HEWLETT PACKARD

This package contains a section of the

CE SERVICE HANDBOOK FOR 79XX SERIES DISC DRIVES

and consists of the following document:

7906A/B/D DISC DRIVE

Part no. 07906-90905

(With Appendix A for "H" Model Drives)

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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PRINTING HISTORY

New editions incorporate all update material since the previous edition. Updating Supplements, which are issued between editions, contain additional and revised information to be incorporated into the manual by the user. The date on the title page changes only when a new edition is published.

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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.

To install or remove a fuse, first disconnect the power cord from the device. Then, using a small screwdriver, turn the fuseholder cap counterclockwise until the cap releases. Install the proper fuse in the cap — either end of the fuse can be installed in the cap. Next, install the fuse and fuseholder cap in the fuseholder by pressing the cap inwards and then turning it clockwise until it locks in place.

HP Computer Museum
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MAINTENANCE PRECAUTIONS

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by service-trained personnel. All WARNING and CAUTION statements in the source documents apply equally to this condensed document.

To avoid dangerous electrical shock, do not operate the disc drive directly from an ac power outlet. AC power for the drive must be obtained from the power panel assembly associated with the drive.

Read the WARNING label attached to the power panel assembly before checking or replacing the primary power fuse.

Hazardous voltages are present within the mainframe whenever ac power is applied. Capacitors may still be charged although power is disconnected. Use extreme caution when working on the disc drive with covers removed.

Do not remove or install PCA's, extender's, or cables with power applied.

"R" Models - the weight of the drive requires two or more persons to safely install it in the rackmount. Before mounting, extend the front legs to prevent tipping of the cabinet. Do not extend more than one module on its rack slides at a time.

Air shipment requires conformance to DOT Regulations, Title 49, parts 171-177 (Hazardous Magnetic Materials).

CAUTION

Do not remove drive covers when the environment is obviously not clean. Do not run the drive without an absolute filter. Do not run the drive for an extended period without a prefilter.

Do not manually extend the carriage as this causes the heads to mechanically load.

Use only the cleaning materials specified; failure to comply can result in loss of factory warranty.

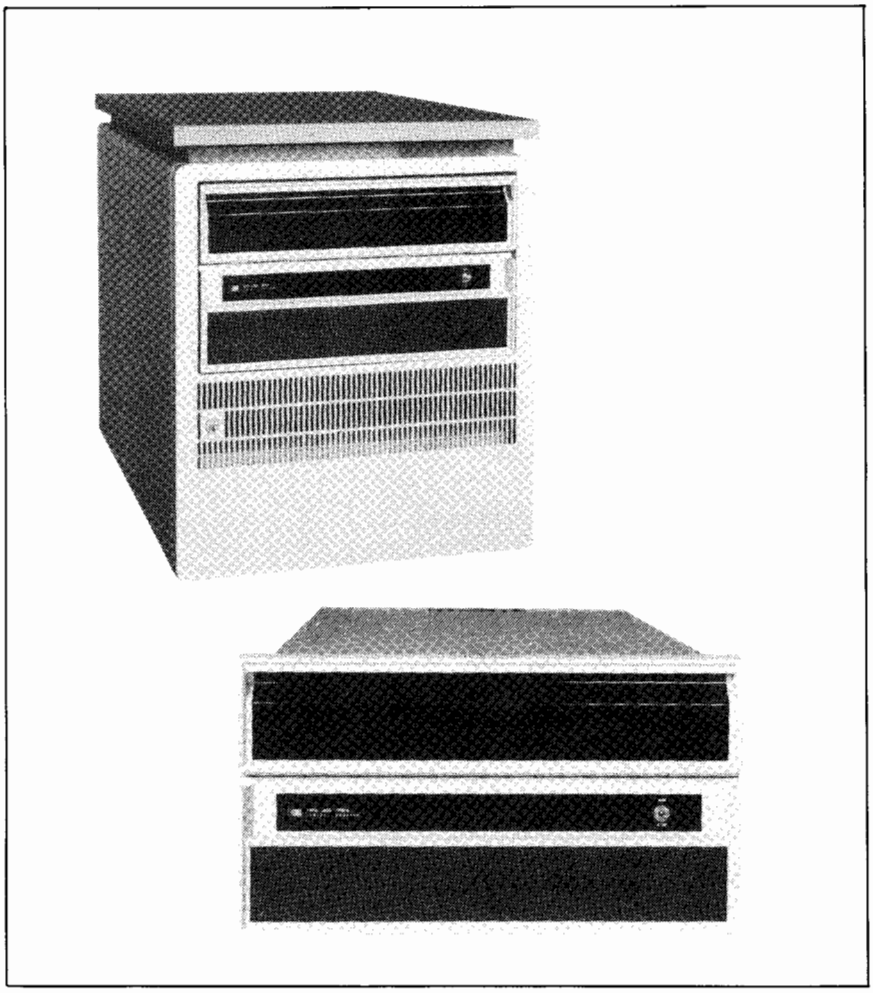
Excessive pressure on the gimbal area of a head can alter the flying attitude, as can contact with an inspection mirror. Use care when cleaning heads.

Do not oil the carriage rails or bearings, and do not allow alcohol to seep into the bearing lubrication pack.

When cleaning the spindle, be sure to remove all masking tape applied.

Ensure that the DSU is disconnected from the drive before 1) checking or adjusting power supply voltages, and 2) before verifying operation of the temperature compensation circuit.

The head alignment PCA must be installed whenever a CE head alignment or servo reference cartridge is to be used.



RELATED MANUALS

P/N "D" Mod.	P/N A/B Mod.	Title
07906-90911	07906-90901	7906 User's
07906-90912	07906-90902	7906 Installation
07906-90913	07906-90903	7906 Service
07906-90904	07906-90904	7906 Tech Info Package (TIP)
12904-90003	12904-90003	12904 Rack Slides Instl.
19510-90911	n/a	19510D Rack Slides Instl.*
29425-90911	29425-90001	29425 Cabinet Instl & Serv.
40019-90911	40019-90901	40019 Prefilter Instl & Serv.

* For Option 025 "D" Model only.

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1-1. PRODUCT DESCRIPTION

The HP 7906 Disc Drive is a 20-megabyte, random-access, mass-storage device with one fixed disc and one removable disc (cartridge).

A fault detection system consisting of four LED's can indicate nine different drive faults to accelerate troubleshooting.

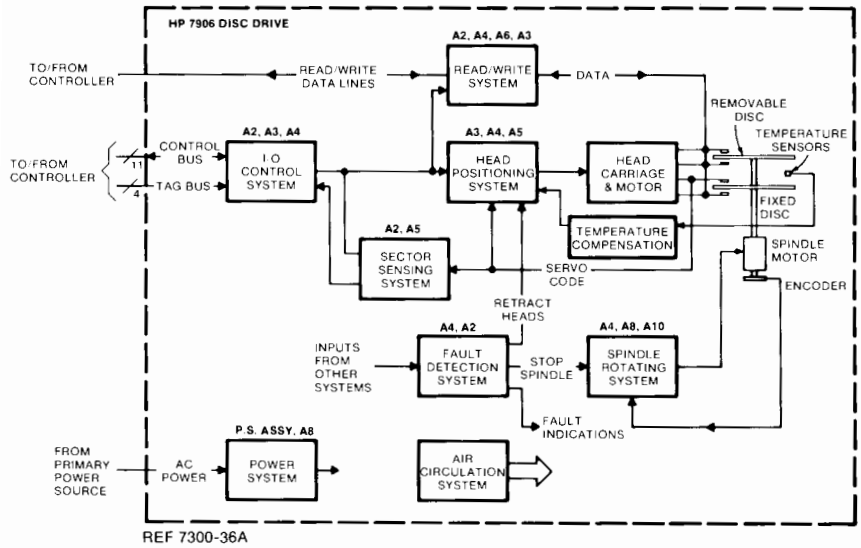


Figure 1-1. Basic Block Diagram (with PCA's listed above blocks)

NOTE: This portion of the handbook describes 7906 "A", "B", and "D" Model drives. Refer to the blue appendix pages for "H" Model. Differences between models are presented in table 1-1.

Table 1-1. Product Descriptions

MODEL	OPT.	DESCRIPTION
7906A		Original drive shipped 1978-1979.
7906B		Redesigned power supply and cabling to meet European regulations - 1979.
7906D		Added shielding for domestic RFI requirements - 1983.
7906H		Current-model drive (i.e.,"D") with integrated controller.
	015	Specifies 230V/50Hz operation.
7906HR		Same as "H" model except designed for rack mounting.
	015	Specifies 230V/50Hz operation.
	020	Substitute 28-in. rack slides for std 30-in.
	025	Substitute rack slide kit for 29431F cabinet slides.
7906M		Master drive(includes 13037 Disc Controller).
	015	Specifies 230V/50Hz operation.
	102	Add HP-IB adapter kit.
7906MR		Rack-mountable version of 7906M;options 015, 020, 025*, and 102 also apply.
7906S		Slave drive (controller not included).
	015	Specifies 230V/50Hz operation.
7906SR		Same as "S" model except designed for rack mounting; options 015, 020, 025 also apply.

* Also substitutes 8-foot cable for standard 12-foot multi-unit cable.

1-2. OPTIONS & ACCESSORIES

Table 1-2. Options & Accessories

PRODUCT	OPT	ACCESSORY TO CURRENT "D" MODEL
13013D		Multi-unit cable (ref table 2-1 for lengths)
13213D		Data cable (ref table 2-1 for lengths)
13175D		HP 1000 CPU I/F kit (ref table 2-1)
13178D		HP 1000 multi-CPU kit (ref table 2-1)
29425D		Low profile cabinet for "M","S",& "H"
19510D		Rack slide kit for 29431F cabinet, meets new RFI requirements
12904A		Rack slides for 29402C cabinet (non-RFI).
	001	Substitute 28-in. rack slides for 30-in.
40019D		Prefilter for 29425D cabinet
	025	Prefilter for 29431F cabinet
13037U		13037 Disc Controller included with "H" models
	015	230V, 50 Hz operation
	025	Substitute mounting rails for 29431F cab.
	050	Add HP-IB extender
	102	Add 12745D HP-IB adapter kit
12940A		10 Mb removable disc cartridge
19903A		7906 spare parts kit
	035	Add spares for "H" model
	036	Spares for "H" model only
19904A		7906 alignment tools kit
	035	Add tools for "H" model
13359C		Servo reformatting kit

1-3. SERVICE KITS

The customer service kit comprises the last three items in table 1-2 above, i.e., HP 19903A, 19904A, & 13359C.

CE service kit part numbers are 07906-67825 (servo formatting tools), 07906-67850 (alignment tools), and 07906-67801 (empty case for spare parts).

Lists of standard and special service tools are listed in paragraph 2-11.

1-4. OPERATING SPECIFICATIONS

For operating specs and characteristics, refer to the appropriate User's Manual and the Technical Data sheet.

For physical and environmental specifications, refer to paragraph 2-1.

2-1. ENVIRONMENTAL REQUIREMENTS

All drives must meet the environmental requirements for the host system. The following environmental requirements are considered minimum for all drives. Refer to the Site Environmental Requirements for Disc/Tape Drives Manual, P/N 5955-3456, for complete specifications.

ENVIRONMENTAL REQUIREMENTS

INLET AIR TEMPERATURE:	10° C TO 40° C (50° F TO 104° F)
TEMP. RATE OF CHANGE:	less than 20° C per hour (36° F/hour)
RELATIVE HUMIDITY:	8 to 80% with max wet bulb not to exceed 25.6° C (78° F), noncondensing
ALTITUDE:	sea level to 4,572 m (1500 feet)
TILT:	+/- 20° about either horizontal axis
SHOCK (11 ms, 0.5 sine):	less than 7 g's
VIBRATION (random profile):	less than 0.88 g rms
ACOUSTIC EMISSION (7906M random seek):	less than 60 dbA
AC POWER:	single phase 100,120,220,240 VAC +5,-10 % frequency range 47.5 to 66 Hz

ELECTROMAGNETIC SUSCEPTIBILITY

RADIATED:	greater than 0.5 V/M, 30 kHz to 1 GHz
CONDUCTED:	greater than 3V rms, 30 Hz to 50 KHz
ELECTROSTATIC DISCHARGE:	greater than 12.5 kV
MAGNETIC:	greater than 5 gauss
MAGNETIC (disc cartridge):	greater than 50 oersteds

RACKMOUNTING REQUIREMENTS ("R" Model Drives)

HEIGHT:	26.52 cm (10.44 in.)
WIDTH (ahead of mounting flange):	48.03 cm (18.91 in.)
WIDTH (behind mounting flange):	44.15 cm (17.38 in.)
DEPTH (from mounting flange):	68.10 cm (26.81 in.)
DEPTH (overall):	71.12 cm (28.00 in.)
WEIGHT (approx.):	73.55 kg (162 lb.)
CENTER OF GRAVITY:	12.95 cm (5.1 in.) up from bottom 40.13 cm (15.8 in.) from front 20.06 cm (7.9 in.) from left
PREFILTER DUCT (29400B or 29402C cabinet):	13.3 cm (5.25 in.)
PREFILTER DUCT (29425D or 29431F cabinet):	8.9 cm (3.5 in.)

2-2. INSTALLATION

For installation details refer to the following manuals:

Series "A", "B", & "H" Drives

- HP 7906 DISC DRIVE INSTALLATION, P/N 07906-90902
- HP 7906 DISC DRIVE SERVICE MANUAL, P/N 07906-90903
- HP 40019 PREFILTER INSTALLATION & SERVICE, P/N 40019-90901
- HP 29425 CABINET INSTALLATION & SERVICE, P/N 29425-90001
- HP 12904 SLIDE MOUNTING KITS INSTALLATION, P/N 12904-90003

Series "D" & "H" Drives

- HP 7906D DISC DRIVE INSTALLATION, P/N 07906-90912
- HP 7906D DISC DRIVE SERVICE MANUAL, P/N 07906-90913
- HP 40019D PREFILTER INSTALLATION & SERVICE, P/N 40019-90911
- HP 29425D CABINET INSTALLATION & SERVICE, P/N 29425-90911
- HP 19510D SLIDE MOUNTING KIT INSTALLATION, P/N 19510-90911

INSTALLATION SUMMARY

1. **AC POWER SOURCE CHECK -**
   verify incoming power (refer to paragraph 2.1)
2. **AC POWER CORD CHECK -**
   verify correct power cord (refer to table 9-1)
3. **FUSE CHECK -**
   verify correct primary/secondary fuses (refer to tables 2-2 & 2-3)
4. **INTERCONNECTIONS -**
   verify cables are routed and anchored properly (see figures 9-3,4,5)
5. **VISUAL INSPECTION -**
   check cable termination and logical unit addresses
6. **ABSOLUTE FILTER AIR PRESSURE -**
   must be greater than 0.35 inches of water
7. **INSPECT HEADS -**
   clean if necessary
8. **+5 VOLT CHECK -**
   check +5V testpoint on A5 track follower for +4.95 to +5.05
9. **TEMPERATURE COMPENSATION CHECK -**
   refer to paragraph 2-1. PM Summary (or service manual section III)
10. **SEEK TIME CHECK -**
    alternate seeks from cylinder 0 to 410 = 42 to 45 msec
11. **RADIAL ALIGNMENT CHECK -**
    refer to paragraph 2-10. PM Summary (or service manual section III)
12. **INDEX TRANSDUCER CHECK -**
    refer to paragraph 2-10. PM Summary (or service manual section III)
13. **HEAD ALIGNMENT CHECK -**
    must be within 6 units of value on cartridge label
14. **A2 MICROPROCESSOR CHECK ("H" DRIVES ONLY) -**
    verify proper jumper configuration (refer to Appendix A)
15. **SELF TEST VERIFICATION ("H" DRIVES ONLY) -**
    verify proper completion
16. **SYSTEM CHECKOUT -**
    verify operational integrity via on-line/off-line utilities.

2-3. CABLE CONNECTIONS

For cable hookup, see interconnection foldout figures 9-3, 9-4, 9-5.

For cable options, refer to table 2-1. ("D" drives must have cables selected from the right column only.)

Table 2-1. Cable Options

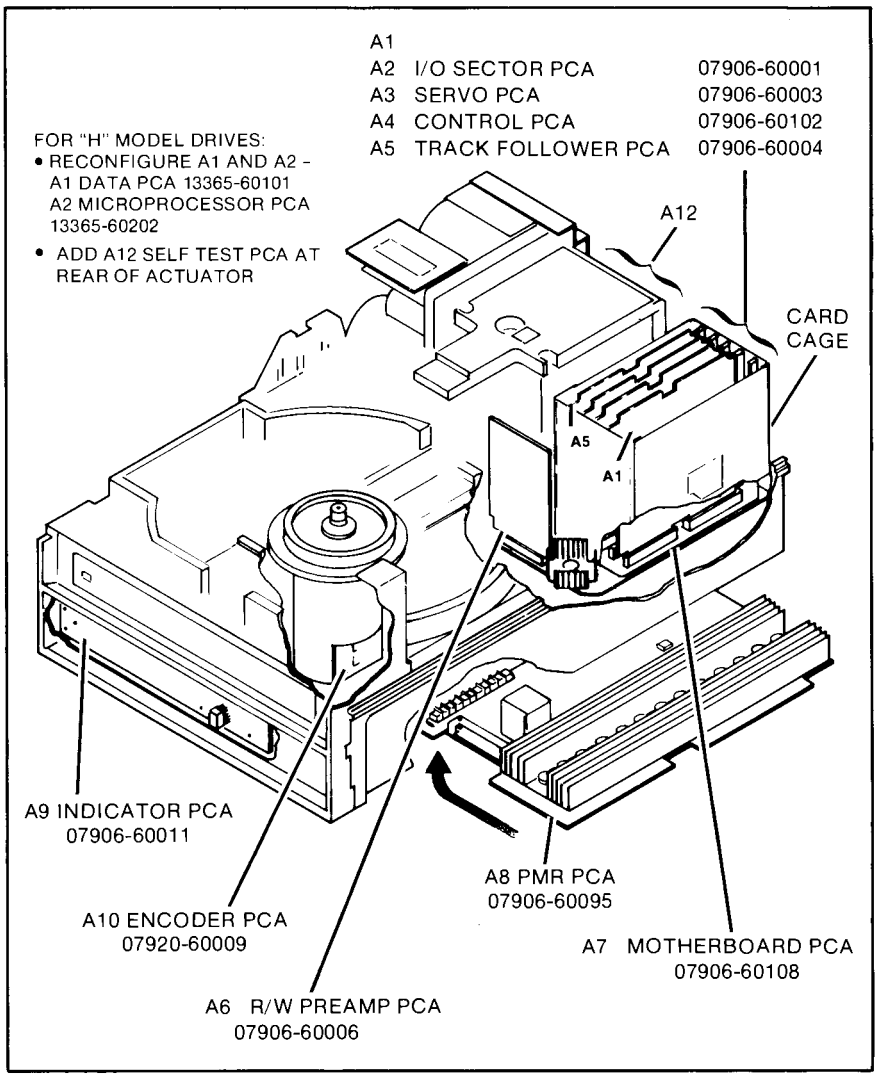
MULTI UNIT CABLES - 13013B/D			
LENGTH*	13013B	OPTION	13013D
6	13013-60011	001	13013-60024
8	13013-60012	003	13013-60025
12	13013-60013	STD	13013-60027
18	13013-60014	002	13013-60028
40	13013-60017	H01	13013-60031
50	13013-60018	H02	13013-60032
25	13013-60019	H03	13013-60029
30	13013-60020	H04	13013-60030
9	13013-60021	H05	13013-60026
60	13013-60022	H09	13013-60033
70	13013-60023	H10	13013-60034
MULTI CPU CABLE & PCA - 13178C/D			
LENGTH*	13178C	OPTION	13178D
8	13178-60003	STD	13178-60007
16	13178-60004	001	13178-60008
50	13178-60005	H04	13178-60010
25	13178-60006	H05	13178-60009
INTERFACE CABLE & PCA - 13175B/D			
LENGTH*	13175B	OPTION	13175D
18	13037-60030	STD	13037-60043
30	13037-60037	H02	13037-60044
50	13037-60036	H05	13037-60045
65	13037-60039	H08	13037-60046
6	13037-60029	025#	13037-60047
DATA CABLES - 13213B/D			
LENGTH*	13213B	OPTION	13213D
6	13213-60006	004	13213-60011
10	13213-60007	STD	13213-60012
25	13213-60008	001	13213-60013
50	13213-60009	002	13213-60014
75	13213-60010	003	13213-60015
*In feet	#Included with 13178C/D STD		

2-4. PCA LOCATION/CONFIGURATION

See figure 2-1 below for PCA location; note "H" model distinctions.

For PCA functions, see figure 1-1 and refer to paragraph 4-3.

For PCA compatibility, refer to table 3-1.



CE 7906-01

Figure 2-1. PCA Locations & Part Numbers

2-5. CONTROLS & INDICATORS

To interpret front panel lights and LED's (behind access door) refer to table 4-1. To interpret "H" model LED's, refer to test failure table in Appendix A.

OPERATOR PANEL

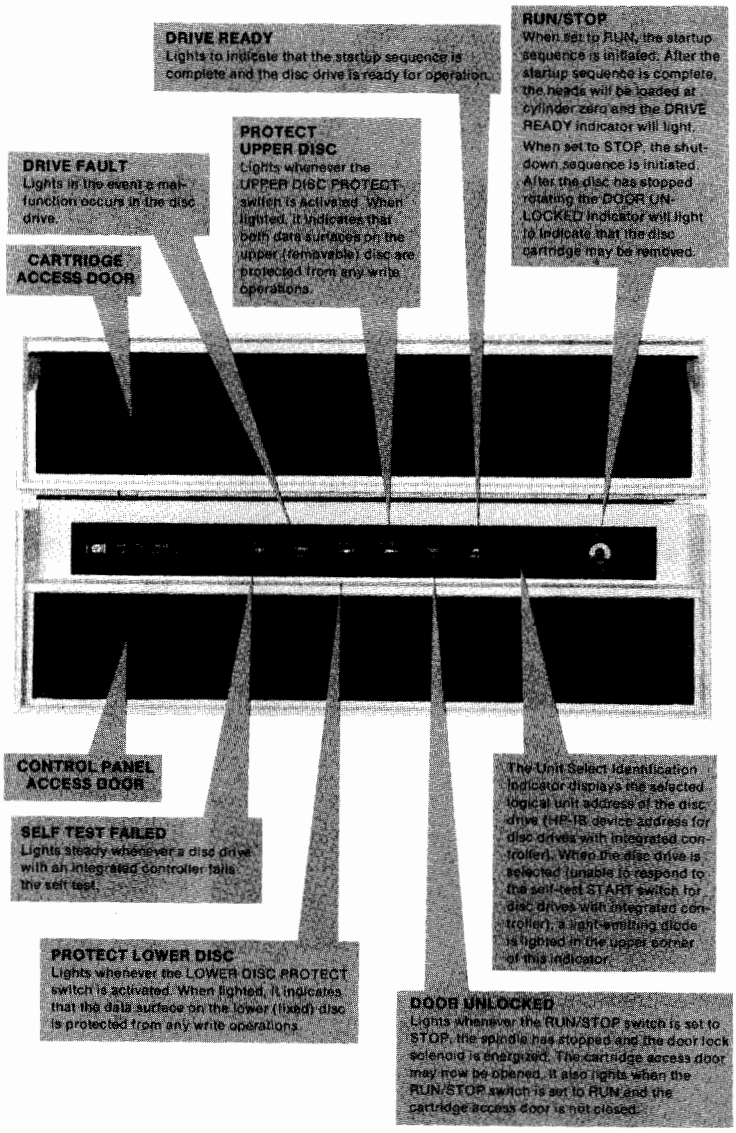


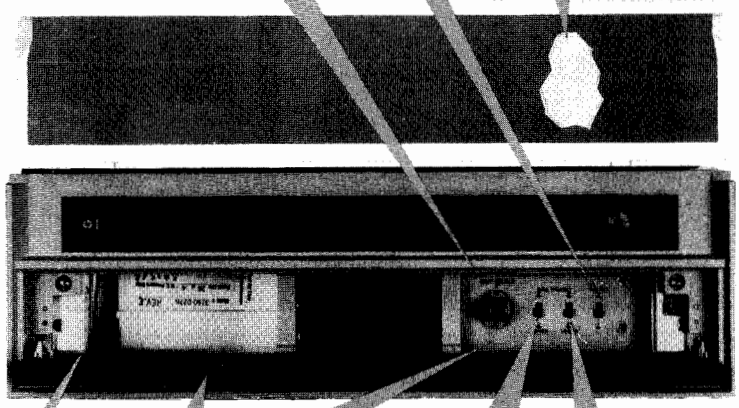
Figure 2-2. Operator Panel

CONTROL PANEL

FORMAT
When set to the alter position (up or •), the contents of the sector address field can be changed. This position is used to initialize an unrecorded disc or to selectively set protected track status bits in the sector address field.
When set to the protected position, the contents of the sector address field cannot be altered.

UNIT SELECT
Selects the logical unit address of the disc drive (HP-IB device address for disc drives with an integrated controller). The Unit Select identification indicator will correspond to the switch setting.

Four LED's indicate any of nine possible Drive Faults (see chart below left). Open door to view LED's.



CONTROL PANEL ACCESS DOOR (OPEN)

OPERATOR CONTROL PANEL

FAULT CODE LABEL
Lists fault states of colored LED's as follows:

FAULT	LED(s) ILLUMINATED
CB	yellow
T	red
AGC	yellow, red
IL	green
W•$\overline{AR}$	yellow, green
R•W	green, red
W•$\overline{AC}$	yellow, green, red
MH	red, red
$\overline{W}$•DC	red, red, yellow

UPPER DISC PROTECT
When set to the protected position (up or •), the data recorded on both surfaces of the upper disc is protected from any write operations. The PROTECT UPPER DISC indicator will light to indicate that the data protection feature is activated.
When set to the unprotected position, the data recorded on both surfaces of the upper disc is not protected from any write operations and therefore it is subject to change.

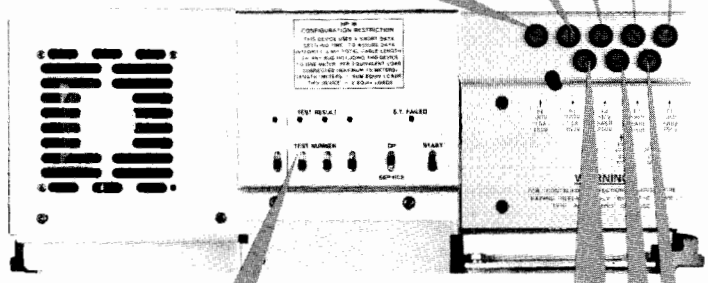
LOWER DISC PROTECT
When set to the protected position (up or •), the data recorded on the data surface of the lower disc is protected from any write operations. The PROTECT LOWER DISC indicator will light to indicate that the data protection feature is activated.
When set to the unprotected position, the data recorded on the data surface of the lower disc is not protected from any write operations and therefore it is subject to change.

Figure 2-3. Control Panel

REAR PANEL

WARNING

To install or remove a fuse, first disconnect the power cord from the device. Then, using a small screwdriver, turn the fuseholder cap counterclockwise until the cap releases. Install the proper fuse in the cap — either end of the fuse can be installed in the cap. Next, install the fuse and fuseholder cap in the fuseholder by pressing the cap inward and then turning it clockwise until it locks in place.



F2
This 8-ampere, 250-volt, slo-blo secondary fuse (part no. 2110-0383) provides overload protection for the -36 Vdc power supply.

F3
This 8-ampere, 250-volt, slo-blo secondary fuse (part no. 2110-0383) provides overload protection for the +36 Vdc power supply.

F4
This 8-ampere, 250-volt secondary fuse (part no. 2110-0342) provides overload protection for the +10 Vdc unregulated (+5 Vdc regulated) power supply.

F5
This 1.5-ampere, 250-volt secondary fuse (part no. 2110-0043) provides overload protection for the +20 Vdc unregulated (+12 Vdc regulated) power supply.

F6
This 1.5 ampere, 250-volt secondary fuse (part no. 2110-0043) provides overload protection for the -20 Vdc unregulated (-12 Vdc regulated) power supply.

Note: A secondary fuse is also located on PCA-A8 (A8F1), P/N 2110-0099, 1A, 125V.

F9
This 20-ampere, 125-volt secondary fuse (part no. 2110-0098) provides initial overload protection for the +20 Vdc unregulated (+12 Vdc regulated) and -20 Vdc unregulated (-12 Vdc regulated) power supplies.

SELF-TEST PANEL AND FAN
Only on disc drives with an integrated controller. A servicing aid for troubleshooting the integrated controller and disc drive. Automatically performs a self-test routine whenever power is turned on, whenever the RUN/STOP switch is set to RUN, by system command, or by activating the self-test panel START switch.

F8
This 20-ampere, 125-volt secondary fuse (part no. 2110-0098) provides initial overload protection for the +10 Vdc unregulated (+5 Vdc regulated) power supply.

F7
This 20-ampere, 125-volt secondary fuse (part no. 2110-0098) provides initial overload protection for the +36 Vdc and -36 Vdc power supplies.

Note: For "H" model drives, see appendix, figure A-5.

Figure 2-4. Rear Panel

2-6. AC POWER: CORDS/FUSES/STRAPPING

2-7. POWER CORD OPTIONS. See figure 9-1 in diagrams section IX for available power cords.

2-8. RESTRAPPING AC. See figure 9-2 in diagrams section IX for restrapping input power.

2-9. FUSES. For fuse locations, see previous figure 2-4. For fuse part numbers, refer to tables 2-2 & 2-3 below.

Table 2-2. Primary Power Fuse Ratings

SOURCE VOLTAGE	REQUIRED RATING	HP PART NO.
100 Vac	12A, 250V	2110-0249
120 Vac	8AT*, 250V	2110-0383
220 Vac	4AT*, 250V	2110-0365
240 Vac	4AT*, 250V	2110-0365

* The T indicates that a time delay or slo-blo fuse must be used.

Table 2-3. Secondary Fuse Ratings

FUSE	REQUIRED RATING	HP PART NO.	SUPPLY VOLTAGE
F2	8A, 250V, SB*	2110-0383	−36 VDC
F3	8A, 250V, SB*	2110-0383	+36 VDC
F4	8A, 250V, SB*	2110-0383	+10 VDC
F5	1.5A, 250V, FB*	2110-0043	+20 VDC
F6	1.5A, 250V, FB*	2110-0043	−20 VDC
F7	20A, 125V, MB*	2110-0098	26 VAC
F8	20A, 125V, MB*	2110-0098	9 VAC
F9	20A, 125V, MB*	2110-0098	17 VAC
A8F1	1A, 125V, FB*	2110-0099	+25 VAC

*SB, MB, and FB indicate slow-blo, medium-blo, and fast-blo, respectively. The correct fuses must be used as specified.

2-10. PREVENTIVE MAINTENANCE

PM for the HP 7906 is scheduled for 6-month intervals in a clean environment, more often if operating environment is considered severe.

Perform PM steps in the order listed below; refer to section II of the service manual for details.

Refer to next paragraph for recommended tools.

PM SUMMARY

1. Prefilter & Impeller

Remove duct and prefilter. Clean inside of duct with Texwipe or vacuum cleaner. Remove compacted dirt from impeller vanes. Replace prefilter if necessary.

2. Absolute Filter Air Pressure

Must be greater than 0.35 inches of water, 50 and 60 Hz.

3. Cleaning Heads

Inspect heads, clean if necessary using ONLY 91% isopropyl alcohol and head cleaning sleeves followed by a clean dry sleeve. Inspect for damage or particulate when completed.

4. Cleaning Rails

Clean rails using ONLY 91% isopropyl alcohol and Q-tips followed by a clean dry Q-tip.

5. Cleaning Spindle Assembly

Remove magnetic particles from hub with masking tape. Clean hub and cone using ONLY 91% isopropyl alcohol and a Texwipe followed by a clean dry wipe.

7. Cleaning Main Casting & Receiver

Remove particles with masking tape or vacuum cleaner. Clean ONLY with 91% isopropyl alcohol and a Texwipe followed by a clean dry wipe.

8. Power Supply Adjustment

Using a digital voltmeter monitor +5V testpoint on A5 Track Follower. Adjust potentiometer on A8 PMR for +4.95 to +5.05 volts (see figure 6-1).

9. Temperature Compensation Check

A. TEMPERATURE SENSOR CABLE ASSEMBLY

Measure Between Pins	Resistance
1 and 5	short
2 and 5*	10k to 500k ohms
3 and 5*	10k to 500k ohms

*Readings must be within 20% of each other.

B. PCA-A5 TRACK FOLLOWER CONNECTOR

1. Test plug side A on PCA-A5J1
2. Voltmeter on delta T testpoint
3. -3.95 to -4.35 Vdc: before DRIVE READY
4. Voltmeter on -P testpoint
5. -1.95 to -2.20 Vdc: after heads load, before DRIVE READY
6. -1.55 to -1.75 Vdc: 2 minutes after DRIVE READY
7. Set STOP switch
8. Test plug side B on PCA-A5J1: set RUN switch
9. Voltmeter on +P testpoint
10. +1.95 to +2.20 Vdc: after heads load
11. 30 seconds after heads load, remove plug, note DRIVE READY.

10. Mainframe Switches & Solenoids

Inspect for damage or loose wires: carriage latch solenoid, cartridge-in-place switch, door lock solenoid, door closed and door locked switches.

11. Seek Time Adjustment:

Alternate seeks, cylinder 0 to 410, 42 to 45 msec. Adjust R92 on A3 Servo board.

12. Radial Alignment

Head 1 functions 4 & 6. Corrected values calculated from cartridge label must not differ by more than 1.0.

13. Index Transducer Alignment

Function 5, heads 0 & 1. Corrected values from cartridge label within 2 of 0 and sum to 0 +/- .4.

14. Head Alignment

20-minute random seek, 50-msec delay. Heads 0 & 1, function 7. Meter reading within 6 units of calibration label values on cartridge.

15. "H" Drive Only

Turn power OFF; if spindown time of card cage fan less than 12 seconds, replace.

2-11. SERVICE TOOLS & SUPPLIES

STANDARD TOOLS

CAUTION

Filtered isopropyl alcohol is a restricted article (flammable liquid). Transport in accordance with Department of Transportation regulations for hazardous materials.

Alcohol, Isopropyl, filtered*	HP 8500-0559
Bit, 1/4-inch drive, hex key (for use with torque wrench, part no. 8710-1007)	HP 8710-0664
Bit, 1/4-inch drive, Pozidriv, #2	HP 8710-0903
Bit, 1/4-inch drive, slotted drive	HP 8710-0669
Bit, 1/4-inch drive, 9/64 Hex	HP 8710-1241
Bit, 12-inch, Extended Hex (for 1535-2653)	HP 8710-1223
Cleaning Sleeves*	HP 9310-5074
Head Cleaning Tool	HP 07900-00091
Cleaning Wipes*	HP 9310-4865
Face Mask	HP 9301-0170
Finger Cot	HP 9300-0399
Inspection Mirror	HP 8830-0005
Kimwipe Tissues	HP 9300-0001
Pin Extractor	HP 8710-0688
Pliers, Diagonal Cutting	HP 8710-0006
Pliers, Long Nose	HP 8710-1094
Q-tips	HP 8520-0023
Screwdriver, 4 x 1/4-inch	HP 8730-0001
Screwdriver, 4 x 1/8-inch	HP 8730-0008
Screwdriver, Pozidriv	HP 8710-0899
Screwdriver, Pozidriv	HP 8710-0900
Steel Rule, 6-inch	HP 8750-0335
Tape, Masking	HP 0460-0030
Wire Strippers	HP 8710-0647
Wrench, Box, 7/16-inch	HP 8720-0017
Wrench, Torque, 0 to 12 inch-pounds	HP 1535-2653
Wrench, Torque, Variable, 80 inch-pounds	HP 8710-1007

*Do not substitute

SPECIAL TOOLS

Actuator Assembly Radial Alignment Tool	12995-20022
Air Pressure Measuring Guage	0101-0374
Air Pressure Probe Assembly	12995-60013
CE Head Alignment Cartridge	12995-60030
CE Servo Reference Cartridge	12995-60031
Dial Indicator	8750-0308
Dial Indicator Holder	12995-20017
Extender PCA	12995-60029
Extension Cable, Servo Head	12995-60038
Formatted Disc Cartridge	12940A
Hand Degausser	0950-1551
Head Initial Position Tool	12995-60012
Head Installation Tool	12995-60008
Head Alignment Tool	12995-60007
Index Transducer Alignment Tool	12995-60051
Index Transducer Alignment Hub	12995-60005
Run/Stop Adapter Tool	07906-60082
Servo Formatting PCA	12995-60114
Torque Wrench, Initial Head, 3 inch-pounds	8710-0665
Torque Wrench, Final Head, 5 inch-pounds	8710-0666
Temperature Compensation Test Fixture	07906-60012
DSU (Disc Service Unit)	13354-60011
Head Alignment PCA	12995-60040
DSU Adapter	12995-60048
DSU Test Module	13354-60005
Head Alignment PCA	13354-60010
50-pin Jumper Cable	13354-60012
20-pin Jumper Cable	13354-60013
I/O Sector PCA (for "H" drives only)	07906-60001
50-pin Connectors (Intern to DSU) (2)	12995-60010

CONFIGURATION

SECTION III

This section contains information pertaining to all "MAC family" drives.

3-1. SYSTEM CONFIGURATION

For information on how MAC family drives are configured in various systems, refer to the Peripheral Configuration Guide, P/N 5953-9450, available from Corporate Literature Distribution Center, COMSYS 0070.

For model differences within the HP 7906, refer to tables 1-1 & 1-2.

For configuration of single drives, see interconnect diagrams in section IX.

3-2. ABSOLUTE FILTER REQUIREMENTS - MAC FAMILY

Note the different filter part numbers and pressure specifications for absolute filters on MAC family drives:

MODEL	FILTER P/N	MINIMUM AIR PRESSURE
All 7905's	3150-0276	0.35
All 7906's	3150-0276	0.35
7920's with contam. shield	3150-0340	0.45
7920's w/o contam. shield	3150-0276	0.60
All 7925's	3150-0340	0.30

The two filter types are mechanically interchangeable but functionally different. The filtration ability is the same but the air volume and venturi point is different. These differences are necessary due to variations in the design of the disc chamber, the contamination shield, or lack of one, and the air pump action created by the varying number of spinning discs.

3-3. FIRST SERIAL NUMBERS

The first serial prefix for each model is listed below. "A" model prefixes are not listed since they are all prior to "B" models.

DRIVE	B	C	D
7906	1915A	none	2332A
7920	1916A	none	2332A
7925	1916A	none	2332A
13037	1630A	1915A	2332A

3-4. 7905/7906 PCA COMPATIBILITY

Table 3-1. PCA Compatibility - 7905 vs. 7906

PCA	7905A	7906A,7906B/H 7906D
A2 I/O Sector	07905-6X001 or 07906-6X001	07906-6X001
A3 Servo	07905-6X003 or 07906-6X003	07906-6X003
A4 Control	07905-6X002 or 07906-6X002 or 07906-6X102 *1	07906-6X002 or 07906-6X102 *1
A5 Track Follower	07905-6X004 or 07906-6X004	07906-6X004
A6 Preamp	07905-6X006 or 07906-6X006	07906-6X006
A7 Motherboard	07905-60008	07906-60008 *2 07906-60042 *2 07906-60108
A8 Power & Motor Regulator	07905-6X005 or 07905-60007	07906-6X005 or 07906-6X095
A10 Spindle Encoder	07905-60009 or 07920-60009 *3	07920-60009
Actuator Assembly	07905-6X030	07905-6X030
Spindle Motor	07905-6X021 or 07906-6X021	07906-6X021
A1 "H" Drive Data	N/A	13365-6X001 *4 13365-6X101
A2 "H" Drive Microprocessor	N/A	13365-6X002 *5 13365-6X102 *5 13365-6X202

*1 disables brush motor
*2 use only 07906-60108 for field replacement
*3 requires two nylon washers (2190-0338) if used with 07905-60021 spindle see service note 7905A-21
*4 use only 13365-6X101 for field replacement - see service note 7906H-07
*5 use only 13365-6X202 for field replacement

4-1. POWER SUPPLY VOLTAGES

See figure 6-1 to verify secondary voltages on PMR board (PCA-A8).

4-2. FAULT INDICATORS

Table 4-1 decodes the front panel fault indicators and LED's.

Table 4-1. Status Lights & LED's

INDICATOR/ INDICATION	CIRCUIT DESCRIPTION	FUNCTIONAL SYSTEM*
Unit Select Identification indicator	Indicator is lit when both of the following conditions are met: a. Control bus bits C0 through C2 match signals US0 through US2 from UNIT SELECT switch S3. b. Unit Select flip-flop set. [ADU (Address Unit) signal selected on tag bus while STROBE signal is active sets flip-flop.]	I/O Control System A2 I/O Sector A4 Control A9 Indicator
PROTECT UPPER/LOWER DISC indicator	Indicator is lit when UPPER PROTECT/LOWER PROTECT switch is set to DISC PROTECT.	Read/Write System A9 Indicator A2 I/O Sector
DOOR UNLOCKED indicator	Indicator is lit when all of the following conditions are met (door lock solenoid energized): a. RUN/STOP switch set to STOP. b. Carriage fully retracted. c. Spindle stopped.	Spindle Rotating System A9 Indicator A4 Control A8 PMR
DRIVE READY indicator	Indicator is lit when all of the following conditions are met: a. AGC (Automatic Gain Control) signal active. b. SB (Servo Balanced) signal active. c. TTO (Temperature Timeout) signal active.	Head Positioning System A3 Servo A4 Control A5 Track Follower A8 PMR
DRIVE FAULT indicator	Indicator is lit when any one of the following nine drive faults occur: TO Timeout ILF Interlock Fault W•$\overline{AR}$ Write AND no Access Ready AGCF AGC Fault R•W Read AND Write together CBF Carriage Back Fault W•$\overline{AC}$ Write AND no ACW signal $\overline{W}$•DC No Write AND DCW present MH Multiple Heads selected	Fault Detection System A4 Control A6 Preamp See breakdown following

*Suspect PCA's are listed in order of probability; non-PCA causes are not listed.

Table 4-1. Status Lights & LED's (cont'd)

INDICATOR/ INDICATION	CIRCUIT DESCRIPTION	FUNCTIONAL SYSTEM*
IL drive fault indication (green LED)	LED is lit when any one of the following conditions is met: a. 25 Vac, +36 Vdc, +12 Vdc, +5 Vdc, -12 Vdc, -24 Vdc or -36 Vdc power source below tolerance or missing (fuse blown). b. PCA-A2, A3, A4, A5, or A6 improperly seated. c. PCA-A8 or A10 has improper wiring connection. d. Track formatter PCA and PCA-A2 both present in drive. e. Temperature switch on PCA-A8 is open.	Fault Detection System. Routed through all PCA's. Circuits on A4 Control.
AGC drive fault indication (yellow, red LED's)	LED's are lit when the AGC signal becomes inactive while the heads are loaded and are not doing a seek home.	Fault Detection System A3 Servo A4 Control A5 Track Follower
CB drive fault indication (yellow LED)	LED is lit when CRB (Carriage Back) and DRDY (Drive Ready) signals active.	Fault Detection System A4 Control
W•$\overline{AR}$ drive fault indication (yellow, green LED's)	LED's are lit when drive is in write mode and ACRY (Access Ready) signal inactive.	Fault Detection System A4 Control A3 Servo A5 Track Follower
R•W drive fault indication (green, red LED's)	LED's are lit when URG (Unselected Read Gate) signal active AND WRITE signal active.	Fault Detection System A2 I/O Sector A4 Control
W•$\overline{AC}$ drive fault indication (yellow, green, red LED's)	LED's are lit when drive is in write mode but no data signal present.	Fault Detection System A4 Control A6 Preamp
MH drive fault indication (red, red LED's)	LED's are lit when more than one head is selected for reading or writing.	Fault Detection System A6 Preamp A4 Control
$\overline{W}$•DC drive fault indication (red, red, yellow LED's)	LED's are lit when DC current is supplied to head drivers and drive is not in write mode.	Fault Detection System A6 Preamp A4 Control
T drive fault indication (red LED)	LED is lit if the heads are not settled on the addressed cylinder (ACRY signal active) within 90 milliseconds after the SK signal becomes active. LED is also lit if either: a. Carriage has not reached the retracted position [CRB (Carriage Back) signal active] within 1.25 seconds after RET (retrack) signal becomes active. b. Heads are not settled on cylinder 0 within 1.25 seconds after the RET or $\overline{RH}$ signal becomes inactive.	Fault Detection System A3 Servo A4 Control

Table 4-1. Status Lights & LED's (cont'd)

INDICATOR/ INDICATION	CIRCUIT DESCRIPTION	FUNCTIONAL SYSTEM
Spindle starts to rotate from a stationary state	Spindle rotation occurs when all of the following conditions are met: a. Cartridge in place and door locked. b. No IL or TO drive fault. c. RUN/STOP switch set to RUN. d. Carriage fully retracted (CRB).	Spindle Rotating System A4 Control A8 PMR A10 Encoder
Spindle continues to rotate	Once started, the spindle continues to rotate as long as carriage is not fully retracted and ILF (Interlock Fault) signal inactive.	Spindle Rotating System A4 Control A8 PMR A10 Encoder
Heads seek to cylinder 0 (home) from the retracted position	During a power-up operation, the heads seek home when the RET (Retract) signal becomes inactive. This occurs when the $\overline{\text{SPU}}$ (Spindle Speed Up) signal becomes active.	Head Positioning System A4 Control A8 PMR A3 Servo A5 Track Follower
Heads seek from one cylinder to another	The heads seek from one cylinder to another provided all of the following conditions are met: a. Heads are settled on a cylinder [ACRY (Access Ready) signal active]. b. The SK (Seek Command) signal from the controller is present. c. The address to which the heads are to seek is not an illegal one (> 410).	Head Positioning System A4 Control A3 Servo A2 I/O Sector A5 Track Follower

4-3. PCA FUNCTIONS

The following list shows the circuits associated with each PCA. For input/output signals and mnemonic definitions, refer to section X.

A2 I/O SECTOR:

Control bus transceivers
Tag bus decoders
Status registers
Sector counters & compare
Seek check & 1st status
Detect logic

A3 SERVO:

AGC fault logic
Cylinder counter logic
Track center detect
Head load/unload logic
Velocity amp
TAC buffer
Servo logic & amp
ICA Detector

A4 CONTROL:

Run spindle logic
Brush & door lock logic
Drive ready logic
Attention logic
Servo control logic
Fault & status logic
Interlock fault detect
Timeout counter

A5 TRACK FOLLOWER

Servo code preamp
Peak detect
Phase lock loop
Offset generator
Head select
Lower disc index detect
AGC integrator/comparator
Position amplifier
Temperature compensation
Offset circuits

A6 R/W PREAMP:

Head select enable
Read data enable
Write data enable
Decrease write current
AC/DC Write current sense
Read preamp

A8 PMR:

3 MHz oscillator
Speed up/down detect
Phase comparator
Motor commutation logic
Spindle power amps
Interlock fault logic
Emergency retract circuit
Servo enable delay
Linear motor amp
Carriage solenoid driver
Brush motor driver
Door latch driver
Sec. voltage regulators

4-4. DSU FUNCTIONS

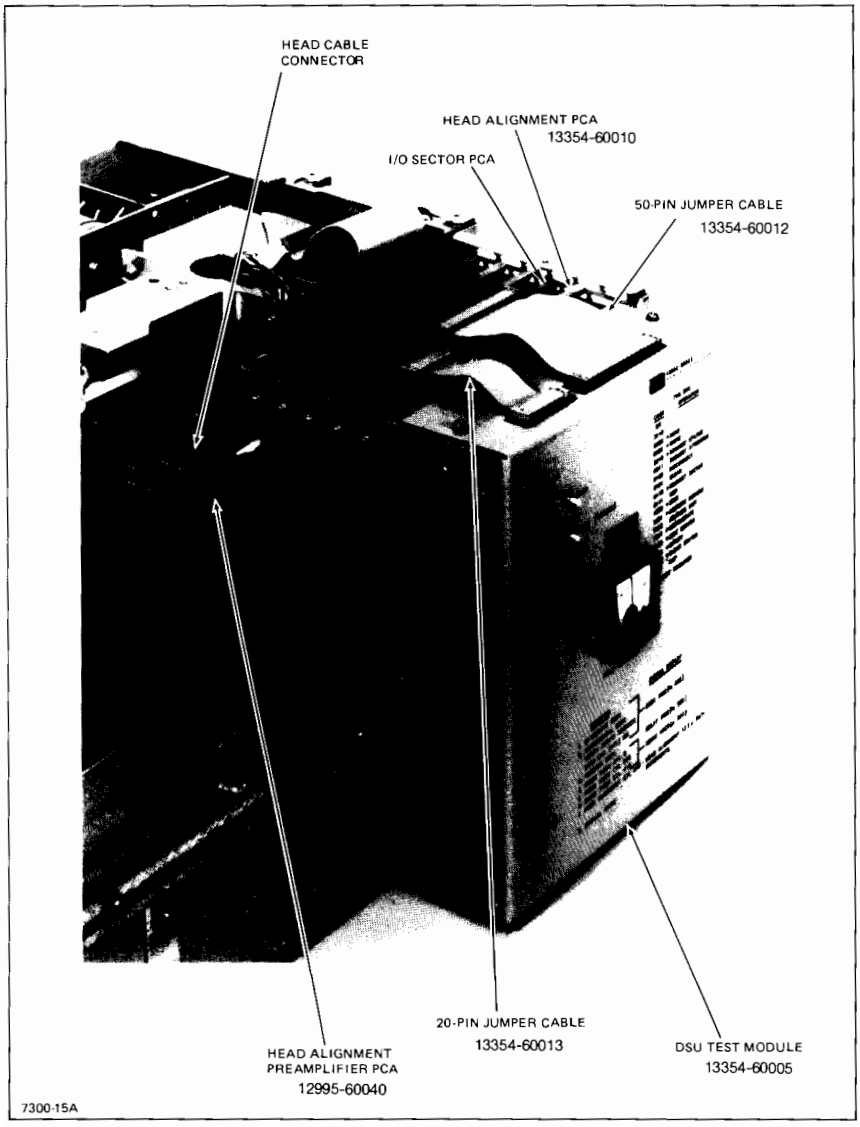


Figure 4-1. DSU Installed

Table 4-2. DSU Functions 1, 2, 3, & 8

CONTROL/ INDICATOR	FUNCTION
	Function No. 1 — Alternate Seek
FUNCTION switch	Selects automatic Alternate Seek function (position 1).
START (STROBE) pushbutton	Starts operation of Alternate Seek function. Heads first seek to cylinder 0, then to the cylinder address selected on the upper bank of ten toggle switches, and then alternately between this address and the cylinder address selected on the lower bank of ten toggle switches. If either selected address is an illegal one (greater than 410), the heads seek to the legal address and remain there. If both addresses are illegal, no seek is performed.
STOP pushbutton	Stops operation of Alternate Seek function. Heads seek to cylinder 0 (home) and remain there.
Upper bank of 10 toggle switches (1 thru 512)	Select cylinder address to which heads seek after leaving cylinder 0.
Lower bank of 10 toggle switches (1 thru 512)	Select cylinder address to which heads seek after leaving cylinder address selected by upper bank of 10 toggle switches.
DELAY control	Selects time interval between seeks.
3-digit display	Indicates time interval for seek. Readout is in milliseconds.
	Function No. 2 — Incremental Seek
FUNCTION switch	Selects automatic Incremental Seek function (position 2).
START (STROBE) pushbutton	Starts operation of Incremental Seek function. Heads first seek to cylinder 0 and then to next address. Next address is determined by adding the numbers selected by the lowest nine (1 thru 256) switches on the lower bank of ten toggle switches. Incremental seeking of the heads to the next address continues until a next address greater than 410 is reached. When this occurs, the programmed next address number is subtracted from the preceding valid next address (410 or less), causing decremental seeking to the next address until cylinder 0 is reached. The heads continue this incremental and decremental seek action until the STOP pushbutton is pressed.
STOP pushbutton	Stops operation of Incremental Seek function. Heads seek to cylinder 0 (home) and remain there.
Lower bank of 9 toggle switches (1 thru 256)	Select amount by which current cylinder address is incremented (or decremented) for next seek.
DELAY control	Selects time interval between seeks.
3-digit display	Indicates time for seek. Readout is in milliseconds.
	Function No. 3 — Random Seek
FUNCTION switch	Selects automatic Random Seek function (position 3).
START (STROBE) pushbutton	Starts operation of Random Seek function. Heads first seek to cylinder 0 and then to cylinder addresses generated by the DSU in a pseudo-random sequence.
	Function No. 3 — Random Seek (Continued)
STOP pushbutton	Stops operation of Random Seek function. Heads seek to cylinder 0 (home) and remain there.
DELAY control	Selects time interval between seeks.
3-digit display	Indicates time interval between seeks. Readout is in milliseconds.

Table 4-2. DSU Functions 1,2,3, & 8 (cont'd)

CONTROL/ INDICATOR	FUNCTION
	Function No. 8 — Manual Mode
FUNCTION switch	Selects Manual mode of operation (position 8).
START (STROBE) pushbutton	When pressed, activates STROBE signal applied to the tag bus decoder in I/O Control PCA-A2. This executes the command selected by tag bus switches 64 through 512 on the upper bank of 10 toggle switches. The STROBE signal is active as long as the START (STROBE) pushbutton is held down.
Upper 4 toggle switches (64 thru 512)	Select input command to be supplied on tag bus to drive. The toggle switch settings and the associated input commands are listed on the upper right-hand corner of the DSU front panel. The DSU does not issue a Write command.
T0 thru T3 LED indicators	Indicate the state of the tag bus bits (input command) selected by the upper 4 toggle switches (64 through 512).
Lower bank of 16 toggle switches (1 thru 512 and 1 thru 32)	Select state of control bus bits C0 through C15 for the following tag bus commands. Bits are strobed into the drive when the START (STROBE) pushbutton is pressed.
	Command / **Control Bits**
	Address Record (ADR) — 1001 — C0 thru C5: Select sector address to be stored in drive Sector Address register.
	C8 and C9: Select head identity to be stored in drive Head register.
	Address Unit (ADU) — 1010 — C0 thru C2: Select identity of drive to be enabled for communication with DSU. (The identity of the drive is the number selected on the UNIT SELECT switch on the drive operator panel.)
	Clear Status (CLS) — 1110 — C0: Clears three Attention flip-flops in drive. This deactivates First Status signal. Note: If C0 and C1 are both selected, the Attention flip-flops and the First Status flip-flop are cleared.
	Seek (SK) — 1000 — C0 thru C8: Select cylinder address to which heads are to seek.
	Set Offset (SOF) — 1101 — C0 thru C5: Select offset magnitude in 53 increments of 25 microinches each.
	C6: Selects direction (+ or −) of offset.
	Transmit Sector (XMS) — 1100 — C0 thru C5: Select sector address to be stored in drive Sector Address register.
C0 thru C15 LED indicators	a. Indicate the state of the control bus bits selected by the lower band of 16 toggle switches when any one of the preceding six commands is selected. b. Indicate the status of the drive when any one of the following commands is selected: Read (READ) — 0000 Write (WRITE) — 0001 Request Status (RQS) — 0010

Table 4-2. DSU Functions 1,2,3, & 8 (cont'd)

CONTROL/ INDICATOR	FUNCTION
	Function No. 8 — Manual Mode (Continued) Coding for the LED's is as follows. With the exception of C0 (ACRY), a lighted LED indicates that the corresponding signal is active. C0, when lighted, indicates that signal ACRY is inactive. C0 — ACRY (Access Ready) C1 — DRDY (Drive Ready) C2 — Illegal sector selected or seek check C3 — First Status C4 — FLT (Fault) C5 — Format C6 — PRT (Protect) C7 — AT (Attention) C8 — SC (Sector Compare) C9 — Ground C10 — Drive Type C11 through C15 — Not used c. Indicate position information when Request Position (RQP) command is selected. Coding for the LED's is as follows: C0 thru C5 — Sector presently under selected head. C6 — RRT (Protect) C7 — AT (Attention) C8 and C9 — Identity of selected head (0 thru 3) C10 — Drive type C11 thru C15 — Not used

4-5. TROUBLESHOOTING FLOWCHARTS

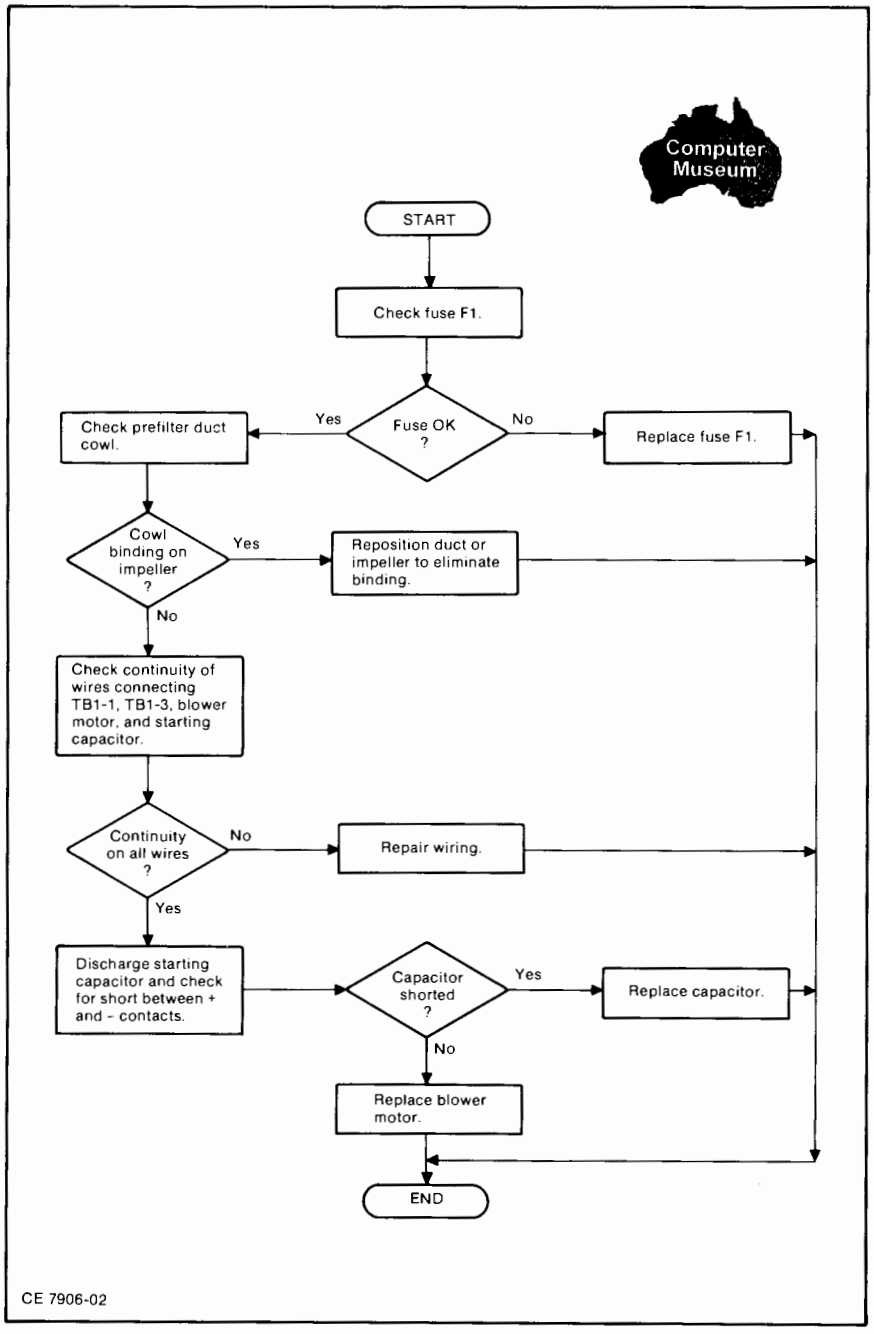


Figure 4-2. Blower Troubleshooting Flowchart

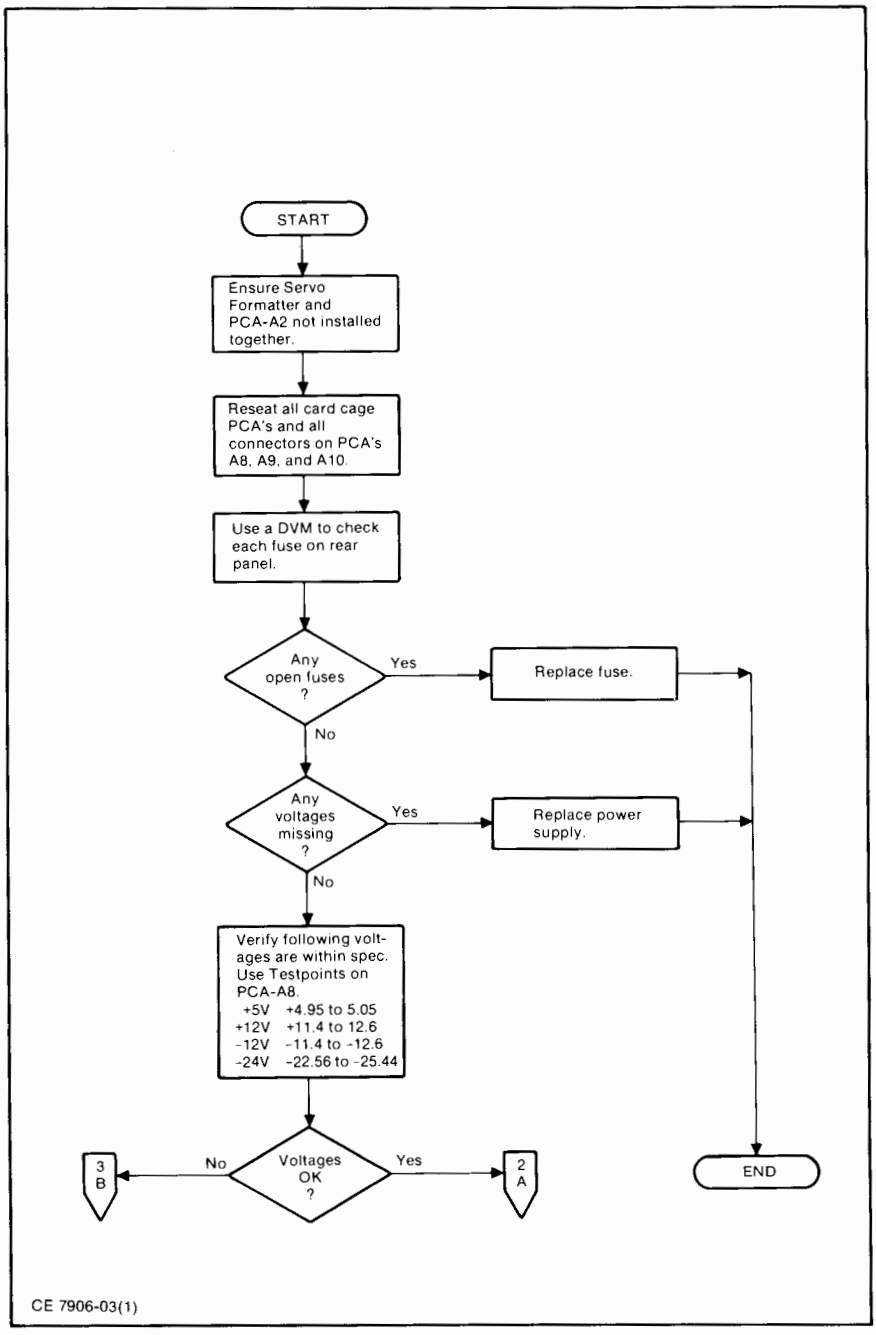


Figure 4-3. IL Drive Fault Indicator Troubleshooting Flowchart (1 of 3)

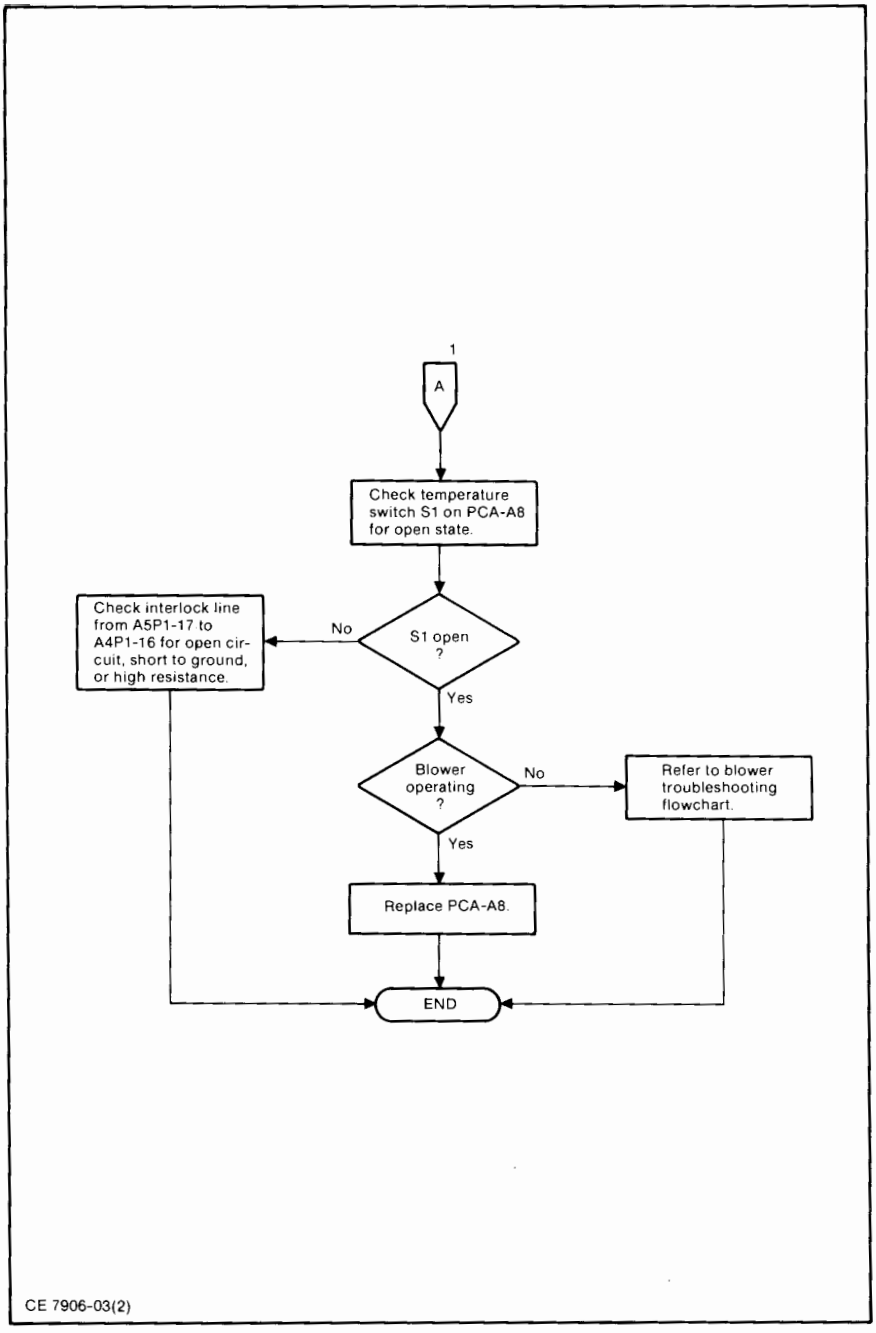


Figure 4-3. IL Drive Fault Indicator Troubleshooting Flowchart (2 of 3)

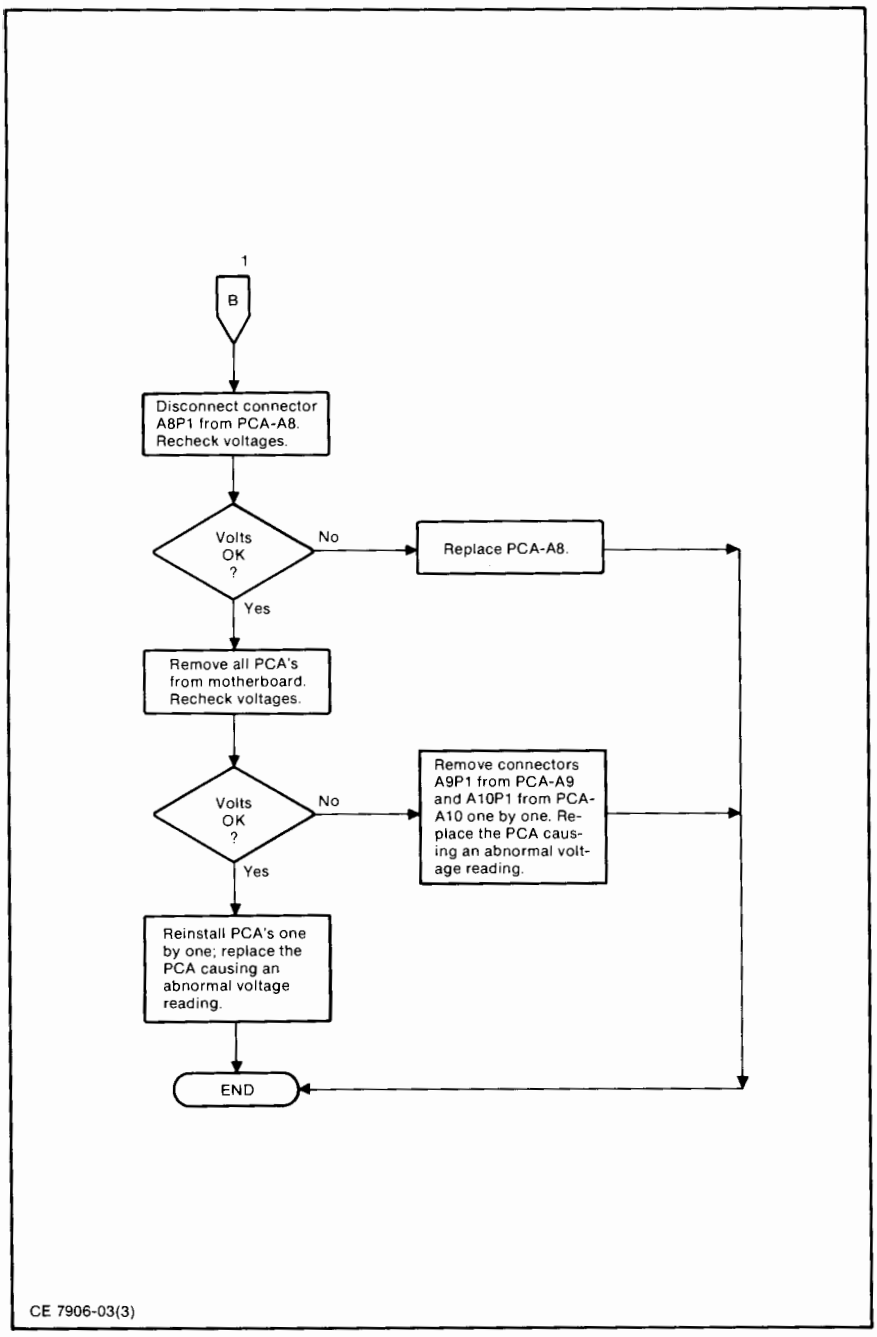


Figure 4-3. IL Drive Fault Indicator Troubleshooting Flowchart (3 of 3)

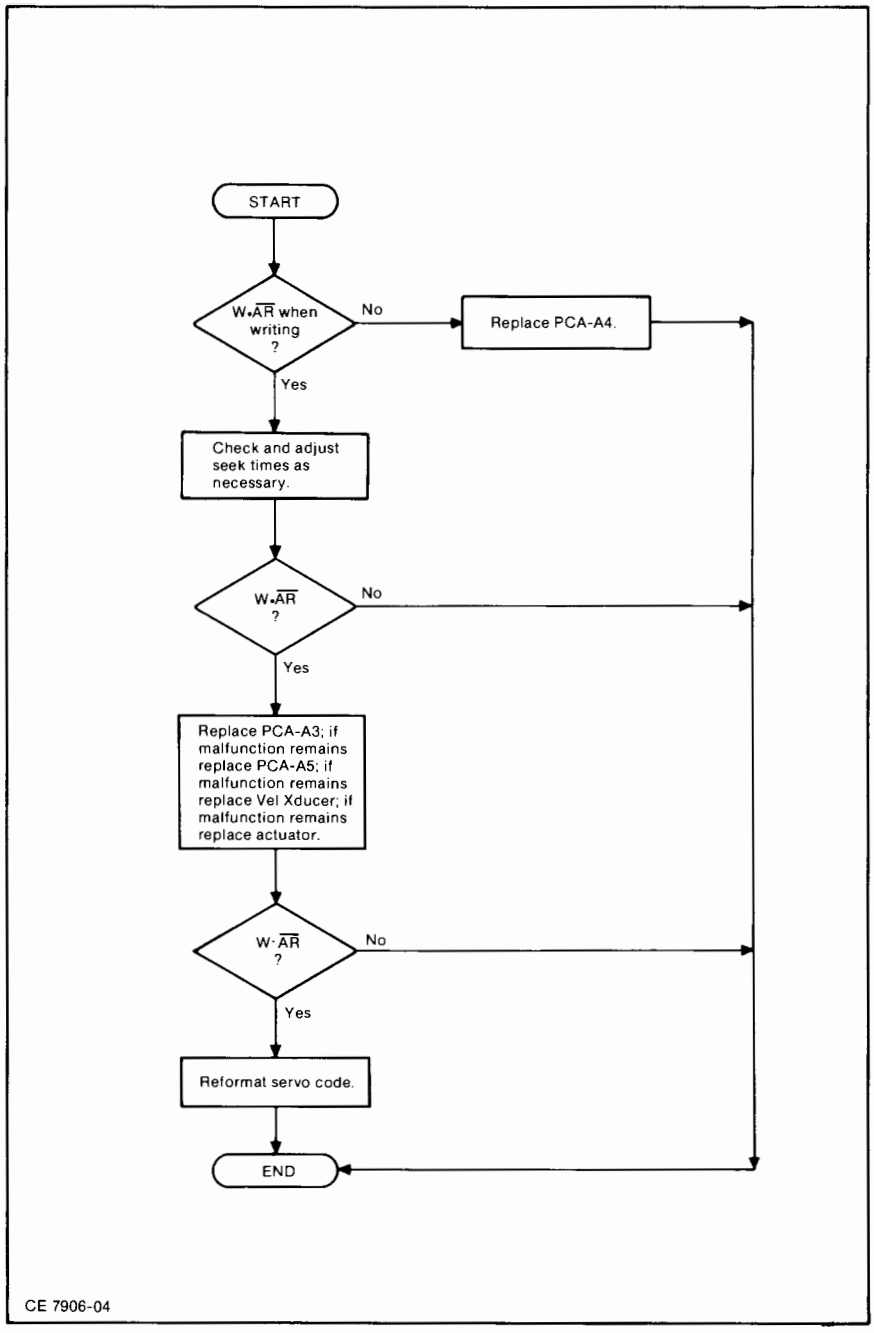


Figure 4-4. W•$\overline{AR}$ Drive Fault Indicator Troubleshooting Flowchart

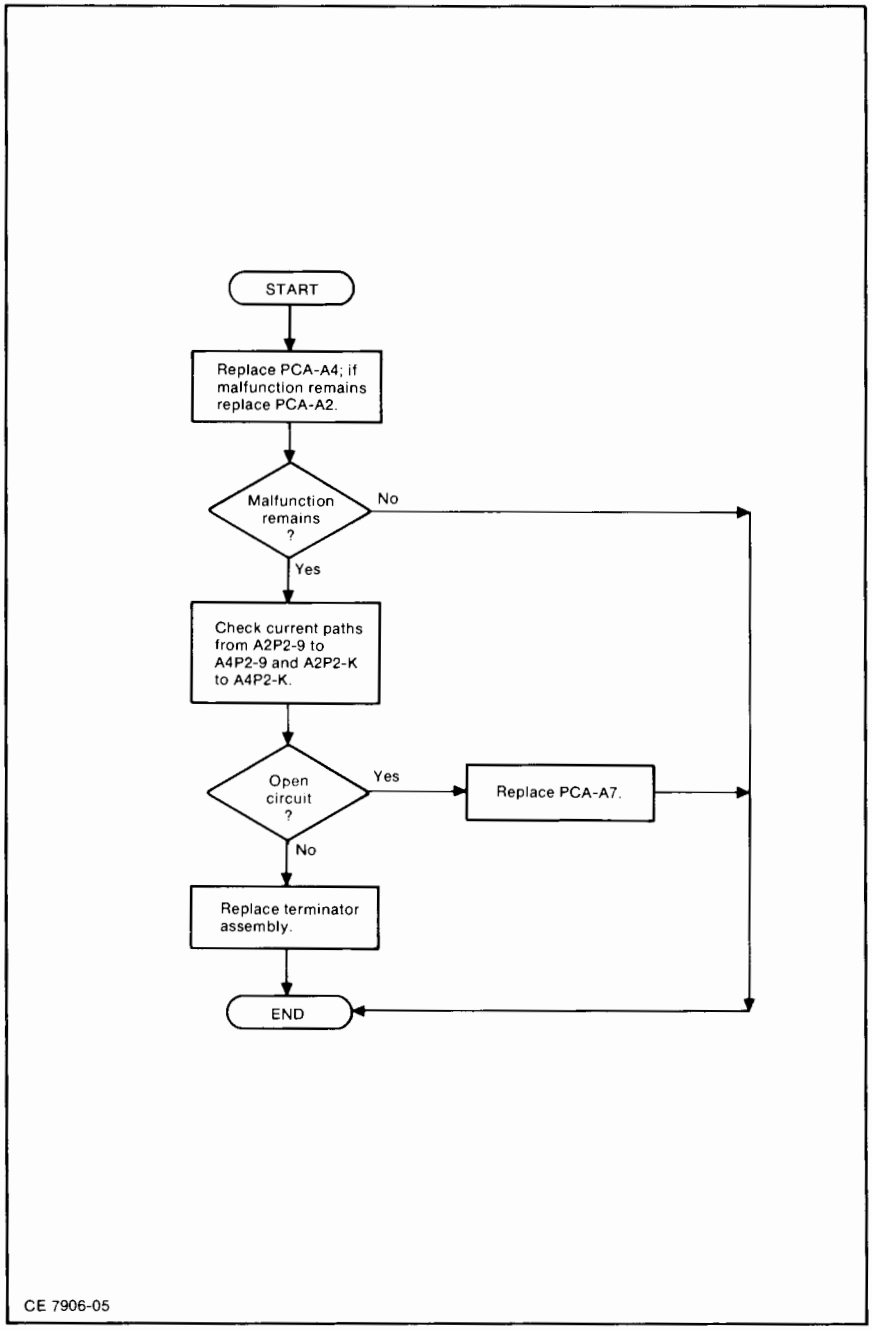


Figure 4-5. R•W Drive Fault Indicator Troubleshooting Flowchart

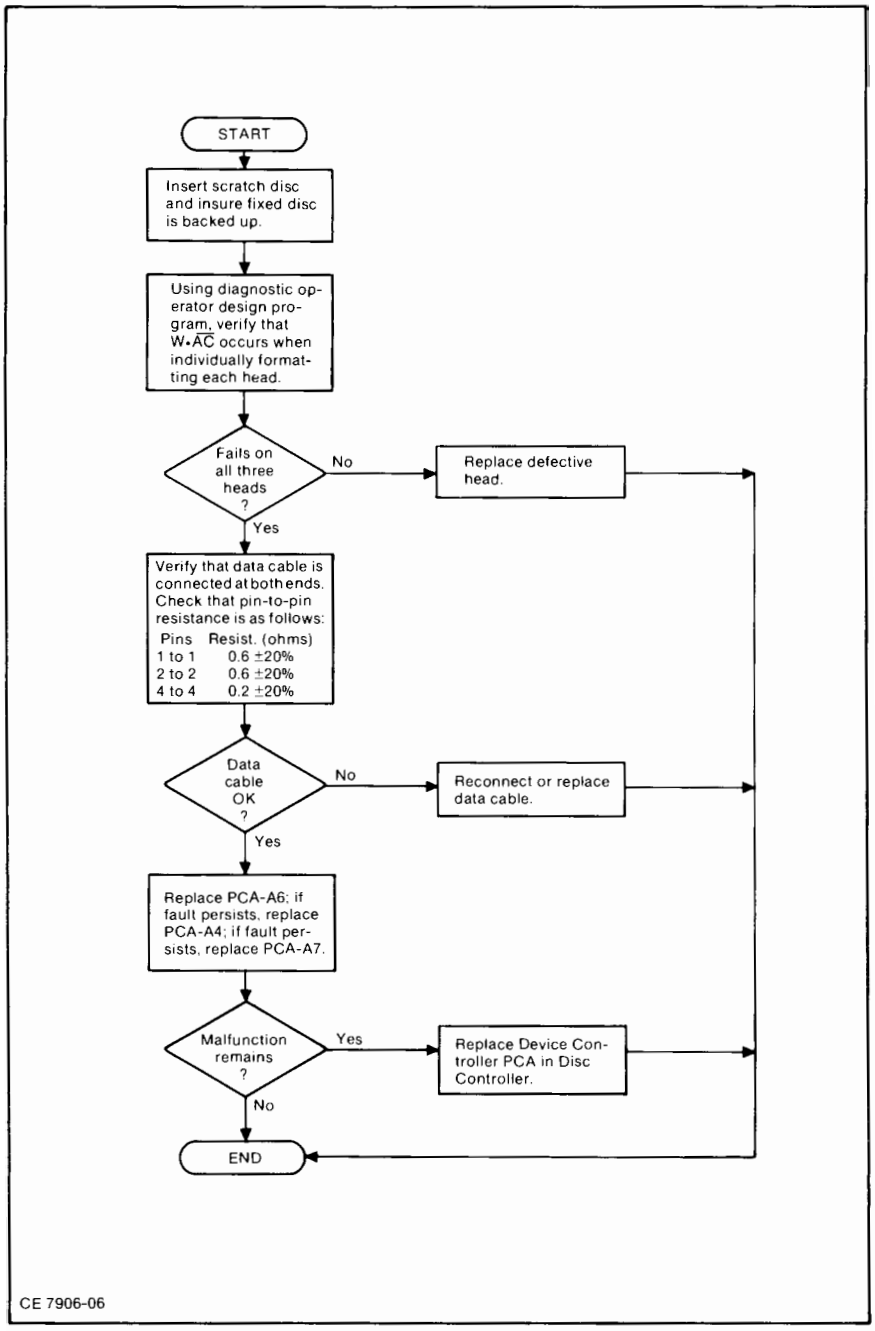


Figure 4-6. W• $\overline{AC}$ Drive Fault Indicator Troubleshooting Flowchart

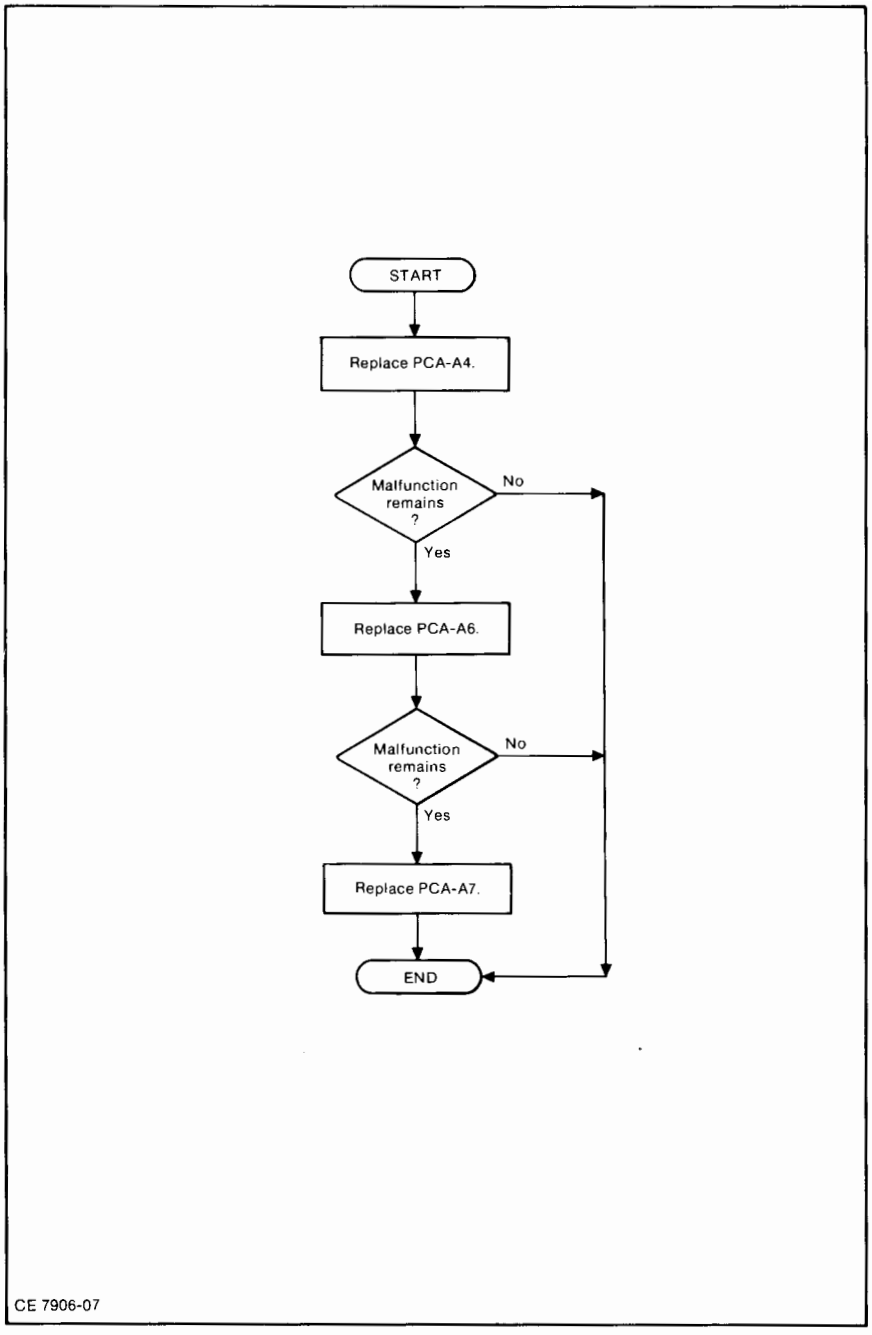
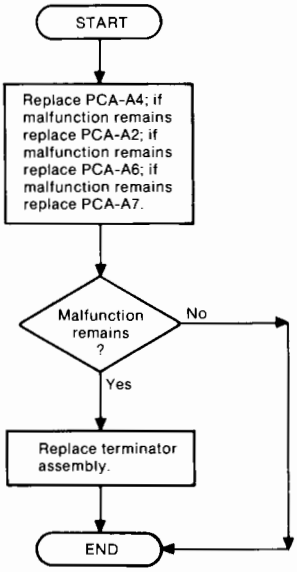
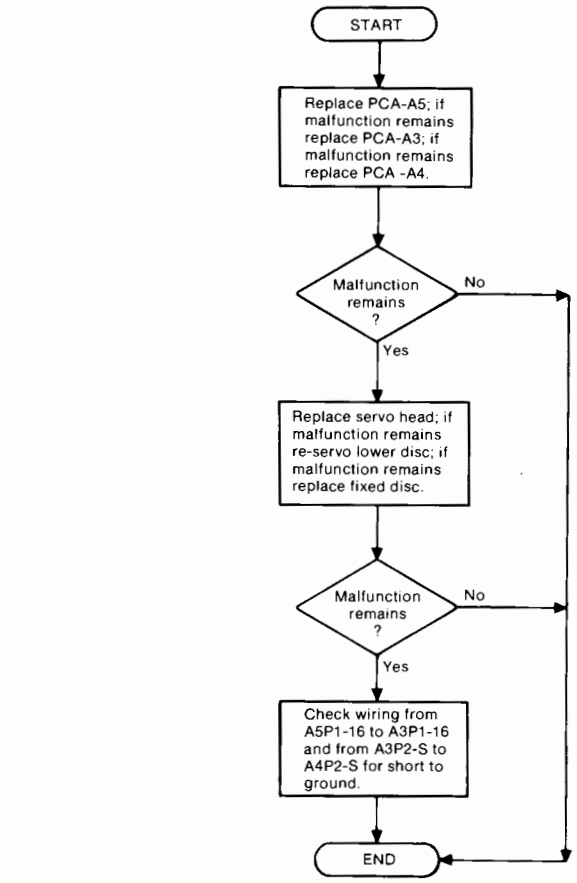


Figure 4-7. MH Drive Fault Indicator Troubleshooting Flowchart



CE 7906-08

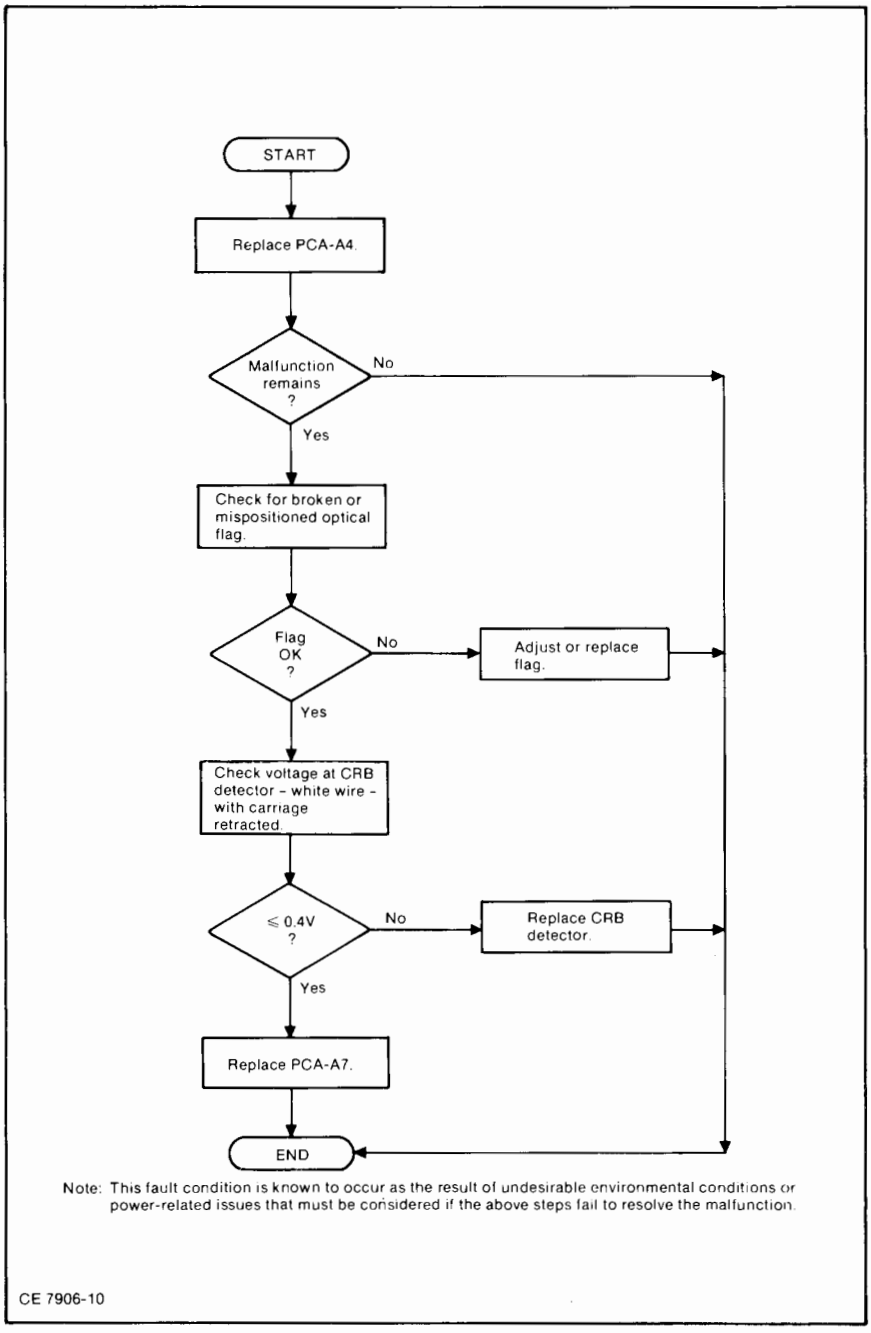
Figure 4-8. $\overline{W}$•DC Drive Fault Indicator Troubleshooting Flowchart



Note: This fault condition is known to occur as the result of undesirable environmental conditions or power-related issues that must be considered if the above steps fail to resolve the malfunction.

CE 7906-09

Figure 4-9. AGC Drive Fault Indicator Troubleshooting Flowchart



Note: This fault condition is known to occur as the result of undesirable environmental conditions or power-related issues that must be considered if the above steps fail to resolve the malfunction.

CE 7906-10

Figure 4-10. CB Drive Fault Indicator Troubleshooting Flowchart

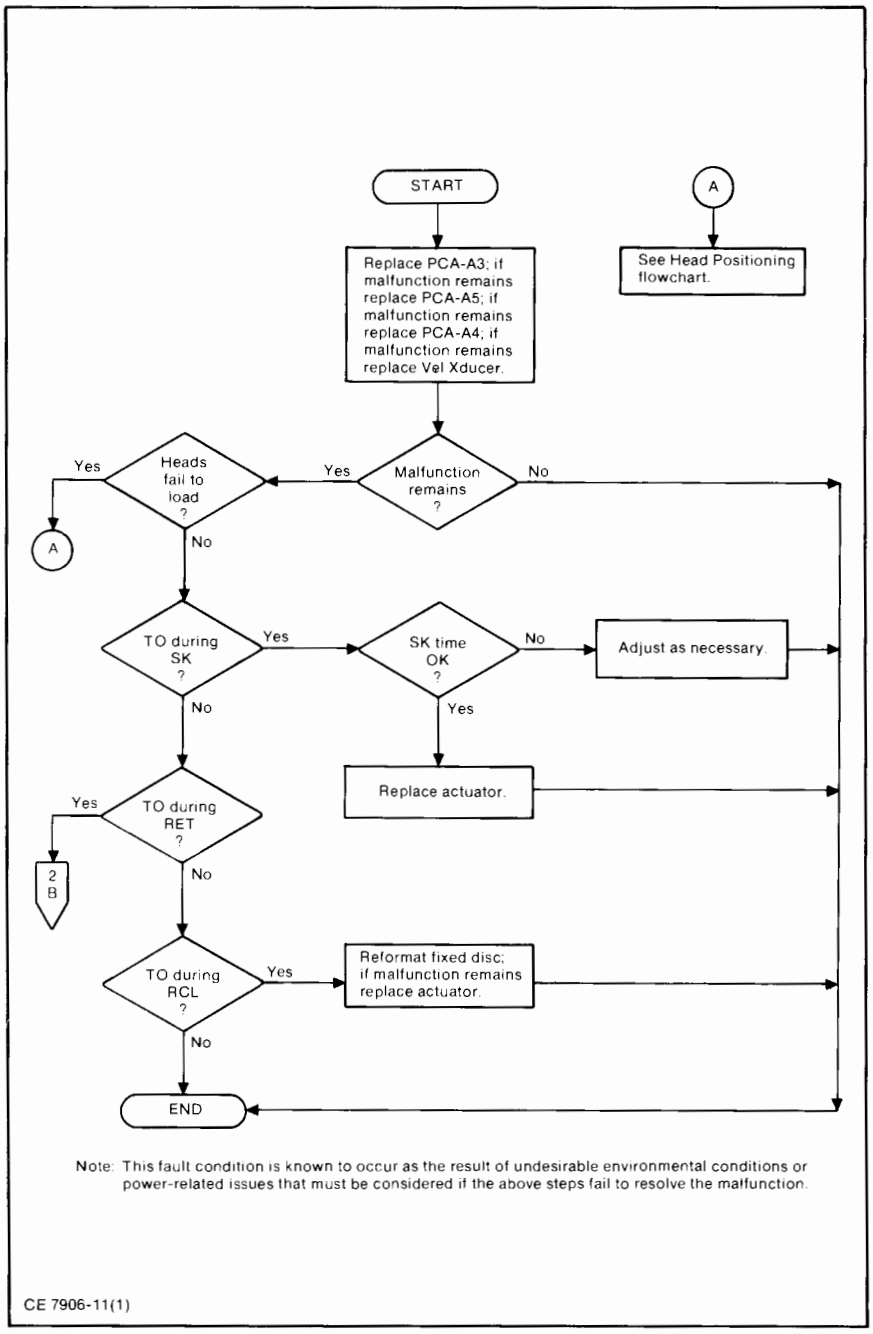


Figure 4-11. T.O. Drive Fault Indicator Troubleshooting Flowchart (1 of 2)

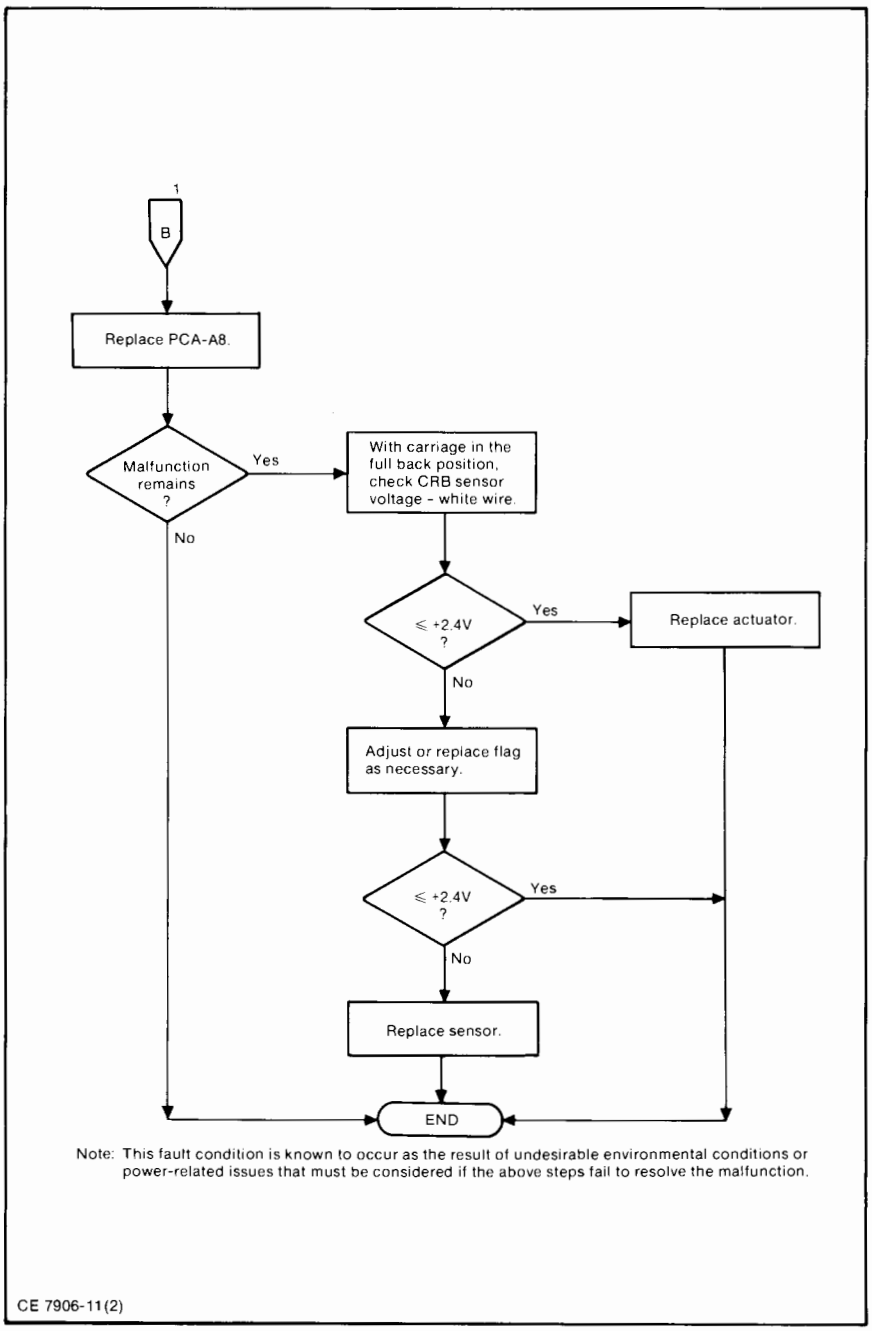


Figure 4-11. T.O. Drive Fault Indicator Troubleshooting Flowchart (2 of 2)

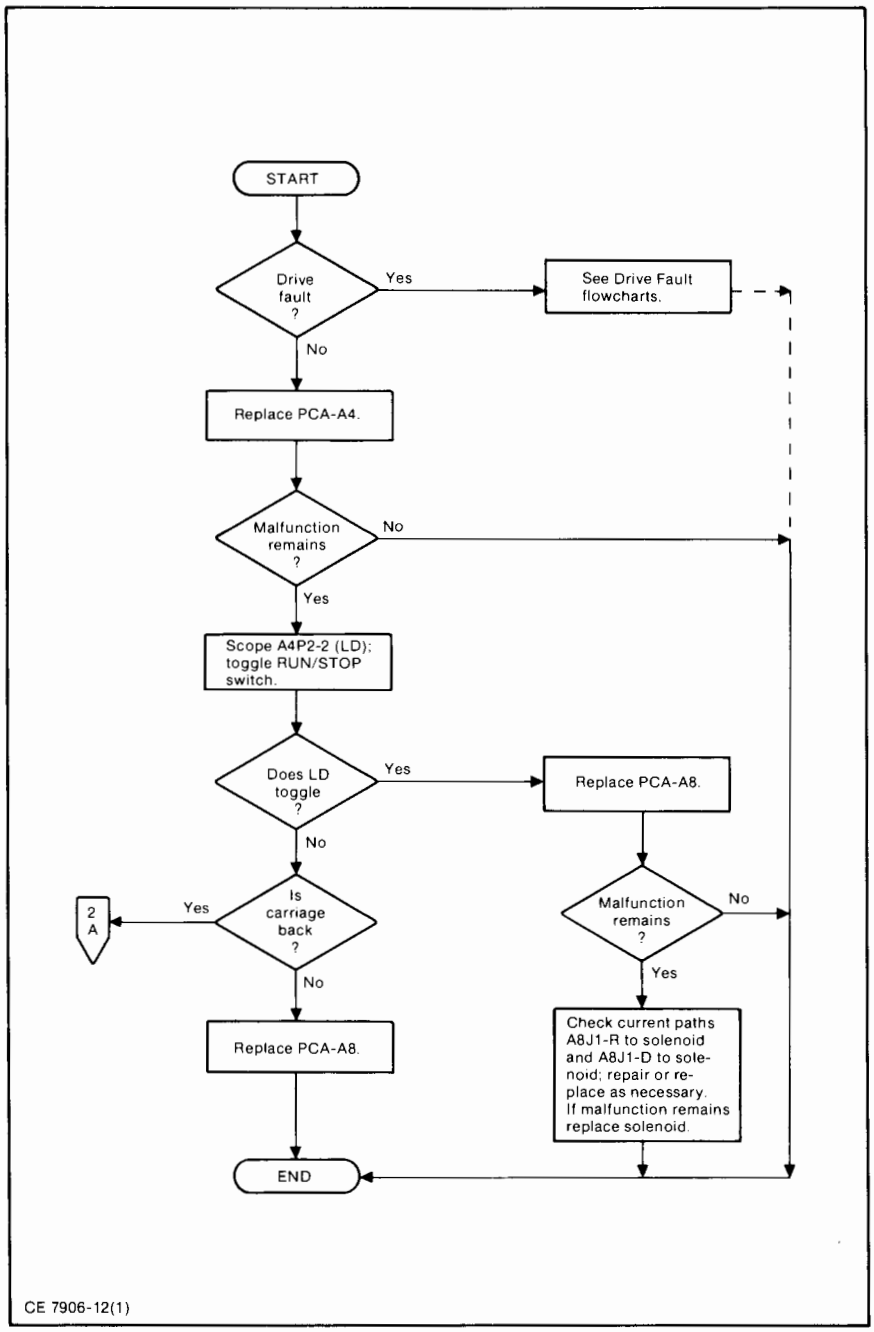


Figure 4-12. Door Lock Solenoid Troubleshooting Flowchart (1 of 2)

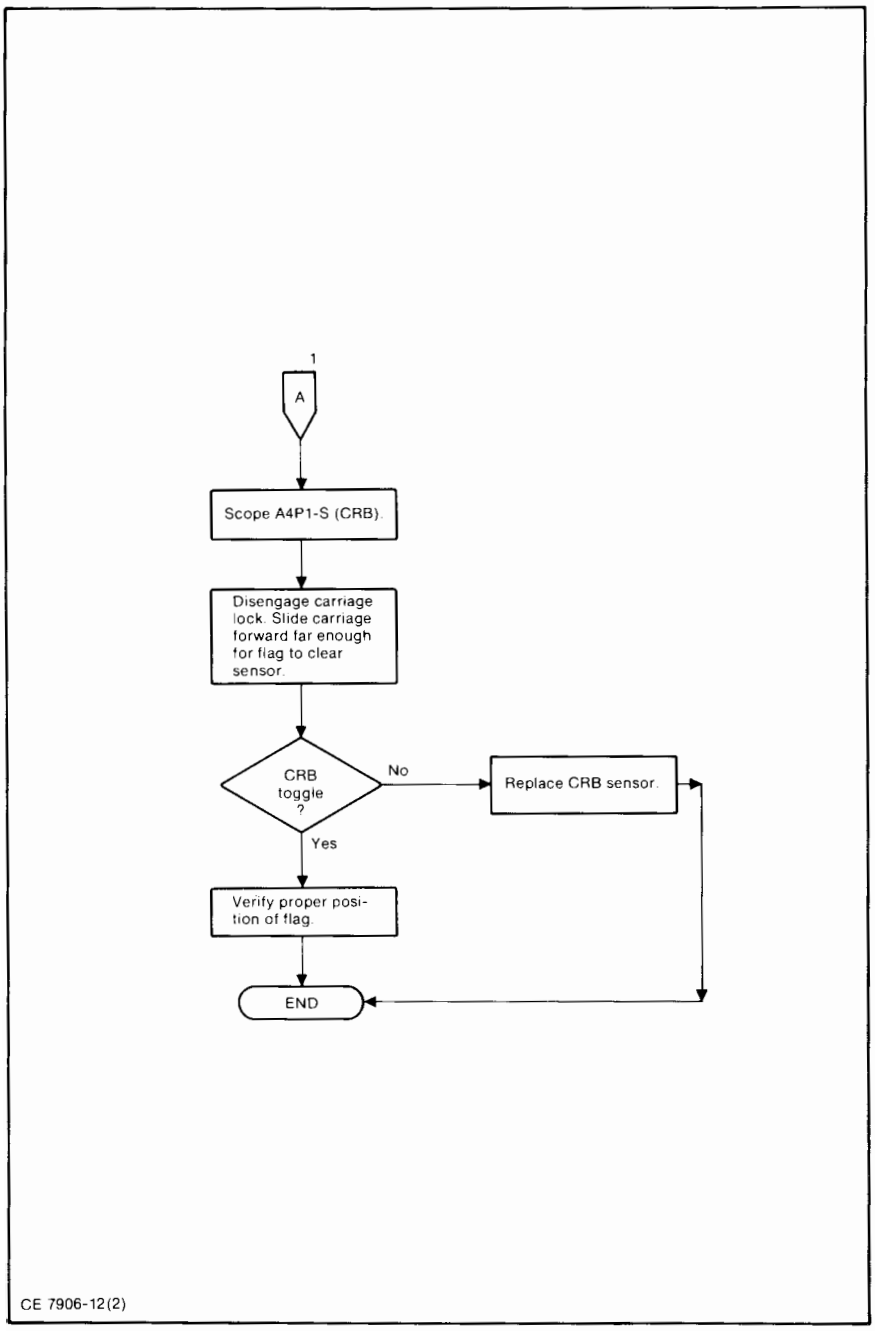


Figure 4-12. Door Lock Solenoid Troubleshooting Flowchart (2 of 2)

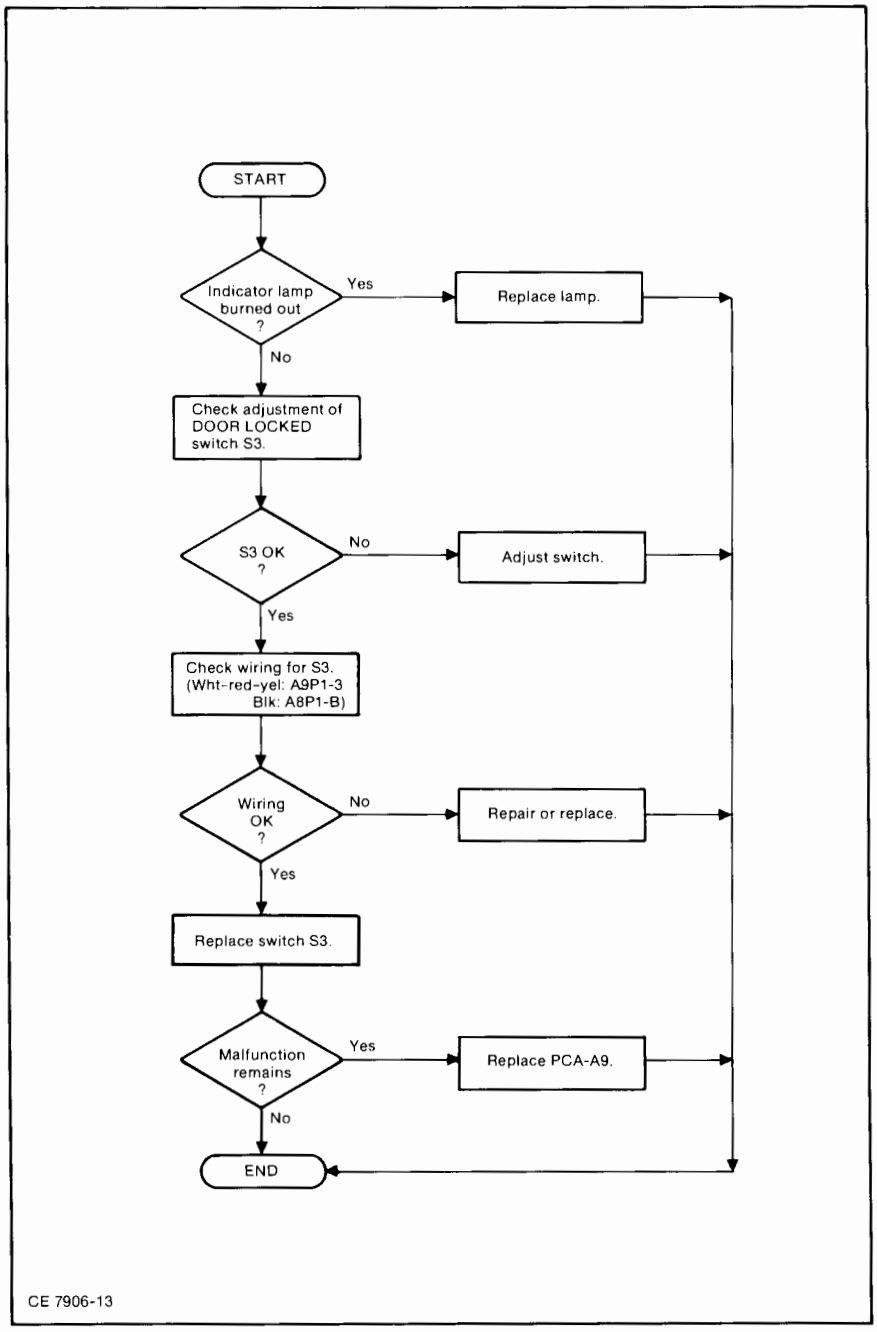


Figure 4-13. DOOR UNLOCKED Indicator Troubleshooting Flowchart

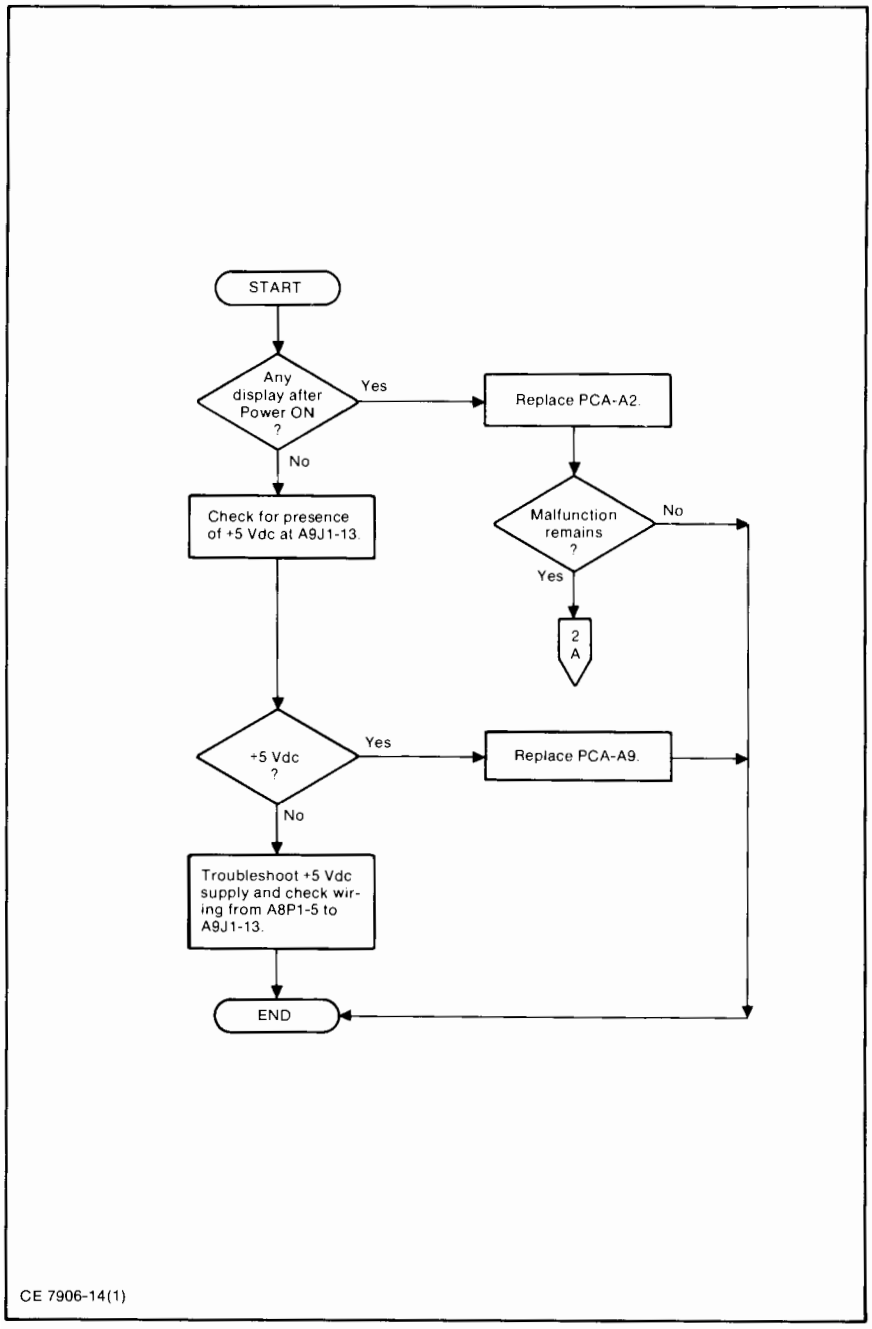


Figure 4-14. Unit Select Indicator Troubleshooting Flowchart (1 of 2)

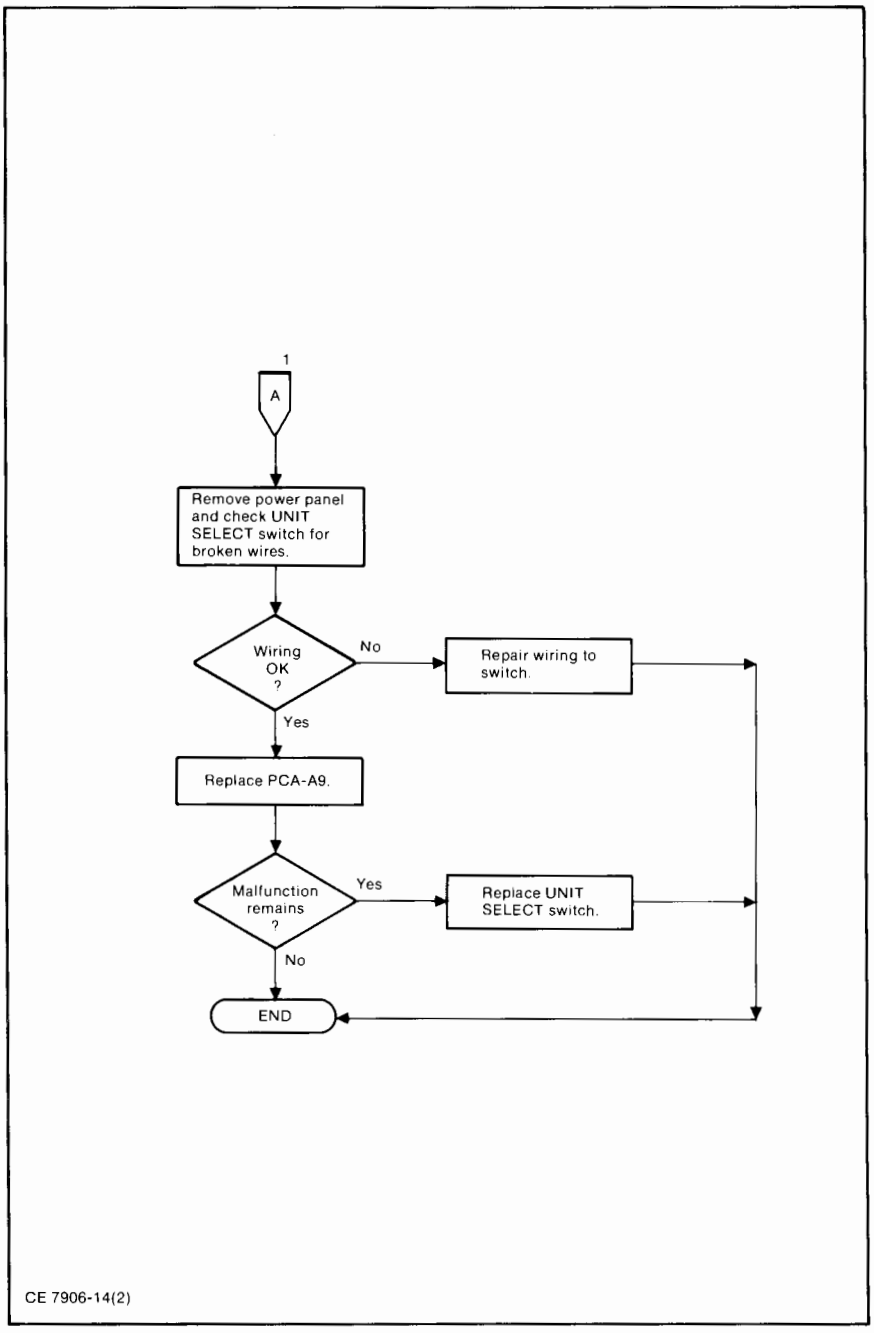


Figure 4-14. Unit Select Indicator Troubleshooting Flowchart (2 of 2)

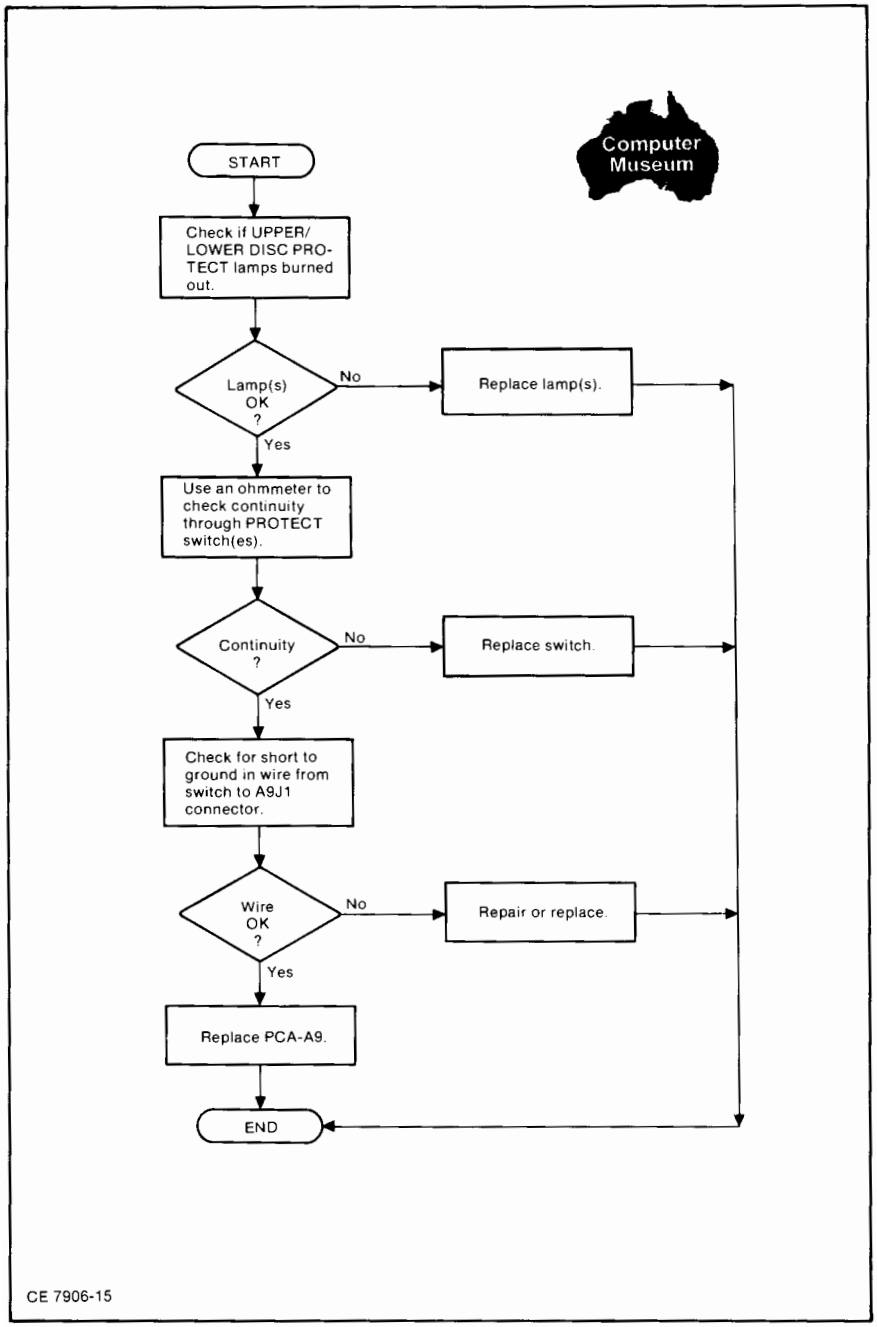


Figure 4-15. DISC PROTECT Indicator Troubleshooting Flowchart

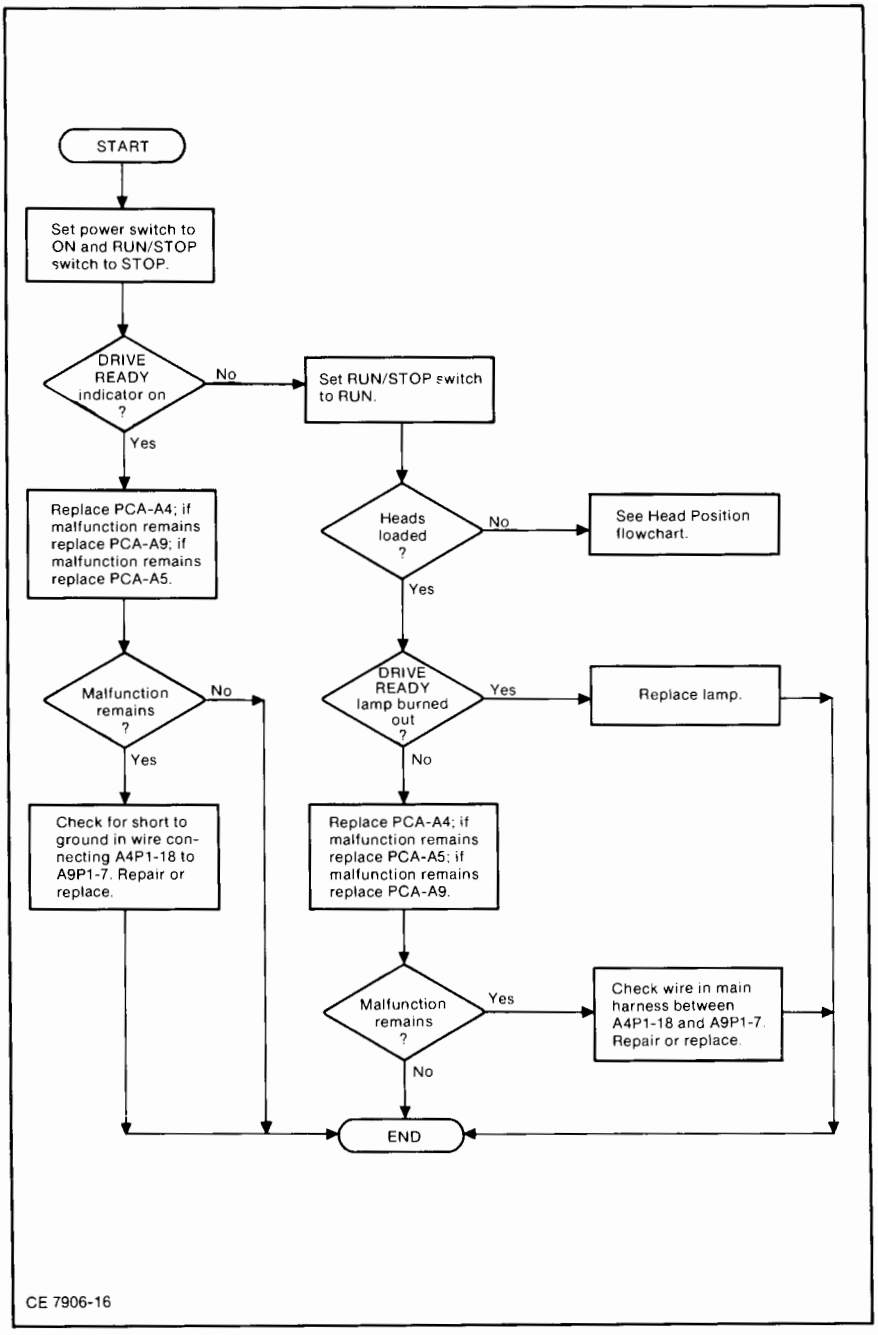


Figure 4-16. DRIVE READY Indicator Troubleshooting Flowchart

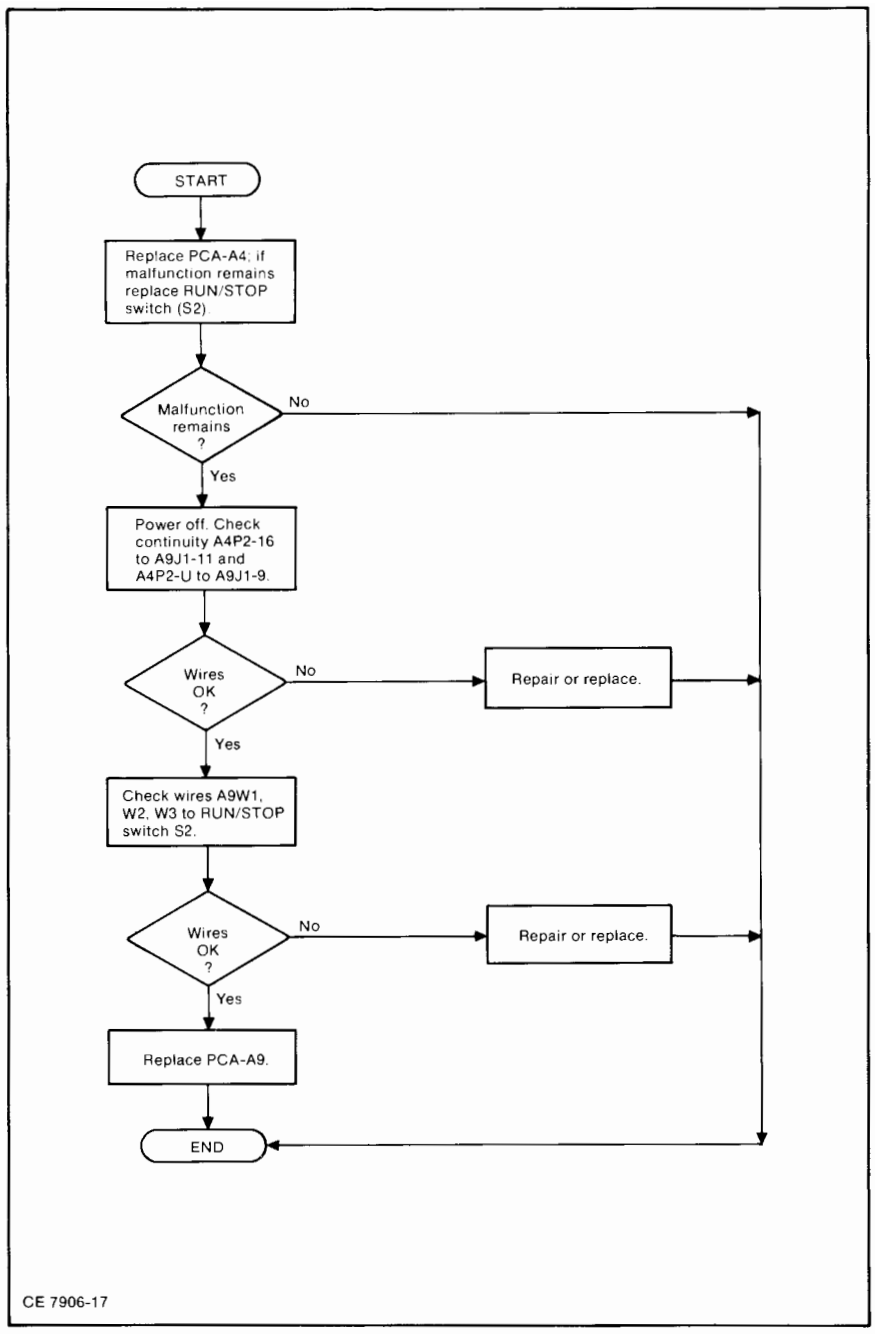


Figure 4-17. RUN/STOP Switch Troubleshooting Flowchart

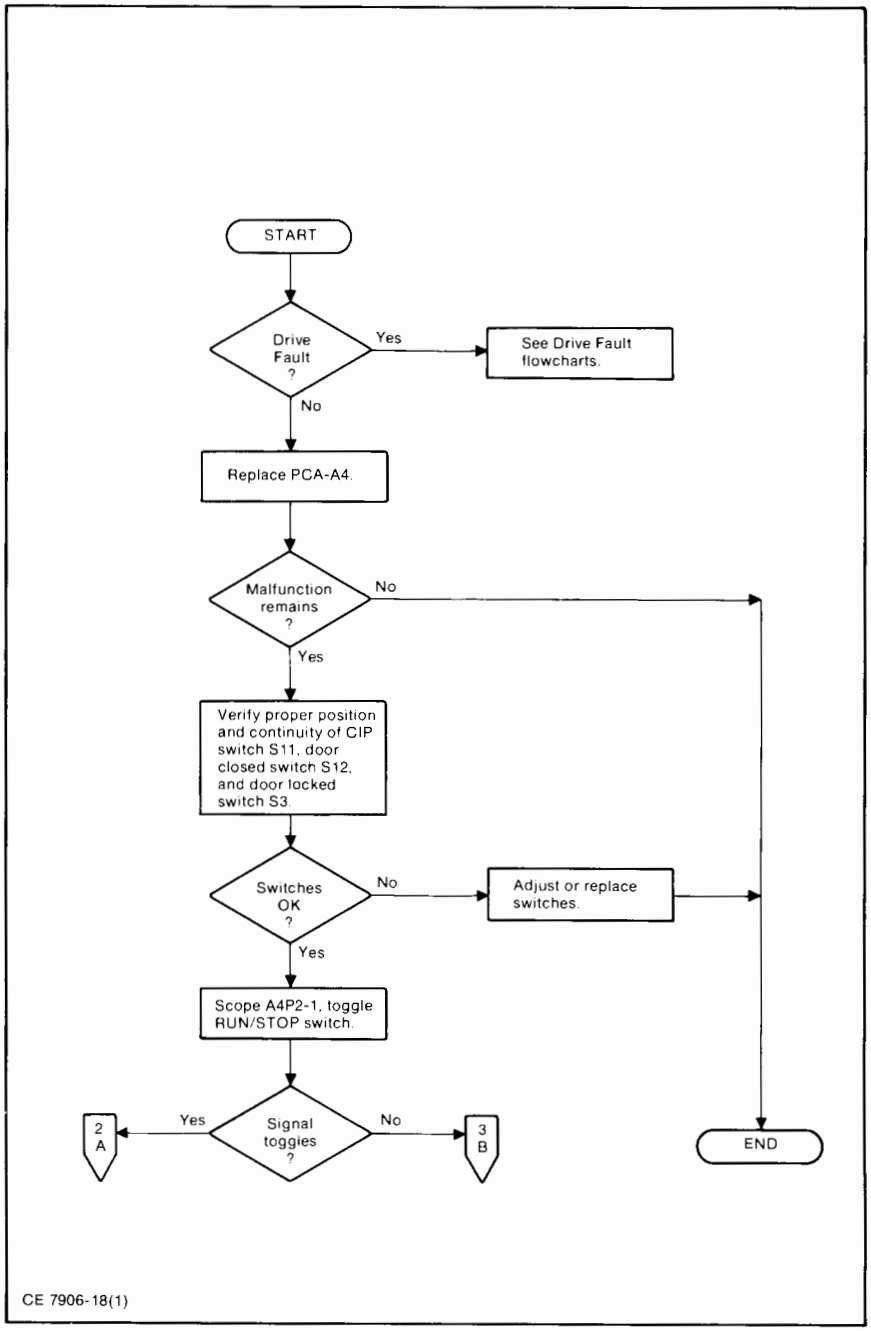


Figure 4-18. Spindle Rotating Troubleshooting Flowchart (1 of 3)

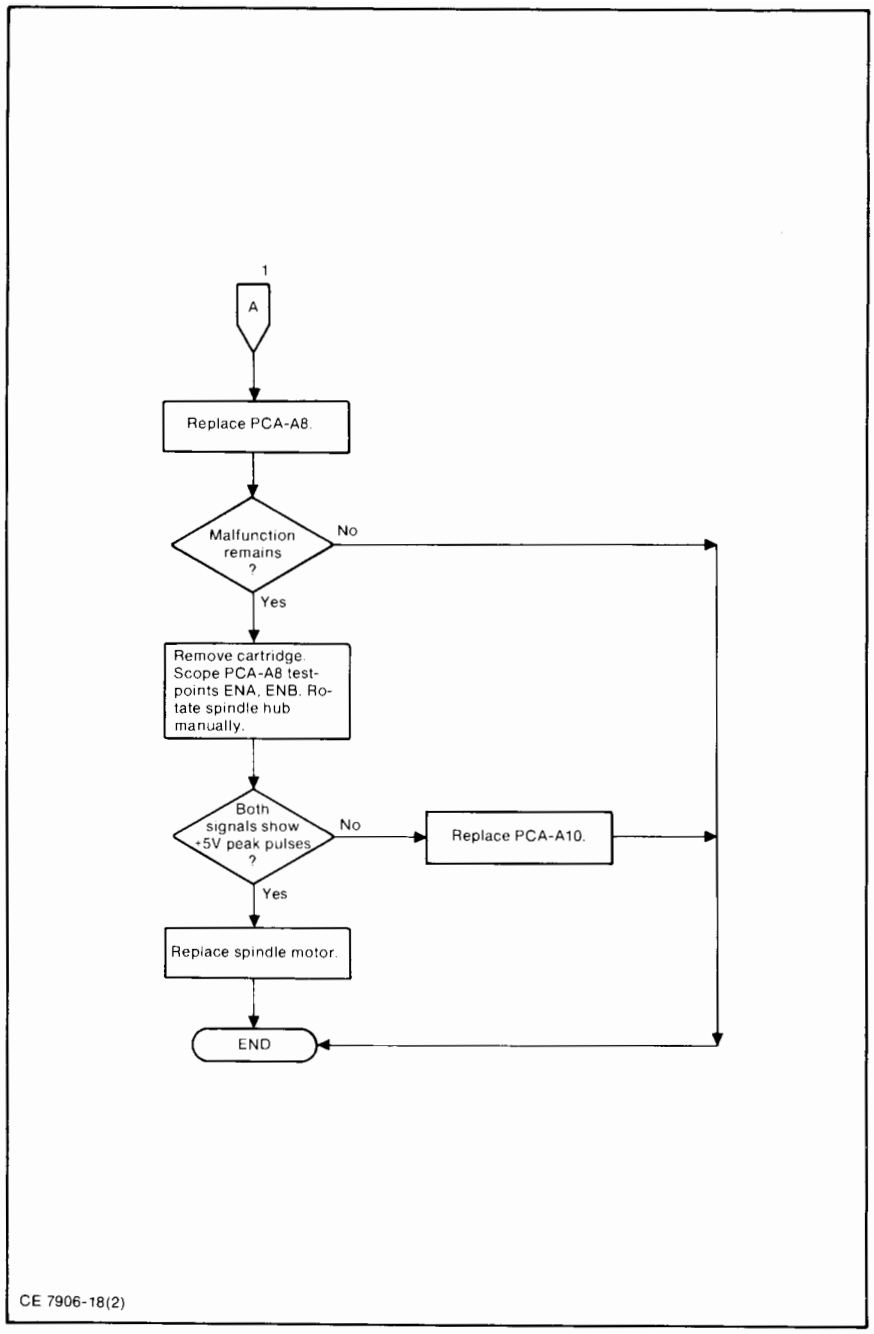


Figure 4-18. Spindle Rotating Troubleshooting Flowchart (2 of 3)

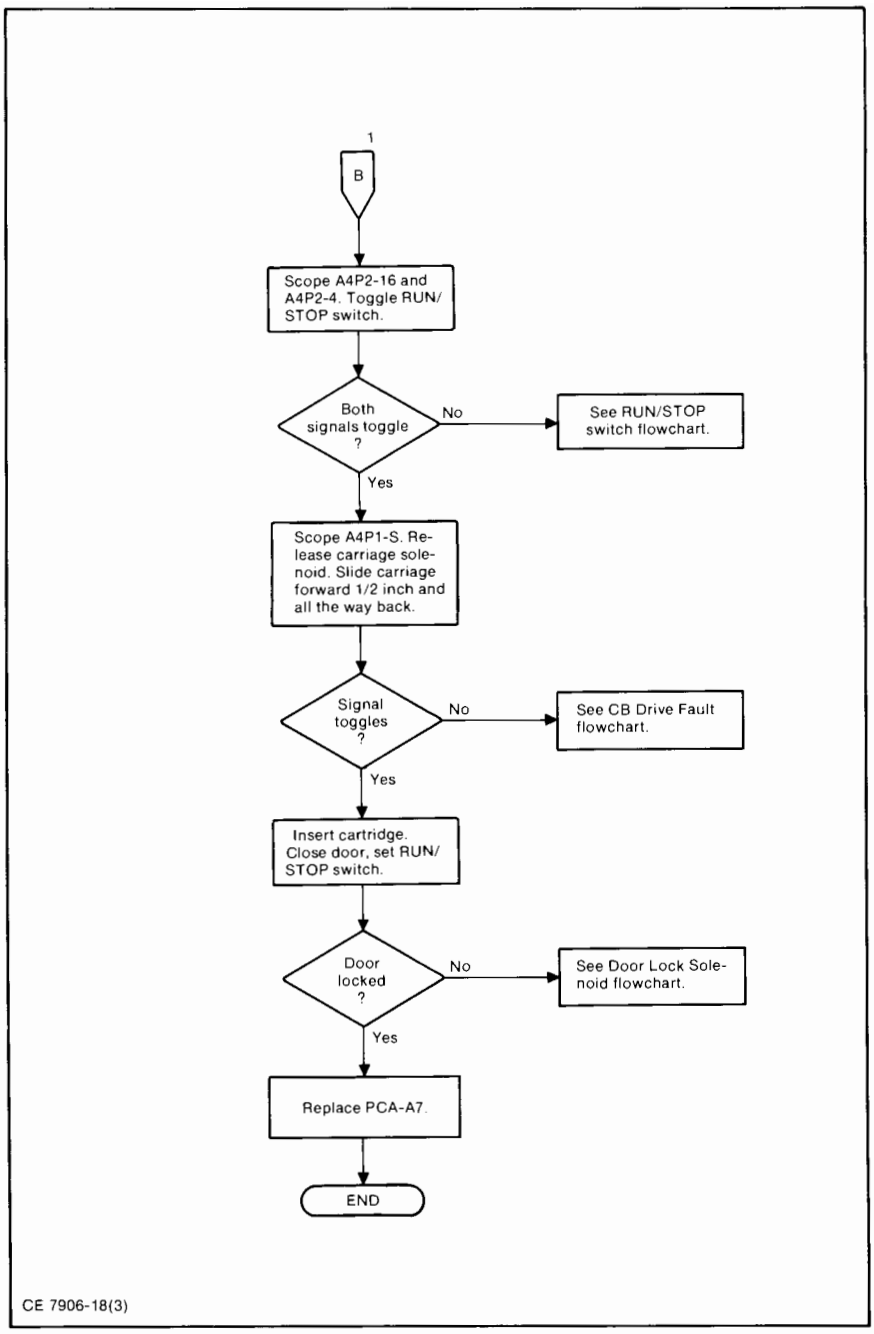


Figure 4-18. Spindle Rotating Troubleshooting Flowchart (3 of 3)

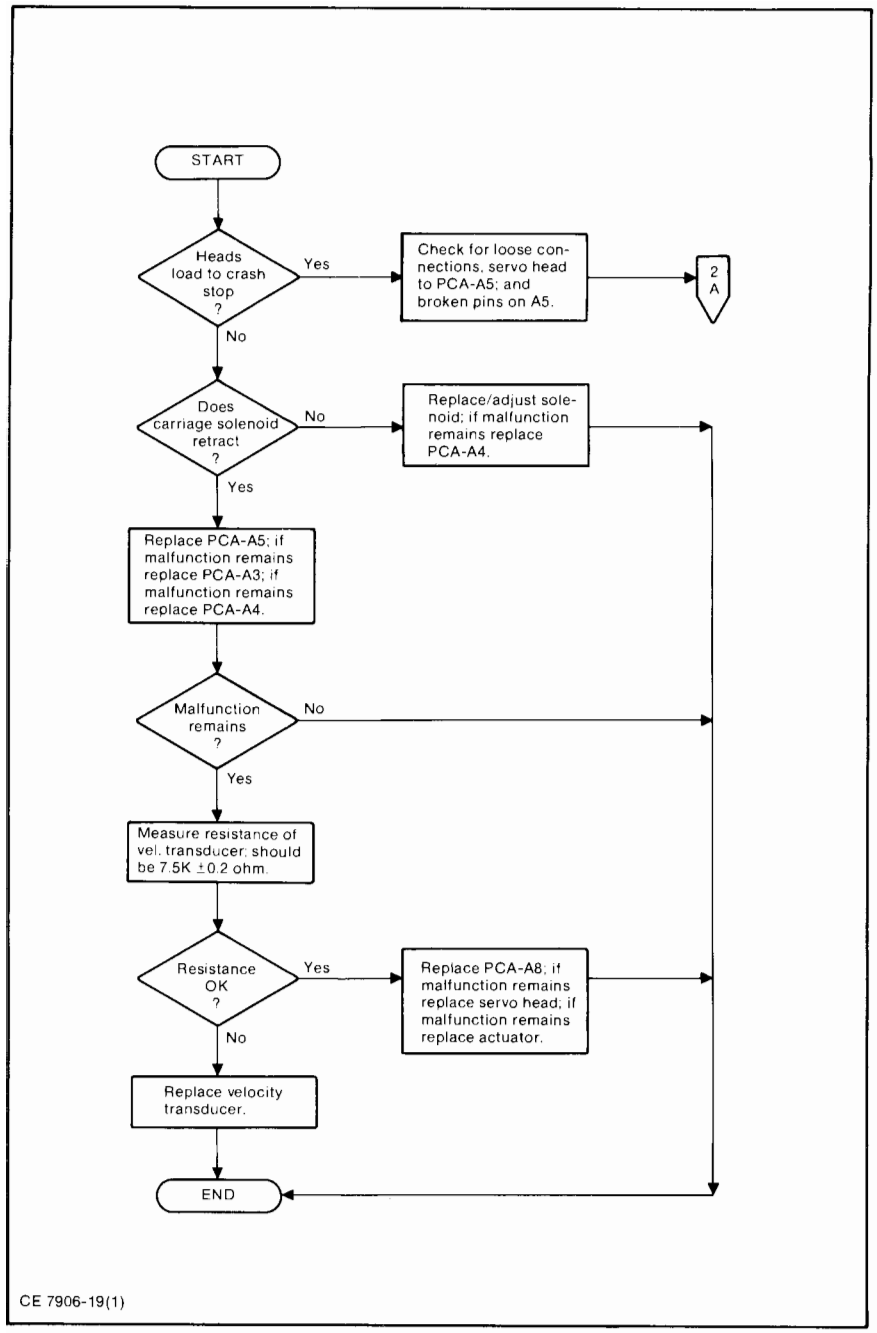


Figure 4-19. Head Positioning Troubleshooting Flowchart (1 of 2)

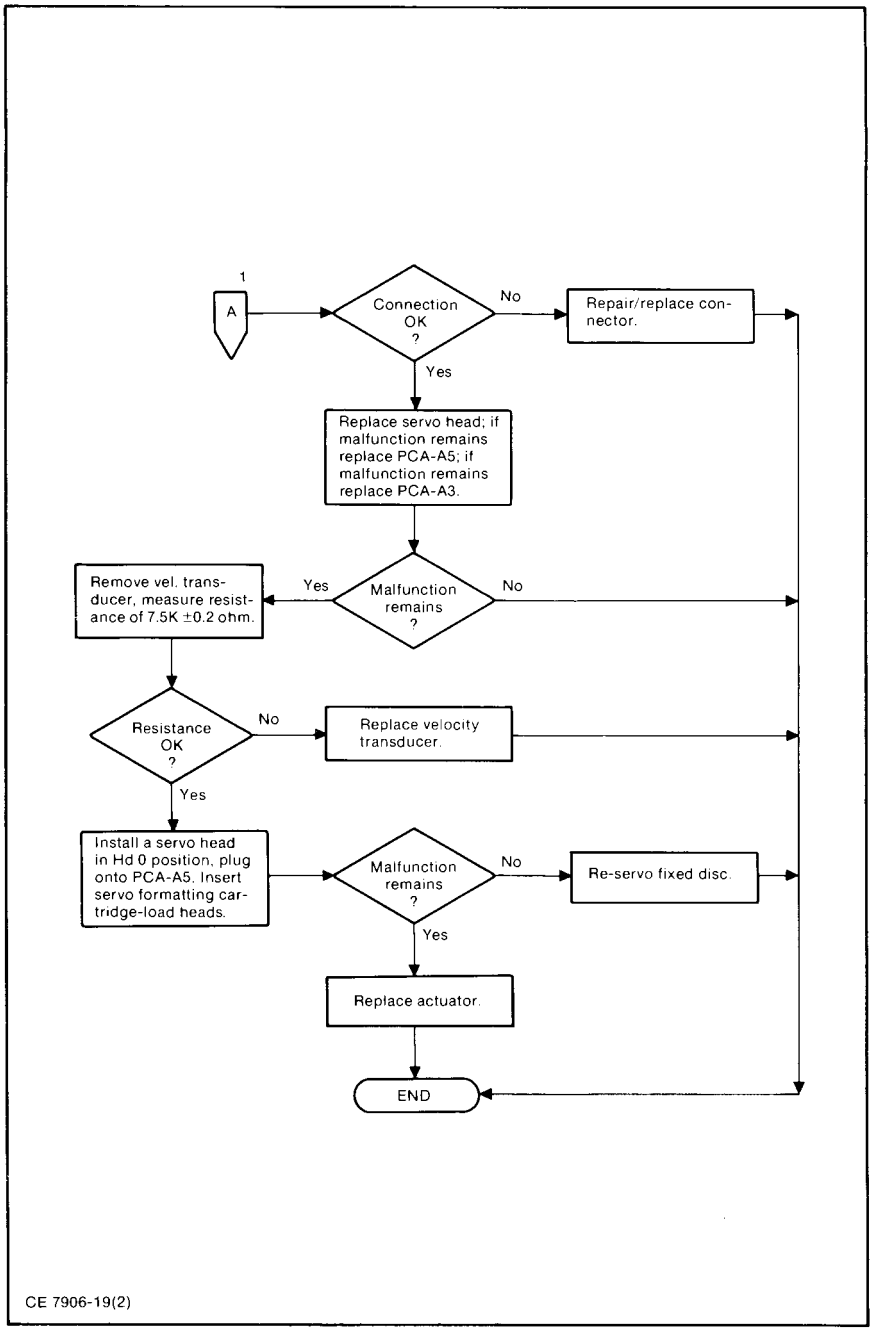


Figure 4-19. Head Positioning Troubleshooting Flowchart (2 of 2)

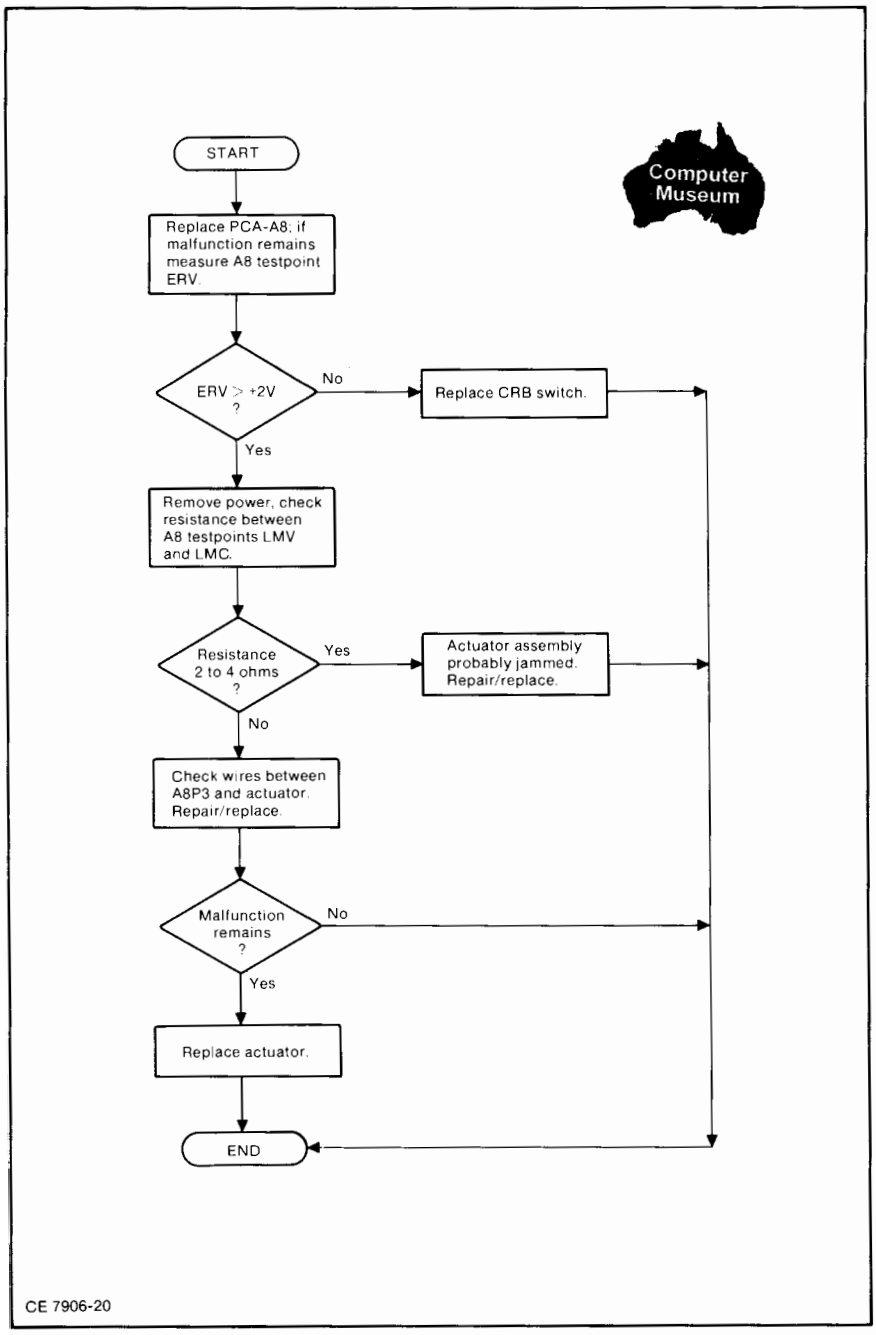


Figure 4-20. Emergency Return (CRB) Indicator Troubleshooting Flowchart

DIAGNOSTICS

SECTION V

ONLY THE "H" MODEL DRIVE CONTAINS A SELF-TEST FEATURE, REFER TO APPENDIX A.

FOR H0ST-RUN DIAGNOSTICS, REFER TO TABLES 5-1 AND 5-2.

Table 5-1. System Diagnostics

HP 1000 M, E, F SERIES

```
TITLE:  HP79XX/13037 Disc Memory Diagnostic
MANUAL P/N:  12962-90001
DIAGNOSTIC MEDIA:  2645 Cartridges  (24396-13306)
                   7900 Disc        (24396-13001)
                   7905 Disc        (24396-13101)
                   7970 B Mag Tape  (24396-13501)
                   7970 E Mag Tape  (24396-13601)
```

HP 1000 M, E, F, L SERIES

```
TITLE:  HP 1000 ICD/MAC Disc Diagnostic
MANUAL P/N:  5955-4355
DIAGNOSTIC MEDIA:  2645 Cartridge   (24398B #20)
                   CS/80 Tape-Linus (24398B #22)
                   8 in. Floppy     (24398B #41)
                   5.25 in. Floppy  (24398B #42)
                   3.5 in. Floppy   (24398B #44)
                   7970E Mag Tape   (24398B #51)
```

HP 9835/9845 DESKTOP

```
TITLE:  DISCO, DISKEY
MANUAL P/N:  (Integrated with diagnostic - HELP)
DIAGNOSTIC MEDIA:  9845 Tape Cartridge  (98041-90010)
```

HP 3000 SERIES III

```
TITLE:  Disc Verifier  (SLEUTH, SLEUTH-07)
MANUAL P/N:  (Integrated with diagnostic)
DIAGNOSTIC MEDIA:  7970E Mag Tape  (32230-90002)

TITLE:  WORKOUT2
MANUAL P/N:  30000-90172  (HP 3000 III CE Handbook)
DIAGNOSTIC MEDIA:  (On-line, integrated with op system)

TITLE:  Colossus
MANUAL P/N:  (Integrated with diagnostic - HELP)
DIAGNOSTIC MEDIA:  7970E Mag Tape  (35074A)
```

HP 250 SERIES

```
TITLE:  Hard Disc Diagnostic
MANUAL P/N:  45000-94000  (CE Handbook)
DIAGNOSTIC MEDIA:  CS/80 Tape-Linus  (45260-19001)
                   8-in. Floppy  (45260-18001)
```

Table 5-2. Status Words for MAC Drives

Status Word 1

15	0	Track flagged spare		
14	1	Track flagged protect		
13	2	Track flagged defective		
12	3	Encoded status	(000000) 00000	Normal complete
			(000400) 00001	Illegal op code
11	4	Encoded status	(001000) 00010	Unit available
10	5	Encoded status	(003400) 00111	Cylinder compare error
9	6	Encoded status	(004000) 01000	Uncorrectable error
			(004400) 01001	Head/sector compare error
8	7	Encoded status	(005000) 01010	I/O program error
7	8	reserved	(006000) 01100	End of cylinder
6	9	reserved	(007000) 01110	Data over-run
			(007400) 01111	Possible correctable error
5	10	reserved	(010000) 10000	Illegal access to spare track
4	11	reserved	(010400) 10001	Defective track
3	12	Unit number	(011000) 10010	Access not ready during data op
			(011400) 10011	Status 2 error
2	13	Unit number	(013000) 10110	Attempt to write on protected trk
1	14	Unit number	(013400) 10111	Unit not available
0	15	Unit number	(017400) 11111	Drive attention (seek complete)

Status Word 2

15	0	Status word 2 error	
14	1	Drive type	000000 = 7906
13	2	Drive type	000001 = 7920
12	3	Drive type	000010 = 7905
			000011 = 7925
11	4	Drive type	
10	5	Drive type	
9	6	Drive type	
8	7	reserved	
7	8	Attention required	
6	9	Write protected	
5	10	Format switch on	
4	11	Drive fault	
3	12	First status (Heads just loaded over media)	
2	13	Seek check	Caused by invalid cylinder, head or sector address,
1	14	Drive not ready	or multiple seeks requested
0	15	Drive busy	

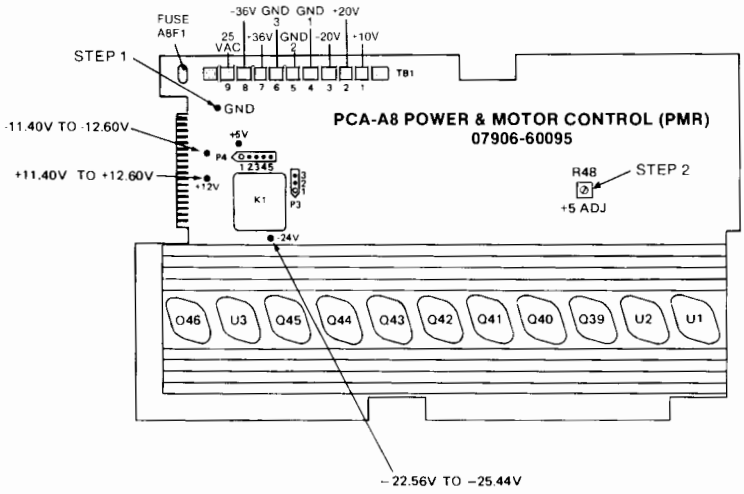
3000 Bit Format
1000 Bit Format

6-1. ADJUSTMENT SEQUENCE

See figure on next page for sequence of adjustments

6-2. +5V ADJUSTMENT

See figure below for procedure, plus tolerances for other DC voltages.



PROCEDURE:

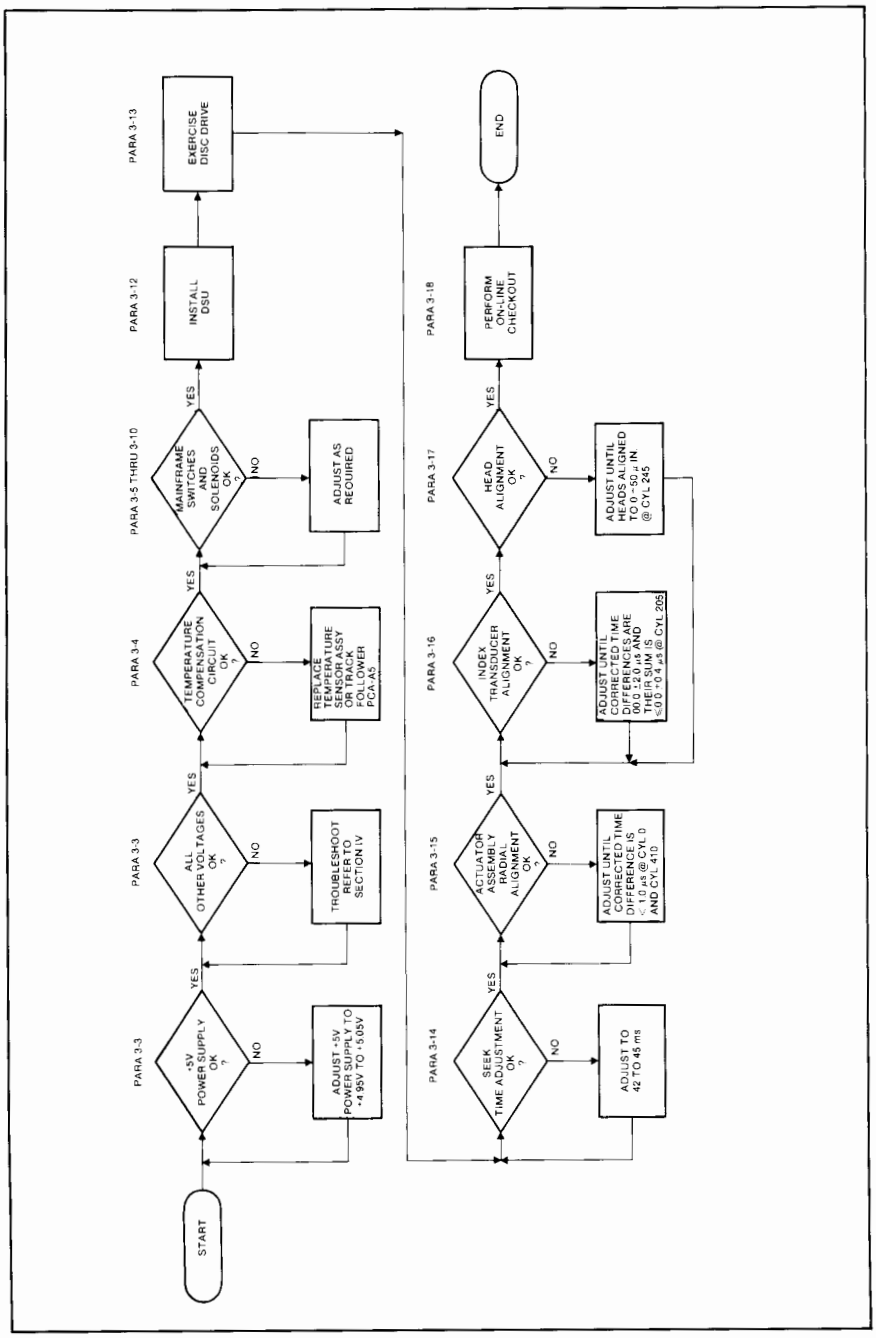
ENSURE THAT THE DSU IS DISCONNECTED FROM THE DISC DRIVE WHEN MEASURING THE +5V VOLTAGE.

1. CONNECT THE DIGITAL VOLTMETER GROUND LEAD TO THE GND TEST POINT SHOWN ABOVE.
2. MEASURE THE +5V VOLTAGE AT THE +5 VOLT TEST POINT ON PCA-A5. IF NOT WITHIN ±0.05V ADJUST R48 ON PCA-A8.

FUSE A8F1 IS A SOLDERED-IN FUSE FOR 25 VAC.

REF 7300-5A

Figure 6-1. DC Voltage Tolerances/+5V Adjustment



REF 7300-35A

Figure 6-2. Adjustment Sequence Flowchart

6-3. COARSE ADJUSTMENTS

Whenever the linear actuator and fixed disc are removed or replaced simultaneously, the following "coarse adjustments" must be performed **(prior to reformatting the servo code.)**

6-4. COARSE INDEX TRANSDUCER ALIGNMENT

A. SETUP

1. Install a servo head in place of head 0.
2. Position the head as far forward as possible with reference to the initial position tool.
3. Connect this head to the track follower PCA.
4. Install head alignment PCA, alignment preamp, DSU and servo formatting cartridge.
5. Turn both PROTECT switches ON.

B. MEASURE OUTPUT

1. Turn ac power ON and RUN/STOP switch to RUN.
2. Connect an oscilloscope probe to P2-H on the I/O sector PCA (this is the output of the index transducer).
3. Make sure the amplitude is greater than +9V-p and the pulses are 16.67ms apart. If not, go to step D-2 below.

C. MOVE HEADS

1. Select DSU FUNCTION 5 and turn on HEAD 1 toggle switch.
2. Push START and drive should seek to cylinder 205.
3. Short the "POS" signal on track follower to ground and slowly move heads inward until the needle on the DSU pegs to the left.
4. Disconnect ground and servo will lock. Note reading on digital display.

D. FINAL ADJUST

1. Digital display must be within 10 units of zero. If not:
2. Set RUN/STOP switch to STOP, remove cartridge, install index transducer alignment hub.
3. Remove lower front frame and disconnect indicator panel connector.
4. Make sure slotted head pivot screw on transducer bracket is tight.
5. Loosen socketed head cap screw.
6. Adjust the index transducer's position until the transducer's tip touches the hub and points straight at the center of the spindle.
7. Reinstall the cartridge, set RUN switch and return to step B above.

6-5. COARSE RADIAL ALIGNMENT

A. INITIAL READING

1. Select DSU FUNCTION 4.
2. Set toggle switch HEAD 1 and push START. Drive will seek to cyl. 0.
3. Short the "POS" signal to ground and slowly move heads until needle on DSU pegs to the left.
4. Disconnect ground short, servo will lock.
5. Note reading on the digital display.

B. CORRECTED READING

1. Select DSU function 6 (seek to cyl. 410) and repeat step A. Be sure to note this second reading from the digital display also.

2. Now compute the true readings using the correction factors noted on the label of the servo cartridge. Use the following formula:

TRUE = DIGITAL - CORRECTION

EXAMPLE A	EXAMPLE B
Digital = +2.1	Digital = +1.7
Correction = +.3	Correction = -.4
True = (+2.1) - (+.3)	True = (+1.7) - (-.4)
True = +1.8	True = +2.1

C. TORQUEDOWN

1. Torque the rear actuator mounting screws to 40 in. lbs.
2. Using the radial alignment tool, adjust the linear motor until the true reading from cylinder 410 is within 0.1 of the true reading from cylinder 0.
3. Now torque the rear mounting screws to the final torque of 80 in./lbs. and repeat steps A & B to verify the fixed position of the linear motor.

Table 6-1. Fixed Disc Installation Guide

A. DISC INSTALLATION PREPARATION

1. Clean spindle hub with sticky side of masking tape.
2. Clean disc chamber and spindle hub (see note).
3. Clean fixed disc cover and clamp ring (see note).
4. Install dial indicator and support post.
5. Put face mask on, then finger cots.
6. Clean data surface (light side) (see note).

B. DISC INSTALLATION

1. Place disc on hub (data surface down).
2. Position clamp ring and screws (finger tight).
3. Perform runout adjustment (2 major divisions).
4. Torque screws to 8 inch/pounds (star pattern).
5. Re-check runout.
6. Perform flatness check (4 major divisions).
7. Install index transducer.
8. Clean servo surface (see note).
9. Install fixed disc cover.

C. SERVO FORMAT PREPARATION

1. Perform index transducer pre-alignment.
2. Degauss fixed disc.
3. Replace receiver and related items.
4. Remove A2, A5 and A6 PCA's.
5. Remove data head 0, replace with a servo head.
6. Install head alignment preamp.
7. Install servo formatting PCA (A5 slot).
8. Connect servo head cables to formatter.
9. Install servo reference cartridge.
10. Warm up for 20 minutes.
11. Turn off all equipment in rack.
12. Ensure stability of disc drive.

D. SERVO FORMAT AND VERIFICATION

1. Depress "START" pushbutton on formatter PCA.
2. Wait for "COMPLETE" LED (8 minutes).
3. Power down, remove servo formatter PCA.
4. Re-install A5 and A2 PCA's.
5. Install DSU and head alignment PCA.
6. Connect head 0 to head alignment PCA.
7. Connect servo head to A5 PCA.
8. Spin-up, align head 0 (DSU function 7).
9. Verify code (DSU function 2, switches S1 and VFY).
10. After one complete pass, stop DSU.

E. PREPARATION FOR ALIGNMENTS

1. Re-install data head 0.
2. Install head alignment cartridge.
3. Random seek for 10 minutes (delay = 50 ms).

F. ALIGNMENTS

1. Pre-align heads 0, 1 (± 30).
2. Seek time.
3. Radial.
4. Index transducer.
5. Final head alignment.

Note: Use only approved cleaning materials:

Isopropyl alcohol	8500-0559
Cleaning wipes	9310-4865

PERIPHERALS

SECTION VII

THIS SECTION WILL CONTAIN HOST (AS OPPOSED TO PERIPHERAL) INFORMATION AS IT BECOMES AVAILABLE---CONTRIBUTIONS WELCOMED.

8-1. COMMON REPLACEABLE PARTS

FILTERS	
Prefilter	3150-0329
Absolute	3150-0276
LAMPS	2140-0537
FUSES	refer to table 2-2 & 2-3
SWITCHES	
Door locked	3102-0009
Door closed	3102-0009
Cartridge-in-place	3102-0009
Unit select	3100-1700
HEADS	
Up (Cartridge)	07905-60024
Up (Fixed)	07906-60010
Down	07905-60025
Servo	07905-60026
MEDIA	
Data cartridge	12940A
Fixed disc	07906-60009
DISC SERVICE UNIT (DSU)	
Switches	3101-1967
Pushbuttons	3101-0858
Pointer knob	0370-1005
Round knob	0370-1001
MISCELLANEOUS	
Velocity transducer	07906-60046
Carriage solenoid	07906-60088
Carriage back detect	1990-0467
Door lock solenoid	07905-60058
CABLES	refer to table 2-1

NOTE: For a complete listing of all field replaceable components, refer to 7906 Service Manual, section III, Replaceable Parts.

8-2. PCA HISTORY

	ASSEMBLY		EXCHANGE	CONSUMABLE
A2	I/O SECTOR PCA	07906-60001	X	
A3	SERVO PCA	07906-60003	X	
A4	CONTROL PCA	07906-60102	X	
A5	TRACK FOLLOWER	07906-60004	X	
A6	R/W PREAMP PCA	07906-60006	X	
A7	MOTHERBOARD PCA	07906-60108		X
A8	POWER & MOTOR CONTROL (PMR)	07906-60095	X	
A9	INDICATOR PCA	07906-60011		X
A10	ENCODER PCA	07920-60009		X

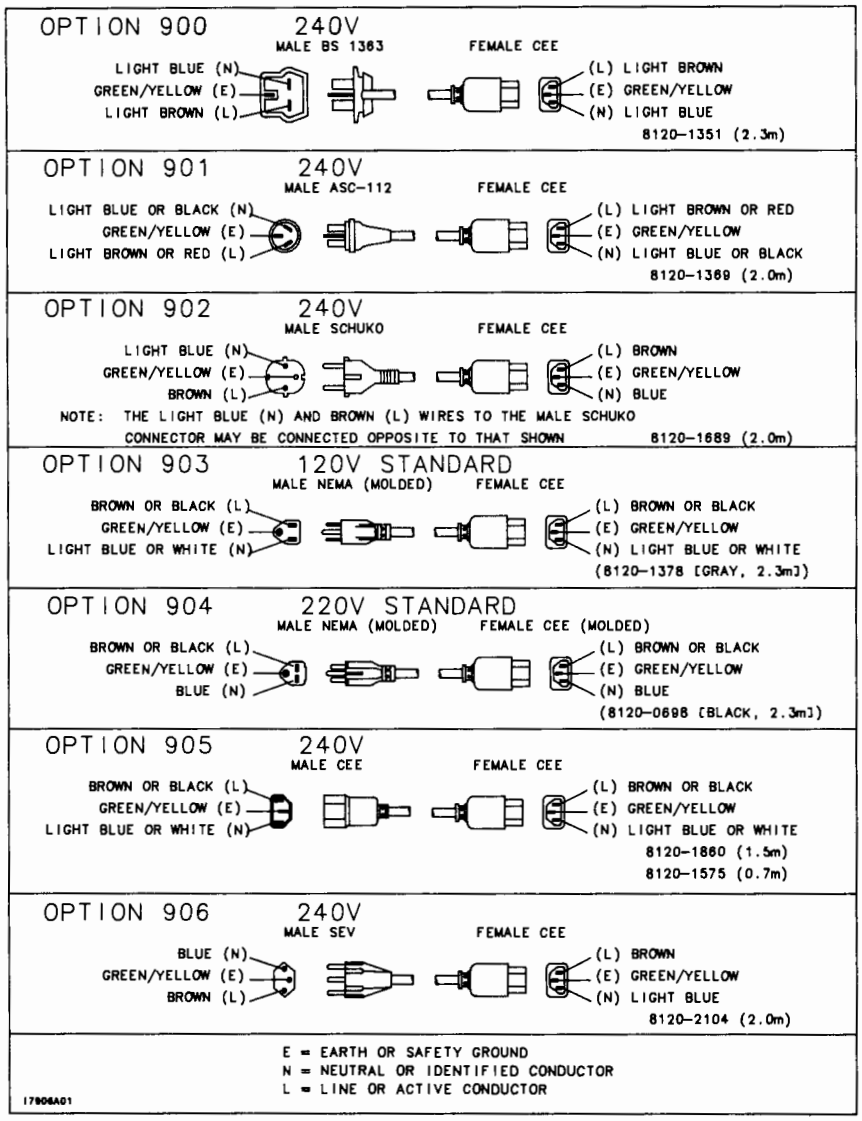


Figure 9-1. Power Cord Options (Sheet 1 of 2)

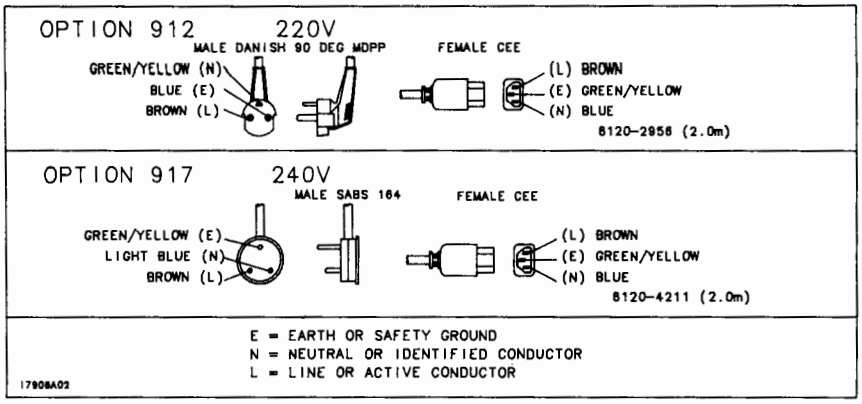
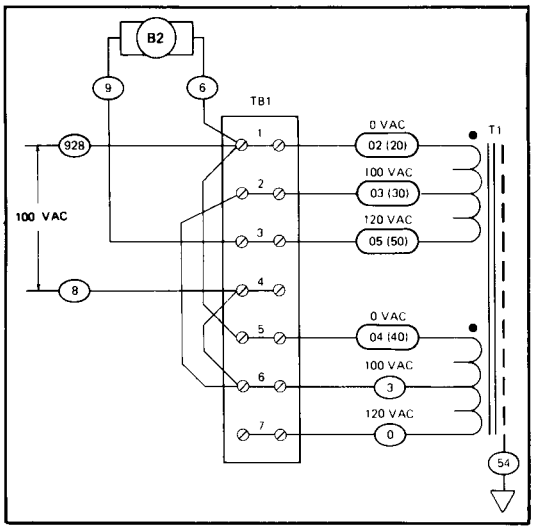


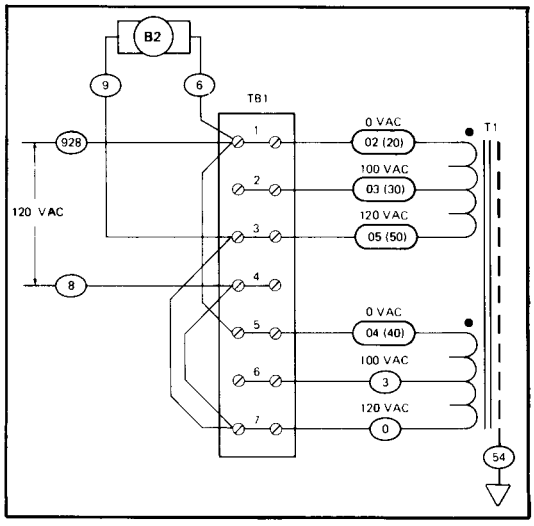
Figure 9-1. Power Cord Options (Sheet 2 of 2)

100 VAC STRAPPING



NOTE FOR 7906H: REAR COVER FAN (B4) CONNECTS TO TERMINALS 5 AND 7.

120 VAC STRAPPING

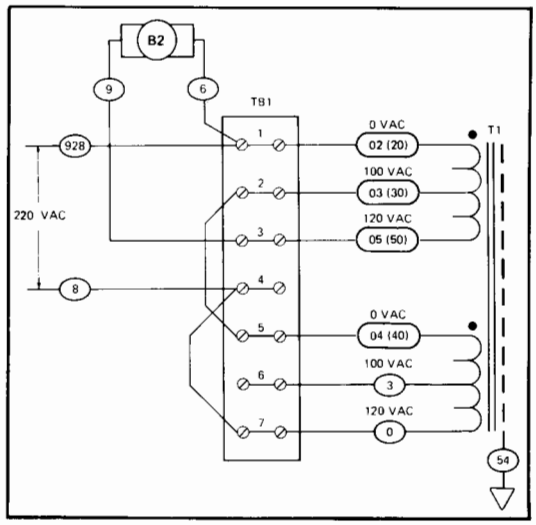


NOTE FOR 7906H: REAR COVER FAN (B4) CONNECTS TO TERMINALS 5 AND 7.

CE 7906-21(1)

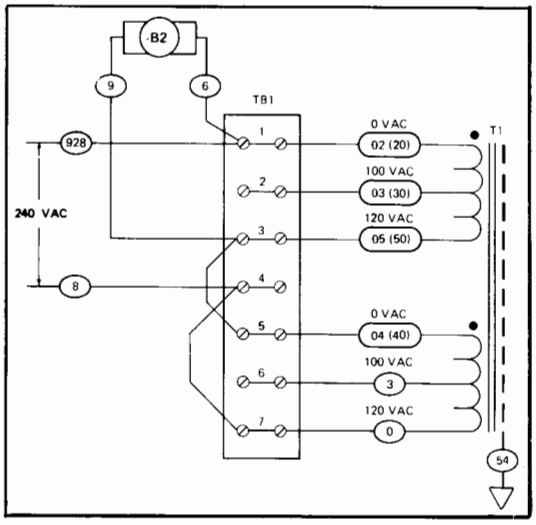
Figure 9-2. VAC Strapping (Sheet 1 of 2)

220 VAC STRAPPING



NOTE FOR 7906H: REAR COVER FAN (B4) CONNECTS TO TERMINALS 5 AND 7.

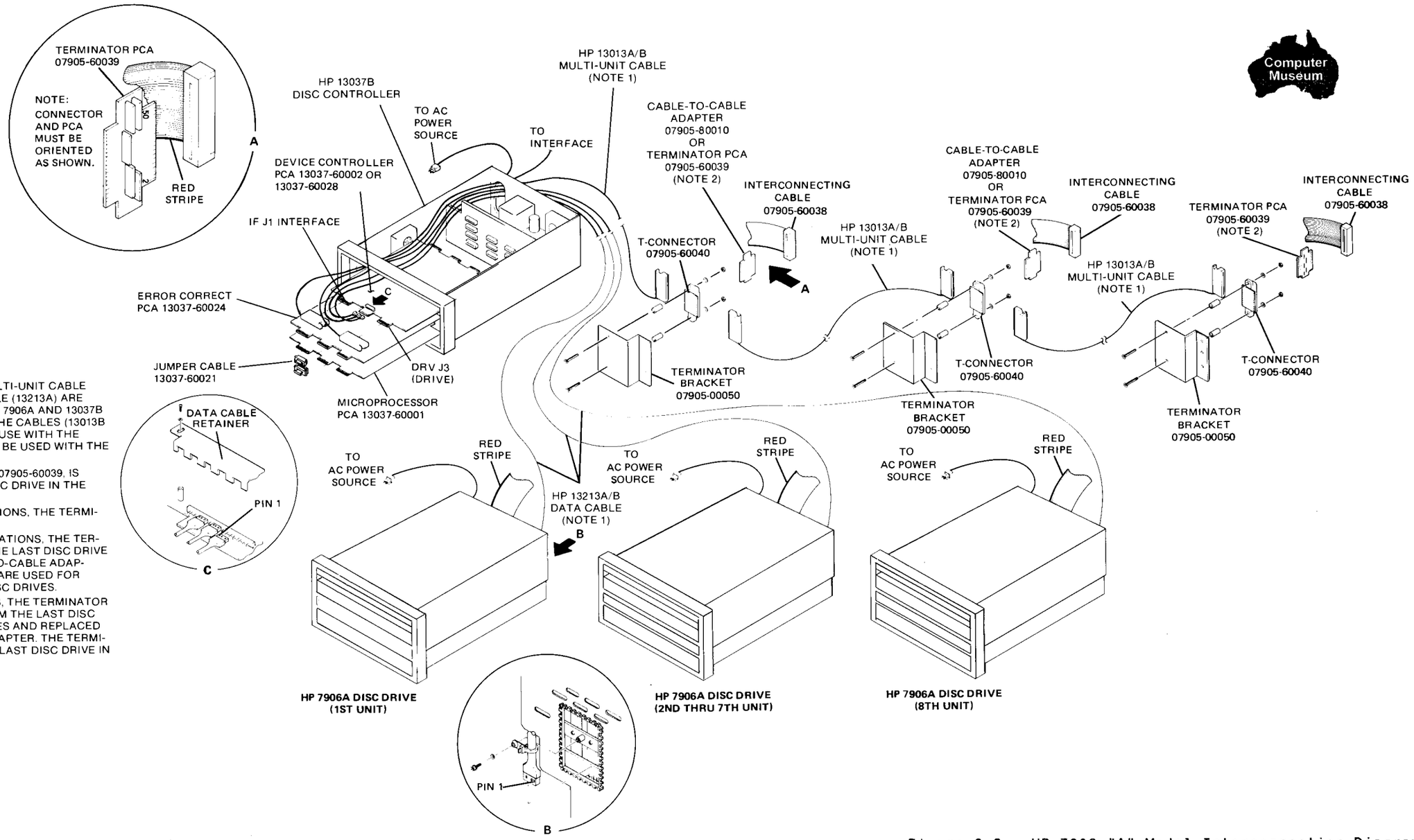
240 VAC STRAPPING



NOTE FOR 7906H: REAR COVER FAN (B4) CONNECTS TO TERMINALS 5 AND 7.

CE 7906-21(2)

Figure 9-2. VAC Strapping (Sheet 2 of 2)



NOTES:

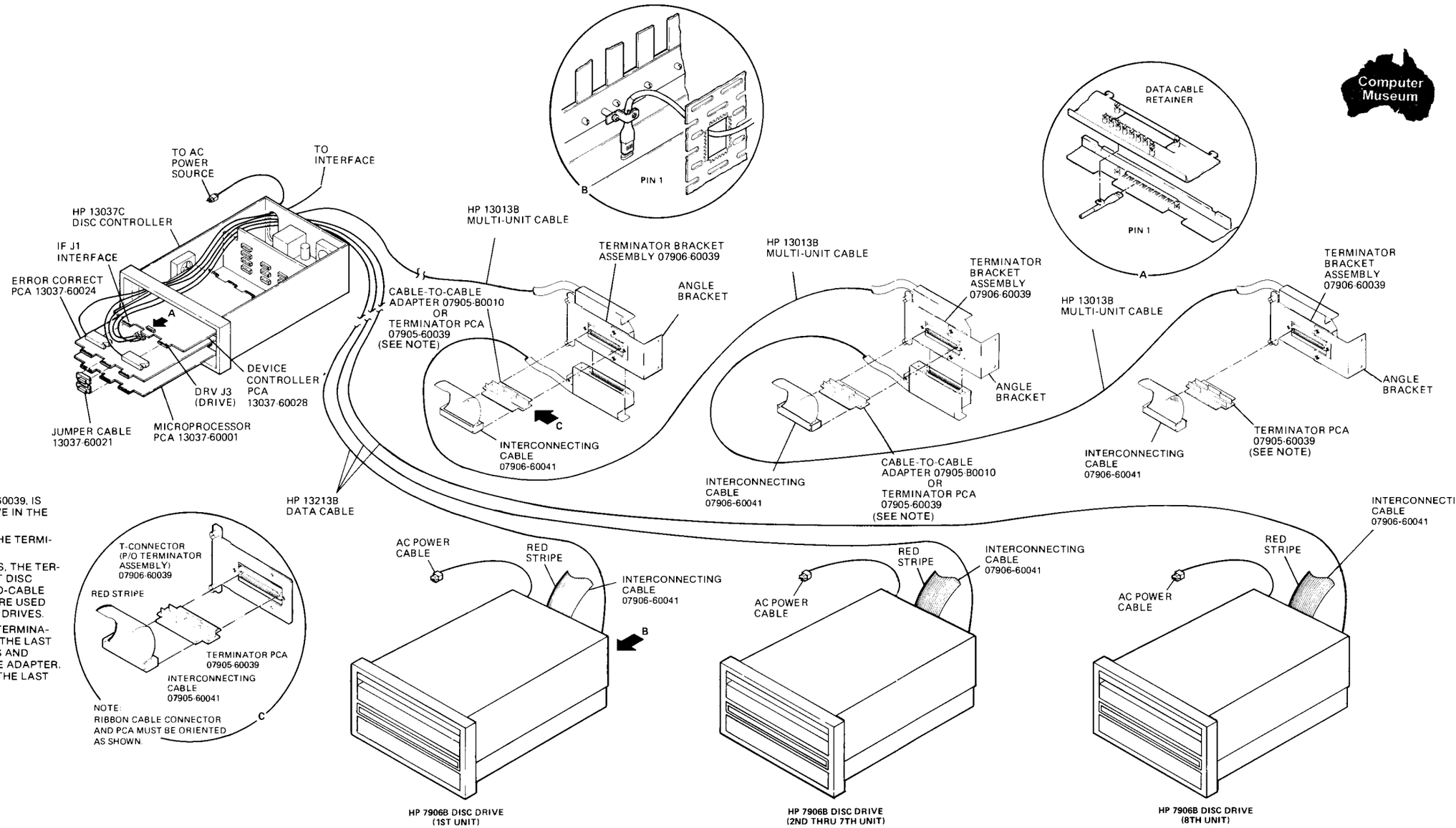
1. EARLY VERSIONS OF THE MULTI-UNIT CABLE (13013A) AND THE DATA CABLE (13213A) ARE SUITABLE FOR USE WITH THE 7906A AND 13037B ONLY. LATER VERSIONS OF THE CABLES (13013B AND 13213B), DESIGNED FOR USE WITH THE 7906B AND 13037C, CAN ALSO BE USED WITH THE 7906A AND 13037B.
2. TERMINATOR PCA, PART NO. 07905-60039, IS ONLY USED ON THE LAST DISC DRIVE IN THE SERIES.

   FOR SINGLE UNIT INSTALLATIONS, THE TERMINATOR PCA IS USED.

   FOR MULTIPLE UNIT INSTALLATIONS, THE TERMINATOR PCA IS USED ON THE LAST DISC DRIVE IN THE SERIES AND CABLE-TO-CABLE ADAPTERS, PART NO. 07905-80010, ARE USED FOR EACH OF THE REMAINING DISC DRIVES.

   FOR ADD-ON INSTALLATIONS, THE TERMINATOR PCA MUST BE REMOVED FROM THE LAST DISC DRIVE IN THE EXISTING SERIES AND REPLACED WITH A CABLE-TO-CABLE ADAPTER. THE TERMINATOR PCA IS USED ON THE LAST DISC DRIVE IN THE NEW SERIES.

Figure 9-3. HP 7906 "A" Model Interconnection Diagram



NOTE:

TERMINATOR PCA, PART NO. 07905-60039, IS ONLY USED ON THE LAST DISC DRIVE IN THE SERIES.

FOR SINGLE UNIT INSTALLATION, THE TERMINATOR PCA IS USED.

FOR MULTIPLE UNIT INSTALLATIONS, THE TERMINATOR PCA IS USED ON THE LAST DISC DRIVE IN THE SERIES AND CABLE-TO-CABLE ADAPTERS, PART NO. 07905-80010, ARE USED FOR EACH OF THE REMAINING DISC DRIVES.

FOR ADD-ON INSTALLATIONS, THE TERMINATOR PCA MUST BE REMOVED FROM THE LAST DISC DRIVE IN THE EXISTING SERIES AND REPLACED WITH A CABLE-TO-CABLE ADAPTER. THE TERMINATOR PCA IS USED ON THE LAST DISC DRIVE IN THE NEW SERIES.

Figure 9-4. HP 7906 "B" Model Interconnection Diagram

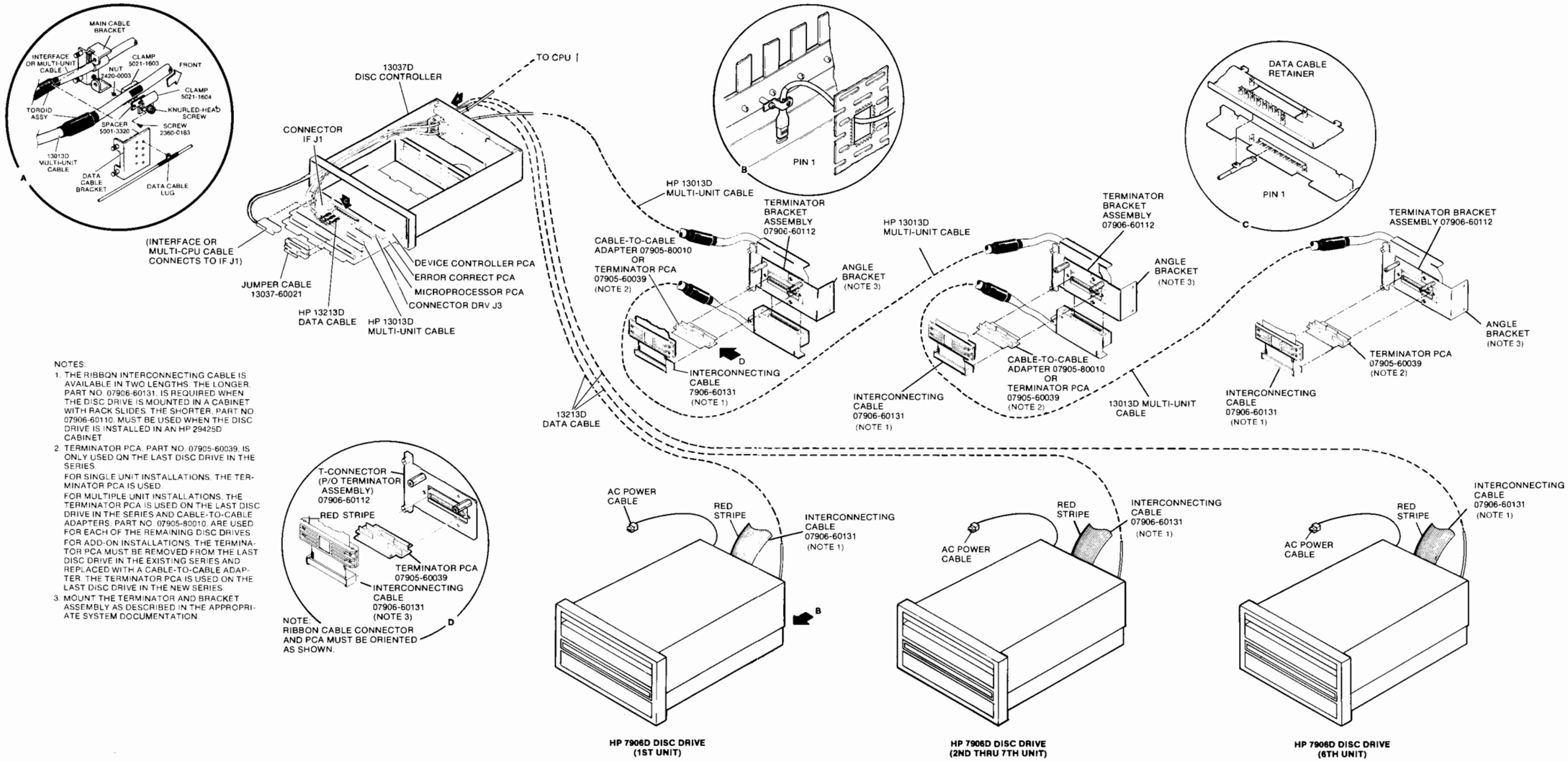


Figure 9-5. HP 7906 "D" Model Interconnection Diagram

10-1. MNEMONICS & ABBREVIATIONS

MNEMONIC	NAME
ACRY	Access Ready
ACW	AC Write Current
ADDR	Address
ADR	Address Record
ADU	Address Unit
AGC	Automatic Gain Control
AGCF	AGC Fault
AT	Attention (test point)
ATTN	Attention
ATTI	Attention 1
B0-B10	Control Bus 0-10
CC	Current Command
CIP	Cartridge-In-Place
CLA	Clear Attention
CLK	Clock
CLO	Clear Offset
CLR	Clear
CLS	Clear Status
CPS	Controller Preset
CRB	Carriage Back
CSOL	Carriage Solenoid
CYL	Cylinder
DCN	Disconnect
DCW	DC Write Current
DDB	Differential Data Buffered
DGC	Data AGC
DIFF	Difference
DL	Door Locked
DPS	Destructive Preset
DRDY	Drive Ready
DRDYL	Drive Ready Lamp
DWA	Decrease Wr. Current (13 ma)
DWB	Decrease Wr. Current (6.5 ma)
DWC	Decrease Wr. Current (3.25 ma)
D0-D10	Control Bus 0-10 Buffered
DWF	Destructive Write Fault
ECS	Energize Carriage Solenoid
EIA	Enable Illegal Address
ENA	Encoder Phase A
ENB	Encoder Phase B
FLT	Fault
FLTL	Fault Lamp
FMT	Format
FWD	Forward
GATEDAT	Gated Attention
HLDD	Heads Loaded
HS0	Head 0 Selected
HS1	Head 1 Selected
HS2	Head 2 Selected
ICA	Illegal Cylinder Address
ILF	Interlock Fault
LD	Lock Door
LIP	Lower Index Pulse
LP	Lower Pulse
LSB	Least Significant Bit
M	Match
M-1	Match Minus One
MH	Multiple Heads
MHS	Multiple Heads Selected
NDPS	Nondestructive Preset
NDWF	Nondestructive Wr. Fault
NLD	Negative Level Detector
O/S	Offset
OSD	Offset Settling Delay
POR	Power-On Reset
POS	Position
PRT	Protect
PRTL	Protect Lower Disc
PRTU	Protect Upper Disc
R	Reset
RBR	Run Brushes
RCL	Recalibrate
RDA	Read Data A
RDB	Read Data B
READ	Read
REF	Reference
RET	Retract
REV	Reverse
RH	Restore Home
RPS	Rotational Position Sensing
RQA	Request Attention
RQP	Request Position (sector)
RQS	Request Status
RS	Run Spindle
S	Set
SB	Servo Balanced
SC	Sector Compare
SCL	Sector Clock
SEL	Select
SEN	Servo Enable
SK	Seek
SKC	Seek Complete
SKH	Seek Home
SKI	Seek Inhibit
SL	Drive Selected by Controller
SMC 1,2	Spindle Motor Current
SOF	Set Offset
SPD	Spindle Speed Down
SPU	Spindle Speed Up
STB	Strobe
STP	Set Timeout Period
SW	Switch
TAC	Tachometer
TCD	Track Centered
TEMP	Temperature
TO	Timeout
TTO	Temperature Timeout
T0-T3	Tag Bus 0-3
UDS	Upper Disc Selected
UIX	Upper Index
UP	Upper Pulse
URG	Unselected Read Gate
USS	Upper Surface Selected
UWG	Unselected Write Gate
USO 0-2	Unit Select 0, 1, 2
WDA	Write Data A
WDB	Write Data B
WEN	Write Enable
WRITE	Write
XMS	Transmit Sector
ZCR	Zero Crossing

10-2. PCA INPUT/OUTPUT SIGNALS

A2 I/O SECTOR

INPUTS		OUTPUTS
B0-B10		D0-D9
ACRY	FLT	PRT
STB	DRDY	CPS
T0-T3	FMT	SOF
CYL	ICA	RH
OSD	ATT1	SK
LIP		CLA
SCL		UWG/URG
PRTL/PRTU		UP
NDPS		USS
US0-US2		UDS
UIX		SEL

A3 SERVO

INPUTS	OUTPUTS
SKH/SK	AGCF
TAC	CLO
RET	LSB
AGC	M
POS	CC
OSD	SB
D0-D8	DWA/DWB/DWC
EIA	CYL
SKI	ICA

A4 CONTROL

INPUTS		OUTPUTS
CIP.DL		LD
CLA	URG/UWG	DPS/NDPS
CRB	SEL	FLT/FLTL
SB	PRT	DRDYL
TTO	USS/UDS	RBR
SOF	ACRY	RET
AGC/AGCF	ACW/DCW	ILF
SPU	MHS	ECS
STOP	DPS/NDPS	ATT1
RUN	DRDY	ACRY
SPD	DWF/NDWF	RS
CPS	RDA/RDB	HS0-HS2
STP		WEN
RET		SKH
SK		DDB
SEN		WDA/WDB
RH		DRDY
CYL		Fault LED's

A5 TRACK FOLLOWER

INPUTS	OUTPUTS
Servo code	SCL
LSB	POS
D0-D5,D7	AGC
SOF	LIP
DWA/DWB	OSD
CLO	TTO
SPU	
M	
USS/UDS	
ACRY	
Temp.comp.	
Drive type	

A6 R/W PREAMP

INPUTS	OUTPUTS
DGC	RDA/RDB
HS0-HS2	MHS
WDA/WDB	ACW
WEN	DCW
DWA/DWB/DWC	

A8 PMR

INPUTS	OUTPUTS
CRB	SMC 1/SMC 2
ENA/ENB	STP/180 Hz
RS	CSOL
DPS	SPU/SPD
ILF	LD
SEN	LMC/LMV
CC	+5V
LD	+12V
RBR	-12V
ECS	-24V
CRB	+10V
	25 VAC

Table 11-1. Service Note Summary

DATE	TITLE	SERVICE NOTE NUMBERS						
		M-	MR-	S-	SR-	H-	HR-	
3'79	NEW TRANSFORMER ASSY.	01		01				
8'79	DATA ERRORS/13213B							01
9'79	COIL OSCILLATION	01	01	01	01			
10'79	WIRING REVERSAL	02	02	02	02			
4'80	DEFECTIVE POWER SWITCHES	03	03	03	01			
7'80	DEFECTIVE TRANSFORMERS	04	04	04	02	01	01	
11'80	NEW DRIVE CONTROL PCA	05	05	05	03	02	02	
6'83	FIXED DISC BRUSH REMOVAL	05A	05A	05A	03A	02A	02A	
11'80	DATA ERRORS ON ICD DISC					03	03	
5'81	MOTHERBOARD CHANGE					04	04	
5'81	TEMPERATURE SENSOR ASSY.	06	06	06	04	05	05	
12'81	IMPROPERLY GROUNDED FANS	07		07		06		
4'82	IMPROPERLY GROUNDED FANS	07A		07A		06A		
1'82	DATA BOARD FAILURES					07	06	
3'82	NEW BLOWER MOTOR	08	07	08	05	08	07	
10'82	MISLOADED CAPACITOR	08	09					
4'83	POWER CONTROL ASSY.		10		06		08	
8'83	NEW UNIT SELECT SWITCH	09	10	09	07	09	09	
1'84	PDU FAN REVERSAL	10						
8'84	SPINDLE COVERS/GND BUTTON	11	11	10	08	10	10	
10'84	SPINDLE COVERS/GND BUTTON	11A	11A	10A	08A	10A	10A	
7'86	FRONT PANEL LED CONVERSION	12	12	11	09	11	11	

NOTE 1: On the occasions when duplicate numbers were erroneously assigned, reference the date and title to differentiate the notes.

NOTE 2: Number MR-08 was never assigned.

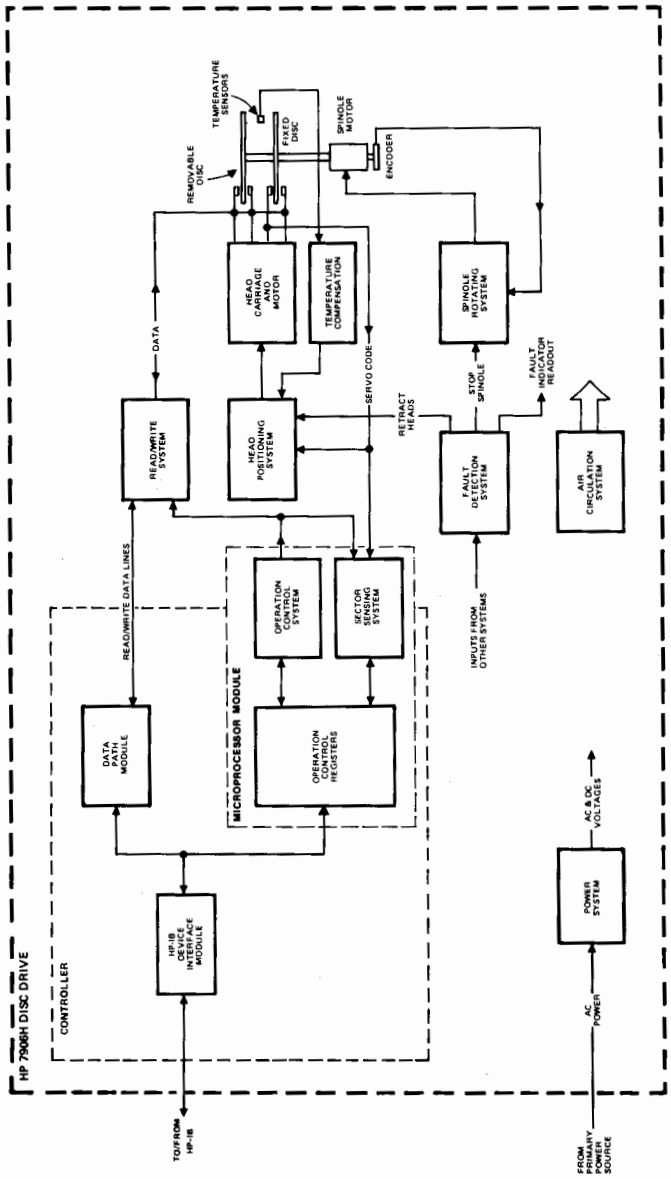
APPENDIX

APPENDIX
A

This section contains information unique to "H" model drives.

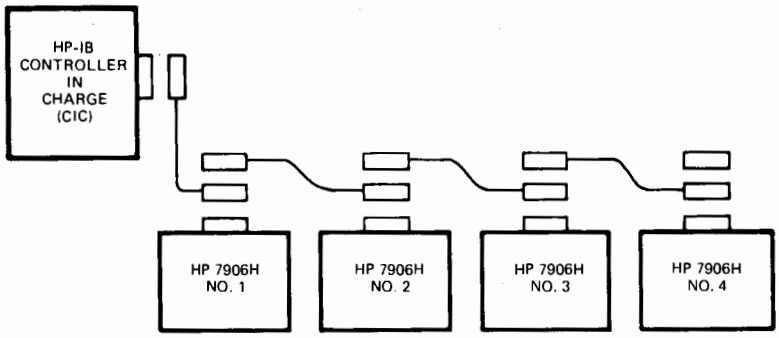
The information supplements the previous handbook sections as follows.

CONTENTS

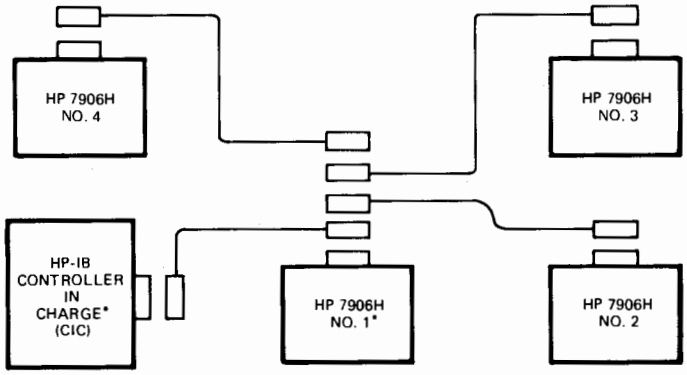


REF 7300-88

Figure A-1. HP 7906H Overall Block Diagram



a. Linear Configuration



*Can be interchanged

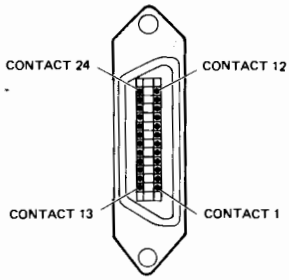
b. "Star" Configuration

NOTES:

1. All interconnecting cables are HP-IB interface cable assemblies, model no. 10833B. The length of this cable is 2 metres (6.55 feet).
2. Observe the cabling length restrictions detailed in paragraph A-7 and listed on the "HP-IB Configuration Restriction" labels attached to the equipment.
3. Four HP 7906H's (maximum) are allowed on one HP-IB channel.

REF 7300-117B

Figure A-2. HP-IB Interconnection Details

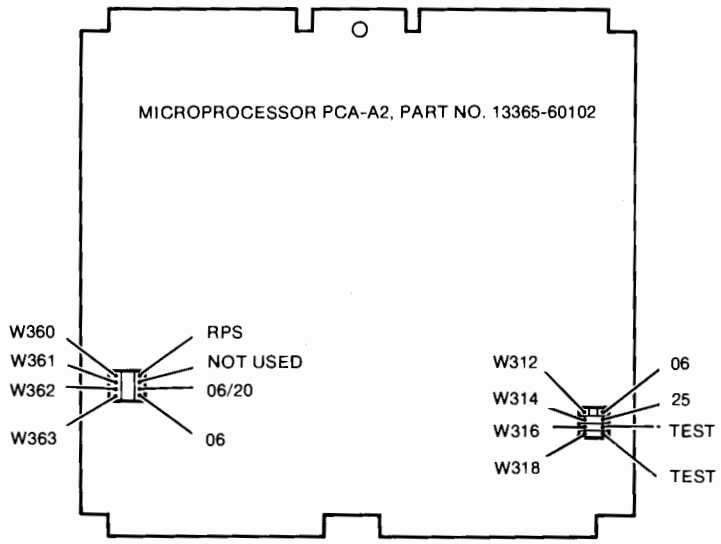


CONTACT	SIGNAL	CONTACT	SIGNAL
1	DIO 1 — Data In/Out 1	13	DIO 5 — Data In/Out 5
2	DIO 2 — Data In/Out 2	14	DIO 6 — Data In/Out 6
3	DIO 3 — Data In/Out 3	15	DIO 7 — Data In/Out 7
4	DIO 4 — Data In/Out 4	16	DIO 8 — Data In/Out 8
5	EOI — End or Identify	17	REN — Remote Enable
6	DAV — Data Valid	18	GND, (6)
7	NRFD — Not Ready for Data	19	GND, (7)
8	NDAC — Not Data Accepted	20	GND, (8)
9	IFC — Interface Clear	21	GND, (9)
10	SRQ — Service Request	22	GND, (10)
11	ATN — Attention	23	GND, (11)
12	SHIELD — Shield	24	GND, LOGIC

NOTE: GND (n) refers to the signal ground return of the referenced contact.

REF 7300-116

Figure A-3. HP-IB Connector Pin Assignments

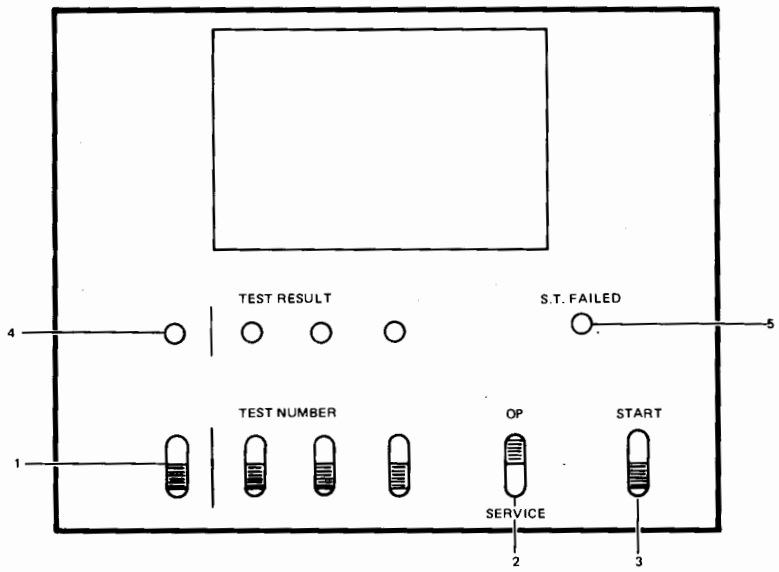


JUMPER	FUNCTION
W360	Not used.
W361	Not used. A spare jumper can be stored here.
W362	Drive type selection. Jumper should be in place for HP 7906H.
W363	Drive type selection. Jumper should be in place for HP 7906H.

JUMPER	FUNCTION
W312	Sector circuit configuration. Jumper should be in place for HP 7906H.
W314	Sector circuit configuration. Jumper should *not* be in place for HP 7906H.
W316	For test purposes only. Jumper should always be in place for normal operation.
W318	Same as W316.

REF 7300-118

Figure A-4. Microprocessor Programming Jumpers (PCA-A2)



1. TEST NUMBER switches — Select desired self-test test number in octal when OP/SERVICE switch (2) is in SERVICE position.

2. OP/SERVICE switch — Selects self-test mode of operation. When OP position is selected, controller executes self-test routine at power turn-on, on HP-IB command, or when START switch (3) is activated. Switch must be in OP position for disc drive to operate normally. When SERVICE position is selected, controller will loop continuously in self test until a fault is detected.

3. START switch — Initiates self-test operation. Switch is spring-loaded in off position.

4. TEST RESULT LED's — Provides a readout of self-test operation. At beginning of self-test routine, LED's will flash briefly, indicating controller activity and testing of LED's. If a test fails, the LED's indicate the number of the failed test in octal. If self test passes, the LED's remain unlit.

5. S.T. FAILED LED — Indicates a self-test (S.T.) failure. Result is duplicated by SELF TEST FAILED indicator on disc drive operator panel.

REF 7300-99

Figure A-5. Rear Panel Self-Test Controls & Indicators

Table A-1. Self-Test Operations

SWITCH SETTING	SELF-TEST ACTION	LED DISPLAY
OP/SERVICE switch: OP TEST NUMBER switches: Any setting START switch: Momentary operation	Tries to execute all tests once. If error in test 17, 16, or 15, controller hangs[1]. If error in tests 14 through 1, exits immediately to controller firmware.	All LED's flash momentarily. If there is an error, TEST RESULT LED's display failed test number, S.T. FAILED LED is also lit. If there is no error, all LED's go off.
OP/SERVICE switch: OP TEST NUMBER switches: Any setting START switch: Held in on position[2]	Loops on entire self test until START switch is released. Exits test only when switch is released. Executes tests up to first error and then restarts self test.	All LED's flash momentarily each pass through self test. Error is not displayed until START switch is released.
OP/SERVICE switch: SERVICE[3] TEST NUMBER switches: n = 2 START switch Momentary operation	Loops on test n until first error is detected. Halts (JMP*) on error until START switch is set again (except for error in test 17, where controller hangs).	TEST RESULT LED's flash test n each time that test is completed. On error in test n, LED's continuously display section number of failure. S.T. FAILED LED is also lit.
OP/SERVICE switch: SERVICE[3] TEST NUMBER switches: 2 START switch: Momentary operation	Generates PHI tuning procedure.	Flashes 2 on TEST RESULT LED's.
OP/SERVICE switch: SERVICE[3] TEST NUMBER switches: 1 START switch: Momentary operation	Causes disc drive to do random seeks.	Flashes 1 on TEST RESULT LED's.
OP/SERVICE switch: SERVICE[3] TEST NUMBER switches: 0 START switch: Momentary operation	Loops on entire self test until error is detected. Halts on error until START switch is set again (except for errors in test 17, where controller hangs).	TEST RESULT LED's flash test number each time test is completed. On error in a test, LED's continuously display failed test number. S.T. FAILED LED is also lit.

Notes:

1. An error in test 17, 16, or 15 will cause the controller to hang (i.e., not respond to HP-IB commands). The only way to reset the controller after a test 17 failure is to reset the disc drive, either by cycling the disc drive power switch or the RUN/STOP switch. In tests 16 and 15, activating the START switch also restarts self test.
2. In the service mode, with the START switch held in the on position, the controller will loop on the appropriate test (or entire self test) until the first error is detected, when it will start over again. The START switch inhibits error halts except in test 17.
3. Always return the OP/SERVICE switch to the OP position to use the disc drive. Otherwise, the controller will not respond to HP-IB commands.

Table A-2. Self-Test Description

TEST NO.	TEST	DESCRIPTION
17	Microprocessor alive	This is the first test executed. It tests the heart of the microprocessor — the sequencers and the branching logic. Some ALU faults are also trapped by test 17. If a fault is detected in test 17, the controller hangs up in a JMP* loop. The only way to exit this loop is to either cycle the POWER switch or the disc drive RUN/STOP switch. This action resets the microprocessor and causes it to start self test over. There are no distinct sections within this test. On error, the TEST RESULT LED's display an octal 17 both in the OP (operating) and SERVICE positions of the OP/SERVICE switch.
16	RALU, Flags	This test checks the 2901 registers and arithmetic/logic units (RALU's), and the program status register flags. Like test 17, if a failure is detected in test 16, the controller hangs. Unlike test 17, the "hang" loop can be exited by activating the START switch. On error, the TEST RESULT LED's display an octal 16 continuously whether in the OP or SERVICE mode (unless the START switch is held in the on position).
15	PHI	This test checks the PHI in its offline mode. The following items are tested: • PHI identity sequence • PHI interrupt flags • Inbound and outbound FIFO data test • Data tag bits (EOI and ATN) On error, test 15 outputs an octal 15 on the TEST RESULT LED's and hangs the controller, whether in the OP or SERVICE mode. The hang condition can be exited by activating the START switch.
14	FIFO's	This test checks the 9403 FIFO's in the controller. The following possible faults are tested: • NTORE stuck at 0 or 1 faults • Data errors within each FIFO At this point, the microprocessor and PHI are assumed good and errors can be reliably reported via the HP-IB. This is the first test that a) reports section numbers, and b) exits to the controller operating firmware after an error is detected. Even if test 14 fails, the controller attempts to execute commands and secondaries. Any operation involving data transfer through the FIFO's will probably fail.
13	PHI/FIFO handshake	This test checks the PHI/FIFO handshake logic, sector word counters, read full/write full flip-flop, and EOT detector. The test transfers data from the FIFO, through the PHI, and back to the FIFO. The PHI is in its offline loopback mode.
12	Formatter/ Separator Loopback Test	This test checks the formatter/separator, serial operation of the FIFO's (both in and out), the overrun detector, and the EOW/8th word counter. The test is divided into three subtests: a. The formatter/separator itself is first tested by passing a known data pattern from the FIFO through the formatter/separator in its loopback mode and back into the FIFO. The received data pattern is then compared with the original. b. The overrun detector is then checked by clearing the FIFO and enabling the formatter/separator. An overrun will result when the formatter/separator tries to pull data from an empty FIFO. c. Finally, the 8th word counter is tested by passing 16 bytes through the formatter/separator, counting EOW's, and seeing that the 8th word flag is set only after the 16th byte (8th word) is transferred.

Table A-2. Self-Test Description (cont'd)

TEST NO.	TEST	DESCRIPTION
11	CRC/Data Path Switch	This test checks the CRC generator/checker (9401) and the data path switch (CRC multiplexer). It checks that the CRC chip generates the proper CRC pattern and properly detects CRC errors. A known pattern is loaded into the FIFO, sent through the CRC chip, and returned through the formatter/separator to the FIFO. The generated CRC pattern is then switched into the data path and loaded into the FIFO, where it is checked against the expected results. The ANYER (CRC error) flag is also checked as data is shifted through the CRC chip.
10	Drive Status	This test looks at the drive status register and reports an error if the disc drive is busy with drive ready set or if the drive is faulted. Self test will loop on Tests 17 through 10 until Drive Ready becomes active, flashing octal 10 every time test 10 is executed. When Drive Ready becomes active, the remaining tests will be executed. If Drive Ready does not become true before 92 seconds have elapsed, the S.T. FAILED LED will light and the TEST RESULT LED's will display octal 10. Note: If the disc drive is powered on and the RUN/STOP switch is not in the RUN position or the disc pack is not in place, the resulting absence of Drive Ready will cause the S.T. FAILED indicator to come on approximately 92 seconds after power on is initiated. If this occurs, proper preparation of the disc drive for operation (disc pack installed and RUN/STOP switch set to RUN) will allow the self-test routine to start again.
7	Head/Sector Logic	This test checks much of the I/O sector logic of the controller. The head register is first tested for stuck-at faults. Disallowing drive types (set via the drive type jumpers) will also be reported as an error. The index counters, sector counters, sector comparators, sector registers, and sector compare flip-flop are also tested here. This section of the test is executed twice, once with head 1 addressed and once with head 2 addressed. This tests both sets of sector counters if the drive type is set to a 7906.
6	Recalibrate Test	This test issues a RECALIBRATE command to the drive, waits for drive attention (with a time limit of 1275 milliseconds), and checks the resulting drive status. If the recalibrate does not complete in time, a timeout error is reported. If an attention is received in time, the drive status is then checked; bad drive status is reported to the TEST RESULT LED's.
5	Seek Test	This test exercises the seek function of the disc drive by issuing a seek to the maximum cylinder address. If the seek completes within 100 milliseconds, the controller issues a seek to the maximum cylinder address + 1, forcing a seek check. If a seek check does in fact occur, the controller then issues a seek to cylinder 0, again with a 100 millisecond timeout. No address verification is done in this test, but if the drive does not end up on cylinder 0, the verify test which follows will fail.
4	Set Offset Test	The purpose of this test is to see if a set offset drive order to the disc drive will complete. The maximum positive offset (+63), maximum negative offset (−63), and zero offset are sent to the disc drive in that order. If attention is not received within 10 milliseconds, a timeout error is reported. This test does not verify that the heads are actually offset the proper direction and magnitude.
3	Verify Cylinder 0	This test attempts to verify cylinder 0 with no head offset. The purpose of this test is to check the read data path from the heads, through the preamp, and to the data separator. This test also verifies that the heads are on cylinder 0 by checking the address field in a sector. The entire cylinder is verified in cylinder mode with track sparing enabled. If a data error is found in any sector, one retry is attempted. If the retry also results in a data error, the test is aborted, and the failure is reported to the test panel LED's. No limit is placed on the number of retries allowed for the entire cylinder. Test 3 can fail due to several non-hardware related problems. Bad media, a track flagged defective but not properly spared, or a spare track in cylinder 0 will cause a test 3 failure. However, the drive can still be used after a test 3 failure.

Table A-2. Self-Test Description (cont'd)

TEST NO.	TEST	DESCRIPTION
2	PHI Tuning Procedure	This test is not a legitimate part of the self-test routine. It is provided for diagnostic and service purposes. When selected, self test loops through the program steps described in the PHI data sheet. The HSE waveform can be measured and the delay stabilization trimmer adjusted.
1	Drive Random Seek Procedure	This test is not a legitimate part of the self-test routine. It is provided for diagnostic and service purposes. When selected, self test will generate seek commands using a pseudo-random number generator.

Table A-3. Test Failure Summary

TEST NO.	SECTION NO.	TEST RESULT LED'S	TEST/SECTION FAILURE	PROBABLE SOURCE
17	—	● ● ● ●	MICROPROCESSOR	PCA-A2*, disc drive
16	—	● ● ● ○	RALU, FLAGS	PCA-A2
15	—	● ● ○ ●	PHI	PCA-A1*, PCA-A2
14		● ● ○ ○	FIFO's	PCA-A1*, PCA-A2
	17	● ● ● ●	NTORE stuck-at-0.	PCA-A1*, PCA-A2
	16	● ● ● ○	NTORE stuck-at-1.	PCA-A1*, PCA-A2
	15	● ● ○ ●	Upper FIFO data error.	PCA-A1
	14	● ● ○ ○	Lower FIFO data error.	PCA-A1
13		● ○ ● ●	PHI/FIFO HANDSHAKE	PCA-A1
	17	● ● ● ●	EOT flag stuck.	PCA-A1
	16	● ● ● ○	Write-to-PHI not complete.	PCA-A1
	15	● ● ○ ●	Sector word counter does not handshake.	PCA-A1
	14	● ● ○ ○	Read full/write full does not override EOS (read from PHI handshake does not complete).	PCA-A1
	13	● ○ ● ●	EOT not detected.	PCA-A1
	12	● ○ ● ○	Lower NIBBLE data bad.	PCA-A1
	11	● ○ ○ ●	Upper NIBBLE data bad.	PCA-A1
12		● ○ ● ○	FORMATTER/SEPARATOR	Data PCA-A1*, PCA-A2
	17	● ● ● ●	EOW stuck true.	PCA-A1
	16	● ● ● ○	No EOW in data test.	PCA-A1
	15	● ● ○ ●	Bad data from formatter/ separator.	PCA-A1
	14	● ● ○ ○	Overrun stuck true.	PCA-A1*, PCA-A2
	13	● ○ ● ●	Undetected overrun.	PCA-A1*, PCA-A2
	12	● ○ ● ○	No EOW in 8th word test.	PCA-A1
	11	● ○ ○ ●	8th word flag stuck true.	PCA-A1*, PCA-A2
	10	● ○ ○ ○	8th word flag stuck false.	PCA-A1*, PCA-A2
11		● ○ ○ ●	CRC/DATA PATH SWITCH	PCA-A1*, PCA-A2
	17	● ● ● ●	No EOW in test.	PCA-A1
	16	● ● ● ○	CRC error stuck false.	PCA-A1*, PCA-A2
	15	● ● ○ ●	CRC error stuck true.	PCA-A1*, PCA-A2
	14	● ● ○ ○	Bad generated CRC pattern.	PCA-A1
10		● ○ ○ ○	DRIVE STATUS	Drive electronics*, PCA-A2
	17	● ● ● ●	Drive fault.	Drive electronics
	16	● ● ● ○	Drive busy while ready.	Drive electronics, PCA-A2
	10	● ○ ○ ○▲	Drive not ready.	Drive electronics

○ = LED "OFF" ● = LED "ON" ▲Display flashing * Most probable source

Table A-3. Test Failure Summary (cont'd)

TEST NO.	SECTION NO.	TEST RESULT LED'S	TEST/SECTION FAILURE	PROBABLE SOURCE
7		○ ● ● ●	HEAD/SECTOR LOGIC	PCA-A2*, drive electronics
	17	● ● ● ●	Illegal drive type.	PCA-A2
	16	● ● ● ○	Bad head register.	PCA-A2
	15	● ● ○ ●	Sector count too large (head 1).	PCA-A2
	14	● ● ○ ○	Sector count not incrementing (head 1).	PCA-A2*, drive electronics
	13	● ○ ● ●	Sector count not properly cleared (head 1).	PCA-A2*, drive electronics
	12	● ○ ● ○	Sector compare stuck-at-1 (head 1).	PCA-A2
	11	● ○ ○ ●	Sector compare stuck-at-0 (head 1).	PCA-A2
	10	● ○ ○ ○	Sector compare set more than once per revolution (head 1).	PCA-A2
	7	○ ● ● ●	Sector count too large (head 2).	PCA-A2
	6	○ ● ● ○	Sector count not incrementing (head 2).	PCA-A2
	5	○ ● ○ ●	Sector count not properly cleared head 2).	PCA-A2*, drive electronics
	4	○ ● ○ ○	Sector compare stuck-at-1 (head 2).	PCA-A2
	3	○ ○ ● ●	Sector compare stuck-at-0 (head 2).	PCA-A2
	2	○ ○ ● ○	Sector compare set more than once per revolution (head 2).	PCA-A2
6		○ ● ● ○	RECALIBRATE	Drive electronics*, PCA-A2
	17	● ● ● ●	Recalibrate timeout error.	Drive electronics*, PCA-A2
	16	● ● ● ○	Attention stuck-at-1.	Drive electronics*, PCA-A2
	4	○ ● ○ ○	Drive busy and attention set.	Drive electronics*, PCA-A2
	3	○ ○ ● ●	Drive not ready.	*Drive electronics
	2	○ ○ ● ○	Seek check.	Drive electronics*, PCA-A2
	1	○ ○ ○ ●	Drive fault.	Drive electronics
5		○ ● ○ ●	SEEK	Drive electronics*, PCA-A2
	17	● ● ● ●	Seek timeout error.	Disc drive*, PCA-A2
	16	● ● ● ○	Attention stuck-at-1.	Drive electronics
	15	● ● ○ ●	Undetected seek check.	Drive electronics*, PCA-A2
	4	○ ● ○ ○	Drive busy and attention set.	Drive Electronics
	3	○ ○ ● ●	Drive not ready.	Drive electronics
	2	○ ○ ● ○	Seek check.	Drive electronics*, PCA-A2
	1	○ ○ ○ ●	Drive fault.	Drive electronics
4		○ ● ○ ○	SET OFFSET	Drive electronics*, PCA-A2
	17	● ● ● ●	Set offset timeout error.	Drive electronics*, PCA-A2
	16	● ● ● ○	Attention stuck-at-1.	Drive electronics
	4	○ ● ○ ○	Drive busy and attention set.	Drive electronics
	3	○ ○ ● ●	Drive not ready.	Drive electronics
	2	○ ○ ● ○	Seek check.	Drive electronics
	1	○ ○ ○ ●	Drive fault.	Drive electronics

○ = LED "OFF" ● = LED "ON" * Most probable source

Table A-3. Test Failure Summary (cont'd)

TEST NO.	SECTION NO.	TEST RESULT LED'S	TEST/SECTION FAILURE	PROBABLE SOURCE
3		○ ○ ● ●	VERIFY CYLINDER ZERO	Drive electronics* disc cartridge, PCA-A1
	17	● ● ● ●	Drive status error.	Drive electronics
	16	● ● ● ○	Address miscompare.	Drive electronics
	15	● ● ○ ●	Defective track error.	Disc cartridge
	14	● ● ○ ○	Direct access to spare track.	Disc cartridge
	13	● ○ ● ●	Head 10 data error.	Disc cartridge*, PCA-A6, PCA-A5
	12	● ○ ● ○	Head 9 data error.	Same as section 13
	11	● ○ ○ ●	Head 8 data error.	Same as section 13
	10	● ○ ○ ○	Head 7 data error.	Same as section 13
	7	○ ● ● ●	Head 6 data error.	Same as section 13
	6	○ ● ● ○	Head 5 data error.	Same as section 13
	5	○ ● ○ ●	Head 4 data error.	Same as section 13
	4	○ ● ○ ○	Head 3 data error.	Same as section 13
	3	○ ○ ● ●	Head 2 data error.	Same as section 13
	2	○ ○ ● ○	Head 1 data error.	Same as section 13
	1	○ ○ ○ ●	Head 0 data error.	PCA-A1*, disc cartridge, PCA-A6, PCA-A5

○ = LED "OFF" ● = LED "ON" * Most probable source

7906SR-07

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 INVENTORY	Return for update ☐		Use as is ☐
	Return for salvage ☐		See text ☒
WARRANTY EXTENDED UNTIL:	n/a		

AFFECTED PRODUCTS: ALL 7905 DISC DRIVES
ALL 7906 DISC DRIVES
ALL 7920 DISC DRIVES
ALL 7925 DISC DRIVES

TITLE: NEW UNIT SELECT SWITCH - HP P/N 3100-1700

DMD MATERIALS AND PRODUCTION ENGINEERS HAVE DEVELOPED A NEW 8 POSITION ROTARY SWITCH FOR USE IN THE MAC FAMILY DISC DRIVES AS THE UNIT SELECT SWITCH. THE SWITCH IS CURRENTLY BEING INSTALLED IN ALL NEWLY MANUFACTURED DRIVES AND IS AVAILABLE THROUGH CORPORATE PARTS CENTER (CPC) AS A REPLACEMENT FOR THE OLDER VERSION SWITCH,WHICH IS NOW OBSOLETE AND NO LONGER AVAILABLE (use any existing parts until gone).

THE NEW SWITCH INCORPORATES ENVIRONMENTALLY SEALED WAFERS FOR INCREASED PROTECTION FROM CORROSION IN ALL ENVIRONMENTS,ESPECIALLY HIGHLY CHEMICAL CORROSIVE OR HIGH TEMPERATURE/HIGH HUMIDITY INSTALLATIONS.

THE SWITCH IS A DIRECT REPLACEMENT FOR THE ORIGINAL VERSION,NOT REQUIRING ANY RETROFITS. THE SWITCH DOES HAVE TWO EXTRA GROUND LUGS,HOWEVER. THESE LUGS MUST BE CONNECTED TOGETHER,AS DIAGRAMMED ON THE REVERSE. ALTHOUGH ALL OTHER CONNECTIONS ARE THE SAME AS THE ORIGINAL,THE WIRING REFERENCE HAS ALSO BEEN PROVIDED.

IT SHOULD BE NOTED THAT THIS CHANGE IS A RELIABILITY ENHANCEMENT,IS NOT MANDATORY AND DOES NOT REQUIRE ANY IMMEDIATE ACTION.

MZ/sg PCO #48-5343 8/83-48

9320-4766 (1/83)

HEWLETT PACKARD

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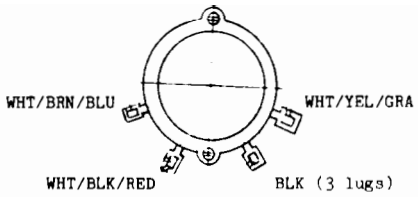

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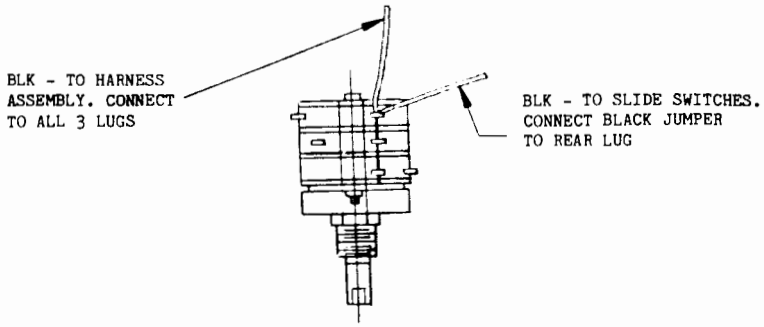

SERVICE NOTE

Supersedes:

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

UNITS AFFECTED:

7905A Disc Drives
7906M Disc Drives - A Version
7920M Disc Drives - A Version
7925M Disc Drives - A Version

TITLE: PDU FAN REVERSAL

SYMPTOM: Intermittent 13037 Controller failures linked to temperature sensitivity when installed in 7905/06/20/25 Master cabinets.

CAUSE: PDU fan may be exhausting air (blowing air out of cabinet).

ACTION: Reverse the fan so it is intaking air (blowing air into the cabinet). This will decrease the temperature of the controller by as much as 8 degrees centigrade. Although some fans will have power cords long enough to allow the reversal, a fan reversal kit (P/N 29425-60026) is available at CPC/PCE for those that are not long enough.

Instructions for reversing the fan, including illustrations, are included with each kit.

It should be noted that the airflow direction of the PDU fan is only a concern on master disc drives as all "B" version and "D"version drives are already intaking air.

MZ/sg PCO# 48-0393 11/83-48

9320-4766 (1/83)

HEWLETT PACKARD

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 EXTENDED UNTIL:			

UNITS AFFECTED:

7905A Disc Drives
7906M Disc Drives - A Version
7920M Disc Drives - A Version
7925M Disc Drives - A Version

TITLE: PDU FAN REVERSAL

SYMPTOM: Intermittent 13037 Controller failures linked to temperature sensitivity when installed in 7905/06/20/25 Master cabinets.

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MZ/sq PCO# 48-0393 11/83-48

9320-4766 (1/83)

HEWLETT PACKARD

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

AFFECTED PRODUCTS: ALL 7905 DISC DRIVES
ALL 7906 DISC DRIVES
ALL 7920 DISC DRIVES
ALL 7925 DISC DRIVES

TITLE: NEW UNIT SELECT SWITCH - HP P/N 3100-1700

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MZ/sg PCO #48-5343 8/83-48

9320-4766 (1/83)

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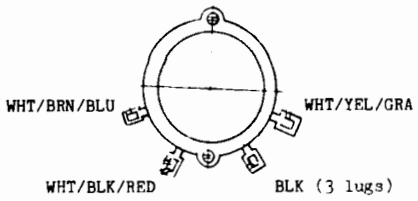

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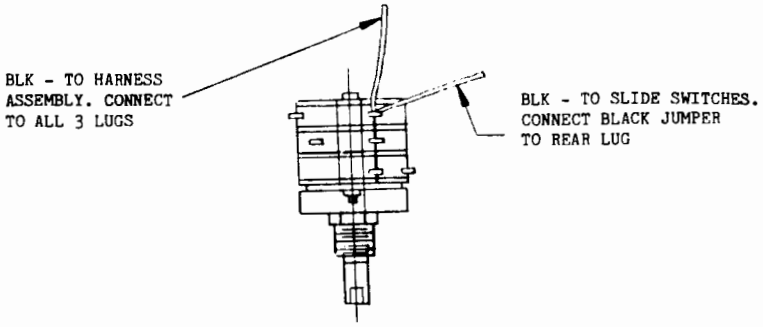

Brendon Sh

LONNIE'S LAWS
For 7905/06 Lower Platter Replacement

1. Remove Receiver
2. Remove indicator assembly
3. Remove cartridge in place switch
4. Remove lower platter cover
5. Insert kimwipe between index transducer and lower platter
6. Remove index transducer
7. Remove lower platter
8. Clean spindle hub and lower disc area
9. Clean data surface of fixed disc
10. Replace lower platter (DARK SIDE UP)
11. Replace retaining ring and tighten screws finger tight
12. Perform runout adjustment (+/- 0.001 in.)
13. Tighten screws in a star fashion to 8.0 in. lbs.
14. Re-check runout and if out of spec, repeat steps 7 thru 13
15. Check flatness (+/- 0.002 in.)
16. Place kimwipe over platter and install index transducer
17. Clean servo surface
18. Replace lower platter cover
19. Perform index transducer pre-alignment
    a. install transducer alignment hub on spindle
    b. position transducer mount in the center of the cover slot
    c. loosen transducer and push forward to touch alignment hub and tighten
20. Degauss lower platter
21. Replace receiver and related items
22. Remove A2 and A5 PCA's (BE SURE TO REMOVE SERVO CABLES FROM A5)

23. Install READ ONLY pre-amp PCA

24. Remove data head 0 and install a servo head in head position 0

25. Use the initial position tool to pre-position the servo head

26. Install servo formatting PCA in the A5 slot

27. Connect the lower servo head to the lower connector and the upper servo head to the upper connector on the servo formatting PCA. (BE SURE NOT TO REVERSE THE CONNECTIONS!!!!)

28. Install CE servo formatting cartridge

29. Load heads and allow to warm up for 30 minutes. The START LED should light when the heads load

30. TURN OFF ALL OTHER EQUIPMENT IN THE RACK TO KEEP THE DRIVE AS STEADY AS POSSIBLE!!!

31. After the 30 min. warm-up, press the white button on the servo formatting PCA (DO NOT ALLOW THE DRIVE TO BE MOVED)

32. After approximately 8 mins., the complete LED should light on the servo formatting PCA indicating that the writting process is complete.

33. Unload heads and remove power from the drive

34. Remove the servo formatting PCA (BE SURE TO REMOVE ALL CABLES)

35. Re-install the A2 and A5 PCA's

36. Install the DSU and head alignment PCA

37. Connect the cable from the lower servo head to the A5 PCA

38. Connect the cable from the upper servo head to the DSU cable using the DSU adapter.

39. With the servo formatting cartridge installed, load heads.

40. Align the UPPER servo head:
    a. select position 7 on the DSU
    b. select head 0
    c. press the start button on the DSU
    d. align head 0 to 0 on the DSU meter

41. Verify servo code:
    a. set the VFY switch on the DSU to the right
    b. select function number 2
    c. flip bottom switch to the right
    d. rotate the delay knob fully ~~counter~~ clockwise
    e. press the start button on the DSU

42. After the drive has made one complete incremental and decremental seek, unload the heads and remove power from the drive.

43. Replace the upper servo head with the normal data head and align the data head with the pre-alignment tool.

44. Remove the servo formatting cartridge and install the head alignment cartridge.

45. Select RANDOM seek on the DSU, press the start button, set the delay knob for 55 on the display, let the drive run for 10 mins.

46. Perform pre-head alignment on heads 0 and 1 (GO BY THE METER NOT THE DISPLAY)

47. Perform index transducer final alignment:
    CAUTION: MAKE SURE THAT THE CORRECTED VALUES ARE WITHIN 10 MICRO SECONDS OF 0, ELSE REPEAT STEP 19!!!!!!!
    a. check cartridge label for tolarences
    b. select function 5 on the DSU
    c. select head 0, press START and observe the display reading
    d. select head 1, press START and observe the display reading
    e. adjust transducer so the CORRECTED values are within +/- 2 of 0 and there sum is 0.0 +/- 0.4

48. Check radial alignment:
    a. select function 4 on the DSU
    b. select head 1
    c. press START and observe the display reading
    d. select function 6 on the DSU
    e. press START and observe the display reading
    f. the two corrected values should be within 1 unit of each other

49. Check seek time:
    a. alternately seek between cylinders 0 and 410 (lower bank of switches 2,8,16,128,256 to the right)
    b. rotate delay knob so that the readings are readable
    c. adjust pot on the servo PCA for a reading of between 42 to 45ms

50. Perform final head alignment (Check cartridge label for tolerances)

51. Unload heads, remove power from the drive, install R/W pre-amp, remove DSU and head alignment PCA, install scratch cartridge, load heads and run diagnostics.

52. GOOD JOB!!!

LONSLW 4/6/82