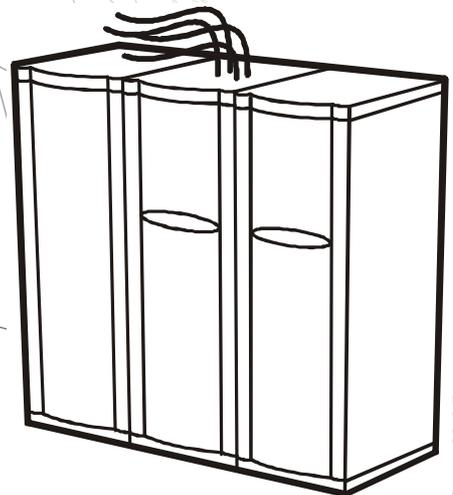


# Installation and Start-Up

## InfraStruXure<sup>®</sup> For Medium Data Centers

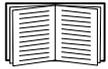
40 kW 208/480/600 V



# About this Manual

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This manual covers basic installation and start-up procedures for certified electricians, American Power Conversion (APC<sup>®</sup>) Field Service Engineers, or APC-trained installers of a 40 kW InfraStruXure<sup>®</sup> system.



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



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

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# Safety

## IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS

---

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

### Symbols 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 death.



**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.



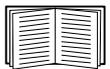
**Caution:** Indicates a potential hazard which, if not avoided, could result in damage to the equipment or other property.



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



**Note:** Indicates important information.



Indicates that more information is available on the same subject.

# Warnings

---

## Installation/Maintenance

Only a certified electrician can perform these tasks:

- Connect the Power Distribution Unit (PDU) to utility power
- Install an upstream circuit breaker
- Route and connect the power cables for under-floor wiring
- Connect a switch to the Emergency Power Off (EPO) interface on the PDU

Only a certified electrician or an APC Field Service Engineer can perform these tasks:

- Connect the PDU to the Symmetra PX UPS
- Perform maintenance of the PDU

Install a circuit breaker to protect the PDU against over-current when you connect the PDU to utility power.



See “Specifications” on page 41 to determine the type of circuit breaker to install.

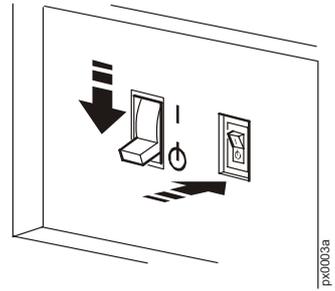
## Maintenance performed while the PDU is receiving input power

APC does not recommend that you perform maintenance of 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.

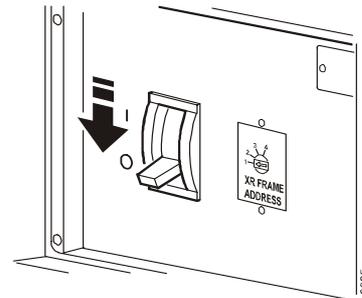
## Total Power Off

- 1 Set the UPS **DC Disconnect** circuit breaker and **System Enable** switch to OFF.



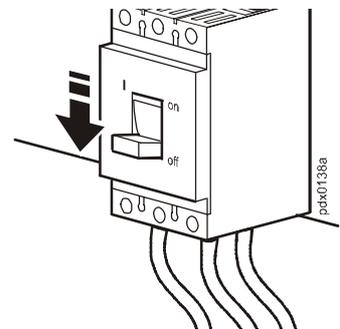
px0003a

- 2 If applicable, set the XR Battery Enclosure **DC Disconnect** circuit breaker to OFF.



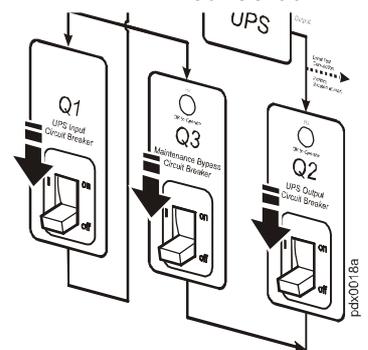
px0005a

- 3 Set the PDU **Main Input** circuit breaker (or switch) to OFF.



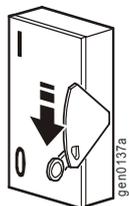
pd00138a

- 4 Open (turn OFF) the **Q1**, **Q2**, and **Q3** circuit breakers on the PDU.



pd0018a

- 5 Set the upstream input utility circuit breaker to the OFF or Locked Out position.



gen0137a

## DANGER—Risk of Electric Shock!



**Electrical Hazard:** Hazardous, live parts inside the Symmetra PX UPS are energized from the battery supply even when the AC power is disconnected.

Hazardous, live parts may exist inside the InfraStruXure PDU because of the Symmetra PX UPS inverter even when the AC power is disconnected. Test any electrical parts before touching them.

## Emergency Power Off (EPO)

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 the 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 you choose to use 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 installation in Canada, the cable should be CSA Certified, type ELC (extra-low-voltage control cable).

If you do not use a 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 a Class A digital device, 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.

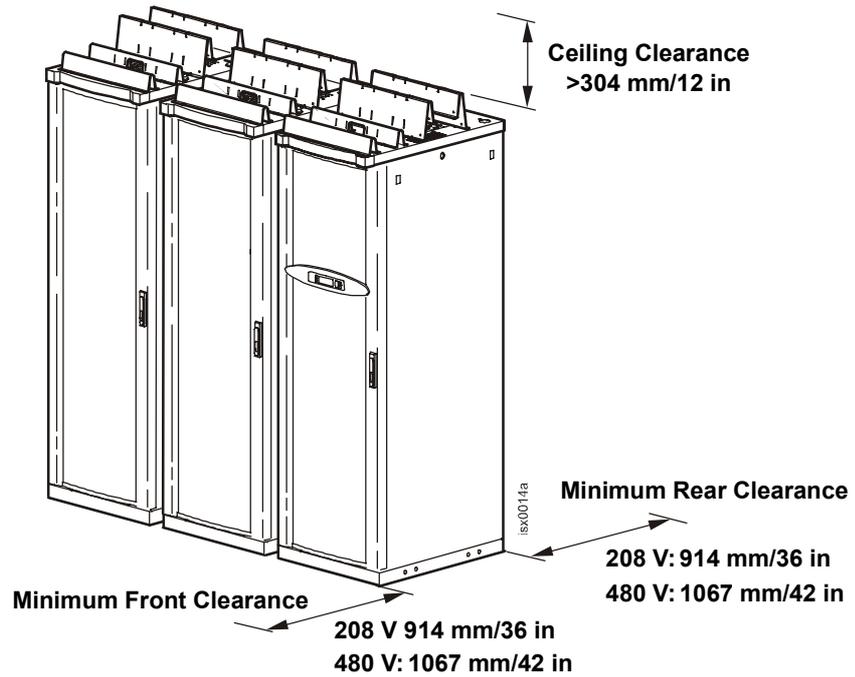
This Class A digital apparatus complies with Canadian ICES-003.

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

# Site Planning

## Space Considerations

Use the figure below to determine the space requirements for installing the InfraStruXure PDU, Symmetra PX UPS, and XR Battery Enclosure. Consult local codes and the NEC for additional requirements.





# Installation Procedures

## Installation Procedure Overview

---

This section provides the basic steps to install the InfraStruXure power and rack components. Follow the references provided with each step for detailed instructions.



**Warning:** Do not begin installing your InfraStruXure system without an APC Field Service Engineer present.



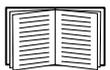
**Note:** Search all boxes and packaging to make sure that they are empty before discarding.

1. Determine the correct placement of the system components by studying the InfraStruXure Configure-To-Order (CTO) report. Move the Symmetra PX UPS, InfraStruXure PDU, XR Battery Enclosure, and NetShelter VX Enclosures to their final location.



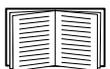
**Warning:** If installing InfraStruXure on a raised floor, make sure that the raised-floor structure has a  $\text{in}^2/\text{lb}$  rating that will support the full weight of the InfraStruXure installation. See “Specifications” on page 41.

2. Level the PDU, UPS, NetShelter, and XR Battery Enclosures, using the 13/14-mm wrench included with each unit.



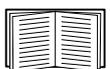
See “Level the PDU, UPS, NetShelter, and XR Battery Enclosures” on page 10 for detailed instructions.

3. Exchange side panels and run battery communication cables, if applicable.



See “Exchange Side Panels” on page 11 for detailed instructions.

4. Join adjacent enclosures.



For instructions on joining the PDU, UPS, and XR Battery Enclosure see “Join the PDU, UPS, and XR Battery Enclosures” on page 13.



For instructions on joining adjacent NetShelter VX Enclosures, see the installation manual included with your enclosures.

5. Ensure total power off.



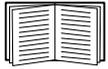
See “Total Power Off” on page 3 for detailed instructions.

6. Connect utility conductors to the PDU.



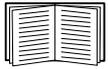
For instructions, see “Connect Utility Conductors to the PDU” on page 14.

7. Connect AC power and control wiring.



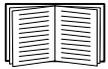
See “Connect AC Power and Control Wiring” on page 18 for detailed instructions.

8. Connect DC power wiring, if applicable.



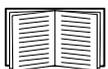
See “Connect DC Power Wiring, if Applicable” on page 20 for detailed instructions.

9. Connect an EPO switch to the PDU user connection plate



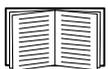
See “Connect an Emergency Power Off Switch” on page 22 for detailed instructions.

10. Connect User Contact Inputs and Relay Outputs to the PDU user connection plate.



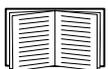
See “Connect User Input Contacts and Relay Outputs to the User Connection Plate” on page 24 for detailed instructions.

11. Install Shielding Troughs, Shielding Partitions, and Cable Ladders.



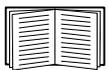
For instructions, see the manuals included with your Shielding Troughs, Shielding Partitions, and Cable Ladders.

12. Install the Rack Automatic Transfer Switches (ATS), Rack Power Distribution Units, and other InfraStruXure rack-mount devices.



For instructions, see the manuals included with your Rack ATS, Rack PDU, or other InfraStruXure rack-mount device.

13. Route and attach power cables to each Rack ATS and/or Rack PDU.



See “Route and Attach Power Cables to the Racks” on page 25 for detailed instructions.

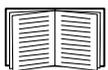
14. Route and attach communication cables to the InfraStruXure Manager hub (or switch).



See “Route Data Cables to the InfraStruXure Manager Hub (or Switch)” on page 28 for detailed instructions.

15. Start the system.

**Only qualified, APC-trained personnel may perform a system start-up.**



See “Start-Up Procedure” on page 29 for detailed instructions.

16. Configure the InfraStruXure Manager.



For instructions, see the manual included with your InfraStruXure Manager.

**Tools Required**

The following tools are required to perform the procedures in this manual. Additional tools may be required for components not covered in this manual.

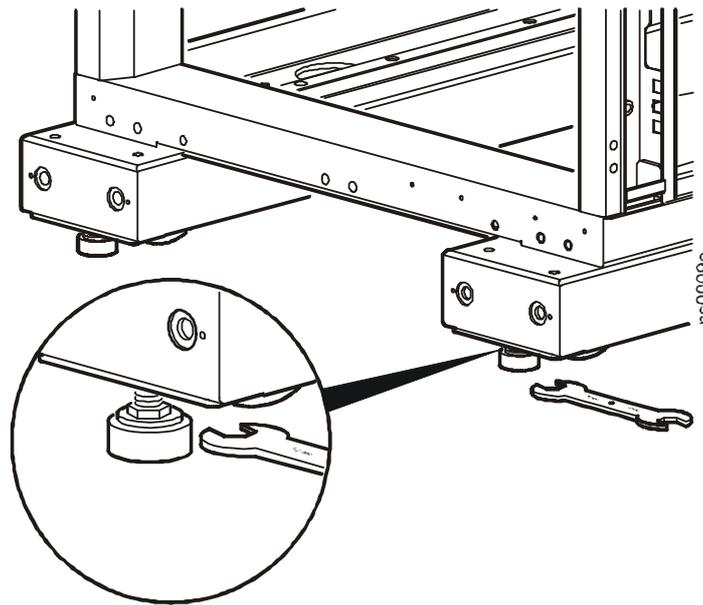
Tool	Supplied?
13-mm socket wrench	No
17-mm socket wrench	No
T-20 screwdriver	No
Standard screwdriver	No
Level	No
Open-ended wrench (14 mm) for adjusting the leveling feet	Yes
Step ladder	No
Crimper	No
Volt-meter	No
Phase-rotation meter	No

# Level the PDU, UPS, NetShelter, and XR Battery Enclosures

---

Leveling feet are attached under the enclosure at each corner. The leveling feet can help provide a stable base if the selected floor space is uneven, but they are not intended to compensate for a badly sloped surface. To level the enclosure:

1. Use a 14-mm end of the open-ended wrench (provided) to extend the leveling foot until it makes firm contact with the floor.

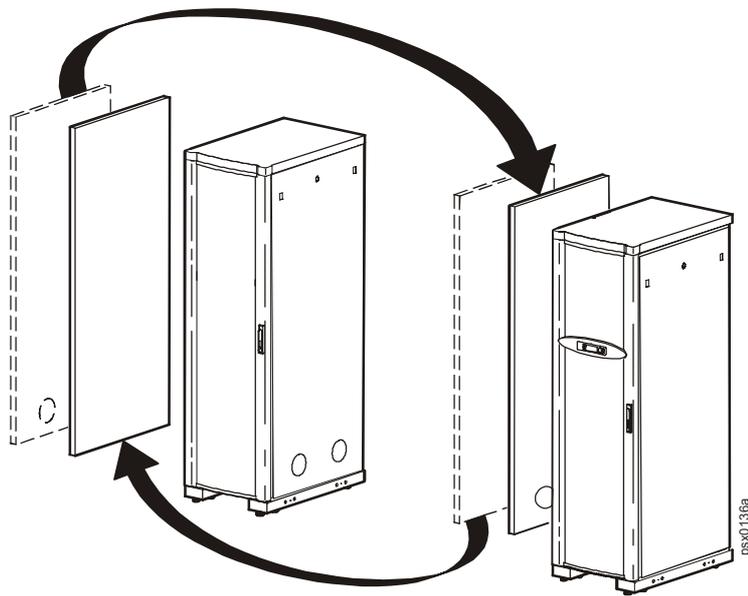


2. Repeat step 1 for each of the remaining leveling feet.
3. Use a level to determine which feet need further adjustment to level the enclosure. Adjust as necessary.

# Exchange Side Panels

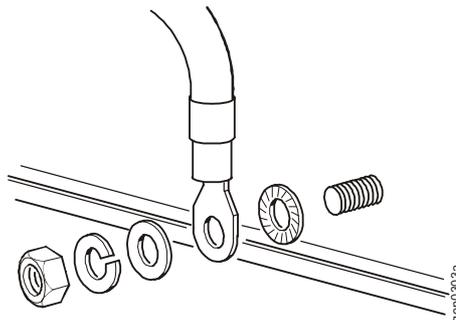
Before installing the InfraStruXure PDU, Symmetra PX UPS, and XR Battery Enclosure, exchange side panels so that the **adjacent** panels will have matching holes for joining the enclosures together and for routing input and output wiring between them. The following side panels will need to be exchanged:

- Adjacent side panels of a PDU and UPS
- Adjacent side panels of a XR Battery Enclosure and a UPS
- Adjacent side panels of two XR Battery Enclosures



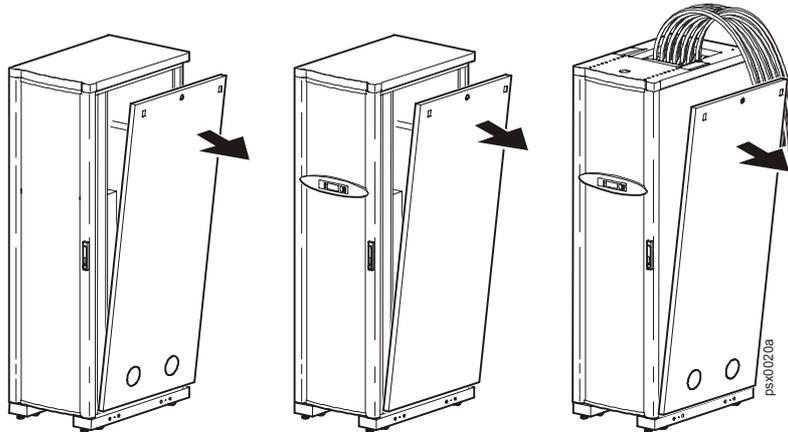
## Exchange Side Panels

1. Detach the ground wires from the side panels.



2. Remove the solid side panels from the side of the UPS that will be adjacent to the PDU and the XR Battery Enclosure in the planned configuration.

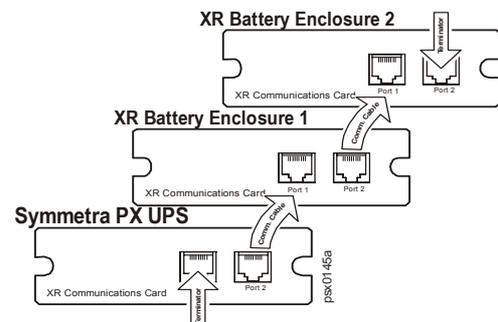
- Remove the side panels from the sides of the PDU and XR Battery Enclosure that will **not** be adjacent to the UPS.



- Remove the rear hole covers from the panels that you removed in step 3.

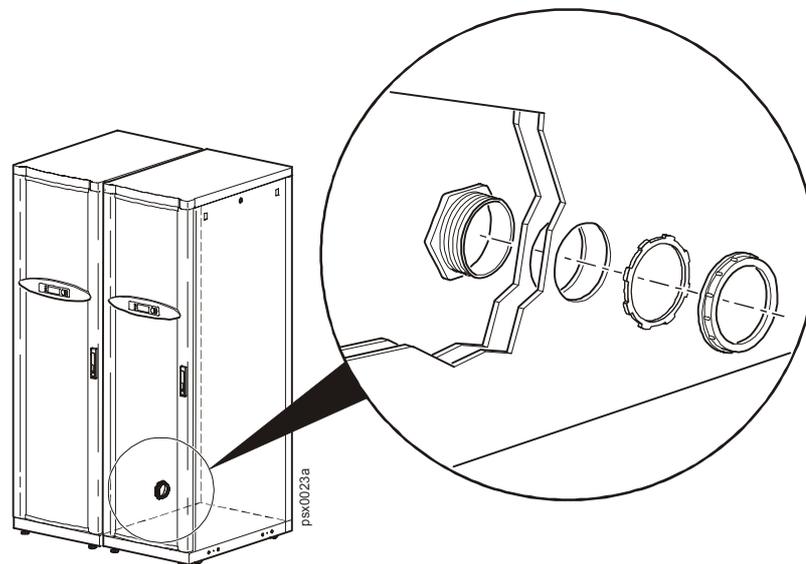
### Connect Battery Enclosure communication cables

- Route the communication cable through the hole between the UPS and the XR Battery Enclosure. Route the cable from the side of the UPS to which it is attached, around the back of the UPS, and through the hole on the other side of the UPS to the front of the XR Battery Enclosure.
- Connect the cable to **Port 1** on the first adjacent XR Battery Enclosure's XR Communication Card.
- Connect **Port 2** on the first XR Battery Enclosure to **Port 1** on the next XR Battery Enclosure. Route the cable the same way as described in step 5. Continue until all XR Communication Cards are connected.
- Locate the XR Communication Card terminator and insert it into the open port of the last XR Battery Enclosure in your configuration.
- Install, on the UPS, the side panels that you removed from the PDU and the XR Battery Enclosure in step 3 and re-attach the ground wires.
- Install, on the PDU and the XR Battery Enclosure, the solid side panel that you removed from the UPS in step 2 and re-attach the ground wires.



# Join the PDU, UPS, and XR Battery Enclosures

1. Move the PDU, Symmetra PX UPS, and XR Battery Enclosures into position, aligning the holes in the adjacent side panels.
2. Level the PDU, Symmetra PX UPS, and XR Battery Enclosure by using a level and adjusting the leveling feet on each enclosure.
3. The following enclosures will need to be attached, refer to the graphic below:
  - An adjacent PDU and UPS
  - An adjacent XR Battery Enclosure and UPS
  - Adjacent XR Battery Enclosures



# Connect Utility Conductors to the PDU

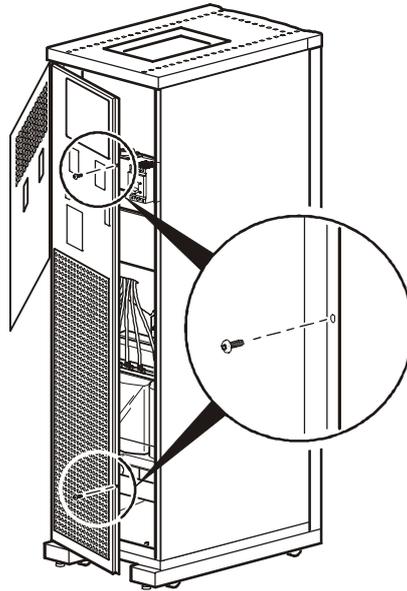
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**Electrical Hazard:** A licensed electrician must connect input conductors to the PDU!

## Access the PDU Main Input switch

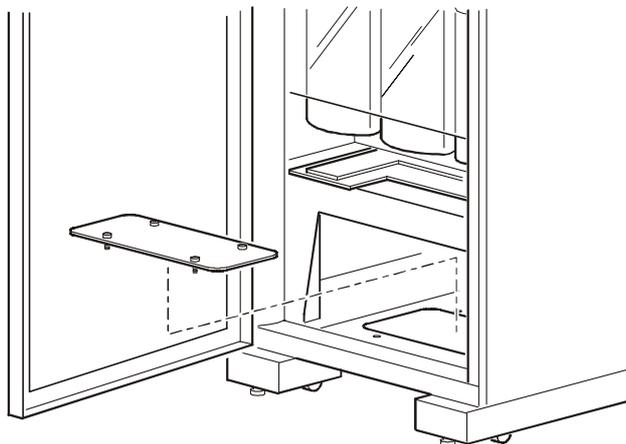
1. Open the back doors of the PDU, unlock the top, smaller door, using the provided red key.
2. Loosen the two screws holding the larger, hinged door in place.



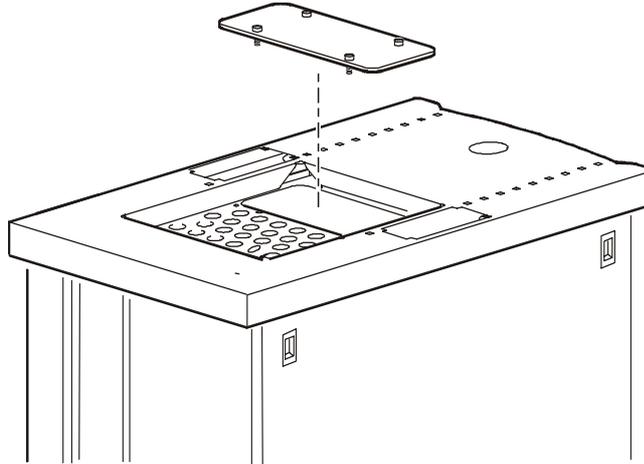
## Attach conduit to the PDU for the input conductors

1. Remove the rectangular gland plate by loosening the captive screws, using a Phillips or standard screwdriver:

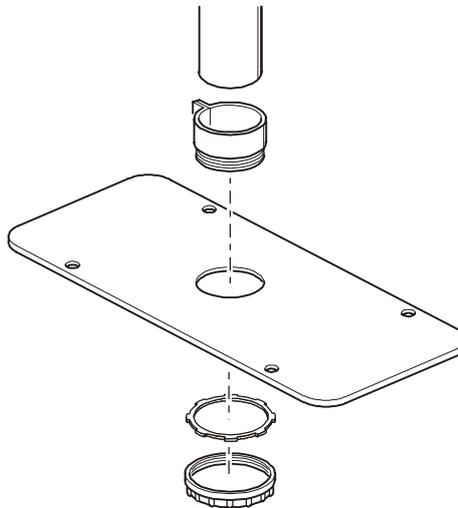
*For wiring under a raised floor:* Remove the plate in the floor of the PDU.



For overhead wiring: Remove the user connection plate from the top of the PDU.



2. Cut an appropriately-sized hole in the gland plate for the conduit.
3. Re-attach the gland plate.
4. Install a lock-nut and bushing to the conduit.
5. Thread the conduit through the hole.



### Install a circuit breaker



**Warning:** When you connect the InfraStruXure PDU to utility, you must install a circuit breaker to protect the PDU against over-current.

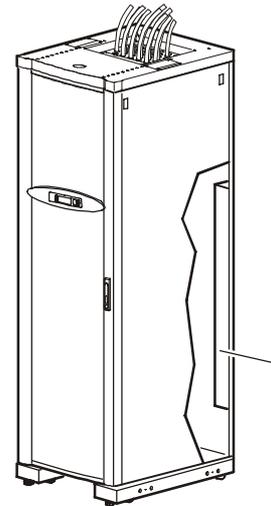
Determine the amperage of the circuit breaker that you need to install:

Input Voltage	Circuit Breaker Amperage
208V	175 A
480V	80 A
600V	60 A

### Route the input conductors to the Main Input switch

For overhead wiring, run the input conductors directly to the Main Input switch.

For wiring under a raised floor, run the input conductors through the wireway (A) within the PDU to the Main Input switch.



### Connect input conductors



**Electrical Hazard:** A licensed electrician must connect input conductors to the PDU!

**Torque specs and tools required.** Before connecting to the terminals, verify the torque specs below by checking the specifications on the Main Input switch.

Terminal	Torque	Tools
L1, L2, L3	150 in-lb	6-mm Allen wrench
N <sup>†</sup>	125 in-lb	13-mm socket wrench
G, GEC	4–6 AWG: 45 in-lb 8 AWG: 40 in-lb	Slotted screwdriver

<sup>†</sup> Only on PDUs without a transformer.

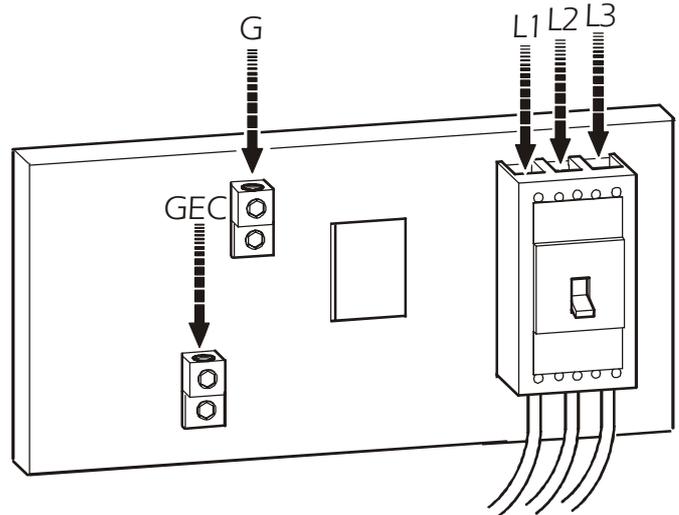
At the Main Input switch, connect the input wiring according to the labels on the switch and the illustrations below.



**Warning:** Connect the conductors to the terminals according to the labels on the terminals. Use copper conductors only.

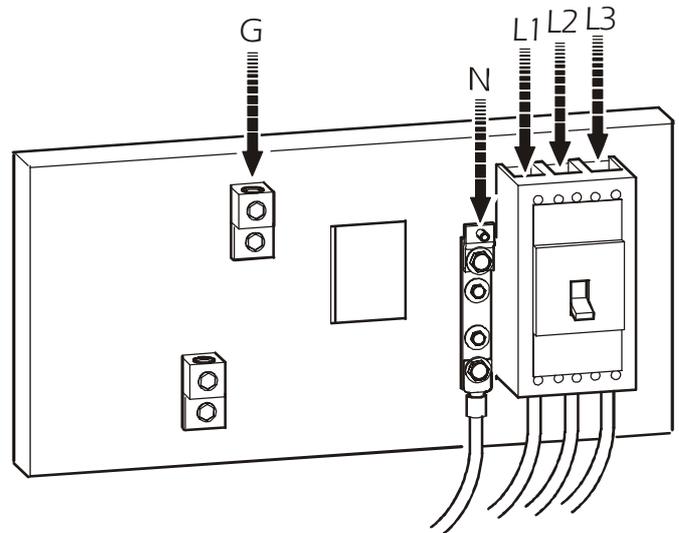
**208/480/600 V input with a transformer:**

3-phase, 3-wire + ground + GEC to a suitable grounding electrode



**208 V input without a transformer:**

208 V, 3-phase, 4-wire + ground



# Connect AC Power and Control Wiring



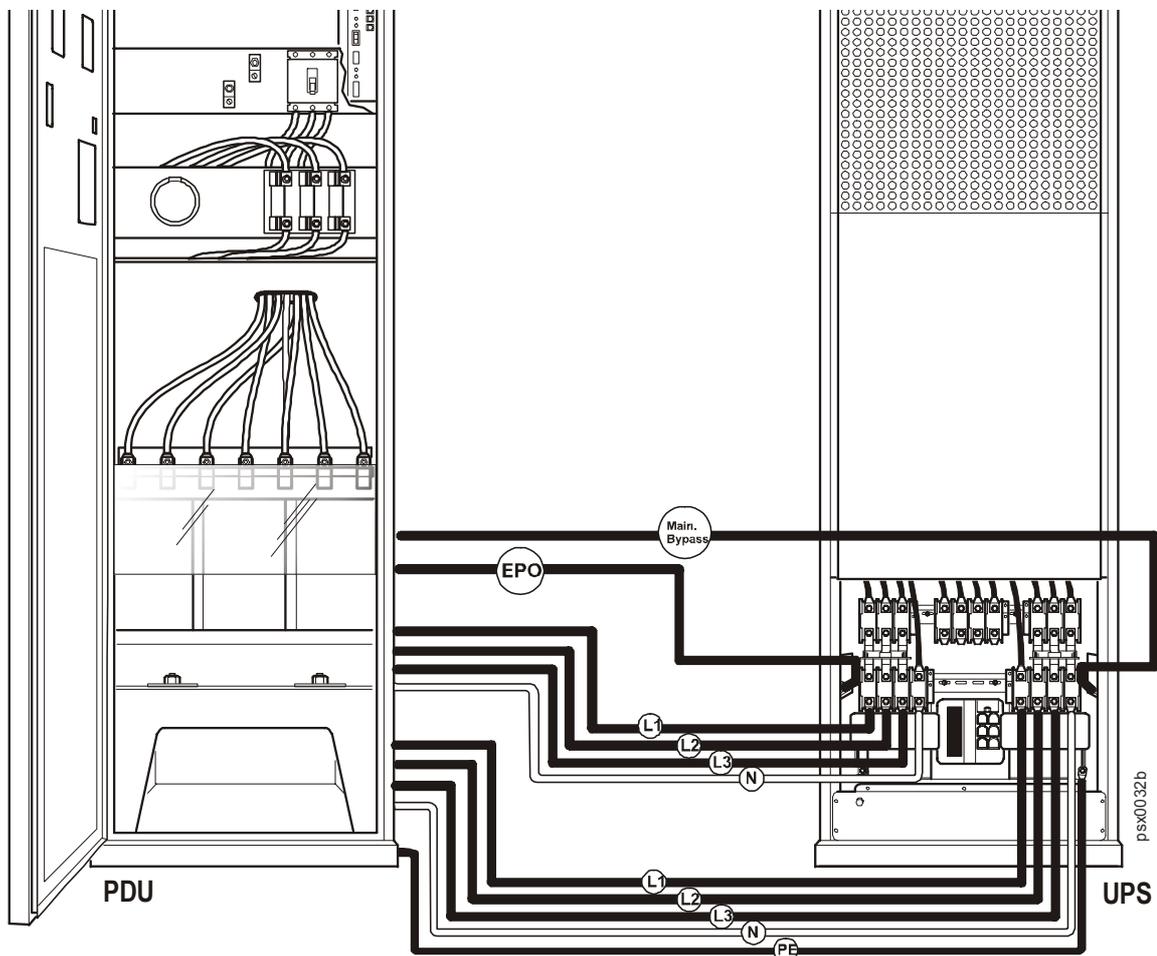
**Electrical Hazard: Only Field Service Engineers or qualified personnel trained by APC may connect the AC power and control wiring.**

Connect AC power and control wiring to the UPS. There are five input wires and four output wires coiled on the floor of the PDU. Each set of wires is labeled. The control wires for the UPS Maintenance Bypass control board and the UPS EPO control board are also coiled in the PDU.

To make the connections, remove the rear lower panel of the UPS and the rear panel of the PDU. Use the opening in the side panels of the enclosures to run the wires.

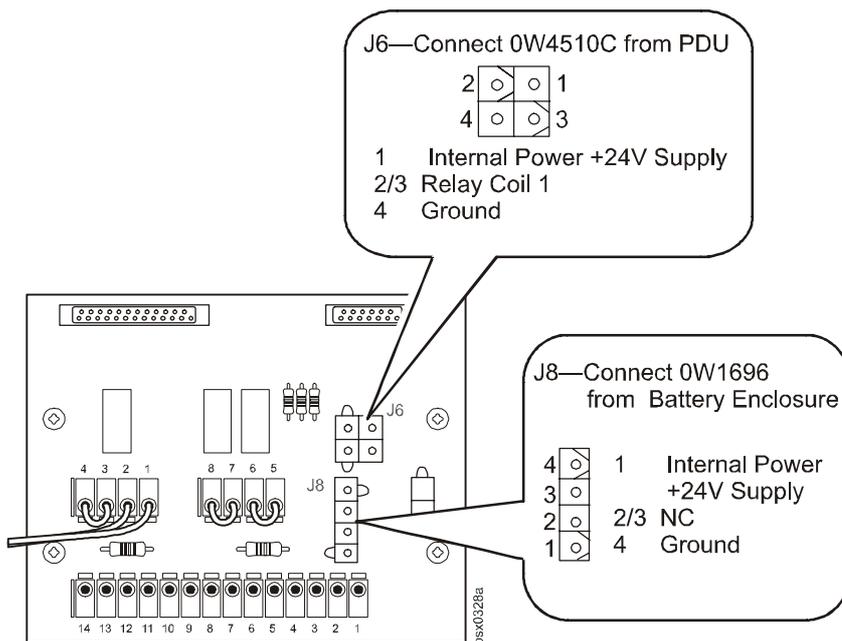
## Connect AC power wiring.

- 1 Attach the input ground wire to the ground lug marked  to the right of the input terminals.
- 2 Attach the **input** wires (L1, L2, L3, N) to the UPS input terminals with corresponding labels.
- 3 Attach the **output** wires (L1, L2, L3, N) to the UPS output terminals with corresponding labels.

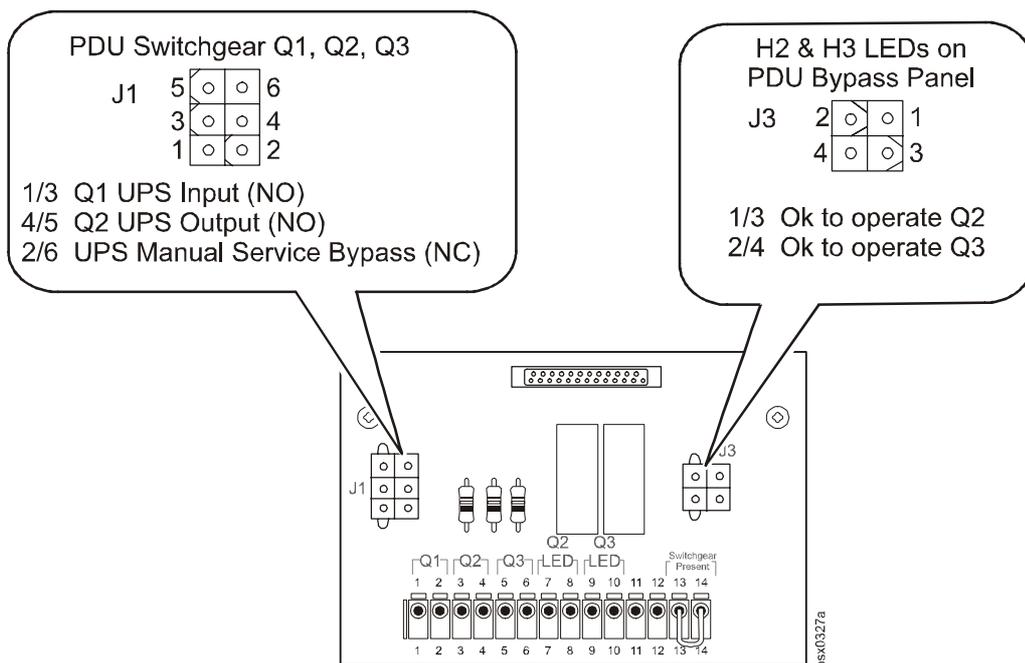


**Connect control wiring.**

1. Connect the EPO control wires from the PDU and the XR Battery Enclosure (if applicable) to the EPO board on the UPS. The control wires are harnessed and coiled in the floor of the PDU and the XR Battery Enclosure. The PDU harness connects to **J6** and the XR Battery Enclosure harness connects to **J8**.



2. Connect the Maintenance Bypass control wire harness from the PDU to the Maintenance Bypass interface board of the UPS. There are two wire harnesses coiled and secured in the PDU. One is a 6-wire harness and the other is a 4-wire harness.



**Note:** A jumper wire must be installed in position 13 and 14.

# Connect DC Power Wiring, if Applicable



**Electrical Hazard:** Only Field Service Engineers or qualified personnel trained by APC may connect the XR Battery Enclosure to the Symmetra PX UPS or to another XR Battery Enclosure.



**Warning:** The supplied power and ground wires are for internal side-panel wiring only. These wires are not for use in external conduits.

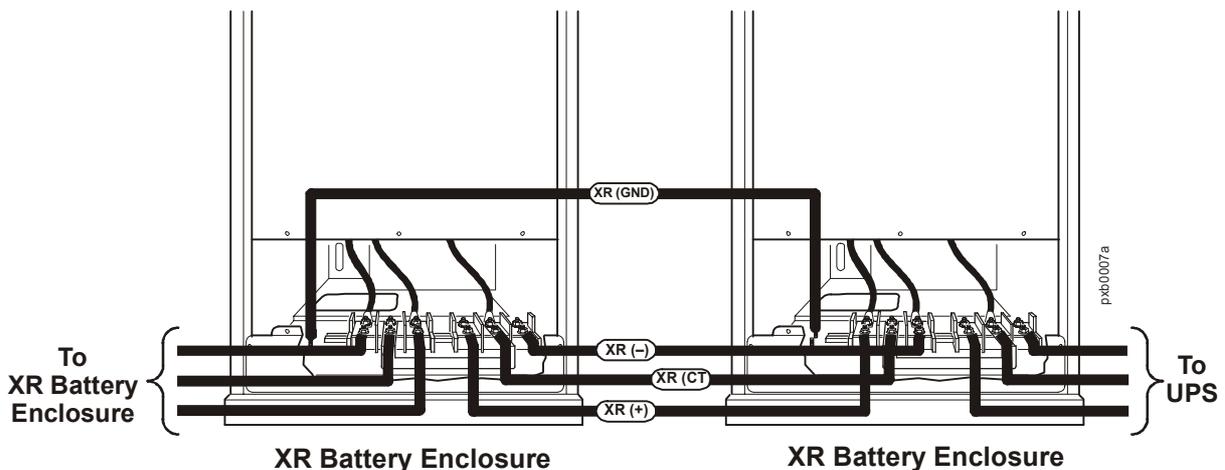


**Electrical Hazard:** Before you begin connecting the DC power wiring, ensure that there are no battery units installed in the XR Battery Enclosures. Do not install battery units until instructed to do so.

## Cascade XR Battery Enclosures

If you have multiple XR Battery Enclosures as part of your InfraStruXure system, you can cascade XR Battery Enclosures to a Symmetra PX UPS. Starting with the XR Battery Enclosure furthest away from the UPS:

1. Route DC output cables and the ground cable (coiled on the floor of the enclosure) from one XR Battery Enclosure to the next XR Battery Enclosure through the adjacent holes in the side panels of the enclosures.
2. Connect the DC output cables from one XR Battery Enclosure to the DC Input Circuit Breaker of the next XR Battery Enclosure [(+) to (+), (CT) to (CT), (-) to (-)].
3. Connect the ground wire from one XR Battery Enclosure to the grounding stud on the next XR Battery Enclosure.



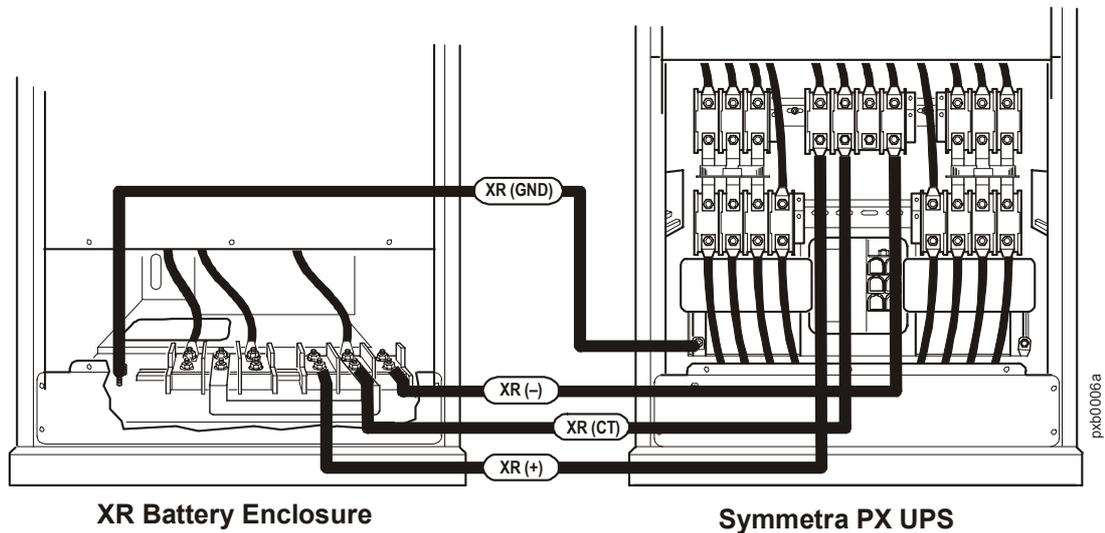
## Connect power cables from the XR Battery Enclosure to the Symmetra PX UPS

1. Route the XR Battery Enclosure DC output cables to the Symmetra PX UPS through the hole in the adjacent side panels.
2. Connect the XR Battery Enclosure DC output cables to the Symmetra PX UPS DC input terminal [(+) to (+), (CT) to (CT), (-) to (-)].



**Tighten the lugs on the terminals only to the torque specified: the power terminal lug diameter is 8 mm with a torque value of 53 lb/in (6Nm).**

3. Connect the XR Battery Enclosure ground cable to the Symmetra PX UPS ground stud through the hole in the adjacent side panels.

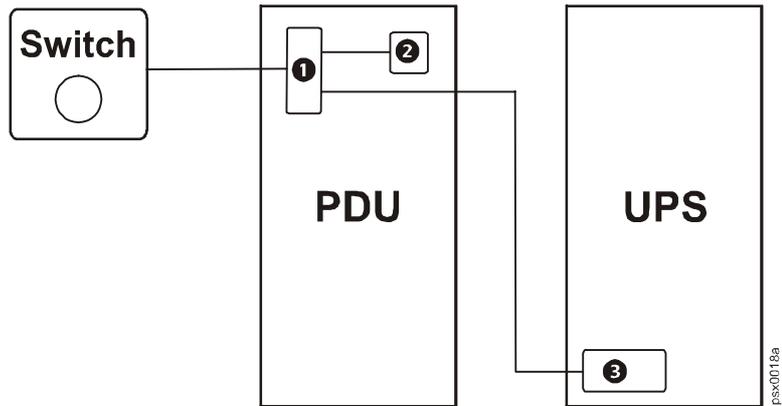


# Connect an Emergency Power Off Switch

## Overview

To provide a mechanism for emergency power off, attach a remote switch (not included) to the EPO interface on the PDU monitoring unit. The EPO interface (1) is connected to the PDU Main Input switch (2) and to the UPS internal EPO switch (3).

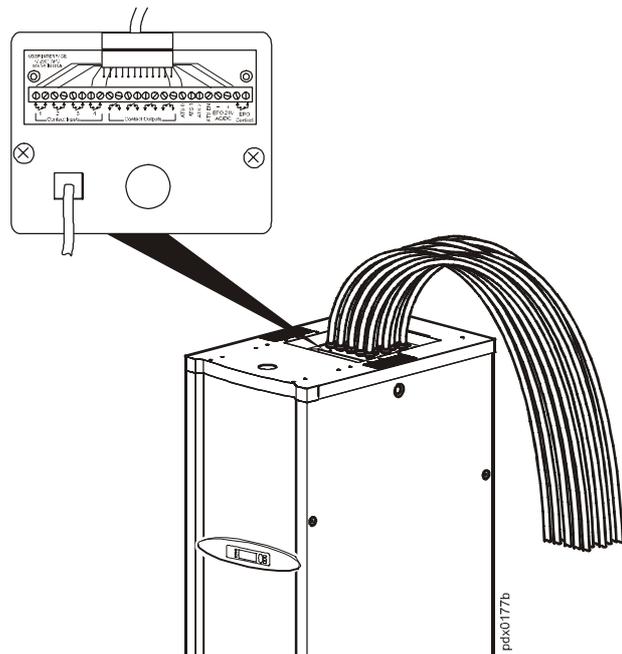
When the EPO is activated, the main input breaker to the PDU transformer is opened, the UPS DC Disconnect breaker is opened, and the UPS System Enable switch is turned off. In this sequence, there is no power from the PDU transformer and there is no power from the UPS inverters and batteries.



**Note:** Contact closure is recommended.

**Connecting the switch.** The Emergency Power Off (EPO) switch connects to the PDU user connection plate. The figure on the right shows the location of the user connection plate on the roof of the PDU. Connect a switch using one of three following connections:

- Contact closure
- 24 Vac
- 24 Vdc

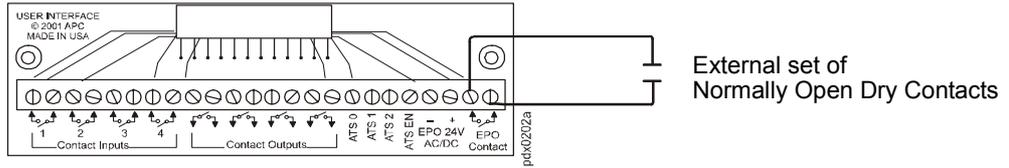


**Note:** APC offers an optional InfraStruXure EPO System (EPW9). Contact your APC sales representative, or visit the APC Web site ([www.apc.com](http://www.apc.com)) for more information.

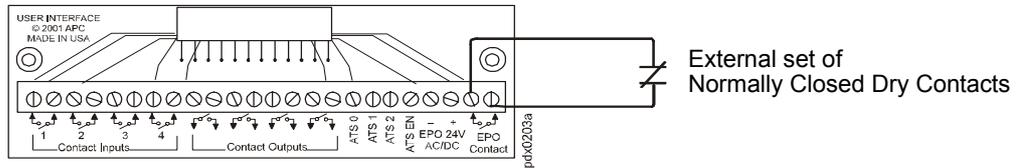
### Connect an EPO switch to the user connection plate

1. Connect the switch to the EPO connection point terminals located on the bottom side of the PDU user connection plate. Read the label next to the terminal block to determine which terminals to connect to for the signal type you are using:

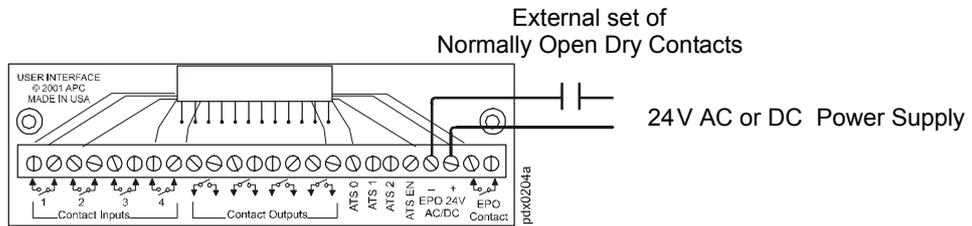
– Contact Closure—Normally Open



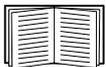
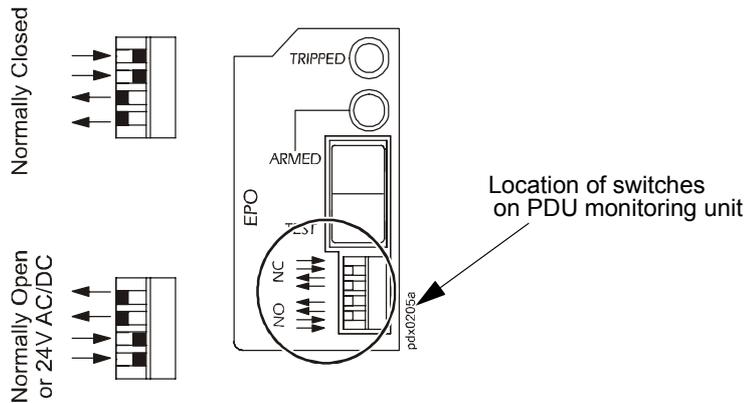
– Contact Closure—Normally Closed



– 24 Vac/Vdc—Normally Open



2. Verify that the EPO DIP switches on the PDU monitoring unit are configured properly for the signal type you are using. The labels above the switches and the figure below show the correct settings for both the Normally Open (NO) and Normally Closed (NC) position.



See the Operation Manual for information on how to test the EPO.

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

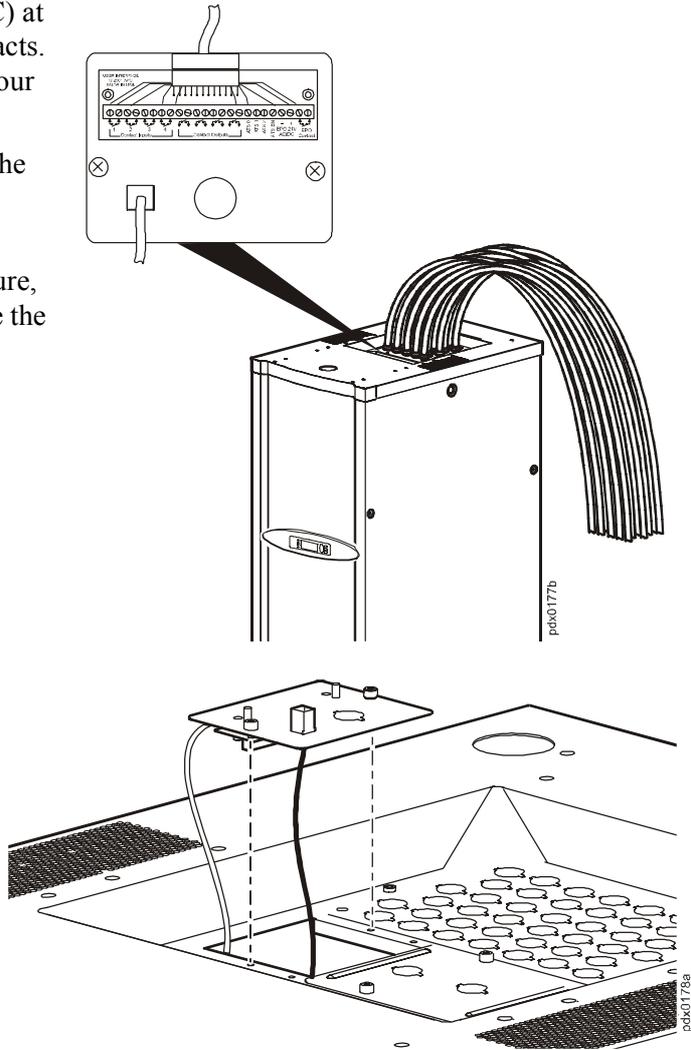
## Overview

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

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

Make the connections from inside the enclosure, or remove the user connection plate and make the connections.

Remove the plate using a Phillips or standard screw driver 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 you remove the plate, make sure that you do not disturb the existing connections.



See the Operation Manual for information on how to configure the input contacts and relay outputs.

# Route and Attach Power Cables to the Racks

## Overhead Wiring

**Route and attach power cables to equipment racks.** If you ordered overhead wiring, connect the prewired power cables of the InfraStruXure PDU as follows:

1. Install the Shielding Troughs, Shielding Partitions, and Cable Ladders so that you can route power cables from the PDU to the Netshelter Enclosures.
2. Find the numbers that indicate the enclosure to which each power cable will supply power. These numbers appear on the roof of the PDU where the power cables exit, and on the ends of each power cable.



**Note:** The enclosures are not numbered. Consult your APC InfraStruXure Configure-To-Order (CTO) report to determine the enclosure associated with each power cable.

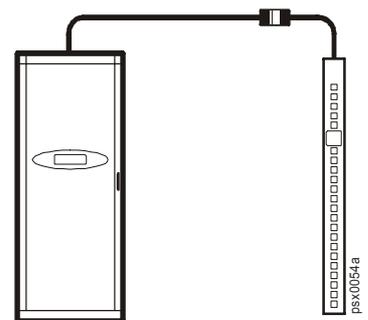
3. Beginning with the power cables for the enclosures farthest from the PDU, run each power cable within the Shielding Trough along the row and, if necessary, across one or more Cable Ladders to the enclosure to which it will provide power.



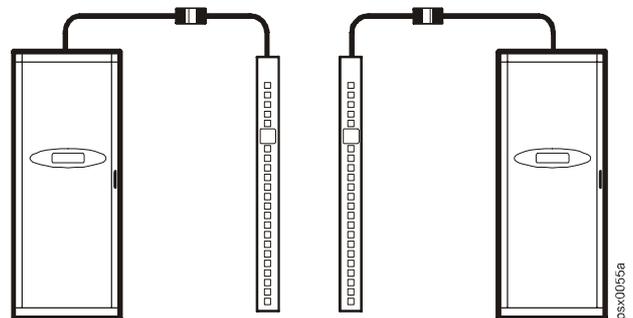
**Note:** Ensure that the L21-20 twist-lock connector at the end of each power cable always lies on top of any longer power cables in the Shielding Trough.

4. Connect the appropriate power cable to APC power management equipment in the enclosure in one of the four following ways:

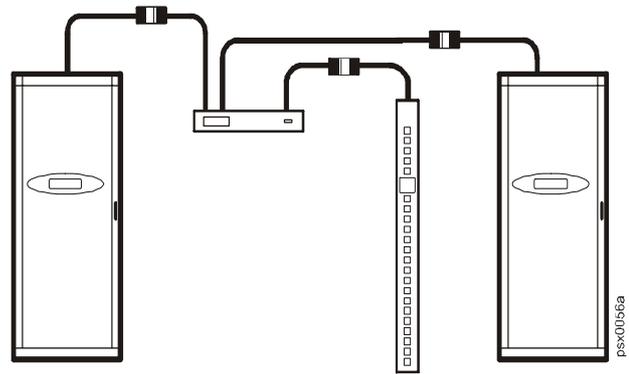
– *For single-feed devices without redundancy:* attach a power cable directly to a Rack PDU installed in a NetShelter VX Enclosure.



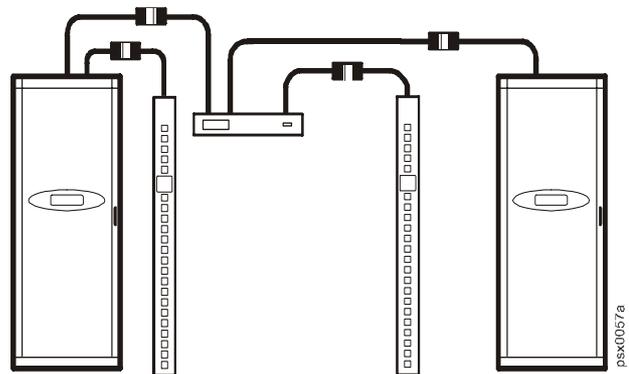
– *For dual-feed devices within a redundant system:* attach a power cable from each PDU into two different Rack PDUs in the NetShelter VX Enclosure.



- For single-feed devices within a redundant system with an Automatic Transfer Switch: connect a power cable to the Automatic Transfer Switch (A and B feeds) and connect the Automatic Transfer Switch power cord to a Rack PDU in the NetShelter VX Enclosure.



- For dual-feed devices in a redundant system with an Automatic Transfer Switch: connect a power cable from each PDU to the Automatic Transfer Switch's A and B feeds, and another power cable from one PDU to a Rack PDU, and the Automatic Transfer Switch's power cord to a second Rack PDU in the NetShelter VX Enclosure.



**Note:** Lay the cables neatly in the Shielding Trough to minimize cable buildup.

5. From each NetShelter VX Enclosure, run the power cable of the appropriate APC power management device out the roof of the enclosure, through the notch in the rear side of the Shielding Trough, to the connector of the appropriate power cable from the PDU. Plug the two connectors together, and twist them clockwise to lock.

## Under Floor Wiring



**Electrical Hazard:** A licensed electrician must route and connect the power cables for under-floor wiring.



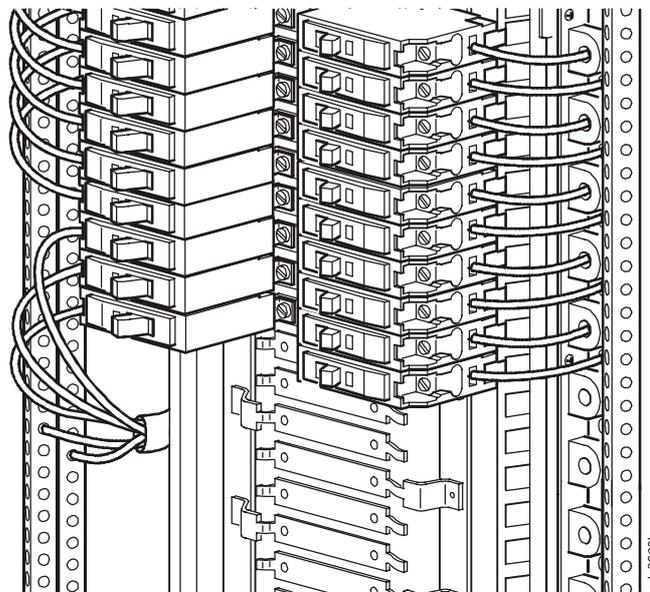
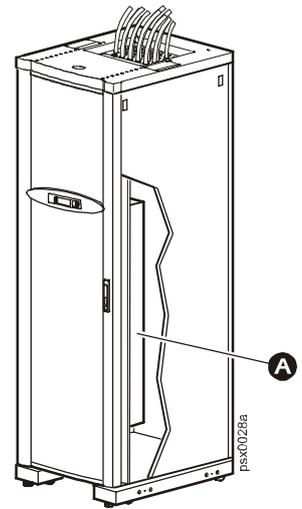
**Warning:** Make sure all wire connections and circuit breaker connections are properly torqued.

To wire each power cable to an enclosure:

1. Push out a knock-out filler in the floor of the PDU to create an opening for the cable.
2. Install Liquidtight™ waterproof conduit under the floor from each enclosure to the PDU.
3. From the Rack PDU or Rack ATS in each enclosure, thread the appropriate power cable (for your

application) from the enclosure through the Liquidtight conduit to the PDU.

4. At the PDU, route the cable through the opening you created in step 1 and then up through the wireway (A) at either side of the PDU. This will allow you to connect the cable to the circuit breaker panel.
5. At the circuit breaker panel, cut the wires to the proper length, and connect the power cable's individual wires:
  - a. If you have branch current monitoring installed, route each phase conductor through a current sensor. If it is a 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 below shows a three-phase cable connecting to three single pole breakers; however, you can also connect a three-phase cable to a three-pole breaker, or a single-phase cable to a single-pole circuit breaker.
  - 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).

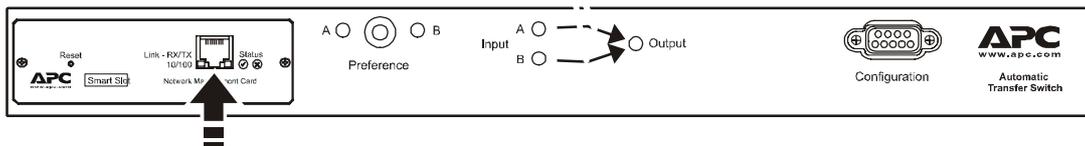


**Caution:** Any multi-circuit power cable that is installed by an electrical contractor must be installed with a 3-pole circuit breaker.

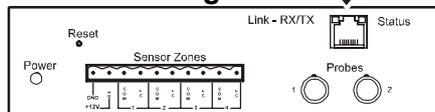
# Route Data Cables to the InfraStruXure Manager Hub (or Switch)

1. Connect a CAT-5 network cable (provided) to the network or 10BaseT ports on your APC InfraStruXure devices. The following devices need to be connected:

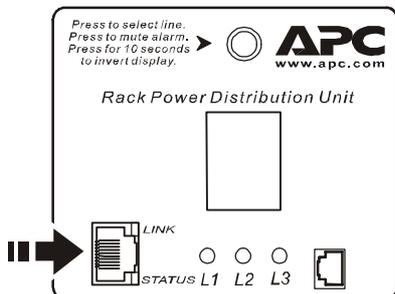
## Automatic Transfer Switch



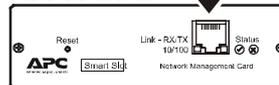
## Environmental Monitoring Unit



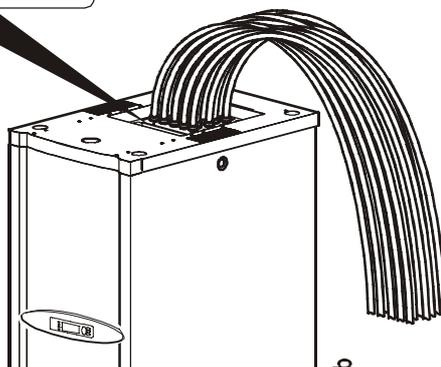
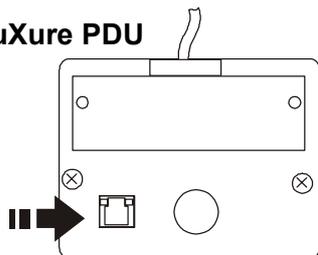
## Rack PDU



## Symmetra PX UPS



## InfraStruXure PDU



2. Run the connected CAT-5 network cables through the data cable troughs to the InfraStruXure Manager Hub (or Switch).
3. Connect each device's network cable to any available station port in the InfraStruXure Manager Hub (or Switch). Station ports are those with an *x* after the number (e.g. 2x).

# Start-Up Procedure

## Apply power to the system

### Safety warnings

This section provides instructions on how to perform a system start-up. Do not skip any steps in this procedure.

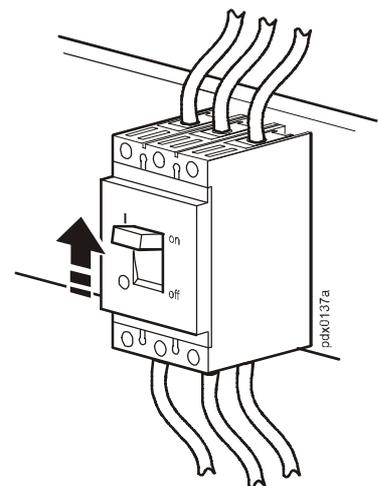
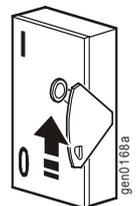


**Electrical Hazard:** Only APC Field Service Engineers or qualified, APC-trained personnel may perform a system start-up. Ensure that all power is off. See “Total Power Off” on page 3.

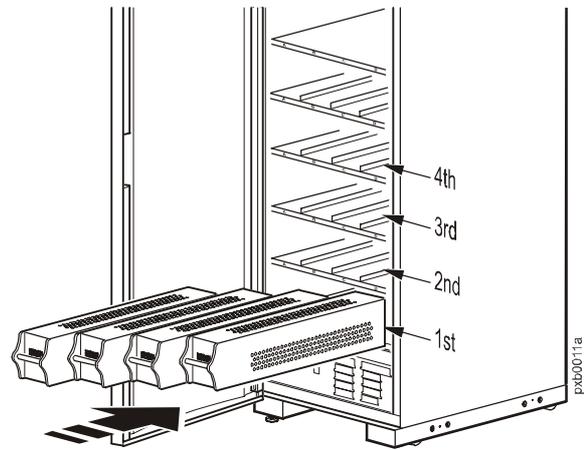


**Warning:** Do not install any batteries into the XR Battery Enclosure or power modules into the Symmetra PX UPS until instructed to do so.

1. Set the upstream main utility input circuit breaker to ON.
2. Ensure A-B-C clockwise phase rotation at the top of the **Main Input** switch on the PDU, using a phase rotation meter.
3. Set the **Main Input** switch on the PDU to ON.
4. Verify A-B-C clockwise phase rotation at the top of the primary winding of the transformer, using a phase rotation meter.
5. Verify that the proper voltage is present on the secondary winding of the transformer (208 V, metered phase-to-phase), using a true RMS voltmeter.



- Install at least one battery module (four battery units) in the Symmetra PX UPS. Install battery modules, starting in the lowest available shelf. Position the battery unit between the grooves, and slide it completely into the enclosure.

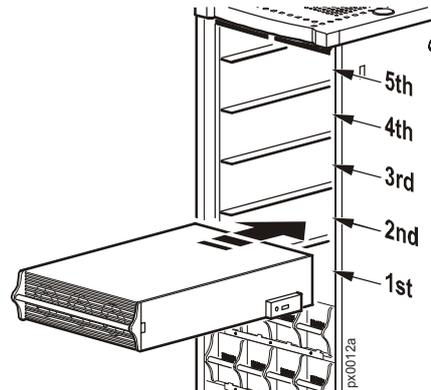


**Heavy:** Use two people to lift and install battery units.



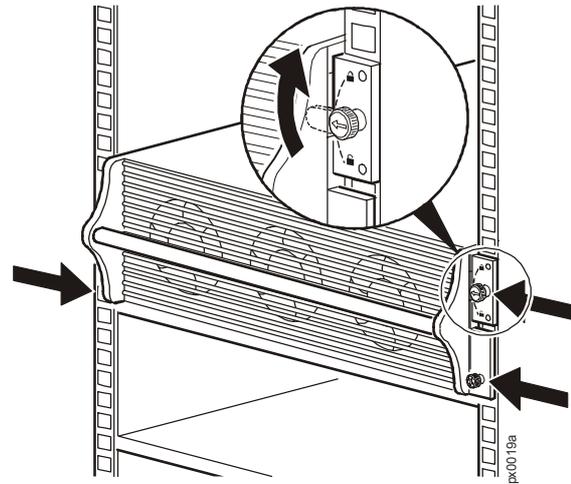
**Electrical Hazard:** The DC bus in the Symmetra PX UPS is energized when battery modules are installed, even when the DC Disconnect circuit breaker is open.

- Install at least one power module in the Symmetra PX UPS. Install power modules starting from the lowest available shelf. Push each module completely into the enclosure.



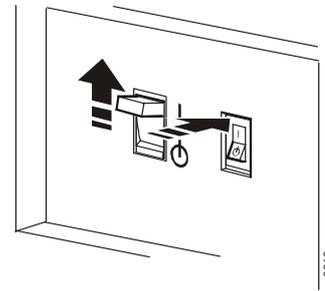
**Heavy:** Use two people to lift and install power modules.

8. Secure the power module:
  - a. Tighten the screws on each side of the power module.
  - b. Turn the locking latch clockwise until the arrow on the knob faces the power module.

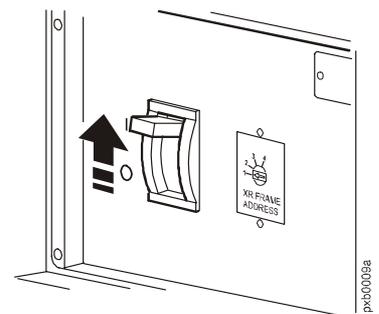


**Note:** The power module will not start unless the locking latch is engaged.

9. Set the UPS **DC Disconnect** circuit breaker to ON, and then set the UPS **System Enable** switch to ON.

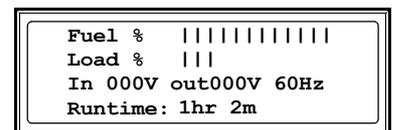
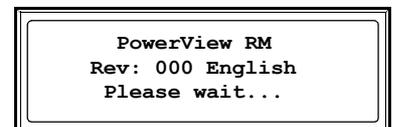


10. If applicable, set the XR Battery Enclosure **DC Disconnect** circuit breaker to ON.



When the **System Enable** switch is in the ON position, the UPS is running on battery. The Startup screen appears on the display interface of the Symmetra PX UPS.

Then, the top-level status screen appears on the display interface. This may take up to 40 seconds.



## Verify UPS battery operation

1. Read the messages displayed on the Symmetra PX UPS display interface. Note any alarms and verify that they are appropriate for start-up conditions.
2. Command the UPS to apply power to the load:
  - a. Press the ESC key to open the top-level menu.
  - b. Select **Control**, and press the ENTER key.
  - c. Select **Turn Load On** from the **Control** menu, and press the ENTER key.

### Top-Level Status Screen

```
Fuel % | | | | | | | | | |
Load % | | |
In 208V out000V 60Hz
Runtime: 1hr 2m
```

### Top-Level Menu

```
→ Control      Logging
Status         Display
Setup          Diags
Accessories    Help
```

### Control Menu

```
UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot
```

```
Graceful Turn Off
Start Runtime Cal
→ Turn Load On
```

- d. On the next screen: select **Yes, UPS Load ON**, and press the ENTER key.

### Confirmation Screen

```
Confirm
→ Yes, UPS Load ON
No, Abort
```

The interface will display the following screen:

```
UPS has been
commanded to turn
load power on...
```

The interface will display the following fault message:

- e. Select **Start Now**, and press the ENTER key.

```
Low/No AC input
Start up on Batt?
→ Start Now
Abort Start-up
```

The interface will display the following screen:

```
UPS has been
commanded to turn
load power on...
```

The LOAD ON LED illuminates and the interface displays the following screen:

```
UPS load is on
Press any key...
```

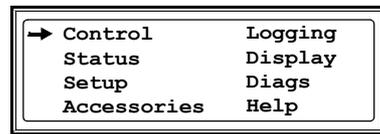
After you have verified that the UPS operates correctly in battery operation, shut down the UPS:

3. Command the UPS to turn off power to the load:
  - a. Press the ESC key at the top-level status screen to open the top-level menu and have access to eight submenus.
  - b. Select **Control**, and press the ENTER key.
  - c. Select **Turn Load Off** from the **Control** menu, and press the ENTER key.
  - d. On the next screen: select **Yes, UPS Load OFF**, and press the ENTER key.

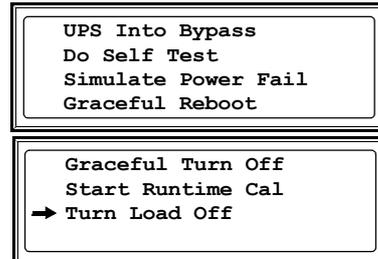
The LOAD ON LED turns off and the interface displays the following two screens:

4. Set the UPS **System Enable** switch to OFF, and then set the UPS **DC Disconnect** circuit breaker and to OFF.
5. If applicable, set the XR Battery Enclosure **DC Disconnect** circuit breaker to OFF.

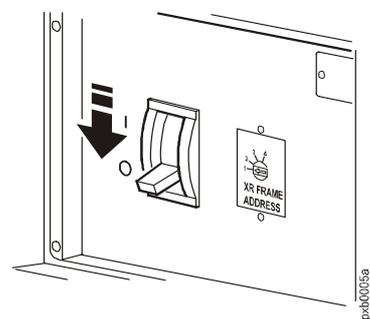
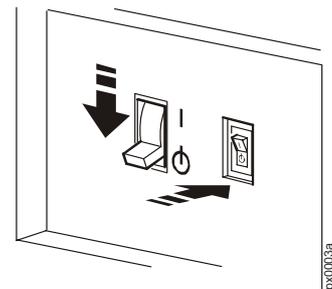
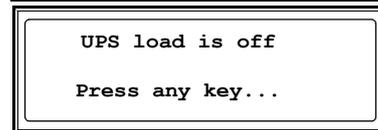
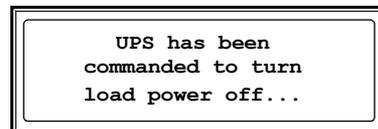
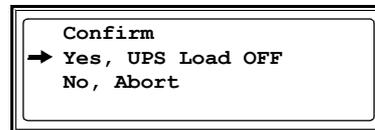
#### Top-Level Menu



#### Control Menu



#### Confirmation Screen





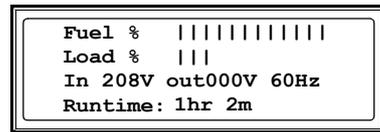
3. Read the messages displayed on the Symmetra PX UPS display interface. Note any alarms and verify that they are appropriate for start-up conditions.
4. Command the UPS to apply power to the load:
  - a. Press the ESC key to open the top-level menu.
  - b. Select **Control**, and press the ENTER key.
  - c. Select **Turn Load On** from the **Control** menu, and press the ENTER key.
  - d. On the next screen: select **Yes, UPS Load ON**, and press the ENTER key.

The interface will display the following screen:

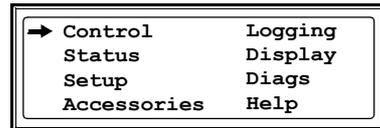
The LOAD ON LED illuminates and the interface displays the following screen:

5. Close (turn ON) the **Q2** circuit breaker on the PDU.

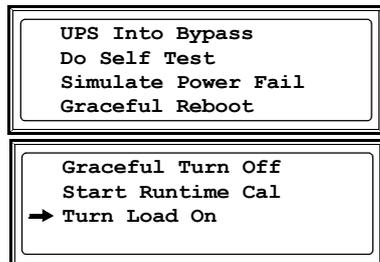
### Top-Level Status Screen



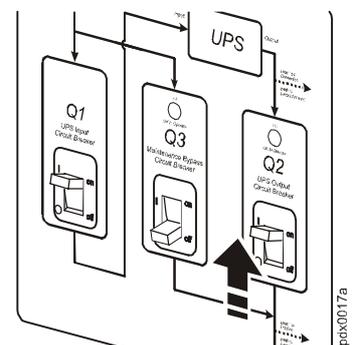
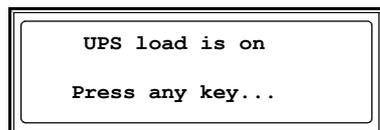
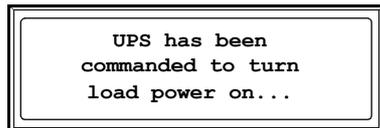
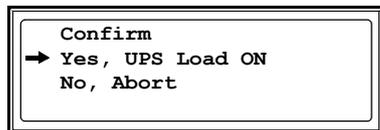
### Top-Level Menu



### Control Menu



### Confirmation Screen

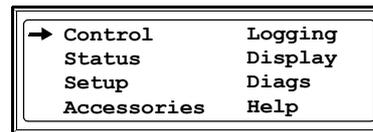


## Verify bypass operation

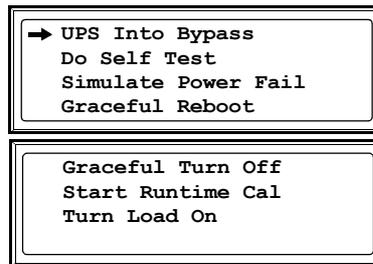
1. Command the UPS into static bypass operation through the UPS display interface:
  - a. Press the ESC key to open the top-level menu.
  - b. Select **Control** on the top-level menu, and press the ENTER key.
  - c. Select **UPS Into Bypass** on the **Control** menu, and press the ENTER key.
  - d. On the next screen: select **Yes, UPS into Bypass**, and press the ENTER key.

The BYPASS LED illuminates and the following screens appear:

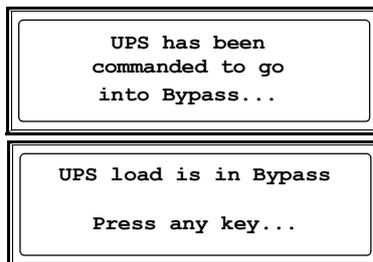
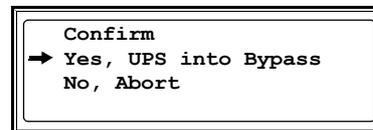
### Top-Level Menu



### Control Menu



### Confirmation Screen



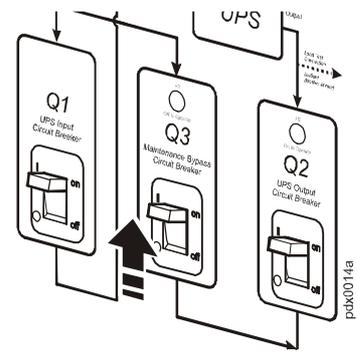
**Note:** The **H3** LED above the **Q3** circuit breaker illuminates, but do not operate the circuit breaker.

2. Use a true RMS voltmeter to make sure that there is no difference in potential between L1 IN and L1 OUT, L2 IN and L2 OUT, and L3 IN and L3 OUT on the **Q3** circuit breaker. The **Q3** circuit breaker must be in the OFF position. The top side of **Q3** will be utility voltage and the bottom side of **Q3** will be the voltage from the UPS in static bypass. Voltage should be less than 2 volts.



**Note:** **Q3** is a 4-pole circuit breaker. Be sure to measure L1 to L1, L2 to L2, and L3 to L3.

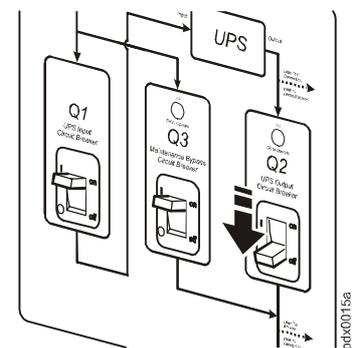
3. Close (turn ON) the **Q3** circuit breaker on the InfraStruXure PDU.



**Note:** The **H2** LED above the **Q2** circuit breaker illuminates, indicating that it is safe to operate the **Q2** circuit breaker.

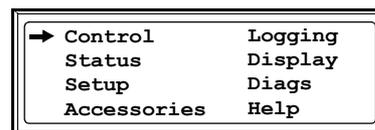
4. Open (turn OFF) the **Q2** circuit breaker on the InfraStruXure PDU.

The UPS will display a Forced Bypass message on the display interface and the Fault LED will be red.

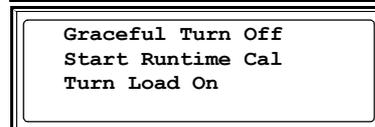
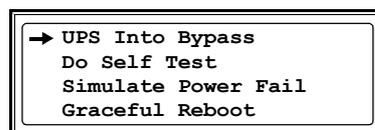


5. Command the UPS into static bypass operation through the UPS display interface:
  - a. Press the ESC key to open the top-level menu.
  - b. Select **Control** on the top-level menu, and press the ENTER key.
  - c. Select **UPS Into Bypass** on the **Control** menu, and press the ENTER key.

#### Top-Level Menu

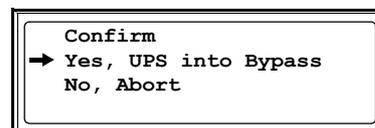


#### Control Menu



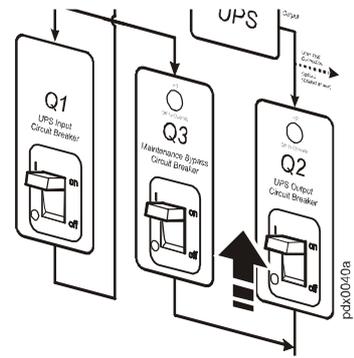
- d. On the next screen: select **Yes, UPS into Bypass**, and press the ENTER key.

#### Confirmation Screen



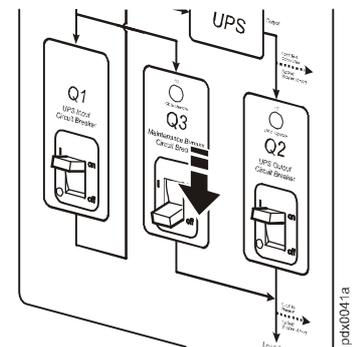
**Note:** The **H2** LED above the **Q2** circuit breaker illuminates, indicating that it is safe to operate the **Q2** circuit breaker.

6. Close (turn ON) the **Q2** circuit breaker on the InfraStruXure PDU.



**Note:** The **H3** LED above the **Q3** circuit breaker illuminates, indicating that it is safe to operate the **Q3** circuit breaker.

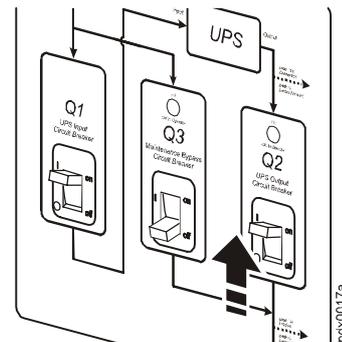
7. Open (turn OFF) the **Q3** circuit breaker on the InfraStruXure PDU.
8. Command the UPS out of static bypass operation through the UPS display interface:
  - a. Press the ESC key at the top-level status screen to open the top-level menu and have access to eight submenus.
  - b. Select **Control**, and press the ENTER key.
  - c. Select **UPS Out of Bypass** on the **Control** menu, and press the ENTER key.



On the next screen: select **Yes, UPS out of Bypass**, and press the ENTER key.

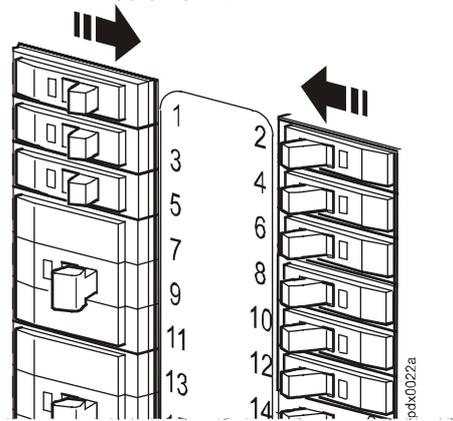
### Power the PDU Distribution Breakers

1. Ensure that the **Q2** circuit breaker on the PDU is closed (ON).



**Note:** When **Q2** is closed, the PDU distribution panel is energized.

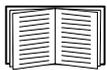
2. Close (turn ON) the PDU **distribution panel** breakers.



**Note:** When the distribution panel circuit breakers are closed, the PDU power cables and connected equipment are energized.

### Configure the InfraStruXure Manager

Once all equipment is installed, the network cables are connected to the InfraStruXure Manager hub (or switch), and start-up of the system is complete, configure the InfraStruXure Manager.



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



**Note:** If you use PowerChute Network Shutdown (PCNS) software with your InfraStruXure UPS, your UPS must have a connection to the “User LAN” (public network) for PCNS to function correctly. If the Network Management Card installed in your UPS is connected to the InfraStruXure Manager’s “APC LAN,” you must install a second Network Management Card in your UPS and connect it to the “User LAN” (public network) to use PCNS.



# Specifications

## 40 kW InfraStruXure PDU

Electrical	PD40F6FK1-M	PD40G6FK1-M	PD40L6FK1-M
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### Input

Nominal Voltage Requirements	208/120 V	480/277 V	600/346 V
Nominal Current	125 A	54 A	43 A
Frequency	57–63 Hz	57–63 Hz	57–63 Hz
Voltage Configuration			
Transformer	3W + G + GEC		
Without Transformer	4W + G		
Upstream Circuit Breaker ††	175 AT	80 AT	60 AT
Main Input Conductor Size ‡	3/0 AWG	#3 AWG	#4 AWG
UPS Breaker Size	175 AT	175 AT	175 AT
Maximum Continuous Current	155 A	67 A	54 A
Grounding	PE node (from AC or floor grid)		

### Output

Voltage AC	3-phase 4-wire PE		
Nominal Voltage	208:120 V WYE		
UPS Breaker Size	150 AT	150 AT	150 AT
Max. Distribution Breaker Size	150 AT	150 AT	150 AT
Number of Distribution Panels	2 × 225 A, 42- position		
Full Load Rating	40 kW	40 kW	40 kW
Max. Contin Current + 125% overload	139 A	139 A	139 A
Nominal Current	111 A	111 A	111 A
Internal Static Switch Fuses †	175 A		
Over-current Protection			
PDU Current	Determined by UPS		
Grounding	Separately derived neutral/ground bond		

### Wiring

UPS to PDU	3W + G (1/0 AWG)
PDU to Distribution Panels	4W + G (1/0 AWG)
Distribution Panels to Racks/Power Strips	4W + G (12 AWG)
Power Cable Connections	L21-20 connector system

<b>Electrical</b>	<b>PD40F6FK1-M</b>	<b>PD40G6FK1-M</b>	<b>PD40L6FK1-M</b>
Power Cable Lengths	various		
Recommended Wire Sizing <sup>‡</sup>			
L1, L2, L3, N	3/0 AWG	4 AWG	4 AWG
G	6 AWG	8 AWG	8 AWG
GEC	4 AWG	4 AWG	4 AWG
Power Cable—top	Accommodates 28, 3-phase power cables (42 knockouts)		
Power Cable—bottom	Accommodates 28, 3-phase power cables (48 knockouts)		
<b>Panel Boards</b>			
Panel Style	3-phase		
Number of Panels per PDU	2 maximum		
Positions per Panel	42		
3-Phase Breakers per Panel	14 maximum		
1-Phase Breakers per Panel	42 maximum		
Panel Rating	240 V/225 A (per phase)		
Breaker Pitch	3/4 in		
Accessibility	Through front of the unit		
<b>Relay Outputs</b>			
Nominal Switching Capacity	1 A at 30 Vdc		
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		
<b>Physical</b>			
<b>PD40F6FK1-M    PD40G6FK1-M    PD40L6FK1-M</b>			
Dimensions (H×W×D)			
PDU	81×24×36 in. (2057 × 610 × 914 mm)		
Shipping	86 × 36 × 48 in (2184 × 914 × 1219 mm)		
Weight			
PDU	1580lb (718.18kg)		
Shipping	1680lb (763.6kg)		
Heat Output With Transformer	4645BTU	4617BTU	3425BTU
Transformer (if installed)			
Type	Isolation	Step-down	Step-down

<b>Physical</b>	<b>PD40F6FK1-M</b>	<b>PD40G6FK1-M</b>	<b>PD40L6FK1-M</b>
Configuration	Delta to WYE		
Maximum Power Rating	60kVA		
Maximum Current Rating	166 A	72 A	58 A
Construction	Cu windings, open core		
Temperature Rating	220° C (Class H)		
Maximum Temperature Rise	150°C		
Efficiency	97–98%		

**Environmental**

Operating Environment	Protected from water and conductive contaminants		
Temperature			
Operating	32 to 104° F (0 to 40° C)		
Storage	32 to 113° F (0 to 45° C)		
Class	Class H (220° C)		
Humidity			
Operating	0 to 95%, non-condensing		
Storage	0 to 95%, non-condensing		
Elevation			
Storage	3,000 ft (10 000 m)		
Acoustic Noise Emission	Maximum 50dB(A) at 1 m		
Heat Rejection at Full Load	5194 BTU/hr. (1.5 kW)		

**Compliance**

Approvals	UL 60950, cUL
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†Transformerless units only.

†† Provided by customer.

‡ The specifications are recommendations. Consult the NEC and local codes for requirements specific to your installation.



## 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) 3 6402-2001
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- 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

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