



User Manual

Power Distribution Unit, Power Pal

Document No. 6002-937
Revision F

Installation and
Operation

*Due to continuous product improvement, this document is subject to change without prior notice.

POWER PAL

TABLE OF CONTENTS

	<u>PAGE</u>
PROPRIETARY	d
1.0 SAFETY	1-1
2.0 OVERVIEW	2-1
2.1 INTRODUCTION	2-1
2.2 BENEFITS	2-1
Illustration 2.1 Power Pal PDU	2-2
2.3 PRODUCT FEATURES	2-3
Illustration 2.2: Unit Component Layout	2-4
Illustration 2-3: Monitoring Panel	2-5
Table 2-6: Meter Options	2-6
Illustration 2-4: Meter Face	2-8
Table 2-9: Alarm Functions	2-9
2.4 INPUT MAIN CIRCUIT BREAKER (IMCB)	2-9
2.5 OUTPUT POWER CONFIGURATION	2-10
2.6 TRANSFORMER	2-10
Illustration 2-5: Taps	2-10
Table 2-11: Input Taps	2-11
2.7 FUNCTIONAL DESCRIPTION	2-11
Illustration 2-6: Functional Block Diagrams	2-12
3.0 OPERATION	3-1
3.1 START-UP PROCEDURES	3-1
3.2 OPERATION	3-2
4.0 SYSTEM OPTIONS	4-1
Table 4-1: System Options	4-1
4.1 OPTIONAL REMOTE EMERGENCY POWER OFF STATION – P/N 9100-787-XX	4-2
Illustration 4-1: Repo Box	4-2
Illustration 4-2: Repo Wiring	4-3
4.2 OPTIONAL THERMAL REMOTE EMERGENCY POWER OFF STATION P/N 9100-	4-3
Illustration 4-3: Thermal Repo Wiring	4-4
4.3 OPTIONAL ENVIRONMENTAL SECURITY INTERFACE –P/N 9100-755-XX	4-5
Illustration 4-4: ESI Wiring	4-5
Illustration 4-5: DIP Switches	4-7
Table 4-9: SW2 Dip Switch Settings	4-8
4.4 OPTIONAL AIR CONDITIONING SHUTDOWN RELAY – P/N 9100-	4-8
Illustration 4-6: A/C Shutdown Relay – Momentary	4-9
Illustration 4-7: A/C Shutdown Relay – Latching	4-9
4.5 OPTIONAL SECONDARY SURGE SUPPRESSION – P/N 9100-783-XX	4-10
4.6 OPTIONAL INPUT/OUTPUT FILTERING – P/N 9100-784-XX	4-10
Illustration 4-8: Input Filter Wiring	4-10
Illustration 4-9: Output Filter Wiring	4-11
4.7 OPTIONAL GROUND INTEGRITY MONITOR – P/N 9100-1279-01	4-11

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	<u>PAGE</u>	
4.8	OPTIONAL FIELD WIRE JUNCTION BOX – P/N 9100-744-XX	4-11
	Illustration 4-10: Field Wired Junction Box	4-12
	Table 4-12: Box Sizes	4-12
4.9	OPTIONAL TRANSIENT SUPPRESSION PLATE – P/N 9100-783-XX	4-13
4.10	OPT NON-STANDARD POWER OUTPUT CONFIGURATION – P/N 9100-1265-XX	4-13
4.11	OPTIONAL SECONDARY MAIN OUTPUT CIRCUIT BREAKER – PN/ 2025-XX	4-13
4.12	OPTIONAL RAISED FLOOR / SEISMIC STAND – P/N 9100-1282-XX	4-13
	Illustration 4-11: Raised Floor Stand	4-14
4.13	OPT ADDITIONAL DISTRIBUTION SIDE CAR/PWR ISLAND – P/N 9100-1265-XX	4-14
	Illustration 4-12: PDU With One Distribution Side Car	4-15
	Illustration 4-13: Cable Access – Side Car	4-16
	Illustration 4-14: Tile Cutout – Side Car	4-16
	Illustration 4-15: Service Clearances – Side Car	4-17
4.14	OPTIONAL INPUT POWER MONITOR – P/N 9100-1262-XX	4-17
4.15	OPTIONAL ADVANCE OUTPUT POWER – P/N 9100-1262-XX	4-17
	Illustration 4-16: System Monitoring Meter	4-18
	Table 4-18: Part Numbers	4-18
	Table 4-19: Specifications	4-19
	Table 4-20: Options	4-20
4.16	OPTIONAL TRANSIENT VOLTAGE SURGE SUPPRESSION – P/N 9100-1440-XX	4-20
5.0	MAINTENANCE	5-1
5.1	SAFETY PRECAUTIONS	5-1
5.2	WHEN TO CALL	5-2
5.3	-----	5-3
5.4	PREVENTIVE MAINTENANCE	5-3
5.5	ONLINE POWER CUSTOMER SERVICE AND SUPPORT	5-3
APPENDICES		
	APPENDIX A - SPECIFICATIONS AND REPLACEABLE PARTS	A-1
6.0	INSTALLATION	6-1
6.1	SITE PLANNING AND PREPARATION	6-1
	Table 6-2: Floor Loading	6-2
	Illustration 6-1: Clearance Layout	6-3
	Illustration 6-2: Floor Tile Cutout	6-3
	Illustration 6-3: Cabinet Cable Access Opening	6-4
6.2	EQUIPMENT UNPACKING	6-4
	Illustration 6-4: Nameplate	6-6
6.3	INSTALLATION	6-6
	Illustration: 6-5: Input and Output Cable Installation	6-8
6.4	INITIAL START-UP	6-10
6.5	SETTING IMCB SHUNT TRIP DIP SWITCHES	6-10
	Table 6-10: SW1	6-10
	Table 6-11: SW2	6-11
	Illustration 6-6: DIP Switches	6-12

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One of our goals is to make our manuals both comprehensive and easy to use. The new format of our user manual is the result of ideas and inputs from customers like you who have taken an active interest in our continued success. We invite and appreciate your feedback on our products and documentation via e-mail, fax, mail, or telephone.

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SERVICE

If you require assistance, please call our 24-hour toll free hot line 800-PWR-SRVC (800-797-7782) or email to info@800pwrsrvc.com.

Please have the following information from your unit's nameplate available to speed assistance:

Serial Number: _____
KVA/Power Rating: _____
Input Voltage: _____
Output Voltage: _____
Manufacturer Date: _____

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1.0 SAFETY

Following safety precautions is important when operating or servicing electrical equipment. The symbols shown are used extensively throughout this manual. Always heed these precautions since they are essential to the safe operation and servicing of this product.



Boxes labeled with “**DANGER**” indicate that there is a high risk of personal injury or death if instructions are not followed.



Boxes labeled with “**CAUTION**” or “**WARNING**” indicate that there is a high probability of equipment malfunction, damage, or destruction if instructions are not followed.



DANGER!

ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UNIT. IMPROPER INSTALLATION HAS PROVEN TO BE THE SINGLE MOST SIGNIFICANT CAUSE OF START-UP PROBLEMS. HIGH AC ELECTRICAL VOLTAGES ARE PRESENT THROUGHOUT THE UNIT(S) AND INCORRECT INSTALLATION OR SERVICING COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT FAILURE.



DANGER!

READ THIS MANUAL IN ITS ENTIRETY BEFORE PERFORMING THE INSTALLATION, START-UP, OPERATION, OR MAINTENANCE OF THE SYSTEM). FAILURE TO DO SO COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT FAILURE.

If you require assistance, call toll free 800-PWR-SRVC (800-797-7782). Please have the following information from your unit’s nameplate available to speed assistance:

Serial Number:

KVA/Power Rating:

Input Voltage:

Output Voltage:

Manufacturer Date:

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DANGER!

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN WHO IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DAMAGE TO THE EQUIPMENTS, INJURY OR DEATH OF PERSONNEL. VERIFY THAT ALL HIGH AND LOW VOLTAGE INPUT POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.



DANGER!

EXERCISE EXTREME CARE WHEN HANDLING UNIT TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. CABINETS WEIGH SEVERAL HUNDRED POUNDS.



DANGER!

TEST LIFT AND BALANCE THE CABINETS BEFORE MOVING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES. THE BOTTOM STRUCTURE WILL SUPPORT THE UNIT ONLY IF THE FORKLIFT FORKS ARE COMPLETELY UNDERNEATH THE UNIT.

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DANGER!

ALL POWER TO THE UNIT MUST BE LOCKED AND TAGGED "OFF" BEFORE PERFORMING ANY SERVICE OR WORK ON THE UNIT. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION.



DANGER!

IN CASE OF FIRE INVOLVING ELECTRICAL EQUIPMENT. ONLY CARBON DIOXIDE FIRE EXTINGUISHERS, OR THOSE APPROVED FOR USE ON ELECTRICAL EQUIPMENT, SHOULD BE USED. USE OF WATER ON FIRES INVOLVING LIVE HIGH VOLTAGE ELECTRICAL CIRCUITS COULD PRESENT AN ELECTROCUTION HAZARD.



DANGER!

EXTREME CAUTION IS REQUIRED WHEN PERFORMING MAINTENANCE. LETHAL VOLTAGES EXIST WITHIN THE EQUIPMENT DURING OPERATION. OBSERVE ALL WARNINGS AND CAUTIONS IN THIS MANUAL. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY OR DEATH. OBTAIN QUALIFIED SERVICE FOR THIS EQUIPMENT AS INSTRUCTED.



DANGER!

BE CONSTANTLY AWARE THAT THE UNIT SYSTEM CONTAINS HIGH AC VOLTAGES. WITH INPUT POWER OFF, HIGH VOLTAGE AT THE FILTER CAPACITORS AND POWER CIRCUITS SHOULD DISCHARGE WITHIN 30 SECONDS. HOWEVER, POWER CIRCUIT FAILURES CAN OCCUR, SO YOU SHOULD ALWAYS ASSUME THAT HIGH VOLTAGE MIGHT STILL EXIST AFTER SHUTDOWN. VERIFY THAT POWER IS OFF USING AC AND DC VOLTMETERS BEFORE MAKING CONTACT.



DANGER!

SOME COMPONENTS WITHIN THE CABINETS ARE NOT CONNECTED TO CHASSIS GROUND. ANY CONTACT BETWEEN FLOATING CIRCUITS AND THE CHASSIS IS A LETHAL SHOCK HAZARD.

2.0 OVERVIEW

2.1 INTRODUCTION

The Power Pal Power Distribution Units (PDUs) are designed to provide the reliable, high-quality power necessary to suit the needs of today's sensitive electronics.

These three-phase, 60 hertz, self-contained, modular units provide isolation, distribution, control and monitoring of AC power. Six taps are on each primary winding of the transformer for voltage selection. Power Pal models are available in either 208 or 480 VAC input voltages and provide 208Y/120 VAC output voltages. The Power Pal unit is available in sizes ranging from 15 to 300 kVA, size, rating and model number information are provided on the nameplate located on the inside of the hinged front door.

2.2 BENEFITS

The Power Pal PDU System is a simple solution specifically designed to power all forms of modern data processing, communication, and process control equipment. The Power Pal PDU Series does not require any derating as other products may when powering 100% electronic loads including switch-mode power supplies.

The Power Pal PDU Series protects sensitive electrical equipment, such as computer systems, telecommunication networks, LANs and multi-user systems, and instrumentation systems, from electrical interference. The Power Pal PDU Series protects these systems from power problems associated with poor quality AC power.

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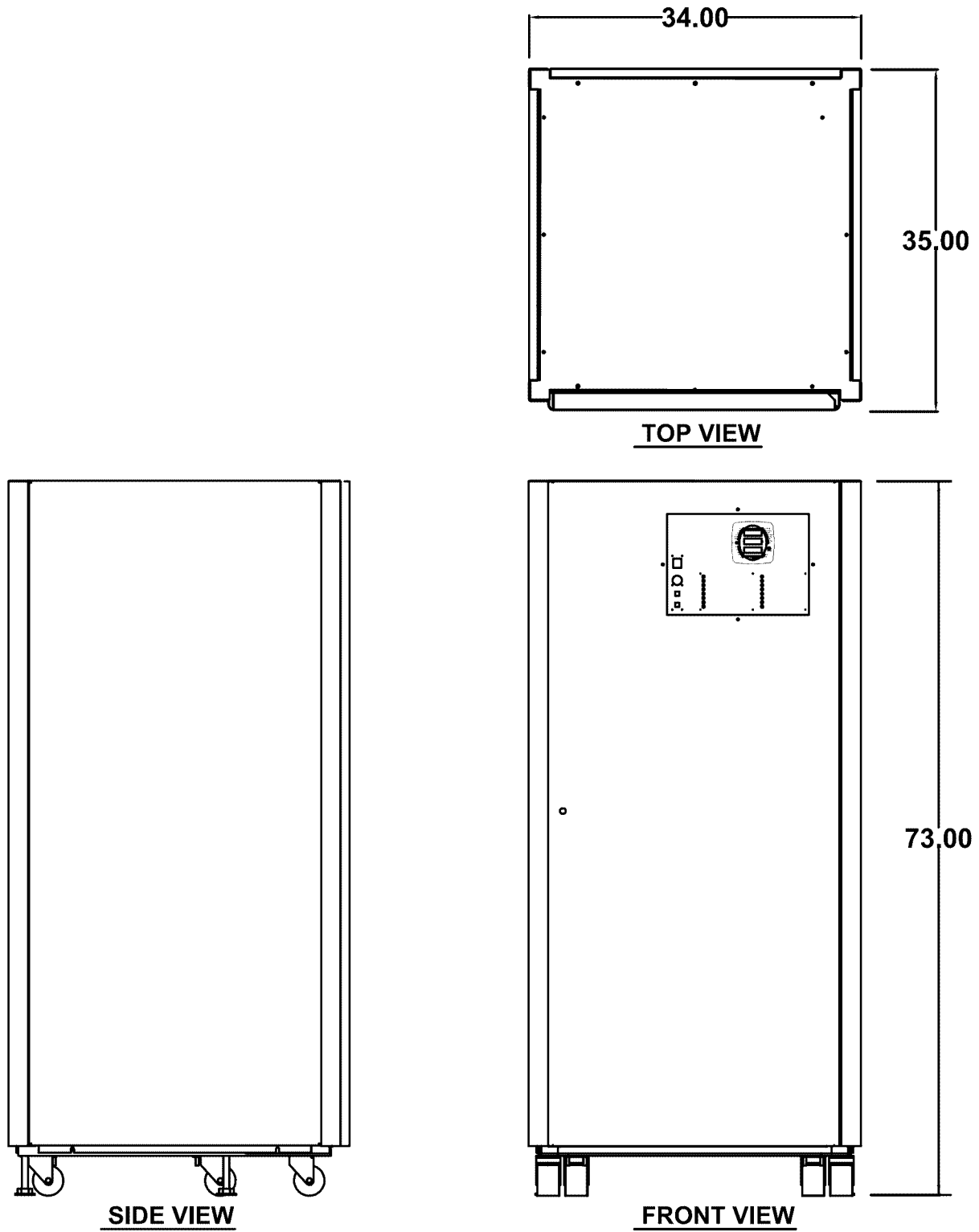


ILLUSTRATION 2-1: POWER PAL PDU

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Electrical disturbances can come from practically anywhere: from the incoming power lines and even from within a building. Outside electrical disturbances include lightning strikes, utility switching, brownouts, and accidents. Electrical disturbances from within a building can be caused by load cycling (elevators, HVAC systems), fault conditions, welders, and other electrically noisy equipment. Whether the electrical disturbances are generated outside or from within the facility, the following power problems will occur:

- Complete power outages
- Brown-outs including momentary sags
- Voltage surges
- Transients including common-mode and transverse-mode noise
- Frequency shifts and fluctuations

Sensitive equipment needs protection from power problems. Without power protection, users of sensitive equipment may experience:

- Loss of data including data corruption
- Database corruption
- Rebuilding of files
- Equipment and component deterioration
- Premature equipment failures
- Unexpected equipment malfunctions
- Missed deadlines, especially during batch processing
- Loss of real time transaction processing
- Loss of employee productivity

2.3 PRODUCT FEATURES

The following describes the major blocks within the Power Pal PDU Series. Please refer to Illustration 2-6 Functional Block Diagram for additional information.

2.3.1 Monitoring Panel

The Monitoring Panel (see Illustration 2-3) is located on a hinged panel on the front of the PDU (see Illustration 2-1, Front View).

The Monitoring Panel monitors vital functions of the output from the secondary side of the transformer. The panel displays the status of the unit and provides an alarm in response to certain external or internal conditions. An example of an external condition is a large fluctuation in the facility power. This can trigger an alarm.

The Monitoring Panel printed circuit board (PCB) is attached to the backside of the hinged panel. The Monitoring Panel PCB samples voltages and currents at the board and receives temperature data from sensors built into the transformer. Based on the data gathered by the Monitoring Panel PCB, the LEDs on the PCB illuminate and shine through the panel membrane.

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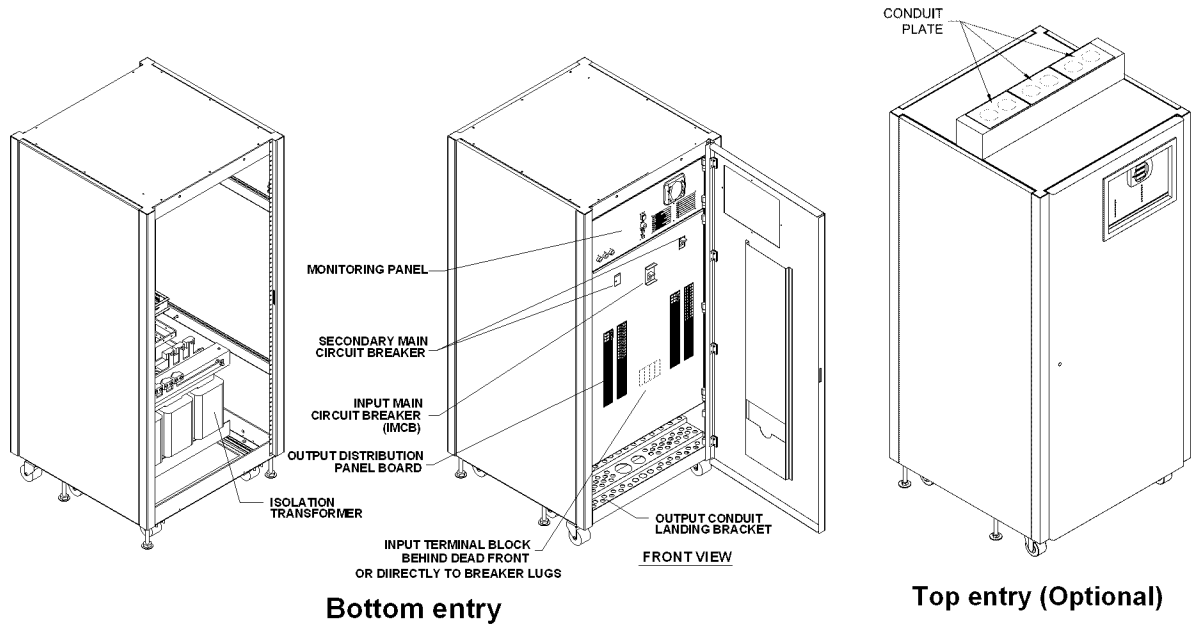


ILLUSTRATION 2-2a: UNIT COMPONENT LAYOUT with 208V Panel-board

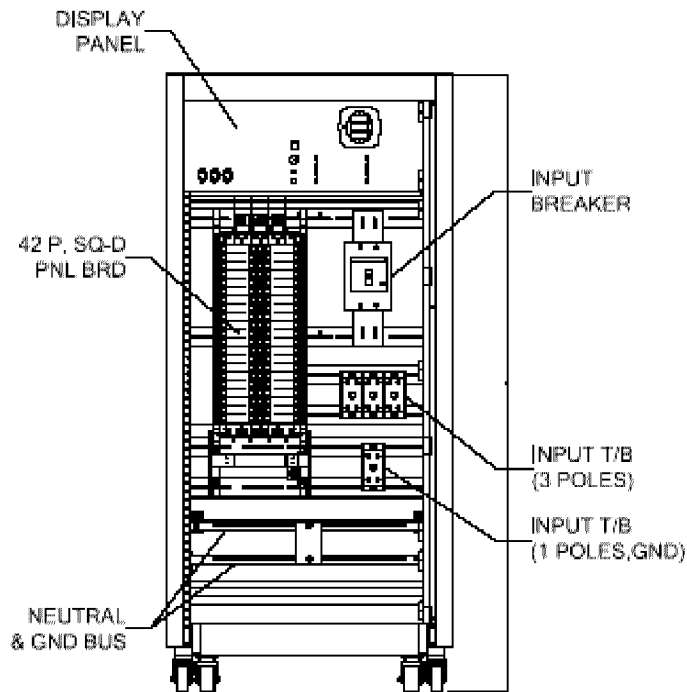


ILLUSTRATION 2-2b: UNIT COMPONENT LAYOUT with 480V Panelboard

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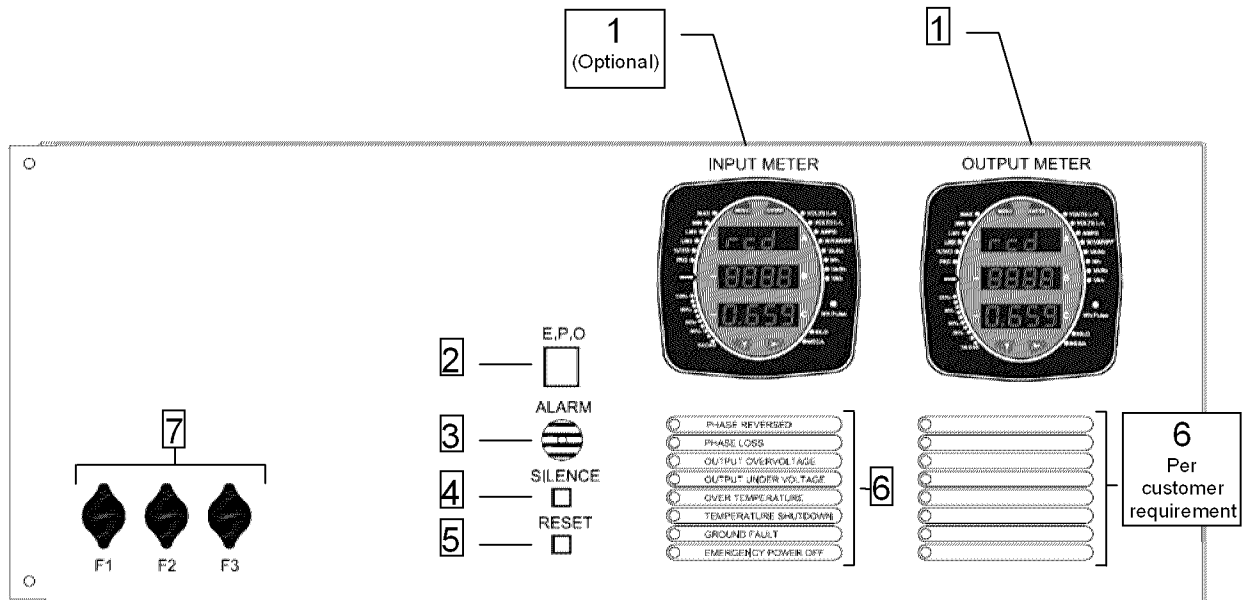


ILLUSTRATION 2-3: MONITORING PANEL

OUTPUT METER TYPICAL (INPUT METER OPTIONAL)

1. Output Digital Meter (Input Digital Meter optional)
2. EPO (emergency power off) switch
3. Audible ALARM
4. Alarm SILENCE switch
5. RESET switch
6. 16 Alarm LEDs (8 typical; additional 8 optional per customer requirement)
 - Phase Reversed
 - Phase loss
 - Output over voltage
 - Output under voltage
 - Over temperature
 - Temperature shutdown
 - Ground fault
 - Emergency power off
7. Fuses

2.3.2 Monitoring Meter

The digital display allows monitoring of secondary voltage, current and power measurements taken from critical points within the system. The output volts, amps and power are displayed continuously. Depending on the load, the power display reads between 000 and the maximum power rating of the unit during normal operation. The Input Meter is an available option for monitoring the input voltage and current. For all additional options with the meter, refer to Table 2-7.

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Digital Meter options and OLP part numbers:

Options

1550-077	-01 thru -04 -11 thru -14				-05, -06 -015, -016	
	V1	V2	V3	V4	V3	V4
Measured Value						
Voltage L-N	✓	✓	✓	✓	✓	✓
Voltage L-N	✓	✓	✓	✓	✓	✓
Current Each Phase	✓	✓	✓	✓	✓	✓
Watts		✓	✓	✓	✓	✓
VAR		✓	✓	✓	✓	✓
VA		✓	✓	✓	✓	✓
Power Factor P.F.		✓	✓	✓	✓	✓
(+ Watt - HR)						
(- Watt - HR)						
Watt - HR Net			✓	✓	✓	✓
(+ VAR - HR)						
(- VAR - HR)						
VAR - HR - NET			✓	✓	✓	✓
VAR - HR			✓	✓	✓	✓
Frequency Hz			✓	✓	✓	✓
Harmonics THD (0/0)				✓	✓	✓
Voltage Angles						
Current Angles						
% Load Bar			✓	✓	✓	✓
Communications DNP3.0			✓	✓		
Limit Exceeding Alarms				✓		✓
RS 485 / Modbus					✓	✓
RS485 / MODBUS	✓	✓	✓	✓		
Wireless / Lanbased Ethernet					✓	✓

60 Hz Unit

OLP Part #	Description
1550-077-01	SHARK 100-60-10-V1-D-X-X Meter standard 60Hz, 5Amp CT, V1
1550-077-02	SHARK 100-60-10-V2-D-X-X Option Meter 60Hz, 5Amp CT, V2
1550-077-03	SHARK 100-60-10-V3-D-X-X Option Meter 60Hz, 5Amp CT, V3
1550-077-04	SHARK 100-60-10-V4-D-X-X Option Meter 60Hz, 5Amp CT, V4
1550-077-05	SHARK 100S-60-10-V3 Meter-Wireless std. 60Hz, 5Amp CT, V3
1550-077-06	SHARK 100S-60-10-V4 Meter-Wireless std. 60Hz, 5Amp CT, V4

Options

OLP Part #	Description
1550-077-07	RS485 / Modbus
1550-077-08	WIFI - Wireless ethernet

Also Available in 50H

TABLE 2-6:

Meter Face Elements

- Reading Type Indicator:
Indicates Type of Reading
- IrDA Communication Port:
Com I Port for Wireless
Communication
- % of Load Bar:
Graphic Display of Amps as percentage of the Load
- Parameter Designator:
Indicates Reading Displayed
- Watt-Hour Test Pulse:
Energy Pulse Output to Test Accuracy

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- Scale Selector:
Kilo or Mega multiplier of Displayed Readings

Meter Face Buttons

Using Menu, Enter, Down, and Right Buttons, perform the following functions:

- View Meter Information
- Enter Display Modes
- Configure Parameters (Password Protected)
- Perform Resets
- Perform LED Checks
- Change Settings
- View Parameter Values
- Scroll Parameter Values
- View Limit States

Enter Button: Press and release to enter one of the following four Display Modes:

Operating Mode (Default),
Reset Mode (ENTER once, then Down)
Settings Mode (ENTER twice, then Down) and
Configuration Mode (ENTER three times, then Down)

Menu Button: Press and release to navigate Config Menu, return to Main Menu

Right Button:

Operating Mode - Max, Mm, %THD, Del kW, Net kW, Total kW
Reset Mode - Yes, No
Settings Mode - On, Off, Settings
Config Mode - Password Digits, Available Values, Digits

Down Button: Scroll DOWN through Mode menus

Use Buttons in Modes of Operation:

Operating Mode (default): View Parameter Values
Reset Mode: Reset Stored Max and Mm Values
Settings Mode: View Meter Setting Parameters and Change Scroll Setting
Configuration Mode: Change Meter Configuration (Can be Password Protected)
Settings Mode: View Meter Setting Parameters and Change Scroll Setting
Configuration Mode: Change Meter Configuration (Can be Password Protected)
Settings Mode: View Meter Setting Parameters and Change Scroll Setting
Configuration Mode: Change Meter Configuration (Can be Password Protected)

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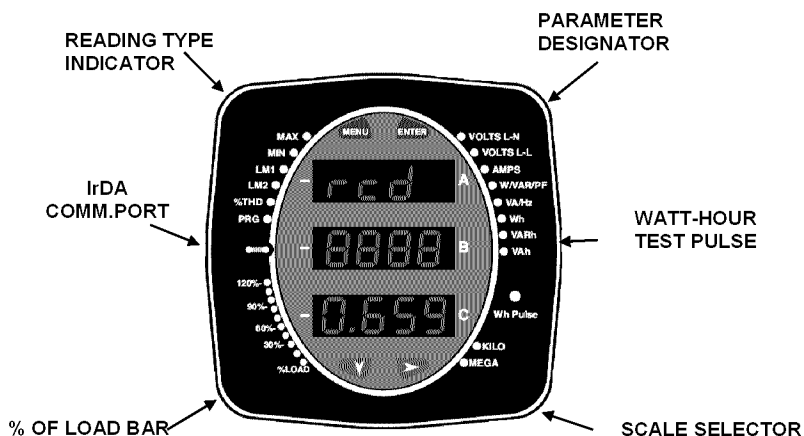


ILLUSTRATION 2-4: METER FACEPLATE

2.3.3 Emergency Power Off (EPO) Switch

Press the EPO switch to shunt trip the IMCB and turn power off to all loads.

2.3.4 Audible Alarm

The sonic ALARM audibly alerts personnel of system malfunction. Press the ALARM SILENCE switch to stop the audible alarm. The ALARM LED associated with the malfunction will remain lit until the alarm condition is cleared and the RESET switch is pushed.

2.3.5 Alarm Silence Switch

The Alarm Silence switch silences an audible alarm, but does not eliminate the alarm condition. Before taking corrective action for alarm condition, press the Alarm Silence switch to silence the audible alarm circuit.

2.3.6 Reset Switch

After an alarm condition has been corrected, pressing the RESET switch will clear the alarm alert and turn off the alarm LED.



CAUTION!

**If alarms activate, immediate action is required.
Check which alarm is being activated.**

2.3.7 Alarm LEDs

The Output Monitoring Panel has eight alarm LEDs that correspond to eight alarm conditions. See Table 2-9. In addition, there are eight LEDs for optional external alarms which can be connected through terminal connections inside the unit.

On sensing an alarm condition, the PDU will report the condition to the Output Monitoring Panel causing an alarm to sound and the corresponding LED to light. A dip switch SW1 located on the Output Monitoring Panel PCB can be set for automatic shut down with the alarm if desired. This feature is available for the following:

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- UNDER VOLTAGE
- OVER VOLTAGE
- PHASE LOSS
- PHASE ROTATION
- TEMP WARNING
- GROUND AMP functions

A second dip switch (SW2) is available for optional alarms. For the dip switch setting procedure, refer to Sections 6.4 (Start Up) and 6.5 (Setting IMCB Shunt-Trip Dip Switches).

The TEMP SHUT DOWN and EPO functions are hard wired and do not provide a choice between alarms only and alarm plus shut down. In an over temperature condition, the TEMP WARNING function triggers the alarm and lights the LED when the sensor in the main transformer coil senses a temperature of 284°F (140°C), if SW1 is set to the OFF position for the TEMP WARNING function, the unit will not shut down. If the over temperature condition persists and the temperature increases to 320°F (160°C), a shunt trip activates and automatically shuts down the unit. The EPO switch will trip the IMCB any time the protective cover is lifted and the switch is pushed.

In addition, there are eight LEDs for optional external alarms which can be connected through terminal connections inside the unit.

ALARM FUNCTIONS	
LED DESIGNATION	FUNCTION
PHASE REVERSED	Indicates counter clockwise phasing.
PHASE LOSS	Indicates a phase loss detected.
OUTPUT OVER VOLTAGE	Indicates voltage surge is 8% above nominal output.
OUTPUT UNDER VOLTAGE	Indicates voltage drop is below 10% of nominal output.
OVER TEMPERATURE	Indicates transformer over-temperature condition of 284°F (140°C).
TEMPERATURE SHUT DOWN	Indicates transformer over-temperature condition of 320°F (160°C).
GROUND FAULT	Indicates 4 amps have been detected on system ground.
EMERGENCY POWER OFF	LED illuminates when the EPO switch is pressed.

2.3.8 Fuses

Three fuses (labeled F1, F2, and F3) protect the Output Monitoring Panel. If the MOV option is installed, the next 3 fuses installed are labeled A7F1, A7F2, A7F3. Fuse F1 protects phase A, F2 protects phase B and F3 protects phase C.

2.4 INPUT MAIN CIRCUIT BREAKER (IMCB)

The INPUT MAIN CIRCUIT BREAKER (IMCB) is located on the dead front panel behind the front door. See Illustration 2-2. Facility power is connected to the PDU at the IMCB. The IMCB is used to switch power to the unit ON and OFF.

The IMCB is shunt tripped by activation of a solenoid within the breaker when one of the following events occurs:

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- the EPO switch is pressed,
- the second-stage thermal switch in the main transformer senses an over temperature condition,
- or the dip switch SW1 on the Output Monitoring Panel PCB is set for automatic shut down on alarm.

Refer to Section 4.3.2 for more information about dip switch SW1.



CAUTION! Be sure to observe ALL warnings and cautions when setting the IMCB to ON or OFF.

2.5 OUTPUT POWER CONFIGURATION

Refer to Sections 4-10 and 4-11 for information pertaining to non-standard panelboard and circuit breaker configurations. The number of circuits and circuit breakers can be expanded beyond those that a single PDU can provide by adding Side Car distribution centers or an optional Power Island distribution center. The standard Power Pal configurations include one 42-pole, 225 Amp Square-D Snap-On panel board with Output Main Circuit Breaker (OMCB). The PDU may include an additional 42-pole panel board and OMCB within the unit. As many as two Side Car distribution centers, each with two panelboards and OMCBs, may be attached to the PDU providing a maximum of 252 output circuit breaker positions.

2.6 TRANSFORMER

The transformer contained in the PDU is designed for convection cooling by means of free circulation of air through the bottom and rear of the unit. Maximum ambient temperatures should not exceed 104°F (40°C). The transformer contains built-in thermal sensors which report internal temperature state to the Output Monitoring Panel.

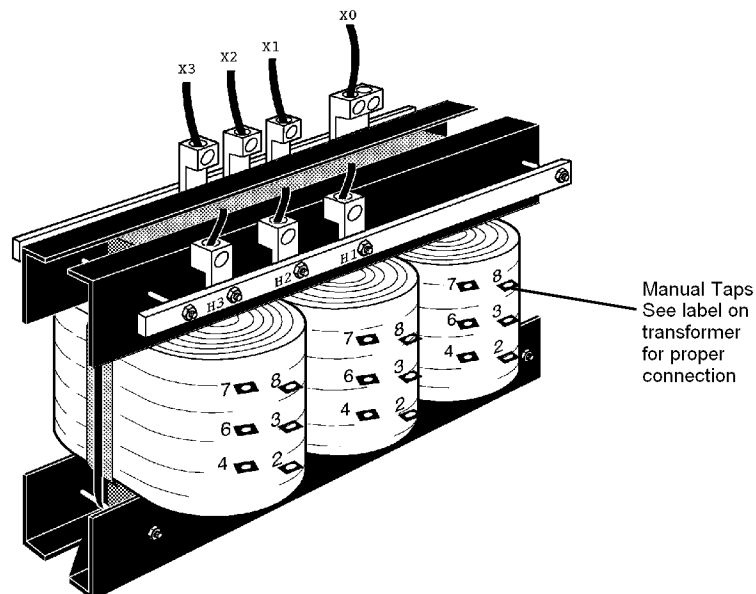


ILLUSTRATION 2-5:TAPS

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480VOLT INPUT TAPS

CONNECT TAPS	VOLTAGE
4-5	504
4-6	492
3-5	480
3-6	468
2-6	456
3-7	444
2-7	432

208V INPUT TAPS

CONNECT TAPS	VOLTAGE
4-5	218
4-6	213
3-5	208
3-6	203
2-6	198
3-7	192
2-7	187

2.7 FUNCTIONAL DESCRIPTION

Illustration 2-6 is a simplified functional block diagram of the Power Pal PDU. This diagram provides an excellent tool in identifying the major building blocks within the Power Pal PDU.

Main input circuit breaker (CB1) - The main input circuit power provides over-current protection to the input side of the Power Pal PDU.

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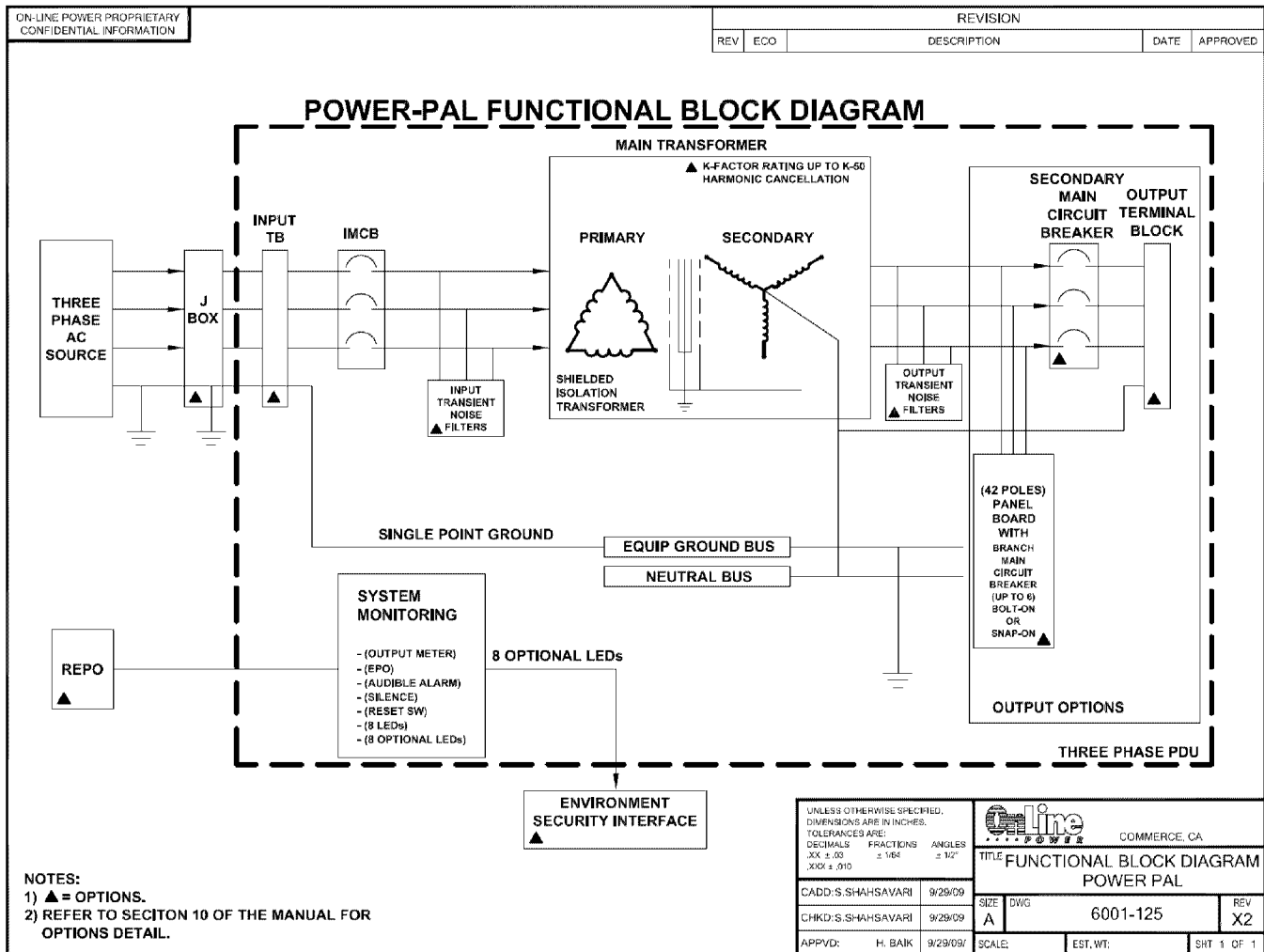


ILLUSTRATION 2-6: FUNCTIONAL BLOCK DIAGRAMS

3.0 OPERATION

3.1 START-UP PROCEDURES

OnLine Power service personnel must perform initial start-up or a factory trained authorized representative. To request start-up, fax a completed Request Turn-On form (6002-1545) to 323-721-3929 or e-mail it to info@800pwrsrv.com. Form is now available in the web at www.800pwrsrv.com.

The start-up procedure described in this manual is a reference only to a start up of the Power Pal PDU System for maintenance and shutdown.

Please be sure not to start up the unit without the assistance of a factory trained, authorize personal as failure to do so may damage the unit and void the unit warrantee.

- 3.1.1 Verify that the main input circuit breaker and output circuit breaker(s), are in the OFF or DOWN positions. Maintenance By Pass Switch is on NORMAL position. Refer to Illustration 2-2 for the location of the circuit breakers.

Note: Check that all cable connections are firmly secured.



CAUTION! If during the start-up procedures anything unusual occurs, immediately turn off the input circuit breaker, and contact Online Power at (800) 797-7782 for technical assistance. Also, use this number for any other questions or additional information.

3.1.2 Turning On The Unit

This procedure is to be used only for starting the unit during the normal course of operation. Follow this operating procedure any time the PDU has been turned off.



CAUTION! If this is the initial startup or if the PDU has been moved, perform the Startup procedure in before applying power to the unit.



CAUTION! Verify that all panelboard output circuit breakers are OFF before turning on branch feeder circuit breaker.

1. Energize the building's branch circuit breaker.
2. Open the front door.
3. Set the IMCB (INPUT MAIN CIRUCIT BREAKER) to ON.
4. Press and release the ALARM SILENCE switch.
5. Press and release the RESET switch.
6. If any alarms are present and will not clear upon pressing the RESET switch, immediately power down the unit and contact customer support at 1-800-797-7782.

Online Power

7. Set the OMCBs (OUTPUT MAIN CIRUCIT BREAKERS) to ON.
8. Set the output circuit breakers to ON (as required).
9. Close the front door.

3.2 OPERATION

Although the PDU is designed for unattended continuous operation, the unit can be switched ON and OFF on a regular basis.

3.2.1 Normal Condition

When the PDU is powered up, the digital display shows the output voltage, output current, and power. The output load display can range from 000 to the maximum kVA rating of the unit, depending on the load applied to the unit.

The normal operating condition of the PDU is as follows:

1. Input Main Circuit Breaker ON.
2. OMCBs set to ON.
3. Output panelboard circuit breakers ON (as required).

4.0 SYSTEM OPTIONS

This section describes options available with the Power Pal PDU System. The following options are available:

DESCRIPTION	PART NO.
REMOTE EMERGENCY POWER OFF STATION	9100-787-XX
THERMAL REMOTE EMERGENCY POWER OFF	9100-
ENVIRONMENTAL SECURITY INTERFACE	9100-755-XX
AIR CONDITIONING SHUTDOWN RELAY	9100-
SECONDARY SURGE SUPPRESSION	9100-783-XX
INPUT/OUTPUT FILTERING	9100-784-XX
GROUND INTEGRITY MONITOR	9100-1279-01
FIELD WIRE JUNCTION BOX	9100-744-XX
TRANSIENT SUPPRESSION PLATE	9100-783-XX
NON-STANDARD POWER OUTPUT	9100-1265-XX
SECONDARY MAIN OUTPUT CIRCUIT BREAKER	2025-XX
RAISED FLOOR/SEISMIC STAND	9100-1282-XX
ADDITIONAL DISTRIBUTION (SIDE CAR /POWER	9100-1265-XX
INPUT POWER MONITOR	9100-1262-XX
ADVANCE OUT PUT POWER MONITOR	9100-1262-XX
TRANSIENT VOLTAGE SURGE SUPPRESSION	9100-1440-XX



DANGER!

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN WHO IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DEATH, INJURY, EXPLOSION, FIRE OR DAMAGE TO THE EQUIPMENT. VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

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4.1 OPTIONAL REMOTE EMERGENCY POWER OFF STATION – P/N 9100-787-XX

The Remote Emergency Power Off Station (REPO) is a wall-mounted unit that enables operating personnel to remotely shut down the PDU in an emergency. The REPO station consists of a painted sheet metal enclosure with a guarded, momentary, normally open, red tactile switch. The REPO station is designed to be vertically mounted and can be located anywhere an emergency shut-off is required. The REPO station is provided with a 50-foot, two-conductor cable. Other length cables are available in five-foot increments.

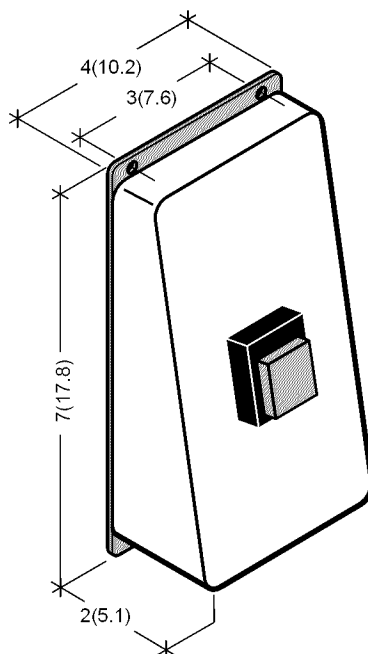


ILLUSTRATION 4-1: REPO BOX

4.1.1 Installation

The REPO cable is 50 to 100 feet long depending on the length ordered. The cable is supplied with bare wires on both ends for connection. This connects to a terminal block in the PDU.

1. Select the location for the REPO box.
2. Mount REPO box on wall or other structure using fasteners that are appropriate for the surface on which the REPO box is to be mounted.
3. Remove REPO box cover.
4. Connect two wires in REPO cable to terminals on REPO switch
5. Route REPO cable from REPO box to PDU. Remove floor tiles as required.
6. Open front door of PDU.
7. Set IMCB to OFF.

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8. Turn OFF main facility circuit breaker, lock and tagout in accordance with OSHA requirements.
9. Remove front panel of Power Pal.
10. Route REPO cable up through cable access opening and into cable landing bracket.
11. Locate the two-terminal REPO terminal block in the PDU.
12. REPO terminal block is accessible from the side of the unit after the left side panel has been removed. The terminal block is located on the upper left part of the interior panel, just behind the fuses.
13. Connect the two wires in REPO cable to REPO terminal block. See Illustration 4-2.
14. Replace floor tiles as required.
15. Replace front panel of PDU.

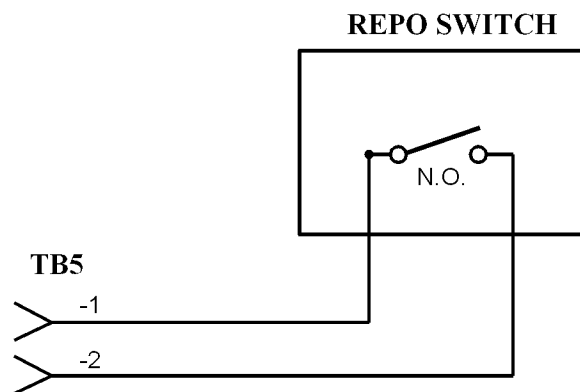


ILLUSTRATION 4-2: REPO WIRING

4.2 OPTIONAL THERMAL REMOTE EMERGENCY POWER OFF STATION– P/N 9100-

The Thermal REPO is a wall-mounted unit that functions as a dual temperature warning and shutdown monitor. The first and second stage over temperature settings are field selectable. The Thermal REPO provides a contact closure for the first stage alarm, and a contact closure for the second stage over-temperature response. In addition, the Thermal REPO displays the ambient temperature on a 3-digit display.

The Thermal REPO station is designed to be vertically mounted at eye level or slightly lower. It can be located anywhere an emergency shut-off is required. The Thermal REPO is provided with a 50-foot three-conductor cable. Longer cables are available in five-foot increments.

Online Power

4.2.1 Installation

The Thermal REPO cable is 50 to 100 feet long depending on the length ordered. The cable is supplied with a three-pin connector on one end and bare wires on the other end. The three-pin connector plugs into jack J8 in the main wiring harness of the PDU. The bare ends connect to the terminals inside the Thermal REPO enclosure.

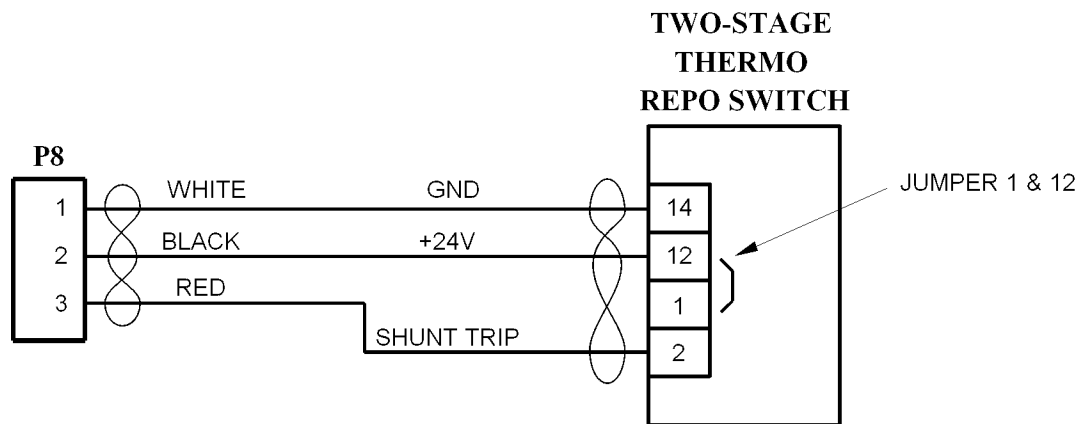


ILLUSTRATION 4-3: THERMAL REPO WIRING

Note: The Thermal REPO is shipped with separate operating instructions.

1. Select the location for the Thermal REPO box.
2. Remove the Thermal REPO box cover.
3. Mount Thermal REPO box on wall or other structure using mounting holes located in the back of the Thermal REPO enclosure. Use fasteners that are appropriate for the surface on which the Thermal REPO box is to be mounted.
4. Connect the three wires from the Thermal REPO cable to terminals on Thermal REPO terminal block as shown in Illustration 4-3.
5. Open front door of PDU.
6. Set IMCB to OFF.
7. Turn OFF facility branch circuit breaker, lock and tagout in accordance with OSHA requirements.
8. Route Thermal REPO cable from Thermal REPO box to PDU. Remove floor tiles as required.
9. Remove left side panel of Power Pal.
10. Route Thermal REPO cable up through cable access opening and into cable landing bracket.
11. Locate J8 in the main wiring harness of the PDU.
12. Connect the three-pin Thermal REPO connector to J8.
13. Replace floor tiles as required.
14. Replace front panel of Power Pal.
15. Turn ON main facility circuit breaker.
16. Set IMCB to ON.

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17. Close front door of PDU.

4.3 OPTIONAL ENVIRONMENTAL SECURITY INTERFACE (ESI) – P/N 9100-755-XX

The Environmental Security Interface (ESI) provides normally open contacts to connect the eight external alarm positions on the Output Status Panel to external controls such as environmental sensors and building safety systems. Each alarm is activated by a closed set of dry contacts. See Illustration 4-4 for wiring.

The ESI is available in a four port version, which contains four interface channels and the appropriate terminal blocks for external connection, and an eight port version, which contains eight interface channels and connection points.

The ESI enclosure is a junction box with mounting flanges which allows the ESI box to be surface mounted to a floor, wall or other structure.

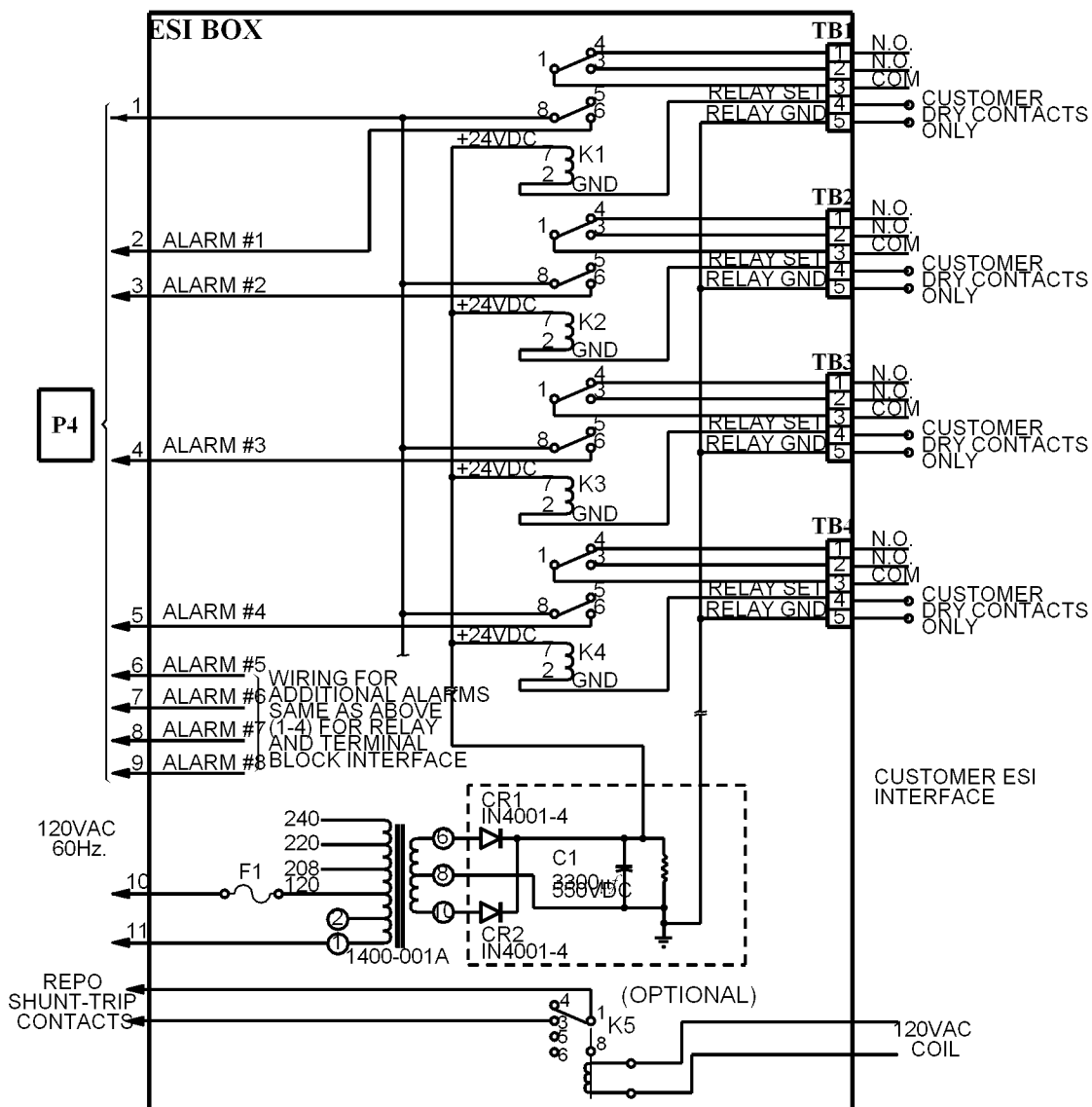


ILLUSTRATION 4-4: ESI WIRING

Online Power

4.3.1 Installation

The ESI box is furnished with a 15 foot (38.1 cm) cable terminated with a plug (or plugs) that connect to jacks in the main harness of the PDU. Wiring from the ESI box to the environmental sensors is furnished by the customer.

1. Punch or drill holes in the box as required to accommodate the fittings for the sensor wires.
2. Select a location within 6 feet of the PDU to install the ESI box.
3. Install the ESI box using fasteners suitable for the surface on which the ESI box is to be mounted.
4. Wire the customer sensors to the ESI terminal blocks inside the ESI box while noting the relay number and function of each sensor alarm. See Illustration 4-4.



CAUTION! Do not apply any voltage across customer ESI terminal block pins 4 and 5. These pins are for dry contact application only. Damage to the ESI circuitry could result.

5. Label the ESI indicator alarms at the Output Only Monitoring Panel as required. A white sheet pulls out from the top of the overlay so the eight alarms can be identified on the front panel.
6. Open front door of PDU.
7. Set IMCB to OFF.
8. Turn OFF facility branch circuit breaker, lock and tagout in accordance with OSHA requirements.
9. Remove floor tiles as required to route ESI cable from ESI box to PDU.
10. Remove front panel and left side panel of Power Pal.
11. Route ESI cable up through cable access opening and into cable landing bracket.
12. Locate J4 in the main wiring harness of the PDU.
13. Connect the ESI connector to J4.
14. Replace floor tiles as required.
15. Replace front panel and side panel of or Power Pal.
16. Turn ON facility branch circuit breaker.
17. Set IMCB to ON.
18. Close front door of PDU.

4.3.2 Setting ESI Shunt-Trip Alarm Characteristics

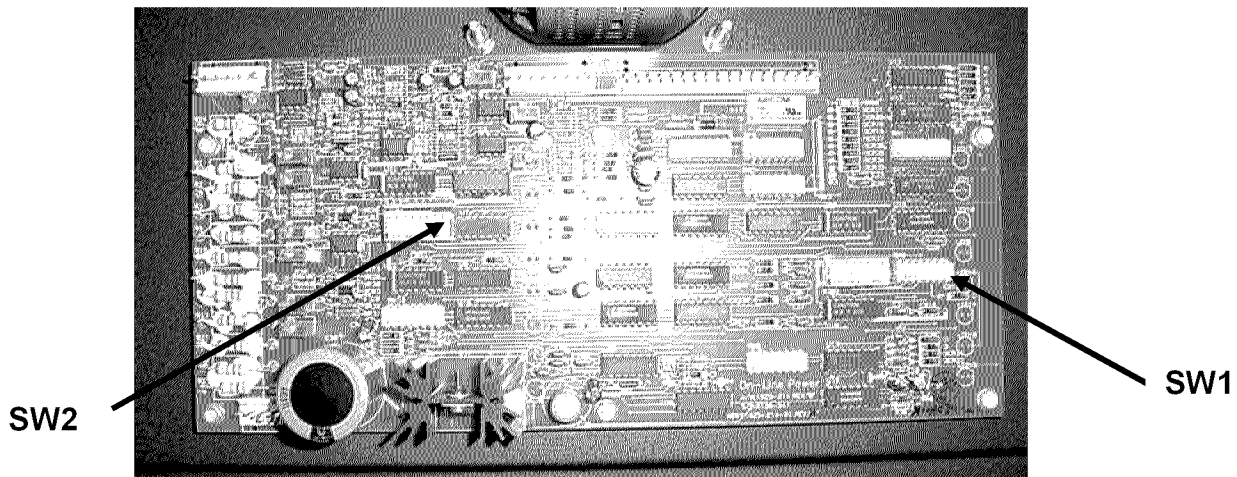
The ESI relays interface to the eight ESI indicator alarms on the Output Only Monitoring Panel. These alarms can be set for alarm only or alarm and automatic shut down.

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When set up for alarm only, an alarm will sound and the corresponding ESI indicator lamp on the Output Only Status Panel will illuminate, indicating a system malfunction. No shunt trip will occur.

When set up for alarm and automatic shut down, an alarm will sound and the corresponding ESI indicator lamp on the Output Only Status Panel will illuminate, indicating a system malfunction. At the same time, the IMCB will shunt trip.

Selecting the alarm only or alarm and automatic shut down condition is easily accomplished by setting dip switch SW2 located on the Output Only Monitoring Panel PCB. See Illustration 4-5. The factory setting is alarm only with all switches set to OFF.



DIP SWITCHES LOCATED ON THE PCB D BEHIND THE MONTORING PANEL

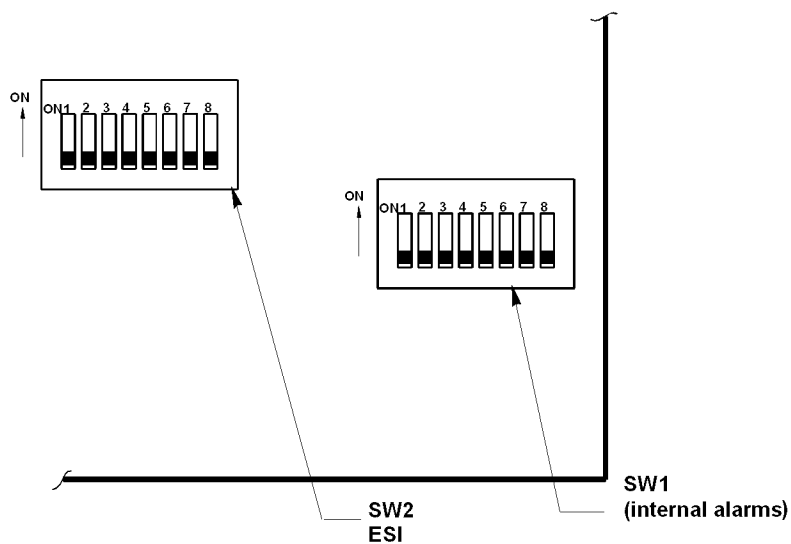


ILLUSTRATION 4-5: DIP SWITCHES

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4.3.3 Setting ESI Alarm Characteristics

For automatic shut down with ESI alarm condition, set selected SW2 switches to ON according to the following procedure:

1. Open front door of PDU.
2. Set OMCBs to OFF.
3. Set IMCB to OFF.
4. Slide latch at top of Output Monitoring Panel to the right. Gently pull panel out and down until it rests in the fully open position.
5. Locate the switch in SW2 that controls the ESI LED to be set. See Illustration 4-5 and Table 4-9.
6. Slide the switch to the ON position.
7. Close the Output Monitoring Panel and slide latch to the left until it engages.
8. Set IMCB to ON.
9. Set OMCBs to ON.
10. Press and release ALARM SILENCE switch.
11. Press and release RESET switch.
12. Set panelboard circuit breakers to ON (as required).
13. Close front door.

SW2 Dip Switch Settings

SW2	
LED	SWITCH
1	7
2	5
3	6
4	8
5	4
6	1
7	3
8	2

4.4 OPTIONAL AIR CONDITIONING SHUTDOWN RELAY – P/N 9100-

The Air Conditioning (A/C) Shutdown Relay is provided to interface with the air conditioning system in the event of an emergency power-off condition which requires that the air in the computer room stop circulating. It is usually used in conjunction with Halon warning or dump conditions.

The A/C Shutdown Relay is available in momentary or latching configuration as described below:

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4.4.1 A/C Shutdown Relay – Momentary

When activated, the momentary A/C Shutdown Relay shunt trips the IMCB. Shut down capability is not maintained. See Illustration 4-6.

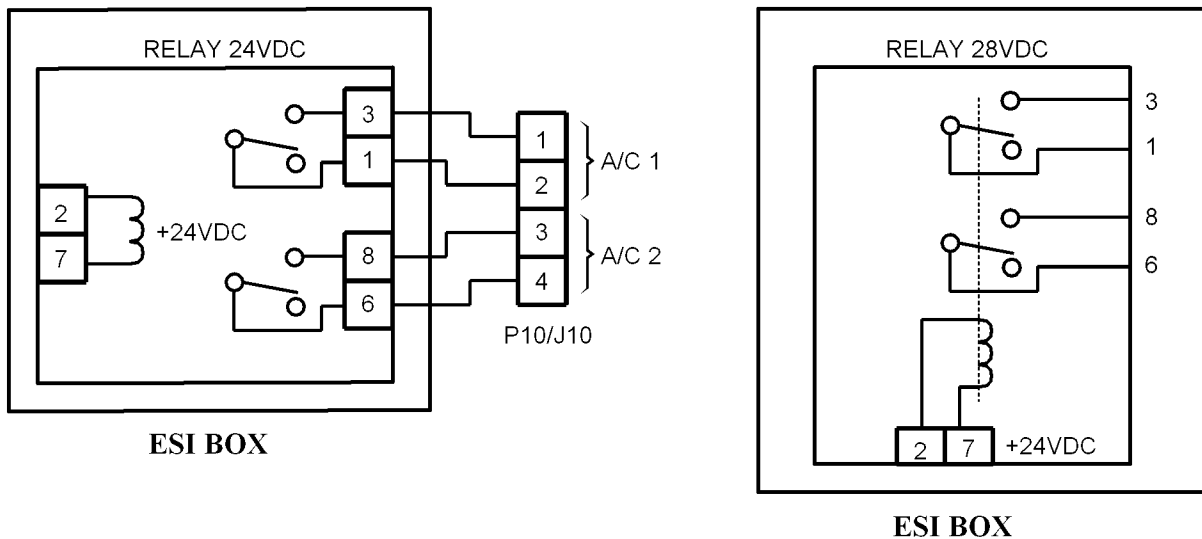


ILLUSTRATION 4-6: A/C SHUTDOWN RELAY - MOMENTARY

4.4.2 A/C Shutdown Relay - Latching

The Latching Relay provides shutdown capability which is maintained in a latched position until a reset push button is pressed. The latching feature is available for devices which require that the shut down circuit be maintained to prevent the re-start of the PDU when the A/C is down. See Illustration 4-7.

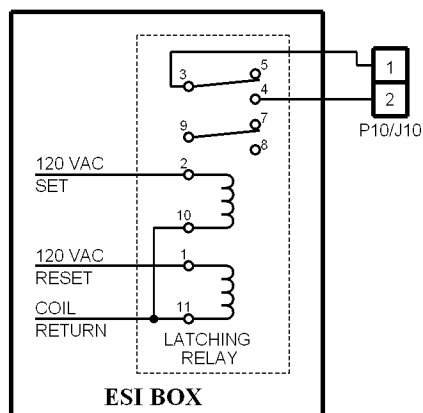


ILLUSTRATION 4-7: A/C SHUTDOWN RELAY – LATCHING

Online Power

4.5 OPTIONAL SECONDARY SURGE SUPPRESSION – P/N 9100-783-XX

The Secondary Surge Suppression circuit consists of a special output filter comprising fuse-protected metal oxide varistors and indicator lights. This option is designed to reduce the affect of load induced electrical noise on other electronics such as connected loads. In addition, the secondary surge suppression circuit prevents electronic and electromechanical devices from interfering with each other.

The characteristics of the filter assembly are as follows:

- Parallel (shunt) operation
- Response time of less than five nanoseconds
- Repetitive transients to 5,000 volts per second
- Clamping voltage (208Y/120): Ratio 1.75 (210 Vac line to neutral, 364 Vac line to line)
- Peak pulse power rating:
 - 27 kW line to neutral
 - 13.4 kW line to line
- Fused for circuit protection with visual blown fuse indicators (one per phase)

The secondary surge suppression circuit is factory installed at the time of production. No assembly or adjustments are required.

4.6 OPTIONAL INPUT/OUTPUT FILTERING – P/N 9100-784-XX

The Input/Output filter consist of an input filter installed on the primary and an output filter installed on the secondary. The input filter includes a resistor/capacitor network, which acts as a large snubber circuit to eliminate high frequency impulses from entering the power system. The output filter consists of a capacitor network which, when coupled with the primary filter, virtually eliminates most electronic noise from reaching the applied load or being fed back to the unit from noise generating loads. See Illustrations 4-8 and 4-9.

This option is factory installed at the time of production. No assembly or adjustment is required.

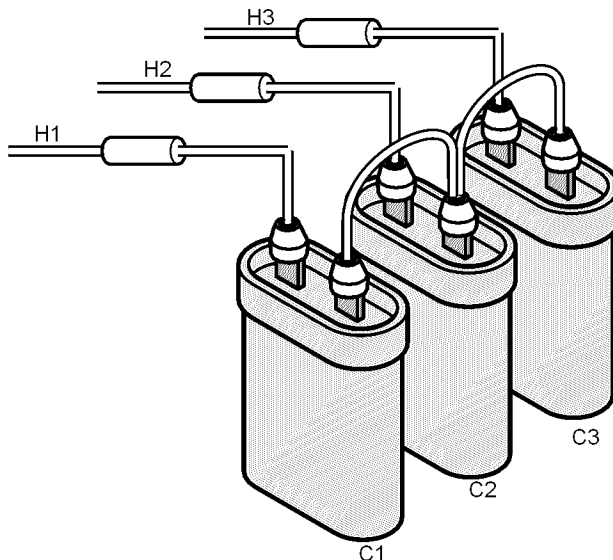


ILLUSTRATION 4-8: INPUT FILTER WIRING

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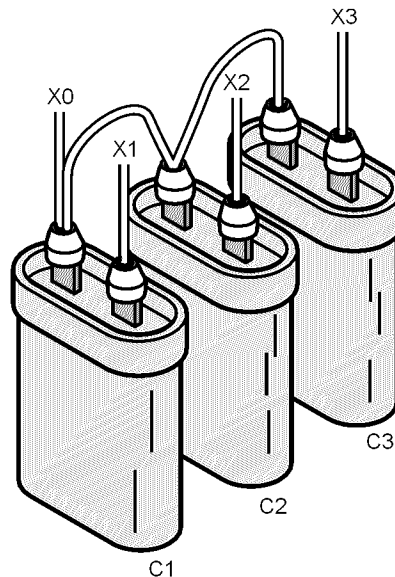


ILLUSTRATION 4-9: OUTPUT FILTER WIRING

4.7 OPTIONAL GROUND INTEGRITY MONITOR – P/N 9100-1279-01

The Ground Integrity Monitor is used to determine the impedance of the ground connection at the service entrance or any code approved equipment grounding point and the single point reference grid in the unit. This option requires the addition of a separate insulated reference wire between the equipment ground and the unit. Therefore, this option must be planned into the installation of the branch circuit or the cost of installation of the sense wire becomes prohibitive.

This option is factory installed at the time of production. No assembly or adjustments are required.

4.8 OPTIONAL FIELD WIRE JUNCTION BOX – P/N 9100-744-XX

The Field Wired Junction Box option is a drip-proof, heavy-gauge, sheet metal junction box. Internal to the junction box is a four-position terminal block (three phases and ground) which provides properly sized termination to bring building power to the input power cable of the PDU. The Field Wired Junction Box is UL Listed as an accessory to the PDU. Refer to Table 4-13 for junction box dimensions.

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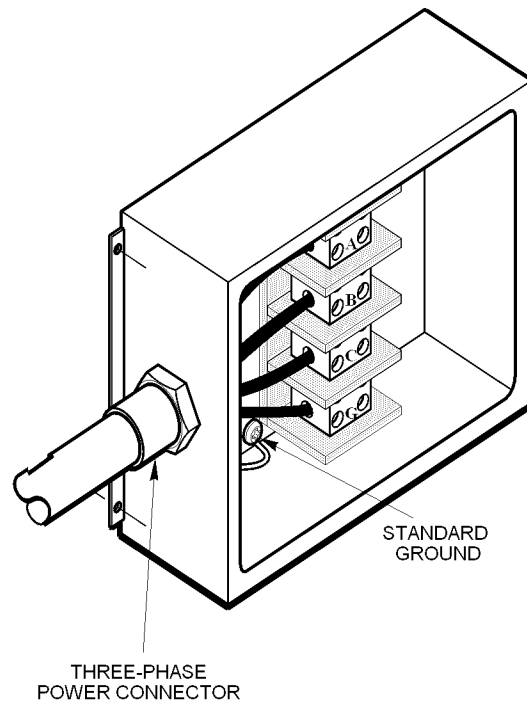


ILLUSTRATION 4-10: FIELD WIRED JUNCTION BOX

UNIT SIZE (KVA)	INPUT VOLTAGE (VAC)	CURRENT (AMP)	BOX SIZE
15	208	43	16 X14X6
	480	19	
30	208	87	16 X14X6
	480	38	
50	208	145	16 X14X6
	480	63	
75	208	271	16 X14X6
	480	94	
100	208	289	16 X14X6
	480	125	
125	208	361	20X16X6
	480	157	
150	208	434	20X16X6
	480	188	
200	208	578	20X20X7
	480	251	20X16X6
225	208	651	20X20X7
	480	282	20X16X6
250	208	723	20X20X7
	480	313	20X16X6
300	208	867	20X20X7
	480	376	20X16X6

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4.9 OPTIONAL TRANSIENT SUPPRESSION PLATE – P/N 9100-783-XX

The Transient Suppression Plate (TSP) acts as one half of a de-coupling capacitor, the other half consists of the re-enforcing bars embedded in the concrete floor of the facility. The nature of RF energy is to travel along the outer surfaces of cables and conduit. This is known as the skin effect. The TSP shunts the RF energy away from the computer system and into the building steel.

The TSP is designed to be used in areas of high RF concentration, such as near search radars or radio and television transmission towers which are in close proximity to the computer facility.

The TSP is a 38 inch by 38 inch, zinc-plated, 16 gauge sheet metal plate.

4.9.1 Installation

Note: The TSP will not perform satisfactorily when mounted on a wall, wooden floor or any other surface which does not contain metal.

- Locate on floor below or adjacent to PDU
- Fasten the TSP to the floor using fasteners suitable for the composition of floor. The TSP may be glued to the floor.

4.10 OPTIONAL NON-STANDARD POWER OUTPUT CONFIGURATIONS – P/N 9100-1265-XX

Panelboards other than Square-D Snap-On are offered in order to provide compatibility with an existing system or to meet other customer requirements.

The following panelboard is offered without secondary overcurrent protection breakers:

GE Bolt-on, 42-pole

The following panelboard is offered with a 225-amp secondary overcurrent protection breaker:

GE Bolt-on, 42-pole

4.11 OPTIONAL SECONDARY MAIN OUTPUT CIRCUIT BREAKER – P/N 2025-XX

The Secondary Main Output Circuit Breaker is used in place of a panelboard. This makes it possible to have a unit with one panelboard and one Secondary Main Output Circuit Breaker or a unit with no panelboards and two Secondary Main Output Circuit Breakers. The maximum rating is 225 Amps for a three-phase breaker.

The Secondary Main Output Circuit Breakers are located in the dead front panel behind the front door. They are labeled OUTPUT BREAKER.

Secondary Main Output Circuit Breaker is factory installed at the time of production.

4.12 OPTIONAL RAISED FLOOR / SEISMIC STAND – P/N 9100-1282-XX

The raised floor stand is adjustable to 12, 16 and 18 inch height.

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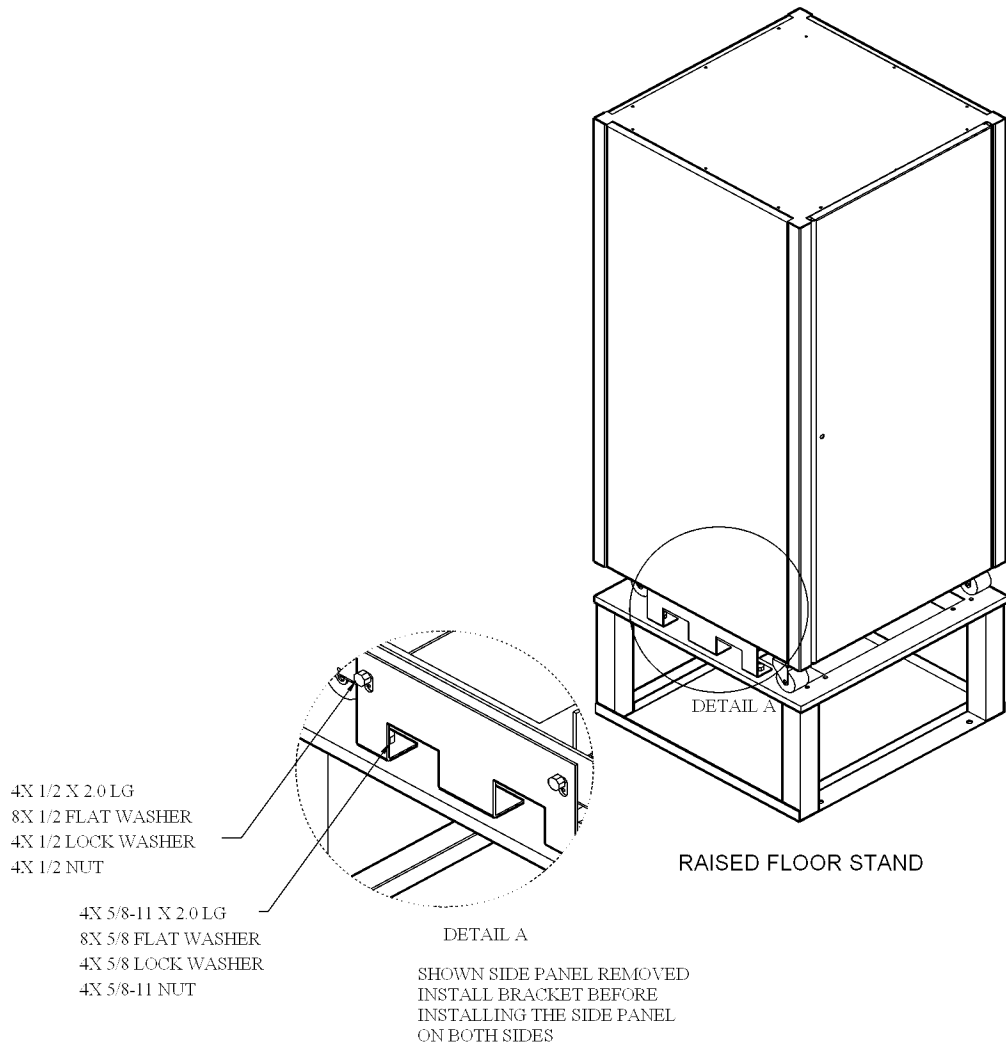


ILLUSTRATION 4-11: RAISED FLOOR STAND

4.13 OPTIONAL ADDITIONAL DISTRIBUTION (SIDE CAR / POWER ISLAND) – P/N 9100-1265-XX

The side car is a distribution center which can be added to the Power Pal for the purpose of extending the distribution capability of the PDU by up to 84 pole positions in each side car, up to 2 side cars can be added to each side of the PDU increasing the distribution capability to 6 (42 pole panelboard). For additional distribution options consult the factory.

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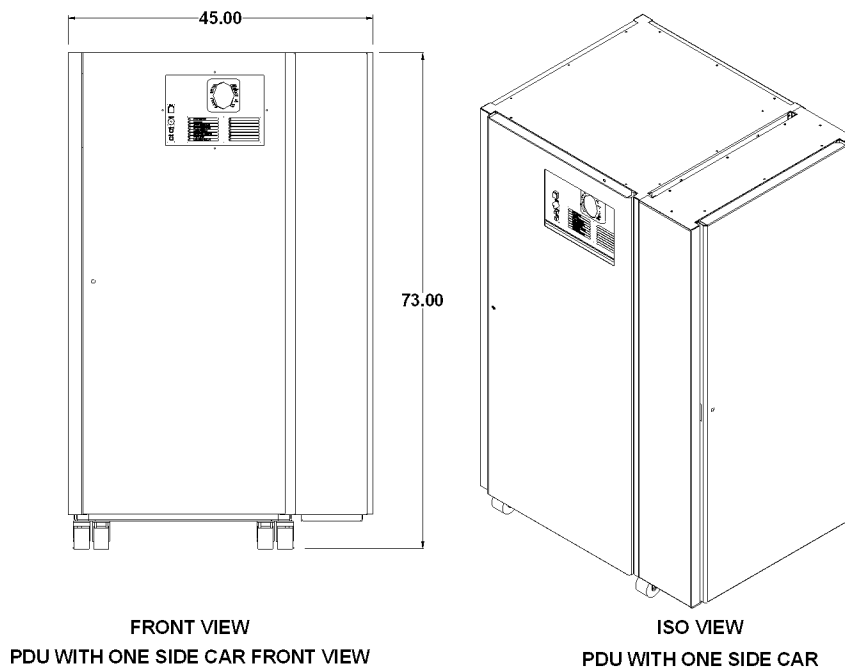
4.13.1 Sidecar Pre-installation

Cable access to the Sidecar is through an opening in the bottom front edge of the unit. If the PDU and Sidecar are located in a room with a raised floor, access the underside of the unit by cutting a hole in the floor tile. When locating the PDU and Sidecar, provide adequate room for accessing the sides and rear of the units and for opening the doors.

4.13.2 Sidecar Installation

The Sidecar can be mounted onto either the right or left side or both sides of the PDU. If the sidecars are not factory assembled, refer to following for Installation:

1. Power down the PDU and turn OFF facility power.
2. Follow Lock-out / Tag out procedures.
3. Select location of PDU and move it into place. Refer to Section 6.1.
4. Open front door of PDU.
5. Remove dead front panel.
6. Remove rear panel of PDU.
7. Open doors of Sidecar.
8. Remove dead front panel.
9. Remove left and right side panels.
10. Move Sidecar into position against left or right side of PDU.
11. Align six bolt holes behind Sidecar with six bolt holes in side of PDU.
12. Bolt Sidecar to PDU.
13. Connect wiring per provided drawing and labeling.
14. Perform start up procedure per instruction on section 3.1 of this manual.



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ILLUSTRATION 4-12: PDU WITH ONE DISTRIBUTION SIDECAR

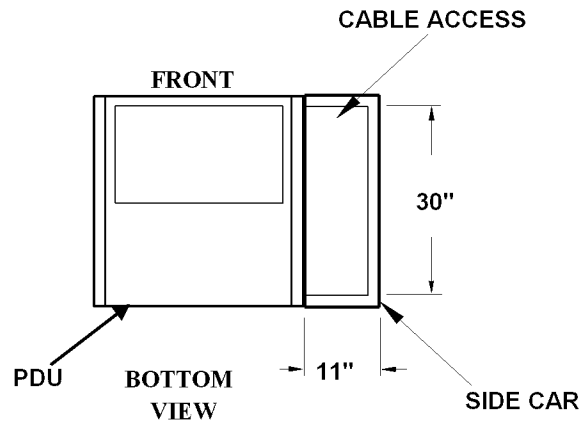


ILLUSTRATION 4-13: CABLE ACCESS – SIDE CAR

If the PDU and the Side Car are located in a room with raised floor, access the underside of the unit by cutting a hole in the floor tile.

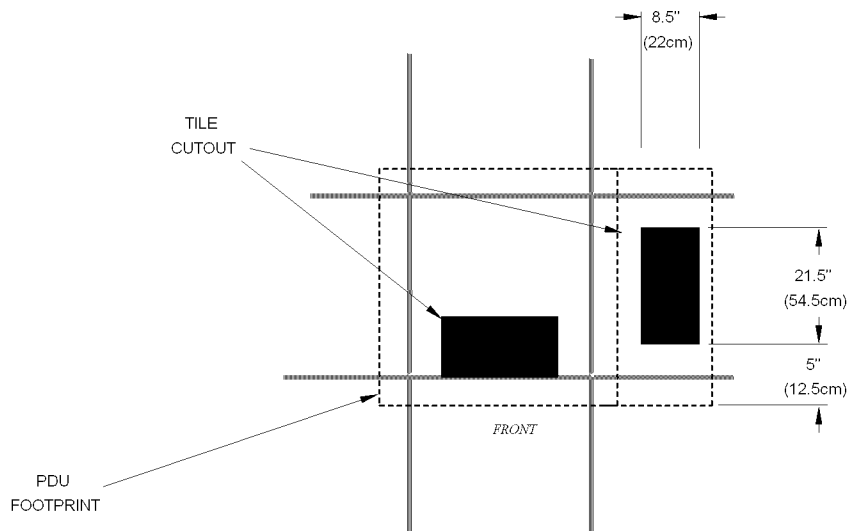


ILLUSTRATION 4-14: TILE CUTOUT – SIDE CAR

Online Power

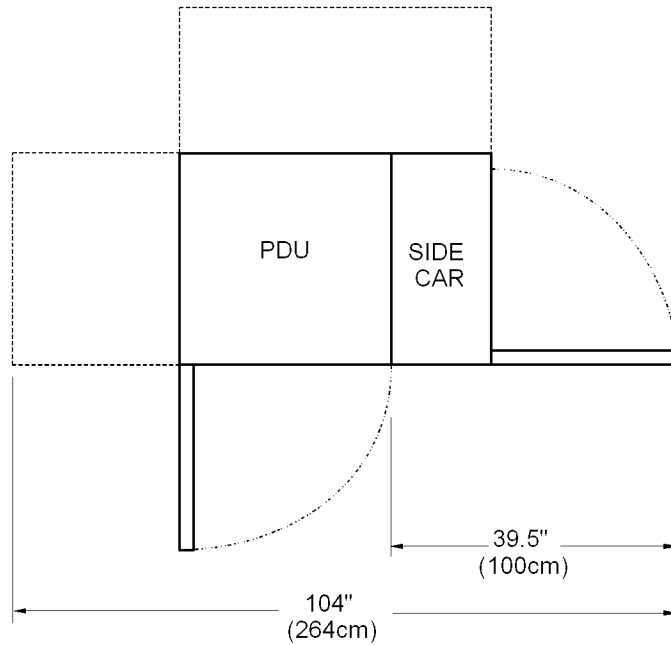


ILLUSTRATION 4-15: SERVICE CLEARANCES – SIDECAR

4.14 OPTIONAL INPUT POWER MONITOR – P/N 9100-1262-XX

Input power monitor is available in V1 switch for monitoring the input voltage and current. See Table 2-6 for meter options.

4.15 OPTIONAL ADVANCE OUTPUT POWER – P/N 9100-1262-XX

Refer to Table 4-21 for list of options.

System Monitoring Meter

APPLICATIONS
 Utility Energy Billing
 Substations Panels, Power Generation
 Sub-Metering, Commercial Metering
 Industrial Metering Campus Metering
 Analog Meter Replacement
 Original Equipment Power Metering



ILLUSTRATION 4-16: SYSTEM MONITORING METER

60 Hz Unit

OLP Part #	Description
1550-074-01	SHARK 200-60-10-V1-D-X-X
1550-074-02	SHARK 200-60-10-V2-D-X-X
1550-074-03	SHARK 200-60-10-V3-D-X-X
1550-074-04	SHARK 200-60-10-V4-D-X-X
1550-074-05	SHARK 200-60-10-V5-D-X-X
1550-074-06	SHARK 200-60-10-V6-D-X-X

50 Hz Unit

OLP Part #	Description
1550-074-11	SHARK 200-50-10-V1-D-X-X
1550-074-12	SHARK 200-50-10-V2-D-X-X
1550-074-13	SHARK 200-50-10-V3-D-X-X
1550-074-14	SHARK 200-50-10-V4-D-X-X
1550-074-15	SHARK 200-50-10-V5-D-X-X
1550-074-16	SHARK 200-50-10-V6-D-X-X

Options

OLP Part #	Description
1550-074-17	INP 100S, 10/100 Base T Ethernet
1550-074-18	ROLS, 2 Relay / 2 Status
1550-074-19	POLS, 4 Pulse / 4 Status
1550-074-20	/MaAOS, 4 Ch, +/- 1MA Output
1550-074-21	2oma A0s, 4 Ch, 4-20 ma Output
1550-074-22	FOS TS, Fiber Optic Serial Port -STTD
1550-074-23	FOVPS, Fiber Optic Serial Port-Versalink

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Voltage Inputs

- 20-256 Volts Line To Neutral, 0-721 Volts Line to Line
- Supports: 3 Element WYE, 2.5 Element WYE, 2 Element Delta, 4 Wire Delta Systems
- Input Withstand Capability – Meets IEEE C37.90.1 (Surge Withstand Capability)
- Universal Voltage Input
- Programmable Voltage Range to Any PT ratio
- Programmable Current to Any CT Ratio
- Burden 0.005VA per phase Max at 11Amps
- 5mA Pickup Current
- Pass through wire gauge dimension: 0.177" / 4.5mm

Isolation

All Inputs and Outputs are galvanically isolated to 2500 VAC.

Environmental Rating

- Storage: (-40 to +85)° C
- Operating: (-30 to +70)° C
- Humidity: to 95% RH Non-Condensing
- Faceplate Rating: NEMA12 (Water Resistant) Mounting Gasket Included

Sensing Method

- True RMS
- Sampling at 400+ Samples per Cycle on all channels measured readings simultaneously
- Harmonic %THD (% of Total Harmonic Distortion)

Update Rate

- Watts, VAR and VA-100msec
- All other parameters-1second

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METER OPTIONS

Measured Value	V1	V2	V3	V4	V5	V6
Voltage L-N	✓	✓	✓	✓	✓	✓
Voltage L-N	✓	✓	✓	✓	✓	✓
Current Each Phase	✓	✓	✓	✓	✓	✓
Watts	✓	✓	✓	✓	✓	✓
VAR	✓	✓	✓	✓	✓	✓
VA	✓	✓	✓	✓	✓	✓
Power Factor P.F.	✓	✓	✓	✓	✓	✓
(+ Watt - HR)	✓	✓	✓	✓	✓	✓
(- Watt - HR)	✓	✓	✓	✓	✓	✓
Watt - HR Net						
(+ VAR - HR)						
(- VAE - HR)						
VAR - HR - NET						
VAR - HR	✓	✓	✓	✓	✓	✓
Frequency Hz	✓	✓	✓	✓	✓	✓
Harmonics THD (0/0)	✓	✓	✓	✓	✓	✓
Voltage Angles						
Current Angles						
% Load Bar	✓	✓	✓	✓	✓	✓
Communications DNP3.0						
Limit Exceeding Alarms	✓	✓	✓	✓	✓	✓
RS 485	✓	✓	✓	✓	✓	✓
MODBUS & DNP 3.0	✓	✓	✓	✓	✓	✓
IRDA Port	✓	✓	✓	✓	✓	✓
2 Megabytes Data Log		✓	✓	✓		
3 Megabytes Data Log					✓	
4 Megabytes Data Log						✓
Harmonics Analysis			✓	✓	✓	✓
Limit & Control Functions				✓	✓	✓
64 Samples/Cycle Waveform Recorder					✓	
51 Samples/Cycle Waveform Recorder						✓

4.16 OPTIONAL TRANSIENT VOLTAGE SURGE SUPPRESSION – P/N 9100-1440-XX

The Din rail TVSS is located behind the dead front. The TVSS is a protective device with a modular thermally protected transient voltage surge suppressor.

In case of a power failure the TVSS should be checked after the power is restored to ensure the TVSS has not been activated, if the visual tabs have been engaged contact, Online Power for a replacement part.

As part of the annual preventive maintenance, the TVSS needs to be inspected to ensure protection of the electronic circuitry.

5.0 MAINTENANCE

5.1 SAFETY PRECAUTIONS



DANGER!

READ AND UNDERSTAND THIS SECTION THOROUGHLY BEFORE PERFORMING ANY MAINTENANCE WORK ON OR AROUND THE UNIT.

ONLY NORMAL SAFETY PRECAUTIONS ARE REQUIRED WHEN THE UNIT IS OPERATING WITH ALL CABINET DOORS CLOSED. HOWEVER, THE UNIT MUST BE KEPT FREE OF STANDING PUDDLES OF WATER, EXCESS MOISTURE, OR DEBRIS. DEBRIS CAN CONSIST OF EXCESSIVE DUST IN AND AROUND THE UNIT, AS THE COOLING FANS IN THE UNIT WILL PULL THIS DUST INTO THE UNIT.



DANGER!

ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UNIT. IMPROPER INSTALLATION HAS PROVEN TO BE THE SINGLE MOST SIGNIFICANT CAUSE OF START-UP PROBLEMS. SERVICE PERSONNEL SHOULD WEAR INSULATING SHOES FOR ISOLATION FROM DIRECT CONTACT WITH THE FLOOR (EARTH GROUND), AND SHOULD MAKE USE OF RUBBER MATS WHEN PERFORMING MAINTENANCE ON ANY PORTION OF THE UNIT WHILE IT IS UNDER POWER. HIGH AC AND DC ELECTRICAL VOLTAGES ARE PRESENT THROUGHOUT THE UNIT(S) AND INCORRECT INSTALLATION OR SERVICING COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT FAILURE.



DANGER!

SPECIAL SAFETY PRECAUTIONS AND LOCKOUT TAGOUT PROCEDURES ARE REQUIRED FOR ALL OPERATIONS INVOLVING THE HANDLING, INSTALLATION, OR MAINTENANCE OF THE UNIT SYSTEM. FAILURE TO FOLLOW SAFETY PROCEDURES COULD RESULT IN DEATH, INJURY OR DAMAGE TO EQUIPMENT.

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DANGER!

THIS EQUIPMENT CONTAINS CIRCUITS THAT ARE ENERGIZED WITH HIGH VOLTAGES. ONLY TEST EQUIPMENT DESIGNED FOR TROUBLESHOOTING HIGH VOLTAGES SHOULD BE USED, PARTICULARLY FOR OSCILLOSCOPES AND PROBES.

ALWAYS CHECK WITH AN AC AND DC VOLTMETER TO ENSURE SAFETY BEFORE INITIATING CONTACT OR USING TOOLS. EVEN WHEN THE POWER IS OFF, DANGEROUSLY HIGH POTENTIAL VOLTAGES MAY EXIST AT CAPACITOR BANKS.

FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DEATH, INJURY OR DAMAGE TO EQUIPMENT.



DANGER!

BE CONSTANTLY AWARE THAT THE UNIT SYSTEM CONTAINS HIGH AC VOLTAGES. WITH INPUT POWER OFF, HIGH VOLTAGE AT THE FILTER CAPACITORS AND POWER CIRCUITS SHOULD DISCHARGE WITHIN 30 SECONDS. HOWEVER, POWER CIRCUIT FAILURES CAN OCCUR, SO YOU SHOULD ALWAYS ASSUME THAT HIGH VOLTAGE MIGHT STILL EXIST AFTER SHUTDOWN. VERIFY THAT POWER IS OFF USING AC AND DC VOLTMETERS BEFORE MAKING CONTACT.

5.2 WHEN TO CALL (1-800-PWR-SRVC / 1-800-797-7782)

Call for service if you encounter any of the following conditions:

1. Repeated start-up attempts are unsuccessful.
2. A PDU alarm occurs which cannot be cleared.
3. Normal operation of the critical load repeatedly causes an overload condition. This is not a unit fault but a qualified person must analyze the total load connected to the unit to prevent unit failure. Momentary overload conditions will be handled within the parameters of the Unit but sustained overloads will cause the Unit to fail.
4. Any indicators or alarms operate abnormally or continuously.
5. Any other abnormal function of the system occurs.
6. When you are unsure of what action to take.

Online Power

5.3 -----

5.4 PREVENTATIVE MAINTENANCE

Unit Operator Maintenance consists of the basic tasks listed in this section. Other maintenance functions require Online Power Service personnel.

5.4.1 Maintenance Log; (Document no. 6005-274)

Careful record keeping will ensure proper maintenance of the Unit, and assist in the correction of any abnormal conditions.

At a minimum, the operator's log should contain the following information:

- Date of system start-up.
- Dates that input and output status readings were checked and the values displayed for these readings.
- Dates and summaries of all communications with Online Power Service Personnel.

Refer to START UP / SERVICE LOG SHEET at the end of this manual

5.4.2 Periodic Testing of Unit

The Unit should be manually exercised on a periodic basis (once every three months, for example). This process activates self-diagnostic testing, which may reveal conditions that require attention.

5.4.5 Power Connections

Check for corrosion and connection integrity. Visually inspect wiring for discolored or cracked insulation. Clean and / or re-torque as required.

Use the correct torque tool to tighten the terminal bolts as indicated in table below and use all hardware's provided with batteries.

5.5 ONLINE POWER CUSTOMER SERVICE AND SUPPORT

Start-up, unit maintenance, and preventative maintenance programs are available through your OnLine Power sales representative or through OnLine Power Customer Service and Support. A program of periodic maintenance is recommended once every six months, but is mandatory once every twelve months since heat and cold will effect the compression of the electrical connections and lack of maintenance will shorten the product's life expectancy possibly causing unsafe operating condition.

5.5.1 Start-Up Services

Various start-up services are available. See your sales representative or telephone OnLine Power Customer Service at 1-800-PWR-SRVC (800-797-7782).

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5.5.2 Maintenance Agreements

Standard Full Service, 24/7 Full Service, and Extended On or OFF Site Maintenance agreements are available. See your sales representative or telephone OnLine Power Customer Service at 1-800-PWR-SRVC (800-797-7782).

5.5.3 Warranties

Contact OnLine Power Customer Service and Support at 1-800-PWR-SRVC (800-797-7782) if you have any questions regarding the warranty on your unit, system or batteries.

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APPENDIX A – SPECIFICATIONS AND REPLACEABLE PARTS

POWER PAL	INPUT VOLTAGE	SIZE (kVA)										
		15	30	50	75	100	125	150	200	225	250	300
NOMINAL	208 or 480											
INPUT VOLTAGE RANGE	208 V	187-218 Manual Taps										
	480 V	432-504 Manual Taps										
MAXIMUM INPUT VOLTAGE	208 V	218										
	480 V	504										
NOMINAL RATED CURRENT	208 V	41.6	83.3	138.8	208	277.6	347	416.3	555.2	624.6	694.0	832.7
	480 V	18	36	60	90.2	120.3	150.4	180.4	240.6	270.6	300.7	360.8
POWER FACTOR		>96%										
FREQUENCY (Hz)		60										
LINE-TO-LINE VARIATION		<2%										
FILTERS: INPUT OUTPUT		Optional NO										
HEAT DISSIPATION (BTU/HR)		1,535	3,017	5,120	7,679	10,239	12,799	15,359	20,478	23,038	25,598	30,717
AMBIENT TEMPERATURE °F (°C)		32° TO 104°F (0° TO 40°C)										
OUTPUT VOLTAGE		208Y120 VAC										
CAPACITY		15, 30, 50, 75, 100, 125, 150, 200, 225, 250, 300 kVA										
NUMBER OF PHASES		3										
HARMONICS ADDED		1% Maximum										
THE FOLLOWING ARE WITHOUT PACKAGING:												
SIZE H X W X D		72 X 34 X 34 (183 cm X 86.5 cm X 86.5 cm)										
WEIGHT lbs (kg)	208 V	500 (227)	650 (295)	910 (231)	1,030 (467)	1,350 (612)	1,600 (726)	2,075 (941)	2,300 (1,043)	2,600 (1,179)	2,900 (1,315)	3,500 (1,588)
	480 V					1,150 (522)	1,245 (565)	1,675 (760)	1,820 (826)	2,180 (989)	2,400 (1,089)	2,900 (1,315)

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POWER PAL TRANSFORMER AND MODEL CONFIGURATIONS

UNIT SIZE (KVA)	INPUT VOLTAGE (VAC)	OUTPUT VOLTAGE (VAC)	MODEL NUMBER
15	208	208Y/120	*NP015B0500I3-K1
	480		*NP015H0500I3-K1
30	208		*NP030B0500I3-K1
	480		*NP030H0500I3-K1
50	208		*NP050B0500I3-K1
	480		*NP050H0500I3-K1
75	208		*NP075B0500I3-K1
	480		*NP075H0500I3-K1
100	208		*NP100B0500I3-K1
	480		*NP100H0500I3-K1
125	208		*NP125B0500I3-K1
	480		*NP125H0500I3-K1
150	208		*NP150B0500I3-K1
	480		*NP150H0500I3-K1
200	208		*NP200B0500I3-K1
	480		*NP200H0500I3-K1
225	208		*NP225B0500I3-K1
	480		*NP225H0500I3-K1
250	208		*NP250B0500I3-K1
	480		*NP250H0500I3-K1
300	208		*NP300B0500I3-K1
	480		*NP300H0500I3-K1

*For PC models replace NP with PC

K FACTOR RATING: K1 AS STANDARD

(FOR NON-STANDARD VOLTAGES, HARMONICS CANCELLATION, AND K FACTOR, CONSULT ONLINE POWER FACTORY)

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SERVICE AND RENEWABLE PARTS

<u>Vendor No.</u>	<u>Vendor</u>	<u>Qty</u>	<u>Description</u>
2075-002	OnLine Power	6	FUSE, 1A, 6 USED
2075-024	OnLine Power	3	FUSE, 1A, 3 USED
1625-214-01	OnLine Power	1	PCB ALARM, Output only, 1 used (not shown)
1680-009	OnLine Power	1	SWITCH, LAMP, EPO, 24VDC
1680-006	OnLine Power	1	SWITCH, LENSE, EPO, RED
1680-005	OnLine Power	1	SWITCH, COVER, EPO,
1680-008	OnLine Power	1	SWITCH, EPO
1690-008	OnLine Power	1	SONAR ALERT, ALL MODELS,
1625-218-01	OnLine Power	1	PCB, SWITCH
1625-213-01	OnLine Power	1	PCB, POWER SUPPLY

6.0 INSTALLATION

6.1 SITE PLANNING AND PREPARATION

Position the unit so that the regulating electronics are not obstructed by the objects that could make servicing the unit difficult. Allow a minimum access of 24" to the rear of the unit and a minimum access of 36" to the front.



CAUTION! The PDU is air cooled by convection. Do not block air flow from the front, rear, bottoms or top of the unit.

6.1.1 Operating Environment

- AMBIENT TEMPERATURE: 0° to 40°C (32 to 104°F)
- OPERATING ALTITUDE: 1,829 M (6,000 FT) DERATE 10% FOR EACH ADDITIONAL 305 M (1,000 FT) UP TO 2,744 m (9,000 FT)
- RELATIVE HUMIDITY: 0% to 95% (non-condensing)

Operating the Power Pal PDU and batteries at either extreme of the temperature range may affect the long-term reliability of the system.

6.1.2 Storage Environment

Provide a storage environment which meets the following conditions:

- AMBIENT TEMPERATURE: -20°C to 68°C (-4 to 154°F)
- RELATIVE HUMIDITY: 0% to 95% non-condensing

Note: System should be stored in its original packaging.

6.1.3 Floor Loading

The Power Pal unit has a base of 34 x 34 (86.5 cm x 86.5 cm). Provide a floor with strength sufficient for loads specified in table below.

Note:

Consult Online Power, Inc. for non-standard configurations

SIZE	INPUT VOLTAGE	FLOOR LOADING lbs/ft ² (kg/m ²)
15	208	73 (355)
	480	
30	208	94 (461)
	480	
50	208	132 (645)
	480	
75	208	149 (730)
	480	

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100	208	196 (956)
	480	167 (816)
125	208	232 (363)
	480	181 (883)
150	208	301 (1470)
	480	243 (1188)
200	208	334 (1630)
	480	264 (1286)
225	208	377 (1842)
	480	316 (1545)
250	208	421 (2055)
	480	348 (1702)
300	208	508 (2481)
	480	421 (2055)

6.1.4 Location Considerations

The Power Pal PDU Cabinet Installation Diagram provides cable/conduit openings on the bottom of the cabinet. Refer to Illustrations 6-1, 6-2 and 6-3.

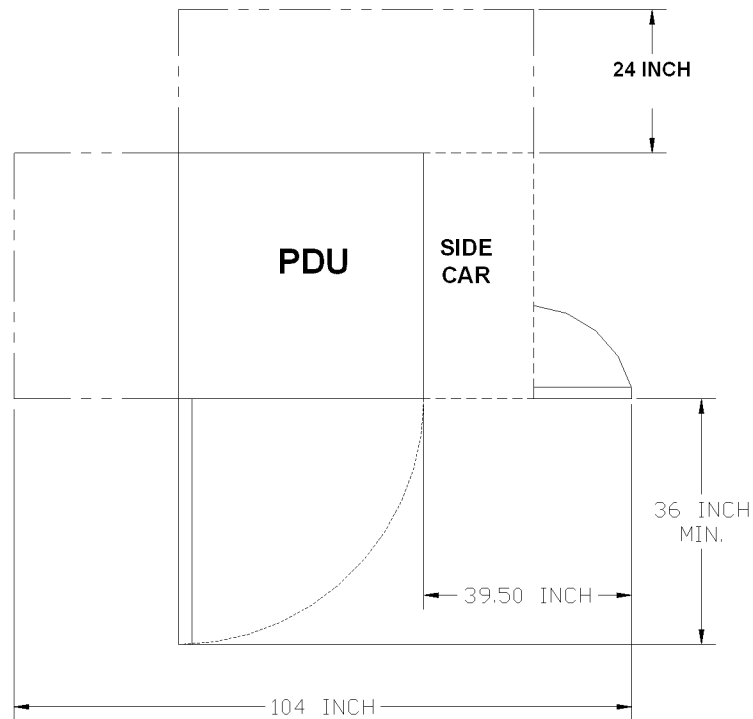


ILLUSTRATION 6-1: CLEARANCE LAYOUT

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6.1.5 Floor Tile Cutout

If the PDU is located in a room with a raised floor, access the underside of the unit by cutting a hole in the floor tile that lines up with the cable access opening in the unit. Position the unit so that the tile adjacent to the cutout can be removed for better cable access.

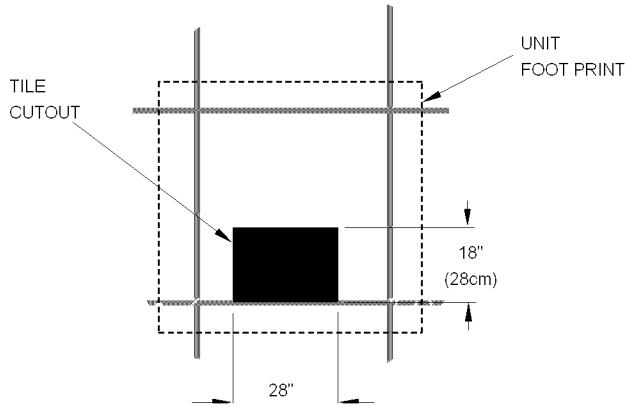


ILLUSTRATION 6-2: FLOOR TILE CUTOUT

6.1.6 Conduit Locations

All customer connections are brought through conduit plate located on the bottom of the unit. The Power Pal PDU consists of one (1) integrated cabinet - housing both the electronics and batteries (depending on KVA).

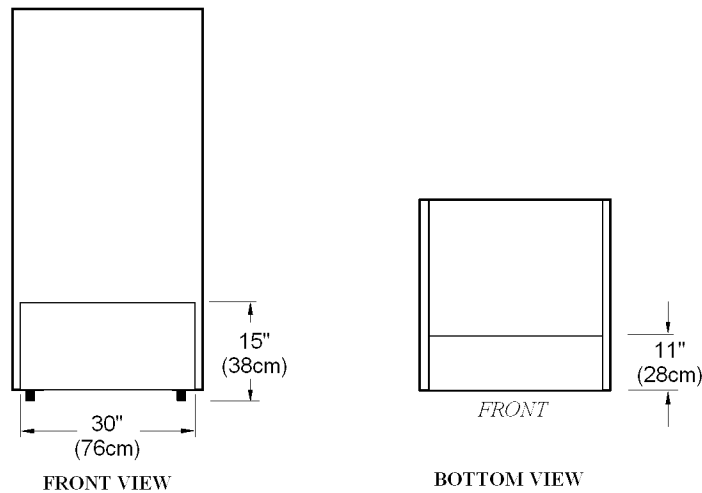


ILLUSTRATION 6-3: CABINET CABLE ACCESS OPENING

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6.2 EQUIPMENT UNPACKING



DANGER!

EXERCISE EXTREME CARE WHEN HANDLING UNIT TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. CABINETS WEIGH SEVERAL HUNDRED POUNDS. TEST LIFT AND BALANCE THE CABINETS BEFORE MOVING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES. THE BOTTOM STRUCTURE WILL SUPPORT THE UNIT ONLY IF THE FORKLIFT FORKS ARE COMPLETELY UNDERNEATH THE UNIT.

6.2.1 Handling suggestions

SHIPPING AND DELIVERY: The PDU is shipped by air ride van or air freight. The PDU is crated on a pallet and can be handled using a fork lift or pallet jack.

TRANSFERRING TO SITE: Plan the route the unit will follow to the installation area to ensure that all passages are large enough and that the floors can support the weight, e.g., are all doorways, ramps, elevators, etc. adequate? Are there any non-negotiable corners?

NOTE: The PDU weighs from 600 lbs (272 kg) to 3,500 lbs (1,588 kg) including the packaging. Use care when rolling the unit. Plywood or steel plates may be used to distribute weight and protect floor surfaces from damage.

Refer to Section 6-2 for unpacking instructions. After unpacking, and with protective film still in place, the PDU can be rolled to the installation site on integral casters.

Any elevator en route to the installation site must be of a size and weight-bearing capacity to carry the PDU. For weight, refer to Table 6-2.

The unit can be removed from the pallet, with protective wrapping still in place, and rolled to installation site on integral casters. Use the following procedure to unpack the unit.

Before unpacking the equipment, inspect the exterior, the shipping container, and the equipment itself for damage that may have occurred during transit. If the shipping container or equipment itself shows evidence of damage, note the damage on the receiving document before signing for receipt of the equipment. Damage claims should be filed directly with the carrier.



DANGER! CUT METAL BANDS CAREFULLY. THEY ARE UNDER TENSION AND MAY CAUSE INJURY.

1. Position the container away from walls or other obstructions.
2. Cut the metal shipping bands.
3. Remove the ramp and set it aside.

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4. Remove the cardboard cover. Avoid puncturing the cardboard cover with sharp objects which may damage the surface of the unit.



CAUTION! The PDU weighs from 600 lbs (272 kg) to 3,500 lbs (1,588 kg) including the packaging. Secure the ramp to the pallet to prevent the ramp from slipping. Use care when rolling the unit. Plywood or steel plates may be used to distribute weight and protect the floor surface from overload damage.

5. Place the thickest edge of the ramp next to the edge of the pallet and secure the ramp to the pallet using clamps, nails or other suitable fasteners.
6. Roll the unit off the pallet and down the ramp. Use enough people to safely handle the weight of the unit. Do not stand in front of the unit as it rolls down the ramp.
7. Roll to installation site on the integral casters.
8. Remove the protective plastic film.
9. Verify information on nameplate (See Illustration 6-4) matches order.
10. Before final positioning of the PDU, verify that all cable routing, conduit and raceway is positioned properly.

NOTE: If site restrictions prevent routing of conduit to the locations where conduit plate is located, do not drill holes in the cabinet without first consulting Online Power at 800-PWR-SRVC (800-797-7782). The conduit plate provided is positioned to prevent airflow disruptions that could cause the unit to overheat. Our engineers will be happy in assisting you in locating the conduit to maintain unit reliability.

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POWER DISTRIBUTION UNIT
MODEL NO: _____
SERIAL NUMBER: _____
NOMINAL INPUT VOLTAGE: _____
INPUT FREQUENCY: _____
OUTPUT VOLTAGE: _____
OUTPUT POWER: _____
OUTPUT FREQUENCY: _____
WEIGHT: _____
DATE CODE: _____
CONFORMS TO: _____

ILLUSTRATION 6-4: NAMEPLATE

If equipment is not ready for normal operation, it must be protected from dust to prevent damage to equipment.

6.3 INSTALLATION

Install the PDU using the procedures in this section. The final installation must be in accordance with NEMA standards and conform to local electrical codes as appropriate.

 DANGER! VERIFY THAT ALL CUSTOMER SUPPLIED WIRING IS DE-ENERGIZED BEFORE PERFORMING ANY ELECTRICAL WORK. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION, INJURY OR DAMAGE TO EQUIPMENT.

 **CAUTION!**

Do not connect the unit to building power until the following procedures has been completed.

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6.3.1 Facility Power Connection

The following instructions cover general requirements for standard installation of the primary input circuit (branch feeder circuit) at the facility power panel. This circuit provides power from the building source to the PDU.

6.3.2 Branch Feeder

The branch feeder circuit is normally supplied with the unit. The standard length of the feeder circuit is 10 feet. The feeder circuit may be longer depending on the options selected. The input to the PDU consists of three conductors and the grounding conductor (3W +Gnd input).

6.3.3 Grounding Conductor

An insulated grounding conductor is supplied as part of the input circuit.

NOTE: The equipment to be connected to the PDU may require special grounding procedures. Refer to technical documentation which accompanies that equipment.

6.3.4 Tools Required

Phase Rotation Meter
Digital Voltmeter

6.3.5 Input Power Connection



CAUTION!

Input power connection and required branch circuit breaker should be installed by a licensed electrical contractor in accordance with local codes.

1. Turn OFF the main facility circuit breaker, lock and tagout in accordance with OSHA requirements.
2. Install the facility branch circuit breaker.
3. Route input power cable to the PDU.
4. Verify that IMCB is set to OFF.
5. Connect the grounding conductor to earth at the service equipment or other acceptable building earth ground such as the building frame in the case of a high-rise steel frame structure.
6. Connect the power conductors to the facility branch circuit breaker.



CAUTION!

Be sure incoming 3-phase power is connected with a clockwise phase rotation sequence (A, B, C). Use a phase rotation meter to verify. Damage to the unit will result if improperly installed.

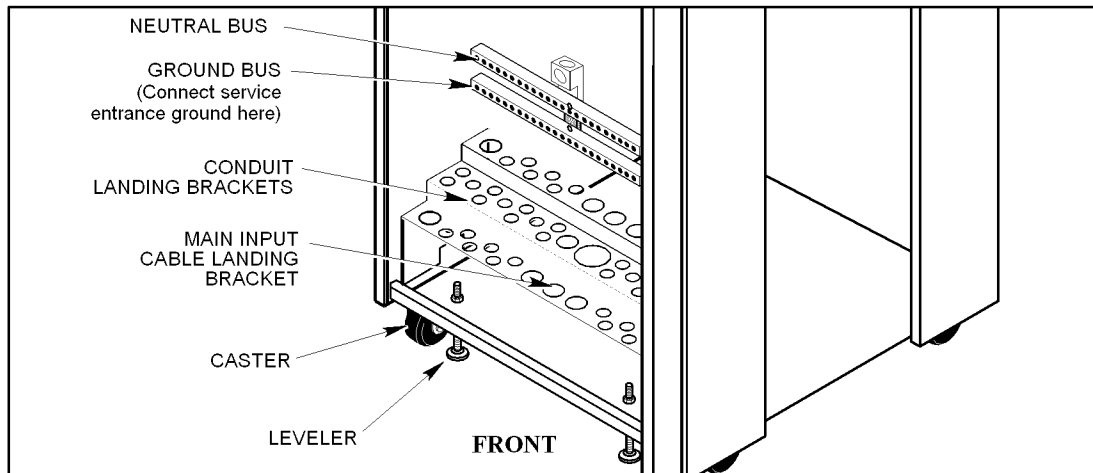
7. Set the facility branch circuit breaker to ON.
8. Verify proper phase sequence connection using a phase rotation meter. Incoming 3 phase power should be connected with clockwise phase rotation sequence (A, B, C). If correct, skip Step 9 and go to Step10.
9. If phase rotation is incorrect, turn off the facility branch circuit breaker. Correct phase error. Go to Step 8.

Online Power

10. Turn OFF the main facility circuit breaker, Lock and tagout according to OSHA requirements.

6.3.6 Output Cable Installation (Shown bottom entry)

The PDU has a conduit landing bracket inside the unit, behind the dead front panel. See Illustration 6-5. The center section of the conduit landing bracket secures the large diameter primary power cable. The two side sections are designed to hold the smaller output cables. Conduit openings correspond to conduit fitting size.



6

ILLUSTRATION 6-5: INPUT AND OUTPUT CABLE INSTALLATION



DANGER! VERIFY THAT INCOMING HIGH VOLTAGE CIRCUITS ARE DE-ENERGIZED BEFORE INSTALLING CABLES OR MAKING ANY CONNECTIONS. FAILURE TO DO SO CAN RESULT IN SERIOUS INJURY OR DEATH.



DANGER! POTENTIAL ELECTRICAL HAZARDS TO HUMAN LIFE EXIST WITHIN THIS EQUIPMENT WHEN ENERGIZED. DISCONNECT INPUT POWER TO UNIT BEFORE OPENING ENCLOSURE OR TOUCHING INTERNAL PARTS.

1. Turn OFF facility branch circuit breaker, lock and tagout according to OSHA requirements.
2. Open front door.
3. Verify that the IMCB and all OMCBs are set to OFF.
4. Open front panel by unbolting four screws located on the left sides of the panel.
5. Remove kick plate by unbolting four screws located at the corners of the panel (as required).

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DANGER!

Verify that incoming high voltage circuits are de-energized before continuing with this procedure. Failure to do so can result in serious injury or death.

6. Pass output cable through floor opening and up into left or right section of cable landing bracket (as required).
7. Secure conduit fitting to landing bracket. Install non-insulated bushings on all conduits and flexes.
8. Route and connect one to three power wires to output circuit breaker or input terminal block if applicable.
9. Route and connect the neutral wire to the neutral buss. See Illustration 6-5 for location of neutral bus.
10. Route and connect the ground wire to the ground bus. See Illustration 6-5 for location of ground bus.
11. Proceed to the following for start up.



CAUTION!

Each model of the POWER PAL PDU System is designed to supply a maximum load which is determined by its kVA (1000's of volt-amperes) and kW rating. It is very important that the load is within the rating of this POWER PAL PDU System to ensure that the connected loads will be properly supported. Each electrical device to be powered by the POWER PAL PDU System should have a specification sheet attached to it, which specifies the amount of power it requires. In addition, this information should be listed in the manual supplied with each piece of equipment. The device's nameplate should also list the electrical requirements of the device. The total load to be powered by the POWER PAL PDU System must not exceed its kVA rating. If the total load is exceeded, the POWER PAL PDU System monitoring will sense an overload condition and a summary alarm will occur.



DANGER!

EVEN WHEN THE POWER PAL PDU SYSTEM IS OFF, THERE ARE POTENTIALLY DANGEROUS VOLTAGES WITHIN THE POWER PAL PDU SYSTEM UNIT. EXTREME CARE MUST BE TAKEN WHEN WORKING WITHIN THE POWER PAL PDU SYSTEM ENCLOSURE TO AVOID THE POSSIBILITY OF ELECTROCUTION, INJURY OR DAMAGE TO THE EQUIPMENT.

Online Power

6.4 INITIAL START-UP

After connecting the input and output cables and before placing the PDU in service, verify the output voltage using the following procedure.

1. Unlock facility branch circuit breaker and turn ON.
2. Open front door.
3. Set IMCB to ON.
4. Measure the line-to-neutral output voltages as follows:
 - a. Verify that power is on to all external subsystems.
 - b. Using the output monitor panel, read the output voltages. Read the voltages both phase to phase and phase to neutral.
 - c. Verify that output voltages agree with the values listed on the label plate located on the inside of the front door and section 3, specifications.

If output voltage readings are out of specification, change the taps on main the transformer.

5. Set IMCB to OFF.
6. Close front door.

The PDU is ready for service.

6.5 SETTING IMCB SHUNT TRIP DIP SWITCHES

The IMCB Shunt-Trip dip switches, SW1 and SW2, are located on the alarm status Panel PCB. See Illustration 6-6. Set SW1 for the Shunt-Trip UNDER VOLTAGE, OVER VOLTAGE, PHASE LOSS, PHASE ROTATION, TEMP WARNING and GROUND AMPS. The factory setting is alarm only with all switches set to off. With the dip switches set to on, the PDU alarms and shunt-trips the IMCB at the same time. Depending upon a particular customer's requirements, some of the dip switches may be set to OFF while others may be set to ON.

6.5.1 SW1 Dip Switch Settings

SW1 (Internal Alarms)	
FUNCTION	SWITCH
UNDER VOLTAGE	6
OVER VOLTAGE	4
PHASE LOSS	7
PHASE ROTATION	5
TEMP WARNING	2
ROUND AMPS	1
EMERGENCY POWER OFF	3

For automatic shut down with alarm condition, set SW1 switches to ON according to the following procedure:

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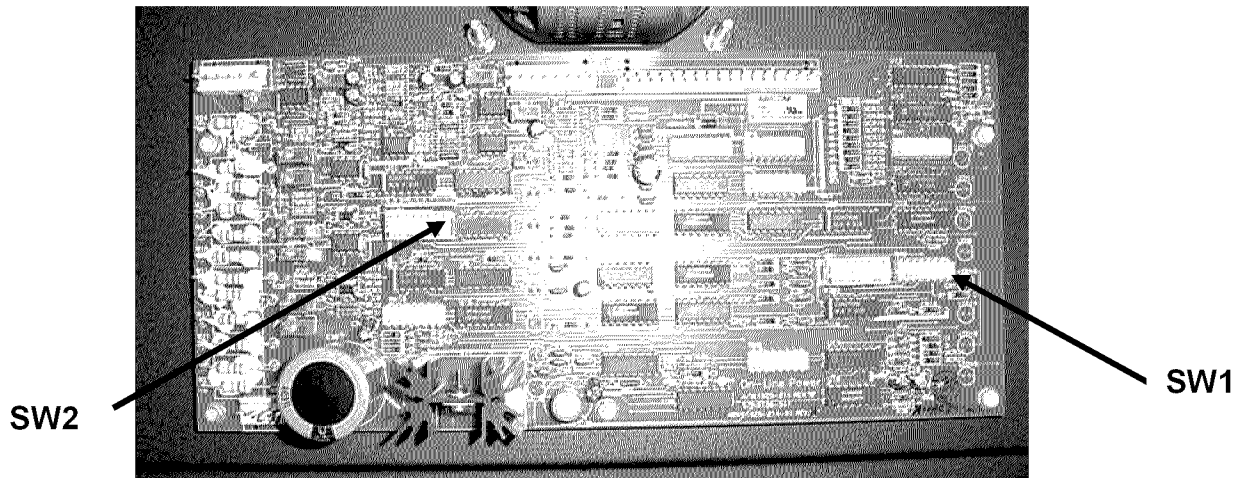
1. Open front door.
2. Turn facility branch circuit breaker OFF, lock and tag.
3. Set OMCBs to OFF.
4. Set IMCB to OFF.
5. Remove two screws on left side of Output Monitoring Panel. The panel is hinged on the right side.
6. Locate the switch that controls the specific function to be set for immediate shut down. See Illustration 6-6, and Table 6-10 for SW1 or Table 6-11 for SW2.
7. Slide the switch to the ON position.
8. Close the Output Monitoring Panel and replace two screws on left side.
9. Set facility circuit breaker to ON.
10. Set IMCB to ON.
11. Press and release ALARM SILENCE switch.
12. Set OMCBs to ON.
13. Set panelboard circuit breakers to ON (as required).
14. Close front door.

Set SW2 if external alarms are connected to non-designated LEDs. Follow the preceding procedure, except refer to Table 6-11 for LEDs and corresponding switch numbers. Refer to Section 4 System Options for more information on external alarms.

6.5.2 SW2 Dip Switch Settings

SW2 (External Alarms)	
LED	SWITCH
1	7
2	5
3	6
4	8
5	4
6	1
7	3
8	2

Online Power



DIP SWITCHES LOCATED ON THE PCB BEHIND THE MONITORING PANEL

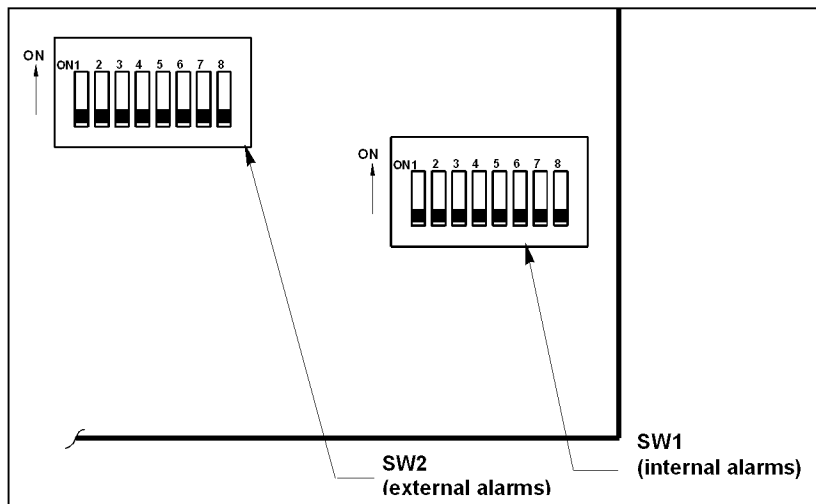


ILLUSTRATION 6-6: DIP SWITCHES