Operation and Configuration

150 kW InfraStruXure® Power Distribution Unit

480 V / 600 V

About This Manual

Audience

This manual provides operation and network configuration information for the 150 kW InfraStruXure® Power Distribution Unit (PDU).

Companion manuals

For information relating to the installation and start-up of your InfraStruXure 150 kW PDU, refer to the latest letter revision of the *Installation and Start-Up Manual* (990-1983).

For information about specific components in your InfraStruXure system, see the documentation included with that component. Before installing or operating any component, refer to the safety instructions in the component's manual.

How to find updates to this manual

The illustrations of products in this manual may vary slightly from the products in your InfraStruXure system.

!
Note   Go to www.apc.com to check for updates to this or any APC user manual.

Contents

Safety

Overview

Save these instructions

This manual contains important instructions that must be followed during installation, operation, and configuration of the InfraStruXure PDU.

Safety symbols that may be used in this manual

Electrical Hazard: Indicates an electrical hazard which, if not avoided, could result in injury or death.

Danger: Indicates a hazard which, if not avoided, could result in severe personal injury or substantial damage to product or other property.

Warning: Indicates a hazard which, if not avoided, could result in personal injury or damage to product or other property.

Heavy: Indicates a heavy load that should not be lifted without assistance.

Caution: Indicates a potential hazard which, if not avoided, could result in personal injury or damage to product or other property.

Tip Hazard: This equipment is easily tipped. Use extreme caution when unpacking or moving.

Note: Indicates important information.

Cross-reference symbol used in this manual
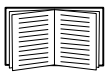
See another section of this document or another document for more information on this subject.

Warnings

Receiving/moving

Do not tilt the PDU more than 45° from its vertical axis. Never lay the PDU on its side.

Installation/maintenance

Refer to the latest letter revision of the *Installation and Start-up Manual* (990-1983).

Maintenance performed while the PDU is receiving input power

APC does not recommend that you perform maintenance on the PDU while it is receiving input power. However, due to the critical nature of data center loads, this may occur. If you must perform maintenance while the PDU is receiving input power, observe the following precautions to reduce the risk of electric shock:

1. Never work alone.

2. Perform the maintenance only if you are a certified electrician who is trained in the hazards of live electrical installation.

3. Know the procedure for disconnecting electricity to the PDU and the data center in case of an emergency.

4. Wear appropriate personal protective equipment.

5. Use double-insulated tools.

6. Always follow local and site regulations when working on the PDU.

Total power off procedure

1. Open (turn OFF) the **main input breaker** on the PDU.

2. Open (turn OFF) the main circuit breaker for the **power source** feeding the PDU.

Safety warnings

Hazardous voltage from the branch circuit must be isolated from the 24 VAC, 24 VDC, and contact closure. 24 VAC and 24 VDC are considered Class 2 circuits as defined in Article 725 of the National Electrical Code (NFPA 70) and Section 16 of the Canadian Electrical Code (C22.1).

A Class 2 circuit is a source having limited voltage and energy capacity as follows:

    a. If an Inherently Limited Power Source, voltage and energy are limited to less than 30 VAC, less than 30 VDC, and 8 A.

    b. If not an Inherently Limited Power Source, voltage and energy are limited to less than 30 VAC, less than 60 VDC, 250 VA, and current is limited to 1000/V max. The fuse is limited to 5 A if less than 20 VAC or 20 VDC, or 100/V maximum if less than 30 VAC or 60 VDC.

If choosing a 24 VAC, 24 VDC, or contact closure connection to the EPO, use one of the following UL-listed wire types:

- CL2 Class 2 cable for general purpose use

- CL2P Plenum cable for use in ducts, plenums, and other space used for environmental air

- CL2R Riser cable for use in a vertical run shaft from floor to floor

- CL2X Limited Use cable for use in dwellings and for use in a raceway

- For installations in Canada, the cable should be CSA-certified, type ELC (extra-low-voltage control cable).

If not using CL2 cable, route the EPO wiring in conduit that does not contain any branch circuit wiring.

EMI

This equipment has been tested and found to comply with the limits for Class A digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. The user will bear sole responsibility for correcting such interference.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Overview

System Overview

The 150 kW InfraStruXure PDU provides distribution and management of electrical power. The InfraStruXure PDU has capacity for 150 kW, accepts 480 V or 600 V 3-phase input, and distributes 208 V 3-phase power to equipment racks and Rack Distribution Panels (RDPs). The RDPs sit in the top 10 U of specially-designed NetShelter® VX enclosures and distribute power to equipment racks. The InfraStruXure PDU is housed in a specially designed 23-inch NetShelter VX enclosure. Each 150 kW InfraStruXure PDU has 75 pole positions available for feeding equipment racks and three, three-pole positions available for feeding RDPs. Each RDP has 39 pole positions available for feeding equipment racks and one, three-pole position for back-feeding functionality.
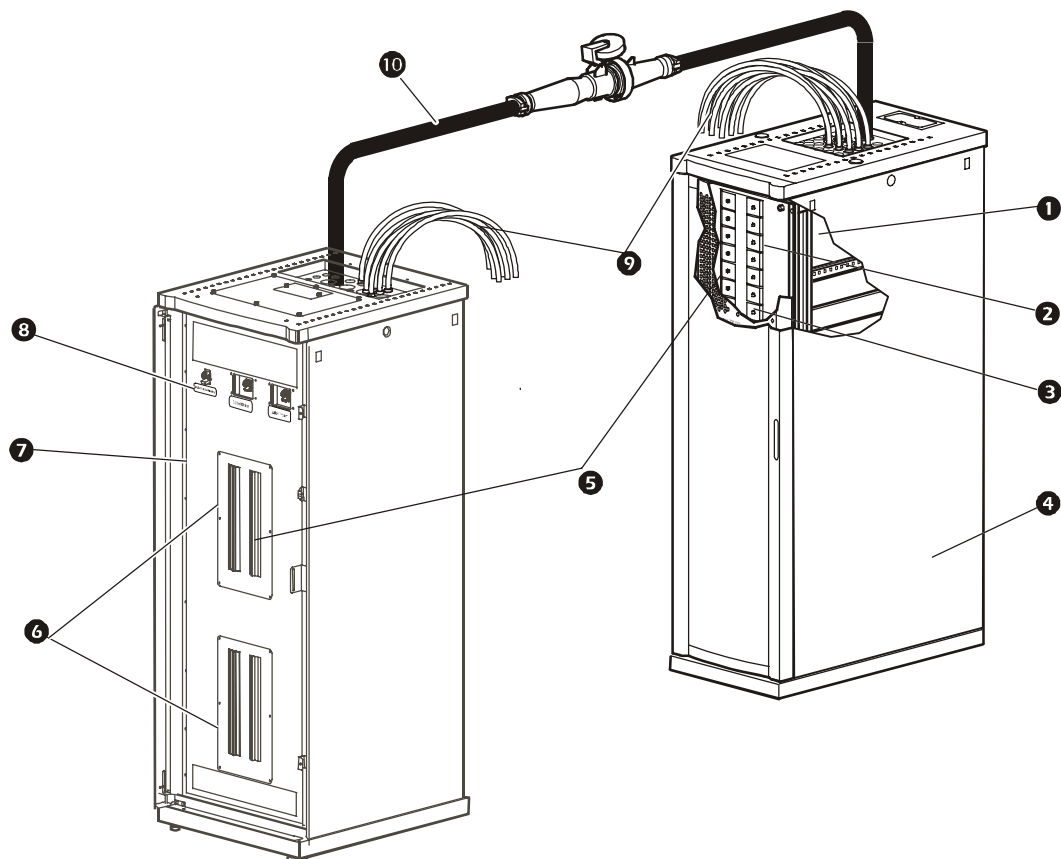
❶ Rack Distribution Panel (RDP)

❷ 39 pole positions available

❸ One, 3-pole breaker for back-feeding

❹ NetShelter VX enclosure

❺ 42-position circuit breaker panel

❻ 75 pole positions available

❼ 150 kW InfraStruXure PDU

❽ Three circuit breakers sub-feeding RDPs

❾ Power cables feeding equipment racks

❿ Sub-feed power cable feeding an RDP

InfraStruXure PDU

Front view

❶ The **PDU power cables** feed equipment racks. The cables are routed through knockout panels on top of the PDU. There are two options for PDU power cables: multi-circuit power cables that terminate with an L21-20 outlet (shown) and single-circuit power cables that terminate with an L6-30 outlet. The number of power cables installed in the PDU depends on your system configuration. Each power cable accepts a variety of APC InfraStruXure rack-mount power distribution accessories.
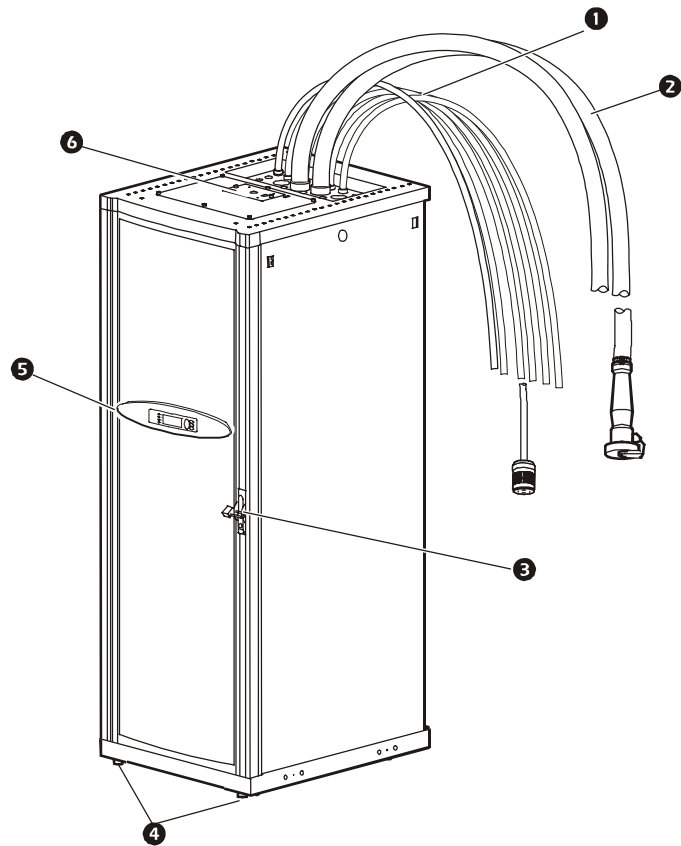
❷ The **sub-feed power cables** are routed through knockout panels on top of the PDU, and serve as an option for feeding RDPs. The power cables consist of five wires: three phases, one neutral, and one ground. As an option, the PDU can distribute up to four sub-feed power cables. Each sub-feed power cable contains an IEC 309 outlet.

❸ A **lock-out bracket** allows use of a padlock on the door to prevent access to the PDU breakers.

❹ The **leveling feet** can be adjusted to level and stabilize the base of the enclosure. All enclosures must be level before electrical installation begins.

❺ The **display interface** provides a local interface for viewing status data. It has an LCD, a five-button interface, basic status lights, and a beeper. See "Display Interface" on page 13 for more information.

❻ The **user connection plate** connects to the PDU monitoring unit and provides easy access to input contact, relay output, network, and EPO connections. These connections can be made from inside or outside the enclosure. Wires connecting to the plate are routed through the knockout on the plate. See "User connection plate" on page 11 for more information.

Front view (interior)
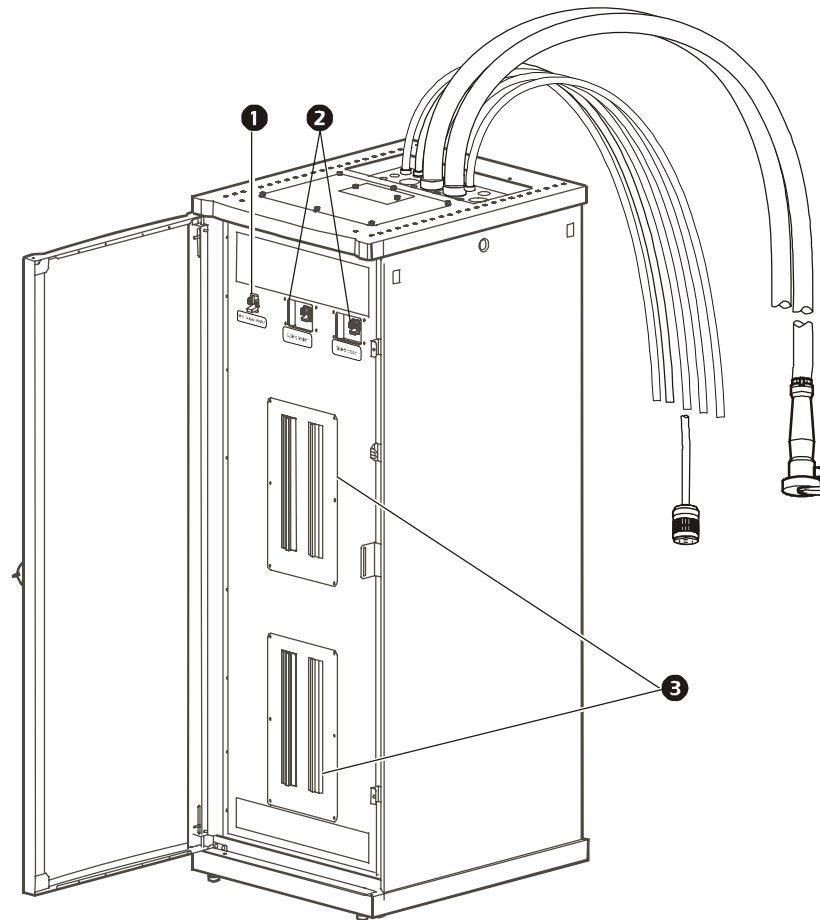
❶ The **main output breaker** protects the distribution circuit breaker panels.

❷ The **optional sub-feed output** circuit breakers offer a means to distribute higher blocks of power to other equipment or other distribution units.

❸ The two **42-position circuit breaker panels** offer a total of 84 positions. Each single pole provides power at 120 volts L-N, while two single poles provide power at 208 volts L-L. The amperage provided to each pole position is dependent on the size of the circuit breaker installed in that position.

Rear view
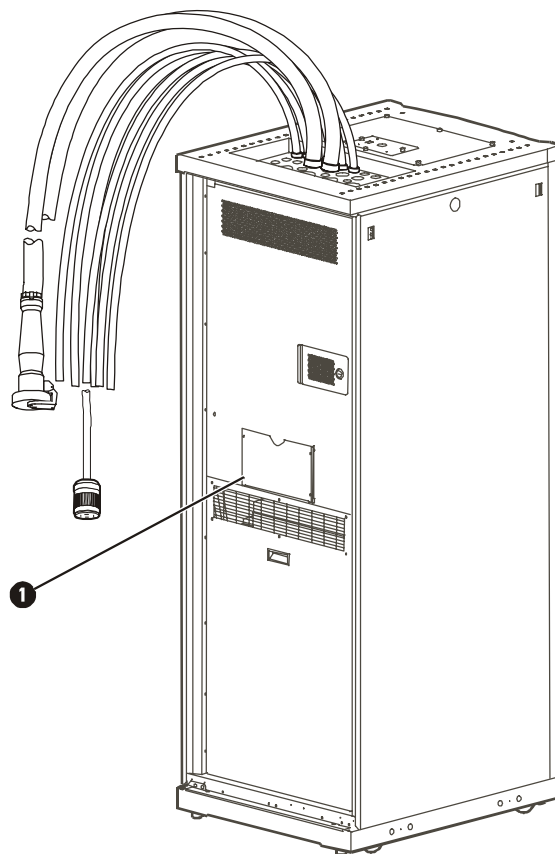
❶ The **document pocket** is where documents relating to the InfraStruXure PDU are typically stored.

Rear view (interior)
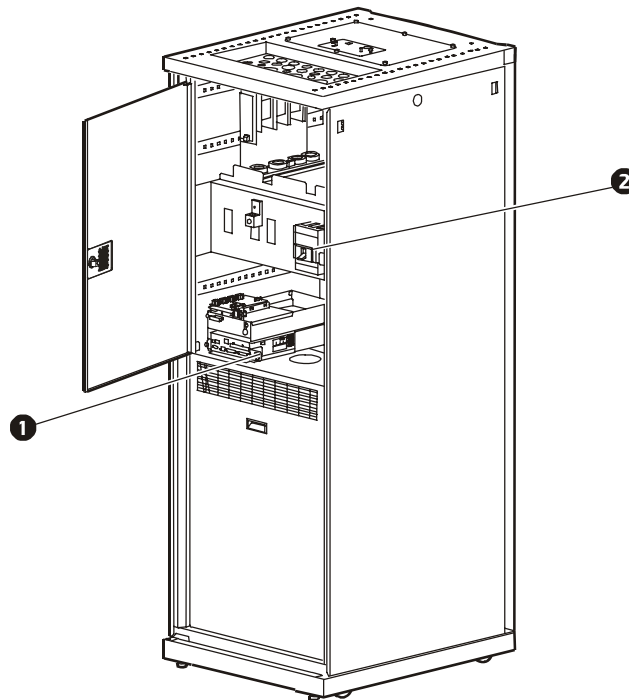
❶ The **PDU monitoring unit** receives signals from several current and voltage monitoring boards that report to a central board assembly located in the PDU monitoring unit. The monitoring unit has one 10 Base-T (CAT-5) connection to the Information Controller Hub (or Switch), four input contact connections, four relay output connections, and one EPO input connection. These connections are made at the user connection plate located on the roof of the PDU. See "PDU monitoring unit" on page 10 for a more detailed description.

❷ The **main input breaker** connects to the main power source. The breaker accepts 480 V input and requires 3-wire input conductors.

PDU monitoring unit
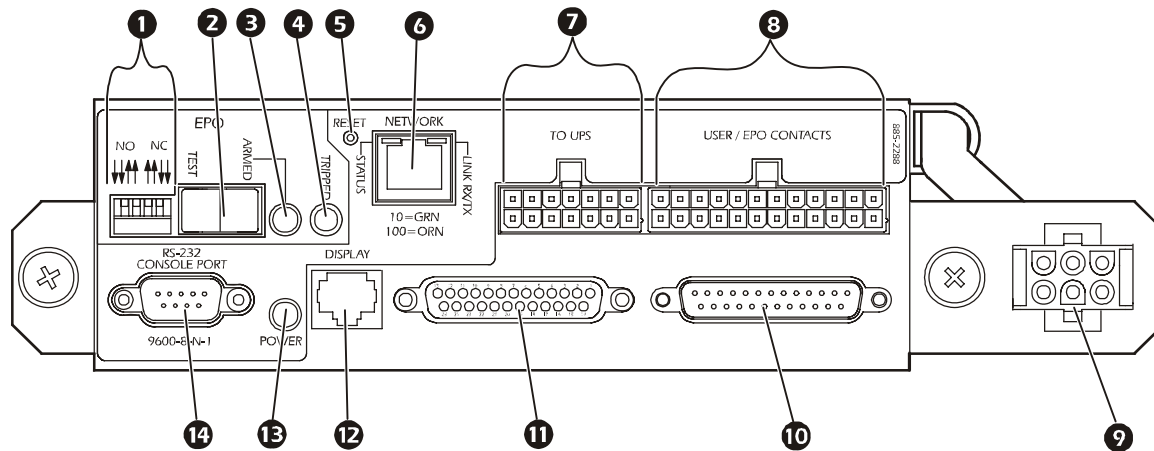
❶   The **EPO DIP switches** configure the EPO input for the type of EPO switch that is connected—Normally Open (NO) or Normally Closed (NC).

❷   When the **EPO Arm/Test rocker** is in the Test position, engaging the EPO switch will not cause the load to power OFF. However, when the rocker is in the Armed position, engaging the EPO switch will cause the PDU's main input breaker to power OFF. See "How to Connect an EPO Switch to the PDU and Test the Switch" on page 53 for information on testing the EPO switch.

❸   The **EPO Armed LED** is lit green when the rocker is in the Armed position. The LED is dark when the rocker is in the Test position.

❹   The **EPO Tripped LED** is lit red when the EPO switch is engaged (the EPO button is pressed), regardless of the state of the EPO Arm/Test rocker.

❺   The **Reset** button resets the network processor; it does not reset the PDU or the PDU monitoring unit.

❻   The **network port** connects to the InfraStruXure Manager.

❼   Not used in this model PDU.

❽   The optional **User/EPO Contacts** port connects to the user connection plate in the roof (or floor) of the PDU through wire harnesses. The port allows four input contacts, four relay outputs, and one EPO input. See "User connection plate" on page 11 for more information.

❾   This connection provides **input power** for the PDU monitoring unit from the circuit breaker on the front of the PDU. If the panel is on and the monitoring unit circuit breaker is closed, the monitoring unit is powered.

❿   Connects to sensors that are monitoring voltage, current, and power values.

⓫   Digital input sensing for monitoring circuit breakers, transformer temperature, fans, etc.

⓬   The **Display port** (RJ-45) connects the PDU monitoring unit to the display interface.

⓭   The **Power LED** indicates whether the monitoring unit is receiving power.

⓮   Use the **Console port** (DB-9) to connect a laptop computer to the monitoring unit using an appropriate communication cable. This port is used to configure items related to servicing.

> **Note**
>
> The branch current monitoring boards connect to the **Branch Current Monitor** ports (RJ-11). These ports are on the side of the PDU monitoring unit, and are labeled on the face of the unit. Each port corresponds to a section of circuit breakers on the PDU circuit breaker distribution panels: upper left = [01..41]; upper right = [02..42]; lower left = [43..83]; lower right = [44..84].

User connection plate

For the location and a general description of the user connection plate, see (❻) on page 6. The user connection plate is shown in greater detail in the illustration below.
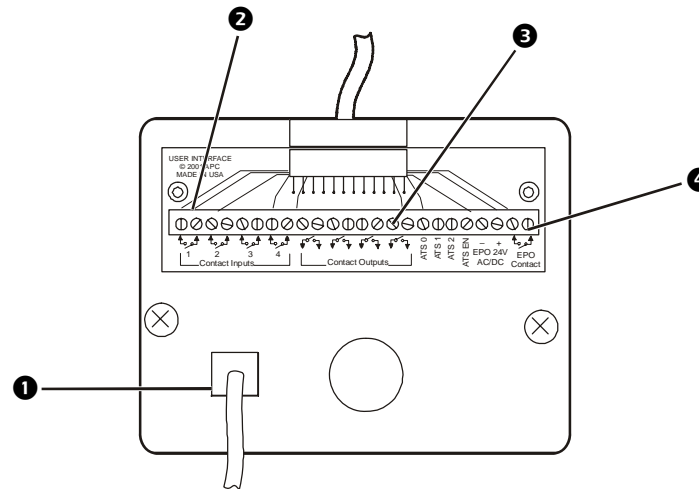
❶ Connect the InfraStruXure PDU to the network or to the InfraStruXure Manager through the **ethernet port**.

❷ The user connection plate has four **input contact connections** for monitoring Normally Open (NO) or Normally Closed (NC) dry contacts.

❸ The user connection plate has four **relay output connections** for monitoring Normally Open (NO) or Normally Closed (NC) dry contacts.

❹ Connect an Emergency Power Off (EPO) switch at one of three choices for **EPO connections**: 24 VDC, 24 VAC, or contact closure.

Display Interface

Overview

Use the display interface to configure settings, set alarm thresholds, and provide audible and visual alarms.
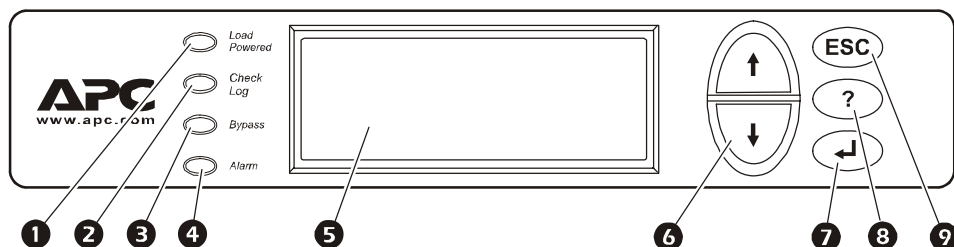
❶	Load Powered LED	When lit green, all output phases are within the limits specified by the output alarm limit thresholds.
❷	Check Log LED	When lit yellow, at least one new alarm condition has been detected.
❸	Bypass LED	When lit yellow, power to the load is being supplied directly by the utility while the UPS has been removed from the circuit for maintenance or replacement. Bypass breakers on the PDU function as input circuit breakers to protect the load equipment (if applicable).
❹	Alarm LED	When lit red, an alarm condition exists.
❺	LCD	View alarms, status data, instructional help, and configuration items.
❻	Up and Down navigation keys	Selects menu items and accesses information.
❼	ENTER key	Opens menu items and inputs changes to system parameters.
❽	HELP key	Launches context-sensitive help. Press the HELP key for information about each item on the screen and for instructions on how to perform certain tasks (i.e., placing the UPS into maintenance bypass operation).
❾	ESC key	Returns to the previously displayed screen.

Top-level status screens

After briefly displaying a start-up screen following system start-up, the display interface scrolls automatically and continuously through four screens of basic status information. Press the Up or Down arrow to interrupt the automatic scrolling and view a specific status screen.

```
Volts In      Volts Out
 L1-2: 000      L1: 000
 L2-3: 000      L2: 000
 L3-1: 000      L3: 000
```

```
Load Current
 L1: 000        Neut:000
 L2: 000
 L3: 000
```

```
Total Output Loading
 kW:   000      PF:  000
 kVA:  000      %LD: 000
 Freq: 00.0
```

```
      No Active Alarms
     System Date/Time:
     Jun-24 2003 07:58
```

Top-level menu screen

From any top-level status screen, press ENTER to open the top-level menu screen.

```
➡ Load-Meter     Alarms
   Volt-Meter    Panel
   Contacts      Config
   Breakers      Help
```

Note

If the display interface is inactive for the time specified as the **Time-out** setting, the interface reverts to the initial basic monitoring screens.

Navigating through screens

To open any screen, press the Up or Down arrow until the selector arrow (Ⓐ) rests next to your desired selection. Press ENTER to view the selected screen.

```
➡ Load-Meter     Alarms
   Volt-Meter    Panel
   Contacts      Config
   Breakers      Help
```

```
Contacts In: 02of04
Name: User Switch #2
Normal➡Open
Status: Open
```

Ⓐ

When configuring settings, press the Up or Down arrow until the selector arrow (Ⓐ) rests next to the setting you want to change and then press ENTER. If the setting is a list of choices, an input arrow (Ⓑ) will appear next to the setting. Press the Up or Down arrow until your desired change is listed. Press ENTER to select the setting.

```
Contacts In: 02of04
Name: User Switch #2
Normal:↕Open
Status: Open
```

Ⓑ

On some screens, continue arrows (**C**) indicate there are additional screens to view in the category. Press the Up or Down arrow to view the additional screens.

```
➡  System/Network
   Electrical Configuration
   Panel Configuration
   Manufacturer Data      ↓
```

```

   Product Data           ↑
   Factory Defaults
   Firmware Updates
```
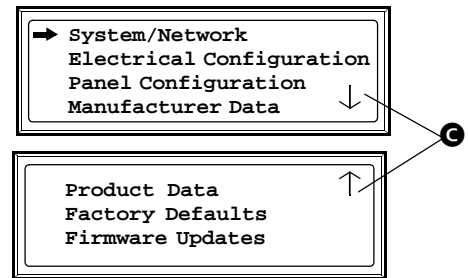
Password-protected screens

When configuring or changing settings, you will be prompted for your password. To enter your password:

1. Press the Up or Down arrow until the correct letter is displayed and then press ENTER.

```
        Enter Password:
          ↕*******
```

   (!) Note   After pressing ENTER, the character you entered is displayed as an asterisk and the input arrow moves to the next space to await your selection of the next password character.

2. Press ENTER twice after you have finished entering your password.

Load-Meter Screen

From the **Load-Meter** screen, you can select the following items:

Total Load by Phase   The load supported by each phase in kVA, in RMS current (**Irms**), and as a percentage of the maximum allowable load (**%LD**).

Total Load Summary   For the total load supported:

- **kW**: The power provided, in kilowatts

- **kVA**: The actual power drawn by the load, in kilovolt-amperes

- **Freq**: The frequency

- **PF**: The power factor (kW/kVA), which affects the power available to the load

- **%LD**: The load as a percentage of the maximum allowable load

Power Factor   For each phase:

- **kVA**: The actual power drawn by the load, in kilovolt-amperes

- **kW**: The power, in kilowatts, provided by the phase

- **PF**: The power factor (kW/kVA), which affects the power available to the load

Volt-Meter Screen

From the **Volt-Meter** screen, you can select the following items:

Output Voltage Displays each phase-to-phase output voltage (e.g., **L1-2** for phase L1 to phase L2) and each phase-to-neutral output voltage (e.g., **L1** for phase L1 to neutral).

Input Voltage Displays each phase-to-phase input voltage (e.g., **L1-2** for phase L1 to phase L2). If using a Wye transformer, displays each phase-to-neutral input voltage (e.g., **L1** for phase L1 to neutral).

Contacts Screen

Overview

The PDU can monitor external contact closure events. Possible applications include:

- Magnetic contact switches
- Window foil
- Tamper switches
- Heat detectors
- Water sensors
- Pressure sensors
- Building smoke and fire detection systems

You can set input contacts to cause alarm conditions based on their present state and a user-defined normal state. Relay outputs can map internal alarms and events to outside devices. Use the **Contacts** screen to display and configure information about input contacts and relay outputs.

Input Contacts Scroll through the list to display information about each of the installed input contacts. For example, **02of04** displays information about the second of four installed input contacts.

- **Name**—The name of this input contact (*Maximum:* 14 alphanumeric characters).
- **Normal**—The normal position of this input contact, either **Open** or **Closed**.
- **Status**—The present position of this input contact. If not the designated position, an alarm condition occurs.

Relay Outputs Scroll through the list to display information about each of the installed relay outputs. For example, **04of04** displays information about the fourth of four installed relay outputs.

- **Name**—The name of this relay output (*Maximum:* 14 alphanumeric characters).
- **Normal**—The normal position of this relay output, either **Open** or **Closed**.
- **Status**—The present position of this relay output.

Alarm Relay Map Configure the relay outputs using
the alarm relay map. Each alarm
map corresponds to a relay
output. For example, alarm map
01of04 corresponds to the first of

```
Alarm Map: 01 of 04
[Vo, By, C4]
➡ Map: Input Voltage
Apply Now
```

four relay outputs. The second line, in brackets [ ], lists the items you
have selected to map to the selected relay. The third line allows you to
select the alarms to which you want to map the relay:
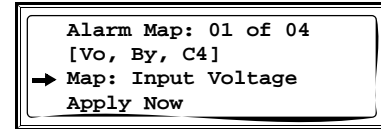
- **Any Load** (L)—Maps to over- or under-current alarms for
  circuit breaker panels and branch circuits.

- **Overload** (O)—Maps to over-current alarms for circuit breaker
  panels, branch circuits, and SYSGND.

- **Input Voltage** (Vi)—Maps to any input voltage alarm.

- **Output Voltage** (Vo)—Maps to any output voltage alarm.

- **PDU in Bypass** (By)—Mapping this option will cause the relay
  output to actuate when the Q3 breaker is closed.

- **Any Breaker** (Br)—Mapping this option will cause the relay
  output to actuate when the input, bypass input (Q10), or cross-
  tie output breaker is not in its normal state.

- **Contacts 1–4** (C1,C2,C3,C4)—Maps to the input contact
  alarms.

To save your changes before exiting the screen, select the **Apply Now**
option at the bottom of the screen.

How to connect contacts to the PDU monitoring unit

1. Choose one or more contact numbers on the **User/EPO contacts** port on the user connection plate.
   The user connection plate connects to the PDU monitoring unit.

2. From the PDU display interface:
   a. Press ESC or ENTER to go to the top-level menu screen.
   b. Select **Contacts** from the top-level menu screen and press ENTER.

```
   Load-Meter   Alarms
   Volt-Meter   Panel
➡ Contacts     Config
   Breakers     Help
```

   c. Select **Contact Inputs** (or **Relay Outputs**) and press ENTER to display the contact inputs (or relay
      outputs) screen.

```
➡ >Contact Inputs
   >Relay Outputs
   >Alarm Relay Map
```
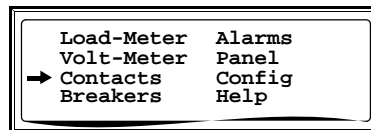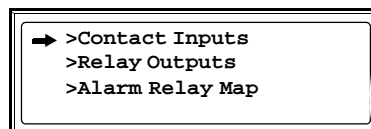
    d. Select **Contact In** and then press ENTER. The continue arrow ⇕ will appear next to the contact number. Press the Up or Down arrow to select the appropriate contact number and press ENTER.
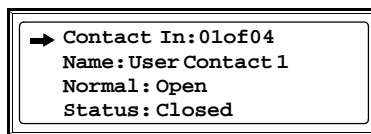
```
➡  Contact In:01of04
   Name:User Contact 1
   Normal:Open
   Status:Closed
```

    e. Press the Down arrow to enter a unique **Name** for the contact and to configure the normal state of the contact (Open or Closed). The default **Normal** state is Open. Press ENTER.

> ! **Note**
>
> You will be prompted for your password.

3. Connect contact wires (300 V-rated cabling required) to the terminal block on the user connection plate. Use a 2.5-millimeter standard screwdriver.

4. Run the wires from the terminal block out the roof or under the floor of the PDU to your contacts.

> ⚠ **Warning**
>
> **Ensure that wires are properly retained and kept away from high-voltage lines and breakers.**

See "Specifications" on page 59 for relay output specifications.

Breakers Screen

Use the **Breakers** screen to view the status of system and PDU circuit breakers.

UPS & System Bypass   Reports the operation mode of the UPS and the state of the Q1, Q2, and Q3 circuit breakers on the PDU (if applicable).

Main Input   Reports the status of the PDU main input breaker (**Open** or **Closed**). During normal operation, this breaker is **Closed** (if applicable).

Alarms Screen

View Active Alarms

Use this option of the **Alarms** screen to display active alarms (alarms that have not been resolved). Scroll through the list to view each active alarm.

Alarm/Event Log

Use this selection of the **Alarms** screen to access the following options:

New Logged Items   Displays a description and the date and time of each alarm that occurred since the last time this option was used. The date/time format is *mm*/*dd/yyyy hh*:*mm*:*ss.*

- The most recent alarm is initially displayed.

- If the log contains no alarms, the screen displays `Alarm Log Empty.`

Entire Log   Displays a description and the date and time of each alarm in the alarm log. The date/time format is *mm/dd*/*yyyy hh*:*mm*:*ss.*

- The most recent alarm is initially displayed. To move to the previous alarm, press the Down arrow. To move to the next more recent alarm, press the Up arrow.

- If the log contains no alarms, the screen displays `Alarm Log Empty.`

Clear Log   Delete the contents of the alarm log. You will be asked to confirm this deletion.

Alarm Setup

Use this option of the **Alarms** screen to access the following options:

Loading Limits   Configure the following in amps and as a percentage of full load:

- **Out High**: The upper limit for output current

- **Out Low**: The lower limit for output current

- **Out Neut**: The upper limit for current on the neutral wire for the output phases

Voltage Limits   Configure the following as a percentage under or over the rated voltage:

- **Input**: The allowed range for input voltage

- **Output**: The allowed range for output voltage

Other Limits	Configure these limits:

> • **Frequency**: The frequency variation, in hertz, that is acceptable for the output current.
>
> • **Gnd Current:** The ground current, in amps, that is acceptable (if applicable).

Global Alarm Config	Set all the loading limits or voltage limits simultaneously as a percentage of full load:

> • **Load Limits:** Set the same percentage for the upper limit of output current, the lower limit of output current, and the upper limit of current on the neutral wire for the output phases (use the **Loading Limits** option to set these thresholds individually).
>
> • **Volt Limits:** Set the same percentage for the high and low thresholds for input and output voltage (use the **Voltage Limits** option to set these thresholds individually).

Select **Apply Now** and then **YES** to implement your changes.

Alarm Beeper

Use this option of the **Alarms** screen to turn the alarm beeper ON or OFF.

PDU Alarms

The following table lists all alarms that can be generated by the InfraStruXure PDU, as displayed by the **All Possible Alarms** option, with numeric variables between the < > characters. Logged alarms will display specific numbers instead.

Alarm Condition	Explanation
Input V <Ln-N>=<Value> Voltage Under Limit	Input voltage of the indicated phase has dropped below the configured lower limit.
Input V <Ln-N>=<Value> Voltage Over Limit	Input voltage of the indicated phase exceeded the configured upper limit.
Output V <Ln-N>=<Value> Voltage Under Limit	Phase-to-neutral output voltage for phase <L-N> dropped below the configured limit.
Output V <Ln-N>=<Value> Voltage Over Limit	Phase-to-neutral output voltage for phase <L-N> exceeded the configured limit.
Output I L<n>=<Value> Current Over Limit	Current of output phase <n> exceeded the configured limit.
Output I L<n>=<Value> Current Under Limit	Current of output phase <n> dropped below the configured limit.
Output Neut=<Value> Current Over Limit	Current on the neutral wire for the output phases exceeded the configured limit.
Output FDev=<Value> Freq Out of Range	Frequency of the output current is above or below the range that was configured as acceptable.

Alarm Condition	Explanation
Input Transformer Temperature Too High	The temperature of the PDU transformer exceeded the normal limit.
Main Breaker Open Alarm Active	The main input breaker is OFF.
<User Contact Name> Alarm Active	A user-configured contact connected to the PDU monitoring unit is reporting an alarm condition.
No UPS Input Breaker Q1 Open	The Q1 circuit breaker is open, and the PDU is not receiving power from the UPS.
No Panel Feed Breakers Q2 & Q3 Open	The Q2 & Q3 circuit breakers are open, and the PDU is not supporting connected equipment.
Atypical Bypass Mode Alarm Active	The system state as set by the Q1, Q2, & Q3 breakers is in bypass mode.
Branch Ckt Pos: <nn> Current Over Limit	Current on one of the poles of a branch circuit breaker <nn> exceeded the configured limit.
Branch Ckt Pos: <nn> Current Under Limit	Current on one of the poles of a branch circuit breaker <nn> dropped below the configured limit.

Panel Screen

Branch Ckt Loading

You can display **Branch Ckt Loading** (Branch Circuit Loading) status if the option to measure current at the distribution circuit breakers is installed.

You can view data for individual pole positions on the distribution panel. To view the status of a pole position, select the range that includes the position:
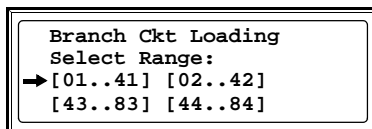
```
   Branch Ckt Loading
   Select Range:
➜ [01..41] [02..42]
   [43..83] [44..84]
```

The top line of selections applies to the top distribution circuit breaker panel on the PDU. The bottom line applies to the bottom distribution circuit breaker panel. The panel position numbers on the screen correspond to the numbers on the distribution panel (odd numbers on the left, even numbers on the right).

After selecting the correct range, press the Up or Down arrow to scroll through the list of circuit breakers within the selected range. Poles that are tied together will be shown on the same screen.

```
   Ckt: 03of21 Irms %LD
   05: 20A     11.3 56.5
```
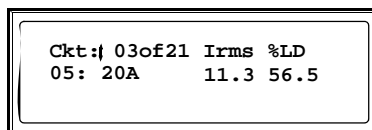
In the example above, the screen shows the third of 21 circuit breakers in the selected range. This is a single-pole circuit breaker, occupying panel position 05. The circuit breaker is rated at 20 amps. The following data are displayed for each pole:

- **Irms**: Measured root mean square (RMS) current of the pole position.

- **%LD**: Present load as a percentage of rated load of the pole position.

Branch Ckt Limits

This is available only if the option to measure individual currents is installed. **Branch Ckt Limits** (Branch Circuit Limits) accesses a scrollable list of the circuit breakers in the panel. For each circuit breaker, the screen displays, in the **Loading** column, the current on each panel position as a percentage of the rated current. In the **Load Alarm** column, you can configure the high and low thresholds for the circuit breaker as a percentage of its rated current. For example, if you set 80% as the high threshold for a single-pole 20-amp circuit breaker, an alarm condition occurs if the current reaches 16 amps.

Panel Configuration

You can configure the branch metering settings for each circuit breaker on a distribution panel, or you can configure all circuit breakers on both panels simultaneously.

To configure a circuit breaker, select the range that includes the circuit breaker. The top line of selections applies to the top distribution circuit breaker panel on the PDU. The bottom line applies to the bottom distribution circuit breaker panel. The numbers correspond to the pole positions (odd numbers on the left, even numbers on the

```
┌─────────────────────────────┐
│  Panel Configuration        │
│  Select Range:              │
│ ➡[01..41] [02..42]          │
│                             │
└─────────────────────────────┘
```

right). After selecting the correct range, configure the settings for each circuit breaker within the range.
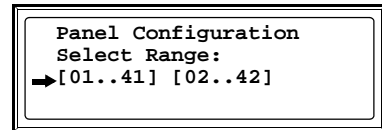
Pos: The pole positions in the selected range.

Breaker: There are two configurable breaker items:

- The circuit breaker rating, in amps.

- The circuit breaker tie indicator. This defines the number of tied (or associated) pole positions. You can associate positions with circuit breakers, which enables you to view the status of each circuit breaker and receive alarm notification when any of a circuit breaker's poles are above or below the configured branch circuit limit. You can also tie together pole positions that are logically associated. For example, you can tie together panel positions for three separate circuit breakers that are connected to the same PDU power cable and that feed power to the same equipment enclosure.

To configure the values on this screen:

1. From the first column, use the arrows to scroll up or down to the pole position you want to configure.

2. Press ENTER to move to the item you want to configure in the third column (the circuit breaker rating or the circuit breaker tie indicator).

3. Scroll again to select the value you want for the circuit breaker rating or the circuit breaker tie indicator. To associate one pole position with the next position in the list, choose the + character immediately following the circuit breaker rating. To indicate that the position is not tied to (associated with) the next pole position in the list, choose the] character immediately following the circuit breaker rating. When you change the + or] character that follows the circuit breaker rating in one row, the + or [character before the circuit breaker rating in the next row also changes to indicate the changed association between the pole positions.

   For example, this screen shows three associated single-pole, 20 A circuit breakers occupying positions 08, 10, and 12 on the top right distribution panel.

```
┌─────────────────────────────┐
│   Pos       Breaker         │
│ ➡08        [ 20A +          │
│   10        + 20A +          │
│   12        + 20A ]          │
└─────────────────────────────┘
```

Global Panel Config

Configures the same number of poles or circuit breaker ratings for all circuit breakers in both distribution panels simultaneously. For example, if your system uses only 3-pole, 60-amp circuit breakers, choose this option, scroll to the value 3 for **Poles** and 60 A for **Amp Rating,** and then select **Apply Now** and **YES** to implement your changes.

Config Screen

System/Network

Use this option of the **Config** screen to access these options:

System Password
- **Password**: Change the system password required to access protected screens and fields in the display interface. Enter a string of up to eight alphanumeric characters, followed by the underline character (_) to indicate the end of the string. The default password is **apc**.
- **Time-out**: Set the time that the display interface waits for user input before it reverts to the initial scrolling of status screens. Select 1, 2, 5, 10 (the default), or 30 minutes; or 1, 2, or 4 hours; or Forever.
- **Invalidate NOW**: Re-enter the system password for viewing password-protected screens.

Date/Time
- **Date**: Set in the following format: *dd/mm/yyyy*.
- **Time**: Set in the following format: *hh:mm:ss*.

Local Interface
- **Contrast**: Set the screen contrast for the LCD. Select from **1** (high contrast) to **8** (low contrast).
- **Key Click**: Choose **On** for an audible click whenever you press a navigation key. Choose **Off** to disable the key click.
- **Beeper**: Select **High**, **Medium**, **Low**, or **Off** to adjust the loudness of the audible beeper and the key click.

Network Address
The following values are set by the InfraStruXure Manager during initial configuration:
- **IP**: The system IP address, which the domain name server translates into a domain name.
- **Mask**: The subnet mask, which identifies the sub-network on which the InfraStruXure PDU operates.
- **GW**: The gateway address. This is the physical address of the InfraStruXure PDU, expressed as a 48-bit hexadecimal number.

Electrical Config

This option of the **Config** screen displays information about the electrical service that provides input to the InfraStruXure PDU. All of the values displayed on this screen are set at the factory. Use this information when viewing and setting alarms.

Input Config	Configure the following items:

- **Main Input**: The voltage from the building's electrical service coming into the PDU main input breaker.

  - 3W: 3-phase Delta, measured line-to-line

  - 4W: 3-phase Wye, measured line-to-neutral

- **Transformer**: Indicates whether the InfraStruXure PDU has a transformer.

- **Bypass Input**: Indicates whether the PDU has a bypass input switch (B).

- **Fuse**: Indicates whether the PDU has fuses protecting the SCRs in the UPS. The fuses are present only on single-fed PDUs without a transformer.

Output Config	Configure the following items:

- **Panel Voltage**: The nominal voltage of the distribution panels supplying power to the load equipment (this is measured line-to-neutral).

- **Panel Breaker**: The rating, in amps, of the circuit breaker feeding the distribution panels.

Other Config Items	Configure the following items:

- **Load Test Port**: Indicates whether the PDU has a load test port installed.

- **Max Power**: Maximum power of your InfraStruXure PDU (40 kW or 80 kW).

Manufacturer Data

Use this option of the **Config** screen to display a scrollable list containing information about the InfraStruXure PDU. This information is useful when requesting service or product updates. The following information is displayed:

- Manufacturer Name

- Date of Manufacture

- Date of Calibration

- Hardware Revision

- Firmware Revision (for PDU monitoring and metering)

- Serial Number

- Model Number

System ID

Use this option of the **Config** screen to identify your InfraStruXure PDU. The following fields can be configured:

Device Name	Set a unique name for your InfraStruXure PDU.
Product Location	Provide the physical location of the PDU in your data center.
Product Contact	Identify the person to notify concerning questions or problems with regard to the PDU.

Factory Defaults

Use this option of the **Config** screen to reset all InfraStruXure PDU settings to their factory default values.

Firmware Updates

Use this option of the **Config** screen to download updated firmware to the InfraStruXure PDU.

Operation

How to Apply Power to the System

1. Close (turn ON) the main circuit breaker for the **power source** feeding the PDU.
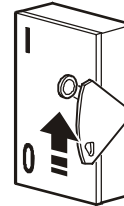
2. Close (turn ON) the **main input breaker** on the PDU.
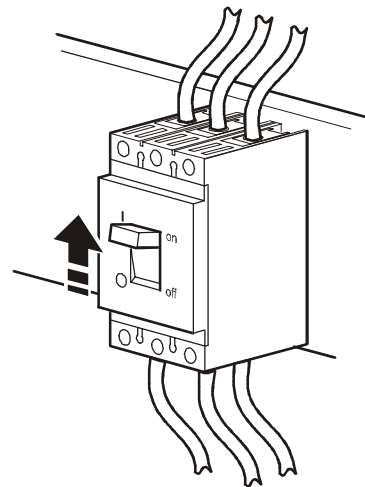
3. Power the PDU distribution circuit breakers:

   a. Close (turn ON) the **main output breaker** on the front of the PDU.
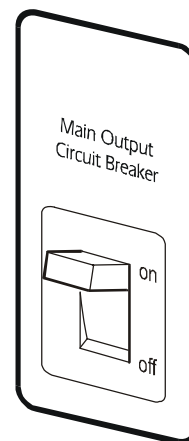
When the main output circuit breaker is closed (turned ON), both PDU distribution panels are energized.

Note

b. Close (turn ON) the individual PDU
   distribution panel circuit breakers.
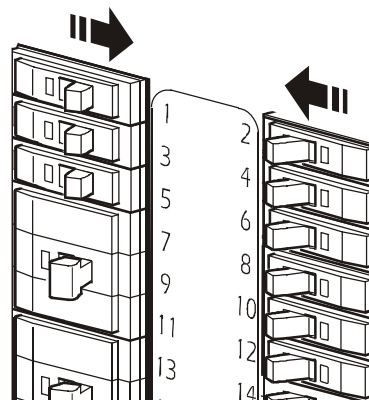
When the distribution panel circuit breakers are closed (turned ON), the PDU power
cables and connected equipment are energized.

Note

c. Close (turn ON) all **sub-feed breakers** (if applicable).
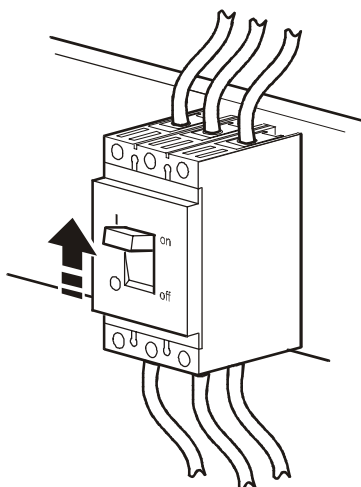
How to Ensure Total Power Off

1. Open (turn OFF) the main circuit breaker for the **power source** feeding the PDU.
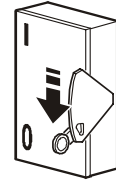
2. Open (turn OFF) the **main input breaker** on the PDU.
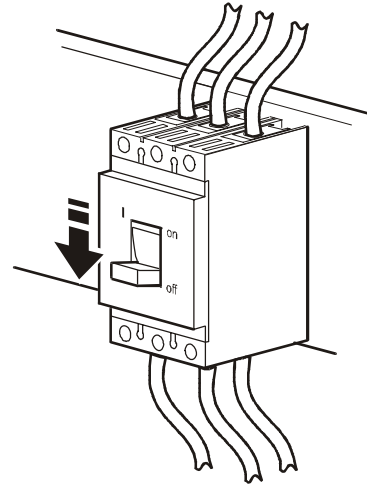
3. Open (turn OFF) the **main output breaker** on the front of the PDU and all s**ub-feed circuit breakers** (if applicable).
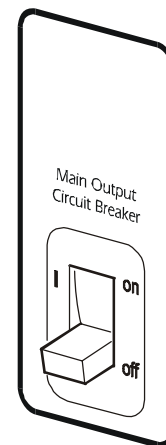
Communication Configuration

InfraStruXure PDU Management Options

Overview

Manage the InfraStruXure PDU and any other InfraStruXure equipment through the InfraStruXure Manager (APC LAN), or through the APC network management interfaces (User LAN).

InfraStruXure Manager

The InfraStruXure Manager is a rack-mount management device that provides a single interface to coordinate the management functions of APC InfraStruXure-certified devices. See "Configuring the InfraStruXure Manager" on page 36 for configuration instructions.

> **See also**
>
> For more information about the InfraStruXure Manager, see the *Installation and Configuration* manual included with the InfraStruXure Manager.

Network management interfaces

Use the control console and Web interfaces to manage the InfraStruXure PDU. See "Configuring the Network Management Interface" on page 37 for configuration instructions.

> **See also**
>
> For more information about the internal user interfaces, see the *Network Management User's Guide*.

Use the SNMP interface with the PowerNet® Management Information Base (MIB) to manage the InfraStruXure PDU. See "Configuring the Network Management Interface" on page 37 for configuration instructions.

> **See also**
>
> To use the PowerNet MIB with an SNMP browser, see the *PowerNet® SNMP Management Information Base (MIB) Reference Guide*, which is provided on the InfraStruXure PDU *Utility* CD.

Configuring the InfraStruXure Manager

Connect the InfraStruXure PDU to the InfraStruXure Manager

1. Connect a CAT-5 network cable to the surge-protected ethernet port on the user connection plate.

   You can make this connection from inside the enclosure, or you can remove the user connection plate to make the connection. Remove the plate using a Phillips or standard screwdriver to loosen the two captive screws. Use the knockout in the plate to route cables to and from the user connections on the plate. Do not disturb the existing connections.

2. Run the connected CAT-5 network cable through the knockout in the user connection plate to the InfraStruXure Manager Hub.

3. Once all equipment has been installed, connect all network cables to the InfraStruXure Manager Hub. When system start-up is complete, configure the InfraStruXure Manager.

See also

For detailed configuration instructions, see the *Installation and Quick-Start* manual included with the InfraStruXure Manager.

Configuring the Network Management Interface

Connect the InfraStruXure PDU to your network

1. Connect a CAT-5 network cable to the surge-protected ethernet port on the user connection plate.

   You can make this connection from inside the enclosure, or you can remove the user connection plate to make the connection. Remove the plate using a Phillips or standard screwdriver to loosen the two captive screws. Use the knockout in the plate to route cables to and from the user connections on the plate. Do not disturb the existing connections.

2. Run the connected CAT-5 network cable through the knockout in the user connection plate to your network connection.

3. Configure the TCP/IP settings of the InfraStruXure PDU. See "Configuration overview" on this page for further instructions.

Configuration overview

Configure the following TCP/IP settings to allow the InfraStruXure PDU to operate on a network:

- IP address of the InfraStruXure PDU

- Subnet mask

- Default gateway

Note

If a default gateway is unavailable, use the IP address of a computer located on the same subnet as the InfraStruXure PDU and that is usually running. The InfraStruXure PDU uses the default gateway to test the network when traffic is very light.

See "Watchdog Features" in the "Introduction" of the InfraStruXure PDU's on-line *Network Management User's Guide* for more information about the watchdog role of the default gateway.

TCP/IP configuration methods

Use one of the following methods to define the TCP/IP settings needed by the InfraStruXure PDU:

- Device IP Configuration Wizard (see "Device IP Configuration Wizard" on this page)

- BOOTP or DHCP server (see "BOOTP & DHCP configuration" on this page)

- Local computer (see "Local access to the control console" on page 40)

- Networked computer (see "Remote access to the control console" on page 40)

Device IP Configuration Wizard

Use the Device IP Configuration Wizard on a Windows NT® 4.0, Windows 2000, or Windows XP computer to discover unconfigured InfraStruXure PDUs and configure their basic TCP/IP settings.

See also
To configure one or more InfraStruXure PDUs by exporting configuration settings from a configured PDU, see "How to Export Configuration Settings" in the on-line *Network Management User's Guide* on the *Utility* CD.

1. Insert the *Utility* CD into a computer on your network.

2. Launch the Wizard, when prompted. If prompted to restart your computer, access the Wizard from the **Start** menu after the computer has restarted.

3. Wait for the Wizard to discover the first unconfigured InfraStruXure PDU, then follow the on-screen instructions.

Note
If you leave the **Start a Web browser when finished** option enabled, use **apc** for both the **User Name** and **Password** to access the InfraStruXure PDU through the browser.

BOOTP & DHCP configuration

The **Boot Mode** setting, a TCP/IP option in the InfraStruXure PDU's **Network** menu, identifies how the TCP/IP settings will be defined. The possible settings are **Manual**, **DHCP only**, **BOOTP only**, and **DHCP & BOOTP** (the default setting).

Note
The **DHCP & BOOTP** setting assumes a properly configured DHCP or BOOTP server is available to provide TCP/IP settings to InfraStruXure PDUs. If these servers are unavailable, see "Device IP Configuration Wizard" on this page, "Local access to the control console" on page 40, or "Remote access to the control console" on page 40 to configure these settings.

With **Boot Mode** set to DHCP & BOOTP, the InfraStruXure PDU attempts to discover a properly configured server. It first searches for a BOOTP server, then a DHCP server, and repeats this pattern until it discovers either a BOOTP or DHCP server.

Note
For more information, see "BOOTP" on this page or "DHCP" on page 39.

BOOTP. Use an RFC951-compliant BOOTP server to configure the TCP/IP settings for the InfraStruXure PDU.

The BOOTP setting assumes that a properly configured BOOTP server is available to provide TCP/IP settings to APC InfraStruXure PDUs. If a BOOTP server is unavailable, see "Device IP Configuration Wizard" on page 38, "Local access to the control console" on page 40, or "Remote access to the control console" on page 40 to configure the TCP/IP settings.

Note

1. Make sure the **BOOTP** setting, a **TCP/IP** option in the InfraStruXure PDU's **Network** menu, is enabled.

2. Enter the InfraStruXure PDU's MAC and IP addresses, the subnet mask and default gateway settings, and an optional bootup file name in the BOOTPTAB file of the BOOTP server.

For the MAC address, look on the quality assurance slip included with the InfraStruXure PDU.

See also

3. When the InfraStruXure PDU reboots, the BOOTP server provides it with the TCP/IP settings.

   – If you specified a bootup file name, the InfraStruXure PDU attempts to transfer that file from the BOOTP server using TFTP or FTP. The PDU assumes all settings specified in the bootup file.

   – If you did not specify a bootup file name, the InfraStruXure PDU can be configured remotely by using Telnet or by using the Web interface: **User Name** and **Password** are both **apc**, by default.

To create the bootup file, see the BOOTP server documentation.

See also

DHCP. Use an RFC2131/RFC2132-compliant DHCP server to configure the TCP/IP settings for the InfraStruXure PDU.

This section briefly summarizes InfraStruXure PDU communication with a DHCP server. For more detailed information about how a DHCP server is used to configure network settings for an InfraStruXure PDU, see "DHCP Configuration" in the InfraStruXure PDU's on-line *Network Management User's Guide*.

See also

1. The InfraStruXure PDU sends out a DHCP request that uses the following identifiers:

   – A vendor class identifier (APC, by default)

   – A client identifier (the PDU's MAC address value, by default)

   – A user class identifier (identification of the PDU's application firmware, by default)

2. A properly configured DHCP server responds with a DHCP offer that includes all of the settings the InfraStruXure PDU needs for network communication. The DHCP offer also includes the vendor specific information option (DHCP option 43). By default, the InfraStruXure PDU will ignore DHCP offers that do not encapsulate the APC cookie in the vendor specific information option using the following hexidecimal format:

   ```
   Option 43 = 01 04 31 41 50 43
   ```

   where:

   – the first byte (01) is the code

   – the second byte (04) is the length

   – the remaining bytes (31 41 50 43) are the APC cookies

See the DHCP server documentation to add code to the vendor specific information option. To disable the APC cookie requirement, see "Local access to the control console" on page 40.

To change the control console's **DHCP Cookie Is** setting, use the **Advanced** option in the TCP/IP menu. See "Remote access to the control console" on this page.

Local access to the control console

To access the control console, use a local computer that connects to the InfraStruXure PDU through the console port on the InfraStruXure PDU monitoring unit.

1. Select a serial port at the local computer, and disable any service using that port.

2. Use the configuration cable (APC part number 940-0103) to connect the selected serial port on the computer to the console port on the PDU monitoring unit.

3. Run a terminal program (such as HyperTerminal®) on your computer and configure the selected port for 9600 bps, 8 data bits, no parity, 1 stop bit, and no flow control. Save the changes.

4. Press ENTER to display the **User Name** prompt.

5. Use **apc** for both **User Name** and **Password**.

6. See "Control console" on page 41 to finish the configuration.

Remote access to the control console

From any computer on the same subnet as the InfraStruXure PDU, use ARP and Ping to assign an IP address to an InfraStruXure PDU, and then use Telnet to access that PDU's control console for configuring the needed TCP/IP settings.

> **Note**
> After an InfraStruXure PDU has its IP address configured, use Telnet, without first using ARP and Ping, to access that PDU.

1. Use ARP to define an IP address for the InfraStruXure PDU, and use the PDU's MAC address in the ARP command. For example, to define an IP address of 156.205.14.141 for an InfraStruXure PDU that has a MAC address of 00 c0 b7 63 9f 67, use one of the following commands:

   – Windows command format:

   ```
   arp -s 156.205.14.141 00-c0-b7-63-9f-67
   ```

   – LINUX command format:

   ```
   arp -s 156.205.14.141 00:c0:b7:63:9f:67
   ```

> **See also**
> For the MAC address, look on the quality assurance slip included with your InfraStruXure PDU.

2. Use Ping with a size of 113 bytes to assign the IP address defined by the ARP command. For the IP address defined in step 1, use one of the following Ping commands:

   – Windows command format:

```
ping 156.205.14.141 -l 113
```

   – LINUX command format:

```
ping 156.205.14.141 -s 113
```

3. Use Telnet to access the InfraStruXure PDU at its newly assigned IP address. For example:

```
telnet 156.205.14.141
```

4. Use **apc** for both **User Name** and **Password**.

5. See "Control console" on this page to finish the configuration.

Control console

After logging on at the control console, as described in "Local access to the control console" on page 40 or "Remote access to the control console" on page 40:

1. Choose **Network** from the **Control Console** menu.

2. Choose **TCP/IP** from the **Network** menu.

3. If you are not using a **BOOTP** or **DHCP** server to configure the **TCP/IP** settings, select the **Boot Mode** menu. Select **Manual boot mode** and then press ESC to return to the **TCP/IP** menu (changes will take effect when you log out).

4. Set the **System IP**, **Subnet Mask,** and **Default Gateway** address values.

5. Press CTRL-C to revert to the **Control Console** menu.

6. Log out (option 4 in the **Control Console** menu).

Note

If you disconnected a cable during the procedure described in "Local access to the control console" on page 40, reconnect that cable and restart the associated service.

How to Access a Network Management Interface on a Configured InfraStruXure PDU

> **⊘**
> **Note**
>
> **Disregard the procedures in this section if using the APC InfraStruXure Manager in your system. See the *Installation and Quick-Start* manual included with the InfraStruXure Manager for network access information.**

Web interface

Use Microsoft® Internet Explorer 5.0 (and higher) or Netscape® 4.0.8 (and higher, except Netscape 6.*x*) to access the InfraStruXure PDU through its Web interface. Other commonly available browsers may also work, though they have not been fully tested by APC.

To use the Web browser to configure InfraStruXure PDU options or to view the event log, use either of the following:

- The HTTP protocol (enabled by default), which provides authentication by user name and password, but with no encryption.

- The more secure HTTPS protocol, which provides extra security through Secure Socket Layer (SSL) and encrypts user names, passwords, and data being transmitted. It also provides authentication of network management cards by means of digital certificates.

To access the Web interface and configure the security of your device on the network:

1. Identify the InfraStruXure PDU by its IP address or DNS name (if configured).

2. Enter the user name and password (by default, **apc** and **apc** for an administrator, and **device** and **apc** for a device manager).

3. Select and configure the type of security you want (this option is available only for administrators).

> **📚**
> **See also**
>
> See the *Network Management User's Guide* for information on choosing and setting up your network security. Use the **Web/SSL** option of the **Network** menu to enable or disable the HTTP or HTTPS protocols.

Telnet and SSH

Access the control console through Telnet or Secure SHell (SSH), depending on which is enabled (an administrator can enable these access methods through the **Telnet/SSH** option of the **Network** menu). By default, Telnet is enabled. Enabling SSH automatically disables Telnet.

Telnet for basic access. Telnet provides the basic security of authentication by user name and password, but not the high-security benefits of encryption. To use Telnet to access an InfraStruXure PDU's control console from any computer on the same subnet:

1. At a command prompt, use the following command line and press ENTER:

   ```
   telnet address
   ```

   For `address`, use the InfraStruXure PDU's IP address or DNS name (if configured).

2. Enter the user name and password (by default, **apc** and **apc** for an administrator, and **device** and **apc** for a device manager).

SSH for high-security access. If choosing the high security of SSL for the Web interface, use Secure SHell (SSH) for access to the control console. SSH encrypts user names, passwords, and transmitted data.

The interface, user accounts, and user access rights are the same whether you access the control console through SSH or Telnet; however, in order to use SSH, you must have an SSH client program installed on your computer and you must have this program appropriately configured.

See the InfraStruXure PDU's on-line *Network Management User's Guide* for more information on configuring and using SSH.

See also

SNMP

After adding the PowerNet MIB to a standard SNMP MIB browser, use that browser for SNMP access to the InfraStruXure PDU. The default read community name is **public**, and the default read/write community name is **private**.

If you enable SSL and SSH for their high-security authentication and encryption, disable SNMP. Allowing SNMP access to the InfraStruXure PDU compromises the high security that was implemented by choosing SSL and SSH. To disable SNMP, use the **SNMP** option of the **Network** menu (you must be an administrator).

Note

FTP and SCP

Use FTP (enabled by default) or Secure CoPy (SCP) to transfer new firmware to the InfraStruXure PDU, or to access a copy of the PDU's event logs. SCP provides the higher security of encrypted data transmission and is enabled automatically when you enable SSH.

If enabling SSL and SSH for their high-security authentication and encryption, disable FTP. Allowing file transfers to the InfraStruXure PDU through FTP compromises the high security that was implemented by choosing SSL and SSH. To disable FTP, use the **FTP Server** option of the **Network** menu (you must be an administrator).

Note

To access the InfraStruXure PDU through FTP or SCP, the default user name and password are **apc** and **apc** for an administrator, and **device** and **apc** for a device manager. In the command line, use the IP address of the unit.

See the InfraStruXure PDU's on-line *Network Management User's Guide* to use FTP or SCP for retrieving log files from the PDU or to transferring firmware files to the PDU.

See also

How to Recover From a Lost Network Management Interface Password

! **Note**

Disregard the procedures in this section if using the APC InfraStruXure Manager in your system. See instead the *Installation and Quick-Start* manual included with the InfraStruXure Manager for information on recovering from a lost password.

1. Select a serial port at the local computer, and disable any service using that port.

2. Use the configuration cable (APC part number 940-0103) to connect the selected port on the computer to the console port on the InfraStruXure PDU monitoring unit.

3. Run a terminal program (such as HyperTerminal®) on your computer and configure the selected port as follows:

   – 9600 bps

   – 8 data bits

   – no parity

   – 1 stop bit

   – no flow control

4. Press ENTER, repeatedly if necessary, to display the **User Name** prompt. If you are unable to display the **User Name** prompt, verify the following:

   – The serial port is not in use by another application.

   – The terminal settings are correct as specified in step 3.

   – The correct cable is being used as specified in step 2.

5. Press the **Reset** button on the PDU monitoring unit. The **Status LED** will flash alternately orange and green. Press the **Reset** button on the PDU monitoring unit a second time while the LED is flashing to temporarily reset the user name and password to their defaults.

6. Press ENTER as many times as necessary to redisplay the **User Name** prompt, then use the default **apc** for both user name and password (if you take longer than 30 seconds to log on after the **User Name** prompt is redisplayed, you must repeat step 5 and log on again).

7. From the **Control Console** menu, select **System**, then **User Manager**.

8. Select **Administrator**, and change the **User Name** and **Password** settings (both had defaulted to **apc** per step 6).

9. Press CTRL-C, log off, reconnect any serial cable you previously disconnected, and restart any service you previously disabled.

Customizing and Updating the PDU

Important Safety Instructions

⚠️ **Warning**

APC does not recommend that you perform maintenance on the PDU while it is receiving input power. However, due to the critical nature of data center loads, this may occur. If you must perform maintenance while the PDU is receiving input power, observe the following precautions to reduce the risk of electric shock:

1. Never work alone.

2. Perform the maintenance only if you are a certified electrician who is trained in the hazards of live electrical installation.

3. Know the procedure for disconnecting electricity to the PDU and the data center in case of an emergency.

4. Wear appropriate personal protective equipment.

5. Use double-insulated tools.

6. Always follow local and site regulations when working on the PDU.

How to Add Circuit Breakers and Power Cables

### Add a circuit breaker on the PDU

1. Snap and bolt the new circuit breaker into a position on the panel.

2. Remove the corresponding plastic blanking plate(s) on the front panel of the PDU.
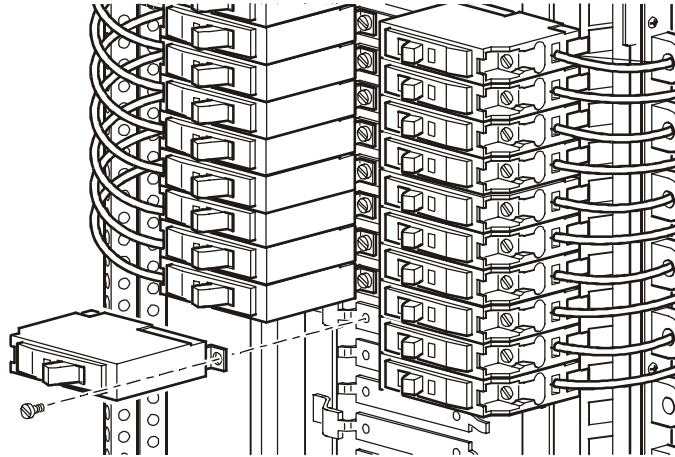
Add a power cable to the PDU

Before adding a power cable, add a circuit breaker.

1. Install a strain-relief connector in any available knockout on the roof of the PDU.

2. Slide enough of the power cable through the strain-relief connector to reach the new circuit breaker.

3. Tighten the strain-relief connector.

4. At the front of the PDU, connect the power cable's individual wires:

   a. If branch current monitoring is installed, route each phase conductor through a current sensor. If using three-phase cable, route the L1, L2, and L3 wires through a separate current sensor.

   b. Connect the L1, L2, and L3 wires to the circuit breaker(s). The illustration on the next page shows single-pole breakers; however, you can also connect three-pole breakers.

   c. Connect the **neutral wire** to the closest open termination point on the Neutral Bar (N).

   d. Connect the **ground wire** to the closest open termination point on the Ground Bar (G).
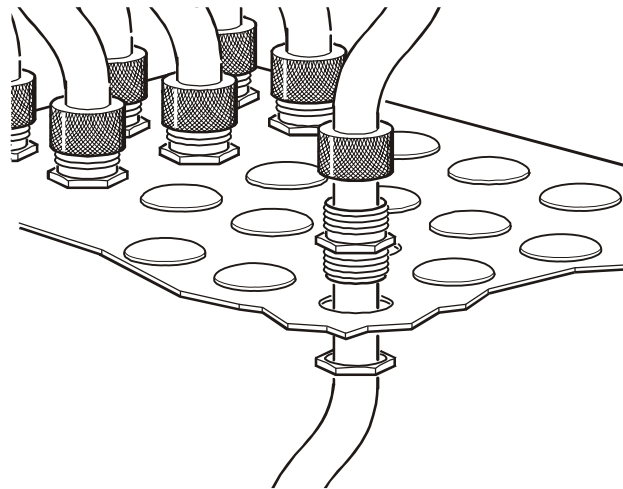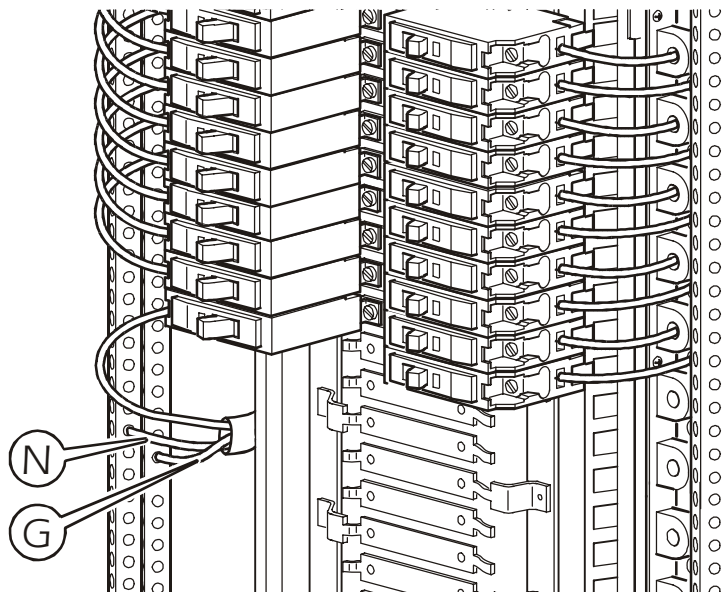
Note (!) Use the InfraStruXure build-out tool to configure the InfraStruXure PDU to use three 20 A, single-pole breakers to feed multi-circuit cables supplying power to L-N loads.

Be aware that one 20 A three-pole circuit breaker must be used with any power cable and rack PDU that feeds L-L loads (NEC, NFPA 70).

How to Add Sub-feed Output Circuit Breakers to the PDU and Connect Power Cables to Sub-feed Breakers

Overview

As an option, you can add 150- or 225-amp sub-feed output circuit breakers (Ⓐ) to the two mounting bracket positions provided on your 150 kW InfraStruXure PDU. These circuit breakers offer a means for distributing higher blocks of power to other equipment. If your PDU has already been configured with one or more sub-feed breakers, proceed to "How to connect cables to sub-feed circuit breakers" on page 50. To install a new sub-feed breaker, follow the instructions in this section.
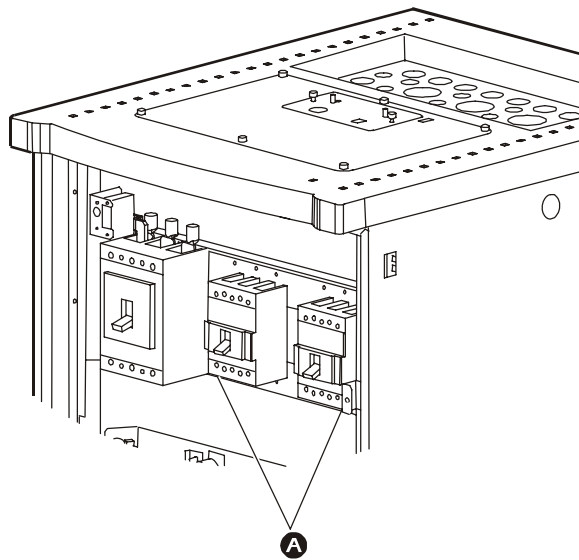
⚠ **Caution** The PDU must be powered down before adding a sub-feed breaker. Refer to "How to Ensure Total Power Off" on page 33.

How to attach the sub-feed breaker to the mounting brackets

1. Mount the sub-feed breaker according to the instructions provided by the manufacturer.

   ⓘ **Note** Install a plastic insulating plate behind the sub-feed breaker before mounting it.

2. Remove the appropriate blanking plate from the door of the PDU and replace it with the faceplate supplied with the sub-feed breaker kit.

3. Using the provided hardware, fasten the **L3** cable to the top of the sub-feed circuit breaker according to the following illustration. Torque to 70 in-lb (8 Nm).
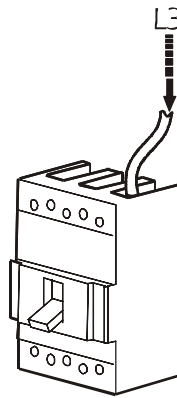
4. Attach an appropriate-sized lug to the other end of the **L3** cable and connect the lug to the terminal block inside the PDU. The following illustrations show the location of the terminal block and the points on the terminal block where phase connections are made. Torque to 275 in-lb (32 Nm).
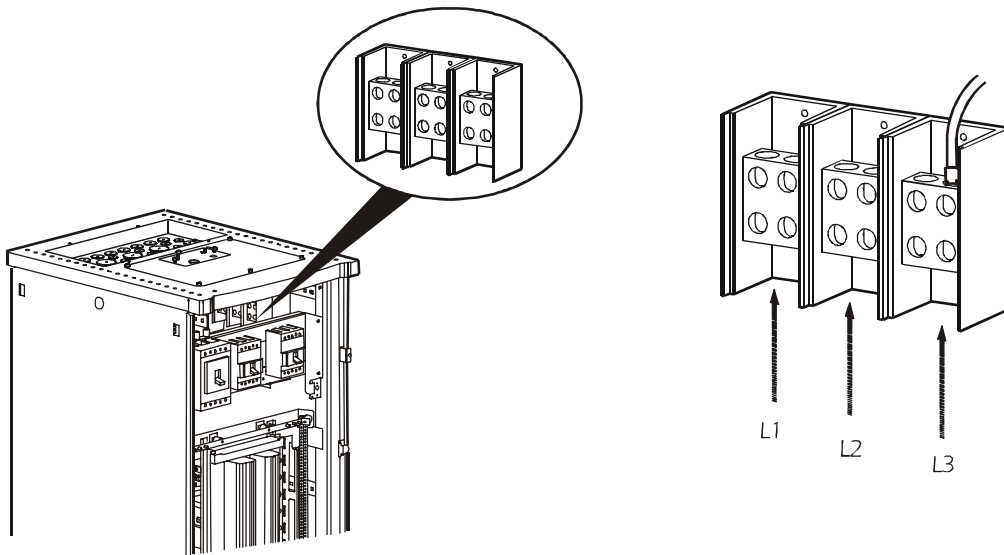
5. Repeat step 3 and step 4 for the remaining **L2** and **L1** cables.

How to connect cables to sub-feed circuit breakers

1. Remove the top or bottom gland plate from the PDU. Use the top gland plate for overhead wiring and the bottom gland plate for under-floor wiring.

2. Use a knockout punch to create an appropriate-sized hole in the gland plate through which you can route the sub-feed cable.

3. Install the conduit, fitting, and lock-nut.

4. Re-attach the gland plate.

5. Thread the sub-feed cable from its load equipment through the conduit to the circuit breaker.

6. Connect the three-phase wires to the load side of the sub-feed breaker.
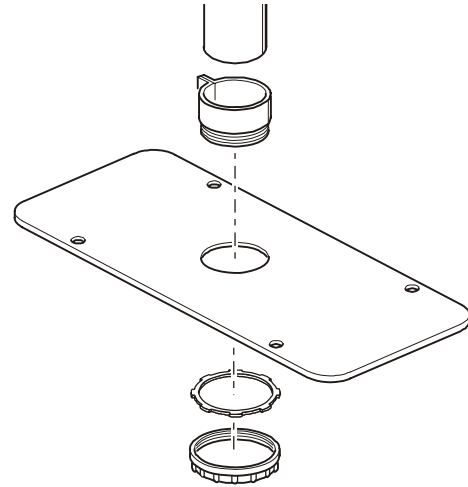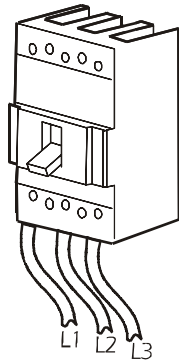
7. Connect the sub-feed **neutral wire** to the neutral bar on the panel (M8 studs are provided).

8. Connect the sub-feed **ground wire** to one of the ground studs on the panel bracket (M8 studs are provided).

How to Connect User Input Contacts and Relay Outputs to the User Connection Plate

Overview

Make contact closure connections (NO or NC) at the user connection plate to monitor dry contacts. You can make up to eight connections—four input contacts and four relay outputs.

The figure on the right shows the location of the user connection plate on the roof of the PDU enclosure.

You can make connections from inside the enclosure, or you can remove the user connection plate to make your connections.

Remove the plate using a Phillips or standard screwdriver to loosen the two captive screws. Use the knockout in the plate to route cables to and from the user connections on the plate. If removing the plate, make sure you do not disturb the existing connections.
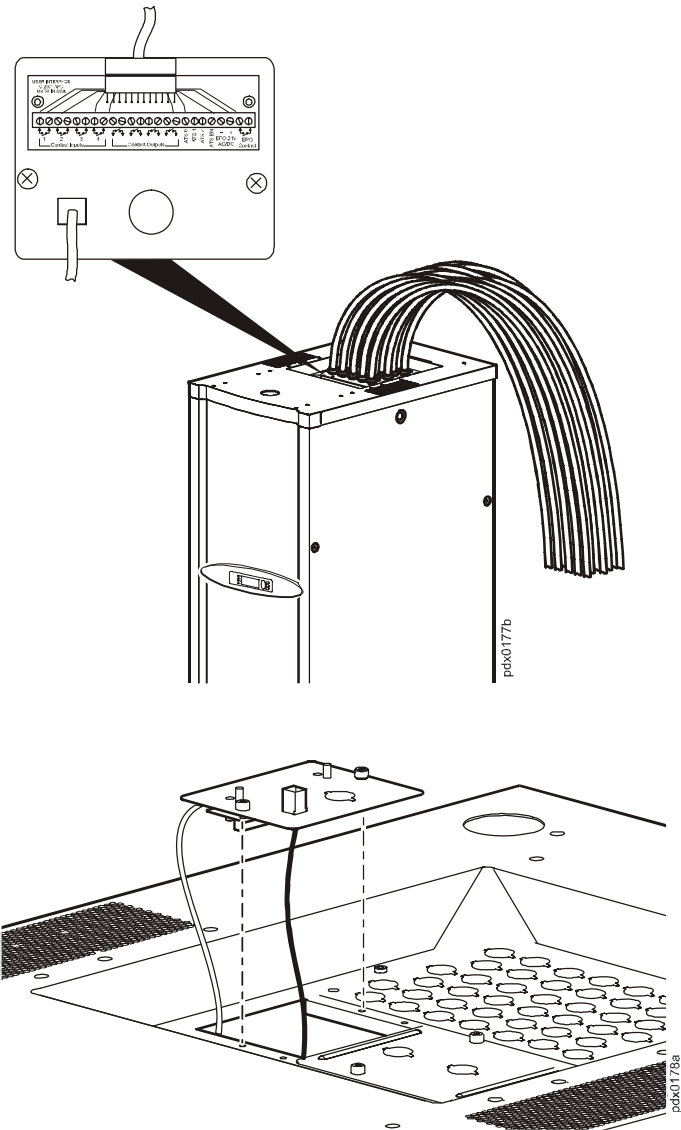
How to connect contacts to the PDU monitoring unit

1. Choose one or more contact numbers on the **User/EPO contacts** port on the user connection plate. The user connection plate connects to the PDU monitoring unit.

2. From the PDU display interface:

   a. Press ESC or ENTER to go to the top-level menu screen.

   b. Select **Contacts** from the top-level menu screen and press ENTER.

   ```
   ┌─────────────────────────┐
   │   Load-Meter    Alarms   │
   │   Volt-Meter    Panel    │
   │ ➤ Contacts      Config   │
   │   Breakers      Help     │
   └─────────────────────────┘
   ```

   c. Select **Contact Inputs** (or **Relay Outputs**) and press ENTER to display the contact inputs (or relay outputs) screen.

   ```
   ┌─────────────────────────┐
   │ ➤ >Contact Inputs        │
   │   >Relay Outputs         │
   │   >Alarm Relay Map       │
   └─────────────────────────┘
   ```
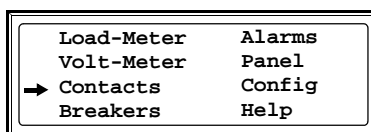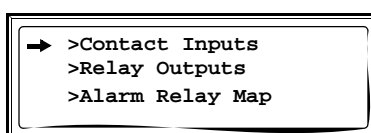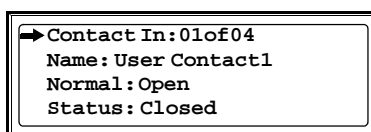
   d. Select **Contact In** and press ENTER to select the number of the contact you are connecting. The continue arrow ↕ will appear next to the contact number. Press the Up or Down arrow to go to the appropriate contact number and press ENTER.

   ```
   ┌─────────────────────────┐
   │ ➤ Contact In:01of04      │
   │   Name: User Contact1    │
   │   Normal: Open           │
   │   Status: Closed         │
   └─────────────────────────┘
   ```

   e. Press the Down arrow to enter a unique **Name** for the contact and to configure the **Normal** state of the contact (Open or Closed). The default **Normal** state is Open. Press ENTER.

   > ⚠ **Note** You will be prompted for your password.

3. Connect contact wires (300 V-rated cabling required) to the terminal block on the user connection plate. Use a 2.5-mm standard screwdriver.

4. Run the wires from the terminal block out the roof or under the floor of the PDU to your contacts.

   > ⚠ **Warning** **Ensure the wires are properly retained and kept away from high-voltage lines and breakers.**

   > 📖 See "Specifications" on page 59 for relay output specifications.

How to Connect an EPO Switch to the PDU and Test the Switch

⊘ **Note**

The main input breaker on the PDU is equipped with a shunt trip for emergency power off. The shunt trip can be activated for EPO functionality by connecting an appropriate power source (24 VAC or 24 VDC) to the EPO interface on the user connection plate.

⊘ **Note**

APC offers an optional InfraStruXure EPO system (EPW9). Contact your APC sales representative or visit the APC Web site (**www.apc.com**) for more information.

⚠ **Caution**

If you are not connecting an Emergency Power Off switch to the PDU, leave the **Arm/Test** rocker on the PDU monitoring unit in the **Test** position.

Safety warnings

Hazardous voltage from the branch circuit must be isolated from the 24 VAC, 24 VDC, and contact closure terminals. 24 VAC and 24 VDC are considered Class 2 circuits as defined in Article 725 of the National Electrical Code (NFPA 70) and Section 16 of the Canadian Electrical Code (C22.1).

A Class 2 circuit is a source having limited voltage and energy capacity as follows:

    a. If an Inherently Limited Power Source, voltage and energy are limited to less than 30 VAC, less than 30 VDC, and 8 A.

    b. If not an Inherently Limited Power Source, voltage and energy are limited to less than 30 VAC, less than 60 VDC, 250 VA, and current is limited to 1000/V max. The fuse is limited to 5 A if less than 20 VAC or 20 VDC, or 100/V maximum if less than 30 VAC or 60 VDC.

If choosing a 24 VAC, 24 VDC, or contact closure connection to the EPO, use one of the following UL-listed wire types:

- CL2 Class 2 cable for general purpose use

- CL2P Plenum cable for use in ducts, plenums, and other space used for environmental air

- CL2R Riser cable for use in a vertical run shaft from floor to floor

- CL2X Limited Use cable for use in dwellings and for use in a raceway

- For installations in Canada, the cable should be CSA-certified, type ELC (extra-low-voltage control cable).

If not using CL2 cable, route the EPO wiring in conduit that does not contain any branch circuit wiring.

Overview

Connecting the switch. The Emergency Power Off (EPO) switch connects to the user connection plate. The figure on the right shows the location of the user connection plate on the roof of the PDU. Three types of EPO connections are available on this plate:

- Contact closure

- 24 VAC

- 24 VDC

! **Note** Contact closure is recommended.
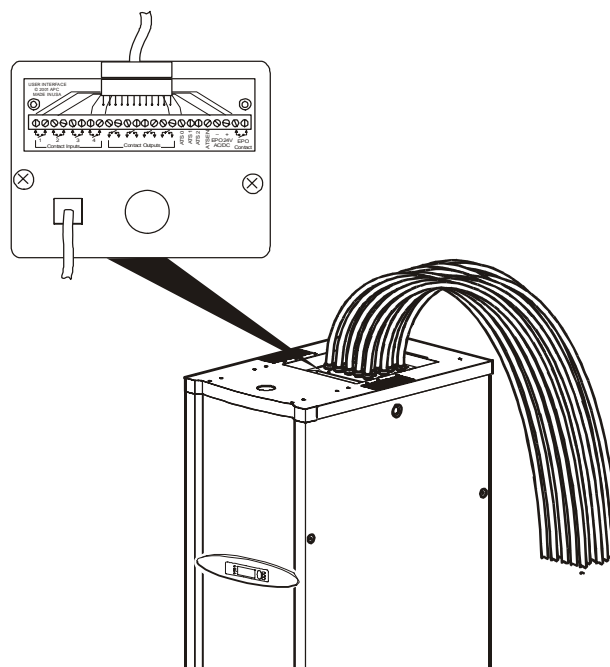
Configuring and testing. Configuring and testing of the switch is done through the EPO interface on the PDU monitoring unit. The figure on the right shows the PDU monitoring unit and the location of the EPO LEDs and DIP switches.

Connect an EPO switch to the user connection plate and test the switch

1. Connect the switch to the appropriate EPO connection points on the terminal block on the user connection plate. Read the label next to the terminal block to determine which connection points apply to your signal type:
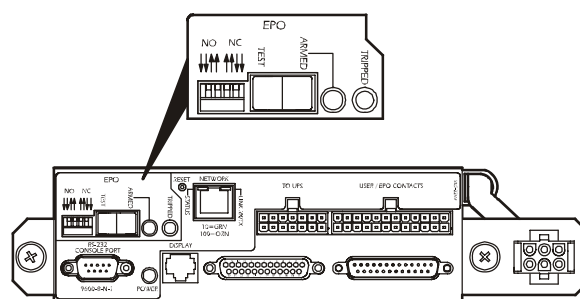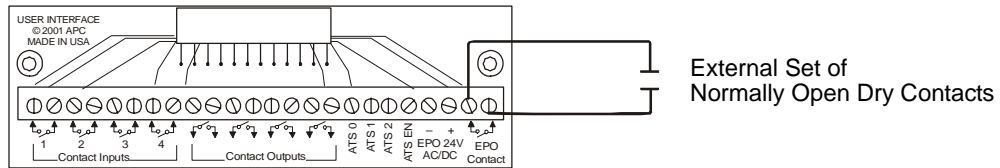
   – **Contact Closure—Normally Open**

   External Set of
   Normally Open Dry Contacts

   – **Contact Closure—Normally Closed**

   External Set of
   Normally Closed Dry Contacts

   – **24 VAC/VDC—Normally Open**

   External Set of
   Normally Open Dry Contacts

   24 V AC or DC Power Supply
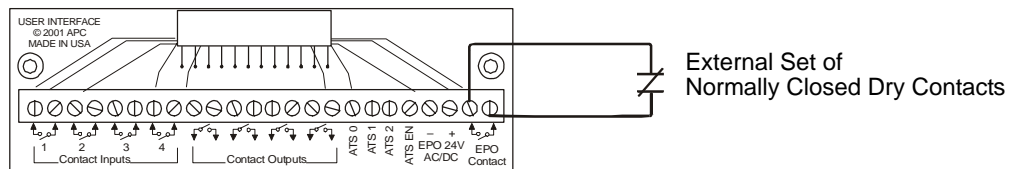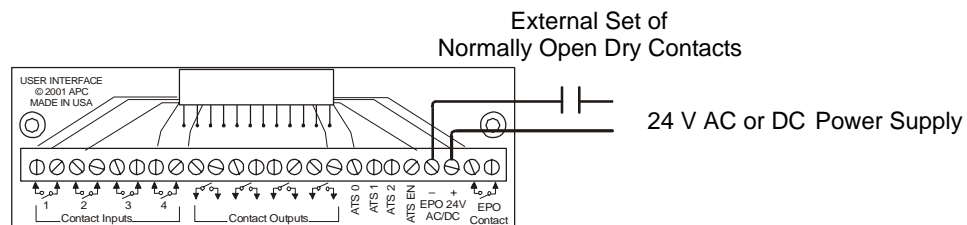
2. Verify that the EPO DIP switches on the PDU monitoring unit are configured properly for your signal type. The labels above the switches and the figure below show the correct settings for both the Normally Open (NO) and Normally Closed (NC) positions.

Note
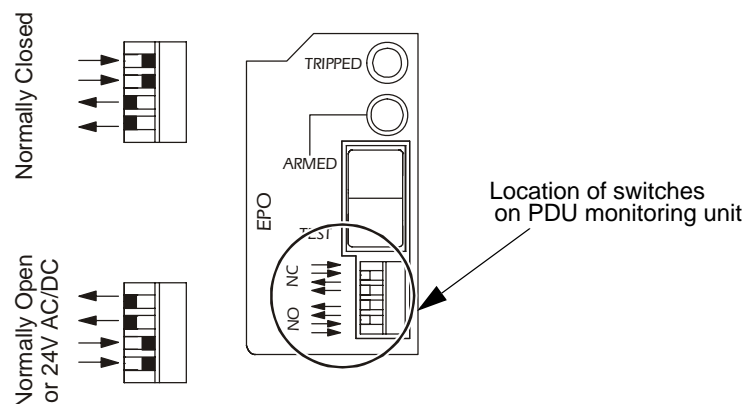
The default setting on the EPO interface is for a **Normally Open (NO)** switch.

3. Test the EPO switch to ensure it is wired correctly and working properly:

   a. Place the **Arm/Test** rocker s in the **Test** position. The EPO state LEDs will be off and the PDU display interface will show the following alarm (in addition to any other active alarms):

```
Active Alarm xxofxx
EPO Ready To Test
```

   b. Engage the EPO switch (if your switch is momentary, engage it while one person is watching the EPO state LEDs and another is at the EPO switch).

   c. Observe the EPO LEDs. If the switch is wired correctly and working properly, both of the EPO state LEDs will light red when the switch is engaged.

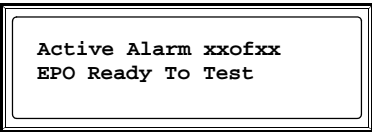   d. If the test was successful, place the **Arm/Test** rocker back to the **Arm** position. The PDU display interface will clear the EPO test mode alarm. If the test was not successful, refer to the following troubleshooting chart:

Problem	Action
Neither state LED was lit red when the EPO switch was engaged.	• Check the wiring to the EPO switch. • Check to make sure the EPO DIP switch configuration is correct for your switch (NO or NC). See step 2 on the previous page for proper configuration instructions.
Only one of the state LEDs was lit red when the EPO switch was engaged.	• Check to make sure the EPO DIP switch configuration is correct for your switch (NO or NC) and retest. See step 2 on the previous page for proper configuration instructions. • If the switch is configured correctly and both LEDs still do not light red after retesting, contact customer support at a number appearing on the back cover of this manual.

   e. Repeat this test for each EPO switch installed.

4. Ensure that the **Arm/Test** rocker is in the **Arm** position on the monitoring unit.

How to Download Firmware Upgrades

Upgrading the PDU monitor processor

You can download available PDU monitor processor upgrades through the PDU display interface. The most obvious indication that a firmware upgrade is necessary occurs when the network management card and the monitor processor stop communicating. This lack of communication ensures PDU data will no longer be accessible through the display interface. A SysData Mismatch alarm will occur. Perform the following steps to upgrade the PDU monitor processor firmware:

1. Upgrade the PDU network management card

See also For instructions on how to upgrade the PDU's network management card, refer to the on-line *Network Management User's Guide* on the *Utility* CD provided with your InfraStruXure PDU.

2. At the PDU display interface, select **Config**, and then **Firmware Updates**. The following screen will appear:

```
Upgrade from X.XX
To X.XX
Press a key.
```
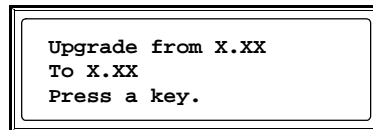
Press any key to download the upgrade.

Note If you do not receive a SysData Mismatch alarm, but want to check for available firmware upgrades, perform step 2 in the procedure above.

From a local computer.

See also To download a firmware upgrade to your computer and then transfer it to the PDU, see "File Transfers" in the InfraStruXure PDU's on-line *Network Management User's Guide* on the *Utility* CD.

1. Select a serial port at the local computer, and disable any service using that port.

2. Use the configuration cable (APC part number 940-0103) to connect the selected serial port on your computer to the console port on the PDU monitoring unit.

3. Run a terminal program, (such as HyperTerminal®) on your computer and configure the selected port for 9600 bps, 8 data bits, no parity, 1 stop bit, and no flow control. Save the changes.

4. Press ENTER twice to display the **User Name** prompt.

5. Enter your **User Name** and **Password** (both **apc**, for administrators only) and press ENTER.

6. From the **Control Console** menu, select **System**, then **Tools**, then **File Transfer**, then **XMODEM**.

7. The system will prompt you with `Perform transfer with XMODEM -CRC?` Type `Yes` and press ENTER.

8. The system will then prompt you to choose a transfer rate and to change your terminal settings to match the transfer rate. Press ENTER to set the PDU to accept the download.

9. In the terminal program, send the file using the XMODEM protocol. Upon completion of the transfer, the console will prompt you to restore the baud rate to normal.

⚠ Do not interrupt the download.
Caution

The PDU network management interface will reboot when the download is complete.

How to recover from a lost network management password

🛈 Disregard this procedure if using the APC InfraStruXure Manager. See instead the *Installation and Quick-Start* manual included with the InfraStuXure Manager.
Note

1. Select a serial port at the local computer, and disable any service using that port.

2. Use the configuration cable (APC part number 940-0103) to connect the selected serial port on the computer to the console port on the InfraStruXure PDU monitoring unit.

3. Run a terminal program (such as HyperTerminal) on your computer and configure the selected port as follows:

   – 9600 bps

   – 8 data bits

   – no parity

   – 1 stop bit

   – no flow control

4. Press ENTER, repeatedly if necessary, to display the **User Name** prompt. If you are unable to display the **User Name** prompt, verify the following:

   – The serial port is not in use by another application.

   – The terminal settings are correct as specified in step 3.

   – The correct cable is used as specified in step 2.

5. Press the **Reset** button on the PDU monitoring unit. The **Status LED** will flash alternately orange and green. Press the **Reset** button on the PDU monitoring unit a second time while the LED is flashing to temporarily reset the user name and password to their defaults.

6. Press Enter as many times as necessary to redisplay the **User Name** prompt, then use the default **apc** for both user name and password (if you take longer than 30 seconds to log on after the **User Name** prompt is redisplayed, you must repeat step 5 and log on again).

7. From the **Control Console** menu, select **System**, then **User Manager**.

8. Select **Administrator**, and change the **User Name** and **Password** settings (both had defaulted to **apc** per step 6).

9. Press CTRL-C, log off, reconnect any serial cable you previously disconnected, and restart any service you previously disabled.

Specifications

150 kW InfraStruXure PDU

Electrical	PD150G6F	PD150L6F
Input		
Nominal voltage	480 V, 3-phase	600 V, 3-phase
Voltage AC	3-phase, 3-wire	3-phase, 3-wire
Frequency	60 Hz , ±3 Hz	60 Hz, ±3 Hz
Max. current per phase	200 A	150 A
Load capacity	150,000 VA	150,000 VA
Max. crest factor	3	3
Output		
Nominal voltage	120, 208 V 1-phase and 208 V 3-phase	
Full load rating	150 kVA	
Nominal current	416 A	
Distribution breaker size	150 A (maximum size)	
Main panel breaker	400 A MCCB	
Sub-feed breaker	150 A/225 A	

Relay Outputs	
Nominal switching capacity	1 A at 30VDC
Maximum switching power	30 W
Maximum switching voltage	60 VDC
Maximum switching current	2 ADC
Maximum carrying current	2 ADC
Surge ratings	2 kV per Bellcore TA-NWT-001089 1.5 kV per FCC part 68

Physical	PD150G6F	PD150L6F
Dimensions (H × W × D)		
PDU	81 × 29 × 36 in (2060 × 740 × 910 mm)	
Shipping	86 × 36 × 48 in (2180 × 910 × 1220 mm)	
Weight		
PDU only	1500 lb (680 kg)	1400 lb (635 kg)
PDU with 28 cables	1900 lb (862 kg)	1800 lb (816 kg)

Physical	PD150G6F	PD150L6F
Shipping	1950 lb (885 kg)	1850 lb (839 kg)
Transformer		
Type	Step-down	
Configuration	Delta to Wye	
Warranty	2 years parts	

Environmental

Temperature		
Operating	32 to 104°F (0 to 40°C)	
Storage	5 to 113°F (–5 to 45°C)	
Humidity		
Operating	0–95%, non-condensing	
Storage	0–95%, non-condensing	
Elevation		
Operating	0 to 3,333 ft (0 to 1016 m)	
Storage	0 to 30,000 ft (0 to 9144 m)	

Compliance

Approvals	cUL Listed, UL Listed

Product Information

How to Obtain Service

Note If you ordered on-site service, see your entitlement certificate and terms and conditions of the service before following the procedure described below. An on-site serve contract entitles you to an on-site visit by an APC technician to assess the issue, determine the problem, and replace parts, if needed (response time varies per contract).

How to contact APC

Customer support for this or any other APC product is available at no charge in any of the following ways:

- Visit the APC Web site to access documents in the APC Knowledge Base and to submit any customer support requests.

    – **www.apc.com** (Corporate Headquarters)

    Connect to localized APC Web sites for specific countries, each of which provides customer support information.

    – www.apc.com/support/

    Global support searching APC Knowledge Base and using e-support.

- Contact an APC Customer Support center by telephone or e-mail.

    – Regional centers:

Direct InfraStruXure Customer Support Line	(1) (877) 537-0607 (toll-free)
APC Headquarters U.S., Canada	(1) (800) 800-4272 (toll-free)
Latin America	(1) (401) 789-5735 (USA)
Europe, Middle East, Africa	(353) (91) 702000 (Ireland)
Japan	(0) 35434-2021
Australia, New Zealand, South Pacific area	(61) (2) 9955 9366 (Australia)

    – Local, country-specific centers: go to **www.apc.com/support/contact** for contact information.

Contact the APC representative or other distributor from whom you purchased your APC product for information on how to obtain local customer support.

APC Worldwide Customer Support

Customer support for this or any other APC product is available at no charge in any of the following ways:

- Visit the APC Web site to access documents in the APC Knowledge Base and to submit customer support requests.
    - **www.apc.com** (Corporate Headquarters)
    Connect to localized APC Web sites for specific countries, each of which provides customer support information.
    - **www.apc.com/support/**
    Global support searching APC Knowledge Base and using e-support.
- Contact an APC Customer Support center by telephone or e-mail.

Regional centers

Direct InfraStruXure Customer Support Line	(1)(877)537-0607 (toll free)
APC headquarters U.S., Canada	(1)(800)800-4272 (toll free)
Latin America	(1)(401)789-5735 (USA)
Europe, Middle East, Africa	(353)(91)702000 (Ireland)
Western Europe (inc. Scandinavia)	+800 0272 0272
Japan	(0) 36402-2001
Australia, New Zealand, South Pacific area	(61) (2) 9955 9366 (Australia)

- Local, country-specific centers: go to **www.apc.com/support/contact** for contact information.

Contact the APC representative or other distributor from whom you purchased your APC product for information on how to obtain local customer support.