

Charles Universal Broadband Enclosure

CUBE-PM63915BN1/BN2

General Description and Installation

| | |
|--|-----------|
| 1. GENERAL INTRODUCTION | 1 |
| 1.1. Document Purpose | 1 |
| 1.2. Product Purpose..... | 1 |
| 1.3. Product Mounting and Location..... | 1 |
| 2. PRODUCT DESCRIPTION..... | 2 |
| 3. INSTALLATION | 4 |
| 3.1. Inspecting the Product..... | 4 |
| 3.2. Following and Using Safety Precautions..... | 4 |
| 3.3. Obtaining Tools and Equipment..... | 4 |
| 3.4. Preparing the Installation Site..... | 4 |
| 3.5. Lifting the CUBE..... | 5 |
| 3.6. Mounting the CUBE..... | 5 |
| 3.8. CUBE Wiring and Equipment | 7 |
| 3.9. Conduit Seals..... | 9 |
| 3.10. Verifying the Installation..... | 9 |
| 4. PERIODIC MAINTENANCE..... | 9 |
| 5. TECHNICAL ASSISTANCE AND REPAIR SERVICE..... | 9 |
| 6. WARRANTY & CUSTOMER SERVICE | 9 |
| 7. SPECIFICATIONS..... | 10 |
| 7.1. Regulatory Specifications | 10 |
| 7.2. Product Specifications..... | 10 |
| 7.3. Macro Alarm Panel Connections | 11 |

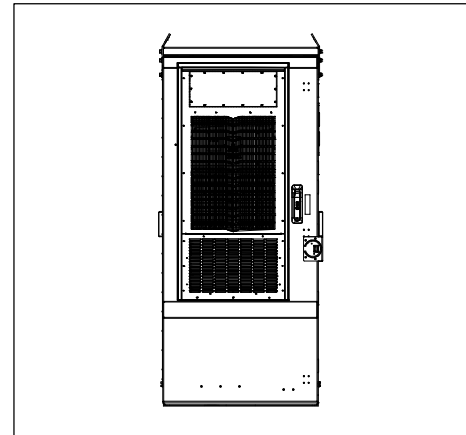


Figure 1 Front View of the CUBE

1. GENERAL INTRODUCTION

1.1. Document Purpose

This document provides general information for the CUBE-PM63915BN1 and CUBE PM-63915BN2 of the Charles Industries' Universal Broadband Enclosure (CUBE) product line. These two models are identical except the BN2 now has R513A refrigerant instead of R134A in the HVAC system. Figure 1 shows a closed front view of the enclosure.

-NOTE-

Hereafter, the Charles Universal Broadband Enclosure CUBE-PM63915BN1/BN2 will be referred to as the "CUBE."

1.2. Product Purpose

The CUBE consists of a protective enclosure for an integrated system of electronic components and equipment that can serve fiber and copper interfaces.

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 concrete pad or steel grate platform. The installer connects the power, fiber, and copper connections. Detailed mounting and installation information is covered in Section 3.

2. PRODUCT DESCRIPTION

The CUBE is a single compartment with 46RU of 19" rack mounting space (40RU horizontal, 6RU vertical) and a 14kBTU DC powered HVAC system.

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

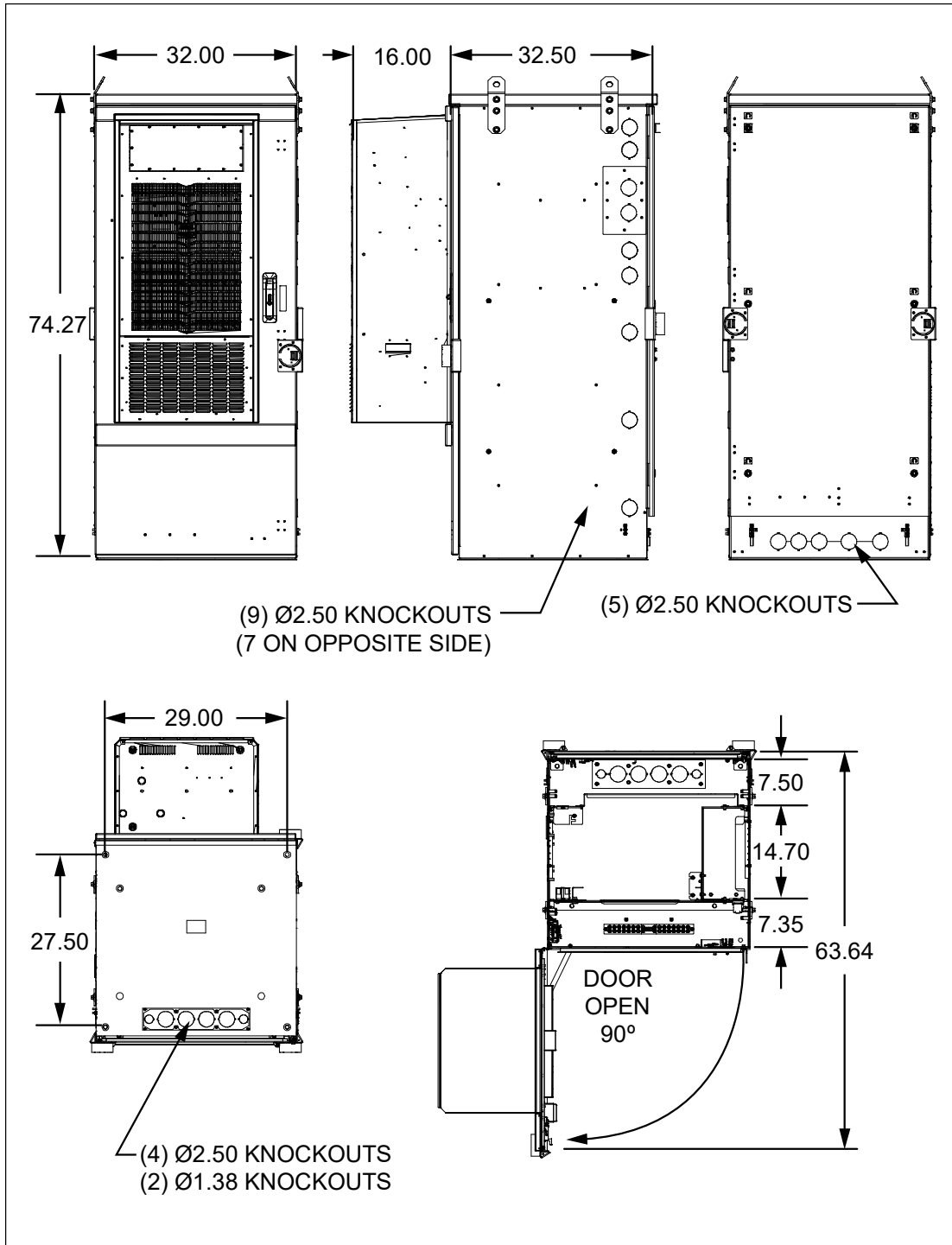


Figure 2 CUBE Dimensions (in inches)

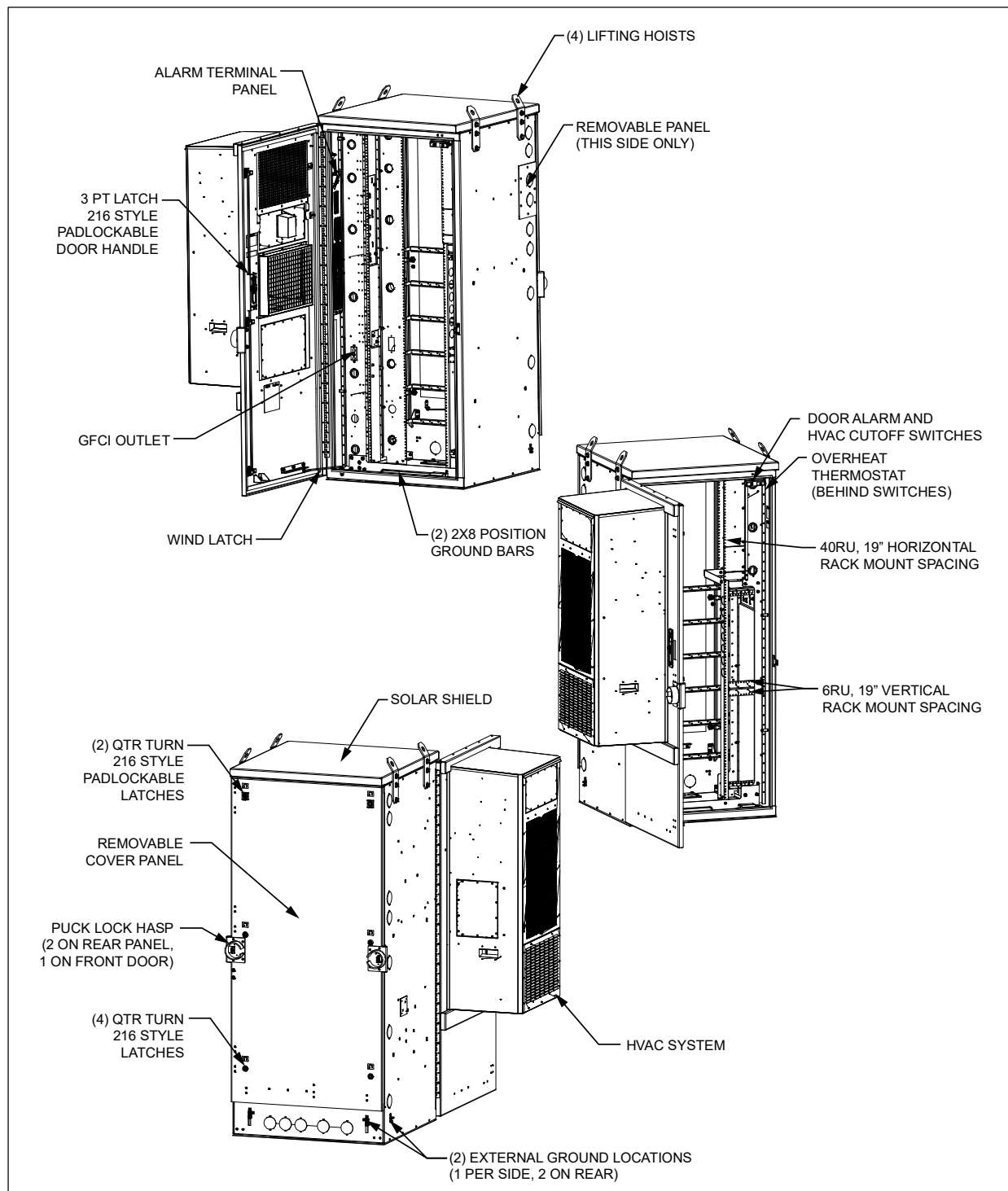


Figure 3 CUBE Components

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.

- 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 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
- 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

| | | |
|---|----------------|--|
|  | WARNING | Improper hoisting equipment and unsafe lifting procedures can result in serious injury or death |
|---|----------------|--|

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.

3.6. Mounting the CUBE

The CUBE can be mounted on a new or existing concrete or composite pad. A gasket for placing the CUBE on a concrete pad is affixed to the bottom of the CUBE. If the gasket becomes damaged during installation, order a replacement under part number 80-006260-A. Ensure that the unit is level.

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% |

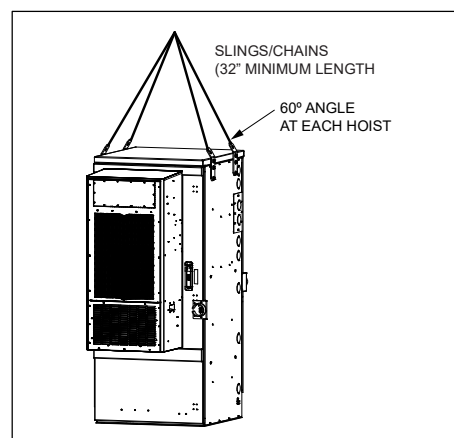



Figure 4 Lifting the CUBE

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.

| | | |
|---|----------------|--|
|  | 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> |
|---|----------------|--|

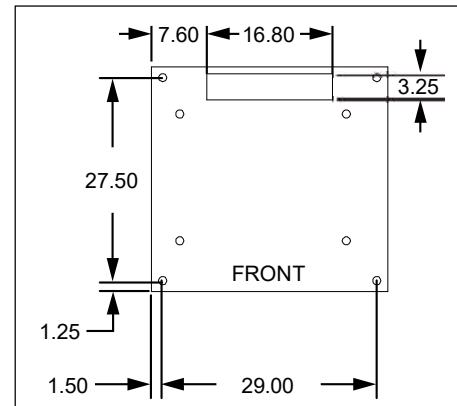


Figure 5
Mounting Hole Dimensions (in inches),
Top View

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.
3. Open the equipment chamber door to allow access to mounting holes.
4. 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.
5. 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.
6. Secure the CUBE to the pad using the 1/2"-13 hex head bolts. Tighten all bolts securely.
7. 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.
8. Once the CUBE is secured, remove the slings and tagline. Close the door.

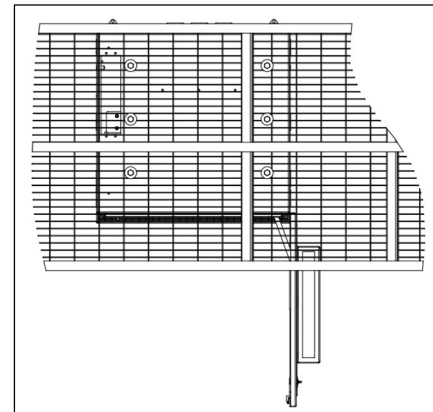


Figure 6 **Installing on a Platform**

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. |
|---|----------------|--|

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 7.

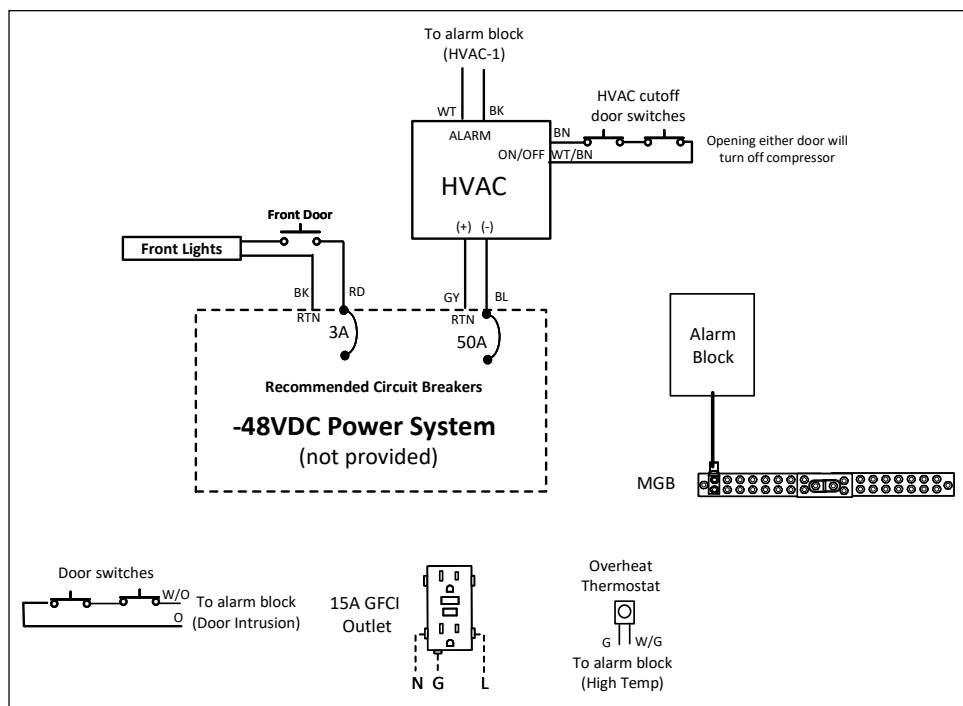


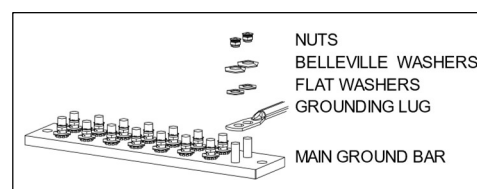
Figure 7 Electrical Diagram

3.8.1. Ground Connection

Use the two 2x8 position ground bars provided in the equipment compartment for all grounding of internal equipment. Stack hardware as shown in Figure 8. External ground lugs are available on the sides and rear of the compartment for connecting a site ground wire.

3.8.2. HVAC Operation

The DC powered 14kBTU HVAC and 500W/K DAC hybrid unit operates mainly in HVAC mode and switches automatically to emergency filtered direct air cooling (EM/DAC) mode when specific unit alarm conditions (temperature and humidity) are met. The emergency DAC mode remains active until all alarms clear.



**Figure 8
Ground Bar Hardware Stack**

The HVAC/DAC temperature regulation follows “precision control” logic with a PID (proportional integral derivative) controller for the fans/compressor speeds to maintain the respective temperature set points. The maximum internal airflow to the equipment is 883CFM.

The EM/DAC system includes an F9/MERV16 high-performance filter for cleaner operation. A built-in damper controls the flow of outside air and switches automatically between the closed and open positions during operation of the HVAC and DAC modes. The unit contains a humidity sensor to ensure the DAC mode does not function when the outside humidity is above 85% to prevent condensation inside the cabinet. A pressure switch is included to inform the customer of the need to change/clean the filter before clogging.

The HVAC mode starts running at 35°C at various speeds, remaining on until the internal temperature is below 30°C. During an HVAC compressor alarm or if the unit goes into LVD mode due to commercial power loss, the unit enters EM/DAC mode at low speed when the

internal temperature reaches 50°C. It remains on until the temperature drops below 32°C or when the alarms clear. The fans adjust speed accordingly to maintain the set point temperature. The heating cycle turns on at 10°C and off at 15°C. The evaporator fan runs continuously at 70% speed during this cycle.

The CUBE is equipped with a cutoff switch that shuts off the HVAC compressor when a door is opened to minimize condensation buildup on the coils. For further information, refer to the HVAC documentation that ships with the CUBE.

| System | On | Off | Notes |
|-----------------------------------|-------|------|--|
| Active Cooling (HVAC) | 35°C | 30°C | Speed-regulated compressor & fans. The compressor varies speed between 2000rpm & 3200rpm. |
| Emergency Cooling (EM/DAC) | 50°C | 32°C | Speed-regulated evaporator & condenser fans |
| Idle Mode (Compressor is off) | 30°C | 10°C | Evaporator fan @ 30% speed / Condenser fan is off |
| Heating Mode | 10°C | 15°C | Evaporator fan @ 70% speed / Condenser fan is off |
| High Temp Alarm Setting | 65°C | 63°C | |
| Low Temp Alarm Setting | 0°C | 2°C | |
| Internal (evaporator) Fan Setting | -40°C | - | The fan runs continuously at 30% speed when the compressor is off. It will vary speed between 50% & 100% when the compressor is on. |
| External (condenser) Fan Setting | 35°C | 30°C | The fan is off when the compressor is off. It will vary speed between 30% & 85% when the compressor is on. |

-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.

3.8.3. 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 50°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.

3.8.4. Macro Alarm Terminal Panel

An integrated macro-site alarm panel is mounted on the left wall of the cabinet. This panel provides forty protected dry contact alarm inputs to screw down terminals or 66-block connections (Figure 9). The cabinet comes with a standard alarm schedule label (See Table 2). The table can be replaced or augmented to match the specific alarms being used. All connections are normally closed and open on alarm.

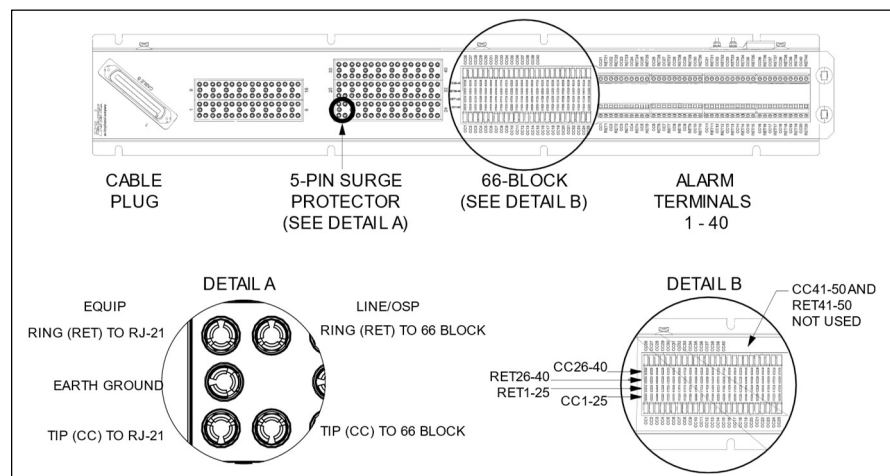


Figure 9 Alarm Terminal Panel

3.8.5. Fiber and Copper Entry

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

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. 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 10. 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.

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.

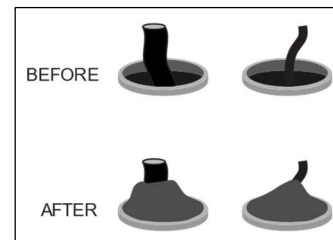


Figure 10 Applying Putty Seal

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.

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.

Refer to the HVAC manual supplied with the HVAC 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 that 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 | 75"Hx32"Wx32"D |
| Weight | Approx. 510 lbs. as shipped |
| 19" Equipment Rack Space and Hole Spacing | 80.5" (46RU) rack spacing with tapped EIA #12-24 mounting holes |
| Maximum Supported Weight | Rack Rails: 506 lbs. |
| Materials | 0.125" aluminum |
| Color | Off-white |
| Electrical | |
| Bonding and Grounding | (2) 2x8 position ground bars inside, external grounds on sides and rear |
| Cable Entry | See Figure 2 and section 3.8.5 |
| Thermal | |
| HVAC System | 48VDC, Vikinor VAF-4000L |
| Cooling Capacity | 14000BTU |
| 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 | 80-006260-A |
| 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 | 17-400329-0 |
| HVAC Cutoff Switch | 17-400322-0 |
| GFCI Outlet | 15A, 04-100207-0 |
| Overheat Thermostat | 99-004548-0 |

Table 1 CUBE Specifications

7.3. Macro Alarm Panel Connections

| Alarm Number | Description |
|--------------|--------------------------------------|
| CC1 | Door Intrusion |
| CC2 | Commercial Power Failure |
| CC3 | Surge Suppressor/Lightening Arrestor |
| CC4 | Rectifier Failure |
| CC5 | Multiple Rectifier Failure |
| CC6 | Battery Discharge |
| CC7 | Low Voltage |
| CC8 | DC Power Failure |
| CC9 | Generator Running |
| CC10 | Generator Low Fuel |
| CC11 | Generator Failure |
| CC12 | HVAC Failure |
| CC13 | High Temp |
| CC14 | Low Temp |
| CC15 | Tower Light |
| CC16 | Tower Light Side |
| CC17 | RRH Up-Convertor Failure |
| CC18 | RRH Power Failure |
| CC19 | RRH High Humidity |
| CC20 | RRH Intrusion |
| CC21 | Smoke/Fire |
| CC22 | Bus Bar Theft |
| CC23 | Battery Breaker Alarm |
| CC24 | |
| CC25 | Microwave Critical |
| CC26 | Microwave Major |
| CC27 | Dehydrator Alarm |
| CC28 | Fire Suppression Discharge |
| CC29 | Fire Suppression Trouble |
| CC30 | Secondary HVAC Running |
| CC31 | Explosive Gas |
| CC32 | High Humidity |

Table 2 Macro Alarm Wiring Table