Power, Cooling, and Control

HMM-370-0
CRAY J98se and CRAY J916se Series Systems
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Figures

Tables

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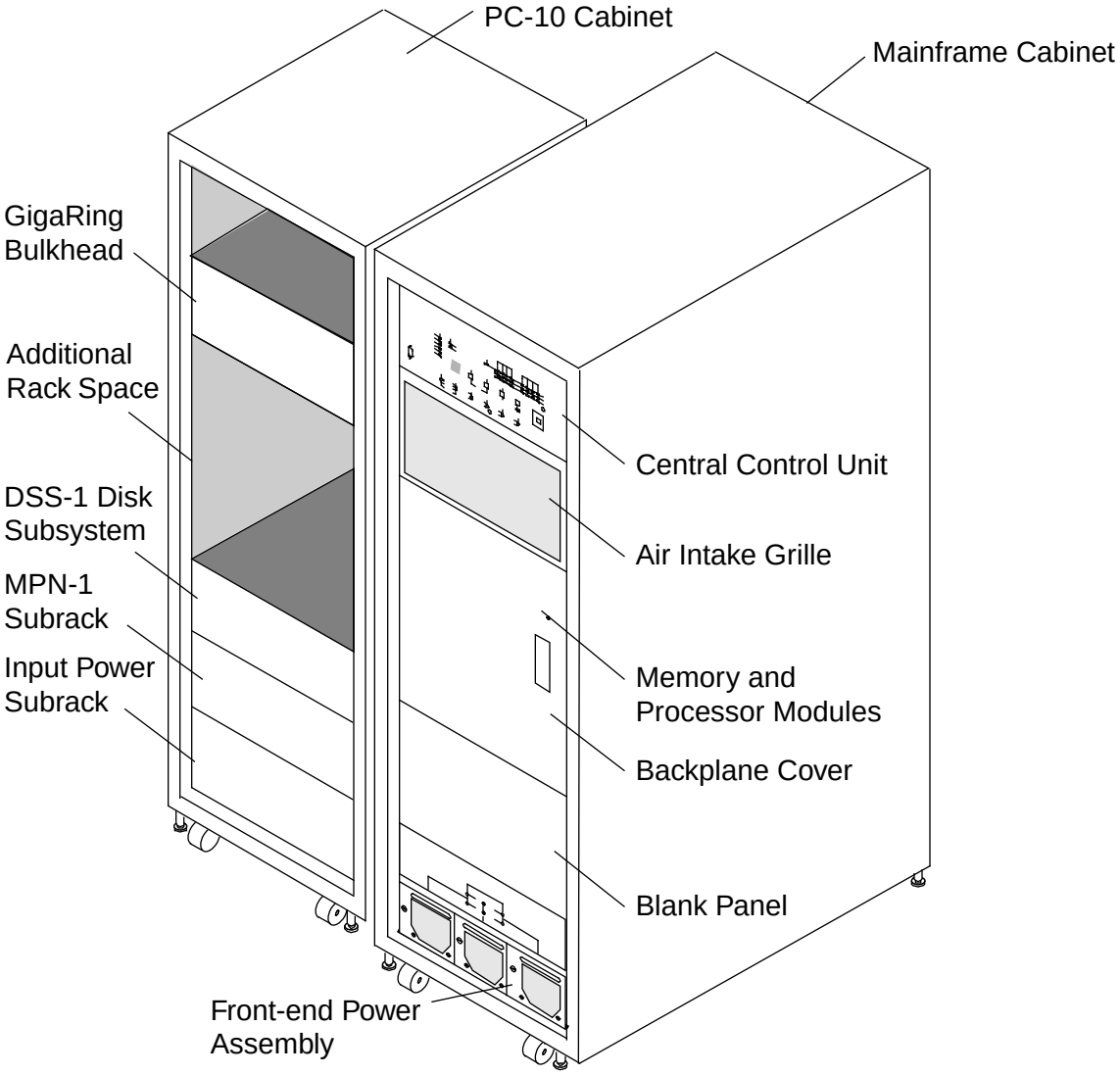
Document Overview

This document describes the power, cooling, and control systems for CRAY J98se and CRAY J916se (hereafter referred to as CRAY J98se/J916se) mainframe cabinets.

Figure 1 lists and illustrates the major components of the mainframe cabinet and PC-10 cabinets. The PC-10 cabinet shown in Figure 1 is only an example of a possible PC-10 cabinet configuration. The central control unit includes some PC-10 cabinet indicators; however, status and fault LEDs that are specific to the PC-10 cabinet are located on the individual PC-10 cabinet components.

Figure 1. CRAY J98se or CRAY J916se Computer System



Operating Requirements

The operating requirements of the CRAY J98se/J916se computer systems must be met in order for the computer systems to operate efficiently and reliably. Table 1 provides the input power requirements for the mainframe cabinet. Table 3 provides a list of the cooling requirements necessary to ensure proper cooling of the mainframe cabinet components.

The maximum power requirements and air-conditioning requirements for the CRAY J98se mainframe cabinet are 3.26 kVA (3.10 kW) and 10.58 Btu/hr.

The maximum power requirements and air-conditioning requirements for the CRAY J916se mainframe cabinet are 3.79 kVA (3.60 kW) and 12.28 Btu/hr.

Table 2 provides the air-conditioning and electrical requirements for the mainframe cabinet.

Table 1. Input Power Requirements

Electrical Service	Specification
Voltage	200 to 240 Vac +6% to -10%, single phase
Frequency	50 or 60 Hz ±5%
Circuit breakers (2 required)	30 amp
Power consumption:	Refer to Table 2.
Hold-up time	16 milliseconds at full load
Total harmonic distortion (THD)	Less than 30% at full load
Power cables (2 supplied)	8-ft (2.4-m) pluggable drop cords
Receptacle: North America and Japan (2 required) Receptacle: International (2 required)	Hubbell #330C6W or equivalent † IEC309, single phase, 32 amp

† A Hubbell #330C6W is an inline-type connector that requires an adapter to accept conduit. A Hubbell #330R6W receptacle with a back box may be substituted.

Table 2. Electrical and Air-conditioning Requirements

Device	Electrical	Air Conditioning
	kVA per Unit	kBtu/hr per Unit
Processor modules (1 to 4 for a CRAY J916se System) (1 or 2 for a CRAY J98se System)	0.30	0.98
Memory modules: (4 for a CRAY J916se System) (2 for a CRAY J98se System)	0.29	0.99

Table 3. Environmental Requirements

Characteristic	Specification
Temperatures:	
Operating	55 to 85 °F (13 to 29°C)
Temperature rate of change	Less than 10 °F (6 °C) per hour
Nonoperating	34 to 120 °F (1 to 49 °C)
Shipping	-40 to 140 °F (-40 to 60 °C)
Storage †	34 to 120 °F (1 to 49 °C)
Relative Humidity:	
Operating	20% to 80% noncondensing
Nonoperating	20% to 80% noncondensing
Shipping	5% to 95% noncondensing
Storage †	10% to 80% noncondensing
Altitude:	
Operating	0 to 6,562 ft (0 to 2,000 m)

† Cray Research assumes that the system is stored in its crate.

Power Assemblies

Refer to Figure 2 while you read the following subsections. The CRAY J98se/J916se mainframe cabinet contains three power assemblies:

- Input Power Assembly
- Front-end Power Assembly
- Logic Power Module

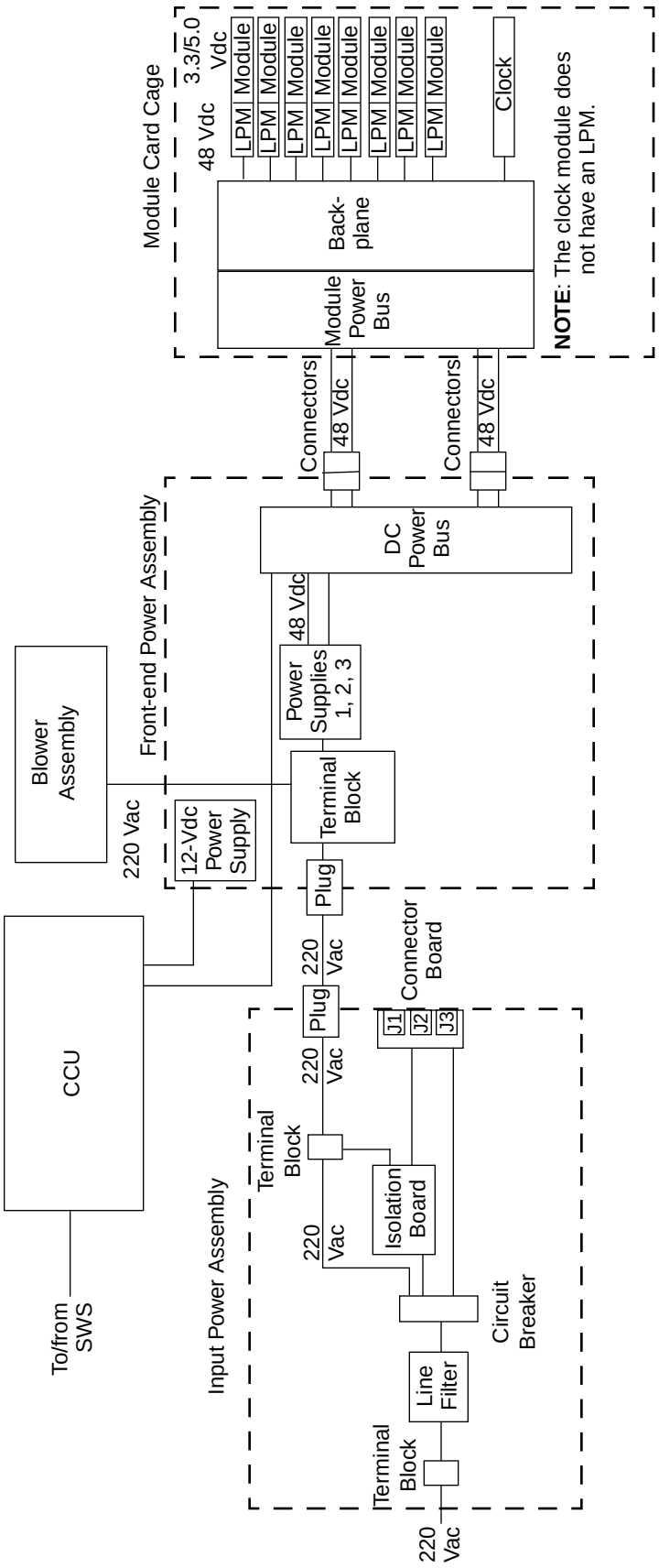


Figure 2. CRAY J98se/J916se Mainframe Power Distribution Block Diagram

Input Power Assembly

The input power assembly (refer to Figure 3) provides the connection for the customer-supplied 220-Vac power to the mainframe. One 220-Vac power line enters the mainframe through this assembly, which is located on the bottom of the back side of the mainframe.

The 220-Vac power line connects to a terminal block inside the input power assembly. The terminal block distributes the power through a line filter, which filters electrical noise that enters or leaves the mainframe cabinet. From the line filter, the 220-Vac power passes through a 2-pole circuit breaker, which removes power from the line if an overcurrent condition exists.

One power output cable from the input power assembly connects to the front-end power assembly at the front of the mainframe cabinet.

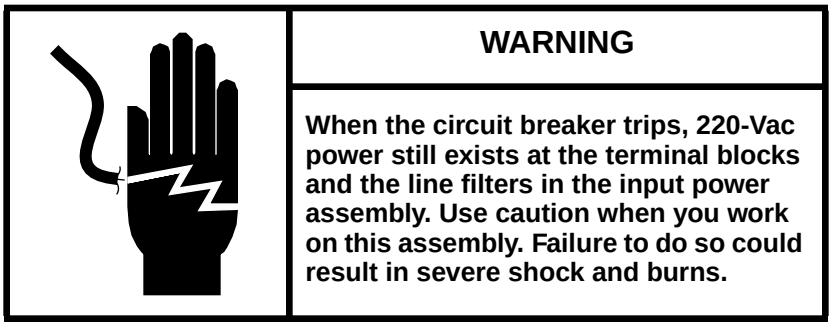
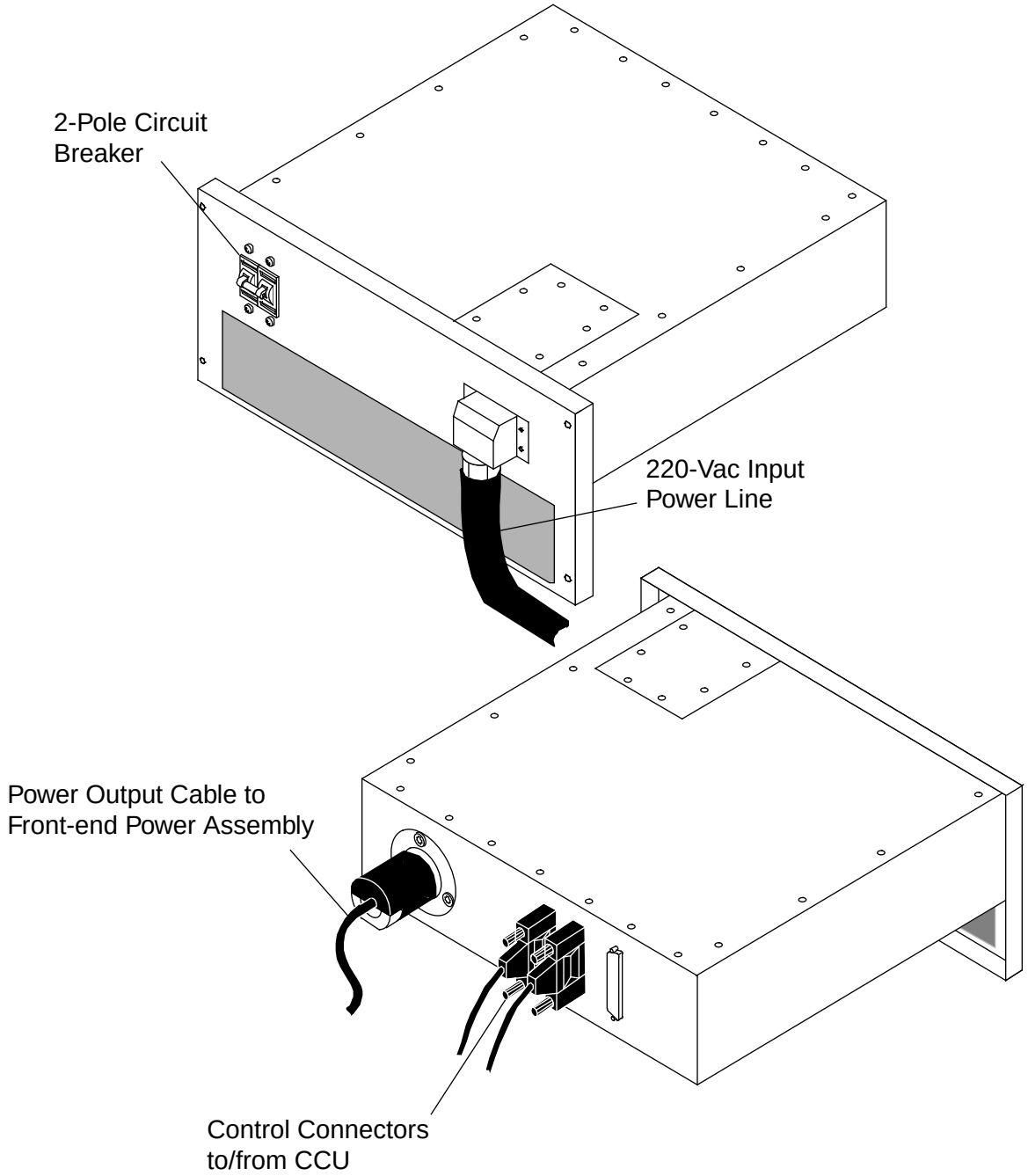


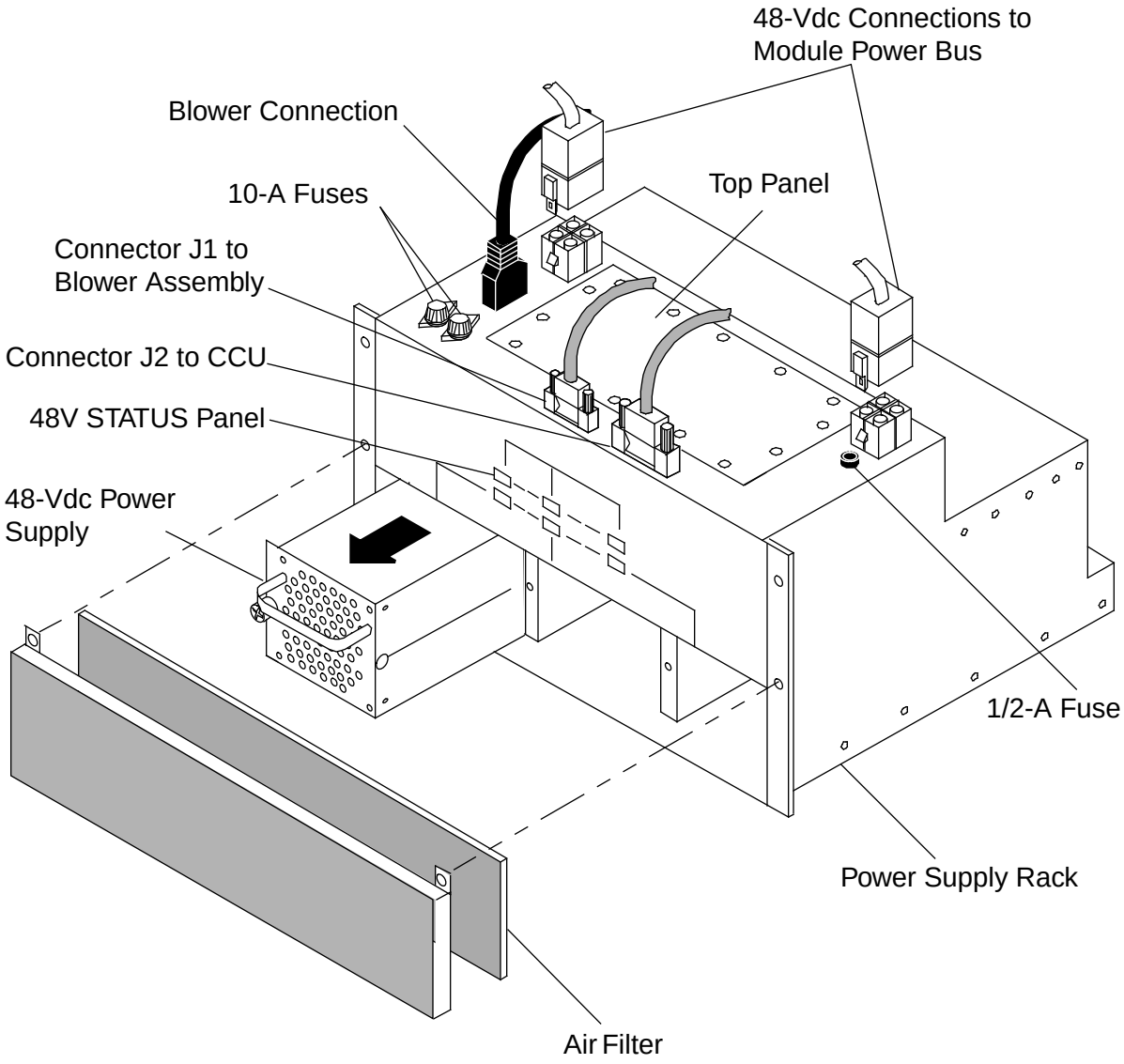
Figure 3. Input Power Assembly



Front-end Power Assembly

The front-end power assembly (refer to Figure 4) receives a 220-Vac power line from the input power assembly (refer to Figure 3) and distributes power to the blower assembly, central control unit (CCU), and module power bus.

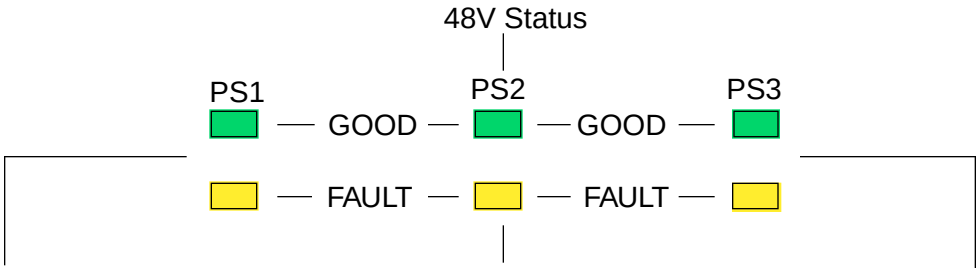
Figure 4. Front-end Power Assembly



NOTE: The 12-Vdc CCU power supply and terminal block are located under the top panel.

48V STATUS Panel

The 48V STATUS panel is located on the front of the front-end power assembly. This panel provides status and fault information for each power supply. Each power supply has two LEDs associated with it: a green LED and a yellow LED. The green LED indicates that a power supply is operating within regulation (good); a yellow LED indicates that a power supply has a fault condition.



12-Vdc Power Supply

The 12-Vdc power supply receives 220-Vac power and converts it to 12-Vdc power for the CCU. The CCU also receives secondary 48-Vdc power, which is used only if the 12-Vdc power supply fails.

48-Vdc Power Supplies

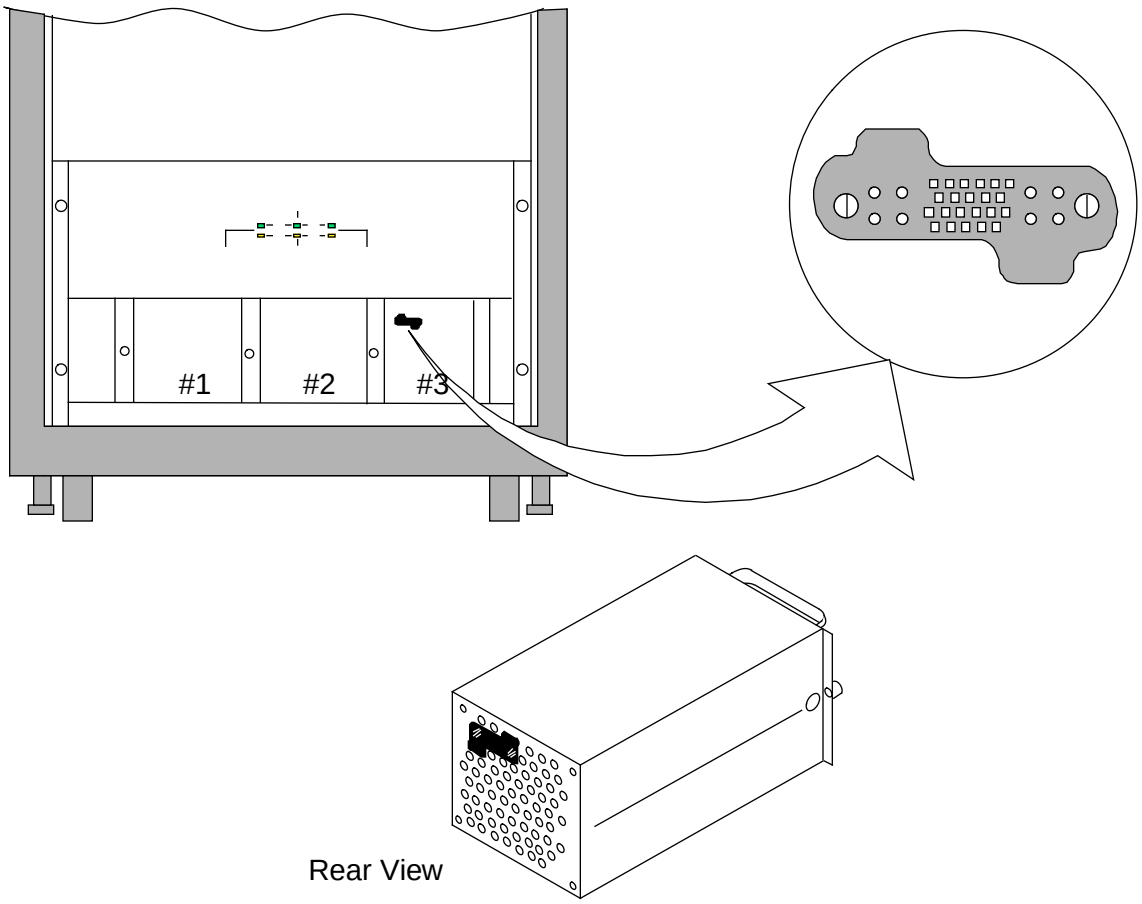
Two or three power supplies provide 48-Vdc power to the modules. The power supplies are mounted in the power supply rack at the bottom of the front-end power assembly. Two power supplies are required to operate a CRAY J98se system and three power supplies are required to operate a CRAY J916se system.

The three power supplies supply power in an n+1 configuration. If one power supply fails, the other power supplies increase their output to accommodate the failed power supply. You do not need to power down the computer system in order to replace a failed power supply because the power supplies are *hot-swap* capable. The term *hot-swap* means that the power supply can be removed and inserted while a system is powered up.

Each power supply has a connector located on the back (refer to Figure 5) that connects with a connector on the back of the power supply rack. These connections are made when you slide the power supply completely to the back of the rack and tighten the screw on the front of the power supply.

NOTE: Always inspect the connectors on the power supply and on the back of the power supply rack for damage before you install a replacement power supply.

Figure 5. 48-Vdc Power Supply Connections

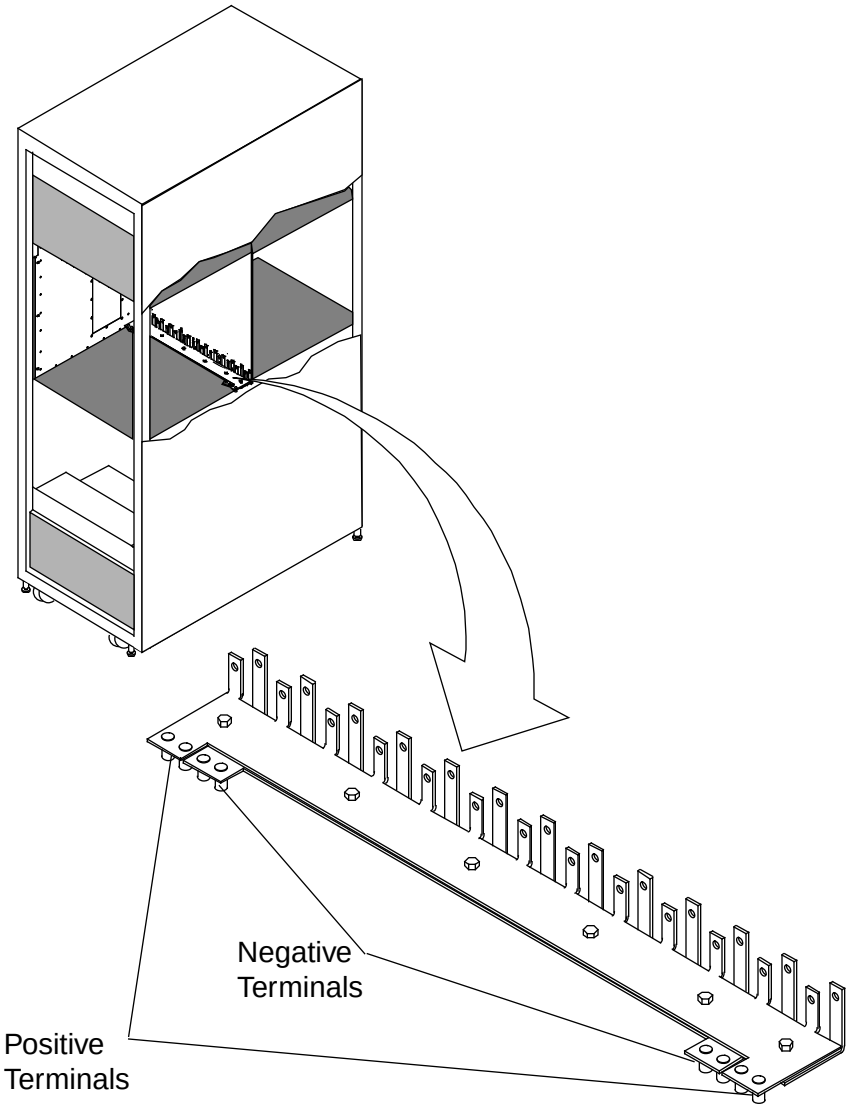


Module Power Bus

For each power supply, the converted 48-Vdc power flows to the module power bus where four lines (two at each end) carry the power to the connectors located on the top of the front-end power assembly. The module power bus (refer to Figure 6) is a thin-plated metal bus that resides on the module card cage backplane.

This power bus consists of two layers of metal: one positive bus and one negative bus. These two layers are separated by an insulating pad. Another insulating pad is also located on the bottom of the module power bus between the power bus and the backplane.

Figure 6. Module Power Bus



Logic Power Module

One logic power module (LPM) mounts internally on each CPU and memory module. Each LPM has seven onboard power supplies (PS1 through PS7) that reduce the 48-Vdc input voltage to either 3.3 Vdc or 5.0 Vdc. The PC+ ASIC operates at 2.6 Vdc as compared to 3.3 Vdc and 5.0 Vdc for the rest of the processor module ASICs. A separate 2.6-Vdc power source for the PC+ ASIC is provided by two PC boards that reduce the 3.3 Vdc from the LPM to 2.6 Vdc.

NOTE: The LPM and power supplies are not field replaceable items.

The power supply voltages are as follows:

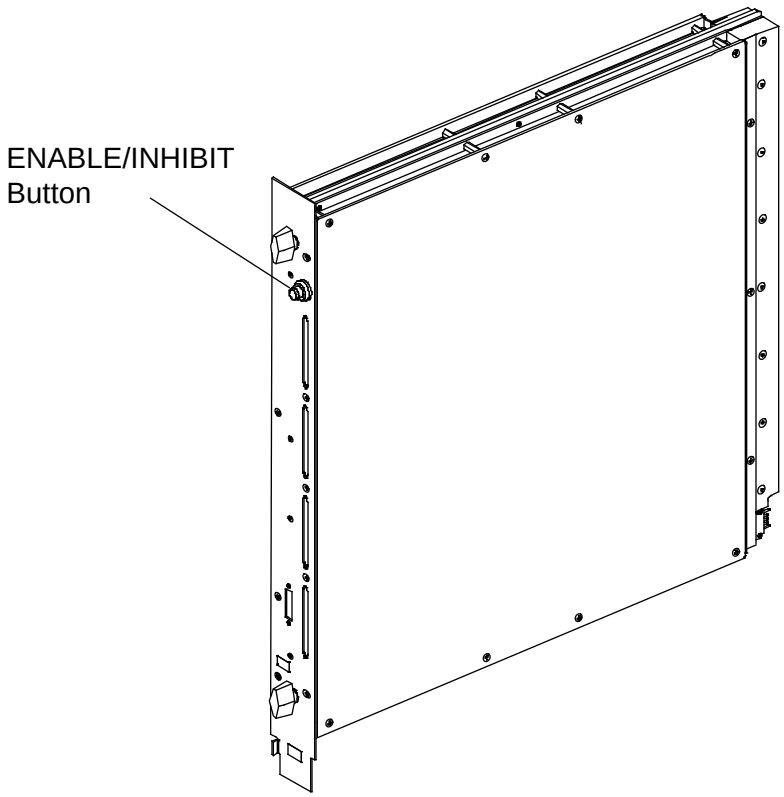
Power Supply	Voltage
PS1	3.3 Vdc
PS2	5.0 Vdc
PS3	5.0 Vdc
PS4	3.3 Vdc
PS5	3.3 Vdc
PS6	5.0 Vdc
PS7	Housekeeping

Module Local ENABLE/INHIBIT Button

Each module has a local ENABLE/INHIBIT button that is located on the front of the module (refer to Figure 7). This button is a two-position button that controls the LPM power output. When the button is pushed in, the center becomes green and the LPM is enabled. When the button is popped out, the center becomes black and the LPM is inhibited.

Use this button when you hot-swap a module. The term *hot-swap* means that you can remove or insert a module while the system is powered on; however, you must halt the operating system first. Before you remove a module, pop out the ENABLE/INHIBIT button to inhibit the LPM. After you install a new module, push in ENABLE/INHIBIT button to enable the LPM. Always press the CPU RESET and I/O RESET buttons on the CCU and reboot the system after you hot-swap a module.

Figure 7. CRAY J90se Series Processor Module



Cooling

The mainframe cabinet is an air-cooled device. The cabinet contains two main heat-producing devices: the modules and power supplies. Air must flow through both of these areas to cool the mainframe. The following subsections describe how the airflow cools the mainframe components.

Blower Assembly

The blower assembly (refer to Figure 8), which is located on the bottom of the module card cage, cools the modules. The blower assembly has a variable-speed blower that adjusts its speed to compensate for changes in environmental conditions.

The blower assembly receives 220-Vac power from the front-end power assembly. This power connects to the blower assembly at connector J1. Single-phase, 220-Vac power is applied to the 3/4-hp blower motor when the mainframe is powered on.

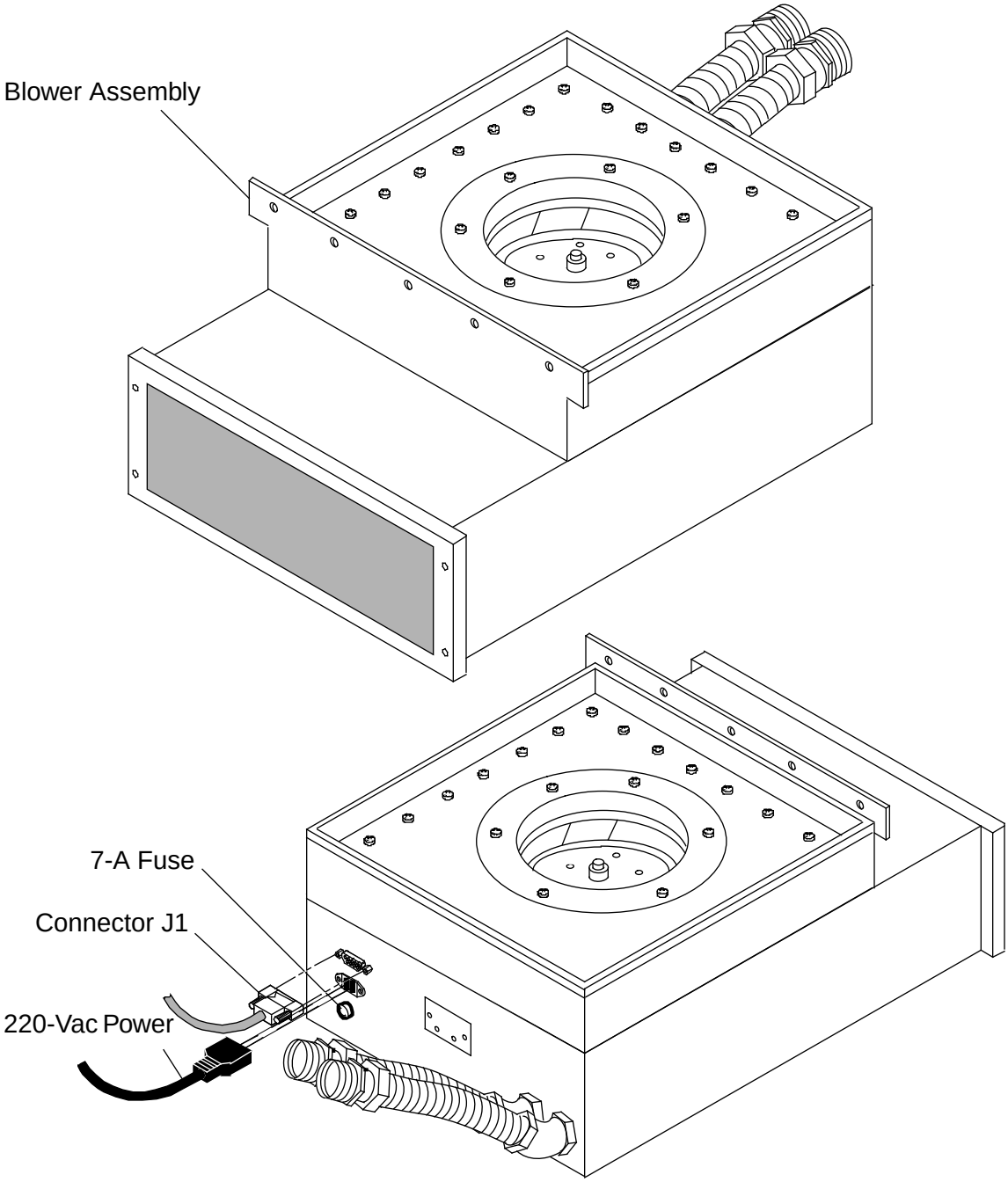
Inside the blower assembly, an airflow sensor monitors the airflow within the assembly. If the airflow is below 500 fpm, the sensor sends a signal to the CCU to indicate that a blower fault has occurred.

Two connectors (J1 and J2) on the front of the blower assembly connect power and the control system to the blower assembly. J1 is a 9-pin connector that connects the control cable to the front-end power assembly. J2 is a male power plug that connects to the 220-Vac power that comes from the front-end power assembly connector J3. A 7-amp time-delay fuse (F1) on the front of the blower assembly protects the blower from a possible overcurrent condition.

48-Vdc Power Supply Fan

Each 48-Vdc power supply has an internal fan that draws air through the power supply assembly and then blows the air out the power-supply exhaust plenum at the bottom of the mainframe.

Figure 8. Blower Assembly



Airflow

Air flows through filters that are located at the top of the chassis. The blower draws this filtered air downward through the modules; the blower then pushes the air out of the exhaust plenum, which is located behind the blower assembly towards the back of the mainframe cabinet.

The 48-Vdc power supplies are also air cooled. Air enters the front-end power assembly at the bottom of the cabinet and then flows through an air filter and into the power supplies.

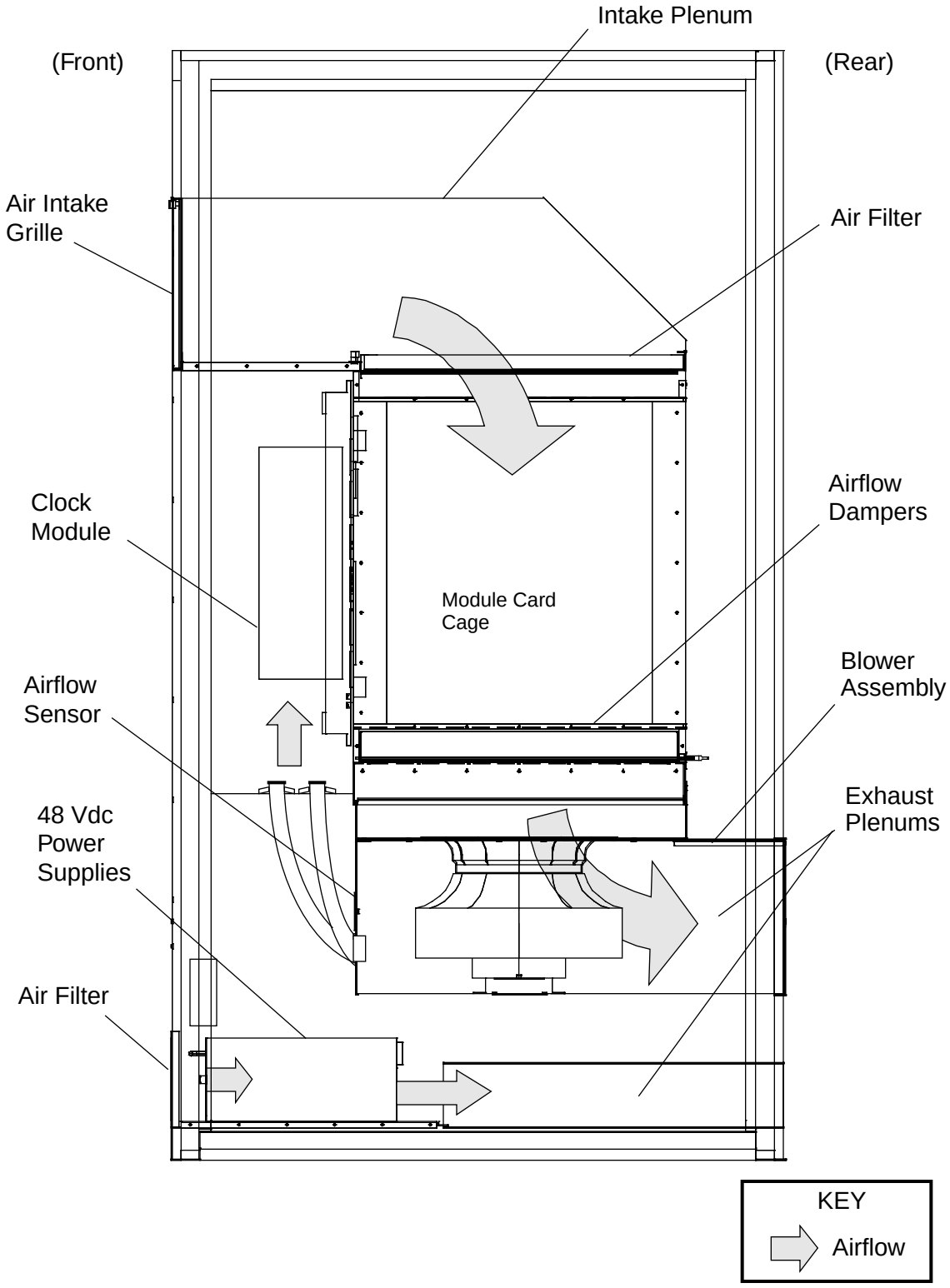
Refer to Figure 9 for an illustration of the cooling process.

Air Filters

Air filters remove dirt or dust particles from the air before the air flows through the mainframe cabinet. The air filters (refer to Figure 9) clean the incoming air before the air flows through the module card cage and power supplies.

Cray Research suggests that you inspect the air filters on a monthly basis, depending on the computer room environment. It is not necessary to power down the system to clean or inspect the air filters. The air filters of computers in a clean environment could be inspected on a biannual or annual basis. Refer to the *Field Replacement Procedures* document for more information on how to inspect and clean the air filters.

Figure 9. CRAY J98se/J916se Mainframe Cooling Process



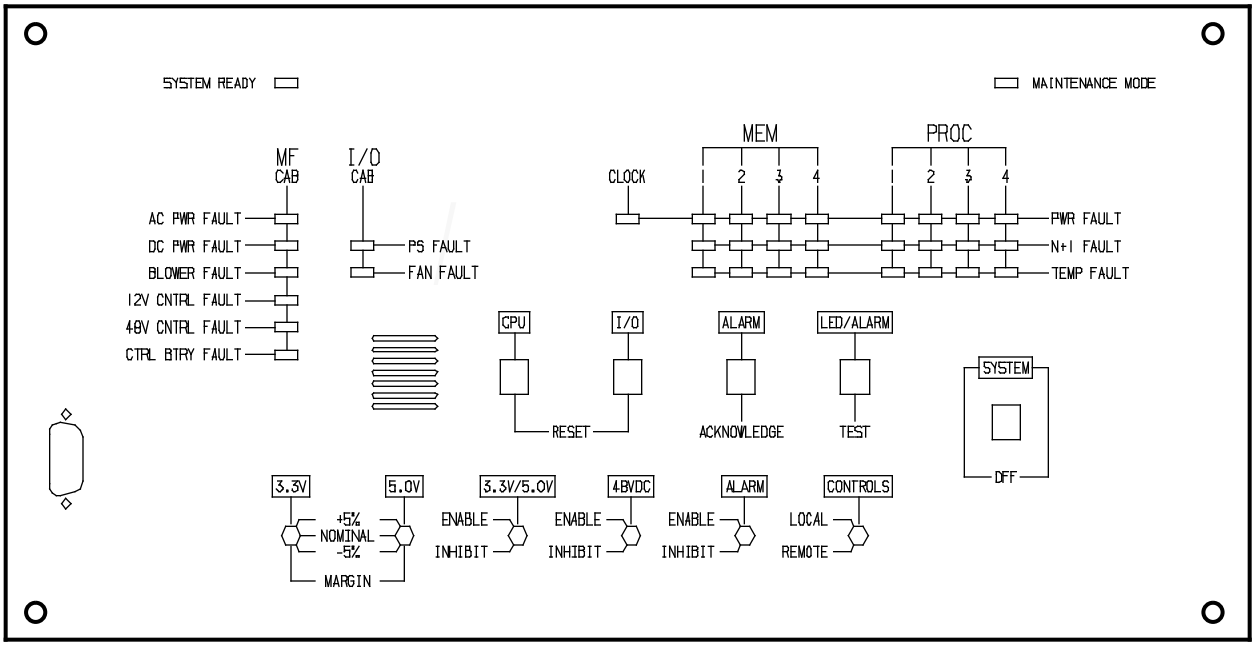
Control System

The control system monitors various conditions within the mainframe cabinet to protect the computer system from any damage that may result from a condition that is not within the acceptable limits.

Central Control Unit (CCU)

The main component of the control system is the central control unit (CCU) assembly (refer to Figure 10). The CCU receives signals from various monitoring points within the mainframe and PC-10 cabinet. The CCU processes these signals to verify that the monitored condition is within the correct range. The CCU also provides an RS-232 serial port connection to the system workstation (SWS) for remote monitoring and control.

Figure 10. Central Control Unit



The CCU monitors the following conditions and illuminates the appropriate front-panel LED:

- Module power
- Module n+1 power redundancy (disabled)
- Module temperatures
- Input AC power
- 48-Vdc power supply output
- Blower airflow
- 12-Vdc power supply output to the CCU
- 48-Vdc power output to the CCU
- CCU backup batteries
- PC-10 cabinet disk tray fan and power supply failures

The CCU also controls a number of conditions through the use of manual controls on the front panel or the remote RS-232 serial port connection (COMM1). Set the REMOTE/LOCAL switch to the REMOTE position to enable the RS-232 port. The CCU controls the following conditions and functions:

- CPU/MPN reset function
- 3.3 V/5.0 V margins
- 3.3 V/5.0 V enable/inhibit function (manual control only)
- 48-Vdc enable/inhibit function
- Alarm enable/inhibit function
- Control mode (manual control only)
- Alarm Acknowledge silence function (manual control only)
- CCU LED/Alarm test function
- System off function

Figure 11 provides a block diagram of the control system and its components.

CCU Logic Board

The CCU logic board receives signals from the control board, which is located in the front-end power assembly. The front-end power assembly control board receives voltage signals from the 48-Vdc power supplies and the 12-Vdc power supply. It also receives fault status signals from the blower assembly and the input power assembly. The control board routes this information to the main CCU logic board.

The CCU logic board also sends power-on signals and voltage enable and inhibit signals to the front-end power assembly control board.

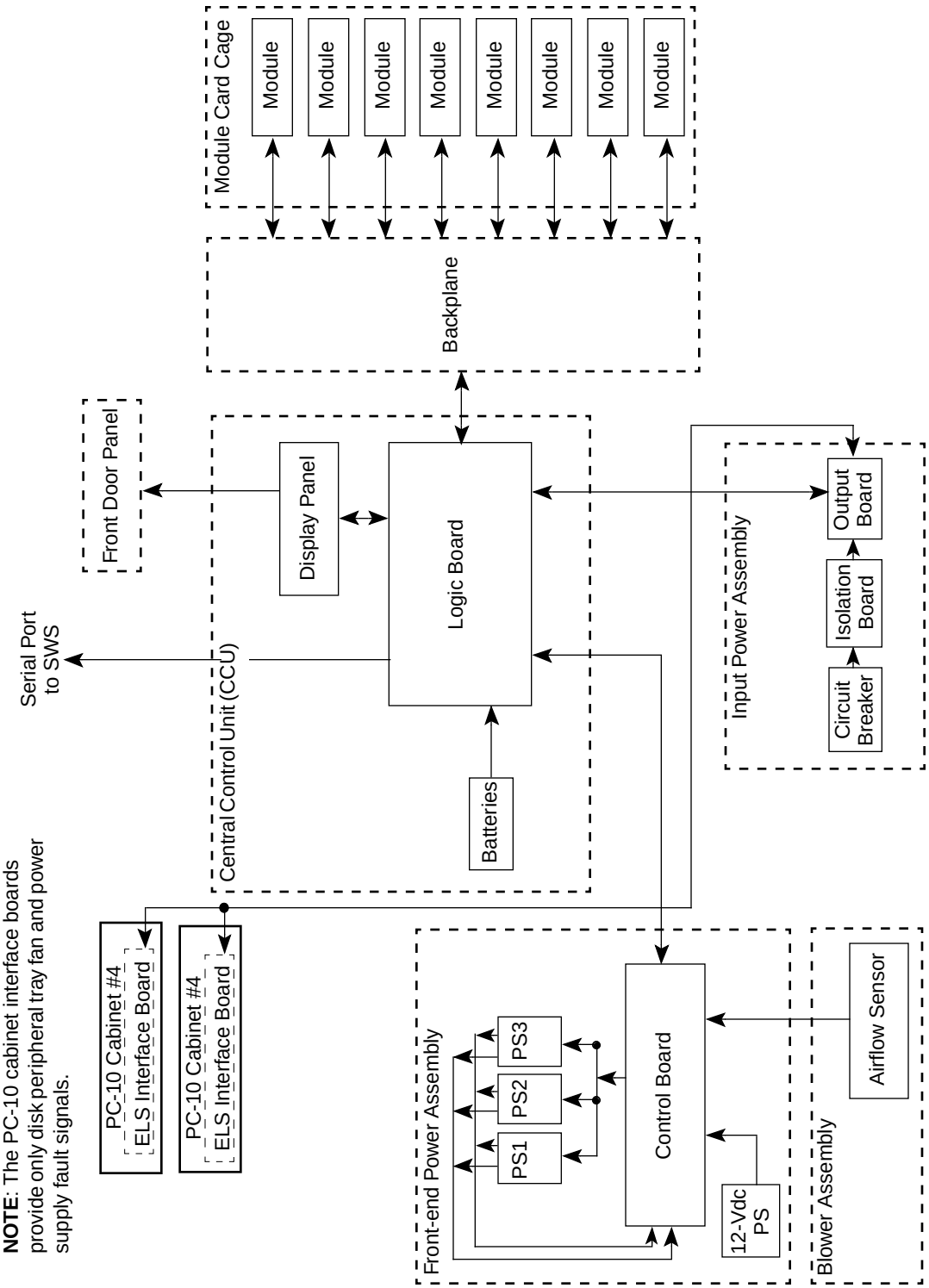


Figure 11. CRAY J98se/J916se Control System Block Diagram

NOTE: The PC-10 cabinet interface boards provide only disk peripheral tray fan and power supply fault signals.

The CCU logic board connects to the CCU display panel that contains the LEDs, switches, and buttons. The main CCU board controls the fault and status LEDs. The display panel sends switch signals to the main CCU board, which then routes the signal to the appropriate component.

As with the CCU display panel, the CCU logic board controls the LEDs on the front door. The CCU logic board also routes the System Off signal that the front door panel sends.

The CCU logic board also receives signals from the backplane. Each module (logic, CPU, and clock) connects to the backplane. Through the backplane, the module signals are routed to two connectors that route the signals to the main CCU board.

The CCU logic board also receives PC-10 cabinet faults; however, this information is limited to power supply or fan faults. The PC-10 interface board receives fault information from at least one PC-10 cabinet and from a maximum of four PC-10 cabinets. This PC-10 interface board sends fault signals to the main CCU board, which then sends the fault signals to the display panel, where the appropriate LEDs illuminate, and to the RS-232 serial port (COMM1) for monitoring by the SWS.

NOTE: The fault information does not indicate which PC-10 cabinet or peripheral component has the fault. You must open the PC-10 cabinet doors to check for fault LEDs on each peripheral component.

Display Panel Functions

A display panel on the front of the CCU assembly provides fault and status LEDs, power-supply margining switches, power enabling switches, buttons, and a power-on display (POD) connection.

Table 4 describes each LED on the CCU display panel. The audible alarm remains audible until the ALARM ACKNOWLEDGE button is pressed. Table 5 describes each switch and button on the CCU display panel.

Table 4. CCU LED Descriptions

LED	Description
SYSTEM READY LED	Indicates the operating status of the mainframe. When this LED illuminates, it indicates that no system critical faults have been detected and that 48-Vdc power has been enabled to the LPMs and clock.
MAINTENANCE MODE	Indicates that one or more of the CCU switches are not in the normal operating position. The following conditions illuminate the MAINTENANCE MODE LED: - 3.3V MARGIN switch not in the NOMINAL position - 5.0V MARGIN switch not in the NOMINAL position - LOCAL/REMOTE switch in REMOTE position - BATTERY switch in off (0) position - ALARM ENABLE/INHIBIT switch in the INHIBIT position - 48VDC ENABLE/INHIBIT switch in the INHIBIT position - 3.3V/5.0V ENABLE/INHIBIT switch in the INHIBIT position
MF CAB - AC PWR FAULT	Illuminates when the mainframe cabinet loses incoming power.
MF CAB - DC PWR FAULT	Illuminates when one or more 48-Vdc power supplies have a fault. (The 48V STATUS panel on the front-end power assembly displays the power supply fault statuses.)
MF CAB - BLOWER FAULT	Illuminates when the airflow sensor signals that no airflow is present. The mainframe ceases operation; however, once the blower resumes operation, the mainframe also resumes operation.
MF CAB - 12V CNTRL FAULT	Illuminates when the CCU loses 12-Vdc input power. This fault condition does not interfere with mainframe operation. Because the CCU assembly has a backup power source (48-Vdc power), the mainframe continues to operate normally.
MF CAB - 48V CNTRL FAULT	Illuminates when the CCU loses 48-Vdc input power.
MF CAB - CTRL BTRY FAULT	Illuminates when a battery fault occurs within the CCU. The CTRL BTRY FAULT LED illuminates when the battery pack is not connected, the battery pack is missing one or more batteries, or one or more of the batteries are shorted.
I/O CAB - PS FAULT	Illuminates when the DC output of a disk peripheral tray fails (could be more than one disk peripheral tray that fails).
I/O CAB - FAN FAULT	Illuminates when one or more of the disk peripheral tray fans fail.
CLOCK PWR FAULT	Illuminates when either the clock module 3.3-V and/or 5.0-V level drops below acceptable levels.
PWR FAULT (MEM or PROC modules)	Indicates that the 3.3-V level or 5.0-V level on the memory (MEM) or processor (PROC) module logic power module (LPM) is out of range. This fault condition exists until the fault is corrected and the local Enable switch on the LPM is toggled.
N+1 FAULT (MEM or PROC modules)	These LEDs are disabled. However, the n+1 power supplies on the LPM are still available. The CCU does not indicate whether one of the n+1 power supplies fails.
TEMP FAULT (MEM or PROC modules)	Illuminates when an overtemperature condition exists on the module and/or on the corresponding LPM. When this LED illuminates, it can indicate that either a warning overtemperature condition has occurred or that a critical (shut-down) overtemperature condition has occurred.

Table 5. CCU Switch and Button Descriptions

Switch	Description
3.3V MARGIN	The 3.3V MARGIN switch controls the 3.3-V power to the processor and memory LPMs. This switch has the following three positions: - Position 1 (up) is +5% - Position 2 (center) is NOMINAL - Position 3 (down) is -5% In order for this switch to work, the LOCAL/REMOTE switch must be in the LOCAL position.
5.0V MARGIN	The 5.0V MARGIN switch controls the 5.0-V power to the processor and memory LPMs. This switch has the following three positions: - Position 1 (up) is +5% - Position 2 (center) is NOMINAL - Position 3 (down) is -5% In order for this switch to work, the LOCAL/REMOTE switch must be in the LOCAL position.
3.3V/5.0V	The 3.3V/5.0V switch controls the 3.3-V and 5.0-V power supplies on all the logic power modules (LPMs) and the clock board. This switch has two positions: ENABLE and INHIBIT. When this switch is in the ENABLE position, the LPMs provide power to the respective modules. When this switch is in the INHIBIT position, the LPMs do not provide any power to the modules.
48VDC	The 48VDC switch controls the 48-Vdc power that comes from the power supplies in the front-end power assembly. This switch has two positions: ENABLE and INHIBIT. When this switch is in the ENABLE position, the 48-Vdc output power is routed to the LPMs from the front-end power assembly. When this switch is in the INHIBIT position, the 48-Vdc output power of the front-end power assembly is shut off.
ALARM	The ALARM switch controls the audible alarm. This switch has two positions: ENABLE and INHIBIT. When this switch is in the ENABLE position, the alarm will sound if a fault condition occurs. When this switch is in the INHIBIT position, the alarm is disabled and will not sound if a fault condition occurs.
CONTROLS	The CONTROLS switch is a two-position switch that controls the CCU operating mode. This switch has two settings: LOCAL and REMOTE. When this switch is in the LOCAL position, the CCU operates from the switch settings on the CCU panel. When the switch is in the REMOTE position, the CCU operates from the RS-232 serial port (COMM1).
CPU RESET	The CPU RESET button provides a reset interrupt signal to the clock module that resets all the processor and memory modules.
I/O RESET	The I/O RESET button provides a reset signal to each multipurpose node (MPN) in each PC-10 cabinet. Individual MPN reset is possible through a reset switch on each MPN.

Table 5. CCU Switch and Button Descriptions (continued)

Switch	Description
ALARM ACKNOWLEDGE	The ALARM ACKNOWLEDGE button silences the audible alarm that sounds during a fault condition. Any additional faults will sound the alarm again.
LED/ALARM TEST	The LED/ALARM TEST button momentarily turns on all of the CCU LEDs and sounds the alarm.
SYSTEM OFF	The SYSTEM OFF button sends a signal to the CCU to remove power from all cabinets. This signal opens the circuit breakers on the input power assembly.

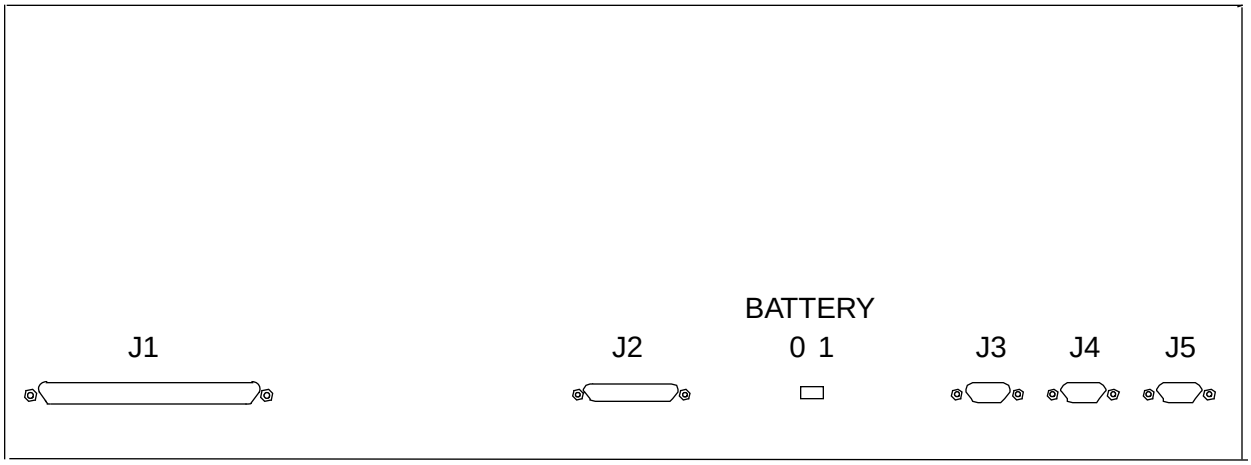
Back Connector Panel

The BATTERY switch and seven connectors are located on the back of the CCU assembly (refer to Figure 12). The BATTERY switch turns the battery power to the CCU assembly on (1) and off (0). Batteries provide power to the CCU assembly if the 12-Vdc power and the 48-Vdc power are not present. In order for the batteries to provide backup to the CCU, the switch needs to be in the on (1) position.

Six connectors enable connections to other system components. Refer to the "Cabling" subsection for more information about these connectors.

NOTE: The battery backup provides power only to maintain fault status if 12-Vdc and 48-Vdc power is lost. It does not provide power for system operation.

Figure 12. CCU Back Connector Panel



Cabling

This subsection provides cabling and pin information for the power and control components of the CRAY J98se/J916se computer systems.

Figure 13 provides a block diagram of the power and control cabling.

Figure 14 provides a pictorial view of the system control cabling with a PC-10A cabinet.

Figure 15 provides a pictorial view of the system control cabling with a PC-10B cabinet.

Table 6 through Table 11 provide cable and pin information as follows:

- Table 6 provides pin information for the CCU connector J1.
- Table 7 provides pin information for the CCU connector J2.
- Table 8 provides pin information for the CCU connector J3.
- Table 9 provides pin information for the CCU connectors J4 and J5.
- Table 10 provides pin information for the CCU connector J6.
- Table 11 provides pin information for the input power assembly connectors J1, J2, and J3.

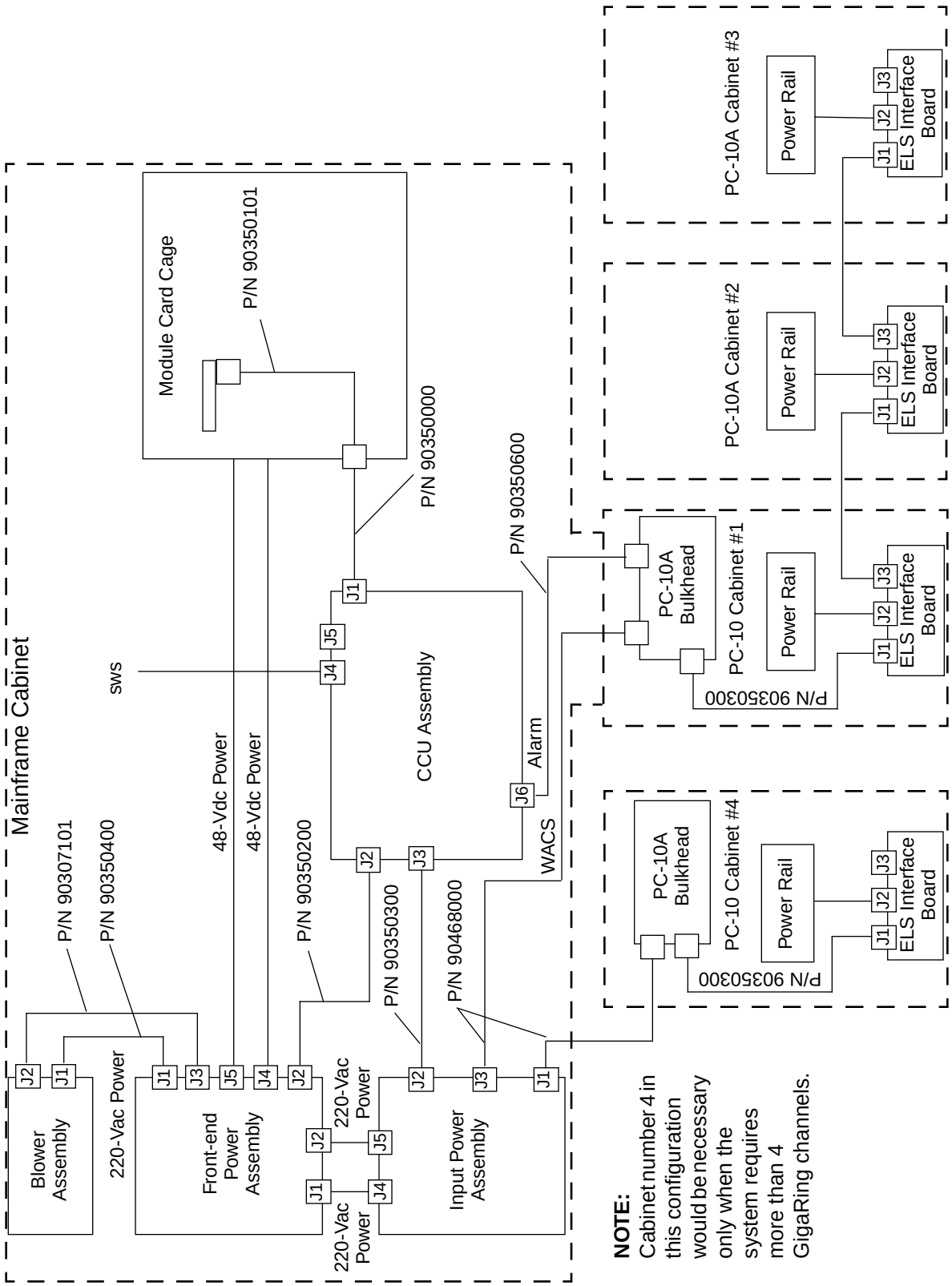


Figure 13. CRAY J98se/J916se Power and Control Cabling Block Diagram

Figure 14. PC-10A Cabling

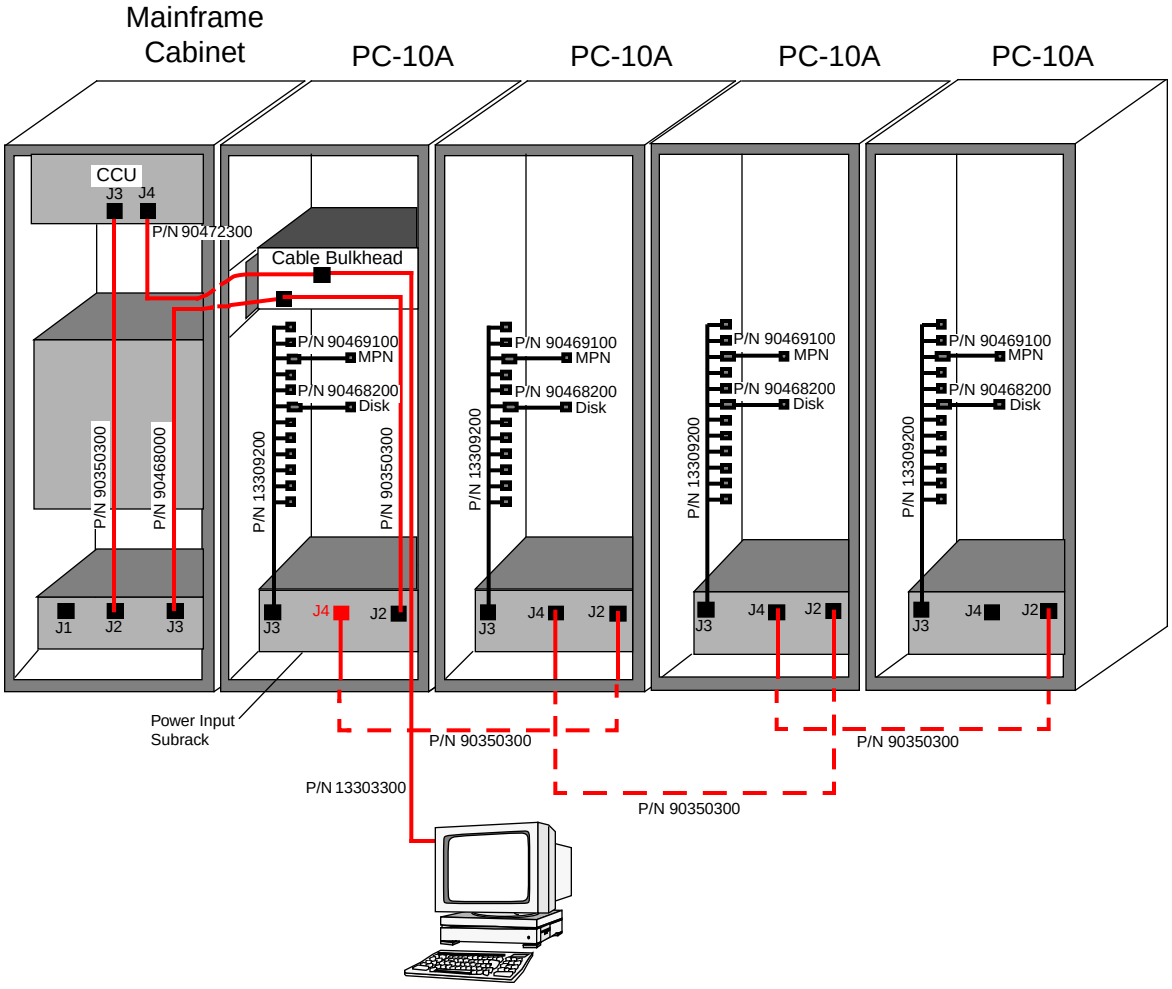


Figure 15. PC-10B WACS Cabling

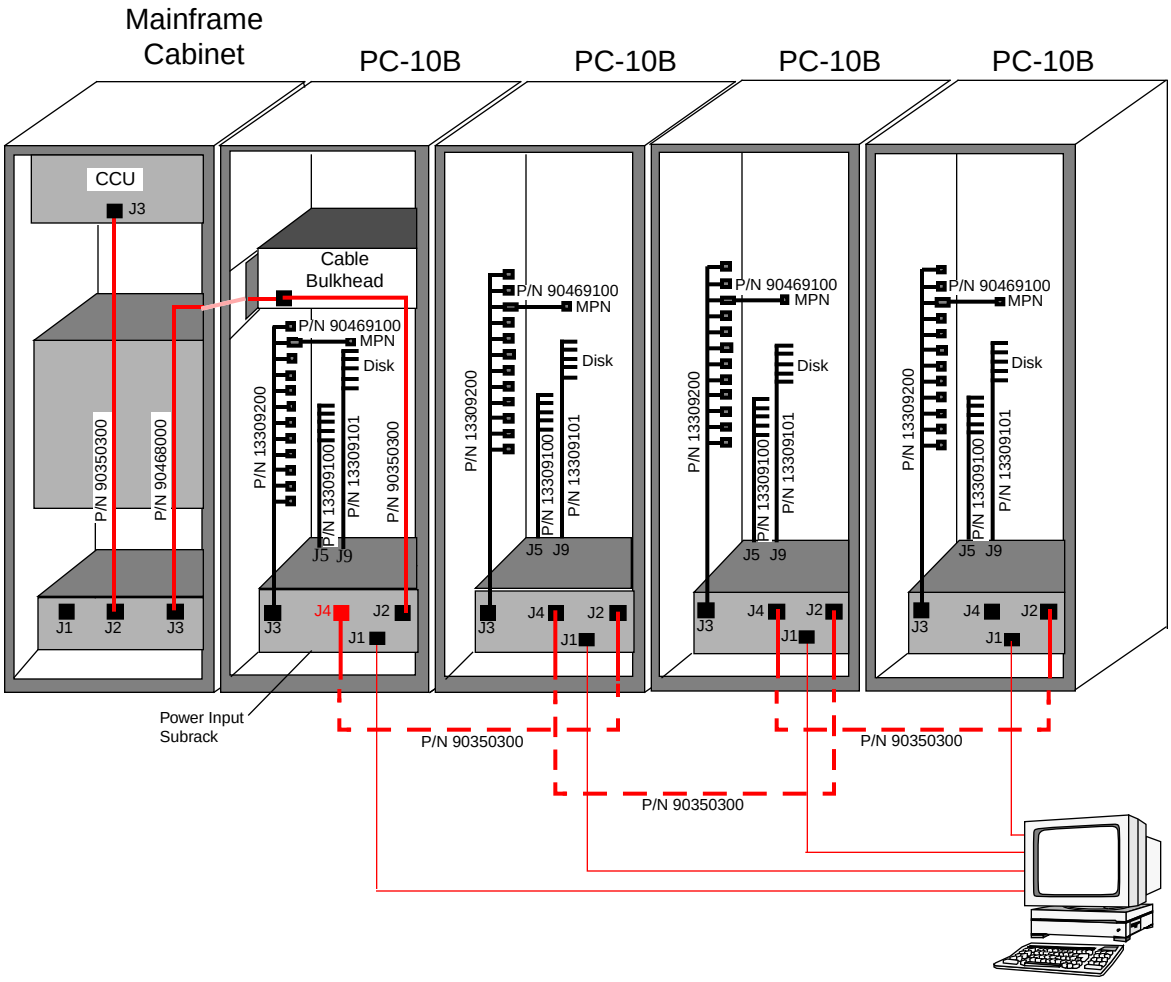


Table 6. CCU Connector J1

CCU J1 Pin No.	Signal Name
1	Logic Ground
2	Logic Ground
3	CPU Reset Return
4	CPU Reset
5	Margin Bit 0
6	Margin Bit 1
7	Margin Bit 2
8	Margin Bit 3
9	3.3 Vdc Status MEM0
10	3.3 Vdc Status MEM1
11	3.3 Vdc Status PROC0
12	3.3 Vdc Status PROC1
13	3.3 Vdc Status PROC2
14	3.3 Vdc Status PROC3
15	3.3 Vdc Status MEM2
16	3.3 Vdc Status MEM3
17	5.0 Vdc Status MEM0
18	5.0 Vdc Status MEM1
19	5.0 Vdc Status PROC0
20	5.0 Vdc Status PROC1
21	5.0 Vdc Status PROC2
22	5.0 Vdc Status PROC3
23	5.0 Vdc Status MEM2
24	5.0 Vdc Status MEM3
25	Clock Board Power Status
26	Overtemperature MEM0
27	Overtemperature MEM1
28	Overtemperature PROC0
29	Overtemperature PROC1
30	Overtemperature PROC2
31	Overtemperature PROC3
32	Overtemperature MEM2
33	Overtemperature MEM3
34	Loss of n+1 MEM0
35	Loss of n+1 MEM1

Table 6. CCU Connector J1 (continued)

CCU J1 Pin No.	Signal Name
36	Loss of n+1 PROC0
37	Loss of n+1 PROC1
38	Loss of n+1 PROC2
39	Loss of n+1 PROC3
40	Loss of n+1 MEM2
41	Loss of n+1 MEM3
42*	Enable/Inhibit Clock Board
43*	Enable/Inhibit MEM0
44*	Enable/Inhibit MEM1
45*	Enable/Inhibit PROC0
46*	Enable/Inhibit PROC1
47*	Enable/Inhibit PROC2
48*	Enable/Inhibit PROC3
49*	Enable/Inhibit MEM2
50*	Enable/Inhibit MEM3

Table 7. CCU Connector J2

CCU J2 Pin No.	Signal Name	Front-end Power Assembly J2 Pin No.
1	+12 Vdc	1*
2	+12 Vdc Return	2*
3	Logic Ground	3
4	Spare	4
5	AC Fault	5*
6	48 Vdc Fault	6*
7	Load Enable 1	7*
8	Load Enable 2	8*
9*	48 Vdc Enable/Inhibit	9
10	Spare	10
11	+48 Vdc	11*
12	Spare	12
13	+48 Vdc Return	13*
14	+12 Vdc	14*
15	+12 Vdc Return	15*
16	Blower Fault	16*
17*	Power-on Reset	17
18	Spare	18
19	Spare	19
20	Spare	20
21	Spare	21
22	Spare	22
23	+48 Vdc	23*
24	Spare	24
25	+48 Vdc Return	25*

NOTE: An asterisk (*) indicates the origin of the signal.

Table 8. CCU Connector J3

CCU Connector J3 Pin No.	Signal Name
1*	N/C
2*	N/C
3	N/C
4	AC Inhibit (-)
5	AC Inhibit (+)
6*	Disk Fan Fault
7	Mainframe Cabinet Auxiliary SW Return
8*	PC-10 Disk Tray PS Fault
9*	Mainframe Cabinet Breaker Status
10	PC-10 Cabinet Return
11	N/C
12	I/O (MPN Only) Reset
13	I/O (MPN Only) Reset Return
14	+ 5 Vdc (DSS-1 WACS board power)
15	N/C

NOTE: An asterisk (*) indicates the origin of the signal.

Table 9. CCU Connectors J4 and J5

CCU Connectors J4 and J5 Pin No.	Signal Name
1	N/C
2	TxD-1
3	RxD-1
4	N/C
5	N/C
6	N/C
7	Logic Ground
8	N/C
9	N/C

Table 10. CCU Connector J6 (External Alarm Relay)

Pin Number	Signal Name
1	Relay 1 - N/O
2	Relay 1 - Common
3	Relay 1 - N/C
4	Not used
5	Not used
6	Relay 2 - N/O
7	Relay 2 - Common
8	Relay 2 - N/C
9	Return

Table 11. Input Power Assembly Connectors J1, J2, and J3

CCU Connector J3 Pin No.	Signal Name
1*	N/C
2*	N/C
3	N/C
4	AC Inhibit (-)
5	AC Inhibit (+)
6*	Disk Fan Fault
7	Mainframe Cabinet Auxiliary SW Return
8*	PC-10 Disk Tray PS Fault
9*	Mainframe Cabinet Breaker Status
10	PC-10 Cabinet Return
11	N/C
12	I/O (MPN Only) Reset
13	I/O (MPN Only) Reset Return
14	+ 5 Vdc (DSS-1 WACS board power)
15	N/C

NOTE: An asterisk (*) indicates the origin of the signal.