Symmetra™ PX

250/500 kW 400/480 V

Single and Parallel Installation

7/2023

www.schneider-electric.com

Legal Information

Table of Contents

Important Safety Instructions — SAVE THESE INSTRUCTIONS

This manual contains important safety instructions for Symmetra PX 250 kVA UPS, Symmetra PX 500 kVA UPS, Battery Breaker Enclosure, and QSBPPX-QMLE916 Maintenance Bypass Panel that should be followed during installation and maintenance of the UPS and batteries.

Read these instructions carefully and look at the equipment to become familiar with it before trying to install, operate, service or maintain it. The following safety messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

Symbols in This Manual

 The addition of this symbol to a “Danger” or “Warning” safety message indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

 This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages with this symbol to avoid possible injury or death.

⚠DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this type of safety message.

Failure to follow these instructions can result in equipment damage.

Please Note

Electrical equipment should only be installed, operated, serviced, and maintained by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Per IEC 62040-1: "Uninterruptible power systems (UPS) -- Part 1: Safety Requirements," this equipment, including battery access, must be inspected, installed and maintained by a skilled person.

The skilled person is a person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which the equipment can create (reference IEC 62040, section 3.102).

FCC Statement

NOTE: 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 the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Safety Precautions

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

All safety instructions in this document must be read, understood and followed.

Failure to follow these instructions will result in death or serious injury.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read all instructions in the Installation Manual before installing or working on this UPS system.

Failure to follow these instructions will result in death or serious injury.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not install the UPS system until all construction work has been completed and the installation room has been cleaned.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- The product must be installed according to the specifications and requirements as defined by Schneider Electric. It concerns in particular the external and internal protections (upstream breakers, battery breakers, cabling, etc.) and environmental requirements. No responsibility is assumed by Schneider Electric if these requirements are not respected.
- After the UPS system has been electrically wired, do not start up the system. Start-up must only be performed by Schneider Electric.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The UPS system must be installed according to local and national regulations. Install the UPS according to:

- IEC 60364 (including 60364–4–41- protection against electric shock, 60364–4–42 - protection against thermal effect, and 60364–4–43 - protection against overcurrent), **or**
- NEC NFPA 70, **or**
- Canadian Electrical Code (C22.1, Part 1)

depending on which one of the standards apply in your local area.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the UPS system in a temperature controlled indoor environment free of conductive contaminants and humidity.
- Install the UPS system on a non-flammable, level and solid surface (e.g. concrete) that can support the weight of the system.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The UPS is not designed for and must therefore not be installed in the following unusual operating environments:

- Damaging fumes
- Explosive mixtures of dust or gases, corrosive gases, or conductive or radiant heat from other sources
- Moisture, abrasive dust, steam or in an excessively damp environment
- Fungus, insects, vermin
- Salt-laden air or contaminated cooling refrigerant
- Pollution degree higher than 2 according to IEC 60664-1
- Exposure to abnormal vibrations, shocks, and tilting
- Exposure to direct sunlight, heat sources, or strong electromagnetic fields

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not drill or cut holes for cables or conduits with the gland plates installed and do not drill or cut holes in close proximity to the UPS.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

HAZARD OF ARC FLASH

Do not make mechanical changes to the product (including removal of cabinet parts or drilling/cutting of holes) that are not described in the Installation Manual.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

RISK OF OVERHEATING

Respect the space requirements around the UPS system and do not cover the product's ventilation openings when the UPS system is in operation.

Failure to follow these instructions can result in equipment damage.

NOTICE

RISK OF EQUIPMENT DAMAGE

Do not connect the UPS output to regenerative load systems including photovoltaic systems and speed drives.

Failure to follow these instructions can result in equipment damage.

Electrical Safety

This manual contains important safety instructions that should be followed during the installation and maintenance of the UPS system.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Electrical equipment must be installed, operated, serviced, and maintained only by qualified personnel.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- Disconnection devices for AC and DC must be provided by others, be readily accessible, and the function of the disconnect device marked for its function.
- Turn off all power supplying the UPS system before working on or inside the equipment.
- Before working on the UPS system, check for hazardous voltage between all terminals including the protective earth.
- The UPS contains an internal energy source. Hazardous voltage can be present even when disconnected from the mains supply. Before installing or servicing the UPS system, ensure that the units are OFF and that mains and batteries are disconnected. Wait five minutes before opening the UPS to allow the capacitors to discharge.
- The UPS must be properly earthed/grounded and due to a high touch current/leakage current, the earthing/grounding conductor must be connected first.
- This product has a leakage (touch) current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous leakage (touch) current may flow if the housing is touched.
- The minimum size PE conductor shall comply with the local safety regulations for high PE conductor current equipment.

Failure to follow these instructions will result in death or serious injury.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

In systems where backfeed protection is not part of the standard design, an automatic isolation device (backfeed protection option or other device meeting the requirements of IEC/EN 62040–1 **or** UL1778 5th Edition – depending on which of the two standards apply to your local area) must be installed to prevent hazardous voltage or energy at the input terminals of the isolation device. The device must open within 15 seconds after the upstream power supply fails and must be rated according to the specifications.

Failure to follow these instructions will result in death or serious injury.

When the UPS input is connected through external isolators that, when opened, isolate the neutral or when the automatic backfeed isolation is provided external to the equipment or is connected to an IT power distribution system, a label must be fitted at the UPS input terminals, and on all primary power isolators installed remote from the UPS area and on external access points between such isolators and the UPS, by the user, displaying the following text (or equivalent in a language which is acceptable in the country in which the UPS system is installed):

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Risk of Voltage Backfeed. Before working on this circuit: Isolate the UPS and check for hazardous voltage between all terminals including the protective earth.

Failure to follow these instructions will result in death or serious injury.

NOTICE

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

This product can cause a DC current in the PE conductor. Where a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of Type B is allowed on the supply side of this product.

Failure to follow these instructions can result in equipment damage.

Battery Safety

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Battery circuit breakers must be installed according to the specifications and requirements as defined by Schneider Electric.
- Servicing of batteries must only be performed or supervised by qualified personnel knowledgeable of batteries and the required precautions. Keep unqualified personnel away from batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Do not dispose of batteries in a fire as they can explode.
- Do not open, alter, or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Batteries can present a risk of electric shock and high short-circuit current. The following precautions must be observed when working on batteries

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear protective glasses, gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect the charging source prior to connecting or disconnecting battery terminals.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electric shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When replacing batteries, always replace with the same type and number of batteries or battery packs.

Failure to follow these instructions will result in death or serious injury.

⚠CAUTION

RISK OF EQUIPMENT DAMAGE

- Mount the batteries in the UPS system, but do not connect the batteries until the UPS system is ready to be powered up. The time duration from battery connection until the UPS system is powered up must not exceed 72 hours or 3 days.
- Batteries must not be stored more than six months due to the requirement of recharging. If the UPS system remains de-energized for a long period, we recommend that you energize the UPS system for a period of 24 hours at least once every month. This charges the batteries, thus avoiding irreversible damage.

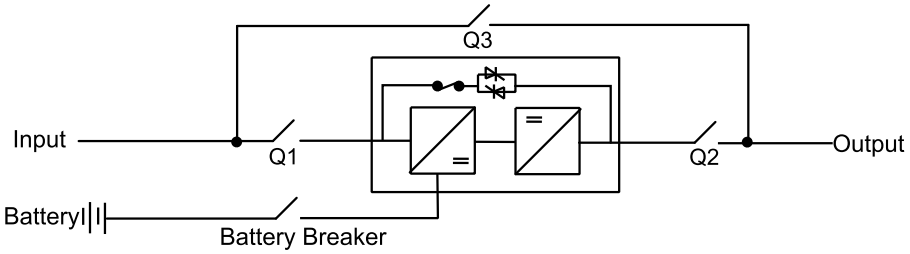
Failure to follow these instructions can result in injury or equipment damage.

Specifications

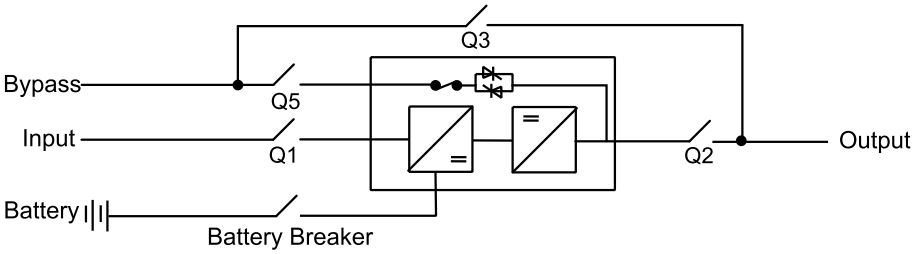
Single Configurations

NOTICE
HAZARD OF EQUIPMENT DAMAGE The neutral connection to utility/mains must not be disconnected even in battery operation. Therefore 4–pole disconnectors/switches must not be used on the bypass. **Failure to follow these instructions can result in equipment damage.**

Single Utility/Mains without Maintenance Bypass

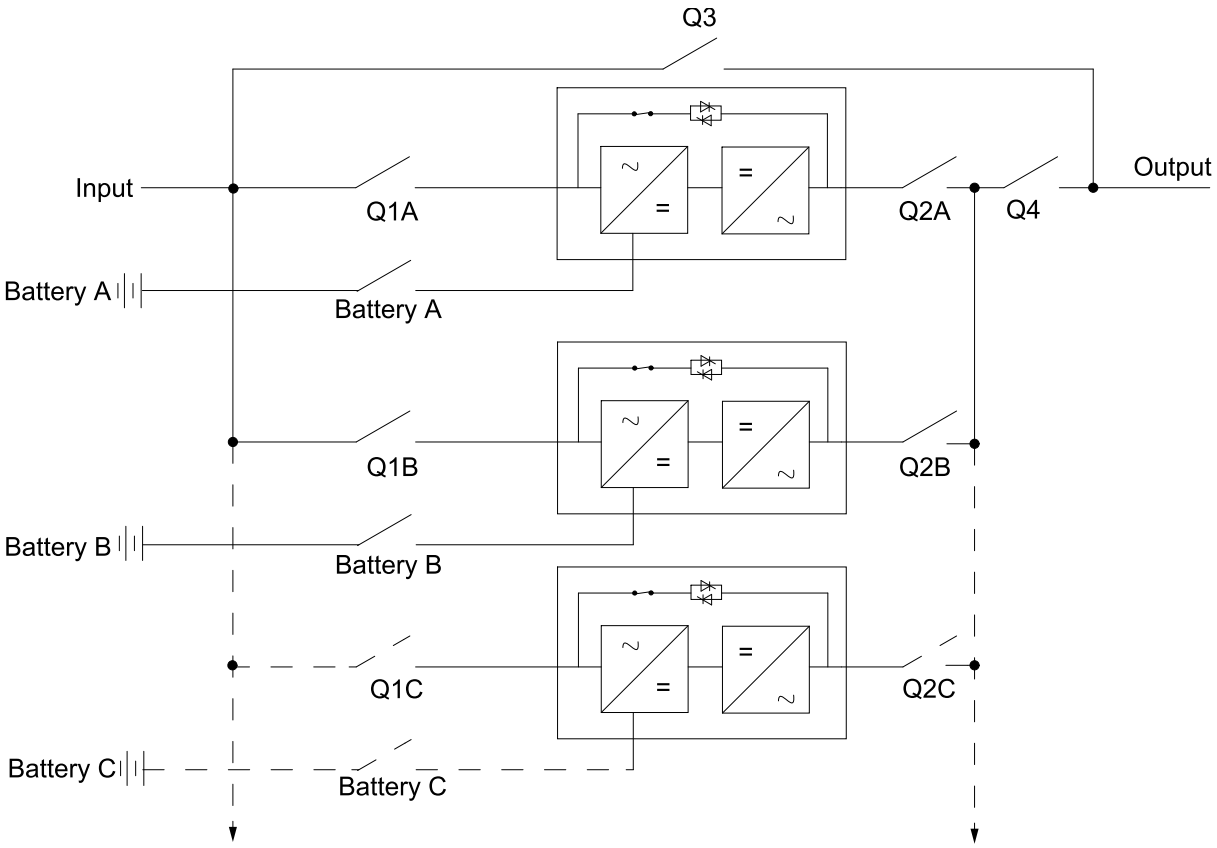


Dual Utility/Mains without Maintenance Bypass

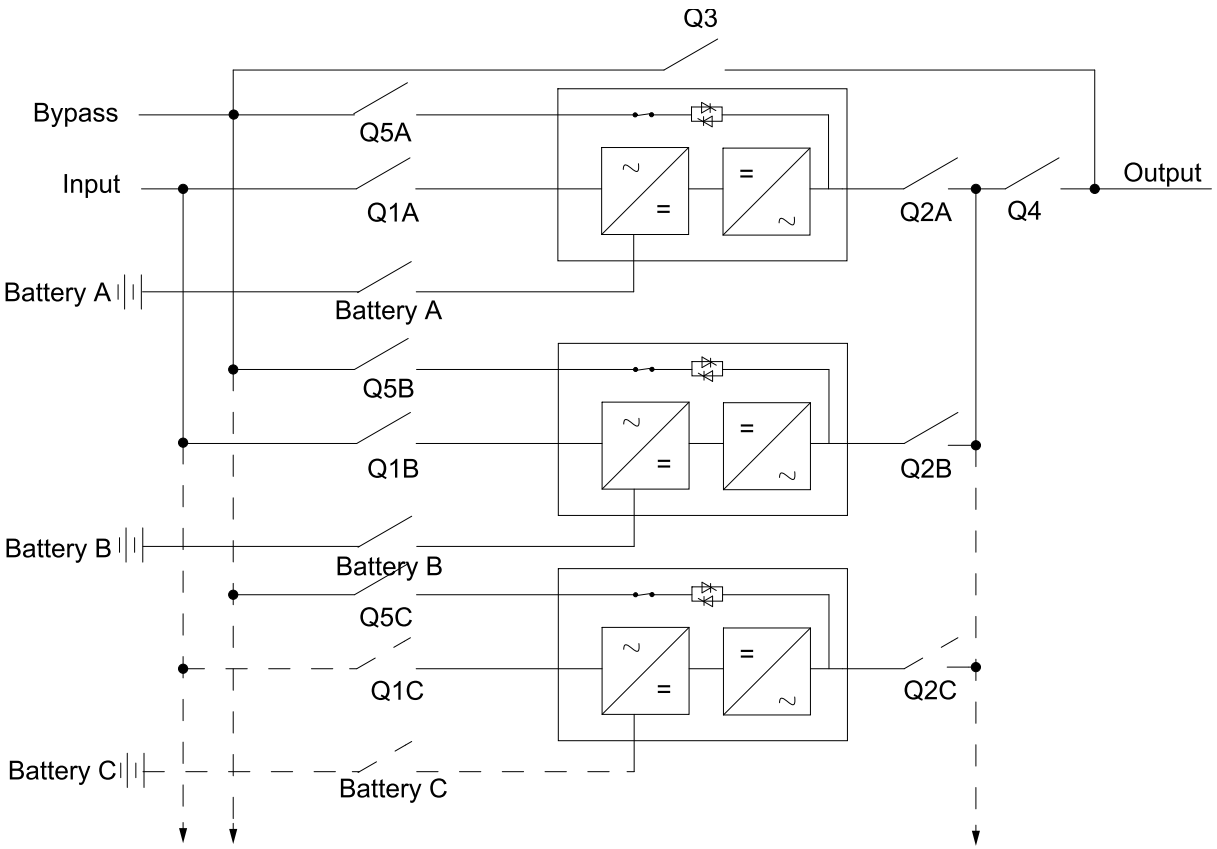


Parallel Configurations

Single Utility/Mains



Dual Utility/Mains



Input Specifications

	250 kW				500 kW			
Input voltage (V)	**380[1]**	**400**	**415**	**480**	**380[1]**	**400**	**415**	**480**
Voltage range (v)	+/-15% at 100% load (340 - 460 V at 400 V, 408 - 552 V at 480 V) -50% for reduced load (200 V at 400 V, 240 V at 480 V)							
Input frequency (Hz)	40–70 with 10 Hz/sec slewrate							
THDI	< 5% at 100% load							
Nominal input current (A)[2]	410	389	375	324	819	779	750	649
Maximum input current (A)[3]	450	428	413	357	901	856	825	717
Input current limitation (A)[4]	460	460	444	383	921	921	887	767
Maximum short circuit level Icw (kA)	Rated short time withstand current Icw: 65 kA. (50 kA with standard maintenance bypass) Rated peak withstand current Ipk: Icw x 2.2							
Minimum short circuit current rating	Dependent on upstream protection. See section for Recommended Fuses, Breakers and Cables for details.							
Input power factor correction	0.995 at load = 100% 0.99 at load > 50% 0.97 at load > 25%							
Softstart (ramp-in) (seconds)	Configurable from 1 to 40 (default 10)							

Bypass Specifications

	250 kW				500 kW			
	380 V	**400 V**	**415 V**	**480 V**	**380 V**	**400 V**	**415 V**	**480 V**
Frequency (Hz)	50/60							
Nominal bypass current (A)	391	372	358	310	783	744	717	619
Maximum short circuit level Icw (kA)	Rated short time withstand current Icw: 65 kA. (50 kA with standard maintenance bypass) Rated peak withstand current Ipk: Icw x 2.2							
Minimum short circuit current rating	Dependent on upstream protection. See section for Recommended Fuses, Breakers and Cables for details.							

1. 380 V has reduced input voltage window (-10% at 100% load).
2. Input current based on rated load and 100% charged batteries.
3. Input current based on 100% battery recharge, nominal voltage and rated load.
4. Current limitation through electronic current limiting is based on 100% battery recharge and -15% input voltage.

Output Specifications

	250 kW				500 kW			
	380 V	**400 V**	**415 V**	**480 V**	**380 V**	**400 V**	**415 V**	**480 V**
Overload capacity	150% for 60 seconds (normal operation) 125% for 10 minutes (normal operation) 150% for 60 seconds (battery operation) 125% for 10 minutes (battery operation) 125% continuous at 480 V and 110% continuous at 400 V (bypass operation)[5] 1000% for 100 milliseconds (bypass operation)							
Voltage tolerance	Symmetric load (0-100%): +/-1% static, +/-5% after 2 milliseconds and +/-1% after 50 milliseconds dynamic Asymmetric load (0-100%): +/-3% static							
Nominal output current (A)	391	372	358	310	783	744	717	619
Output frequency (sync to mains) (Hz)	50/60							
Slew rate (Hz/Sec)	0.25 - 6							
THDU	< 2% linear load < 3% non-linear load							
Output power factor	1							
Dynamic load response	+/- 5%							
Maximum short circuit level Icw (kA)	Rated short time withstand current Icw: 65 kA. (50 kA with standard maintenance bypass) Rated peak withstand current Ipk: Icw x 2.2							
Minimum short circuit current rating	Dependent on upstream protection. See section for Recommended Fuses, Breakers and Cables for details.							

Battery Specifications

	250 kW	**500 kW**
Nominal battery voltage (VDC)	2 x +/- 288	
Battery current at 100% load and nominal battery voltage (A)	452	904
Battery current at 100% load and minimum battery voltage (A)	565	1130
End voltage (V)	1.6–1.75/cell (automatic, depending on load)	
Maximum short circuit withstand rating (kA)	40	
Minimum short circuit current rating	Dependent on upstream protection. See section for Recommended Fuses, Breakers and Cables for details.	

The UPS supports customer-specific battery solutions with 144 cells (+/- 6 cells) for runtime optimization. The display has settings for number of cells on DC voltage levels (V/cell).

NOTE: External Battery Breaker Enclosure (SYBBE) breaker setting is set to maximum. Ir = 1200A and Im = 6000A.

Battery type	Sealed lead acid/wet cells
Nominal voltage (VDC)	+/- 276 to +/- 300
Float voltage (VDC)	+/- 308 to +/- 345
Boost charge voltage (VDC)	+/- 308 to +/- 345

5. This is a thermal performance rating. The continuous overload is not supported by the recommended input protection of the maintenance bypass.

Equalize charge voltage (VDC)	+/- 308 to +/- 345
End of discharge voltage at 100% load (VDC)	+/- 221 to +/- 263
Charging power	20% of nominal power at 0–90% load 10% of nominal power at 100% load
Typical recharge time	3.5 hours

NOTE: Battery specifications are based on VRLA batteries.

UL-Specific Specifications

Recommended Fuses, Breakers, and Cables for UL

In single utility/mains systems, supply the UPS from a grounded 4–wire WYE service.

Schneider Electric also supports 3–wire installations if the utility/mains transformer is a grounded WYE transformer located in the same building. In this installation, the UPS system must be installed as a separately derived system. Leakage currents will occur in the bonding jumper and the technical/system earth.

In dual utility/mains systems, use a 4–wire supply for the bypass and a 3–wire supply for the input. Both must be WYE sources. Delta input supply for either input or bypass is not permitted.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

In 3–wire systems, Schneider Electric recommends that you add a label with the following wording: “Notice! The UPS is installed as a 3–wire system so the system must only be loaded with phase-to-phase load.”

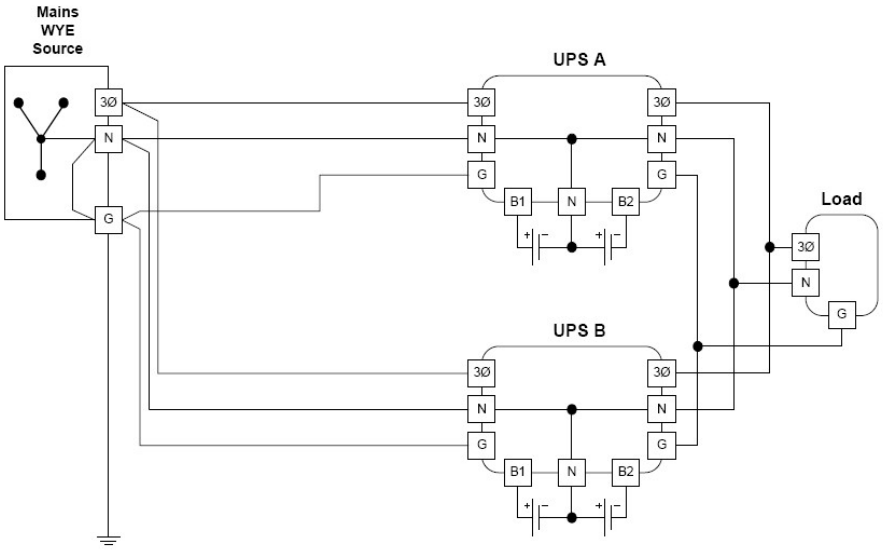
Failure to follow these instructions can result in equipment damage.

NOTE: 3–wire installations using bonding wire will result in a higher leakage current. Leakage current for a typical installation is usually within UL and industry standard requirements.

Parallel Systems

NOTE: For parallel systems, the cable lengths for bypass and output must be the same for all parallel UPS units to ensure correct load sharing in bypass operation. In single utility/mains installations this applies to input cables.

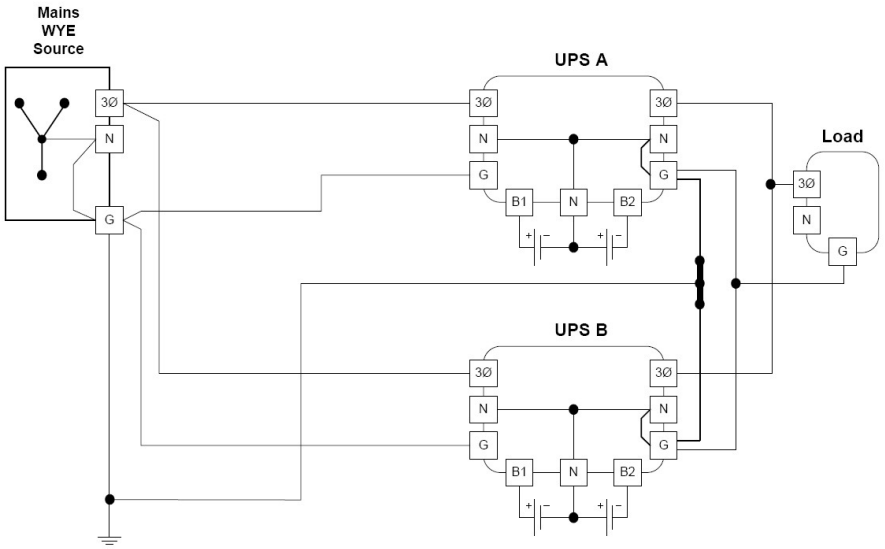
Schneider Electric recommends that the Symmetra PX 250/500 kW parallel system is supplied from a grounded 4–wire WYE service.



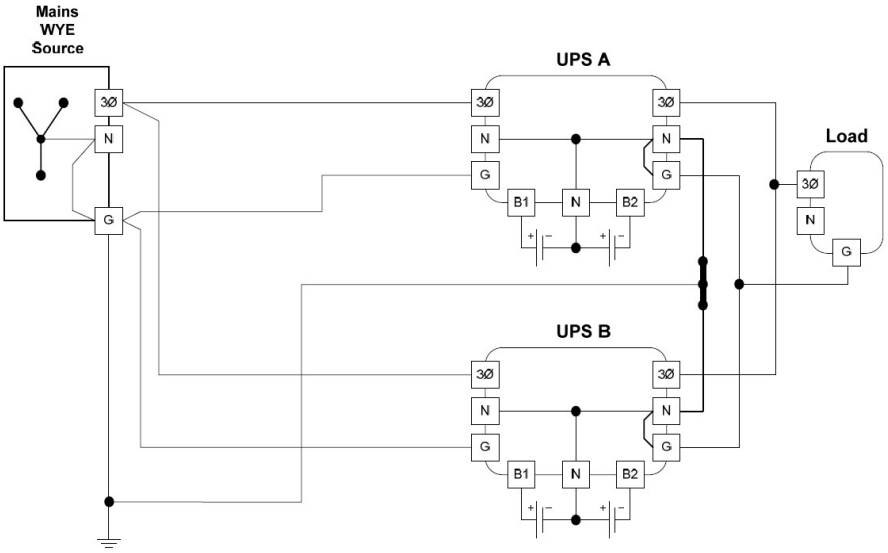
However if the load is a 3–phase load, the three alternatives below for 3–wire installations are allowed:

NOTICE
HAZARD OF MALFUNCTIONING Phase-Neutral loading is not permitted. **Failure to follow these instructions can result in equipment damage.**

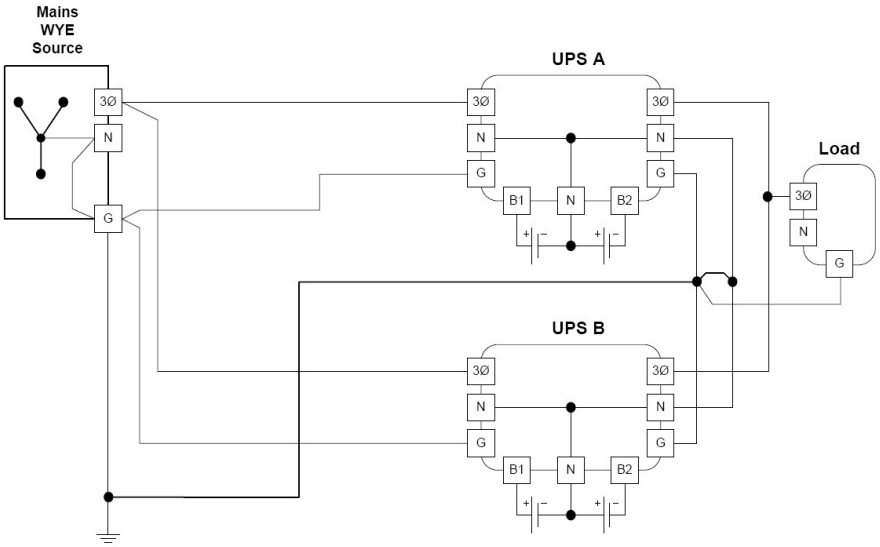
- Connect an N-G bond in each UPS, and connect the UPS output ground via tap conductors to a common grounded electrode bus and a single grounding electrode conductor. See NEC 250.30 (A)(4), including Exception #1.



- Connect an N-G bond in each UPS, and connect the UPS output neutral via tap conductors to a common grounded electrode bus and a single grounding electrode conductor. See NEC 250.30 (A)(4), including Exception #1.



- Connect an output neutral from each UPS to a neutral/bonding bus in the maintenance bypass panel, and bond the maintenance bypass panel neutral bus to the ground with a single N-G bonding jumper and a grounding electrode conductor. See NEC 250.30 (A) Exception #1.



NOTE: Schneider Electric recommends that each UPS in the parallel system has a neutral connection installed. Contact Schneider Electric for information on other configurations.

Recommended Fuses, Breakers, and Cable Sizes

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The product must be installed according to the specifications and requirements as defined by Schneider Electric. It concerns in particular the external and internal protections (upstream circuit breakers, battery circuit breakers, cabling, etc.) and environmental requirements. No responsibility is assumed by Schneider Electric if these requirements are not respected.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

All wiring must comply with all applicable national and/or local electrical codes.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Appropriate disconnect devices must be provided external to the equipment.

Failure to follow these instructions will result in death or serious injury.

NOTE: See Required Breaker Settings for Input Overload and Short-Circuit Protection for Breakers with Electronic Trip Units, page 25 for information on breaker settings.

NOTE: All wiring must comply with all applicable national and/or electrical code (National Electrical Code, ANSI/NFPA 70).

Cable sizes in this manual are based on Table 310.15 of the National Electrical Code 2014 (NEC) with the following assertions:

- 90 °C conductors (THHN) for 75 °C termination
- Not more than 3 current carrying conductors in each conduit
- An ambient temperature of max. 30 °C
- Use of copper or aluminium conductors
- 100% rated breakers
- Nominal operating conditions

If the ambient room temperature is greater than 30 °C, use larger or additional parallel conductors in accordance with the correction factors of the NEC. The maximum allowable conductor size is 600 kcmil.

Equipment Grounding Conductors (EGC) are sized in accordance with NEC Article 250.122 and Table 250.122 Minimum size equipment conductor for grounding equipment.

NOTE: Always consider the EGC size according to the complete electrical installation.

NOTE: The use of aluminium conductors can limit the number of parallel Lithium-ion battery cabinets. Contact Schneider Electric for more information.

The cable sizes are recommendations for maximum configurations with three current carrying conductors in a raceway. For other configurations see the label inside the front door of the I/O cabinet.

NOTE: A separate 800 A protection device for bypass (similar to dual utility/mains) is required for single utility/mains systems from 450 kW 400 V or 475 kW 415 V.

Installations with 100% Rated Circuit Breakers or Fuses

250 kW						
	400 V		415 V		480 V	
	OCPD (A)	Cable	OCPD (A)	Cable	OCPD (A)	Cable
Input Q1	450	2 x 4/0	450	2 x 4/0	400	1 x 500
Bypass Q5[6]	400	2 x 2/0	350	2 x 2/0	350	2 x 2/0
Battery[7]	500	2 x 4/0	500	2 x 4/0	500	2 x 4/0

6. Maximum input protection is 800 A and the maximum cable size is 250 kcmil.
7. If the UPS system includes a battery breaker cabinet and has one or multiple battery strings, each individual string must have a correctly sized fast fuse installed for correct isolation of the battery.

Installations with 100% Rated Circuit Breakers or Fuses (Continued)

250 kW						
	400 V		415 V		480 V	
	OCPD (A)	Cable	OCPD (A)	Cable	OCPD (A)	Cable
Output Q2	400	1 x 500	350	1 x 500	350	1 x 350
Use breaker or class J or class L fuses.						

Installations with 100% Rated Circuit Breakers or Fuses

500 kW						
	400 V		415 V		480 V	
	OCPD (A)	Cable	OCPD (A)	Cable	OCPD (A)	Cable
Input Q1	1000	3 x 400	1000	3 x 400	800	2 x 500
Bypass Q5[8]	800	3 x 250	700	3 x 250	700	3 x 4/0
Battery[9]	1000	3 x 400	1000	3 x 400	1000	3 x 400
Output Q2	800	2 x 500	700	2 x 500	700	2 x 350
Use breaker or class J or class L fuses.						

Installations with 80% Rated Circuit Breakers

250 kW						
	400 V		415 V		480 V	
	OCPD (A)	Cable	OCPD (A)	Cable	OCPD (A)	Cable
Input Q1	600	2 x 300	600	2 x 250	450	2 x 4/0
Bypass Q5[8]	500	2 x 4/0	450	2 x 4/0	400	2 x 3/0
Battery[9]	500	2 x 4/0	500	2 x 4/0	500	2 x 4/0
Output Q2	500	2 x 4/0	450	2 x 4/0	400	1 x 500

Installations with 80% Rated Circuit Breakers

500 kW						
	400 V		415 V		480 V	
	OCPD (A)	Cable	OCPD (A)	Cable	OCPD (A)	Cable
Input Q1	1200	4 x 350	1200	4 x 350	1000	3 x 400
Bypass Q5[8]	Not allowed		Not allowed		800	3 x 250
Battery[9]	1000	3 x 400	1000	3 x 400	1000	3 x 400
Output Q2	Not allowed		Not allowed		800	2 x 500

Typical Q3 and Q4 Breaker Sizes for Parallel Systems

250 kW units in parallel						
	400 V		415 V		480 V	
OCPD Rating	**80%**	**100%**	**80%**	**100%**	**80%**	**100%**
500 kW	1000	800	1000	700	800	700
750 kW	1600	1200	1600	1200	1200	1000
1 MW	2000	1600	2000	1600	1600	1600

8. Maximum input protection is 800 A and the maximum cable size is 250 kcmil.
9. If the UPS system includes a battery breaker cabinet and has one or multiple battery strings, each individual string must have a correctly sized fast fuse installed for correct isolation of the battery.

Typical Q3 and Q4 Breaker Sizes for Parallel Systems (Continued)

250 kW units in parallel						
	400 V		415 V		480 V	
OCPD Rating	**80%**	**100%**	**80%**	**100%**	**80%**	**100%**
1.5 MW	-	-	-	-	-	-
2 MW	-	-	-	-	-	-

Typical Q3 and Q4 Breaker Sizes for Parallel Systems

500 kW units in parallel						
	400 V		415 V		480 V	
OCPD Rating	**80%**	**100%**	**80%**	**100%**	**80%**	**100%**
500 kW	-	-	-	-	-	-
750 kW	-	-	-	-	-	-
1 MW	2000	1600	2000	1600	1600	1600
1.5 MW	3000	2500	3000	2500	2500	2000
2 MW	4000	3000	4000	3000	4000	2500

Recommended Bolt and Lug Sizes for UL

Cable size	Terminal bolt diameter	Single Hole lug	NEMA 2 Lug	Crimping tool/die
4/0 AWG	M10	LCA 4/0-12-X	LCD 4/0-12-X	CT-720/CD-720-3
250 kcmil	M10	LCA250-12-X	LCD250-12-X	CT-720/CD-720-3
300 kcmil	M10	LCA300-12-X	LCD300-12-X	CT-720/CD-720-4
350 kcmil	M10	LCA350-12-X	LCD350-12-X	CT-720/CD-720-5
400 kcmil	M10	LCA400-12-6	LCD400-12-6	CT-720/CD-720-6
500 kcmil	M10	LCA500-12-6	LCD500-12-6	CT-720/CD-720-7

IEC-Specific Specifications

Surge Protection Device (SPD)

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

This UPS is OVCII (Over Voltage Category Class II) compliant. This UPS must only be installed in an OVCII compliant environment.

- If the UPS is installed in an environment with an OVC rating higher than II, an SPD (surge protection device) must be installed upstream of the UPS to reduce the overvoltage category to OVCII.
- The SPD must include a status indicator to show the user if the SPD is operational or is no longer functioning according to design. The status indicator may be visual and/or audible and/or may have remote signalling and/or output contact capability in accordance with IEC 62040-1.

Failure to follow these instructions will result in death or serious injury.

Surge Protection Device Requirements

Select a surge protection device that complies with the following requirements:

Class	Type 2
Rated voltage (Ur)	230/400 V, 277/480 V
Voltage protection level (Up)	< 2.5 kV
Short circuit rating (Isccr)[10]	According to installation prospective short circuit level
Earthing system[11]	TN-S, TT, IT, TN-C
Poles	3P/4P depending on earthing configuration
Standards	IEC 61643-11 / UL 1449
Monitoring	Yes

Upstream and Downstream Protection for IEC

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Circuit breakers must have instantaneous trip time of maximum 60 ms.
- Circuit breakers must have instantaneous override values set according to the table below.
- Circuit breakers must be installed for input (unit input breaker UIB) and bypass (static switch input breaker SSIB).
- For parallel system with three or more UPSs: Circuit breakers must be installed for the output (unit output breaker UOB) of each UPS. The unit output breaker (UOB) is sized as the static switch input breaker (SSIB).

Failure to follow these instructions will result in death or serious injury.

NOTICE

If a residual current-operated protective device (RCD-B) is used upstream as ground fault protection, then the RCD-B shall be sized to not trip on the leakage current of this product, which can be up to 303 mA.

Failure to follow these instructions can result in equipment damage.

Upstream Protection for IEC and Minimum Prospective Phase-To-Earth Short Circuit at the UPS Input/Bypass Terminals

The minimum prospective phase-to-earth short circuit current required at the UPS terminals is dependent on the upstream overcurrent protection device and its settings to ensure proper operation and required operation time, in case of a short circuit between one of the phases and the metal enclosure of the UPS.

10. Lower short circuit rating can be achieved with fuse protection.
11. Corner grounding not permitted.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The upstream overcurrent protective device (and its settings) must be sized to ensure a disconnecting time within 0.2 seconds for a minimum prospective phase-to-earth short circuit current calculated or measured at the input/bypass terminals of the UPS.

Failure to follow these instructions will result in death or serious injury.

If the upstream overcurrent protective device is a breaker with adjustable short time protection, then it is possible to adjust the short time protection current and short time delay (if present) to meet the requirement of 0.2 seconds for a calculated or measured phase-to-earth prospective short circuit current at the input/bypass terminals of the UPS.

Recommended Fuses, Breakers, and Cables for IEC

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The product must be installed according to the specifications and requirements as defined by Schneider Electric. It concerns in particular the external and internal protections (upstream circuit breakers, battery circuit breakers, cabling, etc.) and environmental requirements. No responsibility is assumed by Schneider Electric if these requirements are not respected.

Failure to follow these instructions will result in death or serious injury.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

All wiring must comply with all applicable national and/or local electrical codes.

Failure to follow these instructions will result in death or serious injury.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Appropriate disconnect devices must be provided external to the equipment.

Failure to follow these instructions will result in death or serious injury.

NOTE: For parallel systems, the cable lengths for bypass and output must be the same for all parallel UPS units to ensure correct load sharing in bypass operation. In single utility/mains installations this applies to input cables.

NOTE: See Required Breaker Settings for Input Overload and Short-Circuit Protection for Breakers with Electronic Trip Units, page 25 for information on breaker settings.

Supply the UPS from a 5–wire TN-S system (L1, L2, L3, N, PE).

Cable sizes in this manual are based on table B.52.12 and B.52.13 of IEC 60364-5-52 with the following assertions:

- 90 °C conductors
- An ambient temperature of 30 °C
- Use of copper or aluminium conductors
- Installation method F4 for DC cables and installation method F5 for AC cables, corrected for single layer in perforated cable tray

PE cables are sized in accordance with IEC 60364-5-54 table 54.2 Minimum cross-sectional area of protective conductors.

NOTE: Always consider the PE size according to the complete electrical installation. Minimum size of the PE conductor must comply with local safety regulations for high PE conductor current equipment.

If the ambient temperature is greater than 30 °C, larger conductors are to be selected in accordance with the correction factors of the IEC.

Refer to IEC 60364-5-52 for installation methods. The cable sizes are recommendations for maximum configurations and copper cables. For other system size configurations see label inside of I/O cabinet front door.

Recommended Cable Sizes in Systems with Breaker Protection

Installation method	OCPD (A)	B1 (mm^2)	B2 (mm^2)	C (mm^2)	OCPD (A)	B1 (mm^2)	B2 (mm^2)	C (mm^2)
	400 V				415 V			
	250 kW							
Input	400[1]	2 x 95	2 x 120	2 x 95	400[12]	2 x 95	2 x 120	2 x 95
Bypass	400	2 x 95	2 x 120	2 x 95	355	2 x 95	2 x 120	2 x 95
Battery[13]	500	1 x 120	3 x 95	2 x 95	500	1 x 120	3 x 95	2 x 95
Output	400	2 x 95	2 x 120	2 x 95	355	2 x 95	2 x 120	2 x 95
	500 kW							
Input	800	4 x 120	-	3 x 150	800[12]	4 x 120	-	3 x 150
Bypass	800	4 x 120	-	3 x 150	800	4 x 120	-	3 x 150
Battery[13]	1000	-	-	3 x 240	1000	-	-	3 x 240
Output	800	4 x 120	-	3 x 150	800	4 x 120	-	3 x 150

Recommended Cable Sizes in Systems with Fuse Protection

Installation method	OCPD (A)	B1 (mm^2)	B2 (mm^2)	C (mm^2)	OCPD (A)	B1 (mm^2)	B2 (mm^2)	C (mm^2)
	400 V				415 V			
	250 kW							
Input	500	2 x 95	2 x 120	2 x 150	400[14]	2 x 95	2 x 120	2 x 95
Bypass	400	2 x 95	2 x 120	2 x 95	355	2 x 95	2 x 95	1 x 185
Battery[13]	500	1 x 120	3 x 95	2 x 95	500	1 x 120	3 x 95	2 x 95
Output	400	2 x 95	2 x 120	2 x 95	355	2 x 95	2 x 95	1 x 185
	500 kW							
Input	1000	-	-	4 x 150	1000	-	-	4 x 150
Bypass[14]	800	4 x 120	-	3 x 150	800	4 x 120	-	3 x 150
Battery[13]	1000	-	-	3 x 240	1000	-	-	3 x 240
Output	800	4 x 120	-	3 x 150	800	4 x 120	-	3 x 150

12. The breaker must comply with IEC 60947-2 which guarantees a non-tripping current of 1.05 times current setting for 2 hours. Alternative breaker size must be higher than stated current.
13. If the UPS system includes a battery breaker cabinet and has one or multiple battery strings, each individual string must have a correctly sized fast fuse installed for correct isolation of the battery.
14. Maximum input protection is 800 A.

Typical Q3 and Q4 Breaker Sizes for Parallel Systems

	250 kW		500 kW	
	400 V	**415 V**	**400 V**	**415 V**
For 2 UPS units (A)	800	800	1600	1600
For 3 UPS units (A)	1250	1250	2500	2000
For 4 UPS units (A)	1600	1600	3200	3200

Recommended Bolt and Lug Sizes for IEC

Cable size mm²	Bolt size	Cable lug type
16	M10 x 40 mm	TLK 16-10
25	M10 x 40 mm	TLK 25-10
35	M10 x 40 mm	TLK 35-10
50	M10 x 40 mm	TLK 50-10
70	M10 x 40 mm	TLK 70-10
95	M10 x 40 mm	TLK 95-10
120	M10 x 40 mm	TLK 120-10
150	M10 x 40 mm	TLK 150-10
185	M10 x 40 mm	TLK 185-10
240	M10 x 40 mm	TLK 240-10

Required Breaker Settings for Input Overload and Short-Circuit Protection for Breakers with Electronic Trip Units

Single Utility/Mains Installation (Common Input and Bypass Breaker)

	Input Breaker
In	Maximum input current
STPU	In x A (3 < A < 4)
STD	Maximum 100 ms
LTD	Maximum 3 x In in 5s
Iinst	In x 5

Dual Utility/Mains Installation (Separate Input and Bypass Breaker)

	Input Breaker	**Bypass Breaker**
In	Maximum input current	Maximum input current
STPU	In x A (3 < A < 4)	In x B (10 < B <12)
STD	Maximum 100 ms	Maximum 100 ms

	Input Breaker	Bypass Breaker
LTD	Maximum 3 x In in 5s	Maximum 3 x In in 5s
Iinst	In x 5	In x 15

Environmental

Operating Temperature	0 to 40° C
Storage Temperature	-15 to 40° C for systems with batteries -30 to 70° C for systems without batteries
Operating Relative Humidity	0 - 95%
Storage Relative Humidity	0 - 95%
Operating Elevation	0-1000 m: 100% load 1000–1500 m: 95% load 1500–2000 m: 91% load 2000–2500 m: 86% load 2500–3000 m: 82% load
Storage Elevation	0-15000 meters
Audible noise at 1 meter from surface of unit @ 25° C	480 V 100% load: <54 dBA 480 V 70% load: <45 dBA 400 V 100% load: <60 dBA 400 V 70% load: <49 dBA
Protection Class	NEMA 1, IP 20
Colour	Black

Torque Specifications

Bolt size M8	Bolt size M10
13.5 Nm	30 Nm

Compliance

Safety	IEC 62040-1: 2017, Edition 2.0, Uninterruptible Power Systems (UPS) - Part 1: Safety requirements UL 1778 5th edition
EMC/EMI/RFI	IEC 62040-2: 2016-11, 3rd edition Uninterruptible Power Systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements C2 FCC Part 15 Subpart B, Class A
Transportation	ISTA 2B (2006)
Seismic	SE CoC in accordance with AC 156 protocol
Earthing system[15]	TN, TT, TNC, IT, TN-S, TNC-S
Overvoltage category	This UPS is OVCII compliant. If the UPS is installed in an environment with an OVC rating higher than II, an SPD (surge protection device) must be installed upstream of the UPS to reduce the overvoltage category to OVCII.
Protective class	I
Pollution degree	2

15. Refer to the Earthing Principles for more details.

Installation Procedure

1. Remove the Air Guide from the I/O Cabinet, page 28.
2. Run the cables. Follow one of the procedures:
   a. Run the Cables in Top Entry Systems, page 29.
   b. Run the Cables in Bottom Entry Systems, page 31.
3. In installations where NEMA 2 hole pattern is not used, Remove the NEMA 2 Hole Pattern Plates, page 33.
4. In installations where terminal blocks are used, Install the Terminal Blocks (Optional), page 33.
5. Connect Power Cables, page 34. Follow one of the procedures:
   a. Connect Power Cables in Top Entry Systems, page 34.
   b. Connect Power Cables in Bottom Entry Systems, page 35.
6. Connect the Output Cables, page 36.
7. In 3–wire systems in the US only, Connect the Bonding Jumper, page 37.
8. In 3–wire systems in the US and 5–wire systems in Europe, Africa, and Asia, Connect the Technical Earth, page 38.
9. Connect communication cables between the power module cabinet and the I/O cabinet. Follow one of the procedures:
   a. Connect the Communication Cables between the Power Module and the I/O Cabinets in 250 kW Systems , page 39.
   b. Connect the Communication Cables between the Power Module and the I/O Cabinets in 500 kW Systems, page 40.
10. Connect the EPO, page 42.
11. Install and connect cables to the ancillary monitor board and EPO connection and trip board:
    a. Install the Assembly, page 44.
    b. Connect Signal Wires to the Boards, page 45.
12. Install the Battery Solution, page 52.
13. Reinstall the Air Guide in the I/O Cabinet, page 66.
14. Option: Install Seismic Option, page 67.
15. Option: Install the Air Filter Option in the Power Module Cabinet, page 75.

Prepare the Installation

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

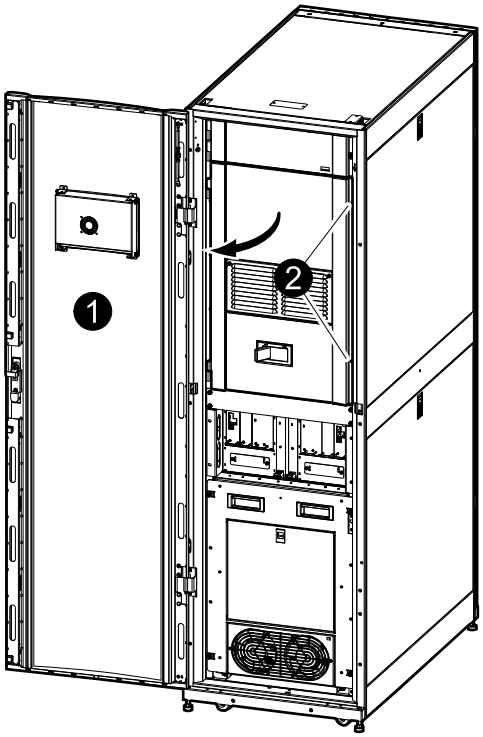
Do not drill or cut holes for cables or conduits with the covers installed and do not drill in close proximity to the UPS.

Failure to follow these instructions will result in death or serious injury.

Remove the Air Guide from the I/O Cabinet

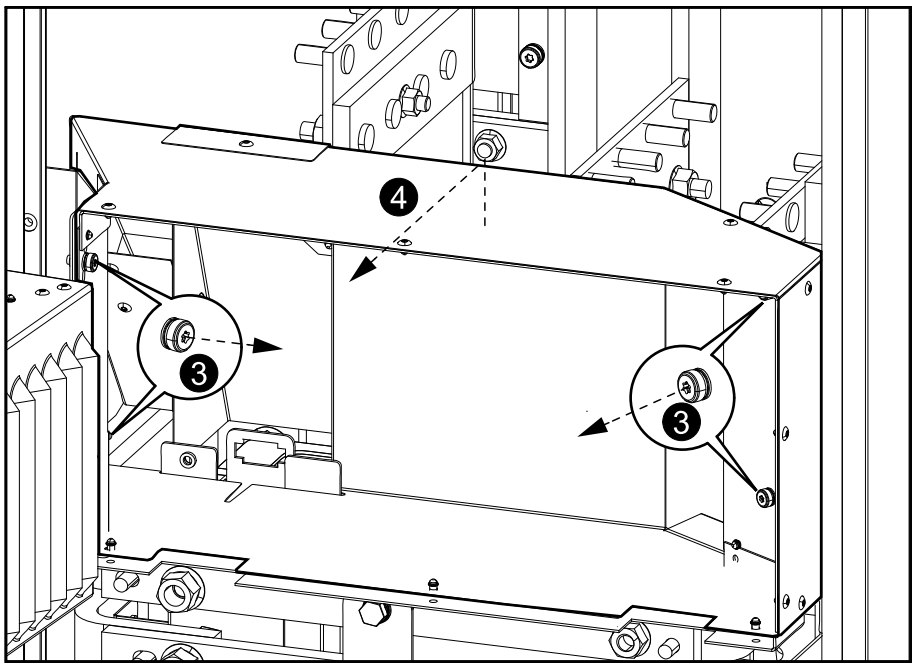
1. Open the front door of the I/O cabinet.
2. Remove the two screws in the right side of the inner door and open the inner door.

Front View of I/O Cabinet



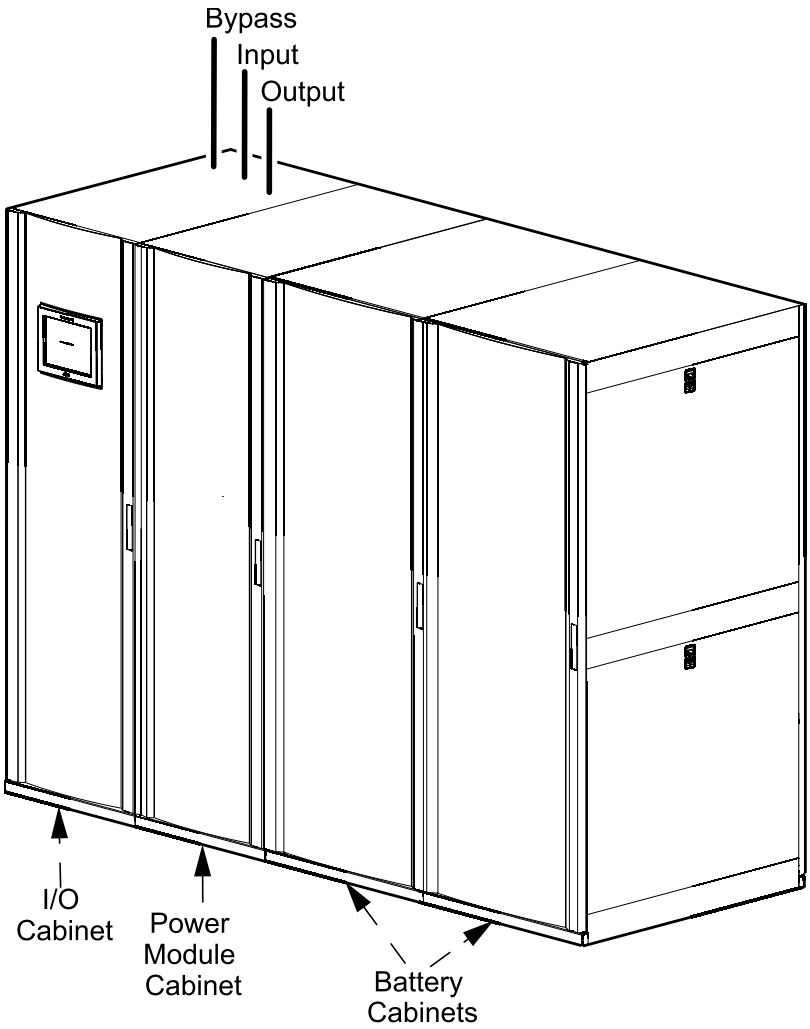
3. Remove the four screws from the air guide as shown.

4. Lift the air guide up and remove it.



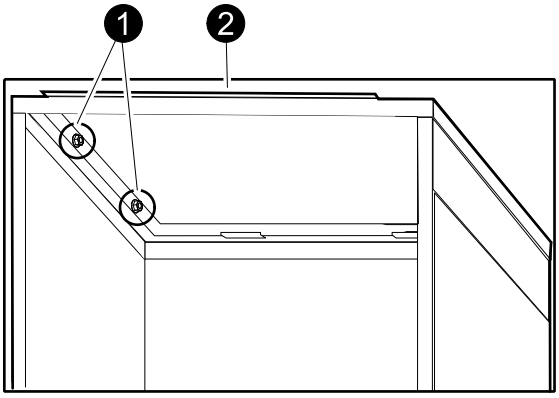
Run the Cables in Top Entry Systems

Top Entry Systems with Line-up and Match Battery Cabinets



1. From the inside of the I/O cabinet, loosen the four screws.

I/O Cabinet



2. Lift up the front of the top cover and slide out the cover.
3. Drill/punch holes for the cables.
4. Refit the cover and install conduits (if applicable).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

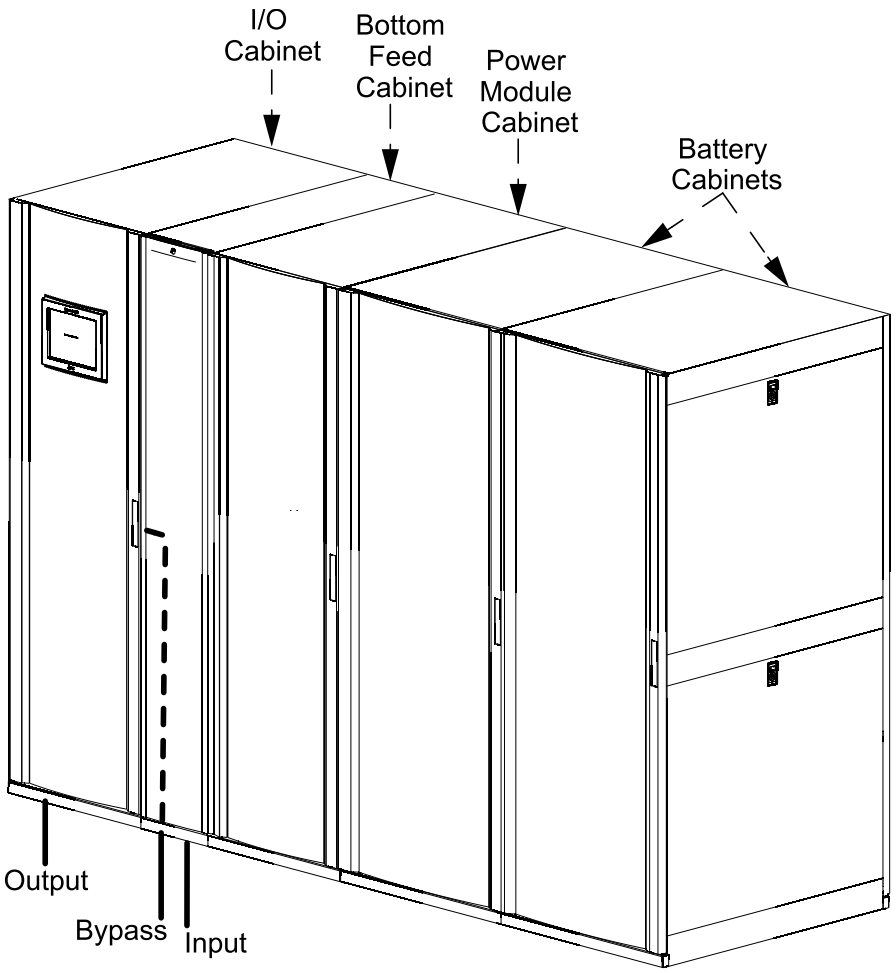
Ensure that there are no sharp edges that can damage the cables.

Failure to follow these instructions will result in death or serious injury.

5. Run the cables through the top of the I/O cabinet to the cable landing area.

Run the Cables in Bottom Entry Systems

Bottom Entry Systems with Line-up and Match Battery Cabinets



In systems with bottom cable entry, the input and bypass cables are routed through the bottom of the bottom feed cabinet. The output cables are routed through the bottom of the I/O cabinet.

1. Remove the bottom cover of the bottom feed cabinet by loosening the four M8 bolts.
2. Drill/punch holes for the cables in the bottom plate.
3. Refit the bottom plate and install conduits (if applicable).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

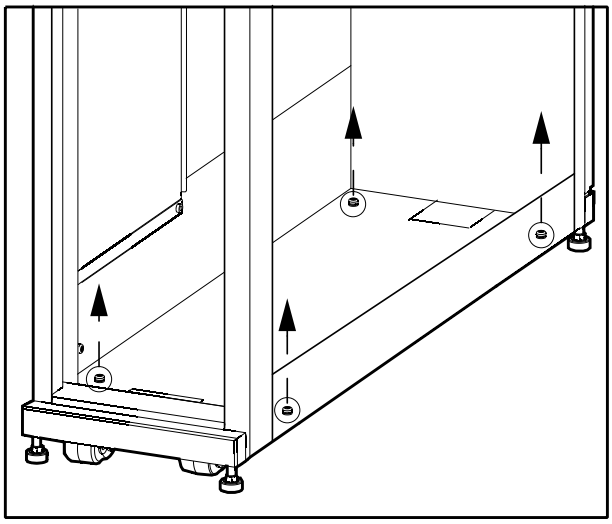
Ensure that there are no sharp edges that can damage the cables.

Failure to follow these instructions will result in death or serious injury.

4. Run the input cables through the bottom of the bottom feed cabinet to the input cable landings.

5. Run the bypass cables through the bottom of the bottom feed cabinet, through the side into the I/O cabinet. In the I/O cabinet, run the cables to the top and then down to the bypass cable landings.

Bottom Feed Cabinet



6. In the I/O cabinet, loosen the two M6 bolts from the back of the cabinet.
7. Lift up the bottom plate and slide it out.
8. Drill/punch holes for the cables in the bottom plate where indicated .
9. Refit the bottom plate and install conduits (if applicable).

⚠DANGER

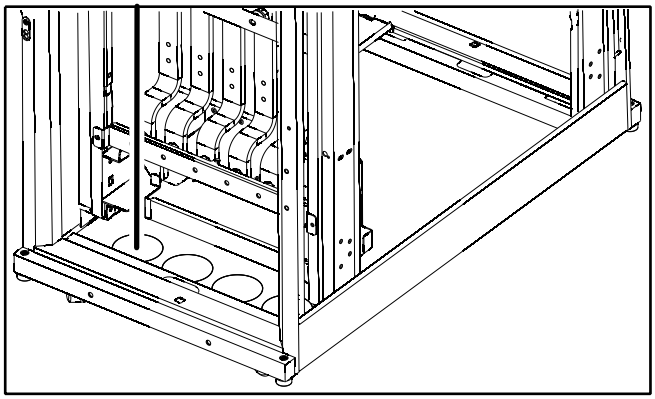
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Ensure that there are no sharp edges that can damage the cables.

Failure to follow these instructions will result in death or serious injury.

10. Run the output cables through the bottom cover in the back of the cabinet all the way to the top and then down to the output cable landings.

I/O Cabinet

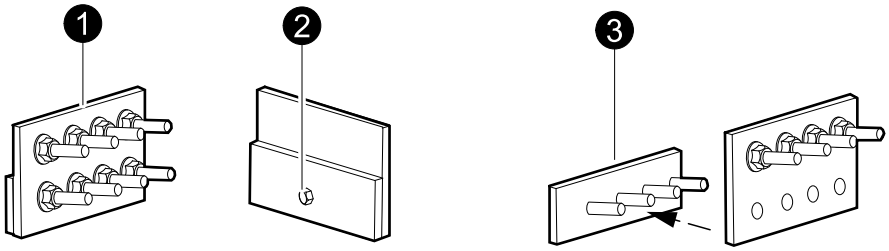


Remove the NEMA 2 Hole Pattern Plates

NOTE: The NEMA 2 hole plates can be installed upside down to gain additional wiring clearances. Use cable lugs with a mutual distance of 44.5 mm in installations with NEMA 2 hole pattern plates.

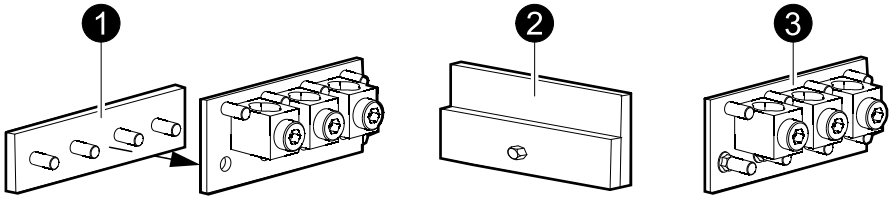
The NEMA 2 hole pattern plates are only used in some installations in the US. In other installations, the NEMA 2 plates must be removed. Follow the below procedure to remove the NEMA 2 hole pattern plates from the busbars.

1. Loosen the four 10 mm nuts connecting the NEMA 2 hole pattern plate to the busbar.
2. Loosen the 8 mm nut on the back of the busbar.
3. Slide the NEMA 2 hole pattern plate off the busbar.



Install the Terminal Blocks (Optional)

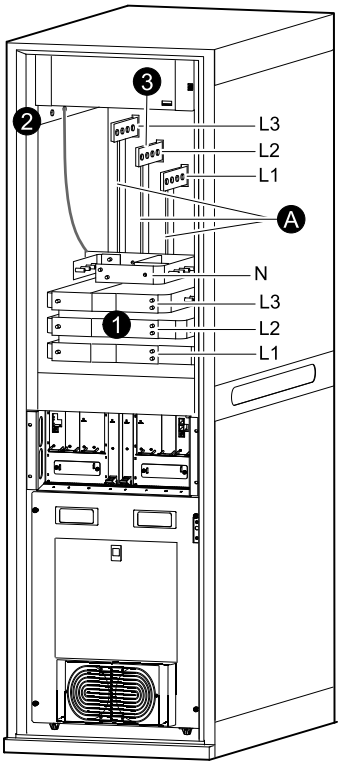
1. Slide the plate with the terminal blocks onto the busbar.
2. Tighten the 8 mm nut on the back of busbar.
3. Tighten the four 10 mm nuts below the terminal blocks.



Connect Power Cables

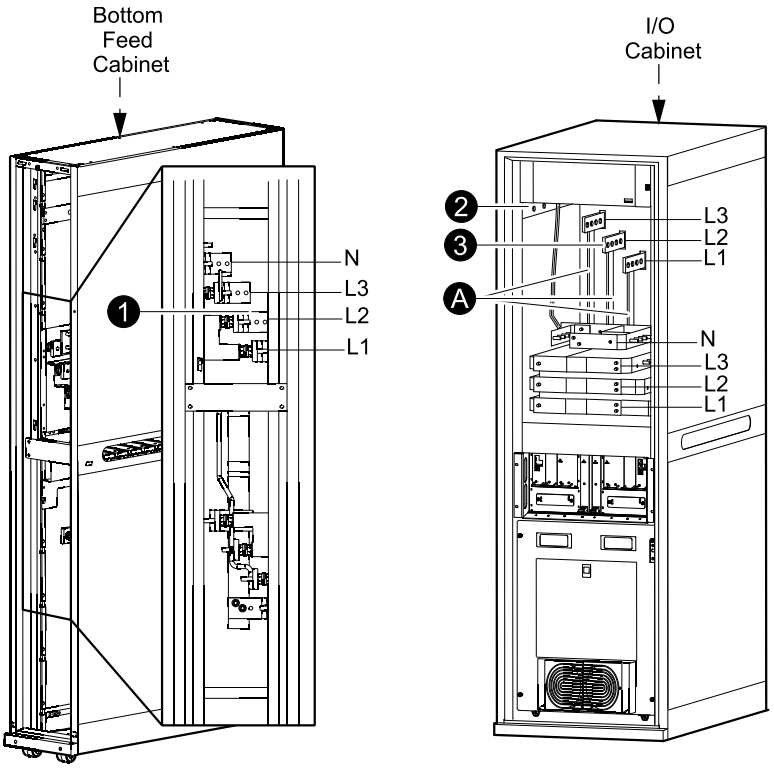
Connect Power Cables in Top Entry Systems

I/O Cabinet



1. Connect the input cables to the input cable landings.
2. Connect the PE/equipment grounding conductor.
3. Only applicable to a dual utility/mains systems: Ensure that the single feed busbars (labeled A) have been removed and connect the bypass cables to the bypass cable landings.
4. Install plastic covers over the input terminals L1, L2, L3, N and bypass terminals L1, L2, L3 (only in dual utility/mains systems).

Connect Power Cables in Bottom Entry Systems

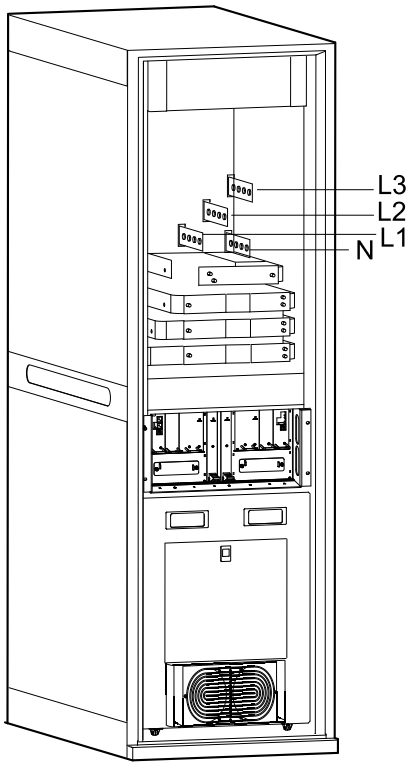


1. Connect the input cables to the input cable landings in the bottom feed cabinet.
2. Only applicable to a dual utility/mains system: Ensure that the single feed busbars (labeled A) have been removed and connect the bypass cables to the bypass cable landings.
3. Connect the PE/grounding electrode conductor.
4. Install plastic covers over the bypass terminals L1, L2, L3.

Connect the Output Cables

1. Connect the output cables to the output cable landings in the I/O cabinet.

I/O Cabinet



2. Install plastic covers over the output terminals L1, L2, L3.

Connect the Bonding Jumper and Technical/System Earth

⚠CAUTION

HAZARD OF ELECTRIC SHOCK

Connect the bonding jumper and the technical/system earth according to the guidelines below.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

The neutral connection to utility/mains must not be disconnected even in battery operation. Therefore 4–pole disconnectors/switches must not be used on the bypass.

Failure to follow these instructions can result in equipment damage.

NOTE: The bonding jumper is not installed from factory.

Systems in the US

- 4–wire systems:
  - Bonding jumper: Not connected
  - Technical/system earth: No local grounding electrode connected
- 3–wire systems:
  - Bonding jumper: Must be connected
  - Technical/system earth: A grounding electrode must be connected via the grounding electrode conductor

Systems in Europe, Africa, and Asia

- 5–wire systems:
  - Bonding jumper: Not connected
  - Technical/system earth: A local earth electrode must be connected

Connect the Bonding Jumper

NOTE: This section is not applicable to 4–wire systems.

⚠CAUTION

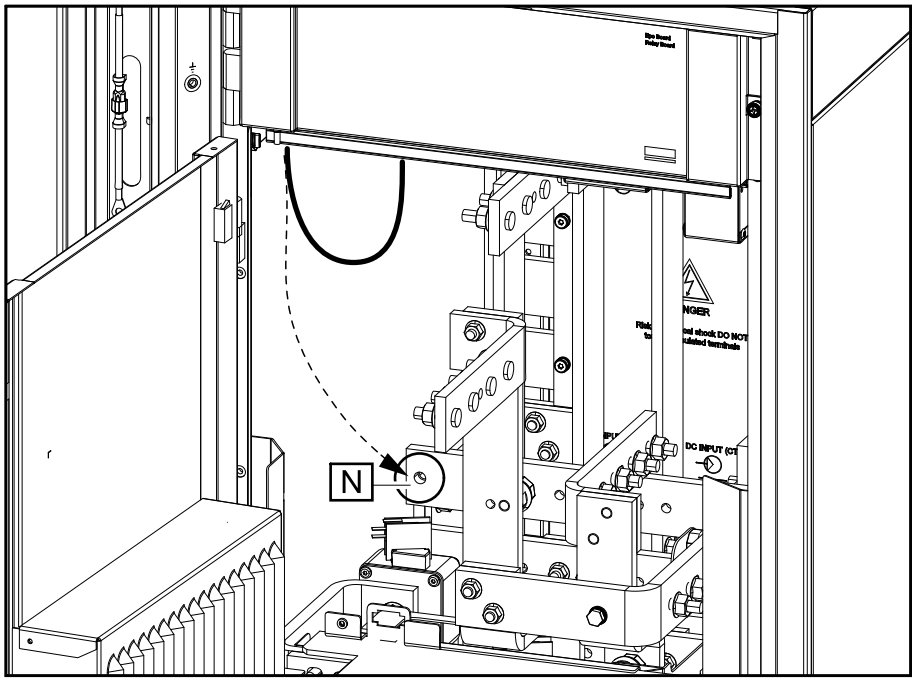
HAZARD OF ELECTRIC SHOCK

Install the bonding jumper in 480 V 3–wire systems.

Failure to follow these instructions can result in injury or equipment damage.

1. Connect the bonding jumper, that is connected to the grounding busbar in the side of the I/O cabinet, to the N-point.

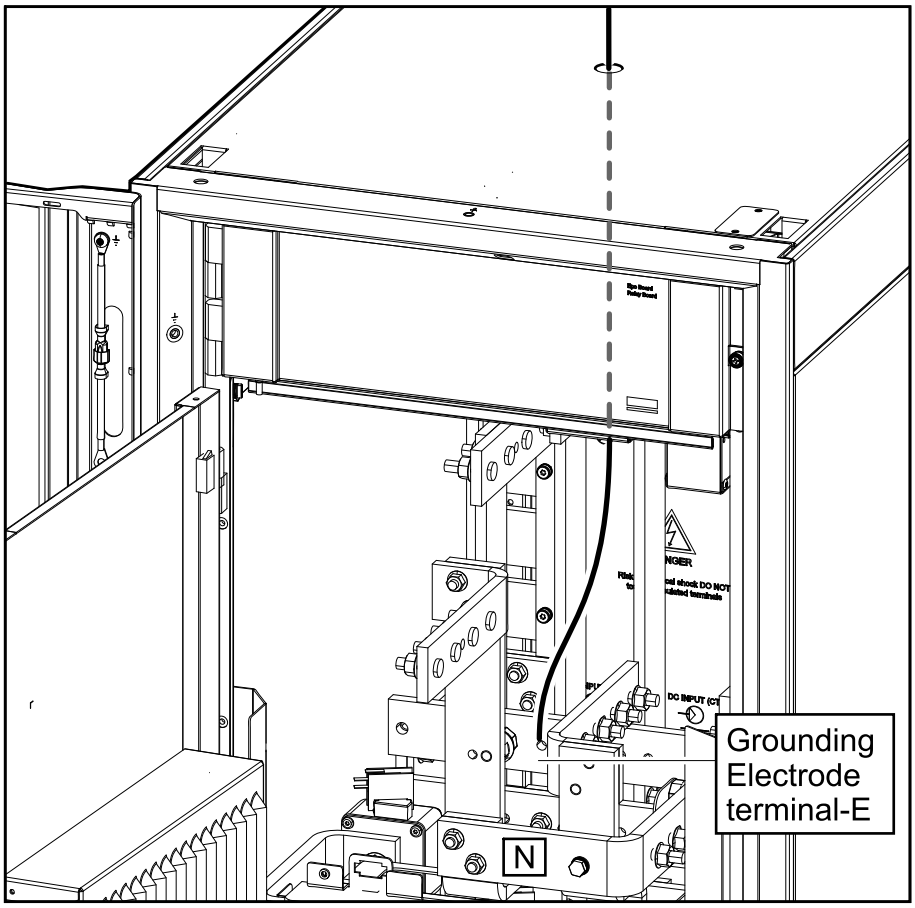
I/O Cabinet



Connect the Technical Earth

1. Connect the earth electrode to the N busbar in the I/O cabinet in the location labeled **Grounding Electrode terminal – E**.

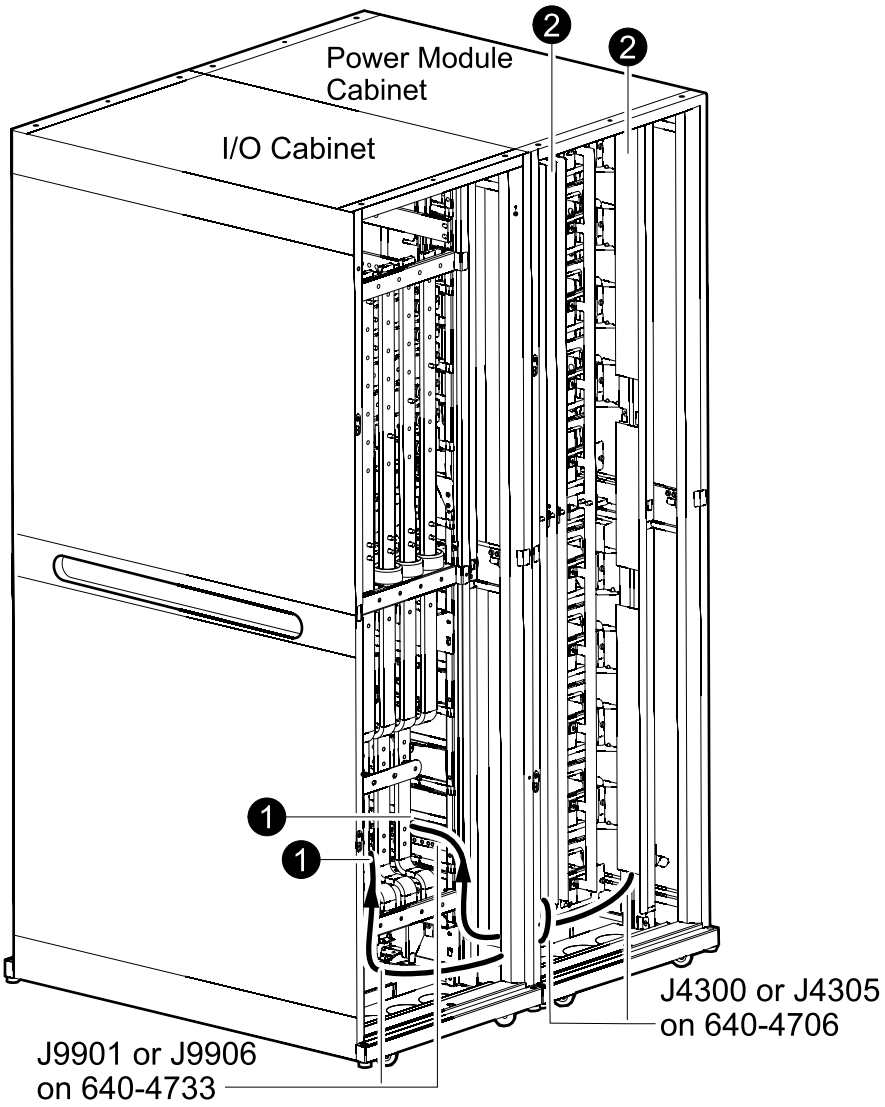
I/O Cabinet



Connect the Communication Cables

Connect the Communication Cables between the Power Module and the I/O Cabinets in 250 kW Systems

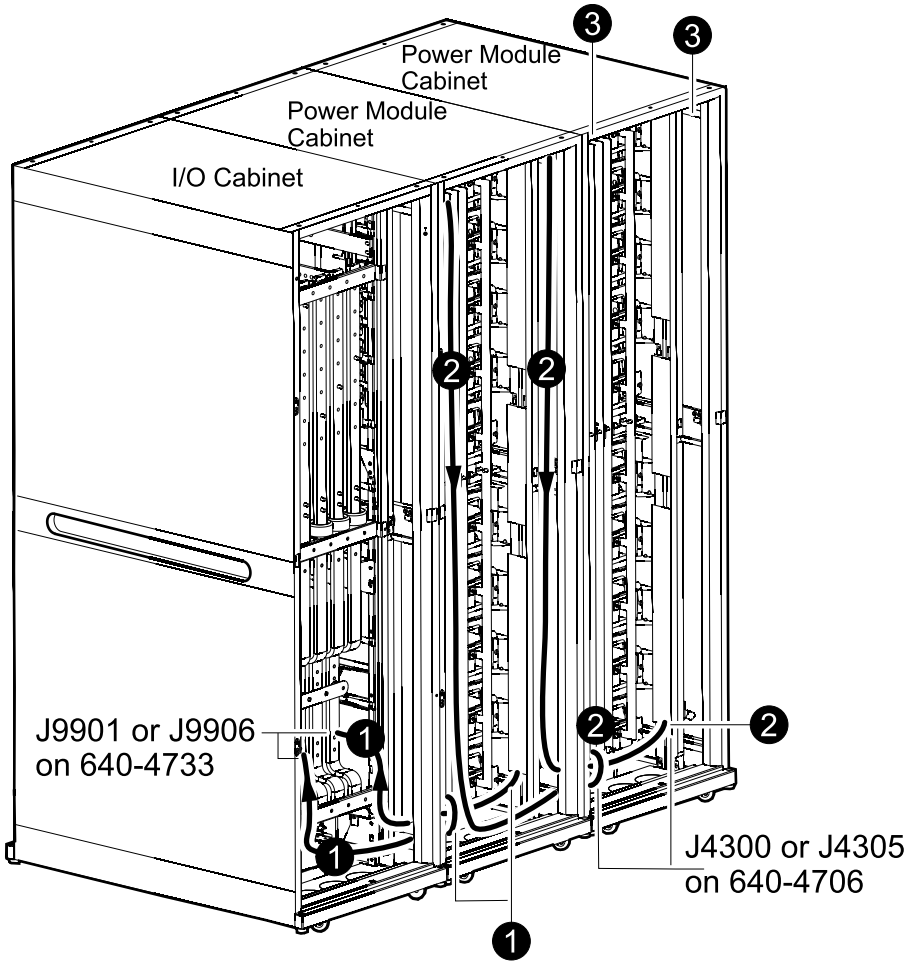
Rear View of I/O Cabinet and Power Module Cabinet



1. Locate the MIM/RIM cables that are placed in the bottom of the power module cabinet and connect them in the bottom of the I/O cabinet (left to left and right to right).
2. Verify that terminators are installed.

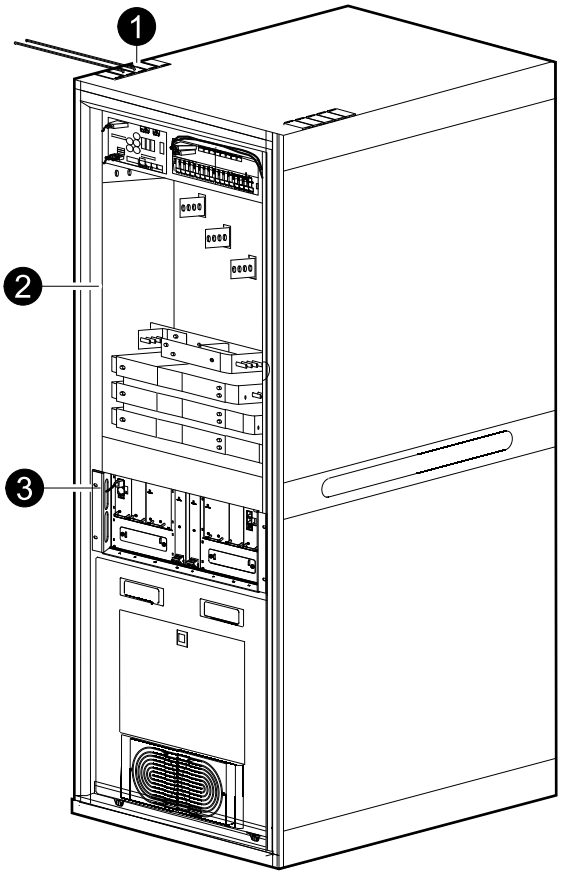
Connect the Communication Cables between the Power Module and the I/O Cabinets in 500 kW Systems

Rear View of I/O Cabinet and Two Power Module Cabinets



1. Locate the MIM/RIM cables that are placed in the bottom of the power module cabinet next to the I/O cabinet and connect them in the bottom of the I/O cabinet (left to left and right to right).
2. Locate the MIM/RIM cables that are placed in the bottom of the other power module cabinet. Connect one end in the top of this power module cabinet and the other end in the bottom of the first power module cabinet (left to left and right to right).
3. Verify that terminators are installed.

Run the Communication Cables



1. Run the cables through the openings in the top cover.
2. Guide the cables through the cable channel in the side.
3. Guide the cables through the hole from the cable tray to the board assembly.

EPO switch wiring

In installations with EPO, the UPS must be connected to either a dry contact or an external 24 VDC EPO (Emergency Power Off) switch.

For installations in the US and Canada

The EPO circuit is considered Class 2 and SELV (Safety Extra Low voltage). A SELV circuit is isolated from primary circuitry through an isolating transformer and designed so that under normal conditions, the voltage is limited to 42.4 V peak or 60 VDC. SELV and Class 2 circuits must be isolated from all primary circuitry. Do not connect any circuit to the EPO terminal block unless it can be confirmed that the circuit is SELV or Class 2.

Installations in the US:

- CL2 Class 2 cable for general purpose use
- CL2 Plenum cable for use in a vertical shaft or from floor to floor
- CL2 R Racer cable for use in dwellings and raceways
- CL2 X Limited use cable for dwellings and raceways

Installations in Canada:

- CL2 R Certified, type ELC (Extra-Low-Voltage Control Cable)
- CL2 X Certified, type ELC (Extra-Low-Voltage Control Cable)

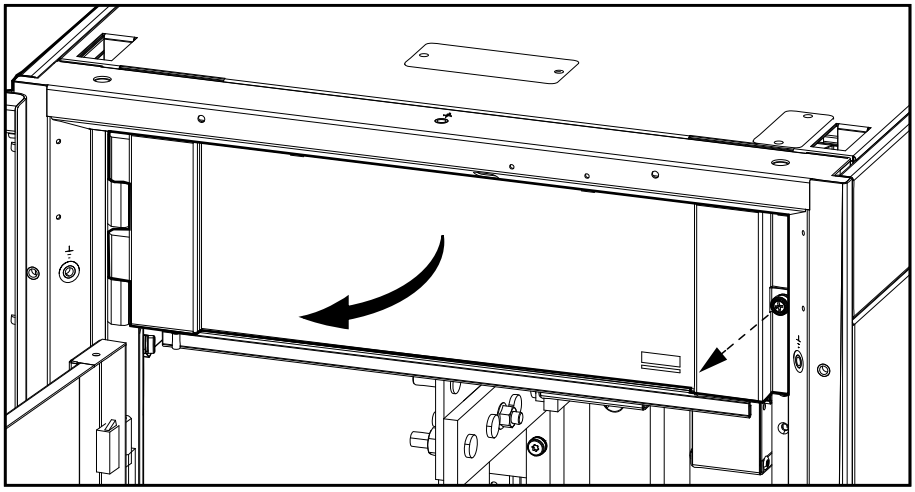
For installations in Europe

The EPO can be achieved with either a contact closure or application of an external 24 V or 24 VDC from a SELV (Safety Extra Low voltage). It is important to note that the hazardous voltage from the input voltage must be isolated from the contact closure or 24 V/24 VDC circuit. The EPO circuit contact closure, the V or VDC circuit is considered a SELV circuit as defined in EN60950 “Safety of Information Technology Equipment”.

Connect the EPO

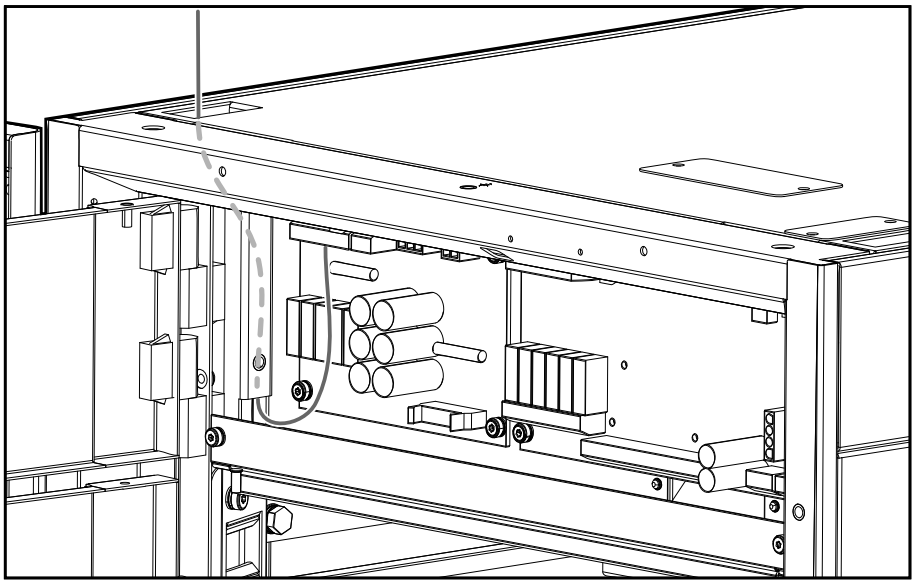
1. Open the door to the communication section in the I/O cabinet.

I/O Cabinet

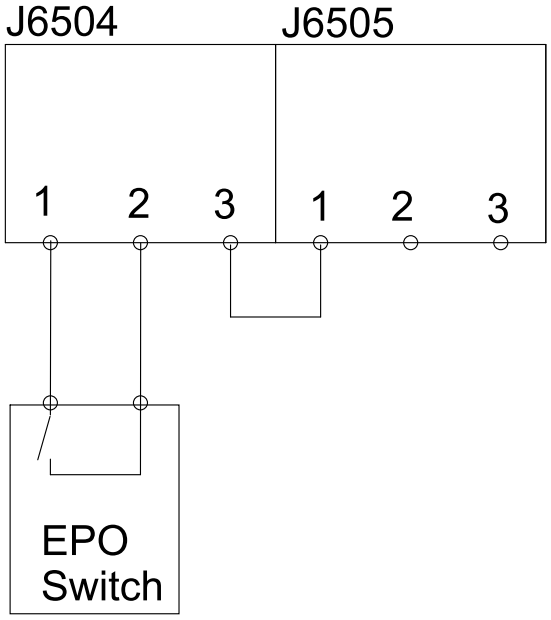


2. Run the cables through the openings in the front left corner of the I/O cabinet.

I/O Cabinet



3. Connect the cable from the EPO to the EPO connection and trip board. A normally open installation is shown.

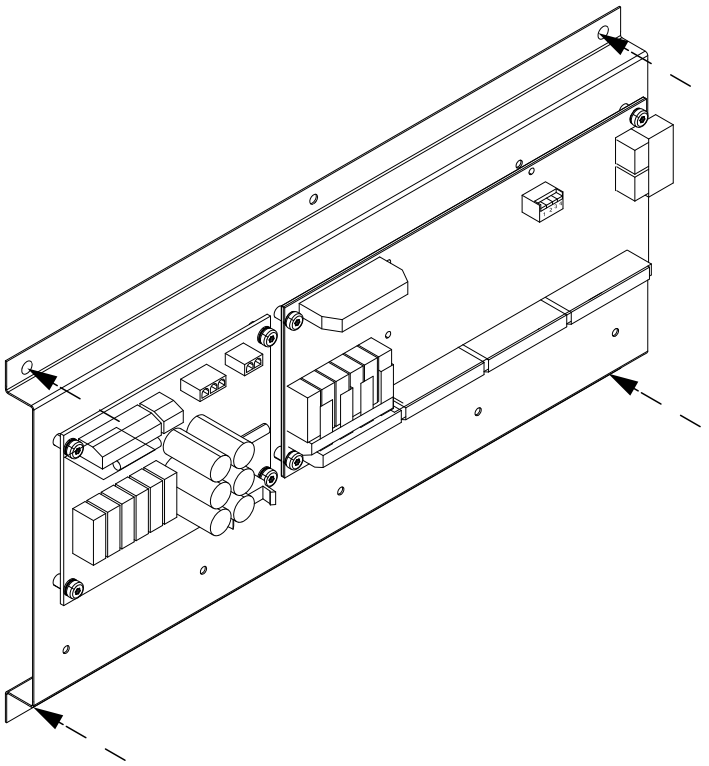


Ancillary Monitor Board and EPO Connection and Trip Board

This section describes how to install the ancillary monitor board and the EPO connection and trip board into a customer-supplied maintenance bypass panel.

Install the Assembly

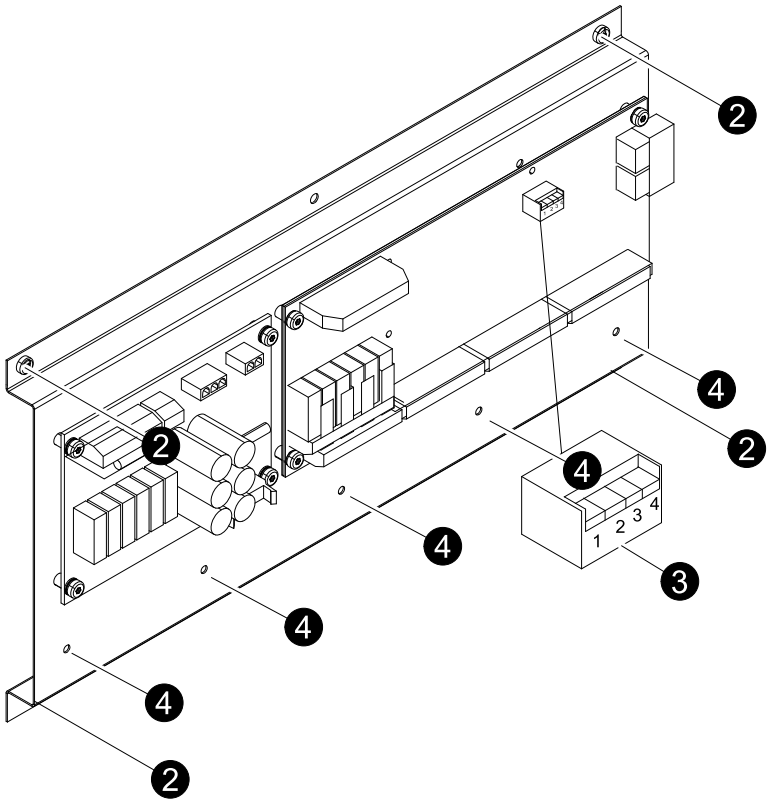
1. Mark the holes in a grounded surface in the maintenance bypass panel and drill four holes (5.5 mm when using the supplied nuts or 4.5 mm when using threaded nuts). Recommended thickness of metal is 1 to 1.5 mm.



2. Attach the assembly with the four supplied M5 screws and nuts.
3. Verify that the ancillary monitor board DIP switch is configured for use in a customer-supplied maintenance bypass panel (Pin 1 up and pins 2–4 down).

SW1	Pin 1	Pin 2	Pin 3	Pin 4
Ancillary monitor board	Up	Down	Down	Down

4. Install the supplied cable ties in the pre-drilled holes at the bottom of the assembly for securing of all signal wires.



Connect Signal Wires to the Boards

⚠WARNING

HAZARD OF ELECTRIC SHOCK

All wiring to the boards should be considered as field wiring rated minimum 480 V and must use copper conductors only.

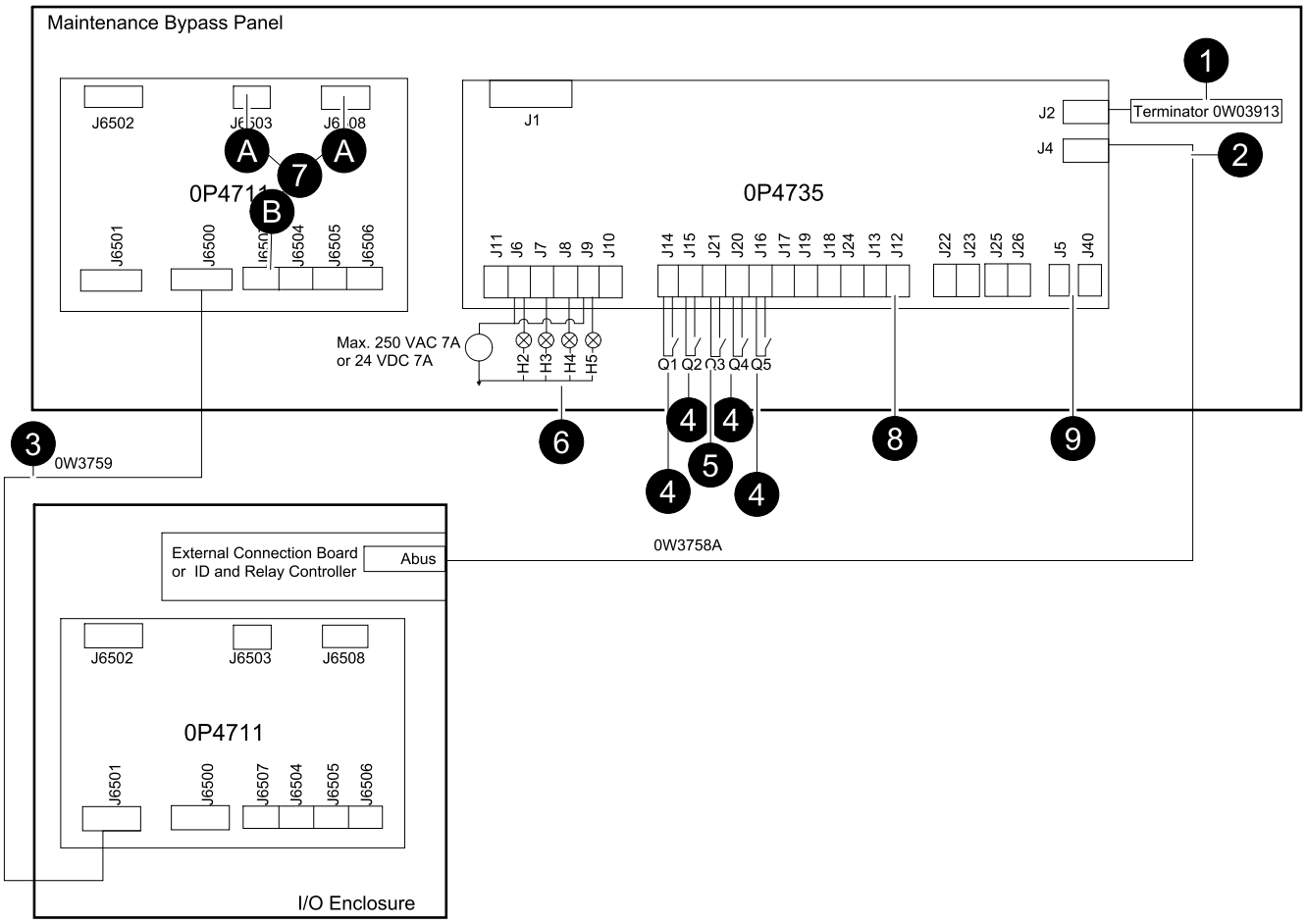
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: All input voltages must have the same ground and 0 V reference.

NOTE: If the inputs for Q2, Q4, Q5 are not used, jumpers must be installed.

NOTE: When the UPS is installed in environments sensitive to interference, the EMC kit with three ferrite cores must be installed with three loops. Add a clip on ferrite for high frequency noises. Use kit 0J-9147.

Connect Signal Wires in Single Systems



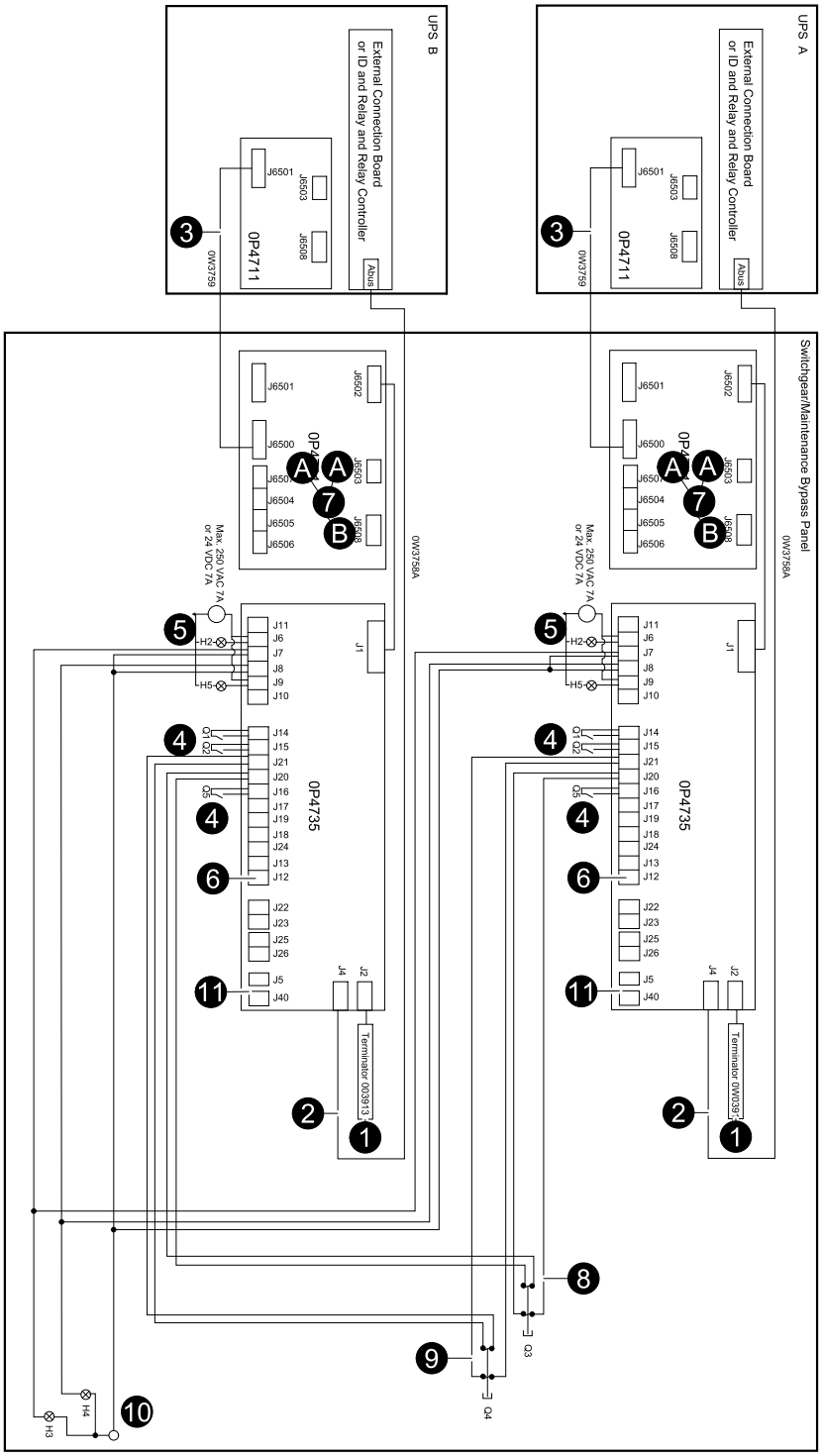
1. Install terminator 0W03913 in the J2 terminal on the 0P4735.
2. Connect the Abus cable 0W3758 from J4 on the 0P4735 to the Abus terminal external connection board or ID and relay controller on the front of the I/O cabinet.
3. Connect the cable 0W3759 from J6500 on 0P4711 in the maintenance bypass panel to J6501 on 0P4711 in the top of the I/O cabinet.
4. Connect a normally open (NO) auxiliary switch for Q1, Q2, Q4, Q5 status. Q1 is mandatory and Q2, Q4, and Q5 are optional depending on installation. If the inputs are not used, jumpers must be installed.
5. Connect normally closed (NC) auxiliary for Q3 status.
6. Connect H2 to H5 lamps for permission to operate Q2 to Q5 (max. 7.2 A/250 V).
7. Connect cable for Q2 tripping to either:
   a. J6503 (UVR). When using Square D UVR or ABB S8 UVR , an external 24 VDC SELV supply must be connected to J6507. For the UVR, the following parts are needed to connect to J6503 pin 2 and 3: 1 TYCO 1-480700-0, M&L 3-position plug housing and 2 TYCO 350218-3 M&L pin, AWG 20-14 (not supplied).
   b. J6508 (SOR). For the SOR shunt trip, the following parts are needed to connect to J6508: 1 TYCO 1-480698-0, M&L 2-position plug housing and 2 TYCO 350218-3 M&L pin, AWG 20-14 (not supplied).
8. Connect contact for door open/close. If the input is not used, jumpers must be installed.

9. Option: Connect external synchronization cables from L1 and L2 of the preferred AC source to J5 (L1) and J40 (L2).

   NOTE: Install a fuse on the external synchronization cable. Fuse size 1–2 A depending on system.

Connect Signal Wires in Parallel Systems

NOTE: The below diagram shows a parallel system with two UPS units. The wiring principle is the same for up to four UPS units.



1. In each UPS, install terminator 0W03913 in the J2 terminal on the ancillary monitor board.
2. In each UPS, connect the Abus cable 0W3758 from J4 on the 0P4735 to the Abus terminal external connection board or ID and relay controller on the front of the I/O cabinet.

3. In each UPS, connect the cable 0W3759 from J6500 on the 0P4711 in the maintenance bypass panel to J6501 on 0P4711 in the top of the I/O cabinet.
4. In each UPS, connect normally open (NO) auxiliary switch for Q1, Q2, and Q5 status.
5. In each UPS, connect H2 and H5 lamps for permission to operate Q2 and Q5.
6. Connect contact for door open/close. If the input is not used, jumpers must be installed.
7. In each UPS, connect cable for Q2 tripping to either:
   a. J6503 (UVR). When using Square D UVR or ABB S8 UVR, an external 24 VDC SELV supply should be connected to J6507. For the UVR, the following parts are needed to connect to J6503 pin 2 and 3: 1 TYCO 1-480700-0, M&L 3-position plug housing and 2 TYCO 350218-3 M&L pin, AWG 20-14 (not supplied).
   b. J6508 (SOR). For the SOR shunt trip, the following parts are needed to connect to J6508: 1 TYCO 1-480698-0, M&L 2-position plug housing and 2 TYCO 350218-3 M&L pin, AWG 20-14 (not supplied).
8. Connect normally closed contact for Q3. Each UPS must be connected to a separate dry contact.
9. Connect normally open contact for Q4. Each UPS must be connected to a separate dry contact.
10. Connect H3 and H4 lamps in parallel.
11. Option: Connect external synchronization cables from L1 and L2 of the preferred AC source to J5 (L1) and J40 (L2) on the 0P4735 board for each UPS in the parallel system.

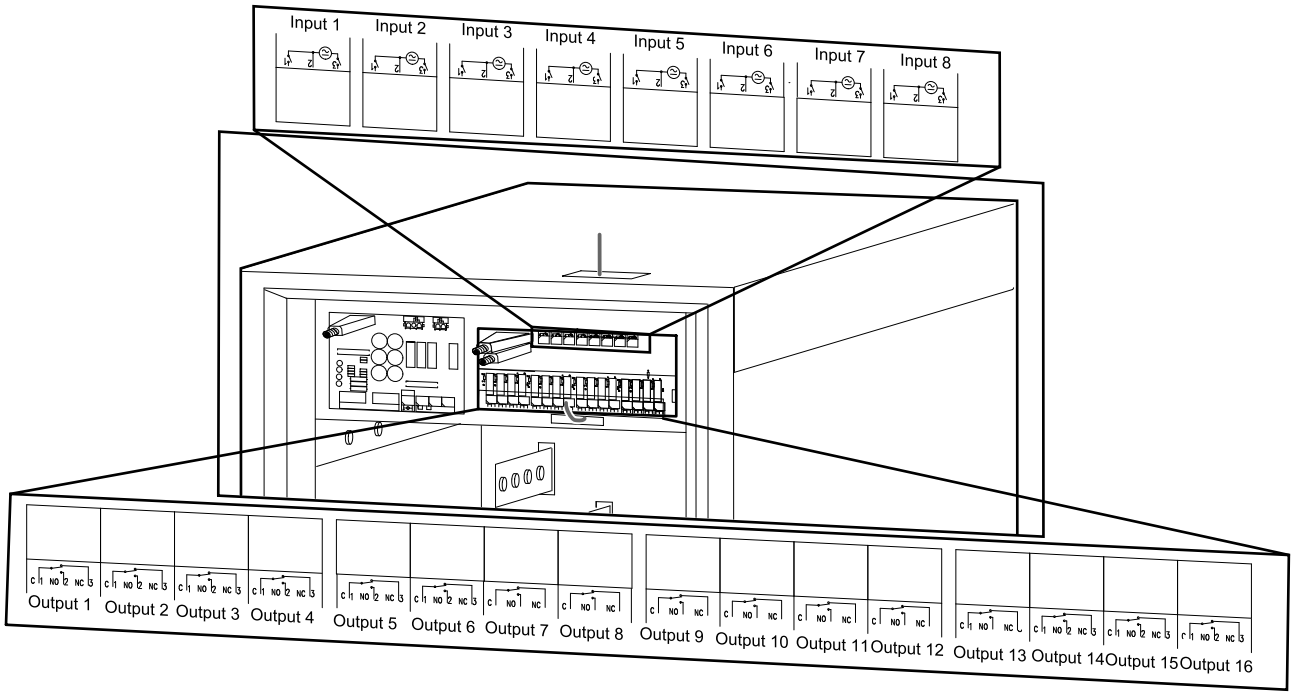
    NOTE: Install a fuse on each external synchronization cable. Fuse size 1–2 A depending on system.

Relay Inputs/Outputs

The relay board informs the user of the operation mode, status, and alarm conditions and has eight input ports and 16 output terminals.

All wiring to the relay board should be considered as field wiring rated minimum 480 V, and must use copper conductors only.

NOTE: Communication cables to the relay board must be run through the openings in the middle of the I/O cabinet via the cable channel to the relay board.



Inputs

All input voltages must have the same ground and 0 V reference.

- Minimum: 12 VAC/VDC
- Maximum: 28 VAC/40 VDC

Input 1	Reduction of charge power
Input 2	Boost charge inhibit
Input 3	Battery ground fault
Input 4	Enable external synchronization
Input 5	Internal use
Input 6	Internal use
Input 7	Door contact
Input 8	Activate mega tie mode

NOTE: When the UPS is installed in environments sensitive to interference, the EMC kit with three ferrite cores must be installed with three loops. Add a clip on ferrite for high frequency noises. Use kit 0J-9147.

Outputs

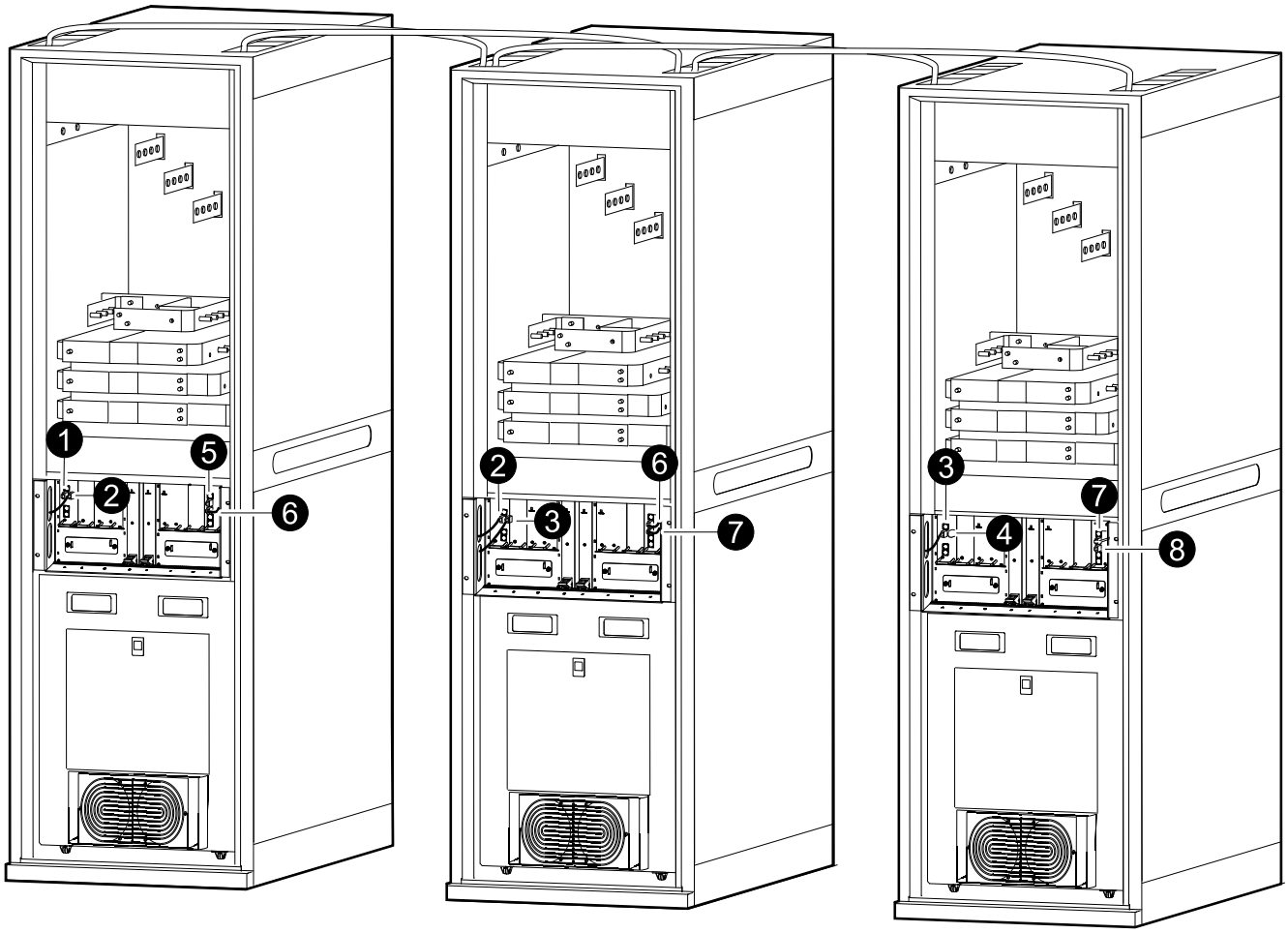
- Maximum. 8 A/250 VAC
- Maximum. 8 A/24 VDC

Output 1	Common alarm, configurable
Output 2	Normal operation, configurable
Output 3	Bypass operation, configurable
Output 4	Battery operation, configurable
Output 5	Battery voltage low, configurable
Output 6	Battery fault, configurable
Output 7	Maintenance bypass on, configurable
Output 8	Input outside tolerance, configurable
Output 9	Bypass outside tolerances, configurable
Output 10	Output outside tolerance, configurable
Output 11	Battery disconnected, configurable
Output 12	Overload on inverter/bypass, configurable
Output 13	Option 1, configured via display
Output 14	Option 2, configured via display
Output 15	Option 3, configured via display
Output 16	Option 4, configured via display

Connect Parallel Cables

Interconnect the UPS units in the parallel system using the provided Pbus cables (SYOPT008). The length of the cable is 25 m.

NOTE: It is important that the Pbus2 cables are connected from left to left and the Pbus1 cables are connected from right to right side.



1. Install terminator in slot Pbus2 2A of UPS 1.
2. Connect white Pbus cable from Pbus2 2B of UPS 1 to Pbus2 2A of UPS 2.
3. Connect white Pbus cable from Pbus2 2B of UPS 2 to Pbus2 2A of UPS 3.
4. Install terminator in slot Pbus2 2B of UPS 3.
5. Install terminator in slot Pbus1 1A of UPS 1.
6. Connect red Pbus cable from Pbus1 1B of UPS 1 to Pbus1 1A of UPS 2.
7. Connect red Pbus cable from Pbus1 1B of UPS 2 to Pbus1 1A of UPS 3.
8. Install terminator in slot Pbus 1B of UPS 3.
9. Verify that there are no P-bus communication alarms.

Install the Battery Solution

Follow the installation procedure for your specific battery solution.

NOTE: Only skilled personnel is allowed access in executing this procedure.

Installation Procedure for Line-Up Battery Cabinets

1. Connect Communication Cables between the I/O Cabinet and Battery Cabinet, page 57.
2. Connect the Communication Cables between the Battery Cabinets, page 59.

Installation Procedure for Remote Battery Cabinets

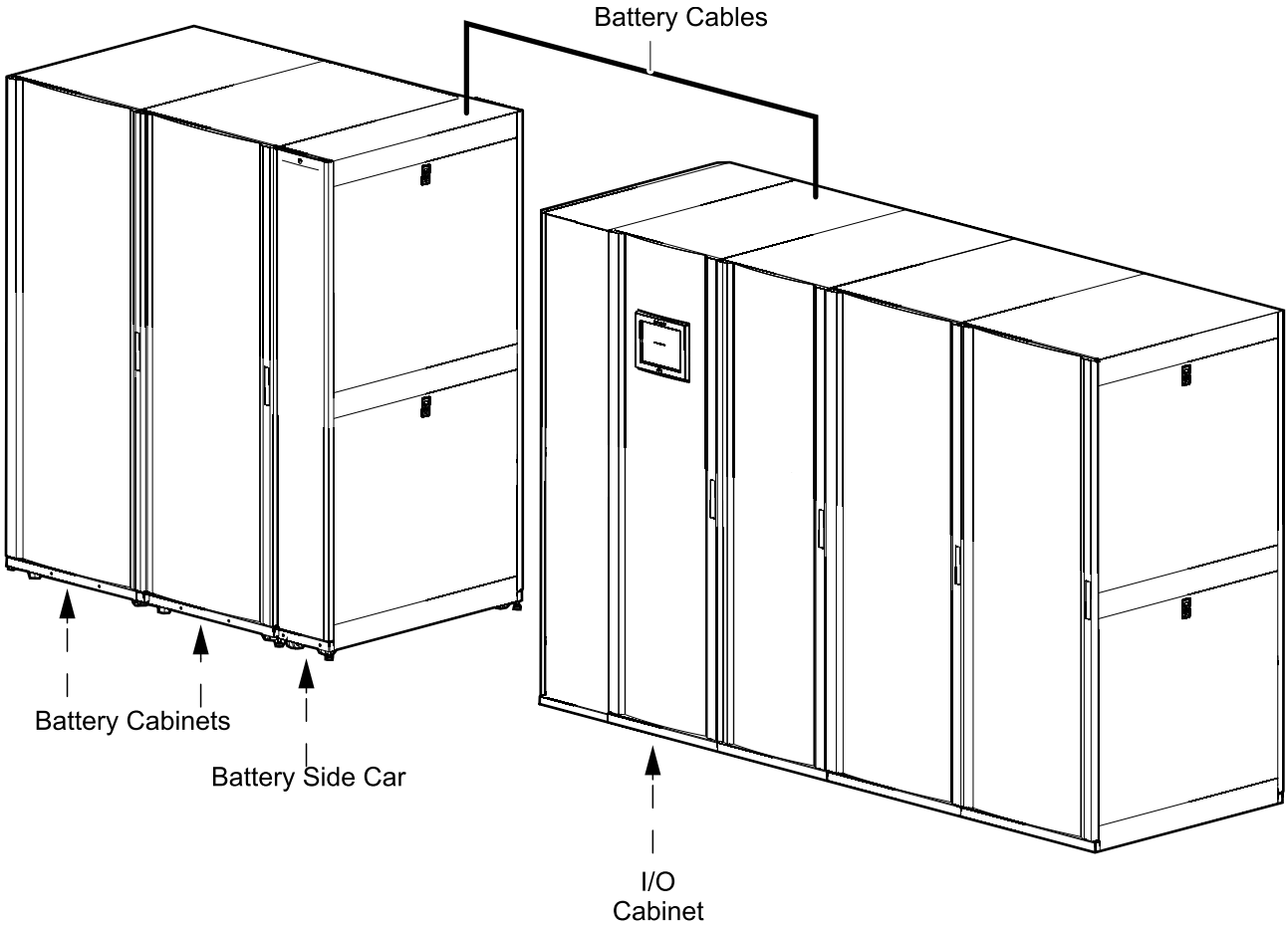
1. Connect the Battery Cables in Systems with Remote Batteries, page 53.
   Follow one of the procedures:
   - Connect the Battery Cables in Top Cable Entry Systems, page 53.
   - Connect the Battery Cables in Bottom Cable Entry Systems, page 55.
2. Connect Communication Cables between the I/O Cabinet and Battery Cabinet, page 57.
3. Connect the Communication Cables between the Battery Cabinets, page 59.

Installation Procedure for Battery Breaker Cabinet

1. Connect the battery cables. Follow one of the procedures:
   - Connect the Battery Cables in Systems with Line-Up Battery Breaker Cabinets, page 62.
   - Connect the Battery Cables in Systems with Remote Battery Breaker Cabinets, page 62.
2. Connect Communication Cables between I/O Cabinet and Battery Breaker Cabinet, page 64.
3. Connect Battery Breaker Cabinet Communication Cables, page 65.

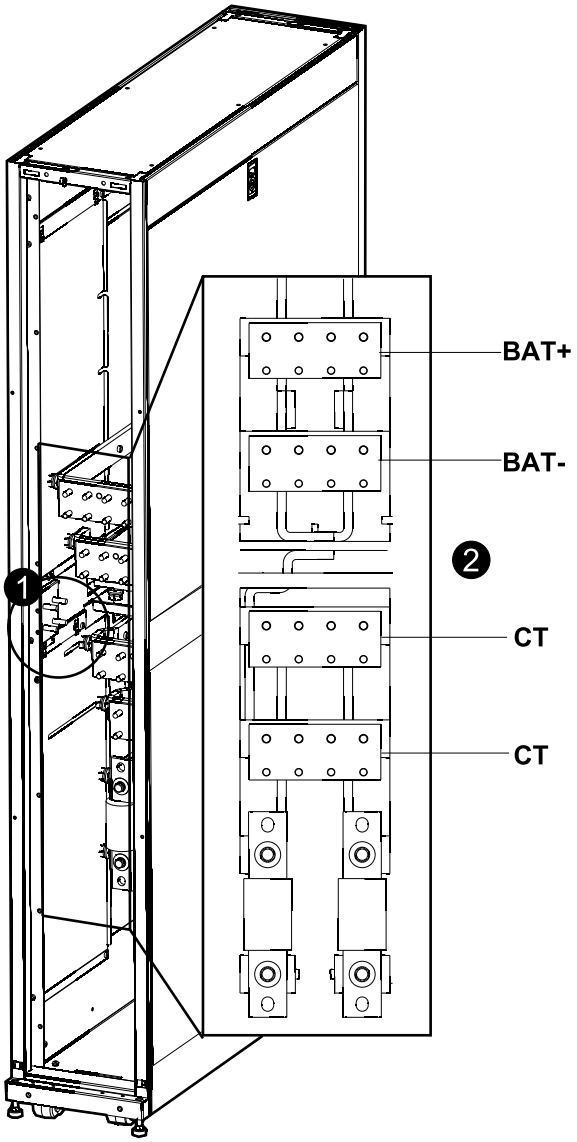
Connect the Battery Cables in Systems with Remote Batteries

Connect the Battery Cables in Top Cable Entry Systems



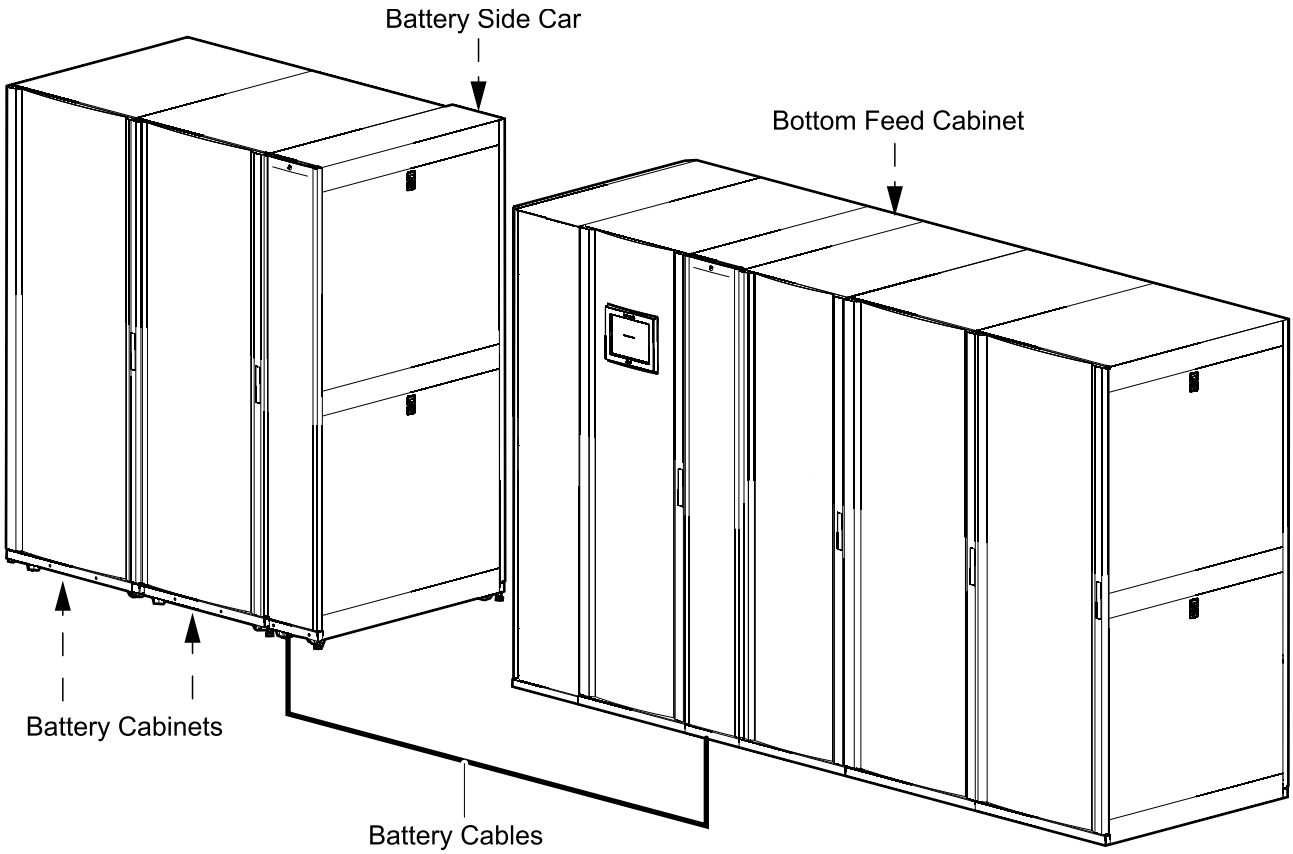
1. In the battery side car, connect the ground/PE cable.

Battery Side Car



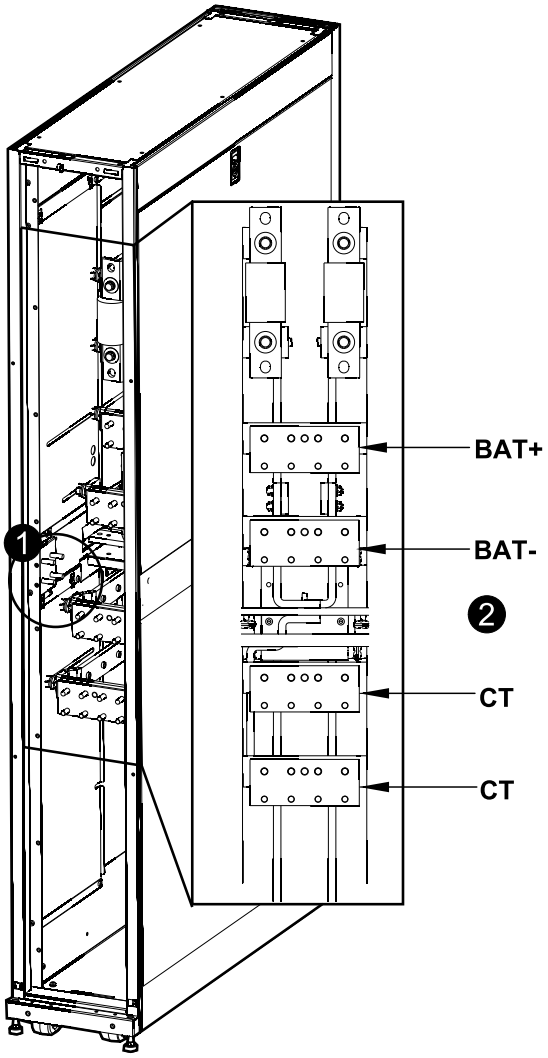
2. Connect one end of the battery cables to the BAT+, BAT-, and CT (Midpoint) cable landings in the battery side car.

Connect the Battery Cables in Bottom Cable Entry Systems



1. In the battery side car, connect the ground/PE cable.

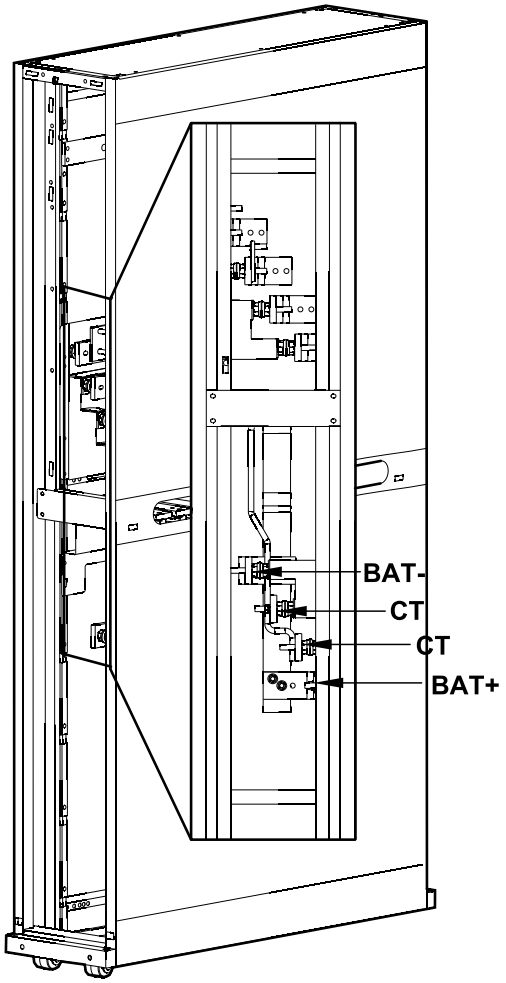
Battery Side Car



2. Connect one end of the battery cables to the BAT+, BAT-, and CT (Midpoint) cable landings in the battery side car.

3. Connect the other end of the battery cables to BAT+, BAT-, and CT (Midpoint) cable landings in the bottom feed cabinet.

Bottom Feed Cabinet



Connect Communication Cables between the I/O Cabinet and Battery Cabinet

⚠DANGER

RISK OF ELECTRIC SHOCK

Do not insert your fingers behind the EPO connection and trip board as hazardous voltages are present if batteries are installed.

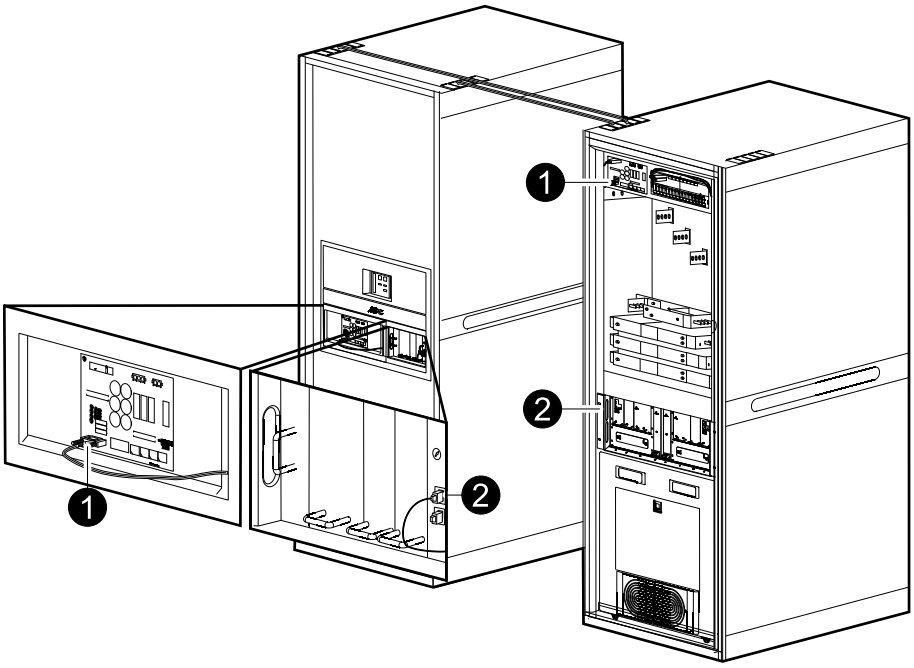
Failure to follow these instructions will result in death or serious injury.

⚠DANGER

RISK OF BURNS

Failed batteries can reach temperatures that exceed the burn threshold for touchable surfaces.

Failure to follow these instructions will result in death or serious injury.



1. Connect the cable 0W4528 (0W3759 in installations with remote batteries) from connector J6500 on 0P4711 in the I/O cabinet to connector J6500 on 0P4711 in the battery cabinet.
2. Route Abus cable 0W4527 (0W3758 in installations with remote batteries) from the Abus terminal in the I/O cabinet to the top Abus terminal in the battery cabinet. Route the cable in the right cable channel and remove the two bolts attaching the top baying kit while routing the cable. Connect the cable.

   NOTE: Only one Abus cable (0W3758) can be used in the installation.

Connect the Communication Cables between the Battery Cabinets

⚠DANGER

RISK OF ELECTRIC SHOCK

Do not insert your fingers behind the boards as hazardous voltages are present if batteries are installed.

Failure to follow these instructions will result in death or serious injury.

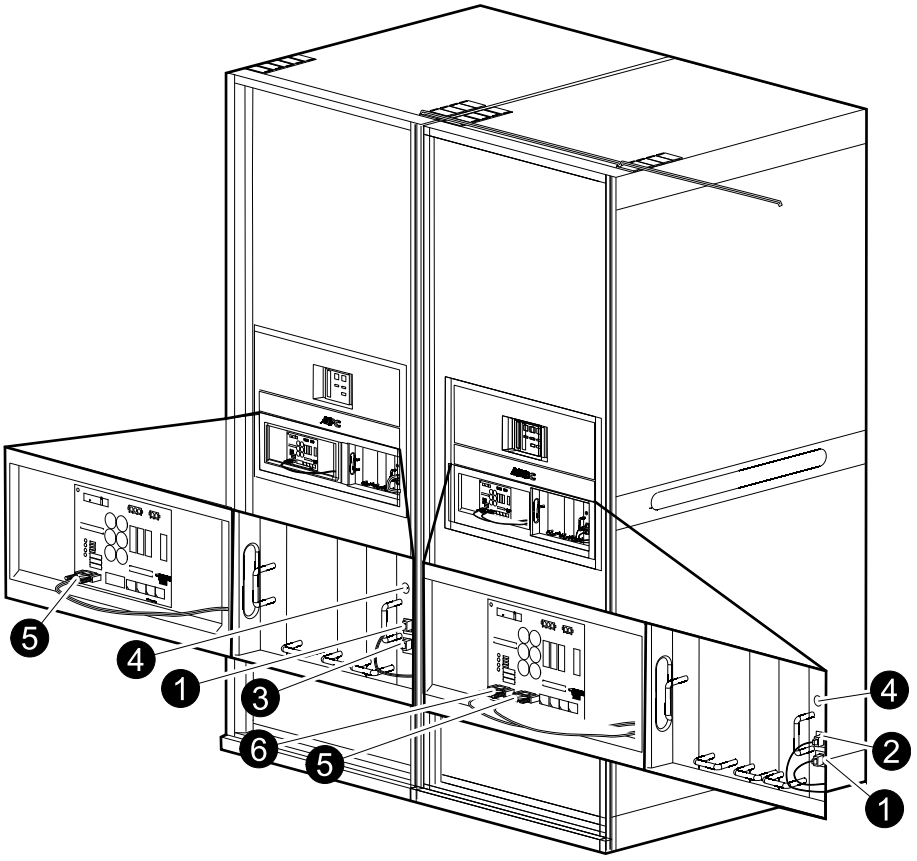
⚠DANGER

RISK OF BURNS

Failed batteries can reach temperatures that exceed the burn threshold for touchable surfaces.

Failure to follow these instructions will result in death or serious injury.

Battery Cabinets



1. Remove the terminator from the bottom Abus terminal on the battery cabinet that is connected to the I/O cabinet. Connect the cable 0W4527 from the Abus terminal to the top Abus terminal in the next battery cabinet.
2. Route the Abus cables 0W4527 between all battery cabinets in the system from the bottom Abus slot to the top Abus slot in the next battery cabinet. Route the cable in the right cable channel and remove the two bolts securing the top baying kit while routing the cable.
3. Install the terminator in the bottom Abus terminal in the last battery cabinet.
4. Set the number of each battery cabinet using the selector.

5. Connect the cable 0W4528 from connector J6501 in the battery cabinet connected to the I/O cabinet to connector J6500 on the next battery cabinet in the system.
6. Connect the cables 0W4528 between all battery cabinets in the system as in step 5.

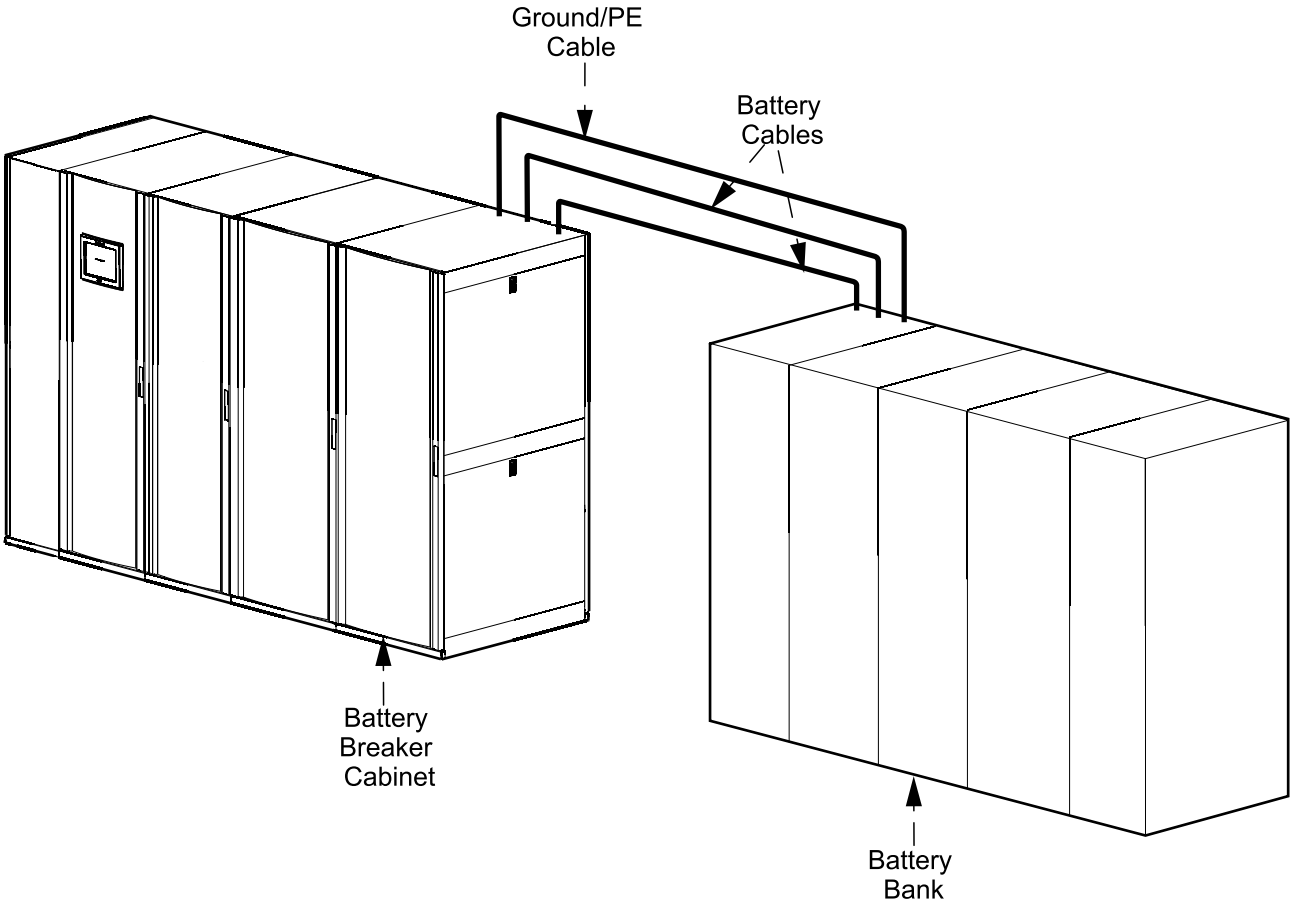
Install the Battery Breaker Cabinet (Option)

The battery breaker cabinet can be installed up against the power module cabinet or remotely.

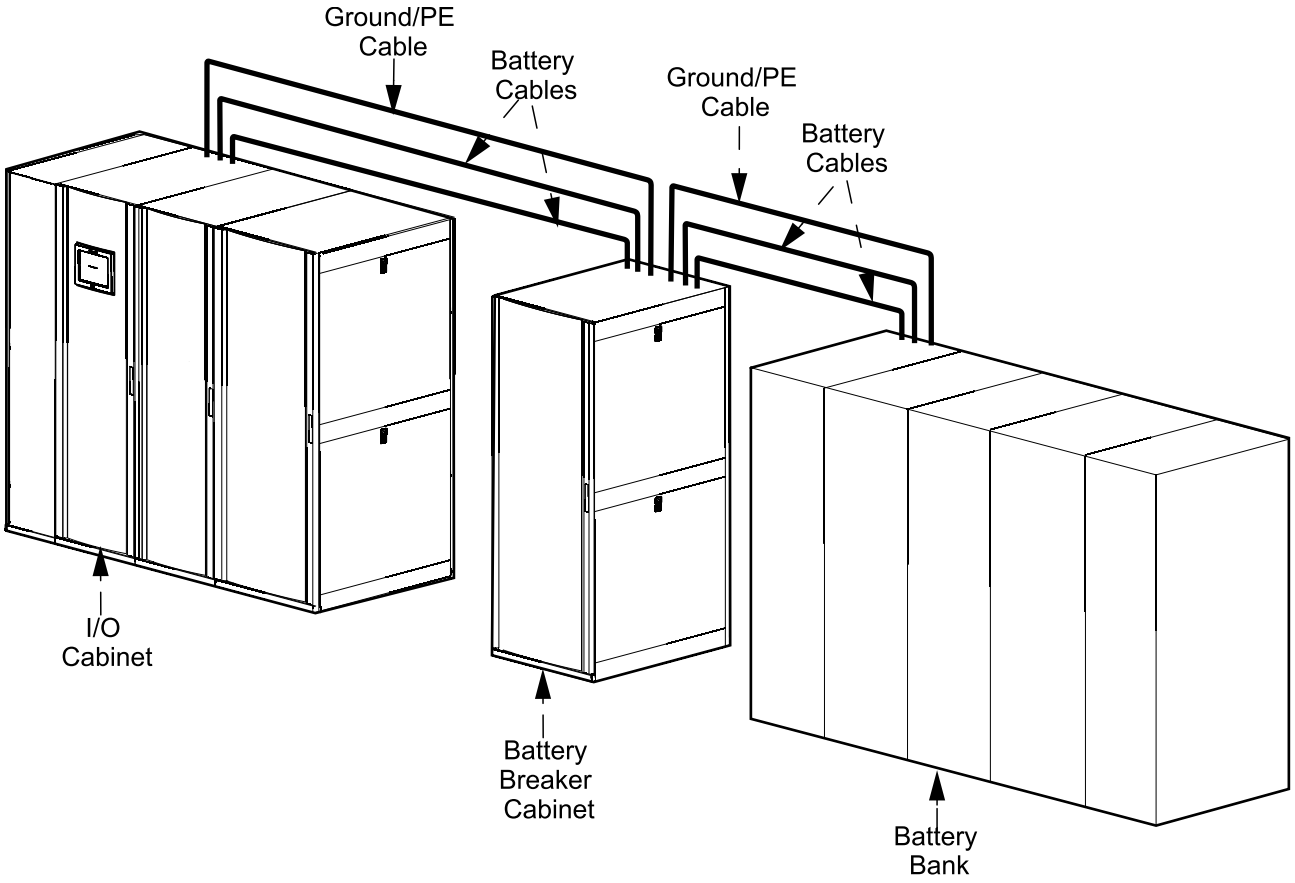
NOTE: In systems with a line-up battery breaker cabinet, the battery breaker cabinet is grounded via the baying kit.

NOTE: In systems with a line-up battery breaker cabinet, the DC output is hard-wired by Schneider Electric via busbars between the battery breaker cabinet and the power module cabinet.

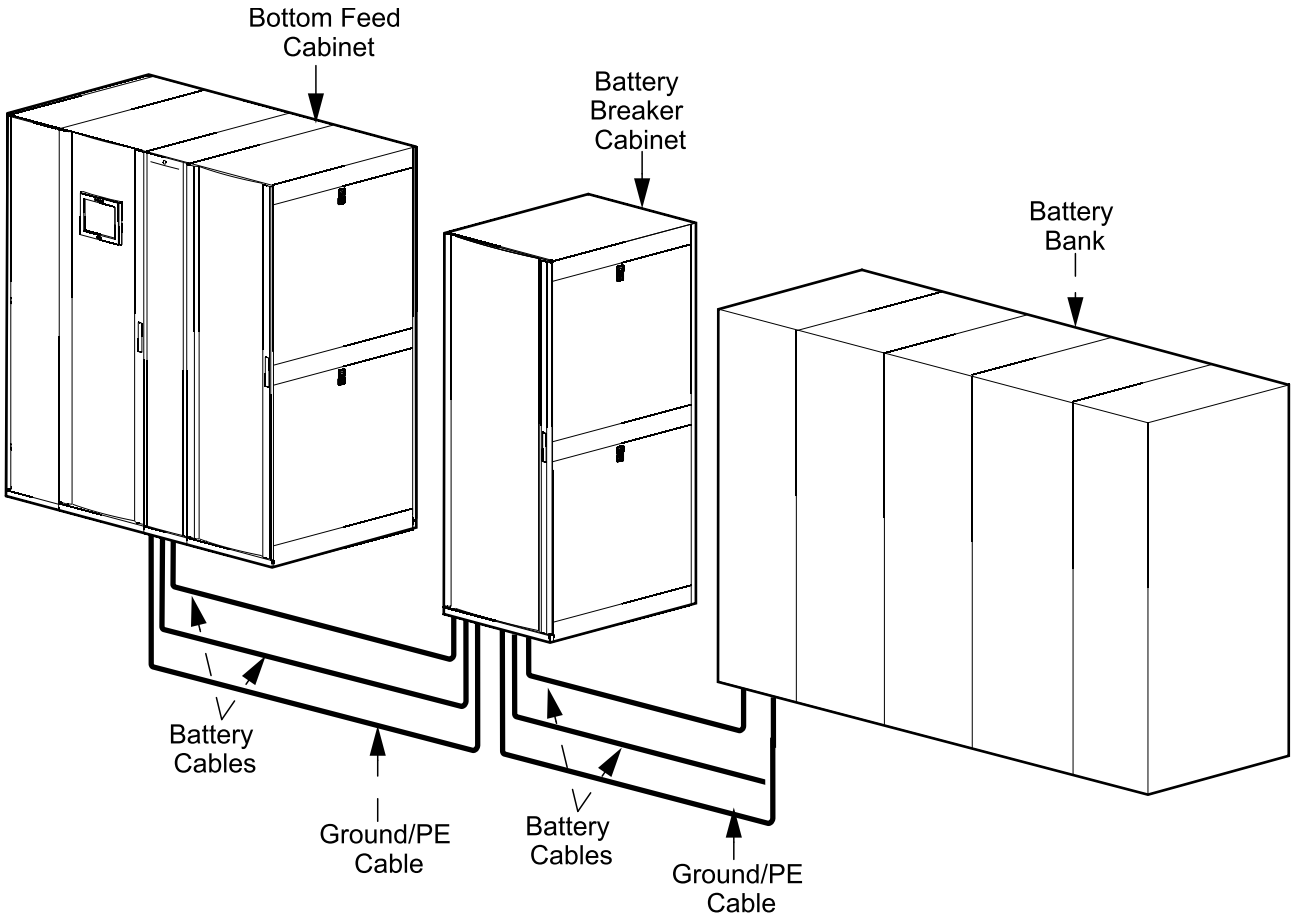
Line-Up Battery Breaker Cabinet



Remote Battery Breaker Cabinet in Top Cable Entry Systems



Remote Battery Breaker Cabinet in Bottom Cable Entry Systems

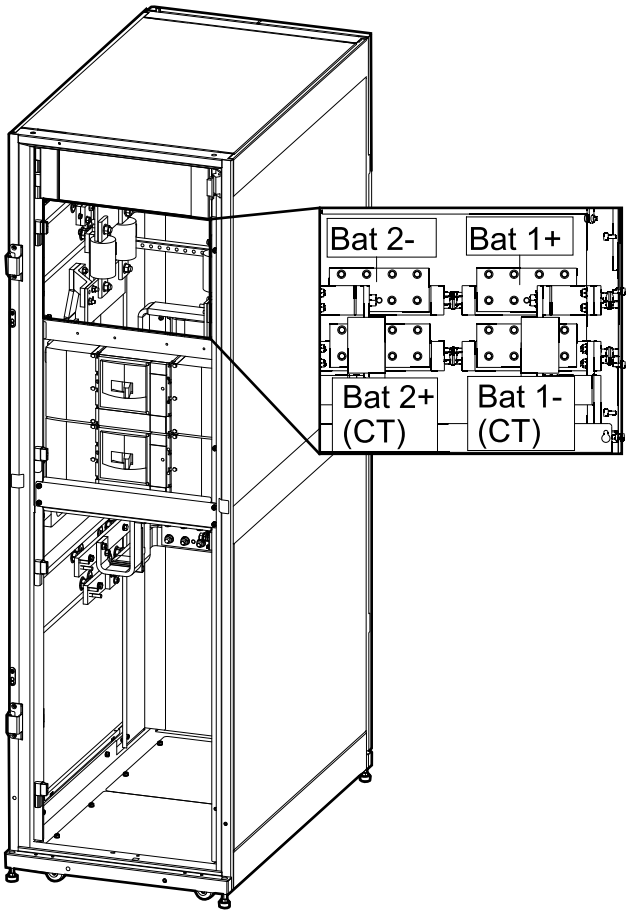


Connect the Battery Cables in Systems with Line-Up Battery Breaker Cabinets

The battery breaker supports two strings of 144 VLA batteries (equal 2 x 288 V). The two strings are divided into a positive (+) and a negative (-) string. For runtime optimization, the number of cells can be adjusted to +/- 6 cells (138-150 cells).

1. Route the battery cables from the battery bank and through the top or bottom of the battery breaker cabinet and guide them to the battery terminals in the top of the cabinet.
2. Connect the battery cables to the Bat 1 and Bat 2 busbars.

Battery Breaker Cabinet

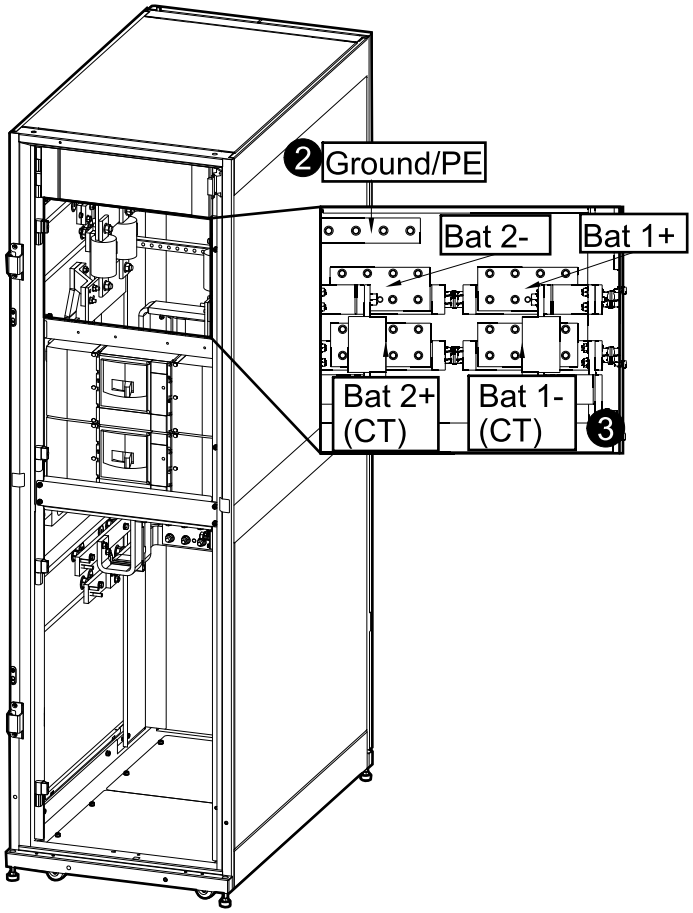


Connect the Battery Cables in Systems with Remote Battery Breaker Cabinets

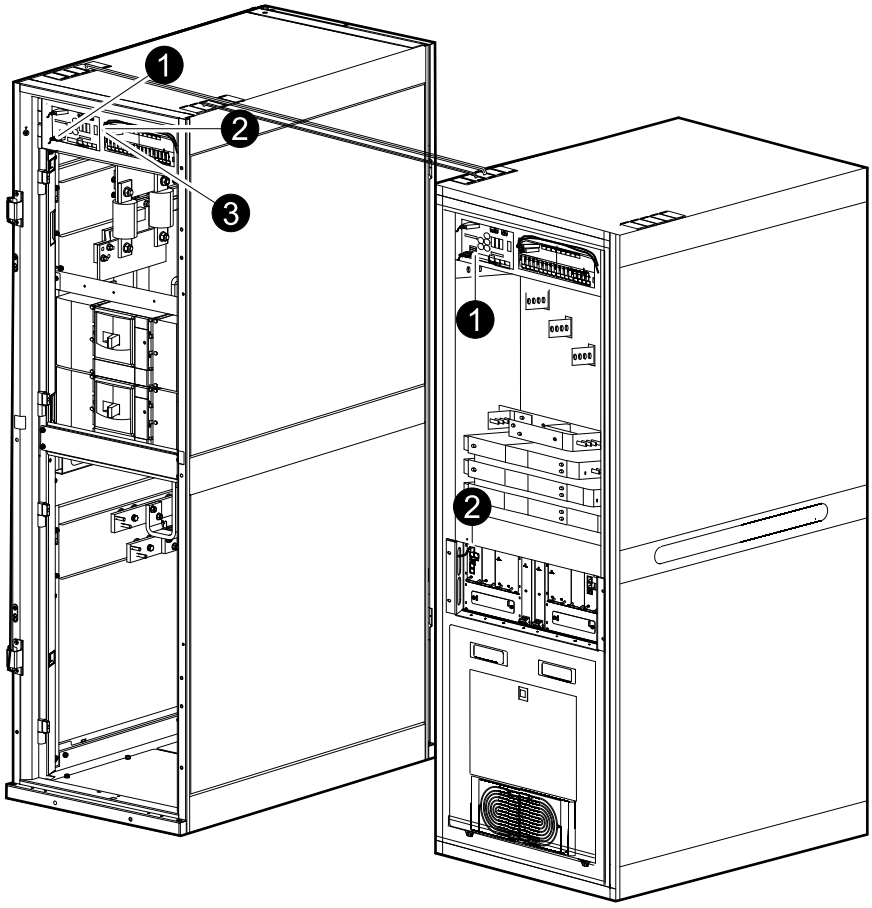
1. Route the battery cables from the battery bank and through the top or bottom of the battery breaker cabinet and guide them to the battery terminals in the top of the cabinet.
2. Connect the ground/PE cable to the equipment grounding terminal in the upper left corner of the cabinet.

3. Connect the battery cables to the Bat 1 and Bat 2 busbars.

Battery Breaker Cabinet

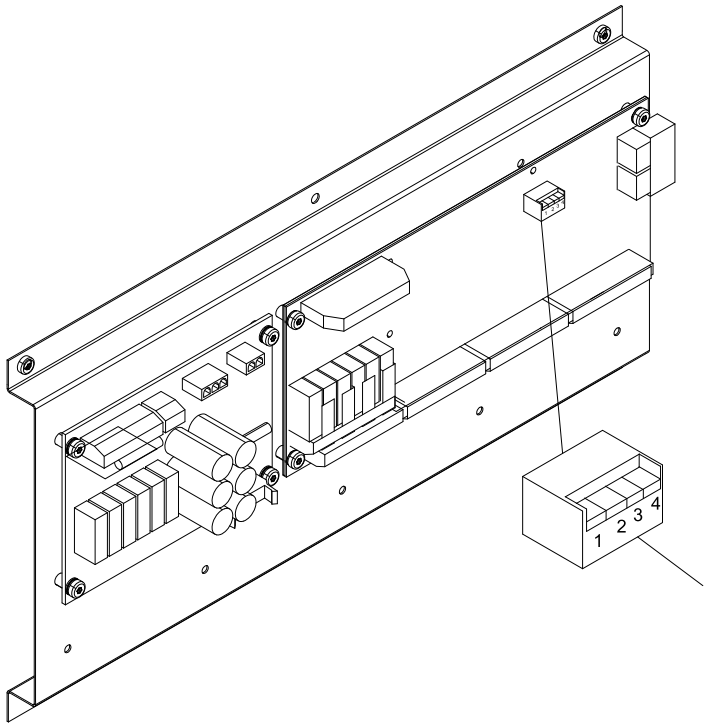


Connect Communication Cables between I/O Cabinet and Battery Breaker Cabinet



1. Connect the cable 0W3759 from connector J6500 on 0P4739 the I/O cabinet to connector J6500 on 0P4739 in the battery breaker cabinet. Attach the cable to the cable relief in the lower left corner.
2. Connect the Abus cable 0W3758 from the Abus terminal in the I/O cabinet to the top Abus terminal J2 on the ancillary monitor board. Attach the Abus cable 0W3758 to the cable relief in the upper right corner.
3. Verify that the terminator 0W03913 is installed in the J4 terminal on the ancillary monitor board in the battery breaker cabinet.

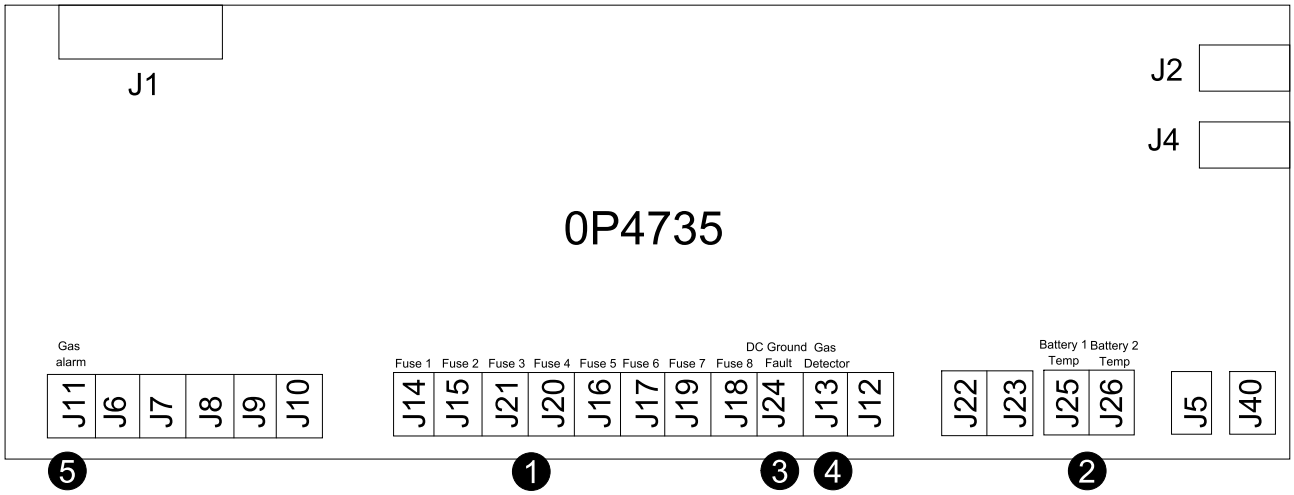
4. Verify that the ancillary monitor board DIP switch is configured for use in a battery breaker cabinet (Pins 1–4 down).



SW1	Pin 1	Pin 2	Pin 3	Pin 4
Ancillary monitor board	Down	Down	Down	Down

Connect Battery Breaker Cabinet Communication Cables

0P4735 in Battery Breaker Cabinet

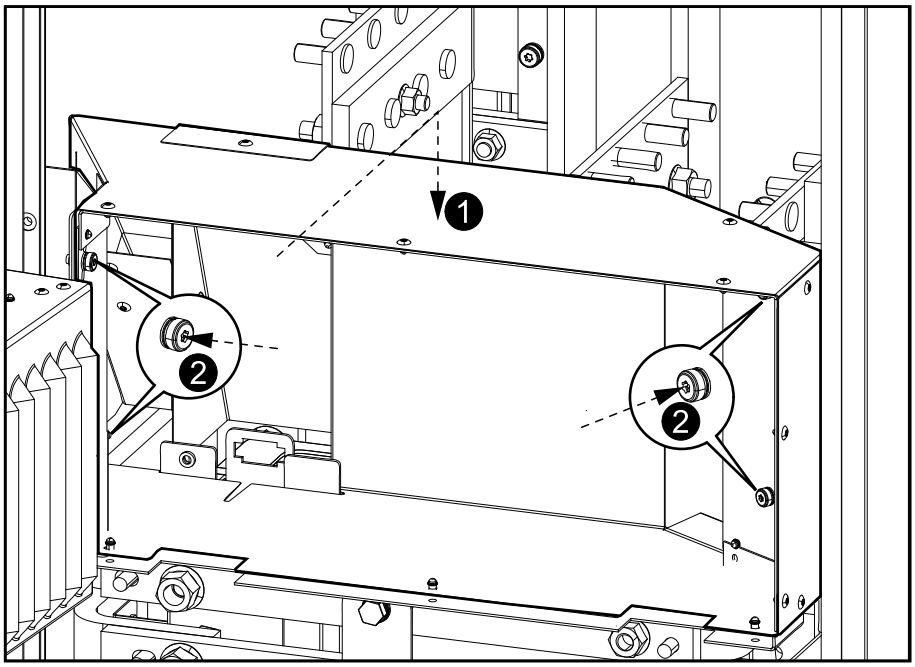


1. Connect cables from fuse indicators in the battery bank to J14-J21. If not used, jump the inputs as they are configured as normally closed (NC).
2. Install the battery temperature sensors in the battery bank as described in the documentation supplied with the battery temperature sensors, and connect cables from the battery temperature sensors to J25 and J26.
3. Connect cables from the DC ground fault detection to J24. If not used, jump the inputs as they are configured as normally closed (NC).
4. Connect cables from the gas detector to J13. If not used, jump the inputs as they are configured as normally closed (NC).

5. Connect cables from gas alarm relay to J11.

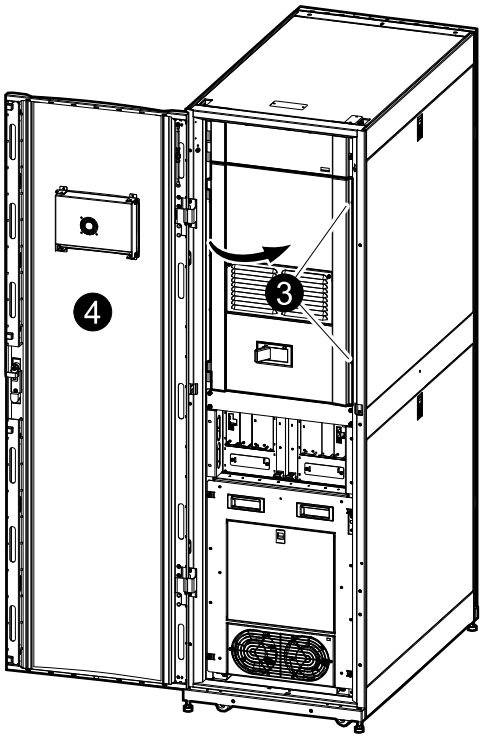
Reinstall the Air Guide in the I/O Cabinet

1. Place the air guide back into the upper section of the I/O cabinet.
2. Reinstall the four screws in the air guide as shown.



3. Close the inner door and reinstall the two screws.
4. Close the front door.

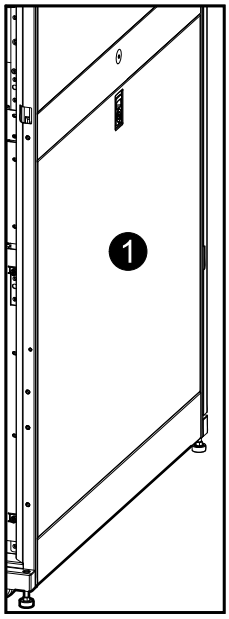
Front View of the I/O Cabinet



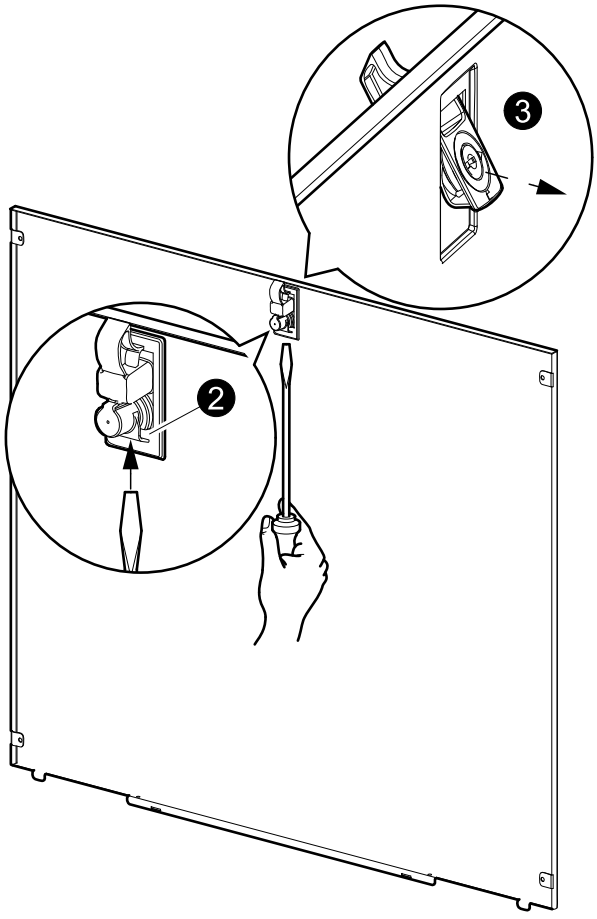
Install Seismic Option

Replace the Side Panel Lock

1. Remove the side panel from the end of row cabinets.

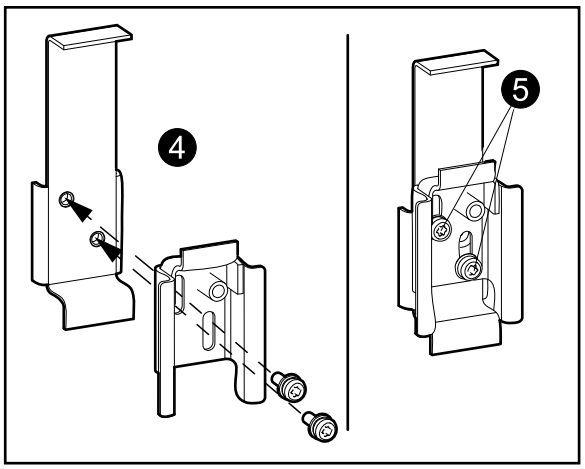


2. Use a screwdriver to press in the tab on the back to remove the lock from the side panel.
3. Pull the lock out and up and remove it from the side panel.

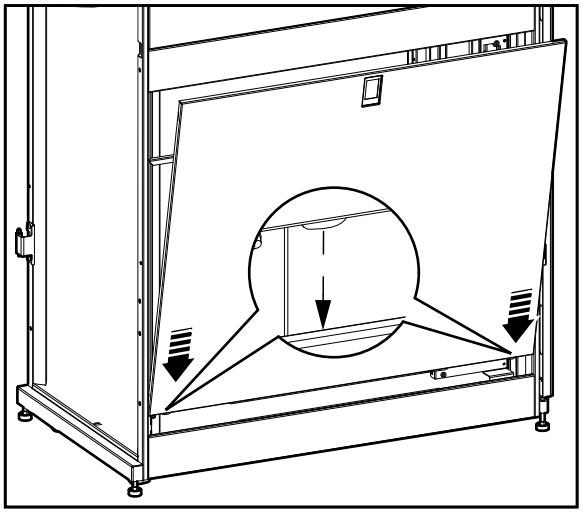


4. Take the two seismic lock parts and put them together.

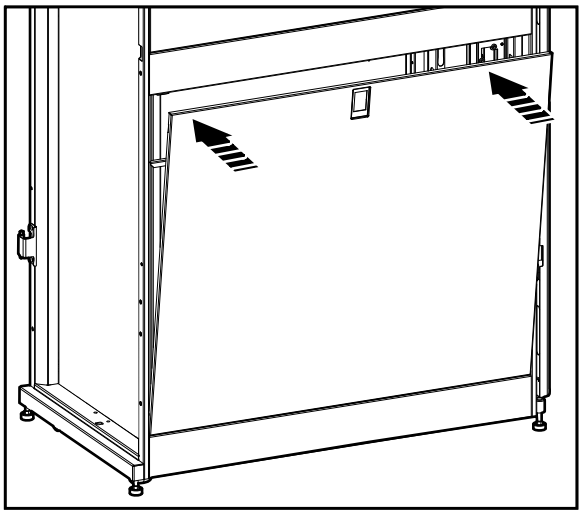
5. Put in the screws but do not tighten completely.



6. Place the side panel at an angle at the bottom of the frame.

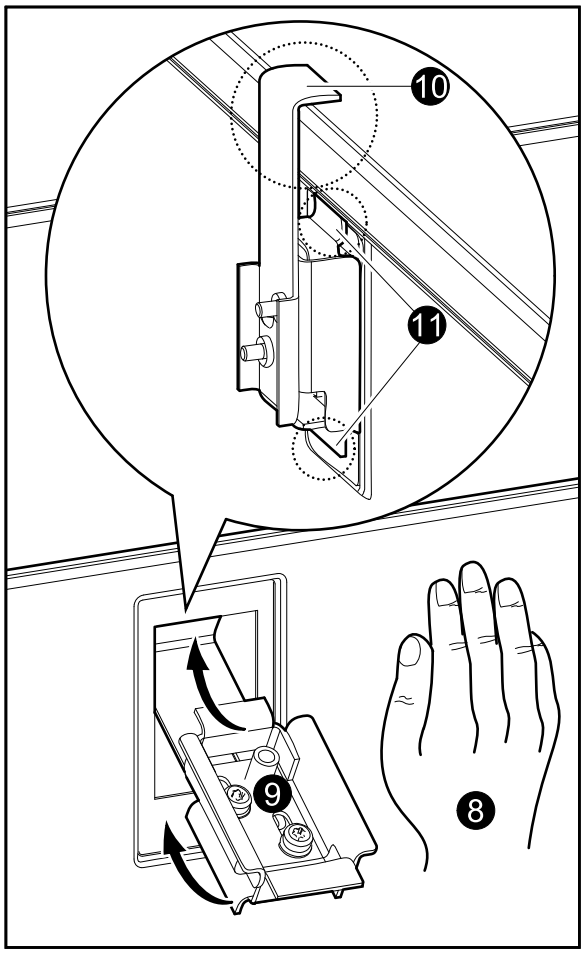


7. Push the top of the side panel in place.

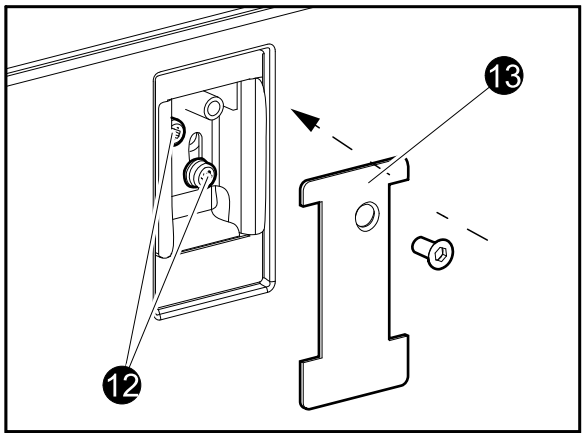


8. Hold the side panel with one hand.
9. Take the lock assembly and guide the top through the hole in the side panel.
10. Lift the lock assembly in place.

11. Ensure that the upper and lower tabs are hidden behind the side panel.

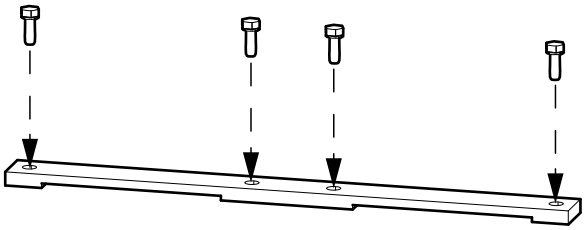


12. Tighten the two screws in the lock assembly.
13. Install the lock cover using the provided screw.

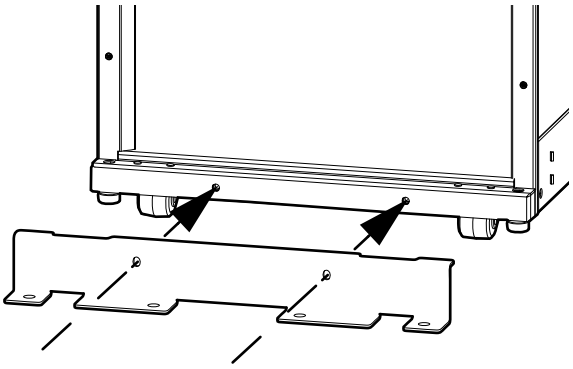


Install the Rear Anchoring Brackets

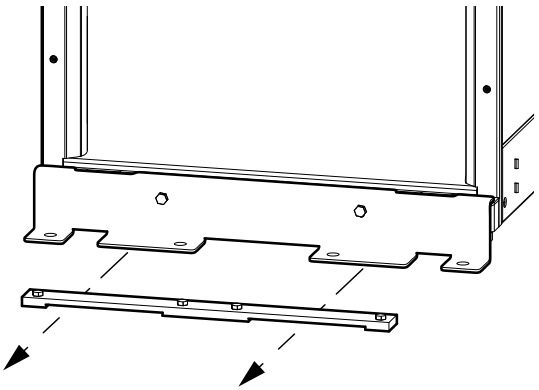
1. Bolt the floor anchoring bracket to the floor using floor anchoring bolts (not supplied). Use M12 strength class 8.8 or 1/2 in grade 5 steel bolts.

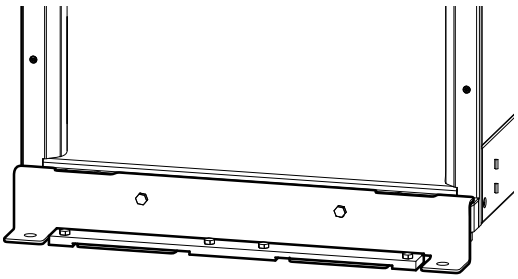


2. Attach the other part of the rear anchoring bracket to the back of the cabinet.



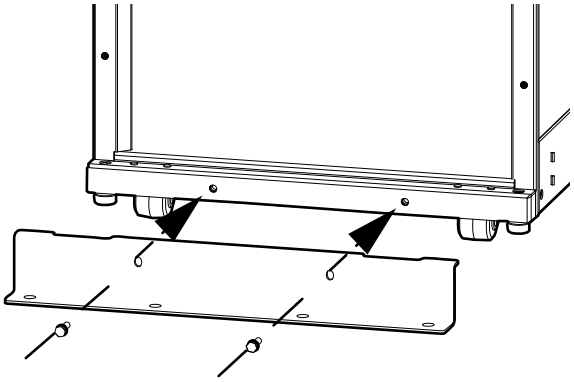
3. Push the cabinet backwards so the rear anchoring bracket on the cabinet slides under the floor anchoring bracket.



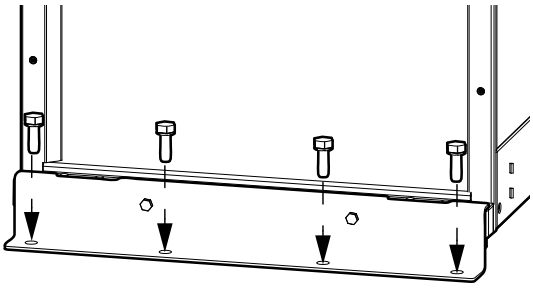


Install the Front Anchoring Bracket

1. Attach the front anchoring bracket to the cabinet.



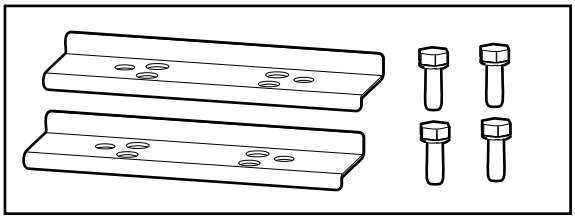
2. Bolt the front anchoring bracket to the floor using floor anchoring bolts (not supplied). Use M12 strength class 8.8 or 1/2 in grade 5 steel bolts.



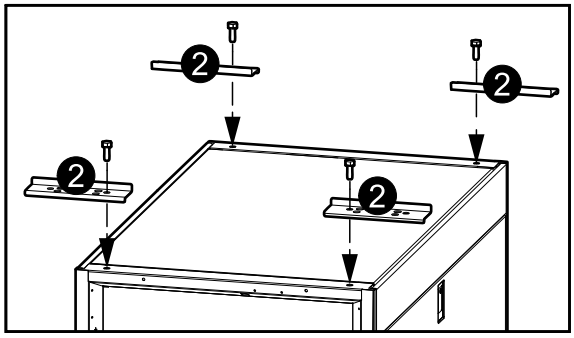
Install the Top Assembly Bracket

Required parts for each assembly:

- Two top assembly brackets
- Four screws



1. **Only applicable for Symmetra PX 100 kW systems:** Dispose of the top assembly brackets supplied with the battery cabinet.
2. Place the top assembly bracket over two adjacent cabinets and attach using two screws.

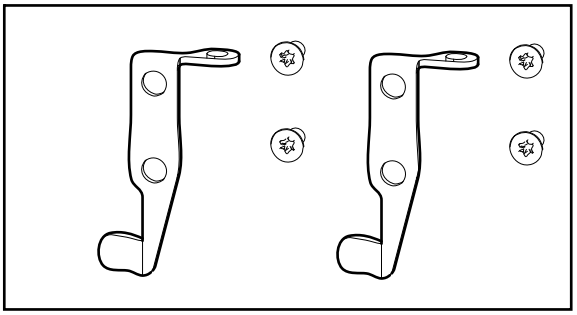


Install the Door Hinge Lock

NOTE: This procedure is only applicable for 600 mm and 750 mm wide cabinets.

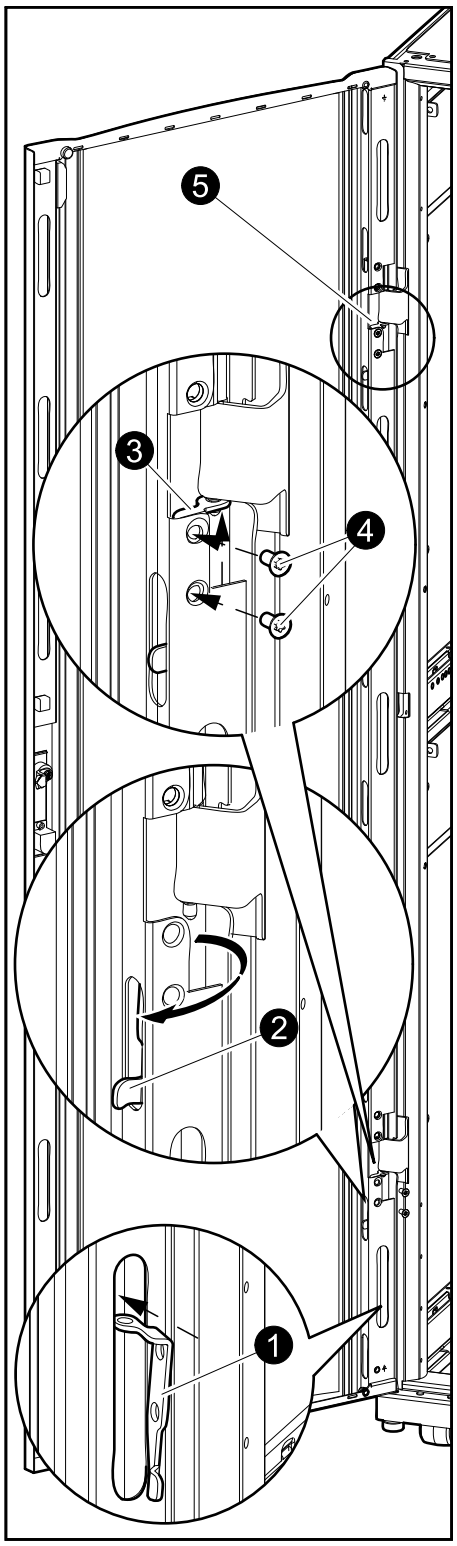
Required parts:

- Two door hinge locks
- Four screws



1. With one hand slide the lock into the hole below the hinge.
2. With the other hand turn the lock 90° while holding the bottom of the lock.
3. Push the lock upwards to the bottom of the hinge.
4. Attach using the two provided screws.

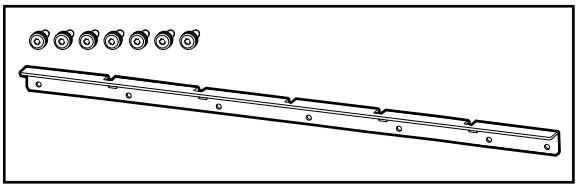
5. Use the same procedure to install the upper door hinge lock.



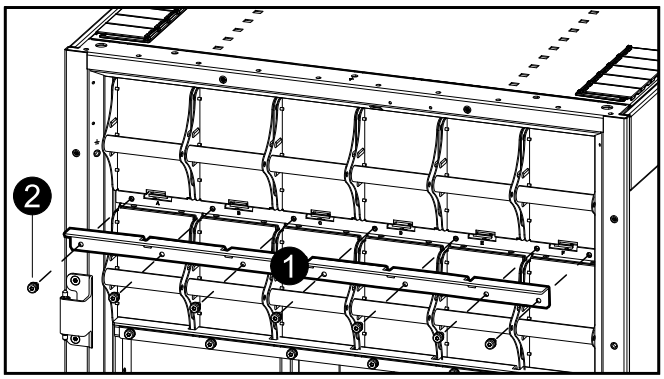
Install the Battery Locks

Required parts:

- Eight battery locks
- 56 screws



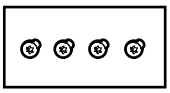
1. Place the battery lock below the battery row.
2. Attach the lock by the seven provided screws.



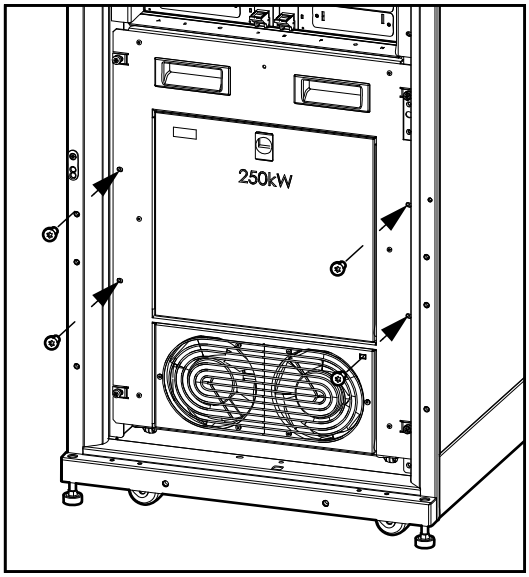
Install the Bypass Static Switch

Required parts:

- Four M5 bolts



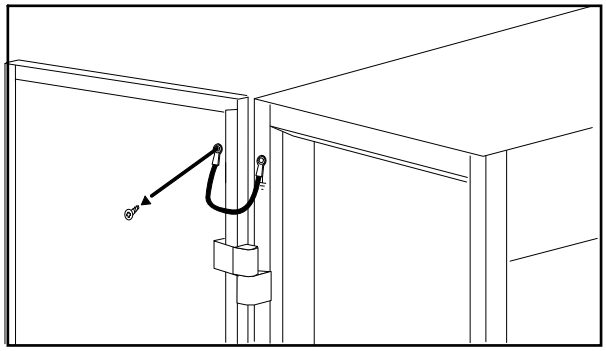
1. Attach the bypass static switch using the four provided bolts.



Install the Air Filter Option in the Power Module Cabinet

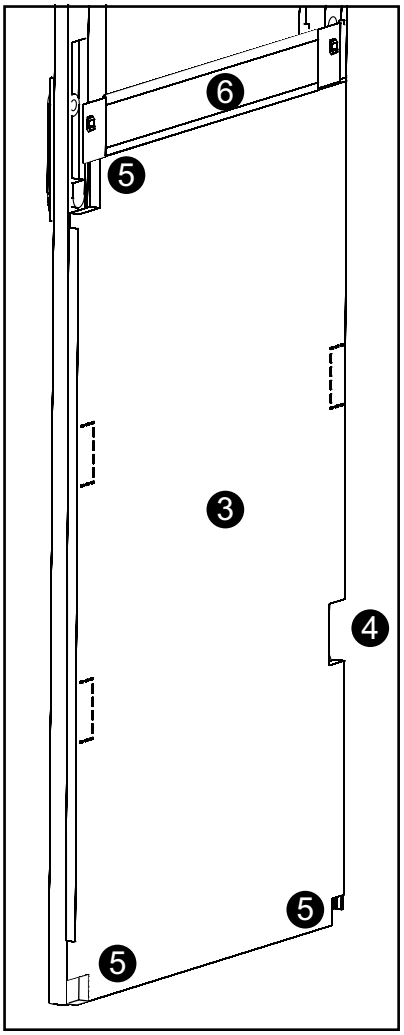
The air filters are used for extra protection of systems installed in environments with conductive dust. Check the air filters once a month. If the air filters show visible dust or other impurities, the air filters must be replaced.

1. Open the front door.
2. Loosen the screws and disconnect the ground wire between the front door and the power module cabinet.



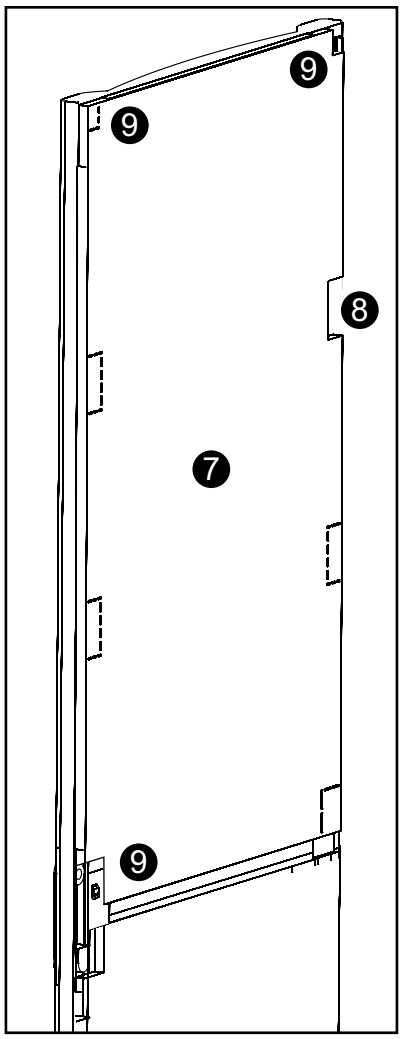
3. Press the bottom air filter plate against the bottom half of the front door.
4. Remove the perforated area in the bottom right of the air filter to get access to the bottom hinge.
5. Remove the three perforated corners marked in the drawing.

6. Install the logo plate.



7. Press the top air filter plate against the top half of the front door.
8. Remove the top right perforated area of the air filter to get access to the top hinge.

9. Remove the three perforated corners marked on the drawing.



10. Reconnect the ground wire disconnected in step 2.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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