

**HP 3000 Computer System**  
**INSTALLATION MANUAL**



11000 WOLFE ROAD  
CUPERTINO, CALIFORNIA 95014



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## INSPECTION OF SHIPMENT

The computer and its accessories are shipped in several containers. When the shipment arrives, check the carrier's papers and verify that all containers have been received.

If damage to a shipping carton is evident, or if a carton is water-stained, ask the carrier's agent to be present when the carton is opened.

When ready to unpack the shipment, open the cartons and locate the looseleaf binder containing the *System Support Log* for the computer system. One of the items in this binder is a list of everything that was shipped.

Unpack the cartons and inspect each item for external damage. Look for broken controls, dented corners, bent panels, scratches, broken circuit cards, bent connector pins, and loose or broken electrical components. Also check the rigid foam-plastic cushioning material (if used) for signs of deformation that could indicate rough handling during transit.

Open all module covers and swing out the power supplies which are mounted in the back of the equipment bays. Check for loose parts or other signs of damage.

If the above procedure reveals any damage to the computer or its accessories, follow the damage claim procedure described under "Claims" later in this chapter.

## SYSTEM INVENTORY

A minimal HP 3000 Computer System includes three equipment bays, a magnetic tape unit, a disc drive, and a set of maintenance panels mounted in a system display desk. A console device (teleprinter or CRT terminal) is also included unless it is to be supplied by the customer. The disc drive may be a rack-mounted HP 7900A or 2660A Disc Drive or a free-standing HP 2888A Disc File. The equipment bays contain all CPU electronics, all necessary power supplies, the magnetic tape unit, and (if present) the HP 7900A or 2660A Disc Drive.

Larger systems may also include line printers, card readers, paper tape readers, paper tape punches, plus additional console devices, disc drives, and magnetic tape units.

A set of paper tapes and magnetic tapes is delivered with the computer system. The paper tapes contain the micro-diagnostics and the magnetic tapes contain all other applicable software. Source listings and documentation for the micro-diagnostics and ROM microcode are provided in the form of hard-copy. Source listings for all other applicable software are provided in the form of microfiche. A microfiche viewer is automatically included in the original computer system shipment.

Besides this installation manual, the following documents are also delivered with the computer system:

- All applicable diagnostic manuals.
- All applicable system software manuals (driver manuals, an *HP 3000 Multiprogramming Executive (MPE) Operating System* reference manual, an *HP 3000 MPE Console Operator's Guide*, an *HP 3000 System Manager/Supervisor* manual, an *HP 3000 Systems Programming Language (SPL) Interpreter* reference manual, an *HP 3000 FORTRAN* reference manual, and/or an *HP 3000 COBOL* reference manual).
- All applicable operating and service manuals.
- All applicable subsystem maintenance manuals.
- A *System Support Log* for the particular computer system.
- A set of detailed diagrams for the computer system.

A detailed inventory list for the computer system is contained in the *System Support Log*.

## CLAIMS

If the computer is incomplete or damaged when received, notify the nearest Hewlett-Packard Electronic Sales and Service Office (HP Electronic Sales and Service Offices throughout the world are listed in the Appendix of this manual). If the damage occurred in transit, notify the carrier also. 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 all packaging materials for inspection.

## THE EQUIPMENT BAYS

### General Description

The HP 30390A Cabinet (figure 2-1) is a single-bay, all-aluminum, sheet metal cabinet used to house electronic units of the HP 3000 Computer System.

The cabinet has mounting strips to receive equipment with EIA standard 19-inch mounting flanges. The mounting strips run the entire height of the equipment bay, both in front and in the rear.

Front and rear cabinet doors are included. The front doors are segmented, five being required to completely close the front of the cabinet (or four and one blower cover). The hinges of the doors attach to the mounting strips. All of the doors have locks to prevent access by unauthorized persons. For convenience, one key will fit the locks on all of the doors.

The cabinet is supported by four casters, one on each corner of the cabinet. Four leveling jacks, one on each corner, provide a means of leveling and stabilizing the cabinet after it has been placed in a permanent location. Eyebolts may be attached temporarily to the top of the cabinet to serve as lifting points.

The cabinet has two ventilation and three power options. In both ventilation options, ambient air is taken into the cabinet near the bottom of the equipment bay, and forced upward, through, and around the equipment. The heated air is expelled through slots in the top cover and in the upper four inches of the rear door. The three power options are physically the same, differing only in the strapping of the input terminal block to accommodate the various types of primary power sources.

Two or more cabinets can be bolted and wired together to form a multi-bay cabinet. The cabinet, whether one or any number of bays wide, is equipped with an EMERGENCY OFF (power shut-down) switch. The switch is located on the right-most bay (as you face the front of the bays) and, when pressed, causes input ac power to all bays to be interrupted.



Figure 2-1. HP 30390A Cabinet



## Identification

The cabinet has an identification label affixed to the right side of the rear of the base. The label is the metallic, press-on type. The cabinet model number (30390A) is the top entry on the label. Also on the label are the serial and option numbers of the cabinet.

**SERIAL NUMBER.** Each cabinet is uniquely identified by a 9-digit, single-letter serial number (0000A00000). The first four digits are a serial-number prefix used to identify the version of the HP 30390A Cabinet. This prefix does not change from one cabinet to another unless the cabinets are different versions. The letter identifies the country in which the cabinet was manufactured ("A" indicates the United States). The last five digits identify the particular cabinet.

**OPTION NUMBER.** The option number of the cabinet is marked on the bottom of the identification label. When optional features are supplied for installation in the field, the appropriate option number should be entered in place of the existing number.

For definition of option numbers, refer to table 2-1, or request the nearest HP Electronic Sales and Service Office to furnish a list of optional features for the 30390A (HP Electronic Sales and Service Offices throughout the world are listed in the Appendix of this manual).

**Table 2-1. Cabinet Options**

Option No.	Description
001	Adds a 115-volt and a 230-volt service strip. Exchanges blower for lower-capacity fan.
002	Adds a 230-volt service strip, an EMERGENCY OFF switch, and a dc enable switch.  Exchanges Power Distribution Unit (PDU) for Power Control Module (PCM) strapped for power input of 120/208 volts ac, 3 phase, 60 hertz.
015	Same as option 002 except that the PCM is strapped for 230 volts ac, 1 phase, 50 hertz.
025	Same as option 002 except that the PCM is strapped for 120/240 volts ac, split phase, 60 hertz.
Note:	There is no 115-volt service strip in option 001 cabinets which are associated with an option 015 main bay.

## Specifications

Cabinet specifications are shown in table 2-2.

**Table 2-2. Specifications**

<b>DIMENSIONS AND WEIGHT</b>	
Height	60 inches (1.524 meters)
Width	21-1/4 inches (0.54 meters)
Cabinet Depth	30 inches (0.762 meters)
Base Depth	42-1/4 inches (1.073 meters)
<b>VENTILATION</b>	
Air Flow	Standard: 610 cu. ft. (17.3 cu. m.) per min. Option 001: 575 cu. ft. (16.3 cu. m) per min.
<b>POWER REQUIREMENTS</b>	
Option 002	120/208 Vac, 3 phase, 60 Hz, 30A
Option 015	230 Vac, 1 phase, 50 Hz, 30A
Option 025	120/240 Vac, split phase, 60 Hz, 30A
<b>POWER CONDUIT</b>	
	Standard 1-1/4 inch trade-sized flex conduit (supplied by customer)
<b>GROUNDING PROVISION</b>	
	All options have provision to receive an earth grounding wire in addition to the neutral wire of the power source.

## Detailed Description

This section contains detailed information pertaining to structural, environmental, and electrical features, and to multi-bay configurations of the cabinet.

**STRUCTURAL FEATURES.** The structural features of the cabinet include the cabinet frame, a set of front and rear doors, mounting strips, casters and eyebolts, leveling jacks, a base extension, and equipment slides.

**Frame.** The cabinet has an all-aluminum structure, consisting of sheet metal panels attached to a supporting frame. The frame consists of four extruded columns bolted between a base plate and a top frame. The overall dimensions of the cabinet are shown in figure 2-2.

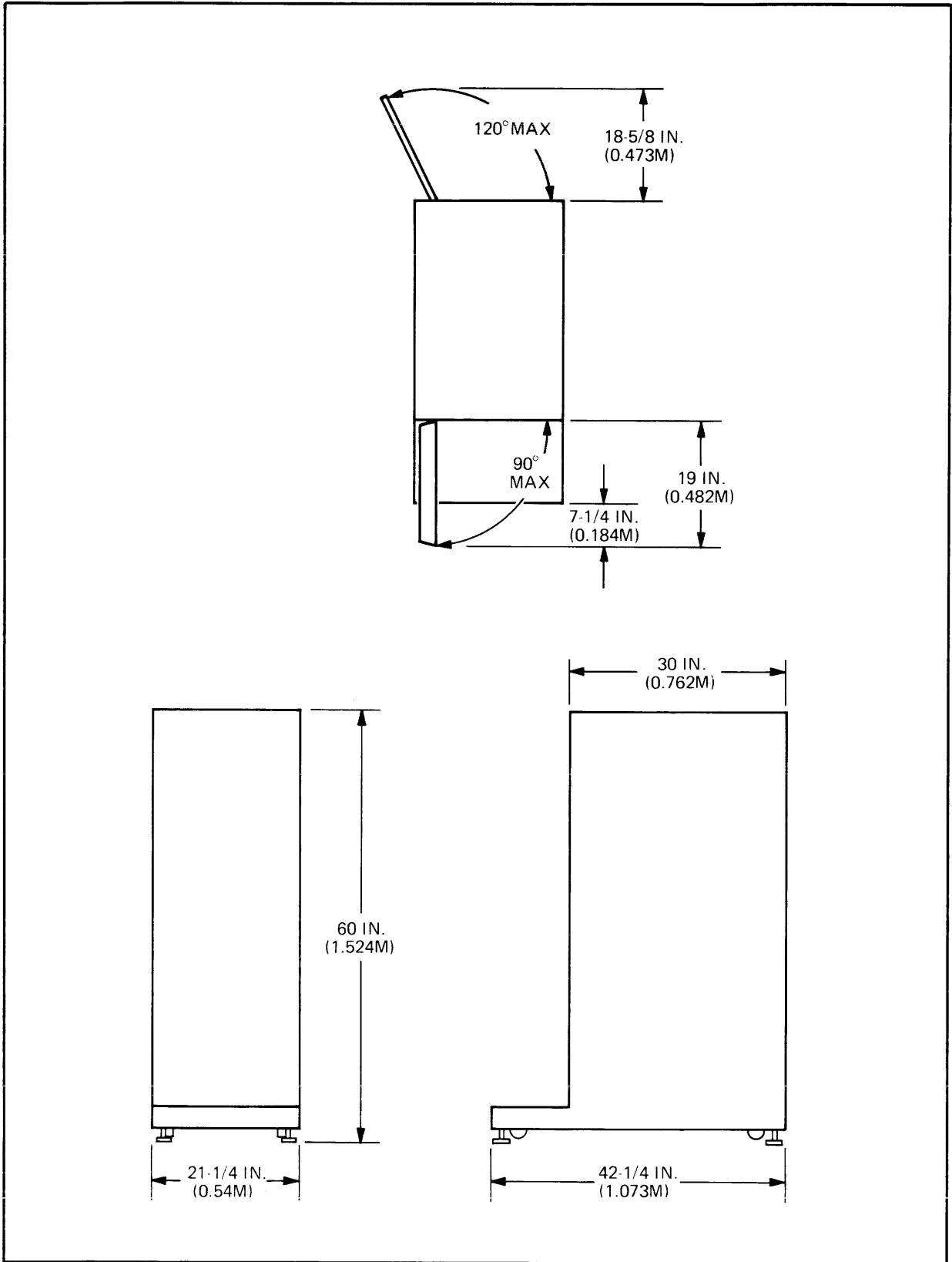


Figure 2-2. Overall Cabinet Dimensions

**Doors.** The cabinet has both front and rear doors. The rear doors open out and to the operator's right, while the front doors open out and to the operator's left. Each door has a lock to prevent access by unauthorized persons. For convenience, one key will fit all locks. All of the doors are attached to the hinges by means of spring-loaded hinge pins, permitting rapid removal for maintenance purposes.

**Mounting Strips.** The cabinet has mounting strips on each side of the equipment bay, both in front and in the rear. The mounting strips consist of short lengths of zinc-plated steel, dropped into a channel in each of the extruded columns (figure 2-3). The strips are drilled and tapped for standard 10-32 machine screws. Each column has seven 7-inch lengths on the bottom, topped with two 1 3/4-inch lengths. Figure 2-4 shows the hole spacing in the mounting strips, and the available equipment space. Equipment is mounted inside the cabinet by securing the equipment mounting flange (standard 19-inch only) to the mounting strips with 10-32 machine screws. The hinges of the front doors are placed directly over the equipment mounting flange and secured to the mounting strips (sandwiching the flange). The front doors may be left off, if desired, to expose the front panels of the equipment.

**Casters and Eyebolts.** The cabinet may easily be rolled over a smooth, flat surface on four casters. Where surface conditions make rolling impractical, the cabinet base is sturdy enough to permit lifting by a forklift. The cabinet may also be lifted by an overhead hoist, by means of four eyebolts. Eyebolts do not come as part of the cabinet, but the cabinet is equipped to accommodate them. The four 3/4-inch bolts that secure the top frame to the columns are internally drilled and tapped (figure 2-5) to receive a 3/8-16 UNC bolt. After removing four hole plugs in the top cover, eyebolts may be easily threaded into the four frame bolts and used as lifting points.

**Leveling Jacks.** Once placed in a permanent location, the cabinet must be leveled and stabilized by means of four leveling jacks. One jack is located in each corner of the cabinet base. The jacks are threaded into the cabinet base. The bottom of the threaded portion is hexagonal, permitting the use of a wrench to extend or retract the jack.

**Base Extension.** The cabinet base extends approximately 1 foot in front of the rest of the frame. This permits slide-mounted equipment to be extended for maintenance without danger of tipping the cabinet. The cabinet comes with the top of the base extension carpeted (for appearance). If desired, the customer can replace this with different carpet or with tile.

**Equipment Slides.** The cabinet does not come equipped with equipment slides. However, the extruded cabinet columns have slots running their entire length, to which standard equipment slides can easily be attached. Ordinary angle-iron (or aluminum) support strips can also be attached to these slots when the weight of the equipment is too great to be supported by the mounting flanges alone.

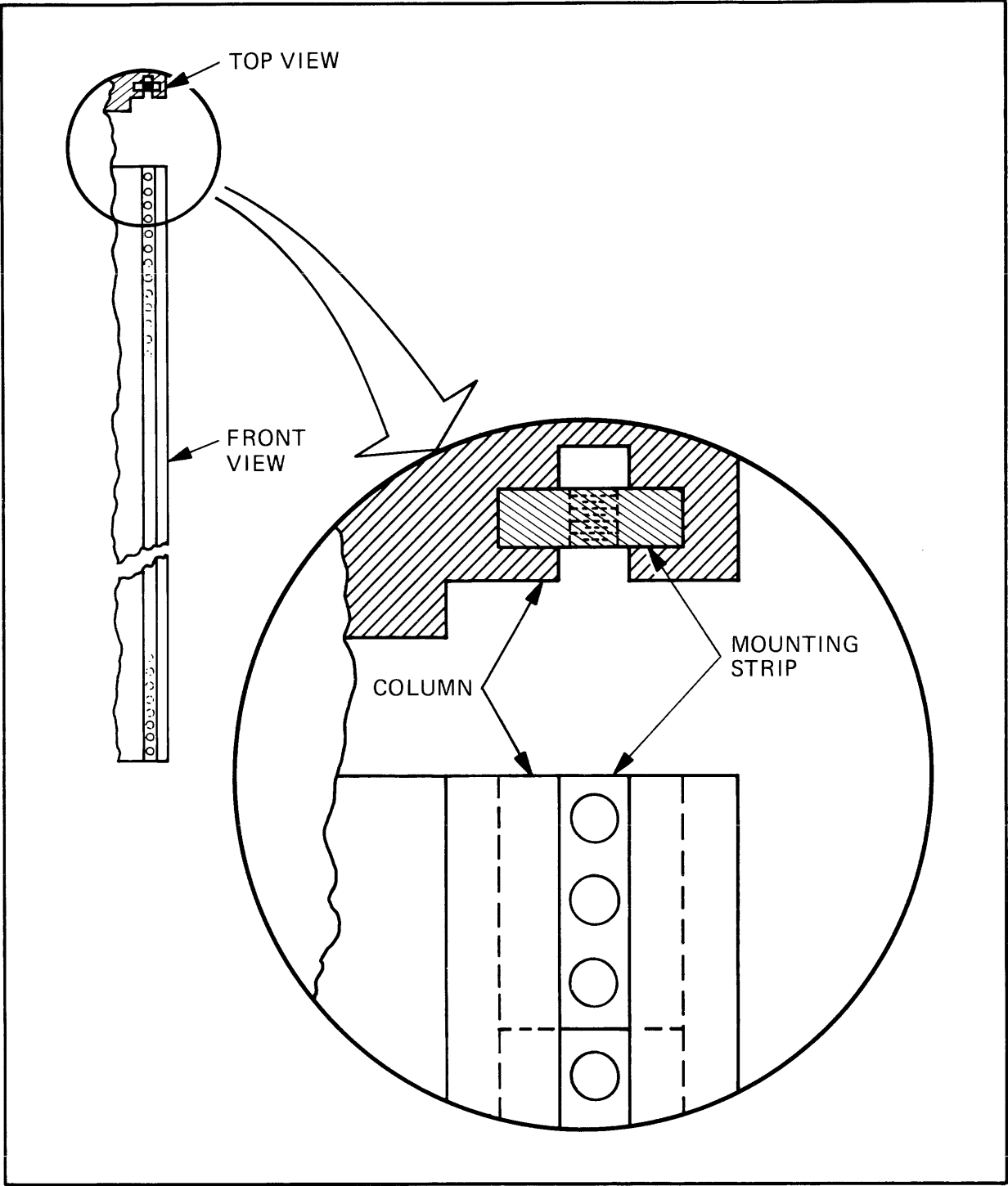


Figure 2-3. Mounting Strips

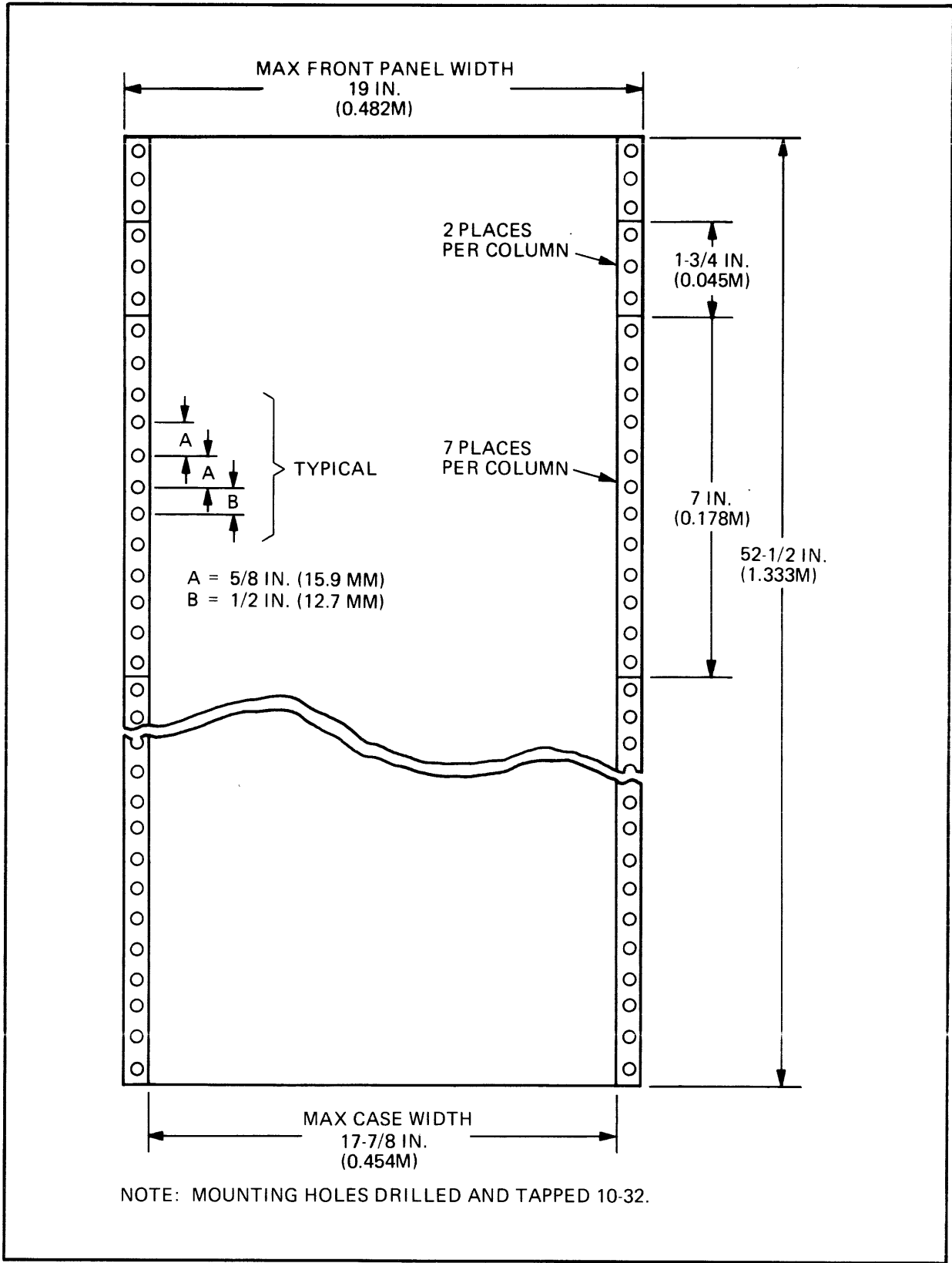


Figure 2-4. Available Mounting Space

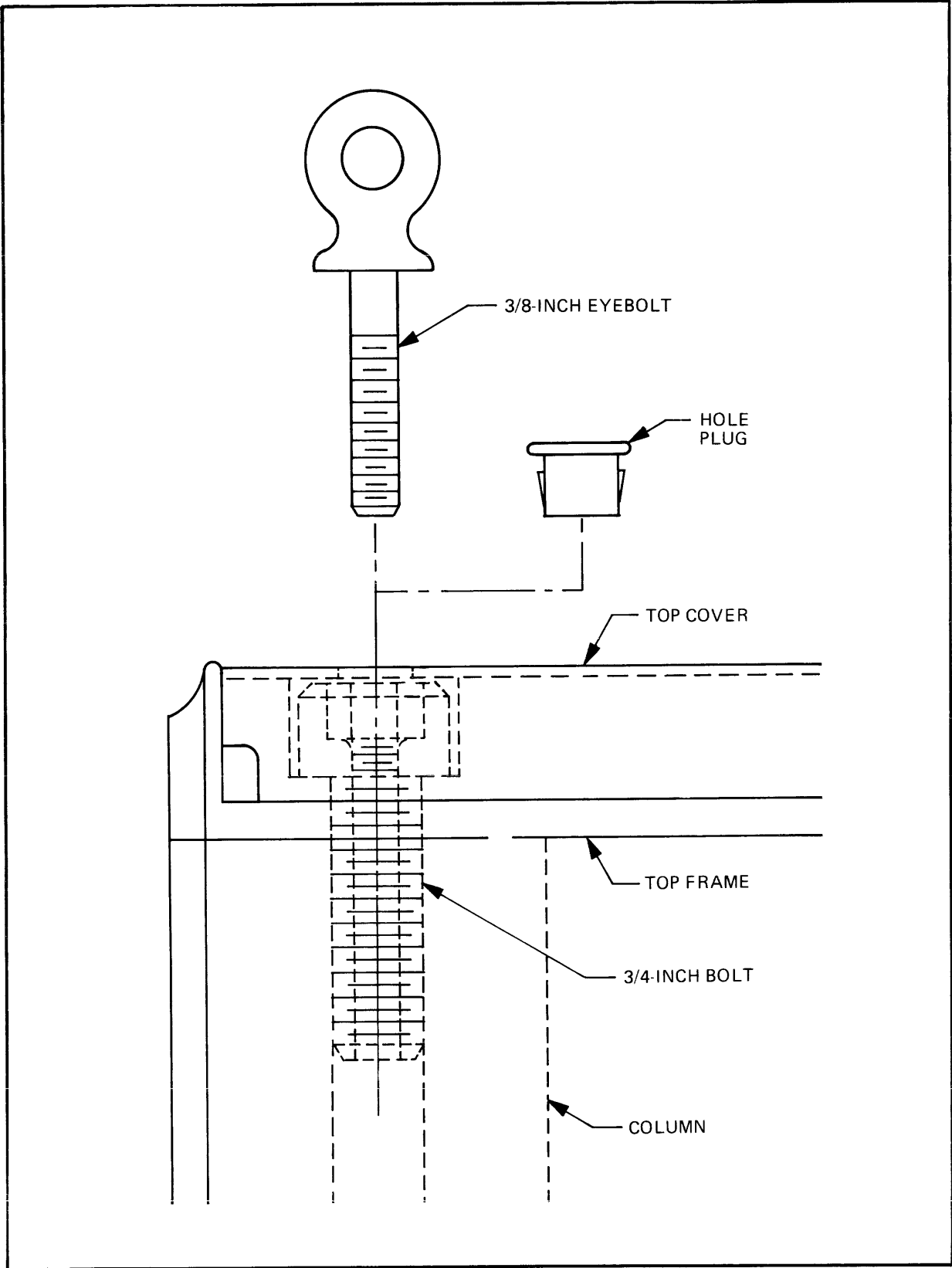


Figure 2-5. Eyebolt Insertion, Side View

**ENVIRONMENTAL FEATURES.** The cabinet comes with one of two cooling options: auxiliary cooling (standard cabinet) or option 001 cooling. In either case, air is pulled through a filter into the bottom of the cabinet and expelled through slots in the top cover and the upper portion of the rear door.

**Auxiliary Cooling.** The standard cabinet and the option 002, 015, and 025 cabinets have a blower (figure 2-6) mounted just behind the bottom front door. The cabinet door on each of the options have a grille in place of the normal solid panel. The grille has no lock, but is held in place magnetically. The blower case has a deflection plate at the rear that directs the air upward toward the equipment. The rated capacity of the blower is 800 cubic feet per minute (cfm).

**Option 001 Cooling.** In the option 001 cabinet, the blower is replaced by a fan mounted at the bottom rear of the cabinet, below the rear door. The fan is rated at 400 cfm.

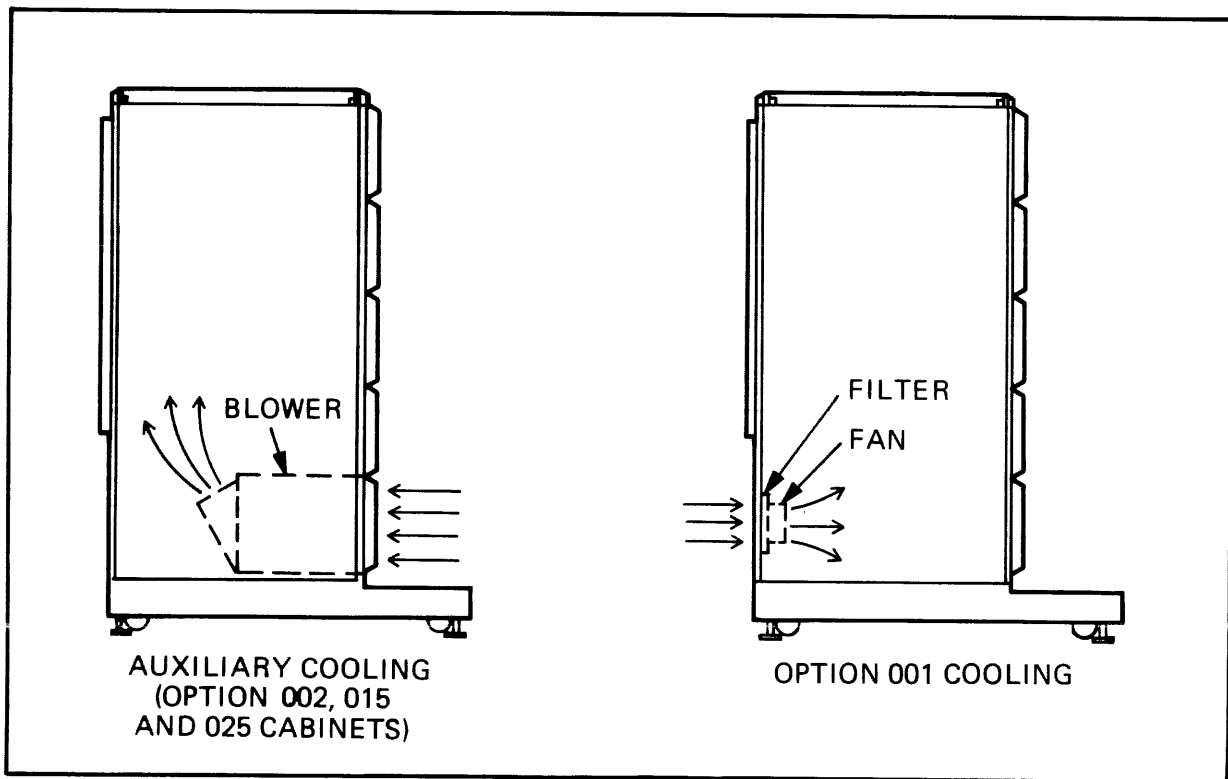


Figure 2-6. Cooling Options



**ELECTRICAL FEATURES.** The electrical features of the cabinet include a power control module or a power distribution unit, service strips, an EMERGENCY OFF (power shutdown) switch, and a SYSTEM DC POWER switch.

**Power Control Module.** The option 002, 015, and 025 cabinets each have a power control module (PCM) through which power is applied. The PCM is located in the rear of the cabinet, just below the rear door. The three power options are physically identical except for the input terminal board strapping within the PCM. The options, and their respective type of power source, are as follows:

- a. Option 002: 120/208 volts, 60 hertz, 3 phase, 4 wire plus earth wire.
- b. Option 015: 230 volts, 50 hertz, 1 phase, 2 wire plus earth wire.
- c. Option 025: 120/240 volts, 60 hertz, split phase, 3 wire plus earth wire.

*Note: For the rest of this section, statements concerning the option 002 cabinet also apply to the option 015 and 025 cabinets.*

For a complete description of the PCM, including maintenance instructions and diagrams and a replaceable parts list, refer to the *HP 30330A Power Control Unit and Power Control Module Maintenance Manual*, part number 30330-90001.

**Power Distribution Unit.** The option 001 cabinet has a power distribution unit (PDU) through which power is applied. The PDU consists of a terminal block and two fuses housed in a metal case. The PDU is located in the rear of the cabinet, just above the bottom of the rear door. The option 001 cabinet, and therefore the PDU, is only used in multi-bay configurations, and the PDU receives its ac power from the PCM in the main equipment bay (or from a power control unit, to be discussed later).

**Service Strips.** The option 001 cabinet has two service strips. One strip has ten CEE-22 230-volt receptacles while the other strip (mounted on the left front column) has eight standard 115-volt receptacles. The strips are wired to the PDU and are fuse-protected.

The option 002 cabinet has one service strip (mounted on the left front column) with ten CEE-22 230-volt receptacles. The strip is wired to the PCM and is fuse-protected.

**EMERGENCY OFF Switch.** The option 002 cabinet has an EMERGENCY OFF pushbutton switch, located in the front upper right corner (in the right end of the nameplate). When pressed, it applies +24 volts dc to a trip coil in the PCM power input circuit breaker, causing the breaker to open. The +24 volts is provided by a dc power supply that is part of the PCM.

**SYSTEM DC POWER Switch.** The option 002 cabinet also has a SYSTEM DC POWER switch assembly, located in the front upper left corner (behind the CPU module door). The switch assembly consists of a two-position toggle switch and an indicator lamp. The switch and the lamp are wired to the CPU module dc power supply. All dc power supply control lines in the system are also wired, in parallel, to the CPU module power supply. The switch and lamp provide on-standby control and indication for the system dc voltage.

## MULTI-BAY CONFIGURATIONS

Two or more cabinets can be physically bolted together to form a multi-bay cabinet. Configurations of any number of bays may be obtained. In the HP 3000 Computer System, the minimum configuration is three bays. The multi-bay configurations have unique structural and electrical features.

### Structural Features

When two cabinets are joined together, the side panels on the mating faces are removed. When desired, they may be replaced by two flat, sheet-metal air covers to provide separation of cooling air for each bay. The air covers have holes to permit the passage of power and signal cables between the bays.

The cabinets are joined to one another by bolting the bases and the top frames together. The small space between the cabinets, caused by slightly wider bases, is filled by foam rubber strips. The strips are located between the front and rear columns, the top covers, and the upper part of the bases. Spacers are used between the top frames due to their narrower width. All the hardware and other parts necessary to join two cabinets are contained in the cabinet assembly hardware kit, part number 30390-60010.

### Electrical Features

When two or more cabinets are joined, an option 002 cabinet is used as the main (rightmost) bay and option 001 cabinets are used for the rest of the bays. The bays are referred to by number. As you face the front of the cabinet, bay #1 (the main bay) is on the right, bay #2 is the next bay to the left, and so forth. An option 002 cabinet is used as the main bay because it contains a PCM through which the primary power must be routed. The option 001 cabinets contain only a power distribution unit (PDU). The PDU in each option 001 cabinet distributes and controls power to that bay only. Distribution is by means of service strips connected to the PDU, and control is by means of fuses. There is one service strip with standard 115 volt receptacles and one with CEE-22 230 volt receptacles.

A multi-bay configuration of any length with just one PCM is limited to a total current draw of 30 amperes per phase. If the equipment to be housed within the bays will draw more than 30 amperes, one of the PDUs will have to be replaced by an HP 30330A Power Control Unit (PCU). A PCU, like a PCM, has a circuit breaker designed to handle 30 amperes per phase. If the current requirements

exceed 60 amperes, two PCUs will be required; if the current requirements exceed 90 amperes, three PCUs will be required; and so forth. The power requirements for the entire multi-bay configuration is thereby segmented, and each PCU, like the PCM, is independently connected to the primary power source. When a PCU is used, it is mounted in place of the fan assembly which is moved to the front of the cabinet.

The main differences between a PCU and a PCM are that the PCU has no +24 volt power supply and that the PCU has provision for supplying power to disc peripherals in addition to service strips. However, the PCU, like a PCM, does have a trip coil in its circuit breaker. The trip coils in the PCM and in all PCUs of a multi-bay configuration can be wired in parallel to the EMERGENCY OFF switch on the main bay. In such a case, pressing the EMERGENCY OFF switch causes all the breakers in the configuration to trip.

For a complete description of the PCU, refer to the *HP 30330A Power Control Unit and Power Control Module Maintenance Manual*, part number 30330-60001.

## Installation

This section contains information about installing an HP 30390A Cabinet.

**SITE REQUIREMENTS.** The power source, power conduit, and space requirements of the cabinet are as follows:

**Power.** One of three types of power are required for the cabinet:

- a. 120/208 volts, 60 hertz, 3 phase, 4 wire plus earth wire (option 002).
- b. 230 volts, 50 hertz, 1 phase, 2 wire plus earth wire (option 015).
- c. 120/240 volts, 60 hertz, split phase, 3 wire plus earth wire (option 025).

**Power Conduit.** The means used to connect the cabinet to the power source must be furnished by the customer and must comply with local electrical codes. The minimum wire size recommended is number 8 AWG. The absolute minimum is number 10 AWG. The wires should be terminated with crimped or soldered ring lugs for connection to the line filter in the PCM/PCU. Standard 1 1/4-inch trade-sized conduit should be used to bring the wires to the cabinet. For ease of maintenance, the last three or four feet should be flexible conduit.

**Space.** A location for the cabinet should be selected that will afford adequate space for the doors to be fully opened. Refer to figure 2-2 for radius and angle of door swing.

**INSTALLATION PROCEDURES.** There are three procedures for multi-bay installation. The first is used to connect the PCM in bay #1 to the main power. The second is used to add a cabinet to an existing cabinet (or configuration). The third is used for PCU installation. When the third procedure is used, steps a through u of the cabinet addition procedure should have been performed first.

**Connecting the PCM to the Main Power.** When installing an HP 3000 Computer System, the PCM which is housed in bay #1 must be connected to the main power. The procedure for doing so is as follows:

- a. Remove the large and small panels from the PCM by removing eight screws, filler washers, and cup washers.
- b. Ascertain the type of power available to the cabinet and verify that factory PCM strapping connections are correct (refer to table 2-3).
- c. Make power input connections to the PCM in accordance with figure 2-7.

*Note: The following step is to be performed only by the customer's electrical contractor.*

- d. Ensure that power mains are turned off. Connect other end of power input wires to power mains. Upon completion, turn on power mains.
- e. (Option 002 only). Using a suitable voltmeter, verify 208 volts ac between each pair of phases (A, figure 2-7) and 120 volts ac between each phase and neutral.
- f. (Option 015 only). Using a suitable voltmeter, verify 230 volts ac between phase A and neutral (B, figure 2-7).
- g. (Option 025 only). Using a suitable voltmeter, verify 240 volts ac between phases A and B (C, figure 2-7) and 120 volts ac between each phase and neutral.
- h. Verify that the EMERGENCY OFF lamp lights (if the lamp does not light, attempt to turn it on by pressing and releasing the EMERGENCY OFF switch).

**Caution:** When the EMERGENCY OFF circuit is properly wired, the EMERGENCY OFF lamp will illuminate as soon as the main power is applied to the cabinet. Damage to the cabinet could occur if the EMERGENCY OFF circuit is not operable.

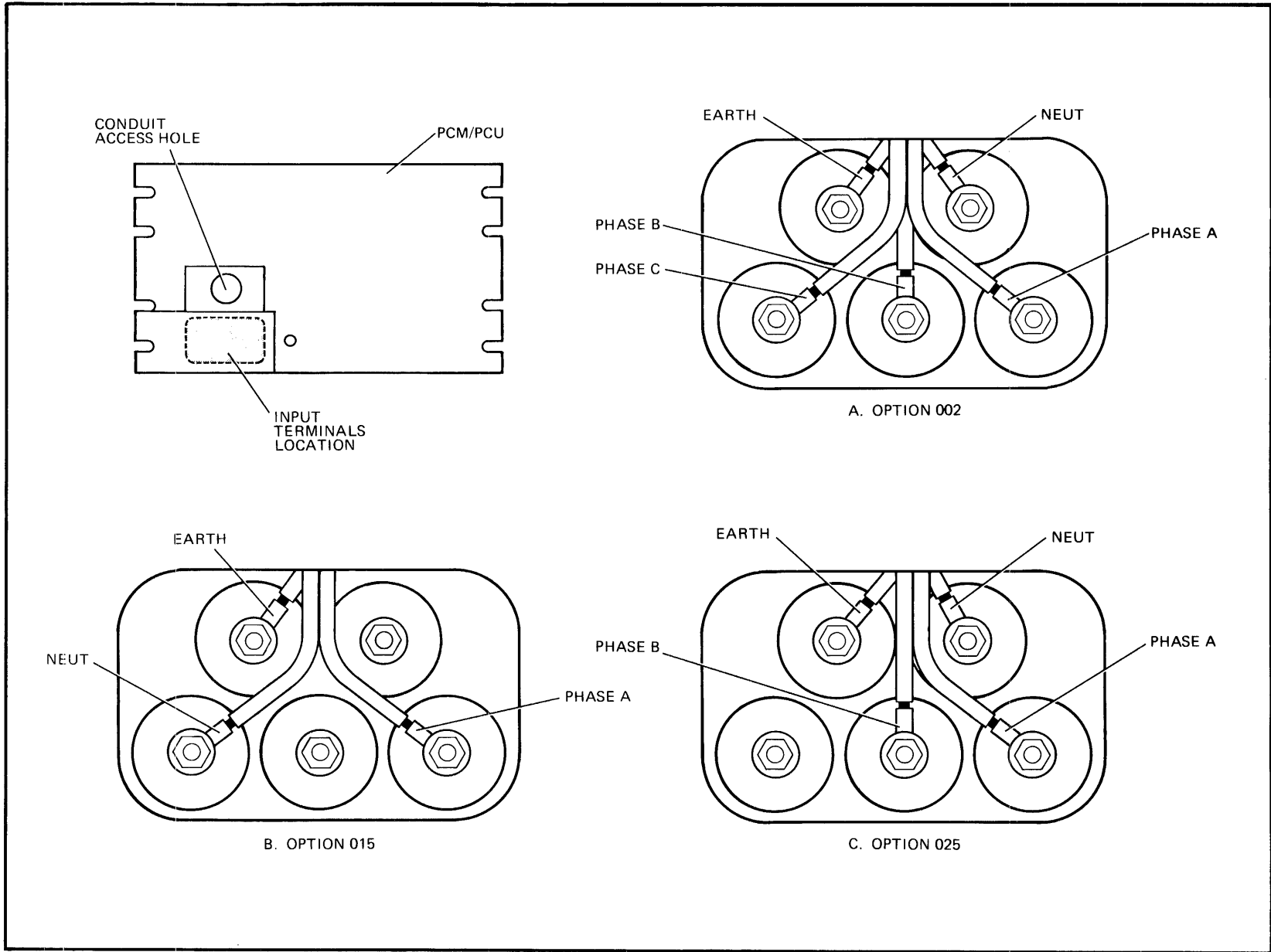


Figure 2-7. Power Input Connections to PCM or PCU

- i. Set the circuit breaker to the ON (up) position and verify that:
  - the blower is operating.
  - the voltage at the CEE-22 receptacles on the service strip is 208 volts ac  $\pm$  10% (option 002), 230 volts ac  $\pm$  10% (option 015), or 240 volts ac  $\pm$  10% (option 025).
- j. Press and release the EMERGENCY OFF switch and verify that:
  - the EMERGENCY OFF lamp goes out.
  - the blower ceases operation.
  - the circuit breaker has tripped to the off (down) position.
- k. Press and release the EMERGENCY OFF switch to enable resetting the circuit breaker.

**Table 2-3. PCM Strapping Connections**

Terminal Block	Option 002 (120/208V, 3 PH, 60 Hz)	Option 015 (230V, 1 PH, 50 Hz)	Option 025 (120/240V, 1 PH, 60 Hz)
TB1	1 to 4	2 to 3	1 to 2
TB1	3 to 4	5 to 6	3 to 4
TB1	4 to 5	----	4 to 5
TB2	4 to 5	5 to 6	4 to 5

**Adding a New Bay.** To add one cabinet to another, proceed as follows:

*Note: In the following procedure, steps flagged with “(B)” are to be performed on both cabinets. The numbers in parentheses refer to callouts in figure 2-8.*

- a. Locate the new cabinet next to the cabinet to which it is to be joined.
- b. Using a suitable wrench, lower the leveling jacks of the new cabinet until the weight of the cabinet is off the casters.
- c. (B) Remove base cover (21) by removing two screws (20) from front.
- d. (B) Remove access plate (13) nearer mating side by removing two screws (12).

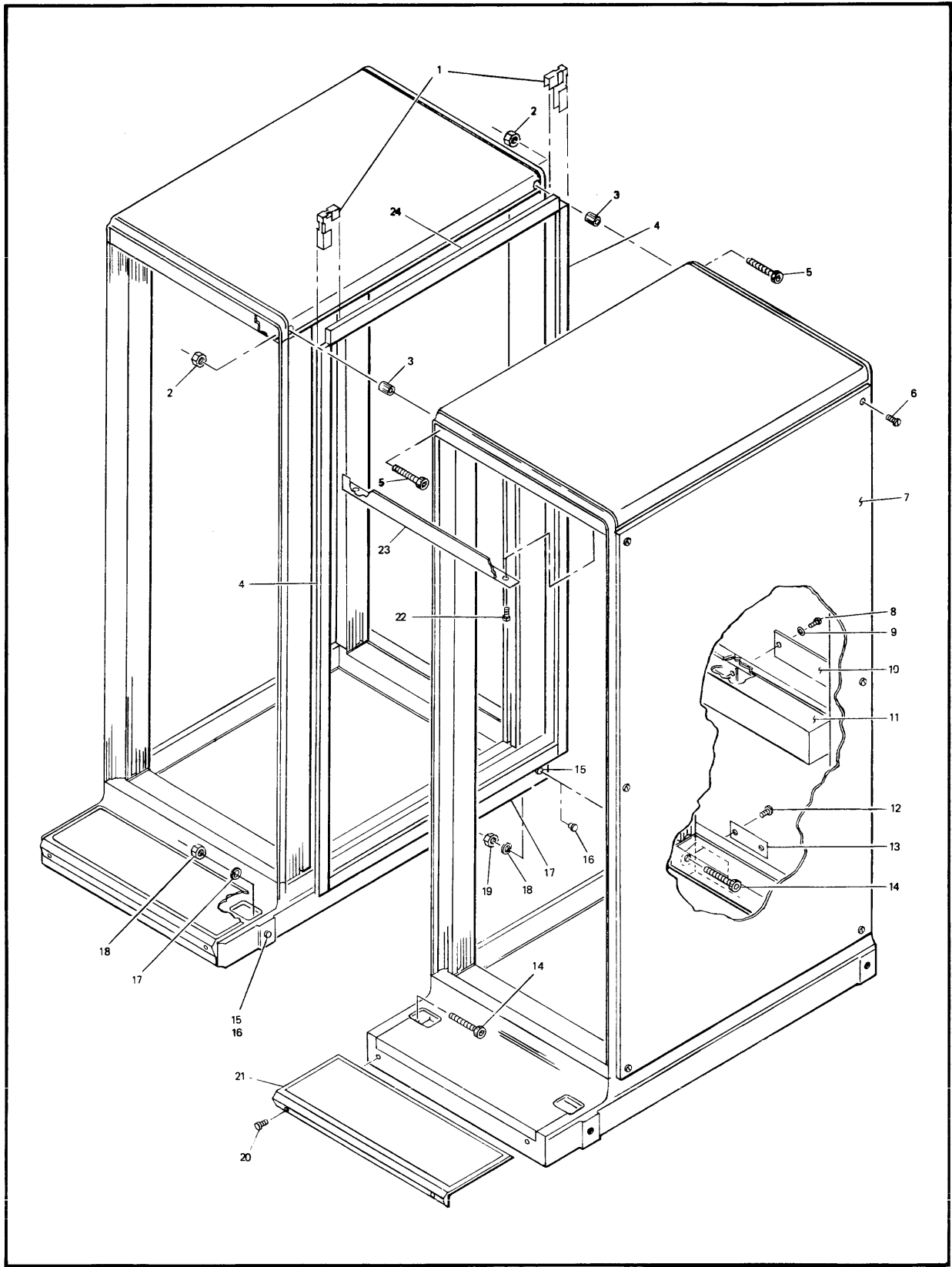


Figure 2-8. Multi-Bay Configuration, Assembly Details

- e. (B) Remove rear door.
- f. (B) Remove front and rear nameplate holders (23) by removing two screws (22) from each.

*Note: In figure 2-9, the side panels to be removed in step g are not shown. Opposite panel on one of the cabinets is shown for general identification purposes.*

- g. (B) Remove side panel (7) from mating side by removing six screws (6).
- h. If desired, install air covers.
- i. Affix bottom foam strip (17) to the base of the new cabinet. (Align the lower edge of the strip with the top ridge that runs horizontally about half way up on the side of the base. The ends of the strip should extend equally beyond the inside edge of the columns).

*Note: The foam strips used between cabinets have a pressure-sensitive adhesive on one side. Peel the paper backing from the adhesive immediately prior to affixing the strip to the cabinet.*

- j. Affix the front and rear foam strips (4) to the columns of the new cabinet. (The outer edges of the strips should be in the same position as the edges of the side panel were in prior to removal. The bottom of the strips should align with the bottom edge of the bottom strip.)
- k. Affix the top foam strip (24) to the edge of the top cover of the new cabinet. Center the strip between the front and rear strips.
- l. Adjust the leveling jacks on the mating side of the new cabinet until the bolt holes (15) in the sides of the bases are aligned vertically.
- m. Adjust the leveling jacks on the non-mating side of the new cabinet until the cabinet is once again level. (Repeat steps l and m as necessary.)
- n. Remove the hole covers (16) from the mating side bolt holes. Bolt the two bases together with two bolts (14), two lock washers (18), and two nuts (19). Tighten finger tight only.

*Note: If both cabinets were properly leveled, the holes at the top of the cabinets will now be aligned. If the holes are not aligned, adjust the leveling jacks to align them.*

- o. Bolt the two top frames together with two bolts (5), two spacers (3), and two nuts (2). Tighten finger tight only.
- p. Set the foam strip covers (1) into place.



- q. Tighten the two bolts joining the bases and the two bolts joining the top frames. (Use a socket wrench with a ratchet handle, or equivalent.)
- r. (B) Replace the access plate at the rear of the base.
- s. (B) Replace the front and rear nameplate holders.
- t. (B) Replace the rear door.
- u. (B) Replace the base cover.
- v. Remove the access plate (10) from the PDU (11) by removing two screws (8) and two lock-washers (9).
- w. Ascertain the type of power available to the cabinet and the position of the new cabinet relative to the PCM (or PCU) from which the PDU will draw current; make the strapping connections to the new PDU in accordance with table 2-4.
- x. Connect the cable attached to the new PCU to the PDU, PCM, or PCU (as applicable) in the mating cabinet in accordance with table 2-5.
- y. Replace the access plate removed in step v.

**Table 2-4. PDU Strapping Connections**

	120/208 Vac 30 60 ~ (002)			230 Vac 50 ~ (015)	120/240 Vac 10 60 ~ (025)	
Bay position relative to PCM and PCU (e.g., PCM, PCU = 1)	2,5,8, 11, etc.	3,6,9, 12, etc.	4,7,10 13, etc.	2,3,4, 5, etc.	2,4,6, 8, etc.	3,5,7, 9, etc.
Strapping at TB1	2 - 3 4 - 5 6 - 7 8 - 9 9 - 10	1 - 2 4 - 5 7 - 8 8 - 9 10 - 11	1 - 2 3 - 4 6 - 7 8 - 9 9 - 10	1 - 2 5 - 6 9 - 10	1 - 2 3 - 4 6 - 7 7 - 8 9 - 10	1 - 2 3 - 4 6 - 7 8 - 9 9 - 10

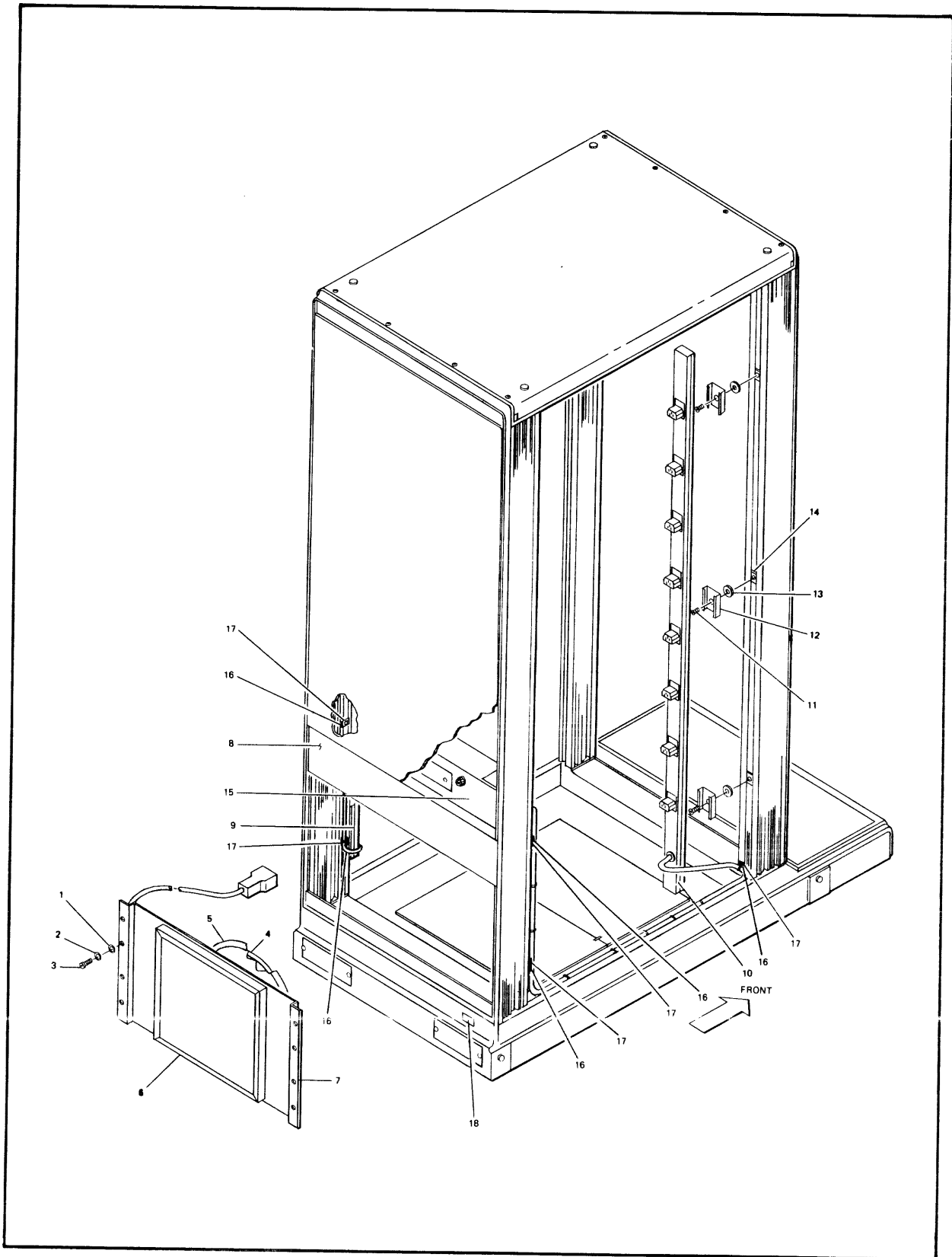


Figure 2-9. HP 30390A Cabinet (Option 001), Replaceable Parts

**Table 2-5. PDU Installation Wiring**

Wire	PDU	PCM	PCU
BLACK	TB1-1	TB3-6	TB2-3
RED	TB1-3	TB3-7	TB2-4
ORANGE	TB1-5	TB3-8	TB2-5
WHITE	TB1-12	TB3-9	TB2-6
GREEN/YELLOW	EARTH BUS	EARTH BUS	EARTH BUS

**PCU Installation.** When required, add a PCU to a newly added cabinet as follows:

**Warning: Connecting the power cable to the power mains is to be left until last to minimize danger due to accidental main power turn-on.**

- a. Disconnect the fan power cord from the service strip.
- b. Remove the fan mounting panel (7, figure 2-9) by removing eight screws, lockwashers, and flat washers.
- c. Remove the bottom front door (grille) from the cabinet by pulling the door open at the right side and removing two screws, lockwashers, and flat washers from the hinge assembly. Also remove the latch bracket from the right mounting strip by removing two screws, lockwashers, and flat washers.
- d. Attach the fan assembly to the mounting strips at the bottom front of the cabinet with the same hardware removed in step b, but leave the middle two holes on each mounting flange open.
- e. Replace the door and latch bracket removed in step c by attaching them to the mounting strips, sandwiching the fan assembly mounting flanges between the door and latch bracket and the mounting strips.
- f. Reconnect the fan power cord to the service strip.
- g. Remove the blank panel (8, figure 2-9) by removing four screws, cup washers, and filler cup washers.
- h. Mount the PCU in the space formerly occupied by the fan assembly. (Mounting hardware is supplied with the PCU.)
- i. Remove the large and small panels from the PCU by removing eight screws, filler washers, and filler cup washers.

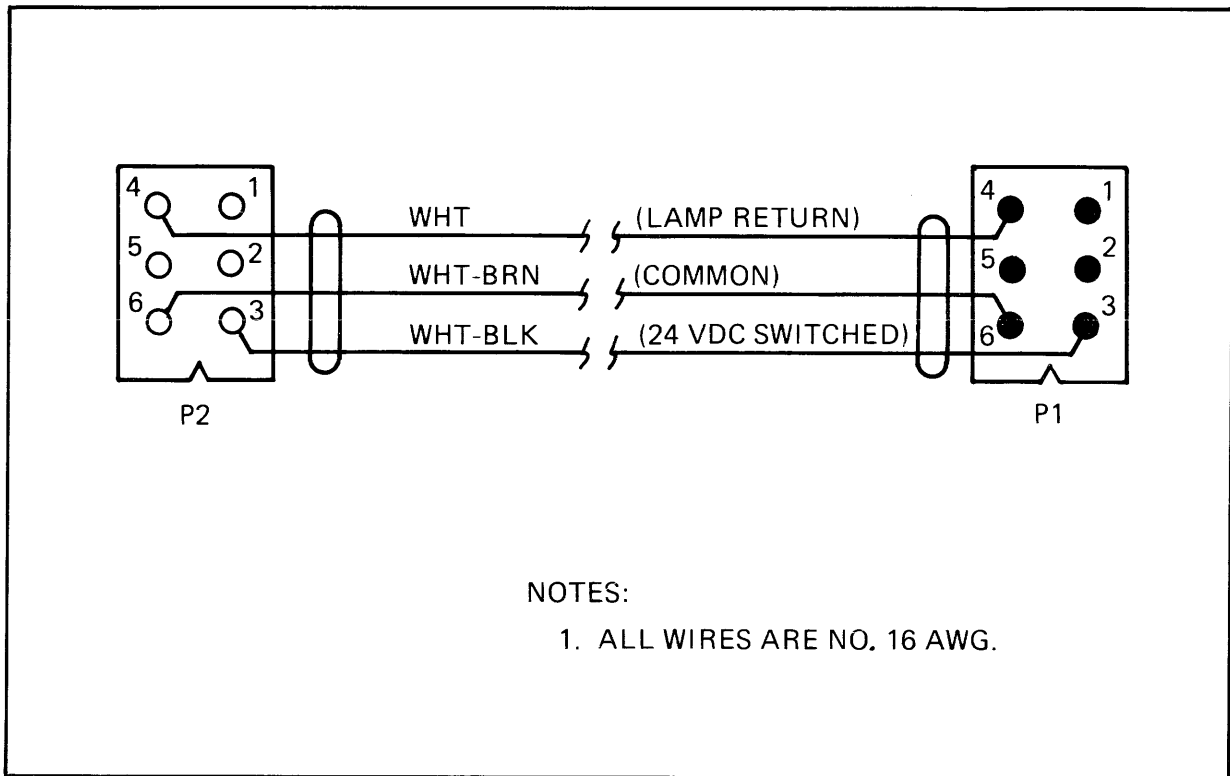
**Caution:** Ensure that the strapping is correct. Units to be housed within the cabinet can be damaged by wrong voltage on the connector assemblies.

- j. Ascertain the type of power available to the cabinet and verify that factory PCU strapping connections are correct (refer to table 2-6).
- k. Make power input connections to the PCU in accordance with figure 2-7.
- l. Remove terminating plug P2 from J2 of the PCM (or of the last added PCU, as applicable) and mate it with J2 of the new PCU.
- m. Connect J2 of the PCM (or of the last added PCU, as applicable) to J1 of the new PCU by means of the interconnecting cable (figure 2-10) supplied with the new PCU.
- n. Remove the access plate from the PDU.
- o. Disconnect the service strip leads from the PDU and reconnect them to the new PCU in accordance with table 2-7. (This step is not applicable if the PCU is added exclusively to provide power to disc drives.)

*Note:* The following step is to be performed only by the customer's electrical contractor.

- p. Ensure that the power mains are turned off. Connect the other end of the power input wires to the power mains. Upon completion, turn on the power mains.
- q. (Option 002 only) Using a suitable voltmeter, verify 208 volts ac between each pair of phases (A, figure 2-7) and 120 volts ac between each phase and neutral.
- r. (Option 015 only) Using a suitable voltmeter, verify 230 volts ac between phase A and neutral (B, figure 2-7).
- s. (Option 025 only) Using a suitable voltmeter, verify 240 volts ac between phases A and B (C, figure 2-7) and 120 volts ac between each phase and neutral.
- t. Verify that the EMERGENCY OFF lamp lights. (If the lamp does not light, attempt to turn it on by pressing and releasing the EMERGENCY OFF switch.)

**Caution:** When the EMERGENCY OFF circuit is properly wired, the EMERGENCY OFF lamp will illuminate as soon as the main power is applied to the cabinet. Damage to the cabinet could occur if the EMERGENCY OFF circuit is not operable.



**Figure 2-10. PCU-to-PCU/PCM Interconnecting Cable**

- u. If the EMERGENCY OFF circuit is working properly, set the circuit breaker on the new PCU to the ON (up) position and verify that:
  - the fan is operating.
  - the voltage at the rear service strip is 120 volts ac  $\pm$  10% (this is not applicable if the main bay is an option 015 cabinet).
  - the voltage at the front service strip is 208, 230, or 240 volts ac  $\pm$  10% for options 002, 015, or 025, respectively.
- v. Press and release the EMERGENCY OFF switch on the front of the main bay and verify that the circuit breaker on the new PCU has tripped to the off (down) position.
- w. Press and release the EMERGENCY OFF switch to enable resetting of the circuit breaker.

**Table 2-6. PCU Strapping Connections**

Terminal Block	Option 002 (120/208V, 3 PH, 60 Hz)	Option 015 (230V, 1 PH, 50 Hz)	Option 025 (120/240V, 1 PH, 60 Hz)
TB1	1 to 2	2 to 3	1 to 2
TB1	4 to 5	3 to 4	4 to 5
TB1	6 to 7	7 to 8	5 to 6
TB1	9 to 10	8 to 9	9 to 10

**Table 2-7. Service Strip Wiring to PCU**

Service Strip	Wire	Terminal
115V	BLK	TB2-1
	WHT	TB2-6
	GRN-YEL	EARTH BUS BAR
230V (CEE-22)	BRN	TB2-1
	BLU	TB2-2
	GRN-YEL	EARTH BUS BAR
<b>Note:</b>	There is no 115-volt service strip in option 001 cabinets which are associated with an option 015 main bay.	

## MEMORY ADD-ON

### Add-On Shipment Inventory

A memory add-on shipment includes some combination of the following:

- Zero to three HP 30005A Module Control Units (MCUs)
- Zero to four HP 30006A 8K Core Memory Stack Printed-Circuit Assemblies (PCAs), part number 30006-60002

- Two Memory Configuration Hoods
- One Set of Terminators and Flat Cables
- One Set of Detailed Diagrams for the HP 30005A and/or HP 30006A

Each HP 30005A Module Control Unit consists of two PCAs: a Load PCA, part number 30005-60001, and a Memory Data/Control PCA, part number 30005-60002. Later in this chapter a separate PCA, called the MCU PCA, must also be discussed. To avoid confusion when referring to one or the other, the following convention will be used. The HP 30005A MCU will be referred to as †MCU whereas the MCU PCA will be referred to merely as the MCU PCA.

The part numbers of the Memory Configuration Hoods vary according to which memory option is being installed. The part numbers are shown in table 2-8.

The part numbers of the set of terminators and flat cables are shown in the legend to figure 2-14.

Table 2-8 summarizes the hardware which is delivered for each memory upgrade.

The detailed diagrams are included only when the associated PCAs are shipped.

## General Add-On Procedure

The memory add-on procedure comprises the following three general tasks:

1. **S-BUS, MCU, and IOP Reconfiguration.** Removing the S-BUS, MCU, and IOP PCAs from the top card cage of bay #1, changing the switch and jumper settings on the PCAs, reinstalling the PCAs in the card cage, and verifying that the proper memory configuration hoods are installed on the front edge of the S-BUS and IOP PCAs.
2. **Memory PCA Reconfiguration.** Removing the memory stack PCAs from all affected slots in the second (and third, if necessary) card cages of bay #1, changing the switch and jumper settings on the removed stack PCAs, verifying the switch and jumper settings on all new stack PCAs, installing the stack PCAs in the card cage(s), and reconnecting the flat cables to the PCAs.

*Note: If the memory configuration is being changed from 1 to 4 or from 2 to 4 †MCUs, then a new set of flat cables must be installed; otherwise the old set is merely reinstalled.*

3. **Power Supply Temperature Sense Reconfiguration.** The temperature sense resistor(s) of the added memory load PCAs must be connected to the temp sense leads of the proper HP 30310A Power Supply(s).

The three general tasks are described as separate topics below.

Present Memory Configuration	Desired Memory Configuration	32K Words 2 †MCUs No interleaving	40K Words 2 †MCUs No interleaving	48K Words 2 †MCUs No interleaving	56K Words 2 †MCUs No interleaving	64K Words 2 †MCUs No interleaving (180) or 2-way interleaving (181)	64K Words 4 †MCUs No interleaving (182) or 4-way interleaving *183
		Option 101	Option 120	Option 140	Option 160	Options 180/181	Options 182/183
<b>Standard</b> 32K Words 1 †MCU No interleaving		1 †MCU 2 Hoods*	1 †MCU 1 8K Stack 2 Hoods*	1 †MCU 2 8K Stacks 2 Hoods*	1 †MCU 3 8K Stacks 2 Hoods*	1 †MCU 4 8K Stacks 2 Hoods*	3 †MCUs 4 8K Stacks 2 Hoods* **
<b>Option 101</b>			1 8K Stack 2 Hoods*	2 8K Stacks 2 Hoods*	3 8K Stacks 2 Hoods*	4 8K Stacks 2 Hoods*	2 †MCUs 4 8K Stacks **
<b>Option 120</b>				1 8K Stack 2 Hoods*	2 8K Stacks 2 Hoods*	3 8K Stacks 2 Hoods*	2 †MCUs 3 8K Stacks 2 Hoods* **
<b>Option 140</b>	<p>* The hoods for the various options have the following part numbers:</p> <p>Option 120            30000-93048</p> <p>Options 101, 182 and 183        30000-93047</p> <p>Options 140, 160, 180, and 181       30000-93049</p> <p>** A set of terminators and flat cables. The part numbers of these items are presented in the legend to figure 2-14.</p>				1 8K Stack	2 8K Stacks	2 †MCUs 2 8K Stacks 2 Hoods* **
<b>Option 160</b>						1 8K Stack	2 †MCUs 1 8K Stack 2 Hoods* **
<b>Options 180/181</b>							

Table 2-8. Summary of Memory Add-On Shipment Hardware Inventory



## S-BUS, MCU, and IOP PCA Reconfiguration (Task 1)

1. Remove the following printed-circuit assemblies (PCAs) from their slots:

PCA	Slot Number
S-BUS PCA (30001-60005)	1F2907 (1A7)
MCU PCA (30001-60007)	1F2909 (1A9)
IOP PCA (30001-60008)	1F2910 (1A10)

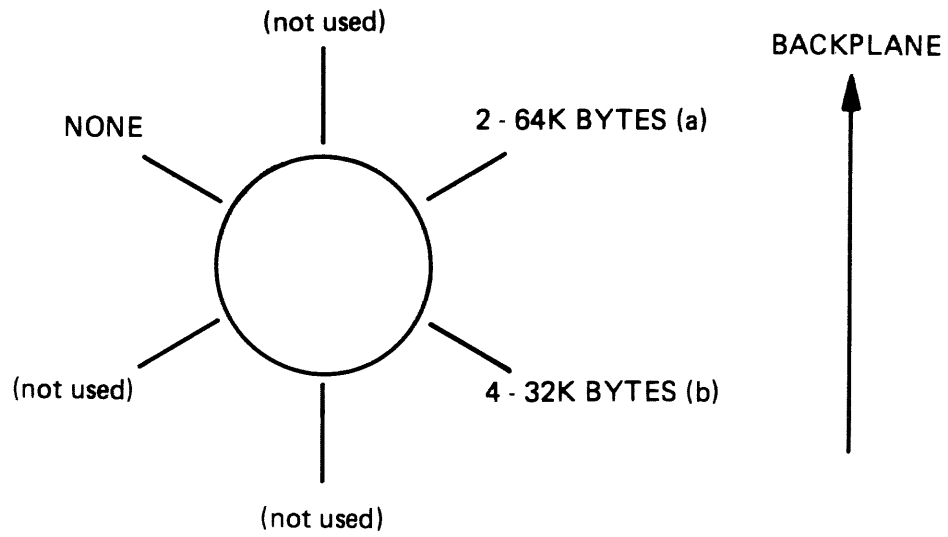
*Note:* The S-BUS PCA must be removed only when the memory interleaving configuration is being changed from no interleaving to 2 way or 4 way interleaving or from 2 way to 4 way interleaving.

2. If the memory interleaving configuration is being changed (see the note in step 1), set all six rotary switches on the S-BUS PCA to specify the new interleaving configuration. *All six switches must be set to the same position.*

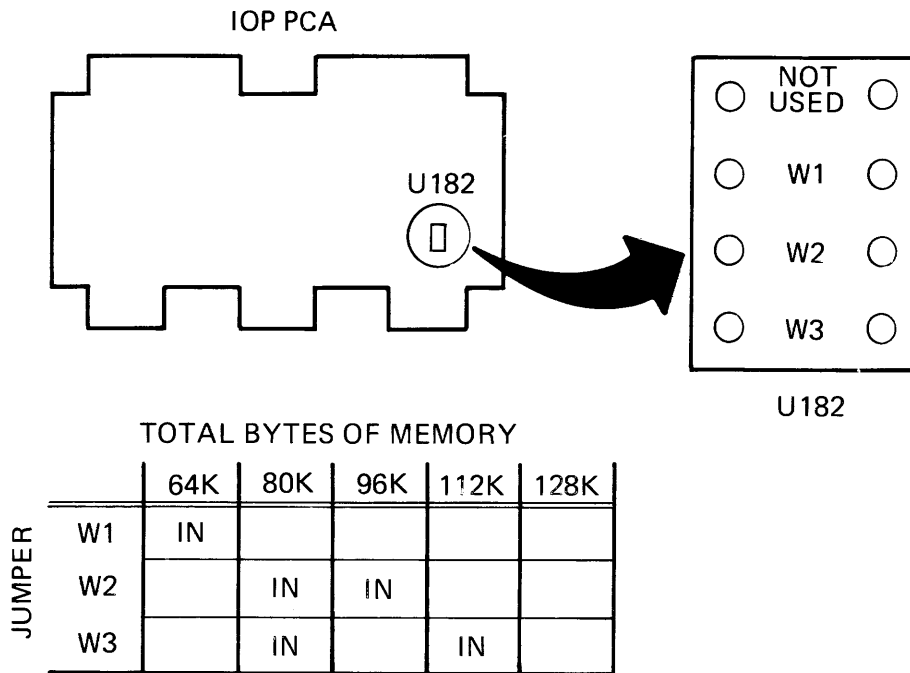
The standard interleaving configuration involves no interleaving and all six switches are therefore set to the NONE position. The two alternative interleaving configurations are as follows:

- a. 2 †MCUs, 64K bytes each, 2 way interleaving (Option 181)
- b. 4 †MCUs, 32K bytes each, 4 way interleaving (Option 183)

The applicable switch settings are as follows:

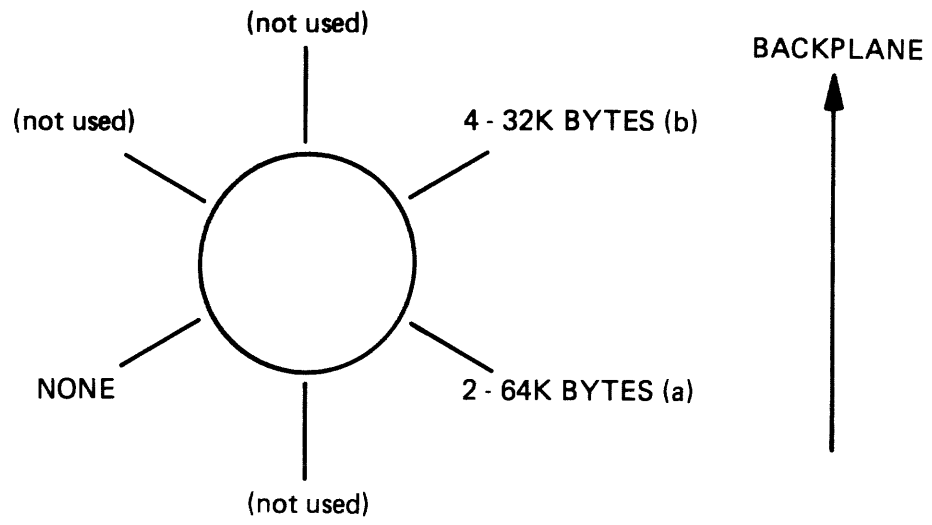


3. Set the W1, W2, and W3 jumpers on the IOP PCA to specify the total number of bytes of memory in the computer system. The appropriate jumper settings are as follows:

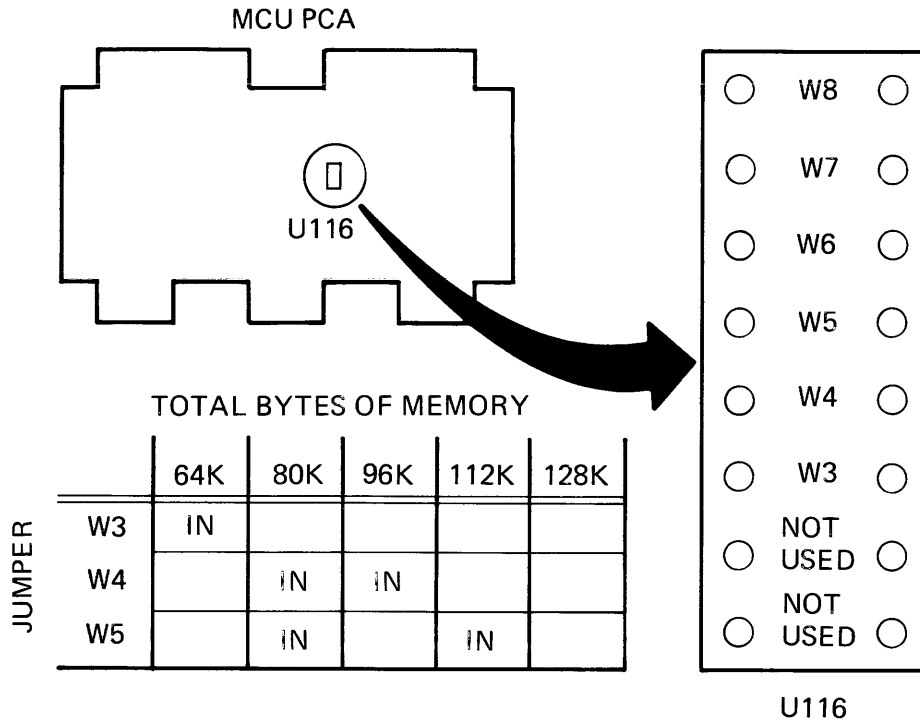


Set the three rotary switches on the IOP PCA to specify the new memory interleaving configuration. *All three switches must be set to the same position.*

The applicable switch settings are as follows:



- Set the W3, W4, and W5 jumpers on the MCU PCA to specify the total number of bytes of memory in the computer system. The appropriate jumper settings are as follows:



- Put the three PCAs back into their slots in the card cage and then mount the two memory configuration hoods on the S-BUS and IOP PCAs.

The memory configuration hoods together specify the size (in bytes) of the first memory module. The standard memory configuration requires no hoods; each of the optional memory configurations requires a pair of hoods. In any given case, the two hoods used are always identical. One hood must be connected to J1 of the S-BUS PCA and the other to J2 of the IOP PCA.

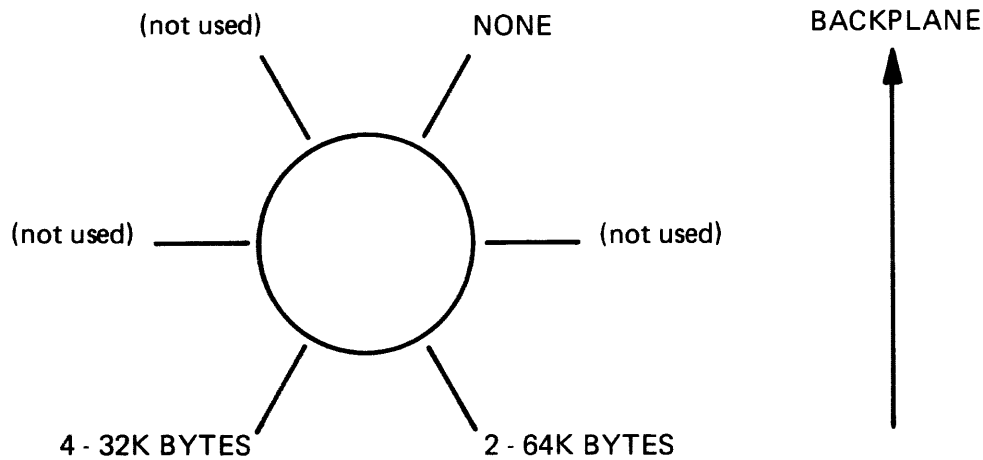
The part number of the hoods used for each memory configuration are shown in table 2-8.

## Memory PCA Reconfiguration (Task 2)

1. Remove the memory data/control PCAs from all affected slots in the second (and third, if necessary) card cages of bay #1. Unused card slots in the original configuration are filled with blank PCAs. Any blank PCAs which are removed will not be used again.
2. Set jumpers W1 through W5 on all removed memory data/control PCAs as illustrated in figure 2-11 (the appropriate settings are determined by the number of the memory module to which the particular PCA belongs).

Set jumpers W6 and W7 on all removed memory data/control PCAs to specify the size (in bytes) of the memory module to which the particular PCA belongs as illustrated in figure 2-11.

Set switches S1 and S2 on all removed memory data/control PCAs to specify the new memory interleaving configuration. The applicable switch settings are as follows:



3. Verify the jumper and switch settings on all new memory data/control PCAs.
4. Install all the memory data/control PCAs in their intended locations in the card cage(s). The intended location of all new memory data/control PCAs is specified on a label which is affixed to the PCA. The intended location of all memory data/control PCAs (new and old) is specified on the "Installation Record" form.

JUMPER	POSITION	MODULE				FUNCTION
		0	1	2	3	
W3	F2	○ ○	○ ○	○ ○	● ●	ENABLE 02
W4	F1	○ ○	○ ○	● ●	● ●	ENABLE 01
W5	F0	○ ○	● ●	● ●	● ●	ENABLE 00
W4	E1	● ●	● ●	○ ○	○ ○	TO/FROM
W3	E0	● ●	○ ○	● ●	○ ○	TO/FROM
W1	D3	○ ○	○ ○	○ ○	● ●	READY 03
	D2	○ ○	○ ○	● ●	○ ○	READY 02
	D1	○ ○	● ●	○ ○	○ ○	READY 01
	D0	● ●	○ ○	○ ○	○ ○	READY 00
W2	C3	○ ○	○ ○	○ ○	● ●	ENABLE 03
	C2	○ ○	○ ○	● ●	○ ○	ENABLE 02
	C1	○ ○	● ●	○ ○	○ ○	ENABLE 01
	C0	● ●	○ ○	○ ○	○ ○	ENABLE 00

JUMPER	POSITION	MODULE CORE SIZE			
		8K	16K	24K	32K
W6	G3	● ●	○ ○	○ ○	○ ○
	G2	○ ○	● ●	● ●	● ●
W7	G1	● ●	● ●	○ ○	○ ○
	G0	○ ○	○ ○	● ●	● ●

INTERLEAVING		
MODE	S1	S2
NONE	5	5
2 x 16K *	3	3
4 x 16K *	2	2
2 x 32K *	1	1

\*WORDS

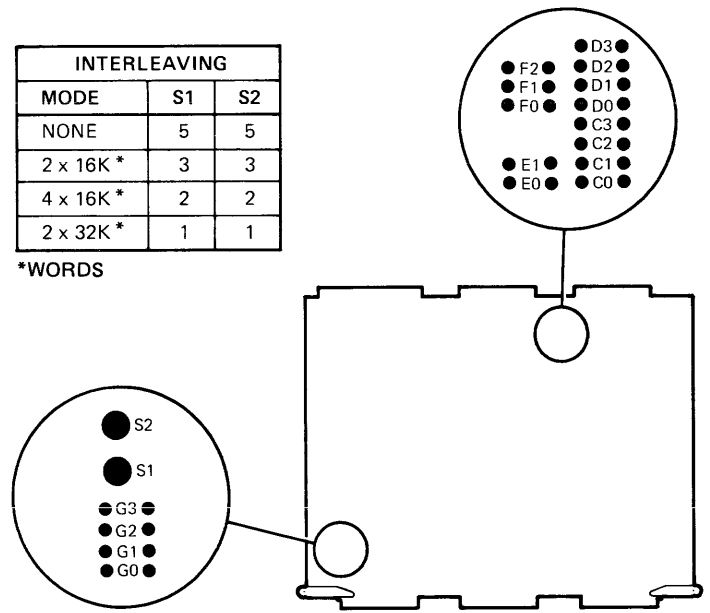
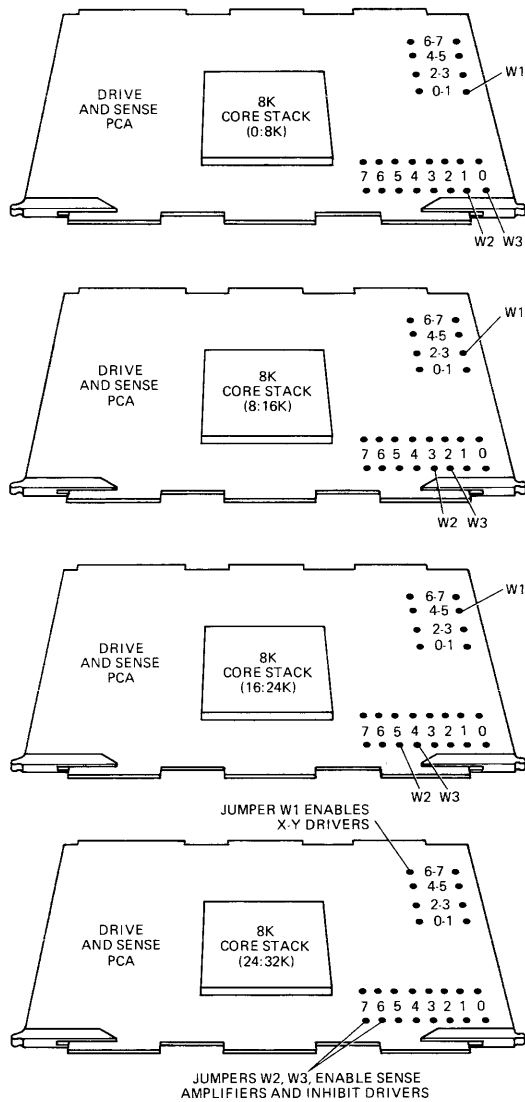


Figure 2-11. Location of Jumpers and Switches on an HP 30005A Memory Data/Control PCA; Summary of Jumper Settings

5. Remove the memory stack PCAs from all affected slots in the second (and third, if necessary) card cages of bay #1. Unused card slots in the original configuration are filled with blank PCAs. Any blank PCAs which are removed will not be used again.
6. Set jumpers W1, W2, and W3 as illustrated in figure 2-12. The jumpers specify the particular stack PCA within its memory module.
7. Using figure 2-12, verify the jumper settings on all new memory stack PCAs.
8. Install all the memory stack PCAs in their intended locations in the card cage(s). The intended location of all new memory stack PCAs is specified on a label which is affixed to the PCA. The intended location of all memory stack PCAs (new and old) is specified on the "Installation Record" form.
9. If the number of †MCUs in the computer system is *not* being increased beyond two, reconnect the original flat cables to the PCAs (the proper connections are illustrated in figure 2-13).

If the number of †MCUs is being increased from 1 to 4 or from 2 to 4, discard the original flat cables and connect the new flat cables to the PCAs as illustrated in figure 2-14.





NOTE: EACH CORE MEMORY MODULE MAY INCLUDE UP TO FOUR 8K STACK PCAs. THE FIRST STACK PCA IN EACH MODULE MUST BE JUMPED AS ILLUSTRATED IN THE TOP PCA IN THIS FIGURE; THE SECOND STACK PCA IN EACH MODULE MUST BE JUMPED AS ILLUSTRATED IN THE SECOND PCA FROM THE TOP; AND SO FORTH.

Figure 2-12. Location of Jumpers on an HP 30006A Memory Stack PCA; Summary of Jumper Settings

Legend for Figure 2-13

Item #	HP Part Number	Quantity
1	30000-93056	3
2	30000-93014	3
3	30000-93046	1
4	30000-93013	1
5	30000-93028	1
6	30000-93068	1
7	30000-93045	1
8	30000-93015	1
9	30000-93038	1
10	30000-93072	1
11	30000-93007	1
12	30000-93005	*
13	30001-60034	2
14	30000-93041	*
15	30000-93040	*
16	30000-93020	*
T1	30001-60009	2
T2	30001-60016	2
T3	30001-60021	2
T4	30035-60003	*

\*Quantity depends upon the number of card cages in bay #2 and/or the number of Multiplexer channels.

*Note: Items 1 through 16 are flat cables and items T1 through T4 are terminators.*

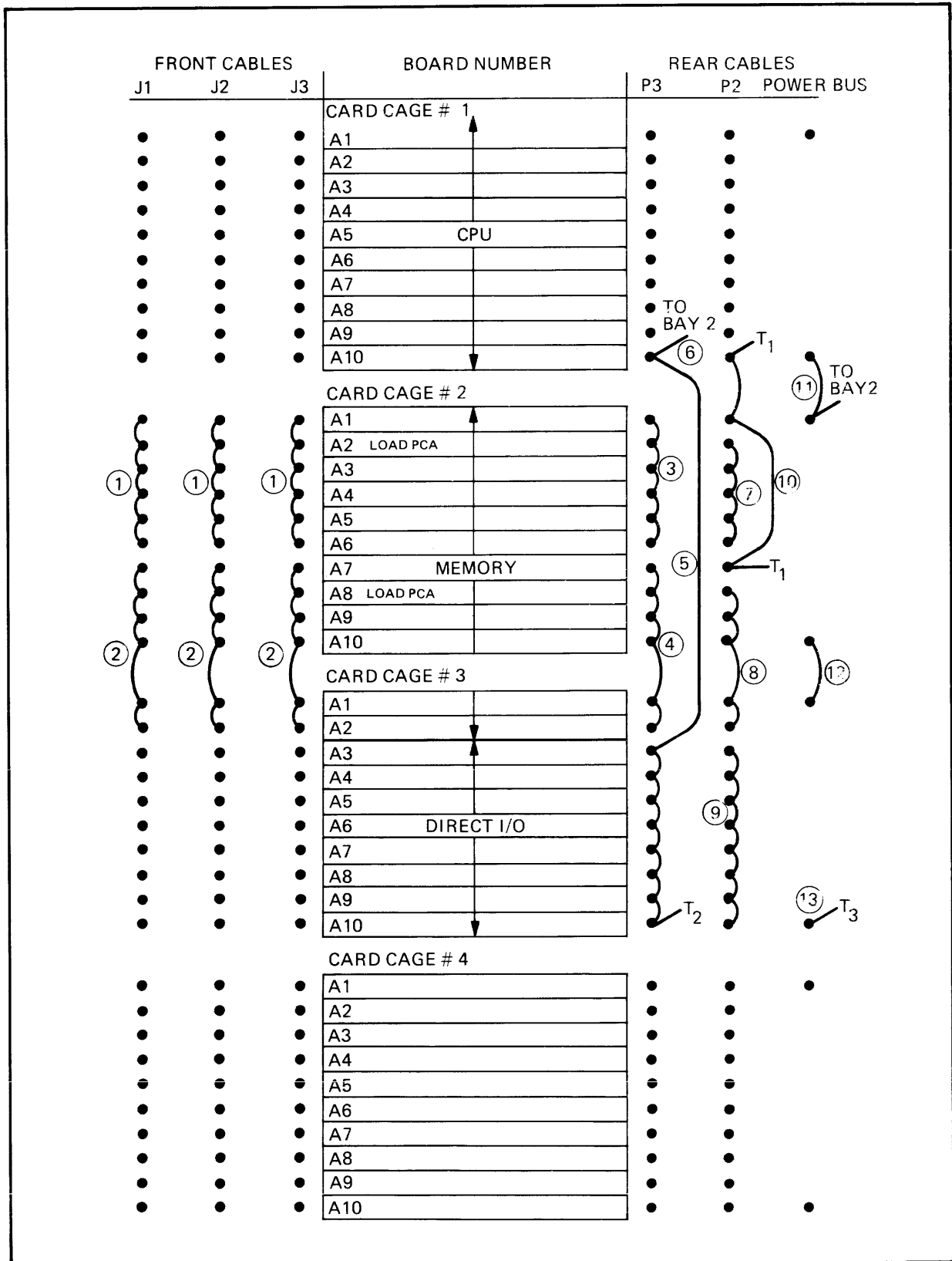


Figure 2-13. Flat Cable Connections for One or Two tMCU Memory Configurations (refer to the legend on the opposite page)

Legend for Figure 2-14

Item #	HP Part Number	Quantity
1	30000-93054	3
2	30000-93018	3
3	30000-93044	1
4	30000-93051	1
5	30000-93024	1
6	30000-93068	1
7	30000-93043	1
8	30000-93050	1
9	(not used)	
10	30000-93073	1
11	30000-93007	1
12	30000-93005	*
13	30001-60034	2
14	30000-93041	*
15	30000-93040	*
16	30000-93020	*
T1	30001-60009	2
T2	30001-60016	2
T3	30001-60021	2
T4	30035-60003	*

\*Quantity depends upon the number of card cages in bay #2 and/or the number of Multiplexer channels.

*Note: Items 1 through 16 are flat cables and items T1 through T4 are terminators.*

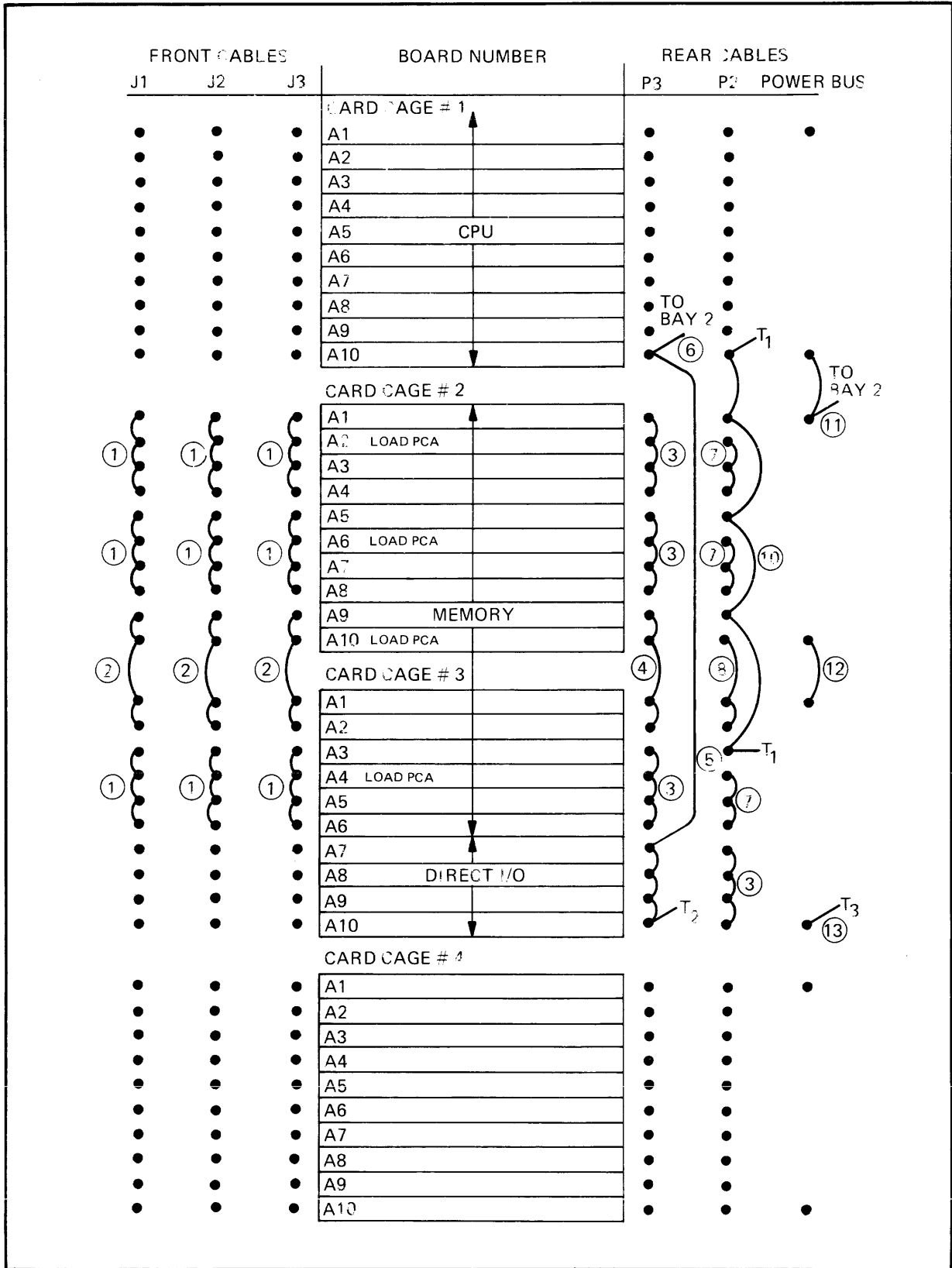


Figure 2-14. Flat Cable Connections for Four tMCU Memory Configurations (refer to the legend on the opposite page)

### **Power Supply Temperature Sense Reconfiguration (Task 3)**

Each †MCU contains a Load PCA which has a Temperature Sensitive resistor. Each HP 30310A Power Supply has a pair of terminals which must be programmed by an external resistor to make the  $\pm 20$  volt memory supply voltages operate within range.

A system with STANDARD 32K WORDS has one Load PCA whose resistor is connected to the sense terminals of the top HP 30310A Power Supply in the same equipment bay. The connection is made by means of a twisted pair from TB3-6 (temp sense return) and TB3-10 (temp sense) on the HP 30310A Power Supply by way of the wiring harness to the 2-pin female receptacle seated over pins 55 and 56 of CARD SLOT A2 in CARD CAGE #2.

The second HP 30310A Power Supply is programmed by means of a fixed 1.21K ohm 1% metal film resistor mounted directly across the terminals TB3-6 to TB3-10, and the receptacle end of the twisted pair should be seated over pins 55 and 56 of CARD SLOT A8 of CARD CAGE #2.

Any system with memory options 101, 120, 140, 160, 180, or 181 has a total of two †MCUs. From the STANDARD 32K WORDS, this is a net increase of one Load PCA. The second power supply should have the 1.21K ohm resistor removed from its TB3 terminals, and its twisted pair temp sense receptacle seated over pins 55 and 56 of CARD SLOT A8 on the PCA backplane of CARD CAGE #2, should it not already be in position.

Any system which starts with and remains at 2 †MCUs does *not* need temp sense reconfiguration.

Any system with memory options 182 or 183 has a total of 4 †MCUs. Only two of the four Load PCAs are used to sense temperature for the two HP 30310A Power Supplies. Reposition the twisted pair receptacle on pins 55 and 56 of CARD SLOT A8 in CARD CAGE #2 to the corresponding pins on CARD SLOT A4 in CARD CAGE #3. Also reposition the twisted pair receptacle on CARD CAGE #2 from pins 55 and 56 of CARD SLOT A2 to the corresponding pins of CARD SLOT A6.

## INTRODUCTION

This chapter contains a series of device installation modules. There is one module for every device. If desired, you may remove those modules which do not pertain to the current configuration. However, when a device is added to the configuration in the future the associated device installation module is *not* included in the add-on shipment. Therefore, *do not discard any of the modules*. The page numbers of each module are preceded by the device's HP number to facilitate quick reference.

For completeness, a brief description of how to make interrupt polling connections is presented in the following topic.

### Interrupt Polling Connections

On the backplane of the card cage(s) containing the input/output device PCAs there are two rows of pins along the back of each PCA. These pins are used for establishing the interrupt polling sequence. The interrupt signal always enters a PCA through the fifth pair of pins from the left (INT POLL IN) as you face the back of the backplane and always leaves through the seventh pair from the left (INT POLL OUT). The connections are made by a twisted pair of wires; one wire is white and the other is blue.

In the CPU card cage the twisted pair must be connected with the white wire on the top. In the I/O card cage(s) the twisted pair must be connected with the white wire on the bottom.

A twisted pair goes from INT POLL OUT of each PCA to INT POLL IN of the next lower PCA in the interrupt polling sequence. Refer to figure 3-1.

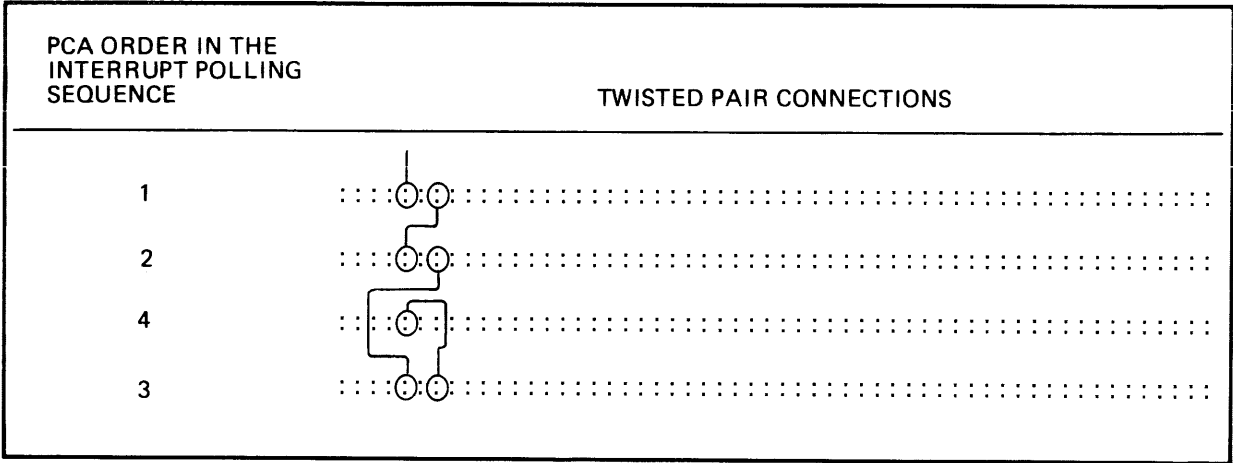


Figure 3-1. Interrupt Polling Connections



# HP 2749B TELEPRINTER SET

## *(Subsystem HP 30124A)*

The HP 2749B Teleprinter Set is a free-standing ASR 33 teleprinter input/output device. There are two models: the 2749B and the 2749B-001. The 2749B is designed to operate from 120V, 60 Hz power and the 2749B-001 is designed to operate from 230V, 50 Hz power.

The terminal may be connected directly to the computer system by way of either an HP 30031A System Clock/Console Interface Subsystem or an HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem or it may be connected indirectly by way of data sets and an HP 30032A-001 or 30032A-002 subsystem.

### SUBSYSTEM INVENTORY

An HP 30124A Console/Terminal Subsystem includes the following materials:

- One HP 2749B or 2749B-001 Teleprinter Set
- One *HP 2749B Teleprinter Set Operating and Service Manual*, part number 02749-90043
- One *HP 30124A Console/Terminal Subsystem Maintenance Manual*, part number 30124-90001
- One Stand-Alone HP 2749B Teleprinter Test, product number 32326A
- One *Stand-Alone HP 2749B Teleprinter Test* manual, part number 02749-90045
- One On-Line HP 2749B Teleprinter Test, product number 32367A
- One *On-Line HP 2749B Teleprinter Test* manual, part number 02749-90044

The HP 30031A subsystem includes the necessary interface cable assembly (part number 30031-60002). The interface cable assemblies for the HP 30032A, 30032A-001, and 30032A-002 subsystems are ordered and shipped as separate items. The part number of the interface cable assembly for an HP 30032A, 30032A-001, or 30032A-002 subsystem varies according to the length of the cable and what hardware is to be connected; the various part numbers are presented in table 2749-1.

**Table 2749-1. HP 30062 Interface Cable Assemblies**

<b>Cable Description</b>	<b>Part Number</b>
25 foot cable for connecting a data set to the connector panel	30062-60004
25 foot cable for connecting a terminal directly to the connector panel	30062-60006
50 foot cable for connecting a data set to the connector panel	30062-60007
50 foot cable for connecting a terminal directly to the connector panel	30062-60009
100 foot cable for connecting a data set to the connector panel	30062-60010
100 foot cable for connecting a terminal directly to the connector panel	30062-60012
<p>Notes: For direct connections, the maximum total cable length between the terminal and the connector panel may be up to 1/2-mile.</p> <p>For data set connections, refer to the RS-232B specifications for the maximum total cable length allowed between the terminal and the data set.</p> <p>If longer total cable lengths are required, contact the nearest HP Sales and Service Office.</p>	

## **SPECIFICATIONS**

The pertinent specifications for the HP 2749B Teleprinter Set are presented in table 2749-2.

## **INSTALLATION**

The HP 2749B Teleprinter Set is packed in a shipping crate. Remove the terminal from the shipping crate and then assemble it as described below under "Assembling the 2749B". Retain all shipping materials in case it becomes necessary to repack the terminal for shipment in the future.

Jumper and polling information for the pertinent printed-circuit assemblies (PCAs), as well as the location of the PCAs in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log* for the particular computer system. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were

**Table 2749-2. HP 2749B Specifications**

<b>Applicable Communications Specification:</b> RS-232B	
<b>Permissible Baud Rates:</b> 110	
<b>HP 2749B AC Power Requirements</b>	
Voltage:	120V      230V
Current:	3A      or      1.5A
Frequency:	60 Hz      50 Hz
<b>Heat Dissipation</b>	
HP 2749B: 775 BTU/hr; 194.53 cal, kg/hr	
<b>Cable Lengths</b>	
HP 2749B Power Cord: 10 ft; 3.048 m	
<b>Net Weight (Unpacked):</b> 77 lb 34.92 kg	<b>Distributed Over:</b> 36 sq in. .023 sq m
<b>Dimensions</b>	
Depth:	18.5 in.; 47 cm
Width:	22 in.; 55.9 cm
Height:	33 in.; 83.8 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	10.5 cu ft; .2974 cu m
Net Weight (Packed) of Crates:	95 lb; 43.08 kg

done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage for inspection (see the following paragraph for an exception).

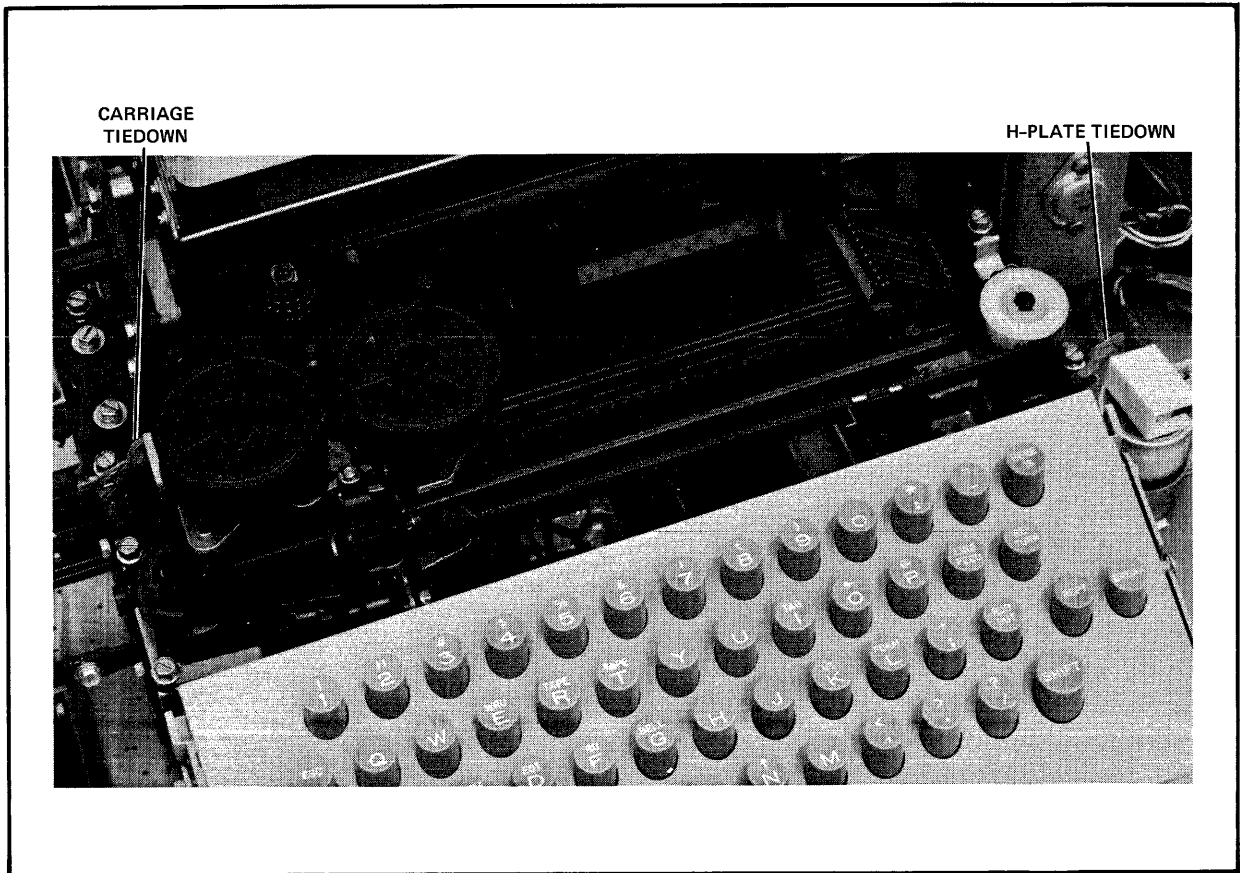
If the HP 2749B is to be connected to the computer system by way of an HP 30031A subsystem, make sure that the BAUD RATE SELECTION switch (switch S1) on the HP 30031A PCA is set to position 9. This switch setting selects a baud rate of 110. While the PCA is out of the card cage, use the "Subsystem Configuration" form to verify that the jumper settings are correct.

### Assembling the 2749B

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

Since the teleprinter is shipped partially disassembled, the unit must be assembled before use. The procedure for doing so is as follows.

- a. Place the teleprinter, with shipping pallet attached, on a workbench. Remove and discard the seven screws on the underside of the pallet and lift the unit from the pallet. Remove the tape that holds the teleprinter cover in place.
- b. Remove the knob from the front-panel LINE/OFF/LOCAL switch by pulling the knob straight out. Remove the nameplate containing the LINE/OFF/LOCAL nomenclature by pulling the nameplate down and out. Remove the platen knob from the left side of the platen.
- c. Unfasten the teleprinter cover by removing the four screws that were uncovered when the nameplate was removed, the three screws on the rear of the unit, and the small screw on the lower rear edge of the tape reader cover. Save these screws for use in step 1.
- d. Remove and discard the material that is used to tie the printing carriage to the left side of the typing assembly and the H-plate to the right side of the typing assembly (see figure 2749-1).
- e. Remove the retaining clip from the tape reader upstop shoulder screw as shown in figure 2749-2.
- f. Visually inspect the teleprinter for obvious defects.
- g. Remove the two screws at the top of the teleprinter-stand rear panel and save them for use in step 1. Remove the rear panel by lifting it up and out. Remove the four screws and washers from the bag attached to the teleprinter-stand.
- h. Support the front of the teleprinter and position the unit on the teleprinter-stand so that the rear panels of the teleprinter and the stand are vertically aligned. Attach the teleprinter to the stand by inserting the four screws into the teleprinter base through the holes in the stand. Use a single washer for each screw. After tightening the screws, level the unit by adjusting the leveling screws under the rear corners of the stand.



**Figure 2749-1. Carriage and H-Plate Tiedown Points**

- i. Remove the cover from the data set coupler. Insert the two plugs that exit from a single cable into the respective jacks on the coupler printed-circuit card. One mating pair of connectors is color-coded with paint. Replace the coupler cover.
- j. Secure the cables with the supplied clamp and then mount the data set coupler as illustrated in figure 2749-3. Connect the coupler power cable to the coupler. The clamp and mounting hardware are furnished with the HP 2749B.
- k. Mount the step-down transformer (HP 2749B-001 Teleprinter Sets only) to the inside bottom of the stand using suitable hardware. Insert the teleprinter power-cord plug into the receptacle on the transformer.
- l. Replace the rear panel of the stand and secure it in place using the screws that were removed in step g. Replace the teleprinter cover and secure it in place using the screws that were removed in step c.
- m. Place the long paper-roll spindle in the slots behind the typewriter platen and place the small paper-roll spindle in the holder directly behind the tape punch. Replace the platen knob (removed in step b).

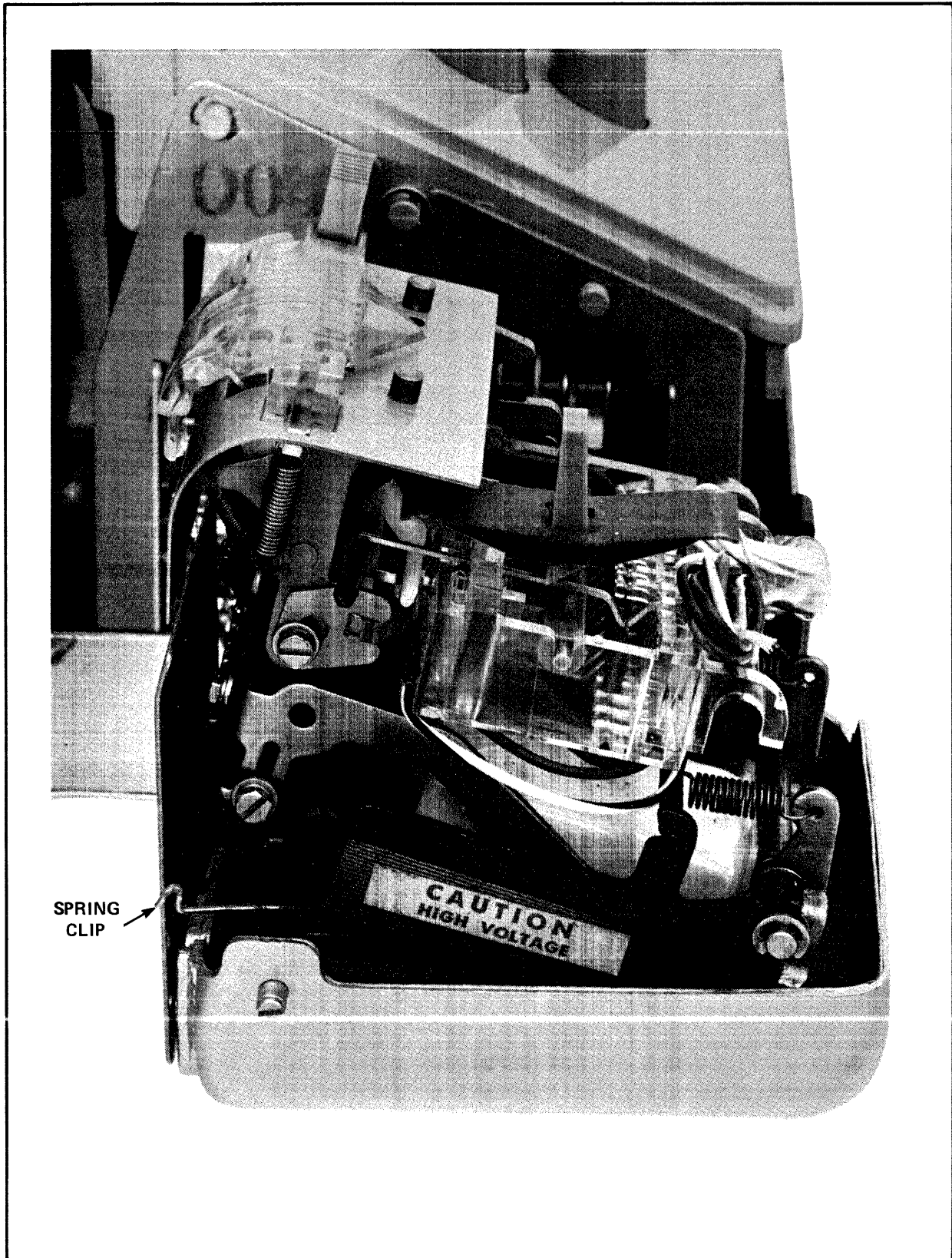


Figure 2749-2. Tape Reader Retaining Clip

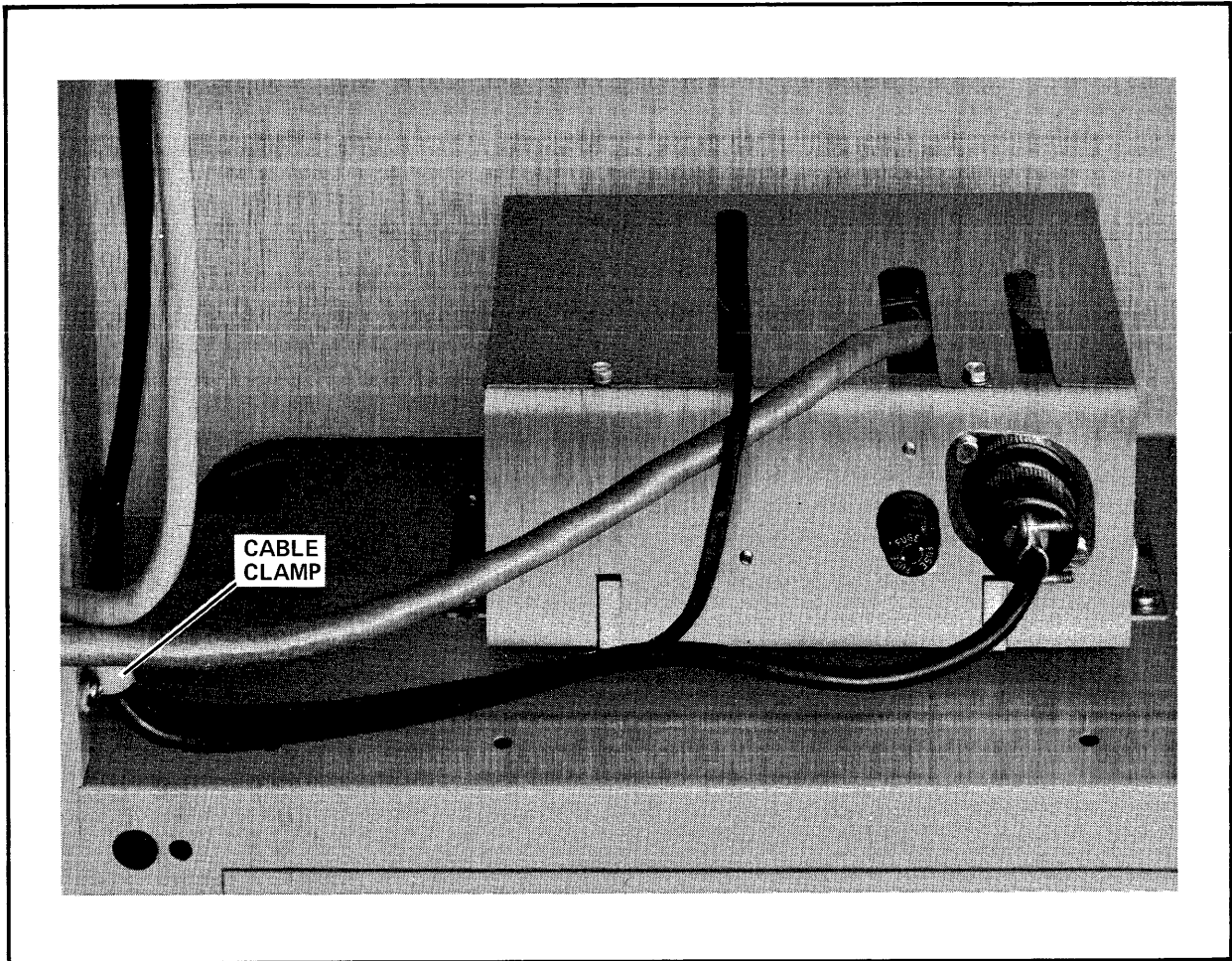


Figure 2749-3. Data Set Coupler Installation

- n. Mount the copy holder on the back of the teleprinter by inserting the copy holder tabs into the matching slots on the teleprinter. Push down on the copy holder until the tabs are fully seated.

### Cable Connections

If the terminal is to be connected to an HP 30031A subsystem, the interface cable assembly is connected to the HP 30031A PCA and coiled inside the bay when the computer system is shipped. If the terminal is to be connected to an HP 30032A, 30032A-001, or 30032A-002 subsystem, the interface cable is ordered and shipped as a separate item. Uncoil the interface cable assembly and connect the equipment as illustrated in figure 2749-4, 2749-5, or 2749-6 (whichever applies). The cable connections are summarized on the "Cable Routing" form in section 1 of the *System Support Log*.

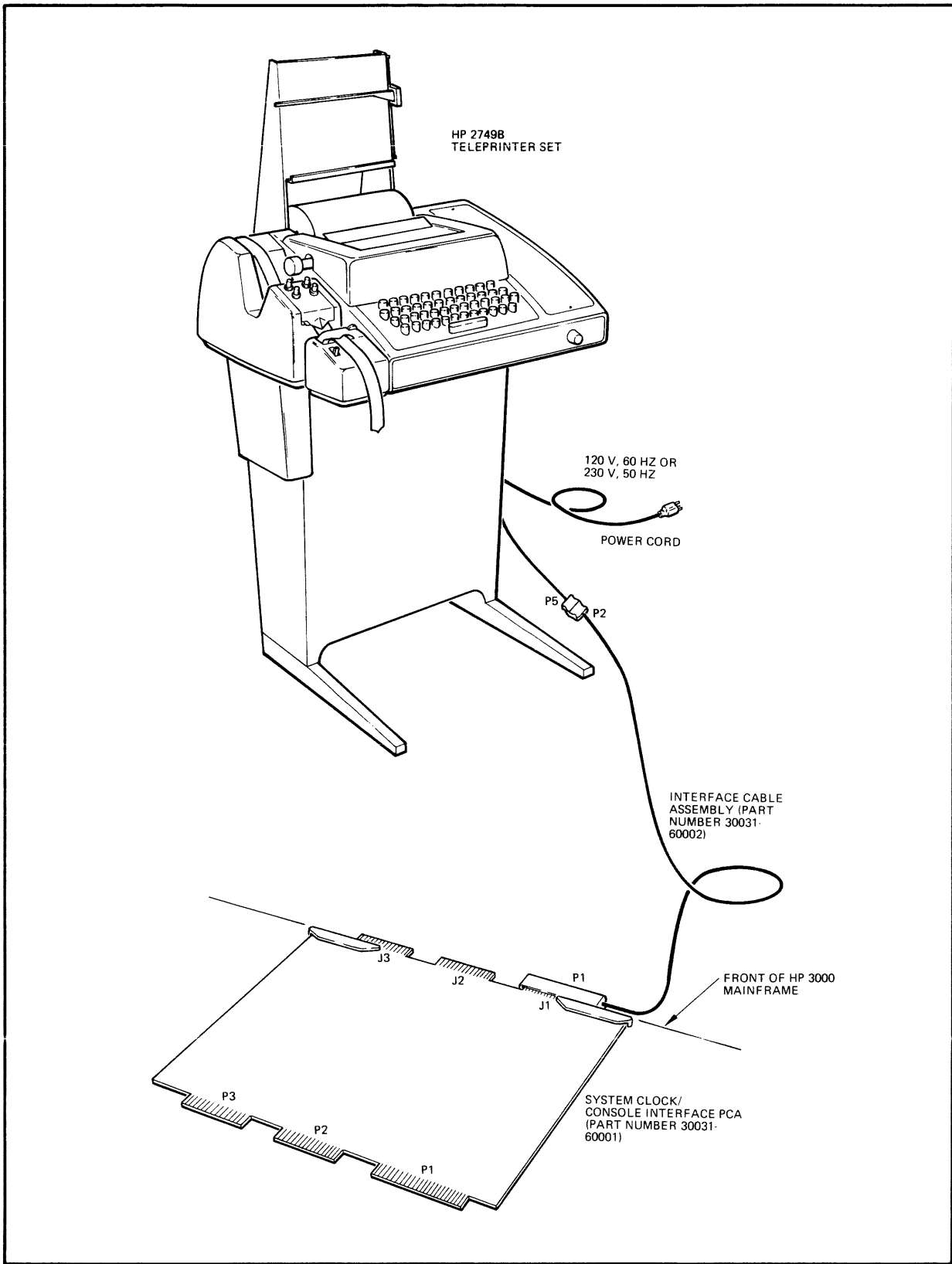


Figure 2749-4. HP 2749B Connected to an HP 30031A System Clock/Console Interface Subsystem



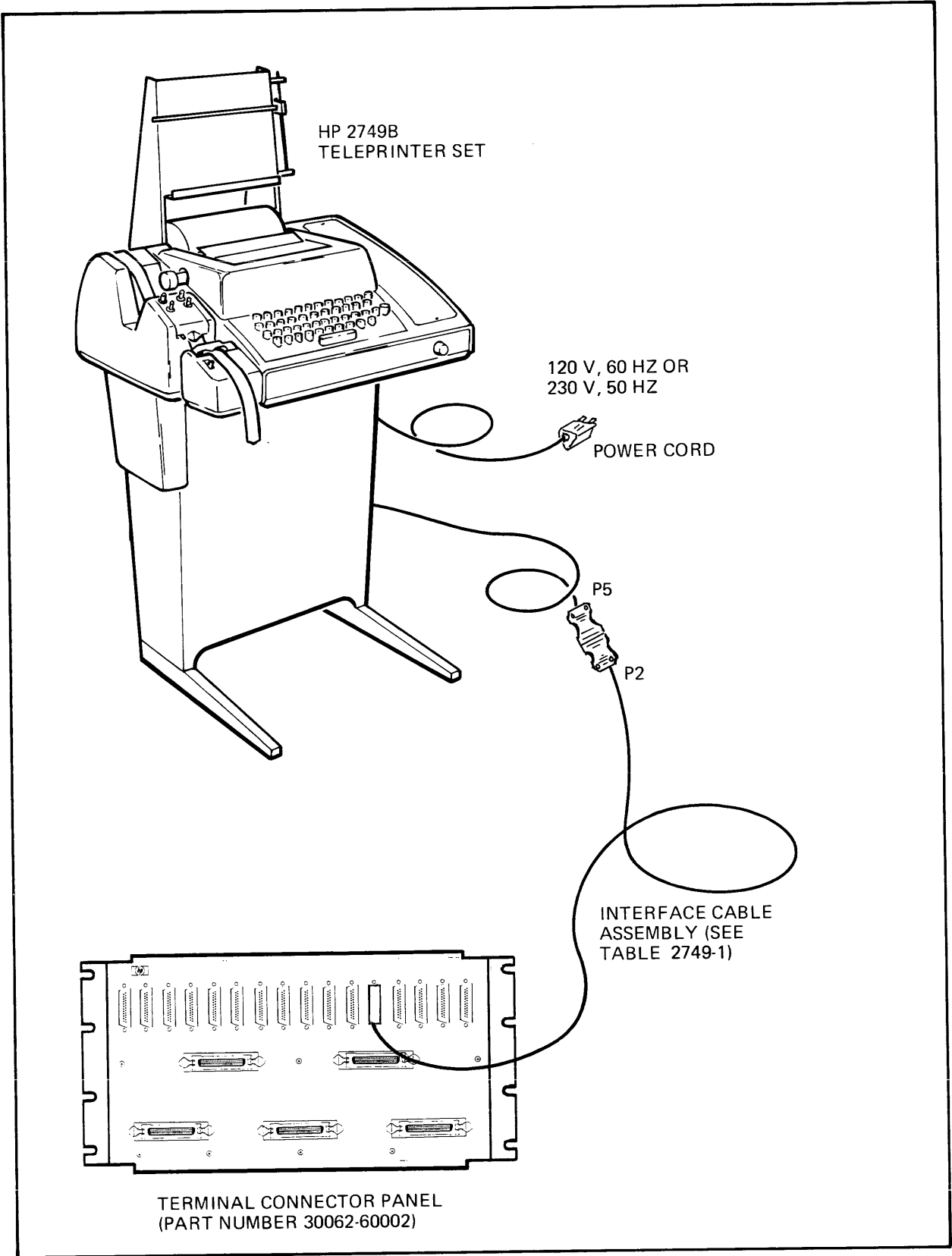


Figure 2749-5. HP 2749B Directly Connected to an HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem

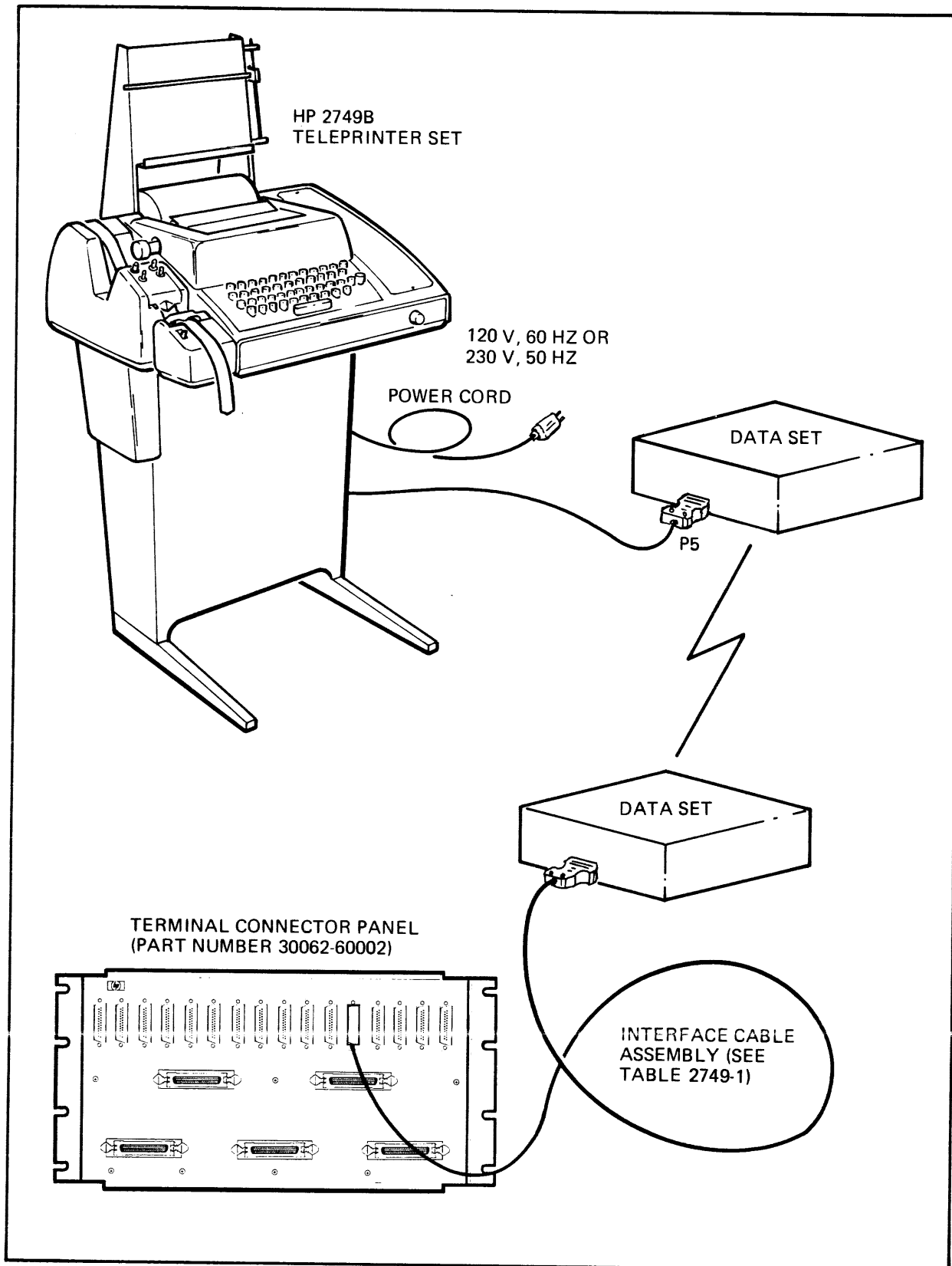


Figure 2749-6. HP 2749B Connected to an HP 30032A-001 or -002 Asynchronous 16-Channel Terminal Controller Subsystem by Way of Data Sets

## Installation Check-Out

Use the following procedure to verify the proper operation of the basic teleprinter functions. The procedure consists of a sample message which is typed and simultaneously punched on paper tape. The paper tape is then placed in the teleprinter's tape reader and the message is printed from the tape.

- a. Turn the LINE/OFF/LOCAL switch to the LOCAL position and press the paper tape punch ON pushbutton.
- b. Using the typewriter keyboard, type the following message:

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK 0123456789

- c. Press the RETURN key, the LINE FEED key, and then type the message again. The tape punch should simultaneously punch the message on paper tape during both typing operations.
- d. The printed message should be exactly as typed for both typing operations. If not, the typing assembly is malfunctioning.
- e. Press the HERE IS key to generate approximately six inches of blank tape. Remove the newly punched tape from the paper tape punch and insert the tape in the paper tape reader.
- f. Momentarily move the tape reader control lever to the MANUAL START position. The tape reader should begin reading the tape and the typewriter assembly should print the messages exactly as they were originally typed. If not, the tape punch or the tape reader is malfunctioning.

## DIAGNOSTIC PROGRAMS

The Stand-Alone HP 2749B Teleprinter Test and the On-Line HP 2749B Teleprinter Test verify the proper operation of the terminal. The operating instructions for each are described in the associated manuals (refer to "Subsystem Inventory").

If the terminal is connected to an HP 30031A subsystem, the Stand-Alone HP 30031A System Clock/Console Interface Test, product number 32325A, can be used to verify the proper operation of the interface PCA. The operating instructions for the diagnostic program are described in the associated manual, part number 30031-90005.

If the terminal is connected to an HP 30032A, 30032A-001, or 30032A-002 subsystem, the On-Line HP 30060A Terminal Data Interface Test, product number 32363A, and On-Line HP 30061A Terminal Control Interface Test, product number 32368A, may be used to verify the proper operation of the interface PCAs. The operating instructions for each are described in the *On-Line HP 30060A Terminal Data Interface Test* manual, part number 30060-90003, and the *On-Line HP 30061A Terminal Control Interface Test* manual, part number 30061-90003, respectively.

## ADD-ON INSTALLATION

An add-on shipment of an HP 30124A Console/Terminal Subsystem includes all the materials listed earlier under "Subsystem Inventory" plus copies of those *System Support Log* forms which pertain to the add-on installation.

There are five possible add-on situations involving an HP 2749B Teleprinter Set, as follows:

1. The terminal can be connected directly to an existing HP 30031A subsystem.
2. The terminal can be connected directly to an existing HP 30032A subsystem.
3. The terminal can be connected by way of data sets to an existing HP 30032A-001 or 30032A-002 subsystem.
4. The terminal can be connected directly to an HP 30032A subsystem which is also being added to the computer system.
5. The terminal can be connected by way of data sets to an HP 30032A-001 or 30032A-002 subsystem which is also being added to the computer system.

The instructions for adding an HP 30032A, 30032A-001, or 30032A-002 subsystem to the computer system are presented in a separate device installation module later in this chapter.

The add-on installation of an HP 2749B Teleprinter Set comprises the following general steps:

1. Uncrating and assembling the terminal.
2. Uncrating and checking-out the data sets (if applicable).
3. Connecting the terminal (and data sets, if applicable) to the appropriate subsystem.
4. Performing the installation check-out procedure for the terminal.

Uncrate and assemble the terminal as described earlier under "Installation".

The procedures for uncrating and checking-out the data sets are beyond the scope of this manual. Such information should be provided by the data set manufacturer.

Every original HP 3000 Computer System installation contains an HP 30031A System Clock/Console Interface Subsystem and has an input/output terminal connected to the HP 30031A subsystem. If the add-on terminal is to be connected to the existing HP 30031A subsystem, disconnect the interface cable assembly from the existing terminal and connect it to the add-on terminal as illustrated in figure 2749-4. The terminal which was disconnected from the HP 30031A subsystem must then be reconnected to the computer system by way of an HP 30032A subsystem (as described in the following paragraph).

The interface cable assemblies for an HP 30032A, 30032A-001, or 30032A-002 subsystem are ordered and shipped as separate items. If the add-on terminal is to be connected to the computer by way of an HP 30032A, 30032A-001, or 30032A-002 subsystem, uncoil the appropriate interface cable assembly and connect the equipment as illustrated in figure 2749-5 or 2749-6 (whichever applies). The cable connections are summarized on the "Cable Routing" form.

Perform the installation check-out procedure for the terminal as described earlier under "Installation".

# HP 2600A KEYBOARD-DISPLAY TERMINAL

## *(Subsystem HP 30123A)*

The HP 2600A Keyboard-Display Terminal is a free-standing cathode ray tube input/output device. There are two models: the 2600A and the 2600A-015. The 2600A is designed to operate from 120V, 60 Hz power and the 2600A-015 is designed to operate from 230V, 50 Hz power.

The terminal may be connected directly to the computer system by way of either an HP 30031A System Clock/Console Interface Subsystem or an HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem or it may be connected indirectly by way of data sets and an HP 30032A-001 or 30032A-002 subsystem.

### SUBSYSTEM INVENTORY

An HP 30123A Keyboard-Display Terminal Subsystem includes the following materials:

- One HP 2600A or 2600A-015 Keyboard-Display Terminal
- One Device Cable, part number 8120-1585
- One *HP 2600A Keyboard-Display Terminal Operator's Manual*, part number 02600-90005
- One *HP 30123A Keyboard-Display Terminal Subsystem Maintenance Manual*, part number 30123-90001
- One On-Line HP 30123A Terminal Diagnostic, product number 32371A
- One *On-Line HP 30123A Terminal Diagnostic manual*, part number 03000-90051
- One *HP 2600A Keyboard-Display Terminal Maintenance Manual*, part number 02600-90001

The device cable is approximately six feet (1.829 m) long and is used for connecting the terminal to either the data set or to the interface cable assembly (refer to figures 2600-1, 2600-2, and 2600-3). The HP 30031A subsystem includes the necessary interface cable assembly (part number 30031-60002). The interface cable assemblies for the HP 30032A, 30032A-001, and 30032A-002 subsystems are ordered and shipped as separate items. The part number of the interface cable assembly for an HP 30032A, 30032A-001, or 30032A-002 subsystem varies according to the length of the cable and what hardware is to be connected; the various part numbers are presented in table 2600-1.

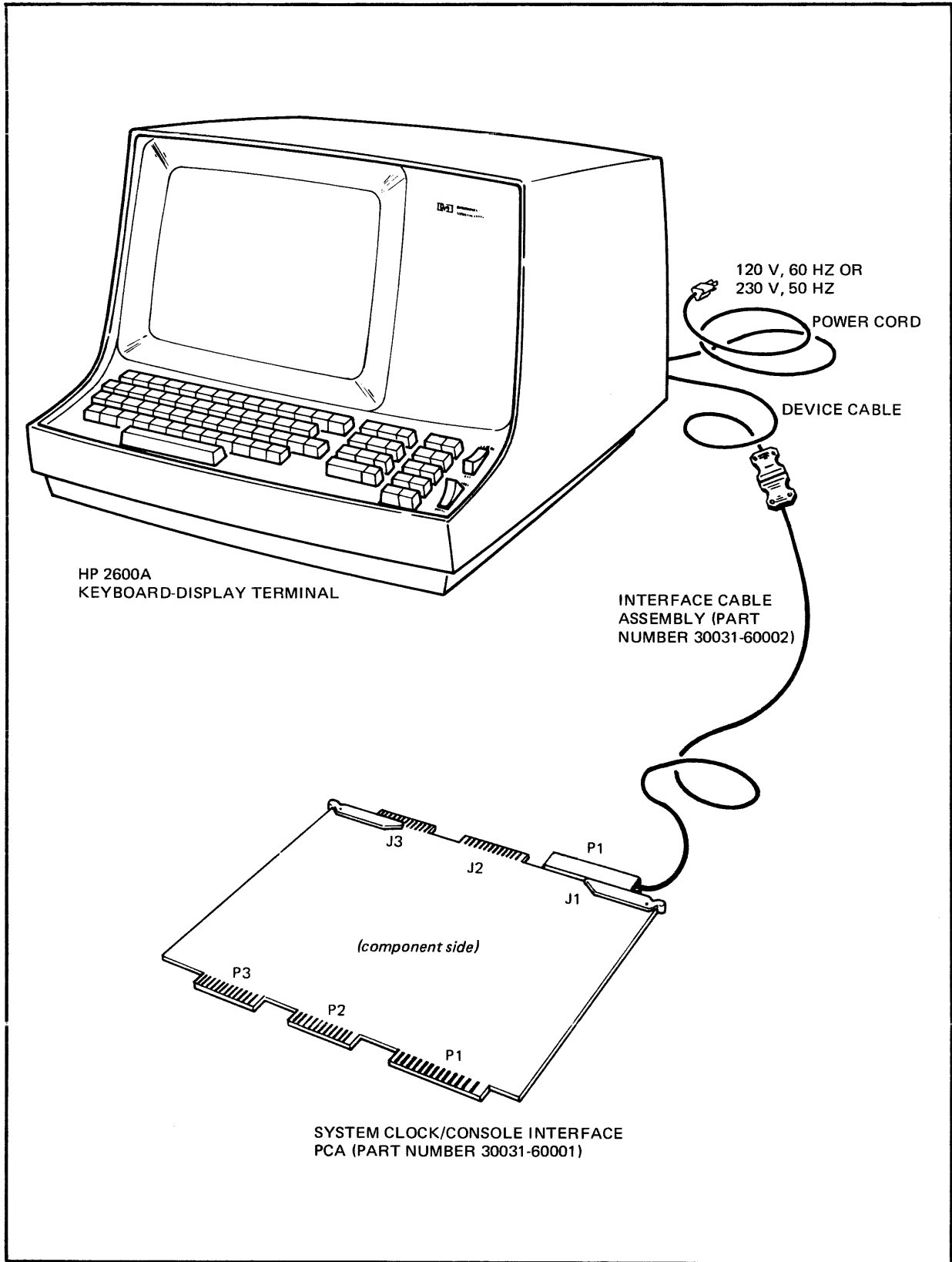


Figure 2600-1. HP 2600A Connected to an HP 30031A System Clock/Console Interface Subsystem

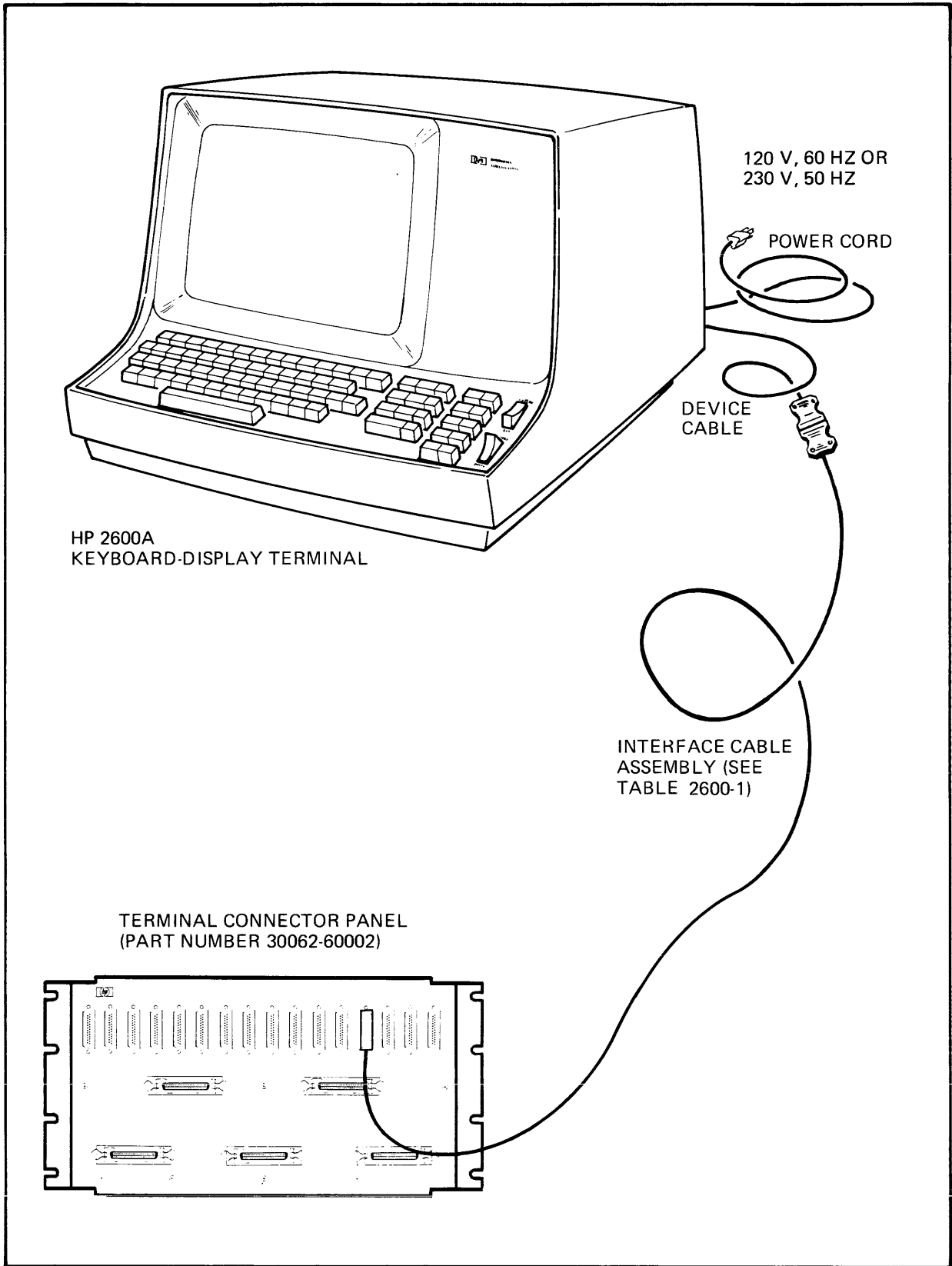


Figure 2600-2. HP 2600A Directly Connected to an HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem



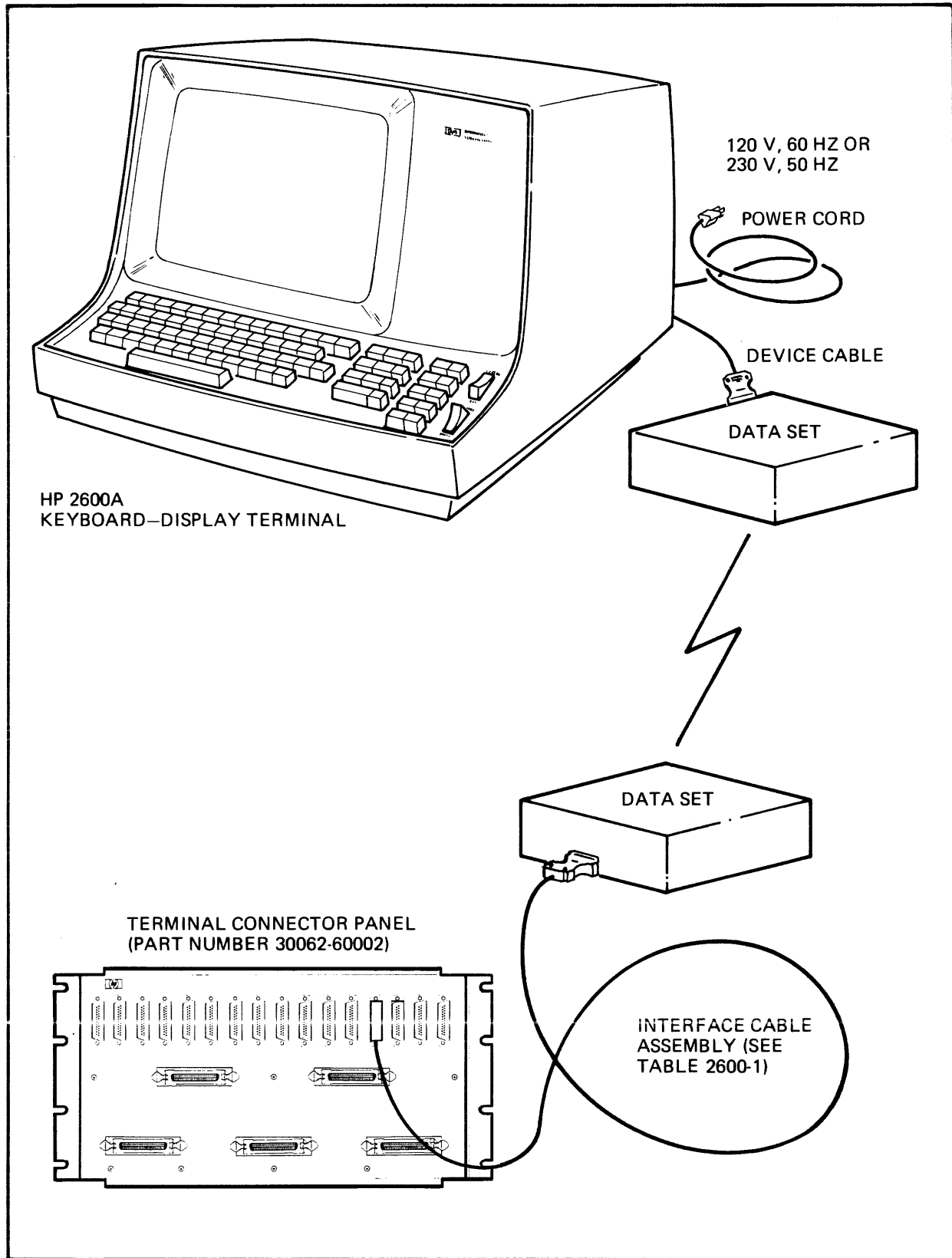


Figure 2600-3. HP 2600A Connected to an HP 30032A-001 or -002 Asynchronous 16-Channel Terminal Controller Subsystem by Way of Data Sets

**Table 2600-1. HP 30062 Interface Cable Assemblies**

Cable Description	Part Number
25 foot cable for connecting a data set to the connector panel	30062-60004
25 foot cable for connecting a terminal directly to the connector panel	30062-60006
50 foot cable for connecting a data set to the connector panel	30062-60007
50 foot cable for connecting a terminal directly to the connector panel	30062-60009
100 foot cable for connecting a data set to the connector panel	30062-60010
100 foot cable for connecting a terminal directly to the connector panel	30062-60012
<p>Notes: For direct connections, the maximum total cable length between the terminal and the connector panel may be up to 1/4-mile for baud rates greater than 600 and up to 1/2-mile for baud rates of 600 or less.</p> <p>For data set connections, refer to the RS-232B specifications for the maximum total cable length allowed between the terminal and the data set.</p> <p>If longer total cable lengths are required, contact the nearest HP Sales and Service Office.</p>	

**SPECIFICATIONS**

The pertinent specifications for the HP 2600A are presented in table 2600-2.

**INSTALLATION**

The HP 2600A is normally shipped by padded van. In such a case the terminal is *not* packed in a shipping crate. If for some reason it must be shipped by unpadded van, the terminal is packed in a shipping crate.

A piece of fiberboard is attached to the base of the terminal by a set of screws; other shipping materials are taped to the terminal. Remove the HP 2600A from its shipping crate (if applicable), and then remove the fiberboard and other shipping materials. To remove the fiberboard, merely unfasten the screws which hold it to the base of the terminal. Retain all materials in case it becomes necessary to repack the terminal for shipment in the future.

**Table 2600-2. HP 2600A Specifications**

<b>Applicable Communications Specification:</b> RS-232B	
<b>Permissible Baud Rates:</b> 110, 150, 220, 300, 440, 600, 880, 1200, 1760, and 2400	
<b>HP 2600A AC Power Requirements</b>	
Voltage:	120V or 230V
Current:	1.8A or 0.9A
Frequency:	60 Hz or 50 Hz
<b>Heat Dissipation</b>	
HP 2600A: 683 BTU/hr; 171.43 cal, kg/hr	
<b>Cable Lengths</b>	
HP 2600A Power Cord: 7 ft; 2.13 m	
HP 2600A Device Cable: 6 ft; 1.83 m	
<b>Net Weight (Unpacked):</b>	48 lb 21.77 kg
<b>Distributed Over:</b>	3.1 sq in. 20 sq cm
<b>Dimensions</b>	
Depth:	20 in.; 50.8 cm
Width:	18.5 in.; 47 cm
Height:	13 in.; 33 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	4.1 cu ft; .1161 cu m
Net Weight (Packed) of Crates:	60 lb; 27.21 kg

Jumper and polling information for the pertinent printed-circuit assemblies (PCAs), as well as the location of the PCAs in the equipment bay, are described on the “Subsystem Configuration” form in section 1 of the *System Support Log* for the particular computer system.

All necessary jumper and polling connections are done at the factory before the computer system is shipped. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cages for inspection (see the following paragraph for an exception). Using the “Subsystem Configuration” form, examine the backplane of the card cage containing the HP 2600A PCA(s) and verify that the applicable polling connections are correct.

If the HP 2600A is to be connected to the computer system by way of an HP 30031A subsystem, remove the HP 30031A PCA from the card cage and make sure that the BAUD RATE SELECTION switch (switch S1) on the PCA is set to select the desired baud rate. While the PCA is out of the card cage, use the “Subsystem Configuration” form to verify that the jumper connections on the PCA are correct. The various BAUD RATE SELECTION switch settings are as follows:

Switch Position	Selected Baud Rate
3	2400
4	1200
5	600
6	300
8	110

*Note: The BAUD RATE SELECTION switch on the PCA and the rotary switch on the back of the terminal must be set to the same position.*

If the terminal is to be interfaced through an HP 30031A subsystem, the interface cable assembly is attached to the HP 30031A PCA and coiled inside the equipment bay when the computer system is shipped. If the terminal is to be interfaced through an HP 30032A, 30032A-001, or 30032A-002 subsystem, the interface cable assembly is ordered and shipped as a separate item. Uncoil the interface cable and connect the equipment as illustrated in figure 2600-1, 2600-2, or 2600-3 (whichever applies). The device power cable plugs into the 115 VAC 60 Hz or 230 VAC 50 Hz connector on the back of the terminal; the device cable plugs into the DATA SET connector on the back of the terminal. The cable connections are summarized on the “Cable Routing” form in section 1 of the *System Support Log*.

After the various cables and equipment have been properly connected, perform the following installation check-out procedure for the HP 2600A.

- a. Remove the cover of the HP 2600A, verify that all the printed-circuit cards inside the terminal are firmly seated in their connectors, and then put the cover back on the terminal.

- b. Set the power switch at the lower right corner of the keyboard to the OFF position.

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

- c. Connect the terminal's power cord to an appropriate ac electrical outlet.
- d. Set the DUPLEX and BAUD RATE switches on the back of the terminal to the proper settings (the proper settings are determined by the equipment configuration and by the computer programs that will be using the HP 2600A).
- e. After the terminal has been connected to the electrical outlet, allow approximately one minute for the CRT filament to warm up. Then set the power switch to the ON position and move the LOCAL/REMOTE switch (located just above the power switch) to the LOCAL position. The blinking cursor should appear in the leftmost character position of the top line on the screen. If the cursor does not appear within approximately fifteen seconds, press the HOME UP key. If the cursor still does not appear, the terminal is defective and cannot be used. *Turn it off immediately* and contact the nearest HP Sales and Service Office.
- f. Verify that the cooling fan is operating properly.
- g. Remove the cover of the HP 2600A and, using a suitable voltmeter, make sure that the proper voltages exist:
- The Regulated +5V is set to 4.8V by adjusting R-9 in the logic power supply. Measure the voltage at the bottom of the 5V fuse (F-1) which is mounted vertically in the power supply just below and to the left of the four potentiometers.
  - The Regulated -5V is set to -5V by adjusting R-21 in the logic power supply. Measure the voltage at PIN-8 on the logic power supply connector P-8.
  - The Regulated -12V is set to -12V by adjusting R-27 in the logic power supply. Measure the voltage at PIN-12 on the logic power supply connector P-8.
  - The Regulated +14V is set to +14V by adjusting R-11 in the logic power supply. Measure the voltage at PIN-15 on the logic power supply connector P-8.
  - The +25V and -25V are not adjustable. Measure these voltages at fuses F-2 and F-3, respectively, on the back panel.
  - The +40V is not adjustable. Measure this voltage at PIN-44 on the deflection amplifier.
  - The +450V deflection voltage is not adjustable. Measure this voltage at TB-1 PIN-6 on the back panel.

- The 15KV power supply can be tested at its output, which is defined by the RED wire jumpered to the CRT. This voltage is not adjustable.

Put the cover back on the terminal.

- h. Verify that all the keys are functioning properly. Note that the REPT key may be used in conjunction with other keys to display the selected character in successive character positions on the screen at a rate of 7-1/2 times per second.

If the terminal is connected to a data set, verify the proper operation of the keys using the following procedure:

- (1) Remove the ac power from both the HP 2600A and the data set.
- (2) Disconnect the signal cable from the DATA SET connector on the back of the terminal.
- (3) Remove the cover of the HP 2600A.
- (4) Short pin-47 on the keyboard to ground. This permits the terminal to operate at the selected baud rate.
- (5) Jumper pins 2 and 3 of the DATA SET connector on the back of the terminal. This simulates remote operation by routing the transmitted signals to the receive sections of the HP 2600A.
- (6) Apply ac power to the terminal and then verify the proper operation of all the keys.
- (7) After the keys have been verified, remove the ac power from the terminal, remove the jumpers, and put the cover back on the terminal.

## DIAGNOSTIC PROGRAMS

The On-Line HP 30123A Terminal Diagnostic verifies the proper operation of the HP 2600A Keyboard-Display Terminal. The operating instructions for the diagnostic program are presented in the associated manual (refer to "Subsystem Inventory").

If the terminal is connected to an HP 30031A subsystem, the Stand-Alone HP 30031A System Clock/Console Interface Test, product number 32325A, may be used to verify the proper operation of the interface PCA. The operating instructions for the diagnostic program are presented in the associated manual, part number 30031-90005.

If the terminal is connected to an HP 30032A, 30032A-001, or 30032A-002 subsystem, the On-Line HP 30060A Terminal Data Interface Test, product number 32363A, and On-Line HP 30061A Terminal Control Interface Test, product number 32368A, may be used to verify the proper operation of the interface PCAs. The operating instructions for each are described in the *On-Line HP 30060A Terminal Data Interface Test* manual, part number 30060-90003, and the *On-Line HP 30061A Terminal Control Interface Test* manual, part number 30061-90003, respectively.

## ADD-ON INSTALLATION

An add-on shipment of an HP 30123A Keyboard-Display Terminal Subsystem includes all the materials listed earlier under "Subsystem Inventory" plus copies of those *System Support Log* forms which pertain to the add-on installation.

There are five possible add-on situations involving an HP 2600A Keyboard-Display Terminal, as follows:

1. The terminal can be connected directly to an existing HP 30031A subsystem.
2. The terminal can be connected directly to an existing HP 30032A subsystem.
3. The terminal can be connected by way of data sets to an existing HP 30032A-001 or 30032A-002 subsystem.
4. The terminal can be connected directly to an HP 30032A subsystem which is also being added to the computer system.
5. The terminal can be connected by way of data sets to an HP 30032A-001 or 30032A-002 subsystem which is also being added to the computer system.

The instructions for adding an HP 30032A, 30032A-001, or 30032A-002 subsystem to the computer system are presented in a separate device installation module later in this chapter.

The add-on installation of an HP 2600A Keyboard-Display Terminal comprises the following general steps:

1. Uncrating and assembling the terminal.
2. Uncrating and checking-out the data sets (if applicable).
3. Connecting the terminal (and data sets, if applicable) to the appropriate subsystem.
4. Performing the installation check-out procedure for the terminal.

Uncrate the HP 2600A as described earlier under "Installation".

The procedure for uncrating and checking-out the data sets are beyond the scope of this manual. Such information should be provided by the data set manufacturer.

Every original HP 3000 Computer System installation contains an HP 30031A System Clock/Console Interface Subsystem and has an input/output terminal connected to the HP 30031A subsystem. If the add-on terminal is to be connected to the existing HP 30031A subsystem, disconnect the interface cable assembly from the existing terminal and connect it to the add-on terminal as illustrated in figure 2749-1. The terminal which was disconnected from the HP 30031A subsystem must then be reconnected to the computer system by way of an HP 30032A subsystem (as described in the following paragraph).

The interface cable assemblies for an HP 30032A, 30032A-001, or 30032A-002 subsystem are ordered and shipped as separate items. If the add-on terminal is to be connected to the computer by way of an HP 30032A, 30032A-001, or 30032A-002 subsystem, uncoil the appropriate interface cable assembly and connect the equipment as illustrated in figure 2600-2 or 2600-3 (whichever applies). The cable connections are summarized on the "Cable Routing" form.

Perform the installation check-out procedure for the terminal as described earlier under "Installation".



# HP 2748B TAPE READER

## *(Subsystem HP 30104A)*

The HP 2748B Tape Reader is a rack-mounted input device which reads data from punched tape at a speed of up to 500 characters-per-second. There are two models: the 2748B and the 2748B-001. The 2748B is designed to operate from 120V, 60 Hz power and the 2748B-001 is designed to operate from 230V, 50 Hz power.

### SUBSYSTEM INVENTORY

An HP 30104A Tape Reader Subsystem includes the following materials:

- One HP 2748B or 2748B-001 Tape Reader
- One HP 30204A Tape Reader Interface
- One *HP 2748B Tape Reader Operating and Service Manual*, part number 02748-90032
- One *HP 30104A Tape Reader Subsystem Maintenance Manual*, part number 30104-90001
- One Rack Mounting Kit, part number 5060-8741
- One On-Line HP 30104A Paper Tape Reader Diagnostic, product number 32372A
- One *On-Line HP 30104A Paper Tape Reader Diagnostic* manual, part number 30104-90003

The HP 30204A Tape Reader Interface includes an HP 30050A Universal Interface (TTL) Printed-Circuit Assembly (PCA), part number 30050-60001, and an Interface Cable Assembly, part number 30204-60001. The interface cable connects the tape reader to the PCA.

### SPECIFICATIONS

The pertinent specifications for the HP 2748B are presented in table 2748-1.

**Table 2748-1. HP 2748B Specifications**

<p><b>Interface DC Power Requirements</b></p> <table border="1"> <tr> <td>+5</td> <td>-5</td> <td>+15</td> <td>-15</td> <td>+20</td> <td>-20</td> </tr> <tr> <td>4.0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table>		+5	-5	+15	-15	+20	-20	4.0	0	0	0	0	0
+5	-5	+15	-15	+20	-20								
4.0	0	0	0	0	0								
<p><b>Tape Reader AC Power Requirements</b></p> <p>Voltage:      [ 120V ]      or      [ 230V ]            Current:      2.5A                      1.25A            Frequency: [ 60 Hz ]                      [ 50 Hz ]</p>													
<p><b>Heat Dissipation</b></p> <p>Tape Reader:    850 BTU/hr; 213.35 cal, kg/hr            Interface:        68 BTU/hr; 17.068 cal, kg/hr</p>													
<p><b>Cable Lengths</b></p> <p>Tape Reader Power Cord:    7.5 ft; 2.286 m            Interface Cable Assembly:    10 ft (standard); 3.048 m                25 ft (maximum); 7.62 m</p>													
<p><b>Net Weight (Unpacked):</b> 42 lb                      <b>Distributed Over:</b> n.a. (rack-mounted)                19.05 kg</p>													
<p><b>Dimensions</b></p> <p>Depth:    16 in.; 40.6 cm            Width:    17 in.; 43.2 cm            Height:    7 in.; 17.8 cm</p>													
<p><b>Shipping Information</b></p> <p>Number of Crates:                      1            Size of Crates:                          3.44 cu ft; .0974 cu m            Net Weight (Packed) of Crates:    46 lb; 20.862 kg</p>													

## INSTALLATION

The tape reader and interface PCA are already mounted in the appropriate equipment bay when the computer system is shipped. If they are housed in the same bay, then they are also already connected to one another. If they are in separate bays, then the interface cable is connected to the PCA and coiled inside the particular bay. In such a case, after the bays are fastened together the interface cable must be uncoiled and connected to the tape reader. When the cable has been connected to the tape reader, secure it by turning the screw on the end of the cable until tight. All cable connections are summarized on the "Cable Routing" form in section 1 of the *System Support Log* for the particular computer system.

Jumper and polling information for the tape reader PCA, as well as the location of the PCA in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

### Installation Check-Out

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

The installation check-out procedure for the HP 2748B is as follows:

- a. Remove the top cover from the unit.
- b. Check for cracked, broken, or loose parts.
- c. Examine the roller surfaces. There should be no signs of wear.
- d. Turn the rotating parts by hand, with no power applied, to ensure that they turn freely (no binding).
- e. Load a roll of punched tape into the unit (this procedure is described under "Operating Procedures" later in this device installation module).
- f. Execute a read instruction in the computer. As the unit reads the tape, listen for excessive bearing or clutch noise and check the mating roller surfaces to ensure that there are no gaps in the contact area between the roller surfaces. Also check the reader pinch roller (refer to figure 2748-1) to ensure that proper tension is being applied.
- g. Press the TAPE FEED switch. Check the tape tracking as the tape starts, moves continuously, and (when the TAPE FEED switch is released) stops. The tape should traverse the read head smoothly with the edge of the tape tracking against the back edge of the trough.

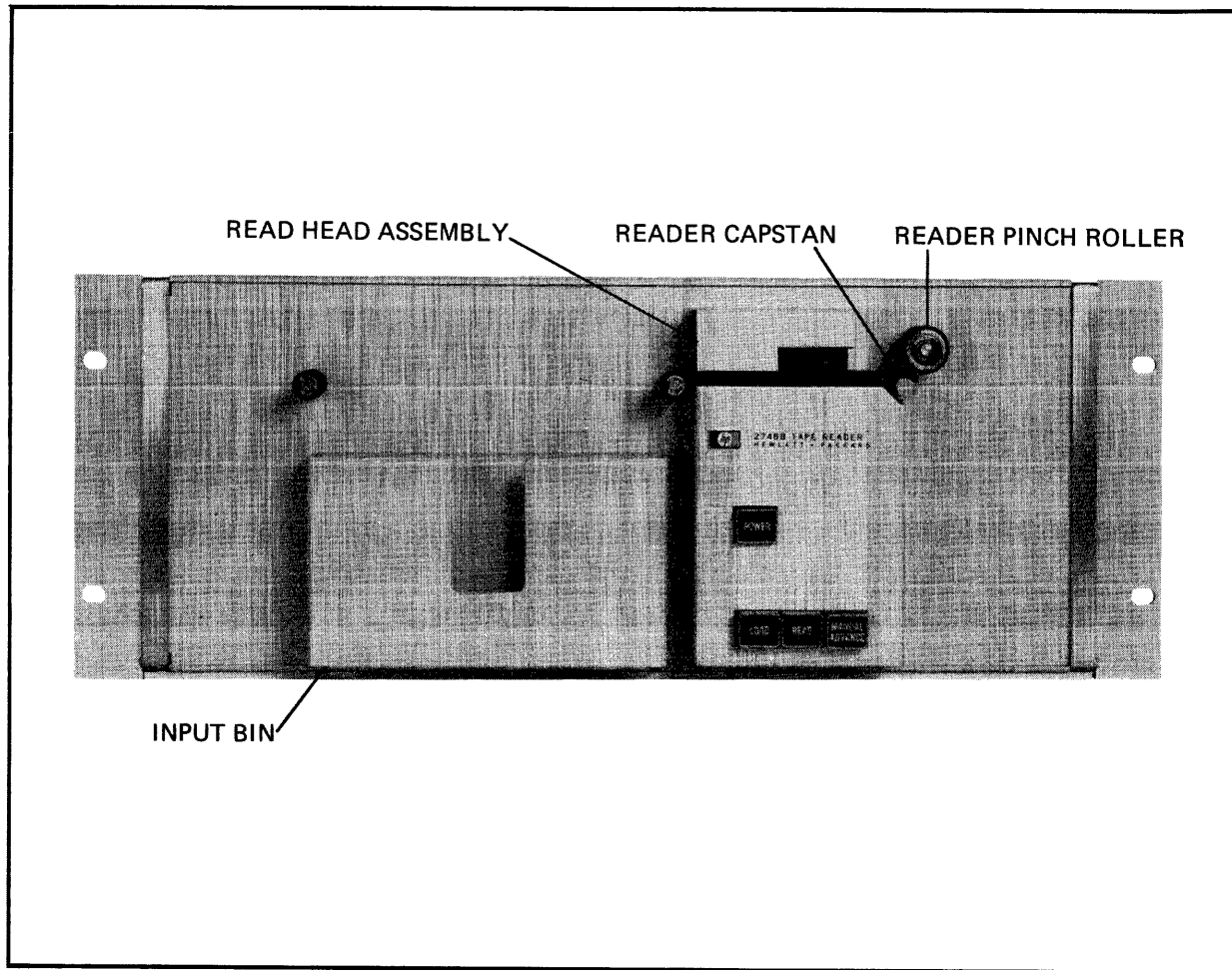


Figure 2748-1. Tape Reader Front Panel

## DIAGNOSTIC PROGRAMS

The On-Line HP 30104A Paper Tape Reader Diagnostic verifies the proper operation of the tape reader and the interface PCA. The operating instructions are described in the associated manual (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30104A Tape Reader Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation.

The add-on procedure comprises the following general steps:

1. Uncrating the shipment.

2. Installing the tape reader PCA.
3. Installing the rack mounting kit.
4. Installing the tape reader.
5. Connecting the cable between the tape reader PCA and the tape reader.
6. Performing the installation check-out procedure.

The HP 2748B Tape Reader is packed in a shipping crate. Remove the unit from the crate and remove any shipping materials from the tape reader. Retain all materials in case it becomes necessary to repack the tape reader for shipment in the future.

The tape reader PCA is already jumpered when shipped. Before installing it in the computer, consult the "Subsystem Configuration" form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The "Subsystem Configuration" form specifies the intended location of the tape reader PCA in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the tape reader PCA may require that other PCAs in the card cage be rearranged to make room for it. If that is the case, then the "Subsystem Configuration" form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the "Subsystem Configuration" form.

The intended location of the tape reader in the appropriate equipment bay is shown in the "HP 3000 Racking Diagram". Bolt the rack mounting kit to the tape reader and then mount the unit in the specified location in the equipment bay. Installation instructions are attached to the rack mounting kit.

Connect the interface cable to the tape reader and to the tape reader PCA. All cable connections are summarized on the "Cable Routing" form.

Perform the installation check-out procedure as described earlier under "Installation".

## **OPERATING PROCEDURES**

### **Loading Tape**

Before loading tape, turn on the tape reader power and press the LOAD switch to release the reader pinch roller.

Tape can be loaded in the tape reader in one of four ways, as shown in figure 2748-2. Make certain that as the tape moves from left to right, the characters on the tape approach the read head assembly in the original sequence punched, and the feed holes are nearer the front panel of the unit. Tape that is rolled can be loaded as shown in figure 2748-2A or 2748-2B, depending upon the location of the feed holes. Long, unrolled lengths of tape should be loaded as shown in figure 2748-2C. Continuous loops of tape should be loaded as shown in figure 2748-2D.

When threading tape through the read head assembly, hold the leader end of the tape between the thumb and forefinger of both hands as shown in figure 2748-3A. With the tape drawn tightly and at an angle to the read head assembly as shown in figure 2748-3B, begin sliding the tape into the slot in the read head. Hold the tape down against the read head surface and slide the tape from left to right and back into the slot in the read head assembly (figure 2748-3C). The tape should slip easily into the recessed tape guide slot and under the plastic-covered wire foot on the read head. The tape is shown in the final loaded position in figure 2748-3D.

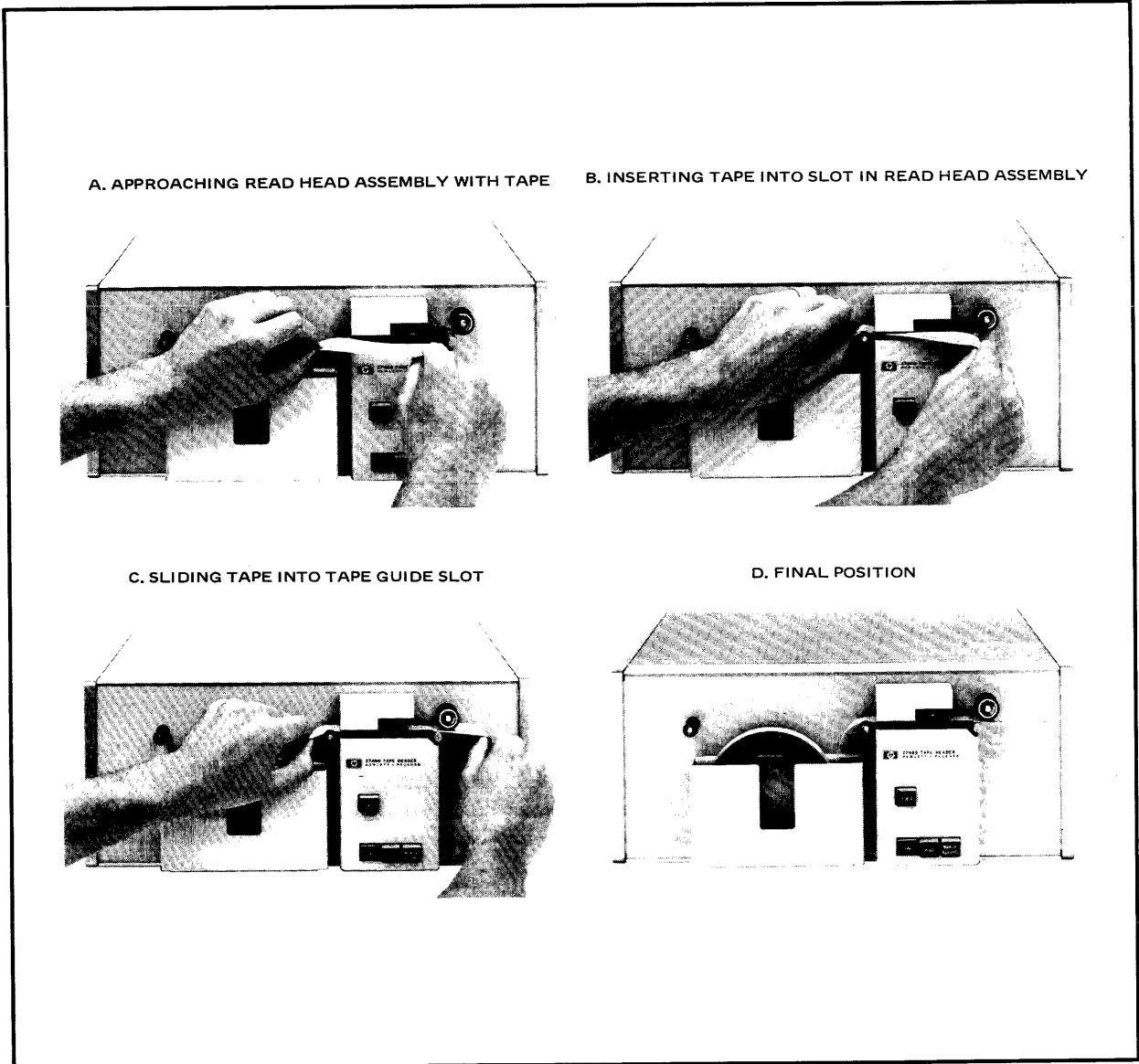


Figure 2748-2. Tape Loading Diagram

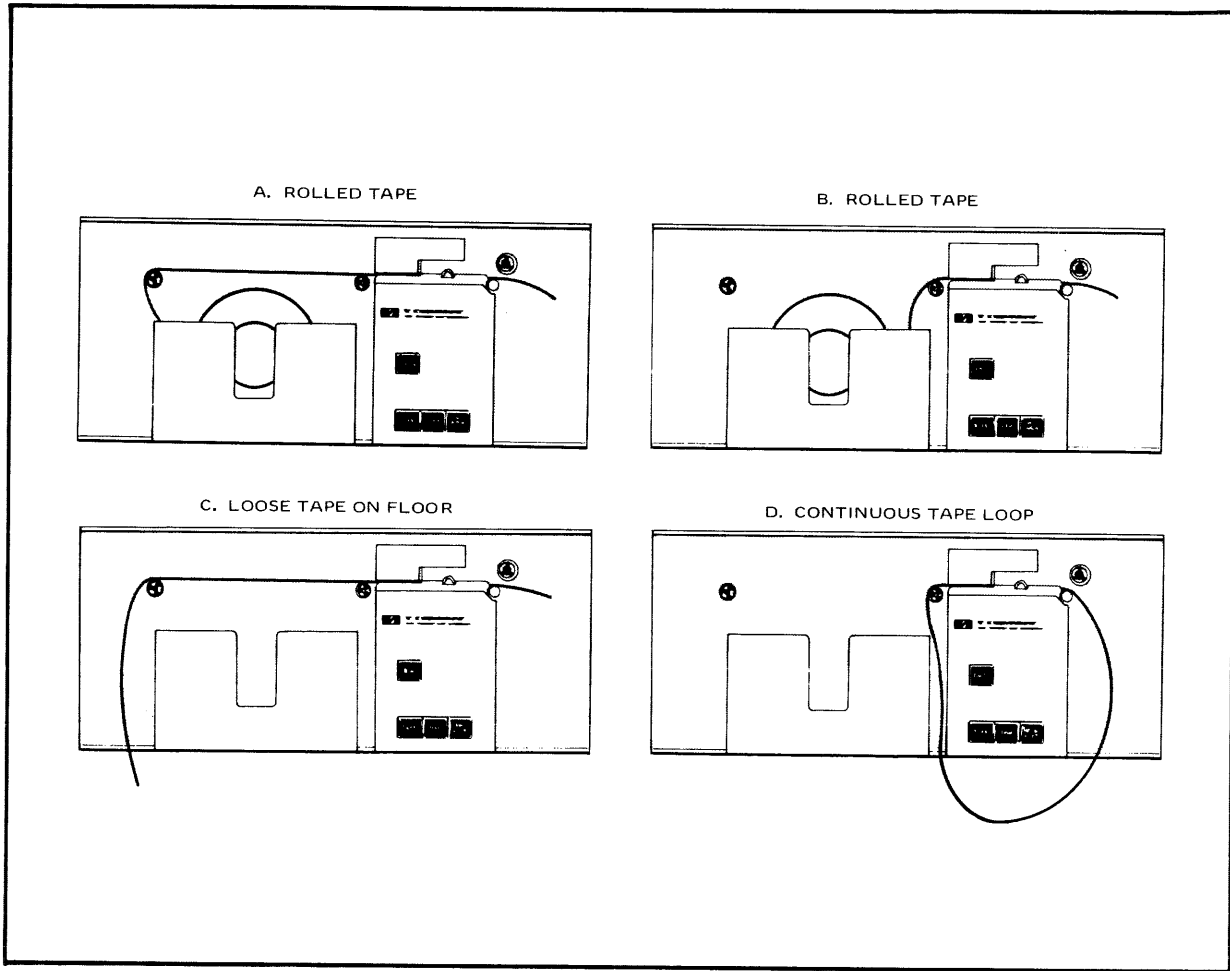


Figure 2748-3. Tape Threading Diagram



# HP 2895B TAPE PUNCH

## *(Subsystem HP 30105A)*

The HP 2895B Tape Punch is a rack-mounted output device which punches data onto paper tape at a speed of up to 75 characters-per-second.

### SUBSYSTEM INVENTORY

An HP 30105A Tape Punch Subsystem includes the following materials:

- One HP 2895B Tape Punch
- One HP 30205A Tape Punch Interface
- One *HP 2895B Tape Punch Operating and Service Manual*, part number 02895-90008
- One *HP 30105A Tape Punch Subsystem Maintenance Manual*, part number 30105-90001
- One Rack Mount Assembly, part number 02895-60003 (moss gray)
- One On-Line HP 30105A Paper Tape Punch Diagnostic, product number 32373A
- One *On-Line HP 30105A Paper Tape Punch Diagnostic* manual, part number 30105-90003

The HP 30205A Tape Punch Interface includes an HP 30050A Universal Interface (TTL) Printed-Circuit Assembly (PCA), part number 30050-60001, and an Interface Cable Assembly, part number 30205-60001. The interface cable connects the tape punch to the PCA.

### SPECIFICATIONS

The pertinent specifications for the HP 2895B Tape Punch are presented in table 2895-1.

**Table 2895-1. HP 2895B Specifications**

<b>Interface DC Power Requirements</b>	
+5	-5
4.0	0
+15	-15
0	0
+20	-20
0	0
<b>Tape Punch AC Power Requirements</b>	
Voltage:	120V
Current:	2.5A
Frequency:	60 Hz
	or
	230V
	1.6A
	50 Hz
<b>Heat Dissipation</b>	
Tape Punch:	683 BTU/hr; 171.43 cal, kg/hr
Interface:	68 BTU/hr; 17.07 cal, kg/hr
<b>Cable Lengths</b>	
Tape Punch Power Cord:	7 ft; 2.13 m
Interface Cable Assembly:	10 ft (standard); 3.048 m 25 ft (maximum); 7.62 m
<b>Net Weight (Unpacked):</b>	35 lb 15.87 kg
<b>Distributed Over:</b>	n.a. (rack-mounted)
<b>Dimensions</b>	
Depth:	21-3/16 in.; 53.8 cm
Width:	16-3/4 in.; 42.6 cm
Height:	10-1/2 in.; 26.7 cm
<b>Shipping Information</b>	
Number of Crates:	2
Size of Crates:	3.06 cu ft; .0876 cu m and 3.87 cu ft; .1096 cu m
Net Weight (Packed) of Crates:	38 lb; 17.23 kg and 22 lb; 9.98 kg

## INSTALLATION

The tape punch and interface PCA are already mounted in the appropriate equipment bay when the computer system is shipped. If they are housed in the same bay, then they are also already connected to one another. If they are in separate bays, then the interface cable is connected to the PCA and coiled inside the particular bay. In such a case, after the bays are fastened together the interface cable must be uncoiled and connected to the tape punch. When the cable has been connected to the tape punch, secure it by moving the slide lock on the cable end to the lock position. All cable connections are summarized on the "Cable Routing" form in section 1 of the *System Support Log* for the particular computer system.

Jumper and polling information for the tape punch PCA, as well as the location of the PCA in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

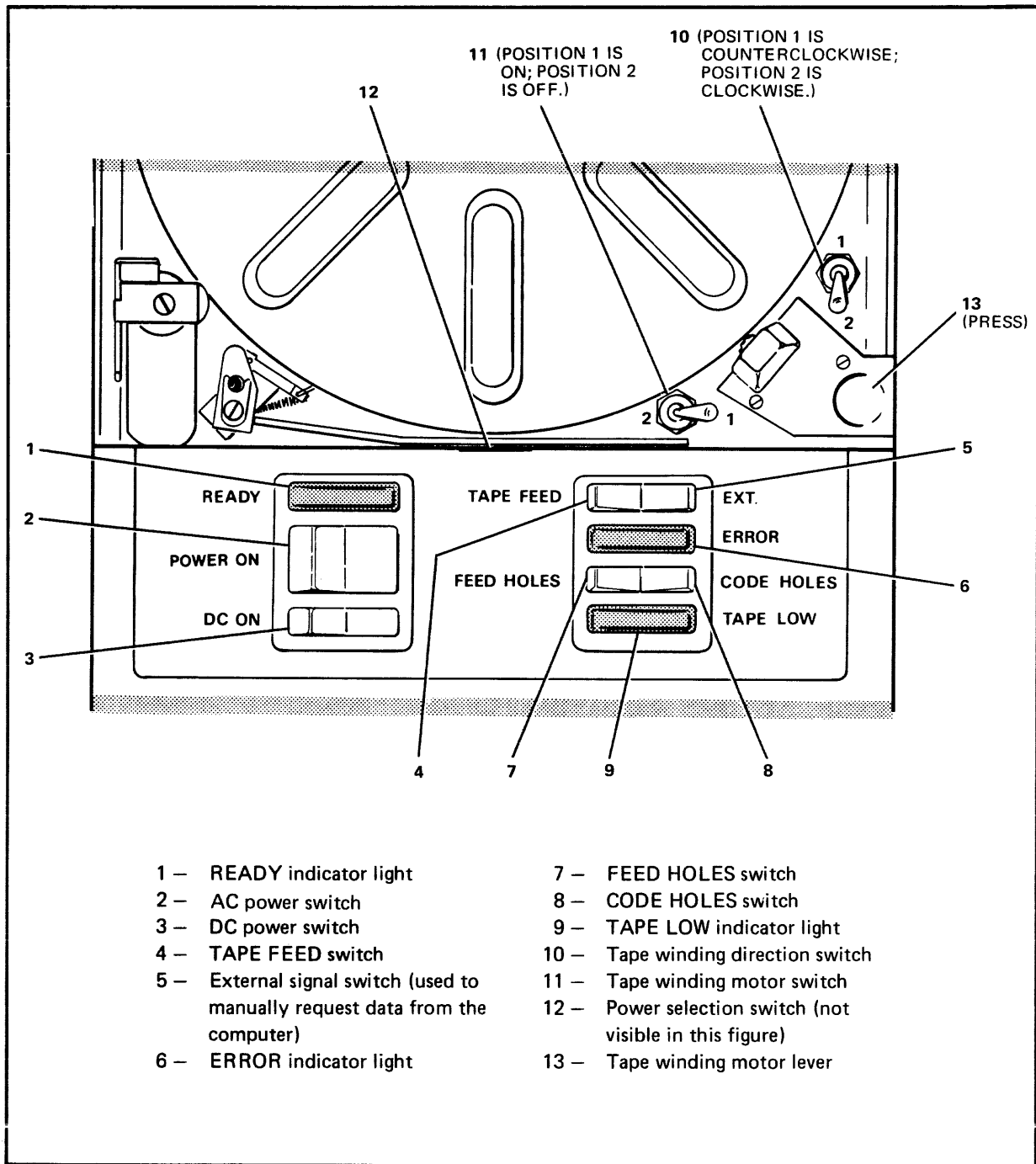
**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

The installation procedure for the HP 2895B is as follows:

- a. Roll the HP 2895B in and out of the equipment bay to ensure that the power and signal cables do not catch on the surrounding hardware.
- b. With the HP 2895B rolled out of the equipment bay, verify that the power selection switch located behind the control panel next to the take-up reel (12 in figure 2895-1) is set to the proper position.
- c. Install a roll of tape (this procedure is described under "Operating Procedures" below).

*Note: Refer to figure 2895-1 for the location of the switches and indicator lights discussed in steps d, e, f, and g. The numbers in parentheses are callouts in figure 2895-1.*

- d. Move the ac power switch (2) to the POWER ON position and the dc power switch (3) to the DC ON position. The power indicator light on the front panel and the READY indicator light (1) should illuminate.
- e. Verify the proper operation of the TAPE FEED (4), FEED HOLES (7), and CODE HOLES (8) switches as follows:
  - Press the TAPE FEED switch. The tape punch should feed tape from the supply reel onto the take-up reel without punching anything (including feed holes).



**Figure 2895-1. Operating Controls and Indicators (Top View of HP 2895B When Rolled Out of Equipment Bay)**

- Press the FEED HOLES switch. The tape punch should feed tape from the supply reel onto the take-up reel while punching feed holes in the tape.
  - Press the CODE HOLES switch. The tape punch should feed tape from the supply reel onto the take-up reel while punching every track (8-level code plus feed hole).
- f. Verify the proper operation of the tape winding direction switch (10) as follows:
- Set the tape winding direction switch to the 1 position.
  - Load the tape so that it winds counterclockwise onto the take-up reel.
  - Press the TAPE FEED switch. The tape should move from the supply reel, through the unit, and counterclockwise onto the take-up reel.
  - Release the TAPE FEED switch.
  - Set the tape winding direction switch to the 2 position.
  - Reload the tape so that it winds clockwise onto the take-up reel.
  - Press the TAPE FEED switch. The tape should move from the supply reel, through the unit, and clockwise onto the take-up reel.
- g. Verify that the TAPE LOW indicator light (9) is functioning properly by simulating a low tape condition (load a small amount of tape onto the supply reel, thread the tape through the unit and onto the take-up reel and then press and hold the TAPE FEED switch; the TAPE LOW light should illuminate before the tape runs off the supply reel).
- h. Install the chad box on the front of the unit.

## DIAGNOSTIC PROGRAMS

The On-Line HP 30105A Paper Tape Punch Diagnostic verifies the proper operation of the tape punch and the interface PCA. The operating instructions are described in the associated manual (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30105A Tape Punch Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation.

The add-on procedure comprises the following general steps:

1. Uncrating the shipment.

2. Installing the tape punch PCA.
3. Installing the rack mounting kit.
4. Installing the tape punch.
5. Connecting the cable between the tape punch PCA and the tape punch.
6. Performing the installation check-out procedure.

The HP 2895B Tape Punch is packed in a shipping crate. Remove the unit from the crate and remove any shipping materials from the tape punch. Retain all materials in case it becomes necessary to repack the tape punch for shipment in the future.

The tape punch PCA is already jumpered when shipped. Before installing it in the computer, consult the "Subsystem Configuration" form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The "Subsystem Configuration" form specifies the intended location of the tape punch PCA in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the tape punch PCA may require that other PCAs in the card cage be rearranged in order to make room for it. If that is the case, then the "Subsystem Configuration" form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the "Subsystem Configuration" form.

Assemble the slide mounting drawer as illustrated in figure 2895-2. The intended location of the tape punch in the appropriate equipment bay is shown on the "HP 3000 Racking Diagram". Install the brackets in the bay and then bolt the drawer to the brackets. Slide the drawer out until it is fully extended and then place the tape punch in the drawer such that the tape reel is at the back of the drawer.

Connect the interface cable to the tape punch and to the tape punch PCA. All cable connections are summarized on the "Cable Routing" form.

Perform the installation check-out procedure as described earlier under "Installation".

2895-7

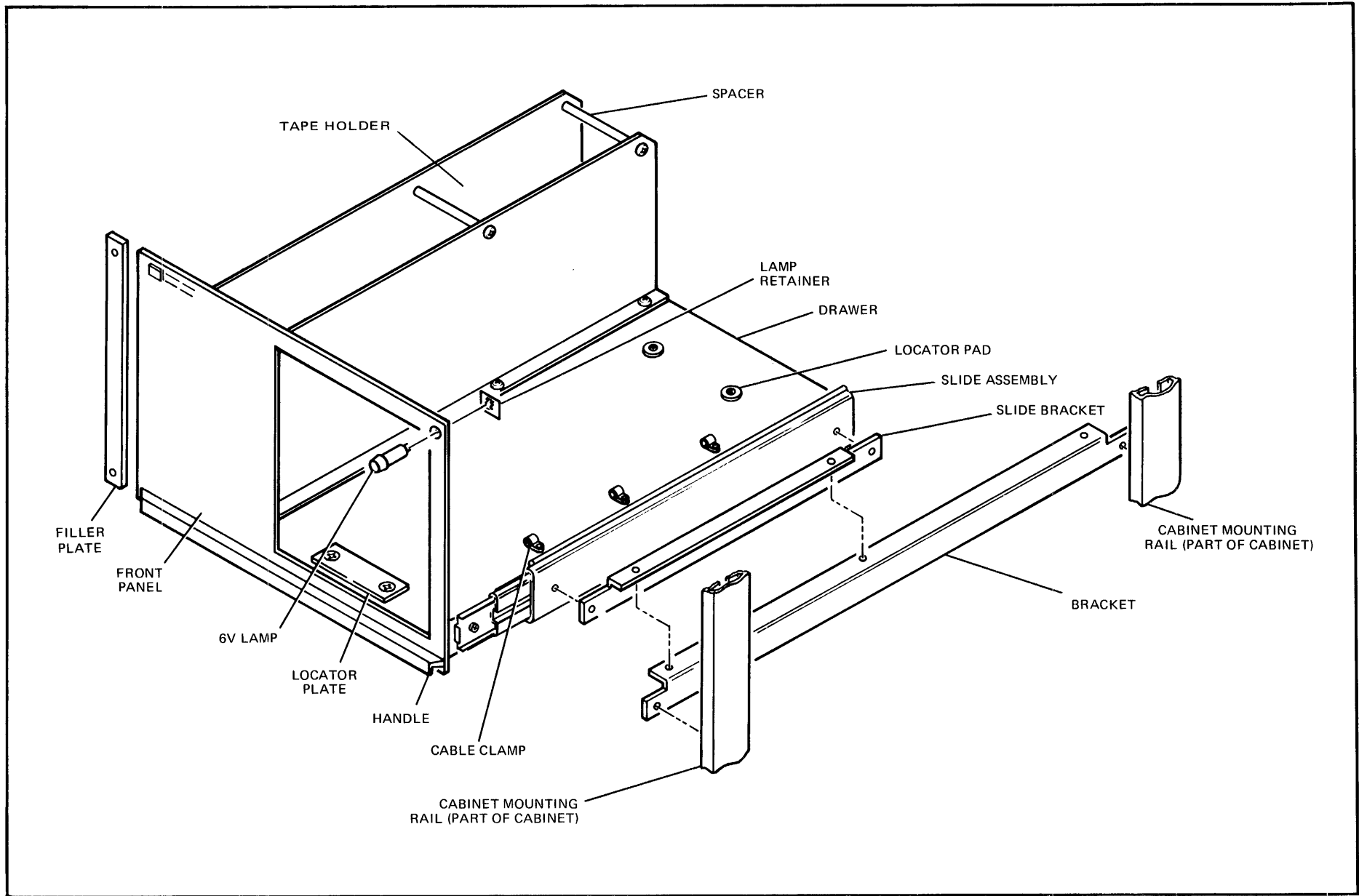


Figure 2895-2. Assembling and Installing the HP 2895B Tape Punch Slide Mounting Drawer

## OPERATING PROCEDURES

### Loading Tape

Refer to the numbered callouts in figure 2895-3 and perform the following steps:

- a. Pull the drawer-mounted HP 2895B out of the equipment bay.
- b. Press downward on the tape winding motor lever (10), release the bobbin on the take-up reel (figure 2895-3, insert A), and remove the take-up reel (7).
- c. Move the tape guide arm (4) to the left until it locks in place.
- d. Release the bobbin lock on the tape supply reel (3) as shown in insert A of figure 2895-3, and remove the empty cardboard bobbin of the previous roll of tape.

*Note: While performing the procedures in step e, be careful when placing a new roll of tape on the tape supply reel bobbin. If the rubber ring is dislodged (see insert C of figure 2895-3), the new roll of tape will not be properly secured to the tape supply reel.*

- e. Unroll approximately 6 feet (2 meters) of tape from the tape roll and place the roll on the tape supply reel so that the tape unrolls clockwise toward the right side of the tape punch. For Hewlett-Packard paper tape, part number 9280-0063, the printing along the edge of the tape will face toward the top of the unit.
- f. Lock the roll of tape in place by pressing downward on the outer edge of the bobbin lock as shown in insert B of figure 2895-3. The bobbin lock has several locking positions to accommodate different diameter bobbins.
- g. Thread the tape around the tape guides (6, 4, 5), then along the edge of the tape punch towards the front panel of the drawer. Insert the tape through the opening in the drawer front panel.
- h. Slide the tape into the front slot (12) of the unit.
- i. If the punched tape is not going to be taken up by the take-up reel, set the tape winding motor switch (11, figure 2895-1) to the off position and then proceed with step j. If the punched tape is to be taken up by the take-up reel, skip to step k.
- j. Press downward on the tape winding motor lever (10) and install the take-up reel (7) over the tape supply reel. Read the following caution and then skip to step o.

**Caution: Do not operate the tape punch without the take-up reel in place. The absence of the take-up reel may cause the spring-loaded winding motor to bind the tape supply reel. The take-up reel driver gear and the tape supply reel will be damaged if this caution is not heeded.**



- k. Set the tape winding motor switch (11, figure 2895-1) to the on position. Set the tape winding direction switch (9) to the desired position.

*Note: Hewlett-Packard recommends that the punched tape be taken up in the clockwise direction.*

- l. Press downward on the tape winding motor lever (10) and install the take-up reel (7) over the tape supply reel.
- m. Pass the loose end of the tape through the metal tape guide (13) and through the protruding loop controller (1).
- n. Wrap one complete loop of tape around the tape lifter (2) and wrap the tape onto the take-up reel in the direction specified by the tape winding direction switch (10, figure 2895-1).

*Note: Cardboard bobbins from empty rolls of tape can be used to collect tape on the take-up reel. In this manner, the bobbin lock on the take-up reel provides a convenient way to separate the punched tape from the take-up reel.*

- o. Move the ac power switch to the POWER ON position and the dc power switch to the DC ON position. The POWER indicator light on the front panel, the READY light on the control panel, and the ERROR light on the control panel should all illuminate.
- p. Unlock the tape guide arm (4) by physically moving it to the right, away from the retaining magnet. The loop controller (1) will retract and not protrude from the side of the tape punch when the tape guide arm (4) is unlocked.
- q. Move the tape guide arm (4) to the right until the ERROR indicator light goes out. Then press the TAPE FEED switch to take up the slack in the tape. When the slack is taken out of the tape path, the tape pressure should hold the tape guide arm in position so that the ERROR indicator light remains dark. Release the TAPE FEED switch.

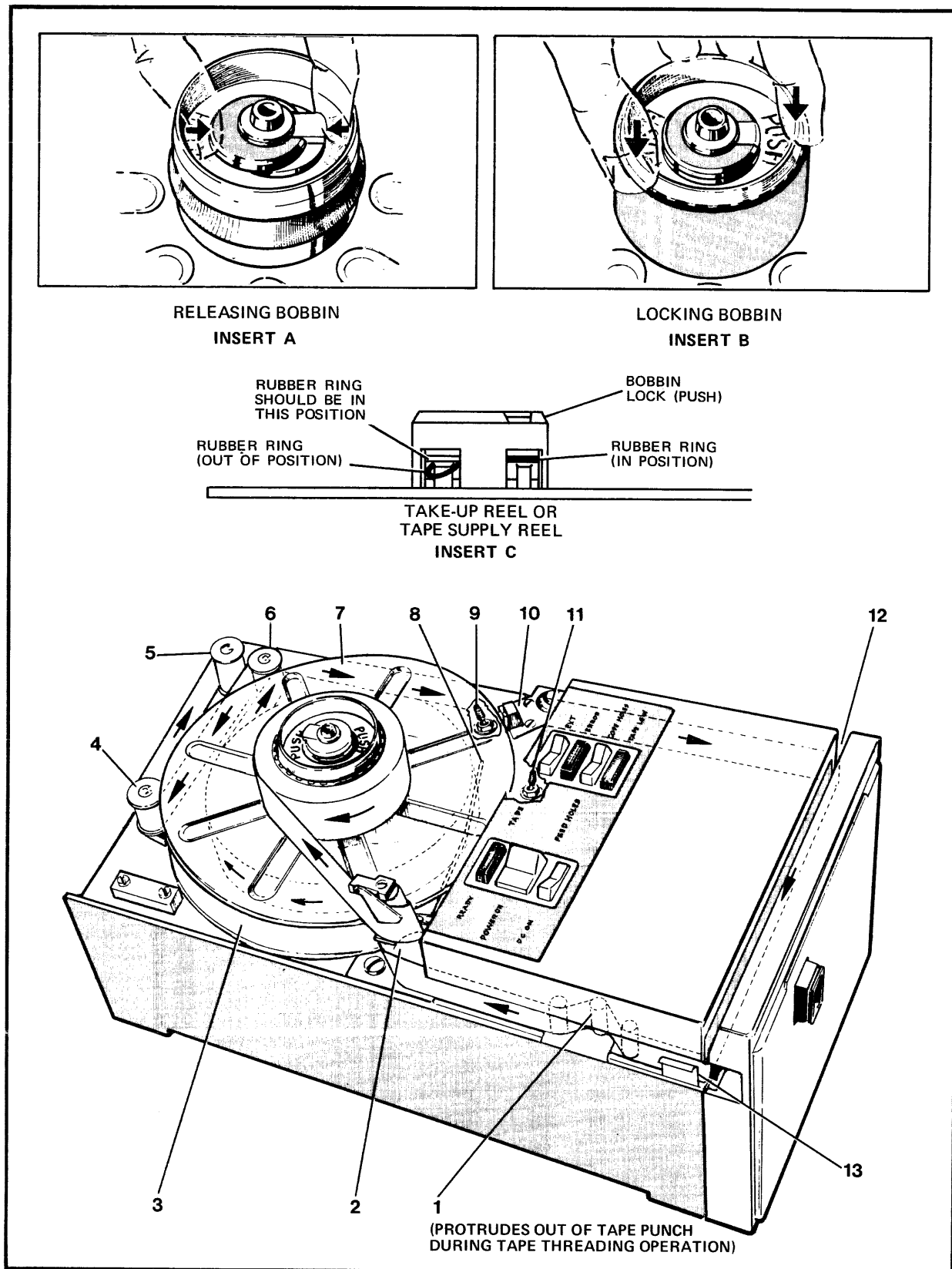


Figure 2895-3. Loading and Threading Tape

# HP 2893A CARD READER

## *(Subsystem HP 30106A)*

The HP 2893A Card Reader is a free-standing input device which reads data from standard 80-column, 12-row tab cards at a speed of 600 cards-per-minute. There are two models: the 2893A and the 2893A-015. The 2893A is designed to operate from 120 volt, 60 hertz power and the 2893A-015 is designed to operate from 230 volt, 50 hertz power.

### SUBSYSTEM INVENTORY

The HP 30106A Card Reader Subsystem (see figure 2893-1) includes the following materials:

- One HP 2893A or 2893A-015 Card Reader
- One HP 30206A Card Reader Interface
- One *HP 30106A Card Reader Subsystem Maintenance Manual*, part number 30106-90001
- One *HP 2892A and 2893A Card Readers Operating and Service Manual*, part number 02892-90001
- One On-Line HP 30106A/30107A Card Reader Test, product number 32365A
- One *On-Line HP 30106A/30107A Card Reader Test* manual, part number 30106-90003

The HP 30206A Card Reader Interface consists of a Card Reader Interface Printed-Circuit Assembly (PCA), part number 30206-60001, an Interface Cable Assembly, part number 30206-60002, and a deck of test cards, part number 30206-60006.

### SPECIFICATIONS

The pertinent specifications for the HP 2893A Card Reader are presented in table 2893-1.

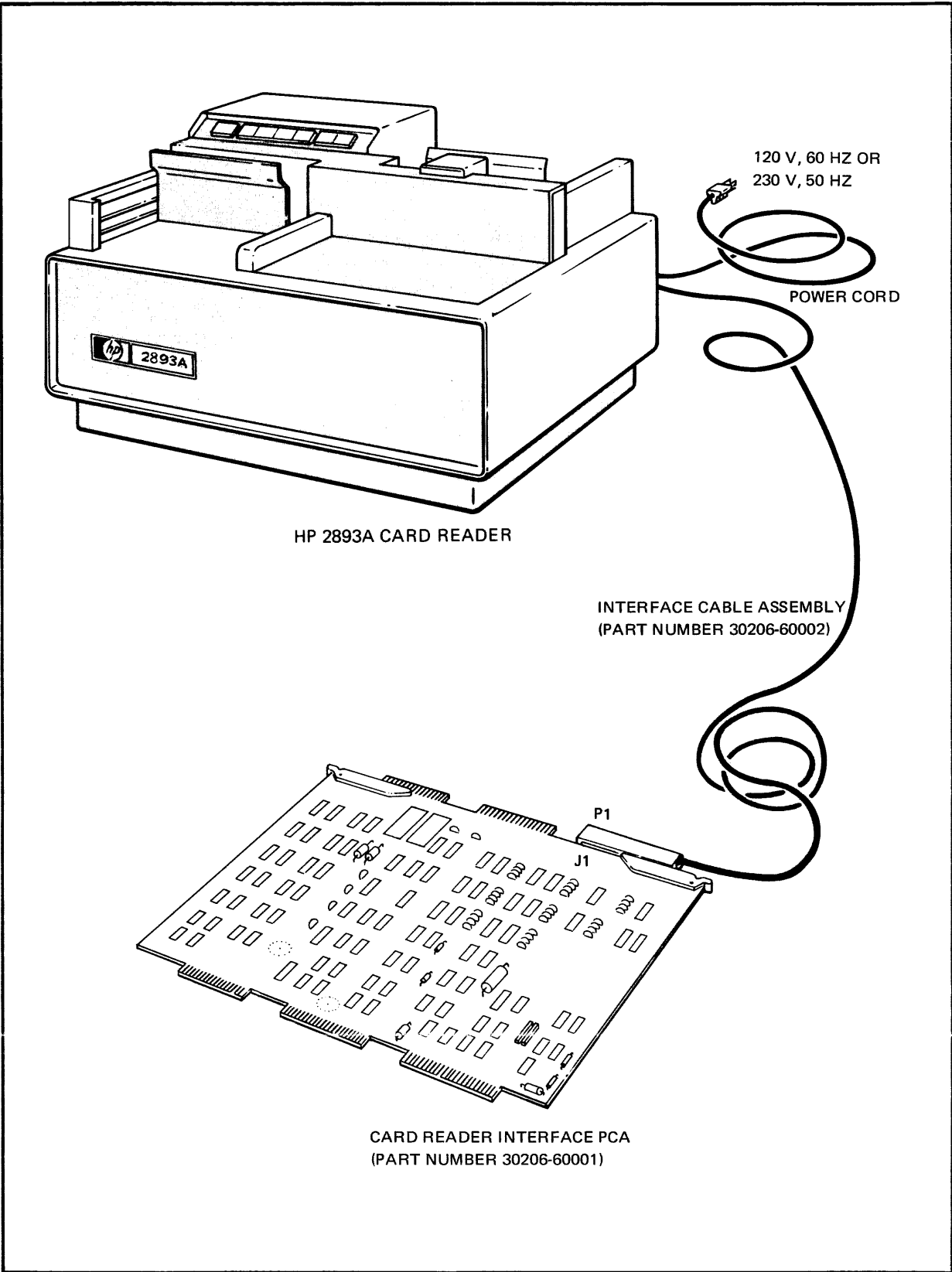


Figure 2893-1. HP 30106A Card Reader Subsystem

**Table 2893-1. HP 2893A Specifications**

<b>Interface DC Power Requirements</b>	
+5	-5
3.3	0
+15	-15
.01	.006
+20	-20
0	0
<b>Card Reader AC Power Requirements</b>	
Voltage:	120V
Current:	5A
Frequency:	60 Hz
or	230V
	2.5A
	50 Hz
<b>Heat Dissipation</b>	
Card Reader:	2000 BTU/hr; 502 cal, kg/hr
Interface:	57 BTU/hr; 14.307 cal, kg/hr
<b>Cable Lengths</b>	
Card Reader Power Cord:	6 ft; 1.829 m
Interface Cable Assembly:	25 ft (standard); 7.62 m 100 ft (maximum); 30.48 m
<b>Net Weight (Unpacked):</b>	76 lb 34.47 kg
<b>Distributed Over:</b>	3.1 sq in. 20 sq cm
<b>Dimensions</b>	
Depth:	18 in.; 45.7 cm
Width:	23 in.; 58.4 cm
Height:	16 in.; 40.6 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	13.2 cu ft; .3738 cu m
Net Weight (Packed) of Crates:	88 lb (118 lb for export) 39.9 kg (53.5 kg for export)

## INSTALLATION

The card reader interface PCA is already installed in the appropriate card cage and equipment bay when the computer system is shipped and the interface cable is connected to the PCA and coiled inside the bay. The card reader and its power cord are shipped in a separate container.

The HP 2893A Card Reader and its power cord are packed in a shipping crate. Remove the unit from the crate and remove any shipping materials from the card reader. There are two shipping screws on the bottom of the card reader which must be removed. The screws are easily discernible because they secure a cardboard sign to the bottom of the unit (the sign merely instructs the Customer Engineer to remove the screws). Retain all materials in case it becomes necessary to repack the card reader for shipment in the future.

Jumper and polling information for the card reader PCA, as well as the location of the PCA in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

After uncrating the card reader, uncoil the interface cable and connect the loose end to the 50-pin connector on the card reader. The 50-pin connector is located in the center of the backside of the card reader near the lower edge. The cable connections are summarized on the "Cable Routing" form.

After connecting the card reader to the PCA, perform the following installation check-out procedure.

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

- a. Connect the female end of the power cord to the primary power connector on the card reader. The primary power connector is located near the lower right corner of the backside of the card reader. Then connect the male end of the power cord to an appropriate ac electrical outlet.
- b. Move the ac power circuit breaker on the rear base panel of the unit to the ON position.
- c. Move the ONLINE/OFFLINE switch on the rear panel of the unit to the OFFLINE position.
- d. Move the SHUTDOWN switch on the rear panel of the unit to the AUTO position.
- e. Press the POWER switch on the front control panel of the unit. The POWER switch should illuminate (note that the blower will *not* come on at this time).
- f. Press and hold the LAMP TEST switch on the rear panel of the unit. All the front control panel indicator lights (except the EOF light) should be illuminated as long as the switch is depressed. Release the LAMP TEST switch.

- g. Press the EOF switch on the front control panel. The switch should illuminate.
- h. Load approximately three inches of unpunched cards into the input hopper (this procedure is described under "Operating Procedures" below).
- i. Press the RESET switch on the front control panel of the unit. The blower should come on and, after a short delay (approximately 3 seconds), the cards should be picked, passed through the reader mechanism, and then stacked in the output stacker. After all the cards have passed from the input hopper to the stacker, the blower should turn off.
- j. Press the POWER switch on the front control panel of the unit. Remove the cards from the output stacker (this procedure is described under "Operating Procedures" below).

## DIAGNOSTIC PROGRAMS

The On-Line HP 30106A/30107A Card Reader Test verifies the proper operation of the card reader. The operating instructions for the diagnostic program are described in the associated manual (refer to "Subsystem Inventory").

## ADD-ON INSTALLATION

An add-on shipment of an HP 30106A Card Reader Subsystem includes all the materials listed earlier under "Subsystem Inventory" plus copies of those *System Support Log* forms which pertain to the add-on installation.

The add-on procedure comprises the following general steps:

1. Uncrating the shipment.
2. Installing the card reader PCA.
3. Connecting the interface cable to the card reader and to the card reader PCA.
4. Performing the installation check-out procedure for the card reader.

The uncrating procedure for the card reader is described earlier under "Installation".

The card reader PCA is already jumpered when shipped. Before installing it in the computer, consult the "Subsystem Configuration" form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The "Subsystem Configuration" form specifies the intended location of the card reader PCA in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the card reader PCA may require that other PCAs in the card cage be rearranged to make room for it. If that is the case, then the "Subsystem Configuration" form also specifies the new location

of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the "Subsystem Configuration" form.

Uncoil the interface cable assembly and connect the hooded end (P1) to the card reader PCA as illustrated in figure 2893-1. Then connect the other end of the cable (P2) to the 50-pin connector on the card reader. The 50-pin connector is located in the center of the backside of the card reader near the lower edge. The cable connections are summarized on the "Cable Routing" form.

Perform the installation check-out procedure for the card reader as described earlier under "Installation".

## OPERATING PROCEDURES

*Note: The input hopper and the output stacker are both located on the top of the HP 2893A. As the operator faces the front of the card reader, the input hopper is on the right nearer the back of the unit and the output stacker is on the left nearer the front.*

### Loading the Input Hopper

Pull the hopper follower back with one hand and insert cards into the input hopper (face forward) with the other hand. The first card to be read must be at the front of the hopper with a 9-edge down and column 1 at the left. Continue placing cards in the input hopper until it is loosely filled (approximately 1000 cards).

**Caution: Do not pack the input hopper so full that the riffle action at the air riffle cap at the front edge of the hopper is inhibited.**

The hopper may be loaded while cards are being read if the operator is careful to keep tension on the front portion of the deck while loading additional cards at the rear. This is best accomplished when the input hopper is one-third to one-half full. Use just enough pressure to maintain the riffle action.

### Removing Cards From the Input Hopper

Normally, all cards loaded into the input hopper are processed through the card reader. However, if it is necessary to remove cards from the hopper, merely pull the hopper follower back and remove the cards. If the cards are arranged in a particular order, exercise care in repacking them in their storage container so that the order is maintained.



### **Removing Cards From the Output Stacker**

Pull the stacker plate forward with one hand and remove the front portion of the card deck from the stacker with the other hand. Be careful to maintain the proper deck order. When unloading cards from the stacker while the card reader is reading cards, be careful not to interfere with the cards which are in the process of being deposited in the stacker and return the stacker plate to its normal position gradually.

### **SHUTDOWN Switch**

The SHUTDOWN switch on the rear panel of the unit selects the mode of operation, MANUAL or AUTO. In the MANUAL mode, the vacuum/blower motor and the drive motor run continuously whenever the card reader power is on. In the AUTO mode (the normal operating mode), the vacuum/blower motor and the drive motor turn off after the last card has been picked from the input hopper.

# HP 2610A LINE PRINTER

## *(Subsystems HP 30108A and 30108A-001)*

There are two models of the HP 2610A Line Printer: a 200 line-per-minute (lpm), 64-character model and a 150 lpm, 96-character model. Both models are available for either 120V, 60 hertz or 230V, 50 hertz power.

### SUBSYSTEM INVENTORY

An HP 30108A Line Printer Subsystem (see figure 2610-1) includes the following materials:

- One 64-character HP 2610A Line Printer
- One HP 30209A Line Printer Interface Kit
- One *HP 30108A Line Printer Subsystem Maintenance Manual*, part number 30108-90001
- One *HP 2610A Line Printer Reference Manual*, part number 02610-90005
- One *HP 2610A Line Printer Field Service Manual*, part number 02610-90001
- One *HP 2610A Line Printer Parts Identification Manual*, part number 02610-90006
- One On-Line HP 2610A/2614A Line Printer Diagnostic, product number 32366A
- One *On-Line 2610A/2614A Line Printer Diagnostic manual*, part number 03000-90030

The HP 30209A Line Printer Interface Kit consists of an Interface Cable Assembly, part number 30209-60002, and a Universal Interface (Differential) printed-circuit assembly (PCA), part number 30051-60001.

The HP 30108A-001 Line Printer Subsystem includes all of the above materials except that a 96-character line printer is delivered instead of the 64-character model and a different reference manual (part number 02610-90014), field service manual (part number 02610-90012), and parts identification manual (part number 02610-90016) are delivered.

### SPECIFICATIONS

The pertinent specifications for the HP 2610A Line Printer are presented in table 2610-1.

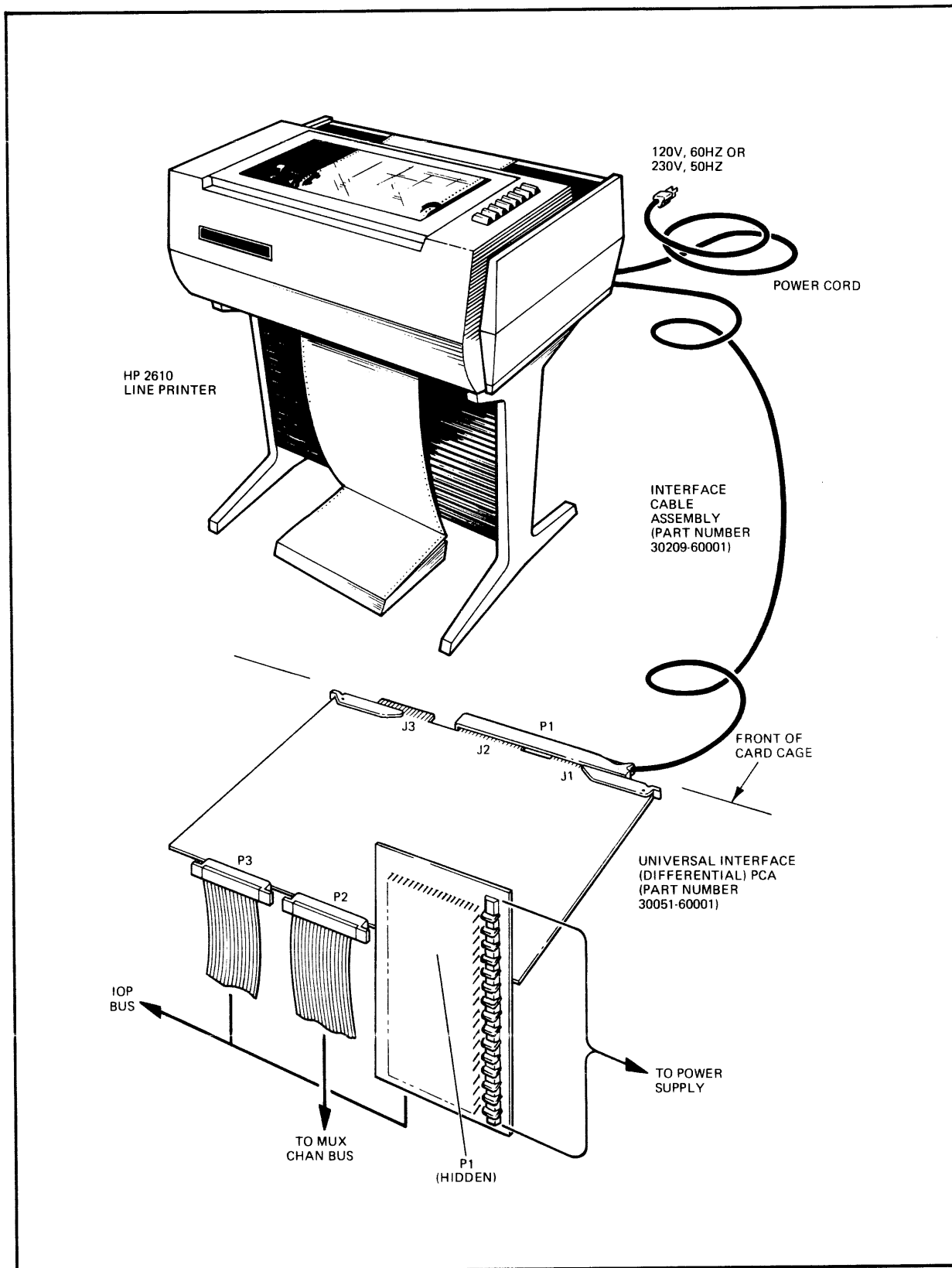


Figure 2610-1. HP 30104A Line Printer Subsystem

**Table 2610-1. HP 2610A Specifications**

<b>Interface DC Power Requirements</b>							
+5	-5						
4.4	0						
+15	-15						
0	0						
+20	-20						
0	0						
<b>Line Printer AC Power Requirements</b>							
Voltage:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="text-align: center;">120V</td> <td style="text-align: center;">230V</td> </tr> <tr> <td style="text-align: center;">7.5A</td> <td style="text-align: center;">4A</td> </tr> <tr> <td style="text-align: center;">60 Hz</td> <td style="text-align: center;">50 Hz</td> </tr> </table>	120V	230V	7.5A	4A	60 Hz	50 Hz
120V	230V						
7.5A	4A						
60 Hz	50 Hz						
Current:	or						
Frequency:	60 Hz						
<b>Heat Dissipation</b>							
Line Printer:	3070 BTU/hr; 770.57 cal, kg/hr						
Interface:	75 BTU/hr; 18.825 cal, kg/hr						
<b>Cable Lengths</b>							
Line Printer Power Cord:	15 ft; 4.57 m						
Interface Cable Assembly:	50 ft (standard); 15.24 m 500 ft (maximum); 152.4 m						
<b>Net Weight (Unpacked):</b>	500 lb 226.76 kg						
<b>Distributed Over:</b>	5.8 sq in. 37.4 sq cm						
<b>Dimensions</b>							
Depth:	25.5 in.; 64.8 cm						
Width:	37 in.; 94 cm						
Height:	41 in.; 104.2 cm						
<b>Shipping Information</b>							
Number of Crates:	1						
Size of Crates:	38 cu ft; 1.076 cu m						
Net Weight (Packed) of Crates:	550 lb; 249.43 kg						

## INSTALLATION

The line printer interface PCA is already installed in the appropriate card cage and equipment bay when the computer system is shipped and the interface cable is connected to the PCA and coiled inside the bay.

The HP 2610A Line Printer is strapped to a shipping pallet. Cut the straps, remove the unit from the pallet, and then remove any shipping materials from the line printer. Retain all materials in case it becomes necessary to repack the line printer for shipment in the future.

Jumper and polling information for the line printer PCA, as well as the location of the PCA in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

After unpacking the line printer, uncoil the interface cable, pull off the back panel of the line printer, and connect the loose end of the cable to the 50-pin female connector (labeled 4J109) inside the line printer. As you face the back of the line printer, the 50-pin female connector is located at the upper right corner of the logic chassis card cage. The interface cable should enter the back of the line printer along side the power cord and should be secured in place using the plastic cable clamp located just above the power cord. The cable connections are summarized on the "Cable Routing" form.

After the line printer is connected to the interface PCA, perform the following installation check-out procedure.

1. Before applying ac power to the line printer, check the vertical advance clutch and brake. The clutch and brake are two separate magnetic particle clutches. During shipping, the magnetic particles settle and can pack solid, in which case the particular clutch assembly must be loosened up.

Level the line printer using the procedure described in section 1 of the appropriate line printer field service manual.

Open the left side cover and remove the back cover. Then open the format reader to protect the channel brushes. To check the brake, try to turn the vertical forms knob counterclockwise without pulling the knob out. If the brake is frozen, the knob will not turn; if the brake is free, the knob will turn. If the brake is frozen, try rocking the knob while tapping the casting at point "A" in figure 2610-2 with a plastic mallet until the knob turns freely. To check the clutch, try to turn the flywheel. If the clutch is frozen, the flywheel will not turn; if the clutch is free, the flywheel will turn. If the clutch is frozen, try rocking the flywheel while tapping the casting at point "A" in figure 2610-2 with a plastic mallet until the flywheel turns freely.

2. Install a ribbon (this procedure is described under "Operating Procedures" below).
3. Install a format tape (this procedure is described under "Operating Procedures" below).
4. Install fan-folded forms (this procedure is described under "Operating Procedures" below).

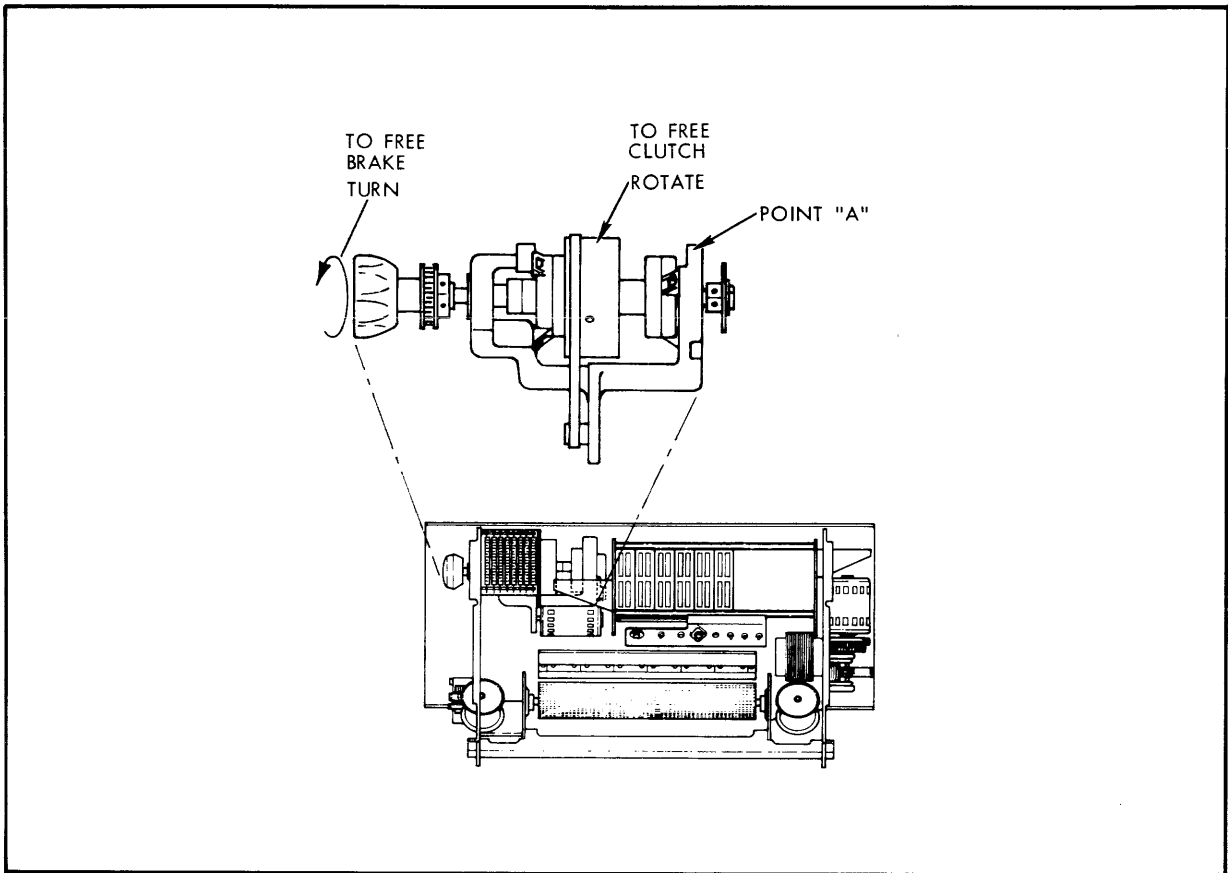


Figure 2610-2. Freeing the Magnetic Particle Brake and Clutch Assemblies

5. Open the print drum gate.

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

6. One end of the power cord is hard-wired to the line printer. Connect the loose end to an appropriate ac electrical outlet and then turn on the line printer. The ribbon should remain slack, the forms should *not* move horizontally or vertically, and no hammers should fire.
7. Close the print drum gate. As soon as the gate is closed, ribbon tension should automatically be applied.
8. Press the PAGE EJECT switch on the line printer control panel. The forms should advance to the top of a new page.

9. Simulate the various line printer fault conditions, as follows:
  - a. Run the printer out of forms. Printing should stop when the “out of forms” condition is sensed.
  - b. Tear the forms just below each pinwheel, first on the left side and then on the right side. Printing should stop whenever torn forms are sensed.
  - c. Open the cover of the format tape reader. Printing should stop immediately.
  - d. Operate the print drum gate latch, as if to open the gate. Printing should stop immediately.
  - e. Jumper a hammer driver fuse to the fuse alarm buss to simulate a blown fuse. Printing should stop immediately.

## DIAGNOSTIC PROGRAMS

The On-Line HP 2610A/2614A Line Printer Diagnostic verifies the proper operation of the line printer and the interface PCA. The operating instructions are described in the associated manual (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30108A or 30108A-001 Line Printer Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation.

The add-on procedure comprises the following general steps:

1. Unpacking the line printer.
2. Installing the interface PCA.
3. Connecting the interface cable to the line printer and to the interface PCA.
4. Performing the installation check-out procedure for the line printer.

The unpacking procedure for the HP 2610A Line Printer is described earlier under “Installation”.

The interface PCA is already jumpered when shipped. Before installing it in the computer, use the “Subsystem Configuration” form to verify that the jumpering was done correctly.

The input/output device interface PCAs are usually housed in a card cage in the top of bay #2. The “Subsystem Configuration” form specifies the intended location of the line printer in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the line printer PCA may require that other PCAs in the card cage be rearranged to make room for it. If this

is the case, then the "Subsystem Configuration" form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the "Subsystem Configuration" form.

Connect the P1 end of the interface cable to the line printer interface PCA as illustrated in figure 2610-1 and then connect the P2 end of the cable to the line printer as described under "Installation". The cable connections are summarized on the "Cable Routing" form.

## **OPERATING PROCEDURES**

### **Adjusting the Phasing Control**

The phasing control is the rotating control at the top of the line printer control panel. Phasing adjustment is normally required only when changing between single-part and multiple-part forms. This control compensates for the thickness of the forms being used. Incorrect phasing is indicated by the loss of the tops or bottoms of the characters across a line. The phasing can best be adjusted by printing the character "E" in all columns and moving the phasing control until the best quality printing is obtained (see figure 2610-3). The print quality on multiple part forms is best observed on the bottom form.

### **Vertical Forms Control**

This is a manual control which is used to advance the forms up or down. The vertical forms control is normally used when setting up the forms before starting to print. The control is located inside the left cover, and is operated by pulling the knob out and rotating it in the required direction (see figure 2610-4).

### **Forms Installation and Set-Up**

Use the following procedure (refer to table 2610-2 for the acceptable form dimensions).

- a. Place the fan-folded forms below the front of the printer.
- b. Turn on the printer.
- c. Press the PAGE EJECT switch on the line printer control panel. This should set the vertical shift mechanism at the "top of form" position and the horizontal shift mechanism at the "home" position.



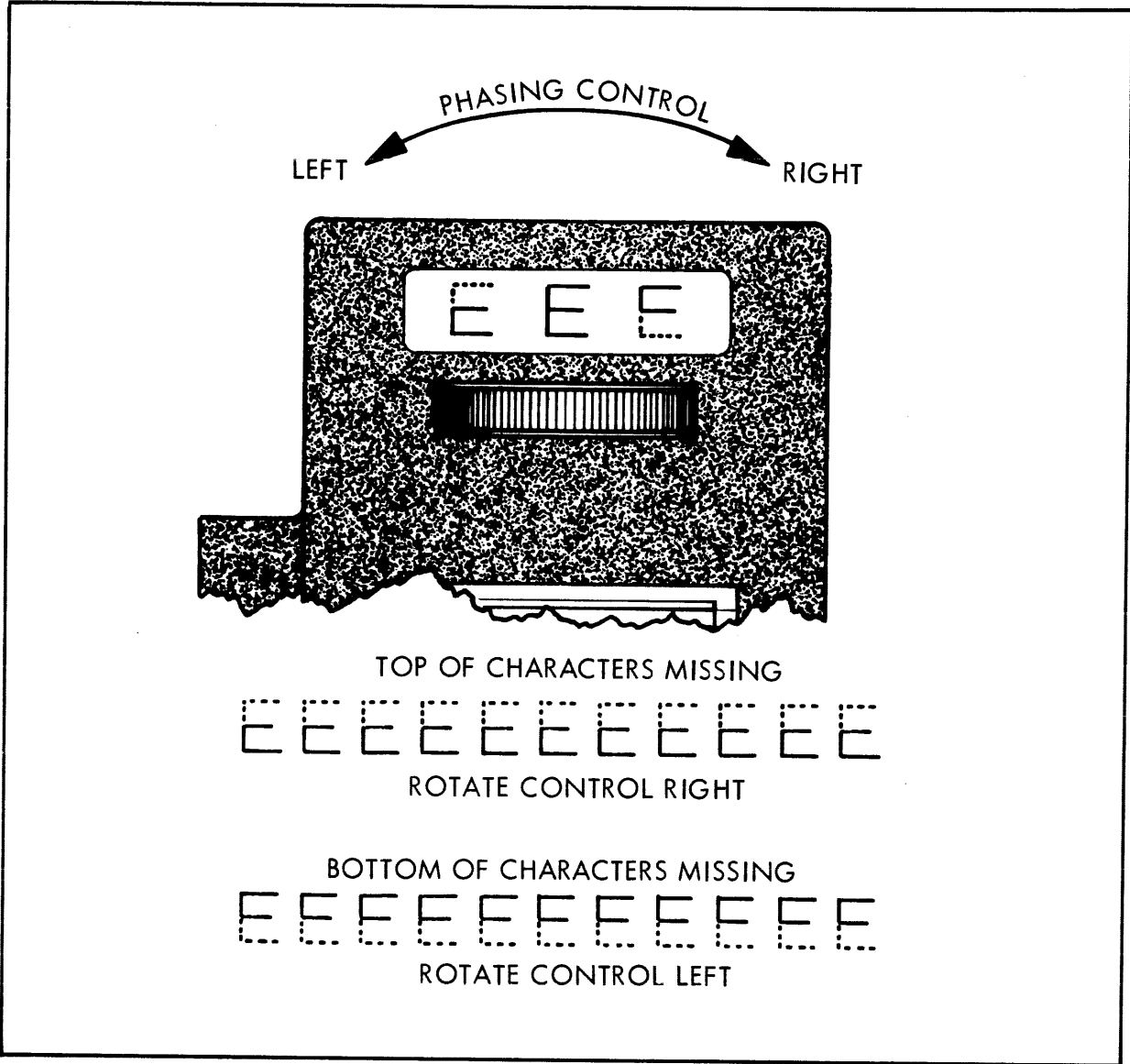
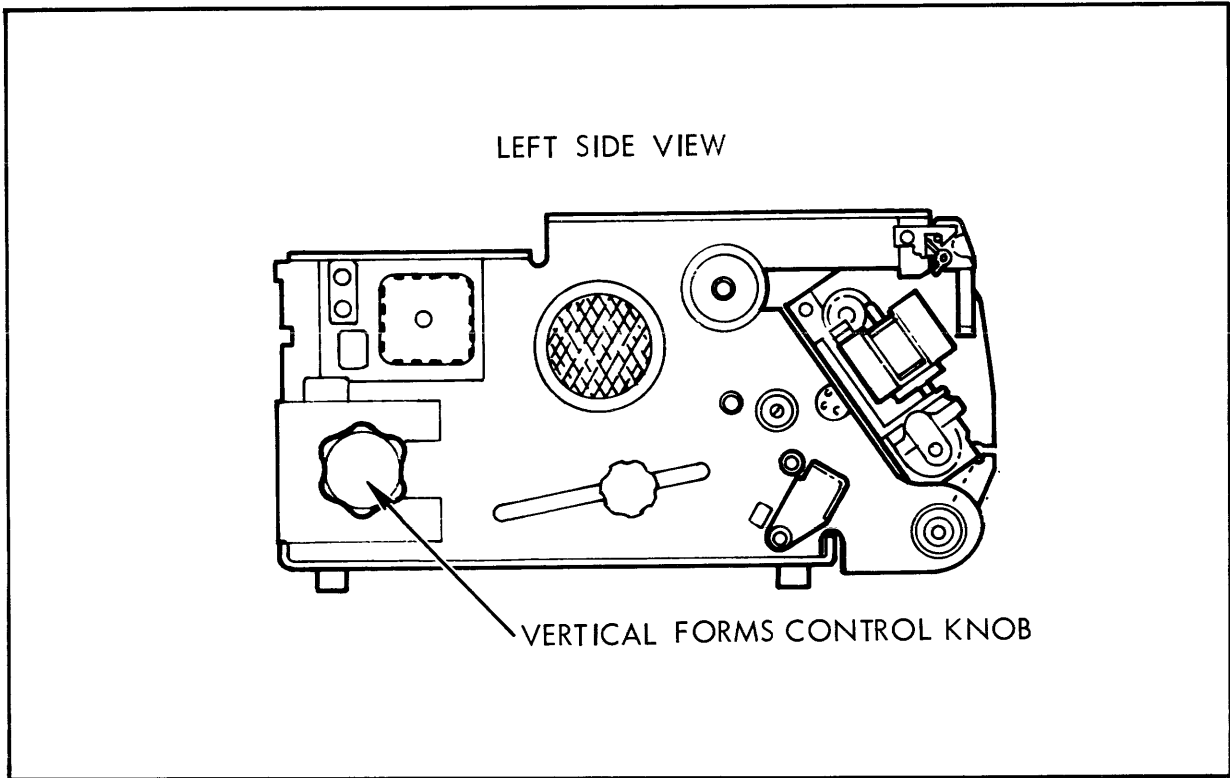


Figure 2610-3. Phasing Adjustment



**Figure 2610-4. Manual Vertical Forms Control**

**Table 2610-2. Form Dimensions**

<b>Form Feed Holes:</b>	All forms used must have round holes punched along both margins $0.25 \pm 0.01$ inches from the paper edge to the hole centerlines. The distance between hole centerlines must be $0.50 \pm 0.01$ inches non-accumulative. The hole diameter shall be $.155 \pm .005$ inches.
<b>Width:</b>	4.0 to 20.5 inches overall.
<b>Length:</b>	Any length continuous form (up to 22 inches under format control) except limited to 11 inches in the paper stacker.
<b>Thickness:</b>	Recommended paper single-part between 15 lbs and 25 lbs (per 1000). Multi-part form maximum of original plus 5 copies at a maximum weight of 15 lbs for the 1st form and 12 lbs for the rest. The maximum multiple part forms thickness is .025 inches.

- d. Raise the top cover window and open the print drum gate. Pass the forms up through the bottom slot and then between the print drum gate and the print mechanism (see figure 2610-5).
- e. Open the pin wheel flaps. Pass the forms over the pinwheels and out of the slot below the hinge of the window (see figure 2610-5).
- f. Refer to figure 2610-6. Install the forms between the two pinwheel drive sprockets and close the flaps.

**Caution:** Be careful to avoid the small pins mounted between the pinwheel cogs.

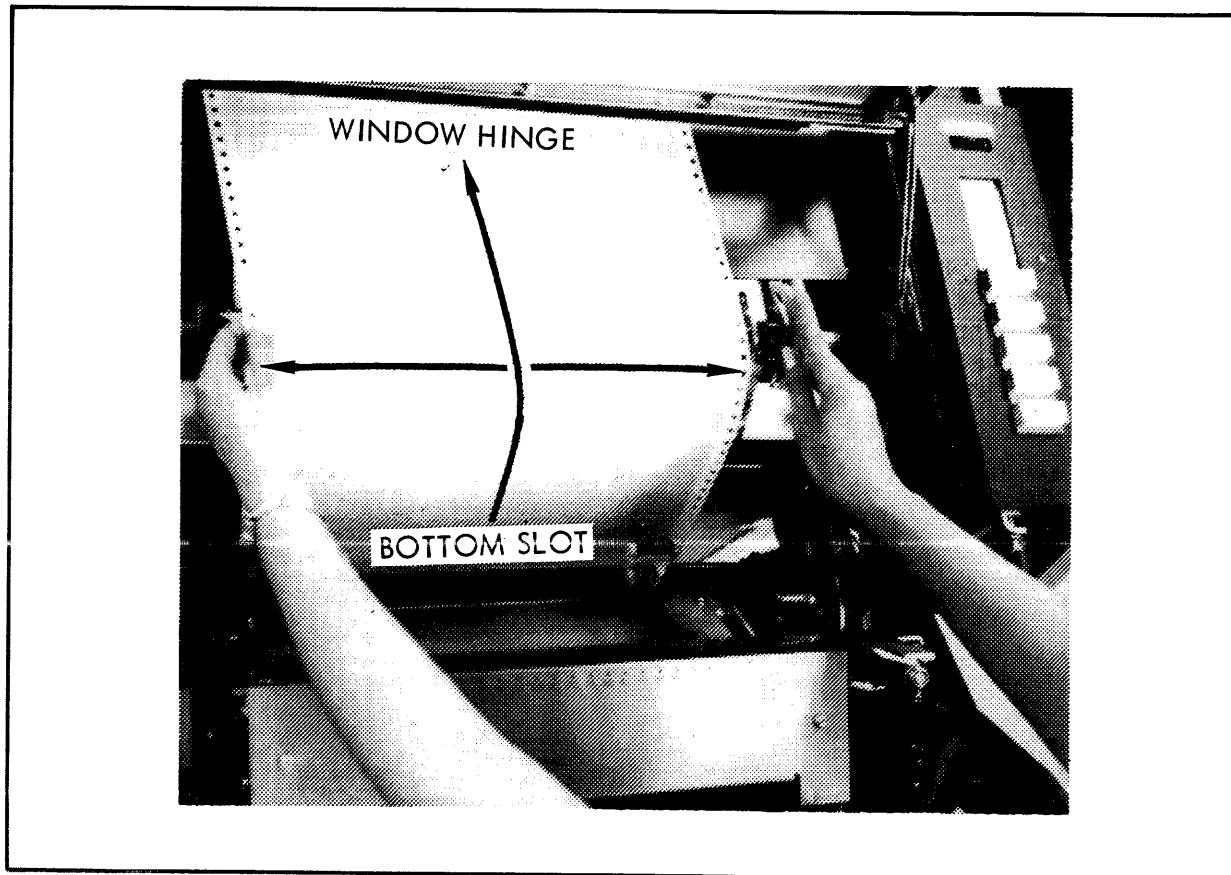


Figure 2610-5. Forms Installation

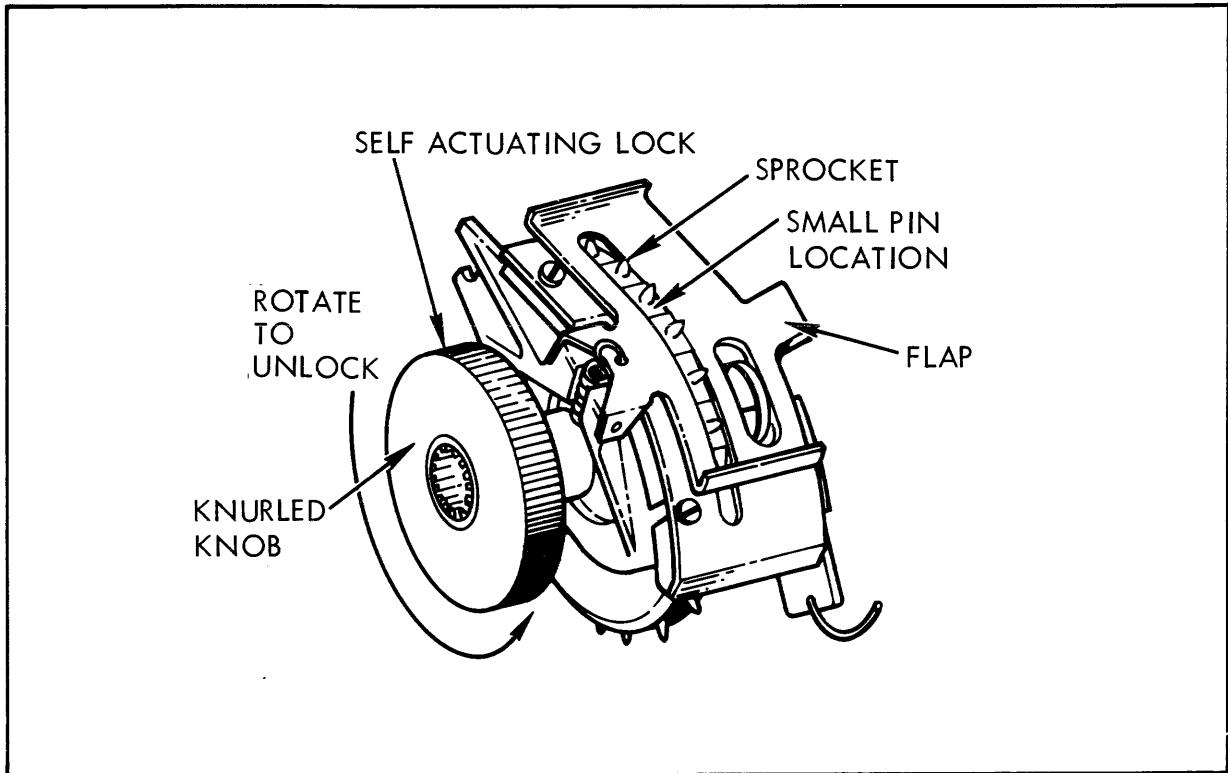


Figure 2610-6. Pinwheel Forms Tractor

- g. First column alignment: If the previous forms were of the same dimensions and type as those being installed, do not adjust the pinwheels and skip directly to step i. If the left index is to be changed, or if a different size form is being installed, proceed as follows. Raise the drum gate up close to the printer without latching the gate. This allows the use of the column indicator on the drum gate (see figure 2610-7). If the left index must be changed, adjust the left pinwheel horizontally to locate the first column. Note that the column indicator will accurately set up forms only if step c (above) was performed.
- h. Adjust the right pinwheel to provide only enough horizontal forms tension to straighten the slack out of the forms.
- i. Open the drum gate all the way. Adjust the forms to the first pint line by pulling out and turning the Vertical Forms Control Knob (left side of printer). Use the linefinder shown in figure 2610-8 to locate the first pint line. The printout will occur as shown in figure 2610-9 in relation to the linefinder.
- j. Close the drum gate. Forms installation is now complete.

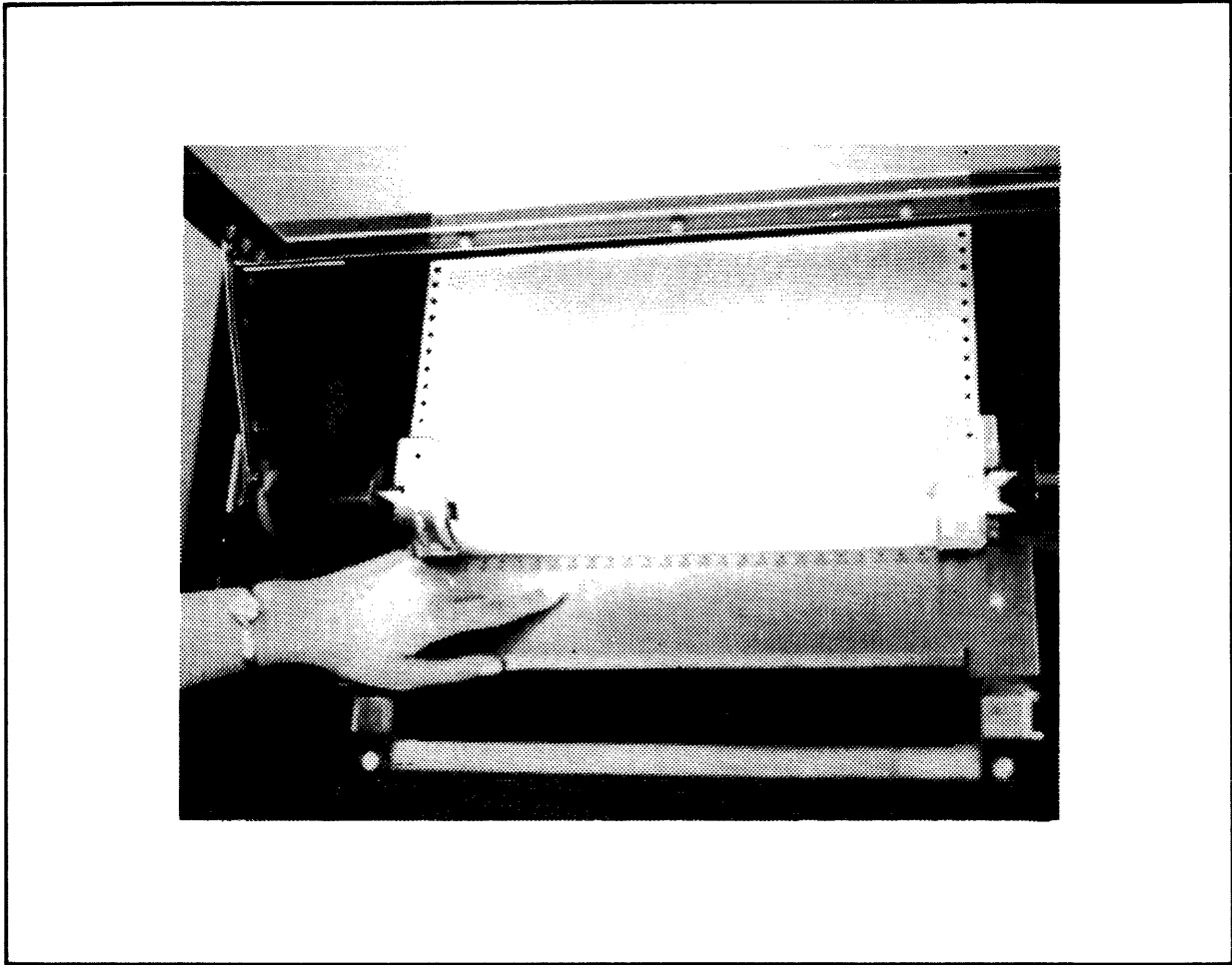


Figure 2610-7. Print Column Indicator

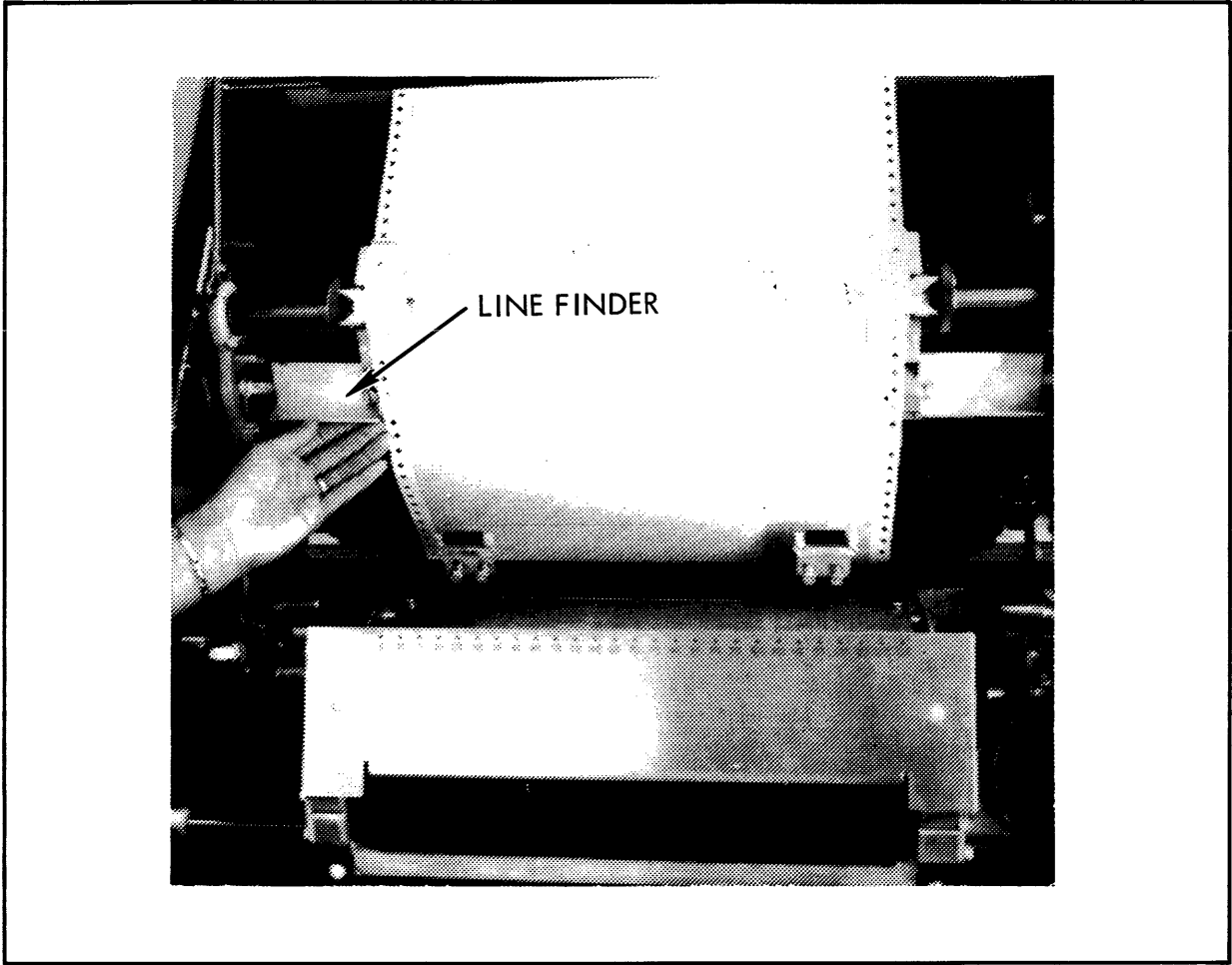


Figure 2610-8. Line Finder Indicator

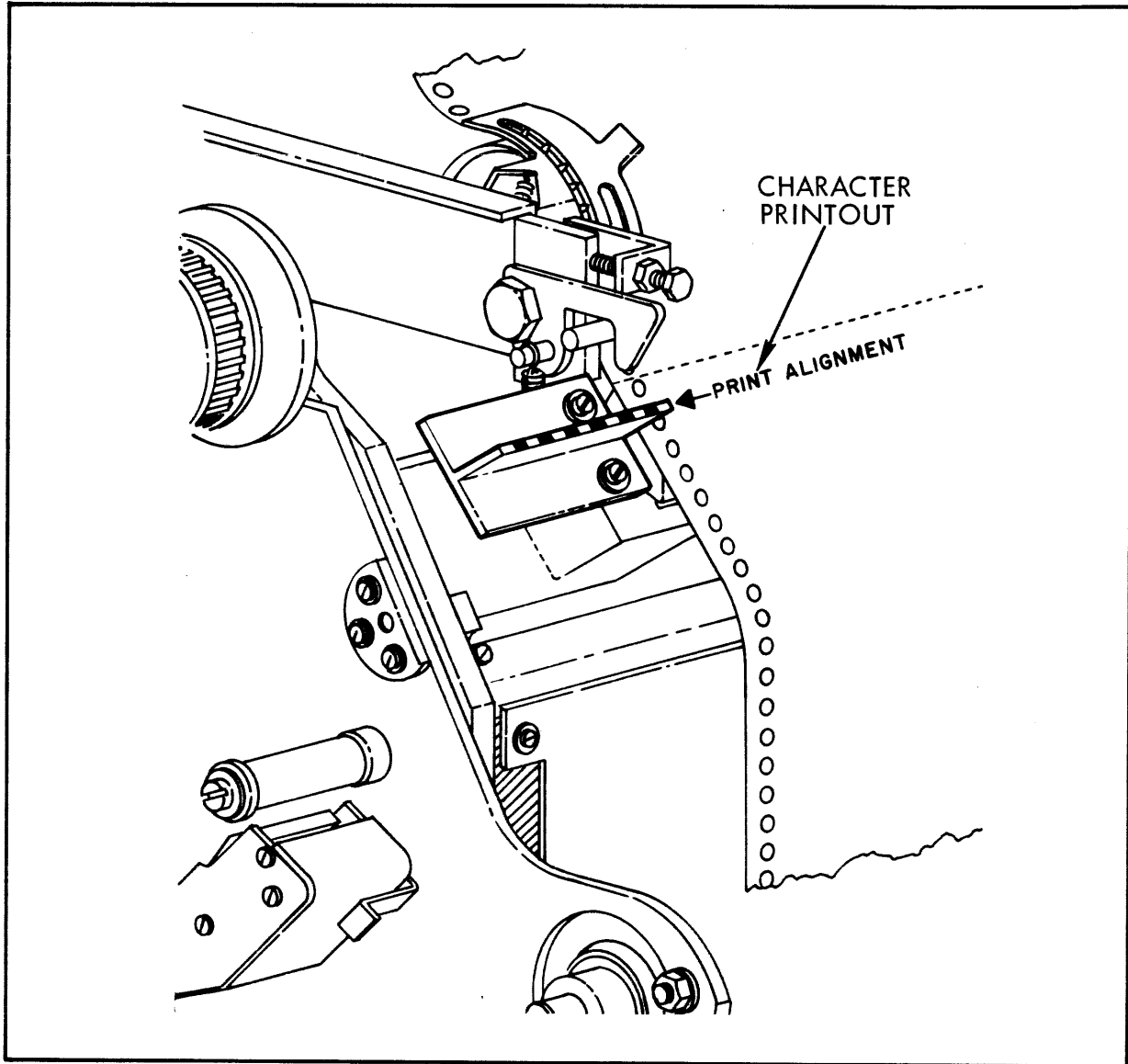


Figure 2610-9. Print Line Location

## Ribbon Maintenance

Raise the top cover window and open the drum gate. The ribbon (part number 9282-0508) is mounted on two spools, one at each side of the drum gate. The ribbon material is two inches wide and 36 yards long. It runs across the inside of the gate behind a mylar shield.

Changing the ribbon can be a clean job. Done with care, there is no need to touch the ribbon material. Be careful, a new ribbon can ink clothing at a touch. Handle the ribbon assembly only by the upper edge of the spools. The following is the procedure for changing a ribbon.

- a. Raise the top cover window and then open the print drum gate. Push the mylar shield back on the right side (see figure 2610-10).
- b. To remove a ribbon, lift the spools from their spindles and move them out around the guide posts (see figure 2610-11). To install a ribbon, hold the ribbon assembly by the upper edge of the spools and guide the ribbon down between the mylar shield and guide posts (it must be unwinding off the spool towards the center of the gate as shown in figure 2610-11). If the ribbon is winding off the front outside of the spools, remove the spools and turn them both over. With the ribbon around the guide posts, set the spools over the spindles. Rotate each spool within one revolution until it has dropped down and locked. Keep the ribbon slack to a minimum when installing the spools.

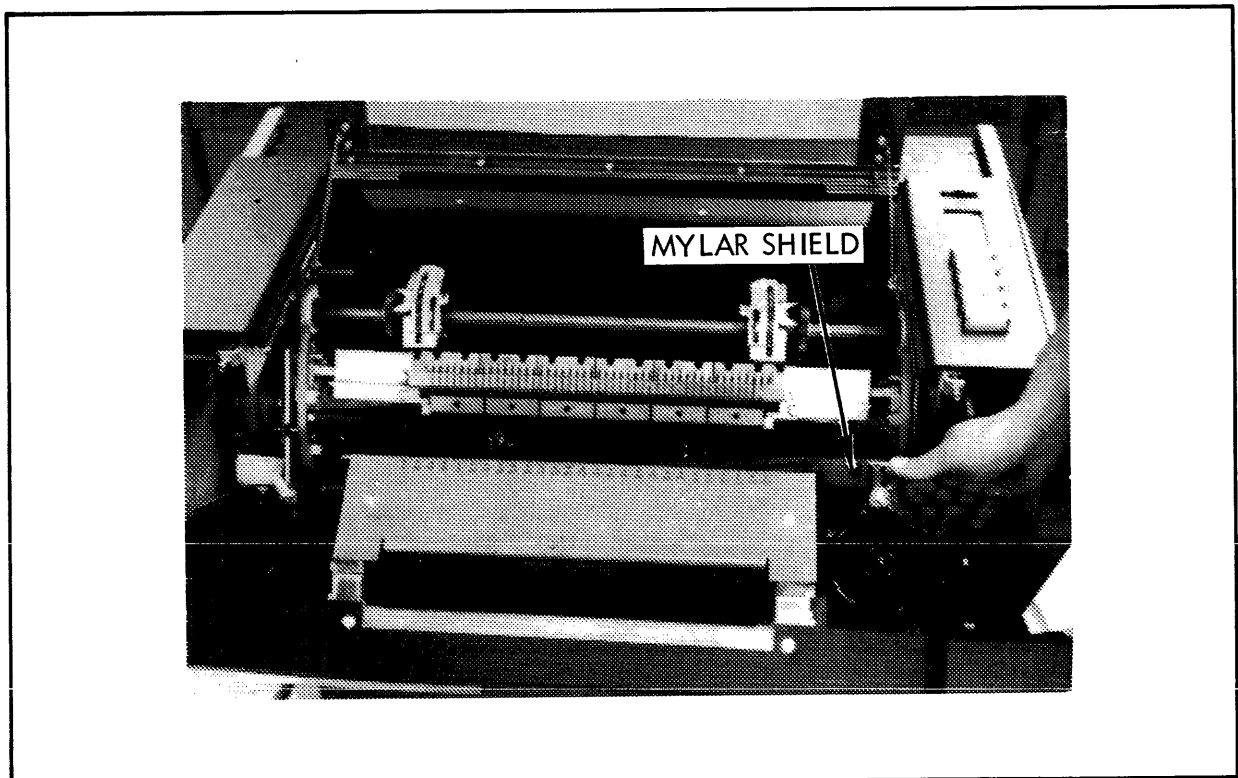


Figure 2610-10. Mylar Ribbon Shield



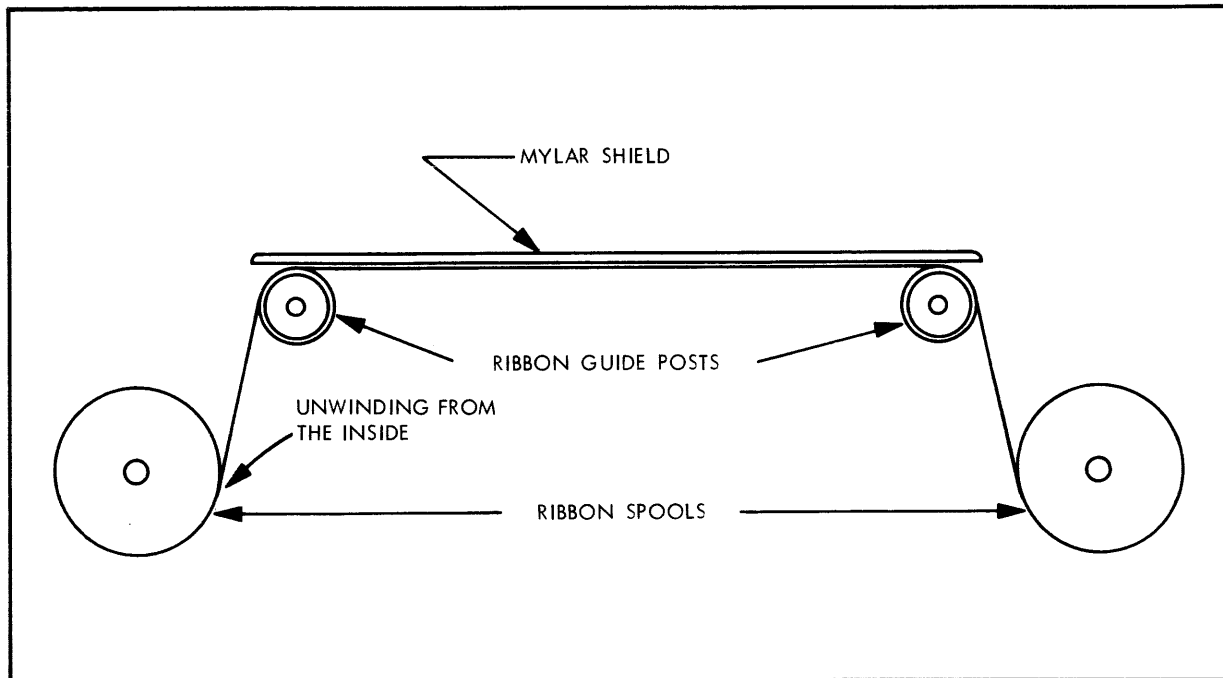


Figure 2610-11. Ribbon Installation Guide

### Installing a Format Tape

The HP part number of the standard format tape is 02610-80001.

To install or remove a format tape, the printer must be stopped and the format reader must be unlatched. To unlatch the format reader, press downward with your thumb on the latch (see figure 2610-12). The format reader swings downward slightly, presenting an opening between the reader and a copper colored contact roller (see figure 2610-13). Format tape tension is applied by the white tension roll (see figure 2610-13). To adjust the tension, loosen the tension roll by turning it counterclockwise. When loosened, the roll slides forward or backward in its slot to release or apply tension to the format tape. When the proper tension has been achieved, turn the tension roll clockwise to lock it in place. The format tape is installed in a form of triangle around the drive sprocket, the contact roller, and the tension roll. The format tape must be center aligned on the drive sprocket cogs so that a red coincidence dot on the drive sprocket appears through one of the coincidence line holes on the tape (see figure 2610-14). The tape channels are labeled 1-12. Channel 1 must be on the inside toward the chassis.

The tape tension should be adjusted to remove slack so that the tape is taught. **DO NOT OVER TIGHTEN.** Close the format reader by raising the reader back to the contact roller. The reader will latch into place with an audible click.

**Caution:** Never try to manually make the format tape move backwards through the format tape reader. To do so will damage the format tape reader.

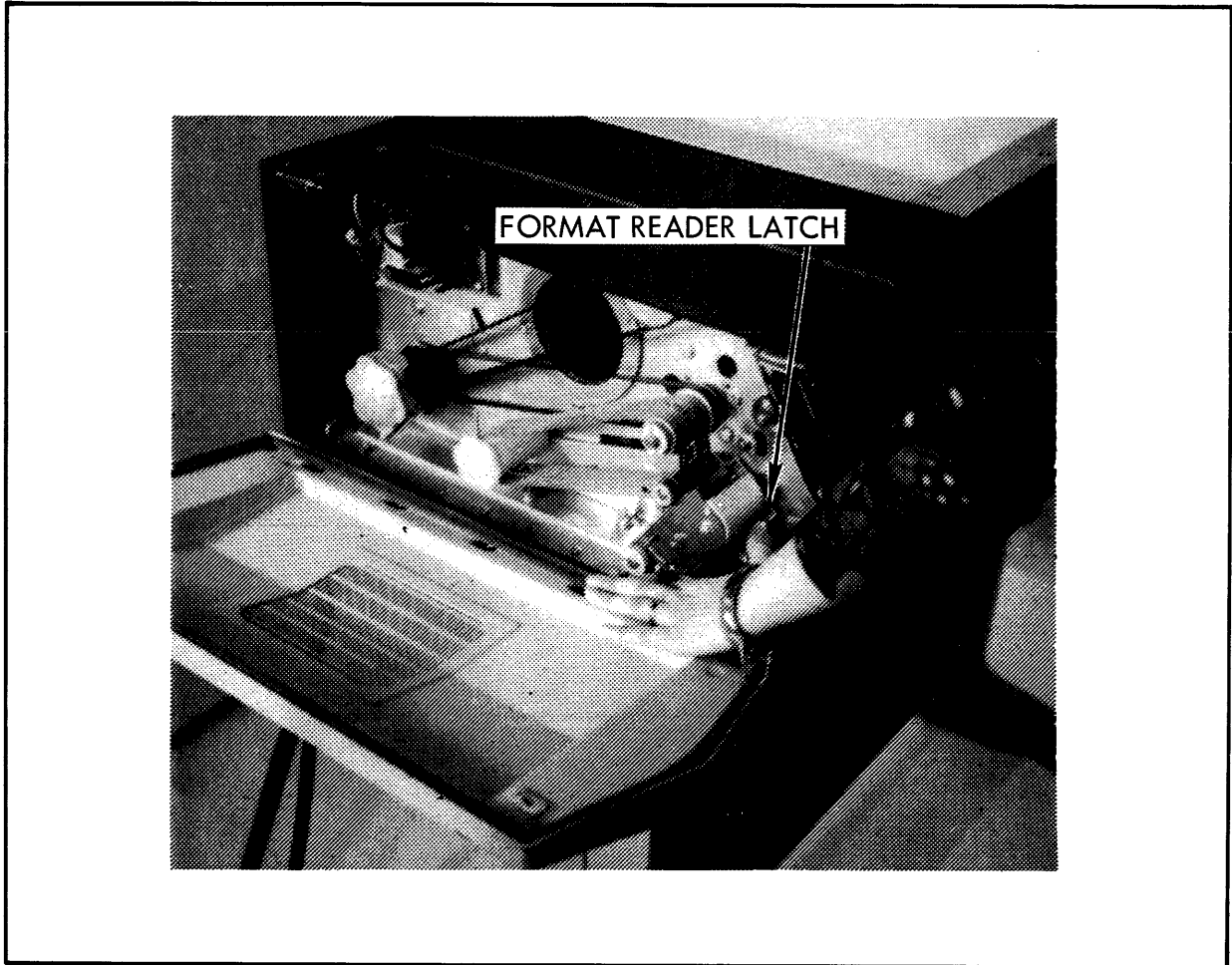


Figure 2610-12. Unlatching the Format Reader

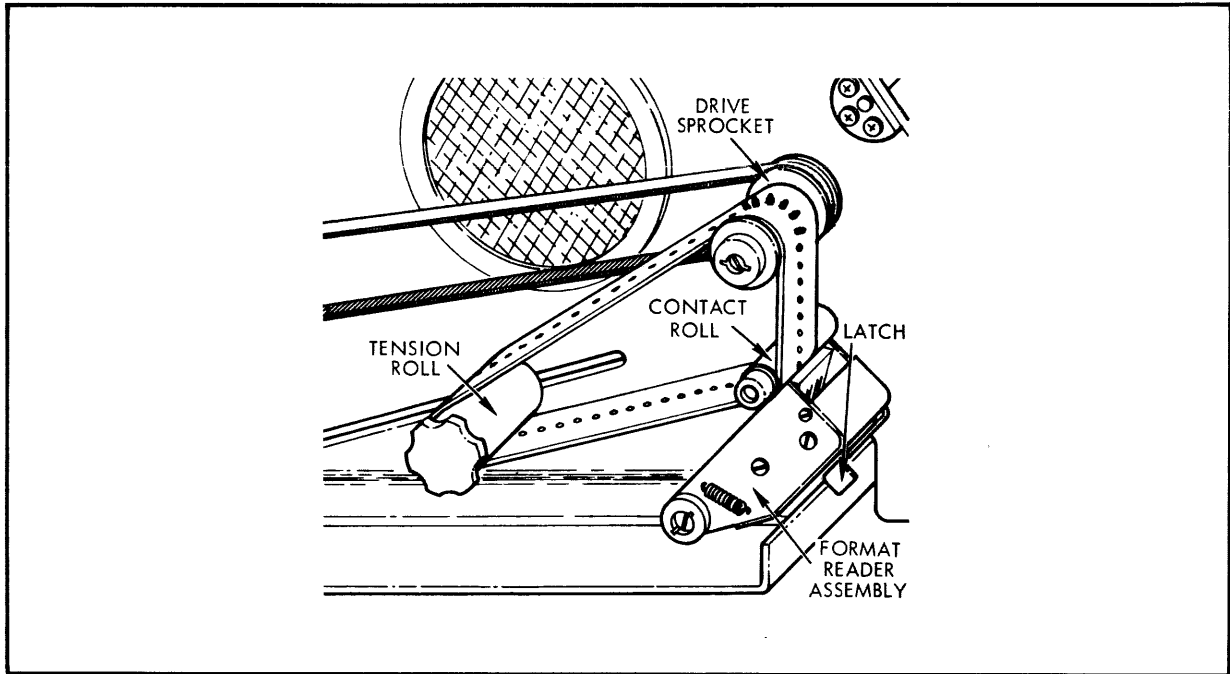


Figure 2610-13. Format Tape Installed

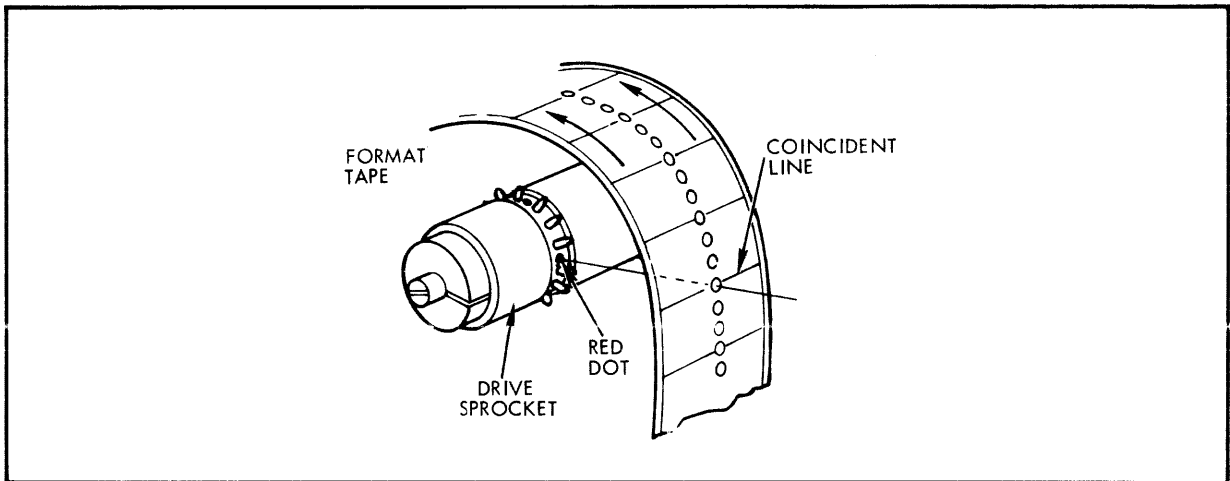


Figure 2610-14. Format Tape Coincident Lines

# HP 2614A LINE PRINTER

## ***(Subsystems HP 30109A and 30109A-001)***

There are two models of the HP 2614A Line Printer: a 600 line-per-minute (lpm), 64-character model and a 400 lpm, 96-character model. Both models are available for either 120V, 60 hertz or 230V, 50 hertz power.

### SUBSYSTEM INVENTORY

The HP 30109A Line Printer Subsystem (see figure 2614-1) includes the following materials:

- One 64-character HP 2614A Line Printer
- One HP 30209A Line Printer Interface Kit
- One *HP 30109A Line Printer Subsystem Maintenance Manual*, part number 30109-90001
- One *HP 2614A Line Printer (Controller) Operating and Service Manual*, part number 02614-90001
- One *HP 2614A Line Printer (Print Head Assembly) Operating and Service Manual*, part number 02614-90006
- One On-Line HP 2610A/2614A Line Printer Diagnostic, product number 32366A
- One *On-Line HP 2610A/2614A Line Printer Diagnostic* manual, part number 03000-90030

The HP 30209A Line Printer Interface Kit consists of an Interface Cable Assembly, part number 30209-60002, and a Universal Interface (Differential) printed-circuit assembly (PCA), part number 30051-60001.

The HP 30109A-001 Line Printer Subsystem includes all of the above materials except that a 96-character line printer is delivered instead of the 64-character model and a different line printer equipment manual (part number 02614-90013) and print head assembly operating and service manual (part number 02614-90011) are delivered.

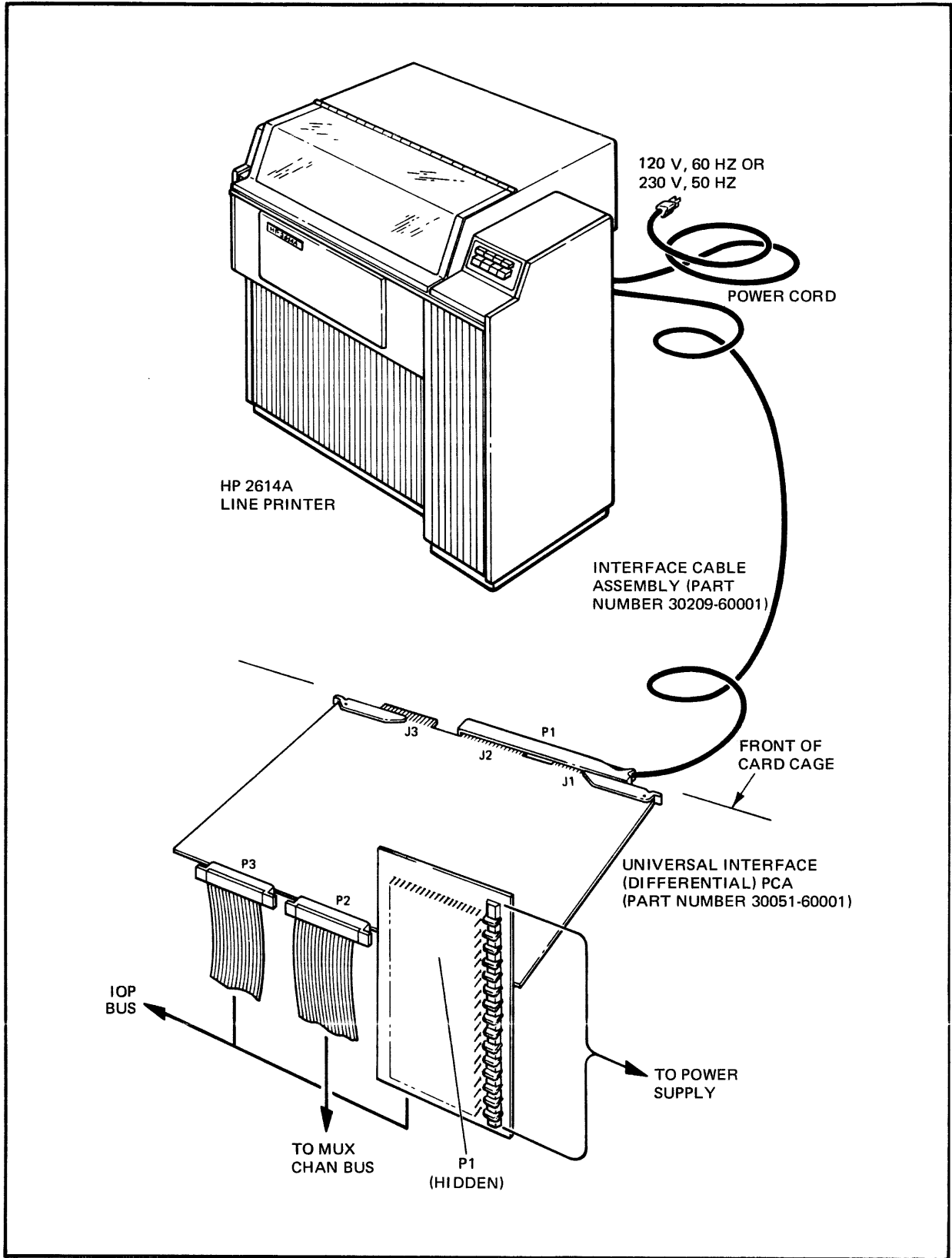


Figure 2614-1. HP 30109A Line Printer Subsystem

## SPECIFICATIONS

The pertinent specifications for the HP 2614A Line Printer are presented in table 2614-1.

**Table 2614-1. HP 2614A Specifications**

<b>Interface DC Power Requirements</b>	
+5	-5
+15	-15
+20	-20
4.4	0
0	0
0	0
<b>Line Printer AC Power Requirements</b>	
Voltage:	120V
Current:	9A
Frequency:	60 Hz
	or
	230V
	4.5A
	50 Hz
<b>Heat Dissipation</b>	
Line Printer:	3700 BTU/hr; 928.7 cal, kg/hr
Interface:	75 BTU/hr; 18.825 cal, kg/hr
<b>Cable Lengths</b>	
Line Printer Power Cord:	15 ft; 4.57 m
Interface Cable Assembly:	50 ft (standard); 15.24 m 500 ft (maximum); 152.4 m
<b>Net Weight (Unpacked):</b>	900 lb 408.16 kg
<b>Distributed Over:</b>	7.3 sq in. 47.1 sq cm
<b>Dimensions</b>	
Depth:	34 in.; 86.4 cm
Width:	46 in.; 116.8 cm
Height:	48 in.; 121.92 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	63 cu ft; 1.784 cu m
Net Weight (Packed) of Crates:	1100 lb; 498.87 kg

## INSTALLATION

The line printer interface PCA is already installed in the appropriate card cage and equipment bay when the computer system is shipped and the interface cable is connected to the PCA and coiled inside the bay.

The HP 2614A Line Printer is *not* packed in a shipping crate and is *not* strapped to a shipping pallet. Remove any shipping materials from the line printer. Retain all materials in case it becomes necessary to repack the line printer for shipment in the future.

Jumper and polling information for the line printer PCA, as well as the location of the PCA in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

After unpacking the line printer, remove the back and left (as you face the back of the line printer) panels. Uncoil the interface cable, feed it up through the access hole in the bottom of the line printer, and connect it to the 50-pin female connector (labeled 4J100) inside the line printer. The 50-pin female connector is located between the bank of capacitors and the line printer power supply components. The cable connections are summarized on the "Cable Routing" form.

### Initial Check-Out

Perform the following steps before applying power to the HP 2614A Line Printer.

- a. Level the printer using the five leveling screwfeet under the frame.
- b. Check the paper motion brake and clutch units for freedom of movement.
- c. Check the vertical advance clutch and brake. The clutch and brake are two separate magnetic particle clutches. During shipping, the magnetic particles settle and can pack solid, in which case the clutch and/or brake must be loosened up.

Open the left side cover and remove the back cover. Then open the format reader to protect the channel brushes.

To check the brake, try to turn the vertical forms knob (see figure 2614-2) counterclockwise without pulling the knob out. If the brake is frozen, the knob will not turn. If the brake is frozen, lightly tap the area immediately to the left (as you look in the rear of the unit) of the forms advance flywheel. Joggle the flywheel as you tap. Repeat until the brake is free.

To check the clutch, rotate the forms advance flywheel so that the top of the flywheel is rotating towards the rear of the unit. If the vertical forms knob turns with the flywheel, the clutch is frozen. If the clutch is frozen, lightly tap the area immediately to the left (as you look in the rear of the unit) of the forms advance flywheel. Joggle the flywheel as you tap. Repeat until the clutch is free.

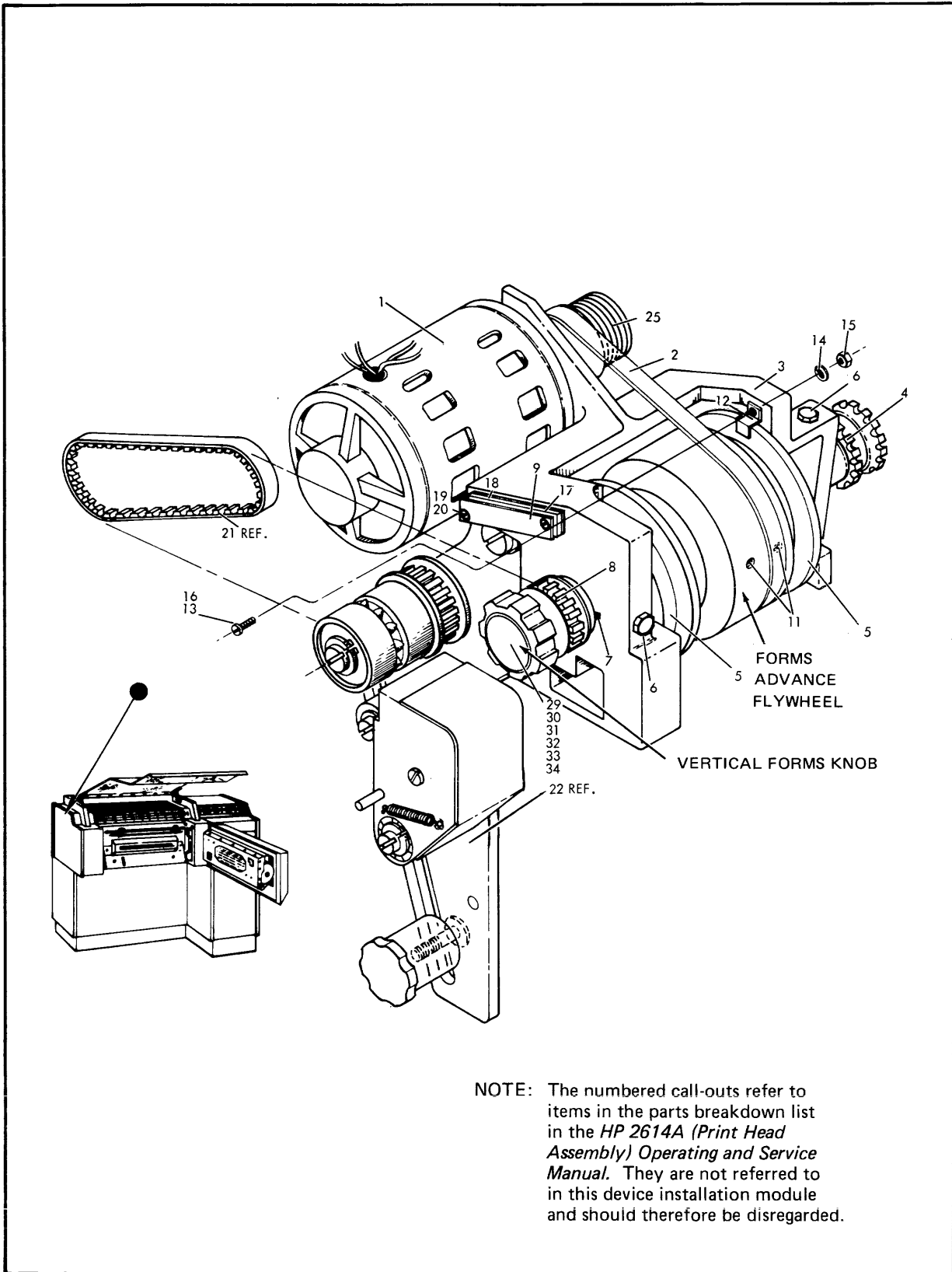


Figure 2614-2. Paper Drive Unit Assembly



**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

- d. Pull the line printer power cord through the access hole in the base of the printer and plug it into an ac electrical outlet.

### Power-On Checks

After the line printer power cord has been plugged into an ac electrical outlet, perform the following steps:

- a. Energize the circuit breakers.
- b. Press the POWER ON switch.
- c. Observe the drum rotation and paper motion drive for smooth, quiet operation.
- d. With the ac power off, check for blown fuses and other signs of electrical problems.
- e. With the ac power on, check the line printer voltages for conformance with the power requirements of the particular model of line printer.
- f. Press the POWER OFF switch.

*Note: For steps g and h, refer to the Interconnection Diagram in the Diagrams section of the HP 2614A Line Printer (Print Head Assembly) Operating and Service Manual for terminal blocks, jacks, plugs, and switches.*

- g. Check for correct and tight cable connections within the HP 2614A between the print mechanism and the line printer controller.
- h. Check for correct and tight cable connections between the line printer and the computer system.

### Start-Up Procedure

Perform the following steps in sequence to assure proper operation of the line printer.

- a. Install a ribbon (this procedure is described under "Operating Procedures" below).

- b. Open the drum arm and load fan-folded forms (this procedure is described under “Operating Procedures” below).
- c. Install a format control tape (this procedure is described under “Operating Procedures” below).
- d. Press the POWER ON switch.

## DIAGNOSTIC PROGRAMS

The On-Line HP 2610A/2614A Line Printer Diagnostic verifies the proper operation of the line printer and the interface PCA. The operating instructions are described in the associated manual (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30109A or 30109A-001 Line Printer Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation.

The add-on procedure comprises the following general steps:

1. Unpacking the line printer.
2. Installing the interface PCA.
3. Connecting the interface cable to the line printer and to the interface PCA.
4. Performing the installation check-out procedure for the line printer.

The unpacking procedure for the HP 2614A Line Printer is described earlier under “Installation”.

The interface PCA is already jumpered when shipped. Before installing it in the computer, use the “Subsystem Configuration” form to verify that the jumpering was done correctly.

The input/output device interface PCAs are usually housed in a card cage in the top of bay #2. The “Subsystem Configuration” form specifies the intended location of the line printer in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the line printer PCA may require that other PCAs in the card cage be rearranged to make room for it. If this is the case, then the “Subsystem Configuration” form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the “Subsystem Configuration” form.

Connect the P1 end of the interface cable to the line printer interface PCA as illustrated in figure 2614-1 and then connect the P2 end of the cable to the line printer as described under "Installation". The cable connections are summarized on the "Cable Routing" form.

## OPERATING PROCEDURES

### Forms Installation

Use the following procedure (refer to table 2614-2 for the acceptable form dimensions).

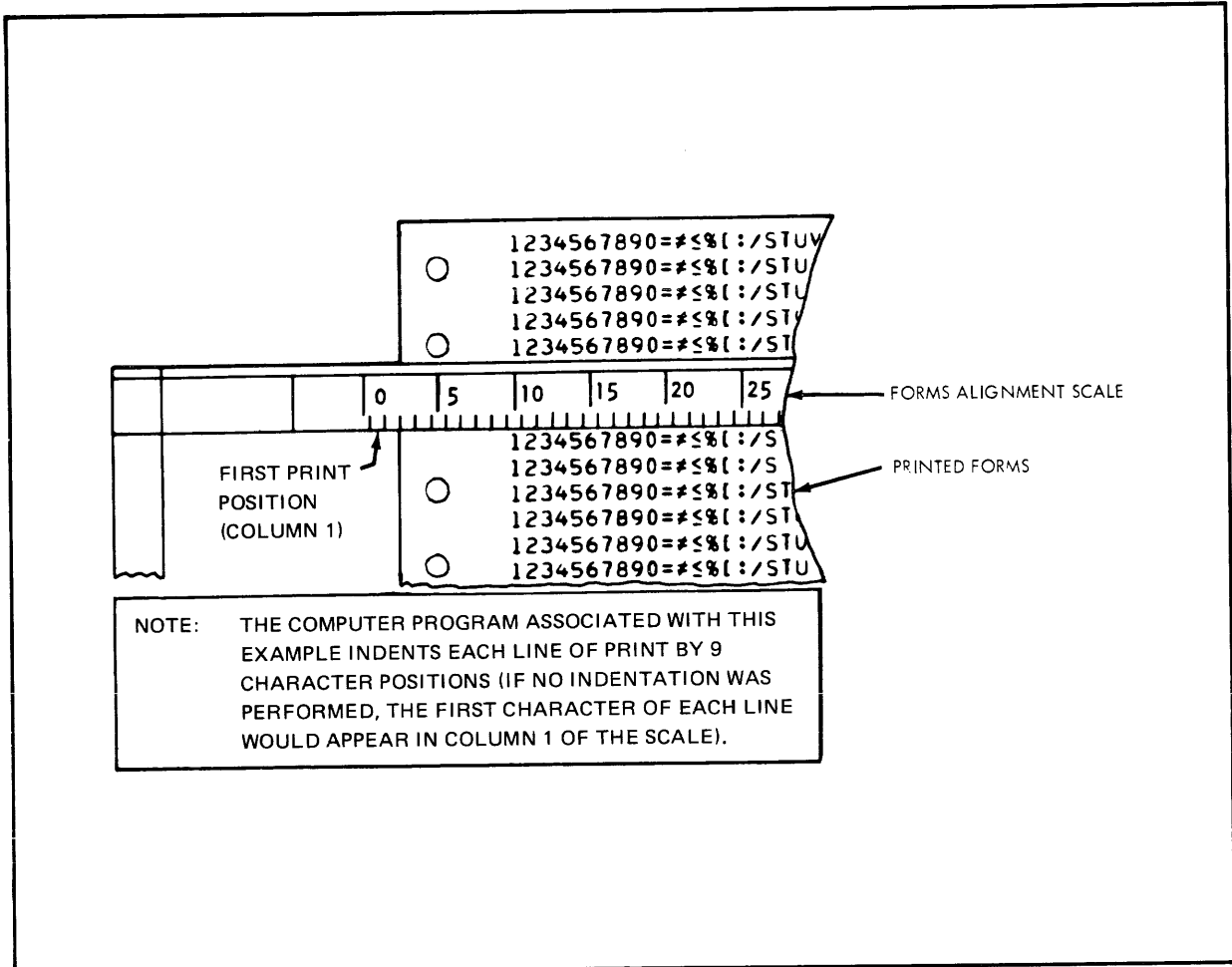
1. Cause the tape to move and stop at "top of form" by pressing PAGE EJECT switch.

**Caution: Do not press PAGE EJECT switch while vertical forms adjustment knob is pulled out.**

2. Unlatch and swing the drum arm group away from the print station to gain complete access to the forms tractors.
3. Open tractor flaps.
4. Loosen tractor locking screws. Set the upper and lower left tractors at the desired position on the guide shafts (preferably in detent rings). Refer to figure 2614-3.
5. Insert forms on the tractor lugs and close tractor flaps.
6. Align paper horizontally by moving tractors and paper until forms match paper scale. Lock all tractors in position.
7. Adjust the right tractor for proper horizontal paper tension. The paper should lie flat between tractors without strain or enlargement of the paper's pin feed holes.
8. Pull out vertical forms adjustment knob and move the forms upward, using the bottom edge of the paper scale assembly as a vertical position guide. To start printing at the top of the form, stop vertical movement when the bottom edge of the mylar shield window opening matches the bottom of the desired first print line position.
9. Pivot the paper scale back into the drum arm group. In this position, the scale will still be visible for horizontal column positioning when the drum arm is closed. Close and latch the drum arm group.
10. Initiate printing. Make final character positioning adjustments, if necessary, with the vernier adjustment assembly and character phasing control knobs (refer to "Horizontal Forms Fine Adjustment" and "Phasing Control Adjustment" below).
11. If horizontal paper tension requires adjustment, loosen the upper and lower right hand tractor locks, move the tractor to obtain proper forms tension, and lock the tractors.

**Table 2614-2. Form Dimensions**

<b>Form Feed Holes:</b>	All forms used must have round holes punched along both margins 0.25 ± 0.01 inches from the paper edge to the hole centerlines. The distance between hole centerlines must be 0.50 ± 0.01 inches non-accumulative. The hole diameter shall be .155 ± .005 inches.
<b>Width:</b>	4.0 to 20.5 inches overall.
<b>Length:</b>	Any length continuous form (up to 22 inches under format control) except limited to 11 inches in the paper stacker.
<b>Thickness:</b>	Recommended paper single-part between 15 lbs and 25 lbs (per 1000). Multi-part form maximum of original plus 5 copies at a maximum weight of 15 lbs for the 1st form and 12 lbs for the rest. The maximum multiple part forms thickness is .025 inches.



**Figure 2614-3. Forms Alignment**

## Format Tape Loading

The HP part number of the standard format tape is 02610-80001.

The format tape assembly is located at the left side of the print mechanism, providing direct accessibility to the operator for installing tapes. Refer to figure 2614-4. The assembly consists of a format tape drive roller, a contact roller, an adjustable idler roller, a format loop mounting plate, and a format loop reader assembly containing one ground brush and up to 12 control brushes for sensing holes in the tape.

Install the tape in the following manner:

1. Loosen the idler roller by rotating counterclockwise.
2. Unlatch the format tape loop reader assembly and rotate it forward, away from the contact roller.
3. Place format tape of the drive roller (with a hole in any channel on every coincident line) such that a coincident line is adjacent to any red dot on the sprocket wheel. Thread the tape between the contact roller and brushes and around the idler roller.

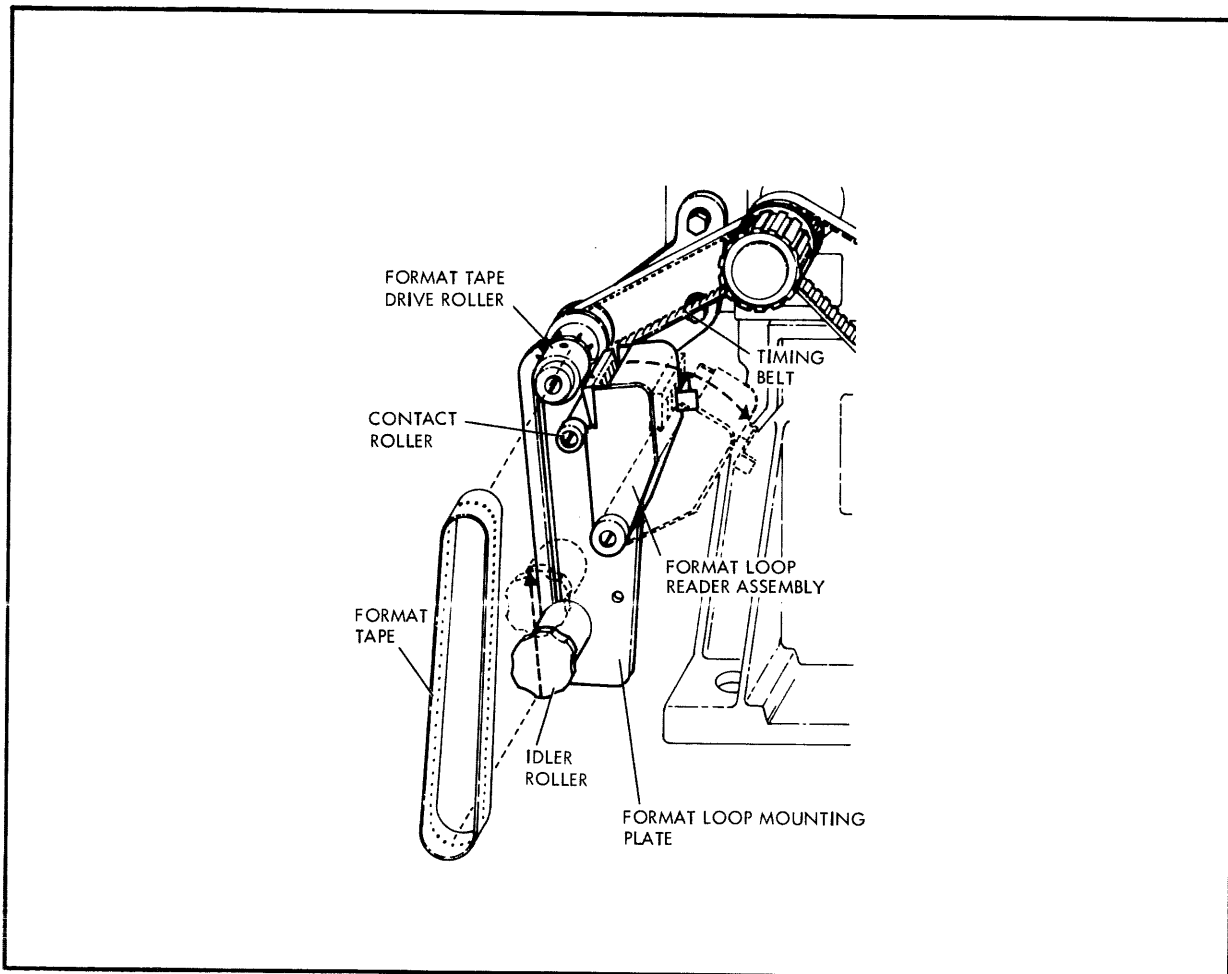


Figure 2614-4. Format Tape Loading

4. Allow the full weight of the idler roller to rest on the tape.
5. Tighten the idler roller (clockwise) and close the format loop reader assembly.

**Caution:** Never try to manually make the format tape move backwards through the format tape reader. To do so will damage the format tape reader.

### Ribbon Replacement

The 15-inch wide, 25-yard long nylon ribbon (part number 9282-0505) runs directly from the ribbon roll over the upper ribbon reversing bar, through the print station, over the lower ribbon reversing bar, and onto the lower roll. Refer to figure 2614-5.

To change the ribbon, press the STOP switch and open the drum arm group. Ribbon must pass between the forms alignment scale and the print drum. Detailed instructions for ribbon removal and replacement are included, along with a pair of plastic gloves, with each replacement ribbon package.

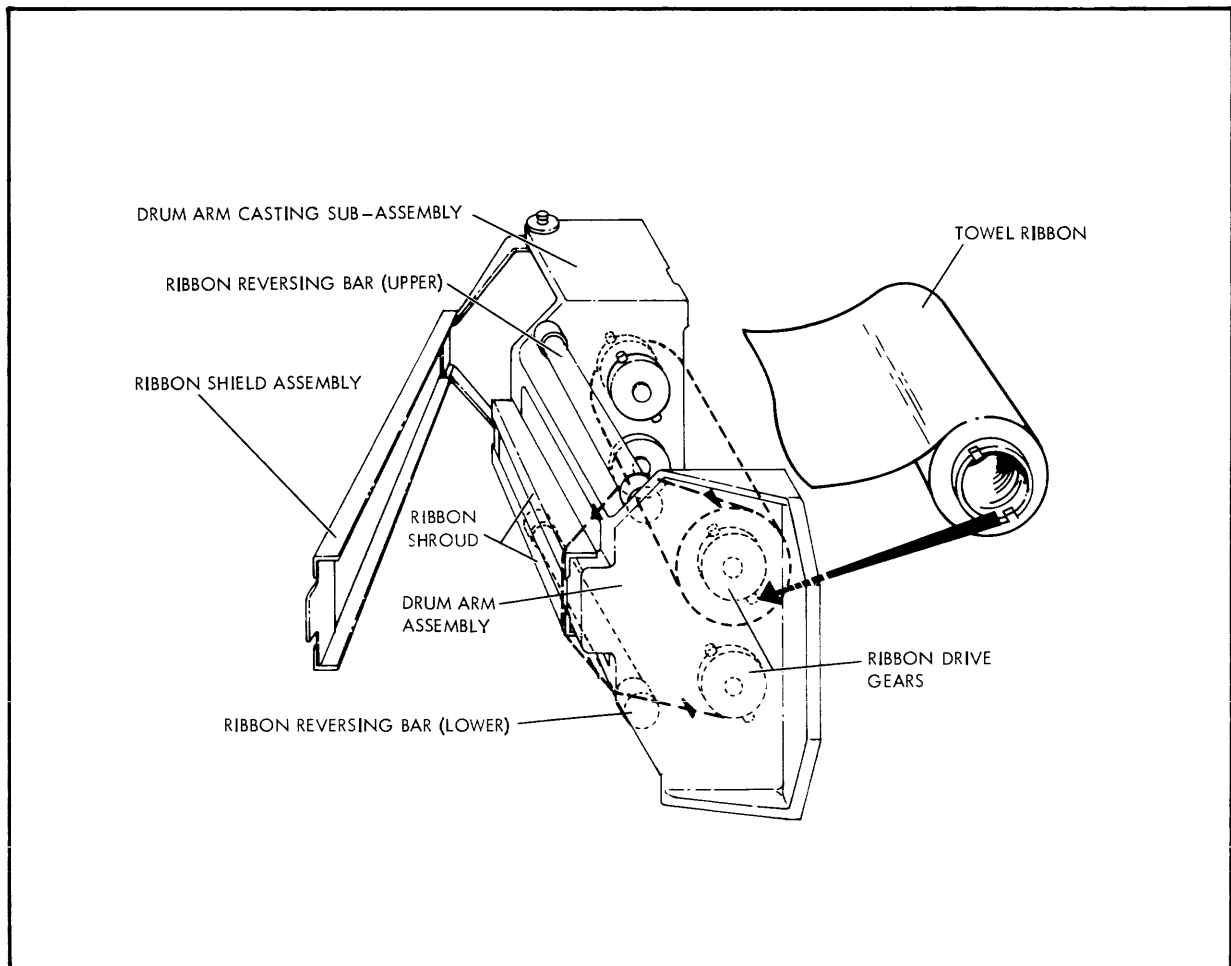


Figure 2614-5. Ribbon Path

## **Phasing Control Adjustment**

There are two rotating controls located just to the left of the line printer control panel. The right rotating control adjusts the character phasing. Incorrect phasing is indicated by the loss of the tops or bottoms of the characters across a line. Phasing adjustment is normally required when changing between single-part and multiple-part forms. The phasing control compensates for the thickness of the particular forms being used. The phasing can best be adjusted by printing the character "E" in all columns and moving the phasing control until the best quality printing is obtained (see figure 2614-6). The print quality on multiple-part forms is best observed on the bottom form.

## **Vertical Forms Adjustment**

The vertical forms adjustment knob (see figure 2614-7) is used for manually advancing the forms up or down. The adjustment knob is normally used when setting up the forms before starting to print. The knob is located inside the left cover, and is operated by pulling the knob out (left) and rotating it in the required direction.

## **Horizontal Forms Adjustment**

The horizontal forms position is set by loosening the locking screws on each tractor and sliding the upper and lower left hand tractors along the guide shafts. When these are in position, tighten the locking screws and place the holes of the forms over the tractor feed pins. Then slide the right hand upper and lower tractors into position with the right hand tractor pins inserted in the form holes. Tighten the locking screws.

## **Horizontal Forms Fine Adjustment**

There are two rotating controls located just to the left of the line printer control panel. The left rotating control is used for horizontal forms fine adjustment within plus or minus two columns of the desired print column. Turn the knob upward to move the print columns to the left. Initially, the knob should be in the center position to allow maximum adjustment in each direction.

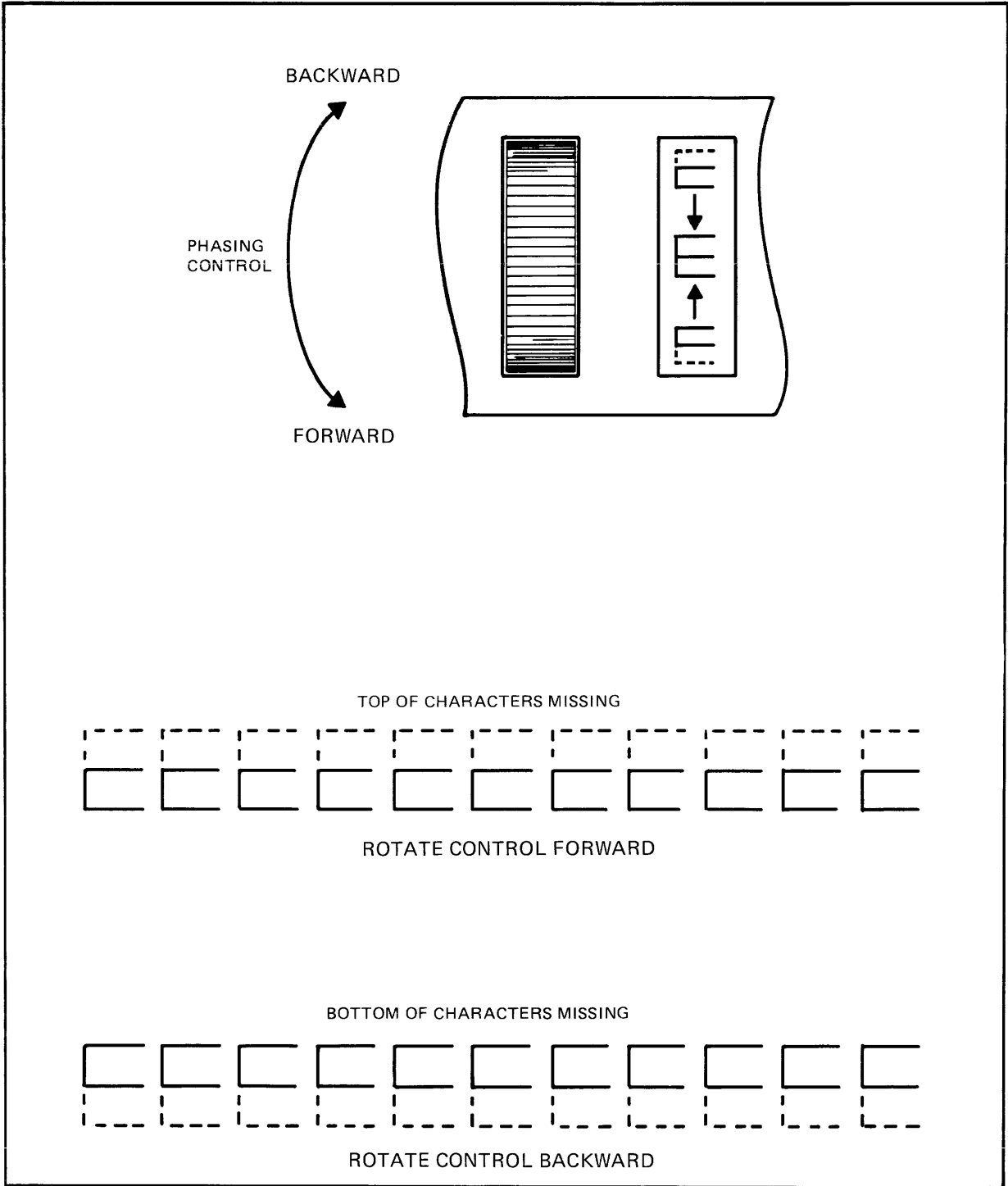


Figure 2614-6. Phasing Control Adjustment



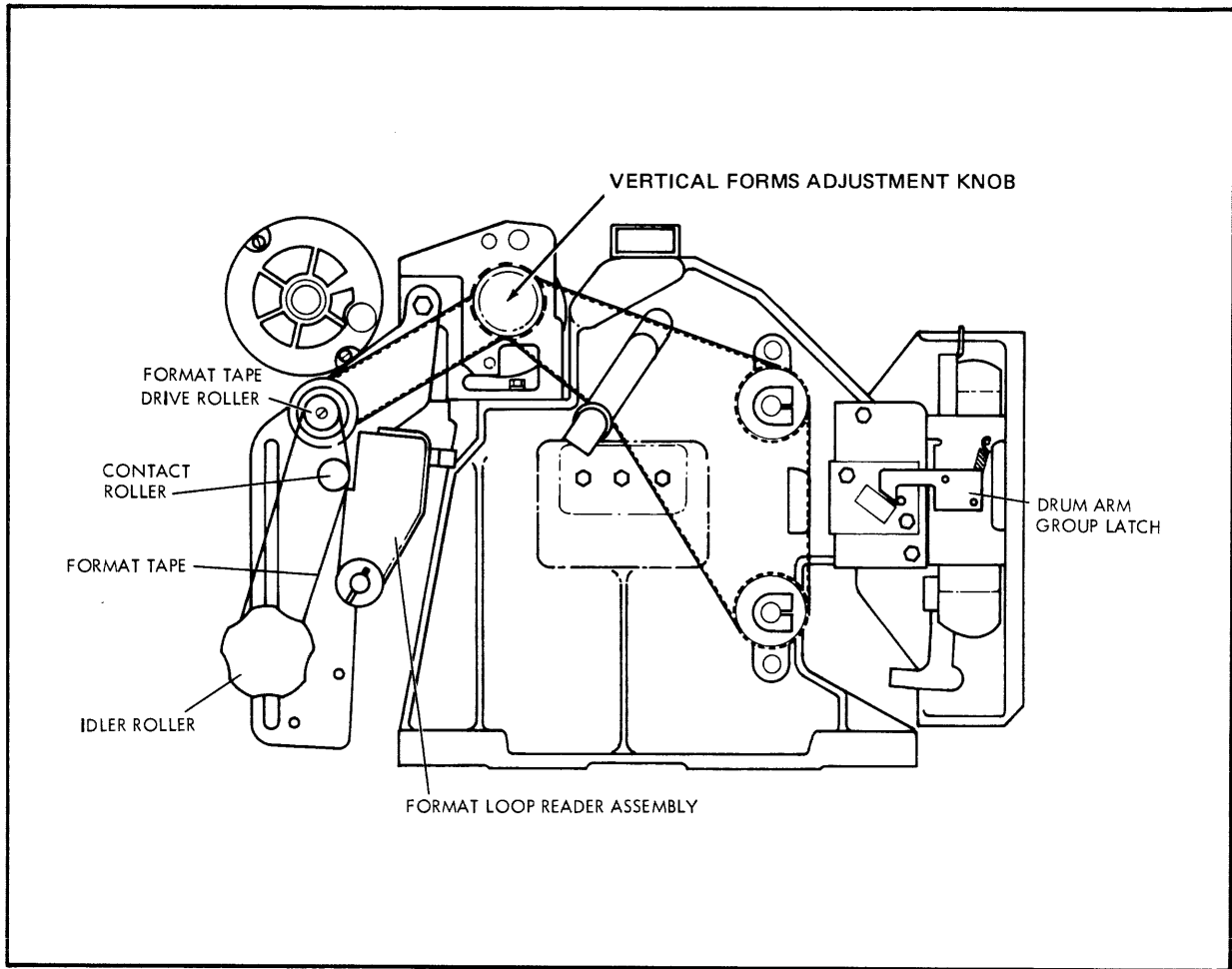


Figure 2614-7. Left Side View of Printer with Left Cover Open

# HP 2660A DISC DRIVE

## *(Subsystems HP 30103A, 30103A-001, and 30103A-002)*

The HP 2660A Disc Drive is a rack-mounted, fixed-head (head-per-track) disc drive which uses a set of permanently installed disc platters. Each HP 2660A requires a rack-mounted HP 30325A Disc Drive Power Supply. The power supplies are available for use with any of the following types of power:

- 208V, 60 Hz, three-phase
- 240V, 60 Hz, split-phase
- 230V, 50 Hz, single-phase

The type of power is specified at the time the order is placed. The disc drive is available with any of the following data storage capacities:

- 1,048,576 bytes (1 megabyte)
- 2,097,152 bytes (2 megabytes)
- 4,194,304 bytes (4 megabytes)

To change the storage capacity from 1 to 2, 1 to 4, or 2 to 4 megabytes, it is necessary to replace the disc drive with one containing the desired storage capacity.

### SUBSYSTEM INVENTORY

#### HP 30103A Subsystem

The HP 30103A Disc Memory Subsystem (see figure 2660-1) includes the following materials:

- One HP 2660A Disc Drive (1 megabyte capacity)
- One HP 30325A Disc Drive Power Supply
- One HP 30203A Disc Memory Interface
- One *HP 2660 Disc Drive Operating and Service Manual*, part number 02660-90001

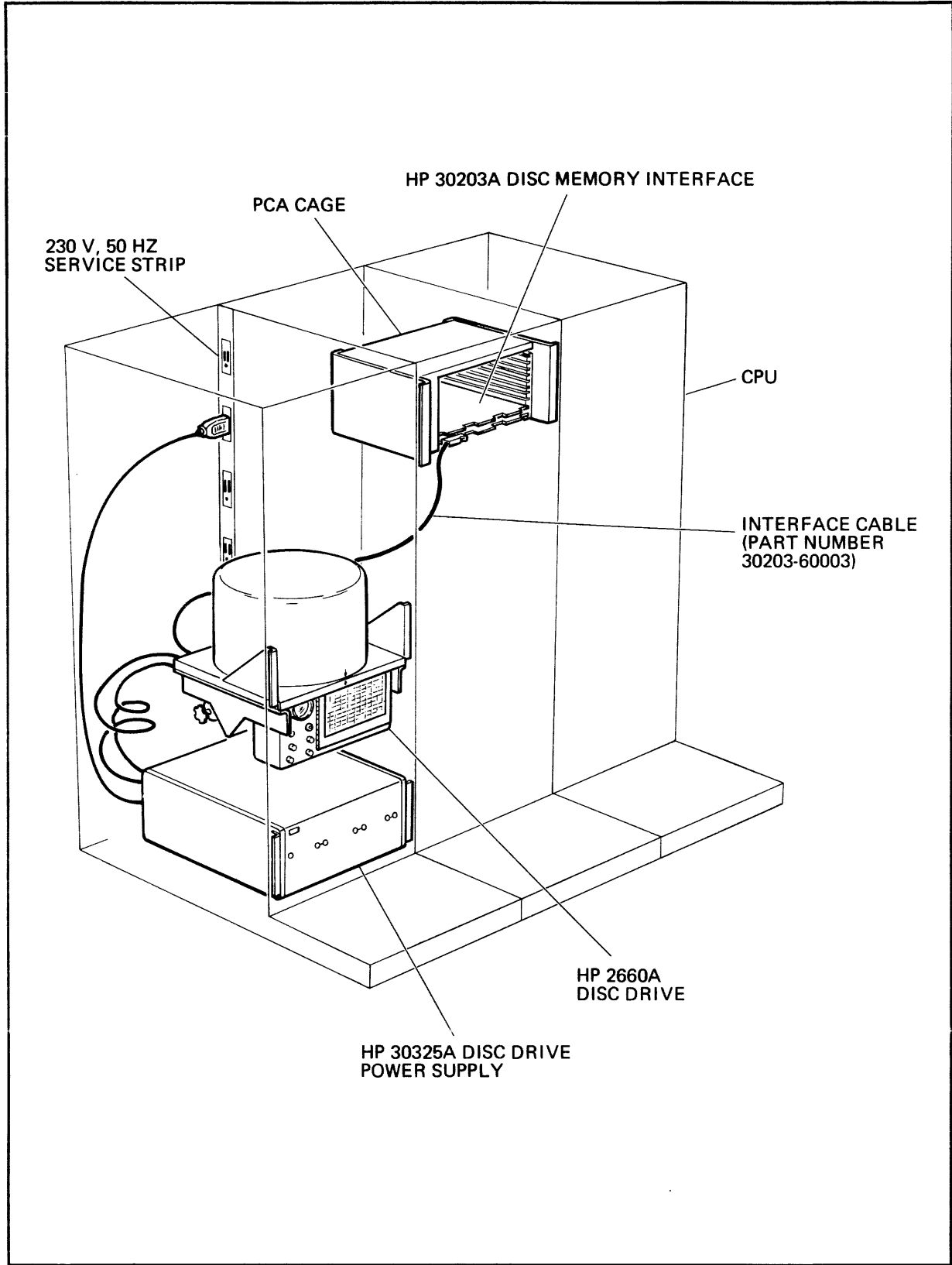


Figure 2660-1. HP 30103A Disc Memory Subsystem

- One *HP 30325A Disc Drive Power Supply Operating and Service Manual*, part number 30325-90001
- One *HP 30103A Disc Memory Subsystem Maintenance Manual*, part number 30103-90001
- One Stand-Alone HP 30103A Disc Test, product number 32328A
- One *Stand-Alone HP 30103A Disc Test* manual, part number 30103-90003

The HP 30203A Disc Memory Interface consists of:

- One Controller Printed-Circuit Assembly (PCA), part number 30203-60001
- One Data PCA, part number 30203-60002
- One 15-foot (4.57 m.) Interface Cable, part number 30203-60003
- One Connecting Cable, part number 30000-93062
- One Jumper Connector, part number 02660-60002

The 02660-60002 Jumper Connector configures the interface for a 1 megabyte disc drive. The connector and cables fasten to the PCAs as illustrated in figure 2660-2.

### **HP 30103A-001 Subsystem**

The HP 30103A-001 Disc Memory Subsystem includes everything listed above except that the disc drive has a 2 megabyte capacity and the jumper connector has the part number 02660-60003.

### **HP 30103A-002 Subsystem**

The HP 30103A-002 Disc Memory Subsystem includes everything listed above except that the disc has a 4 megabyte capacity and the jumper connector has the part number 02660-60004.

## **SPECIFICATIONS**

The pertinent specifications for the HP 2660A Disc Drive and the HP 30325A Disc Drive Power Supply are presented in tables 2660-1 and 2660-2, respectively.

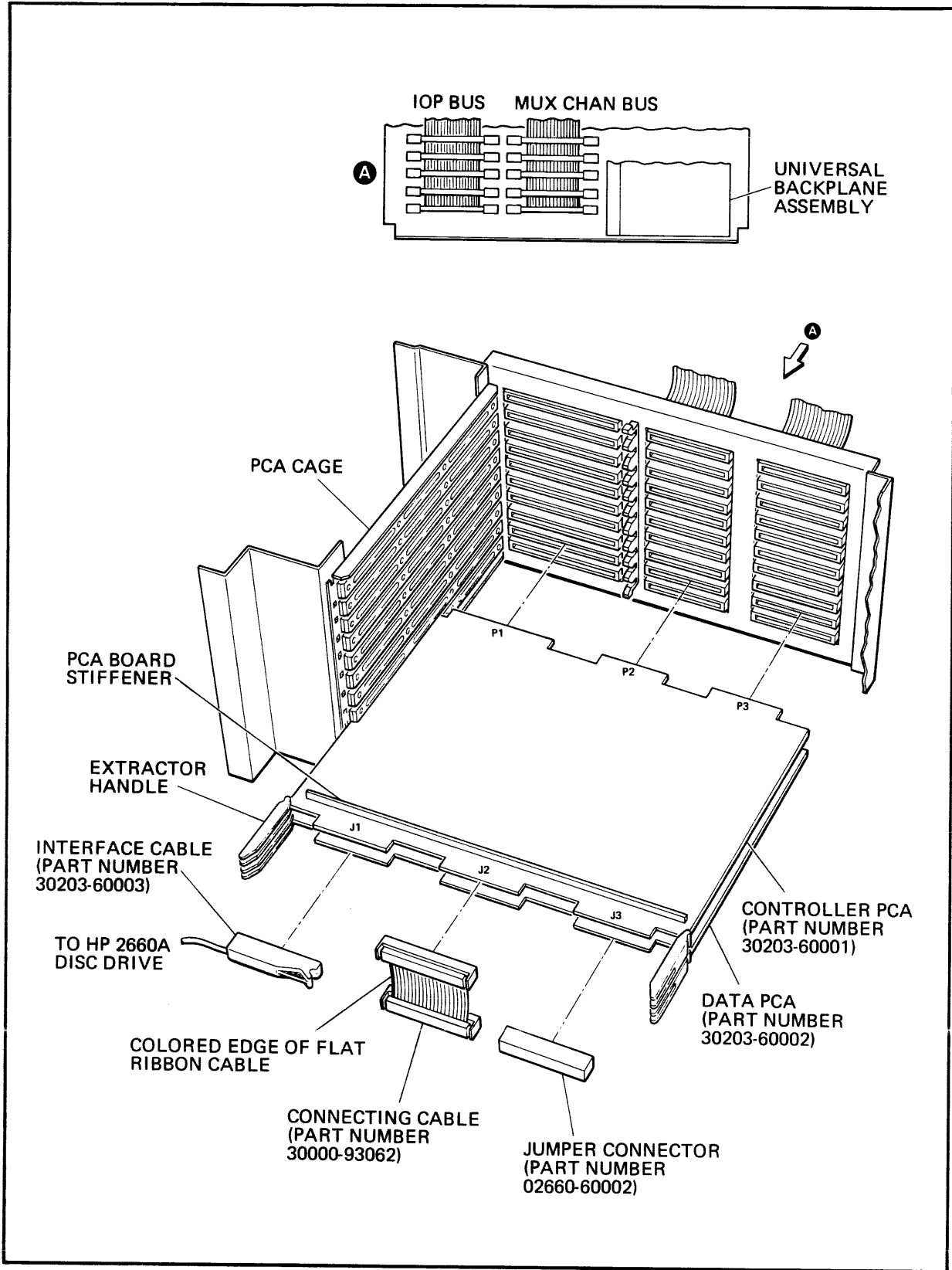


Figure 2660-2. HP 30203A Disc Memory Interface

**Table 2660-1. HP 2660A Specifications**

<b>Interface DC Power Requirements</b>	
+5	-5
+15	-15
+20	-20
5.5	0
0	0
0	0
0	0
<b>Disc Drive AC Power Requirements</b>	
Voltage:	115V (supplied by the HP 30325A).
Current:	(included in the "Current" specification in table 2660-2)
Frequency:	50 or 60 Hz
<b>Heat Dissipation</b>	
Disc Drive and Power Supply: 1550 BTU/hr; 389.05 cal, kg/hr	
<b>Cable Lengths</b>	
Disc Drive AC Power Cord:	6 ft; 1.89 m
Disc Drive DC Power Cord:	6 ft; 1.89 m
Interface Cable:	15 ft; 4.57 m
<b>Net Weight (Unpacked):</b>	180 lb 81.63 kg
<b>Distributed Over:</b>	n.a. (rack-mounted)
<b>Dimensions</b>	
Depth:	21 in.; 53.34 cm
Width:	17.866 in.; 45.38 cm
Height:	21 in.; 53.34 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	18.4 cu ft; .5211 cu m
Net Weight (Packed) of Crates:	213 lb; 96.599 kg

**Table 2660-2. HP 30325A Specifications**

<b>AC Power Requirements</b>	
Voltage:	208, 240, or 230 V $\pm$ 10%
Current:	2A
Frequency:	50 or 60 Hz $\pm$ 3%
<b>Heat Dissipation:</b> (included in table 2660-1)	
<b>Cable Lengths</b>	
AC Power Cord: 6 ft; 1.89 m	
<b>Net Weight (Unpacked):</b> 43 lb 19.501 kg	<b>Distributed Over:</b> n.a. (rack-mounted)
<b>Dimensions</b>	
Depth:	19-3/4 in.; 50.17 cm
Width:	16-3/4 in.; 42.55 cm
Height:	7 in.; 17.78 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	3.898 cu ft; .1104 cu m
Net Weight (Packed) of Crates:	67 lb; 30.385 kg

## INSTALLATION

The disc power supply and the interface PCAs are already mounted in the equipment bay when the computer system is shipped, while the disc drive is shipped in a separate crate. When the shipment arrives, the Customer Engineer must uncrate the disc drive, install it in the equipment bay, and then connect the cables between the disc drive, the power supply, and the interface PCAs. Jumper and polling information for the interface PCAs, as well as the location of the PCAs in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log* for the particular computer system.

### Uncrating the Disc Drive

The disc drive is shipped in a crate which is 31 inches wide, 31 inches deep, and 33 inches high. The crate is built on a pair of 2- by 4-inch skids as shown in figure 2660-3. The recommended tools and equipment for uncrating the disc drive are listed in table 2660-3. Figure 2660-4 shows an exploded view of the shipping materials.

*Note: The HP 2660A Disc Drive weighs 213 lbs. (96.7 kg.) crated and 180 lbs. (81.7 kg.) uncrated. If a fork lift is not used, two strong men will be required to lift the unit.*

The procedure for uncrating the disc drive is as follows:

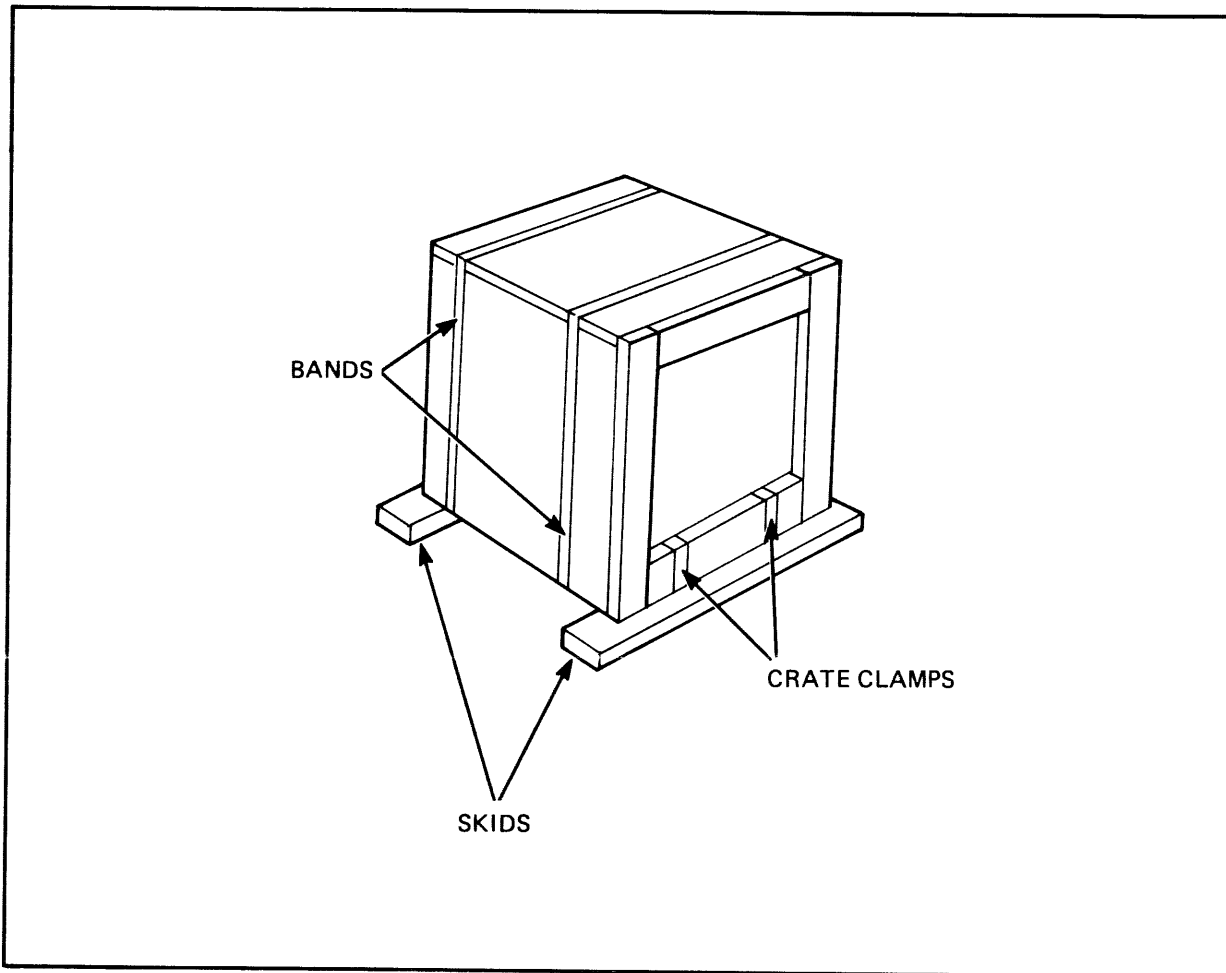
1. Move the crate into the room where the disc drive is to be installed.
2. With a wire cutter, cut the metal straps holding the lid on the crate.
3. With a pry bar or claw hammer, remove the crate clamps.
4. Remove the lid and sides of the crate and the polyethylene dust cover.
5. With two 7/16-inch wrenches, remove the four nuts holding the U-brackets of the disc drive to the base of the crate.
6. Carefully lift the disc drive off the base of the crate and set it on a clean flat surface where there is sufficient clearance for installation preparations.

*Note: Do not remove the shipping U-brackets at this time. Retain all shipping materials in case it becomes necessary to repack the disc drive for shipment in the future.*



**Table 2660-3. Recommended Tools and Equipment for Uncrating the Disc Drive**

Quantity	Item	Description
1	Powered fork lift.	300 pound capacity.
1	Pry bar or claw hammer.	Suitable for removing crate clamps.
1	Wire cutter.	Suitable for cutting metal straps.
2	Open end wrench.	7/16-inch.
1	Screwdriver.	Slot.



**Figure 2660-3. HP 2660A Disc Drive Shipping Crate (Sealed)**

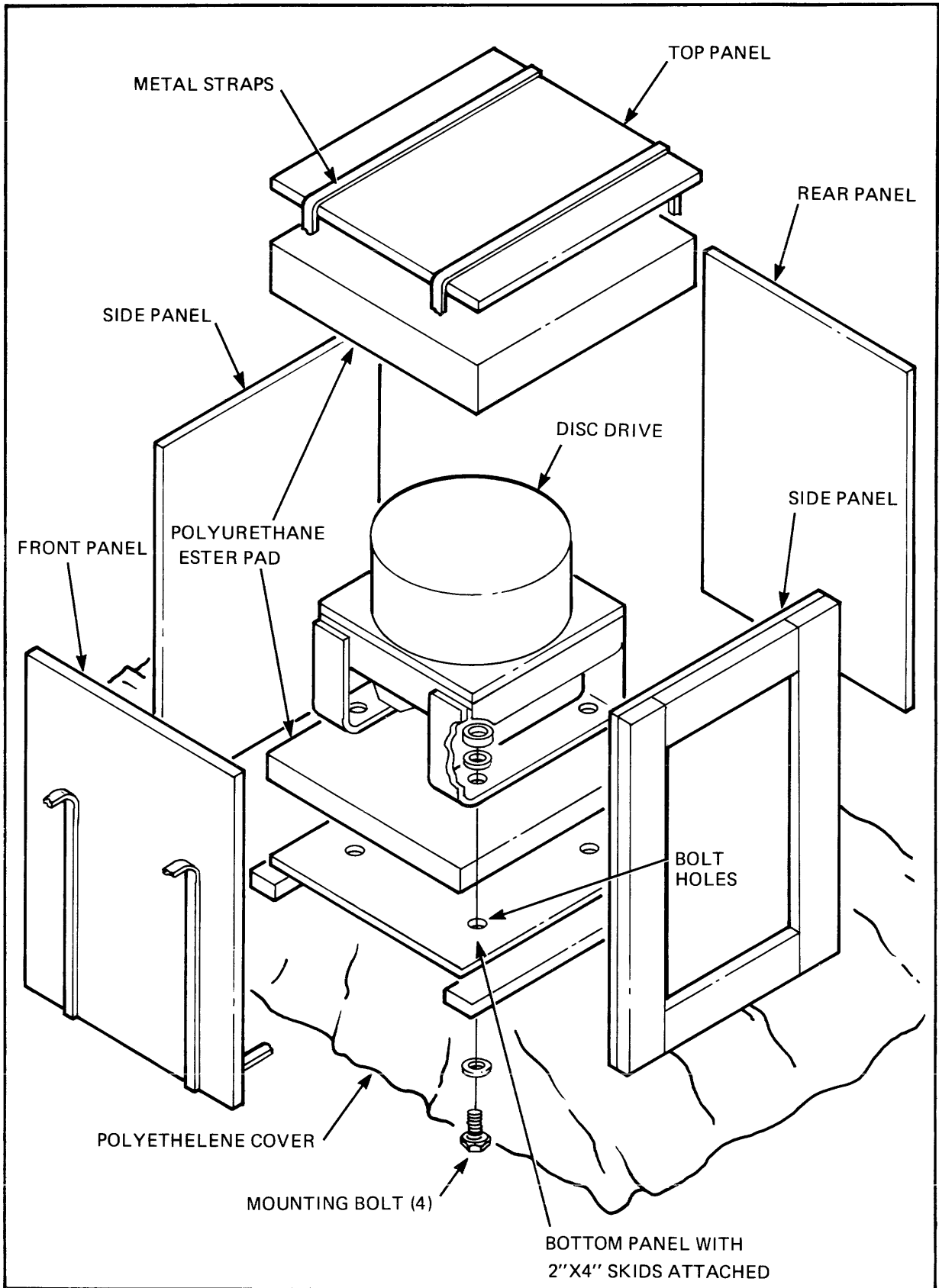


Figure 2660-4. HP 2660A Disc Drive Shipping Materials (Exploded View)

## Inspecting the Helium Atmosphere System

Refer to figures 2660-5 and 2660-6. Before mounting the disc drive in the equipment bay, verify the following:

- The helium supply bottle is securely clamped in place.
- The helium supply valve is open (completely counterclockwise).
- The high pressure gauge indicates that no more than approximately 150 psi per week leakage occurred during the shipment.

*Note: The helium supply bottle is at a pressure of at least 1800 psi at the time the disc drive is shipped.*

- The low pressure gauge indicates some positive pressure less than 1/2 psi at room temperature after the pressure relief valve has been manually actuated to reduce pressure to zero. If not, adjust the regulator as described in Section IV of the *HP 2660A Disc Drive Operating and Service Manual*.

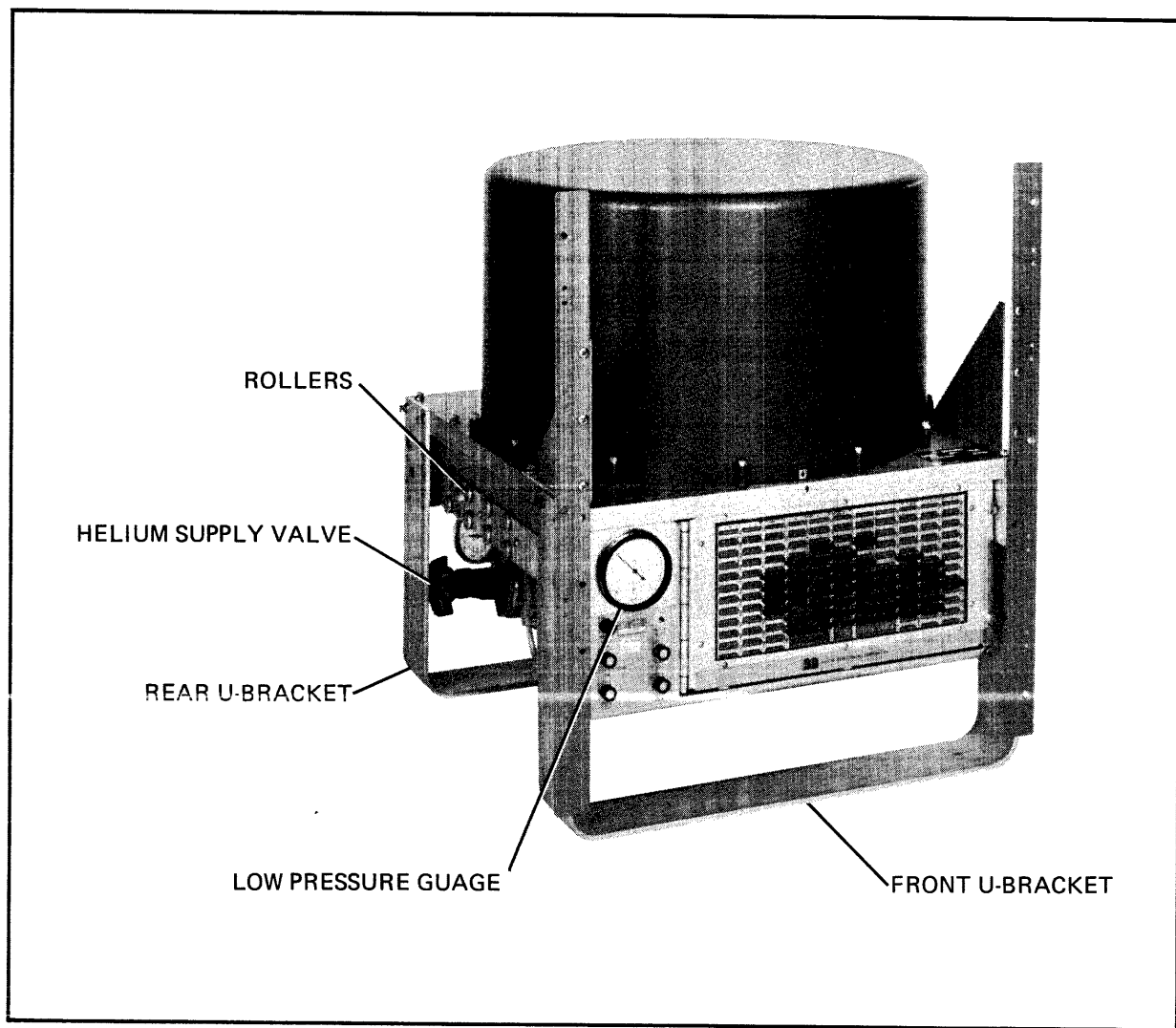


Figure 2660-5. HP 2660A Disc Drive

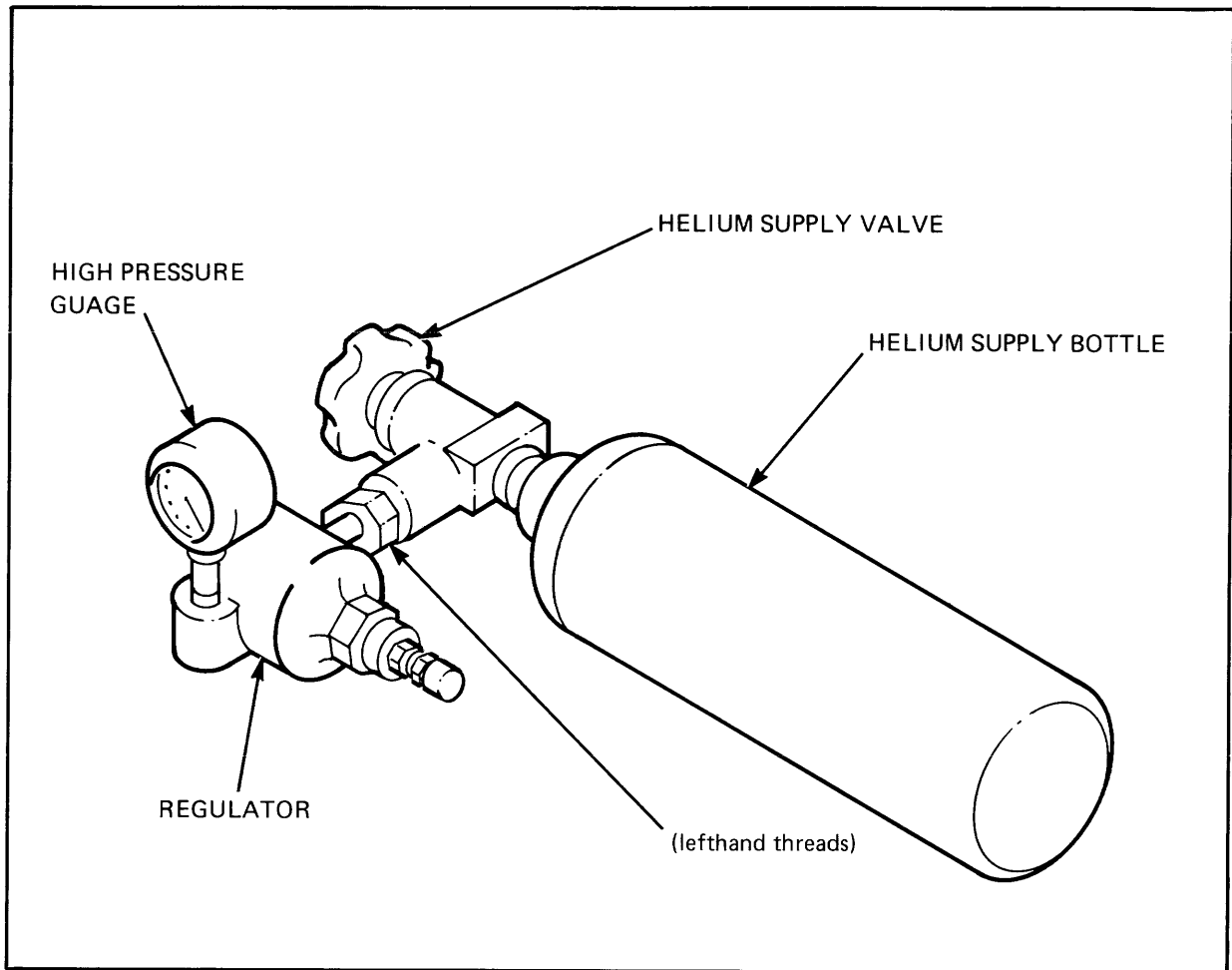


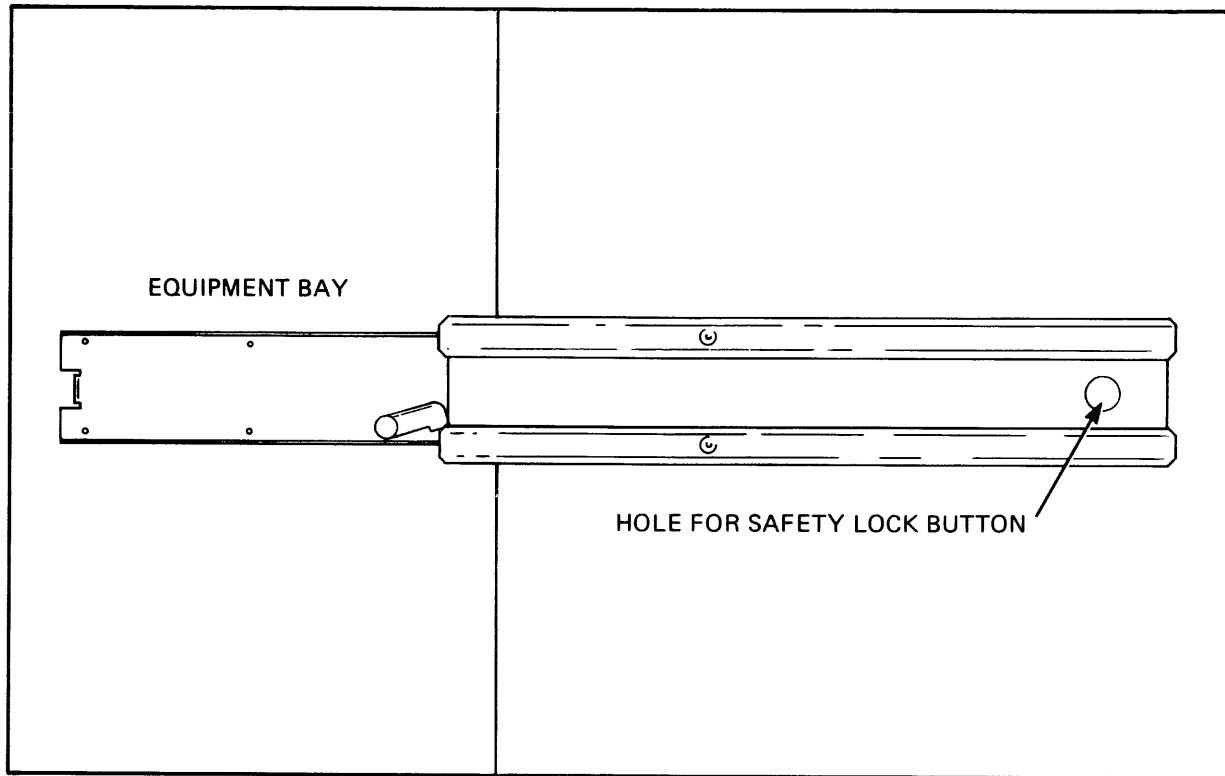
Figure 2660-6. Helium Sustaining System (Located at the Rear of the Unit Under the Baseplate)

### Installing the Disc Drive

The procedure for installing the disc drive in the equipment bay is as follows:

1. Move the equipment slides (figure 2660-7) in the bay out until they lock in the fully extended position. Make sure that the stabilizer feet of the bay are screwed all the way down so that they are firmly in contact with the floor surface.

**Caution:** Failure to screw the stabilizer feet all the way down before installing the disc drive could result in the cabinet tipping over, due to the weight of the disc drive.



**Figure 2660-7. Right Equipment Slide Fully Extended (Side View Looking From the Left)**

2. Lift the disc drive until the rollers (figure 2660-5) on both sides of the drive are aligned with the slides. Move the disc drive into the bay so that the rollers fit into the slides.

**Caution:** When moving the disc drive into the bay, do not turn the drive to the right or to the left. Turning the disc drive in either direction could cause the rollers to slip out of the equipment slides. As the disc drive is moving into the bay, visually verify that the rollers on both sides are staying in the slides.

3. When the disc drive is part way into the bay, safety lock buttons on the disc drive mounting assemblies will catch against the front of the slides and prevent the drive from being pushed any further into the bay. Press in both safety lock buttons and continue to move the disc drive into the bay until the safety lock buttons engage in holes in the slides.
4. Remove the front and rear U-brackets (figure 2660-5) from the disc drive. Press in both safety lock buttons and move the drive all the way into the bay. Retain both U-brackets in case it becomes necessary to repack the disc drive for shipment in the future.

## Connecting the Cables

Connect the interface cable between the disc drive and the interface Data PCA and connect the two power cables between the disc drive and the disc power supply. The ends of the cables, as well as the associated connecting points, are labeled to facilitate this task. In addition, the cable connections are summarized on the “Cable Routing” form. The connection of the cable to the interface PCA is illustrated in figure 2660-2.

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

Plug the disc power supply power cord into the CEE service strip in the equipment bay.

## DIAGNOSTIC PROGRAMS

The Stand-Alone HP 30103A Disc Test verifies the proper operation of the disc drive and interface. The operating instructions are described in the associated manual (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30103A, 30103A-001, or 30103A-002 Disc Memory Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus the following:

- One Disc Power Supply Rack Mounting Kit, part number 30390-60012.
- One Disc Memory Mounting Kit, part number 02770-60004.
- Copies of those *System Support Log* forms which pertain to the add-on installation.

The rack mounting kit is a pair of brackets which must be installed on the disc power supply to make it rack-mountable. The disc memory mounting kit is a pair of equipment slides which must be installed in the equipment bay; the disc drive, in turn, is then mounted on the slides.

The add-on installation procedure comprises the following general steps:

1. Uncrating the shipment.
2. Installing the disc power supply.
3. Installing the equipment slides.
4. Installing the disc drive.

5. Installing the disc memory interface PCAs.
6. Connecting the cables between the disc drive, the disc power supply, and the interface.

Before installing the disc drive and its power supply, remove the three module covers from the lower half of bay #3. If there is already equipment mounted in that space (such as an HP 7900A Disc Drive), remove the equipment also. The "HP 3000 Racking Diagram" form shows where all the equipment is to reside.

### **Uncrating the Shipment**

The procedure for uncrating the disc drive is described earlier under "Installation". Retain all shipping materials in case it becomes necessary to repack the units for shipment in the future.

### **Installing the Disc Power Supply**

The HP 30325A Disc Power Supply must always be installed in the bottom of bay #3 (see figure 2660-1). The installation procedure is as follows:

- a. Unpack the unit from its shipping container. Save all shipping materials in case it becomes necessary to repack the unit for shipment in the future.
- b. Install the rack mounting kit, part number 30390-60012, on the front side edges of the unit as shown in figure 2660-8.
- c. Place the unit in the bottom of bay #3. Slide the unit all the way into the bay so that the brackets mounted in step b are flush against the mounting strips of the bay.
- d. Secure the unit to the bay using four #10-32X.500 flat head screws as shown on figure 2660-8.

### **Installing the Equipment Slides**

The procedure for installing the disc memory mounting kit in the equipment bay is as follows:

- a. Open both equipment slides to the fully extended position so that the slide lock is activated (refer to figure 2660-7).
- b. Attach the slide adapters to the equipment slides so that the bend in adapters will face towards the inside of the bay. To attach the adapters, it is first necessary to press the slide lock and retract the slide slightly. After the slide adapters have been attached to the slides, retract the slides fully.
- c. Determine the approximate location in the equipment bay where the slides are to be mounted. After the slides have been mounted, the bottom of each should be 23 inches above the floor of the bay. Insert the channel nuts (four per equipment slide) in the side channels of the bay so

that the longer side of the nut is in a vertical position. With a Pozidriv screwdriver, press and twist against the channel nut spring force until the channel nut grooves mate with the channel edges.

- d. Using the supplied mounting screws, loosely attach the slides to the channel nuts. Adjust the slides to the exact desired position and then tighten the mountscrews firmly to the channel nuts.

*Note: To adjust the slides once they have been permanently mounted, press the slide at the point where the mounting screws connect with the channel nuts and simultaneously move the slide up or down. This prevents the channel nuts from binding against the channel edges.*

### **Installing the Disc Drive**

Inspect the helium atmosphere system and install the disc drive in the equipment bay as described earlier under “Installation”.

### **Installing the Disc Memory Interface PCAs**

The disc memory interface PCAs are already jumpered when shipped. Before installing them in the computer, consult the “Subsystem Configuration” form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2 (refer to figure 2660-2). The “Subsystem Configuration” form specifies the intended location of the disc memory interface PCAs in the card cage. PCAs are always inserted in the card cage with the component side facing up. Occasionally, installation of the disc memory interface PCAs may require that other PCAs in the card cage be rearranged to make room for them. If that is the case, then the “Subsystem Configuration” form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, connect the ribbon cable between the two disc memory interface PCAs as illustrated in figure 2660-2 and make any necessary polling connections on the backplane of the card cage in accordance with the “Subsystem Configuration” form. Also make sure that the jumper connector is installed on the J3 tab of the Data PCA as illustrated in figure 2660-2.

### **Connecting the Cables**

Connect the various cables between the disc drive, the disc power supply, and the disc memory interface PCAs as described earlier under “Installation”.



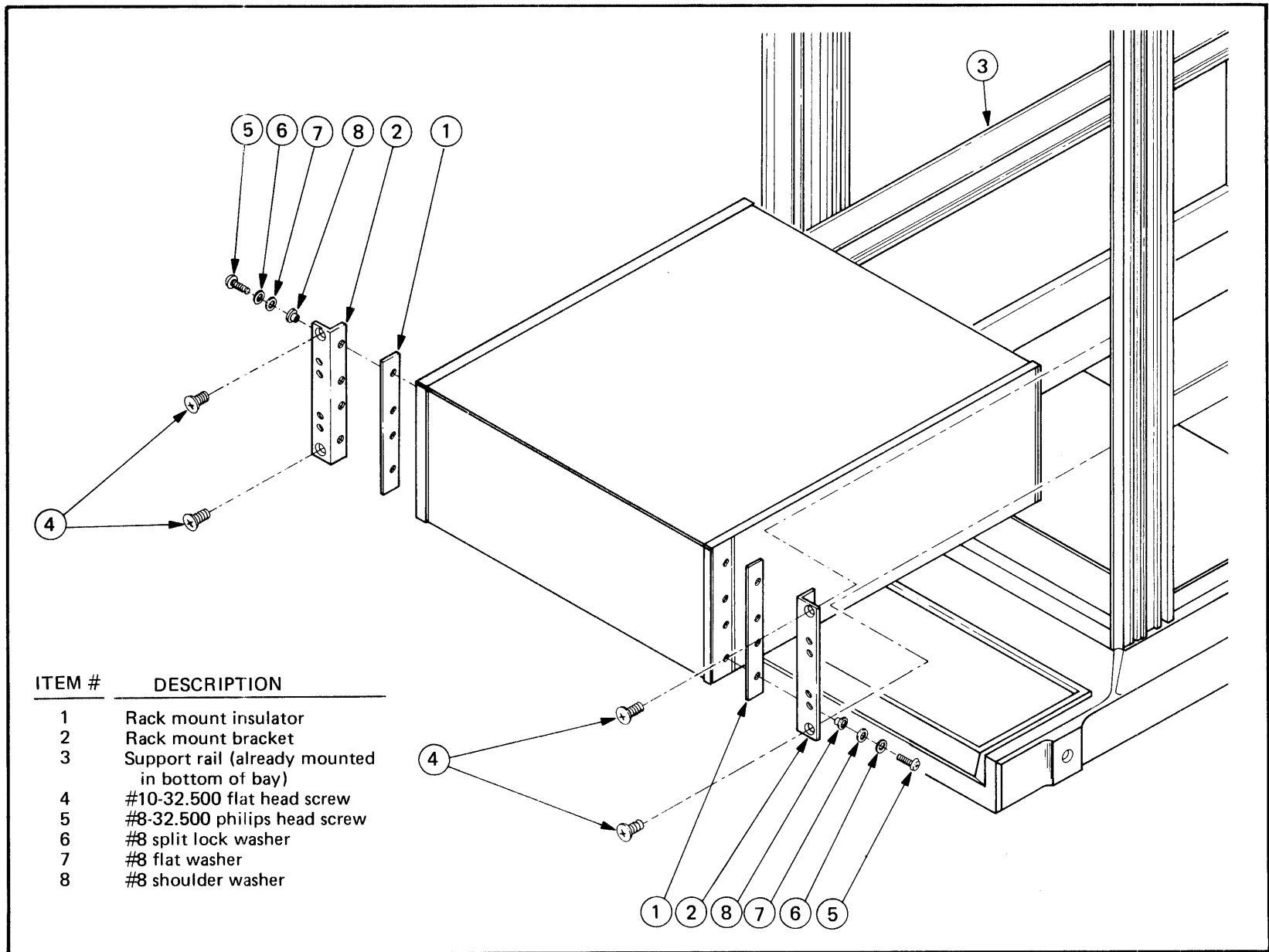


Figure 2660-8. Installing the HP 30325A Disc Power Supply

# **HP 2888A DISC FILE**

## ***(Subsystems HP 30102A and 30102A-010)***

The HP 2888A Disc File is a free-standing mass storage device which uses removable disc packs (IBM 2316 or equivalent). The disc pack has 20 recording surfaces with 406 data tracks on each surface. The maximum data storage capacity of a disc pack is 47.12 million bytes or 23.56 million 16-bit data words. The disc drives are available for use with 208V, 60 Hz, 3 phase power, 230V, 50 Hz, single phase power, or 240V, 60 Hz split phase power.

The disc file controller can control up to eight disc drives. The disc drives are connected to the controller by way of a junction panel located in one of the equipment bays. The junction panel accommodates a maximum of eight drives.

Power is supplied to the disc drives by an HP 30330A Power Control Unit (PCU), no matter which power option is chosen. The only difference from one option to another is the PCU terminal strapping. PCU strapping is described in chapter 2, "CPU Assembly," of this manual. When operating from 208V, 60 Hz, 3 phase power, one PCU is sufficient for up to eight disc drives. When operating from either of the other two power options, however, a single PCU is sufficient for only four disc drives; a second PCU is automatically supplied when a 5th disc drive is delivered. Each PCU has two ac power output terminals (labeled J3 and J4) to which the disc drives are connected. Figure 2888-10 illustrates how the disc drives are "daisy-chain" connected to the PCU; figure 2888-12 illustrates a maximum configuration for all three power options.

### **SUBSYSTEM INVENTORY**

#### **HP 30102A Subsystem**

The HP 30102A Disc File I/O Subsystem (see figure 2888-1) includes the following materials:

- One HP 2888A Disc File
- One HP 30333A Disc Pack
- One HP 30202A Disc File Controller
- One HP 30330A Power Control Unit (PCU)
- One HP 30331A Junction Panel
- One Stand-Alone HP 30102A Disc File Diagnostic, product number 32323A

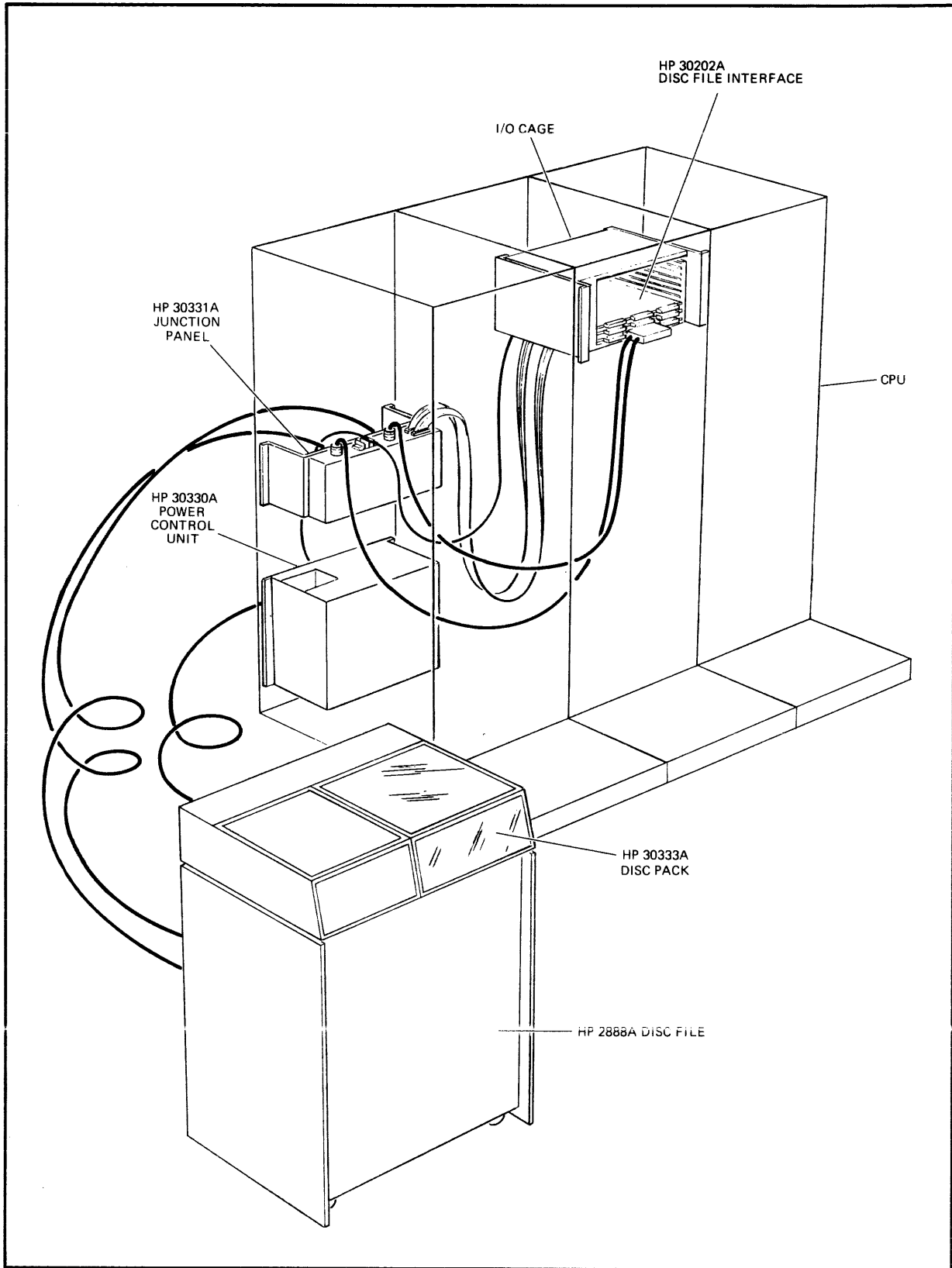


Figure 2888-1. HP 30102A Disc File I/O Subsystem

- One *Stand-Alone HP 30102A Disc File Diagnostic* manual, part number 30102-90004
- One *On-Line HP 30102A Disc File Diagnostic*, product number 32360A
- One *On-Line HP 30102A Disc File Diagnostic* manual, part number 30102-90003
- One *HP 30102A Disc File I/O Subsystem Maintenance Manual*, part number 30102-90001
- One *HP 30330A Power Control Unit Equipment Manual*, part number 30330-90001
- One *HP 30333A Disc Pack Care and Handling Manual*, part number 30333-90001
- One *HP 2888A Disc File Operating and Service Manual*, part number 02888-90001
- One HP 30202-60001 Disc File Read/Write Printed-Circuit Assembly (PCA) Diagram Set 600, part number 30202-90001
- One HP 30202-60002 Disc File Bus PCA Diagram Set 601, part number 30202-90005
- One HP 30202-60003 Disc Controller Processor PCA Diagram Set 602, part number 30202-90006

The HP 30202A Disc File Controller (see figure 2888-2) consists of:

- One Disc File Read/Write PCA, part number 30202-60001
- One Disc File Bus PCA, part number 30202-60002
- One Disc Controller Processor PCA, part number 30202-60003

Unless one of the other two power options was specified in the original computer system order, the HP 30330A PCU is strapped for 208V, 60 hertz, 3 phase operation.

### **HP 30102A-010 Subsystem**

The HP 30102A-010 Disc File I/O Subsystem provides an additional HP 2888A Disc File. This subsystem may be used for adding a 2nd, 3rd, 4th, 5th, 6th, 7th, or 8th disc drive to the computer system. Besides the disc drive, this subsystem includes an HP 30333A Disc Pack and an additional HP 30330A PCU (if needed).

Note that all disc drives attached to a single controller must operate from the same type of power. The disc drive of an HP 30102A-010 Subsystem is designed to operate from whatever type of power was specified in the original computer system order.

### **SPECIFICATIONS**

The pertinent specifications for the HP 2888A Disc File are presented in table 2888-1.

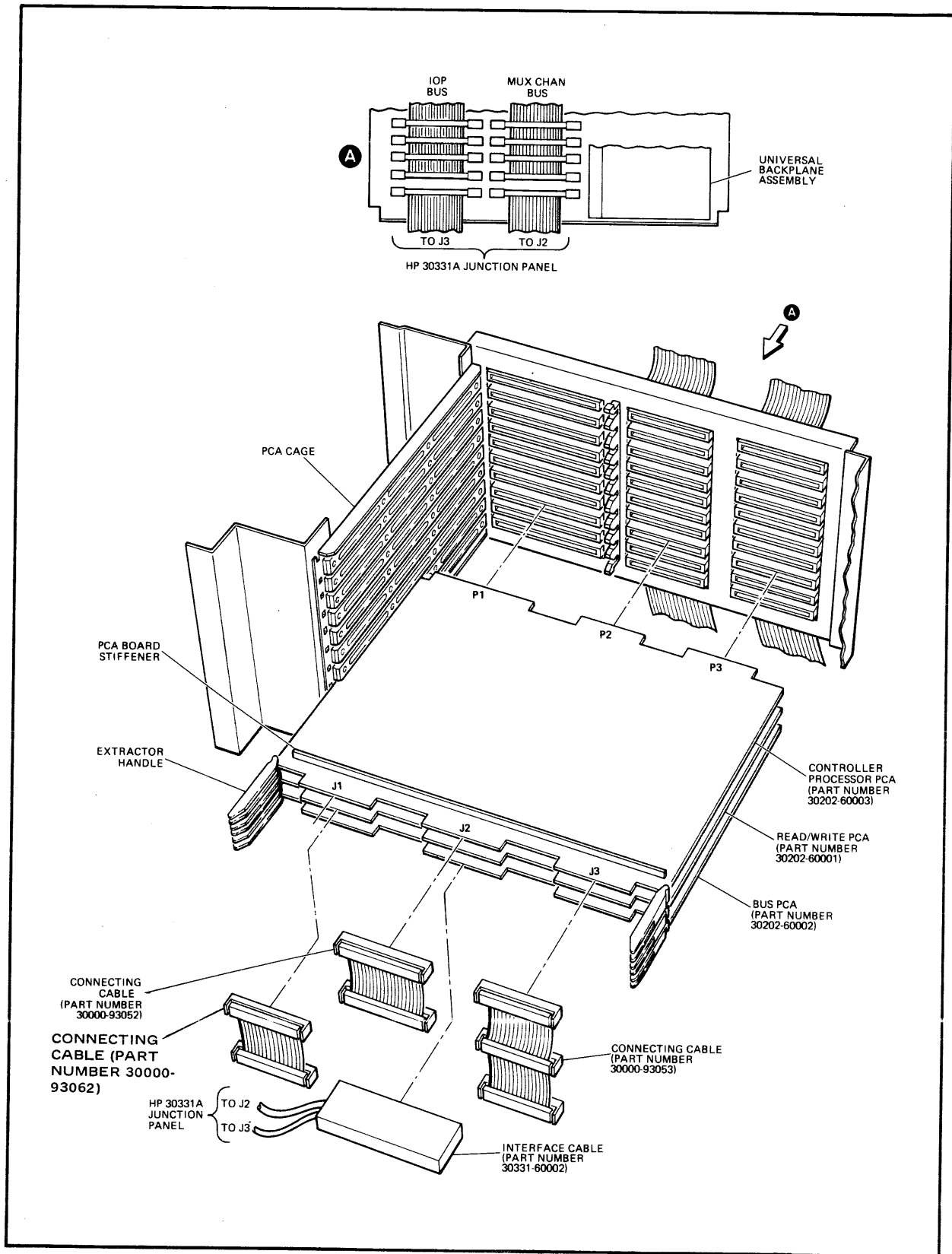


Figure 2888-2. HP 30102A Disc File I/O Subsystem PCA Interface

**Table 2888-1. HP 2888A Specifications**

<b>Interface DC Power Requirements</b>	
+5	-5
14.3	0
+15	-15
.10	.07
+20	-20
0	0
<b>Disc Drive AC Power Requirements</b>	
Voltage:	208V
Current:	6A*
Frequency:	60 Hz
or	230V
or	6A*
or	50 Hz
or	240V
or	6A*
or	60 Hz
*25A surge during start-up	
<b>Heat Dissipation</b>	
Disc Drive:	3500 BTU/hr; 878.5 cal, kg/hr
Interface:	245 BTU/hr; 61.495 cal, kg/hr
<b>Cable Lengths</b>	
Disc Drive AC Power Cable:	8 ft (minimum between units); 2.438 m 54 ft (maximum between units); 16.459 m 100 ft (total maximum for 6 units); 30.48 m
Disc Drive DC Power Cable:	8 ft (minimum); 2.438 m 50 ft (maximum); 15.24 m
Disc Drive Signal Cable:	8 ft (minimum between units); 2.438 m 54 ft (maximum between units); 16.459 m 100 ft (total maximum for 8 units); 30.48 m
<b>Net Weight (Unpacked):</b>	410 lb 185.94 kg
<b>Distributed Over:</b>	5.3 sq in. 34.2 sq cm
<b>Dimensions</b>	
Depth:	24 in.; 61 cm
Width:	30 in.; 76.2 cm
Height:	40 in.; 101.6 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	37.2 cu ft; 1.054 cu m
Net Weight (Packed) of Crates:	510 lb; 231.29 kg

## INSTALLATION

The disc file controller PCAs, the PCU(s), and the junction panel are already mounted in the appropriate equipment bays when the computer system is shipped. The disc drives and the connecting cables are shipped in separate containers.

The disc drive is bolted to a shipping base and packed in a crate when shipped. Remove the crate from the drive, unfasten the bolts holding the drive to the shipping base, and remove the drive from the shipping base. Remove any shipping materials from the disc drive. Retain all materials in case it becomes necessary to repack the disc drive for shipment in the future.

After the bays are fastened together, the various cables must be uncoiled and connected to the appropriate equipment. The necessary cable connections are described in detail under "Drive Cabling" later in this device installation module and are illustrated in figures 2888-1, 2888-2, 2888-10, and 2888-12. In addition, all cable connections are summarized on the "Cable Routing" form in section 1 of the *System Support Log* for the particular computer system.

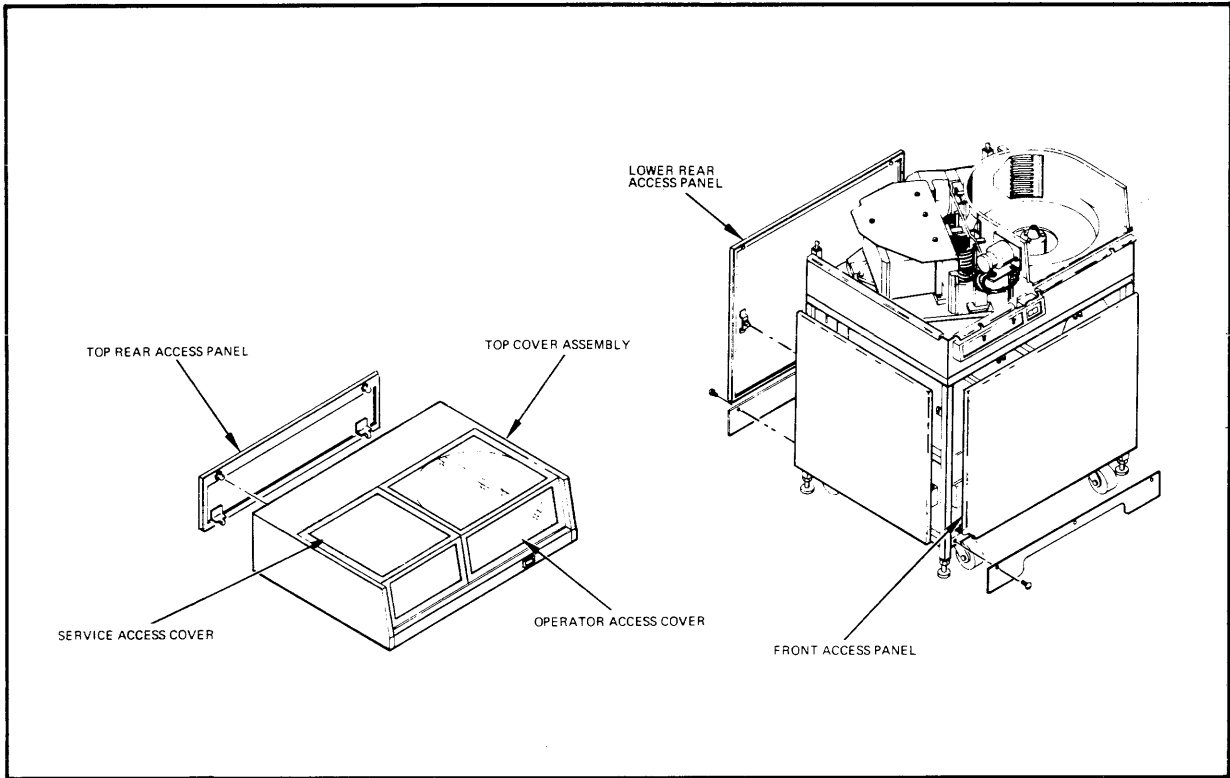
Jumper and polling information for the disc file controller PCAs, as well as the location of the PCAs in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

### Equipment Set-Up

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

The equipment set-up procedure is as follows:

1. Remove the covers for inspection (see figure 2888-3). Remove the front access panel, the lower rear access panel, and the top rear access panel by depressing the latch, grasping the upper edge of the panel, and pulling the panel away from the frame structure. Remove the manual and strapping from inside the panel. Remove the package from inside the rear area. Verify that the package contains two kick plates, six screws, an installation report form, and an identification marking strip.
2. Raise the operator cover and try to manually turn the spindle. If the spindle hold brake is functioning properly, the spindle should lock.
3. Remove the top cover assembly (see figure 2888-3) by pushing the rear retainer clamps forward to unlock the mounting studs at the rear of the cover. From the front, when facing the unit, lift the rear of the assembly to free it from the studs and then slide the assembly forward to remove it from the frame.



**Figure 2888-3. Disc Drive, Service Access Covers**

4. Inspect the internal areas of the unit both above and below the baseplate. Look for loose connections on such items as fuse holders, filters, and screws that may have occurred during shipment. Verify that all screw terminals are tight.
5. Open the electronic gate (see figure 2888-4) and check all printed-wiring assemblies (PWAs) and paddle boards to ensure that all are securely seated in their respective sockets.
6. Remove the carriage lock, the air deflector, the EMA shield, and then unload the torsion rods.
7. Push the heads out of the cams. Move the carriage back and forth and check for freedom of movement.
8. Check the primary and secondary gratings on the carriage assembly and access transducer (below and behind the read/write heads; see figures 2888-5, 2888-6, and 2888-7) for cracks, obstructions, or other irregularities.
9. Move the heads back on the cam tower and reload the torsion rods.
10. Check the cam-follower surface of each head-arm assembly to verify that the arms are properly engaged with the cams on the cam tower.
11. Check the position of the torsion rods on the head-arm assemblies for proper contact with the load button of the read/write heads.
12. Replace the EMA shield and the air deflector.



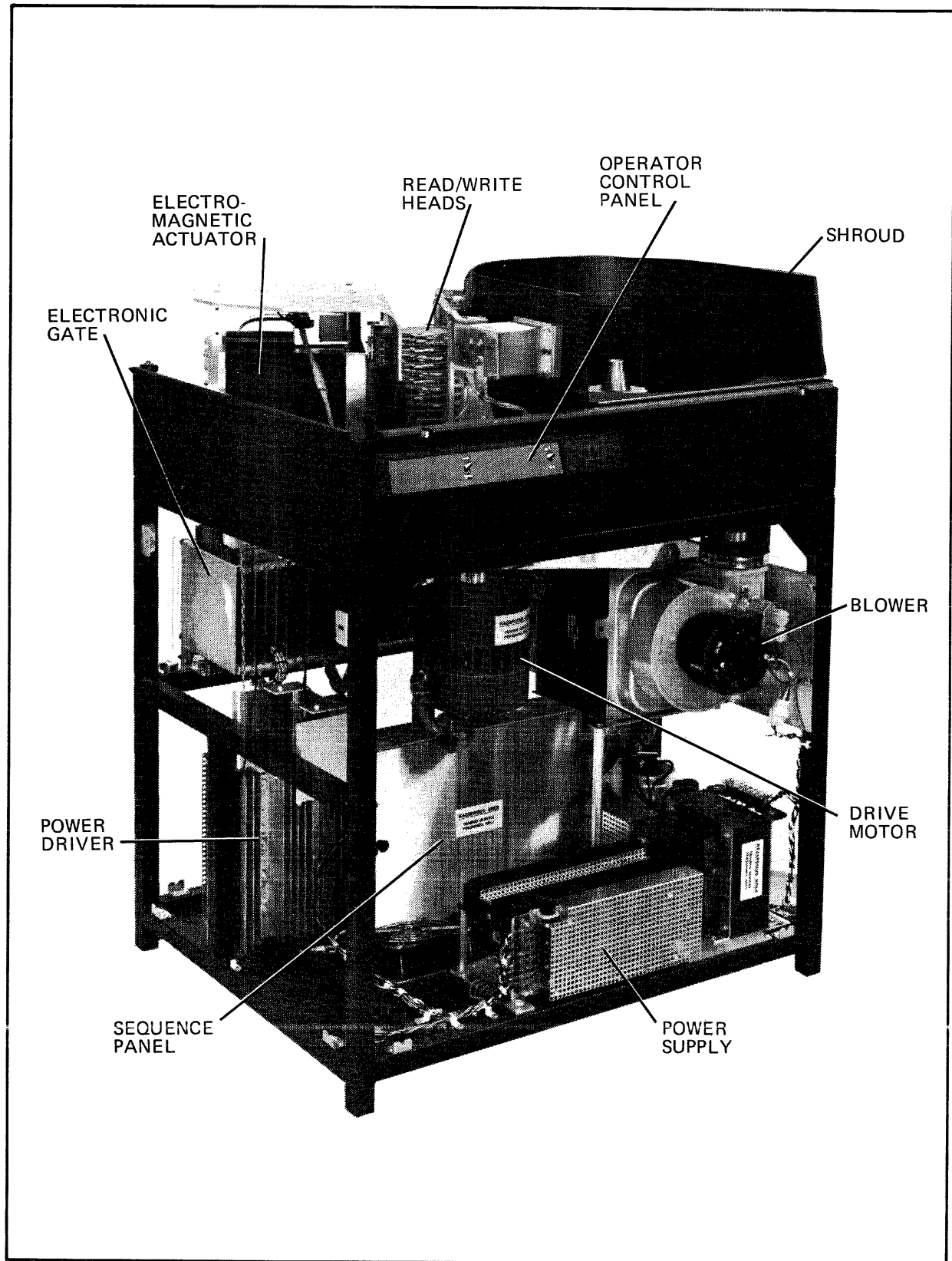


Figure 2888-4. Disc Drive, Front View With Covers Removed

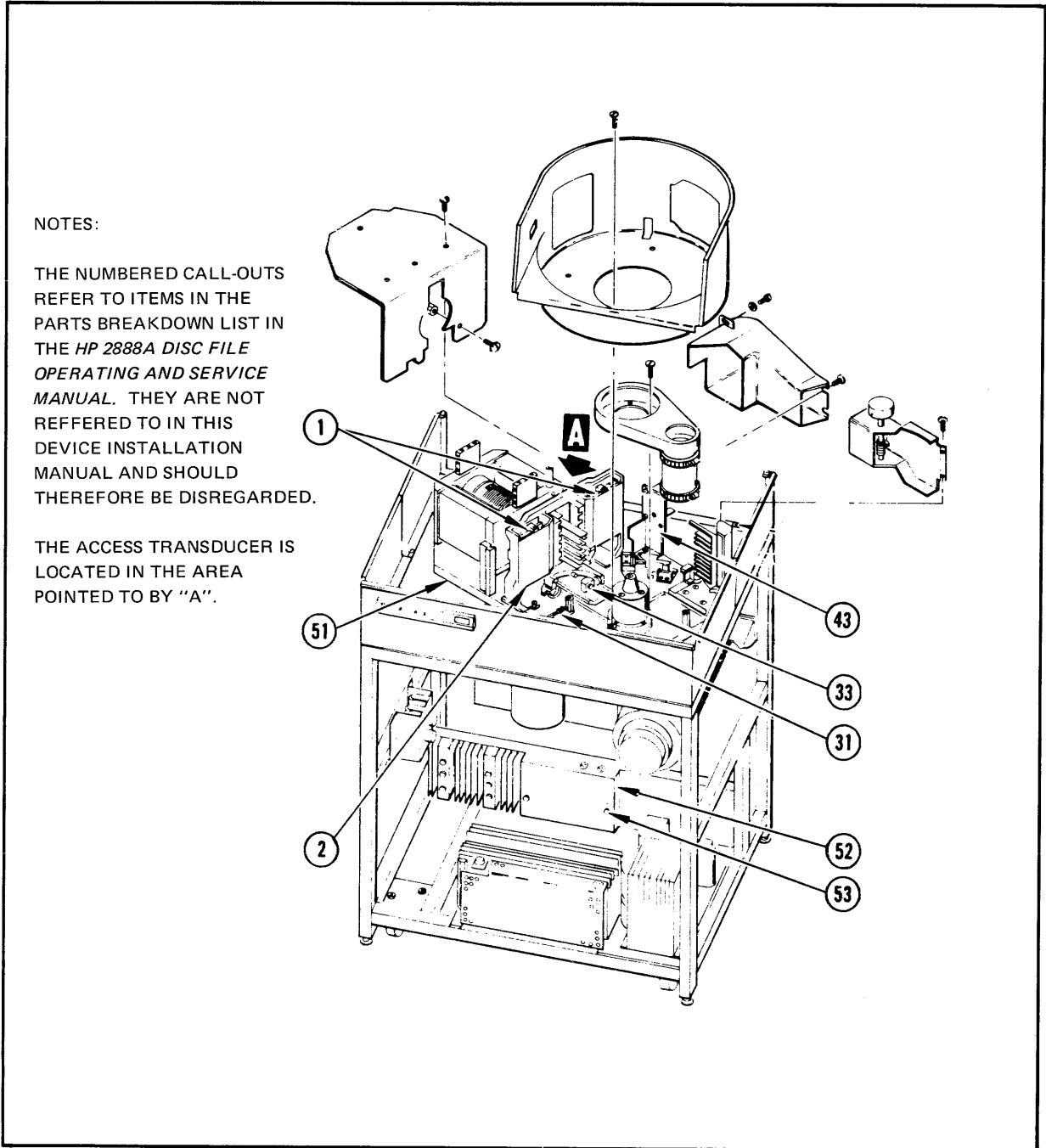


Figure 2888-5. Disc Drive (Front View), Parts Breakdown Diagram

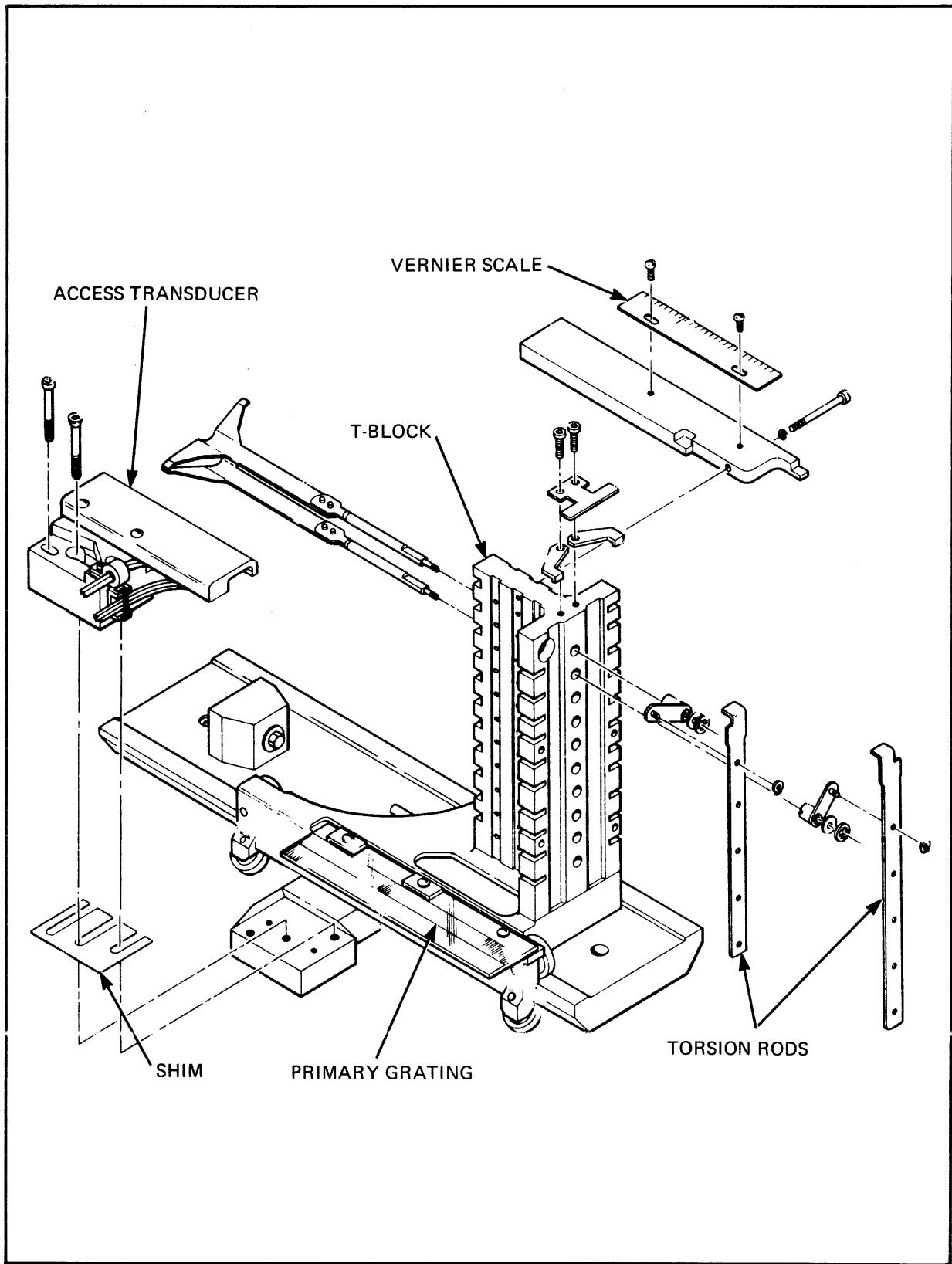


Figure 2888-6. Carriage Assembly, Parts Breakdown Diagram

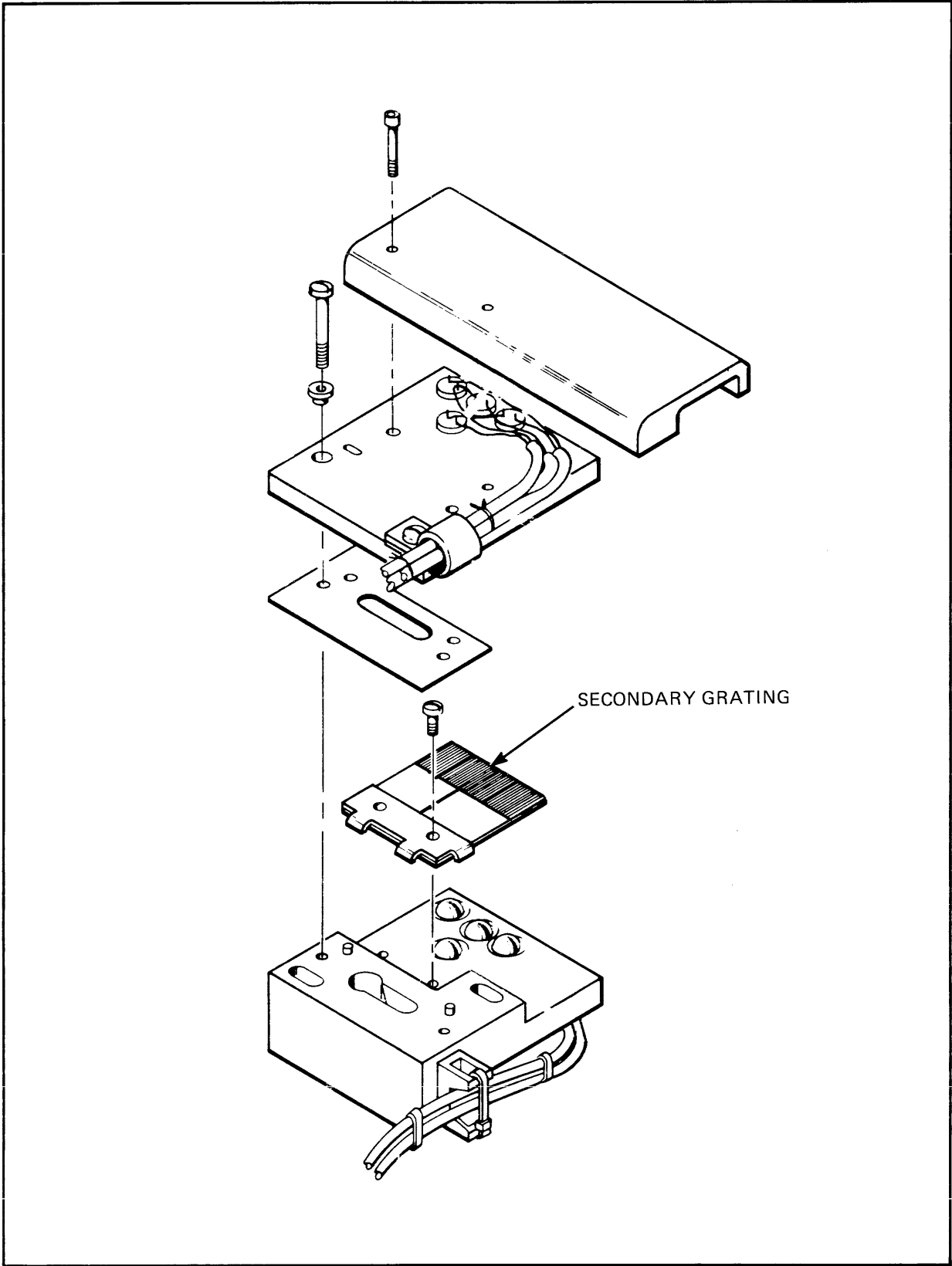


Figure 2888-7. Access Transducer, Parts Breakdown Diagram

13. Check the positioning of the matrix PWAs on the cam tower for proper seating in their sockets. Also make sure that all head plugs are properly seated.
14. Check the drive belt assembly and the spindle by manually turning the spindle to verify that it spins freely.
15. Check the electromagnetic actuator coil resistance across terminals 15 and 16 of PD1 on the rear of the power driver (see figures 2888-4 and 2888-8) to ensure that no shorts or opens exist and to verify that resistance is within 2.0 to 2.5 ohms.
16. Check the pivot action of the index transducer by pressing the white index transducer pushrod on top of the air deflector (see figure 2888-9) and verify that the transducer pivots out of the shroud area.
17. Replace all covers. Roll the disc to its intended location and position it in place. Level the drive by lowering the four leveler jacks to remove all weight from the casters. The jacks should be adjusted so that the top of the drive is even with the tops of the other disc drives in the system.
18. Wipe all exterior covers using Kimwipes Hi-Count Disposable Wipers (Type 900-S, Stock Number 3415) dampened with 90% isopropyl alcohol.

### Drive Cabling

Input to each disc drive is by three cables: the ac power cable, the dc cable, and the signal cable. The disc drives are "daisy chain" connected to the ac power cable string as illustrated in figure 2888-10 (J3 of PCU to AC IN of first drive, AC OUT of first drive to AC IN of second drive, etc.). A separate dc cable is connected between the junction panel and each individual disc drive (see figure 2888-10). The disc drives are "daisy chain" connected to the signal cable string as illustrated in figure 2888-10 (J1 of junction panel to SIGNAL IN of first drive, SIGNAL OUT of first drive to SIGNAL IN of second drive, etc.). The last disc drive in the series must have a signal terminator connected to its SIGNAL OUT receptacle.

The maximum length of each dc cable is 50 feet. Both the ac power cable and the signal cable are limited to a maximum accumulated length of 100 feet. The ac and signal cables are available in individual lengths of 8 to 54 feet, while the dc cables are available in lengths of 8 to 50 feet. The cable and terminator ISS part numbers are shown in table 2888-2.

**Table 2888-2. Cable and Connector Part Numbers**

ISS PART NUMBER	DESCRIPTION
84000694-X*	CABLE ASSY, AC INTERCONNECTING (60 Hz)
84003770-X*	CABLE ASSY, AC INTERCONNECTING (50 Hz)
84000729-X*	CABLE ASSY, DC INTERCONNECTING
83003857-X*	CABLE ASSY, SIGNAL INTERCONNECTING (50 Hz)
83003856-X*	CABLE ASSY, SIGNAL INTERCONNECTING (60 Hz)
84000731-X*	CABLE ASSY, SIGNAL EXIT
76000696-5	TERMINATOR ASSY

\*Cable length in feet is designated by dash numbers from 8 to 54. Tolerance on cable length 8 to 30 feet is  $\pm 4$  inches, 31 to 54 feet is  $\pm 8$  inches.

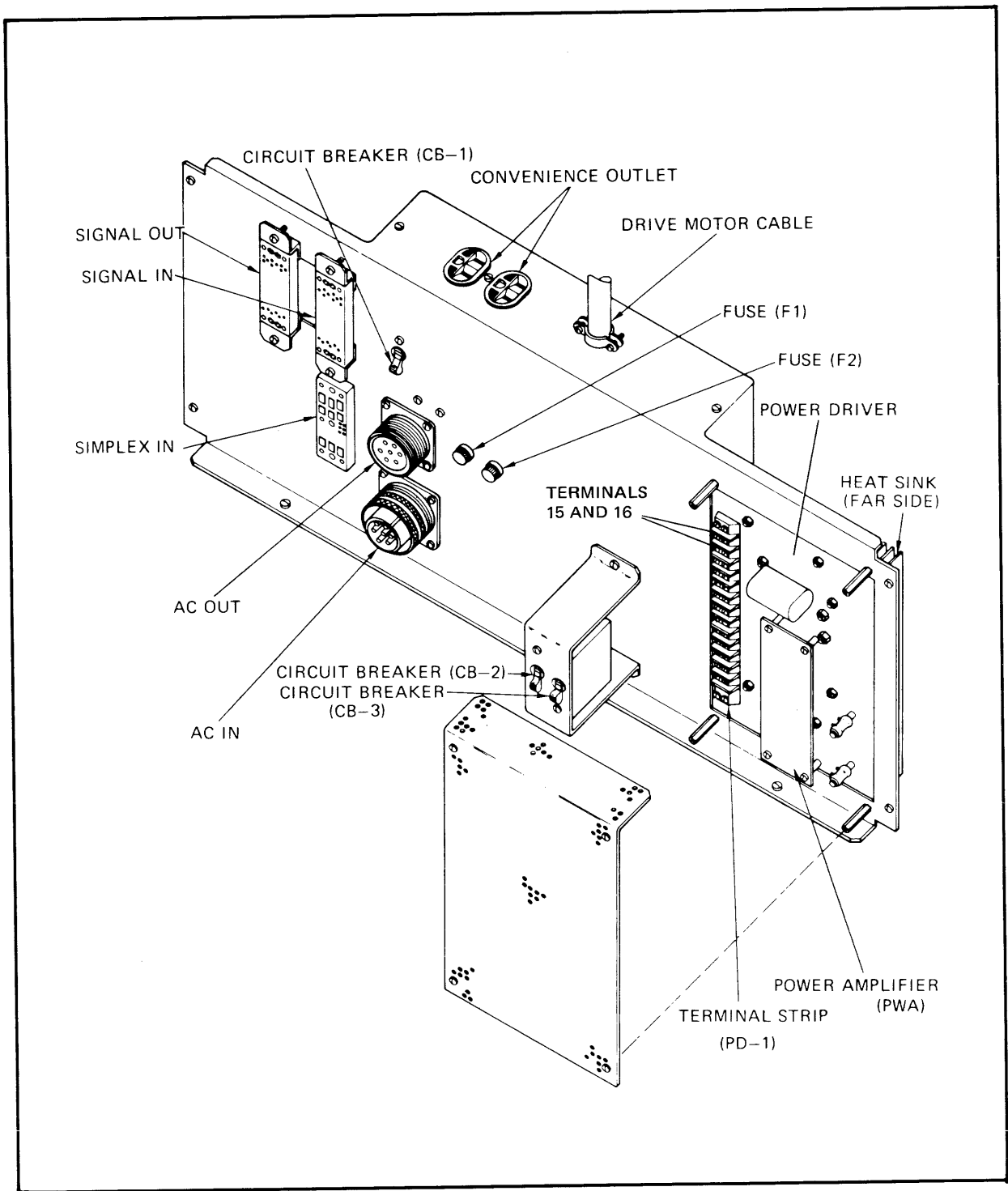
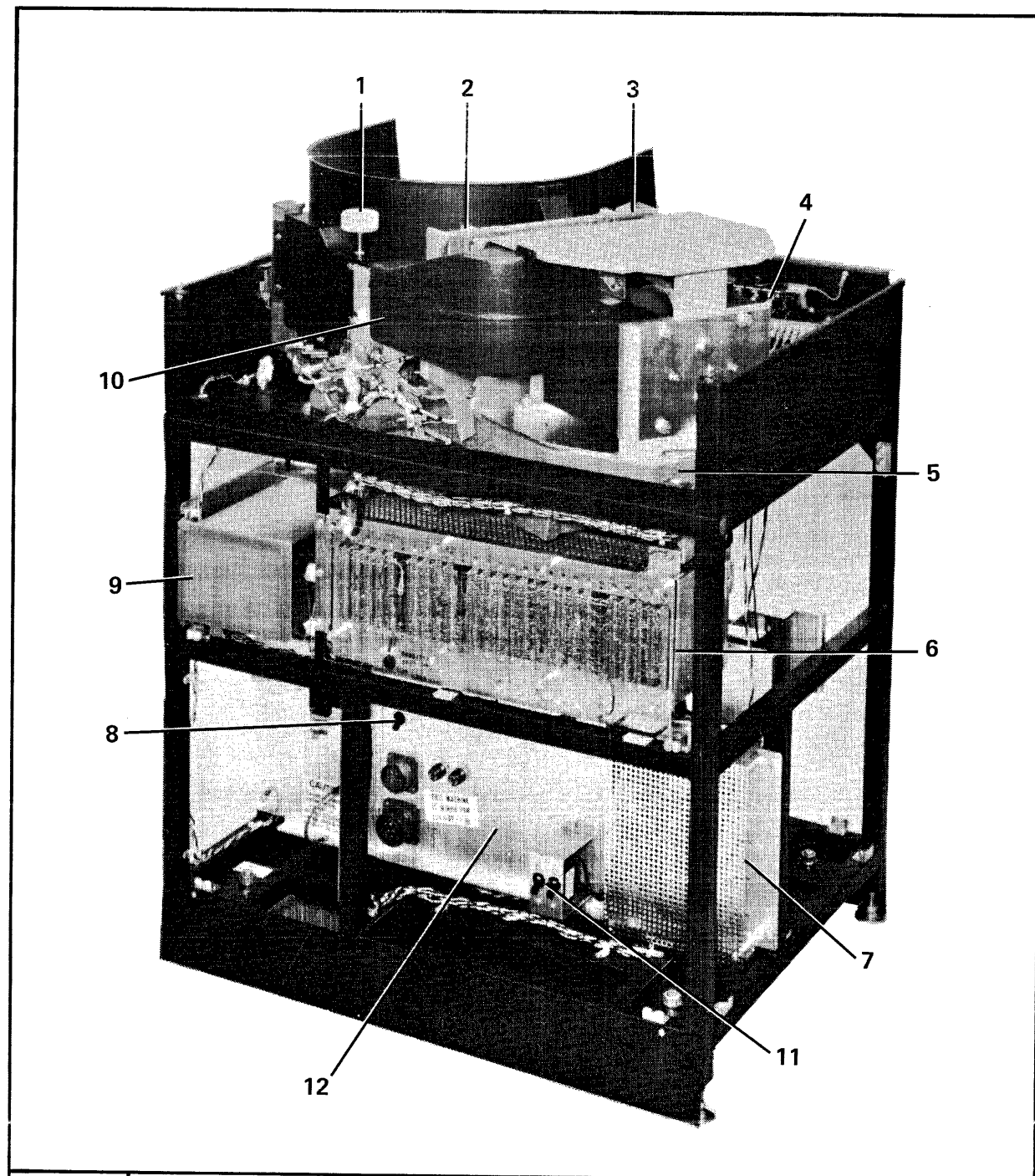


Figure 2888-8. Sequence Panel and Power Driver Details



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	INDEX TRANSDUCER PUSH ROD	7	POWER DRIVER
2	A MATRIX PWA	8	CB1
3	B MATRIX PWA	9	EXTERIOR PREFILTER
4	INDICATOR LAMPS	10	AIR DEFLECTOR
5	BASEPLATE	11	CB2 AND CB3
6	ELECTRONIC GATE	12	SEQUENCE PANEL

Figure 2888-9. Disc Drive, Rear View With Covers Removed

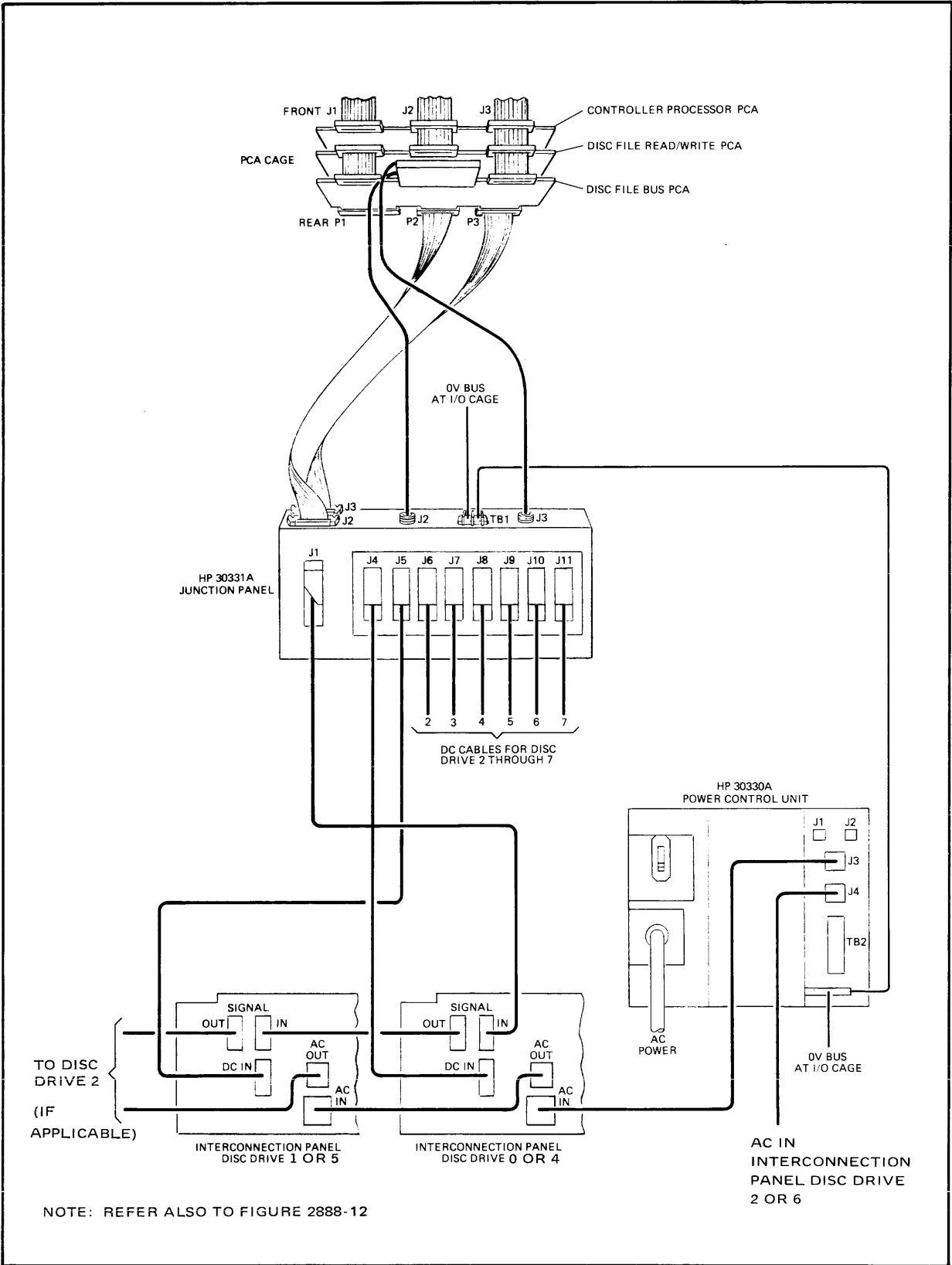


Figure 2888-10. HP 30102A Disc File I/O Subsystem Cabling



## Preoperational Checkout/Adjustments

**POWER SUPPLY VOLTAGE CHECK.** The disc drive dc voltages must be within the required ranges. Place the circuit breaker CB1 to ON (leave CB2 and CB3 off). The circuit breakers are located on the sequence panel (see figures 2888-9 and 2888-8). Verify that both exhaust fans start up. Check the dc voltage levels on the rear of the electronic gate (see figure 2888-4) at the points shown in figures 2888-11.

*Note: Oscilloscopes or meters used in the field for maintenance of equipment must bear evidence of current calibration. Meter readings must be accurate within  $\pm 1\%$  of full scale deflection; oscilloscopes, within  $\pm 3\%$ ; see 5.3.2 in the HP 2888A Disc File Operating and Service Manual for additional specifications.*

**HOLD REVERSE CURRENT CHECK.** The drive is shipped with a carriage lock that restricts forward carriage motion when the drive is transported. The carriage lock is fastened to the top front of the electromagnetic actuator cover (see figure 2888-4). *Do not remove the carriage lock to perform this check.*

*Note: The carriage lock should permit the carriage to retract sufficiently to actuate the HEADS EXTENDED switch. If it does not, CB3 will trip when step 4 of the procedure is performed.*

Perform the check as follows:

1. Manually check the carriage to determine that enough reverse motion travel is possible to actuate the HEADS EXTENDED switch (if the switch is activated, an audible click can be heard).
2. Install a disc pack on the drive.
3. Place CB1 to the OFF position. Ensure that the carriage lock is in place, then manually move the carriage forward from the retracted position so that it rests against the carriage lock.
4. Place CB2 and CB3 to the ON position, then place CB1 to the ON position. Check for presence of the Hold Reverse current by verifying that the carriage moves backward against the rear stop.
5. Place CB1, CB2, and CB3 to the OFF position after completing this check.
6. Remove the carriage lock to free the carriage. The lock should be retained for reinstallation prior to future relocation or shipment of the unit. A tapped hole is provided on the terminal strip mounting block behind the control panel for carriage lock storage.

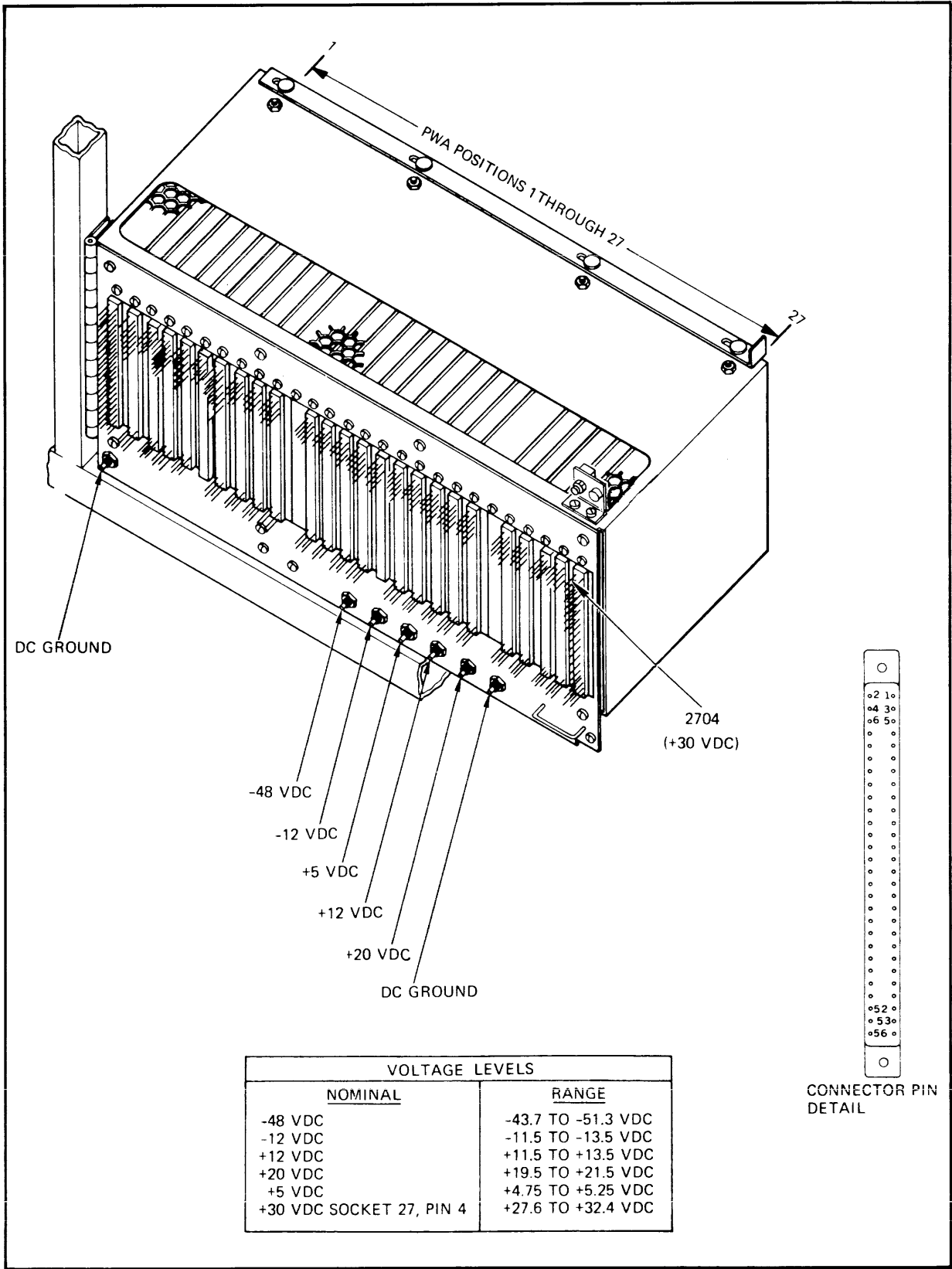


Figure 2888-11. Electronic Gate, Voltage Points

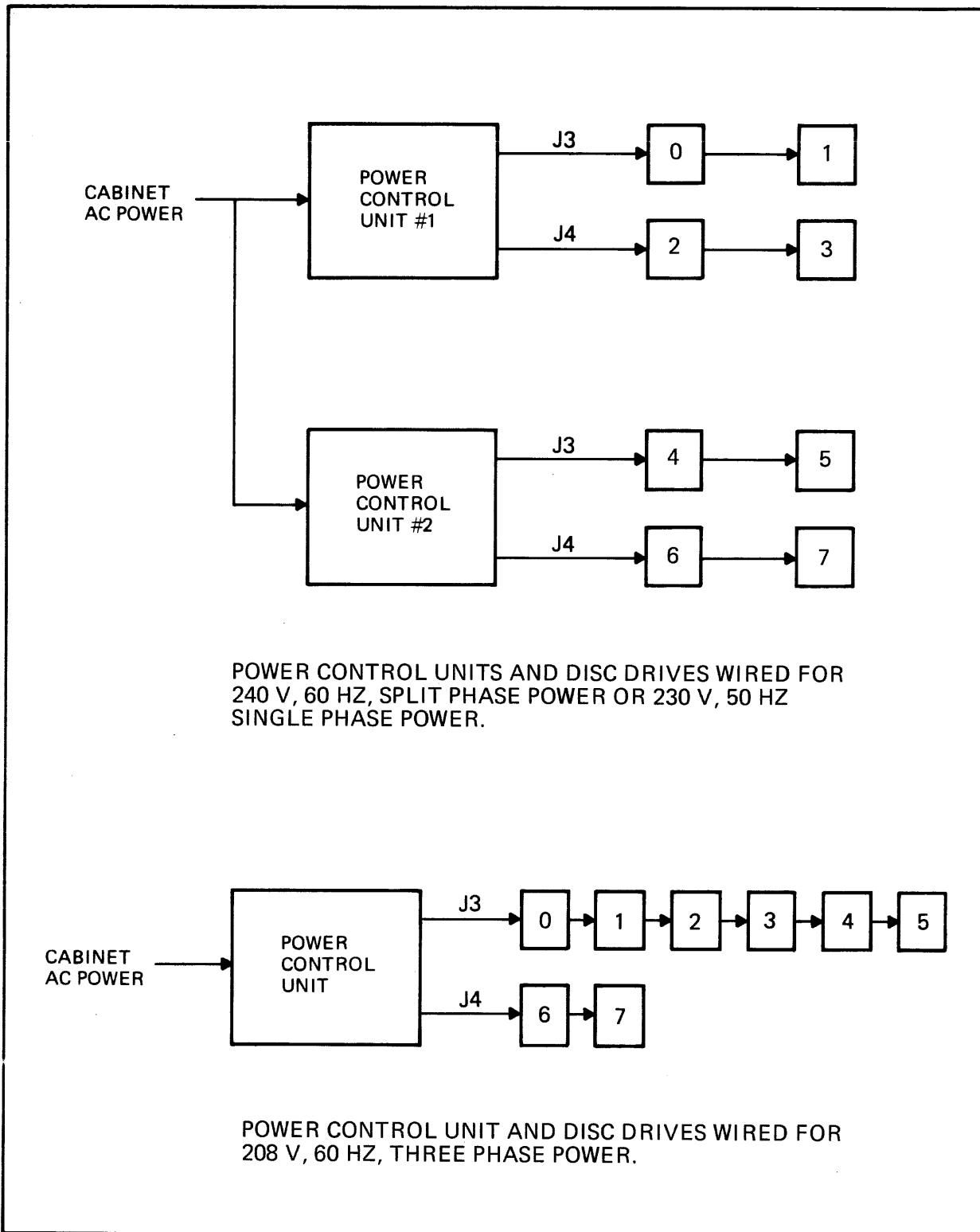


Figure 2888-12. HP 2888A Disc File Power Configurations

## Functional Checks

Drive functional checks are performed with the disc drive disconnected from the junction panel.

If the drive has been stored or exposed to extreme high or low temperatures just prior to positioning at the facility, allow the drive to stand for approximately six hours at facility environment to reach thermal equilibrium before performing the functional checkout.

**HEAD LOAD CHECK.** Perform the check as follows:

1. Install a disc pack on the drive.
2. Set CB2 and CB3 to the ON position and then turn the master power circuit breaker (CB1) to the ON position. Set the START/STOP switch on the disc drive control panel to the START position and look for the following functions as the disc drive cycles through the power-on sequence.
  - a. Drive motor starts.
  - b. Brushes cycle into and out of the disc pack.
  - c. Carriage moves forward to load the heads, then returns to cylinder 000 (the outermost cylinder).
  - d. FILE READY indicator light illuminates.

*Note: Refer to chapter 7 of the HP 2888A Disc File Operating and Service Manual for select lock troubleshooting procedures if a SELECT LOCK condition occurs.*

3. Set the START/STOP switch on the disc drive control panel to the STOP position and make sure that the dynamic brake operates properly (the disc pack should stop rotating within 25 seconds). Refer to chapter 7 of the *HP 2888A Disc File Operating and Service Manual* troubleshooting charts if the dynamic brake is malfunctioning.

**DRIVE MOTOR START-INHIBIT CHECK.** Perform the check as follows:

1. Install a disc pack on the drive.
2. Set the START/STOP switch on the disc drive control panel to the START position. As soon as the brushes begin to enter the pack, set the START/STOP switch to the STOP position and then return the switch to the START position.
3. Observe the action of brush cycling to verify that power to the drive motor is disabled until the brushes return to the stored position. Also, the drive motor should start automatically when the brushes are fully retracted (thus resulting in another brush cycle and head loading).
4. Set the START/STOP switch to the STOP position after this check is finished.

**READ/WRITE HEAD ALIGNMENT.** The read/write heads must be aligned when the disc drive is installed. Perform head alignment check and adjustment in accordance with the procedures in chapter 6 of the *HP 2888A Disc File Operating and Service Manual*. Note that approximately two hours warm-up is required before adjusting the heads.

**POWER-ON, DRIVE-START, SEQUENCE CHECK.** This check must be performed with the disc drive on-line. The check procedure verifies that the installed drive can be stopped and restarted along with the other disc drives in the computer system. Perform the check as follows:

1. Make sure that the system power is off and that disc packs are installed on all the drives. Set all the disc drive START/STOP switches to the START position and then turn on the system power. All disc drive motors should turn on (in ascending sequence) and the brush cycle should start on all drives.
2. Power down the PCU. The disc drive motors will all stop when the PCU has been powered down.
3. Check each drive to verify that the heads are retracted from the disc pack.

## DIAGNOSTIC PROGRAMS

The Stand-Alone HP 30102A Disc File Diagnostic and the On-Line HP 30102A Disc File Diagnostic verify the proper operation of the disc drive(s). The operating instructions for each are described in the associated manuals (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30102A or 30102A-010 Disc File I/O Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation.

The add-on procedure comprises the following general steps:

1. Uncrating the shipment.
2. Installing the disc file controller PCAs. *This step is necessary only when the existing computer system does not already include at least one HP 2888A Disc File.*
3. Installing an HP 30330A PCU. *This step is necessary only when the existing computer system does not already include at least one HP 2888A Disc File or when the add-on disc drive increases the total number of HP 2888A Disc Files in the computer system beyond four.*
4. Installing the junction panel. *This step is necessary only when the existing computer system does not already include at least one HP 2888A Disc File.*

5. Connecting the cables between the PCAs, the junction panel, the PCU, and the disc drive(s).
6. Performing the set-up and check-out procedures for the disc drive(s).

The uncrating procedure for the disc drive is described earlier under “Installation”.

The disc file controller PCAs are already jumpered when shipped. Before installing them in the computer, consult the “Subsystem Configuration” form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The “Subsystem Configuration” form specifies the intended location of the disc file controller PCAs in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the disc file controller PCAs may require that other PCAs in the card cage be rearranged to make room for them. If that is the case, then the “Subsystem Configuration” form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the “Subsystem Configuration” form.

If an HP 30330A PCU must be installed, the “HP 3000 Racking Diagram” shows the intended location of the PCU as well as the new location of anything which must be moved to make room for it. The procedure for installing a PCU is described in chapter 2, “CPU Assembly,” of this manual.

If an HP 30331A Junction Panel must be installed, the “HP 3000 Racking Diagram” shows the intended location of the panel as well as the new location of anything which must be moved to make room for it. The screws which secure the particular module cover will also be used for securing the panel. To install the panel, remove the module cover and the associated latch bracket from the front of the bay. While holding the panel in its intended location, replace the module cover and latch bracket, sandwiching the panel between the module cover, the latch bracket, and the mounting strips.

Connect the various cables between the PCAs, the junction panel, the PCU, and the disc drive(s) as illustrated in figures 2888-1, 2888-2, and 2888-10. The necessary cabling is described in detail earlier under “Installation”. All cable connections are summarized on the “Cable Routing” form.

Perform the equipment set-up, preoperational checkout/adjustments, and functional checks procedures described earlier under “Installation”.

# HP 7900A DISC DRIVE

## *(Subsystems HP 30110A and 30110A-010)*

The HP 7900A Disc Drive is a rack-mounted, moving-head disc drive which uses a pair of disc platters: a permanently installed platter and a removable cartridge. The disc drive is available in two models: the 7900A and the 7900A-001. The 7900A is designed to operate from 60 hertz power and the 7900A-001 is designed to operate from 50 hertz power. Each disc drive requires a rack-mounted power supply unit. The HP 13215A Disc Power Supply is designed to operate from 60 hertz power and the HP 13215A-001 Disc Power Supply is designed to operate from 50 hertz power. The ac voltage required by the disc drive (115V) is provided by the disc power supply. Strapping in the disc power supply allows the use of the unit with either 120V ( $\pm 10\%$ ) or 230V ( $\pm 10\%$ ) input power. The strapping is described in table 7900-3 and figures 7900-1 through 7900-4.

The cartridge disc interface can control up to four disc drives. The interface, the disc drives, and the disc drive power supplies are already mounted in the equipment bay when the computer system is delivered.

### SUBSYSTEM INVENTORY

#### HP 30110A Subsystem

The HP 30110A Cartridge Disc Subsystem includes the following materials:

- One HP 7900A or 7900A-001 Disc Drive
- One HP 13215A or 13215A-001 Disc Power Supply
- One HP 30210A Cartridge Disc Interface
- One HP 30334A Disc Cartridge
- One *HP 7900A Disc Drive Operating and Service Manual*, part number 07900-90002
- One *HP 13215A Disc Power Supply Operating and Service Manual*, part number 13215-90003
- One *HP 30110A Cartridge Disc Subsystem Maintenance Manual*, part number 30110-90001
- One Stand-Alone HP 30110A Cartridge Disc Diagnostic, product number 32324B
- One *Stand-Alone HP 30110A Cartridge Disc Diagnostic manual*, part number 30110-90004

- One On-Line HP 30110A Cartridge Disc Diagnostic, product number 32361A
- One *On-Line HP 30110A Cartridge Disc Diagnostic* manual, part number 30110-90003

The Cartridge Disc Interface consists of:

- One Controller Processor Printed-Circuit Assembly (PCA), part number 30202-60003
- One Disc Controller PCA, part number 30210-60001
- Two 1-1/2-inch (38 mm) Connecting Cables, part number 30000-93052
- One 15-foot (4.56 m) Interconnecting Cable, part number 30210-60002

### HP 30110A-010 Subsystem

The HP 30110A-010 Cartridge Disc Subsystem adds one HP 7900A (or 7900A-001) Disc Drive and an HP 30334A Disc Cartridge to the computer system. With an HP 30110A subsystem already installed, an HP 30110A-010 subsystem may be added up to three times (total of four disc drives on one cartridge disc controller).

An HP 30110A-010 Subsystem includes the following materials:

- One HP 7900A or 7900A-001 Disc Drive
- One HP 13215A or 13215A-001 Disc Power Supply
- One HP 30334A Disc Cartridge
- One HP 13212A Multiunit Cable (W2), part number 07900-60034
- One *HP 7900A Disc Drive Operating and Service Manual*, part number 07900-90002
- One *HP 13215A Disc Power Supply Operating and Service Manual*, part number 13215-90003

### SPECIFICATIONS

The pertinent specifications for the HP 7900A (or 7900A-001) Disc Drive and the HP 13215A (or 13215A-001) Disc Power Supply are presented in tables 7900-1 and 7900-2, respectively.

### INSTALLATION

The disc drive, disc power supply, and cartridge disc interface PCAs are already installed in the appropriate equipment bays when the computer system is shipped. The interconnecting cable is connected to the disc controller PCA and coiled inside the bay. The disc drive and its power supply are usually installed in the same bay, in which case the necessary cables are already connected between the two units. After the bays are fastened together the interconnecting cable must be uncoiled



**Table 7900-1. HP 7900A Specifications**

<b>Disc Drive DC Power Requirements</b>													
<table border="1"> <tr> <td>+5</td> <td>+12</td> <td>-12</td> <td>+24</td> <td>-24</td> </tr> <tr> <td>4.5</td> <td>1.3</td> <td>1.0</td> <td>4.0</td> <td>4.0</td> </tr> </table>	+5	+12	-12	+24	-24	4.5	1.3	1.0	4.0	4.0			
+5	+12	-12	+24	-24									
4.5	1.3	1.0	4.0	4.0									
<b>Interface DC Power Requirements</b>													
<table border="1"> <tr> <td>+5</td> <td>-5</td> <td>+15</td> <td>-15</td> <td>+20</td> <td>-20</td> </tr> <tr> <td>9.9</td> <td>.06</td> <td>.10</td> <td>.08</td> <td>0</td> <td>0</td> </tr> </table>	+5	-5	+15	-15	+20	-20	9.9	.06	.10	.08	0	0	
+5	-5	+15	-15	+20	-20								
9.9	.06	.10	.08	0	0								
<b>Disc Drive AC Power Requirements</b>													
Voltage:	115V (supplied by the HP 13215A).												
Current:	(included in the "Current" specification in table 7900-2).												
Frequency:	50 or 60 Hz												
<b>Heat Dissipation</b>													
Disc Drive:	180 BTU/hr; 45.18 cal, kg/hr												
<b>Cable Lengths</b>													
Disc Drive AC Cable:	8 ft; 2.438 m												
Disc Drive DC Cable:	8 ft; 2.438 m												
Interconnecting Cable:	15 ft (to first drive); 4.57 m 50 ft (maximum to first drive); 15.24 m 20 ft (between disc drives); 6.096 m 110 ft (total maximum for 4 drives); 33.528 m												
<b>Net Weight (Unpacked):</b>	117 lb 53.06 kg												
<b>Distributed Over:</b>	n.a. (rack-mounted)												
<b>Dimensions</b>													
Depth:	25-5/8 in.; 65.1 cm												
Width:	19 in.; 48.3 cm												
Height:	10-1/2 in.; 26.7 cm												
<b>Shipping Information</b>													
Number of Crates:	1												
Size of Crates:	16.464 cu ft; .4663 cu m												
Net Weight (Packed) of Crates:	160 lb; 72.56 kg												

**Table 7900-2. HP 13215A Specifications**

<b>AC Power Requirements</b>				
Voltage:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td style="padding: 2px 10px;">120V</td></tr> <tr><td style="padding: 2px 10px;">3.4A</td></tr> <tr><td style="padding: 2px 10px;">60 Hz</td></tr> </table> or $\left[ \begin{array}{c} 230V \\ 1.7A \\ 50\text{ Hz} \end{array} \right]$	120V	3.4A	60 Hz
120V				
3.4A				
60 Hz				
Current:				
Frequency:				
<b>Heat Dissipation:</b> 1400 BTU/hr; 351.4 cal, kg/hr				
<b>Cable Lengths</b>				
AC Power Cord: 15 ft; 4.57 m				
<b>Net Weight (Unpacked):</b> 55 lb 24.94 kg	<b>Distributed Over:</b> n.a. (rack-mounted)			
<b>Dimensions</b>				
Depth:	19-3/4 in.; 50.2 cm			
Width:	16-3/4 in.; 42.6 cm			
Height:	7 in.; 17.8 cm			
<b>Shipping Information</b>				
Number of Crates:	1			
Size of Crates:	3.99 cu ft; .113 cu m			
Net Weight (Packed) of Crates:	65 lb; 29.478 kg			

and the loose end must be connected to connector XA17 on the back of the first disc drive in the configuration. The necessary cabling is discussed in detail as a separate topic below. In addition, the cable connections are summarized on the "Cable Routing" form in section 1 of the *System Support Log* for the particular computer system.

Jumper and polling information for the cartridge disc PCAs, as well as the location of the PCAs in the equipment bay, are described on the "Subsystem Configuration" form in section 1 of the *System Support Log*. Using the "Subsystem Configuration" form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

## Cabling

A 7900A connects to its power supply as illustrated in figure 7900-5. Figure 7900-6 shows the back of the power supply. Tables 7900-5 and 7900-6 show the cable connections in terms of color-coded wires. The disc power supply must be connected to the appropriate service strip in the equipment bay.

The first disc drive is connected to the cartridge disc interface by means of an interconnecting cable as illustrated in figure 7900-17. The hooded end of the interconnecting cable attaches to J1 of the disc controller PCA and the other end of the cable attaches to connector XA17 on the disc drive. If there is a second disc drive in the computer system, a multiunit cable must be attached to connector XA16/20 of the first disc drive and to connector XA17 of the second disc drive. The same applies to the second and third, and third and fourth disc drives (if present). The final disc drive in the series must have a termination assembly A20 attached to connector XA16/20.

## Drive Identification

*Note: The drive identification strapping is done at the factory before the computer system is shipped. Using the following information, examine the strapping and verify that it was done correctly.*

Located on the Input/Output Multiplex Assembly A7 PCA in each disc drive are three jacks (J1, J2, and J3). Strap J1 to specify the proper disc drive number (0, 1, 2, and 3) and strap J2 and J3 according to the notes in the upper right corner of the Input/Output Multiplex Assembly A7 schematic on page 5-35 of the *HP 7900A Disc Drive Operating and Service Manual*.

*Note: The first HP 7900A Disc Drive in each configuration must always be assigned the number 0. The remaining numbers (1, 2, and 3) may be assigned without regard to sequence.*

**Caution: Do not assign the same number to two or more disc drives.**

## Disc Power Supply Strapping

The HP 13215A Disc Power Supply strapping is described in table 7900-3 and figures 7900-1 through 7900-4.

**Table 7900-3. HP 13215A Disc Power Supply Strapping**

<b>STRAPPING FOR 100V ±10%, 50/60 Hz (see figure 7900-1)</b>		
<b>TB1 Pin</b>	<b>Voltage</b>	<b>Description</b>
5 & 6	100 Vac ±10%, 50/60 Hz ±2%	Input power (Jumper 4 to 5, 6 to 7)
1 & 7	120 Vac ±10%, 50/60 Hz ±2%	Output power to motors in disc drive
2 & 6	120 Vac ±10%, 50/60 Hz ±2%	Output to fan in disc power supply
<b>*STRAPPING FOR 120V ±10%, 50/60 Hz (see figure 7900-2)</b>		
<b>TB1 Pin</b>	<b>Voltage</b>	<b>Description</b>
1 & 6	120 Vac ±10%, 50/60 Hz ±2%	Input power (Jumper 1 to 2, 6 to 7)
1 & 7	120 Vac ±10%, 50/60 Hz ±2%	Output power to motors in disc drive
2 & 6	120 Vac ±10%, 50/60 Hz ±2%	Output to fan in disc power supply
<b>STRAPPING FOR 200V ±10%, 50/60 Hz, 1-PHASE (see figure 7900-3)</b>		
<b>TB1 Pin</b>	<b>Voltage</b>	<b>Description</b>
5 & 6	200 Vac ±10%, 50/60 Hz ±2%	Input Power (Jumper 7 to 8, 3 to 4)
1 & 7	120 Vac ±10%, 50/60 Hz ±2%	Output power to motors in disc drive
2 & 6	120 Vac ±10%, 50/60 Hz ±2%	Output to fan in disc power supply
<b>**STRAPPING FOR 220V ±10%, 50/60 Hz, 1-PHASE (see figure 7900-3)</b>		
<b>TB1 Pin</b>	<b>Voltage</b>	<b>Description</b>
5 & 6	220 Vac ±10%, 50/60 Hz ±2%	Input power (Jumper 7 to 8, 2 to 3)
1 & 7	120 Vac ±10%, 50/60 Hz ±2%	Output power to motors in disc drive
2 & 6	120 Vac ±10%, 50/60 Hz ±2%	Output to fan in disc power supply
<b>***STRAPPING FOR 240V ±10%, 50/60 Hz, 1-PHASE (see figure 7900-4)</b>		
<b>TB1 Pin</b>	<b>Voltage</b>	<b>Description</b>
1 & 6	240 Vac ±10%, 50/60 Hz ±2%	Input power (Jumper 7 to 8, 2 to 3)
1 & 7	120 Vac ±10%, 50/60 Hz ±2%	Output power to motors in disc drive
2 & 6	120 Vac ±10%, 50/60 Hz ±2%	Output to fan in disc power supply
<p>*Factory strapping for USA installations.</p> <p>**Factory strapping for continental Europe installations.</p> <p>***Factory strapping for Great Britain installations.</p>		

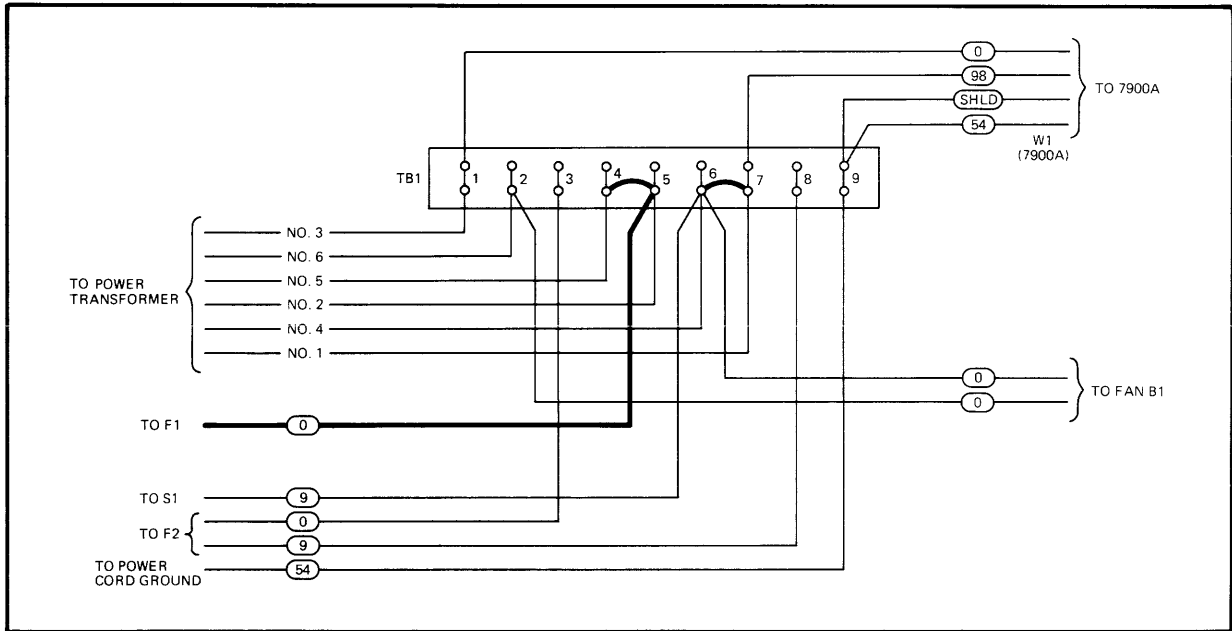


Figure 7900-1. Power Supply Strapping for 100V ± 10%, 50/60 Hz

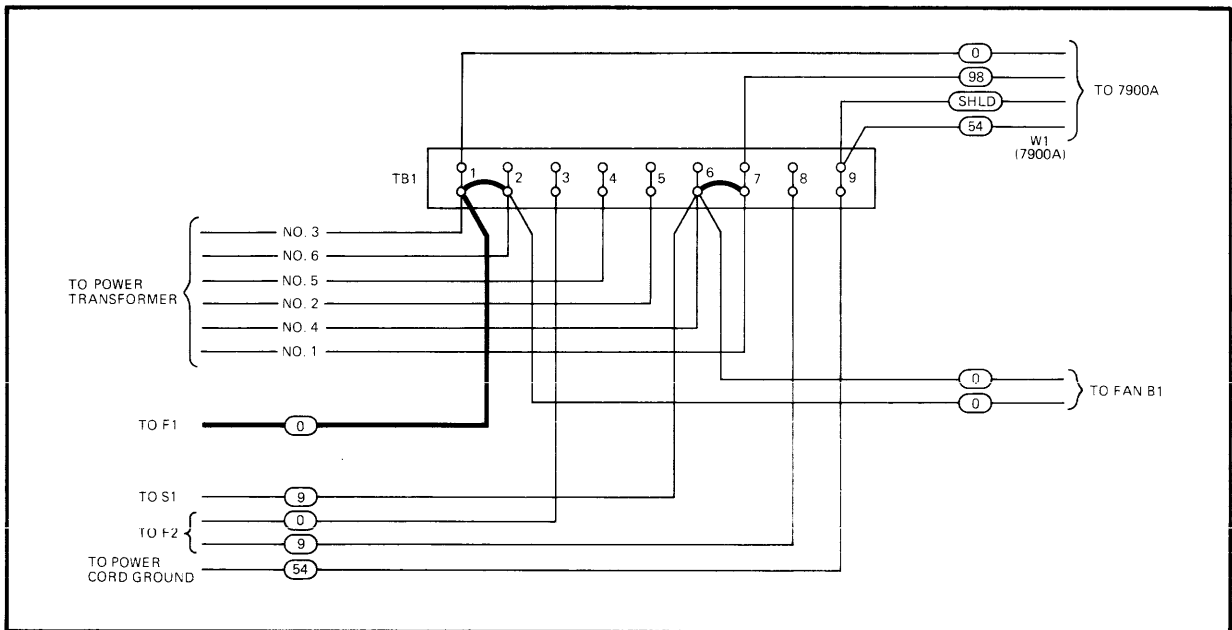


Figure 7900-2. Power Supply Strapping for 120V ± 10%, 50/60 Hz

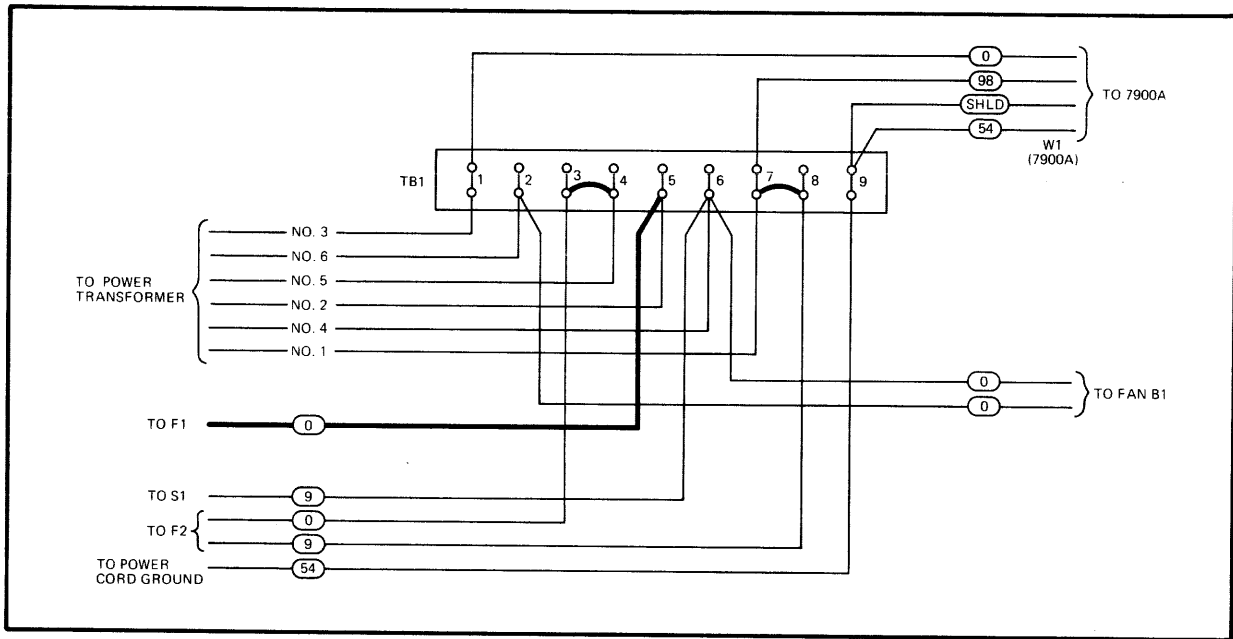


Figure 7900-3. Power Supply Strapping for 200 to 220V  $\pm$  10%, 50/60 Hz

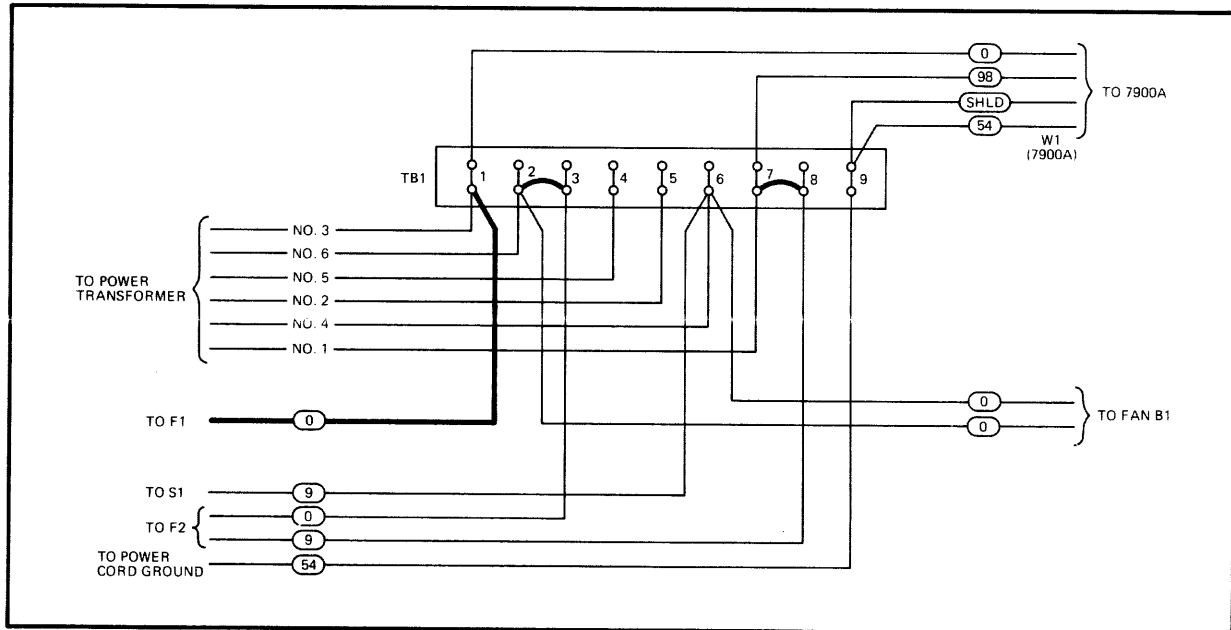


Figure 7900-4. Power Supply Strapping for 240V  $\pm$  10%, 50/60 Hz

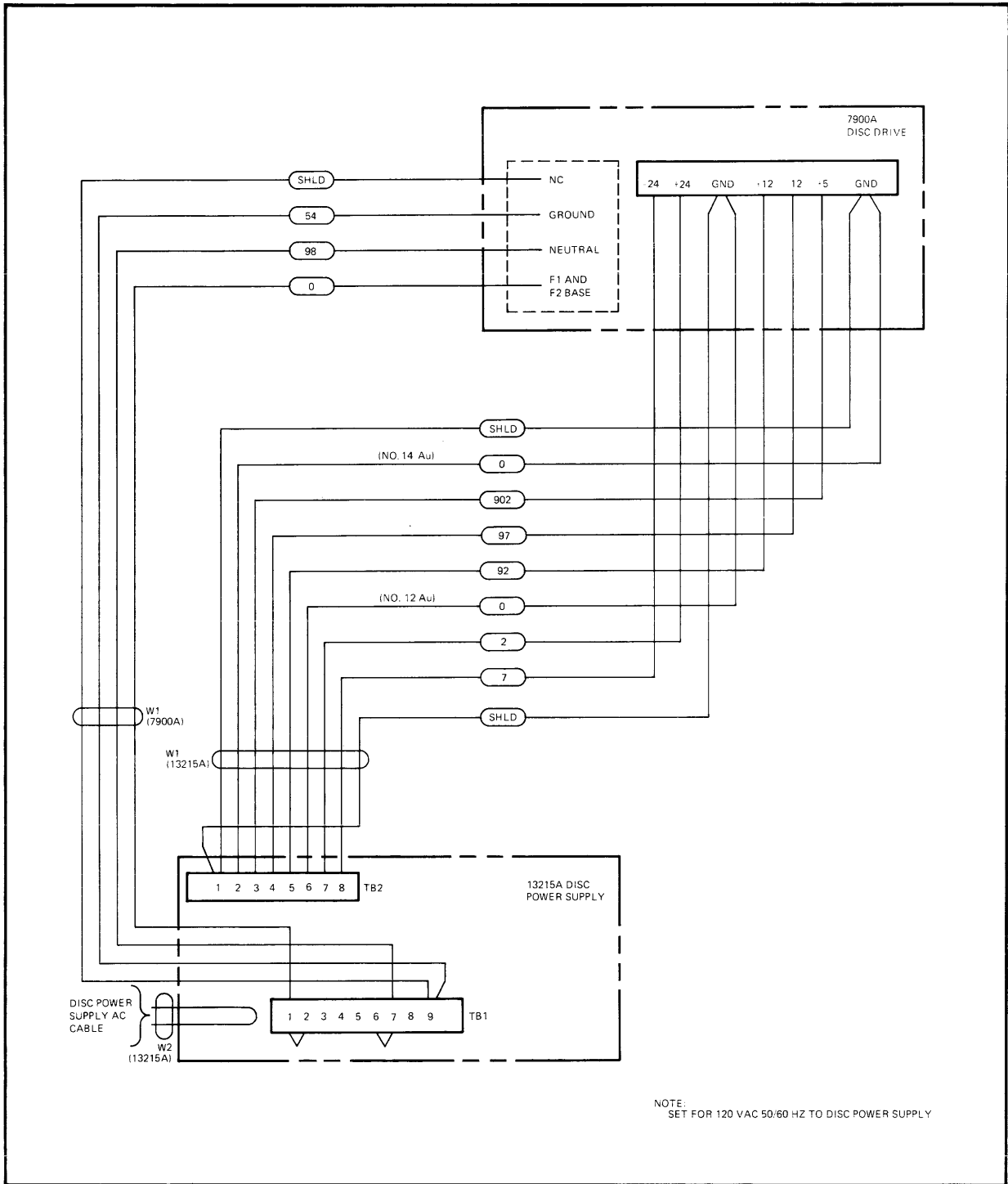


Figure 7900-5. Disc Drive/Disc Power Supply Connecting Diagram

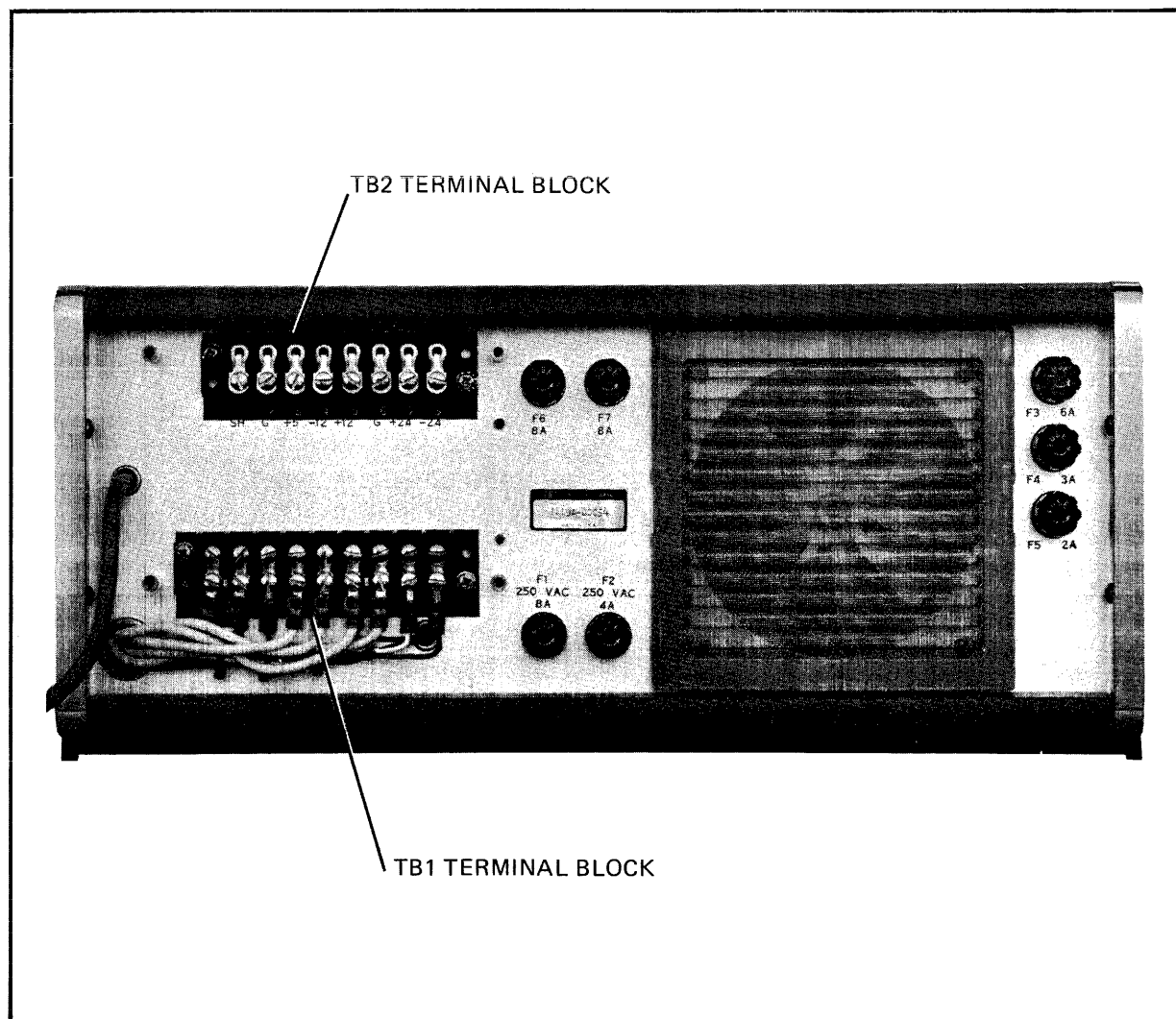


Figure 7900-6. Rear View of an HP 13215A Disc Power Supply

### Disc Power Supply Check-Out

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

The check-out procedure for the HP 13215A Disc Power Supply is as follows:

- a. With the ac input power disconnected, test to make sure that there is no electric continuity between the power supply and the equipment bay.



- b. Check the strapping of the TB1 terminal block on the power supply to make sure that it conforms to the strapping for the desired power option (see figures 7900-1, 7900-2, 7900-3, and 7900-4).
- c. Make sure that the power supply is connected to an appropriate ac electrical outlet and then set the POWER switch on the front of the power supply to the ON position.
- d. Using an HP 427A Multi-Function Meter or equivalent, check terminals TB2-1 through TB2-8 on the power supply for the voltages shown in table 7900-4.

**Table 7900-4. Disc Power Supply TB2 Terminal Voltages**

Terminal	Voltage
TB2-1	Ground
TB2-2	Ground
TB2-3	+5 Vdc $\pm$ 2%
TB2-4	-12 Vdc $\pm$ 5%
TB2-5	+12 Vdc $\pm$ 3%
TB2-6	Ground
TB2-7	+24 Vdc $\pm$ 20%
TB2-8	-24 Vdc $\pm$ 20%

There is only one adjustable voltage: +5 Vdc. The adjustment procedure is described in paragraphs 5-12 through 5-16 of the *HP 13215A Disc Power Supply Operating and Service Manual*.

If a circuit malfunction is suspected, refer to figure 5-1 in the *HP 13215A Disc Power Supply Operating and Service Manual* for troubleshooting procedures.

If all voltages are within specifications, proceed with the disc drive check-out procedures.

### **Disc Drive Check-Out**

**ELECTRICAL CHECK-OUT.** The electrical check-out procedure for the HP 7900A Disc Drive is as follows:

- a. Remove the head block from the cartridge compartment of the disc drive.
- b. Set the POWER switch on the front of the power supply to the OFF position.

- c. Connect the disc drive ac and dc cables to the TB1 and TB2 terminal blocks on the back of the power supply (see figures 7900-5 and 7900-6 and tables 7900-5 and 7900-6).

**Table 7900-5. Disc Power Supply dc Cable Connections**

Wire Color		TB2-	Voltage
two shields	to	1	Ground
black	to	2	Ground
white-red-black	to	3	+5 Vdc
white-violet	to	4	-12 Vdc
white-red	to	5	+12 Vdc
black	to	6	Ground
red-black	to	7	+24 Vdc
violet-black	to	8	-24 Vdc

**Table 7900-6. Disc Power Supply ac Cable Connections**

Wire Color		TB1-
black	to	1
white-gray	to	7
green-yellow	to	9
shield	to	9

- d. Unplug the disc drive power cord from the service strip and then test to make sure that there is no electric continuity between the disc drive and the equipment bay. Plug the disc drive power cord back into the service strip.
- e. Set the POWER switch on the front of the power supply to the ON position.
- f. Set the LOAD/UNLOAD switch on the front of the disc drive to the LOAD position.
- g. Using an HP 427A Multi-Function Meter or equivalent, check terminals TB-1 through TB-8 on the disc drive for the voltages shown in table 7900-7. The TB terminals are located in the center on the rear of the disc drive.

**Table 7900-7. Disc Drive TB Terminal Voltages**

Terminal	Voltage
TB-1	Ground
TB-2	Ground
TB-3	+5 Vdc $\pm$ 2%
TB-4	-12 Vdc $\pm$ 5%
TB-5	+12 Vdc $\pm$ 3%
TB-6	Ground
TB-7	+24 Vdc $\pm$ 20%
TB-8	-24 Vdc $\pm$ 20%

If all voltages are within specifications, proceed with the rest of the disc drive check-out procedures.

*Note: The following disc drive check-out procedures require the use of an oscilloscope and an HP 13219A Disc Service Unit. The disc service unit is described in the HP 13219A Disc Service Unit Operating and Service Manual, part number 13219-90000.*

*When the disc service unit is initially connected to a disc drive, and when not actually in use during servicing, the DRIVE OPERATION CONTROL switch on the disc service unit should be set to the ACCESS STOP position to prevent any accidental initiation of operations.*

**HEAD ALIGNMENT.** To align the heads of an HP 7900A Disc Drive, proceed as follows:

*Note: Before performing the head alignment procedure, install a scratch disc cartridge in the HP 7900A and set the LOAD/UNLOAD switch on the disc drive to the LOAD position. Check to make sure that the heads will load and the drive will seek.*

- a. Turn on the disc power supply and set the UP DISC PROTECT SWITCH S3 on the disc drive to the PROTECT position.
- b. Install the alignment disc cartridge, part number 1535-0066.
- c. Set the LOAD/UNLOAD switch on the disc drive to the LOAD position.
- d. Set the disc service unit to allow the disc drive to alternately seek between cylinders 00 and 128. The DELAY switch on the disc service unit must be in the ON position.
- e. Allow the disc drive to operate in this manner for approximately 25 minutes to stabilize the disc drive temperature. The top cover of the disc drive must be on all during this time.

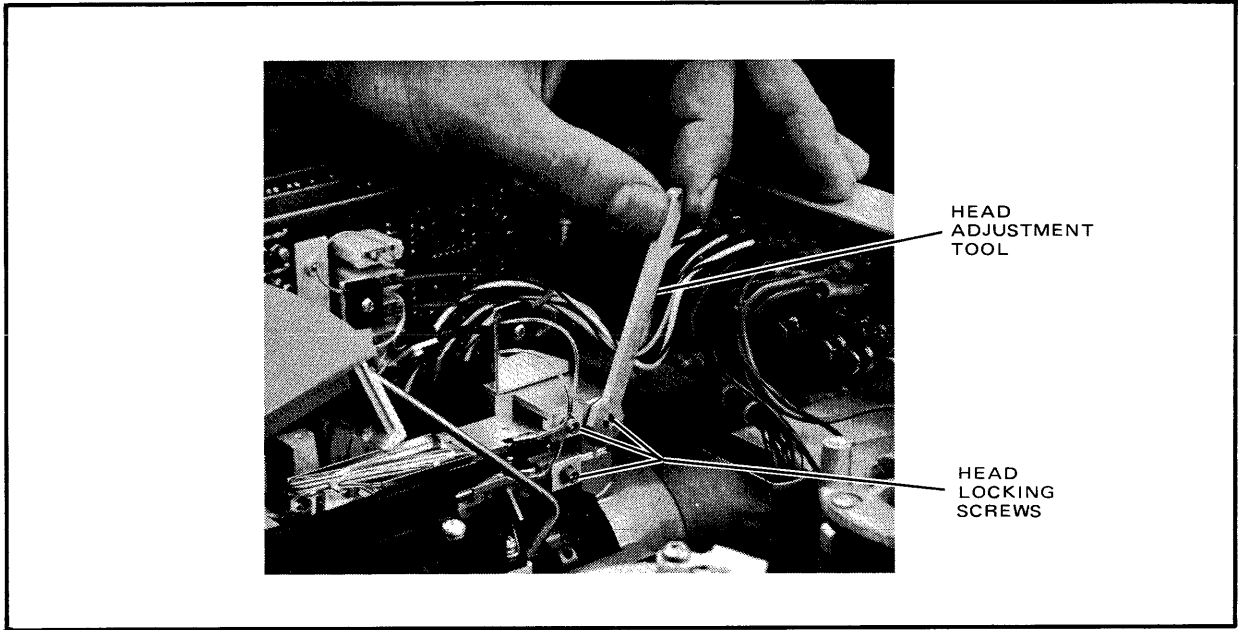
- f. Using the disc service unit, position the carriage at cylinder 100 and select head 0.
- g. Connect the oscilloscope to test point TP2 on the Read/Write Preamplifier Assembly A13 of the disc drive.
- h. Connect the SYNC probe of the oscilloscope to test point TP4 on the Sector Count and Compare Assembly A8 of the disc drive.
- i. Set the RESET DRIVE FAULT switch on the disc service unit to the ON position.
- j. Loosen the locking screw that holds the head in place (see figure 7900-7).
- k. Using the head adjusting tool (see figure 7900-7), position the head to minimize the amplitude modulation of the output signal (figure 7900-8).
- l. Tighten the locking screw that holds the head in place. Be sure that the adjustment has not changed.
- m. Perform a seek to cylinder 95; the circumferential adjustment waveform (see figure 7900-9) should appear on the oscilloscope screen.

*Note: If the circumferential adjustment waveform does not appear on the oscilloscope screen, it is possible that the head was accidentally aligned (during step k) to cylinder 105 instead of to cylinder 100. Cylinders 100 and 105 are the only cylinders on the alignment disc cartridge that can produce the desired waveform (figure 7900-8) at step k. If the head was improperly aligned at step k, repeat steps j through m.*

- n. Using the disc service unit, select head 1.
- o. Repeat steps j through m for head 1.
- p. Set the DRIVE OPERATION CONTROL switch on the disc service unit to the ACCESS STOP position.
- q. Set the LOAD/UNLOAD switch on the disc drive to the UNLOAD position and turn off the power supply.
- r. Remove the alignment disc cartridge from the disc drive.

**SECTOR CIRCUMFERENTIAL ALIGNMENT.** To adjust the HP 7900A Disc Drive for minimum circumferential seek (or skew), proceed as follows:

- a. Turn on the disc power supply and set the UP DISC PROTECT SWITCH S3 on the disc drive to the PROTECT position.
- b. Install the alignment disc cartridge, part number 1535-0066.



HEAD  
ADJUSTMENT  
TOOL

HEAD  
LOCKING  
SCREWS

Figure 7900-7. Head Alignment

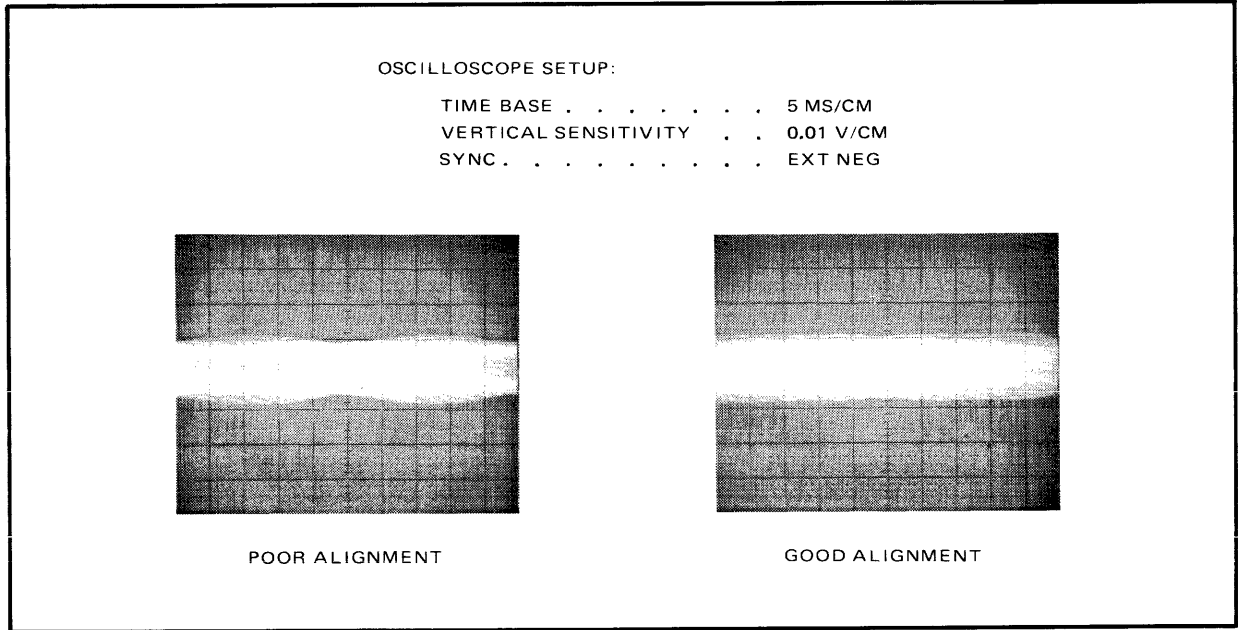


Figure 7900-8. Head Alignment Waveforms

OSCILLOSCOPE SETUP:

TIME BASE . . . . . 5  $\mu$ S/CM  
VERTICAL SENSITIVITY . . . . 0.01 V/CM  
SYNC . . . . . EXT NEG

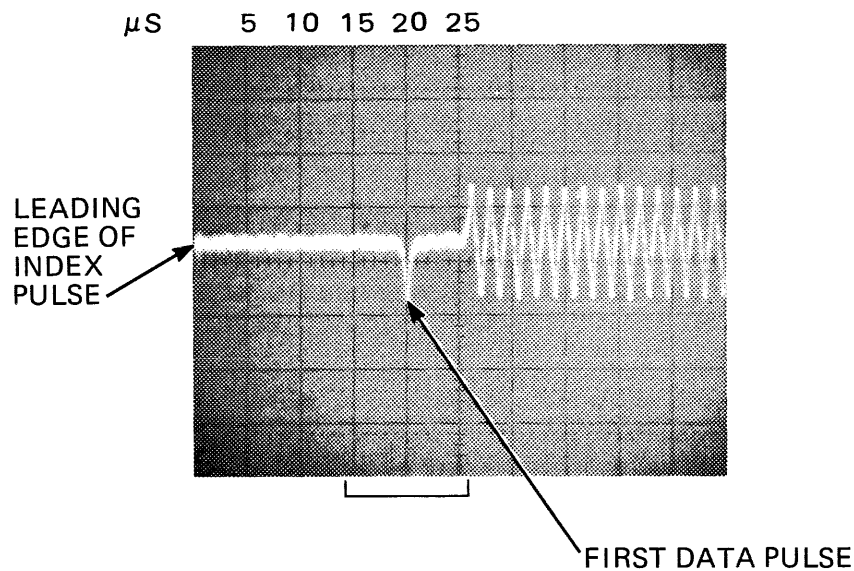


Figure 7900-9. Sector Circumferential Adjustment Waveform

- c. Set the LOAD/UNLOAD switch on the disc drive to the LOAD position.
- d. Using the disc service unit, position the carriage at cylinder 95 and select head 0.
- e. Connect the oscilloscope to test point TP2 on the Read/Write Preamp Assembly A13 PCA of the disc drive.
- f. Connect the SYNC probe of the oscilloscope to test point TP4 on the Sector Count and Compare Assembly A8 PCA of the disc drive.
- g. Adjust the sector position variable resistor (R2 on the A8 PCA in the disc drive) so that the first data pulse is 20  $\mu$ s from the leading edge of the index pulse (beginning of sweep) as shown in figure 7900-9.
- h. Using the disc service unit, select head 1.

- i. Observe the waveform on the oscilloscope screen. The first data pulse should be  $20 \pm 6 \mu\text{s}$  from the leading edge of the index pulse (beginning of sweep) as shown by the bracket in figure 7900-9.

*Note: If the above condition is not met, ensure that the heads are properly seated in the carriage assembly. If this does not correct the condition, replace the head assembly.*

- j. Adjust the sector position variable resistor to move the data pulse halfway between its current position and the  $20 \mu\text{s}$  position. This assures equal displacement of the data pulses for heads 0 and 1 in relation to the  $20 \mu\text{s}$  position (i.e., both data pulses should now be within  $3 \mu\text{s}$  of the  $20 \mu\text{s}$  position).
- k. Set the DRIVE OPERATION CONTROL switch on the disc service unit to the ACCESS STOP position.
- l. Set the LOAD/UNLOAD switch on the disc drive to the UNLOAD position and turn off the power supply.
- m. Remove the alignment disc cartridge from the disc drive.

**“SEEK TIME” (VEL CMND) ADJUSTMENT.** To adjust the “seek time” of the HP 7900A Disc Drive, proceed as follows:

- a. Turn on the disc power supply and set the UP DISC PROTECT SWITCH S3 on the disc drive to the PROTECT position.
- b. Install the alignment disc cartridge, part number 1535-0066.
- c. Set the LOAD/UNLOAD switch on the disc drive to the LOAD position.
- d. Connect the oscilloscope to the SELECT ACCESS READY test point on the disc service unit.
- e. Adjust the VEL CMND variable resistor (R36) on the Cylinder Address Assembly A11 PCA of the disc drive so that the “not” Access Ready signal is low (0 volts) for  $53 \pm 2$  milliseconds.
- f. Set the DRIVE OPERATION CONTROL switch on the disc service unit to the ACCESS STOP position.
- g. Set the LOAD/UNLOAD switch on the disc drive to the UNLOAD position and turn off the power supply.
- h. Remove the alignment disc cartridge from the disc drive.

## DIAGNOSTIC PROGRAMS

The Stand-Alone HP 30110A Cartridge Disc Diagnostic and the On-Line HP 30110A Cartridge Disc Diagnostic verify the proper operation of the HP 7900A Disc Drive. The operating instructions for both are described in the associated manuals (refer to "Subsystem Inventory").

**Caution:** If the HP 7900A Disc Drive contains the disc copy of configured MPE/3000, do not run either of the diagnostics. The diagnostics always destroy the information contained in both disc platters.

## ADD-ON INSTALLATION

An add-on shipment of an HP 30110A or 30110A-010 Cartridge Disc Subsystem includes all the materials listed earlier under "Subsystem Inventory" plus copies of those *System Support Log* forms which pertain to the add-on installation. If necessary, an HP 30390A-001 Cabinet is also included (in such a case, the disc drive and its power supply are already mounted in the cabinet when shipped).

If the shipment includes an HP 30390A-001 Cabinet, the add-on procedure comprises the following general steps:

1. Connecting the new cabinet to the existing computer system.
2. Installing the cartridge disc interface PCAs. *This step is necessary only when the existing computer system does not already include at least one HP 7900A Disc Drive or when the add-on disc drives increase the total number of HP 7900A Disc Drives in the system beyond four.*
3. Connecting the cable between the disc drive and the interface.
4. Checking-out the disc drive and its power supply.

If the shipment does *not* include an HP 30390A-001 Cabinet, the add-on procedure comprises the following general steps:

1. Uncrating the shipment.
2. Installing the disc power supply.
3. Installing the disc drive.
4. Installing the cartridge disc interface PCAs. *This step is necessary only when the existing computer system does not already include at least one HP 7900A Disc Drive or when the add-on disc drives increase the total number of HP 7900A Disc Drives in the system beyond four.*
5. Connecting the cables between the disc drive, the disc power supply, and the interface.
6. Checking-out the disc drive and its power supply.



## Uncrating the Shipment

The disc drive and disc power supply are packed in separate shipping crates. Remove the units from the crates. There is a shipping clamp inside the HP 7900A which must be removed. The shipping clamp is used to prevent internal movement which could cause damage to the heads or disc components during packing or in transit. Remove the top cover of the disc drive and then remove the shipping clamp as illustrated in figure 7900-10. When removing the shipping clamp, take care not to bump or jar the heads or snag the head leads. The shipping clamp is secured in place by a pozi drive screw. Retain all shipping materials (including the shipping clamp) in case it becomes necessary to repack the units for shipment in the future.

## Connecting the Equipment Bays

If an HP 30390A-001 Cabinet is included in the shipment, connect it to the existing computer system as described in chapter 2, "CPU Assembly," of this manual.

## Installing the Disc Power Supply

Remove the feet from the disc power supply by pressing the release buttons on the feet and then attach the filler strip (part number 5040-6676) to the bottom front edge of the power supply (refer to figure 7900-11). The "HP 3000 Racking Diagram" shows the intended location of the disc power supply in the equipment bay. Remove the appropriate module covers from the front of the equipment bay and mount the support rails (part number 13215-60014) in the appropriate location in the bay. Attach the mounting brackets to the front edges of the power supply as illustrated in figure 7900-12 and then slide the power supply into the bay so that the unit rests on the two support rails. When the unit is all the way into the bay, secure it to the mounting strips on the front of the bay.

*Note: The module cover must be put back on the front of the bay so that it sandwiches the mounting brackets of the power supply between the cover hinge and the mounting strip of the bay. The screws that secure the module cover to the bay also will secure the appropriate side of the power supply to the bay.*

## Installing the Disc Drive

The "HP 3000 Racking Diagram" shows the intended location of the disc drive in the equipment bay. Remove the appropriate module covers from the front of the bay and then install the disc drive as follows:

- a. Place the disc drive on a table in an environmentally clean area. Attach the right and left chassis slides to the disc drive using eight number 8-32, 0.625 flat head screws, four on each side, as shown in figure 7900-13.

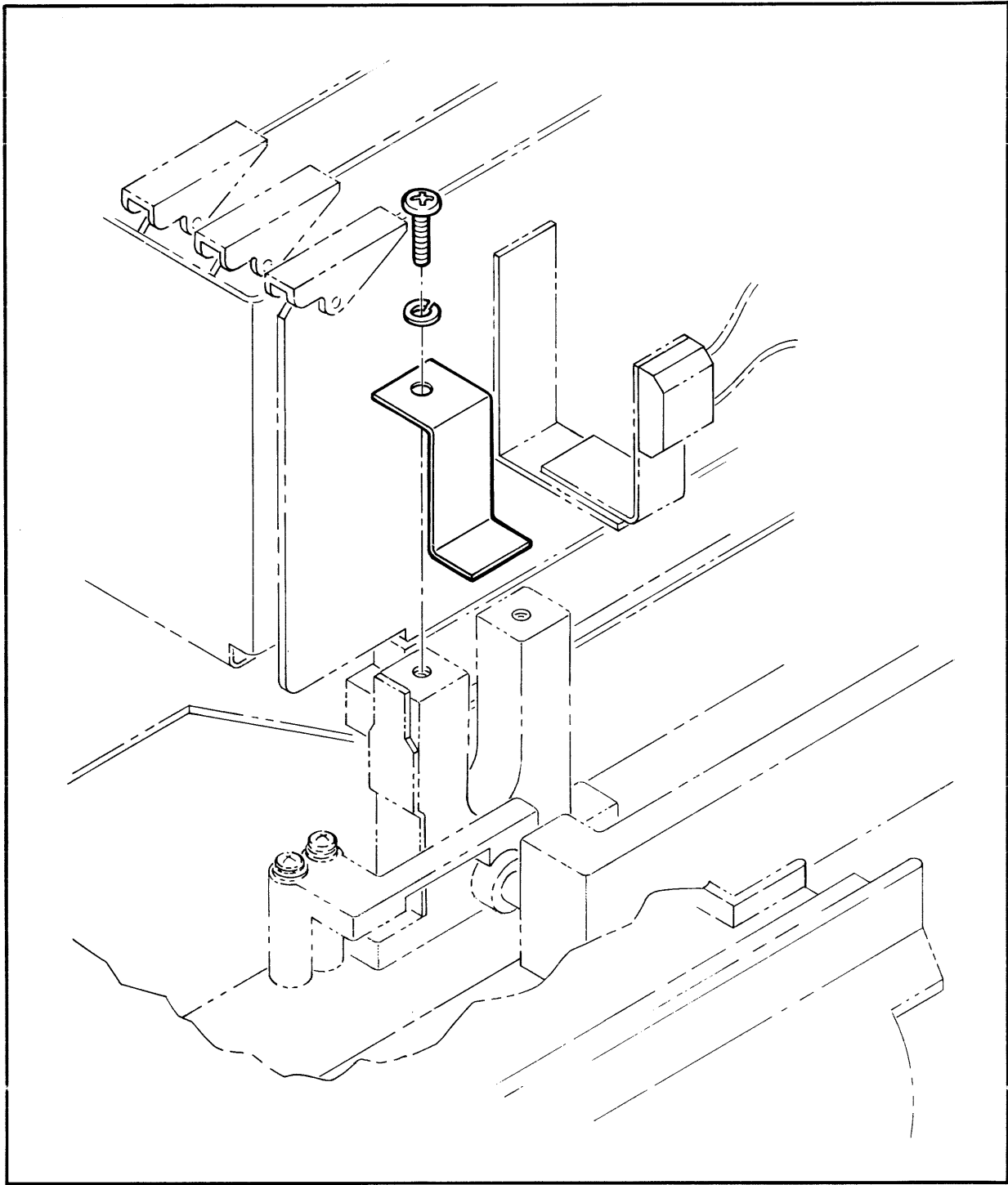
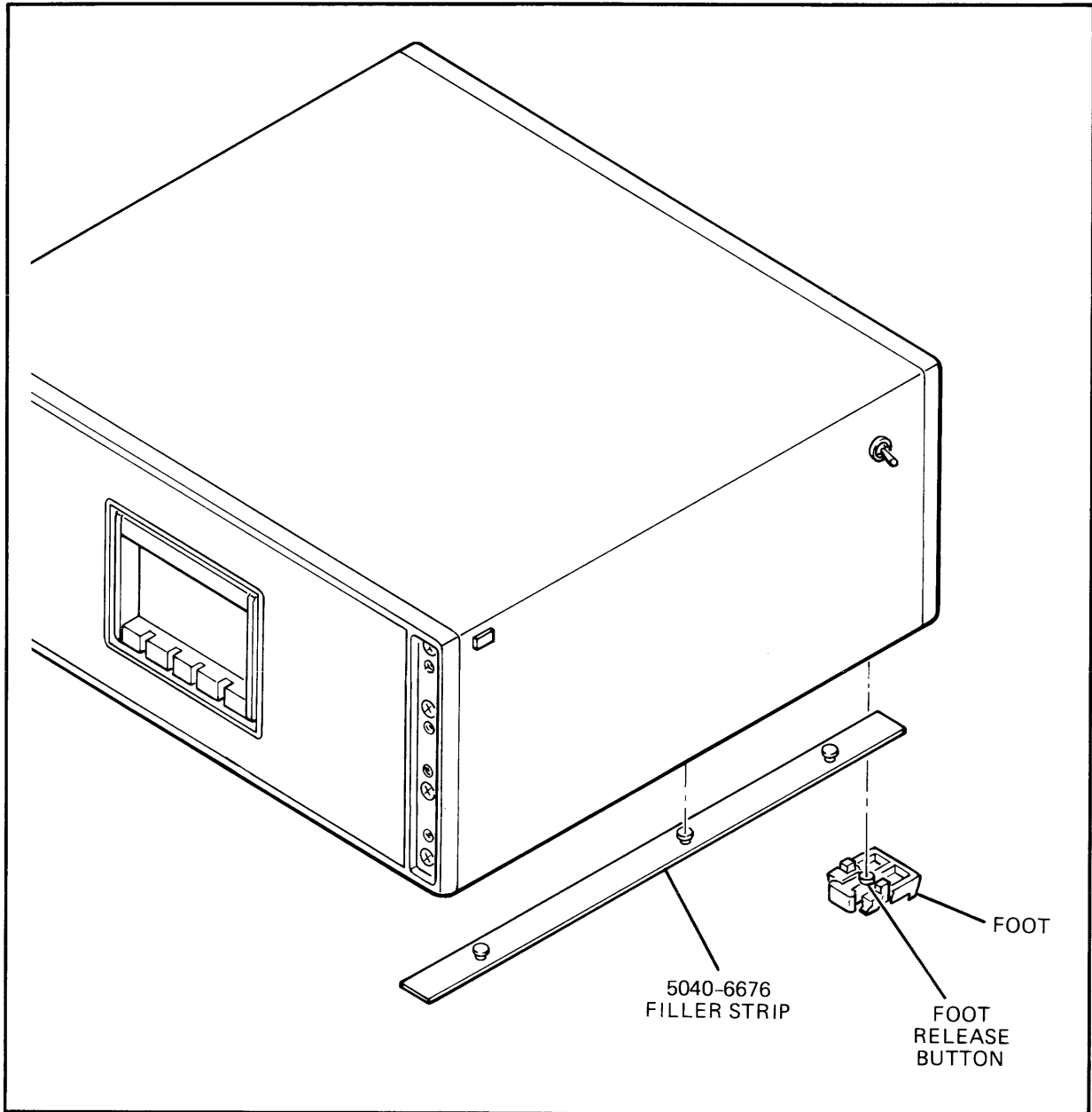


Figure 7900-10. Disc Drive Shipping Clamp



**Figure 7900-11. Removing the Feet From an HP 13215A and Attaching the Filler Strip**

7900-22

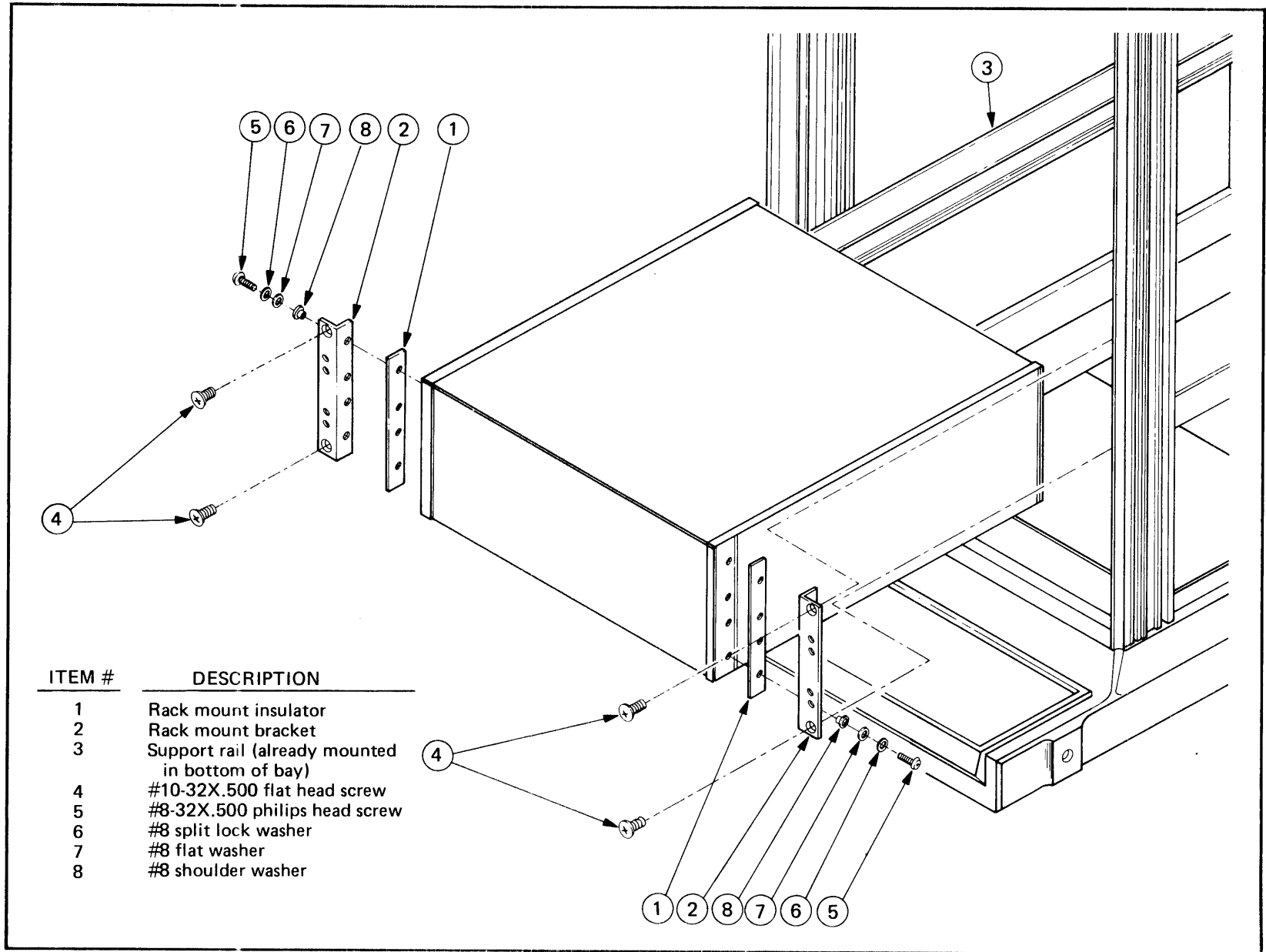
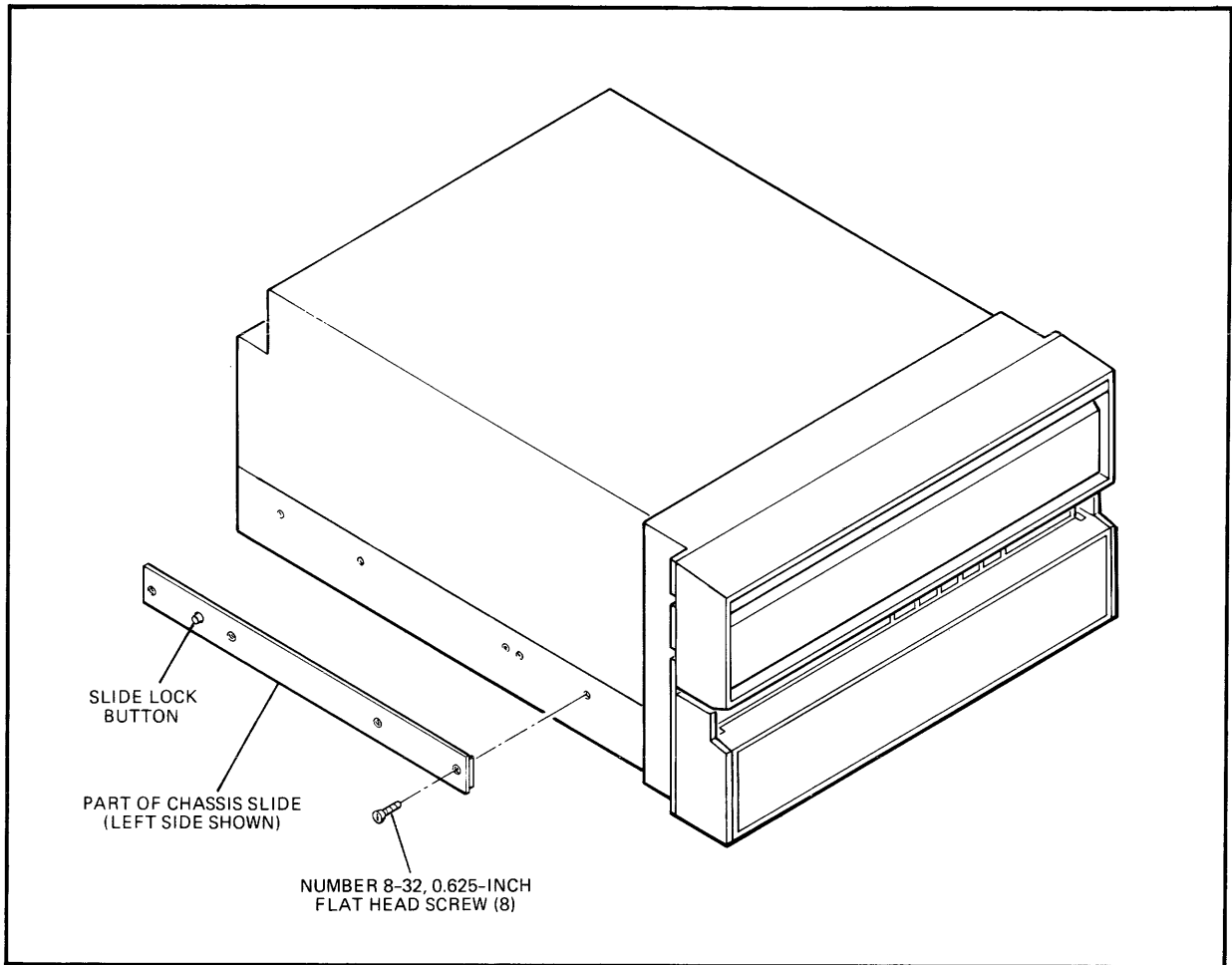


Figure 7900-12. Installing the HP 13215A Disc Power Supply



**Figure 7900-13. Chassis Slide Attachment**

- b. Attach the rack mount brackets to the rack cabinet using eight number 1/4-20, 0.5-inch hexagon head screws with eight number 1/4 split lock washers and eight number 1/4-20 spring nuts as shown in figure 7900-14. Before tightening to rack cabinet, ensure that the mounting brackets are level from front to rear.

*Note: Align the mounting screw in conjunction with RETMA mounting pattern shown in figure 7900-14. Proper alignment with the RETMA pattern will assure alignment of the 7900A chassis mounting holes with the RETMA pattern holes used for securing the disc drive front panel to the cabinet.*

*A minimum vertical clearance of 10-1/2 inches above the bottom front of the rack mount bracket must be maintained to allow for disc drive clearance.*

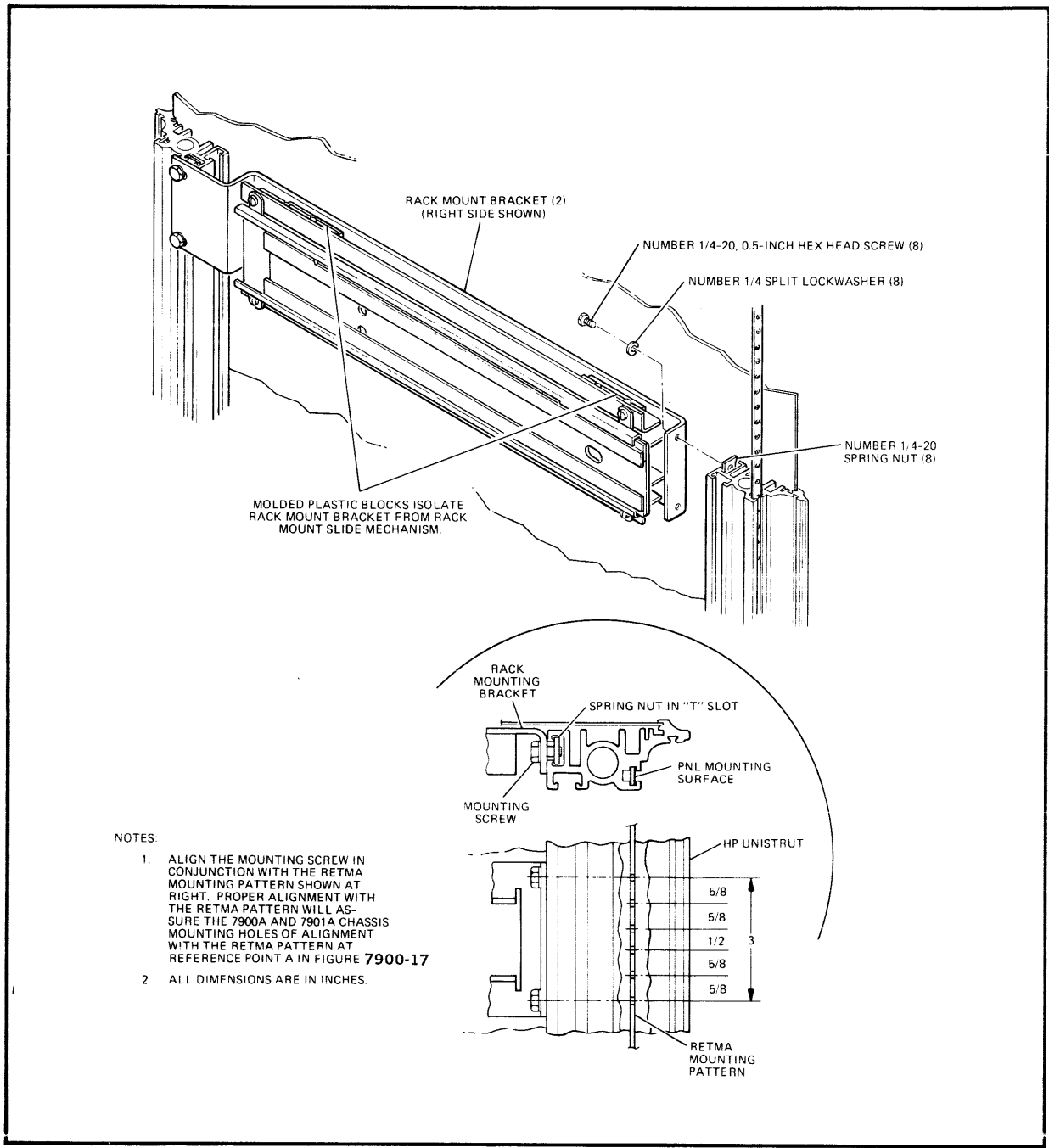


Figure 7900-14. Rack Mount Bracket Attachment

- c. Extend the chassis slides out, as shown in figure 7900-15, from the front of the rack cabinet. Lift the disc drive into place with the attached chassis slides so that the chassis slides on the disc drive slide into the extended chassis slides in front of the rack cabinet. Press in on the slide lock buttons located on the sides of the disc drive chassis slides and ensure that the buttons are in place in the holes in the extended chassis slides. While holding the slide lock buttons in, push the drive partially back into the rack cabinet.
- d. With the disc drive secure in the chassis slides, open the front panel and observe the four drive chassis mounting slots shown in figure 7900-16. The holes will line up with the RETMA standard mounting holes if the rack mount brackets were correctly installed. Using four number 10-32, 0.5-inch flat head screws, secure the disc drive to the front of the rack cabinet. Although the front panel is bolted to the rack cabinet, disc drive chassis grounding is isolated from the cabinet by an RF filter connected between the disc drive chassis and front panel.

**Caution:** The rack slide mounting kit must be used in its entirety; using only the four number 10-32, 0.5-inch flat head screws to secure the disc drive could result in damage to the disc drive and rack cabinet since the screws can not support the disc drive weight.

If more than one disc drive is mounted in a rack cabinet, care should be taken to extend only one at a time for servicing or adjustments; otherwise, the rack cabinet may tip over.

### Installing the Interface PCAs

The cartridge disc interface PCAs are already jumpered when shipped. Before installing them in the computer, consult the "Subsystem Configuration" form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The "Subsystem Configuration" form specifies the intended location of the cartridge disc interface PCAs in the card cage. PCAs are always inserted in the card cage with the component side facing up. Occasionally, installation of the cartridge disc interface PCAs may require that other PCAs in the card cage be rearranged to make room for them. If that is the case, then the "Subsystem Configuration" form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, connect the two ribbon cables between the two cartridge disc interface PCAs as illustrated in figure 7900-17 and make any necessary polling connections on the backplane of the card cage in accordance with the "Subsystem Configuration" form.

## Connecting the Cables

Connect the cables between the disc drive, the disc power supply, and the interface PCAs as described earlier under "Installation".

## Installation Check-Out

Perform the installation check-out procedures for the disc drive and the disc power supply as described earlier under "Installation".

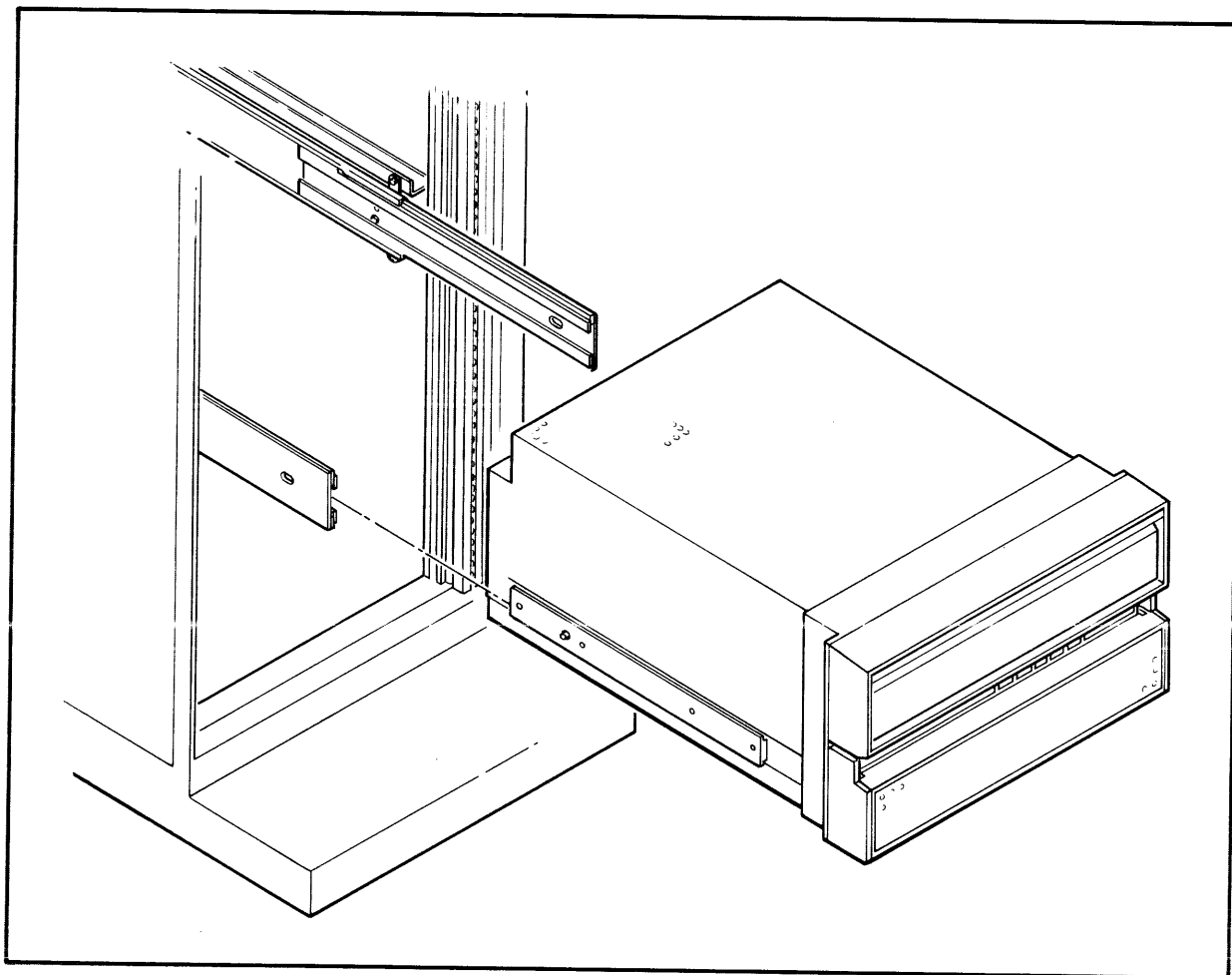


Figure 7900-15. Disc Drive Slide Attachment



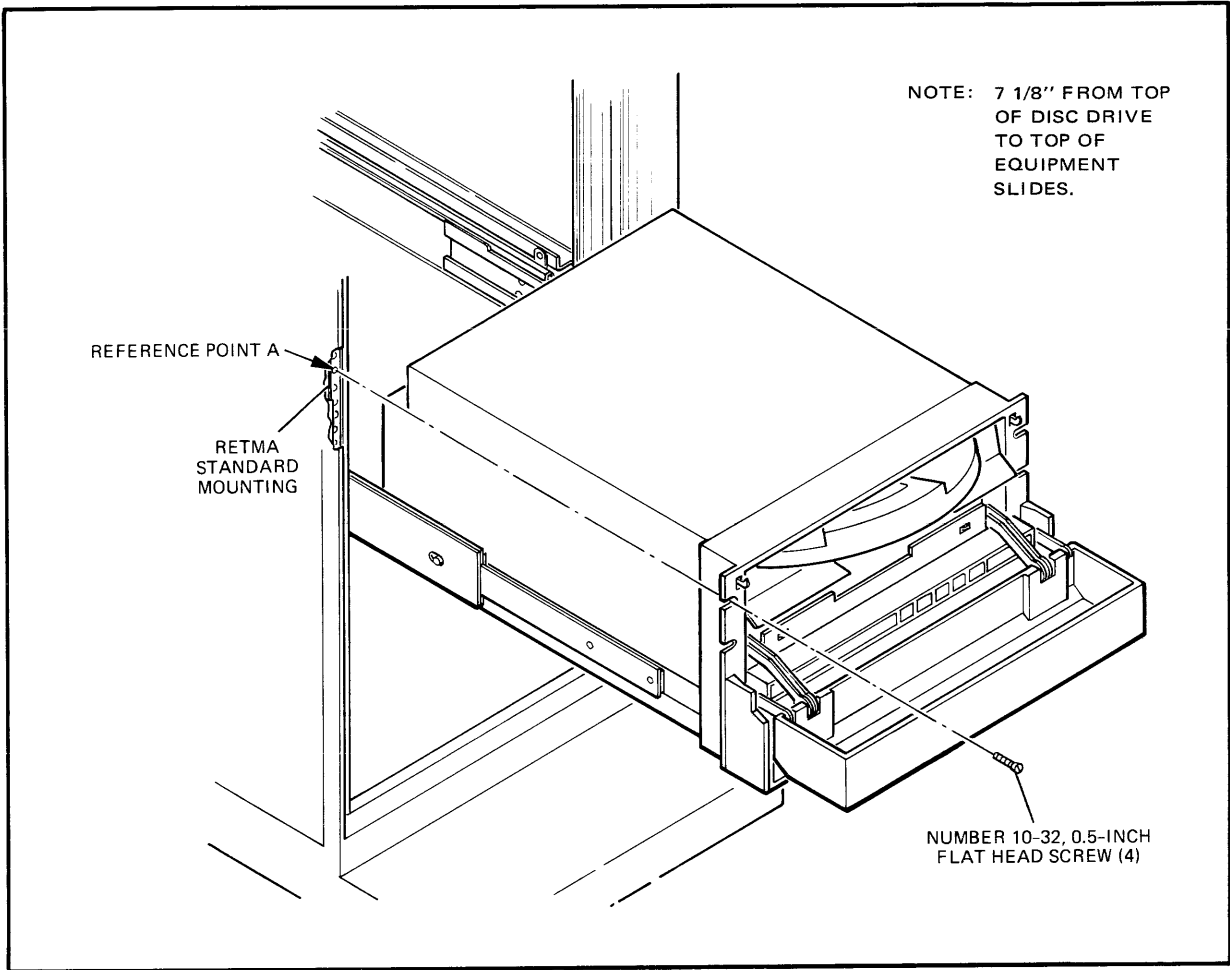


Figure 7900-16. Disc Drive to RETMA Attachment

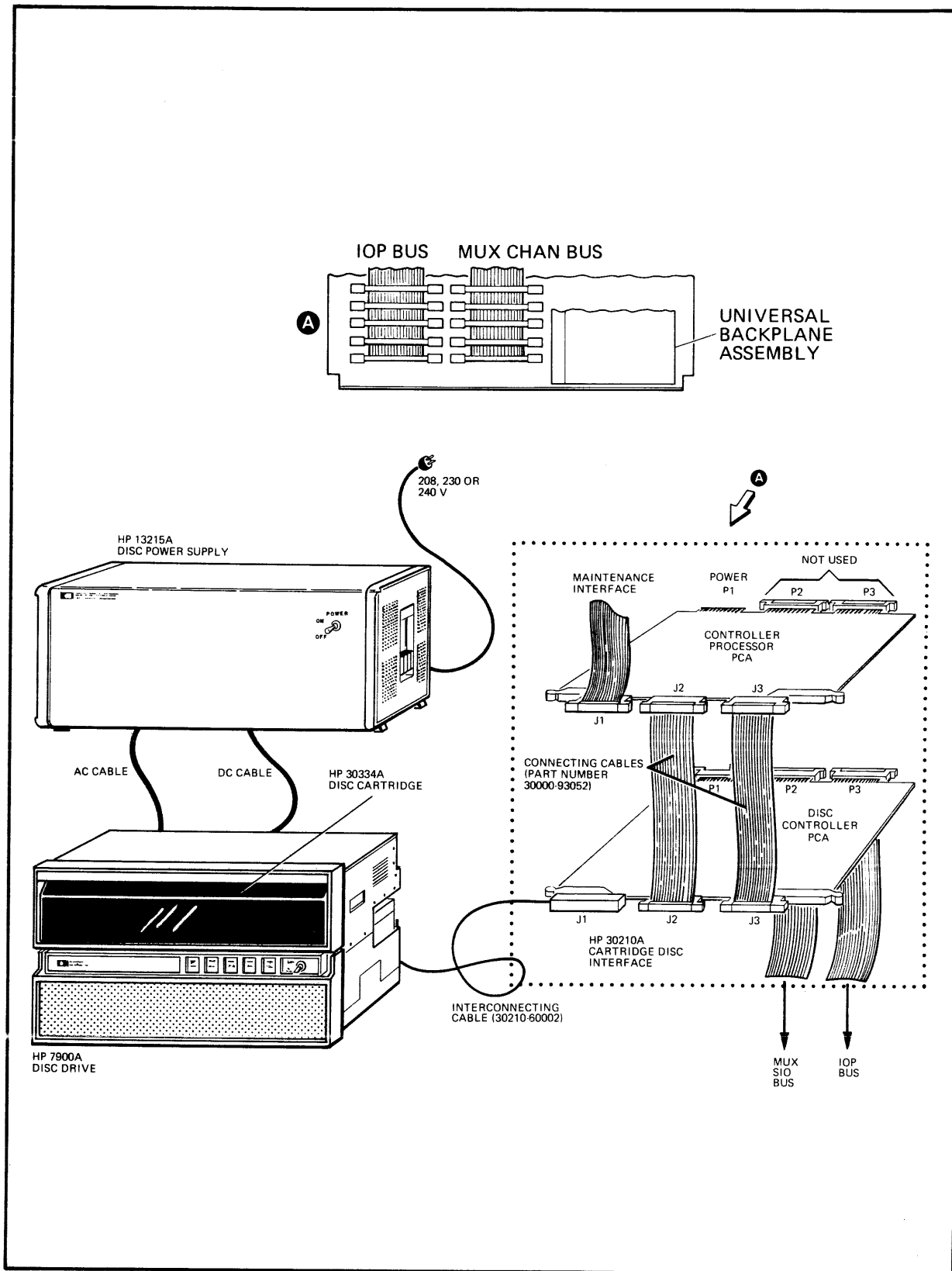


Figure 7900-17. Connecting an HP 7900A to the Disc Power Supply and to the Interface PCA

# **HP 7970B/7970E DIGITAL MAGNETIC TAPE UNITS**

## ***(Subsystems HP 30115A, 30115A-100; 30115A-200, 30115A-300, and 30115A-400)***

The HP 7970B supplied as part of this subsystem is an 800 bytes-per inch (bpi), 45 inches-per-second (ips), NRZI digital magnetic tape unit. The HP 7970E is a 1600 bpi, 45 ips, phase encoded (PE) digital magnetic tape unit. The 7970E is further divided into Master and Slave units. An HP 3000 Computer System may contain a combination of 7970B, Master 7970E, and Slave 7970E tape units.

When using NRZI tape units, the maximum data transfer rate is 36,000 bytes-per-second (18,000 words-per-second). When using phase encoded tape units, the maximum data transfer rate is 72,000 bytes-per-second (36,000 words-per-second). The tape, reels, and NRZI recording format are all in accordance with the USA Standard (USAS) X3.22-1967, *Recording Magnetic Tape for Information Interchange (800 cpi, NRZI)*. The phase encoded recording format is American National Standards Institute (ANSI) and industry compatible.

The tape units may be operated from either 120 volt, 60 hertz or 230 volt, 50 hertz power. On the back of the tape units is a slide switch which specifies what type of power is being used. For 230 volt operation, the tape unit plugs into the 230 volt service strip in the equipment bay *after* the slide switch on the tape unit has been moved to the 230 volt position.

A magnetic tape controller (see figure 7970-1) can control up to four tape units. Additional controllers may be included in the computer system if it is necessary to divide the control of two or more tape units. Each controller consists of the following materials:

- One Magnetic Tape (Nine-Track) Controller Printed-Circuit Assembly (PCA), part number 30215-60001
- One Magnetic Tape Controller Processor PCA, part number 30215-60002
- Two Connecting Cable Assemblies, part number 30000-93052
- One Interface Cable Assembly, part number 30215-60003

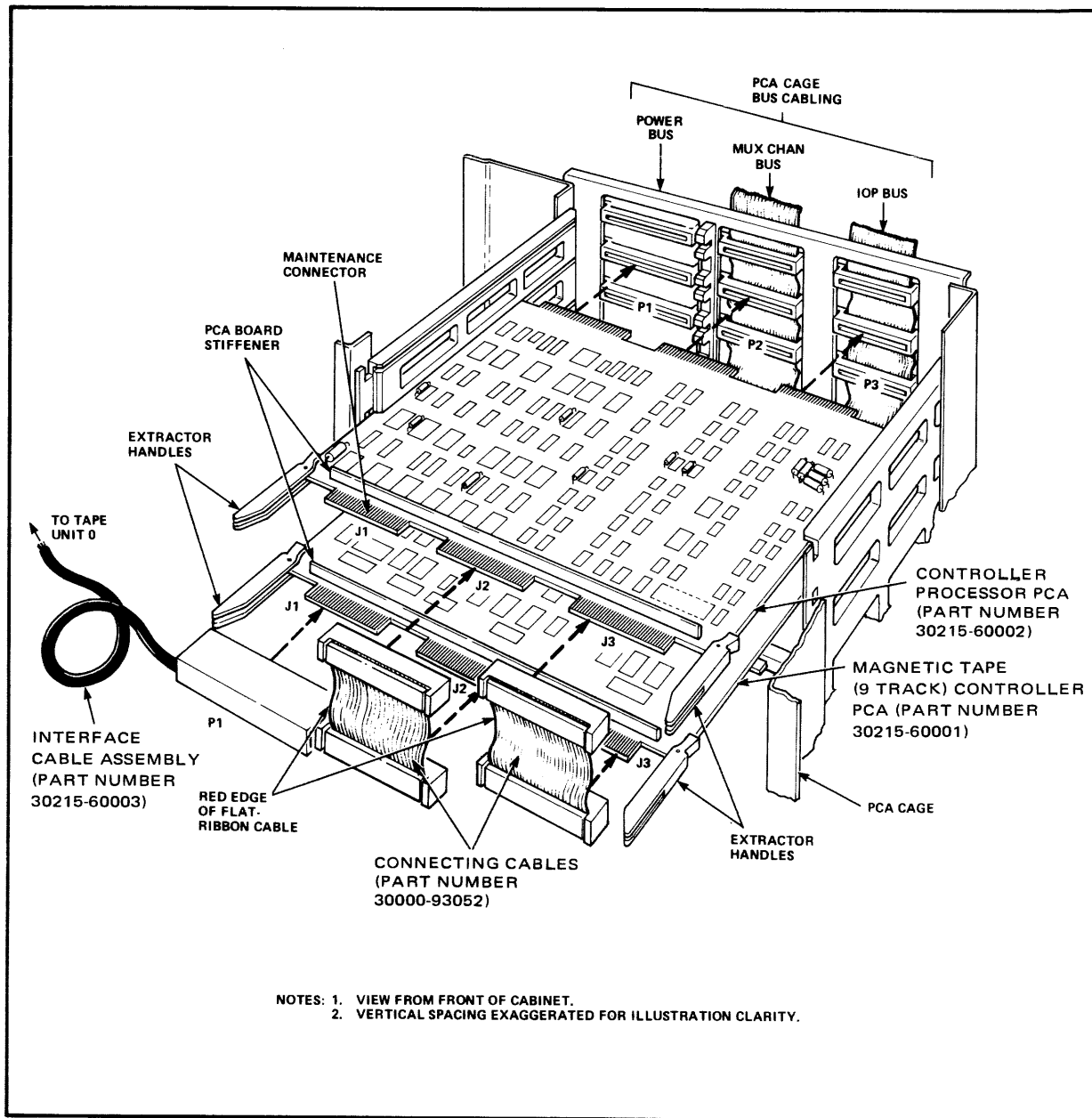


Figure 7970-1. HP 30215A Magnetic Tape Unit Interface

### Tape Unit Configurations

A magnetic tape unit controller can control a combination of 7970B, Master 7970E, and Slave 7970E tape units (maximum of four tape units on one controller). When connecting different types of tape units to a single interface, the following constraints apply:

- A 7970B tape unit must always be connected either directly to the interface or to another 7970B

- A Master 7970E must always be connected directly to the interface, to a 7970B, or to another Master 7970E
- A Slave 7970E must always be connected either to a Master 7970E or to another Slave 7970E

By adhering to the above constraints, there are 24 possible configurations as illustrated in figure 7970-2.

## SUBSYSTEM INVENTORY

### HP 30115A Subsystem

An HP 30115A Nine-Track Magnetic Tape Subsystem includes the following materials:

- One HP 7970B Digital Magnetic Tape Unit (NRZI)
- One Tape Unit Power Cable Assembly, part number 8120-1395
- One Tape Reel (empty), part number 1490-0738
- One Tape Reel (blank tape), part number 9162-0025
- One Container of Head Cleaner
- Mounting Accessories
- One Magnetic Tape (Nine-Track) Controller PCA, part number 30215-60001
- One Magnetic Tape Controller Processor PCA, part number 30215-60002
- Two Connecting Cable Assemblies, part number 30000-93052
- One Interface Cable Assembly, part number 30215-60003
- One On-Line HP 30115A Magnetic Tape Test, product number 32362A
- One *On-Line HP 30115A Magnetic Tape Test* manual, part number 30115-90003
- One *HP 7970B Digital Magnetic Tape Unit Operating and Service Manual*, part number 07970-90383
- One *HP 30115A Nine-Track (NRZI-PE) Magnetic Tape Subsystem Maintenance Manual*, part number 30115-90001

The Tape Unit Power Cable Assembly is approximately 7 feet (2.13 meters) long. The tape reels are 10-1/2 inches (267 mm) in diameter and the reel of blank tape contains approximately 2400 feet (731 meters) of tape. The Connecting Cable Assemblies are approximately 1-1/2 inches (38 mm) long and the Interface Cable Assembly is approximately 20 feet (6.1 meters) long.

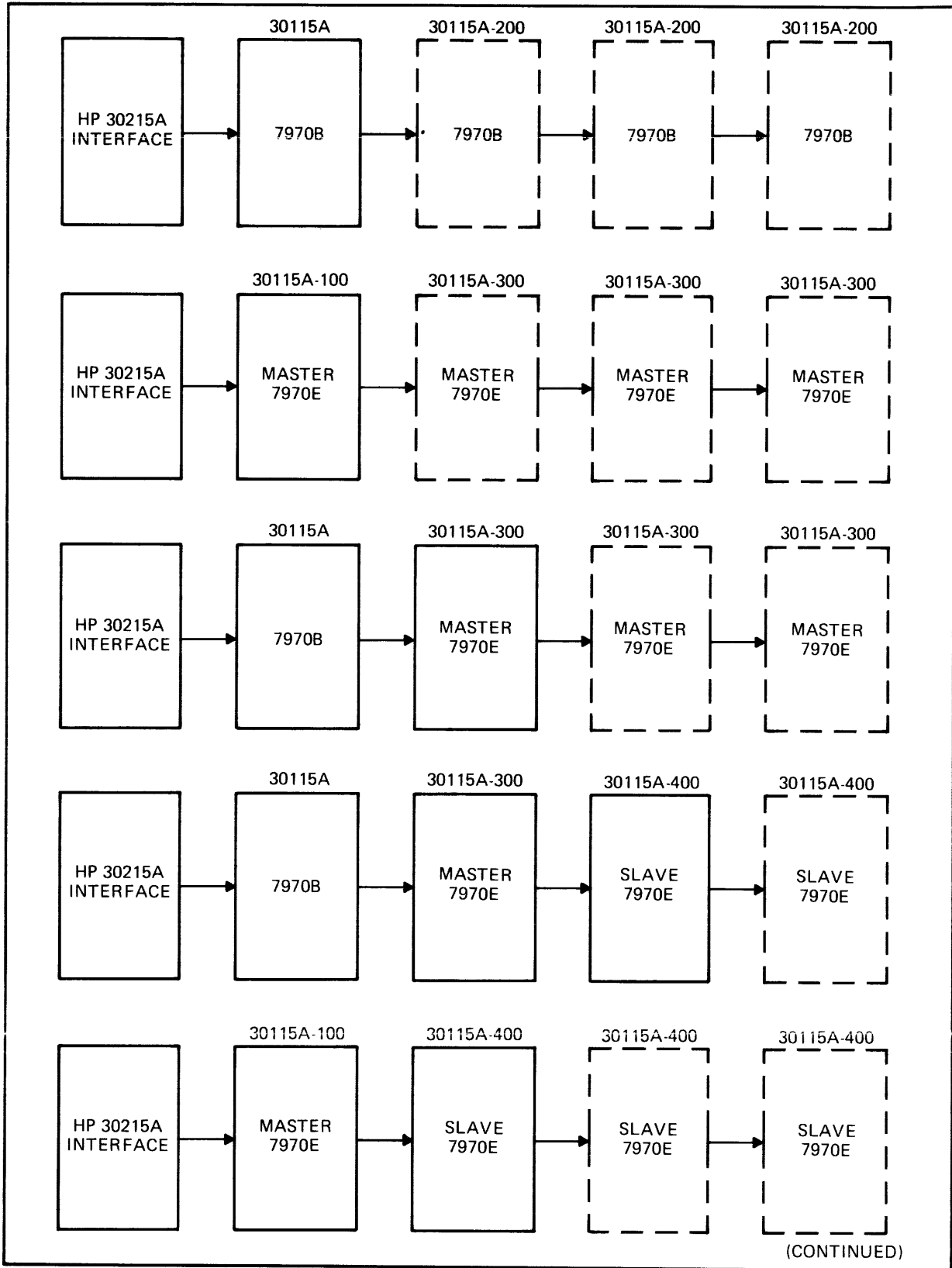


Figure 7970-2. HP 7970B/7970E Configurations (Part A)

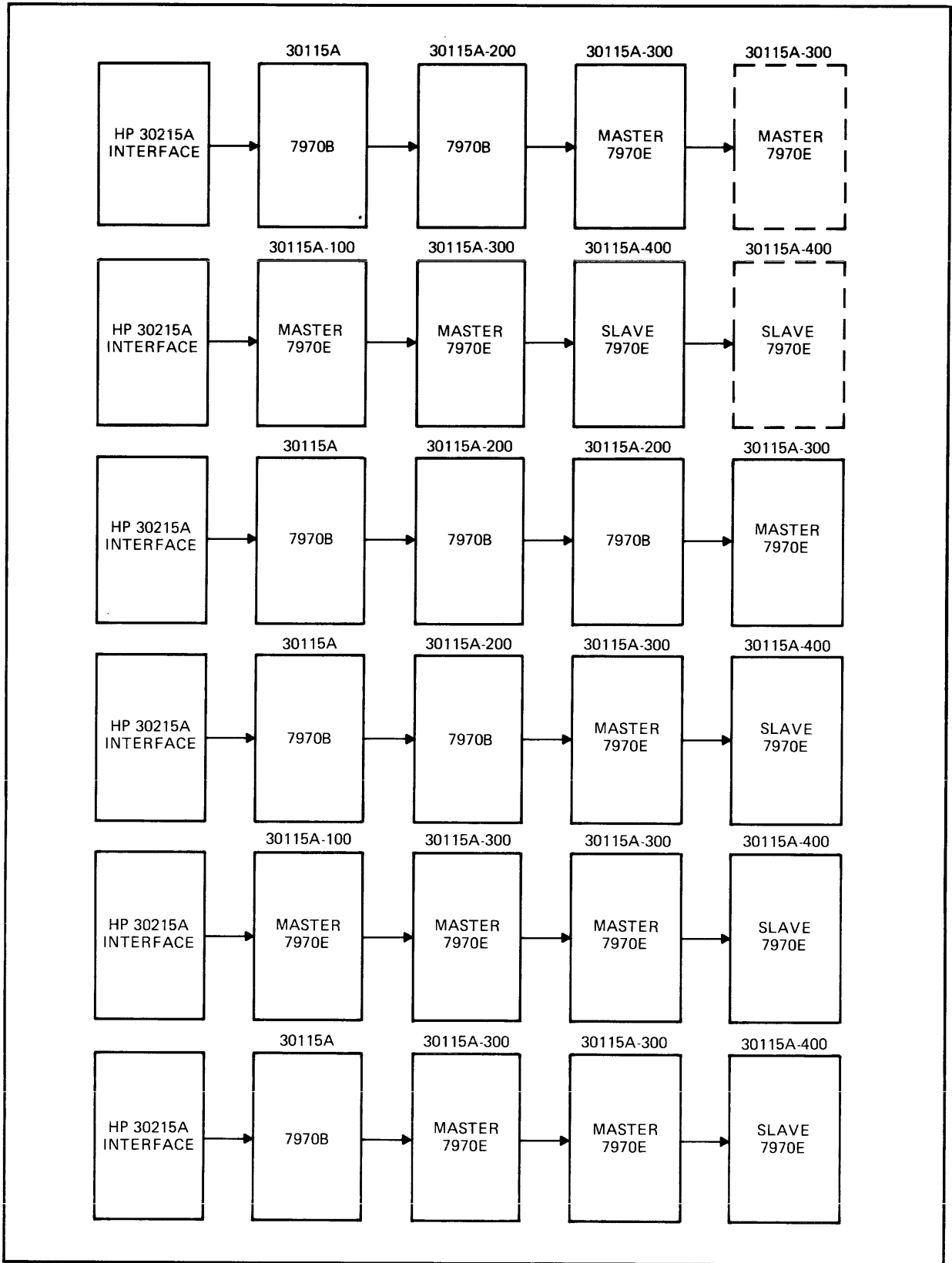


Figure 7970-2. HP 7970B/7970E Configurations (Part B)

## HP 30115A-100 Subsystem

An HP 30115A-100 Nine-Track Magnetic Tape Subsystem includes the following materials:

- One Master 7970E Digital Magnetic Tape Unit (PE)
- One Tape Unit Power Cable Assembly, part number 8120-1395
- One Tape Reel (empty), part number 1490-0738
- One Tape Reel (blank tape), part number 9162-0025
- One Tape Unit Extender Printed-Circuit Assembly (PCA), part number 07970-60420
- One Container of Head Cleaner
- Mounting Accessories
- One Magnetic Tape (Nine-Track) Controller PCA, part number 30215-60001
- One Magnetic Tape Controller Processor PCA, part number 30215-60002
- Two Connecting Cable Assemblies, part number 30000-93052
- One Interface Cable Assembly, part number 30215-60003
- One On-Line HP 30115A Magnetic Tape Test, product number 32362A
- One *On-Line HP 30115A Magnetic Tape Test* manual, part number 30115-90003
- One *HP 7970E Digital Magnetic Tape Unit Operating and Service Manual*, part number 07970-90765
- One *HP 30115A Nine-Track (NRZI-PE) Magnetic Tape Subsystem Maintenance Manual*, part number 30115-90001

The Tape Unit Power Cable Assembly is approximately 7 feet (2.13 meters) long. The tape reels are 10-1/2 inches (267 mm) in diameter and the reel of blank tape contains approximately 2400 feet (731 meters) of tape. The Connecting Cable Assemblies are approximately 1-1/2 inches (38 mm) long and the Interface Cable Assembly is approximately 20 feet (6.1 meters) long.

## HP 30115A-200 Subsystem

The HP 30115A-200 Nine-Track Magnetic Tape Subsystem adds one HP 7970B Digital Magnetic Tape Unit (NRZI) to the computer system. With an HP 30115A Subsystem already installed, an HP 30115A-200 Subsystem may be added up to three times (total of four tape units on one magnetic tape controller PCA).

An HP 30115A-200 Subsystem includes the following materials:

- One HP 7970B Digital Magnetic Tape Unit (NRZI)
- One HP 13194A or 13190B Multiunit Cable



- One Tape Unit Power Cable Assembly, part number 8120-1395
- One Tape Reel (empty), part number 1490-0738
- One Tape Reel (blank tape), part number 9162-0025
- Mounting Accessories

The Tape Unit Power Cable Assembly is approximately 7 feet (2.13 meters) long. The tape reels are 10-1/2 inches (267 mm) in diameter and the reel of blank tape contains approximately 2400 feet (731 meters) of tape. The Multiunit Cable is approximately 20 feet (6.1 meters) long.

### **HP 30115-300 Subsystem**

The HP 30115A-300 Nine-Track Magnetic Tape Subsystem adds one Master HP 7970E Digital Magnetic Tape Unit (PE) to the computer system. With an HP 30115A or 30115A-100 Subsystem already installed, an HP 30115A-300 Subsystem may be added up to three times (total of four tape units on one magnetic tape controller PCA).

An HP 30115A-300 Subsystem includes the following materials:

- One Master HP 7970E Digital Magnetic Tape Unit (PE)
- One HP 13194A Multiunit Cable
- One Tape Unit Power Cable Assembly, part number 8120-1395
- One Tape Reel (empty), part number 1490-0738
- One Tape Reel (blank tape), part number 9162-0025
- Mounting Accessories

The Tape Unit Power Cable Assembly is approximately 7 feet (2.13 meters) long. The tape reels are 10-1/2 inches (267 mm) in diameter and the reel of blank tape contains approximately 2400 feet (731 meters) of tape. The Multiunit Cable is approximately 20 feet (6.1 meters) long.

### **HP 30115A-400 Subsystem**

The HP 30115A-400 Nine-Track Magnetic Tape Subsystem adds one Slave HP 7970E Digital Magnetic Tape Unit (PE) to the computer system. With an HP 30115A-100 Subsystem already installed, an HP 30115A-400 Subsystem may be added up to three times (total of four tape units on one magnetic tape controller PCA).

An HP 30115A-400 Subsystem includes the following materials:

- One Slave HP 7970E Digital Magnetic Tape Unit (PE)
- One HP 13194A-001 Multiunit Cable

- One Tape Unit Power Cable Assembly, part number 8120-1395
- One Tape Reel (empty), part number 1490-0738
- One Tape Reel (blank tape), part number 9162-0025
- Mounting Accessories

The Tape Unit Power Cable Assembly is approximately 7 feet (2.13 meters) long. The tape reels are 10-1/2 inches (267 mm) in diameter and the reel of blank tape contains approximately 2400 feet (731 meters) of tape. The Multiunit Cable is approximately 20 feet (6.1 meters) long.

## SPECIFICATIONS

The pertinent specifications for the HP 7970B and 7970E Digital Magnetic Tape Units are presented in table 7970-1.

## INSTALLATION

The magnetic tape units and controller PCAs are already mounted in the appropriate equipment bays when the computer system is shipped. The interface cable is connected to the Magnetic Tape (Nine-Track) Controller PCA and coiled in the bay. The multiunit cable for connecting each tape unit to the next unit in the series is connected to the tape unit and coiled inside the bay. After the bays are fastened together, uncoil the cables and connect them as described below under “Cabling”. All cable connections are summarized on the “Cable Routing” form in section 1 of the *System Support Log* for the particular computer system.

Jumper and polling information for the controller PCAs, as well as the location of the PCAs in the equipment bay, are described on the “Subsystem Configuration” form in section 1 of the *System Support Log*. Using the “Subsystem Configuration” form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

### Cabling

The first tape unit in the series is connected to the Magnetic Tape (Nine-Track) Controller PCA by way of the Interface Cable Assembly. The tape units in the series are connected to one another by way of a Multiunit Cable. Note that an HP 13194A Multiunit Cable is used to connect a 7970B to a 7970B, a Master 7970E to a 7970B, or a Master 7970E to a Master 7970E whereas an HP 13194-001 Multiunit Cable is used to connect a Slave 7970E to either a Master 7970E or another Slave 7970E.

Figure 7970-3 illustrates how to connect the hooded end of the Interface Cable Assembly to the interface PCA. Figure 7970-4 illustrates how to connect the cables to a 7970B tape unit. Figures 7970-5 and 7970-6 illustrate how to connect the cables to a Master 7970E and to a Slave 7970E tape unit, respectively. Figures 7970-7, 7970-8, and 7970-9 are cabling diagrams that illustrate how to connect a 7970B to the interface PCA and how to connect two sample series of tape units.

**Table 7970-1. HP 7970B/7970E Specifications**

<b>Interface DC Power Requirements</b>	
+5	-5
+15	-15
+20	-20
9.9	0
0	0
0	0
<b>Tape Unit AC Power Requirements</b>	
Voltage:	120V
Current:	3.4A
Frequency:	60 Hz
	or
	230V
	1.7A
	50 Hz
<b>Heat Dissipation</b>	
Tape Unit:	1365 BTU/hr; 342.62 cal, kg/hr
Interface:	170 BTU/hr; 42.67 cal, kg/hr
<b>Cable Lengths</b>	
Tape Unit Power Cord:	7 ft; 2.13 m
Interface and Multiunit Cables:	15 ft (to first unit); 4.57 m
	25 ft (maximum to first unit); 7.62 m
	15 ft (between units); 4.57 m
	60 ft (total maximum for 4 units); 18.29 m
<b>Net Weight (Unpacked):</b> 130 lb	
58.96 kg	
<b>Distributed Over:</b> n.a. (rack-mounted)	
<b>Dimensions</b>	
Depth:	12 in.; 30.5 cm
Width:	19 in.; 48.3 cm
Height:	24 in.; 61 cm
<b>Shipping Information</b>	
Number of Crates:	1
Size of Crates:	14.42 cu ft; .4084 cu m
Net Weight (Packed) of Crates:	190 lb; 86.167 kg

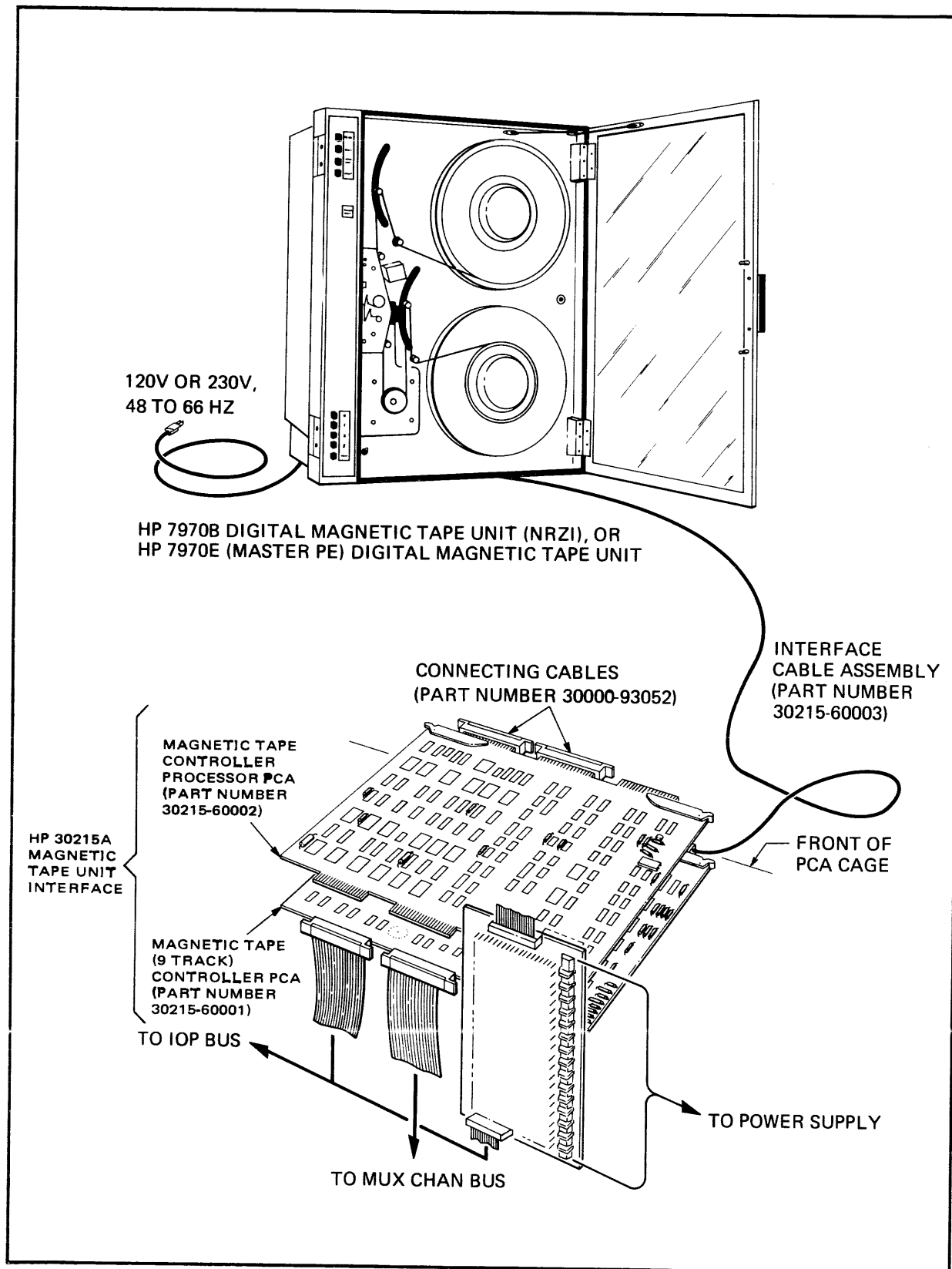


Figure 7970-3. Connecting an HP 7970B/7970E to the PCA

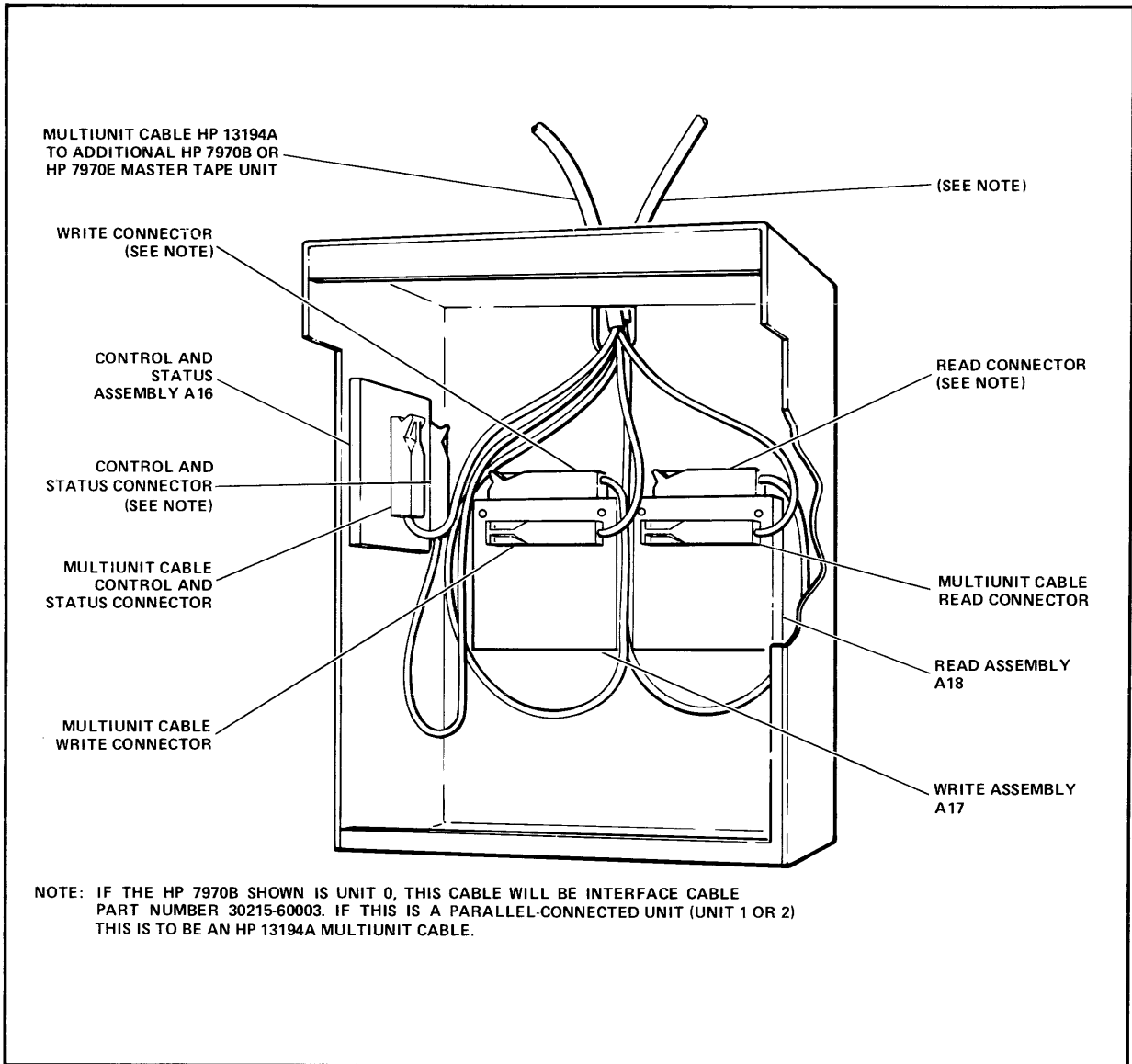
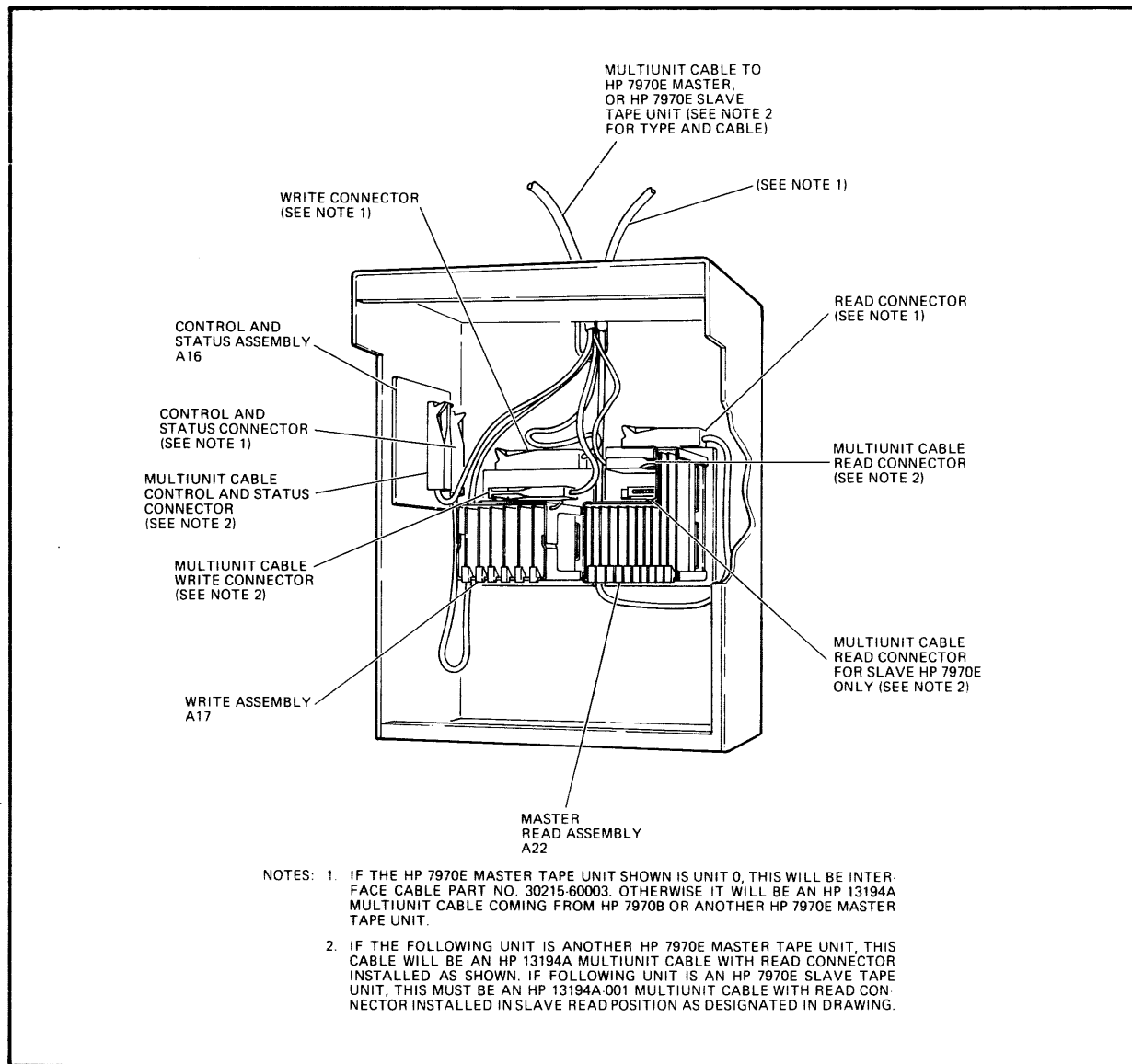
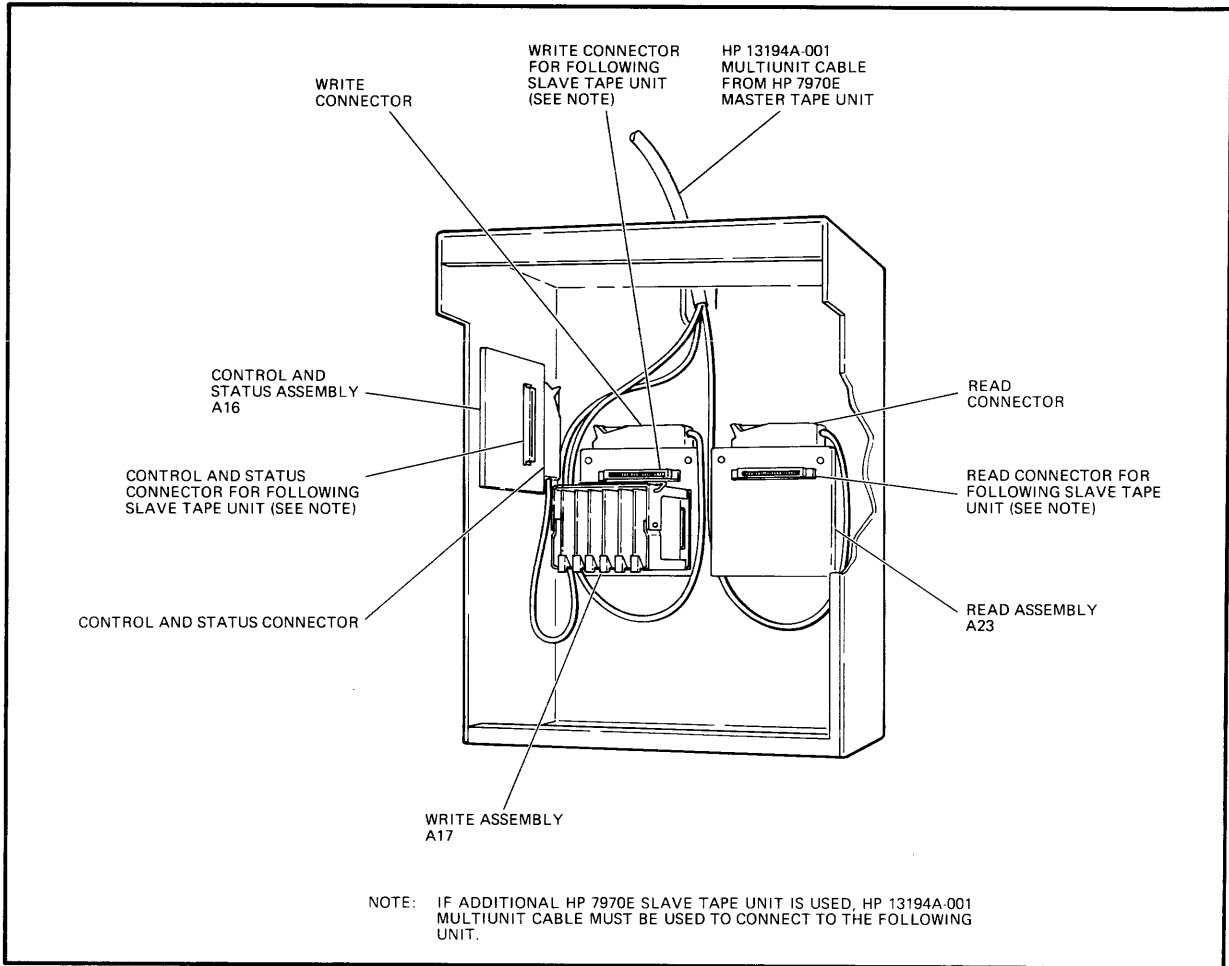


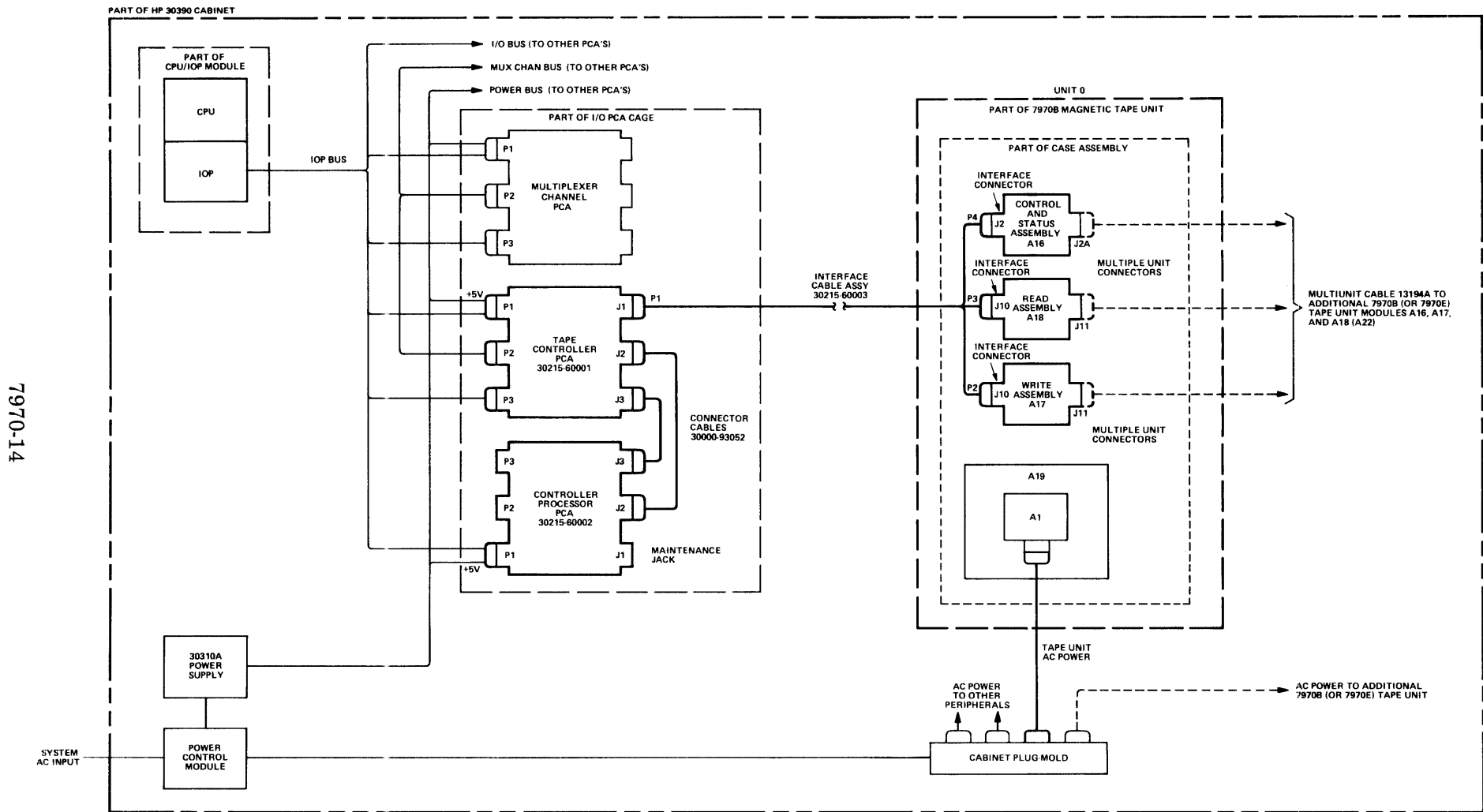
Figure 7970-4. Connecting the Cables to an HP 7970B



**Figure 7970-5. Connecting the Cables to an HP Master 7970E**



**Figure 7970-6. Connecting the Cables to an HP Slave 7970E**



7970-14

Figure 7970-7. Cabling Example: 7970B to PCA



OPTION CONFIGURATION TABLE (SEE NOTES 1 AND 2)

UNIT 0	UNIT 1	UNIT 2	UNIT 3
B	B	B	B
E	E	E	E
B	E	E	E
E	S <sup>3</sup>	S <sup>3</sup>	S <sup>3</sup>
B	B	E	E
E	E	S <sup>3</sup>	S <sup>3</sup>
B	E	S <sup>3</sup>	S <sup>3</sup>
B	B	B	E
B	B	E	S <sup>3</sup>
E	E	E	S <sup>3</sup>
B	E	E	S <sup>3</sup>

NOTES:

1. SUPERSCRIP 3 IN THE TABLE SIGNIFIES NOTE 3 BELOW.
2. LETTERS IN THE TABLE REPRESENT TAPE UNITS AS FOLLOWS: "B" MEANS 7970B, "E" MEANS MASTER 7970E, "S" MEANS SLAVE 7970E. UNIT 0 CAN BE A "B" OR "E" AS SHOWN IN SMALL OUTLINED BOX. ALL POSSIBLE COMBINATIONS USING TWO TAPE UNITS ARE SHOWN BY LETTER COMBINATIONS IN THE SECOND LARGEST OUTLINED BOX, ETC. ALL COMBINATIONS USING FOUR (MAXIMUM) UNITS IS SHOWN USING ENTIRE TABLE.
3. MULTIUNIT CABLE HP 13194A-001 MUST BE USED AND FROM 7970E MASTER TO SLAVE TAPE UNIT AND FROM SLAVE TO SLAVE. SEE EXAMPLE CONNECTION DIAGRAM NUMBER 2.

7970-15

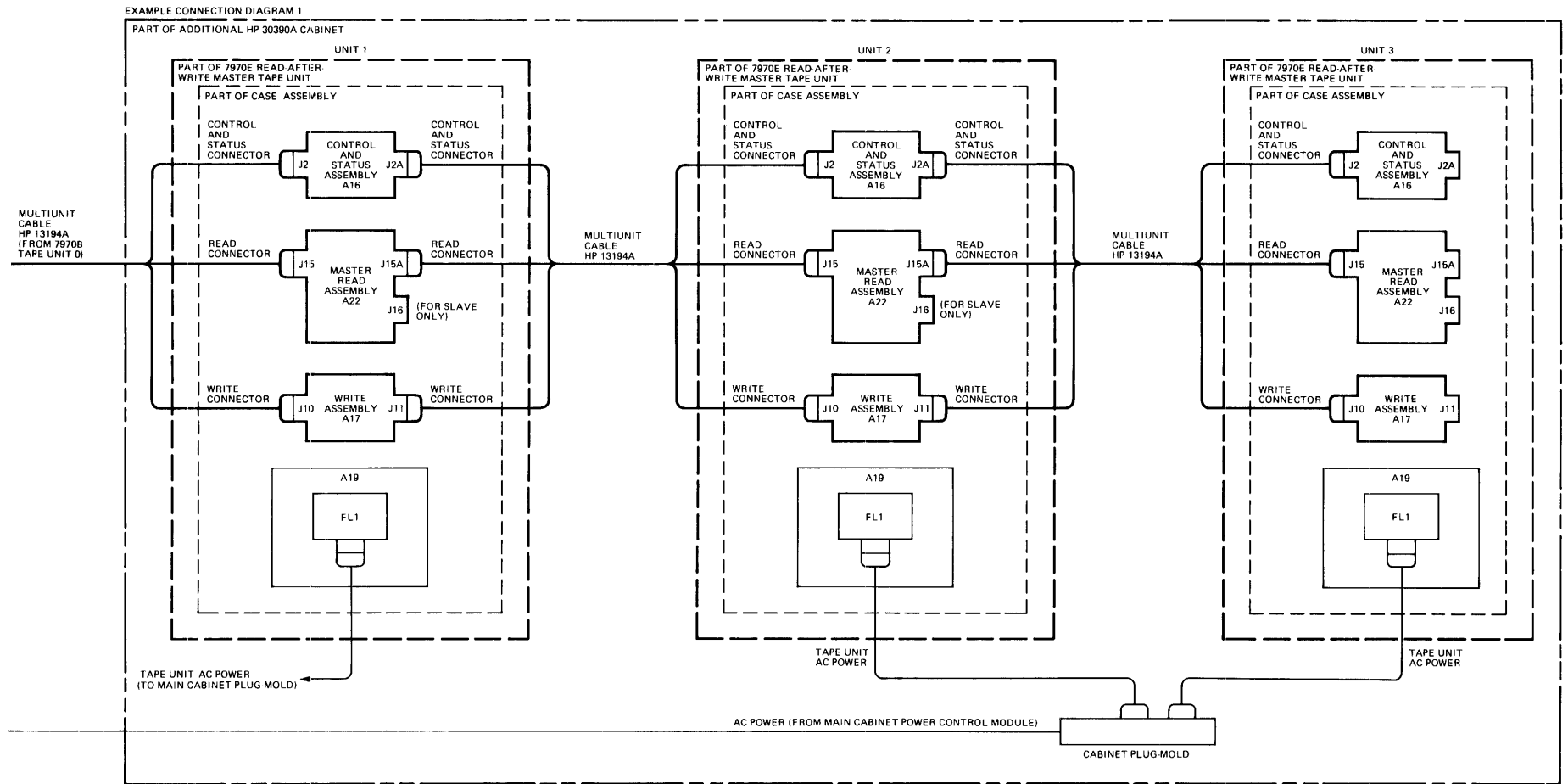


Figure 7970-8. Cabling Example: Master 7970E to Master 7970E to 7970B

7970-16

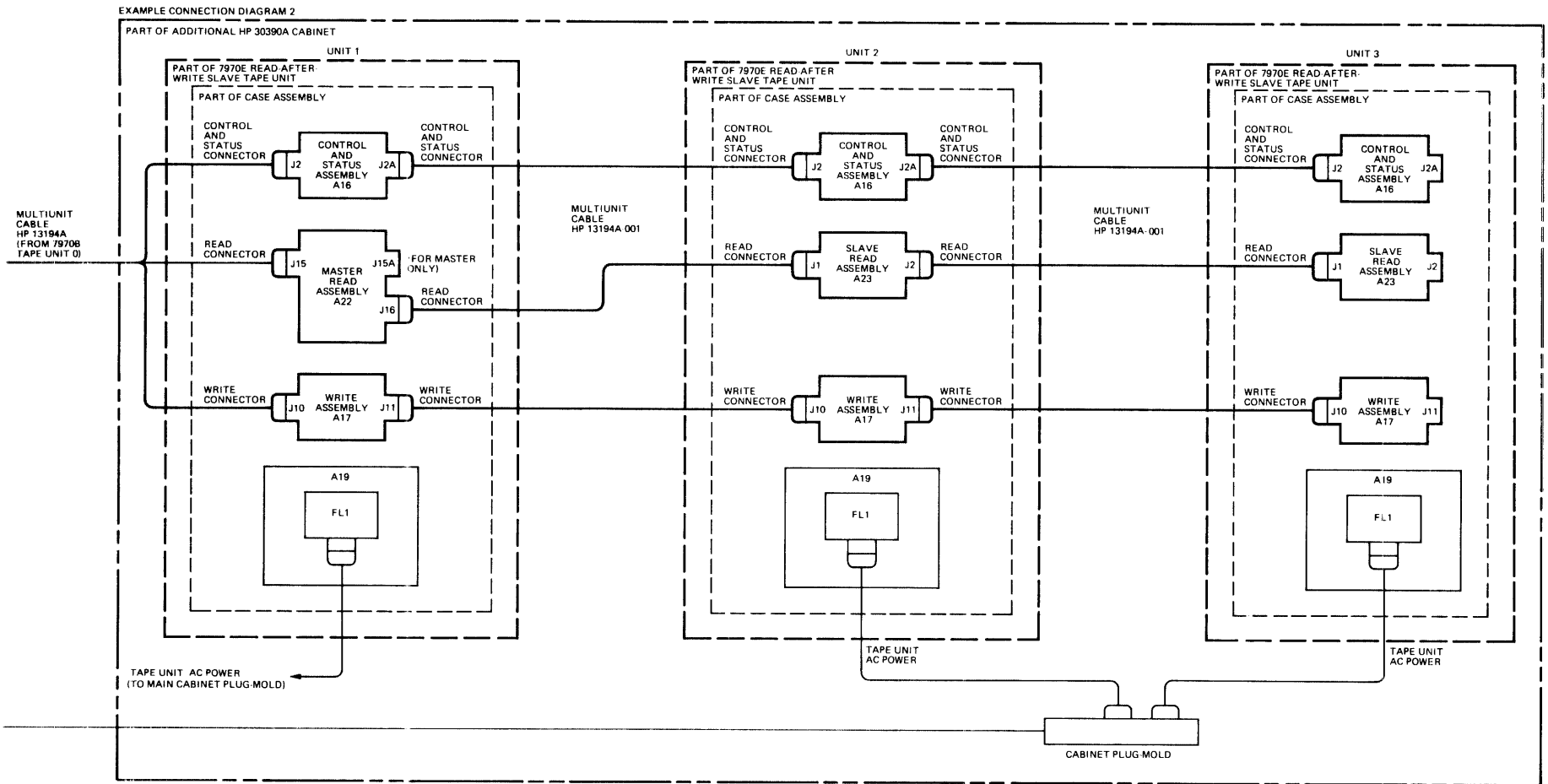


Figure 7970-9. Cabling Example: Slave 7970E to Slave 7970E to Master 7970E to 7970B

## Mechanical Check-Out

- a. Open and close the cover door. When the cover door is closed, verify that it rests snugly against the rubber seal and that the detents hold firmly.
- b. Swing the cover door all the way open. Verify that the hinges operate freely and that the door stop brackets prevent the cover door from opening more than approximately 105 degrees.
- c. Press the RESET, REWIND, ON-LINE, and LOAD pushbuttons. Verify that they press freely and that they can be entirely depressed.
- d. Press the density select and address select pushbuttons. Verify that the mechanical interlocks are working properly.
- e. Release the transport latch and swing the transport out. Verify that all cable connectors, motion cards, and data cards are securely seated, that there is an unobstructed airflow for instrument cooling, and that the address select jumper is connected to the pin labeled OFF.
- f. Slowly swing the transport in and out. Verify that the wire harnesses, wire cable, and ribbon cables fold properly.

## Motion Control and Electrical Check-Out

**Warning:** Before initially plugging any product into an electrical outlet, test the polarity of the hot and neutral lines in accordance with the national configuration (such as NEMA or CEE) to ensure that the hot leg will be broken when the power switch on the product is set to the off position.

- a. Move the 115-230 Vac slide switch to the proper position, and then connect the power cord to the appropriate service strip in the equipment bay.
- b. Move the manual control switches on the capstan servo PCA inside the tape unit to the OFF position (switches down).
- c. Move the power switch to the ON position. The RESET, unit address, and density select push-button indicators should illuminate.
- d. Check the regulated and unregulated power voltages as follows:

Regulated voltages will remain within tolerances over a primary voltage range of  $\pm 10$  percent. DC voltages and tolerances are to be as specified below. The peak-to-peak ripple values are nominal and minor variances may be expected. Ripple is stated under tension-only conditions.

- The +5 volt supply must be  $+5.000 \pm 0.050$  Vdc
- The +12 volt supplies must be  $12.000 \pm 0.360$  Vdc

Unregulated supply voltages are a direct function of line voltage. The following list of nominal values should be judged only at a line voltage of 115 volts. RMS ripple values are nominal and apply at 60 hertz.

- $\pm 40$  Vdc: Nominal value is  $\pm 57$  volts; ripple of 150 mv p-p (sawtooth)
  - +20 Vdc: Nominal value is +23 volts; ripple of 600 mv p-p (sawtooth)
  - -20 Vdc: Nominal value is -23 volts; ripple of 300 mv p-p (sawtooth)
  - +10 Vdc: Nominal value is +12 volts; ripple of 900 mv p-p (sawtooth)
- e. Remove the write enable ring from a reel of tape and then mount the reel on the supply (upper) hub. Before pressing the quick disconnect latch on the hub, be sure that the reel is firmly seated on the hub. Mount an empty reel on the takeup (lower) hub and thread the tape from the supply reel onto the takeup reel.
- f. Press and hold the LOAD pushbutton. The tape should move until the tape tension arms are centered and proper tape tension is established.
- g. Release the LOAD pushbutton. The motion control logic should initiate a loadpoint (BOT) search. During a loadpoint search, the tape moves from the supply reel onto the takeup reel at 20 ips. When a loadpoint is found, the tape should stop moving and the LOAD pushbutton indicator should illuminate.
- h. Press the address select and OFF pushbuttons one at a time. As each pushbutton is pressed, it should illuminate and all others should go dark.
- i. Press and release the ON-LINE pushbutton. The ON-LINE pushbutton indicator should illuminate and the REWIND and LOAD switches should be inoperative. Press the REWIND and LOAD pushbuttons and verify that nothing happens.
- j. Press the RESET pushbutton. The ON-LINE pushbutton indicator should go dark and the RESET pushbutton indicator should illuminate.
- k. Check the capstan manual control switches as follows:
- (1) Open the cover door and release the transport latch.
  - (2) Close the cover door.
  - (3) Swing the transport out.
  - (4) Move the capstan servo FWD switch to the ON position (up). The tape should move from the supply reel onto the takeup reel.
  - (5) Move the capstan servo FWD switch to the OFF position (down). The tape should stop moving.

- (6) Move the capstan servo +160 switch to the ON position (up). The tape should move from the supply reel onto the takeup reel at high speed. Allow approximately 100 feet of tape to wind onto the takeup reel.
  - (7) Move the capstan servo +160 switch to the OFF position (down). The tape should stop moving.
  - (8) Move the capstan servo REV switch to the ON position (up). The tape should move from the takeup reel onto the supply reel.
  - (9) Move the capstan servo REV switch to the OFF position (down). The tape should stop moving.
  - (10) Swing the transport back into place and make sure that it latches in place.
- l. Press the REWIND pushbutton. The REWIND pushbutton indicator should illuminate, the RESET pushbutton indicator should go dark, and the tape should move from the takeup reel onto the supply reel at high speed.
  - m. Press the RESET pushbutton. The RESET pushbutton indicator should illuminate, the REWIND pushbutton indicator should go dark, and the tape should stop moving.
  - n. Press the REWIND pushbutton again. When the loadpoint is passed, the tape should stop moving and the motion control logic should initiate a loadpoint search. When the loadpoint is found, the tape should stop moving and the LOAD pushbutton indicator should illuminate.
  - o. Press and hold the REWIND pushbutton. The tape should rewind past the loadpoint and off the takeup reel. When the tape rewinds off the takeup reel, the REWIND pushbutton indicator should go dark, the RESET pushbutton indicator should illuminate, and the tape should stop moving.
  - p. Remove the supply reel and install a write enable ring.
  - q. Mount the supply reel back on the supply hub. The WRITE ENABLE indicator should illuminate.

## DIAGNOSTIC PROGRAMS

The On-Line HP 30115A Magnetic Tape Test verifies the proper operation of the magnetic tape units and the magnetic tape controller. The operating instructions for the diagnostic program are described in the associated manual (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30115A, 30115A-100, 30115A-200, 30115A-300, or 30115A-400 Nine-Track Magnetic Tape Subsystem includes all the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation.

If necessary, the shipment also includes one or more additional HP 30390A-001 Cabinets. In such a case, those magnetic tape units which are to be mounted in the additional cabinets are mounted in the cabinets before the computer system is shipped.

In many cases, the add-on shipment includes several of the subsystems described earlier under “Subsystem Inventory”. For example, if a Master 7970E and two Slave 7970E tape units are being added to a computer system which already includes one 7970B tape unit, the add-on shipment includes one HP 30115A-300 and two 30115A-400 subsystems.

The mounting accessories mentioned under “Subsystem Inventory” include the following materials:

- One Rack Mounting Bracket, part number 07970-00580
- Seven Number 10 Lockwashers, part number 2190-0034
- Three Number 10-32 0.500-inch Screws, part number 2680-0103
- Four Number 10-32 0.375-inch Screws, part number 2680-0116
- Four Number 10-32 0.312-inch Screws, part number 2680-0129
- Seven Flat Washers, part number 3050-0002

The add-on procedure comprises some combination of the following general steps:

1. Connecting one or more equipment bays to the existing computer system. *This step is necessary only when additional bays are required to house the add-on tape units.*
2. Uncrating and installing a tape unit. *This step is necessary only when there is room in the existing computer system to accommodate one of the add-on tape units.*
3. Installing the controller PCAs. *This step is necessary only when the existing computer system does not already include at least one magnetic tape unit.*
4. Connecting the cables between the controller PCAs and the tape units.
5. Performing the installation check-out procedures for the tape units.

### **Connecting the Equipment Bays**

Connect the additional equipment bays to the existing computer system as described in chapter 2, “CPU Assembly”, of this manual.

### **Uncrating and Installing a Tape Unit**

The HP 7970B/7970E tape units are packed in a shipping crate. Remove the tape unit from the shipping crate and remove any shipping materials from the tape unit. Retain all materials in case it becomes necessary to repack the tape unit for shipment in the future.

The procedure for installing the tape unit in an HP 30390A-001 Cabinet is as follows:

- a. Remove the protective covering from the accessory kit and locate the four number 10-32 0.375-inch flat-head screws (part number 2680-0116) and the rack mounting bracket (part number 07970-00580).
- b. The correct location of the tape unit in the equipment bay is illustrated on the “HP 3000 Racking Diagram”. Attach the rack mounting bracket to the left rail of the HP 30390A-001 Cabinet using the four screws. Orient the rack mounting bracket so that the upper and lower flanges face the inside of the bay. These flanges form a cradle to hold the left (hinged) side of the tape unit.
- c. Place the tape unit into position and then attach the right side of the tape unit to the cabinet using three number 10-32 0.5-inch machine screws (part number 2680-0103), three flat washers (part number 3050-0002), and three number 10 lockwashers (part number 2190-0034).
- d. Using the remaining four number 10-32 0.312-inch machine screws, flat washers, and number 10 lockwashers, secure the left side of the tape unit to the rack mounting bracket.

**Warning:** The tape unit power cable is equipped with a three-wire connector. Do not defeat the ground connection by using an adapter or breaking the grounding pin of the connector. Isolating the unit from ground creates a hazardous condition which may result in death or serious injury.

- e. Connect the female polarized connector of power cable W1 to the male power connector of the tape unit. Connect the other end of the power cable to the appropriate ac electrical service strip in the HP 30390A-001 Cabinet.

### Installing the Controller PCAs

The controller PCAs are already jumpered when shipped. Before installing them in the computer, consult the “Subsystem Configuration” form to verify that the jumpering was done correctly.

The interface PCAs for all input/output devices are usually housed in a card cage in the top of bay #2. The “Subsystem Configuration” form specifies the intended location of the magnetic tape controller PCAs in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the magnetic tape controller PCAs may require that other PCAs in the card cage be rearranged to make room for them. If that is the case, then the “Subsystem Configuration” form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the “Subsystem Configuration” form.

## **Connecting the Cables**

Connect the cables between the tape units and the controller PCAs as described earlier under “Installation”.

## **Installation Check-Out**

Perform the mechanical, electrical, and motion control check-out procedures for the tape units as described earlier under “Installation”.



# ASYNCHRONOUS 16-CHANNEL TERMINAL CONTROLLER

***(Subsystems HP 30032A, 30032A-001,  
and 30032A-002)***

The HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem provides an interface between the HP 3000 Computer System and up to 16 hard-wired serial devices. The HP 30032A-001 Asynchronous 16-Channel Terminal Controller Subsystem provides an interface between the HP 3000 Computer System and up to 16 type 103 data sets and/or hard-wired serial devices. The HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem provides an interface between the HP 3000 Computer System and up to 16 type 103 data sets, type 202 data sets, and/or hard-wired serial devices.

## SUBSYSTEM INVENTORY

### HP 30032A Subsystem

An HP 30032A Asynchronous 16-Channel Terminal Controller Subsystem includes the following materials:

- One Terminal Data Interface Printed-Circuit Assembly (PCA), part number 30060-60001.
- One Terminal Connector Panel, part number 30062-60002.
- One Terminal Data Interface PCA Connector Cable, part number 30060-60003.
- One *HP 30032A Asynchronous Terminal Controller Maintenance Manual*, part number 30032-90001.
- One On-Line HP 30060A Terminal Data Interface Test, product number 32363A.
- One *On-Line HP 30060A Terminal Data Interface Test* manual, part number 30060-90003.

### HP 30032A-001 Subsystem

An HP 30032A-001 Asynchronous 16-Channel Terminal Controller Subsystem includes the following materials:

- One Terminal Data Interface PCA, part number 30060-60001.

- One Terminal Control Interface PCA, part number 30061-60001.
- One Terminal Data Interface PCA Connector, part number 30060-60003.
- One Terminal Control Interface PCA Connector, part number 30061-60003.
- One *HP 30032A Asynchronous Controller Maintenance Manual*, part number 30032-90001.
- One On-Line HP 30060A Terminal Data Interface Test, product number 32363A.
- One *On-Line HP 30060A Terminal Data Interface Test* manual, part number 30060-90003.
- One On-Line HP 30061A Terminal Control Interface Test, product number 32368A.
- One *On-Line HP 30061A Terminal Control Interface Test* manual, part number 30061-90003.

### **HP 30032A-002 Subsystem**

An HP 30032A-002 Asynchronous 16-Channel Terminal Controller Subsystem includes the following materials:

- One Terminal Data Interface PCA, part number 30060-60001.
- Two Terminal Control Interface PCAs, part number 30061-60001.
- One Terminal Data Interface PCA Connector Cable, part number 30060-60003.
- Two Terminal Control Interface PCA Connector Cables, part number 30061-60003.
- One *HP 30032A Asynchronous Controller Maintenance Manual*, part number 30032-90001.
- One On-Line HP 30060A Terminal Data Interface Test, product number 32363A.
- One *On-Line HP 30060A Terminal Data Interface Test* manual, part number 30060-90003.
- One On-Line HP 30061A Terminal Control Interface Test, product number 32368A.
- One *On-Line HP 30061A Terminal Control Interface Test* manual, part number 30061-90003.

### **INSTALLATION**

The PCA(s) and terminal connector panel are already installed in the appropriate equipment bays when the computer system is shipped. The “Subsystem Configuration” and “HP 3000 Racking Diagram” forms in section 1 of the *System Support Log* for the particular computer system describe the location of the PCA(s) and the terminal connector panel, respectively. The cables for connecting the PCA(s) to the terminal connector panel are already connected to the panel and are coiled inside the bay. Receptacles J16 through J20 on the terminal connector panel are used for connecting the PCAs to the panel. After connecting the bays together, uncoil the PCA-to-panel cables and connect the loose ends to the appropriate PCAs as illustrated in figure 30032-1.

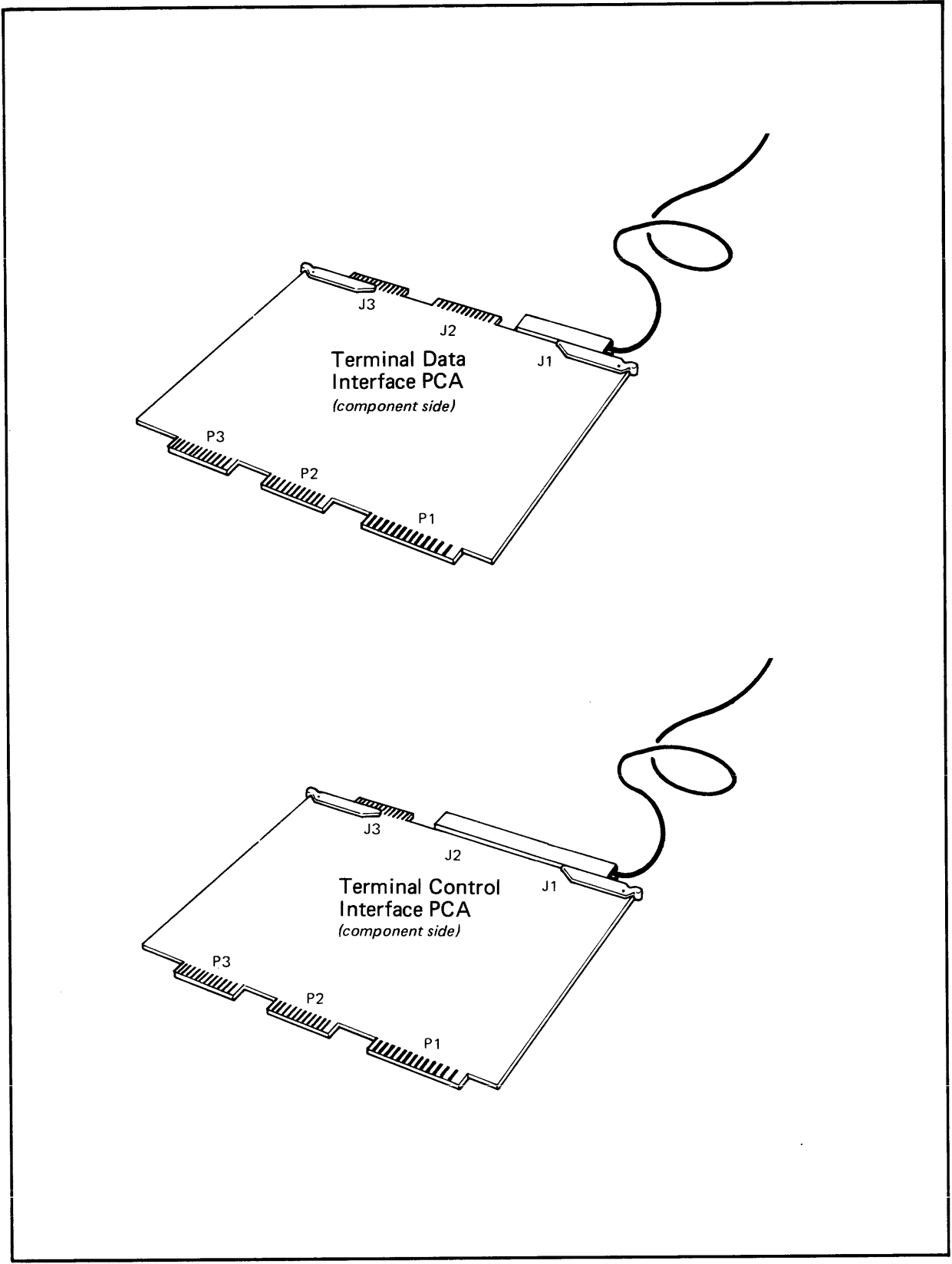


Figure 30032-1. Connecting the Terminal Data and Terminal Control Cable Assemblies to the Terminal Data and Terminal Control Interface PCAs

Jumper and polling information for the PCA(s) is described on the “Subsystem Configuration” form. Using the “Subsystem Configuration” form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

The interface cable assemblies for connecting input/output devices to the terminal connector panel are ordered and shipped as separate items. The part numbers of the various interface cable assemblies are shown in table 30032-1. Uncoil the cables and connect them to the terminal connector panel and to the devices. The cable connections for each standard HP input/output device are described in the appropriate device installation module earlier in this chapter. For information on how to connect the cables to non-standard devices, consult the documentation associated with the devices.

## DIAGNOSTIC PROGRAMS

The On-Line HP 30060A Terminal Data Interface Test and the On-Line HP 30061A Terminal Control Interface Test verify the proper operation of the terminal data and terminal control interface PCAs, respectively. The operating instructions for each are described in the associated manuals (refer to “Subsystem Inventory”).

## ADD-ON INSTALLATION

An add-on shipment of an HP 30032A, 30032A-001, or 30032A-002 Asynchronous 16-Channel Terminal Controller Subsystem includes all of the materials listed earlier under “Subsystem Inventory” plus copies of those *System Support Log* forms which pertain to the add-on installation. The cables for connecting devices to the terminal connector panel are ordered and shipped as separate items (the part numbers of the various device-to-panel cables are shown in table 30032-1).

The add-on procedure comprises the following general steps:

1. Installing the interface PCAs.
2. Installing the terminal connector panel.
3. Connecting the cables between the PCAs and the panel.

The interface PCAs are already jumpered when shipped. Before installing them in the computer, use the “Subsystem Configuration” form to verify that the jumpering was done correctly.

**Table 30032-1. HP 30062 Interface Cable Assemblies**

Cable Description	Part Number
25 foot cable for connecting a data set to the connector panel	30062-60004
25 foot cable for connecting a terminal directly to the connector panel	30062-60006
50 foot cable for connecting a data set to the connector panel	30062-60007
50 foot cable for connecting a terminal directly to the connector panel	30062-60009
100 foot cable for connecting a data set to the connector panel	30062-60010
100 foot cable for connecting a terminal directly to the connector panel	30062-60012
<p>Notes: For direct connections, the maximum total cable length between the terminal and the connector panel may be up to 1/4-mile for baud rates greater than 600 and up to 1/2-mile for baud rates of 600 or less.</p> <p>For data set connections, refer to the RS-232B specifications for the maximum total cable length allowed between the terminal and the data set.</p> <p>If longer total cable lengths are required, contact the nearest HP Sales and Service Office.</p>	

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The "Subsystem Configuration" form specifies the intended location of the HP 30032A PCAs in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the HP 30032A PCAs may require that other PCAs in the card cage be rearranged to make room for them. If that is the case, then the "Subsystem Configuration" form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the "Subsystem Configuration" form.

The "Racking Diagram" specifies where the terminal connector panel is to be mounted. Install the panel in the rear of the specified equipment bay as illustrated in figure 30032-2.

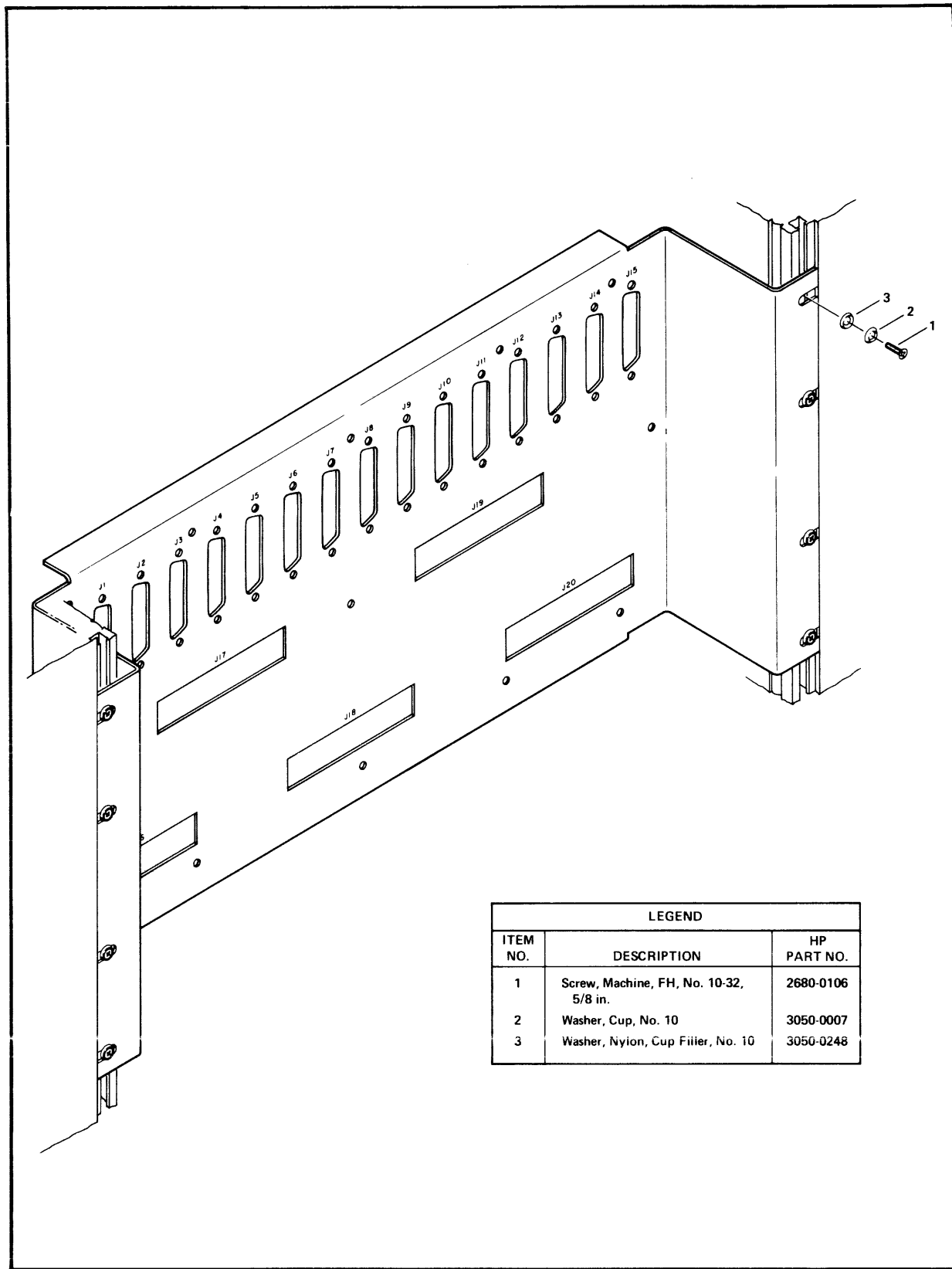
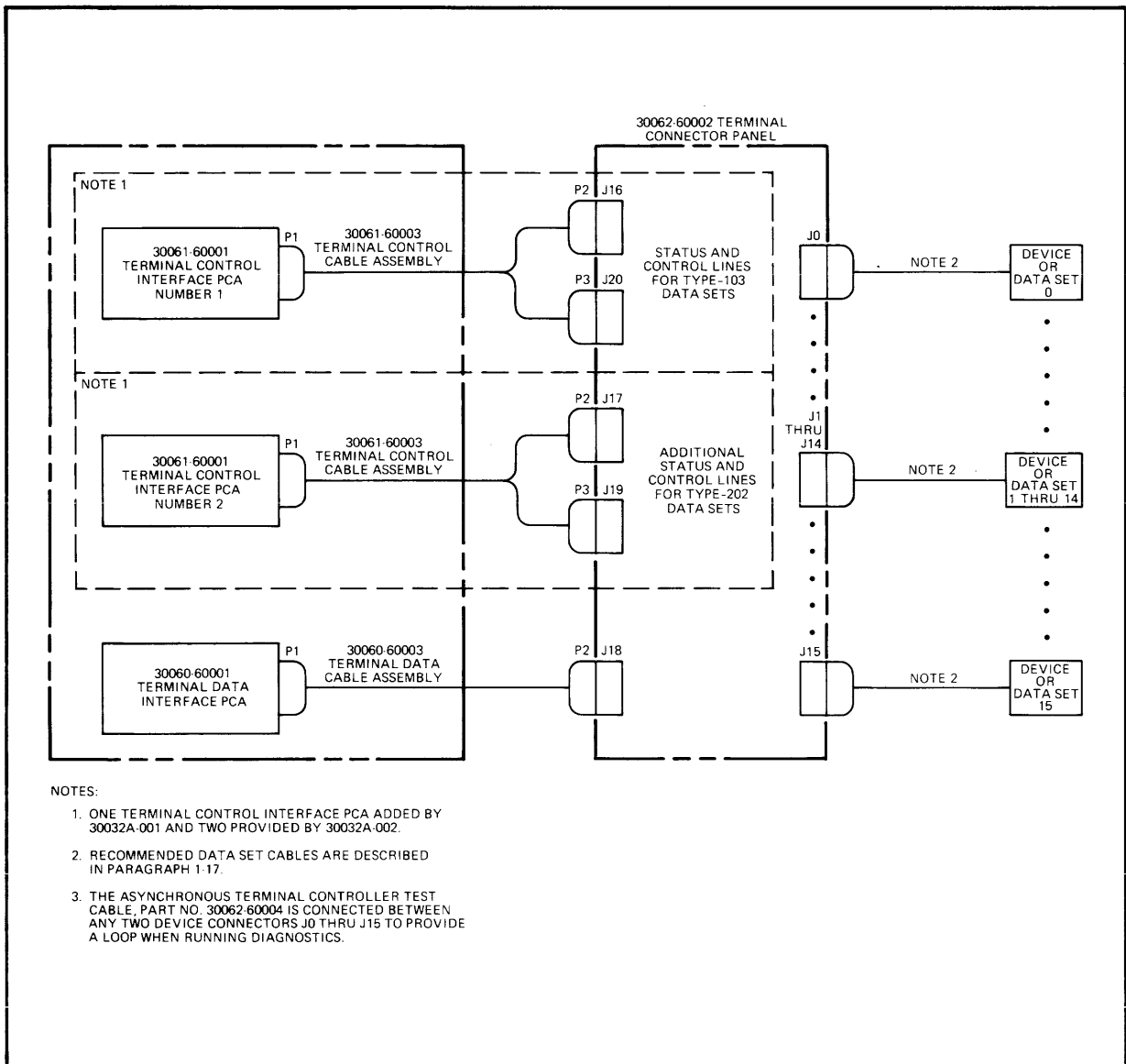


Figure 30032-2. Installing the Terminal Connector Panel in the Equipment Bay (Looking at the Bay From the Rear)

Receptacles J0 through J15 on the terminal connector panel are used for connecting the devices (or data sets) to the panel, while receptacles J16 through J20 are used for connecting the PCAs to the panel. Connect the Terminal Data and Terminal Control Interface PCA Connector Cables to the panel and to the PCAs as illustrated in figures 30032-1 and 30032-3. Connect the various device-to-panel cables to the terminal connector panel and to the devices. The cabling connections for HP devices are described in the appropriate device installation modules earlier in this chapter. For information on how to connect the interface cable assemblies to non-HP devices, consult the documentation associated with the devices. The cable connections to HP equipment are summarized on the "Cable Routing" form.



**Figure 30032-3. Connecting the Terminal Data and Terminal Control Cable Assemblies to the Terminal Connector Panel**

# UNIVERSAL INTERFACE

## ***(Subsystems HP 30050A, 30050A-001, and 30051A)***

The HP 30050A and 30050A-001 Universal Interface (TTL) Subsystems provide interface capability between the HP 3000 Computer System and an external device which uses parallel data transfer through TTL logic circuits. The 30050A is used with devices which require negative-true interface whereas the 30050A-001 is used with devices which require positive-true interface. The HP 30051A Universal Interface (Differential) Subsystem provides interface capability between the HP 3000 Computer System and an external device which uses parallel data transfer through differential logic circuits.

### SUBSYSTEM INVENTORY

#### HP 30050A Subsystem

An HP 30050A Universal Interface (TTL) Subsystem includes the following materials:

- One Universal Interface (TTL) printed-circuit assembly (PCA), part number 30050-60001.
- One *HP 30050A Universal Interface (TTL) Maintenance Manual*, part number 30050-90001.
- One 25-foot Length of Cable, part number 8120-1895.
- One (hooded) Connector Kit, part number 5060-8338.
- One On-Line HP 30050A/30051A Universal Interface Test, product number 32364A.
- One *On-Line HP 30050A/30051A Universal Interface Test* manual, part number 30050-90006.

#### HP 30050A-001 Subsystem

An HP 30050A-001 Universal Interface (TTL) Subsystem includes the following materials:

- One Universal Interface (TTL) PCA, part number 30050-60003.
- One *HP 30050A Universal Interface (TTL) Maintenance Manual*, part number 30050-90001.
- One 25-foot Length of Cable, part number 8120-1895.



- One (hooded) Connector Kit, part number 5060-8338.
- One On-Line HP 30050A/30051A Universal Interface Test, product number 32364A.
- One *On-Line HP 30050A/30051A Universal Interface Test* manual, part number 30050-90006.

### HP 30051A Subsystem

An HP 30051A Universal Interface (Differential) Subsystem includes the following materials:

- One Universal Interface (Differential) PCA, part number 30051-60001.
- One *HP 30051A Universal Interface (Differential) Maintenance Manual*, part number 30051-90001.
- One 25-foot Length of Cable, part number 8120-1895.

*Note: There are two alternative cable length options available. Option 001 provides a 50-foot length and Option 002 provides a 100-foot length.*

- One (hooded) Connector Kit, part number 5060-8338.
- One On-Line HP 30050A/30051A Universal Interface Test, product number 32364A.
- One *On-Line HP 30050A/30051A Universal Interface Test* manual, part number 30050-90006.

## INSTALLATION

A universal interface PCA is included as part of some HP device subsystems. In such cases, all necessary information regarding installation of the PCA is described in the appropriate device installation module earlier in this chapter. The following discussion is applicable only when the universal interface PCA is included in the computer system for the purpose of interfacing a non-standard device.

The PCA is already mounted in the appropriate equipment bay when the computer system is shipped. The cable and hooded connector are shipped as separate items.

Jumper and polling information for the PCA, as well as the location of the PCA in the equipment bay, are described on the “Subsystem Configuration” form in section 1 of the *System Support Log* for the particular computer system.

All necessary polling and jumper connections are done at the factory before the computer system is shipped. Using the “Subsystem Configuration” form, verify that the polling connections on the backplane of the card cage were done correctly. To minimize the possibility of damaging PCAs, it is recommended as a general rule that PCAs *not* be removed from the card cage merely for the purpose of verifying the jumper connections.

Using table 4-1 in the *HP 30050A Universal Interface (TTL) Maintenance Manual* or the *HP 30051A Universal Interface (Differential) Maintenance Manual*, attach the hooded connector to one end of the cable. Using the documentation associated with the device, attach the device connector to the other end of the cable. Connect the hooded end of the interface cable assembly to the universal interface PCA as illustrated in figure 30050-1 and connect the other end to the device. For information on how to connect the interface cable assembly to the device, consult the documentation associated with the device.

## DIAGNOSTIC PROGRAMS

The On-Line HP 30050A/30051A Universal Interface Test verifies the proper operation of the universal interface PCA. The operating instructions are described in the associated manual (refer to “Subsystem Inventory”).

*Note: The On-Line HP 30050A/30051A Universal Interface Test requires an HP 30049A Self-Test Hood. The hood is ordered and shipped as a separate product.*

## ADD-ON INSTALLATION

A universal interface PCA is included as part of some HP device subsystems. In such cases, all necessary information regarding add-on installation of the PCA is described in the appropriate device installation module earlier in this chapter. The following discussion is applicable only when the universal interface PCA is being added to the computer system for the purpose of interfacing a non-standard device.

The PCA is already jumpered when shipped. Before installing it in the computer, consult the “Subsystem Configuration” form to verify that the jumpering was done correctly.

The interface PCAs for input/output devices are usually housed in a card cage in the top of bay #2. The “Subsystem Configuration” form specifies the intended location of the PCA in the card cage. PCAs are always installed with the component side facing up. Occasionally, installation of the universal interface PCA may require that other PCAs in the card cage be rearranged to make room for it. If that is the case, then the “Subsystem Configuration” form also specifies the new location of all affected PCAs. When removing or inserting PCAs, observe the normal precautions for avoiding damage to components and circuit cards.

After the PCAs are all properly arranged in the card cage, make any necessary polling connections on the backplane of the card cage in accordance with the “Subsystem Configuration” form.

Using table 4-1 in the *HP 30050A Universal Interface (TTL) Maintenance Manual* or the *HP 30051A Universal Interface (Differential) Maintenance Manual*, attach the hooded connector to one end of the cable. Using the documentation associated with the device, attach the device connector to the other end of the cable. Connect the hooded end of the interface cable assembly to the universal interface PCA as illustrated in figure 30050-1 and connect the other end to the device. For information on how to connect the interface cable assembly to the device, consult the documentation associated with the device.

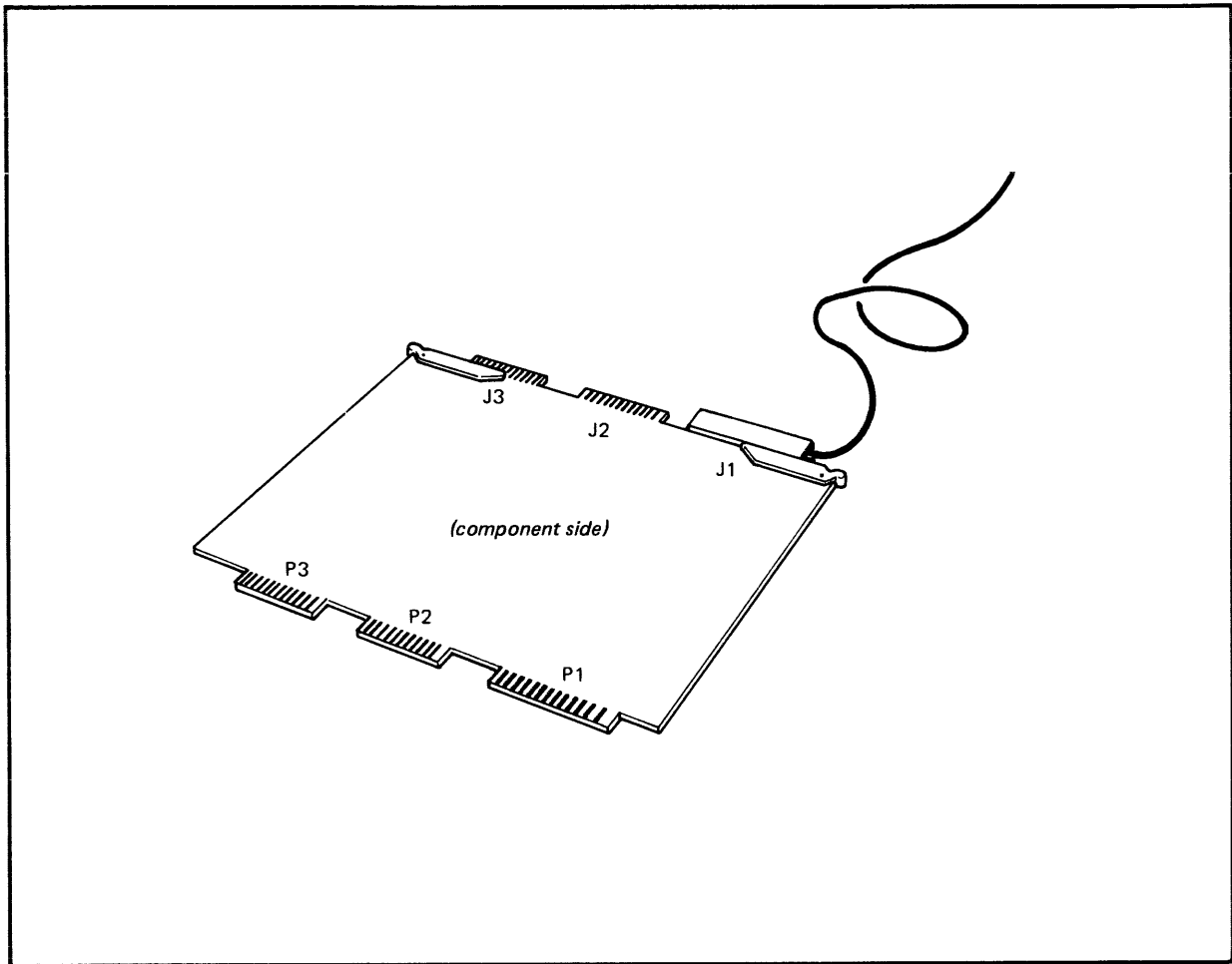


Figure 30050-1. Connecting the Interface Cable Assembly to the Universal Interface PCA

## DIAGNOSTIC TESTS

*Note: At this point it is assumed that all peripheral devices have been connected to the computer system and that all mechanical, electrical, and installation check-out procedures for each individual device have been performed (refer to Chapter 3 of this manual). It is also assumed that the equipment bays have been fastened together, the wiring between bays has been connected, the strapping connections of all PCMs, PDUs, and PCUs have been verified, and the input power cabling to the PCM/PCU has been connected and tested for the proper voltage (refer to Chapter 2 of this manual).*

Before running the diagnostic programs, do the following:

1. Verify that all buses, polls, clocks, jumpers, and card locations in the equipment bays are correct. To do this, refer to the *System Support Log* for the particular computer system.
2. Using a suitable voltmeter, test the vertical rows of connector screws on the card cages in bays #1 and #2. The black cables are dc grounds. To test a particular connector screw, touch one of the leads from the voltmeter to a dc ground screw and touch the other lead to the screw connector being tested.

*Note: The equipment bay chassis is not a dc ground.*

The non-black cables carry a variety of dc voltages. The proper voltage associated with each color code is shown in table 4-1.

3. Install the Hardware Maintenance Panel (HMP) and the Auxiliary Control Panel (ACP) as described later in this chapter. Verify the proper operation of the panels by performing the procedures described under "Self Test" in Section II of the *HP 30350A Auxiliary Control Panel and 30352A Hardware Maintenance Panel Operator's Manual*, part number 30352-90001.

4. The computer should now be in a HALT loop.
5. Run the firmware memory checkerboard test, as follows (refer to figures 4-2 and 4-3):
  - a. Press the CPU RESET and I/O RESET switches on the ACP.
  - b. On the HMP, set the RAR LOAD REGISTER switches to 3704<sub>8</sub> and then press the LOAD RAR switch.
  - c. On the ACP, set the A REGISTER or B REGISTER switches to the octal starting address (lower limit address) and then press the LOAD FROM A or LOAD FROM B switch.
  - d. On the ACP, set the A REGISTER or B REGISTER switches to the octal ending address (upper limit address) and then press the LOAD FROM A or LOAD FROM B switch.

The firmware memory checkerboard test automatically begins executing as soon as step d has been performed. If no errors are detected, the program loops indefinitely; if an error is detected, the computer halts. The test may be considered successful if the program loops for approximately 3 minutes. To terminate the test, press the CPU RESET switch on the ACP.

**Table 4-1. Cable Color Code and Voltage Relationships**

Color Code	Proper Voltage
Purple	-5
Red	+5
White with Purple Stripes	-15
White with Red Stripes	+15
White with Orange and Gray Stripes	-20*
White with Red and Black Stripes	+20*
*Refer to paragraphs 2-26 through 2-28 of the <i>HP 30005A/30006A Memory Maintenance Manual</i> , part number 30005-90001, for the exact voltage ranges in various temperature environments.	

A set of magnetic tapes and paper tapes are delivered with every HP 3000 Computer System. The magnetic tapes contain two versions of configured MPE/3000 (one is for a standard configuration and the other is for the customer's configuration), the stand-alone and on-line diagnostics, the System Diagnostic Monitor (SDM/3000), the various language subsystems, and the compiler and scientific libraries. The paper tapes contain the micro-diagnostics.

Source listings for all of the programs on the magnetic tapes are supplied in the form of microfiche; hard-copy source listings are provided for the micro-diagnostics.

The operating instructions for the diagnostics are presented in the associated manuals which are also shipped with the computer system. The part numbers of the various diagnostic manuals are listed in the *HP 3000 Technical Publications Catalogue*, part number 03000-90037. The operating instructions, and other necessary documentation, for the micro-diagnostics are contained in the hard-copy source listings mentioned in the above paragraph.

The operating instructions for performing a "cold-start" of the configured MPE/3000 are described as a separate topic later in this chapter.

Run the diagnostics and micro-diagnostics in the following general order:

6. Run all applicable stand-alone diagnostics (refer to table 4-2).

**Caution:** In addition to the copies of MPE/3000 that reside on magnetic tape, there is a copy on one of the system discs (the disc copy is the version for the user's configuration). It is imperative that the disc copy *not be destroyed*. If the disc version of MPE/3000 is on an HP 7900A Disc Drive, do not run either of the diagnostic programs for that disc drive. If the disc version of MPE/3000 is on an HP 2888A Disc File, be sure that the MPE/3000 disc pack is removed (and a scratch pack is mounted) before running either of the diagnostics for that disc drive.

7. Run all micro-diagnostics (refer to table 4-3).
8. Cold-start configured MPE/3000 (the version for the customer's configuration).
9. Run all applicable on-line diagnostics (refer to table 4-4). See the CAUTION under step 6.

*Note:* For steps 10 and 11, use the ET 6710 ROM Simulator to set the clocks at high or low margin. The procedure is as follows:

- a. Connect the clock output of the ROM Simulator to the external clock input on the rear of the CPU card cage.
- b. Set the EXT CLOCK/INTL CLOCK switch on the HMP to the EXT CLOCK position.
- c. Set the clocks to high or low margin by using the clock potentiometer on the ROM Simulator.

10. Repeat steps 6 through 9 with the clocks set at high margin (+10%).
11. Repeat steps 6 through 9 with the clocks set at low margin (-10%).

**Table 4-2. Stand-Alone Diagnostics**

Stand-Alone HP 30001A CPU Diagnostic
Stand-Alone HP 3000 Memory Pattern Test
Stand-Alone HP 3000 Extended Instruction Set Diagnostic
Stand-Alone HP 30035A Multiplexed Channel Test
Stand-Alone HP 30030A Selector Channel Diagnostic
Stand-Alone HP Serial Terminal Interface Test
Stand-Alone HP 30031A System Clock/Console Interface Test
Stand-Alone HP 30055A Synchronous Single Line Controller Test
Stand-Alone HP 2749B Teleprinter Test
Stand-Alone HP 30102A Disc File Diagnostic
Stand-Alone HP 30103A Fixed Head Disc Diagnostic
Stand-Alone HP 30110A Cartridge Disc Diagnostic

**Table 4-3. Micro-Diagnostics**

CPU/IOP/MEM/MUX Micro-diagnostic
I/O Processor Micro-diagnostic

**Table 4-4. On-Line Diagnostics**

On-Line HP 30050A/30051A Universal Interface Test
On-Line HP 30060A Terminal Data Interface Test
On-Line HP 30061A Terminal Control Interface Test
On-Line HP 2749B Teleprinter Test
On-Line HP 30123A Terminal Diagnostic
On-Line HP 30106A/30107A Card Reader Test
On-Line HP 30104A Paper Tape Reader Diagnostic
On-Line HP 30105A Paper Tape Punch Diagnostic
On-Line HP 2610A/2614A Line Printer Diagnostic
On-Line HP 30115A Magnetic Tape Test
On-Line HP 30102A Disc File Diagnostic
On-Line HP 30110A Cartridge Disc Diagnostic

#### **INSTALLING THE HARDWARE MAINTENANCE AND AUXILIARY CONTROL PANELS**

The HP 30350A Auxiliary Control Panel (ACP) and HP 30352A Hardware Maintenance Panel (HMP) are permanently mounted on an HP 30355A System Display Desk. The ACP provides the means for manually controlling the HP 3000 Computer System and is also used as a software troubleshooting aid. The ACP and HMP together are used for troubleshooting the CPU/IOP portion of the computer. When not in use, the ACP and HMP slide down into the desk. The panels are illustrated in figures 4-1, 4-2, and 4-3.

An ACP includes the following:

- One Auxiliary Control Panel
- One Interface Printed-Circuit Assembly (PCA), part number 30350-60006
- Two Switch Keys, part number 1390-0246
- One Data Cable Assembly (two cables in a single protective sleeve), part number 30350-60011
- One Power Cable Assembly, part number 30350-60004
- One *HP 30350A Auxiliary Control Panel Operator's Guide*, part number 30350-90001
- One *HP 30350A Auxiliary Control Panel Maintenance Manual*, part number 30350-90002



An HMP includes the following:

- One Hardware Maintenance Panel
- One Power Cable Assembly, part number 30350-60004
- One Maintenance Panel Interface (MPI) Cable Assembly, part number 30352-60003
- One *HP 30350A Auxiliary Control Panel and HP 30352A Hardware Maintenance Panel Operator's Manual*, part number 30352-90001
- One *HP 30350A Auxiliary Control Panel and HP 30352A Hardware Maintenance Panel Maintenance Manual*, part number 30352-90002

### Location of Parts for Shipment

The ACP and HMP are already installed in the system display desk when shipped and the cables which connect the panels to the computer system are connected to the ACP and HMP and coiled up beneath the desk. The MPI cable is also shipped in the desk and is installed in its operating position connecting the panels to one another.

The ACP interface PCA is shipped in its operating position in the top card slot in bay #1 of the computer system. The two switch keys are shipped in the key switch at the top of the ACP. The manuals are shipped together with the other system manuals.

### Installation Procedure

The installation procedure for the ACP, HMP, and system display desk is as follows:

- a. Unpack, inspect, and inventory the units which comprise the computer system. When inspecting the desk, ACP, and HMP, examine the exterior of the items for dents or bends. Look for scratches or abrasions on the exterior finish, and for discoloration due to rain leakage. (To extend the ACP and HMP from the desk for examination, first press down on the rear of the cover plate over each of the units. These cover plates are level with the top of the desk, and are situated at the rear of the desk. When each cover plate is open, reach in, grasp the top of the ACP or HMP, and draw it upward until it locks into place.)
- b. When the ACP and HMP have been inspected, lower them back into the desk. (This is done by pressing inward on the spring catch at each side of the ACP or HMP, while holding the unit in the extended position. Then lower the ACP or HMP into the desk.)
- c. Position the system display desk at its operating position. Before moving the desk into place, release the brake on each front caster by pressing down the brake lever on each caster. If the cables connecting the desk to the computer system will run on top of the floor, the maximum separation between the desk and bay 1 of the computer system is approximately 15 feet (4.5 meters). If the cables will run beneath the floor, the maximum separation must be reduced by an amount equal to the added cable drop and rise.

- d. When the desk is in place, set the caster brakes by pulling the brake levers up.
- e. Unfasten the rolled-up cables beneath the desk.
- f. Open the door in front of the top PCA cage in unit 1. This PCA cage is referred to as unit 1.
- g. Open the rear door of bay 1, and swing out the power supplies. The power supplies are hinged at the right-hand side, and are released by removing the holding screws at the left side.
- h. Using the following procedure, connect the data cable assembly (part number 30350-60011) as indicated in figure 4-1.
  - (1) Pass the cables, within their protective sleeve, through the cable slot at the rear of bay 1. This slot is at the bottom of the bay.
  - (2) Run the cables up the bay, behind the PCA cages, and pass them over unit 1 to the front of the bay.
  - (3) Connect the cable from HMP J4 to A1J1. (A1 is the top PCA in unit 1, J1 is the leftmost edge connector on the PCA.) When facing A1J1, the colored stripe on the cable must be to the left. The two cables in the sleeve can be distinguished from each other by the seam on the sleeve. The cable next to the seam beneath the desk is also the cable next to the seam at the other end of the cables.
  - (4) Connect the cable from ACP J2 to A8J1. (A8 is the eighth PCA from the top in unit 1.) The colored stripe on the cable must be to the left.
- i. Using lacing cord, fasten the data cable assembly in place inside bay 1.
- j. Return the power supplies to their original position, and replace their retaining screws.
- k. Connect the two power cable assemblies (part number 30350-60004) as indicated in figure 4-1.
- l. Extend the ACP and HMP from the desk.
- m. Install the slide cover on each side of the ACP and HMP. The slide covers are held in place by a single screw at the top.
- n. When the entire computer system has been installed, apply power to the system and check operation of the ACP and HMP by means of the self-test procedure. This procedure is described in paragraph 2-82 of the following manual: *Operator's Manual, HP 30350A Auxiliary Control Panel and HP 30352A Hardware Maintenance Panel*, part number 30352-90001.

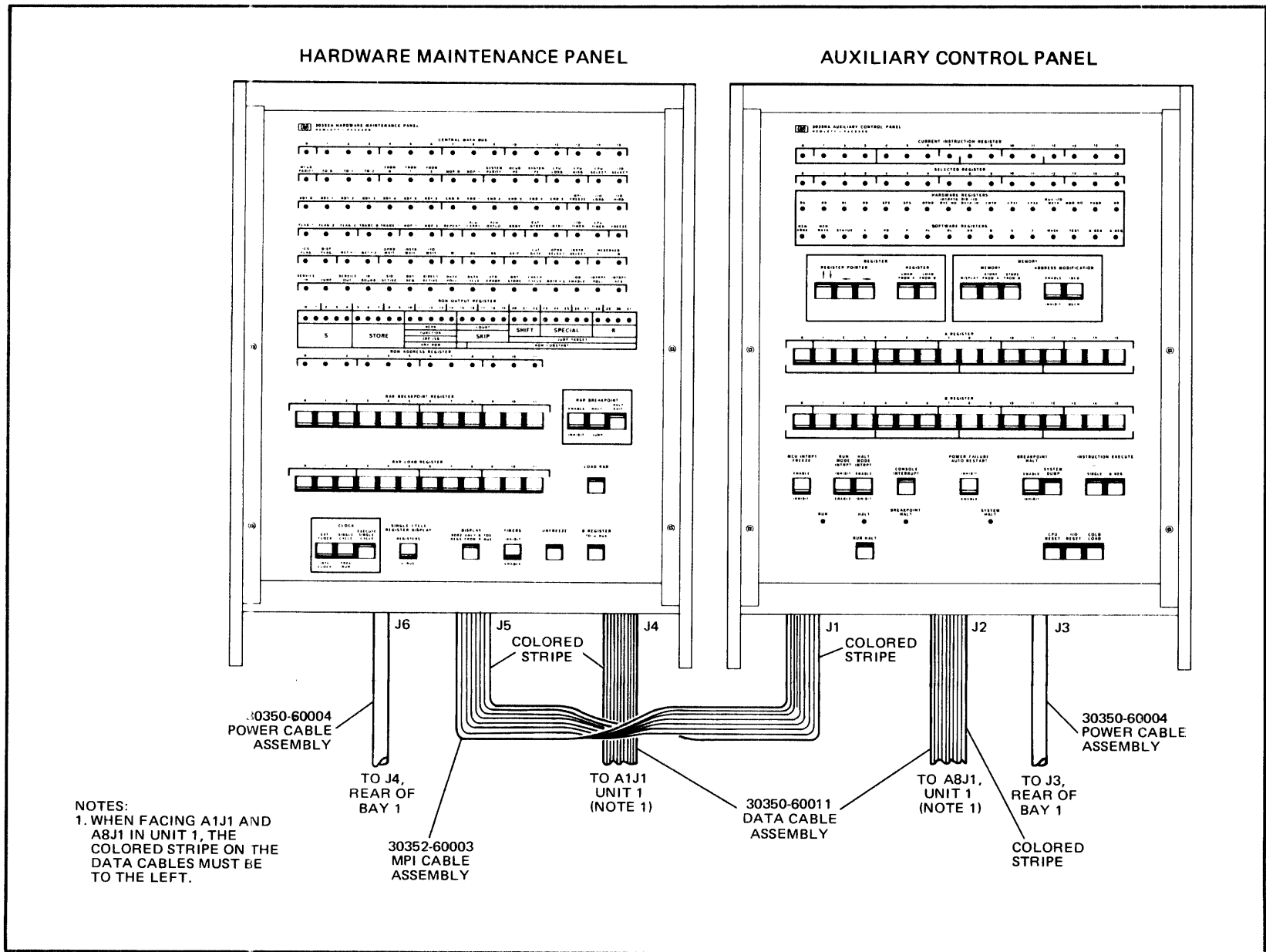


Figure 4-1. HP 30350A Auxiliary Control Panel and 30352A Hardware Maintenance Panel Cabling

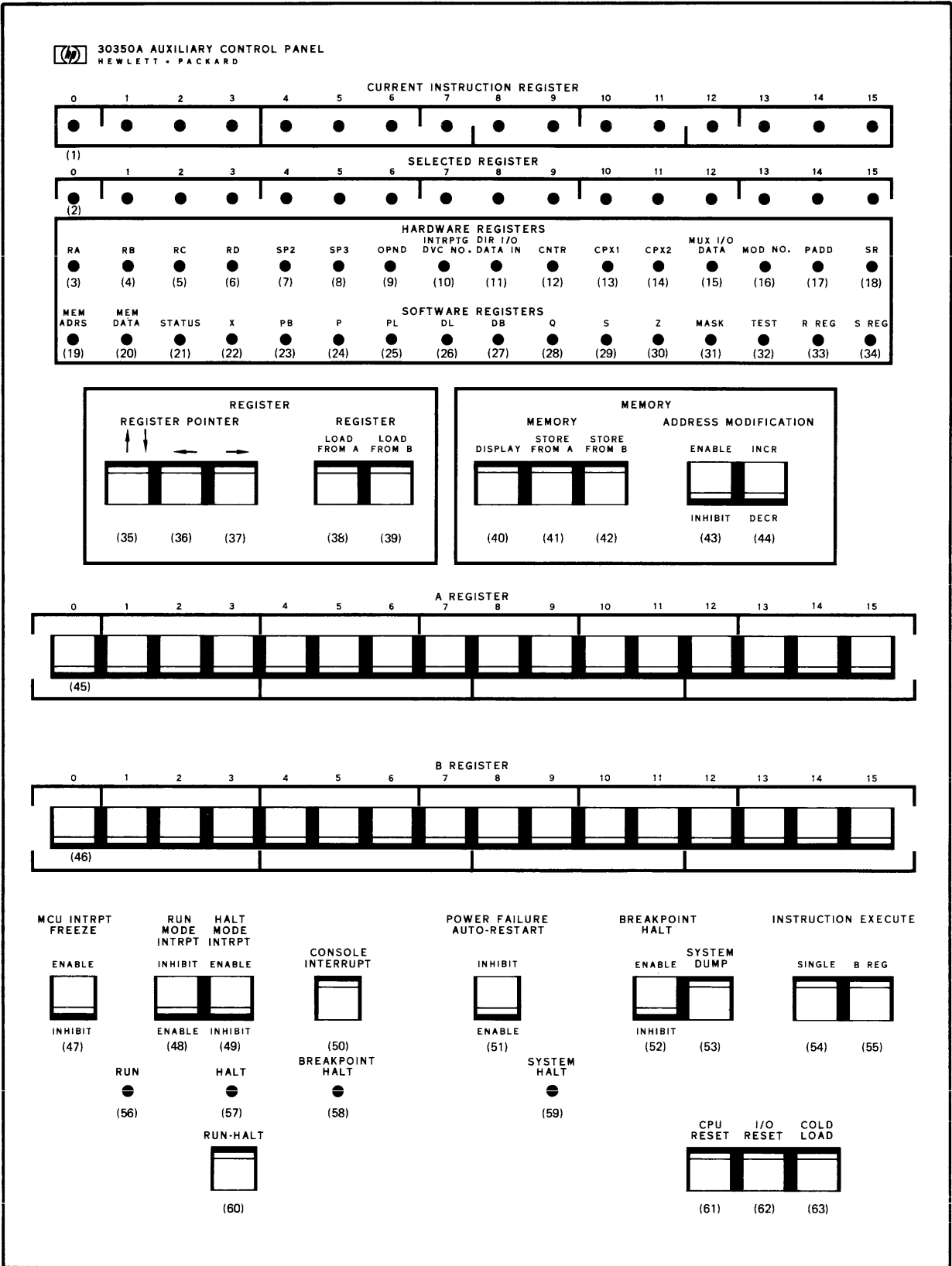


Figure 4-2. HP 30350A Auxiliary Control Panel

**30352A HARDWARE MAINTENANCE PANEL**  
 HEWLETT • PACKARD

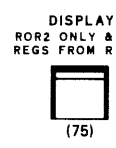
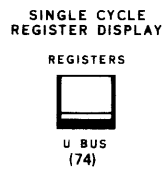
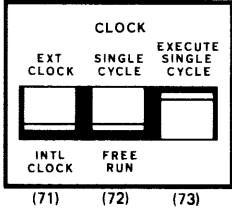
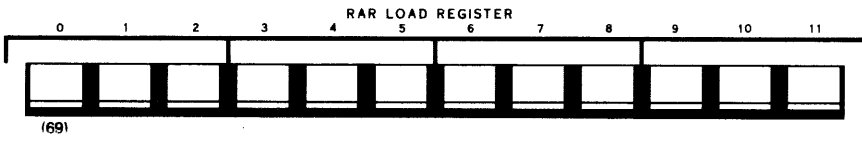
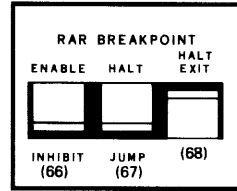
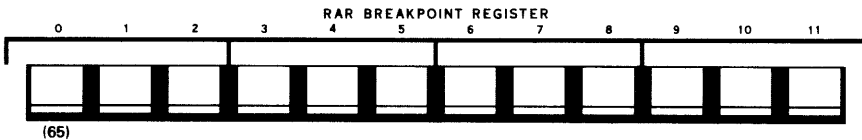
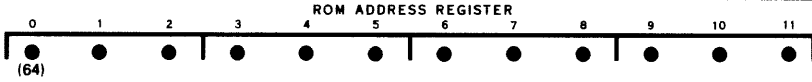
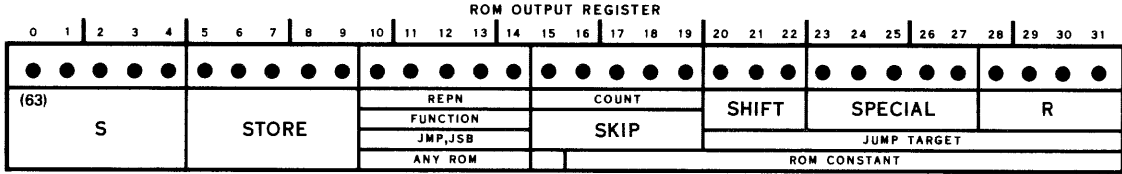
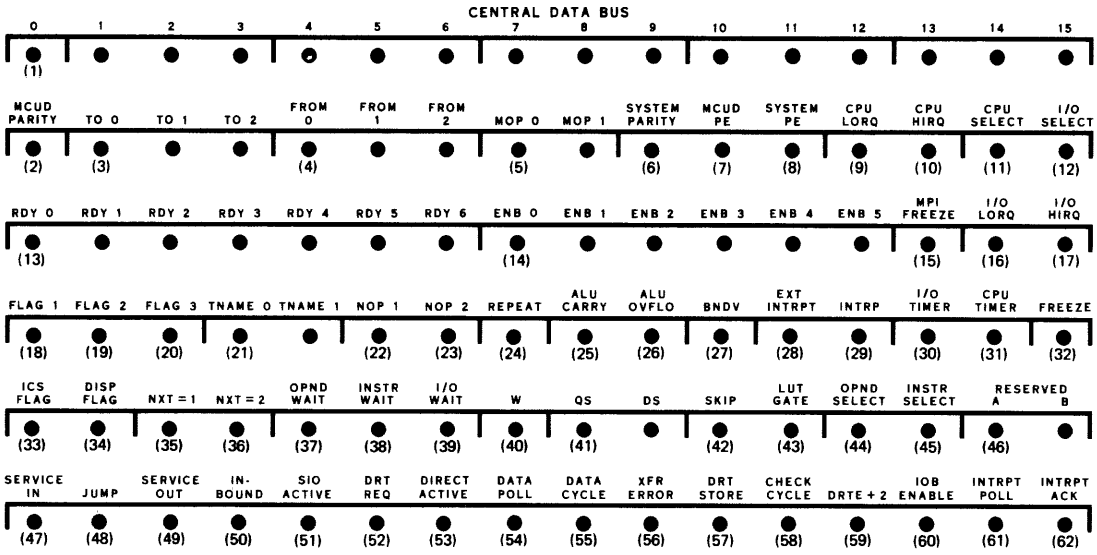


Figure 4-3. HP 30352A Hardware Maintenance Panel

## MPE/3000 COLD-START PROCEDURE

*Note: When the cold-start procedure is performed, it is assumed that the magnetic tape containing the user's version of configured MPE/3000 is mounted on tape unit 0, the disc pack containing configured MPE/3000 is mounted on a disc drive (any drive), and that the magnetic tape unit and the disc drive are connected on-line to the computer system.*

The cold-start procedure loads MPE/3000 from magnetic tape, using the input/output device and system configuration on that tape plus the user files and directory information currently on disc. This allows modification of the system configuration while retaining the user's information.

The cold-start procedure allows the operator to alter the input/output device configuration currently in effect. This is done through an interactive dialogue between the user and the MPE/3000 Initiator. This dialogue is described later in this section.

When the system is started, the initialization of blank disc packs, the writing of labels for them, and the renaming of volumes, is accomplished by the MPE/3000 Initiator. (Formatting of blank disc packs, however, is done by a disc diagnostic program rather than by the Initiator.)

When using the Initiator to modify MPE/3000, the operator requires certain background information. This information is noted below.

### Changing Main Memory Size

MPE/3000 runs on HP 3000 Computers with main-memory of the following sizes:

(K = 1024 words)

32K

40K

48K

56K

64K

The size specified by the operator during configuration should be the actual size of main-memory used with the machine on which this MPE/3000 configuration is to run. This entry is required so that other configuration parameters (such as table sizes) that depend on main-memory size can be set up correctly.

## Changing Input/Output Device Configuration

Every physical input/output device in the system is identified by a unique logical device number, ranging from 1 to 255. Input/output configuration consists of specifying this number and various other characteristics for each such device. Some of these characteristics (such as DRT entry number, device unit number, and select code for SIO Multiplexor, described below) are determined by physical hardware connections made prior to system generation. Other characteristics (such as whether a device is interactive or duplicative, whether it can accept jobs and sessions, and the device class to which it belongs) are operator options. When the operator is deleting or re-specifying devices already on the system, he can determine the characteristics of these devices by requesting a Device Characteristics Listing during the re-configuration process. When he is adding a new device, he must know the hardware-dependent characteristics of the device and must also carefully determine those characteristics that are user options, as noted below. The characteristics that must be specified for each device are:

1. Logical Device Number

The logical device number is the value by which the MPE/3000 File Management System recognizes a particular device. For each device, this is a unique, three-digit number ranging from 001 to 255, determined by the user.

2. Device Reference Table (DRT) Entry Number

Every device on the system is cabled to a device controller. (A particular controller may serve more than one device of the same type.) For every controller, there is an entry in the DRT in main-memory that contains pointers to the driver and interrupt programs that serve the controller (and its devices).

Because each DRT entry is four words long, the size of the DRT (in words) is

$$4 \times (\text{Total number of controllers})$$

The DRT is located in fixed-memory locations beginning at octal address 14. The maximum upper limit for the DRT is location  $1777_8$ , thus limiting the maximum number of four-word DRT entries to  $253_{10}$ .

Since each DRT entry is always four-words long, it is convenient for the hardware to map controllers to DRT addresses simply by multiplying by four. Since the DRT begins at location 14, the lowest controller (DRT entry) number is 3 ( $14_8 / 4 = 3$ ). (DRT entry numbers 0, 1, and 2 do not exist.)

When re-configuring the system, the operator needs to know the highest DRT entry number that can be assigned to a device. He determines this by adding three to the total number of controllers planned. This value may not exceed  $255_{10}$ .

The operator also needs to know the DRT entry number of any device that he is adding or deleting. This is a hardware-dependent value consisting of three decimal digits, ranging from 003 to 255, and is determined by a set of jumpers on the device controller board.

### 3. Unit Numbers

When a controller services only one device, that device is generally assigned a unit number of 0 (recognized by the associated driver). When the controller serves more than one device, each device is assigned a unique unit number (with respect to that controller) to distinguish it from others cabled to the same controller. The unit number of any device is a hardware-dependent characteristic determined when the device is physically connected to its controller. The value ranges from 0 to a maximum number determined by the type of device controller.

### 4. Start Input/Output (SIO) Multiplexor DRT Entry Number

When a device is run under SIO, the DRT entry number of the SIO multiplexor connected to the device is specified. This number is determined by the user in the same manner as any other device's DRT entry number.

### 5. SIO Multiplexor Select Code

This number identifies the port on the SIO multiplexor to which the device is connected, as determined by the physical hardware cabling.

### 6. Device Type

This number determines the type of device, where

- 0 = Moving-Head Disc
- 1 = Fixed-Head Disc
- 8 = Card Reader
- 9 = Paper Tape Reader
- 16 = Terminal
- 24 = Magnetic Tape Unit
- 32 = Line Printer
- 33 = Card Punch
- 34 = Paper Tape Punch

### 7. Device Sub-Type

This characteristic is specified for a device whose driver handles devices with different characteristics (such as an HP 7900A Disc Drive versus an HP 2888A Disc File). It is a decimal number ranging from 0 to 15, depending upon the actual device referenced (as specified in table 4-5).

### 8. Corresponding Output Device

If the device can be used as a job/session input device, the operator should specify (by logical device number or device class name) a device that will be recognized as the corresponding job/session list device. That is, all input read from the job/session input device is listed on that particular list device.



#### 9. Option to Accept Job and Session Input Stream

The operator can optionally specify that this device can accept an input stream from a job or session; in other words, that it can accept the MPE/3000 :JOB or :HELLO commands, and thus serve as a job/session input device.

#### 10. Option to Accept Data From Outside the Job/Session Input Stream

The operator can optionally specify that a device can read data from outside the job/session input stream; in other words, that it can accept the MPE/3000 :DATA command. (Typically, a device is designated to accept job/sessions, but not data external to a job/session.)

#### 11. The operator can optionally specify that this device is a member of an *interactive pair*. An input device and a list device are said to be interactive if a real-time dialogue can be established between a program and a person using the list device as a channel for programmatic requests, with appropriate responses from a person using the input device. For example, an input file and a list file opened to the same terminal would be an interactive pair.

#### 12. Duplicative Option

The operator can also specify that the device is a member of a *duplicative pair*; in such a pair, input from an input device is automatically duplicated on a corresponding list device. For example, a terminal upon which the information input is also output is duplicative.

#### 13. Driver Name

The name of the driver associated with the device/controller is specified. For standard devices supported by HP, appropriate driver names are found in table 4-5. For nonstandard drivers supplied by the user, this is the name of the program file containing the driver; the name must contain from one to eight alphanumeric characters, beginning with a letter. (If the driver name is preceded by an asterisk (\*), the driver will always reside in main-memory.)

#### 14. Device Class

The general class to which a device belongs must be specified. (This enables a user to request a device by class name, such as any disc drive or any magnetic tape unit.) These names are arbitrary, user-dependent names that are left to the discretion of the user with *system supervisor capability*. They consist of up to eight alphanumeric characters, beginning with a letter. A device can belong to more than one class, such as DISC and FHDISC. The only device class specifically referenced by MPE/3000 is DISC; it is the default device class for such operations as building files.

### Initiator/Operator Dialogue

The Initiator's output consists of questions (ended by a question mark) and statements (ended by a period). The content of the questions generally indicates the type of answer required. To those questions requiring a simple positive or negative answer, the user responds with YES (or simply Y) or NO (or N, or simply a carriage return). Other questions contain values followed by a question mark; they normally quote an existing parameter value and ask whether the user wants to change it. To retain the quoted value, the user enters a carriage return. To change the value, he enters the new value desired. In any case, the user must always conclude an entry with a carriage return to transmit the entry to MPE/3000.

To begin the Initiator/Operator Dialogue, do as follows:

1. Mount the tape containing configured MPE/3000 on the tape unit specified by DRT Entry Number 6, Unit 0. The operator's console must be the terminal specified by DRT Entry Number 3.
2. Set the SWITCH REGISTER on the Computer Control Panel to octal 3006.  
The SWITCH REGISTER consists of 16-bits; each bit is set *on* by placing the corresponding switch in the up position, or *off* by placing the switch in the down position.
3. Press the following switches on the Computer Control Panel downward in the order shown:
  - a. I/O RESET
  - b. CPU RESET
  - c. COLD LOAD

This causes the MPE/3000 Initiator to be read into main-memory.

4. Press the RUN switch on the Computer Control Panel. The MPE/3000 Initiator prints a message showing the current update and fix levels. Then, the Initiator begins its dialogue with the operator by printing the following information on the console. (In the dialogue shown below, output from the Initiator is shown verbatim in uppercase letters and input from the operator is described in mixed-upper-and-lowercase letters.)

Step No.	Dialogue
1.	WHICH OPTION (COLDSTART/RELOAD/UPDATE)? Enter COLDSTART
2.	LOAD MAP? To request a map showing the correspondences between MPE/3000 segments, programs, and code segment table (CST) entries, enter YES. The format of the map is shown in figure 4-4. To suppress this map, enter NO.
3.	ANY CHANGES? To proceed with changes to the current configuration, enter YES. To maintain the current configuration and skip to Step 26, enter NO.
4.	CORE SIZE=xx? The value <i>xx</i> is the current size of main-memory for the system (in multiples of 1024 words). To change this value, enter one of the following values (specifying main-memory size in multiples of 1024 words): 32, 40, 48, 56, or 64.

**Step No.**

**Dialogue**

5.

**LIST I/O DEVICES?**

To print a list of input/output devices currently assigned to the system, enter YES.

To suppress this listing, enter NO.

If an input/output device listing is requested, it is displayed in tabular form, showing the following items for each device:

- Logical Device Number
- DRT Entry Number
- Unit Number
- SIO Multiplexor DRT Entry Number (if the device does not run under SIO, zero is output)
- SIO Multiplexor Select Code
- Device Type, where
  - 0 = Moving-Head Disc
  - 1 = Fixed-Head Disc
  - 8 = Card Reader
  - 9 = Paper Tape Reader
  - 16 = Terminal
  - 24 = Magnetic Tape Unit
  - 32 = Line Printer
  - 33 = Card Punch
  - 34 = Paper Tape Punch
- Device Sub-Type
- Record Length (the length of the physical records read or written by the device in words)
- Output Device. The logical device number or device class name of the job/session list device corresponding to jobs/sessions entered on *this* input device. (If this is not an input device, zero is output.)
- Mode, where
  - J = The device can accept jobs or sessions (:JOB or :HELLO commands)
  - A = The device can accept data external to job/session input stream (:DATA command)
  - I = The device is interactive
  - D = The device is duplicative

Step No.	Dialogue
5. (cont'd)	<ul style="list-style-type: none"> <li>● Driver Name. The name of the driver for this input/output device. The driver resides permanently in main-memory if its name is preceded by an asterisk.</li> <li>● Device Classes. The classes to which this device belongs, defined by a System Supervisor user.</li> </ul>
6.	<p>HIGHEST DRT NUMBER=xx.?</p> <p>In the output, <i>xx</i> is a number denoting the present highest DRT Entry Number that can be assigned to a device.</p> <p>To change <i>xx</i>, enter the new value desired. If the highest-numbered device in the configuration is a device that uses two DRT entries (such as a terminal controller with two data sets), be sure to enter the <i>higher</i> of the two entry numbers.</p> <p>To maintain the current <i>xx</i>, enter a carriage return.</p>
7.	<p>LOGICAL DEVICE #?</p> <p>To specify a device to be added or removed, enter the logical device number of that device.</p> <p>To skip to Step 21, enter zero.</p>
8.	<p>DRT #?</p> <p>To add a device, enter its DRT Entry Number.</p> <p>To remove a device and return to Step 6, enter zero.</p>
9.	<p>UNIT #?</p> <p>Enter the physical hardware unit number of the device, if the device shares its controller with other devices.</p> <p>Otherwise, enter zero to continue.</p>
10.	<p>SIO MPX DRT #?</p> <p>If the device runs under SIO, enter the DRT Entry Number of the SIO multiplexor to which this device is connected.</p> <p>If the device does not run under SIO, enter zero and skip to Step 12.</p>
11.	<p>SIO MPX SELECT CODE?</p> <p>Enter the port number on the SIO multiplexor to which this device is connected.</p>

Step No.	Dialogue
12.	<p>TYPE?</p> <p>Enter the device type (see table 4-5).</p>
13.	<p>SUB-TYPE?</p> <p>Enter the device sub-type (see table 4-5).</p>
14.	<p>OUTPUT DEVICE?</p> <p>If the device can be used as a job or session input device, enter the device class name or logical device number of the device to be used for the corresponding job/session listing device. (If a device class name is entered, any device of this class can be used as the listing device.)</p> <p>If this is not a job/session input device, enter zero.</p>
15.	<p>ACCEPT JOBS OR SESSIONS?</p> <p>To specify that this device can accept a job or session input stream, enter YES.</p> <p>Otherwise, enter NO.</p>
16.	<p>ACCEPT DATA?</p> <p>To specify that this device can accept data external to a job or session input stream, enter YES.</p> <p>Otherwise, enter NO.</p>
17.	<p>INTERACTIVE?</p> <p>To specify that this is an interactive device, enter YES.</p> <p>Otherwise, enter NO.</p>
18.	<p>DUPLICATIVE?</p> <p>To specify that this is a duplicative device, enter YES.</p> <p>Otherwise, enter NO.</p>
19.	<p>DRIVER NAME?</p> <p>Enter the name of the program file containing the driver for this device (see table 4-5). For drivers written and supplied by the user, this name must contain from one to eight alphanumeric characters, beginning with a letter. (If the driver name is preceded by an asterisk, the driver will permanently reside in main-memory.)</p>

Table 4-5. HP 3000 I/O Devices

Part #	Description	Sub-type	Driver Name	Type	Record Width
30031A	System clock/console interface		IOCLTTYØ	16	36
30124A	–ASR 33, 35	Ø			
	–HP 2762A, 10 cps	1			
30120A	–HP 2762A, 15 cps	2			
	–HP 2762A, 30 cps	3			
	–HP 2600A, 10 cps	4			
	–HP 2600A, 15 cps	5			
30123A	–HP 2600A, 30 cps	6			
	–HP 2600A, 60 cps	7			
	–HP 2600A, 120 cps	8			
	–HP 2600A, 240 cps	9			
30032A	Asynchronous terminal controller		IOTERMØ	16	36
	–Hardwired terminal	Ø			
	–Interfaced over 103A modem	1			
	–Interfaced over 202A modem	2			
30115A -100	9 Channel magnetic tape	Ø	IOTAPEØ	24	128
30103A	Fixed head disc 1 megabyte	Ø	IOFDISKØ	1	128
-001	2 megabyte	1			
-002	4 megabyte	2			
30110A	Cartridge disc	2	IOMDISKØ	Ø	128
	–Lower platter only	1			
	–Upper platter only	Ø			
30102A	Disc file	3	IOMDISKØ	Ø	128
30106A, 30107A -001	Card reader	Ø	IOCDRDØ	8	4Ø
30108A, 30109A -001	Line printer	Ø	IOLPRTØ	32	66

Step No.

Dialogue

20. DEVICE CLASSES?

Enter a list containing at least one device class name (up to eight alphanumeric characters, beginning with a letter). Class names are separated from each other by commas. These names are left to the discretion of the System Supervisor. They will be used in certain file commands when any member of a group of devices (such as any disc drive) can be referenced.

A device can belong to more than one device class, such as DISC and FHDISC. When the device class is complete, enter a carriage return to return to Step 7.

21. LIST I/O DEVICES?

To print a listing of the new input/output configuration, enter YES. This list appears in the format described in Step 5.

To suppress the list, enter NO.

22. LIST VOLUME TABLE?

To list the disc volumes and their currently-assigned logical device numbers, enter YES. The listing is printed in the following format:

VOLUME	LOG DEV #
volname	ldn
.	.
.	.
.	.

In this listing, *volname* is a name of up to eight alphanumeric characters, beginning with a letter, identifying the volume; *ldn* is the logical device number assigned to that volume.

To suppress this listing, enter NO.

23. ADD VOLUME?

To prepare to add a volume, enter YES.

To bypass addition and skip to step 25, enter NO.

24. ENTER VOLUME NAME?

To add a volume, enter the volume name (when the name is entered, the question is repeated).

Otherwise, enter a carriage return.

If any volume was added, the Initiator proceeds to Step 25. Otherwise, the Initiator skips to step 26.

Step No.	Dialogue
25.	<p><b>LIST VOLUME TABLES?</b></p> <p>To list the disc volumes and their currently-assigned logical device numbers (as in step 22), enter YES.</p> <p>To suppress this listing, enter NO.</p>
26.	<p>At this point, the MPE/3000 Initiator ensures that all volumes defined in the volume table are mounted, that all discs have valid labels, and that the volume name of each disc is in the volume table. As a result of this verification, any of the following messages may appear:</p> <p style="margin-left: 40px;">a. <b>DEVICE ldn VOLUME volname NOT DEFINED IN TABLE. ENTER VOLUME NAME?</b></p> <p style="margin-left: 80px;">This means that the volume identified by <i>volname</i>, with the logical device number <i>ldn</i>, does not appear in the volume table. To add this volume, identified by this <i>volname</i> and <i>ldn</i>, enter a carriage return.</p> <p style="margin-left: 80px;">To add this volume under a different volume name, enter the new name. The new name will be entered in the volume table, and the volume will be relabeled with that name.</p> <p style="margin-left: 40px;">b. <b>INVALID LABEL FOR DEVICE ldn. ENTER VOLUME NAME?</b></p> <p style="margin-left: 80px;">This means that device <i>ldn</i> does not contain a valid MPE/3000 volume label. The user must enter a volume name. If the name entered corresponds to that of a volume in the volume table, the logical device number <i>ldn</i> is set for that volume. Otherwise, a new entry is made in the volume table. The disc label is then updated.</p> <p style="margin-left: 40px;">c. <b>ALL VOLUMES MUST BE MOUNTED.</b></p> <p style="margin-left: 80px;">This message occurs when an entry appears in the volume table but no corresponding disc is attached to the system.</p> <p>If any of the above messages appears and the user responds properly, the Initiator proceeds to Step 27. If none of these messages is displayed, the Initiator skips to Step 28.</p>
27.	<p><b>LIST VOLUME TABLE?</b></p> <p>To list the disc volumes and their currently-assigned logical device numbers (as in steps 22 and 25), enter YES.</p> <p>To suppress this listing and return to Step 5, enter NO.</p>



**Step No.**

**Dialogue**

28.

DATE?

Enter the current date in the following format:

mm/dm/yr

where

mm = Two digits representing the month

dm = Two digits representing the day of the month

yr = The last two digits of the year

29.

TIME?

Enter the current time-of-day in the following format:

hh:mm

where

hh = Two digits indicating the hour (on a 24-hour basis)

mm = Two digits indicating the minute of the hour

The Initiator program now terminates, transferring control to MPE/3000. The system is ready for use.

**Load Map**

The load map requested in Step 2 of the Initiator/Operator Dialogue appears as shown in figure 4-4. This map shows the correspondence between MPE/3000 code segments, programs, and code segment table (CST) entries. In the first column of this listing, the CST number (in octal) is shown. In the second column, the System Segmented Library (SL) segment name or program name is presented (SL segment names are followed by a parenthesized value in the third column; program file names are not). In the third column, the parenthesized number indicates the logical segment number of the segment within the system library (identified as SL.PUB.SYS).

20	DIRC	(0)
21	CROUTINE	(1)
22	MMDISK	(2)
23	IOUTILITY	(4)
24	MISC0	(5)
25	CHECKER	(6)
26	PCREATE	(7)
27	MORGUE	(12)
30	MESSAGE	(13)
31	DATASEG	(14)
32	JOBTABLE	(15)
33	PROCMail	(16)
34	ABORTTRAP	(17)
35	SYSDEBUG	(20)
36	LOADER1	(21)
37	SYSSTOPS	(22)
40	SYSDSPLY	(23)
41	TTYINT	(24)
42	MMCORER	(26)
43	ALLOCATE	(27)
44	FILESYS7	(30)
45	DISKSPC	(31)
46	FILESYS6	(32)
47	FILESYS1	(51)
50	UTILITY	(107)
51	FILESYS5	(110)
52	FILESYS4	(111)
53	FILESYS3	(112)
54	RINS	(114)
55	PINT	(11)
56	DEBUG	(25)
57	CIINIT	(37)
60	CIMISC	(40)
61	CISUBS	(41)
62	CIFILEB	(42)
63	CIFILEM	(43)
64	CIPRUN	(44)
65	CILISTF	(46)
66	CIUTIL	(47)
67	SEGUTIL	(106)
70	FILESYS2	(113)
71	ININ	
72	DISPATCH	
73	MAPP	
74	DATAIOPM	
75	IOFDISK0	
76	DISKIOPM	
77	IOCLTTY0	
100	TERMIOPM	
101	IOTAPE0	
102	SIODIOPM	
103	IOLPRT0	
104	IOCDRD0	
105	IOTERM0	
106	UCOP	
107	DEVREC	
110	LOAD	
111	PROGEN	

Figure 4-4. Load Map

This appendix lists all the Hewlett-Packard Electronic Sales and Service Offices throughout the world.

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