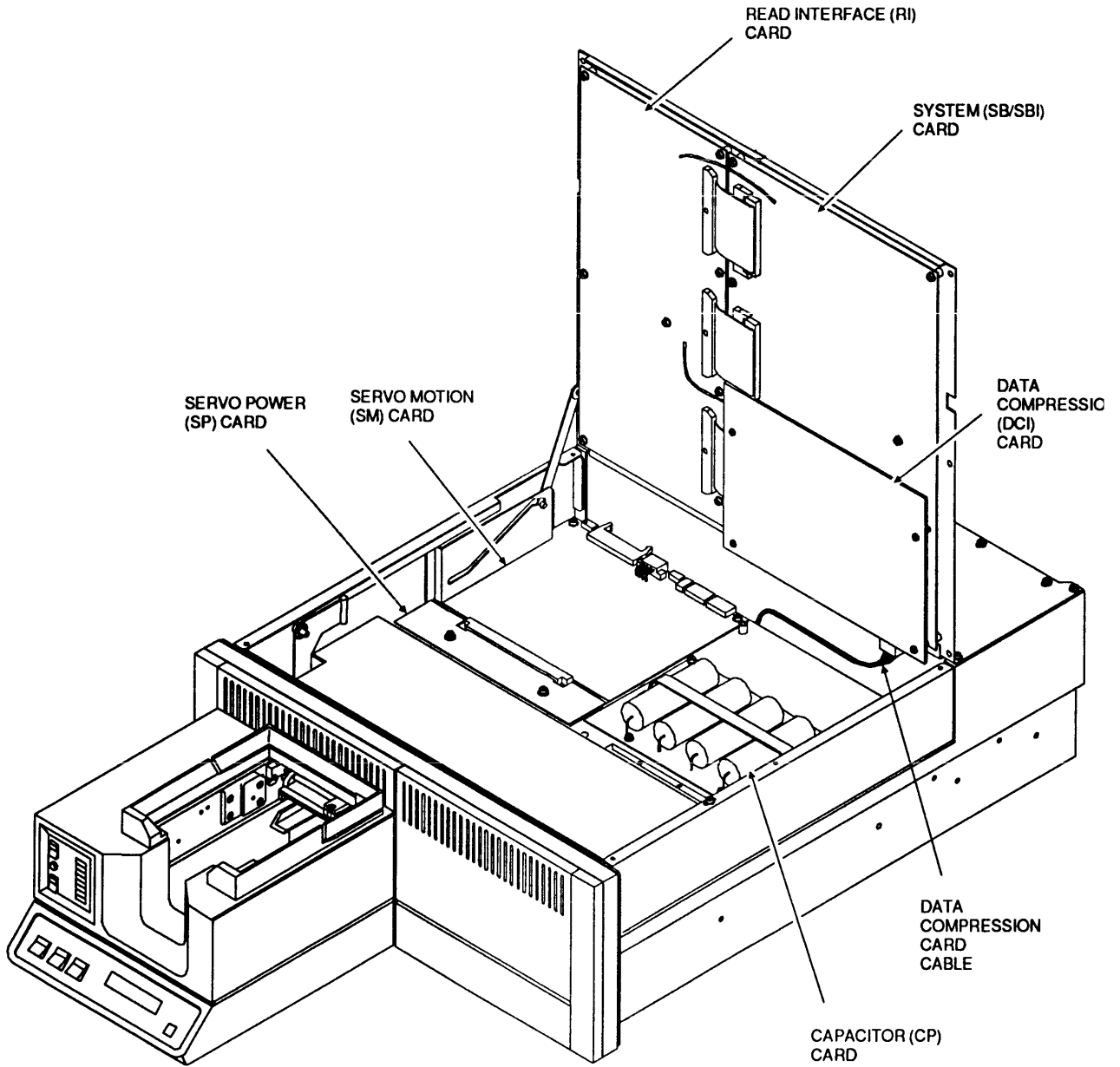


Figure 5 - 5.
4220 Controller Module FRU's (Left-hand Mount)

8. Replace the Capacitor (CP) Card

You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the CP Card (Refer to Figure 5-4.)



1. Remove the host interface cable(s) from the rear of the 4220.
2. Extend the 4220 unit from cabinet.
3. Remove the six screws securing the top front cover to partition.
4. Raise top front cover to expose read interface card and secure the cover with the support prop.
5. Unplug cable connector (P1) from the CP card.
6. Remove six screws securing CP card to partition. Remove CP card.

Installing the CP Card

1. Position CP card on partition.
2. Install the six screws securing the CP card to partition.
3. Plug cable connector (P1) to CP card.
4. Lower top front cover and install the six screws that secure it to the partition.
5. Slide 4220 back into cabinet.
6. Install the host interface cable(s) to the rear of the 4220.
7. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

9. Replace the Servo Motion (SM) Card & Servo Power (SP) Card

WARNING:

If you replace either card, you must replace both cards.



You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the SM & SP Cards (Refer to Figure 5-4.)

1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove the ten screws securing the top front cover to partition.
4. Lift top front cover to expose the SM and SP cards and secure the cover with the support prop.
5. Remove the seven cable connectors (P34, P136, P32, P30, a 5-pin connector, a 4-pin connector, and a 2-pin connector) from servo motion card.
6. Remove four screws securing servo motion card and servo power card to unit.

Installing the SM & SP Cards

1. Install four screws securing servo motion card and servo power card to unit.
2. Connect the seven cable connectors (P34, P136, P32, P30, a 5-pin connector, a 4-pin connector, and a 2-pin connector) to servo motion card.
3. Lower top front cover and install the ten screws that secure it to partition.
4. Slide 4220 back into cabinet.
5. Install the host interface cable(s) to rear of 4220.
6. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

10. Replace the SCSI Interface (SZ/SZI) Card

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.



CAUTION:

**As you remove screws, make sure you keep them separated.
If you replace screws in holes other than those they came out
of, you may damage the host interface card.**

Removing the SZ/SZI Card

(Refer to Figure 5-6 and 5-7.)

1. Remove the host interface cable(s) from rear of 4220, and extend 4220 unit from cabinet.
2. Remove five screws securing top rear cover. Lift top rear cover and secure with support prop.
3. Disconnect power cable connector (P70) and flat ribbon cable connector (P71) from host interface card.
4. Remove four screws securing host interface card to cover.
5. Remove four screws from top rear cover securing bracket to SZ/SZI card. Remove the SZ/SZI card.

Installing the SZ/SZI Card

1. Make sure SW4 on the dipswitch on the replacement card is set "ON" for differential interface configuration, and that the SH cards are over the pins marked "DIFF." (Refer to Figure 5-7.)
2. Install four screws to rear top cover securing the bracket to the connector on the host interface card. These are the four shortest screws that you removed. Do not tighten until all six screws are installed.
3. Install the four screws with plastic washers that secure the host interface card to top rear cover.
4. Connect power cable connector (P70) and flat ribbon cable connector (P71) to host interface card.
5. Lower top rear cover. Install five screws that secure it.

6. Slide 4220 back into cabinet and install the host interface cable(s) to rear of 4220.
7. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

11. Replace the Shorting (SH) Card

NOTE:

The SCSI interface card is the only interface card that uses the SH card.



You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

CAUTION:

As you remove screws, make sure you keep them separated. If you replace screws in holes other than those they came out of, you may damage the host interface card.

Removing the SH Card

(Refer to Figure 5-7.)

1. Remove the host interface cable(s) from rear of 4220, and extend 4220 unit from cabinet.
2. Remove five screws securing top rear cover. Lift top rear cover and secure with support prop.

NOTE:

The SZ/SZI card has two SH cards. They should be positioned over the set of pins labeled "DIFF."

3. Remove the SH card from the SZ/SZI card by lifting it away from the SZ/SZI card.

Installing the SH Card

1. Install the SH card over the set of pins on the SZ/SZI card labeled "DIFF."
2. Lower top cover. Install five screws that secure it.
3. Slide 4220 back into the cabinet and install the host interface cable(s) to rear of 4220.
4. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

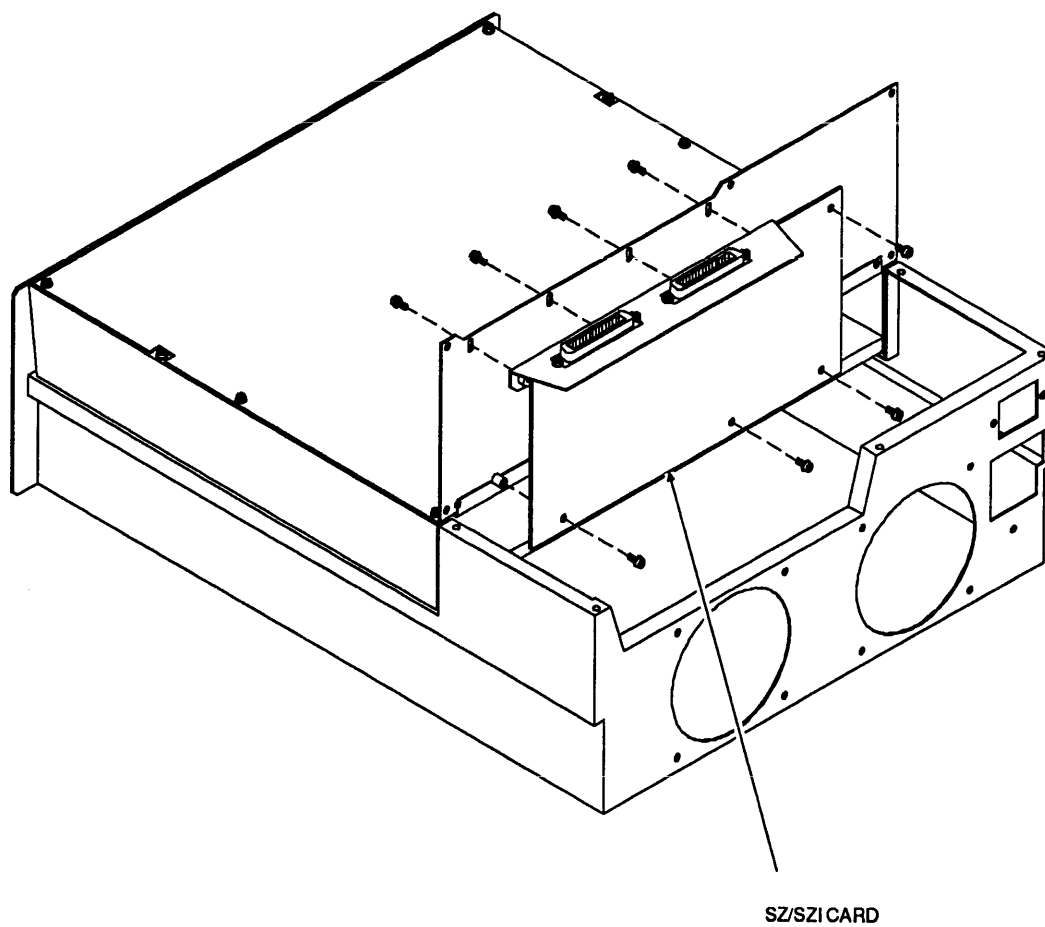


Figure 5 - 6.
SZ/SZI Card

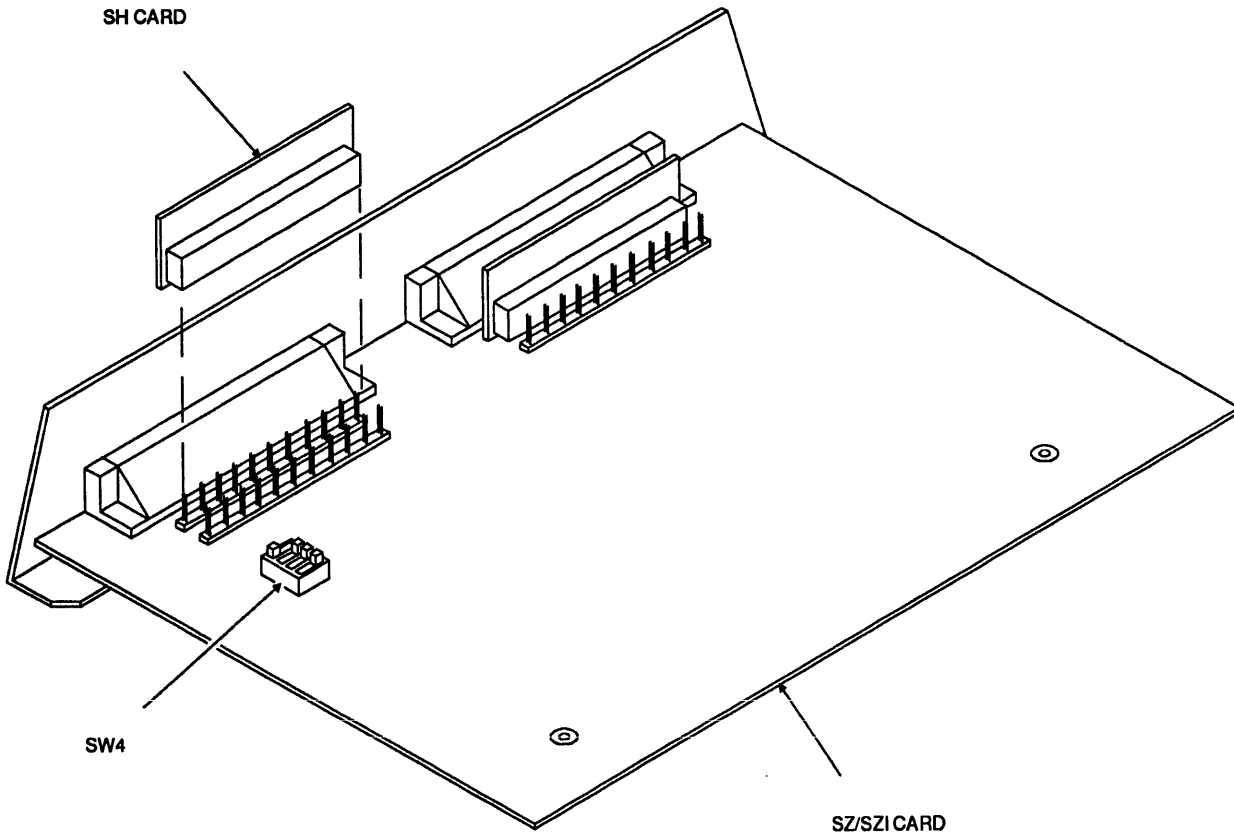


Figure 5 - 7.
SZ/SZI Card Switch and SH Card

NOTE: THERE IS A
LEFT-HAND
MOUNTED UNIT
IN FIGURE 5-9.

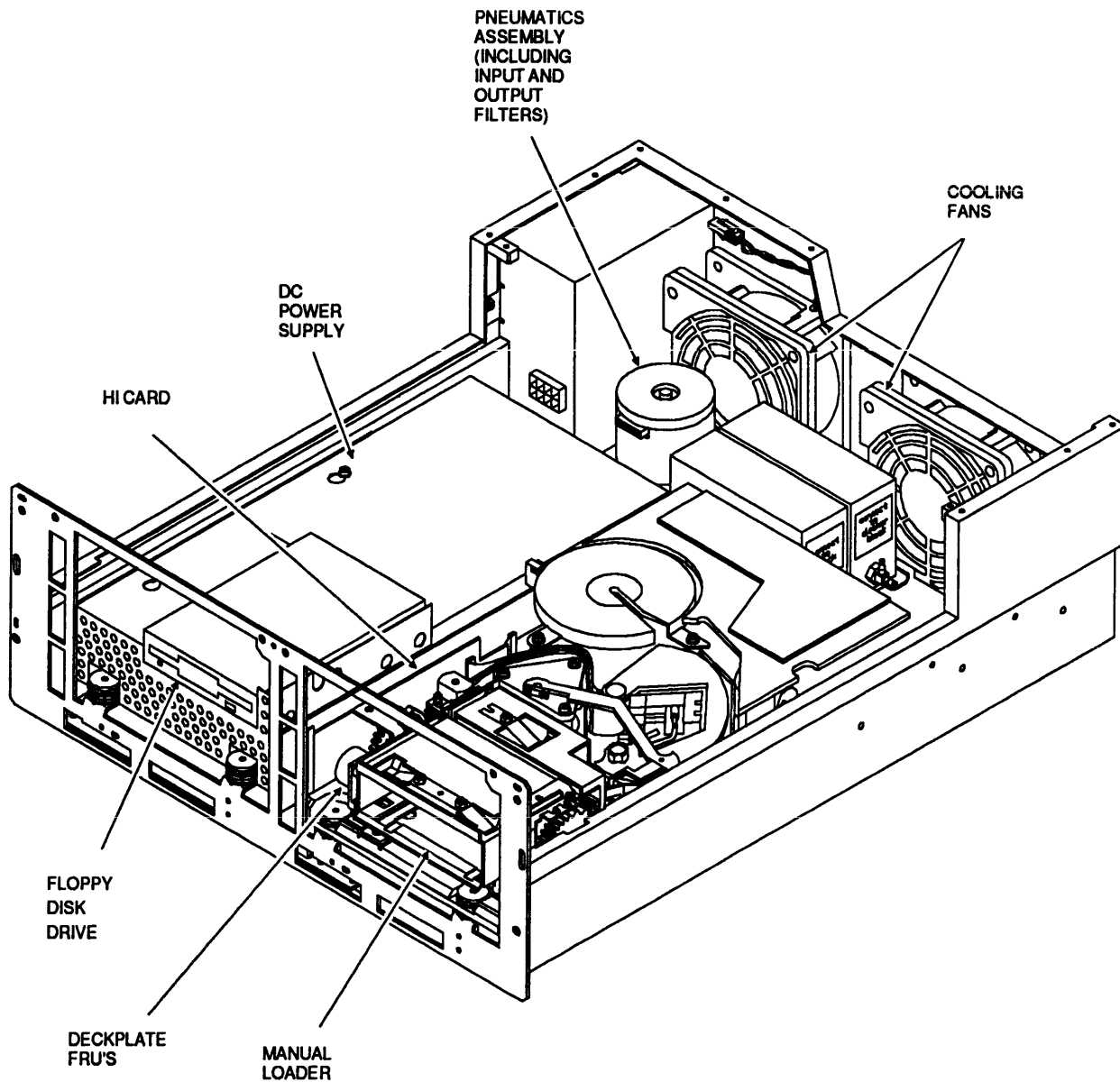


Figure 5 - 8.
Drive Module FRU's (Right-hand Mount)

NOTE: THERE IS A
RIGHT-HAND
MOUNTED UNIT
IN FIGURE 5-8.

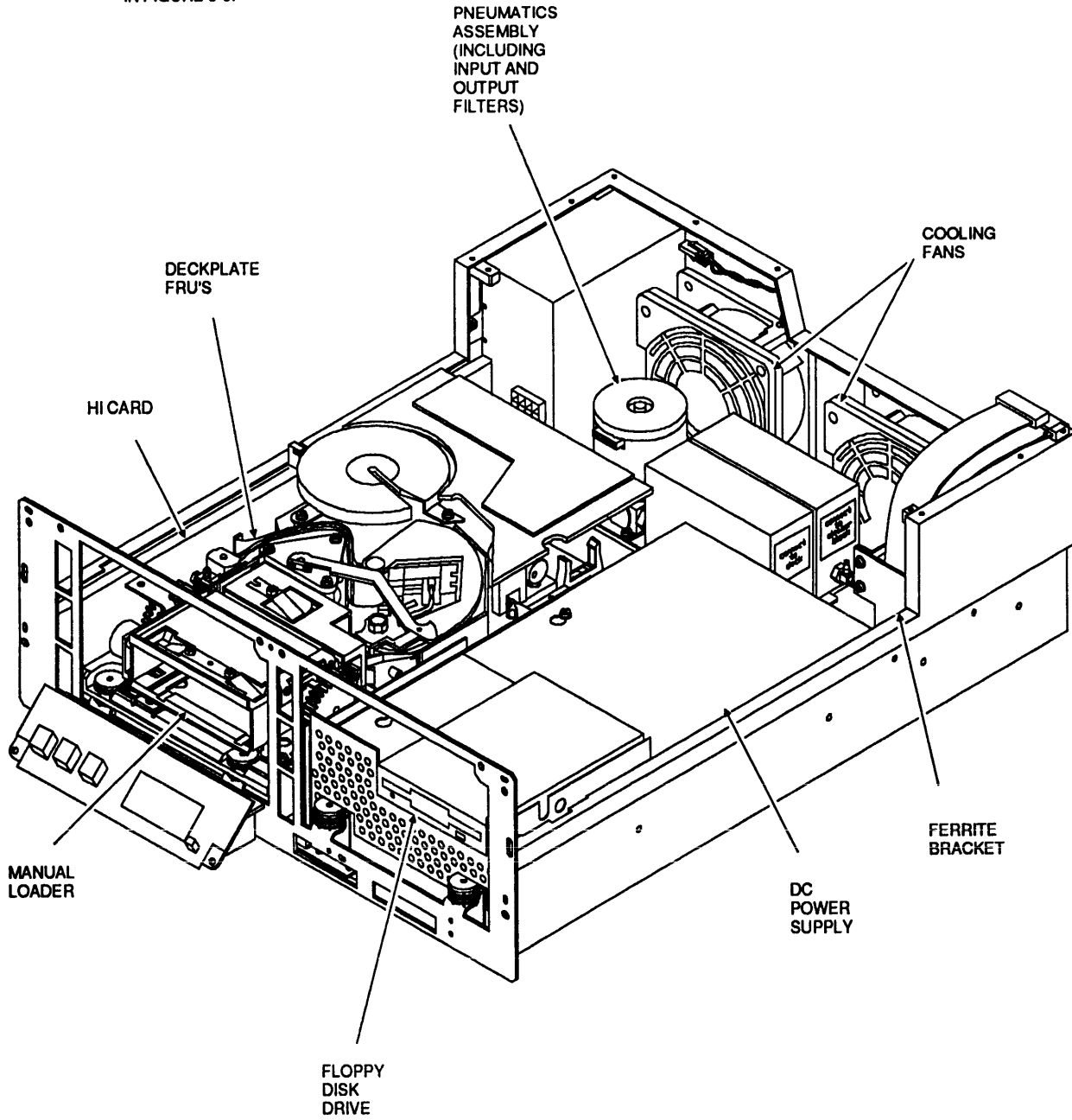


Figure 5 - 9.
Drive Module FRU's (Left-hand Mount)

12. Replace the DC Power Supply

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Power Supply (Refer to Figures 5-8 and 5-10.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove the 4220 from the slide rails and place the 4220 on a work table.

WARNING:

Lifting the 4220 unit requires two people.

4. Loosen two cover release screws and raise partition into the locked position.
5. Loosen the rear screw securing rear black cover, which is located behind the floppy drive.
6. Completely remove the front screw securing the rear black cover.
7. Slide the rear black cover toward back of chassis and remove the cover.
8. Unplug cable connectors (P80 and P81) from rear of floppy disk drive.
9. Unplug all cables from rear of power supply.
10. Loosen two screws on side of floppy disk drive and remove sheet metal cover (with floppy drive attached) from power supply.
11. Unplug power supply cable from the line filter.
12. Remove three big screws securing power supply to 4220 chassis and save blue shock mounts.
13. Lift power supply from the 4220 chassis.

Installing the Power Supply

1. Place the power supply in the chassis.
2. Install the blue shock mounts and three big screws that secure the power supply to 4220.
3. Plug power supply cable into the line filter.
4. Install sheet metal cover (with floppy drive attached) onto power supply and tighten two screws on side of floppy disk drive.
5. Plug all cables into the rear of the power supply.
6. Plug cable connectors (P80 and P81) into rear of floppy disk drive.
7. Slide the rear black cover over the screw, located on top of the power supply, and toward the floppy drive.
8. Install the front screw that secures the rear black cover.
9. Tighten the rear screw that secures the rear black cover.
10. Lower the partition and tighten two cover release screws.

WARNING:

Lifting the 4220 unit requires two people.

11. Slide 4220 back into cabinet.
12. Install the host interface cable(s) to rear of 4220.
13. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

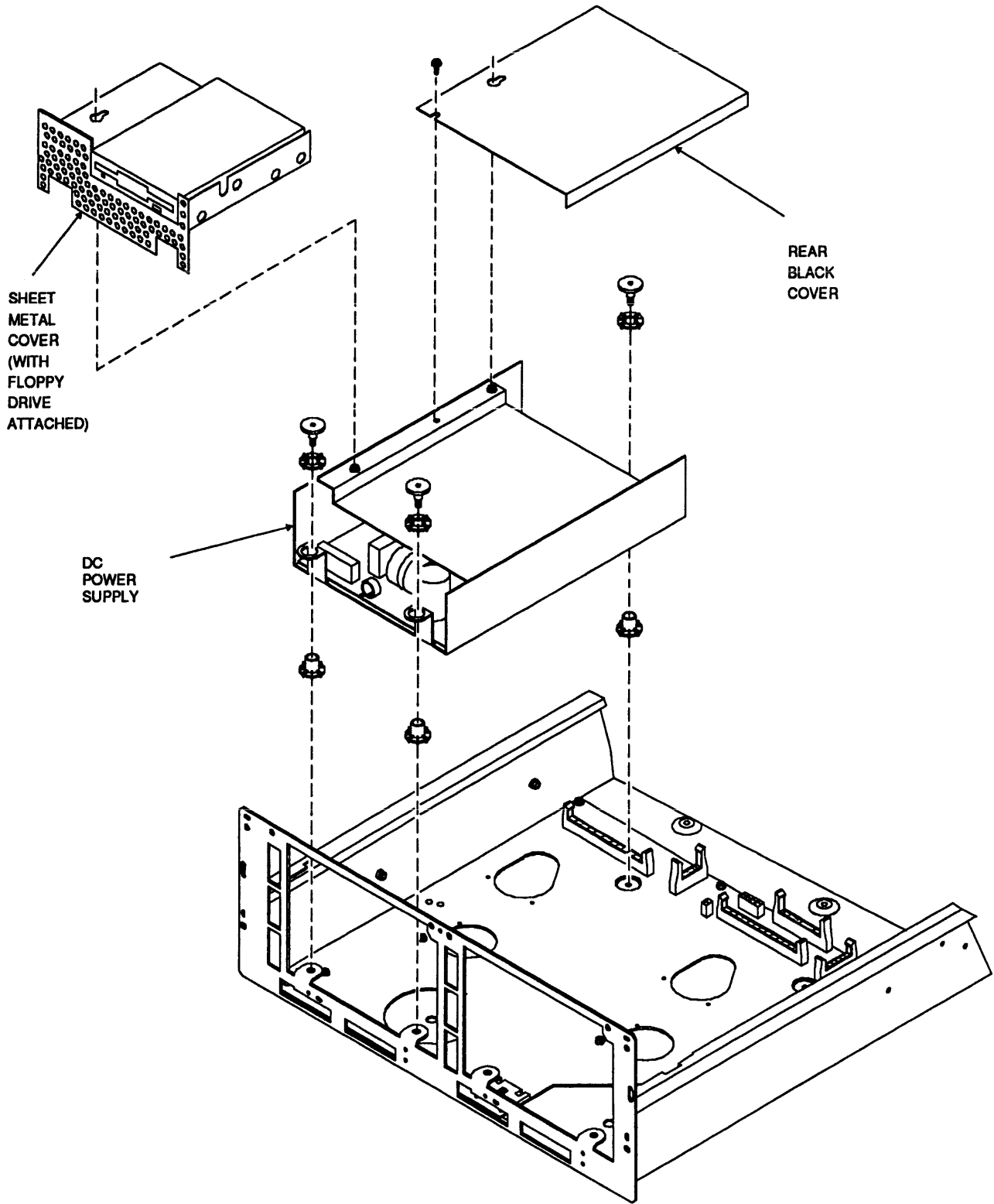


Figure 5 - 10.
DC Power Supply

13. Replace the DC Cooling Fans

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Fan (Refer to Figure 5-11.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove twelve screws from top rear cover. Lift cover for access.
4. Disconnect fan lead.
5. Cut tie strap that holds leads.
6. Remove four screws securing external finger guard to fan assembly for each fan to be removed. Remove external finger guard.
7. Remove fan assembly.

Installing the Fan

1. Insert one screw through finger guard and place it in hole of chassis.
2. Align fan assembly hole with the single screw, insert the screw into fan, and tighten until snug. The fan lead is on the top of the fan.
3. Install the other three screws, then tighten all four screws.
4. Connect fan lead.
5. Lower top rear cover. Install the twelve screws that secure it.
6. Slide 4220 back into cabinet.
7. Install the host interface cable(s) to rear of 4220.
8. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

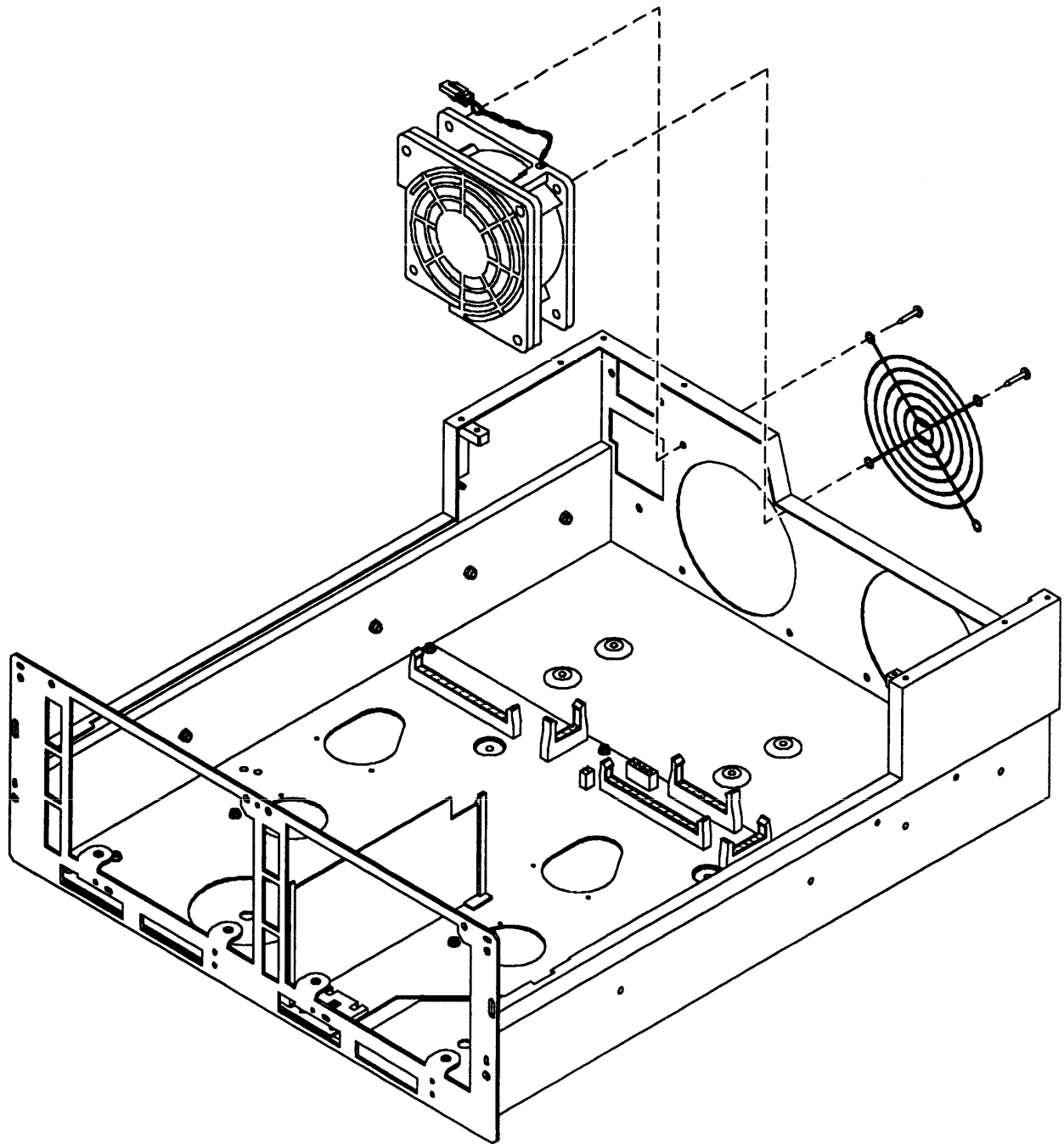


Figure 5 - 11.
DC Cooling Fans

14. Replace the Floppy Disk Drive Assembly

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Floppy Disk Drive

(Refer to Figure 5-8 and 5-12.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove the 4220 from the slide rails and place on a work table.

WARNING:

Lifting the 4220 unit requires two people.

4. Loosen two cover release screws and raise partition into locking position.
5. Loosen the rear screw securing rear black cover, which is located behind the floppy drive.
6. Remove the front screw securing rear black cover.
7. Slide the rear black cover toward back of chassis and remove the cover.
8. Unplug two cables from back of floppy drive.
9. Remove two screws securing sheet metal cover to chassis.
10. Raise sheet metal cover (with floppy still attached) from the chassis.
11. Remove four screws securing floppy drive to sheet metal and remove the floppy disk drive.

Installing the Floppy Disk Drive

1. Position the floppy disk drive on the sheet metal cover and secure with four screws.
2. Position the sheet metal cover in the chassis.
3. Install two screws securing sheet metal cover to chassis.

4. Plug two cables to back of floppy drive.
5. Slide the rear black cover over the rear screw located on top of the power supply.
6. Install the front screw that secures the rear black cover.
7. Tighten the rear screw that secures the rear black cover.
8. Lower the partition and tighten two cover release screws.

WARNING:

Lifting the 4220 unit requires two people.

9. Slide 4220 back into cabinet.
10. Install the host interface cable(s) to rear of 4220.
11. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

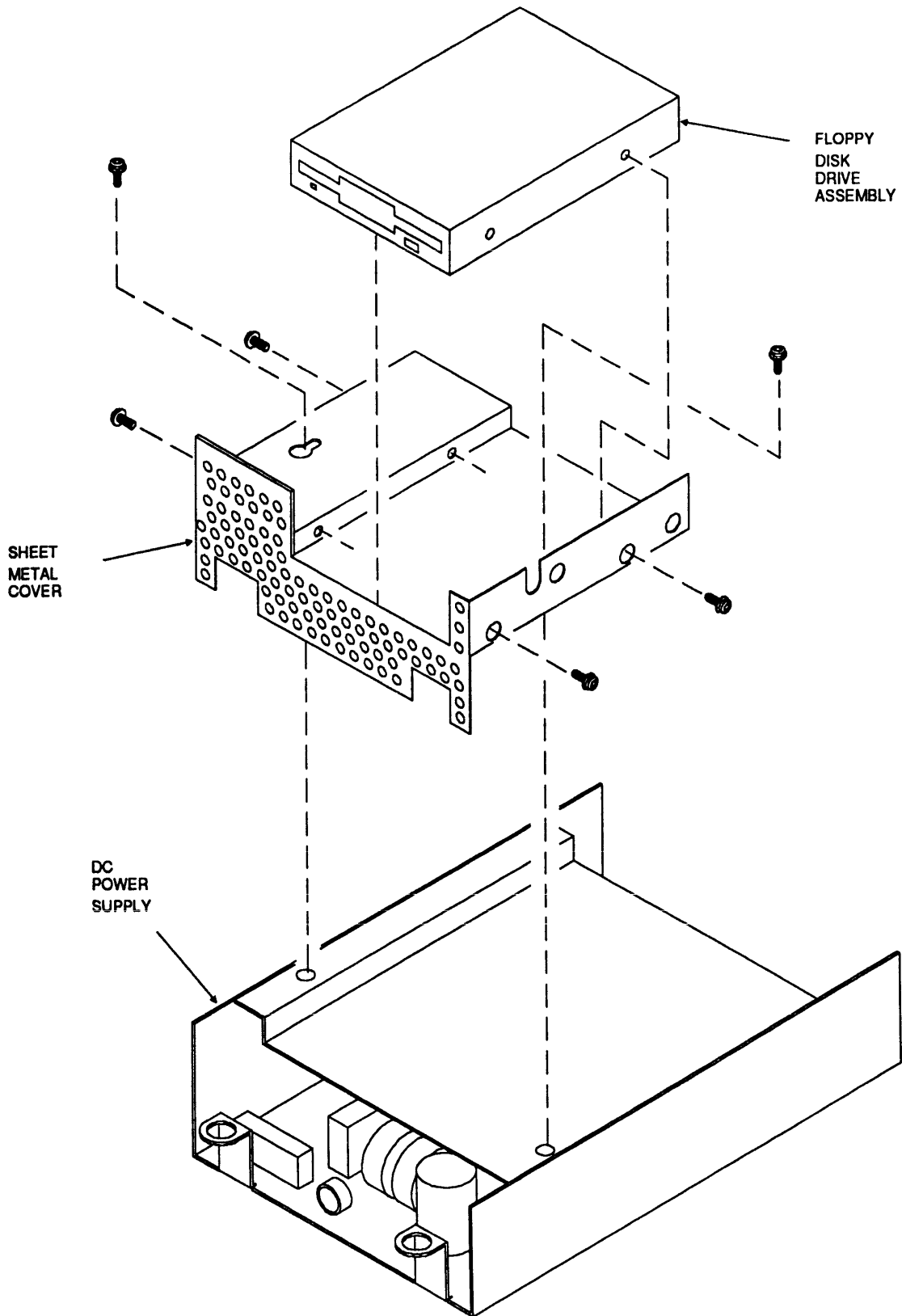


Figure 5 - 12.
Floppy Disk Drive Assembly

15. Replace the Input Filter

NOTE:

The input filter is the pneumatics filter with two nozzles on the right hand side as viewed from front of 4220.



You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the Input Filter (Refer to Figure 5-13.)

1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove five screws from top rear cover. Lift cover for access.
4. Remove the two screws that secure the ferrite bracket (Refer to Figure 5-9.) and move it out of the way.
5. Disconnect clear hose from filter.
6. Disconnect fitting between the input filter and pump by pressing down on spring loaded latch. Slide filter toward front of drive to disengage two tabs from slots located in mounting plate. Remove filter.

Installing the Input Filter

1. Slide filter in to engage two tabs in slots located in mounting plate, and insert nozzle through pump fitting.
2. Install the ferrite bracket and install the two screws that secure it.
3. Connect clear hose to filter.
4. Lower top rear cover. Install twelve screws securing it.
5. Slide 4220 back into cabinet.
6. Install the host interface cable(s) to rear of 4220.
7. Install ac power cable to rear of 4220. Power up unit.

Testing

1. With no tape loaded, insure tension and pressure levels are set to zero. If adjustments are needed, use the pressure pot (AG04) and tension pot (CG16) on the SM card.
2. Run offline diagnostics. (See Chapter 4, Section 5.)
3. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

16. Replace the Output Filter

NOTE:

The output filter is the pneumatics filter on the left hand side as viewed from front of 4220.



You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the Output Filter (Refer to Figure 5-13.)

1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove five screws from top rear cover. Lift cover for access.
4. Disconnect clear hose from filter.
5. Disconnect fitting between the output filter and pump by pressing down on spring loaded latch. Slide filter toward front of drive to disengage two tabs from slots located in mounting plate. Remove filter.

Installing the Output Filter

1. Slide filter in to engage two tabs in slots located in mounting plate and insert nozzle through pump fitting.
2. Connect clear hose to filter.
3. Lower top rear cover. Install the five screws that secure it.
4. Slide 4220 back into cabinet.
5. Install the host interface cable(s) to rear of 4220.
6. Install ac power cable to rear of 4220. Power up unit.

Testing

1. With no tape loaded, insure tension and pressure levels are set to zero. If adjustments are needed, use the pressure pot (AG04) and tension pot (CG16) on the SM card.
2. Run offline diagnostics. (See Chapter 4, Section 5.)
3. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

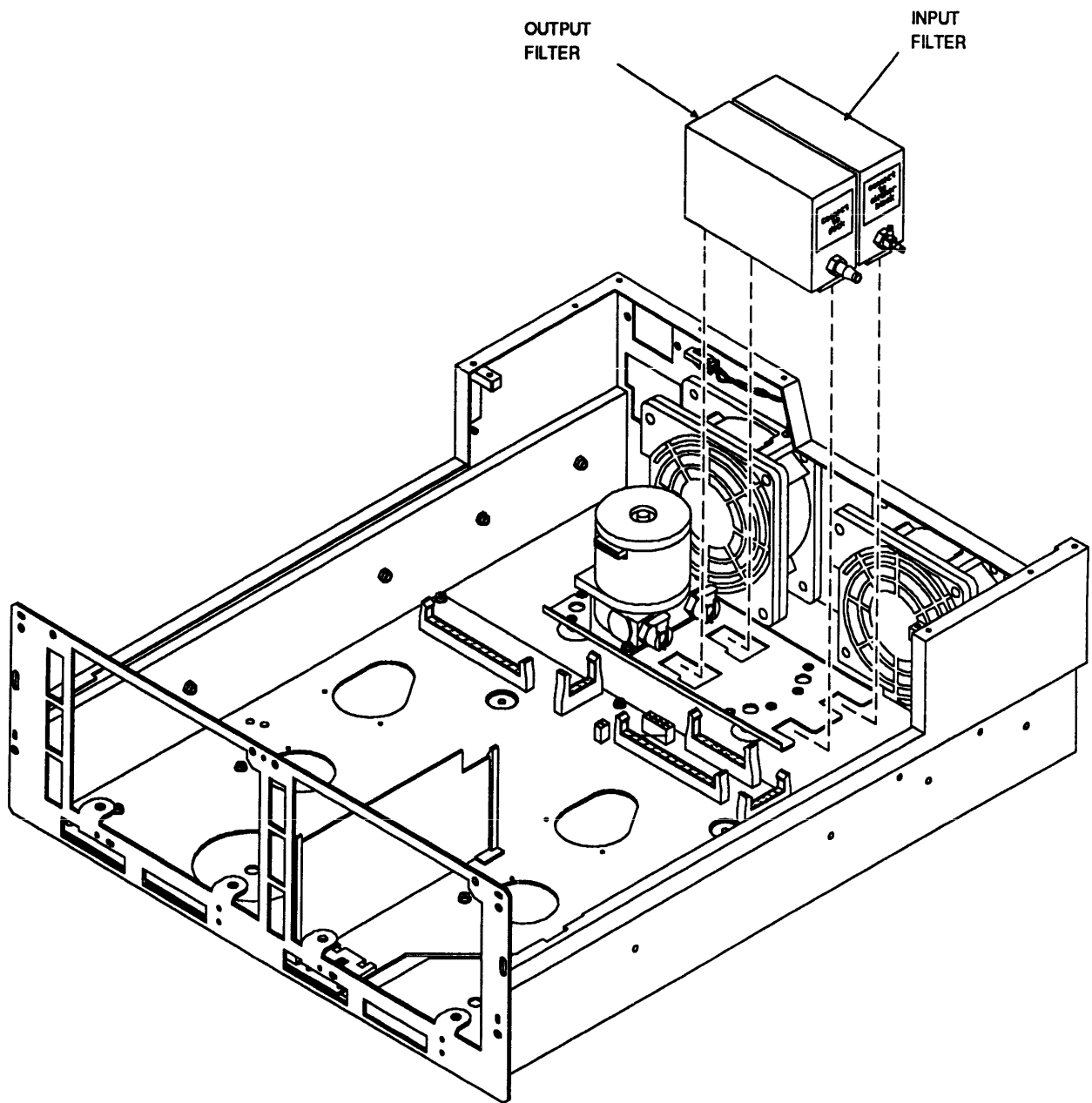


Figure 5 - 13.
Input and Output Filters

17. Replace the Pneumatics Assembly

NOTE:

Pneumatics assembly includes pump, both filters and mounting bracket.



You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the Pneumatics Assembly

(Refer to Figure 5-14.)

1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove six screws from top rear cover. Lift cover for access.
4. Remove the two screws that secure the ferrite bracket (Refer to Figure 5-9.) and move it out of the way.
5. Disconnect power cable connector (#1) from pump.
6. Remove input and output filters. (Refer to Sections 15 and 16.)
7. Remove two rear and two front screws securing pneumatics assembly to chassis.
8. Remove pneumatics assembly.

Installing the Pneumatics Assembly

1. Put the pneumatics assembly in place.
2. Install the two front and two rear screws that secure pneumatics assembly to chassis.
3. Install input and output filters. (Refer to Sections 15 and 16.)
4. Connect power cable connector (#1) to pump.
5. Install the ferrite bracket and install the two screws that secure it.
6. Lower top rear cover. Install the six screws that secure it.
7. Slide 4220 back into cabinet.

8. Install the host interface cable(s) to rear of 4220.
9. Install ac power cable to rear of 4220. Power up unit.

Testing

1. With no tape loaded, insure tension and pressure levels are set to zero. If adjustments are needed, use the pressure pot (AG04) and tension pot (CG16) on the SM card.
2. Run offline diagnostics. (See Chapter 4, Section 5.)
3. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

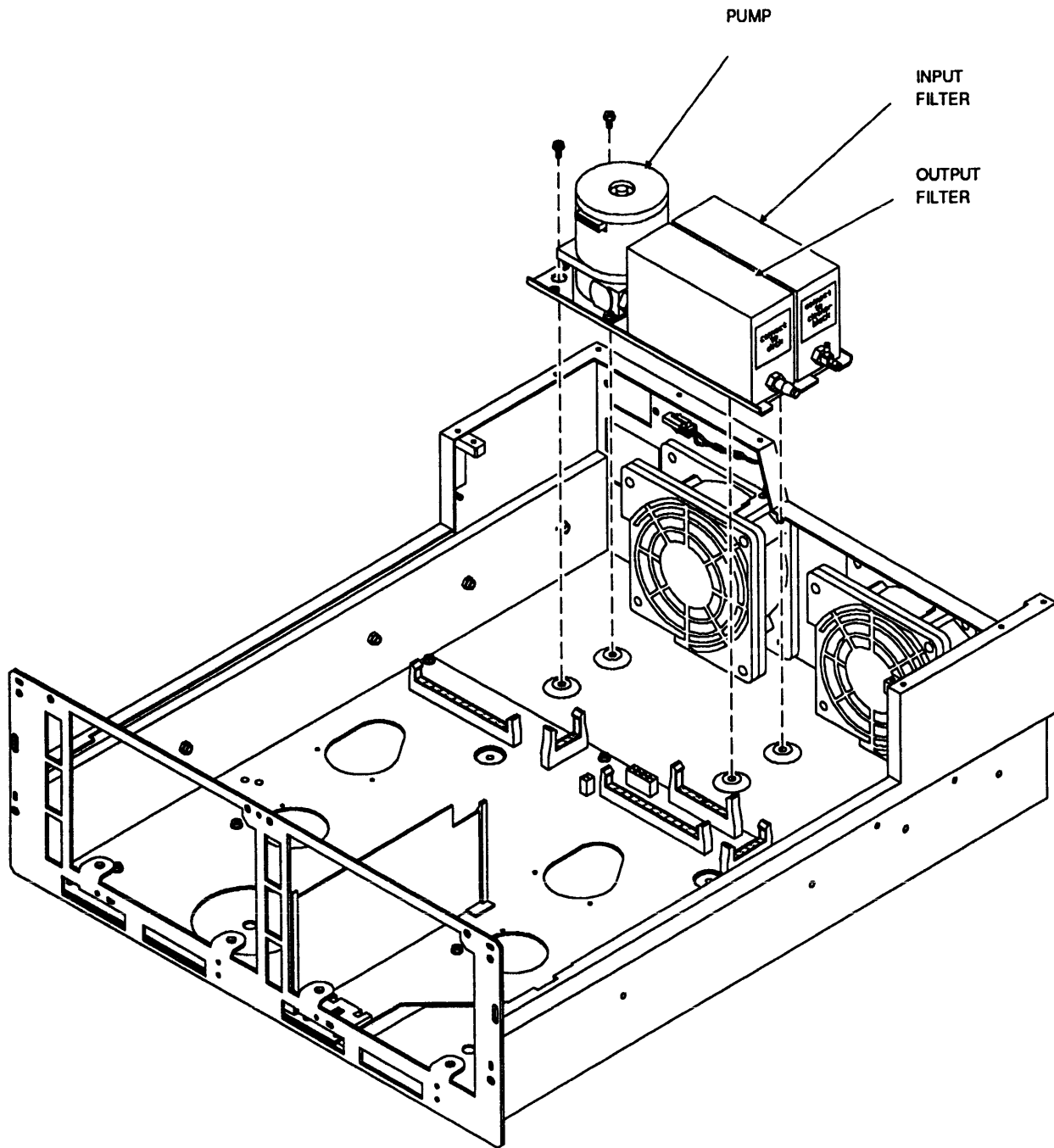


Figure 5 - 14.
Pneumatics Assembly

18. Replace the Head Interface (HI) Card

You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the HI Card

(Refer to Figure 5-8 and 5-16.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Disconnect cable connector (a 2-pin connector) and the read and write flex leads from head interface card.
5. Loosen the two top screws at each end of the HI card and rotate the small plastic hold downs. Lift the HI card vertically to disengage it from connector pins on bottom card.

Installing the HI Card

NOTE:

Do not tamper with pre-set hex switches.

1. Connect head interface card to connector pins on bottom card. Position the two small plastic clips over the card and tighten the screws at each end of the HI card.
2. Connect cable connector (a 2-pin connector) and the read and write flex leads to head interface card.
3. Manually move thread arm to make sure the arm does not interfere with read flex lead.
4. Lower the partition and tighten two cover release screws.
5. Slide 4220 back into cabinet.
6. Install the host interface cable(s) to rear of 4220.
7. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

19. Replace the Display (DP) Card

NOTE:

This procedure refers to a 4220 with a manual loader.



You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the DP Card (Refer to Figure 5-15.)

1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two release screws and raise partition into the locked position.
4. Remove the two upper screws, located inside chassis, securing manual loader cover to chassis.
5. Remove two screws located below corners of manual loader cover.
Remove manual loader cover.
6. Release two fasteners securing display card to chassis.
7. Disconnect three cable connectors (P60, P61, P162) from back of DP card.

Installing the DP Card

1. Connect three cable connectors (P60, P61, P162) to display card.
2. Install two fasteners securing display card to chassis.
3. Install two screws below corners of manual loader cover.
4. Install two upper screws inside the chassis to secure the manual loader cover to the chassis.
5. Lower the partition and tighten two cover release screws.
6. Slide 4280 back into cabinet.
7. Install the host interface cable(s) to rear of 4280.
8. Install ac power cable to rear of 4280. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

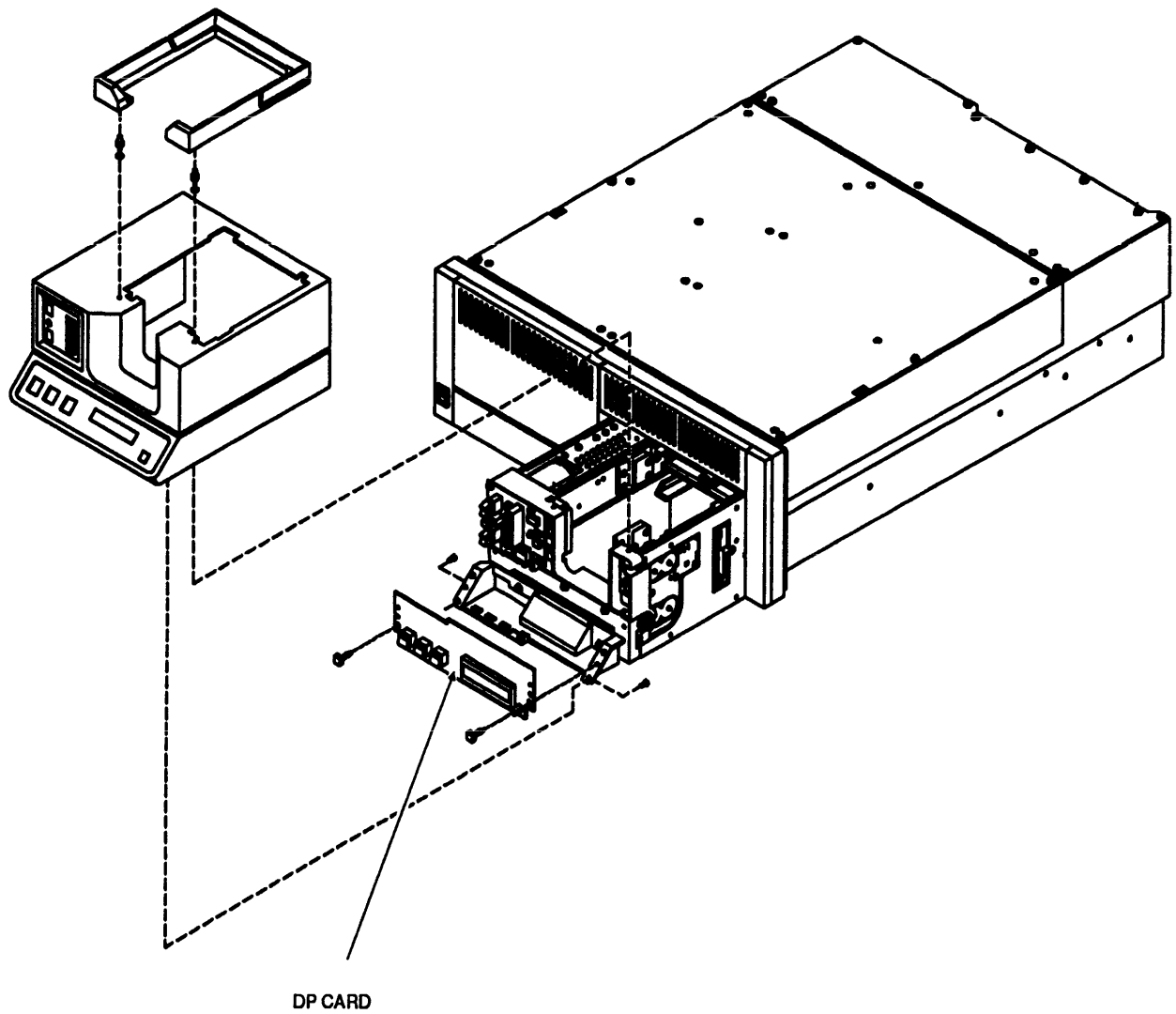


Figure 5 - 15.
Display Card

20. Replace the Manual Loader

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Manual Loader (Refer to Figure 5-17.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into locked position.
4. Manually move thread arm to "thread arm at reel" position.
5. Disconnect file protect cable connector (a 2-pin connector) from HI card.
6. Remove the two upper screws, located inside chassis, securing manual loader cover to chassis.
7. Remove two screws located below corners of manual loader cover.
Remove manual loader cover.
8. Remove cable connector (P60) from back of DP card.
9. Remove three screws securing manual loader to deckplate and remove the manual loader.

Installing the Manual Loader

1. Install new manual loader and install three screws securing manual loader to deckplate.
2. Connect cable connector (P60) to back of DP card.

NOTE:

P192 remains disconnected.

3. Install manual loader cover. Install two screws below the manual loader cover.
4. Install the two upper screws, inside the chassis, to secure the manual loader cover to chassis.
5. Disconnect file protect cable connector (a 2-pin connector) to HI card.

6. Lower the partition and tighten two cover release screws.
7. Slide 4220 back into cabinet.
8. Install the host interface cable(s) to rear of 4220.
9. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

21. Replace the Manual Loader (ML) Card

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Manual Loader Card (Refer to Figure 5-17.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into locked position.
4. Manually move thread arm to "thread arm at reel" position.
5. Remove three screws securing manual loader to deckplate.
6. Remove four screws securing manual loader card to loader.
7. Disconnect two cable connections to manual loader at manual loader card.

Installing the Manual Loader Card

1. Connect two cable connections to manual loader at manual loader card.
2. Install four screws securing manual loader card to loader.
3. Install three screws securing manual loader to deckplate.

NOTE:

P192 remains disconnected.

4. Lower the partition and tighten two cover release screws.
5. Slide 4220 back into cabinet.
6. Install the host interface cable(s) to rear of 4220.
7. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

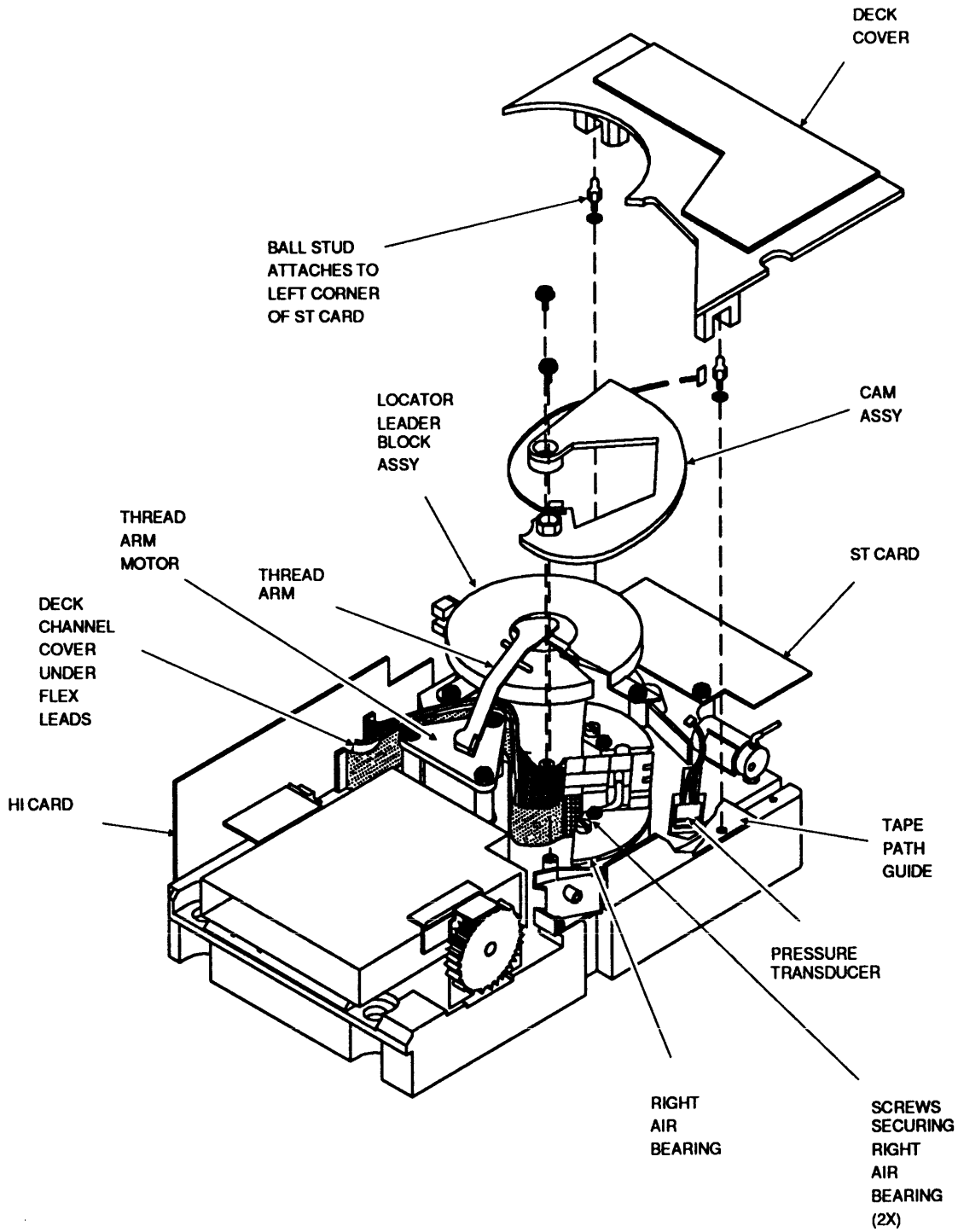
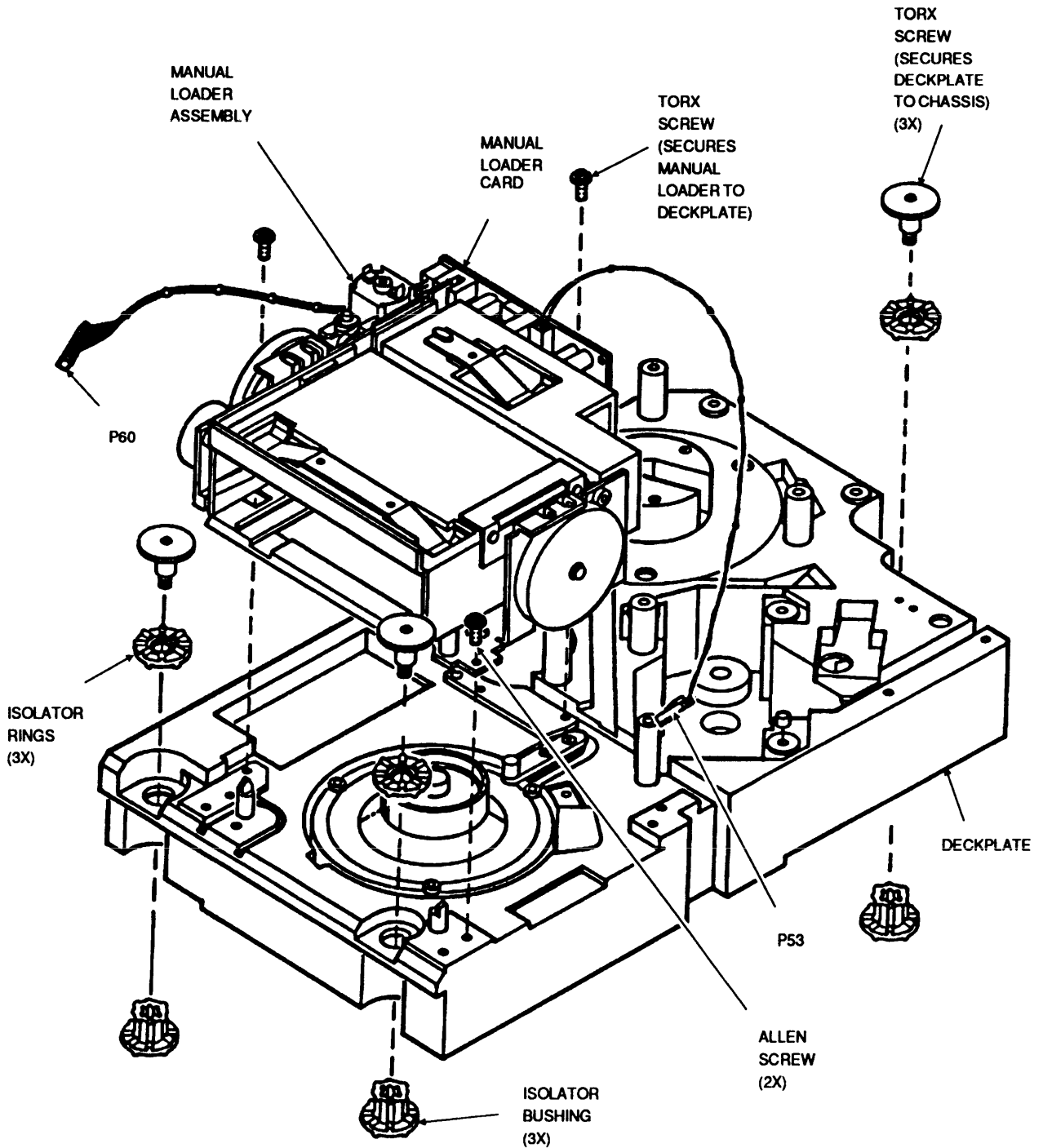


Figure 5 - 16.
Deckplate With Deck Cover



NOTE: VARIOUS COMPONENTS OMITTED WITHIN DECKPLATE FOR CLARITY

Figure 5 - 17.
Manual Loader, Drive Transport, and Deckplate

22. Replace the Locator Leader Block Assembly with Sensor

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Locator Leader Block Assembly (Refer to Figure 5-18.)



1. Remove host interface cable(s) from rear of 4220 and extend unit from cabinet.
2. Loosen two cover release screws and raise partition into locked position.
3. Be sure thread arm is away from locator leader block assembly and in the "thread arm at home" position.
4. Remove deck cover by lifting it on the right side and left rear until it releases from the two ball stud screws.
5. Remove three screws from top of locator leader block assembly.
6. Disconnect sensor cable connector from cable connector (D303).
7. Remove locator leader block assembly.

Installing the Locator Leader Block Assembly

1. Install locator leader block assembly.
2. Connect sensor cable connector to cable connector (D303).
3. Install three screws to top of locator leader block assembly, but do not tighten them down.
4. Install ac power cable to rear of 4220. Power up unit.
5. Load a cartridge tape.
6. Initiate "Retention Tape" Test (refer to diagnostics chapter).
7. As the tape is moving, rotate the locator leader block assembly to optimum location (no-audible deflection) and tighten down the three mounting screws.
8. Verify that there is a smooth transistion from the locator leader block assembly to the thread arm cam assembly. If needed, loosen the two screws securing the thread arm cam, move it as required, and retighten the screws. (Refer to Figure 5-16.)

9. Snap deck cover onto ball studs.
10. Lower the partition and tighten two cover release screws.
11. Slide 4220 into cabinet and attach host interface cable(s) to rear of 4220.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

23. Replace the Thread Arm Cam Assembly with Sensor

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Thread Arm Cam Assembly (Refer to Figure 5-18.)



1. Remove host interface cable(s) from rear of 4220 and extend unit from cabinet.
2. Loosen two cover release screws and raise partition into the locked position.
3. Be sure thread arm is away from locator leader block assembly and in the "thread arm at reel" position.
4. Remove two screws securing thread arm cam assembly to deckplate assembly.
5. Disconnect thread arm cam assembly sensor cable from cable connector (D302).
6. Remove thread arm cam assembly.

Installing the Thread Arm Cam Assembly

1. Install thread arm cam assembly.
2. Connect thread arm cam assembly sensor cable to cable connector (D302).
3. Loosely install two screws securing thread arm cam assembly to deckplate. Move cam to provide smooth transition to locator leader block. Tighten screws. (Refer to Figure 5-16.)
4. Move thread arm back to "thread arm at home" position.
5. Lower the partition and tighten two cover release screws.
6. Slide 4220 back into cabinet.
7. Install the host interface cable(s) to rear of 4220.
8. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

24. Replace the Read/Write Head Assembly

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Read/Write Head Assembly (Refer to Figure 5-18.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Manually lower the manual loader assembly.
5. Manually position the thread arm to the "thread arm at reel" position.
6. Remove two screws securing thread arm cam assembly to deckplate. Set thread arm cam assembly aside.
7. Loosen two screws securing thread arm to top of thread arm motor. Remove thread arm.
8. Disconnect read and write flex leads from head interface card.
9. Remove deck cover by lifting it at the right side and left rear until it releases from the two ball stud screws.
10. Remove the screw and ball stud screw securing tape path guide (one-piece vertical wall located between the thread arm cam assembly and the head air valve). Remove the tape path guide.
11. Disconnect larger plastic air line from nipple of pneumatics input filter.
12. Disconnect smaller diameter plastic air line from the air valve assembly at the nipple connection on top of read/write assembly.
13. Disconnect tension transducer cable connector from 4-pin cable connector at head assembly. Tension transducer and cable are removed with read/write head assembly.

CAUTION:

When you remove the read/write head, do not allow fingers, tools, or parts to touch the read/write head.

14. Remove three screws securing read/write head assembly to deckplate.
15. Remove the read/write head assembly.

Installing the Read/Write Head Assembly

1. Position the read/write head assembly on the deckplate and install the three screws that secure it.
2. Connect tension transducer cable connector to 4-pin cable connector at head assembly.
3. Connect plastic air line input at nipple of pneumatics input filter. Connect smaller diameter plastic air line for output at nipple connection on top of read/write head assembly.
4. Install the tape path guide (one-piece vertical wall located between the thread arm cam assembly and the head air valve) and secure it with screw and ball stud screw.
5. Connect read and write flex leads to head interface card.
6. Install thread arm assembly and loosely install two screws that secure it to deckplate. Move cam to provide smooth transition to locator leader block. Tighten screws. (Refer to Figure 5-16.)
7. Install thread arm to top of thread arm motor and secure with two screws.
8. Snap deck cover onto ball studs.
9. Lower the partition and tighten two cover release screws.
10. Slide 4220 back into cabinet.
11. Install the host interface cable(s) to rear of 4220.
12. Install ac power cable to rear of 4220. Power up unit.

Testing

1. With no tape loaded, insure tension and pressure levels are set to zero. If adjustments are needed, use the pressure pot (AG04) and tension pot (CG16) on the SM card.
2. Run offline diagnostics. (See Chapter 4, Section 5.)
3. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

25. Replace the Servo Transition (ST) Card

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the ST Card (Refer to Figure 5-16.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Remove deck cover by lifting it on the right side and left rear until it releases from the two ball stud screws.
5. Disconnect two flat ribbon cable connectors (P305 and P334) from the ST card.
6. Disconnect five wire cable connectors (P301, P302, P303, a 2-pin connector, and a 4-pin connector) from the ST card.
7. Remove the two screws that secure the ST card to rear of deckplate assembly.
8. Remove ST card.

Installing the ST Card

1. Position the ST card over the screw holes in rear of deckplate.
2. Install the two screws that secure ST card to rear of deckplate assembly.
3. Connect the five wire cable connectors (P301, P302, P303, a 2-pin connector, and a 4-pin connector) to the ST card.
4. Connect two flat ribbon cable connectors (P305 and P334) to ST card.
5. Snap deck cover onto ball studs.
6. Lower the partition and tighten two cover release screws.
7. Slide 4220 back into cabinet.
8. Install the host interface cable(s) to rear of 4220.

9. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

26. Replace the Head Air Valve

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Head Air Valve (Refer to Figure 5-18.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Remove deck cover by lifting it on the right side and left rear until it releases from the two ball stud screws.
5. Remove transparent tube from nozzle on head air valve.
6. Disconnect head air valve cable connector (a 2-pin connector) from ST card.
7. Pull up on head air valve until it is free of the clamp.

Installing the Head Air Valve

1. Install head air valve in clamp.
2. Connect head air valve cable connector (a 2-pin connector) to ST card.
3. Connect transparent tube to nozzle on head air valve.
4. Snap deck cover onto ball studs.
5. Lower the partition and tighten two cover release screws.
6. Slide 4220 back into cabinet.
7. Install the host interface cable(s) to rear of 4220.
8. Install ac power cable to rear of 4220. Power up unit.

Testing

1. With no tape loaded, insure tension and pressure levels are set to zero. If adjustments are needed, use the pressure pot (AG04) and tension pot (CG16) on the SM card.
2. Run offline diagnostics. (See Chapter 4, Section 5.)
3. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

27. Replace the Motor/Thread Arm Assembly

You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the Motor/Thread Arm Assembly (Refer to Figure 5-18.)



1. Remove host interface cable(s) from rear of 4220 and slide unit from cabinet.
2. Loosen two cover release screws and raise partition into the locked position.
3. Make sure the thread arm assembly is approximately 1/2 inch from "thread arm at home position," leaving the arm tab clear of sensor.
4. Remove three screws from top triangular plate of thread arm motor assembly.
5. Lift thread arm motor assembly away from deckplate assembly.
6. Remove thread arm cam assembly. (Refer to Section 23.)
7. Disconnect cable connector from 2-pin cable connector.

Installing the Motor/Thread Arm Assembly

1. Connect cable connector to 2-pin cable connector.
2. Install thread motor cam assembly. (Refer to Section 23.)
3. Install three screws to top triangular plate of thread arm motor assembly.
4. Rotate thread arm clock wise to seat it at its home position.
5. Lower the partition and tighten two cover release screws.
6. Slide 4220 into cabinet and attach host interface cable(s) to rear of 4220.
7. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

28. Replace the Take-Up Motor Assembly

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Take-Up Motor Assembly (Refer to Figure 5-18.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Remove deck cover by lifting it on the right side and left rear until it releases from the two ball stud screws.
5. Remove the locator leader block assembly and set it aside. (Refer to Section 22.)
6. Disconnect tach cable connector (P304) from ST card.
7. Align the reel so you can remove the three screws that secure the motor to deckplate assembly. Remove the three screws.
8. Lift the take-up motor from deckplate assembly.
9. Disconnect cable connector (P83) from take-up motor.

Installing the Take-Up Motor Assembly

1. Connect cable connector (P83) to take-up motor.
2. Place the take-up motor on deckplate assembly.
3. Align the reel so you can install the three screws that secure the motor to deckplate assembly.
4. To avoid damage to deckplate threads, insert and begin threading by hand the three screws that secure motor to deckplate. After all three screws are started into deckplate, tighten them.
5. Rotate the takeup reel to verify that it does not interfere with any cabling or cable guides.
6. Connect tach cable connector (P304) to ST card.
7. Install locator leader block assembly with sensor. (Refer to Section 22.)

8. Snap deck cover onto ball studs.
9. Lower the partition and tighten two cover release screws.
10. Slide 4220 back into cabinet.
11. Install the host interface cable(s) to rear of 4220.
12. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

29. Replace the Supply Motor

You must complete power down procedures before you remove this FRU. Remove the ac power cable from the rear of the 4220.

Removing the Supply Motor (Refer to Figure 5-18.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Disconnect manual loader (refer to Section 20) from deckplate or the autoloader (refer to ACL installation manual) and set it aside.
5. Remove the two screws that secure the cartridge reference pin bracket.
6. Note position of screw holes in motor, then remove three screws located at 120 degree intervals around perimeter of motor.
7. Lift supply motor away from deckplate and disconnect the two cable connectors (Tach and P83, including ground wire) from motor.

Installing the Supply Motor

1. Connect the two cable connectors (Tach and P83, including ground wire) to motor and install supply motor to deck plate. Make sure the cables are clear of motor.
2. To avoid damage to deckplate threads, insert and begin threading by hand the three screws that secure motor to deckplate. After all three screws are started into deckplate, tighten them.
3. Install cartridge reference pin bracket.
4. Install manual loader (refer to Section 20) or autoloader (refer to ACL installation manual) to deckplate.
5. Lower the partition and tighten two cover release screws.
6. Slide 4220 back into cabinet.
7. Install the host interface cable(s) to rear of 4220.
8. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

30. Remove the Pressure Transducer

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the Pressure Transducer (Refer to Figure 5-18.)



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 from cabinet.
3. Loosen two cover release screws and raise partition into the locked position.
4. Remove deck cover by lifting it on the right side and left rear until it releases from the two ball stud screws.
5. Remove the two screws securing the tape path guide (one-piece vertical wall located between the thread arm cam assembly and the head air valve). Remove the tape path guide.
6. Disconnect cable connector from cable connector (D37).
7. Locate pressure transducer below tape path guide within cavity on deckplate. (Refer to Figure 5-16.) Twist and lift transducer to uncouple compression fit. Do not lose paper washer.
8. Remove pressure transducer.

Installing the Pressure Transducer

1. Be sure paper washer is in place.
2. Install pressure transducer.
3. Connect cable connector to cable connector (D37).
4. Install tape path guide and secure with two screws.
5. Snap deck cover onto ball studs.
6. Lower the partition and tighten two cover release screws.
7. Slide 4220 back into cabinet.
8. Install the host interface cable(s) to rear of 4220.
9. Install ac power cable to rear of 4220. Power up unit.

Testing

1. With no tape loaded, insure tension and pressure levels are set to zero. If adjustments are needed, use the pressure pot (AG04) and tension pot (CG16) on the SM card.
2. Run offline diagnostics. (See Chapter 4, Section 5.)
3. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

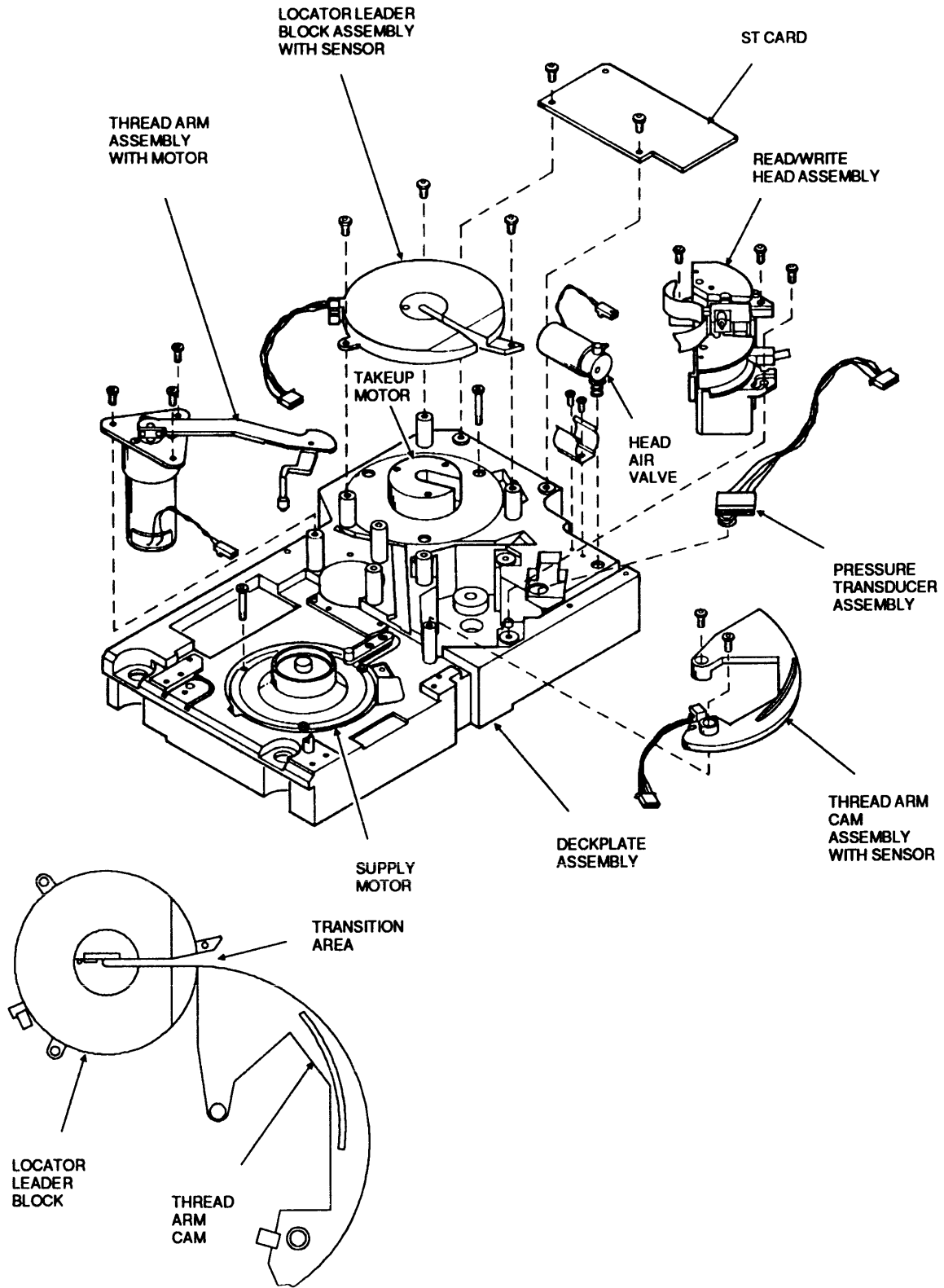
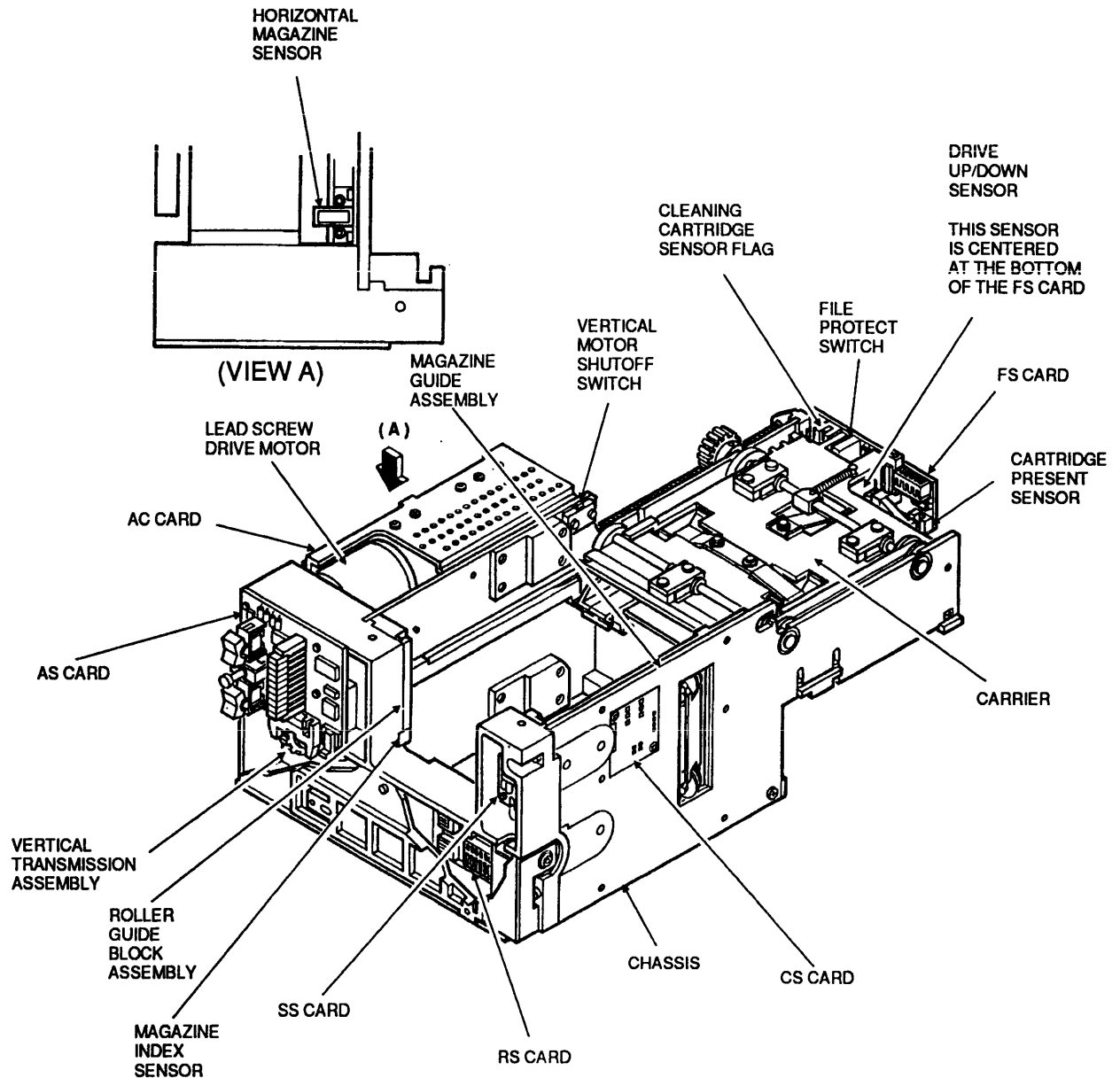


Figure 5 - 18.
Deckplate FRU's

31. ACL - Introduction

The figure below shows the locations of FRU's on the ACL Feature.



NOTES:

1. ACL IS SHOWN WITH COVERS REMOVED.
2. VERTICAL MOTORS IS LOCATED DIRECTLY BELOW THE LEAD SCREW DRIVE MOTOR.
3. HORIZONTAL TIMING BELT THE AS CARD (OPERATOR PANEL).
4. NOT ALL SENSORS ARE FRU'S; THEY ARE SHOWN HERE FOR REFERENCE ONLY.

Figure 5 - 19.
ACL FRU Locations

32. Replace the ACL Cover

Removing the Cover

(Refer to Figure 5-20.)



1. Remove the snap-on collar.
2. Unscrew and remove the two ball stud screws and washers securing the ACL cover to the ACL chassis. If there are two screws underneath the ACL panel which secure the ACL cover to the DP bracket, remove the two screws.
3. Remove the cover.

Installing the Cover

1. Replace the cover over the ACL.
2. Secure the cover with two ball stud screws. If there were two screws underneath the ACL panel, install both screws to secure the ACL cover to the DP bracket.
3. Replace the snap-on collar

33. Replace the Display (DP) Card

NOTE:

This procedure refers to a 4220 with an ACL.

You must complete power down procedures before you remove this FRU.
Remove the ac power cable from the rear of the 4220.

Removing the DP Card



1. Remove the host interface cable(s) from rear of 4220.
2. Extend 4220 unit from cabinet.
3. Remove the snap-on collar.
4. Unscrew and remove the two ball stud screws and washers securing the ACL cover to the ACL chassis.
5. Remove two screws located below corners of ACL cover.
6. Remove ACL cover.
7. Release two fasteners securing display card to chassis.
8. Disconnect two cable connectors (P61 and P162) from DP card.

Installing the DP Card

1. Connect two cable connectors (P61 and P162) to DP card.
2. Install two fasteners securing display card to chassis.
3. Install ACL cover.
4. Install two screws below corners of ACL cover.
5. Secure the cover with two ball stud screws and washers.
6. Replace the snap-on collar.
7. Slide 4220 back into cabinet.
8. Install the host interface cable(s) to rear of 4220.
9. Install ac power cable to rear of 4220. Power up unit.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

34. Replace the AS Card

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the AS Card

(Refer to Figure 5-20.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the four screws securing the AS card.
3. Disconnect cable connectors (P440 and P441) from the AS card.

Installing the AS Card

1. Connect cable connectors (P440 and P441) to the AS card. Be sure to connect each plug to its proper corresponding jack.
2. Secure the AS card to the chassis with four screws.
3. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

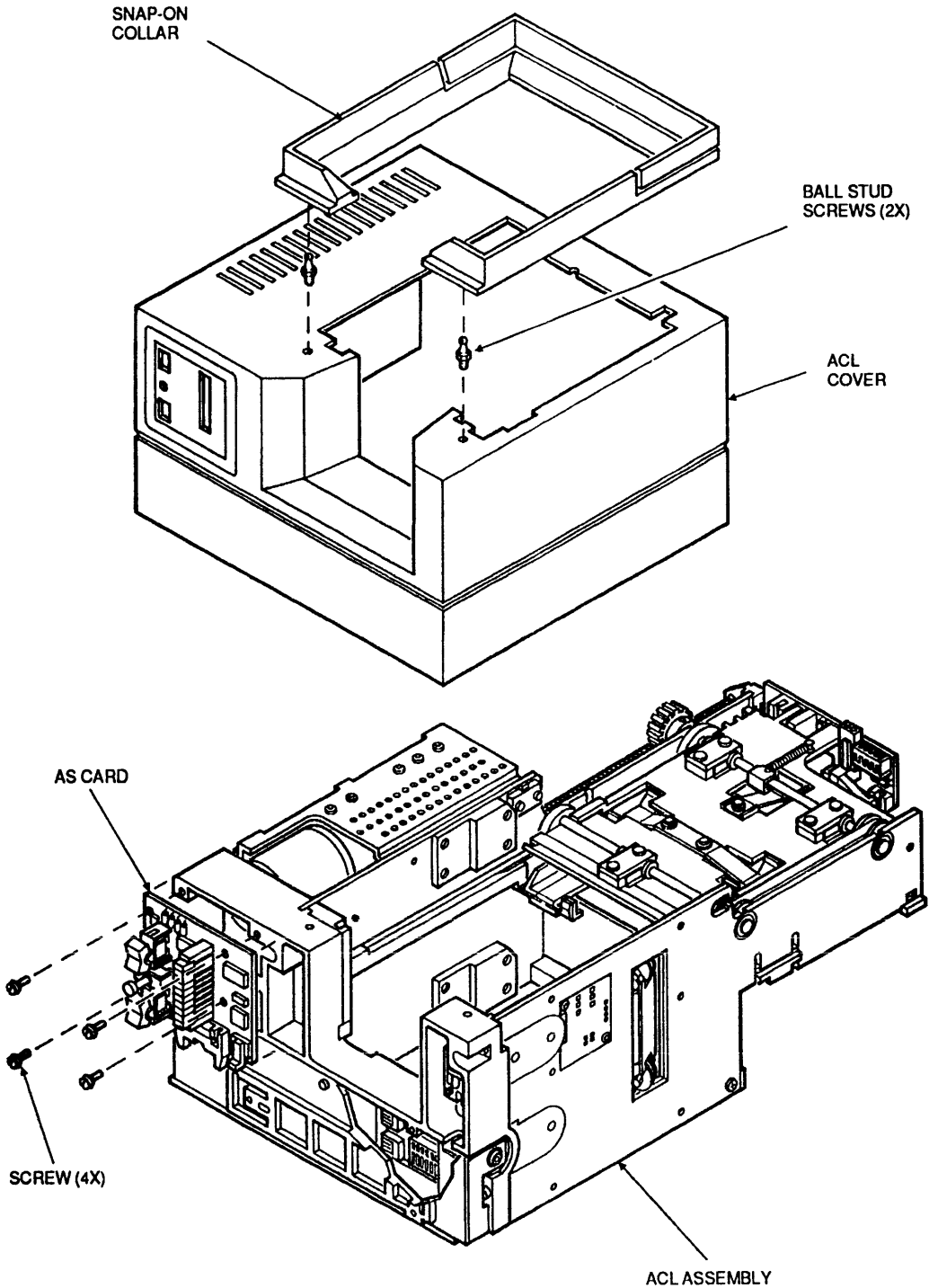


Figure 5 - 20.
ACL Cover and AS Card

35. Replace the AC Card

You must complete normal power down procedures before you replace this FRU. Remove ac power cable from rear of 4220.

Removing the AC Card

(Refer to Figure 5-21.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws securing the top of the AC card.
3. Disconnect cable connectors (P90, P91, and P92) from the AC card.

Installing the AC Card

1. Connect cable connectors (P90, P91, and P92) to the AC card. Be sure the plugs are joined to their corresponding jacks.
2. Position the AC card against the chassis. Install the two screws on the top of the card and tighten.
3. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

36. Replace the FS Card

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the FS Card

(Refer to Figure 5-21.)



1. Remove the ACL cover (refer to Section 32).
2. Disconnect cable connectors (a 2-pin connector and a 4-pin connector) from the FS card.
3. Carefully disengage the thread arm from the slot in the carrier by moving the thread arm toward the reel motor.
4. Locate and loosen the two flathead Torx screws that secure the side of the ACL to the deckplate.
5. Locate and remove the flathead Torx screw that secures the rear of the ACL to the deckplate.
6. Tilt the rear of the ACL upwards approximately 20° to allow tool clearance when you perform the next step.
7. Remove the three screws that secure the FS card and remove the FS card.

Installing the FS Card

1. Position the FS card against the chassis.
2. Install the three screws that secure the FS card to the chassis
3. Lay the ACL on the deckplate and replace the Torx screw you removed previously.
4. Tighten the two Torx screws that you loosened earlier.
5. Connect cable connectors (a 2-pin connector and a 4-pin connector) to the FS card.
6. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

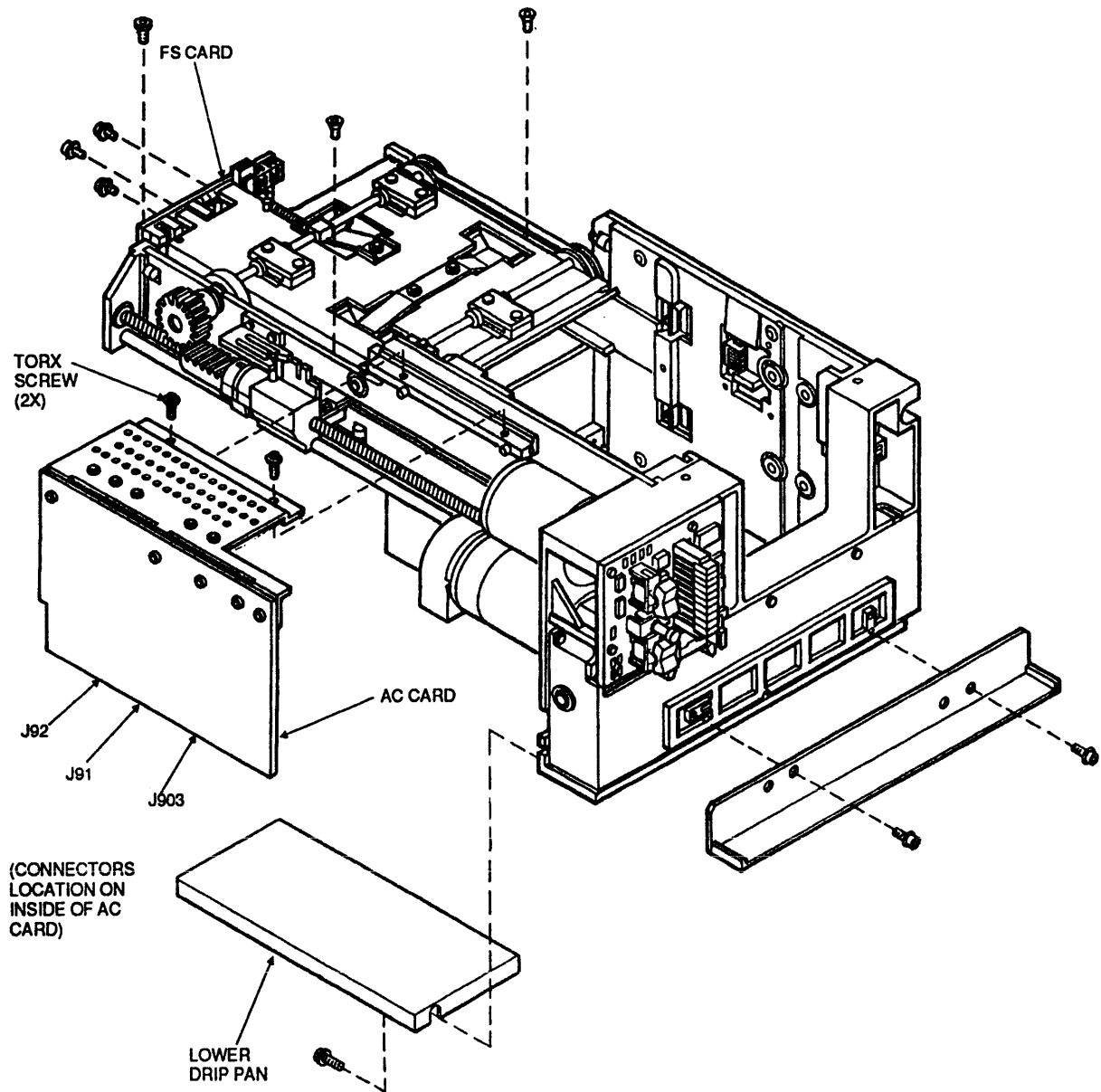


Figure 5 - 21.
AC and FS Cards

37. Replace the Carrier FRU Kit

Machine Preparation

1. Remove host interface cable(s) from the rear of the 4220.
2. Extend the 4220 unit from cabinet.
3. Loosen two cover release screws and raise partition into locked position.



Removing the Carrier FRU Kit

(Refer to Figure 5-23.)

1. Press down on the carrier assembly and move the thread arm away from the carrier.
2. Disconnect the file protect cable connector (two-pin connector) from the HI card.
3. Remove the three screws securing the drip pan located beneath the carrier and remove the pan.
4. Remove the two mounting screws on the sides of the ACL and the screw in the rear of the ACL with the allen wrench included in the kit. (Refer to Figure 5 - 22.)
5. Disconnect plugs P162/262, P192/292, and P117/118.
6. Slide the ACL out of the chassis.
7. Disconnect the FS card cable P92 and the file protect cable P78.
8. Remove the four retaining rings from the ends of the axles and discard.
9. Slide the four bearings out of the chassis slots.
10. Remove and discard the driver gear, barrel spacer, and Woodruff key. (Refer to Figure 5 - 23.)
11. Raise the carrier out of the ACL chassis.

Installing the Carrier FRU

1. Place the timing belt on the carrier.
2. Install carrier axles through the ACL chassis slots.
3. Install the two bearings on the rear shaft of the carrier.

4. Install new Woodruff key, spacer, and driver gear.
5. Install retaining rings on the rear shaft.
6. Turn the drive gear counterclockwise until the shaft is at the rear stops. (Both the front and rear shafts should be at their rear stops.)
7. Install the front bearings and retainer rings.
8. Connect the cables to the FS card.
9. Install the ACL and tighten the two side screws and rear screw that secure the ACL to the 4220.
10. Connect P162/262, P192/292, and P117/118.
11. Attach the drip pan, placing the two shorter screws in the front.
12. Connect the file protect cable connector to the HI card.
13. Press down on the carrier assembly and move the thread arm to home position.

Machine Preparation

1. Lower the partition and tighten the two cover release screws.
2. Slide the 4220 back into the cabinet.
3. Install the host interface cable(s) to the rear of the 4220.

Install the ACL Cover

1. Place the cover over the ACL.
2. Secure the cover with two ball stud screws. If there were two screws underneath the ACL panel, install both screws to secure the ACL cover to the DP bracket.
3. Replace the snap-on collar.

Power Up

1. Install ac power cable to rear of 4220.
2. Switch on the front and rear power switches.
3. Verify that the unit is communicating with host.

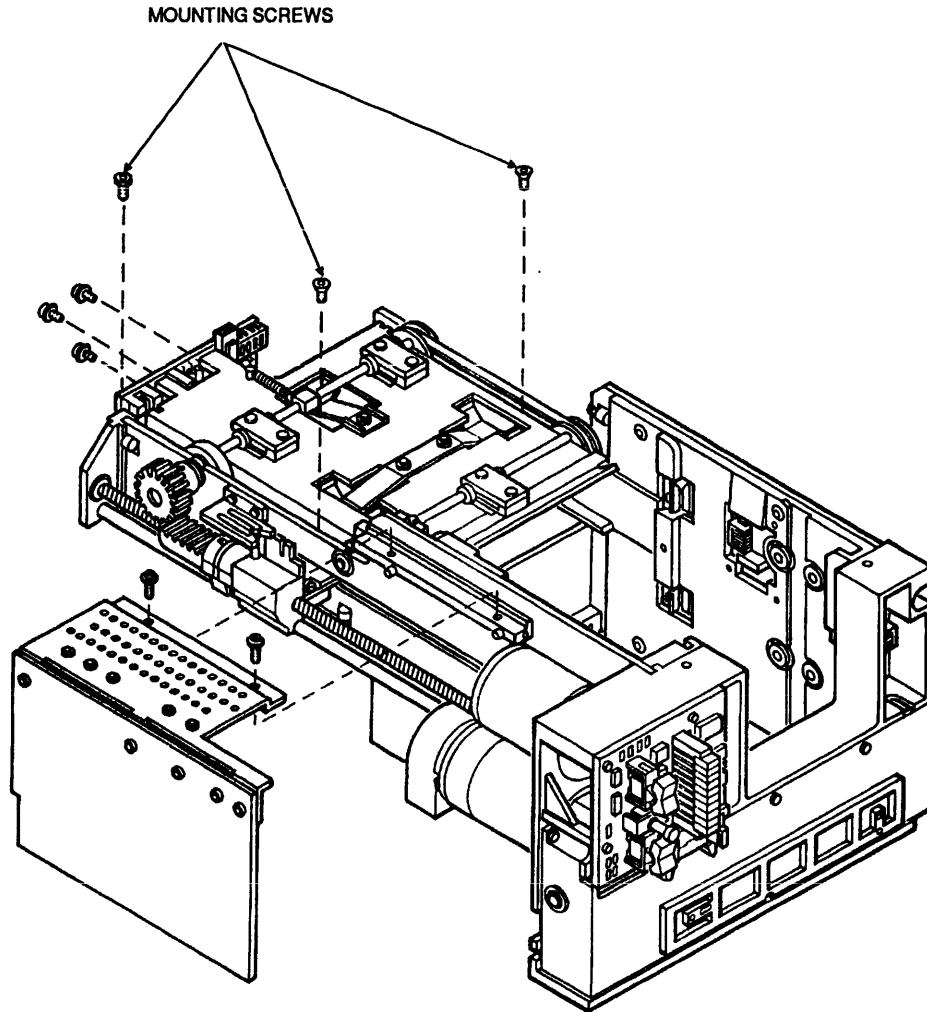


Figure 5 - 22.
ACL Mounting Screws

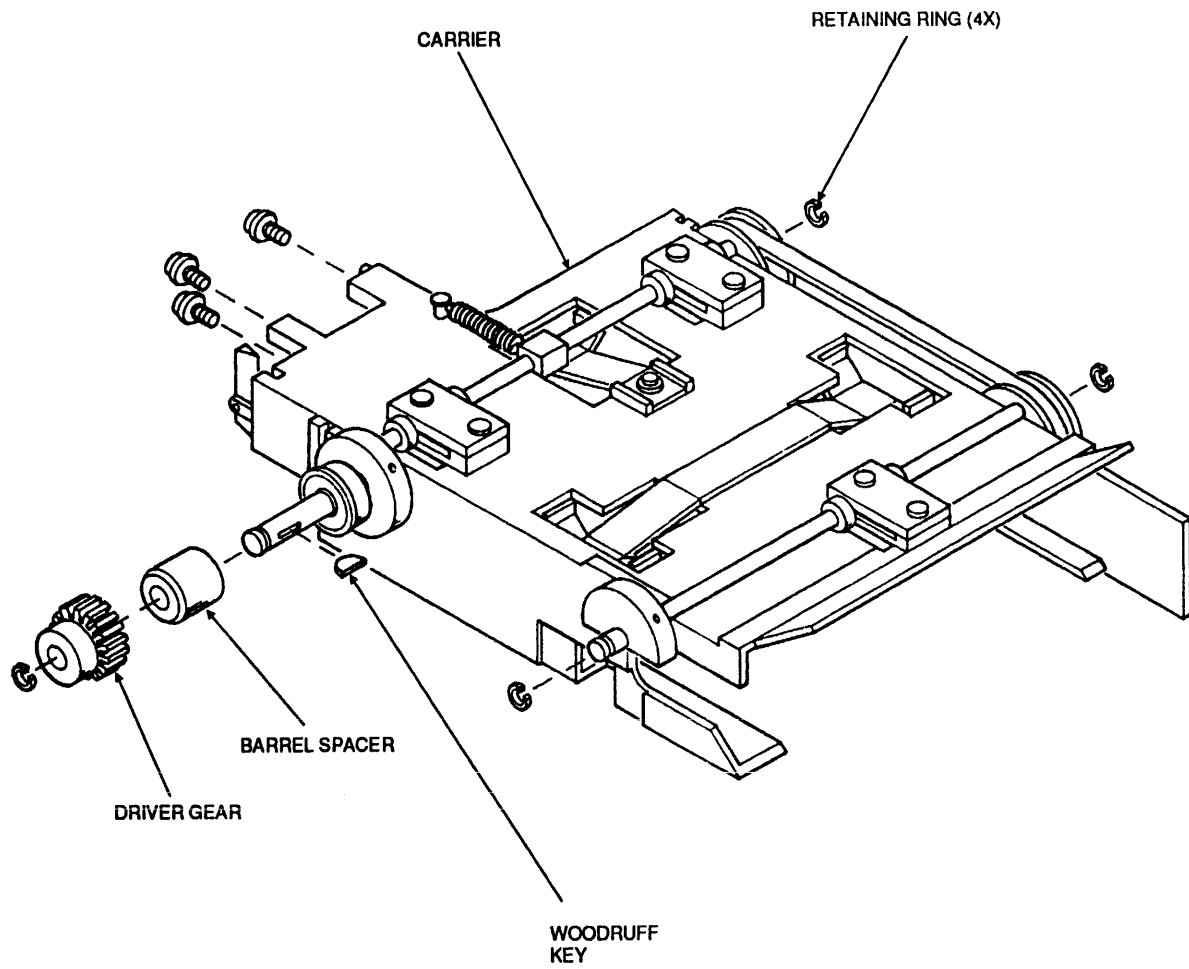


Figure 5 - 23.
Carrier Assembly

38. Replace the SS Card

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the SS Card

(Refer to Figure 5-24.)

1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws securing the SS card.
3. Disconnect cable connector (P446) from the SS card.



Installing the SS Card

1. Connect cable connector (P446) to the SS card. Be sure plugs mate with correct jacks.
2. Secure the SS card with two screws.
3. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

39. Replace the CS Card

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the CS Card (Refer to Figure 5-24.)

1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws that secure the CS card.
3. Disconnect cable connector (P447) from the CS card.



Installing the CS Card

1. Connect cable connector (P447) to the CS card. Be sure plugs mate with correct jacks.
2. Secure the CS card with two screws.
3. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

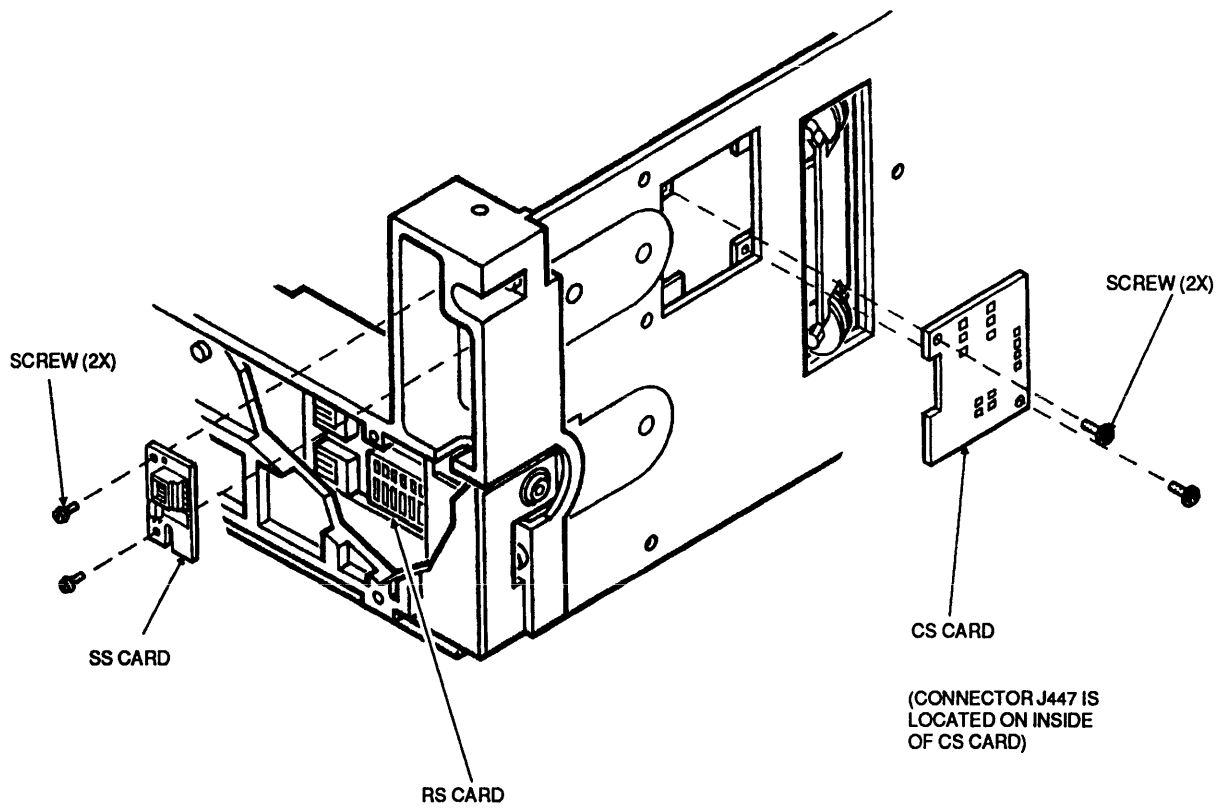


Figure 5 - 24.
CS and SS Cards

40. Replace the Vertical Transmission Assembly

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Vertical Transmission Assembly

(Refer to Figure 5-25.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the DP card by pinching the plastic fasteners and pushing them through the holes of the DP card bracket.
3. Remove the two screws that secure the DP card bracket to chassis.
4. Remove the two screws that secure the AS card.
5. Remove the four screws that secure the vertical transmission assembly.

Installing the Vertical Transmission Assembly

1. Position the vertical transmission assembly against the chassis and secure it with four screws.
2. Secure the AS card to ACL with two screws.
3. Install DP card bracket to chassis and secure with two screws. (Right side of bracket should align with ACL chassis.)
4. Install DP card to bracket by inserting plastic fasteners through holes of DP card bracket.
5. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

41. Replace the RS Card

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the RS Card

(Refer to Figure 5-25.)



1. Remove the ACL cover (refer to Section 32).
2. Remove AS card (refer to Section 34).
3. Remove the vertical transmission assembly (refer to Section 40).
4. Remove the three screws that secure the RS card.
5. Slide the RS card off the two bottom posts.
6. Disconnect cable connectors (P99, P97, P95, P96, P98) from the RS card.

Installing the RS Card

1. Connect cable connectors (P99, P97, P95, P96, P98) to the RS card. Be sure the plugs are mated with their corresponding jacks.
2. Install the RS card on the two bottom posts.
3. Install the three screws that secure the RS card.
4. Install the vertical transmission assembly (refer to Section 40).
5. Install the AS card (refer to Section 34).
6. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

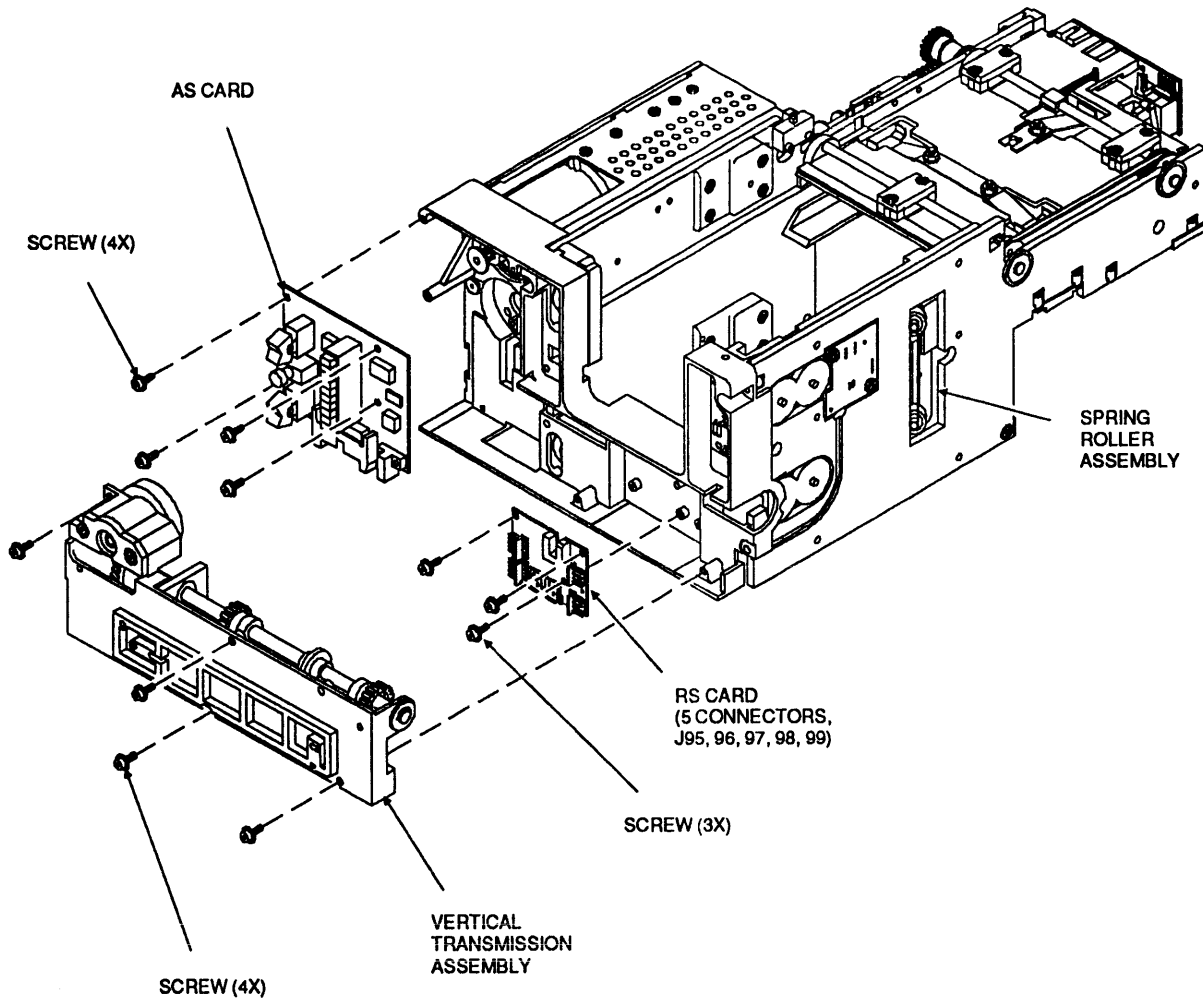


Figure 5 - 25.
RS Card and Vertical Transmission Assembly

42. Replace the Lead Screw Drive Motor

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Lead Screw Drive Motor (Refer to Figure 5-28.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws that secure the AC card and move the card to the side.
3. Remove the four screws that secure the AS card and move the card to the side.
4. Remove the two screws that secure the motor and set the belt aside.
5. Disconnect the motor's cable connector from the cable connector (HM).

Installing the Lead Screw Drive Motor

1. Install the belt, the motor, and the screws that secure the motor.
2. Connect the motor's cable connector to the cable connector (HM).
3. Install the AS card and secure it with four screws.
4. Install the AC card and secure it with two screws.
5. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

43. Replacing the Horizontal Magazine Sensor

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Sensor (Refer to Figure 5-28.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws that secure the AC card and move the AC card to the side.
3. Remove the four screws that secure the AS card and move the AS card to the side.
4. Remove the vertical transmission assembly (refer to Section 40).
5. Note cable routing prior to removal. Cut tie straps.
6. Remove four screws that secure the RS card.
7. Disconnect the sensor cable connector (P96) from the RS card.
8. Remove the lead screw drive motor (refer to Section 42).
9. Remove the two #10 Torx screws securing sensor to ACL chassis and remove the horizontal magazine sensor.

Installing the Sensor

1. Secure the sensor to the ACL chassis with two #10 Torx screws.
2. Install lead screw drive motor (refer to Section 42).
3. Connect the sensor cable connector (P96) to the RS card.
4. Install four screws that secure the RS card.
5. Tie strap the cables together and arrange them so that they do not interfere with the vertical transmission.
6. Install the vertical transmission assembly (refer to Section 40).
7. Install the AS card and four screws that secure it.
8. Install the AC card and two screws that secure it.
9. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

44. Replace the Magazine Index Sensor

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Sensor

(Refer to Figure 5-19.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the four screws that secure the AS card and move the AS card to the side.
3. Remove the vertical transmission assembly (refer to Section 40).
4. Note cable routing prior to removal of sensor. Cut tie straps.
5. Remove four screws that secure the RS card.
6. Disconnect the sensor cable connector from J98 on the RS card.
7. Remove the #10 Torx screw securing sensor to chassis and remove the sensor. (Refer to Figure 5-28.)

Installing the Sensor

1. Secure the sensor to chassis with #10 Torx screw.
2. Connect the sensor cable connector to J98 on the RS card.
3. Install four screws that secure the RS card.
4. Tie strap cables together and arrange them so they do not interfere with the vertical transmission.
5. Install the vertical transmission assembly (refer to Section 40).
6. Install the AS card and four screws that secure it.
7. Install the cover and collar (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

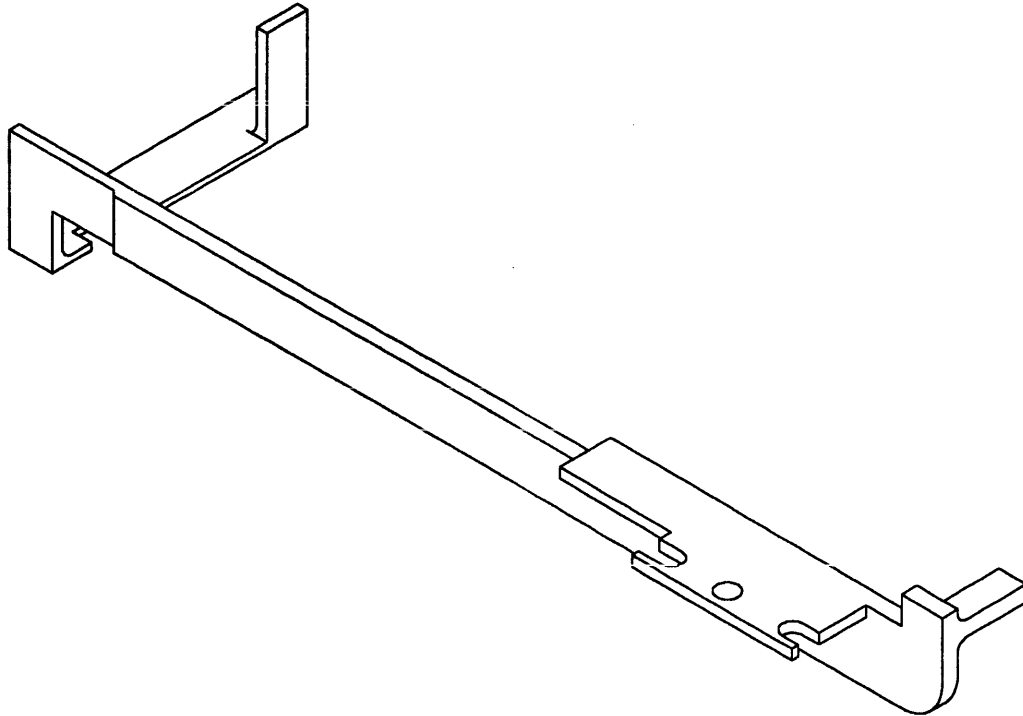


Figure 5 - 26.
Caliper

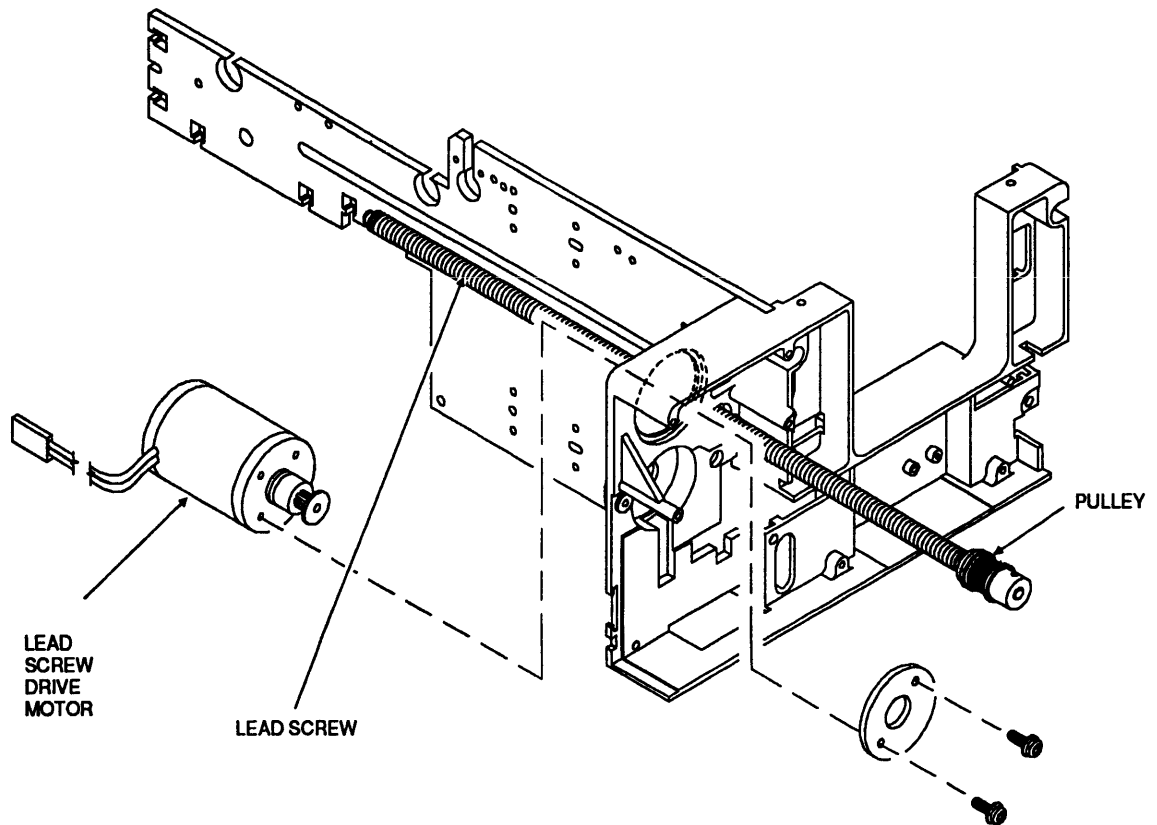


Figure 5 - 27.
Lead Screw Assembly and Lead Screw Drive Motor

45. Replace the Lead Screw Assembly

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Remove the Lead Screw Assembly

(Refer to Figures 5-26 and 5-28)



1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws that secure the AC card and move the AC card to the side.
3. Remove the four screws that secure the AS card and the AS card to the side.
4. Move the caliper guide block assembly until it engages with retainer clip.

NOTE:

The lead screw should only be touched between the driver gear and the lead screw bracket. To move the lead screw toward rear of ACL, run your thumb downward on the lead screw.

5. Remove 3/8" plastite Torx screw from the caliper with a T10 driver.
6. Reach through the magazine opening and grasp the caliper. The caliper is an approximately five-inch long metal bar that guides the cartridge out of the magazine and into the carrier. Remove the caliper through the magazine opening. (Refer to Figure 5 - 27.)
7. Loosen the two screws in the lead screw drive motor, but do not remove them.
8. Rotate the lead screw drive motor clockwise to allow slack in the motor belt.
9. Remove the motor belt from the lead screw drive motor and the pulley.
10. Loosen the set screw on the pulley with a 1/16 Allen wrench and remove pulley and pre-load spring.

CAUTION:

Lead screw should be handled with care to prevent damage.

11. Push lead screw toward back of ACL until it comes to a stop. Unscrew the lead screw through the back of ACL bracket by running thumb in a downward motion as before. Hold caliper guide block as you unscrew lead screw.

Install the Lead Screw

1. Insert the lead screw assembly through the lead screw bracket hole.
2. Align guide slots on bottom of nut rack housing and caliper guide block and place them on guide rod.
3. Move lead screw by rolling it downward with the thumb. Remember, the lead screw is to be touched only in the section between the driver gear and lead screw bracket. Continue until bearing attached to lead screw is flush with hole in lead screw bracket and the lead screw extends through bearing in front housing.
4. Move the caliper guide block assembly until it engages with the retainer clip.
5. Place pre-load spring on front end of lead screw.
6. Place pulley on lead screw and push it flush with the end of the lead screw. (Refer to Figure 5-26.)
7. Tighten the pulley screw with 1/16 Allen wrench.
8. Replace the pulley belt on the horizontal motor and pulley.
9. Set eccentric bearing flush with chassis.
10. Rotate lead screw drive motor counter clockwise in order to tighten pulley belt.
11. Tighten two screws in lead screw drive motor.
12. Replace caliper inside the ACL and install the caliper screw.
13. Attach the rear bearing to the lead screw and attach with retaining ring.

14. Install the AS card and four screws that secure it.
15. Install the AC card and two screws that secure it.
16. Install the cover and collar (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

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4220 Cartridge Tape Subsystem
FRU REPLACEMENT

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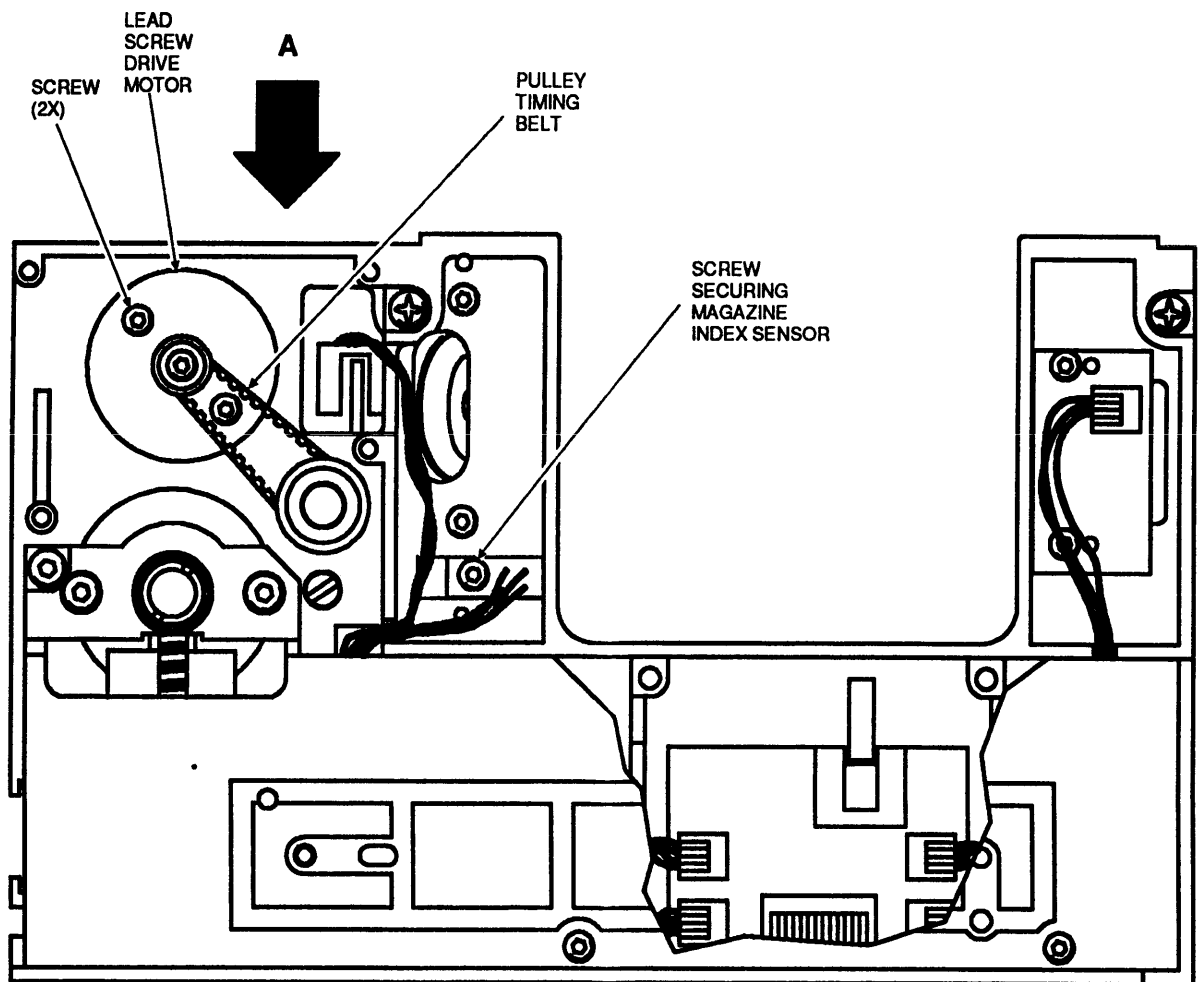
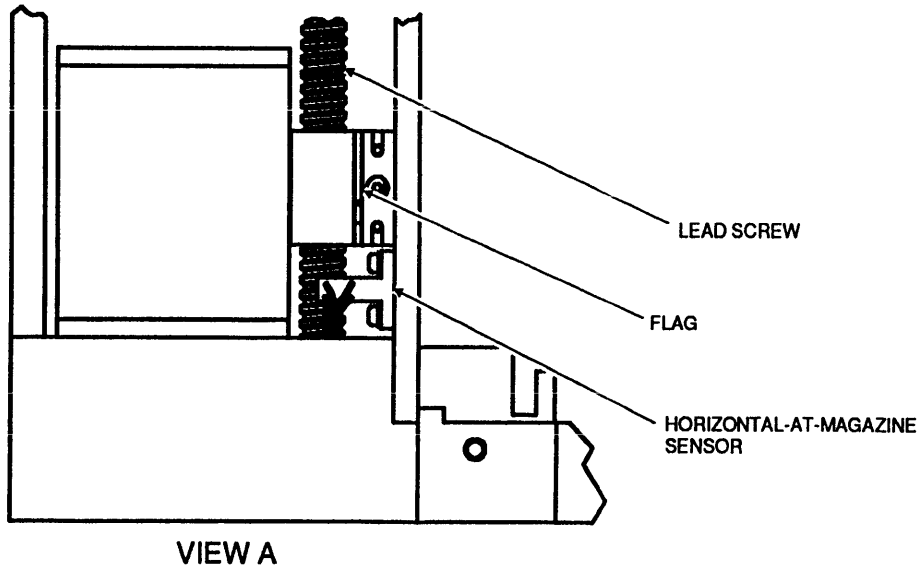


Figure 5 - 28.
Lead Screw Drive Motor

46. Replace the Vertical Motor

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Vertical Motor

(Refer to Figure 5-29.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws that secure the AC card and move the AC card to the side.
3. Remove the four screws that secure the AS card and move the AS card to the side.
4. Remove the vertical transmission assembly (refer to Section 40).
5. Remove the two screws securing the vertical motor and lift out the motor.
6. Disconnect the cable connector from the cable connector (VM).

Installing the Vertical Motor

1. Position the motor against the chassis and secure it with two screws.
2. Connect the cable connector to the cable connector (VM).
3. Install the vertical transmission assembly (refer to Section 40).
4. Install the AS card and four screws that secure it.
5. Install the AC card and two screws that secure it.
6. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

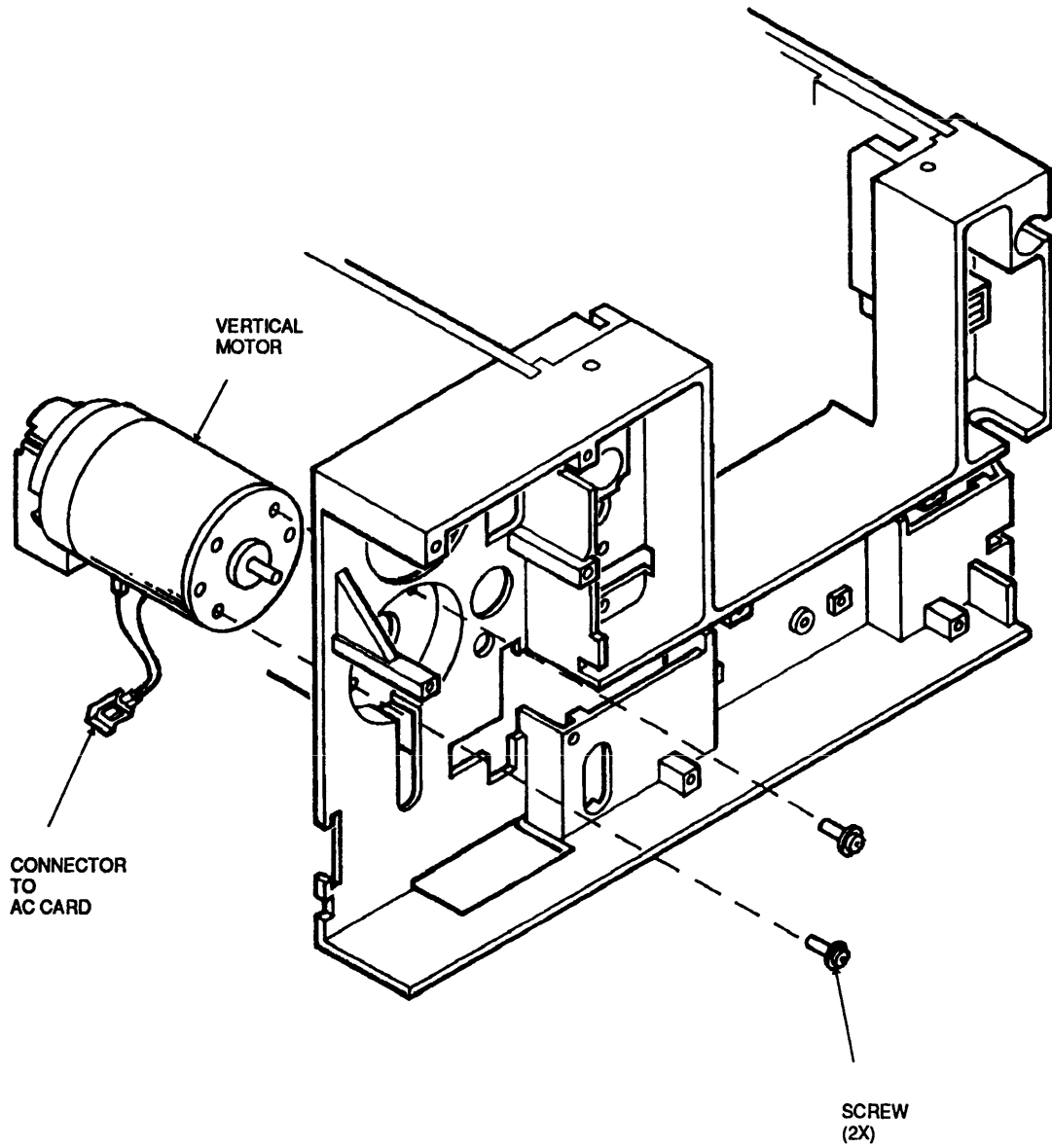


Figure 5 - 29.
Vertical Motor

47. Replace the Roller Guide Block Assembly

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Assembly (Refer to Figure 5-31.)



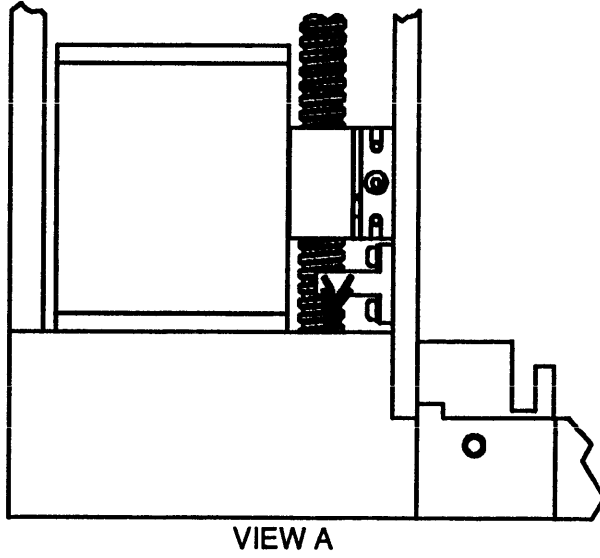
1. Remove the ACL cover (refer to Section 32).
2. Remove the four screws that secure the AS card and move it to the side.
3. Remove the vertical transmission assembly (refer to Section 40).
4. Remove the two screws that secure the roller guide block assembly to the chassis (refer to Figure 5-30).
5. Apply pressure to the top and bottom of the assembly and slide the assembly toward the rear of the ACL.

Installing the Assembly

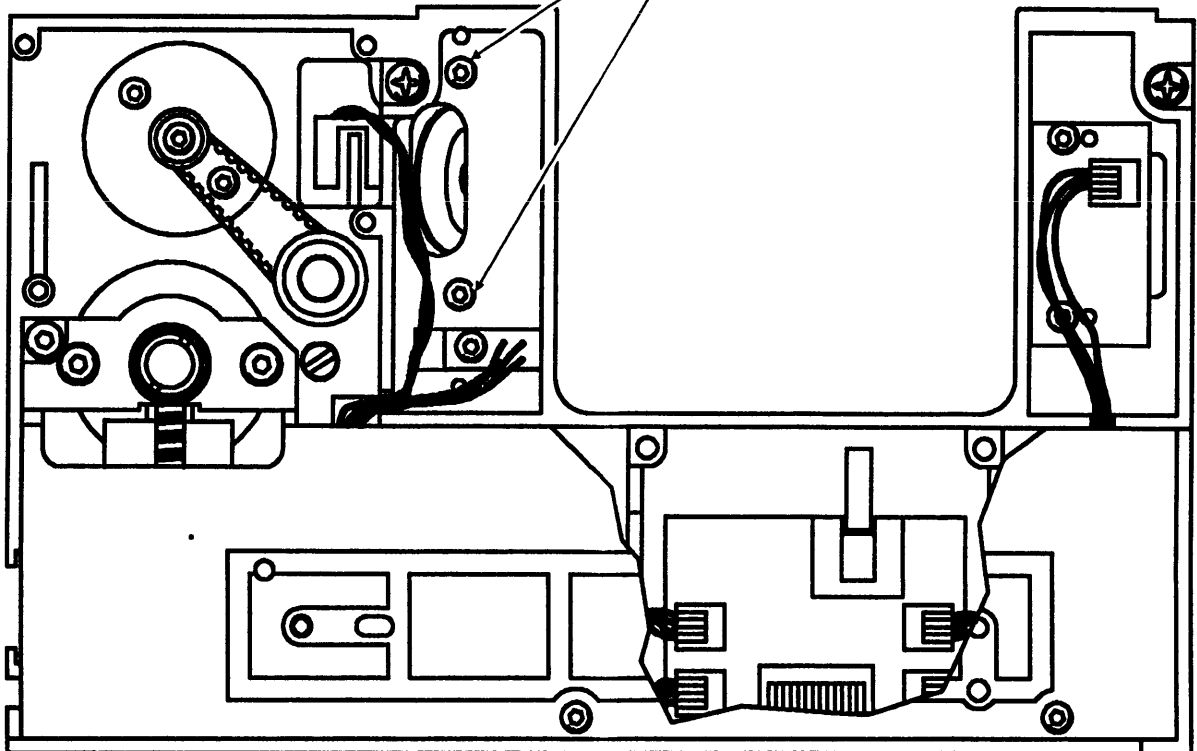
1. Slide the assembly into its position behind the face of the ACL.
2. Install the two screws that secure the roller guide block assembly to the chassis.
3. Install the vertical transmission assembly (refer to Section 40).
4. Install the AS card and four screws that secure it.
5. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)



A



SCREWS SECURING
ROLLER GUIDE
BLOCK ASSEMBLY

Figure 5 - 30.
Roller Guide Block Screws

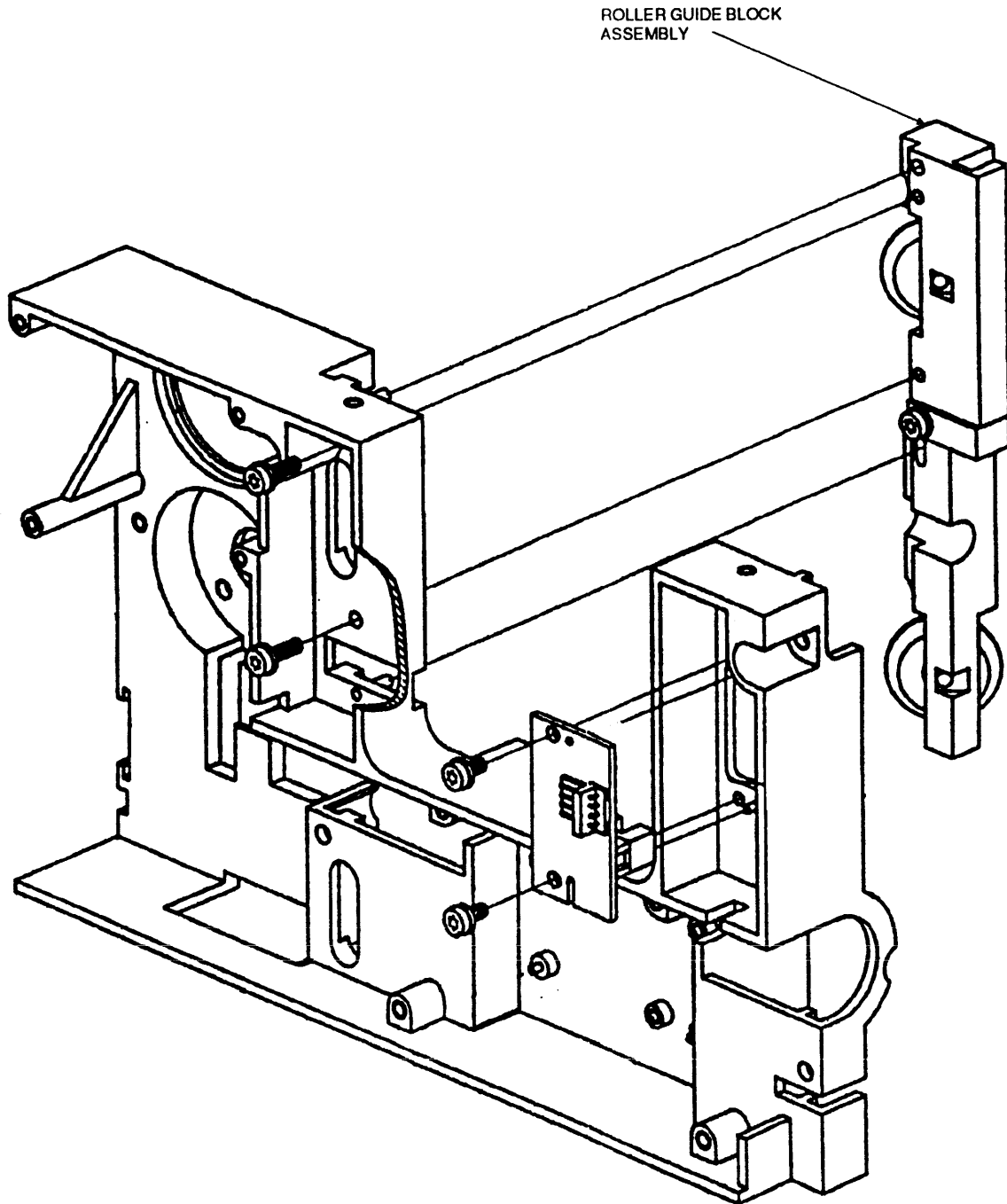


Figure 5 - 31.
Roller Guide Block Assembly

48. Replace the Magazine Guide Assembly

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Assembly

(Refer to Figure 5-32.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the CS card from the assembly by pushing on the inside face of the card.
3. Remove the two #10 Torx screws that secure the spring roller assembly (refer to Figure 5-25) to the magazine guide assembly.
4. Remove the four screws that secure the magazine guide assembly to the chassis.
5. Remove the assembly by pushing it toward the center of the ACL and then lifting it up.

Installing the Assembly

1. Lower the magazine guide assembly down into the chassis.
2. Install the four screws that secure the assembly to the chassis.
3. Align shim(s) to holes in spring roller assembly.
4. Hold spring roller assembly and shim(s) up to chassis with rounded end of the dowel pins facing outer part of ACL. Shim(s) will be placed between spring roller assembly and screws.
5. Install the two #10 Torx screws that secure the spring roller assembly to the magazine guide assembly.
6. Install the CS card into the ACL.
7. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

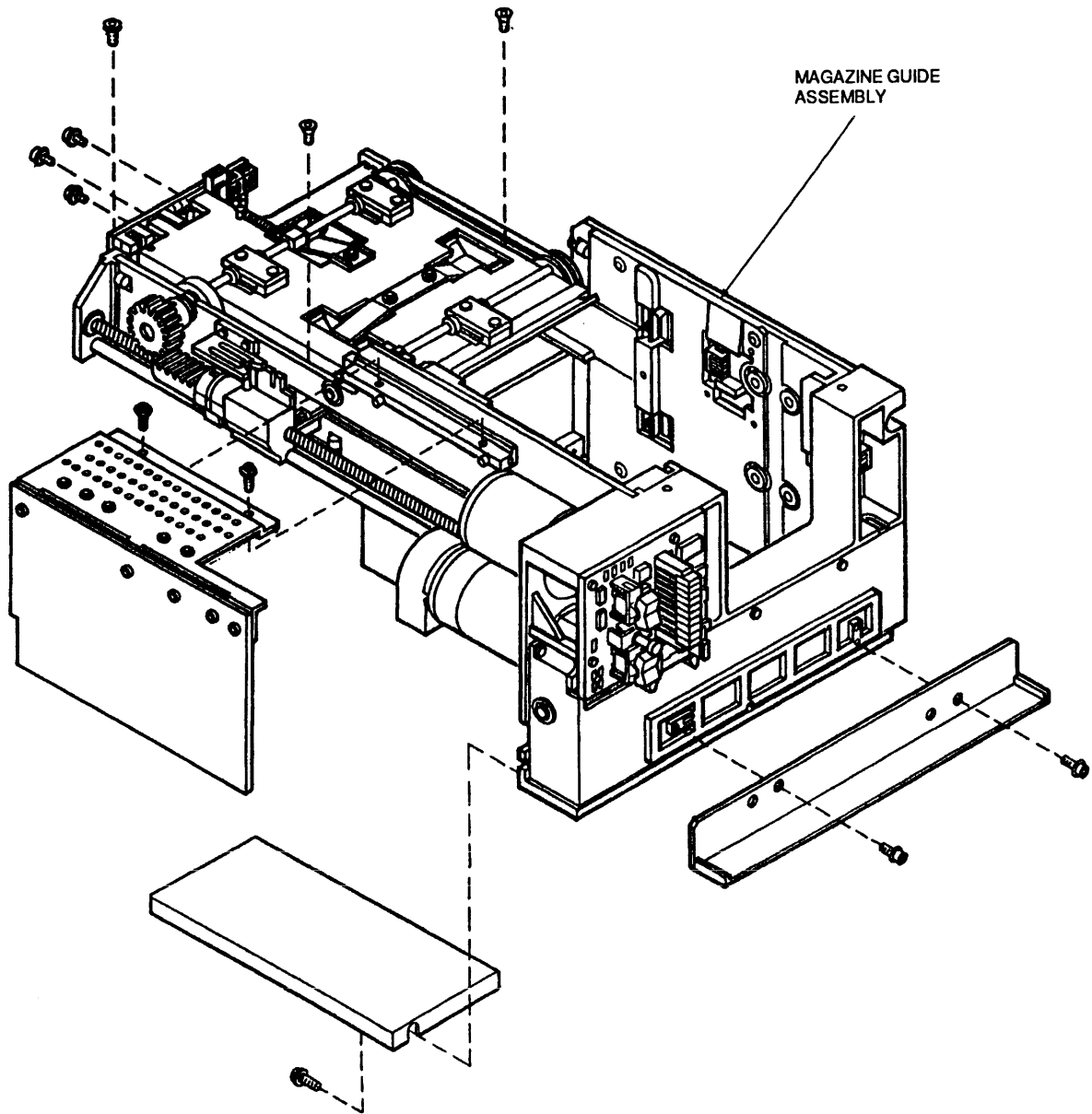


Figure 5 - 32.
Magazine Guide Assembly

49. Replace the Pulley Timing Belt

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Belt

(Refer to Figure 5-26.)



1. Remove the ACL cover (refer to Section 32).
2. Remove the two screws that secure the AC card and move the card to the side.
3. Remove the four screws that secure the AS card and move the AS card to the side.
4. Loosen the two screws in the lead screw drive motor, but do not remove them.
5. Rotate the lead screw drive motor clockwise to allow slack in the pulley timing belt.
6. Remove the pulley timing belt from the lead screw drive motor and pulley.

Installing the Belt

1. Install the pulley timing belt on the lead screw drive motor and pulley.
2. Set eccentric bearing flush with chassis.
3. Rotate lead screw drive motor counter clockwise in order to tighten pulley timing belt.
4. Tighten two screws in lead screw drive motor.
5. Install the AS card and four screws that secure it.
6. Install the AC card and two screws that secure it.
7. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

50. Replace the Vertical Motor Shut-Off Switch

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Switch

(Refer to Figure 5-19.)



1. Remove the ACL cover (refer to Section 32).
2. Remove two screws securing AC card and set AC card to the side.
3. Cut tie strap.
4. Disconnect switch cable connector (J101) from P101.
5. Remove the two #2 Allen screws that secure the switch to ACL chassis and remove the switch.

Installing the Switch

1. Secure switch to chassis using two #2 Allen screws.
2. Connect switch cable connector (J101) to P101.
3. Secure cable with a tie strap.
4. Install the AC card and two screws that secure it.
5. Install the ACL cover (refer to Section 32).

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

51. Replace the Cleaning Cartridge Sensor Flag

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Flag

(Refer to Figure 5-19.)



1. Following instructions in the ACL installation manual, remove the ACL assembly from the transport and set it on a workbench before you try to remove and install this FRU.
2. Remove the three Torx screws that secure the FS card to the carrier.
3. Grip the metal rod that slides through the crossbar of the sensor flag and slide the rod to the left until the flag can be removed.

Installing the Flag

1. Position flag so that the bent arm is facing the front of ACL. The metal spring arm should be above the flag crossbar and against the rear of carrier.
2. Grip metal rod that secures flag to carrier and slide the rod to the right until the other end of the rod is flush with the flag support.
3. Install the three Torx screws that secure the FS card to the carrier.
4. Following instructions in the ACL instruction manual, install the ACL assembly.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

52. Replace the Chassis Assembly

You must complete normal power down procedures before you remove this FRU. Remove ac power cable from rear of 4220.

Removing the Chassis Assembly



1. Following instructions in the ACL installation manual, remove the ACL assembly from the transport and set it on a workbench before you try to remove and install this FRU.
2. Remove the AC card (refer to Section 35).
3. Remove the AS card (refer to Section 34).
4. Remove the vertical transmission assembly (refer to Section 40).
5. Remove the lead screw drive motor (refer to Section 42).
6. Remove the vertical motor (refer to Section 46).

Installing the Chassis Assembly

1. Install the vertical motor (refer to Section 46).
2. Install the lead screw drive motor (including the belt) (refer to Section 42).
3. Install the vertical transmission assembly (refer to Section 40).
4. Install the AS card (refer to Section 34).
5. Connect all leads going to the AC card. Be sure all plugs are mated with their corresponding jacks.
6. Install the AC card (refer to Section 35).
7. Following instructions in the ACL installation manual, install the ACL assembly.

Testing

1. Run offline diagnostics. (See Chapter 4, Section 5.)
2. If you have ICRC, also run online diagnostics. (See Chapter 4, Section 6.)

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4220 Cartridge Tape Subsystem

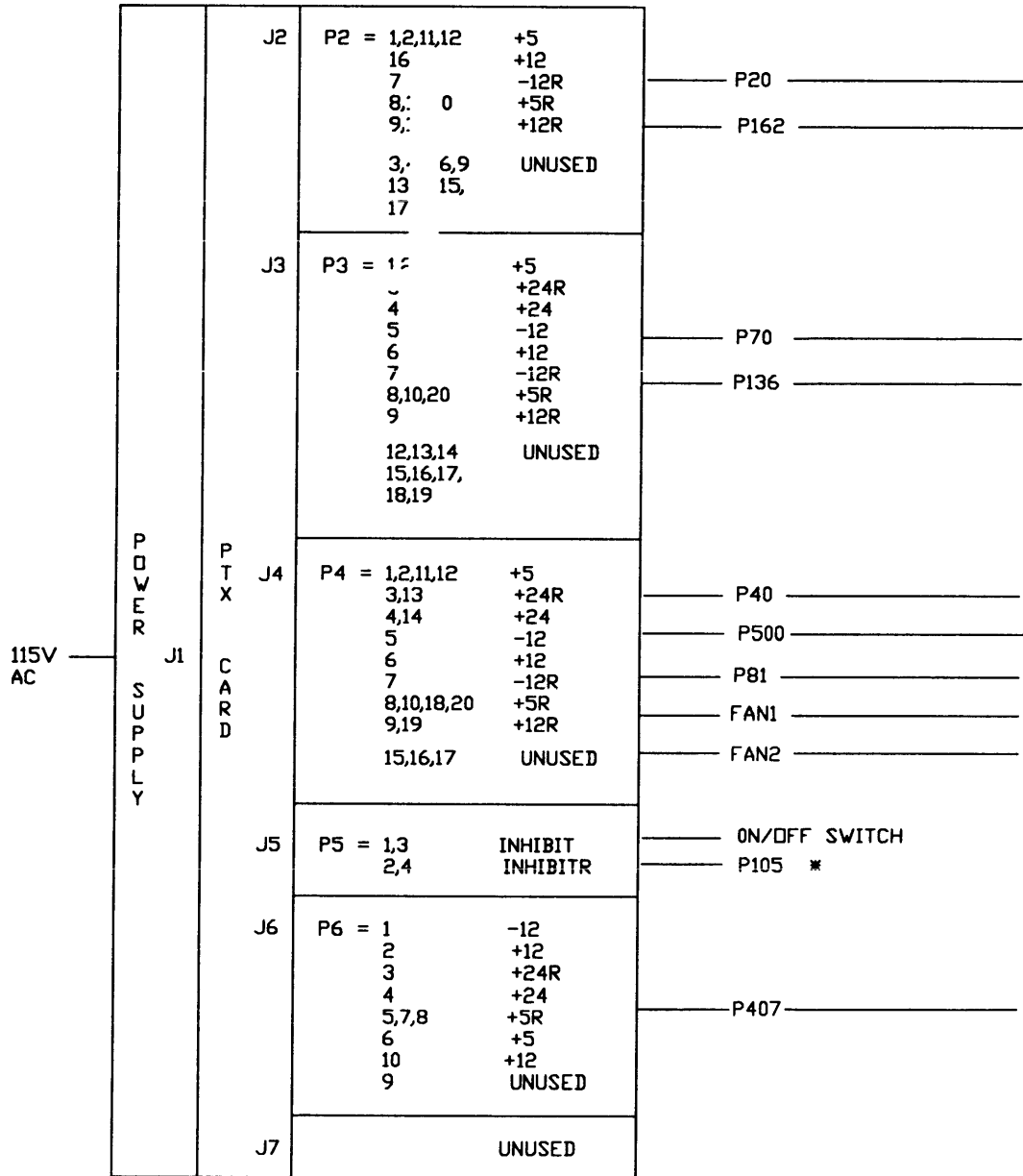
Chapter 6

POWER DISTRIBUTION

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4220 Cartridge Tape Subsystem
POWER DISTRIBUTION

4220 DC INTERCONNECT



* NOTE: J105 ON BT BOARD - PIN 1 (OVERTEMP_OFF) SB BOARD J121 PIN 68
PIN 2 (GND)

Figure 6 - 1. (Sheet 1 of 2)
4220 Power Distribution

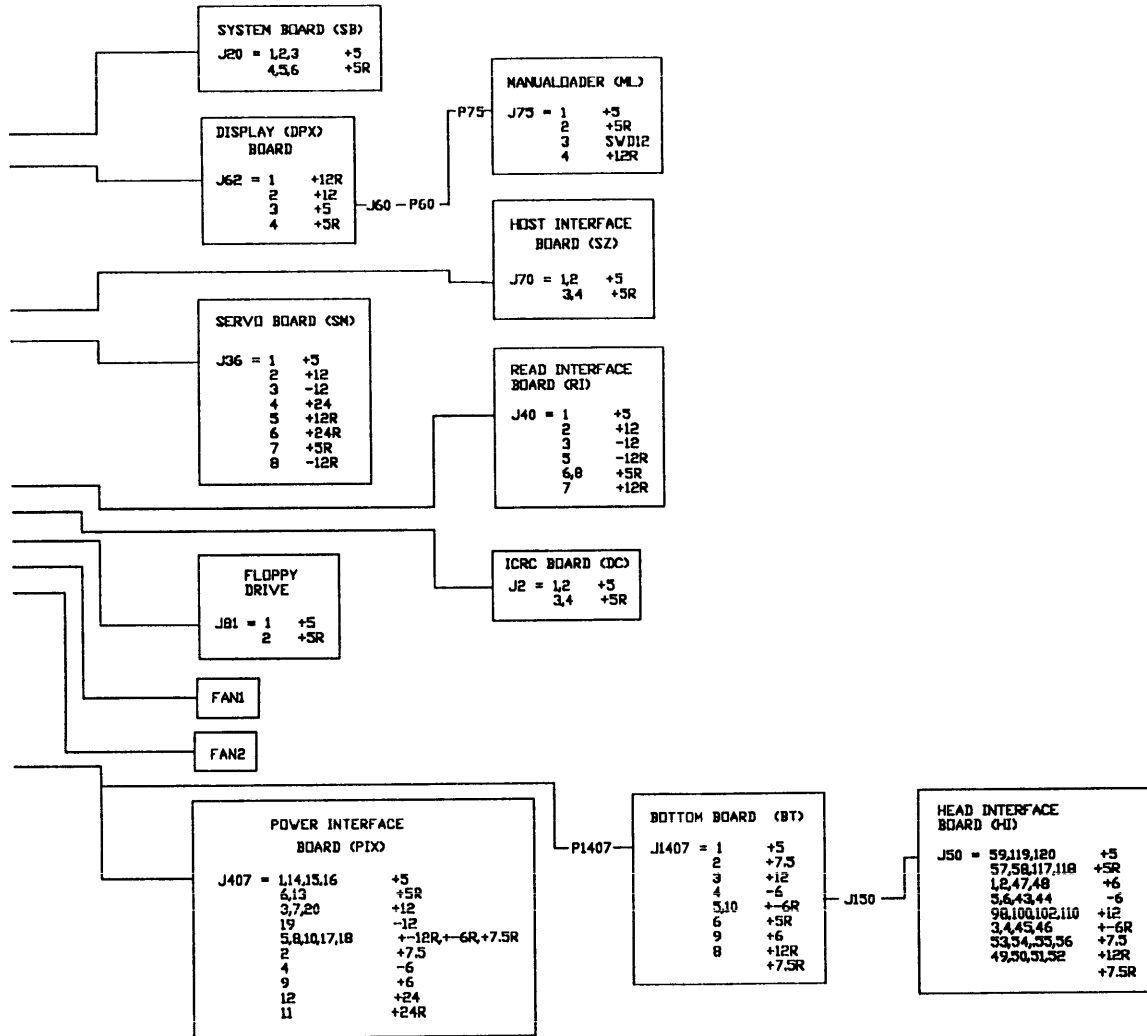


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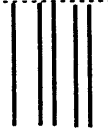
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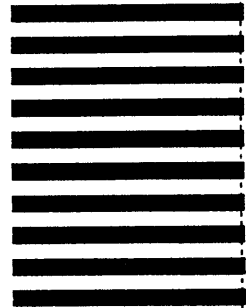
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