PCS125HV Power Conditioning System

Maintenance Manual

Version: 1.0.3

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Conventions

General Conventions

The following conventions are used in this manual:

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

WARNING!
Warning information appears before the body of text indicting a hazardous situation, which if not avoided, could result in death or serious injury.

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

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.

About to this Manual

Version Control

Table 1: Version Control

Rev.	Change Description	Date
1.0.0	First release.	08June2022
1.0.1	Change maintenance pictures	12July2022
1.0.2	Add a note for maintenance environment	08Oct2022
1.0.3	Add PCS maintenance on seaside	13Feb2023

Purpose

This manual provides includes safety guidelines, detailed instructions for the maintenance and troubleshooting of the Delta PCS125HV.

Target Audience

This manual is intended for customers intending to maintain and troubleshoot these products. Installers should be certified technicians or electricians.

Manual Organization

This manual is divided into two primary sections: the front matter (section 1) and three chapters (second section).

Section 1:

- **Front Matter:** This section contains safety, regulatory, convention and important information used throughout this manual and on the device.

Section 2:

- **Chapter 1 Hardware Introduction:** This chapter provides an overview of the system, including features, specifications, and physical descriptions.
- **Chapter 2 Preventive Maintenance:** This chapter provides an overview of guidelines and information for the regular maintenance of equipment and consumable components.
- **Chapter 3 Maintenance:** This chapter details the processes required to repair field serviceable components.

Maintenance Flowchart

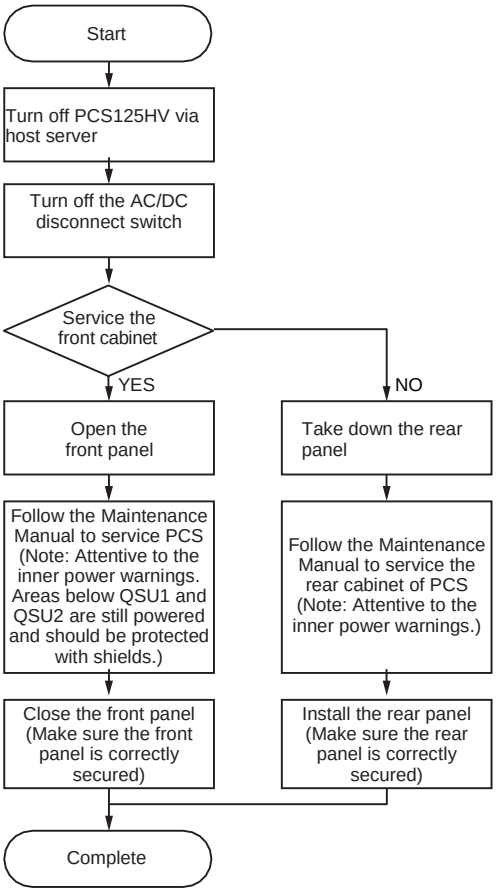

Figure 1. Maintenance Flowchart

Safety Instructions

Warnings

WARNING!

Read all the instructions before using this product.

WARNING!

This device should be supervised when used around children.

WARNING!

The PCS must be grounded through a permanent wiring system or an equipment grounding conductor.

WARNING!

Do not install or use the PCS near flammable, explosive, harsh, or combustible materials, chemicals, or vapors.

WARNING!

Turn off input power at the circuit breaker before installing or cleaning the PCS.

WARNING!

Use the PCS only within the specified operating parameters.

WARNING!

Never spray water or any other liquid directly at the wall mounted control box. Never spray any liquid onto the charge handle or submerge the charge handle in liquid. Store the charge handle in the dock to prevent unnecessary exposure to contamination or moisture.

WARNING!

Stop using and do not use the PCS if it is defective, appears cracked, frayed, broken, or otherwise damaged, or fails to operate.

WARNING!

Do not attempt to disassemble, repair, tamper with, or modify the PCS. The PCS is not user serviceable. Contact Tesla for any repairs or modification.

WARNING!

When transporting the PCS, handle with care. Do not subject it to strong force or impact or pull, twist, tangle, drag, or step on the PCS, to prevent damage to it or any components.

WARNING!

Do not touch the PCS's end terminals with fingers or sharp metallic objects, such as wire, tools, or needles.

WARNING!

Do not forcefully fold or apply pressure to any part of the PCS or damage it with sharp objects.

WARNING!

Do not insert foreign objects into any part of the PCS.

WARNING!

Use of the PCS may affect or impair the operation of any medical or implantable electronic devices, such as an implantable cardiac pacemaker or an implantable cardioverter defibrillator. Check with your electronic device manufacturer concerning the effects that charging may have on such electronic devices before using the PCS.

Cautions

CAUTION!

DO NOT USE PRIVATE POWER GENERATORS AS A POWER SOURCE FOR CHARGING.

CAUTION!

INCORRECT INSTALLATION AND TESTING OF THE PCS COULD POTENTIALLY DAMAGE EITHER THE VEHICLE'S BATTERY AND/OR THE PCS ITSELF. ANY RESULTING DAMAGE IS EXCLUDED FROM THE NEW VEHICLE LIMITED WARRANTY AND THE CHARGING EQUIPMENT LIMITED WARRANTY.

CAUTION!

DO NOT OPERATE THE PCS IN TEMPERATURES OUTSIDE ITS OPERATING RANGE OF -22°F TO 122°F (-30°C TO +50°C).

Notes

Note:
Ensure that the PCS's charging cable is positioned so it will not be stepped on, driven over, tripped on, or subjected to damage or stress.

Note:
Do not use cleaning solvents to clean any of the PCS's components. The outside of the PCS, the charging cable, and the connector end of the charging cable should be periodically wiped with a clean, dry cloth to remove accumulation of dirt and dust.

Note:
Be careful not to damage the circuit boards or components during installation.

Safety in Maintenance

Electrical Safety

Grounding

General Safety

Safe Start-up and Operation

Important Safety Instructions

This document contains important instructions and warnings that must be followed when installing and maintaining the PCS.

Installation and Wiring Compliance

The installation and wiring must comply with local and regional electrical codes. The installation must be done by a certified electrician.

Preventing Electrical Shock

- Always connect the grounding connection on the PCS to the designated grounding system.
- Servicing of the PCS must be carried out by qualified personnel only.
- Disengage all AC and DC inputs before servicing any components.
- Always take precaution when touching bare terminals. High lethal voltages may be present even after the power has been removed.

Installation Environment

- The PCS should be installed indoor only in a well ventilated, cool, dry environment.
- Do not expose the PCS to moisture, rain, snow or liquids of any type.
- Do not obstruct the airflow, air intakes/exhaust to prevent the risk of overheating and fire.

Preventing Fire and Explosion Hazards

Maintenance or servicing the PCS may produce sparks. For this reason, the PCS should only be installed in an environment free of flammable material or gases. These areas may exclude locations that house gas online-powered machinery, fuel tanks, and battery compartments.

Electronic Shock - Cause and Effect on the Human Body

Overview

Electric current (i) flows between two points if they are connected by a conductor and there is an electrical voltage (V) difference between the them. The electrical current (I) flows from the higher voltage to the lower voltage. The value of current flow is directly proportional to the voltage difference and inversely proportional to the electrical resistance (R) i.e. I = V / R. This relationship is called Ohm's Law.

As the Earth is considered to have zero voltage, any source of electrical voltage drives a current to the Earth if the sources is connected to the Earth through a conductor.

In relations to the human body, it possesses an electrical resistance of around 100 Kilo Ohm when dry. When the human body is wet, the electrical resistance drops to 1 Kilo Ohm. Earth potential (0 V) is achieved if a person is standing on Earth. Upon touching a voltage source, a current can flow through the human body causing the body to receive an electrical shock.

Foremost Factors

Three primary factors affect the severity of the shock a person receives when he or she is a part of an electrical circuit:

- Amount of current flowing through the body (measured in Amperes).
- Path of the current through the body.
- Length of time the body is in the circuit.

Related Factors

Other factors to consider that may affect the severity of the shock:

- The voltage
- Moisture present in the environment
- When the shock occurs, the phase of the heart cycle
- Overall person's health

Effects of Electrical Shock

Although the exact injuries or severity of shock are not known, the effects can range from a tingle to severe burns or a cardiac arrest.

The following table depicts probable effects on the human body for a 60-cycle, one second, hand-to-foot shock.

Table 2: Effects of Electrical Shock

Current Levels (Milliampere, mA)	Probable Effects on the Human Body
1 mA	Perceptible tingling sensation. Possibly dangerous under certain conditions.
5 mA	Shock sensation. Strong involuntary reactions. Possible injury may occur.
6 mA - 16 mA	Painful shock, loss of muscular control may occur.
17 mA - 99 mA	Respiratory arrest may occur, severe musuclar contractions and extreme pain. Death is possible.
100 mA - 2,000 mA	Ventricular fibrillation, muscular contractions, and nerve damage occurs. Death is likely.

Table 2: Effects of Electrical Shock (Continued)

Current Levels (Milliampere, mA)	Probable Effects on the Human Body
>2,000 mA	Sever burns, cardiac arrest, and internal organ damage occurs. Death is probable.

Safety Instructions - PCS Related

Preventing Paralleling of the AC Output

Do not connect the AC output of the PCS directly to an electrical breaker panel (load center), which is fed from the utility power/generator. The direct connection may result in parallel operation (different power sources) which will result in feedback into the PCS causing damage to the output sections and posing a fire/safety hazard.

Preventing Input Over-Voltage

It is to be ensured that the DC input voltage of this unit does not exceed 16.8 + / - 0.3 VDC for the 12V battery version and 33.6 + / - 0.6 VDC for the 24V battery version to prevent permanent damage to the unit. Please observe the following precautions:

- Ensure that the maximum charging voltage of the external battery charger / alternator / solar charge controller does not exceed 16.8 + / - 0.3 VDC for the 12V battery version and 33.6 + / - 0.6 VDC for the 24V battery version.
- Do not use unregulated solar panels to charge the battery connected to this unit. Under cold ambient temperatures, the output of the solar panel may reach >22 VDC for 12V Battery System and > 44 VDC for the 24V Battery system. Always use a charge controller between the solar panel and the battery.
- Do not connect this unit to a battery system with a voltage higher than the rated battery input voltage of the unit (e.g. do not connect the 12V version of the unit to 24V battery system or the 24V version to the 48V Battery System)

Preventing Reverse Polarity on the Input Side

When making battery connections on the input side, make sure that the polarity of battery connections is correct (Connect the Positive of the battery to the Positive terminal of the unit and the Negative of the battery to the Negative terminal of the unit). If the input is connected in reverse polarity, DC fuse(s) inside the PCS will blow and may also cause permanent damage to the PCS.

Hardware 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.

In addition, the PCS can operate by local or remote control. The local access is enabled through the remote control access is performed through commands from a computer connected to the PCS through an Ethernet communication link using Mod-bus protocols.

Environmental Considerations

The PCS system can be installed where there is TN or TT power distribution system.

The PCS system installation must meet the following guidelines:

- The system must be installed on a level floor suitable electronic equipment. The floor must be able to support heavy weight and wheeling.
- The system must be installed in an area with temperature and humidity control free of conductive contaminants.
- The cabinet must be installed in a standalone configuration.
- The equipment operating environment must meet the weight requirements shown in Table 3, "Weight Requirements" .

Table 3: Weight Requirements

PCS	PCS 125HV

Enclosure Front and Side Sections

This section describes the physical characteristics of the PCS. These converters are housed in NEMA R3 enclosures. To better describe all of the components, the respective location is divided as follows: Front Side Locations, Access Door Locations, Front Compartment Locations (Internal), Rear Compartment Locations (Internal), and Rear Side Locations.

Front Side Locations

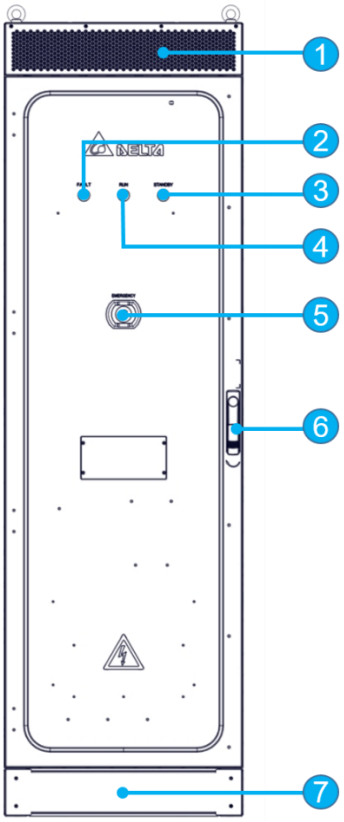

Figure 2. Front Panel view

Table 4: Front Panel View

No.	Description	No.	Description
1	Air exit (grill)	2	Fault indicator lamp
3	Run indicator lamp	4	Standby indicator lamp
5	Emergency stop button	6	Enclosure door latch, lockable (handle and key hole)
7	Front side base cover ● Provides access for forklift ● Provides access for front side cable routing		

Left and Right Side Locations

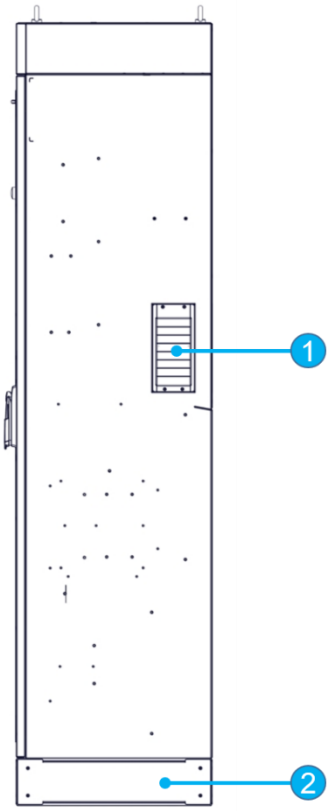

Figure 3. Left and Right Side Views

Table 5: Left and Right Side Views

No.	Description	No.	Description
1	Side air inlet filter	2	Side base cover ● Provides access for forklift ● Provides access for front side cable routing

Rear Side Locations

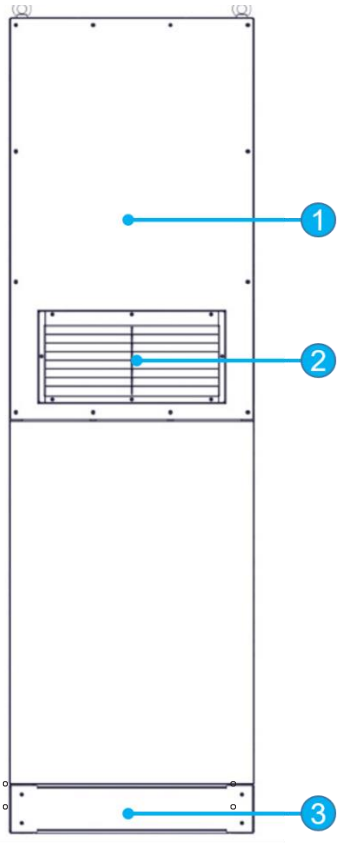

Figure 4. Rear side view

Table 6: Rear side view

No.	Description	No.	Description
1	Rear panel	2	Rear air inlet filter
3	Rear base cover ● Provides access for forklift ● Provides access for front side cable routing		

Internal Enclosure Views

Open Front Panel

The front panel houses a number of components, in order to protect person against electric shock, PCS interior components are under the safety covers. The following figure illustrates the serviceable components as seen from an open access door.

Front Protective Cover Locations and parts of Components

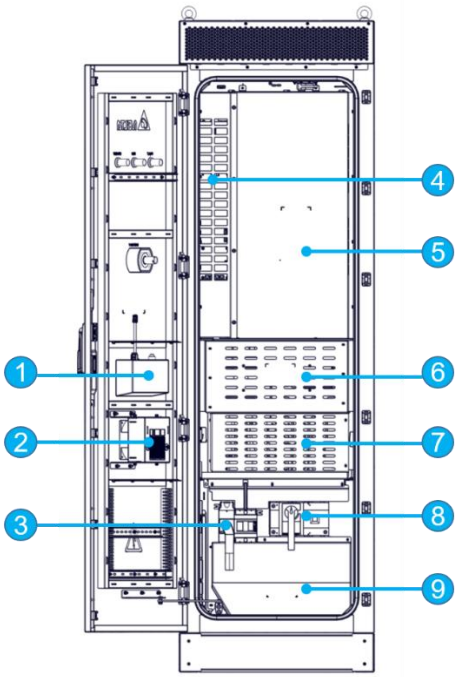

Figure 5. Open Front Panel and Internal Cabinet Views

Table 7: Open Front Panel and Internal Cabinet Views

No.	Description	No.	Description
1	Communication port	2	Heater
3	DC breaker	4	C board safety cover
5	A board safety cover	6	F board safety cover
7	DC/AC fuse safety cover	8	AC breaker
9	DC/AC power cable safety cover		

Cable Access Plate

All power cables and wiring can be routed through the bottom plate locations in the enclosure.

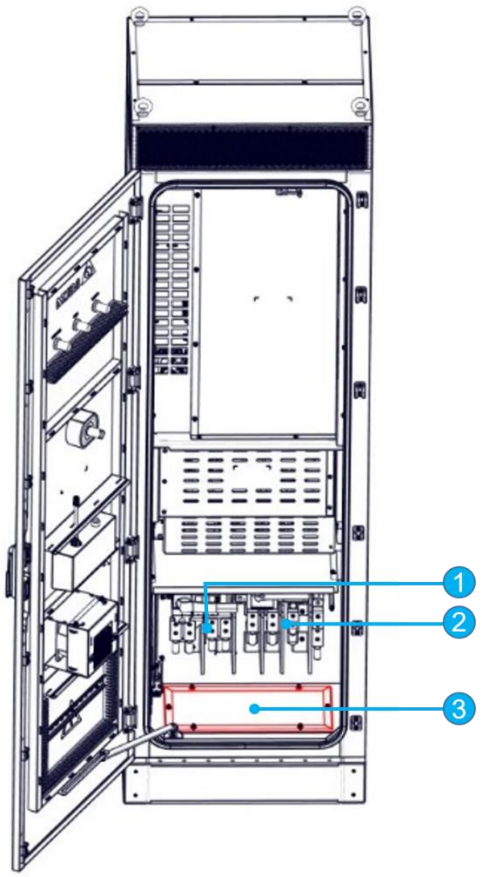

Figure 6. Cable Access Plate

Table 8: Front Compartment Components

No.	Description	No.	Description
1	DC cable connecting terminals	2	AC cable connecting terminals
3	Protection plate for leading cables		

Compartment Components Locations

After removing the front compartment interior safety covers. The main components can be seen.

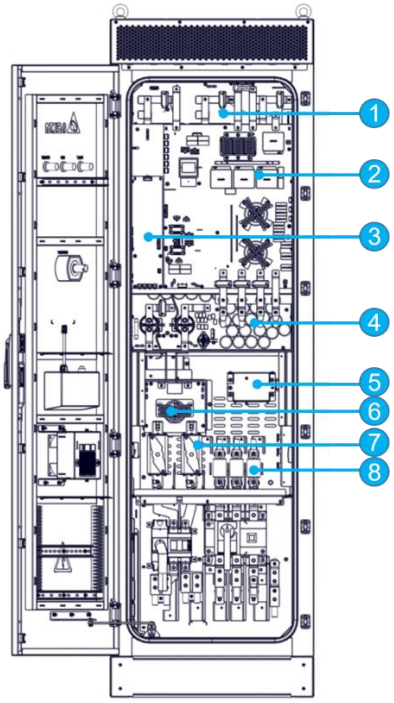

Figure 7. Front Compartment Components

Table 9: Front Compartment Components

No.	Description	No.	Description
1	AC filter board (D board)	2	AC EMI relay aux board (A board)
3	Module control board (C board)	4	Bulk capacitor board (E board)
5	AC EMI core	6	DC EMI board (F board)
7	DC fuse	8	AC fuse

Internal Compartment right side Components

The internal compartment houses the components only accessible after removing the cabinet's internal safety cover.

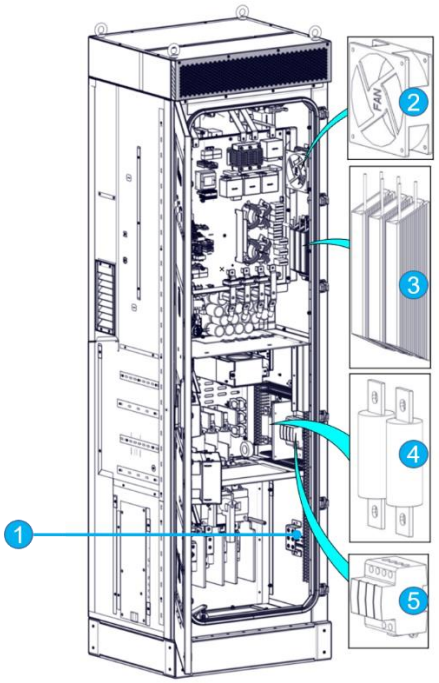

Figure 8. Right side component in front compartment Table

Table 10: Right side component in front compartment

No.	Description	No.	Description
1	Grounding bar	2	A board cooling fan
3	AC Soft-start resistor	4	DC SPD fuse
5	AC SPD		

Internal Compartment left side Components

The internal compartment houses the components only accessible after removing the cabinet's internal safety cover.

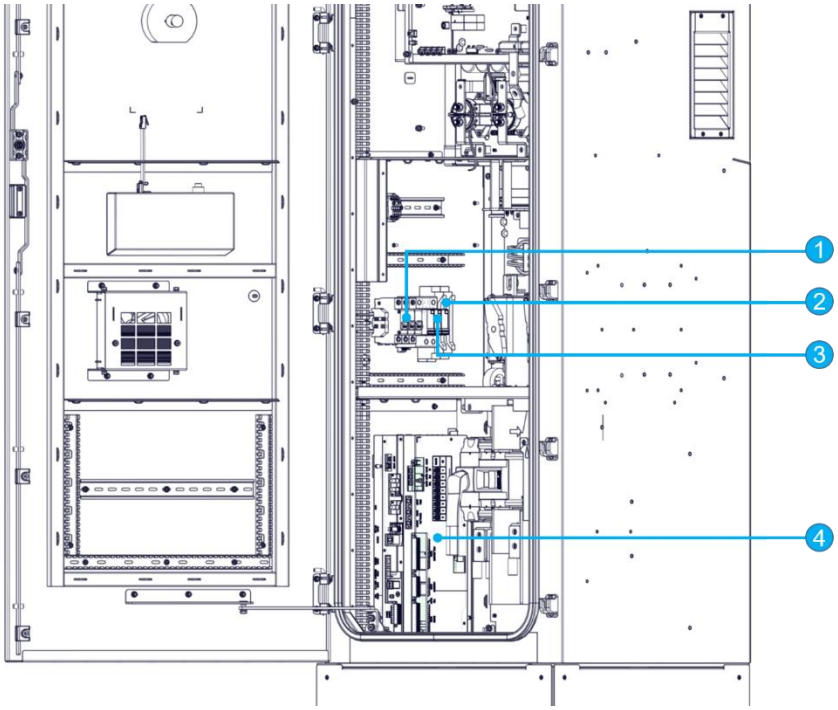

Figure 9. Left side component in front compartment Table

Table 11: Left side component in front compartment Table

No.	Description	No.	Description
1	Micro breaker	2	DC SPD
3	DC SPD fuse	4	Control box

Internal Compartment left side Components

The internal compartment houses the components only accessible after removing A board and C board.

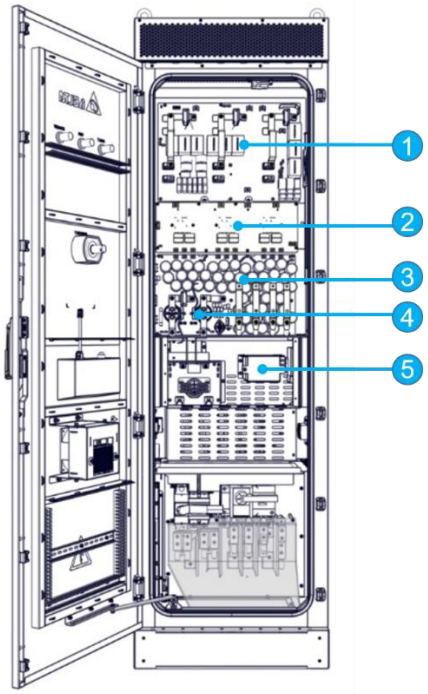

Figure 10. Left side component in front compartment Table

Table 12: Components within Interior of Top Cabinet

No.	Description	No.	Description
1	AC filter board (D Board)	2	IGBT driver board (B board)
3	Bulk capacitor board (E board)	4	DC main relay
5	AC EMI Core		

Rear Compartment Locations

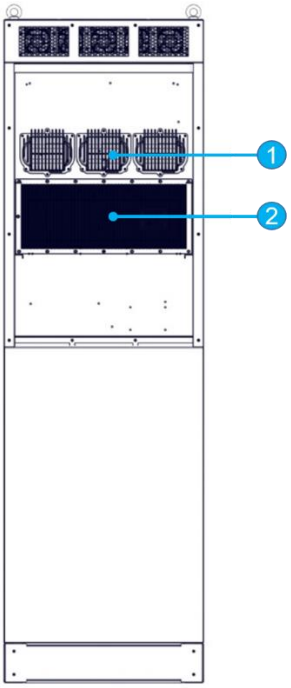

Figure 11. Open Compartment, Rear View

Table 13: Open Compartment, Rear View

No.	Description	No.	Description
1	Inductor	2	IGBT HSK

Preventive Maintenance

The Delta PCS125HV Power Conditioning System (PCS) is a bi-directional conversion system that converts power between energy storage and grid. Due to the complexity of the PCS, it is recommended to have all repairs or maintenance procedures performed by a qualified power supply technician. Before attempting any procedures, the technician must be familiar with the components of the PCS and the related procedures.

The components inside the Delta PCS125HV Power Conditioning System (PCS) are secured to the frame or enclosures, which are, in turn, secured to the frame. All serviceable parts and assemblies are designed for easy assembly and installation. The design of the PCS allows service personnel convenient access for maintenance and serviceability.

It is highly recommended to develop a regular maintenance schedule to keep the PCS operating as intended and prevent possible system failures.

General Overview

It is important to keep in mind that the PCS is designed to supply power in the event of a power failure from the power utility grid. The internal components of the PCS are unsafe until the DC power source is disconnected and the capacitors are discharged. After disconnecting the utility power and disabling the DC power, it is recommended that authorized service personnel wait at least five minutes for capacitor bleed-off before attempting to service any internal components.

Due to the complexity of the PCS, it is highly recommended that all repairs be performed by a qualified power supply technician. Before attempting any service procedures, the technician should be familiar with the system and the operation design.

WARNING!

Don’t allow to perform PCS maintenance in rainy day when PCS installed outdoor.

WARNING!

When servicing the PCS, dangerous voltage levels may exist. All AC and DC capacitors should be discharged. Use extreme caution when measuring primary circuitry since this is at line potential.

Observe the following precautions before performing maintenance or servicing the PCS:

- Remove any metal objects, rings or watches prior to attempting any work.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Disconnect the external power source prior to connecting or disconnecting terminals.

Preventive Maintenance Guidelines

While the PCS requires little preventive maintenance, it is advisable to follow a regular maintenance schedule, which includes periodic inspection, to keep the PCS operating normally. The task of maintaining or servicing the PCS must be performed by authorized service personnel.

WARNING!

Before starting any maintenance work, disengage the AC and DC capacitors. Follow the proper power down procedures to make sure that the power cannot be inadvertently turned back on.

Daily Maintenance

The following items should be performed on a daily basis:

- Inspect the area around the PCS. Make sure the area is clean and access to the PCS is not hampered.
- Ensure the system operating normally. If a status LED indicates an error or fault, make sure to contact an authorized service technician.

Scheduled maintenance

WARNING!

When servicing the PCS, dangerous voltage levels may exist. All AC and DC capacitors should be discharged. Use extreme caution when measuring primary circuitry since this is at line potential.

Periodic inspections of the PCS should be made to determine if any components, wiring, and connections exhibit evidence of wear:

- Monitor system parameters on the control panel “Enclosure Front and Side Sections” on page 2.
- Inspect all air intakes, see “Hardware Introduction” on page 1 for further details. Make sure all air intakes and exhaust openings are not blocked.
- Ensure the operating environment is within the parameters specified in “Environmental Considerations” on page 1.
- Perform a visual inspection of all internally mounted equipment, cables, and major components.
- Inspect all terminals, cables, and enclosures for corrosion.
- Inspect all fuses.
- Inspect the operation of all safety devices (emergency stop, door switches).
- Check the filters (located behind the front door) and wash or replace as necessary. Contact your service representative for replacement filters. To replace the filters:
  a. Open the front door latch and swing the doors open.
  b. Replace the filters.
  c. Close the doors and secure the latch.
- Obtain all operating voltages and current readings displayed on the front display panel.
- Record the check results and any corrective actions in a suitable log.
- Record all completed inspections.

Guidelines for Cleaning and General Inspection

The PCS should be cleaned from the interior first by blowing low pressure compressed air into the bottom of the unit first then continue by moving upwards.

By maintaining the PCS in good electrical condition, many hazards stemming from disrepair can be avoided. Any equipment defect or safety hazard should be reported. Do not use any defective equipment.

If PCS is installed on seaside, should decrease maintenance periodic according site situation. And should pay more attention to following maintenance items.

- Wash PCS fixing equipment with fresh water to clean the salinity every six months.
- Repair any PCS enclosure scratch and corrosion once find it.
- Make sure the foundation can’t be flooded.

Guidelines for Cable Maintenance

Inspect cables frequently for damage to the insulation and the connectors. Replace or repair cracked or worn cables immediately. Do not overload cables. Do not touch the output terminal while equipment is energized.

Guidelines for Power Component Maintenance

All components must be kept clean and free of dirt and obstructions to prevent heat buildup, thus helping to increase the lifespan of the device.

It is also advisable to inspect all terminal blocks for evidence of overheating, most evident in loose electrical connections. In addition, inspect the following:

- tightness on electrical and mechanical connections
- all wiring, leads and cables
- cuts, abrasions, and signs of deterioration
- all leads for broken strands on the terminals
- all door hinges

The fasteners may be loosened due to thermal expansion and vibration. It is advisable to check and re-torque the following on a set schedule:

- clamps
- bolt-on connections
- mounting fasteners

The inspection process should be repeated every six (6) months. Make sure to follow the recommended torque specifications.

Guidelines for Air Filter Maintenance

The provided air filters help to maintain a uniform airflow through the system. The air filters must be in place at all times during operation. Aside from the airflow the air filters provide clean air circulation for the system.

The provided filters are permanent, re-cleanable types. They must be cleaned at regular intervals. The recommended maximum filter load for efficient performance is [dust levels per net sq./ft. To clean the air filters, remove and flush the filters with a stream of water. After the filters have been flushed, allow the water to drain. It is not necessary to use cleaners or chemical solutions.

Guidelines for General Maintenance

Follow all local and regional guidelines when repairing electronic components. When servicing interconnecting lead connections to components, make sure proper wire terminations are used. Route all leads as neatly as possible using ties, clamps, etc. During maintenance, make sure to use only the same size components as the provided originals.

The hardware for this system is metric, however, there may be components present using standard sizes S.A.E. Only use metric tools to loosen or tighten metric components, as much as standard size tools should only be used on standard size components.

Maintenance

This section contains preventive maintenance instructions.

WARNING!

Read the “Safety Instructions” on page ix on the first at the beginning of this manual before performing any service on the components. Ignoring safety instructions may result in injury, damage or death.

CAUTION!

DANGEROUS VOLTAGE LEVELS MAY BE PRESENT FOLLOWING DISCONNECTION. DO NOT OPEN THE CABINET UNTIL A REASONABLE PERIOD OF TIME HAS ELAPSED.
DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

The internal components of the PCS are unsafe until the DC power source is disconnected and the capacitors are discharged. After disconnecting the utility power and disabling the DC power, it is recommended that authorized service personnel wait at least five minutes for capacitor bleed-off before attempting to service any internal components.

Due to the complexity of the PCS, it is highly recommended that all repairs be performed by a qualified power supply technician. Before attempting any service procedures, the technician should be familiar with the system and the operation design.

Powering off the PCS

To power off the system, see the following guidelines:

1. Upper level controller sends the **PCS OFF** command to PCS to switch the PCS system to Standby mode.
2. Open the front door.
3. Turn the AC and DC switches to the **OFF** state as shown in following Figure.

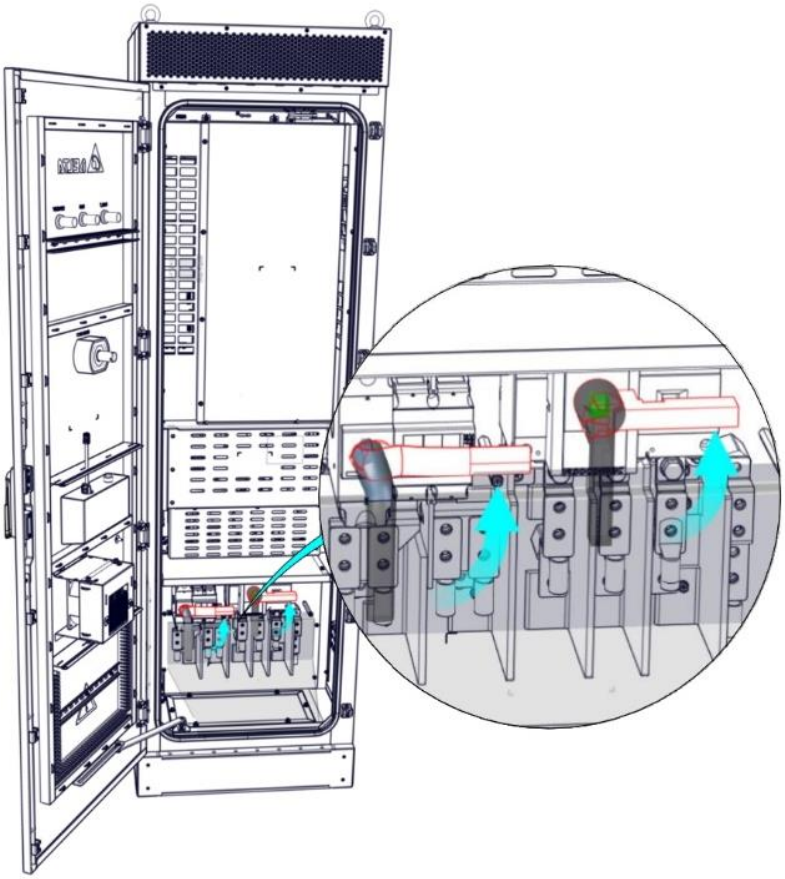

Figure 12. Front Panel

CAUTION!

DANGEROUS VOLTAGE LEVELS MAY BE PRESENT FOLLOWING DISCONNECTION. DO NOT REMOVE THE PROTECTION PLATE UNDER THE AC/DC DISCONNECTOR.
DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Front Panel

In order to install or remove components from the system, you first need to open the panels.

WARNING!

Read the “Safety Instructions” on page ix on the first at the beginning of this manual before performing any service on the components. Ignoring safety instructions may result in injury, damage or death.

CAUTION!

DANGEROUS VOLTAGE LEVELS MAY BE PRESENT FOLLOWING DISCONNECTION. DO NOT OPEN THE CABINET UNTIL A REASONABLE PERIOD OF TIME HAS ELAPSED.
DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Important Safety Instructions

It is important to remember that the PCS is designed to supply power even when it is disconnected from the power grid. The interior of the PCS is unsafe until the DC power source is disconnected and the AC/ DC inputs are disengaged. It is recommended to wait a period of at least five minutes for capacitor bleed-off before attempting to service any components.

Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Opening a Front Panel

1. Insert the key to unlock the front panel.

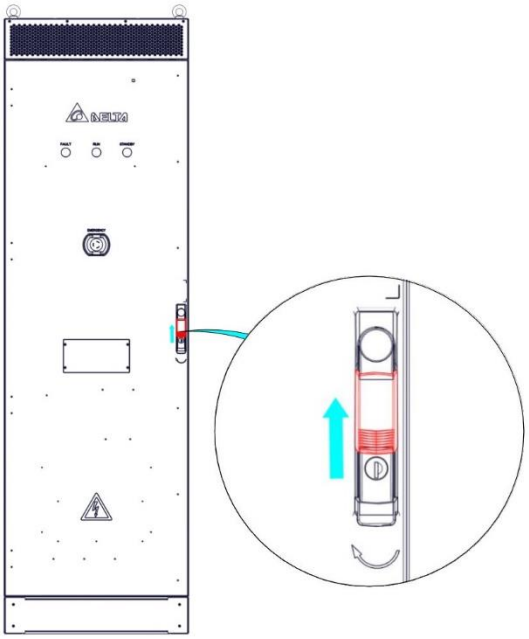

Figure 13. Unlock the front panel

2. Open the door handle of lock.

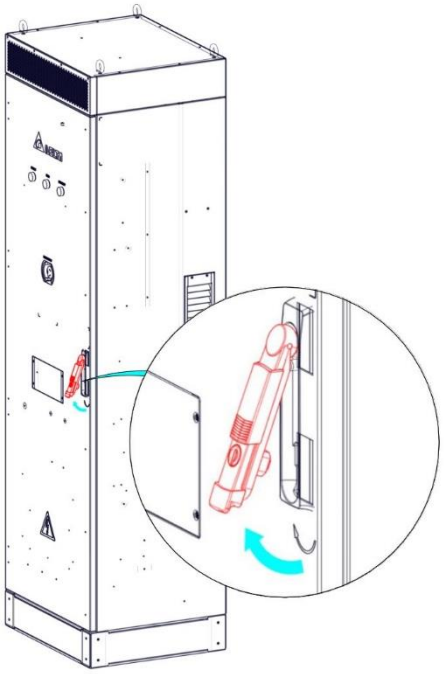

Figure 14. Open the handle

3. Rotate the door handle to unlock the front panel.

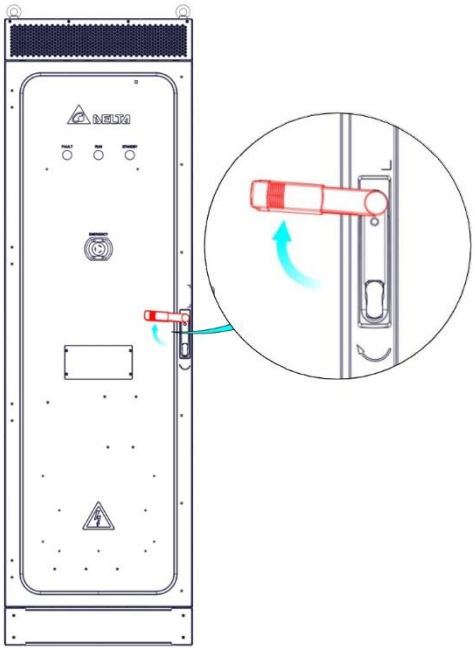

Figure 15. Rotate the door handle

4. Open the front panel open and swing it open until it locks in place.

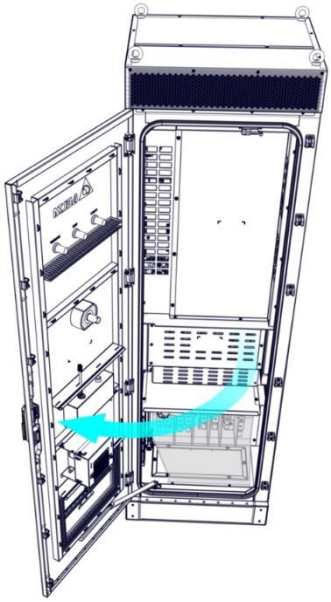

Figure 16. Opening a Front Panel

5. Make sure the locking mechanisms at the bottom of the panel engages in the track to keep the front panel from closing accidentally.

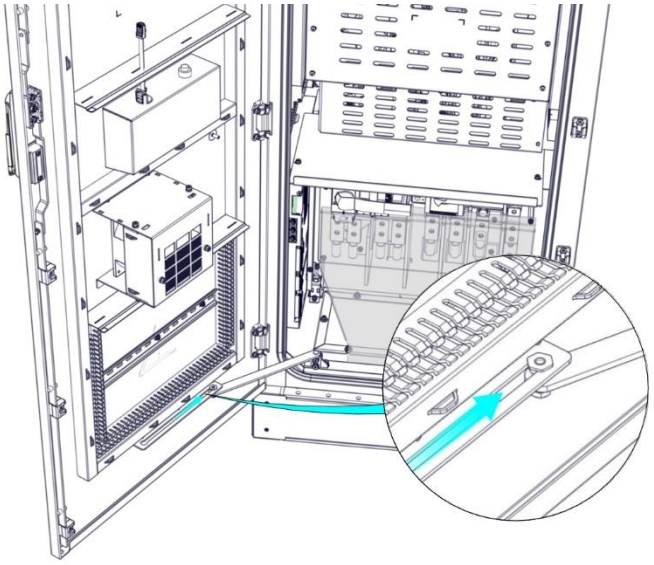

Figure 17. Locking a Front Panel in a Cabinet

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

Closing a Front Panel

1. Locate the track on the bottom corner of the cabinet, see Figure 21 Unlocking the Lower Track.
2. Locate the track at the bottom of the cabinet and lift it up to release the locking mechanism.
3. Once the track is unlocked, close the front panel. Use gentle force to make sure it is flush in the cabinet.

   Make sure the locking mechanisms at the top and bottom of the panel engage with the respective slits on the cabinet.

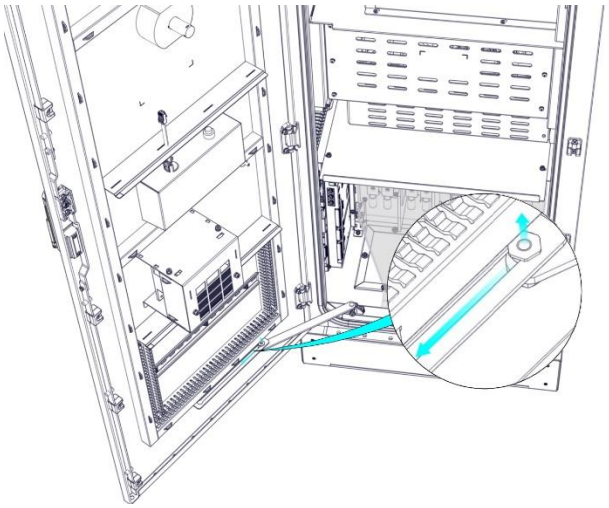

Figure 18. Unlocking the Lower Track

4. Maintain pressure on the panel while rotating the door handle to lock the front panel to the cabinet.

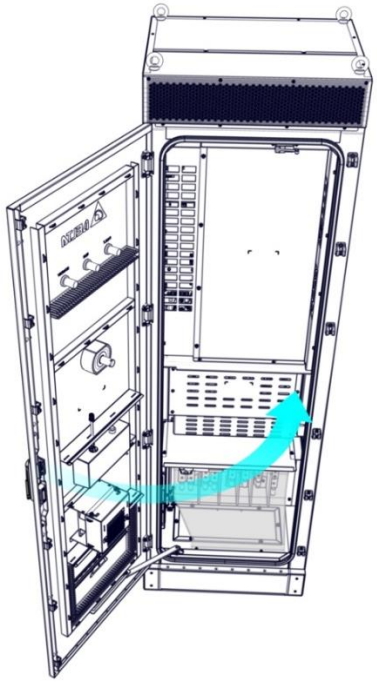

Figure 19. Close the front panel

Note:
To ensure a closed front panel, make sure there is no gap between the front panel and the cabinet.

5. Rotate the door handles to the vertical position to lock the front panel.

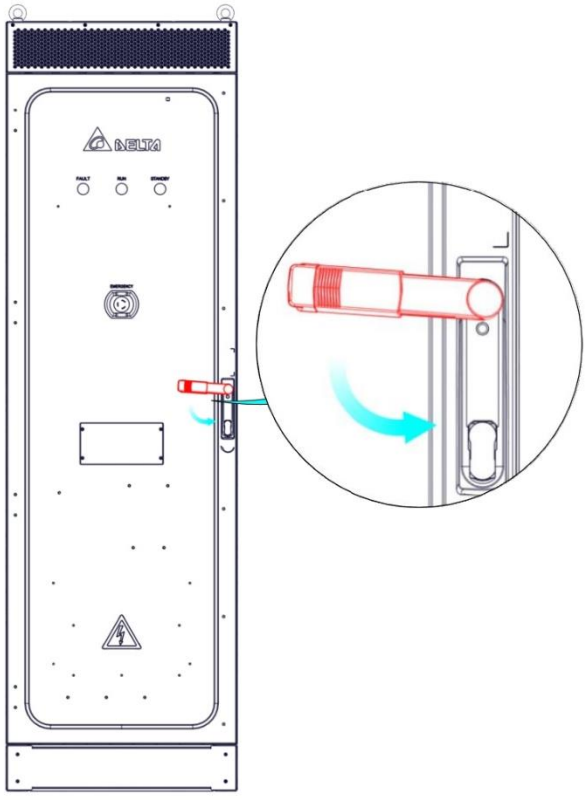

Figure 20. Lock the front panel

Rear Panel

In order to install or remove components from the system, you first need to open the panels.

WARNING!

Read the “Safety Instructions” on page ix on the first at the beginning of this manual before performing any service on the components. Ignoring safety instructions may result in injury, damage or death.

CAUTION!

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DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Important Safety Instructions

It is important to remember that the PCS is designed to supply power even when it is disconnected from the power grid. The interior of the PCS is unsafe until the DC power source is disconnected and the AC/ DC inputs are disengaged. It is recommended to wait a period of at least five minutes for capacitor bleed-off before attempting to service any components.

Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Opening a Rear Panel

1. Unscrew the securing screws of rear panel.

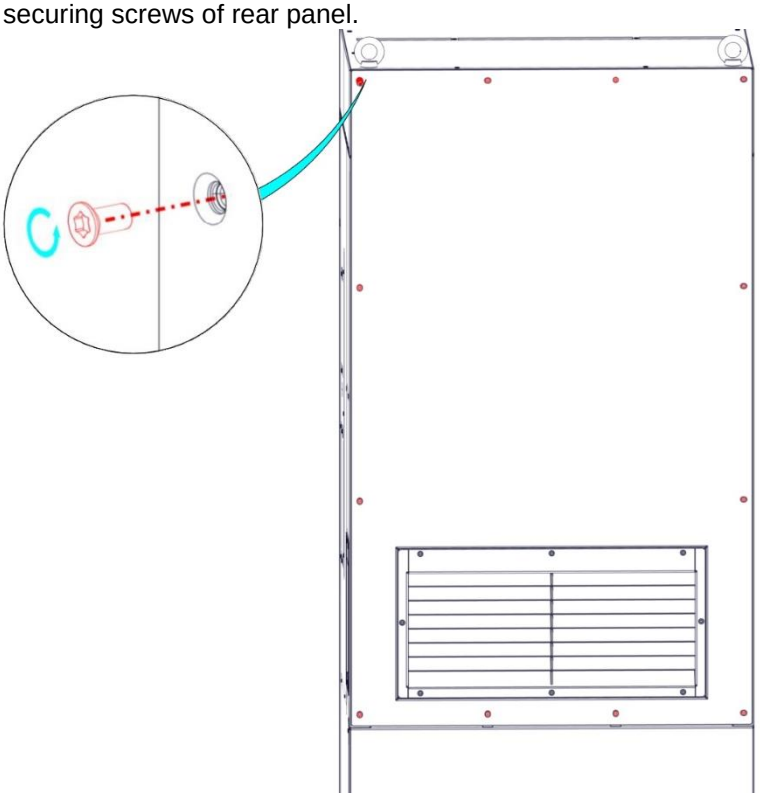

Figure 21. Unscrew the securing screws

2. Take down the rear panel.

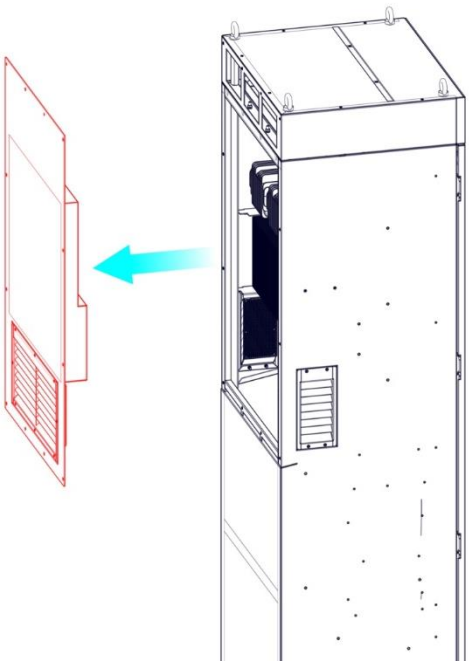

Figure 22. Take down rear panel

Closing a Rear Panel

Before you install a panel, make sure there are no obstructions hindering the panel from closing correctly.

1. Secure the rear panel to PCS rear frame.

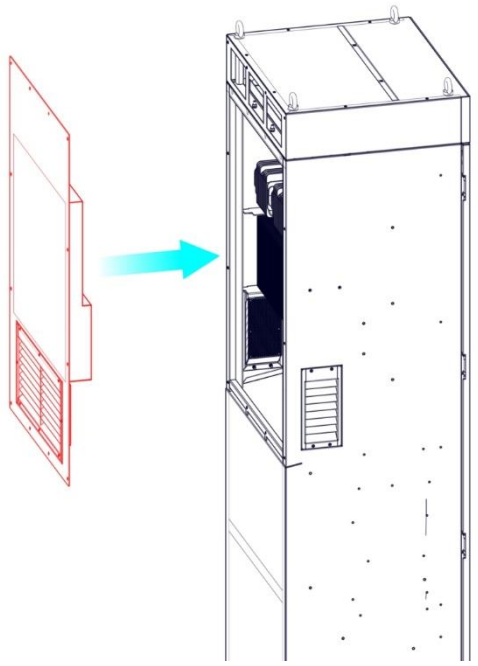

Figure 23. Secure rear panel to PCS

2. Fasten all sixing screws of rear panel.

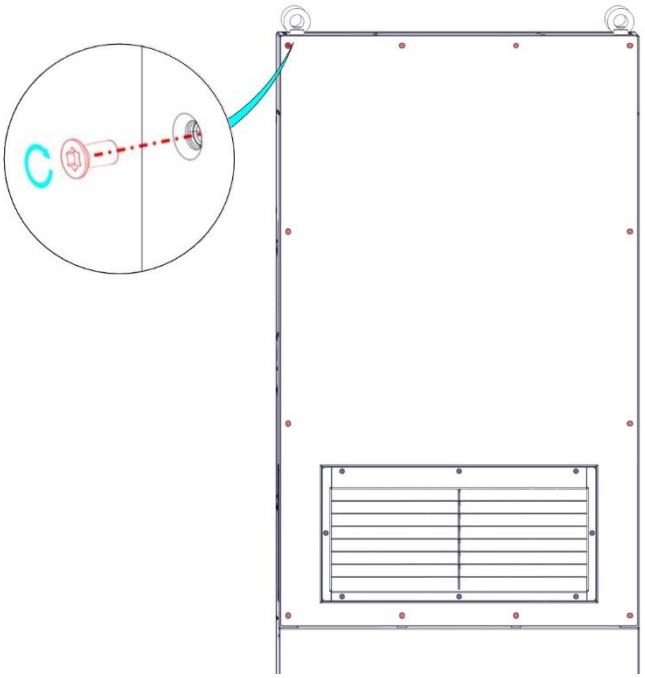

Figure 24. Closing a Rear Panel

Note:
To ensure a closed rear panel, make sure there is no gap between the rear panel and the cabinet.

Control Box

The control box is an enclosure made up of a front cover which provides access to its internal (front) components. Components can also be found on the rear of the control box.

When the control box is opened in its entirety, access can be gained to the top internal section of the cabinet.

WARNING!

Read the “Safety Instructions” on page ix on the first at the beginning of this manual before performing any service on the components. Ignoring safety instructions may result in injury, damage or death.

CAUTION!

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DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Important Safety Instructions

It is important to remember that the PCS is designed to supply power even when it is disconnected from the power grid. The interior of the PCS is unsafe until the DC power source is disconnected and the AC/ DC inputs are disengaged. It is recommended to wait a period of at least five minutes for capacitor bleed-off before attempting to service any components.

Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a Control Box

The control box is inside the left bottom of PCS.

1. Open the front panel. See “Opening a Front Panel” .
2. Power off the PCS. See “Power off a PCS” .
3. Unscrew the nuts for securing control box.

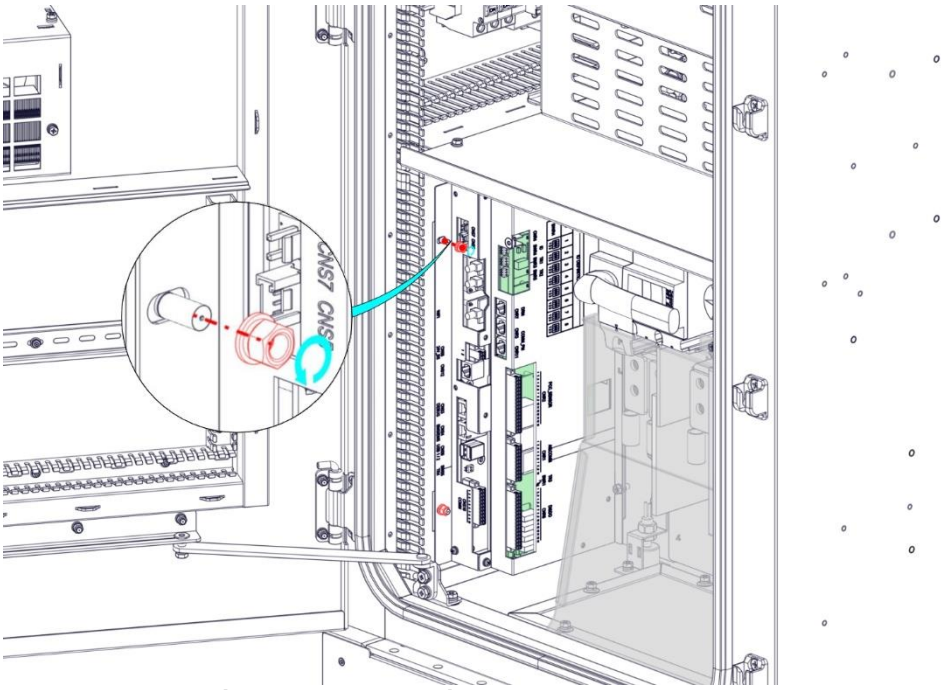

Figure 25. Unscrew the nuts

4. Unscrew the screws securing the control box.

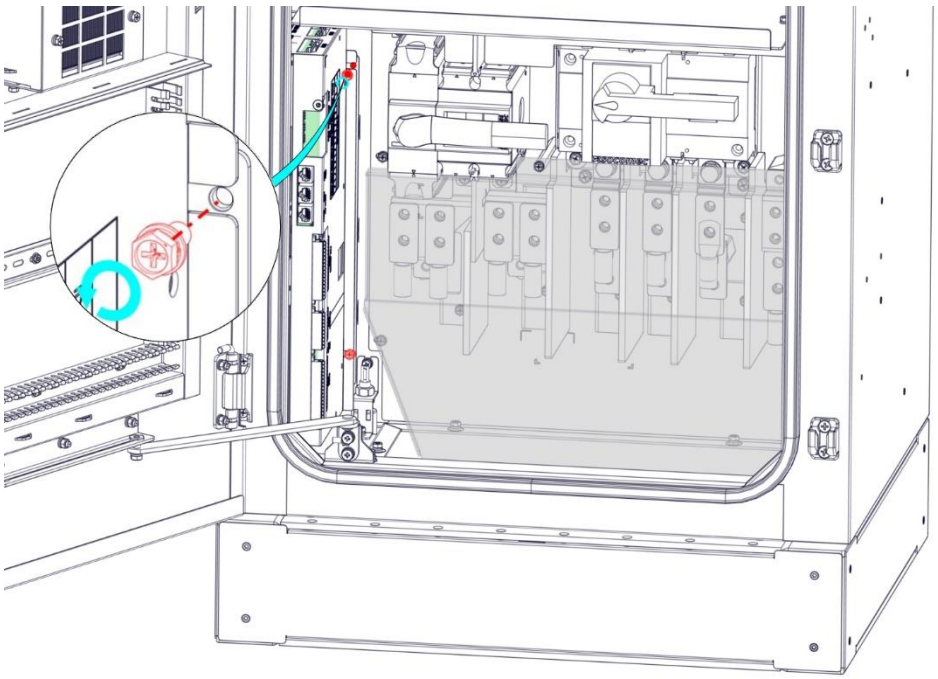

Figure 26. Unscrew the screws

5. Grasp the control box and take it out.

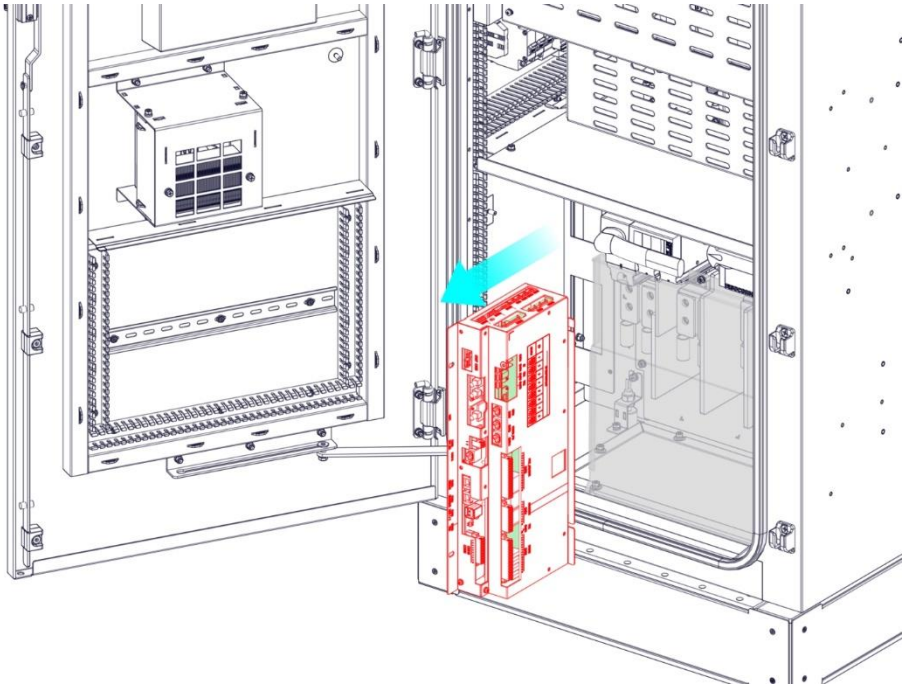

Figure 27. Take out control box

Installing a Control Box

1. Put new control box into PCS and hang it on the left side securing bolts.

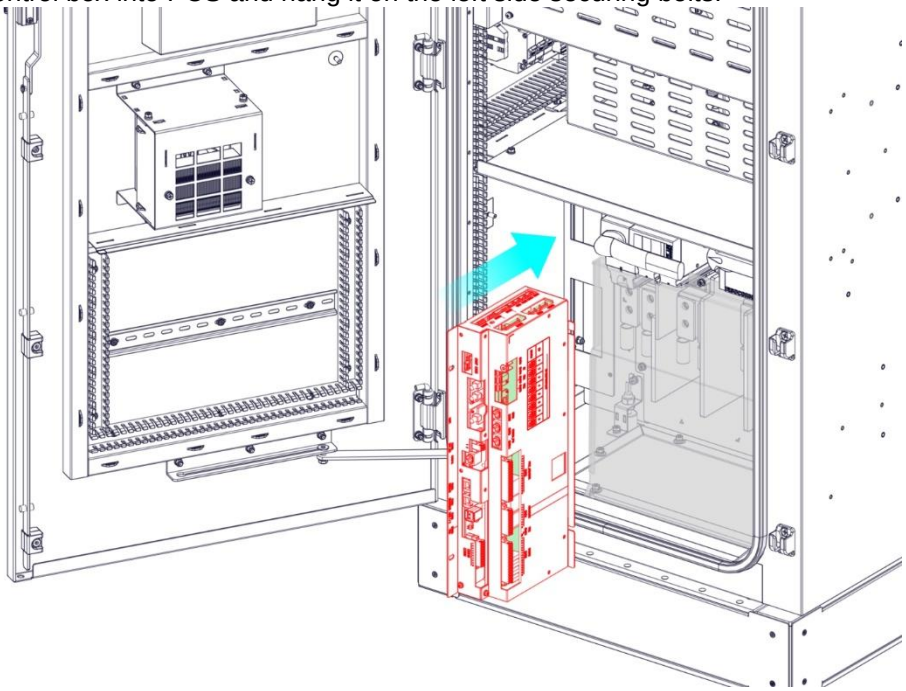

Figure 28. Mount new control box

2. Secure a control box on support frame with securing screws.

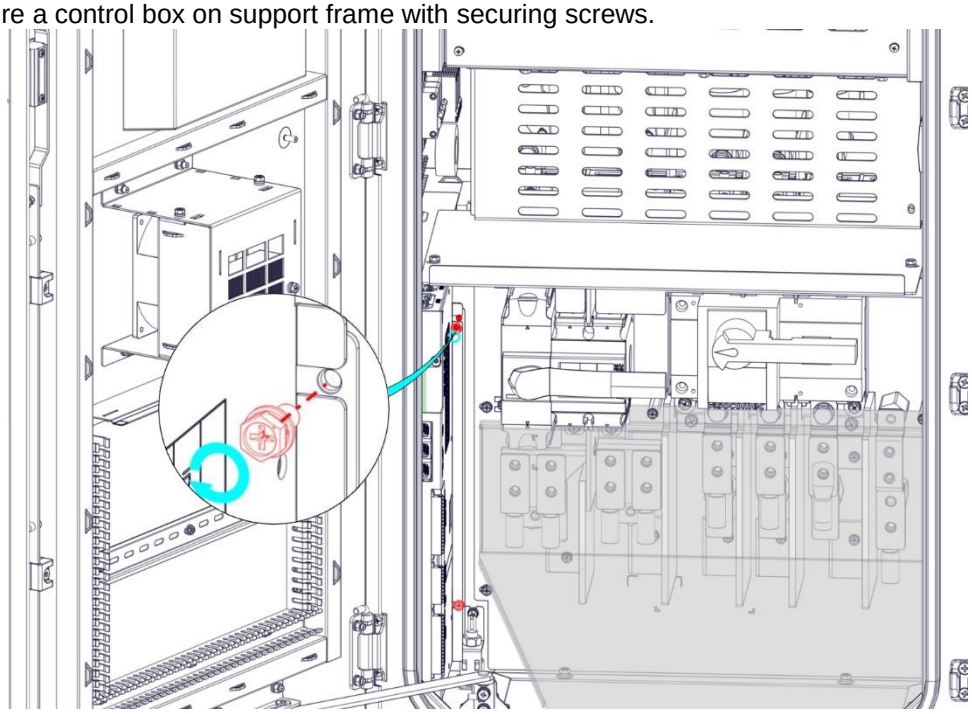

Figure 29. Secure a control box

3. Fasten left side securing nuts.

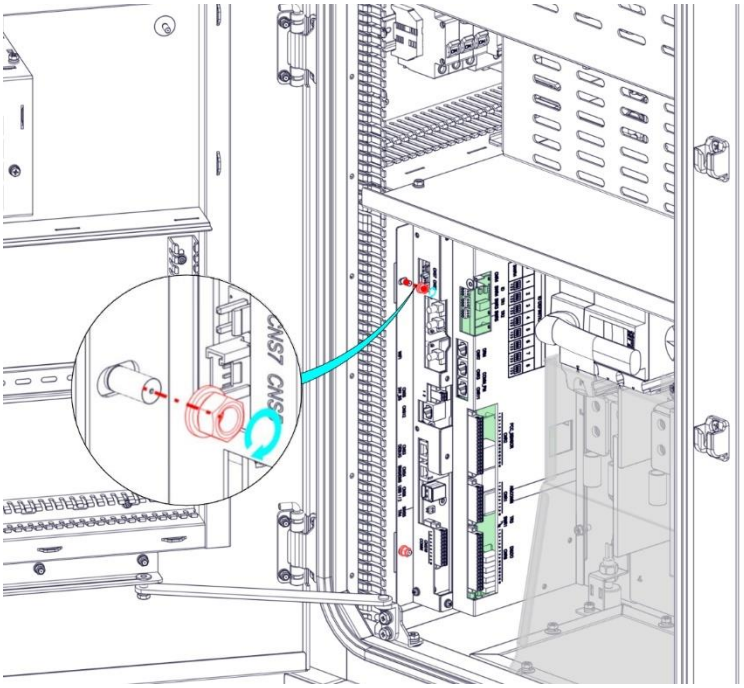

Figure 30. Fasten securing nuts

Safety Cover

The safety cover is designed to prevent access to the bottom internal sections of the cabinet. To service key components, first open the safety cover.

WARNING!

Read the “Safety Instructions” on page ix on the first at the beginning of this manual before performing any service on the components. Ignoring safety instructions may result in injury, damage or death.

CAUTION!

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Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing Safety Covers

1. Open the front panel. See “Opening a Front Panel” .
2. Power off the PCS. See “Power off a PCS” .
3. Unscrew all front securing screws of safety cover.

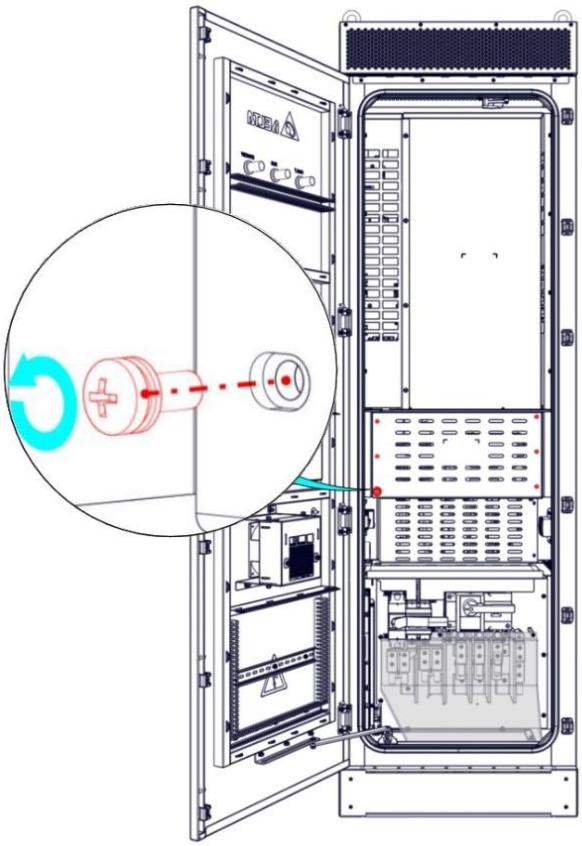

Figure 31. Unscrew the front securing screws

4. Unscrew all bottom securing bolts of safety cover.

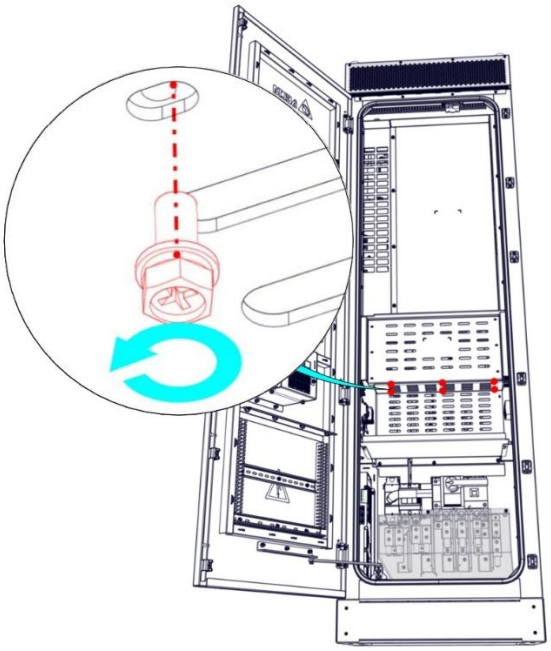

Figure 32. Unscrew bottom bolts

5. Grasp the safety cover and take it out.

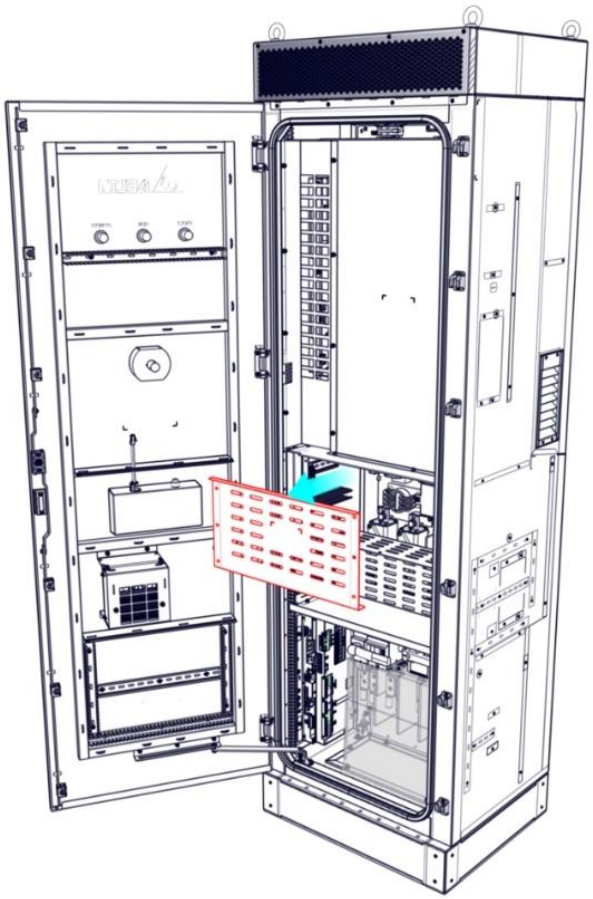

Figure 33. Take out safety cover

6. There are two safety plates mounted on the front of A board and C board to protect these two board against damaged by external force. And the right one is used to protect A board.
7. Unscrew front securing bolts of safety plate of A board and C board.

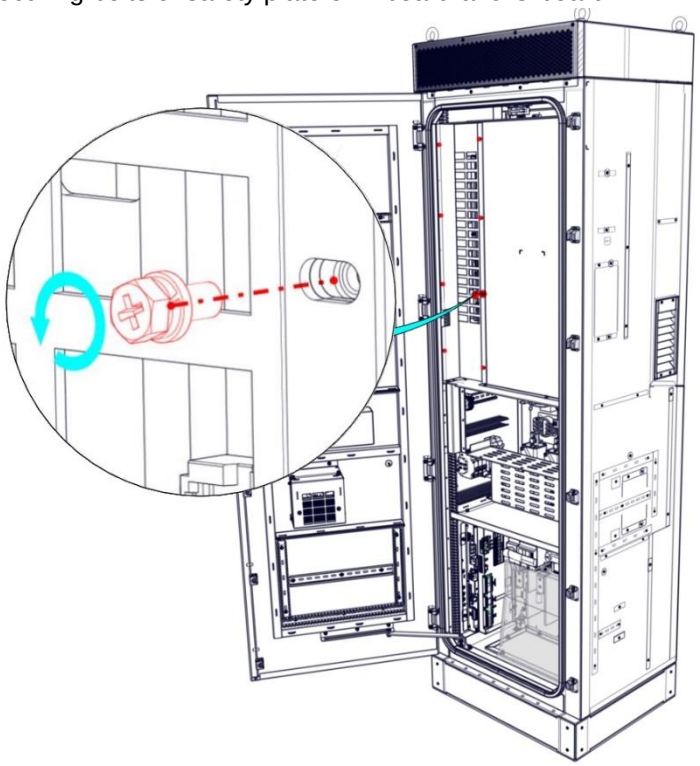

Figure 34. Remove the front securing bolts

8. Unscrew the bolts securing safety plate to right PCS bracket.

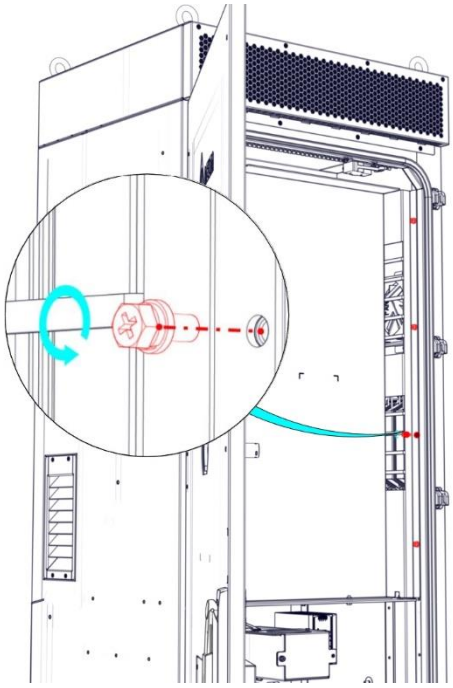

Figure 35. Unscrew securing bolts

9. Remove the bottom securing bolts of safety plate.

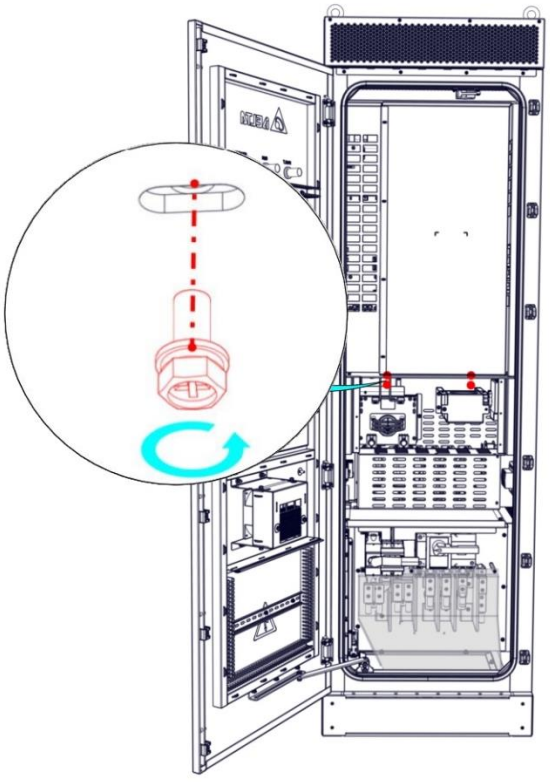

Figure 36. Removing bottom bolts

10. Grasp the safety plate and take it out.

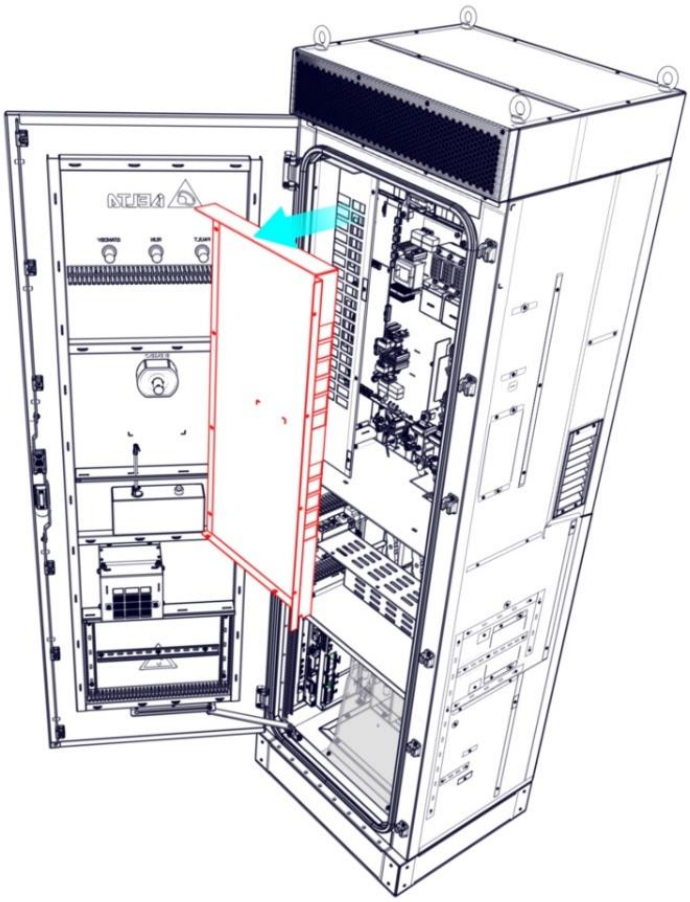

Figure 37. Take out safety plate of A board

11. Once remove the A board safety plate, then C board safety plate can be removed.

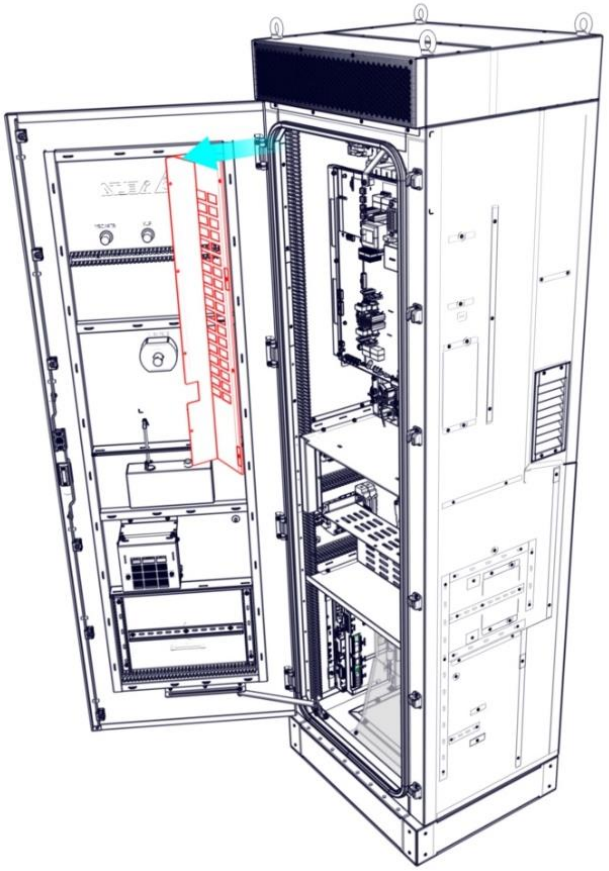

Figure 38. Take out safety plate of C board

12. Unscrew top securing bolts of insulation plate.

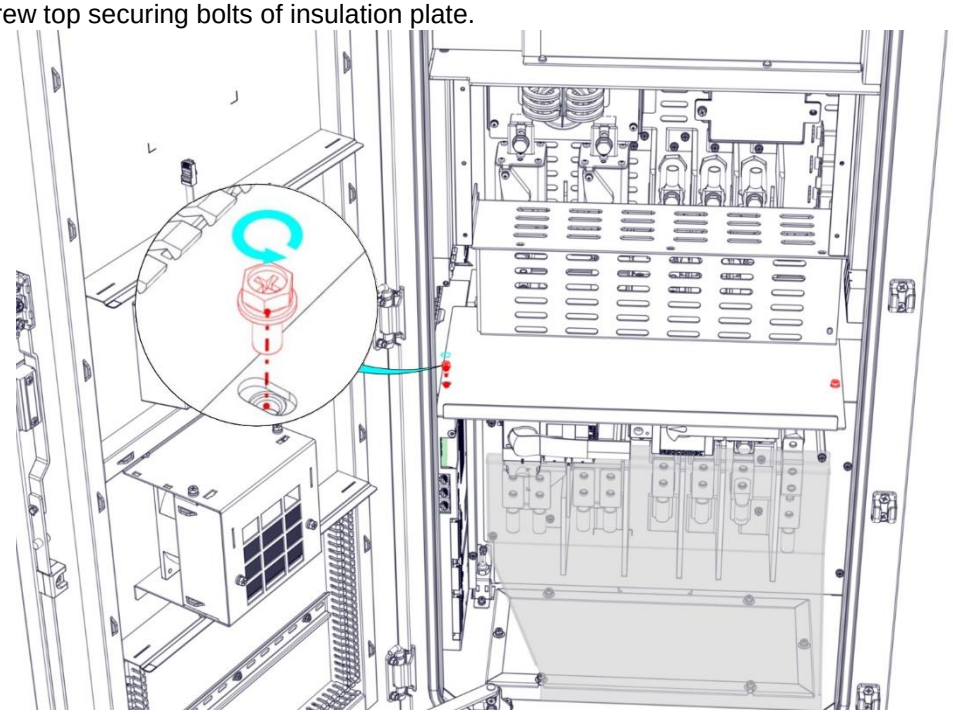

Figure 39. Unscrew top securing bolts

13. Unscrew the rest securing bolts of safety cover.

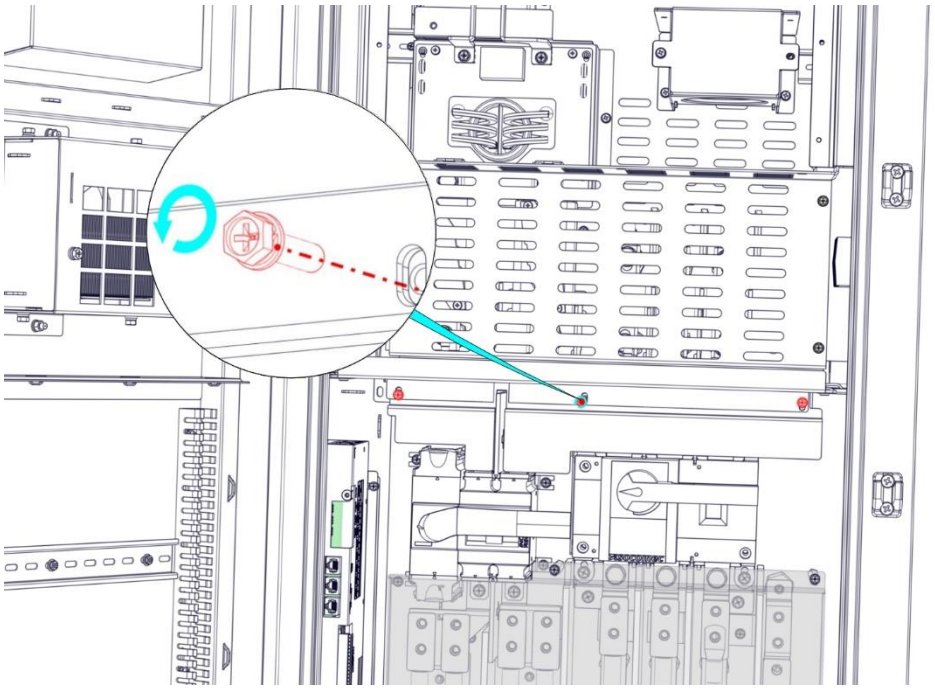

Figure 40. Unscrew the rest securing bolts

14. Grasp the insulation plate and slip it out toward to you.

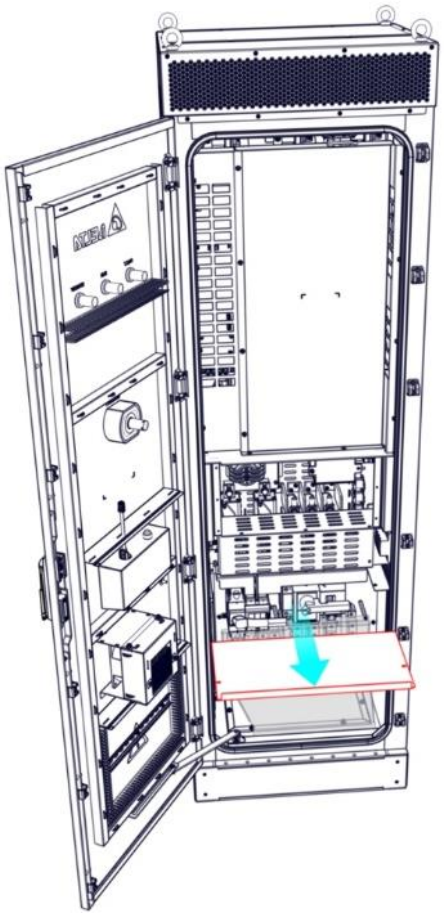

Figure 41. Slip out insulation plate

15. After the insulation plate is taken out, then grasp the safety cover and take it out.

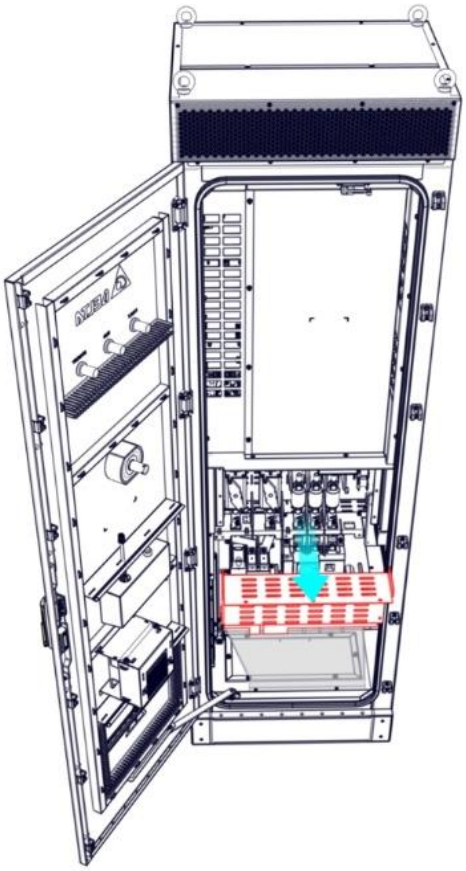

Figure 42. Take out safety cover

16. To protect person against electric shock, one safety cover is mounted in the front of AC/DC input terminals.

CAUTION!

DANGEROUS VOLTAGE LEVELS MAY BE PRESENT. DO NOT DISASSEMBLE SAFETY COVER BEFORE YOU DISCONNET PCS UPSTREAM SWITCH.
DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

17. Unscrew all securing bolts of safety cover.

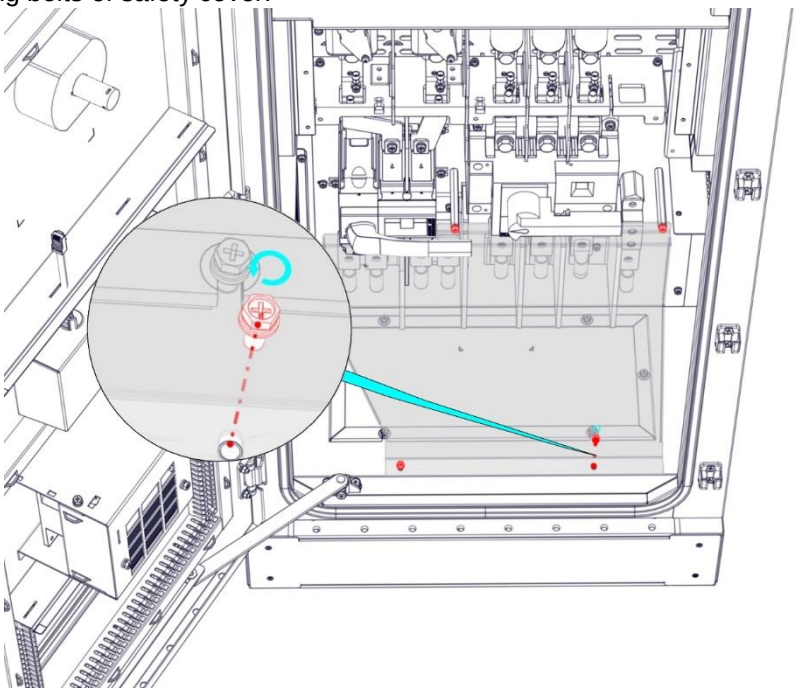

Figure 43. Unscrew all securing bolts

18. Lift up the safety cover a little and take it out carefully.

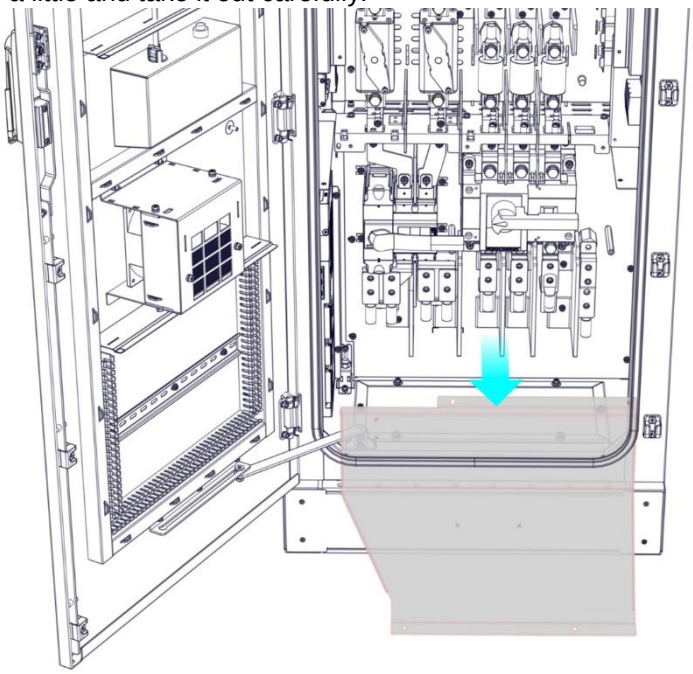

Figure 44. Take out safety cover

Installing Safety Covers

1. Put the safety coves into PCS cabinet carefully.

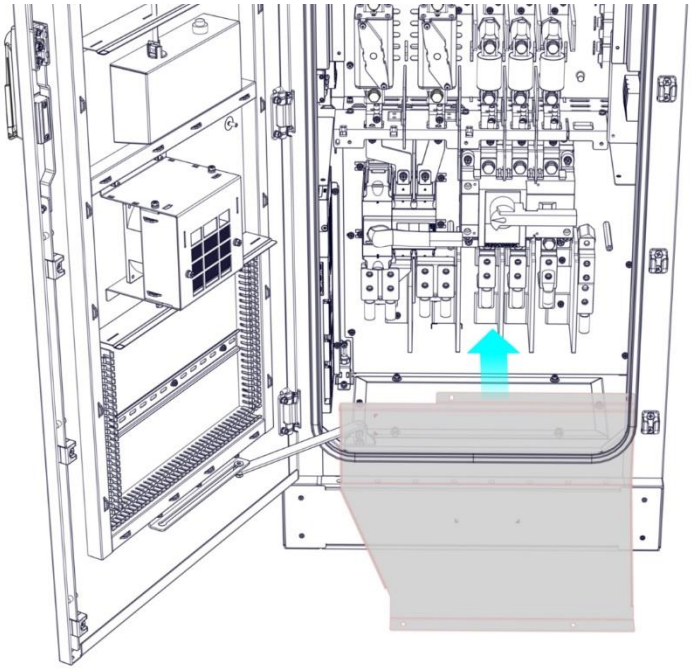

Figure 45. Put a safety cover into PCS

2. Fasten all securing bolts of safety cover.

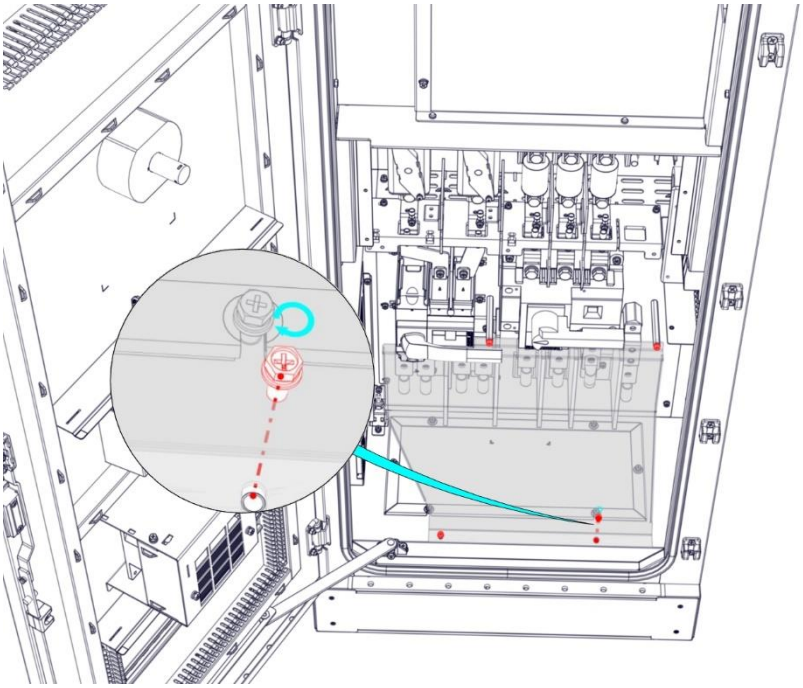

Figure 46. Fasten securing bolts

3. Put a safety cover onto the PCS bracket

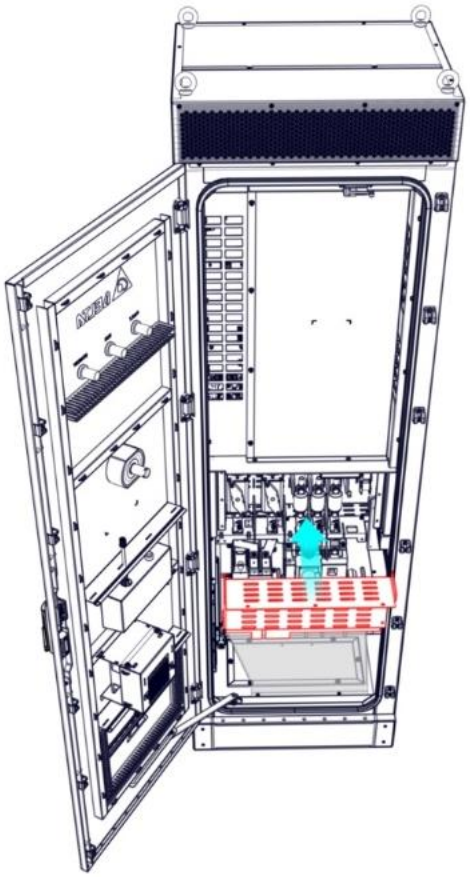

Figure 47. Install a safety cover

4. Fasten all securing bolts except the top bolts.

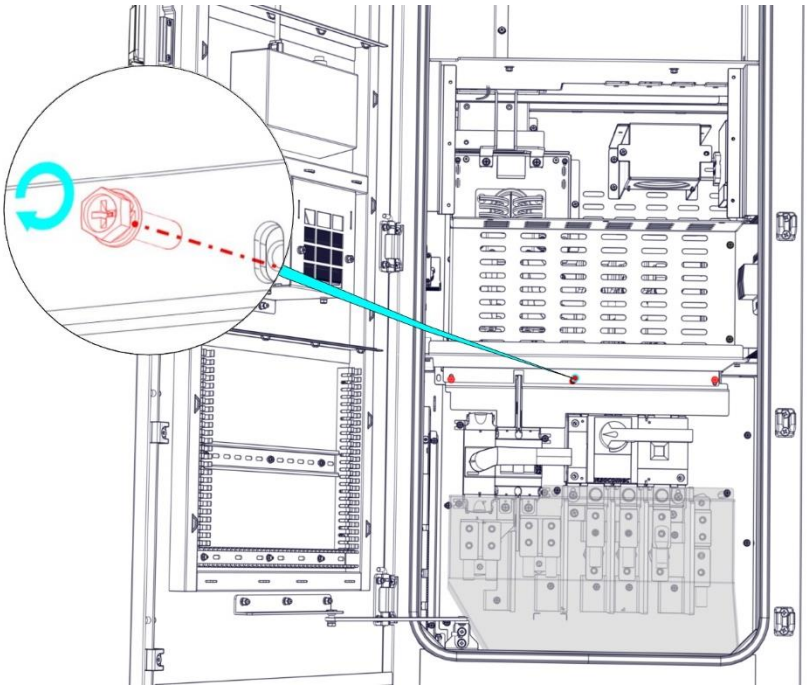

Figure 48. Fasten securing bolts

5. Insert insulation plate into PCS along with PCS bracket.

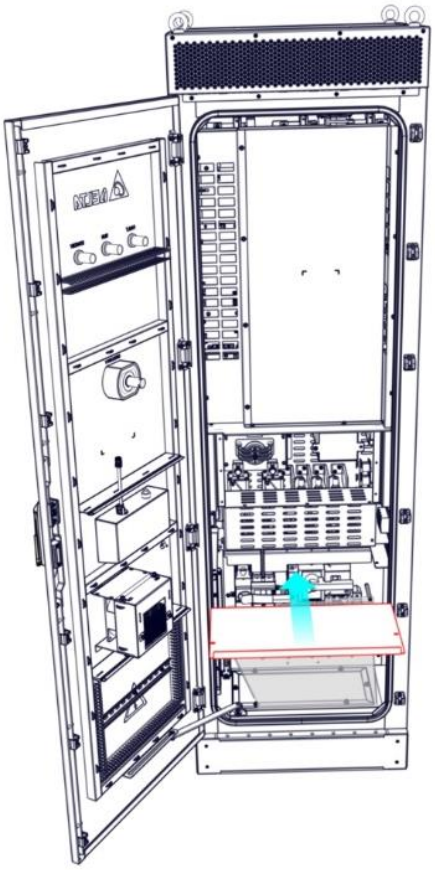

Figure 49. Insert an insulation plate

6. Fasten the top securing bolts of insulation plate.

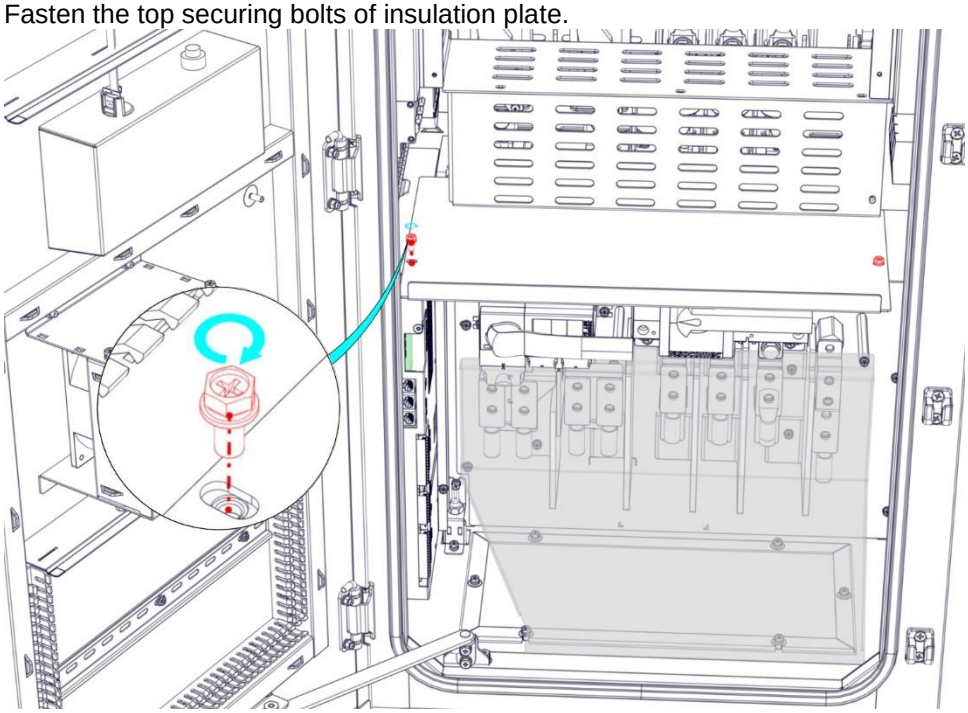

Figure 50. Fasten top securing bolts

7. Secure C board safety plate to PCS bracket.

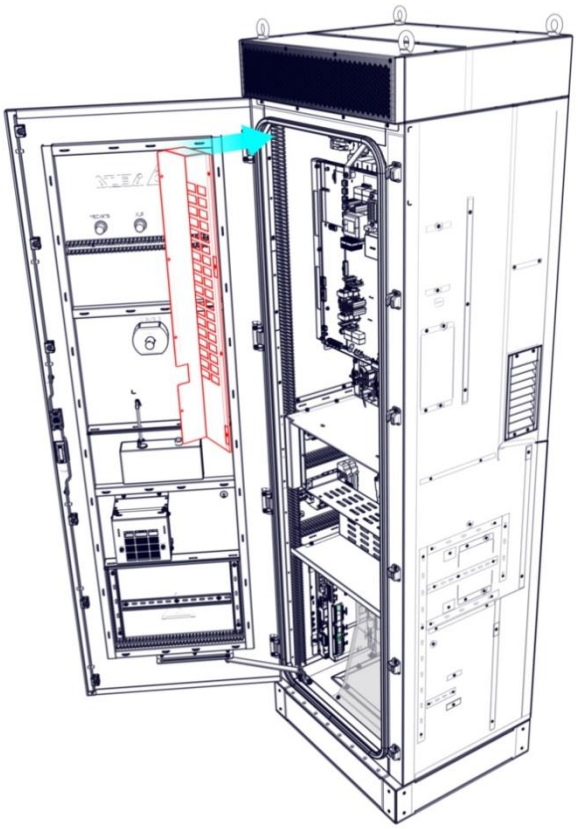

Figure 51. Mount C board safety plate

8. Secure A board safety plate to PCS bracket.

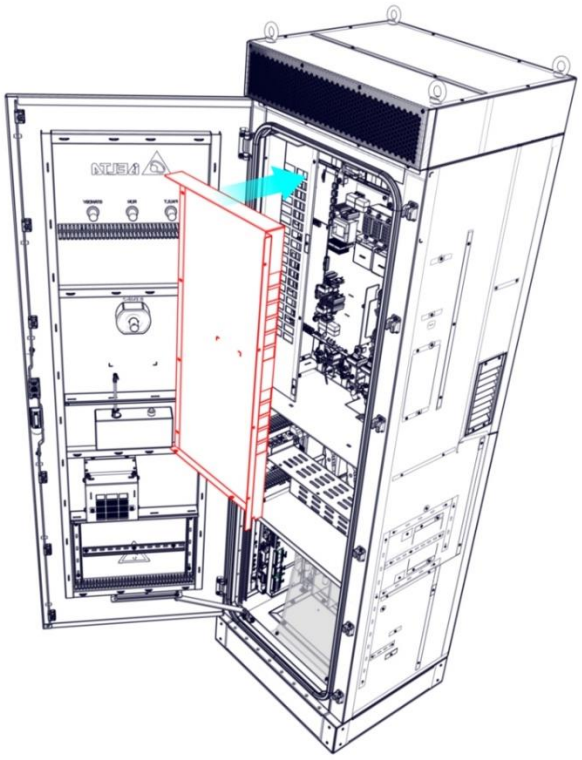

Figure 52. Mount A board safety plate

9. Fasten right side securing bolts of A board safety plate.

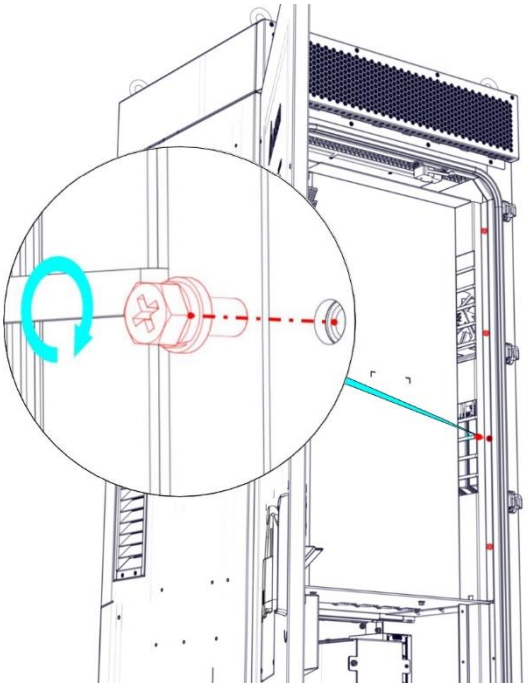

Figure 53. Fasten right side securing bolts

10. Fasten front securing bolts of A board safety plate and left side bolts of C board safety plate.

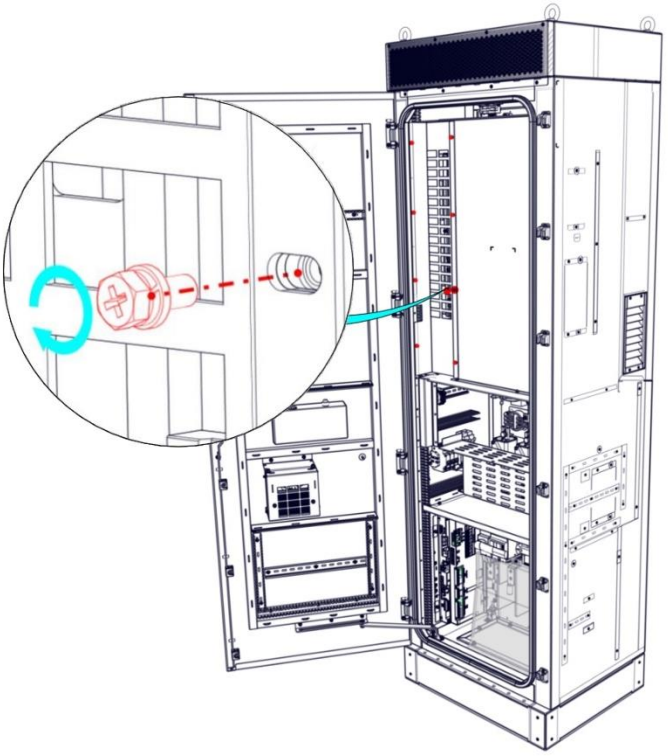

Figure 54. Fasten front and left side securing bolts

11. Fasten bottom securing bolts of A board safety plate.

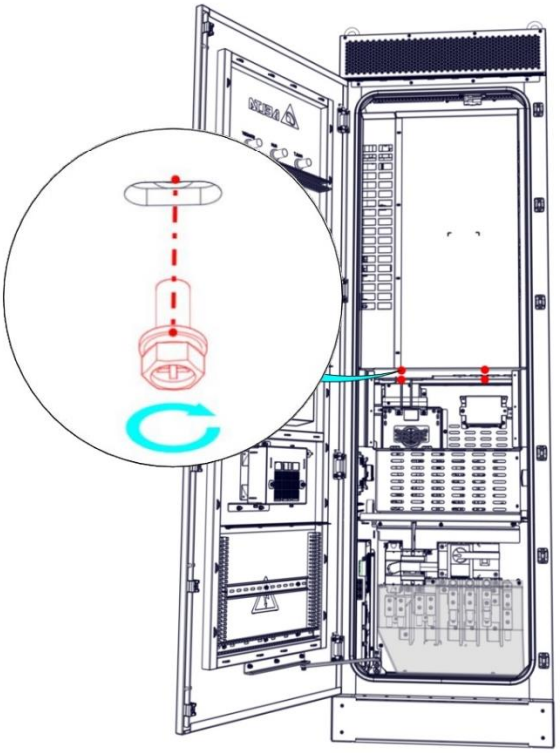

Figure 55. Take out safety cover

12. Install a safety cover into PCS cabinet.

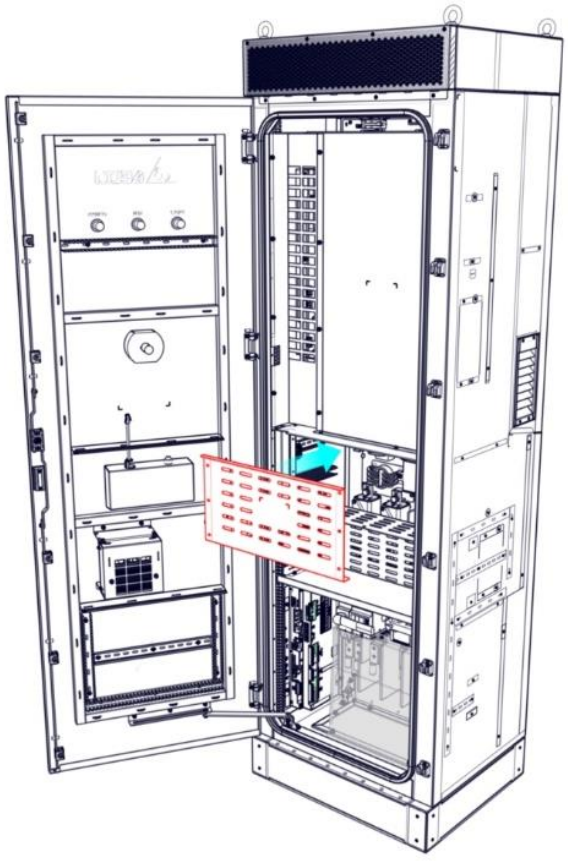

Figure 56. Installing a Safety Cover

13. Fasten bottom securing bolts of the safety cover.

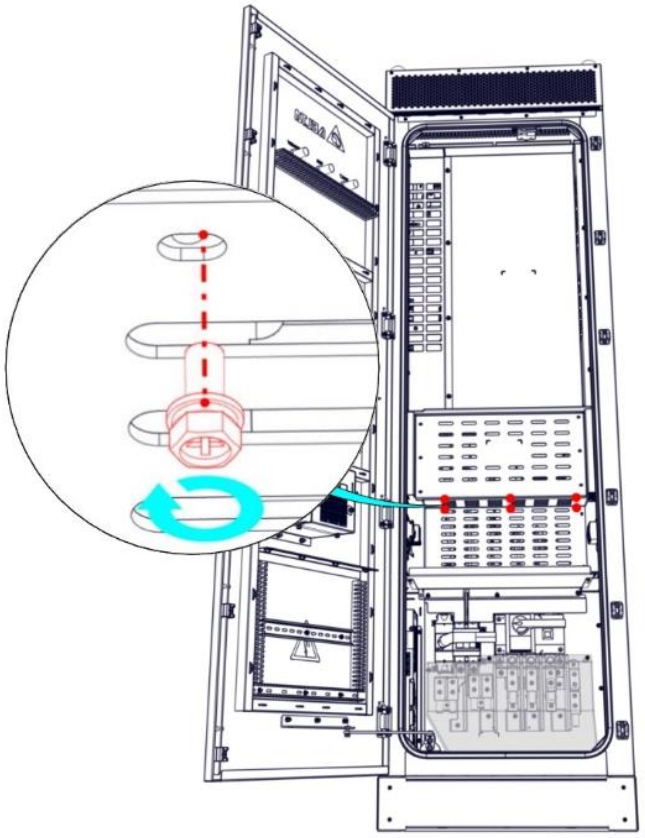

Figure 57. Fasten bottom securing bolts

14. Fasten front securing screws of safety cover.

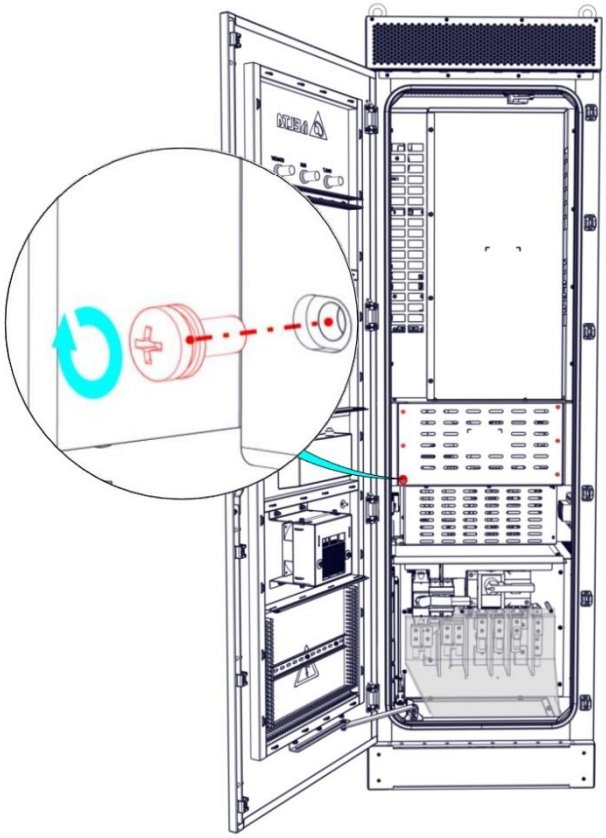

Figure 58. Fasten front screws

Emergency Stop Switch

The emergency stop switch is housed on the front panel. To facilitate maintenance on the switch, you will need access to both the internal and external sides of the front panel.

The bus capacitor discharge time is 15 minutes. Before starting any maintenance, switch power off, wait for more than 15 minutes, and check for residual voltage with a meter etc., to avoid a hazard of electrical shock.

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Note:

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- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an Emergency Stop Switch

1. Open the front panel. See “Opening a Front Panel” .
2. Locate the emergency stop button on the front panel. See the following figure.

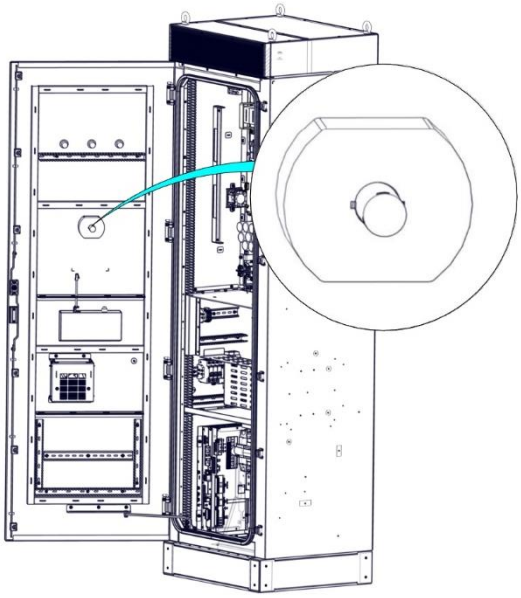

Figure 59. Emergency Stop switch Location

3. The rear side of the switch is accessible from the open panel. Locate the connecting wires on the switch.
4. The wires are secured by the screws. Loosen the captive screws to disconnect the wires.
5. Pull out the connecting wires.

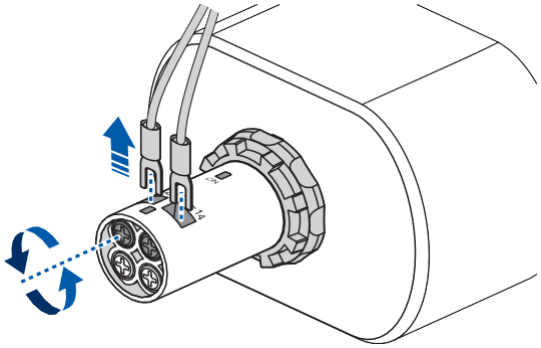

Figure 60. Disconnecting Wires on a Switch

6. Turn the locking nut to detach it from the barrel.

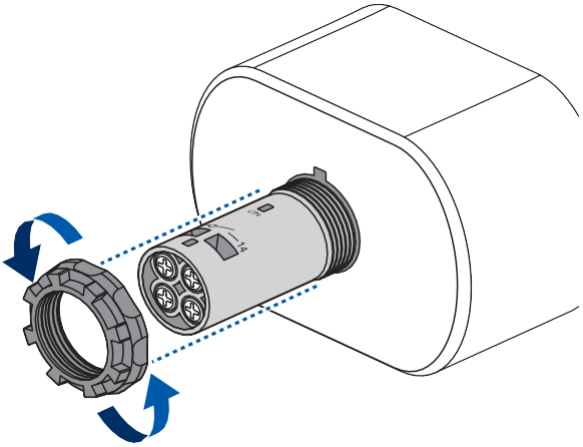

Figure 61. Removing a Locking Nut from a Switch

7. From the front of the cabinet locate the switch mechanism.
8. Grasp the switch and slide it out of the panel.

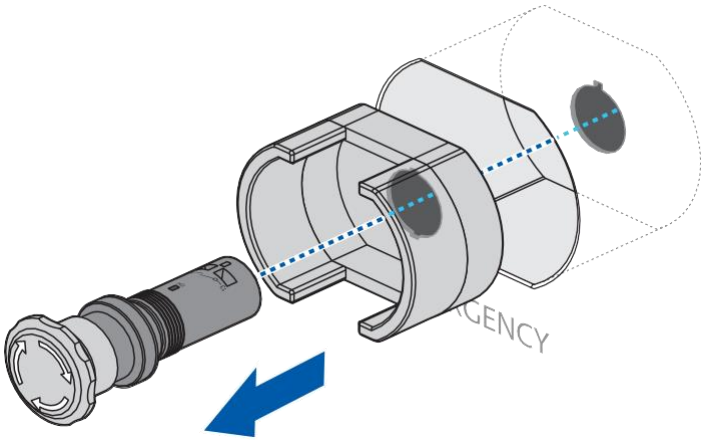

Figure 62. Removing an Emergency Stop Switch

Installing an Emergency Stop Switch

1. Open the front panel if it isn't open already. See "Opening a Front Panel" on page 20. To install an emergency stop switch, you will need to access the front and rear side of the front panel.
2. While facing the external side the front panel, locate the housing for the emergency stop switch.
3. Hold the plunger mechanism and align it so that the CN marking faces upwards and the plunger faces outwards in order to setup the proper alignment. See the following figure for further details.
4. Insert the barrel mechanism through the opening on the housing until it comes to a stop. The rubber ring in the middle of the mechanism should be flush in the opening of the housing.

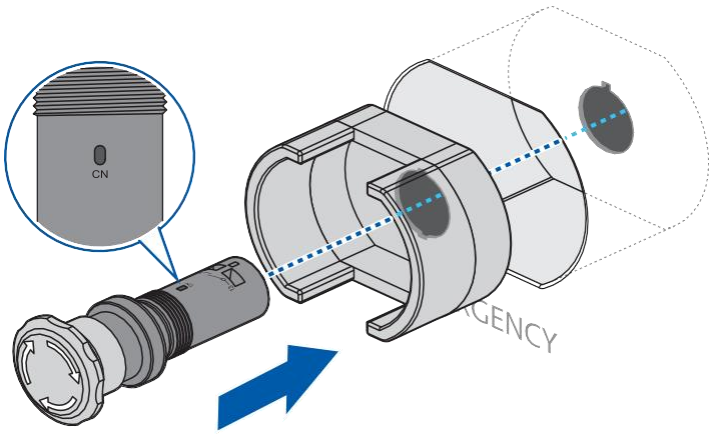

Figure 63. Inserting a Switch Mechanism in its Housing

5. Position yourself to view the inner side of the front panel. From this angle the bottom side of the plunger mechanism is visible.
6. Inspect the mechanism to make sure it is inserted correctly. The screw threads on the barrel should all be visible if the mechanism is seated correctly.
7. Make sure the CN guide marks are facing upwards
8. Take a locking nut and position it so that the flat side faces the housing mechanism.
9. Insert the nut through the barrel until it reaches the threaded section. Turn the nut until it is flush with the mechanism.

Make sure the plunger mechanism is seated securely in the housing before continuing with the remaining procedures.

If the mechanism is loose, remove the locking nut and realign the plunger mechanism before attempting to secure it with the locking nut once again.

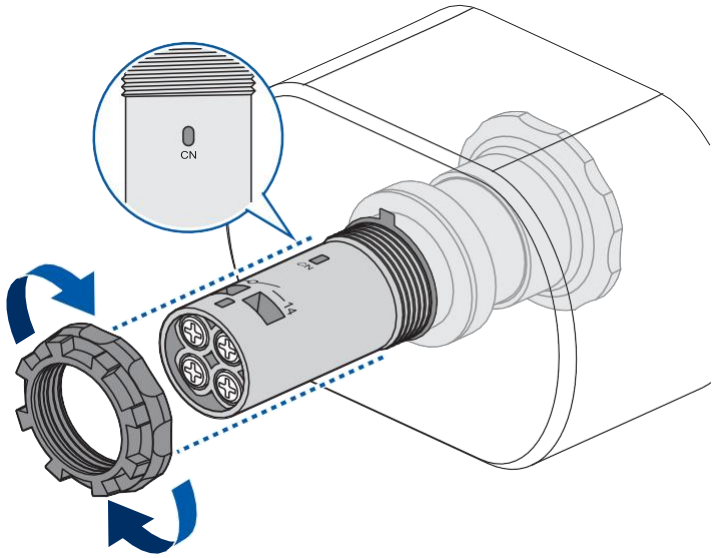

Figure 64. Installing a Locking Nut

10. Before inserting the connection wires, makes sure the CN marking is facing upwards.
11. Insert the connect (13) wire into the connector and turn the captive screw to secure it.
12. Once the first wire is secured, continue in the same way with the disconnect (14) wire.

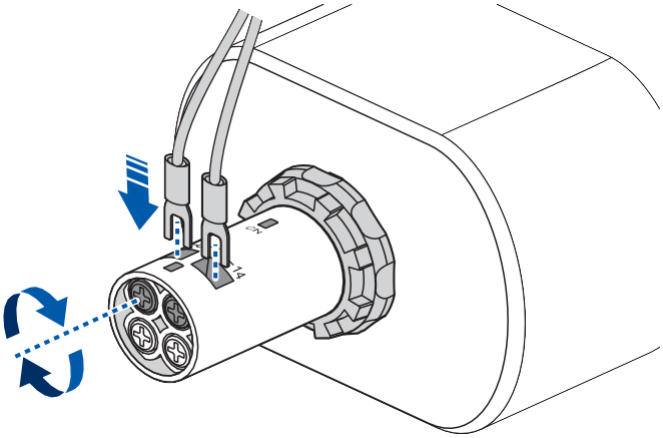

Figure 65. Connecting Wires on the Emergency Stop Switch

13. Close the front panel. See “Closing a Front Panel” on page 22.

DC Fuse Fan

The fan is housed in the cabinet. To facilitate maintenance on the fan, you will need access to the interior of the cabinet.

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Note:

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a DC Fuse Fan

The fan module is located on the front panel of the enclosure. In order to reach the fan assembly, you must first open remove the safety cover.

1. Open the front panel. See “Opening a Front Panel” .
2. Power off the PCS power. See “Power Off PCS”
3. Disconnect power cable of fan and heater.
4. Unscrew all securing nuts of fan subassembly.

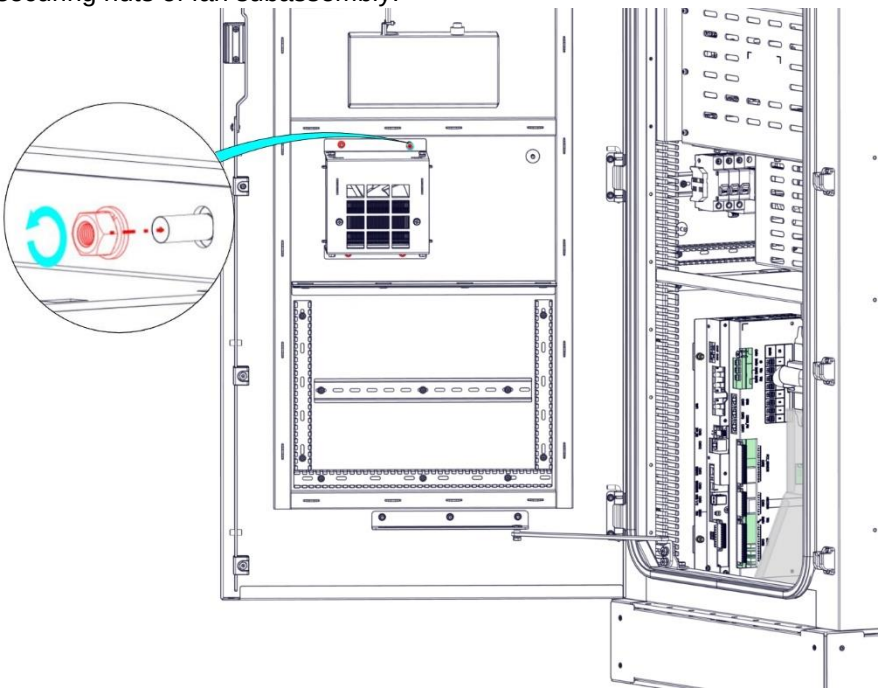

Figure 66. Unscrew securing nuts

5. Grasp the fan subassembly and take it down.

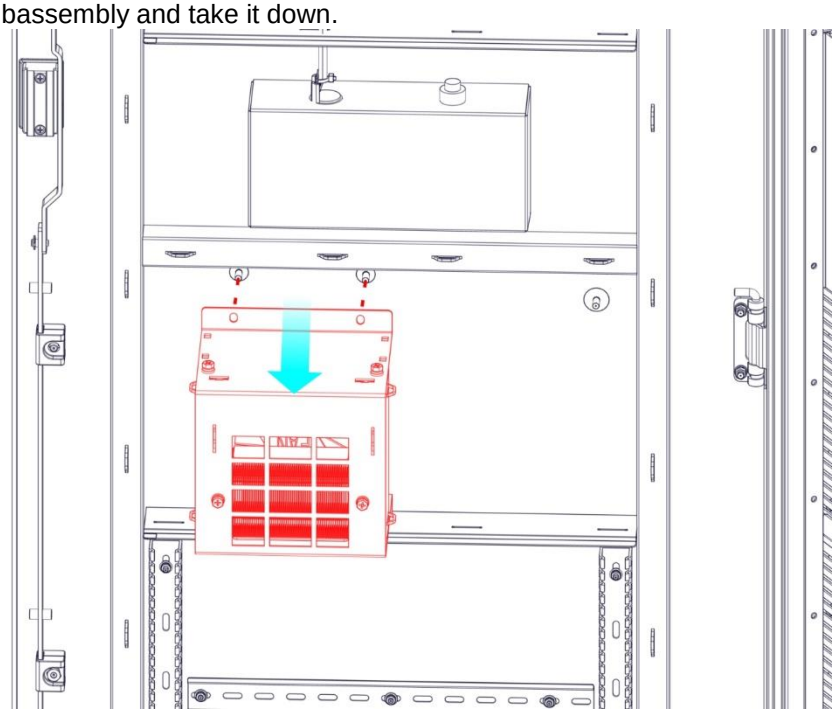

Figure 67. Take down fan subassembly

6. Unscrew the fan securing screws and separate the fan from its bracket.

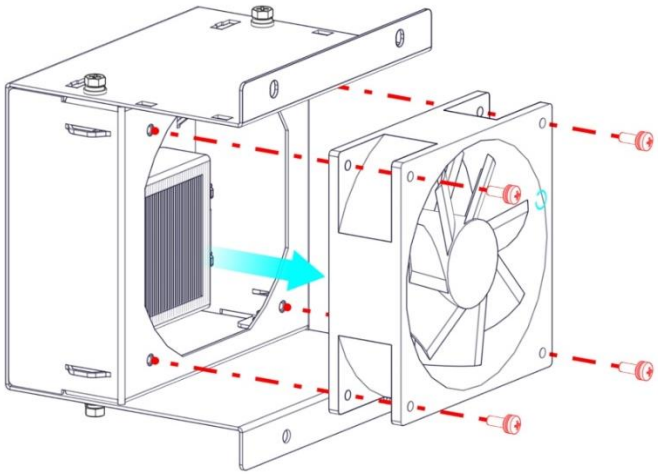

Figure 68. Separate the fan and bracket

Installing DC Fuse Fan

1. Mount fan module on its support bracket and make sure the air flow direction aligns with arrow. Normally the air flow direction is marked on side of fan module.

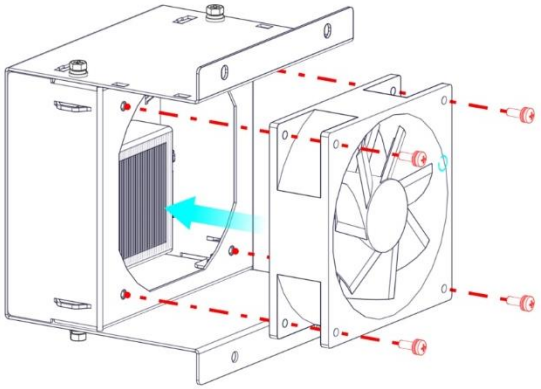

Figure 69. Assembling a DC-side Fan Assembly

2. Take up the fan subassembly and hang it on securing bolts.

Figure 70. Install the fan subassembly

3. While holding the fan assembly in place, fasten securing nuts.

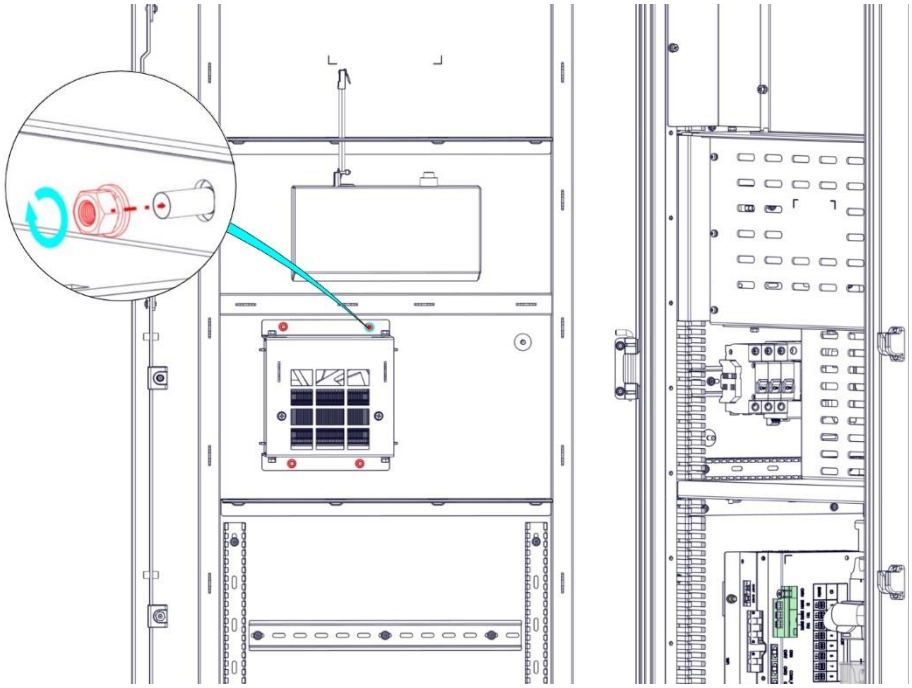

Figure 71. Fasten securing nuts

4. Reconnect the power cable of fan module and heater.
5. Close the front panel. See “Closing a Front Panel” on page 22.

DC Fuse

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- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a DC Fuse

1. Open the front panel. See “Opening a Front Panel” .
2. Remove the safety cover. See “Removing Safety Covers” .
3. Remove the screws securing the DC fuse.

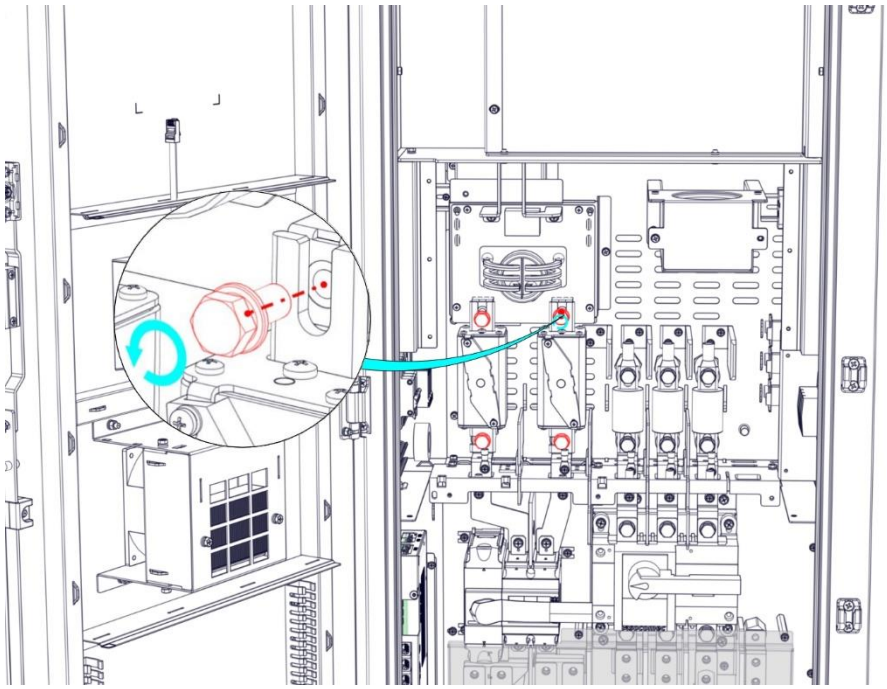

Figure 72. Removing DC Fuse securing bolts

4. Remove the DC fuse.

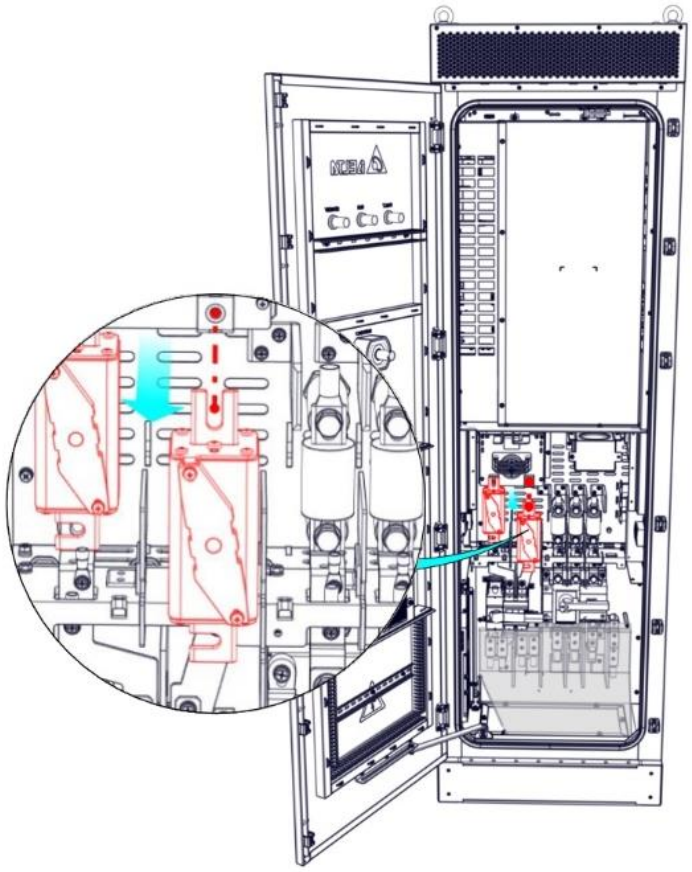

Figure 73. Removing a DC Fuse

Installing a DC Fuse

1. Align the DC fuse with the holes on the chassis.

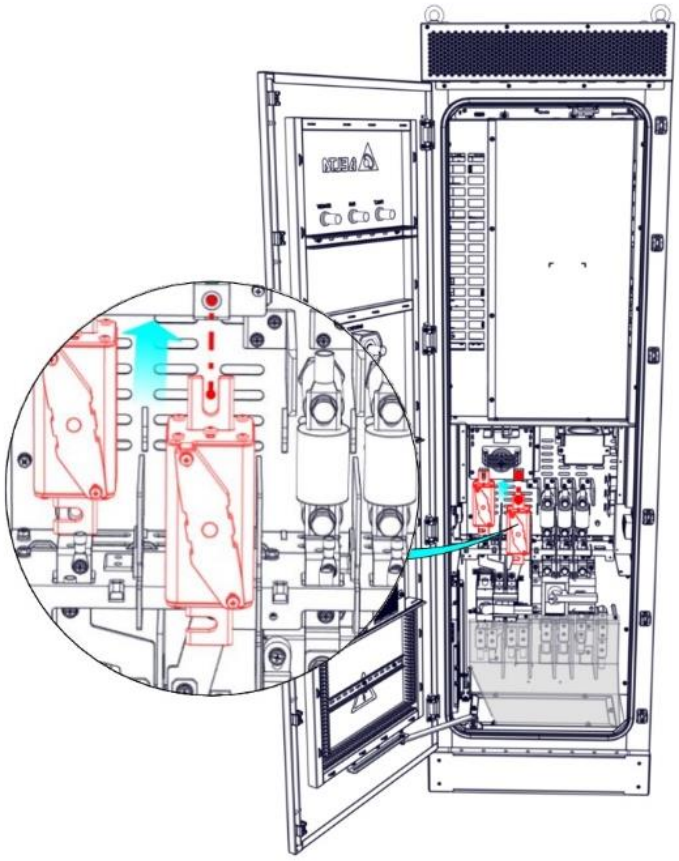

Figure 74. Installing a DC Fuse

2. Secure the DC fuse with bolts.

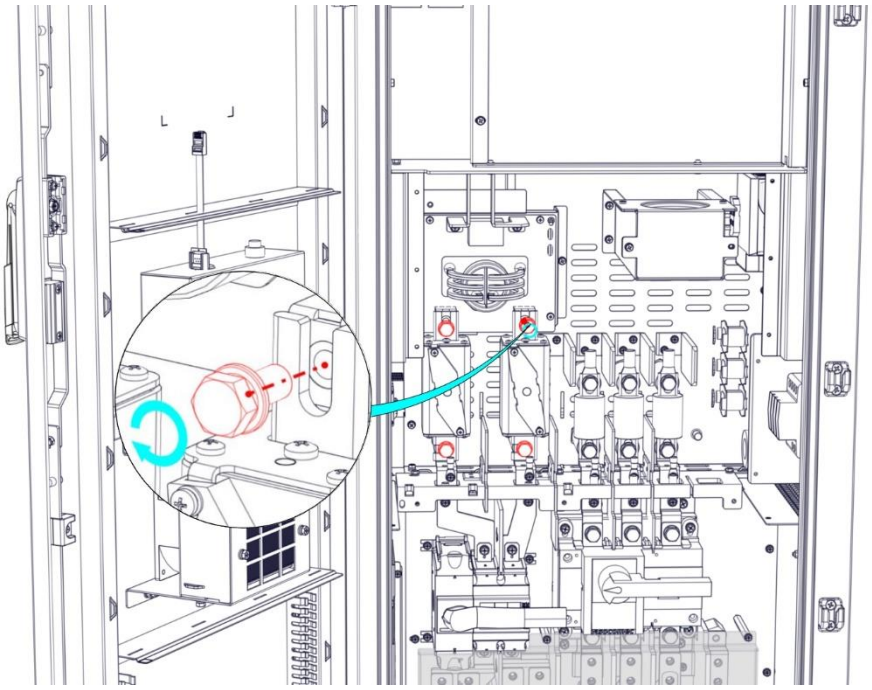

Figure 75. Screw the securing bolts

3. Installing a safety cover. See “Installing Safety Covers”.
4. Close the front panel. See “Closing a Front Panel” .

AC Fuse

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- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an AC Fuse

1. Open the front panel. See “Opening a Front Panel” .
2. Remove the safety cover. See “Removing Safety Covers” .
3. Remove the screws securing the AC fuse.

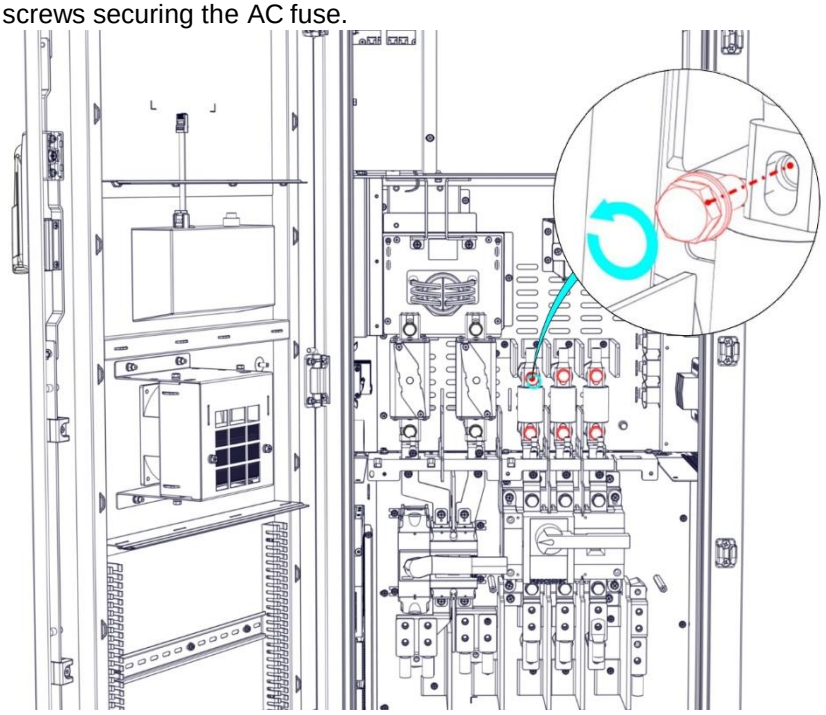

Figure 76. Removing securing bolts

4. Remove the AC fuse.

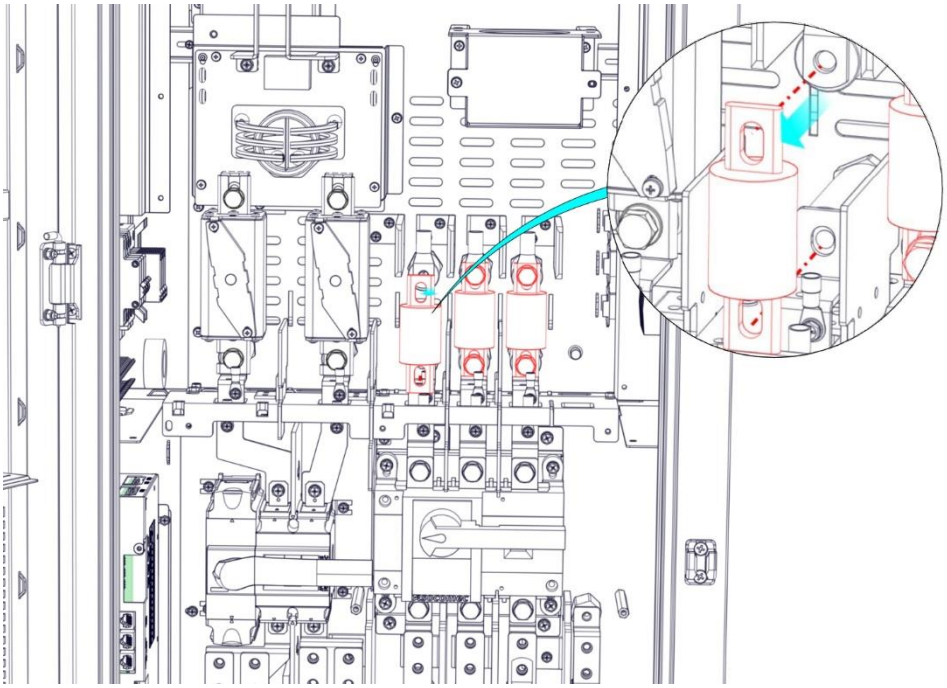

Figure 77. Removing an AC Fuse

Installing an AC Fuse

1. Align the AC fuse and secure the AC fuse with bolts.

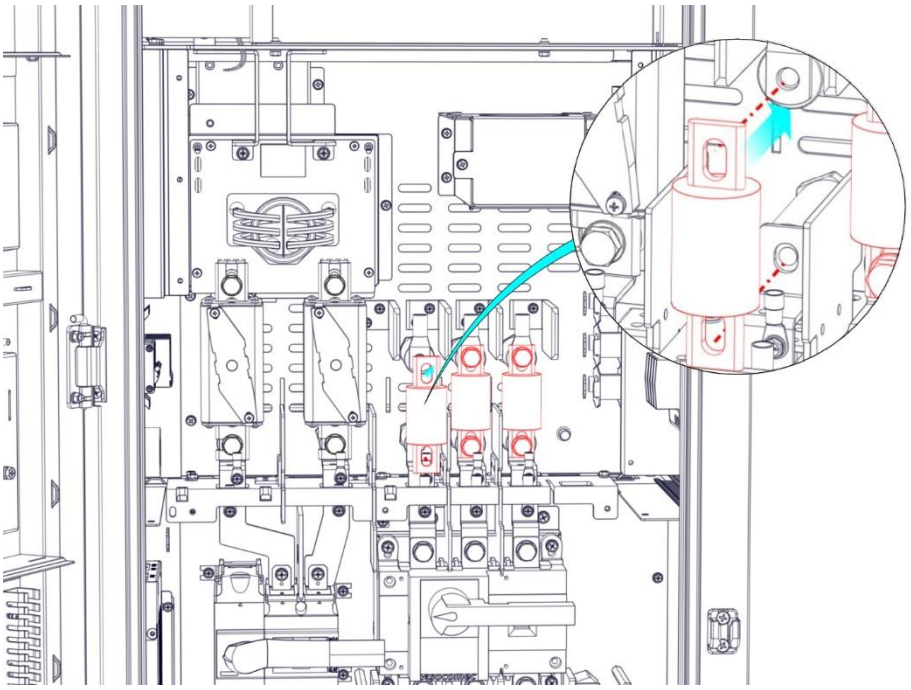

Figure 78. Installing an AC Fuse

2. Secure the AC fuse with bolts.

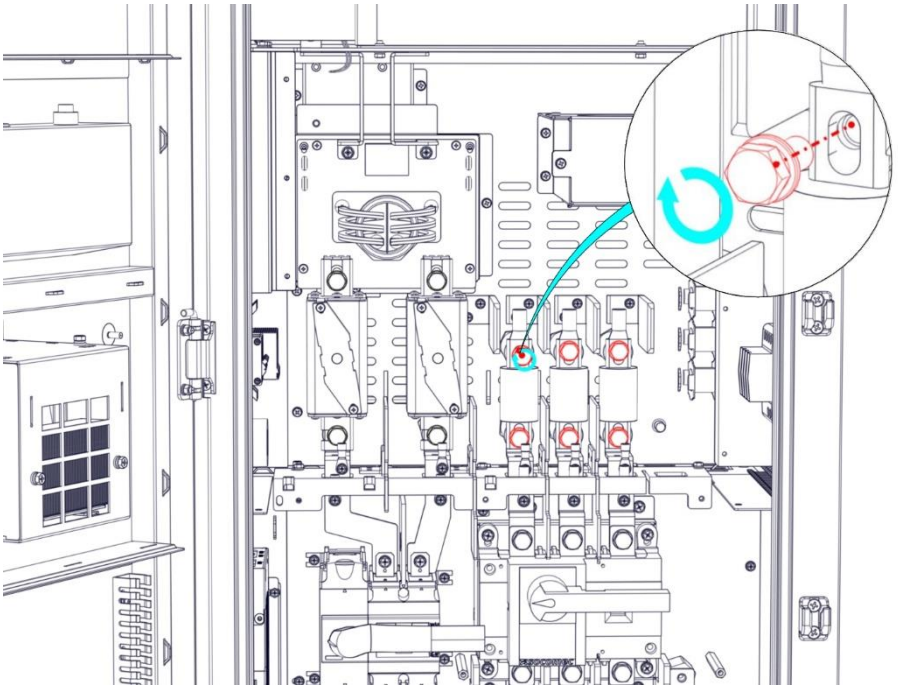

Figure 79. Fasten securing bolts

3. Installing a safety cover. See “Installing Safety Covers”.
4. Close the front panel. See “Closing a Front Panel” .

DC EMI Filter Board (F Board)

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- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an F Board

1. Open the front panel. See “Opening a Front Panel”.
2. Remove the safety cover. See “Removing Safety Covers”.
3. Remove DC fuse. See “Removing DC Fuse”.
4. Remove the bolts securing the F board and copper bus bar.

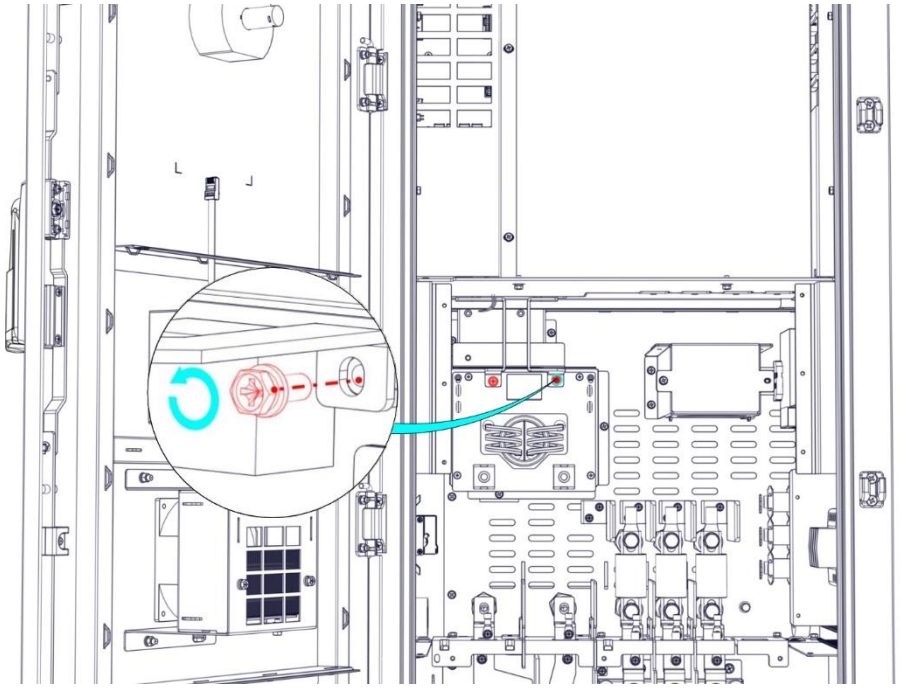

Figure 80. Removing bolts

5. Remove the screws securing the F board.

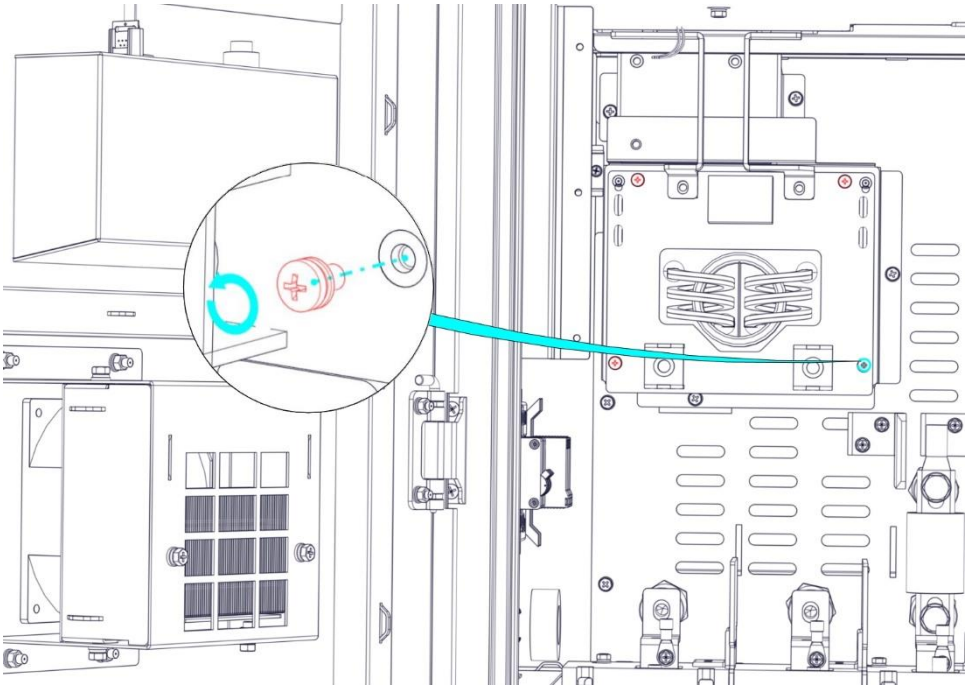

Figure 81. Removing F board securing screws

6. Slip the F board downward and take it out.

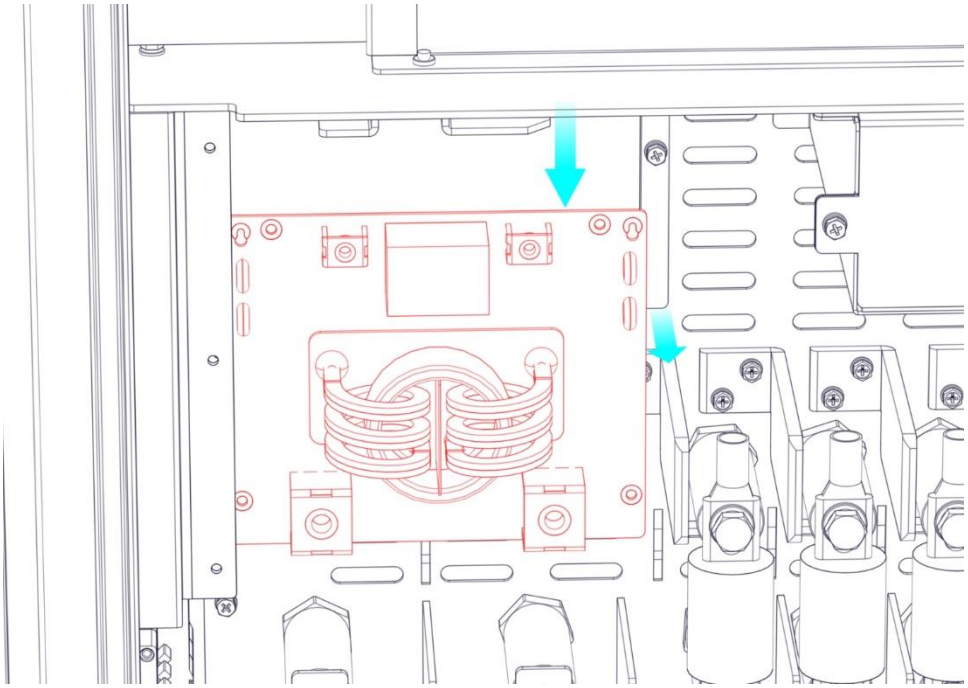

Figure 82. Removing an F Board

Installing an F Board

1. Slip a F board upward and align the securing holes.

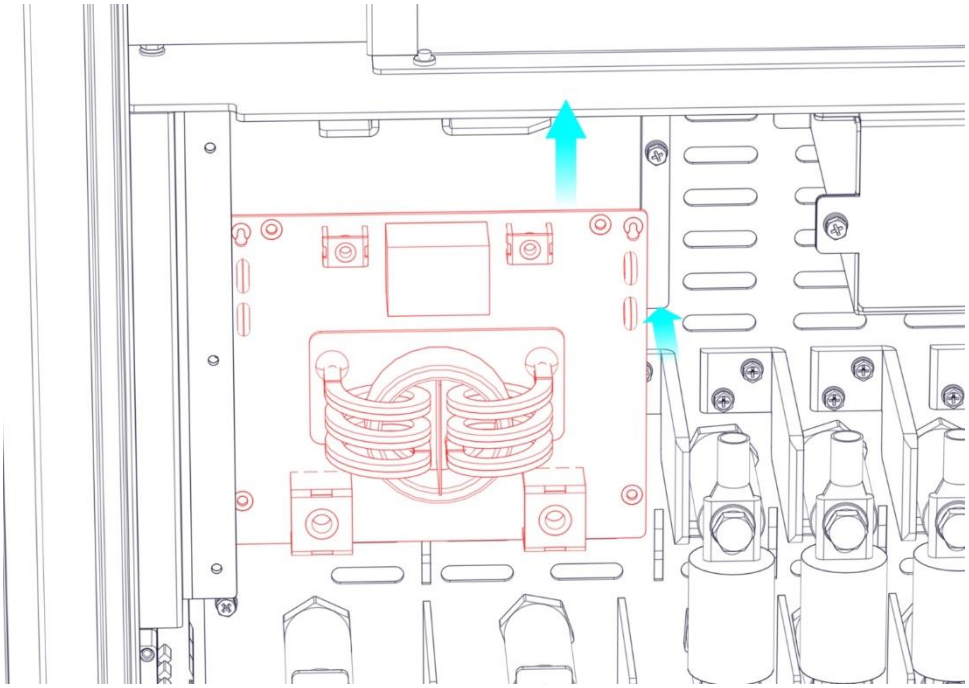

Figure 83. Installing an F Board

2. Secure the F board with screws.

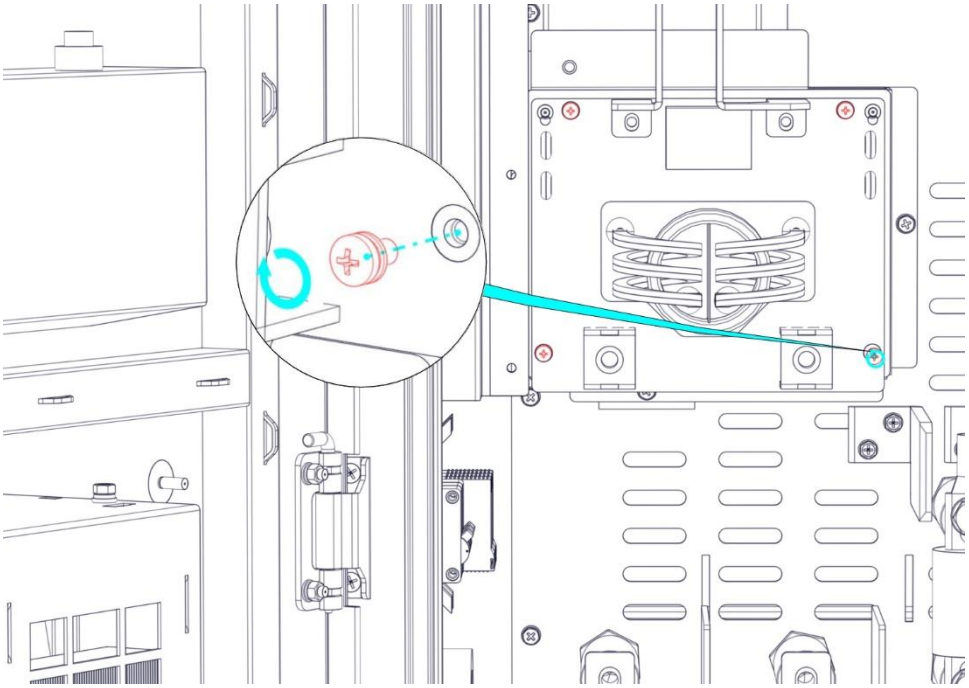

Figure 84. Installing an F Board

3. Securing the copper bus bar to F board with bolts.

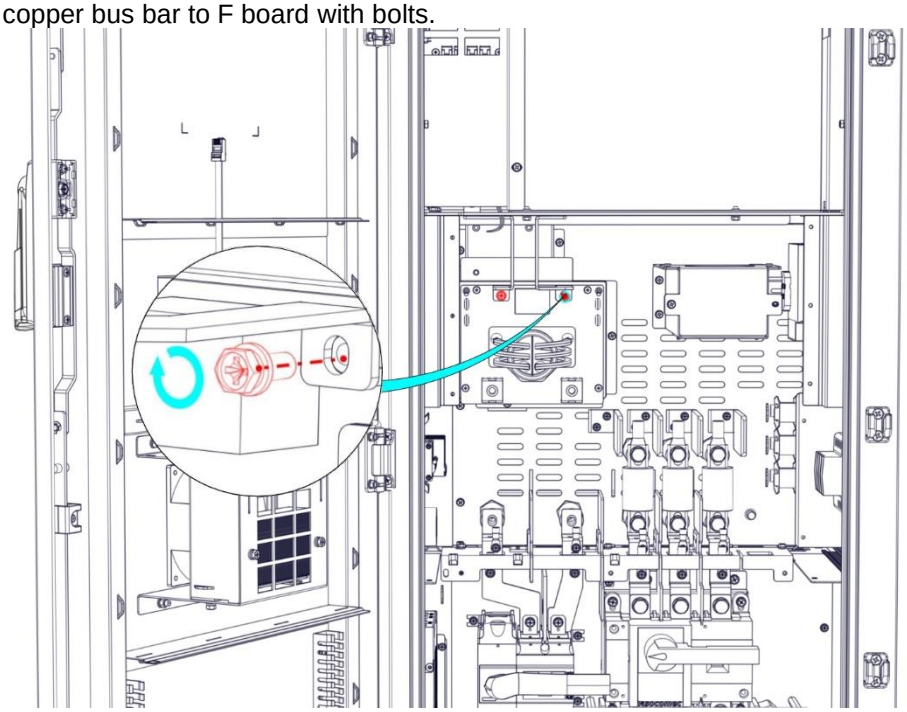

Figure 85. Fasten bolts

4. Install a DC fuse. See “Installing a fuse”.
5. Installing a safety cover. See “Installing a Safety Cover”.
6. Close the front panel. See “Closing a Front Panel”.

AC Switch

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- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an AC Switch

1. Open the front panel. See “Opening a Front Panel”.
2. Remove the safety cover. See “Removing a Safety Cover”.
3. Unscrew the breaker terminals connecting bolts.

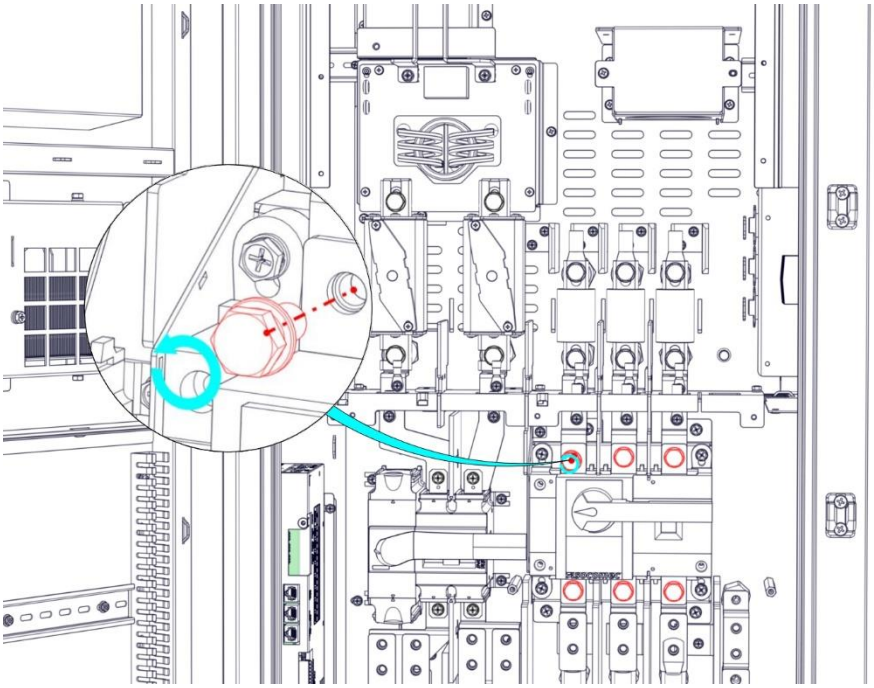

Figure 86. Unscrew terminals bolts

4. Unscrew breaker securing bolts.

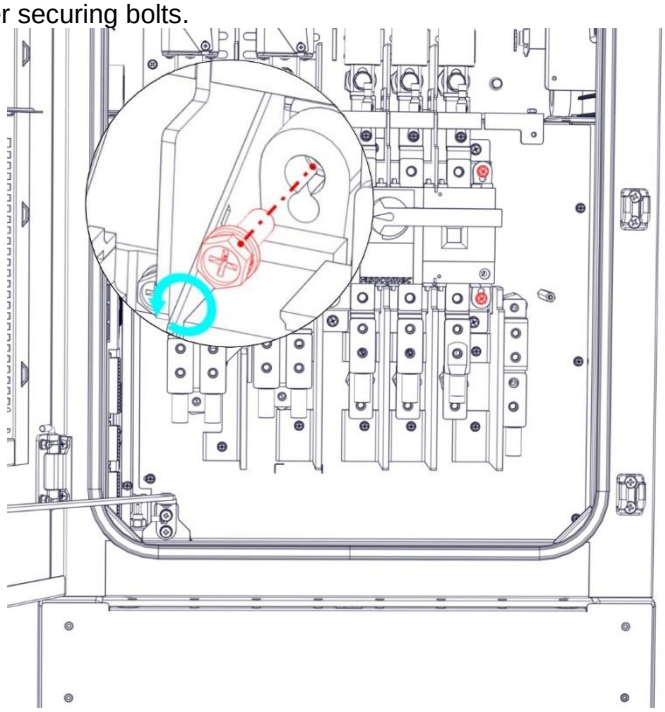

Figure 87. Unscrew breaker securing bolts

5. Grasp breaker and take it out carefully, due to it a little heavy.

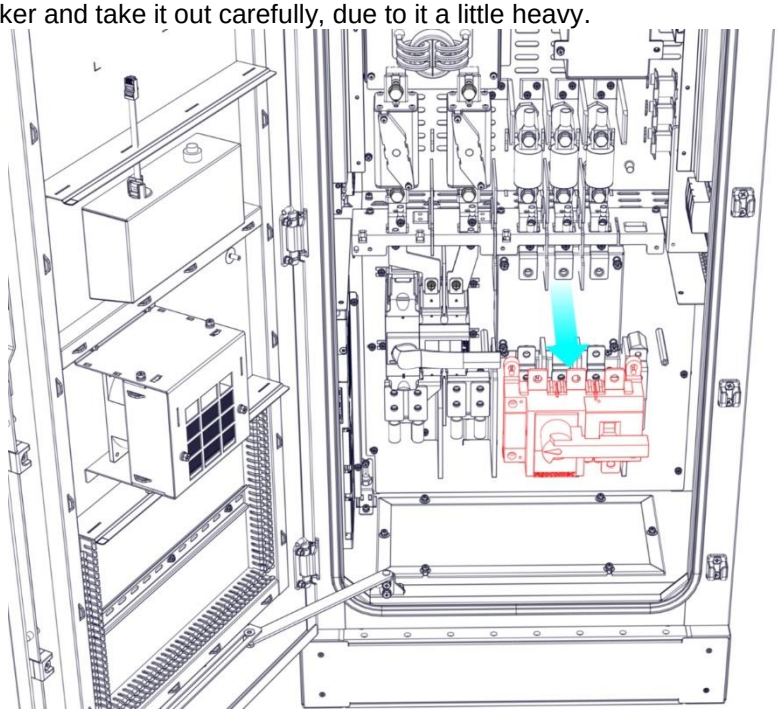

Figure 88. Take out breaker

Installing an AC Switch

1. Align the securing holes of AC breaker with the post on the chassis.

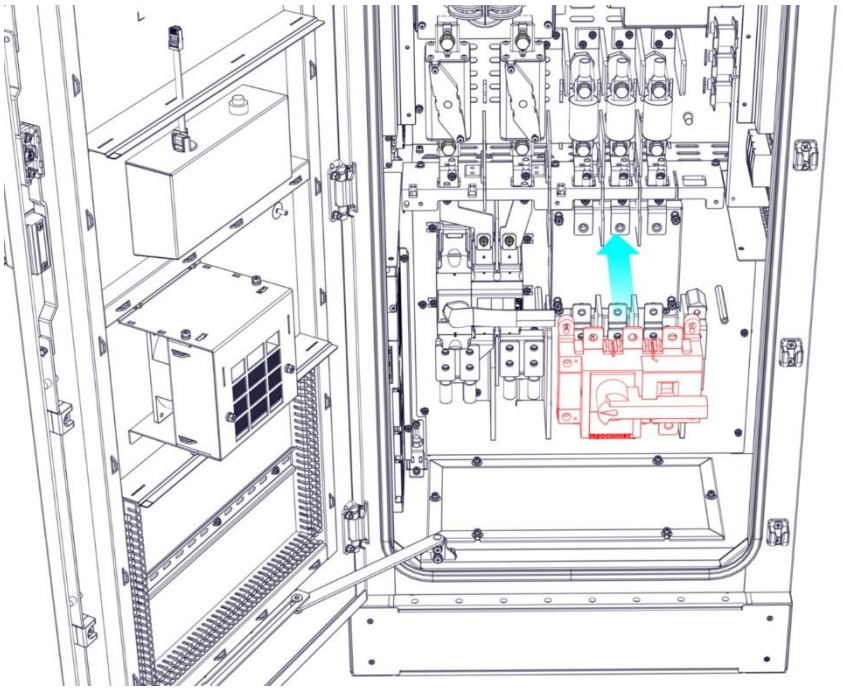

Figure 89. Installing AC breaker

2. Secure the AC switch with bolts.

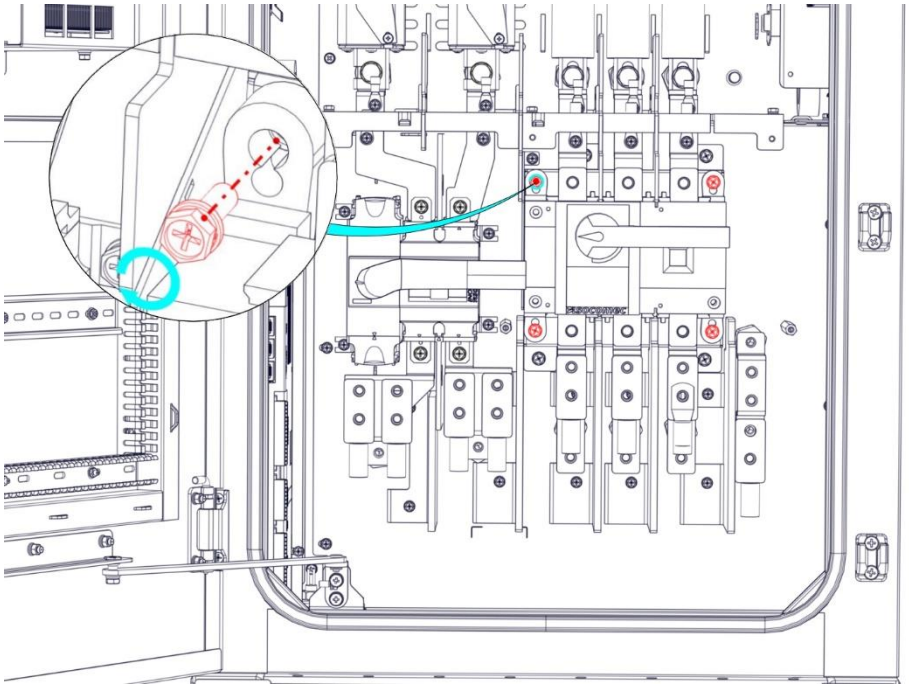

Figure 90. Fasten securing bolts

3. Fasten AC breaker terminals bolts.

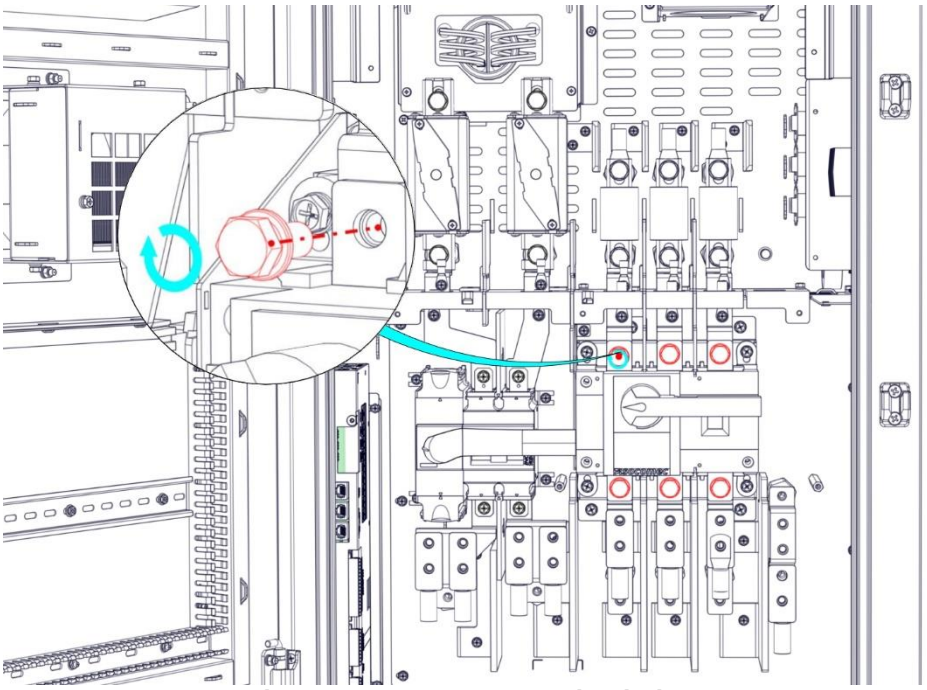

Figure 91. Fasten securing bolts

4. Secure the wires, washers and brackets with screws.
5. Install the safety cover. See “Installing safety covers”
6. Close the front panel. See “Closing a Front Panel”

DC Switch

WARNING!

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CAUTION!

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DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Important Safety Instructions

It is important to remember that the PCS is designed to supply power even when it is disconnected from the power grid. The interior of the PCS is unsafe until the DC power source is disconnected and the AC/ DC inputs are disengaged. It is recommended to wait a period of at least five minutes for capacitor bleed-off before attempting to service any components.

Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a DC Switch

1. Open the front panel. See “Opening a Front Panel” .
2. Remove the safety cover. See “Removing Safety Covers”.
3. Unscrew the breaker terminals connecting bolts.

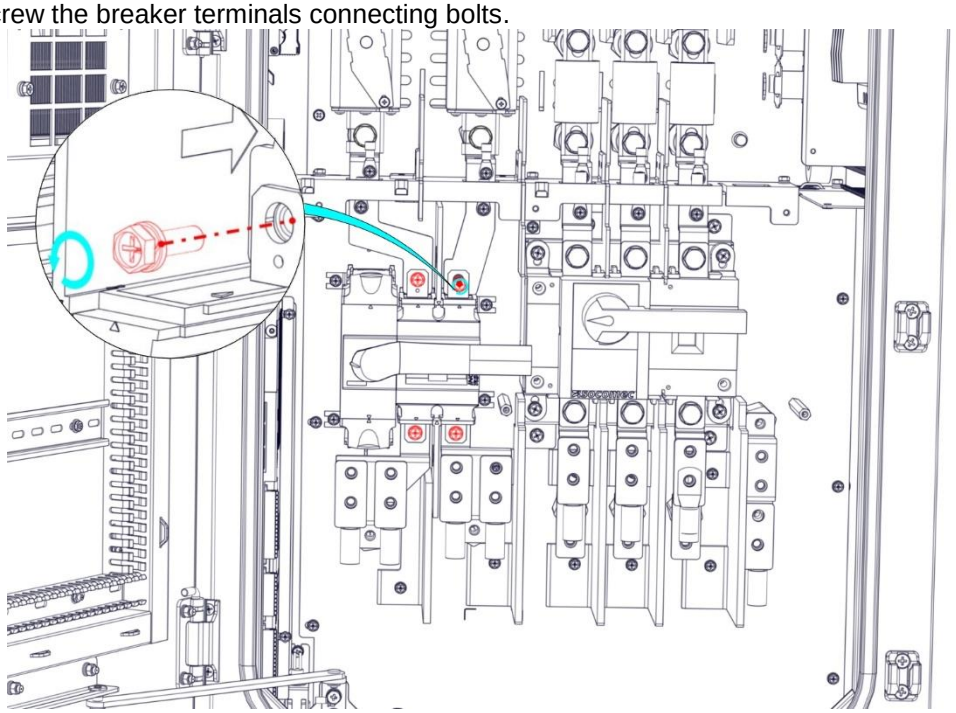

Figure 92. DC Switch Location

4. Unscrew breaker securing bolts

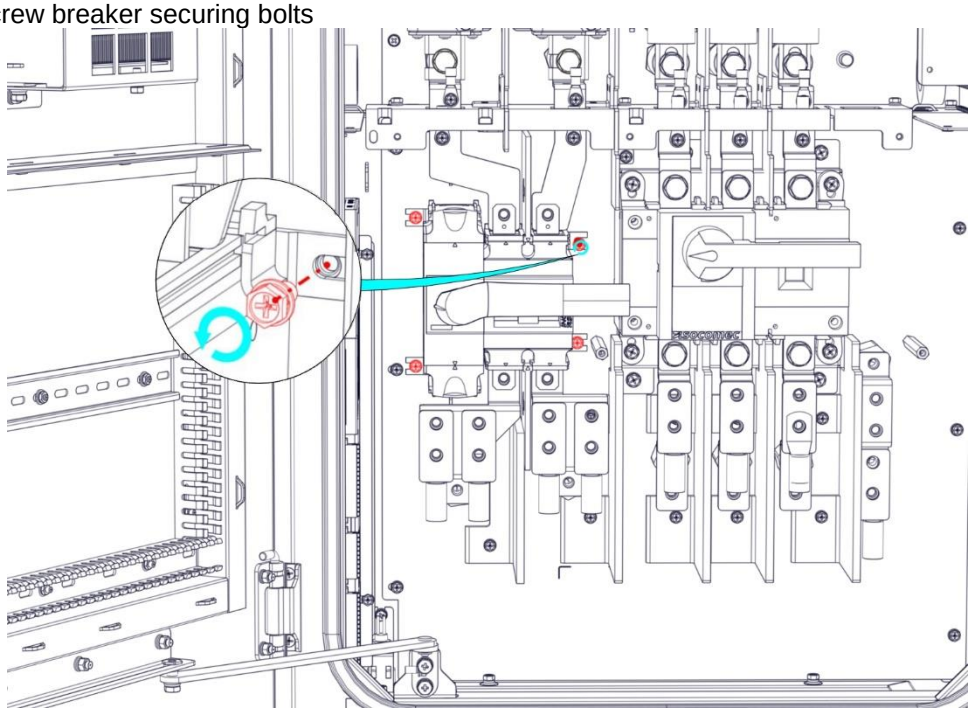

Figure 93. Removing a Cable

5. Grasp the DC breaker and take it out.

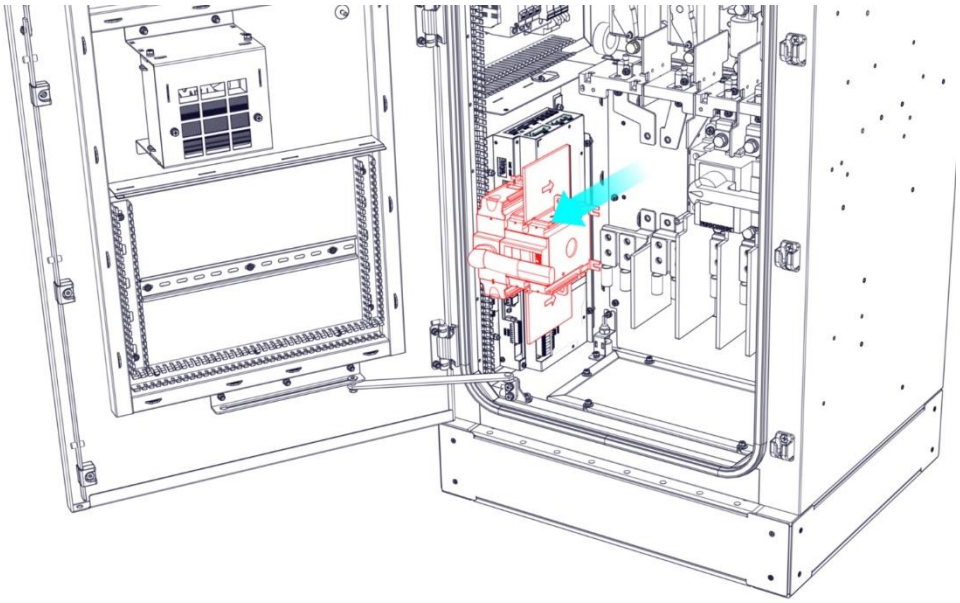

Figure 94. Take out the DC breaker

Installing a DC Switch

1. Align the holes on the DC switch with the posts on the chassis.

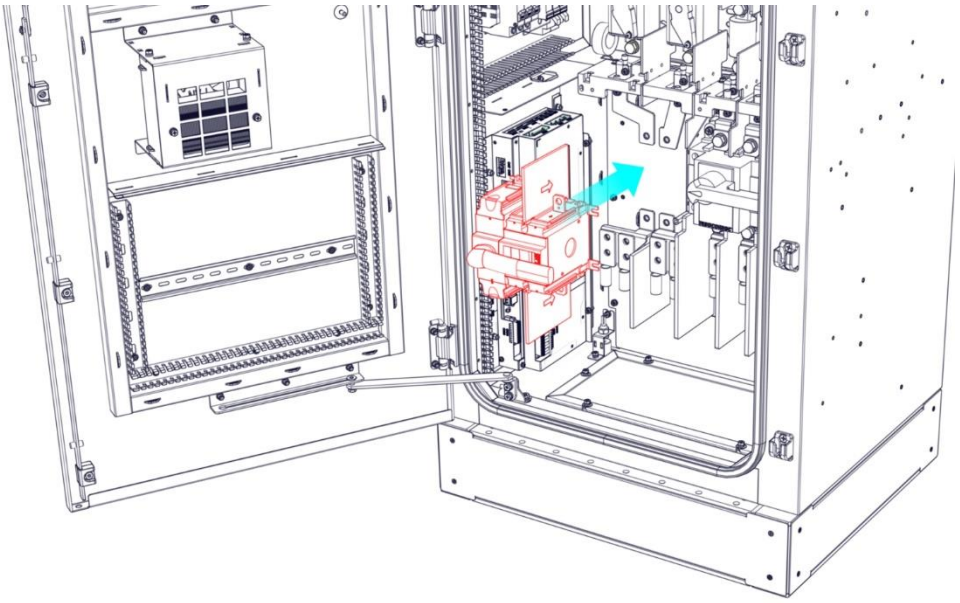

Figure 95. Installing a DC Switch

2. Secure the DC switch with screws.

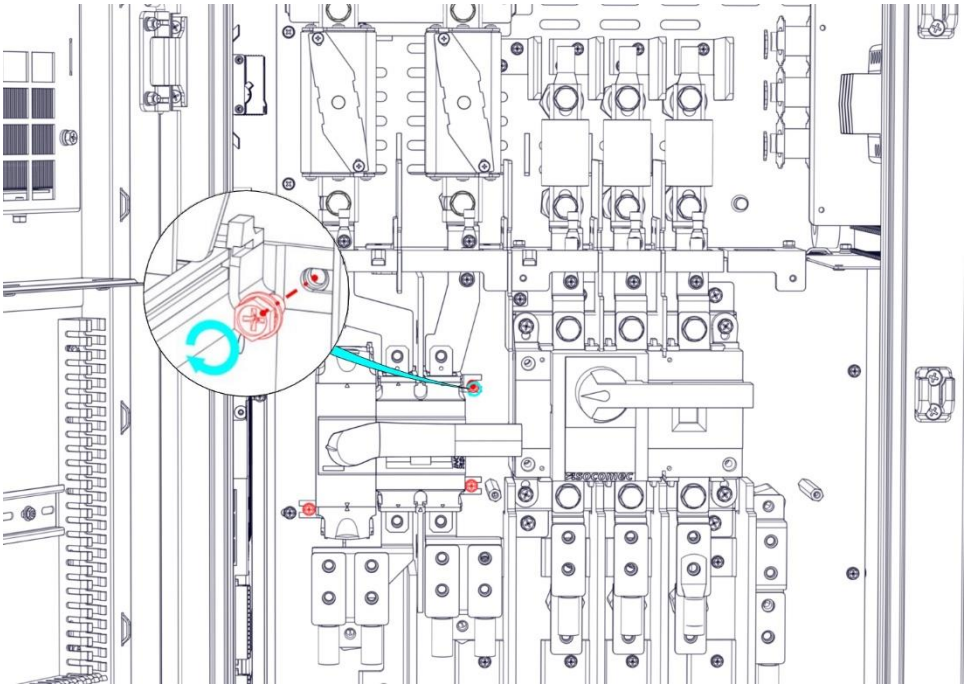

Figure 96. Secure the DC breaker

3. Fasten AC breaker terminals bolts.

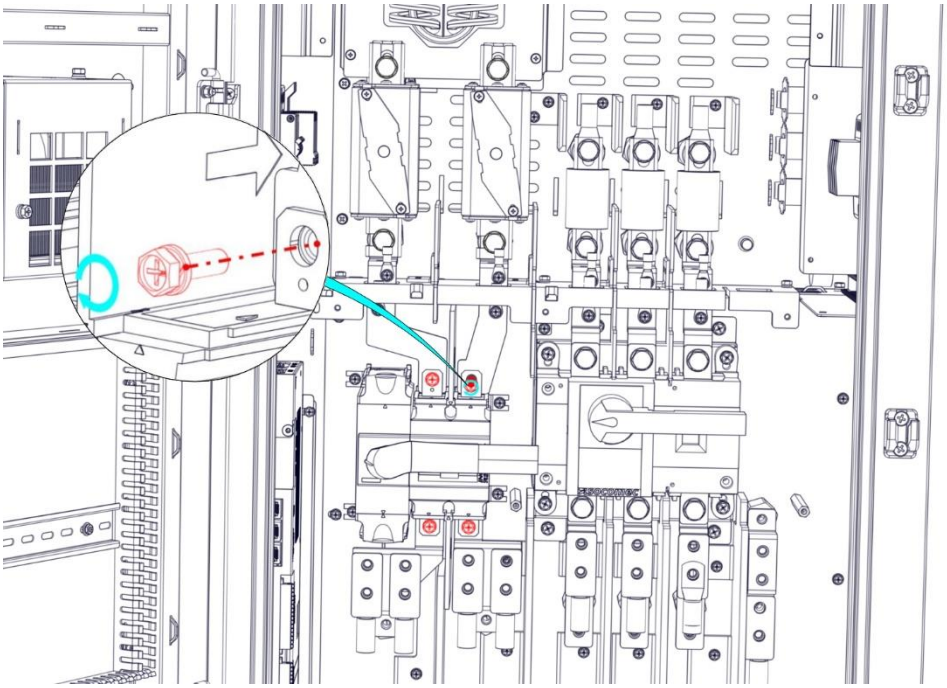

Figure 97. Fasten terminal bolts

4. Installing a safety cover. See “Installing Safety Covers”.
5. Close the front panel. See “Closing a Front Panel” .

AC EMI Relay Aux Board (A Board)

WARNING!

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CAUTION!

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Important Safety Instructions

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Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an A Board

1. Open the front panel. See “Opening a Front Panel”.
2. Remove safety covers. See “Removing safety covers”.
3. Locate the A board.

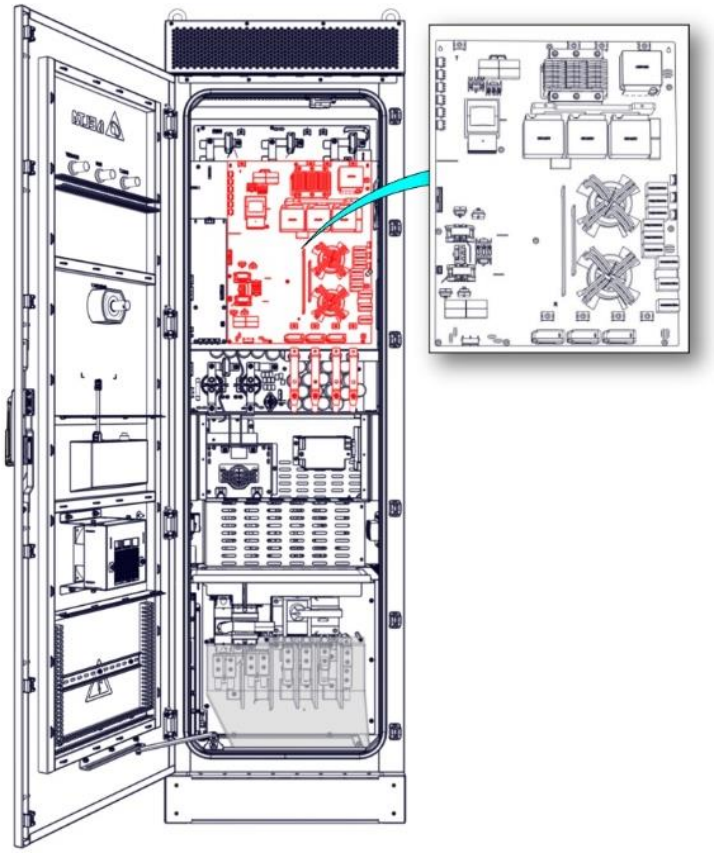

Figure 98. A Board Location

4. Disconnect the cables from the A board.
5. Unscrew the securing bolts of copper bus bar which connects A board and D board, and remove the copper bus bar.

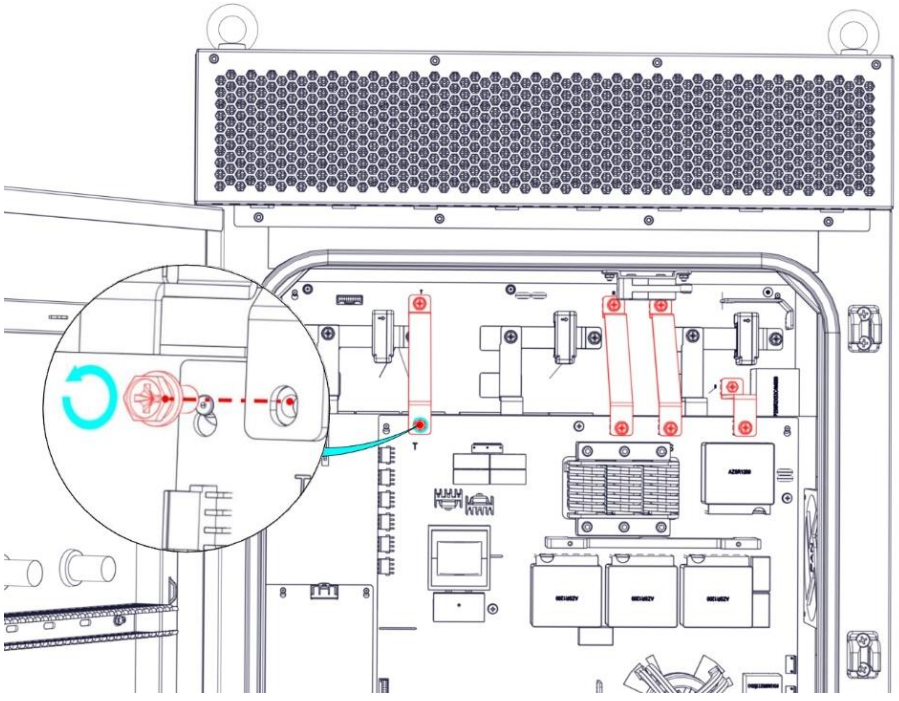

Figure 99. Remove copper bus bar

6. Unscrew the securing bolts of AC copper bus bars which connect AC breaker to A board.

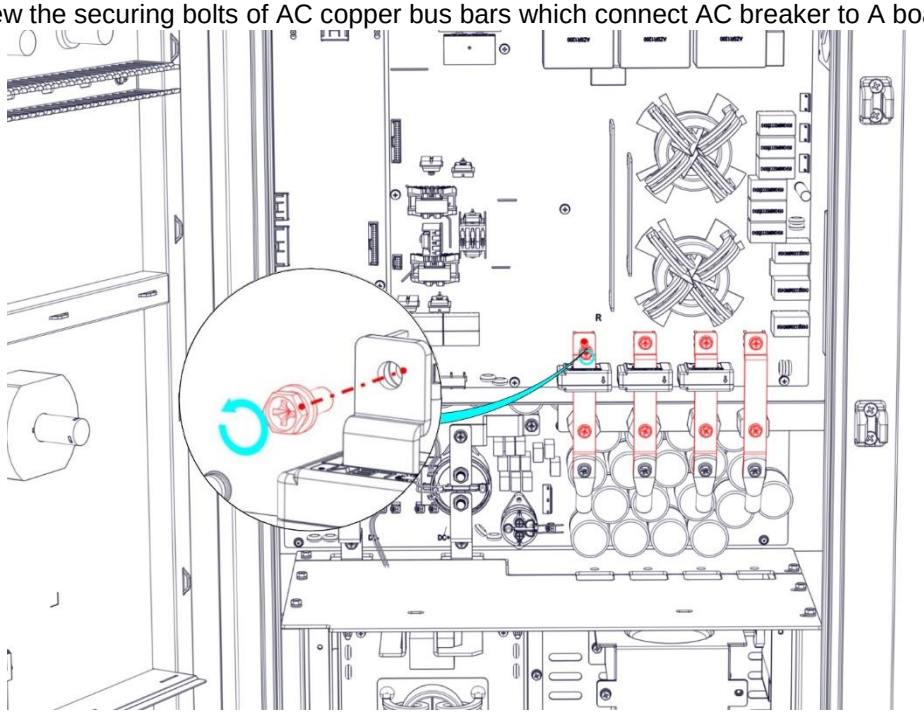

Figure 100. Unscrew securing bolts

7. Pull the copper bus bars downward, till they are out of the current sensor fully.

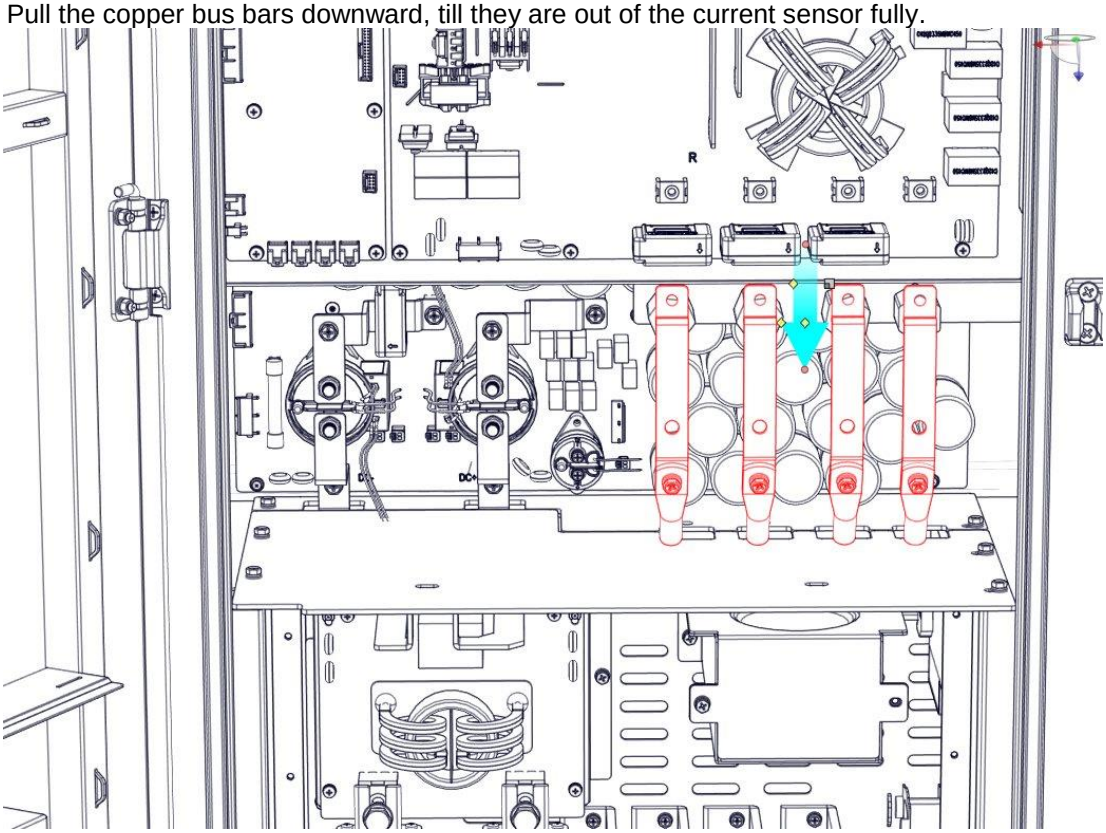

Figure 101. Pull out AC copper bus bar

8. Unscrew all A board securing screws.

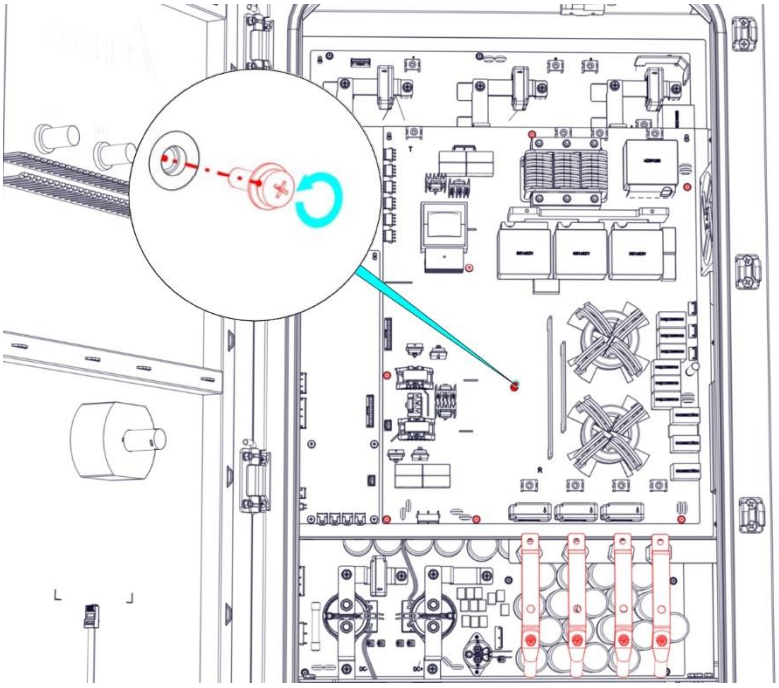

Figure 102. Unscrew securing screws

9. Remove the A board

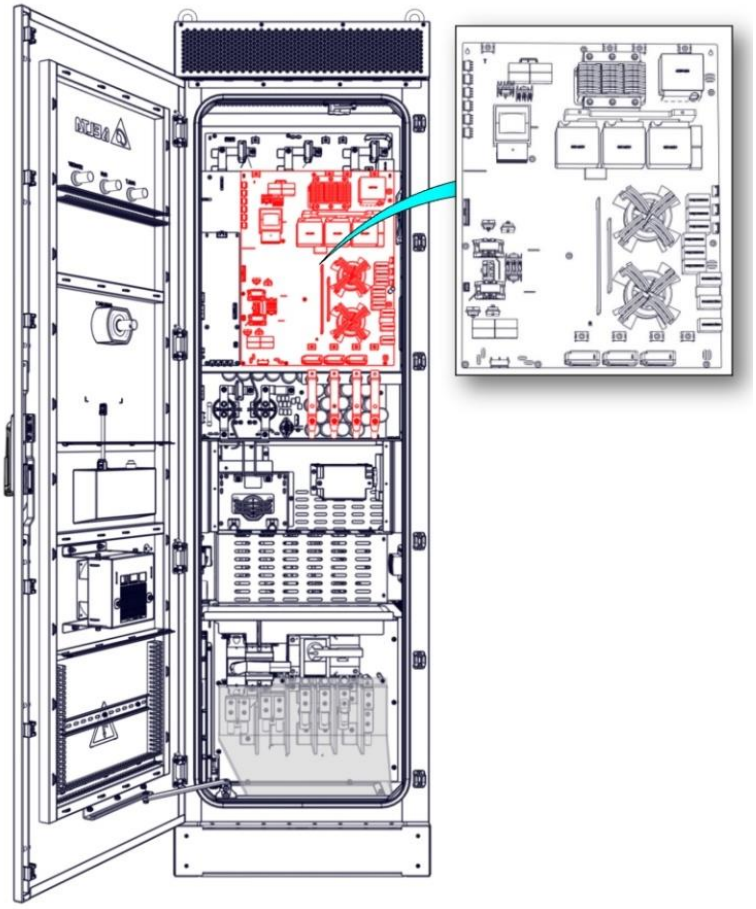

Figure 103. Removing an A Board

Installing an A Board

1. Align the holes on the A board with the holes on the bracket, and fasten all securing screws.

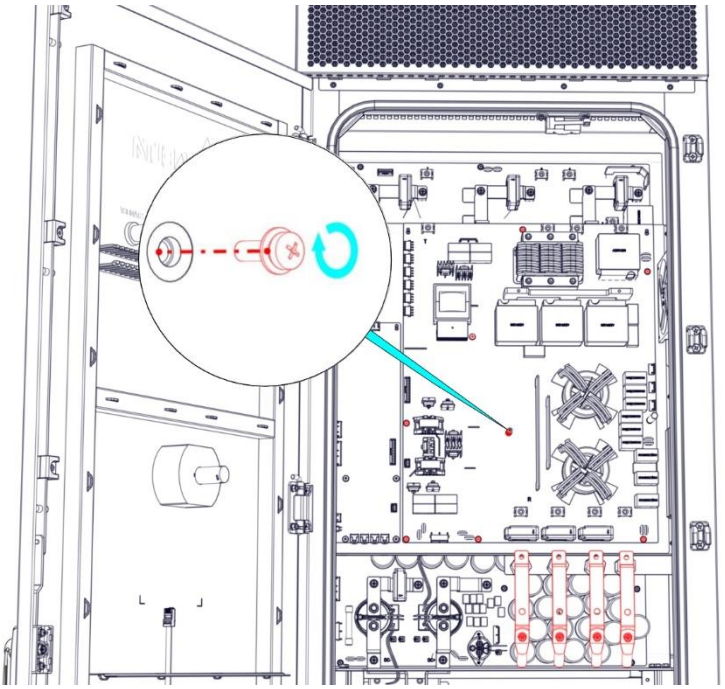

Figure 104. Installing an A Board

2. Lead the AC copper bus bars through current sensors, and don't mistake their position.

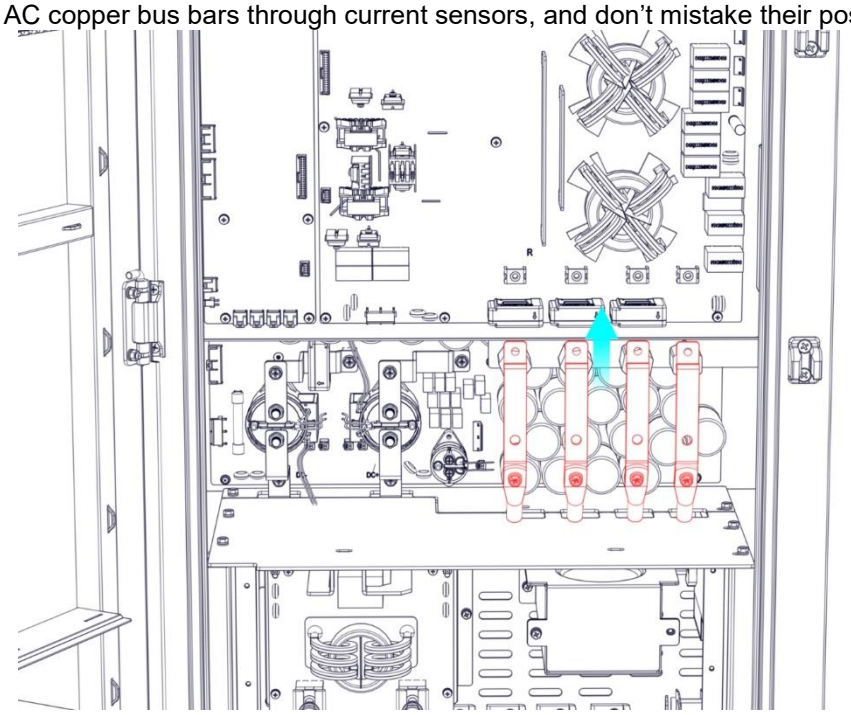

Figure 105. Install AC copper bus bar

3. Fasten all securing bolts of AC copper bus bar.

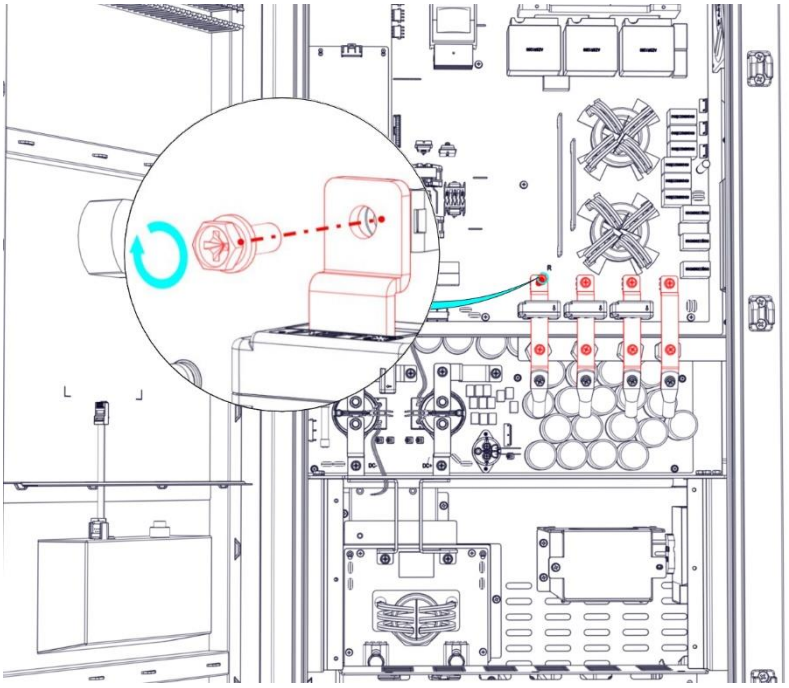

Figure 106. Fasten securing bolts of AC bus bar

4. Install copper bus bars connecting A board and D board, and fasten all securing bolts.

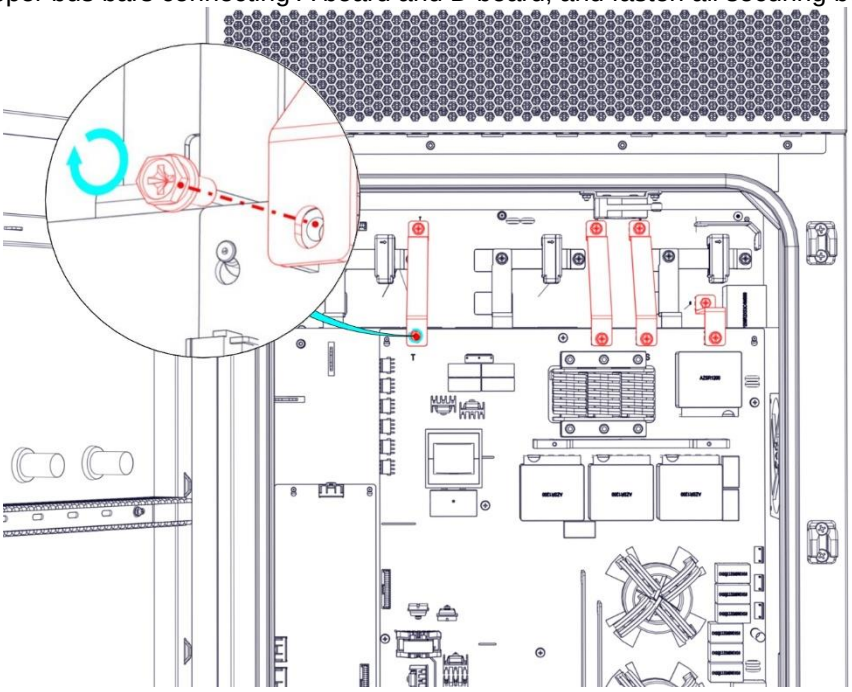

Figure 107. Install copper bus bar

5. Connect all cables to A board.
6. Install the safety covers. See “Install safety Cover”.
7. Close the front panel. See “Closing a Front Panel” .

Module Control Board (C Board)

WARNING!

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Important Safety Instructions

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Note:

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an C Board

1. Open the front panel. See “Opening a Front Panel”.
2. Remove the safety covers. See “Removing Safety Covers”.
3. Locate the C board.

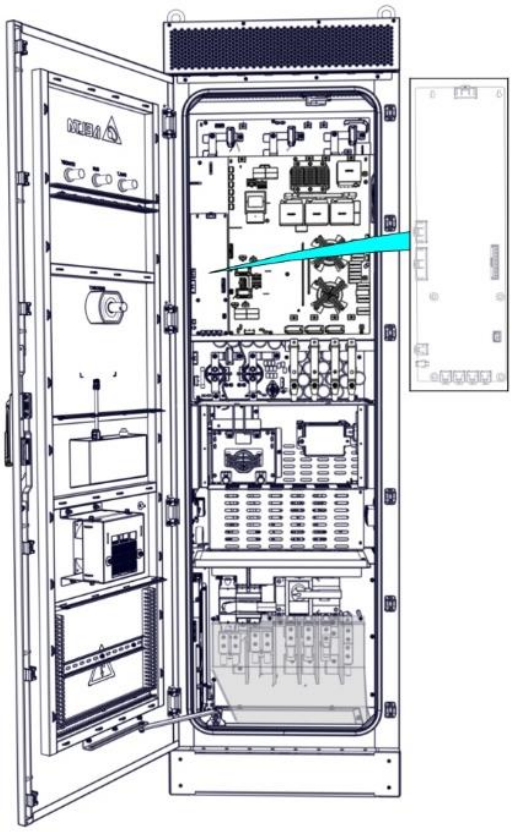

Figure 108. S Board Location

4. Disconnect the cables from the C board.
5. Unscrew all C board securing screws.

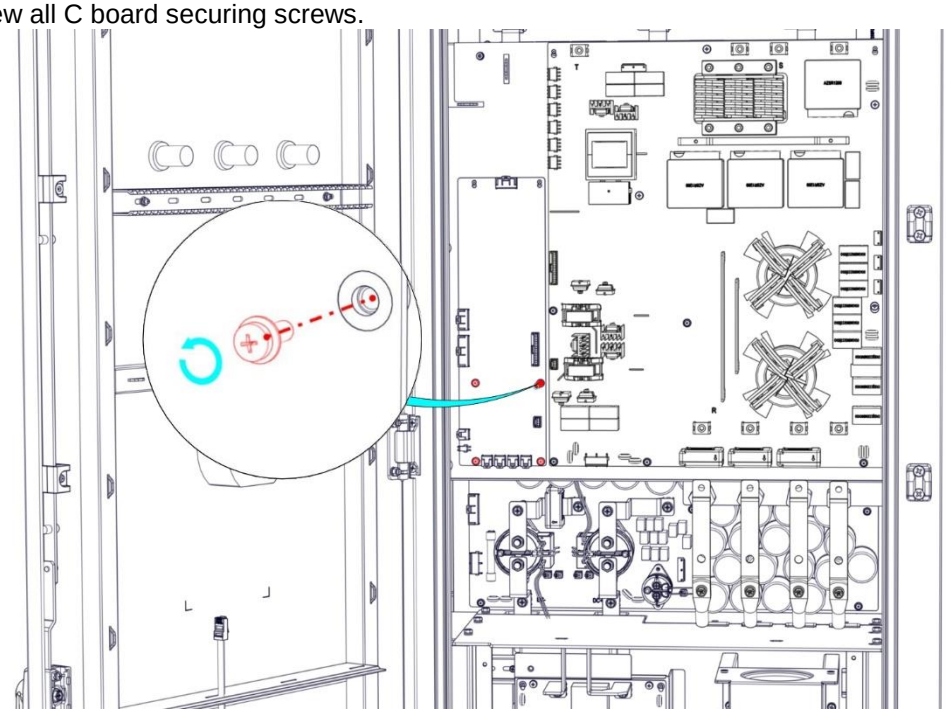

Figure 109. Disconnecting the Cables

6. Remove the S board

Installing an C Board

1. Locate the C board.

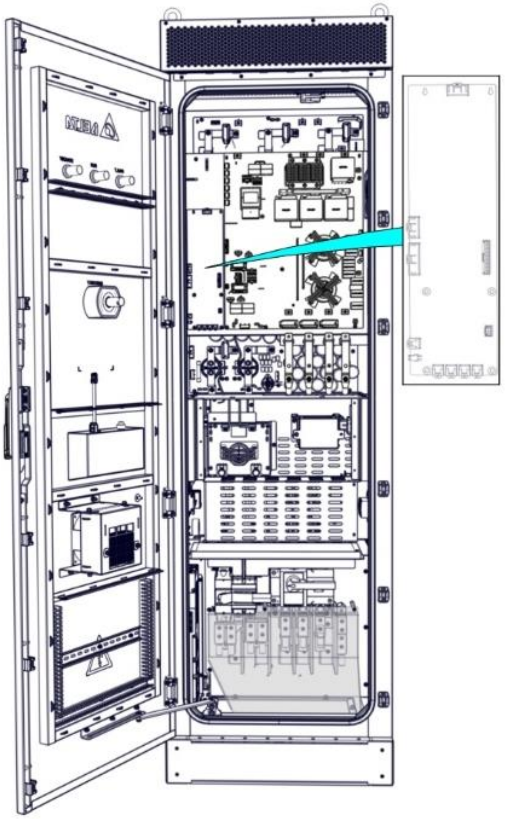

Figure 110. S Board Location

2. Align the holes on the C board with the holes on the chassis, and fasten all securing screws.

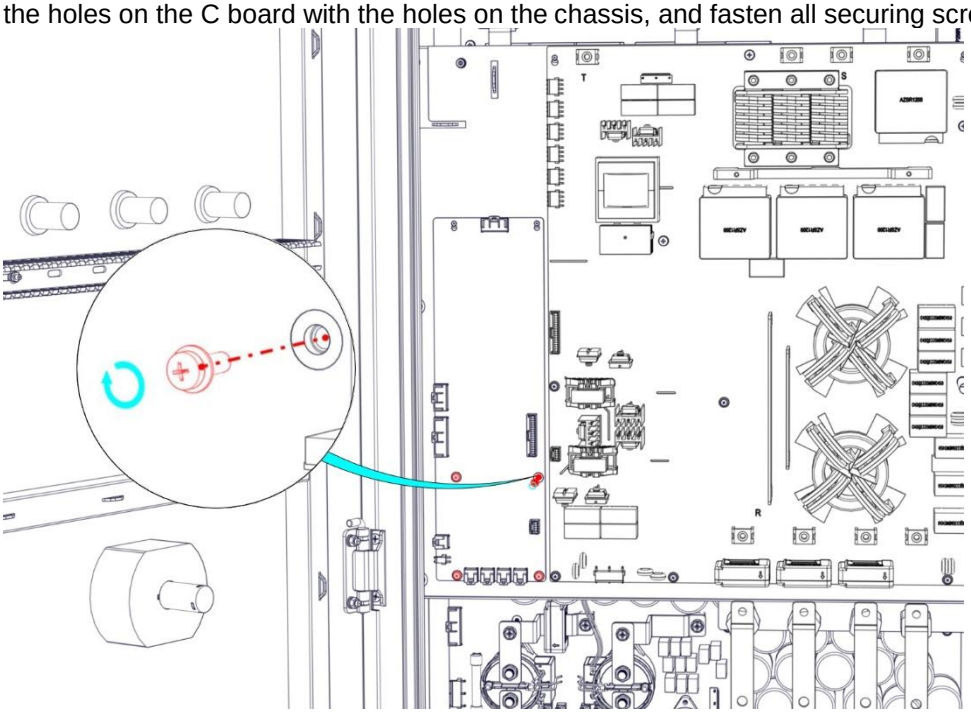

Figure 111. Installing an S Board

3. Connect the cables to the C board.
4. Install safety covers. See “Installing Safety Covers”.
5. Close the front panel. See “Closing a Front Panel”.

A Board Support Bracket

WARNING!

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- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an A Board Bracket

1. Open the front panel. See “Opening a Front Panel”.
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Unscrew left side securing bolts.

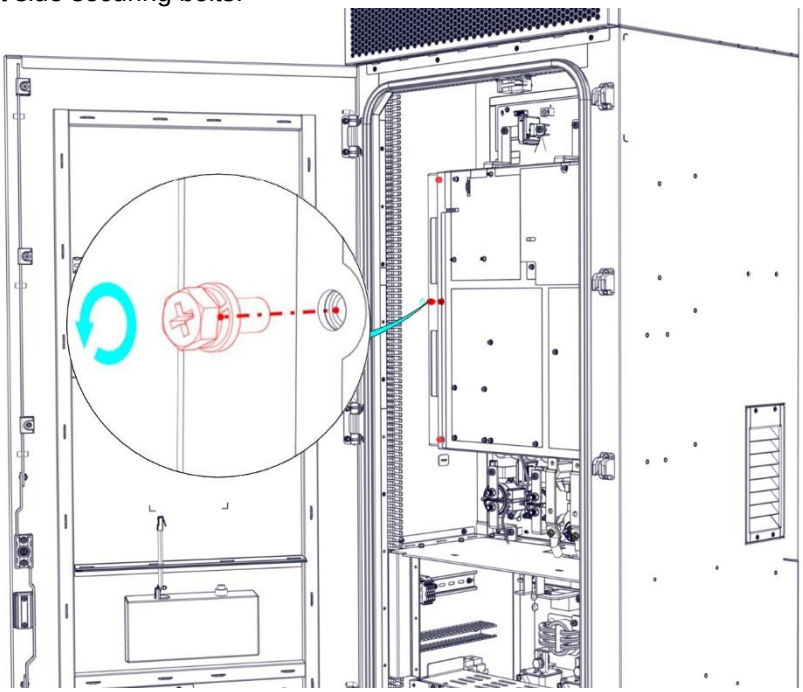

Figure 112. Unscrew left bolts

6. Unscrew right side securing bolts.

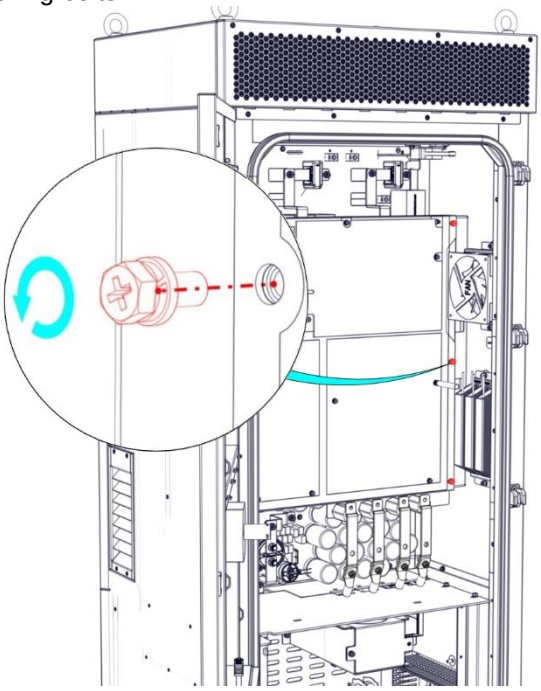

Figure 113. Unscrew right bolts

7. Remove the A board bracket.

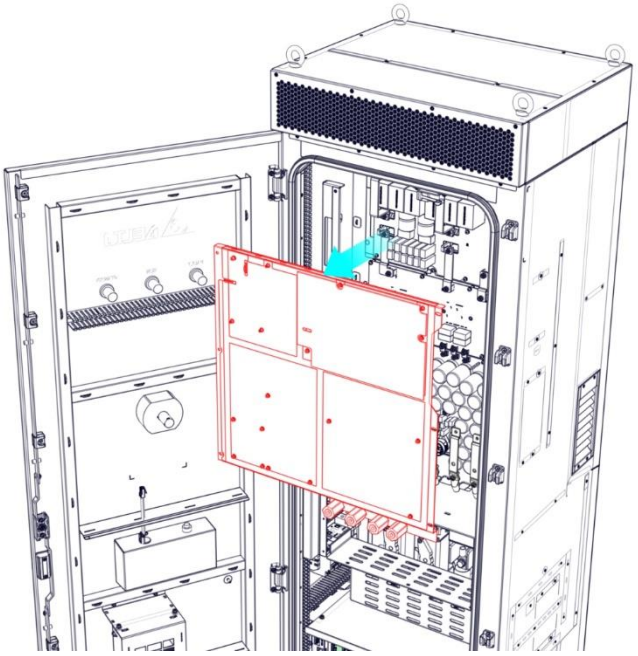

Figure 114. Removing A board bracket

Installing an A Board Bracket

1. Align the holes on the A board bracket with the holes on the chassis.

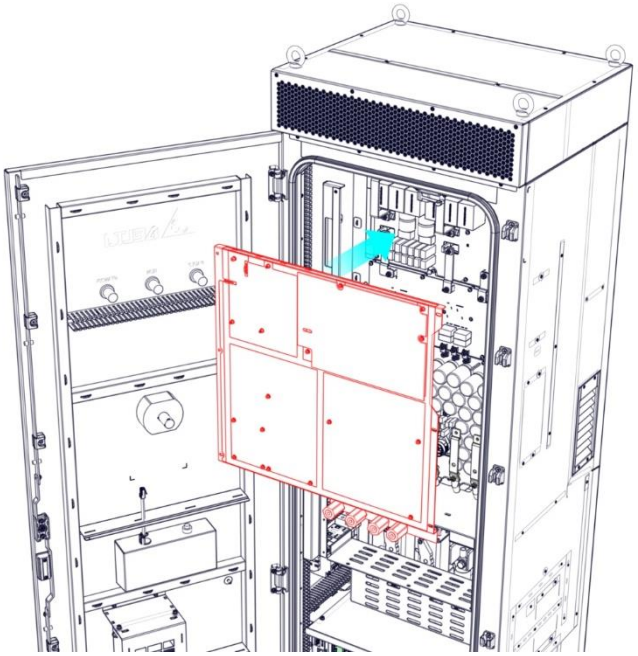

Figure 115. Install A board bracket

2. Screw left side securing bolts of A board bracket.

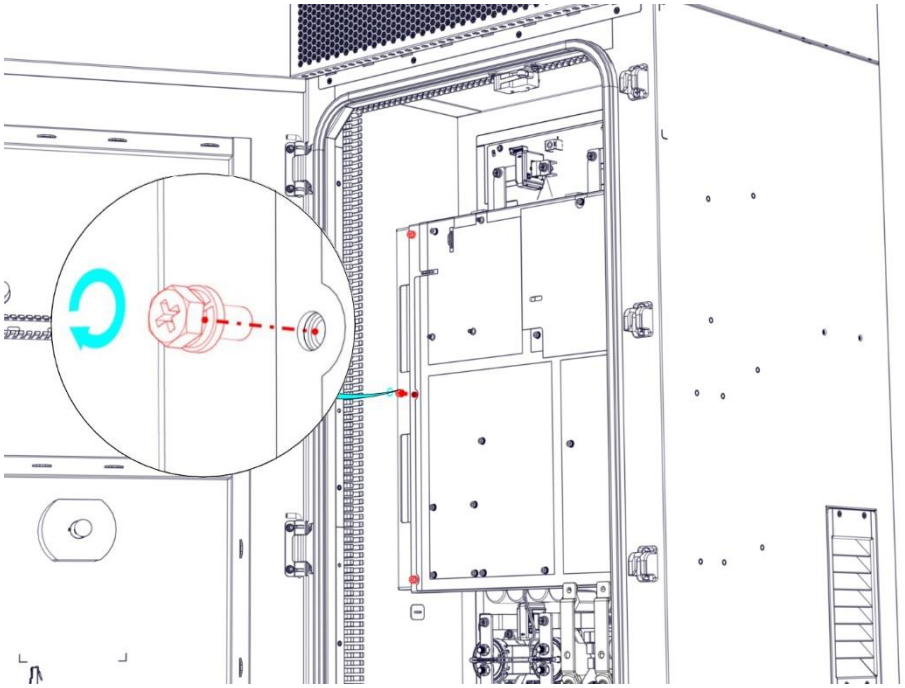

Figure 116. Screw left bolts

3. Screw the right side securing bolts of A board bracket.

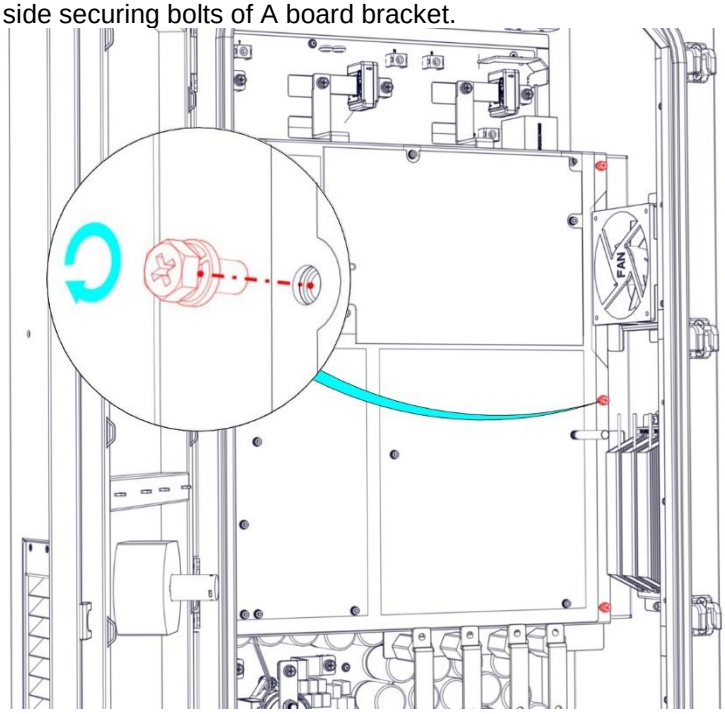

Figure 117. Screw right bolts

4. Install the C board. See “Installing a C Board”.
5. Install the A board. See “Installing an A Board”.
6. Install the safety covers. See “Installing Safety covers”.
7. Close the front panel. See “Closing a Front Panel”.

AC Filter Board (D Board)

WARNING!

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- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a D Board

1. Open the front panel. See “Opening a Front Panel” .
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Remove the A board bracket. See “Removing A Board bracket”
6. Locate the D board.

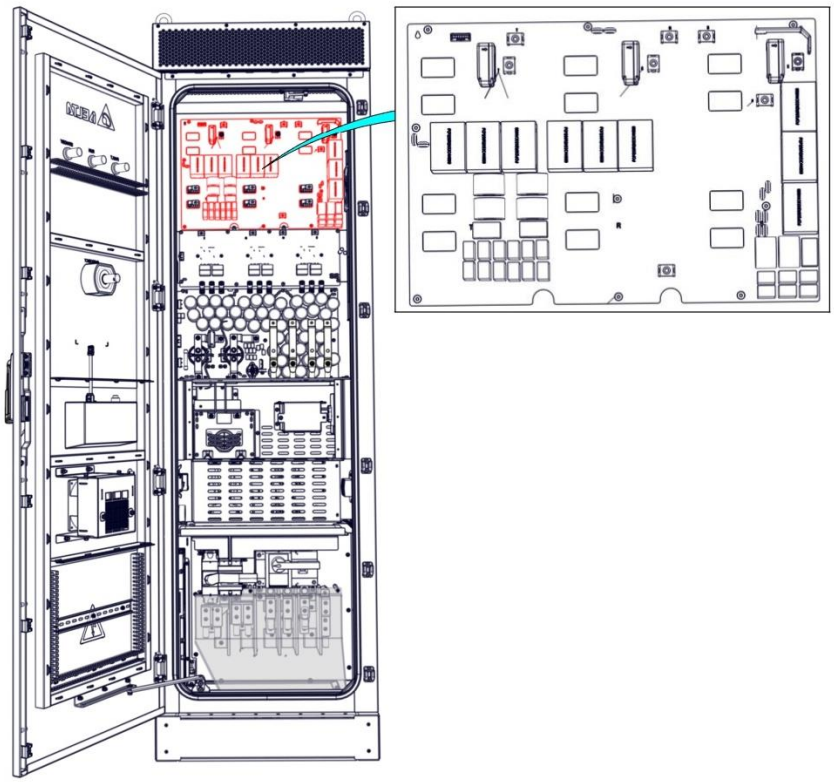

Figure 118. D Board Location

7. Unscrew the securing bolts of copper bus bars connecting D board to inductor, and remove the bus bars.

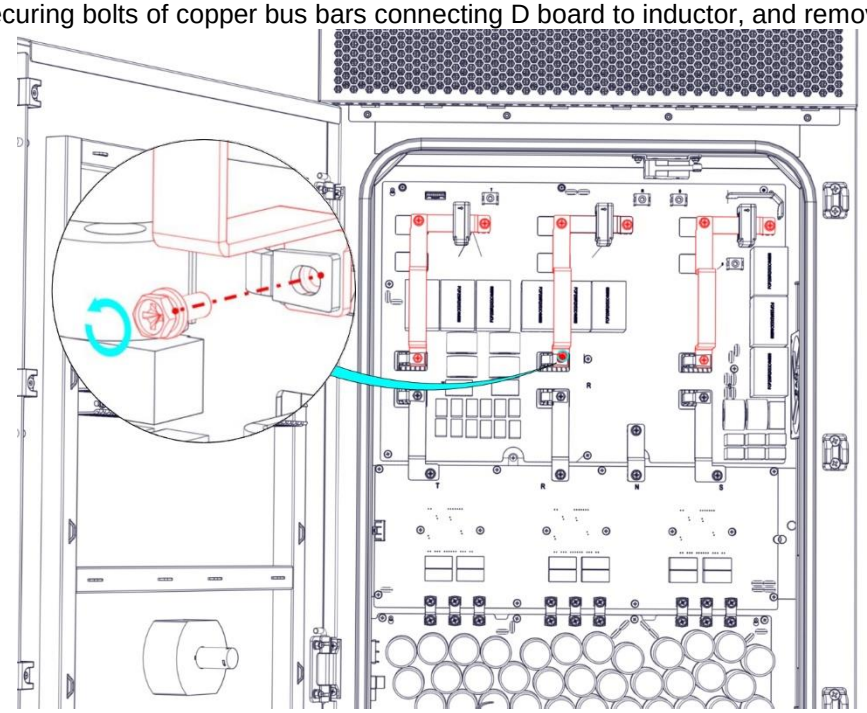

Figure 119. Remove copper bus bar

8. Unscrew the securing bolts of copper bus bars connecting D board to B board, and remove the copper bus bars.

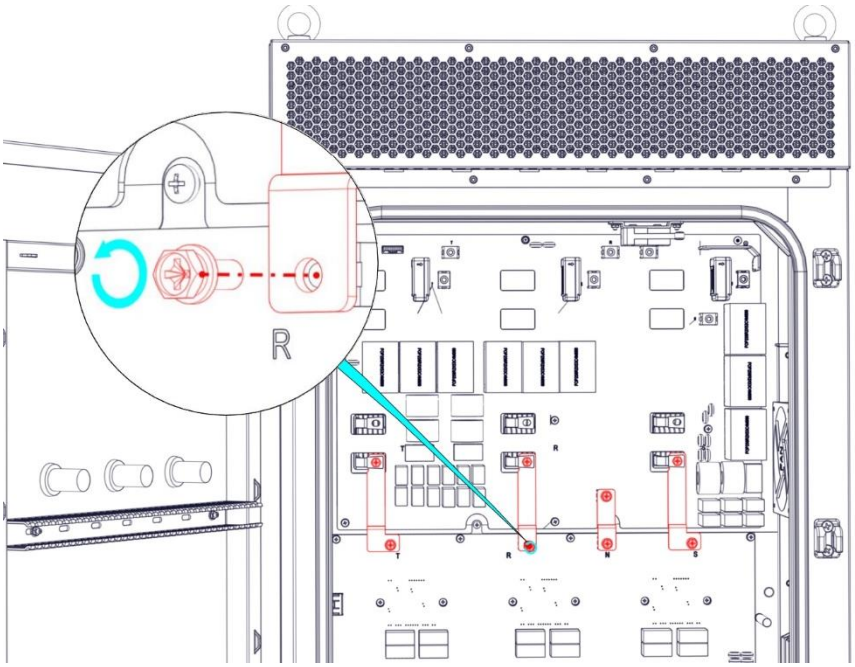

Figure 120. Remove copper bus bar

9. Unscrew all securing screws.

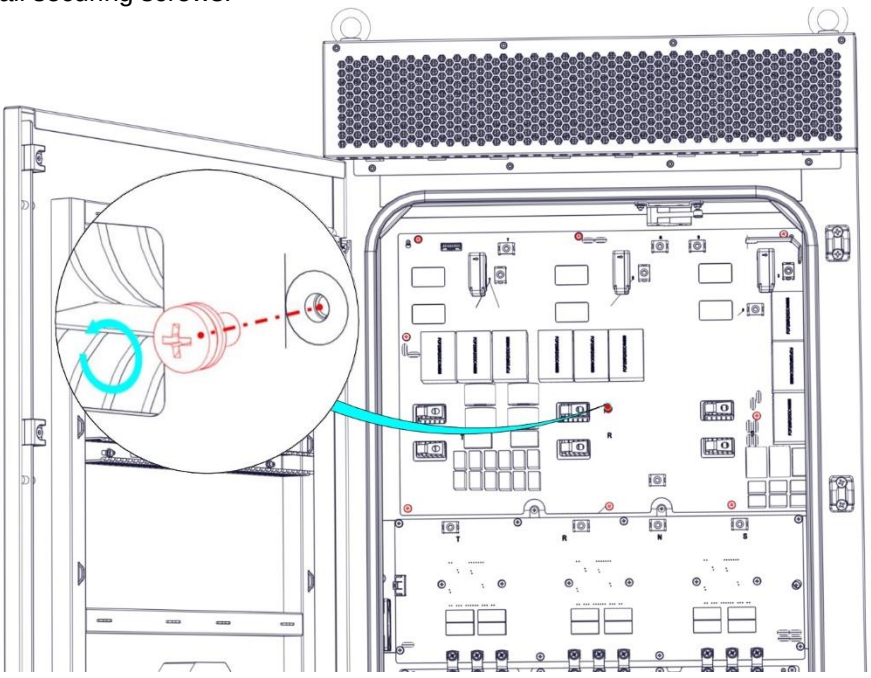

Figure 121. Unscrew securing screws

10. Slide and remove the D board.

Installing a D Board

1. Align the holes on the D board with holes on the chassis.
2. Screw all securing screws of D board.

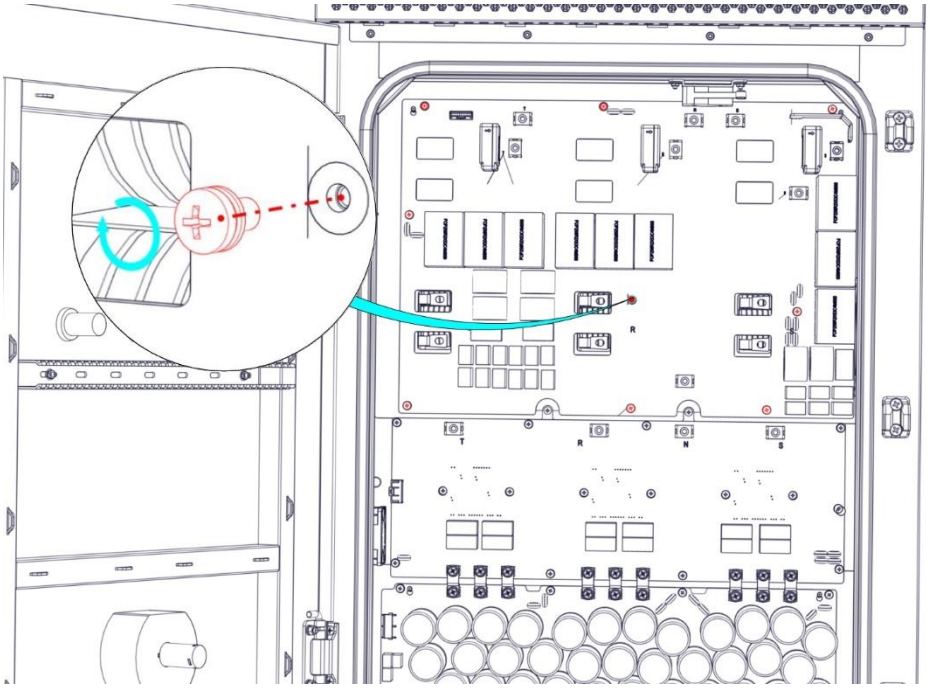

Figure 122. Screw securing screws

3. Install copper bus bar connecting D board to B board, and fasten the bolts.

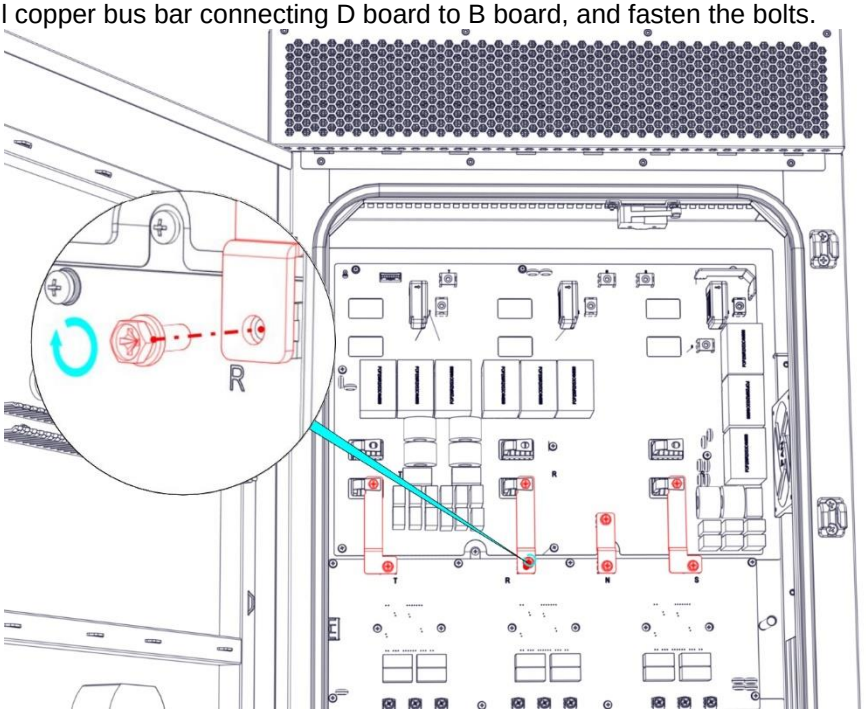

Figure 123. Installing copper bus bar

4. Install the copper bus bar connecting D board to inductor, and fasten the bolts.

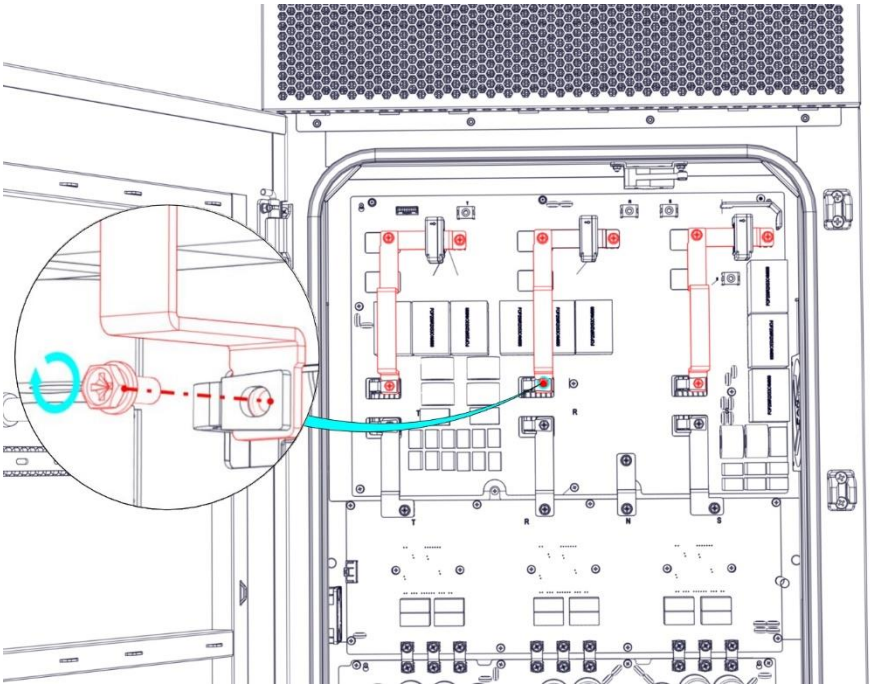

Figure 124. Securing the bolts

5. Install the A board bracket. See “Installing a A board bracket”.
6. Install the C board. See “Installing a C board”.
7. Install the A board. See “Installing a A board”.
8. Install the safety covers. See “Installing Safety covers”.
9. Close the front panel. See “Closing a Front Panel” .

IGBT Driver Board (B Board)

WARNING!

Read the “Safety Instructions” on page ix on the first at the beginning of this manual before performing any service on the components. Ignoring safety instructions may result in injury, damage or death.

CAUTION!

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DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Important Safety Instructions

It is important to remember that the PCS is designed to supply power even when it is disconnected from the power grid. The interior of the PCS is unsafe until the DC power source is disconnected and the AC/ DC inputs are disengaged. It is recommended to wait a period of at least five minutes for capacitor bleed-off before attempting to service any components.

Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a B Board

1. Open the front panel. See “Opening a Front Panel” .
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Remove the A board bracket. See “Removing A Board bracket”
6. Locate the B board.

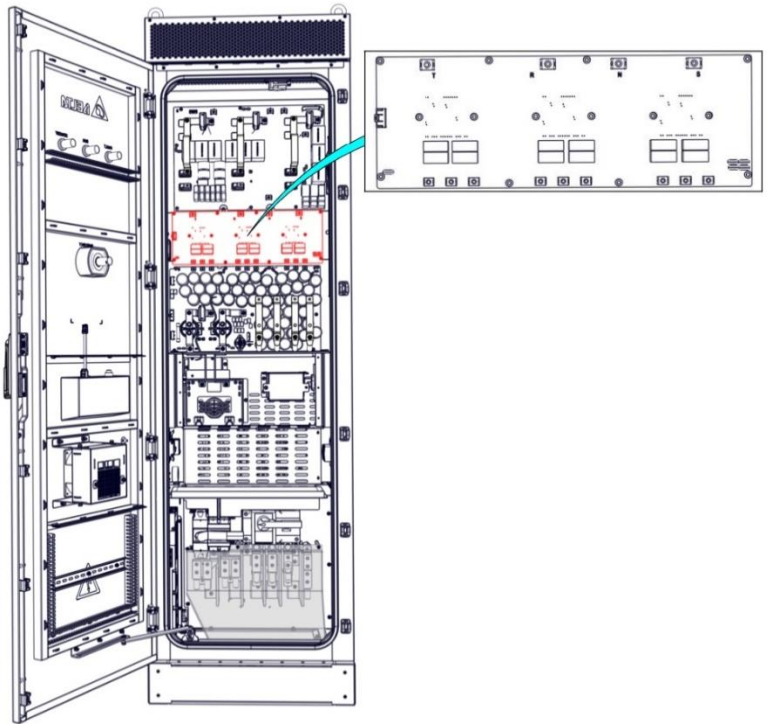

Figure 125. B Board Location

7. Unscrew the securing bolts of copper bus bar connecting D board to B board.

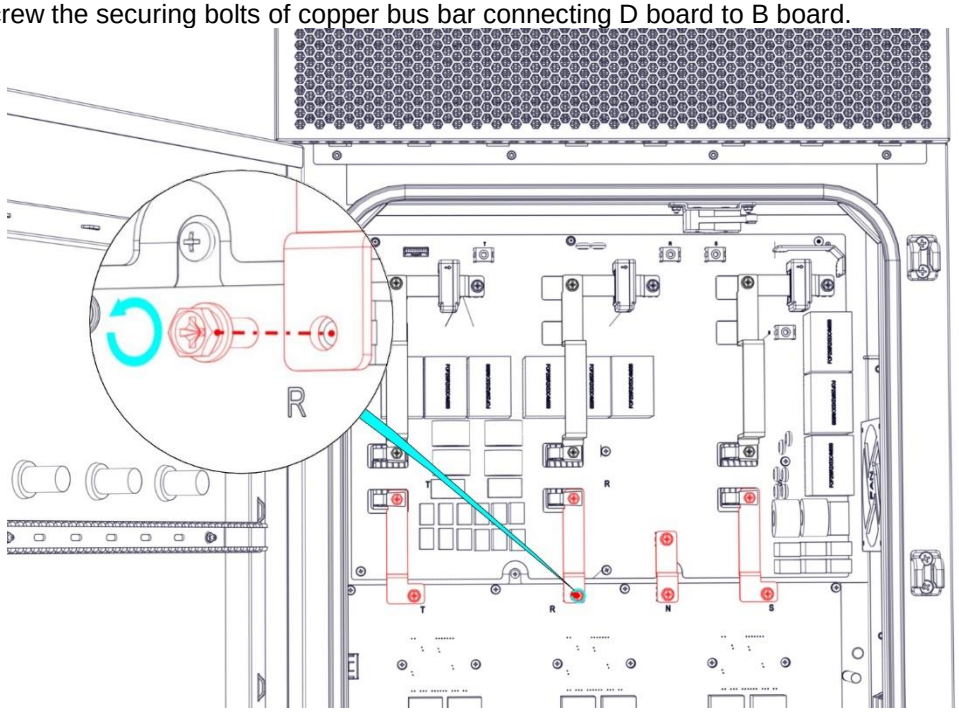

Figure 126. Unscrew securing bolts

8. Unscrew the securing bolts of copper bus bar connecting B board to E board.

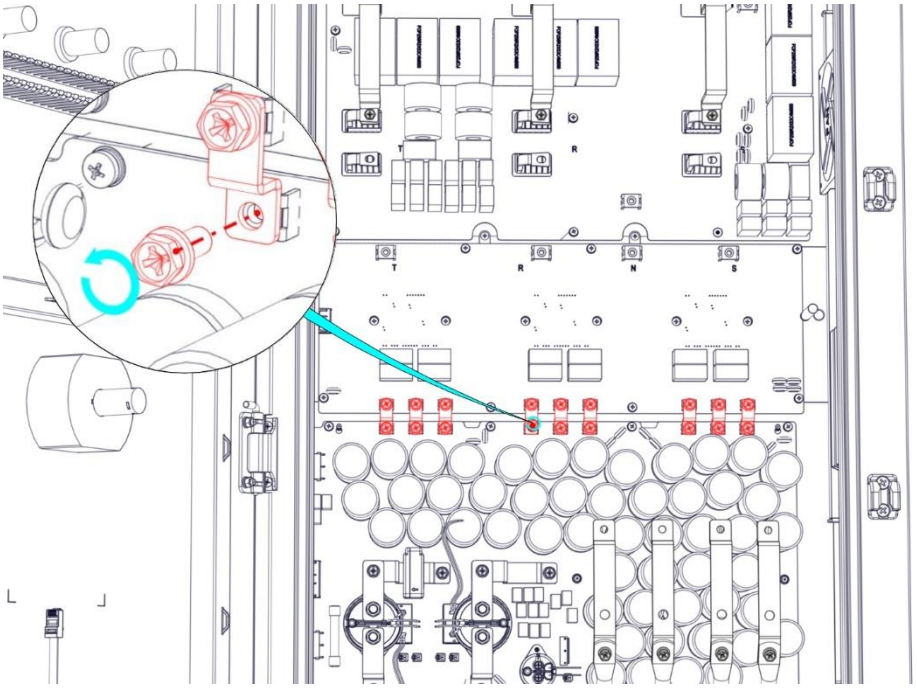

Figure 127. Unscrew securing bolts

9. Unscrew B board securing screws.

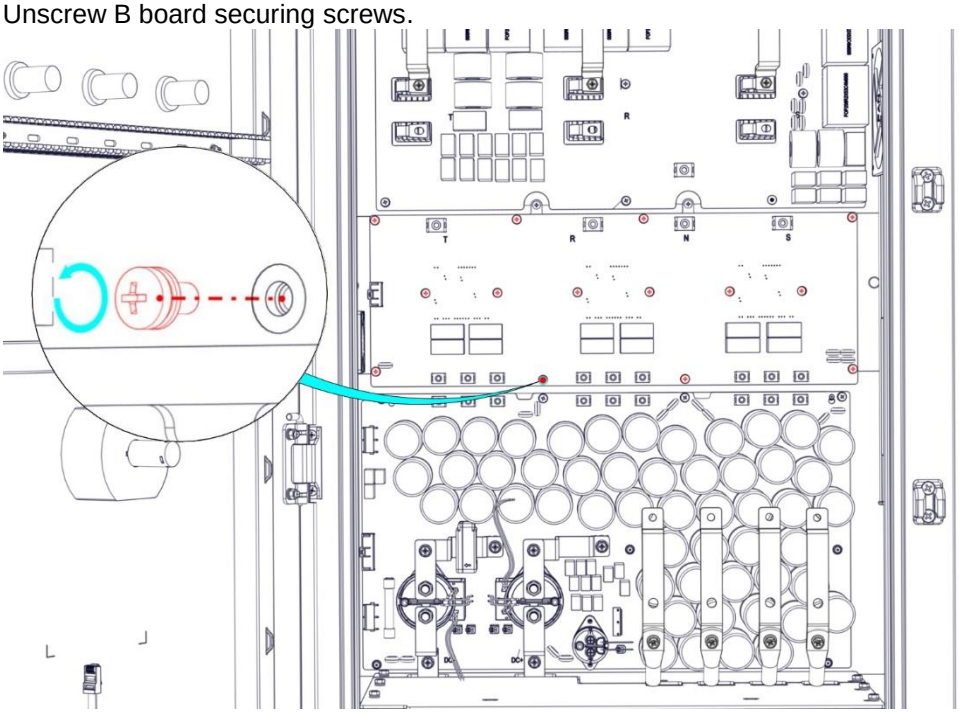

Figure 128. Unscrew securing screws

10. Remove the B board.

Installing a B board

1. Align the holes on the B board with the holes on the chassis, and fasten the securing screws.

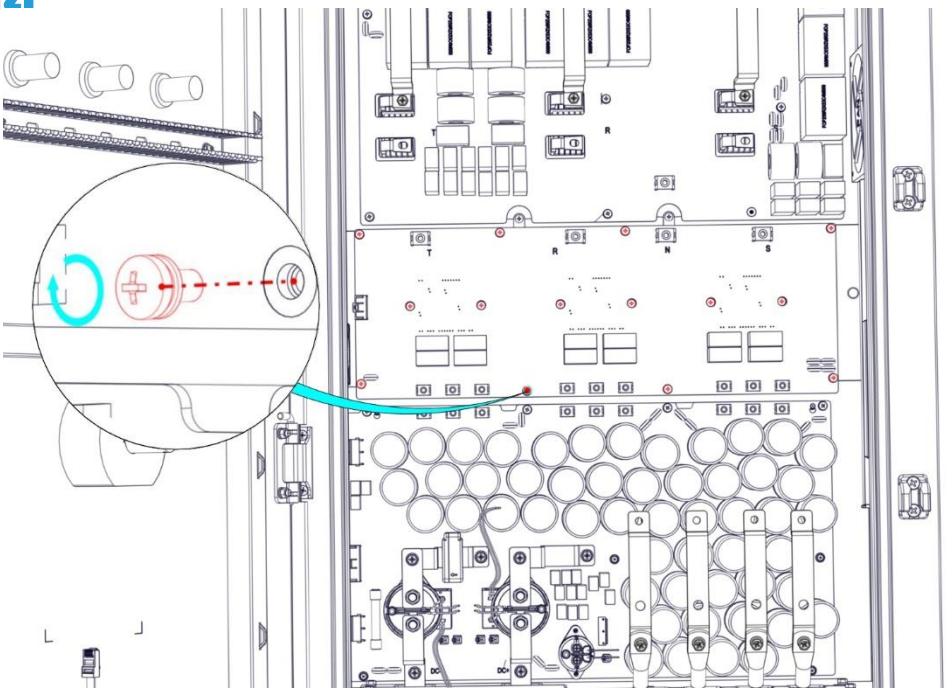

Figure 129. Installing a B Board

2. Install copper bus bar connecting B board to E board, and fasten securing bolts.

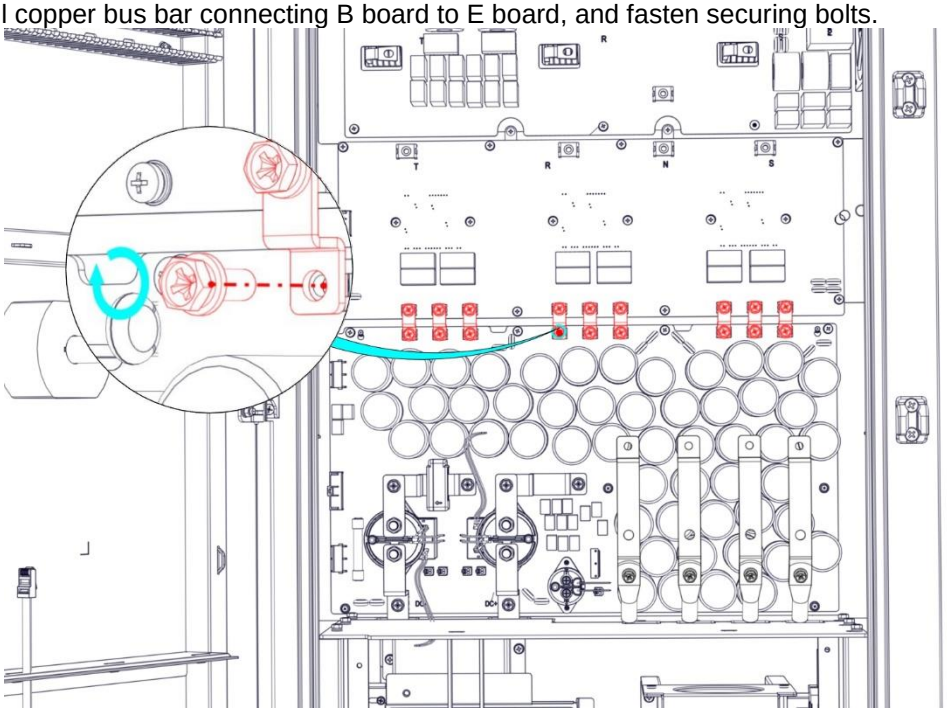

Figure 130. Installing copper bus bars

3. Install copper bus bar connecting B board to D board, and fasten securing bolts.

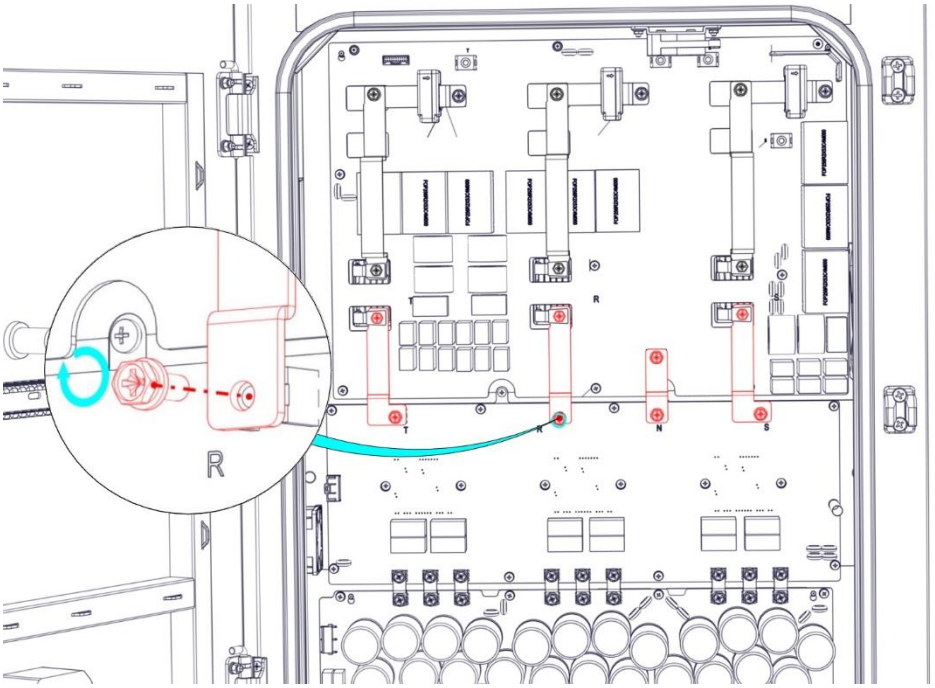

Figure 131. Install copper bus bars

4. Install the A board bracket. See “Installing a A board bracket”.
5. Install the C board. See “Installing a C board”.
6. Install the A board. See “Installing a A board”.
7. Install the safety covers. See “Installing Safety covers”.
8. Close the front panel. See “Closing a Front Panel” .

Bulk Cap Board (E Board)

WARNING!

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CAUTION!

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DEATH, SERIOUS INJURY, OR HARDWARE DAMAGE CAN RESULT IF CAUTION IS NOT TAKEN.

Important Safety Instructions

It is important to remember that the PCS is designed to supply power even when it is disconnected from the power grid. The interior of the PCS is unsafe until the DC power source is disconnected and the AC/ DC inputs are disengaged. It is recommended to wait a period of at least five minutes for capacitor bleed-off before attempting to service any components.

Note:

- Maintenance should only be performed by qualified personnel.
- Lethal voltage is present in the PCS. The unit must not be operated with the front panel doors open. At no time should you make any assumptions of the electrical state of the PCS.

Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a E Board

1. Open the front panel. See “Opening a Front Panel” .
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Remove the A board bracket. See “Removing A Board bracket”
6. Locate the E board.

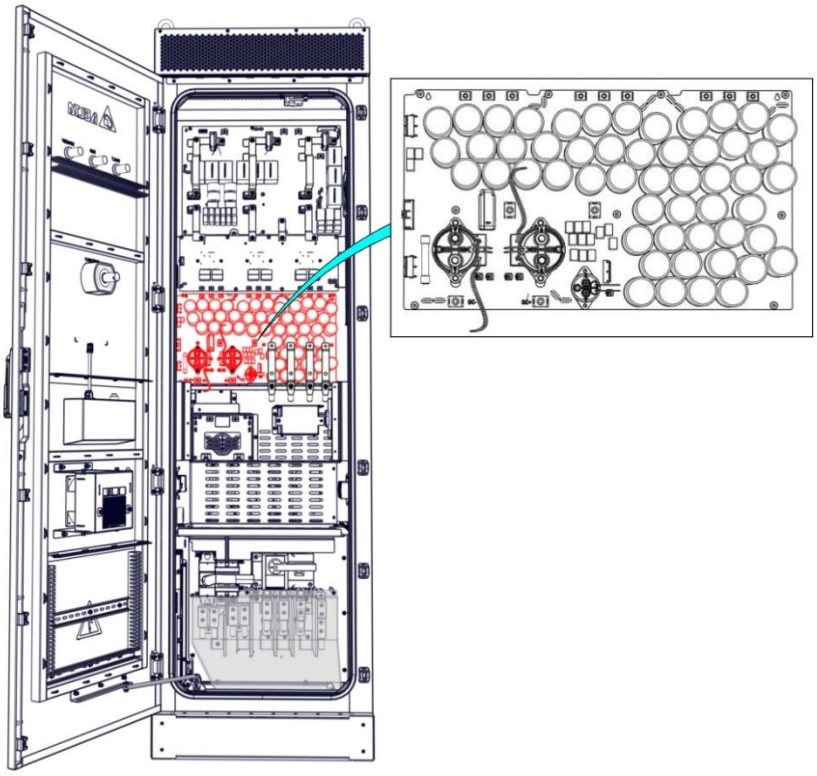

Figure 132. M Board Location

7. Unscrew securing bolts of insulation plate.

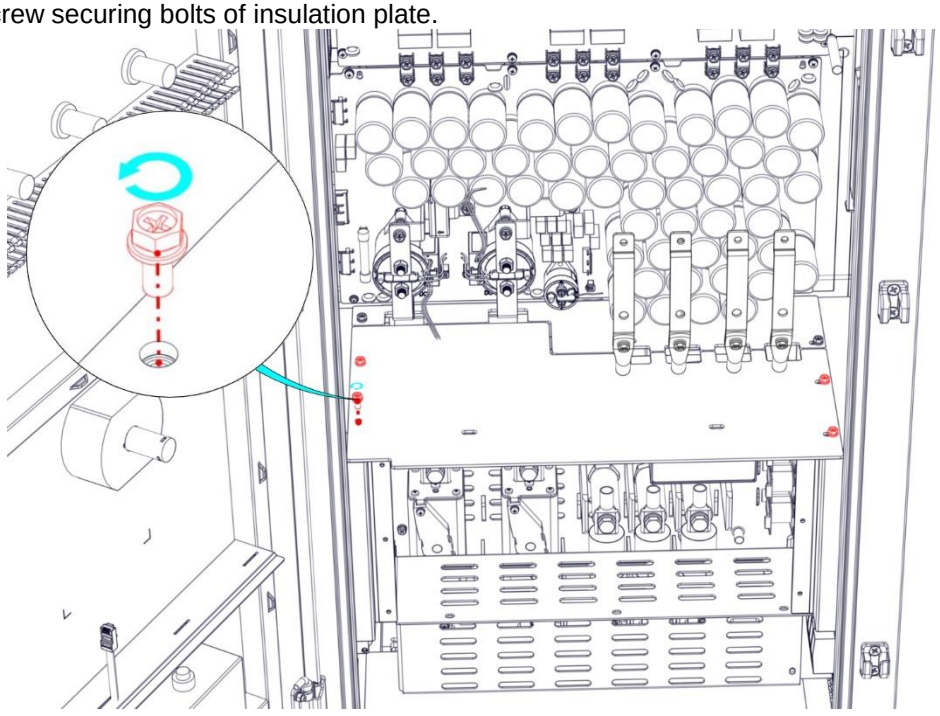

Figure 133. Remove insulation plate

8. Slip out the insulation plate, then take out it.

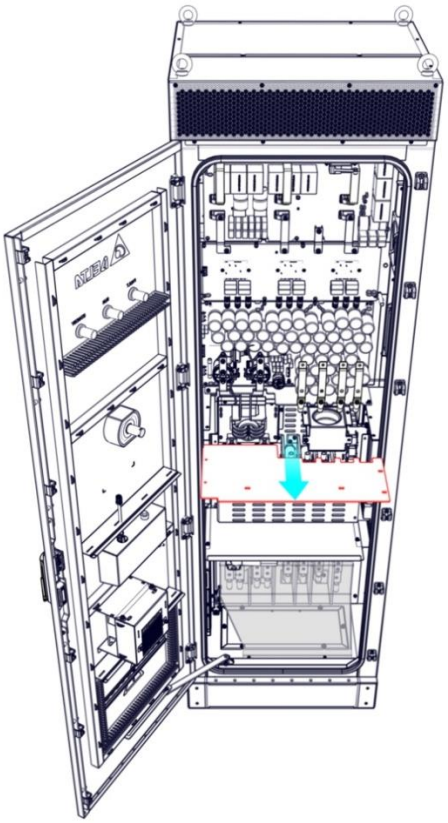

Figure 134. Remove insulation plate

9. Remove the nuts securing the copper bus bars on DC relays.

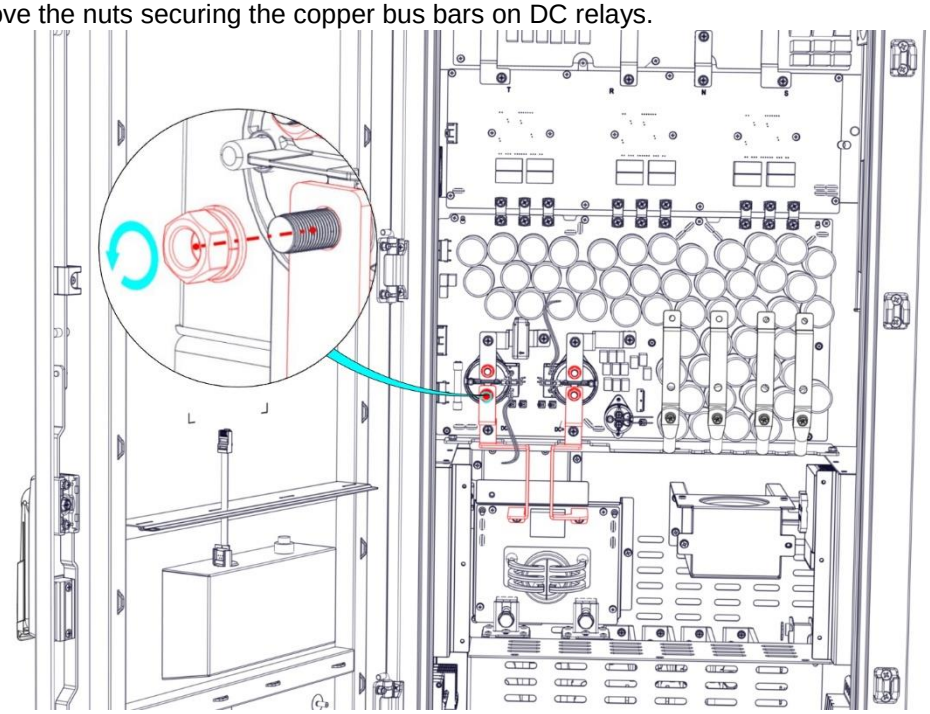

Figure 135. Unscrew securing nuts

10. Remove the bolts securing the copper bus bars on E board and F board.

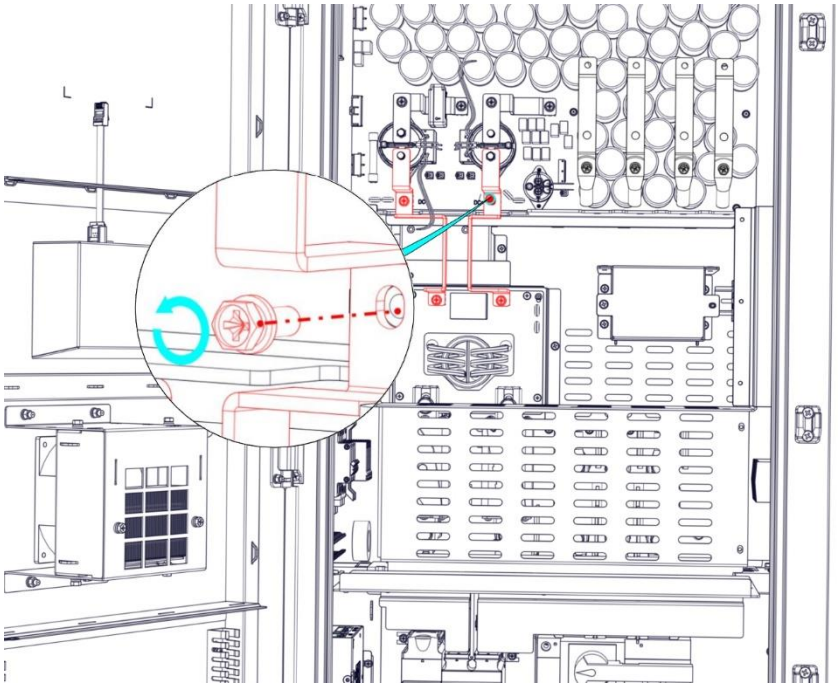

Figure 136. Unscrew securing bolts

11. Remove the bolts securing the copper bus bars on E board and remove the bus bars.

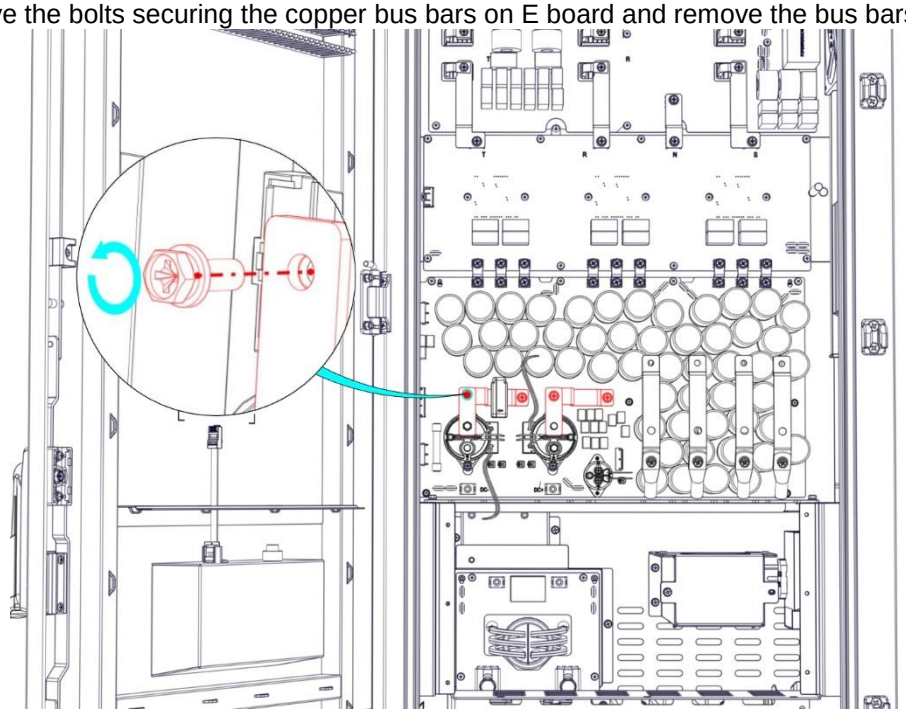

Figure 137. Remove copper bus bars

12. Remove the bolts securing the copper bus bars on E board and remove the bus bars.

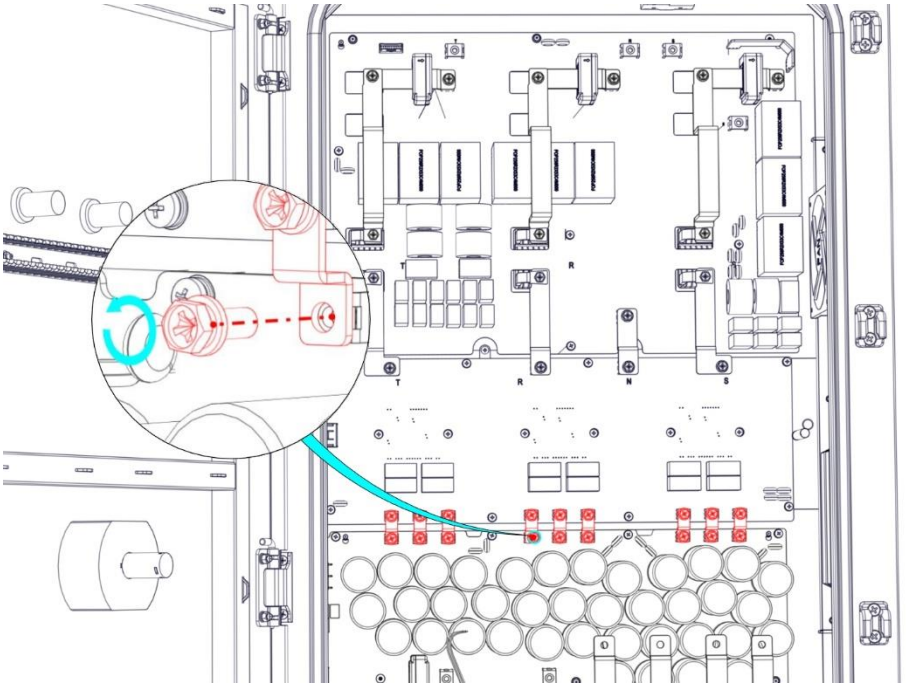

Figure 138. Removing copper bus bars

13. Unscrew securing screws of E board.

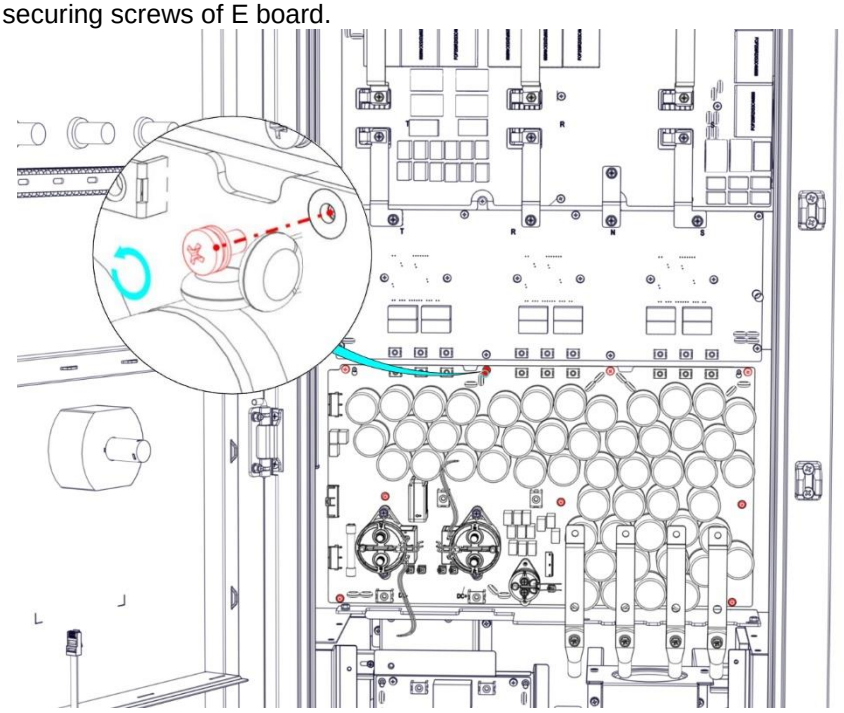

Figure 139. Removing a E Board

14. Remove the E board.

Installing a E Board

1. Align the holes on the E board with the holes on the bracket, and fasten all securing screws.

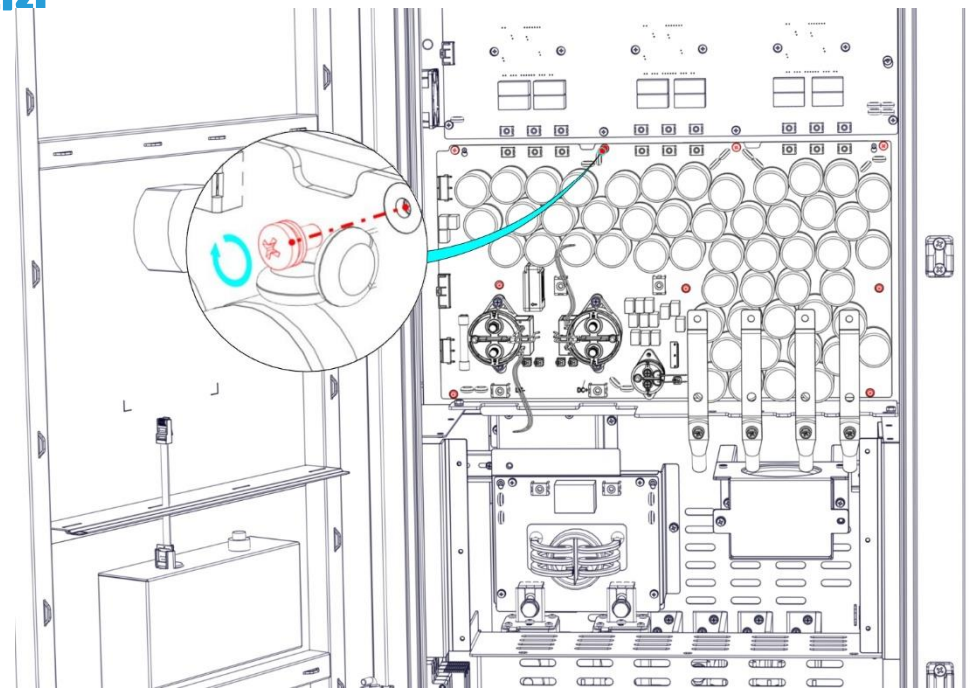

Figure 140. Installing a E Board

2. Install copper bus bar connecting B board to E board, and fasten securing bolts.

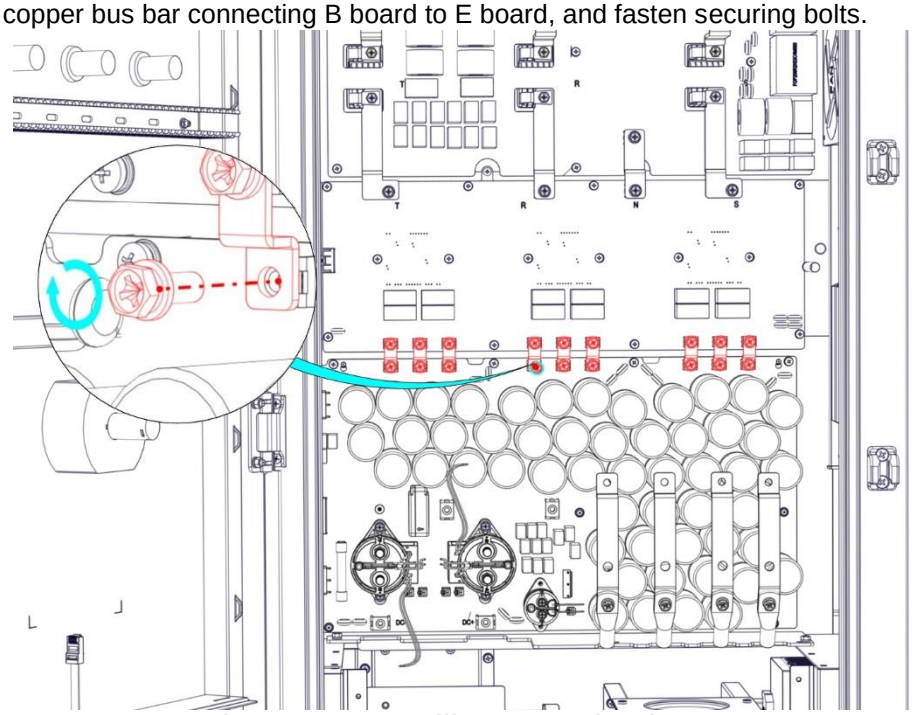

Figure 141. Installing copper bus bar

3. Install copper bus bar connecting E board to DC relays, and the left side bus bar should be through the current sensor. Finally, fasten the securing bolts..

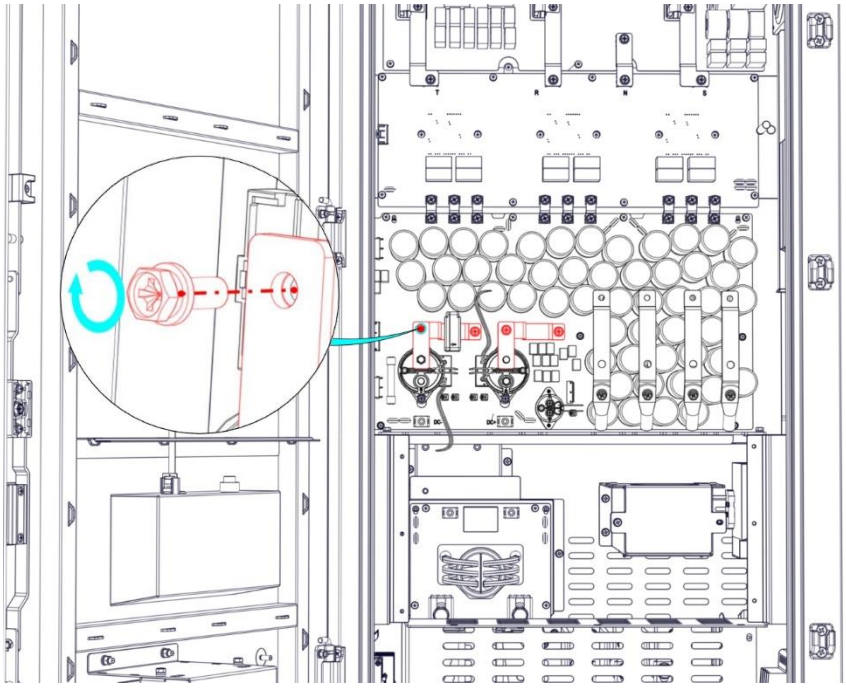

Figure 142. Install copper bus bar

4. Install copper bus bars connecting E board to F board, and secure the bus bars to E board and F board with bolts.

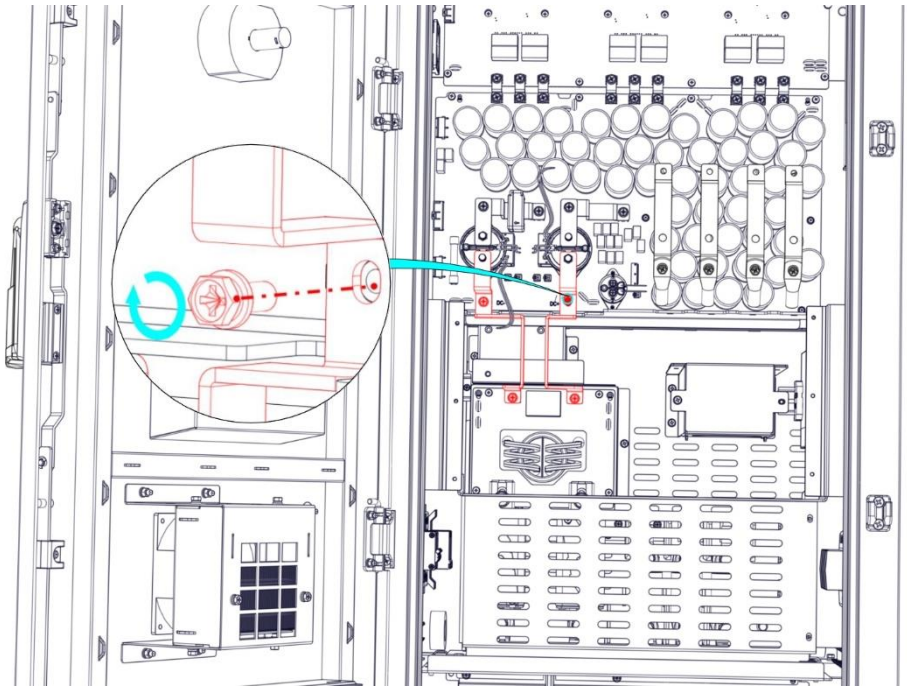

Figure 143. Install copper bus bar

5. Secure copper bus bar on DC relay with nuts.

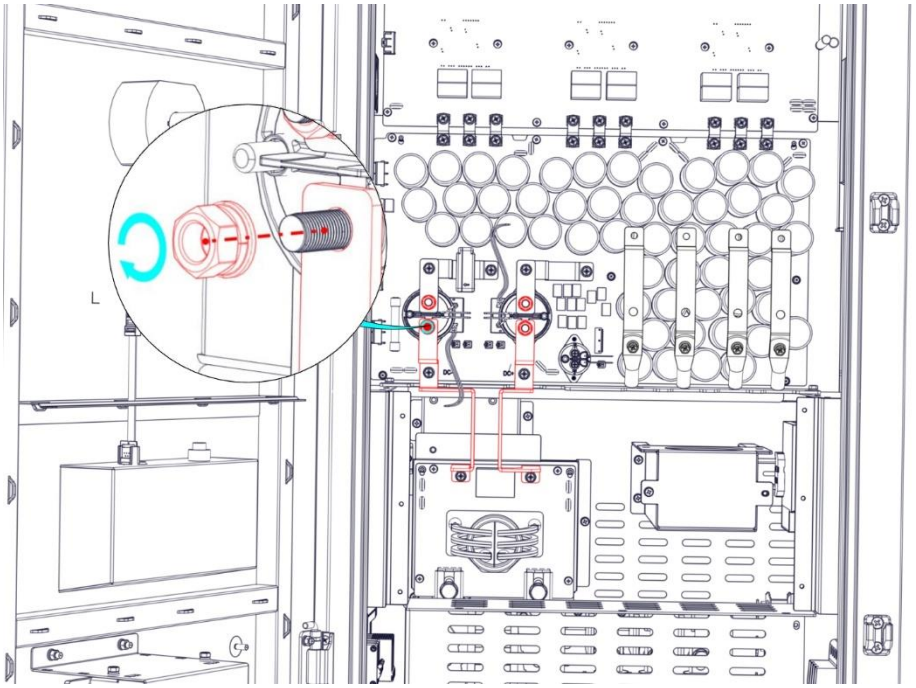

Figure 144. Installing an F Board

6. Install the insulation plate into PCS cabinet.

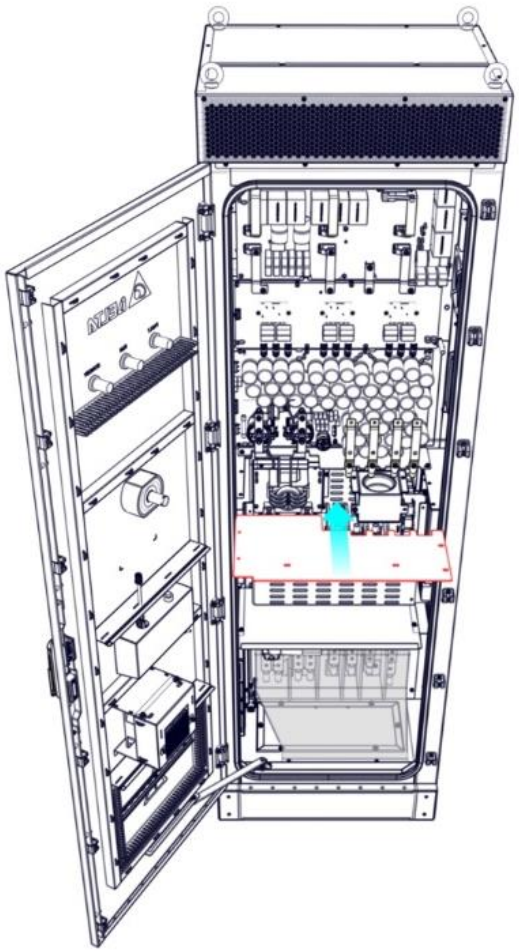

Figure 145. Installing an insulation plate

7. Secure the insulation plate with bolts.

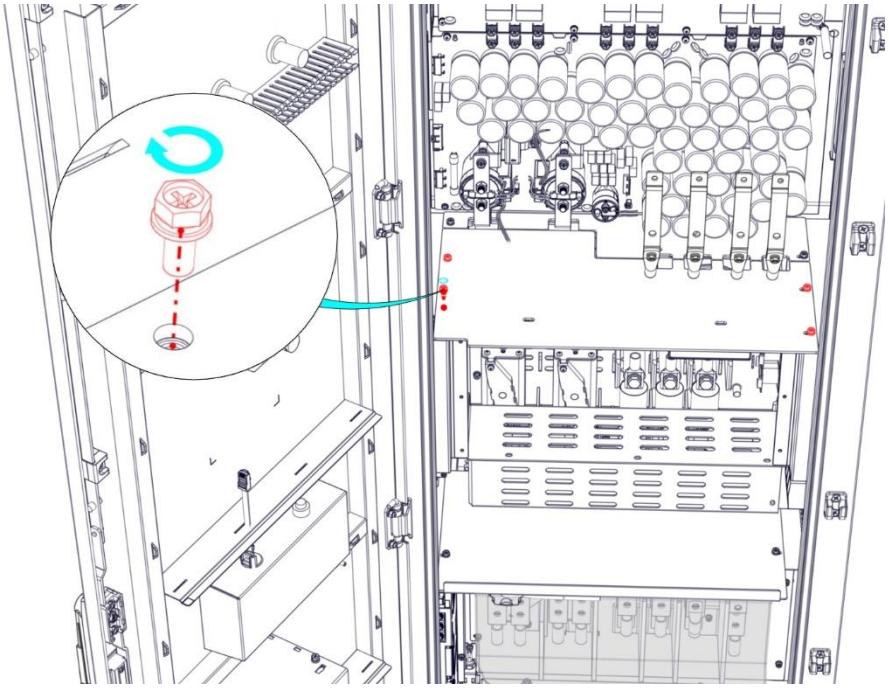

Figure 146. Secure insulation plate

8. Install the A board bracket. See “Installing a A board bracket”.
9. Install the C board. See “Installing a C board”.
10. Install the A board. See “Installing a A board”.
11. Install the safety covers. See “Installing Safety covers”.
12. Close the front panel. See “Closing a Front Panel” .

Ventilation Fan for IGBT module

WARNING!

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an Ventilation Fan Module

1. Open the front panel. See “Opening a Front Panel”.
2. Unscrew the screws securing the fan safety cover.

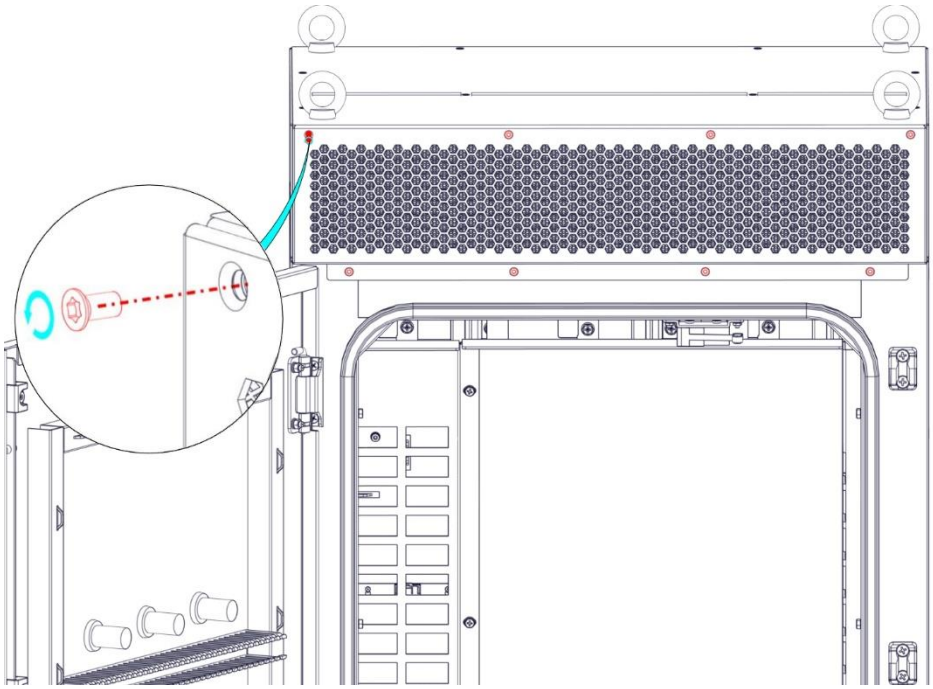

Figure 147. Unscrew the securing screws

3. Remove the fan safety cover.

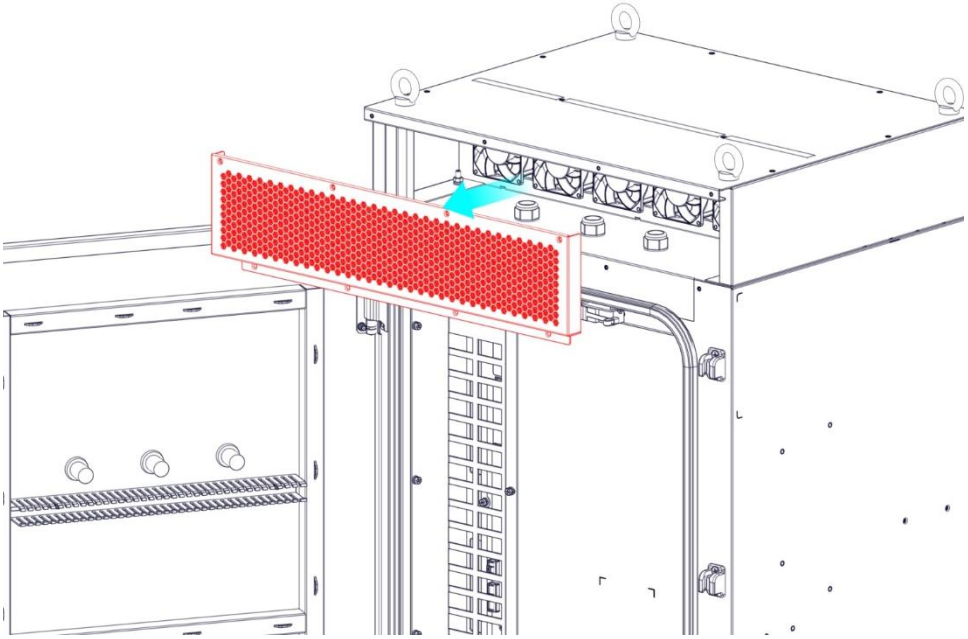

Figure 148. Remove the fan safety cover

4. Disconnect the cable from the fan assembly.
5. Unscrew the screws securing the fan assembly.

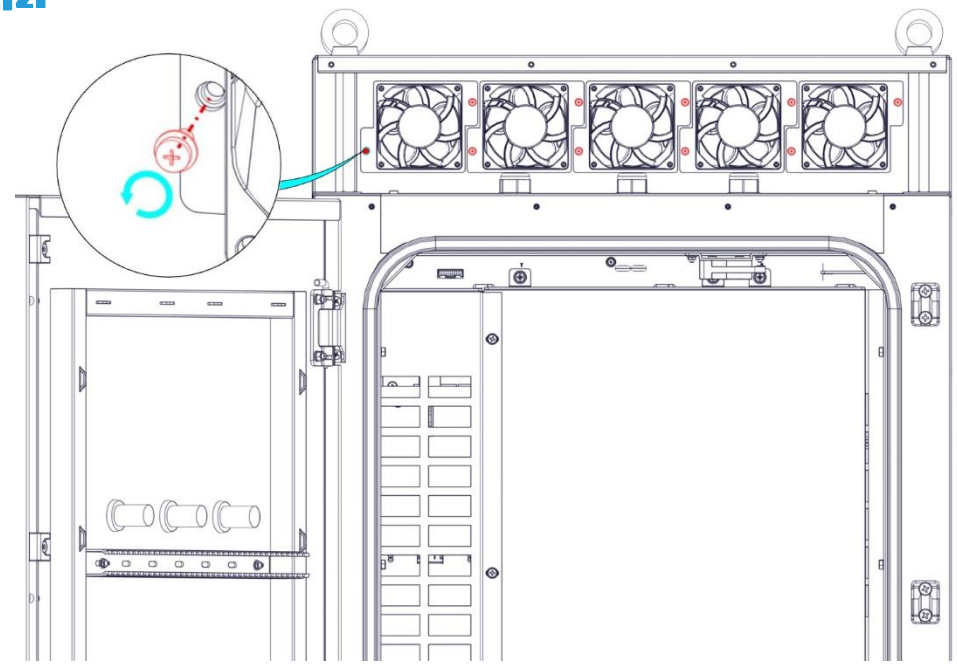

Figure 149. Removing an Auxiliary Power Fan Module

6. Grasp the fan assembly and pull out it from PCS ventilation duct.

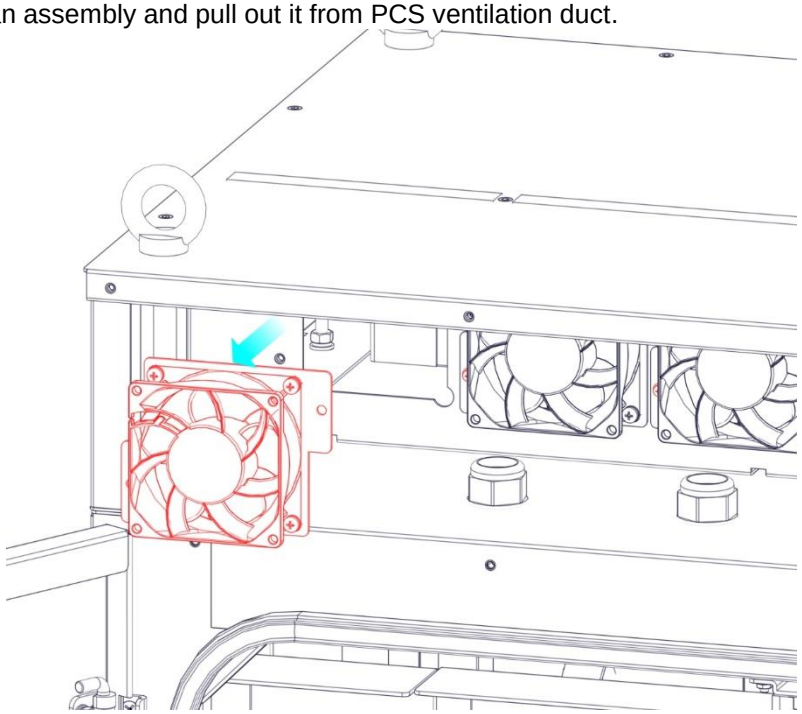

Figure 150. Remove the fan assembly

7. Unscrew all securing screws, then separate the fan module from its bracket.

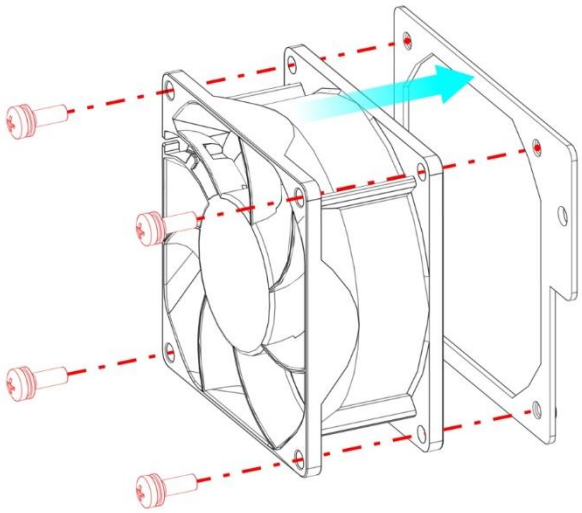

Figure 151. Separate fan module from bracket

Installing a Ventilation Fan Module

1. Install the ventilation fan module into the fan bracket, align air flow direction with the arrow, the air flow direction is marked on the side of fan module. At last, fasten securing screws.

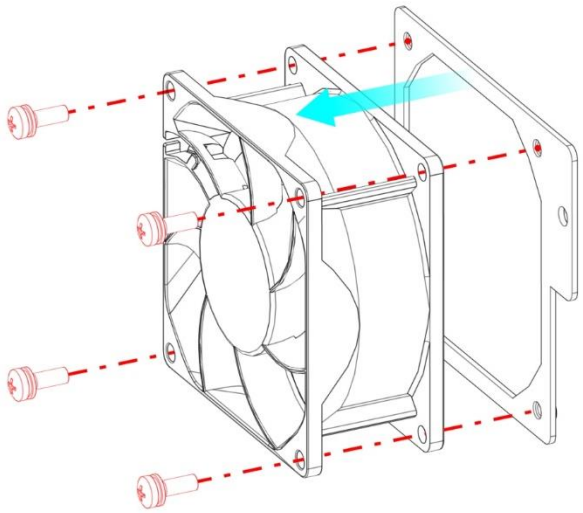

Figure 152. Installing a fan module

2. Install the fan assembly in ventilation duct.

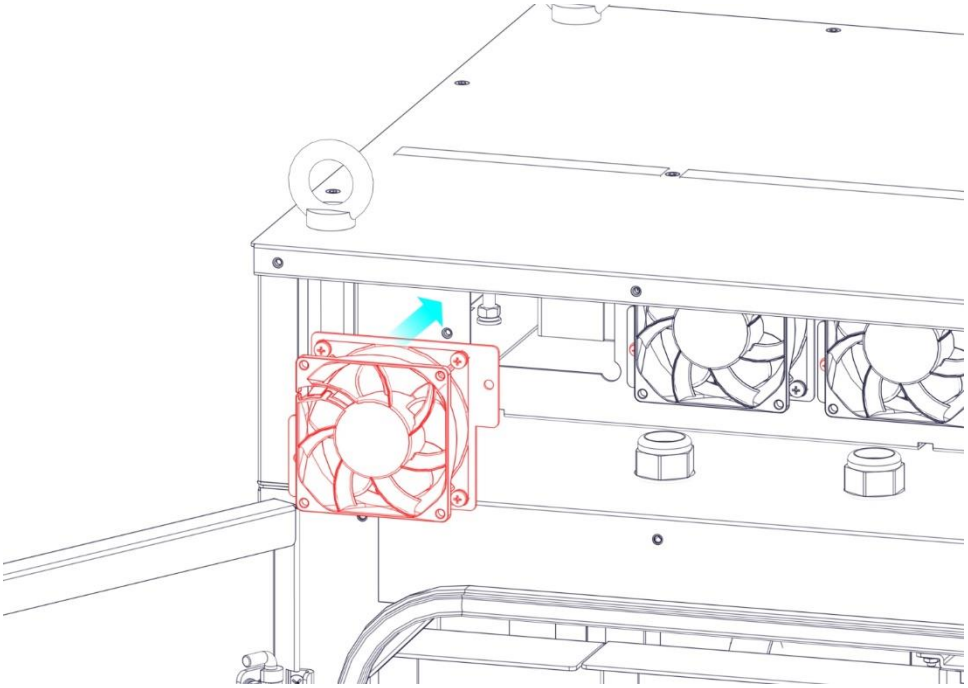

Figure 153. Installing the fan assembly

3. Align the holes of fan assembly with the holes PCS chassis, and secure the fan assembly with screws.

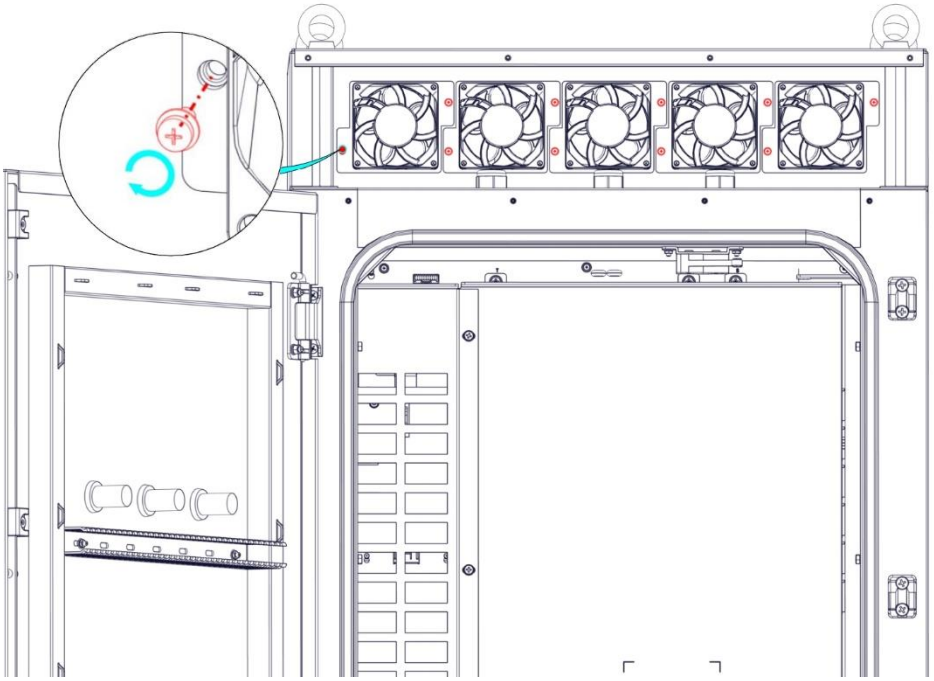

Figure 154. Fasten securing screws

4. Reconnect the power cable of fan module.
5. Install the fan safety cover.

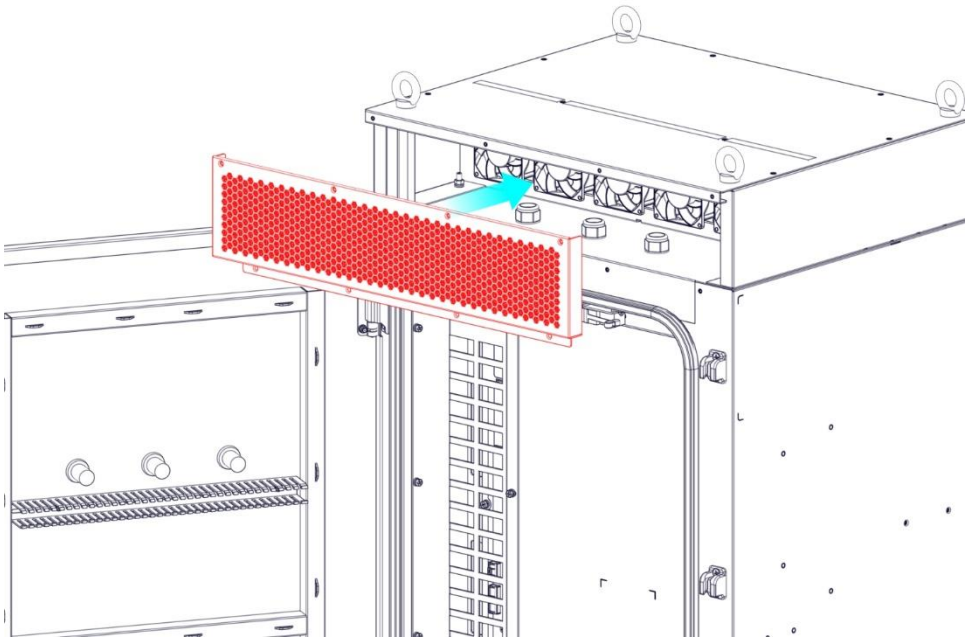

Figure 155. Installing the fan safety cover

6. Secure the fan safety cover on PCS chassis with screws.

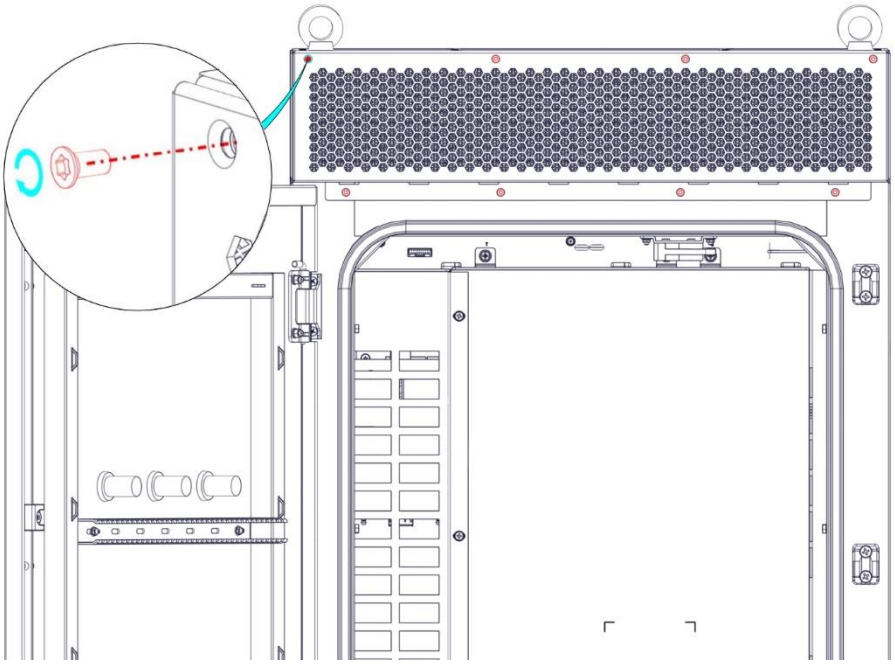

Figure 156. Installing a Fan Assembly

7. Close the front panel. See “Closing a Front Panel” .

Inductor

WARNING!

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Note:

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Before attempting any work around the PCS, observe the following precautions:

- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an inductor

1. Open the front panel. See “Opening a Front Panel”.
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Remove the A board bracket. See “Removing A Board bracket”
6. Open the rear panel. See “Opening a Rear Panel”.
7. Unscrew securing bolts of copper bus bar connecting inductor to D board.
8. Remove the screws securing the inductor.

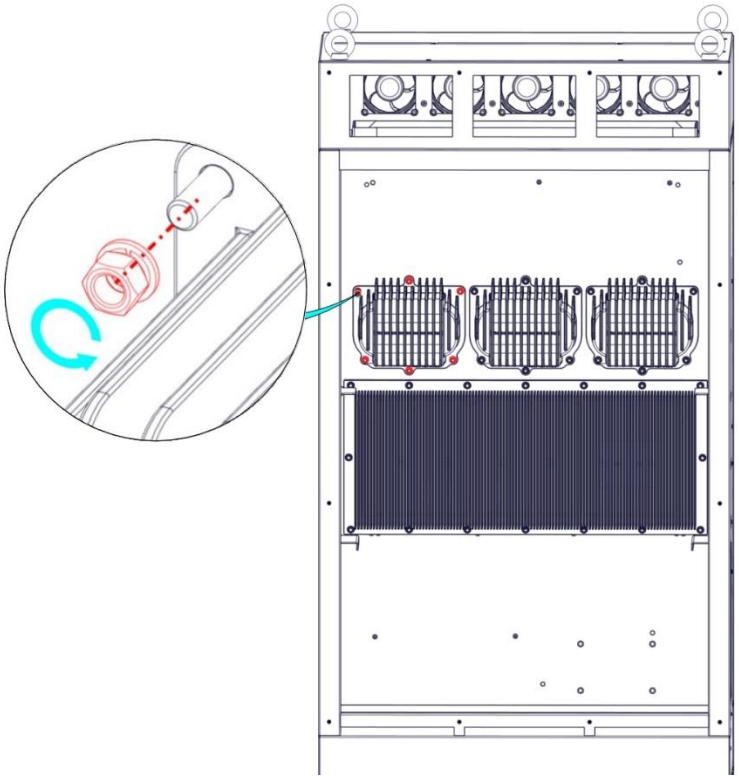

Figure 157. Unscrew securing nuts

9. Grasp the inductor and take it out carefully, the inductor is a little heavy, so protect yourself against harm.

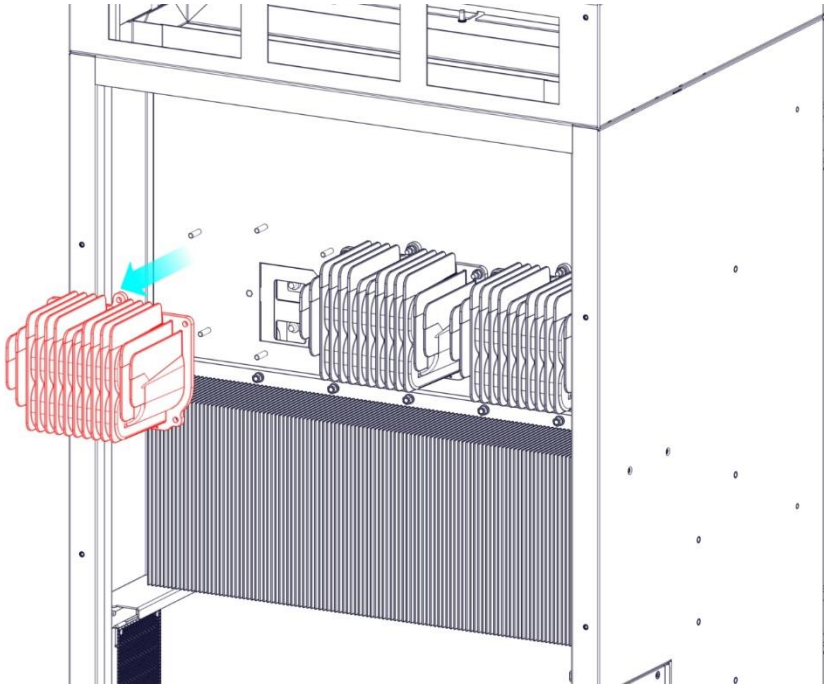

Figure 158. Removing an inductor

Installing an Auxiliary Transformer

1. Align the holes on the inductor with the posts on the chassis, and hang inductor on the posts.

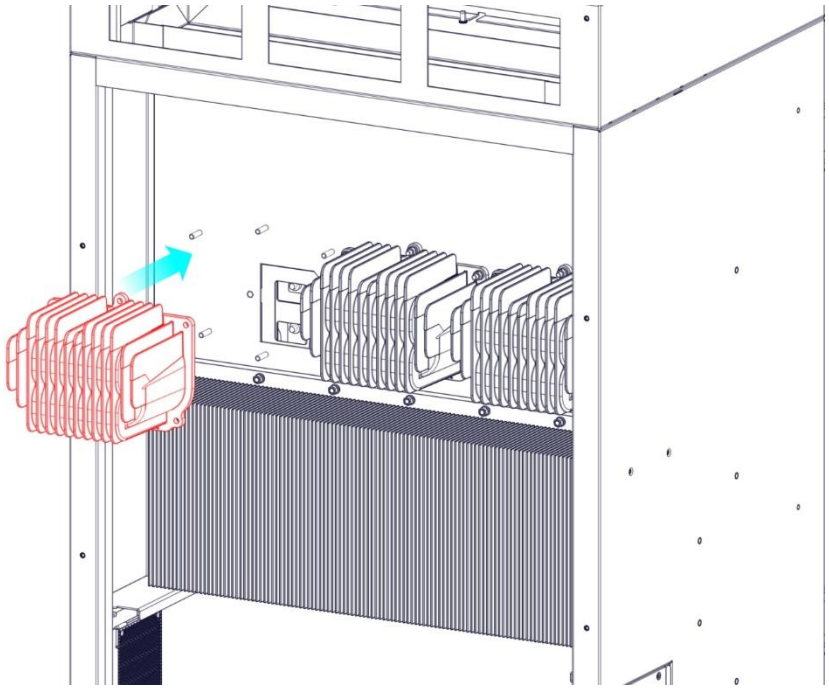

Figure 159 Installing an inductor

2. Secure the inductor with nuts.

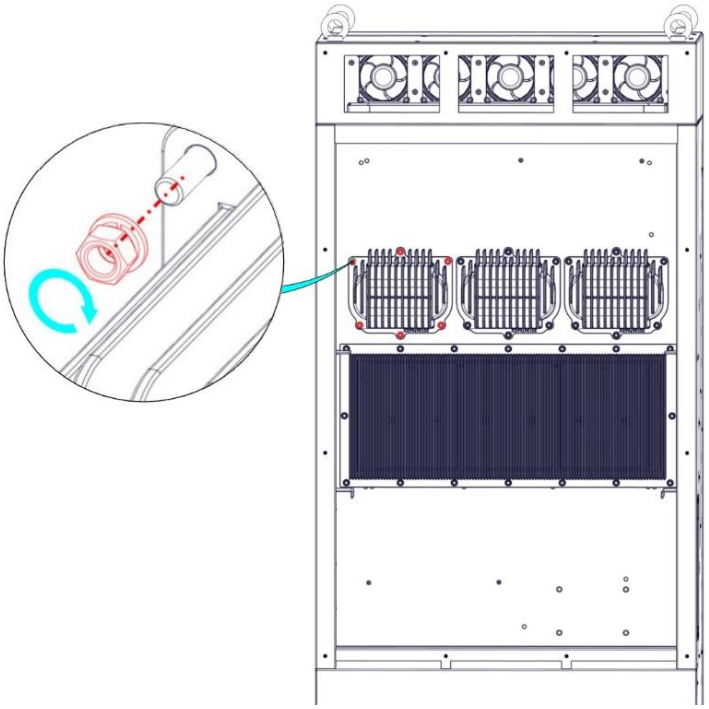

Figure 160. Fasten securing nuts

3. Secure inductor terminals on D board with bolts.

4. Close the rear panel. See “Closing a Rear Panel” .
5. Install the A board bracket. See “Installing a A board bracket”.
6. Install the C board. See “Installing a C board”.
7. Install the A board. See “Installing a A board”.
8. Install the safety covers. See “Installing Safety covers”.
9. Close the front panel. See “Closing a Front Panel” .

Air Intake Filter

The filters need to be checked and changed periodically. Check the dustiness of the air inlet meshes to ascertain if cleaning is necessary.

Important Safety Instructions

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Note:

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an Air Intake Filter

1. Unscrew securing screws of air inlet filter cage.

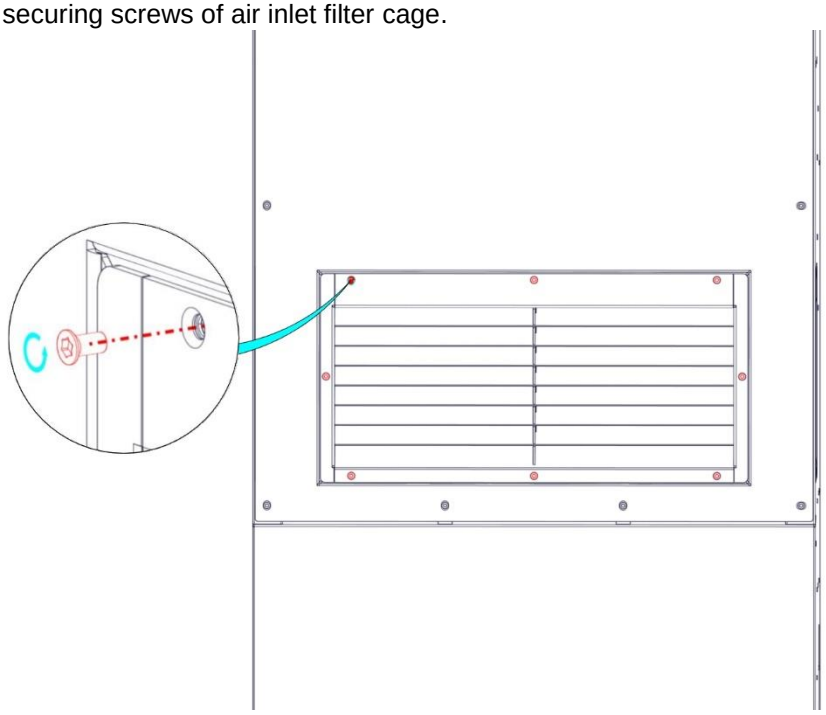

Figure 161. Unscrew securing screws

2. Grasp the air filter cage and take down it.

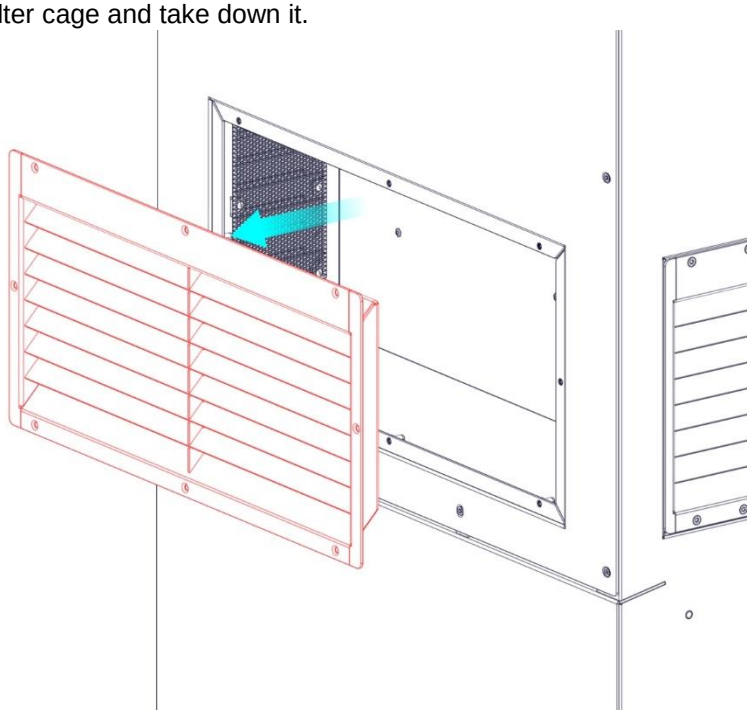

Figure 162. Take down air filter cage

3. Use a vacuum cleaner with an antistatic hose and nozzle to clean the filter. A normal vacuum cleaner creates static discharges.

   The filter can also be cleaned with water. Make sure the filter is completely dried before reusing it in the system.

Figure 163. Clear air filter

Installing an Air Intake Filter

1. Align holes on the air filter cage with the holes on the rear panel, and make sure the air filter cage isn't upside down.

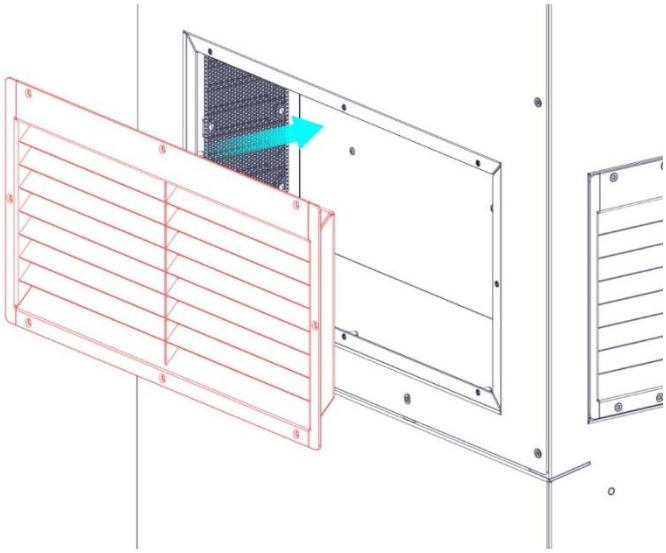

Figure 164. Installing an Air Filter Cage

2. Secure the air filter cage with screws.

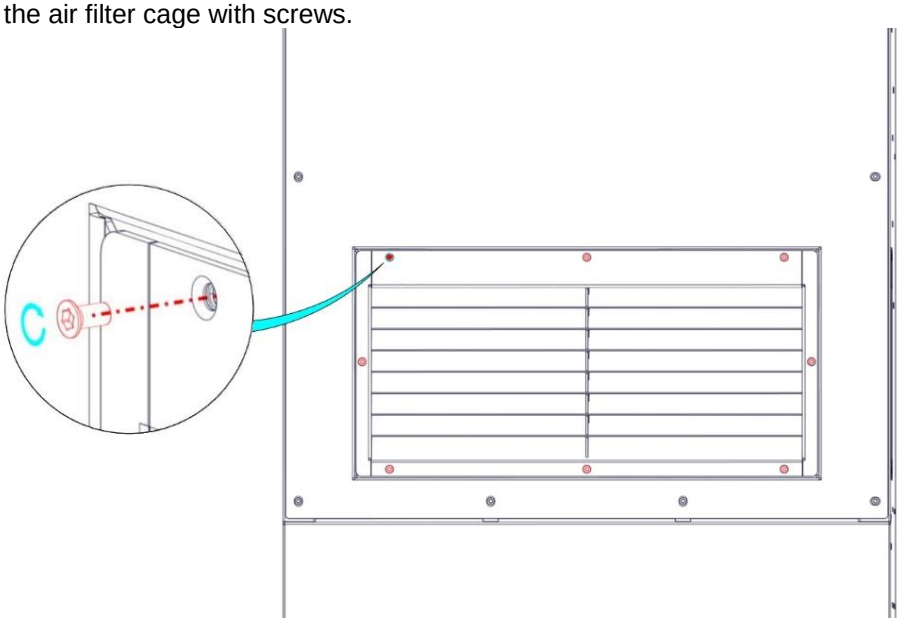

Figure 165. Securing air filter cage

IGBT Heatsink

WARNING!

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- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing a IGBT Heatsink

1. Open the front panel. See “Opening a Front Panel”.
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Remove the A board bracket. See “Removing A Board bracket”
6. Remove the B board. See “Removing B Board”.
7. Open the rear panel. See “Opening a Rear Panel”.
8. Remove the nuts securing the IGBT HSK.

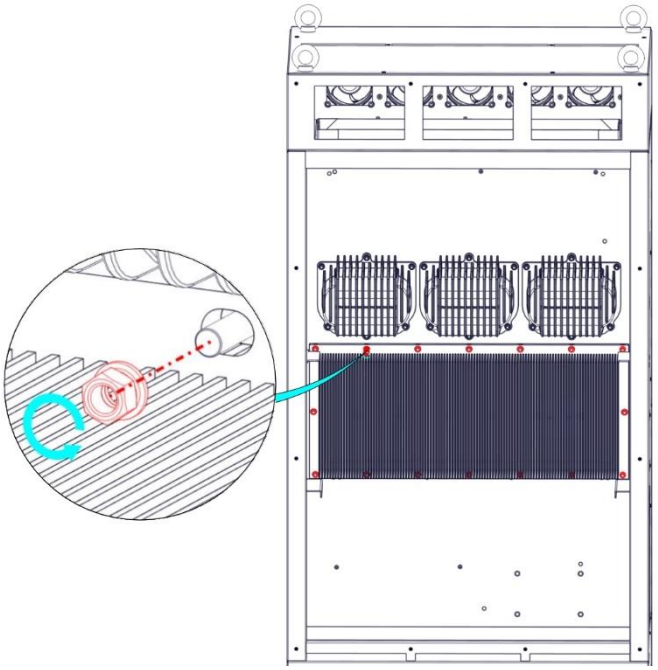

Figure 166. Removing the Screws

9. Grasp IGBT heatsink and take it out carefully, it is very heavy, so should protect yourself against harm.

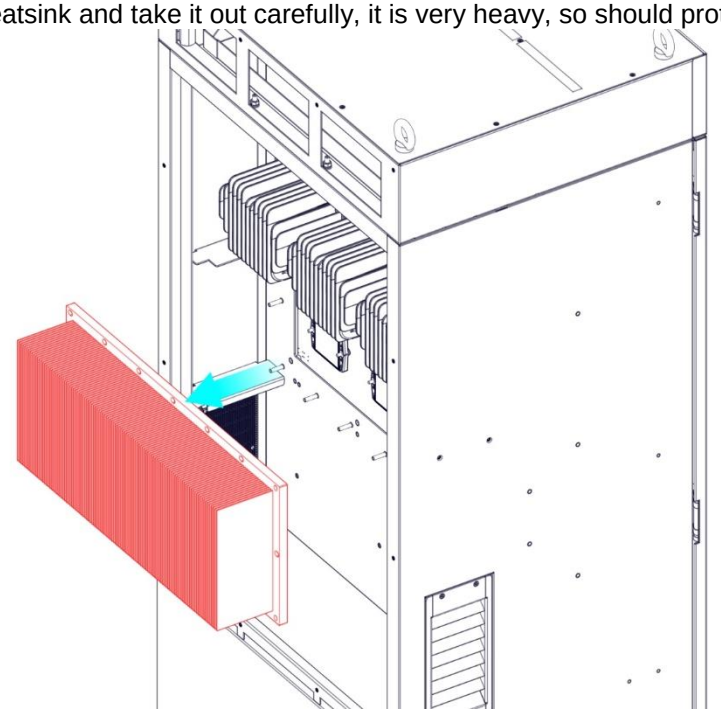

Figure 167. Removing an IGBT HSK

Installing an IGBT HSK

1. Align the IGBT HSK with the posts on the chassis.

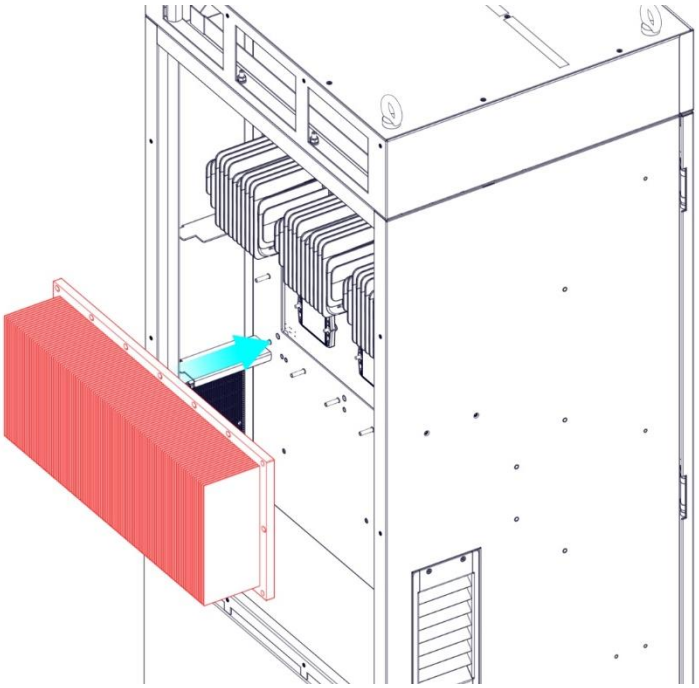

Figure 168. Installing an IGBT HSK

2. Secure the IGBT HSK and the chassis with nuts.

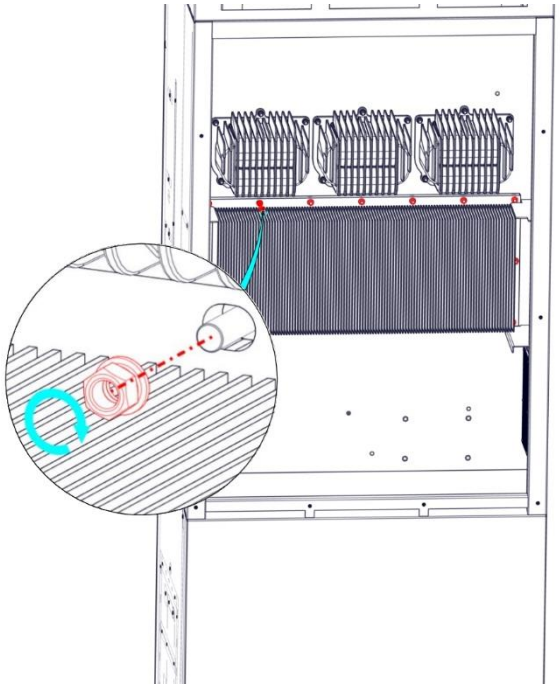

Figure 169. Installing an IGBT HSK

3. Close the rear panel. See “Closing a Rear Panel”.
4. Install the B board. See “Installing a B board”.
5. Install the A board bracket. See “Installing a A board bracket”.
6. Install the C board. See “Installing a C board”.
7. Install the A board. See “Installing a A board”.
8. Install the safety covers. See “Installing Safety covers”.
9. Close the front panel. See “Closing a Front Panel”.

A Board Fan

WARNING!

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- Remove any watches, rings, or other metallic accessories.
- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an A board FAN

1. Open the front panel. See “Opening a Front Panel”.
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove two secure nuts of base of A board fan.

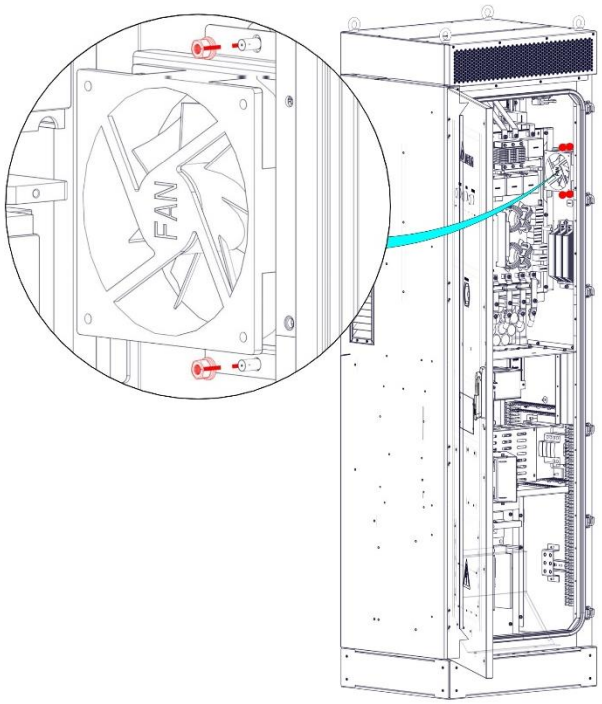

Figure 170. A board fan

4. Take out the fan with its base.

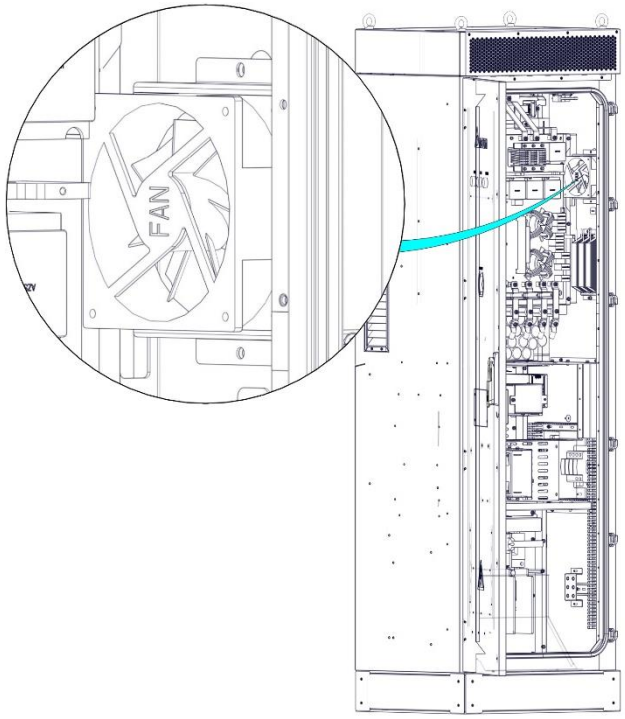

Figure 171. Take out fan

5. Remove securing screws of fan to separate fan and base.

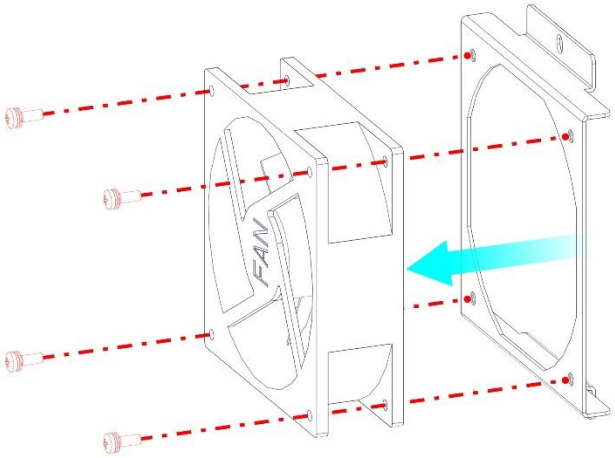

Figure 172. Separate fan with base

Installing an A board FAN

1. Mount fan on the base with screws, but note the air flow direction, don’t mistake it.

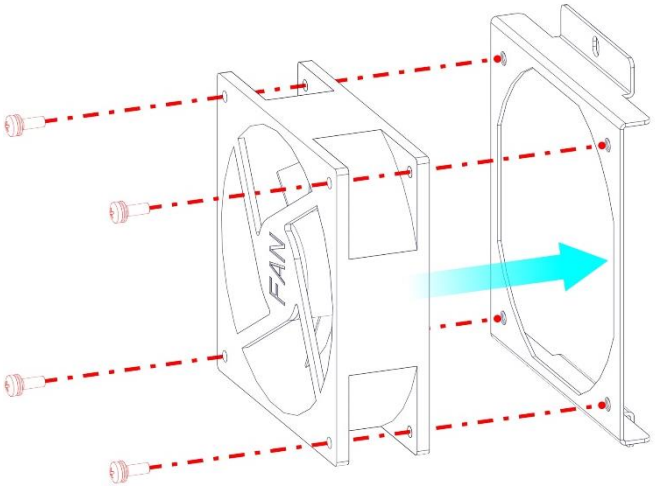

Figure 173. Secure fan on base

2. Hang the fan subassembly on the posts of chassis.

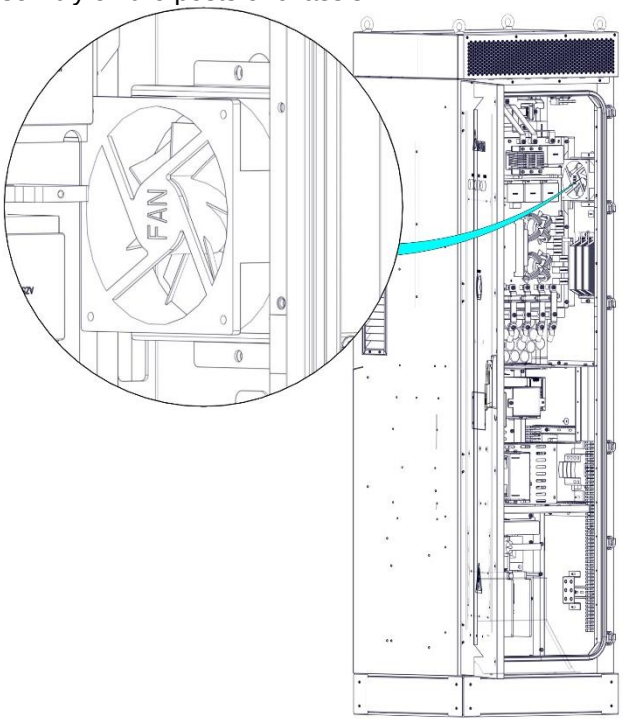

Figure 174. Install fan with base

3. Secure the fan subassembly and the chassis with nuts.

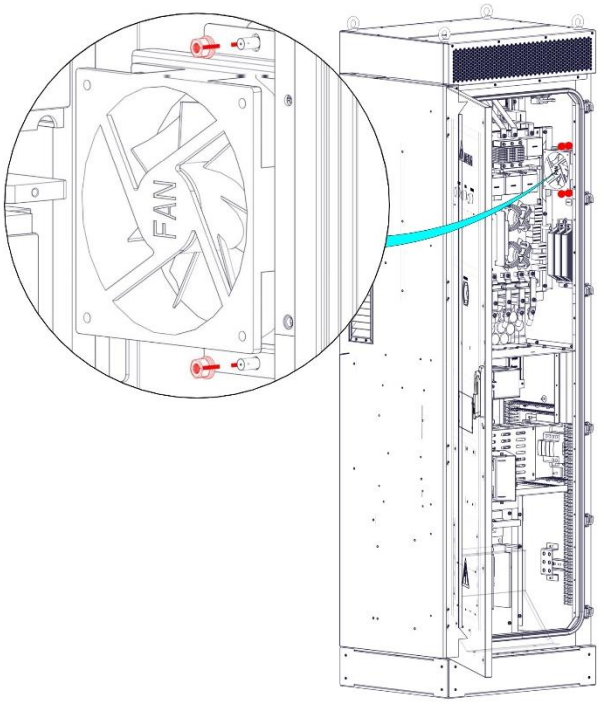

Figure 175. Fasten nuts

4. Install the safety covers. See “Installing Safety covers”.

5. Close the front panel. See “Closing a Front Panel”.

B Board Fan

WARNING!

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Before attempting any work around the PCS, observe the following precautions:

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- Only use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the cabinet.

Removing an B board FAN

1. Open the front panel. See “Opening a Front Panel” .
2. Remove safety covers. See “Removing Safety Covers”.
3. Remove the A board. See “Removing A Board”.
4. Remove the C board. See “Removing C Board”.
5. Remove the A board bracket. See “Removing A Board bracket”
6. Remove two secure nuts of base of B board fan.

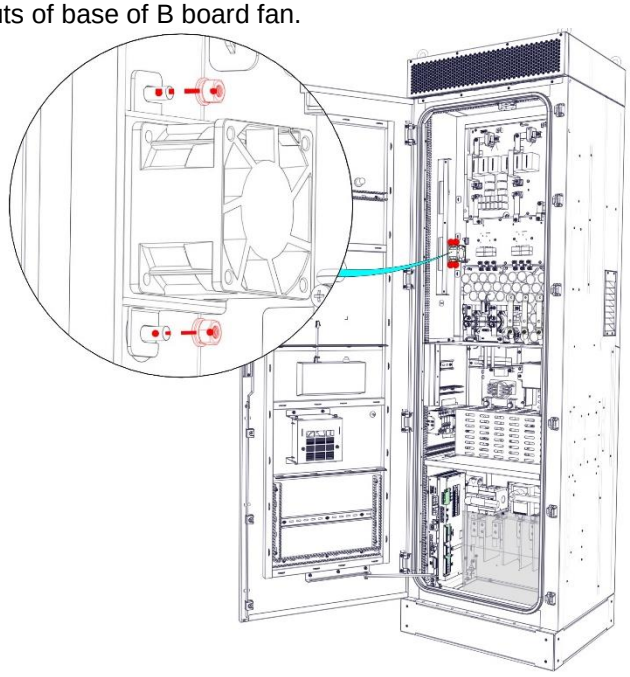

Figure 176. B board fan

7. Take out the fan with its base.

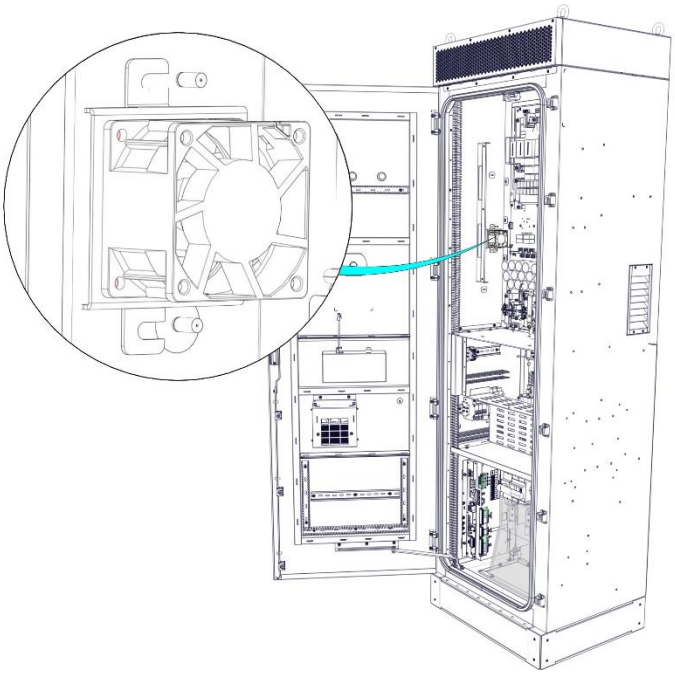

Figure 177. Take out fan

8. Remove securing screws of fan to separate fan and base.

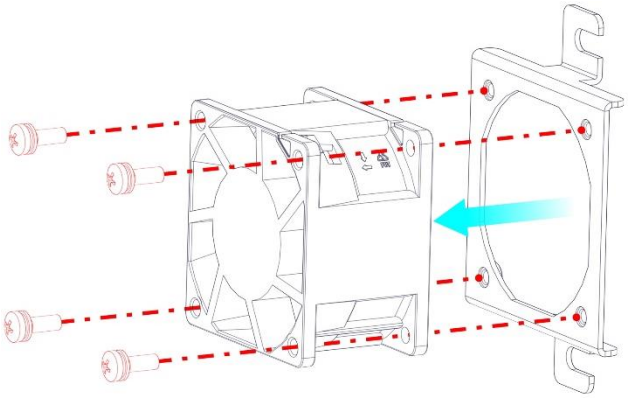

Figure 178. Separate fan with base

Installing an B board FAN

1. Mount fan on the base with screws, but note the air flow direction, don’t mistake it.

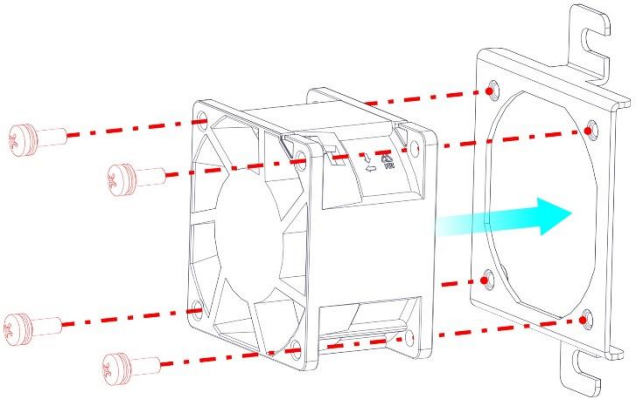

Figure 179. Secure fan on base

2. Hang the fan subassembly on the posts of chassis.

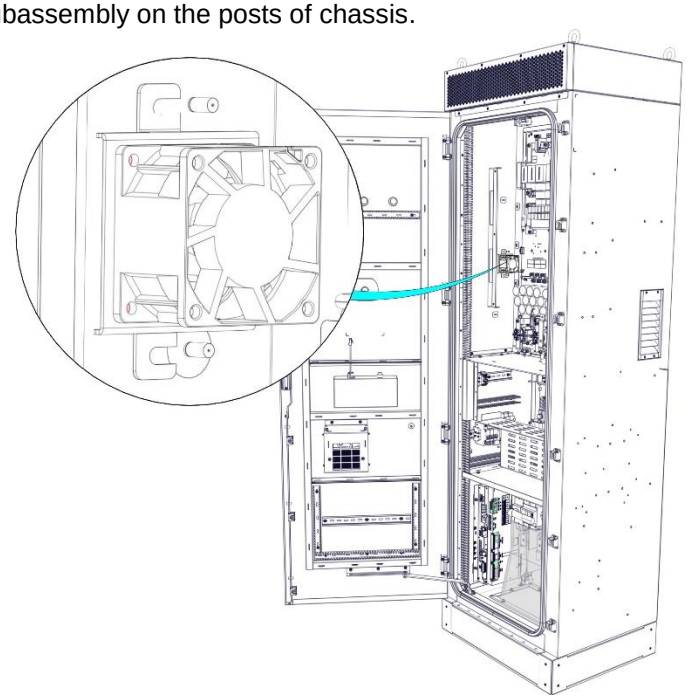

Figure 180. Install fan with base

3. Secure the fan subassembly and the chassis with nuts.

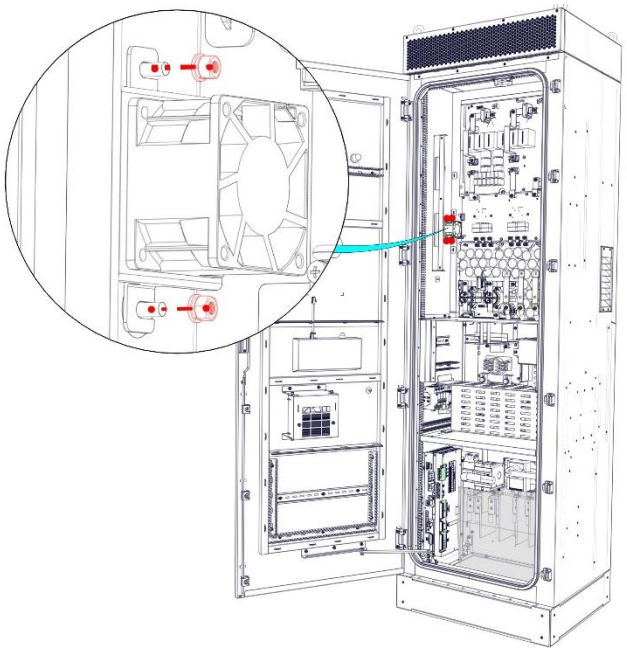

Figure 181. Fasten nuts

4. Install the A board bracket. See “Installing a A board bracket”.
5. Install the C board. See “Installing a C board”.
6. Install the A board. See “Installing a A board”.
7. Install the safety covers. See “Installing Safety covers”.
8. Close the front panel. See “Closing a Front Panel” .

Control Box Fan

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Removing a Control box FAN

1. Open the front panel. See “Opening a Front Panel” .
2. Power off the PCS. See “Power off a PCS” .
3. Remove control box. See “Removing a control box”
4. Unscrew all screws and remove the front cover of control box.

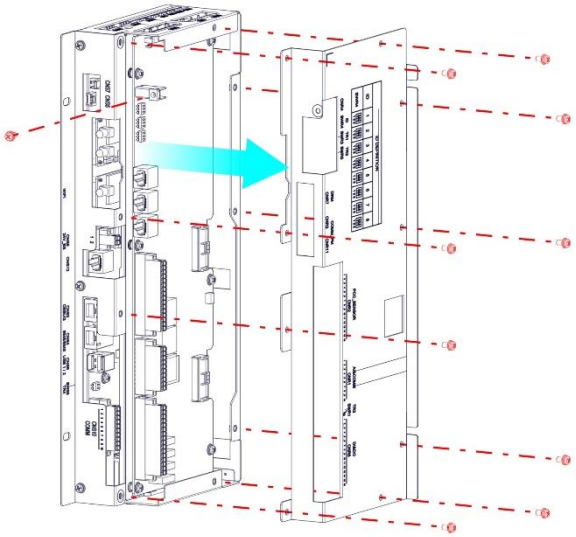

Figure 182. Remove front cover

5. Unscrew all screws and take out R board.

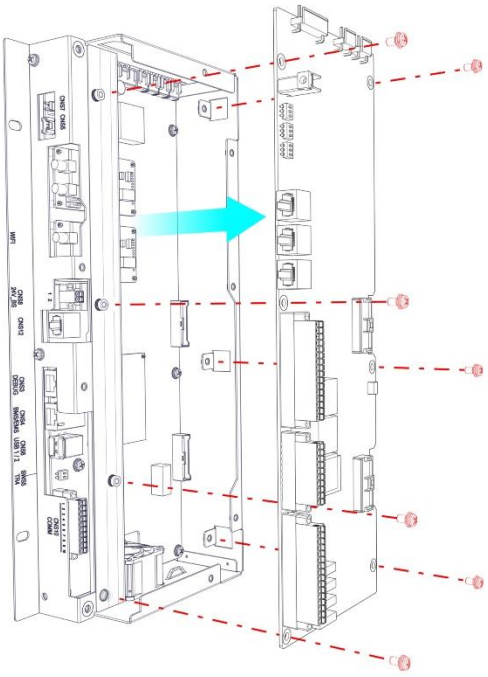

Figure 183. Remove R board

6. Remove securing screws of fan.

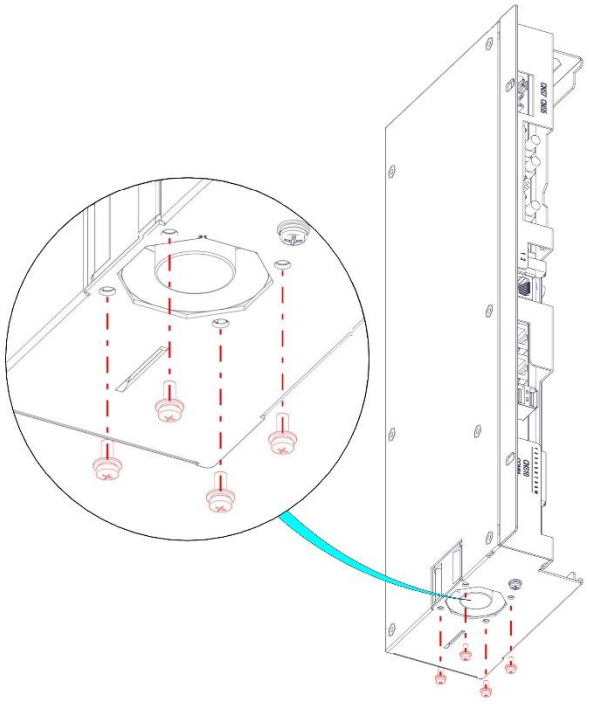

Figure 184. Remove screws

7. Take out the fan from control box.

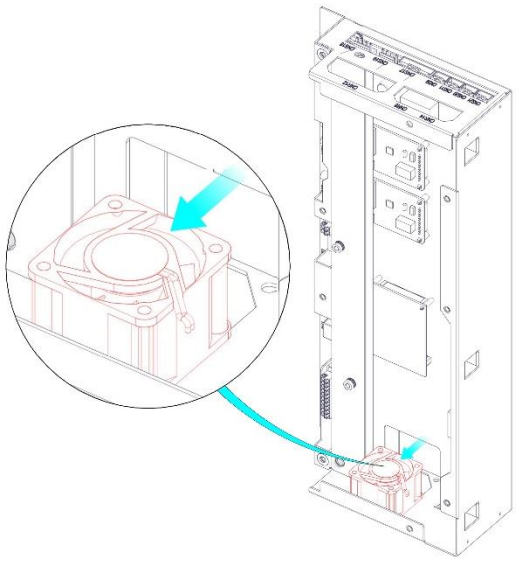

Figure 185. Take out fan

Installing a Control box FAN

1. Insert the fan into control box bottom, but note the air flow direction, don’t mistake it.

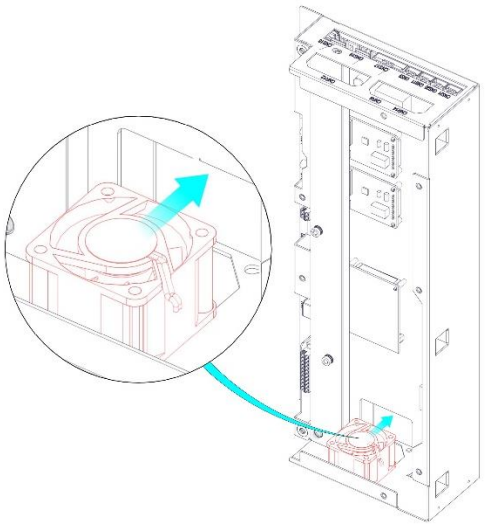

Figure 186. Insert fan into control box

2. Tighten the screws from bottom of control box.

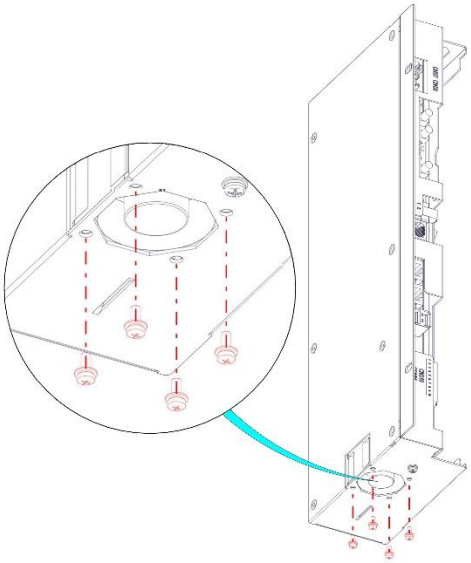

Figure 187. Tighten screws

3. Install R board in control box and tighten its screws.

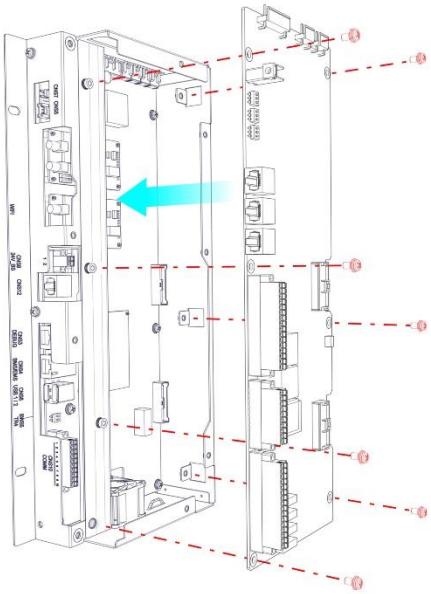

Figure 188. Mount R board

4. Install the front covers of control box and tighten its screws.

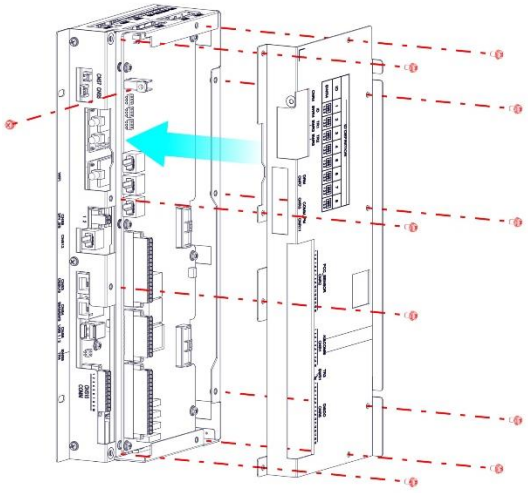

Figure 189. Mount front cover

5. Install the control box. See “Installing a control box”
6. Close the front panel. See “Closing a Front Panel”.

Appendix

Terms and Abbreviations

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 1: 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

1. 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 2: 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