Delta Power Conditioning System (PCS100)

Installation Manual

Version: 1.0.4

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About this Manual

Version Control

Table 1: Version Control

Rev.	Change Description	Date
1.0.0	1. Add opening the door space. 2. Add parallel installation. 3. Add detail description about terminal resistor switch and terminals on new J board. 4. Delete chapter “System configuration and commissioning”	31Dec2020
1.0.1	Add description about Icc declaration.	9Apr2021
1.0.2	Update Figure4 about Anchoring Holes Placement in page 8	1Sep2021
1.0.3	1. Update Figure7 about space limitation on top; 2. Update specification in page 59&60. 3. Add description about RCM/RCD device in page16 4. Add description of capability of PCS operate in parallel in page43	27Sep2021
1.0.4	Add description about DC disconnect switch shall be external in page 15	2Dec2021
1.0.5	Add information for connecting DRED device for DRM control	22DEC2021

Purpose

The purpose of this Installation Manual is to provide explanations and standard procedure for installing, configuring the Delta Power Conditioning System PCS100 series product.

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 PCS100. 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.

Introduction

Overview

Delta's 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.

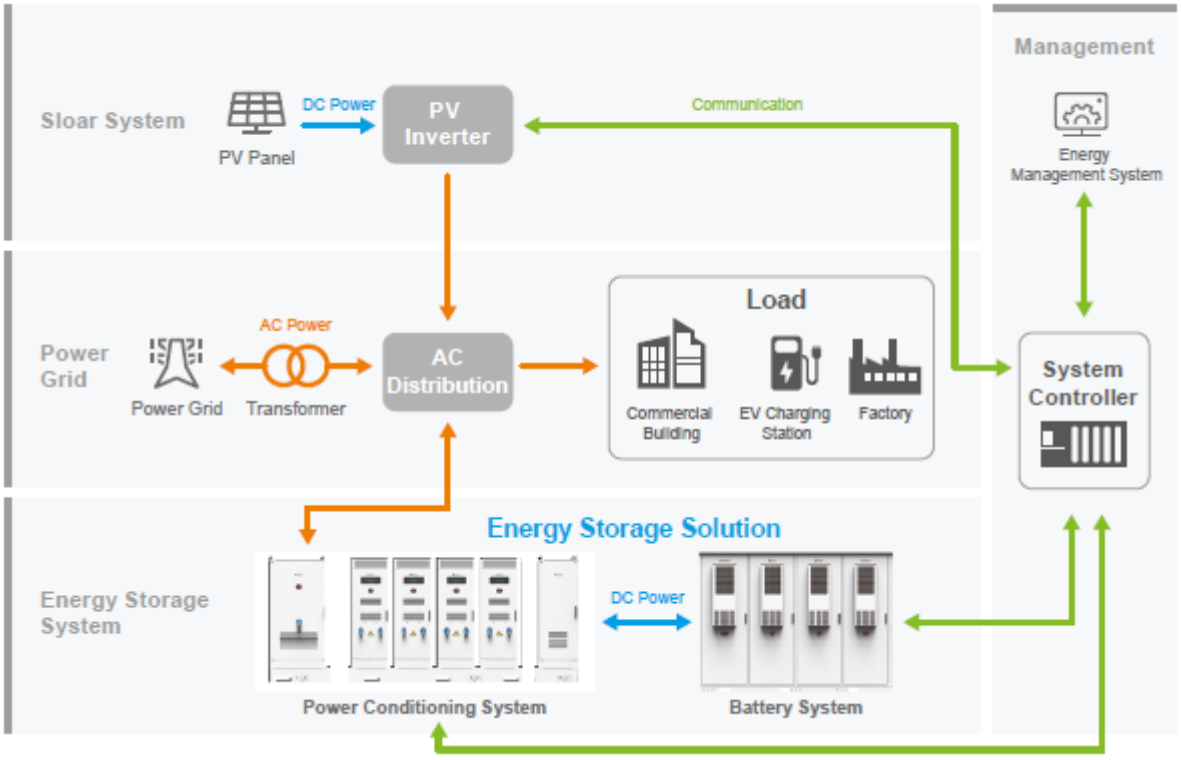


Figure 1. Typical PCS Application System Architecture

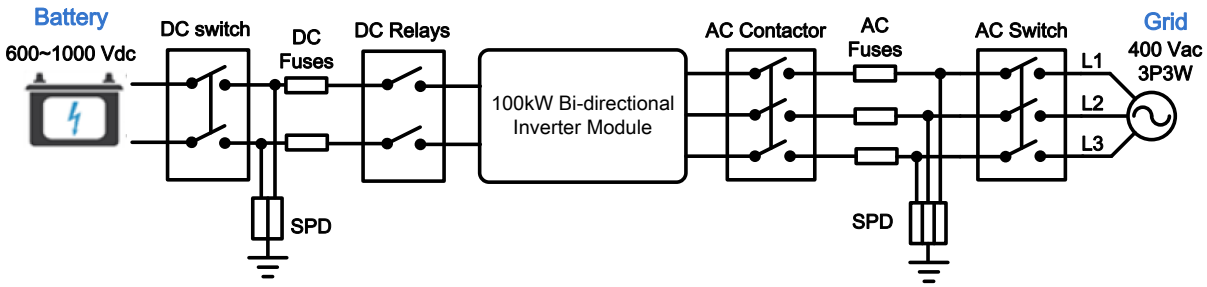


Figure 2. Delta PCS100 System Block Diagram

Features

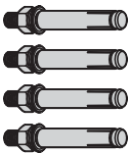
- High conversion efficiency with latest technologies
  - High efficiency: peak 97.9%
  - High power density in outdoor application: 146 W/l, 322 W/kg
  - Low standby power loss: < 25W @sleep mode
- Integrated AC and DC switches for easy installation
- Scalable up to 500 kW in parallel configuration
- Quick system response time (< 40 ms)
- IP55 enclosure compliance for outdoor application

Applications

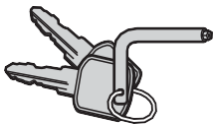
- Demand charge management (Power Dispatch)
- Load shifting for Time-of-Use saving
- Power quality improvement (P-Q Control, Frequency Regulation)
- Emergency backup power

Accessory Kits

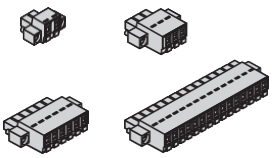
Check that the following items are included. Contact your vendor if any items are missing or appear damaged.



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

14 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.

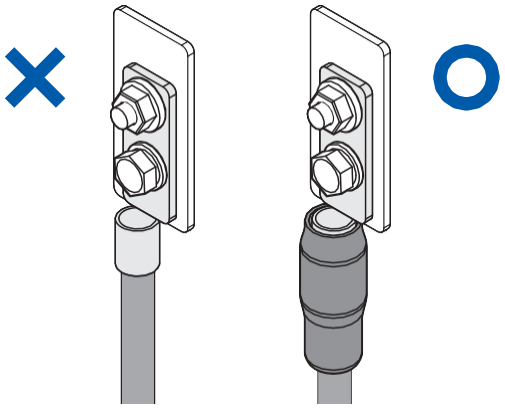


Figure 3. Final Wire Installation with Sleeve

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. System grounding, when required by EN 62477-1, 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.

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 746 mm (11.81 x 29.37 in.) as marked in number 2.

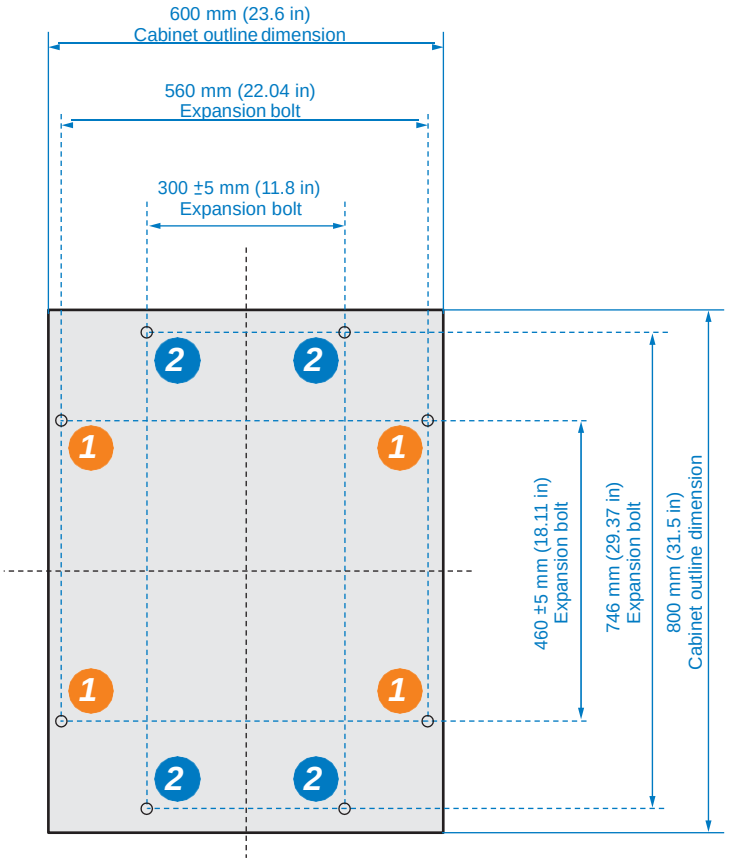


Figure 4. Mounting Layout and Anchoring Holes Placement Variations (Top View)

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

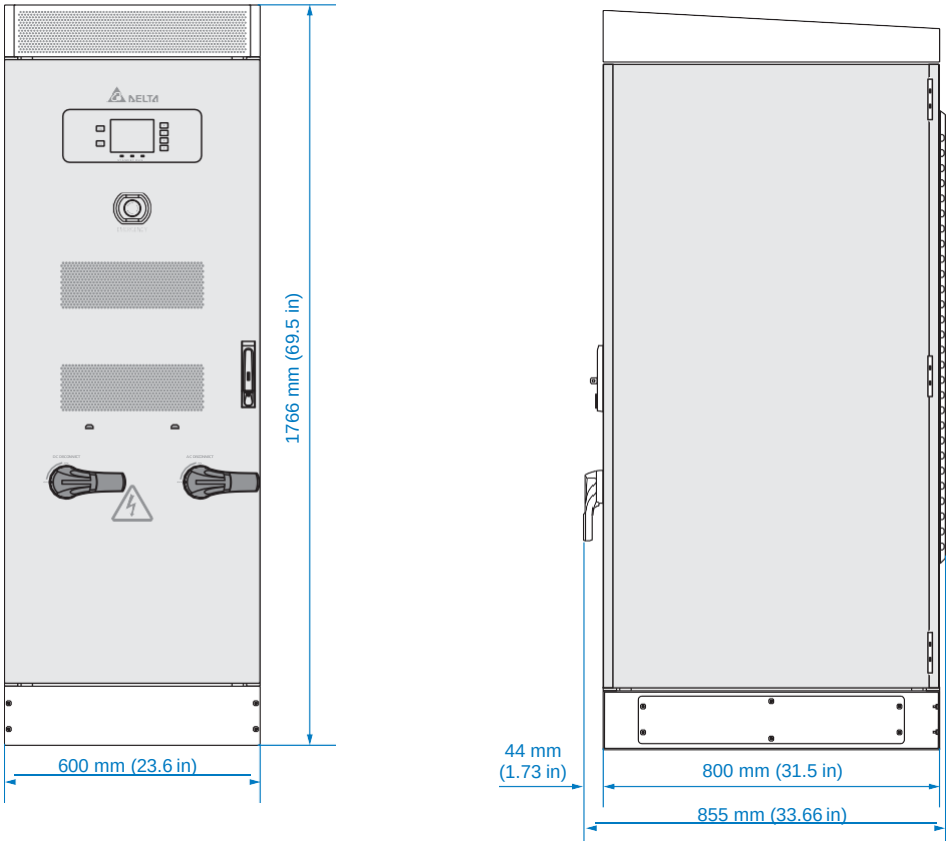


Figure 5. Front and Side Views of a Delta PCS100

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.

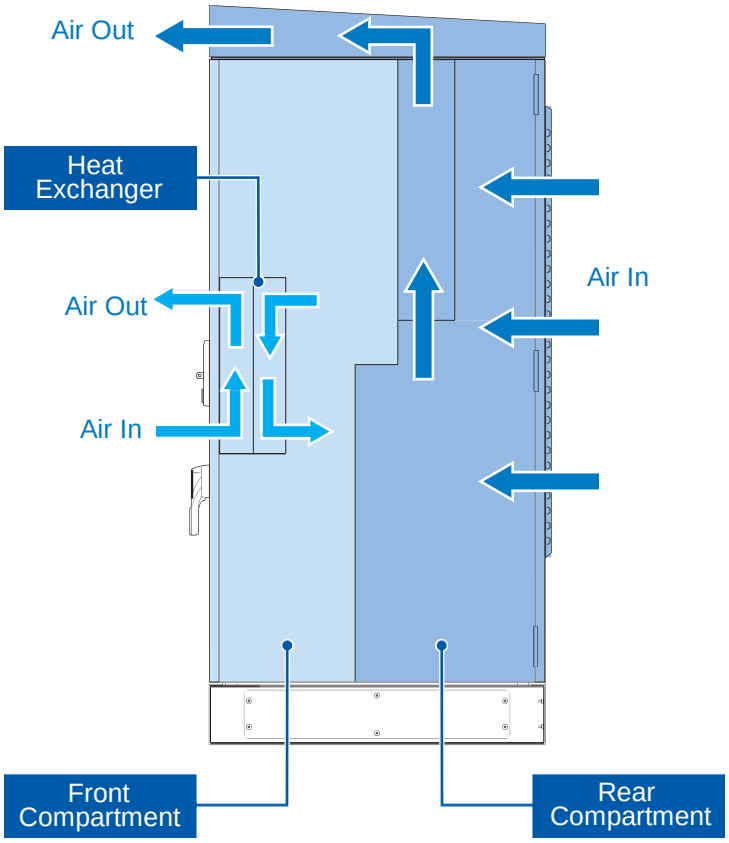


Figure 6. Diagram of PCS Airflow Design (Side View)

Maintenance distance requirements

A minimum distance of 800 mm behind the PCS is required for maintenance from rear side, a minimum distance of 800mm in front of the PCS is required for maintenance from front side and a minimum distance of 100mm on top of the PCS is required for lifting the PCS if needed as shown in Figure 7.

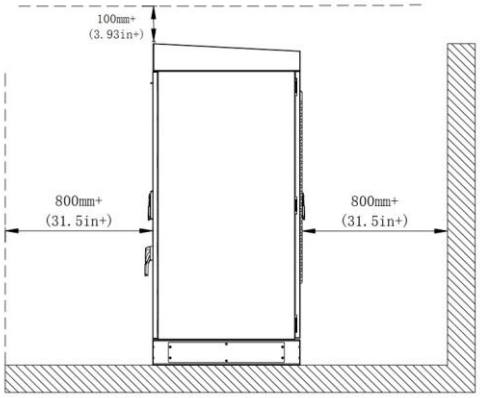


Figure 7. Front and Rear Maintenance Clearance Distance

Opening the door space

When installing the PCS, take into consideration the necessary ventilation space as well as the space requirements to allow access when opening the doors. At the same time, 306mm opening the door space should be reserved as shown in Figure 8.

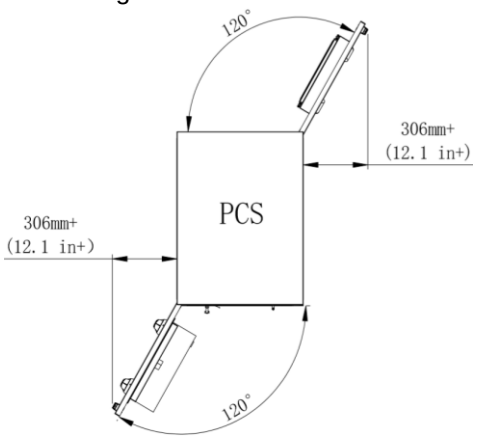


Figure 8. Top View of Door Clearance

Parallel installation

When PCS are installed side by side, the clearance between PCS should be greater than 10 mm as shown in Figure 9.

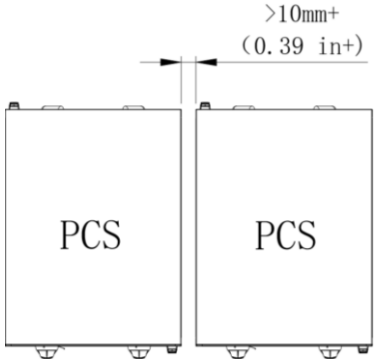


Figure 9. Top View of Side by Side

Unpacking the Unit

Use a forklift to move and place the crate containing the PCS100 and the wooden pallet on a designated location. Make sure the location is clean and prepared prior to moving the crate.

WARNING!

The PCS100 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!

Before opening the package, make sure the Tip Tell label is OK. If the Tip Tell label shows the PCS100 had topple and fall, immediately contact Delta and the Shipping Company.

1. Use a ladder to reach the top of the PCS100.
2. Remove the screws securing the top cover.
3. Remove the top cover.

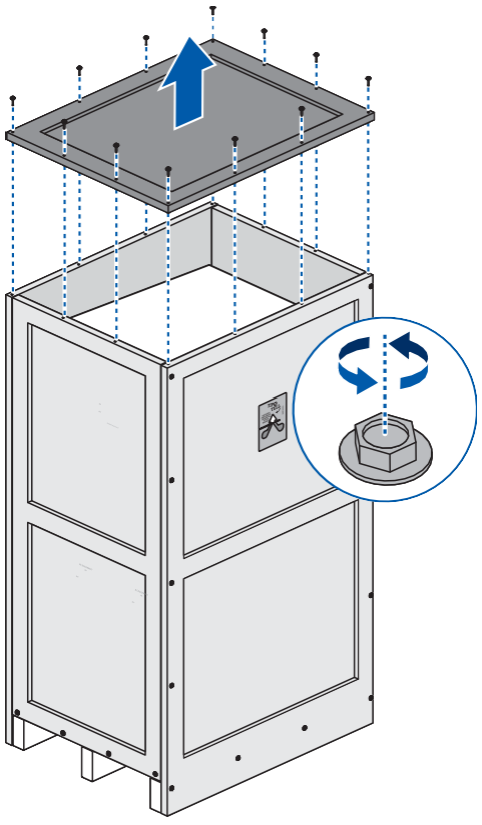


Figure 10. Removing a Top Cover

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

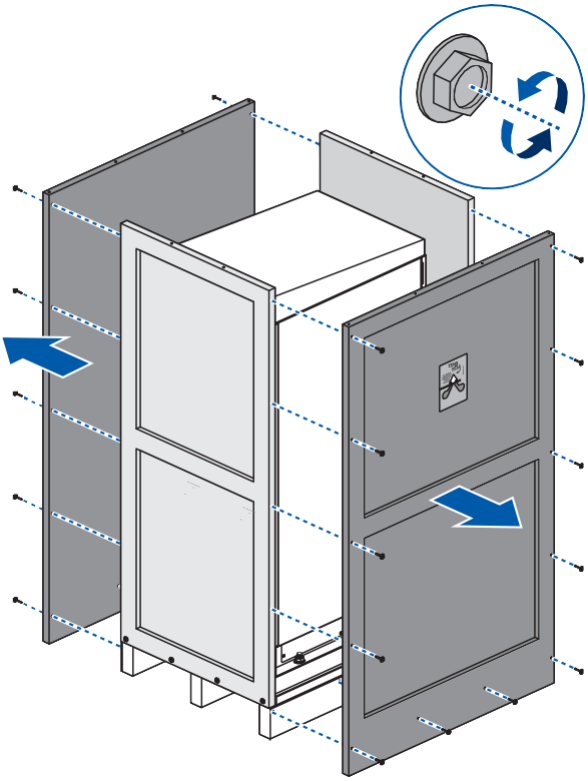


Figure 11. Removing Left and Right Sidewalls

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

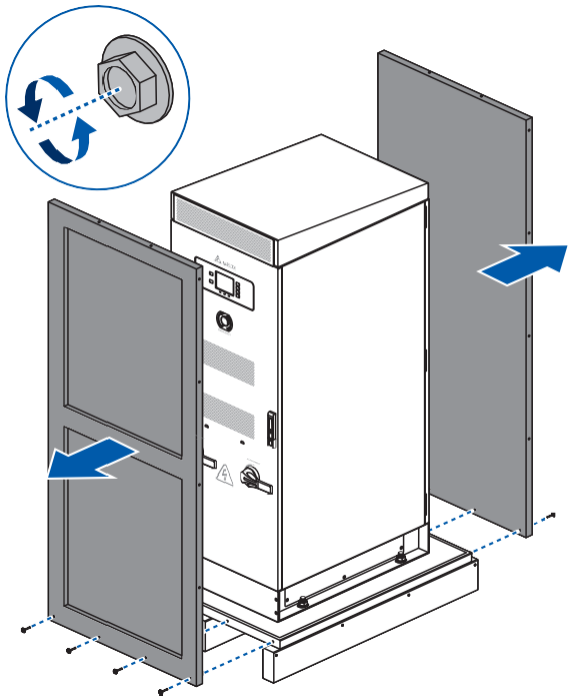


Figure 12. Removing Front and Rear Walls

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 68.

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.

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 PCS. The PCS is equipped with a Class II SPD to cover the system when not placed in a directly lightning strike area.

Due to the wide surge energy, voltage and frequency range of over voltage in lightning strike areas, it is recommended:

1. Where the system is equipped with an external lightning protection system(LPS) or protection against effects of direct lightning is otherwise specified, Class I SPDs shall be used.

2. Where the system is not equipped with an external lightning protection system(LPS) and where the occurrence of direct lightning strike to the overhead lines between the last pole and the entrance of the installation is to be taken into consideration, Class I SPDs at or near the origin of the electrical installation shall be used.

3. Class II SPDs shall at least be installed as close as possible to the origin of the installation in the system, for example in the upstream distribution board for PCS.

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.

To prevent possible ground fault risks, equip the corresponding GFD equipment. If PCS is installed in a grounded system, a Residual Current Monitoring (RCM) Device is necessary to do GFD function. A type B (universal current sensitive) RCM device is recommended. It is recommended to install RCM on the AC side. The measuring range of the ground fault current of the RCM shall be at least from 10mA to 500mA.
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.

DC Disconnect Switch Concern

To break the DC side between the battery system and PCS under load, an external DC disconnect switch with load breaking capacity complying with the local standard is recommended to install in the energy storage system. The recommended DC switch rating is 1000Vdc / 200A.

Chain Hoist Installation

The dimensions and weights specified must be taken into consideration when mounting the PCS100. 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 PCS100 during the mounting process.

CAUTION!

TO MOVE THE PCS100, 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 PCS100, see “Unpacking the Unit” on page 12.
2. Remove the hexagonal nuts and washers securing the PCS100 to the shipping pallet.

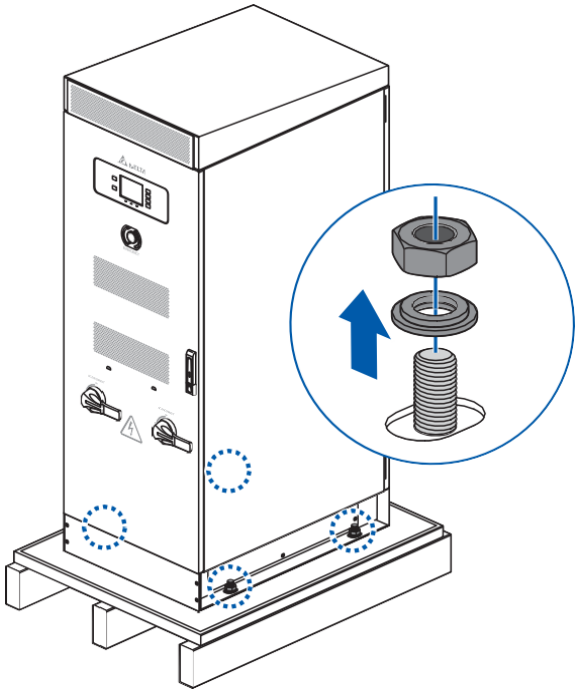


Figure 13. Detaching PCS from a Pallet

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.

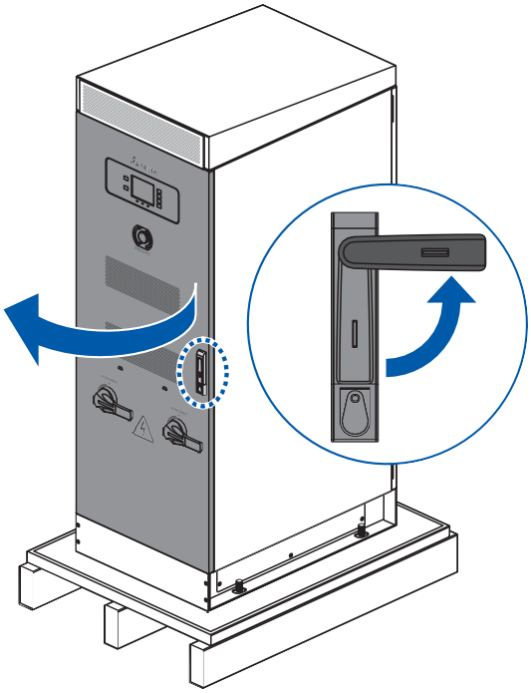


Figure 14. Opening a Front Panel

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

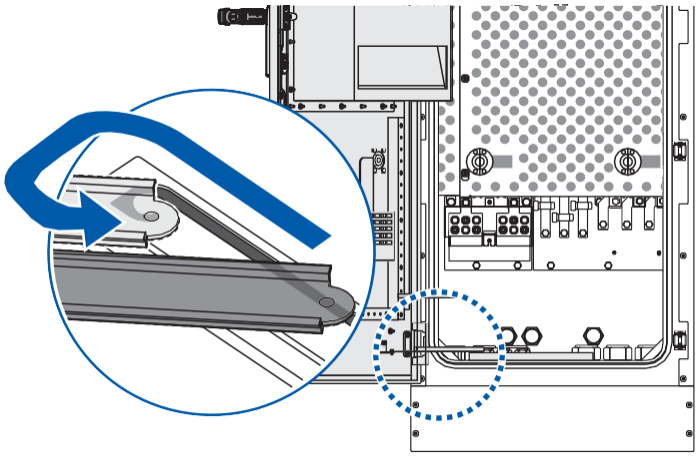


Figure 15. Engaging the Front Panel Limiter

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

5. Repeat for the rear panel.

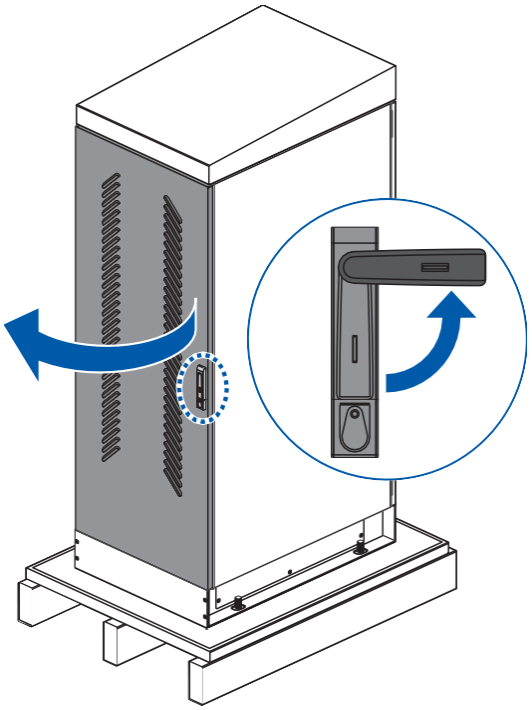


Figure 16. Opening a Rear Panel

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

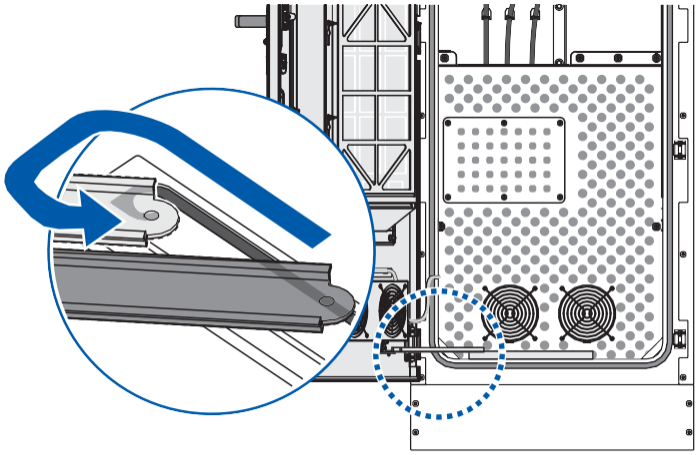


Figure 17. Locking a Rear Panel in a Cabinet

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.

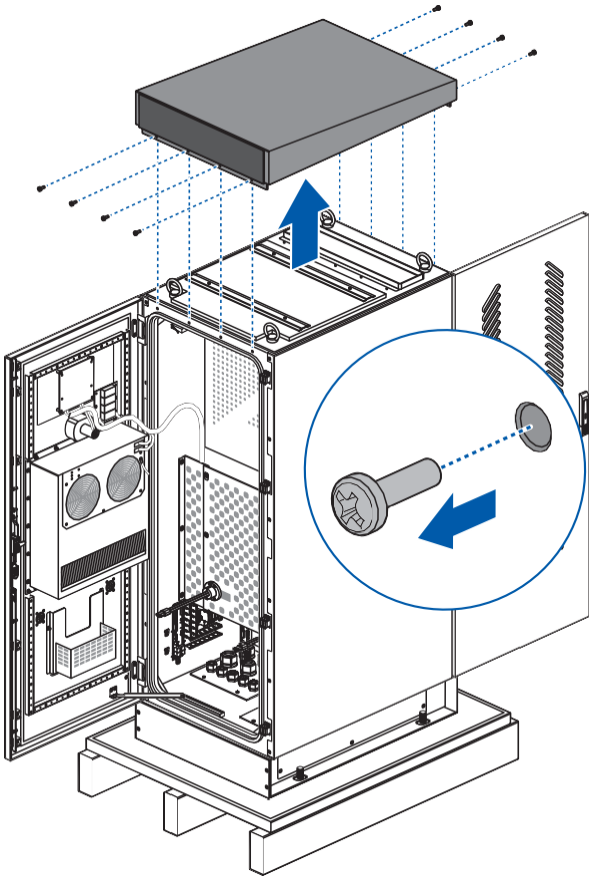


Figure 18. Removing the Top Cover

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.

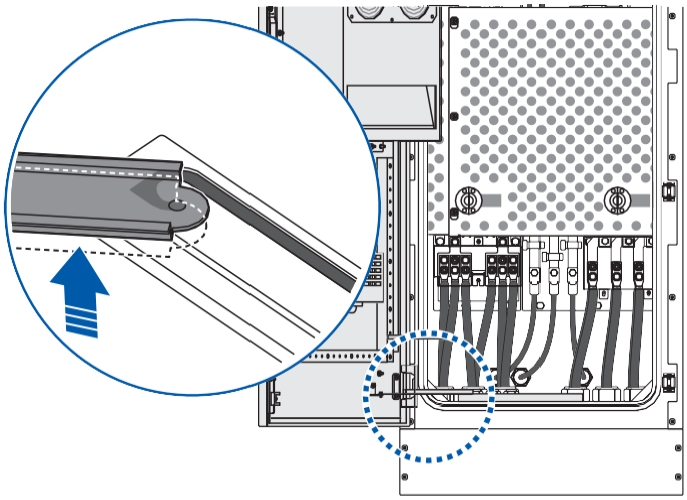


Figure 19. Release a Mechanism

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.

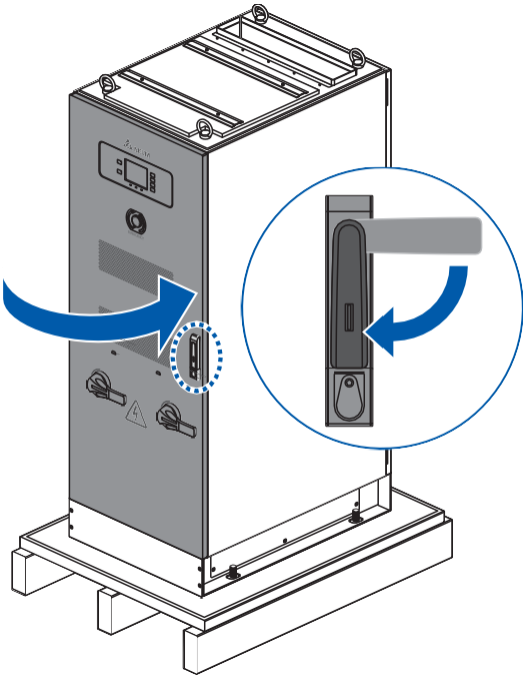


Figure 20. Closing a Front Panel

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.

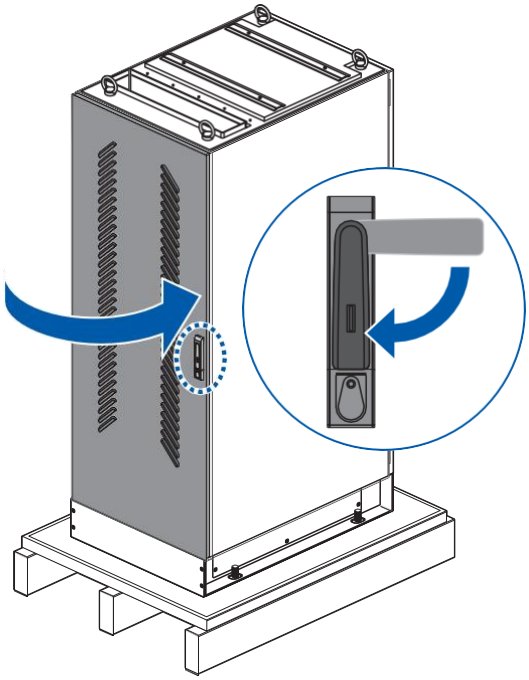


Figure 21. Closing a Rear Panel

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 PCS100.
14. Check the eye bolts are properly tightened to frame.

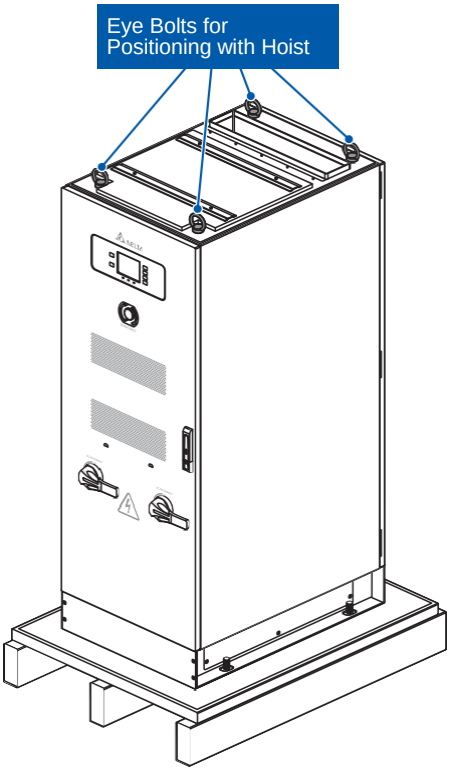


Figure 22. Eye Bolts Locations

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 45º and preferably greater than 60º. 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 60º and generally safe.

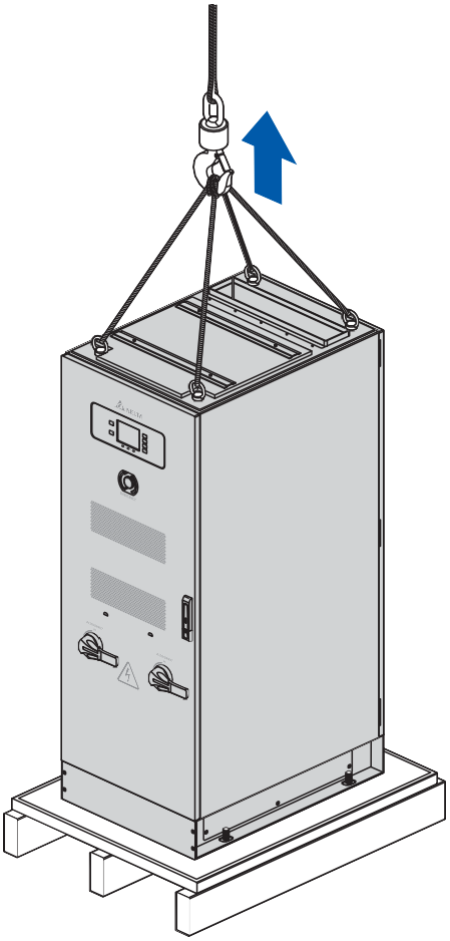


Figure 23. Eye Bolts Locations

17. Once the PCS is place in its final installation site, secure the PCS to the site as described in “Securing a Cabinet in a Final Location” on page 28.
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 28.

Forklift Installation

CAUTION!

TO MOVE THE PCS100, 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 PCS100, see “Unpacking the Unit” on page 12.
2. Using the forklift to move the PCS100.

   Removing the PCS100 from left/right side:

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

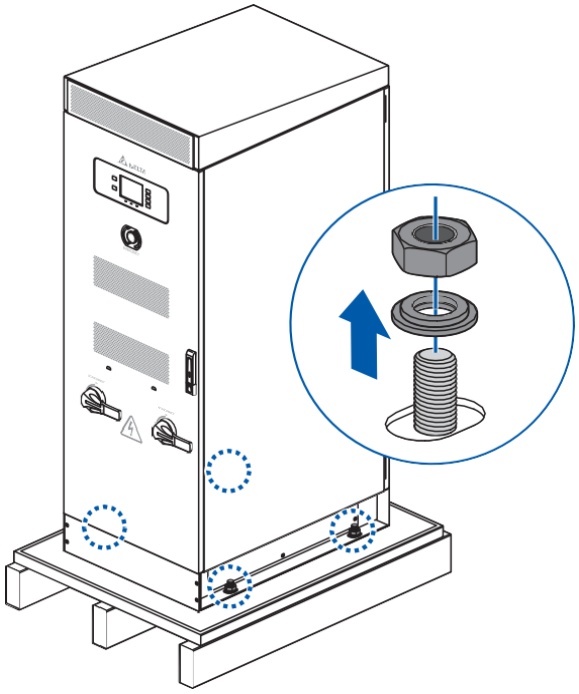


Figure 24. Releasing a PCS from a Pallet

   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.

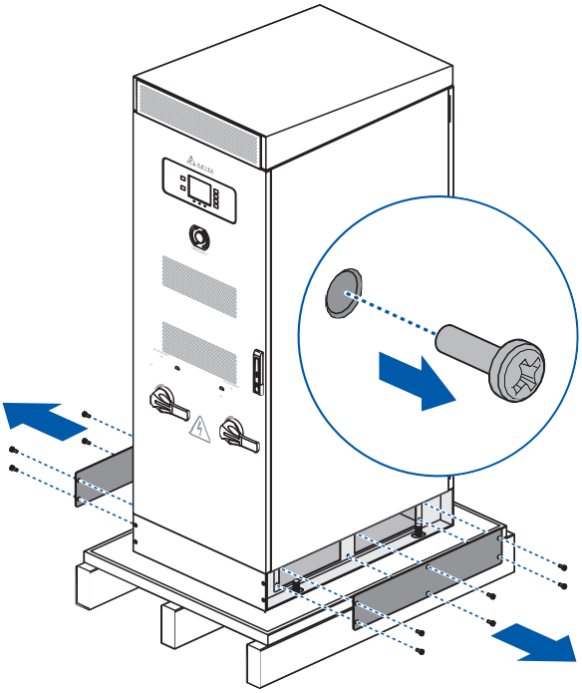


Figure 25. Removing Left and Right Base Covers

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.

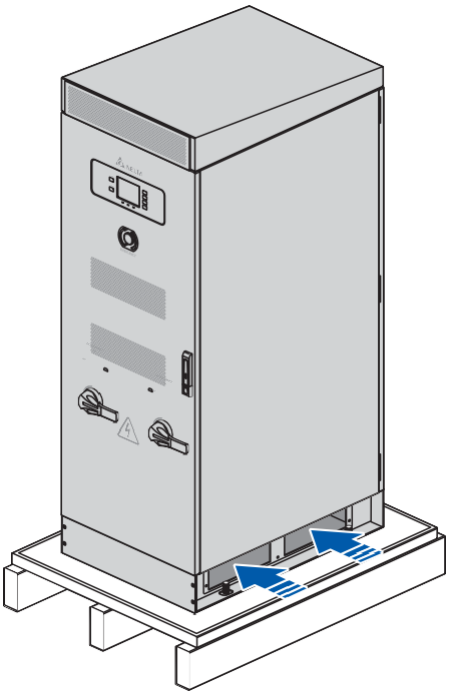


Figure 26. Lateral Handling of PCS

Front/Rear Handling

a. Remove the hexagonal nuts and washers.

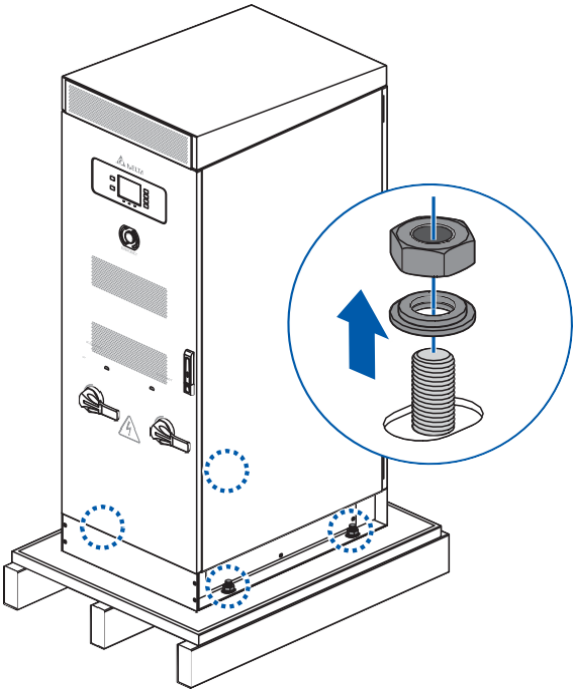


Figure 27. Releasing a PCS from a Pallet

b. Remove the screws securing the front/rear base covers.

c. Remove the front and rear side panels.

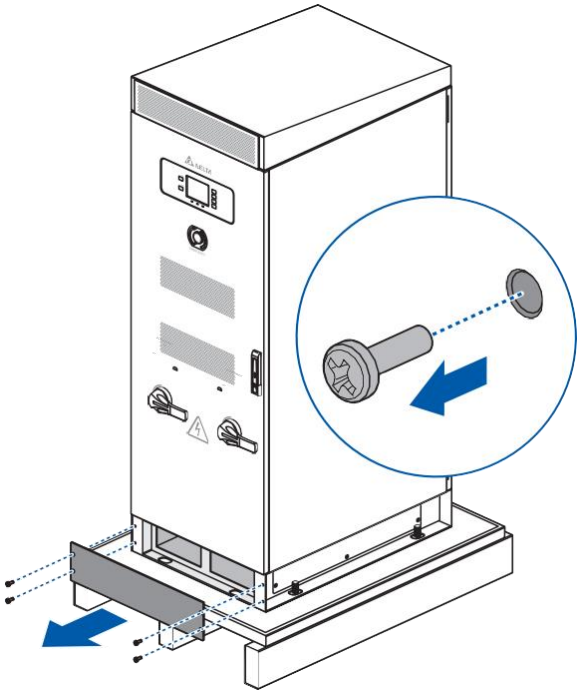


Figure 28. Removing Front/Rear Base Covers

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.

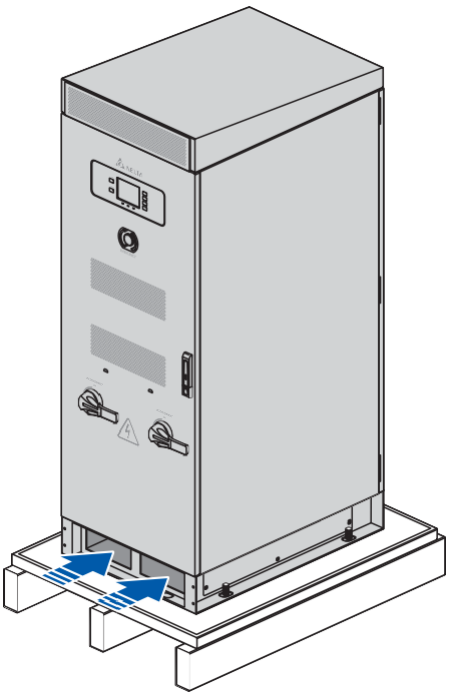


Figure 29. Front/rear Side Handling

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.

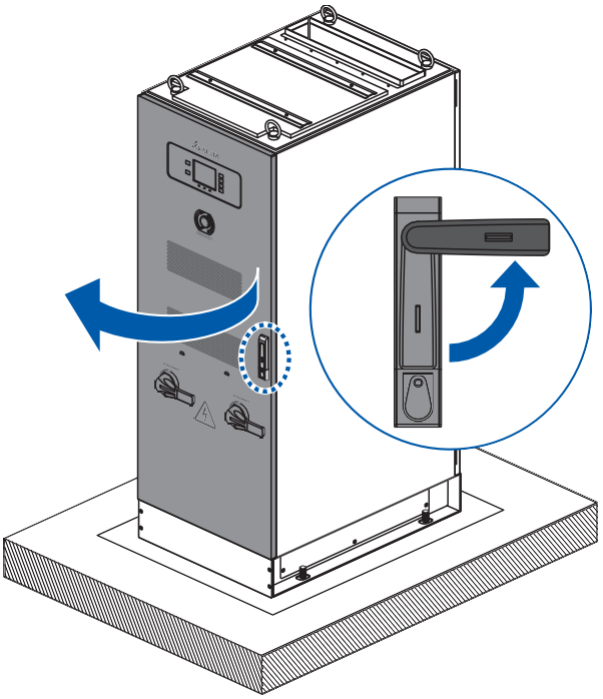


Figure 30. Opening a Front Panel

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

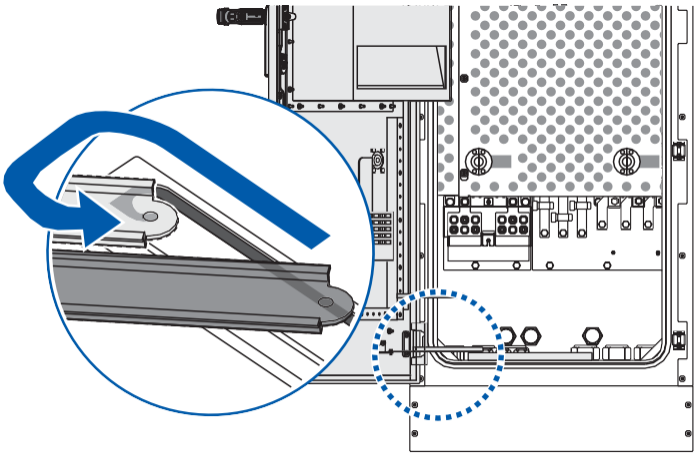


Figure 31. Engaging the Front Panel Limiter

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

c. Repeat for the rear panel.

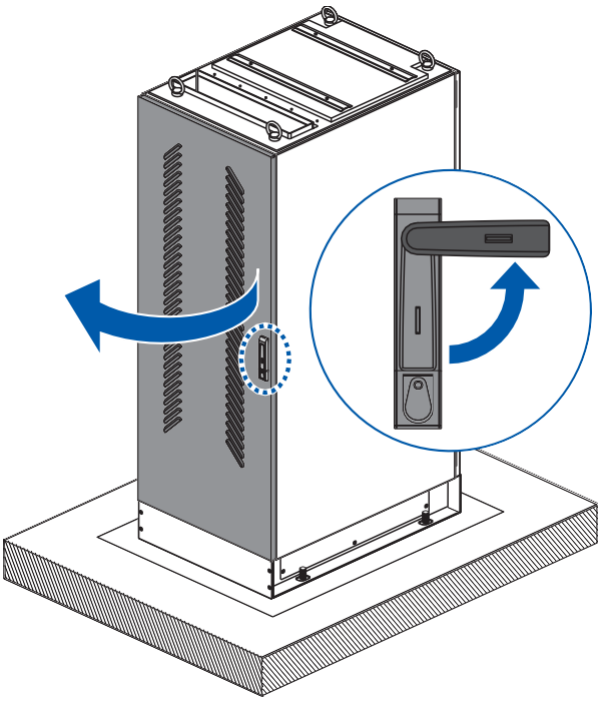


Figure 32. Opening a Rear Panel

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

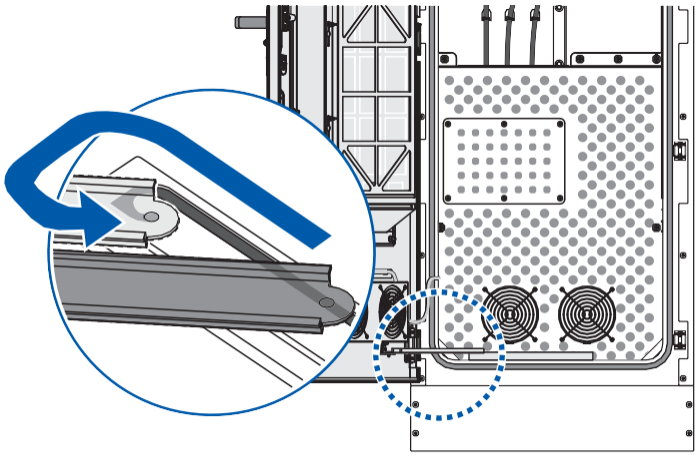


Figure 33. Locking a Rear Panel in a Cabinet

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

d. Install the top cover and secure the top cover to the PCS100 with screws.

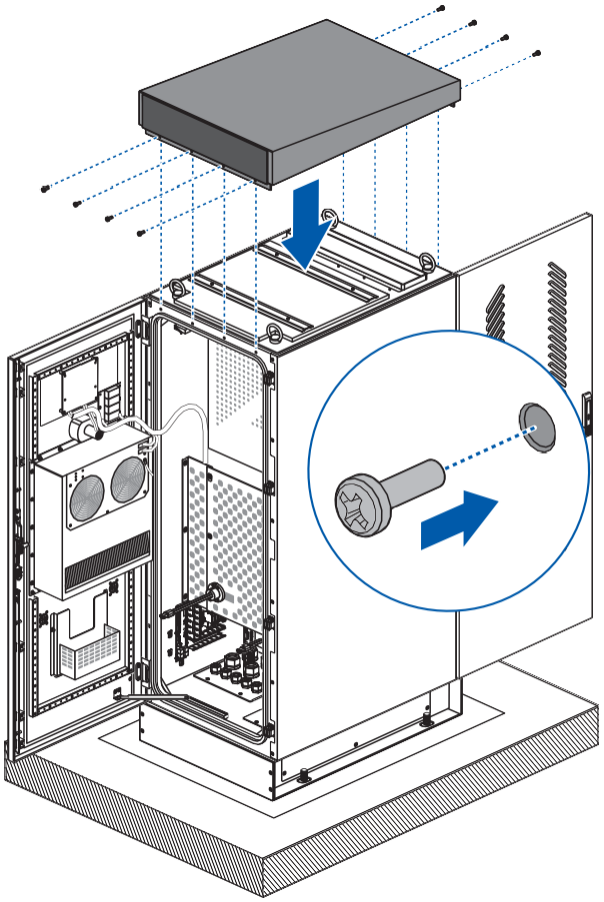


Figure 34. Installing the Top Cover

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.

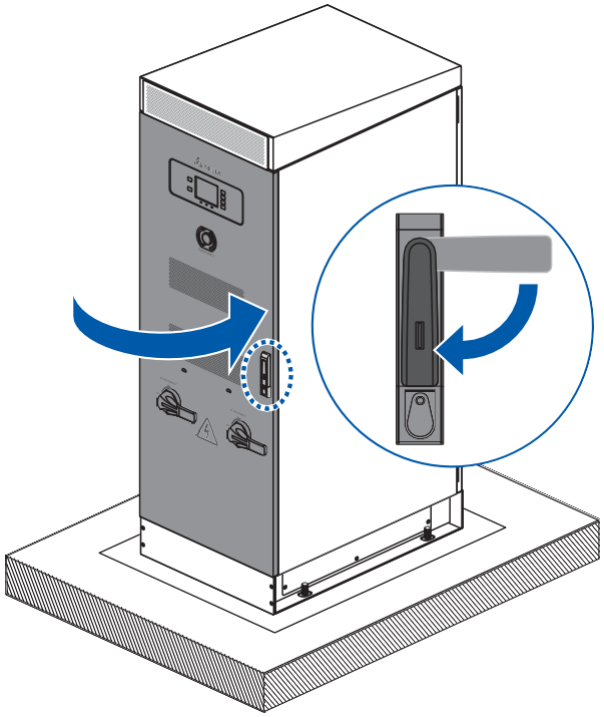


Figure 35. Closing a Front Panel

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.

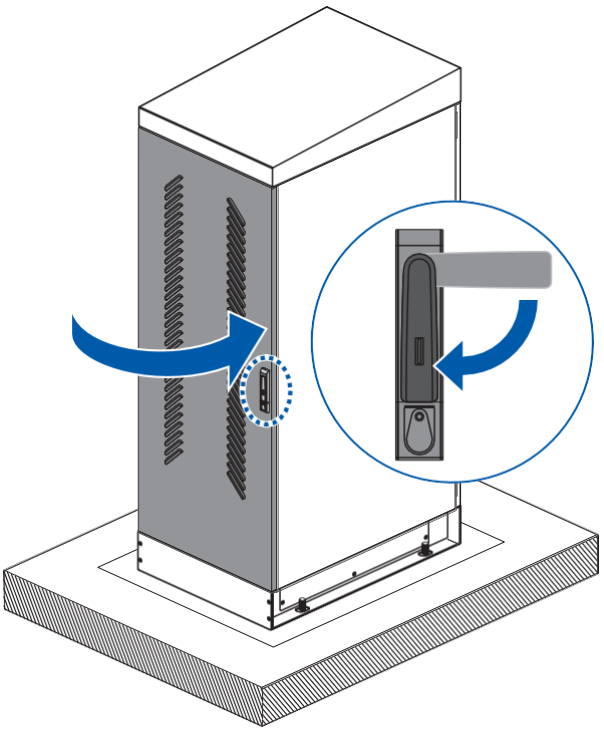


Figure 36. Closing a Rear Panel

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.
8. Move on to the opposite side of the bolt and tighten the bolt.
9. Repeat in the same manner for the remaining anchoring bolts.

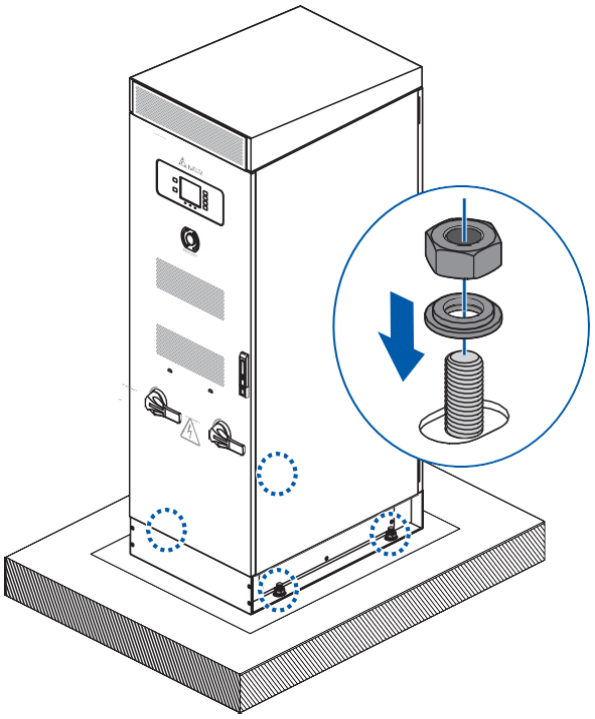


Figure 37. Securing a Cabinet with Anchoring Bolts

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 wring 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 PCS100 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, is the responsibility of the installer.

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.

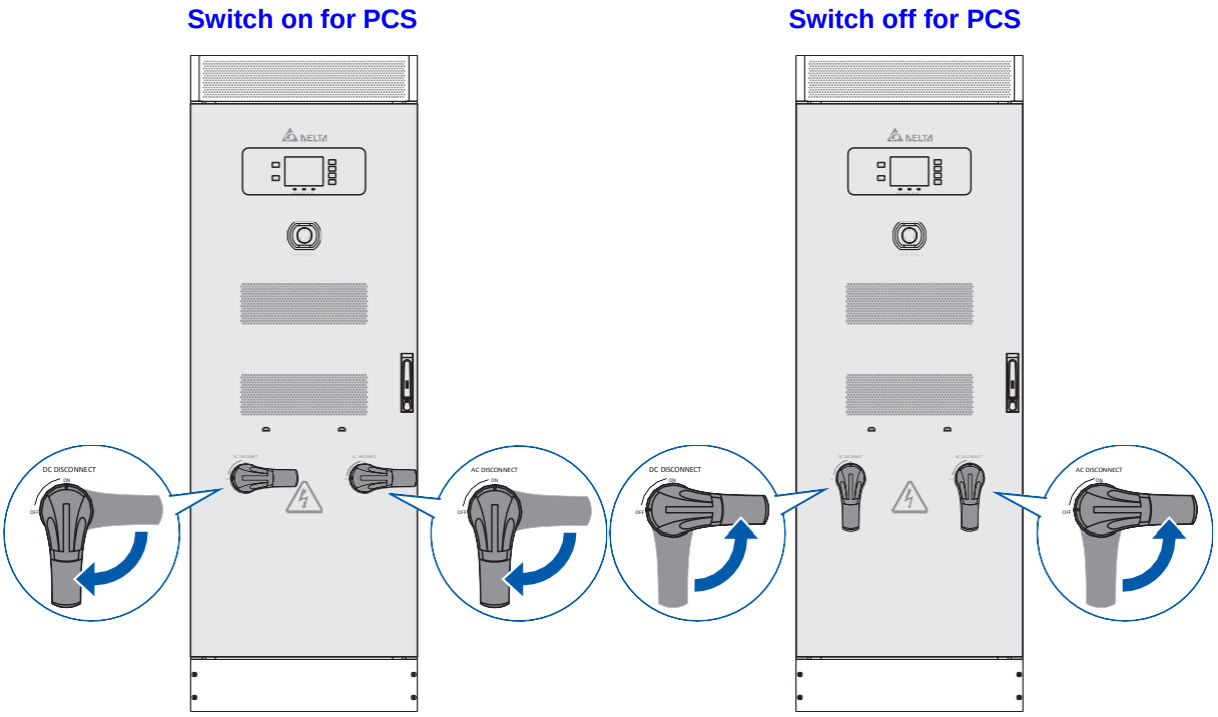


Figure 38. PCS Front View with AC, DC Disconnects Status

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 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.

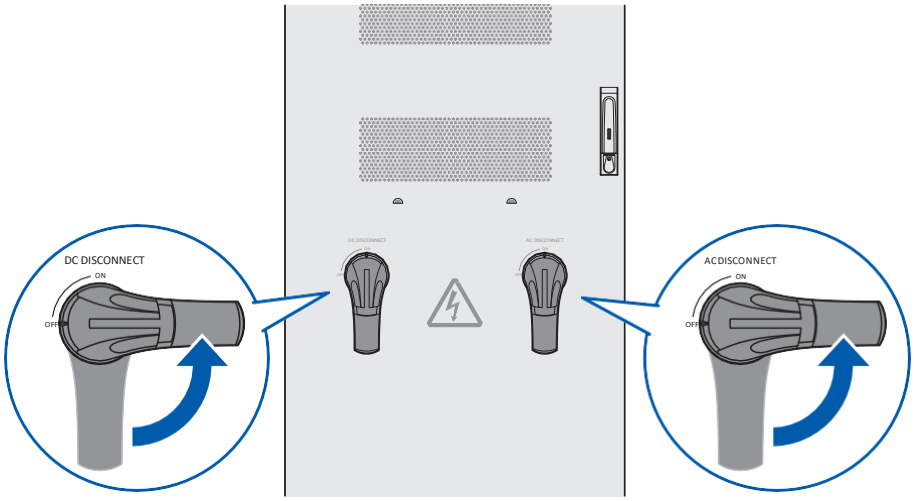


Figure 39. Disconnecting the AC and DC Inputs

2. Insert the key to unlock the front panel.

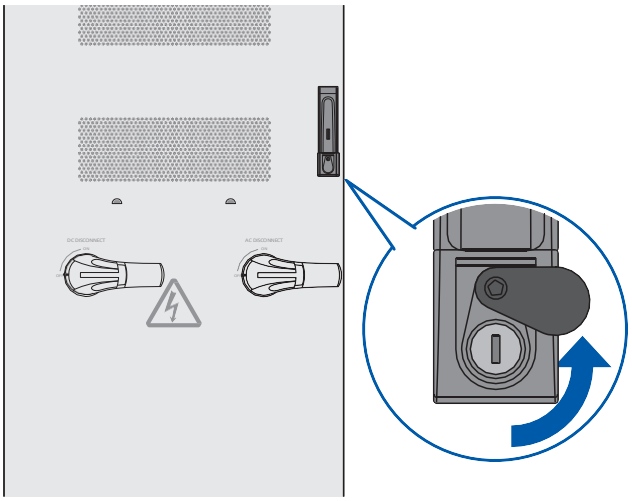


Figure 40. Unlocking a Front Panel

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.

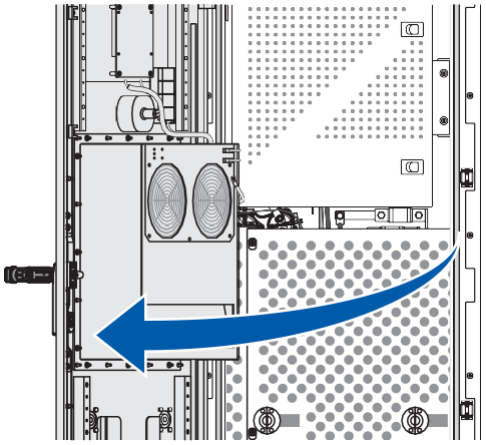


Figure 41. Opening a Front Panel

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

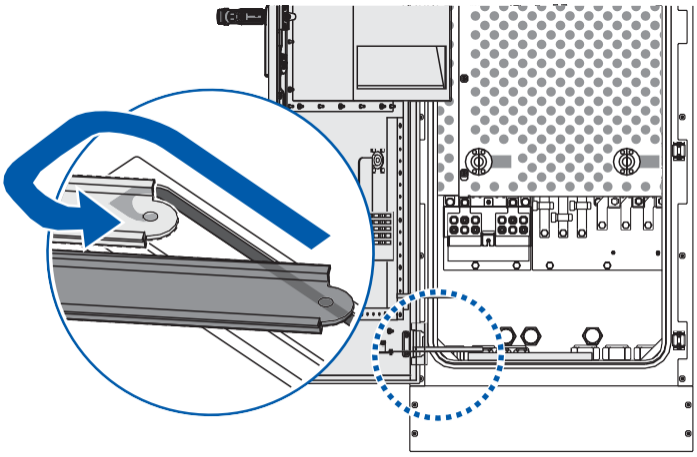


Figure 42. Engaging the Front Panel Limiter

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	33.62 ~ 53.49 mm^2 (2 AWG ~ 1/0 AWG)
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 (1/0 AWG)
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	26.67~ 53.49 mm^2

Table 4: Grounding Wire Sizing and Ratings (Continued)

Cable Type	Solid Copper Conductor
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 (16 AWG)
Quantity	The following connectors, enclosed in accessory kit: ● 8 for CNJ3, 15-pin connector ● 2 for CNJ5, 2-pin connector ● 5 for CNJ13, 6-pin connector ● 8x2 for CNJ11, CNJ12, 8-pin RJ45 connector

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 37.

The following items require preparation:

- 2 x 1000V, 53.49 mm^2 (1/0 AWG) cables for DC (battery) connection
- 6 x 600V or greater, 33.62 ~ 53.49 mm2 (2 AWG ~ 1/0 AWG) cables for AC connection
- 1 x 600V or greater, 26.67~ 53.49 mm2 cables for grounding
- 29 x 600V or greater, 16 AWG wires for communication or I/O connection
- 9 x 2-hole cable lugs
- 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)
- 2 x RJ45 connector

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 accessary kit.
2. Continue inserting the cable until its head reaches the wire inspection indicator, as shown in the following figure:

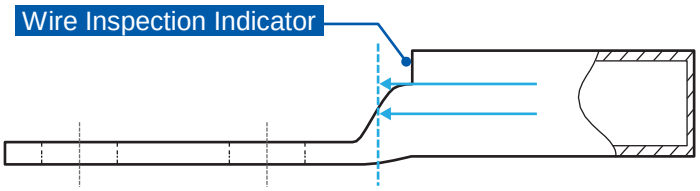


Figure 43. Inserting a Power Cable into a Cable Lug, Depth Reference Diagram

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:

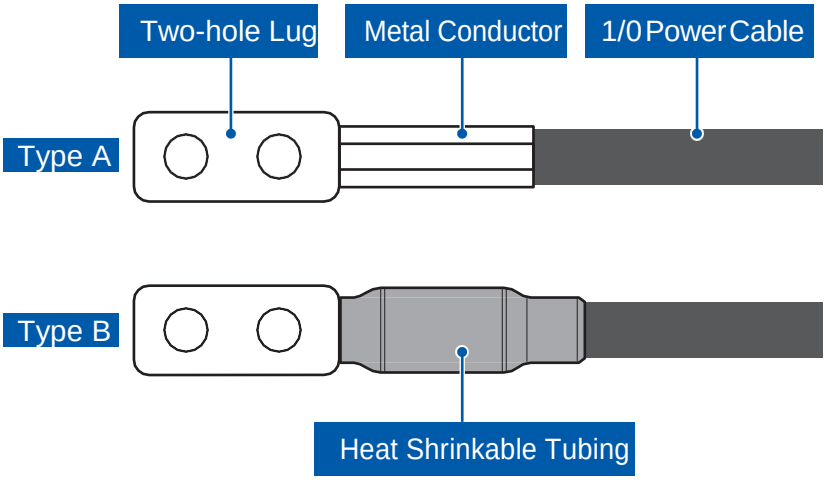


Figure 44. Preparation of AC/DC Cables

Communication and I/O Wiring and Terminal Resistor Setting

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:

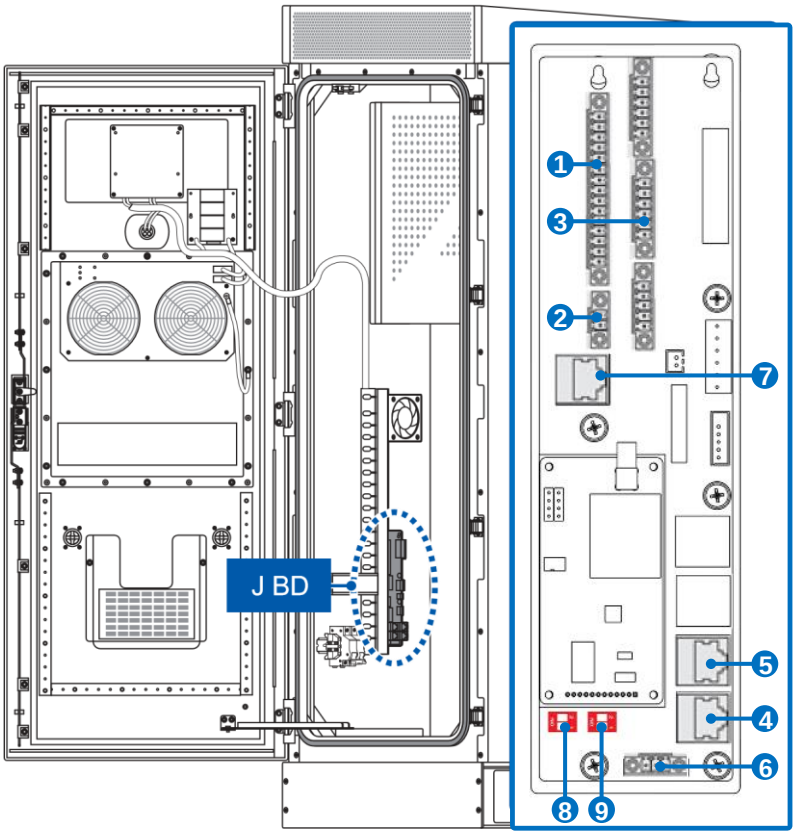


Figure 45. Communication and I/O Connection Location

Table 6: Communication and I/O Connection

No.	Connector	Description
1	CNJ3	I/O system 15-pin connector
2	CNJ5	Black Start auxiliary power (24V) 2-pin connector
3	CNJ13	PCS-BMS communications 6-pin connector
4	CNJ11	PCS parallel RS485 & CAN communications RJ45 connector
5	CNJ12	PCS parallel RS485 & CAN communications RJ45 connector
6	CNJ7	RS485 communications for site controller 3-pin connector
7	CNJ16	Ethernet communications for site controller or utility server RJ45 connector
8	SJ1	Terminal resistor switches for RS485 and CAN
9	SJ2	Terminal resistor switches for RS485 and CAN

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 mm^2 (0.0508 inch) wires to pin 1~4 and pin 7~10 of this connector as shown in the following figure.

The 3 dry contact outputs are programmable. They are reserved function. The state of contact outputs （short or open） can be configured according to customer' requirements. Similarly， the wet inputs detect the state of contacts from customer. They are also programmable according to the requirements. A customized FW revision is needed to realize both the dry outputs and wet inputs function.

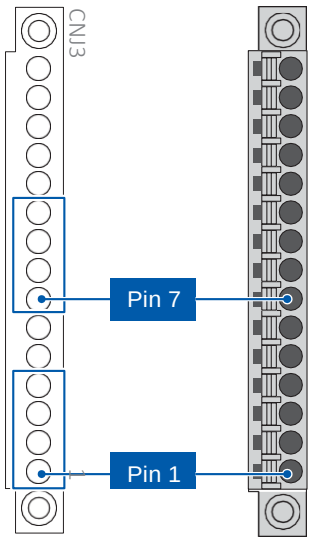


Figure 46. CNJ3 Pin Assignment

Table 7: CNJ3 Pin Assignment

Item	Pin Assignment	Notes
CNJ3	1: Digital Output 1-1	Internal use only
	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	No Connection
	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 CAN bus. RS485 requires three prepared AWG 16 wires connected to pins 1 to 3 on the 6-pin connector from the accessory kit. For CAN bus, connect two prepared AWG 16 wires to pins 5 and 6.

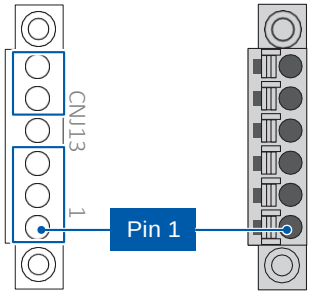


Figure 47. CNJ13 Pin Assignment

Table 8: CNJ13 Pin Assignment

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

Communication Connector (CNJ11, CNJ12)

Multiple PCSs can be connected in parallel to fulfill different power requirement of site application. To make the PCSs operate in parallel correctly, the following connection method should be followed.

The CNJ11 and CNJ12 connectors are for communication with ESS controller or with other PCS in parallel operation. Prepare two RJ45 connectors and 8 AWG 16 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:

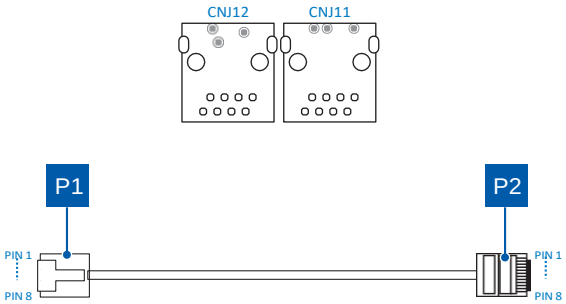


Figure 48. CNJ11, CNJ12 Pin Assignment

Table 9: CNJ11, CNJ12 Pin Assignment

Item	Pin Assignment	Notes
CNJ11, CNJ12	1: RS485-A2	For Site controller / ESS Controller and PCS parallel.
	2: RS485-B2	
	3: NC	
	5: CAN-H2	For PCS parallel
	6: CAN-L2	
	7: NC	Reserved
	8: NC	

Site Controller Communication (CNJ7)

CNJ7 connector is used for the site controller input. Connect three AWG 16 wires to the bottom side of the connector as illustrated in the following table.

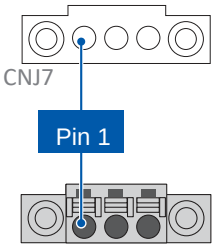


Figure 49. CNJ7 Pin Assignment

Table 10: CNJ7 Pin Assignment

Item	Pin Assignment	Notes
CNJ7	1: RS485A2	The same RS485 terminal as pin1 and pin2 of CNJ11, for ESS Controller/Site Controller/ Local Controller/PC
	2: RS485B2	
	3: NC	

Auxiliary Power Interface Connector (CNJ5)

The CNJ5 connector is used for alternative auxiliary power input with 24Vdc 0.5A. Connect two AWG 16-22 wires to the 2 pins connector as the pin assignment table below. Customer can run PCS100 in black start mode via this terminal.

Table 11: CNJ5 Pin Assignment

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

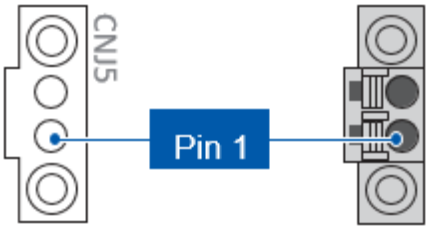


Figure 50. CNJ5 Pin Assignment

DRM Connector (CNL9)

PCS100 supports all the demand response modes (DRMs) defined in the standard AS/NZS 4777.2. The CNL9 connector is an RJ45 socket that can be connected to a demand response enabling device (DRED).

Table A: DRM mode definition

Mode	Requirement
DRM 0	Operate the disconnection device
DRM 1	Do not consume power
DRM 2	Do not consume at more than 50 % of rated power
DRM 3	Do not consume at more than 75 % of rated power AND supply reactive power if capable
DRM 4	Increase power consumption (subject to constraints from other active DRMs)
DRM 5	Do not generate power
DRM 6	Do not generate at more than 50 % of rated power
DRM 7	Do not generate at more than 75 % of rated power AND absorb reactive power if capable
DRM 8	Increase power generation (subject to constraints from other active DRMs)
NOTE Demand response modes of Table 3.1 are as described in AS/NZS 4755.3 series of Standards.	

The DRM function can be used or reserved.

If the DRM function is not used, keep the RJ45 terminal which has a settled resistor as shown in the following figure connected to CNL9. If the DRM function is used, an RJ45 terminal which is complied with the standard should be connected to CNL9.

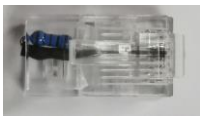


Figure A. CNL9 connector with Terminal resistor

Table B: CNL9 Pin Assignment

Item	Pin Assignment	Notes
CNL9	1: DRM1/5	FOR DRM function
	2: DRM2/6	
	3: DRM3/7	
	4: DRM4/8	
	5: REF GEN/0	
	6: COM LOAD/0	
	7: Shorted to PIN 8	
	8: Shorted to PIN 7	

Black Start

To black start the system, use the following guidelines:

1. Connect the communication cable between the BMS and the PCS, making sure to set the correct batter manufacturer settings.
2. Turn on the BMS power.

   The BMS establishes a communication connection with the PCS, and the battery outputs to the HV DC.

   Once DC input from the battery to the PCS is established, operation mode is initiated. The PCS is then activated and a micro grid is established, completing the black start process.

Ethernet Communication Connector (CNJ16)

The CNJ16 connector is used for Ethernet communication. Use a common Ethernet cable to connect to a site controller or cloud server or remote server.

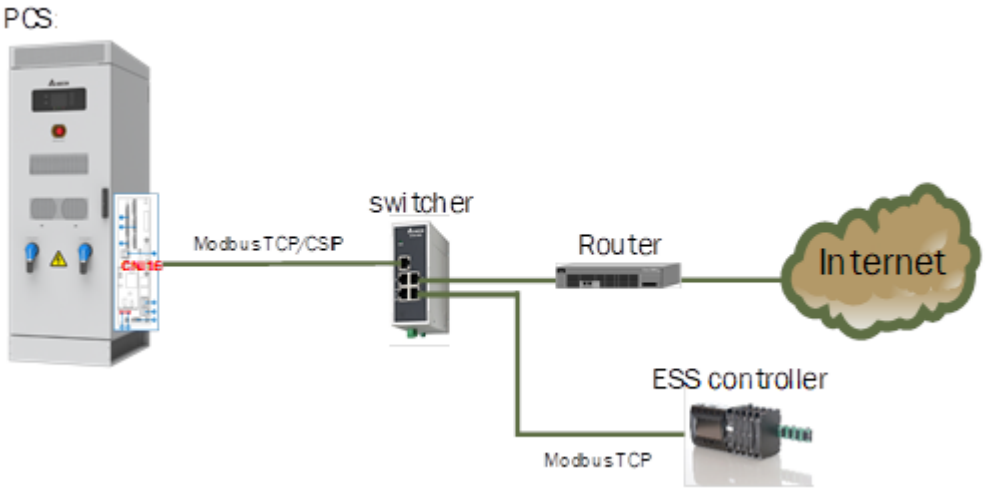


Figure 51　Communication connection diagram

Table 12: CNJ16 Pin Assignment

Item	Pin Assignment	Notes
CNJ16	1: Eth_RD+	For Ethernet communication
	2: Eth_RD-	
	3: Eth_TD+	
	4: NC	
	5: NC	
	6: Eth_TD-	
	7: NC	
	8: NC	

Terminal resistor setting (SJ1, SJ2)

The SJ1 and SJ2 switches are used to setting the terminal resistors of RS485 and CAN. When the switch is placed at the left side (ON Marking), the corresponding terminal resistor is connected.

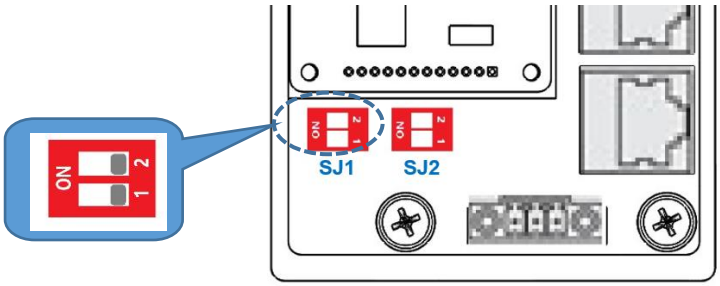


Figure 52.　SJ1, SJ2 Assignment

Communication wiring

The PCS125 supports two methods for communication: Ethernet and RS485. Ethernet can be used for a site controller or cloud server or remote server. And RS485 can be used for a site controller.

- Ethernet and RS485 can't be connected at the same time.
- A 120Ω terminal resistor must be settled in the site controller before it's connected by RS485.

The connection diagrams of the two communication methods are shown in Figure 53 and Figure 54.

1. Connected by Ethernet.

When a single PCS#1 is used, make sure the connector CNJ11 not connected.

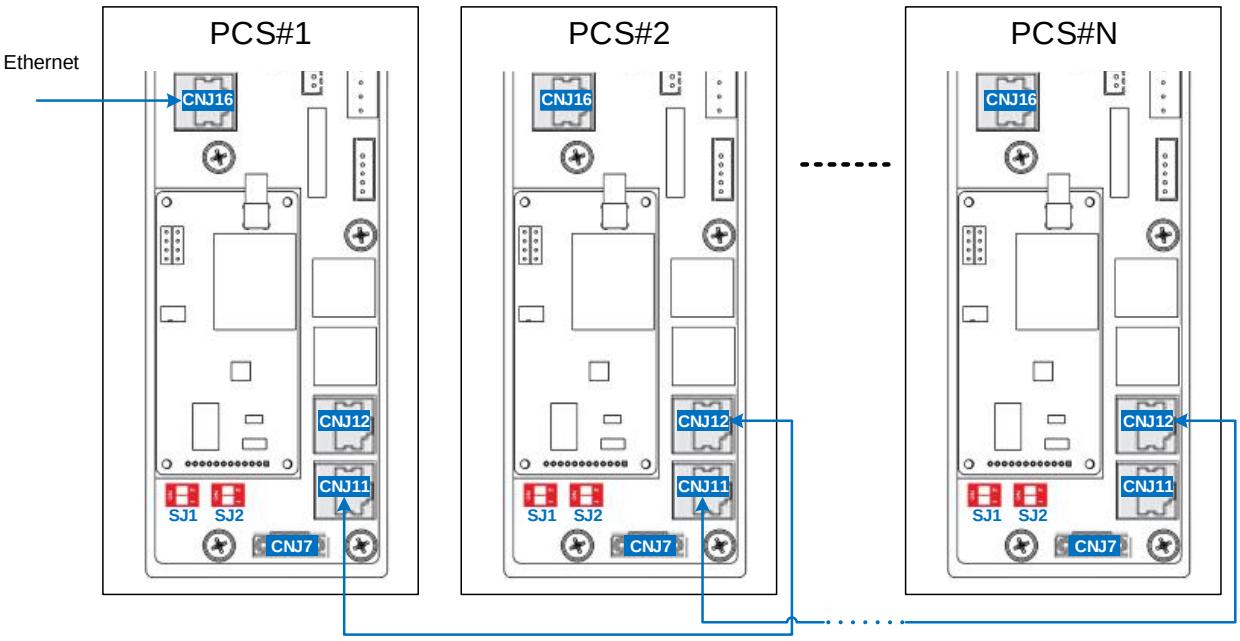


Figure 53. Connected by Ethernet

2. Connected by RS485

When a single PCS#1 is used, make sure the connector CNJ12 not connected.

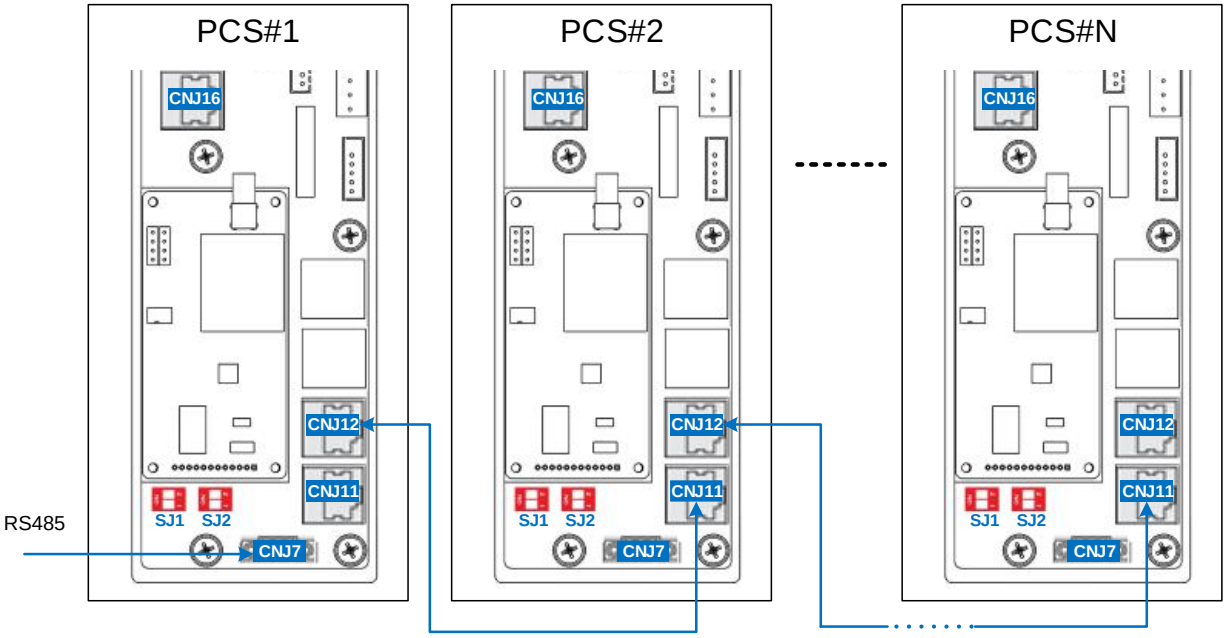


Figure 54. Connected by RS485

Terminal resistors setting

The terminal resistor switches SJ1 and SJ2 must be set according to Table 13-16.

Table 13: Terminal resistor switches setting of single PCS for Ethernet communication

Switches	1# PCS
SJ1-1	√
SJ2-1	√
SJ1-2	×
SJ2-2	×
	

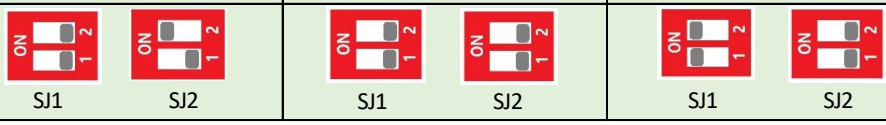
Table 14: Terminal resistors switches setting of parallel PCS for Ethernet communication

Switches	1# PCS	2# PCS	n# PCS
SJ1-1	√	×	×
SJ2-1	×	×	√
SJ1-2	√	×	×
SJ2-2	×	×	√
			

Table 15: Terminal resistors switches setting of single PCS for RS485 communication

Switches	1# PCS
SJ1-1	√
SJ2-1	×
SJ1-2	×
SJ2-2	×
	

Table 16: Terminal resistors switches setting of parallel PCS for RS485 communication

Switches	1# PCS	2# PCS	n# PCS
SJ1-1	×	×	√
SJ2-1	×	×	×
SJ1-2	×	×	√
SJ2-2	√	×	×
			

Note:

When the PCS is connected to site controller via RS485, the terminal resistor must be installed in the site controller side.

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.

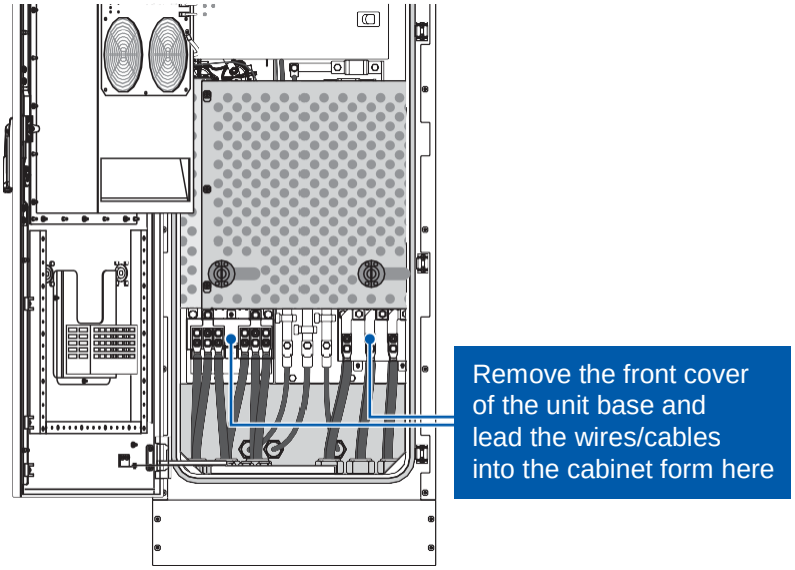


Figure 55. Remove the Front Cover of the Unit Base and the Protective Cover

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:

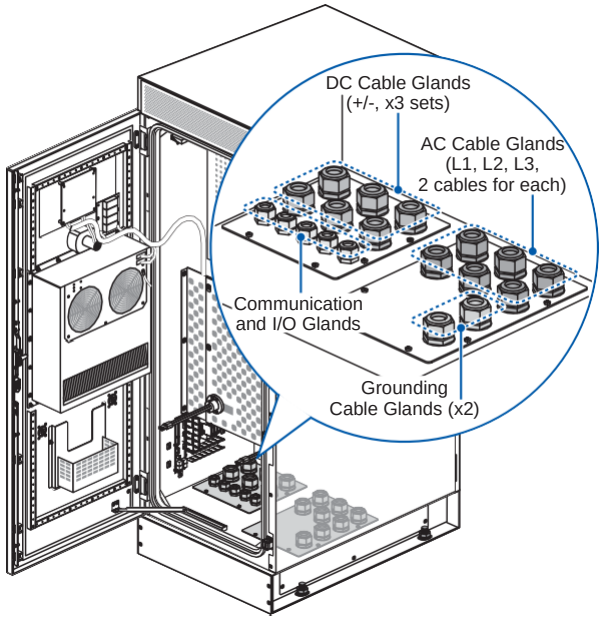


Figure 56. AC, DC, and Communication Wiring Cable Glands

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.

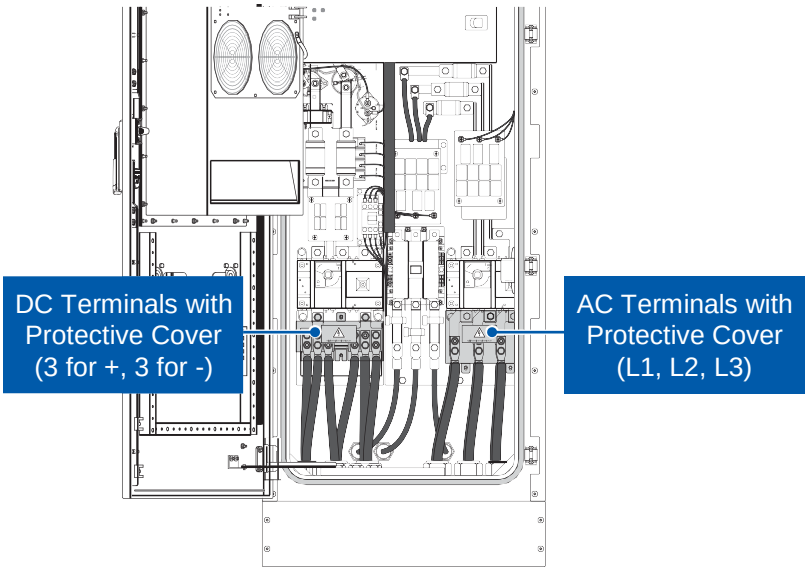


Figure 57. DC and AC Connection Labels and Terminals

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.

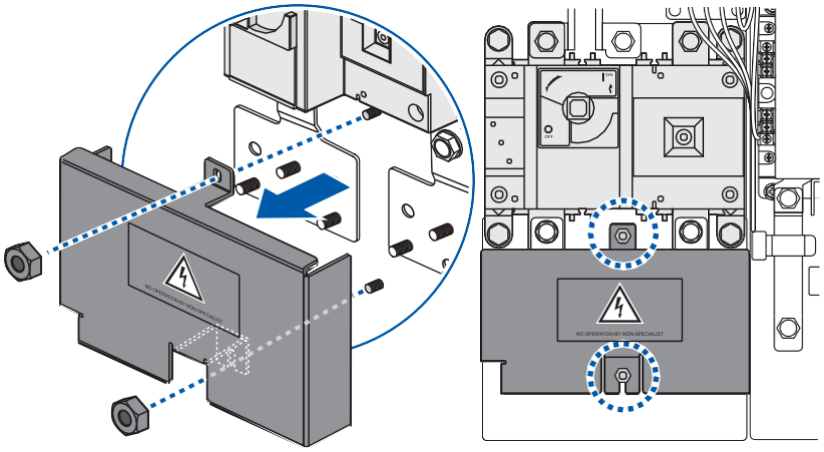


Figure 58. Removing DC Protective Cover

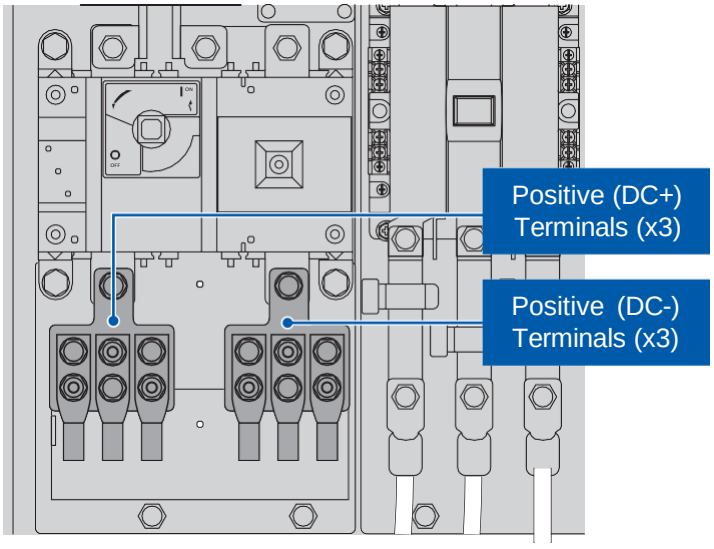


Figure 59. DC Terminal Labels

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.

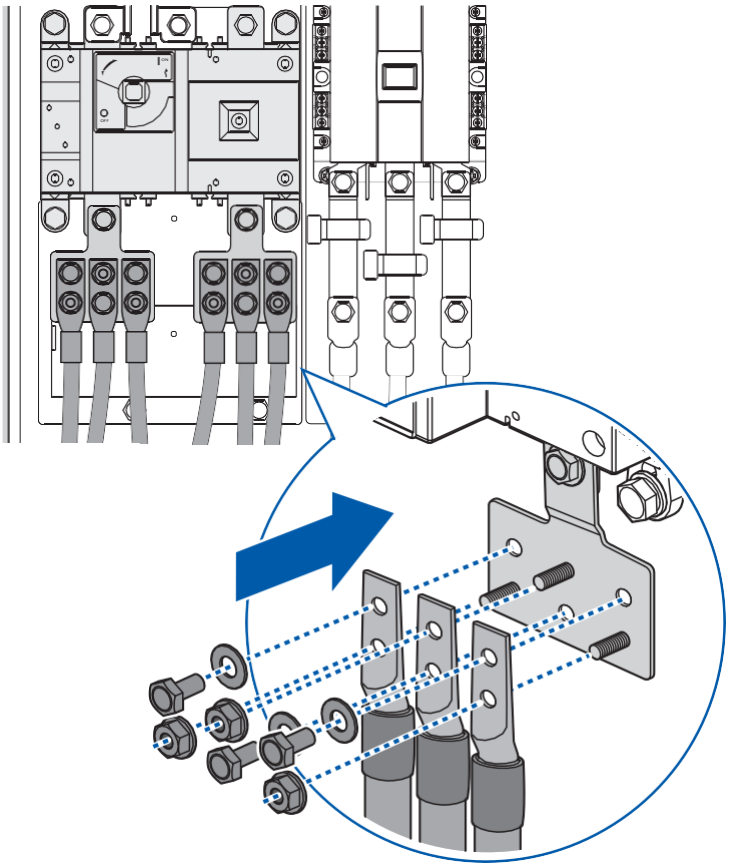


Figure 60. Positive (+) and Negative (-) DC Cable Terminals

4. Reinstall and secure the DC protective cover.

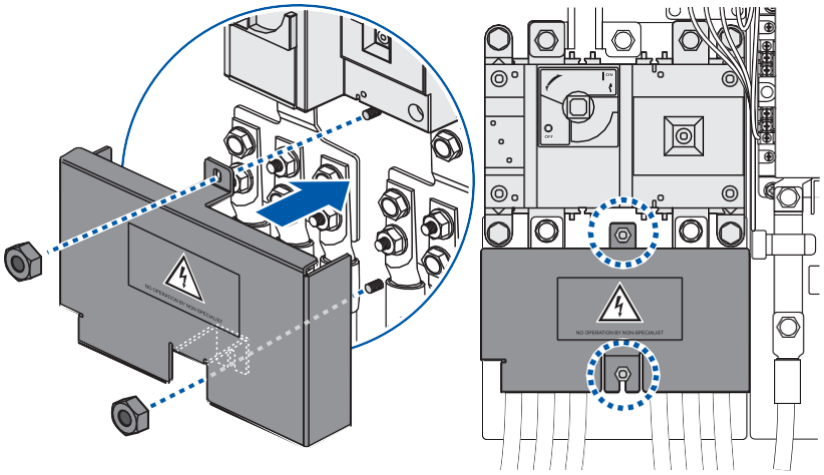


Figure 61. Installing DC Protective Cover

AC Wiring

1. **Prepare AC cables:** Prepare six 53.49 ~ 33.62 mm^2 (0.3249 ~ 0.2576 inch) 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.

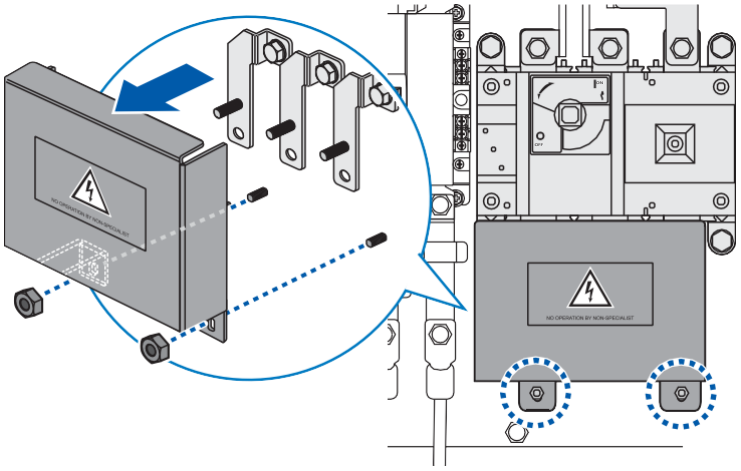


Figure 62. Removing AC Protective Cover

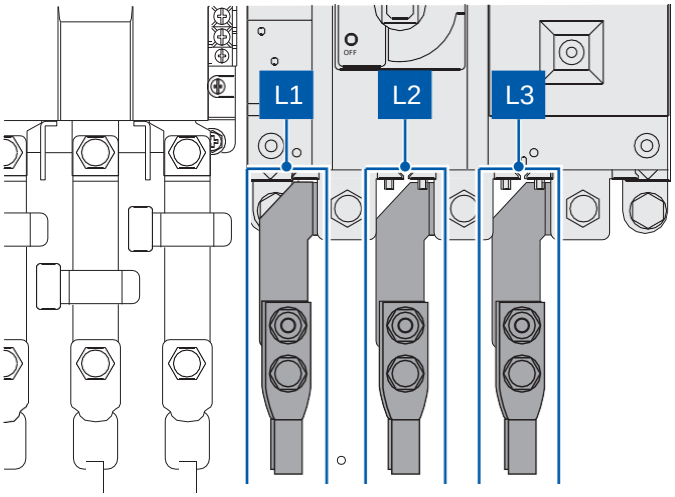


Figure 63. AC Terminal Labels

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.

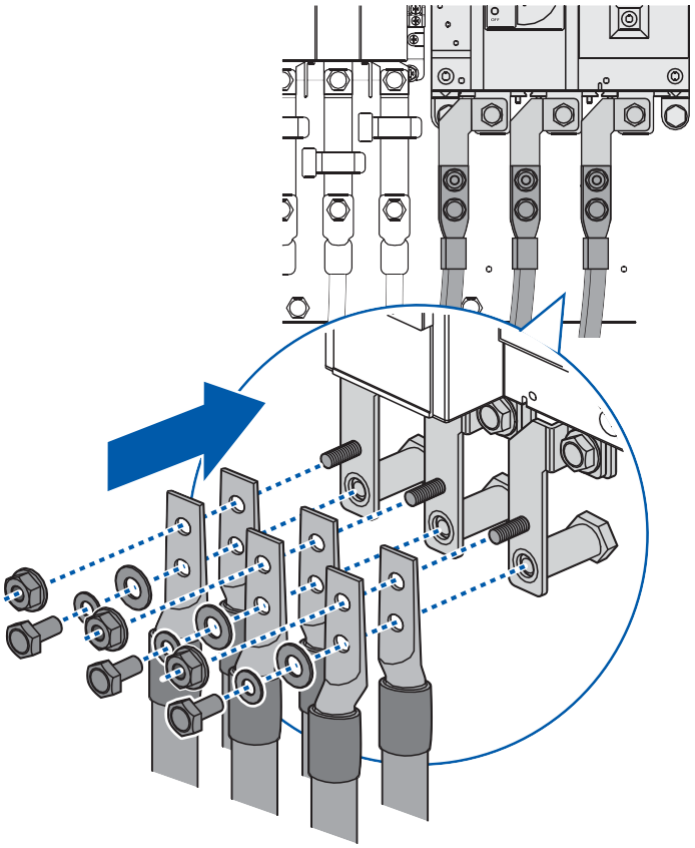


Figure 64. AC Cable Connection with L1, L2, L3 Terminals

4. Reinstall and secure the AC protective cover.

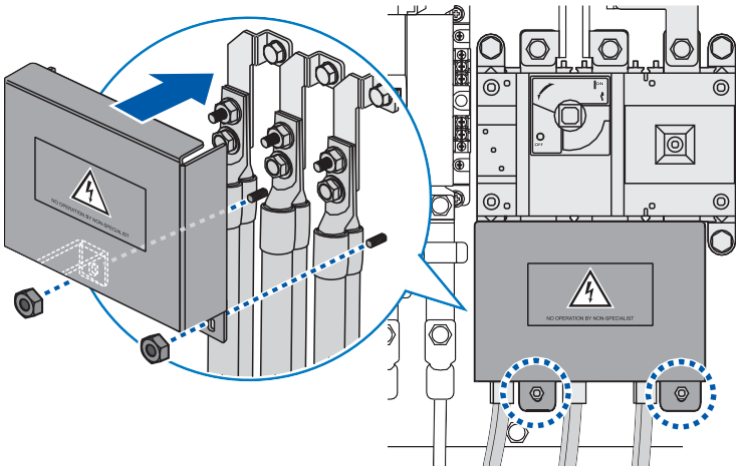


Figure 65. Installing AC Protective Cover

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:

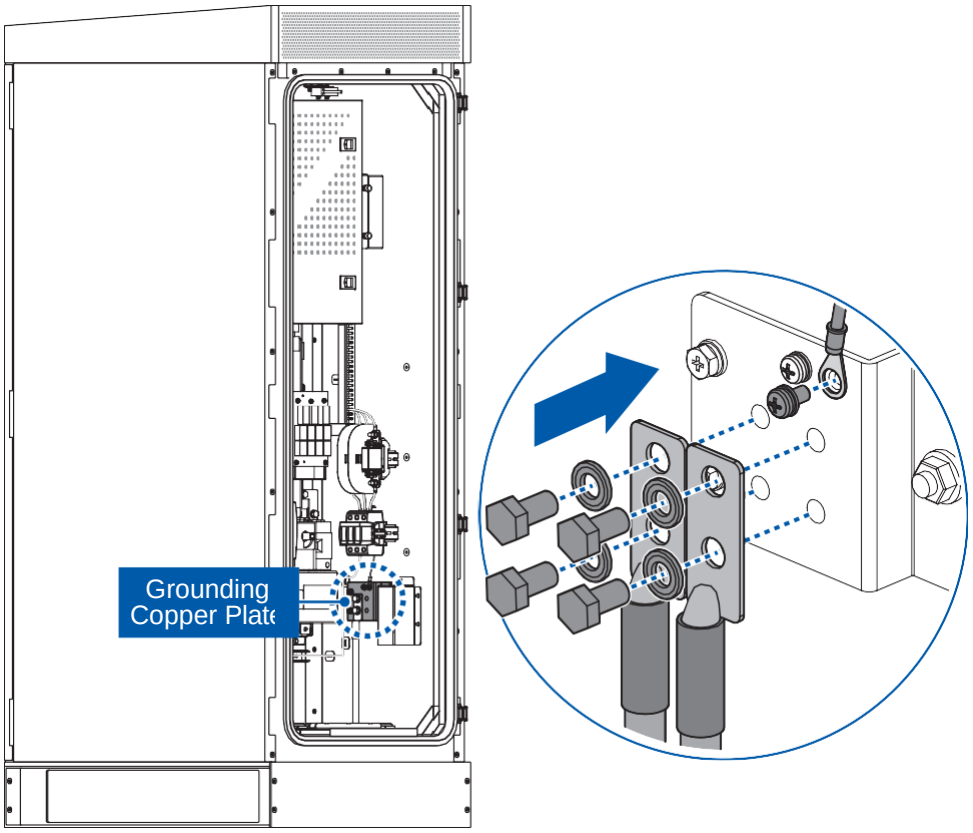


Figure 66. Grounding Cable Connection with Grounding Copper Bar

Note:

The grounding cable only needs a 53.49 ~ 26.67 mm^2 (0.3249 ~ 0.2294 inch) 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.

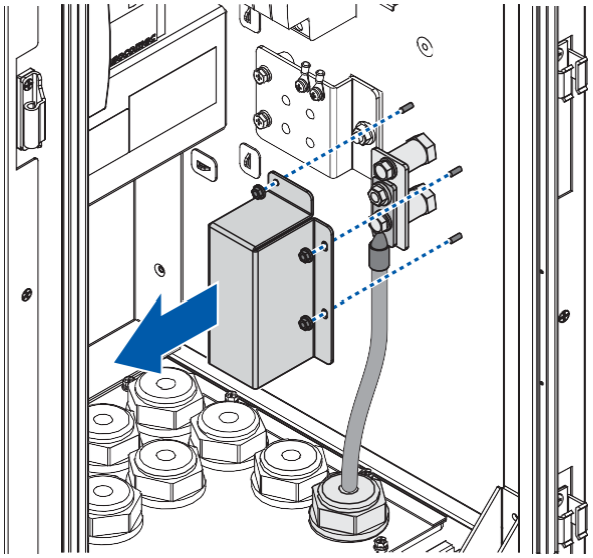


Figure 67. Removing the Plexiglass Cover

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.

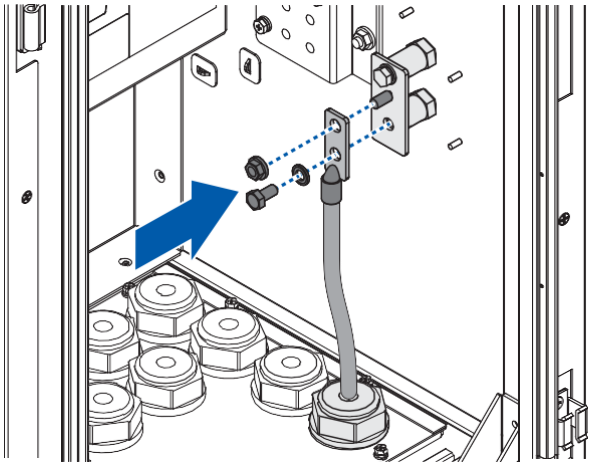


Figure 68. Connecting N Cable

5. Install the plexiglass cover and secure the nuts.

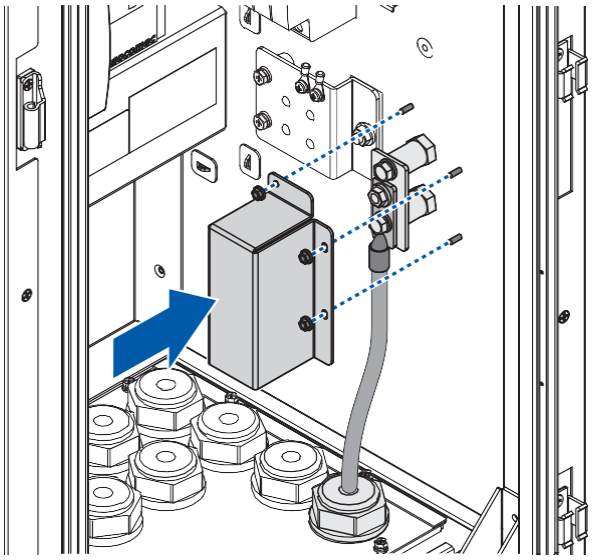


Figure 69. Installing the Plexiglass Cover

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

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. operated in unusual circumstances such as strikes, riots, wars or nuclear disasters;
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. damaged by rodents, improper temperature, humidity or any unmet environmental requirement;
7. deliberately damaged;
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 17: Technical Specifications of the Delta PCS100

Item	Description
Grid-tied Operation	
Rated Grid Voltage	400 Vac, 3 phase
Grid Voltage Range	312 to 459 Vac
Rated Grid Frequency	50 Hz (60 Hz optional)
Frequency Range	45 to 55 Hz, adjustable
Rated AC Power	100 kVA
Rated AC Current	144.3 A
Max. Continuous AC Current	160.4 Arms
Current THD	< 3% at rated power
Power Factor	-1 to 1, continuously adjustable
Charging-discharging transfer time	< 100 ms
Power response time	< 40 ms
Battery Input Performance	
DC Voltage Range	600 to 1,000 Vdc
Rated DC Voltage	900 Vdc
Rated Discharge Power	103 kW
Rated Charge Power	97 kW
Max. Discharge DC Current	171.7A
Max. Charge DC Current	161.7A
Standalone Mode Performance	
Rated Output Voltage	400V, 3P3W (3P4W, extra transformer needed)
Rated Output Power	100kVA/ 100kW with linear load 100kVA with RCD load (CF≤ 2)
Rated Output Current	144.3 A
Rated Output Frequency	50 Hz ± 1%
Power Factor	0.8 to 1
Output Voltage Accuracy	1%
Voltage Symmetry	± 1%, @ 100% linear balanced load
Output Voltage THD	< 3% @ 12.5 ~ 100% liner load < 5% @ 12.5 ~ 100% RCD load (Crest factor ≤ 2.0)
Output Voltage Regulation	< 10%, at dynamic; Recovering within tolerance in 100 ms

Table 17: Technical Specifications of Delta PCS100 (Continued)

Item	Description
Crest Factor	2.0 @ rated power
Environment	
Max Altitude	3,000 m
Operating Temperature	≤ 2000 m: -25 ~ 60ºC, derating > 50ºC (3%/ºC), -25 ~ 40ºC, > 2000 m
Storage Temperature	-25 ~ 70ºC
Humidity	0 to 95% RH, no-condensing
Cooling	Fan cooled, speed controlled and alarmed signal
Pollution Degree	3
Acoustic Noise	< 72 dB, @ 1m
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 operation button, Fault LEDs
Emergency Stop	Local EPO button & remote control
Communication	RS-485 / Modbus RTU, Ethernet/ Modbus TCP
System Characteristic	
Peak Efficiency	97.9%
Standby Loss	< 25 W @Sleep Mode
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/EN 62477-1, VDE-AR-N4105, G99, AS/NZS 4777.2 IEC/EN 61000-6-2, IEC/EN 61000-6-4 (Class A)
Product Conformity	CE, RCM
Applicable Battery Chemistry	Lithium-ion, flow battery

Table 18: Icc declaration (r.m.s. value, Icp,mr, device)

			Characteristics of SCPD		
Ports	Icc	Icp,mr	Type	Location	Specification
AC	25kA	5kA	170M1371, Bussmann	FU1, FU2, FU3	Rated current: 250A; rated voltage:690V; Interrupt rating: 200kA RMS Sym.
DC	20kA	5kA	170M1813, Bussmann	FU4,FU5	Rated current: 250A; rated voltage:1000V; breaking capacity: 50kA.

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.

- 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.

- THD

  Total harmonic distribution.

- Icc

  Conditional short-circuit current.

- SCPD

  Short-circuit current protective device.

- Icp,mr

  Minimum required prospective short-circuit current.

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 18: 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	3.0 ± 0.2
Steel Plate	Aluminum Plate	0.7 ± 0.1	1.4 ± 0.15	3.0 ± 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 19: Screw Torque Table for M6~M16 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 ± 10	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