



100kW Power Conditioning System (PCS)

Installation Manual



Version: 1.0.0

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About this Manual

Version Control

Table 1: Version Control

Rev.	Change Description	Date
1.0.0		

Purpose

The purpose of this Installation Manual is to provide explanations and standard procedure for installing, configuring the Delta 100kW PCS.

Scope

The manual provides safety guidelines, detailed planning and setup information, standard procedure of installing the PCS, and information about configuration of the unit. It does not provide details of batteries.

Audience

The manual is intended for anyone who needs to install Delta 100kW PCS. Installers should be certificated technicians or electricians.

Organization

This manual is organized into the following chapters:

- Chapter 1: "About the Manual"
- Chapter 2: "Introduction"
- Chapter 3: "Installation"
- Chapter 4: "Wiring Instructions"
- Chapter 5: "Warranty"
- Chapter 6: "Appendix"

Important Safety Instructions

Save these Instructions

General Safety Instructions (EN)

This manual contains important instructions for PCS that should be followed during installation and maintenance.

PCS is designed and tested to meet all applicable International safety standards. However, like all electrical and electronic equipment, safety precautions must be observed and followed during installation and operation of PCS to reduce the risk of personal injury and to ensure a safe installation.

Installation, commissioning, service, and maintenance of PCS must only be performed by qualified personnel that are licensed and/or satisfy state and local jurisdiction regulations.

Before starting installation or commissioning of the PCS, read through the entire manual and note all DANGER! WARNING! CAUTION!, and NOTICE! Statements.

All electrical installations must comply and be in accordance with all the state, local, and utility regulations.

Safety Symbols and Terminology Definitions



Note:

Indicates additional information that is relevant to the current process or procedure.



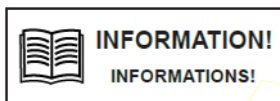
WARNING!

Warning information appears before the text it references to emphasize that the content may prevent damage to the device or equipment.



CAUTION!

CAUTIONS APPEAR BEFORE THE TEXT IT REFERENCES. CAUTIONS APPEAR IN CAPITAL LETTERS TO EMPHASIZE THAT THE MESSAGE CONTAINS VITAL HEALTH AND SAFETY INFORMATION.



INFORMATION provided that when known and used will ensure optimal operation of the system.



HIGH VOLTAGE WARNING! Indicates hazardous high voltages are present, which, if not avoided, will result in death or serious injury. Thus, only authorized and trained personnel should install and/or maintain this product.



Hot surface



Equipment grounding conductor (PE)



Wait for a prescribed amount of time before engaging in the indicated action.

Safety Instructions

The PCS installation must be performed by an authorized electrician in accordance with the local requirements or European Standard.

- The PCS section does not contain user-serviceable parts. For all service and maintenance, a Delta repair technician or authorized service partner is required for onsite maintenance services.
- Read all of these instructions, cautions, and warnings for the PCS and associated PCS documentation.
- Before connecting the PCS to the AC distribution grid, approval must be received by the appropriate local utility as required by national and state interconnection regulations, and must be connected only by qualified personnel.
- In operation, the PCS wiring and connections can have hazardous high voltages and currents present, thus only authorized and qualified personnel shall install and/or maintain the PCS.
- In some operation instances, the PCS chassis and heat sink surfaces may become hot.

Typographical Conventions

The following typographical conventions are used in this document:

Italics

Indicates book titles, directory names, file names, path names, and program/process names.

`Constant width`

Indicates computer output shown on a computer screen, including menus, prompts, responses to input, and error messages.

Constant width bold

Indicates commands or information literally entered by a user on the computer. Variables contained within user input are shown in angle brackets (< >).

Bold italics.

Indicates keyboard keys that are pressed by the user.

Introduction

Overview

Delta's 100kW Power Conditioning System (PCS) is a bi-directional conversion system that converts power between energy storage and grid, along with energy and grid power quality management features.

It supports demand charge management by peak shaving, enables load shifting for time-of-use savings, and provides real power and reactive power compensation to improve power quality.

With Delta's PCS solution you can realize the fullest value of an energy storage system.

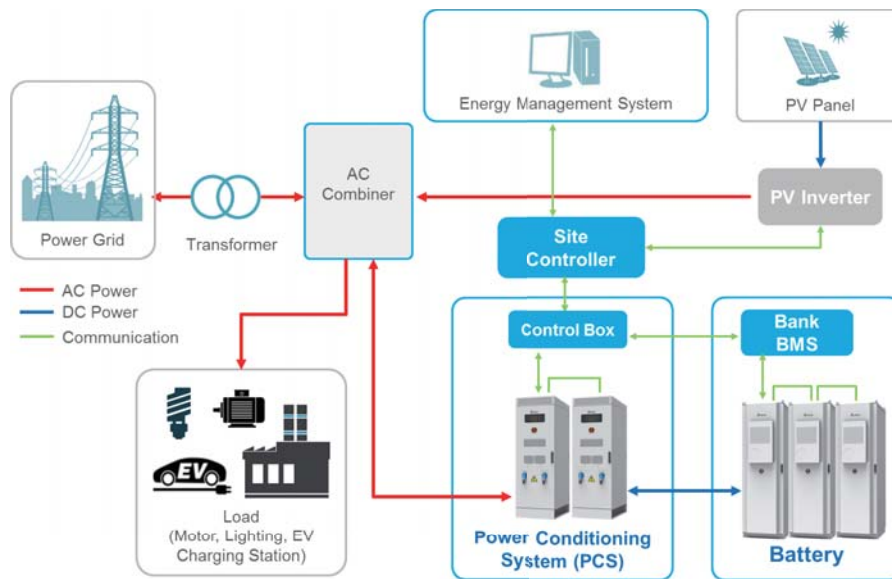


Figure 1. Typical PCS Application System Architecture

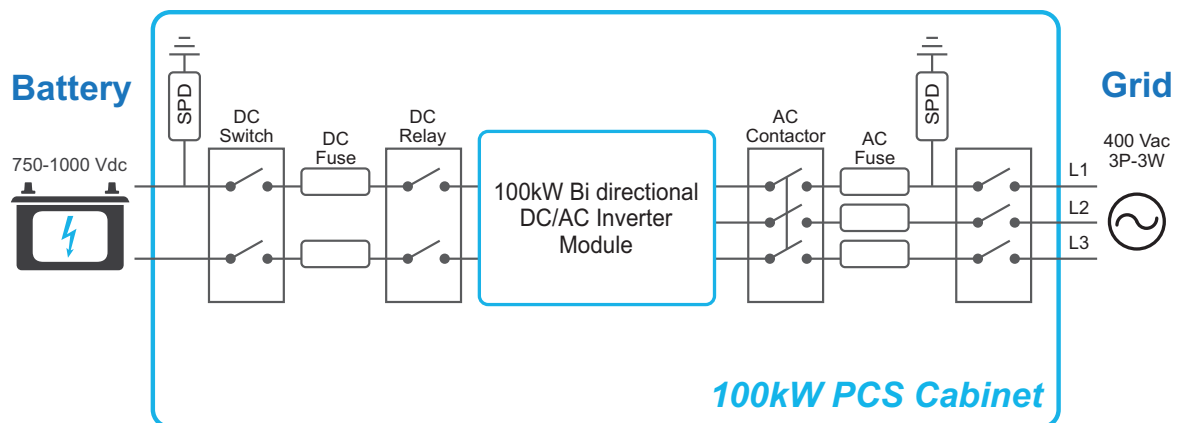


Figure 2. Delta 100kW PCS System Block Diagram

Features

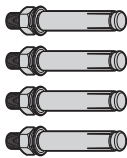
- High conversion efficiency with latest technologies
 - High efficiency: peak 97.2%
 - High power density in outdoor application: 146 W/l, 322 W/kg
 - Low standby power loss: < 25W
- Integrated AC and DC switches for easy installation
- Scalable up to 400 kW in parallel configuration
- Quick system response time (< 40 ms)
- IP55 enclosure compliance for outdoor application

Applications

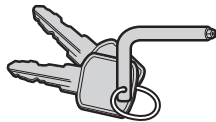
- Demand charge management (Power Dispatch)
- Load shifting for Time-of-Use saving
- Power quality improvement (P-Q Control, Frequency Regulation)
- Emergency backup power

Accessory Kits

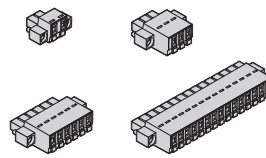
Check that the following items are included. Contact your vendor if any items are missing or appear damaged.



4 x M16
expansion bolts



2 x keys



Connectors:
1 x 15-pin, 2 x 6-pin,
1 x 3-pin and 1 x 2-pin



16 x insulating tubing

Wire Instructions:

Connect insulating sleeves between the wires and the two-hole terminals. The accessory kit includes the insulating sleeves, alternatively you can use local materials as is appropriate.

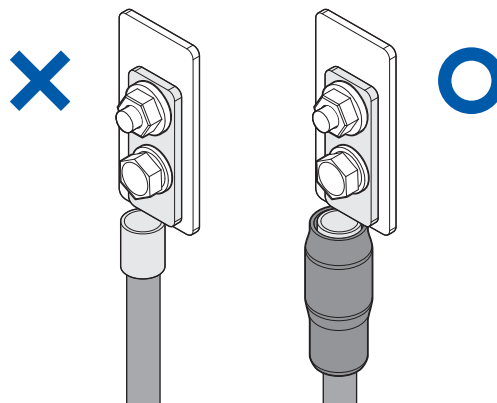


Figure 3. Final Wire Installation with Sleeve

Installation

This chapter describes how to mount and install the PCS, including the information about recommended tools, groundwork preparation, location and ventilation considerations, unpacking, moving and mounting. Read this chapter and plan your PCS layout and installation accordingly.

Before You Begin

Recommended Tools

The following tools are recommended for a successful installation:

- 1 x PH2*100 mm Phillips screwdriver
- 1 x PH3*100 mm Phillips screwdriver
- 1 x M8 hex bolt socket wrench
- 1 x M16 hex bolt socket wrench
- 1 x M6 hex bolt socket wrench
- 1 x M6 Allen wrench
- Concrete drill
- 1 x 24-inch adjustable wrench
- Hydraulic crimping tools (capable to crimp cable lugs)
- Wire cutter
- Wire stripper
- Diagonal pliers

Grounding Instructions



WARNING!

Grounding: All input and output circuits are isolated from the enclosure (leakage current: 2.24 mA). System grounding, when by EN 62477-1 and AS 62040.1.1, is the responsibility of the installer.

An equipment grounding conductor or a grounded, metal, and permanent wiring system is required for the PCS connection. This should be run with circuit conductors and connected to the equipment grounding bar or lead on the PCS.

Surge Arrester Safety

The function of lightning and surge protection systems is to protect the devices, functional isolations and over voltage-sensitive consumer equipment of the 100kW PCS. The 100kW PCS is equipped with a Type 2 Surge Arrester to cover the system when not placed directly in a lightning strike area.

Due to the wide energy voltage and frequency range of over voltage in lightning strike areas, it is advisable to install a Type 1 Surge Arrester to augment the protection coverage around the user's switchboard.

Foundation

The PCS cabinet is recommended to be mounted on concrete floor. Follow the illustration below to prepare the groundwork.

Before installing a PCS cabinet, it is recommended to have a solid foundation established. The following information is provided to serve as a guide for the setup of a recommended foundation.

The footprint boundary area of the PCS is 600 x 800 mm (23.62 x 31.49 in.), and there are two ways for mounting:

1. Mounting by the left and right sides of the unit base: Drill four holes for M16 expansion bolts at the 4 corners of an area of 560 x 460 mm (22.05 x 18.11 in.) as marked in number 1.
2. Mounting by the front and rear sides of the unit base: Drill four holes for M16 expansion bolts at the 4 corners of an area of 300 x 726 mm (11.81 x 28.58 in.) as marked in number 2.

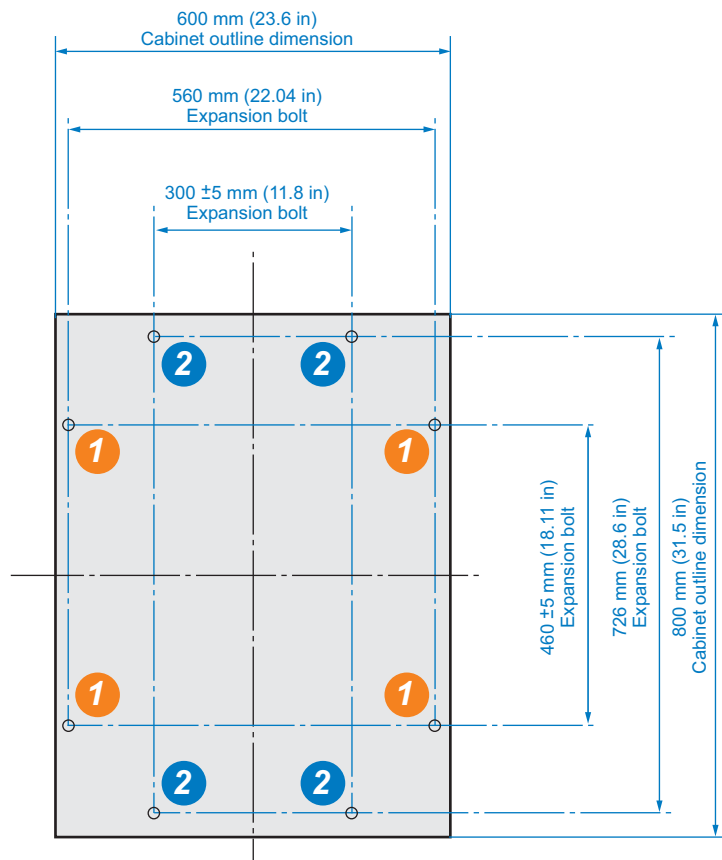


Figure 4. Mounting Layout and Anchoring Holes Placement Variations (Top View)

Once the anchoring holes are completed, insert the expansion sleeves into the anchoring holes:

- Remove four M16 expansion bolts from the accessory kit.
- Separate the nuts and washers from the bolts.
- Once the expansion sleeves are individually separated, insert each one into the anchoring holes.

Location and Ventilation Requirements

Dimensions

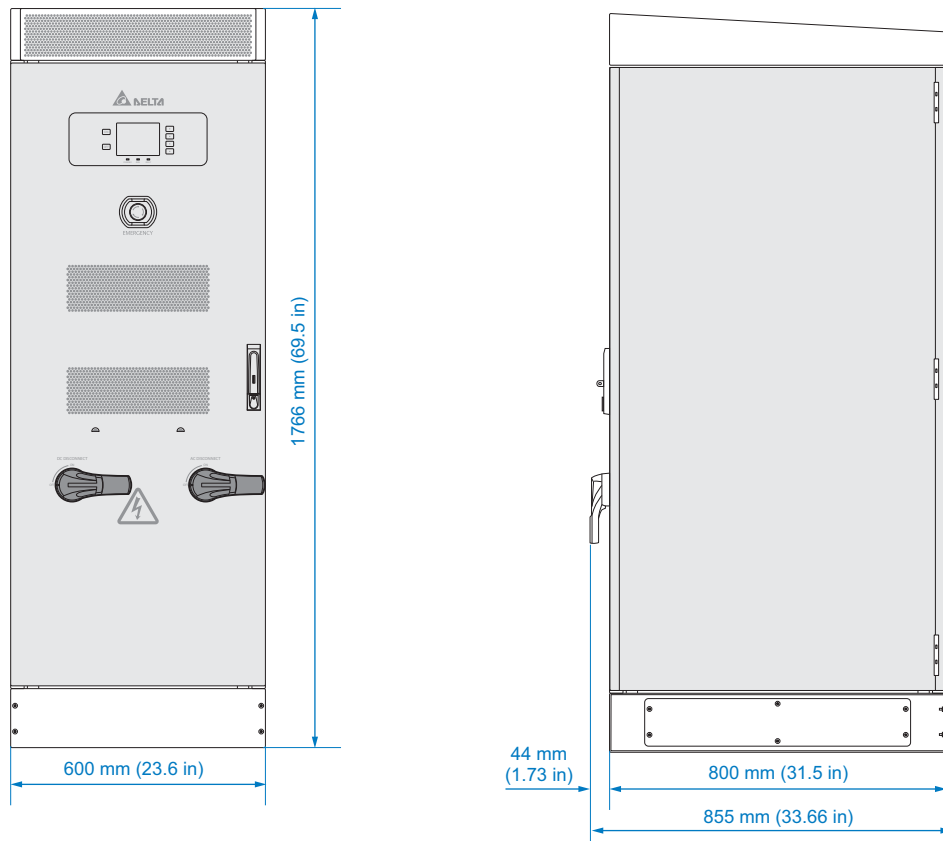


Figure 5. Front and Side Views of a Delta 100kW PCS

Location Considerations

To fully experience the benefits and reliability of the PCS design, follow the provided guidelines:

- The PCS unit is rated IP55 and configured for outdoor installations.
- Install the PCS in an accessible location following local requirements or European Standard for enclosure and door clearances and proximity to other equipment.
- For optimal PCS life and performance, do not mount the PCS in direct sunlight, especially in hot climates. If the unit must be mounted in direct sunlight, a metal sun-shield is recommended but not required.
- The PCS is forced-air-cooled. The cabinet is separated into two compartments: front and rear compartments.

In the case of front compartment, a heat exchanger is mounted on the front door and air is drawn in by the heat exchanger fans through vents at the lower part of the front door, and exhaust air is emitted from vents at the higher part of the front door, as shown in Figure 6.

From the rear compartment, air is drawn in through vents at the lower part of the rear door, and exhaust air is emitted from vents in the front of the roof. The air inlet and outlet must not be blocked, and the installation location should be sufficiently ventilated to prevent the PCS heat output from increasing the ambient temperature beyond the PCS's rating.

- Under certain operating conditions, the PCS emits an audible noise. It is advisable to install away from living accommodations to protect against noise levels.
- The PCS should not be installed in an area that is excessively dusty, as this may decrease the performance of the air cooling system.
- The PCS must not be installed in areas in which dust containing conductive particles (e.g. iron filings) may form.

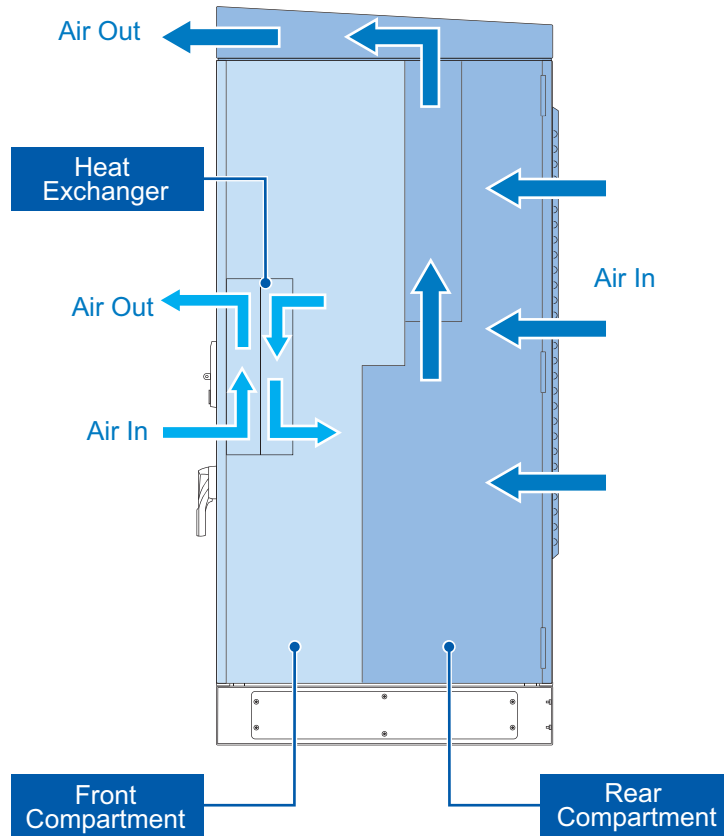


Figure 6. Diagram of PCS Airflow Design (Side View)

Opening Requirements

A minimum distance of 3 feet (914.4 mm) behind the PCS is required for maintenance from rear side as shown in Figure 7.

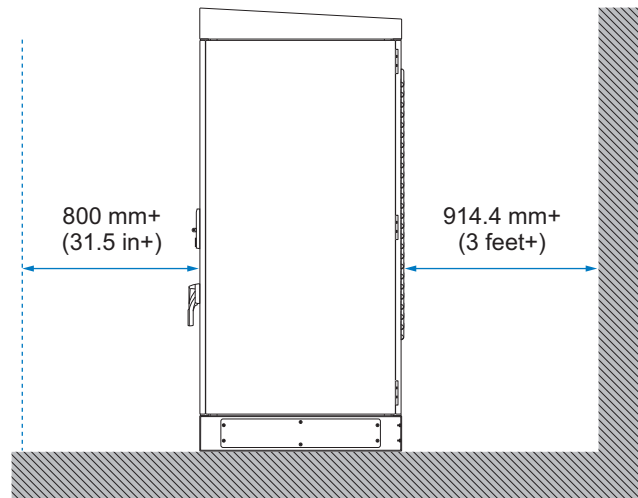


Figure 7. Front and Rear Maintenance Clearance Distance

When installing the PCS, take into consideration the necessary ventilation space as well as the space requirements to allow access when opening the doors.

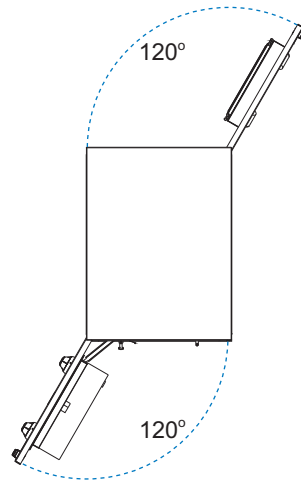


Figure 8. Top View of Door Clearance

Unpacking the Unit

Use a forklift to move and place the crate containing the 100kW PCS and the wooden pallet on a designated location. Make sure the location is clean and prepared prior to moving the crate.



WARNING!

The 100kW PCS and crate have a combined weight of approximately 418 kg/921 lbs. DO NOT attempt to lift and/or move the package/unit by hand. The unit is extremely heavy. Attempting to move the unit by hand may lead to injury, damage, and even possibly death.



WARNING!

To prevent injury or damage, make sure to check the shockwatch and tiltwatch indicators throughout the unpacking process.

1. Use a ladder to reach the top of the 100kW PCS.
2. Remove the screws securing the top cover.
3. Remove the top cover.

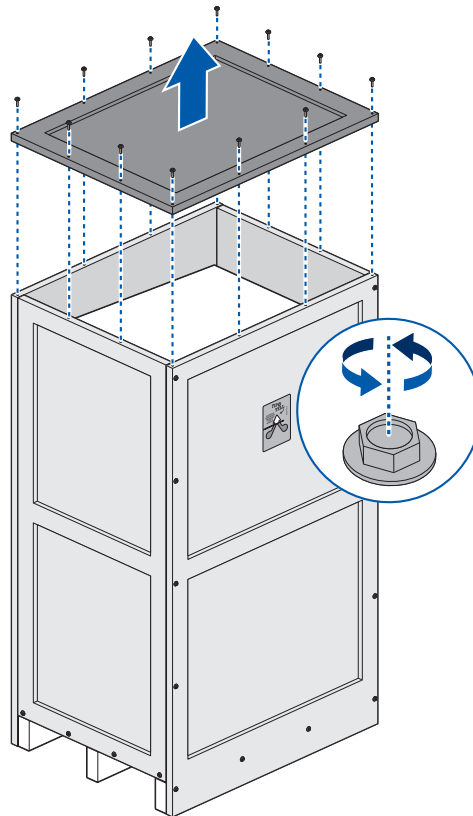


Figure 9. Removing a Top Cover

4. Remove the screws securing the left and right sidewalls from the shipping package.
5. Remove the right and left sidewalls.

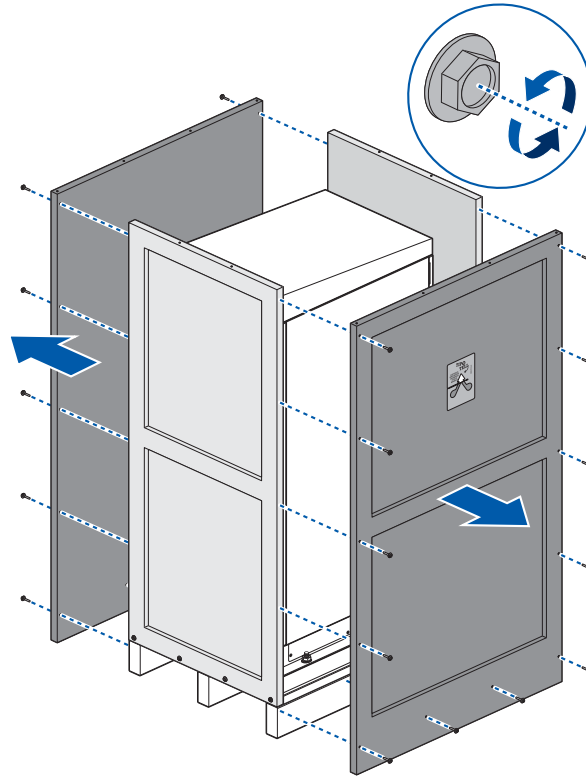


Figure 10. Removing Left and Right Sidewalls

6. Remove the screws securing the front and rear walls from the shipping package.
7. Remove the front and rear walls.

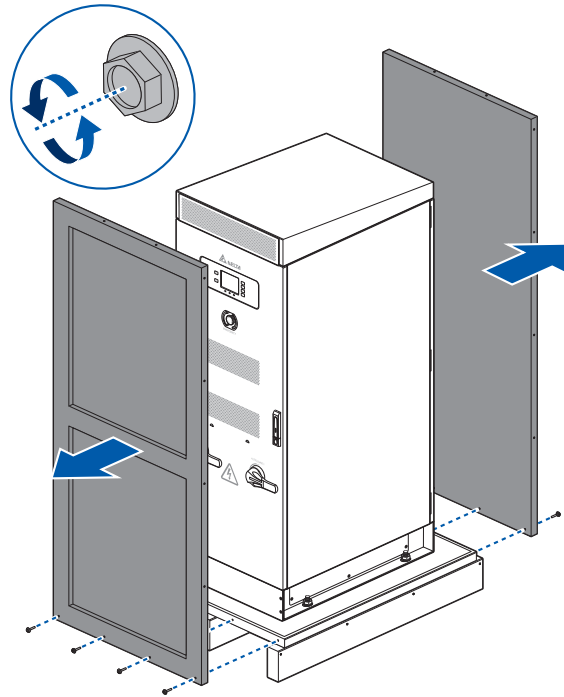


Figure 11. Removing Front and Rear Walls

Upon unpacking the page, inspect the unit for signs of damages that may have been caused during shipping. If damage is found, immediately contact Delta and the shipping company..

Installing the PCS Onsite

The PCS Series must be located in weather-proof enclosure or enclosed-area. The PCS is not intended or designed for exposure to water or excessive dust.

The PCS system is designed to support the requirements of various environments.

- The PCS must be in an upright position at all times.
- The PCS functions at optimal operating performance if installed in a temperature range of -20°C to 25°C (32°F to 77°F).
- The specifications are available in “Specifications” on page 61.

Safety Considerations

The following safety information is intended to reduce the risk of accidents:

- Keep the floor around the PCS clean to prevent metallic dust, iron or other metal filings from being drawn inside the device, consequently causing short circuits.

Closed area installations:

- The floors and surrounding area around the PCS must use non flammable material.
- A portable powder fire extinguisher must be installed within easy reach of the PCS.
- An automatic fire extinguishing system should be installed and enabled for the site.
- Access to the installation site should be restricted to qualified service personnel.

Battery Ground Fault Concerns

The following are concerns surrounding potential risks of DC ground faults and the possible causes.



WARNING!

To prevent possible escalation into serious or catastrophic ground faults, make sure to equip the corresponding Ground Fault Detection (GFD) equipment and follow strict maintenance guidelines.

The primary concerns with any Battery Ground Fault include three principle areas:

1. Fire due to ground fault.
2. Risk to personnel due to ground or battery fault.
3. Risk to system reliability due to ground fault.

Causes of Battery Ground Faults

There are several causes for introducing a ground fault into a battery system. The following presents the most common causes for ground faults.

- Debris on the surface of the container- Dirt and debris on the surface of the battery can develop paths for tracking to the battery rack.
- Maintenance activities can place residual electrolyte on the container, which can enhance the conduction path created by the debris exacerbating the level of ground fault.
- Penetration in the container- issues such as cracks by stress or holes by penetration in the container create an opportunity for electrolyte to seep out of the container and contact the battery.

To prevent possible ground fault risks, equip the corresponding GFD equipment. The battery warranty may be null and void if the GFD equipment is not equipped.



WARNING!

The weight of the PCS is distributed on a small surface of the floor. It is necessary to verify the floor load-bearing capacity.

All service and maintenance personnel must be trained in normal as well as emergency procedures.

Chain Hoist

The dimensions and weights specified must be taken into consideration when mounting the 100kW PCS. All lifting equipment and lifting components (hooks, bolts, lifts, slings, chains, etc.) must be properly sized and rated to safely lift and hold the weight of the 100kW PCS during the mounting process.

Hoisting and Rigging Hazards

It is important that personnel involved with hoisting and rigging activities are trained in both safety and operating procedures. Hoisting equipment should be operated only by trained personnel.

The cause of rigging accidents can often be traced to a lack of knowledge on the part of a rigger.

To prevent hoisting and rigging hazards, it is necessary for the operator to understand the following:

- the weight of the load and rigging hardware
- the capacity of the hoisting device
- the working load limit of the hoisting rope, slings, and hardware.

When the weights and capacities are known, the rigger must then determine how to lift the load so that it is stable.

Training and experience enable riggers to recognize hazards that can have an impact on a hoisting operation.

- be aware of elements that can affect hoisting safety, factors that reduce capacity, and safe practices in rigging, lifting, and landing loads.
- be familiar with the proper inspection and use of slings and other rigging hardware.
- be aware of all the aspects of the lift and a means of communication has been agreed upon, including what signals to be used, when the crane operator is working with a rigger or a rigging crew.

Chain Hoist Installation



CAUTION!

TO MOVE THE 100kW PCS, USE LIFTING EQUIPMENT THAT HAS APPROPRIATELY RATED LIFT CAPACITY.



CAUTION!

IF USING LIFTING LUGS, BE SURE THE SPREADER BAR IS SUFFICIENTLY LONG TO PREVENT DAMAGE TO THE HOOD AND BE SURE TO USE A MINIMUM OF FOUR STRAPS OF SUFFICIENT LENGTH.

1. Unpack the 100kW PCS, see “Unpacking the Unit” on page 12.
2. Remove the hexagonal nuts and washers securing the 100kW PCS to the shipping pallet.

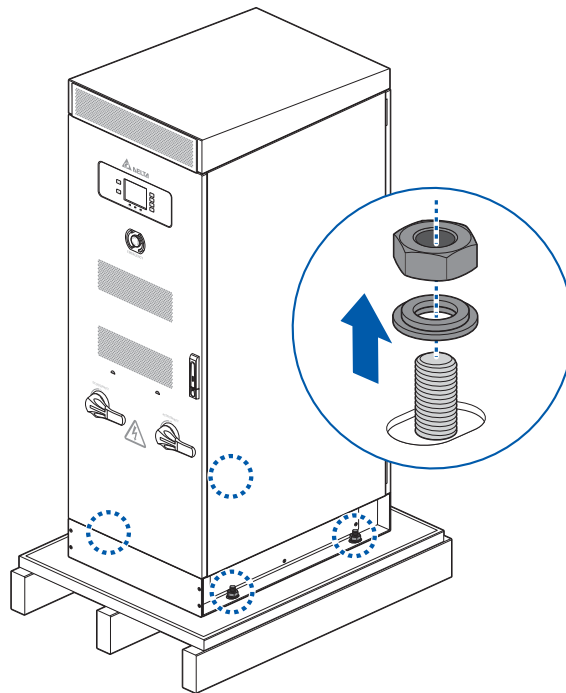


Figure 12. Detaching PCS from a Pallet



CAUTION!

MAKE SURE THE SWITCH IS OFF (POWERED OFF) BEFORE OPENING THE FRONT PANEL.

3. Use the provided key to unlock the front panel.
4. Rotate the door handle to open the front panel and pull the door open.

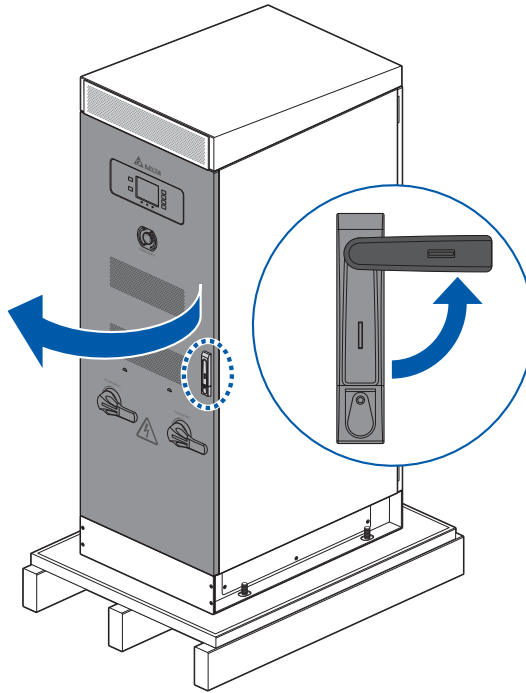


Figure 13. Opening a Front Panel

Make sure the door limiter at the bottom of the panel engages in the track to keep the front panel from closing accidentally.

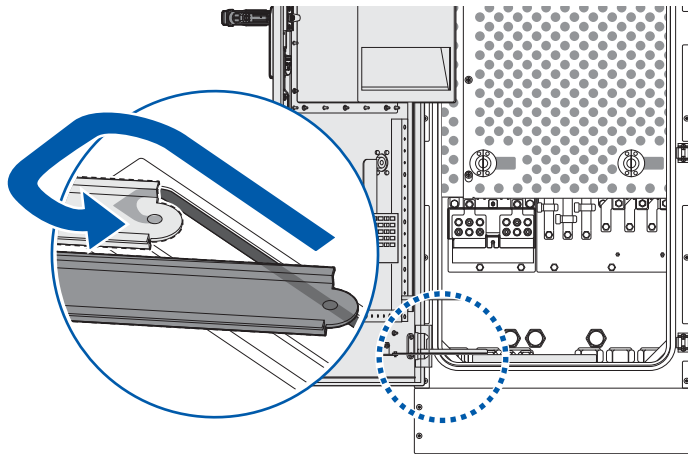


Figure 14. Engaging the Front Panel Limiter

The front panel locks in place when it is fully extended.

5. Repeat for the rear panel.

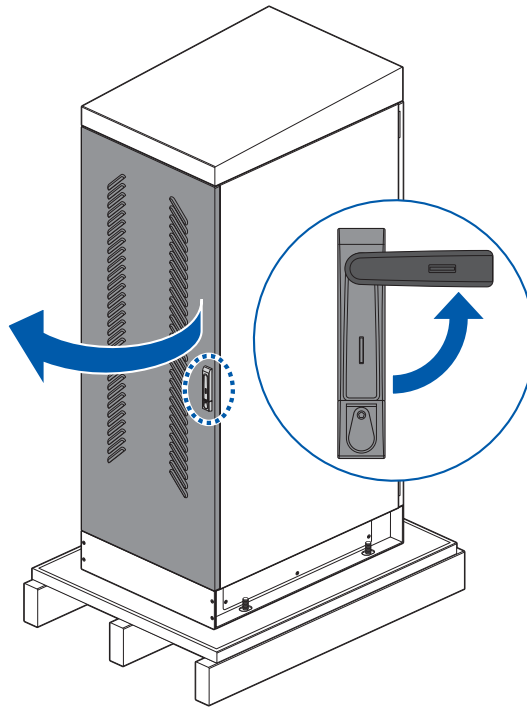


Figure 15. Opening a Rear Panel

Make sure the door limiter at the bottom of the panel engages in the track to keep the rear panel from closing accidentally.

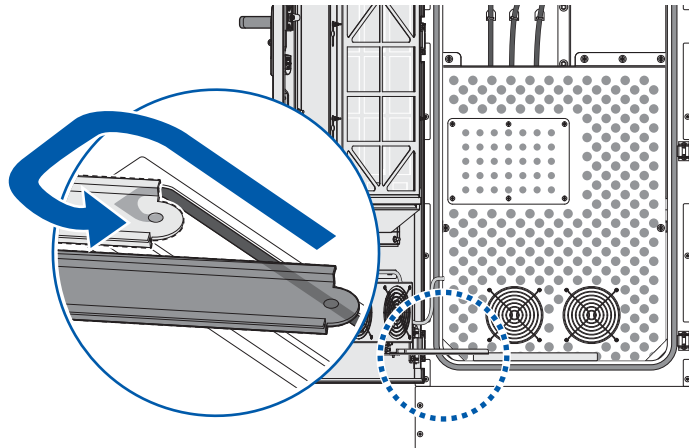


Figure 16. Locking a Rear Panel in a Cabinet

The rear panel locks in place when it is fully extended.

6. Locate the top cover, see the following figure and remove the screws from the front and rear sides.
7. At least two individuals are required to safely lift the top cover. Lift both ends simultaneously and remove the top cover from the PCS. Place the cover in a clean work surface as it is needed for the final phase of the installation.

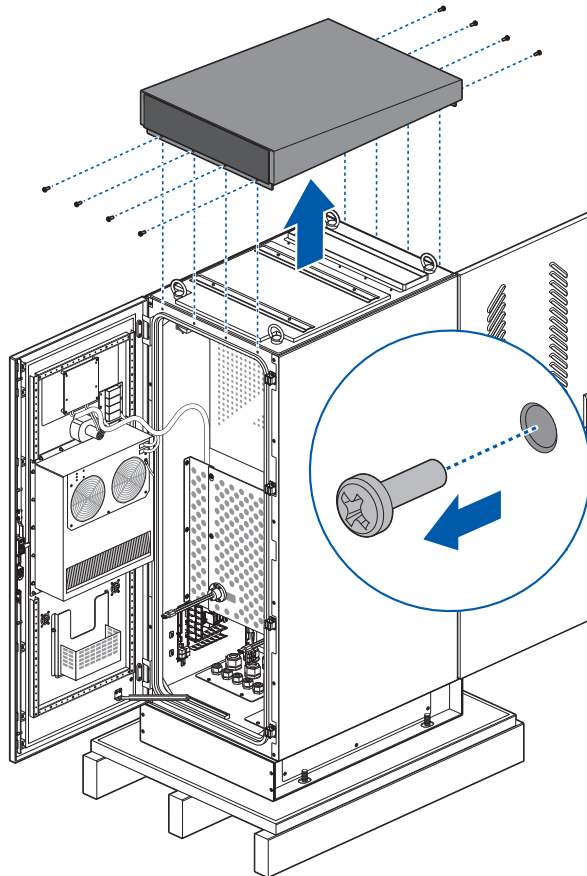


Figure 17. Removing the Top Cover

To close the front panel, the interlocking mechanism holding the door and cabinet in place must be first released.

8. Locate the interlocking mechanism at the base of the door. See the following image.
9. Push the mechanism upwards to unlock it from the rail.

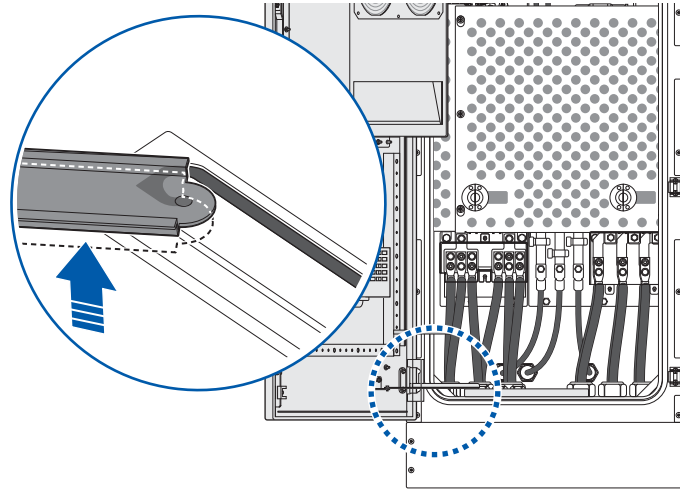


Figure 18. Release a Mechanism

10. Close the front panel. Make sure the front panel closes correctly with the cabinet. The top and bottom of the panel are flush with the cabinet if the panel is closed correctly.
11. Rotate the door handle to the locked position, and press it in to lock it in place.

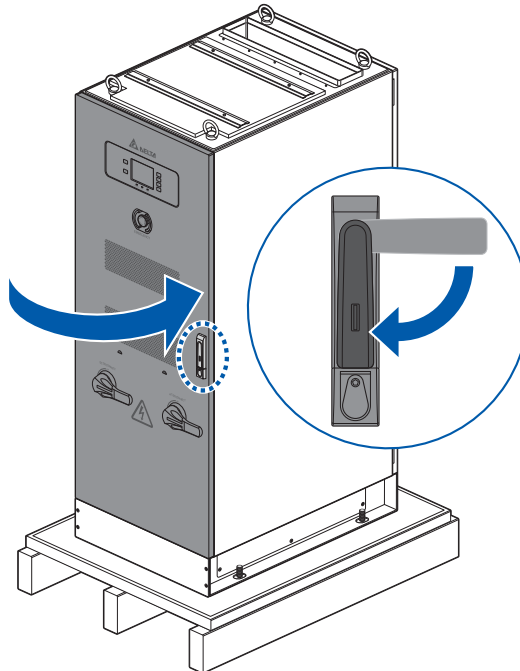


Figure 19. Closing a Front Panel



Note:

Make sure there is no gap between the front panel and the cabinet. An improperly closed front panel may damage the locking mechanism on the cabinet, the cabinet or cause injury.

12. Repeat for the rear panel.

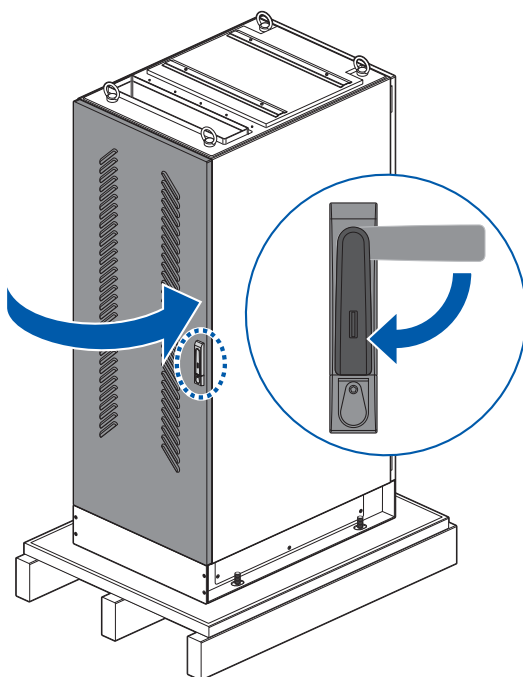


Figure 20. Closing a Rear Panel



CAUTION!

THE UNIT WEIGHS APPROXIMATELY 310 KG/ 683 LBS. TO PREVENT POSSIBLE DAMAGE OR INJURY ANY LIFTING DEVICE MUST BE RATED TO WITHSTAND THE MAXIMUM REQUIRED WEIGHT.



CAUTION!

THE UNIT SHOULD NOT BE INSTALLED WITH THE CABINET DOORS OPEN.

13. Locate the eye bolts on each corner of the 100kW PCS.
14. Check the eye bolts are properly tightened to frame.

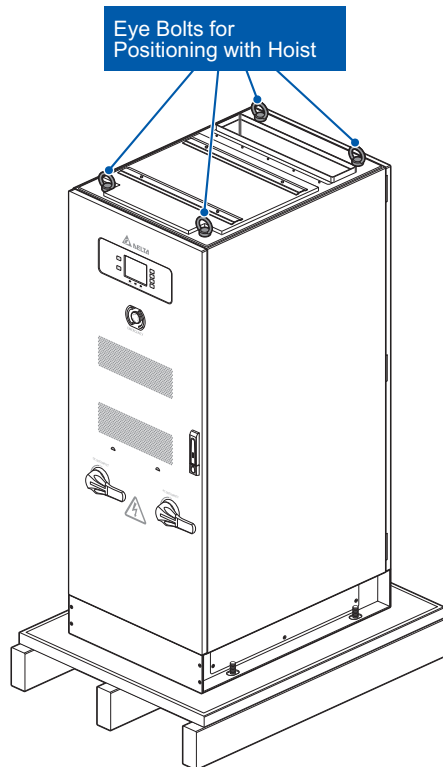


Figure 21. Eye Bolts Locations



WARNING!

Before proceeding with the normal operation of the hoist, the operator (s) must be trained accordance with the hoist manufacturer's operation manual. Failure to read and comply with any of the instructions and limitations noted in this manual and the hoist manufacturer's manual can result in product failure, serious bodily injury or death, and/or property damage.

Follow the initial start-up procedures for the hoist as described in the manufacturer's operation manual. Do not attempt operation until all start-up procedures have been fulfilled.

The load attachment may differ from the following figure depending on the type of chain hoist used. The following is a depicting to illustrate a possible scenario.



WARNING!

Keep hoist lines plumb. The working load limits of hoisting equipment apply only to freely suspended loads on plumb hoist lines. If the hoist line is not plumb during load handling, side loads are created which can destabilize the load and cause structural failure or tip-over, with little warning.

15. Connect the hoist to the eye bolts on the cabinet. Make sure the load is secured before making any attempt to move it. The recommended diagonal length of the sling is 2 to 2.5 m (6.56 to 8.2 ft.).
16. Follow the hoist manufacturer's guidelines on moving the load as described in the manufacturer's operation manual.



WARNING!

Check on Sling Angle. Ensure that the sling angle is always greater than 45° and preferably greater than 60°. When the horizontal distance between the attachment points on the load is less than the length of the shortest sling leg, then the angle is greater than 60° and generally safe.

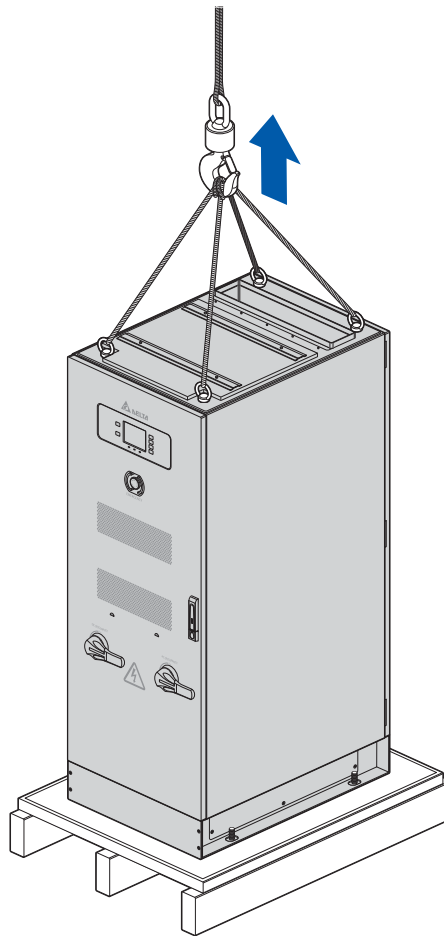


Figure 22. Eye Bolts Locations

17. Once the PCS is placed in its final installation site, secure the PCS to the site as described in "Securing a Cabinet in a Final Location" on page 30.
18. Remove the hoist.
19. Once the cabinet is secured to the location, install the top cover, see "Securing a Cabinet in a Final Location" on page 30.

Forklift Installation



CAUTION!

TO MOVE THE 100kW PCS, USE A FORKLIFT THAT HAS AN APPROPRIATELY RATED LIFT CAPACITY AND A 915 CM (36-INCH) FORK SPAN.



CAUTION!

THE ENCLOSURE MUST BE LIFTED FROM THE BOTTOM. THE ENCLOSURE MUST BE SUPPORTED ON ALL FOUR SIDES WHEN LIFTING. PRECAUTIONS MUST BE TAKEN TO AVOID TIPPING OF THE ENCLOSURE FRONT TO BACK AND SIDE TO SIDE DURING LIFTING BECAUSE THE CENTER OF GRAVITY OF THE ENCLOSURE IS NOT THE CENTER OF THE ENCLOSURE.

1. Unpack the 100kW PCS, see “Unpacking the Unit” on page 12.
2. Using the forklift to move the 100kW PCS.

Removing the 100kW PCS from left/right side:

- a. Remove the hexagonal nuts and washers securing cabinet to the pallet.

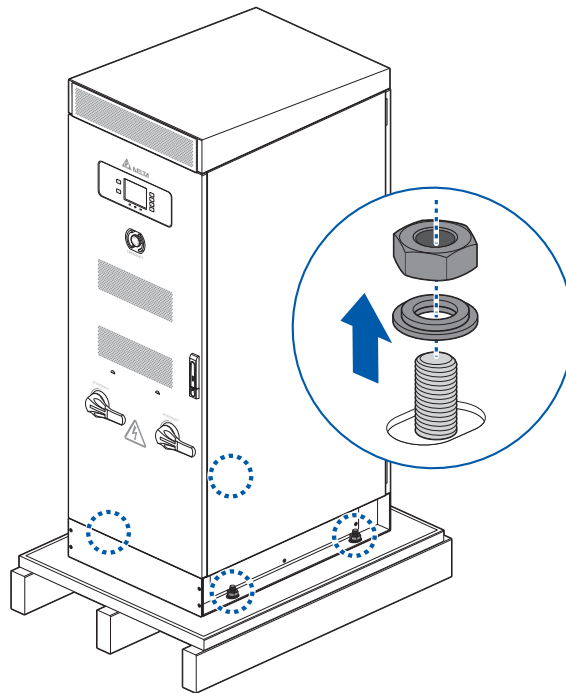


Figure 23. Releasing a PCS from a Pallet

- b. Remove the screws securing the side base covers.
- c. Remove the base covers. Place them in a clean work surface for later use. The covers must be replaced after cabinet installation and cable routing is completed.

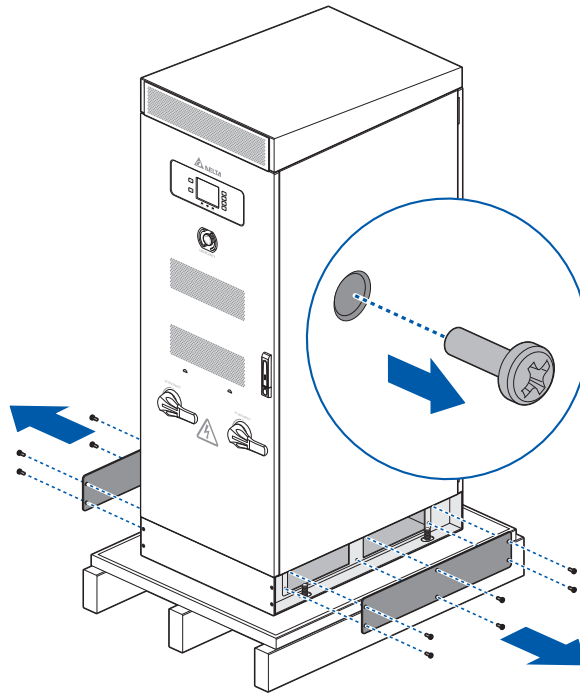


Figure 24. Removing Left and Right Base Covers

- d. Align the forklift with the bottom channels on the cabinet, see the following image.
- e. Once aligned, insert the forks into the channels until they are completely through the opposite side of the insertion channels.

**WARNING!**

Take care the unit is balanced and no risk to prevent it fell.

- f. Carefully lift the cabinet.

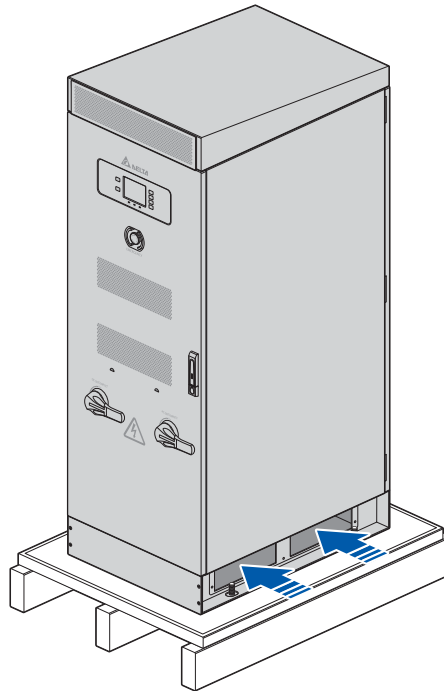


Figure 25. Lateral Handling of PCS

Front/Rear Handling

- a. Remove the hexagonal nuts and washers.

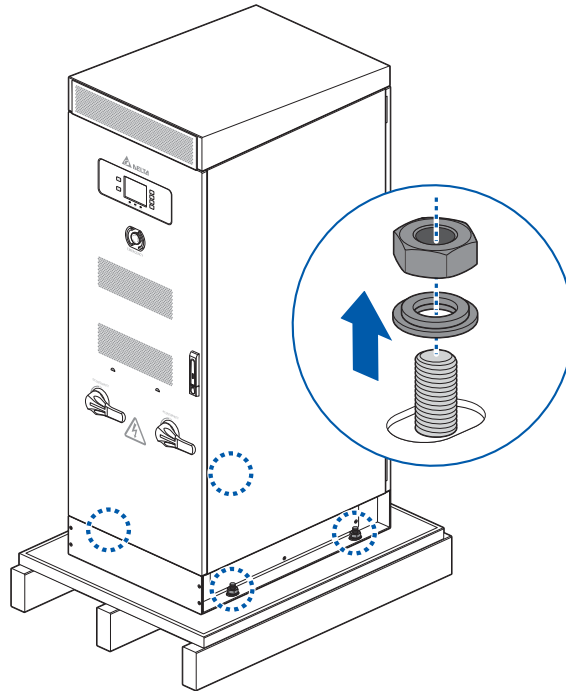


Figure 26. Releasing a PCS from a Pallet

- b. Remove the screws securing the front/rear base covers.
- c. Remove the front and rear side panels.

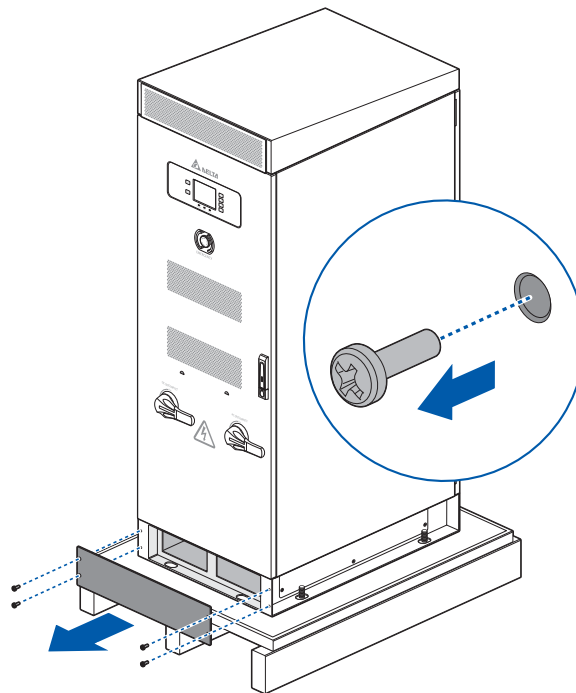


Figure 27. Removing Front/Rear Base Covers

- d. Align the forklift with the bottom channels on the cabinet, see the following image.
- e. Once aligned, insert the forks into the channels until they are completely through the opposite side of the insertion channels.

**WARNING!**

Take care the unit is balanced and no risk to prevent it fell.

- f. Carefully lift the cabinet.

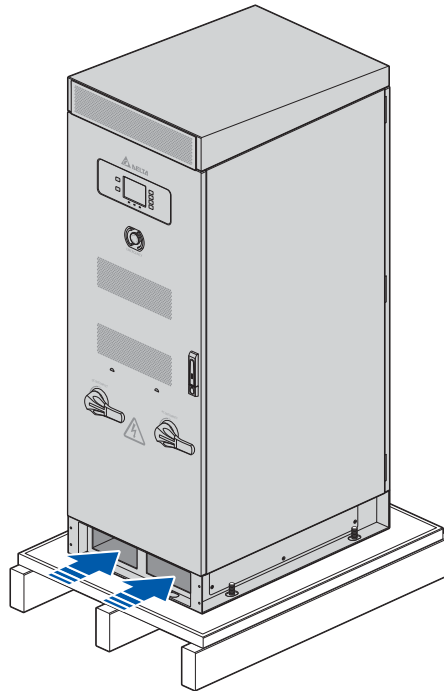


Figure 28. Front/rear Side Handling

- 3. Once the cabinet is secured to the location, install the top cover, see “Securing a Cabinet in a Final Location” on page 30.

Securing a Cabinet in a Final Location

1. Make sure the installation sites has been prepared, see “Before You Begin” on page 7.



CAUTION!

MAKE SURE THE SWITCH IS OFF (POWERED OFF) BEFORE OPENING THE FRONT PANEL.

2. Use the following guidelines to secure the cabinet if installed using a chain hoist:
 - a. Use the key to unlock the front panel.
 - b. Rotate the door handle to open the front panel and pull the door open.

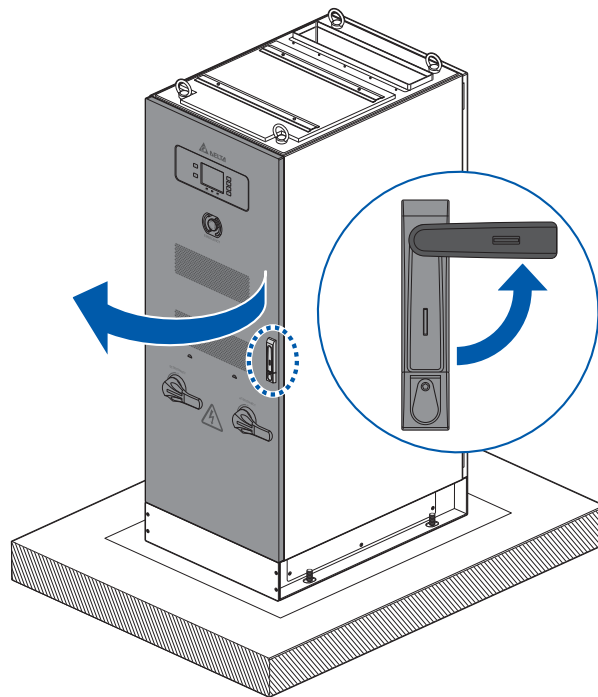


Figure 29. Opening a Front Panel

Make sure the door limiter at the bottom of the panel engages in the track to keep the front panel from closing accidentally.

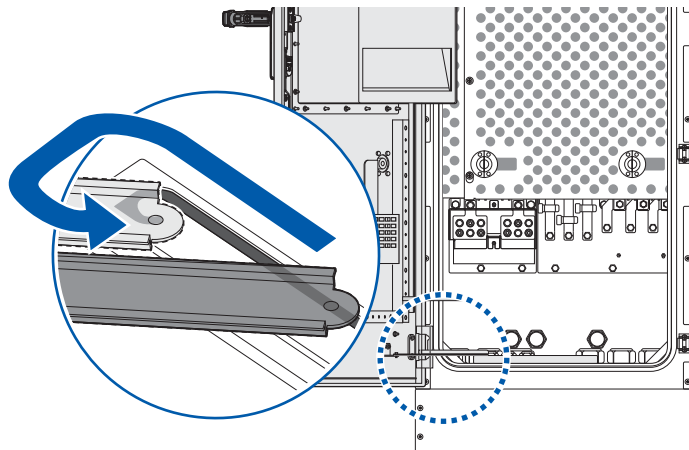


Figure 30. Engaging the Front Panel Limiter

The front panel locks in place when it is fully extended.

- c. Repeat for the rear panel.

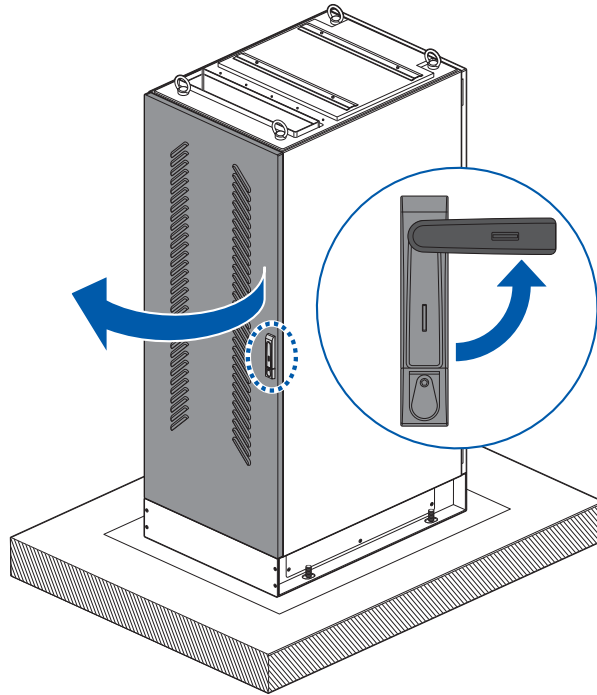


Figure 31. Opening a Rear Panel

Make sure the door limiter at the bottom of the panel engages in the track to keep the rear panel from closing accidentally.

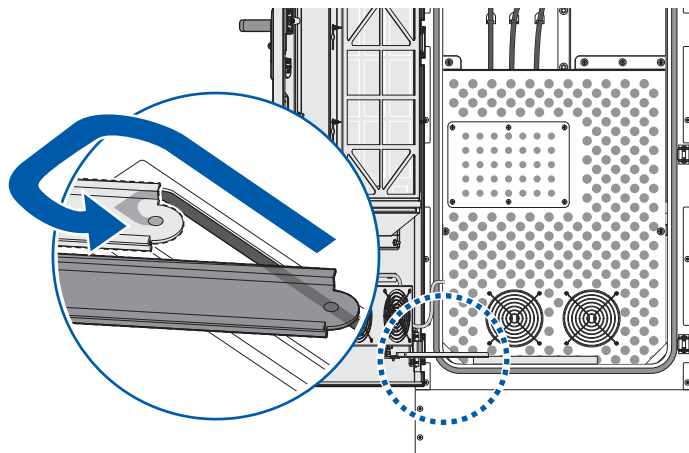


Figure 32. Locking a Rear Panel in a Cabinet

The rear panel locks in place when it is fully extended.

- d. Install the top cover and secure the top cover to the 100kW PCS with screws.

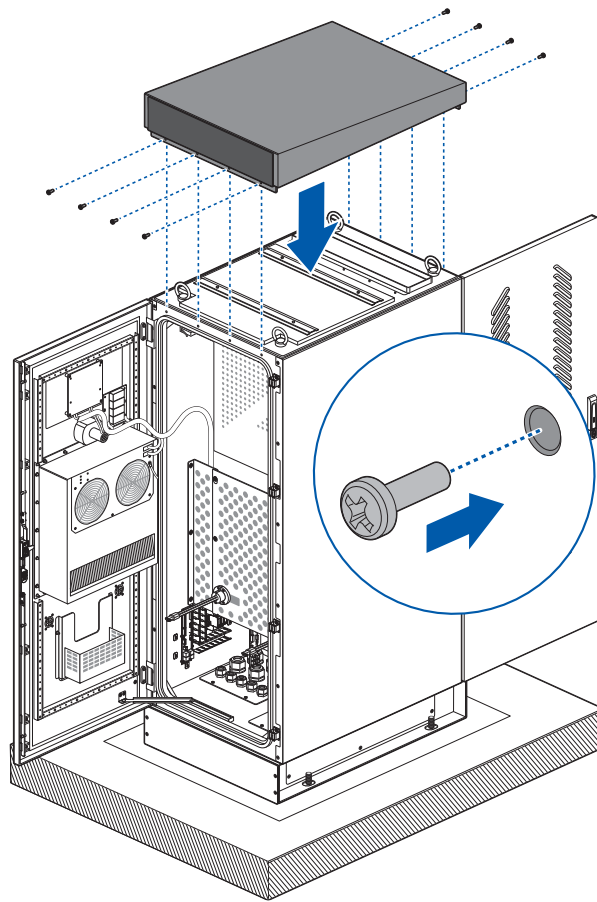


Figure 33. Installing the Top Cover

- e. Push the mechanism upwards to unlock it from the rail.
- f. Push the front panel in completely. Make sure the door limiter on the top and bottom of the cabinet are engaged with the front panel.
- g. Rotate the door handle to lock.

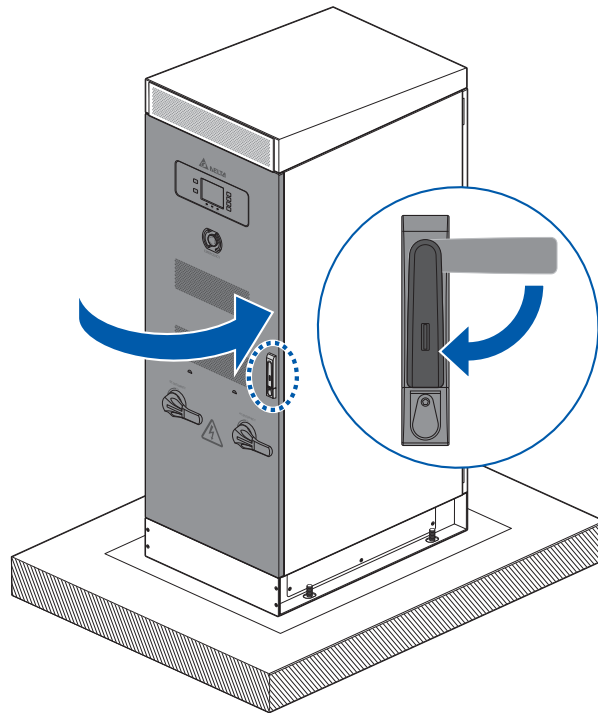


Figure 34. Closing a Front Panel



Note:

Make sure there is no gap between the front panel and the cabinet. An improperly closed front panel may damage the locking mechanism on the cabinet, the cabinet or cause injury.

3. Repeat for the rear panel.

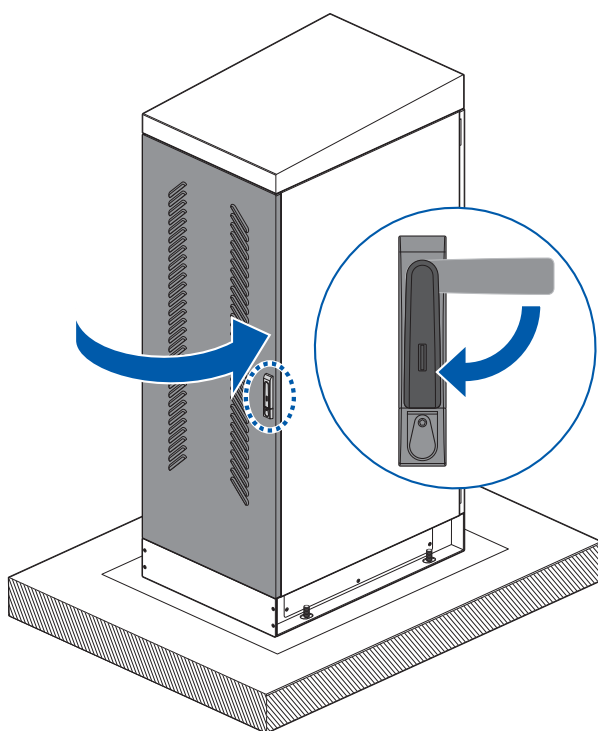


Figure 35. Closing a Rear Panel



Note:

The hole diameter on the cement base of the expansion tube is 20 mm (0.79").

4. First insert a washer in the anchoring bolt followed by a nut.
5. Turn the nut until it is lowered in the bolt. Do not tighten at this time. All nuts must be inserted in their respective anchoring bolts.
6. Repeat for the remaining anchoring bolts.
7. Once all nuts are inserted, tighten the anchoring bolts in an ascending order. See the following figure.

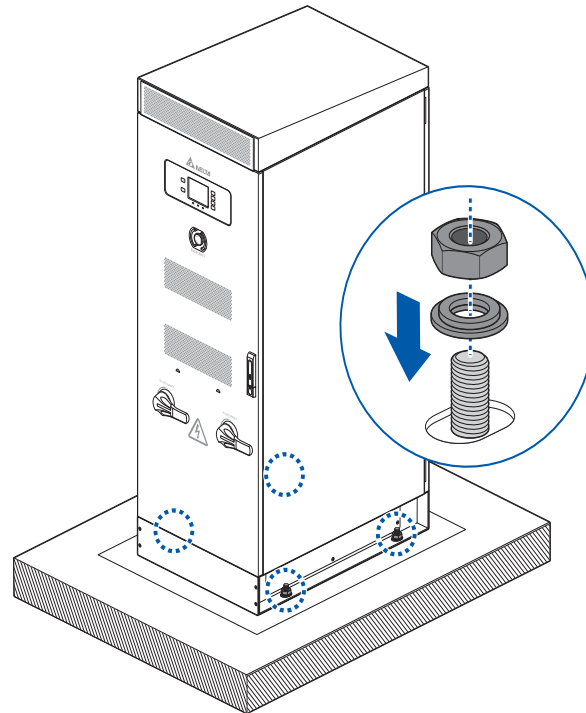


Figure 36. Securing a Cabinet with Anchoring Bolts

Wiring Instructions

This chapter describes how to perform the system wiring and cabling procedures.

Read the Safety section first follow the rule carefully before doing any wiring and cabling works to ensure personal safety.

Safety



Shock Hazard: Ensure that no DC voltage is being supplied to the PCS and that no AC voltage is present on the AC wiring. Failure to do so could cause serious injury or death. A warning label is provided to inform all personnel that multiple sources of power are available inside. This label is installed on the outside of the door and should remain clearly visible. Ensure all sources are OFF or disconnected before servicing.

The Delta 100kW PCS contains electrical components carrying potentially lethal voltages and currents. Extreme caution should be exercised around the system, especially when the cabinet door is open once it's installed. Before opening the cabinet, all supply power should be disconnected using a standard physical lock-out procedure and the service personnel should wait 5 minutes prior to opening the enclosure door.



WARNING!

Grounding: All input and output circuits are isolated from the enclosure. System grounding, when required by EN 62477-1 and AS 62040.1.1, is the responsibility of the installer.

Surge Arrester Safety

The function of lightning and surge protection systems is to protect the devices, functional isolations and over voltage-sensitive consumer equipment of the 100kW PCS. The 100kW PCS is equipped with a Type 2 Surge Arrester to cover the system when not placed directly in a lightning strike area.

Due to the wide energy voltage and frequency range of over voltage in lightning strike areas, it is advisable to install a Type 1 Surge Arrester to augment the protection coverage around the user's switchboard.

Battery Ground Fault Concerns

The following are concerns surrounding potential risks of DC ground faults and the possible causes.



WARNING!

To prevent possible escalation into serious or catastrophic ground faults, make sure to equip the corresponding Ground Fault Detection (GFD) equipment and follow strict maintenance guidelines.

The primary concerns with any Battery Ground Fault include three principle areas:

1. Fire due to ground fault.
2. Risk to personnel due to ground or battery fault.
3. Risk to system reliability due to ground fault.

Causes of Battery Ground Faults

There are several causes for introducing a ground fault into a battery system. The following presents the most common causes for ground faults.

- Debris on the surface of the container- Dirt and debris on the surface of the battery can develop paths for tracking to the battery rack.
- Maintenance activities can place residual electrolyte on the container, which can enhance the conduction path created by the debris exacerbating the level of ground fault.
- Penetration in the container- issues such as cracks by stress or holes by penetration in the container create an opportunity for electrolyte to seep out of the container and contact the battery.

To prevent possible ground fault risks, equip the corresponding GFD equipment. The battery warranty may be null and void if the GFD equipment is not equipped.

Opening/Closing the Enclosure Doors



Disconnect Position: The AC and DC disconnects on the front door have an interlock mechanism to prevent the front door from being opened if it is not in their OFF position. Turn the disconnects to OFF position before opening/closing the doors. Turning the disconnects clockwise sets them to ON (vertical) position, while turning the disconnects counter clockwise sets them to OFF (horizontal) position.

AC, DC Disconnect Position

The following figures show the status of AC and DC disconnects.

- ON: Vertical, turn counterclockwise to horizontal position to OFF state.
- OFF: Horizontal, turn clockwise to vertical position to ON state.

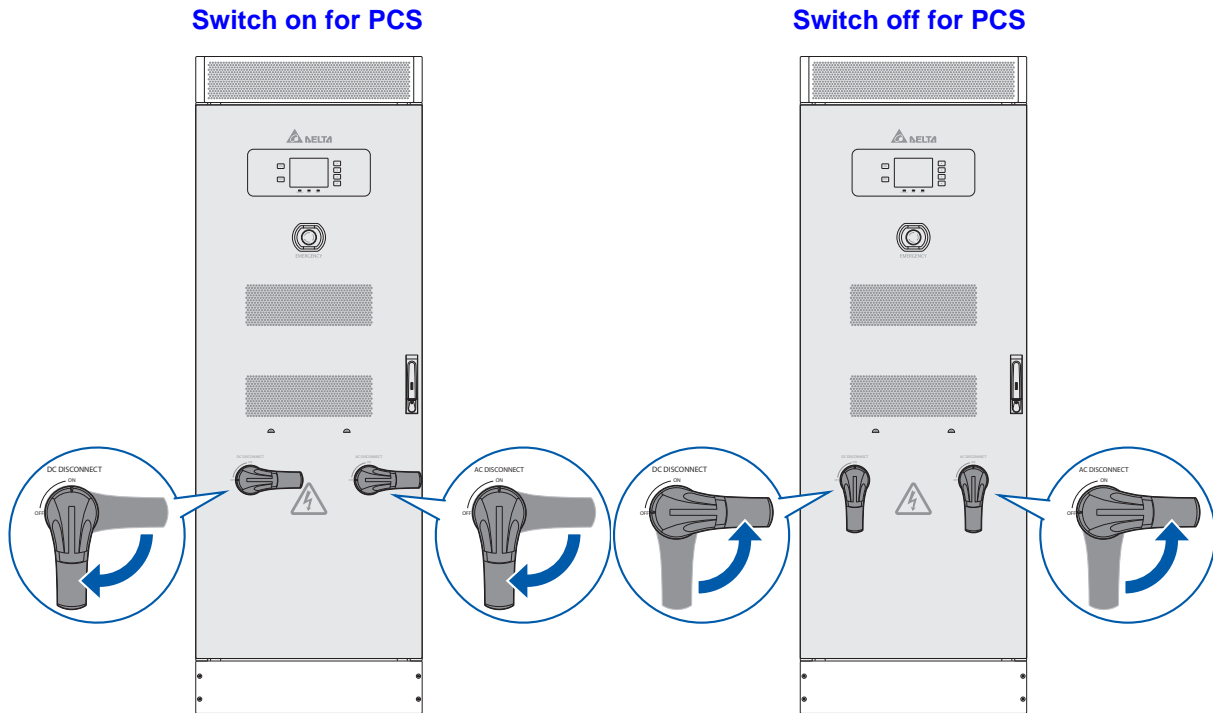


Figure 37. PCS Front View with AC, DC Disconnects Status

Opening a Front Panel

The AC and DC disconnects have an interlock mechanism to prevent the front door from being opened when not in the OFF (horizontal) position. After turning the disconnects to the OFF (horizontal) position, wait at least five minutes before opening the front door.

1. Rotate the switch handles to the OFF position to disconnect the AC and DC disconnects.

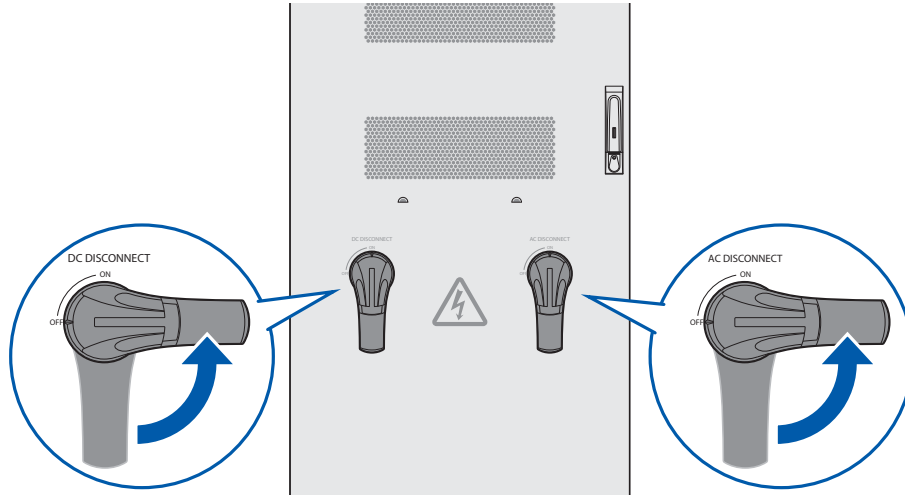


Figure 38. Disconnecting the AC and DC Inputs

2. Insert the key to unlock the front panel.

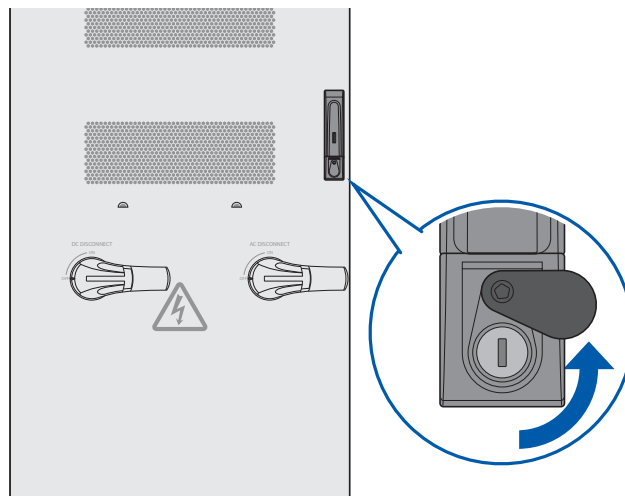


Figure 39. Unlocking a Front Panel

3. Rotate the door handle to unlock the front panel.
4. Open the front panel open and swing it open until it locks in place.

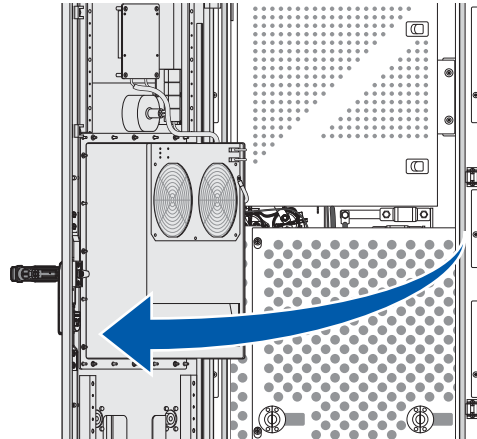


Figure 40. Opening a Front Panel

Make sure the door limiter at the bottom of the panel engages in the track to keep the front panel from closing accidentally.

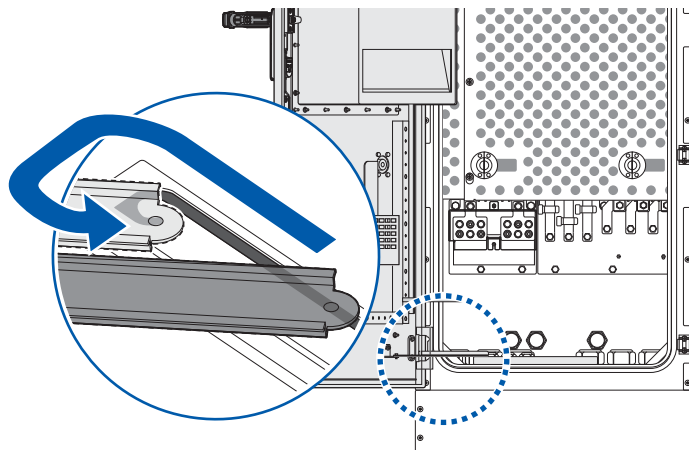


Figure 41. Engaging the Front Panel Limiter

The front panel locks in place when it is fully extended.

Wire Sizing and Ratings

AC Wire Sizing and Ratings

Prepare all the AC power cables meeting the following wiring specifications:

Table 2: AC Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	600 Volts or greater
Temperature	70°C or greater
Gauge	53.49 ~ 33.62 mm ²
Insulation	PVC
According to	IEC standard
Flame Test	V-1
Quantity	6 (2 for L1, 2 for L2, 2 for L3)

DC Wire Sizing and Ratings

Prepare all the DC power cables meeting the following wiring specifications:

Table 3: DC Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	1000 Volts or greater
Temperature	70°C or greater
Gauge	53.49 mm ²
Insulation	PVC
According to	IEC standard
Flame Test	V-1
Quantity	2 per battery set (1 for positive, 1 for negative up to 3 sets)

Grounding Wire Sizing and Ratings

All ground wiring must meet the following specifications:

1. The grounding wire sizing must be larger than half of the AC or DC wire sizing.
2. Wire sizing and ratings are recommended in the previous tables by manufacture.

If wiring other than posted is used, the wiring must comply with the local regulations.

Table 4: Grounding Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	600 Volts or greater
Temperature	70°C or greater
Gauge	53.49 ~ 26.67 mm ²
Quantity	1

Communication and I/O Wire Sizing and Ratings

Here are the requirements for the communication and I/O wires:

Table 5: Communication and I/O Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	600 Volts or greater
Temperature	70°C or greater
Gauge	1.32 mm ²
Quantity	<p>The following connectors, enclosed in accessory kit:</p> <ul style="list-style-type: none"> • 8 for CNJ3, 15-pin connector • 2 for CNJ5, 2-pin connector • 5 for CNJ13, 6-pin connector • 6 for CNJ1, 6-pin connector • 3 shielded network cables for CNJ11, CNJ12, and X1 • CNJ7 (optional)

Preparation of Cables

This section describes how to prepare the cable prepare the corresponding cables and wires to meet the specified requirements, see “Wire Sizing and Ratings” on page 41.

The following items require preparation:

- 2 x 1000V, 53.49 mm² cables for DC (battery) connection
- 6 x 600V or greater, 53.49 ~ 33.62 mm² cables for AC connection
- 1 x 600V or greater, 53.49 ~ 26.67 mm² cables for grounding
- 2 x 2-hole cable lugs (attached in the accessory kit) for grounding cable
- 1 x 15-pin green connector (enclosed in the accessory kit)
- 2 x 6-pin green connector (enclosed in the accessory kit)
- 1 x 2-pin green connector (enclosed in the accessory kit)
- 1 x 3-pin green connector (enclosed in the accessory kit)
- 3 x RJ45 connector



Note:

A RJ45 communication terminal resistor is inserted in CNJ11 (default). In parallel PCS installation, the communication terminal resistor is installed in the last PCS.



Note:

Wiring must comply with the IEC standard and local regulations.

Preparing AC/DC Cables

The following guidelines describe how to prepare the AC/DC cables for a grid connection.

When crimping cable, a hexagonal crimping method is recommended.

1. Strip the head of the insulator of the AC and DC power cables. Insert the exposed part of the power cable into the junction hole of the corresponding cable lug, which is available from the accessory kit.
2. Continue inserting the cable until its head reaches the wire inspection indicator, as shown in the following figure:

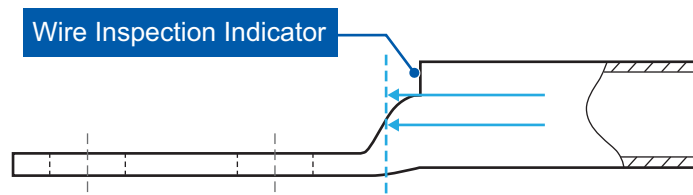


Figure 42. Inserting a Power Cable into a Cable Lug, Depth Reference Diagram

3. For safety purpose, use heat shrinkable tubing on the junction between the cables and lugs. The voltage rating of the heat shrinkable tubing should be at least 1000 V for DC power cable or 600 V for AC power cable. Make sure the exposed part of the junction between the cables and lugs is fully covered by the tubing, as shown in the following figures.
4. Prepare the cables as follows:

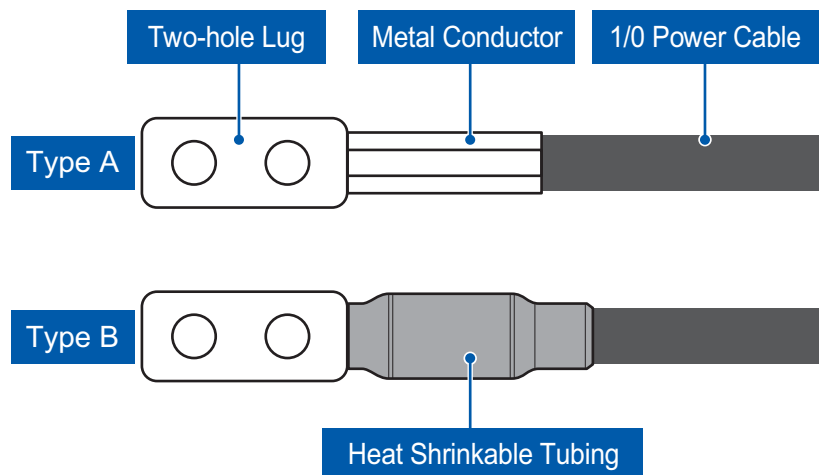


Figure 43. Preparation of AC/DC Cables

Communication and I/O Wiring

Lead the wires with 15-pin, 6-pin and 3-pin connectors prepared for communication and I/O connection through the front square hole of the unit base and through the wire glands in front of the DC cable glands.

Plug these connectors into the relevant connector bases built-in at the inner side wall of the cabinet adjacent to the DC terminals as the following figure:

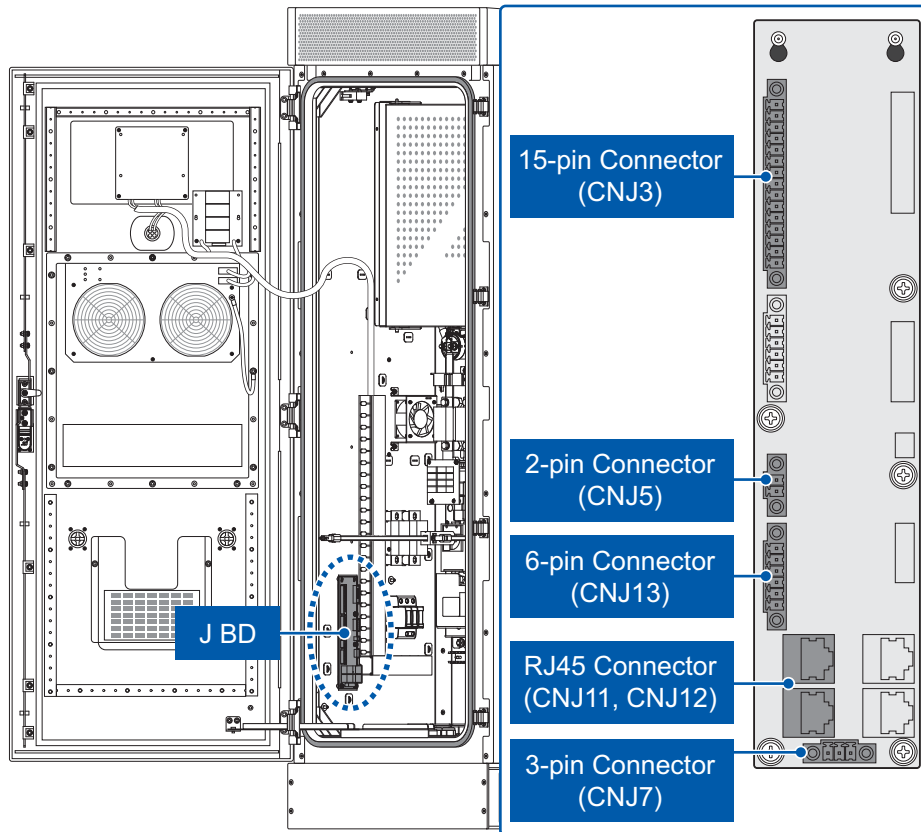


Figure 44. Communication and I/O Connection Location

I/O Connector (CNJ3)

The CNJ3 connector is for digital I/O connection. Take out the green 15-pin connector (CNJ3) from the accessory kit, and connect eight prepared 1.32 mm² wires to pin 1~4 and pin 7~10 of this connector as shown in the following figure.

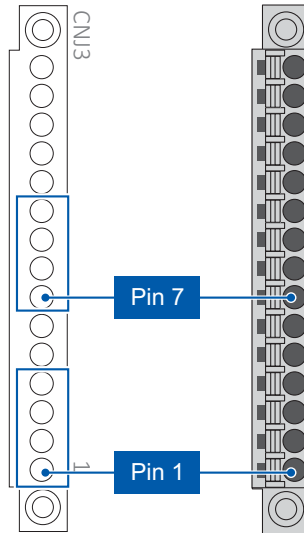


Figure 45. CNJ3 Pin Assignment

Table 6: CNJ3 Pin Assignment

Item	Pin Assignment	Notes
CNJ3	1: Digital Output 1-1	Dry Contact 1 (only for internal use) (Max 24Vdc/10mA)
	2: Digital Output 1-2	
	3: Digital Output 2-1	Dry Contact 2 (Max 24Vdc/10mA)
	4: Digital Output 2-2	
	5: Digital Output 3-1	Dry Contact 3 (Max 24Vdc/10mA)
	6: Digital Output 3-2	
	7: Digital Input 1-1	Wet Contact 1 (24Vdc/20mA)
	8: Digital Input 1-2	
	9: Digital Input 2-1	Wet Contact 2 (24Vdc/20mA)
	10: Digital Input 2-2	
	11: Digital Input 3-1	Wet Contact 3 (24Vdc/20mA)
	12: Digital Input 3-2	
	13: NC	Not Connect
	14: REPO_1	Remote EPO, Wet Contact for customer.
	15: REPO_2	

BMS Communication Connector (CNJ13)

The CNJ13 connector is for communication between PCS and BMS. Communication with BMS is handled in two ways, RS485/Modbus or CANbus. RS485 requires three prepared 1.32 mm² wires connected to pins 1 to 3 on the 6-pin connector from the accessory kit. For CANbus, connect two prepared 1.32 mm² wires to pins 5 and 6.

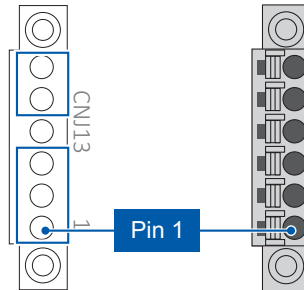


Figure 46. CNJ13 Pin Assignment

Table 7: CNJ13 Pin Assignment

Item	Pin Assignment	Notes
CNJ13	1: RS485-B3	For BMS
	2: RS485-A3	
	3: GND5	
	4: NC	For BMS (optional)
	5: CAN-H4	
	6: CAN-L4	



Note:

CAN and Modbus/RTU (RS485) are both provided for different vendors of battery. When Modbus/TCP IP (Ethernet) in system configuration is required to communicate with PCS, install an Ethernet converter accordingly connected to CNJ13 in PCS.

Analog I/O Connector (CNJ1)

The CNJ1 connector is CT ports for external current detecting from customer. It requires six prepared 1.32 mm² (AWG16) wires connected to pins 1 to 6 on the 6-pin connector from the accessory kit, as shown in Figure 47 and Table 8.

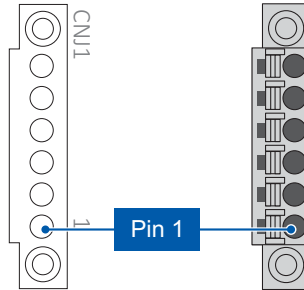


Figure 47. CNJ1 Pin Assignment

Table 8: CNJ1 Pin Assignment

Item	Pin Assignment	Notes
CNJ1	1: CT1-2	For grid/load 3 phase current sense; Current range: 0~ 5A; Pin1: L1_P2; Pin2: L1_P1; Pin3: L2_P2; Pin4: L2_P1; Pin5: L3_P2; Pin6: L3_P1.
	2: CT1-1	
	3: CT2-2	
	4: CT2-1	
	5: CT3-2	
	6: CT3-1	

Communication Connector (CNJ11, CNJ12)

The CNJ11 and CNJ12 connectors are for communication with ESS controller or with other PCS in parallel operation. Prepare two RJ45 connectors and six 1.32 mm² wires for each, and connect the wires to the pin 1~2 and pin 4~7 of the RJ45 connector as the graphic and pin assignment below:

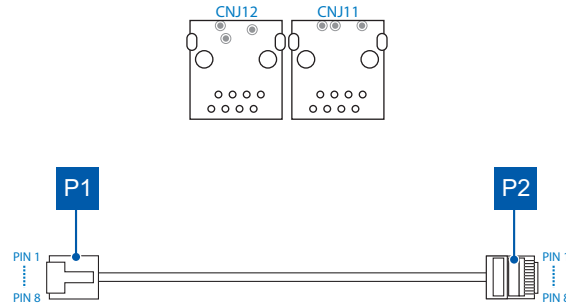


Figure 48. CNJ11, CNJ12 Pin Assignment

Table 9: CNJ11, CNJ12 Pin Assignment

Item	Pin Assignment	Notes
CNJ11, CNJ12	1: RS485-A2	For ESS Controller
	2: RS485-B2	
	3: NC	
	5: CAN-H2	For PCS parallel
	6: CAN-L2	
	7: CAN-H3	For voltage detection
	8: CAN-L3	

Table 10: Used for Upper Controller (Use 3-pin)

Item	Pin Assignment	Notes
CNJ7	1: RS485A2	The same RS485 terminal as pin1 and pin2 of CNJ11/CNJ12, for ESS Controller/Site Controller/Local Controller/PC.
	2: RS485B2	
	3: NA	Used for installation when only one PCS.



Note:

CNJ11 and CNJ12 are used for parallel operation more than one PCS. When multiple PCSs are parallel operated, the network cable should be connected hand by hand, with CNJ11 or CNJ12 of the first PCS is connected to upper controller and the terminal resistors should be inserted to CNJ11 or CNJ12 of the last one.

Auxiliary Power Interface Connector (CNJ5)

CNJ5 is located on J board called Interface board, shown in the following figure. It is used for alternative auxiliary power input with 24Vdc 0.5A. Connect two 1.32 ~ 0.326 mm² wires to the 2-pins connector as the pin assignment table below. Customer can run PCS in black start mode via this terminal.

Table 11: For Black Start Use (Optional) (Use 2-pin)

Item	Pin Assignment	Notes
CNJ5	1: Vdc +	24Vdc, 0.5A; For Black Start
	2: Vdc -	

Black Start

1. After the auxiliary power is connected, the communication part of PCS starts to work.
2. Make sure you connect the communication cable between the BMS and the PCS correctly and the PCS battery manufacturer type is set correctly. The default setting is LGC battery in the Modbus setting.
3. Turn on the auxiliary power of the BMS.
4. The BMS establishes a communication connection with the PCS, and the batter outputs the HV DC.
5. The DC input of the PCS comes from the battery. Enters the island operation mode, starts the PCS, establishes the microgrid, and completes the black start.

Demand Response Management (RJ45)

Demand Response Management

The inverter provides a RJ45 port to support the connection to a demand response enabling device (DRED). The support is required as the DRED asserts demand response modes (DRMs). When the inverter detects a demand response command, it initiates a response. The following table lists the DRMs supported by the inverter.



Note:

The mandatory respond mode is DRM0 (standby), while support for the remaining listed modes is option and may not be applicable for all models.

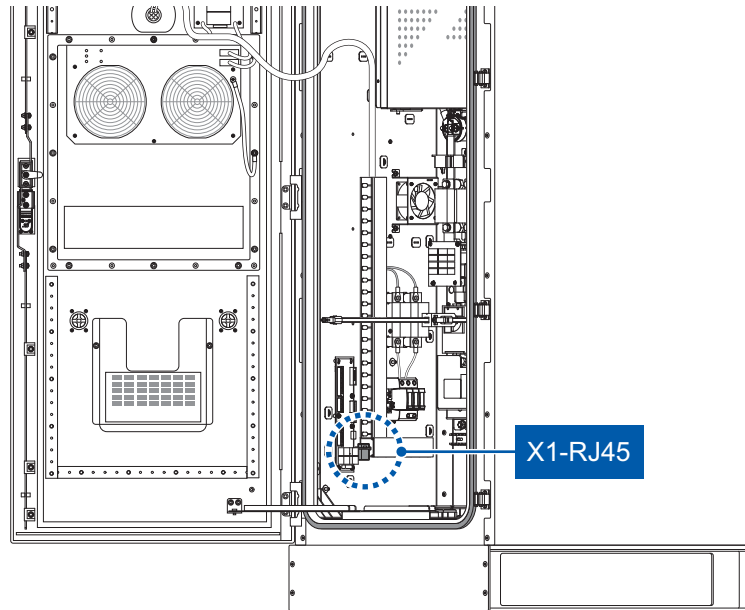
Table 12: Demand Response Modes (DRMs)

Mode	Description
DRM0	The inverter is in standby.
DRM1	Power consumption from the grid is 0.
DRM2	Power consumption from the grid is no more than 50% of the rated power.
DRM3	Power consumption from the grid is no more than 75% of the rated power, while source reactive power enabled.
DRM4	Increased power consumption, but subject to the constraints from other active DRMs.
DRM5	Do not generate power
DRM6	The export power to the grid is no more than 50% of the rated power.

Table 12: Demand Response Modes (DRMs) (Continued)

Mode	Description
DRM7	The export power to the grid is no more than 75% of the rated power.
DRM8	The export power to the grid is 100% of the rated power, but subject to the constraints from other active DRMs.

The inverter shall have a means of connecting to a DRED. This means of connection shall include a terminal block or RJ45 socket. The terminal block or RJ45 socket may be physically mounted in the inverter or in a separate device that remotely communicates with the inverter. The X1-RJ45 socket in PCS100 is located nearby J board as shown in the following figure.


Figure 49. X1-RJ45 Socket Location for DRED Interfacing
Table 13: X1-RJ45 Socket Pin Assignment

Pin	Assignment for Inverters Capable of Both Charging and Discharging
1	DRM 1/5
2	DRM 2/6
3	DRM 3/7
4	DRM 4/8
5	RefGen
6	COM/DRM 0
7	V+
8	V-


Note:

Pins 7 and 8 are designated for internal short circuit protection.

Wiring

General Introduction

For wiring convenience, you can lead the cables and wires from the left, right, front or rear bottom side of the unit into the cabinet.

The following sections will be described in the case of wiring from the front bottom side of the unit as an example. As for the other cases, please remove the relevant side cover of the unit base to lead the cables and wires into the cabinet.

To do the wiring works from the front bottom side of the PCS, first remove the front cover of the unit base and the protective cover in the middle of the cabinet and with a Phillips screwdriver.

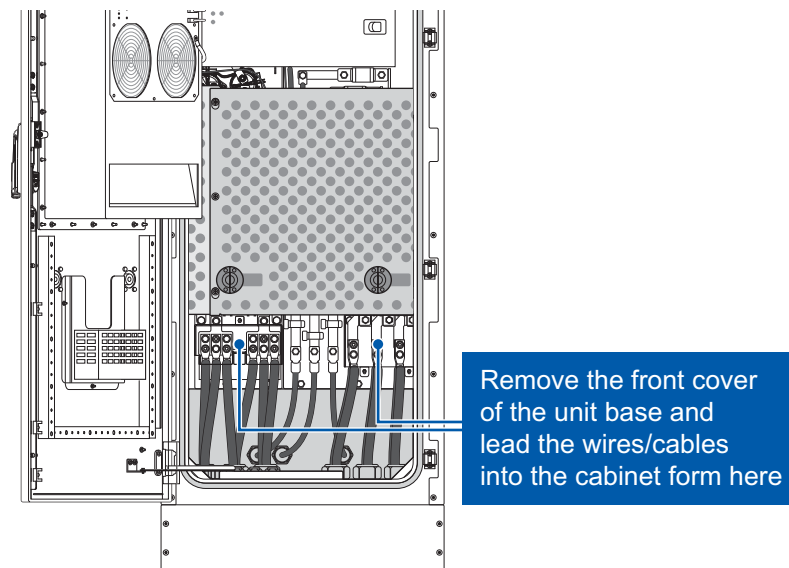


Figure 50. Remove the Front Cover of the Unit Base and the Protective Cover

Inside the PCS cabinet, you will see several cable glands for DC, AC and communication wiring on the bottom of the cabinet as shown below:

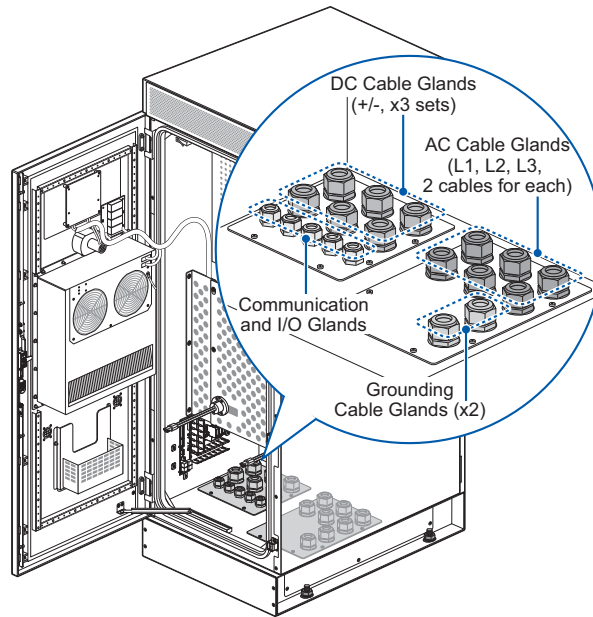


Figure 51. AC, DC, and Communication Wiring Cable Glands

Above the cable glands, several labels marked DC+, DC-, L1, L2, and L3 along with the protective covers and relevant terminals are illustrated. See the following figure.

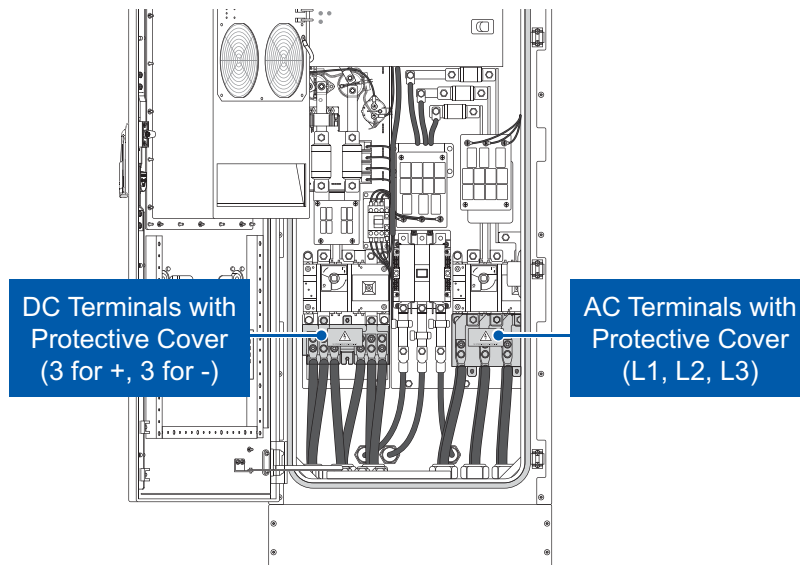


Figure 52. DC and AC Connection Labels and Terminals



Note:

There are 3 sets of Positive and Negative terminals for up to 3 Battery connections.

DC Wiring

1. **Prepare DC cables:** Prepare several 1/0 size, 1000V cables for DC wiring. The PCS supports up to 3 sets of battery connection, and each set of battery connection requires two cables (one for positive, the other for negative). Connect the DC cables to the two-hole lugs which are available in the accessory kit, and use heat shrinkable tubing on the junction between the cables and lugs to prevent the exposure of the conductive part.
2. **Remove protective cover of DC terminals:** Remove the protective cover in front of the DC terminals as shown in the following figure. There are two labels indicating the polarity of the terminals: "DC+" for positive, and "DC-" for negative. Each pole provides 3 two-hole terminals and can be connected side by side.

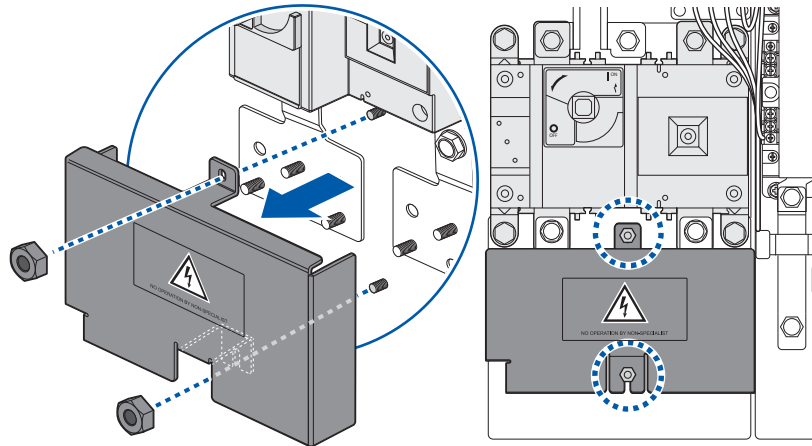


Figure 53. Removing DC Protective Cover

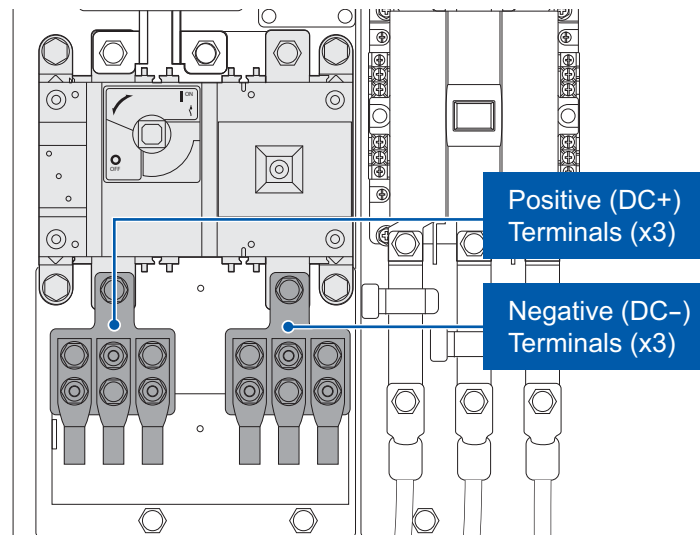


Figure 54. DC Terminal Labels

3. **Connect DC cables to DC terminals:** Loose the hex socket screws of the DC terminals, then lead the DC cables with two-hole lugs through the DC cable glands into the PCS. Connect and secure these cables to the relevant “DC+” and “DC-” terminals.

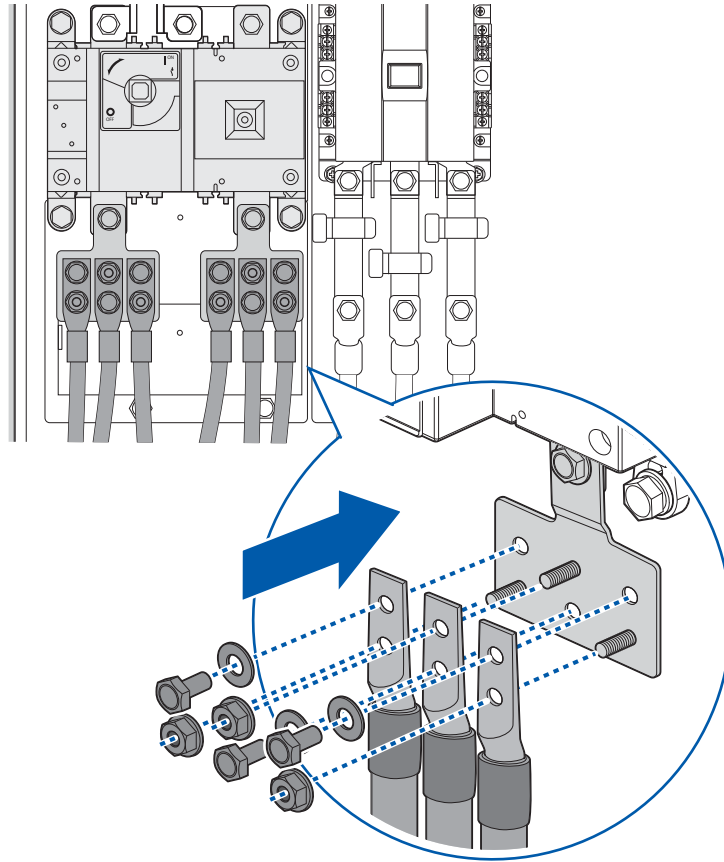


Figure 55. Positive (+) and Negative (-) DC Cable Terminals

4. Reinstall and secure the DC protective cover.

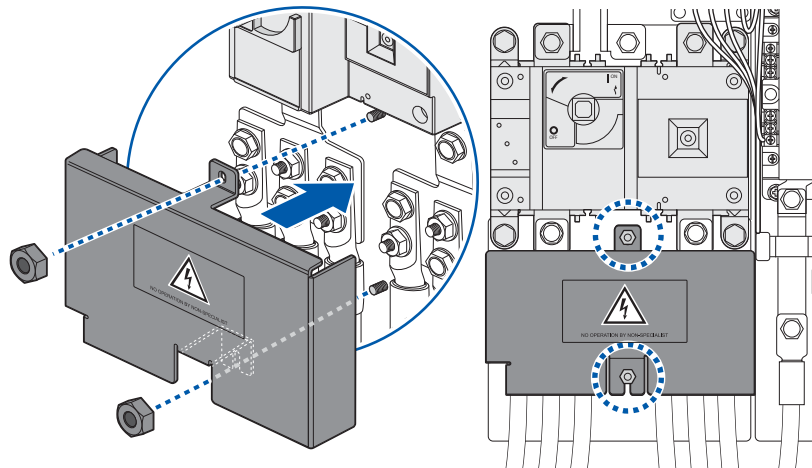


Figure 56. Installing DC Protective Cover

AC Wiring

1. **Prepare AC cables:** Prepare six 53.49 ~ 33.62 mm² 600V cables for AC wiring. The PCS supports 3-phase/3-wire connection type AC wiring with L1, L2 and L3 phase terminals, and each phase terminal requires two cables to connect. Attach the AC cables to the two-hole lugs in the accessory kit, and use thermal casing to prevent the exposure of the naked part.
2. **Remove protective cover of AC terminals:** Remove the protective cover in front of the AC terminals as the figure shown below. There are three labels indicating the phases of the terminals: "L1" for L1 phase, "L2" for L2 phase, and "L3" for L3 phase. Each phase terminal provides back-to-back connection way for connecting two AC cables.

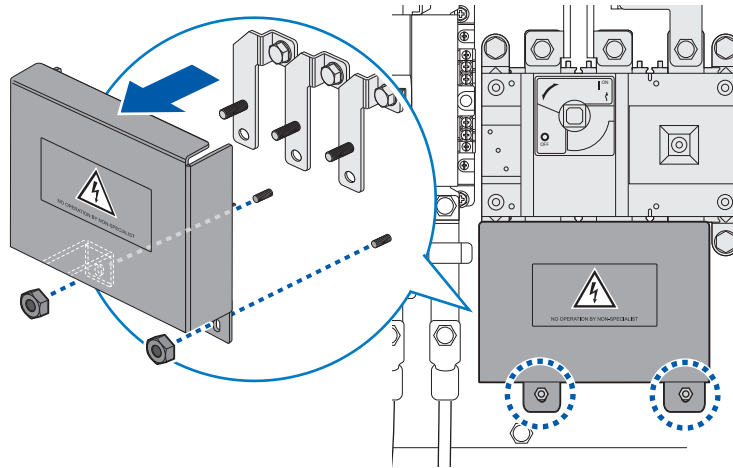


Figure 57. Removing AC Protective Cover

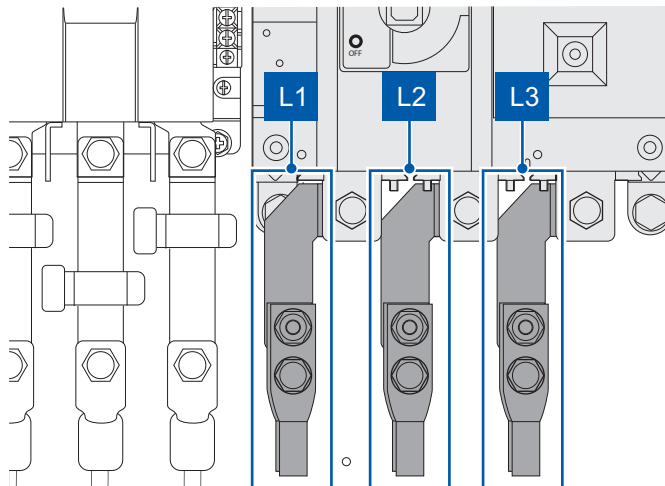


Figure 58. AC Terminal Labels

3. **Connect AC cables to AC terminals:** Loose the hex socket screws of the AC terminals by Allen wrench, then lead the AC cables with two-hole lugs through the AC cable glands into the PCS, connect and secure these cables to the relevant “L1”, “L2” and “L3” terminals.

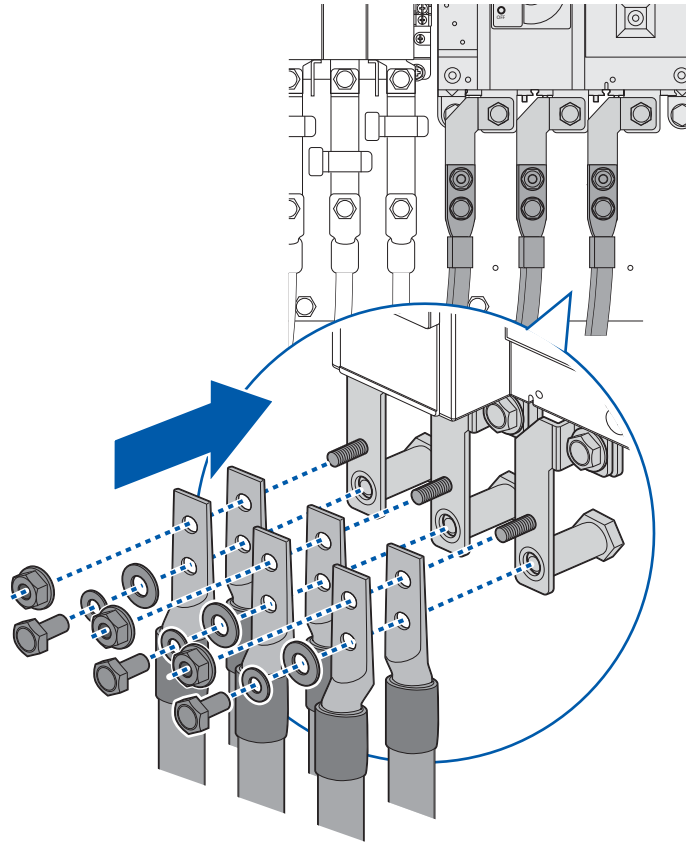


Figure 59. AC Cable Connection with L1, L2, L3 Terminals

4. Reinstall and secure the AC protective cover.

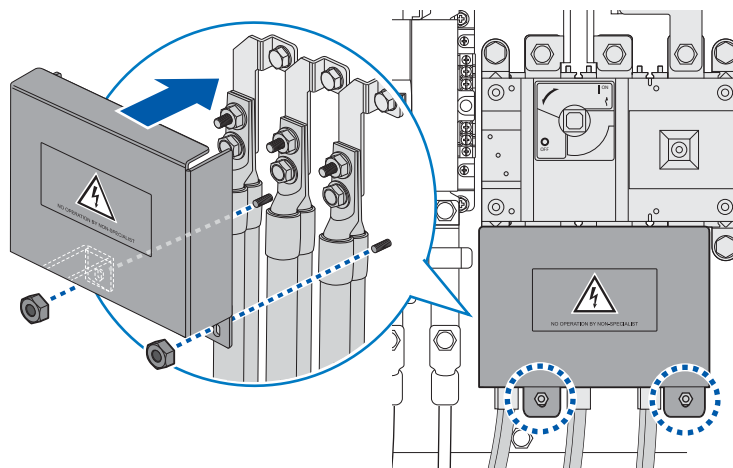


Figure 60. Installing AC Protective Cover

Grounding

First attach the two 600 V, 1/0 size cables prepared for grounding to the 2-hole lugs in the accessory kit. Then lead these grounding cables through the front square hole of the unit base and through the grounding cable glands into the PCS cabinet.

Then use a socket or adjustable wrench to connect and secure the grounding cable lugs to the grounding copper plate at the inner side wall of the cabinet adjacent to the AC terminals as shown below:

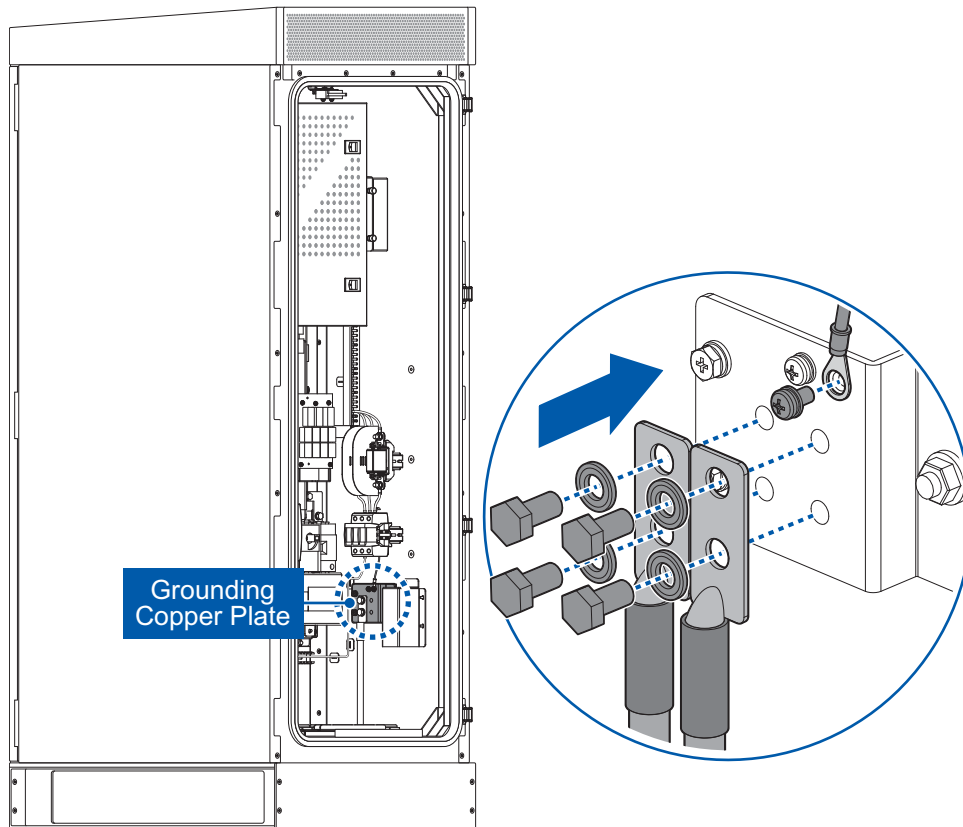


Figure 61. Grounding Cable Connection with Grounding Copper Bar



Note:

The grounding cable only needs a 53.49 ~ 26.67 mm² cable.

When multiple cabinets are combined, the grounding cable can be connected one by one. At this time, there are two grounding cables on the floor.



Note:

The grounding wire sizing must be larger than half of AC or DC wire sizing.

The wire sizing and ratings are recommended by the manufacturer. If non-recommended wiring is used, it should comply with local regulations.

Wiring N Cable

According to the demand to decide wiring the N cable or not.

1. Prepare the 1/0 600V wire.
2. Remove the nuts securing the plexiglass cover then remove the plexiglass cover.

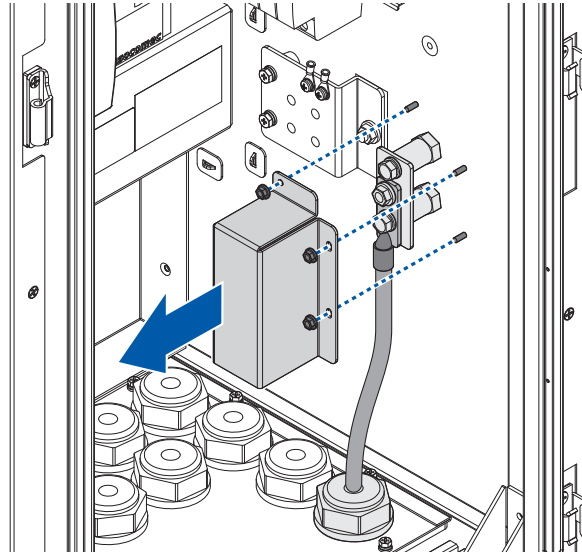


Figure 62. Removing the Plexiglass Cover

3. Remove the two-hole terminal on the copper bar and crimp the 1/0 wire into the two-hole terminal.
4. Connect the two-hole terminal and wire on the copper bar.

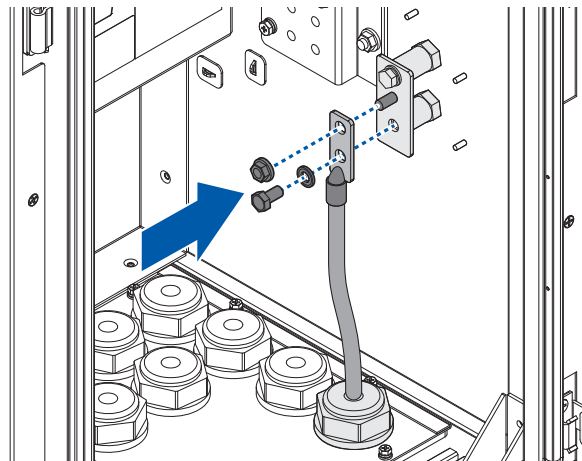


Figure 63. Connecting N Cable

5. Install the plexiglass cover and secure the nuts.

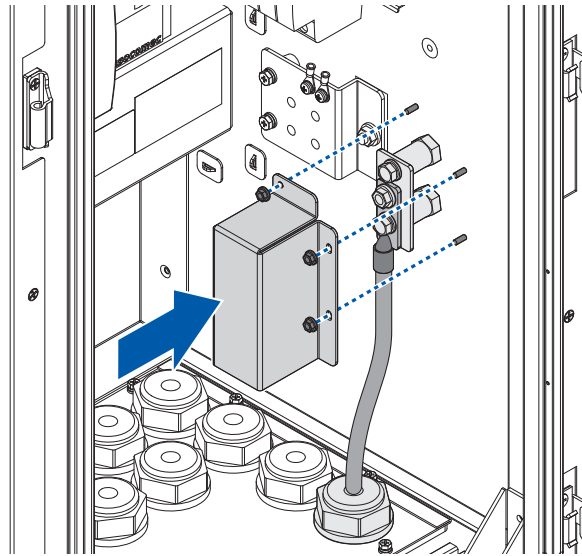


Figure 64. Installing the Plexiglass Cover

After finishing all the wiring works, reinstall the protective cover, close and lock the front door.



Note:

The specification of PCS100 is designed for 3P3W & PE. The reserved N terminal is floating connected that used only for N from 3P4W & PE in customer's system. It is just for wiring with no electric connection. When PCS100 is configured in IT system application, N wire is forbidden to connected to PCS100. Besides, the Isolation Monitor Device (IMD) is essential. Customer must install IMD in proper location in the ESS complied with the IEC standard or local regulations.



Note:

Make sure all wirings are secured.

After wiring, the protective cover must be installed and can not be energized without protective covers.

Wiring need to be fixed firmly.

Two-hole terminals must be wrapped with thermoplastic sleeves or insulating sleeves to avoid potential safety hazards.

During the installation process, the disassembled items are placed centrally to avoid loss.

Warranty

The warranty may be void and invalid when the product has been exposed to the following conditions:

1. used in a manner inconsistent with any instructions provided hereby or the given specifications;
2. damaged by water, earthquake, lightning or typhoons;
3. event of Force Majeure, any circumstance not within the reasonable control of the operation design;
4. repaired, modified, moved or installed by any party without Delta's prior written authorization;
5. damage due to accidents such as fire, inundation, unusual electric shock, power failure or shipping.
6. damage due to rodents, improper temperature, humidity or any unmet environmental requirement;
7. deliberate damage.
8. corresponding GFD equipment is not equipped.

Additional charges and cost may apply when maintenance services are required due to the improper maintenance of the product.

Appendix

Specifications

Table 14: Technical Specifications of Delta 100kW PCS

Item	Description
Grid-tied Operation	
Rated Grid Voltage	400 Vac, 3 phase 3 wire
Grid Voltage Range	320 to 440 Vac (VDE-AR-N4105) 312 to 450 Vac (AS/NZS 4777.2)
Rated Grid Frequency	50 Hz
Frequency Range	47.5 to 51.5 Hz (VDE-AR-N4105) 47 to 52 Hz (AS/NZS 4777.2, Australia) 45 to 52 Hz (AS/NZS 4777.2, New Zealand)
Rated AC Power	100 kVA
Rated AC Current	144.3 A
Max. Continuous AC Current	160.4 Arms
Current THD	< 3% at rated power (VDE-AR-N4105 and AS/NZS 4777.2 Compliant)
Power Factor	-1 to 1, continuously adjustable
Charging-discharging Transfer Time	< 100 ms ($\pm 90\%$ rated power)
Power Response Time	< 40 ms (0~100% rated power)
Battery Input Performance	
DC Voltage Range	750 to 1,000 Vdc
Rated DC Voltage	900 Vdc
Rated Discharge Power	103 kW
Rated Charge Power	97 kW
Max. Discharge DC Current	137.3 A (103 kW @ 750 Vdc)
Max. Charge DC Current	129.3A (97 kW @ 750 Vdc)
Standalone Mode Performance	
Rated Output Voltage	400 Vac, 3P3W (In 3P4W case, extra Dyn transformer needed)
Rated Output Power	100 kVA/100 kW
Rated Output Current	144.3 A
Rated Output Frequency	50 Hz $\pm 1\%$
Power Factor	0.8 to 1
Output Voltage Accuracy	1%
Voltage Symmetry	$\pm 1\%$, @ 100% linear balanced load
Output Voltage THD	< 3% @ 12.5 ~ 100% liner load < 5% @ 12.5 ~ 100% non-liner load (Crest factor ≤ 2.0)

Table 14: Technical Specifications of Delta 100kW PCS (Continued)

Item	Description
Output Voltage Regulation	< 10%, at dynamic; Recovering within tolerance in 100 ms
Crest Factor	2.0 @ rated power
Max Altitude	3,000 m (9,843 ft) Thermal derating above 2,000 m (6,561.68 ft.)
Environment	
Operating Temperature	≤ 2,000 m: -25 ~ 60°C (-13 ~ 140°F), derating > 50°C (3%/°C) > 2,000 m: -25 ~ 40°C (-13 ~ 104°F),
Storage Temperature	-25 ~ 70°C (-13 ~ 158°F)
Humidity	0 to 95% RH, no-condensing
Cooling	Fan cooled, speed controlled and alarmed signal
Pollution Degree	3
Acoustic Noise	< 72 dBA @ 1 m (3.3 ft)
IP Degree	IP55
Interface & Communication	
Digital I/O	3 x Input, 0 - 24 V 2 x Output relays
User Interface	4.9 inch LCD screen with push button, Fault LEDs
Emergency Stop	Local EPO button & remote control
Communication	RS-485 / Modbus RTU, CAN
System Characteristic	
Peak Efficiency	97.2%
Sleep Mode Loss	< 25 W
Operation Mode	<ul style="list-style-type: none"> • Demand charge management (Power Dispatch) • Load shifting for Time-of-Use saving • Power quality improvement (P-Q Control, Frequency Regulation) • Emergency backup power
Dimensions (W x D x H) (excl. Package)	600 mm x 800 mm x 1,766 mm / 23.6 in x 31.5 in x 69.5 in
Net Weight (excl. Package)	310 kg / 683 lbs
Standard Compliance	
Certificate	IEC 62477-1, VDE-AR-N 4105, AS 62040.1.1, AS/NZS 4777.2, IEC 61000-6-2/-4
Applicable Battery Chemistry	Lithium-ion, lead-acid, flow battery

Glossary

- AC
Abbreviation for “Alternating Current”.
- AHJ
Abbreviation for “Authority Having Jurisdiction” (electrical inspector).
- AWG
American Wire Gauge.
- Basic Insulation
Insulation to provide basic protection against electric shock.
- BMS
Battery management system.
- DC
Abbreviation for “Direct Current”.
- EMC
The Electro-Magnetic Compatibility (EMC) concerns the technical of the mutual influencing of electrical devices through electromagnetic fields caused by them.
- EPO
Emergency power off.
- ESS
Energy storage system.
- Galvanic isolation
No conductive connection between two component parts.
- GEC
Grounding Electrode Conductor
- GET
Grounding Electrode Terminal
- IEEE
The Institute of Electrical and Electronics Engineers or IEEE is an international non-profit, professional organization for the advancement of technology related to electricity.
- IMI
Isolation Monitor Interrupter
- ISC
Short Circuit Current
- Local utility company
A local utility company is a company that distributes electricity over the grid.
- MPP
The Maximum Power Point is the point on the current-voltage (I-V) curve of an array or string, where the product of current and voltage has it's maximum value.

- PCS
Power Conditioning System, an electrical device which converts DC direct voltage into AC voltage and/or direct current into alternating current.
- Power dissipation
Power dissipation is designated as the difference between absorbed power and power of a device or process yielded. Power dissipation is released mainly as heat.
- PVC
Polyvinyl chloride.
- RJ-45
Abbreviation for standardized eight-pole electrical connector connection. RJ stands for Registered Jack (standardized socket).
- RS-485 (EIA485)
Differential voltage interface on which the genuine signal is transmitted on one core and the negated (or negative) signal on the other core.
- SPD
Surge protection device.
- String
Designates a group of electrical PV modules amended in series.
- THD
Total harmonic distribution.
- VOC
Open Circuit Voltage

Screw Torque Table

1. The torque level for M3~M5 screws is 4.8, refer to the following torque standard table to make sure the washers are in close contact with the screws.

Table 15: Screw Torque Table for M3~M5 Screws

		Screw Assembly Torque Standard		Unit: N·m
Screw Type		M3	M4	M5
Screw Thread		Standard	Standard	Standard
Material		N/A		
Securing	Secured			
Steel Plate	Steel Plate	0.8 ± 0.15	1.4 ± 0.2	2.0 ± 0.2
Steel Plate	Aluminum Plate	0.7 ± 0.1	1.0 ± 0.15	1.6 ± 0.2
Aluminum Plate	Aluminum Plate			
Plastic	Aluminum Plate	0.6 ± 0.1	0.8 ± 0.15	1.2 ± 0.2
Plastic	Steel Plate	0.6 ± 0.1	0.8 ± 0.15	1.2 ± 0.2
PWB	Steel Plate	0.6 ± 0.2	1.0 ± 0.2	N/A
Insulator	Copper Plate	0.6 ± 0.2	1.2 ± 0.2	1.6 ± 0.2

2. The torque level for M6 or bigger screws is 8.8, refer to the following torque standard table to make sure the washers are in close contact with the screws.

Table 16: Screw Torque Table for M3~M5 Screws

		Screw Assembly Torque Standard					Unit: N·m	
Screw Type		M6	M8	M10	M12	M14	M16	ST5.5
Screw Thread		Standard	Standard	Standard	Standard	Standard	Standard	Customized
Material		N/A						
Securing	Secured							
Steel Plate	Steel Plate	5 ± 1	12.5 ± 1	25 ± 2	42 ± 3	N/A	100 ± 100	5.5 ± 1
Copper Plate	Copper Plate	5 ± 1	12.5 ± 1	25 ± 2	42 ± 3	N/A	100 ± 10	N/A
Insulator	Copper Plate	5 ± 1	10 ± 1	12.5 ± 2	N/A	N/A	N/A	N/A