HEWLETT PACKARD

This package contains a section of the

CE SERVICE HANDBOOK
FOR
79XX SERIES DISC DRIVES

and consists of the following document:

7957A/7958A
DISC DRIVES
Part no. 07957-90905

Insert this section into the handbook binder P/N 9282-0683 along with cover and tabset P/N 5957-4228

NOTE

This handbook is intended as a reference of most- frequently-used material for the trained HP Customer Engineer. The information is condensed from other manuals related to the product and is not intended as a substitute for these manuals (see Related Manuals, page iv).

P.O. Box 39, Boise, Idaho 83707-0039

PRINTED: AUGUST 1988
PRINTED IN U. S. A.

07957-90905
E0888

Notice

The information contained in this document is subject to change without notice.

HEWLETT-PACKARD MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. HEWLETT-PACKARD shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this material.

HEWLETT-PACKARD assumes no responsibility for the use or reliability of its software on equipment that is not furnished by HEWLETT-PACKARD.

Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

A software code may be printed before the date; this indicates the version level of the software product at the time the manual or update was issued. Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

Edition 1 ..... JANUARY 1987
Edition 2 ..... AUGUST 1988

Herstellerbescheinigung

Hiermit wird bescheinigt, daß das Gerät/System HP 7957A/HP 7958A in Übereinstimmung mit den Bestimmungen von Postverfügung 1046/84 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes/Systems angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Manufacturer's Declaration

This is to certify that the product(s) HP 7957A/HP 7958A is in accordance with the Radio Interference Requirements of Directive FTZ 1046/1984. The German Bundespost was notified that this equipment was put into circulation; the right to check the series for compliance with the requirements was granted.

Additional Information for Test and Measurement Equipment

If Test and Measurement Equipment is operated with unscreened cables and/or used for measurements on open setups, the user has to assure that under operating conditions the Radio Interference Limits are still met at the border of his premises.

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

Safety Considerations

GENERAL - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOLS

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.

Indicates hazardous voltages.

Indicates earth (ground) terminal.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure or practice that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

SAFETY EARTH GROUND - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER - Verify that the product is configured to match the available main power source according to the input power configuration instructions provided in this manual.

If this product is to be operated with an autotransformer make sure that the common terminal is connected to the earth terminal of the main power source.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by service-trained personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged after the product has been disconnected from the main power source.

To avoid a fire hazard, fuses with the proper current rating and of the specified type (normal blow, time delay, etc.) must be used for replacement. To install or remove a fuse, first disconnect the power cord from the device. Then, using a small flat-bladed screw driver, turn the fuseholder cap counterclockwise until the cap releases. Install either end of a properly rated fuse into the cap. Next, insert the fuse and fuseholder cap into the fuseholder by pressing the cap inward and then turning it clockwise until it locks in place.

Contents

Contents (continued)

Figures and Tables

Product Information 1

1-1. Product Description

FEATURES:

- 81-megabyte capacity (formatted) - HP 7957A
- 130-megabyte capacity (formatted) - HP 7958A
- Rugged, sealed head-media design
- 5 1/4-inch plated media
- 29.0 ms average seek time
- Integrated controller and power supply
- Built-in diagnostic capability

PHYSICAL CHARACTERISTICS:

Refer to table 1-2 for physical characteristics.

1-2. Options and Accessories

The following items are included with the standard drive:

07957-90901	7957A/7958A Owner's Manual
5955-3456	Site Environmental Requirements Manual
8120-3445	1-metre HP-IB cable
8120-1378	Power cord
2110-0003	Fuse (2 each)

The following options are available:

OPTION 015 - Set for 230 Vac operation
OPTION 550 - Delete HP-IB cable

The following accessories are available:

HP 92211A	Desk-height stand-alone cabinet
HP 19500B	Rack mount kit for 19-inch rack

The following packaging items are required when repackaging the drive for shipment:

9211-4692		Shipping Carton
9222-1177		Plastic Bag
07941-80001	(2)	Foam Cushion

1-3. Service Kits

Table 1-1 lists the contents of the recommended Product Support Package for the disc drive.

NOTE

DMD does not supply this package.

Table 1-1. Product Support Package

PART NO.	DESCRIPTION
07908-16001	HP 85 External Exerciser Tape (Rev 2630 & Up)
07957-90903	Service Manual
5955-3462	CS/80 External Exerciser Reference Manual
9300-0794	Anti-Static Workstation
8710-1426	TORX* Field Kit

**TORX is a registered trademark of Camcar Division, Textron Inc.*

1-4. Operating Specs and Characteristics

Operating specifications and characteristics are listed in table 1-2.

Table 1-2. Operating Specifications and Charcteristics

OPERATING SPECIFICATIONS

Average controller overhead time:	3.0 ms
Average seek time (including settling):	29.0 ms
Average rotational delay:	8.3 ms
Average time to transfer 1 kbyte (at 853 kbytes/sec):	1.2 ms
Total average transaction time (excluding system overhead):	41.5 ms
Disc performance index:	24.1*

**Maximum disc transactions per second, for 1 kbyte transfers, less 2*Maximum disc transactions per second, for 1 kbyte transfers, less system overhead.*

Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.

DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Byte	8				
Sector	2,048	256			
Track	129,024	16,128	63		
Head	130,701,312	16,337,664	63,819	1,013	
HP 7957A	653,506,560	81,688,320	319,095	5,065	5
HP 7958A	1,045,610,496	130,701,312	510,552	8,104	8

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	132 mm (5.2 in.)
Width:	325 mm (12.8 in.)
Depth:	285 mm (11.2 in)

WEIGHT

Net (total):	
Standard:	9.9 kg (21.8 lb)
Shipping (total):	
Standard:	12.9 kg (28.5 lb)

Table 1-2. Operating Specifications and Charcteristics (cont'd)

OPERATING CHARACTERISTICS

HEAT DISSIPATION

Maximum:	85 Watts (290 Btu/hr; 73 kcals/hr)
Typical:	65 Watts (222 Btu/hr; 56 kcals/hr)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7957A/7958A -- For U.S.A., designed to meet FCC docket 20780 for Class B computing peripheral devices. These products comply with the limits for a Class B computing device persuant to Subpart J of part 15 of the FCC Rules. See instructions if interference to radio reception is suspected.
- HP 7957A/7958A -- for Europe, designed to meet EMI level FTZ 1046/84 and provides a Manufacturer's Declaration. Refer to your local sales representative for more information.

Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating:	<5 gauss on all surfaces

POWER CHARACTERISTICS

Voltages (true RMS):

115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)

Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 85 Watts (90V, 60Hz) 230V setting; 85 Watts (198V, 50Hz)
Typical Power:	115 setting; 65 Watts (115V, 60Hz) 230V setting; 65 Watts (230V, 50Hz)
Maximum Current (occurs during spin-up):	115V setting; 1.6A (true RMS at 90V, 60Hz) 230V setting; 1.0A (true RMS at 180V, 50Hz)
Typical Current:	115V setting; 0.80A (true RMS at 115V, 60Hz) 230V setting; 0.50A (true RMS at 230V, 50Hz)

Line Dropout: No effect on performance; no operator intervention required for dropout equal to or less than one cycle of the ac line frequency (20.0 ms, 50 Hz; 16.7 ms, 60 Hz).

Table 1-2. Operating Specifications and Charcteristics (cont'd)

ACOUSTIC EMISSIONS

Average sound pressure level (L_{pA}):	41 dB(A)
Sound power level (L_{wA}):	52 dB(A)

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

Environmental/Installation/PM 2

2-1. Environmental Requirements

Table 2-1 contains environmental information pertinent to the operation of the disc drive. For detailed environmental requirement data, refer to the Site Environmental Requirements Manual, part no. 5955-3456. Figure references in table 2-1 are figures in the Site Environmental Requirements Manual.

2-2. Installation

First-time installation of the drive requires use of the following manuals.

- Site Environmental Requirements for Disc/Tape Drives, P/N 5955-3456.
- HP 7957A/HP 7958A Owner's Manual, P/N 07957-90901

2-3. Installation Checklist

1) Verify input ac voltage, fuse rating, and selector switch setting.

2) Connect HP-IB cable and set address select switch

3) Power up and perform self test (refer to Section V).

2-4. Handling

While the disc drive has been designed to withstand a certain shock level it is still a delicate device. Care should be taken when handling or transporting the product. The following precautions should be observed when handling or transporting the disc drive. Failure to observe these handling precautions could result in loss of data or damage to the product.

Handling Precautions

- Avoid sharp shocks to the disc drive.
- Always repackage the disc drive in approved packaging (see figure 2-1) when transporting the product from one area to another.

2-5. Controls and Connectors

Figure 2-2 shows the location of the disc drive controls and indicators.

2-6. AC Power: Voltage Selection/Fuses/Cords

Voltage Selection:

CAUTION

Disconnect the power cord from the disc drive ~AC LINE connector before changing the Voltage Selector.

Slide the VOLTAGE SELECTOR switch to the proper position (115V or 230V) for the voltage available.

Fuse:

WARNING

Remove the power cord from the disc drive before installing or replacing the fuse.

Replace the fuse with one of the same type and rating.

The same fuse is used for 115V and 230V operation:

HP P/N: 2110-0003 DESCRIPTION: 3A, 250V, medium time delay

Power Cords:

Refer to the Site Environmental Requirements for Disc/Tape Drives HP part no. 5955-3456 Appendix D for power cord information.

Table 2-1. Environmental Requirements

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this subsystem is not connected to a Hewlett-Packard (HP) system. When this subsystem is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	5°C to 45°C (41°F to 113°F)
Nonoperating range:	-40°C to 65°C (-40°F to 149°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	8% to 90% relative humidity, noncondensing, and wet bulb temperature not to exceed 29°C (84°F).
Nonoperating:	8% to 90% relative humidity, noncondensing and wet bulb temperature not to exceed 29°C (84°F).

VIBRATION

Operating	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.00005 g^2/Hz at 500 Hz.
Nonoperating	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of 0.008 g^2/Hz from 137 to 350 Hz; -6 dB/ octave from 350 to 500 Hz; PSD of 0.0039 g^2/Hz at 500 Hz.

SHOCK

Recommended operating range:	<.067g
Operating:	2 g maximum at 11 ms, half sine waveform
Nonoperating:	20 g maximum at 11 ms, half sine waveform

Table 2-1. Environmental Requirements (cont'd)

ALTITUDE	
Operating:	maximum 4 500m (14,800 ft.)
Nonoperating:	maximum 15 000m (49,200 ft)
ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE	
Radiated Electric Field:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3 Vrms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 Vrms
Electrostatic Discharge:	<15.0 kV
Recommended limit:	<5 kV
Magnetic Field:	<1 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV and <50 A (open circuit voltage)
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV and <100 A (open circuit voltage)
Recommended limit:	<500V
COOLING REQUIREMENTS	
Allow 76.2 mm (3 in.) in front and behind for adequate air flow	
POWER REQUIREMENTS	
Voltages (true RMS):	
115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)
Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 184 V-A (90V, 60Hz)
	230V setting; 230 V-A (200V, 50Hz)
Typical Power:	115 setting; 92 V-A (115V, 60Hz)
	230V setting; 115 V-A (230V, 50Hz)

Table 2-1. Environmental Requirements (cont'd)

Maximum Current (occurs during spin-up):	115V setting; 1.6A (true RMS at 90V, 60Hz) 230V setting; 1.0A (true RMS at 180V, 50Hz)
Typical Current:	115V setting; 0.80A (true RMS at 115V, 60Hz) 230V setting; 0.50A (true RMS at 230V, 50Hz)
Distortion:	<5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.

TILT

The drive shall meet all performance specifications when mounted in an upright orientation which maintains the horizontal plane of the device to within +/- 15 degrees of parallel to the horizon.

	115V Setting	230V Setting	Phase	Frequency
Operating Voltage (true RMS)	90-132V	180-254V	Single	47.5-66 Hz
Maximum Operating Current (true RMS)	1.6A at 90V	1.0A at 180V	Single	60 Hz
Typical Operating Current (true RMS)	1.15A at 115V	0.70A at 230V	Single	60 Hz
Maximum Operating Power (Volt/Amps)	184VA at 90V	230VA at 180V	Single	60 Hz
Typical Operating Power (Volt/Amps)	92VA at 115V	115VA at 230V	Single	60 Hz
Maximum Operating Power (Heat)	85W at 90V	85W at 180V	Single	60 Hz
Typical Operating Power (Heat)	65W at 115V	65W at 230V	Single	60 Hz

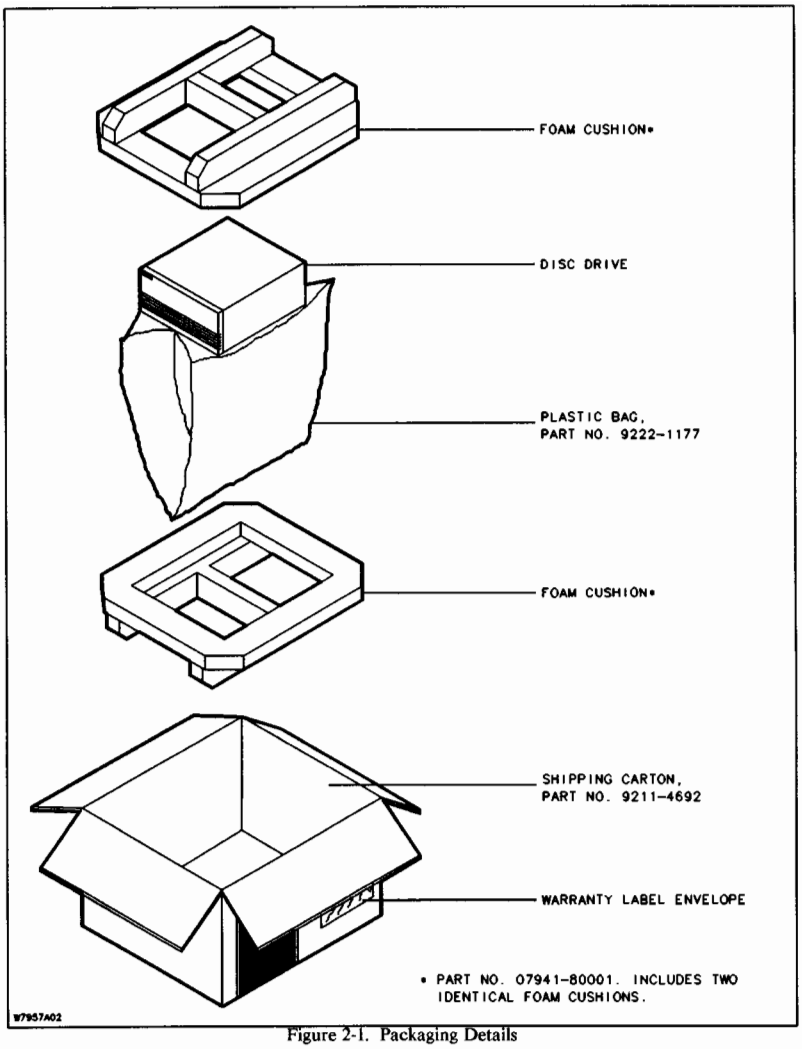


Figure 2-1. Packaging Details

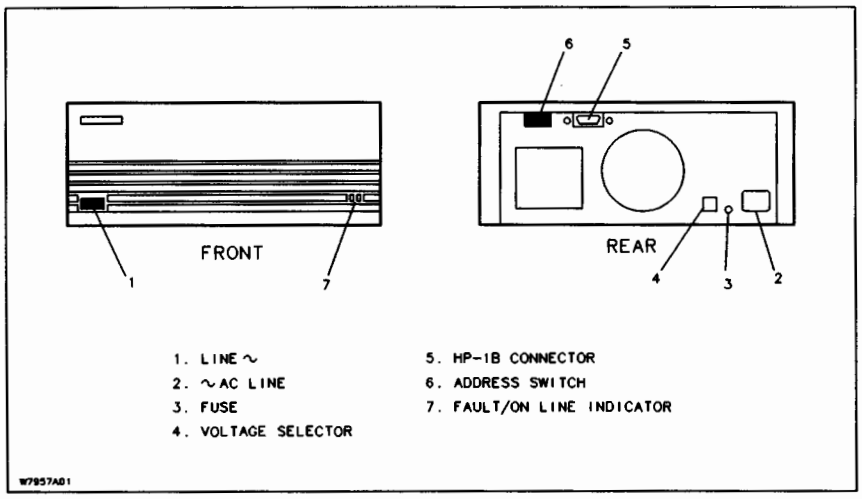


Figure 2-2. Controls and Connectors

2-7. HP-IB Interconnections

CAUTION

Do not connect or disconnect the HP-IB cable to the disc drive if the system is in an active state.

Do not power the disc drive down if the system bus is in an active state.

A 1-metre HP-IB cable is supplied with the disc drive. Other HP-IB cables available from the Corporate Parts Center are listed in table 2-2 (lengths must be within load limits specified in next paragraph).

Table 2-2. HP-IB Cables

CABLE LENGTH	HP PART NUMBER	PRODUCT NUMBER
0.5 metre	8120-3444	10833D
1.0 metre	8120-3445 *	10833A
2.0 metres	8120-3446 *	10833B
4.0 metres	8120-3447	10833C
6.0 metres	8120-3448	Not assigned
8.0 metres	8120-3449	Not assigned

*Prior to AUG 82, P/Ns were 5060-9455 & 5060-9456 respectively. (Identical cables - new vendor.)

Cabling is limited to one metre per HP-IB load. Typically, the host system is seven equivalent loads and the disc/tape drive is one equivalent load. In multi-drive systems, the HP standard allows seven metres of cable between the host and the nearest device, and one metre between each additional device. The maximum configuration is eight devices (not including the CPU) per HP-IB channel or a maximum of 15 metres or 15 equivalent loads (see figure 2-3). Refer to host configuration guides for any additional system limitations.

2-8. HP-IB Device Address

Set the HP-IB address according to figure 2-2.

2-9. Preventative Maintenance

No regularly scheduled PM is required.

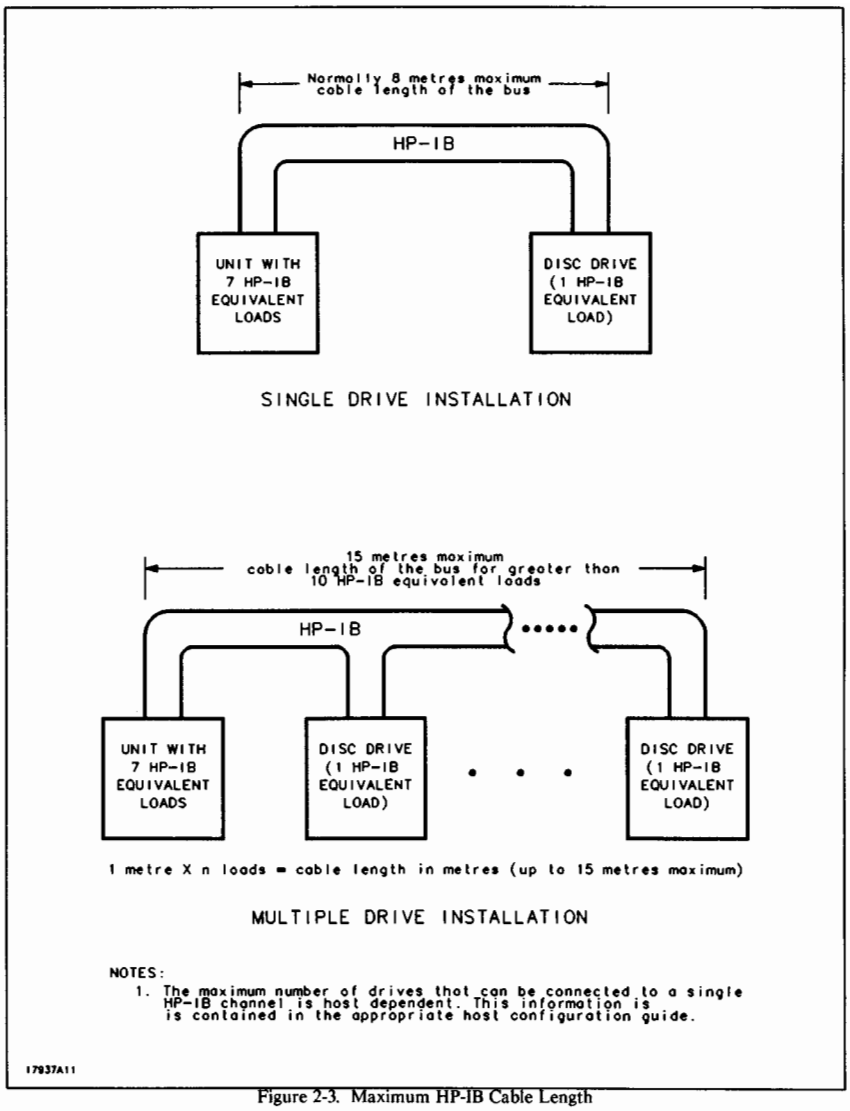


Figure 2-3. Maximum HP-IB Cable Length

Configuration 3

3-1. Introduction

This section not applicable for these products.

Troubleshooting 4

4-1. Self-Test

Figure 4-1 shows the self-test display. Refer to Section V for detailed self-test and diagnostic information.

4-2. PCA Location and Layout

CAUTION

The field-replaceable assemblies (FRA's) in the disc drive are electrostatic sensitive devices. Take appropriate precautions when removing the FRA's from the disc drive. Use of an anti-static pad and wrist strap is recommended. (These components are contained in the anti-static work station, part no. 9300-0749.) Immediately after removal, store the FRA's in anti-static, conductive plastic bags.

Figures 4-2 shows the location of the FRA's. Figures 4-3 through 4-6 show the layout and cable connections for each FRA.

4-3. Power Supply Voltage

WARNING

With ac power applied, hazardous voltages are present on the power supply assembly A3.

All power supply voltages can be measured on the power supply assembly A3 . Figure 4-5 shows the locations of the voltage test points and the values that should be measured at each one.

4-4. Troubleshooting

When troubleshooting the disc drive, the first thing to do is to determine if the fault is repeatable or intermittent. A repeatable fault usually causes the same self-test fail result to be presented each time self test is performed. An intermittent fault, on the other hand, occurs at random intervals, and may not always cause a self-test failure.

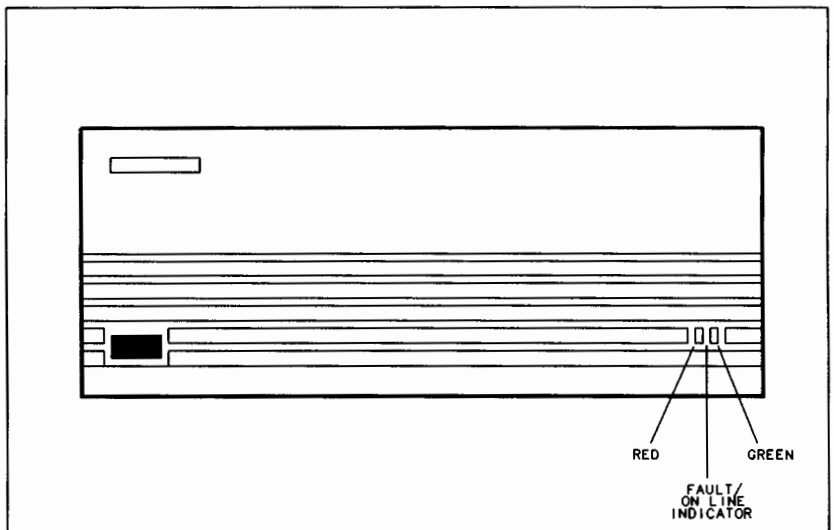
In the case of a repeatable fault, self test will identify the failing FRA with a 95 percent certainty. In the event that more than one FRA is listed as the possible cause of the failure, replace the FRA's one at a time, in the order given in the self-test display.

NOTE

Cable faults (an open cable conductor, loose cable connector, etc.) may present a multiple FRA failure message. The FRA's listed will be the FRA's at either end of the defective cable. All cabling should therefore be checked before replacing any FRA's.

Cables W1 and W3 are sufficiently long to allow PCA-A1 (disc drive assembly A1) to be connected into the circuit adjacent to the disc drive cabinet. This allows a substitute PCA-A1 to be connected into the circuit without removing PCA-A1 from the cabinet.

Attempt to isolate the fault to a specific FRA by running self test following the replacement of each FRA.



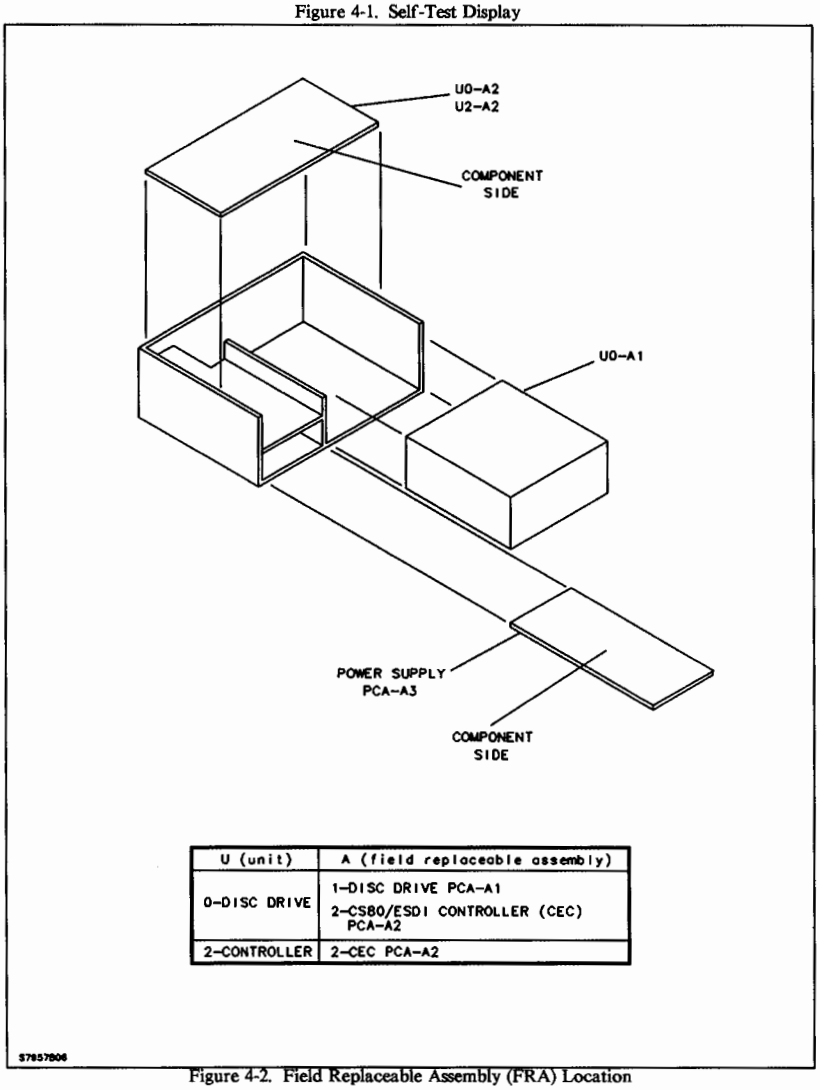
FAULT/ON LINE INDICATOR

RED	GREEN	
ON	ON	ON FOR 5 SECONDS AT POWER ON WHILE CONTROLLER RUNS SELF TEST AND DISC MECHANISM SPINS UP. IF EITHER CONTROLLER SELF TEST OR MECHANISM SPIN UP FAILS THEN BOTH LED's REMAIN ON.
OFF	FLASHING	EXECUTING SELF TEST OR DISC DRIVE ACTIVE.
ON	OFF	DISC DRIVE HAS FAILED MECHANISM SELF TEST THE DISC DRIVE MAY STILL BE ACCESSED BY THE HOST CPU TO RUN DIAGNOSTICS.
OFF	ON	DISC DRIVE IS IN A READY STATE
OFF	FLASHING	DISC DRIVE IS ACTIVE (i.e., PROCESSING A COMMAND)

W7957A04

Figure 4-1. Self-Test Display

Figure 4-1. Self-Test Display



U (unit)	A (field replaceable assembly)
0-DISC DRIVE	1-DISC DRIVE PCA-A1 2-CS80/ESDI CONTROLLER (CEC) PCA-A2
2-CONTROLLER	2-CEC PCA-A2

Figure 4-2. Field Replaceable Assembly (FRA) Location

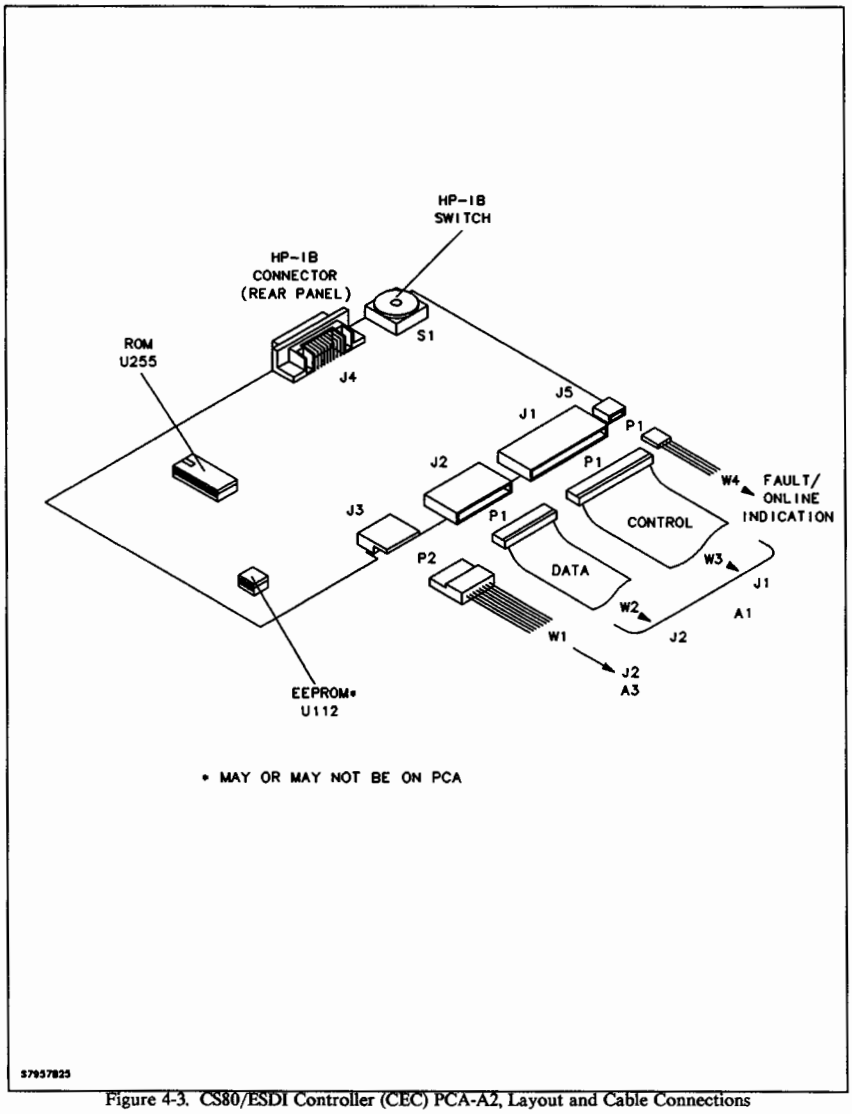


Figure 4-3. CS80/ESDI Controller (CEC) PCA-A2, Layout and Cable Connections

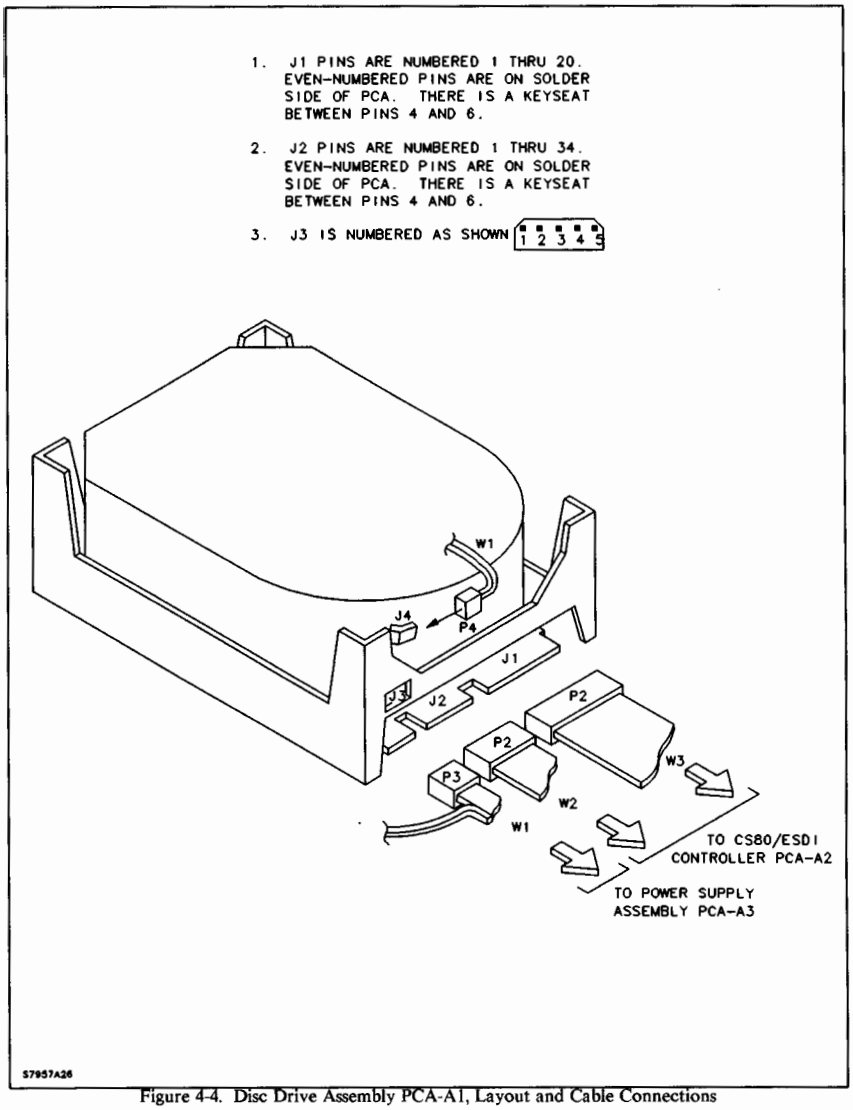
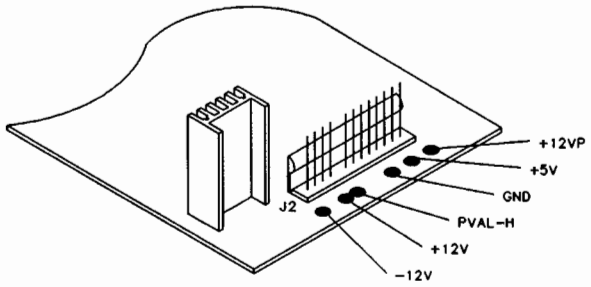


Figure 4-4. Disc Drive Assembly PCA-A1, Layout and Cable Connections



TEST POINT	VOLTAGE RANGE
-12V	-11.4 TO -12.6V
+12V	+11.64 TO +12.36V
PVAL-H	≥ +2.4V (TYPICALLY 4.0V)
+5V	+4.85 TO 5.15V
+12VP	11.0 TO 13.0V

NOTE: 1. -12V IS NOT USED IN THE HP 7957 AND HP 7958.
2. USE RET (GND) TEST POINT FOR VOLTMETER RETURN.
3. THE OUTPUT VOLTAGES ARE NOT ADJUSTABLE.
4. MAXIMUM RIPPLE:
5V SUPPLY: <50 mV P-P
12V SUPPLIES: <100 mV P-P

S7957A07

Figure 4-5. Power Supply (PCA-A3) Test Points and Voltages

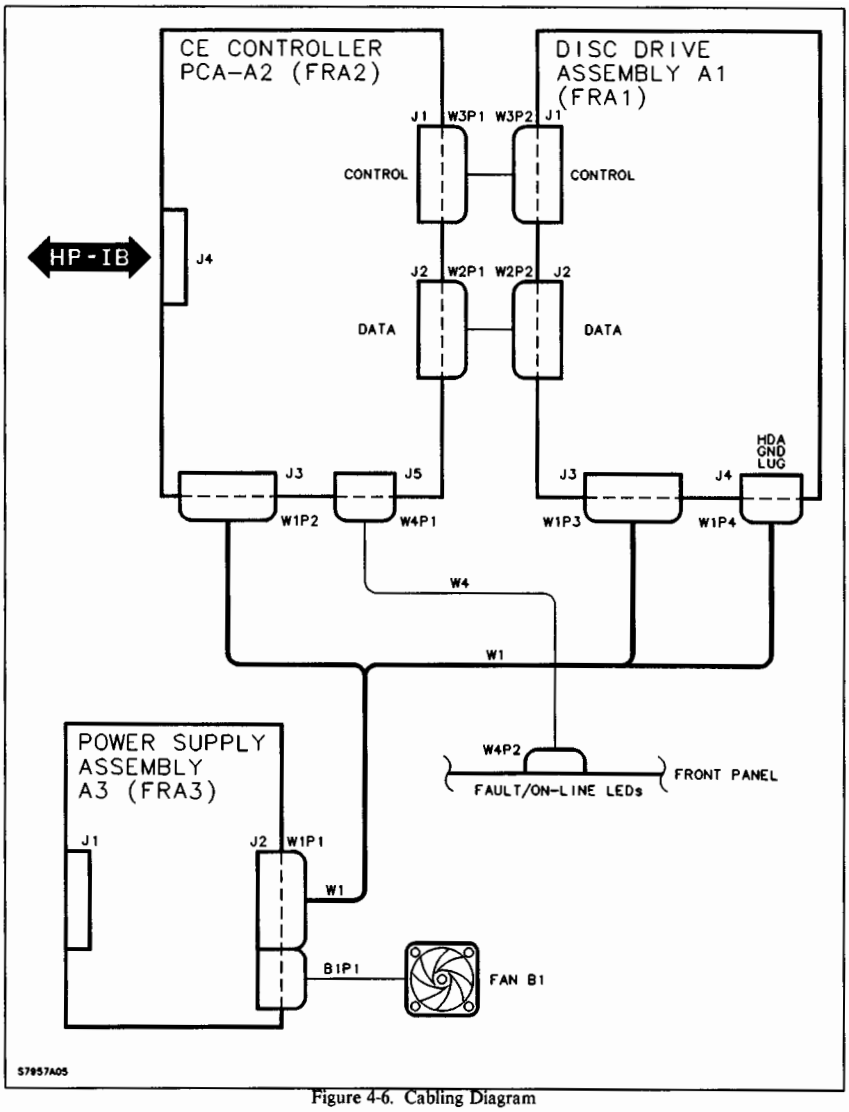


Figure 4-6. Cabling Diagram

Diagnostics 5

5-1. Initiate Diagnostics Command (DIAG)

The following options are available when using this command:

0 = initiates self-test
1 = initiates random seek test
2 = initiates outside diameter to inside diameter seek test
3 = initiates incremental seek test
4 = initiates butterfly seek test
5 = initiates EEPROM test (for disc drives with EEPROM only)

5-2. CS/80 Describe Command Response

In response to a CS/80 DESCRIBE command the disc CEC will respond with the following information:

```
CONTROLLER DESCRIPTION FIELD
INSTALLED UNIT <1 bit for each unit>:
****1000 0000 0000 0001****
MAXIMUM TRANSFER RATE: 1000 K-BYTES/SEC
CONTROLLER TYPE:  0
<INTEGRATED SINGLE-UNIT CONTROLLER>
```

UNIT 0 DESCRIPTION FIELD	7957A	7958A
GENERIC DEVICE TYPE: 0		
<FIXED DISC>		
HP PRODUCT NUMBER	079570	079580
NUMBER OF BYTES PER BLOCK	256	256
NUMBER OF BLOCKS THAT CAN BE BUFFERED	64	64
RECOMMENDED BURST SIZE	0	0
BLOCK TIME (microseconds)	265	265
CONTINUOUS AVE TRANS RATE <KBYTES/SEC>	900	900
OPTIMAL RETRY TIME (tens of millisec>	80	80
ACCESS TIME PARAMETER	500	500
MAXIMUM INTERLEAVE FACTOR	1	1

```
FIXED VOLUME BYTE <one bit per vol>:
****0000 0001****
REMOVABLE VOLUME BYTE <one bit per vol>:
****0000 0000****
```

VOLUME 0 DESCRIBE FIELD		
MAXIMUM CYLINDER ADDRESS	1012	1012
MAXIMUM HEAD ADDRESS	4	7
MAXIMUM SECTOR ADDRESS	62	62
MAXIMUM SINGLE-VEC ADDRESS	319094	510551
CURRENT INTERLEAVE FACTOR	1	1

5-3. Self-Test Controls

The disc drive self-test controls include a red/green FAULT/ON LINE indicator on the front panel (see Figure 5-1, Self-Test Display). Information regarding the use of these controls and indicators is provided in the following paragraphs.

5-4. Fault/On Line Indicator

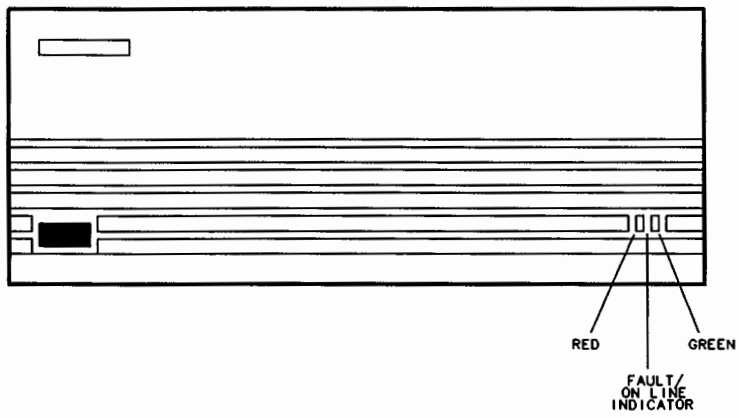
The FAULT/ON LINE indicator is a red/green display which signals the operating status of the disc drive. When line voltage is applied to the disc drive, the FAULT (red) and ON LINE (green) portions of the display will illuminate for 5 seconds while the CEC PCA-A2 runs Self-Test and the Disc Drive Assembly PCA-A1 spins up. Next, the green portion will flash during the time that the disc drive is executing its internal self-test routines. Self-Test takes between six and twelve seconds to complete. If the disc drive passes self-test, the display will change to a solid green. If the disc drive fails self-test, the display will change to a solid red with a flashing green indicating that the self-test failure has occurred, but that the self-test routines are still accomplishing some "housekeeping" tasks. When these tasks are complete, the green indicator will extinguish, indicating that the disc drive is ready to accept host commands such as diagnostics. The green indicator will flash again when the disc drive attempts to respond to these commands. A solid red and green display indicates that the CEC PCA-A2 has failed self-test.

After a successful self-test, a solid green display indicates that the disc drive is idle and a flashing green display indicates that the disc drive is active.

5-5. Internal Diagnostics

The disc drive internal diagnostics includes self-test routines and run time error and fault reporting circuits. The self-test routines, activated at power on, consist of a series of subtests which check the overall operation of the disc drives.

When the disc drive is powered on, the red and green LED's will both be on for about 5 seconds while the CEC PCA-A2 tests its memory. If the memory self-test fails, both LED's will remain on and the disc drive will not attempt to come on line. If the memory self-test passes then the red LED is turned off and the green LED flashes, as the self-test sequence establishes communications with the Disc Drive Assembly PCA-A1 to attempt seeks and read/write tests. If the Disc Drive PCA-A1 is unable to spin up there will be no index pulse to flash the green LED. A misleading front panel indication will occur for approximately 1 minute until the self-test times out and fails.



FAULT/ON LINE INDICATOR

RED	GREEN	
ON	ON	ON FOR 5 SECONDS AT POWER ON WHILE CONTROLLER RUNS SELF TEST AND DISC MECHANISM SPINS UP. IF EITHER CONTROLLER SELF TEST OR MECHANISM SPIN UP FAILS THEN BOTH LED's REMAIN ON.
OFF	FLASHING	EXECUTING SELF TEST OR DISC DRIVE ACTIVE.
ON	OFF	DISC DRIVE HAS FAILED MECHANISM SELF TEST THE DISC DRIVE MAY STILL BE ACCESSED BY THE HOST CPU TO RUN DIAGNOSTICS.
OFF	ON	DISC DRIVE IS IN A READY STATE
OFF	FLASHING	DISC DRIVE IS ACTIVE (i.e., PROCESSING A COMMAND)

W7957A04

Figure 5-1. Self-Test Display

This portion of the self-test, tests the Disc Drive PCA-A1 and normally requires 10 to 15 seconds to complete. If this portion passes the disc drive comes on line and the red LED will be off and the green LED will be on indicating a drive ready state.

If the Disc Drive Assembly PCA-A1 fails self-test the red LED will light and the green LED will be off. The disc drive will come on line and the diagnostic result bit will be set. It is strongly recommended that the host not attempt to access data on the disc drive or issue commands to the disc drive if the power-on self-test has failed.

Note: Faults which occur during run time do not affect the red or green LED.

After power-on and completion of self-test, circuits monitor the operation of the disc drive and log run time errors and faults on the maintenance track. Details of these two diagnostics tools are provided in the following paragraphs. Refer to table 5-1 for a summary of supported utilities.

5-6. Self-Test

Self-test consists of the following subtests:

- Microprocessor Self-Test
- RAM Self-Test
- ROM Checksum Test
- HP-IB Interface IC Loopback Test
- Buffer Self-Test
- Hardware/Firmware Initialization
- Select A Drive
- Command Complete
- ESDI Status Check
- Reset Attention
- Check for Drive Ready
- Request Configuration
- Mechanism Self-Test

Table 5-1. Supported Utilities

CS/80 NO EXECUTION MESSAGE (no information is returned to host)

Clear Logs
Preset

CS/80 SEND EXECUTION MESSAGE (drive returns information to host)

Read Fault Log
Read Run Time Error Log
Read Error (ERT) Log
Measure Seek Time
Read Spare Table
Locate and Read Full Sector
Servo Test
Pattern Error Rate Test (ERT)*
Random Pattern Error Rate Test (ERT)*
Read Only Error Rate Test (ERT)*
Random Read Only Error Rate Test (ERT)*
Read ROM Revision Number

*These utilities provide both a NO EXECUTION MESSAGE and a SEND EXECUTION MESSAGE depending upon the bits set in the "Initiate Utility" command. Refer to paragraph 5-28.

- Read Write ECC Test
- Build Spare Tables
- Seek With Verify Position
- Copy EEPROM Logs to Self-Test Cylinder (for disc drives with EEPROM only)
- Finish HP-IB Interface IC Initialization

These self-test routines are stored in the ROM on the CEC PCA-A2. The host can determine the details of self-test failures at the Select A Drive Subtest point by using the CS/80 Request Status Command.

5-7. Self-Test Subtests

5-8. Microprocessor Self-Test

Note: Hardware forces the LED's ON when a power-on reset condition occurs.

Limitations: This self-test is by no means intended to be a thorough test of the operation of the microprocessor or even a sufficient subset of the microprocessor's operation.

Process: The X and D registers are loaded with C355hex (H). The Y and U registers are loaded with 3CAAH. The registers are compared against the loaded values and a mismatch in any register causes the firmware to loop forever at the point where the error was detected. The purpose of the infinite loop is to assure that the CEC PCA-A2 will not attempt to come on line.

Fault Reporting: The only means of communicating a failure to the user is through the two LED's. Both the red and green LED's will remain on indefinitely.

Note: Without monitoring the address of the firmware loop this fault will be indistinguishable from RAM Self-Test failure, ROM Checksum Failure, or a Buffer Self-Test failure.

5-9. RAM Self-Test

Limitations: This is a 2k RAM which the microprocessor uses for its stack and for variables. Each byte is tested for stuck at one and stuck at zero.

Process: A 3-byte pattern (00H, A5H, C3H) is written to the RAM. The RAM is read to make certain each byte contains the correct value. The RAM is rewritten with another 3-byte pattern (FFH, 5AH, 3CH) such that each byte is written with the complement of the value it received on the first write pass. The RAM is read and each byte is compared against the value it should contain.

If a failure occurs, the firmware enters an infinite loop. The disc drive is not allowed to come on line.

Fault Reporting: The only means of communicating a failure to the user is through the two LED's. Both the red and green LED's will remain on indefinitely.

Note: Without monitoring the address of the firmware loop this fault will be indistinguishable from a Microprocessor Self-Test Failure, ROM Checksum Failure, or a Buffer Self-Test failure.

5-10. ROM Checksum Test

A checksum is calculated and compared to the ROM's checksum.

Process: If a failure occurs, the firmware enters an infinite loop. The drive is not allowed to come on line.

Fault Reporting: The only means of communicating a failure to the user is through the two LED's. Both the red and green LED's will remain on indefinitely.

Note: Without monitoring the address of the firmware loop this fault will be indistinguishable from a Microprocessor Self-Test Failure, RAM Self-Test Failure, or a Buffer Self-Test Failure.

5-11. HP-IB Interface IC Loopback Test

Limitations: Data patterns are written to the internal Outbound FIFO and are read back through the Inbound FIFO. A check is made to see that the last byte is tagged with EOI as it should be. This test does not attempt to check functionality of most of the interrupts. It cannot verify the ability of the circuit to control lines over the HP-IB interface.

Process: If this test fails the firmware will loop indefinitely. The disc drive will not come on line.

Fault Reporting: The only means of communicating a failure to the user is through the two front panel LED's. Both the read and green LED's will remain on indefinitely.

Note: Without monitoring the address of the firmware loop this fault will be indistinguishable from a Microprocessor Self-Test Failure, a RAM Self-Test Failure, or a Buffer RAM Self-Test Failure.

This test is not available through the diagnostics command option 0. It only occurs as part of the power-on sequence.

5-12. Buffer Test

Limitations: These are the two buffers (0 and 1) which the DMA uses to buffer data transfers between the host and the Disc Drive Assembly PCA-A1. It is also used to receive commands from the host and to return reports and execution messages to the host.

Each byte is tested for stuck at one and stuck at zero.

Process: A 3-byte pattern (00H, A5H, C3H) is written to the buffers. The buffer is read to make certain each byte contains the correct value. The buffer is rewritten with another three byte pattern (FFH, 5AH, 3CH) such that each byte is written with the complement of the value it received on the first write pass. The buffer is read and each byte is compared against the value it should contain.

If a failure occurs, the firmware enters an infinite loop. The drive is not allowed to come on line.

The self-test which is done as a result of an initiate Diagnostic command also does a walking one and a walking zero test on each byte of the buffer.

Fault Reporting: The only means of communicating a failure to the user is through the two LED's. Both the red and green LED's will remain on indefinitely.

Note: Without monitoring the address of the firmware loop this fault will be indistinguishable from a Microprocessor Self-Test Failure, ROM Checksum Failure, or a RAM Self-Test Failure.

5-13. Hardware/Software Initialization

Process: The Disc CEC PCA-A2 IC is initialized and placed in a benign state. The HP-IB interface IC is initialized to a harmless state, but its initialization is not complete at this point. Certain status and global variables are initialized to their power-on values. The spare table is cleared and the error rate test table is initialized. The seek variables are initialized.

Fault Reporting: No self-test is associated with this step in the power-on process so no faults are detected.

The preceding portion of self-test normally takes about 2-3 seconds to execute.

5-14. Select A Drive

Limitations: This CEC PCA-A2 was designed to support only a single Disc Drive Assembly PCA-A1. Therefore, the Disc Drive Assembly PCA-A1 will always be selected by the firmware.

Process: The ESDI drive select line for Disc Drive Assembly PCA-A1 is asserted. Up to 60 seconds is allowed for the Disc Drive Assembly PCA-A1 to assert the drive selected line in response. If the drive selected line is not asserted within the timeout period the mechanism self-test will terminate and the disc drive will not attempt to come on line. The disc drive is not allowed to come on line because the "drive not selected" condition may be the result of a disconnected ESDI Data Cable (W2). If this is the case the READ CLOCK to the DDC IC which would make DMA transfers to the host impossible.

Fault Reporting: In this case both LED's are on solid. In the second case, the disc drive comes on line and reports self-test fault #69 in P7 and P3. The diagnostic result bit will be set. P1 contains the code for the first suspect FRA. It will be 1 (Disc Drive Assembly PCA-A1). P2 contains the code for the second suspect FRA. a two (2) indicates the CEC PCA-A2. The ribbon cables between the CEC PCA-A2 and the Disc Drive Assembly PCA-A1 are also suspect but no FRA number exists for this component.

Note: Disc Drive Assembly PCA-A1 must be de-selected and re-selected as part of the initialization. If the disc drive fails to respond with "drive selected" then the "Can't Select Drive" diagnostic fault is generated. The remainder of the self-test and initialization is skipped and the disc drive comes on line to report the fault.

Once the power-on sequence completes Select A Drive the disc drive will always come on line and report the nature of subsequent self-test failures using the CS/80 status bytes P1, P2, P3, P7, P8, and P9. This does not mean that subsequent self-test failures are less critical or that the disc drive is operable. On the contrary, it is strongly advisable for the host not to issue commands to the Disc Drive Assembly PCA-A1 after any self-test failure. If the diagnostic result bit is set during the power on self-test, any operation initiated by the host can have unpredictable results.

The only reason that the disc drive is allowed to come on line is to report the nature of the self-test failure to the operator.

At this point in the power-on process the red LED will be turned off. The green LED will blink if an index pulse is available from the Disc Drive Assembly PCA-A1.

5-15. Command Complete

Process: The CEC PCA-A2 will wait up to 60 seconds for the Disc Drive Assembly PCA-A1 to assert the ESDI command complete line. If the command complete line is not asserted within the timeout period a fault will be generated. The remainder of the self-test and initialization is skipped and the disc drive comes on line to report the fault.

Fault Reporting: The disc drive comes on line and reports self-test fault #70 in P7 and P3. The diagnostic result bit will be set. P1 contains the code for the first suspect FRA. A one (1) indicates Disc Drive Assembly PCA-A1. P2 contains the code for the second suspect FRA. A two (2) indicates CEC PCA-A2. The ribbon cables between the CEC PCA-A2 and the Disc Drive Assembly PCA-A1 are also suspect but no FRA number exists for this component.

Note: At this point it is strongly advisable for the host not to attempt any further operations with the disc drive. If the host attempts to run utilities or diagnostics, unpredictable results will occur. For example, diagnostics may return a status of pass without having done anything. This result comes from the fact that configuration was not executed.

5-16. ESDI Status Check

Process: This is the first time that the CEC PCA-A2 attempts to send a command over the ESDI serial communication line. More than one type of fault can arise.

An ESDI request status command is sent to the Disc Drive Assembly PCA-A1. The Disc Drive Assembly PCA-A1 should respond with a 16-bit general status word. If the status is successfully received from the Disc Drive Assembly PCA-A1 the vendor unique status bit is checked. If the vendor unique status bit is set, the vendor unique status is requested from the Disc Drive Assembly PCA-A1, a fault is generated, and the fault number, ESDI status and least significant byte of the vendor unique status are returned to the host. Information from the 16-bit word is compressed into the ESDI status word.

If the vendor unique status available bit is not set then several of the other status bits are checked. If any of these bits are set, a fault is generated. The fault and ESDI status will be returned to the host.

```
Compressed ESDI status bits:
          7 = SMS-spindle motor stopped
          6 = PON-power-on conditions exist/
            start spindle motor command may
            be required
          5 = CDP- command data parity fault
          4 = IF-interface fault
          3 = IC-invalid or unimplemented command
          2 = SF-seek fault
          1 = WG-write gate with track offset fault
          0 = 1-write fault
```

Note: Bit 6 is expected to be set during a fault condition.

Note: Retry commands are transparent to the self-test procedure. If the ESDI communication fails but a retry is successful, the self test will pass and none of the bits listed above should be set.

Fault Reporting: If the vendor unique status bit is set, fault #76 will be placed in P3. The first suspect (P1) is the Disc Drive Assembly PCA-A1. The second suspect (P2) is set to zero which implies that the guilty party is known with sufficient confidence that no second suspect is necessary.

```
P7 = fault 76
P8 = compressed ESDI statues
P9 = least significant byte of vendor unique status
```

If one of the ESDI status bits is set indicating that the Disc Drive Assembly PCA-A1 is in an unexpected state then:

```
P1 = Disc Drive Assembly PCA-A1
P2 = zero
P3 = fault 71
P7 = fault 71
P8 = compressed ESDI status
P9 = least significant byte of vendor unique status
```

5-17. Reset Attention

Process: The ESDI reset attention command is sent to the Disc Drive Assembly PCA-A1. This command deasserts the attention line and clears the status. A fault occurs if an ESDI communication timeout occurs and the retries are exhausted or if the attention line is still asserted after the reset attention command is sent.

Fault Reporting: The disc drive comes on line and reports self-test fault #75 in P3. The diagnostic result bit will be set. P1 contains the code for the first suspect FRA. A one (1) indicates Disc Drive Assembly PCA-A1. P2 contains the code for the second suspect FRA. A two (2) indicates CEC PCA-A2. The ribbon cables between the CEC PCA-A2 and the Disc Drive Assembly PCA-A1 are also suspect but no FRA number exists for this component.

P7 will contain either fault #75 if the attention line was not reset or a fault number describing the ESDI communication problem if that condition occurred. P8 and P9 will contain the status associated with the fault number stored in P7.

Note: At this point it is strongly advisable for the host not to attempt any further operations with the disc drive. If the host attempts to run utilities or diagnostics, unpredictable results will occur. For example, diagnostics may return a status of pass without having done anything. This result comes from the fact that configuration was not executed.

5-18. Check for Drive Ready

Process: The firmware will read the ESDI drive ready line. If drive ready is not asserted a fault is generated.

Fault Reporting: The disc drive comes on line and reports self-test fault #72 in P3 and P7. The diagnostic result bit will be set. P1 contains the code for the first suspect FRA. A one (1) indicates Disc Drive Assembly PCA-A1. P2 contains the code for the second suspect FRA. A two (2) indicates CEC PCA-A2. The ribbon cables between the CEC PCA-A2 and the Disc Drive Assembly PCA-A1 are also suspect but no FRA number exists for this component. P8 and P9 will contain the compressed ESDI status and vendor unique status respectively.

Note: At this point it is strongly advisable for the host not to attempt any further operations with the disc drive. If the host attempts to run utilities or diagnostics, unpredictable results will occur. For example, diagnostics may return a status of pass without having done anything. This result comes from the fact that configuration was not executed.

5-19. Request Configuration

Process: The ESDI request configuration command is used to determine capacity and feature characteristics of the Disc Drive Assembly PCA-A1. The information which the Disc Drive Assembly PCA-A1 returns is not bounds checked, but is assumed to be correct. The only faults which can result from this step in the initialization process are ESDI communication faults.

Note: The configuration process issues a set number of unformatted bytes per sector command. This command overrides the 63 sector configuration set by internal jumpers. The Disc Drive Assembly PCA-A1 is now configured for 325 bytes per sector which results in 64 sectors per track.

Fault Reporting: The disc drive comes on line and reports self-test fault #73 in P3. The diagnostic result bit will be set. P1 contains the code for the first suspect FRA. A one (1) indicates Disc Drive Assembly PCA-A1. P2 contains the code for the second suspect FRA. A two (2) indicates CEC PCA-A2. P7 will contain the fault number describing the ESDI communication problem. P8 and P9 will contain the status associated with the fault number stored in P7.

Note: At this point it is strongly advisable for the host not to attempt any further operations with the disc drive. If the host attempts to run utilities or diagnostics, unpredictable results will occur. For example, diagnostics may return a status of pass without having done anything. This result comes from the fact that configuration was not executed.

5-20. Disc Drive Assembly PCA-A1 Self-Test

Limitations: The Disc Drive Assembly PCA-A1 self-test is not intended to be exhaustive or to verify the product specifications. It does attempt to determine if minimal read, write and seek capabilities exist.
Process: The Disc Drive Assembly PCA-A1 self-test is broken down into four major subtests.

1) seeks without position verify

2) Read, Write and ECC tests

3) Build Spare Tables

4) seeks on all heads with position verify after each seek

5-21. Seek Test Without Position Verify

Process: Logical seeks are performed with head 0 selected. The target tracks are 0, 1, 2, 4, 8 . . . max logical, 0, max logical, max logical - 1, max logical -2, max logical -4, max logical -8 . . . 0. Faults occur if the Disc Drive Assembly PCA-A1 reports a seek fault or ESDI communication problems arise. No attempt is made to read a header to verify that a seek actually occurred.
Fault Reporting:

```
P1 = 1 (Disc Drive Assembly PCA-A1)
P2 = 2 (CEC PCA-A2)
```

```
P3 = 77 Disc Drive Assembly PCA-A1 self-test failed
P7 = fault #
P8 = status associated with fault # in P7
P9 = status associated with fault # in P7
```

5-22. Read Write ECC Test

Limitations: A sector may be found which can be read and written 10 times without an error yet still contain a slight media defect. The defect could cause some inconsistency in the ECC test results.

Process: There are two phases to the Read/Write ECC test. The first consists of finding a sector which can be written and read 10 times without a data error. This sector is then assumed to be free of major media defects and so it is used for the second phase which is the ECC portion of the test.

The test begins with a physical seek to the outside-diameter (OD) self-test cylinder which is at physical cylinder 0. Starting on head 0, up to 5 sectors are tried in an attempt to find one which can be read and written 10 times without an error. If five sectors are tried unsuccessfully self-test fault #67 is generated to indicated that the Read/Write retry count was exhausted. If any other fault is detected during the read/write test it will be reported. As soon as a fault occurs testing stops.

When a sector is found that can be read and written without an error the ECC test is performed. This consists of writing an uncorrectable data error on the sector. The sector is read and an uncorrectable error must be detected. A correctable error is written and it must be read back as a correctable error. The corrected data is checked to make certain that the errors were accurately corrected. The final step is to rewrite the sector with no error. An ECC test failure results in fault #68.

The tests outlined in the preceding two paragraphs are repeated for each head at the OD self-test cylinder and again for each head on the inside diameter (ID) self-test cylinder.

Each time a sector is read as part of the read/write test the data is compared against that which was written. Any mismatch which was not detected by the ECC is flagged as a fault #66. Fault #66 is a self-test data compare error. The data is read into various locations in the buffer space in an attempt to guarantee the integrity of the buffer RAM addressing and the DMA.

Fault Reporting: The three most likely faults to be generated are:

```
66 self-test data compare error
67 self-test read/write retry count exhausted
68 ECC test failed
```

The errors would be reported in P3 and P7.

```
For Faults 66 and 68: P1 = 2 (CEC PCA-A2)
                      P2 = 0 (no second suspect)
For Fault 67:         P1 = 1 (Disc Drive Assembly PCA-A1)
                      P2 = 2 (CEC PCA-A2)
```

5-23. Build Spare Tables

Since the spare table is not stored on a maintenance track, it must be built at power on. A seek is done on each head and the sector header is read. If the flag byte indicates that there is a spare track in use, then the header cylinder value is entered in the table for the head being accessed. If the spare table cannot be built

(due to data errors or faults) then no spares will be in the spare table. However, if an attempt is made to access a spared out track, a Unit Fault will be reported.

5-24. Copy EEPROM Logs to Self-Test Cylinder (drives with EEPROM only)

Process: This procedure will not generate a self-test fault. It is intended as a debug aid for manufacturing. The entire 512 byte EEPROM is copied to maximum logical sector -1 and maximum logical sector of each head on the OD self-test cylinder. It is hoped that one of these redundant copies will be readable when the Disc Drive Assembly PCA-A1 is returned to the factory.

Faults can be generated during the process of copying the EEPROM to the self-test cylinder but the diagnostic result bit should not be set.

5-25. Finish HP-IB Interface IC Initialization

Process: No self-test faults can be generated by this step. The HP-IB Interface IC initialization is completed. The green light is turned on solid (blink is set to off). The interrupts are enabled.

5-26. Request Status

If an Initiate Diagnostic command (DIAG) is issued to the disc drive and an execution message returns a QSTAT of 1, this means that a self-test error has occurred. A Request Status command (REQSTAT) should be issued to obtain the reason for the previous QSTAT of 1. When the Request Status command is executed, a 20-byte field is returned. This field is defined in the *CS/80 Instruction Set Programming Manual*, part no. 5955-3442. When self-test is executed and it fails, the Diagnostic Result Bit (bit 24) will be set in the Fault Error Field (sometimes referred to as the Error Fault Field) of the 20 bytes returned from the Request Status command. When bit 24 is set, P1, P2, P3, P7, and P8 contain specific self-test results, as detailed below:

- P1 - Identifies the most suspect FRA:
  1 = PCA1 (Disc Drive Assembly A1)
  2 = PCA2 (CEC PCA-A2)
- P2 - Identifies the next most suspect FRA:
  Same code as P1
- P3 - Failed disc drive (unit 0) self-test subtest.
  Refer to table 5-2
- P7 - Failed disc drive error condition.
  Refer to table 5-2
- P8 - Details of failed disc drive error condition.
  Refer to table 5-2

5-27. Request Status Example

The following example shows how to interpret P1, P2, P3, P7 and P8 returned for a Request Status command following a self-test failure.

P1 = 1
P2 = 2
P3 = 4E (hex)
P7 = 4E
P8 = 0000 0100

P1 indicates that the most suspect FRA is PCA-A1 (Disc Drive Assembly [HDA]). P2 indicates that the next most suspect FRA is PCA-A2 (CS80/ESDI Controller [CEC]). P3 indicates that the failed self-test subtest is 4E (hex) which is defined in table 5-2 as "One of the 4 seek diagnostic tests failed". P7 contains the fault code 4E and P8 contains the ESDI status with bit 2 set indicating a seek fault.

Note: P7 may contain a fault code other than 4E if more detailed information on the cause of the failure is available.

NOTE

The OFFSET and REPORT bytes are don't care bytes for these products.

5-28. Utilities

Utilities are firmware routines which perform error rate tests, access error logs, access fault logs and access the spare table. The utilities may be initiated through the CS/80 command "Initiate Utility". The utilities are classified by the method through which they are invoked. Table 5-1 includes all the supported utilities. This product does not support utilities which receive execution messages.

The format for the "Initiate Utility" command is:

<INITIATES Utility> <Micro Code> <up to 8 parameter bytes>

Initiate utility = 001100XX
Where XX: 00 = no execution message
01 = not supported on 7957A/7958A
10 = device will send execution message text

5-29. Run Time and Fault Logs (Media Based)

The Run Time (RT) Error Log and Fault Log contain data error information and fault information, respectively. The Run Time Error Log and Fault Log are stored in four contiguous sectors on physical cylinder 0. The Fault Log has a capacity for recording 46 faults and are written over in a FIFO fashion. The Run Time Error Log has a capacity for recording 50 faults and are written over in a FIFO fashion. The ERT log is RAM based and contains information on data errors which occur during error rate testing.

During a run time operation, marginal and nonrecoverable data errors are immediately logged to the Run Time Error Log. The CEC PCA-A2 will not be able to respond to commands for a period of 100 ms while the error information is being stored in the Run Time Error Log. The disc drive does not request release to store the error information. The Read Run Time Error Log utility extracts the run time error information from the maintenance track and returns it to the host.

Faults which occur during utilities/diagnostics and run time activities are, with a few exceptions (see fault ranges), stored in the maintenance track Fault Log. The CEC PCA-A2 will not respond to commands for 100 ms while a fault is being logged. Release is not requested to log a fault. Each fault creates a unique log

entry. (An occurrence count of faults is not stored.) The Read Fault Log utility extracts the fault information from the Fault Log and returns it to the host. Error codes are listed in table 5-2. Codes are divided in functional groups for ease of use. Each group of faults identifies which parameter byte(s) is affected by the fault.

5-30. Run Time and Fault Logs (EEPROM Based)

The Run Time (RT) Error Log and Fault Log contain data error information and fault information, respectively. The Run Time Error Log and Fault Log are stored in an EEPROM on the CEC PCA-A2. The size of the EEPROM limits the total number of entries for both logs to 50. The ERT log is RAM based and contains information on data errors which occur during error rate testing.

NOTE

Maintenance tracks are not used to store fault or error information.

During a run time operation, marginal and nonrecoverable data errors are immediately logged to the Run Time Error Log. The CEC PCA-A2 will not be able to respond to commands for a period of 100 ms while the error information is being stored in the Run Time Error Log. The disc drive does not request release to store the error information. The Read Run Time Error Log utility extracts the run time error information from the EEPROM and returns it to the host.

Faults which occur during utilities/diagnostics and run time activities are, with a few exceptions (see fault ranges), stored in the EEPROM Fault Log. The CEC PCA-A2 will not respond to commands for 100 ms while a fault is being logged. Release is not requested to log a fault. Each fault creates a unique log entry. (An occurrence count of faults is not stored.) The Read Fault Log utility extracts the fault information from the Fault Log and returns it to the host. Error codes are listed in table 5-2. Codes are divided in functional groups for ease of use. Each group of faults identifies which parameter byte(s) is affected by the fault.

5-31. EEPROM

The EEPROM is used as a circular buffer where the oldest information is overwritten once the buffer is full. Since the process of overwriting old fault/error information is anticipated, a fault is not generated when it occurs. There will be a total of 50 entries in the EEPROM. Faults and run time errors are interspersed in the EEPROM. They are distinguishable by the fault code value.

ERROR 20H . . . 3FH
FAULT 1 . . . 1FH, 40H . . . FFH

Note: A fault may be generated when reading from or writing to the EEPROM log. A location in the EEPROM is reserved as a pointer for the circular buffer. If this pointer does not contain a legal EEPROM address a 'corrupted EEPROM' fault is generated. This fault is reported to the host and the EEPROM logs will automatically be cleared in an attempt to restore the logs to a usable state. There are three causes for this fault condition:

(1) The CEC PCA-A2 was shipped from the factory without first initializing the pointer.
(2) The CEC PCA-A2 lost power while updating the pointer.
(3) A hardware problem exists which renders the EEPROM unusable.

The EEPROM structure is as follows:

Bytes 0-2 = Pointer
Bytes 2-7 = Number of sectors read
Bytes 8-507 = Log entries

Run time data errors take the following format in the EEPROM:

Current physical cylinder	2 bytes
Current physical head	1 byte
Current logical cylinder	2 bytes
Current logical head	1 byte
Logical sector	1 byte
Fault Code (most recent error)	1 byte
Error Byte	1 byte
Occurrence Count	1 byte

Faults take the following format in the EEPROM:

Current logical cylinder	2 bytes
Current logical head	1 byte
Target logical cylinder	2 bytes
Target logical head	1 byte
Logical sector	1 byte
Fault Code	1 byte
Status byte	1 byte
Status byte	1 byte

Note: Run time errors and faults take on a slightly different format in the execution message of a read fault log or read run time log utility command. Refer to paragraphs 5-42 and 5-43.

Faults are distinguished from data errors by the fault code number. Errors are in the range 20H through 3FH. Fault code numbers may have any other number except 0 which is reserved.

5-32. Fault Status Bytes

The contents of the two status bytes which are associated with a Fault entry depends on Fault code of that entry. The range of all possible Fault codes (00H . . . FFH) has been divided into subranges for the purpose of defining appropriate contents for the status bytes (refer to table 5-2 for a listing of error codes).

```
 1-1FH   Faults not logged on maintenance track
         Faults not logged in EEPROM
20-3FH   Data errors NO fault log entry
40-4FH   Status1 = compressed ESDI status,
                 Status 2 = vendor unique status
50-5FH   Status1 = 0, Status2 = 0
60-6FH   Status1 = compressed ESDI status,
                 Status2 = vendor unique status
70-8FH   Status1 = Disc Controller IC Status reg,
                 Status2 = Disc Controller IC error reg
90-AFH   Status1 = compressed ESDI status,
                 Status2 = vendor unique status
B0-DFH   Status1 = 0, Status2 = 0
E0-FFH   Status1 = compressed ESDI status,
                 Status2 = vendor unique status
```

Compressed ESDI status:

```
bit 0 = write fault
bit 1 = write gate with track offset
bit 2 = seek fault
bit 3 = invalid or unimplemented command
bit 4 = interface fault
bit 5 = command data parity fault
bit 6 = power on conditions exist
bit 7 = spindle motor stopped
```

Disc Controller IC Status Register:

```
bit 0 = header fault
bit 1 = next disc command
bit 2 = header match completed
bit 3 = local request
bit 4 = remote command busy
bit 5 = local command busy
bit 6 = correction cycle active
bit 7 = error detected
```

Disc Controller IC Error Register:

```
bit 0 = header failed although sector matched
bit 1 = data field error
bit 2 = sector not found
bit 3 = sector overrun
bit 4 = no data sync
bit 5 = FIFO data lost
bit 6 = correction failed
bit 7 = late interlock
```

Vendor Unique status:

Only the least significant byte of the first word of vendor unique status is saved. This information is not available to the field.

5-33. Physical Address Reporting

Faults will normally be reported with a logical address as is shown in paragraph 5-42. If the seek preceding the occurrence of the fault was a physical seek then the current logical cylinder and target logical cylinder will be replaced by a current physical cylinder and a target physical cylinder. The exercisers and test systems are informed of the switch by setting the most significant bit of the cylinder address.

5-34. Run Time Sectors Read Count (Media and EEPROM Based)

The CEC PCA-A2 maintains an estimate of the number of sectors read during run time (i.e., not utility or diagnostic) commands. An estimate of the number of sectors read per head is returned to the host in the header of the read run time log execution message.

The 'estimate' is given to the count for several reasons. The count is not kept on an individual head basis as is the case for the ERT sectors read count. The run time sectors read count is a total for all heads, which is

divided by the total number of heads, to give an estimate of the number of sectors read by an individual head.

The count is also compromised by the fact that it is initially kept in RAM. The count is only moved to a more permanent location (maintenance track or EEPROM) when a run time marginal/unrecoverable data error occurs or the utility command PRESET is issued. Therefore, if power is lost before the RAM based count is added to the EEPROM based count, an inaccuracy equal to the RAM based count occurs.

Note: Reading the run time error log also updates the EEPROM count with the total of the RAM based count and the EEPROM count.

5-35. Error Rate Test (ERT) Log

The RAM based ERT table will store data error information on a maximum of 50 locations.

The log is allocated in the following way:

```
        sectors read head 0       5 bytes
        sectors read head 1       5 bytes
                  .                 .
                  .                 .
                  .                 .
        sectors read head N*      5 bytes
                                -----------
                                  80 bytes

*N = 4 for HP 7957A (total bytes = 25 bytes)
*N = 7 for HP 7958A (total bytes = 40 bytes)

entry:physical cylinder         2 bytes
      physical head             1 byte
      physical sector           1 byte  (equal logical sector)
      logical cylinder          2 bytes
      logical head              1 byte
      logical sector            1 byte
      error byte                1 byte
      occurrence count          1 byte
                               ----------
                                10 bytes

               50 entries ===> 500 bytes
```

If the error rate tests are initiated via CS/80 using the 'send execution message' option, errors are reported immediately to the host and are not logged to the ERT log.

Both 'send execution' and 'no execution' ERT utilities keep a count of the sectors successfully read by individual heads. The sectors read count is read by the host through the read ERT log command.

5-36. Error Byte Description

The error byte is used by error rate test utilities and by the run time log to report the location of a data error and its severity to the host.


```
 error byte format:
        bit 7 = byte sync (no data sync or sector overrun)
        bit 6 = error in header field
        bit 5 = error in data field
        bit 4 = unrecoverable data error
                (all retries exhausted)
        bit 3 = ECC marginal data error
        bit 2 = retry marginal data error
                (more than 1 retry required)
        bit 1 = recoverable on the first retry
        bit 0 = FIFO data lost or track offset invoked

bits 5-7 describe the location
bits 1-4 describe the severity
```

Bit 0 of the error byte serves two functions.

(1) If bit 0 and bit 1 are set simultaneously, a FIFO data loss has occurred during a write operation. This is a condition from which the write firmware can recover. It is reported because a high frequency of occurrence can affect drive performance. None of the location bits will be set.

(2) The second function is reported when bit 0 is set along with bit 2, bit 3, or bit 4. This implies that the head had to be moved off track center to successfully read data. The error location and severity are accurate.

Note: The recoverable bit (bit 1) will not be set when bit 0 signifies track offset used for data recovery. This is because the first retry is always performed on track center. The two definitions for bit 0 are reported in a unique way so that there should be no confusion as to which meaning to assign to bit 0 if ERT's are run in send execution message mode.

(Confusion can occur when error bytes are "ORed" together in an ERT log entry.)

If a data error occurs more than once at the same location (i.e., same physical cylinder, physical head, and logical sector) on the disc, the error byte is 'OR'ed to give a cumulative report, and the occurrence count is incremented.

5-37. CS/80 No Execution Message Utilities

5-38. Clear Logs

```
MICRO OPCODE : 0CDH (205)
PARAMETERS   : 0 = clear all logs (run time/Fault
                   log and ERT log)
               1 = clear ERT log only
               2 = clear EEPROM logs (fault, run time
                   data error)
```

Clearing the ERT log clears all ERT entries. Clearing the fault logs clears all log entries.

5-39. Preset

```
MICRO OPCODE : 0CEH  (206)
PARAMETERS   : none
```

This command adds the RAM based run time sectors read count to the EEPROM based sectors read count and stores the total on the maintenance track or in the EEPROM. The RAM based count is cleared.

If this utility is used before scheduled system shutdowns, a more accurate sectors read count will be maintained.

5-40. Faults/Errors During Error Rate Testing

Faults: If a fault is encountered, the ERT is halted and the state of the machine is saved. QSTAT is set and the status will indicate the fault. The host may continue the test by sending the ERT command sequence with the loop count set to zero.

A fault is generated during error rate testing if the ERT log overflows. The host is allowed to read the ERT log, send the clear ERT log command and then continue the error rate test by sending the ERT command sequence with the loop count set to zero.

Errors: If a data error occurs, it will be logged in the ERT log and the test will continue at the next block. QSTAT will be "pass" if only data errors occur.

If no errors have occurred since the last restart of the test, then one byte (containing a zero) tagged with EOI will be returned to the host upon completion of the test.

5-41. CS/80 Send Message Utilities

5-42. Read Fault Log

```
MICRO OPCODE : 0C7H  (199)
PARAMETERS   : none
```

The utility searches through the maintenance track or the EEPROM for any faults which have occurred. These faults are returned to the host in chronological order.

Note: Performing an error rate test does not clear the fault log, so unless the log is specifically cleared before beginning a test, the faults which are returned may have occurred during previous tests or run time activities.

```
format:

header:
        # of entries          1 byte

(Max. number of entries:  50)
entry:
        Current logical cylinder  2 bytes
        Current logical head      1 byte
        Logical sector            1 byte
```

```
Target logical cylinder   2 bytes
Target logical head       1 byte
Logical sector            1 byte

Fault code                1 byte
Status                    1 byte
Status                    1 byte
```

Refer to paragraph 5-32 for a description of the contents of the status bytes. Refer to paragraph 5-33 for a description of physical address reporting for faults.

5-43. Read Run Time Error Log

```
MICRO OPCODE : 0C5H  (197)
PARAMETERS   : head #  (1 byte)
```

The utility searches through the maintenance track or the EEPROM looking for any data errors. The number of data error entries on the selected head and a report on the location of these errors are returned to the host.

Note: Since an entry contains an occurrence count, the total number of errors may exceed the number of entries.

```
header:
        # of entries on the selected head   1 byte
        estimate sectors read by this head  5 bytes
        not used  = 0                       2 bytes
        # of entries on the selected head   1 byte

entry: (selected head only)
        Current physical cylinder           2 bytes
        Current physical head               1 byte
        not used = 0                        1 byte
        Current logical cylinder            2 bytes
        Current logical head                1 byte
        Logical sector                      1 byte
        'Error byte'                        1 byte
        occurrence count                    1 byte
```

The error byte gives information about the location in the sector where the error occurred and the severity of the error (i.e., recoverable, nonrecoverable).

```
error byte format:
    bit 7 = byte sync (no data sync or sector overrun)
    bit 6 = error in header field
    bit 5 = error in data field
    bit 4 = unrecoverable data error
            (all retries exhausted)
    bit 3 = ECC marginal data error
    bit 2 = retry marginal data error
            (more than 1 retry required)
    bit 1 = recoverable on the first retry
    bit 0 = FIFO data lost or track offset invoked
```

5-44. Read Error (ERT) Log

```
MICRO OPCODE : 0C6H  (198)
PARAMETERS   : head #    (1 byte)
```

This utility returns the data error information stored in the RAM based ERT log to the host. Only those data errors which occurred on the specified head are sent to the host.

```
format:

header:
        # of entries on the selected head   1 byte
        # of sectors read by this head      5 bytes
        not used  = 0                       2 bytes
        # of entries on the selected head   1 byte

entry: (selected head only)
        current phys cyl                    2 bytes
        current phys head                   1 byte
        current phys sector                 1 byte
                (logical sector)
        current log cyl                     2 bytes
        current log head                    1 byte
        current log sector                  1 byte
        'Error byte'                        1 byte
        occurrence count                    1 byte
```

The error byte gives information about the location in the sector where the error occurred and the severity of the error (i.e., recoverable, nonrecoverable).

```
error byte format:
    bit 7 = Byte sync (no data sync or sector overrun)
    bit 6 = error in header field
    bit 5 = error in data field
    bit 4 = unrecoverable data error
            (all retries exhausted)
    bit 3 = ECC marginal data error
    bit 2 = retry marginal data error
            (more than 1 retry required)
    bit 1 = recoverable on the first retry
    bit 0 = FIFO data lost or track offset invoked
```

If a data error occurs more than once at the same location (i.e., same physical cylinder, physical head, and logical sector) on the disc, the error byte is 'OR'ed to give a cumulative report, and the occurrence count is incremented.

5-45. Measure Seek Time

```
MICRO OPCODE : 0F7H  (247)
PARAMETERS   :   physical cyl  (2 bytes)
                 physical head (1 byte)
```

This utility measures the time required to seek from the present location to the physical track specified by the input parameters. The output consists of 2 bytes which is the seek time in milliseconds. If the seek fails, the fault will be logged in status, QSTAT will equal 1, and the time returned will be zero.

5-46. Read Spare Table

```
MICRO OPCODE : 0C4H  (196)
PARAMETERS   :   Table = 1 (spare table)
```

The spare table is the only accessible table in this controller. Since the spare table is not stored on maintenance tracks, it must be built on power up. This is done by going to the spare track area and seeing which have been allocated. Reading the spare table only reports spared tracks. Sector spares are not reported.

```
     HEADER
Head #                          1 byte
# of field track spares         2 bytes (MSB first)
# of spare tracks used          1 byte
# of logical spared tracks      1 byte

     ENTRY
Cylinder High                   1 byte
Cylinder low                    1 byte
Scalar #                        1 byte
```

The 'head #' is the head address. There will be one header for each head in the drive.

The '# of field track spares' is the number of spare tracks on this head which have been allocated during field sparing operations.

The '# of spare tracks used' is the total number of spare tracks on this head that have been allocated by factory and field sparing operations.

The '# of logical spared tracks' is the number of tracks on this head which have been determined to be defective and were spared. The number of logical spared tracks will be equal to the number of entries.

The 'scalar #' indicates which of the spare tracks on a surface were used when the defective track was spared. For example, if there are 6 (0 through 5) spare tracks per surface, and the second spare track was used by this entry, then the scalar # would be 1.

5-47. Locate And Read Full Sector

```
MICRO OPCODE : 0C0H  (192)
PARAMETERS   :   physical cylinder     (2 bytes)
                 physical head         (1 byte)
                 physical sector       (1 byte)
                 (logical sector)
```

The utility will read a physical sector and return the 256 data bytes from that sector and the 6 ECC bytes. The total execution message will be 262 bytes long. Faults will show up in the status, but data errors are neither detected nor reported.

Headers are not read by the read full sector command.

5-48. Servo Test

```
MICRO OPCODE : 0BFH  (191)
PARAMETERS   : Loop count
```

This utility will perform seeks to the following tracks: 0, 1, 2, 4, 8, 16, 32, . . . n, 0, n, n-1, n-2, n-4, n-8, n-16, n-32, . . . 0 (n = max log track). This sequence of seeks is repeated once for each head.

A seek failure or a timeout will be reflected in the status as well as the first byte of the execution message. A seek error will only be reflected in the first byte of the execution message. A seek error results if the header is readable, and it shows the head is not on target track.

Servo test can be canceled or cleared for early termination.

The test will halt and return the execution message as soon as the first failure occurs.

```
execution message:
   byte 1:  0 = pass              QSTAT 0
            1 = seek failure      QSTAT 1
                (timeout, header read failed)
            2 = seek error        QSTAT 0
                 (target versus actual different)

   byte 2, 3:  Number of seeks completed in the last loop.
```

5-49. Pattern Error Rate Test (ERT) (Log Option)

```
MICRO OPCODE : 0C8H  (200)
PARAMETERS   : LOOP    (0-255) 255 implies infinite loop
             : OFFSET  (XXXXXXXX)
             : REPORT  (XXXXXXXX)
             : TEST AREA       0 = SECTOR
                               1 = TRACK
                               2 = CYLINDER
                               3 = SURFACE
                               4 = VOLUME (the whole disc)
             : PATTERN SELECT  0 = change pattern with
                                   each loop
                               1 = 39CE7H
                               2 = C30H
                               3 = 30E61CC3987H
                               4 = B8F32E3CCH
                               5 = CCH
                               6 = DB6H
                               7 = 33F94CFE5H
                               8 = random data
```

No Message Option: This utility stores the addresses of data errors in the ERT Log.

Send Message Option: This utility will report data errors to the host immediately after they occur. The errors are not stored in the ERT log.

The sector count is updated for each head.

The first loop of the test begins at the target address which should be determined by the complementary command 'Set Address'. If the target address is in the middle of the test area, the first pass will consist of writing from the target address to the end of the test area. The first read operation will also be from the target address to the end of the test area. The second loop and each loop thereafter will be from the start of the test area to the end of the test area.

Each loop consists of writing and reading the test area. If the loop count is set to 255, the test will continue indefinitely until a CANCEL or CLEAR command is sent from the host.

If a fault occurs, the test will halt; QSTAT is set; status will indicate the fault.

If a data error occurs, the execution message has the following format:

```
     (no header is sent)
    entry:
           current phys cyl              2 bytes
           current phys head             1 byte
           current logical sector        1 byte
           current logical cyl           2 bytes
           current logical head          1 byte
           current logical sector        1 byte
           error byte                    1 byte
           loop count when error occurred 1 byte

 error byte format:
    bit 7 = byte sync (no data sync or sector overrun)
    bit 6 = error in header field
    bit 5 = error in data field
    bit 4 = unrecoverable data error
            (all retries exhausted)
    bit 3 = ECC marginal data error
    bit 2 = retry marginal data error
            (more than 1 retry required)
    bit 1 = recoverable on the first retry
    bit 0 = FIFO data lost or track offset invoked
```

The state of the test is saved when an error or fault occurs. After reporting the error/fault, the test may be continued by re-sending the ERT command sequence with the loop count set to zero.

At the end of the test (loop count exhausted), one byte (containing a zero) tagged with EOI will be sent to the host.

5-50. Random Pattern Error Rate Test (Log Option)

```
MICRO OPCODE : 0CBH  (203)
PARAMETERS   : LOOP    (0-255) 255 implies infinite loop
             : OFFSET  (XXXXXXXX)
             : REPORT  (XXXXXXXX)
             : PATTERN SELECT  0 = change pattern with
                                   each loop
                               1 = 39CE7H
                               2 = C30H
```

```
                                3 = 30E61CC3987H
                                4 = B8F32E3CCH
                                5 = CCH
                                6 = DB6H
                                7 = 33F94CFE5H
                                8 = random data
```

The Random Pattern ERT functions exactly like the nonrandom Pattern ERT with the exception that the test area is randomly generated. This is done by generating a random starting address and then generating a random transfer length between 1 sector and 64 sectors. It is assumed that random error rate test is allowed to read and write anywhere in the logical data space of the disc. If the randomly generated transfer length would go beyond the disc boundaries the length is truncated to fit within the disc volume.

The sector count is updated for each head.

Refer to paragraph 5-48 for details on execution message.

5-51. Read Only Error Rate Test (Log Option)

```
MICRO OPCODE : 0C9H  (201)
PARAMETERS   : LOOP    (0-255) 255 implies infinite loop
             : OFFSET  (XXXXXXXX)
             : REPORT  (XXXXXXXX)
             : TEST AREA       0 = SECTOR
                               1 = TRACK
                               2 = CYLINDER
                               3 = SURFACE
                               4 = VOLUME (the whole disc)
```

No message option: This utility will store the addresses of data errors in the ERT Log and fault descriptions.

Send message option: This utility will report data errors to the host as soon as they occur.

The sector count is updated for each head and is available by reading the ERT log. As the name implies, this test does not write data on the disc. Therefore, data written previous to calling this utility will not be destroyed.

The first loop of the test begins at the target address which should be determined by the complementary command 'Set Address'. If the target address is in the middle of the test area, the first pass will consist of reading from the target address to the end of the test area. Each loop thereafter will begin at the start of the test area.

If a fault occurs, the test will halt; QSTAT is set; status will indicate the fault.

If a data error occurs, the execution message has the following format:

```
     (no header is sent)
    entry:
          current phys cyl              2 bytes
          current phys head             1 byte
          current phys sector           1 byte
           (current logical sector)
```

```
                                        (equals 0)
            current logical cyl         2 bytes
            current logical head        1 byte
            current logical sector      1 byte
            error byte                  1 byte
            loop count when error occurred 1 byte
error byte format:
    bit 7 = byte sync (no data sync or sector overrun)
    bit 6 = error in header field
    bit 5 = error in data field

    bit 4 = unrecoverable data error
            (all retries exhausted)
    bit 3 = ECC marginal data error
    bit 2 = retry marginal data error
            (more than 1 retry required)
    bit 1 = recoverable on the first retry
    bit 0 = FIFO data lost or track offset invoked
```

The state of the test is saved when an error or fault occurs. After reporting the error/fault, the test may be continued by re-sending the ERT command sequence with the loop count set to zero.

At the end of the test (loop count exhausted), one byte (containing a zero) tagged with EOI will be sent to the host.

5-52. Random Read Only Error Rate Test (Log Option)

```
MICRO OPCODE : OCCH  (204)
PARAMETERS   : LOOP    (0-255) 255 implies infinite loop
```

This routine functions like the Read Only Error Rate test. The one exception is that the TEST AREA is generated randomly. This is done by generating a random starting address and then generating a random length between 1 sector and 64 sectors. If the random length exceeds the length between the starting address and the end of the disc volume, the length will be truncated to stop at the volume boundary.

Refer to paragraph 5-51 for details on the execution message.

5-53. Read Revision Numbers

```
MICRO OPCODE : OC3H (195)
PARAMETERS    : none
```

This utility will read the firmware ROM revision numbers and return them in an execution message. The first byte specifies the number of revision number bytes that will follow.

```
byte #
   0    number of bytes to follow
        (equals 1 since there is only one ROM)
   1    revision # for ROM
```

The format for the revision byte is for the most significant nibble to contain the main revision

number, and for the least significant nibble to contain a secondary revision number.

5-54. Troubleshooting

When troubleshooting the disc drive, the first thing to do is to determine if the fault is repeatable or intermittent. A repeatable fault usually causes the same self-test fail result to be presented each time self-test is performed. An intermittent fault, on the other hand, occurs at random intervals, and may not always cause a self-test failure.

In the case of a repeatable fault, self-test will identify the failing FRA with a 95 percent certainty. In the event that more than one FRA is lsited as the possible cause of the failure, replace the FRA's one at a time, in the order given in the self-test display.

NOTE

Cable faults (an open cable conductor, loose cable connector, etc.) may present a multiple FRA failure message. The FRA's listed will be the FRA's at either end of the defective cable. All cabling should therefore be checked before replacing any FRA's.

Cables W1 and W3 are sufficiently long to allow PCA-A1 (disc drive assembly A1) to be connected into the circuit adjacent to the disc drive cabinet. This allows a substitute PCA-A1 to be connected into the circuit without removing PCA-A1 from the cabinet.

Attempt to isolate the fault to a specific FRA by running self-test following the replacement of each FRA.

Table 5-2. Error Codes (1 of 6)

Miscellaneous errors. These errors are caused by externally initiated operations. These errors do not cause a fault log entry to be generated. Only error 1C-1FH will affect P7.

Oct	Dec	Hex	Description
010	01	01	End Of Volume
020	02	02	Channel Parity Error
050	05	05	Illegal Opcode
070	07	07	Address Bounds
100	08	08	Parameter Bounds
110	09	09	Illegal Parameter
120	10	0A	Message Sequence
130	11	0B	EEPROM diagnostic failed. (EEPROM only)
140	12	0C	Message Length
200	16	10	No spares available on this head.
210	17	11	Media wear - one or fewer spare tracks left on this head after this sparing operation.
220	18	12	Power on initialization.
270	23	17	FIFO Data Loss on Read successful retries.
300	24	18	FIFO Data Loss on Write successful retries.

NOTE

THE FOLLOWING ERRORS WILL AFFECT P7:

360	30	1E	Corrupted EEPROM log. (EEPROM only)
370	31	1F	No acknowledge or R/W retries exhausted. (EEPROM only)

Data errors (media related data bit errors). A run log entry will be generated. In the Request Status parameter bytes, P7 will contain the error code.

400	32	20	Data field - marginal data error - on a read operation.
410	33	21	Data field - marginal data error - correction operation was used to recover the data.
420	34	22	Data field - uncorrectable data error on read.
430	35	23	Marginal Header Failed Although Sector Matched error on a read operation.
440	36	24	Unrecoverable Header Failed Although Sector Matched error on a read operation.
450	37	25	Marginal Sector Not Found error on a read operation.
460	38	26	Unrecoverable Sector Not Found error on a read operation.
470	39	27	Marginal No Data Sync error on a read operation.
500	40	28	Unrecoverable No Data Sync error on a read operation.
510	41	29	Marginal Sector Overrun error on a read operation.
520	42	2A	Unrecoverable Sector Overrun error on a read operation.
570	47	2F	Unrecoverable data error on write operation (header not readable).
630	51	33	Marginal Header Failed Although Sector Matched error on a write operation.
640	52	34	Unrecoverable Header Failed Although Sector Matched error on a write operation.

Table 5-2. Error Codes (2 of 6)

Oct	Dec	Hex	Description
650	53	35	Marginal Sector Not Found error on a write operation.
660	54	36	Unrecoverable Sector Not Found error on a write operation.
670	55	37	Marginal No Data Sync error on a write operation.
700	56	38	Unrecoverable No Data Sync error on a write operation.
710	57	39	Marginal Sector Overrun error on a write operation.
720	58	3A	Unrecoverable Sector Overrun error on a write operation.

Self test errors. A fault log entry will be generated. In the Request Status parameter bytes, P7 will contain the fault code, P8 will contain the ESDI status, P9 will contain the least significent byte (LSByte) of Vendor Unique Status.

1010	65	41	Buffer RAM test failed.
1020	66	42	Self test data compare failed.
1030	67	43	Self test R/W retry count exhausted.
1040	68	44	ECC test failed.
1050	69	45	Drive selected line not asserted during power on.
1060	70	46	Timeout 30 seconds waiting for Command Complete during power on.
1070	71	47	Illegal ESDI status during power on.
1100	72	48	Drive Ready not asserted after Command Complete during power on.
1110	73	49	Auto configuration failed; probably ESDI communication problem (no configuration parameters checked).
1130	75	4B	Reset attention failed during power on.
1140	76	4C	Vendor unique status available.
1150	77	4D	Mechanism self test has failed.
1160	78	4E	One of the four seek diagnostic tests failed (ATN, ESDI comm, verify failed twice).

Controller Faults. A fault log entry will be generated. In the Request Status parameter bytes, P7 will contain the fault code.

1220	82	52	FIFO data loss retry on a read operation failed.
1230	83	53	FIFO data loss retry on a write operation failed.
1240	84	54	Offset recovery position unknown.
1250	85	55	Seek recovery position unknown.

COMPRESSED ESDI STATUS

```
0 = write fault
1 = write gate with track offset fault
2 = seek fault
3 = invalid/unimplemented command fault
4 = interface fault
5 = command data parity fault
6 = PON conditions exist/start spindle motor command may be required
7 = spindle motor stopped
```

Table 5-2. Error Codes (3 of 6)

Controller faults with Disc Data Controller (DDC) IC status. A fault log entry will be generated and the fault log entry will include the Disc Data Controller (DDC) IC status. In the Request Status parameter bytes, P7 will contain the fault code, P8 will contain the Disc Data Controller (DDC) IC Status register, and P9 will contain the Disc Data Controller (DDC) IC Error register. .

Oct	Dec	Hex	Description
1400	96	60	Disc Data Controller (DDC) IC timed out when trying to read sector headers (0-63).
1410	97	61	Error detected during read full sector.
1420	98	62	Disc Data Controller (DDC) IC indicates a fatal fault on a read operation.
1430	99	63	Disc Data Controller (DDC) IC indicates a fatal fault on a write operation.
1440	100	64	Retries exhausted during Format Track.
1450	101	65	Retries exhausted during verify initialize. No header was readable on track.
1460	102	66	Retries exhausted during Read Header.
1470	103	67	This should not directly cause a bit in status to be set. It is used by Wait For INT or ATN (a low level routine) to call Save drive info and get the right information stored away.
1500	104	68	Disc Data Controller (DDC) IC timeout when trying to read any header for sparing.
1510	105	69	Disc Data Controller (DDC) IC timeout when formatting a spare track to deallocate it.
1520	106	6A	Disc Data Controller (DDC) IC timeout while formatting a track to flag a sector defective.
1530	107	6B	Disc Data Controller (DDC) IC timeout while formatting the spare track before the data is written.
1540	108	6C	Retries exhausted during format track; last problem was Disc Data Controller (DDC) IC timeout.
1550	109	6D	Retries exhausted during Read Header operation; last problem was Disc Data Controller (DDC) IC timeout.
1560	110	6E	Retries exhausted when verifying initialize; last problem was Disc Data Controller (DDC) IC timeout.

Unit fault with Disc Data Controller (DDC) IC status. A fault log entry will be generated and the fault log entry will include the Disc Data Controller (DDC) IC status. In the Request Status parameter bytes, P7 will contain the fault code, P8 will contain the Disc Data Controller (DDC) IC status, P9 will contain the Disc Data Controller (DDC) IC error register.

1610	113	71	Error Detected (ED) bit set in Disc Data Controller (DDC) IC during read defect list.
1620	114	72	Failed due to Disc Data Controller (DDC) IC error while formatting a track to flag a sector defective.
1630	115	73	Failed due to Disc Data Controller (DDC) IC error while formatting the spare track for track sparing.
1640	116	74	Failed due to an Disc Data Controller (DDC) IC error while formatting a spare track to deallocate it.
2010	129	81	FIFO data loss occurred on a read operation.
2020	130	82	FIFO data loss occurred on a write operation.

Table 5-2. Error Codes (4 of 6)

Oct	Dec	Hex	Description
2030	131	83	Header failed although sector number matched error (missed seek if head error bit not set in Disc Data Controller (DDC) IC status register). (EEPROM only)
2040	132	84	Data field error occurred. (EEPROM only)
2050	133	85	No data sync, Sector overrun, Sector not found. (EEPROM only)
2060	134	86	Correction failed error erroneously set.
2070	135	87	Late interlock error erroneously set.
2100	136	88	Illegal DDC status detected in utilities.
Unit fault with Compressed ESDI status. A log entry will be generated and the fault entry will include the compressed ESDI status. In the Request Status parameter bytes, P7 will contain the fault code, P8 will contain the compressed ESDI status, P9 will contain the LSByte of Vendor Unique Status.			
2210	145	91	ESDI status indicates a fatal fault on a read operation.
2220	146	92	ESDI status indicates a fatal fault on a write operation.
2230	147	93	Retry of Write Fault (Offtrack on write) was unsuccessful.
2240	148	94	Retry of Write with Offset (aggressive seek on write) failed.
2250	149	95	Drive set attention during read headers (verify position).
2260	150	96	Local write expected an offtrack write error but received another ESDI error instead.
2270	151	97	ATN set during read full sector.
2300	152	98	ATN set during read defect list.
2310	153	99	ESDI command utility failed.
2320	154	9A	Retries exhausted during format track. Track probably did not get formatted.
2330	155	9B	Retries exhausted during verify initalize. No header readable on a track.
2340	156	9C	Retries exhausted during read headers operation.
2350	157	9D	Used by low level routine (wait for INT or ATN). Should not directly affect status. Used when calling save-drive-information to save the right information.
2360	158	9E	Logs unreadable due to unrecoverable on all copies.
2370	159	9F	Logs unreadable due to no valid copies.
2400	160	A0	Failed due to ATN being set by the drive while formatting a track to flag a sector defective.
2410	161	A1	Failed due to ATN being set by the drive while formatting the spare track before the data is written on it.
2420	162	A2	Failed due to ATN being set by the drive while reading any header for sparing.
2430	163	A3	Failed due to ATN being set by the drive while formatting a track to deallocate a spare.
2470	167	A7	HDA did too many internal recalibrations in a utility.
2500	168	A8	ATN set to many times during a write (write fault).
2510	169	A9	A fatal fault was detected (probably on a seek).
2520	170	AA	Local read saw ATN set (fatal so no retries).
2530	171	AB	A check of the HDA saw it was deasserted.

Table 5-2. Error Codes (5 of 6)

Unit Faults. A log entry will be generated and the extra byte in the fault entry will be zero. In the Request Status parameter bytes, P7 will contain the fault code. P8 through P10 will be zeroes.

Oct	Dec	Hex	Description
2600	176	B0	Logical seek timeout.
2610	177	B1	Physical seek timeout.
2620	178	B2	Defective track reached when doing a logical seek (field spare deallocation).
2630	179	B3	When seeking back to defective track to flag it defective, header is not logical cylinder or head.
2640	180	B4	Headers bad when flagging a sector defective.
2650	181	B5	Defective sector header not found when sector sparing.
2660	182	B6	Headers on spare track bad after they tested good (when writing logical headers).
2700	184	B8	Cannot read any headers for sparing. (EEPROM only)
2710	185	B9	Header unrecoverable during write of data for sparing. (EEPROM only)
2720	186	BA	Header failed although sector matched without Header Fault - seek retried successfully - but retry of read not successful.
2730	187	BB	Header failed although sector matched without Header Fault - seek retried successfully - but retry of write not successful.
2740	188	BC	Reseek in local operation failed.
2760	190	BE	No Disc Data Controller (DDC) IC interrupt while reading the defect list.
2770	191	BF	No Disc Data Controller (DDC) IC interrupt while reading full sector.
3000	192	C0	ERT log overflow
3010	193	C1	Cannot read disc logs during power up.
3030	195	C3	Verify position failed after initialize media - cylinder and head in header did not match as expected.
3050	197	C5	The Disc Data Controller (DDC) IC timed out during an ECC correction cycle.
3060	198	C6	Bad parity on EEPROM data read. (EEPROM only)
3070	199	C7	All headers bad on a track during format option 2.
3100	200	C8	Headers unreadable during verify position (servo test).
3110	201	C9	Header does not match logical target address (seek diagnostic).
3120	202	CA	Hardware fault other than Disc Data Controller (DDC) IC fault. (EEPROM only)
3130	203	CB	Disc Data Controller (DDC) IC communication time out.
3140	204	CC	Unrecoverable data error occurred.
3150	205	CD	Two spare tracks in a row were bad when sparing attempted (includes section spares).
3200	208	D0	Transfer acknowledged set timed out after transfer request was set (took longer than 10 milliseconds).
3210	209	D1	Transfer acknowledged reset timed out after transfer request was reset (took longer than 10 milliseconds).
3220	210	D2	Command timed out (Command Complete was not asserted a specified time after the command was sent).
3230	211	D3	Command retried out (number of times a command was retried exceeded the retry count).
3250	213	D5	Request ESDI status command failed.

Table 5-2. Error Codes (6 of 6)

Oct	Dec	Hex	Description
3260	214	D6	Reset Attention command failed.
3270	215	D7	HDA timed out while controller waited for command complete before sending a command.
3300	216	D8	Timeout on auto recalibrate during a read or write.
3340	220	DC	Command Complete signal drop out on a read operation.
3350	221	DD	Command Complete signal drop out on read retry.
3360	222	DE	Command Complete signal drop out on write.
3370	223	DF	Command Complete signal drop out on a write retry.
Unit fault that is logged only. A log entry will be generated and the fault log entry will contain the Compressed ESDI status. No bits will be set in the Request Status bytes.			
3400	224	E0	ESDI attention line set.
3410	225	E1	ESDI command retried.
3420	226	E2	Bad parity detected on read data.
3430	227	E3	Header failed although sector matched on read operation without a Header Fault - Seek retried OK - Read retried OK.
3440	228	E4	Header failed although sector matched for write operation.
3450	229	E5	Retry of a Write Fault (Offtrack) successful.
3460	230	E6	Retry of a Write with Offset (Aggressive seek on write) successful.
3560	238	EE	Retries required during Format Track.
3570	239	EF	Retries required during Read Headers. Recovery was successful.
3600	240	F0	Seek error header does not match target (servo test).
3610	241	F1	Timed out waiting for operation complete INT during Disc Data Controller (DDC) IC reset.
3630	243	F3	The Reserved Interrupt Vector was taken.
3640	244	F4	The SWI3 Interrupt Vector was taken.
3650	245	F5	The SWI2 Interrupt Vector was taken.
3660	246	F6	The SWI1 Interrupt Vector was taken.
3670	247	F7	The NMI Interrupt Vector was taken.
3700	248	F8	Seek missed target track during a read retry.
3710	249	F9	Seek missed target track during a write retry.
3720	250	FA	Write fault during write in utilities (retried).
3730	251	FB	HDA auto recal detetected in utilities.

Adjustments 6

6-1. Introduction

There are NO operating or maintenance adjustments required.

Peripherals 7

7-1. Introduction

This chapter is not applicable for these products.

Replaceable Parts 8

WARNING

The screw on the left side of the disc drive and the power supply shield must be in place before power is applied to the disc drive.

NOTE

The screw and space on the front of the power supply must be tightened securely or the disc drive may not pass RFI specifications.

8-1. Major Replaceable Assemblies

The replacement assemblies are shown in figure 8-1. Table 8-1 lists all replaceable items and their part numbers. A complete list of all replaceable parts is included in the product hardware support manual, part. no. 07957-90903.

8-2. Removal and Replacement Notes

The following information applies to removal and replacement procedures:

The following torque specifications should be adhered to to ensure that the disc drive meets RFI specifications.

Screw (front of power supply, with spacer)-14 in./lbs and seated

Screw (Attaches front panel to mainframe)-10 in./lbs

Screw (attaches tray to HDA)-10 in./lbs

Screw (attaches HDA assembly to mainframe)-15 in./lbs

8-3. Field Stocking Inventory

The following parts are recommended for spares stocking.

PART NO.	QTY	DESCRIPTION
2110-0003	1	FUSE, 3A, 250V
07941-60019	1	FAN
07957-69021	1	DISC MECHANISM (81 Mbyte)
07958-69021	1	DISC MECHANISM (130 Mbyte)
09133-67120	1	Power Supply Assembly PCA-A3
07957-10101	1	ESDI/HPIB PROM KIT
07941-60003	1	CABLE, LED (W4)
07957-60092	1	CABLE, Power (W1)
07957-60005	1	CABLE, Control (W3)
07957-60006	1	CABLE, Date (W2)
07957-69001	1	HPIB/ESDI CEC PCA-A2

8-4. Disc Drive Assembly PCA-A1 Return

The defective Disc Drive Assembly (HDA) PCA-A1 being returned to the factory must be packaged and shipped in Hewlett-Packard shipping material or the warranty will be void. (See part numbers below.)

9222-0662	Antistatic Bag
07957-80005	Foam Cushion
9211-5699	Corrugated Carton

Table 8-1. Disc Drive Replaceable Parts

FIG.& INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
8-1-	7957A	DISC DRIVE	28480	7957A	REF
	7958A	DISC DRIVE	28480	7958A	REF
1	07957-60107	* TOP SHROUD ASSEMBLY	28480	07957-60107	1
		(Attaching Parts)			
2	0515-0374	* SCREW,pnh,T10,M3.0 X 0.50, 10 mm long w/scw	00000	OBD	3
		- - - X - - -			
3	07957-60016	* FRONT PANEL ASSEMBLY, 7957A	28480	07957-60016	1
	07958-60016	* FRONT PANEL ASSEMBLY, 7958A	28480	07958-60016	1
		Index items 4, 5, and 6 are shipped with index item 3			
		(Attaching Parts)			
4	5001-3344	* FRONT PANEL SHIELD	28480	5001-3344	1
5	07941-60003	* LED Cable Assembly (W4)	28480	07941-60003	1
6	1400-0510	* CLAMP, cable	02768	8511-28-00-99	1
7	0515-0374	* SCREW,pnh,T10,M3.0 X 0.50, 10 mm long w/scw	00000	OBD	4
8	0624-0590	* SCREW, tapping, pnh, T25, 8-16, 0.312	00000	OBD	4
		- - - X - - -			
9	07957-60001	* HP-IB/ESDI CONTROLLER PCA ASSEMBLY	28480	07957-60001	1
		Item 10 will be shipped with exchange assembly 07957-69001			
		(Attaching Parts)			
10	07957-10161	* ESDI/HP-IB PROM KIT	28480	07957-10161	1
11	0380-1656	* SPACER, SNAP-IN, 0.625 in. long, 0.280 in. OD, Nylon	00000	OBD	1
12	0380-1332	* STANDOFF, hex, 6-32, 0.18 in. long	28480	0380-1332	2
13	2190-0074	* WASHER, lock, helical, no. 8	00000	OBD	2
		- - - X - - -			
14	07957-60092	* ESDI POWER CORD ASSEMBLY (W1)	28480	07957-60092	1
15	07957-60005	* ESDI CONTROL CABLE ASSEMBLY (W3)	28480	07957-60005	1
16	07957-60006	* ESDI DATA CABLE ASSEMBLY (W2)	28480	07957-60006	1
		- - - X - - -			
17	07941-60019	* FAN	28480	07941-60019	1
		(Attaching Parts)			
18	07941-00026	* GRILLE, fan	28480	07941-00026	1
19	0624-0661	* SCREW, tapping, pnh, T20, 10-14, 0.625 in. long	00000	OBD	4
20	1400-0510	* CLAMP, cable	02768	8511-28-00-99	2
		- - - X - - -			
21	09133-67120	* POWER SUPPLY ASSEMBLY	28480	09133-67120	1
		(Attaching Parts)			
22	0515-0665	* SCREW, machine, pnh, T10, M3.0 by 0.5, 14 mm long, w/scw	00000	OBD	1
23	5021-1534	* SPACER	28480	5021-1534	1
24	0515-0433	* SCREW, machine, pnh, T15, M4.0 by 0.7, 8 mm long, w/scw	00000	OBD	2
25	2110-0565	** CAP, fuse	28480	2110-0565	1

Table 8-1. Disc Drive Replaceable Parts (continued)

FIG.& INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
26	2110-0003	** FUSE, 3A, 250V, nontime delay	75915	2A250V3.0A	1
27	09144-45404	** SHIELD, power supply	28480	09144-45404	1
28	09133-40202	** SHAFT, switch	28480	09133-40202	1
29	0380-1655	** HOLDER, shaft	28480	0380-1655	1
30	5041-1203	** CAP	28480	5041-1203	1
		- - - X - - -			
31	07957-60021	* DISC DRIVE ASSEMBLY, 7957 (A1/FRA1)	28480	07957-60021	1
	07958-60021	* DISC DRIVE ASSEMBLY, 7958 (A1/FRA1)	28480	07958-60021	1
		(Attaching Parts)			
32	5001-3341	* DISC TRAY	28480	5001-3341	1
33	0515-0433	* SCREW, machine, pnh, T15, M4.0 by 0.7, 8 mm long, w/scw	00000	OBD	4
34	2360-0464	* SCREW, pnh, T15, 0.375 in. long, 6-32 w/scw	00000	OBD	4
		- - - X - - -			
35	5061-3145	* MAINFRAME ASSEMBLY	28480	5061-3145	1
		(Attaching Parts)			
36	09121-48303	* FOOT, front	28480	09121-48303	1
37	0403-0427	* FOOT, rear	94959	SJ-5008	2
38	8160-0280	* CONTACT, finger	28480	8160-0280	1
		- - - X - - -			
39	8120-3445	* HP-IB CABLE ASSEMBLY, 1m, (Model 10833A)	28480	8120-3445	1
40	8120-0698	* POWER CORD ASSEMBLY, NEMA5A/CEE	28480	8120-0698	1
	8120-1351	* POWER CORD ASSEMBLY, BS 1363/CEE	28480	8120-1351	1
	8120-1369	* POWER CORD ASSEMBLY, ASC 112/CEE	28480	8120-1369	1
	8120-1378	* POWER CORD ASSEMBLY, NEMA5A/CEE	28480	8120-1378	1
	8120-1689	* POWER CORD ASSEMBLY, GMBH/CEE	28480	8120-1689	1
	8120-1860	* POWER CORD ASSEMBLY, CEE/CEE	28480	8120-1860	1
	8120-2104	* POWER CORD ASSEMBLY, SEV/CEE	28480	8120-2104	1
	8120-2956	* POWER CORD ASSEMBLY, MDPP/CEE	28480	8120-2956	1
	8120-4211	* POWER CORD ASSEMBLY, SABS/CEE	28480	8120-4211	1

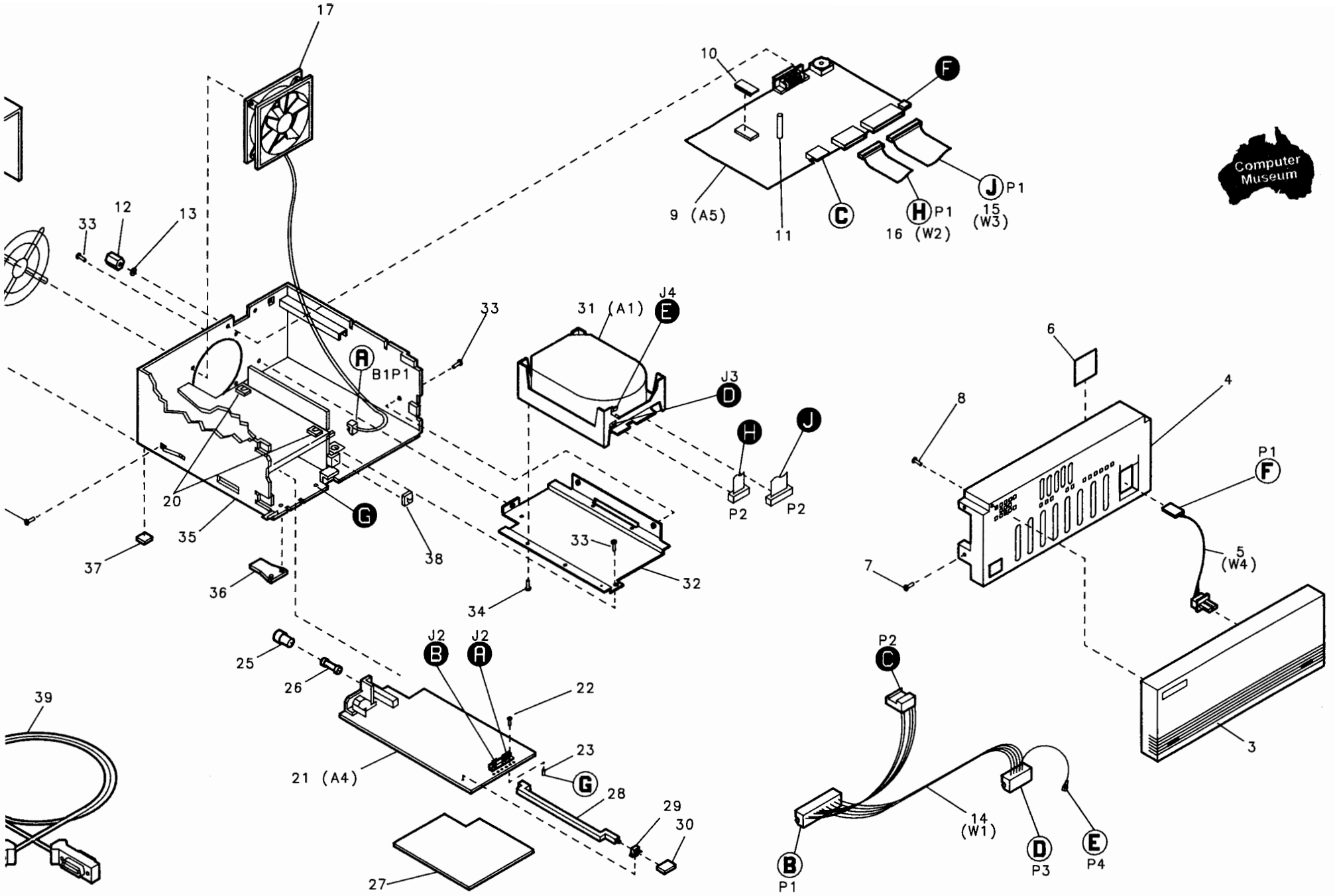
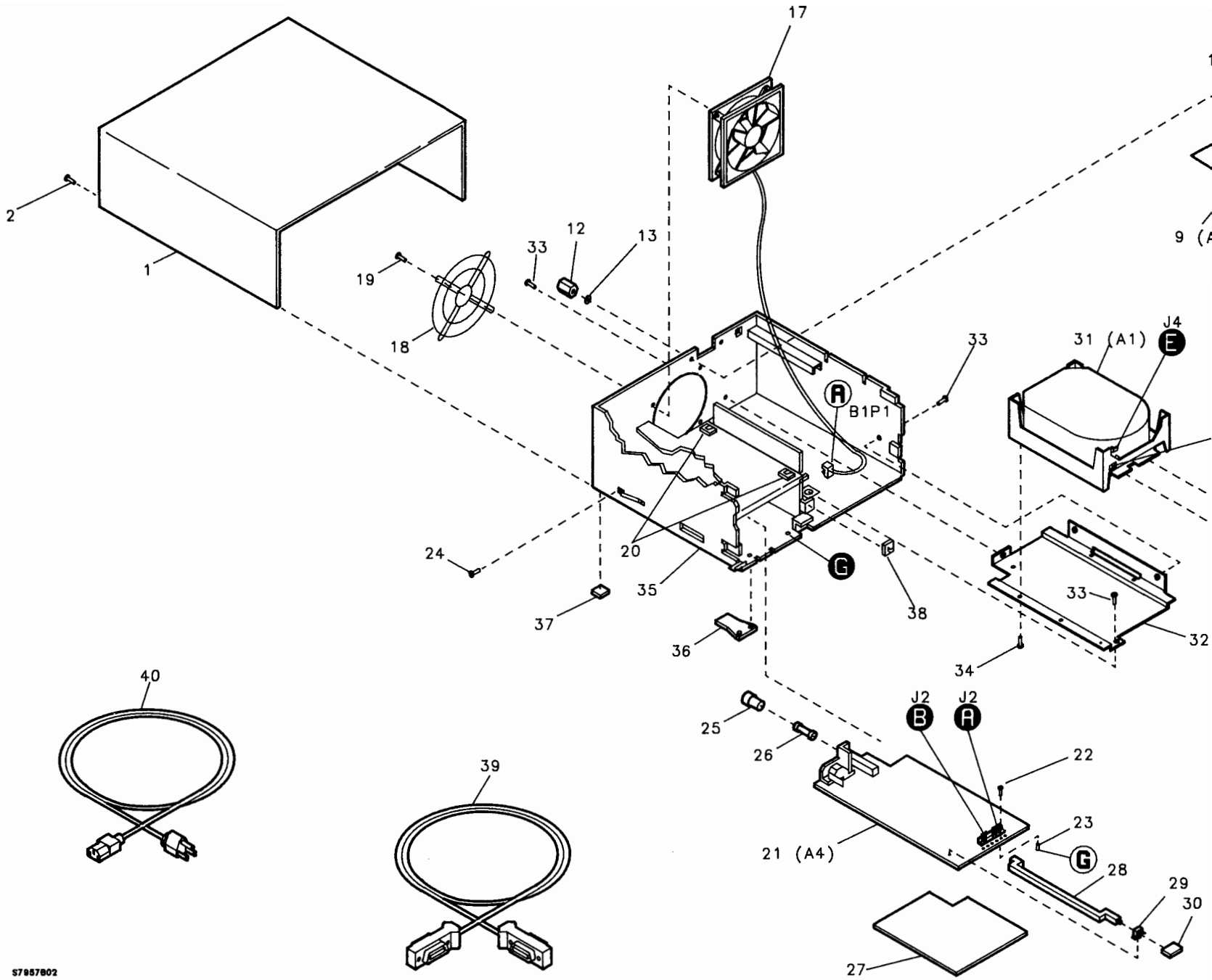


Figure 8-1. Disc Drive, Exploded View


17
2
1
19
18
33
12
13
9 (A
33
31 (A1)
J4
E
A
B1P1
24
20
35
G
38
37
36
33
32
34
40
39
25
26
J2
B
J2
A
22
23
G
21 (A4)
28
29
30
27
S7957802

Diagrams 9

9-1. Introduction

This chapter contains diagrams of the disc format, sector format, HDA PCA-A1 diagrams, and functional block diagrams.

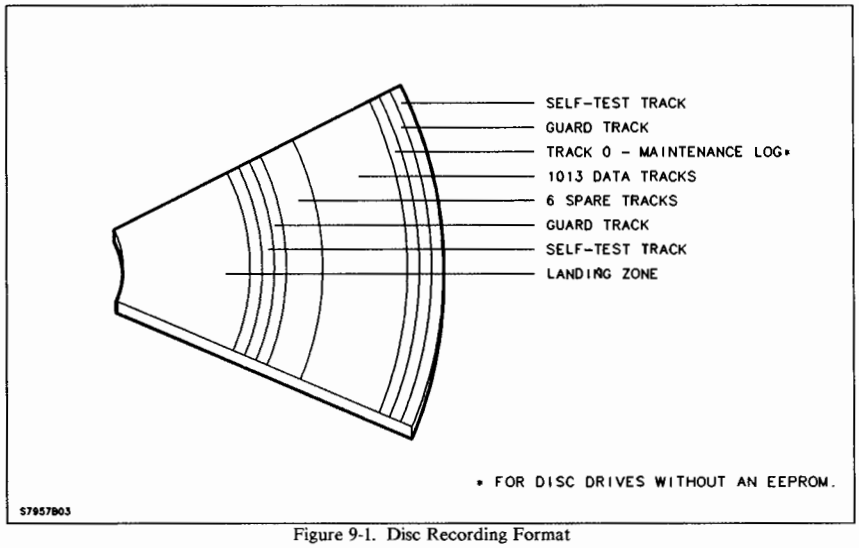


Figure 9-1. Disc Recording Format

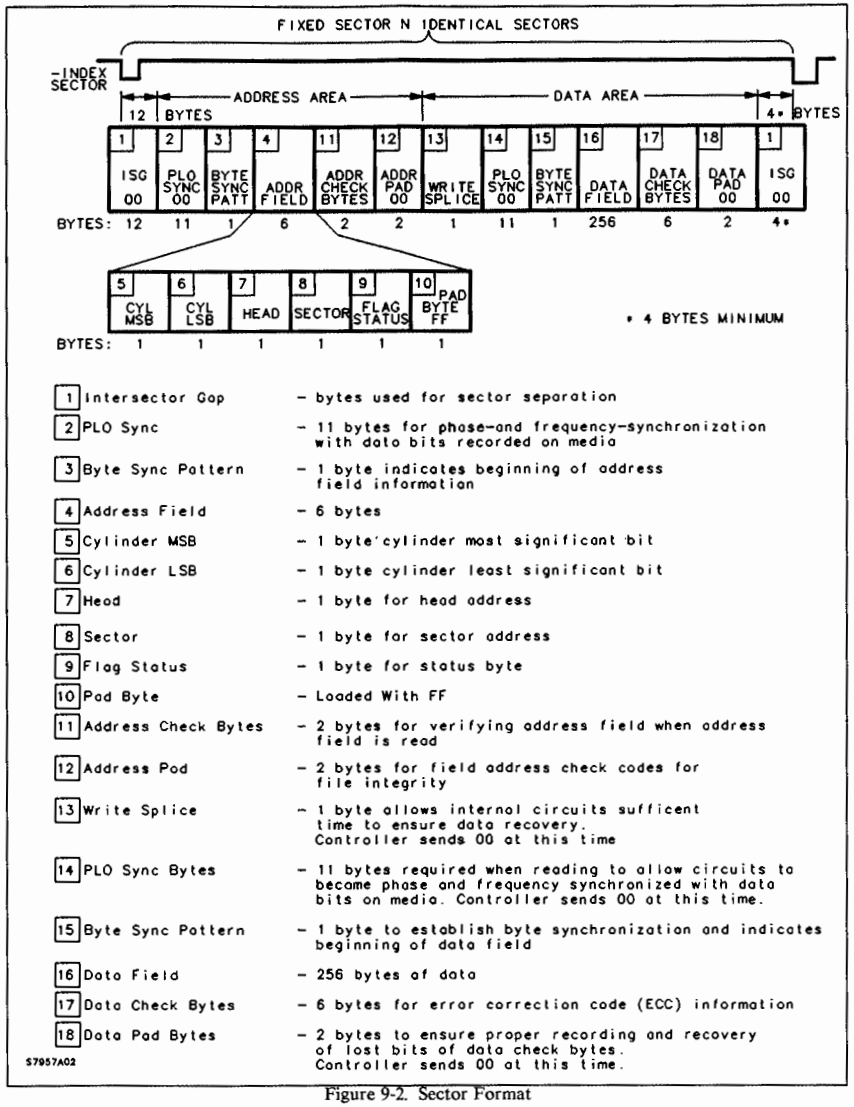


Figure 9-2. Sector Format

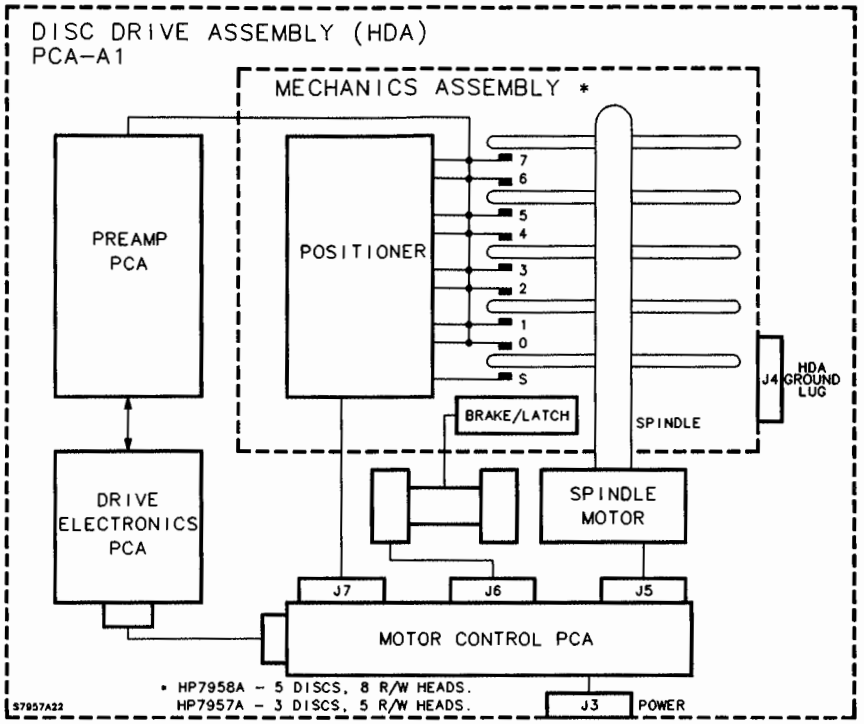


Figure 9-3. Disc Drive Assembly PCA-A1 Block Diagram

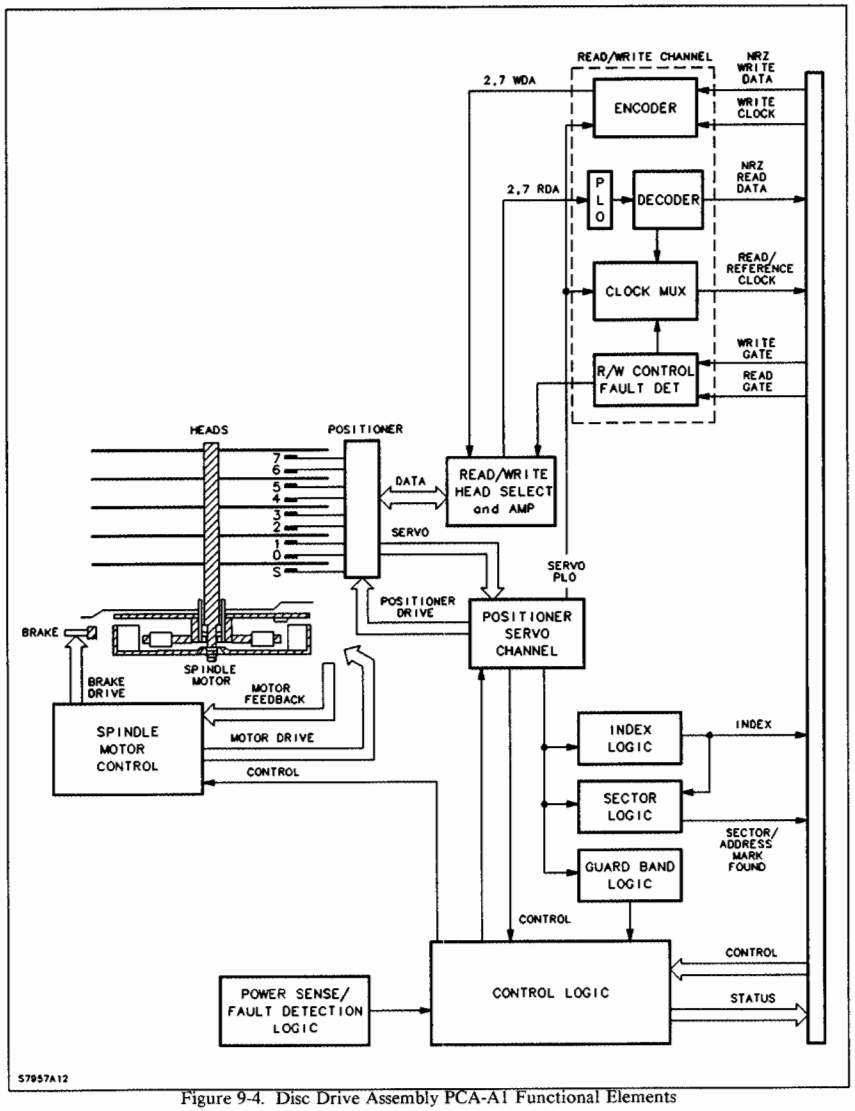


Figure 9-4. Disc Drive Assembly PCA-A1 Functional Elements

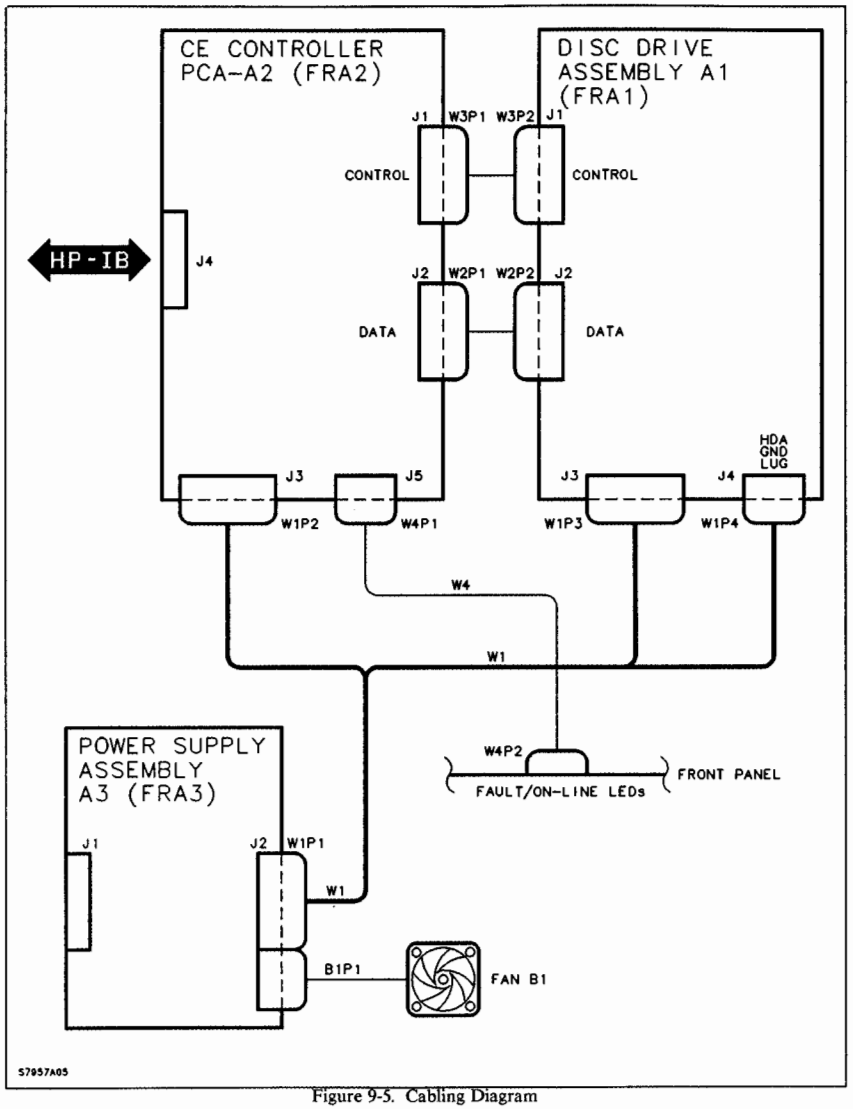


Figure 9-5. Cabling Diagram

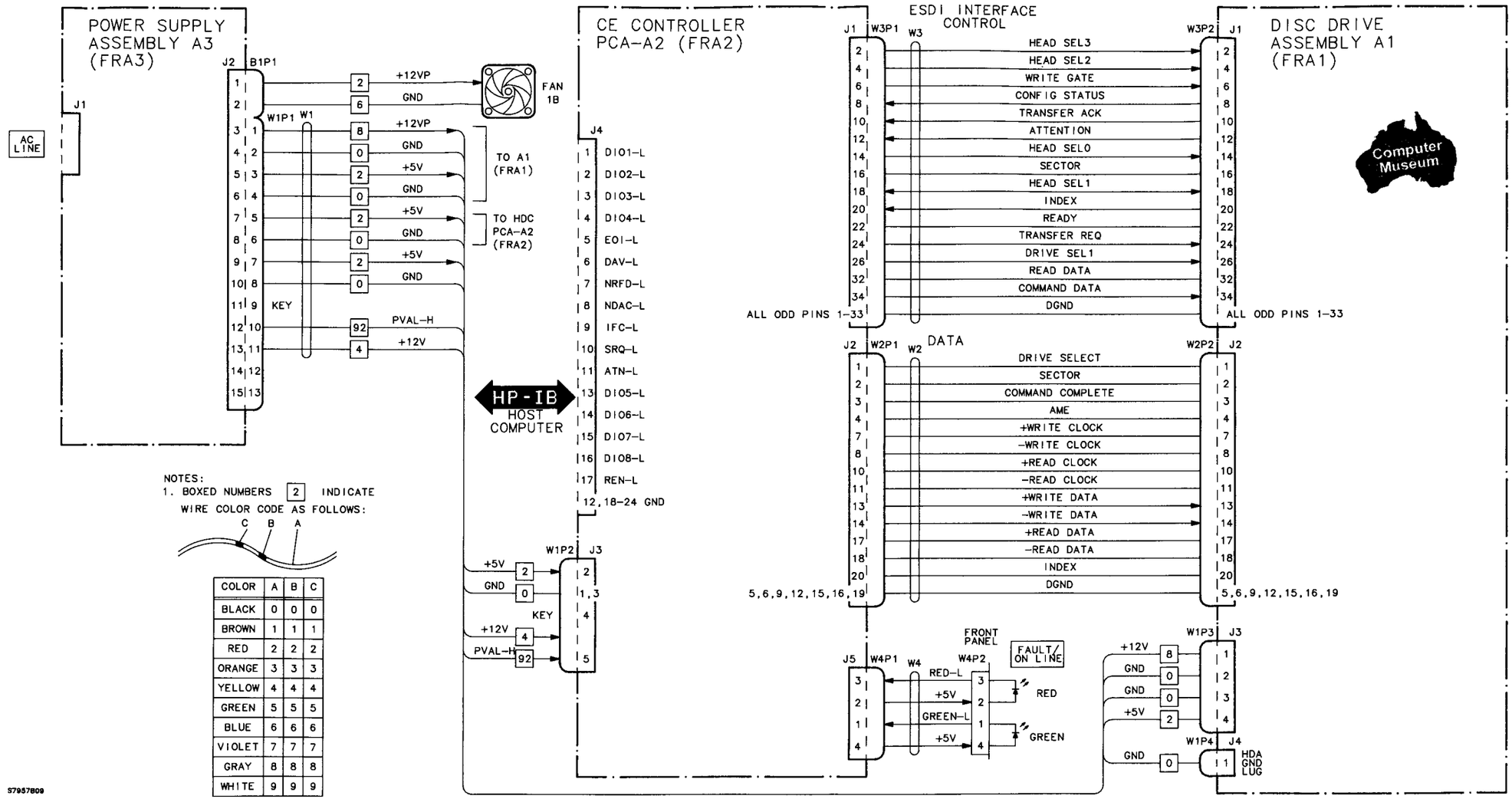


Figure 9-6. Signal Distribution

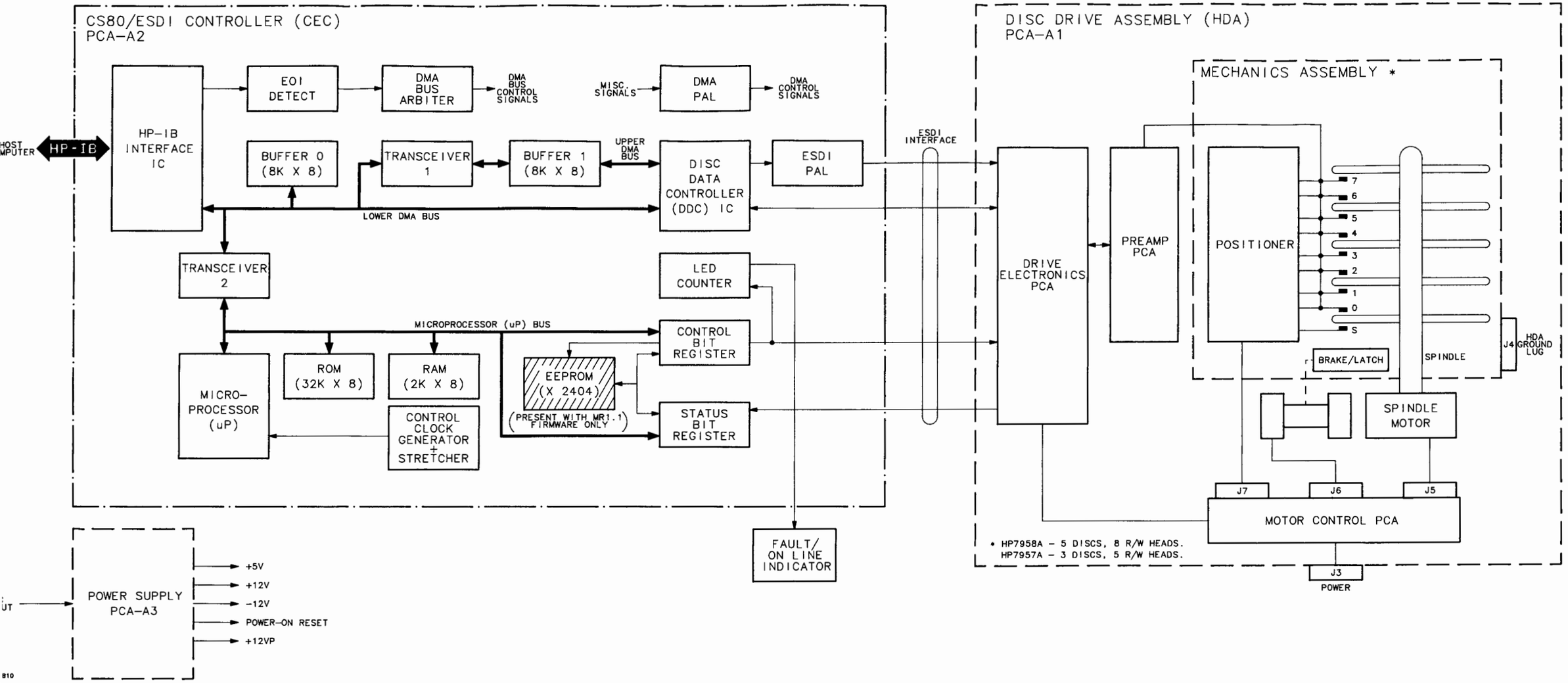


Figure 9-7. Disc Drive Functional Block Diagram

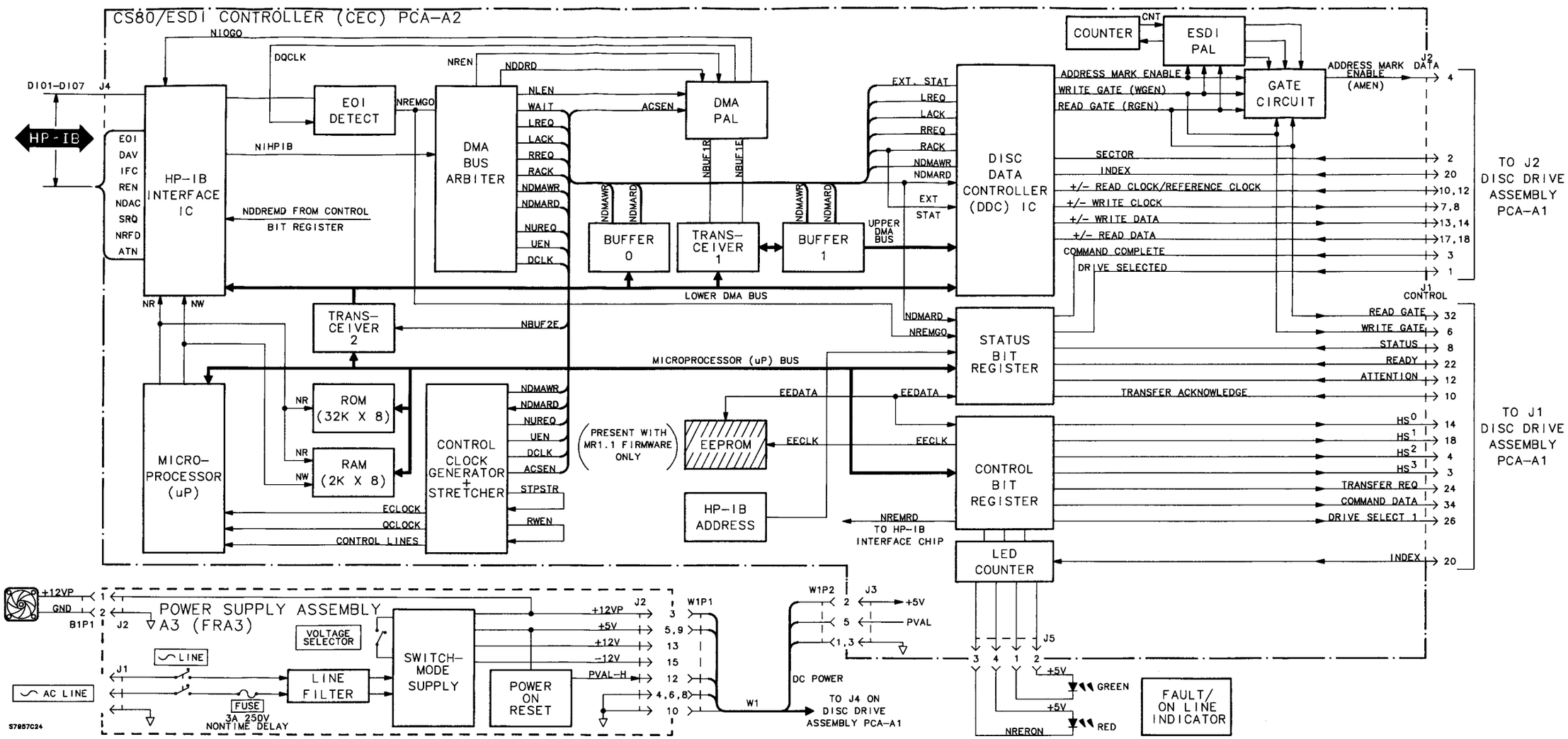


Figure 9-8. CS80/ESDI Controller (CEC) PCA-A2 Functional Block Diagram

Reference 10

Introduction

For more information refer to the the manuals listed below:

5955-3456 Site Environmental Requirements for Disc/Tape Drives
07957-90901 7957A/7958A Owner's Manual
07957-90903 7957A/7958A Hardware Support Manual

Service Notes 11

11-1. Introduction

The following service notes have been released at the time of this printing:

SN-1 MR1.2 Firmware

HEADQUARTER OFFICES
If there is no HP Sales Office in your area,
contact one of these headquarter offices.

UNITED STATES:
Hewlett-Packard Company
4 Choke Cherry Road
Rockville, MD 20850
Telephone: (301) 670-4300

Hewlett-Packard Company
5201 Tollview Drive
Rolling Meadows, IL 60008
Telephone: (312) 255-9800

Hewlett-Packard Company
5161 Lankershim Blvd.
North Hollywood, CA 91601
Telephone: (818) 505-5600

Hewlett-Packard Company
200 South Park Place
Atlanta, GA 30339
Telephone: (404) 955-1500

CANADA:
Hewlett-Packard Ltd.
6877 Goreway Drive
Mississauga, Ontario L4V1M8
Telephone: (416) 678-9430

AUSTRALIA/NEW ZEALAND:
Hewlett-Packard Australia Ltd.
31-41 Joseph Street,
Blackburn, Victoria 3130
Melbourne, Australia
Telephone: (03) 895-2895

EUROPE/AFRICA/MIDDLE EAST:
Hewlett-Packard Company
Central Mailing Department
P.O. Box 999
1180 AZ Amstelveens
The Netherlands
Telephone: (31) 20/5479999

FAR EAST:
Hewlett-Packard Asia Ltd.
47/F China Resources Building
26 Harbour Road, Hong Kong
Telephone: (5) 833-0833

JAPAN:
Yokogawa-Hewlett-Packard Ltd.
29-21 Takaido-Higashi 3-chrome
Suginami-ku, Tokyo 168, Japan
Telephone: (03)331-6111

LATIN AMERICA:
Hewlett-Packard de Mexico,
Sp.A. de C.V.
Monte Pelvux No. 111
Lomas de Chapultepec
11000 Mexico D.F., Mexico
Telephone: (905) 596-7933

UNITED KINGDOM:
Hewlett-Packard Ltd.
Miller House – The Ring
Bracknell
Berkshire RG12 1XN, England
Telephone: (4) 344/424898

04/88

Manual Part Number: 07957-90905
Printed in U.S.A., AUGUST 1988
Edition 2
E0888

HEWLETT PACKARD