



**HEWLETT
PACKARD**

**OPERATING AND INSTALLATION
MANUAL**

7908

DISC/TAPE DRIVE



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OPTIONS COVERED

This manual covers the HP 7908P and HP 7908R model
Disc/Tape Drives as well as options 015 and 140.



**HP-IB: Not just IEEE-488, but the
hardware, documentation and
support that delivers the shortest
path to a computation system.**

FOR U.S.A. ONLY

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of the users of this product.

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RADIO FREQUENCY INTERFERENCE
STATEMENT**

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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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.

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.

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.

If this product is to be energized via an auto-transformer (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.

GENERAL INFORMATION

SECTION

I

1-1. INTRODUCTION

The HP 7908 Disc/Tape Drive (figure 1-1) is a medium performance random access data storage device for small and medium size computers. Each HP 7908 provides 16 megabytes of formatted disc storage. The HP 7908 comes in two configurations: the HP 7908P is a stand-alone cabinet model with casters, intended for use on any stable floor surface; the HP 7908R is a rack-mount model, intended to be installed in a system rack. The information in this manual should only be used by service-trained personnel. Table 1-1 provides a listing of the HP 7908 characteristics.

Each disc/tape drive is manufactured complete with a Hewlett-Packard Interface Bus (HP-IB)* controller. Disc/tape drive operations are controlled by the new

CS/80 Instruction Set for mass storage devices. The CS/80 Instruction Set has been used to increase the efficiency and speed of channel operations between disc/tape drive mass storage devices and their associated host computers.

Each HP 7908 (except option 140) includes a tape cartridge backup unit. This unit uses a DC 600 type preformatted data cartridge that provides either 16.7 megabytes (S-Cartridge) or 67 megabytes (L-Cartridge) of storage. Tapes are ordered in groups of five per box.

**HP-IB: Not just IEEE-488, but the hardware, documentation and support that delivers the shortest path to a computation system.*

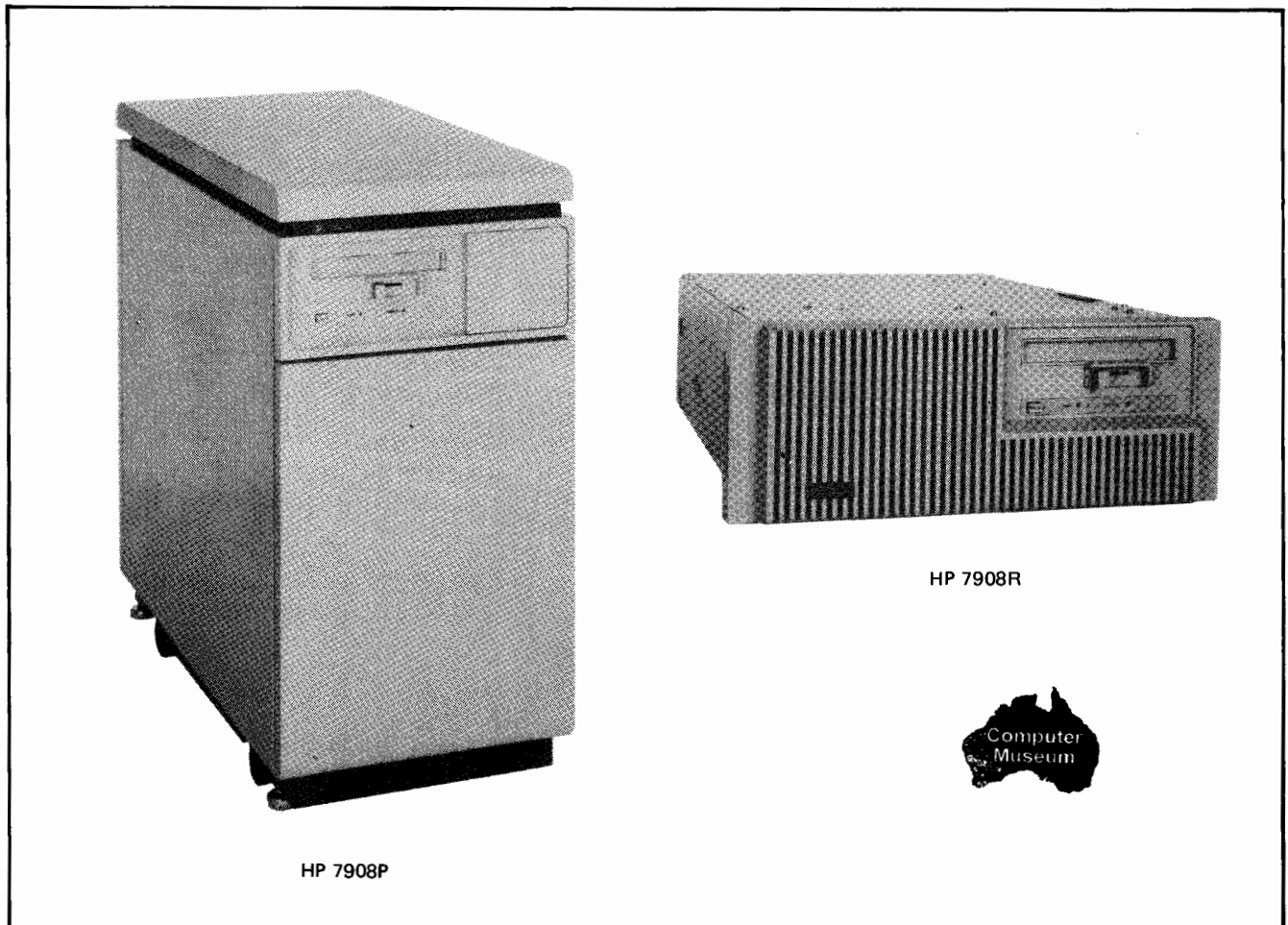


Figure 1-1. HP 7908 Disc/Tape Drives

1-2. ACCESSORIES

The following accessories may be ordered with the disc/tape drive or separately from your local Hewlett-Packard Sales and Support Office. Major Sales and Support Offices are listed at the back of this manual.

HP Order No.	Description
92170G	Table (compatible with stand-alone drives)
88140S	Uncertified 16.7 megabyte Tape Cartridge (box of 5)
88140SC	Certified 1617 megabyte Tape Cartridge (box of 5)
88140L	Uncertified 67.0 megabyte Tape Cartridge (box of 5)
88140LC	Certified 67.0 megabyte Tape Cartridge (box of 5)
8500-1251	Head Cleaner, 118 millilitre (4 ounce) metal can (for refilling plastic bottle)
9300-0767	Cleaning Swabs (package of 50)

WARNING

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

1-3. SUPPORTING DOCUMENTATION

The following documentation may be ordered from a Hewlett-Packard Sales and Support Office.

- *Site Environmental Requirements for Disc/Tape Drives*, part no. 5955-3456.
- *HP 7908 Disc/Tape Drive Operator Instructions*, part no. 07908-90901.
- *HP 7908 Disc/Tape Drive Service Manual*, part no. 07908-90903.
- *CS/80 Instruction Set Programming Manual*, part no. 5955-3442.
- *CS/80 External Exerciser Manual*, part no. 5955-3462.

Table 1-1. HP 7908 Disc/Tape Drive Characteristics

Safety		
<ul style="list-style-type: none"> • HP 7908P/R — CSA certified to CSA 22.2 No. 143 and No. 154. • HP 7908P/R — Meets all applicable safety standards of IEC 380 and IEC 435. • HP 7908P — UL listed to UL 114 and UL 478. • HP 7908R — UL recognized to UL 114 and UL 478. 		
Physical Characteristics		
	HP 7908R*	HP 7908P
Height:	177 mm (7 in.)	720 mm (28.4 in.)
Width:	482 mm (19.0 in.)	354 mm (14.0 in.)
Depth:	738 mm (29.1 in.)	711 mm (28.0 in.)
Weight		
Net:	37.0 kg (81.6 lb)	72.5 kg (160 lb)
Shipping:	58.9 kg (130 lb)	104 kg (230 lb)
*Including front panel.		
Power Characteristics		
Voltage:	88 to 127V (includes 100, 110, and 120V) 180 to 253V (includes 208, 220, and 240V)	
Frequency:	47.5 to 66 Hz	
Phase:	Single	
Power:	400 watts	
Line Dropout:	No effect on performance for dropout equal to or less than one-half cycle of the ac line. Greater than one-half cycle interrupt, the drive may become "not ready". Drive will return to "ready" within 60 seconds after normal power is restored.	
Cooling Requirements		
Allow 76.2 mm (3 in.) in front and behind for adequate air flow.		

2-1. INTRODUCTION

This section contains information needed for a normal initial setup and checkout of the HP 7908 Disc/Tape Drive. (See figure 1-1.) This section also contains information necessary for shipment of the disc/tape drive, therefore, should be retained for reference purposes. For servicing, refer to the *HP 7908 Disc/Tape Drive Service Manual*, part no. 07908-90903. Refer to the *Site Environmental Requirements for Disc/Tape Drives Manual*, part no. 5955-3456, for environmental information related to installation.

2-2. UNPACKING AND INSPECTION

The disc/tape drive is shipped in a reusable container. When the shipment arrives, ensure that the container has been received as specified by the carrier's bill of lading. Inspect the shipping container immediately upon receipt for evidence of mishandling during transit. If the container is damaged or water stained, request that the carrier's agent be present when the container is unpacked.

The disc/tape drive comes in two configurations: a stand-alone cabinet (HP 7908P), or a rackmount (HP 7908R). The HP 7908P is packaged differently than the HP 7908R and requires a different unpacking procedure. (See paragraph 2-4.)

If the container appears to be in satisfactory condition, proceed with the unpacking instructions.

2-3. UNPACKING THE HP 7908R

CAUTION

To avoid damage to the disc/tape drive, do not apply any sudden mechanical shocks to it.

- a. Locate the packing list and compare this list against the purchase order to verify that the shipment is correct.
- b. Cut the container polystrap bands (see figure 2-1).
- c. Lift the container top from the pallet base.
- d. Remove the accessories box and the front panel from the protective cover.
- e. Lift the protective cover from the disc/tape drive.

WARNING

The HP 7908R weighs 37.0 kg (81.6 lb) and two people should lift it from the shipping pallet.

- f. Lift the disc/tape drive off the pallet base and remove the plastic bag.
- g. Visually inspect the disc/tape drive for damage.
- h. If a visual examination reveals any damage to the HP 7908R, follow the claims procedure described in paragraph 2-7.

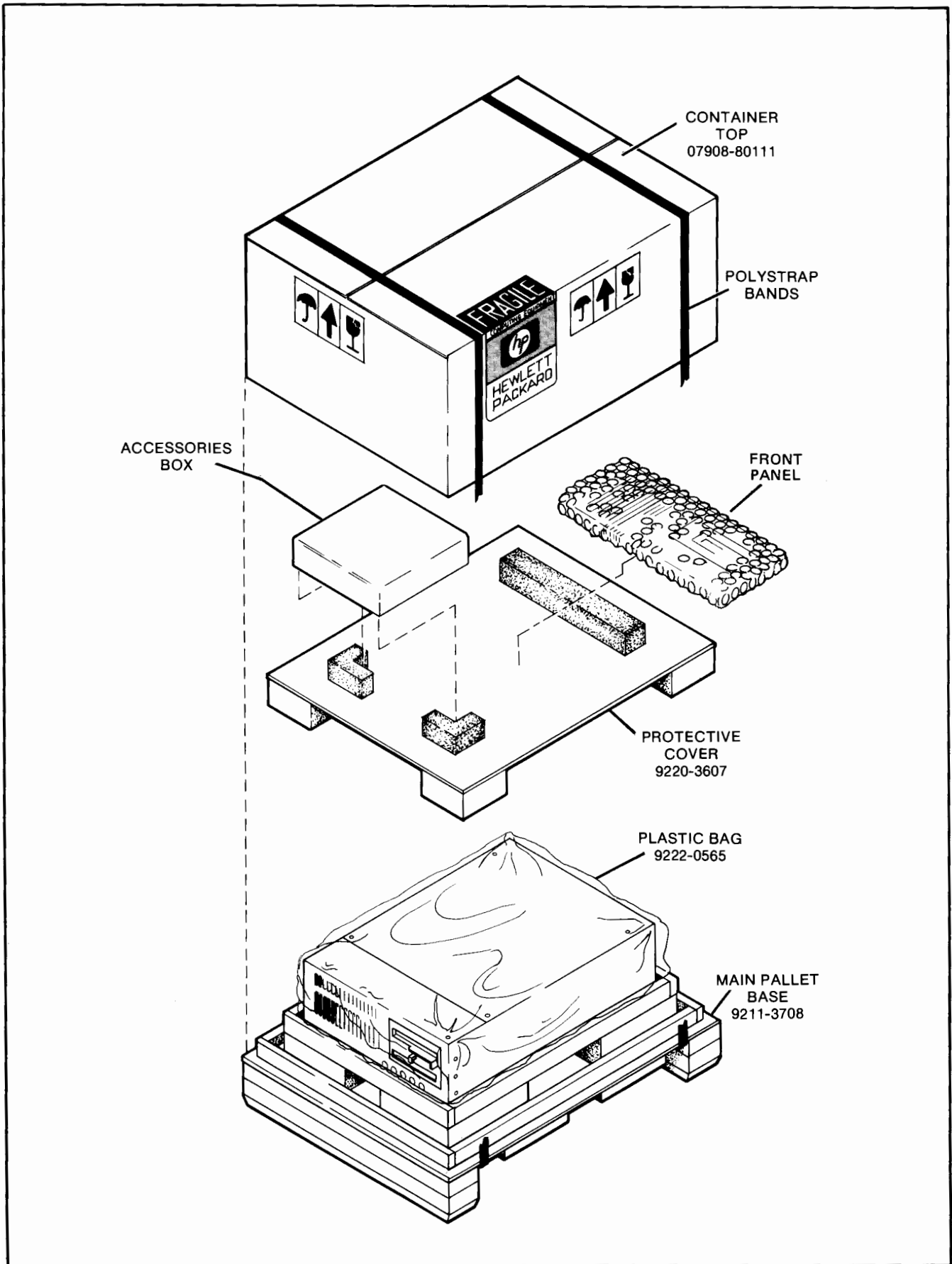
Note: Retain the shipping container and packing material for future use.

2-4. UNPACKING THE HP 7908P

CAUTION

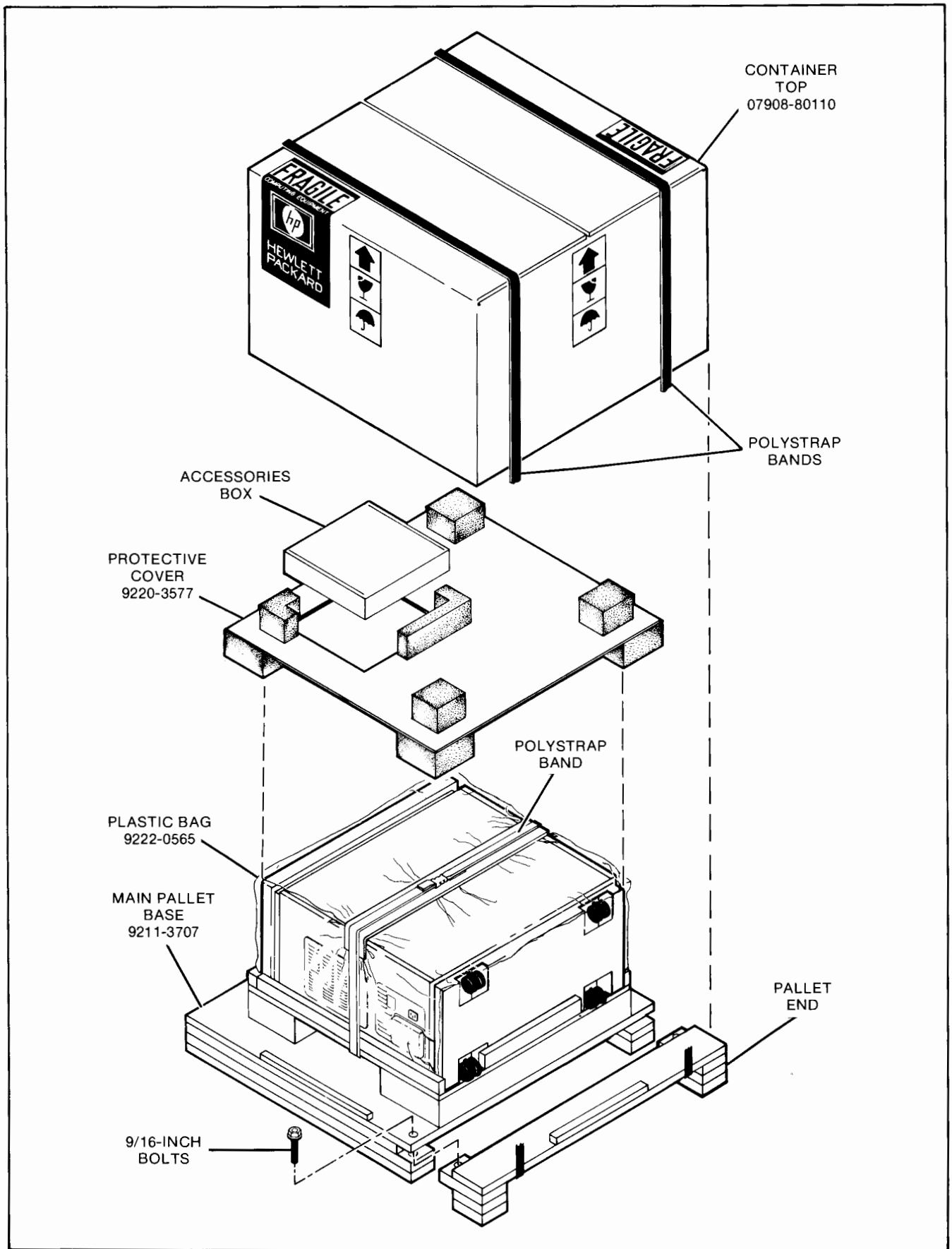
To avoid damage to the disc/tape drive, do not apply any sudden mechanical shocks to it.

- a. Locate the packing list and compare this list against the purchase order to verify that the shipment is correct.
- b. Cut the polystrap bands (see figure 2-2).
- c. Lift the container top from the shipping pallet.
- d. Remove the accessories box.
- e. Lift the protective cover from the disc/tape drive.
- f. Using a 9/16-inch wrench, remove the two bolts that hold the pallet end to the main pallet base.
- g. Pull the pallet end from the main pallet base.
- h. Lift the other end of the main pallet base up until the cabinet casters rest firmly on the floor (see figure 2-3).
- i. Cut the polystrap band holding the disc/tape drive to the main pallet base.
- j. Separate the disc/tape drive from the pallet.
- k. Visually inspect the disc/tape drive for damage.



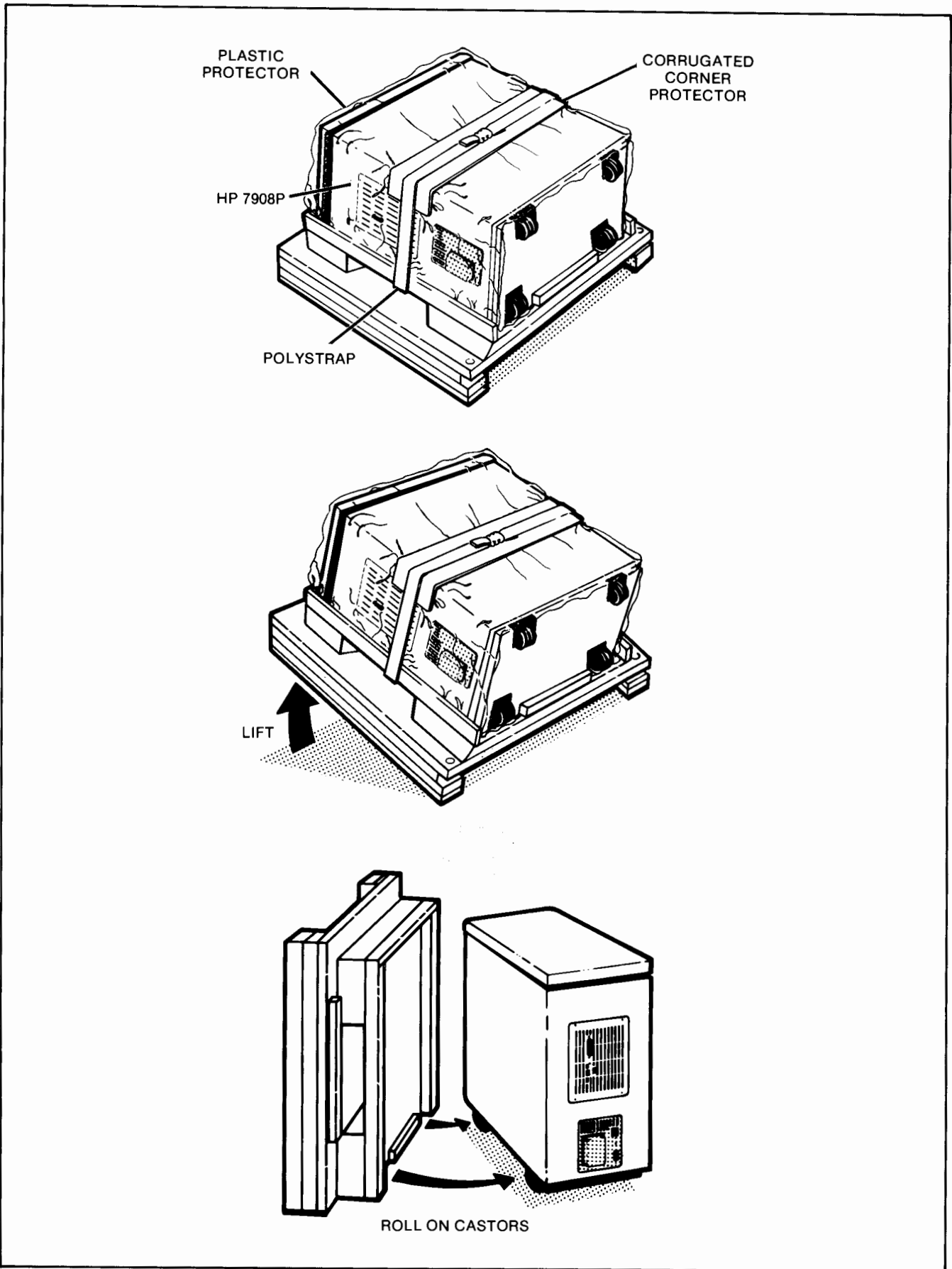
7908-3A

Figure 2-1. HP 7908R Shipping Package



7908-4B

Figure 2-2. HP 7908P Shipping Package



7908-5A
7908-14A
7908-15A

Figure 2-3. HP 7908P Removal

1. If a visual examination reveals any damage to the HP 7908P, follow the claims procedure described in paragraph 2-7.

Note: Retain the shipping container and packing material for future use.

2-5. MANUALS

Check to ensure that all manuals specified on the packing list have been received.

2-6. EQUIPMENT

The HP 7908 model number and full serial number are stamped on an identification label located behind the pop-off front panel. Be sure to include the model number and serial number in any correspondence with Hewlett-Packard about this product.

2-7. CLAIMS PROCEDURE

WARNING

To avoid dangerous electrical shock, do not apply power to the HP 7908 when there are signs of physical damage to any portion of the outer enclosure.

If the shipment is incomplete or if the equipment is damaged or fails to meet specifications, notify your nearest Hewlett-Packard Sales and Support Office. If damage occurred in transit, notify the carrier as well. Hewlett-Packard will arrange for replacement or repair without waiting for settlement of claims against the carrier. In the event of damage in transit, retain the shipping container(s) and packaging material for inspection.

2-8. SITE PREPARATION

WARNING

The HP 7908 does not contain operator-serviceable parts. To prevent electrical shock, refer all installation and maintenance activities to service-trained personnel.

The site must be prepared in accordance with the information given in the *Site Environmental Requirements for Disc/Tape Drives Manual*, part no. 5955-3456.

2-9. ENVIRONMENTAL REQUIREMENTS

CAUTION

The HP 7908 has been designed to operate within the environmental lim-

its specified in the *Site Environmental Requirements for Disc/Tape Drives Manual*, part no. 5955-3456.

Operation of the HP 7908 outside the specified limits may result in degradation or failure and may not be covered by warranty.

CAUTION

The operating temperature should be between 10°C (50°F) and 40°C (104°F) and should not change more than 10°C (18°F) per hour.

2-10. COOLING REQUIREMENTS

A fan in the disc/tape drive provides adequate ventilation when the disc/tape drive is operated in an appropriate environment. As shown in figure 2-4, cooling air is drawn into the disc/tape drive through the front, and is exhausted through the rear panel.

Note: To obtain maximum cooling efficiency, ensure that the airflow through the front and rear of the disc/tape drive is not restricted. Leave at least 76.2 mm (3 in.) between the rear of the unit and the nearest wall.

2-11. MOUNTING REQUIREMENTS

CAUTION

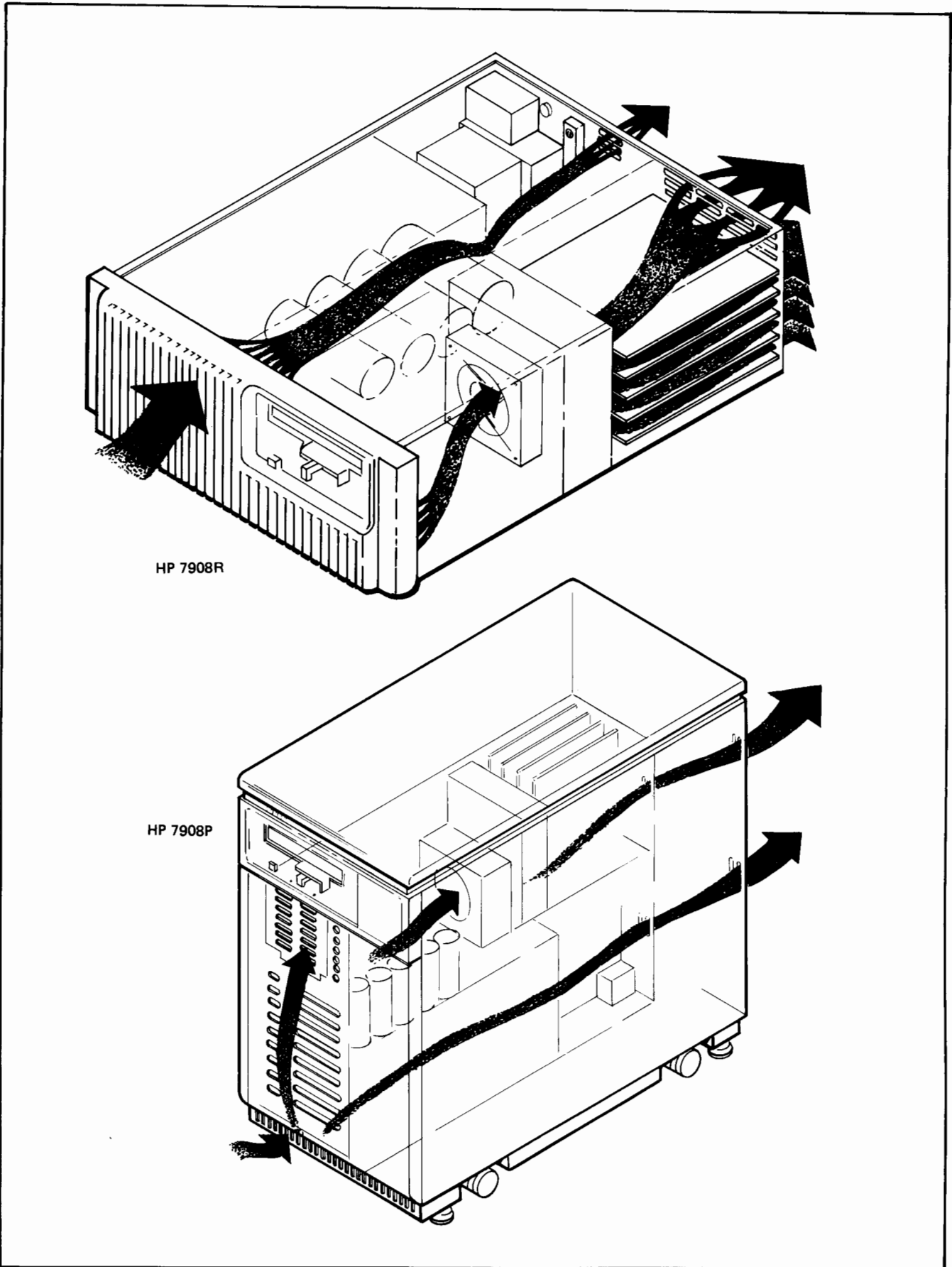
The HP 7908P is equipped with casters only for moving the unit. During installation and for subsequent operation, the leveling feet must be lowered far enough so that the casters carry no weight. The leveling feet must all touch the floor holding the HP 7908P in a stable, horizontal position. A small adjustable wrench will assist in adjustment of the leveling feet.

The HP 7908P includes leveling feet and is intended for installation on any flat stable floor.

The HP 7908R will fit in only two HP cabinets: the HP 29429A and the HP 29431E. To prepare the HP 7908R for rack mounting, proceed as follows:

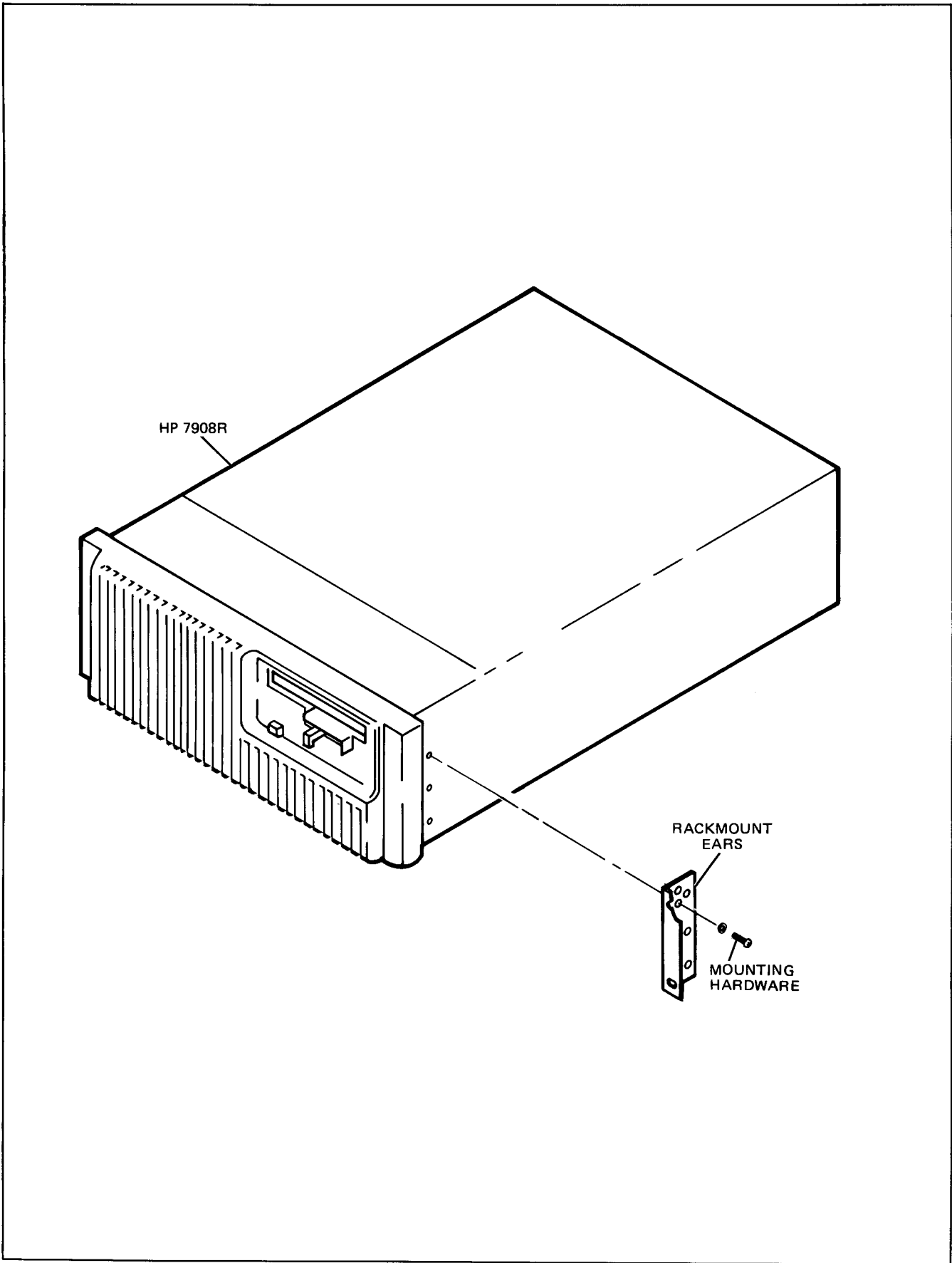
- a. Remove the rackmount ears (HP part no. 07908-00023) from the accessories box.
- b. Connect the rackmount ears to the side of the HP 7908R (see figure 2-5).





7908-6
7908-7

Figure 2-4. HP 7908P/R Airflow



7908-8

Figure 2-5. HP 7908R Rackmounting Information

WARNING

It takes two people to install the HP 7908R in the cabinet.

- c. Install the HP 7908R in the cabinet and connect with the appropriate hardware.

Note: Use the bottom hole (see figure 2-5) to mount rackmount ears to disc/tape drive.

Note: On HP systems, the rack slides are provided in the cabinet.

- d. Place the front panel in place by pushing firmly on the front.

2-12. INSTALLATION INFORMATION

The following paragraphs provide the necessary information to install the HP 7908. They include information on updating supplements, tools and test equipment required for installation, ac outlet and external ground requirements, power cord information, and HP-IB considerations

2-13. UPDATING SUPPLEMENTS

Before installing the disc/tape drive, read all updating supplements (if any) for the HP 7908 manuals and any related manuals. Updating supplements are provided with the appropriate manual.

2-14. TOOLS AND TEST EQUIPMENT REQUIRED

2-15. TOOLS. No installation tools other than ordinary handtools are required.

2-16. TEST EQUIPMENT. Test equipment capable of measuring the limits of the environmental and power specifications are required during the installation of the disc/tape drive.

2-17. POWER REQUIREMENTS**CAUTION**

Do not attempt to operate a disc/tape drive configured for 120 Vac on 220 Vac or vice versa. Damage to the disc/tape drive will result.

The HP 7908 has been preset for the proper operating voltage before being shipped. The standard model is set for voltages between 88-127 Vac, and option 015 is set for voltages between 180-253 Vac.

2-18. AC POWER OUTLET AND EXTERNAL GROUND

Have a qualified electrician check the power outlet with an ac voltmeter to ensure that the required voltage is present. (See table 1-1.) Also, check the earth or safety ground in the power outlet to ensure that there is a good earth ground (properly earthed ac outlet).

2-19. FUSE RATING CHECK

The HP 7908 is equipped with one primary power fuse. Figure 2-6 indicates the location of the primary power fuse on the rear panel. The fuse value is dependent on the operating voltage; therefore, it should be checked to ensure it is the value shown in the following list:

Nominal Operating Voltage	Fuse Description	HP Part No.
120 Vac	8A, 250V, fast-blo	2110-0342
220 Vac	4A, 250V, fast-blo	2110-0055

2-20. VOLTAGE SELECTION

The voltage is preset at the factory before shipment. Voltage selection is made by a voltage strap internal to the disc/tape drive (see figure 2-7).

Disc/Tape Drive Voltage Operation	Input AC Voltage Range
120V	88 to 127 Vac
220V	180 to 253 Vac

2-21. HP 7908P VOLTAGE STRAPPING. To change or check the disc/tape drive voltage strapping, proceed as follows:

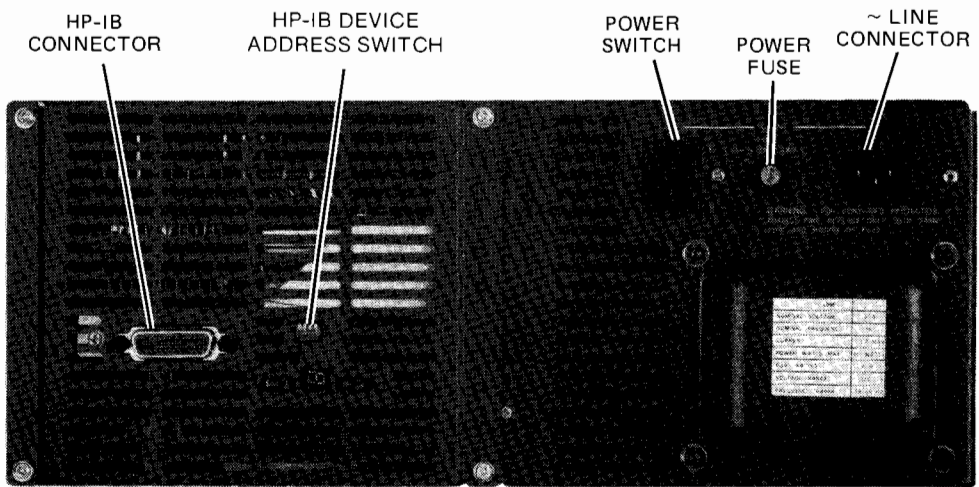
WARNING

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

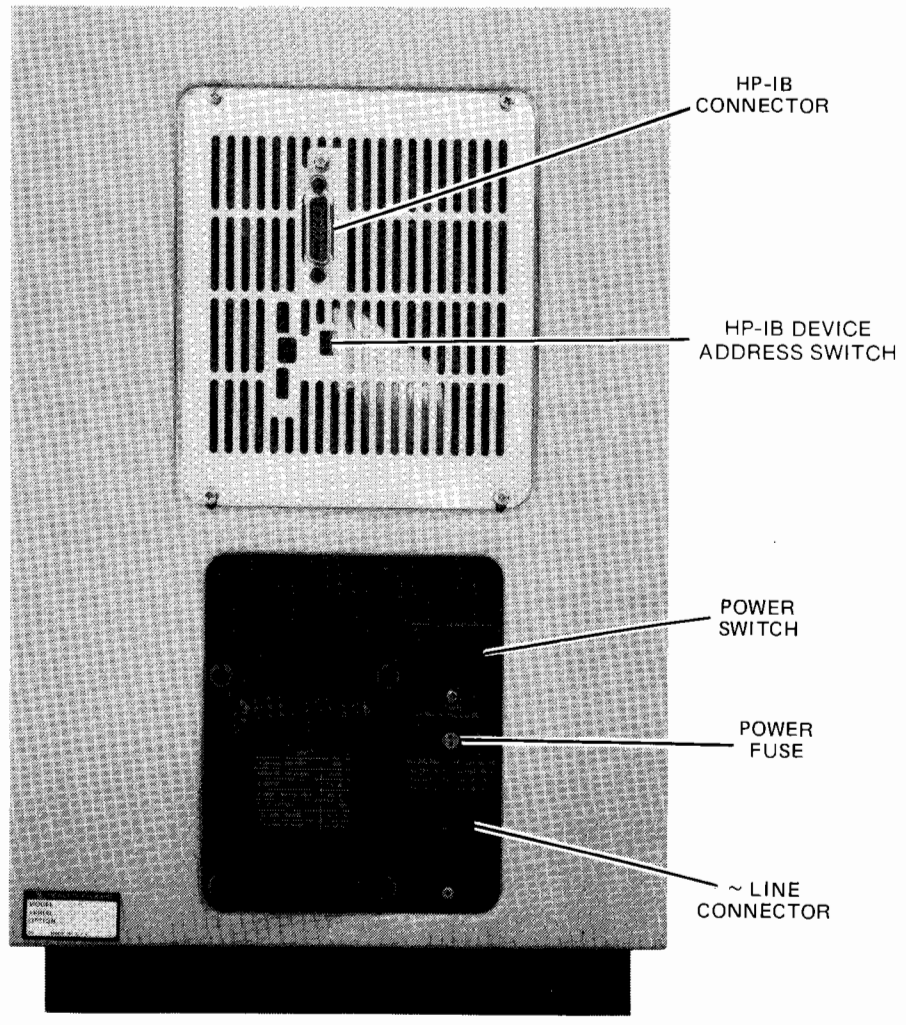
- Set the POWER switch (see figure 2-6) on the rear panel to the 0 (off) position.
- Disconnect the ac power cord from the wall outlet and from the receptacle on the rear of the disc/tape drive.

CAUTION

Always ensure that power has been removed before disconnecting the HP-IB cable.



HP 7908R



HP 7980P

Figure 2-6. HP 7908 Rear Panel

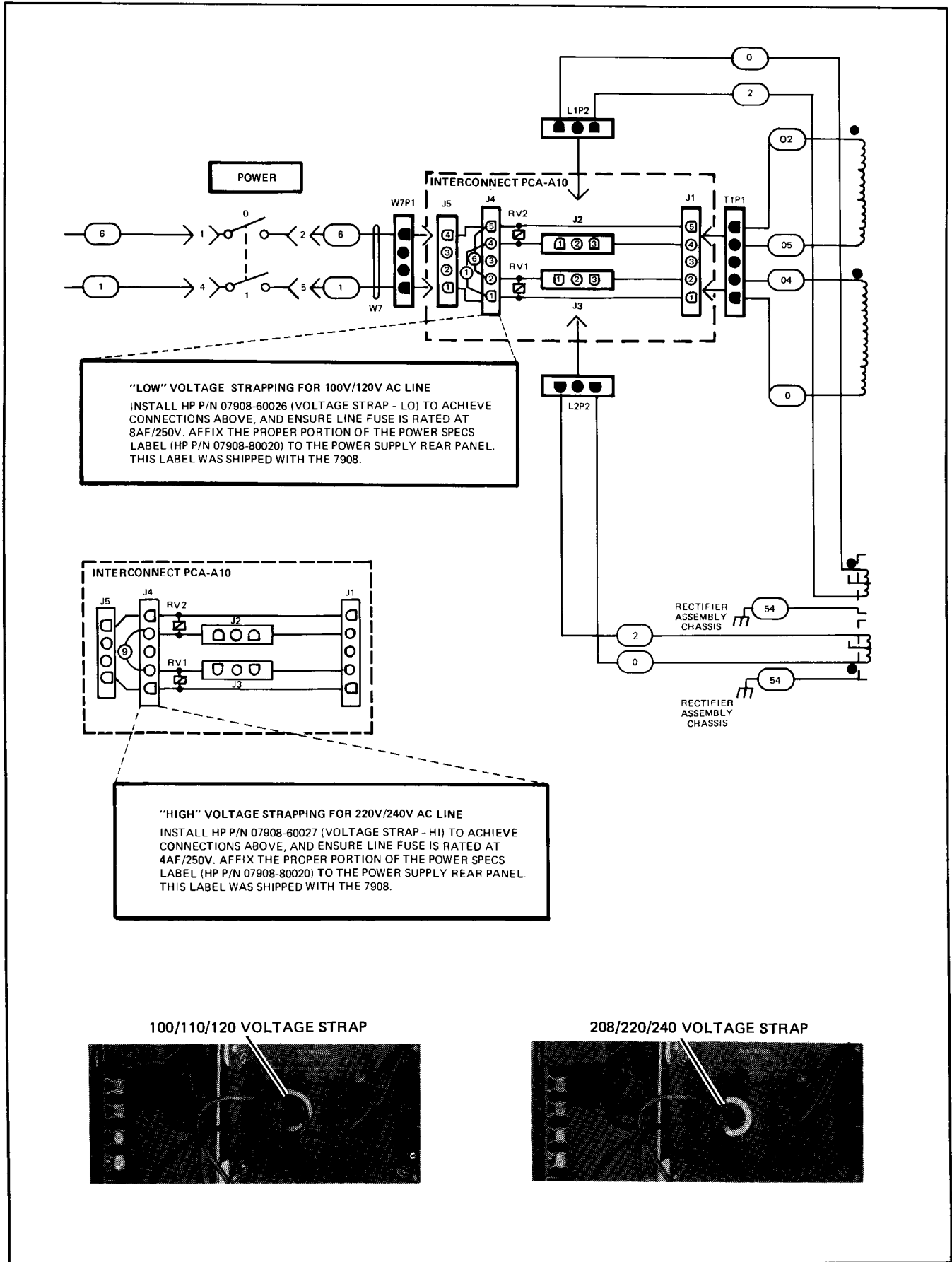


Figure 2-7. Voltage Selection

- c. If applicable, loosen the two thumb screws which hold the HP-IB cable connector (see figure 2-6) in place and disconnect the HP-IB cable.
- d. The lower front panel is removed by pulling the top of it forward and sliding it up and out of the cabinet base assembly.
- e. The upper front panel on the standard disc/tape drive is removed by pulling it forward. The upper front filler panel (option 140) is held on by one screw located beneath the panel.
- f. Remove the five screws that hold the rear panel in place.
- g. Remove the four screws that hold the flip top in place.
- h. Lift the front of the flip top up and back until it faces up.
- i. Lift the flip top up and off of the cabinet base assembly.
- j. Remove the disc module top cover.
- k. When the cover is removed, the voltage strap is accessible (see figure 2-7).
- l. For 100, 110 or 120 volt operation, the voltage strap (part no. 07908-60026) should have two wires (one brown [1], one blue [6]).
- m. For 208, 220 or 240 volt operation, the voltage strap (part no. 07908-60027) should have one white [9] wire.
- n. To switch voltage straps, squeeze the ends of the voltage strap and pull out from the power supply.
- o. To put the voltage strap into place, push the new voltage strap in until it is seated.
- p. Change to the correct fuse value.
- q. Change the power specification label.

2-22. HP 7908R VOLTAGE STRAPPING. To check or change the disc/tape drive voltage strapping, proceed as follows:

WARNING

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

- a. Set the POWER switch on the rear panel to the 0 (off) position.
- b. Disconnect the ac power cord from the wall outlet and from the receptacle on the rear of the disc/tape drive.

CAUTION

Always ensure that power has been removed before disconnecting the HP-IB cable.

- c. If applicable, loosen the two thumb screws which hold the HP-IB cable connector (see figure 2-6) in place and disconnect the HP-IB cable.
- d. Pull the front cover from the HP 7908R.
- e. Remove the hardware that holds the rackmount ears to the cabinet.

WARNING

Use two people to lift the HP 7908R from the cabinet.

- f. Remove the disc/tape drive from the cabinet.
- g. Remove the disc module top cover.
- h. When the cover is removed, the voltage strap is accessible (see figure 2-7).
- i. For 100, 110 or 120 volt operation, the voltage strap (part no. 07908-60026) should have two wires (one brown [1], one blue [6]).
- j. For 208, 220 or 240 volt operation, the voltage strap (part no. 07908-60027) should have one white [9] wire.
- k. To switch voltage strap, squeeze the sides of the voltage strap and pull out from the power supply.
- l. To put the voltage strap into place, push the new voltage strap into place until it is seated.
- m. Change to the correct fuse value.
- n. Change the power specification label.

2-23. POWER CORD INSTALLATION

CAUTION

For U.S.A. operation, use only a UL listed, detachable power cord with type SJT flexible cord, suitable for rated voltage and current. Check the input ac voltage plug before connecting the

power cord. The HP 7908 is shipped with an appropriate power cord.

CAUTION

Do not attempt to operate an HP 7908 configured for 100/120 Vac on 220/240 Vac or vice versa. Damage to the disc/tape drive will result.

Check the input ac voltage and fuse rating before proceeding with the power cord installation. The HP 7908R uses power cord part no. 8120-1378. The HP 7908P uses power cord part no. 8120-2371. The various power cords available are shown in figure 2-8.

To attach a power cord, proceed as follows:

- Set the POWER switch (see figure 2-6) on the disc/tape drive rear panel to 0 (off) position.
- Plug the female end of the power cord into the connector on the disc/tape drive rear panel.

2-24. INTERCONNECTION INSTRUCTIONS

CAUTION

Do not connect or disconnect the HP-IB cable with power applied to the HP 7908.

The interconnection of the disc/tape drive to a system through the Hewlett-Packard Interface Bus (HP-IB) cable (part no. 8120-3446) is dependent on the system. The location of the HP-IB connector for the disc/tape drive is shown in figure 2-6. The major HP-IB considerations concerning the HP 7908 are contained in the following paragraphs.

2-25. HP-IB CABLING. The Hewlett-Packard Interface Bus (HP-IB) has certain rules which must be followed for successful installation of the HP 7908. Cabling is limited to 1 metre per HP-IB load. Typically the Central Processing Unit (CPU) is 7 equivalent loads and the HP 7908 is 1 equivalent load (see figure 2-9).

The CPU adheres to an HP standard which allows 7 metres of HP-IB cable between the CPU and the nearest device connected to it and 1 metre of cable between each additional device. The maximum configuration is eight devices (not including CPU) per HP-IB channel or a maximum of 15 metres or 15 equivalent loads.

2-26. HP-IB DEVICE ADDRESS. This switch is accessible through the rear panel (see figures 2-6 and 2-10). The HP-IB Address Switch permits setting one of eight unique addresses. The address switch can be set

with a nonmetallic pointed tool (e.g., wooden match, etc.). Address settings, which are generally set one time, are as follows:

Switch Settings					HP-IB Address
*(msb)	1	2	3	4 (lsb)	
X	0	0	0	0	0
X	0	0	0	1	1
X	0	1	0	0	2
X	0	1	1	0	3
X	1	0	0	0	4
X	1	0	1	0	5
X	1	1	0	0	6
X	1	1	1	0	7

*msb = most significant bit

lsb = least significant bit

X = don't care

Note: Check the HP-IB device address switch and ensure that no two devices in the system have the same address.

2-27. INSTALLATION CHECKS

After the HP 7908 has been installed and the power connections made, visually inspect the installation. If the inspection verifies that everything is in order and correct, proceed to the power-on sequence and installation checks.

CAUTION

Do not connect or disconnect the HP-IB cable with power applied to the disc/tape drive.

2-28. POWER-ON SEQUENCE

Set the rear panel POWER switch to the 1 (on) position (refer to figure 2-11 and table 2-1). When power is applied to the disc/tape drive, it performs an internal power-on test. The power-on test takes approximately 1 minute. During the power-on test a high-pitched sound will be heard for approximately eight seconds. This sound will be followed by the buzzing sound of the tape drive. The tape drive sound will last for several seconds. At the completion of the test the letter **!** and a period (.) will be displayed on the Status Readout. The period indicates completion of the power-on test and the letter **!** indicates that the HP 7908 has passed the power-on test.

If a tape cartridge is installed in the tape drive, the HP 7908 will continue with tape loading (1 to 2 minutes) and a 3-second tape drive test. At the completion of the tape drive test, a **!** will be displayed on the Status Readout.

Any indication other than **!** indicates that the disc/tape drive has failed one of the internal tests and requires further testing to isolate the trouble to a unique assembly. The testing is activated by the Self-Test or Diagnostic switches on the rear panel.

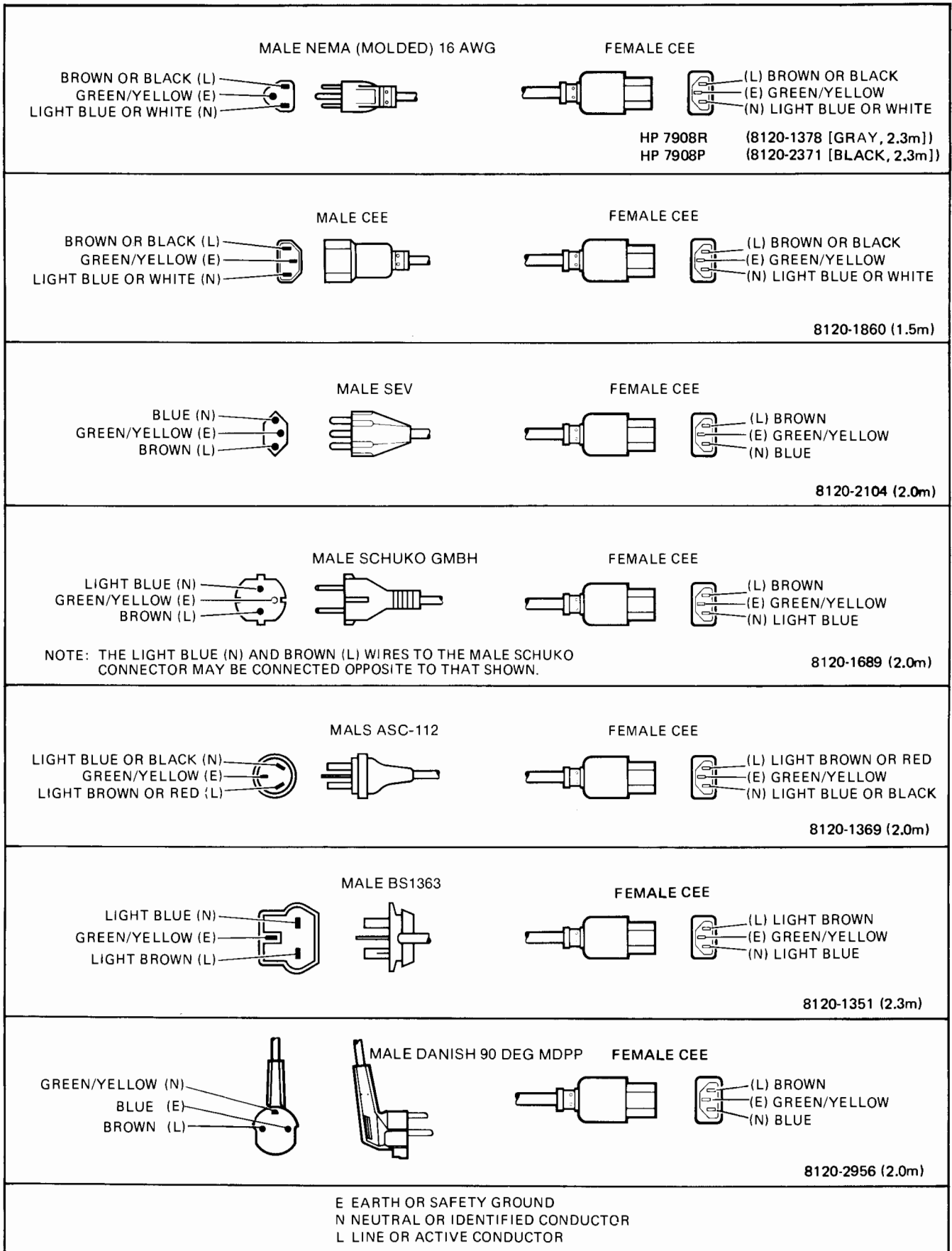
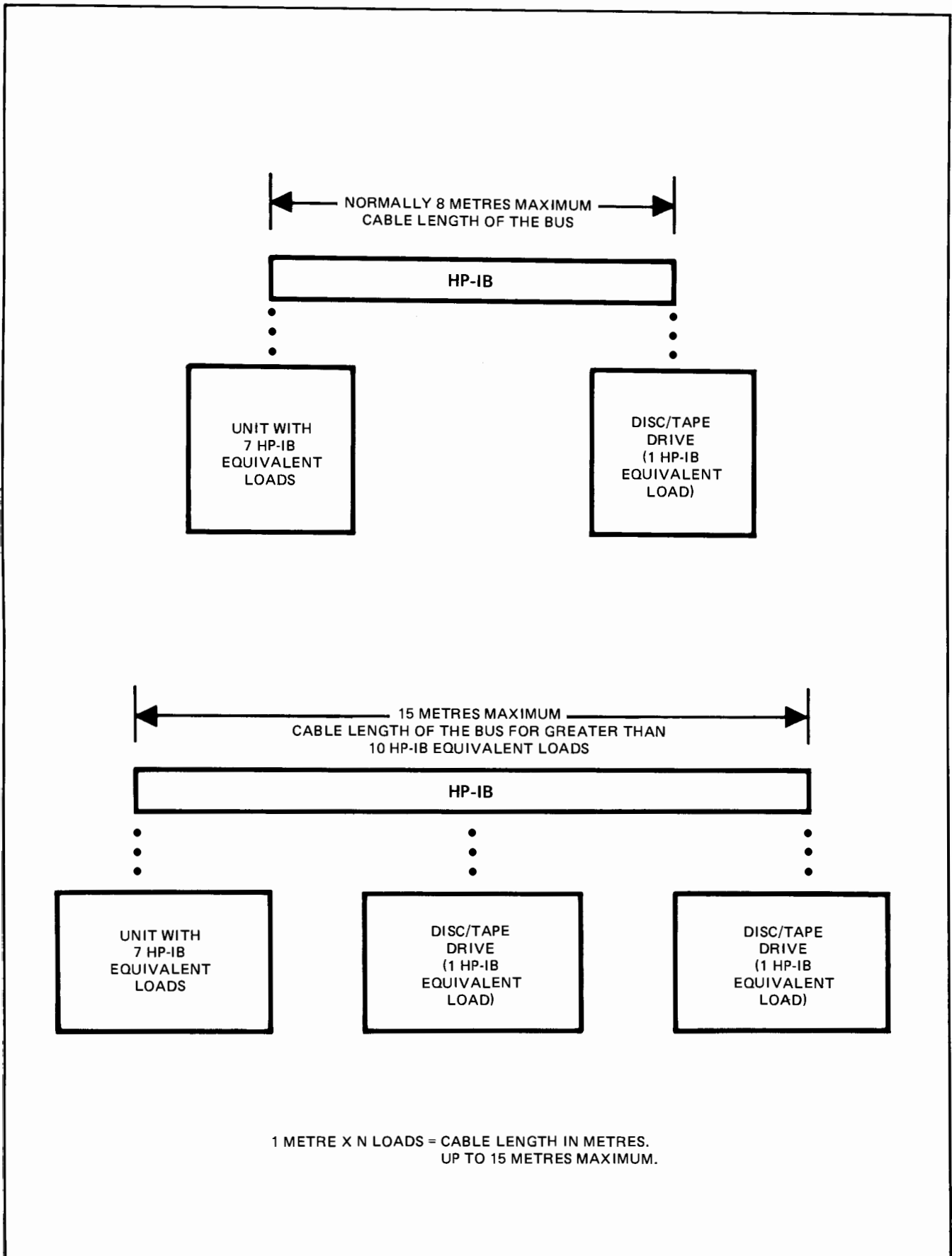


Figure 2-8. AC Power Cord Sets



7908-10

Figure 2-9. Maximum Cable Length for HP-IB Channel

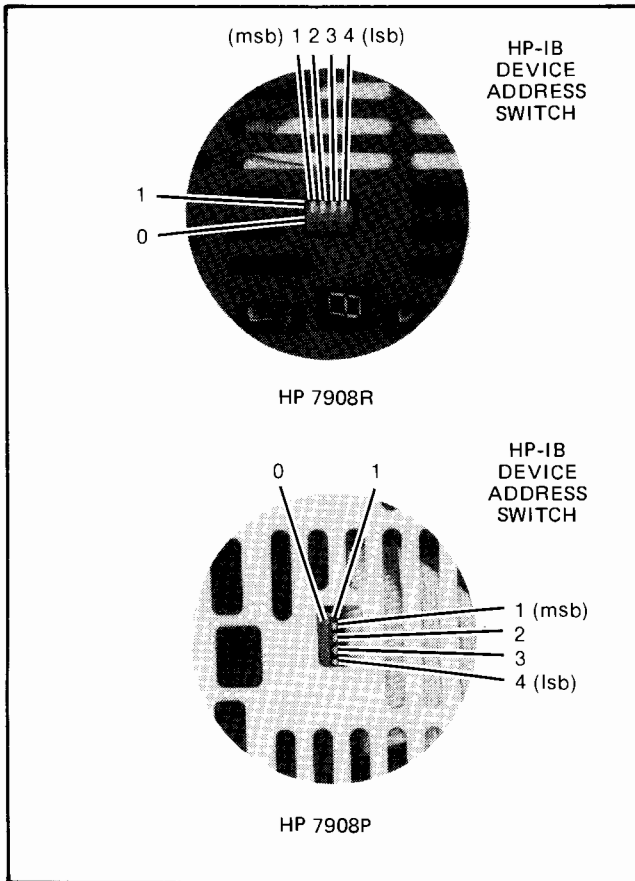


Figure 2-10. HP-IB Device Address Switch

The disc/tape drive is capable of executing two troubleshooting routines which have been preprogrammed into the microprocessor ROM. Both routines execute thorough hardware checks. The self-test routine performs a short error rate test. The diagnostic routine performs an extensive seek and verify test.

When the disc/tape drive is first powered on, it is in the normal mode (see figure 2-11). In the normal mode,

momentarily pressing the Self-Test switch will activate the self test, and momentarily pressing the Diagnostic switch will activate the diagnostics. Simultaneously pressing the Self-Test and Diagnostic switches causes a power-on to occur and is equivalent to turning the disc/tape drive power switch to 0 (off) and then to 1 (on) again (see figure 2-11).

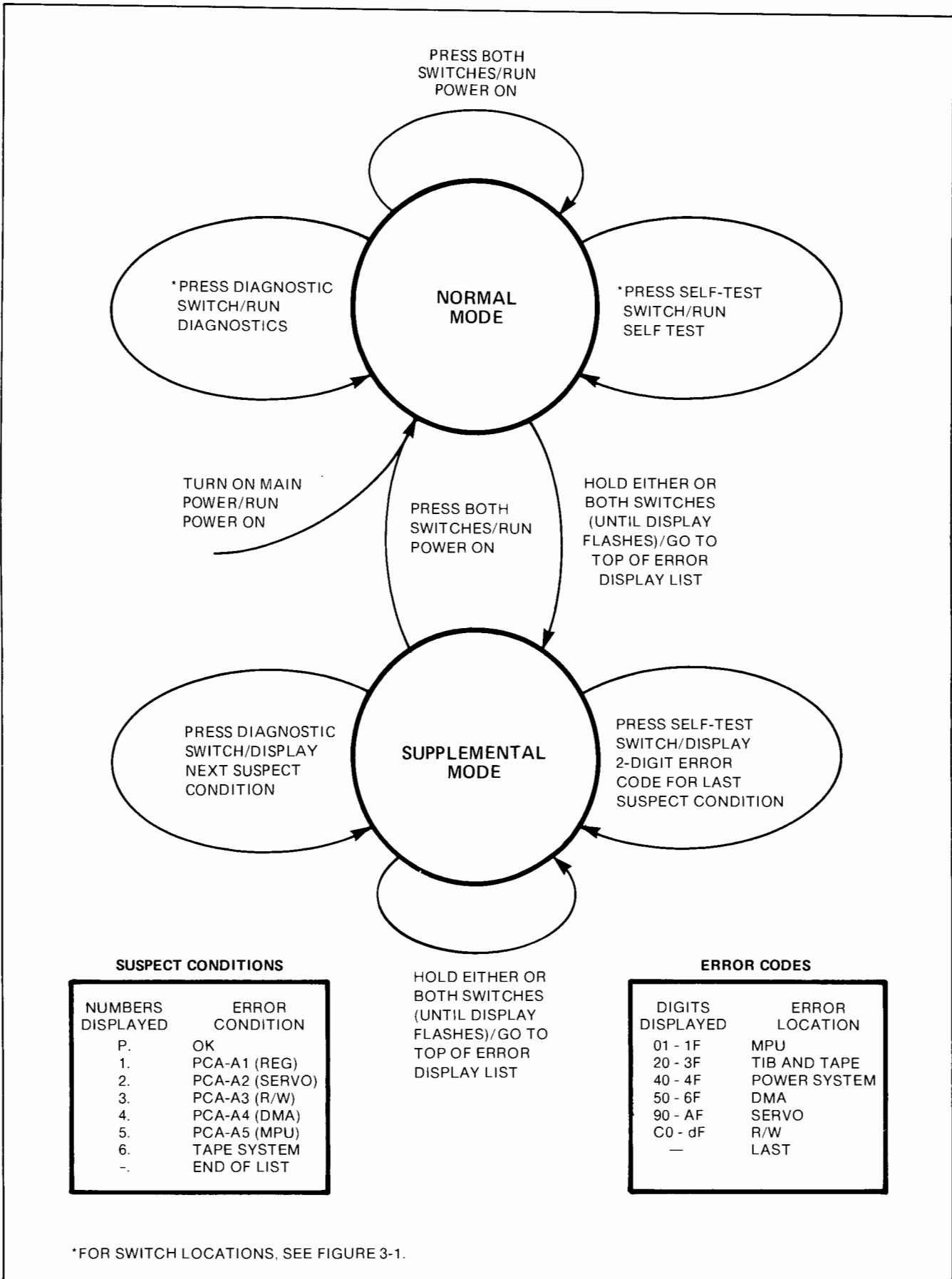
When in the normal mode, holding either the Self-Test or Diagnostic switch depressed until the display flashes causes the HP 7908 to enter the supplemental mode. The supplemental mode should only be used for troubleshooting the disc/tape drive. Once in supplemental mode, a number or P appears on the Status Readout. A P means that the HP 7908 passed all tests which were run. If a number appears, this indicates a suspect condition (see figure 2-11). Press the Self-Test switch momentarily to see a two-digit error code associated with the suspect error condition which was displayed. The two digits represent an error code as shown in figure 2-11. Pressing the Diagnostic switch momentarily will show the next suspect condition, if any. Any time “-” appears on the Status Readout, the last error condition or last error code has been displayed for that assembly.

At any time the Self-Test or Diagnostic switches can be held until Status Readout flashes, and the results of the test run can be displayed again. To exit supplementary mode, simultaneously press both Self-Test and Diagnostic switches momentarily.

Once the first CS/80 instruction is received by the HP 7908, background diagnostics are enabled. This permits the HP 7908, when idle, to check itself at approximately two second intervals. Background diagnostics monitor the controller system and the fault latch for vital information during idle states. An idle state occurs when the host CPU has not conversed with the HP 7908 for one second or more. Each time background diagnostics are completed, a P is displayed on the status readout; therefore, during idle states the status readout will display a flashing P at two second intervals.

Table 2-1. State Diagram Symbols

SYMBOL	DESCRIPTION
	<p>STATE SYMBOL. This symbol indicates the current condition a device is in. The symbol contains the name of the state.</p> <p>INPUT. Information read from an external source (such as a switch) which causes a response.</p> <p>RESPONSE. The output caused by a certain input while in a certain state.</p> <p>TRANSITION. The path from one state to another or from one state to itself.</p>



SUSPECT CONDITIONS

NUMBERS DISPLAYED	ERROR CONDITION
P.	OK
1.	PCA-A1 (REG)
2.	PCA-A2 (SERVO)
3.	PCA-A3 (R/W)
4.	PCA-A4 (DMA)
5.	PCA-A5 (MPU)
6.	TAPE SYSTEM
-	END OF LIST

HOLD EITHER OR BOTH SWITCHES (UNTIL DISPLAY FLASHES)/GO TO TOP OF ERROR DISPLAY LIST

ERROR CODES

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

*FOR SWITCH LOCATIONS, SEE FIGURE 3-1.

Figure 2-11. Internal Diagnostic States

2-29. CONTROLLER INSTRUCTION SET

The HP 7908 contains a controller that responds to the new Hewlett-Packard CS/80 Instruction Set. This new instruction set has been written to increase the efficiency and speed of channel operations between disc/tape drive mass storage devices and their associated computers. Refer to *CS/80 Instruction Set Programming Manual*, part no. 5955-3442, for detailed information.

2-30. REPACKAGING FOR SHIPMENT

When the HP 7908 requires repackaging for shipment, use the original container and packing material. If the container is not available, consult your local Hewlett-Packard Sales and Support Office regarding shipment. Before shipment, the container (or equipment) should have a tag identifying the owner and the service or repair to be performed. Include the equipment model number and full serial number.

2-31. HP 7908R REPACKAGING

To repack the HP 7908R, proceed as follows:

- a. Pull the front cover from the disc/tape drive.
- b. Remove the rackmount ears.
- c. Place the disc/tape drive in a plastic bag and put it on the base.
- d. Wrap the front cover in bubble plastic.
- e. Place the protective cover over the disc/tape drive.
- f. Place the wrapped front cover on the protective cover (see figure 2-1).
- g. Secure the container top to the pallet base using 1/2-inch polystrap banding.

2-32. HP 7908P REPACKAGING

To repack the HP 7908P, proceed as follows:

CAUTION

The HP 7908P should be repackaged exactly as shown in figure 2-2, so that when the main pallet base is to the left of the drive, the rear panel of the drive faces forward. Damage may result if the disc/tape drive is repackaged improperly.

- a. Place the main pallet base on edge (see figure 2-3).
- b. Place the protective bag over the HP 7908P.
- c. Position the disc/tape drive so the side is flush with the inside of the main pallet base.
- d. Tighten and secure a 1/2-inch polystrap around the disc/tape drive.
- e. Lay the main pallet base flat on the floor (see figure 2-2).
- f. Move the pallet base flush to the end of the pallet (see figure 2-2).
- g. Replace and tighten the two 9/16-inch bolts.
- h. Place the protective cover over the disc/tape drive.
- i. Place the outside cover on the disc/tape drive.
- j. Secure with two polystrap bands.

OPERATING INSTRUCTIONS

SECTION

III

3-1. OPERATING PRECAUTIONS

The operator should observe the following precautions when operating the HP 7908 Disc/Tape Drive.

WARNING

The HP 7908 does not contain operator-serviceable parts. To prevent electrical shock, refer all installation and service activities to service-trained personnel.

CAUTION

Before an uncertified DC 600 tape cartridge is used, it must be certified by any host system which supports CS/80 devices.

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

Do not attempt to remove a tape cartridge until a tape cartridge unloading sequence has been completed.

- Heed all warning and caution labels affixed to the HP 7908.
- Do not cycle the HP 7908 power on and off unnecessarily.
- Do not clean the tape drive capstan or head with a cleaning swab other than the one listed in the cleaning procedures.
- Only service-trained personnel can unpack and install the HP 7908.
- When not in use, all tape cartridges should be removed from the tape drive and stored in the protective plastic case. If tape cartridges are left in the tape drive, they may dent the capstan and may collect excessive amounts of dust and dirt.
- Tape cartridges should not be left in areas of direct sunlight or areas where magnetic fields are present (e.g., motors, transformers, etc.).
- Tape cartridges should not be operated at temperatures below 10°C (50°F) or above 40°C (104°F) or stored at temperatures below -40°C (-40°F) or above 60°C (140°F).
- Do not drop tape cartridges or subject them to rough handling.

- To protect data stored on the tape cartridge, turn the safe arrow in the corner of the tape cartridge to SAFE.

3-2. CONTROLS AND CONNECTORS

Figure 3-1 identifies the HP 7908 controls and connectors.

3-3. BUSY INDICATOR

The busy indicator illuminates when a tape drive operation is in progress. A tape drive operation occurs when a cartridge is first plugged in, the system requires tape drive access, or a cartridge unload sequence is initiated by the operator or host system.

3-4. PROTECT INDICATOR

The protect indicator illuminates when the cartridge presently in the tape drive has been set to SAFE. This is done by turning the screw on the cartridge so that the arrow points toward the area marked SAFE (see figure 3-3).

CAUTION

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

3-5. EJECT

CAUTION

Do not force EJECT lever.

The EJECT slide lever ejects the cartridge out of the tape drive. An interlock prevents the cartridge eject from working unless the cartridge has been unloaded as described in paragraph 3-20.

3-6. UNLOAD

This front panel mounted switch when pressed, following a request release sequence from the host system, updates the error logs near the front of tape (if necessary), rewinds the tape to "End of Tape" (EOT), updates the Use log, and unlocks the cartridge with an audible buzz. The switch, if pressed during an autoloading, will stop the autoloading and perform an unload operation. If pressed during a save or restore operation, it will temporarily stop those operations. If it is then pressed a second time while the BUSY light is flickering, an unload operation will occur. If it is not pressed in 5 seconds, the save or restore operation will resume.

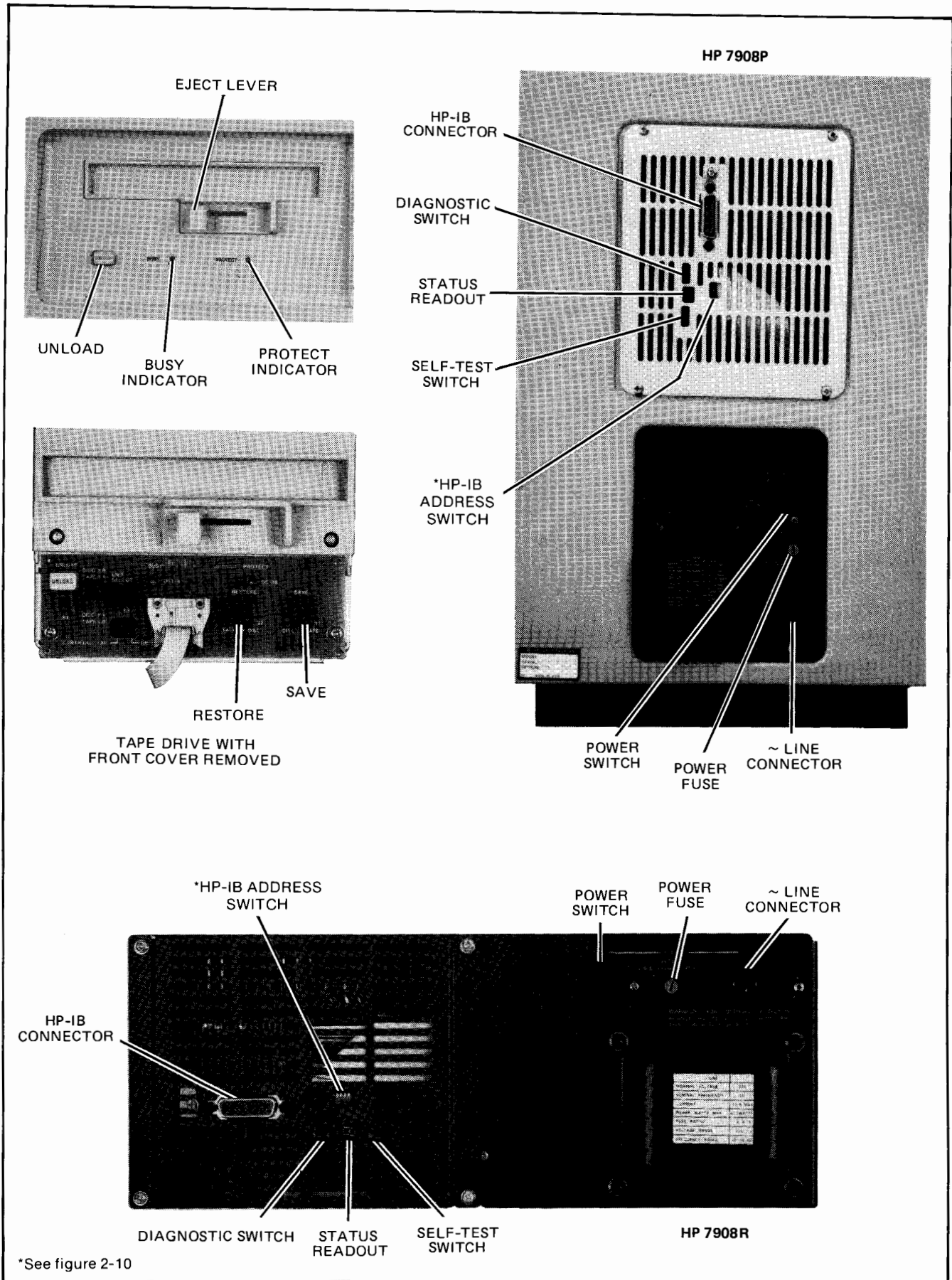


Figure 3-1. HP 7908 Controls and Connectors

Pressing the UNLOAD switch during any other active operation initiates a request release sequence with the host before unloading the tape. The unload sequence can also be executed from the system via an UNLOAD command.

Note: The following tape drive controls are visible after removing the tape drive front cover.

3-7. SAVE SWITCH

A full volume (the entire disc) can be copied to the tape cartridge by using the SAVE switch, located on the front of the switch PCA. Save (SW1-L) can be done only when the tape system BUSY light (LAMP1) is off. The save operation does not require any host intervention, therefore it can be performed while the disc/tape drive is on or off line; however, when on line, the disc/tape must request release from the host to perform a save. To initiate a full volume (image) back-up of the disc, press the SAVE switch once; the BUSY light should begin to flicker (eight times per second). While the light is flickering, press the SAVE switch again to begin the back-up. If a save is attempted while the disc/tape drive is on line, the BUSY light may not flicker indicating that the host has not granted release and that the save operation will not be performed. If this occurs, the save operation should be retried by pressing the SAVE switch again.

The transfer will start from logical block 0 on the disc and tape, and proceed until the disc volume has been completely transferred, or end of volume occurs on the tape. After the last block is written, a file mark is added. When SAVE is successfully completed, the cartridge is unloaded. If a data error is encountered on the disc, the best guess is sent to the tape, and the save operation continues to completion. However, the tape is not unloaded and the flashing BUSY light (once per second) indicates a fault. Pushing the UNLOAD switch at this time unloads the cartridge and clears the fault conditions. Unreadable keys on the tape are marked in the spare table and skipped. The save operation continues to conclusion with no fault indicated, and the cartridge is unloaded. If a hardware fault interrupts the save, the BUSY light flashes (if possible) and the tape is stopped. The subsystem returns from release with the appropriate failure status.

3-8. RESTORE SWITCH

The RESTORE switch, located on the front of the switch PCA, performs the same function as the SAVE switch but in reverse: the entire contents of the tape are copied to the disc. In all other aspects the operation of the RESTORE switch is identical to the operation of the SAVE switch.

3-9. HP-IB CONNECTOR

The HP-IB connector provides cable interface between the disc/tape drive and CPU.

3-10. SELF-TEST SWITCH

Pressing this switch initiates an internal self test. This test verifies the operational condition of the HP 7908. The results of this self test are indicated by the Status Readout.

3-11. STATUS READOUT

This readout is used to indicate HP 7908 operational status and the results of the self test or internal diagnostics during troubleshooting.

3-12. DIAGNOSTIC SWITCH

Pressing this switch initiates an internal diagnostic test. This test verifies the overall operation of the disc/tape drive by performing an extensive seek and verify operation. The results of this test are indicated on the Status Readout.

3-13. HP-IB ADDRESS SWITCH

The HP-IB address switch permits setting one of eight unique addresses. The address switch can be set with a nonmetallic pointed tool (e.g., wooden match, etc.). Address settings, which are generally set one time, are as follows:

Switch Settings	HP-IB Address
*(msb) 1 2 3 4 (lsb)	
X 0 0 0	0
X 0 0 1	1
X 0 1 0	2
X 0 1 1	3
X 1 0 0	4
X 1 0 1	5
X 1 1 0	6
X 1 1 1	7

*msb = most significant bit
lsb = least significant bit
X = don't care



3-14. POWER FUSE

WARNING

The power fuse is not an operator-serviceable component and should only be replaced by service-trained personnel.

The power fuse provides protection from an ac power overload. The current and voltage ratings and the HP part number of the required fuse are listed below.

Source Voltage	Required Rating	HP Part Number
88 to 127 Vac	8 amperes	2110-0342
180 to 253 Vac	4 amperes	2110-0055

3-15. ~ LINE CONNECTOR

This three-terminal power line connector provides the means to connect ac power to the HP 7908.

3-16. POWER SWITCH

The power switch controls the application of ac power to the disc drive power supply and blower motor. Power "on" condition is with this switch in the 1 (on) position. The 1 and 0 correspond to international symbology in use.

3-17. TAPE CARTRIDGE INFORMATION

3-18. TAPE CARTRIDGE DESCRIPTION

The cartridge is a DC 600 type preformatted data cartridge. Two sizes are available: the 67 megabyte cartridge with 600 feet of tape, and the 16.7 megabyte cartridge with 150 feet of tape. The formatted blocks

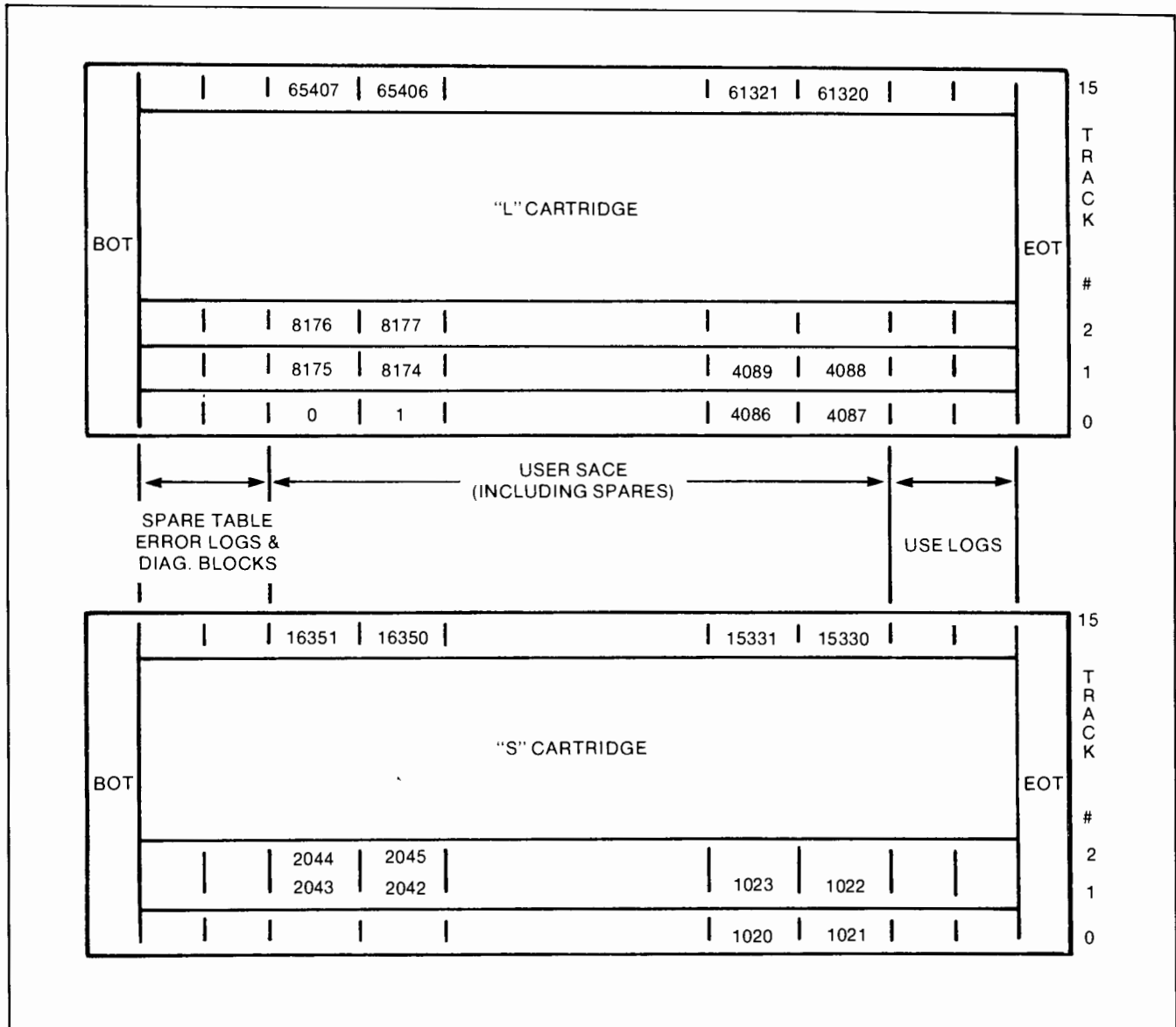
include space for 1 kilobyte of data, error correction, block addresses, and cyclic redundancy check. Figure 3-2 illustrates the tape cartridge formats. A mechanical write protect key is built into the cartridge also.

Before a tape cartridge can be used in host-initiated data operations, it must be certified. The certification routine, which is initiated by the host, takes approximately 17 minutes for a 150-foot tape and approximately 67 minutes for a 600-foot tape. Although not recommended, Save and Restore, operations which are initiated and performed locally by the drive, can be done using an uncertified tape cartridge.

3-19. TAPE CARTRIDGE LOADING

To load the tape cartridge into the tape drive, proceed as follows:

- a. Remove the tape cartridge from the plastic case.



7908-11A

Figure 3-2. Tape Cartridge Formats

- b. Set the tape cartridge safe screw (see figure 3-3) to the desired position. This screw is used to protect the data stored on the cartridge. When the arrow points to SAFE, new information cannot be written onto the tape cartridge. When the arrow is in the opposite direction from SAFE, the tape can be written onto with the possible loss of previously stored data. If a tape cartridge set to SAFE is installed in the tape drive, the PROTECT indicator will illuminate.
- c. Place the tape cartridge at the tape drive door. The SAFE label on the tape cartridge should be toward the upper left-hand corner. Insert the tape cartridge into the door and push until a click is heard. This indicates that the tape is installed properly.
- d. The disc/tape drive will immediately start a tape cartridge conditioning sequence where the tape is positioned to the end of the tape and back to the beginning of the tape. During this period of time, the BUSY indicator will be illuminated. This indicator is illuminated any time the tape drive is in motion. This conditioning technique prevents loss of data or poor operation due to a loose tape. Tape conditioning will take from 1 to 2 minutes depending on the model of the tape cartridge installed.
- e. At the completion of tape cartridge conditioning, the HP 7908 will immediately run an internal self test on the tape drive unit. At the completion of tape self test (approximately 3 seconds), a \mathcal{P} will be displayed on the status readout. Any indication other than \mathcal{P} means that the HP 7908 requires the attention of service-trained personnel.

3-20. TAPE CARTRIDGE UNLOADING

To unload the tape cartridge, proceed as follows.

CAUTION

Do not attempt to remove a tape cartridge until the tape cartridge has been unloaded.

- a. Press the UNLOAD switch.

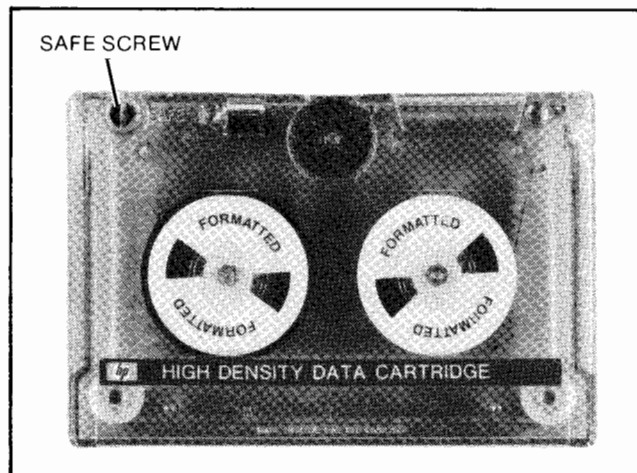


Figure 3-3. Tape Cartridge Identification

- b. Wait for the tape cartridge to rewind. The BUSY indicator will be illuminated while the tape is rewinding and extinguish when the rewind operation is complete. A buzzing noise will also be heard.
- c. To remove the tape cartridge, move the eject lever to the right. This requires some degree of pressure to eject the tape cartridge. The tape cartridge will eject from the tape drive.
- d. Ensure that the tape cartridge safe arrow is in the desired position. Place the tape cartridge in the protective plastic box.

3-21. TAPE DRIVE MAINTENANCE

WARNING

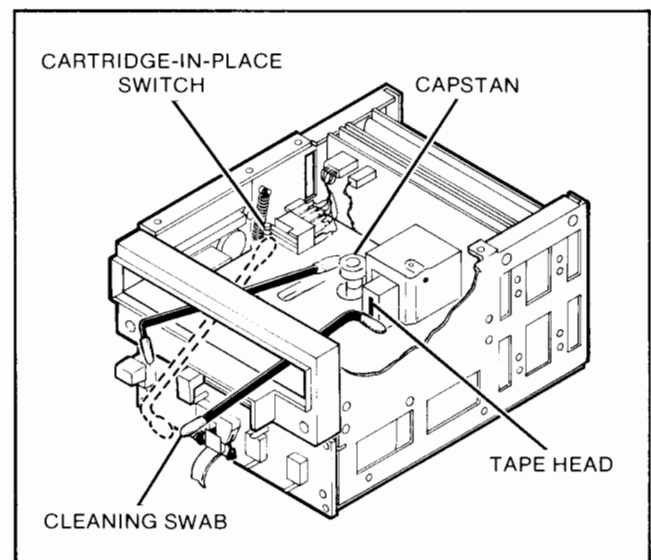
All products which utilize tape head cleaner are shipped with a Material Safety Data Sheet (MSDS). Follow all applicable safety precautions when using the tape head cleaner.

CAUTION

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

CAUTION

The use of new tape media requires more frequent cleaning of the tape head. If a new tape cartridge is being used, the tape head should be cleaned following any operation that accesses most or all of the tape (e.g., disc backup, tape certification). Head cleaning



7912-22

Figure 3-4. Tape Head Cleaning Identification

is recommended the first several times a new tape cartridge is used. Failure to comply with this precaution could result in loss of data.

The maintenance required to keep the tape drive working properly is minimal. Once a month, or more often in heavy usage, the capstan and head should be cleaned. Each disc/tape drive is shipped with foam cleaning swabs (package of 10) and a bottle of head cleaner. The swab has two cleaning ends. The straight end is used to clean the capstan and the right-angle end is used to clean the head. Figure 3-4 illustrates the tape drive cleaning procedure.

3-22. TAPE CAPSTAN CLEANING

CAUTION

When initiating the tape mechanism cleaning procedure, do not press the cartridge-in-place switch more than once or hold it down for more than 1 second. If either of these conditions occur, a unit fault will be logged and reported to the host computer; it will also be necessary to restart the cleaning operation.

Slightly dampen the straight end of the cleaning swab with head cleaner. Hold the tape drive door open and

insert the cleaning swab (see figure 3-4). (The tape drive interior is shown for clarity.) Use the swab to momentarily press and release the cartridge-in-place switch; after a 2-second delay, the tape head is raised and the capstan rotates. To clean the rotating capstan, hold the swab against its left side.

3-23. TAPE HEAD CLEANING

Slightly dampen the right-angle end of the cleaning swab with head cleaner. Hold the tape drive door open and insert the cleaning swab (see figure 3-4). (The tape drive interior is shown for clarity.) Wipe the ceramic head surface with an up and down motion. Use the swab to press and release the cartridge-in-place switch to stop capstan rotation and to return the tape head to its starting position.

Note: The tape stepping motor will make a "buzzing" sound as the head is stepped down; this is normal.

Note: Do not reuse cleaning swabs; discard after use.

3-24. POWER-DOWN SEQUENCE

To power-down the disc/tape drive, proceed as follows:

- a. Unload and remove any tape cartridge, using the instructions given in paragraph 3-20.
- b. Set the rear panel POWER switch to 0 (off).