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AutoMax® Power Supply Module and Racks

M/N 57C491 Power Supply Module
M/N 57C331 16-Slot Rack
M/N 57C332 10-Slot Rack

Industrial
CONTROLS

J-3670

RELIANCE ELECTRIC

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WARNING

ONLY QUALIFIED PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THE CONTROLLED EQUIPMENT SHOULD INSTALL, ADJUST, OPERATE, AND/OR SERVICE THIS EQUIPMENT. READ AND UNDERSTAND THIS MANUAL AND OTHER MANUALS APPLICABLE TO YOUR INSTALLATION. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

WARNING

INSERTING OR REMOVING THE POWER SUPPLY MODULE OR ITS CONNECTING CABLES MAY RESULT IN UNEXPECTED MACHINE MOTION. POWER TO THE MODULE SHOULD BE TURNED OFF BEFORE INSERTING OR REMOVING THE MODULE OR ITS CONNECTING CABLES. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

WARNING

RELIANCE STRONGLY RECOMMENDS THE THE USE OF AN EXTERNAL, HARDWIRED EMERGENCY STOP CIRCUIT THAT WILL DISABLE THE SYSTEM IN CASE OF IMPROPER OPERATION. UNCONTROLLED MACHINE OPERATION MAY RESULT IF THIS PROCEDURE IS NOT FOLLOWED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

CAUTION

THE POWER SUPPLY MODULE AND RACKS CONTAIN STATIC-SENSITIVE COMPONENTS. CARELESS HANDLING CAN CAUSE SEVERE DAMAGE. DO NOT TOUCH THE CONNECTORS ON THE BACK OF THE POWER SUPPLY MODULE OR THE RACKS. WHEN NOT IN USE, THE POWER SUPPLY MODULE SHOULD BE STORED IN AN ANTI-STATIC BAG. THE PLASTIC COVER SHOULD NOT BE REMOVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF EQUIPMENT.

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1.0 INTRODUCTION

The products described in this instruction manual are manufactured by Reliance Electric Industrial Company.

The Power Supply module (M/N 57C491) converts 115 VAC input power into the D-C voltages necessary to operate the other modules contained in the Rack. The Rack provides the mechanical means of mounting 10 (M/N 57C332) or 16 (M/N 57C331) DCS 5000 or AutoMax modules, as well as the Power Supply module. The Multibus™ backplane in the Rack provides two sets of bus lines for local communication among the DCS 5000 and AutoMax modules.

This instruction manual describes the functions and specifications of the Power Supply module and the Rack. It also includes a detailed overview of installation and servicing procedures.

1.1 Additional Information

You should be familiar with the instruction manuals which describe your system configuration. This may include, but is not limited to, the following:

- J-3600 DCS 5000 ENHANCED BASIC LANGUAGE INSTRUCTION MANUAL
- J-3601 DCS 5000 CONTROL BLOCK LANGUAGE INSTRUCTION MANUAL
- J-3602 DCS 5000 LADDER LOGIC LANGUAGE INSTRUCTION MANUAL
- J-3616 KERMIT COMMUNICATIONS SOFTWARE INSTRUCTION MANUAL
- J-3618 NORTON EDITOR INSTRUCTION MANUAL
- J-3636 COMMON MEMORY MODULE INSTRUCTION MANUAL
- J-3649 AutoMax CONFIGURATION TASK MANUAL
- J-3630 ReSource AutoMax PROGRAMMING EXECUTIVE INSTRUCTION MANUAL VERSION 1.0
- J-3650 AutoMax PROCESSOR MODULE INSTRUCTION MANUAL
- J-3661 ReSource AutoMax SOFTWARE LOADING INSTRUCTIONS
- J-3668 DCS 5000 POCKET REFERENCE
- J-3669 AutoMax POCKET REFERENCE
- J-3675 AutoMax ENHANCED BASIC LANGUAGE INSTRUCTION MANUAL
- J-3676 AutoMax CONTROL BLOCK LANGUAGE INSTRUCTION MANUAL
- J-3677 AutoMax LADDER LOGIC LANGUAGE INSTRUCTION MANUAL
- J-3684 ReSource AutoMax PROGRAMMING EXECUTIVE INSTRUCTION MANUAL VERSION 2.0

- IEEE 518 GUIDE FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT TO MINIMIZE ELECTRICAL NOISE INPUTS TO CONTROLLERS
- IEEE 796 STANDARD MICROCOMPUTER SYSTEM BUS
- Other instruction manuals applicable to your hardware configuration
- Your personal computer and DOS operating system manual(s).

1.2 Related Hardware and Software

The Power Supply module and Racks are sold individually. M/N 57C491 contains one Power Supply module. M/N 57C331 contains one 16-Slot Rack. M/N 57C332 contains one 10-slot Rack. One Power Supply module and one Rack are used with various input, output, and special purpose modules, as well as the following hardware and software, which can be purchased separately:

1. M/N 57C430 AutoMax Processor(s) or M/N 57C407 DCS 5000 Processor(s). Note that all Processors in a single Rack must be of the same type, i.e., AutoMax and DCS 5000 Processors cannot be mixed in one Rack.
2. M/N 57C304 or 57C305 ReSource AutoMax Programming Executive software if using M/N 57C430, or M/N 57C300 or 57C301 ReSource DCS 5000 Programming Executive software if using M/N 57C407.
3. M/N 61C126 ReSource Personal Computer, or other IBM XT- or AT-compatible personal computer running DOS V3.1 or later.
4. M/N 61C127 RS-232C ReSource Interface Cable. This cable is used to connect the personal computer to the Processor module. The ReSource Portable Computer (item #3 above) includes this cable. It can also be purchased separately.
5. M/N 57C413 Common Memory module. This module is used when there is more than one Processor (of either type) in the Rack.
6. M/N 57C492 Battery Back-Up. This unit is used when there is a Common Memory module (M/N 57C413 only), a M/N 57C407 Processor, or both in the Rack.
7. M/N 57C384 Battery Back-Up cable. This cable is used with the Battery Back-Up unit.

2.0 MECHANICAL/ELECTRICAL DESCRIPTION

The following is a description of the mechanical and electrical components, as well as the characteristics of the input connections, for the Power Supply module and Racks.

2.1 Power Supply Module Mechanical Description

The Power Supply module is a printed circuit board assembly that plugs into the leftmost position of either the 10- or 16-Slot Rack. The module is enclosed in a protective steel housing with integral heatsink. Through its connection to the Multibus backplane of the Rack, the Power Supply module provides the D-C voltages necessary to power the logic circuitry of modules in the Rack. On the faceplate of the module are four LED indicators, a terminal block connector, a keyswitch, and a battery back-up connector. See figure 2.1.

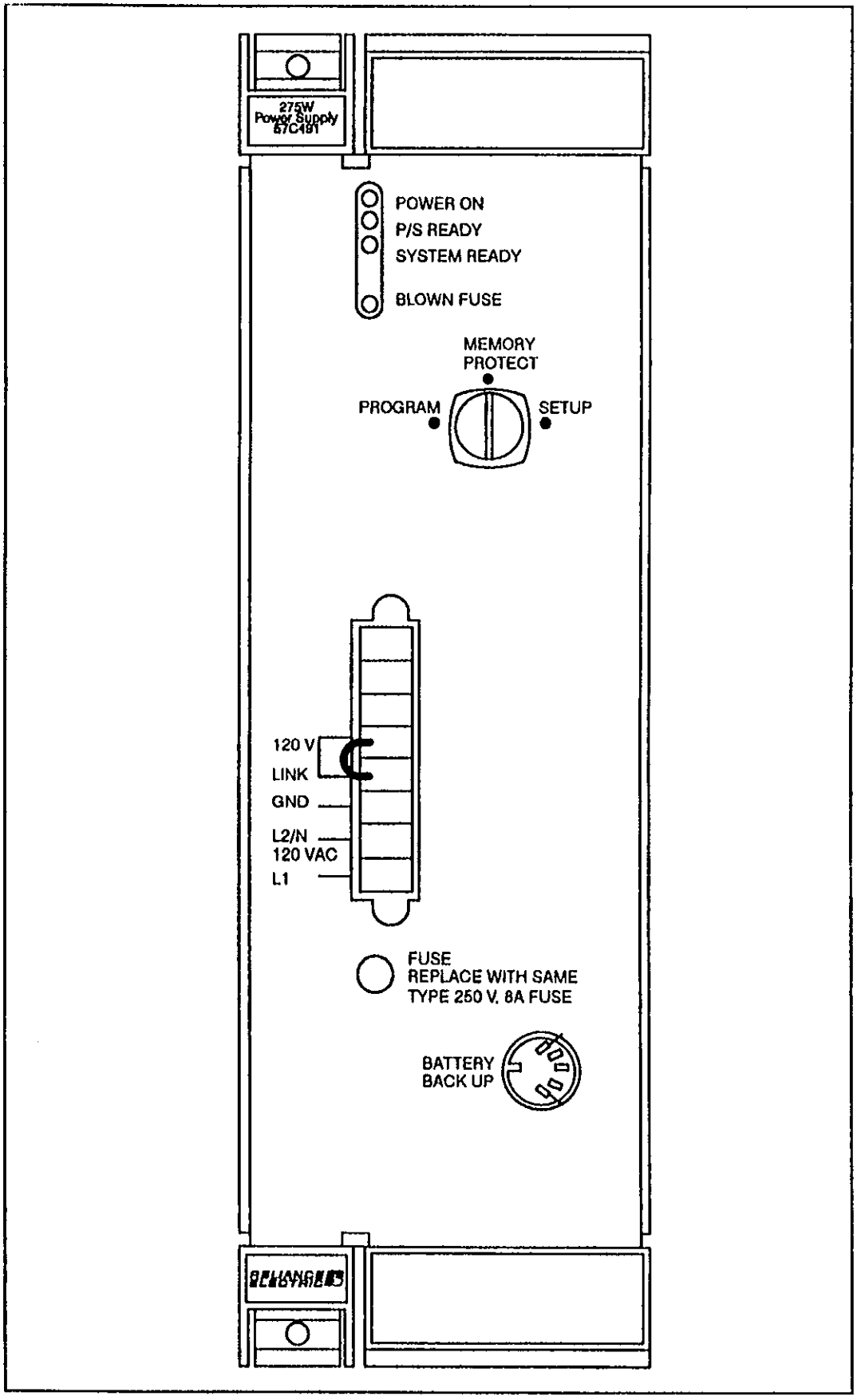


Figure 2.1 - Power Supply Module

2.1.1 Power Supply Module LED Indicators

The Power Supply module faceplate LED labeled "POWER ON" is lit to indicate when incoming A-C power is within the specified ranges. "P/S READY" is lit when the Power Supply is producing all required D-C voltages within the specified ranges. The "SYSTEM READY" LED indicates whether the system watchdog is being properly reset. If any of the Processors in the Rack stop functioning properly, this LED will be turned off. If the "BLOWN FUSE" LED is lit, the fuse has blown and must be replaced. See section 4.4 for more information.

2.1.2 Power Supply Module Terminal Block

The terminal block on the Power Supply faceplate provides the means to connect the 115 VAC power and a ground wire from the rack to the module. Note that terminals 1-3 (reading top to bottom) are not functional. Terminals 4 and 5 come from the factory with a jumper attached. This jumper must be in place at all times for the Power Supply module to operate correctly.

The green ground wire from the Rack connects to the "GND" terminal on the faceplate of the Power Supply. Terminal "L2/N" is the connection for the A-C neutral input line from the Rack. Terminal "L1" is the connection for the A-C hot input line from the Rack. See section 3.2 for more information.

2.1.3 Power Supply Module Battery Connection

The faceplate connection labeled "BATTERY BACK UP" provides the means to connect the Battery Back-Up (M/N 57C492) to the Power Supply module. Note that the Battery Back-Up unit is required only when there is a DCS 5000 Processor module (M/N 57C407) or a Common Memory module (M/N 57C413) in the Rack. The Battery Back-Up unit can save the contents of the Common Memory and DCS 5000 Processor RAM in the event of a power failure.

The keyswitch is used to reset the "OK" signal on the Battery Back-Up. It is necessary to reset this signal if the battery fails or if the cable is removed. See 2.1.4 and 2.2 for more information.

2.1.4 Power Supply Module Keyswitch

The keyswitch on the faceplate routes TTL signals through the Multibus backplane to the Processor module(s) to allow lockout of programming functions for system security. The three positions of the keyswitch are PROGRAM, MEMORY PROTECT, and SET UP. The position of the keyswitch indicates the security level of the rack, i.e., the kind of ON-LINE Menu operations that can be performed through a personal computer communicating with the processors in the rack. The MEMORY PROTECT position allows only monitoring of variables and saving of tasks from the rack. SETUP allows the operator to monitor all variables, modify tunable variables, and save tasks from the rack. The PROGRAM position allows the operator to perform all ON-LINE Menu functions, providing the password for the rack is also entered. See J-3630 or J-3684 for more information.

2.2 Power Supply Module Electrical Description

When the Power Supply module powers-up, it executes a "soft start," gradually increasing its output until it reaches the voltage necessary for logic operations. At this time, the module generates an initialize signal and the "P/S READY" indicator is illuminated.

Should the A-C input fall below the lower line voltage limit, the module will generate a power fail interrupt signal at least three milliseconds before loss of the regulated D-C power to allow for orderly system shutdown. The holdover time on loss of A-C input is 20 milliseconds.

In the event of a power fail interrupt signal, 5 Volt output power is supplied by the Battery Back-Up (if installed) for maintaining the volatile memory of DCS 5000 Processor modules and the Common Memory module. When the regulated output power of the Power Supply module is restored to 4.85 Volts or greater, power will be supplied by the Power Supply module. Note that AutoMax processors have on-board battery back-up and do not require Battery Back-Up unless there is a Common Memory module in the rack.

If Battery Back-Up Voltage ever drops below 3.0 Volts, or the cable between the Battery Back-Up and Power Supply module is disconnected with the power off, memory will be lost and the Processor modules will not function until the Power Supply is manually reset by turning the keyswitch on the front panel from MEMORY PROTECT to the PROGRAM position.

2.3 Rack Mechanical Description

The 10- and 16-Slot Racks provide the mechanical means for mounting the indicated number of DCS 5000 and AutoMax modules, as well as the Power Supply module. Both Racks are designed for panel mounting and include two built-in high capacity cooling fans, an A-C line filter, and a cable management tray. See figures 2.2 and 2.3.

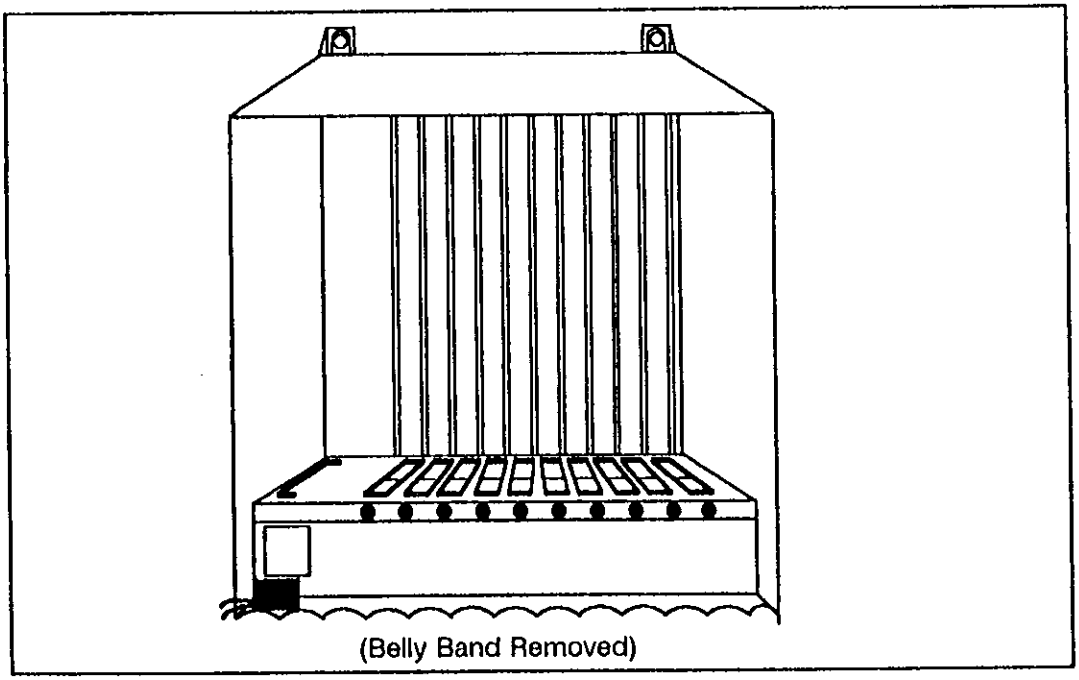
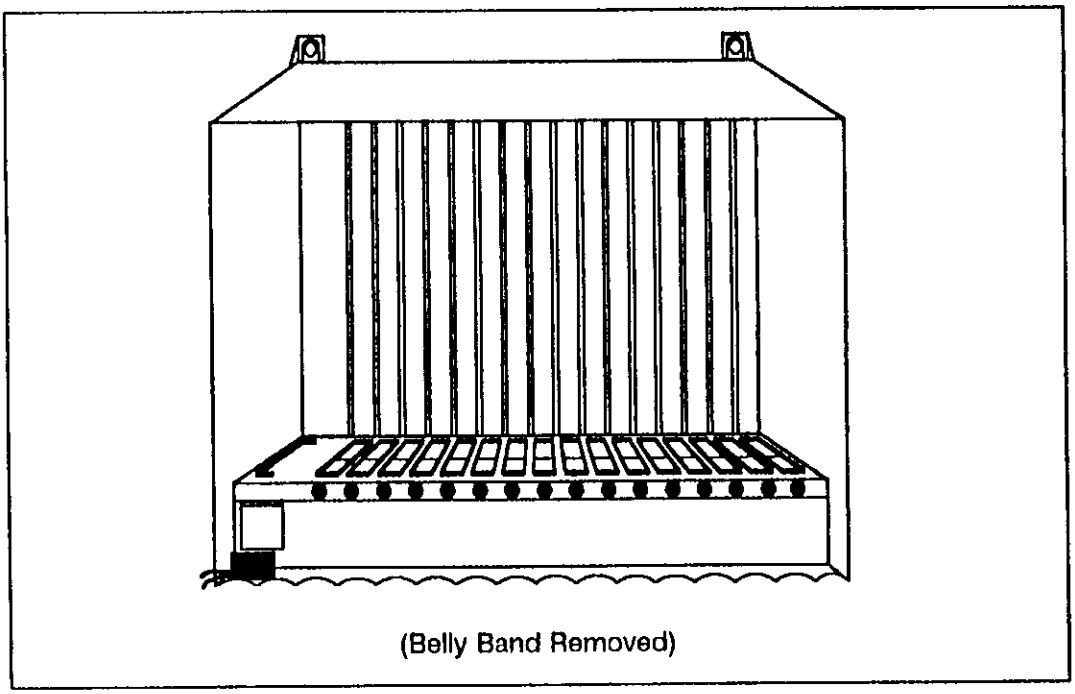


Figure 2.2 - 10-Slot Rack



(Belly Band Removed)

Figure 2.3 - 16-Slot Rack

Dedicated signal lines on the Multibus backplane require limitations on slot placement for some types of DCS 5000/AutoMax modules. See figure 2.4.

Module	Module Slot Position															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10-Slot Rack: Common Memory	•															
Processor	•	•	•	•	•											
D-C Drive[1]						•	•	•	•							
All Other	•	•	•	•	•	•	•	•	•	•						
16-Slot Rack: Common Memory	•															
Processor	•	•	•	•	•											
D-C Drive[1]						•	•	•	•			•	•	•	•	
All Other	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

[1] Must be grouped together.

Figure 2.4 - Rack Slot Limitations

2.4 Rack Electrical Description

The Multibus backplane of the Rack supports two sets of bus lines that serve as the electrical connection for all slots in the Rack. The P1 bus, the larger of the two electrical connectors, conforms to the IEEE Microcomputer System Bus Standard for the P796 bus, compliance level D16M20I16. This bus is used for communication and control signals among the different modules in the Rack. The P2 bus, the smaller of the two backplane electrical connectors, follows a Reliance pin assignment as permitted by the IEEE P796 standard. The P2 bus is used for functions such as determining the type of module in the slot. See Appendix C for a description of the pins on the Rack backplane. See J-3649 for guidelines on using non-Reliance modules in the Rack.

The A-C line filter on the Rack filters the incoming power signal before it is transmitted to the Power Supply module. No other connections to the A-C line are permitted between the line filter and the Power Supply module. See figure 2.5 for a typical Input power signal.

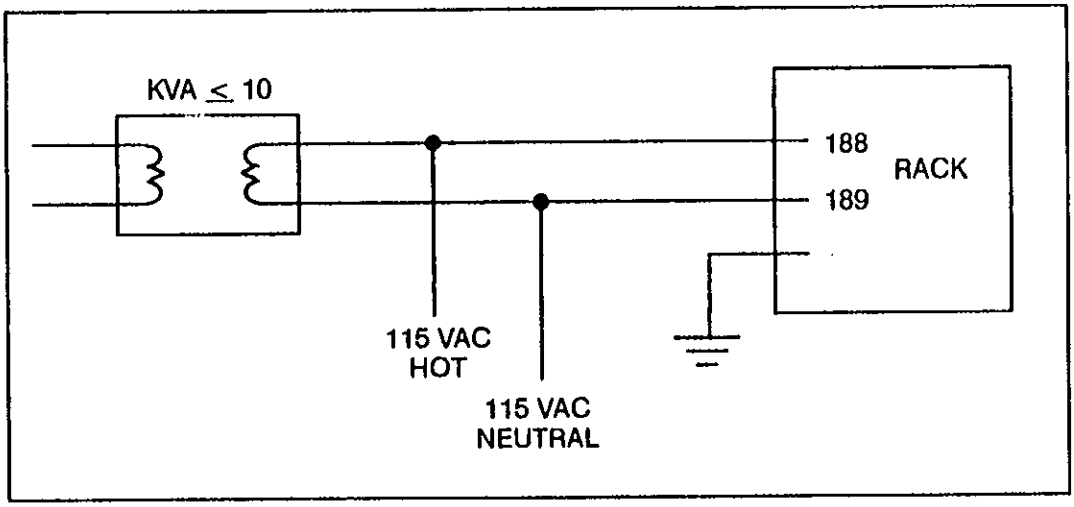


Figure 2.5 - Typical Input Power Connections

3.0 INSTALLATION

This section describes how to install and replace the Power Supply module and Rack.

DANGER

THE USER IS RESPONSIBLE FOR CONFORMING WITH THE NATIONAL ELECTRICAL CODE AND ALL OTHER APPLICABLE LOCAL CODES. WIRING PRACTICES, GROUNDING, DISCONNECTS, AND OVER-CURRENT PROTECTION ARE OF PARTICULAR IMPORTANCE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS BODILY INJURY OR LOSS OF LIFE.

CAUTION

THIS EQUIPMENT MUST BE CONNECTED TO A POWER SOURCE FOR WHICH IT WAS DESIGNED. VERIFY THAT THE AVAILABLE POWER IS 115 VOLTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO EQUIPMENT.

3.1 Wiring

To reduce the possibility of electrical noise interfering with the proper operation of the control system, exercise care when installing the wiring between the system and the external devices. For detailed recommendations refer to IEEE 518.

The external wiring to the modules in the Rack must be carefully routed to minimize electrical noise and crosstalk between input and output wiring. Group and bundle wire types by similar electrical signals, being especially careful to separate low- and high-level control signals and A-C and D-C wiring.

If the 115 VAC input signal is subject to severe harmonic distortion, install a constant voltage transformer on the line. Use a 10KVA transformer to limit the fault current to acceptable levels in order to maintain UL listing of the Power Supply module.

3.2 Initial Installation

CAUTION

THE CABINET OR PANEL ON WHICH THE RACK IS MOUNTED MUST BE LOCATED IN AN AREA AWAY FROM OR SHIELDED FROM SOURCES OF EMI, SUCH AS RADAR BEAMS AND TRANSMISSION TOWERS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

CAUTION

AIR FLOW AROUND THE RACK MUST BE SUFFICIENT TO DISSIPATE THE HEAT GENERATED BY ALL OF THE HARDWARE IN AND AROUND THE RACK. ALLOW AT LEAST TWO INCHES OF CLEARANCE ON EACH SIDE OF THE RACK. AVOID PLACING LARGE, HEAT-GENERATING EQUIPMENT UNDERNEATH THE RACK FANS. ADDITIONAL USER-SUPPLIED FAN COOLING OR AIR CONDITIONING IS REQUIRED IF THE AMBIENT TEMPERATURE EXCEEDS 60 C. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

CAUTION

THE RACK MUST BE LOCATED IN A CLEAN ENVIRONMENT. DO NOT EXPOSE THE RACK TO DRIPPING WATER OR CORROSIVE ATMOSPHERES CONTAINING CARBON DUST, METAL PARTICLES, OR OTHER CONTAMINANTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

Use the following procedure to install the Rack and Power Supply module. Before you begin, make certain that you have provided enough space for the Rack, wiring, and terminal strips or other devices that must be mounted near the Rack. Make certain that the panel is sturdy enough to support the Rack and all modules that it will hold. Including connectors attached to module faceplates, a fully-loaded 10-Slot Rack weighs between 70 and 80 lbs. A fully-loaded 16-Slot Rack weighs between 105–115 lbs.

Step 1. Mount the Rack (10- or 16-Slot) on a panel or cabinet made of heavy gauge steel sturdy enough to hold the Rack, all of the hardware modules that will go into the Rack, and the terminal strip/connector assemblies for I/O modules. The connector end of each terminal strip/connector assembly is attached to the appropriate module faceplate. The terminal strip end of each assembly can be mounted on the panel itself or on lashing bars attached to the panel. Refer to the instruction manual for each individual module in your installation for more specific information. Follow the procedure below to install the Rack.

a) Drill four holes in the panel using the appropriate mounting pattern in Appendix D.

b) In each hole, screw in one 1 1/4" 20-thread tap tite™ bolt, leaving approximately 1/8" to 1/4" of the thread exposed.

c) Remove the large belly band (labeled "AutoMax") from the rack by removing the three screws near the base holding it to the cable guide area.

d) Position the Rack against the panel at a slight angle so that the bottom is a few inches away from the panel. Place the top of the Rack against the panel so that the upper two bolts are visible through the larger part of the bolt holes at the top of the Rack.

Carefully slide the Rack down so that the bolts are wedged in the top (smaller) area of the bolt holes, while at the same time moving the lower portion of the Rack toward the cabinet or panel onto the lower bolts. The lower bolts should be firmly wedged against the upper edge of the lower bolt holes on the Rack. Tighten all the bolts.

Step 2. Mount the Power Supply module in the Rack following the steps below.

a) Take the Power Supply module out of its shipping container and anti-static bag, being careful not to touch the connectors on the back of the module.

b) Remove the two keyswitch keys which are taped to the front of the module. Insert the module into the leftmost and widest slot in the Rack. Use a screwdriver to attach the module to the Rack. Store the keyswitch keys in a secure area.

c) Connect the Battery Back-Up unit, if using. Plug one end of the Battery Back-Up cable into the Power Supply module faceplate connector labeled "BATTERY BACK UP". Plug the other end of the cable into the Battery Back-Up unit.

Step 3. Mount the terminal strip end of the terminal strip/connector assemblies for I/O modules on the panel or on lashing bars. The terminal strips should be mounted to permit easy access to the screw terminals. Make certain that the strips are close enough to the Rack so that the connecting cables will reach between terminal strips and the modules. Most cables are approximately 60" long.

Step 4. Fasten wiring for the external hardware to the terminal strips. Make certain that all field wires are securely attached. Label all terminal strips and field wires to allow easy reconnection at a later date.

For I/O modules, note carefully that bit numbers and wire numbers (located on wires between the faceplate connector and terminal strip) are not the same. Refer to the instruction manuals describing the modules in the installation section for more information.

Step 5. Take the Processor module(s) and other modules out of their shipping containers and insert them into the desired slots. See figure 2.4 for slot restrictions for certain modules. Use a screwdriver to attach the modules to the Rack.

Step 6. Attach the connector ends of the terminal strip/connector assemblies to their mating halves on the appropriate modules. Use a screwdriver to attach the connectors to the modules. Use the cable guides at the base of the rack to keep cables separate.

Note that in most cases both the connectors and their mating halves are equipped with movable "keys". These keys should be used to prevent the wrong connector from being plugged into a module in the event that the connector needs to be removed and then re-attached later.

At the time of installation, rotate the keys on the connector and the mating half on the module to mirror image positions so that they can be connected together securely. For all modules equipped with keys, the key on each successive module in the Rack should be rotated one position to the right of the key on the preceding module.

Step 7. Wire the Rack following the instructions below.

CAUTION

DO NOT CONNECT INCOMING A-C POWER DIRECTLY TO THE POWER SUPPLY MODULE FACEPLATE. CONNECT A-C POWER TO THE CORRECT TERMINALS ON THE RACK ONLY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

a) Ground the cabinet or panel on which the Rack will be mounted. Make certain that there is an unbroken path from the cabinet to the plant ground (earth).

b) Connect incoming A-C power to the Rack as follows:

Rack Terminal Label	Input
189	115 VAC - (neutral)
188	115 VAC + (hot)

Cover the incoming wire ends with a Faston™ connector and attach them securely to the appropriate terminals using a screwdriver.

c) Connect the power and ground wires from the Rack to the Power Supply module as follows:

Wire Color	Wire Label	Power Supply Faceplate Connector
black	L2	L2/N
orange	L1	L1
green	--	GND

The wires labeled L2 and L1 should remain twisted together as much as possible between the Rack and the Power Supply module.

Step 8. Using a screwdriver, re-attach the belly band to the base of the rack.

Step 9. Turn on power to the system.

DANGER

THE POWER SUPPLY MODULE OPERATES USING A-C INPUT VOLTAGE CAPABLE OF PRODUCING SEVERE SHOCK. MAKE CERTAIN THAT THE EXTERNAL A-C SUPPLY CIRCUIT IS TURNED OFF BEFORE INSERTING OR REMOVING THE MODULE OR ANY CONNECTING CABLES. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS BODILY INJURY OR LOSS OF LIFE.

Step 10. Verify the installation by connecting the personal computer to the port labeled "PROGRAMMER/PORT B" on the leftmost Processor in the Rack and running the ReSource programming software. Use the I/O MONITOR function to attempt to read from or write to the registers on each of the modules in the Rack.

WARNING

BE CAREFUL TO INSURE THAT NO UNEXPECTED MACHINE MOTION WILL RESULT WHEN WRITING TO OUTPUTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

Refer to the Instruction manuals describing other hardware in the installation for more information.

3.3 Power Supply Module Replacement

Use the following procedure to replace the Power Supply module:

Step 1. Turn off power to the Rack and all connections.

DANGER

THE POWER SUPPLY MODULE OPERATES USING A-C INPUT VOLTAGE CAPABLE OF PRODUCING SEVERE SHOCK. MAKE CERTAIN THAT THE EXTERNAL A-C SUPPLY CIRCUIT IS TURNED OFF BEFORE INSERTING OR REMOVING THE MODULE OR ANY CONNECTING CABLES. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS BODILY INJURY OR LOSS OF LIFE.

Step 2. Use a screwdriver to disconnect the terminal strip from the Power Supply module. Do not remove the wires from the terminal strip. Disconnect the Battery Back-Up cable, if used.

Remove the belly band from the rack by removing the three screws near the base holding it to the cable guide area.

Step 3. Use a screwdriver to loosen the screws holding the Power Supply module in the Rack and remove the module, being careful not to touch the connectors on the back. Store the module in the anti-static bag it came in.

Step 4. Mount the replacement Power Supply module in the Rack following the steps below:

a) Take the replacement Power Supply module out of its shipping container and anti-static bag, being careful not to touch the connectors on the back of the module.

b) Remove the two keys to the keyswitch which are taped to the front of the module. Store the keyswitch keys in a secure area. Use a screwdriver to disconnect the terminal strip from the replacement Power Supply module.

c) Insert the module into the leftmost and widest slot in the Rack. Use a screwdriver to attach the module to the Rack.

d) Use a screwdriver to attach the terminal strip from the old Power Supply module to the replacement Power Supply module. Make certain that the connector is attached correctly by verifying that the wiring and the terminal labels on the faceplate match as follows:

Wire Color	Wire Label	Power Supply Faceplate Connector
black	L2	L2/N
orange	L1	L1
green	--	GND

e) If you are using the Battery Back-Up unit, plug one end of the Battery Back-Up cable into the Power Supply module faceplate connector labeled "BATTERY BACK UP". Plug the other end into the Battery Back-Up unit.

f) Using a screwdriver, re-attach the belly band to the base of the rack.

Step 5. Turn on power to the system.

Step 6. Verify the installation by connecting the personal computer to the port labeled "PROGRAMMER/PORT B" on the leftmost Processor in the Rack and running the ReSource programming software. Use the I/O MONITOR function to attempt to read from or write to the registers on each of the modules in the Rack.

WARNING

BE CAREFUL TO INSURE THAT NO UNEXPECTED MACHINE MOTION WILL RESULT WHEN WRITING TO OUTPUTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

Refer to the instruction manuals describing the specific hardware in the installation for more information.

3.4 Rack Replacement

Use the following procedure to replace the Rack:

Step 1. Turn off power to the Rack and all connections.

DANGER

THE POWER SUPPLY MODULE OPERATES USING A-C INPUT VOLTAGE CAPABLE OF PRODUCING SEVERE SHOCK. MAKE CERTAIN THAT THE EXTERNAL A-C SUPPLY CIRCUIT IS TURNED OFF BEFORE INSERTING OR REMOVING THE MODULE OR ANY CONNECTING WIRES. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS BODILY INJURY OR LOSS OF LIFE.

Step 2. Using a screwdriver, remove the belly band from the rack by removing the three screws near the base holding it to the cable guide area. Loosen all the screws holding connectors to the modules in the Rack. Remove the connectors. Disconnect the wires attached to the terminal strip on the Power Supply module.

Step 3. Use a screwdriver to loosen the screws holding all modules, including the Power Supply module, in the Rack. Take all of the modules out of the Rack, being careful not to touch the connectors on the back.

Step 4. Loosen the bolts that hold the rack to panel approximately 1/8"-1/4". Lift the Rack slightly while holding it against the panel until both top bolts are positioned in the larger bolt holes and the lower two bolts have cleared the smaller holes. Pull the Rack away from the panel and set aside.

Step 5. Position the replacement Rack against the panel at a slight angle so that the bottom is a few inches away from the panel. Place the Rack against the panel so that the upper two bolts are visible through the larger part of the bolt holes at the top of the Rack.

Carefully slide the Rack down so that the bolts are wedged in the top (smaller) area of the bolt holes, while at the same time moving the lower portion of the Rack toward the cabinet or panel onto the lower bolts. The lower bolts should be firmly wedged against the upper edge of the lower bolt holes on the Rack. Tighten all the bolts.

Step 6. Insert the Power Supply module into the leftmost and widest slot in the Rack. Use a screwdriver to attach the module to the Rack.

Step 7. If you are using the Battery Back-Up unit, plug one end of the Battery Back-Up cable into the Power Supply module faceplate connector labeled "BATTERY BACK UP". Plug the other end into the Battery Back-Up unit.

Step 8. Insert the Processor module(s) and other modules. Use a screwdriver to attach the modules to the Rack.

Step 9. Use a screwdriver to attach the connectors to their mating halves on the appropriate modules.

Step 10. Connect 115 VAC power to the Rack following the instructions below.

CAUTION

DO NOT CONNECT INCOMING A-C POWER DIRECTLY TO THE POWER SUPPLY MODULE FACEPLATE. CONNECT POWER TO THE CORRECT TERMINALS ON THE RACK ONLY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

a) Make certain that there is an unbroken path from the cabinet to the plant ground.

b) Connect incoming A-C power to the Rack as follows:

Rack Terminal Label	Input
189	115 VAC - (neutral)
188	115 VAC + (hot)

Cover the incoming wire ends with a Faston™ connector and attach them securely to the appropriate terminals using a screwdriver.

c) Connect the power and ground wires from the Rack to the Power Supply module as follows:

Wire Color	Wire Label	Power Supply Faceplate Connector
black	L2	L2/N
orange	L1	L1
green	--	GND

The wires labeled L2 and L1 should remain twisted together as much as possible between the Rack and the Power Supply module.

Step 11. Using a screwdriver, re-attach the belly band to the base of the rack.

Step 12. Turn on power to the system.

Step 13. Verify the installation by connecting the personal computer to the port labeled "PROGRAMMER/PORT B" on the leftmost Processor in the Rack and running the ReSource programming software. Use the I/O MONITOR function to attempt to read from or write to the registers on each of the modules in the Rack.

WARNING

WHEN WRITING TO OUTPUTS, BE CAREFUL TO INSURE THAT NO UNEXPECTED MACHINE MOTION WILL RESULT. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

Refer to the instruction manuals describing the specific hardware in the installation for more information.

4.0 DIAGNOSTICS AND TROUBLESHOOTING

This section explains how to troubleshoot the Power Supply module and Rack. Any problems with either the Power Supply module or the Rack can usually be isolated by observing the condition of the LEDs on the Power Supply module faceplate. Problems with the Rack backplane (bus) will result in error codes on the LEDs of Processor modules in the Rack. See J-3650 for more information on troubleshooting the AutoMax Processor module. See J-3668 for more information on troubleshooting the DCS 5000 Processor.

DANGER

THE POWER SUPPLY MODULE OPERATES USING A-C INPUT VOLTAGE CAPABLE OF PRODUCING SEVERE SHOCK. MAKE CERTAIN THAT THE EXTERNAL AC SUPPLY CIRCUIT IS TURNED OFF BEFORE INSERTING OR REMOVING THE MODULE OR ANY CONNECTING WIRES. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS BODILY INJURY OR LOSS OF LIFE.

If the problem cannot be determined using the troubleshooting instructions below, the hardware is not user-serviceable.

DANGER

SOME OF THESE STEPS ARE MADE WITH POWER ON. EXERCISE EXTREME CAUTION BECAUSE HAZARDOUS VOLTAGE EXISTS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

4.1 The POWER ON LED Is Off

Problem: the POWER ON LED on the Power Supply module is off. This LED should always be on when input power is on. If the LED is off, the module is not receiving 115 VAC power. Use the following procedure to isolate the problem.

Step 1. Using a voltmeter, verify that the Rack is receiving 115 VAC power.

Step 2. Turn off power to the Rack. Wait until all of the LEDs on the faceplate of the Power Supply module have gone out. Verify that the connections at the Rack and the L1 and L2 connections at the Power Supply module are tight.

Step 3. Turn on power to the Rack. If the problem is not corrected, replace the Power Supply.

4.2 The P/S READY LED Is Off

Problem: the P/S READY LED on the Power Supply module is off. This LED should always be on when input power is on. If the LED is off, use the following procedure to isolate the problem.

Step 1. Turn off power to the Rack and all connections.

Step 2. Wait until all of the LEDs on the faceplate of the Power Supply module have gone out. Use a screwdriver to loosen the screws holding the Power Supply module in the Rack. Slide the module out about one inch to insure that the backplane connections have been broken. Do not take the module out of the Rack.

Step 3. Turn on power to the Rack. If the P/S READY LED turns on, the problem lies in the Rack backplane. Go on to step 4.

If the P/S READY LED does not light, the Power Supply module is malfunctioning and needs to be replaced.

Step 4. Turn off power again. Wait until all of the LEDs on the faceplate of the Power Supply module have gone out. Use a screwdriver to disconnect the terminal strip from the Power Supply module. Do not remove the wires from the terminal strip.

Step 5. Remove the module from the Rack and verify that card edge connectors are clean and that the connectors on the backplane are in good condition.

Step 6. Re-insert the Power Supply module. Use a screwdriver to re-connect the terminal strip to the Power Supply module. Turn on power to the rack. If the problem is not corrected, replace the Rack.

4.3 The SYSTEM READY LED Is Off

Problem: the SYSTEM READY LED on the Power Supply module is off. This LED should always be on when input power is on and all Processor modules in the Rack are operating correctly. The light will go off if the OK LEDs on any Processors in the Rack go off.

Check the OK LEDs on all Processor modules in the Rack. Troubleshoot the Processor(s) whose LEDs are off. Verify that the Power Supply output is sufficient to power all of the modules in the Rack by checking the total power requirements of the modules in the Rack against the Power Supply output.

4.4 The BLOWN FUSE LED Is On

Problem: the BLOWN FUSE LED on the Power Supply module is on. This LED should always be off. Use the following procedure to isolate the problem.

CAUTION

THE FUSE MUST BE REPLACED ONLY BY ANOTHER 250V 8AMP NORMAL BLOW FUSE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

Step 1. Turn off power to the Rack.

Step 2. Wait until all of the LEDs on the faceplate of the Power Supply module have gone out. Use a screwdriver to release the fuse holder (labeled "FUSE") located on the Power Supply module faceplate. Pull the fuse holder out of the module.

Step 3. Take the old fuse out of the fuse holder and replace with the new fuse.

Step 4. Re-insert the fuse holder into the module. Turn the screwdriver clockwise and press down on the fuse holder at the same time. The fuse holder must be flush against the faceplate.

Appendix A

Technical Specifications
Power Supply Module

Ambient Conditions

- Storage temperature: -55°C - 85°C
- Operating temperature: 0°C - 60°C
- Humidity: 5-90% non-condensing
- Altitude: operation from sea level at 60°C to 10,000 feet (3048 meters) at 40°C with linear derating between the two altitudes.

Dimensions

• Height:	$11\frac{3}{4}$	inches	29.8	cm
• Width:	4	inches	10.2	cm
• Depth:	$7\frac{3}{4}$	inches	19.7	cm
• Weight:	$8\frac{1}{2}$	lbs	3.8	kg

Maximum Power Dissipation

- 393 Watts

System Power Requirements

- Input voltage: nominal 120 VAC, 100-132 VAC acceptable range
- Current: 5 Amp at 120 VAC
- Frequency: nominal 50/60 Hz, 47-63 Hz acceptable range
- Protection: 8 Amp 250 VAC AGC normal blow fuse
- Fault current limit: 10KVA

D-C Output

- +5 VDC at 30 amps
- +/-12 VDC at 4 amps
- +/-15 VDC at 1 amp
- Maximum continuous output power: 275 Watts
- Holdover time: 20 msec. minimum after loss of A-C input
- Soft start: output current gradually increases at start-up

Regulation

- Nominal +5 VDC: -3% to +5% regulation
- Nominal +/- 12 VDC: +/- 15% regulation
- Nominal +/- 15 VDC: +/- 1% regulation

Efficiency

- 70% minimum at nominal line voltage and full load

Isolation

- 1500 VAC input to output
- 600 VDC output to chassis

Protection

- Overvoltage: Power Supply will not operate if the +5 VDC output reaches 120% of nominal voltage
- Overcurrent: +5 VDC Power Supply output is protected against excessive output current conditions of 120% of the nominal output

Appendix A (Cont.)

Technical Specifications
16-Slot and 10-Slot Rack

Ambient Conditions

- Storage temperature: -55°C - 85°C
- Operating temperature: 0°C - 60°C
- Humidity: 5-90% non-condensing

Rack Dimensions

M/N 57C331 16-Slot Rack

- Height: $19^{1}/_{8}$ inches 48.6 cm
- Width: $24^{9}/_{16}$ inches 62.4 cm
- Depth: $12^{1}/_{4}$ inches 31.1 cm
- Weight: 105-115 lbs 47-52 kg fully loaded

M/N 57C332 10-Slot Rack

- Height: $19^{1}/_{8}$ inches 48.6 cm
- Width: $17^{1}/_{16}$ inches 43.3 cm
- Depth: $12^{1}/_{4}$ inches 31.1 cm
- Weight: 70-80 lbs 32-36 kg fully loaded

Bus Specifications

- Type: Intel Multibus™
- P1 bus connector: IEEE standard P796 bus
- P2 bus connector: IEEE standard P796 modified bus

A-C Line Filter:

- 10 Amp
- 120/250 VAC
- 50/60 Hz

Fans

- Two (2) per Rack
- Nominal power dissipation: 14 Watts each

Appendix B

External Connections

Input Power to Rack (M/N 57C331 and 57C332)

Terminal Label	Input
189	A-C neutral
188	A-C hot
GND	Rack/earth ground

Rack (M/N 57C331 and 57C332) to Power Supply Module (M/N 57C491)

Wire Color	Wire Label	Power Supply Faceplate Connector
black	L2	L2/N
orange	L1	L1
green	--	GND

Appendix C

Rack Backplane

P1 Bus

	Component Side		
	Pin[1]	Mnemonic	Description
Power Supplies	1	GND	Signal Ground
	3	+5V	+5 VDC
	5	+5V	+5 VDC
	7	+12V	+12 VDC
	9 NC	-5V	-5 VDC
	11	GND	Signal Ground
Bus Controls	13	BCLK	Bus Clock
	15	BPRN/	Bus Priority In
	17	BUSY/	Bus Busy
	19	MRDC/	Memory Read Command
	21	IORC/	I/O Read Command
	23	XACK/	Transfer Acknowledge
Bus Controls and Addresses	25	LOCK/	Lock
	27	BHEN/	Byte Hi Enable
	29	CBRQ/	Common Bus Request
	31	CCLK/	Common Clock
	33 NC	INTA/	Interrupt Acknowledge
Parallel Interrupts Requests	35 MOD	INT6/	CPU Communication Interrupt
	37 NC	INT4/	General Purpose Interrupt
	39	INT2/	General Purpose Interrupt
	41	INT0/	General Purpose Interrupt
Address	43	ADRE/	Address Bus
	45	ADRC/	
	47	ADRA/	
	49	ADR8/	
	51	ADR6/	
	53	ADR4/	
	55	ADR2/	
	57	ADR0/	
Data	59	DATE/	Data Bus
	61	DATC/	
	63	DATA/	
	65	DAT8/	
	67	DAT6/	
	69	DAT4/	
	71	DAT2/	
	73	DAT0/	
Power Supplies	75	GND	Signal Ground
	77 NC		Reserved
	79	-12V	-12V
	81	+5V	+5 VDC
	83	+5V	+5 VDC
	85	GND	Signal Ground

NC: No connection
MOD: Modified definition of Multibus specification
NU: No usage in system; driven per Multibus specification

Appendix C (Cont.)

Rack Backplane

P1 Bus (Cont.)

	Solder Side		
	Pin[1]	**Mnemonic**	**Description**
Power Supplies	2	GND	Signal Ground
	4	+5V	+5 VDC
	6	+5V	+5 VDC
	8	+12V	+12 VDC
	10 NC	-5V	-5 VDC
	12	GND	Signal Ground
Bus Controls	14	INIT/	Initialize
	16	BPRO/	Bus Priority Out
	18	BREQ/	Bus Request
	20	MWTC/	Memory Write Commmand
	22	IOWC/	I/O Write Command
	24 MOD	PRIV/	Privilege
Bus Controls and Addresses	26 MOD	MMUMAP	MMU Map Select
	28	AD10/	Address Bus
	30	AD11/	Address Bus
	32	AD12/	Address Bus
	34	AD13/	Address Bus
Parallel Interrupts Requests	36 MOD	INT7/	System WDOG Interrupt
	38 NC	INT5/	General Purpose Interrupt
	40	INT3/	General Purpose Interrupt
	42	INT1/	General Purpose Interrupt
Address	44	ADRF/	Address Bus
	46	ADRD/	
	48	ADRB/	
	50	ADR9/	
	52	ADR7/	
	54	ADR5/	
	56	ADR3/	
	58	ADR1/	
Data	60	DATF/	Data Bus
	62	DATD/	
	64	DATB/	
	66	DAT9/	
	68	DAT7/	
	70	DAT5/	
	72	DAT3/	
	74	DAT1/	
Power Supplies	76	GND	Signal Ground
	78 NC		Reserved
	80	-12V	-12V
	82	+5V	+5 VDC
	84	+5V	+5 VDC
	86	GND	Signal Ground

NC: No connection
MOD: Modified definition of Multibus specification
NU: No usage in system; driven per Multibus specification

Appendix C (Cont.)

Rail Backplane

P2 Bus

Component Side		
Pin	**Mnemonic**	**Description**
1	AGND	Analog Ground
3	5VB	+5V Battery
5	IDA0/	Address ID #0
7	DB	Dedicated High Speed Bus
9	IDA1/	Address ID #1
11	DB	Dedicated High Speed Bus
13	DB	Dedicated High Speed Bus
15	DB	Dedicated High Speed Bus
17	PFSN/	Power Fial Sense
19	PFIN/	Power Fail Interrupt
21	AGND	Analog Ground
23	A +15V	Analog +5 VDC
25	A -15V	Analog +5 VDC
27	DB DPR0/	Data Parity 0
29	DB APR0/	ADDR Parity 0
31	DB APR2/	ADDR Parity 2
33	DB	Dedicated High Speed Bus
35	KEY0/	Key Lock Position 0
37	KEY1/	Key Lock Position 1
39	WDOK/	Watchdog OK
41	MPOSO	Dedicated High Speed Bus
43	MPOS2/	Dedicated High Speed Bus
45	MPOS4/	Dedicated High Speed Bus
47	MPOS6/	Dedicated High Speed Bus
49	MPOS8/	Dedicated High Speed Bus
51	MPOSA/	Dedicated High Speed Bus
53	MPOSC/	Dedicated High Speed Bus
55	MPOSE/	Dedicated High Speed Bus
57	MDFLT/	Dedicated High Speed Bus
59	MVAGND	Dedicated High Speed Bus

Appendix C (Cont.)

Rail Backplane

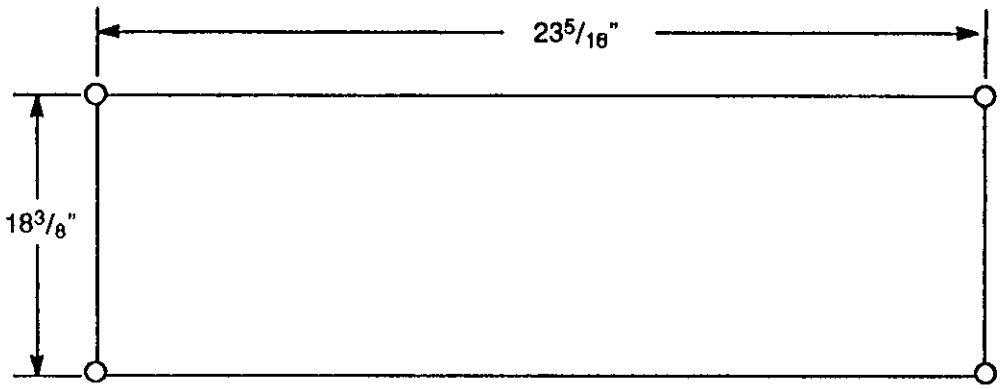
P2 Bus (Cont.)

Solder Side		
Pin	**Mnemonic**	**Description**
2	AGND	Analog Ground
4	5VB	+5V Battery
6	DBR	Dedicated High Speed Bus
8	DBR	Dedicated High Speed Bus
10	IDA2/	Address ID #2
12	DB	Dedicated High Speed Bus
14	IDA3/	Address ID #3
16	DBR	Dedicated High Speed Bus
18	DBR	Dedicated High Speed Bus
20	MPRO/	Memory Protect
22	AGND	Analog Ground
24	A +15V	Analog +15 VDC
26	A -15V	Analog -15 VDC
28	DPR1/	Data Parity 1
30	APR1/	ADDR Parity 1
32	PREN/	Parity Enable
34	DIAG/	Diagnostic Loop
36	BD RST/	Board Reset
38	DB	Dedicated High Speed Bus
40	DB	Dedicated High Speed Bus
42	MPOS1	Dedicated High Speed Bus
44	MPOS3/	Dedicated High Speed Bus
46	MPOS5/	Dedicated High Speed Bus
48	MPOS7/	Dedicated High Speed Bus
50	MPOS9/	Dedicated High Speed Bus
52	MPOSB/	Dedicated High Speed Bus
54	MPOSD/	Dedicated High Speed Bus
56	MPOSF/	Dedicated High Speed Bus
58	MVAREF	Dedicated High Speed Bus
60	MVAGND	Dedicated High Speed Bus

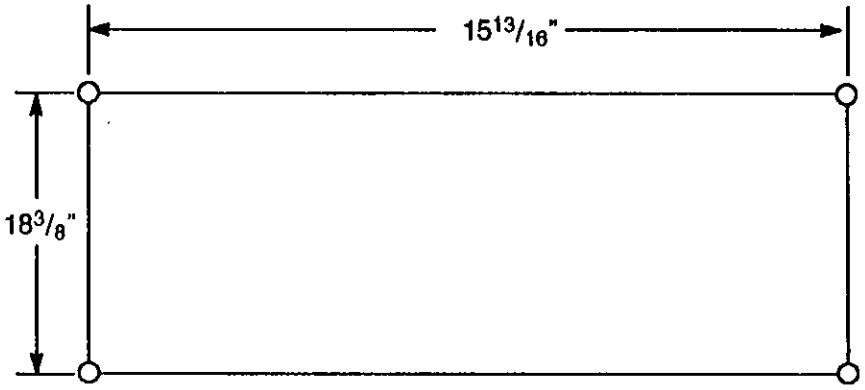
Appendix D

Rack Mounting Pattern

16-Slot Rack



10-Slot Rack



Dimensions shown are between mounting hole centers.
Diameter of mounting holes: .312"

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