an EnerSys® company

Cordex® CXPS-HSS
Hyperboost Converter Systems

User Guide ID: 0921002-J0
Effective: 06/2023

Read this document carefully.
Learn how to protect your equipment from damage and fully understand its functions.

Cordex® CXPS-HSS
Hyperboost Converter Systems

Copyright notice

Contents

1. Safety

Save these instructions

This document contains important safety instructions that must be followed during the installation, servicing, and maintenance of the product. Keep it in a safe place. Review the drawings and illustrations contained in this document before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies Ltd. or the nearest Cordex® power system representative.

1.1 Safety symbols

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this document. Where these symbols appear, use extra care and attention.

Symbol	Type	Description
	**WARNING**	Risk of serious injury or death Equipment in operation poses a potential electrical hazard which could result in serious injury or death to personnel. This hazard may continue even when power is disconnected.
	**CAUTION**	Cautions indicate the potential for injury to personnel.
	**CAUTION**	Risk of burns A device in operation can reach temperature levels which could cause burns.
	**ATTENTION**	The use of attention indicates specific regulatory or code requirements that may affect the placement of equipment or installation procedures. Follow the prescribed procedures to avoid equipment damage or service interruption.
	**GROUNDING**	This symbol indicates the location or terminal intended for the connection to protective earth. An enclosure that is not properly connected to protective earth presents an electrical hazard. Only a licensed electrician can connect AC power and protective earth to the enclosure.
	**NOTICE**	A notice provides additional information to help complete a specific task or procedure or general information about the product.

1.2 General warnings and cautions

You must read and understand the following warnings before installing the system and its component. Failure to do so could result in personal injury or death.

- **Read and follow all instructions included in this document.**
- **Only trained personnel are qualified to install or replace this equipment and its components.**
- **Use proper lifting techniques whenever handling equipment, parts, or batteries.**

WARNING

This system is designed to be installed in a restricted access location that is inaccessible to the general public.

Ce système est conçu pour être installé dans un endroit à accès restreint inaccessible au grand public.

WARNING

This equipment is not suitable for use in locations where children are likely to be present.

Cet équipement ne convient pas pour une utilisation dans des lieux ou des enfants sont susceptibles d'être présents.

1.3 Mechanical safety

- Keep hands and tools clear of fans. Fans are thermostatically controlled and switch on automatically.
- Power supplies can reach extreme temperatures under load.
- Use caution around sheet metal components and sharp edges.

1.4 Electrical safety

WARNING

Hazardous voltages are present at the input of power systems. The DC output from power modules, though not dangerous in voltage, has a high short-circuit current capacity that can cause severe burns and electrical arcing.

The DC output from converters is a potentially hazardous voltage. Do not touch the output connections when under power. Ensure that power has been removed from the outputs before working on them.

Before working with any live battery or power system, follow these precautions:

- Remove all metallic jewelry, such as watches, rings, metal rimmed glasses, or necklaces.
- Wear safety glasses with side shields at all times during the installation.
- Use Occupational Safety and Health Administration (OSHA®) approved insulated hand tools. Do not rest tools on top of batteries.

WARNING

Lethal voltages are present within the power system. Always assume that an electrical connection or conductor is energized. Check the circuit with a voltmeter with respect to the grounded portion of the enclosure (both AC and DC) before performing any installation or removal procedure.

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Hazardous voltages are present at the input of power systems. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.
- Always assume electrical connections or conductors are live. Turn off all circuit breakers and double-check with a voltmeter before performing installation or maintenance.
- Place a warning label on the utility panel to warn emergency personnel that a reserve battery source is present which will power the loads in a power outage condition or if the AC disconnect breaker is turned off.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

1.5 Installation and safety precautions

- Only qualified personnel should install and connect the power components within the Cordex® power system.
- Make sure to connect the protective earthing (master grounding) terminal within the AC load center of the equipment to the earth point in the building installation or the site reference ground.
- Only install the power system using the mounting hardware provided by Alpha Technologies Ltd.

1.6 Lifting

CAUTION

Follow all local safety practices and guidelines while lifting the enclosure. All personnel involved with lifting and positioning the enclosure must wear head and eye protection, and gloves. Only properly trained and certified personnel should operate the crane. Only properly trained and certified personnel should operate the forklift.

Before lifting the power system into place:

- Ensure the modules are not installed.
- The distribution panel door is firmly affixed.
- Open and latch the enclosure front door.

2. Introduction

2.1 Document scope

This document covers the features, options, installation, and startup of Cordex® CXPS-HSS hyperboost converter systems. Images contained in this document are for illustrative purposes only and may not exactly match your installation. To assist with installation, refer to the drawings at the end of this document.

2.2 Product overview

The –48 Vdc to –58 Vdc Cordex® CXPS-HSS hyperboost converter system is a unidirectional boost converter system designed to allow for larger loads to be powered while keeping the load current constant. By using a DC power system as its input, the unidirectional boost converter boosts DC voltage as high as 58 volts at its output.

The system is based on the Cordex® HP –48 to –58 Vdc 3 kW hyperboost converter shelf and module and are used to boost the DC voltage to reach the remote radio head (RRH) while leveraging existing power cable infrastructure. The Cordex® CXPS-HSS hyperboost converter system can be deployed as a standalone system, with an optional in-shelf controller or can be paired with Cordex® CXPS –48 Vdc power system for a tightly integrated solution using our flagship Cordex® HP controller.

Each fan-cooled converter module can deliver up to 3,000 watts of nominal power up to 149°F (65°C) and 2,400 watts of power up to 167°F (75°C).

Information, adjustments, and controls are a simple process with the Cordex® HP family of controllers. Configuration, adjustments, and information monitoring of the power equipment are accessible through a network web browser.

1. Matrix C16™ high density connectorized DC distribution breaker panel
2. Matrix C16™ SmartSwitch controller (view input bus voltage, input bus current, and alarm status)
3. 40 amp Slimline load breakers (6)
4. Cordex® HP –48 to –58 Vdc 3 kW hyperboost shelves and modules

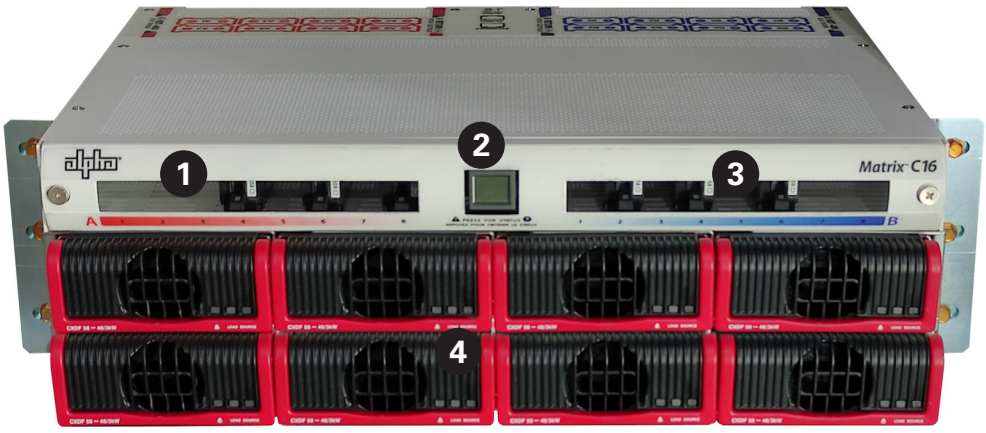


Figure 1: Cordex® CXPS-HSS hyperboost converter system

1. Matrix C16™ high density connectorized DC distribution breaker panel
2. Matrix C16™ panel CAN interface ports
3. Matrix C16™ panel alarm port
4. Shelf ID ports (one per shelf)
5. Hyperboost CAN ports (one per shelf)
6. Output load cable connectors
7. Matrix C16™ panel ground
8. Rack mount brackets

Figure 2: Cordex® CXPS-HSS hyperboost converter system rear view (without rear cover)

1. –58 Vdc output connectors (5)
2. Matrix C16™ panel alarm port
3. Matrix C16™ panel CAN ports (2)
4. –58 Vdc output connectors (4)

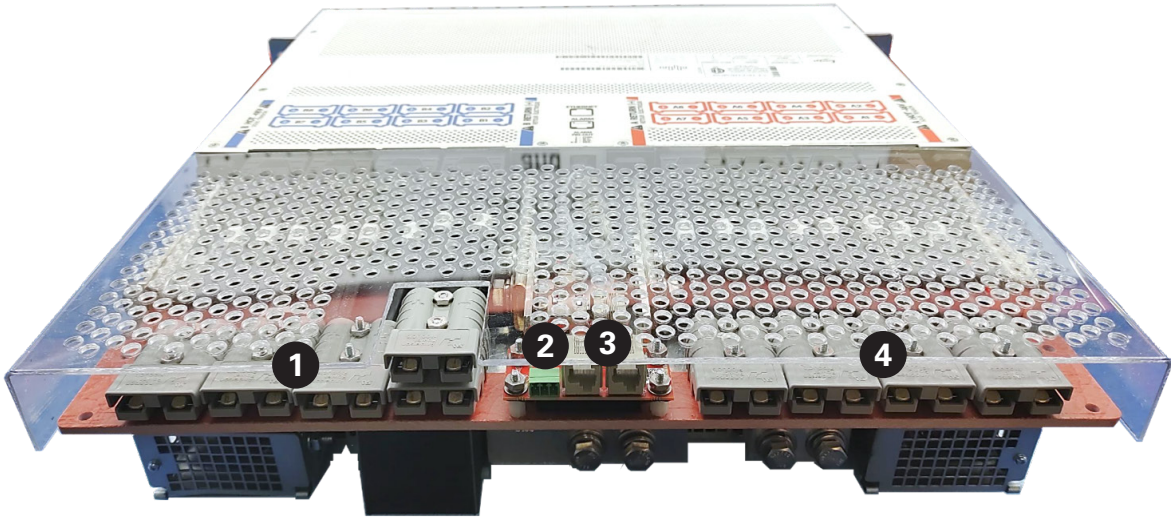


Figure 3: Cordex® CXPS-HSS hyperboost converter system and major components

1. –58 Vdc output busbar and protective cover
2. Return busbar
3. –48 Vdc input busbar

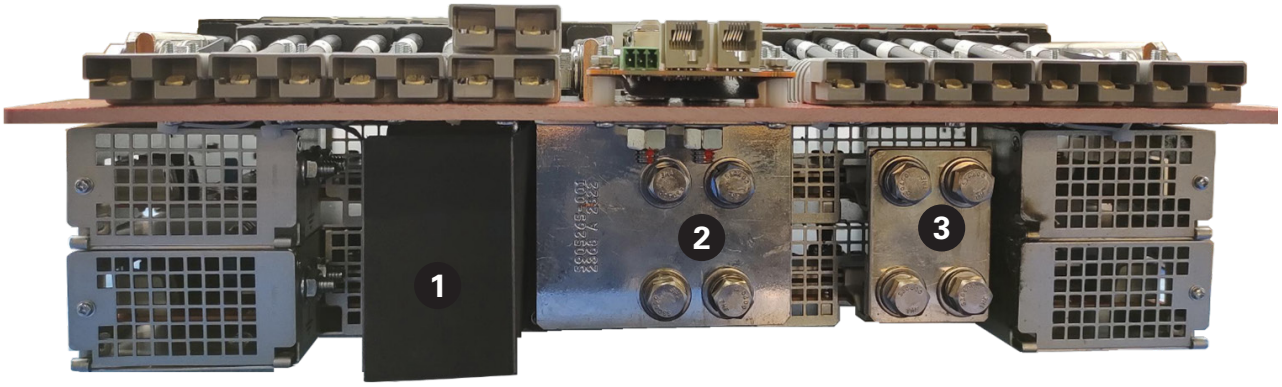


Figure 4: Cordex® CXPS-HSS hyperboost converter system busbar view

2.3 Features and benefits

- High system efficiency for reduced operational expense and carbon footprint.
- Extended operating temperature range for deployment in the harshest outdoor environments.
- Modular and scalable system to support power upgrades to existing macro infrastructure and future technologies.
- Intelligent distribution panel monitors load current and voltage to each RRH.
- Communication with the Cordex® HP controller family for advanced site monitoring applications. The controller provides advanced remote web based monitoring and control features.
  For more information, refer to the Cordex® HP controller documentation.

2.4 Product part numbers

Product	Part number
Cordex® CXPS-HSS hyperboost converter system	0921002-001
Cordex® 3 kW hyperboost converter module	0120090-001
Blanking plate	5905349-001
12 ft (3.65 m) output cable assembly	8701457-001
40 amp Slimline circuit breaker	C470-705-10

3. Specifications

3.1 Cordex® CXPS-HSS Hyperboost converter system

Electrical	
Input voltage	–38 to –58 Vdc
Efficiency	98% peak
Output voltage	–58 Vdc
Output power	21,000 W maximum
Output current	360 A maximum
Load regulation	<±0.5%
Features	
Matrix C16™ SmartSwitch controller	• Per circuit output voltage • Per circuit output current • Bus output voltage • Bus output current
Status indicators (LEDs)	DC load port, DC source port, and Module alert
Adjustments	• Output voltage • High voltage alarm • Low voltage alarm • High voltage shutdown • Start delay timer
Protections	• 40 amp load breakers (6) • Current limit and short circuit • Startup delay • Input and output fuses • Output high voltage shutdown • Power limiting • Over temperature
Mechanical	
Dimensions H × W × D	5.2 × 17.4 × 19.4 in. (133 × 442 × 492 mm)
Weight (no modules)	49 lb (22.2 kg)
Mounting	3RU
	Offset center mount
CAN communication	RJ12 offset
IP communication (distribution)	RJ45
Auxiliary alarm communication (distribution)	3-pin Molex® connector
Load connection	6 × 10 ft (3.05 m) load cable with quick disconnects
	Expandable to 9
Environmental	
Temperature	**Operating:** –40 to 149°F (–40 to 65°C)
	Storage: –40 to 185°F (–40 to 85°C)
Relative humidity	5 to 95% non-condensing
Elevation	Up to 9,842 ft (3,000 m)

Regulatory compliance	
Safety	CSA/UL 62368-1 Edition 3
EMC	FCC CFR47 Part 15/B- Class A
	CAN ICES-003(A)/NMB-003(A)
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.	

3.2 Cordex® HP 3 kW Hyperboost converter module

Electrical	
Output power	3,000 W nominal per module
Output current	62.5 A maximum per module
Load regulation	<±0.5%
Acoustic	<60 dBA
Mechanical	
Dimensions H × W × D	1.6 × 4.1 × 13.1 in. (41 × 104 × 333 mm)
Weight	4 lb (1.8 kg)
Modules per shelf	Up to 4 modules per shelf (19-inch shelf)

4. Cordex® 3 kW Hyperboost modules and shelf

4.1 Converter modules

4.1.1 Status indicators

The converter module has three LEDs. Refer to Troubleshooting Cordex® hyperboost module LEDs for more information. The LEDs are color-coded to indicate converter status.

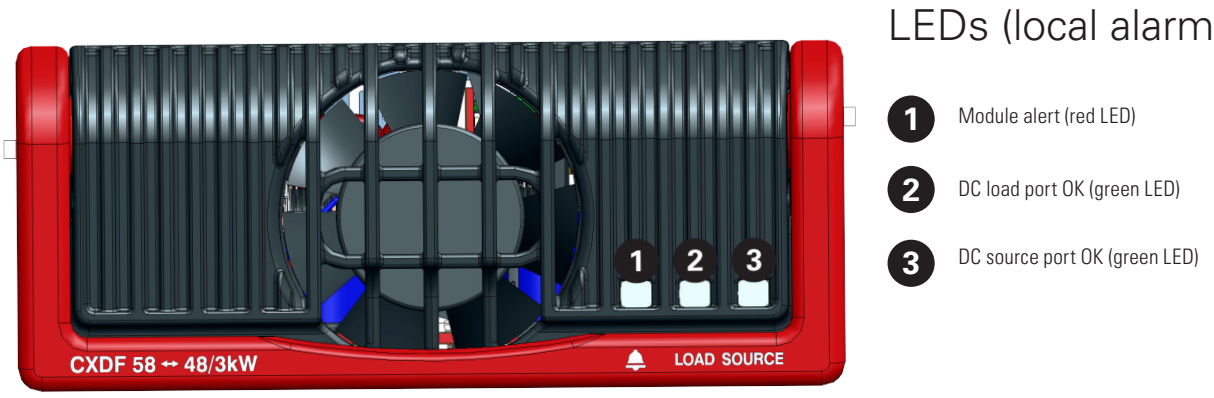


Figure 5: Cordex® CXDF 58 – 48/3 kW module LEDs

The three LEDs on the front panel are module alert (red LED), DC load port (green LED), and DC source port (green LED). The green LEDs are off to indicate no power and they flash at one hertz to indicate that the voltage is out of range. They are on solid to indicate normal power and voltage conditions.

The red LED is the fault or alert LED and indicates an internal error. A solid red LED indicates a critical alert that keeps the converter module from delivering power, while a flashing red LED indicates a warning as described in Maintenance and troubleshooting.

4.1.2 Blanking plate

Blanking plates are available for unused slots (three blanking plates included with PN: 0921002-001).

NOTICE

Install blanking plates in any unused slots.

4.1.3 Shelf connections

CAN: Daisy chain the CAN bus from one shelf to the next. If one of these shelves is that last shelf in the chain, terminate the chain by installing a CAN terminator (PN: 7400644-001) in the remaining open CAN port.

Shelf ID: Shelf ID location technology is built into the converter shelf. This feature is capable of remotely locating the exact position of a power module within a large system. This can be useful for quickly locating a unit during a service interruption or when a unit has failed. The optional Cordex® HP Shelf/Bay ID peripheral (PN: 0180050-001) is required for this feature to work.

4.1.4 Rack mounting

Cordex® CXPS-HSS hyperboost converter systems can be installed in a variety of Alpha® 19-inch and 23-inch seismic racks. These racks have been Z4 rated and Network Equipment-Building System (NEBS) L3 certified. The racks vary in their Z4 seismic capabilities from 500 to 2500 lb (227 to 1134 kg) and 3.5 to 9 feet in height (standard 7 foot racks are available as well).

4.1.5 Fan operation

Each converter module is equipped with a front-mounted variable-speed fan. The speed of the fan is determined based on ambient temperature, converter module temperature, and the load. The airflow from the fan is from front-to-rear, with the exhaust air exiting through internal vents at the rear of the module. The fan will spin in required situations.

4.1.6 Over temperature protection

Blockage or obstruction of airflow can result in the internal temperature rising with reduced output power or even shut down the converter module. The module will resume normal operation when the temperature lowers to a safe level.

Over temperature shut down can also occur when a fan failure has occurred. To protect itself from ambient over temperature scenarios, the converter module will limit its output power, as shown in the following plot.

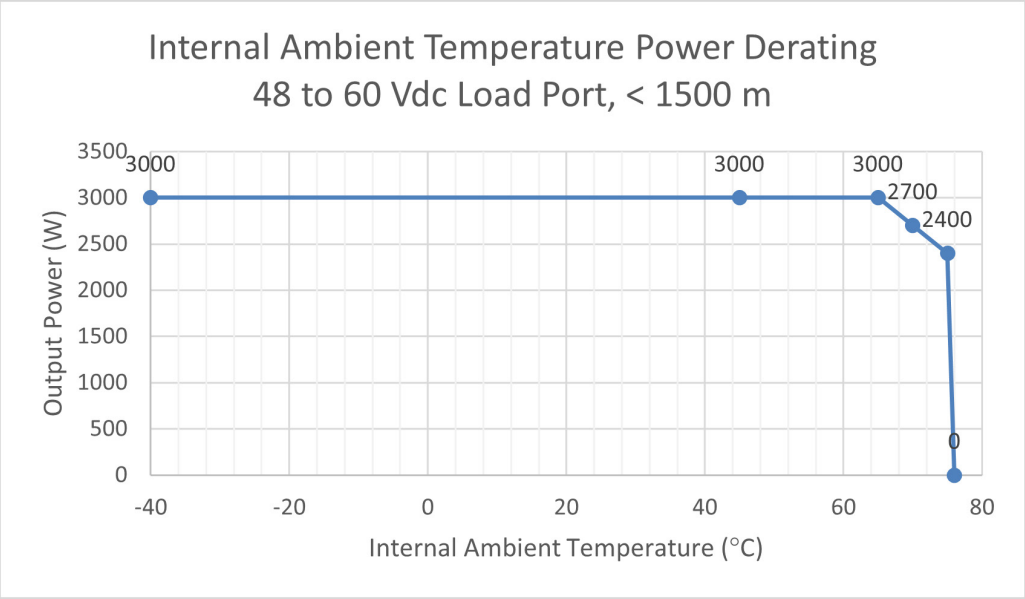


Figure 6: Internal ambient temperature power derating

4.1.7 Fan failure

If there is a fan failure, the converter module will report the fan failure alarm over the CAN bus to the controller. The fan is field replaceable, and the procedure is described in 10.2 Fan replacement on page 30.

If a fan failure occurs, the module will enter into a thermally stable state due to the temperature dependent power derating or the module will automatically shut down without any damage due to heatsink over temperature.

4.1.8 Startup and soft start delay

The start up time of each converter module (including soft start) is one second to have an output voltage of 58 Vdc. The startup time is required to complete inrush limit routine and DC measurement.

4.1.9 Current limit and short circuit protection

The current limit function determines the maximum output current limit of the converter module, regardless of the output voltage or power. The maximum output current is limited to a constant value down to a short circuit condition.

The converter module will sustain a continuous short circuit at the load port. The maximum short circuit current will not exceed 62.5 amps per module.

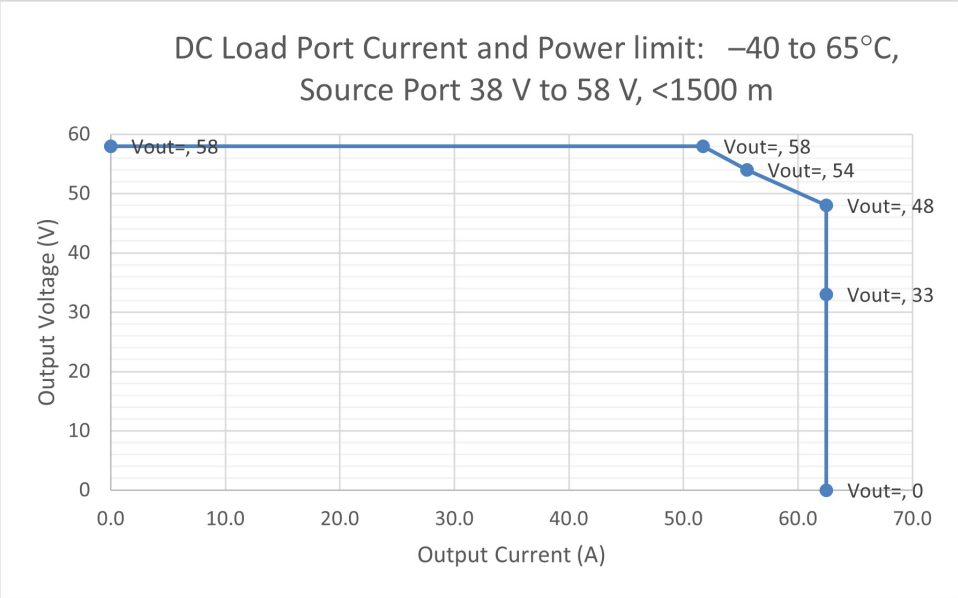


Figure 7: DC load port current and power limit

4.1.10 Power limit

Each converter module is designed to limit the power output to achieve the module specification of 3 kW. This enables more current to be supplied at lower output voltages and allows matching the output power to the demands of constant power loads, which can be required for telecom equipment.

NOTICE

The current limiting feature overrides the power limiting feature.

5. Matrix C16™ DC distribution breaker panel

The Matrix C16™ high density connectorized DC distribution breaker panel provides high reliability, high power, DC distribution in a compact form factor.

NOTICE

The Matrix C16™ panel distribution auxiliary alarm connection point has been extended close to the rear output connectors of the system. The Matrix C16™ panel distribution auxiliary alarm is only for the distribution. The Cordex® CXPS-HSS hyperboost converter system does not have its own auxiliary alarm.

NOTICE

The Cordex® CXPS-HSS hyperboost converter system includes a board that translates the RJ45 pinout to a 3-pin Molex® connector.

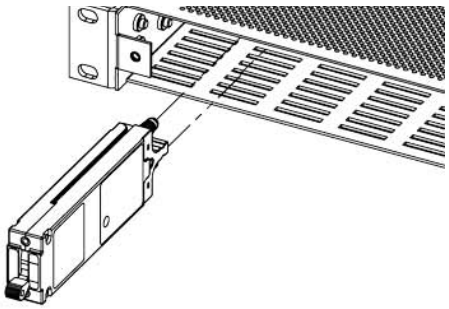
5.1 Breaker installation

CAUTION

Ensure circuit breakers are in the OFF position prior to installation. Ensure circuit breakers are completely inserted.

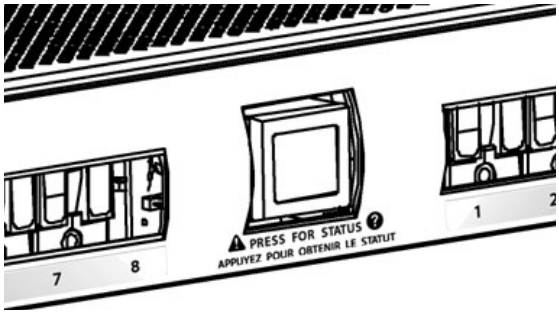
There are 16 breaker positions in the Matrix C16™ breaker panel. A maximum of nine breakers can be installed in the system.

1. Remove the breaker compartment door from the panel by loosening the two thumb screws on the door.
2. Select a breaker of sufficient ampacity and insert it into the desired output circuit, making sure to seat the breaker securely. A breaker legend is applied to the inside of the compartment door to allow an installer to mark the use of each breaker.
3. Once all desired circuit breakers have been installed, reinstall the breaker compartment door and secure it with the thumb screws.



5.2 Operation

The Matrix C16™ breaker panel is equipped with a SmartSwitch controller LCD on the front panel. This display allows you to configure settings and view information.



5.2.1 User interface

To advance any item in the menu, tap the SmartSwitch LCD. Fully depress the LCD itself for less than one second. To select a value or enter a menu, press and hold the SmartSwitch LCD for at least three seconds.

5.2.2 Home screen information

The SmartSwitch home screen displays input bus voltage, input bus current, and alarm status. Under normal operation, the home screen backlight will remain green.

The dual input SmartSwitch home screen will automatically cycle between the A and B bus displays. Tapping the LCD once will cycle through the menus manually. The available options from the home screen are **Input A**, **Input B**, **VIEW BKR LOAD**, and **SETUP** menus.

The home screen indicates the realtime status of the panel based on its backlight color.

Backlight color	Status indicated	Alarm type
Green	Normal operation	N/A
Orange	Warning	Minor
Red	Alarm	Major

5.3 Initial operation

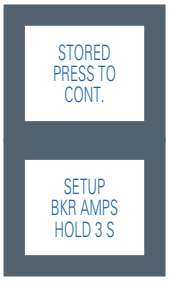
Once all breakers are installed and power is present on the inputs, remove the breaker compartment door and slide the power switch to the on position. The power switch is located on the front right side of the SmartSwitch LCD. The LCD turns on and displays the Alpha® logo followed by the firmware version.

5.3.1 Breaker inventory process

Before the monitoring features of the Matrix C16™ panel can be viewed on a Cordex® HP controller, a breaker inventory must be taken.

1. Upon first power up, the system prompts **TURN ON THE BKRS HOLD 3S**.
2. Turn on all breakers to be inventoried. Press and hold the LCD as prompted.

3. The LCD will show the number of breakers installed in the panel. If the number of breakers displayed is incorrect, check that all installed breakers are fully seated, in the correct orientation, and turned on.
4. If the number of breakers is correct, press and hold the LCD for three seconds to continue.
5. The LCD shows **STORED PRESS TO CONT**. Tap the LCD to continue and set the breaker ampacity.



5.3.2 Setting breaker ampacity

The SmartSwitch LCD prompts **SETUP BKR AMPS HOLD 3S**.

1. Press and hold the LCD for three seconds to enter the menu to set breaker ampacity.
2. The first breaker in inventory will be displayed, along with its currently set ampacity. If the ampacity is incorrect, press and hold the LCD for three seconds to enter the menu.
3. Tap the LCD until the correct ampacity is displayed (the display will advance through standard Slimline breaker ampacities: 1, 3, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 80, 90, and 100), then press and hold the LCD for three seconds to save the value.
4. The next breaker in inventory will now be displayed. Repeat steps 1 to 3 for each breaker in inventory.
5. Once all of the breaker ampacities are set correctly, advance to the screen that says **EXIT HOLD 3 S** and press and hold the LCD for three seconds to exit the menu and save the values.

This completes the initial SmartSwitch setup.

5.3.3 VIEW BKR LOAD HOLD 3 S

Entering this menu will display voltage, current, and alarm status information for each circuit that is stored in inventory. When the menu is entered, the first circuit in inventory will be displayed. Tapping the SmartSwitch LCD will advance to the next circuit in inventory.

5.3.4 SETUP HOLD 3 S (setup menu)

The setup menu is used to configure the SmartSwitch LCD. The system will prompt you with **SETUP HOLD 3 S** to enter the menu. This menu is accessed by taping the home screen until the prompt appears, then pressing and holding the LCD for three seconds.

5.3.5 SETUP BKR INV HOLD 3 S (breaker inventory)

Press and hold the SmartSwitch LCD for three seconds to enter the menu and perform a breaker inventory. Follow the on-screen prompts to finish inventorying circuits. A breaker inventory must be performed every time a new circuit is added to the Matrix C16™ panel.

5.3.6 SETUP BUS ALMS

Press the LCD for three seconds to access the **Bus Alarm Menu**.

This menu is used to set the input bus rating to enable the panels over current monitoring features.

1. To set the bus A ampacity, select the option that displays **SETUP BUS A HOLD 3 S.** The LCD will then display **HOLD TO EDIT, TAP TO SHIFT**. Press the LCD to access the first bus.
2. Three digits will now appear on screen with an arrow under the first digit.
3. To edit a digit, press the LCD for three seconds, then tap to change its value. Hold for three seconds to save the edits.
4. Repeat these steps for each digit that needs to be edited.
5. Repeat for bus B.

5.3.7 SETUP BKR ALMS

Press the LCD for three seconds to access the **Breaker Alarm Menu**.

This menu is used to configure the alarm and warning threshold for overcurrent alarms.

The alarm setting is used to set the threshold for the panel's overcurrent alarm. An alarm condition will annunciate locally with a red display and an audible alarm. It will also cause a remote alarm via the Form C dry alarm contact and email alerts via the Ethernet web server.

The warning setting is used to set the threshold for the panel's overcurrent warning (pre-alarm). The warning will only annunciate locally.

5.3.8 SETUP VOLT CAL

Press the LCD for three seconds to access the **Voltage Calibration Menu**.

This menu is used to calibrate displayed bus voltages. Voltage can only be edited if within valid voltage range.

6. Inspection

6.1 Packing materials

Alpha Technologies Ltd. is committed to providing products and services that meet our customers' needs and expectations in a sustainable manner, while complying with all relevant regulatory requirements. As such Alpha strives to follow our quality and environmental objectives from product supply and development through to the packaging for our products.

Power modules and batteries are shipped on individual pallets and are packaged according to the manufacturer's guidelines.

Almost all Alpha packaging material is from sustainable resources and or is recyclable.

6.2 Returns for service

NOTICE

Alpha Technologies Ltd. is not responsible for damage caused by improper packaging of returned products.

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is unavailable, make sure that the product is packed with at least three inches of shock-absorbing material to prevent shipping damage.

6.3 Check for damage

Before unpacking the product, note any damage to the shipping container. Unpack the product and inspect the exterior for damage. If any damage is observed, contact the carrier immediately. Continue the inspection for any internal damage. In the unlikely event of internal damage, inform the carrier and contact Alpha Technologies Ltd. for advice on the impact of any damage.

6.4 General receipt of shipment

The inventory included with your shipment depends on the options you have ordered. The options are clearly marked on the shipping container labels and bill of materials.

6.5 Miscellaneous small parts

Review the packing slip and bill of materials to determine the part number of the configuration kits included with your system. Review the bill of materials to verify that all the small parts are included. Contact us if you have any questions before you proceed.

7. Installation

The equipment is suitable for installation in network telecommunication facilities.

WARNING

This system is designed to be installed in a restricted access location that is inaccessible to the general public.

Ce système est conçu pour être installé dans un endroit à accès restreint inaccessible au grand public.

NOTICE

The following wiring setup is only an example of installing the Cordex® CXPS-HSS hyperboost converter system in a Cordex® CXPS-E6 edge power system.

The following procedure is written for qualified personnel to install this product in a clean and dry environment. For the battery installation, refer to the manufacturer's documentation.

7.1 Installation overview

1. Wiring setup
2. Additional wiring setup for additional RRH
3. Controller setup
4. Final tests

7.2 Safety precautions

Refer to the Safety section before beginning this installation.

7.3 Installation tools

Various insulated tools are essential for the installation. Use this list as a guide:

- Lifting apparatus (if required)
- Digital voltmeter equipped with test leads
- Torque wrench: 1/4 inch drive, 0 to 150 in-lb (0 to 17 Nm)
- Torque wrench: 3/8 inch drive, 0 to 100 ft-lb (0 to 135 Nm)
- Insulating canvases as required
- Various insulated hand tools including:
  - Combination wrenches
  - Ratchet and socket set
  - Various screwdrivers
  - Electricians knife
- Cutters and wire strippers 14 to 22 AWG (2.5 to 0.34 mm²)
- Cutters and wire strippers 8 to 25 AWG (10 to 4 mm²)

7.3.1 Recommended torque values

Connection	Torque value
Busbar bracket fastener	150 in-lb (16.9 Nm)

7.4 Wiring setup

WARNING

Ensure the AC input breaker and the battery breakers are in the **OFF** position. Lockout may be required.

CAUTION

Some edges can be sharp
Wear cut resistant gloves during the installation of the Cordex® CXPS-HSS hyperboost system.

CAUTION

Two people are recommended to lift and place the Cordex® CXPS-HSS hyperboost system into place above the existing power system.

1. Take the Cordex® CXPS-HSS hyperboost system out of its packaging and inspect for damage. Prepare the other ordered parts that will be used with the Cordex® CXPS-HSS hyperboost system as well as the required tools.
2. Install the Cordex® CXPS-HSS hyperboost system in the rack securing it using rack mounting screws.

Figure 8: Cordex® CXPS-HSS hyperboost system on top of existing Cordex® CXPS-E6 edge power system

3. Locate the rear busbars of the existing power system and remove the eight hex head screws and washers attached to those busbars.
4. Align and install the new spacer and –48 V hot link busbar brackets to the shelves' busbars using the supplied eight stainless steel hex head screws and washers by first finger tightening all of them into place and then use the socket wrench to tighten to the required torque specification.

NOTICE

The new spacer is placed in between the Cordex® CXPS-HSS hyperboost system input bus bar and the new –48 V hot link busbar.

Figure 9: Spacer (not shown) with the –48 V link busbars installed to the right of the system

5. Align and install the larger common link busbar bracket using the supplied eight stainless steel hex head screws and washers. Similar to the previous step, finger tighten all the screws into place.

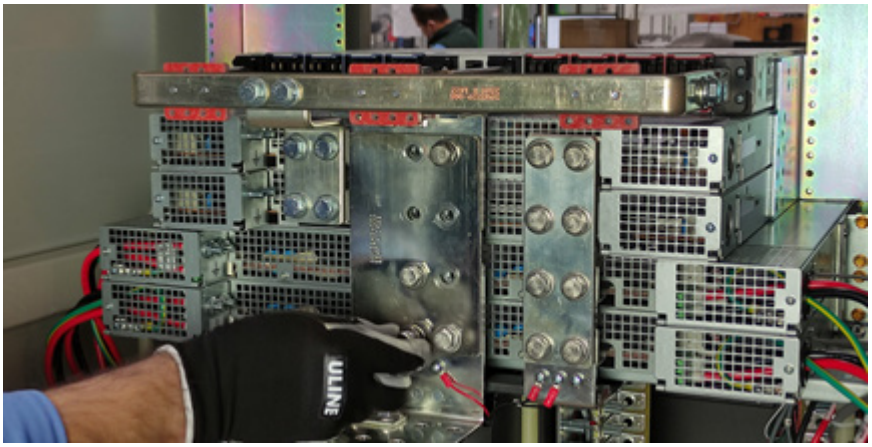


Figure 10: Common link busbar bracket installed on the middle of the system

6. Torque all sixteen newly installed screws and washers to 150 in-lb (16.9 Nm) using a torque wrench.

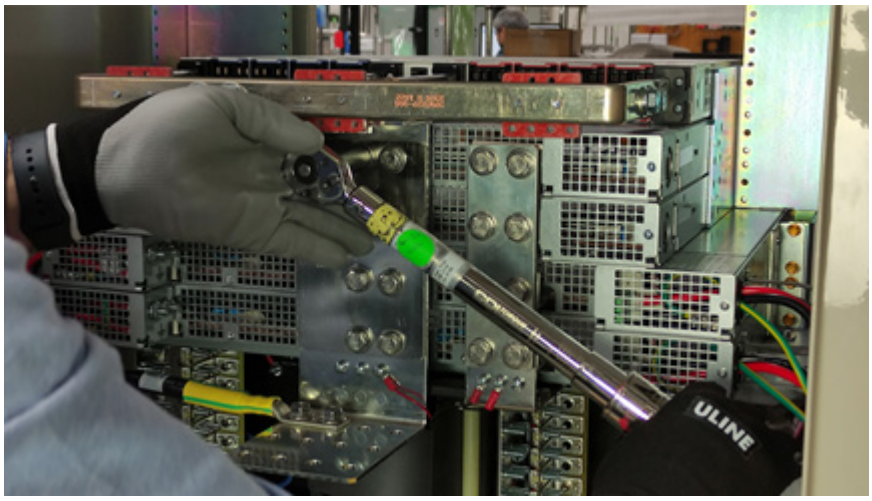


Figure 11: Hex head screws torqued to proper specifications

7. Facing the rear of the unit, located at the right side of the existing power system, remove the center-pinned CAN terminator plug from the power system's bottom rectifier shelf and install the new center to offset CAN cable assembly from the lower rectifier shelf to the lower hyperboost shelf.

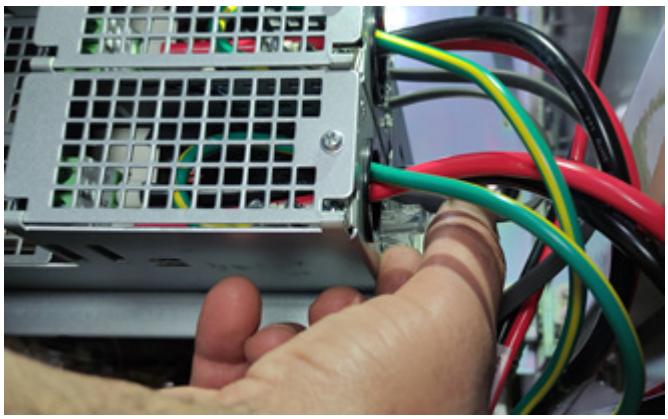


Figure 12: CAN terminator plug location

Figure 13: CAN cable installed to the lower hyperboost shelf

8. Connect the right side CAN port of the Cordex® CXPS-HSS hyperboost converter shelf to the right side Matrix C16™ panel CAN interface port using an offset to offset CAN cable assembly.

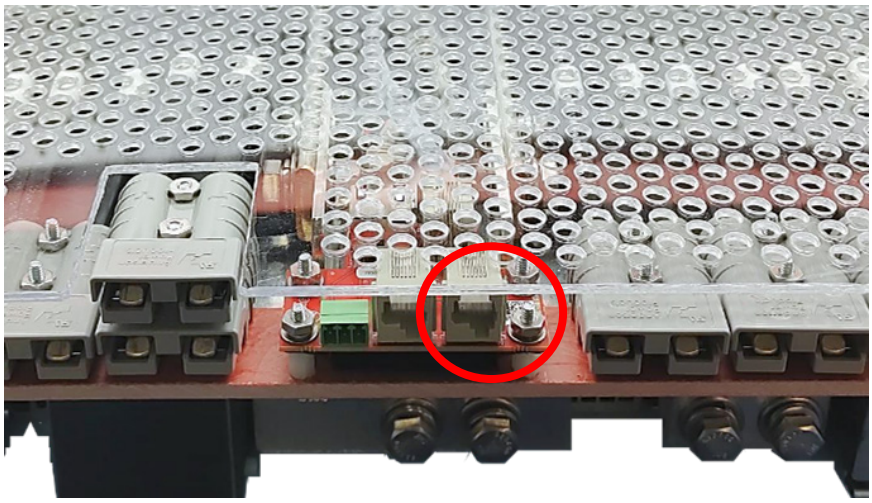


Figure 14: Matrix C16™ panel CAN interface port

9. Connect a CAN terminator to the other CAN interface port using an offset CAN terminator.
10. With the connectors located on the left side of the hyperboost shelves, install the new offset to offset CAN cable assembly.

Figure 15: Inter-shelf CAN cable assembly

11. Install the protective insulator cover to the –48V input busbar with cable ties.
12. Connect the six output cable assemblies to the –58 Vdc output connector. Un-hinge the output cable zip tie holder bracket and attach each output cable assemblies using zip ties
13. Wire all the six output cable assemblies to the six surge protection device (SPD) modules and neatly route the cables.
14. Visually inspect the installation thoroughly.

WARNING

Orange cables indicate the system is hot (–58 Vdc) and the black cables are the system return (common).

7.5 Cordex® HP controller setup

NOTICE

Ensure the Cordex® HP controller is using software version 8.00 or later.

7.5.1 Navigating the menu

Configuration

A key configuration in the system is the **Load Bus Output Voltage**. This is the load bus output voltage that the converters will always maintain. From the controller interface, go to **Systems > Hyperboost System > Configure System**. In the **Configuration** table, the **Load Bus Output Voltage** can be set. The load bus output voltage has a range between 48 and 58 volts.

System status

From the controller interface, go to **Systems > Hyperboost System > Status**. The **System** table on this page shows system summary information, such as the average source port and load port voltages, and total source port and load port power.

Power flow

For a graphical view of the system, from the controller interface, go to the power flow page (only available from the web interface). On the power flow page, select the icon of the hyperboost system or the DC system icon to see the power flow view of each respective system. Further selecting the icons from inside the system level diagram will navigate to the associated table in the menu, allowing for more details of that item.

NOTICE

The controller front Ethernet port IP address can be found through the controller LCD by browsing to Shortcut > Ethernet Port.

1. Connect a CAT 5 or CAT 6 cable to the front Ethernet port of the controller and to the management computer. Set the IP address so it is on the same network as the controller (IP address and subnet mask).
2. Open an internet browser and enter the IP address of the controller. If everything is set up properly, you should be greeted with a username and password sign in screen. Enter the user name and password.
3. Navigate to **Controller > Files & Upgrades > Software Upgrade** and select the **Upload New Controller Software and Reboot** button.
4. Update the controller software to version 8.00 by selecting the file and then selecting the **Upload** button.
5. Navigate to **Systems > Add or Remove Systems** and select the **Create System** button.
6. From the dropdown menu, select **Converter System**.
7. Follow the wizard and select **Hyperboost System 48V-58V** as the system type.

8. Wiring

This chapter provides cabling details and notes on cable sizing for DC applications with respect to the product.

WARNING

Ensure that the power is switched off by switching off power modules and removing battery line fuses, turn off battery breakers before attempting work on the wiring. Use a voltmeter to verify the absence of a voltage. Clearly mark the correct polarity of the battery leads before starting work on DC connections.

8.1 Installation notes

Refer to the Installation section for safety precautions and tools required.

8.1.1 Calculating output wire size requirements

Although DC power wiring and cabling in telecommunication applications tend to exceed electrical code requirements, mostly due to the voltage drop requirements, all applicable electrical codes take precedence over the guidelines and procedures in the present chapter, wherever applicable.

Wire size is calculated by first determining the appropriate maximum voltage drop requirement. Use the following formula to calculate the circular mil area (CMA) wire size requirement. Determine the size and number of conductors required to satisfy the CMA requirement.

$$\mathbf{CMA = (A \times LF \times K) / AVD}$$

A = Ultimate drain in amps.

LF = Conductor loop feet.

K = 11.1 constant factor for commercial (TW type) copper wire.

AVD = Allowable voltage drop.

Check again that the ampacity rating of the cable meets the requirement for the installation application. Consult local electrical codes (for example, National Electrical Code® and Canadian Electrical Code) for guidelines. If required, increase the size of the cable to meet the code.

Refer to Table A for cable size equivalents.

Table A — Cable size equivalents

Cable size	Circular mils	Square millimeters	Equivalent metric cable
20 AWG	1020	0.519	1
18 AWG	1624	0.8232	1
16 AWG	2583	1.309	1.5
14 AWG	4107	2.081	2.5
12 AWG	6530	3.309	4
10 AWG	10380	5.261	6
8 AWG	16510	8.368	10
6 AWG	26250	13.30	16
4 AWG	41740	21.15	25
2 AWG	66370	33.63	35
0 AWG (or 1/0)	105600	53.48	50 or 70
00 AWG (or 2/0)	133100	67.42	70
0000 AWG (or 4/0)	211600	107.2	120
313 MCM (or kcmil)	313600	159	150 or 185

Table A — Cable size equivalents			
Cable size	**Circular mils**	**Square millimeters**	**Equivalent metric cable**
350 MCM (or kcmil)	350000	177.36	185
373 MCM (or kcmil)	373700	189	185 or 240
500 MCM (or kcmil)	500000	253.36	300
535 MCM (or kcmil)	535300	271	300
750 MCM (or kcmil)	750000	380.00	400
777 MCM (or kcmil)	777700	394	400

8.1.2 Required torque values

The following table lists the recommended torque values for connection to the power system with the following hardware:

- Clear hole connections (nut and bolt)
- PEM studs
- PEM threaded inserts
- Thread formed connections (in copper busbar)

Grade 5 rated hardware is required for these torque values.

Table B — Recommended torque values	
Size	**Torque value**
1/4 inch	8.8 ft-lb (11.93 Nm)
3/8 inch	32.5 ft-lb (44.06 Nm)
1/2 inch	73 ft-lb (98.97 Nm)

8.2 Grounding

Connect the isolated power system battery return bus (BRB) to the building master ground bus (MGB), or floor ground bus (FGB) in a larger building. This acts as a system reference and as a low impedance path to the ground for surges, transients and noise. The MGB or FGB must have a direct low impedance path to the building grounding system.

The cable from the power system to the MGB or FGB must be sized to provide sufficient ampacity to clear the largest fuse or breaker on the power system, excluding the battery protection fuse or circuit breaker. This is the minimum requirement. Other factors including length of cable and special grounding requirements of the load must also be factored in. The insulated cable must be equipped with two-hole crimp type lugs and must not have any tight bends or kinks.

Table C — Typical ground reference conductor selection	
Power system ampacity	**Recommended ground reference conductor size**
<30A	10 AWG (6 mm²)
30A to 100A	6 to 2 AWG (16 to 35 mm²)
100A to 400A	0000 AWG (107 mm²)
400A to 800A	350 MCM (185 mm²)
>800A	750 MCM (400 mm²)

The power system frame must also be connected to the MGB or FGB. This is done for personnel safety and to meet many Telecom grounding requirements. Each bay must have its own frame or site ground connection. Refer also to the customer connections drawing at the end of this document.

9. Maintenance and troubleshooting

Although very little maintenance is required with Cordex® power systems, routine checks and adjustments are recommended to ensure optimum system performance. Qualified service personnel should do the repairs. The following table lists a few maintenance procedures for this system. These procedures should be performed at least once a year.

To order more breakers refer to the options listed in the specifications. Always replace circuit breakers with the same type and rating.

Consult support or sales for all replacement parts.

WARNING

Use extreme care when working inside the unit while the system is energized. Do not make contact with live components or parts.

ATTENTION

Circuit cards, including semiconductor devices, can be damaged by static electricity. Always wear a grounded wrist strap when handling or installing circuit cards.

ATTENTION

Ensure redundant modules or batteries are used to eliminate the threat of service interruptions while performing maintenance on the system's alarms and control settings.

Table D — Sample maintenance log

Procedure	Date completed
Inspect all system connections. Re-torque if necessary.	
Verify alarm and control settings.	
Verify alarm relay operation.	
Clean ventilation openings of the breaker panel and converters.	

9.1 Replacing a converter module via the controller

When a converter is permanently removed, the system generates a **Converter Comms Lost** alarm. That alarm is cleared by removing the converter from the system inventory.

To remove the converter from the system inventory do the following:

1. Remove the defective converter from the shelf.
2. To remove a module, flip the handle up and pull the module away from the rear connector and out of the shelf.
3. In the web interface go to **Systems > Hyperboost System > Inventory > Converter > Status**.
4. Select the **Forget Power Modules in Comms Lost** button.
5. Place the new converter in the shelf.
6. If not set to auto-assign, in the **Modules Available for Assignment** table, assign the new converter to the Hyperboost system.
7. Confirm the assignment.

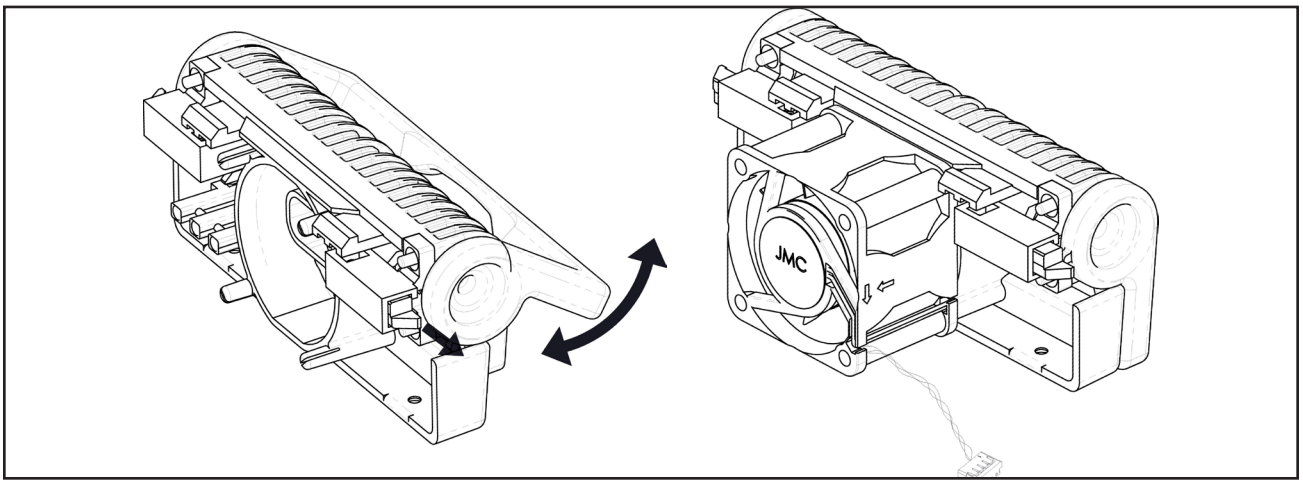
9.2 Fan replacement

NOTICE

For more information, refer to the technical drawings at the end of this document.

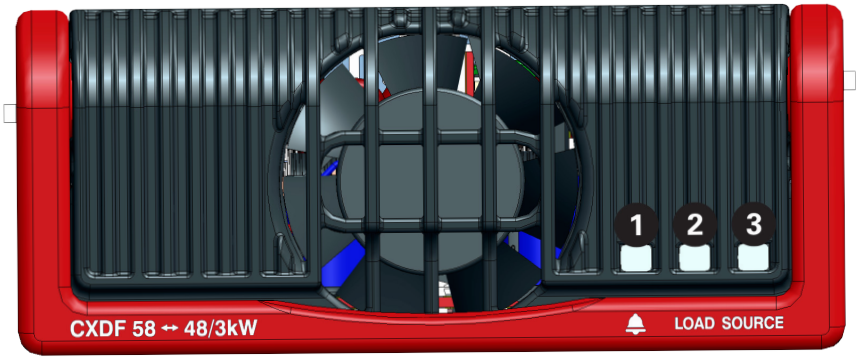
The fan on the individual power modules is designed for very high reliability and long life. During year six of the life of the product the manufacturer recommends replacement of the fan assembly.

1. Lift the locking handle and slide the module 4 in. (10 cm) out of the shelf. Wait ten minutes for the module capacitors to discharge and then slide the powder module out of the shelf.
2. Remove the two bottom screws that secure the front panel to the module chassis.
3. Push in the two plastic protrusions on top of the power module and disengage the front panel and attached fan from the power module.
4. Disconnect the fan cables from the module by pulling out the fan cable connector.



5. Discard the old fan assembly and unpack the new replacement assembly.
6. Reconnect the fan cable. Insert the connector into the fan connector in the power module. Ensure proper polarity and that the wires stay clear of the fan blade.
7. Slide the front panel into the power module body.
8. Ensure the metal tabs of the power module body aligned with the screw holes of the front panel.
9. Ensure the plastic tabs of the front panel are protruding through the metal cutouts in the power module body.
10. Secure the front cover by hand tightening the bottom screws.

9.3 Troubleshooting Cordex® Hyperboost module LEDs



Status indicators (LEDs)

1. Module alert LED (red)
2. Load bus LED (green)
3. Source bus LED (green)

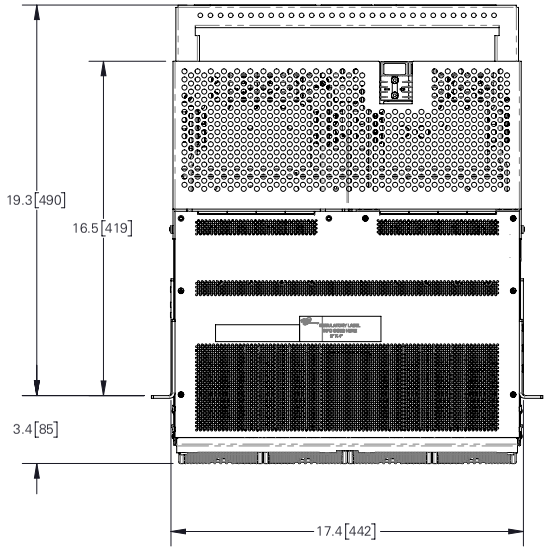
Figure 16: Cordex® CXDF 58 – 48/3 kW module LEDs

LED name	Color	State	Meaning
Module alert	Red	Off	No minor or major alert.
		Solid	Major alert (See CAN documentation for definition of major alert).
		Flashing (1 Hz)	Minor alert (See CAN documentation for definition of major alert). Find module[1]
Load bus	Green	Off	The port is not driven.
		Solid	The port is driven.
		Flashing (1 Hz)	Find module[1]
Source bus	Green	Off	No voltage[2]
		Solid	Source port voltage is within nominal range.[3]
		Flashing (1 Hz)	Voltage out of range[3] Find module[1]

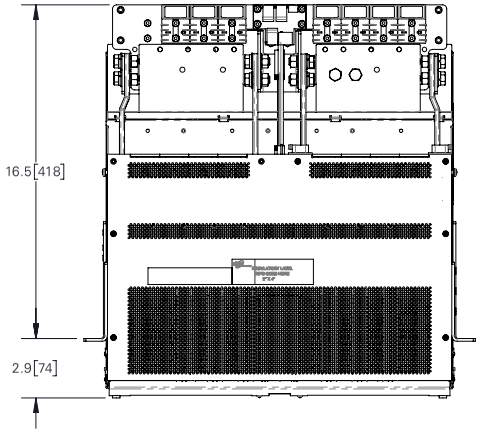
[1] All LEDs have a left-to-right right-to-left pattern which changes every 0.5 seconds.

[2] The threshold voltage is 25 volts due to possible leakage through the module.

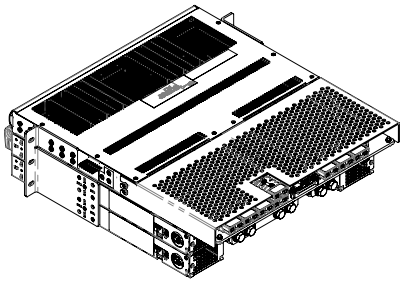
[3] If the input voltage is lower than 38 volts or above 59.9 volts it is classified as out of the classified range.

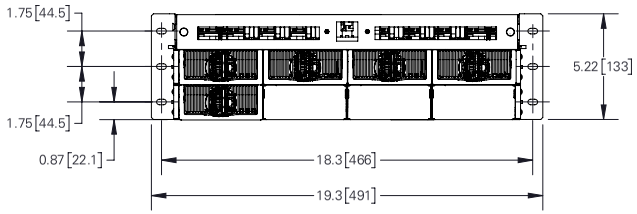


TOP VIEW WITH POWER MODULES, BACK COVER
AND CABLE MOUNTING BRACKET INSTALLED

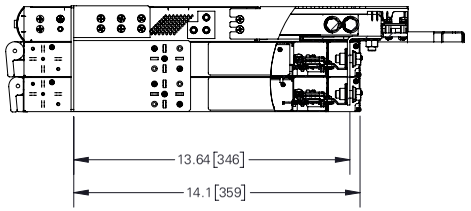


TOP VIEW WITHOUT COVER & POWER MODULES

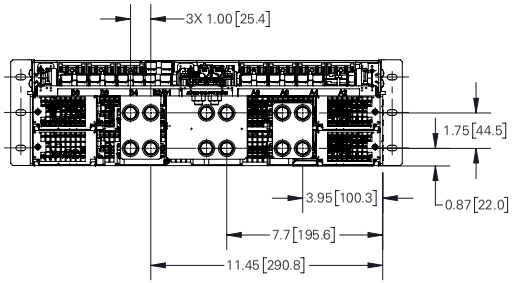




FRONT VIEW



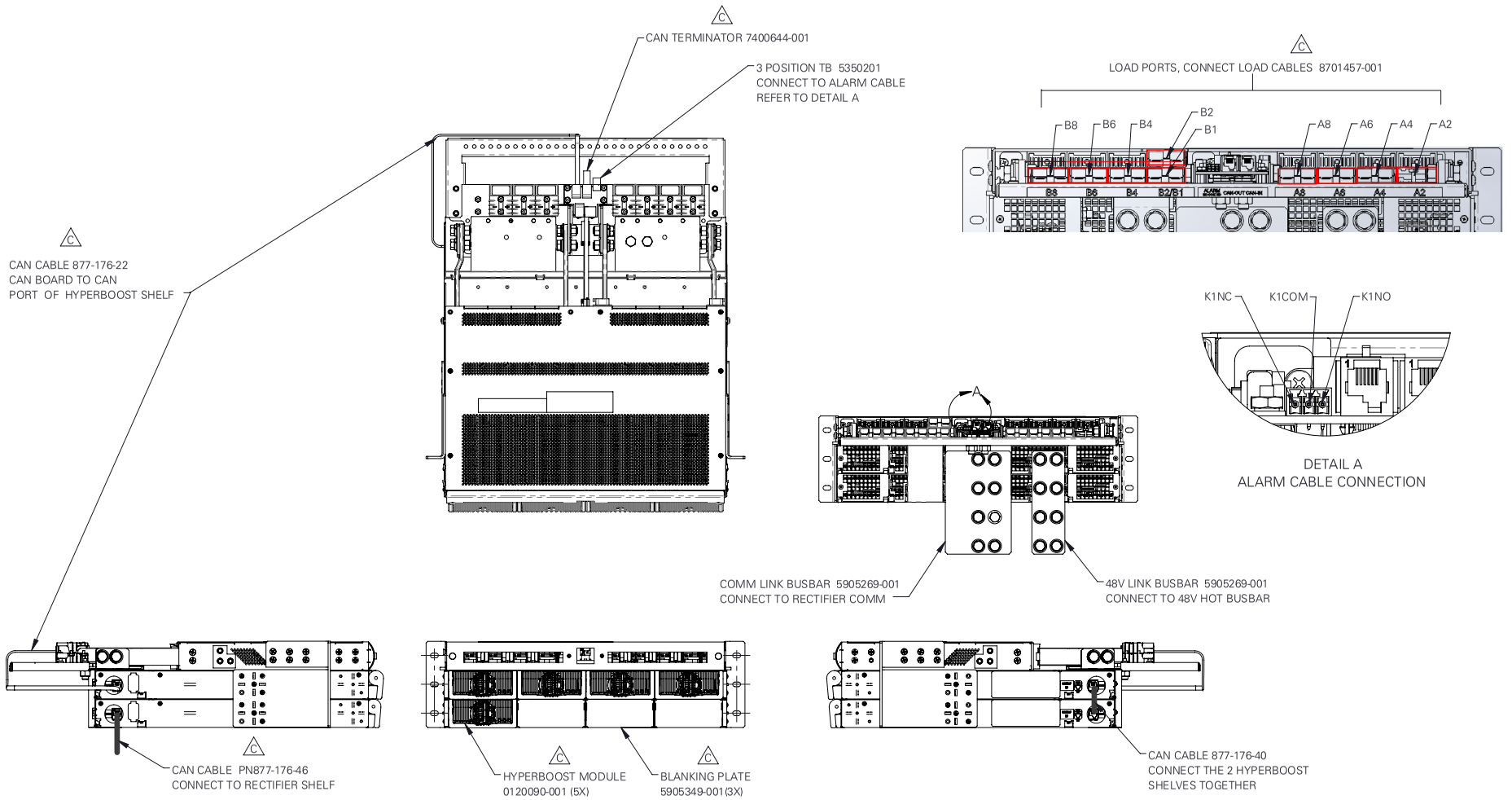
SIDE VIEW



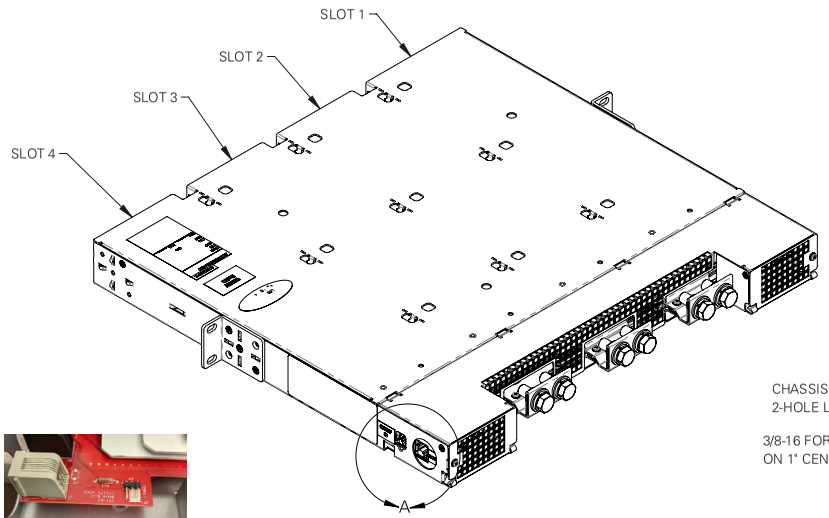
BACK VIEW

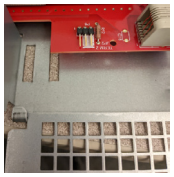
DIMENSIONS ARE IN IN[MM]

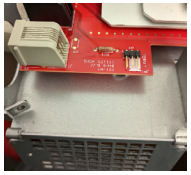
0250043-06

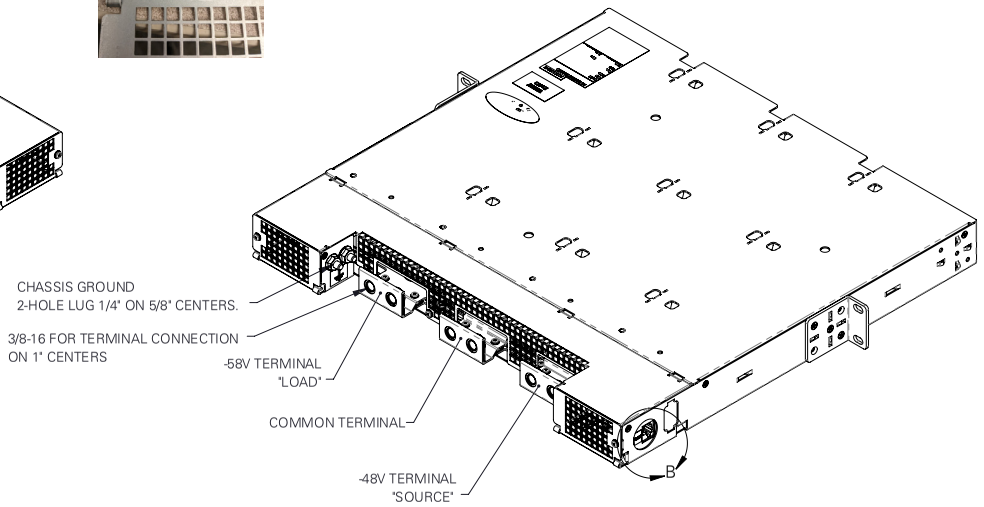

C
CAN TERMINATOR 7400644-001
3 POSITION TB 5350201
CONNECT TO ALARM CABLE
REFER TO DETAIL A
C
LOAD PORTS, CONNECT LOAD CABLES 8701457-001
B8
B6
B4
B2
B1
A8
A6
A4
A2
C
CAN CABLE 877-176-22
CAN BOARD TO CAN
PORT OF HYPERBOOST SHELF
K1NC
K1COM
K1NO
A
DETAIL A
ALARM CABLE CONNECTION
COMM LINK BUSBAR 5905269-001
CONNECT TO RECTIFIER COMM
48V LINK BUSBAR 5905269-001
CONNECT TO 48V HOT BUSBAR
C
CAN CABLE PN877-176-46
CONNECT TO RECTIFIER SHELF
C
HYPERBOOST MODULE
0120090-001 (5X)
C
BLANKING PLATE
5905349-001(3X)
CAN CABLE 877-176-40
CONNECT THE 2 HYPERBOOST
SHELVES TOGETHER

CUSTOMER CONN, 19"
SHLF, UNIDIR,HYPERBOOST

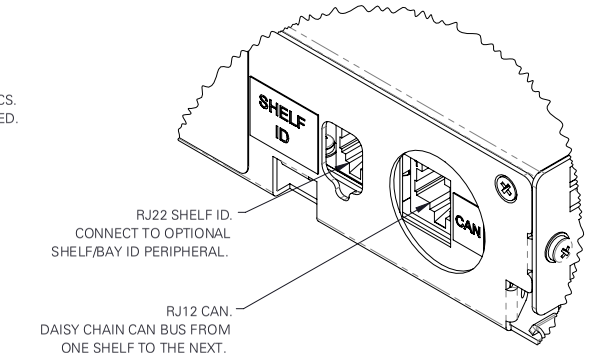




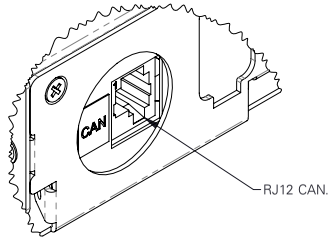




OPTIONAL ALTERNATIVE CAN TERMINATION:
OPEN THE REAR COVER ON THE OPPOSITE
SIDE FROM THE INSTALLED CAN CABLE.
INSTALL THE SUPPLIED JUMPER ON THE TWO PINS
LABELED "TERM" AND INDICATED ON THE PCB GRAPHICS.
DO NOT DO THIS IF THE EXTERNAL TERMINATOR IS USED.
ONLY INSTALL ONE TERMINATION PER SYSTEM.



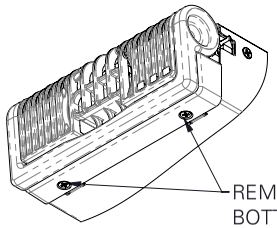
DETAIL A



DETAIL B

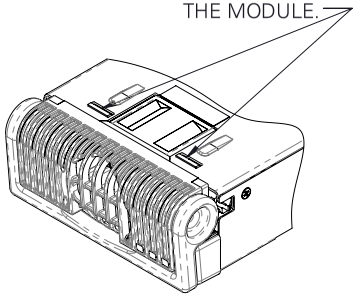
CAUTION

Before performing this procedure, wait 10 minutes after removing power from the module to allow the electrical caps to discharge.

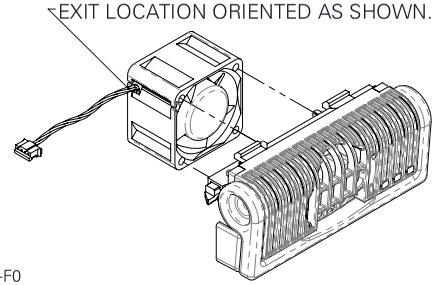


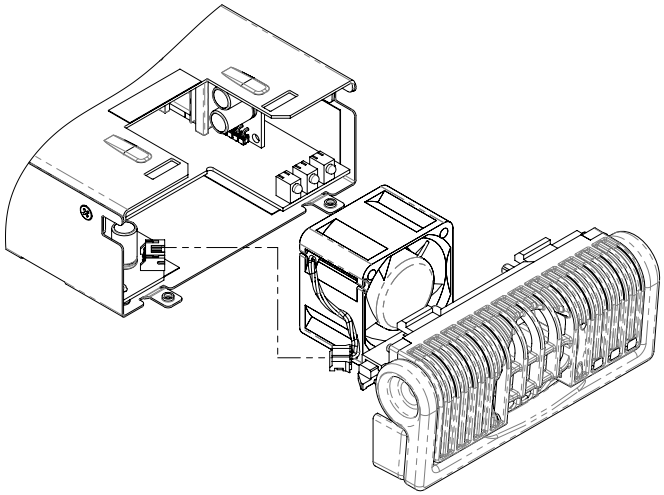
REMOVE THE TWO SCREWS ON THE BOTTOM OF THE FRONT PANEL AND SET ASIDE.

DEPRESS THE TWO PLASTIC CATCHES ON THE TOP OF THE MODULE AND DISENGAGE THE FRONT PANEL FROM THE MODULE.



ENSURE THE FAN IS INSTALLED ON THE FRONT PANEL WITH THE CABLE EXIT LOCATION ORIENTED AS SHOWN.





DISCONNECT THE FAN CABLE FROM THE MODULE BY PULLING OUT THE FAN CONNECTOR. DISCARD THE OLD ASSEMBLY AND UNPACK THE NEW ASSEMBLY.

INSERT THE CONNECTOR INTO THE FAN CONNECTOR SOCKET IN THE MODULE. ENSURE THE CONNECTOR IS SEATED PROPERLY AND THAT THE FAN WIRES STAY CLEAR OF THE FAN BLADES.

SLIDE THE FRONT PANEL INTO THE MODULE BODY.

ENSURE THE METAL TABS OF THE MODULE BODY ALIGN WITH THE SCREW HOLES OF THE FRONT PANEL.

ENSURE THE PLASTIC CATCHES OF THE FRONT PANEL ARE PROTRUDING THROUGH THE METAL CUTOUTS IN THE MODULE BODY.

SECURE THE FRONT COVER BY INSTALLING THE SCREWS AND TORQUING TO 0.5 Nm (4.4 in-lb).

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