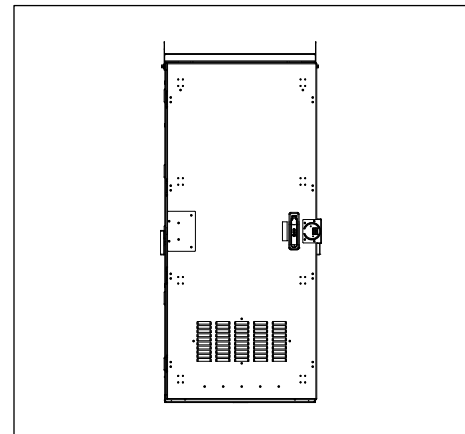


# Charles Universal Broadband Enclosure

## CUBE-BB48E2HNA

### General Description and Installation

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**Figure 1 Front View of the CUBE**

## 1. GENERAL INTRODUCTION

### 1.1. Document Purpose

This document provides general information for the CUBE-BB48E2HNA of the Charles Industries’ Universal Broadband Enclosure (CUBE) product line. Figure 1 shows a closed front view of the enclosure.

*-NOTE-*  
*Hereafter, the Charles Universal Broadband Enclosure CUBE-BB48E2HNA will be referred to as the “CUBE.”*

### 1.2. Product Purpose

The CUBE is a battery backup unit that houses multiple strings of -48VDC customer supplied Saft NiCd batteries.

### 1.3. Product Mounting and Location

This enclosure is suitable for outside plant-type (OSP) locations and those that may require NEC compliance. The outdoor, weather-resistant CUBE is to be mounted on a pad or platform. The installer connects the CUBE to a -48VDC power supply housed in a separate enclosure. Detailed mounting and installation information is covered in Section 3.

## 2. PRODUCT DESCRIPTION

The CUBE is a battery backup enclosure that supports up to five strings of customer supplied Saft NiCd batteries. It is equipped with a direct air cooling system (DAC) that is thermostat controlled. Each battery string is controlled by a disconnect breaker.

The swing direction of the door can be reversed, if desired. Instructions are in section 3.8.

Figure 2 shows the CUBE dimensions. Figure 3 shows the main components of the CUBE.

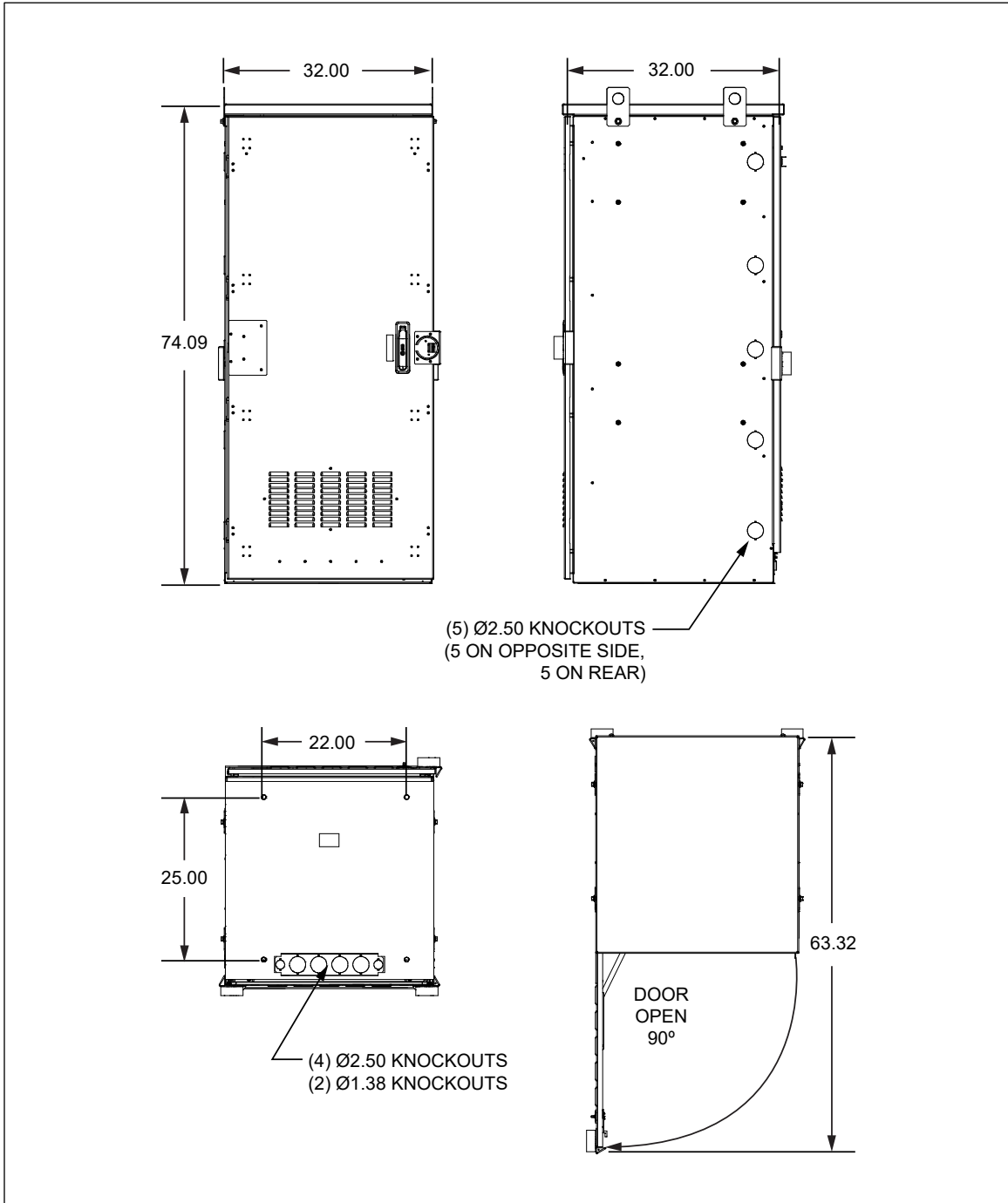
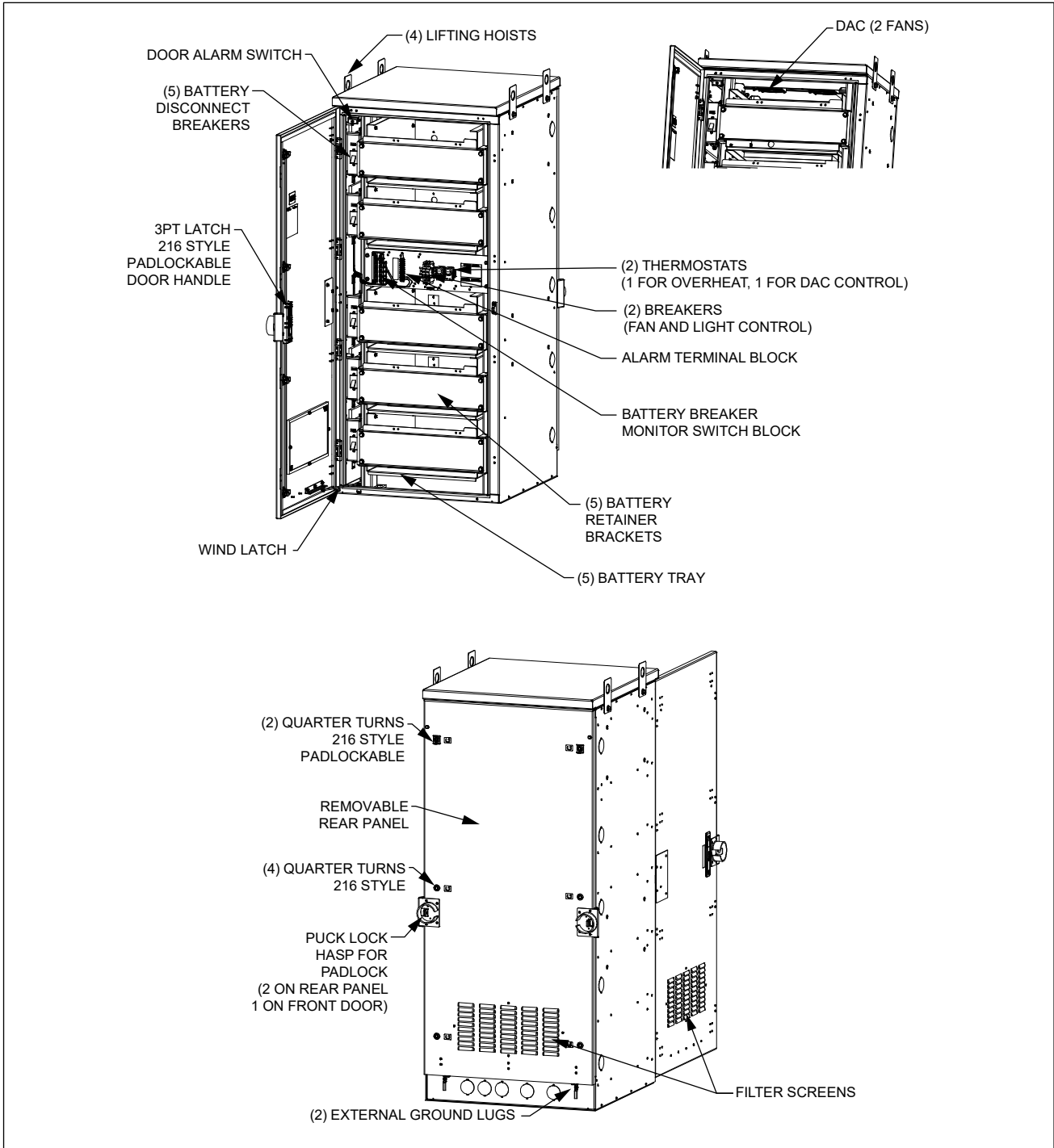


Figure 2 CUBE Dimensions (in inches)



**Figure 3 CUBE Components**

### 3. INSTALLATION

#### 3.1. Inspecting the Product

The CUBE is shipped mounted upright on a skid. Remove the bolts, unpack the unit, and dispose of the packaging material.

*-INSPECTION NOTE-*

*Visually inspect the unit for damages prior to installation. If the equipment was damaged in transit, immediately report the extent of the damage to the transportation company.*

#### 3.2. Following and Using Safety Precautions

Read the following site and safety tips, cautions, and warnings, then proceed with the paragraphs that follow.

- For installation, follow all National Electrical Codes (NEC) ANSI/NFPA 70, local, environmental, workplace, and company codes, safety procedures, and practices.
- Minimum spacing between the accessories and components and the housing for ITE equipment shall be maintained for safe operation of the equipment when installed in accordance with NEC ANSI/NFPA 70.
- Read all instructions, warnings and cautions on the equipment and in the documentation shipped with the product.
- Always connect ground connections first.
- Do not place this product on weak or unstable surfaces which may allow the product to fall, resulting in potentially serious damage(s) to persons or product.
- Only authorized trained personnel shall install the CUBE.
- In windy conditions, be sure to engage the door latches to secure the door in a stationary position.

#### 3.3. Obtaining Tools and Equipment

Obtain the following recommended or needed items for installing the CUBE.

- Protective and/or insulated work gloves
- Safety glasses
- Tape measure
- Marking utensil
- #6 ground wire or rod and earth ground materials
- Any exterior cable strain relief, per company practice
- Slotted, hex, and Phillips screwdrivers
- Torque wrench
- Assorted cable ties, clips, or fasteners (optional)
- Can wrench (216 type tool)
- Mallet/hammer
- Driver for 1/2" and 3/8" nuts
- Derrick for lifting
- Level

#### 3.4. Preparing the Installation Site

Observe the following site preparation recommendations.

- Leave adequate horizontal and vertical space between multiple installations to allow for proper cable access, as well as enough room around the enclosure to open the door(s).
- The site must meet minimal personnel and equipment safety requirements.
- The distance from the cable entry point should be consistent with local installation practices.
- The pad or platform must be able to support the weight of the CUBE.
- Run all fiber and copper facilities to the site.

### 3.5. Lifting the CUBE

See Table 1 for CUBE weight. Charles recommends the following procedure for lifting the CUBE.

#### 3.5.1. Required Equipment

- One derrick (crane) capable of lifting the CUBE
- Spreader bars
- Four lifting slings or chains with each having a 2,500 lbs. capacity
- Connecting links to attach slings to the CUBE's lifting brackets
- 75-ft. long tagline rope

Insert the lifting sling connecting links securely through each of the lifting brackets as shown in Figure 4.

#### 3.5.2. Warnings and Specific Safety Precautions

	<b>WARNING</b>	<p><b>Improper hoisting equipment and unsafe lifting procedures can result in serious injury or death</b></p> <p><b>Because of the added risk of injury or damage, do not lift enclosures with batteries installed.</b></p>
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Observe the following local safety procedures when performing the tasks in this section.

- Keep the CUBE away from any power lines.
- Keep bystanders away from the work operations at all times.
- Only trained operators shall operate the crane for lifting and setting the CUBE.
- Do not suspend loads over people or equipment.
- All persons working with hoisting equipment shall wear standard safety gear according to local practices including safety helmets and steel-toed shoes.
- Do not operate the hoisting equipment until all stabilizer are extended and in firm contact with the ground or adequate support structure.
- Do not attempt to retract or extend the stabilizers while a load is suspended.

### 3.6. Mounting the CUBE

The CUBE can be mounted on a new or existing concrete or composite pad. A gasket is affixed to the bottom of the CUBE for mounting on a concrete pad. If the gasket becomes damaged during installation, order a replacement under part number 80-006682-A. Ensure that the unit is level.

An optional mounting plinth is available. Order part number 97-PLNTHPMBBCAB.

#### 3.6.1. Torque Requirements

Torque all hardware as shown below (unless otherwise noted). These values apply to SAE Grade 1 & 2 Low Carbon Steel, ASTM A307 Low Carbon Steel, and Stainless Steel Grade 18-8.

Thread Size	In-lbs	Ft-lbs
4-40	4±10%	
6-32	8±10%	
8-32	16±10%	
10-32	26±10%	
12-24	50±10%	
1/4-20/M6	60±5%	5±5%
5/16-18	125±5%	10.4±5%
3/8-16	180±5%	15.0±5%
1/2-13	500±2%	41.7±2%
5/8-11	1000±1%	83.3±1%

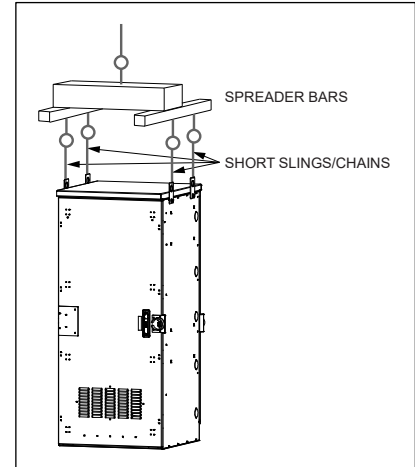
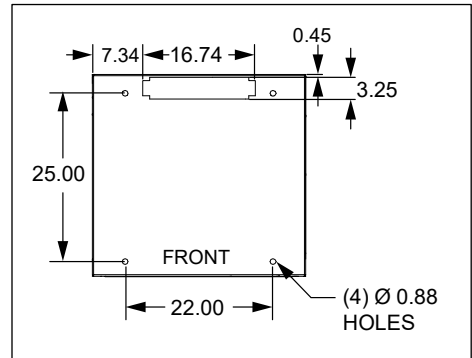


Figure 4 Lifting the CUBE

**3.6.2. Constructing a New Pad**

- Use only concrete for new pad construction. Do not use substitute materials since they lack the rigidity for CUBE placement.
- Observe local building practices for pad construction. Charles recommends that the pad should extend a minimum of 8” beyond the CUBE base on all sides.
- Use a minimum of 6” of sand or gravel as a base for the pad for leveling purposes.
- Figure 5 shows the required conduit openings and mounting hole dimensions for entering/mounting the bottom of the CUBE. Use these dimensions when designing the pad.



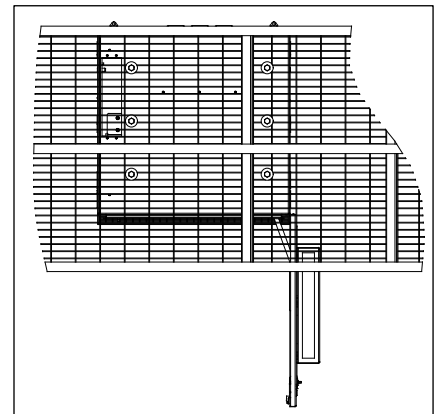
**Figure 5**  
Mounting Hole Dimensions (in inches)

	<b>WARNING</b>	<p><b>When pad mounting, the compression strength of the pad must be at least 4000 psi as determined by ASTM C39 test of compression strength of concrete cylinders.</b></p> <p><b>The slump of the concrete shall be 2” to 4” as determined by ASTM C143 test method.</b></p>
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**3.6.3. Mounting the CUBE on a Pad**

Four customer supplied, corrosion resistant, 1/2”-13 hex head bolts with anchors are required for mounting the CUBE to the concrete pad. Use the following steps to mount the CUBE to a pad.

1. Layout, drill, and set the 1/2” anchors per manufacturer’s recommendations. The embedment depth is not to exceed 3.5”.
2. Clean any debris from the concrete pad.
1. Open the cabinet door to allow access to mounting holes.
2. Ensure that the CUBE is parallel to the pad surface as it is placed onto the pad and that it aligns with the holes in the pad. Dress the cable/conduit so that it aligns with the CUBE openings as it is lowered onto the pad.
3. Place the CUBE on the pad. Loosen the slings so that all the weight is on the pad. Check that the CUBE is properly aligned.
4. Secure the CUBE to the pad using the 1/2”-13 hex head bolts. Tighten all bolts securely.
5. To secure the CUBE to a steel grate platform, install 1/2" corrosion-resistant Grade 5 steel hardware through the cabinet and platform grate. Ensure that the bolts are long enough to extend past the nut on the bottom side of the platform grate. For all mounting applications, each bolted joint should have a minimum Ø1 inch fender washer on the inside of the cabinet (and underside of the platform grate for platform mounting) with a lock washer. The washer on the underside of the platform must be large enough to cover both adjacent bearing bars as shown in Figure 6.
6. Once the CUBE is secured, remove the slings and tagline. Close the cabinet door.



**Figure 6** Installing on a Platform

### 3.8. Reverse the Door Swing

The CUBE door can be removed and re-hung so that it swings in the opposite direction.

**Note: this procedure only applies to CUBE revisions L or later (see the serial number label on the CUBE). This procedure cannot be applied to earlier revisions of the CUBE.**

#### 3.8.1. Remove the CUBE Door

The hinges used on this CUBE have several components. See Figure 7 for a diagram of the hinge with all components labeled.

In the initial configuration, the hinge is on the left side of the CUBE doorway, with the hinge base attached to the CUBE door frame and the hinge plate attached to the door.

Find a safe place to store all hardware removed from the door and the CUBE. All hardware must be used for the new door configuration, so do not lose it.

1. Remove the nut that holds the ground strap to the door. Save the nut.
2. Remove the two nuts that hold the wind latch to the CUBE door frame. Save the nuts.
3. Lift the hinge pin out of the hinge. Use a rubber mallet to move the pin upward if needed. The hinge pin retainer clip will pop out as the pin is raised (Figure 8, pin and clip shaded in gray). Save the pin and clip for later re-installation. Repeat for all hinges.
4. Lift the door away from the CUBE (Figure 9).

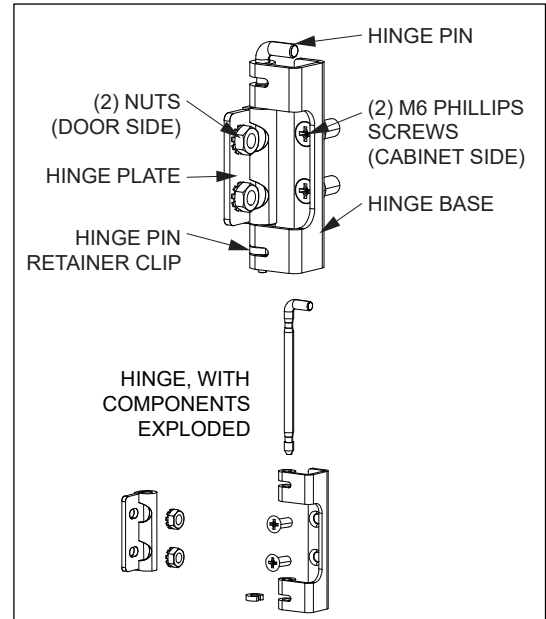


Figure 7 Hinge Components

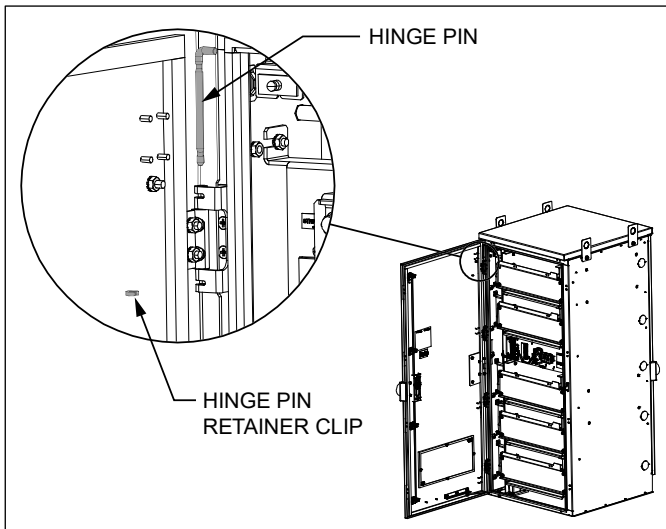


Figure 8 Remove Hinge Pins

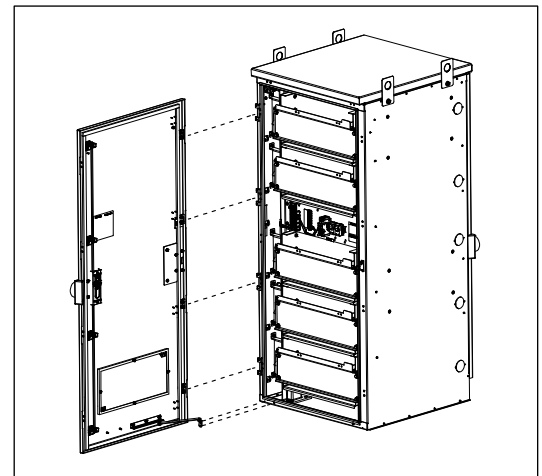
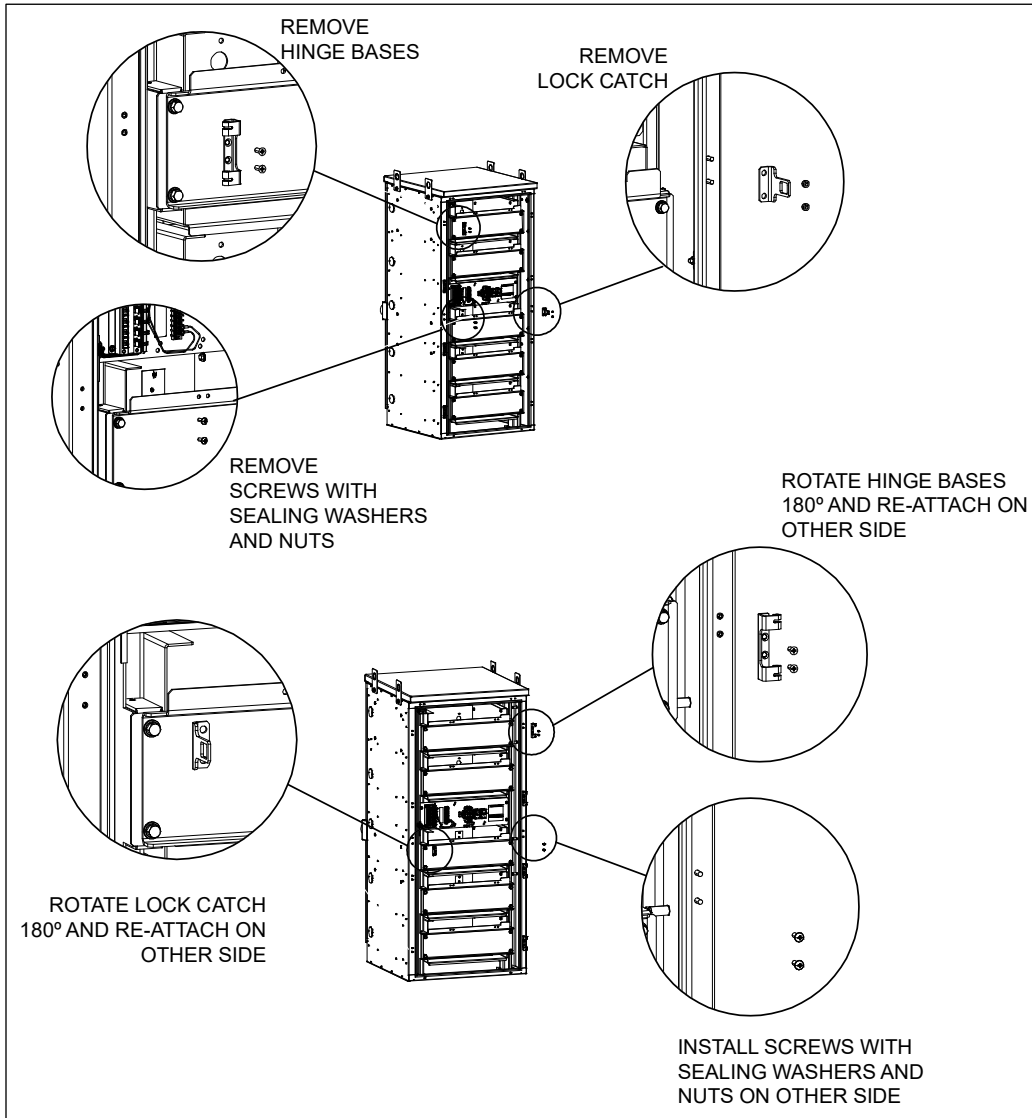


Figure 9 Remove Door

**3.8.2. Prepare the CUBE for Door Re-installation**

1. Remove all four hinge bases from the left side of the CUBE doorway. Rotate them 180° and re-attach them to the holes on the right side of the doorway.
2. Remove the screw, sealing washer, and nut from the holes on the left side of the doorway and set aside.
3. Remove the lock catch from the right side of the doorway. Rotate it 180° and re-attach it to the holes on the left side, where the screws and sealing washers were just removed.
4. Attach the screws, sealing washers, and nuts removed in step 2 to the now-empty holes on the right side.



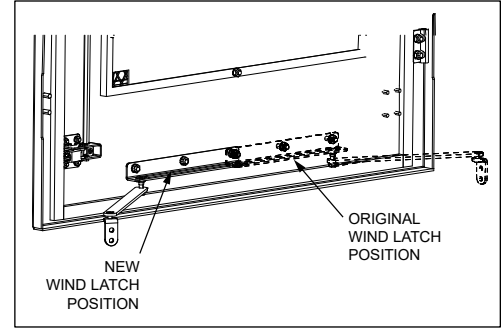
**Figure 10 Move Hinge Bases and Lock Catch**



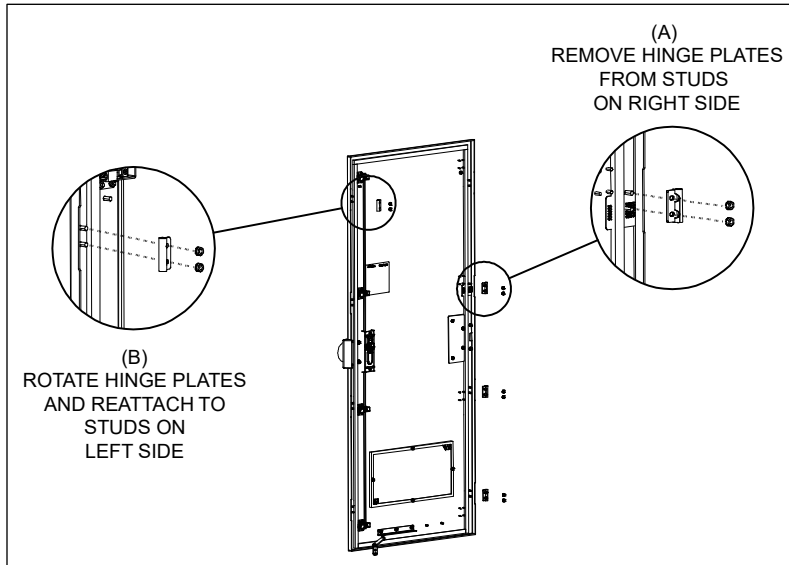
**3.8.3. Prepare the Door for Re-installation**

Multiple components on the door must be removed and replaced on the opposite side of the door.

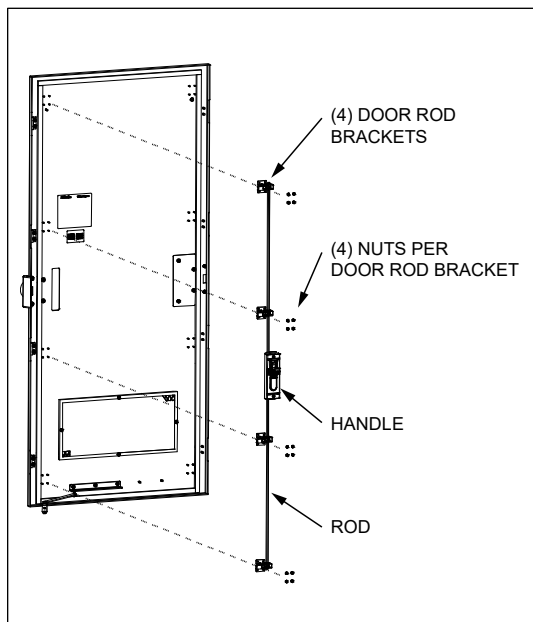
1. Move the wind latch assembly by repositioning it to the left-most mounting studs (Figure 11).
2. Remove the four hinge plates from the right side of the door, rotate 180°, and secure to the mounting studs on the left side (Figure 12).
3. Remove the door latch assembly (Figure 13).



**Figure 11 Reposition Wind Latch**



**Figure 12 Reposition Hinge Plates**



**Figure 13 Remove Door Latch Assembly**

4. Reposition the door rod in the latch (Figure 14).
  - a. Remove the door rod from the latch assembly.
  - b. Remove the rod control arm, rotate it 180°, and replace it in the latch assembly.
  - c. Slide the rod through the rod control arm.
5. Set aside the latch assembly and the hardware.
6. Remove the puck lock assembly and the inside and outside cover plates (Figure 15).

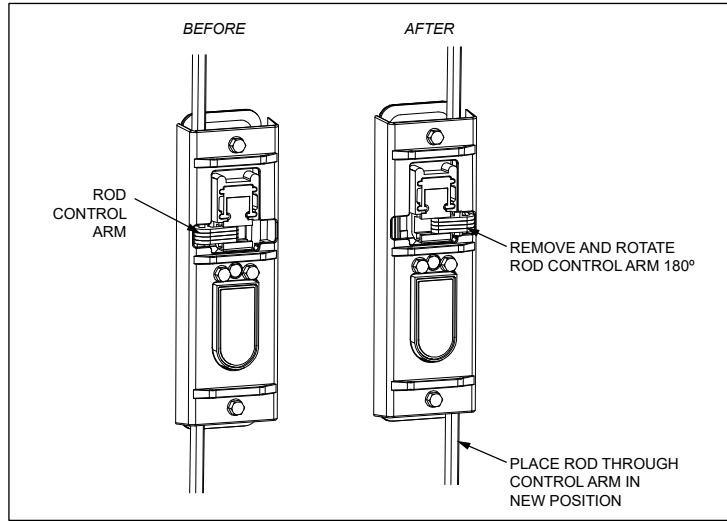


Figure 14 Reposition Door Rod

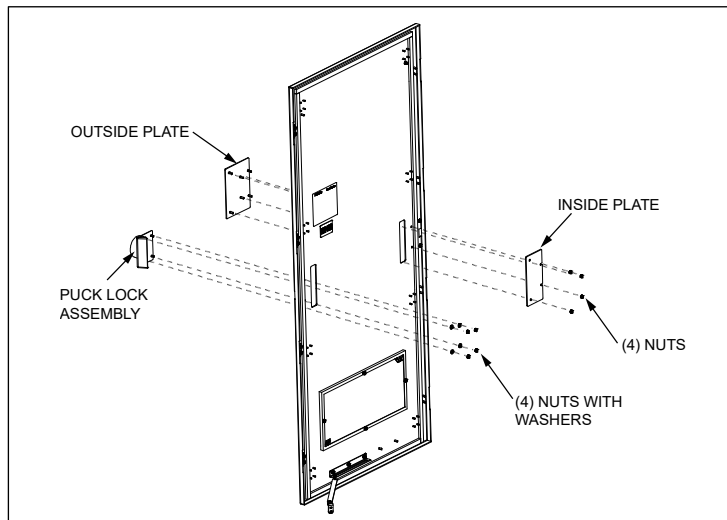
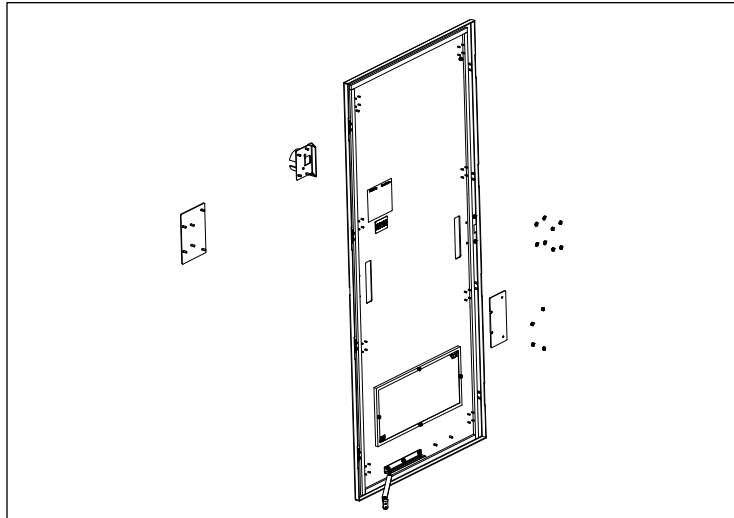


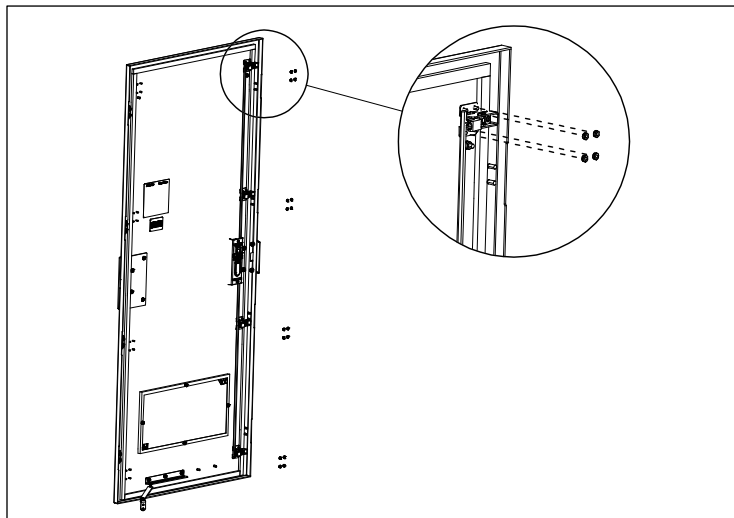
Figure 15 Remove Puck Lock and Cover Plates

7. Rotate the door plates and the puck lock 180° and attach them onto the studs on the opposite side of the door from their original positions (Figure 16).
8. Mount the door latch assembly onto the opposite side of the door (Figure 17).

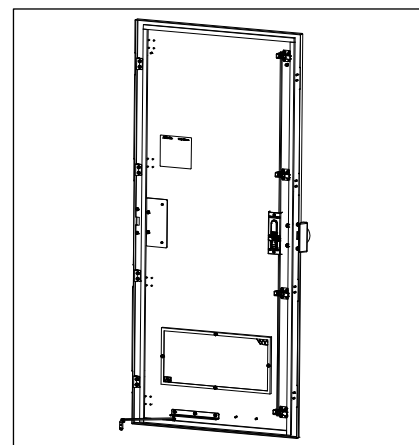
The complete reversed door is shown in Figure 18.



**Figure 16** Reposition Puck Lock and Cover Plates



**Figure 17** Reposition Door Latch Assembly

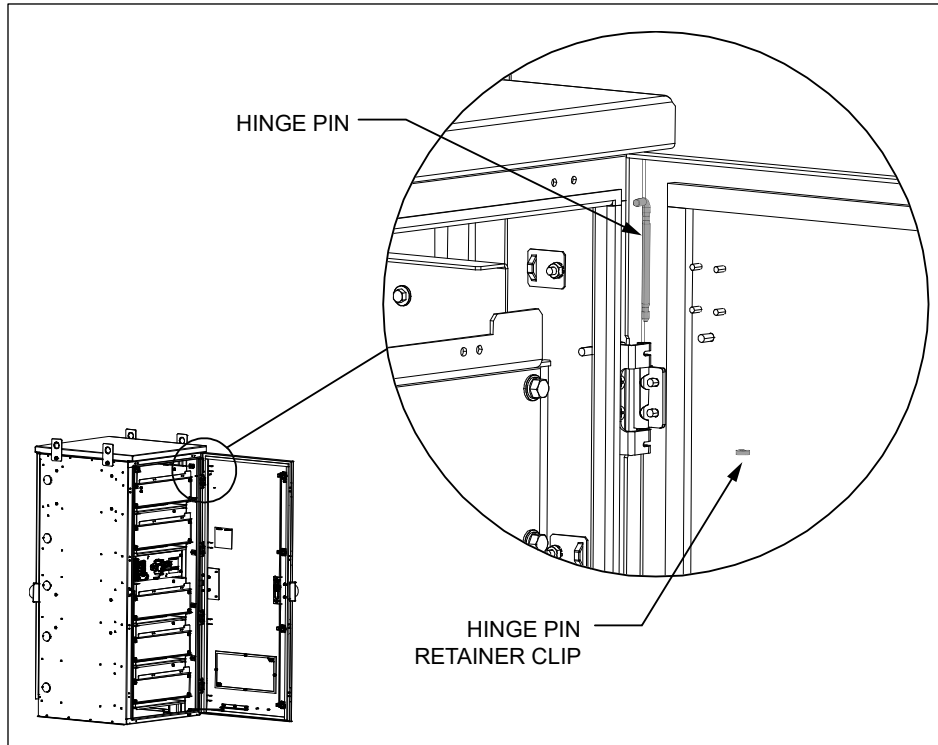


**Figure 18**  
Complete Reversed Door

**3.8.4. Mount the Door**

Place the door so that the hinge plates are aligned with the pin holes in the hinge bases. Hold the door in this position and use the hinge pins and hinge pin retainer clips to secure the door (Figure 19, hinge pin and clip shaded in gray). If necessary, use the rubber mallet to push the pin downward.

Use the saved hardware to attach the ground strap and the wind latch.



**Figure 19 Remove Hinge Pins**

### 3.9. CUBE Wiring and Equipment

After the CUBE is properly mounted in the desired location, apply No-Ox where bus bar and other 2-hole lug connections will be made. Install ground and power connections. Always ground the equipment first, before making any other connections.

	<b>WARNING</b>	<b>Perform all bonding and grounding connections prior to any electrical and communications connections.</b>
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In order to prevent condensation prior to being placed in service, do not remove the desiccant until the CUBE is sealed and power is applied. A basic electrical diagram is shown in Figure 20.

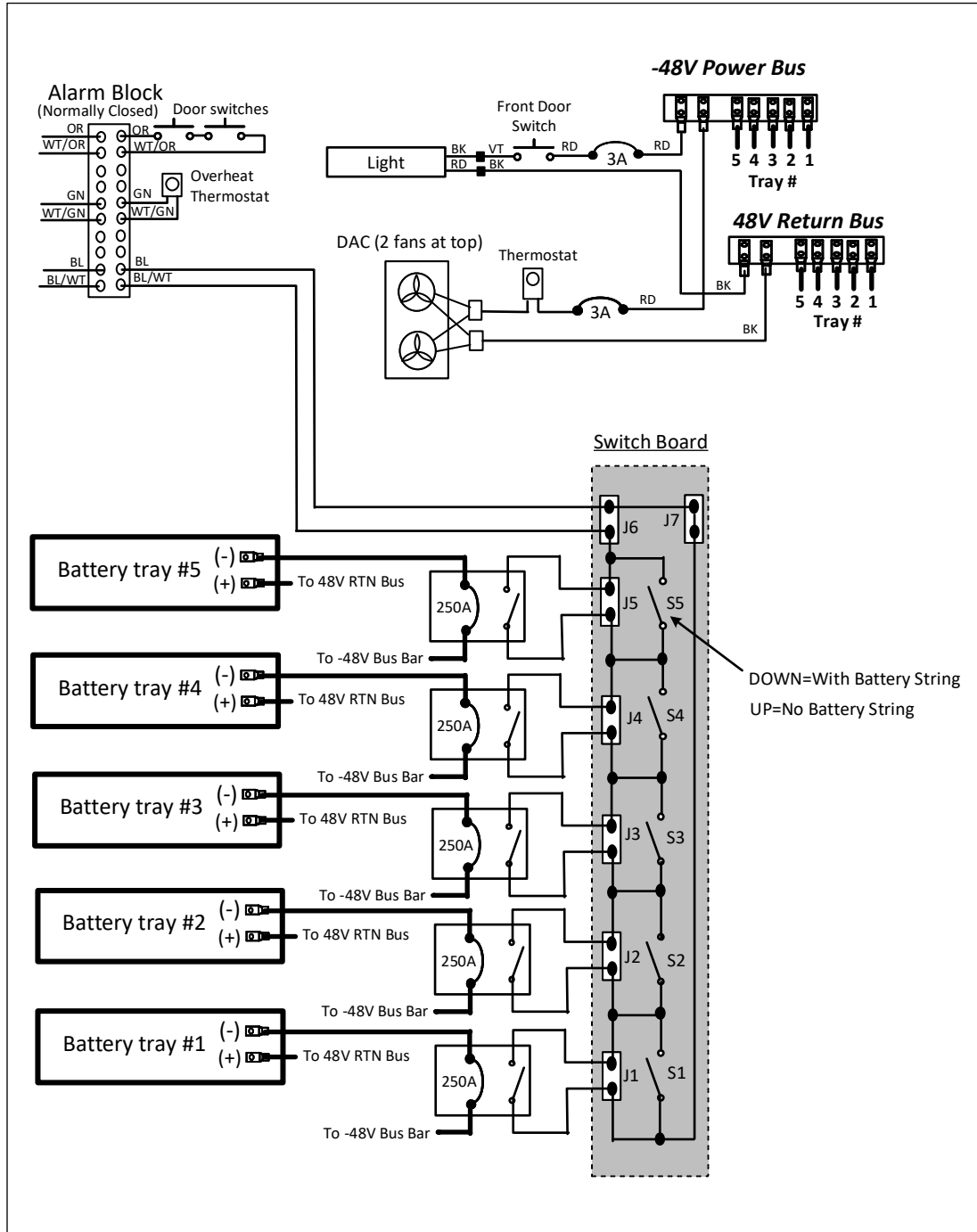


Figure 20 Electrical Diagram

**3.9.1. Ground Connection**

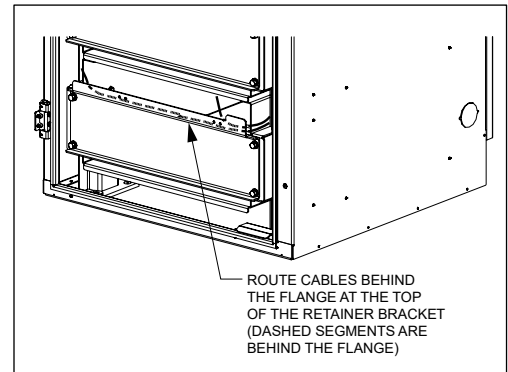
External ground lugs are available on the rear of the CUBE for connecting a site ground wire.

**3.9.2. Battery Connection**

	<b>WARNING</b>	<b>Always turn off battery breakers prior to servicing batteries.</b>
--	----------------	---

Verify the polarity of the cables prior to terminating them to the batteries. Ensure the battery terminations are properly insulated to avoid shorting prior to terminating to the batteries.

1. Switch off the battery breakers located next to the battery trays.
2. Remove the battery retainer bracket by removing the hardware.
3. If replacing batteries, disconnect battery cables from terminals and loosen the battery retaining strap(s).
4. Remove the interconnecting straps from the batteries. Remove batteries.
5. Carefully position the new batteries on the battery tray. Connect the interconnecting straps to each battery string.
6. Connect the battery cables to the appropriate terminals.
7. Secure the battery retaining straps and reinstall the battery retainer brackets using hardware from step 2.
8. Secure the battery cables behind the top flange of the retainer bracket as shown in Figure 21.
  - o Use lacing cord or cable ties suitable for 4/0 cable, 0.800 O.D.
  - o Ensure that the bending radius is at least 5x the cable diameter (e.g. 4/0 battery cable = 4 inch bend radius).
  - o Use as few bends as possible between the two termination points.
  - o Do not bend the cable at the termination points.
  - o Isolate the lug and insulation by at least 1/4" from all metal surfaces.
9. Switch on the battery breaker.



**Figure 21 Battery Cable Routing**

**Notes:**

- Batteries are terminated at the power shelf.
- NiCd batteries require nickel plated lugs. Charles cables are equipped with the correct nickel plating.
- Ensure back up battery amperage is inputted into the power system controller per power system guidelines.
- Ensure float voltage is set per power system and battery guidelines.
- Ensure all battery terminations and bus bars have No Ox applied.
- Refer to the battery manufacturer’s documentation for proper battery installation and maintenance information.

**3.9.3. Battery Breaker Switches**

The CUBE has a switch board on the panel at the front of the battery retainer brackets that is connected to the battery breakers and serves as an alarm monitor. The default switch setting is to the bottom, indicating that a battery string is present and the battery breaker is turned on. If any battery breaker is turned off or tripped, it will cause a normally open alarm connection on the alarm block “BAT BRKR” position. If no battery string is present, then move the switch for that shelf into the top position to bypass the breaker.

**3.9.4. DAC Operation**

The DAC system consists of filtered louvers and a shroud with dual fans. The fans are connected to a control thermostat and power. The fan wiring is routed to the equipment compartment and connected to a circuit breaker on the -48VDC power system. The control thermostat is factory set at 30°C (±4°C). The thermostat turns the cooling fans on at the set point and turns them off when the temperature drops by 7°C.

<p><b>-NOTE-</b></p> <p><i>Changing the thermostat set point from its factory default setting can lead to system performance issues, such as reduced battery life, condensation buildup, excessive runtimes, premature fan failure, and filter clogging, in addition to unnecessary power use, noise, and vibration.</i></p>
--

### 3.9.5. Overheat Thermostat

The CUBE is equipped with an overheat (high temperature) alarm thermostat in the equipment compartment that provides a normally closed connection. The overheat alarm is factory set at 35°C and opens the connection if this temperature is exceeded.

*-NOTE-*

*Changing the overheat (high-temp) thermostat default factory set points can lead to unnecessary alarms or system performance issues, such as equipment failures as a result of unreported alarms.*

### 3.9.6. Alarm Block Connections

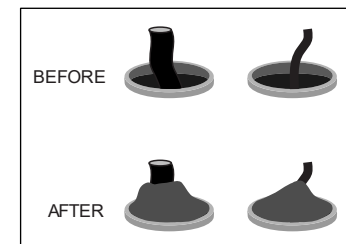
A 10-position, labeled alarm block monitors components in the equipment compartment. See the electrical diagram for information about alarm connections. All connections are normally closed and will open upon alarm.

### 3.9.7. Fiber and Copper Entry

The CUBE has multiple Ø2.50" knockouts on the sides and rear that accommodate Ø2.00" and conduit fittings. See Figure 2 for knockout locations.

## 3.10. Conduit Seals

All conduit openings on the CUBE must be completely sealed with a duct seal compound to prevent moisture from entering the CUBE. Use a moldable, flame-retardant putty style duct seal material. Do not use an expanding foam seal. Mold the putty so that the open space around the wire or conduit is completely sealed, as shown in Figure 22. If the openings must be accessed at any time, remove the putty and set it aside. When work is complete, re-mold the putty to re-seal the opening.



**Figure 22** Applying Putty Seal

## 4. PERIODIC MAINTENANCE

In the event that the enclosure must be opened in freezing conditions, use a narrow, pointed metallic object such as a screwdriver or chisel, along with a non-metallic device like a rubber mallet, to remove excessive ice buildup around the door and locking mechanism. A commercial aerosol de-icer spray can be used to free up locks and latches if needed. Use protective gloves and safety glasses when applying de-icer sprays.

Periodic cleaning of the battery filter screens is important to maintain proper ventilation. To clean the filter screens, remove the four nuts on each screen and take out the screens. Use a soft brush or hose to remove any debris from the screen. Once clean, replace the screens using the four nuts removed previously.

## 5. TECHNICAL ASSISTANCE AND REPAIR SERVICE

For questions on product repair or if technical assistance is required, contact Charles Technical Support.

847-806-8500

[techserv@charlesindustries.com](mailto:techserv@charlesindustries.com) (email)

<http://www.charlesindustries.com/techserv.htm>

## 6. WARRANTY & CUSTOMER SERVICE

Charles Industries LLC offers a one-year warranty on the CUBE product. The Charles warranty is limited to the operation of the CUBE hardware as described in this documentation and does not cover equipment which may be integrated by a third party. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract. For questions on warranty or other customer service assistance, contact your Charles Customer Service Representative.

847-806-6300

[mktsev@charlesindustries.com](mailto:mktsev@charlesindustries.com) (email)

[http://www.charlesindustries.com/main/telecom\\_sales\\_support.htm](http://www.charlesindustries.com/main/telecom_sales_support.htm)

## 7. SPECIFICATIONS

### 7.1. Regulatory Specifications

- Designed to meet GR-487
- UL-2416 Listed

If CUBEs are field-modified, a customer provided ETL field evaluation of the modified components may be required to re-establish ETL certification to UL standards. Consult local jurisdictions for guidance on a site-by-site basis.

### 7.2. Product Specifications

<b>Physical</b>	
Dimensions	74"Hx32"Wx33"D
Weight	Approx. 720 lbs. as shipped
Battery Tray Size	10"Hx21"Wx26"D
Maximum Supported Weight	Battery Trays: 600 lbs. per tray
Materials	0.125 aluminum
Color	Off-white
<b>Electrical</b>	
Supported Batteries	180Ah, 48VDC, Saft NiCd: 80-94890-02 Tel.X-Plus 180 Up to five strings, with five 8-cell modules per string
Cable Entry	See Figure 2 and section 3.8.7
<b>Thermal</b>	
DAC Fans	243CFM, Delta PFB1248UHE-EP
<b>Environmental</b>	
Operating Temp. Range, Outside Enclosure	-40° to +115°F, -40° to 46°C
Operating Temp Range, Inside Enclosure	-40° to +149°F, -40° to 65°C
Humidity	0 to 95% (non-condensing)
Altitude	Up to 2,000 meters (6560 feet)
<b>Kits and Replacement Parts</b>	
Touch-up Paint	02-000290-0
216 Type Security Tool	07-002070-0
Replacement Gasket	80-006682-A
Optional Mounting Plinth	97-PLNTHPMBBCAB
Shim Kit for Leveling	97-000010-0
Lift-Up Handle	39-000335-0
Door Rod Latch	39-000336-0
1/4 Turn Latch	39-000142-0
1/4 Turn Latch with Padlock Hasp	39-000311-0
4-Wire Door Alarm Switch (Black)	17-400319-0
Overheat Thermostat	99-004548-0
Battery Disconnect	18-908176-0
DAC On/Off Thermostat	99-004234-0
Temporary Battery Shelf Kit	97-002145-A

**Table 1 CUBE Specifications**