

Honeywell



LEVEL 6

HARDWARE

POWER SYSTEM

SERIES 60 (LEVEL 6)
POWER SYSTEM

Document No. 71010290-600 Order No. FL34, Rev. 5

This manual has been revised to the -600 level.
It supersedes all previous issues.

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I INTRODUCTION

This manual covers the power supply units, power distribution units, and the grounding system designed and built by Honeywell Information Systems for use with the Series 60 Level 6 computer systems. These units are defined within major sections in this manual under the following titles:

1. Central System Power Supplies
2. Memory Save Power Supplies
3. Diskette Power Supplies
4. Power Distribution Units
5. Grounding System.

The central system power supply, located at the rear of the card chassis of the central processor, provides the regulated +5, +12, and -12 Vdc required by the logic and control circuitry of the computer. This supply also provides +18 Vdc which may be used for future applications.

The memory save power supply is a separate optional supply delivering the +5 Vdc and +12 Vdc required by the computer's MOS memory. During normal power up conditions, this power supply operates from local primary power, generating the required output voltages while keeping its rechargeable batteries at full charge. During power outages, the memory save regulator circuits are driven by the +18 Vdc obtained from the series-wired batteries providing refresh voltages to maintain the contents of the MOS memory.

The diskette power supply (DPS) was specifically designed for installation at the rear of the diskette chassis housing up to two flexible disk drive (diskette) data storage units. The DPS provides +5, -5, and +24 Vdc for two flexible disk drives.

The power distribution units (PDUs) are units into which the central processor unit and all the devices may be plugged. This permits all the system components to be powered up with one switch. Each PDU also contains a filter that helps eliminate noise on the ac line.

The grounding system used in the Series 60 Level 6 systems is called multipoint grounding which is a safe, low-noise, and mechanically simple arrangement. A major advantage of multipoint grounding is the noise reduction relative to the dc ground wire current generated by dc switching supplies, e.g., those used in the central system and memory save power supplies.

The Series 60 Level 6 computer systems are available in 60-inch rack-mountable, 30-inch rack-mountable (including office furniture package), and tabletop configurations. In all configurations, the central system power supply is housed directly behind the card chassis of the central processor. (See the appropriate Series 60 Level 6 System Manual for details on location.) When a Type PSS9001 memory save power supply is installed in a tabletop configuration, it is housed in a wraparound directly below the central processor. In a 60-inch rack-mountable or 30-inch rack-mountable (including office furniture package) configuration, the Type PSS9002 memory save power supply is located in the rack. Figure 1-1 shows the power supplies described in this manual. Figure 1-2 shows a typical 60-inch rack-mountable configuration. Figure 1-3 shows a typical 30-inch rack-mountable configuration. Figure 1-4 shows a typical tabletop configuration.

Figure 1-5 is a block-diagram of a typical power supply system for a Series 60 Level 6 system.

Honeywell's maintenance philosophy for the power supplies described in this manual calls for on-site replacement of failed units. These units should not be repaired on site but should be routed to designated repair depots after replacement. Power supply replacement procedures are covered under corrective maintenance in the sections describing the respective power supplies.

Where applicable, the subject matter of each section in this manual is divided into the following categories: description, installation, operation, maintenance, and reference diagrams.

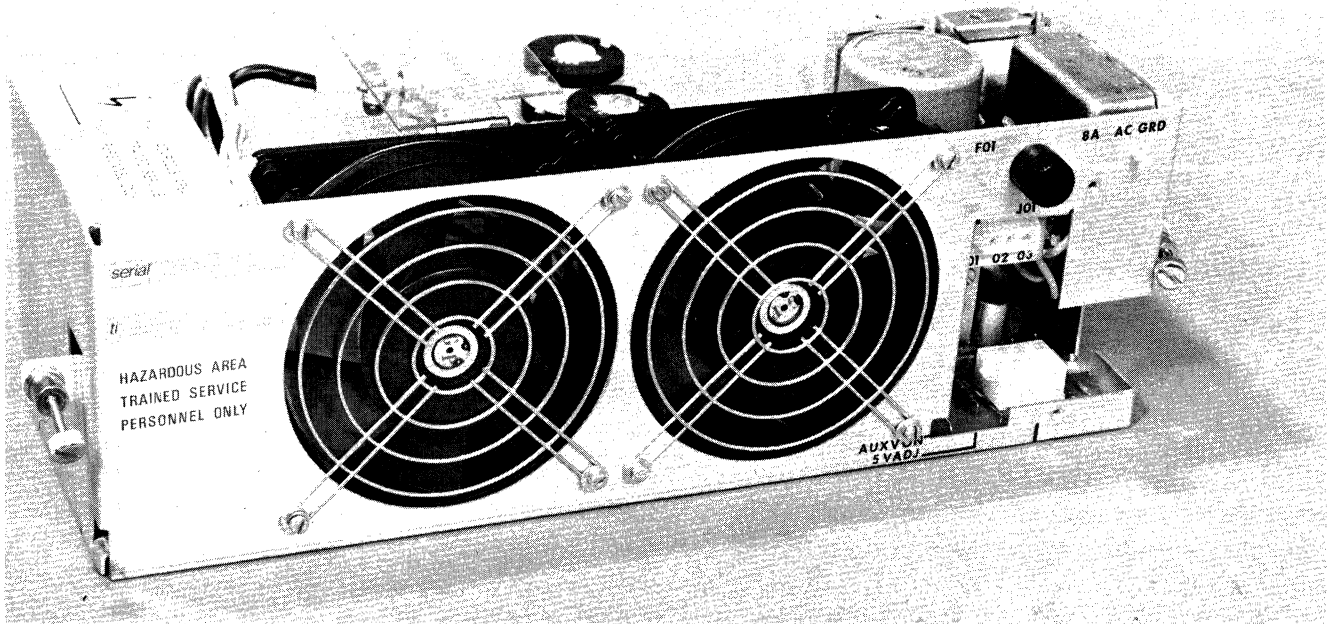
Photographs, illustrations, and schematic diagrams are included to facilitate an understanding of power supply construction and operation.

As used in this manual, dimensional references have the following meanings when viewed from the front of the rack or housing:

- Width - right to left dimension
- Depth - front to rear dimension
- Height - top to bottom dimension.

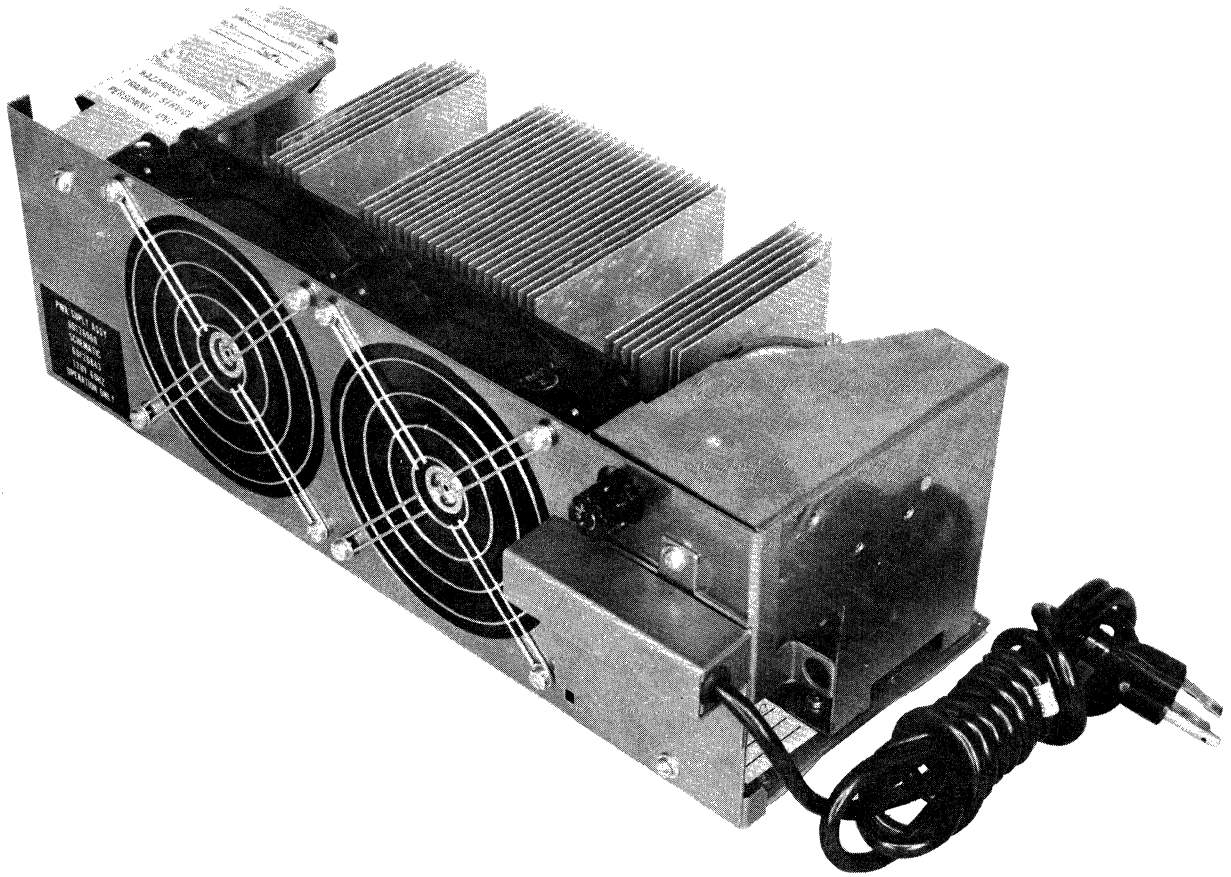
Rear-chassis adjustment, connectors, etc., are referred to as being located at right-rear, center, or left-rear as seen from the rear of the cabinet.

Table 1-1 is a summary of the specification data for the central system power supplies. Table 1-2 is a summary of the specification data for PSS9001/PSS9002 memory save power supply.



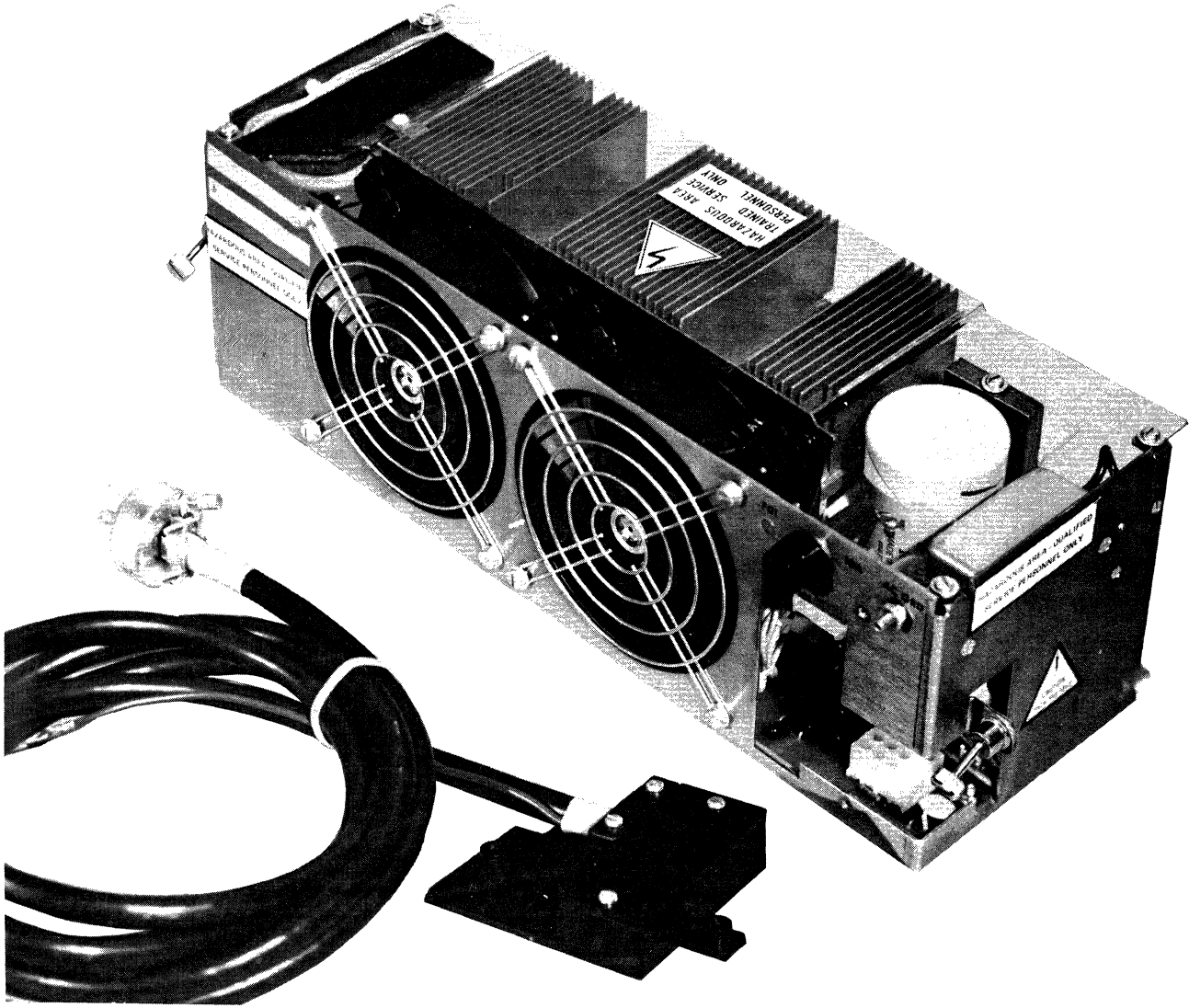
(a) Type M60 Central System Power Supply

Figure 1-1 Series 60 Level 6 Power Supplies (Sheet 1 of 5)



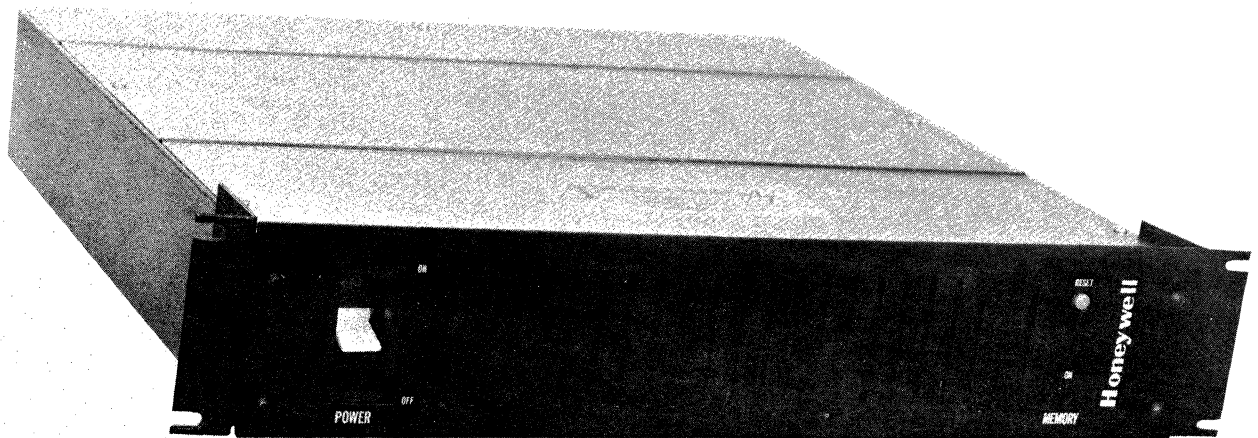
(b) Type M100 Central System Power Supply

Figure 1-1 Series 60 Level 6 Power Supplies (Sheet 2 of 5)



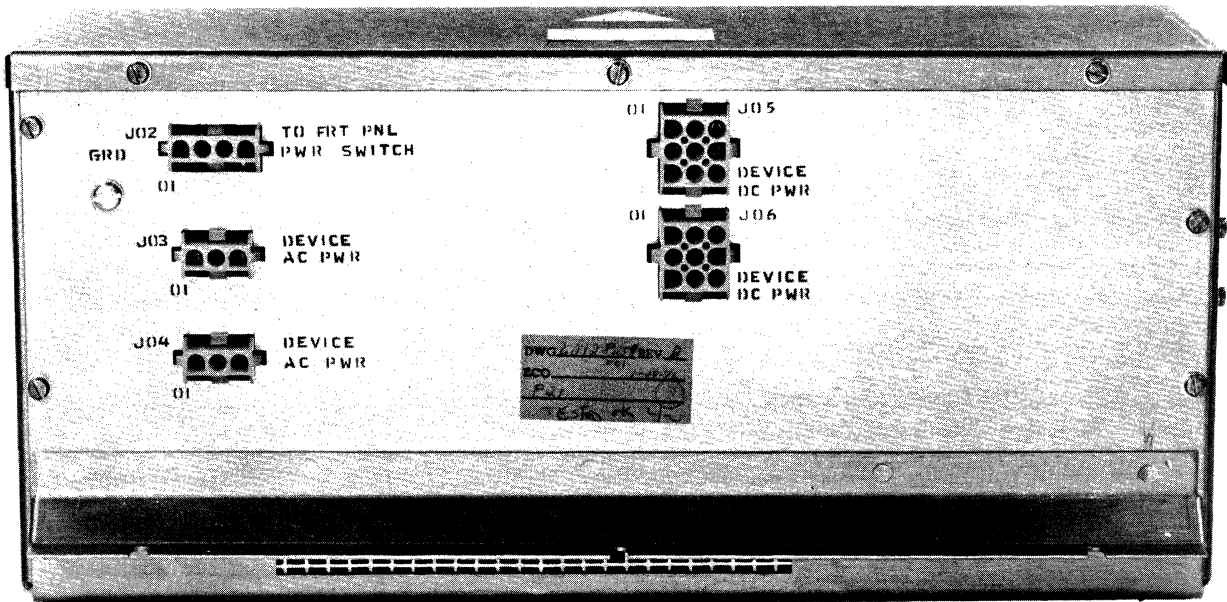
(c) Type M150 and M170 Central System Power Supply

Figure 1-1 Series 60 Level 6 Power Supplies (Sheet 3 of 5)



(d) Type PSS9001/PSS9002 Memory Save Power Supply

Figure 1-1 Series 60 Level 6 Power Supplies (Sheet 4 of 5)



(e) Diskette Power Supply

Figure 1-1 Series 60 Level 6 Power Supplies (Sheet 5 of 5)



Figure 1-2 Typical Series 60 Level 6 60-Inch Rack-Mountable Configuration

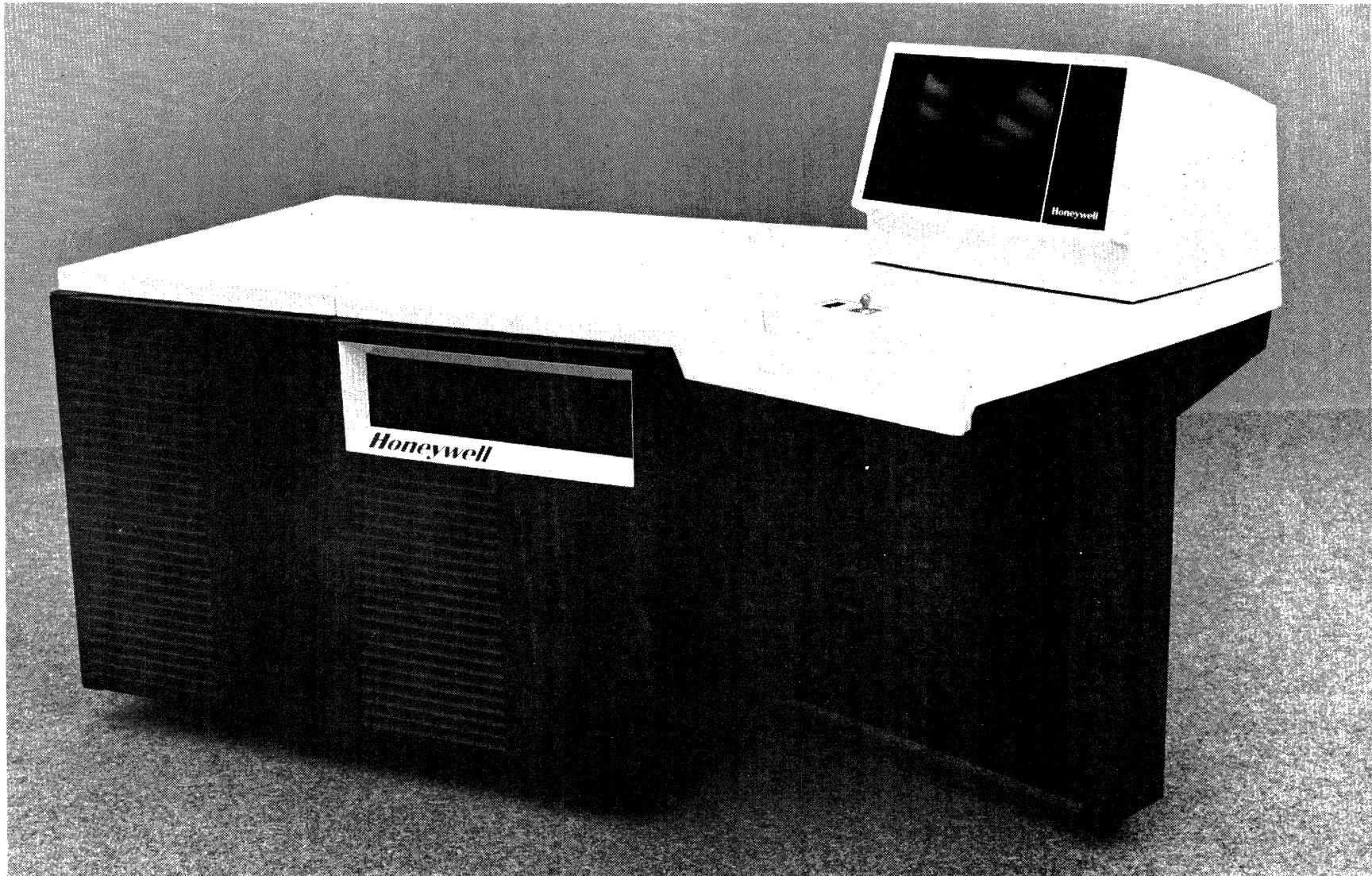


Figure 1-3 Typical Series 60 Level 6 30-Inch Rack-Mountable
(Includes Office Furniture Package) Configuration

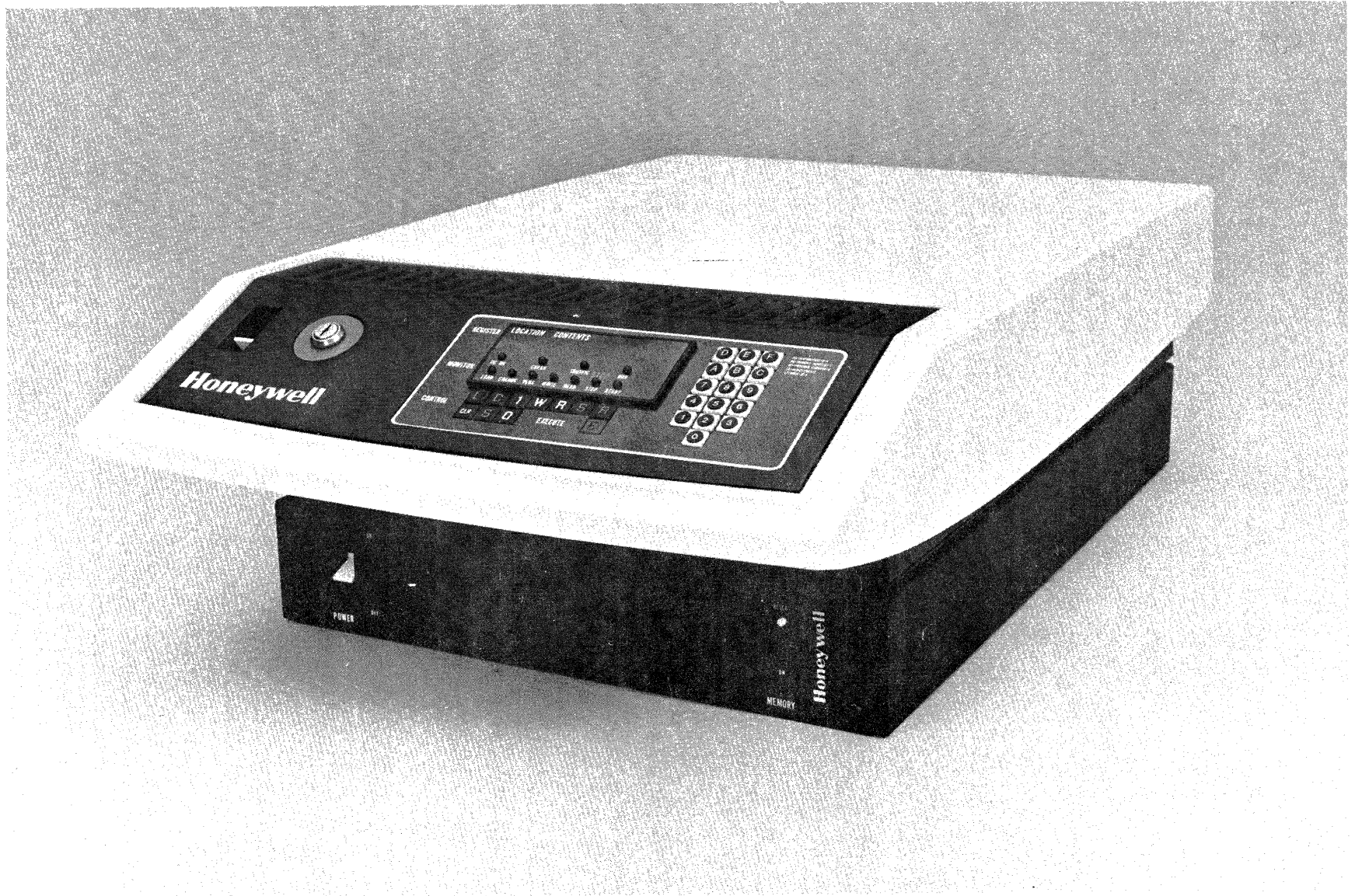


Figure 1-4 Typical Series 60 Level 6 Tabletop Configuration

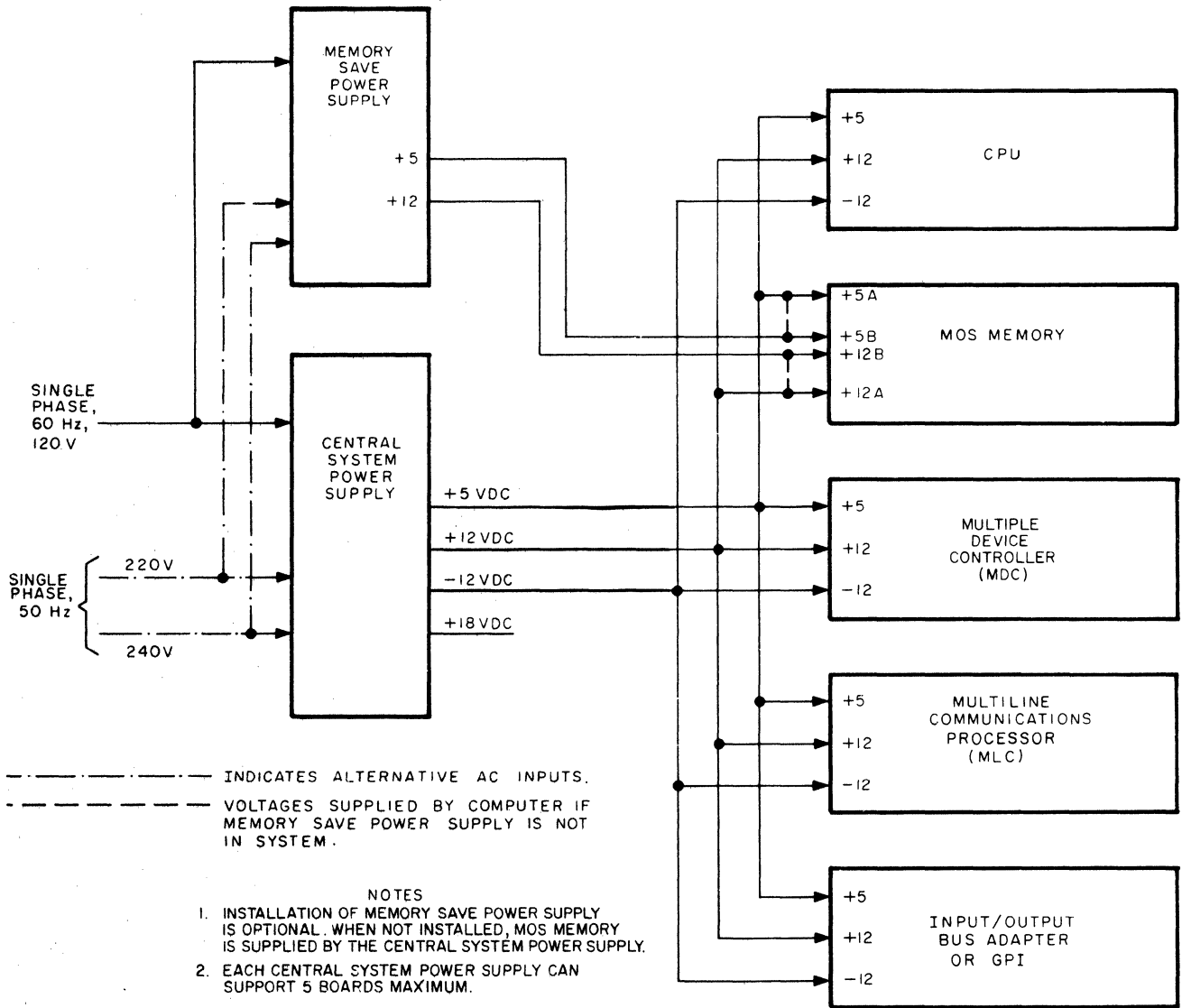


Figure 1-5 Typical Series 60 Level 6 Power Supply System

Table 1-1 Specification Data - Series 60 Level 6 Central System
Power Supplies (Sheet 1 of 3)

ITEM	CENTRAL SYSTEM POWER SUPPLIES			
	M60	M100	M150	M170
IPI Number 60 Hz 50 Hz	BPWR260A-001 BPWR261A-001	BPWU480A BPWU481A	BPWU490A BPWU491A	BPWU500A-001 BPWU501A-001
DIMENSIONS, NOMINAL <u>Chassis</u> Width, cm (in.) Depth, cm (in.) Height, cm (in.) <u>Weight, Kg. (lb.)</u> <u>Cooling Fans</u> 101-132V, 50/60 Hz	38.10 (15.0) 15.14 (5.96) 12.70 (5.0) 5.9 (13) 03820038-001 (Low Noise Boxer) 60067104-002 (Super Boxer)	38.10 (15.0) 15.14 (5.96) 12.70 (5.0) 5.9 (13) 70964008-006 (Super Boxer) 60067104-002 (Super Boxer)	38.10 (15.0) 13.87 (5.46) 12.70 (5.0) 5.9 (13) 70964008-006 (Super Boxer) 60067104-002 (Super Boxer)	38.10 (15.0) 13.87 (5.46) 12.70 (5.0) 5.9 (13) 03820038-001 (Low Noise Boxer) 6007104-002 (Super Boxer)
INPUT SPECIFICATIONS <u>Voltages</u> 60 Hz or 50 Hz 50 Hz <u>Power, Watts</u> <u>Phase</u> <u>Connector</u>	120V ^{+10%} _{-15%} 220V ^{+10%} _{-15%} 240V ^{+6%} _{-15%} 460 Single 3-pin AMP Mate-N-Lock (Table 2-3)	120V ^{+10%} _{-15%} 220V ^{+10%} _{-15%} 240V ^{+6%} _{-15%} 460 Single 3-pin AMP Mate-N-Lock (Table 2-3)	120V ^{+10%} _{-15%} 220V ^{+10%} _{-15%} 240V ^{+6%} _{-15%} 600 Single 3-pin AMP Mate-N-Lock (Table 2-3)	120V ^{+10%} _{-15%} 220V ^{+10%} _{-15%} 240V ^{+6%} _{-15%} 700 Single 3-pin AMP Mate-N-Lock (Table 2-3)
FUSES (ON REAR OF CHASSIS)	F01-8A for 60 Hz F01-5A for 50 Hz	F01-8A for 60 Hz F01-5A for 50 Hz	F01-10A for 60 Hz F01-6A for 50 Hz	F01-12A for 60 Hz F01-8A for 50 Hz
OUTPUT SPECIFICATIONS <u>+5 Vdc Supply</u> Maximum Current Minimum Current Overcurrent Protection Overvoltage Protection Regulation Ripple and Noise	36A* 10A Protected for short circuits of less than 1 minute duration Autotrip at 6.3V ±5% 200 mV (p-p) maximum	36A* 10A Protected for short circuits of less than 1 minute duration Autotrip at 6.3V ±5% 200 mV (p-p) maximum	55A*** 10A Protected for short circuits of less than 1 minute duration Autotrip at 6.3V ±5% 200 mV (p-p) maximum	70A**** 10A Protected for short circuits of less than 1 minute duration Autotrip at 6.3V ±5% 200 mV (p-p) maximum

Table 1-1 Specification Data - Series 60 Level 6 Central System
Power Supplies (Sheet 2 of 3)

ITEM	CENTRAL SYSTEM POWER SUPPLIES			
	M60	M100	M150	M170
OUTPUT SPECIFICATIONS (Cont'd)				
<u>-5Vdc Supply</u>				
Maximum Current				
Minimum Current				
Overcurrent Protection				
Overvoltage Protection				
Undervoltage Protection				
Regulation				
Ripple and Noise				
<u>+12 Vdc Supply</u>				
Maximum Current	3.0A**	3.0A**	3.0A**/**	3.0A**/**
Minimum Current	0A	0A	0A	0A
Overcurrent Protection	Internal short circuit limiting	Internal short circuit limiting	Internal short circuit limiting	Internal short circuit limiting
Overvoltage Protection	Autotrip at 13.5V	Pulse-rated zener diode	Pulse-rated zener diode & Autotrip at 13.5V	Pulse-rated zener diode & Autotrip at 13.5V
Undervoltage Protection	NA	NA	NA	NA
Regulation	±5%	±5%	±5%	±5%
Ripple and Noise	300 mV (p-p) maximum	300 mV (p-p) maximum	300 mV (p-p) maximum	300 mV (p-p) maximum
<u>-12 Vdc Supply</u>				
Maximum Current	3.0A	3.0A	3.0A	3.0A
Minimum Current	0A	0A	0A	0A
Overcurrent Protection	Internal short circuit limiting	Internal short circuit limiting	Internal short circuit limiting	Internal short circuit limiting
Regulation	±5%	±5%	±5%	±5%
Ripple and Noise	300 mV (p-p) maximum	300 mV (p-p) maximum	300 mV(p-p) maximum	300 mV (p-p) maximum
<u>+18 Vdc Supply (Core Memory Only)</u>				
Maximum Current	3.0A	1.0A	3.0A	3.0A
Minimum Current	0A	0A	0A	0A
Regulation	+33%, -12%	+33%, -12%	+33%, -12%	+33%, -12%
<u>+24 Vdc Supply</u>				
Maximum Current				
Minimum Current				
Overvoltage Protection				
Undervoltage Protection				
Regulation				
Ripple and Noise				
AC CONNECTOR(S)	NOT APPLICABLE			
DC CONNECTOR(S)	12-pin AMP Mate-N-Lock (J07) (Table 2-4)	12-pin AMP Mate-N-Lock (J07) (Table 2-4)	12-pin AMP Mate-N-Lock (J07) (Table 2-4)	12-pin AMP Mate-N-Lock (J07) (Table 2-4)

Table 1-1 Specification Data - Series 60 Level 6 Central System
Power Supplies (Sheet 3 of 3)

ITEM	CENTRAL SYSTEM POWER SUPPLIES			
	M60	M10	M150	M170
RECEPTACLES, PRIMARY POWER (Rear of Chassis)	NOT APPLICABLE			
+5V AND GRD OUTPUTS	+5 Vdc-W0102 GRD-W0202 (Connection made by push-on bar or screw connection to verti- cal bus bar)	+5 Vdc-W0102 GRD-W0202	+5 Vdc-W0102 GRD-W0202 (Connection made by push-bar or screw connection to verti- cal bus bar)	+5 Vdc-W0102 GRD-W0202 (Connection made by push-bar or screw connection to verti- cal bus bar)
OPERATING AMBIENT TEMPERATURE	0-62°C (32-144°F)	0-62°C (32-144°F)	0-62°C (32-144°F)	0-62°C (32-144°F)
ADJUSTMENTS	+5V to +5.10V	+5V to +5.10V +12V to +12.20V	5V to 5.1V Adjusted off shelf at factory only	5V to 5.1V Adjusted off shelf at factory only
RELIABILITY MTBF With fans	58,000 hrs. 71.21 failures/ 10 ⁶ hrs.	36,000 hrs. 28.00 failures/ 10 ⁶ hrs.	36,000 hrs. 28.00 failures/ 10 ⁶ hrs.	36,000 hrs. 28.00 failures/ 10 ⁶ hrs.
Without fans	140,000 hrs. 7.21 failures/ 10 ⁶ hrs.	125,000 hrs. 8.00 failures/ 10 ⁶ hrs.	125,000 hrs. 8.00 failures/ 10 ⁶ hrs.	125,000 hrs. 8.00 failures/ 10 ⁶ hrs.
RIDETHROUGH TIME 100% drop in primary voltage % drop in primary voltage	60 ms 25% - No Shutdown	60 ms 28% - No Shutdown	40 ms 25% - No Shutdown	40 ms 22% - No Shutdown

*In the M60 and M100 configurations where the total +12V and -12V currents are less than 4.0 amperes, the difference can be traded for extra 5V current in accordance with the equation:

$$I_{5V} + 36 + 3 [4 - (I_{+12V} + I_{-12V})] \text{ or a maximum of 45.0 amperes.}$$

The sum of +12V, -12V, and +18V currents should not exceed 4.0 amperes.* The sum of the +12V and the +18V currents should not exceed 3.0 amperes.

***In M150 configurations where the total 5V current is less than 55 amperes, the difference can be traded for extra ±12V current in accordance with the equation:

$$I_{\pm 12V} = 4.0 + \frac{(55.0 - I_{+5V})}{4} \text{ or a maximum of 5.0 amperes.}$$

****In M170 configurations, where the total +12V and -12V currents are less than 4.0 amperes, the difference can be traded for extra 5V current in accordance with the equation:

$$I_{5V} = 70 + 4 [4 - (I_{+12} + I_{-12})] \text{ of a maximum of 75.0 amperes}$$

In M170 configurations, where the total 5V current is less than 70.0 amperes, the difference can be traded for extra ±12 current in accordance with the equation:

$$I_{\pm 12} + 4.0 + \left(\frac{70 - I_{+5V}}{4} \right) \text{ or a maximum of 5.0 amperes.}$$

Table 1-2 Specification Data - Series 60 Level 6 Miscellaneous Power Supplies (Sheet 1 of 3)

ITEM	POWER SUPPLY		
	MEMORY SAVE PSS9001/PSS9002		DISKETTE
IPI Number 60 Hz 50 Hz	BBBU060A BBBU050A		**
DIMENSIONS, NOMINAL <u>Chassis</u> Width, cm (in.) Depth, cm (in.) Height, cm (in.) <u>Weight</u> <u>Cooling Fans</u> 102-132V, 60 Hz	43.18 (17.0) 43.18 (17.0) 8.13 (3.2) 16.4 (36.0) One, 655.4 LPM (20 CFM) 120V, 50/60 Hz		35.56 (14.0) 12.70 (5.0) 16.51 (6.5) 8.1 (18.0) One, 566.4 LPM (20 CFM) 120V, 50/60 Hz
INPUT SPECIFICATIONS <u>Voltages</u> 60 Hz or 50 Hz 50 Hz <u>Power, Watts</u> <u>Phase</u> <u>Connector</u>	120V ^{+10%} _{-15%} * 220V ^{+10%} _{-15%} 240V ^{+6%} _{-15%} 120 Single 60 Hz Parallel Blade (70941108-002) 50 Hz Twist Lock (04820287-001)	THIS COLUMN INTENTIONALLY LEFT BLANK	120V ^{+10%} _{-15%} (60 Hz only) 220V ^{+10%} _{-15%} 240V ^{+6%} _{-15%} 180 Single 60 Hz Parallel Blade (70941108-002) 50 Hz Twist Lock (04820287-001)
FUSES (On Rear of Chassis)	F01-12A for 60 Hz and 50/60 Hz (line Pro- tection) F01-7A for 50 Hz (Line Protection) F02-2A for 60 Hz and 50/60 Hz F02-1A for 50 Hz		F01-15A for both 60 Hz and 50 Hz (Line Pro- tection) F02-2A for both 60 Hz and 50 Hz (Transformer Protection)

Table 1-2 Specification Data - Series 60 Level 6 Miscellaneous Power Supplies (Sheet 2 of 3)

ITEM	POWER SUPPLY		
	MEMORY SAVE PSS9001/PSS9002		DISKETTE
OUTPUT SPECIFICATIONS			
<u>+5 Vdc Supply</u>			
Maximum Current	3.5A		3.0A
Minimum Current	0.5A		1.5A
Overcurrent Protection	Short Circuit Protected		Short Circuit Current Limiting
Overvoltage Protection	Autotrip at 6.2V		Internal Safe Area Protection
Undervoltage Protection	Autotrip at 4.4V		Internal Thermal Overload Protection
Regulation	±5%		±5%
Ripple and Noise	200 mV (p-p) maximum		200 mV (p-p) maximum
<u>-5 Vdc Supply</u>			
Maximum Current			0.3A
Minimum Current			0.15A
Overcurrent Protection			Short Circuit Current Limiting
Overvoltage Protection	Not Applicable		Internal Safe Area Protection
Undervoltage Protection		THIS COLUMN INTENTIONALLY LEFT BLANK	Internal Thermal Overload Protection
Regulation			±5%
Ripple and Noise			100 mV (p-p) maximum
<u>+12 Vdc Supply</u>			
Maximum Current	2.0A		
Minimum Current	0.2A		
Overcurrent Protection	Short Circuit Protected		
Overvoltage Protection	Autotrip at 13.0V		Not Applicable
Undervoltage Protection	Autotrip at 11.4V		
Regulation	±5%		
Ripple and Noise	300 mV (p-p) maximum		
<u>-12 Vdc Supply</u>			
Maximum Current			
Minimum Current			
Overcurrent Protection	Not Applicable		Not Applicable
Regulation			
Ripple and Noise			
<u>+18 Vdc Supply</u>			
Maximum Current			
Minimum Current	Not Applicable		Not Applicable
Regulation			

Table 1-2 Specification Data - Series 60 Level 6 Miscellaneous Power Supplies (Sheet 3 of 3)

ITEM	POWER SUPPLY			
	MEMORY SAVE PSS9001/PSS9002		DISKETTE	
OUTPUT SPECIFICATIONS (Cont'd) +24 Vdc Supply Maximum Current Minimum Current Overvoltage Protection Undervoltage Protection Regulation Ripple and Noise	Not Applicable	THIS COLUMN INTENTIONALLY LEFT BLANK	4.0A 2.0A Constant-Voltage Trans- former Constant-Voltage Trans- former ±10% 500 mV (p-p) maximum	
AC CONNECTOR(S)	Not Applicable		J02 AMP 4-pin Mate-N- Lock (Table 4-3) J03 & J04 AMP 3-pin Mate-N-Lock, each (Table 4-3)	
DC CONNECTOR(S)	9-pin AMP Mate-N- Lock (Table 3-5)		J05 and J06 Device dc Power (9-pin AMP Mate- N-Lock, each) (Table 4-2)	
RECEPTACLES, PRIMARY POWER (Rear of Chassis) +5V and GRD OUTPUTS	J03 Duplex (Switched) Not Applicable		J07 Duplex (Switched) Not Applicable	
OPERATING AMBIENT TEMPERATURE	0-55°C(32-131°F)		0-55°C(32-131°F)	
ADJUSTMENTS	+5V to 5.10V +12V to 12.2V		None	
RELIABILITY MTBF With Fans Without Fans	61,000 hrs. (16.4 failures/10 ⁶ hrs.) Not Applicable		132,000 hrs. (7.6 failures/10 ⁶ hrs.) 384,000 hrs. (2.6 failures/10 ⁶ hrs.)	
RIDETHROUGH TIME 100% Drop in Primary Voltage % Drop in Primary Voltage	2 hrs. Approximately Continuous Operation		Not Applicable	
<p>*PSS9001/PSS9002 Memory Save power supplies before 60128279, Rev. G require a 60 Hz input. PSS9001/PSS9002 Memory Save power supplies 60128279, Rev. G and above may have 50 or 60 Hz without alteration.</p> <p>**IPI No. 60 Hz: BDSKT03A, BDSKT09A, BDSKT04A, and BDSKT10A. IPI No. 50 Hz: BDSKT01A, BDSKT05A, BDSKT07A, BDSKT11A, BDSKT02A, BDSKT06A, BDSKT08A, and BDSKT12A.</p>				

1-17/1-18

II CENTRAL SYSTEM POWER SUPPLIES

2.1 DESCRIPTION

Four types of central system power supplies; namely M60, M100, M150 and M170, are used in the Series 60 Level 6 computer systems (see Table 2-1). At a +5V output, both the M60 and M100 supplies have a nominal maximum output current of 35 amperes. At a +5V output, the M150 supply has a maximum nominal output current of 55 amperes, and the M170 supply has an output of 70 amperes. The M170 supply is identical to the M150 supply except that higher rated components are used.

Table 2-1 Central System Power
Supplies Used in Series 60
Level 6 Computer Systems

COMPUTER SYSTEM MODEL NUMBER	CENTRAL SYSTEM POWER SUPPLY TYPE
06	M60, M100
33	M60, M100, M150, M170
43	M150, M170
47	M170
53	M170

All type power supplies are designed to be used with either 50/60 Hz, 120V RMS; or 50 Hz, 220-240V RMS operation. However, fans, fuses, unit identification, and internal jumpers are different between the 120V and 220-240V design applications.

Primary power for the 50/60 Hz model is provided through a three-wire cord that can be plugged into any parallel-blade receptacle carrying 120 volts, 50/60 Hz. A twist-lock receptacle carrying 220-240 volts, 50 Hz power is required for the 50 Hz model. At the right rear of the supply, the line cord enters the ac interlock assembly, which is secured to the backpanel by two machine screws. Removal of the interlock assembly automatically disconnects power from the supply at plug/jack P01/J01.

Figure 2-1 shows the interior of the central system power supply. Removal and replacement of this supply in the event of its malfunction is a relatively simple process (see subsection on maintenance).

WARNING

Because of high energy storage potentials in the power supply, the importance of observing appropriate precautions regarding personal safety cannot be overemphasized. All warning labels and safety procedures must be carefully observed. Power supply repair must be performed at designated depots.

Structurally, the central system power supply consists of the following major assemblies:

- AC interlock assembly
- AC components assembly
- Heat sink assembly
- Major board assembly.

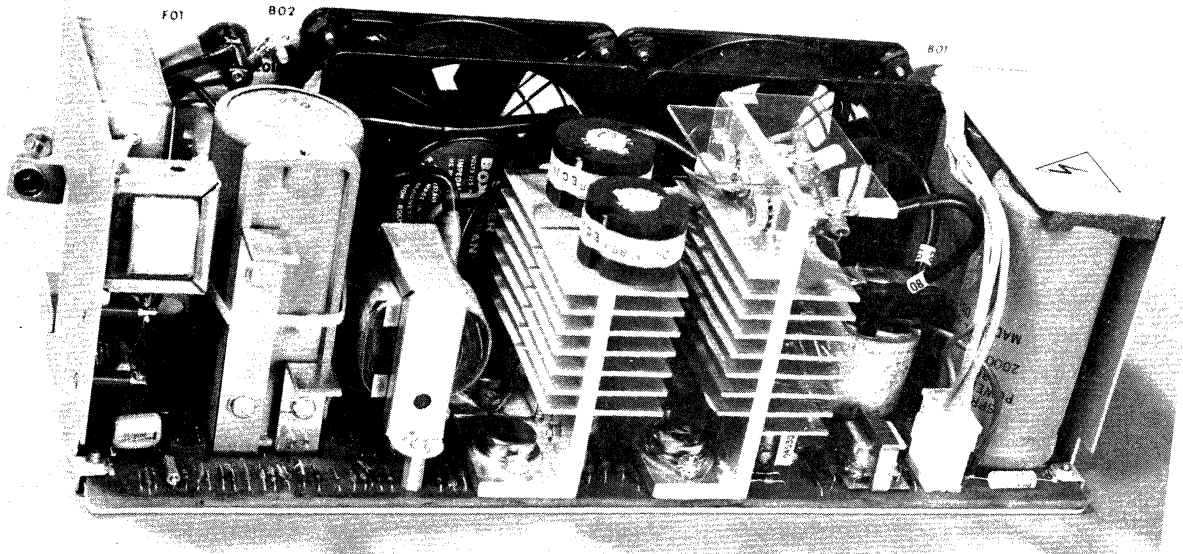
The supply is built on one side of a 1/8-inch-thick printed wiring board (PWB). It uses a heat sink for mounting and cooling heat-sensitive components, such as power transistors and diodes.

2.1.1 Controls, Indicators, and Adjustments

Table 2-2 lists central system power supply controls, indicators, and adjustments.

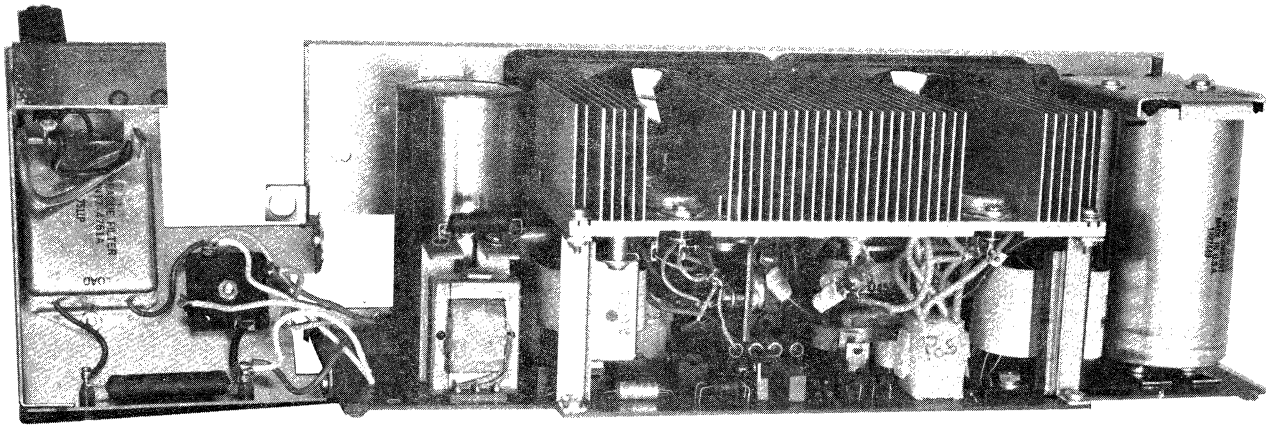
2.1.2 Specification Data

Table 1-1 lists central system power supply specification data.

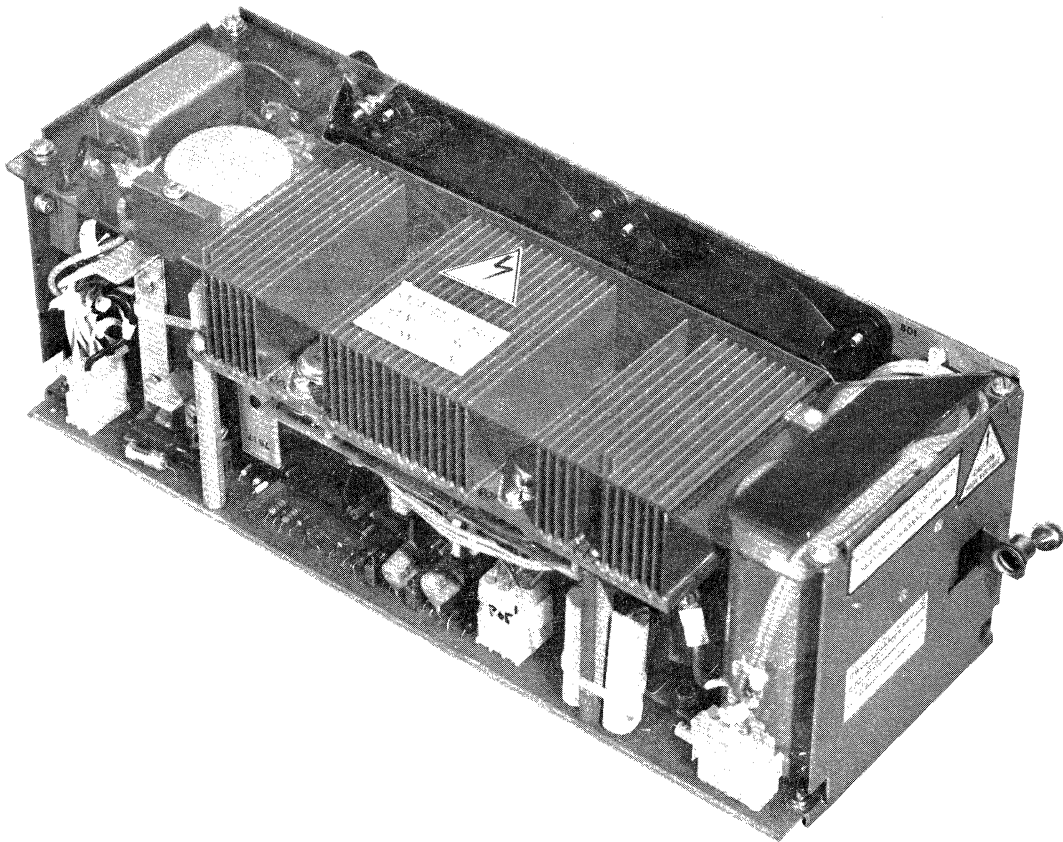


(a) M60 Central System Power Supply

Figure 2-1 Central System Power Supplies, Interior Views
(Sheet 1 of 2)



(b) M100 Central System Power Supply



(c) M150 and M170 Central System Power Supply

Figure 2-1 Central System Power Supplies, Interior Views
(Sheet 2 of 2)

Table 2-2 Central System Power Supply Controls, Indicators and Adjustments

CONTROL/ INDICATOR	M60	POWER SUPPLY		M170	LOCATION	FUNCTION
		M100	M150			
Power ON/OFF	Control	Control	Control	Control	Front Panel	Turns Power On/Off in Computer and PDU
DC ON	Indicator (LED-Red)	Indicator (LED-Red)	Indicator (LED-Red)	Indicator (LED-Red)	Front Panel	When Illuminated Indicates +5 Vdc is Present at CPU
+5V and ±12V ON	Indicator (LED-Red)	Indicator (LED-Red)	Indicator (LED-Red)	Indicator (LED-Red)	Right Rear of Supply	Illuminates When Supply is Operating
+12V ADJ.	No Operator Adjustment for This Voltage	ADJ Trimpot R30 50 ohms	No Operator Adjustment for This Voltage	No Operator Adjustment for This Voltage	Right Rear of Supply	Sets +12 Vdc Level
+5V ADJ.	Adjusting Trimpot R25 1K ohms	Adjusting Trimpot R11 500 ohms	Adjusting Trimpot R44 500 ohms	Adjusting Trimpot R44 500 ohms	Right Rear of Supply	Set +5V Vdc Level

2.1.3 Cooling

Cooling of the computer and its power supply is provided by two 50/60 Hz, 120-volt fans or, in the European configuration, by two 50 Hz, 120-volt fans. The 120 volts used to power the fans is supplied from a tap on the input power transformer. In both versions, the fans are mounted at the rear of the power unit. Air drawn into the supply through the logic/memory package area is exhausted at the rear of the power supply through fan cutouts having protective grilles.

2.1.4 AC Cable-Connector Pin Identification

Pin designations for the three-prong AMP Mate-N-Lock ac connector P01/J01 are given in Table 2-3.

Table 2-3 Central System Power
Supply Input Connector Pin
Identification

PIN	FUNCTION
01	Phase wire (switched)
02	Ground
03	Neutral (switched)

2.1.5 DC Output Connector Pin Identification

In the M100 type power supply, dc output voltages are fed from the power supply to the computer logic/memory boards through 12-pin AMP Mate-N-Lock connector P07/J07. Pin identifications for this connector are given in Table 2-4. The +5 Vdc and ground have bus terminals W0102 and W0202, respectively, which feed two No. 8 cables with ring tongue terminals.

Table 2-4 Central System Power Supply
DC Output Connector Pin
Identification

PIN	FUNCTION
01	Power On/Fail (BSPWON)
02	Time base reference (BSTIMR)
03	Ground (+5V memory save)
04	Ground (BSPWON RET)
05	Ground (+12V memory save)
06	+5 Vdc memory save
07	+12 Vdc memory save
08	M60-Spare, M100-GRD, M150 & M170-GRD Sense
09	M60 & M100-Spare, M150 & M170 - +5V Sense
10	-12 Vdc
11	+12 Vdc
12	+18 Vdc unregulated

In the Type M60, M150, and M170 power supplies, dc output voltages are also fed from the power supply to the computer logic boards through the 12-pin AMP Mate-N-Lock connector P07/J07. Pin identification for this connector is given in Table 2-4. Again, the +5 Vdc and ground have terminals W0102 and W0202, respectively. Connections to these terminals are made with either push-on clips mounted directly on the distribution bus or two No. 8 cables with ring tongue terminals.

The 60-inch rack-mountable, the 30-inch rack-mountable (including the office furniture package), and the tabletop computer configurations provide personnel with maximum protection from electrical hazards.

In all configurations, the central system power supply is completely enclosed in the computer tray and wrapper assembly, details of which are included in the applicable model system manual.

The tray structure prevents access to the power supply on its underside.

The wrapper assembly prevents access to the power supply from the top and from the sides. In addition, the tabletop configuration has a shielded plastic cover.

The power supply, the rearmost assembly in the computer, has a vertical metal panel at the rear. Mounted in this panel are two 23.6 liters/second (50 cfm) fans. The panel, together with the fan-blade guards, prevents access to the power supply when installed in the computer tray and wrapper assembly.

The forward face of the supply is also inaccessible after installation, being separated from the horizontally oriented, vertically stacked major board assemblies and resistor-termination boards by a grille structure.

2.2 INSTALLATION

The computer systems covered in this manual may be either tabletop, 60-inch rack-mountable, or 30-inch rack-mountable (including the office furniture package) configurations. In either versions, the central system power supply is mounted at the rear of the computer system and checked out before the equipment is delivered to the customer.

WARNING

Grounding circuit continuity is vital for safe operation of the system. Never operate machine with grounding conductor disconnected. See installation instructions.

2.2.1 Tabletop Installation

For the tabletop installation, the only external connection required is to insert the computer primary power plug into a convenience receptacle. For a 60 Hz (50/60 Hz) model the attached three-

wire cord can be plugged into any receptacle carrying 120 volts. For a 50 Hz model the cord can be plugged into a twist-lock receptacle carrying 220-240 volts.

If a memory save power supply is used with the tabletop computer, the power plug of the memory save unit is connected to the primary power. The primary power plug of the computer mainframe is inserted into receptacle J03, and a peripheral device plug can also be inserted into this receptacle. The duplex receptacle is in the rear of the memory save unit.

For the tabletop installation, all necessary ac and dc grounding is automatically completed when the power plugs are inserted into their respective receptacles, effecting a multipoint grounding system. Section VI discusses the grounding system in more detail.

If condensation is present as a result of shipment or storage conditions, the equipment must be dried out. The power supply fans must not be used for this purpose.

2.2.2 60-Inch Rack-Mountable and 30-Inch Rack-Mountable (Including Office Furniture Package) Installation

Typical rack-mounted configurations are illustrated in Figures 1-2 and 1-3. Normally, such systems are delivered with all ac power plugs for the rack-mounted units already inserted into receptacles at the rear of the power distribution unit (see Section V for PDU information). In this case, the only primary power connection required is the plugging in of the primary plug of the PDU into the user's power source. Refer to Section V for PDU descriptions and installation procedure.

The ac and dc ground provisions for the rack-mounted equipment are discussed in subsection 2.2.1, desktop installation.

2.3 OPERATION

2.3.1 Primary Power - Type M60 and M100 Power Supply

For 120-volt (110 to 132 volts, RMS), 50/60 Hz applications, power is applied to the power supply (see Figure 2-2) through an eight-ampere fuse, an RFI filter, and a voltage doubler and rectifier to produce an unregulated 300 volts.

For 220-240-volt (187 to 254-volts RMS), 50 Hz applications, power is applied to the power supply through a five-ampere fuse, an RFI filter, and a full-wave bridge rectifier to produce an unregulated 300 volts.

The power converter in the M100 delivers transistor-switched, variable-frequency, fixed pulse width pulses to an isolation transformer having one 5-volt and two 18-volt secondary windings. In the M60, the converter delivers transistor-switched, fixed-frequency, variable width pulses to the secondaries. The output of these secondary windings are then rectified and filtered to obtain the required +5, +18 and -18 Vdc.

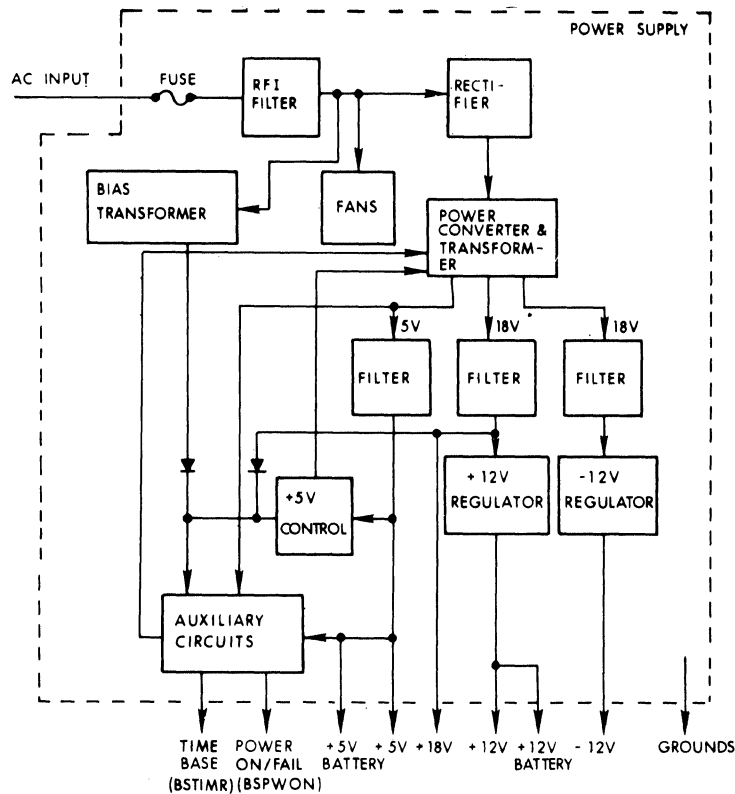


Figure 2-2 Central System Power Supply Block Diagram

2.3.2 Primary Power - Type M150 and M170 Power Supply

For 120-volt (110-132 volts, RMS), 50/60 Hz applications, power is applied to the power supply (see Figure 2-2) through a fuse (M150 - 10 amperes, M170 - 12 amperes), an RFI filter, and a voltage doubler and rectifier to produce an unregulated voltage of approximately 300 volts.

For 220-240-volt (187 to 254 volts, RMS), 50 Hz applications, power is applied to the power supply (see Figure 2-2) through a fuse (M150 - six amperes, M170 - eight amperes), an RFI filter, and a full-wave bridge rectifier to produce an unregulated voltage of approximately 300 volts.

The power converter delivers transistor-switched, fixed-frequency, variable-duty-cycle pulses to an isolation transformer having one 5-volt and two 18-volt (center tap ground) secondary windings. The outputs from these windings are rectified and filtered to obtain the required +5, +18, and -18 Vdc. The M150 and M170 power supplies are identical in physical configuration, but some components in the M170 are higher rated but still physically identical.

2.3.3 +5 Vdc Output

The +5-volt output is held to the design tolerances (± 5 percent) by the control regulation.

2.3.4 +12 and -12 Vdc Outputs

The +12 and -12 Vdc outputs are obtained from the +18 and -18 Vdc outputs, respectively. Series IC regulators effect the necessary voltage reduction and stabilization to specified tolerances.

2.3.5 Control (Bias) Voltage

Power for power supply control functions is generated by a bias voltage transformer. After rectification, the available control voltage is +18 volts.

2.3.6 Time Base Reference

The time base reference is a clipped sine wave of approximately 5-volts amplitude at the same frequency (50 or 60 Hz) as the input voltage.

2.3.7 Power On/Fail Signal

A Power On/Fail signal generated in the power supply is sent to the CPU for use by the I/O processor to initiate a Power On/Fail interrupt. Ground (0.52 volt maximum at 250 milliamperes external load) is used to indicate the absence of power. During power on, this signal switches to a logical One after all the dc voltages are in regulation.

Power shutdown occurs 60 msec in M60 and M100, 40 msec in M150, and M170 power supplies, respectively, (each at 120 volts input voltage) after ac power is removed by either an off sequence or power outage. All outputs are guaranteed to be in tolerance (i.e., the 5-volt output is greater than 4.6 volts at the backboard pins) for two msec after the Power On/Fail signal is grounded. When ac power is reapplied after a line outage, the minimum time the Power On/Fail signal is at ground level is four msec. Similarly, once the Power On signal switches to a logic One, signifying that all dc voltages are in regulation, the minimum time the Power On/Fail signal is at a logic One is four msec. This signal is OR-wired with all power supplies in a system.

2.4 MAINTENANCE

In the power supplies described in this manual, the use of solid-state circuitry and printed circuit boards minimizes the preventive maintenance required. In the case of corrective maintenance the maintenance philosophy calls for replacement of a failed supply with a checked out spare unit of the same type. The following subsections describe the procedures for both preventive and corrective maintenance (rear and front access) of the central system power supplies.

2.4.1 Preventive Maintenance

The following preventive maintenance procedure should be performed as required:

1. Vacuum chassis, electrical components, and heat sink assemblies to prevent dust build-up.
2. See that power bus connections and power supply output connections are secure.
3. Check operation of cooling fans. To replace a fan, first remove the power supply by following the procedure outlined in subsection 2.4.2.1. Then remove fan by removing the four screws holding both the fan guard and fan to chassis. Lift fan up and disconnect ac input leads and remove fan. Replace fan by reversing the preceding procedure.

WARNING

All maintenance must be performed by qualified personnel. The presence of high energy storage potentials makes it vital that the supply be de-energized for at least 60 seconds before access to the interior or before power supply replacement is attempted.

2.4.2 Corrective Maintenance - Rear Access

2.4.2.1 Rear Access Power Supply Removal

Only qualified personnel should perform this operation. Under normal conditions, the physical location of the power supply (at the rear of the computer) makes removal a relatively simple process. Removal is accomplished as follows:

1. Look at the LED indicators on the rear of power supplies to determine faulty unit.
2. Set the computer front panel ON/OFF switch and the PDU front panel circuit breaker CB01 to OFF.
3. Pull the primary power plug of the faulty power supply from its receptacle at the PDU (relay rack installations) or from the convenience outlet (if tabletop configuration is involved).

WARNING

When replacing the central power supply or the diskette power supply, the recommended procedure is to turn off the memory save power supply. However, it is possible to prevent the loss of the memory refresh function (for up to two hours) by not de-energizing the memory save power supply. Since live voltages +5 Vdc B and +12 Vdc B will then be present on the memory backplane, extreme care must be exercised.

4. With rear-access assumed, the first step in power supply removal is to unscrew the two captive machine screws securing the small ac input assembly to the rear panel assembly at the right end of the supply (seen from the rear).
5. Pull small panel/power plug P01 assembly free to break the P01/J01 ac connection to the supply.
6. Disconnect dc power plug connection (12-pin J07/P07) between power supply and computer.
7. In the M100 power supply, remove two No. 8 pan head screws securing the +5 Vdc and ground leads to their respective buses at points labeled W0102 and W0202.
8. Rotate the two nickel-plated captive screws at the extreme right and left of the supply counterclockwise until the supply can be physically detached from the rear of the computer frame structure.
9. The power supply can now be removed and the checked-out replacement supply installed.

2.4.2.2 Rear Access Power Supply Replacement

Replacement of the central system power supply with a checked-out spare is accomplished by reversing the procedures in steps 2 through 8 in the preceding subsection (2.4.2.1).

2.4.3 Corrective Maintenance - Front Access

For customer installations in which the computer and related options are add-ons to existing rackmounted computer systems, rear access to the computer may be impractical or impossible. However, power supply replacement can be accomplished by removing the entire computer from its rackmounting enclosure. Removal and replacement are accomplished in a series of steps determined by the type of equipment with which the computer is integrated.

2.5 REFERENCE DIAGRAMS

The following reference diagrams are included for instructional or reference purposes only.

- Figure 2-3 M60 Central System Power Supply Schematic
- Figure 2-4 M100 Central System Power Supply Schematic
- Figure 2-5 M150 Central System Power Supply Schematic
- Figure 2-6 M170 Central System Power Supply Schematic.

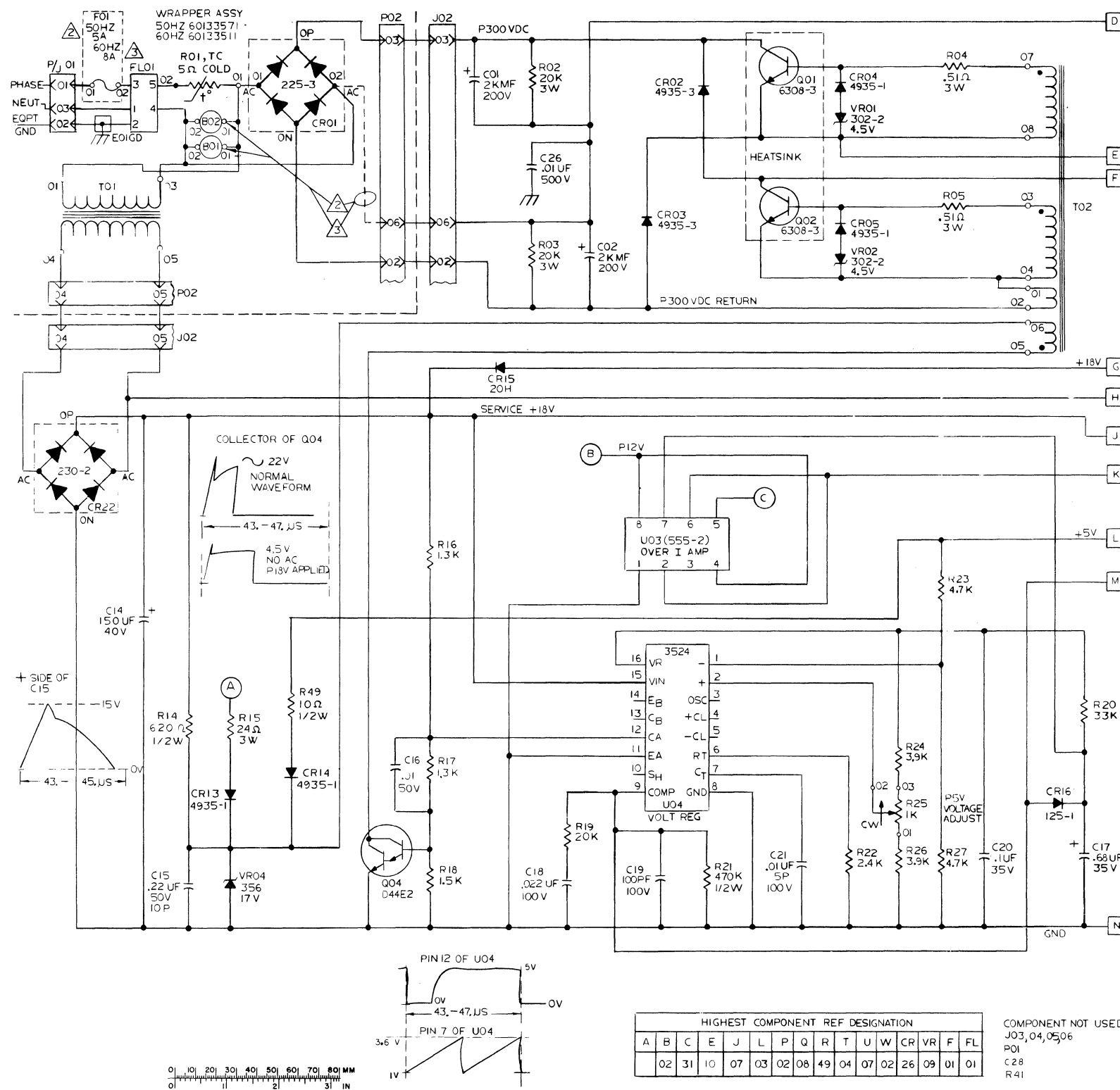


Figure 2-3 M60 Central System Power Supply Schematic Diagram (Sheet 1 of 2)

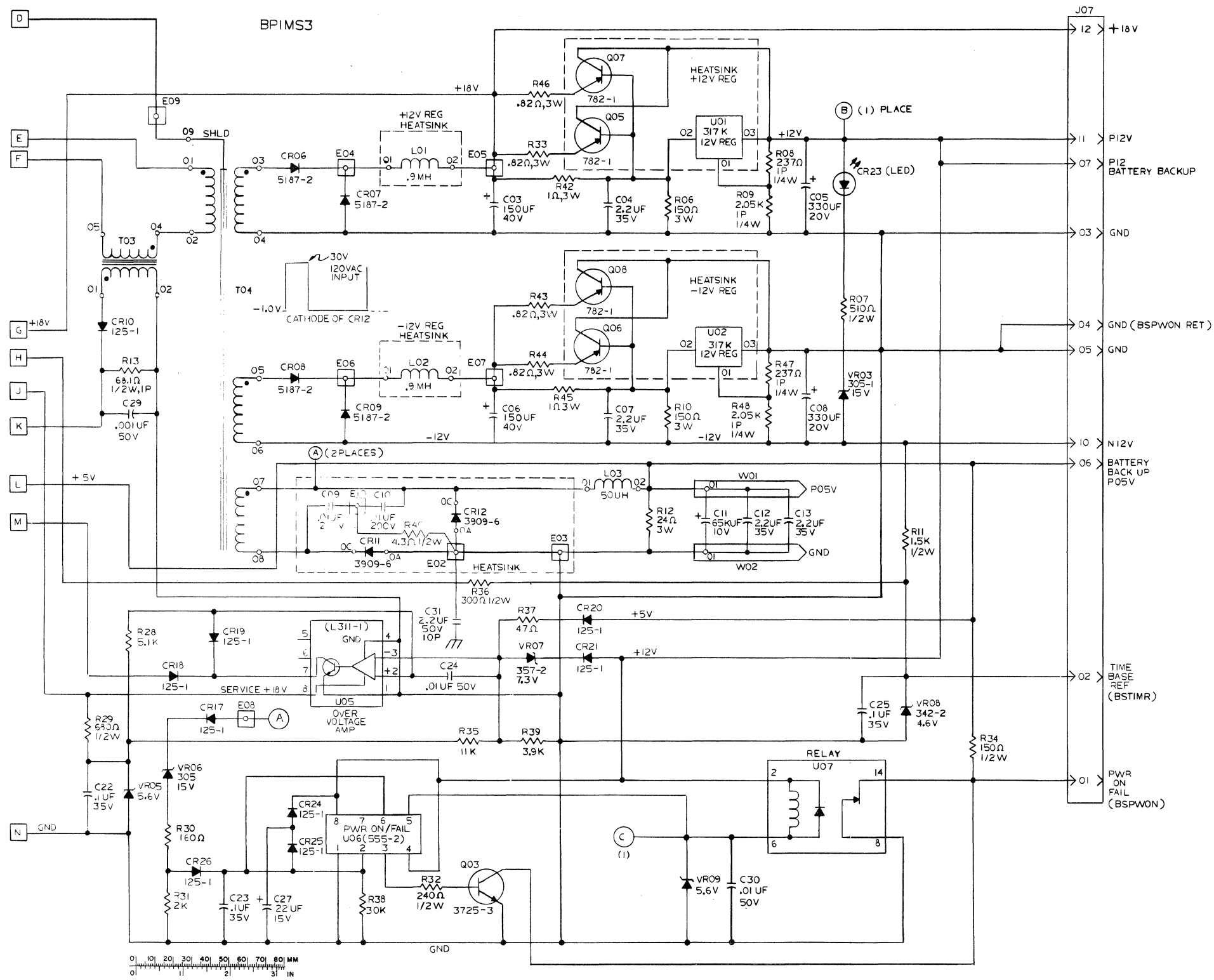


Figure 2-3 M60 Central System Power Supply Schematic Diagram (Sheet 2 of 2)

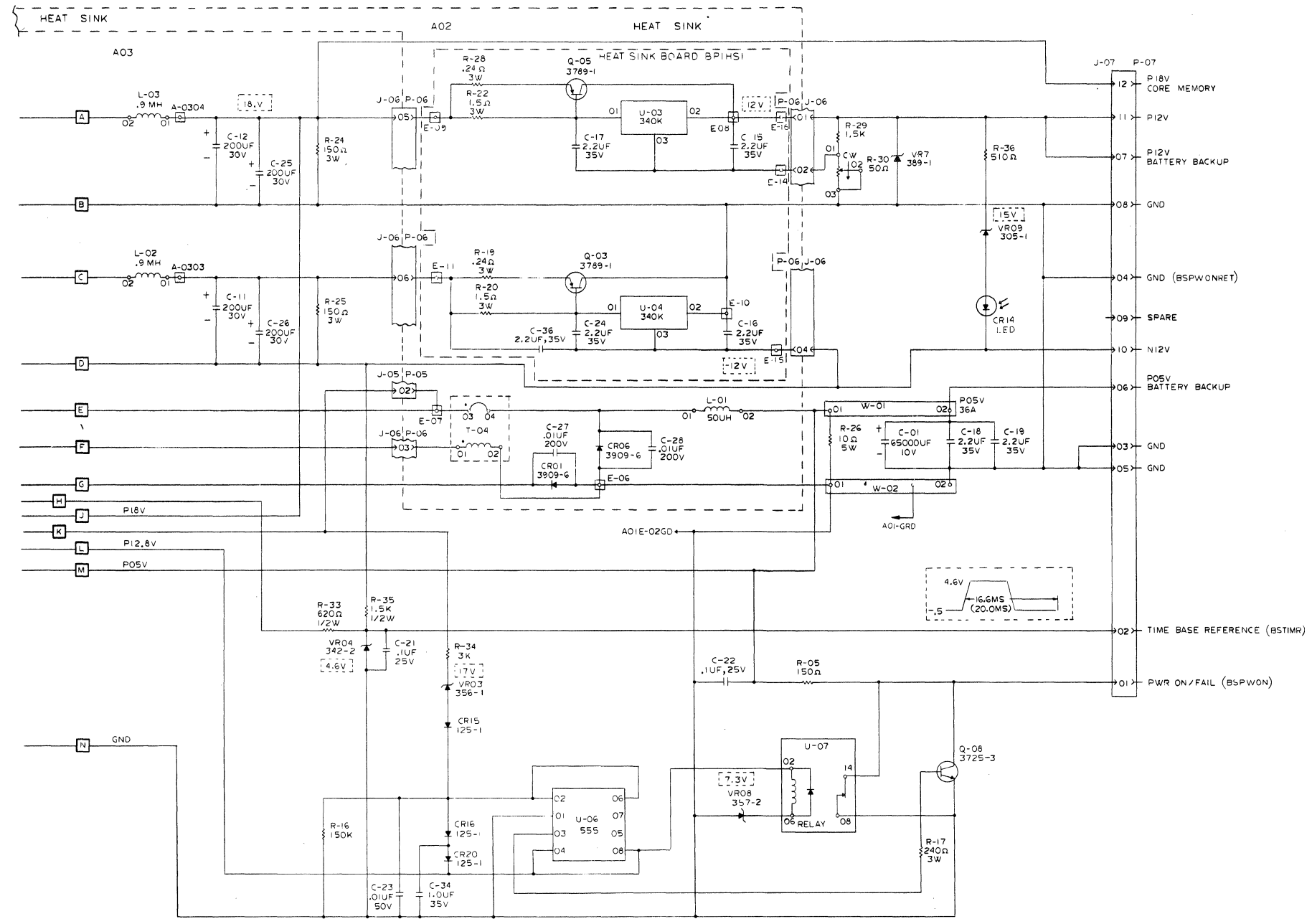


Figure 2-4 M100 Central System Power Supply Schematic Diagram (Sheet 2 of 2)

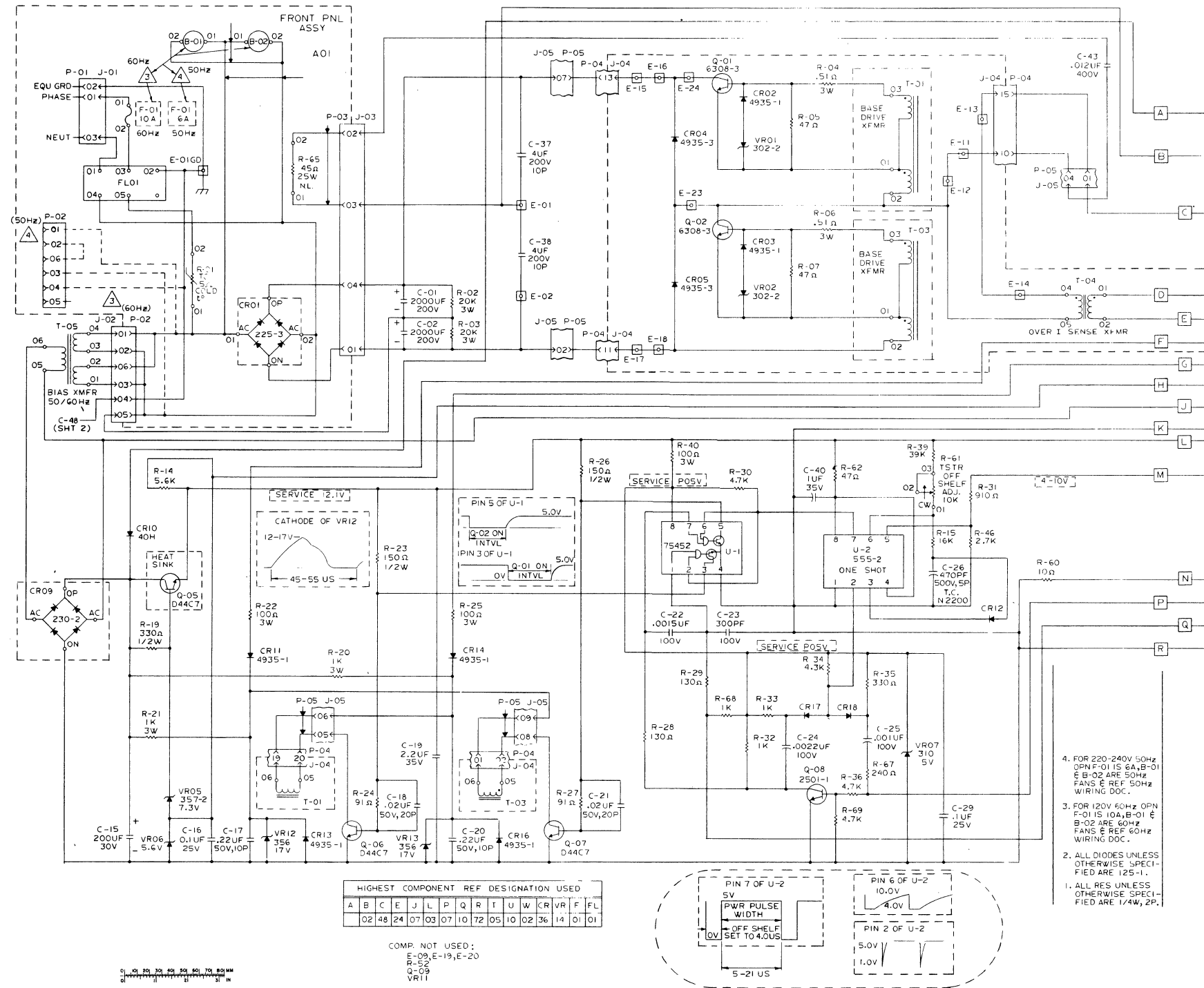


Figure 2-5 M150 Central System Power Supply Schematic Diagram (Sheet 1 of 2)

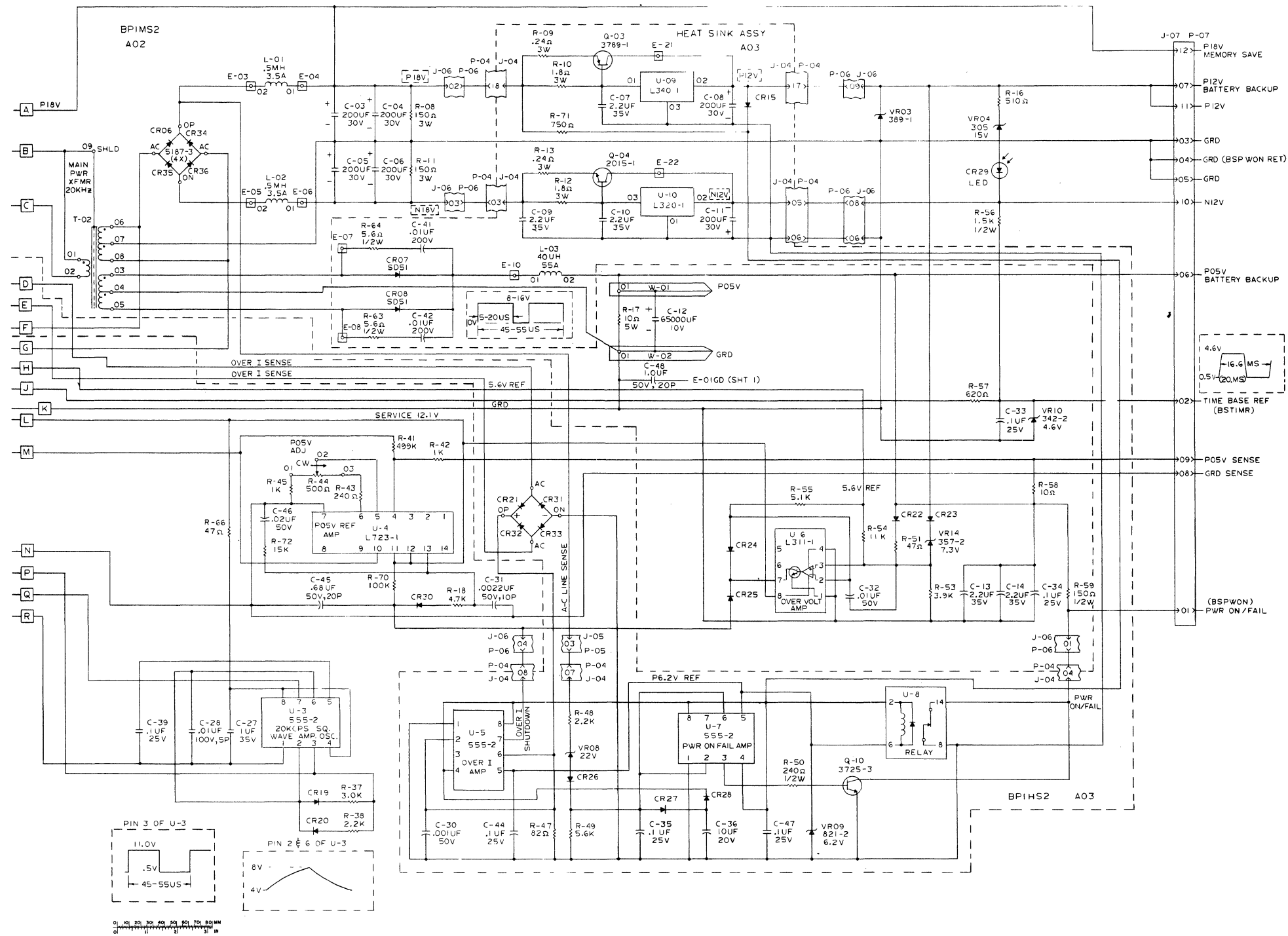
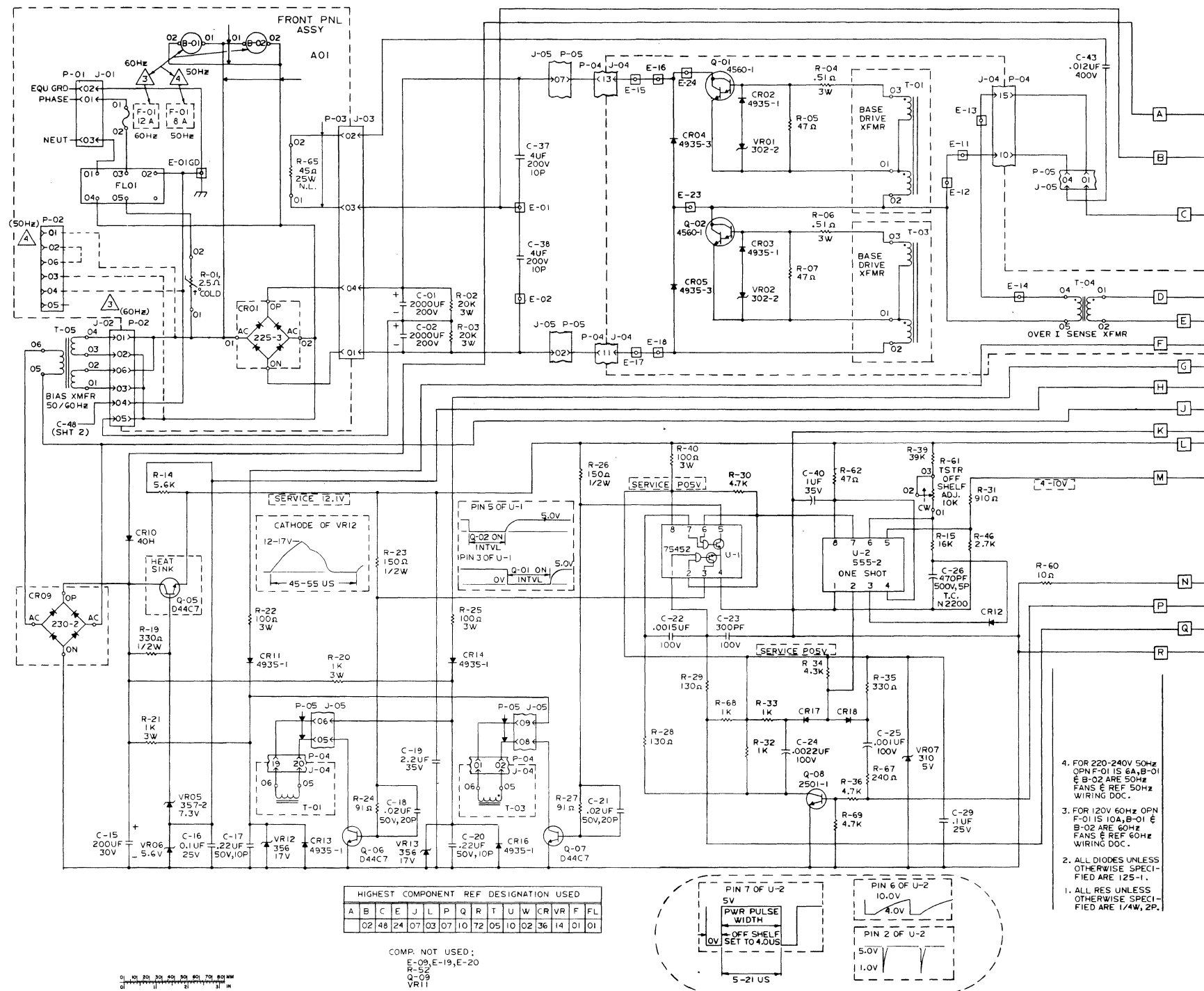


Figure 2-5 M150 Central System Power Supply Schematic Diagram (Sheet 2 of 2)



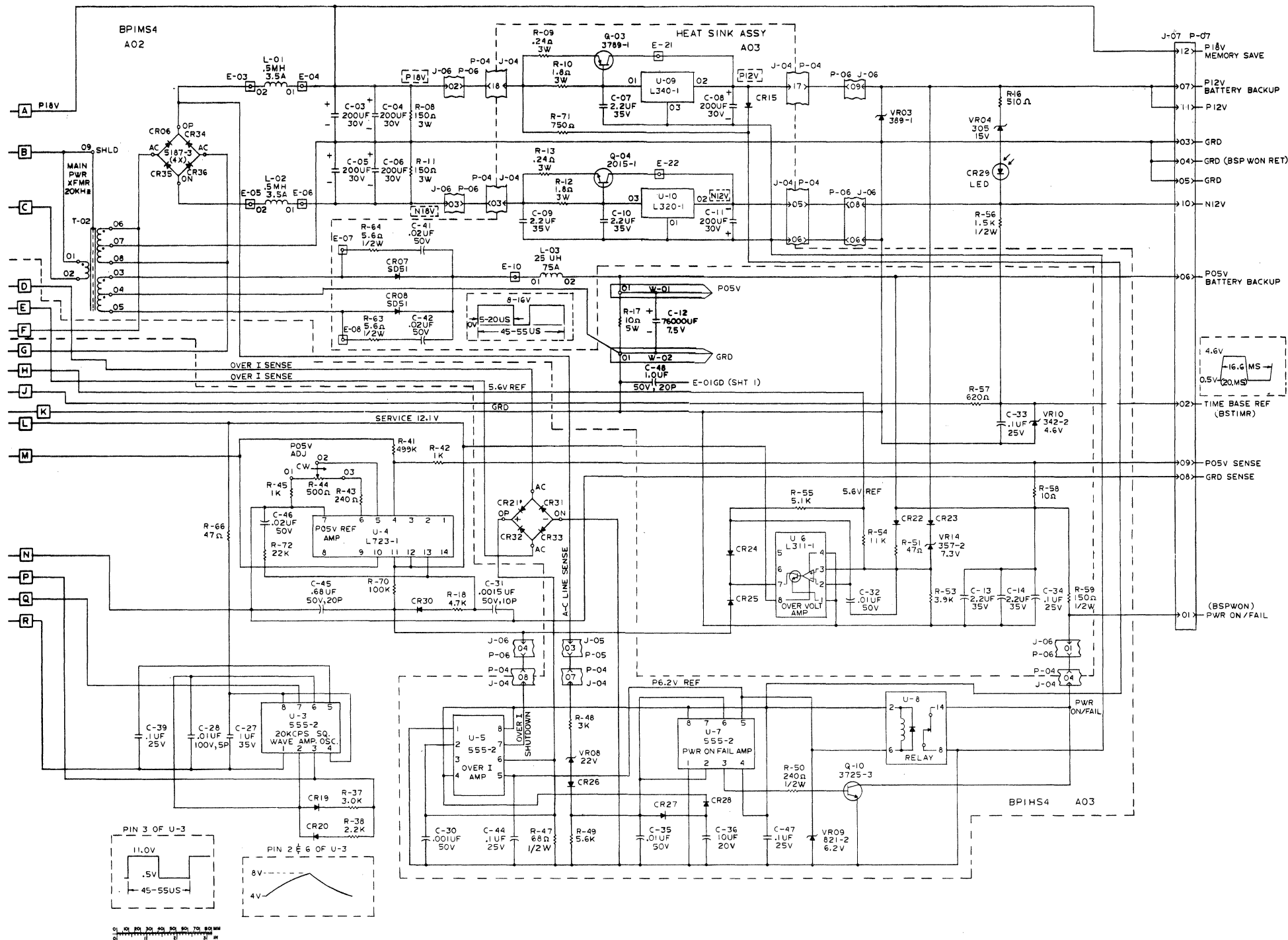


Figure 2-6 M170 Central System
Power Supply Schematic
Diagram (Sheet 2 of 2)

III

MEMORY SAVE POWER SUPPLIES

There are two types of memory save power supplies provided for the Series 60 Level 6 computer users; Types PSS9001/PSS9002. Type PSS9002 is used in the 60-inch and the 30-inch rack-mountable configurations. Type PSS9001 is identical to the PSS9002 electrically and physically but it is housed in an external wrapper that is designed to be used with the tabletop configuration. Types PSS9001/PSS9002 are designed for the Level 6 Models, 06, 33, 43, 47, and 53 systems.

3.1 TYPE PSS9001/PSS9002 DESCRIPTION

The memory save power supply provides Series 60 Level 6 computer users with an emergency capability for retaining the content of the computer MOS memory during power outages lasting approximately two hours. During normal power-up operation, the memory save power supply is energized by the user's single-phase, 120-volt, 60-Hz or 50/60-Hz primary power (for European installations, single-phase, 220-240 volt, 50 Hz). In this mode, the supply delivers the +5 Vdc and +12 Vdc required for the MOS memory and charges its gel-type, lead-dioxide batteries.

When primary power to the system is lost, the PSS9001/PSS9002 memory save power supply is energized by the three series-wired six-volt batteries. Figure 3-1 is a photograph of the supply; dimensions are also shown in Figure 3-1. The batteries are compact, lightweight, inexpensive, readily available, and maintenance free.

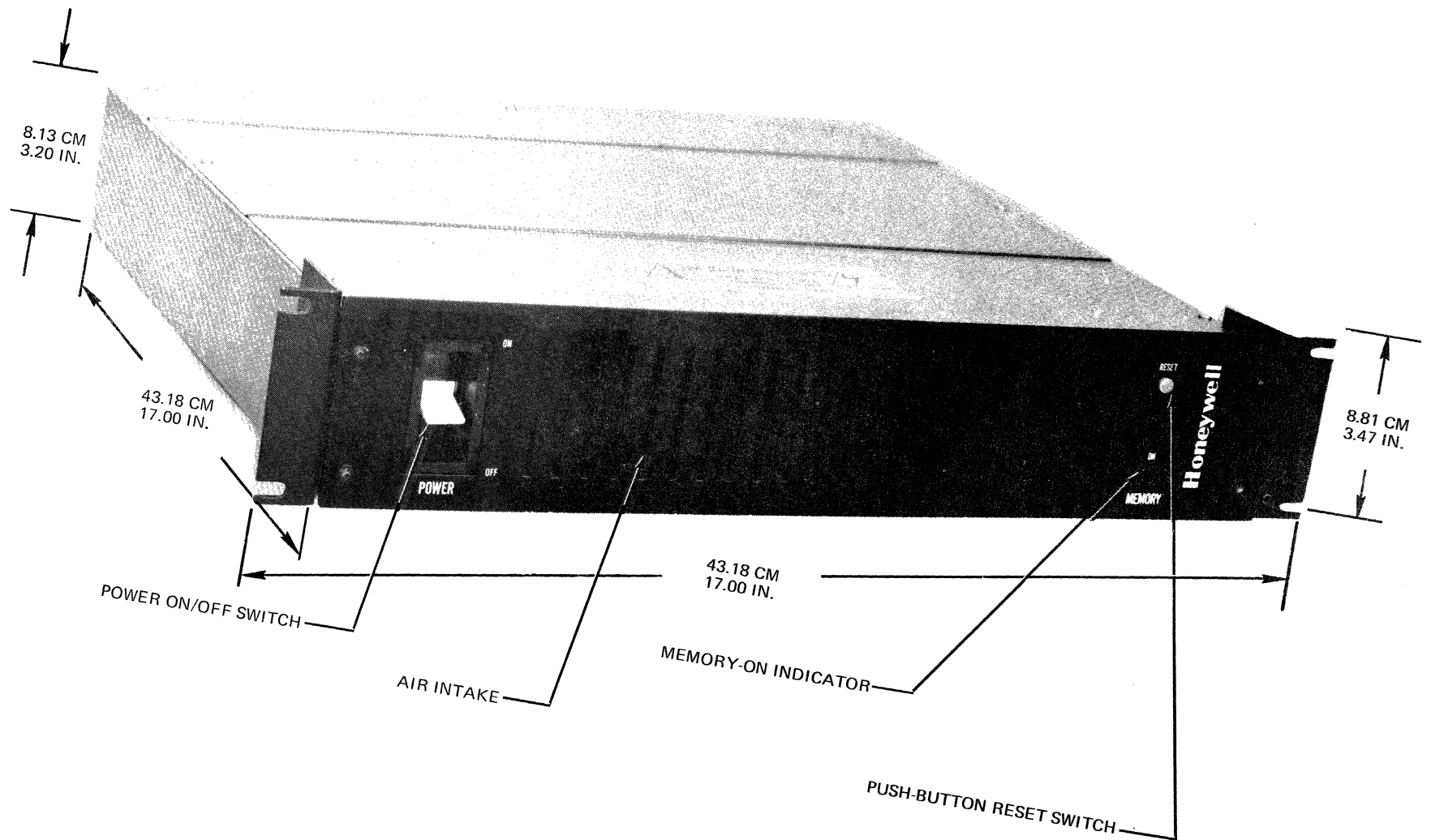


Figure 3-1 Type PSS9001/PSS9002 Memory Save Power Supply

The PSS9001/PSS9002 memory save power supply is a completely enclosed unit, the chassis of which is 43.18 cm (17 in.) in depth and width and 8.13 cm (3.20 in.) high. Its front panel is 48.26 cm (19 in.) wide and 8.81 cm (3.47 in.) high. Total weight (with batteries) is approximately 16.4 kg (36 lb).

In normal on-line operation, the primary voltage input is transformed to 24 volts, full-wave rectified and filtered to obtain 26 Vdc. This intermediate voltage energizes two pulse-width-modulated regulators, one delivering +5 Vdc and the other +12 Vdc.

The PSS9001/PSS9002 memory save power supply is comprised of the following (see Figure 3-2):

1. An ac input section
2. +5/+12-Vdc regulator assembly
3. Battery assembly.

Supply protective features include overvoltage, undervoltage, overcurrent, and a power on/fail signal. A LED lamp indicates that memory voltages are present, and extinguishes if the memory-refresh voltage has been inadvertently interrupted. A manual reset push-button is pressed to start/restart the supply and restore LED illumination.

Backup supplies for European installations differ from the NAO design in the following particulars:

1. The input power transformer has a 220-240-volt, 50-Hz primary with a primary tap at 120 volts to power the fan.
2. The power cord has European color coding.
3. The rear-mounted receptacle (J03) is a twist-lock type rather than standard plug-in type.
4. Fuses F01 (ac input) and F02 (power supply) are changed from 12A to 10A, and from 2A to 1A, respectively.
5. Chassis markings indicate the European voltage and fuse ratings for the supply.

3.1.1 Type PSS9001/PSS9002 Controls, Indicators, and Adjustments

Figures 3-1 and 3-3 show the controls, indicators, and adjustments on the front panel and the rear of the chassis. Table 3-1 describes their functions.

3.1.2 Type PSS9001/PSS9002 Specification Data

Table 3-2 lists memory save power supply specification data.

3.1.3 Type PSS9001/PSS9002 Cooling

The power supply is cooled by a single 120-volt, 566.4 lfm (20 cfm) fan. For European installations, a tap on the power transformer 220-240-volt primary gives the required 120 volts for fan operation. The fan, located in the left rear corner of the chassis, draws air into the supply through a grille in the front of the unit and exhausts air through a small grille adjacent to

the fan itself in the rear of the chassis. The fan draws approximately 16 watts of ac power. During the memory save mode of operation, no fan cooling is provided.

3.1.4 Type PSS9001/PSS9002 AC Input Connections

The memory save power supply is connected to primary power by means of a power cord that enters the chassis at the rear. The input wires are: phase (line leg), neutral, and service ground.

3.1.5 Type PSS9001/PSS9002 DC Output-Connector Pin Identification

In the central system power supply, the dc output connects to the computer backpanel through jack/plug J/P 07 (see subsection 2.1.5). The dc interface between the memory save and central system power supplies and the computer backpanel is accomplished by a special Y-connector (see Figure 3-4). With this arrangement, plug P07 is mated with jack J07A of the Y-connector, whose P07A plug is mated with computer power supply jack J07. The third element of the Y, plug P02, is mated with J02 of the memory save power supply. All current flow paths from the two power supplies are independent except the common power on/fail line. Pin designations for J07A, J07, and J02 are given in Tables 3-3, 3-4, and 3-5.

3.1.6 Type PSS9001/PSS9002 Personnel Protection and Safety

The memory save power supply, being a completely enclosed cabinet structure, presents no high voltage hazard to personnel during normal computer operations.

Removal of the memory save power supply and replacement by an identical checked-out unit should be performed only by qualified personnel (see subsection 3.4, on maintenance).

3.2 TYPE PSS9001/PSS9002 INSTALLATION

The Honeywell Series 60 Level 6 systems are available in either a tabletop, 60-inch rack-mountable, or a 30-inch rack-mountable (includes office furniture package) configuration. In either configuration the Type PSS9001/PSS9002 memory save power supply is housed in a self-contained cabinet. In either configuration the memory save power supply has similar electrical and physical characteristics. In 60-inch or 30-inch rack-mountable configurations, the chassis slides into tray guides as described in subsection 3.2.2.

3.2.1 Type PSS9001 Tabletop Installation

CAUTION

If condensation is present as a result of shipment or storage conditions, the equipment must be dried out before the following turn-on sequence is carried out. Do not use the power supply fans to dry out equipment.

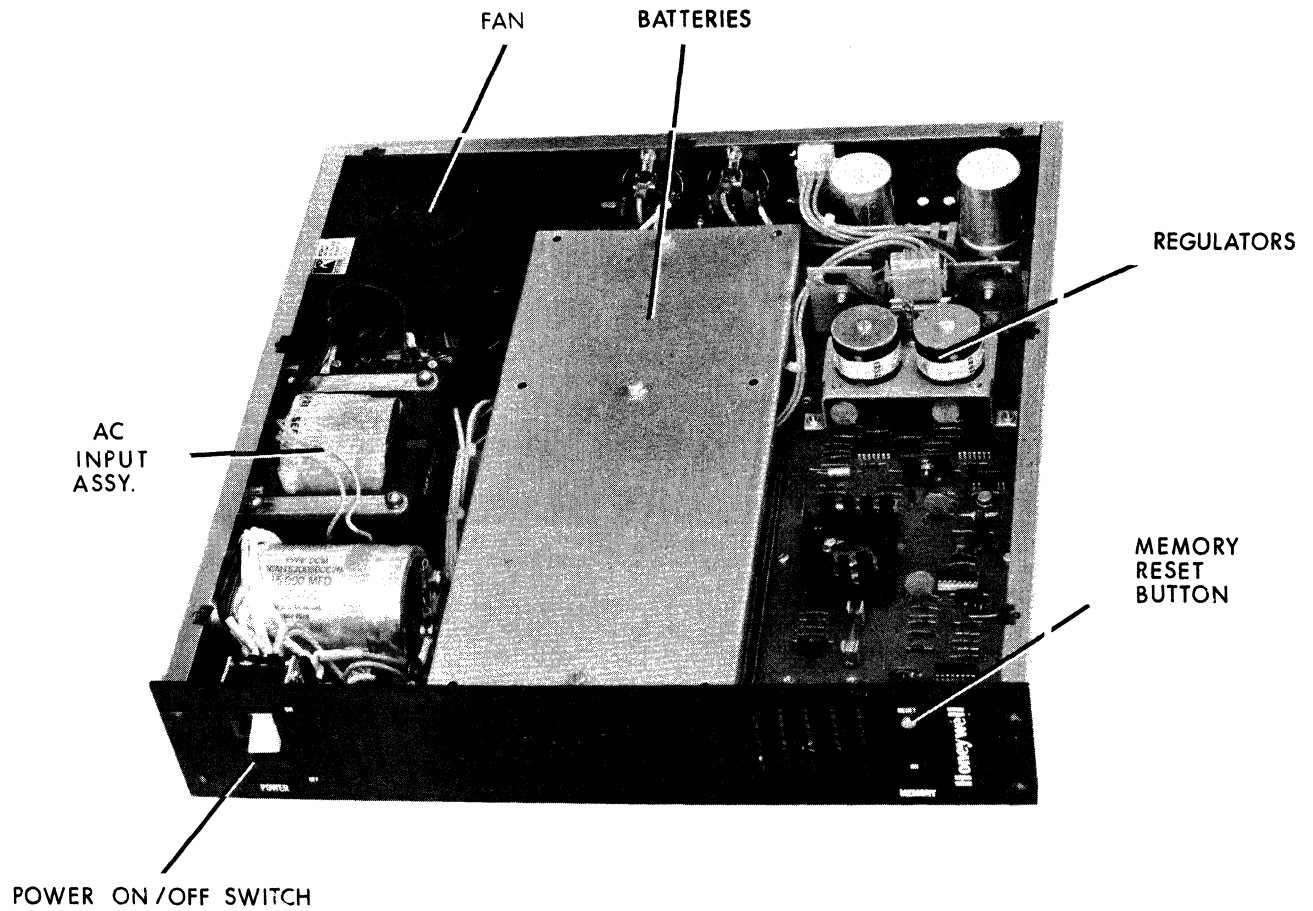


Figure 3-2 Type PSS9001/PSS9002 Memory Save Power Supply - Interior View

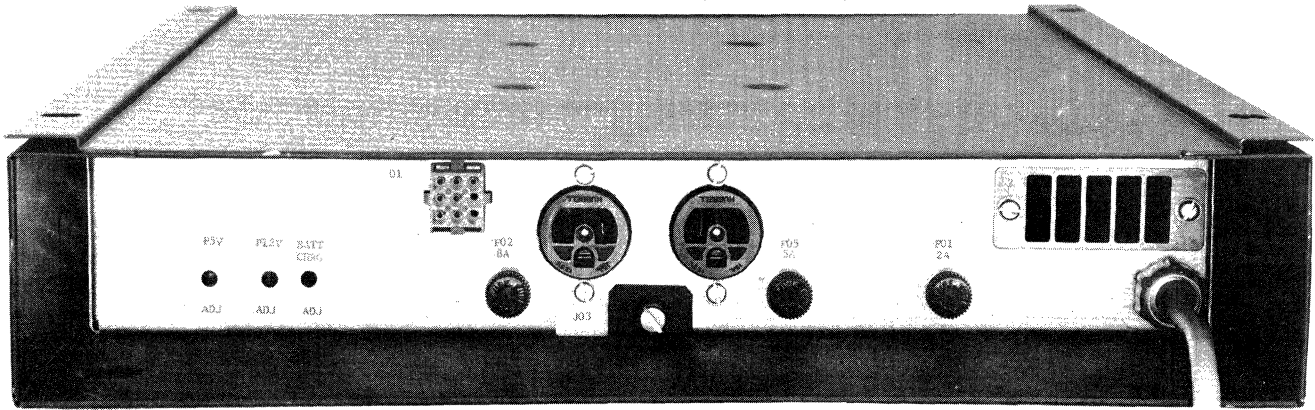


Figure 3-3 Type PSS9001 Memory Save Power Supply - Rear View

Table 3-1 Type PSS9001/PSS9002 Memory Save Power Supply Controls, Indicators, and Adjustments

CONTROL/ INDICATOR	CATEGORY	LOCATION	ILLUSTRATION	FUNCTION
POWER ON/OFF	Control	Front Panel	Figure 3-1	Controls ac and battery power
MEMORY RESET	Control	Front Panel	Figure 3-1	Enables MEMORY ON indicator to reilluminate after loss of memory-refresh voltage
MEMORY ON	Indicator	Front Panel	Figure 3-1	Extinguishes if memory-refresh voltage is interrupted
P5V ADJ	Trimpot, R24, 500 Ω , 3/4w	Chassis, rear	Figure 3-3	Adjusts +5 Vdc output level
P12V ADJ	Trimpot, R8, 500 Ω , 3/4w	Chassis, rear	Figure 3-3	Adjusts +12 Vdc output level
BATT CHRГ ADJ	Trimpot R36, 500 Ω , 3/4w	Chassis, rear	Figure 3-3	Adjusts battery charging voltage

Table 3-2 Type PSS9001/PSS9002 Memory Save Power
Supply Specifications (Sheet 1 of 2)

CHARACTERISTIC	DESCRIPTION
Dimensions, nominal Chassis width Chassis depth Chassis height Front panel width Front panel height	43.18 cm (17.0 in.) 43.18 cm (17.0 in.) 8.13 cm (3.20 in.) 48.26 cm (19.0 in.) 8.81 cm (3.47 in.)
Weight	16.4 Kg (36 lb)
Cooling fan*	566.4 lpm (20 cfm), 120 volt, 50/60 Hz
Input specifications** Voltages Power Phase Power factor Fuse	60 Hz - 120 volts $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50 Hz or 60 Hz - 120 V $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50 Hz - 220 volts $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50 Hz - 240 volts $\begin{matrix} +6\% \\ -15\% \end{matrix}$ 120 watts Single Unity 120V (60 Hz or 50/60 Hz) - 2 amp 220V & 240V (50 Hz) - 1 amp
Output specifications, +5 Vdc supply Regulation Ripple and noise Maximum current Minimum current Overvoltage protection Undervoltage protection Overcurrent protection	+5% 200 mV (p-p), maximum 3.5 amperes 0.5 ampere Autotrip at 6.2 volts Autotrip at 4.4 volts Short-circuit protected
Output specifications, +12 Vdc supply Regulation Ripple and noise Maximum current Minimum current Overvoltage protection Undervoltage protection Overcurrent protection	+5% 300 mV (p-p), maximum 2.0 amperes 0.2 ampere Autotrip at 13.0 volts Autotrip at 11.4 volts Short-circuit protected

Table 3-2 Type PSS9001/PSS900s Memory Save Power Supply Specifications (Sheet 2 of 2)

CHARACTERISTIC	DESCRIPTION
Connector, output	9-pin AMP Mate-N-Lock J02 (see Table 3-5)
Operating ambient temperature	0° - 55°C (32° - 131°F)
Reliability MTBF	61,000 hours (16.4 failures/10 ⁶ hours)
Fuses (rear of chassis)	
F01 - 120V (50/60, Hz)	For mainframe (switched) receptacle on rear of memory save power supply
- 12 amp	
- 220-240V (50 Hz)	
- 7 amp	
F02 - 120V (50/60 Hz)	AC overload protection (fan, transformer, rectifier filter, and AC portion of memory save power supply chassis).
- 2 amp	
- 220-240V (50 Hz)	
- 1 amp	
Receptacles (on rear of chassis) J03	Switched AC - (for all 120/220 through 240V inputs regardless of Hz.)

*Same fan is used for both NAO and European installations. European units use a tap on the 220-240-volt primary of the power transformer.

**Supplies (120V) prior to 60128279, Rev. G must have a 60 Hz input. Supplies (120V) 60128279, Rev. G and above can have either a 50 Hz or a 60 Hz input without alteration.

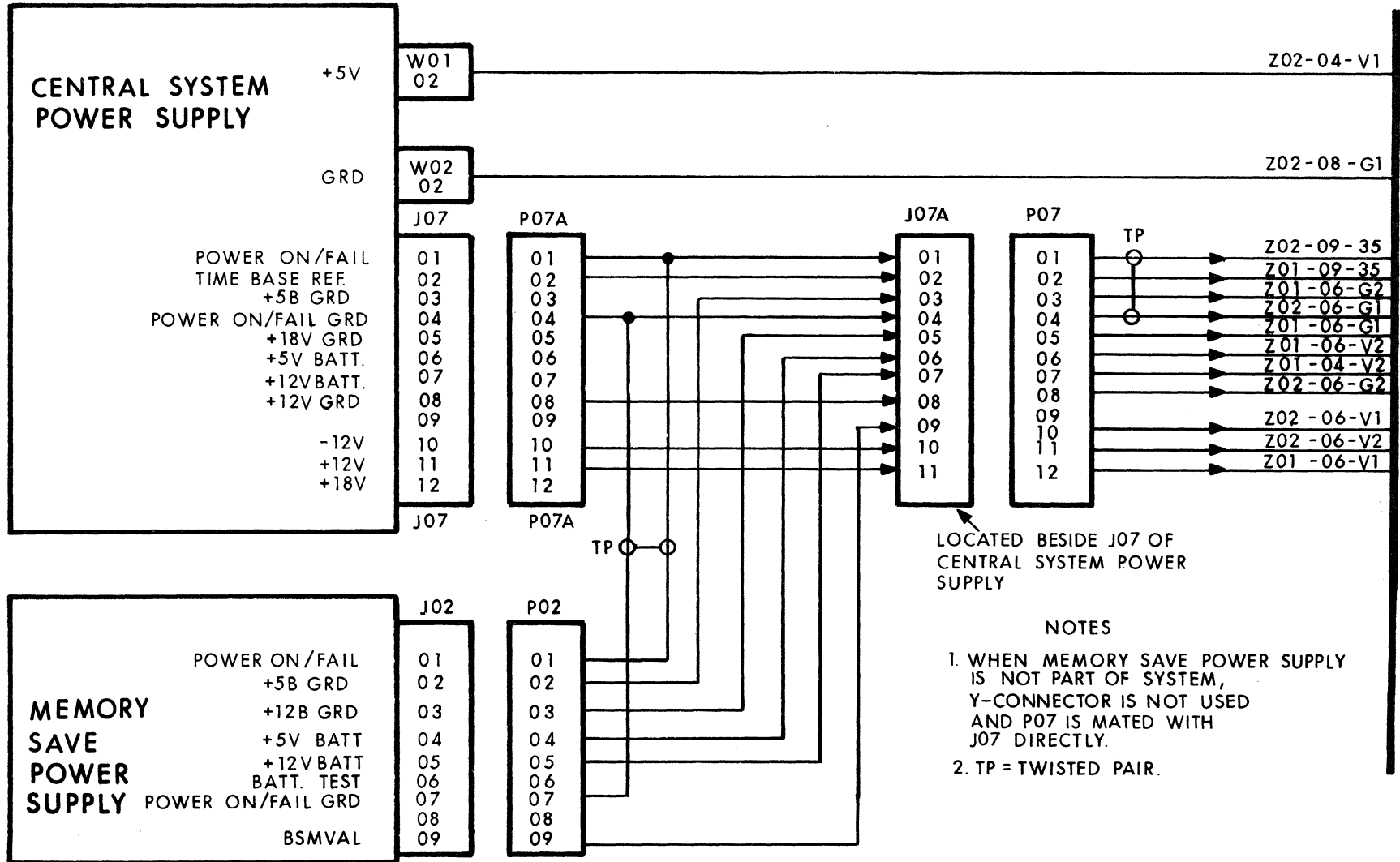


Figure 3-4 Central System Power Supply and Type PSS9001/PSS9002 Memory Save Power Supply Y Interconnections

Table 3-3 Type PSS9001/PSS0992 J07A Connector Pin Identification

PIN	CONNECTOR	FUNCTION
01	P02/P07A	Power on/fail line (A&B)
02	P07A	Central system power supply time base reference line
03	P02	Memory save power supply +5 B ground
04	P02/P07A	Power on/fail ground (A&B)
05	P02	Memory save power supply +12 B ground
06	P02	Memory save power supply +5 B ground
07	P02	Memory save power supply +12 B ground
08	P07A	Central system power supply -12 V ground
09	P02	BSMVAL (B)
10	P07A	Central system power supply -12 V
11	P07A	Central system power supply +12 V
12		Not used

NOTE

The following is an explanation of the abbreviations used in this table:

- B = memory save power supply
- A = central system power supply
- BSMVAL = Battery Supply Memory Valid

Table 3-4 Type PSS9001/PSS9002 J07 Connector Pin Identification

PIN	CONNECTOR	FUNCTION
01	P07A/P07	Power failure signal line to computer backpanel
02	P07A/P07	Time base reference signal line to computer backpanel
03	P07	+5 B ground (not used if memory save power supply is part of system)
04	P07A/P07	Power on/fail ground
05	P07	+18 ground (not used if memory save power supply is part of system)
06	P07	+5 B (not used if memory save power supply is part of system)
07	P07	+12 B (not used if memory save power supply is part of system)
08	P07A/P07	+12 B ground
09		Not used
10	P07A/P07	-12 V
11	P07A/P07	+12 V
12		+18 V

Table 3-5 Type PSS9001/PSS9002 Memory Save Power Supply J-2 Connector Pin Identification

PIN	FUNCTION
01	Power failure signal line
02	+5 V ground
03	+12 V ground
04	+5 V B
05	+12 V B
06	Battery test
07	GRD power on/fail signal
08	Not used
09	BSMVAL (battery supply memory valid)

Figure 3-5 shows a typical tabletop installation with the memory save power supply supporting the computer physically as well as electrically.

The Y-connector for effecting the necessary dc connections between the central system power supply and the memory save power supply will have been installed at time of delivery. To ready the system for use, perform the following steps:

1. See that the ON/OFF switches of both units are set to OFF.
2. Plug the primary power plug of the central system power supply into receptacle J03 of the memory save power supply chassis (center rear).
3. Insert the primary power plug of one peripheral into receptacle J03.
4. Insert the primary power plug of the memory save power supply into any 120-volt, 60 or 50 Hz, single-phase receptacle for a NAO configuration; or into a 220-240 volt 50 Hz, single-phase receptacle for a European configuration.

NOTE

All ac and dc grounding is automatically completed when equipment power plugs are mated to primary power receptacles. Section VI gives details of multipoint grounding.

5. Set the memory save power supply front panel ON/OFF switch to ON. Press MEMORY RESET button.
6. See that the front panel MEMORY ON indicator on the front of the memory save power supply is illuminated.
7. Set the central system power supply front panel ON/OFF switch to ON.
8. See that the computer front panel DC ON indicator and the +12 Vdc indicator (LED CR14) at the rear of the central system power supply are illuminated.

3.2.2 Type PSS9002 60-inch and 30-inch (Including Office Furniture Package) Rack-Mountable Installation

A typical 60-inch rack-mountable configuration is shown in Figure 1-2. A typical 30-inch rack-mountable configuration is shown in Figure 1-3. Normally, either system configuration is delivered to the site with all component chassis installed and ac power plugs already inserted into receptacles at the rear of the power distribution unit.

NOTE

The primary power plug of the Memory Save Power Supply is plugged into the unswitched receptacle of the PDU marked UNSWITCHED BATT. BKUP. or MEM. SAVE.



Figure 3-5 Tabletop Configuration With Type PSS9001 Memory Save Power Supply

If the primary power plugs of the 60-inch or 30-inch rack-mounted PDUs have not been connected at the time of installation, refer to Section V, Power Distribution Units.

3.3 TYPE PSS9001/PSS9002 OPERATION

3.3.1 Type PSS9001/PSS9002 Primary Power

When the memory save power supply is energized by setting its front-panel ON/OFF switch to ON, primary power enters the chassis through an external line cord (see Figure 3-6), passes through an RFI filter, 2-ampere fuse F01 (1-ampere for 50-Hz installations), the OFF/ON switch and the primary of the transformer. This primary power also drives a 9.45 liters/second (20 cfm) cooling fan. For 50-Hz, 220-240-volt installations, the fan is driven by 120 volts taken from a tap on the primary of the transformer.

Transformer output is fullwave rectified and filtered to deliver 26 Vdc to two switching regulators whose outputs are, respectively, +5 and +12 Vdc.

The memory save power supply includes three identical sealed 6-volt lead dioxide batteries. When used with the computer, this supply provides the +5 and +12 Vdc potentials required by the MOS memory. During normal operation, the batteries of the memory save power supply are either charged or charging on the 26 Vdc line that energizes the switching regulators.

Being diode-gated to the 26 Vdc bus, the battery automatically takes over the function of energizing the switching regulators whenever dropout of the ac supply removes the 26 Vdc potential. The battery-operated supply will maintain (refresh) the contents of the 64K MOS memory during power outages of approximately two hours, supplying 5 volts up to 3.5 amperes and +12 volts up to 0.5 ampere.

If the computer is not in active use or is under repair, the memory can be operated in a standby mode in which its contents can be retained at reduced power consumption.

If the ac line to the memory save power supply is opened by setting the front panel POWER ON/OFF switch to OFF, the battery circuit to the switching regulators is also opened in order to prevent the battery from discharging in the process of powering the memory for extended periods after the ac is removed. This standby mode is initiated by setting the computer POWER ON/OFF switch to OFF while leaving the memory save power supply POWER ON/OFF switch set to ON.

Rear-chassis mainframe receptacle J03 and its 12 ampere (10 ampere for 50-Hz installations) fuse are on the load side of the ac input switch and provide line voltage to the computer when the memory save power supply is part of a tabletop system. The ON/OFF switch of the memory save power supply then becomes the ON/OFF switch for the system. The power cord from the backup supply to the customer's primary power receptacle carries all ac power for the system.

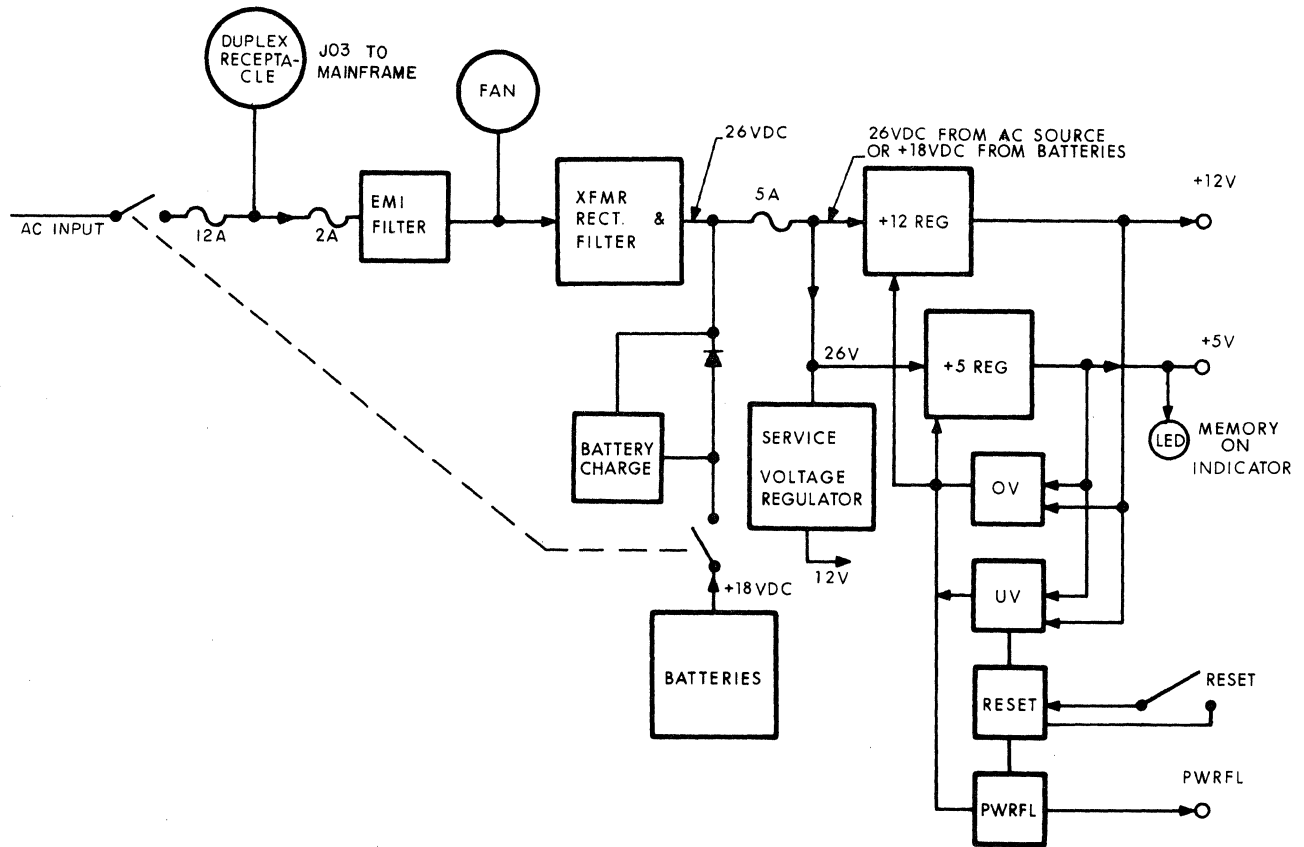


Figure 3-6 Type PSS9001/PSS9002 Memory Save Power Supply Block Diagram

3.3.2 Type PSS9001/PSS9002 Protection and Auxiliary Circuits

A power fault signal is issued whenever loss of dc output voltage occurs.

A light-emitting diode (LED) MEMORY ON indicator illuminates when memory operating voltages are present. Loss of memory voltage through battery discharge or circuit failure causes the LED indicator to extinguish. Since manual reset by means of the MEMORY RESET switch (S-2) is required to reilluminate the LED, this action serves as a reminder that the integrity of the memory has been jeopardized. (Automatic reset for this condition is available as an option.)

Overvoltage protection for the +5 Vdc and +12 Vdc outputs is provided by an SCR crowbar fuse circuit. The memory is protected against damage caused by power supply failures.

The undervoltage protection provided at the +12 Vdc output removes power from the memory whenever the battery has discharged to a level that will not support the required output capability.

3.4 TYPE PSS9001/PSS9002 MAINTENANCE

In the Series 60 Level 6 power supplies, the use of solid-state circuitry and printed circuit boards minimizes the preventive maintenance required. In the case of corrective maintenance, the maintenance philosophy calls for replacement of a failed supply with a checked out spare unit of the same type. The following subsections describe the procedures for both preventive and corrective maintenance of the memory save power supply in either the tabletop, 60- or 30-inch rackmounted configurations.

3.4.1 Preventive Maintenance - Type PSS9001/PSS9002

The following preventive maintenance procedures should be performed on the memory save power supply as required:

1. Vacuum clean the chassis, electrical components, and heat sink assemblies to prevent dust buildup.
2. See that power input connections and power supply output connections are secure.
3. Check voltage levels.

WARNING

The presence of high potentials makes it vital that the supply be deenergized for at least 60 seconds before access to interior or before power supply replacement is attempted.

4. Charge batteries. The batteries, when stored at a mean ambient temperature of +20°C (68°F), lose 2 to 3 percent of their capacity per month. Above room temperature, the self-discharge effect increases somewhat, first slowly, and then more rapidly as temperature rises.

Batteries should be fully charged before storage. When stored at room temperature or less, they should be recharged at least once a year to ensure maximum battery life and performance.

3.4.2 Corrective Maintenance - Type PSS9001 Memory Save Power Supply in Tabletop Configuration

3.4.2.1 Removal of A Type PSS9001 Memory Save Power Supply in Tabletop Configuration

Only qualified personnel should attempt to remove the memory save power supply. Removal (from tabletop configuration) is accomplished in the following steps:

1. Set the POWER ON/OFF switches of the computer, the memory save power supply, and the single peripheral unit to OFF.
2. Pull the primary power plug of the computer at receptacle J03 at the rear of the memory save unit.
3. Remove the dc output plug at J02 (left rear of power supply as seen from the rear of the unit).
4. Pull the primary power plug of the memory save power supply at the customer's convenience outlet for the installation.
5. Release the captive screw (at the rear of the memory save power supply), used to secure the supply to its wrapper assembly, and remove the memory save power supply from the front.

3.4.2.2 Replacement of a Type PSS9001 Memory Save Power Supply in Tabletop Configuration

Replacement of the Type PSS9001 memory save power supply (in tabletop configuration) with a checked-out spare is accomplished in the following steps:

1. Insert the new power supply in the location formerly occupied by the failed unit and tighten captive retaining screw.
2. With the POWER ON/OFF switches of the computer, memory save power supply, and peripheral unit set to OFF, return the primary power plugs of the three units to their original locations (see steps 2, 3, and 4 above).
3. Set the memory save power supply POWER ON/OFF switch to ON, and press its MEMORY RESET pushbutton to enable the supply and restore the MEMORY ON indication.
4. Set the POWER ON/OFF switches of the computer and the peripheral unit to ON.
5. System operation can then be resumed.

3.4.3 Corrective Maintenance – Type PSS9002 Memory Save Power Supply in 60-inch or 30-inch (Includes Office Furniture Package) Rack-Mountable Configuration

Any removal or replacement of the rack-mountable memory save power supply requires rear access to the cabinet enclosing the rack so that ac and dc power plugs can be pulled prior to starting work. Normally, such access is through swing-open doors at the rear of the cabinet.

3.4.3.1 Removal of a Type PSS9002 Memory Save Power Supply in a 60-inch or 30-inch (Includes Office Furniture Package) Rack-Mountable Configuration

To remove a rack-mounted Type PSS9002 memory save power supply, perform the following steps:

1. Set the central system power supply POWER ON/OFF switch and PDU front panel circuit breaker CB01 to OFF, thus removing ac primary power from all rack equipment.
2. Set the memory save power supply POWER ON/OFF switch to OFF.
3. Pull the memory save power supply primary power plug at receptacle J08 of the PDU (right rear of the chassis as seen from the rear of the relay rack).
4. Disconnect the memory save power supply dc power plug at J02 (left rear or memory save power supply chassis).
5. Loosen the four oval-head machine screws securing the chassis front panel to the rack at its right and left edges and two screws in the rear.
6. Pull chassis forward on its guide rails and set on nearby support surface.

NOTE

The memory save power supply weights approximately 16.4 kg (36 lb). Care must be exercised in transferring the power supply from the relay rack to a nearby table, or dolly.

3.4.3.2 Replacement of Type PSS9002 Memory Save Power Supply in a 60- or 30-inch (Includes Office Furniture Package) Rackmounted Configuration

To replace a rackmounted power supply, perform the following steps:

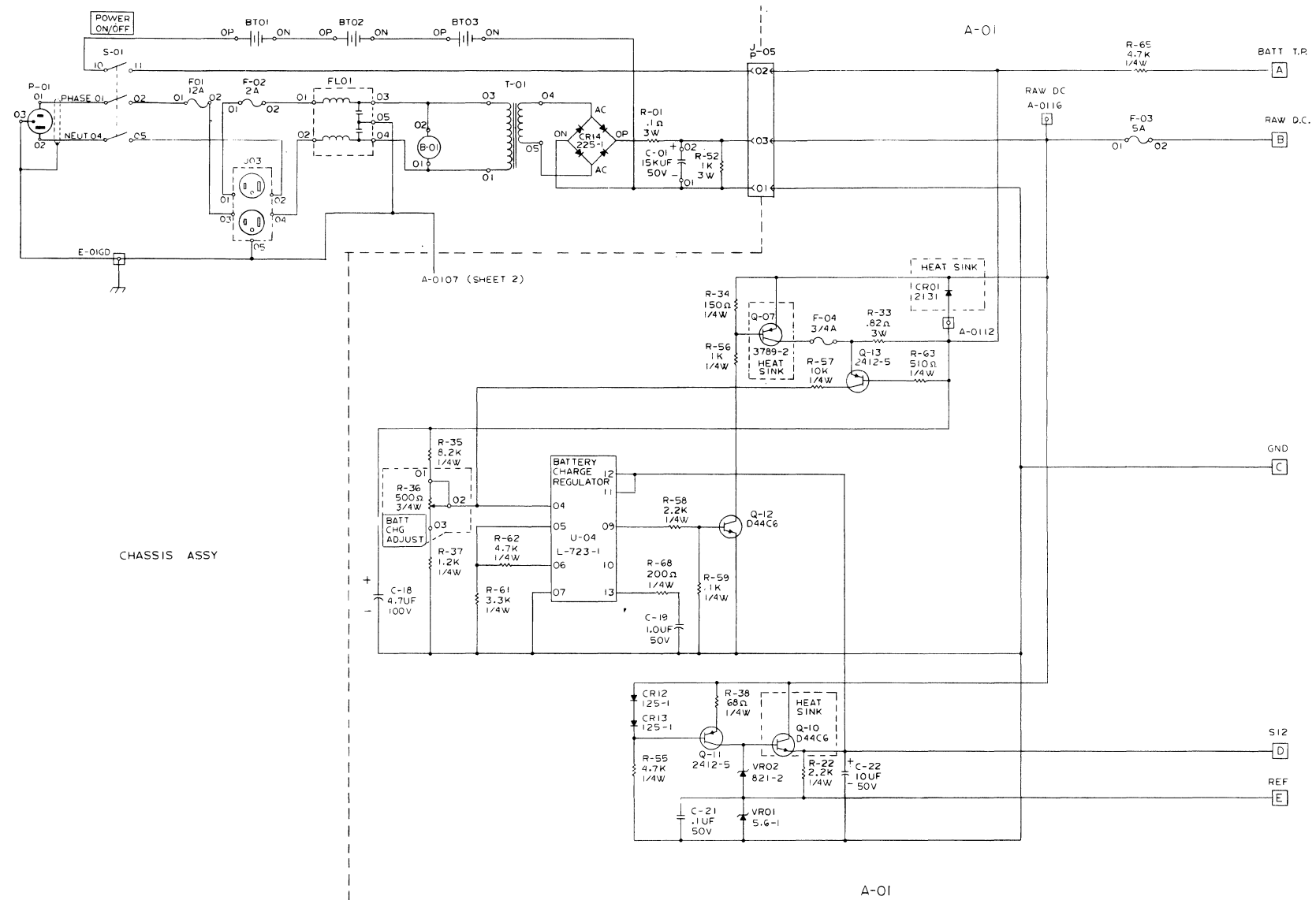
1. Slide replacement power supply onto rack guide rails, maintaining proper alignment.
2. Secure unit in rack by inserting and tightening the four front panel oval-head machine screws and two screws in the rear.

3. At rear of rack, insert dc power plug into J02.
4. Insert primary power plug of backup supply into receptacle J08 of the PDU.
5. Set PDU circuit breaker to ON.
6. Set POWER ON/OFF switch of new memory save power supply to ON.
7. Depress MEMORY RESET pushbutton on front panel of memory save supply. See that the MEMORY LED is on.
8. Set computer POWER ON/OFF switch to ON. System operation can now be resumed.

3.5 TYPE PSS9001/PSS9002 REFERENCE DIAGRAMS

The following reference diagrams are included for instructional or reference purposes only.

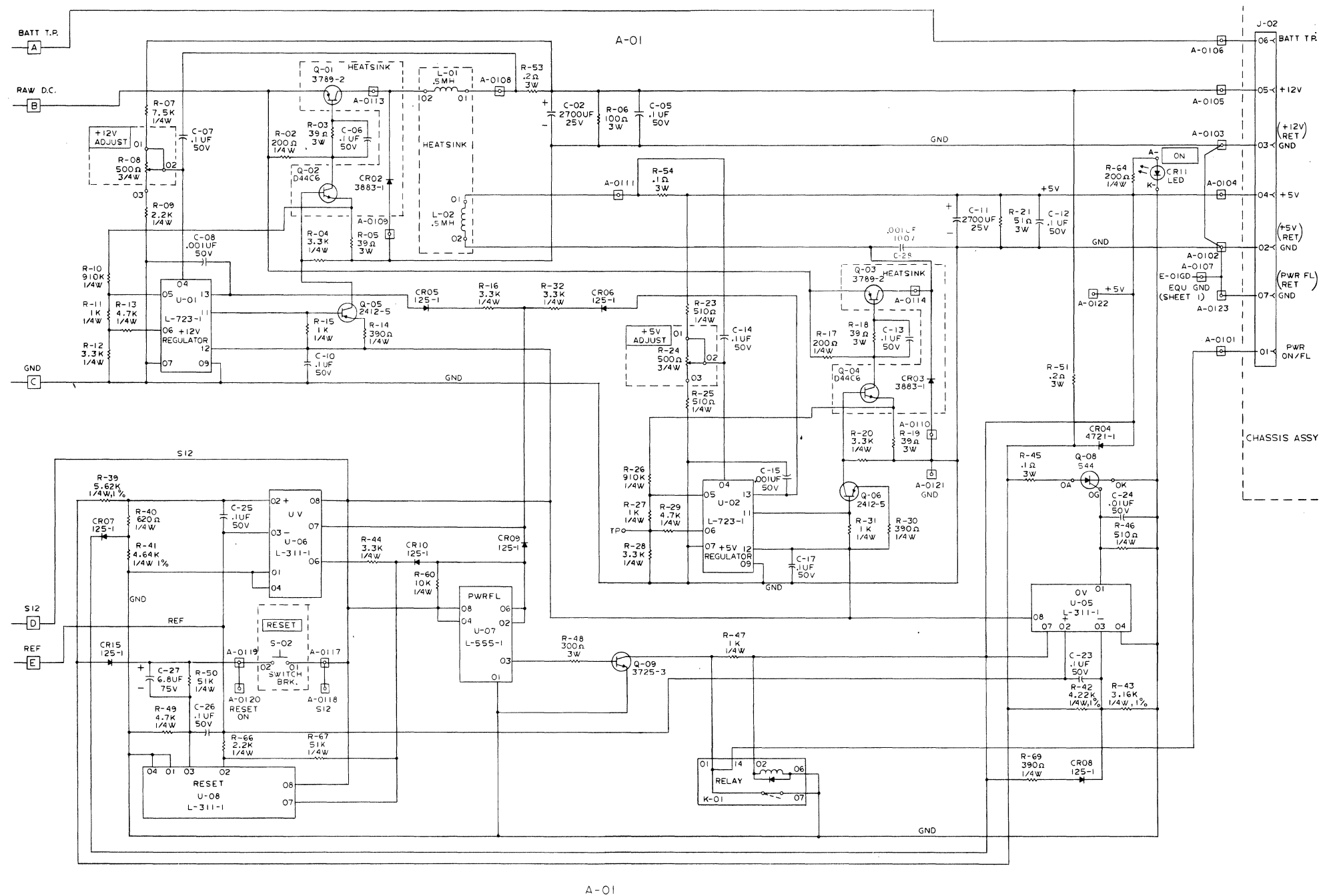
- Figure 3-7 Type PSS9001/PSS9002 Memory Save Power Supply Schematic, 120V, 60 Hz
- Figure 3-8 Type PSS9001/PSS900s Memory Save Power Supply Schematic, 220-240V, 50 Hz.



HIGHEST COMPONENT NUMBER USED														
P	B	C	F	K	L	Q	R	S	T	U	BT	CR	FL	VR
05	01	2	04	01	02	13	69	02	01	08	03	15	01	02

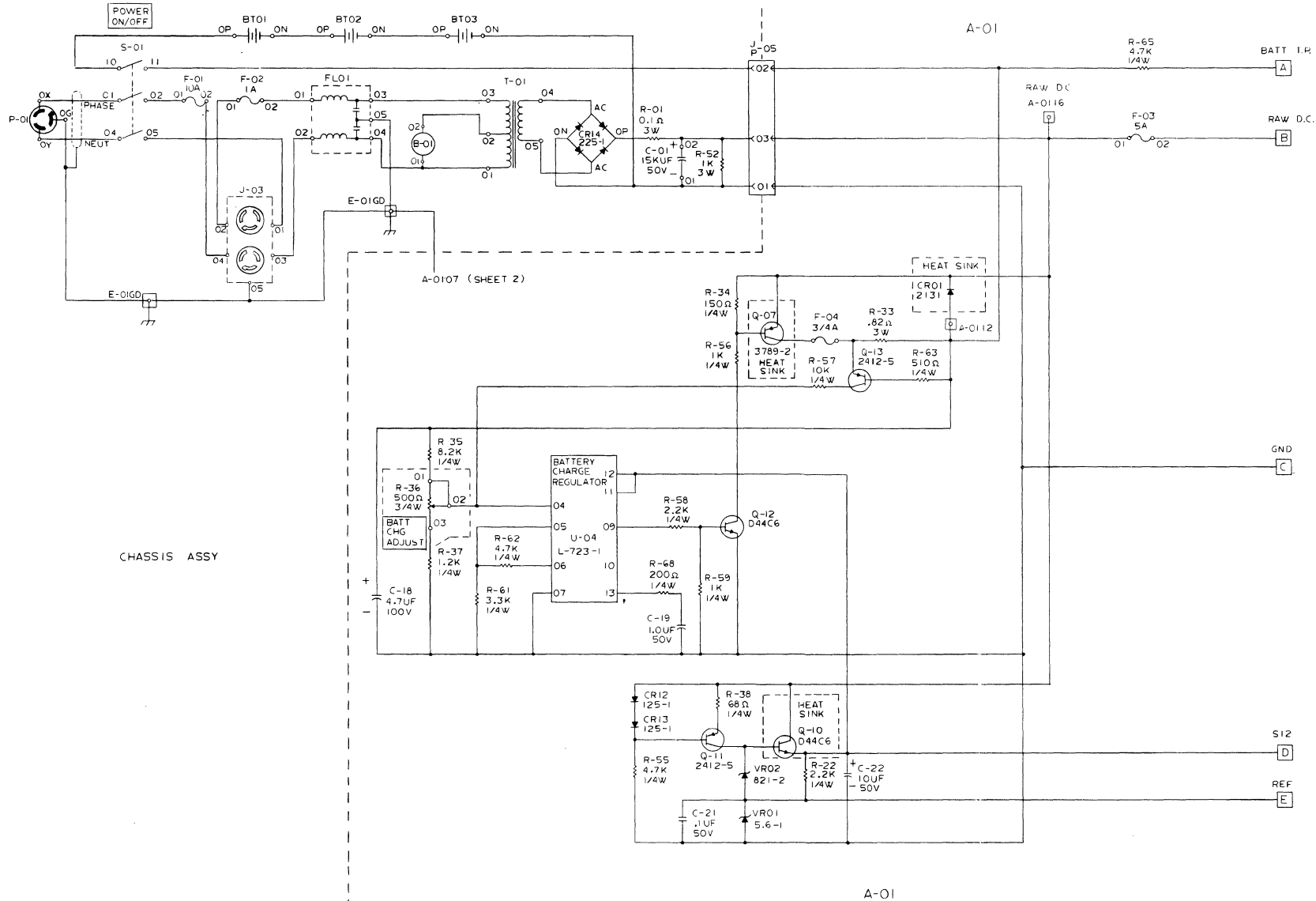
NOT USED:
C-03,04,09,16,20
U-03

Figure 3-7 Type PSS9001/PSS9002
60-Hz Memory Save
Power Supply
Schematic
(Sheet 1 of 2)



01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Figure 3-7 Type PSS9001/PSS9002
60-Hz Memory Save
Power Supply
Schematic
(Sheet 2 of 2)



CHASSIS ASSY

HIGHEST COMPONENT NUMBER USED														
P	B	C	F	K	L	Q	R	S	T	U	BT	CR	FL	VR
05	01	2	05	01	02	13	69	02	01	08	03	15	01	02

NOT USED:
C-03,04,09,16,20
U-03

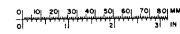


Figure 3-8 Type PSS9001/PSS9002
50-Hz Memory Save
Power Supply
Schematic
(Sheet 1 of 2)

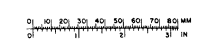
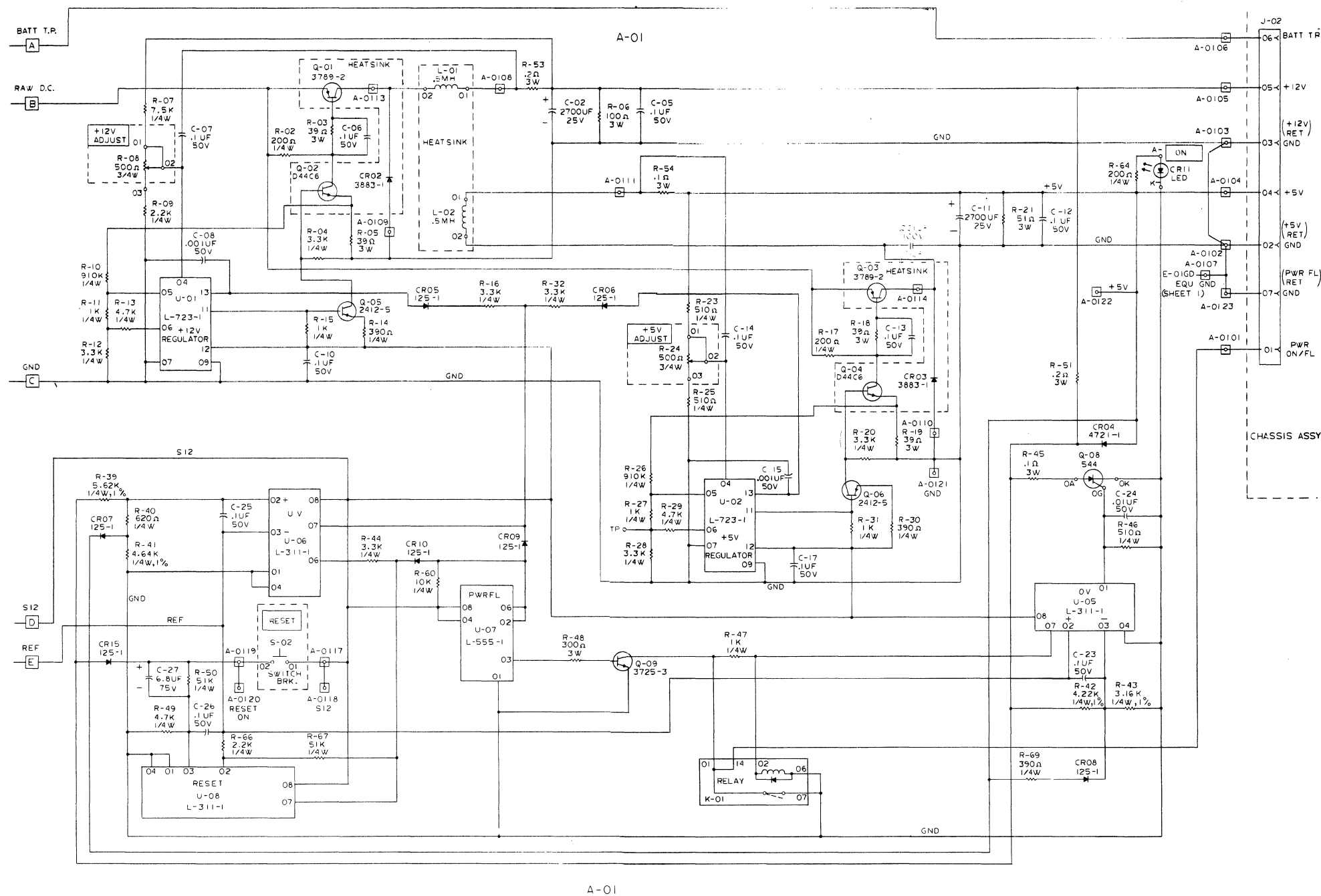


Figure 3-8 Type PSS9001/PSS9002
 50-Hz Memory Save
 Power Supply
 Schematic
 (Sheet 2 of 2)

IV

DISKETTE POWER SUPPLIES

4.1 DESCRIPTION

The Diskette Power Supply (DPS) is a compact, completely enclosed package providing +5 Vdc, -5 Vdc, and +24 Vdc for the two disk-type data storage devices in each drawer of a typical diskette.

Figures 4-1 and 4-2 show a tabletop diskette, front and rear views, respectively. Figure 4-3 shows a typical rackmounted configuration which can be installed in computer system configurations shown in Figures 1-2 and 1-3.

The diskette power supply is 35.56 cm (14 in.) wide, 12.70 cm (5.0 in.) deep, and 16.51 cm (6.5 in.) high. It weighs 8.18 kg (18 lb.). Figure 4-4 is a diagram of the diskette power supply dimensions.

The supply is energized by 120-volt, 60-Hz or 220-240 volt, 50-Hz primary power. Individual power on/off control is provided by a switch on the front panel of each diskette drawer. In normal rackmounted system operation, the diskette power supply switches are initially set to ON and left there. All subsequent operations are controlled by the main power switch on the front panel of the computer (acting in conjunction with the power distribution unit, which is described in Section V). The supply is mounted at the rear of each 55.88 cm (22.0 in.) deep, 48.26 cm (19 in.) wide, and 17.78 cm (7.0 in.) high drawer.

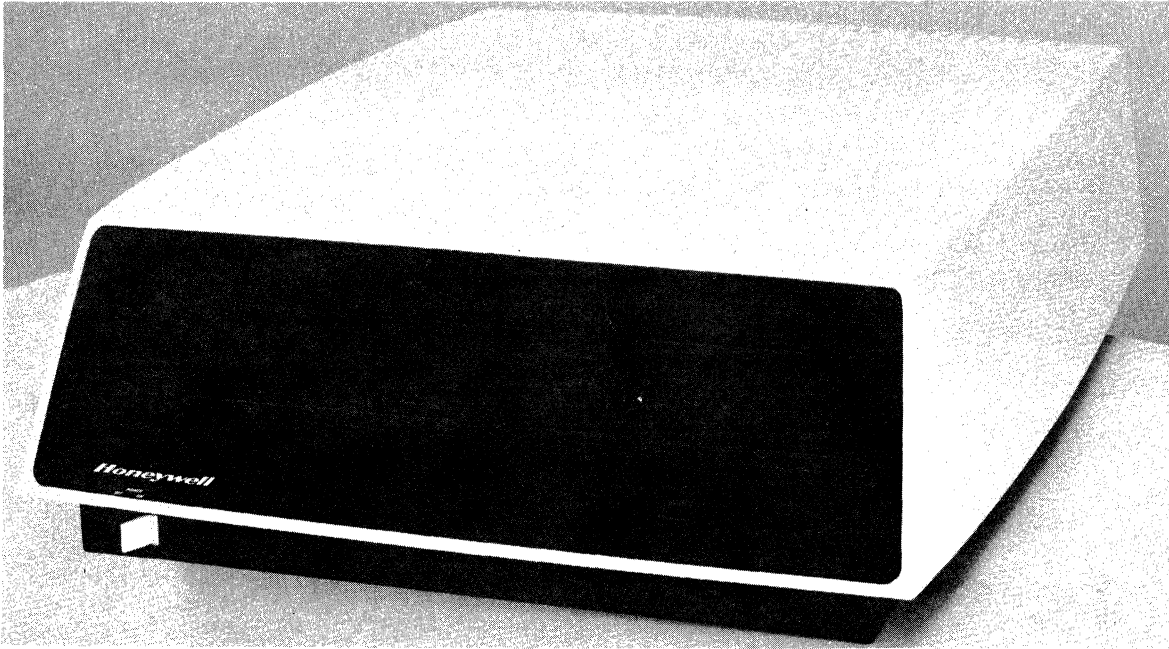


Figure 4-1 Tabletop Model Diskette - Front View

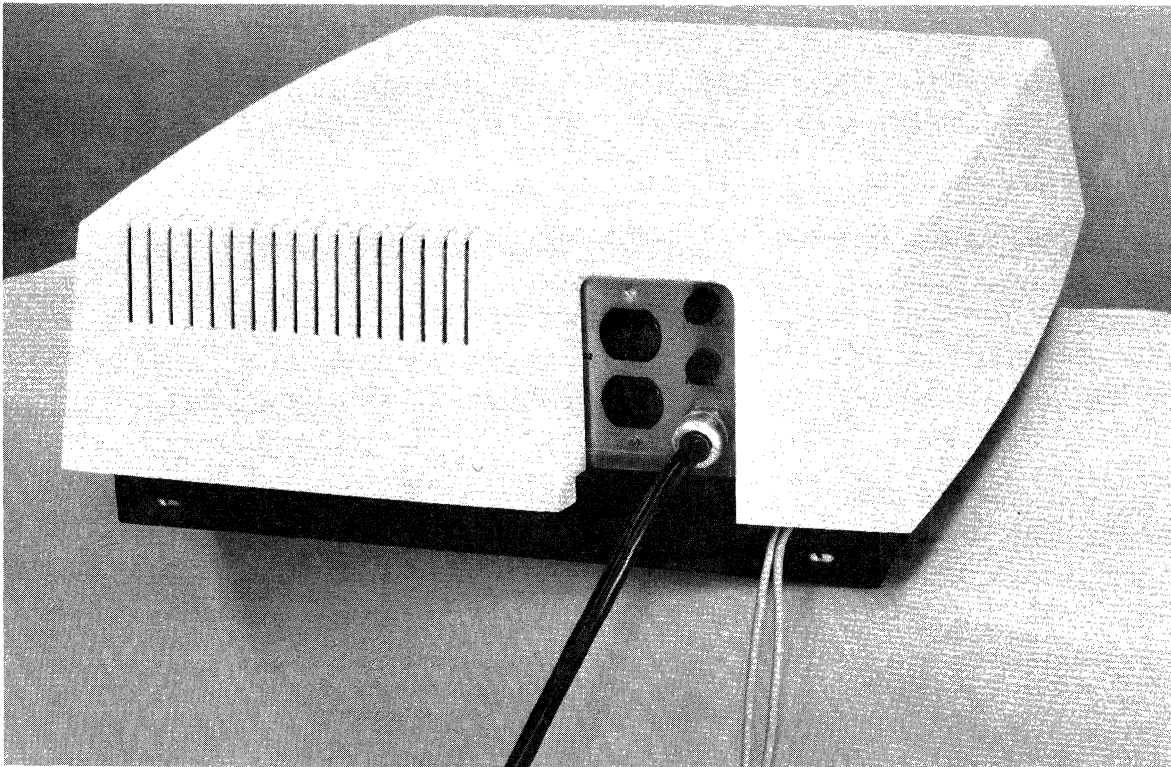


Figure 4-2 Tabletop Model Diskette - Rear View

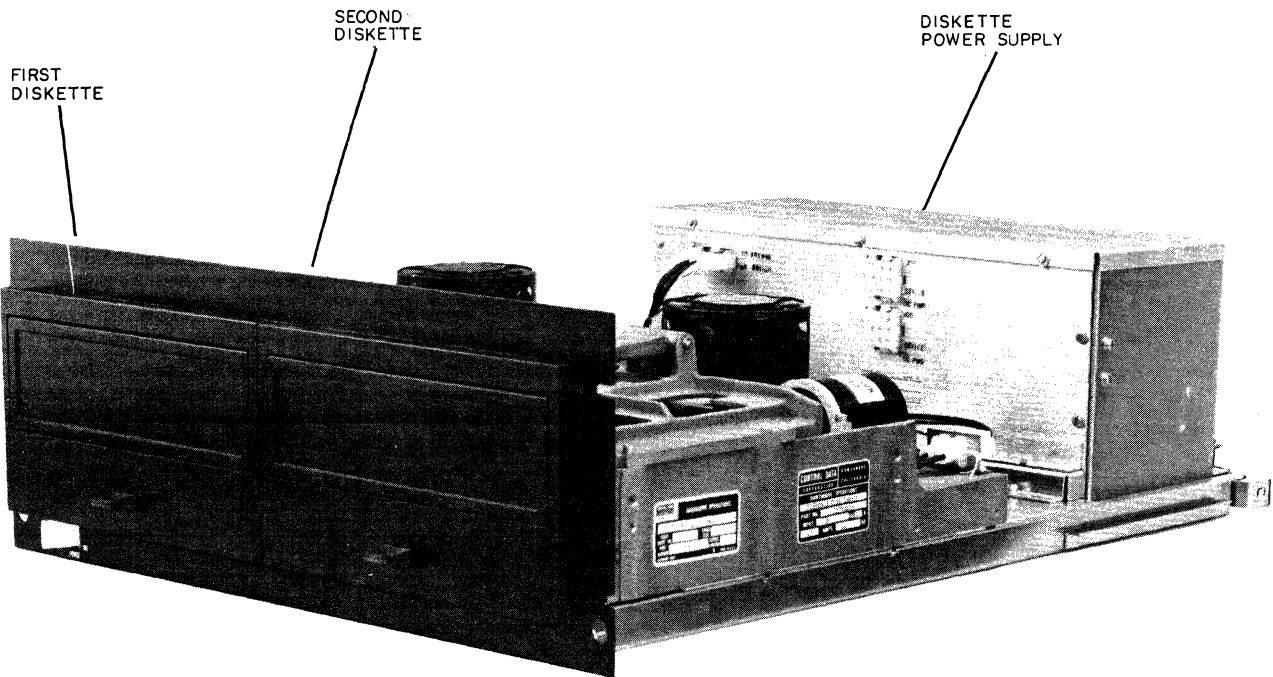


Figure 4-3 Rackmounted Diskette - Interior View

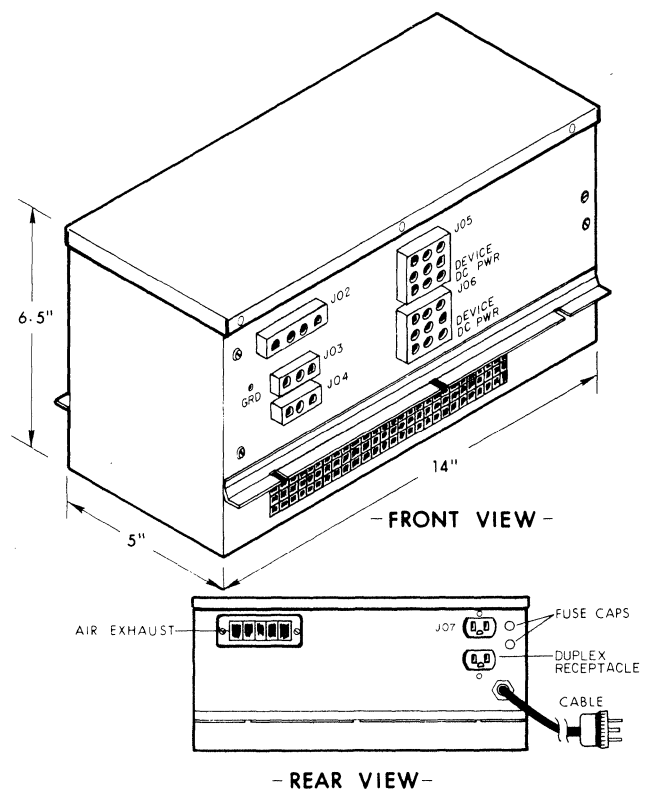


Figure 4-4 Diskette Power Supply Dimensions

The diskette power supply uses a constant-voltage transformer and monolithic IC voltage regulators to provide +5 Vdc at 3 amperes, -5 Vdc at 0.3 amperes, and +24 Vdc at 4 amperes for the two devices in its drawer.

The three-wire ac service cord enters the supply at the rear, where two fuses and a standard duplex receptacle are mounted (see Figure 4-4). Air exhaust from a 566.4 lpm (20 cfm) fan is also at the back of the unit. At the front surface are two nine-pin dc connectors (one for each disk storage unit in the drawer), two three-pin connectors providing ac for the POWER ON/OFF switch at the front of the drawer (see Figure 4-1). Air enters the unit through a rectangular grille at the front surface (see Figure 4-4).

4.1.1 Controls, Indicators, and Adjustments

The diskette power supply has no controls, indicators, or adjustments. Power on/off is by means of a double-pole, single-throw switch on the front panel of the diskette drawer.

4.1.2 Specification Data

Table 4-1 lists the specification data for the diskette power supply.

The diskette power supply is a single assembly with conventional wiring; i.e., printed circuit boards are not required for this application. The supply also serves as a distribution box for the ac supplied to the disk storage units. The fuse-protected duplex outlet is energized whenever the POWER ON/OFF switch for the diskette drawer is set to ON.

Input overload protection is provided by a 15 ampere fuse, F01. Internal overload protection is by fuse F02, rated at 2 amperes. The +5 Vdc regulators have internal short circuit, current limiting, and thermal overload protection. Overcurrent protection for the +24 Vdc circuits is provided by the constant-voltage transformer.

The diskette power supply has no requirements for power failure detection, output voltage adjustments, or voltage sequencing turn-on and turn-off.

Diskette power supplies for European installations differ from the NAO design in the following particulars:

1. The input power transformer has a 220-240 volts, 50-Hz primary with a primary tap at 120 volts to power the fan.
2. The power cord is color coded as shown in the following table.

NAO	EUROPEAN	FUNCTION
White	Blue	Neutral
Black	Brown	Phase wire
Green/Yellow stripe	Green/Yellow stripe	Ground

3. The duplex receptacle at the rear of the unit is a twist-lock type.
4. European primary voltages are marked on the chassis.

The power supply is secured to the drawer chassis by six No. 8 machine screws.

4.1.3 Cooling

Cooling of the diskette power supply is provided by a single 120-volt, 566.4 lpm (20 cfm) fan. For European installations, a tap on the power transformer primary gives the required 120 volts for fan operation. The fan draws air through a grille in the front of the unit and exhausts through a smaller grille adjacent to the fan itself at the rear of the unit. The fan takes approximately 16 watts of ac power.

4.1.4 AC Input Connection

The power supply is connected to primary power by a three-wire cable entering the chassis from the rear. The input wires are: phase (line leg), neutral, and safety ground.

4.1.5 DC Output Connector Pin Identification

The diskette power supply has two identical nine-pin output connectors, J05 and J06 (see Figure 4-5), each feeding one of the two disk-type data storage devices in the rackmounted drawer. Table 4-2 gives the pin identifications for these connectors.

4.1.6 AC Output Connector Pin Identification

Table 4-3 gives pin identifications for connectors J01, J03, and J04. Connector J01 provides a phase wire/neutral pair to a phase wire/neutral return from the diskette POWER ON/OFF switch at the front of the diskette drawer. J03 and J04 provide the means for primary power distribution between the diskette power supply and the two data storage units in the diskette drawer.

4.1.7 Personnel Protection and Safety

The diskette power supply chassis wraparound and cover provide complete protection from hazardous voltages.

4.2 INSTALLATION

In system installations the diskette drawer is shipped with either one or two disk storage units, for which space is provided. All cabling between the diskette power supply and each disk storage unit is completed prior to shipment to the customer.

If, after installation of the single unit configuration, the customer exercises his option for the second diskette, its connection to the power supply is performed on site by qualified personnel.

Table 4-1 Diskette Power Supply Specifications (Sheet 1 of 2)

CHARACTERISTICS	DESCRIPTION
Dimensions, nominal	
Width	35.56 cm (14.0 in.)
Depth	12.70 cm (5.0 in.)
Height	16.51 cm (6.50 in.)
Weight	8.18 kg (18 lb.)
Cooling fan*	566.4 lpm (20 cfm); 120 volts; 50/60 Hz
Input Specifications	
Voltages	60 Hz - 120 volts $\begin{matrix} +10\% \\ -15\% \end{matrix}$
	60 Hz - 220 or 230 volts $\begin{matrix} +10\% \\ -15\% \end{matrix}$
	50 Hz - 240 volts $\begin{matrix} +6\% \\ -15\% \end{matrix}$
Power	180 watts
Phase	Single
Power factor	Unity
Fuses (rear of chassis)	F01 - 15 ampere for 60- and 50-Hz line protection F02 - 2 ampere for 60- and 50-Hz transformer protection
Output Specifications, +5 Vdc Supply	
Maximum current	3 amperes
Minimum current	1.5 amperes
Overcurrent protection	Short circuit and thermal protected
Overvoltage protection	Internal safe area and thermal overload protection provided by IC regulator
Regulation	$\pm 5\%$
Ripple noise	200 mV (p-p) maximum
Output Specifications, -5 Vdc Supply	
Maximum current	0.3 amperes
Minimum current	0.15 amperes
Overcurrent protection	Short circuit and thermal protected
Overvoltage protection	Internal safe area and short-circuit protection provided by IC regulator

Table 4-1 Diskette Power Supply Specifications (Sheet 2 of 2)

CHARACTER	DESCRIPTION
Output Specifications, -5 Vdc Supply (Cont'd)	
Regulation	±5%
Ripple and noise	100 mV (p-p) maximum
Output Specifications, +24 Vdc Supply	
Maximum current	4.0 amperes
Minimum current	2.0 amperes
Overvoltage protection	Constant voltage transformer
Regulation	±10%
Ripple and noise	500 mV (p-p) maximum
Connectors	
AC	J02, 4-pin AMP Mate-N-Lock (see Table 4-3)
	J03 and J04, 3-pin AMP Mate-N-Lock (see Table 4-3)
DC	J05 and J06, 9-pin AMP Mate-N-Lock (see Table 4-2)
Receptacle, primary power (rear of chassis)	Duplex-switched 120 Vac, 60 Hz Duplex-switched 220-240 Vac, 50 Hz
Operating ambient temperature	0 - 55°C (32 - 131°F)
Reliability MTBF	132,000 hours (7.6 failures/10 ⁶ hrs.)
Ride-through time for 100% drop in primary voltage	TBD

*Same fan is used for both NAO and European installations. European units use a center tap on the 220-240 primary of the power transformer.

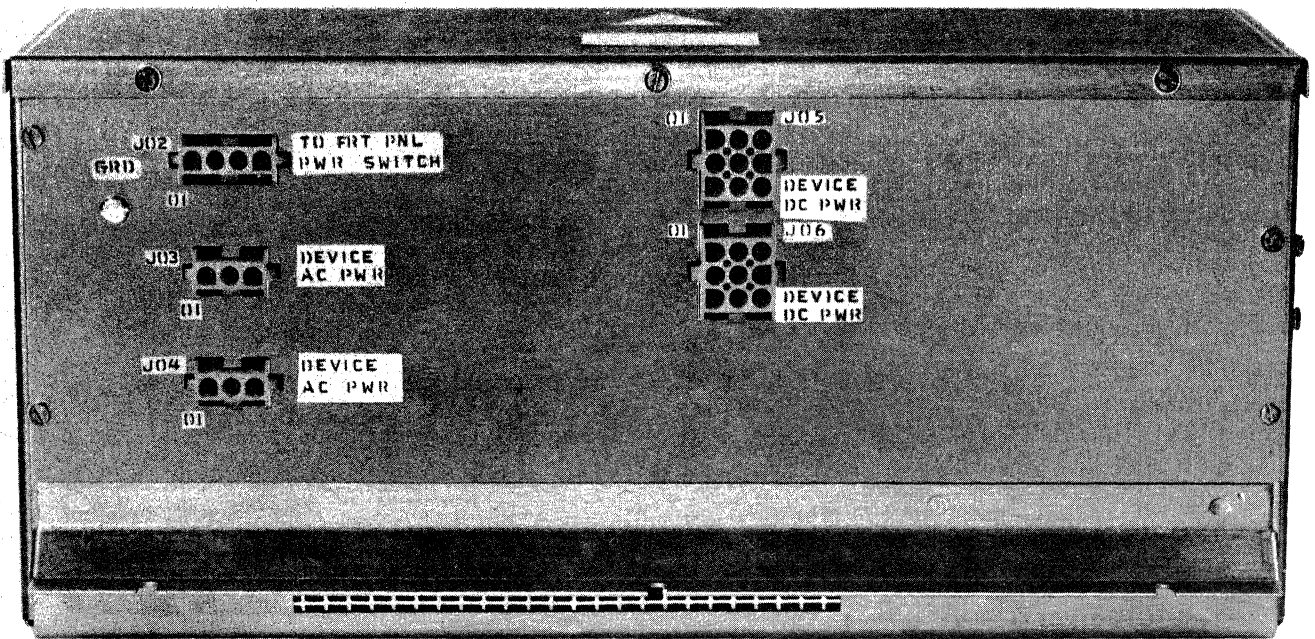


Figure 4-5 Diskette power Supply Connector - Front View

Table 4-2 Diskette Power Supply
DC Output Connectors J05 and
J06 - Pin Identifications

PIN	FUNCTION
01	+24 Vdc
02	Grd (-5 Vdc common)
03	-5 Vdc
04	Grd (+24 Vdc common)
05	Spare
06	Spare
07	+5 Vdc
08	Grd (+5 Vdc common)
09	Spare

Table 4-3 Diskette Power Supply AC Output Connectors
J02, J03, and J04 - Pin Identifications

CONNECTOR	PIN	FUNCTION	
		UNSWITCHED	SWITCHED
J02 (4-pin Mate-N-Lock)	01	Neutral	Phase wire Neutral
	02	Phase wire	
	03		
	04		
J03 & J04 (3-pin Mate-N-Lock)	01	Phase wire	
	02	Ground	
	03	Neutral	

NOTE

Installation details for the second diskette unit, including its cabling to the microprocessor, are covered in the appropriate systems manual.

Connection of the second diskette unit to the power supply is carried out as follows:

1. Set the diskette drawer POWER ON/OFF switch to OFF.
2. Pull the diskette drawer primary power plug at its source.
3. Plug nine-pin Mate-N-Lock dc connector plug P06 into jack J06 at the front of the power supply.
4. Plug three-pin Mate-N-Lock ac connector plug P03 into jack J03 on the front of the power supply.
5. Install I/O cable from CPU to diskette unit.
6. Plug primary power plug of diskette power supply into receptacle from which it was removed in step 2.
7. Set POWER OFF/ON switch at front of diskette drawer to ON.

The two-diskette configuration is now operational.

4.3 OPERATION

When the POWER ON/OFF switch on the front panel of the diskette drawer is set to ON, power enters the diskette power supply through a line cord at the rear of the unit and passes through an RFI filter and fuse (see Figure 4-6). Primary power is applied to the duplex connector at the back of the supply, the two ac connectors (J03 and J04) on the front of the supply, and, through a fuse (F02), to the power transformer.

The transformer is of the constant-output-voltage type. It performs the dual function of stepping down the input voltage and providing the required isolation. The single secondary winding is tapped to provide three voltages that are rectified and filtered to obtain dc voltages of ± 9 volts and +24 volts. The ± 9 volt outputs are connected to IC series regulators to obtain ± 5 volts within the required tolerances. The three dc voltages and their ground returns are brought to two identical dc output connectors, J05 and J06.

4.4 MAINTENANCE

Three preventive maintenance procedures, listed in subsection 4.4.1, should be performed as often as required to ensure reliable operation of the diskette power supply. Corrective maintenance of the diskette power supply consists of removal of the failed supply and replacement with a checked-out spare of the same type. Only qualified personnel should perform these operations.

4.4.1 Preventive Maintenance

Preventive maintenance required on the diskette power supply is performed in the following procedures:

1. Vacuum clean the chassis and electrical components to prevent dust buildup.
2. Check that power input connections and power supply output connections are secure.
3. Check voltage levels.

WARNING

The presence of high potentials makes it vital that the supply be deenergized for at least 60 seconds before access to interior or before power supply replacement is attempted.

4.4.2 Corrective Maintenance

4.4.2.1 Diskette Power Supply Removal

To remove the diskette power supply, perform the following steps:

1. Set the power supply ON/OFF switch (on front panel of diskette drawer) to OFF.

2. Pull the diskette power supply primary power plug at its source.
3. Pull the primary power plugs of any devices connected to the duplex receptacle at the rear of the diskette power supply.
4. Pull ac connector plugs at J01, J03, and J04 at the front of the diskette power supply.
5. Pull the dc output connector plugs at J05 and J06, also at the front of the diskette power supply.
6. Remove the six No. 8 machine screws securing the unit to the drawer.
7. Remove the diskette power supply from the drawer.

4.4.2.2 Diskette Power Supply Replacement

To install the replacement diskette power supply, perform the following steps:

1. Mount the new unit with the same orientation as the original supply (i.e., with ac and dc connectors facing toward the front of the drawer). Replace the six screws loosened in removing the original supply.
2. Insert dc connector plugs P05 and P06 into jacks J05 and J06, respectively.
3. Insert ac connector plugs P01, P03, and P04 into jacks J01, J03, and J04, respectively.
4. Reconnect any peripheral or other loads connecting to the duplex receptacle primary power outlets on the back of the diskette power supply.
5. Plug the diskette power supply primary power plug into the same receptacle occupied by the plug of the replaced supply.
6. Set the POWER ON/OFF switch at the front panel of the diskette drawer to ON. The diskette drawer is now operational.

4.5 REFERENCE DIAGRAMS

The following reference diagrams are included for instructional or reference purposes only.

- Figure 4-7 Diskette Power Supply Schematic, 120V, 60 Hz.
- Figure 4-8 Diskette Power Supply Schematic, 220-240V, 50 Hz.

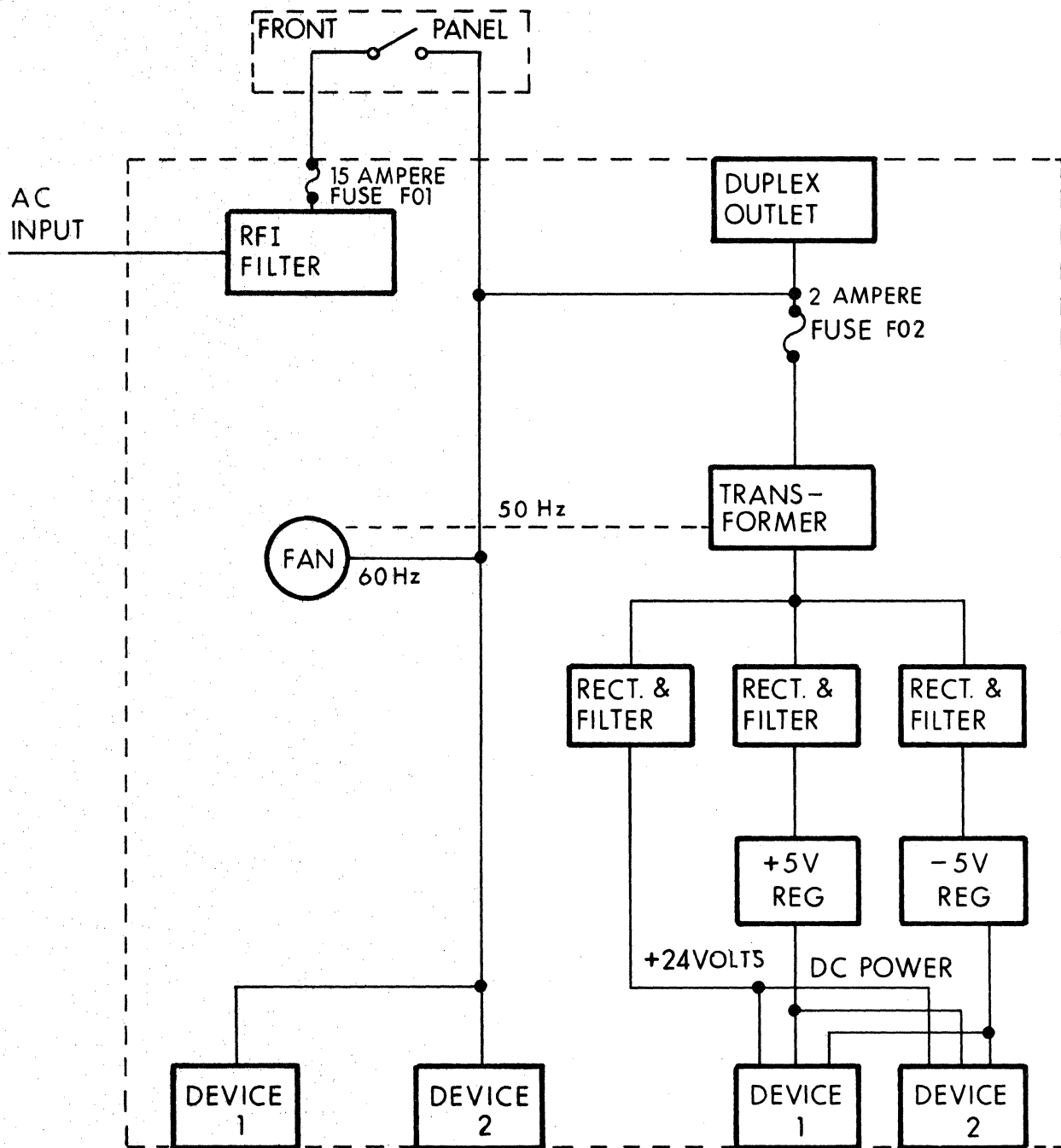


Figure 4-6 Diskette Power Supply Block Diagram

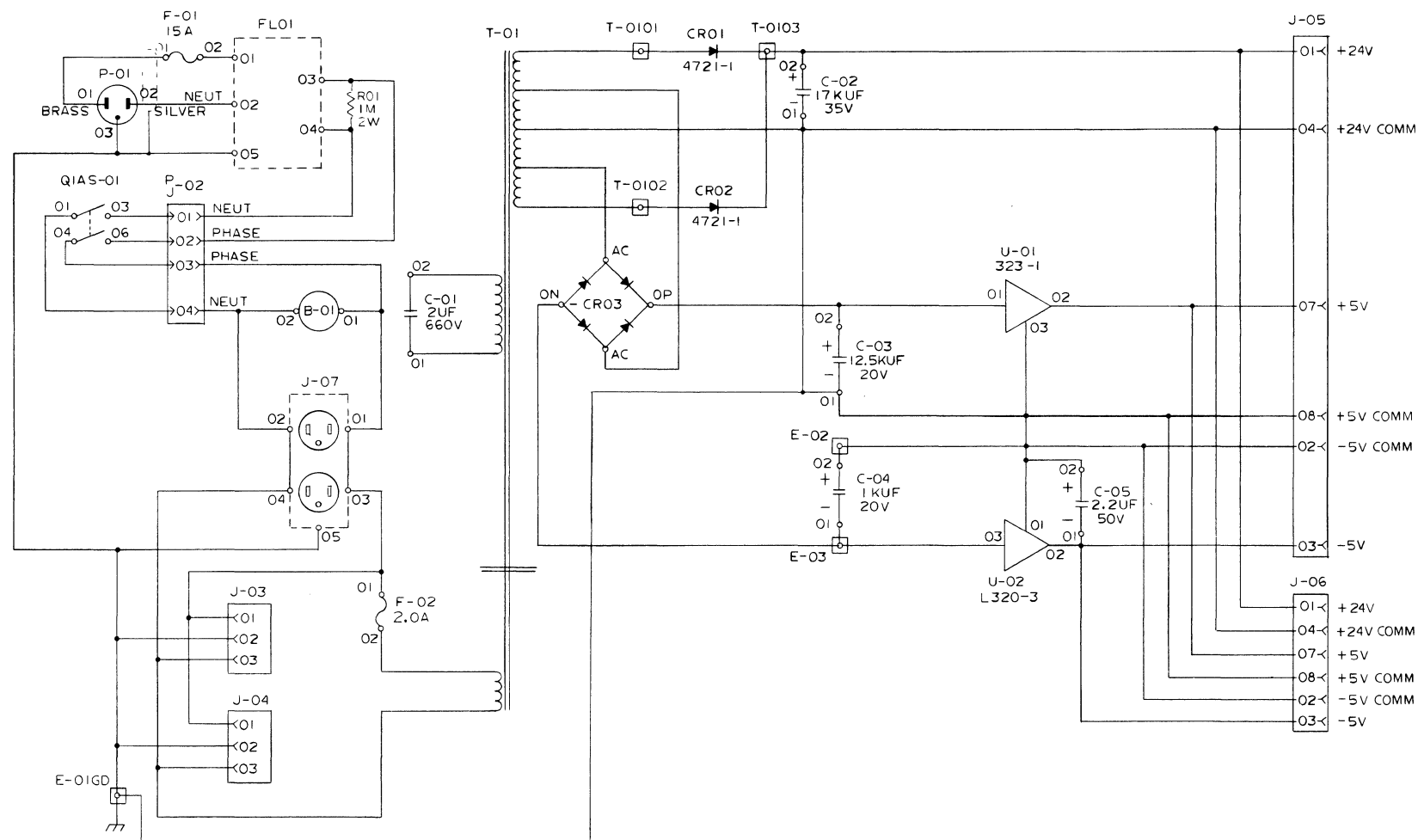


Figure 4-7 Diskette Power Supply Schematic, 120V, 60 Hz

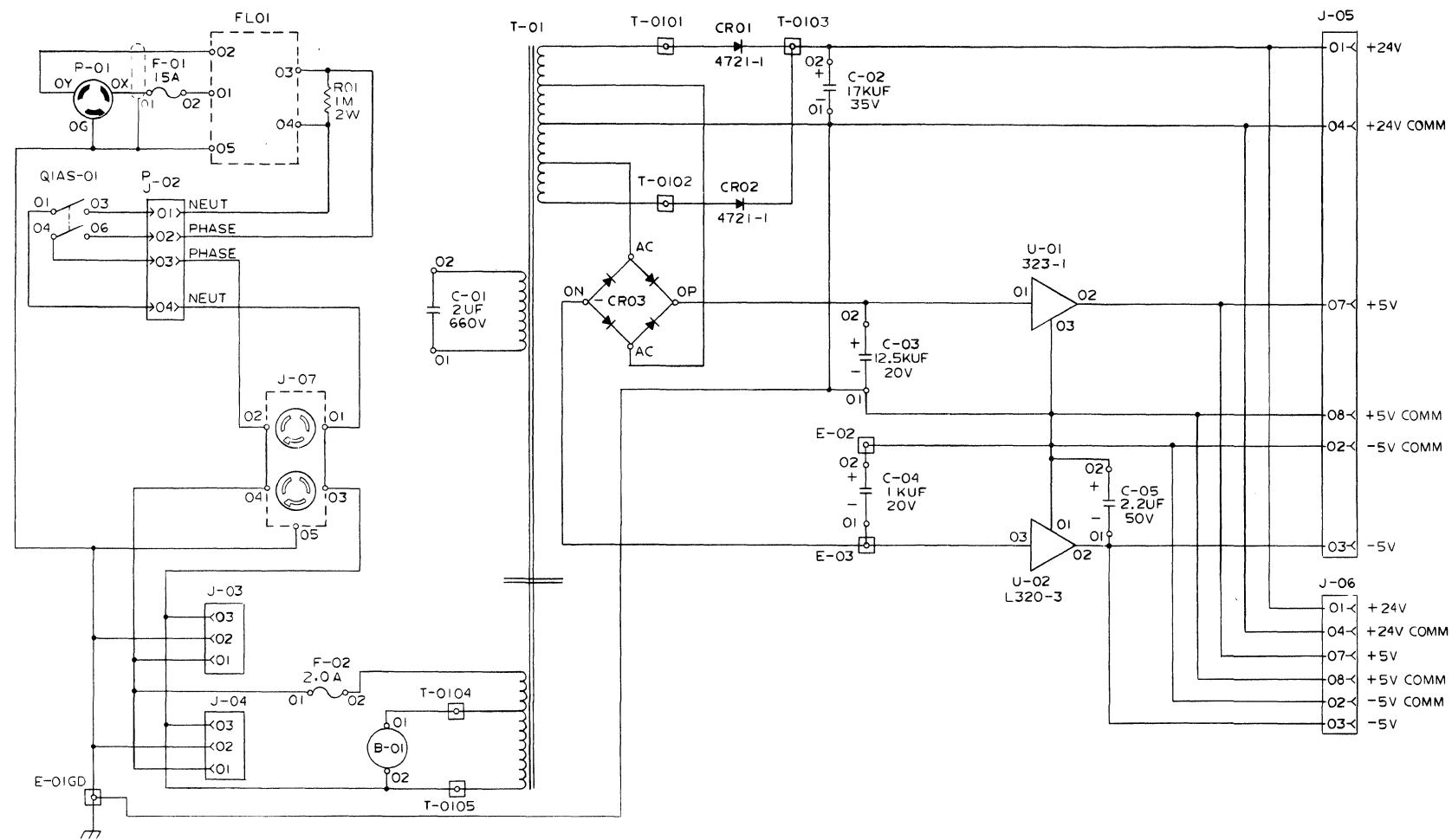


Figure 4-8 Diskette Power Supply Schematic. 220-240V, 50 Hz

V POWER DISTRIBUTION UNITS

5.1 GENERAL INFORMATION

This section describes the Power Distribution Units (PDU) designed and built by Honeywell Information Systems for use with the Series 60 Level 6 computer systems. These PDUs consist of the following types:

1. Two-phase, 60-Hz, 30-ampere type used for North American Operation (NAO) products (Voltage Sense PDU BPDU060B-60132031 and Current Sense PDU BPDU060A-D60128143).
2. Single phase, 50-Hz, 30-ampere type used for European products (Voltage Sense PDU BPDU050B-60132032 and Current Sense PDU BPDU050A-60128179).
3. Single phase, 60-Hz, 30-ampere type used for NAO products (Voltage Sense PDU BPDU630A-60131995).
4. Single phase, 60-Hz, 20 ampere type used for NAO products (Voltage Sense PDU BPDU620A-60131907-001).
5. Single phase, 60-Hz, 15-ampere type used for NAO products (Voltage Sense PDU BPDU615A-60131907-002).
6. Single phase, 50-Hz, 15-ampere type used for European products (Voltage Sense PDU BPDU515A-60131908).

The PDUs listed in items 1 and 2 above are for use with 60-inch rackmounted systems as shown in Figure 1-2. All four are quite similar in operation and are described in subsection 5.3. The PDUs listed in items 3 through 6 above are for use with 30-inch rackmounted (including office furniture package) systems as shown in Figure 1-3. These PDUs are described in subsection 5.4.

5.2 STANDARD CONNECTORS USED WITH OR IN POWER DISTRIBUTION UNITS

Figure 5-1 shows the standard connectors used in or with the Level 6 System Power Distribution Units.

5.3 TWO-PHASE, 60-Hz, 30-AMP PDU (BPDU060A/B) (SINGLE-PHASE, 50-Hz, 30-AMP PDU (BPDU050A/B))

5.3.1 Description

These power distribution units provide single-phase 120 Vac, 60-Hz (220-240 Vac, 50-Hz) primary power to all drawers of the rack in which they are installed. Front, rear, and interior views of the 60-Hz PDU are shown in Figures 5-2 through 5-6.

All equipment connected to the PDU, with the exception of the memory save power supply, is simultaneously energized when the POWER ON/OFF switch of the computer is set to ON and is deenergized when this switch is set to OFF. The memory save power supply is energized continually by the unswitched receptacle of the PDU. The PDU and all rackmounted equipment are completely deenergized if the PDUs 25-ampere front-panel circuit breaker is manually set to OFF (see Figure 5-2). If system shutdown is required, the memory save power supply ON/OFF switch should be set to OFF.

The 60-Hz (NAO) and 50-Hz (European) PDUs have the same physical configuration and components. They are 41.91 cm (16.5 in.) wide, 30.48 cm (12 in.) deep, and 12.70 cm (5 in.) high. The front panel is 48.26 cm (19.0 in.) wide and 13.34 cm (5.25 in.) high. Total weight is approximately 8.2 kg (18.0 lb.).

In addition to the front panel, the chassis wraparound, and the top cover, the Voltage Sense PDU - BPDU060B is comprised of:

1. A five-wire primary connector cord with a five-prong twist-lock grounding type plug at the input end and a compression coupling where the cord enters the rear of the chassis.
2. An input RFI filter, FL01.
3. A two-pole, 25-ampere circuit breaker, CB01.
4. A voltage-energized contactor (K01) that closes when the computer POWER ON/OFF switch is set to ON.
5. The following rear-chassis receptacles (see Figure 5-4):
 - a. J01 - single receptacle, contactor control.
 - b. J02 through J06 - duplex receptacles that are energized whenever K01 closes.
 - c. J07 - peripherals, duplex receptacle, switched by K01 and wired in series with a RFI noise filter to minimize noise transients produced by some peripheral loads.
 - d. J08 - Mainframe and memory save power supply, unswitched, duplex receptacle.
6. A four microfarad capacitor (C01) used to suppress noise transients generated by coil of contactor K01.

7. A four microfarad bypass capacitor (C02) for both the 50-Hz and 60-Hz units.
8. A four microfarad bypass capacitor (C03) for 60-Hz units only.
9. The following front-panel fuses:
 - a. F01 - for receptacle J08; 60-Hz, 10 amperes and 50-Hz, 10 amperes.
 - b. F02 through F07 - for switched duplex receptacles J02 through J07; 60-Hz, 15 amperes and 50-Hz, 15 amperes.

The NAO power distribution unit operates from a two-phase 60-Hz system to generate two 120-volt, single-phase branches. (See Figures 5-20 and 5-21). One phase energizes three switched receptacles (duplex) and two single receptacles, the latter to provide primary power for the mainframe power plug of the computer and for the memory save power supply. The second phase powers three switched duplex receptacles, one of which is fed through an RFI filter that minimizes noise transients produced by peripherals connected to it. All receptacles are protected by fuses located on the front panel of the PDU.

The Current Sense PDU - BPDU060A differs from the above in that contactor K01 is current energized via the mainframe receptacle J01, and the memory save power supply plugs into an unswitched single receptacle (J08).

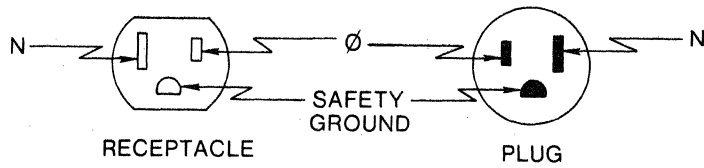
The European PDU operates from a single-phase 220-240-volt, 50-Hz primary power (see Figure 5-22 and 5-23). A single phase supplies this voltage to the same receptacle array as in the NAO PDU. The 50-Hz unit differs from the 60-Hz unit in the following particulars:

1. The 50-Hz unit has twist-lock rather than parallel blade-type receptacles throughout.
2. The 50-Hz unit uses European color coding for the primary power cord as identified in the following table.

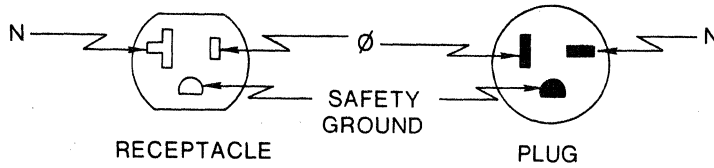
CONDUCTOR	COLOR	
	NAO	EUROPEAN
Neutral	White	Blue
Phase	Black	Brown
Ground	Green/yellow strip	Green/yellow stripe

3. In the 50-Hz unit, the contactor K01 has additional turns to compensate for the higher voltage.
4. In the 50-Hz unit, F01 is a 10-ampere fuse.

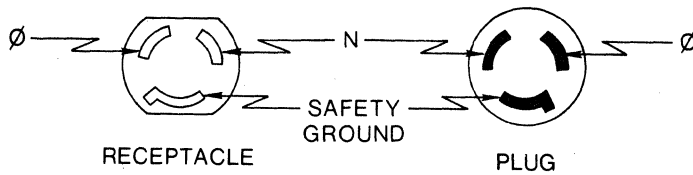
The Current Sense PDU - BPDU050A differs from the above in that contactor K01 is current energized via the mainframe receptacle J01, and the memory save power supply plugs into an unswitched single receptacle (J08).



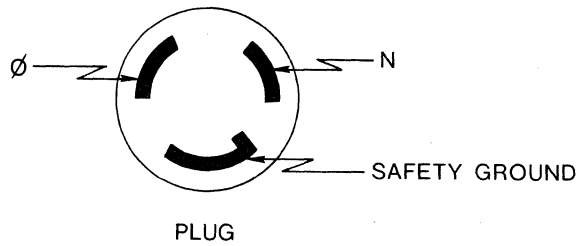
(a) 1Ø, 15A, 60HZ PARALLEL BLADE



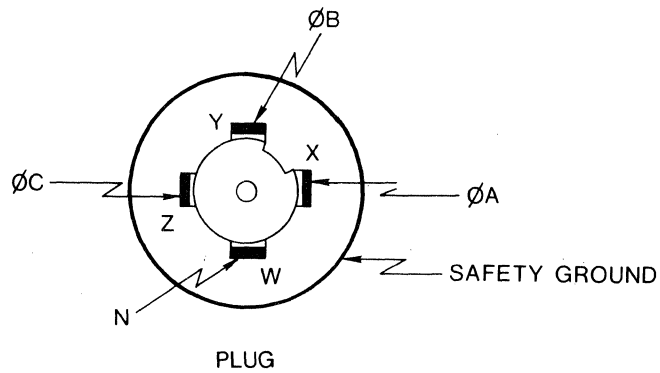
(b) 1Ø, 20A, 60HZ RIGHT-ANGLE BLADE



(c) 1Ø, 15A, 50HZ TWIST-LOCK



(d) 1Ø, 30A, 60HZ TWIST-LOCK



(e) 2Ø/3Ø, 30A, 60HZ FIVE-PRONG TWIST-LOCK

Figure 5-1 Standard Type Power Connectors Used In or With Level 6 System Power Distribution Units

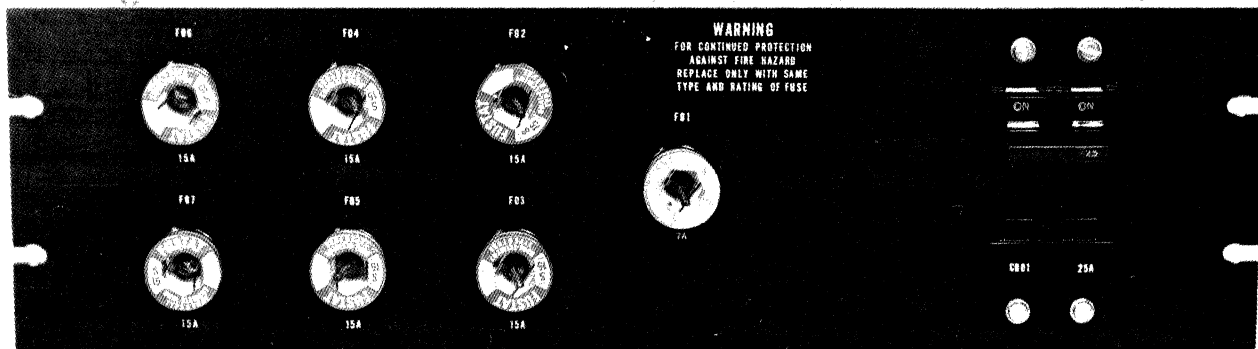


Figure 5-2 Power Distribution Unit, 60-Hz - Front View (BPDU060A and BPDU060B)

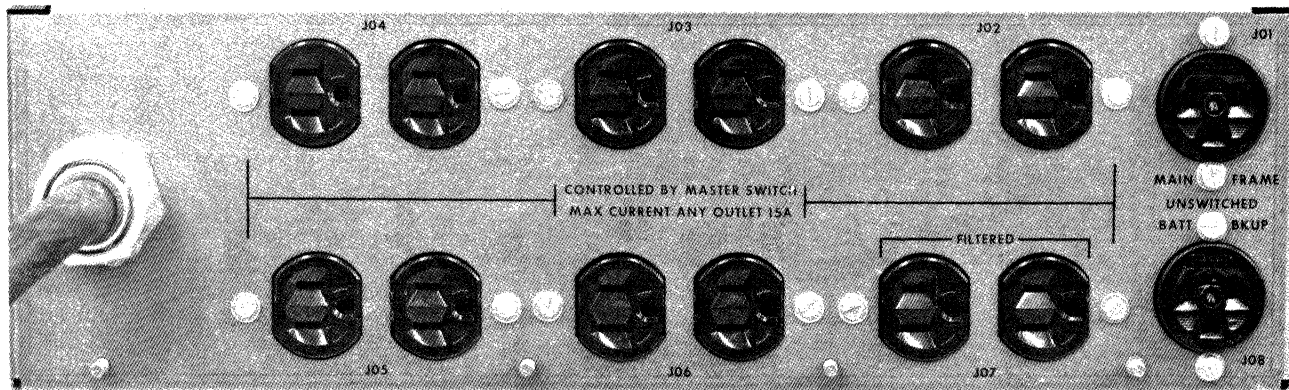


Figure 5-3 Power Distribution Unit, 60-Hz - Rear View (Current Sense - BPDU060A)

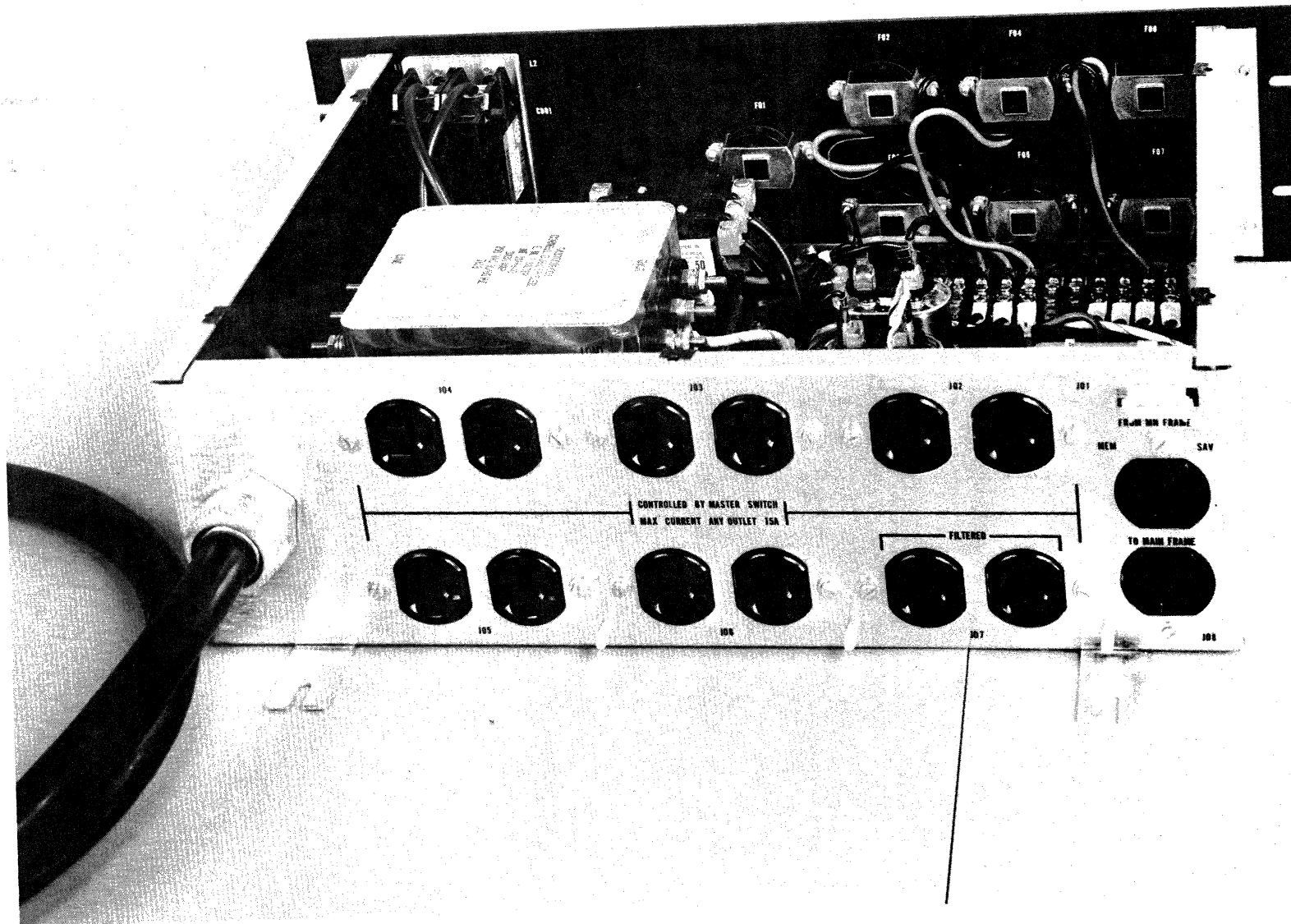


Figure 5-4 Power Distribution Unit, 60-Hz - Rear View (Voltage Sense - BPDU060B)

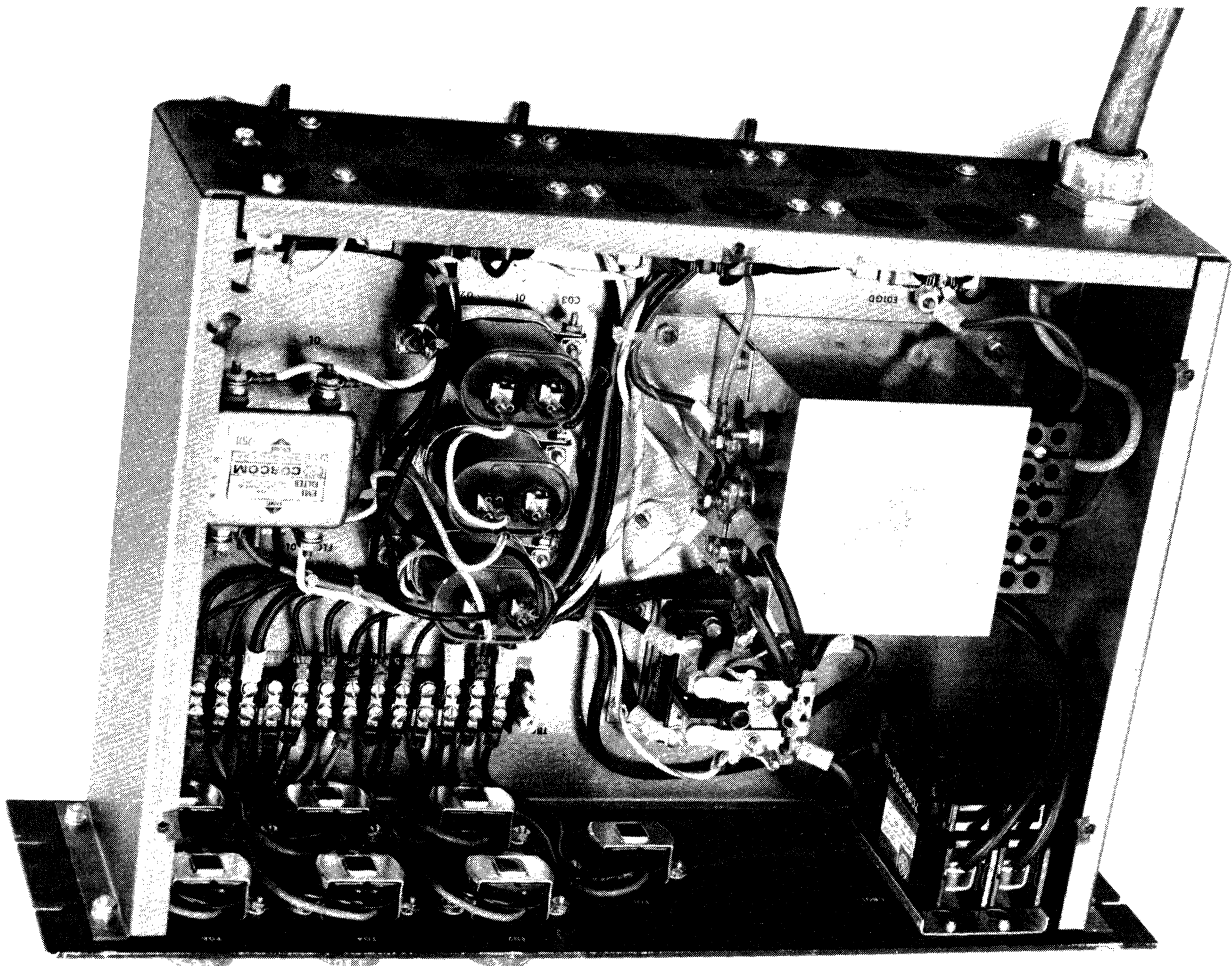


Figure 5-5 Power Distribution Unit, 60-Hz - Interior View (Current Sense - BPDU060A)

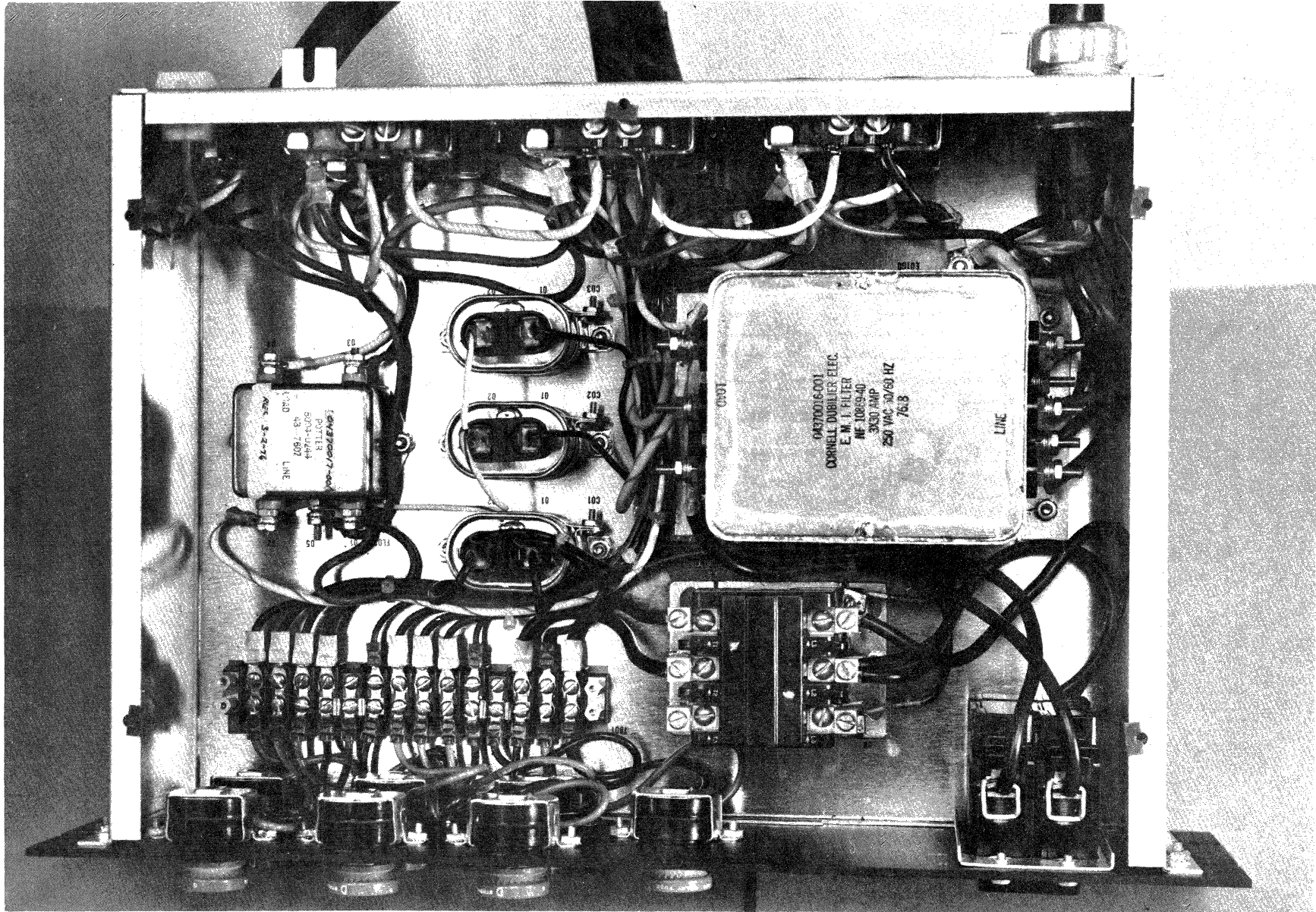


Figure 5-6 Power Distribution Unit, 60-Hz - Interior View (Voltage Sense - BPDU060B)

5.3.1.1 Controls, Indicators, and Adjustments

The power distribution unit has only one control, CB01, a two-pole 25-ampere circuit breaker located on the right end of the control panel (see Figure 5-2). Its function is to provide on/off control and short-circuit protection for the entire PDU. When set to OFF, the circuit breaker cuts off primary power to all equipment in the rack.

5.3.1.2 Specification Data

Table 5-1 gives the specification data for the PDUs.

5.3.1.3 Cooling

Since the dissipation losses in the PDU are negligible, no cooling is required.

5.3.1.4 Personnel Protection and Safety

The power distribution unit chassis, chassis wraparound, and top cover provide complete personnel protection from hazardous voltages.

WARNING

All maintenance must be performed by qualified personnel. The presence of high potentials makes it vital that the PDU be deenergized for at least 60 seconds before access to the interior or before replacement is attempted.

5.3.2 Installation

5.3.2.1 Original Installation

Typical 60-inch rackmounted configurations are illustrated in Figure 1-2. Normally, such systems are delivered with all ac power plugs for the rackmounted units already inserted into receptacles at the rear of the power distribution unit. In this case, the only primary power connection required is to plug the primary power plug of the PDU into a 25-ampere, receptacle providing two-phase power for NAO and single-phase power for European installations. All loads on the PDUs are single phase. Figures 5-7 through 5-10 show the typical connections between the PDUs and the POWER ON/OFF switch in rackmounted configurations.

If the primary power plugs of the loads have not been connected at the time of installation, the following steps should be taken:

1. See that the two-pole circuit breaker on the PDU is set to OFF.
2. See that all POWER ON/OFF switches on the rackmounted units are set of OFF.
3. Insert control panel plug into mainframe receptacle J01 for BPDU060A or J01 and J08 for BPDU060B.

4. Insert the primary power plug of the memory save power supply (if used) into memory save receptacle J08 at the right rear of the PDU.
5. Insert the ac power plugs of up to two peripheral units in filtered receptacles marked J07 (ASR).
6. Insert plugs of other rack units into receptacles J02 through J06, as needed, approximately balancing loads between the two single-phase branches (J02 through J04 are on one branch circuit; J05 through J07 are on the other).

It is recommended that loads be connected from right to left and bottom to top as this will leave any unused receptacles clear for future use.

7. Insert the four-pole, primary power plug of the PDU into the customer's receptacle.
8. Turn on the PDU circuit breaker, set the POWER ON/OFF switches on the memory save power supply to ON, reset the memory save power supply, and set the POWER ON/OFF switch on the computer control panel to ON to complete the primary power turn-on sequence for the rackmounted equipment.

5.3.2.2 Expansion of Power Distribution Units

The two-phase 30A, 60-Hz PDUs (BPDU060A/B) and 50-Hz PDUs (BPDU050A/B) are designed to provide single phase ac power for two highboy 60-inch racks of equipment. When a system configuration requires three 60-inch racks, a second PDU will have to be installed in the third rack if the following conditions exist:

- The load of the third 60-inch rack will cause the load count on all phases of the master PDU to exceed 24 amperes. See Table 5-2.
- The number of system primary power cords exceeds 12. This is exclusive of the mainframe supply and the memory save unit.

Not all of the PDUs listed in paragraph 5.1 can be used for expansion. Neither the 60-Hz Current Sense PDU BPDU060A or the 50-Hz Current Sense PDU BPDU050A can be used as slave PDUs because they have no means of being energized from the master PDU. The BPDU620A type cannot be used as a slave because none of the PDUs used as a master unit has a 20A receptacle.

The 50-Hz and 60-Hz PDUs cannot be mixed in the same system. The 15A and 20A single-phase PDUs can only be used in master-slave configurations to the limit of the fuse in the master unit (i.e., if the master is a 20A PDU, slaving can only be done until the total load is 16A).

Figures 5-11 through 5-18 show some of the possible PDU expansions for Level 6 rack-mounted configurations. Figure 5-19 shows the PDU assignments for six representative office furniture packages with the load currents for the devices used and the amount of available (margin) load current for expansion.

Table 5-1 Power Distribution Unit Specifications
(Sheet 1 of 2)

CHARACTERISTIC	DESCRIPTION
<u>Dimensions, Nomial</u>	
Chassis	
Width	41.91 cm (16.5 in.)
Depth	30.48 cm (12.0 in.)
Height	12.70 cm (5.0 in.)
Front Panel	
Width	48.26 cm (19.0 in.)
Height	13.34 cm (5.25 in.)
Weight	8.2 kg (18 lb.)
<u>Input Specifications</u>	
Voltages	60 Hz - 120/208 $\begin{matrix} +10\% \\ -15\% \end{matrix}$ volts
	120/240 $\begin{matrix} +10\% \\ -15\% \end{matrix}$ volts
	125/250 $\begin{matrix} +6\% \\ -15\% \end{matrix}$ volts
	115/230 $\pm 10\%$ volts
	50 Hz - 220 $\begin{matrix} +10\% \\ -15\% \end{matrix}$ volts
	230 $\begin{matrix} +10\% \\ -15\% \end{matrix}$ volts
	240 $\begin{matrix} +6\% \\ -15\% \end{matrix}$ volts
Current/Phase Maximum	60 or 50 Hz - 24A
Phases	60 Hz - Two or center-tapped single 50 Hz - Single
RFI Filter	Four-wire, 250 Vac 50/60 Hz, 30A
Circuit Breaker	Two-pole, 25A, 120/240 Vac
Contactor	BPDU060A/BPDU050A, 30 Ampere, Current-Operated Heavy Duty Power Relay BPDU060B/BPDU050B, 50 Ampere, Voltage-Operated Power Contactor
<u>Output Specifications</u>	
Receptacle J01	120 Vac, 15A, 60 Hz - BPDU060A - Parallel blade, grounding type, single outlet 120 Vac, 15A, 60 Hz - BPDU060B - Three pin, Ampere Mated lock receptacle 220-240 Vac, 15A, 50 Hz - BPDU050A - Twist-lock grounding type, single outlet

Table 5-1 Power Distribution Unit Specifications
(Sheet 2 of 2)

CHARACTERISTICS	DESCRIPTION
<u>Output Specifications</u> <u>Cont'd</u>	
Receptacle J01	220-240 Vac, 15A, 50 Hz - BPDU050B - Three-pin, Ampere Mated lock receptacle
Receptacle J02 through J07	120 Vac, 15A, 60 Hz - BPDU060A/ BPDU060B - Parallel blade, grounding type, duplex switched outlets 220-240 Vac, 15A, 50 Hz - BPDU050A/ BPDU050B - Twist-lock, grounding type, duplex switched outlets RFI output filter on J07 on all units.
Receptacle J08	120 Vac, 30A, 60 Hz - BPDU060A - Parallel blade grounding type, single, unswitched 120 Vac, 30A, 60 Hz - BPDU060B - Parallel blade grounding type, duplex, unswitched 220-240 Vac, 30A, 50 Hz - BPDU050A - Twist-lock, grounding type, single, unswitched 220-240 Vac, 30A, 50 Hz - BPDU050B - Twist-lock, grounding type, duplex unswitched
Fuse F01	60 Hz - BPDU060A - 10 Amperes for J01 and J08 60 Hz - BPDU060B - 15 Amperes for J08 50 Hz - BPDU050A - 10 Amperes for J01 and J08 50 Hz - BPDU050B - 15 Amperes for J08
Fuse F02 through F07	60 Hz/50 Hz - 15 Amperes for switched receptacles J02 through J07
Operating Temperature	0 to 55°C (32 to 131°F)
Reliability Data MTBF	455,000 hours (2.2 failures/10 ⁶ hrs.)

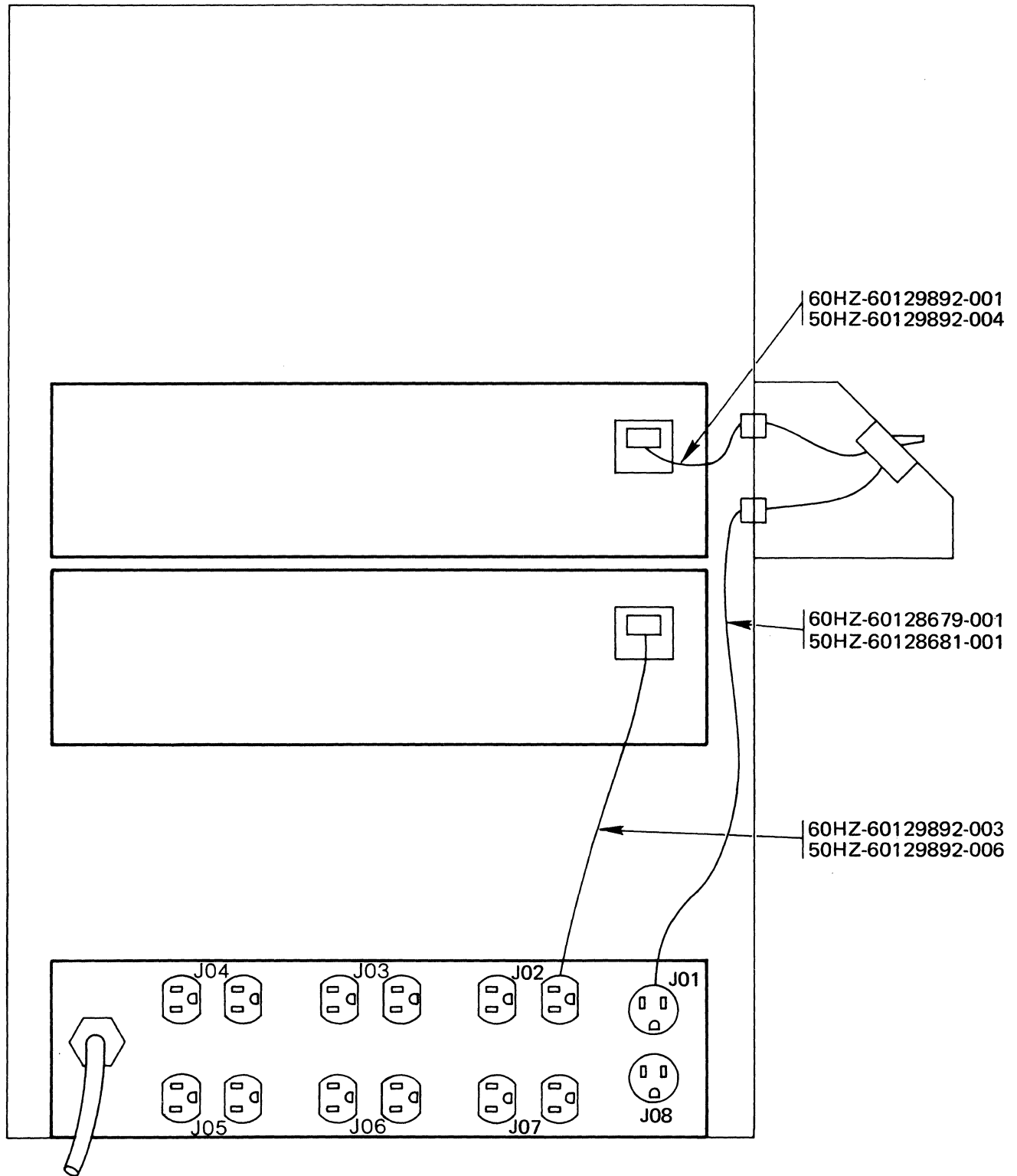


Figure 5-7 Typical Cabinet Connections, BPDU060A and BPDU050A (Rear View)

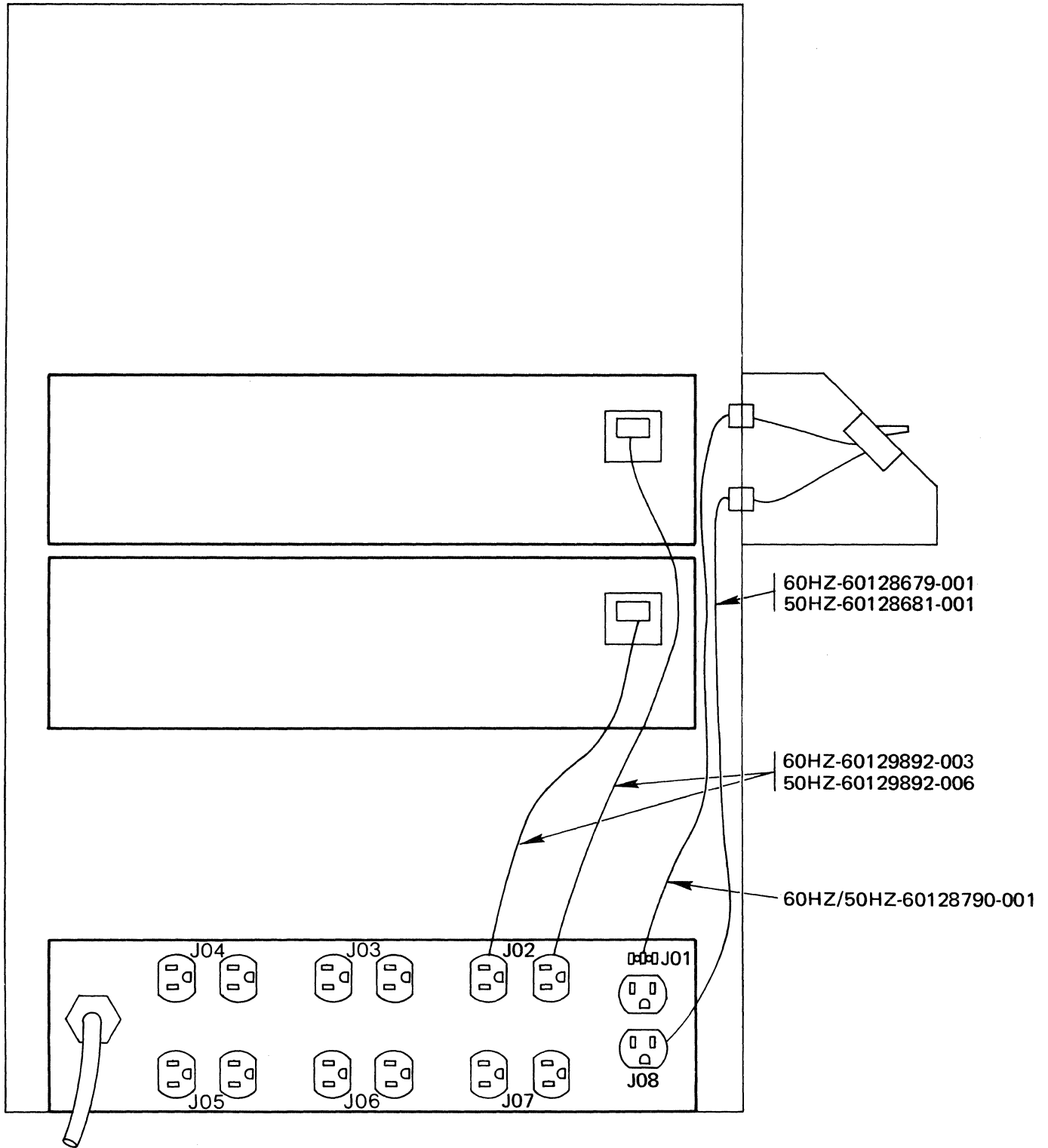


Figure 5-8 Typical Cabinet Connections, BPDU060B and BPDU050B
(Rear View)

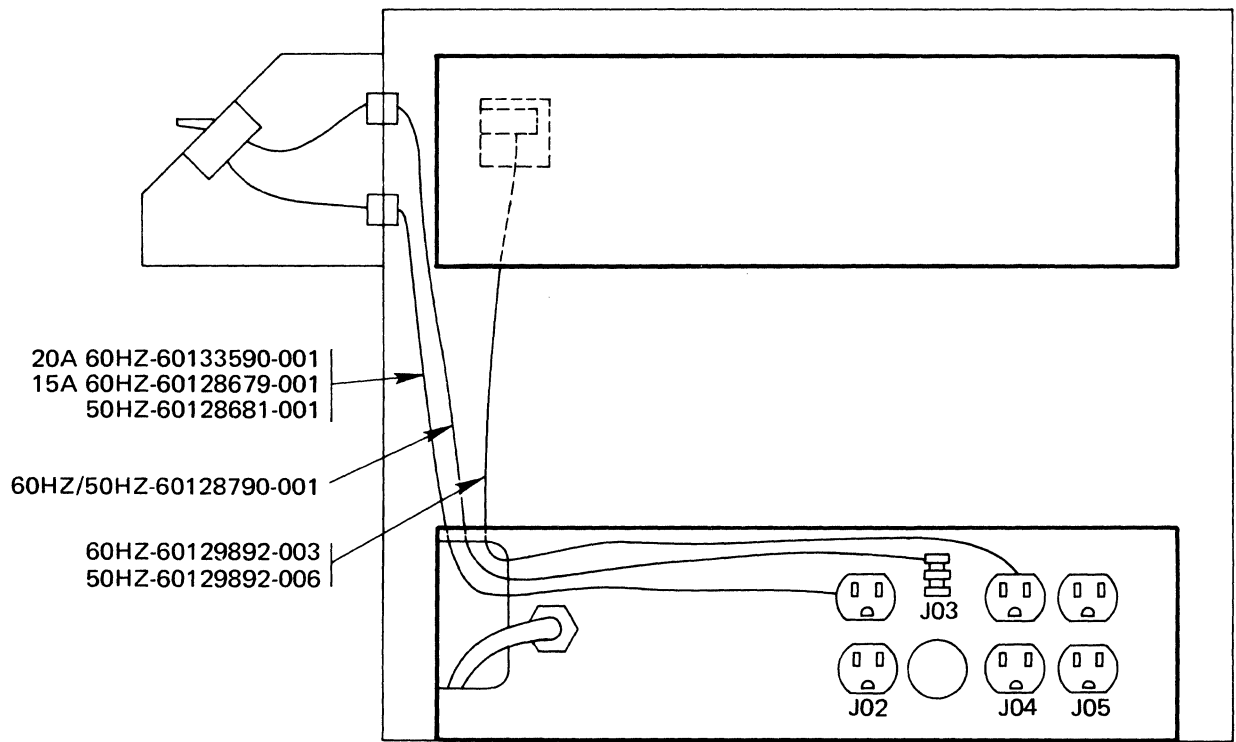


Figure 5-9 Typical Cabinet Connections, BPDU515A/BPDU615A/BPDU620A, Single Phase (Rear View)

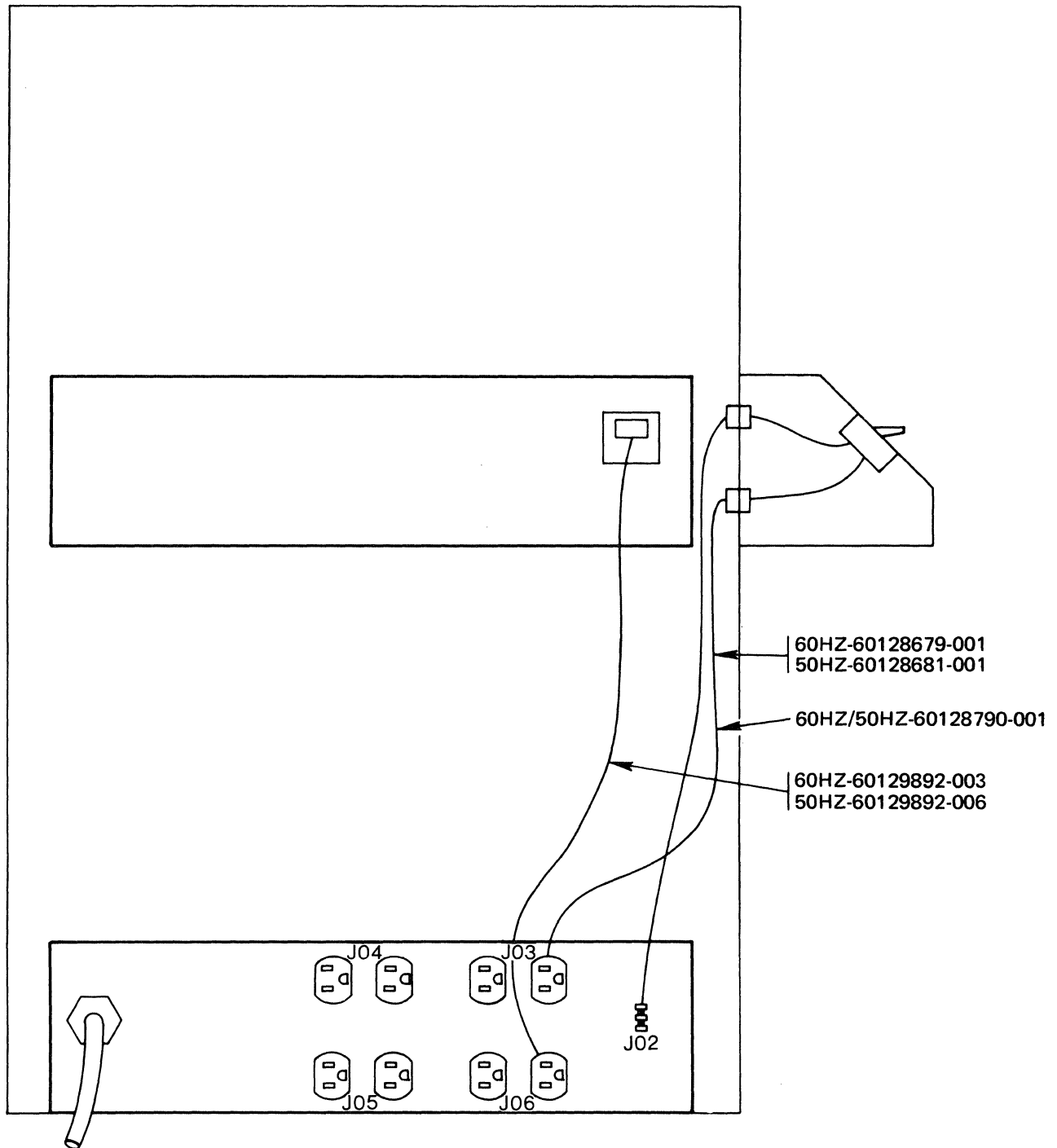


Figure 5-10 Typical Cabinet Connections, BPDU630A, Single Phase (Front View)

Table 5-2 Nominal Line Current
for Level 6 Devices

UNIT	DESIGNATION	NOMINAL* CURRENT
Power Supplies	M60	4.5(A)
	M100	4.5(A)
	M150	7.0(A)
	M170	7.5(A)
	H700	5.5(A)
Memory Save Unit		1.0(A)
Diskettes (2 Devices)		2.0(A)
Printers	Centronics	5.0(A)
	Data Products	6.0(A)
	HISI	5.0(A)
Card Reader	-	1.75(A)
Card Reader	CII	1.5(A)
Magnetic Tape	Bright Ind.	9(A)
CRT Display		2(A)
Disks	Caelus 100TP1	3.5(A)
	Caelus 200TP1	5(A)
	MP1 (Hawk)	5(A)
	OK1 Data	3(A)
ASR33, ASR35 and KSR33		2(A)
Paper Tape Punch		5(A)
Paper Tape Reader		2(A)
Cassette		2(A)

*120Vac, single phase, 60 Hz. For 220 Vac -
240 Vac operations (for estimate purposes only)
assume nominal current to be one half that of
the 120 Vac values.

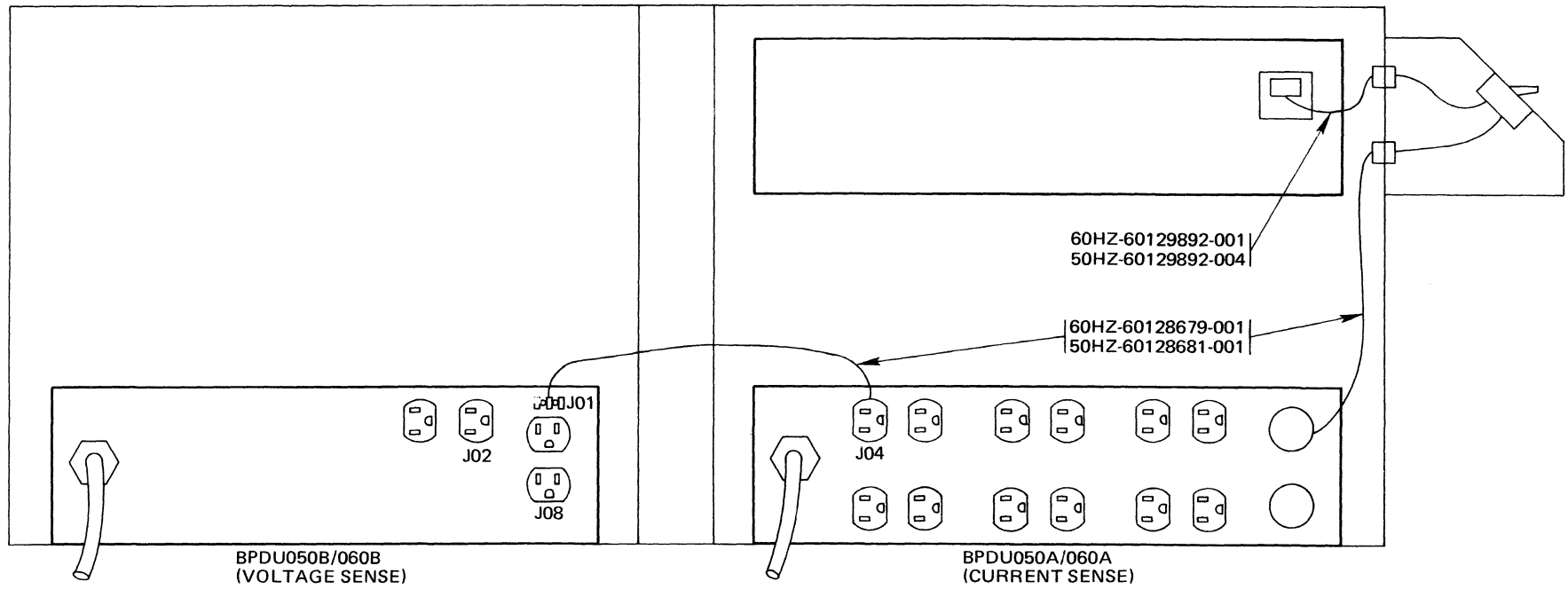


Figure 5-11 Typical Expansion of BPDU050A/BPDU060A (Rear View)

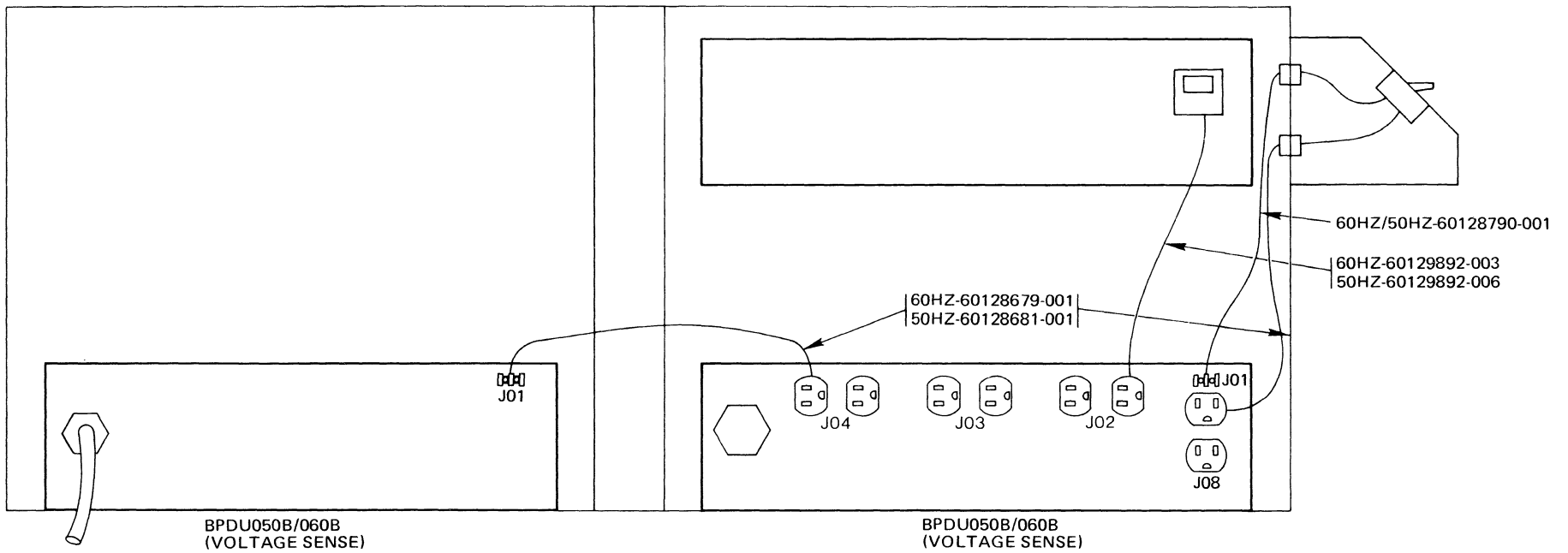


Figure 5-12 Typical Expansion of BPDU050B/BPDU060B (Rear View)

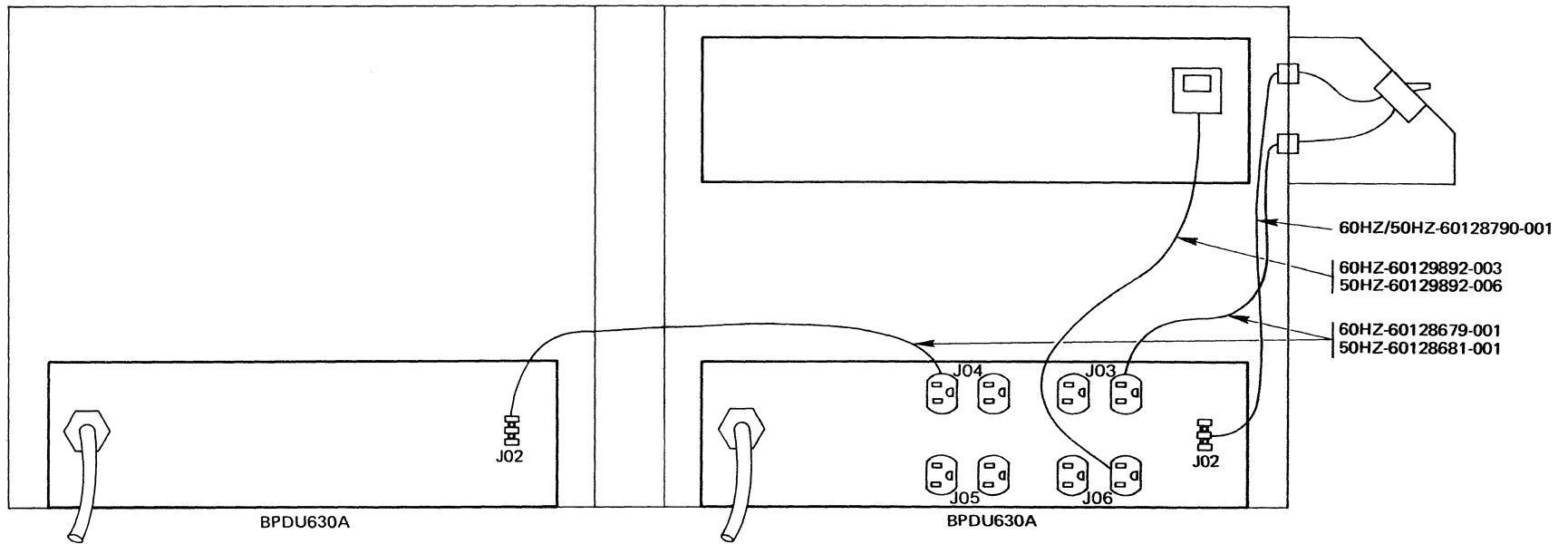


Figure 5-13 Example 1: Typical Expansion of BPDU630A, Single Phase (Rear View)

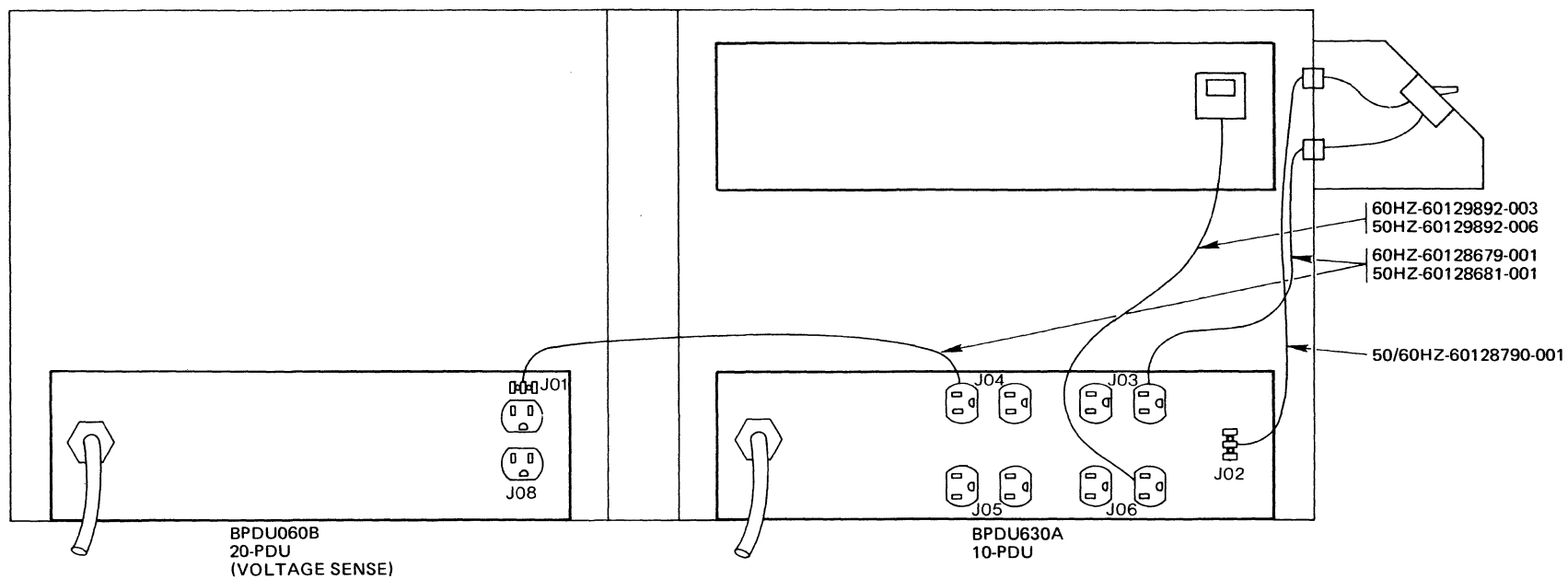


Figure 5-14 Example 2: Typical Expansion of BPDU630A (Rear View)

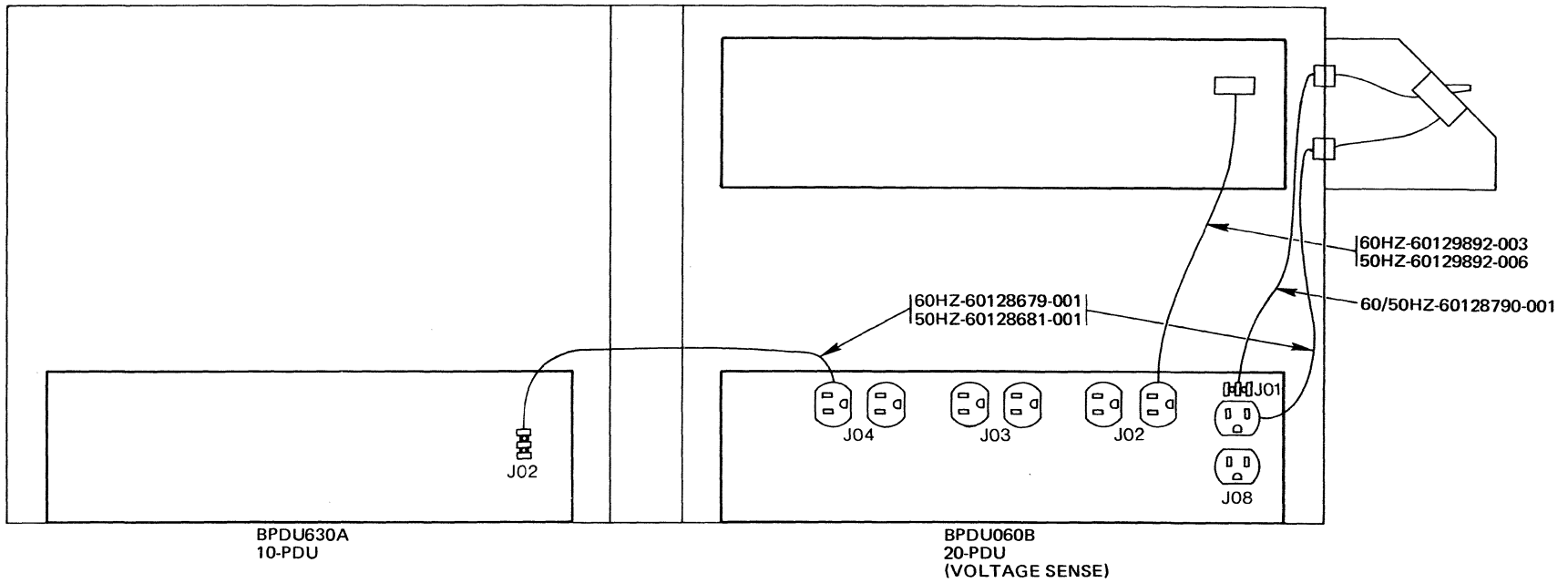


Figure 5-15 Typical Expansion of BPDU060B (Rear View)

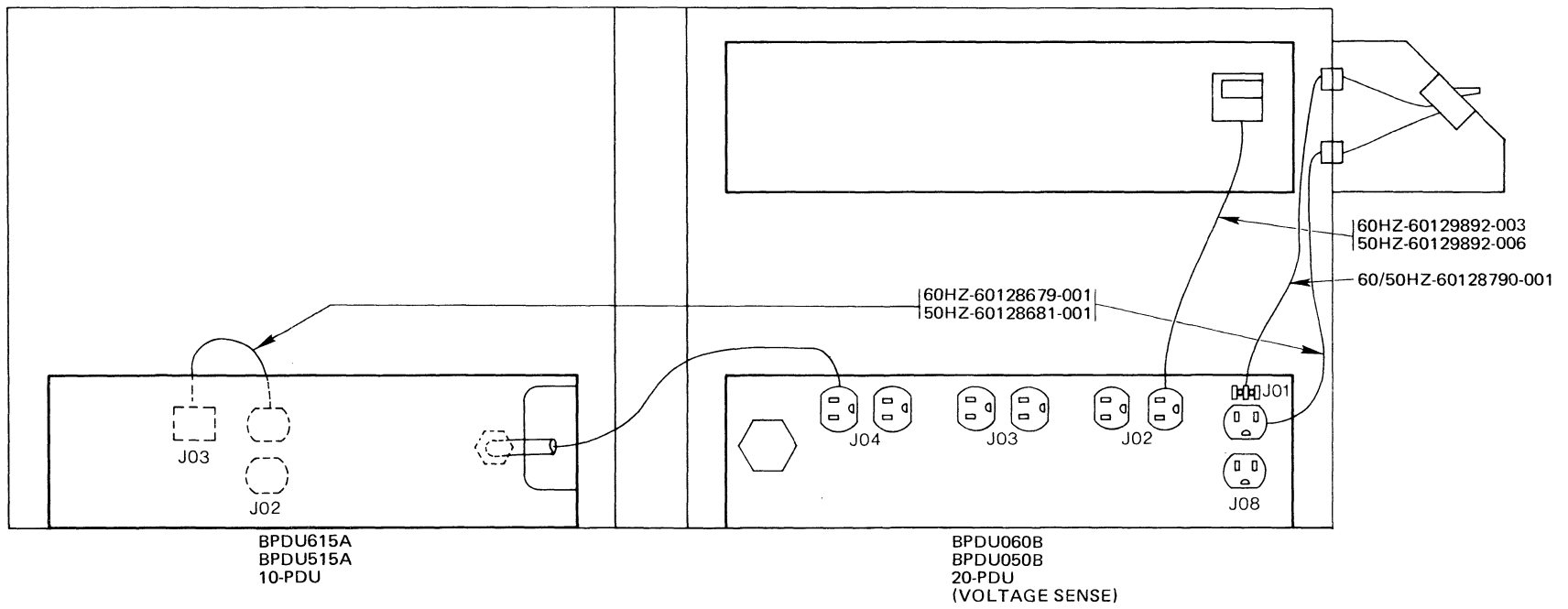


Figure 5-16 Typical Expansion of BPDU050B/BPDU060B (Rear View)

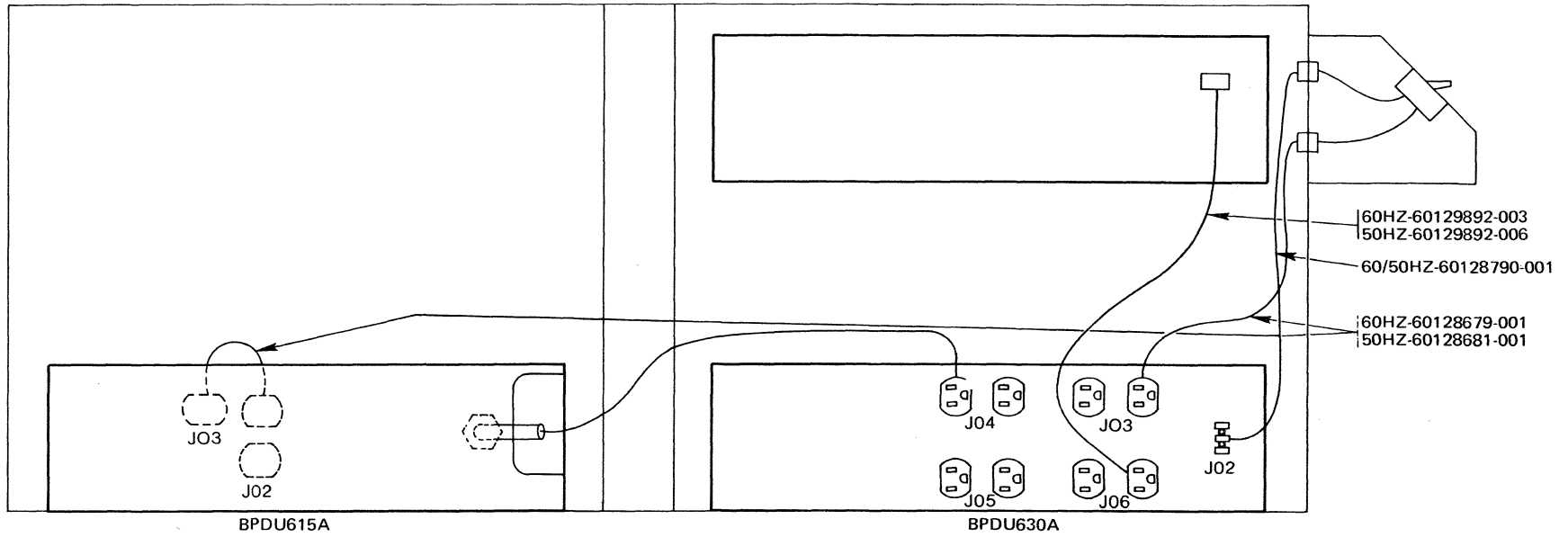


Figure 5-17 Typical Expansion of BPDU630A, Single Phase (Rear View)

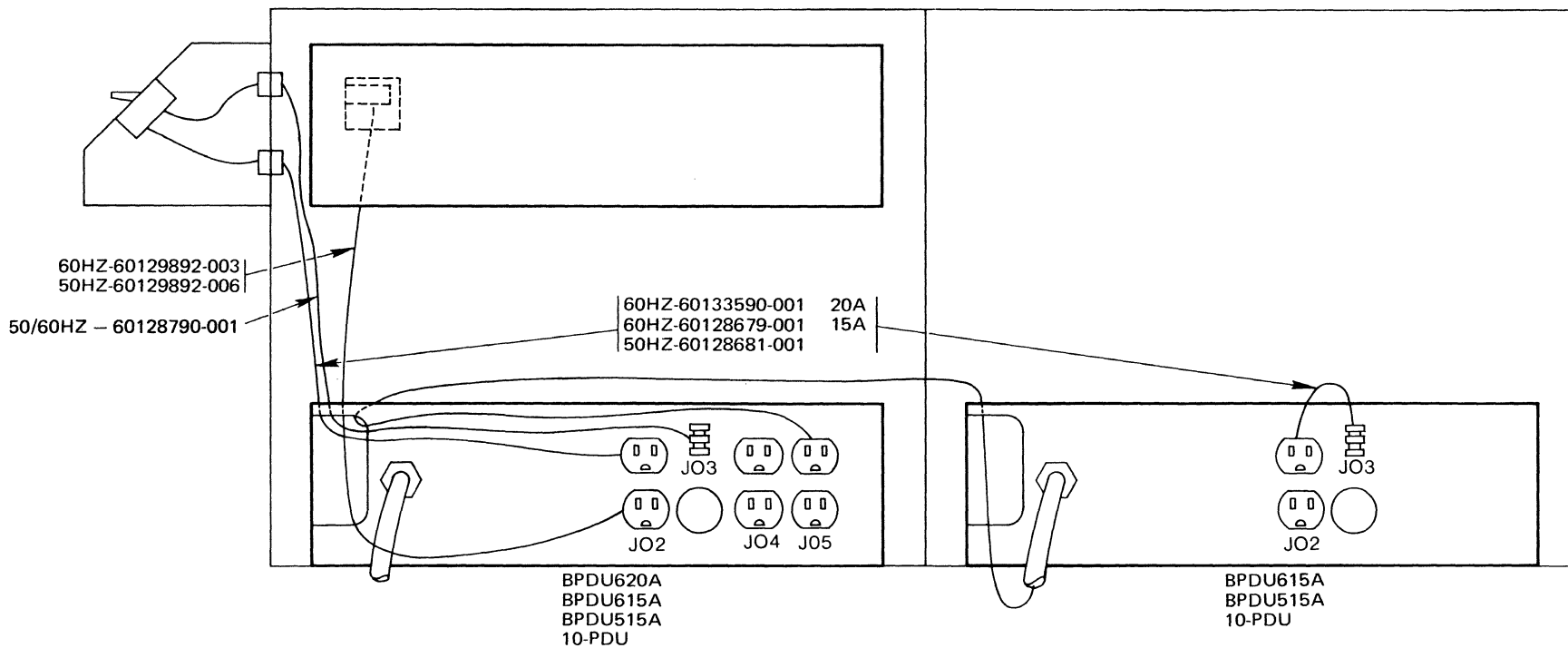


Figure 5-18 Typical Expansion of BPDU515A/BPDU615A/BPDU620A,
Single Phase (Front View)

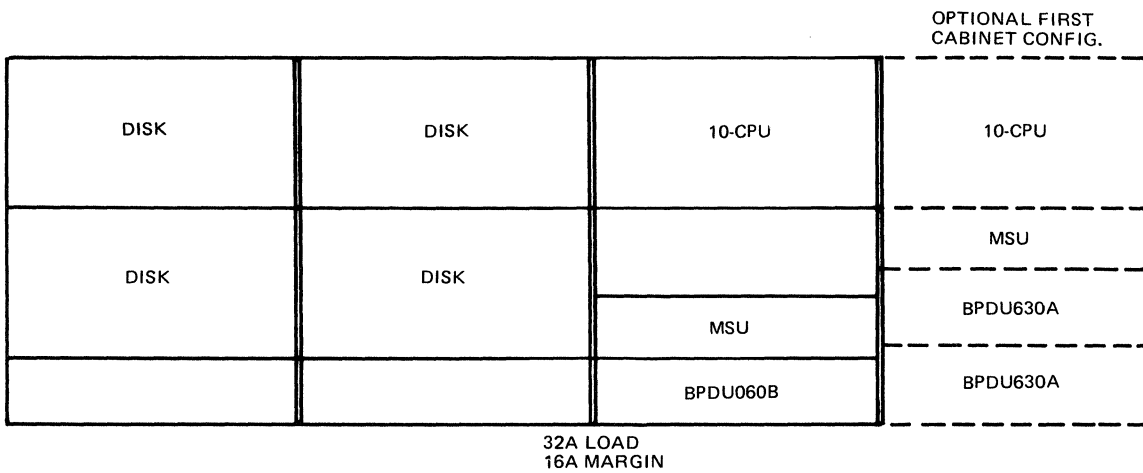
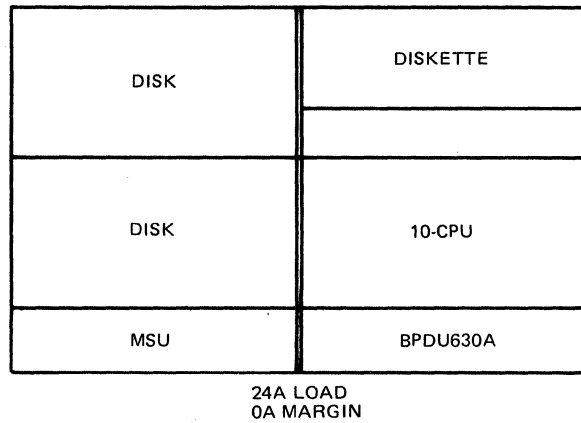
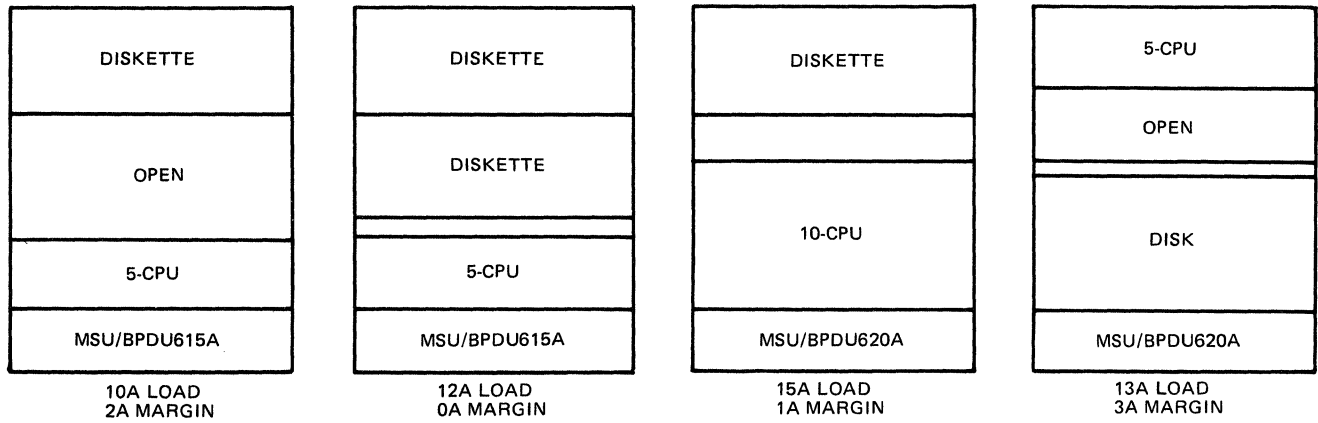


Figure 5-19 Typical Power Distribution Unit Assignment for 30-Inch Rack-Mounted Cabinets (Including Office Furniture Package)

5.3.3 Operation

5.3.3.1 60-Hz Power Distribution Unit

Primary power is brought to the PDU by a five-conductor cable carrying three phase wires, neutral, and safety ground (see Figures 5-20 and 5-21). The free end of this input cable terminates in a Hubbell five-pole male connector. The cord enters the chassis through a compression coupling and is hard wired to a two-phase RFI filter. Only two of the three phases are used in the PDU, the third phase wire being terminated. Phases A and B from the filter output terminals are connected to a two-pole, 25-ampere circuit breaker.

In the BPDU060A the phase B output from the circuit breaker passes through a 10-ampere fuse to a single receptacle, J08, for the memory save power supply and to one side of the coil of contactor K01. The other terminal of the coil is wired to the phase terminal of receptacle J01 to which is connected the computer power supply via the on/off switch.

In the BPDU060B phase B passes through a 15-ampere fuse to a duplex receptacle, J08, into which is plugged the memory save power supply and a three-wire cable to the POWER ON/OFF switch. Another three-wire cable returns to J01 on the PDU from the above switch to the coil of contactor K01.

Although the memory save power supply is energized whenever circuit breaker, CB01, is set to ON, the PDU load beyond the contactor K01 is not energized until the computer ON/OFF switch is set to ON. Setting this switch to ON connects phases A and B to their respective branch loads: phase B to fuse/receptacle combinations F02/J02, F03/J03 and F04/J04; phase A to fuse/receptacle combinations F05/J05, F06/J06 and F07/J07.

Output RFI filter FL02 connected in series with the phase and neutral lines to J07, prevents noise generated by peripheral devices connected to J07 from entering the PDU.

The six output receptacles are all duplex types connected to a common neutral and a common safety ground and fused at 15-amperes.

5.3.3.2 50-Hz Power Distribution Unit

The basic functional difference between the 60-Hz and 50-Hz PDUs is, rather than having two branch circuits for the output receptacles, the 50-Hz units have all receptacles connected to a single 220, 230 or 240 volt single-phase input power source (see Figures 5-22 and 5-23).

The connections to the mainframe and the memory power supply for PDUs BPDU050A and BPDU050B are identical respectively to 60-Hz PDUs BPDU060A and BPDU060B. Also, the neutral ground connections to the output receptacles and the RFI filtering of J07 are the same as the 60-Hz units.

5.3.4 Maintenance

The only maintenance required on power distribution units is the replacement of failed units.

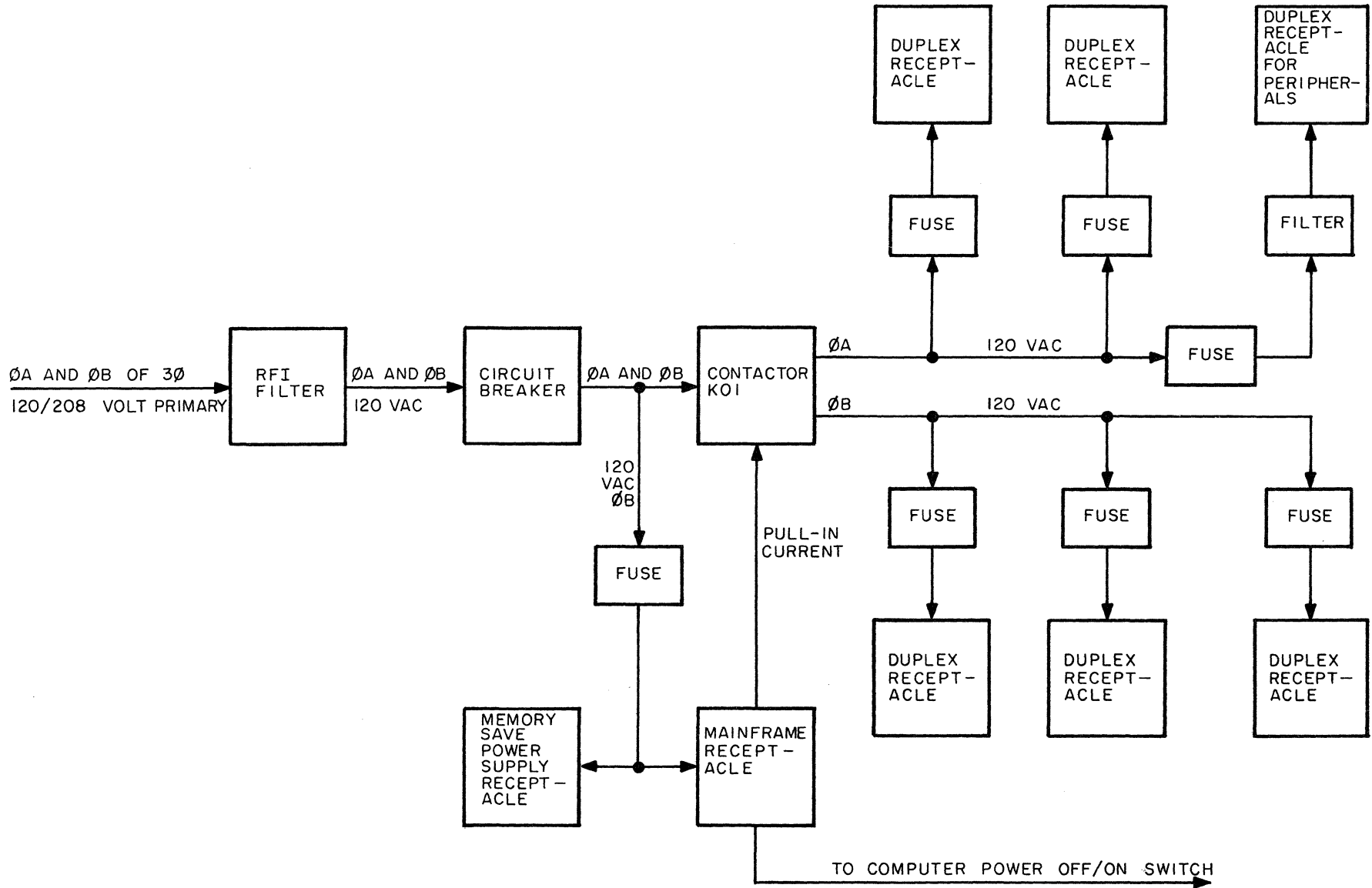


Figure 5-20 Power Distribution Unit, 60-Hz, Block Diagram (BPDU060A)

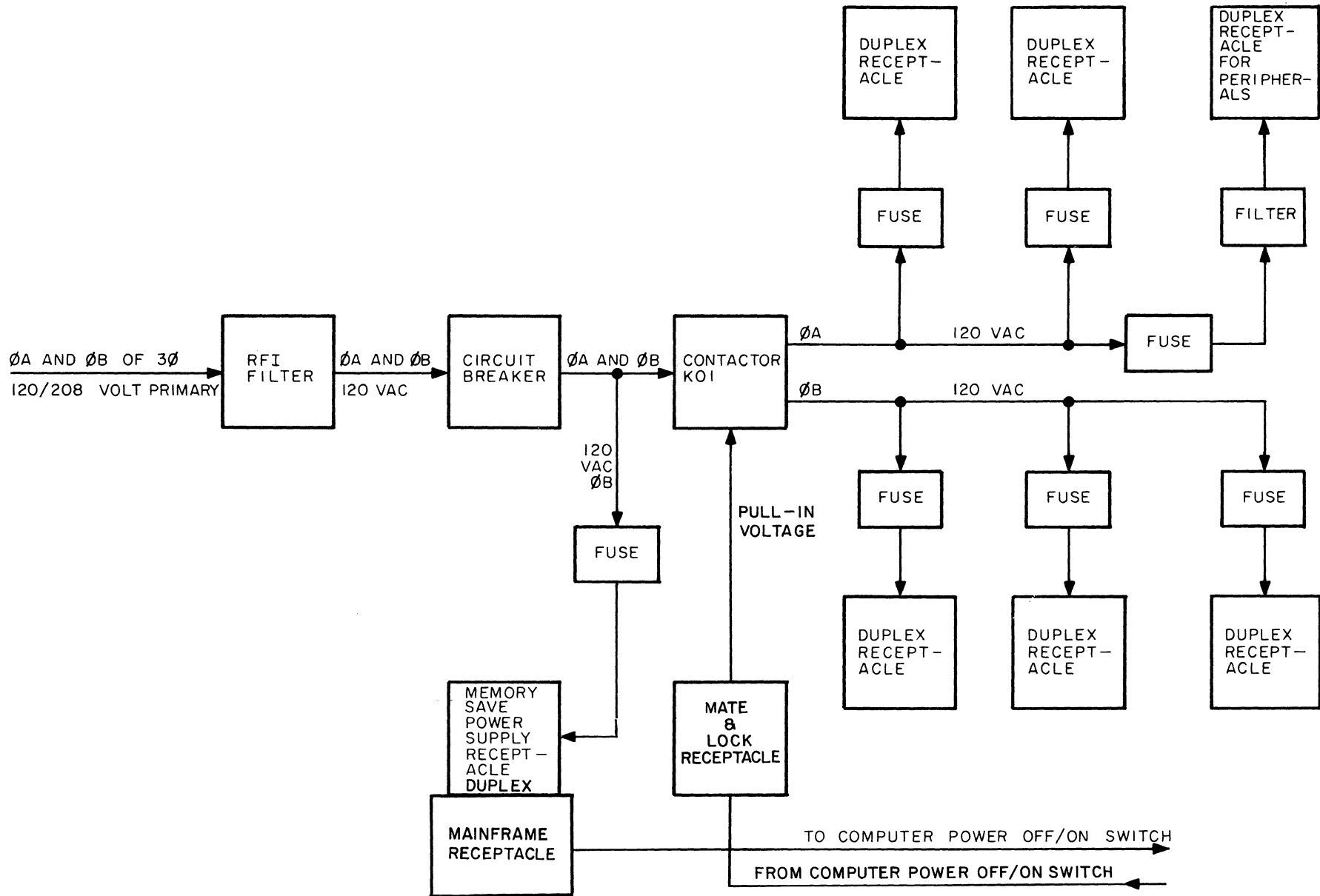


Figure 5-21 Power Distribution Unit, 60-Hz, Block Diagram (BPDU060B)

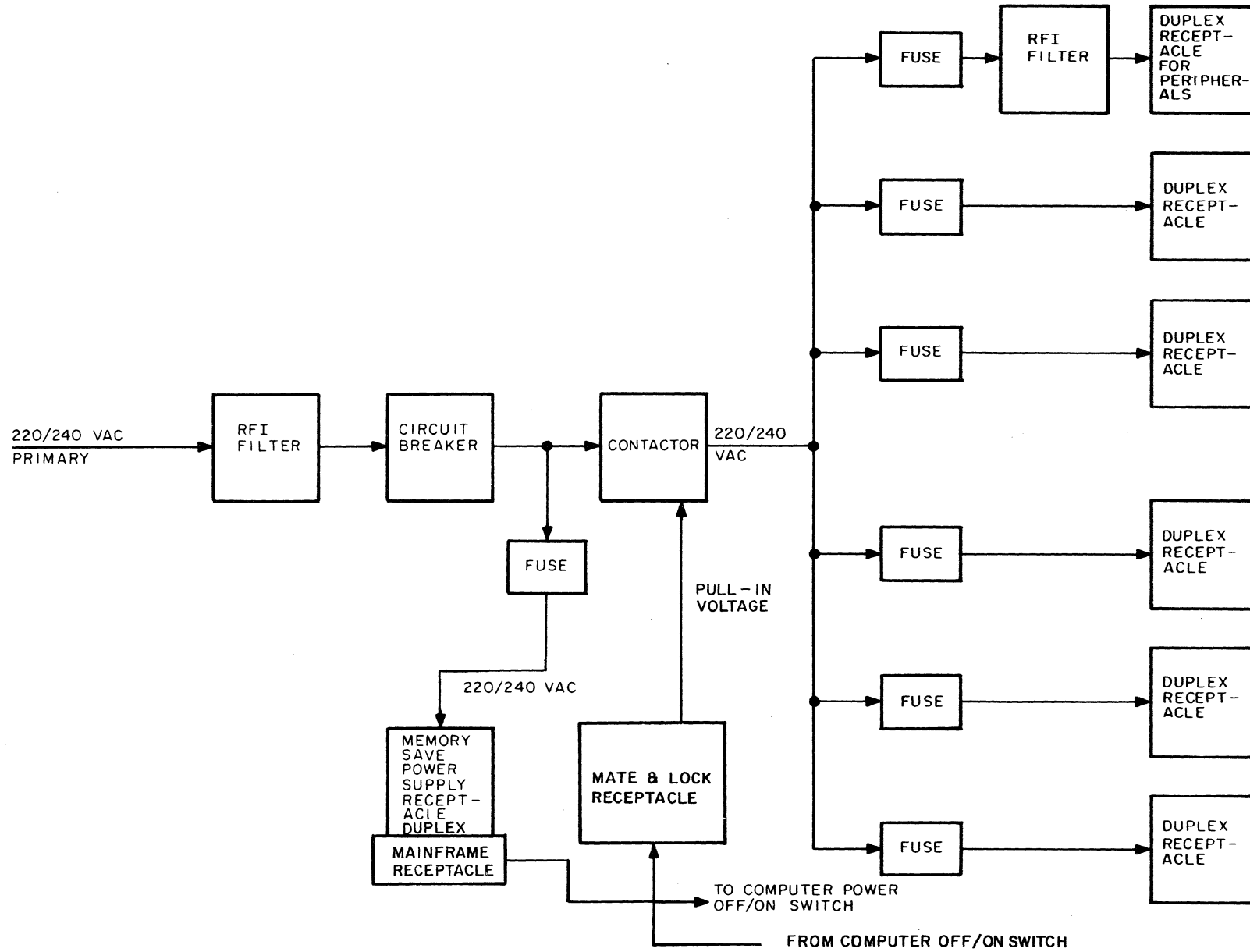


Figure 5-22 Power Distribution Unit, 50-Hz, Block Diagram (BPD050A)

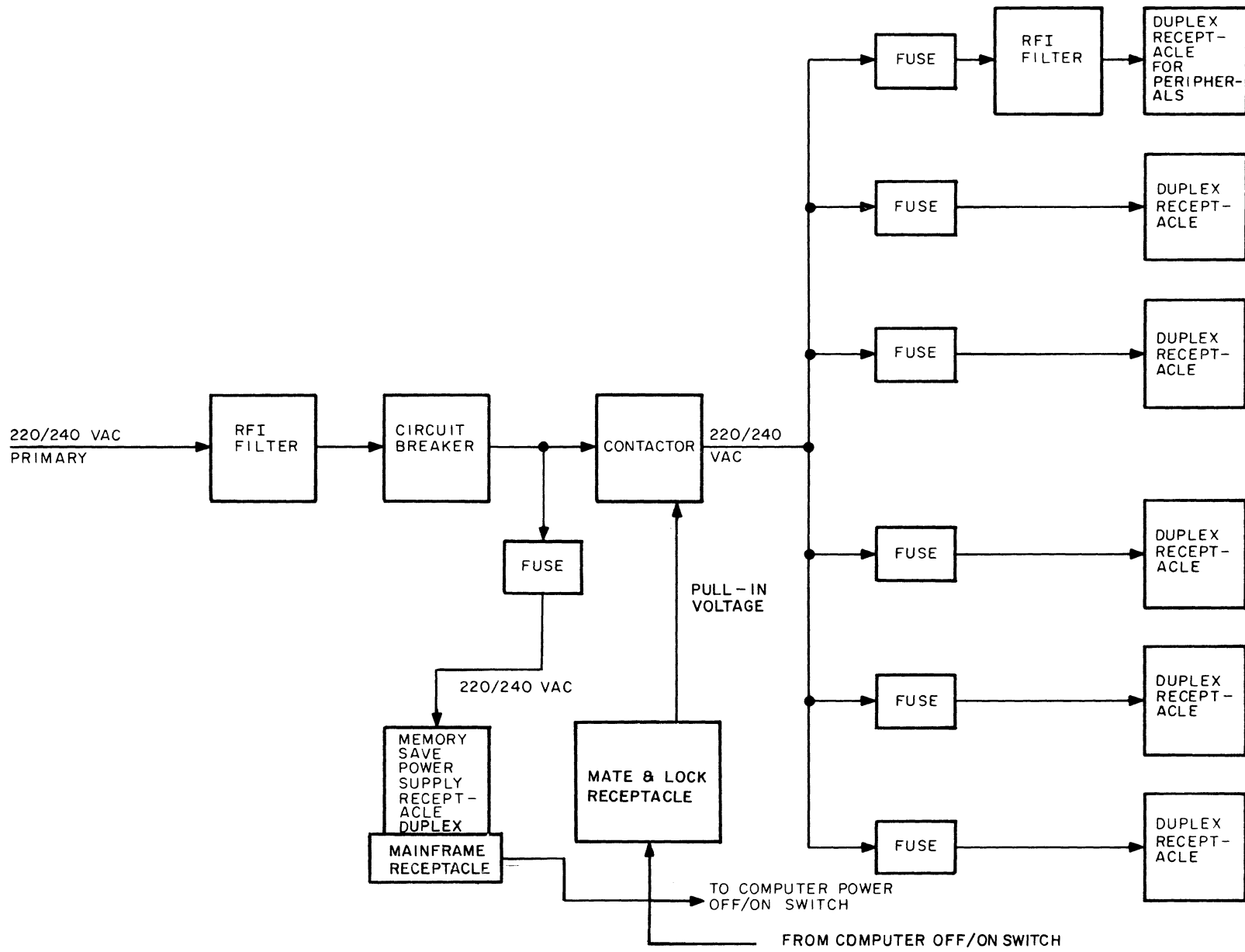


Figure 5-23 Power Distribution Unit, 50 Hz, Block Diagram (BPDU050B)

5.3.4.1 Preventive Maintenance

Power distribution units require no preventive maintenance.

5.3.4.2 Corrective Maintenance

On-site corrective maintenance of failed power distribution units is limited to the replacement of complete units. Only qualified personnel should perform this operation.

5.3.4.2.1 Power Distribution Unit Removal

Removal of the power distribution unit is accomplished using the following procedure:

1. Set the POWER ON/OFF switch on the front panel of the computer to OFF. If system shutdown is required, the ON/OFF switch on the memory save power supply should be set to OFF.
2. Manually set power distribution unit circuit breaker CB01 to OFF.
3. Pull the PDU input primary power plug at its receptacle.
4. At the rear of the PDU pull the equipment primary power plugs from all receptacles (J01 through J08).
5. At the front of the PDU, remove the four machine screws and washers securing the PDU front panel to the rack members.
6. Withdraw PDU and set aside.

5.3.4.2.2 Power Distribution Unit Replacement

To install the replacement power distribution unit, perform the following steps:

1. Slide the unit into its rack space until front panel is flush with other front panels above it.
2. Replace the four machine screws and washers, and secure the PDU front panel to the vertical rack members.
3. For Type BPDU050ABPDU060A PDUs, insert the control panel power plug into receptacle J01 located at the rear of the unit (see Figure 5-11). For Type BPDU050B/BPDU060B PDUs, insert the two control panel power plugs into receptacles J01 and J08 located at the rear of the unit as shown in Figure 5-12.
4. Insert the memory save power supply primary power plug into J08.
5. Insert primary power plugs of peripherals (no more than two can be accommodated) into duplex receptacle J02.
6. Insert primary power plugs of any remaining rackmounted equipment into duplex receptacles J02 through J06.

CAUTION

To prevent damage to the equipment, check that the PDU circuit breaker (CB01) is set to its OFF position before the next step.

7. Insert the PDU primary power plug into wall or floor mounted primary power receptacle from which the original PDU was disconnected.
8. Set CB01 to ON.
9. Reset the memory save power supply. MEMORY ON indicator should be illuminated.
10. Set the computer POWER ON/OFF switch to ON.
11. Make sure that all rack equipment is receiving primary power whenever the ON/OFF switch is set to ON and that all primary power to rackmounted units is removed when this switch is set to OFF.

To prevent damage to the equipment, see that CB01 is set to OFF before replacing any PDU fuse.

5.3.5 Reference Diagrams

The following reference diagrams are included in this manual for instructional or reference purposes only:

- Figure 5-24 Power Distribution Unit BPDU060A Schematic - 60 Hz (60128468)
- Figure 5-25 Power Distribution Unit BPDU060B Schematic - 60 Hz (60128742)
- Figure 5-26 Power Distribution Unit BPDU050A Schematic - 50 Hz (60128471)
- Figure 5-27 Power Distribution Unit BPDU050B Schematic - 50 Hz (60128741)
- Figure 5-28 Power Distribution Unit: 60-Hz Power Sources and Connections.



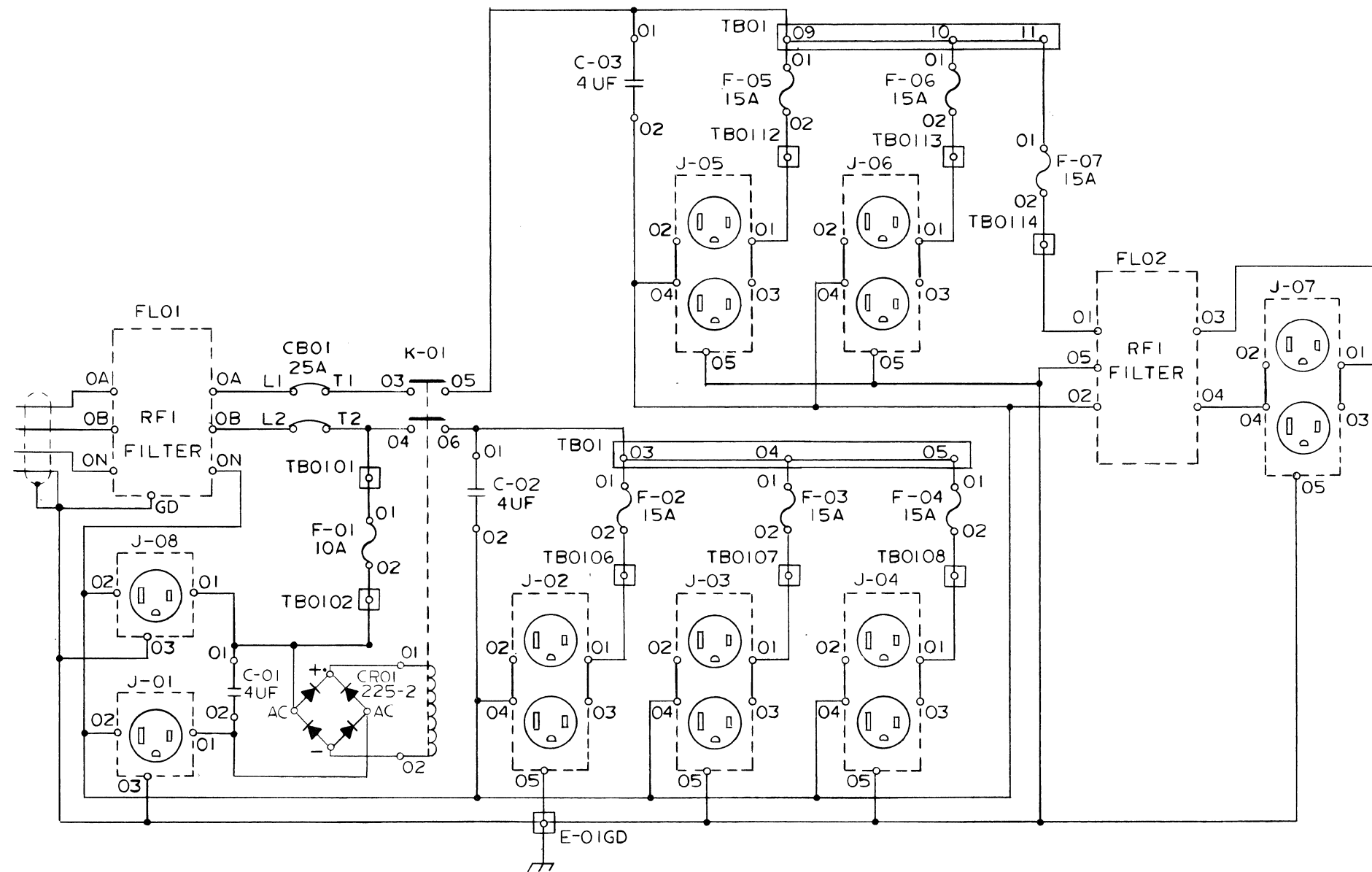


Figure 5-24 Power Distribution Unit, BPDU060A Schematic 60-Hz (60128468)

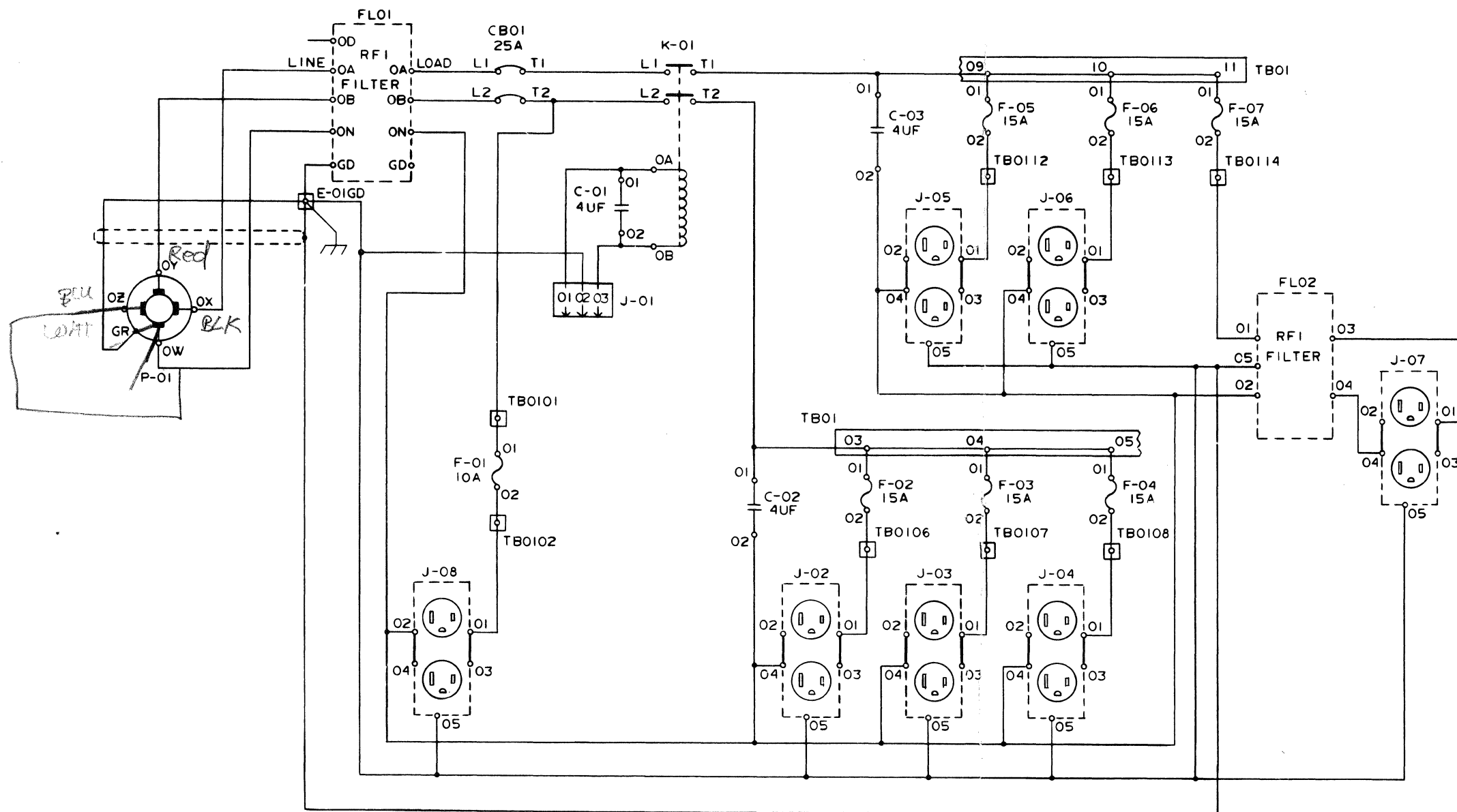


Figure 5-25 Power Distribution Unit, BPDU060B Schematic 60-Hz (60128742)

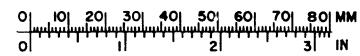
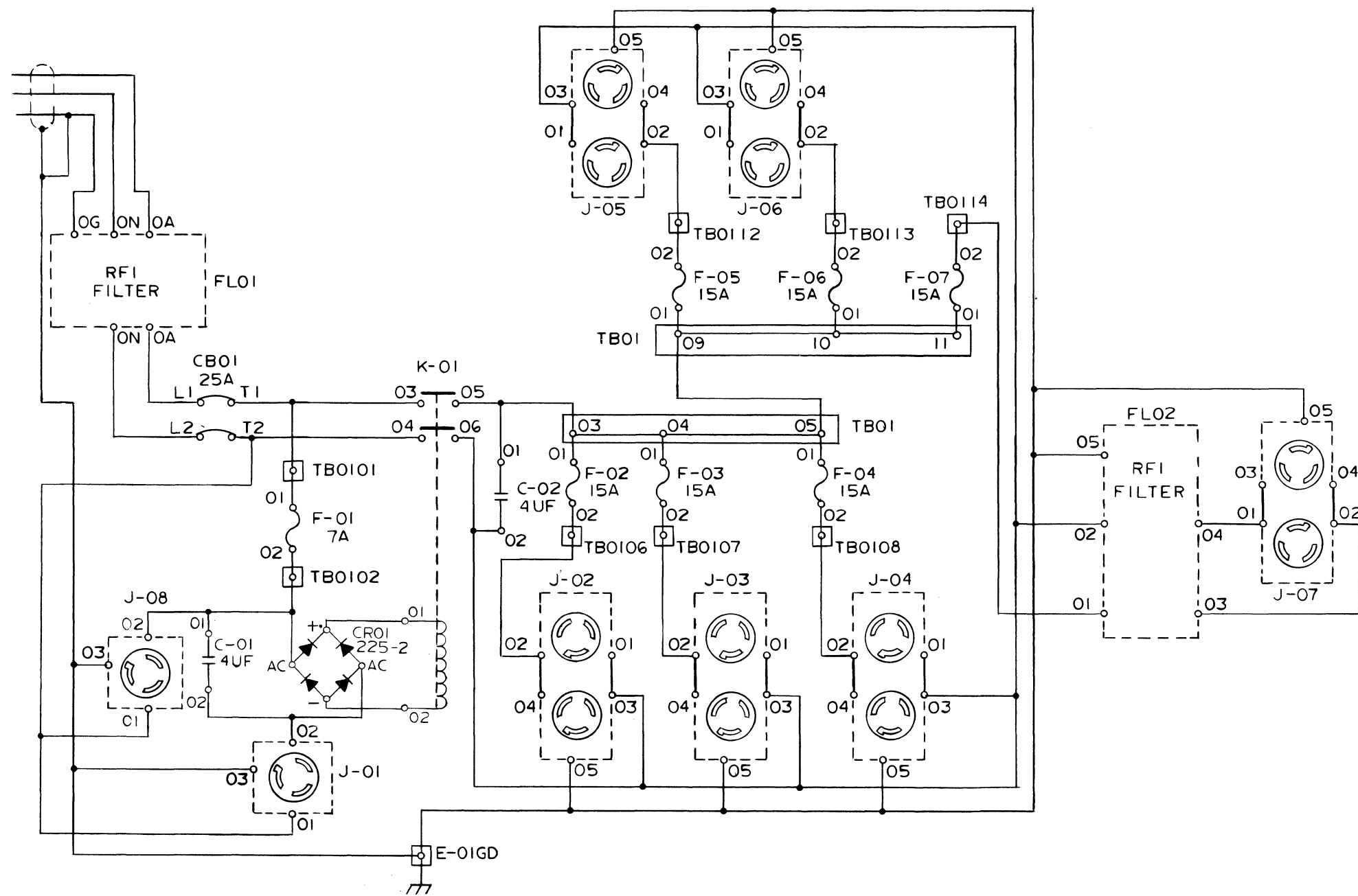


Figure 5-26 Power Distribution Unit, BPDU050A Schematic 50-Hz (60128471)

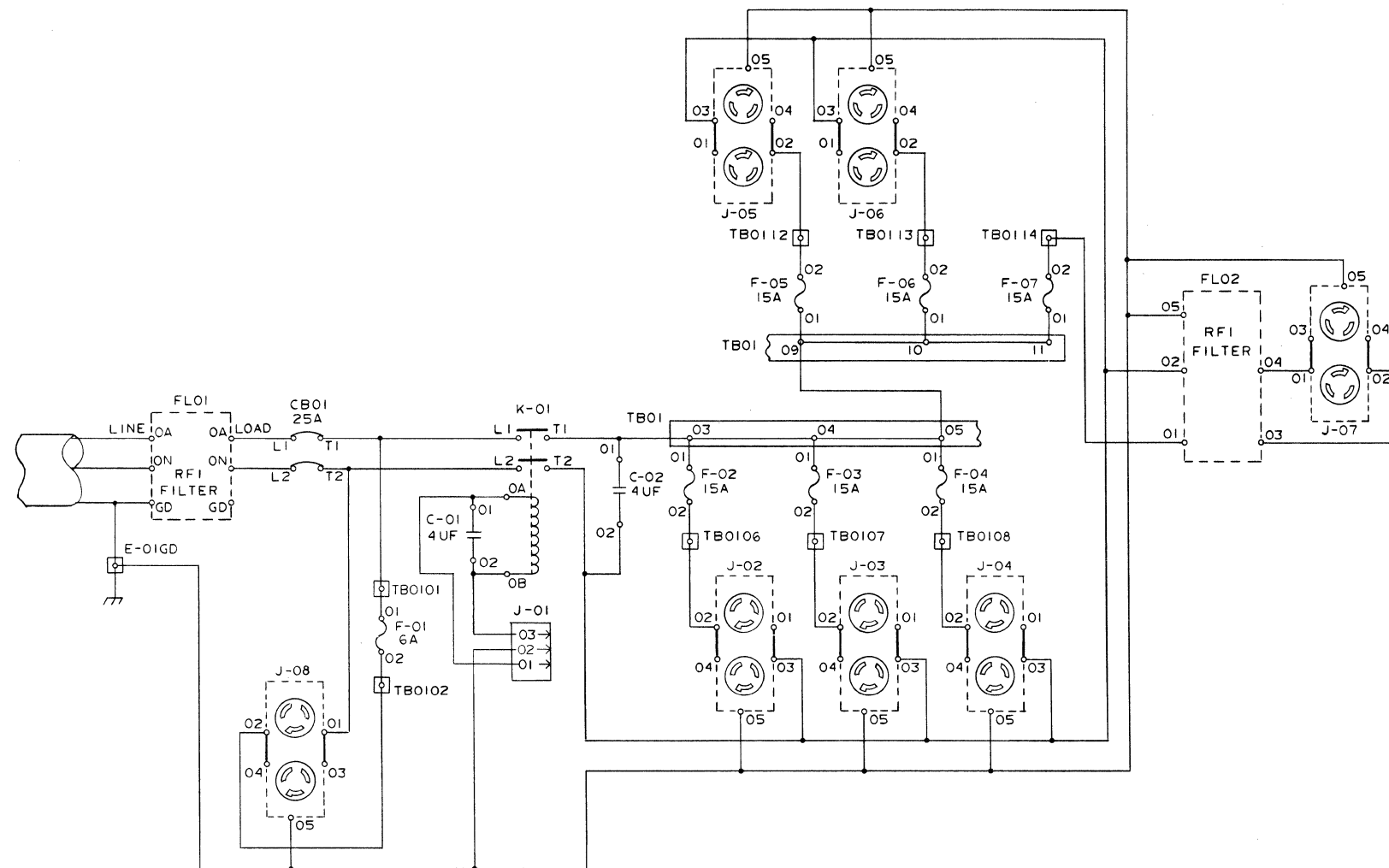
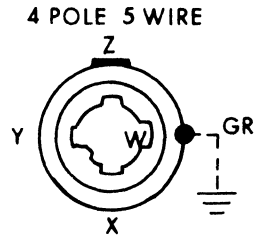
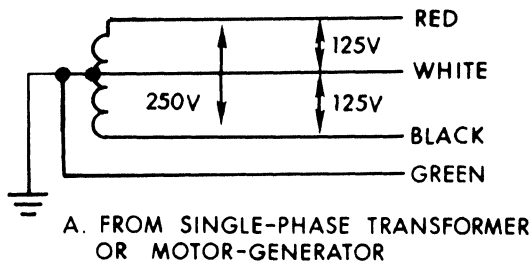
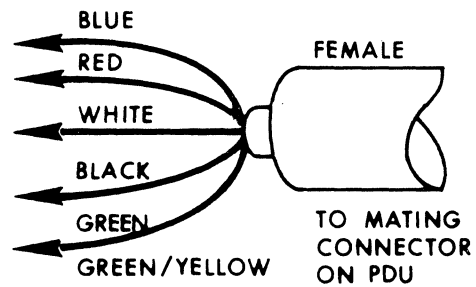
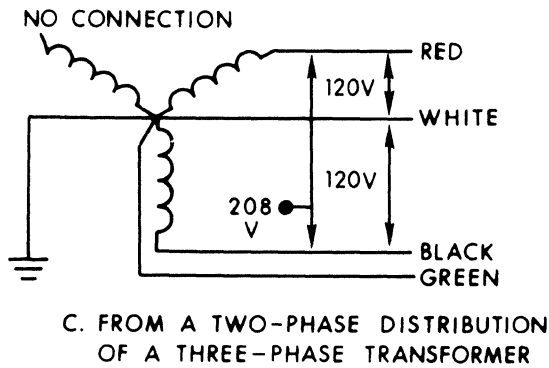
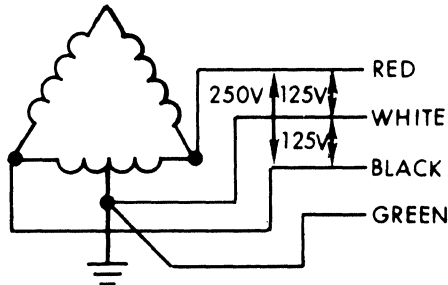


Figure 5-27 Power Distribution Unit, BPDU050B Schematic 50-Hz (60128741)



CUSTOMER-SUPPLIED FEMALE CONNECTOR AS VIEWED FROM MATING SIDE

- X - BLACK
- Y - RED
- Z - BLUE
- W - WHITE
- GR - GREEN OR GREEN/YELLOW



NOTE

WHERE BLUE WIRE IS NOT REQUIRED, IT IS TERMINATED AT THE SOURCE BY ANY MEANS ACCEPTABLE TO THE LOCAL CODE.

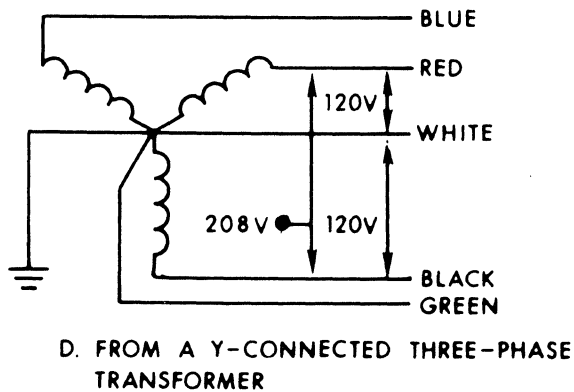


Figure 5-28 Power Distribution Unit: 60-Hz Power Sources and Connections

5.4 SINGLE-PHASE PDU'S

These PDUs, which are itemized in subsection 5.1, items 3 through 6, provide either 120 Vac, 60-Hz or 220-240 Vac, 50-Hz primary power to all drawers of the rack in which they are installed. Front, rear, and interior views of the various PDUs are shown in Figures 5-29 through 5-36.

All equipment connected to the PDU, with the exception of the memory save power supply, is simultaneously energized when the POWER ON/OFF switch on the computer is set to ON and is removed when the switch is set to OFF. The memory save power supply is energized continually by the unswitched receptacle of the PDU. In the single-phase 30-ampere assembly, the PDU and all rackmounted equipment are completely deenergized if the circuit breaker on the front panel is manually set to OFF (see Figure 5-31).

With the exception of the 30-ampere assembly, all the single-phase PDUs, including both the 60-Hz NAO and the 50-Hz European types, have the same physical configuration and components. The physical dimensions (including the front panel) are 48.26 cm. (19.0 in.) wide, 16.66 cm. (6.56 in.) deep, and 12.32 cm. (4.86 in.) high. Total weight is approximately 4.54 kg (10.0 lb.). The physical dimensions of the 30-ampere assembly are 41.91 cm. (16.5 in.) wide, 20.22 cm. (8.00 in.) deep, and 12.47 cm. (4.91 in.) high. The front panel of the 30-ampere assembly is 48.26 cm. (19.0 in.) wide, and 13.26 cm. (5.22 in.) high.

In addition to the front panel and the chassis wraparound, the 15- and 20-ampere PDUs (see Figures 5-29, 5-30, 5-32, and 5-33) are comprised of:

1. A three-wire shielded primary connection cord with a three-prong, straight-blade, grounding-type plug at the input end. The blades of the 15-ampere PDU plug are parallel to each other, while the blades of the 20-ampere PDU plug are turned 90 degrees from each other. Both the 15- and the 20-ampere PDU have a compression clamp where the cord enters the front panel.
2. An input RFI Filter, FL01.
3. A fuse (F01) - 12A for a 15-ampere PDU, and 15A for a 20-ampere PDU.
4. An unswitched duplex output (J02) for the memory save unit, and the control panel input power cable.
5. An input connector (J03) with switched input power for the control panel cable.
6. Two switched duplex outlets (J04 and J05).

In addition to the front panel and the chassis wraparound, the 30-ampere PDU (see Figures 5-34 through 5-36) is comprised of:

1. A three-wire shielded primary connection cord with a three-prong, twist-lock, grounding-type plug at the input end and a compression clamp where the cord enters the rear panel.
2. An input single-pole circuit breaker (CB01).

3. An input RFI Filter (FL01).
4. An unswitched duplex output (J01).
5. An input connector (J02).
6. A voltage-energized contactor (K01).
7. Three duplex outputs (J04, J05, and J06) mounted on the rear panel.
8. Four 15A fuses mounted on the front panel.
9. A four microfarad bypass capacitor.

The 50-Hz, 15-ampere PDU is similar to the 60-Hz, 15-ampere PDU (see Figure 5-31) with the following exceptions:

1. The input plug and duplex outlets are twist-lock rather than parallel blade type.
2. The color coding for the input primary power cord is as shown in the following table.
3. Fuse (F01) - 10A for 15-ampere PDU.

CONDUCTOR	COLOR	
	NAO	EUROPEAN
Neutral	White	Blue
Phase	Black	Brown
Ground	Green/yellow stripe	Green/yellow stripe

5.4.1 Controls, Indicators, and Adjustments

The only single-phase PDU that has a control is the 30-ampere type. This PDU has a single-pole circuit breaker located on the right end of the control panel (see Figure 5-34). The function of this circuit breaker is to provide an on/off control and short-circuit protection for the entire PDU. When set to OFF, the circuit breaker cuts off primary power to all equipment in the rack.

5.4.2 Specification Data

Tables 5-3 and 5-4 list specifications for the single-phase PDU.

5.4.3 Cooling

Since the dissipative losses in the single-phase PDU is negligible, no cooling is required.

5.4.4 Personnel Protection and Safety

The power distribution unit chassis, chassis wraparound, and top cover provide complete personnel protection from hazardous voltages.



Figure 5-29 Power Distribution Unit, 60-Hz, Single-Phase, 15A, BPDU615A (Front View)



Figure 5-30 Power Distribution Unit, 60-Hz, Single-Phase, 20A, BPDU620A (Front View)

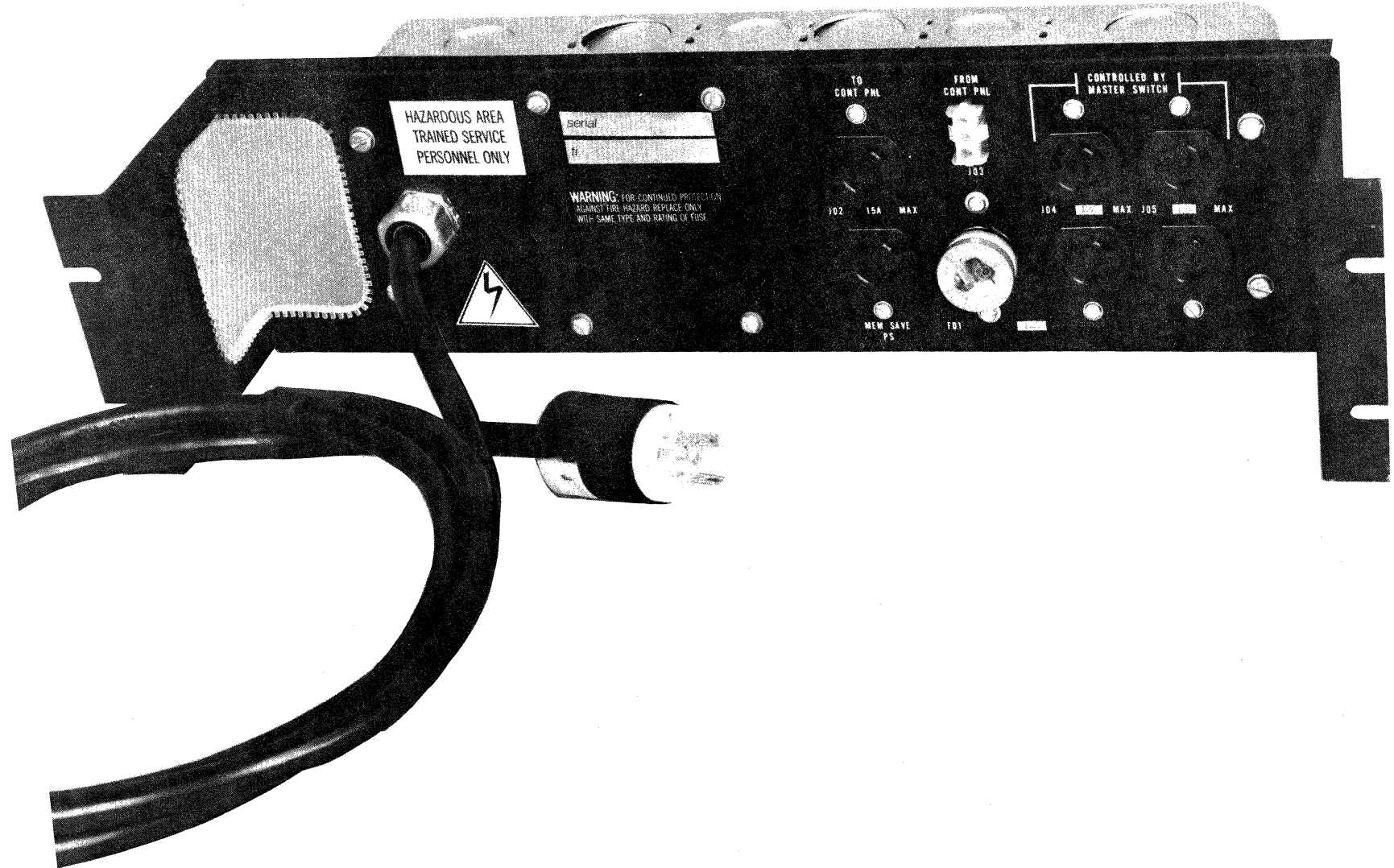


Figure 5-31 Power Distribution Unit, 50-Hz, Single-Phase, BPDU515A (Front View)

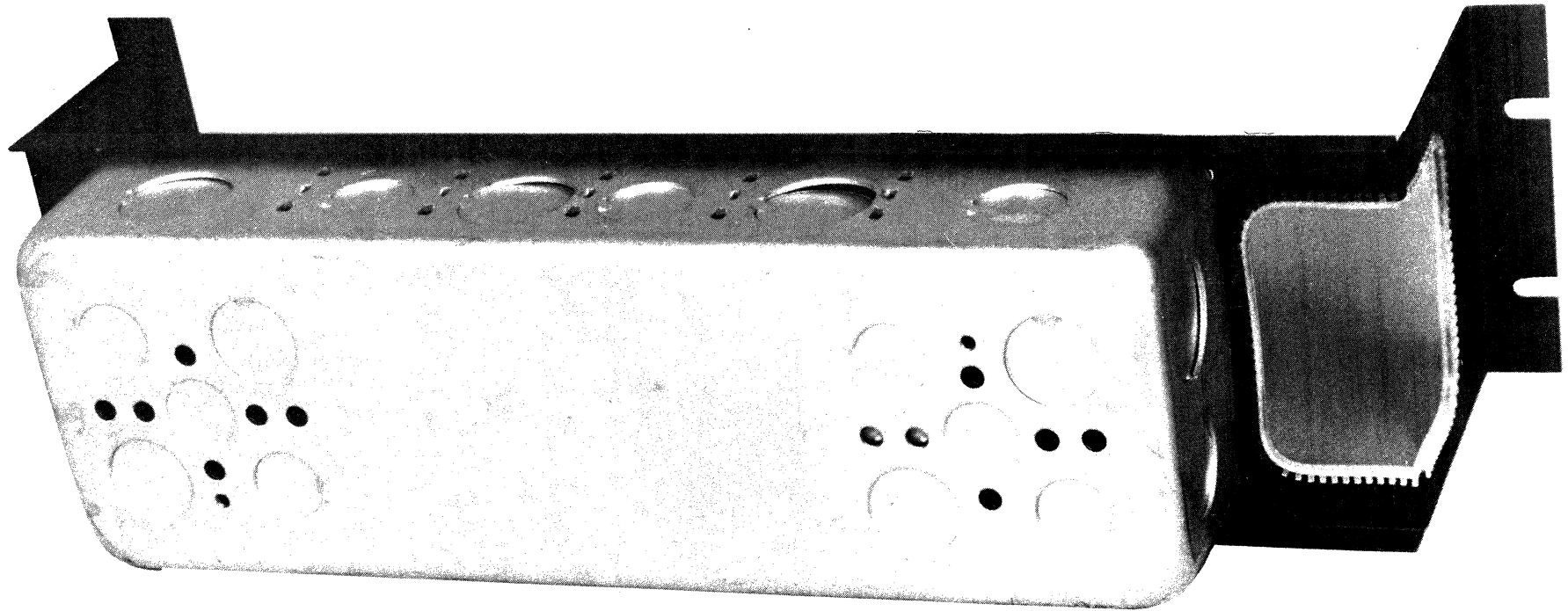


Figure 5-32 Power Distribution Unit, 50/60-Hz, Single Phase,
BPDU615A, BPDU620A and BPDU515A (Rear View)

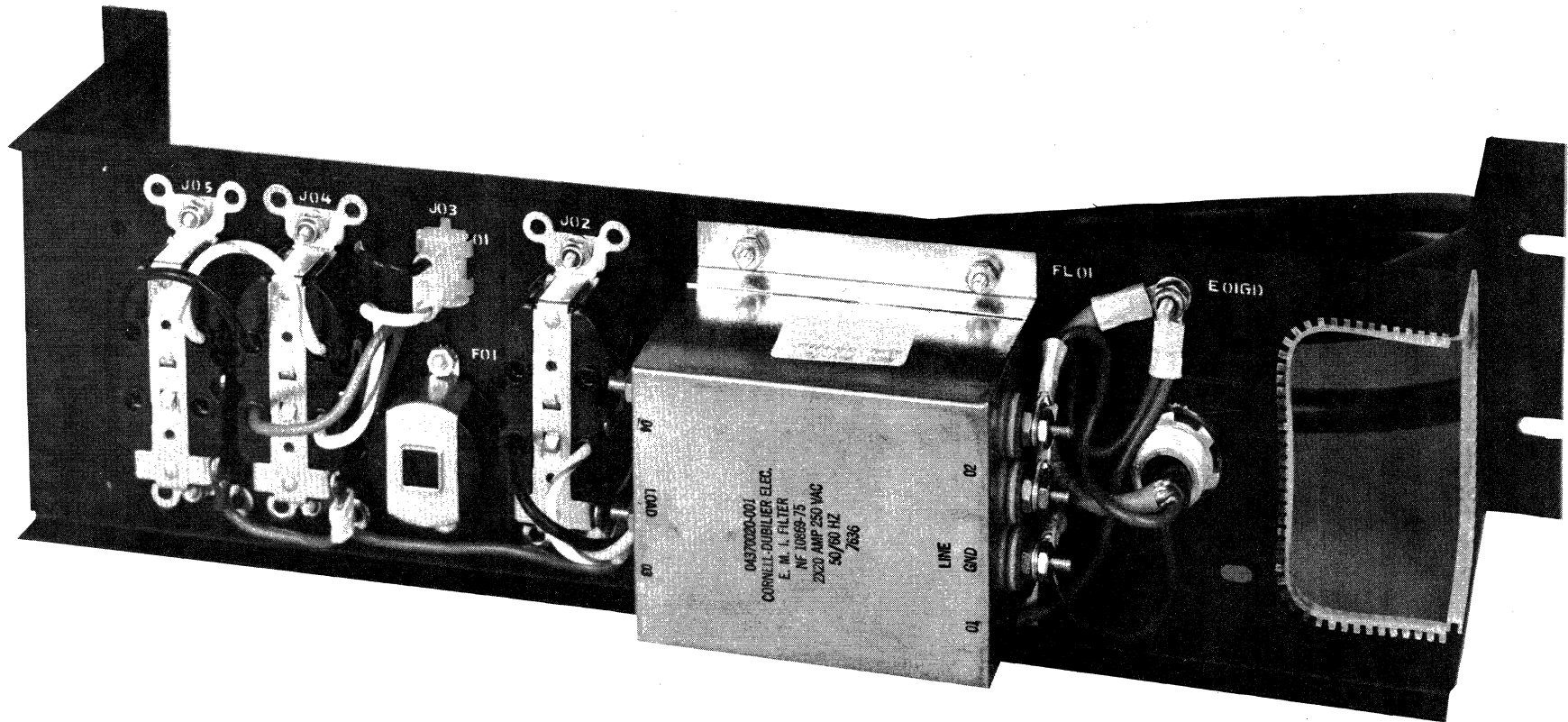


Figure 5-33 Power Distribution Unit, 50/60-Hz, Single Phase, 15/20A, BPDU615A, BPDU620A and BPDU515A (Interior View)

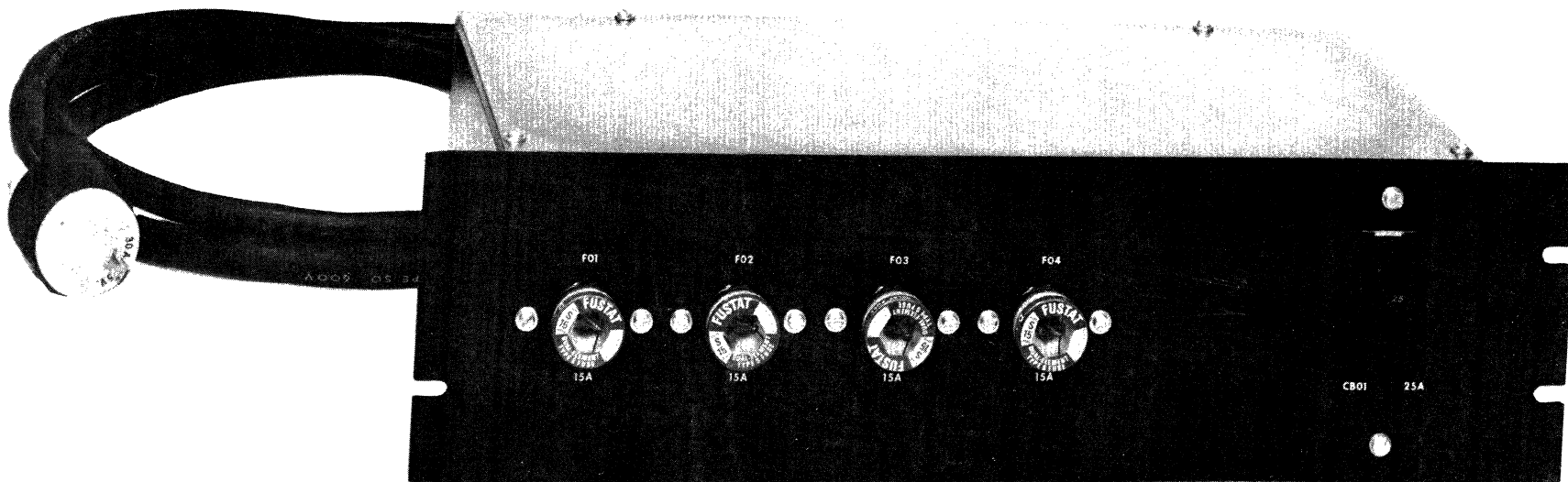


Figure 5-34 Power Distribution Unit, 60-Hz, Single-Phase, 30A, BPDU630A (Front View)

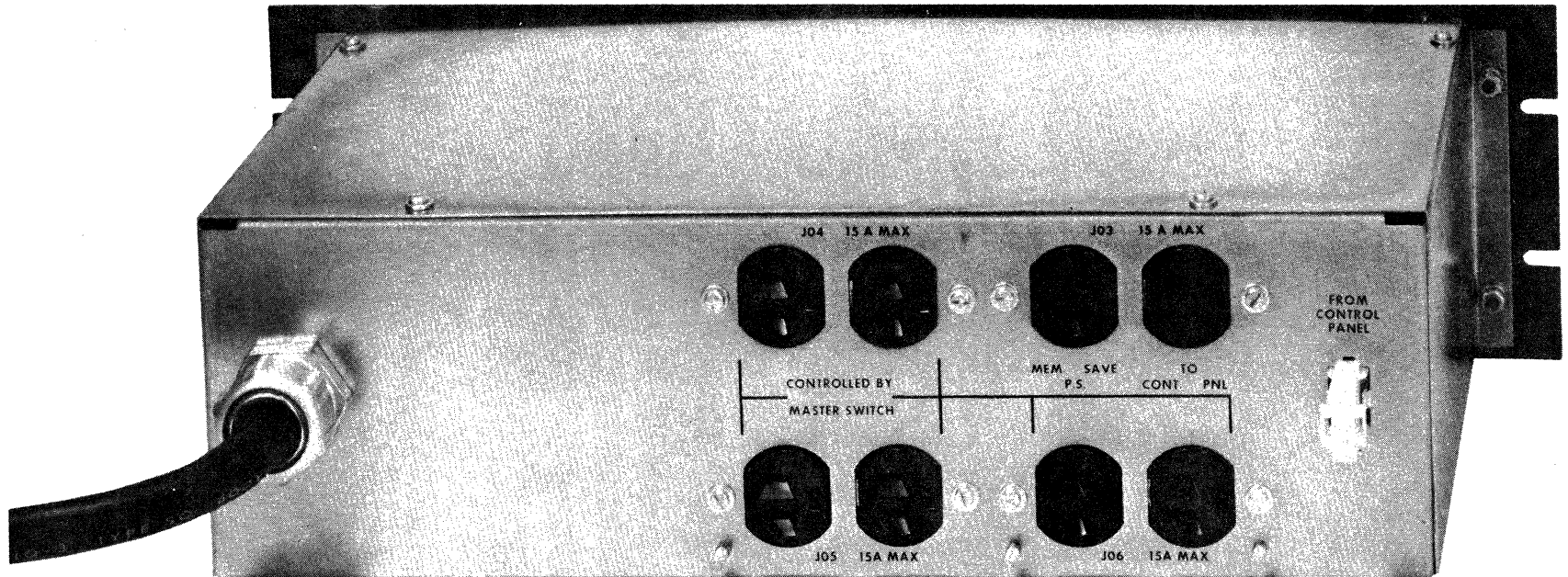


Figure 5-35 Power Distribution Unit, 60-Hz, Single-Phase, 30A, BPDU630A (Rear View)

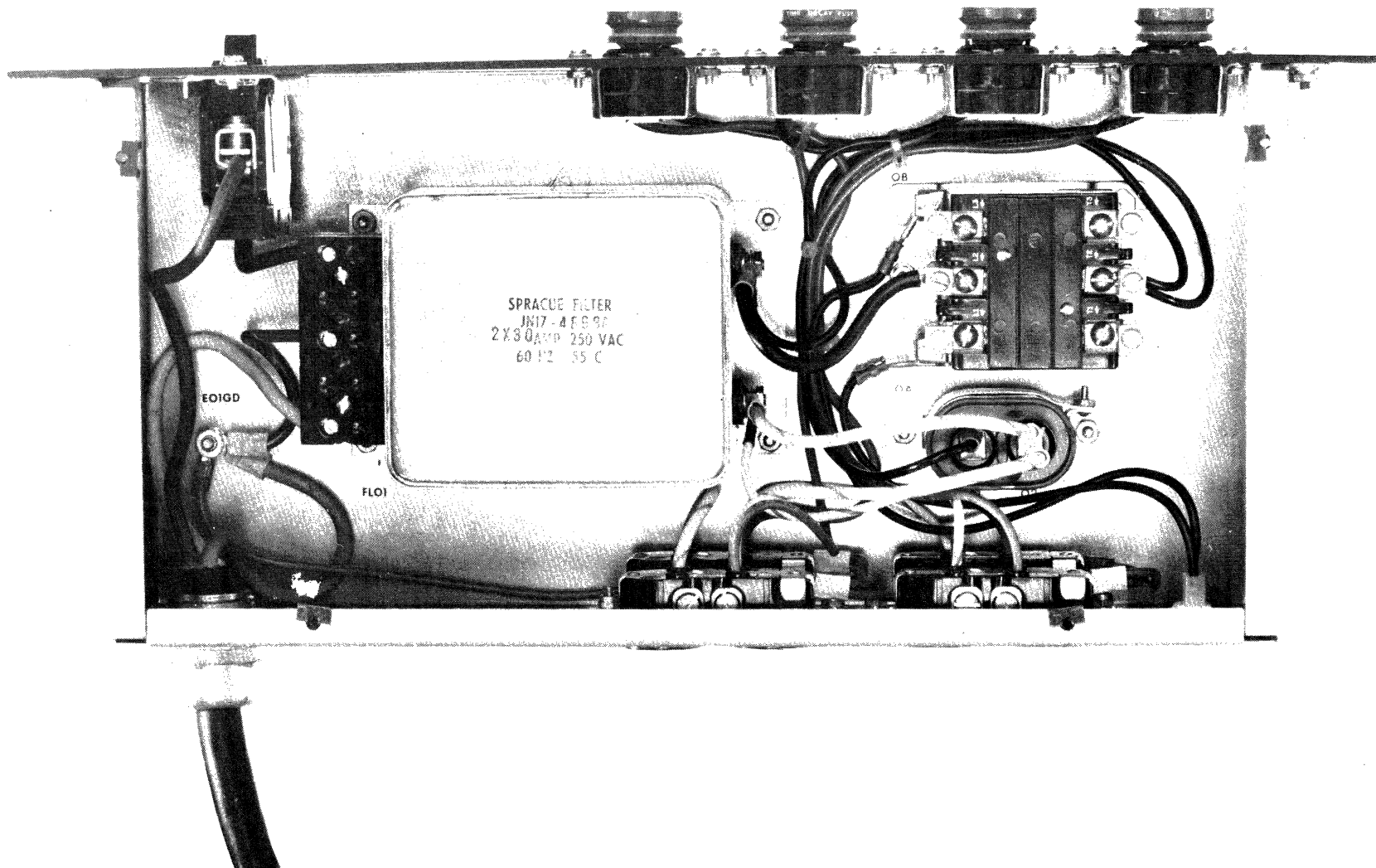


Figure 5-36 Power Distribution Unit, 60-Hz, Single Phase, BPDU630A (Interior View)

Table 5-3 15A and 20A PDU (BPDU615A, BPDU620A,
and BPDU515A Specifications

CHARACTERISTIC	DESCRIPTION
<u>Dimensions, Nominal</u> Front panel width Front panel height Front panel depth Rear Cover depth Weight	48.76 cm (19.0 in.) 12.32 cm (4.85 in.) 10.16 cm (4.0 in.) 6.50 cm (2.56 in.) 4.54 kg (10.0 lb.)
<u>Input Specifications</u> Voltages Current Phases EMI/RFI Filter	60 Hz - 120V RMS $\begin{matrix} +10\% \\ -15\% \end{matrix}$ 50 Hz - 220V - 240V RMS $\begin{matrix} +10\% \\ -15\% \end{matrix}$ (15A PDU only) 15A PDU - 12 Amperes maximum 20A PDU - 15 Amperes maximum All units are single phase Single phase 20A, 250Vac 50/60 Hz
<u>Output Specifications</u> Receptacle J02 Receptacles J04 and J05 Fuse F01	120 Vac, 15A, 60-Hz: parallel-blade duplex grounding type, unswitched 120 Vac, 20A, 60-Hz: right-angle blade duplex grounding type, unswitched 220-240 Vac, 15A, 50-Hz: twist-lock duplex grounding type, unswitched 120 Vac, 15A, 60-Hz: parallel-blade duplex grounding type, switched 120 Vac, 20A, 60-Hz: parallel-blade duplex grounding type, switched 220-240 Vac, 15A, 50-Hz: twist-lock duplex grounding type, switched For receptacles J02, J03, J04 and J05 60 Hz 15A PDU - 12 Amperes 20A PDU - 15 Amperes 50 Hz 15A PDU - 10 Amperes
Operating ambient temperature	0 to 55°C (32 to 131°F)

Table 5-4 30A Single-Phase Power Distribution Unit
(BPDU630A) Specifications

CHARACTERISTIC	DESCRIPTION
<u>Dimensions, Nominal</u>	
Chassis width	41.91 cm (16.5 in.)
Chassis depth	20.22 cm (18.0 in.)
Chassis height	12.47 cm (4.91 in.)
Front panel width	48.26 cm (19.0 in.)
Front panel height	13.26 cm (5.22 in.)
Weight	6.8 kg (15.0 lbs.)
<u>Input Specifications</u>	
Voltages	60 Hz - 120 volts $\begin{matrix} +10\% \\ -15\% \end{matrix}$
Current	60 Hz - 24 Amperes
Phases	60 Hz - One
RFI Filter	1 phase, three-wire, 250 Vac, 50/60 Hz, 30 Ampere
Circuit breaker	Single-pole, 25 Ampere, 120 Vac, 10,000 AIC
Contactors	50 Ampere, heavy duty power relay
<u>Output Specifications</u>	
Receptacle J03	120 Vac, 15A, 60 Hz - parallel blade, grounding type, duplex
Receptacles J04 through J06	120 Vac, 15A, 60 Hz - parallel blade, grounding type, duplex, switched
Fuse	For receptacle J03 (15 Amperes)
Fuse F02 through F04	For switched receptacles J04 through J06 - 15 Amperes
Operating ambient temperature	0 to 55°C (32 to 131°F)

WARNING

All maintenance must be performed by qualified personnel. The presence of high potentials makes it vital that the PDU be deenergized for at least 60 seconds before access to the interior or before replacement is attempted.

5.4.5 Installation

When shipped as part of a system, the PDU is already installed in the bottom-level rack position. All intrarack primary power cabling to PDU receptacles will have been completed prior to shipment.

For special cases in which a PDU is added to an existing system, detailed installation procedures cannot be formulated until system details are available. In general, incorporation of the PDU would require that rack space of 5.25 inches front panel vertical dimension be made available and that all existing equipment have its primary power plugs transferred to the switched receptacles of the PDU.

The location of the rack POWER ON/OFF control can be at any desired location on the rack provided that the primary power connection from the switch to the PDU (mainframe receptacle) is completed.

See Figures 5-13 through 5-18 for typical rackmounted application of the single-phase PDUs.

5.4.6 Operation

5.4.6.1 15A and 20A, 60-Hz PDU (BPDU615A and BPDU620A)

As shown in Figure 5-37 primary power enters the PDU via a three-conductor cable carrying a phase wire, neutral, and safety ground. The free end of this cable terminates in a three-pole male connector. The cord enters the front panel of the PDU through a compression clamp and is hard-wired to the single-phase EMI/RFI filter. The phase and neutral outputs from the filter are in turn hard-wired through F01 to a duplex receptacle (J02). One of the J02 receptacles is for the memory save power supply and the other is connected to the two-pole on/off switch on the remote operator's control panel by a three-conductor cable (see Figure 5-39). The cable is hard-wired to the on/off switch with one lead being connected to ground. Switched phase and neutral wires are returned from the switch to J03 on the PDU. From J03 the phase wire is connected in series with duplex receptacles J04 and J05. Fuse (F01) is rated at 12 amperes for a 15A PDU and 15 amperes for a 20A PDU. Both J04 and J05 are connected to a common neutral and common safety ground.

Although the memory save power supply is energized whenever the input power cable is connected to a power source, power to the main frame and other units using J04 and J05 is not applied until the remote on/off switch is on.

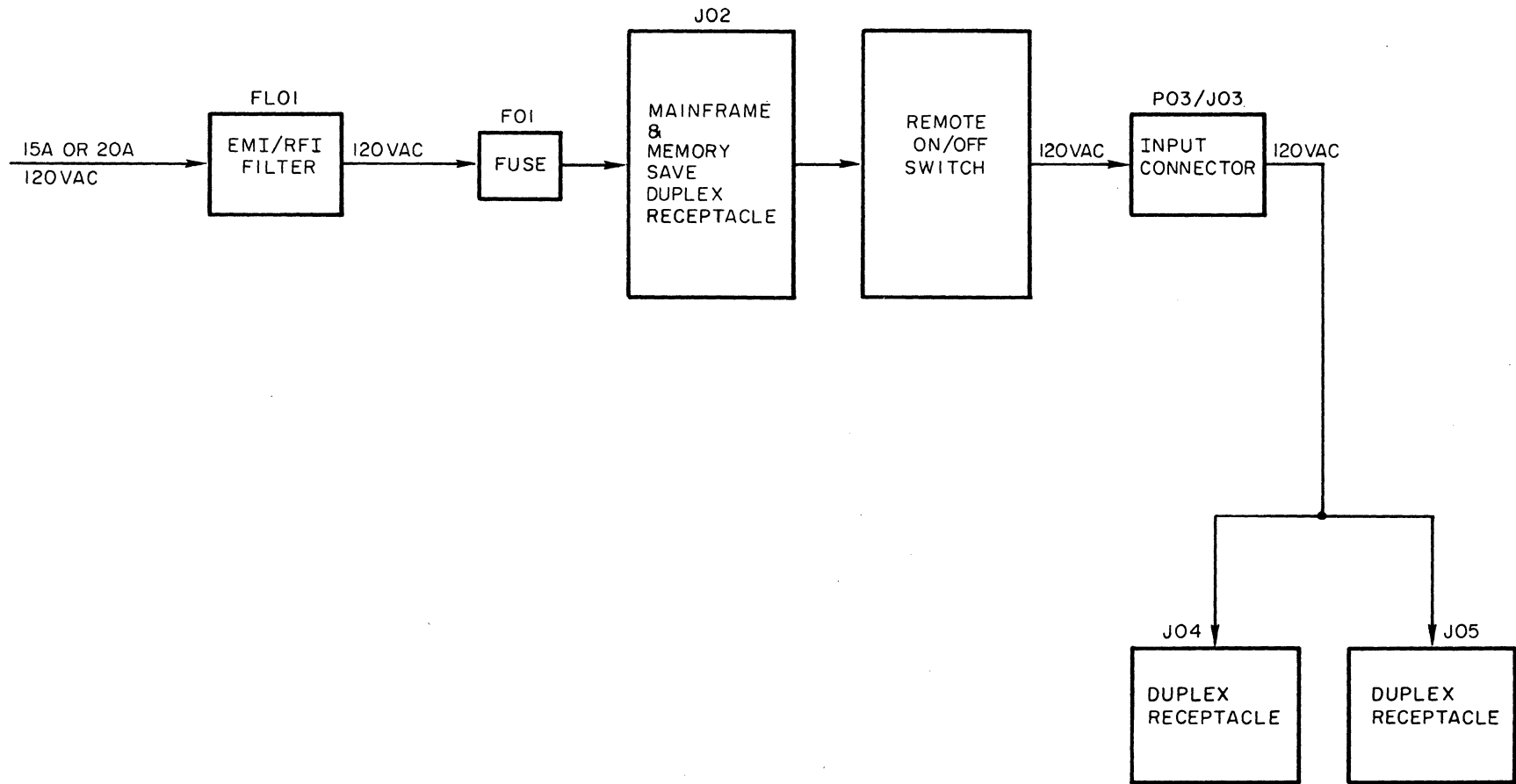


Figure 5-37 Power Distribution Unit, 15/20A, BPDU615A/BPDU620A Block Diagram

5.4.6.2 15A, 50-Hz PDU (BPDU515A)

The 15A, 50-Hz functions identically to the 15A, 60-Hz model describes in subsection 5.4.6.1 (see Figures 5-38 and 5-40). The only differences are:

1. The primary input power is 220-240 Vac.
2. The color coding of the conductors in the input cable is different (see table in subsection 5.4).
3. The duplex receptacles are of the twist-lock type.
4. F01 is 10 amperes.

5.4.6.3 30A, 60-Hz PDU (BPDU630A)

As shown in Figure 5-38, primary power enters the PDU via a three-conductor cable carrying a phase wire, neutral, and safety ground. The free end of this input cable terminates in a three-pole male connector. The cord enters the cassis through a compression clamp. After passing through the compression clamp, the neutral lead is hard-wired to the EMI/RFI filter. The phase wire is connected to a single pole, 25A circuit breaker, and the output of the breaker is wired to the phase terminal of the EMI/RFI filter.

The output from the filter passes through a 15-ampere fuse to a duplex receptacle (J03) and is also tied to the input of line contactor K01. One of the J02 receptacles is for the memory save power supply, and the other is for use through a switch in the remote control panel.

As shown in Figure 5-41, when the switch in the remote control panel is turned on, the coil of K01 in the PDU is energized, allowing the phase voltage to connect to fuse/receptacle combination F02/J04, F03/J05, and F04/J06. A four microfarad capacitor (C01) is connected from the phase to the neutral on the load side of K01 to suppress voltage transients that can occur when the contacts of K01 open.

Although the memory save power supply is energized whenever the circuit breaker is set to ON, the switch at the remote control panel must be ON before phase voltage will be present at J04, J05, and J06.

All fuses are rated at 15-amperes, and all receptacles are of the duplex type. All receptacles are connected to a common neutral and common safety ground.

5.4.7 Maintenance

The only maintenance required on the single-phase PDU is replacement of complete units.

5.4.7.1 Preventive Maintenance

The single-phase PDU requires no preventive maintenance.

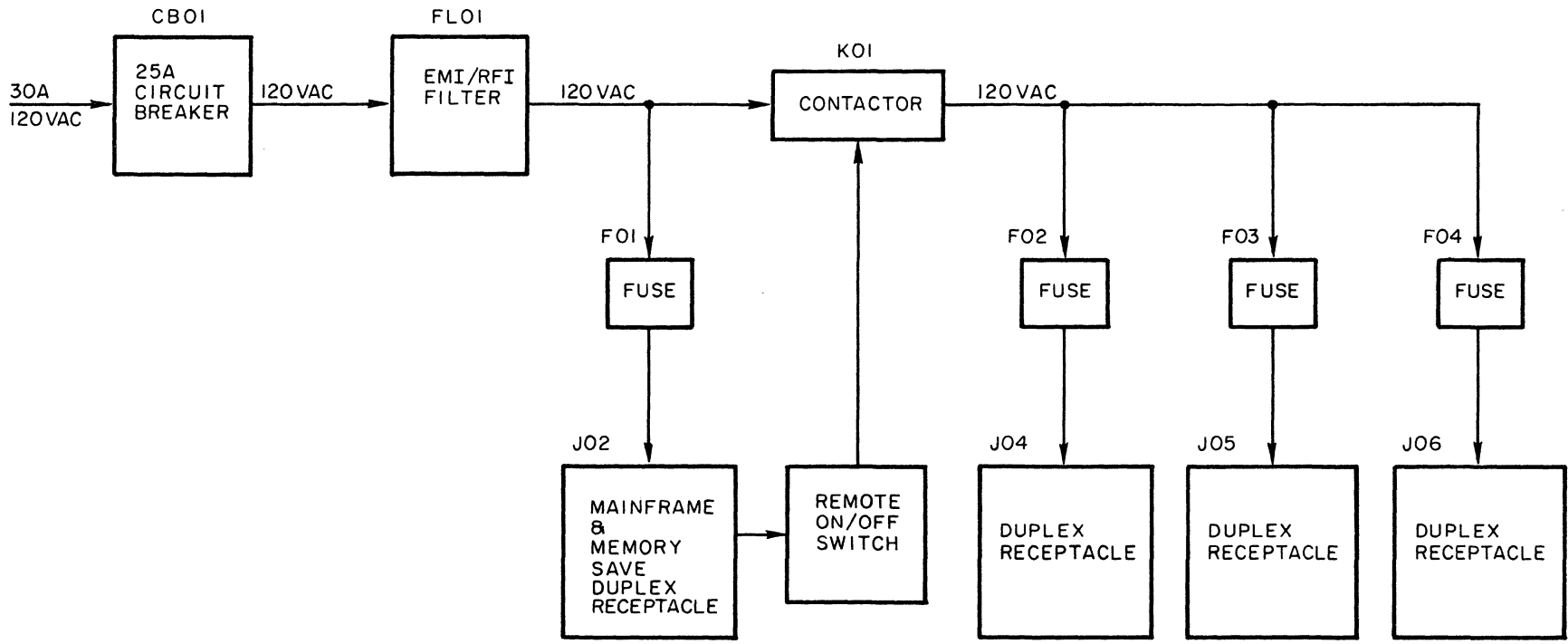


Figure 5-38 Power Distribution Unit, 30A, BPDU630A Diagram

5.4.7.2 Corrective Maintenance

On-site corrective maintenance of a failed PDU is limited to replacement of complete units. Only qualified personnel should perform this operation.

5.4.7.2.1 PDU Removal

Removal of the PDU is accomplished using the following procedures:

1. Set the POWER ON/OFF switch on the front panel of the computer to OFF.
2. Set the POWER ON/OFF switch on the front panel of the memory save power supply to OFF.
3. On a 30A PDU, manually set circuit breaker CB01 to OFF.
4. Pull the PDU input primary plug from its receptacle.
5. Pull the equipment primary plug from all receptacles.
6. At the front of the PDU, remove the four machine screws and washers securing the PDU front panel to the rack members.
7. Withdraw PDU and set aside.

5.4.7.2.2 PDU Replacement

To install a replacement PDU, perform the following steps:

1. Slide the unit into its rack space until the front panel is flush with the front panels above it.
2. Replace the four machine screws and washers, and secure the PDU front panel to the vertical rack members.
3. Insert the primary power plug of the computer into its receptacle.
4. Insert the memory save power supply primary power plug into its receptacle.
5. Insert power plugs of any remaining rackmounted equipment into output duplex receptacles.

CAUTION

To prevent damage to the equipment, check that the 30A PDU circuit breaker (CB01) and computer POWER ON/OFF switch and memory save power supply ON/OFF switch are set to the OFF position before performing the next step.

6. Insert PDU primary power plug into wall or floor-mounted primary receptacle from which the original PDU was disconnected.
7. On a 30A PDU, set CB01 to ON.
8. Set memory save power supply ON/OFF switch to ON.

9. Set the POWER ON/OFF switch on the remote control panel to ON.
10. Make sure that all rack equipment is receiving primary power when the switch on the remote control panel is ON, and that all primary power to rackmounted units is removed when the switch is set to OFF.

CAUTION

To prevent damage to the equipment, before replacing a fuse, see that CB01 or the power switch on the remote control panel is OFF on a 30A PDU. On all other single-phase type PDUs, make sure that the switch on the remote control panel is OFF.

5.4.8 Reference Diagrams

The following schematic diagrams are included in this manual for instructional or reference purposes only:

- Figure 5-39 Power Distribution Unit (BPDU615A and BPDU620A) Schematic - 15A, 20A, 60-Hz
- Figure 5-40 Power Distribution Unit (BPDU515A) Schematic - 15A, 50-Hz
- Figure 5-41 Power Distribution Unit (BPDU630A) Schematic - 30A, 60-Hz.



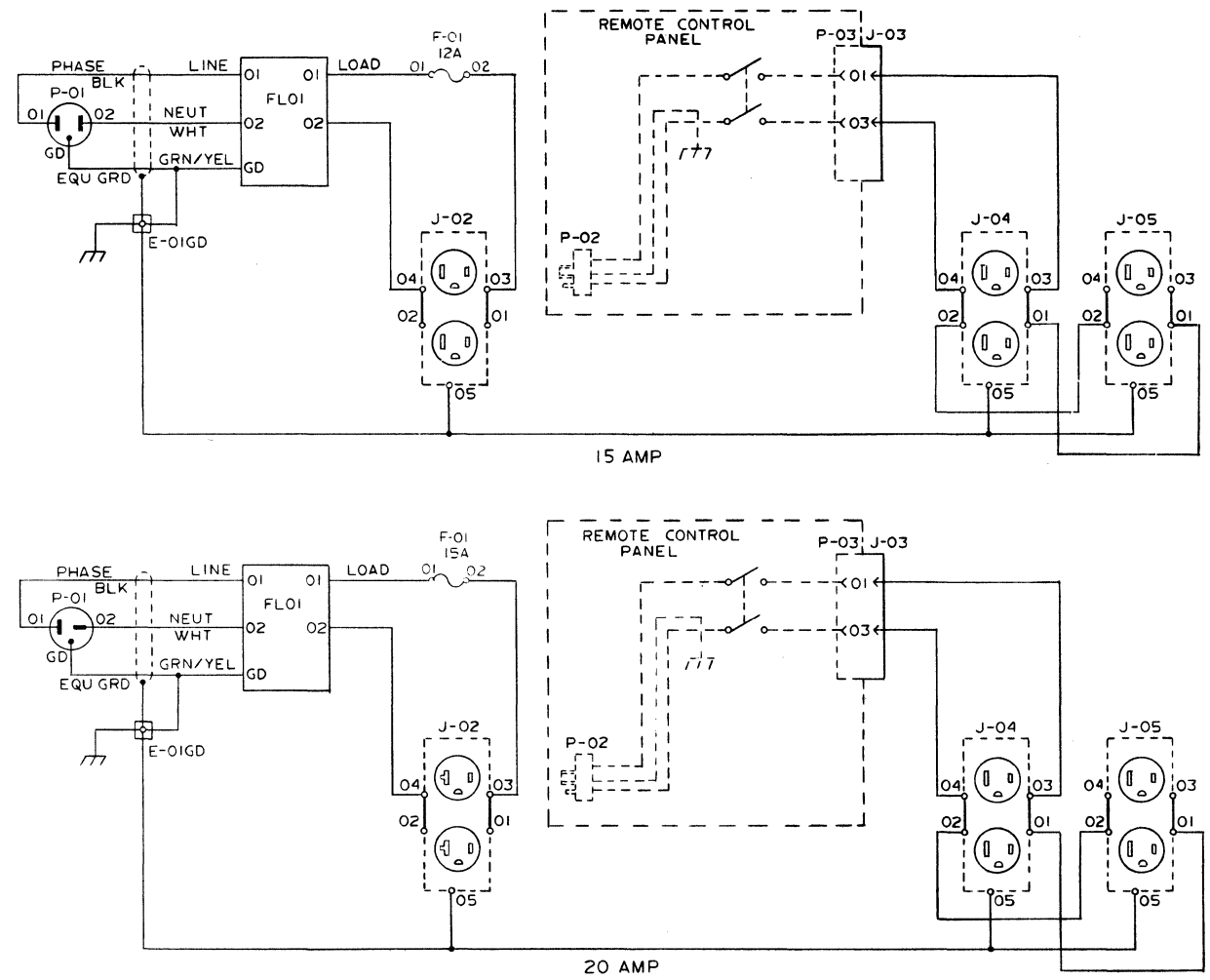


Figure 5-39 Power Distribution Unit, 60-Hz, 15/20A, BPDU615A/BPDU620A Schematic

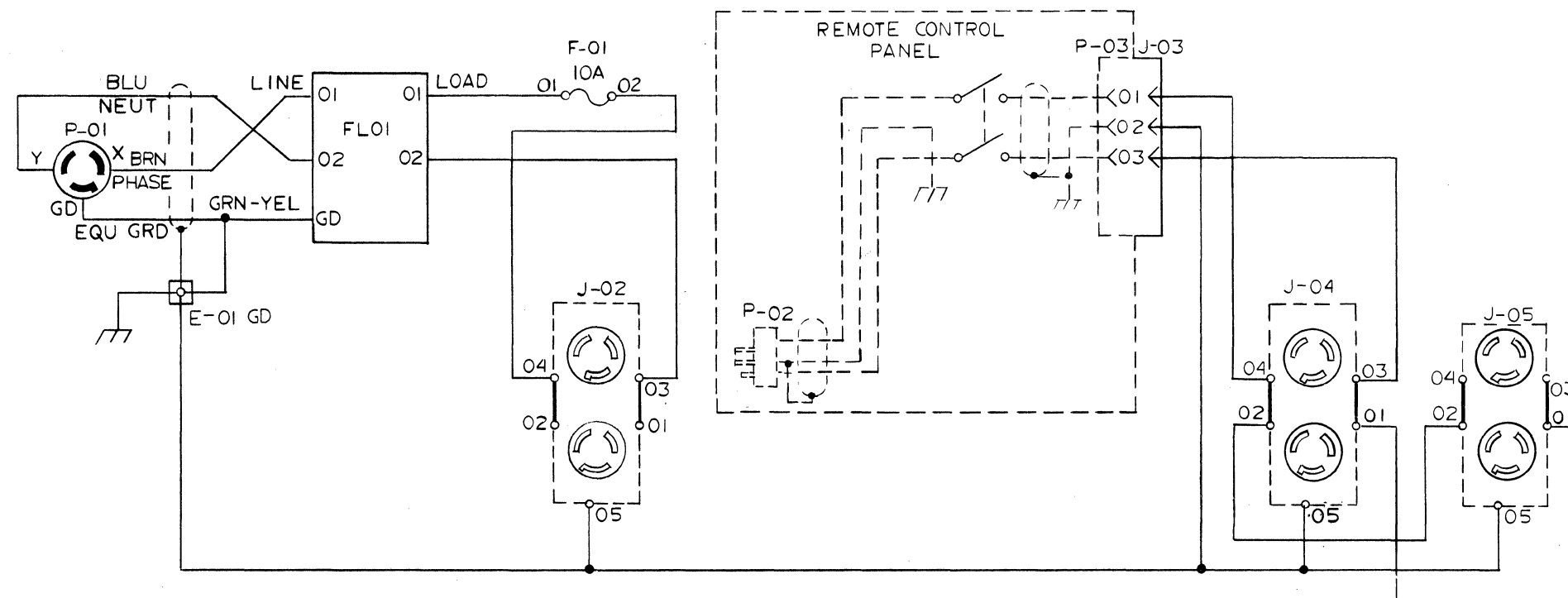


Figure 5-40 Power Distribution Unit, 50-Hz, 15A, BPDU515A Schematic

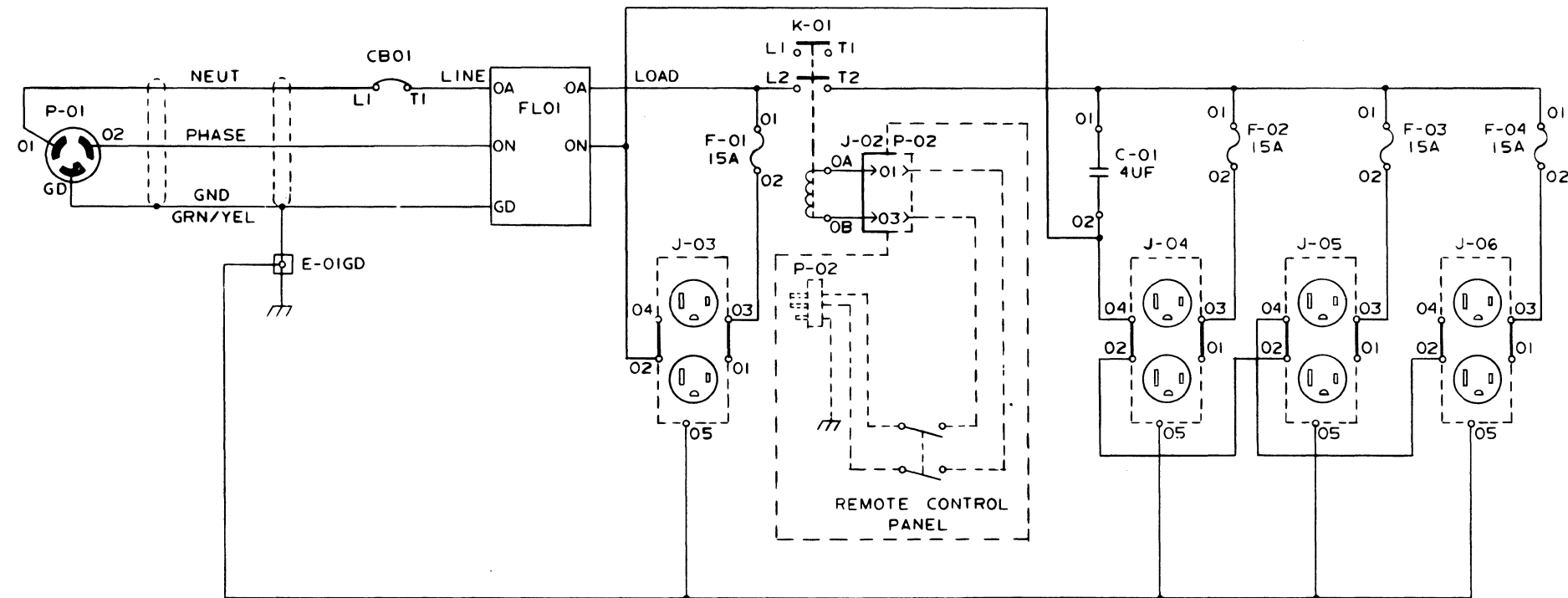


Figure 5-41 Power Distribution Unit, 60-Hz, 30A, BPDU630A Schematic

VI

GROUNDING SYSTEM

6.1 GENERAL

The Series 60 Level 6 multipoint grounding system is a safe, low-noise, mechanically simple arrangement. A major advantage of multipoint grounding is the noise reduction relative to the dc ground wire current generated by dc switching supplies, e.g., those used in the central system and memory save power supplies.

6.2 DESCRIPTION

Figure 6-1 illustrates multipoint grounding of a typical table-top system. Figure 6-2 illustrates multipoint grounding of a 60- or 30-inch rackmounted dual-unit system with a single peripheral.

6.3 INSTALLATION

Systems are delivered with all wiring completed for multipoint grounding. Connection to primary power safety ground is accomplished automatically when the PDU primary power plug is inserted in a three-phase receptacle at the user's location.

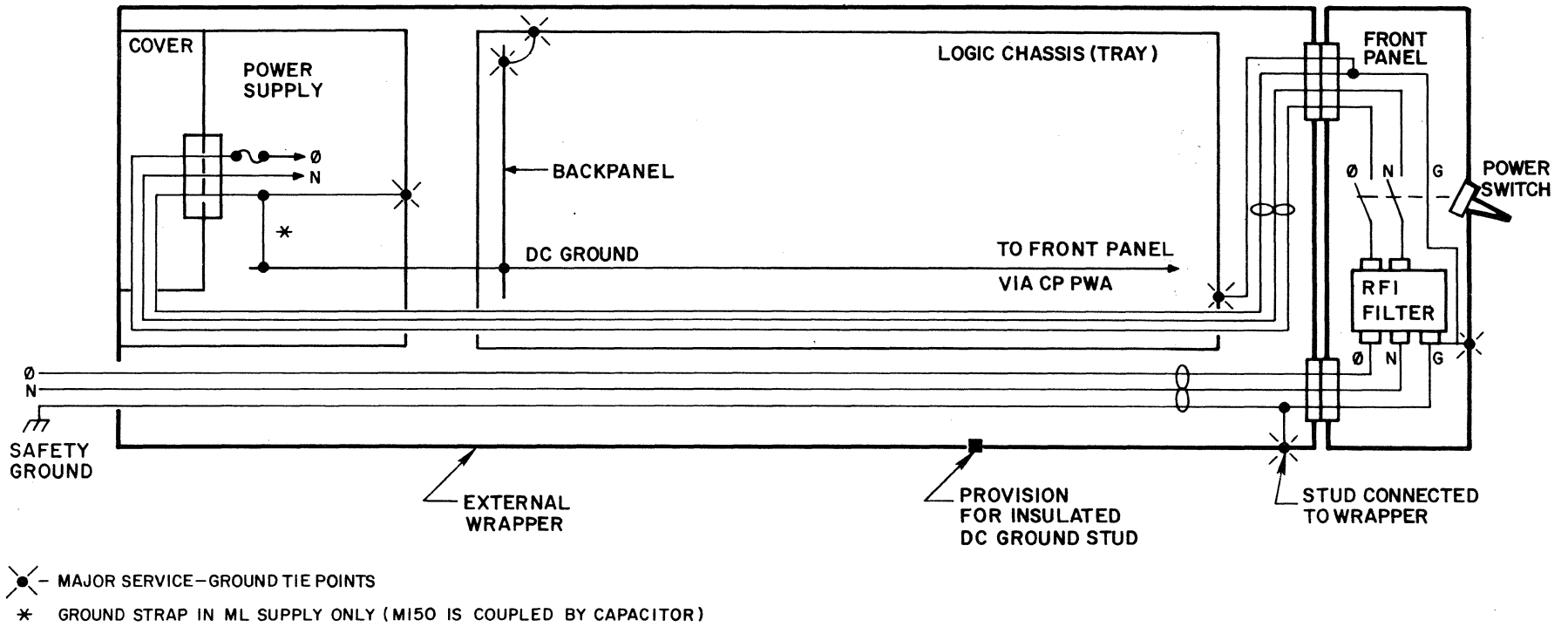
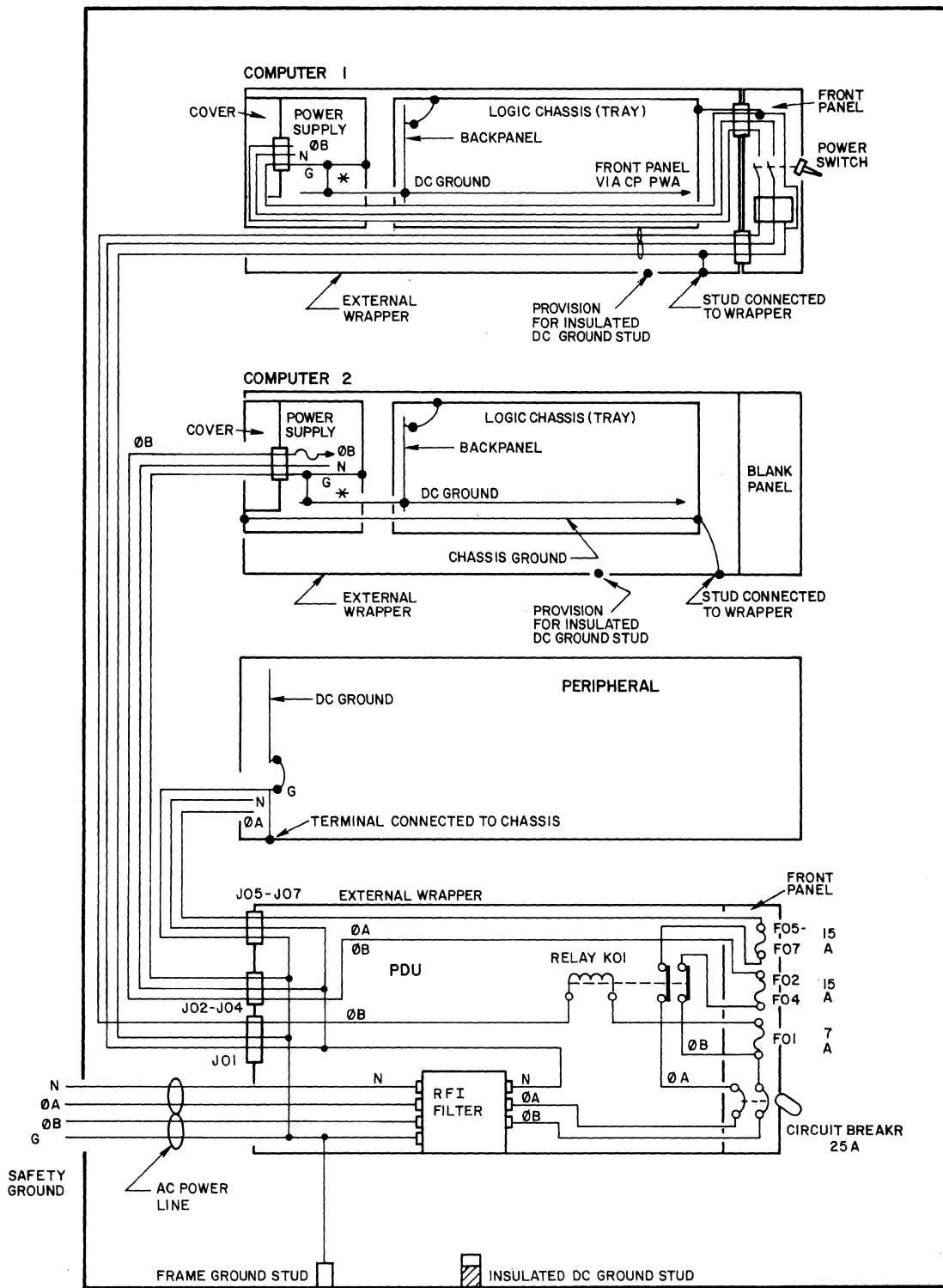


Figure 6-1 Multipoint Grounding, Tabletop Configuration



* GROUND STRAP IN TYPE ML SUPPLY ONLY.
 TYPE M150 IS COUPLED BY CAPACITOR.

Figure 6-2 Multipoint Grounding, Rackmounted Dual-Unit System With Single Peripheral (60-Inch and 30-Inch Including Office Furniture Package)

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