HEWLETT PACKARD

This package contains a section of the

CE SERVICE HANDBOOK FOR 79XX SERIES DISC DRIVES

and consists of the following document:

7911/7912/7914 DISC/TAPE DRIVES

Part no. 07912-90905

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

NOTE

The tabset consists of model numbers for all DMD disc drives to be documented in the CE Service Handbook. Not all of these sections are available at this printing-refer to periodic announcements in the CSD service publication *Support Update* for part numbers and availability.

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 v).

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NOTICE

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SAFETY CONSIDERATIONS

KEEP WITH MANUAL

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, practice, or the like, which, if not correctly performed or adhered to, could result in 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, practice, or the like, which, 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 per the input power configuration instructions provided in this manual.

If this product is to be energized via an autotransformer (for voltage reduction) make sure 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 even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

All products which utilize tape head cleaner are shipped with a Material Safety Data Sheet (MSDS). Follow all applicable precautions when using the tape head cleaner.

TAPE DRIVE PRECAUTIONS

CAUTION

Do not touch the tape. Do not attempt to clean the tape or tape guides within the cartridge.

Do not attempt to remove a tape cartridge while the BUSY indicator is illuminated. Wait until the tape cartridge unloading sequence has been completed.

Do not use excessive force on the tape eject lever. It will not operate when power is off (unless the tape was properly unloaded) or when the BUSY indicator is illuminated.

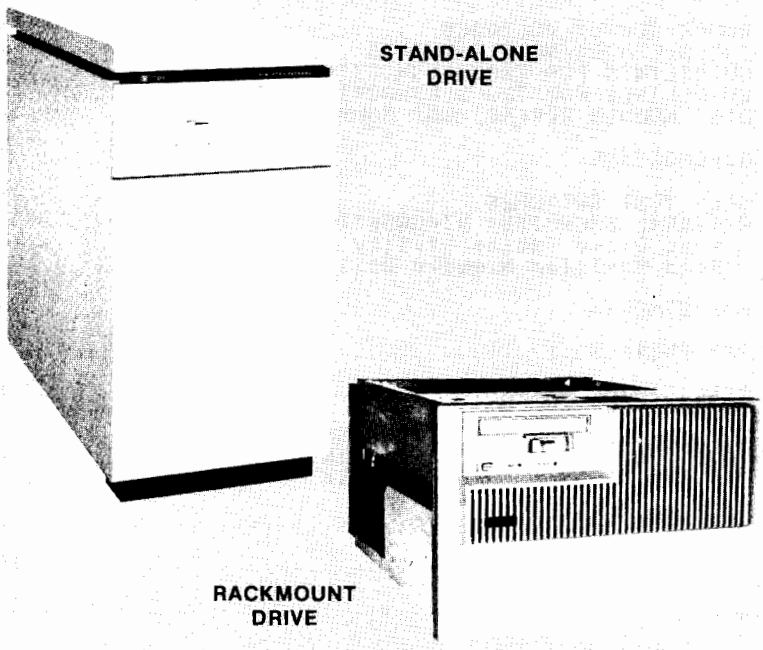
CAUTION

The use of new tape media requires more frequent cleaning of the tape head. If a new tape cartridge is being used, the tape head should be cleaned following any operation that accesses most or all of the tape (e.g., disc backup, tape certification). Head cleaning is recommended the first several times a new tape cartridge is used. Failure to comply with this precaution could result in loss of data.

A power loss during a tape read operation could cause an unwanted write to occur. A tape should be "write-protected" by turning the screw on the cartridge to the "SAFE" position when the tape is not to be written to.

RELATED MANUALS

Part No.	Title
5955-3456	Site Environmental Requirements for Disc/Tape Drives.
5955-3442	CS/80 Instruction Set Programming
5955-3462	CS/80 External Exerciser Reference
5957-4205	7908/7911/7912 Quick Reference Guide
07912-90901	7911/7912/7914 Operator Instructions
07912-90902	7911/7912/7914 Operating & Installation
07912-90903	7911/7912/7914 Service



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GENERAL INDEX

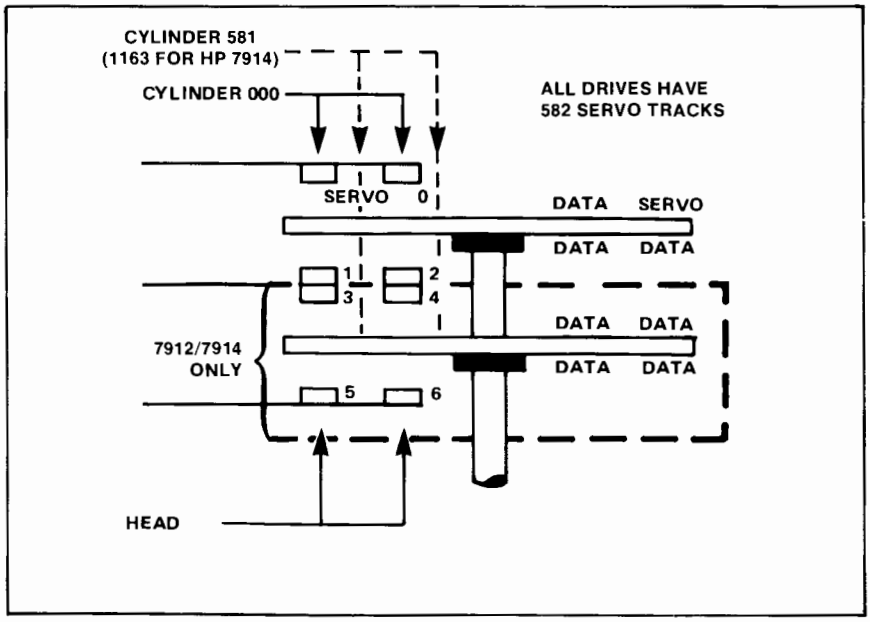
1-1. PRODUCT DESCRIPTION

FEATURES

28-megabyte, 1 fixed disc (HP 7911)
65-megabyte, 2 fixed discs (HP 7912)
132-megabyte, 2 double-density discs (HP 7914)
Sealed Winchester mechanism
Stand-alone cabinet or rackmount
Built-in cartridge tape
Built-in controller (single or dual)
Self-diagnosis and error logging

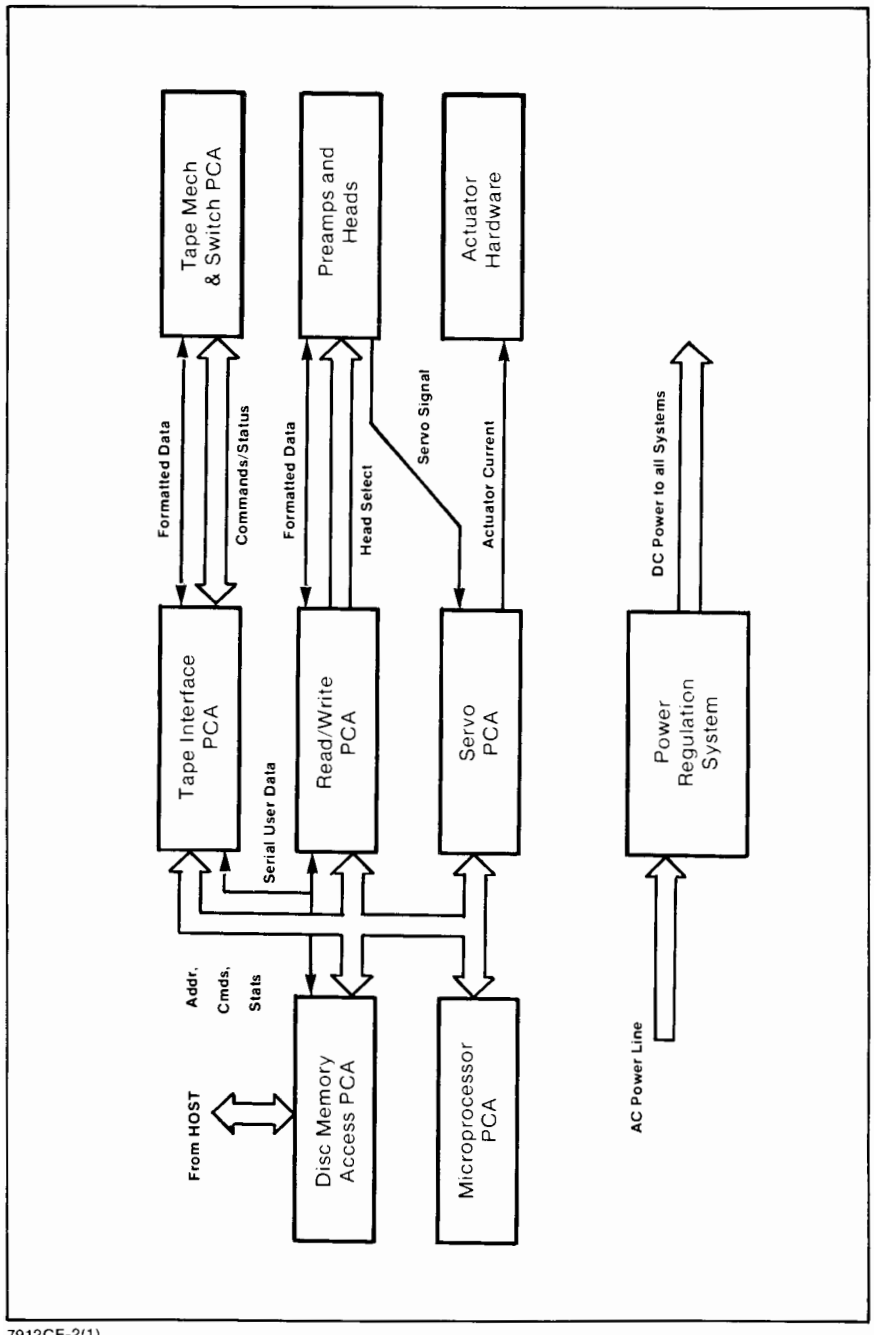
PHYSICAL DIMENSIONS

	Rackmount Drives	Stand-alone Drives
Height:	310 mm (12.2 in.)	720 mm (28.4 in.)
Width:	482 mm (19.0 in.)	354 mm (14.0 in.)
Depth:	744 mm (29.3 in.)	740 mm (29.1 in.)
Net Weight:	67.2 kg (148 lb.)	85.4 kg (188 lb.)
Shipping Weight:	89.9 kg (198 lb.)	117.1 kg (258 lb.)



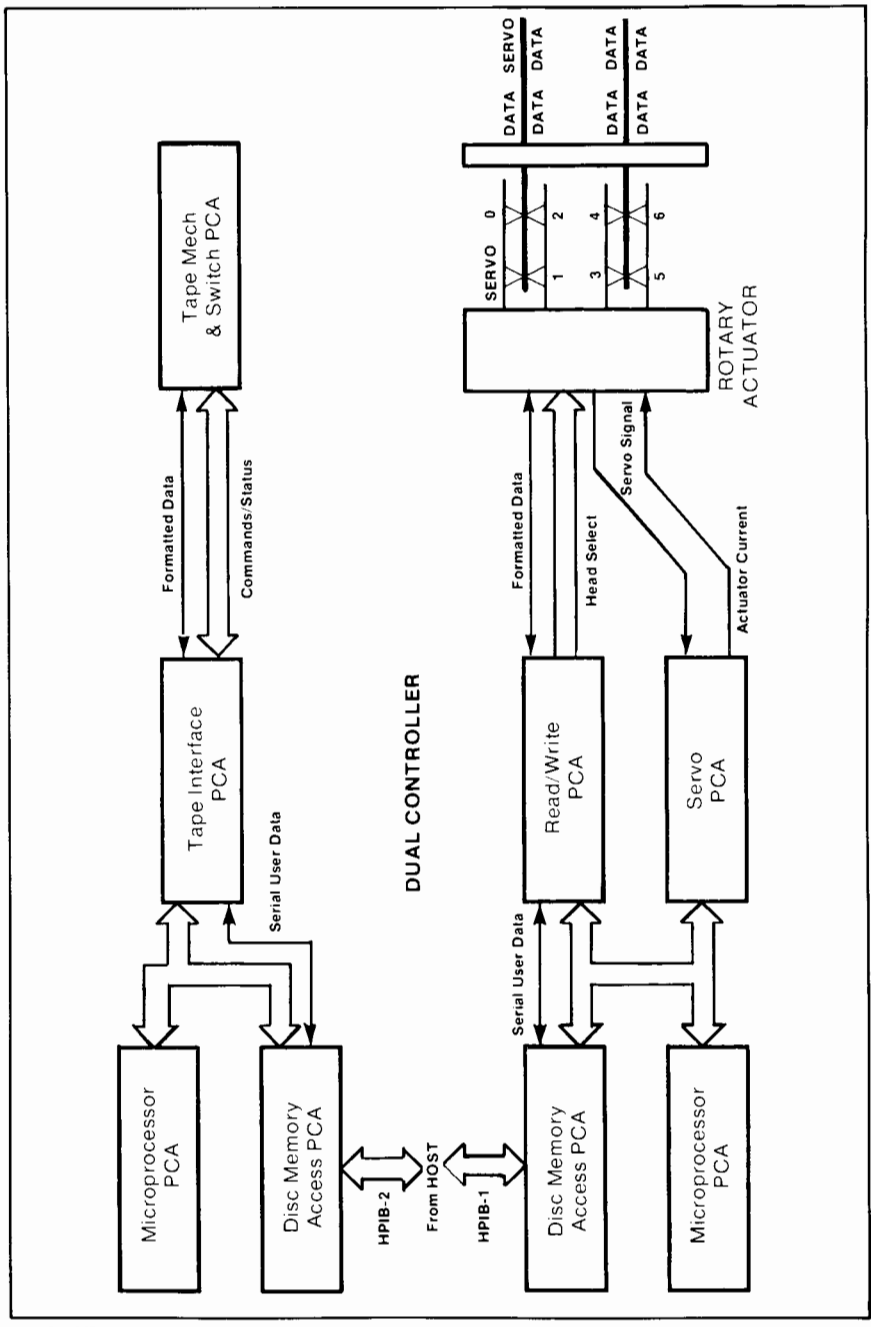
7912CE-1

Figure 1-1. Head and Disc Arrangement



7912CE-2(1)

Figure 1-2. HP 791X Functional Block Diagram



7912CE-2(2)

Figure 1-3 HP 791X Dual Controller Diagram

1-2. OPTIONS AND ACCESSORIES

The following items are included with the standard drive:

07912-90901	7911/7912/7914 Operator Instructions
07912-90902	7911/7912/7914 Operating & Installation Manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
9164-0127	67-megabyte tape cartridge
8120-3445	1-metre HP-IB cable (stand-alone model)
OR	
8120-3446	2-metre HP-IB cable (rackmount)
8120-2371	2.3-metre power cord
*	1-ounce bottle of tape cleaner
*	10 tape head cleaning swabs

* Reorder in quantities specified in the list below.

The following options are available:

OPTION 001 - Dedicated tape controller

OPTION 015 - 180 to 255 volt operation

OPTION 140 - Delete cartridge tape drive

The following accessories or consumables are available:

88140SC	Tape cartridges, box of 5, 16.7 Mbytes, 150 ft
88140LC	Tape cartridges, box of 5, 67.0 Mbytes, 600 ft
8500-1251	Tape head cleaner, 4 ounce can
9300-0767	Lint-free cleaning swabs, box of 50
10833A	RFI shielded HP-IB cable, 1 metre
10833B	RFI shielded HP-IB cable, 2 metre

The following packaging items are required to protect the disc mechanism case during reshipment:

9211-3969		Container - corrugated
9220-3747	(2)	Pad - corrugated, foam corner blocks
9211-3967		Tray - corrugated
9211-3966		Pallet - wood

1-3. SERVICE KITS

The Product Support Package comprises the following items.

5010-0566	HP85 External Exerciser Tape (Rev 2534 & up)
07912-90903	Service Manual
09815-20602	Motherboard PCA Removal Tool
1535-2653	Torque Wrench
1540-0724	Transit Case
5955-3462	CS/80 External Exerciser Reference Manual
8710-1007	Torque Wrench
8710-1213	IC inserter
8710-1426	TORX(R) Field Kit (req. for disassembly)
8710-1448	Drive Socket
8720-0011	Wrench, Open End
9164-0211	Tape Cartridge, 600 feet
9300-0794	Anti-Static Workstation
8710-1450	Socket, hex key
8710-1457	Coupler, hex drive

NOTE: TORX(R) is a registered trademark of Camcar Division Inc. The TORX(R) Field Kit consists of the foll

8710-1424	Bit T6
8710-1423	Bit T7
8710-1422	Bit T8
8710-1421	Bit T9
8710-1418	Bit T10
8710-1465	Bit T10 (3.5 in.)
8710-1415	Bit T15
8710-1416	Bit T20
8710-1417	Bit T25
8710-1420	Bit T27
8710-1419	Bit T30
8710-1413	Driver Handle
8710-1425	Extension
8710-1412	Pouch

The Product Support Package for the tape drive consists of a transit case designed to hold a spare tape module.

1540-0725 Transit Case, Tape Drive

NOTE: See Section VIII, REPLACEABLE PARTS, for recommended spares.

1-4. OPERATING SPECS AND CHARACTERISTICS

Table 1-1. Operating Information

OPERATING SPECIFICATIONS

DISC DRIVE

	7911/7912	7914
Average controller throughput time:	9.4 ms	9.4 ms
Average seek time:	26.7 ms	27.7 ms
Average rotational delay:	8.3 ms	8.3 ms
Average time to transfer 1 kbyte:	1.0 ms	1.0 ms
Total average transaction time (excluding system overhead):	45.4 ms	46.4 ms

	7911/7912	7914
Disc performance index:	22.0*	21.5*

**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.

TAPE DRIVE

Speed

Read/write:	152.4 cm/s (60 in./s)
Search:	228.6 cm/s (90 in./s)

Data Transfer Rate

Average Transfer Rate:	
Over internal data path:	35.0 kbytes/s
Over HP-IB:	System dependent (35 kbytes/s maximum)
Burst Transfer Rate:	
Over HP-IB:	1 Mbyte/s maximum

OPERATING CHARACTERISTICS

DISC DRIVE DATA CAPACITY

	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per
Byte	8	1		
Word	16	2		
Sector	2,048	256	1	
Track	131,072	16,384	64†	1
Head (7911, 7912)	74,973,184	9,376,148	36,608	572†
Head (7914)	150,994,944	18,874,368	73,728	1,152†
HP 7911‡	224,919,552	28,114,944	109,824	1,716
HP 7912‡	524,812,228	65,601,536	256,256	4,004
HP 7914‡	1,056,964,608	132,120,576	516,096	8,064

†Total number of tracks per 7911/7912 head is 582, and total number of tracks per 7914 head is 1,164. Eight tracks are used as spares for defective track allocation and two are used for maintenance tracks on all models. The 7914 has two additional tracks reserved for future use. Total number of sectors per track is 65, with one used as a spare.
‡The HP 7911, HP 7912, and HP 7914 utilize two heads per surface.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table 1-1. Operating Information (cont'd)

Power Characteristics

Voltage:	100, 120, 220, 240V; +5%, -10%
Frequency:	50 Hz, 60 Hz; +10%, -5%
Phase:	Single
Line Dropout:	No effect on performance: no operator intervention required for dropout equal to or less than one-half cycle of the ac line.
Power:	700 watts

Power Requirements

Voltage:	100, 120, 220, 240V; +5%, -10%
Frequency:	50 Hz, 60 Hz; +10%, -5%
Phase:	Single
Current:	8 amperes maximum at 120 Vac, 60 Hz
Distortion:	5% peak and flat harmonic distortion
Over/Under Voltage:	25% to 200% of nominal line voltage for 30 seconds
Neutral to Ground Noise:	≤ 10V peak-to-peak
Ground to Ground Noise:	≤ 10V peak-to-peak

Heat Dissipation

700 Watts (2389 Btu/hr) maximum

TAPE DRIVE DATA CAPACITY (HP 88140SC, 150 ft)

	Data Bits Per	Data Bytes Per	Data Words Per	Blocks Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track	8,372,224	1,046,528	523,264	1,022	
Cartridge	133,955,584	16,744,448	8,372,224	16,352*	16

*Total number of blocks per 150 ft. cartridge is 16,624 with 32 of them utilized as spares and 240 of them used as maintenance blocks.

TAPE DRIVE DATA CAPACITY (HP 88140LC, 600 ft)

	Data Bits Per	Data Bytes Per	Data Words Per	Blocks Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track	33,488,896	4,186,112	2,093,056	4,088	
Cartridge	535,822,336	66,977,792	33,488,896	65,408**	16

**Total number of blocks per 600 ft. cartridge is 65,776 with 128 of them utilized as spares and 240 of them used as maintenance blocks.

For complete information, refer to the *Site Environmental Requirements*, part no. 5955-3456.

2-1. ENVIRONMENTAL REQUIREMENTS

For complete information, refer to the Site Environmental Requirements manual, P/N 5955-3456.

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device 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.

Table 2-1. Environmental Requirements

TEMPERATURE	
Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	10°C to 40°C (50°F to 104°F)
Nonoperating range:	-40°C to 60°C (-40°F to 140°F)
Maximum rate of change:	10°C (18°F) per hour
HUMIDITY	
Operating:	20% to 80% relative humidity, noncondensing and with a maximum of 0.015 kg of water per kg of dry air. For example, this is equivalent to a maximum of 80% relative humidity at 24°C (75°F), a maximum of 50% relative humidity at 32°C (90°F), or a maximum of 32% relative humidity at 40°C (104°F).
Nonoperating:	10% to 90% relative humidity, noncondensing, and with wet bulb temperature not to exceed 25.6°C (78°F). For example this is equivalent to a maximum of 90% relative humidity at 27°C (81°F), a maximum of 50% relative humidity at 34°C (93°F), or a maximum of 32% relative humidity at 40°C (104°F).
VIBRATION	
Operating: (See Figure 2-1) R Models Only	Random vibration with power spectral density (PSD) of 2.5 X 10^{-5} g^2/Hz from 5 to 10 Hz; 7.5 dB/octave from 10 to 25 Hz; PSD of 2.5 X 10^{-4} g^2/Hz from 25 to 30 hz; -24 dB/octave from 30 to 40 Hz; PSD of 2.5 X 10^{-5} g^2/Hz from 40 to 2000 Hz; -9.3 dB/octave from 2000 to 2500 Hz; PSD of 1.25 x 10^{-5} g^2/Hz at 2500 Hz.
Operating: P Models Only	Random vibration with power spectral density (PSD) of 9 X 10^{-6} g^2/Hz from 5 to 2500 Hz.
Nonoperating (See Figure 2-2)	Random vibration with power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.

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

SHOCK

Recommended operating range:	<0.67 g's
Operating:	2g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 4 600 m (15,000 ft)
Nonoperating:	maximum 15 000 m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

This disc drive has been successfully type tested under conditions of radiated and conducted interference. Operation at levels exceeding these may result in degraded performance and is not covered under warranty.

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	14 kHz to 1 GHz, <0.5 V/m
Conducted:	30 Hz to 50 kHz, <3V rms
Recommended limit:	<1 V rms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 V/m
Electrostatic Discharge:	≤12.5 kV
Recommended limit:	<5 kV
Magnetic:	47.5 Hz to 198 Hz,<5 gauss
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV
Recommended limit:	<500V

POWER REQUIREMENTS

Recommended limit:	The daily average not to vary more than ±2% from the correct voltage
Voltage:	100, 120, 220, 240V; +5%,-10%
Frequency:	50 Hz, 60 Hz; +10%, -5%*
Recommended frequency:	47.5 to 52.5 Hz, 57 to 66 Hz
Phase:	Single
Current:	8 amperes maximum at 120 Vac, 60 Hz
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

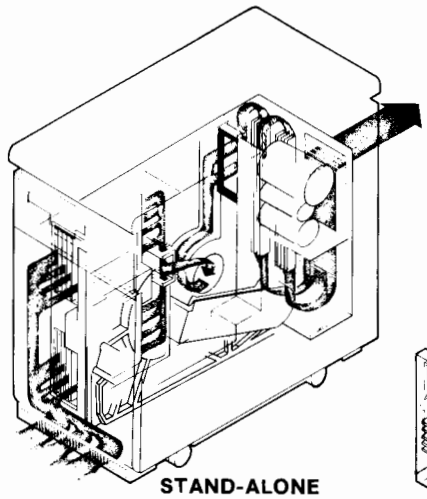
Can be operated in any position; however, the disc drive drive should not be rotated about its axis (vertical axis for the HP 7914P; horizontal axis for the HP 7914R) at a rate greater than 0.2 radians/second due to gyroscopic effects. Rotation beyond this rate can cause errors which require reinitialization of the media.

COOLING REQUIREMENTS

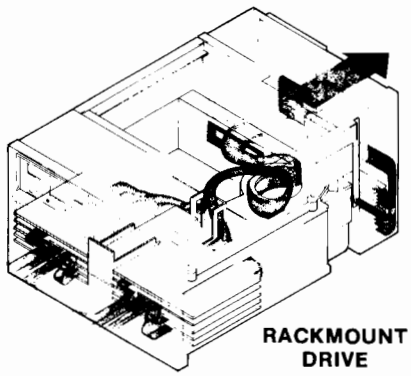
Allow 76.2 mm (3 in.) in front and behind for adequate air flow.

*The HP 7911/HP 7912/HP 7914 Disc/Tape Drives require a pulley and belt change when changing between 50 Hz and 60 Hz.

MAINTAIN AT LEAST 75 MM (3 IN.) CLEARANCE FRONT AND REAR.



STAND-ALONE DRIVE



RACKMOUNT DRIVE

THERMAL SWITCH ON PCA-A13 TRIPS POSITIVE CROWBAR IF TEMPERATURE EXCEEDS 90.5°C (195°F). RECOVERS AT 70°C (158°F). SIMILAR SWITCH ON DRIVE MOTOR OPENS 120 VAC TO SHUT DOWN MOTOR.

REF 7912-30

Figure 2-1. Internal Airflow

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.

Operating and Installation Manual for HP 7911/7912/7914 Disc/Tape Drives, P/N 07912-90902.

INSTALLATION CHECKLIST

1. Verify input ac voltage and fuse rating. To change power cord, fuses, strapping, or frequency configuration, refer to later paragraphs in this section.
2. Connect HP-IB cable and set address select switch.
3. Release shipping locks (refer to figure 2-2).
4. Reseat all PCAs.
5. Power-on the drive and check that the status readout indicates "P." If not, the selftest failed and the problem must be isolated and repaired before proceeding with the installation.

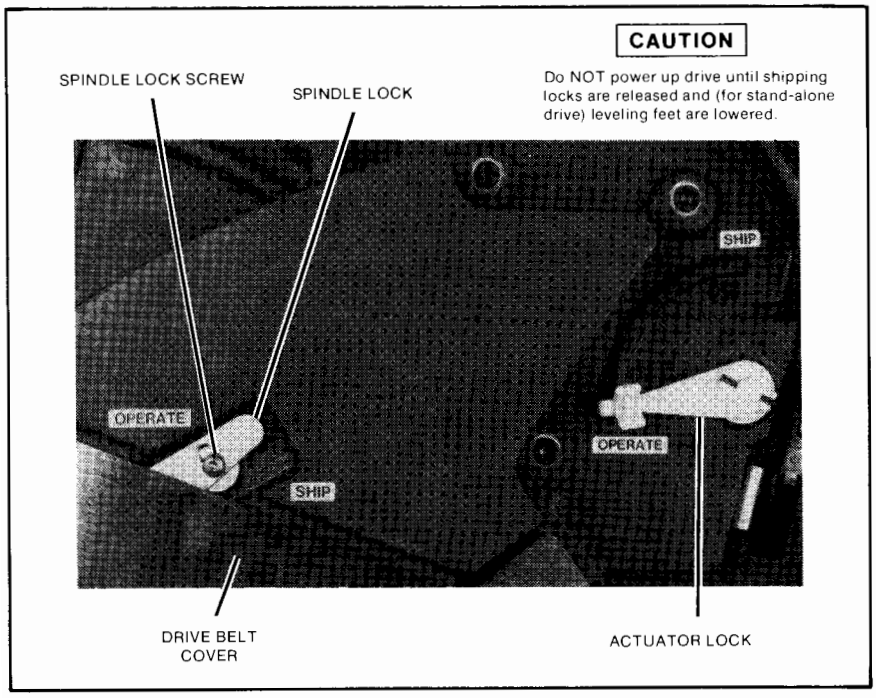


Figure 2-2. Shipping Locks

6. Using the CS/80 External Exerciser, initialize the media retaining primary spares.

7. Initialize the maintenance tracks retaining all spares.

8. Perform one pass of WTR ERT.

9. Read the ERT log and the Fault log. Spare any uncorrectable errors logged in the ERT log. Isolate and repair any faults logged in the Fault log.

10. Power cycle the drive and ensure that the status display indicates a successful power-on selftest (P.). If the selftest was not successful, troubleshoot and repair the drive.

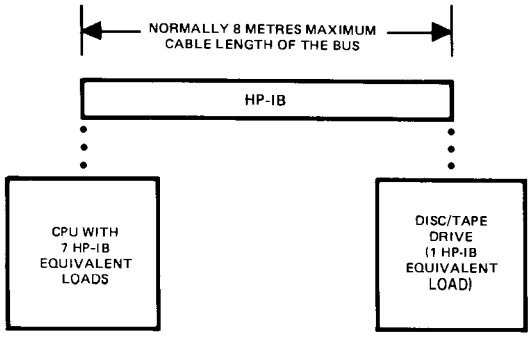
2-3. HP-IB INTERCONNECTION

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

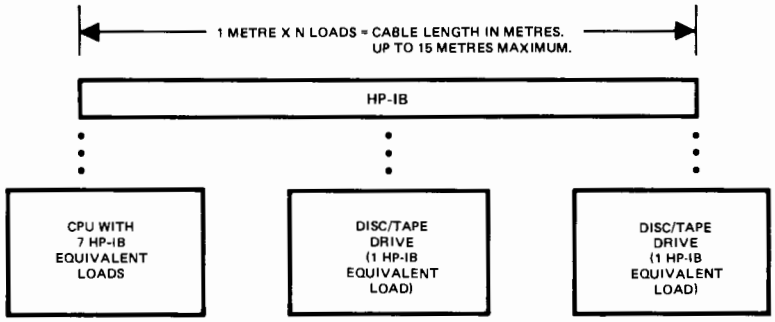
CABLE LENGTH	HP PART NUMBER	PRODUCT NUMBER
0.5 metre	8120-3444	10833D
1.0 metre	8120-3445 *	10833A
2.0 metres	8120-3446 *	10833B
4.0 metres	8120-3447	10833C
6.0 metres	8120-3448	Not assigned
8.0 metres	8120-3449	Not assigned

* Prior to AUG 82, P/Ns were 5060-9455 & 5060-9456 respectively. (Supplier change only - no functional difference.)

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. (Refer to host configuration guides for any additional system limitations.)

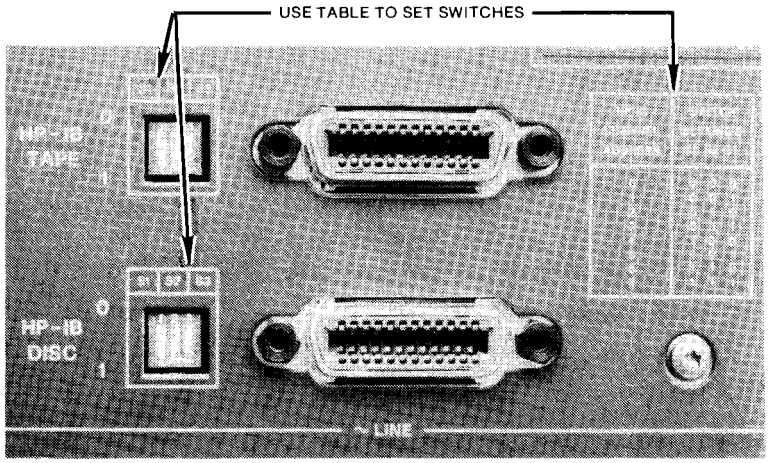


A star or daisy-chain configuration may be used to connect the CPU to multiple disc/tape drives. However, the star setup requires a dedicated GIC per drive.

Table 2-2. System Configurations

SYSTEM	MAX DRIVES	HP-IB CABLE	INTERFACE
250	4	2m max	PIC
1000A/L	4	2m (10 max)	12009A-001
1000E/F	8	2m (10 max)	12821A (2)
3000/3x	3(Opt 140) 1(Opt 001)	1m 1m	GIC GIC (2)
3000/4x	4(Opt 140) 1(Opt 001)	1m 1m	GIC GIC (2)
3000/64	1	1m	GIC (2 for 001)
9845	2	1m (max)	98034B-045

2-4. HP-IB DEVICE ADDRESS



Note two device select switches on the rear panel: one for the disc drive and one for the tape drive. If the tape drive has a dedicated controller (Option 001) the HP-IB TAPE switch must have a different address from the DISC, otherwise ignore this setting.

When connecting the HP-IB cable to a standard (i.e., single controller) drive, use the bottom connector as shown above.

2-5. PCA LOCATION

	PCA	NEW P/N	EXCH. P/N	LOCATION
A1	DMA(Opt 001)	07912-60210	-69210	Card Cage
A2	MPU(Opt 001)	07912-60011	-69011	Card Cage
A3	MPU	(same as A2 MPU)		
A4	DMA	(same as A1 DMA)		
A6	TIB	07908-60241	-69241	Card Cage
A7	Jumper	07912-60008	------	Card Cage
A8	Read/Write	07914-60204	-69204	Card Cage
A9	Servo	07914-60001	-69001	Card Cage

(See IPB foldout in section VIII for location:

A11	Motherboard	07912-60103	------	Rear of Card Cage
	(or)	07914-60103		
A13	Power Reg	07912-60006	-69006	Inside Power Box
A14	HP-IB	07912-60009	------	Inside Power Box
A15	Switch	07908-60142	------	Tape Drive, Front

NOTES: Option 001 (dual controller) has A7 slot empty.
Option 140 (no tape module) has A6 & A15 empty.
Refer to section VIII for PCA history/compatibility.

2-6. PCA REVISION HISTORY

(See section VIII, table 8-1.)

2-7. MPU FIRMWARE UPDATE HISTORY

(See section VIII, table 8-2.)

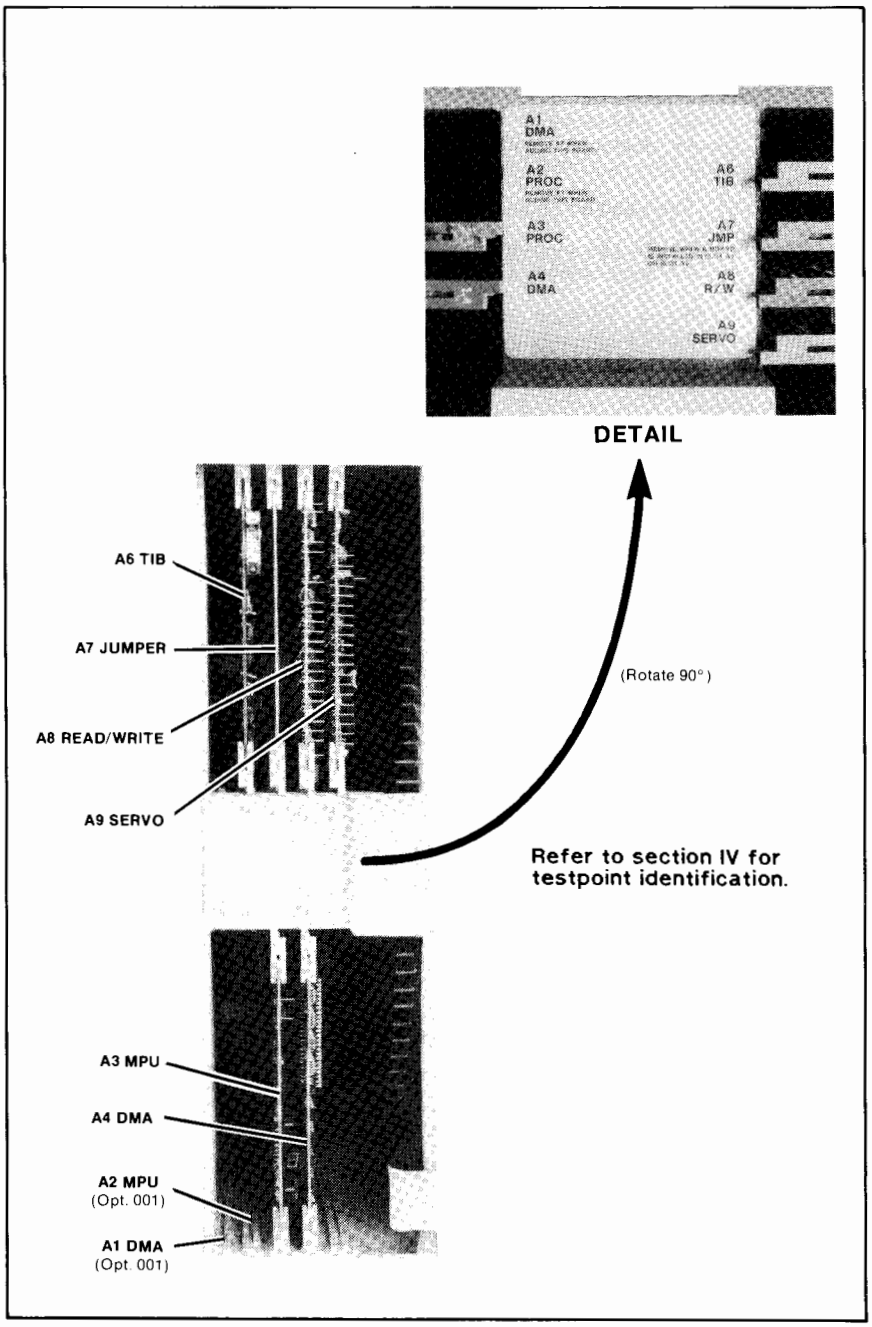


Figure 2-3. Card Cage Layout

2-8. CONTROLS & INDICATORS

FRONT PANEL - TAPE DRIVE

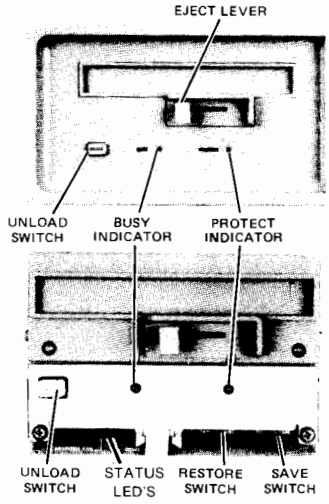
BUSY	ON indicates tape being exercised (don't unload or turn off main power). FLASHING indicates tape drive fault or read/write error.
PROTECT	Indicates tape cartridge set to SAFE.
UNLOAD	Push to rewind tape (and update use log) before removing.
Eject Lever	Push firmly to right after UNLOAD (never when BUSY).
SAVE	Push (twice) for full disc to tape transfer.
RESTORE	Push (twice) for full tape to disc transfer.

(Two tape cartridges are required to back up an HP 7914. When the first tape is full the BUSY light flickers to prompt the user to install the second tape. For a restore operation, the sequence of tape insertion is unimportant.)

Status LEDs (to left of SAVE/RESTORE switches):

Left Lamp CARTRIDGE FAILURE	Right Lamp DRIVE FAILURE	CAUSE
OFF	OFF	See paragraph 4-3, subsection 4.0 Auto Load Failures.
ON	OFF	
OFF	ON	
ON	ON	

TAPE MECHANISM



NOTE:
See CS/80 tab for tape certifying, testing, sparing. (Also para. 4-3.)

FRONT PANEL - SELF TEST

Self test is invoked with each power-up, taking 1 to 3 minutes depending on tape installed. "P." indicates pass, a number indicates suspect PCA.

SUMMARY OF TEST SWITCH FUNCTIONS

To Duplicate Power-On Test:
Press both switches < 3 sec

To Run 15-Second Self Test:
Press self test switch < 3 sec

To Run 90-Second Diagnostic Test:
Press diagnostic switch < 3 sec

TEST MODE

RESULTS IN "P." OR PCA DIGIT. ("-" = END)

To Enter Supplemental Mode:
Hold either switch until flash

To Obtain Test Error Code:
Press self test switch < 3 sec

To Obtain Next Suspect PCA:
Press diagnostic switch < 3 sec

DIAGNOSTIC MODE

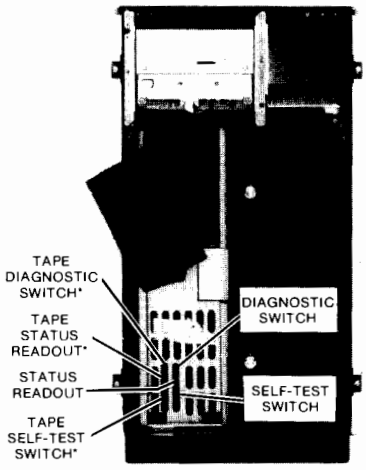
RESULTS IN 2-DIGIT HEX CODE (ONE AT A TIME). "-" = END.

To Repeat Test Results (Anytime)
Hold either switch until flash

To Return To Normal Mode:
Press both switches < 3 sec

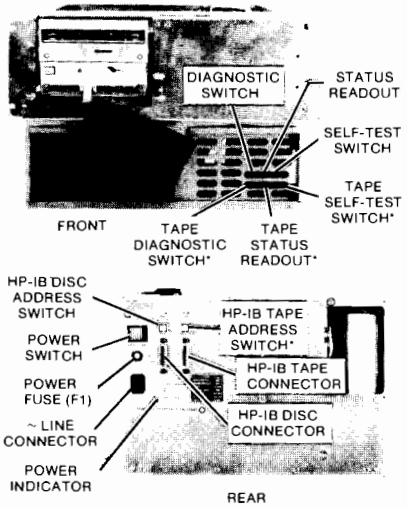
NOTE: See Section V DIAGNOSTICS for error code tables.

STAND-ALONE DRIVE



* OPT 001 ONLY

RACKMOUNT DRIVE



*OPT 001 ONLY

SUSPECT PCA's

DISPLAY	CONDITION
P.	OK
1.	A1 TIB DMA
2.	A2 TIB MPU
3.	A3 MPU
4.	A4 DMA
6.	TAPE
8.	A8 R/W
9.	A9 SERVO
d.	A13 REG
-.	END

ERROR CODES

DISPLAY	LOCATION
01 - 1F	MPU
20 - 3F	TIB & TAPE
40 - 4F	POWER SYSTEM
50 - 6F	DMA
90 - AF	SERVO
C0 - dF	R/W
-	END

Figure 2-4. Disc Drive Switches and Indicators

2-9. AC POWER: CORDS/FUSES/STRAPPING/ LINE FREQUENCY

POWER CORDS

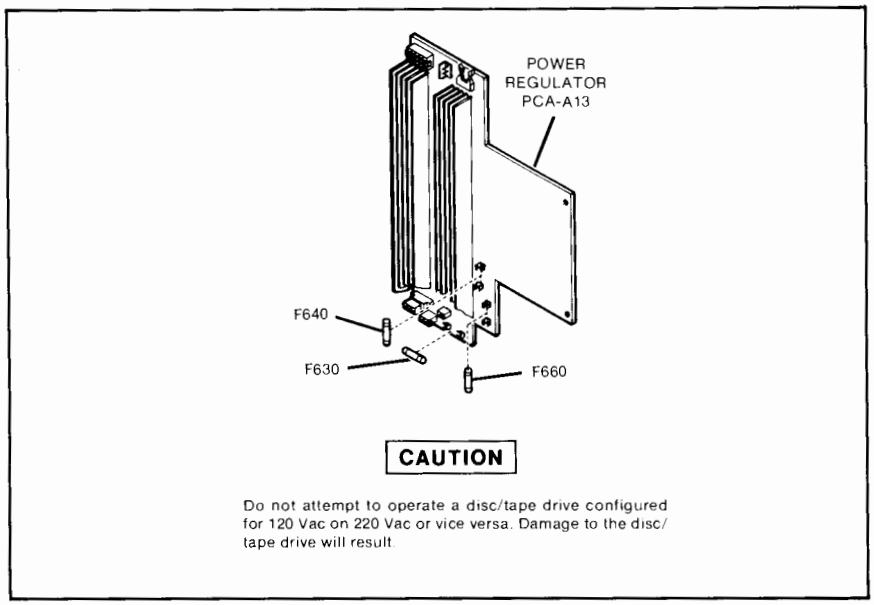
See section IX, figure 9-2, for alternate power cords.
See figure 8-2 for quick access to power supply area.

NOTE: Remember that changing the power cord may require changing fuses, strapping, frequency, and rear label.

FUSES

DESCRIPTION	I.D.	RATING	HP P/N	LOCATION
100/120V med-blo	Main	10A,250V	2110-0051	Rear Panel
220/240V slo-blo	Main	5A,250V	2110-0030	Rear Panel
+20V	F2,F3	15A,250V	2110-0054	Figure 2-7
+11.5V	F630	25A,32V	2110-0250	Figure 2-5
+20V	F640	8A,250V	2110-0342	Figure 2-5
-20V	F660	3A,250V	2110-0003	Figure 2-5
+/-20V	F617,F717	2A,125V	2110-0540	PCA-A9 zone 6/7

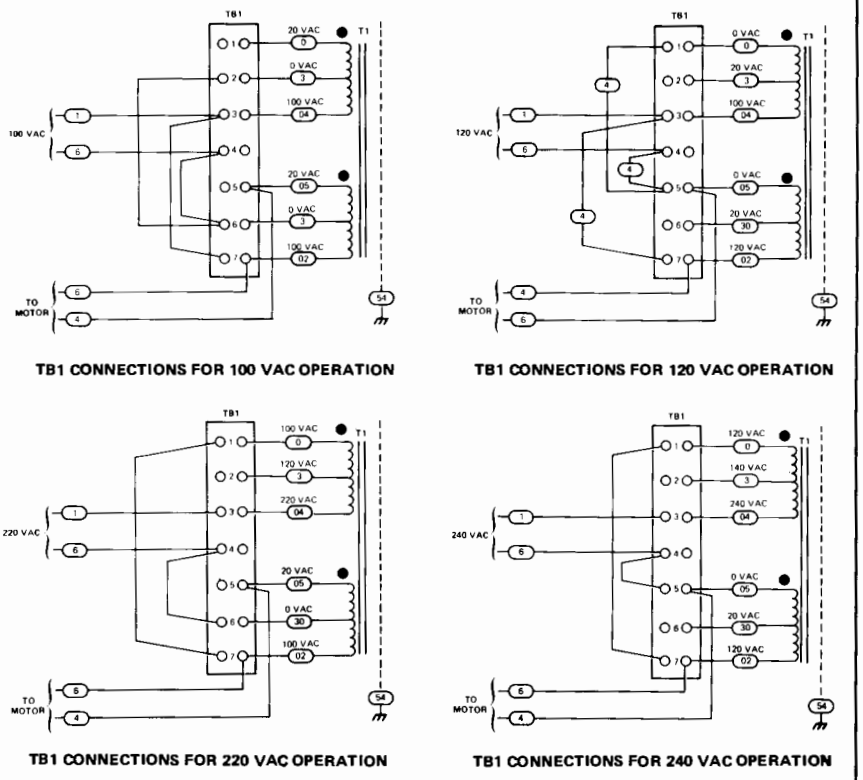
NOTE: If fuses are intact and all voltages are within tolerance, the rear panel LED power indicator will remain lighted while main power is applied.



7912CE-4

Figure 2-5. Secondary Fuse Location (F630,F640,F660)

NOTE: When restrapping be sure to change main power fuse, power cord, power label on rear panel, and frequency of drive motor as applicable. See figure 2-6 for restrapping and figure 2-7 for terminal board access.



TB1 CONNECTIONS FOR 100 VAC OPERATION

TB1 CONNECTIONS FOR 120 VAC OPERATION

TB1 CONNECTIONS FOR 220 VAC OPERATION

TB1 CONNECTIONS FOR 240 VAC OPERATION

INPUT VOLTAGE RANGE	TB1 STRAP
90 to 105 Vac	100V
108 to 126 Vac	120V
198 to 231 Vac	220V
216 to 252 Vac	240V

WARNING

To avoid dangerous electrical shock, do not perform the voltage strapping procedure until the ac mains power is removed from the disc/tape drive.

REF 7912-12

Figure 2-6. Strapping Configurations

WARNING

With ac power applied, hazardous voltages are present within the power box.

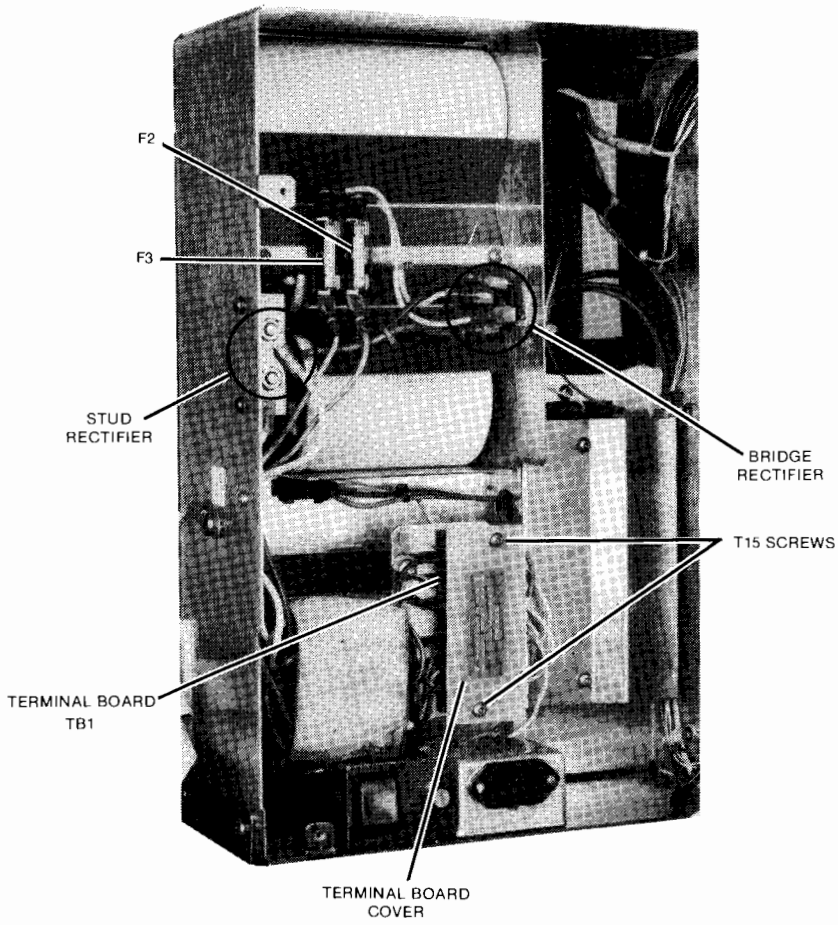


Figure 2-7. Terminal Board TB1 Access

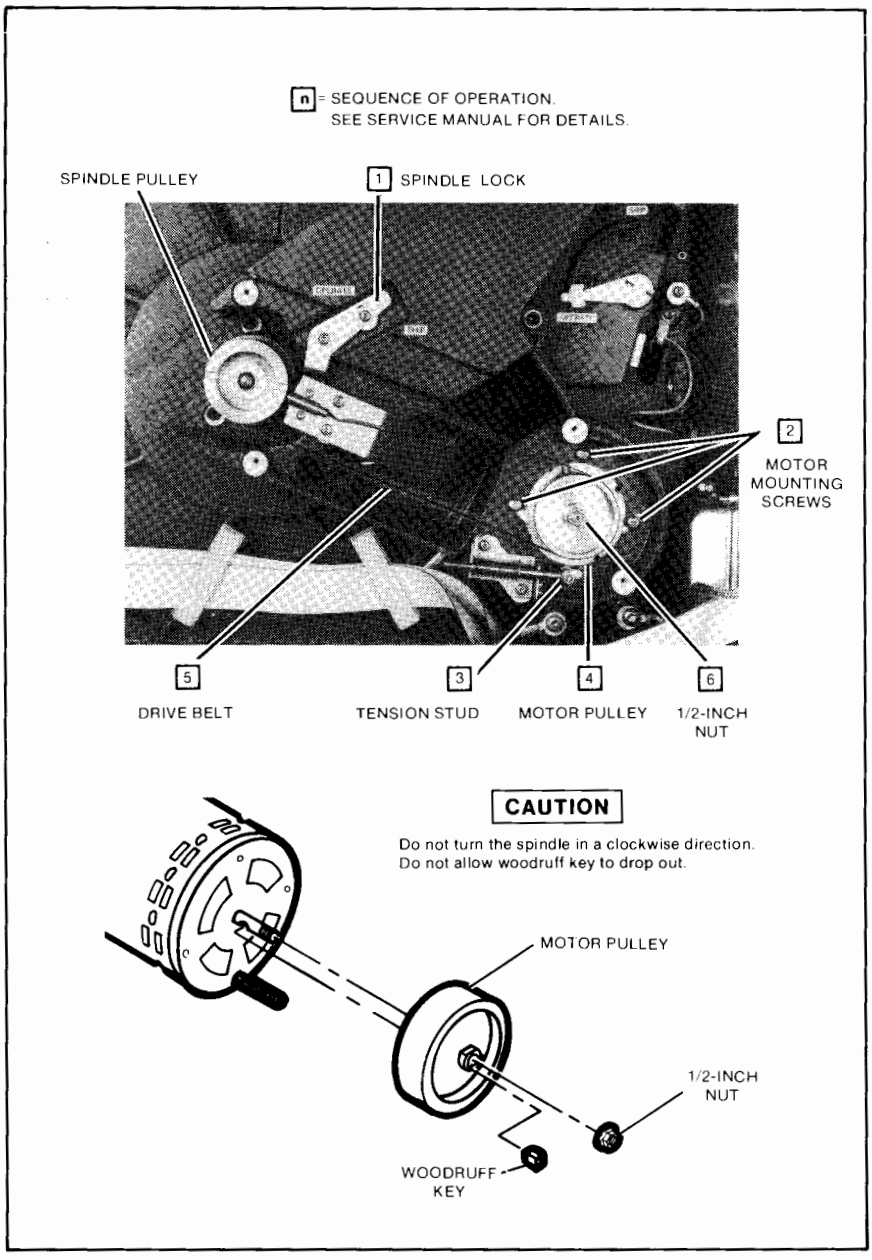


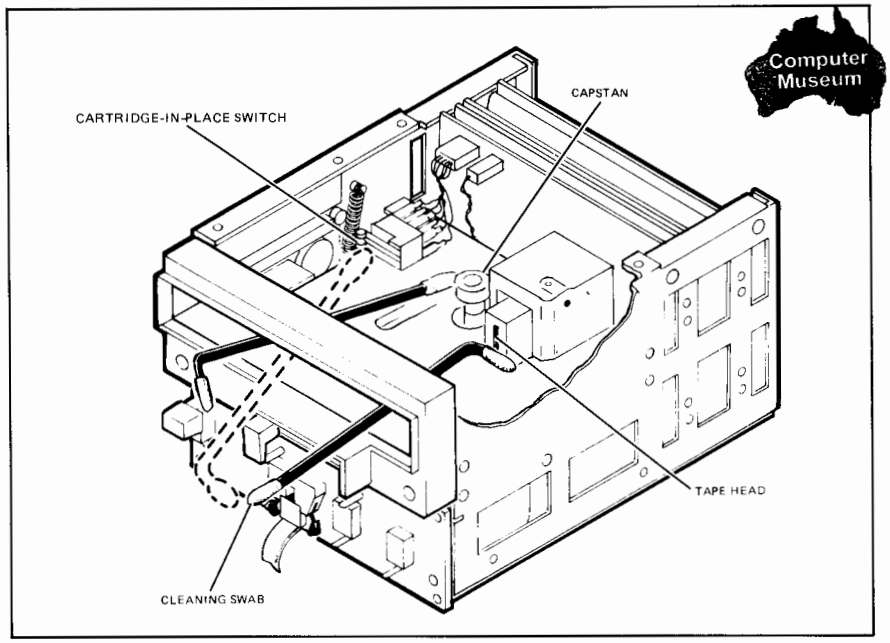
Figure 2-8. Frequency Conversion

2-10. PREVENTIVE MAINTENANCE

NO regularly scheduled PM on any of the drives--except:

Clean tape head and capstan once per week and each time a new tape is certified.

Brush or vacuum the foam filter on the card cage and the intake screen below the front panel as needed.



REF 7912-22

Figure 2-9. Tape Head Cleaning

1. With power ON and cartridge removed, momentarily press lower part of cartridge-in-place switch. Wait for head to raise.
2. Dampen swab straight end and clean rotating capstan.
3. Dampen swab bent end and clean head with up and down motion. Press cartridge-in-place switch again to release head and stop capstan. (Ignore buzzing sound.)

CAUTION

Do not touch the tape. Do not attempt to clean the tape or tape guides within the cartridge. Do not use cleaning materials other than those specified.

Do not press cartridge-in-place switch more than once or hold down longer than 1 second (causes unit fault/ system shutdown).

CONFIGURATION

SECTION III

For system configuration, see related system manuals/handbooks.

For product configuration, look under Installation in Section II.

For disc and tape configuration, see CS/80 tab in this handbook.

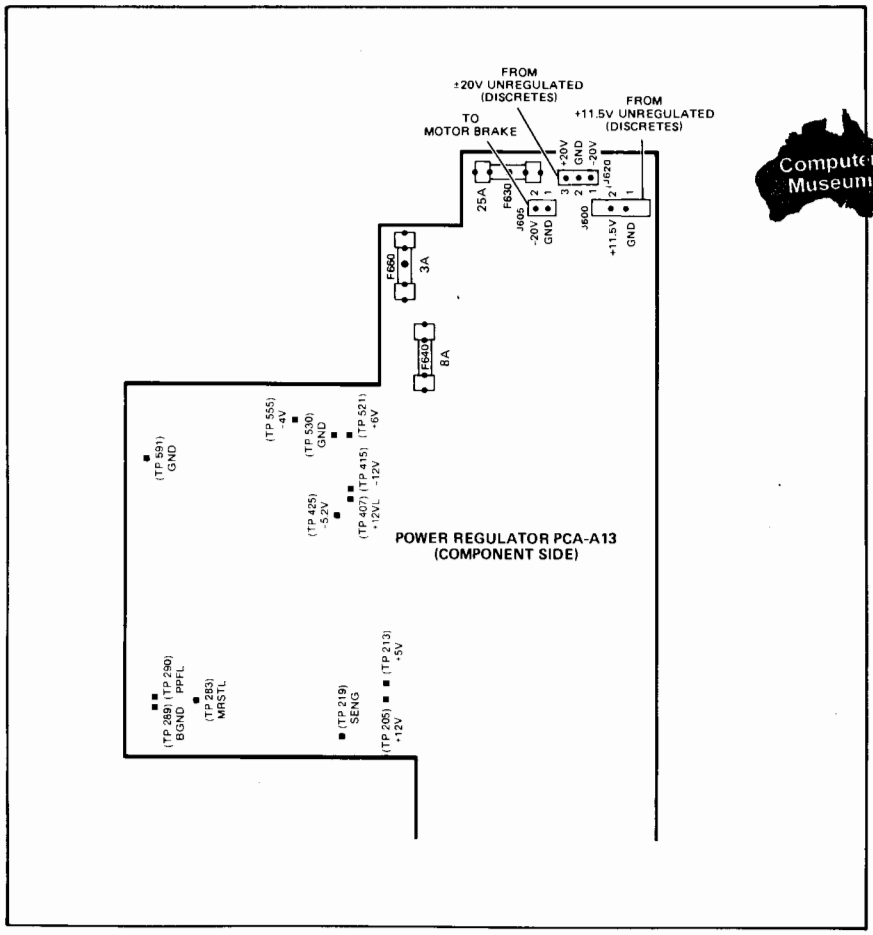
See next section for self test and diagnostic procedures.

See IPB foldout in Section VIII for subassembly location.

4-1. POWER SUPPLY VOLTAGES

If the red power indicator LED does not come on with main power, check secondary voltages at test points in figure 4-1 and fuses at locations shown in figure 2-5 and 2-7.

(The only other status indicators are on the front panel, ref 2-8.)

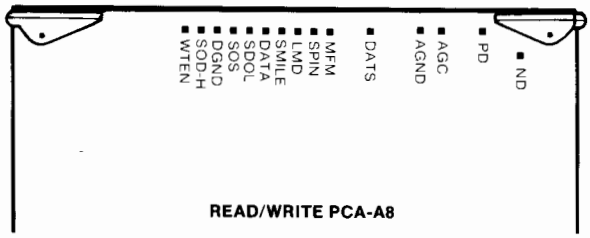


7912CE-6

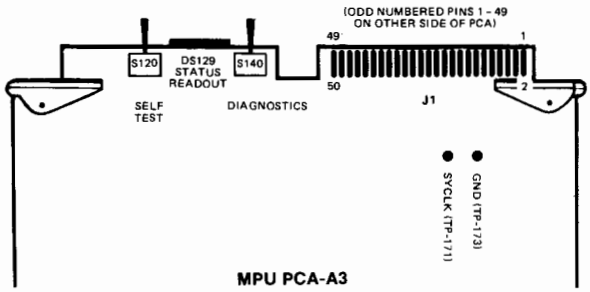
Figure 4-1. PCA Voltage Testpoints

WARNING

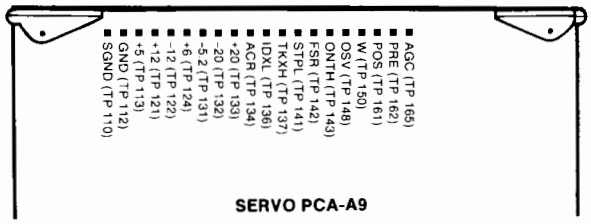
With ac power applied, hazardous voltages are present within the power box.



READ/WRITE PCA-A8



MPU PCA-A3



SERVO PCA-A9

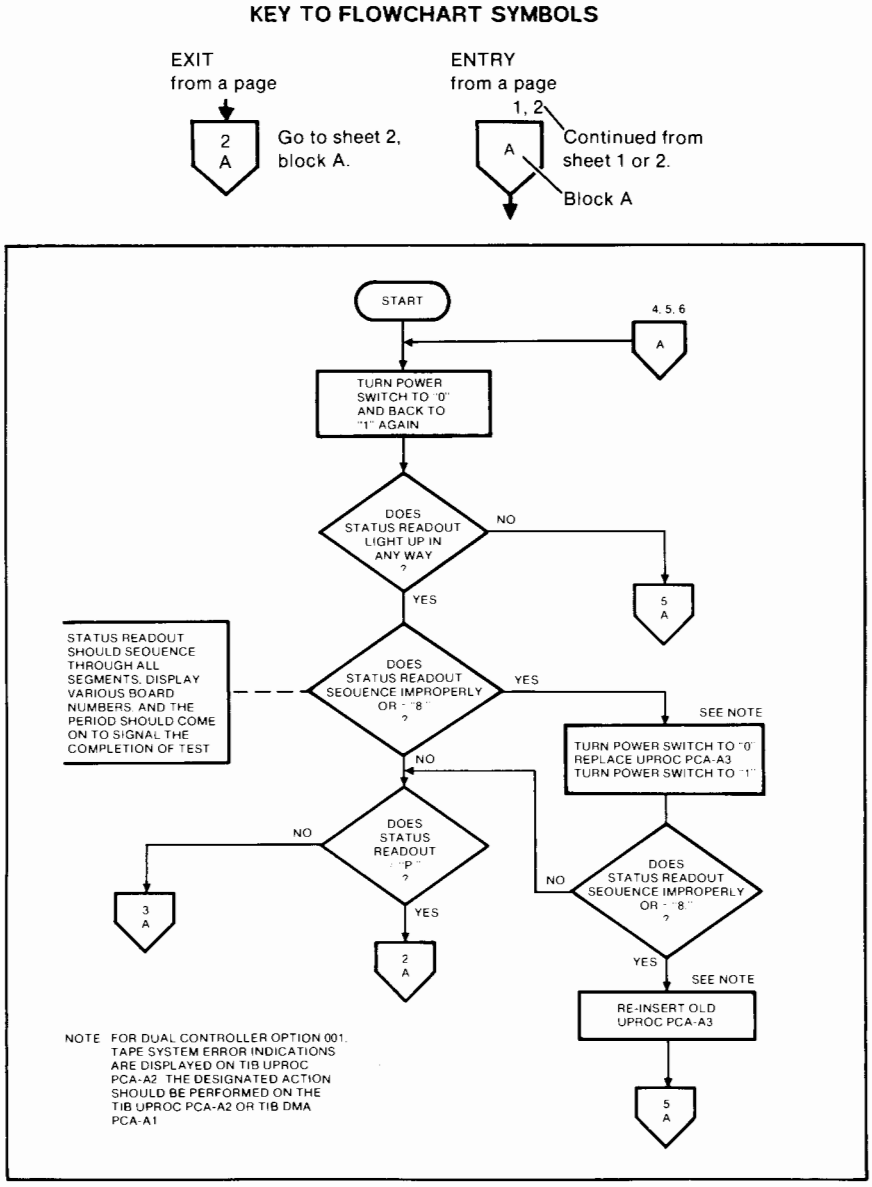
NOTE: See figure 9-1 for ROM locations on MPU board.

7912-6

Figure 4-1. PCA Voltage Testpoints (cont'd)

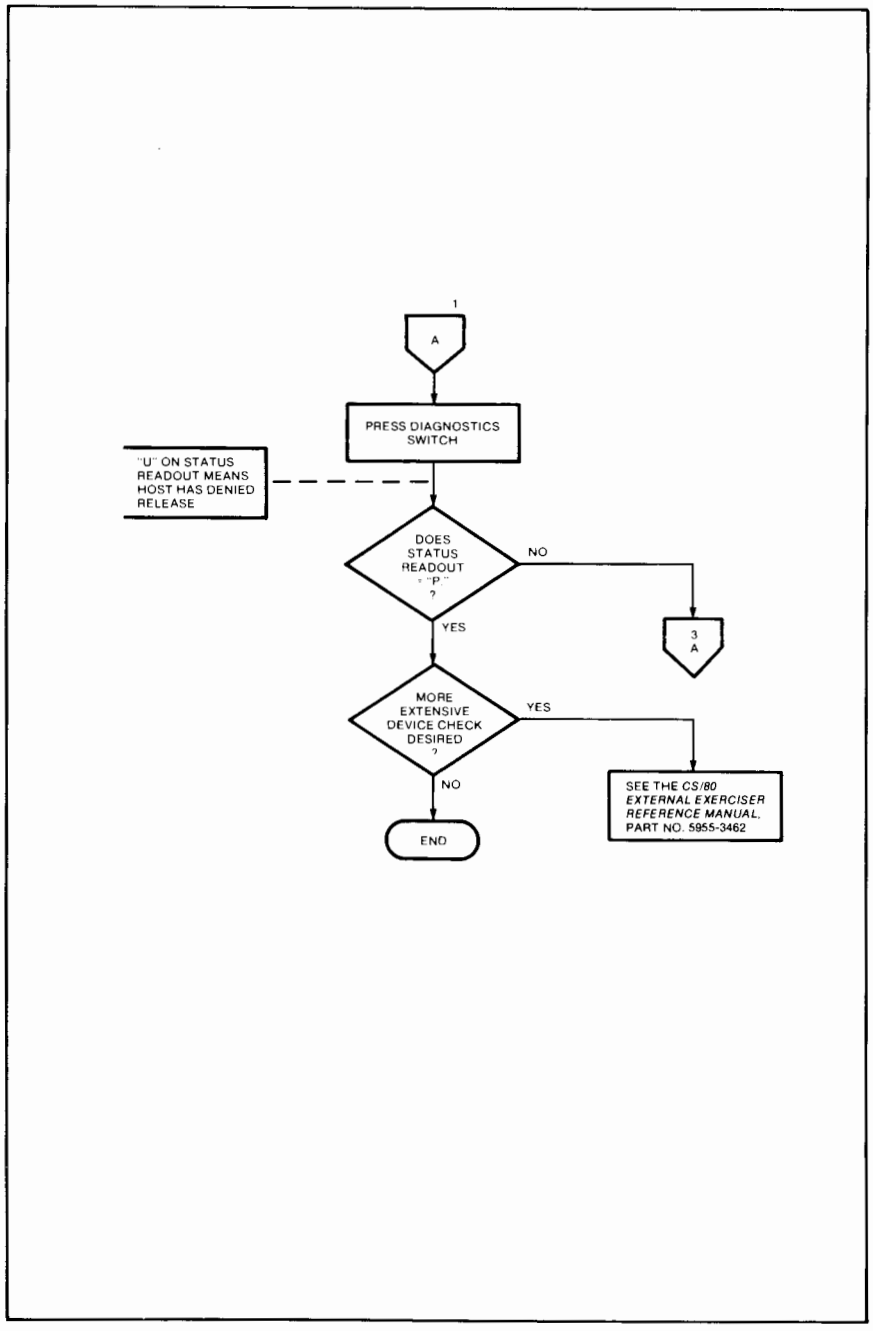
4-2. TROUBLESHOOTING FLOWCHARTS

The following flowcharts are intended for use with the self test switches. (Paragraph references are to the service manual.)



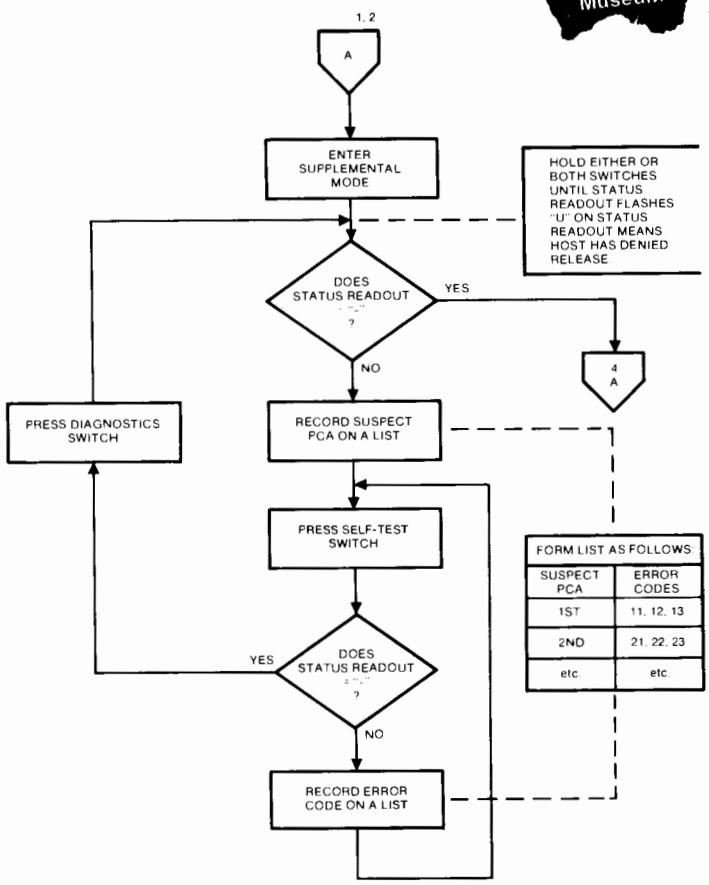
7912-72 (1)

Figure 4-2. Troubleshooting Flowcharts (sheet 1 of 7)



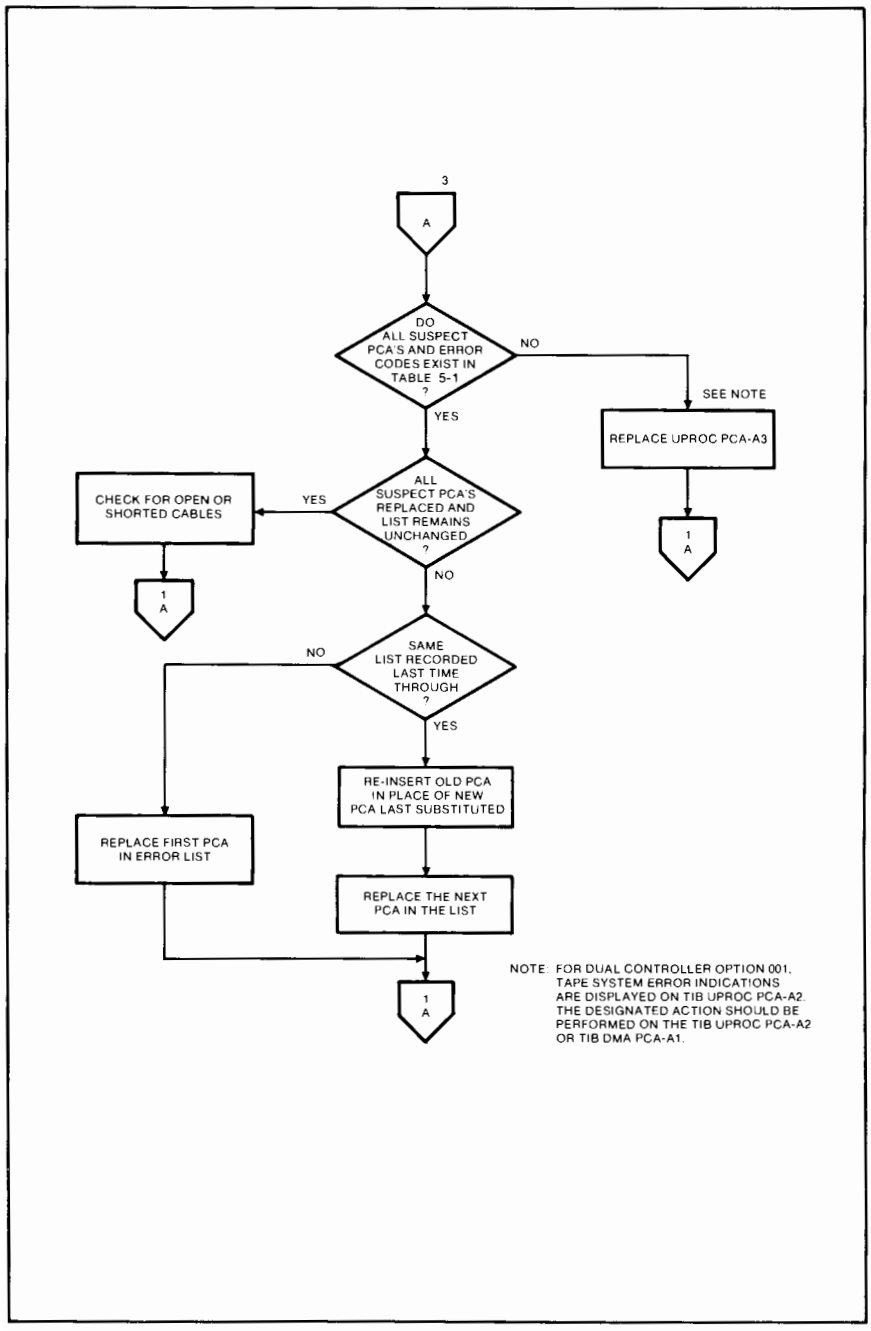
7912-72 (2)

Figure 4-2. Troubleshooting Flowcharts (sheet 2 of 7)



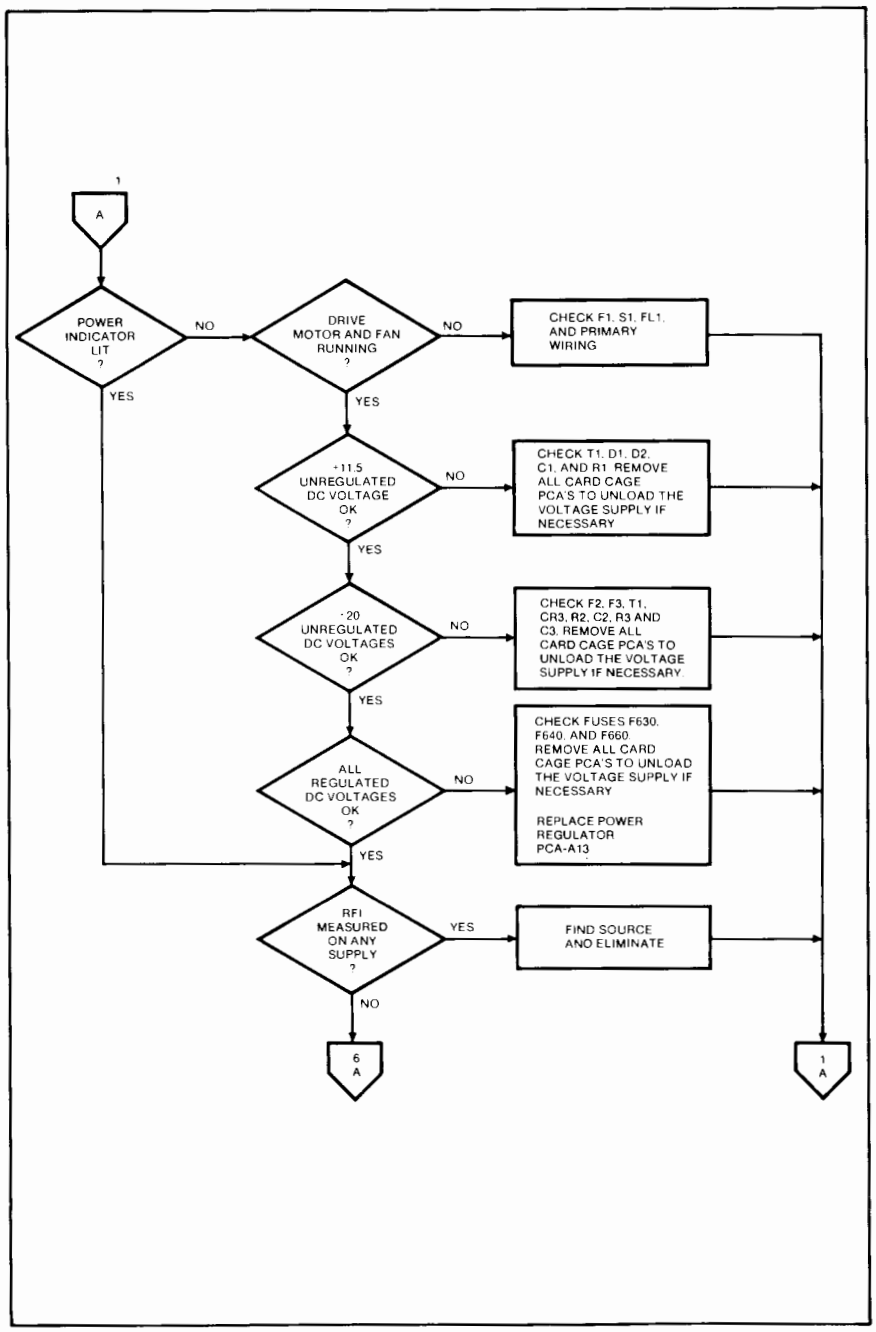
7912-72 (3)

Figure 4-2. Troubleshooting Flowcharts (sheet 3 of 7)



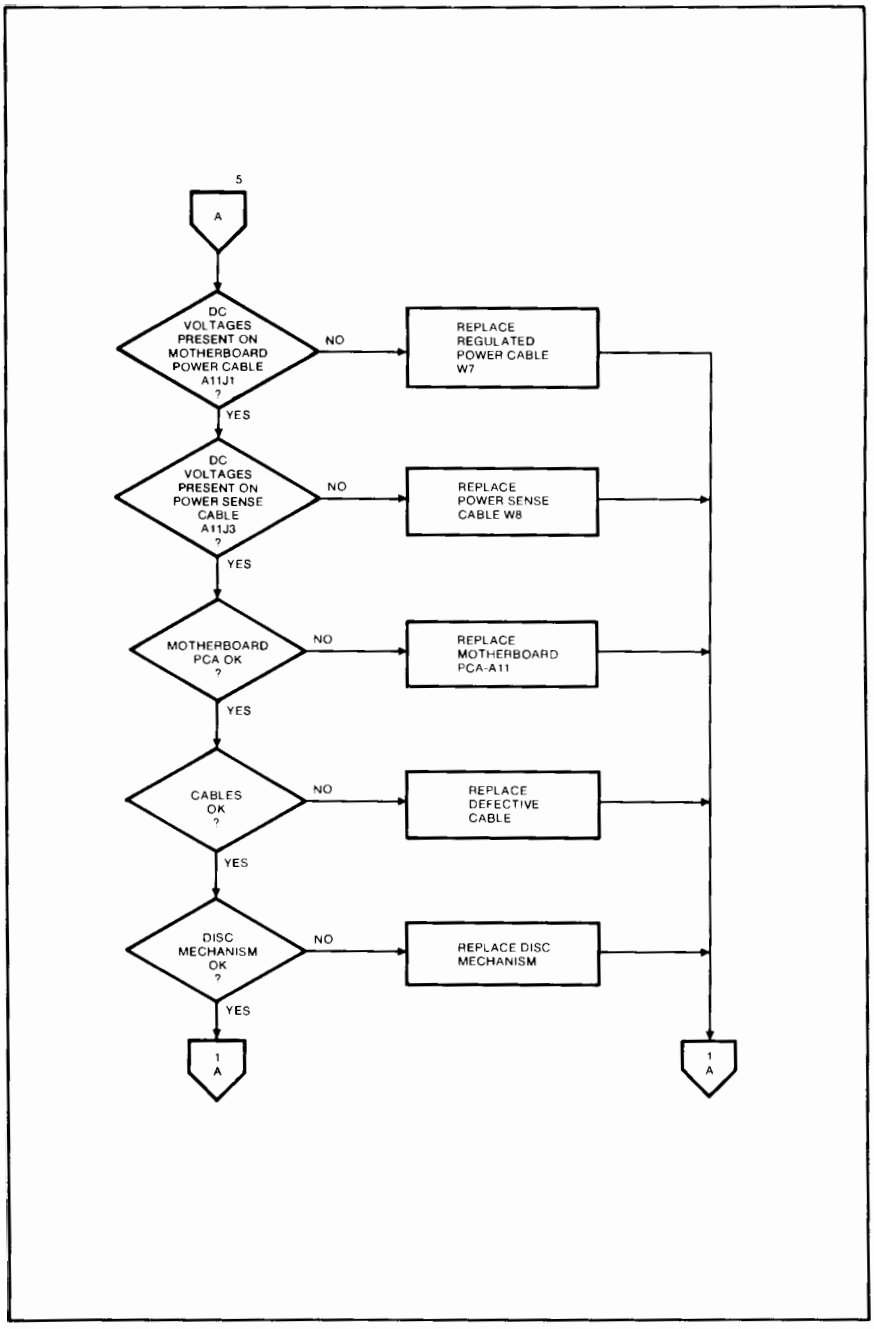
7912CE-7

Figure 4-2. Troubleshooting Flowcharts (sheet 4 of 7)



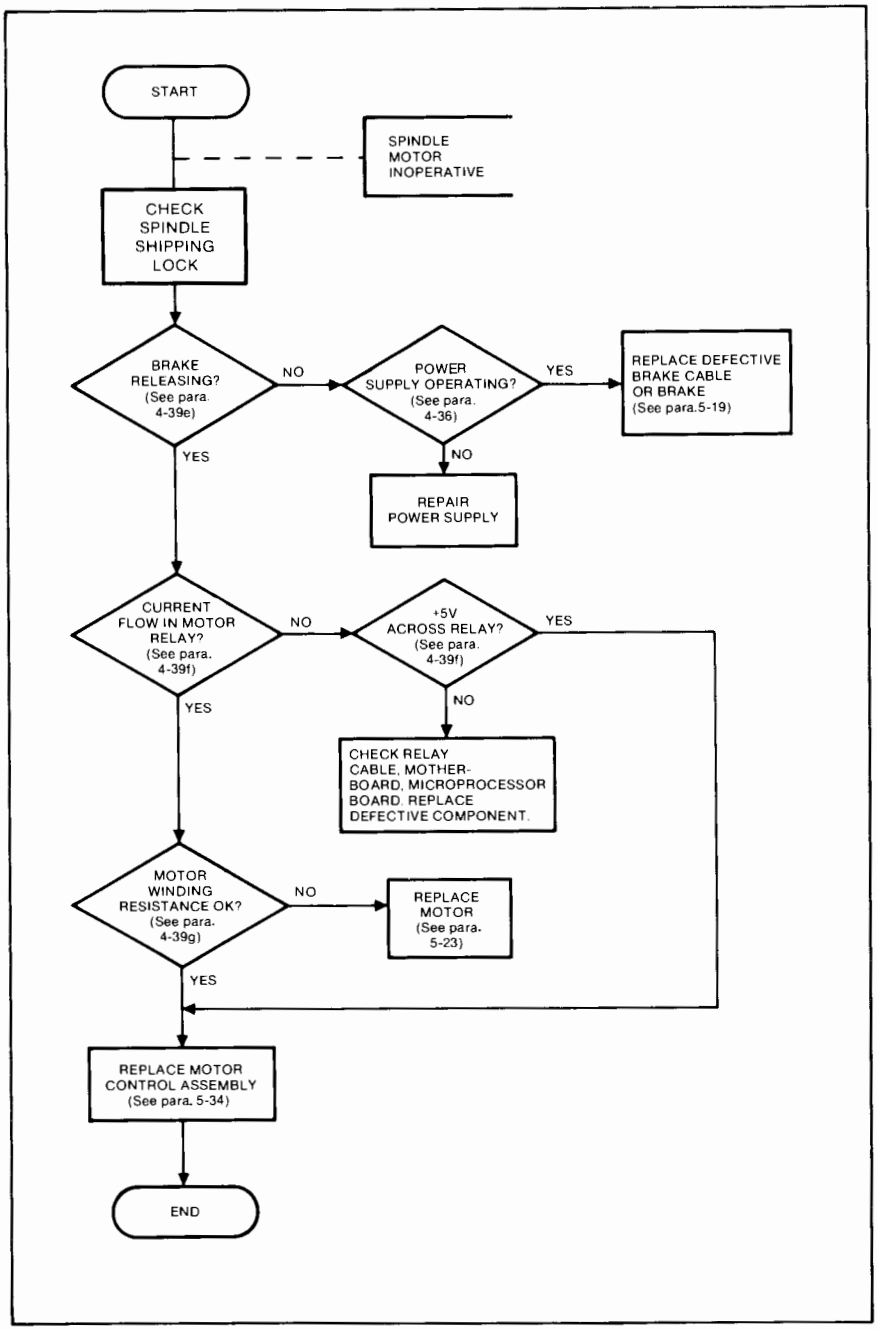
7912-72 (5)

Figure 4-2. Troubleshooting Flowcharts (sheet 5 of 7)



7912-72 (6)

Figure 4-2. Troubleshooting Flowcharts (sheet 6 of 7)



7912-86A

Figure 4-2. Troubleshooting Flowcharts (sheet 7 of 7)

4-3. GUIDELINES FOR TROUBLESHOOTING - LINUS

CONTENTS

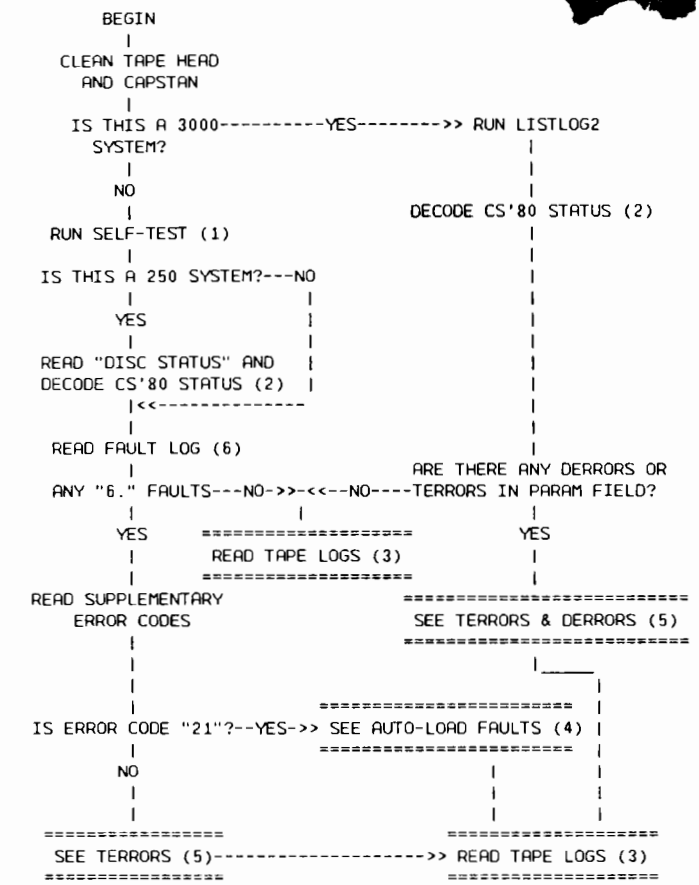
INTRODUCTION

This document is in the form of a flowchart. Begin on page 2 and follow the chart through.

Each section has either a detailed description of the test conditions and functions or a pointer to where this information can be found.

Where appropriate, at the end of a section there is a pointer to the next applicable section. This has been highlighted using =========.

TROUBLESHOOTING FLOWCHART



(1) See CE Handbook: 7908, page 5-2 or 7911/12/14, page 5-15
(2) Go to subsection A
(3) Go to subsection B
(4) Go to subsection C
(5) Go to subsection G
(6) Go to subsection D

A. DECODING CS'80 STATUS

1. HP 3000 SYSTEMS

On 3000 systems with CS80UTIL run the CONVERT command to decode the status message, returned by LISTLOG2, to English.

Systems without CS80UTIL will require decoding the status messages in LISTLOG2. These messages will consist of 20 octal bytes and require conversion to binary and hex for analysis.

2. HP 250 SYSTEMS

On 250 systems, use the DISC STATUS command to retrieve the last two status messages. The last 10 words (20 bytes) of the 250's status message are the CS'80 status bytes.

3. DECODING STATUS BITS

Full details are given in the CS'80 Instruction Set Programming manual, HP P/N 5955-3442, page 2-39. (CE Handbook CS/80 tab, chapter VII.)

If bit 24 is set there have been TERRORS; bytes P1 to P4 in the parameter field will be the TERROR field.

```
P1 = most suspect component
P2 = next most suspect component
P3 = TERROR associated with P1
P4 = TERROR associated with P2
```

Any DERRORS will be recorded in the parameter field in bytes P7 to P10.

==========

Refer to table 5-1 & 5-2 in section V for decoding TERRORS and DERRORS.

If no TERRORS or DERRORS are logged then refer to subsection B to read the tape logs.

==========

B. READING AND USING TAPE LOGS

1. READING LOGS

Use the HP 85 to access the following tape logs. See the CS/80 External Exerciser Reference manual appendices for instructions on loading host diagnostics. Also refer to the CS/80 tab in this handbook. If the drive firmware is earlier than REV 5.0, issue a PRESET command before reading the logs. This will force the existing RAM information to be updated to the Run Log.

2. ERT LOG

Shows the errors recorded since the last CLEAR LOGS instruction. Generated during Read only or Write then Read ERT tests (including certification).

If the cartridge is write-protected, the ERT LOGS cannot be updated.

If the number of Permanents or Unlocatables/Uncorrectables exceeds the values shown in subsection J, step 1, the tapes should be discarded.

==========
To run an ERT test, refer to subsection E.
==========

3. RUN LOG

Shows the accumulated data errors during user access of the tape since the last CLEAR LOGS command. Errors encountered during self-test and error rate tests are logged in the ERT log.

==========
If there are any uncorrectables or the accumulated errors exceed the values shown in subsection J, step 2, run an ERT test and flag plot, refer to subsection E.
==========

4. USE LOG

Shows the number of blocks accessed during the lifetime of the tape, and the number of times the tape was loaded into the system. This log cannot be cleared but also is not updated on write protected tapes.

HP recommended maximum usage is 2500 cycles of BOT to EOT to BOT. This is equivalent to approximately 277 full-volume accesses or 20,480,000 blocks on the 88140LC tape and 5,120,000 blocks on the 88140SC tape.

C. AUTO-LOAD FAILURES

Symptoms - One or more of the LED's behind the switch panel board 07908-60142 on the tape drive will be on and the self-test LED will output "21" as an error code. See note 1.

Debugging - Use drive LED's as a GUIDELINE only for suspecting components. Keep accurate records of actions as these failures tend to be intermittent.

CARTR LED	DRIVE LED	SUSPECT COMPONENT	ACTION
OFF	OFF	NONE	NORMAL CONDITION
OFF	ON	1.DIRTY HEADS	1.CLEAN HEADS
		2.WORN CARTRIDGE	2.TRY NEW CARTRIDGE (4)
		3.DEFECTIVE DRIVE	3.TRY NEW DRIVE
ON	OFF	1.DIRTY HEADS	1.CLEAN HEADS
		2.CARTRIDGE IS NOT AN 88140LC or 88140SC or HAS BEEN DEGAUSSED	2.SEE NOTE (3)
		3.DEFECTIVE CARTRIDGE	3.IF CORRECT CARTR.(3) MAY BE WORN OUT - REPLACE
		4.DEFECTIVE DRIVE	4.ON MULTIPLE FAILURES REPLACE THE DRIVE
ON	ON	1.TIB MAY HAVE ERASED TAPE	1.CARTRIDGE FORMAT IS RUINED - REPLACE TIB AND TAPE
		2.HEAD OFF TAPE	2.DRIVE

NOTES 1. The LED's only stay lit until a new cartridge is loaded.

2. 3000 systems record the drive failures in the status logs (LISTLOG2). Look for DERROR 203 dec status in the parameter field which indicates this fault.

3. Can only use cartridges formatted for use in this drive. If cartridge becomes degaussed it is ruined.
ROCKING TAPES - cartridge may have tape almost wound off hub. Rotate the drive wheel so about 4 revolutions of tape wind on to the small spool and try auto-loading again. This should occur only with a new tape, if it happens with an old tape the drive may be defective.

4. If 2 or more tapes show this problem then the tape drive, not the tape, may be at fault.

If the cartridge is suspect an ERT test can be performed and a resultant FLAG PLOT obtained to assist in confirmation of diagnosis; refer to subsection E.

D. FAULT LOG

Accessing the FAULT LOG will give the historical record of faults occurring since the last time the logs were cleared. On versions of firmware prior to REV 5.0, faults may be lost if the device is powered down or a CLEAR command is sent to the device controller. When using early versions of firmware, faults are collected in RAM and only written to the disc when the RAM is full (i.e., 5 entries). A PRESET command forces the Fault Log to be updated from the RAM.

The fault log contains tape system errors, only on single controller units.

Using the host resident CS'80 Exerciser program do the FAULT LOG command. The disc will then return all the accumulated DERRORS and TERRORS.

==========
Refer to table 5-1 & 5-2 (in section V) for DERRORS and TERRORS.
==========

E. USE OF TAPE ERT'S

1. ATTRIBUTES

If the cartridge is suspect, an ERT test can be performed and the resultant Flag Plot obtained to assist in cartridge and tape drive diagnosis.

The ERT tests cannot be run if the cartridge is write protected. Before running ERT tests it can be useful to print out the ERT log contents as historical data.

Now clear the ERT log (only) using the CLEAR LOGS command. Clean tape head before running test.

RO ERT — This is a read only error rate test that can be used when data must not be lost--for example, if the data integrity is uncertain because the tape may have been written with a dirty head causing a low amplitude signal. Takes half as long as WTR ERT on full length tape tests.

WRT ERT — DESTROYS THE DATA ON THE TAPE but does give full control of the write and read conditions.

2. TEST RESPONSES AND DETAILS

To run an ERT test use the TAPE program of the External Exerciser and run RO ERT or WTR ERT. Respond to the questions as follows.

FULL TEST	RESPONSES RO ERT	RESPONSES WTR ERT
Test name	RO ERT	WTR ERT
Continue	N/A	YES
Loop count	1	1
Addreses, tracks or tape	C	C
New block address	0	0
Tape length	ALL	ALL
Pattern source	N/A	RN

Note: For short tapes RO ERT takes 8 mins., for long tapes 35 mins..
For short tapes WTR ERT takes 17 mins., for long tapes 70 mins..

PARTIAL TEST	RESPONSES RO ERT	RESPONSES WTR ERT
Test name	RO ERT	WTR ERT
Continue	N/A	YES
Loop count	1	1
Addreses, tracks or tape	C	C
New block address	0	0
Tape length	16000	8000
Pattern source	N/A	RN

Note: All tests take 8 minutes and for a short tape this is a full test.

3. OUTPUT FROM ERT TESTS

Read the ERT log and compare the results with the following table. This table shows the maximum limits for ERT tests.

ENTRY	88140LC FULL TEST		88140SC FULL TEST		88140LC, 88140SC PARTIAL TEST
	WTR	RO	WTR	RO	WTR & RO
# Blocks	130816*	65408*	32704*	16352*	16000
# Permanents	250	250	128	128	64
# Transients	N/A				
# Unlocatables	15	N/A	10	N/A	10
# Uncorrectables	0	1	0	1	1

***these values may vary if the cartridge is not certified.**

When done access the Flag Plot to help determine the cause of failure. Refer to subsection E.

F. FLAG PLOT

A Flag Plot is generated as a result of ERT testing or certifying and is available from the ERT LOG (see CS'80 External Exerciser Reference Manual, P/N 5955-3462). The flag plot gives a visual indication of the positions of various faults on a tape. The following symbols appear on the plot in equivalent positions to the error on the tape.

+	=	a permanent error
U	=	an uncorrectable error
K	=	an unlocatable error

A listing is also available giving the logical addresses of the errors. More errors may appear on the listing of addresses than on the flag plot due to the flag plot's dramatic compression of the X axis resulting in multiple errors in one spot. The bits to the right of the error list indicate in which frame the error occured.

A Flag Plot of the positions of used spares is available after the Read Drive Tables Utility (TABLES). These are indicated with an 'S'.

INTERPRETING FLAG PLOTS

The flag plot descriptions listed below can be used to determine tape quality. See subsection J for the appropriate actions.

1. Permanent errors grouped at BOT (0000) on odd tracks only, usually with the number of errors per track increasing with track number. This indicates ISV (instantaneous speed variation)

2. As above but also grouped at EOT (1021 or 4087) on the even tracks is also ISV.

3. Permanent error clumping (horizontal). Causes a) Dirty tape head b) Tape drive is not 07908-6X340. c) Media defect, if error occurs on tracks 0 and 1 or 14 and 15 only it is edge damage and the tape should be discarded.

4. Permanent and or Unlocatable clumping (vertical). This is typical of contamination. Look for evidence of white powder on the tape friction pins and on the cartridge drive belt.

5. Excessive spares, vertical clumping (usually on alternating tracks) indicates poor formatting of the tape by the manufacturer. This is not a problem unless the spares are all used.

G. TERRORS AND DERRORS

Refer to tables 5-1 and 5-2 in Section V, Troubleshooting.

H. TAPE VERIFICATION

Tapes which have been saved from disc are not verified due to the nature of LINUS, i.e., no read after write.

To perform a backup and verification on a tape use the following verification options or utilities.

SYSTEM TYPE	VERIFY UTILITY
250	"FVBACK" with softkey "VERIFY ON"
1000	In RTE-6, "PSAVE" with "VE" option
	In RTE-A/XL, "PVB" utility
9845	"TAPE VERIFY" utility
9836	"TAPE BACKUP" utility with verify option
9000	"DISC BACKUP" utility with verify
3000	"VINIT", use "VERIFY" command

J. TAPE REPLACEMENT CONDITIONS

Any tape fullfilling the following conditions will be replaced by HP-DMK.

1. Any tape exceeding the certify limits. Note that # of blocks tested must equal the certify value to qualify.

ENTRY	88140LC	88140SC	COMMENTS
# Blocks	131072	32768	= certify value
# Permanents	250*	128	
# Transients	N/A	N/A	does not affect tape/drive perf
# Uncor/Unloc	32	8	unlocatables should predominate

*Reduced to 250 from 256 following agreement with tape manufacturer

2. Any tape exceeding the Run log limits (assumes a certified tape).

ENTRY	88140LC	88140SC	CSO REPLACEMENT
# Unlocatables	128	32	in the 90 day warranty
# Uncorrectables	1	1	in the 90 day warranty
# Uncorrectables	5	2	in 1 year and the Use log is less than the max specified below

Maximum Use = 20,480,000 blocks = 2500 cycles on 88140LC
Maximum Use = 5,120,000 blocks = 2500 cycles on 88140SC

3. Any tape having used all spares within the warranty period.

   i.e., Short tapes = 32 entries
   Long tapes = 128 entries

4. Any tape showing signs of ISV on the flag plot.

5. Any tape showing signs of edge damage.

6. Any tape showing signs of white contamination.

7. All tapes returned to CSO must include failure information.

4-4. GUIDELINES FOR TROUBLESHOOTING - DISC MECHANISM

A. GATHER DATA

The 7911/12/14 disc has many utilities which can be aids when troubleshooting the disc. Most often, the system error codes are too general and relate to operating system errors caused by the disc malfunction. Very specific information can be retrieved from the disc by using the supplemental mode of the self-test (see section 5, figure 5-2). Error codes displayed on the 8-segment display are Test Errors (TERRORS) and are displayed in hexidecimal digits. Also the Fault Log, Run Log and ERT Log contain error locations and codes that aid in pinpointing the assembly at fault. Error codes in these logs will be in decimal digits and will be labeled either TERROR (Test Errors) or DERRORS (Runtime Drive Errors). Tables 5-1 and 5-2 decode the error codes. These logs can be accessed using the external exerciser.

The exerciser should be used prior to replacing the disc mechanism. If it is necessary to isolate the disc from system problems, the exerciser should be run using the HP-85. Additionally, if there is any doubt about replacing the part, a Response Center should be contacted. If an HP-85 external exerciser command does not complete normally and a "unit n requires service" message is returned, set the unit # to n and request status. Then try the command again.

B. USE THE TROUBLESHOOTING TABLE

The information in table 4-1 details a specific troubleshooting routine for specific error code patterns.

Locate the error codes associated with the failure in the following table and follow the replacement sequence only until the problem is solved. In addition to error codes, use notes in the comment field as indicators of points to enter the troubleshooting sequence. When replacing a R/W PCA, servo PCA, or mechanism, check table 8-3 for compatibility.

C. IF INIT MEDIA IS NECESSARY

INIT MEDIA COMMAND

M = initialize the maintenance tracks only. All spares are retained.

P = retaining only primary (factory) spares, this option rewrites preamble postamble and data segments of only user accessible tracks, after verifying the track location. Use this option if a hardware fault which caused many field spares has been repaired.

A = retaining all spares, this option accesses only user tracks and is the minimum init media option. Bad address verification or CRC/ECC errors may be solved with this option.

Interleave value = 1, at present this applies to all systems.

INITIALIZE RETAINING SPARES

1. Save the customer data using the front panel switches. Hardware faults may abort this process, uncorrectables will not.

2. Read and save the disc logs (Fault, Run, ERT).

3. Initialize media retaining spares (primary only, or primary and secondary). Use an interleave of 1. The initialization takes approximately XX minutes.

4. Initialize the maintenance tracks.

5. If only primary spares are retained, run the following number of full-volume passes of WTR ERT: 10 for HP 7911/7912; 5 for HP 7914. The time required to perform a single pass of a WTR ERT on each drive is as follows:

7911	1:15 min
7912	2:30 min
7914	5:27 min

5. Read the ERT log. Spare all sectors that are unrecoverable and uncorrectable. Also spare any sectors that are repeatedly unrecoverable and uncorrectable. If the sector is correctable, sparing is usually not necessary; however, if the sector is repeatedly correctable, sparing may be advisable.

D. CHECK FIELD REPLACEABLE PARTS

The speed transducer, belt, motor pulley, motor, brake and fan are all field replaceable separate from the mechanism. Check to make sure these parts are not the cause of the problem.

E. RETURN DATA TO THE DIVISION

Any and all data retrieved from self-test and the logs should accompany the defective mechanism when it is returned to be repaired. Often more data is available then will fit on the CSO, so return the external exerciser and error log printouts and notes attached to the CSO.

If uncorrectable errors are still occurring, the following hardware is suspect: Servo PCA-A9, R/W PCA-A8, DMA PCA-A4, disc mechanism.

DURATION OF WTR ERT (1 PASS) WITH PEP FIRMWARE

7911	1:15 min.	(was 1:50 min)
7912	2:30 min.	(was 3:40 min)
7914	5:27 min.	(was 8:00 min)

D. CHECK FIELD REPLACEABLE PARTS

The speed transducer, belt, motor pulley, motor, brake and fan are all field replaceable separate from the mechanism. Check to make sure these parts are not the cause of the problem.

E. RETURN DATA TO THE DIVISION

Any and all data retrieved from self-test and the logs should accompany the defective mechanism when it is returned to be repaired. Often more data is available than will fit on the CSO, so return the external exerciser and error log printouts and notes attached to the CSO.

Table 1. DISC MECHANISM TROUBLESHOOTING - 7911/12/14

SELF-TEST ASSEMBLY IN ERROR	TERROR HEX	TERROR DECIMAL	DERROR	REPLACEMENT SEQUENCE	COMMENTS
8.	C0	192	64 BIT 0	1. Replace R/W PCA. 2. If problem remains, replace disc mechanism.	
8.			64 BITS 3&4 (WOT)	1. Replace Servo PCA. 2. If problem remains, replace mechanism.	
8.	C4 C6 C7 C5 dA-dE	196 198 199 197 214 218 - 222	2 23	1. Read the fault log to determine if this condition is the result of multiple faults and to determine which assembly is at fault. Troubleshoot assembly at fault. a) If an out-of-range cylinder head or sector is reported, replace the DMA PCA. b) Clear logs, if maintenance track overflow has occurred. 2. Replace R/W PCA & C5,C6,C7 & Derror 2 may also require a new DMA. 3. Init media retaining spares. This may require a new R/W PCA. If this fails, attempt an init media with I option, retaining no spares. 4. If problem remains, replace disc mechanism.	Any of these errors may occur alone or with some others in this list. All these errors require the same replacement.
8.	C9	200	229	1. Install a 7914 servo PCA. 2. Replace the MPU PCA. 3. Initialize media retaining spares. 4. If problem remains, replace the disc mechanism.	
9.	90 Ab	144 171		1. Check actuator lock. 2. Servo Board, check the fuses for opens or loose connections. Replace PCA if necessary. 3. If problem remains, replace disc mechanism.	Replace original servo if mech. is replaced & it also shows a "90" error.

Table 1. Disc Mechanism Troubleshooting (cont'd)

SELF-TEST ASSEMBLY IN ERROR	TERROR HEX	TERROR DECIMAL	DERROR	REPLACEMENT SEQUENCE	COMMENTS
9.	97	151		1. Check speed transducer gap (1mm) 2. Check speed transducer connection & output. 3. Replace speed transducer. 4. Replace the servo PCA. 5. Replace the MPU PCA. 6. Replace disc mechanism, if the chirp caused by a recalibrate can be heard with this error code, the mechanism has a faulty servo surface.	Motor spins up normally. See Service Note 7911 P/R-09 or 7912P/R-09.
				1. Check wiring to motor. 2. Check for 120 VAC at motor connection. 3. Check brake for -20V unregulated. 4. Check spindle, it should move freely when brake releases, if not, bearings are frozen. 5. Check motor lamination resistance. a. Connect DVM ground to yellow wire of motor connector. b. Connect DVM red wire to blue wire on motor connector. Should be about 7 OHMS. c. Connect DVM Red wire to Red wire of motor connector. Should be about 12 OHMS. If not, replace the motor.	Motor does not spin-up.
				1. Check brake, power on for about 15 sec then off. Brake should disengage when powered on. Check for -20v unregulated and a resistance of about 40 ohms. Replace brake if necessary. 2. Check motor start relay. a. disconnect yellow wire to capacitor start relay. b. connect DVM black lead to where yellow wire was on capacitor start relay. c. connect DVM red lead to yellow wire. At power on observe 3.5 milliamps.	Motor spins up slowly.

Table 1. Disc Mechanism Troubleshooting (cont'd)

SELF-TEST ASSEMBLY IN ERROR	TERROR HEX	TERROR DECIMAL	DERROR	REPLACEMENT SEQUENCE	COMMENTS
				d. switch DVM to DC volts observe +5v at power on between yellow wire to start capacitor. If 3.5 ma and +5v are present, then replace the motor start relay. e. if 5v is not present, check connector on motherboard for 5v at power on. If present, replace yellow/red cable. Connect yellow/red cable back to their assembly. f. if 5v is not present on motherboard connector at power on, replace: 1) R/W PCA 2) MPU PCA 3) Motherboard 3. Check power supply. Check MRST LED, (on rear door of power supply box). a. if not on, check for loading by a PCA. Remove one PCA at a time & powerup, MRST LED will turn on when loading assy is removed. Replace loading PCA. Remove motherboard from the mechanism & leave power cables connected. Turn power on & observe if MRSTL returns. If MRST LED is on, the mechanism is loading the supply. b. Check cabling. c. Check fuses on power regulator PCA. d. Replace power regulator PCA.	
9.	96 Ab	150		1. Replace servo PCA. 2. Replace MPU PCA. 3. If problem remains and if MPU firmware is earlier than 07912-19005, this failure is caused by a servo surface defect. Replace disc mechanism.	Motor spins up normally, can hear chirp caused by recalibration.

4-5. DISC MODULE REPLACEMENT SUMMARY

STAND-ALONE DRIVE

1. First remove the power cord and HP-IB cable, then the following items.
   - Lower and upper front panels, plus flip-top cover
   - Card cage shield and all PCA's
   - Tape module and storage box
   - Power supply
2. Set both shipping locks to SHIP and disconnect all cables from disc.
3. Remove four 1/2-inch nuts from front and base shock mounts.
4. Remove the two T30 screws attaching the ground straps to module.

WARNING

The disc module weighs 34 kg (75 lbs.).
Two people are required to lift it.

5. Using two people, lift disc module from cabinet base.
6. Remove the two T30 screws attaching the mounting bracket at bottom-rear of the old module and re-install bracket on new disc module, tightening to 80 inch-pounds.
7. Unscrew the two shock mounts from the old module and install on the new module, finger tight.
8. Transfer the following cables to the new disc module.
   - Tape power cable
   - Tape TIB cable
   - Switch tape cable
   - HP-IB cable(s)
9. Using two people, place the new disc module into the cabinet base.
10. Re-install the four shock mount nuts, tightening to 60 inch-pounds.
11. Re-attach both ground straps, tightening T30 screws to 60 inch-pounds.
12. Connect remaining cables to disc module and set locks to OPERATE.
13. Replace items removed in step 1 in reverse order.

RACKMOUNT DRIVE

1. Remove power cord and HP-IB cable, then the following items.

   - Front panel
   - Tape module
   - Card cage shield and all PCA's
   - Power supply

2. Set both shipping locks to SHIP and disconnect all cables from disc.

WARNING

The disc module weighs 34 kg (75 lbs.).
Two people are required to lift it.

3. Remove the six T20 screws that secure the rackmount chassis to the rack slides. Using two people, remove the drive from the rack slides.

4. Remove the T30 screw attaching the power supply ground strap to the disc module. Transfer this strap to the new disc module (60 in./lbs.).

5. Remove the socket head cap screw attaching the two tape module ground straps to the disc module. Transfer these to the new module.

6. Remove the six T30 screws attaching the disc module to the rackmount. (If installation brackets are available, mount these on the yoke of the new module first to prevent possibility of dropping.)

7. Lift the rackmount chassis off the disc module and install on new disc module. Tighten screws to 60 inch-pounds.

8. Transfer the following cables to the new disc module.

   - Tape power cable
   - Tape data (TIB) cable
   - Switch tape cable
   - HP-IB cable(s)
   - Connect all cables removed in step 2.

WARNING

If installation brackets are not available, ensure that the front pins on the slides engage the holes in the rackmount chassis. The drive may fall if the pins are not engaged properly.

9. Using two people, lift the drive onto the rack slides and engage front pins in the holes on the rackmount chassis.

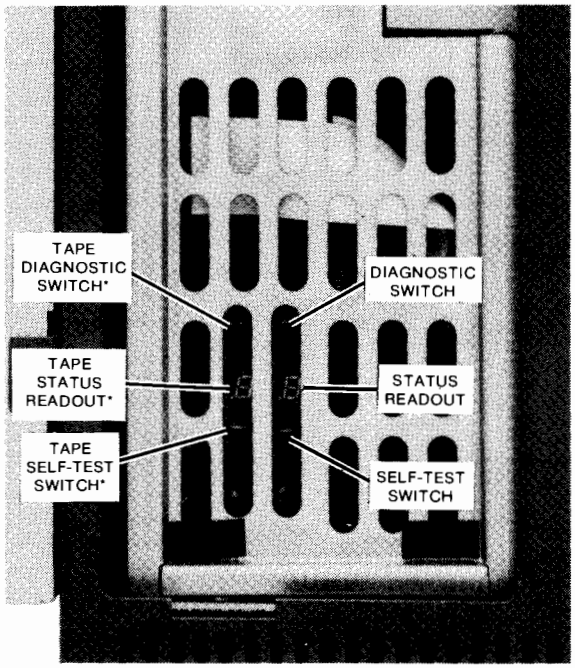
10. Secure the rack slides to the chassis with six T20 screws and tighten to 20 inch-pounds. Set both shipping locks to OPERATE.

11. Re-install items removed in step 1 in reverse of order listed.

Refer to CS/80 tab for external exerciser interfacing.

5-1. SELF-TEST SWITCHES

(ORIENT 90° LEFT FOR RACKMOUNT)



* OPT 001 ONLY

SUSPECT CONDITIONS

NUMBERS DISPLAYED	ERROR CONDITION
P.	OK
1.	PCA-A1 (TIB DMA)
2.	PCA-A2 (TIB UPROC)
3.	PCA-A3 (UPROC)
4.	PCA-A4 (DMA)
6.	TAPE SYSTEM
6.	PCA-A8 (R/W)
9.	PCA-A9 (SERVO)
d.	PCA-A13 (REG.)
-.	END OF LIST

ERROR CODES

DIGITS DISPLAYED	ERROR LOCATION
01 - 1F	UPROC
20 - 3F	TIB AND TAPE
40 - 4F	POWER SYSTEM
50 - 6F	DMA
90 - AF	SERVO
C0 - dF	R/W
-	LAST

Figure 5-1. Selftest/Diagnostic Switches

TERRORS

Table 5-1. Internal Diagnostic Test Error Codes

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
1	01	MPU RAM data miscompare error during self-test.	1) MPU PCA (RAM, Z-80, or Data/Address bus)
2	02	Incorrect MPU ROM checksum found during self-test.	1) MPU PCA (EPROM, ROM, Data/Address bus or Z-80) 2) Another PCA is corrupting the common data bus
3	03	CTC self-test or diagnostic failure of any of 5 diagnostic tests for the counter timer circuit.	1) MPU PCA (CTC, Z-80 interrupt circuit, or data/address bus)
4	04	Cannot write to the 4-bit tape counter during a diagnostic. A write/read check of the tape 4-bit counter failed.	1) MPU PCA (tape counter) 2) TIB PCA (tape counter control circuitry CTCT-H)
5	05	Addressing problems found during self-test. Any of the controller or interface PCAs may be responding to an illegal address.	1) MPU PCA (addressing circuits) 2) Any PCA which shares the address bus (DMA, read/write, servo)
6	06	Bus corruption found during self test. Data bus failure on the common MPU bus.	1) MPU PCA (data bus latches) 2) Any PCA which shares the common data bus (DMA, read/write, servo)
7	07	Bad response to bus select during self-test. DMA, read/write, or servo PCA decode failure.	1) MPU PCA 2) Any of the selected PCAs (DMA, read/write, servo)
8	08	MPU RAM failure found during self-test or background tests.	1) MPU PCA (RAM) 2) Data or address bus

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
9	09	The Z-80 did not respond to the LINT-L generated by the PHI during a self-test. LINT-L circuitry is not operational.	1) MPU PCA (LINT-L to Z-80 circuit) 2) DMA PCA (PHI interrupt circuit)
10	0A	The controller did not detect either a disc or tape unit. The TIB, read/write, and/or servo PCA is not connected to the MPU bus.	1) Read/write, servo, or TIB not plugged into motherboard
11	0b	Either or both of the MPU self-test switches is continuously active for more than 30 seconds. MPU switches register active for too long.	1) MPU PCA (self-test switches may be stuck in the active state)
12	0C	The CPU trapped an illegal opcode. An illegal instruction was encountered.	1) MPU PCA (Z-80 or ROM)
15	0F	One of the previously mentioned errors has occured (01_{16}- $0C_{16}$). This error is an "or" of the RAM, ROM, CTC, and tape counter errors, and is used by the isolation routine as one place to look for general MPU health. See the descriptions for the TERRORS "01_{16}- $0C_{16}$".	1) MPU PCA
16	10	The sector pulse is not incrementing the CTC circuit during a read/write self-test. The counter timer circuit is not operational.	1) MPU PCA (CTC or Z-80 interrupt) 2) Disc or read/write PCA not providing sector pulse
32	20	Cartridge not inserted.	1) Tape not inserted 2) Tape data cable 3) Tape mechanism (does not see the tape)
33	21	Tape did not meet the requirements for loading (tension, key readability, etc.).	See paragraph 4-38 in Service Manual for troubleshooting autoload failures.

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
34	22	The MPU read illegal status from the tape drive (routed through the TIB PCA).	1) TIB PCA 2) MPU PCA 3) Tape data cable 4) Tape mechanism
35	23	CRC circuitry on the TIB is not correcting errors.	1) TIB PCA
37	25	Manufacturer's block unreadable. The tape may be of the wrong type (i.e., not made for use in the tape drive).	1) TIB PCA 2) Dirty tape head (visible debris) 3) Tape media (cartridge) 4) Tape mechanism
38	26	The sector toggle flip-flop cannot be made to function from the TIB PCA. Tape/DMA interface circuits are not functioning properly.	1) TIB PCA 2) DMA PCA
39	27	The DMA to TIB loopback failed, and the ability of the TIB to source a known pattern failed.	1) TIB PCA 2) DMA PCA
40	28	The DMA-TIB loopback test failed but the test where the TIB sources a pattern to the DMA has passed (cannot write, but can read).	1) TIB PCA 2) DMA PCA
41	29	The address counter did not increment by four sectors when the TIB sent one block (1k) to the DMA. TIB/DMA interface circuits failed.	1) DMA PCA 2) TIB PCA
42	2A	The TIB is failing to sequence the four frames within the 1k block.	1) TIB PCA

TERRORS

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
43	2b	Timeout error for TIB sourcing the known pattern to the DMA. The TIB is not responding to self-test mode control. by sending a known buffer of data.	1) TIB PCA 2) DMA PCA
44	2C	Unable to write to self-test system blocks and cannot read keys.	1) TIB PCA 2) Tape media (cartridge) 3) Tape mechanism
45	2d	Could not read from the system test blocks during self-test. Tape unreadable at the system block area. Could not read keys or frame headers.	1) TIB PCA 2) Tape media (cartridge) 3) Tape mechanism
46	2E	The data read back from the tape did not compare with the data written.	1) TIB PCA 2) DMA PCA
64	40	The fault latch bit which indicates a possible power fail (PPF-L) is set. This bit is tested during the read/write diagnostic.	1) Regulator PCA 2) Servo PCA (fault register)
80	50	DMA self-test control and status registers cannot be properly read.	1) DMA or MPU PCA (DMA/MPU interface)
81	51	During DMA self-test, the MPU could not read and write to every location in the 16-byte header.	1) DMA PCA (header RAM) 2) MPU PCA (interface/data bus)
82	52	The MPU cannot read and write to every location in the 4k DMA data RAM.	1) DMA PCA (data RAM) 2) MPU (interface/data bus)
83	53	The data field bit is incorrect or the disc address counter points to the wrong area.	1) DMA PCA (disc interface, ECC chip) 2) Read/write PCA

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
84	54	Data compare error during a disc read (occurs if header, data, CRC, ECC byte is wrong).	1) DMA PCA (disc interface, ECC chip) 2) Read/write PCA
85	55	The CRC error bit is set during a read of a good sector, or is not set during a read of a bad sector.	1) DMA PCA (CRC circuit)
86	56	The sector counter did not increment after the read of a good sector or the sector counter did not decrement after a sector had been written to the disc.	1) DMA PCA (sector counter circuits)
87	57	DMA self-test data compare error of any sector byte during a disc write.	1) DMA PCA (disc interface, ECC chip) 2) Read/write PCA
88	58	Unused signal line(s) are being pulled low by another PCA.	1) DMA PCA (read/write interface, ECC chip)
89	59	The disc address counter did not increment after a sector was read from the disc.	1) DMA PCA (disc address counter) 2) Read/write PCA (interface circuitry)
91	5B	The ECC-to-formatter/seperator interface test failed. The ECC-to-formatter/seperator interface lines are probably faulty.	1) DMA PCA (ECC circuitry) 2) Read/write PCA (interface circuitry)
92	5C	The ECC-to-DMA or the ECC-to-MPU interface test failed. The ECC-to-DMA or the ECC-to-MPU interface lines may be faulty.	1) MPU PCA 2) DMA PCA
93	5d	An internal function of the ECC failed.	1) DMA PCA (ECC chip)

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
96	60	Improper PHI interrupt bits are set during the PHI diagnostic.	1) DMA PCA (PHI) 2) MPU PCA (PHI to Z-80 interface)
97	61	The PHI self-test microdiagnostic had a FIFO wrap-around data miscompare.	1) DMA PCA (PHI)
98	62	PHI self-test identify bytes were not the same as those loaded.	1) DMA PCA (PHI) 2) MPU PCA
99	63	The byte counter failed during a write operation.	1) DMA PCA (security circuit)
100	64	No EOI was received during a write operation.	1) DMA PCA (PHI) 2) MPU PCA
101	65	A secondary command was not detected during a disc write.	1) DMA PCA (PHI) 2) MPU PCA
102	66	PHI to data RAM data miscompare or data over-run has occurred.	1) DMA PCA (I/O circuits)
103	67	Left-over bytes were not in the inbound FIFO after the buffer became full or the byte count expired during an I/O write (possible overrun).	1) DMA PCA (I/O circuits)
104	68	Transfer stopped in the wrong place during an I/O read (possibly did not stop after sending EOI).	1) DMA PCA (I/O circuits)
105	69	The sector did not increment at the sector boundry on an I/O write.	1) DMA PCA (sector or I/O address counter)
106	6A	The sector counter did not decrement at the sector boundry during an I/O read.	1) DMA PCA (sector or I/O address counter)

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
107	6b	Sector overrun or security circuit malfunction has occurred.	1) DMA PCA (security circuit)
108	6C	A data compare error occurred after an I/O read.	1) DMA PCA (I/O circuits)
109	6d	The DMA I/O counter stopped early.	1) DMA PCA (I/O circuits)
110	6E	The status register bits on the DMA PCA make no sense.	1) DMA PCA
111	6F	The DMA RAM failed the nondestructive RAM test during either the power-on or background test.	1) DMA PCA (RAM)
144	90	The fault register bit which indicates a servo AGC fault (AGC-L) was set when the register was read. A servo AGC fault may have occurred, or the fault register may be failing.	1) Actuator lock may be engaged 2) Servo PCA (check fuses F617 & F717; refer to table 11-1, Service Note SN-11) 3) Disc mechanism
145	91	The offtrack bit (OFT-L) of the fault register indicated a servo offtrack condition when read. A servo offtrack fault occurred, or the fault register may be bad.	1) Servo PCA (track-following hardware, fault register) 2) Disc mechanism
146	92	A track compare error has occurred during a read/write diagnostic. A header may be incorrect or unreadable, or the servo may have "jumped the track".	1) Servo PCA (track-following hardware) 2) Read/write PCA
148	94	Unable to seek or verify after a successful recalibrate.	1) Servo PCA 2) Read/write PCA

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
150	96	Track crossings are not indicated when expected. Track crossing detection is faulty or the device is not crossing tracks. Servo head may be in a zone where servo code is invalid or missing.	1) Servo PCA (refer to table 11-1, Service Note SN-11) 2) MPU (counter timer chip) 3) Disc mechanism
151	97	The disc does not reach or maintain the minimum specified speed within a reasonable interval.	1) Speed sensor (refer to table 11-1, Service Note SN-9) 2) Servo PCA (refer to table 11-1, Service Note SN-11) 3) MPU PCA 4) Spindle motor or belt (refer to paragraph 4-38 in Service Manual) 5) Disc mechanism
154	9A	The number of allowable offtracks was exceeded during a verify operation. Too many offtracks occurred.	1) Servo PCA 2) Disc mechanism (motor constant too weak or servo resonance)
155	9b	Too many verifies during a verify operation. Verify operation is failing.	1) Read/write PCA 2) Servo PCA 3) Disc mechanism (motor constant too weak or servo resonance)
157	9d	Servo ontrack indicator disagrees with expected state or no ontrack signal after a seek. Seek failed or ontrack indicator is bad.	1) Servo PCA (phase-locked loop, AGC circuitry, track follower circuit, or track crossing and offtrack detection) 2) Disc mechanism (flex circuit)

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
170	AA	The fault register speed OK (SOK-H) bit indicates that proper spindle speed has not been restored from a slower spindle speed.	1) Servo PCA (speed indicator, fault register) 2) Spindle motor, belt, or motor control assembly
171	Ab	Could not verify track zero, or an unrecognizable DERROR was reported from the recalibrate operation.	1) Actuator lock may be engaged 2) Servo PCA (refer to table 11-1, Service Note SN-11) 3) Disc mechanism
172	AC	The device has attempted to force an offtrack condition by sending a very large offset command to the servo. No offtrack was indicated on the servo PCA. The device may not be over servo code, the servo offset circuitry may be defective, or the offset detection circuitry may be failing.	1) Servo PCA (track follower offtrack detection)
173	Ad	The interval between index pulses detected was too long or too short, or no pulse was detected. The servo head may not be over a zone where index pulse code exists, the index detection circuitry (e.g, the servo PROM) may be bad, or the index pulse code may be missing or incorrectly written on the disc.	1) Servo PCA (index detection circuitry, data or address lines) 2) MPU PCA (seek electronics - ROM) 3) Disc mechanism (index pulse code)
174	AE	The fault register SOK-H (speed OK) bit indicates a fault. The spindle speed is out of specification, or the speed-check circuitry is defective.	1) Spindle motor or motor control assembly 2) MPU PCA (speed-check circuitry) 3) Servo PCA (fault register)
175	AF	Servo speed-check circuitry does not detect out-of-specification spindle speed. The speed-check circuitry may be defective, or the spindle speed may not be responding to speed control commands.	1) Spindle motor control assembly 2) MPU PCA (speed-check circuitry)

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
192	C0	The DWF-L (Destructive Write Fault) bit of the fault register indicated a fault when the fault register was read. A destructive write fault may have occurred.	1) Read/write PCA 2) Servo PCA (fault register) 3) Disc mechanism (preamplifier)
193	C1	The WOT-L (Write-and-Offtrack) bit of the fault register indicated a fault when read. An offtrack may have occurred during a write.	1) Servo PCA (track-follower or fault register) 2) Disc mechanism
196	C4	No useable maintenance track could be found for the head indicated. This TERROR should always be accompanied by the head that was used to look for a good maintenance track. The drive could not successfully seek to a maintenance track or could not read any of the maintenance track sectors, using the head specified. Look at the head numbers (TERRORS "$d0_{16}$" to "$d6_{16}$") that were also logged. TERRORS logged by servo tests will prevent the read/write diagnostic from running. If all the heads are included, then the suspected hardware is most likely common to all the heads, such as the read/write PCA or the disc media. If only some of the heads were logged, most likely causes include the read/write select circuitry or the disc mechanism preamplifier(s). In addition to replacing any defective hardware, it may also be necessary to reinitialize the disc media.	1) Read/write PCA (read chain, control or select circuitry) 2) Disc media 3) Disc mechanism (preamplifier)
197	C5	When the ECC correctable sector of the maintenance track was read, no ECC correctable error was reported. May have read the wrong sector, error detection may be defective, or reads are marginal. The DMA PCA is listed as the second most suspect because any serious DMA errors would have blocked the execution of the read/write diagnostic.	1) Read/write PCA (sector counters, formatter/separator, and analog read chain) 2) DMA PCA (ECC circuitry)

Table 5-1. Internal Diagnostic Test Error Codes (continued)

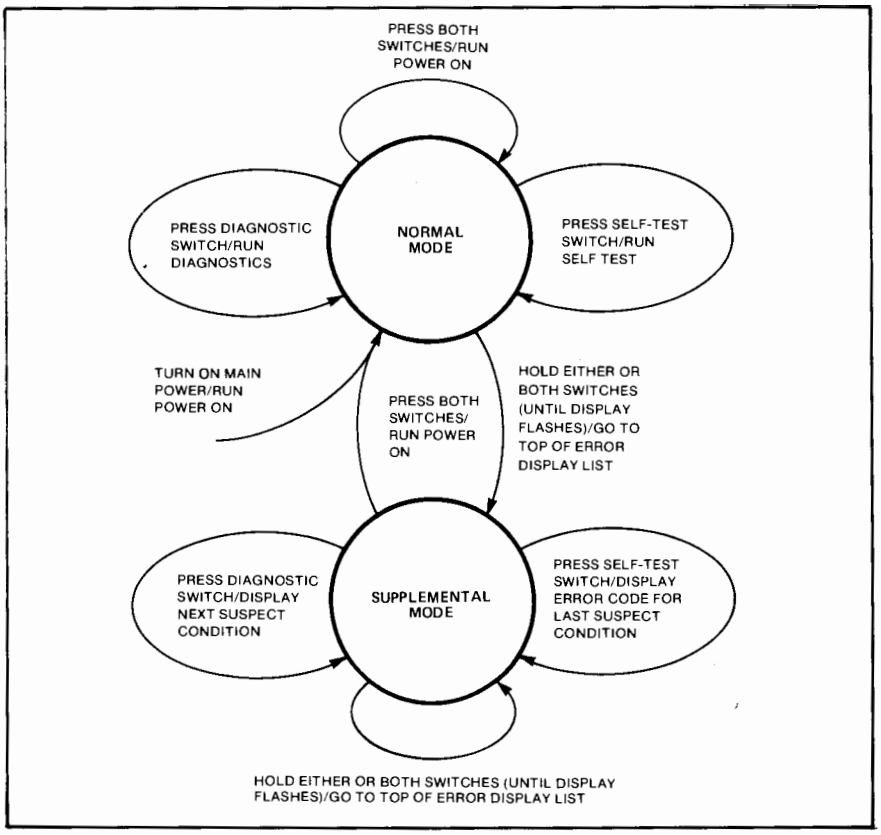
NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
198	C6	Write/read tests on maintenance track write test areas failed for the head(s) indicated by TERRORS "$d0_{16}$" to "$d6_{16}$". Read or write faults, or sector addressing problems. Error detection circuitry (CRC, ECC) could be reporting problems where none exist, but since this circuitry has been tested prior to the read/write diagnostic, this is less likely.	1) Read/write PCA (formatter/separator read chain, read/write control) 2) DMA PCA (ECC chip)
199	C7	The data that was read from a write test sector of the maintenance track differs from the data that should have been written to that sector. This error implies a data miscompare between a write to and a read from the same disc sector. This could mean that that the ability to write to the disc media has been lost, although reads can still be performed. Such an error would not be detected by the CRC, as long as the last write to that sector left a CRC consistent with the rest of the sector data. Normally, this error will occur with a write/read TERROR "$C6_{16}$". Look at the pattern of head failures for this error for clues to the problem.	1) Read/write PCA (write control and write path) 2) DMA PCA 3) Disc media 4) Disc mechanism (preamplifier)
201	C9	A sector compare error was detected after a disc read operation. This error is detected exactly as it would be during run-time reads. If no other read errors were reported, then this error probably points to sector counting problems rather than problems reading/writing sector headers. Three PCAs are involved in sector counting: the servo, read/write, and MPU PCAs. The servo PCA generates a byte clock, which the read/write PCA uses to produce sector pulses. The CTC (counter timer chip) on the MPU PCA counts sector pulses to determine which sector is currently addressed. At this point, the CTC and servo have passed their crucial diagnostic tests (or the read/write test would have been blocked).	1) Servo PCA (if original is not 07914-60001) 2) MPU PCA (counter timer chip) 3) Disc media 4) Disc mechanism

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER DEC	NUMBER HEX	CAUSE	SUSPECT HARDWARE
208-214	d0-d6	Whenever TERRORS "$C4_{16}$", "$C5_{16}$", "$C6_{16}$", or "$C7_{16}$" are logged the heads on which they occurred are also logged. The head(s) reported were being used when one of the above-mentioned errors occurred. The number which follows the "d" is the number of the head involved. Refer to TERRORS $C4_{16}$- $C7_{16}$ for the hardware to suspect. The pattern of head errors should provide additional clues to the problem. Select circuitry problems may result in only one head or chip being selected. If all heads are reported, the problem is probably common to all the heads.	1) Read/write PCA (head select) 2) Disc mechanism (preamplifier)
216	d8	No sector timing pulse was detected by the MPU CTC (counter timer chip) within a reasonable period. The sector timing pulse is either not being generated by the servo and read/write PCAs, or it is not being detected by the MPU CTC.	1) Read/write PCA (check for other TERRORS) 2) Servo PCA (check for other TERRORS) 3) MPU PCA (counter timer chip)
217	d9	The DMA detected the wrong level for the Start-Of-Data (SOD-L) signal from the read/write PCA during a sector read. The read/write PCA is not generating Start-Of-Data (SOD-L) signals, or the DMA is not detecting them.	1) Read/write PCA (SOD-L circuitry) 2) DMA PCA (disc interface)
218	dA	The device was unable to read the spare table on the maintenance track. Reads from or writes to the maintenance track are failing or inconsistent, or the maintenance track spare table cannot be located.	1) Read/write PCA 2) DMA PCA 3) Servo PCA 4) Disc media 5) Disc mechanism (flex circuit)
220	dC	A logical seek failed during a verify operation. The device cannot read/write well enough to verify, or the seek failed.	1) Read/write PCA 2) DMA PCA 3) Servo PCA

Table 5-1. Internal Diagnostic Test Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
221	dd	The diagnostic error-rate test found an uncorrectable sector. Reads/writes are marginal or inconsistent, or the media is defective. Note: Early firmware revisions (prior to rev. 4-0) report this error whenever a correctable or uncorrectable data error occurs during the diagnostic error-rate test. If early firmware is installed, rerun the diagnostic twice using the external exerciser or the diagnostic self-test switch. If the error does not recur, it is safe to assume that the error was a transient correctable error and no action is necessary. If the error recurs, run error rate tests and spare out as noted in 4-4. Guidelines for Troubleshooting Disc Mechanism.	1) Read/write PCA 2) DMA PCA 3) Disc media
222	dE	Cannot read interleave table on maintenance track. Reads are not working, previous write to interleave table was bad, or cannot locate the interleave table (track or sector).	1) Read/write PCA 2) DMA PCA 3) Servo PCA 4) Disc media

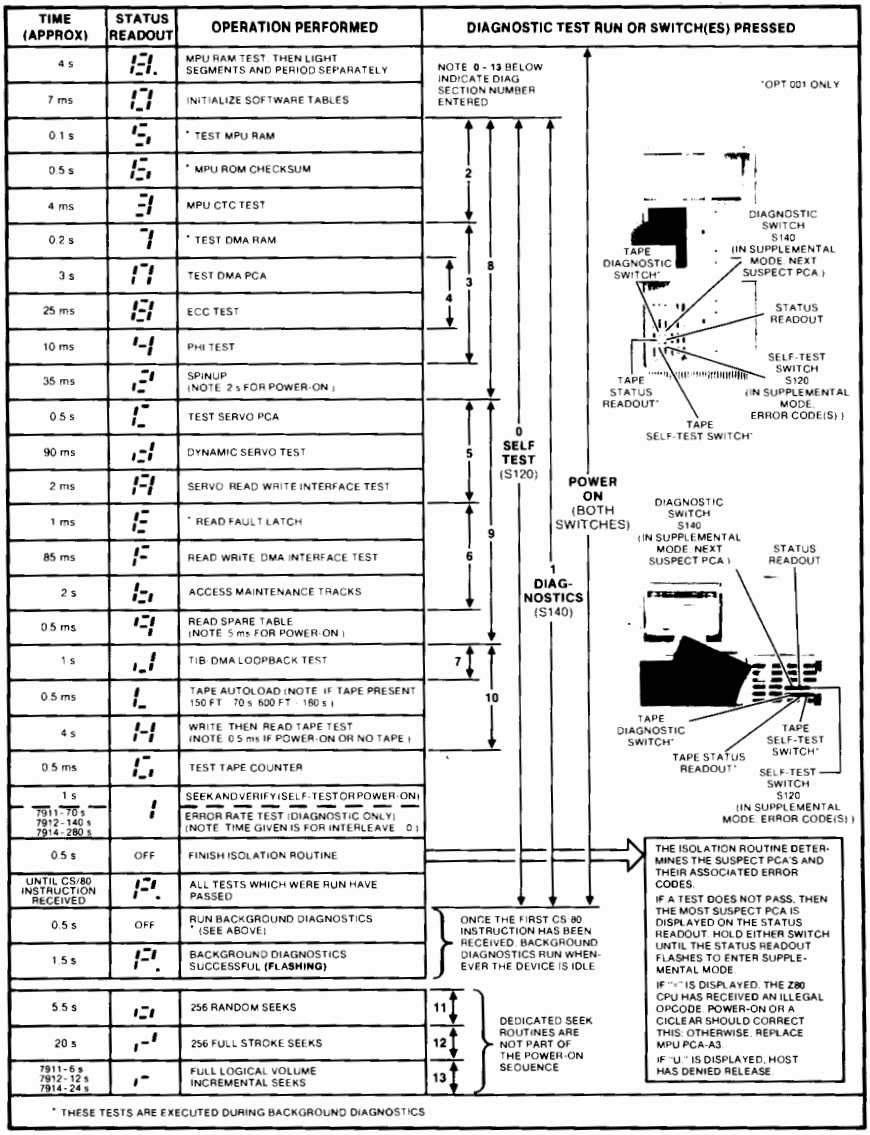


REF 7912-31

Figure 5-2. Internal Diagnostic States

NOTE: Self-test cannot be run when host is HP 3000 (disconnect from GIC).

TIME (APPROX)	STATUS READOUT	OPERATION PERFORMED
4 s	8.	MPU RAM TEST, THEN LIGHT SEGMENTS AND PERIOD SEPARATELY
7 ms	0	INITIALIZE SOFTWARE TABLES
0.1 s	5	* TEST MPU RAM
0.5 s	6	* MPU ROM CHECKSUM
4 ms	3	MPU CTC TEST
0.2 s	7	* TEST DMA RAM
3 s	8	TEST DMA PCA
25 ms	9	ECC TEST
10 ms	A	PHI TEST
35 ms	2	SPINUP (NOTE: 2 s FOR POWER-ON.)
0.5 s	C	TEST SERVO PCA
90 ms	d	DYNAMIC SERVO TEST
2 ms	F	SERVO READ WRITE INTERFACE TEST
1 ms	E	* READ FAULT LATCH
85 ms	F	READ WRITE DMA INTERFACE TEST
2 s	b	ACCESS MAINTENANCE TRACKS
0.5 ms	9	READ SPARE TABLE (NOTE: 5 ms FOR POWER-ON.)
1 s	d	TIB DMA LOOPBACK TEST
0.5 ms	L	TAPE AUTOLOAD (NOTE: IF TAPE PRESENT 150 FT - 70 s, 600 FT - 180 s.)
4 s	H	WRITE, THEN READ TAPE TEST (NOTE: 0.5 ms IF POWER-ON OR NO TAPE.)
0.5 ms	C	TEST TAPE COUNTER
1 s 7911-70 s 7912-140 s 7914-280 s	1	SEEK AND VERIFY (SELF-TEST OR POWER-ON) ERROR RATE TEST (DIAGNOSTIC ONLY) (NOTE: TIME GIVEN IS FOR INTERLEAVE = 0.)
0.5 s	OFF	FINISH ISOLATION ROUTINE
UNTIL CS/80 INSTRUCTION RECEIVED	P.	ALL TESTS WHICH WERE RUN HAVE PASSED
0.5 s	OFF	RUN BACKGROUND DIAGNOSTICS * (SEE ABOVE)
1.5 s	P.	BACKGROUND DIAGNOSTICS SUCCESSFUL **(FLASHING)**
5.5 s	10	256 RANDOM SEEKS
20 s	11	256 FULL STROKE SEEKS
7911-6 s 7912-12 s 7914-24 s	12	FULL LOGICAL VOLUME INCREMENTAL SEEKS



REF 7912CE-3A

Figure 5-3. Micro and Macro Diagnostics

Table 5-2. Run-Time Drive Error Codes

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
2	02	During a read or verify operation a read error was encountered that the ECC could not correct (uncorrectable read error). This error can be caused by either bad media or a read/write chain fault. If the media is bad, the defective area should be spared. A test of the read/write chain should determine if hardware is at fault.	1) Read/write PCA (read/write chain) 2) Disc media
3	03	During a read operation, both an uncorrectable read error and a servo system off-track error were encountered. The off-track error is the prime suspect; off-track can induce an uncorrectable read error. Perform a full servo system test. If that passes, the read/write system should be tested.	1) Servo PCA 2) Read/write PCA
4	04	During a read operation, the DMA hardware reported a data CRC error. The ECC should have detected and reported the error.	1) DMA PCA (ECC chip)
5	05	The CRC caught a read data error and the fault register indicates off-track status. The off-track condition might easily have caused the read data error. Therefore, the servo system is more suspect than the read/write chain. A full test of the servo system should be performed. If that is successful, then a read/write test should be performed.	1) Servo PCA 2) Read/write PCA
6	06	During a drive operation that was receiving data from the host, the drive received an end of transfer before the number of bytes expected to be sent to the drive were received. In some cases (receiving a command) the early EOI status is expected and is not an error. The internal diagnostic should be able to find any errors associated with the EOI status. The DMA PCA controls this status message.	1) DMA PCA

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
7	07	During a receive or a receive and write operation, the number of bytes expected from the host was received but the last byte was not tagged with EOI. Under normal conditions, this is a reporting error. If this error is associated with some possible hardware problem, the DMA PCA is suspect.	1) DMA PCA
8	08	During a receive or receive and write operation, a secondary was received while expecting data or commands. If this error is associated with a drive problem, the DMA PCA could have problems. This error is a reporting error and does not mean that there are any hardware problems. If a drive problem seems to exist, the DMA PCA is suspect.	1) DMA PCA
9	09	An incremental seek was requested that would extend beyond the last track of the device. RAM/ROM failure or a request by the host for a transfer that would extend past the end of the volume.	1) MPU PCA
10	0A	During a verify operation, a bad sector was encountered that the ECC could not correct. An occasional occurrence of this error is acceptable; however, frequent occurrences indicate a problem.	1) Read/write PCA 2) DMA PCA 3) Disc mechanism
11	0B	During a verify operation, a bad sector was encountered that the ECC could not correct; however, there was also an indication that the head was off track. The off track condition is the real problem and is most likely caused by the servo PCA.	1) Servo PCA
12	0C	A CRC error occurred during a verify operation. An occasional occurrence of this error is acceptable; however, frequent occurrences indicate a problem.	1) Read/write PCA 2) DMA PCA 3) Disc mechanism

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
13	0D	During a verify operation, the CRC detected a bad sector; however, there was also an indication that the head was off track. The off track condition is the real problem and is most likely caused by the servo PCA.	1) Servo PCA
14	0E	When a check was made of the header read from the disc, the first byte (status) had the most significant bit clear. This bit should always be set. The read/write PCA is suspect. A full self-test should be performed on the read/write chain.	1) Read/write PCA 2) DMA PCA
15	0F	When a check was made of the sector header read from the disc, the head number was not the one expected. The read/write chain is suspect. A full self-test on the read/write chain should be performed.	1) Read/write PCA (head select) 2) DMA PCA
16	10	When a check was made of the sector header read from the disc, the sector number was not a legal one for this device. The read/write chain is suspect. A full self-test on the read/write chain should be performed.	1) Read/write PCA 2) DMA PCA
17	11	When a check was made of the sector header read from the disc, the cylinder number was not the one expected. The read/write chain and the servo system are suspect. A full self-test should be performed on both the read/write chain and the servo system.	1) Read/write PCA 2) DMA PCA 3) Servo PCA 4) Disc media
18	12	DMA status indicates that the DMA buffer is full of data. The DMA buffer is held clear during this operation, so the DMA should not report a full buffer. The firmware holds the buffer not full on internal disc read operations (buffer reads).	1) DMA PCA

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
21	15	During a DMA buffer write to the disc, a rotational latency was incurred. During a buffered write, all the data is already in the DMA RAM so this error would indicate that the DMA PCA is faulty.	1) DMA PCA
23	17	The drive has been unable to access a valid copy of a system maintenance file. This could be because seeks to the various copies were unable to be completed or that the read/write chain encountered errors that caused the drive to spare out all its possible copies of the maintenance file. Note that maintenance track sparing is not related to the CS/80 spare command and proceeds without host intervention. If this error is a result of a read/write problem, the disc media will have to be reinitialized or replaced; if the error is due to a servo system failure, it should be possible to recover the maintenance track data. This error is usually accompanied by TERROR C4. A full self-test should be performed on the read/write system and then the servo system.	1) Read/write PCA 2) DMA PCA 3) Servo PCA 4) MPU PCA 5) Disc media
24	18	During an access to a system maintenance area, a maintenance file was read that had an invalid checkword. This had to be caused by a read/write failure, an uncorrectable read error, or bad media. If this error occurred during an access to the spare track table file, the spare table will be zeroed and the drive will seek to the original physical track on an access to a previously spared track. A full self-test should be performed on the read/write chain. If the read/write chain is found to be satisfactory, it must be assumed that a faulty write occurred and the disc media must be reinitialized or replaced.	1) Read/write PCA 2) DMA PCA 3) MPU PCA 4) Disc media
25	19	An access of the system maintenance area was made and all the copies of the files contained the pattern of an unitialized disc. The disc media has not been properly initialized for use.	1) The disc media needs initializing

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
27	1B	A seek was unable to successfully reach the target track. If error logging is enabled, this error will be preceeded by other DERROR's that elaborate on the actual nature of the failure. Note: If this error has occurred, then the heads are currently over physical cylinder zero. Since an inability to successfully read from the target track in order to verify position can also trigger this fault, both the servo system and the read/write chain are suspect. A full self-test should be performed on both the servo system and the read/write chain.	1) Servo PCA (track follower or actuator driver) 2) Read/write PCA 3) DMA PCA
28	1C	The sector interleave value could not be read from the disc. This means that the firmware will default to an interleave of one (no interleave).	None
29	1D	A recalibration operation was unable to successfully attain the normal recal position. This error will prompt a head unload operation. If fault logging is enabled, this error will be preceeded by other DERROR's that elaborate on the cause of the failure. The servo system is suspect. A full self-test should be performed on the servo system.	1) Servo PCA
30	1E	A head unload operation failed to detect that the heads were retracted and the drive was forced to perform an emergency retract (if the drive has that ability). The servo system is suspect; a full servo system test should be performed.	1) Servo PCA 2) Disc media 3) Disc mechanism
32	20	At the end of a read operation, no data errors were indicated by the hardware, but at some time since the last seek operation, the drive has gone off track. The data read is considered to be valid. If there are hardware problems associated with this error, the servo electronics should be checked out.	This error is an information error only.

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
33	21	During a disc read or write operation, the target sector was passed because there was either no room in the DMA buffer for the sector to be read or there was not a sectors-worth of information in the DMA buffer to be written to the disc. With RPS enabled during a write operation, this error could mean that the RPS window was missed. Otherwise, during a write operation, at least one sector was written to the disc and the latency was induced by a subsequent sector write.	None
34	22	The ECC electronics reported a correctable error during a read or verify. If this error is associated with hardware problems, the ECC electronics should be checked.	This error is an information error only.
35	23	The error log on the disc is full (it contains 101 entries). This may be an indication of an increasing error rate.	1) Read/write PCA 2) Disc media
36	24	The disc fault log is full (contains 65 entries). This might be an indication of degrading drive performance. A full internal diagnostic should be performed as the state of the drive is perhaps suspect. The severity of this error is directly related to the length of time since the fault log was last cleared; if the log has been cleared recently, this error may indicate a more serious drive malfunction.	None
37	25	ECC detects a correctable error in the ECC field.	This error is an information error only.

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
64	40	During a disc read or write operation the drive detected a hardware fault register bit set. When this fault occurs, the contents of the fault register is recorded in the status message and the fault log; this fault register status byte indicates which hardware assembly has experienced a fault. The condition causing the fault to be reported will be set high true in the fault register status byte.	1) Assembly indicated by the hardware fault register 2) MPU PCA Bit 0 = DWF-L Destructive Write Fault Bit 1 = AGC-L AGC line Bit 2 = PPF-L Possible Power Fail Bit 3 = OFT-L Off Track Bit 4 = WOT-L Write and Off Track Bit 5 = SOK-H Speed OK Bit 6 = IDENT Drive Identify (low = 7911; high = 7912/7914) Bit 7 = SPUD Spindle speed indicator pulses
65	41	Servo PCA is/was not phase-locked to the disc servo code.	1) Servo PCA 2) Disc mechanism
66	42	Timeout while waiting for an interrupt from the CTC. Seek failure caused by servo system fault or by MPU not generating or responding to interrupts.	1) Servo PCA 2) Disc Mechanism 3) MPU PCA (CTC chip)
67	43	Timeout while waiting for a track crossing interrupt from the CTC.	1) MPU PCA (CTC chip) 2) Servo PCA 3) Disc mechanism

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
68	44	Timeout while waiting for ONT-L (ontrack) at target track. This error is usually caused by a servo code defect that causes the servo PLL to come unlocked.	1) Servo PCA 2) Disc mechanism
76	4C	Off track bit (OFT-L) wrong at the end of a seek.	1) Servo PCA 2) Read/write PCA 3) MPU PCA
77	4D	Did not verify that a recalibrate finished on track zero. A double index pulse should have been detected but was not.	1) Servo PCA 2) Disc mechanism
79	4F	Disc not at speed before a seek or recalibrate. Either the disc is not spinning, or the speed detection circuitry is not working.	1) Spindle motor or belt 2) Speed sensor (refer to table 11-1, Service Note SN-9) 3) Servo PCA 4) MPU PCA
80	50	This error is an indication that the DMA PCA may not be transfering data to the read/write PCA because the DMA is not receiving the control signals from the read/write electronics or, alternatively, there is a component failure on the DMA PCA.	1) Read write PCA 2) DMA PCA
90	5A	A spare operation retaining data was unable to seek to the target track. It is advised that a full internal diagnostic be performed before any sparing operation to ensure that ability to seek and read/write has not been lost. This error may be the reason why sparing was invoked originally.	1) Servo PCA 2) Read/write PCA

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
91	5B	A spare operation retaining data was unable to read all of the data from the target track. It is advised that a full internal diagnostic be performed before any sparing operation to ensure that the ability to read/write has not been lost. This error may be the reason the sparing operation was invoked originally.	1) Read/write PCA
92	5C	A sparing operation was unable to seek to either of the two closest available spare tracks to be used in that operation. A full internal diagnostic is recommended before any sparing operation. This error would seem to indicate that perhaps a full cylinder of available spare tracks are defective or that the drive can no longer seek.	1) Servo PCA 2) Read/write PCA
93	5D	A sparing operation was unable to write the available spare track and successfully verify it. A full internal diagnostic is recommended before any sparing operation. This error would seem to indicate that either a full cylinder of available spare tracks were defective or that the drive can no longer read/write.	1) Read/write PCA
94	5E	An error was detected in the logical head load routine from the physical head load driver. The specific DERROR from the physical driver should be the next DERROR.	1) Servo PCA
96	60	The CTC did not decrement or reload after the time for one sector. This problem can originate anywhere along the sector timing pulse data path.	1) MPU PCA
97	61	When the firmware has decided that a non-burst disc write operation is complete, it checks the DMA as it should stop in parallel with the firmware. This error is declared if the firmware and the DMA do not agree. This error is not possible in a burst mode write since the DMA is not currently receiving data from the channel during such a write.	1) DMA (channel circuitry)

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
98	62	A fault bit was detected on the DMA that should never be set for this device. The DMA PCA is highly suspect and the DMA internal diagnostic should be performed.	1) DMA PCA 2) MPU PCA
99	63	The ECC experienced a data compare error during a disc write operation. The ECC chip should be thoroughly tested. Any further disc writes before this fault is investigated are highly suspect.	1) DMA PCA (ECC chip)
100	64	An attempt was made to reset the ECC chip but the write error status bit from the ECC did not reset. Either the ECC circuitry is defective or the the MPU is having problems selecting the ECC electronics.	1) DMA PCA (ECC chip) 2) MPU PCA
102	66	The DMA electronics set a bit that indicates the end of a transfer before the expected termination of the transfer. Either the circuitry on the DMA PCA that looks for the end of a transfer is faulty or the ability of the MPU to sense these bits is faulty. A full internal diagnostic should be performed.	1) DMA PCA 2) MPU PCA
103	67	This error indicates that the desired sector number did not appear from the CTC within a full disc rotation. Either the CTC is not counting (perhaps due to either the CTC circuitry being in fault or the sector timing circuitry that generates the sector pulses is failing) or that has been a controller fault that caused us to be looking for an illegal sector number. A full internal diagnostic of the drive should be performed.	1) MPU PCA 2) Servo PCA (sector timing circuitry)
107	6B	Inconsistent internal error code(s) encountered by error reporting routine.	1) MPU PCA

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
108	6C	While waiting for the sector counter (STP register) to reach an expected value, it was noted that the STP was counting at a faster rate than is legally possible. The STP circuitry (it is a channel of the counter-timer chip (CTC) on the MPU PCA) or the circuitry generating sector timing pulses (track follower) is bad. A full self test should be performed on the servo system and the MPU PCA.	1) MPU PCA 2) Servo PCA (STP pulse generating circuitry)
111	6F	A microdiagnostic failed that refers to the controller unit as opposed as to one of the mass storage units.	As the associated TERROR desribes
114	72	A channel parity error has been detected by the channel interface or an illegal channel interface state (caused by receiving bus control, DMA handshake error with channel) or channel loopback failure has occurred. The error could be caused by a faulty channel or a fault in the DMA channel interface. This error could also be caused by faulty system configuration or operation.	1) DMA PCA 2) Host system channel cabling, configuration, or interface
115	73	The device received a message type which conflicted with its current state. Assuming host computer is operational, there could be a problem with the DMA hardware.	1) HP-IB cable(s) 2) DMA PCA
118	76	Channel activity has placed the device interface in an illegal state. Host software placed the device in an illegal state, or DMA hardware is improperly communicating with the interface chip (PHI).	1) DMA PCA 2) System configuration
119	77	The received length (in bytes) of an HP-IB message conflicted with the expected length. This is an internal error or possibly an interface problem.	1) HP-IB configuration 2) DMA PCA
121	79	An HP-IB message was abnormally terminated. This is an internal error or possibly an interface problem.	1) DMA PCA 2) Channel configuration

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
128	80	The CPU sent an illegal opcode to the device. This is an internal error or possibly a transmission problem.	1) HP-IB cables 2) DMA PCA
129	81	The CPU sent a unit or volume number which was out of bounds for this device. This is an internal error or possibly a transmission problem.	1) HP-IB cable 2) DMA PCA
130	82	The CPU sent a command which did not have the correct number of parameter bytes for the opcode(s) included. This is an internal error or possibly a transmission problem.	1) HP-IB cables 2) DMA PCA
136	88	An internal diagnostic failed. Look at TERROR to determine which one failed.	Determined by TERROR
139	8B	PHI parallel poll synchronization problem was experienced by the CPU or the CPU tried to talk to the drive while it was automatically released.	1) DMA PCA
146	92	No more spares are available for a requested sparing operation. Disc media is getting too old, has been damaged, or read/write electronics has problems.	1) Read/write PCA 2) Disc media
148	94	Retry attempts have failed to rectify a data error during a read operation.	1) Read/write PCA
177	B1	One of the first four data frames in a block had a CRC error. The TIB PCA performed a correction and the data was recovered.	None (occurs normally)
178	B2	A CRC error was detected in one of the ECC frames (frame 5 or 6).	None (occurs normally)

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
179	B3	Two nonadjacent frames on the tape had CRC errors. This combination of frames with CRC errors makes the block uncorrectable.	Note: No repair action is required unless this error occurs more than two times. 1) Tape media 2) Tape mechanism (if HP part no. 07908-60140)
180	B4	The frame number returned in the DMA buffer after a transfer of data from the TIB PCA to the DMA buffer is not one of the expected values.	1) TIB PCA
182	B6	When attempting to write a block of data to the tape, the target key is unreadable. When attempting to read a block of data from the tape, the target key and the first 3 frames within that block have CRC errors (the TIB PCA will attempt to retreive the key address from the first three data frames of the block).	Note: No repair action is required unless this error occurs more than two times. 1) Tape media (cartridge) 2) TIB PCA 3) Tape mechanism
183	B7	During a tape verify operation where the TIB PCA is performing an "n" block verify operation, a key with a CRC error was encountered. This part of the hardware verify operation will be implemented only for products which support parallel operations.	Note: No repair action is required unless this error occurs more than two times. 1) Tape media (cartridge) 2) TIB PCA 3) Tape mechanism
184	B8	Too many blocks in a row with a key CRC error (see DERROR "$B6_{16}$"). The count is set to 20 keys in a row with CRC errors.	1) Tape media (cartridge) 2) TIB PCA 3) Tape mechanism

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
185	B9	This error is set after multiple attempts to seek and locate the target key. If auto sparing is on and this is a write operation, the block will be automatically spared.	Note: No repair action is required unless this error occurs more than two times. 1) Tape media (cartridge) 2) TIB PCA 3) Tape mechanism
186	BA	Eight-tenths of a second passed and the TIB PCA did not report finding a key. The TIB PCA is lost or has been "fooled" by the tape. It is usually difficult to get this error to recur.	1) Tape media
188	BC	If during a tape read and transmit operation, the host computer is slow receiving the data being sent to it, the tape may need to stop to allow the host to catch up. If the TIB PCA has data to be transfered to the DMA and a key is read on the tape, the TIB will stop the tape and report the situation to the firmware. The firmware will reposition the tape for the next data block.	None (occurs normally)
189	BD	This error is the same as the "BC_{16}" except that a key was read on the tape before a block of data was received from the host computer to be written to the tape. Another case where this error may appear is when a copy data from the disc to the tape is being performed and disc read retries are necessary, which forces a data overrun on the tape.	None (occurs normally)
191	BF	This error is generated when the tape encounters a jump spare on the tape since the new block is too far away from the spared block. In most cases, this error is just information for the user indicating more than one seek was necessary in order to locate the target block.	Note: No repair action is required unless this error occurs more than two times. 1) TIB PCA 2) Tape media (cartridge)

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
192	C0	The TIB PCA indicates that it has useful information in the completion code register. Upon reading the completion code register, the drive firmware finds the information meaningless.	1) TIB PCA 2) MPU PCA
194	C2	A command was strobed to the tape device and the tape drive did not acknowledge the command within two seconds.	1) TIB PCA 2) Tape data cable 3) Tape mechanism
196	C4	The command strobe procedure was called to strobe a command to the tape drive. This procedure will wait two seconds for the tape to go "not busy", in the case where the tape drive was busy before the procedure strobed the command. If the tape drive is busy and stays busy for the time limit, this error is reported.	1) TIB PCA 2) Tape data cable 3) Tape mechanism
197	C5	A stop command was strobed to the tape drive. The tape drive set busy status indicating it is busy stopping the tape but the busy status does not go away.	1) TIB PCA 2) Tape data cable 3) Tape mechanism
200	C8	A motion command was strobed to the tape drive. The line indicating the drive is busy is asserted by the tape drive but this line never goes false.	1) TIB PCA 2) Tape data cable 3) Tape mechanism
201	C9	A command was sent to the tape tape drive to start the tape in motion. The tape drive acknowledged the command and supposedly started the tape without any problems, but when the tape status register was read, the "at speed" bit was not set.	1) TIB PCA 2) Tape data cable 3) Tape mechanism

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
202	CA	Since there is no sector signal when transferring data between the TIB and DMA, the TIB toggles a flip flop for each block (256 bytes) transfered between the DMA and TIB. If the TIB does not toggle the flip flop, this error is reported.	1) TIB PCA 2) DMA PCA
203	CB	Status byte from tape drive has most significant bit (bit 7) set which indicates secondary status. This secondary status byte from the tape is also reported in the byte following the error byte. The bits of the secondary status byte indicate the type of failure. The suspect hardware is a function of the particular bit that is set. Bit 0 = AGC or signal-to-noise (S/N) error. Make sure the tape has not passed the tape marks at the beginning or end of the tape by manually winding the tape onto the small spool. Bit 1 = Off tape. No tape pattern was sensed on the current portion of the tape. The TIB may have erased the tape, rendering it useless. Bit 2 = Stepper motor error Bit 3 = ROM error Bit 4 = Abnormal tach signal. Even if this error is unrepeatable the tape mechanism should be changed. Bit 5 = Abnormal motor load. Ensure that the tape is not jammed or damaged. Even if this error is unrepeatable the tape mechanism should be changed. Bit 6 = Illegal command Bit 7 = Will be set high to indicate the existence of a fault.	Bit 0: 1) Tape cartridge 2) Tape mechanism Bit 1: 1) TIB PCA 2) Tape cartridge Bit 2: 1) Tape mechanism Bit 3: 1) Tape mechanism Bit 4: 1) Tape mechanism Bit 5: 1) Tape cartridge 2) Tape mechanism Bit 6: 1) TIB PCA 2) Tape data cable 3) Tape mechanism

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
204	CC	This error will occur if, during a write operation, the TIB PCA does not pulse the four-bit down counter on the MPU PCA in 23 milliseconds. Or, if during a read operation, the TIB PCA does not indicate the completion of the operation in approximately the same time.	1) TIB PCA
205	CD	This error is set when the host attempts to perform a tape operation before the tape has completed the autoload, read the spare table and manufacturer's block on the tape. If the "not ready" status is reported even after the tape has completed the autoload and the autoload did not fail.	None
207	CF	After reseting the tape drive or after acknowledging the secondary status sent from the tape drive, the most significant bit of the tape drive status register did not return to zero after a specified time.	1) TIB PCA 2) Tape data cable 3) Tape mechanism (controller)
208	D0	During a data transfer between the TIB and DMA, the disc address counter did not increment by four.	1) TIB PCA 2) DMA PCA
209	D1	In a tape certification or a write-then-read error rate test, the firmware compares the data read with what it wrote. If they do not compare this error is reported.	1) TIB PCA 2) DMA PCA
211	D3	The firmware was waiting for the CTC to interrupt which indicates that the CTC pulsed the TIB PCA. The CTC interrupt never came.	1) MPU PCA
212	D4	When the target key is located, the TIB PCA pulses the counter timer chip on the MPU. This timer will time the delay to the initial erase and time the length of the initial erase (erase before first frame). If the CTC does not start counting after the target key is located during a write operation, this error is reported.	1) TIB PCA 2) MPU PCA

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
213	D5	The MPU terminated the in-progress write operation after noticing that the TIB had sequencing problems.	1) TIB PCA 2) MPU PCA (4-bit tape counter)
216	D8	The tape drive reported that a tape was in the mechanism, there was no autoload in progress and the not ready staus bit indicated that the tape was ready for use. This indicates to the firmware that the tape is ready for use. Some time later, the firmware wanted to strobe a command byte to the tape drive but the status now indicates it is not ready for use.	1) TIB PCA 2) MPU PCA 3) Tape data cable 4) Tape mechanism
217	D9	This error is used by the firmware to force the unrecoverable error bit to be set in the status field returned to the host computer. It means retries expired for a media related error.	1) Tape media 2) Tape mechanism (if HP part no. 07908-60140) Note: Check the preceeding errors in the parameter field of the status report for more information on suspect hardware.
218	DA	The firmware was unable to recover from a non-media related problem (possibly through retries). When doing an internal tape write/read test, the firmware will use this error to report that a situation encountered could not be recovered through retries or could not recover and retries are not allowed.	Check the preceeding errors in the parameter field of the status report for information on suspect hardware.
219	DB	An attempt was made to read from a tape which was never written to.	1) User inserted blank tape 2) MPU firmware
220	DC	The host attempted to access beyond the logical end of volume.	1) HP-IB cable 2) DMA PCA

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
222	DE	During an internal tape error rate test (ERT), the ERT log overflowed.	1) Dirty tape head. 2) Tape media (cartridge) 3) Tape mechanism
223	DF	An attempt was made to write to a tape which is write protected.	None
225	E1	A parameter bounds error occurred in a set address command.	1) HP-IB cables 2) DMA PCA
226	E2	A parameter bounds error occurred in a command other than unit, volume, or address.	1) HP-IB cables 2) DMA PCA
228	E4	At the end of any disc disc read operation, the firmware will compare the header information that was read from the last sector of the disc to the expected values for that sector address. If this address is incorrect, this error is reported. This fault is an indication of a possible DMA data RAM failure.	1) DMA PCA
229	E5	At the end of any disc read operation, the header information from the last sector read is compared to the expected sector number. If the values differ, this error is reported. There are a number of possible reasons why this situation could occur. The DMA header RAM could be failing, the CTC could be failing, the read/write electronics could have problems or the servo electronics could be dropping sector timing pulses which go to the CTC on the MPU PCA. Also, if the media has a defect which causes the servo PCA to miss a start of sector signal in the servo code this error could be reported.	1) DMA PCA 2) Read/write PCA 3) Servo PCA 4) MPU PCA 5) Disc mechanism

Table 5-2. Run-Time Drive Error Codes (continued)

NUMBER		CAUSE	SUSPECT HARDWARE
DEC	HEX		
230	E6	The device was not in proper position to access the media when the CPU commanded a media access. Media not inserted, head loading or diagnostic failure, or a drive fault during real time access may have occurred.	1) Servo PCA 2) Read/write PCA

5-2. EXTERNAL EXERCISER DIAGNOSTICS

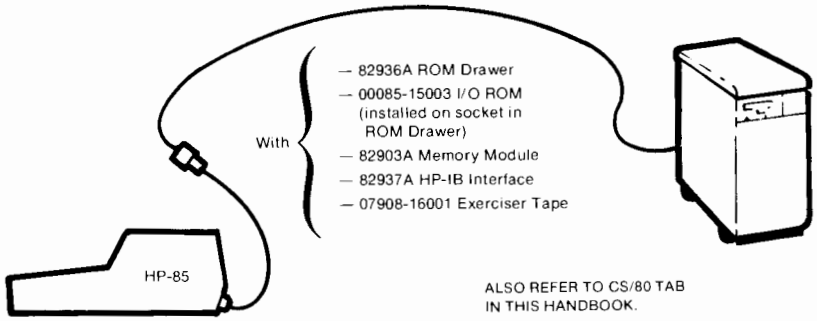


Table 5-3. External Exerciser Commands

COMMAND*	OPERATION PERFORMED	COMMAND*	OPERATION PERFORMED
CANCEL	CANCEL TRANSACTION SEQUENCE	PRESET	PRESET DRIVE UTILITY
CERT	CERTIFY TAPE CARTRIDGE	REQSTAT	REQUEST STATUS
CHANNEL	CHANNEL TEST UTILITY	REV	READ REVISION NUMBER UTILITY
CICLEAR	CHANNEL INDEPENDENT CLEAR	RO ERT	READ ONLY ERROR RATE TEST
CLEAR LOGS	CLEAR LOGS UTILITY	RUN LOG	READ RUN LOG UTILITY
DIAG	INTERNAL DIAGNOSTIC TEST	SDCLEAR	SELECTED DEVICE CLEAR
ERRSUM	READ ERROR SUMMARY UTILITY	SPARE	SPARE BLOCK UTILITY
ERT LOG	READ ERROR RATE LOG UTILITY	TABLES	READ DRIVE TABLES UTILITY
EXIT	EXIT EXTERNAL EXERCISER	UNIT	SET UNIT NUMBER UTILITY
FAULT LOG	READ FAULT LOG UTILITY	UNLOAD	UNLOAD TAPE
HELP	DISPLAY HELP INFORMATION	USE LOG	READ TAPE USE LOG
INIT MEDIA	INITIALIZE SELECTED MEDIA	WRITE FM	WRITE FILE MARK ON TAPE
OPER	ENTER CS/80 OPERATIONS ROUTINE	WTR ERT	WRITE-THEN-READ ERROR RATE TEST

* Some commands must be followed by an address; valid logical addresses in the HP 7911 and HP 7912 are as follows:

SECTOR	0 - 63	HEAD	0 - 2 (HP 7911) 0 - 6 (HP 7912/7914)
CYLINDER (LOGICAL)	0 - 571 (HP 7911/7912) 0 - 1151 (HP 7914)		

NOTE: Refer to CS/80 External Exerciser Reference Manual, P/N 5955-3462, Section 2, for examples.

Table 5-4. Operator Designed Commands (OPER)

COMMAND	DESCRIPTION
CLR	Channel Independent Clear
CMPR	Write-Then-Read and Compare
COMP	Complementary Command
EDIT	Replace an OPER Program Step
ENDLP	End Loop
EXEC	Execute OPER Program Steps
EXIT	Exit the Current Program
HELP	Print List of Commands
INSK	Incremental Seek
LCRD	Locate and Read
LCWR	Locate and Write
LIST	List OPER Program Steps
LOOP	Loop
NEW	Clear Current OPER Program
NULL	Delete OPER Program Step
RQST	Request Status

NOTE: Refer to CS/80 External Exerciser Reference Manual, Section 4, for examples.

Table 5-5. TAPE Commands

COMMAND	DESCRIPTION
CANCEL	Cancel Previous Command
CERT	Certify Tape Cartridge
CICLEAR	Channel Independent Clear
CLEAR LOGS	Clear Drive Logs Utility
ERRSUM	Read Error Summary Utility
ERT LOG	Read Error Rate Log Utility
EXIT	Exit the Current Program
HELP	Print List of Commands
INIT MEDIA	Initialize Tape
PRESET	Preset Drive Utility
RQSTAT	Request Status
RO ERT	Read Only Error Rate Test
RUN LOG	Read Run Time Log Utility
SDCLEAR	Selected Device Clear
SPARE	Spare Block Utility
TABLES	Read Drive Tables Utility
UNIT	Set Unit Number Utility
UNLOAD	Unload the Tape
USE LOG	Display Tape Use Log
WRITE FM	Write Filemark on Tape
WTR ERT	Write-Then-Read ERT

NOTE: Refer to CS/80 External Exerciser Reference Manual, Section 3, for examples.

Table 5-6. DIAG Test Entries

DIAGNOSTIC NUMBER	DIAGNOSTIC TEST RUN IN HP 7911/7912/7914
0	Complete internal diagnostics: including micro-diagnostics and write/read test. (Equivalent to pressing self test switch.)
1	Complete internal diagnostics as above followed by complete verify of entire disc. (Equivalent to pressing diagnostic switch.)
2	MPU PCA-A5 micro-diagnostic.
3	DMA PCA-A4 micro-diagnostic.
4	Read/Write-DMA interface macro-diagnostic.
5	Servo PCA-A2 micro-diagnostic.
6	Read/Write PCA-A3 micro-diagnostic.
7	TIB PCA-A6 micro-diagnostic.
8	Data path macro-diagnostic: DMA to Read/Write.
9	Disc system macro-diagnostic: Read/Write to Servo, Read/Write to disc mechanism, Servo to disc mechanism.
10	Tape system macro-diagnostic: DMA to TIB, TIB to tape mechanism, tape mechanism auto test.
11	Random seek test: 256 seeks with verify.
12	Maximum seek test: 256 seeks from physical cylinder 0 to 379 and back (512 seeks total).
13	Incremental seek test: all logical cylinders from 0 to 369 accessed and verified.

5-3. READ DRIVE TABLES UTILITY

The TABLES command listed in table 5-3 returns values stored in the following disc/tape drive tables.

TABLE	DESCRIPTION
1	Disc Spare Track Table
M	Manufacturer's Tape Block Table
S	Tape Spare Block Table
C	Copy Data Table

The disc spare track table lists the logical tracks which have been spared for each head, and which sequential spare (scalar) was used to replace the defective track. The corresponding physical cylinder address for each scalar is as follows:

SCALAR 7911	SCALAR 7912/14	PHYSICAL CYLINDER ADDRESS
0-2	0-6	62
3-5	7-13	124
6-8	14-20	186
9-11	21-27	248
12-14	28-34	310
15-17	35-41	373
18-20	42-48	435
21-23	49-55	497

The manufacturer's tape block table identifies the tape origin and size of the tape cartridge. The tape spare block table contains the physical addresses of tape blocks which are spared. The copy data table contains the address of the first disc sector transferred to the tape during a copy data operation (HP 7914 only).

NOTE: Refer to CS/80 tab for information on sparing.

5-4. READ REVISION NUMBERS UTILITY

The REV command listed in table 5-3 allows the external exerciser to receive a list of ROM revision and rework numbers. The most current version is shown below. (See CS/80 tab for more data.)

PART ID	07914-1X003 (REV 5.0)	07914-1X103 (REV 5.1)	07914-1X203 (REV 5.2)	07914-1X303 (REV 5.3)
U241 (0)	5-0	5-0	5-0	5-0
U261 (1)	5-0	5-1	5-1	5-1
U271 (2)	5-0	5-0	5-2	5-3
U291 (3)	5-0	5-0	5-0	5-0
U2101 (4)	5-0	5-0	5-0	5-0
U121 (5)	5-0	5-0	5-0	5-0

NOTE: Lower code numbers indicate obsolete firmware.

ADJUSTMENTS

SECTION VI

There are NO operating or maintenance adjustments in the drives.

The disc mechanism and tape module are replaceable as assemblies only.

Refer to the service manual for removal/replacement of faulty components.

PERIPHERALS

SECTION VII

This section is intended for system-related information not documented in the product manuals.

Table 7-1. HP 3000 Reference Table

DISC	STARFISH	S/30	S/33	S/40	S/44	S/64
7933H	4	3	3	8	8	16
7920/25M	0	1	1	2	2	16
7920/25S	0	7	7	7	14	14
7911/12/14	0	3	3	4	4	1
7906M	0	1	1	1	1	0
7906S	0	7	7	6	7	0
MAX DISCS	4	8	8	8	16	16
LINUS	0	1	1	1	1	1

NOTES: High speed GICs are required on all CS/80 family drives. The Linus (tape drive in the 791X series) requires a dedicated GIC. The HP 7914 Linus is not yet supported.

REPLACEMENT PARTS

SECTION VIII

A complete list of replaceable parts is contained in the service manual. This section covers only major assemblies and spares.

See section I for service kit, accessories, and consumables.

8-1. RECOMMENDED FIELD STOCKING INVENTORY - DISC DRIVE

NUMBER	QTY	DESCRIPTION
1400-0493	3	CABLE TIE, 5.5 in
2110-0003	5	FUSE, 3A, NB
2110-0051	5	FUSE, 10A, 250V
2110-0054	5	FUSE, 15A, 250V
2110-0250	5	FUSE, 25A, 32V
2110-0342	5	FUSE, 8A, NB
2110-0030	5	FUSE, 5A, 250V, TD
8120-3445		CABLE, HP-IB, 1 metre
8120-3446		CABLE, HP-IB, 2 metre
07914-19103		EPROM KIT (REV 5.2)
07912-20013		PULLEY, motor, 50 Hz
07912-20024		PULLEY, motor, 60 Hz
07912-40017		BELT, drive, 60 Hz
07912-40018		BELT, drive, 50 Hz
07912-60103	(or):	MOTHERBOARD, PCA HP 7912
07914-60103		MOTHERBOARD, PCA HP 7914
07912-60008		JUMPER PCA
07912-60009		HP-IB PCA
07912-60044		HARNESS, power
07912-60045		CABLE, power sense
07912-60046		CABLE, HP-IB DMA
07912-60053		HARNESS, motor
07912-60054		HARNESS, unreg power
07912-60071		CABLE, motor relay
07912-60097		CABLE, brake
07912-60111		SPEED SENSE ASSY (see note 1)
07912-69006		PCA-PWR SUP/EXCHANGE
07912-69210		PCA-DMA/EXCHANGE
07912-69011		PCA-MPU/EXCHANGE
07914-69204		PCA-RW/EXCHANGE
07914-69001		PCA-SERVO/EXCHANGE

Plus one or more mechanisms per HP Area: (see note 2)

07911-69X00	HP 7911 DISC MODULE/EXCHANGE	See table 8-3
07912-69X00	HP 7912 DISC MODULE/EXCHANGE	See table 8-3
07914-69100	HP 7914 DISC MODULE/EXCHANGE (motherboards are included)	

NOTES:
1. Drive prefix 2251 & below have P/N 07912-60031
2. Parts coordinators should retain all packaging for reshipment purposes (CE transit case alone is NOT sufficient).

8-2. RECOMMENDED FIELD STOCKING INVENTORY — LINUS

NUMBER	DESCRIPTION
9164-0211	Cartridge Tape - 600 ft.
9164-0212	Cartridge Tape - 150 ft.
07912-60047	Cable, Tape Power
07912-60048	Cable, Tape Data
07912-60049	Cable, Tape 10P (rackmount)
07908-60142	Switch PCA-A8
07908-60143	Cable Assy, Data
07908-60144	Cable Assy, Switch (stand-alone)
07908-60145	Cable, Power Tape
07908-69340	Exch.Tape Mechanism
07908-69241	Exch.PCA-A6 TIB

8-3. PARTS HISTORY AND COMPATIBILITY

Refer to table 8-1 opposite for PCA revision history.

Refer to table 8-2 opposite for MPU firmware update history.

Refer to table 8-3 on next page for replacement parts compatibility between the various drives. To use the table, look for the replacement part number in column 1, then read across to determine compatibility of the new part with other parts in the drive.

Table 8-1. PCA Revision History

PCA	ORIGINAL P/N	UPDATE	EXCHANGE	1st DRIVE PREFIX	SVC NOTE
A1/4 DMA	07912-60010		-69010		
		-60210	-69210		
A2/3 MPU	07912-60011		-69011		
A6 TIB[1]	07908-60141		-69141		
		-60241	-69241	2206	SN-02, 03,04
A7 JMPR	07912-60008				
A8 R/W	07912-60004		-69004		
		-60104	-69104	2216	SN-05
	07914-60004		-69004		
		-60104	-69104	2430	SN-07
		-60204	-69204	2533	SN-20
A9 SERVO[2]	07912-60001		-69001		
		-60121	-69121	2220	SN-05
	07914-60001		-69001		
A11 M-BD	07912-60003				
		-60103			
A11 M-BD	07914-60103				
A13 PWR	07912-60006		-69006		
A14 HPIB	07912-60009				
A15 SWC	07908-60142				

NOTES:

1. A6, -60241 requires firmware -1X004 or above, but older -60141 does not; also -60241 date code E-2206 can give TERROR CO or DA in error rate test or certify, TERROR 28 in selftest, or times out during tape read (ref SN-04). Date code 2249 and greater should have sockets U142 & U241 removed (corrects intermittent errors T25, T26 & D204, D203, D186).

2. A9, 07912-60121 is not compatible with old A8, 07912-60004; replace with both new A8 & A9 if either original PCA fails. A9, 07914-60001 and A8, 07914-60004 compatibility with other parts must be verified if either board is replaced, see table 8-3.

Table 8-2. MPU Firmware History

KIT P/N	OBSOLETES	DRIVE PREFIX	TIB DATE CODE	REF PCO	MANDATORY
07912-1X004	-1X003	2206	E-2206	48-4693	yes
Kit comprises:					
U241: 07912-89020	(was -89002)				
U261: 07912-89021	(was -89003)				
U271: 07908-89059	(was -89006)			(REV E)	
U291: 07908-89060	(was -89054)				
U2101: 07908-89061	(was -89007)				
U121: 07908-89062	(was -89050)				
U2101: 07908-89065	(was -89061)		2223/2229	48-4907	no
07912-1X005	-1X004	2230	------	48-4938	yes
U241: 07912-89024					
U261: 07912-89025					
U271: 07908-89068				(REV F)	
U291: 07908-89069					
U2101: 07908-89070					
U121: 07908-89071					
07914-1X001	-1X004	2304	------	48-6142	no
U241: 07914-89021					
U261: 07914-89022					
U271: 07914-89023					
U291: 07914-89024					
U2101: 07914-89025					
U121: 07914-89026					
07914-1X002	-1X001	2326	-----	48-6193	yes
U241: 07914-89031					
U261: 07914-89032					
U271: 07914-89033				(PEP)	
U291: 07914-89034					
U2101: 07914-89035					
U121: 07914-89036					
07914-1X003	-1X002	2429	-----		no
U241: 07914-89041					
U261: 07914-89042					
U271: 07914-89043				(REV 5.0)	
U291: 07914-89044					
U2101: 07914-89045					
U121: 07914-89046					

Table 8-2. MPU Firmware History (cont)

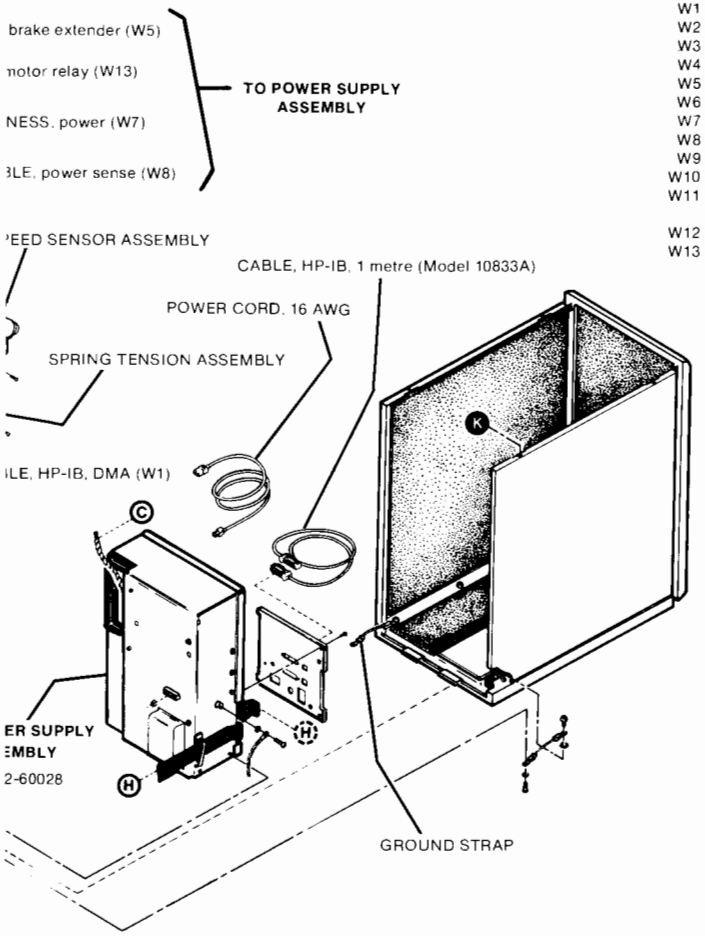
KIT P/N	OBSOLETES	DRIVE PREFIX	TIB DATE CODE	REF PCO	MANDATORY
07914-1X103	-1X003	2429 to 2529	-----	48-1257 (REV 5.1)	no
Contents same as 07914-1X003 except P/N for U261 is 07914-89142.					
07914-1X203	-1X103	2606	-----	48-1768 (REV 5.2)	no
Contents same as 07914-1X103 except P/N for U271 is 07914-89143.					
07914-1X303	-1X203	2623	-----	48-2069 (REV 5.3)	no
Contents same as 07914-1X203 except P/N for U271 is 07914-89153.					

Table 8-3. Replacement Parts Compatibility

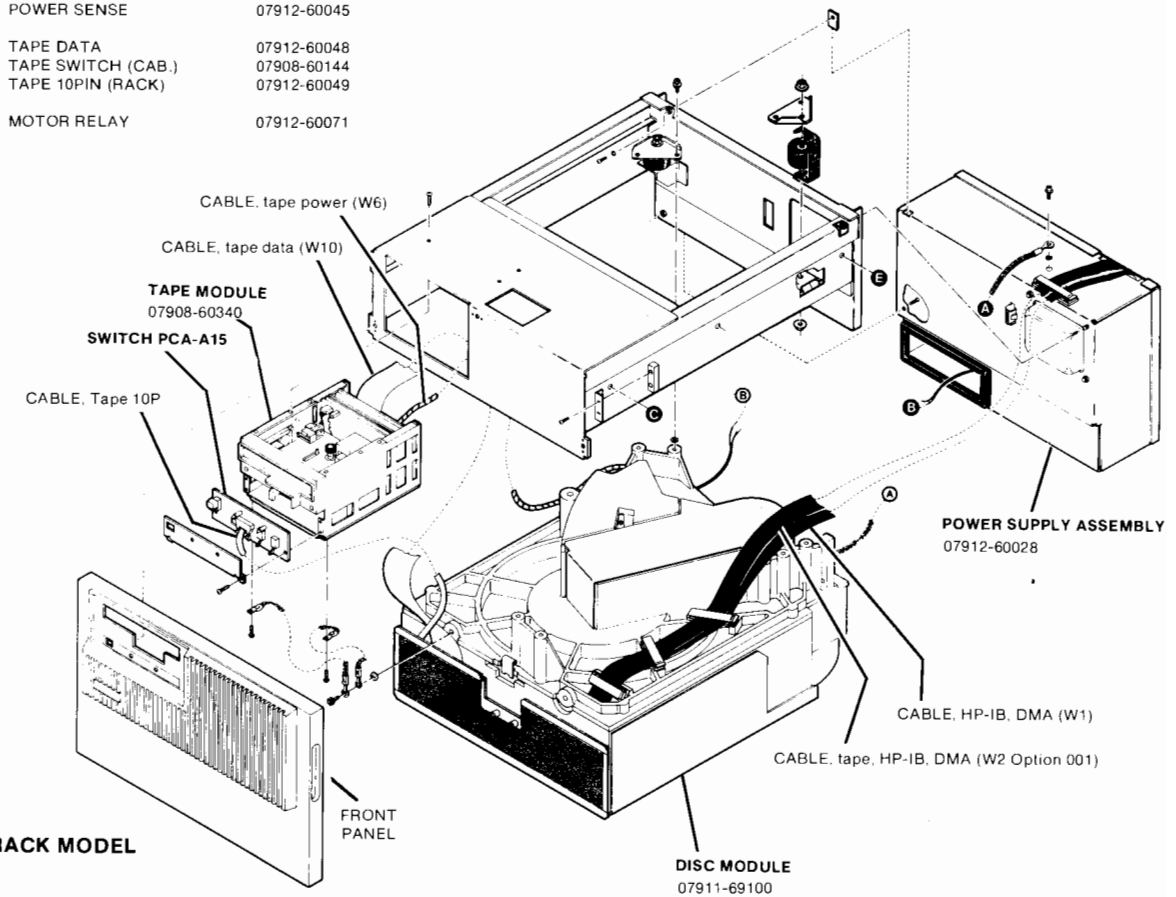
REPLACEMENT PART	COMPATIBLE WITH										
	Servo A9			Read/Write A8					Mechanism		
	07912-6X001	07912-6X121	07914-6X001	07912-6X004	07912-6X104	07914-6X004	07914-6X104	07914-6X204	07911/07912-6X100	07911/07912-6X200	07914-6X100
Servo A9											
07912-6X121				No	Yes	Yes	No	No	Yes	No	No
07914-6X001				No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Read/Write A8											
07912-6X104	No	Yes	Yes						Yes	Yes	No
07914-6X004	No	Yes	Yes						Yes	Yes	Yes
07914-6X104	No	No	Yes						No	No	Yes
07914-6X204	No	No	Yes						Yes	Yes	Yes
Mechanism											
07911/12-6X100	No	Yes	Yes	No	Yes	Yes	No	Yes			
07911/12-6X200	No	No	Yes	No	Yes	Yes	No	Yes			
07914-6X100	No	No	Yes	No	No	Yes	Yes	Yes			

CABLE TABLE

W1	HP-IB DMA	07912-60046
W2	TAPE HP-IB DMA OPT 001	07912-60046
W3		
W4		
W5	MOTOR BRAKE EXTENDER	07912-60097
W6	TAPE POWER	07912-60047
W7	POWER HARNESS	07912-60044
W8	POWER SENSE	07912-60045
W9		
W10	TAPE DATA	07912-60048
W11	TAPE SWITCH (CAB.)	07908-60144
	TAPE 10PIN (RACK)	07912-60049
W12		
W13	MOTOR RELAY	07912-60071



BINET MODEL

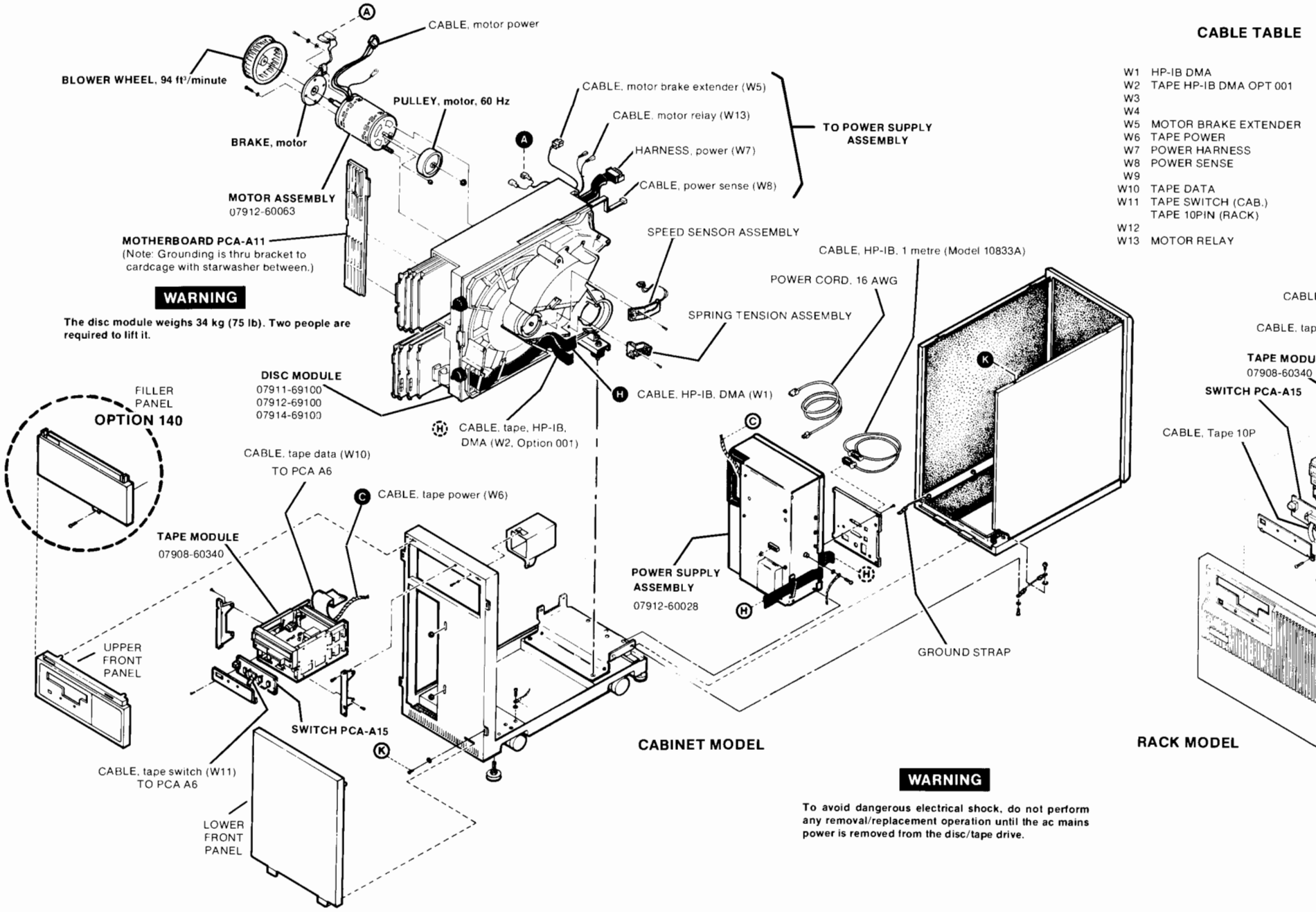


RACK MODEL

WARNING

To avoid dangerous electrical shock, do not perform any removal/replacement operation until the ac mains power is removed from the disc/tape drive.

Figure 8-1. Subassembly IPB



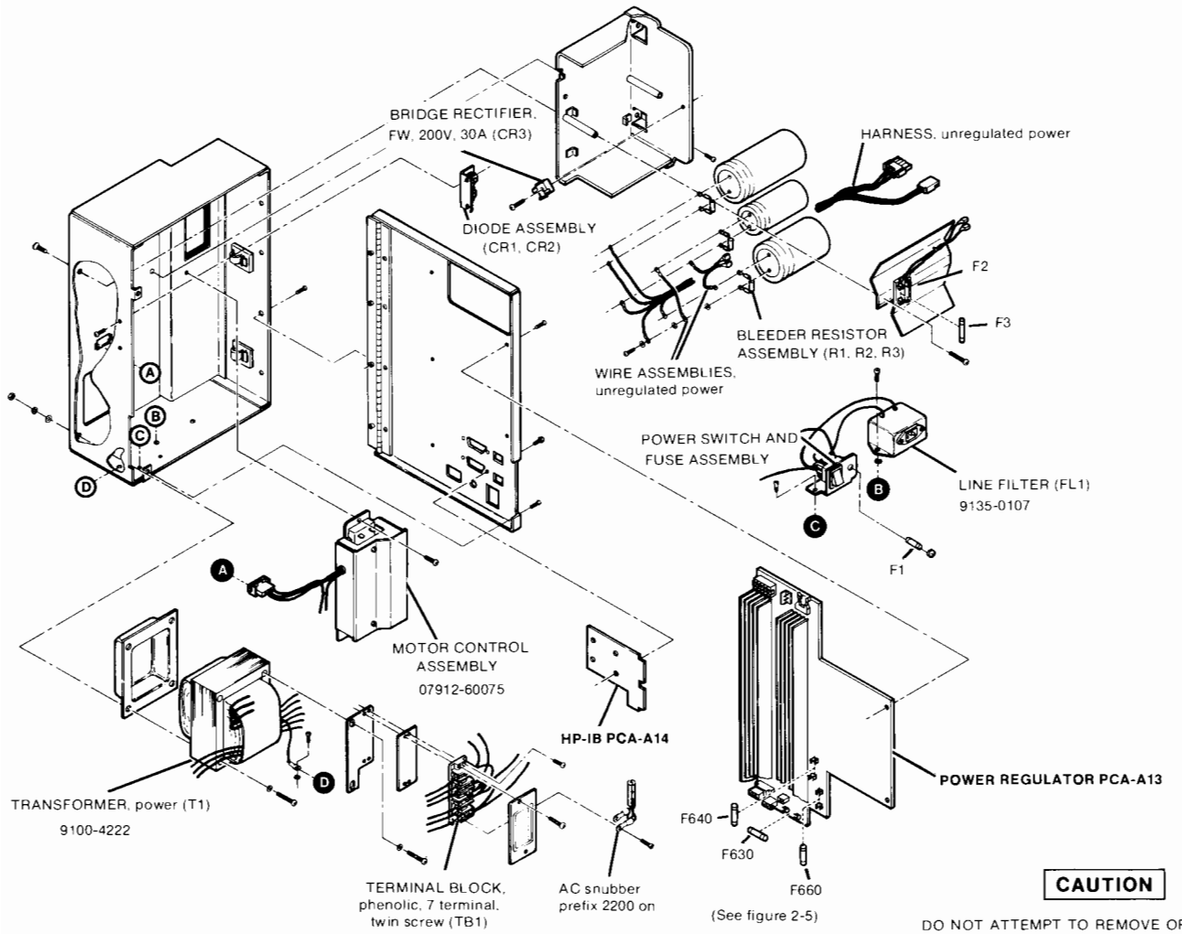
CABLE TABLE

W1	HP-IB DMA
W2	TAPE HP-IB DMA OPT 001
W3	
W4	
W5	MOTOR BRAKE EXTENDER
W6	TAPE POWER
W7	POWER HARNESS
W8	POWER SENSE
W9	
W10	TAPE DATA
W11	TAPE SWITCH (CAB.) TAPE 10PIN (RACK)
W12	
W13	MOTOR RELAY

WARNING

To avoid dangerous electrical shock, do not perform any removal/replacement operation until the ac mains power is removed from the disc/tape drive.

REF 7912-35B, 36A, 38B



POWER SUPPLY SUBASSEMBLY

CAUTION

DO NOT ATTEMPT TO REMOVE OR REPLACE FIXED ASSEMBLIES OR COMPONENTS BEFORE READING THE INSTRUCTIONS AND PRECAUTIONS IN THE SERVICE MANUAL.

REF 7912-37

Figure 8-1. Subassembly IPB (cont'd)

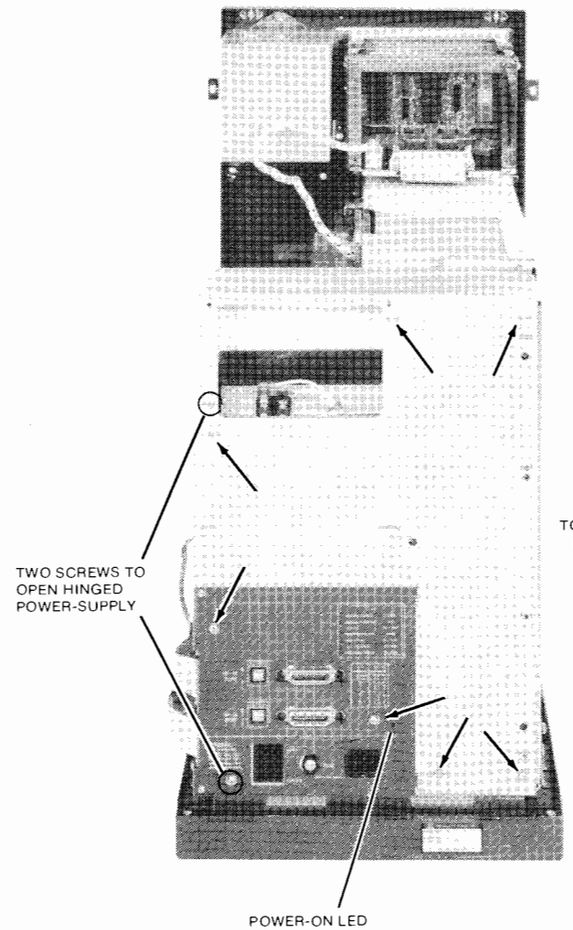
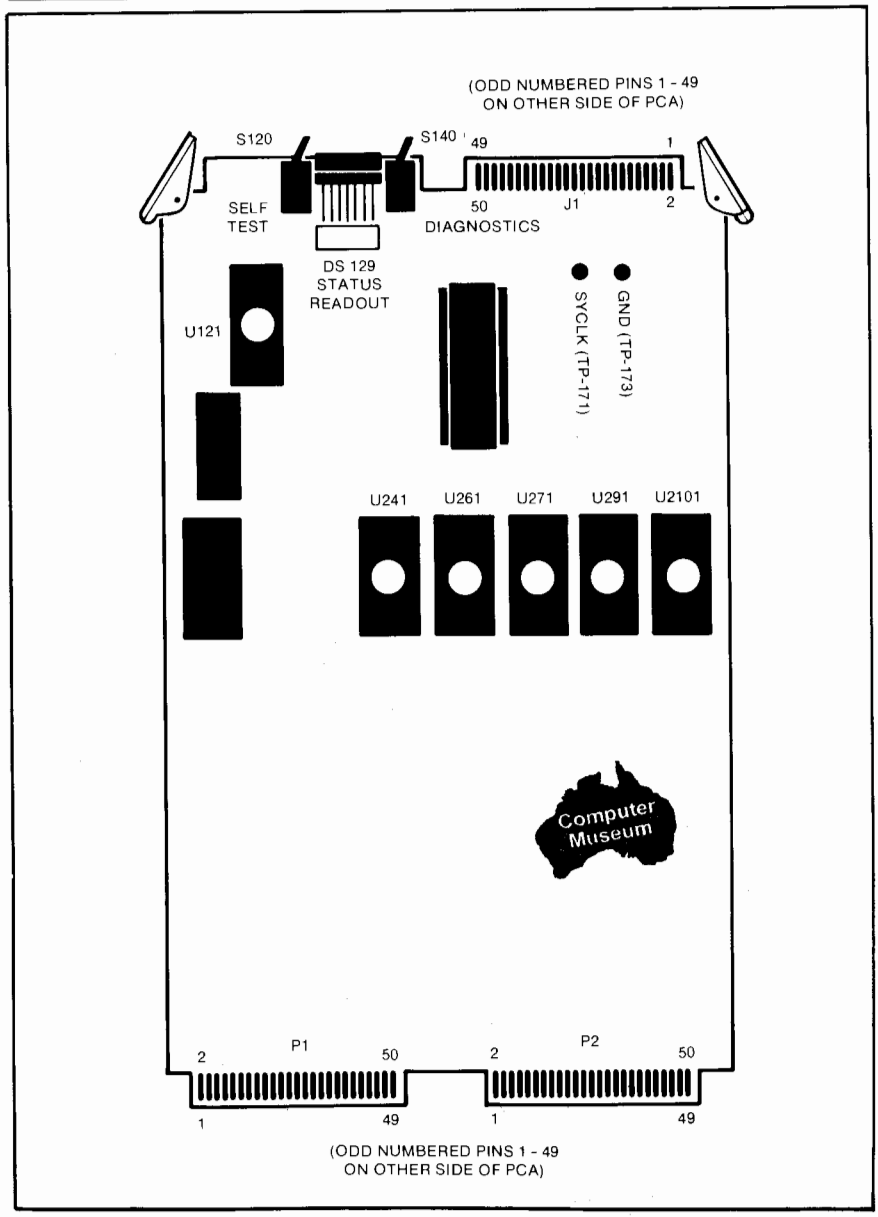


Figure 8-2. Access to Power Supply Area (Cabinet Model)



REF 7908CE-8

Figure 9-1. ROM Locations - Microprocessor PCA

HP Power Cordset Option Number for Countries of the World

HP PART NO.	PRODUCT OPTION # / PLUG RATING / SPECIFICATION
8120-1351	900  250V BS 1363A
8120-1369	901  250V NZSS 198/AS C112
8120-1689 8120-2857	902  250V CEE7-VII
8120-2371	903  125V NEMA 5-15P
8120-0698	904  250V NEMA 6-15P
8120-1860	905  250V CEE22-VI
8120-2104	906  SEV 1011.1959 250V 24507,Type 12
8120-2956	912  220V DHCK 107

Ctry. Codes	Country	HP Opt	Mains V	Hz
531	Afghanistan	902	220	50
481	Albania	902	220	50
721	Algeria	902	220	50
951	American Samoa	903	120	50
762	Angola	902	220	50
357	Argentina	901	220	50
602	Australia	901	240	50
433	Austria	902	220	50
467	Azores	902	220	50
236	Bahamas	903	120	60
525	Bahrain	900	240	50
538	Bangladesh	902	240	50
272	Barbados	900	240	50
423	Belgium	902	220	50
208	Belize (Br. Honduras)	903	120	60
761	Benin (Dahomey)	902	220	50
232	Bermuda	903	120	60
335	Bolivia	902	220	50
793	Botswana	900	240	50
351	Brazil	903	120	60
781	Br. Indian Ocean Terr.	900	240	50
561	Brunei	900	240	50
487	Bulgaria	902	220	50
546	Burma	902	240	50
767	Burundi	902	220	50
243	Caicos	903	120	60
742	Cameroon	902	220	50
122	Canada	903	120	60
733	Canary Islands	902	220	50
941	Canton	900	240	50
244	Cayman Island	903	120	60
754	Central African Republic	902	220	50
756	Chad	902	220	50
337	Chile	902	220	50
570	China (Mainland)	901	220	50
583	China (Taiwan)	903	120	60
301	Columbia	903	120	60
789	Comoros	902	220	50
763	Congo (Brazzaville)	902	220	50
223	Costa Rica	903	120	60
239	Cuba	903	120	60
491	Cyprus	900	240	50
435	Czechoslovakia	902	220	50
409	Denmark	912	220	50
777	Djibouti	902	220	50
247	Dominican Republic	903	120	60
331	Ecuador	903	120	60
729	Egypt	902	220	50
211	El Salvador	903	120	60
941	Enderbury Island	900	240	50
738	Equatorial Guinea	900	240	50
447	Estonia	902	220	50
774	Ethiopia	902	220	50
372	Falkland Is. (Is. Malvinas)	900	240	50
405	Finland	902	220	50
427	France	902	220	50
317	French Gulana	902	220	50
790	French Indian Ocean Areas	902	220	50
641	French Pacific Islands	902	220	50
283	French West Indies	903	120	50
755	Gabon	902	220	50
750	The Gambia	900	240	50
512	Gaza Strip	902	220	50

7912CE-10

Figure 9-2. Power Cordset Options

STANDARD

HP Power Cordset Option Number for Countries of the World (continued)

Ctry. Codes	Country	HP Opt	Mains V	Mains Hz
429	Germany, Demo. Rep. (E)	902	220	50
428	Germany, Fed. Rep. (W)	902	220	50
749	Ghana	900	240	50
472	Gibraltar	900	240	50
473	Gozo	902	220	50
484	Greece	902	220	50
101	Greenland	912	220	50
935	Guam	903	120	60
205	Guatemala	903	120	60
746	Guinea	900	240	50
312	Guyana	903	120	60
245	Haiti	903	120	60
215	Honduras	903	120	60
582	Hong Kong	900	220	50
437	Hungary	902	220	50
400	Iceland	902	220	50
533	India	902	240	50
560	Indonesia	902	220	50
507	Iran	902	220	50
505	Iraq	902	220	50
419	Ireland	900	240	50
508	Israel	903	220	50
475	Italy	902	220	50
748	Ivory Coast	902	220	50
241	Jamaica	903	120	50
588	Japan	903	100	50
511	Jordan	902	220	50
555	Kampuchea	903	120	50
779	Kenya	900	240	50
580	Korea, Republic of	903	100	60
513	Kuwait	902	240	50
553	Laos	903	220	50
449	Latvia	902	220	50
504	Lebanon	902	240	50
248	Leeward & Windward Islands	903	120	50
799	Lesotho	900	240	50
765	Liberia	903	120	60
725	Libya	902	240	50
451	Lithuania	902	220	50
423	Luxembourg	902	220	50
566	Macao	900	240	50
759	Madeira Islands	902	220	50
788	Malagasy Republic	902	220	50
797	Malawi	900	240	50
557	Malaysia	900	240	50
745	Mali	902	220	50
473	Malta	902	220	50
741	Mauritania	902	220	50
785	Mauritius	900	240	50
201	Mexico	903	120	60
931	Midway Islands	903	120	60
161	Miquelon	902	220	60
574	Mongolia	902	220	50
714	Morocco	902	220	50
787	Mozambique	902	220	50
792	Namibia	902	240	50
536	Nepal	902	240	50
277	Netherlands Antilles	902	220	50
421	Netherlands (Holland)	902	220	50
614	New Zealand	901	220	50
219	Nicaragua	903	220	50
751	Niger	902	240	50
753	Nigeria	900	240	50
579	North Korea	902	100	60
403	Norway	902	220	50
523	Oman	902	240	50
686	Other Pacific Islands	903	120	60
535	Pakistan	902	240	50
225	Panama	903	120	60
604	Papua New Guinea	901	220	50
353	Paraguay	902	220	50
333	Peru	903	220	60
565	Philippines	903	120	60
455	Poland	902	220	50
471	Portugal	902	220	50
903	Puerto Rico	903	120	60
518	Qatar	900	240	50
791	Republic of So. Africa	902	240	50
485	Romania	902	220	50
769	Rwanda	902	220	50
758	St. Helena	900	240	50
161	St. Pierre Islands	902	220	60
517	Saudi Arabia	902	220	50
744	Senegal	902	220	50
780	Seychelles	900	240	50
747	Sierra Leone	900	240	50
559	Singapore	900	240	50
770	Somalia	902	220	50
568	Southern Asia	900	240	50
622	Southern Pacific Islands	900	240	50
469	Spain	902	220	50
735	Spanish Africa	902	220	50
542	Sri Lanka (Ceylon)	902	240	50
732	Sudan	900	240	50
315	Suriname	903	120	60
795	Swaziland	900	240	50
401	Sweden	902	220	50
441	Switzerland	906	220	50
502	Syria	902	220	50
783	Tanzania	900	240	50
549	Thailand	903	220	50
274	Tobago	903	120	60
752	Togo	902	220	50
274	Trinidad	903	120	60
684	Trust Terr. of Pacific Is.	903	120	60
723	Tunisia	902	220	50
489	Turkey	902	220	50
243	Turks Is.	903	120	60
778	Uganda	900	240	50
520	United Arab Emirates	900	240	50
412	United Kingdom	900	240	50
760	Upper Volta	902	220	50
355	Uruguay	901	220	50
000	U.S.A.	903	120	60
461	USSR	902	220	50
307	Venezuela	903	120	60
552	Vietnam	903	120	50
911	Virgin Islands	903	120	60
933	Wake Island	903	120	60
764	Western Africa	902	220	50
737	Western Sahara	902	220	50
615	Western Samoa	901	240	50
522	Yemen (Aden)	900	240	50
521	Yemen (Sana)	900	240	50
479	Yugoslavia	902	220	50
766	Zaire	902	220	50
794	Zambia	900	240	50
796	Zimbabwe	900	240	50

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Figure 9-2. Power Cordset Options (cont'd)

REFERENCE

SECTION X

SERVICE NOTES

SECTION XI

The service notes published for the HP 7914 are listed in table 11-1. Table 11-2 lists the service notes for the HP 7911 and HP 7912 drives.

Table 11-1. 7914 Service Note Summary

SERVICE NOTE	TOPIC	PREFIX AFFECTED
01A	Tape Despooling	2301 to 2310
02	Firmware Update "PEP"	< 2326
03	Speed Transducer Spinup Errors	2330
04	Tape Cartridge Replacement	Note 1
05	7914 Installation Procedure	All
06	Firmware Update (REV 5.0)	2430
07	New Read/Write PCA	< = 2430
08	New Servo PCA	2444
09	Foam Shipping Spacer	< = 2445
10	Firmware Update (REV 5.1)	2430 to 2504
11	Wrong Power Fuse Installed	2504
12	New Read/Write PCA	< = 2533
13	Motor Run Capacitor Ground Cable	All
14	Firmware Update (REV 5.2)	> 2606
15	Firmware Structured to MPU PCA	None

NOTES:
1. Affects tape serial numbers X0XXX-XXXX thru X4XXX-XXXX.

Table 11-2. 7911/12 Service Note Summary

SERVICE NOTE	TOPIC	PREFIX AFFECTED
01A	Disc Backup Tape Cartridges	Note 1
02	MPU Firmware Update	< = 2205A
03	Tape Read or Certify Errors	< = 2205A
04	Special TIB PCA-A6 Update	2206A to 2209A
05	Write-Off-Track Errors	< 2220
06	MPU Firmware Update "F"	< = 2229
07	Tape Initialization Failures	< = 2248
08	Servo & Mech. Compatibility	< = 2301
09	Speed Transducer Rollover	< = 2251
10A	Tape Despooling	2301 to 2310
11B	Backwards Servo Code	< = 2209
12	Firmware Update "PEP"	< 2326
13	Speed Transducer Spinup Errors	2330
14	Tape Cartridge Replacement	Note 2
15	Firmware Update (REV 5.0)	2429
16	Foam Shipping Spacer	> = 2444
17	Firmware Update (REV 5.1)	2429 to 2503
18	Wrong Power Fuse Installed	2503
19	New Servo PCA	> = 2527
20	New Read/Write PCA	> = 2533
21	Motor Run Capacitor Ground Cable	All
22	Firmware Update (REV 5.2)	< 2606
23	Firmware Structured to MPU PCA	None

NOTES:

1. Affects tape serial numbers: 88140S (2XX41 thru 2XX49) and 88140L (5XX41 thru 5XX48).
2. Affects tape serial numbers X0XXX-XXXX thru X4XXX-XXXX.

SERVICE NOTE

Supersedes:

APPLIES TO:	All Units X		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only X
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update ☐		Use as is ☐
	Return for salvage ☐		See text X
WARRANTY EXTENOED UNTIL:	N/A		

Model Numbers: 7908, 7911, 7912, 7914

Parts Involved: Boxes of five tapes; 88140L, 88140LC, 88140S, 88140SC

Individual tapes; P/N 9164-0156, 9164-0127, 9164-0211, 9164-0212

Revision Numbers involved: XOXXX-XXXX through X4XXX-XXXX

TITLE: TAPE CARTRIDGE REPLACEMENT

SYMPTOM: Tape cartridges purchased prior to October 1, 1983, or cartridges having a revision number with a second digit of "4" or lower stamped on the metal back plate (for example, X4XXX-XXXX) are subject to the following failures.

- Data loss, may result in auto sparing or verify failures.
- Shortened tape life.
- Autoload failures, cartridge fail LED may be on.
- Cartridge may unload during a read or write with a possible off tape status.

These failures are caused by a white dust that can be released from the tape. This dust collects on the cartridge guide pins, tensioning belt, and the recording surface of the tape and can cause both read and write errors. The contamination can also collect on the tape drive heads.

LR/sg 48/1-84

9320-4766 (1/83)

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FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. IN EUROPE, CALL YOUR LOCAL HP SALES or SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2 - Geneva, Switzerland. IN JAPAN, Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

SOLUTION: All tapes prior to revision "5" should be returned by the customer to HP for replacement. The method of replacement is:

. UNITED STATES -
Return tapes to:
Hewlett Packard Company
Computer Supplies Operation
1326 Kifer Road
Sunnyvale, CA 94086
Contact CSO sales development (408 720-2343) for details and to request a pre-authorized return form. Any questions should be directed to Mark Manqueros at CSO, (408) 720-2433, COMSYS A500.

. HPSA -
Tape replacement will be handled by the sales force 09 group in each European country, with the SF09 managers acting as the contact person for questions. Replacements will be supplied to customers immediately following the return of defective cartridges. Dieter Heck, BBN x 2118, COMSYS 6017, will be coordinating the program and any questions that cannot be answered locally should be addressed to him.

. ICON -
The replacement will be handled locally by the Country Support Administration Manager and the ACEM's, with the ACEM's coordinating the replacement to distributors. Please contact them for details. If questions cannot be answered by the local contacts, please direct them to Joyce Smith, ICON (Div. 18), (415) 857-3707.

. CANADA -
Canadian customers received the same packet of information and preauthorization as United States customers, and certainly that replacement procedure will be supported by CSO. But due to customs regulations, shipping tapes to CSO across an international boundary is slow and complex. For these reasons, Canada will set up their own replacement program through the Canadian Parts Distribution Center, 2050. Customers should call one of the following numbers:

Manitoba and West	1-800-387-3154
Toronto	671-8383
Ontairo	1-800-268-6982
Quebec and East	1-800-387-3417

Any questions should be directed to Rob Young, COMSYS 2050.

HEAD CLEANING: Please encourage all customers to clean the head and capstan regularly; a minimum of once a week. Also, the cleaning procedure should be the first step in tape drive troubleshooting. For head/capstan cleaning procedures, refer to the Operating and Installation Manual (07908-90902 or 07912-90902), or the Operator Instructions (07908-90901 or 07912-90901) for details.

WARRANTY: . Tape replacement through CSO.
. Only revision "5", or greater tapes, will be supported by DMD. Warranty will not apply to failures caused by use of old revision (0 - 4) tapes after July, 1984.

SERVICE NOTE

Supersedes: NONE

APPLIES TO:	All Units ☒	Only Units on Agreement ☐
PERFORM:	Immediately ☐	At PM/Normal Call ☐
	On Failure ☐	Information Only ☒

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X

SERVICE	Return for update ☒	Use as is ☐
INVENTORY	Return for salvage ☐	See text ☒

WARRANTY EXTENDED UNTIL: N/A

TITLE:NEW FIRMWARE FOR 7911 P/R DISC DRIVES (REV 5.0, P/N 07914-19003)

SYMPTOM: NEW FIRMWARE IS BEING IMPLEMENTED IN 7911 P/R DISC DRIVES BEGINNING WITH SERIAL PREFIX 2429. THIS FIRMWARE (REV. 5.0) WILL PROVIDE THE FOLLOWING ENHANCEMENTS.

1. READ FULL SECTOR WILL BE IMPLEMENTED. THIS COMMAND EXISTS ON "EXRSI2" AS RF SECTOR. EXECUTING RF SECTOR WILL RETURN THE HEADER BYTES, THE DATA BYTES, THE CRC BYTES, AND ECC BYTES OF THE SPECIFIED SECTOR.

2. IN MR5, RUN TIME INFORMATION (RUN LOG) WILL BE REPORTED DIFFERENTLY THAN ERT TEST INFORMATION. CORRECTABLE ERRORS WILL NO LONGER BE COUNTED DURING DATA TRANSFERS. IN ADDITION, RECOVERABLE ERRORS WILL BE COUNTED BUT NOT HAVE THEIR ADDRESSES LOGGED. THIS MEANS THAT THE RECOVERABLE ERROR COUNT WILL APPEAR WHERE THE CORRECTABLE ERROR COUNT USED TO APPEAR IN THE "EXRSIZ" PRINTOUT. MARGINAL RECOVERABLE ERROR AND UNRECOVERABLE ERROR HANDLING WILL BE UNCHANGED.

ERROR TYPE:	DEFINITION:	RUN LOG:	ERT LOG:
CORRECTABLE	CORRECTED BY ECC	IGNORED	COUNTED
RECOVERABLE	RECOVERED BY ONE RETRY	COUNTED	ADDRESS RECORDED
MARGINAL	RECOVERED BY MORE THAN ONE RETRY	ADDRESS RECORDED	ADDRESS RECORDED
UNRECOVERABLE	NOT RECOVERED IN 800 MSEC	ADDRESS RECORDED	ADDRESS RECORDED

3. INCREASES THE DEFAULT RETRY TIME TO 800 MSEC FROM 100 MSEC. THIS ALLOWS FOR A MORE AGGRESSIVE READ OFFSET DURING RETRIES.

HW/sg 8/84-48

9320-4766 (1/83)

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4. ADDS AN INITIALIZE MEDIA OPTION WHICH ONLY WRITES THE MAINTENANCE TRACKS AND LEAVES THE USER DATA ALONE. IN "EXRSI2", INIT MEDIA HAS BEEN MODIFIED TO GIVE THE FOLLOWING CHOICES:

   I= INITIALIZE MAINTENANCE TRACKS ONLY. (THIS IN NO LONGER PHYSICAL FORMAT)
   P= RETAIN ONLY PRIMARY SPARES
   B= RETAIN PRIMARY AND SECONDARY SPARES

5. REWRITES THE SPARE SECTOR ON A GIVEN TRACK IF A READ RETRY IS NECESSARY. THIS WILL PREVENT A LOW AMPLITUDE SPARE SECTOR FROM INTERFERING WITH THE PLL CIRCUITRY.

6. CHECKS CRC AFTER A WRITE. THIS CHECKS FOR OSCILLATOR FAILURE ON THE DMA BOARD. IF THERE IS A FAILURE, DERROR 106 (OR 6A IN HEX) WILL BE GENERATED.

7. THE DRIVE WILL REQUEST RELEASE TO UPDATE THE MAINTENANCE TRACKS AFTER EVERY FAULT OR UNCORRECTABLE ERROR DURING RUN TIME. THIS WILL PREVENT USEFUL SERVICE INFORMATION FROM BEING LOST IN RAM IF THE DRIVE IS POWERED DOWN OR CLEARED.

8. DERROR'S 10, 11, AND 12 HAVE BEEN ELIMINATED AND THE CAUSE OF DERROR 13 HAS BEEN CHANGED TO:

   WHEN CHECK WAS MADE OF THE SECTOR HEADER READ FROM THE DISC, THE FIRST BYTE (STATUS) AND THE SIXTH BYTE (SPARE) DID NOT CONTAIN SECTOR NUMBERS POINTING TO THE SAME SECTOR.

   SUSPECT HARDWARE FOR THIS ERROR IS 1.) READ/WRITE PCA 2.) DMA PCA

ACTION: THIS IS A NON-MANDATORY CHANGE, HOWEVER ALL FSI SHOULD BE ROLLED TO THE NEW FIRMWARE. THE NEW EPROM KIT IS 07914-10003 AND THE EXCHANGE KIT IS 07914-19003.

THE KIT, 07914-19003, WILL BE SUPPLIED THROUGH CPC BLUE STRIPE EXCHANGE PROGRAM. ALL FSI IS TO BE UPDATED TO 07914-19003 AS SOON AS POSSIBLE. ALL EXCHANGE EPROMS ARE TO BE RETURNED TO CPC WITHIN 90 DAYS.

THE FOLLOWING IS A LIST OF THE INDIVIDUAL EPROMS AND THEIR "U" NUMBER ASSIGNMENTS ON THE MPU PCA. THE INDIVIDUAL EPROMS ARE NOT ORDERABLE.

07914-8X041	U241
07914-8X042	U261
07914-8X043	U271
07914-8X044	U291
07914-8X045	U2101
07914-8X046	U121

USING THE CS/80 REV COMMAND, THE NUMBERS RETURNED ARE 5.0 FOR ALL THE EPROMS.

SERVICE NOTE

Supersedes: None

7911/12-P/R NEW READ/WRITE PCA

SERIAL PREFIXES INVOLVED:
2533 and greater

PART NUMBERS INVOLVED:

07914-60204
07914-69204

replaces:

07914-60004
07914-69004

APPLIES TO:	All Units ☒	Only Units on Agreement ☐
PERFORM:	Immediately ☐	At PM/Normal Call ☐
	On Failure ☐	Information Only ☒

WARRANTY:	**EXTENDED**	**NORMAL**	**NONE**
LABOR:			X
PARTS:			X
TRAVEL:			X

SERVICE INVENTORY	Return for update ☐	Use as is ☒
	Return for salvage ☐	See text ☐

WARRANTY EXTENDED UNTIL: N/A

7911/12-P/R Disc Drives with serial prefix 2533 (or greater) will have a new Read/Write PCA (part no. 07914-60204) replacing the older Read/Write PCA (part no. 07914-60004). The new board may be easily identified by its yellow extractor tabs. The 07914-60004 R/W PCA had blue extractors.

The new 204 Read/Write board makes some minor refinements to the previous 07914-60104 board which was available only in the 7914. The major change makes the 204 R/W board compatible with the 7911 and 7912 Disc Drives. The board also provides significantly more margin in the 7911 and 7912 than the 004 board.

Due to the increased margin over the 004 board we recommend the following sequence of events before replacing a disc mechanism for read/write error rate performance in a 7911/12:

1.) Replace 07914-60004 R/W PCA with 07914-60204 R/W PCA.

2.) Reformat the disc using new firmware (MR5.1, part no. 07914-19103) with INIT MEDIA OPT. I (maintenance tracks).

3.) Reformat the disc using INIT MEDIA OPT. B (retaining field and factory spares) NOTE: this will destroy customer data!

4.) Replace disc mechanism as a last resort if previous steps do not resolve error rate problems.

JH/sg 8/85-48

9320-4766 (1/83)

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FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 **OR WRITE**, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. **IN EUROPE, CALL YOUR LOCAL HP SALES or SERVICE OFFICE OR WRITE**, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2 - Geneva, Switzerland. **IN JAPAN**, Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

SERVICE NOTE

Supersedes: None

APPLIES TO:	All Units ☐	Only Units on Agreement/Warranty ☒
PERFORM:	Immediately ☐	At PM/Normal Call ☒
	On Failure ☐	Information Only ☐

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:	X		
TRAVEL:			X

SERVICE	Return for update ☐	Use as is ☐
INVENTORY	Return for salvage ☐	See text ☒

WARRANTY EXTENDED UNTIL: 1 Sept, 1987

7911/12/14 DISC DRIVES

SERIAL NUMBERS INVOLVED:
See text

PARTS AFFECTED:
07914-89143 - MR5.2 ROM
07914-1X203 - MR5.2 kit

TITLE: MR5.3 FIRMWARE UPDATE

Repair Type: 02G
Repair Class: CO
Service Code: 20047
Supply Division: 4800

PROBLEM: The Medusa chip, used to replace the PHI HPIB controller chip on the 07912-60210 DMA PCA, contains an enhancement that can be used to put the HPIB bus in delayed handshake mode. The 791X drives do not support this mode; however, under certain conditions, the current firmware can inadvertantly set the Medusa chip in the delayed handshake mode. Cycling power is currently the only way to reset this condition.

SYMPTOM: If the delayed handshake mode is set, the HPIB data transfer rate is decreased by 3% to 5%. This problem is a performance issue only; it does not affect data integrity.

SOLUTION: The firmware has been modified to eliminate the possibility of the Medusa chip being set in the delayed handshake mode. The new revision is MR5.3.

A single ROM (U271), P/N 07914-89153, is available to upgrade from MR5.1 or MR5.2 to MR5.3. Upgrades from MR5.0 or earlier will require the entire kit, P/N 07914-10303. On the next PM or service call, any drive that has an 07912-6X210 DMA PCA should be upgraded to MR5.3.

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9320-4766 (1/83)

HEWLETT PACKARD

Since the firmware is now structured to the MPU PCA (See Service Notes 7911/12 P/R - 23 and 7914 P/R - 15), FSI of MPU PCAs, P/N 07912-6X011, should be upgraded to include MR5.3.

The firmware has also been removed from the Blue Stripe Exchange program; therefore, it is no longer necessary to return the firmware for credit.

WARRANTY: Warranty will only be extended for upgrades from MR5.1 or MR5.2 to MR5.3 which require the single ROM. Warranty will not be extended for the MR5.3 kit or on units purchased internally by HP (TAC).

LABOR: None

PARTS: 07914-89153 - MR5.3 ROM (U271)

TRAVEL: None

When completing the Customer Support Order (CSO), the repair type must be coded 02G and the repair class must be coded CO (component). The service code block must be filled in with 20047.

SERVICE NOTE

7911/12/14 Disc Drives

Supersedes: None

PARTS INVOLVED:
Unregulated Power Harness
P/N 07912-60054
J600 Connector
P/N 07912-60211

UNITS AFFECTED:
See Text

TITLE: J600 CONNECTOR ON POWER REGULATOR PCA

APPLIES TO:	All Units ☒	Only Units on Agreement/Warranty ☐
PERFORM:	Immediately ☐	At PM/Normal Call ☐
	On Failure ☐	Information Only ☒

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X

SERVICE INVENTORY	Return for update ☐	Use as is ☐
	Return for salvage ☐	See text ☒

WARRANTY EXTENDED UNTIL: N/A

PROBLEM: Drives manufactured prior to March 1984 may have poor contact between the unregulated power harness, P/N 07912-60054, and the J600 connector on the power regulator PCA, P/N 07912-60006. The power harness and the connector were modified to improve the connection; therefore, drives manufactured with date code 2410 and later do not display this problem. Since the original power harness and connector are still in some older drives, there is a possibility that these failures could still occur.

SYMPTOM: Poor contact of the contact pins can result in damage to the power regulator PCA and fuse blowing in the power supply. The most noticeable evidence of this type of failure is discoloration of the J600 connector, P/N 07912-60211.

SOLUTION: The power harness and the J600 connector were modified in March 1984. The black shrink tubing on the power harness wires entering the white connector was removed to eliminate twisting of the contact pins. The J600 connector was revised to decrease the effect of pin rotation. The part number of the power harness did not change; the date code of the power supply changed from 2340 to 2410.

Some older drives with the old style power harness and connector may still display this problem. To improve the reliability of these drives, the J600 connector should be inspected for damage. If it is discolored and deformed, the connector and the power harness should be replaced.

WARRANTY: None. This is an information only service note.

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FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 857-8200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. IN EUROPE, CALL YOUR LOCAL HP SALES or SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2 - Geneva, Switzerland. IN JAPAN, Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

SERVICE NOTE

Supersedes: None

7911/12/14 Disc Drives

PARTS AFFECTED:

TIB PCA: 07908-6X241

SERIAL NUMBERS:

See text

APPLIES TO:	All Units [X]	Only Units on Agreement/Warranty [ ]
PERFORM:	Immediately [ ]	At PM/Normal Call [ ]
	On Failure [ ]	Information Only [X]

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X

SERVICE INVENTORY	Return for update [ ]	Use as is [ ]
	Return for salvage [ ]	See text [X]

WARRANTY EXTENDED UNTIL: N/A

TITLE: TIB PCA MODIFICATION

PROBLEM: The current 791X tape subsystem does not optimally handle media related faults such as instantaneous speed variations and drop-outs. Such faults can cause the PLL on the TIB PCA to lose phase lock during a read which occasionally results in unrecoverable data errors.

CAUSE: When the PLL encounters a media related problem on a read, it can lose phase lock. In the current TIB PCA design, once the PLL loses lock, it may lose it for the remainder of the block. This can result in an unrecoverable data error.

SOLUTION: The TIB PCA has been modified to ensure the PLL can relock to data at the beginning of each frame. This will provide a reliability enhancement to the tape subsystem in that it will decrease the occurence of unrecoverable data errors due to media problems.

The part number of the TIB PCA is not changing; however, the date code will change from F-2508 to H-2628. SMR/SME will be updating boards that are returned for repair.

WARRANTY: None. This is an information only service note.

SH 8/86-48

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SERVICE NOTE

Supersedes:

APPLIES TO:	All Units X		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only ☐
WARRANTY:	**EXTENDED**	**NORMAL**	**NONE**
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update ☐		Use as is ☐
	Return for salvage ☐		See text X
WARRANTY EXTENDED UNTIL:	N/A		

Model Numbers: 7908, 7911, 7912, 7914

Parts Involved: Boxes of five tapes; 88140L, 88140LC, 88140S, 88140SC

Individual tapes; P/N 9164-0156, 9164-0127, 9164-0211, 9164-0212

Revision Numbers involved: X0XXX-XXXX through X4XXX-XXXX

TITLE: TAPE CARTRIDGE REPLACEMENT

SYMPTOM: Tape cartridges purchased prior to October 1, 1983, or cartridges having a revision number with a second digit of "4" or lower stamped on the metal back plate (for example, X4XXX-XXXX) are subject to the following failures.

- Data loss, may result in auto sparing or verify failures.
- Shortened tape life.
- Autoload failures, cartridge fail LED may be on.
- Cartridge may unload during a read or write with a possible off tape status.

These failures are caused by a white dust that can be released from the tape. This dust collects on the cartridge guide pins, tensioning belt, and the recording surface of the tape and can cause both read and write errors. The contamination can also collect on the tape drive heads.

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SOLUTION: All tapes prior to revision "5" should be returned by the customer to HP for replacement. The method of replacement is:

. UNITED STATES -
Return tapes to:
Hewlett Packard Company
Computer Supplies Operation
1326 Kifer Road
Sunnyvale, CA 94086
Contact CSO sales development (408 720-2343) for details and to request a pre-authorized return form. Any questions should be directed to Mark Manqueros at CSO, (408) 720-2433, COMSYS A500.

. HPSA -
Tape replacement will be handled by the sales force 09 group in each European country, with the SF09 managers acting as the contact person for questions. Replacements will be supplied to customers immediately following the return of defective cartridges. Dieter Heck, BBN x 2118, COMSYS 6017, will be coordinating the program and any questions that cannot be answered locally should be addressed to him.

. ICON -
The replacement will be handled locally by the Country Support Administration Manager and the ACEM's, with the ACEM's coordinating the replacement to distributors. Please contact them for details. If questions cannot be answered by the local contacts, please direct them to Joyce Smith, ICON (Div. 18), (415) 857-3707.

. CANADA -
Canadian customers received the same packet of information and preauthorization as United States customers, and certainly that replacement procedure will be supported by CSO. But due to customs regulations, shipping tapes to CSO across an international boundary is slow and complex. For these reasons, Canada will set up their own replacement program through the Canadian Parts Distribution Center, 2050. Customers should call one of the following numbers:

Manitoba and West	1-800-387-3154
Toronto	671-8383
Ontairo	1-800-268-6982
Quebec and East	1-800-387-3417

Any questions should be directed to Rob Young, COMSYS 2050.

HEAD CLEANING: Please encourage all customers to clean the head and capstan regularly; a minimum of once a week. Also, the cleaning procedure should be the first step in tape drive troubleshooting. For head/capstan cleaning procedures, refer to the Operating and Installation Manual (07908-90902 or 07912-90902), or the Operator Instructions (07908-90901 or 07912-90901) for details.

WARRANTY: . Tape replacement through CSO.
. Only revision "5", or greater tapes, will be supported by DMD. Warranty will not apply to failures caused by use of old revision (0 - 4) tapes after July, 1984.

SERVICE NOTE

Supersedes:

APPLIES TO:	All Units ☒		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only ☒
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update ☒		Use as is ☐
	Return for salvage ☐		See text ☐
WARRANTY EXTENDED UNTIL:	N/A		

TITLE:NEW FIRMWARE FOR 7912 P/R DISC DRIVES (REV 5.0, P/N 07914-19003)

SYMPTOM: NEW FIRMWARE IS BEING IMPLEMENTED IN 7912 P/R DISC DRIVES BEGINNING WITH SERIAL PREFIX 2429. THIS FIRMWARE (REV. 5.0) WILL PROVIDE THE FOLLOWING ENHANCEMENTS.

1. READ FULL SECTOR WILL BE IMPLEMENTED. THIS COMMAND EXISTS ON "EXRSI2" AS RF SECTOR. EXECUTING RF SECTOR WILL RETURN THE HEADER BYTES, THE DATA BYTES, THE CRC BYTES, AND ECC BYTES OF THE SPECIFIED SECTOR.

2. IN MR5, RUN TIME INFORMATION (RUN LOG) WILL BE REPORTED DIFFERENTLY THAN ERT TEST INFORMATION. CORRECTABLE ERRORS WILL NO LONGER BE COUNTED DURING DATA TRANSFERS. IN ADDITION, RECOVERABLE ERRORS WILL BE COUNTED BUT NOT HAVE THEIR ADDRESSES LOGGED. THIS MEANS THAT THE RECOVERABLE ERROR COUNT WILL APPEAR WHERE THE CORRECTABLE ERROR COUNT USED TO APPEAR IN THE "EXRSIZ" PRINTOUT. MARGINAL RECOVERABLE ERROR AND UNRECOVERABLE ERROR HANDLING WILL BE UNCHANGED.

ERROR TYPE:	DEFINITION:	RUN LOG:	ERT LOG:
CORRECTABLE	CORRECTED BY ECC	IGNORED	COUNTED
RECOVERABLE	RECOVERED BY ONE RETRY	COUNTED	ADDRESS RECORDED
MARGINAL	RECOVERED BY MORE THAN ONE RETRY	ADDRESS RECORDED	ADDRESS RECORDED
UNRECOVERABLE	NOT RECOVERED IN 800 MSEC	ADDRESS RECORDED	ADDRESS RECORDED

3. INCREASES THE DEFAULT RETRY TIME TO 800 MSEC FROM 100 MSEC. THIS ALLOWS FOR A MORE AGGRESSIVE READ OFFSET DURING RETRIES.

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4. ADDS AN INITIALIZE MEDIA OPTION WHICH ONLY WRITES THE MAINTENANCE TRACKS AND LEAVES THE USER DATA ALONE. IN "EXRSI2", INIT MEDIA HAS BEEN MODIFIED TO GIVE THE FOLLOWING CHOICES:

   I= INITIALIZE MAINTENANCE TRACKS ONLY. (THIS IN NO LONGER PHYSICAL FORMAT)
   P= RETAIN ONLY PRIMARY SPARES
   B= RETAIN PRIMARY AND SECONDARY SPARES

5. REWRITES THE SPARE SECTOR ON A GIVEN TRACK IF A READ RETRY IS NECESSARY. THIS WILL PREVENT A LOW AMPLITUDE SPARE SECTOR FROM INTERFERING WITH THE PLL CIRCUITRY.

6. CHECKS CRC AFTER A WRITE. THIS CHECKS FOR OSCILLATOR FAILURE ON THE DMA BOARD. IF THERE IS A FAILURE, DERROR 106 (OR 6A IN HEX) WILL BE GENERATED.

7. THE DRIVE WILL REQUEST RELEASE TO UPDATE THE MAINTENANCE TRACKS AFTER EVERY FAULT OR UNCORRECTABLE ERROR DURING RUN TIME. THIS WILL PREVENT USEFUL SERVICE INFORMATION FROM BEING LOST IN RAM IF THE DRIVE IS POWERED DOWN OR CLEARED.

8. DERROR'S 10, 11, AND 12 HAVE BEEN ELIMINATED AND THE CAUSE OF DERROR 13 HAS BEEN CHANGED TO:

   WHEN CHECK WAS MADE OF THE SECTOR HEADER READ FROM THE DISC, THE FIRST BYTE (STATUS) AND THE SIXTH BYTE (SPARE) DID NOT CONTAIN SECTOR NUMBERS POINTING TO THE SAME SECTOR.

   SUSPECT HARDWARE FOR THIS ERROR IS 1.) READ/WRITE PCA 2.) DMA PCA

ACTION: THIS IS A NON-MANDATORY CHANGE, HOWEVER ALL FSI SHOULD BE ROLLED TO THE NEW FIRMWARE. THE NEW EPROM KIT IS 07914-10003 AND THE EXCHANGE KIT IS 07914-19003.

THE KIT, 07914-19003, WILL BE SUPPLIED THROUGH CPC BLUE STRIPE EXCHANGE PROGRAM. ALL FSI IS TO BE UPDATED TO 07914-19003 AS SOON AS POSSIBLE. ALL EXCHANGE EPROMS ARE TO BE RETURNED TO CPC WITHIN 90 DAYS.

THE FOLLOWING IS A LIST OF THE INDIVIDUAL EPROMS AND THEIR "U" NUMBER ASSIGNMENTS ON THE MPU PCA. THE INDIVIDUAL EPROMS ARE NOT ORDERABLE.

07914-8X041	U241
07914-8X042	U261
07914-8X043	U271
07914-8X044	U291
07914-8X045	U2101
07914-8X046	U121

USING THE CS/80 REV COMMAND, THE NUMBERS RETURNED ARE 5.0 FOR ALL THE EPROMS.

SERVICE NOTE

Supersedes: None

7911/12-P/R NEW READ/WRITE PCA

SERIAL PREFIXES INVOLVED:
2533 and greater

PART NUMBERS INVOLVED:

07914-60204
07914-69204

replaces:

07914-60004
07914-69004

APPLIES TO:	All Units X		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only X
WARRANTY:	**EXTENDED**	**NORMAL**	**NONE**
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update ☐		Use as is X
	Return for salvage ☐		See text ☐
WARRANTY EXTENDED UNTIL:	N/A		

7911/12-P/R Disc Drives with serial prefix 2533 (or greater) will have a new Read/Write PCA (part no. 07914-60204) replacing the older Read/Write PCA (part no. 07914-60004). The new board may be easily identified by its yellow extractor tabs. The 07914-60004 R/W PCA had blue extractors.

The new 204 Read/Write board makes some minor refinements to the previous 07914-60104 board which was available only in the 7914. The major change makes the 204 R/W board compatible with the 7911 and 7912 Disc Drives. The board also provides significantly more margin in the 7911 and 7912 than the 004 board.

Due to the increased margin over the 004 board we recommend the following sequence of events before replacing a disc mechanism for read/write error rate performance in a 7911/12:

1.) Replace 07914-60004 R/W PCA with 07914-60204 R/W PCA.

2.) Reformat the disc using new firmware (MR5.1, part no. 07914-19103) with INIT MEDIA OPT. I (maintenance tracks).

3.) Reformat the disc using INIT MEDIA OPT. B (retaining field and factory spares) NOTE: this will destroy customer data!

4.) Replace disc mechanism as a last resort if previous steps do not resolve error rate problems.

JH/sg 8/85-48

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SERVICE NOTE

Supersedes: None

APPLIES TO:	All Units ☐	Only Units on Agreement/Warranty ☒
PERFORM:	Immediately ☐	At PM/Normal Call ☒
	On Failure ☐	Information Only ☐

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:	X		
TRAVEL:			X

SERVICE INVENTORY	Return for update ☐	Use as is ☐
	Return for salvage ☐	See text ☒

WARRANTY EXTENDED UNTIL: 1 Sept. 1987

7911/12/14 DISC DRIVES

SERIAL NUMBERS INVOLVED:
See text

PARTS AFFECTED:
07914-89143 - MR5.2 ROM
07914-1X203 - MR5.2 kit

TITLE: MR5.3 FIRMWARE UPDATE

Repair Type: 02G
Repair Class: CO
Service Code: 20047
Supply Division: 4800

PROBLEM: The Medusa chip, used to replace the PHI HPIB controller chip on the 07912-60210 DMA PCA, contains an enhancement that can be used to put the HPIB bus in delayed handshake mode. The 791X drives do not support this mode; however, under certain conditions, the current firmware can inadvertantly set the Medusa chip in the delayed handshake mode. Cycling power is currently the only way to reset this condition.

SYMPTOM: If the delayed handshake mode is set, the HPIB data transfer rate is decreased by 3% to 5%. This problem is a performance issue only; it does not affect data integrity.

SOLUTION: The firmware has been modified to eliminate the possibility of the Medusa chip being set in the delayed handshake mode. The new revision is MR5.3.

A single ROM (U271), P/N 07914-89153, is available to upgrade from MR5.1 or MR5.2 to MR5.3. Upgrades from MR5.0 or earlier will require the entire kit, P/N 07914-10303. On the next PM or service call, any drive that has an 07912-6X210 DMA PCA should be upgraded to MR5.3.

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9320-4766 (1/83)

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Since the firmware is now structured to the MPU PCA (See Service Notes 7911/12 P/R - 23 and 7914 P/R - 15), FSI of MPU PCAs, P/N 07912-6X011, should be upgraded to include MR5.3.

The firmware has also been removed from the Blue Stripe Exchange program; therefore, it is no longer necessary to return the firmware for credit.

WARRANTY: Warranty will only be extended for upgrades from MR5.1 or MR5.2 to MR5.3 which require the single ROM. Warranty will not be extended for the MR5.3 kit or on units purchased internally by HP (TAC).

```
**********************************************************************
*                                                                    *
*  LABOR:  None                                                      *
*                                                                    *
*  PARTS:  07914-89153 - MR5.3 ROM  (U271)                           *
*                                                                    *
*  TRAVEL: None                                                      *
*                                                                    *
*  When completing the Customer Support Order (CSO), the repair      *
*  type must be coded 02G and the repair class must be coded CO      *
*  (component).  The service code block must be filled in with       *
*  20047.                                                            *
**********************************************************************
```

SERVICE NOTE

7911/12/14 Disc Drives

Supersedes: None

PARTS INVOLVED:
Unregulated Power Harness
P/N 07912-60054
J600 Connector
P/N 07912-60211

UNITS AFFECTED:
See Text

TITLE: J600 CONNECTOR ON POWER REGULATOR PCA

APPLIES TO:	All Units [X]		Only Units on Agreement/Warranty [ ]
PERFORM:	Immediately [ ]		At PM/Normal Call [ ]
	On Failure [ ]		Information Only [X]
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update [ ]		Use as is [ ]
	Return for salvage [ ]		See text [X]
WARRANTY EXTENDED UNTIL:	N/A		

PROBLEM: Drives manufactured prior to March 1984 may have poor contact between the unregulated power harness, P/N 07912-60054, and the J600 connector on the power regulator PCA, P/N 07912-60006. The power harness and the connector were modified to improve the connection; therefore, drives manufactured with date code 2410 and later do not display this problem. Since the original power harness and connector are still in some older drives, there is a possibility that these failures could still occur.

SYMPTOM: Poor contact of the contact pins can result in damage to the power regulator PCA and fuse blowing in the power supply. The most noticeable evidence of this type of failure is discoloration of the J600 connector, P/N 07912-60211.

SOLUTION: The power harness and the J600 connector were modified in March 1984. The black shrink tubing on the power harness wires entering the white connector was removed to eliminate twisting of the contact pins. The J600 connector was revised to decrease the effect of pin rotation. The part number of the power harness did not change; the date code of the power supply changed from 2340 to 2410.

Some older drives with the old style power harness and connector may still display this problem. To improve the reliability of these drives, the J600 connector should be inspected for damage. If it is discolored and deformed, the connector and the power harness should be replaced.

WARRANTY: None. This is an information only service note.

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9320-4766 (1/83)

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SERVICE NOTE

Supersedes: None

7911/12/14 Disc Drives

APPLIES TO:	All Units [X]	Only Units on Agreement/Warranty [ ]
PERFORM:	Immediately [ ]	At PM/Normal Call [ ]
	On Failure [ ]	Information Only [X]

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X

SERVICE INVENTORY	Return for update [ ]	Use as is [ ]
	Return for salvage [ ]	See text [X]

WARRANTY EXTENDED UNTIL: N/A

PARTS AFFECTED:

TIB PCA: 07908-6X241

SERIAL NUMBERS:

See text

TITLE: TIB PCA MODIFICATION

PROBLEM: The current 791X tape subsystem does not optimally handle media related faults such as instantaneous speed variations and drop-outs. Such faults can cause the PLL on the TIB PCA to lose phase lock during a read which occasionally results in unrecoverable data errors.

CAUSE: When the PLL encounters a media related problem on a read, it can lose phase lock. In the current TIB PCA design, once the PLL loses lock, it may lose it for the remainder of the block. This can result in an unrecoverable data error.

SOLUTION: The TIB PCA has been modified to ensure the PLL can relock to data at the beginning of each frame. This will provide a reliability enhancement to the tape subsystem in that it will decrease the occurence of unrecoverable data errors due to media problems.

The part number of the TIB PCA is not changing; however, the date code will change from F-2508 to H-2628. SMR/SME will be updating boards that are returned for repair.

WARRANTY: None. This is an information only service note.

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9320-4766 (1/83)

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FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. IN EUROPE, CALL YOUR LOCAL HP SALES or SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2 - Geneva, Switzerland. IN JAPAN, Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

SERVICE NOTE

Supersedes:

APPLIES TO:	All Units ☒		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only ☒
WARRANTY:	**EXTENDED**	**NORMAL**	**NONE**
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update ☐		Use as is ☐
	Return for salvage ☐		See text ☒
WARRANTY EXTENDED UNTIL:	N/A		

Model Numbers: 7908, 7911, 7912, 7914

Parts Involved: Boxes of five tapes; 88140L, 88140LC, 88140S, 88140SC

Individual tapes; P/N 9164-0156, 9164-0127, 9164-0211, 9164-0212

Revision Numbers involved: X0XXX-XXXX through X4XXX-XXXX

TITLE: TAPE CARTRIDGE REPLACEMENT

SYMPTOM: Tape cartridges purchased prior to October 1, 1983, or cartridges having a revision number with a second digit of "4" or lower stamped on the metal back plate (for example, X4XXX-XXXX) are subject to the following failures.

- Data loss, may result in auto sparing or verify failures.
- Shortened tape life.
- Autoload failures, cartridge fail LED may be on.
- Cartridge may unload during a read or write with a possible off tape status.

These failures are caused by a white dust that can be released from the tape. This dust collects on the cartridge guide pins, tensioning belt, and the recording surface of the tape and can cause both read and write errors. The contamination can also collect on the tape drive heads.

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SOLUTION: All tapes prior to revision "5" should be returned by the customer to HP for replacement. The method of replacement is:

. UNITED STATES -
Return tapes to:
Hewlett Packard Company
Computer Supplies Operation
1326 Kifer Road
Sunnyvale, CA 94086
Contact CSO sales development (408 720-2343) for details and to request a pre-authorized return form. Any questions should be directed to Mark Manqueros at CSO, (408) 720-2433, COMSYS A500.

. HPSA -
Tape replacement will be handled by the sales force 09 group in each European country, with the SF09 managers acting as the contact person for questions. Replacements will be supplied to customers immediately following the return of defective cartridges. Dieter Heck, BBN x 2118, COMSYS 6017, will be coordinating the program and any questions that cannot be answered locally should be addressed to him.

. ICON -
The replacement will be handled locally by the Country Support Administration Manager and the ACEM's, with the ACEM's coordinating the replacement to distributors. Please contact them for details. If questions cannot be answered by the local contacts, please direct them to Joyce Smith, ICON (Div. 18), (415) 857-3707.

. CANADA -
Canadian customers received the same packet of information and preauthorization as United States customers, and certainly that replacement procedure will be supported by CSO. But due to customs regulations, shipping tapes to CSO across an international boundary is slow and complex. For these reasons, Canada will set up their own replacement program through the Canadian Parts Distribution Center, 2050. Customers should call one of the following numbers:

Manitoba and West	1-800-387-3154
Toronto	671-8383
Ontairo	1-800-268-6982
Quebec and East	1-800-387-3417

Any questions should be directed to Rob Young, COMSYS 2050.

HEAD CLEANING: Please encourage all customers to clean the head and capstan regularly; a minimum of once a week. Also, the cleaning procedure should be the first step in tape drive troubleshooting. For head/capstan cleaning procedures, refer to the Operating and Installation Manual (07908-90902 or 07912-90902), or the Operator Instructions (07908-90901 or 07912-90901) for details.

WARRANTY: . Tape replacement through CSO.
. Only revision "5", or greater tapes, will be supported by DMD. Warranty will not apply to failures caused by use of old revision (0 - 4) tapes after July, 1984.

7914P/R-5

SERVICE NOTE

Supersedes: none

7914P/R Disc/Tape Drive

APPLIES TO:	All Units ☒		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only ☒
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE INVENTORY	Return for update ☐		Use as is ☐
	Return for salvage ☐		See text ☒
WARRANTY EXTENDED UNTIL	Effective thru 10/84		

UNITS AFFECTED: All

TITLE: 7914 Installation Procedure

SYMPTOM: Performing this installation procedure may reduce the possibility of occurrence of DERROR's (decimal) 14 and 229, and uncorrectable data errors.

CAUSE: DMD is investigating head shift which can result from thermal cycling during shipping. Because the heads can move away from data previously written (at the factory), the Read/Write PCA may not be able to sync on the offset data. DERROR 14 (header status byte error) or 229 (sector compare error), TERROR 9.92 (hex) (track compare error), or uncorrectable data errors may result.

SOLUTION: This procedure will "zero out" all the head positions upon installation at the customer's site.

1. Remove the shipping locks.
2. Reseat the PCA's in card cage.
3. Power on the drive and let it warm up for 25 minutes. Running internal random write-then-read (WTR) error rate tests while the drive is warming up is recommended.
4. Perform an "INIT MEDIA" retaining all spares.
5. Clear the ERT Log and run one full volume pass of WTR ERT.
6. Read the ERT Log and Fault Log. There should be no uncorrectable errors or DERRORS logged.
7. Power the drive on and off. Run diagnostics from the self test diagnostic switch.

To run the tests, the Hp-85 External Exerciser or host resident Exerciser (CS80DIAG, EXER, etc.) should be used. ~~PP/sg 40 5/84~~

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This procedure is intended to take less than one hour, so there will be no change to the installation charge for the 7914P, 7914R, 7914TD, or 7914ST.

Performing this procedure upon installation will reduce the chance of these symptoms occurring. In some cases, temperature changes in the customer's environment can precipitate these symptoms or can cause TERROR's 8.C5 (hex) (ECC correctable sector not correct), C6 (Write/Read test on maintenance track failed), or C7 (Read/Write test verify error). If any of these symptoms develop, consult your mass storage TSE.

7914P/R-06

SERVICE NOTE

Supersedes: NONE

APPLIES TO:	All Units ☒		Only Units on Agreement ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only ☒
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE	Return for update ☒		Use as is ☐
INVENTORY	Return for salvage ☐		See text ☐
WARRANTY EXTENDED UNTIL:	N/A		

TITLE:NEW FIRMWARE FOR 7914 P/R DISC DRIVES (REV 5.0, P/N 07914-19003)

SYMPTOM: NEW FIRMWARE IS BEING IMPLEMENTED IN 7914 P/R DISC DRIVES BEGINNING WITH SERIAL PREFIX 2430. THIS FIRMWARE (REV. 5.0) WILL PROVIDE THE FOLLOWING ENHANCEMENTS.

1. READ FULL SECTOR WILL BE IMPLEMENTED. THIS COMMAND EXISTS ON "EXRSI2" AS RF SECTOR. EXECUTING RF SECTOR WILL RETURN THE HEADER BYTES, THE DATA BYTES, THE CRC BYTES, AND ECC BYTES OF THE SPECIFIED SECTOR.

2. IN MR5, RUN TIME INFORMATION (RUN LOG) WILL BE REPORTED DIFFERENTLY THAN ERT TEST INFORMATION. CORRECTABLE ERRORS WILL NO LONGER BE COUNTED DURING DATA TRANSFERS. IN ADDITION, RECOVERABLE ERRORS WILL BE COUNTED BUT NOT HAVE THEIR ADDRESSES LOGGED. THIS MEANS THAT THE RECOVERABLE ERROR COUNT WILL APPEAR WHERE THE CORRECTABLE ERROR COUNT USED TO APPEAR IN THE "EXRSI2" PRINTOUT. MARGINAL RECOVERABLE ERROR AND UNRECOVERABLE ERROR HANDLING WILL BE UNCHANGED.

ERROR TYPE:	DEFINITION:	RUN LOG:	ERT LOG:
CORRECTABLE	CORRECTED BY ECC	IGNORED	COUNTED
RECOVERABLE	RECOVERED BY ONE RETRY	COUNTED	ADDRESS RECORDED
MARGINAL	RECOVERED BY MORE THAN ONE RETRY	ADDRESS RECORDED	ADDRESS RECORDED
UNRECOVERABLE	NOT RECOVERED IN 800 MSEC	ADDRESS RECORDED	ADDRESS RECORDED

3. INCREASES THE DEFAULT RETRY TIME TO 800 MSEC FROM 100 MSEC. THIS ALLOWS FOR A MORE AGGRESSIVE READ OFFSET DURING RETRIES.

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4. ADDS AN INITIALIZE MEDIA OPTION WHICH ONLY WRITES THE MAINTENANCE TRACKS AND LEAVES THE USER DATA ALONE. IN "EXRSI2", INIT MEDIA HAS BEEN MODIFIED TO GIVE THE FOLLOWING CHOICES:

   I= INITIALIZE MAINTENANCE TRACKS ONLY. (THIS IN NO LONGER PHYSICAL FORMAT)
   P= RETAIN ONLY PRIMARY SPARES
   B= RETAIN PRIMARY AND SECONDARY SPARES

5. REWRITES THE SPARE SECTOR ON A GIVEN TRACK IF A READ RETRY IS NECESSARY. THIS WILL PREVENT A LOW AMPLITUDE SPARE SECTOR FROM INTERFERING WITH THE PLL CIRCUITRY.

6. CHECKS CRC AFTER A WRITE. THIS CHECKS FOR OSCILLATOR FAILURE ON THE DMA BOARD. IF THERE IS A FAILURE, DERROR 106 (OR 6A IN HEX) WILL BE GENERATED.

7. THE DRIVE WILL REQUEST RELEASE TO UPDATE THE MAINTENANCE TRACKS AFTER EVERY FAULT OR UNCORRECTABLE ERROR DURING RUN TIME. THIS WILL PREVENT USEFUL SERVICE INFORMATION FROM BEING LOST IN RAM IF THE DRIVE IS POWERED DOWN OR CLEARED.

8. DERROR'S 10, 11, AND 12 HAVE BEEN ELIMINATED AND THE CAUSE OF DERROR 13 HAS BEEN CHANGED TO:

   WHEN CHECK WAS MADE OF THE SECTOR HEADER READ FROM THE DISC, THE FIRST BYTE (STATUS) AND THE SIXTH BYTE (SPARE) DID NOT CONTAIN SECTOR NUMBERS POINTING TO THE SAME SECTOR.

   SUSPECT HARDWARE FOR THIS ERROR IS 1.) READ/WRITE PCA 2.) DMA PCA

ACTION: THIS IS A NON-MANDATORY CHANGE, HOWEVER ALL FSI SHOULD BE ROLLED TO THE NEW FIRMWARE. THE NEW EPROM KIT IS 07914-10003 AND THE EXCHANGE KIT IS 07914-19003.

THE KIT, 07914-19003, WILL BE SUPPLIED THROUGH CPC BLUE STRIPE EXCHANGE PROGRAM. ALL FSI IS TO BE UPDATED TO 07914-19003 AS SOON AS POSSIBLE. ALL EXCHANGE EPROMS ARE TO BE RETURNED TO CPC WITHIN 90 DAYS.

THE FOLLOWING IS A LIST OF THE INDIVIDUAL EPROMS AND THEIR "U" NUMBER ASSIGNMENTS ON THE MPU PCA. THE INDIVIDUAL EPROMS ARE NOT ORDERABLE.

07914-8X041	U241
07914-8X042	U261
07914-8X043	U271
07914-8X044	U291
07914-8X045	U2101
07914-8X046	U121

USING THE CS/80 REV COMMAND, THE NUMBERS RETURNED ARE 5.0 FOR ALL THE EPROMS.

SERVICE NOTE

Supersedes: None

APPLIES TO:	All Units ☐		Only Units on Agreement/Warranty ☒
PERFORM:	Immediately ☐		At PM/Normal Call ☒
	On Failure ☐		Information Only ☐
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:	X		
TRAVEL:			X
SERVICE INVENTORY	Return for update ☐		Use as is ☐
	Return for salvage ☐		See text ☒
WARRANTY EXTENDED UNTIL:	1 Sept. 1987		

7911/12/14 DISC DRIVES

SERIAL NUMBERS INVOLVED:
See text

PARTS AFFECTED:
07914-89143 - MR5.2 ROM
07914-1X203 - MR5.2 kit

TITLE: MR5.3 FIRMWARE UPDATE

Repair Type: 02G
Repair Class: CO
Service Code: 20047
Supply Division: 4800

PROBLEM: The Medusa chip, used to replace the PHI HPIB controller chip on the 07912-60210 DMA PCA, contains an enhancement that can be used to put the HPIB bus in delayed handshake mode. The 791X drives do not support this mode; however, under certain conditions, the current firmware can inadvertantly set the Medusa chip in the delayed handshake mode. Cycling power is currently the only way to reset this condition.

SYMPTOM: If the delayed handshake mode is set, the HPIB data transfer rate is decreased by 3% to 5%. This problem is a performance issue only; it does not affect data integrity.

SOLUTION: The firmware has been modified to eliminate the possibility of the Medusa chip being set in the delayed handshake mode. The new revision is MR5.3.

A single ROM (U271), P/N 07914-89153, is available to upgrade from MR5.1 or MR5.2 to MR5.3. Upgrades from MR5.0 or earlier will require the entire kit, P/N 07914-1X03. On the next PM or service call, any drive that has an 07912-6X210 DMA PCA should be upgraded to MR5.3.

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Since the firmware is now structured to the MPU PCA (See Service Notes 7911/12 P/R - 23 and 7914 P/R - 15), FSI of MPU PCAs, P/N 07912-6X011, should be upgraded to include MR5.3.

The firmware has also been removed from the Blue Stripe Exchange program; therefore, it is no longer necessary to return the firmware for credit.

WARRANTY: Warranty will only be extended for upgrades from MR5.1 or MR5.2 to MR5.3 which require the single ROM. Warranty will not be extended for the MR5.3 kit or on units purchased internally by HP (TAC).

LABOR: None

PARTS: 07914-89153 - MR5.3 ROM (U271)

TRAVEL: None

When completing the Customer Support Order (CSO), the repair type must be coded 02G and the repair class must be coded CO (component). The service code block must be filled in with 20047.

SERVICE NOTE

7911/12/14 Disc Drives

Supersedes: None

PARTS INVOLVED:
Unregulated Power Harness
P/N 07912-60054
J600 Connector
P/N 07912-60211

UNITS AFFECTED:
See Text

TITLE: J600 CONNECTOR ON POWER REGULATOR PCA

APPLIES TO:	All Units ☒		Only Units on Agreement/Warranty ☐
PERFORM:	Immediately ☐		At PM/Normal Call ☐
	On Failure ☐		Information Only ☒
WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X
SERVICE	Return for update ☐		Use as is ☐
INVENTORY	Return for salvage ☐		See text ☒
WARRANTY EXTENDED UNTIL:	N/A		

PROBLEM: Drives manufactured prior to March 1984 may have poor contact between the unregulated power harness, P/N 07912-60054, and the J600 connector on the power regulator PCA, P/N 07912-60006. The power harness and the connector were modified to improve the connection; therefore, drives manufactured with date code 2410 and later do not display this problem. Since the original power harness and connector are still in some older drives, there is a possibility that these failures could still occur.

SYMPTOM: Poor contact of the contact pins can result in damage to the power regulator PCA and fuse blowing in the power supply. The most noticeable evidence of this type of failure is discoloration of the J600 connector, P/N 07912-60211.

SOLUTION: The power harness and the J600 connector were modified in March 1984. The black shrink tubing on the power harness wires entering the white connector was removed to eliminate twisting of the contact pins. The J600 connector was revised to decrease the effect of pin rotation. The part number of the power harness did not change; the date code of the power supply changed from 2340 to 2410.

Some older drives with the old style power harness and connector may still display this problem. To improve the reliability of these drives, the J600 connector should be inspected for damage. If it is discolored and deformed, the connector and the power harness should be replaced.

WARRANTY: None. This is an information only service note.

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SERVICE NOTE

Supersedes: None

7911/12/14 Disc Drives

APPLIES TO:	All Units X	Only Units on Agreement/Warranty ☐
PERFORM:	Immediately ☐	At PM/Normal Call ☐
	On Failure ☐	Information Only X

WARRANTY:	EXTENDED	NORMAL	NONE
LABOR:			X
PARTS:			X
TRAVEL:			X

SERVICE	Return for update ☐	Use as is ☐
INVENTORY	Return for salvage ☐	See text X

WARRANTY EXTENDED UNTIL: N/A

PARTS AFFECTED:

TIB PCA: 07908-6X241

SERIAL NUMBERS:

See text

TITLE: TIB PCA MODIFICATION

PROBLEM: The current 791X tape subsystem does not optimally handle media related faults such as instantaneous speed variations and drop-outs. Such faults can cause the PLL on the TIB PCA to lose phase lock during a read which occasionally results in unrecoverable data errors.

CAUSE: When the PLL encounters a media related problem on a read, it can lose phase lock. In the current TIB PCA design, once the PLL loses lock, it may lose it for the remainder of the block. This can result in an unrecoverable data error.

SOLUTION: The TIB PCA has been modified to ensure the PLL can relock to data at the beginning of each frame. This will provide a reliability enhancement to the tape subsystem in that it will decrease the occurence of unrecoverable data errors due to media problems.

The part number of the TIB PCA is not changing; however, the date code will change from F-2508 to H-2628. SMR/SME will be updating boards that are returned for repair.

WARRANTY: None. This is an information only service note.

SH 8/86-48

9320-4766 (1/83)

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