

Charles Universal Broadband Enclosure

CUBE-SC21632xxx Series

General Description and Installation

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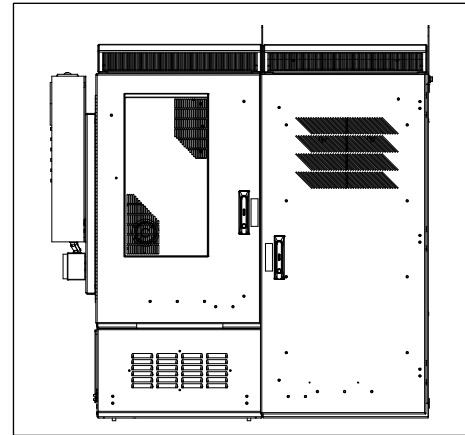


Figure 1 Front View of the CUBE

1. GENERAL INTRODUCTION

1.1. Document Purpose

This document provides general information for the CUBE-SC21632xxx series 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-SC21632xxx will be referred to by individual part number or as the "CUBE."

1.2. Product Purpose

This high power, small cell CUBE consists of a protective enclosure for an integrated system of electronic components and equipment.

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. The installer connects the power, fiber, and copper connections. Detailed mounting and installation information is covered in Section 3. Charles recommends the CPAD composite pad for pad mounting applications.

2. PRODUCT DESCRIPTION

The CUBE has radio, equipment, and battery compartments. The equipment compartment has 16RU of 19" horizontal rack spacing, a 14-position AC load center with a 50A generator inlet switch. The battery compartments in all CUBEs in the series support one string of customer supplied 48VDC NiCd batteries. The radio compartment has a -48VDC direct air cooling system (DAC) with four fans and supports two 60/90W or dual band radios.

The differences in the models in this series are in the thermal and power systems included, summarized below.

- SC21632DP1/DP2: 760W heat exchanger. DP2 model has an ABB power system.
- SC21632JP1/JP2: 4000BTU HVAC system. JP2 model has an ABB power system.
- SC21632NP1/NP2: no thermal system. NP2 model has an ABB power system.

Figure 2 shows the dimensions of the CUBE-SC21632DP2. Except for the thermal system depth, these dimensions are common to the entire series. Figure 3 shows the main components of the CUBE.

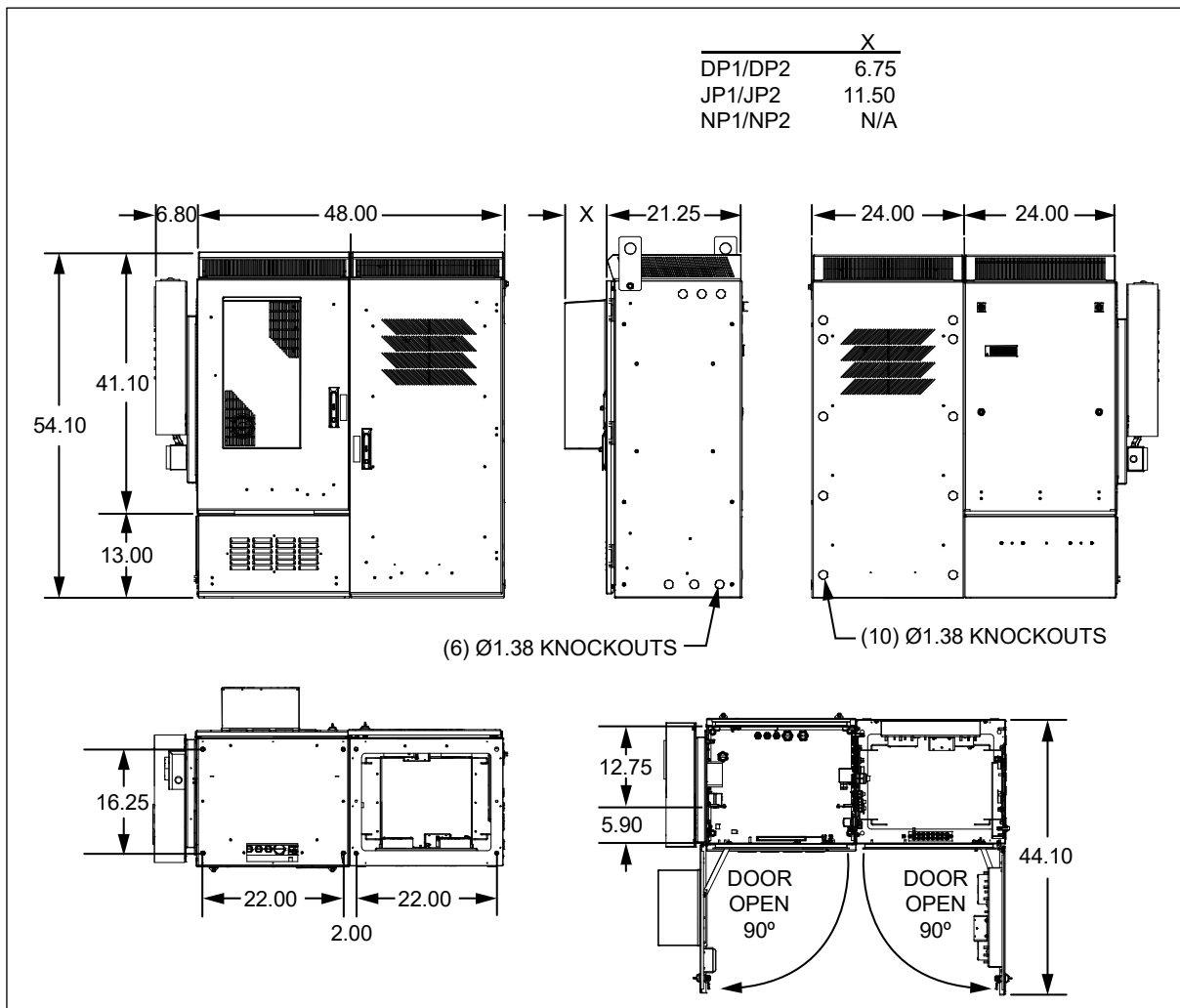


Figure 2 CUBE Dimensions (in inches)
 NP1/NP2 has no thermal system.

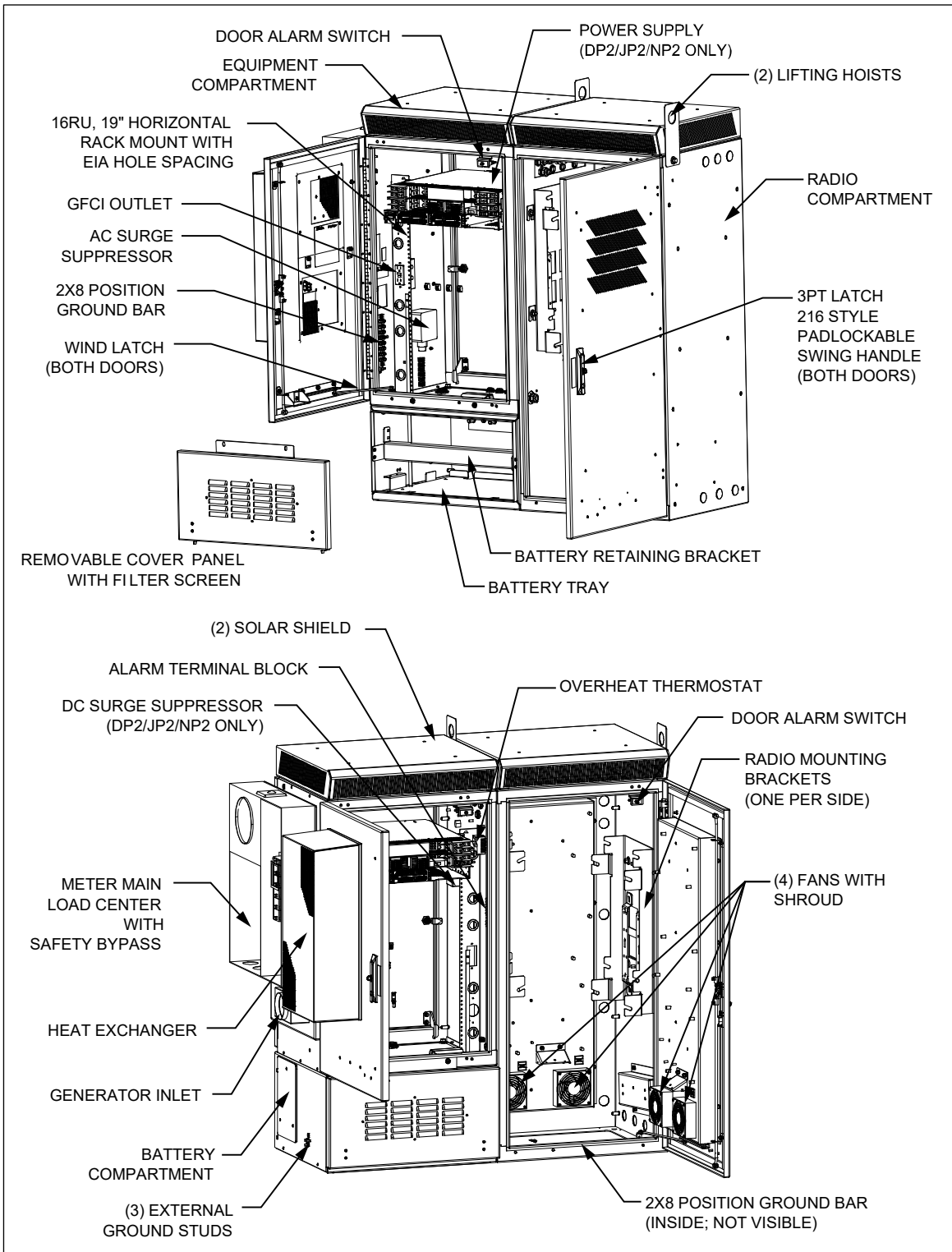


Figure 3 SC21632DP1/DP2 Components
JP1/JP2 has an HVAC system in place of the heat exchanger.
NP1/NP2 has no thermal unit.

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.

- Sufficient length and quantities of fiber cable (or pigtails)
- Cable scoring, opening, and cutting tools for cable sheathing, shields, wrappings, strength members and buffer tubes
- Wire strippers
- Crimpers
- Cable, tube, wire, and fiber cleaning materials
- Protective and/or insulated work gloves
- Safety glasses
- Tape measure
- Marking utensil
- #6 ground wire or rod and earth ground materials
- Bond strap (optional, from cable bond clamp to bond post)
- 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)
- 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 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 bar
- Two 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

	WARNING	<p>Improper hoisting equipment and unsafe lifting procedures can result in serious injury or death</p> <p>Because of the added risk of injury or damage, do not lift enclosures with batteries installed.</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 stabilizers 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.

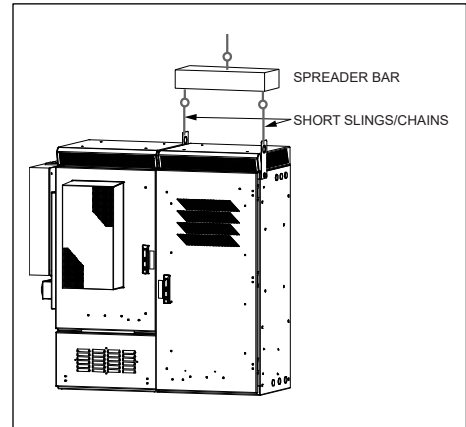


Figure 4 Lifting the CUBE

3.6. Mounting the CUBE

The CUBE can be mounted on a new or existing concrete or composite pad. Charles recommends the CPAD-S2EXXXXXXXX composite pad. Two gaskets are provided for placing the CUBE on a concrete pad. If a gasket becomes damaged during installation, order a replacement under part number 39-000520-0. The gaskets are not needed if mounting on a CPAD.

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%

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.

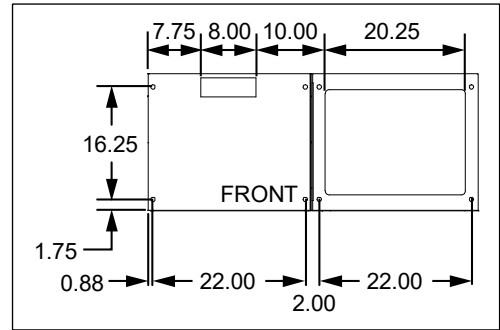


Figure 5
Mounting Hole Dimensions (in inches),
Top View

	WARNING	<p>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.</p> <p>The slump of the concrete shall be 2” to 4” as determined by ASTM C143 test method.</p>
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3.6.3. Mounting the CUBE on a Pad

Eight 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”. Use the gasket as a mounting hole location template.
2. Clean any debris from the concrete pad.
3. Install the gasket by positioning it on the pad so that it is underneath the bottom of the CUBE when the cabinet is installed. Line up the gasket so that the cutouts are in proper position around the conduit opening and the bolt holes as shown in Figure 6.
4. Open the equipment chamber door and remove the screws at the top of the battery compartment cover. Open the battery and radio compartments to allow access to mounting holes.
5. 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 and the gasket. Dress the cable/conduit so that it aligns with the CUBE openings as it is lowered onto the pad.
6. 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.
7. Secure the CUBE to the pad using the 1/2”-13 hex head bolts. Tighten all bolts securely.
8. Once the CUBE is secured, remove the slings and tagline. Replace any panels removed and close the doors.

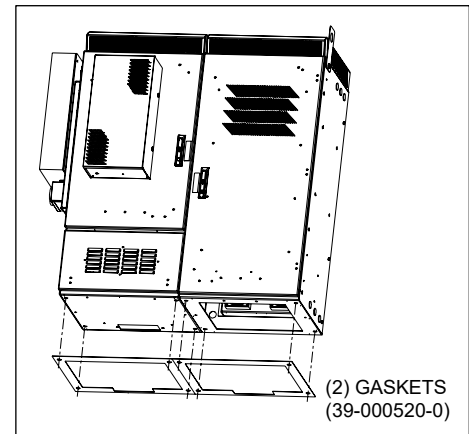


Figure 6 Gasket Installation

3.6.4. Mounting the CUBE on a CPAD

First, follow the instructions that ship with the CPAD to ensure that the CPAD is securely installed in the ground. Then proceed to mount the CUBE on the CPAD. Eight customer supplied, corrosion resistant, 1/2”-13, 2” long fully threaded hex head bolts with flat and lock washers are required for mounting the CUBE to the CPAD. Use the following steps to mount the CUBE to a CPAD.

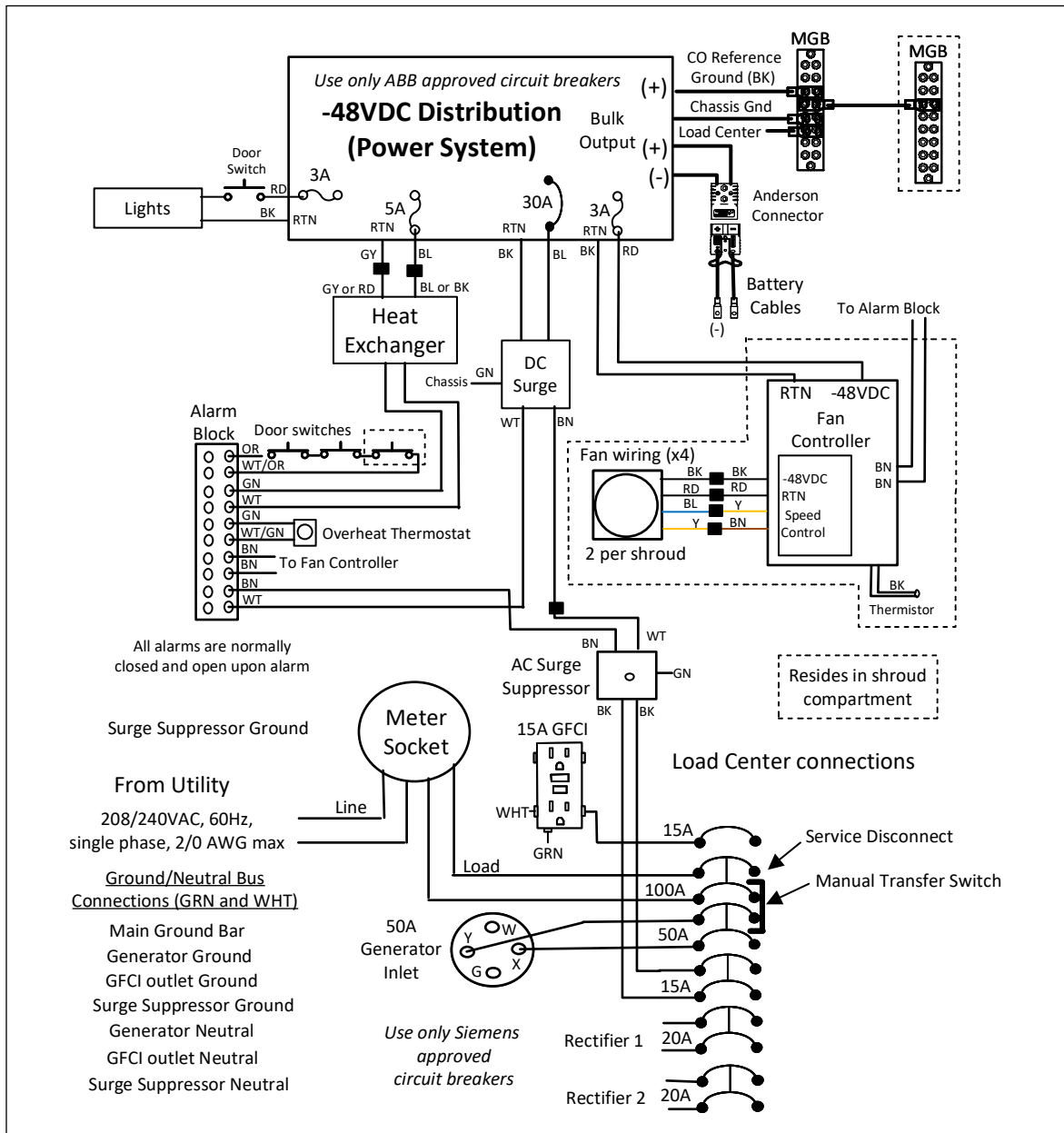
1. Clean any debris from the CPAD.
2. Open the equipment chamber door and remove the screws at the top of the battery compartment cover. Open the battery and radio compartments to allow access to mounting holes.
3. Ensure that the CUBE is parallel to the CPAD surface as it is placed onto the CPAD and that it aligns with the holes in the CPAD. Dress the cable/conduit so that it aligns with the CUBE openings as it is lowered onto the CPAD.
4. Place the CUBE on the CPAD. Loosen the slings so that all the weight is on the CPAD. Check that the CUBE is properly aligned.
5. Secure the CUBE to the CPAD using the 1/2”-13 hardware. Tighten all bolts securely.
6. Once the CUBE is secured, remove the slings and tagline. Replace any panels removed and close the doors.

3.8. 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.

	WARNING	Perform all bonding and grounding connections prior to any electrical and communications connections.
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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. Basic electrical diagrams are shown in Figures 7, 8, and 9.



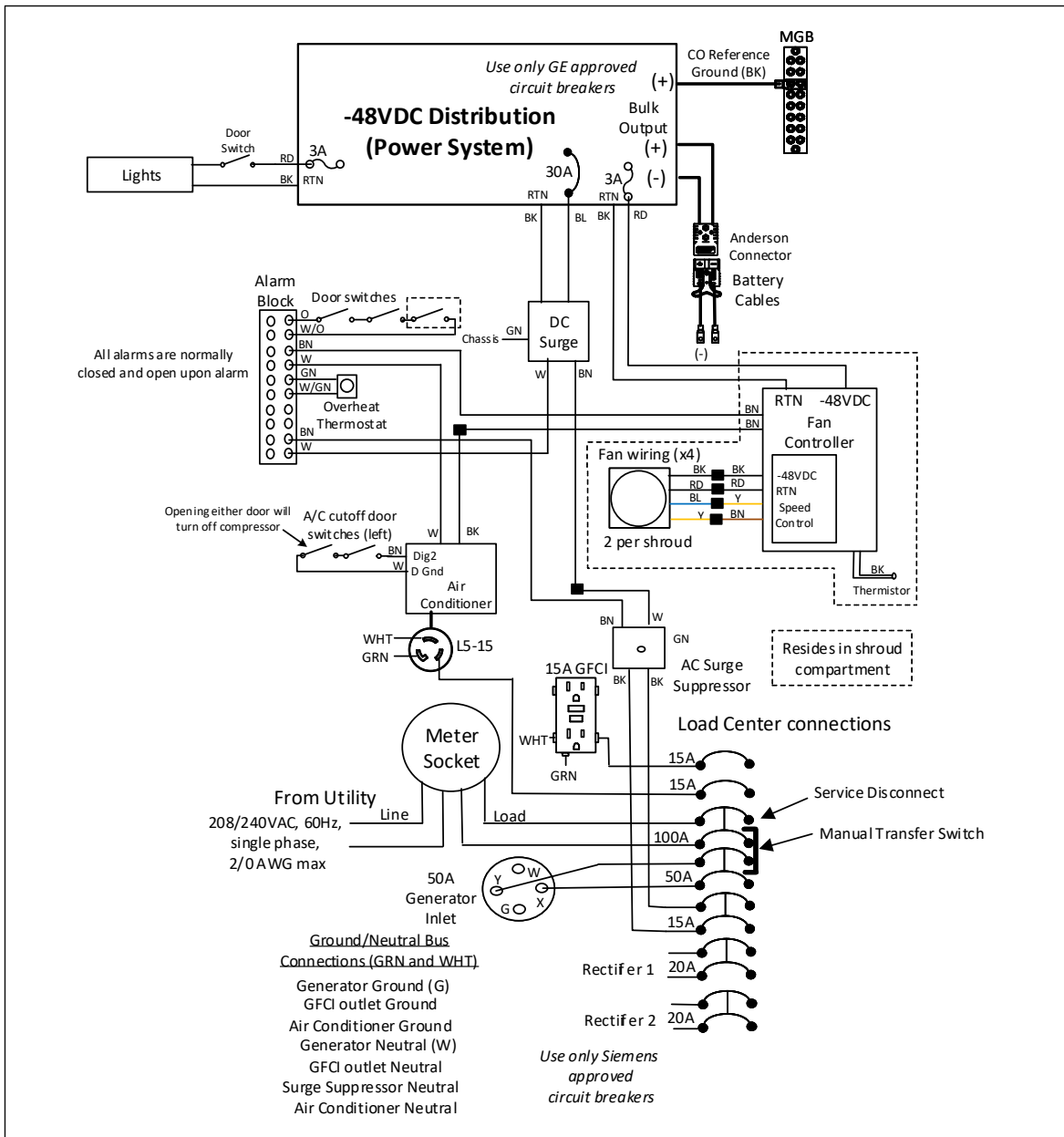


Figure 8 SC21632JP2 Electrical Diagram
 (JP1 is the same, but power system is customer supplied)

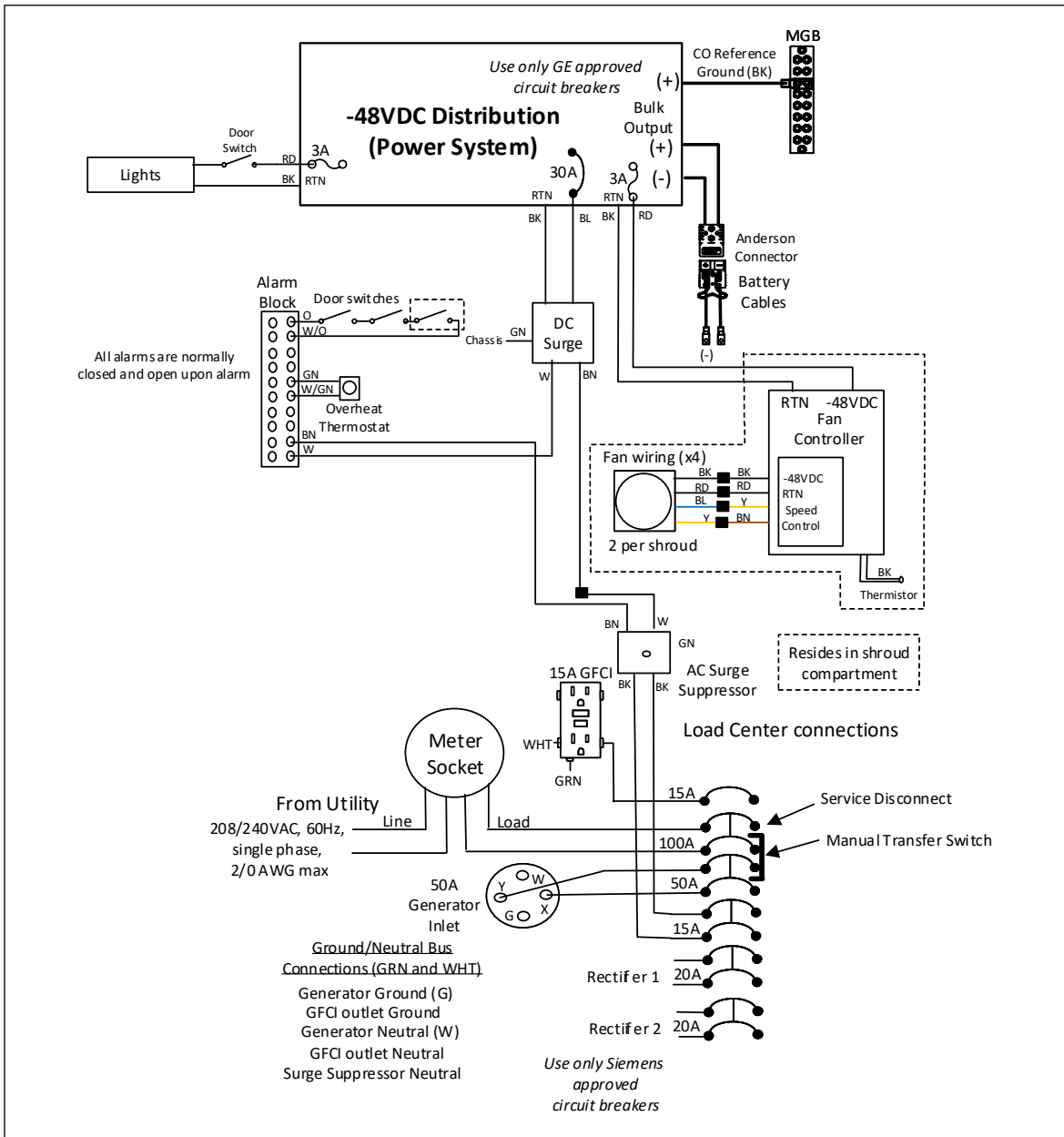


Figure 9 SC21632NP2 Electrical Diagram
(NP1 is the same, but power system is customer supplied)

3.8.1. Ground Connection

Use the 2x8 position ground bars provided in the equipment and radio compartments for all grounding of internal equipment. Stack hardware as shown in Figure 10. External ground lugs are available on the sides of the battery compartment for connecting a site ground wire.

3.8.2. AC Voltage Connection

The incoming AC voltage is a single phase 208/240 at 60Hz. The installer connects the voltage to the 100A service disconnect breaker. Use wire that is sized per National Electrical Code NFPA70 table 310.16.

Generator Inlet and Manual Transfer Switch: The CUBE is normally powered from the 208/240VAC from the utility. In the event of a power outage, an external 50A generator can be connected to the generator inlet. The generator inlet uses the 2-pole 50A breaker in the load center. When power from the main utility is off, turn on this inlet breaker, which physically turns off the 100A main breaker. When power from the main utility is restored, turn on the main breaker, which turns off the inlet breaker.

The AC load center is configured as a sub panel with the separate neutral and ground busses. If the load center needs to be configured as a main panel, the green bonding screw inside the load center must be screwed down to connect the busses. See location of the bonding screw in Figure 11.

3.8.3. -48VDC Power System

The SC21632DP2, JP2 and NP2 are equipped with a -48VDC ABB Infinity S-Flex Power System. The power shelf is equipped with a controller, two 50A rectifiers, and a DC distribution shelf with twelve GMT fuse positions and eight bullet breaker slots. Refer to the ABB power supply documentation located inside the CUBE for information regarding the power supply operation and configuration.

3.8.4. Battery Connection

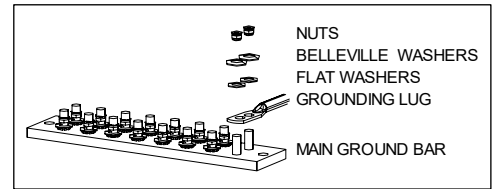


Figure 10
Ground Bar Hardware Stack

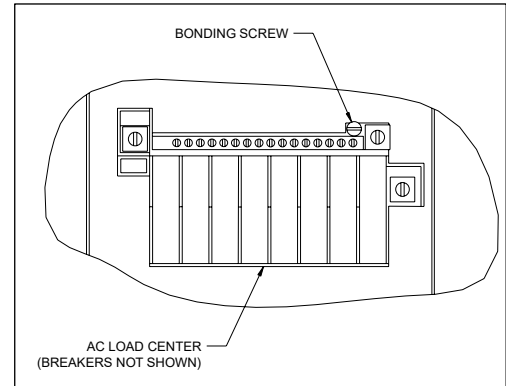


Figure 11 AC Load Center Bonding Screw

	WARNING	<p>Always disconnect blue Anderson connectors prior to servicing batteries.</p> <p>Disregard the (+) and (-) polarity markings on the blue Anderson connectors. The cable assemblies are used on both +24VDC and -48VDC products, so markings on the Anderson connectors are misleading.</p>
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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. Disconnect the Anderson connector located in the battery compartment.
2. Open the equipment compartment door, remove the two screws at the top of the battery compartment, and slide the cover off. Remove the battery retainer bracket from the front and loosen the provided battery straps.
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. Properly manage the battery cables.
 - o Ensure that the bending radius does not exceed 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.
9. Reconnect the Anderson connector.

Notes:

- Anderson connectors terminate 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.

3.8.5. HVAC Operation (JP1/JP2 Only)

The 4000BTU AC powered HVAC is driven by a built-in controller and temperature sensor. The factory cooling cycle turns on at 30°C and off at 27°C. The heating cycle turns on at 10°C and turns off at 15°C. The CUBE is equipped with a cutoff switch that shuts off power to the HVAC compressor when the door is opened to minimize condensation buildup on the coils. See the label on the air conditioner for firmware information. For further information, refer to the HVAC documentation that ships with the CUBE.

-NOTE-

Changing the cooling or heating cycles' default factory set points can lead to system performance issues, such as equipment failures, increased power use, unnecessary alarms, noise, condensation build up, compressor or fan failure caused by excessive runtimes and vibration.

Avoid placing items in front of the HVAC's return and supply vents. Maintain a minimum of 6" clearance to enable proper air flow.

3.8.6. Heat Exchanger Operation (DP1/DP2 Only)

The 760W DC powered heat exchanger in the equipment compartment has a fan speed controller and includes an internal and an external fan. Both fans' speed increases with increasing internal cabinet temperature. Fans and heat exchanger settings are defined below and are based off of the cabinet interior temperature. The maximum airflow amount supplied to the equipment by the heat exchanger is 147CFM.

Setting	Internal	External
Turn-on Setting (5°C Differential)	0°C	30°C
Medium Temp Setting	30°C	35°C
High Temp Setting	45°C	50°C
High Temp Alarm Setting	70°C	N/A
Low Temp Alarm Setting	-40°C	N/A

For more information, refer to the heat exchanger documentation found inside the CUBE.

-NOTE-

Changing the speed controller default factory set points can lead to system performance issues, such as equipment failures, increased power use, unnecessary alarms, noise, condensation build up, fan failure caused by excessive runtimes and vibration.

Avoid placing items in front of the heat exchanger's return and supply vents. Maintain a minimum of 6" clearance to enable proper air flow.

3.8.7. 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 60°C (DP1/DP2) or 50°C (JP1/JP2) and will open the connection when this temperature is exceeded. The thermostat automatically resets once the temperature has dropped by 7°C.

-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.

3.8.8. 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 alarm connections are normally closed and will open upon alarm.

3.8.9. Radio Mounting

The radio compartment accommodates multiple radio configurations. Mount the radios by positioning the radio mounting bolts into the slots on the brackets, and tightening the bolts to secure the radios in place. Available configurations are listed below.

1. (1) B25 4x30 (on the left) and (1) B4 2x60 AWS (on the right; must remove bracket)
2. (1) B25 4x30 and (1) B66 4x45
3. (2) AHxxA dual band

3.8.10. Fiber and Copper Entry

There are six Ø1.38" knockouts on the right side, and ten Ø1.38" knockouts on the rear of the cabinet. These knockouts accommodate Ø1.0" conduit fittings. There is a rectangular cutout in the bottom of the radio compartment for cable ingress/egress.

Equipment to battery compartment

- Two 1" plugged conduit holes
- One 1" 2-hole battery fitting

- Three 1/2” plugged conduit holes

Equipment to radio compartment

- One 1” cord grip fitting
- Two 1/2” cord grip fittings
- Two 1” plugs
- Four 1/2” plugs between equipment and radio compartment

3.9. Conduit Seals

All internal and external conduit openings on the CUBE must be completely sealed with a duct seal compound to prevent moisture from entering the equipment compartment. The battery compartment (if present) must be internally sealed from the equipment compartment to prevent outgassing from the batteries into the equipment compartment. 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 12. 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.

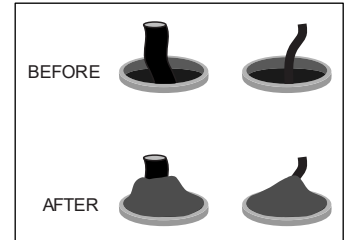


Figure 12 Applying Putty Seal

3.10. Verifying the Installation

Verify that earth ground and all grounding and bonding is complete and functional. After verifying that all installer connections are secure and complete, apply voltage.

4. PERIODIC MAINTENANCE

In the event that the enclosure needs to be opened in freezing conditions, a narrow, pointed metallic object such as a screwdriver or chisel, along with a non-metallic device like a rubber mallet, may be used 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.

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.

Reset the GFCI duplex receptacle periodically to ensure it is working. The unit meets UL-943, which requires an auto-monitoring (self-testing) feature. A flashing or solid red LED indicates a fault. If the unit continues to show a fault after resetting, replace the unit.

The heat exchanger (if equipped) requires no scheduled maintenance other than cleaning the fans and heat exchanger core if they become contaminated with dust or residue. Remove the cover by removing the screws on the outside. Examine periodically to determine the required cleaning periods based on the installed environmental conditions.

Refer to the HVAC manual supplied with the HVAC (if equipped) for periodic maintenance requirements.

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 (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
mktserv@charlesindustries.com (email)
http://www.charlesindustries.com/main/telecom_sales_support.htm

7. SPECIFICATIONS

7.1. Regulatory Specifications

- Designed to meet GR-487
- GFCI: UL-943 Listed

If CUBE's 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

Physical	
Dimensions	54"Hx48"Wx21"D
Weight	Approx. weights as shipped: SC21632DP1: 389 lbs. SC21632DP2: 407 lbs. SC21632JP1: 436 lbs. SC21632JP2: 454 lbs. SC21632NP1: 356 lbs. SC21632NP2: 374 lbs.
19" Equipment Rack Space and Hole Spacing	28" (16RU) rack spacing with tapped EIA #12-24 mounting holes
Battery Tray Size	10.9"Hx20.8"Wx15.7"D
Maximum Supported Weight	Rack Rails: 176 lbs. Battery Tray: 1000 lbs.
Materials	0.125" aluminum
Color	Off-White
Electrical	
Power System (DP2/JP2/NP2)	GE Infinity 150038170
Rectifiers	(2) GE CC109158878
DC Surge Suppressor	Raycap DC1-60
AC Load Center	Cooper B-Line U214MTBL
AC Surge Suppressor	Raycap AC2080-02-W
Supported Batteries	Saft Tel.X 80Ah (80-94690-02) or 100Ah (80-94692-02)
Bonding and Grounding	(2) 2x8 position ground bars (1 in equipment compartment, 1 in radio compartment)
Cable Entry	See Figure 2 or Section 3.7.11
Thermal	
HVAC (JP1/JP2 Only)	4000BTU, 48VDC, Dantherm 708142
Cooling Capacity	1200W
Heat Exchanger (DP1/DP2 Only)	760W, 48VDC, Vikinor VHC-040-DC
Maximum Heat Dissipation	700W@19°C above ambient with solar
Environmental	
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)
Kits and Replacement Parts	
Touch-up Paint	02-000290-0
216 Type Security Tool	07-002070-0
Replacement Gasket	39-000520-0
Shim Kit for Leveling	97-000010-0
Swing Handle	39-000148-0
4-Wire Door Alarm Switch	17-400319-0
2-Wire Door Alarm Switch	17-400314-0
15A GFCI Outlet	04-100207-0
Overheat Thermostat	99-004548-0
Replacement 48VDC DAC Fans	18-950454-0

Table 1 CUBE Specifications