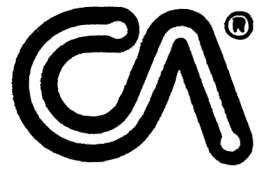
CHASSIS CONFIGURATION REFERENCE AND INSTALLATION MANUAL

21426-91 (A1)

AUGUST 1982



ComputerAutomation®

NAKED MINI® Division

18651 Von Karman, Irvine, CA 92713
tel. (714) 833-8830 TWX: (910) 595-1767

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A1	Aug. 1982	Corrects fuse value and other power supply information.

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PREFACE

The Chassis Configuration Reference and Installation Manual describes all Computer Automation, Inc. chassis and power supplies. The manual gives the basic procedures for planning system layout and the considerations in selecting chassis and power supplies. Chassis cooling and physical installation information is also provided.

The user should consult the appropriate reference manual for details pertaining to specific processors. Available documentation is listed in the NAKED MINI® Division User Publications Index, 21223-91.

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SECTION 1

SYSTEM PLANNING AND LAYOUT

Computer Automation, Inc. manufactures several chassis and power supplies permitting considerable flexibility in system configuration, including the use of multiple (expansion) chassis with some chassis types. Prior to assembling a system, the chassis size and power supply requirements must be calculated. The calculations are based on the number and type of devices to be placed in the system. After determining these requirements, the arrangement of the boards in the chassis must be arrived at.

The arrangement of printed circuit boards in the system chassis is dependent on three considerations: the installation requirements of the chassis used; device priorities determined from system analysis; and (if an expansion chassis is used) the available power. The installation requirements and priority chain propagation directions for each chassis, and the output capabilities of the available power supplies are described in this manual. Power requirements for processor, memory, I/O controller and other devices are found in the corresponding reference manual.

1.1 INITIAL PLANNING

The initial step in planning the system layout is to list all of the devices that draw power from the chassis supply. Figure 1-1 is a sample hardware summary form that can be used for this purpose. Three full size worksheets can be found in the appendix. The following columns are provided.

CARD SIZE--Half or full. This column is useful in counting the number of occupied slots in the chassis. Leave this column blank when listing Intelligent Cables.

MAXIMUM CURRENT--The maximum current (in amps) required by the device of each power supply output voltage. This information can be obtained from the appropriate reference manual or data sheet.

I/O CONTROLLER--Check the appropriate type. This column is useful for arranging cards along the appropriate priority chain.

MEMORY CAPABILITY--Storage capacity of the memory in kilobytes.

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1.2 HOW TO USE THE HARDWARE SUMMARY FORM

A separate hardware summary form should be filled out for each chassis in the system. The best approach is to assign the cards in the most desirable arrangement, and then check that this arrangement gives the best ordering of cards along the various priority chains without exceeding the available power. The hardware summary form acts, in effect, as a worksheet which may require up to two alterations--once if the available chassis power is exceeded, and again if rearrangement is required to make better use of the priority chains.

Begin the board assignment procedure by listing each board in the processor chassis. Enter processor board and console data on the first and second line of the form, respectively. (If the processor uses an option card, the current draw of the card must also be included.) Then enter data for each card in that chassis. List each I/O controller and memory module on a separate line. Also list each Intelligent Cable separately, making sure that enough I/O Distributor channels are available. Then, if required, use a new form to enter the boards in the expansion chassis, starting with the buffer card. Blank drawings of the chassis in which the location of all devices can be filled in are also provided in the appendix.

1.3 CHASSIS SELECTION RESTRICTIONS

The user must ensure that the total complement of devices will never consume more power than the supply provided is guaranteed to deliver. The power limitation can be investigated by adding the current consumption of all boards and Intelligent Cables listed on the hardware summary form for that chassis, and comparing the total with the appropriate power supply output.

DEVICE NAME	CARD SIZE	MAX. CURRENT			I/O CONTROLLER			MEMORY CAPACITY
		+5V	+12V	-12V	DMA	Interrupt	Intel. Cable	

Figure 1-1. Hardware Summary List

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SECTION 2

POWER SUPPLIES

Computer Automation, Inc. manufactures 10, 17, 25, 36, and 60 amp power supplies. The 10, 17, 25, and 36 amp supplies are available as internally mounted versions provided with the chassis ordered. The 36 and 60 amp supplies are available in externally mounted versions. The externally mounted versions can be connected to the standard 9-slot, S9, and S17 chassis. (The 9- and 17-slot "split" chassis are designated S9 and S17, respectively.) The S9-chassis is available in two versions. One uses one externally mounted power supply only. The other has provision for two externally mounted supplies. The S17-chassis has provision for two externally mounted supplies.

2.1 HALF-CARD CHASSIS 10-AMP POWER SUPPLY

This subsection describes the 10-Amp power supply available with the 3-slot half-card chassis.

2.1.1 AC Inputs

The half-card chassis 10 A power supply accepts single-phase input power at 47 to 63 Hz in either of two voltage ranges:

- 115 VAC ± 10%
- 230 VAC ± 10%

The AC input range is preset at the factory, but is field-alterable.

2.1.2 Power Supply Outputs

The half-card chassis 10 A power supply outputs four DC voltages and two logic signals. The DC output voltages are as follows:

- +5 VDC ± 2% at 10 A max.
- +5 VDC Hang ± 5% at 0.1 A max.
- +12 VDC ± 2% at 0.8 A max.
- -12 VDC ± 2% at 0.8 A max.

The +5 VDC 10 A and +12 VDC outputs include an overvoltage crowbar. These crowbars prevent the 5-volt output from exceeding 6.8 VDC and the +12-volt output from exceeding +13.5 VDC in the event of a power supply failure or application of a higher potential from an external source. Further, each power supply output is provided with current- and voltage-limiting circuitry to prevent damage to the supply in any situation.

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The power supply presents two logic signals to the computer, PFD- and TTLF. Power Fail Detect (PFD-) is driven low if the AC line voltage drops below a preset level wherein the power outputs are in danger of going out of tolerance, and is used with +5V Hang to perform an orderly shutdown of the computer. Twice The Line Frequency (TTLF) is a pulse train having twice the frequency of the AC power line and is used as a time base by the Real-Time Clock.

2.1.3 Environmental Characteristics

The 10 A power supply operates in an ambient temperature range of -5°C to 50°C and a relative humidity range of 5% to 95% without condensation, at altitudes up to 10,000 feet. It can be stored in an environment with an ambient temperature range of -40°C to +80°C and a relative humidity range of 10% to 90% without condensation, at altitudes up to 40,000 feet.

2.1.4 Mechanical Characteristics

The 10 A chassis power supply is 14.22 cm. (5.6 in.) wide, 44.45 cm. (17.5 in.) long and 20.52 cm. (8.08 in.) deep. The line fuse and power switch associated with the power supply are located on the power supply chassis.

The DC outputs of the power supply, as well as its logic and control signals, are accessible at the Molex connector J4 on the motherboard. Table 2-1 summarizes the pin assignments for this connector.

Table 2-1. Pin Assignments, Connector J4

PIN	SIGNAL	PIN	SIGNAL
1	Ground	11	PFD-
2	+12 V	12	+5 V
3	Blank (Key)	13	+5 V
4	−12 V	14	Ground
5	+5 V Hang	15	Ground
6	TTLF	16	+5 V
7	+5 V	17	+5 V
8	Ground	18	Not Used
9	Ground	19	Ground
10	+5 V	20	Ground

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2.1.5 Power Conversion

The half-card chassis with a 10-AMP power supply may be powered from a 115 or 230 VAC input source. The power supply is configured to accept either source and can be field-altered to accept the alternate source. Figure 2-1 illustrates the power supply control panel.

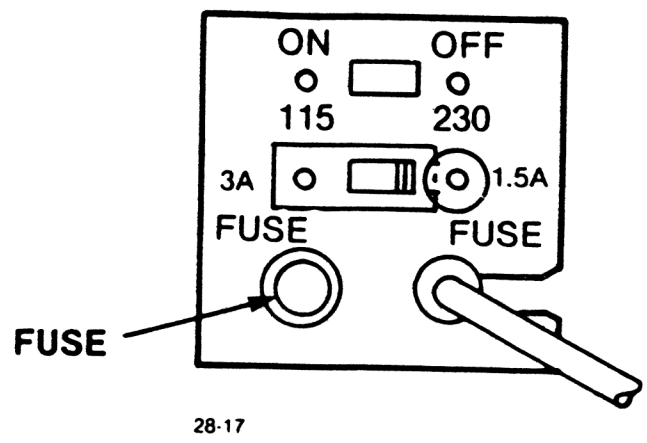


Figure 2-1. 10-Amp Power Supply Control Panel

2.1.5.1 Converting From 115 VAC to 230 VAC

To convert from 115 VAC to 230 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.
2. Lift plastic cover from the conversion switch on the power supply control panel.
3. Insert a narrow blade screwdriver in the power conversion switch slot and move the switch fully to the 230 VAC position.
4. Replace plastic cover under nylon washer.
5. Install an appropriate 3-conductor grounding 230-volt AC plug on the line cord.
6. Replace the 3 A, 125 V slo-blo line fuse with a 1.5 A, 250 V slo-blo fuse.
7. Connect the line cord to its AC power source, then switch power on and test the computer.

2.1.5.2 Converting From 230 VAC to 115 VAC

To convert from 230 VAC to 115 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.
2. Lift plastic cover from the conversion switch on the power supply control panel.

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3. Insert a narrow blade screwdriver in the power conversion switch slot and move switch fully to the 115 VAC position.

4. Replace plastic cover under nylon washer.

5. Install an appropriate 3-conductor grounding 115-volt AC plug on the line cord.

6. Replace the 1.5 A, 250 V slo-blo line fuse with a 3 A, 125 V slo-blo fuse.

7. Connect the line cord to its AC power source, then switch power on and test the computer.

2.2 HALF-CARD CHASSIS 17-AMP POWER SUPPLY

This subsection describes the 17-AMP power supply available with the 3-slot and 5-slop half-card chassis. The 17-AMP power supply is shown in Figure 2-2.

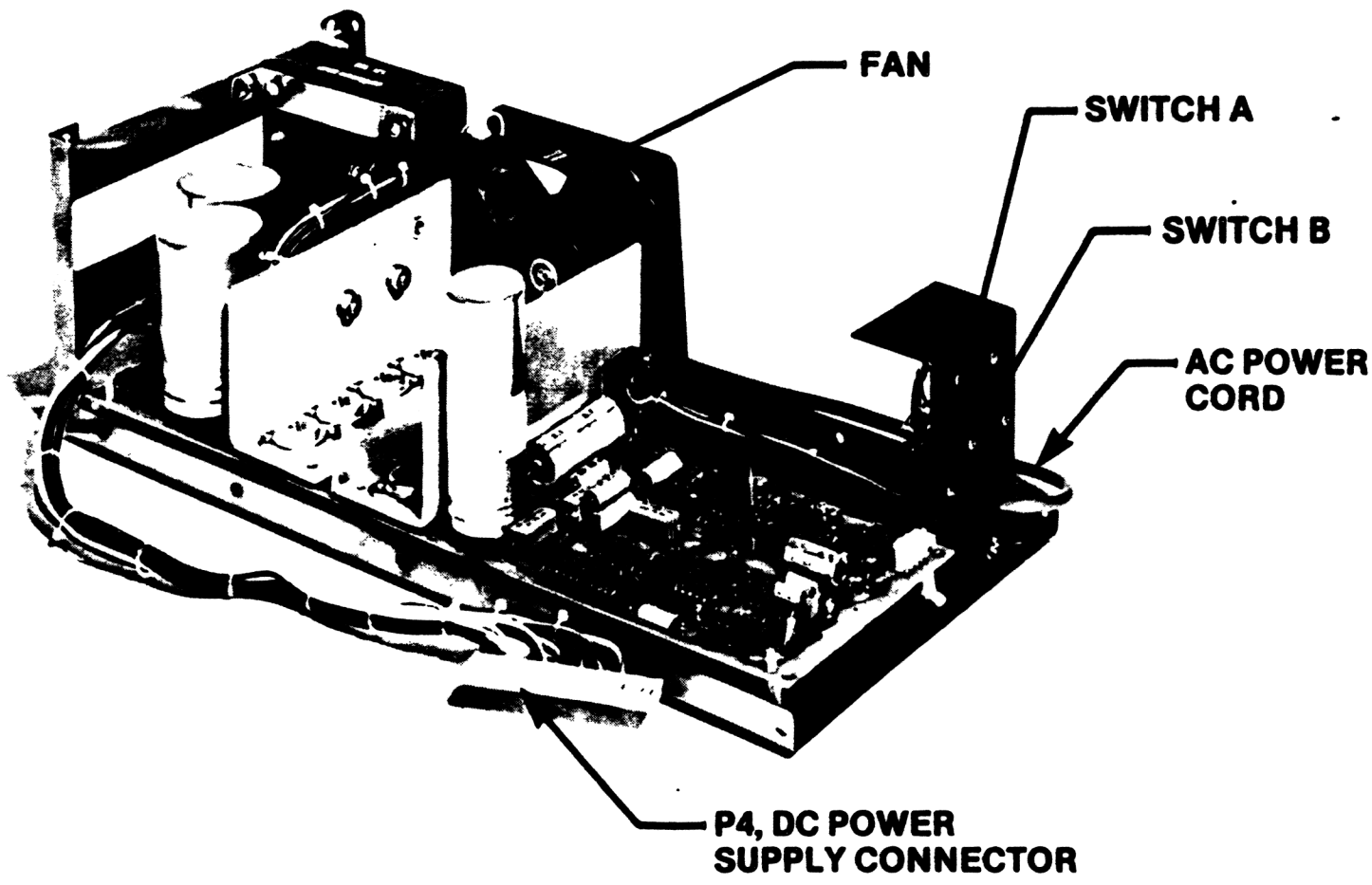


Figure 2-2. 17-AMP Power Supply

2.2.1 AC Inputs

The half-card chassis 17 A power supply accepts single-phase input power at 47 to 63 Hz in any of four voltage ranges:

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100 VAC ± 10%
117 VAC ± 10%
220 VAC ± 10%
240 VAC ± 10%

The AC input range is preset at the factory, but is field-alterable.

2.2.2 Power Supply Outputs

The half-card chassis 17 A power supply outputs four DC voltages and two logic signals. The DC output voltages are as follows:

+5 VDC ± 2% at 17 A max.
+5 VDC Hang ± 5% at 0.1 A max.
+12 VDC ± 2% at 1.5 A max.
-12 VDC ± 2% at 3.5 A max.

The +5 VDC 10 A, + 12 V and -12 V outputs include an overvoltage crowbar. This crowbar prevents the 5-volt output from exceeding 6.8 VDC and the ± 12-volt outputs from exceeding ± 14.5 VDC, respectively, in the event of a power supply failure or application of a higher potential from an external source. Further, each power supply output is provided with current- and voltage-limiting circuitry to prevent damage to the supply in any situation.

The power supply presents two logic signals to the computer, PFD- and TTLF. Power Fail Detect (PFD-) is driven low if the AC line voltage drops below a preset level wherein the power outputs are in danger of going out of tolerance (operation plus 2ms for storage), and is used together with +5V Hang to perform an orderly shutdown of the computer. Twice The Line Frequency (TTLF) is a pulse train having twice the frequency of the AC power line and is used as a time base by the Real-Time Clock.

2.2.3 Environmental Characteristics

The 17 A power supply operates in an ambient temperature range of -5°C to 50°C and a relative humidity range of 5% to 95% without condensation, at altitudes up to 10,000 feet. It can be stored in an environment with an ambient temperature range of -40°C to +80°C and a relative humidity range of 5% to 95% without condensation, at altitudes up to 40,000 feet.

2.2.4 Mechanical Characteristics

The 17 A chassis power supply is 20.52 cm. (8.08 in.) wide, 44.45 cm. (17.5 in.) long and 14.22 cm. (5.6 in.) deep. The line fuse and power switch associated with the power supply are located on the power supply chassis.

The DC outputs of the power supply, as well as its logic and control signals, are accessible at the Molex connector J4 on the motherboard. Table 2-2 summarizes the pin assignments for this connector.

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Table 2-2. Pin Assignments, Connector J4

PIN	SIGNAL	PIN	SIGNAL
1	Ground	11	PFD–
2	+12 V	12	+5 V
3	Blank (Key)	13	+5 V
4	–12 V	14	Ground
5	+5 V Hang	15	Ground
6	TTLF	16	+5 V
7	+5 V	17	+5 V
8	Ground	18	Not Used
9	Ground	19	Ground
10	+5 V	20	Ground

2.2.5 Power Conversion

The half-card chassis with a 17-AMP power supply may be powered from a 100, 117, 220 or 240 VAC input source. The power supply is configured to accept either a 100/117 VAC source or a 220/240 VAC source, and can be field-altered to accept the alternate source. Figure 2-3 illustrates the power supply control panel.

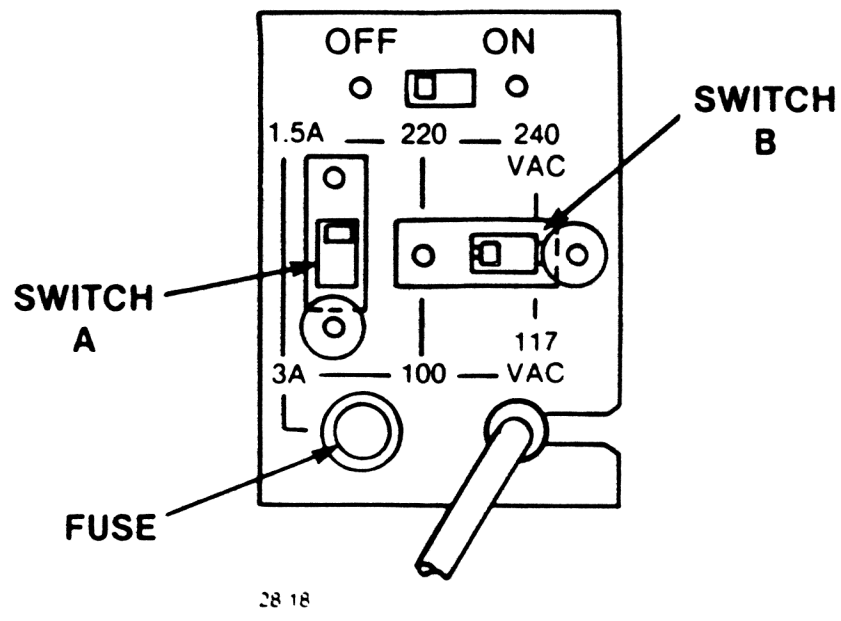


Figure 2-3. 17-AMP Power Supply Control Panel

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2.2.5.1 Converting From 100/117 VAC to 220/240 VAC

To convert from 100/117 VAC to 220/240 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.
2. Lift plastic covers from Switch A and Switch B at the rear of the power source.
3. Determine switch settings from Table 2-3 and, using a narrow blade screwdriver, set the switches accordingly.
4. Replace plastic switch covers under nylon washers.
5. Install an appropriate 3-conductor grounding 230-volt AC plug on the line cord.
6. Replace the 3 A, 125 V slo-blo line fuse with a 1.5 A, 250 V slo-blo fuse.
7. Connect the line cord to its AC power source, then switch power on and test the computer.

2.2.5.2 Converting From 220/240 VAC to 100/117 VAC

To convert from 100/117 VAC to 220/240 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.
2. Lift plastic covers from Switch A and Switch B at the rear of the power supply.
3. Determine switch settings from Table 2-3 and, using a narrow blade screwdriver, set the switches accordingly.
4. Replace plastic switch covers under nylon washers.
5. Install an appropriate 3-conductor grounding 115-volt AC plug on the line cord.
6. Replace the 1.5 A, 250 V slo-blo line fuse with a 3 A, 125 V slo-blo fuse.
7. Connect the line cord to its AC power source, then switch power on and test the computer.

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Table 2-3. Voltage Range Switch Settings

LABEL	VOLTAGE RANGE		SWITCH POSITION		FUSE
	Low	High	Switch A	Switch B	
100	90	110	3A	100/220	3A
117	105.3	128.7	3A	117/240	3A
220	198	242	1.5A	110/220	1.5A
240	216	264	1.5A	117/240	1.5A

2.3 5-SLOT FULL-CARD CHASSIS 25-AMP POWER SUPPLY

This subsection describes the 25 A power supply available with the 5-slot chassis. The 25-AMP power supply is shown in Figure 2-4.

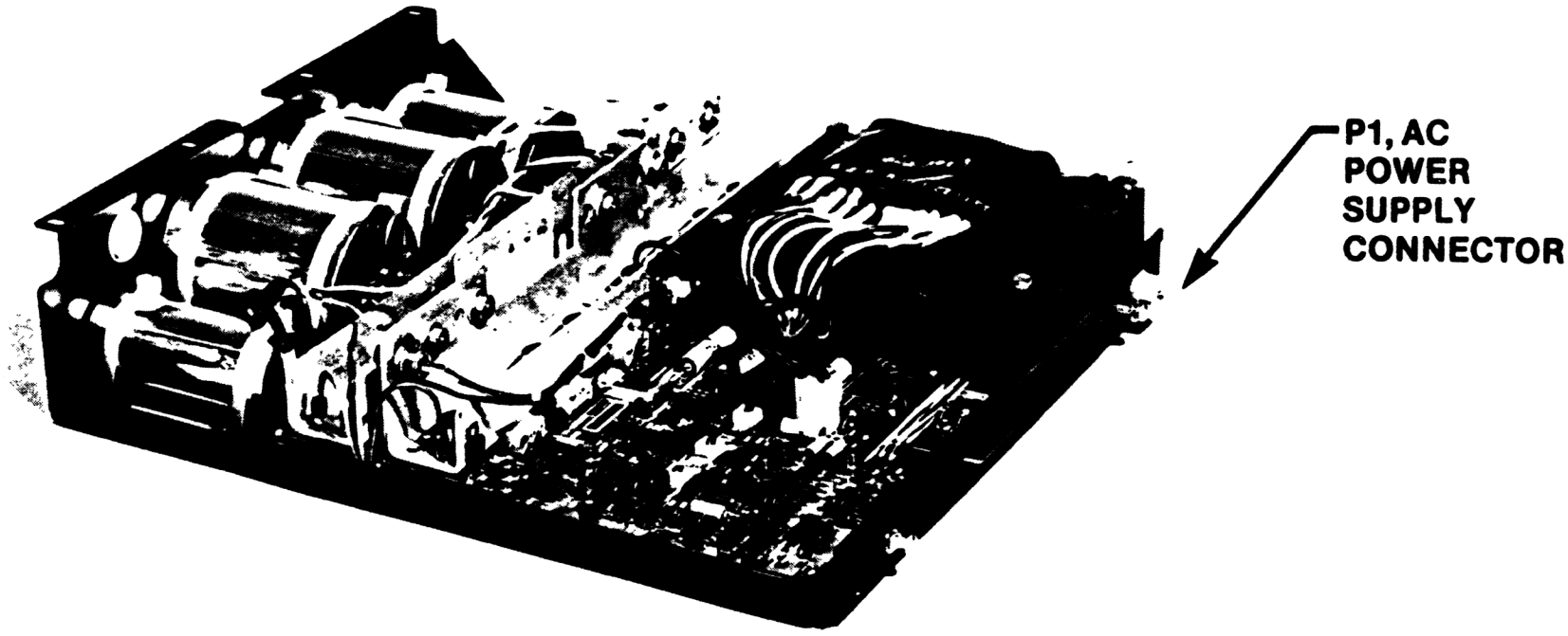


Figure 2-4. 25-AMP Internal Power Supply

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2.3.1 AC Inputs

The 5-slot chassis 25 A power supply accepts single-phase input power at 47 to 63 Hz in any of four voltage ranges:

- 100 VAC ± 10%
- 117 VAC ± 10%
- 220 VAC ± 10%
- 240 VAC ± 10%

The AC input range is set at the factory, but is field-alterable.

2.3.2 Power Supply Outputs

The 5-slot chassis 25 A power supply outputs four DC voltages and two logic signals. The DC output voltages are as follows:

- +5 VDC + 2% at 25 A max.
- +5 VDC Hang ± 5% at 0.2 A max.
- +12 VDC ± 2% at 4 A max.
- -12 VDC ± 2% at 9 A max.

The +5 VDC 25 A output includes an overvoltage crowbar. This crowbar prevents the 5-volt output from exceeding 6.8 VDC in the event of a power supply failure or application of a higher potential from an external source. Further, each power supply output is provided with current- and voltage-limiting circuitry to prevent damage to the supply in any situation.

The power supply presents two logic signals to the computer, PFD- and TTLF. Power Fail Detect (PFD-) is driven low if the AC line voltage drops below a preset level wherein the power outputs are in danger of going out of tolerance, and is used together with +5V Hang to perform an orderly shutdown of the computer. Twice The Line Frequency (TTLF) is a pulse train having twice the frequency of the AC power line and is used as a time base by the Real-Time Clock.

2.3.3 Environmental Characteristics

The 25 A power supply operates in a ambient temperature range of -5°C to 50°C and a relative humidity range of 10% to 90% without condensation, at altitudes up to 10,000 feet. It can be stored in an environment with an ambient temperature range of -40°C to +80°C and a relative humidity range of 5% to 95% without condensation, at altitudes up to 40,000 feet.

2.3.4 Mechanical Characteristics

The 25 A chassis power supply is 38.1 cm. (15 in.) wide, 42.55 cm. (16.75 in.) long and 8.89 cm. (3.5 in.) deep. The line fuse and power switch associated with the power supply are located on the computer chassis.

The AC input from the line cord is transferred to the power supply via a fan housing cable harness, which has a 6-pin Molex connector that plugs into the power supply through a cutout in the chassis motherboard. (AC power to the

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fans is returned to the harness from a power supply transformed secondary winding, so the fan always receives 115 VAC, regardless of the primary line voltage.)

The DC outputs of the power supply, as well as its logic and control signals, are accessible at edge connector F100, the bottom connector on the motherboard. Table 2-4 summarizes the pin assignments for this connector.

Table 2-4. Pin Assignments, Connector F100

PIN	SIGNAL	PIN	SIGNAL
101	TTLF	119	+12 V
102	−12 V	120	Ground
103	+5 V Hang	121	+12 V
104	−12 V	122	Ground
105	PFD−	123	−12 V
106	−12 V	124	Ground
107	+5 V	125	−12 V
108	+12 V	126	Ground
109	+5 V	127	−12 V
110	+12 V	128	Ground
111	+5 V	129	+5 V
112	+12 V	130	Ground
113	+5 V	131	+5 V
114	Ground	132	Ground
115	Ground	133	+5 V
116	Ground	134	Ground
117	Ground	135	+5 V
118	Ground	136	Ground

2.3.5 Power Conversion

The 5-slot chassis with a 25-amp power supply may be powered from a 100, 117, 220 or 240 VAC input source. The power supply is configured to accept either a 100/117 VAC source or a 220/240 VAC source, but can be field-altered to accept the alternate source.

2.3.5.1 Converting From 100/117 VAC to 220/240 VAC

To convert from 100/117 VAC to 220/240 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.

2. Remove Console from front of chassis.

3. Disconnect AC power connector P1 from the power supply. Power connector P1 is connected to the power supply thought a cutout in the motherboard.

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4. Using a Molex removal tool, remove pin 3 from power connector P1. (The pins are numbered on the wiring side of the connector. See Figure 2-5 for reference.) Insulate the pin with a piece of electrical tape, then tie back onto the cable.

5. Remove pin 6 from power connector P1 and insert it into the pin 3 position of P1.

6. Install an appropriate 3-conductor grounding 230-volt AC plug on the line cord.

7. Replace the 7 A, 125 V slo-blo line fuse with a 4 A, 250 V slo-blo fuse.

8. Reconnect power connector P1 to the power supply.

9. Reinstall the Console.

10. Connect the line cord to its AC power source, then switch power on and test the computer.

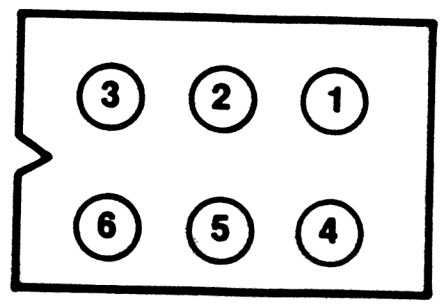


Figure 2-5. Pin Locations on Power Connector P1

2.3.5.2 Converting From 220/240 VAC to 100/117 VAC

To convert from 220/240 VAC to 100/117 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.

2. Remove Console from front of chassis.

3. Disconnect AC power connector P1 from the power supply. Power connector P1 is connected to the power supply through a cutout in the motherboard.

4. Using a Molex removal tool, remove pin 3 from power connector P1 and insert it into the pin 6 position of P1. (The pins are numbered on the wiring side of the connector. See Figure 2-3 for reference.)

5. Take the pin that is tied back onto the power cable (it contains a blue wire and a black wire) and insert it into the pin 3 position of P1.

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6. Install an appropriate 3-conductor grounding 115-volt AC plug on the line cord.

7. Replace the 4 A, 250 V slo-blo line fuse with a 7 A, 125 V slo-blo fuse.

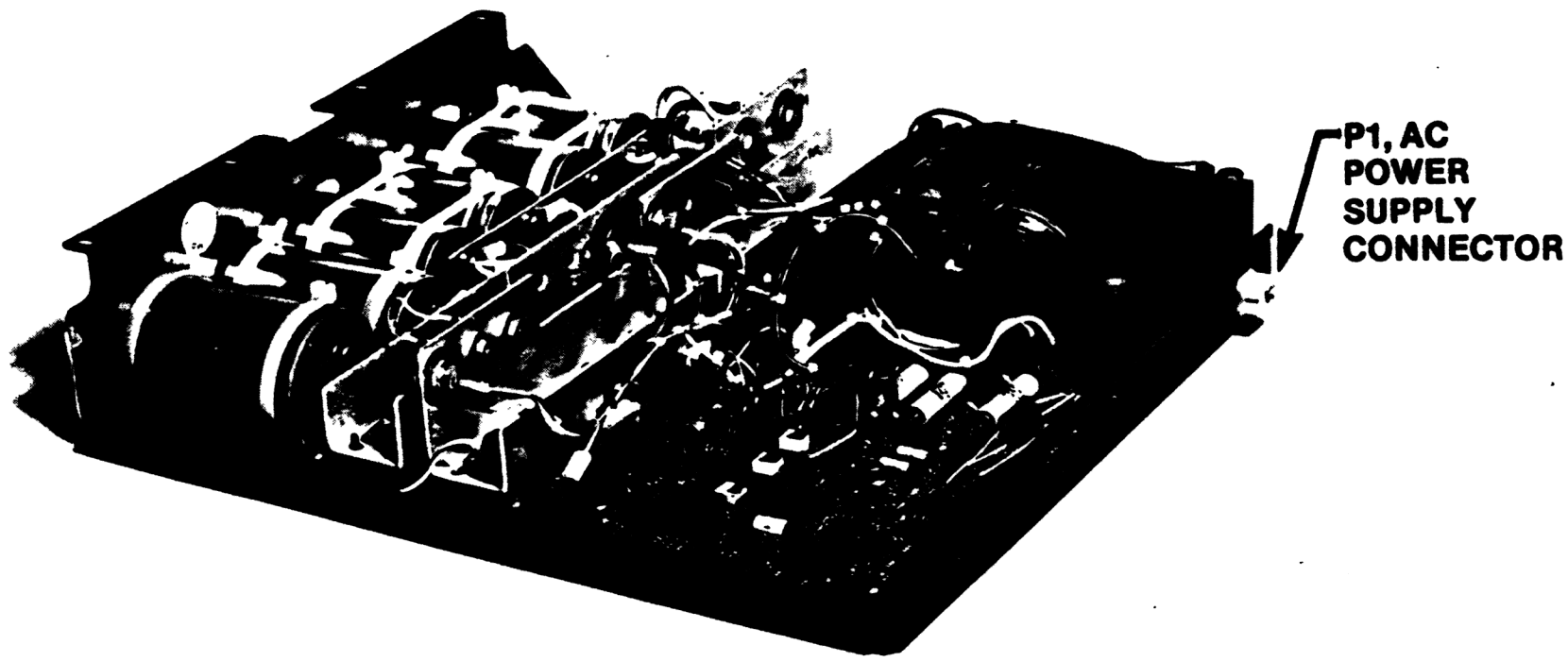
8. Reconnect power connector P1 to the power supply.

9. Reinstall the Console.

10. Connect the line cord to its AC power source, then switch power on and test the computer.

2.4 5-SLOT FULL-CARD CHASSIS 36-AMP POWER SUPPLY

This subsection describes the 36 AMP power supply available with the 5-slot chassis. The supply is internally mounted. The 36-AMP internal power supply is shown in Figure 2-6. A 5-slot full-card chassis with power supply mounted is shown in Figure 2-7.

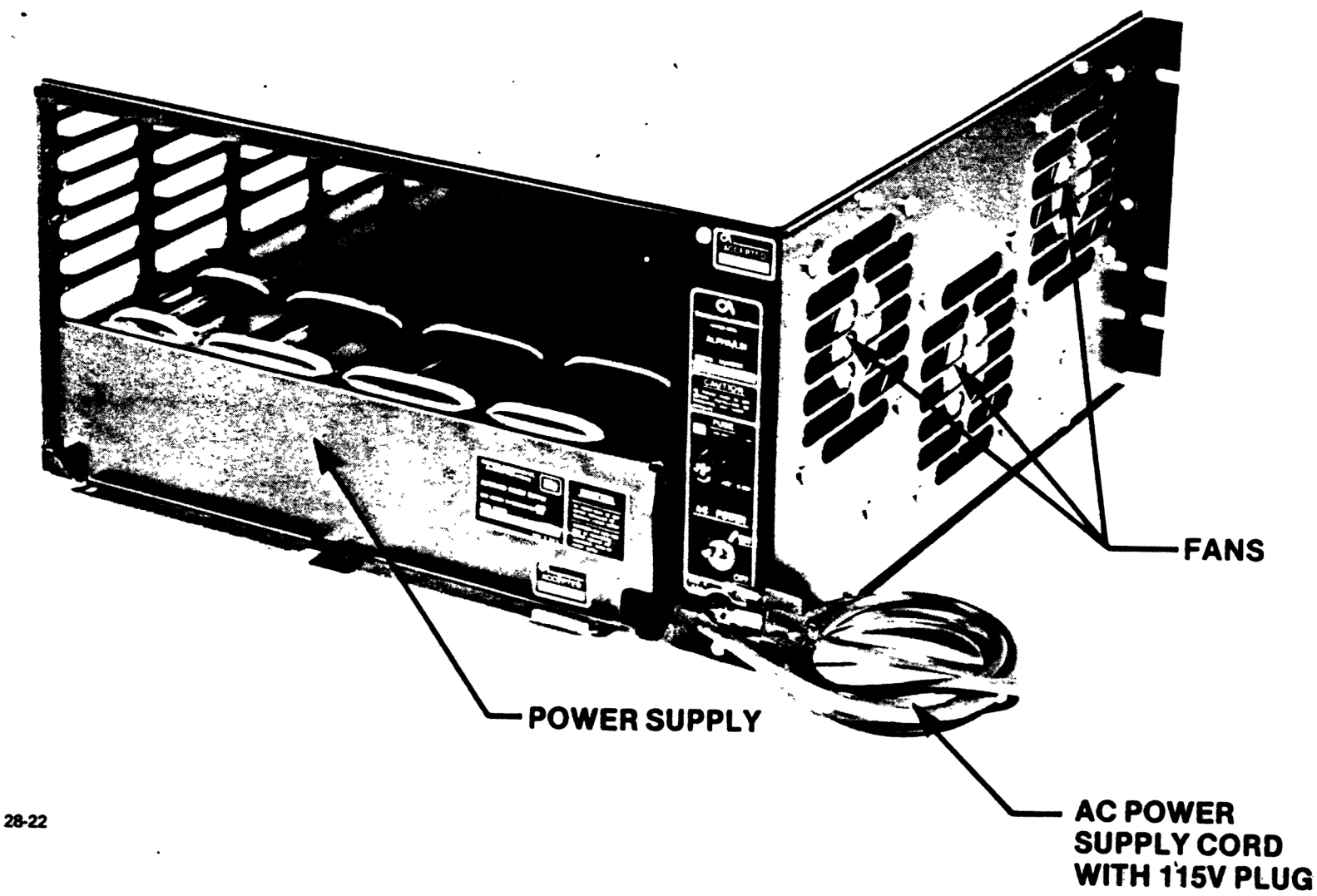


28-27

Figure 2-6. 36-AMP Internal Power Supply

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28-22

Figure 2-7. 5-Slot Full-Card Chassis with Power Supply

2.4.1 AC Inputs

The 5-slot chassis 36 A power supply accepts single-phase input power at 47 to 63 Hz in any of four voltage ranges:

- 100 VAC ± 10%
- 117 VAC ± 10%
- 220 VAC ± 10%
- 240 VAC ± 10%

The AC input range is set at the factory, but is field-alterable.

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2.4.2 Power Supply Outputs

The 5-slot chassis 36 A power supply outputs four DC voltages and two logic signals. The DC output voltages are as follows:

- + 5 VDC ± 2% at 36 A max.
- + 5 VDC Hang ± 5% at 0.2 A max.
- + 12 VDC ± 2% at 6 A max.
- - 12 VDC ± 2% at 9 A max.

The + 5 VDC 36 A and +12 VDC outputs include an overvoltage crowbar. These crowbars prevent the 5-volt output from exceeding 6.8 VDC, and the 12-volt output from exceeding 14.5 VDC, in the event of a power supply failure or application of a higher potential from an external source. Further, each power supply output is provided with current- and voltage-limiting circuitry to prevent damage to the supply in any situation.

The power supply presents two logic signals to the computer, PFD- and TTLF. Power Fail Detect (PFD-) is driven low if the AC line voltage drops below a preset level wherein the power outputs are in danger of going out of tolerance, and is used together with +5V Hang to perform an orderly shutdown of the computer. Twice The Line Frequency (TTLF) is a pulse train having twice the frequency of the AC power line and is used as a time base by the Real-Time Clock.

2.4.3 Environmental Characteristics

The 36 A power supply operates in a ambient temperature range of 0°C to +50°C and a relative humidity range of 10 to 90% without condensation, at altitudes up to 10,000 feet. It can be stored in an environment with an ambient tempera-ture range of -40°C to +80°C and a relative humidity range of 10 to 90% without condensation, at altitudes up to 40,000 feet.

2.4.4 Mechanical Characteristics

The 36 A chassis power supply is 38.1 cm. (15 in.) wide, 41.28 cm. (16.25 in.) long and 9.27 cm. (3.65 in.) deep. The line fuse and power switch associated with the power supply are located on the computer chassis.

The AC input from the line cord is transferred to the power supply via a fan housing cable harness, which has a 6-pin Molex connector that plugs into the power supply through a cutout in the chassis motherboard. (AC power to the fans is returned to the harness from a power supply transformed secondary wind ing, so the fan always receives 115 VAC, regardless of the primary line voltage.)

The DC outputs of the power supply, as well as its logic and control signals, are accessible at edge connector F100, the bottom connector on the mother-board. Table 2-4 summarizes the pin assignments for this connector.

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2.4.5 Power Conversion

The 5-slot chassis with a 36-AMP power supply may be powered from a 100, 117, 220, or 240 VAC input source, and can be field-altered to accept any one of these sources.

2.4.5.1 Converting From 100/117 VAC to 220/240 VAC

To convert from 100/117 VAC to 220/240 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.
2. Remove Console from front of chassis.
3. Disconnect AC power connector P1 from the power supply. Connector P1 is connected to the power supply through a cutout in the mother-board.
4. Using a Molex removal tool, remove pin 3 from power connector P1. (The pins are numbered on the wiring side of the connector.) Insulate the pin with electrical tape, then tie it back onto the cable.
5. Remove pin 4 from power connector P1 and insert it into the pin 3 position of P1.
6. Replace the 15 A, 250 V slo-blo line fuse with an 8 A, 250 V slo-blo fuse.
7. Install an appropriate 3-conductor grounding 230-volt AC plug on the line cord.

2.4.5.2 Converting From 220/240 VAC to 100/117 VAC

To convert from 220/240 VAC to 100/117 VAC, use the following procedure.

1. Switch power off and unplug the line cord from its AC power source.
2. Remove Console from front of chassis.
3. Disconnect AC power connector P1 from the power supply. Connector P1 is connected to the power supply through a cutout in the mother-board.
4. Using a Molex removal tool, remove pin 3 from power connector P1. (The pins are numbered on the wiring side of the connector.)
5. Take the pin that is tied back onto the power cable and insert it into the pin 3 position of P1.
6. Replace the 8 A, 250 V slo-blo line fuse with a 15 A, 250 V slo-blo fuse.

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7. Install an appropriate 3-conductor grounding 115-volt AC plug on the line cord.

8. Remove the two screws that fasten the power supply to the computer chassis and slide the power supply out of the chassis.

9. The placement of the orange and yellow jumper wires attached to the transformer determine the AC input voltage. To select a new input voltage, reposition these jumpers according to Table 2-5.

10. Slide the power supply back into the computer chassis and refasten the two attachment screws.

11. Reconnect power connector P1 to the power supply.

12. Reinstall the Console.

13. Connect the line cord to its AC power source, then switch power on and test the computer.

Table 2-5. Transformer Jumper Connectors

JUMPER	100 VAC	117 VAC	220 VAC	240 VAC
Orange Yellow	E B	D C	D B	D C

2.5 EXTERNALLY MOUNTED 36-AMP POWER SUPPLY

This subsection describes the 36 A power supplies available for use with chassis that have provision for external mounting of the power supply, i.e., the standard 9-slot, S9, and S17 chassis.

2.5.1 AC Inputs

The externally mounted 36 A power supply accepts single-phase input power at 47 to 63 Hz in any of four voltage ranges:

- 100 VAC ± 10%
- 117 VAC ± 10%
- 220 VAC ± 10%
- 240 VAC ± 10%

The AC input range is set at the factory, but is field-alterable.

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2.5.2 Power Supply Outputs

The externally mounted 36 A power supply outputs four DC voltages and two logic signals. The DC output voltages are as follows:

- +5 VDC ± 2% at 36 A max.
- +5 VDC Hang ± 5% at 0.2 A max.
- +12 VDC ± 2% at 6 A max.
- -12 VDC ± 2% at 10 A max.

The +5 VDC 36 A and 12 VDC outputs include an overvoltage crowbar. These crowbars prevent the 5-volt output from exceeding 6.8 VDC, and the 12-volt outputs from exceeding 14.5 VDC, in the event of a power supply failure or application of a higher potential from an external source. Further, each power supply output is provided with current- and voltage-limiting circuitry to prevent damage to the supply in any situation.

The power supply presents two logic signals to the computer, PFD- and TTLF. Power Fail Detect (PFD-) is driven low if the AC line voltage drops below a preset level wherein the power outputs are in danger of going out of tolerance, and is used together with +5V Hang, to perform an orderly shutdown of the computer. Twice The Line Frequency (TTLF) is a pulse train having twice the frequency of the AC power line and is used as a time base by the Real-Time Clock.

2.5.3 Environmental Characteristics

The 36 A power supply operates in a ambient temperature range of 0°C to 55°C and a relative humidity range of 10% to 90% without condensation, at altitudes up to 10,000 feet. It can be stored in an environment with an ambient tempera-ture range of -40°C to +80°C and a relative humidity range of 10% to 90% without condensation, at altitudes up to 40,000 feet.

2.5.4 Mechanical Characteristics

The 36 A chassis power supply is 48.26 cm. (19 in.) wide, 45.72 cm. (18 in.) deep and 13.34 cm. (5.25 in.) deep. The line fuse and power switch are located on the rear of the power supply chassis.

The AC input is connected to the power supply through a 6-foot standard 3-wire line cord fitted with a 3-wire plug.

The DC outputs of the power supply, as well as its logic and control signals, are accessible at connector J101 (AMP P/N 26306-1). Table 2-6 lists the pin assignments for connector J101.

An additional connector, J102 (TRW Cinch P/N S306 FP), supplies AC power for the chassis fans. A voltage of 115 volts ± 15% is always supplied to the fans, regardless of the primary line voltage. Table 2-7 lists the pin assign-ments for connector J102.

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Table 2-6. Pin Assignments, Connector J101

PIN	SIGNAL	PIN	SIGNAL
1	+5 V	20	Chassis Ground
2	+5 V	21	Chassis Ground
3	+5 V	22	+5 V Return
4	+5 V	23	(No Connection)
5	+5 V Return	24	Signal Ground
6	+5 V Hang	25	PFD-
7	+5 V Sense	26	TTLF
8	+5 V	27	Chassis Ground
9	+5 V Return	28	+5 V Return
10	+5 V Return	29	-12 V Return
11	+5 V Hang Return	30	-12 V Sense Return
12	+5 V Sense Return	31	+12 V
13	+12 V Return	32	+12 V Sense Return
14	+5 V	33	+12 V Return
15	+5 V Return	34	-12 V
16	-12 V	35	-12 V Sense
17	-12 V Return	36	+12 V Sense
18	Chassis Ground	37	+12 V
19	Chassis Ground		

Table 2-7. Pin Assignments, Connector J102

PIN	SIGNAL	PIN	SIGNAL
1	110 VAC	4	Interlock Out
2	(No Connection)	5	Chassis Ground
3	110 VAC Return	6	Interlock Return

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2.5.5 Power Conversion

The standard 9-slot, S9, and S17 chassis with 36 AMP power supplies are powered from a 100, 117, 220 or 240 VAC input source, and can be field-altered to accept any one of these sources.

The power conversion procedure is as follows:

1. Switch power off and unplug the line cord from its AC power source.

2. Remove the cover of the power supply. It is secured by 12 sheet-metal screws--6 on the front, 2 at the base of each side and 2 at the rear edge of the top.

3. Locate the power transformer and jumper terminal strip T101 at the front of the supply chassis. Note that pin 1 of the terminal strip is located at the innermost end of the strip. The jumper wires connected to T101 select the AC input voltage. To select a new input voltage for an MDI power supply, reconfigure these jumpers according to Table 2-9. For a CEC power supply, reconfigure jumpers as shown in Table 2-9.

4. Connect the black wire to terminal 1 or 2 as shown in the table.

5. Check the fuse in the fuse holder at the rear of the power supply, and replace if necessary. A 100 VAC or 117 VAC input source requires a fuse rated at 15 A, 250 V (Bussman MDA 15 or equivalent). A 220 VAC or 240 VAC input source requires a fuse rated at 8 A, 250 V (Bussman MDA 8 or equivalent).

6. Inspect and insure that cables and wire leads are no closer than 0.1 inch away from chassis, sides or cover and away from any objects which may cause insulation to abrade.

7. Replace cover using loctite 290 or 242 applied to screws.

8. Install a 3-conductor grounding 115 volt or 230 volt AC plug, as appropriate, on the line cord.

9. Connect the line cord to the AC power source, then switch the power on.

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Table 2-8. 36-Amp MDI External Supply Voltage Conversion

POWER SOURCE	100 VAC	117 VAC	220 VAC	240 VAC
Jumper Connections	2 to 5 3 to 6	1 to 4 3 to 6	3 to 5 2 to 2	3 to 4 1 to 1
Black Wire Connection	2	1	2	1
Test Voltage	110	120	220	250

Table 2-9. 36-Amp CEC External Supply Voltage Conversion

POWER SOURCE	100 VAC	117 VAC	220 VAC	240 VAC
JUMPERS	3 to 6 4 to 7	2 to 5 4 to 7	4 to 5 omit 4 to 7	4 to 5 omit 4 to 7
LINE FILTER (HI)	3	2	3	2
LINE FILTER (LOW)	7	7	7	7

2.6 EXTERNALLY MOUNTED 60-AMP POWER SUPPLY

This subsection describes the 60 A power supplies available for use with chassis that have provision for external mounting of the power supply, i.e., the standard 9-slot, S9, and S17 chassis. The standard 9-slot chassis has provision for one power supply only. The S9 chassis is available in two models. Model 21259-02 has provision for one power supply. Model 21259-01 has provision for two supplies. Figure 2-8 shows a 9-slot chassis. The chassis is the same for the standard 9-slot or Model 21259-02 S9 chassis. A Model 21259-01 S9 chassis is shown in Figure 2-9. The chassis is shown resting on top of one power supply.

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2.6.1 AC Inputs

The 60 A power supply accepts single-phase input power at 47 to 63 Hz in any of four voltage ranges:

- 100 VAC ± 10%
- 117 VAC ± 10%
- 220 VAC ± 10%
- 240 VAC ± 10%

The AC input range is set at the factory, but is field-alterable.

2.6.2 Power Supply Outputs

The 9-slot chassis 60 A power supply outputs four DC voltages and two logic signals. The DC output voltages are as follows:

- +5 VDC ± 2% at 60 A max.
- +5 VDC Hang ± 5% at 0.2 A max.
- +12 VDC ± 2% at 8 A max.
- -12 VDC ± 2% at 11 A max.

Figure 2-8. 9-Slot Standard Chassis/S9 Chassis (Single Power Supply Model)

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The +5 VDC 60 A and 12 VDC outputs include an overvoltage crowbar. These crowbars prevent the 5-volt output from exceeding 6.8 VDC, and the 12-volt outputs from exceeding 14.5 VDC, in the event of a power supply failure or application of a higher potential from an external source. Further, each power supply output is provided with current- and voltage-limiting circuitry to prevent damage to the supply in any situation.

The power supply presents two logic signals to the computer, PFD- and TTLF. Power Fail Detect (PFD-) is driven low if the AC line voltage drops below a preset level wherein the power outputs are in danger of going out of tolerance, and is used together with +5V Hang, to perform an orderly shutdown of the computer. Twice The Line Frequency (TTLF) is a pulse train having twice the frequency of the AC power line and is used as a time base by the Real-Time Clock.

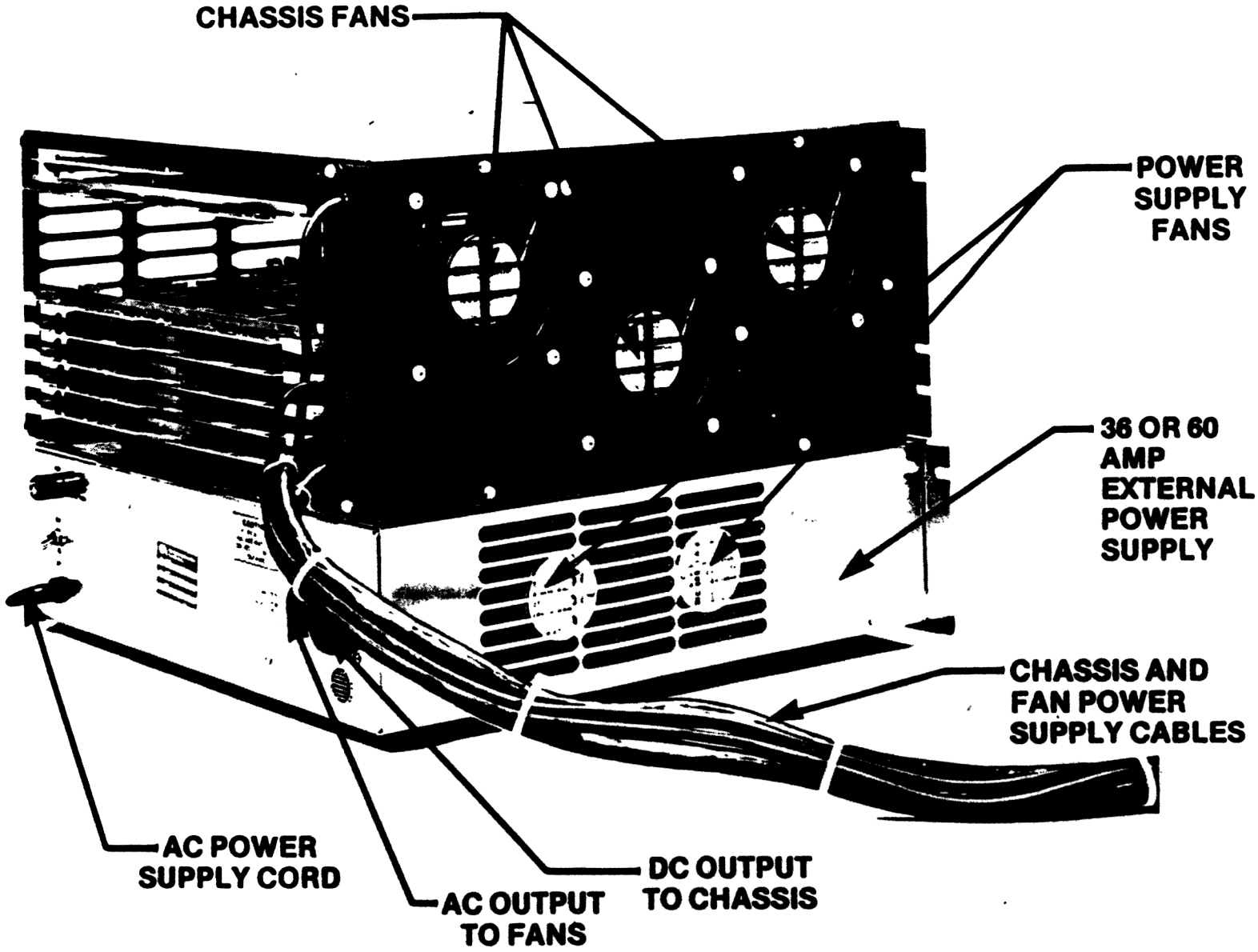


Figure 2-9. S9-Chassis (Two-Power Supply Model)

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2.6.3 Environmental Characteristics

The 60 A power supply operates in a ambient temperature range of 0°C to 55°C and a relative humidity range of 10% to 90% without condensation, at altitudes up to 10,000 feet. It can be stored in an environment with an ambient temperature range of -40°C to +80°C and a relative humidity range of 10% to 90% without condensation, at altitudes up to 40,000 feet.

2.6.4 Mechanical Characteristics

The 60 A chassis power supply is 48.26 cm. (19 in.) wide, 45.72 cm. (18 in.) deep and 13.34 cm. (5.25 in.) height. The line fuse and power switch are located on the rear of the power supply chassis.

The AC input is connected to the power supply through a 6-foot standard 3-wire line cord fitted with a 3-wire plug.

The DC outputs of the power supply, as well as its logic and control signals, are accessible at connector J101 (AMP P/N 26306-1). Table 2-6 summarizes the pin assignments for connector J101.

An additional connector, J102 (TRW Cinch P/N S306 FP), supplies AC power for the chassis fans. A voltage of 115 volts ± 15% is always supplied to the fans, regardless of the primary line voltage. Table 2-7 summarizes the pin assignments for connector J102.

2.6.5 Power Conversion

The standard 9-slot, S9, and S17 chassis with a 60 AMP power supply are powered from a 100, 117, 220, or 240 VAC input source, and can be field-altered to accept any one of these sources.

The power conversion procedure is as follows:

1. Switch power off and unplug the line cord from its AC power source.

2. Remove the cover of the power supply. It is secured by 12 sheet-metal screws--6 on the front, 2 at the base of each side and 2 at the rear edge of the top.

3. Locate the power transformer and jumper terminal strip T101 at the front of the supply chassis. Note that pin 1 of the terminal strip is located at the innermost end of the strip. The jumper wires connected to T101 select the AC input voltage. To select a new input voltage, reconfigure these jumpers according to Table 2-10 for an MDI power supply. See Table 2-11 for a CEC power supply.

4. Check the fuse in the fuse holder at the rear of the power supply, and replace if necessary. An MDI power supply with a 100 VAC or 117 VAC input source requires a fuse rated at 15 A, 250 V (Bussman MDA 15 or equivalent). The CEC power supply requires a 10 A fuse for 220/240 V or a 20 A fuse for 100/117 V.

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5. Install the cover of the power supply.

6. Inspect and insure that cables and wire leads are no closer than 0.1 inch away from chassis, sides or cover and away from any objects which may cause insulation to abrade.

7. Replace cover using loctite 290 or 242 applied to screws.

8. Install a 3-conductor grounding 115 volt or 230 volt AC plug, as appropriate, on the line cord.

9. Connect the line cord to the AC power source, then switch the power on.

Table 2-10. 60-Amp MDI External Supply Voltage Conversion

POWER SOURCE	100 VAC	117 VAC	220 VAC	240 VAC
ORANGE BLUE	1 to 3A 4 to 1A	1 to 3 4 to 2	1 to SPARE 2 to 3A	1 to SPARE 2 to 3

Table 2-11. 60-Amp CEC External Supply Voltage Conversion

POWER SOURCE	100 VAC	117 VAC	220 VAC	240 VAC
JUMPERS	3 to 6 4 to 7	2 to 5 4 to 7	4 to 5 omit 4 to 7	4 to 5 omit 4 to 7
LINE FILTER (HI)	3	2	3	2
LINE FILTER (LOW)	7	7	7	7

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SECTION 3

CHASSIS CONFIGURATIONS

Computer Automation, Inc. manufactures 3, 5, 9, and 17 slot chassis. The 3-slot chassis is a half-card chassis, used with the NAKED MINI® 4/10 computer only. The 5-slot chassis is available in half-card and full-card models. The half-card model is used only with the NAKED MINI® 4/10 computers. The full-card versions of the 5-slot chassis, 9-slot and 17-slot chassis can be used with any LSI-2 Series or NAKED MINI® 4 Family processor based system.

The 9-slot chassis is available in two versions. One uses a standard and the other a "split" motherboard. A split motherboard is required in systems using a memory management unit, and, conversely, a memory management unit board must be installed in any system using a split motherboard. The 17-slot chassis is available in a split motherboard version only.

The slots in each chassis are lettered vertically, starting from slot A at the top. In half-card chassis each slot contains connector pins numbered 1 through 86. In the full-card chassis, the slots are divided into two sets of connectors, forming vertical columns on each side of the chassis. As viewed from the rear (open end) of the computer, the righthand column of connectors is called the "100 side." Connectors in the 100 side have pins numbered 101 through 186. The left-hand column of connectors is called the "200 side." Connectors in the 200 side have pins numbered 201 through 286.

3.1 SINGLE HALF-CARD CHASSIS SYSTEM SLOT ASSIGNMENTS

The slot assignments for the I/O controllers and memory modules within a single half-card chassis system is based on the relative placement of each device in the appropriate priority chains. Priority level assignments are dependent on system applications.

3.1.1 Memory Chain (MBIN/MBOT)

The assignment of addresses to memory boards is based on the position of the board in the MBIN/MBOT priority chain. Assignment of addresses takes place automatically. The priority chain begins at slot A. Boards must be placed in sequence along the chain, without gaps, or the automatic allocation feature will allocate addresses only up to the slot where the MBIN/MBOT chain is broken.

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3.1.2 DMA Controller Priority Chain (DPIN-/DPOT-)

The DPIN-/DPOT- chain follows the same chassis routing as the MBIN/MBOT chain, and DMA controllers must be placed in order of descending priority along the chain. That is the DMA controller assigned the highest priority must be the first such controller encountered on the chain, the second-highest priority DMA controller must be the next such controller encountered on the chain, and so on.

In addition, since most DMA controllers generate interrupts, their placement in the PRIN-/PROT- priority chain should also be considered.

3.1.3 Interrupt I/O Controller Priority Chain (PRIN-/PROT-)

The PRIN-/PROT- chain also follows the same chassis routing as the MBIN/MBOT chain. I/O controllers that have interrupt capability must be placed in order of descending priority along the chain.

Figures 3-1 and 3-2 illustrate the paths of MBIN/MBOT, DPIN-/DPOT-, and PRIN-/PROT- chains in the 3-slot and 5-slot half-card chassis, respectively.

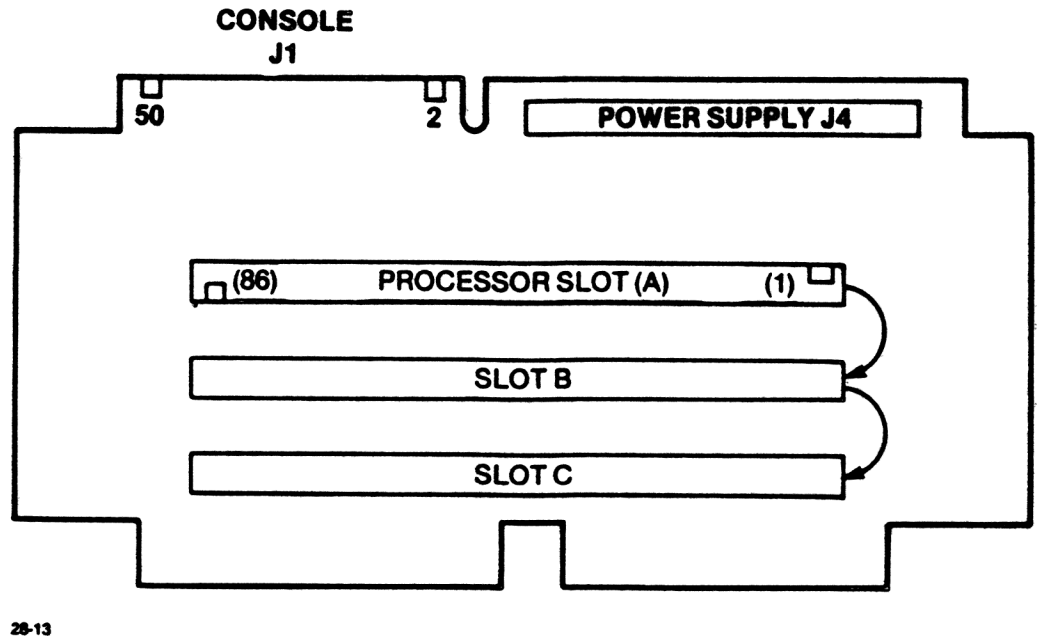


Figure 3-1. 3-Slot Half-Card Chassis Priority Chains

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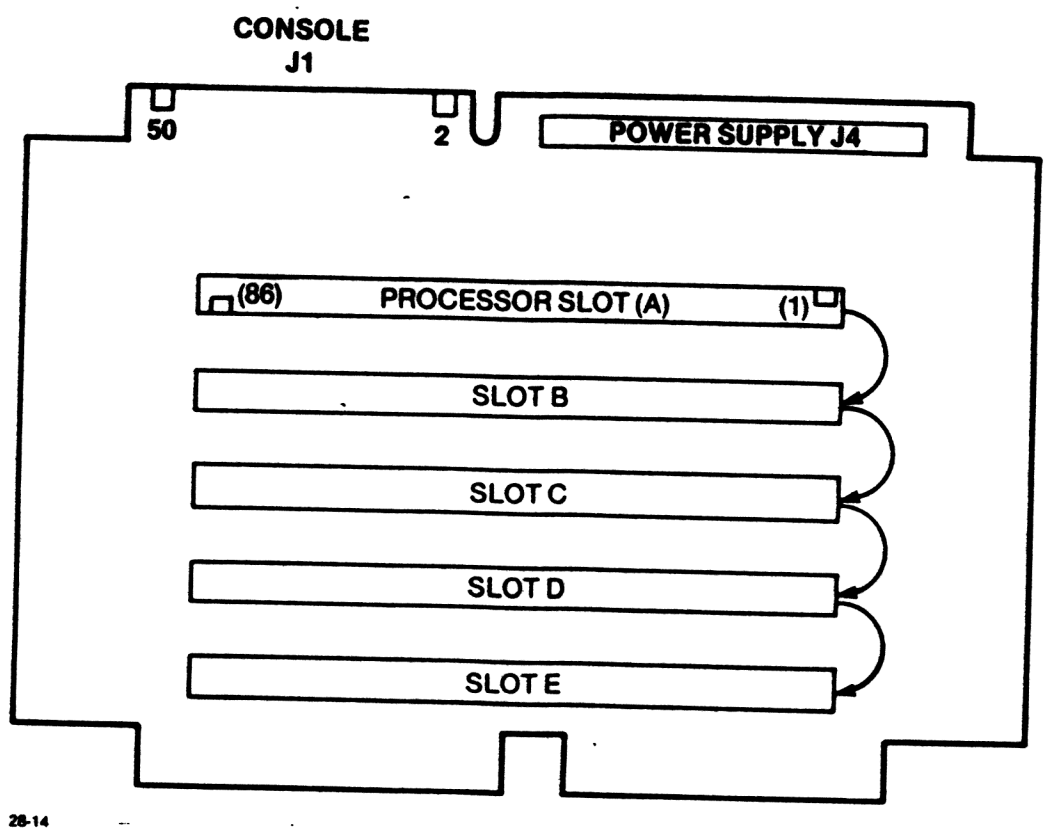


Figure 3-2. 5-Slot Half-Card Chassis Priority Chains

3.2 SINGLE FULL-CARD CHASSIS SYSTEM SLOT ASSIGNMENTS

The slot assignments for the I/O controllers and memory modules within a single-chassis system is based on the relative placement of each device in the appropriate priority chains. Priority level assignments are dependent on system applications.

Figures 3-3 and 3-4 illustrate the paths of MBIN/MBOT, DPIN-/DPOT-, and PRIN-/PROT- chains in the 5-slot full-card and standard 9-slot chassis, respectively.

3.2.1 Memory Chain (MBIN/MBOT)

The assignment of addresses to memory boards is based on the position of the boards in the MBIN/MBOT priority chain. Assignment of addresses takes place automatically. In D revision level motherboards and above, the MBIN/MBOT chain originates on the 200 side of the processor slot, slot A, passes down the 200 side, and then down the 100 side of the motherboard. (In motherboards below the D revision, the MBIN/MBOT priority chain is not propagated on the 100 side of the chassis.) Boards must be placed in sequence along the chain, without gaps, or the automatic allocation feature allocates addresses only up to the slot where the MBIN/MBOT chain is broken.

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3.2.2 DMA Controller Priority Chain (DPIN-/DPOT-)

The priority level of DMA controllers is determined by the placement of the controller board in the DPIN-/DPOT- priority chain. The DPIN-/DPOT- chain follows the same routing as the MBIN/MBOT chain. As in the case of the MBIN/MBOT chain, the DPIN-/DPOT- chain is propagated on the 100 side only in motherboards of D revision and above. DMA controllers must be placed along the chain in descending order of priority. That is, the DMA controller assigned the highest priority must be the first such controller encountered on the chain, the second highest, the second in the chain, and so on. In addition, since most DMA controllers also generate interrupts, their placement in the PRIN-/PROT- priority chain must also be considered.

3.2.3 Interrupt I/O Controller Priority Chain (PRIN-/PROT-)

The priority level of interrupt generating controllers is determined by the placement of the controller in the PRIN-/PROT- priority chain. The PRIN-/PROT- chain originates on the 200 side of the processor slot, slot A, and follows a down and across pattern through the slots of the motherboard. (The down and across pattern is followed in all motherboard revision levels.) I/O controllers with interrupt capability must be placed in order of descending priority along the chain.

Figure 3-3. 5-Slot Chassis Priority Chains

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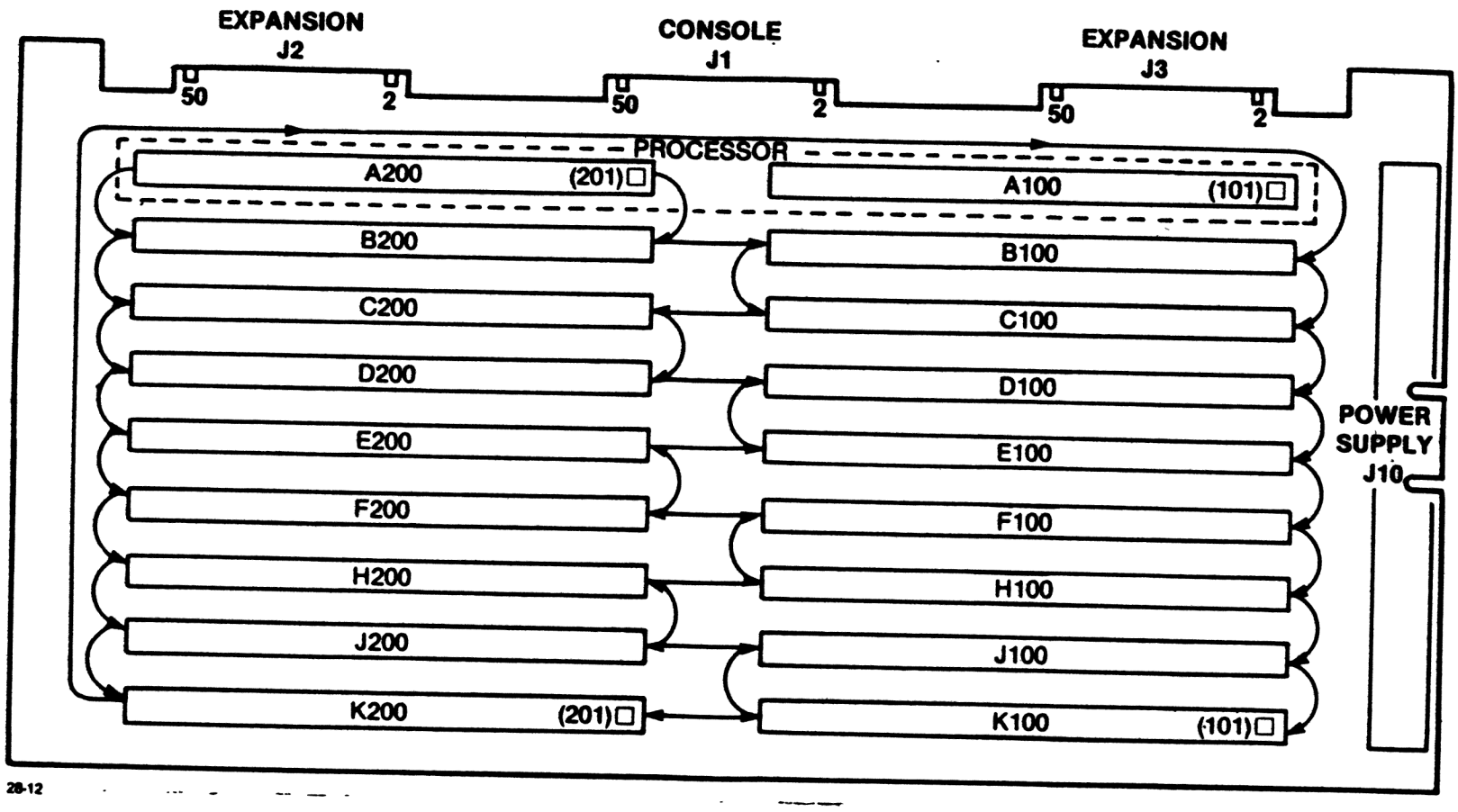


Figure 3-4. 9-Slot Chassis Priority Chains

3.3 S9-CHASSIS SYSTEM SLOT ASSIGNMENTS

The S9-Chassis is used in systems that require a memory management unit (MMU). The memory management unit translates logical into physical addresses, permitting memory addressing of greater than 128K bytes for NAKED MINI® 4 processors, and 64K bytes for LSI-2 processors. The memory management unit is assigned a special slot, slot E, in the motherboard. The processor and the DMA controllers, all of which address memory, are placed in the logical address space above slot E. Controllers using programmed or interrupt driven I/O can be placed above or below the memory management unit slot. All memory boards must be installed in the physical address space below the memory management unit. The logical and physical address space assignments in the S9-Chassis are shown in Figure 3-5.

3.3.1 Priority Chains

The processor must be installed in chassis slot A. A half-card processor is placed in the 100 side and can be joined to a filler, DMA, or I/O controller occupying the 200 side. A controller installed on the 200 side must have a connector to accept the sixteen wire jumper from the processor. Slot assignments for DMA and I/O controllers are dependent on the priority level, determined by system application. Priority is assigned to DMA controllers through placement in the DPIN-/DPOT- priority chain. Priority is assigned to interrupt generating controllers through placement in the PRIN-/PROT- priority chain. Automatic allocation of addresses to memory boards is based on placement of the boards in the MBIN/MBOT priority chain. The closer a board is to the processor in any chain, the higher the priority of the device in that chain.

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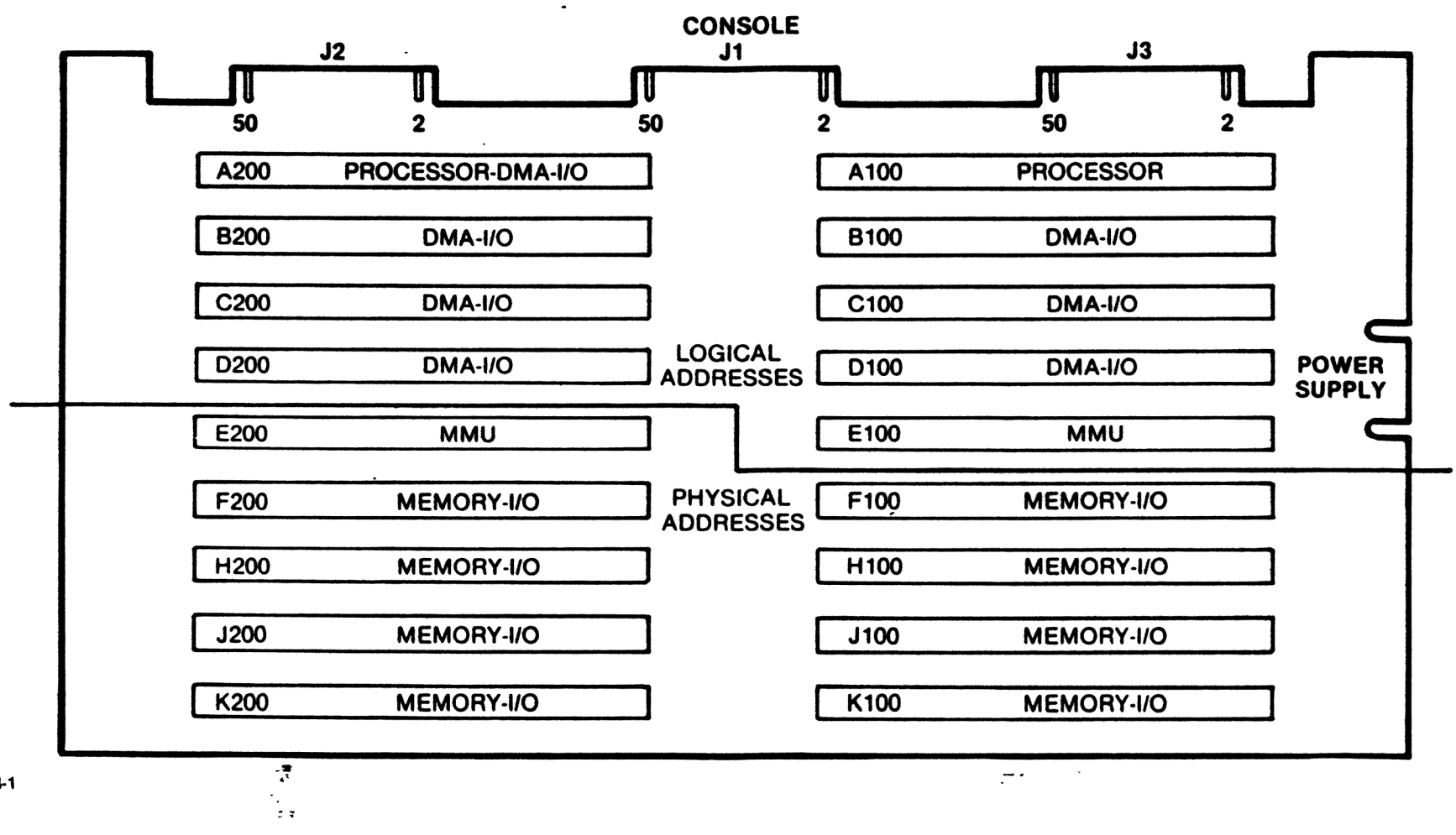


Figure 3-5. S9-Chassis Logical/Physical Space Allocations

3.3.1.1 DMA Priority Chain (DPIN-/DPOT-)

The DMA priority chain is based on the propagation of the DPIN-/DPOT- signals. The chain begins at slot A200 and follows a down and across pattern, shown in Figure 3-6. DMA controller boards can be joined directly or to a non-DMA I/O controller board, since all I/O controllers must propagate, even if they do not use, the DPIN-/DPOT- priority chain. Most DMA controllers also generate end of block interrupts. This makes the relative placement of DMA and interrupt driven I/O controllers significant. End of block interrupts generated by a DMA controller will have a higher priority than the data service, as well as the end of block interrupts, of any I/O controller lower in the PRIN-/PROT- priority chain.

3.3.1.2 Interrupt I/O Controller Priority Chain (PRIN-/PROT-)

The priority chain used by interrupt generating controllers is based on the propagation of the PRIN-/PROT- signals. The chain begins at slot A100 and follows an across and down pattern, shown in Figure 3-7. I/O controllers that have interrupt capabilities must be placed in descending order of priority along the chain. Because they do not address memory, controllers that

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transfer data using interrupts can be installed above or below the memory management unit. All slots in the logical address space must be full before using slots in the physical address space to avoid breaking the interrupt priority chain. Because the DMA and interrupt priority chains follow the same pattern, controller boards can be placed in the chassis with a maximum requirement of one filler board.

3.3.1.3 Memory Chain (MBIN/MBOT)

The assignment of addresses to memory boards is based on the position of the board in the MBIN/MBOT priority chain. Assignment of addresses takes place automatically. The priority chain begins at slot A, is connected directly to slot E, and is propagated throughout the physical address space in a down and across pattern. Boards must be placed in sequence along the chain, without gaps, or the automatic allocation feature will allocate addresses only up to the slot where the MBIN/MBOT chain is broken. The MBIN/MBOT priority chain is shown in Figure 3-8.

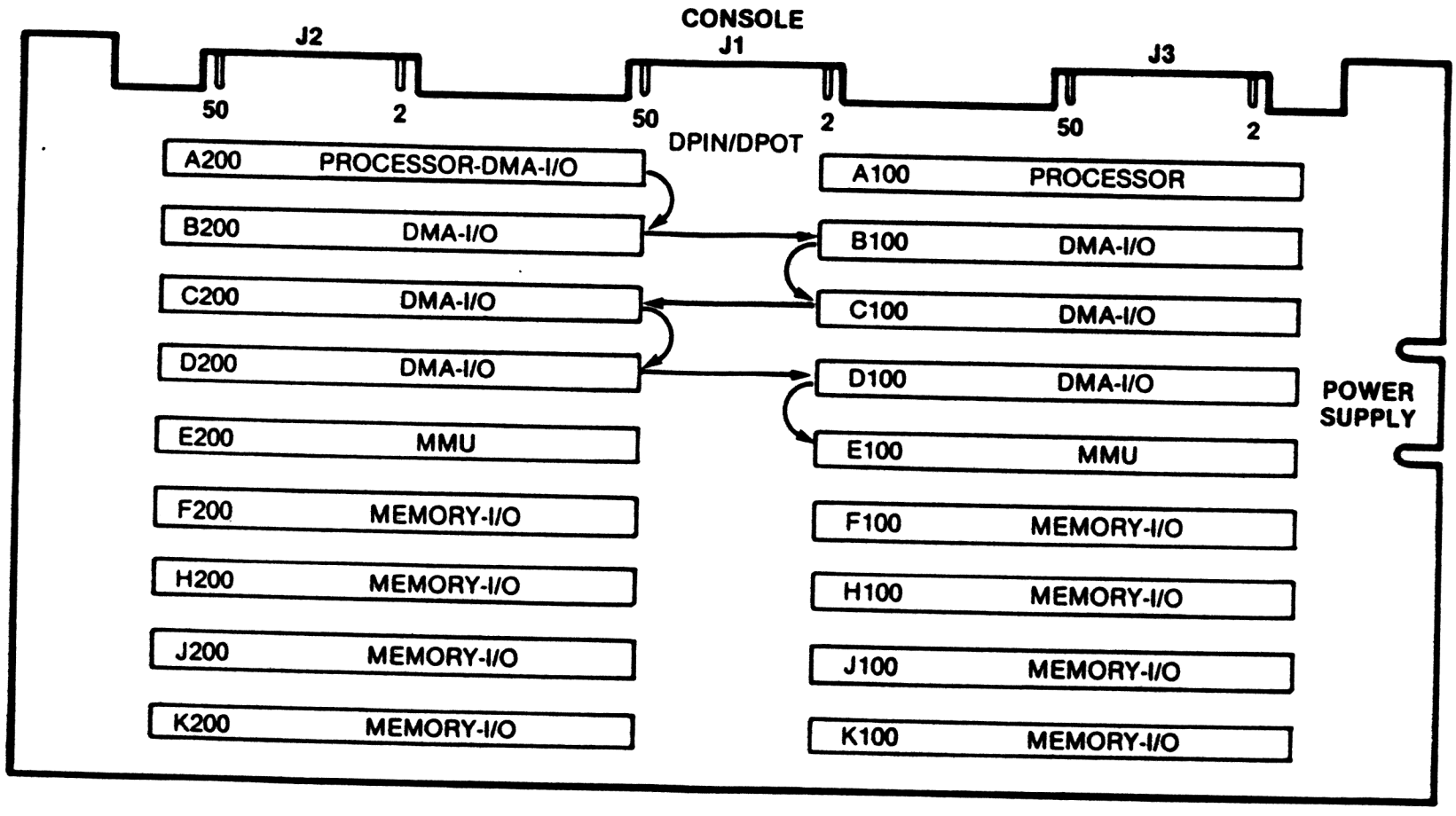


Figure 3-6. S9-Chassis DMA Priority Chain

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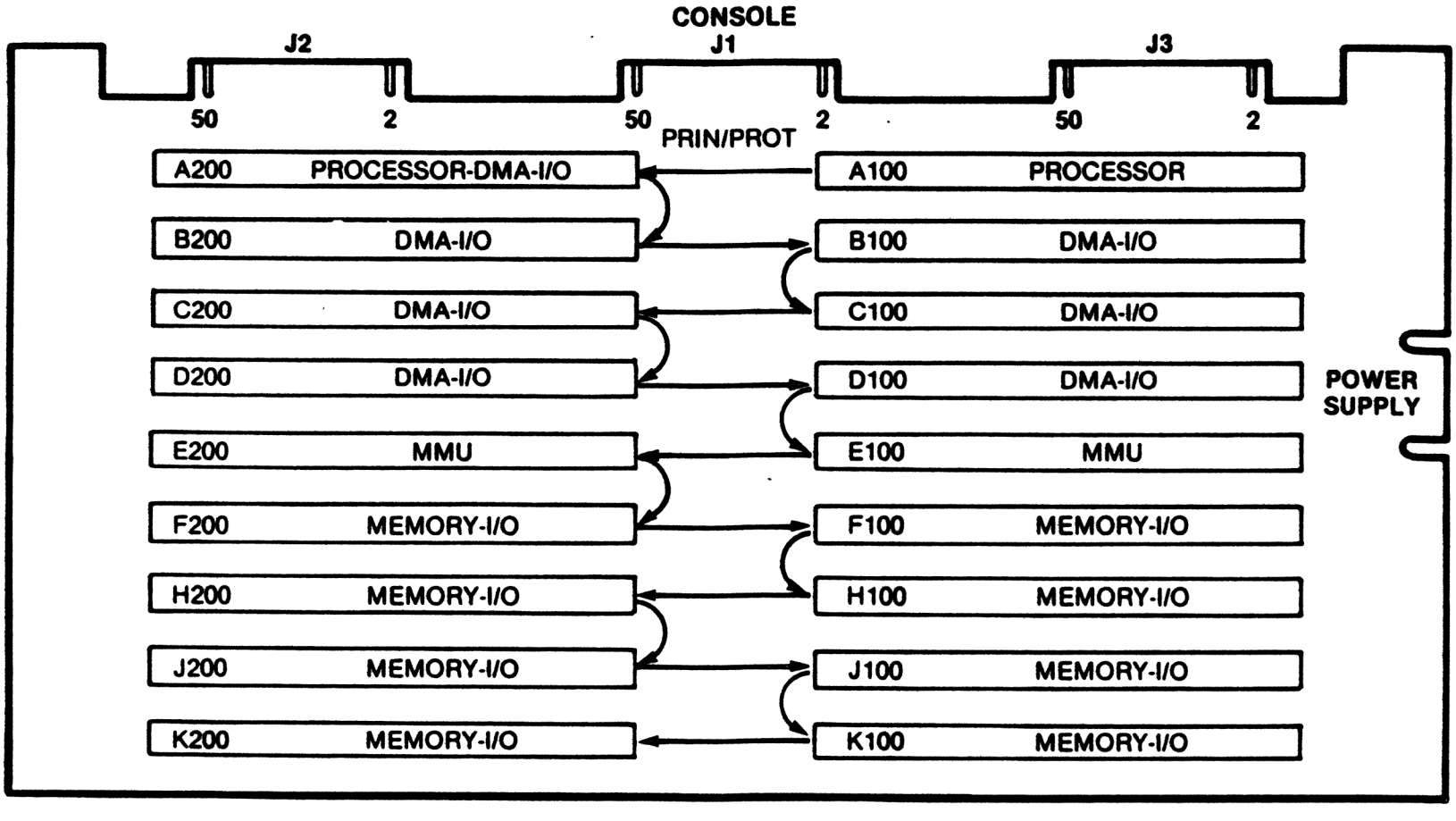


Figure 3-7. S9-Chassis Interrupt Priority Chain

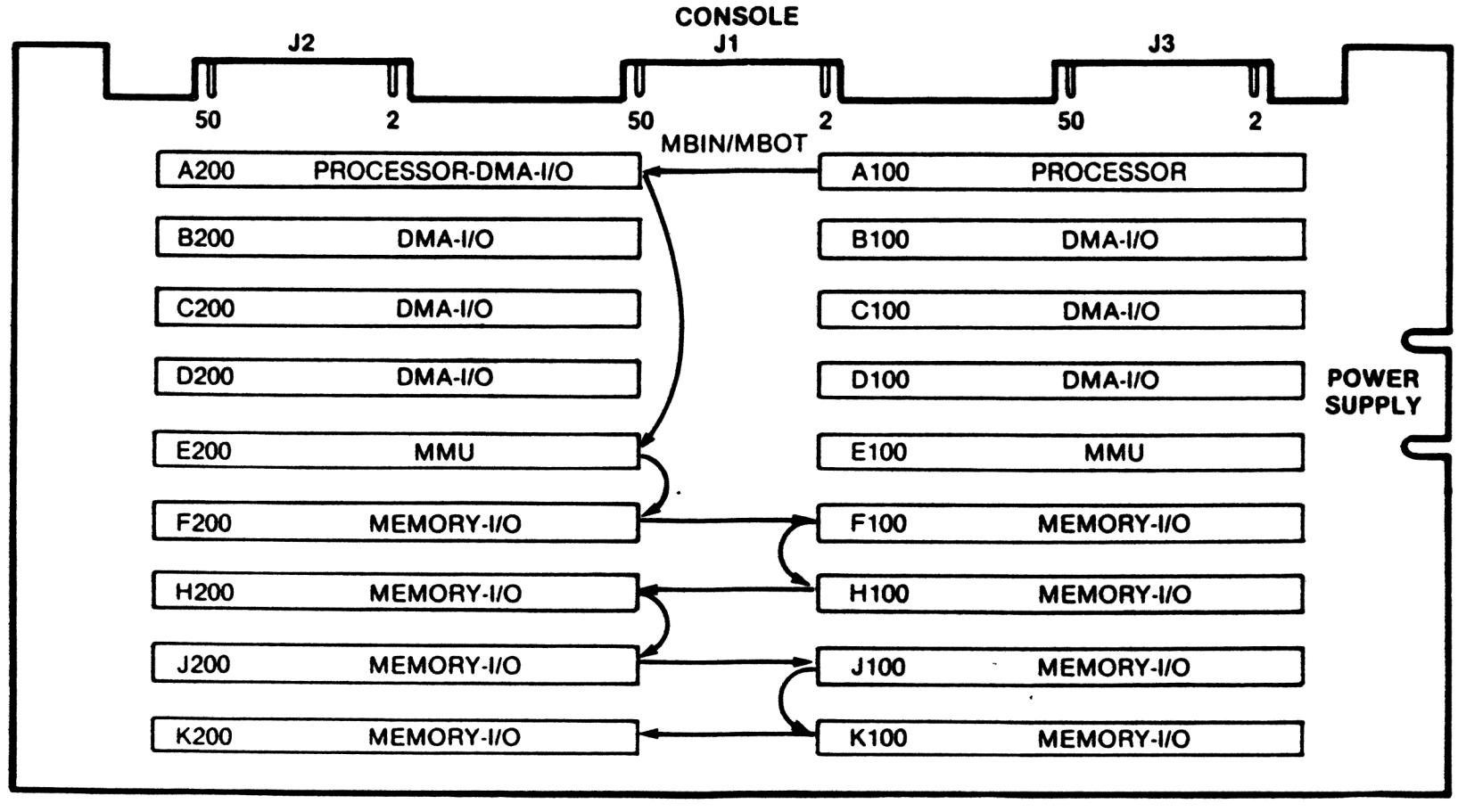


Figure 3-8. S9-Chassis Memory Priority Chain

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3.4 S17-CHASSIS SYSTEM SLOT ASSIGNMENTS

The S17-Chassis is used in systems that require a memory management unit (MMU). The memory management unit translates logical into physical addresses, permitting memory addressing of greater than 128K bytes. The memory management unit is assigned a special slot, slot K, in the motherboard. The processor and the DMA controllers, all of which address memory, are placed in the logical address space above slot K. Controllers using programmed or interrupt driven I/O can be placed above or below the memory management unit slot. All memory boards must be installed in the physical address space below the memory management unit. The logical and physical address space assignments in the S17-Chassis, together with the slot designations, are shown in Figure 3-9.

3.4.1 Priority Chains

The processor must be installed in chassis slot A. A half-card processor is placed in the 100 side and can be joined to a filler, DMA, or I/O controller occupying the 200 side. A controller installed on the 200 side must have a connector to accept the sixteen wire jumper from the processor. Slot assignments for DMA and I/O controllers are dependent on the priority level, determined by system application. Priority is assigned to DMA controllers through placement in the DPIN-/DPOT- priority chain. Priority is assigned to interrupt generating controllers through placement in the PRIN-/PROT- priority chain. Automatic allocation of addresses to memory boards is dependent on placement of the boards in the MBIN/MBOT priority chain. The closer a board is to the processor in any chain, the higher the priority of the device in that chain.

3.4.1.1 DMA Priority Chain (DPIN-/DPOT-)

The DMA priority chain is based on the propagation of the DPIN-/DPOT- signals. The chain begins at slot A200 and follows a down and across pattern terminating at slot K100. DMA controller boards can be joined directly or to a non-DMA I/O controller board, since all I/O controllers must propagate, even if they do not use, the DPIN-/DPOT- priority chain. Most DMA controllers also generate end of block interrupts. This makes the relative placement of DMA and I/O controllers significant. End of block interrupts generated by a DMA controller will have a higher priority than the data service, as well as the end of block interrupts of any I/O controller lower in the PRIN-/PROT- priority chain.

3.4.1.2 Interrupt I/O Controller Priority Chain (PRIN-/PROT-)

The priority chain used by interrupt generating controllers is based on the propagation of the PRIN-/PROT- signals. The chain begins at slot A100 and follows an across and down pattern terminating at slot U200. I/O controllers that have an interrupt capability must be placed in descending order of priority along the chain. Because they do not address memory, controllers that transfer data using interrupts can be installed above or below the memory management unit. All slots in the logical address space must be full before using slots in the physical address space to avoid breaking the interrupt priority chain. Because the DMA and interrupt priority chains follow the same pattern, and all controllers must propagate the signals, controller boards can be placed in the chassis with a maximum requirement of one filler board.

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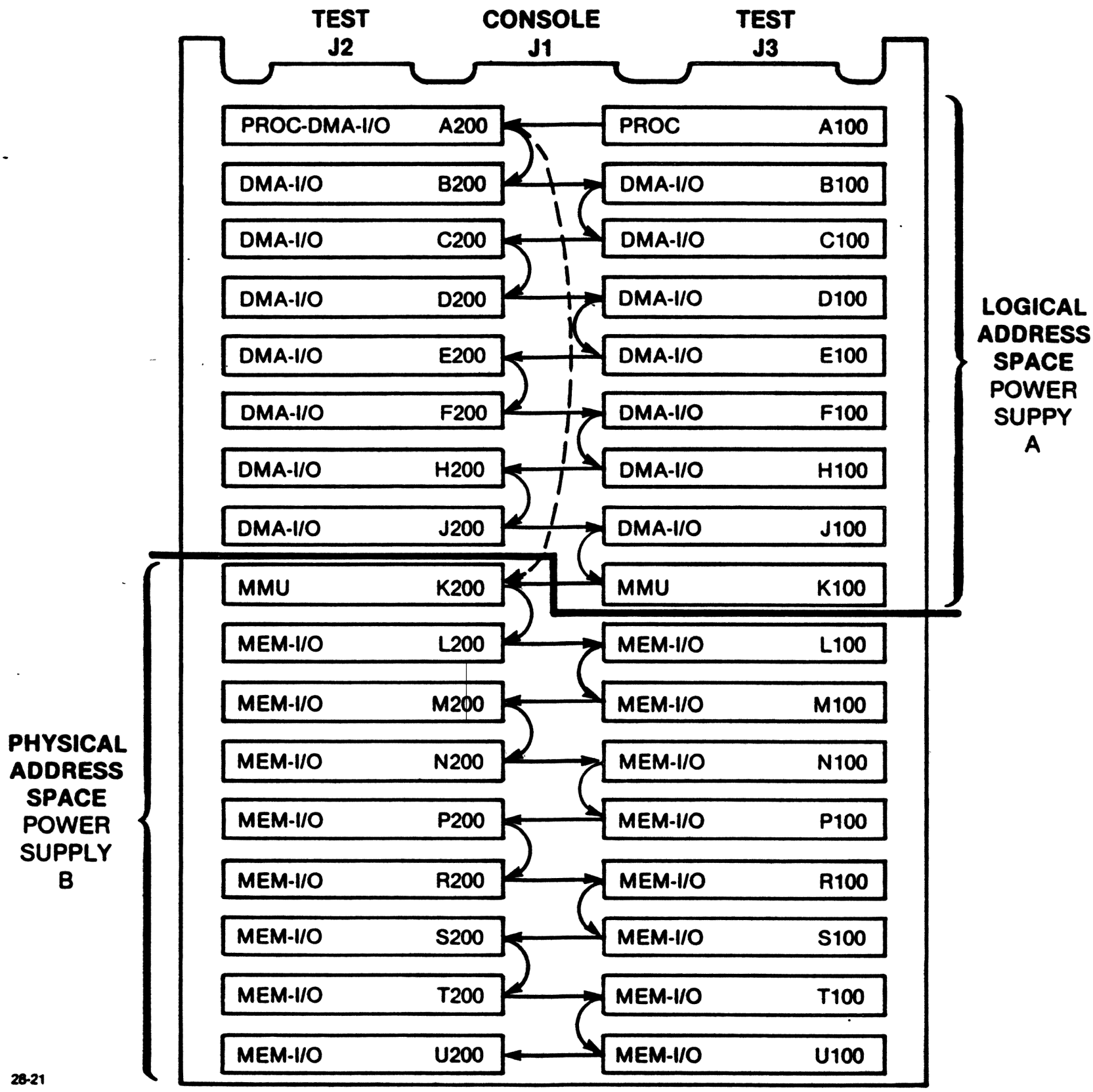


Figure 3-9. Address Space Assignments and Priority Chain Propagation in the S17-Chassis

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3.4.1.3 Memory Chain (MBIN/MBOT)

The assignment of addresses to memory boards is based on the position of the board in the MBIN/MBOT priority chain. Assignment of addresses takes place automatically. The priority chain begins at slot A, is connected directly to slot K200, and is propagated throughout the physical address space in a down and across pattern. The chain terminates at slot U200. Boards must be placed in sequence along the chain, without gaps, or the automatic allocation feature will allocate addresses only up to the slot where the MBIN/MBOT chain is broken.

3.5 MULTIPLE-CHASSIS SYSTEM SLOT ASSIGNMENTS

The 5-slot full-card and standard 9-slot chassis allow system expansion if the number of slots in the processor chassis are insufficient to hold all of the memory and I/O modules for a particular application. The system may be expanded by adding one or two expansion chassis. The slot assignment of I/O controller and memory modules within a multiple-chassis system is based on the relative placement of each module along the appropriate priority chain.

NOTE

The expansion buffer board manufactured by Computer Automation, Inc., does not permit memory expansion of the S9 and S17 chassis.

3.5.1 MAXI-BUS® Interface Propagation Between Chassis

The buffer card on the expansion chassis is used to propagate the MAXI-BUS® interface from one chassis to another, but it does not provide a fully bidirectional link. In fact, the buffer card maintains the bidirectionality of only the Data Bus between chassis, and propagates all other lines in only one direction--either upstream (toward the processor) or downstream, as appropriate. For example, the buffer card passes the Address Bus only downstream, which has considerable impact on inter-chassis addressing.

Since the processor board must be installed in the top slot of the top chassis, the processor is able to communicate with any I/O controller or memory module in the system. However, DMA controllers can be assigned anywhere in the system, which affects their ability to communicate with other I/O controllers and memory modules in the system. DMA controllers located in the processor chassis can communicate with any I/O controller or memory module. A DMA controller located in an expansion chassis can communicate with I/O controllers and memory modules located in the same chassis or in a downstream expansion chassis, but cannot communicate with I/O controllers or memory modules located in an upstream chassis.

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3.5.2 Priority Chain Continuation to Expansion Chassis

The 5-slot and 9-slot chassis motherboards are designed to permit the three priority chains (PRIN-/PROT-, MBIN/MBOT and DPIN-/DPOT-) to be continued through one or more expansion chassis. These priority chains are physically continued between chassis via the inter-chassis connecting cables, but one or more jumper wires will have to be added if any DMA controller and/or memory module is installed in the 100 side of the processor chassis or (in a three-chassis system) first expansion chassis.

Figure 3-10 shows priority chain continuation in a two-chassis system. If any DMA controller or memory module is to be installed on the 100 side of the top chassis, the points labeled "A and B" must be jumpered together.

The processor chassis and, in three-chassis systems, the first expansion chassis must have all slots occupied in the side from which the priority chains are being propogated from to ensure propagation.

3.6 EXPANSION CHASSIS

The expansion chassis is identical to the processor chassis--same power supply, same motherboard--but includes a buffer board for propagating the MAXI-BUS® interface signals and a set of ribbon cables for interconnecting chassis. Four different expansion chassis are available, two for expansion of a 5-slot chassis sytem and two for expansion of a 9-slot chassis system.

An LSI-2 series or NAKED MINI® 4 Family based system may include up to three chassis; the processor chassis and two expansion chassis. As expansion chassis are added, a memory speed degradation will occur in that memory modules housed in expansion chassis will exhibit a slower access and cycle time. For NAKED MINI® 4 Family systems the degradation time is 30 ns for each expansion chassis. For LSI-2 series systems the degradation time is 400 ns (worst case) for each expansion chassis.

3.6.1 Interconnecting Chassis

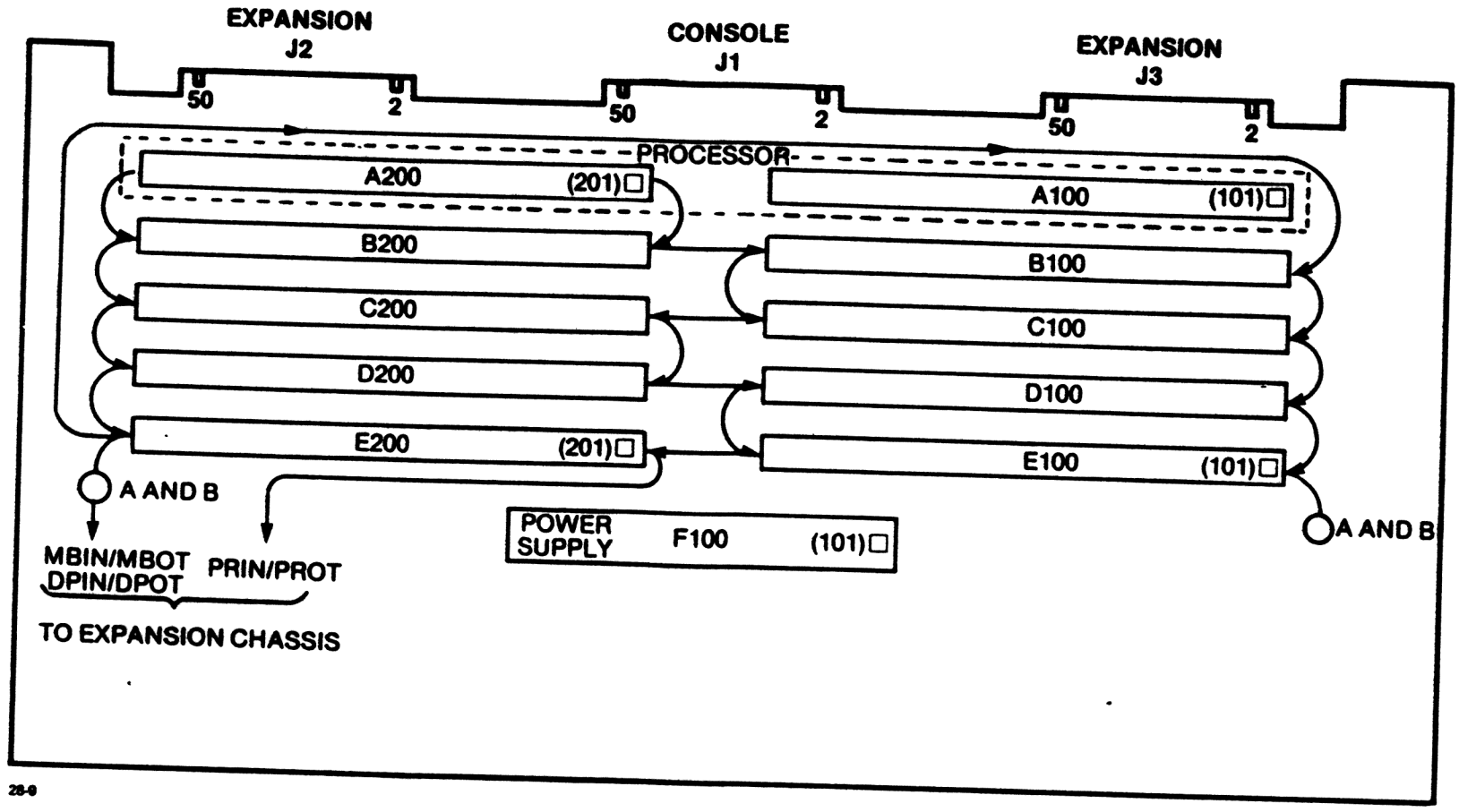
Figures 3-11 illustrates the way three chassis are interconnected. For simplicity, chassis are shown with consoles removed, and expansion chassis buffer boards are shown "exploded" away from chassis. Expansion chassis must be installed below the processor chassis.

To enable the expansion, MAXI-BUS® interface expansion connectors J2 and J3 are provided on the motherboard immediately above slot A. Processor chassis connectors J2 and J3 are connected to buffer board connectors J2 and J1, respectively, on the first expansion chassis. The connection is made via two 10-inch ribbon cables which are routed behind the processor chassis console down to the first expansion chassis.

The buffer board is mounted vertically, with the component side facing the expansion chassis motherboard. Emanating from the center of the component side of the buffer board are two ribbon cables, W1 and W2. When viewed from the front of the chassis, the cable on the right (W2) interfaces with connector J2 on the expansion chassis motherboard and the cable on the left (W1) interfaces with connector J3 on the expansion chassis motherboard.

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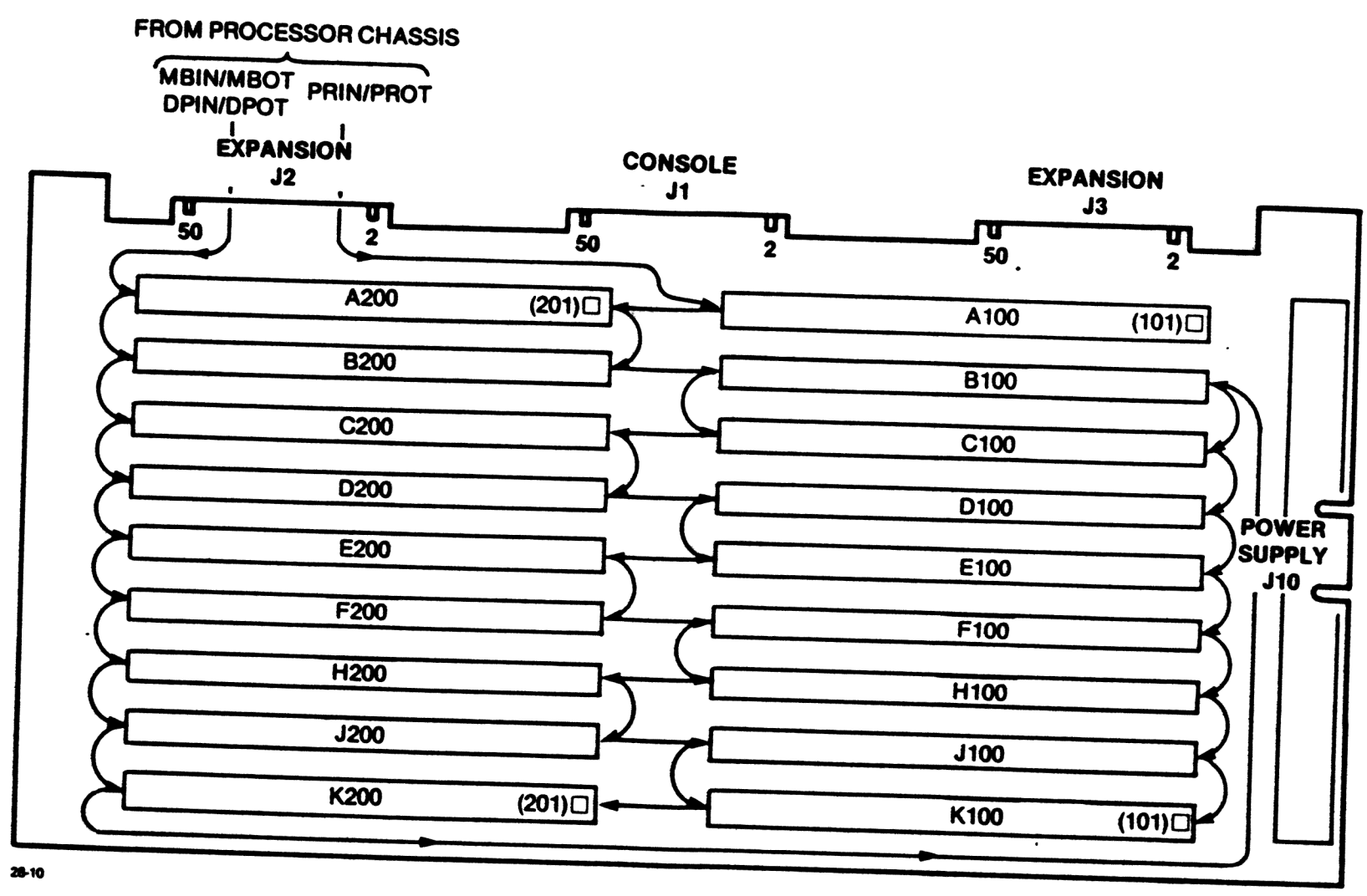


Figure 3-10. Priority Chains in a Two-Chassis System

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If a second expansion chassis is required, connectors J4 and J3 at the bottom of the buffer board are connected to J2 and J1, respectively, of the second expansion chassis buffer board.

3.6.2 Motherboard Strapping

The strapping options discussed here apply to systems using revision D and later versions of the 5-slot and 9-slot chassis motherboards. The motherboards below revision D do not provide for extension of the DPIN-/DPOT- chain and MBIN/MBOT chain to the 100 side of the chassis.

In multiple chassis systems, a strapping option must be considered for the processor chassis and, in a three-chassis system, for the first expansion chassis.

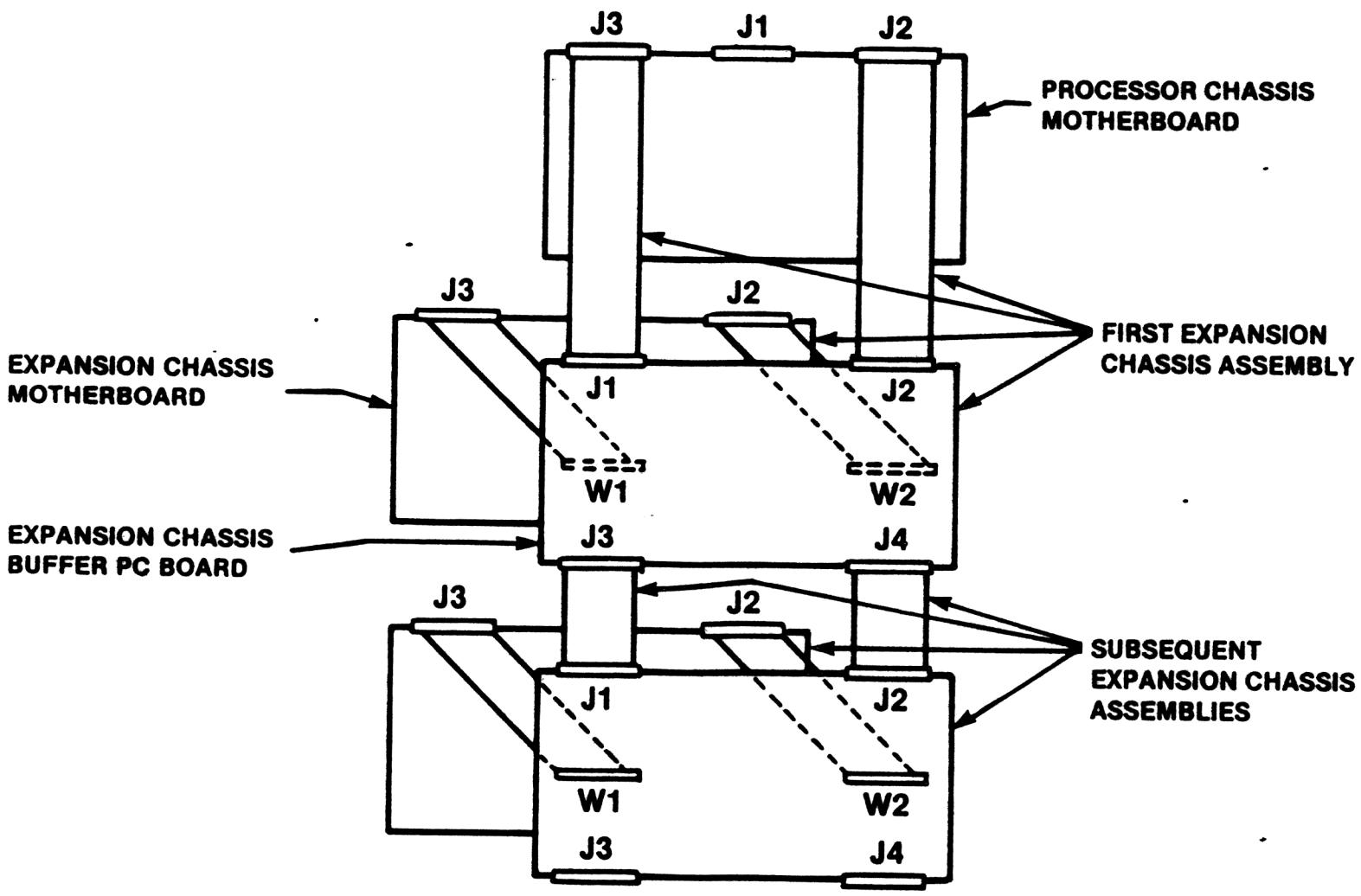


Figure 3-11. Expansion Chassis Cabling

If both the MBIN/MBOT and DPIN-/DPOT- chains are continued from slot E200 in the 5-slot full-card chassis or K200 in the standard (non-split) 9-slot chassis, strapping is not required. If either or both are continued from slot E100 in the 5-slot chassis or K100 in the standard 9-slot or S9 chassis, the motherboard must be strapped as follows:

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1. Turn off all power, disconnect the system from the AC line voltage, and remove the console or expansion chassis front cover.

2. Locate points A and B below the last slot on the 200 side of the motherboard. Refer to Figures 3-12 and 3-13.

3. Carefully cut the etch where indicated; cut A if DPIN-/DPOT- is being continued from the 100 side of the motherboard and B if MBIN/MBOT is being continued from the 100 side of the motherboard.

4. If A was cut, insert a jumper (AWG 24 to 28 solid insulated wire) between the solder pad at A below the 100 side of the motherboard and the solder pad at A below the 200 side of the motherboard.

5. If B was cut, insert a jumper (AWG 24 to 28 solid insulated wire) between the solder pad at B below the 100 side of the motherboard and the solder pad at B below the 200 side of the motherboard.

6. Solder all connections and dress the jumper wires close to the motherboard.

7. Replace the console or expansion chassis front cover and restore power to the system.

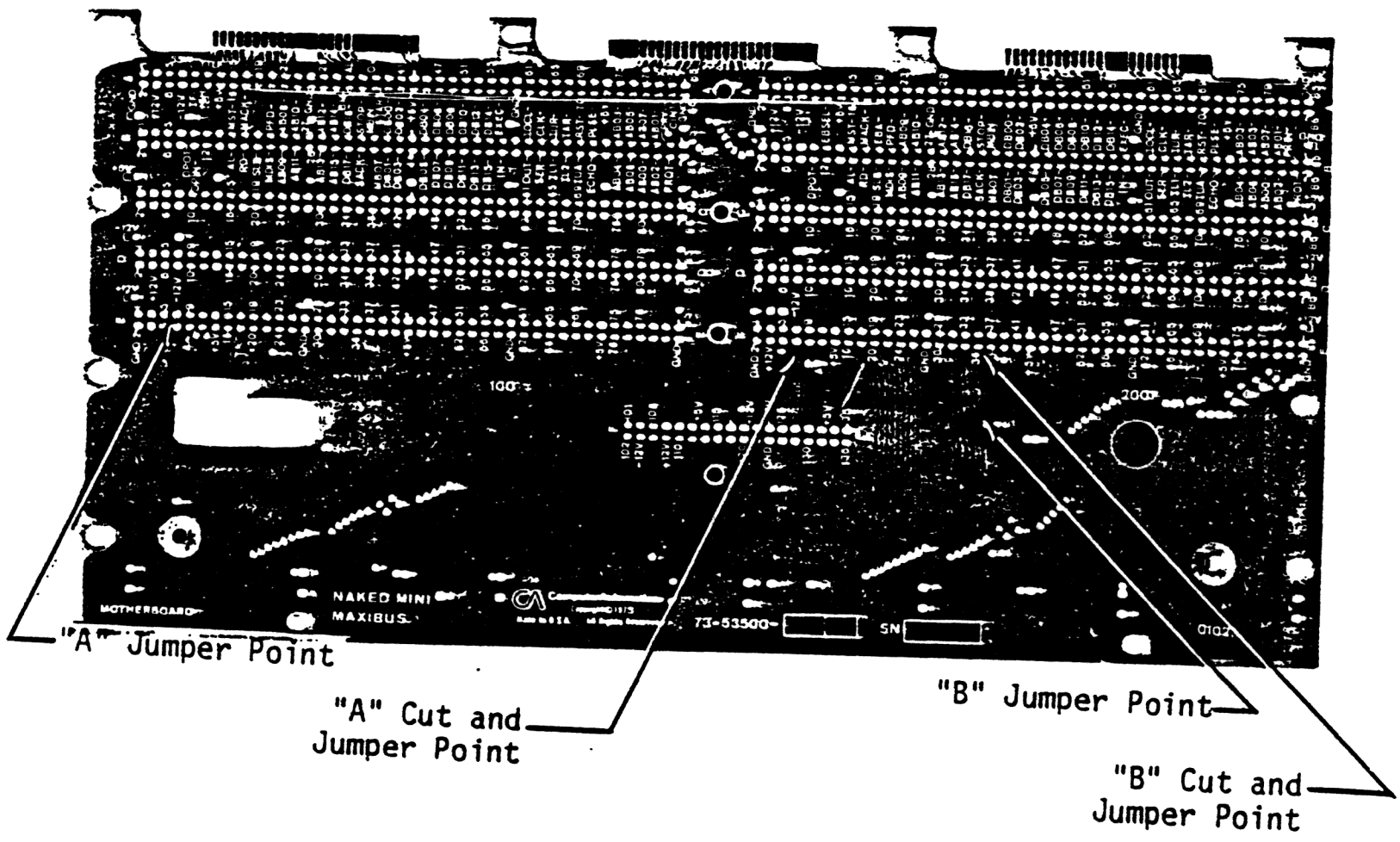


Figure 3-12. 5-Slot Chassis Motherboard

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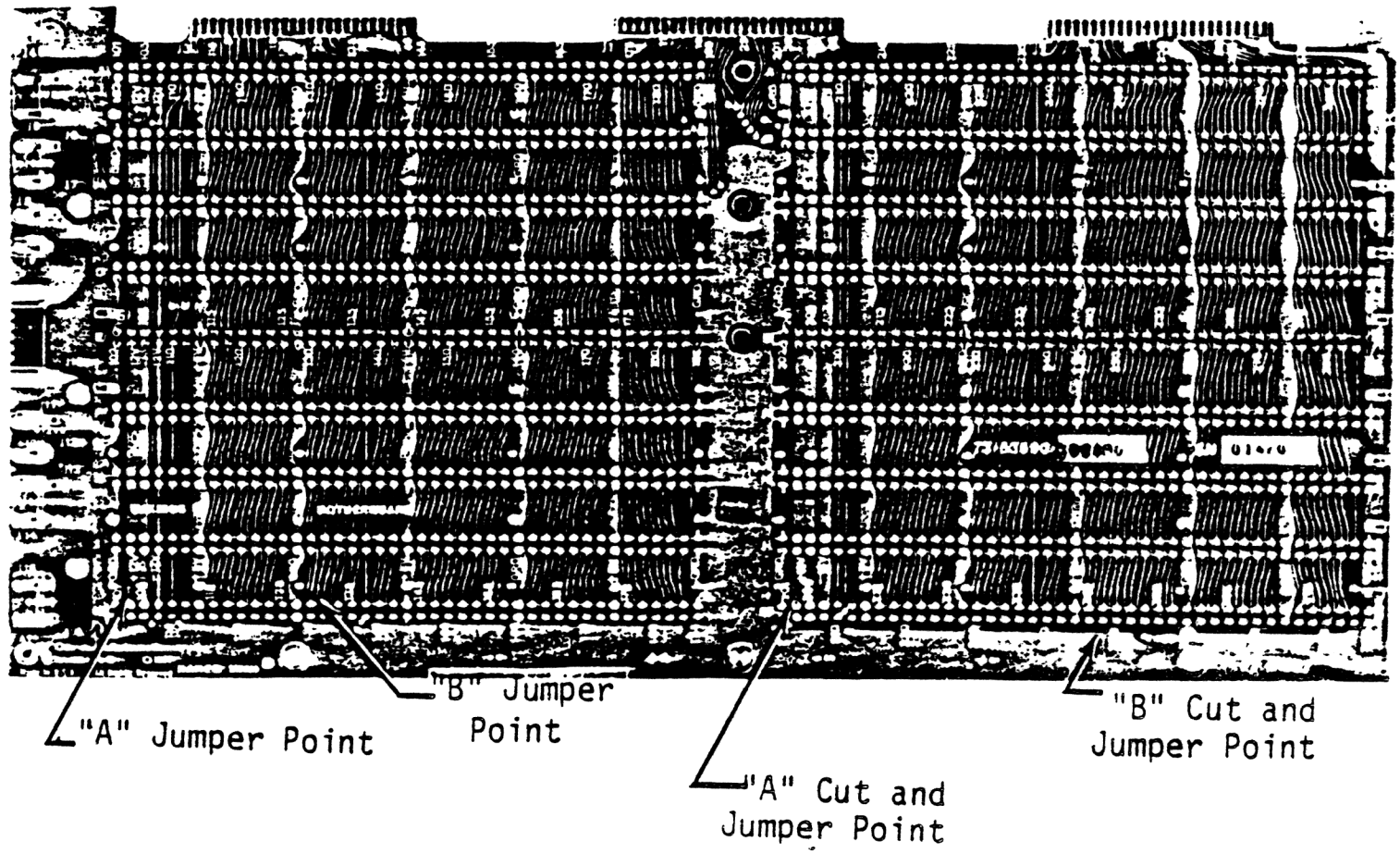


Figure 3-13. 9-Slot Chassis Motherboard

3.7 MOTHERBOARD GROUNDING

Computer Automation, Inc., ships its motherboards with separate logic and chassis grounding. If it is desirable to connect the grounding, proceed as follows. For the 5-slot and standard (non-split) 9-slot chassis:

1. Remove one of the lower mounting screws. (On the 5-slot chassis, the lower mounting screws are located below E200 and F100. They are located below K100 and K200 on the 9-slot chassis.)

2. Replace the fiberwasher with a #6 lockwasher.

3. Re-insert the mounting screw.

For the S9 and S17 chassis:

1. Place a fast-on type connector on power supply pin J4.

2. Connect J4 to common ground.

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3.8 JOINING HALF-BOARDS

PC boards are either "full-boards" or half-board," depending on their width. Half-boards can be joined with other half-boards or fillers to make a full-board width. Full-boards can be used in 19" width user designed enclosures or in the Computer Automation, Inc., full-card chassis.

Where several half-boards are used in a user-designed 19" width enclosure, or in the Computer Automation, Inc., full-card chassis, they must be joined to form full-sized boards. In those cases where an odd multiple of half-boards is used, a blank filler board must be used with the odd half-board to provide mechanical strength and convenience.

If joined with a filler board, filler board model 13638-01, model 13638-02, or model 13265-02 must be used. Filler board 13638-01 is used for joining to a 4/10 processor board. Filler board 13638-02 is used when propagation of the priority chain is required. Filler board 13265-02 is blank and does not propagate the priority chain; it can be used only as the last board in the chain.

Half card modules are joined using a Computer Automation, Inc., stiffener kit part number 95-20660). This kit contains the following parts:

- One stiffener bar
- Six 4-40 x 3/8" screws, with washers and hex nuts
- Twelve fiber washers
- Two plastic mounting blocks, with four nylon screws
- Two nylon board extractors, with roll pins

In addition to the stiffener kit, a 16-wire jumper is shipped along with 4/10 Processor Boards ordered for installation in a full-card chassis.

3.9 JOINING THE 4/10 PROCESSOR BOARD TO ANOTHER HALF-BOARD

When joining the 4/10 Processor Board to another board be sure to position the half-boards such that the 4/10 Processor Board will plug into slot A100 in the full card chassis. Before joining the 4/10 Processor Board to another half-board check to make sure the selected half-board has a DIP connector socket positioned adjacent to J1 on the 4/10 Processor Board. The screw securing the outer edge of the Intelligent Cable retainer on the 4/10 Processor Board must be removed before proceeding with the joining procedure to allow installation of the stiffener bar.

The half-board joining procedure is:

1. Install the two plastic mounting blocks between the half-boards by inserting two nylon screws in each block from the solder side of the board (see section A-A of Figure 3-14). Do not tighten screws firmly at this time.

2. Position the stiffener bar at the read edge of the component side of the joined boards so that the mounting holes in the stiffener bar are lined up with the mounting holes in the board.

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3. Insert one 4-40 screw through a fiber washer and through each mounting hole in the card (from the solder side), through another fiber washer and through each hole in the stiffener (total six screws), as shown in section B-B of Figure 3-14. Install a lock washer and hex nut onto each screw, but do not tighten firmly at this time.

4. Stand the two-card assembly vertically on a level surface with the front edge down. Position the cards so that the sides are butted together and both front edge connectors are touching the level surface. Tighten each of the screws securely while maintaining position of the two cards.

5. Examine the card extractors on a full-card module. Install the supplied card extractors in a similar manner on opposite read edges of the joned card, using the mounting holes provided. Secure the extractors with the supplied roll pins.

6. If the two-card assembly includes the 4/10 Processor Board, plug one end of the 16-wire jumper into J1 on the 4/10 Processor Board and the other end into the adjacent DIP connector socket on the other half-card.

This completes the joining operation. The two-card assembly is now ready to install in the appropriate chassis slot. If the two-card assembly includes the 4/10 Processor Board and Intelligent Cables are being installed, the Intelligent Cables must be attached before installing the two-card assembly in the chassis.

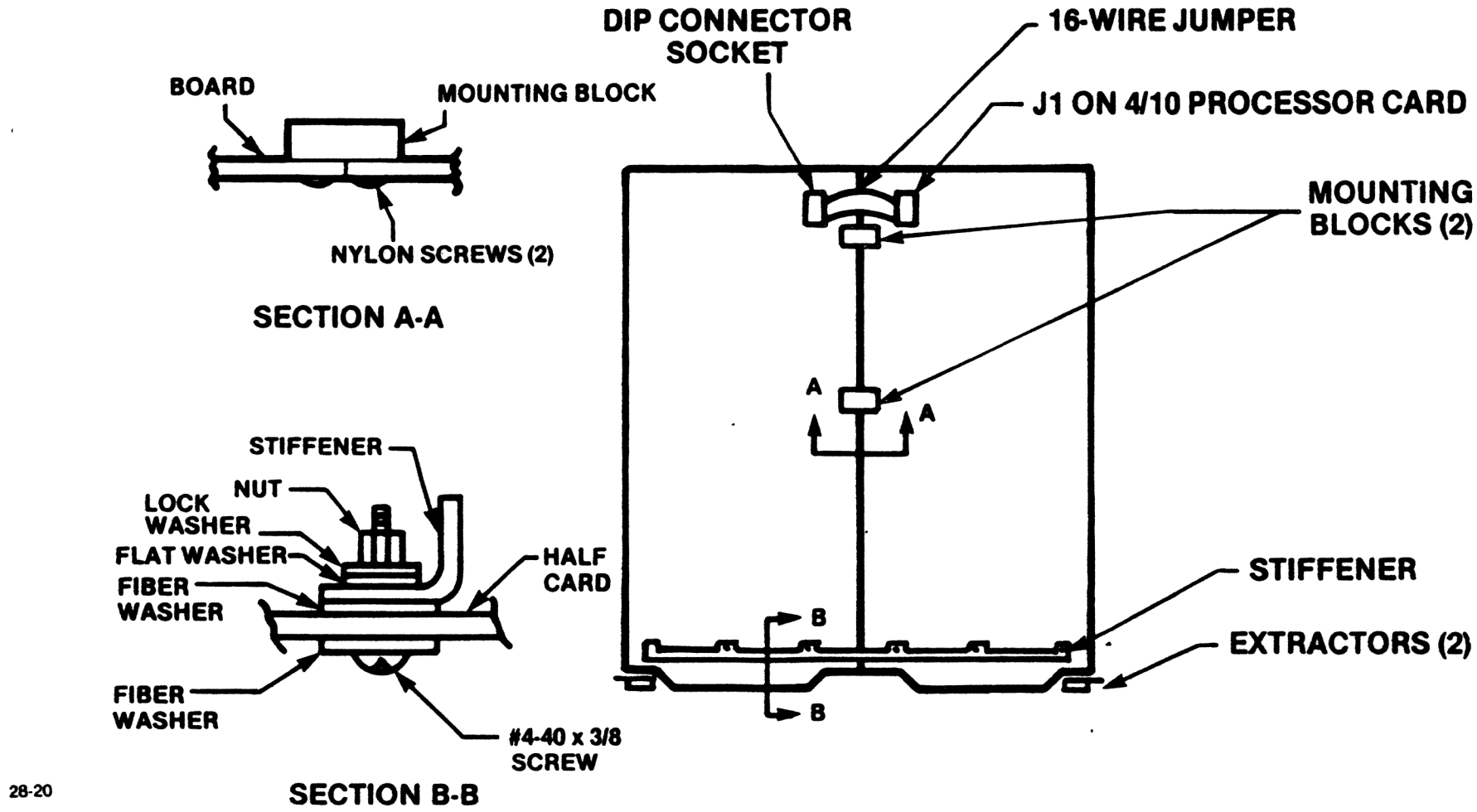


Figure 3-14. Joining Half-Cards

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CAUTION

All I/O interface modules (except for floppy disk) must have the rear-edge cable connector installed prior to operation of the processor. If the connector is not installed, a default device address of zero will be assigned to the module, causing improper instruction execution. Device address zero is reserved exclusively for processor use. For details concerning assignment of a unique device address to each I/O interface module, refer to the associated interface description which is packed with each module.

3.10 INSTALLING OPERATOR'S/PROGRAMMER'S CONSOLE

The Operator's and Programmer's Console are installed on the chassis identically. Install the console on the chassis shown in Figure 3-15 as follows:

1. Align red striped edge of console ribbon cable connector W1 with pin 1 of motherboard connector J1 and press connector firmly into place.

2. Align console ball studs with chassis ball stud receptacles and apply pressure to console face to seat ball studs.

3.11 INSTALLING CONNECTOR AND JUMPER FOR AUTOMATIC AUTOLOAD

When the processor is operated without a console and automatic AutoLoad is desired, the Sense Switch (input) must be grounded by installing a Viking connector number 3VH25/1JN5 with a jumper from pin 39 to 41 at J1 on the motherboard.

3.12 CHASSIS COOLING

The computers operate in a ambient temperature range of 0° to 50°C. Sufficent air flow must be maintained across the computer modules to assure that the local ambient termperature does not exceed 50°C. Half-card chassis are equipped with a small fan, but are basically designed to be cooled by free-air flow. The 5- and 9-slot full-card chassis are equipped with three fans powered through the power transformer. The S17 chassis has six fans. Each fan typically delivers 60 to 80 CFM. This is sufficient to maintain the temperature of components at 5°C below allowable limitations where operating at an ambient temperature of 50°C and with a worst case complement of printed circuit boards. The fans operate on 115 V even if a 220/250 V supply is used. The fans operate at either 50 or 60 Hz.

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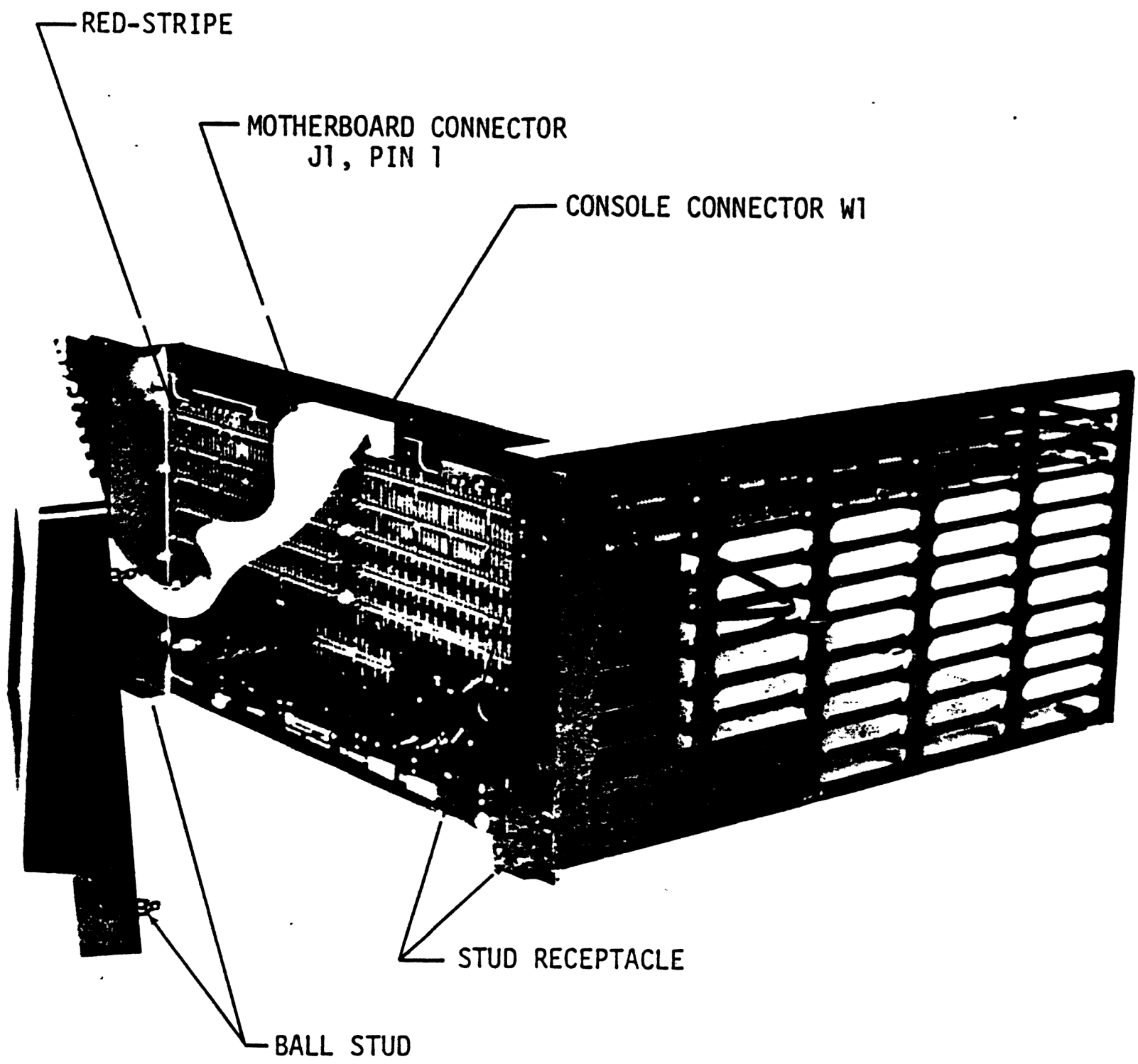


Figure 3-15. Console Installation on Full Card Chassis

When installed in an enclosure, one of three types of vertilating systems must be employed to maintain the temperature requirements. The three systems are as follows:

1. Closed ventilating system

   In the closed ventilating system, it is assumed the ambient termperature will be maintained by the thermal interface. The minimum size enclosure must provide adequate air flow paths for the computer's internal fans.

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2. Side ventilating system

   The side ventilating system establishes the minimum enclosure size and rectangular surface for the minimum size opening. This provides for a safety guard if necessary.

3. Top/Bottom ventilating system

   The top/bottom ventilating system defines the minimum airflow paths for a cabinet with stacked equipment or an individual console enclosure.

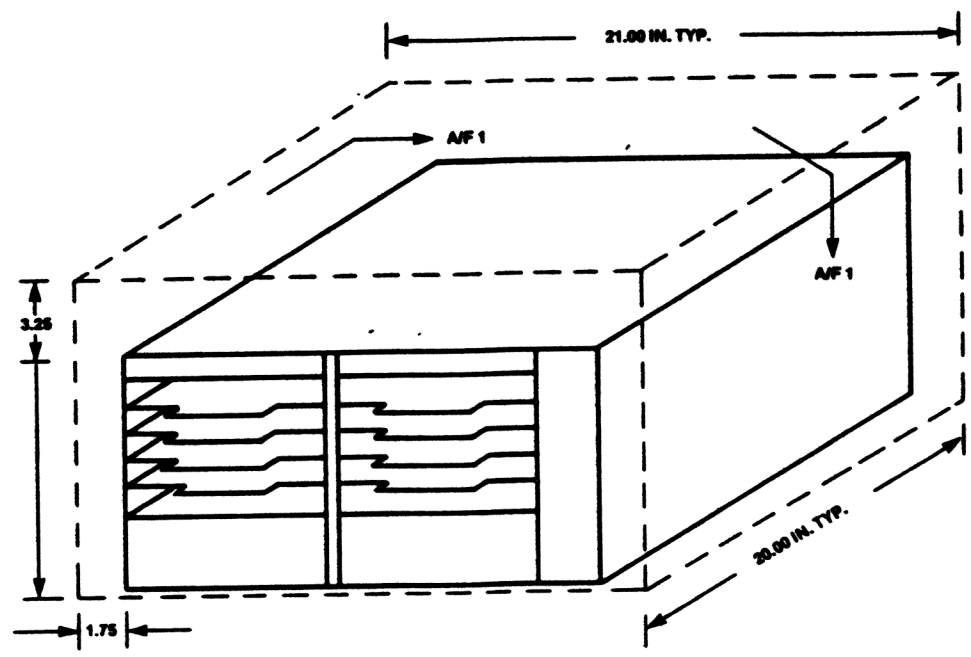
The three arrangements are illustrated in Figure 3-16. Table 3-1 gives the dimensions of the required clearances indicated in the figure to permit proper airflow. The dimensions given in clumns A, B, and C are in inches. The dimensions in Column D are in square inches.

Table 3-1. Chassis Airflow Clearance Dimensions

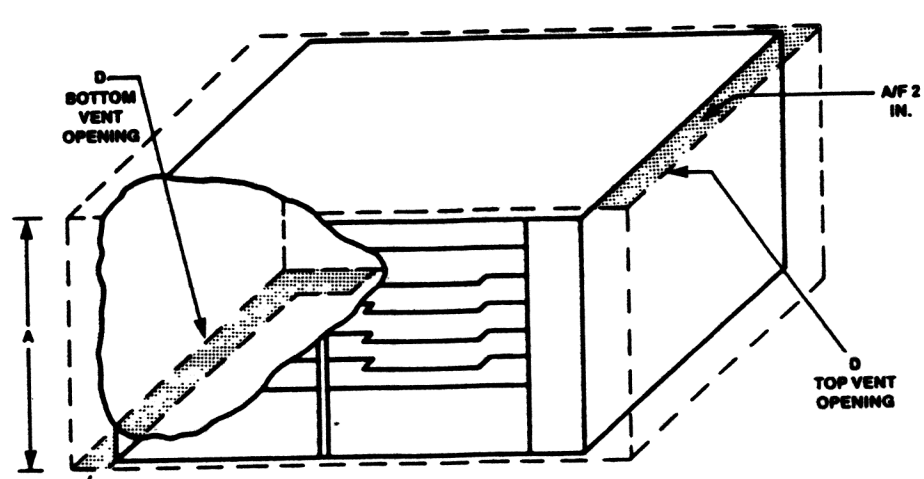
CHASSIS TYPE	AIR FLOW DIRECTION	VENTILATION SYSTEM	"A"	"B"	"C"	"D"
3-Slot Half-Card 5-Slot Half-Card 5-Slot Full-Card 9-Slot Standard S9	A/F #1	Closed	12.00	—	—	—
	A/F #2	Top/Bottom	8.75	—	—	44.0
	A/F #3	Side	8.75	7.0	16.0	112.0
S17	A/F #1	Closed	24.00	—	—	—
	A/F #2	Top/Bottom	17.50	—	—	44.0
	A/F #3	Side	17.50	14.0	16.0	224.0

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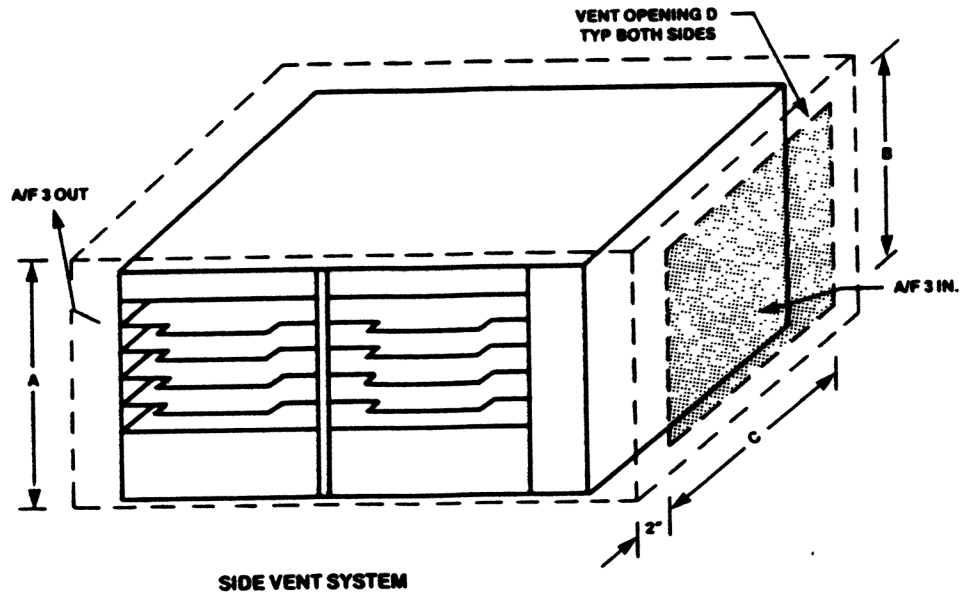
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CLOSED VENT SYSTEM



TOP/BOTTOM VENT SYSTEM



SIDE VENT SYSTEM

28-28

Figure 3-16. Chassis Airflow Ventilation Arrangements

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APPENDIX A

WORKSHEETS

The worksheets supplied within Appendix A are provided as an aid to be used in determining installation requirements, configurations, and system loading.

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DEVICE NAME	CARD SIZE	MAXIMUM CURRENT			I/O CONTROLLER			MEMORY CAPACITY
		+ 5V	+ 12V	– 12V	DMA	Interrupt	Intelli-gent Cable	

28-28

Figure A-1. Hardware Summary List Worksheet

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DEVICE NAME	CARD SIZE	MAXIMUM CURRENT			I/O CONTROLLER			MEMORY CAPACITY
		+ 5V	+ 12V	– 12V	DMA	Interrupt	Intelli-gent Cable	

28-28

Figure A-1. Hardware Summary List Worksheet Continued

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DEVICE NAME	CARD SIZE	MAXIMUM CURRENT			I/O CONTROLLER			MEMORY CAPACITY
		+ 5V	+ 12V	– 12V	DMA	Interrupt	Intelli-gent Cable	

28-28

Figure A-1. Hardware Summary List Worksheet Continued

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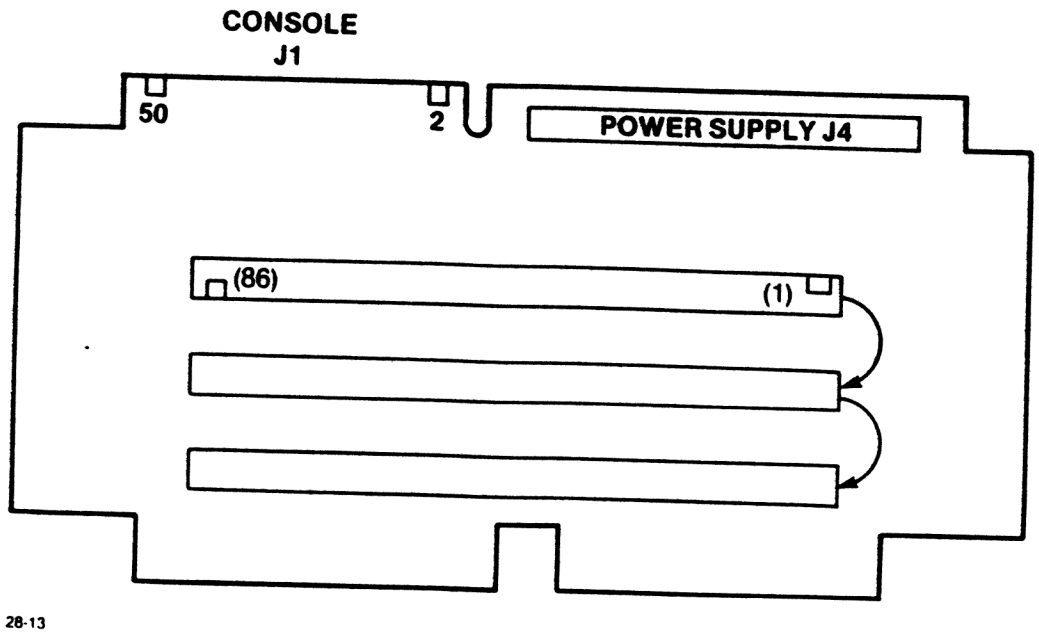


Figure A-2. Three-Slot Chassis Worksheet

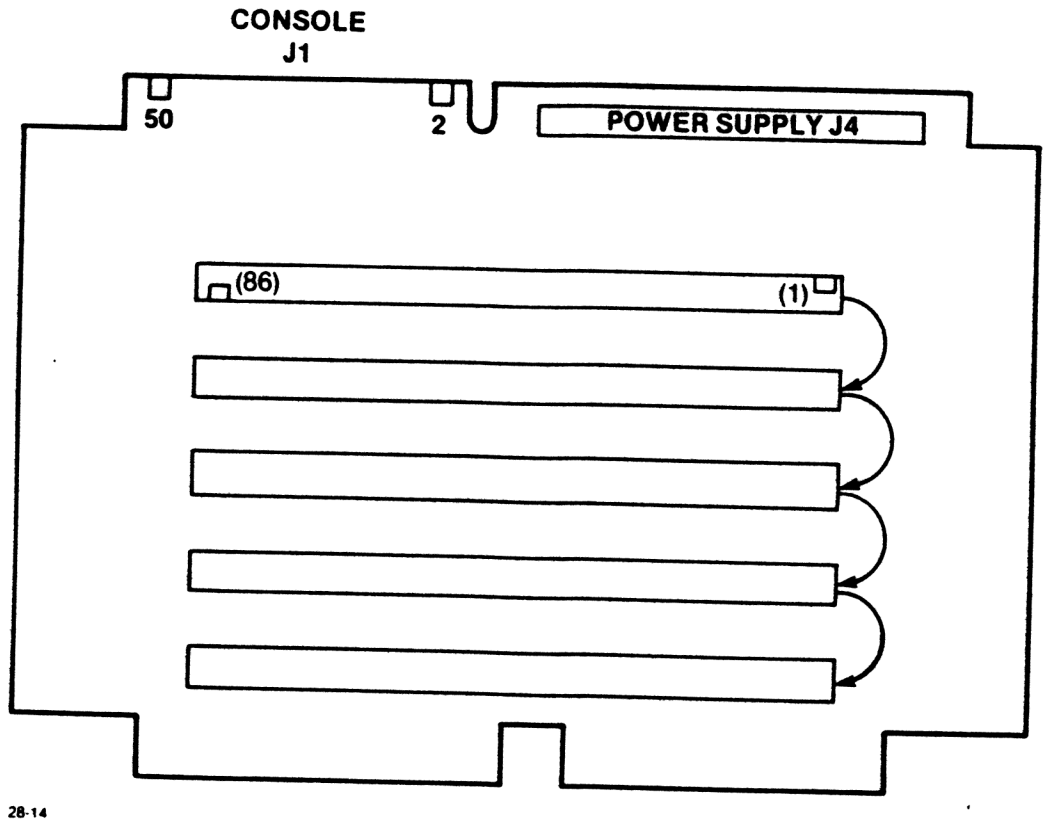


Figure A-3. Five-Slot Half-Card Chassis Worksheet

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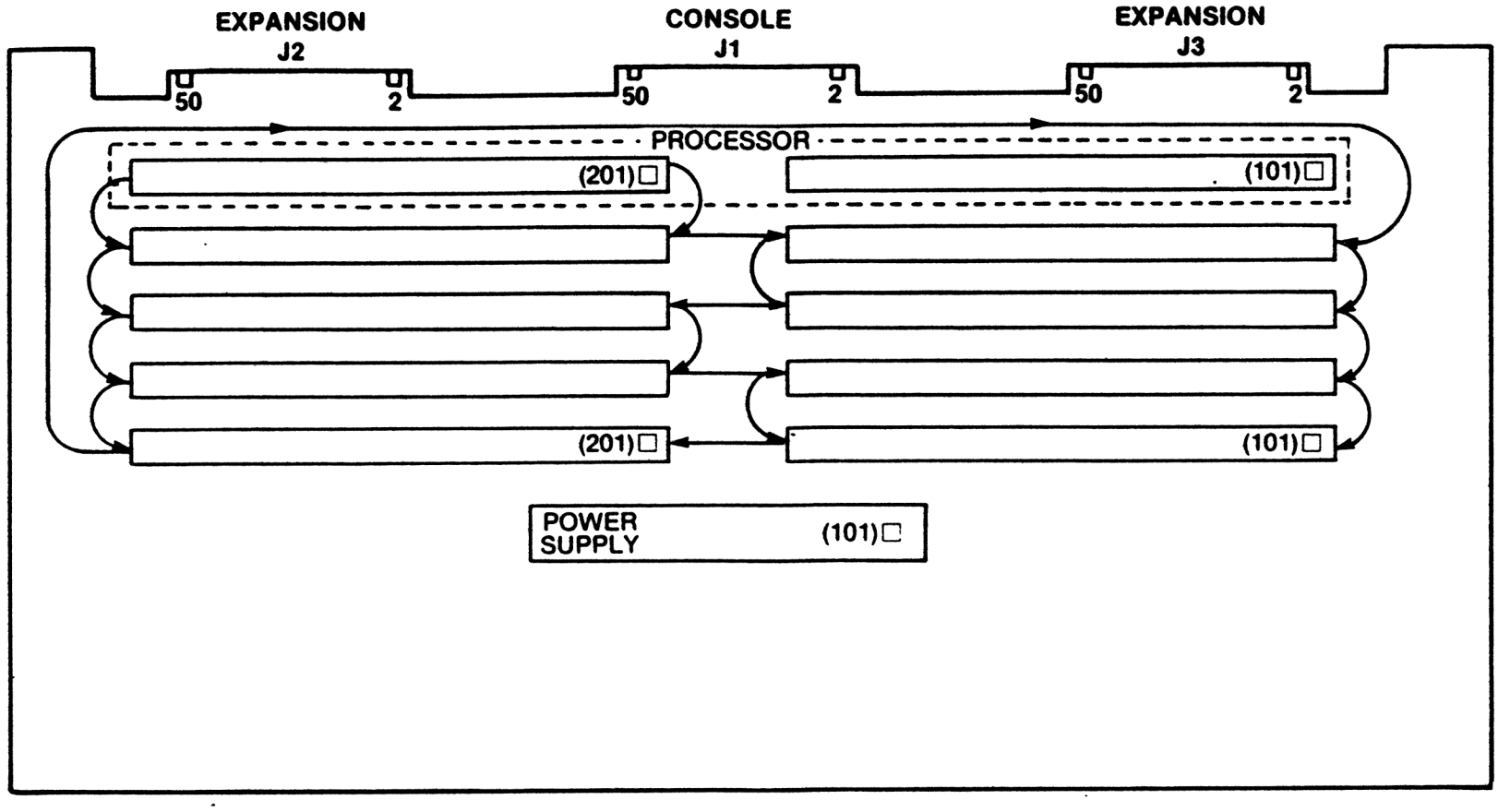


Figure A-4. Five-Slot Full-Card Chassis Worksheet

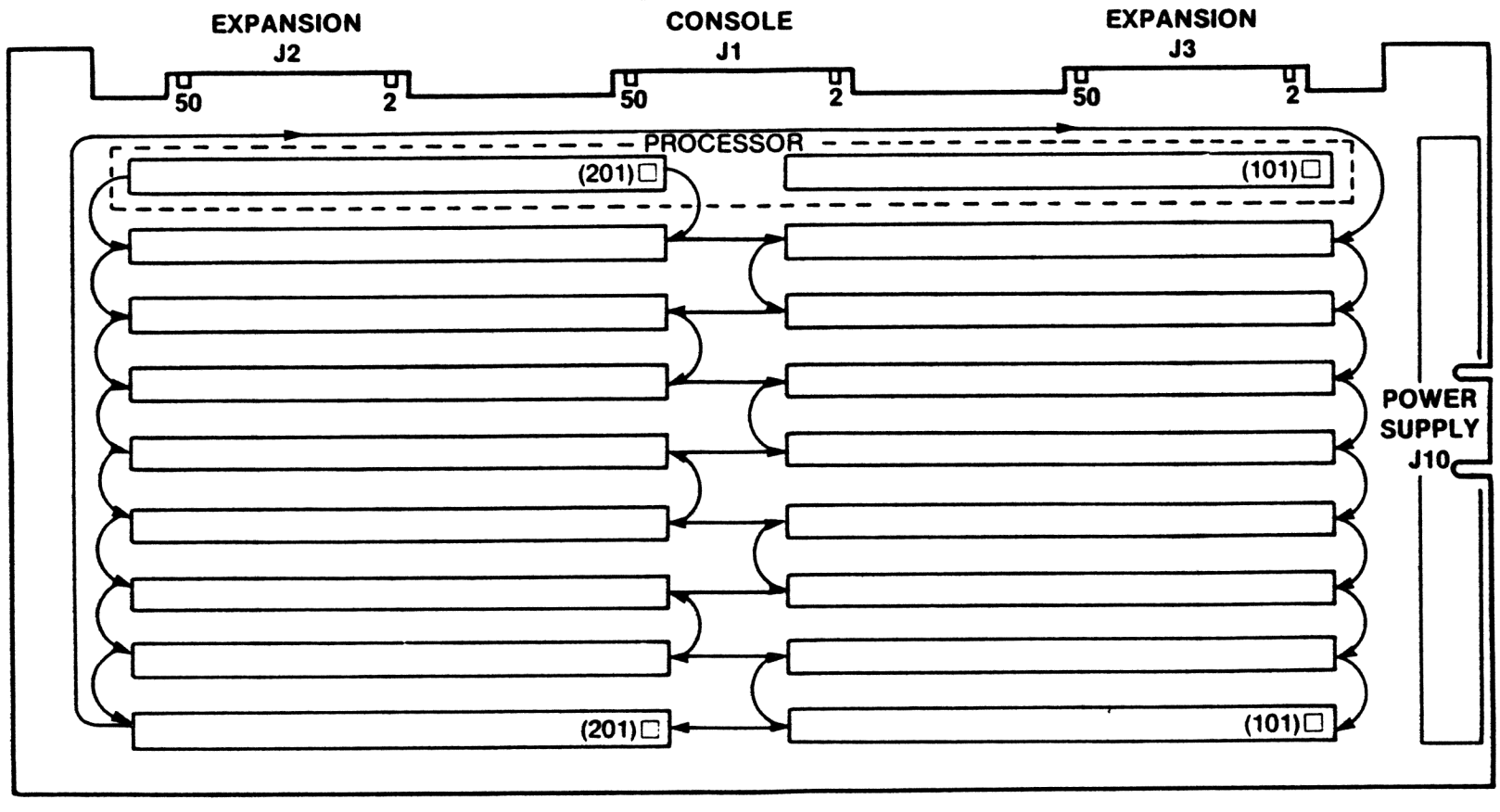


Figure A-5. Standard 9-Slot Chassis Worksheet

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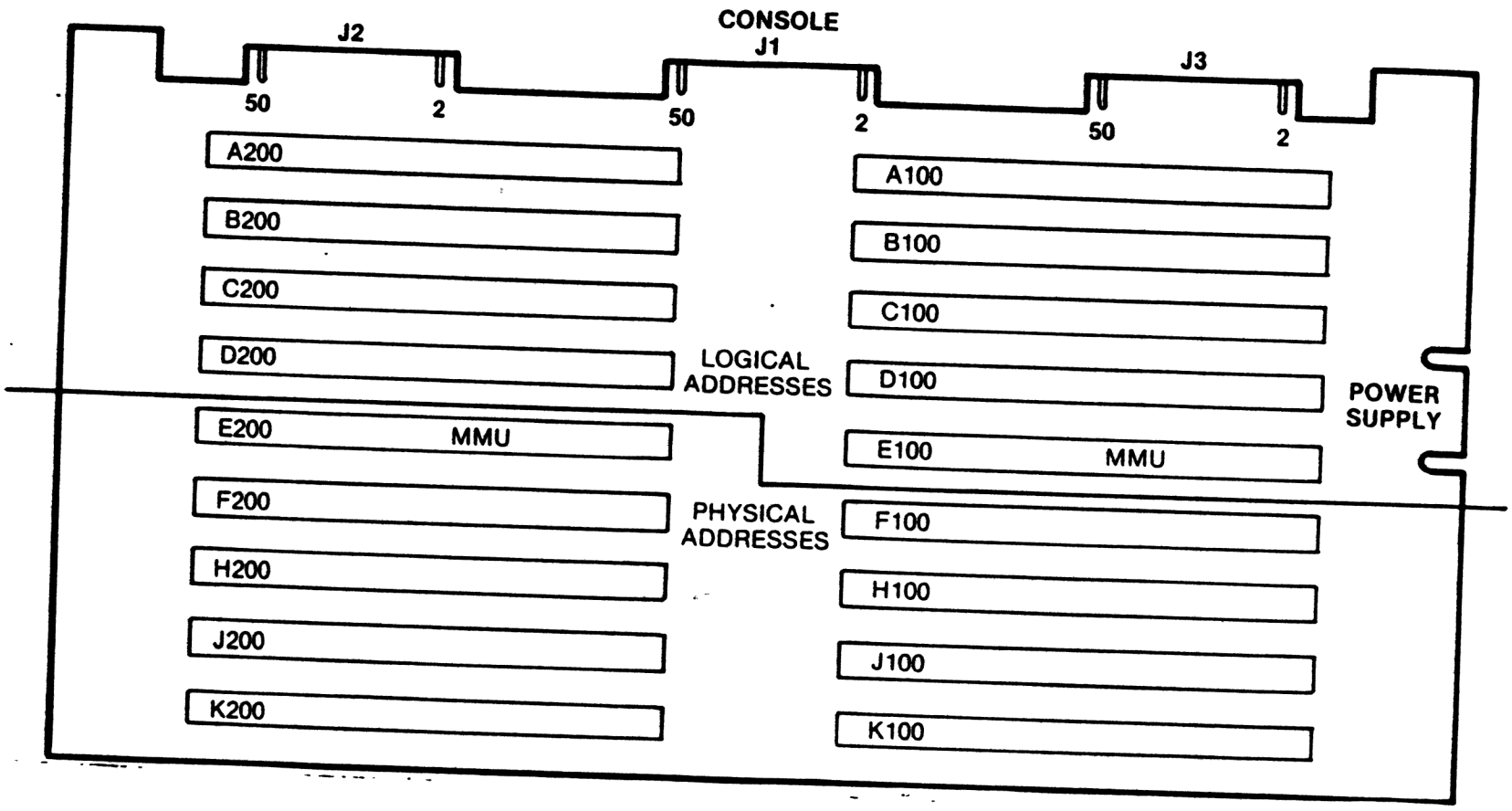


Figure A-6. S9-Chassis Worksheet

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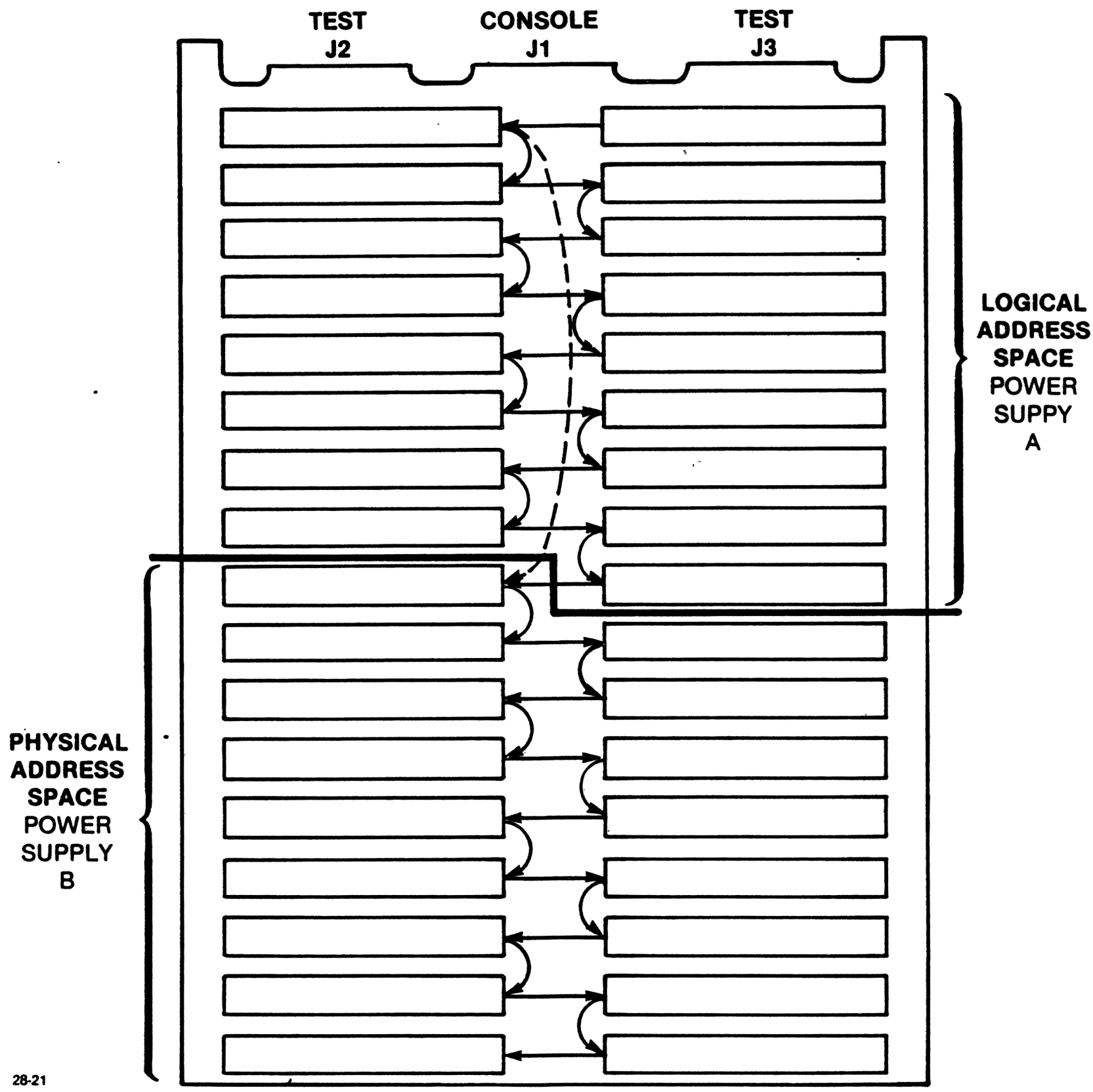


Figure A-7. S17-Chassis Worksheet

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Japan
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TLX: 2422827

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9322 Gijzegem
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PH: 53/21-4628
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