

Charles Universal Broadband Enclosure

CUBE-PM62422KE2 and CUBE-PM62422KE3

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	11
3.10. Verifying the Installation	11
4. PERIODIC MAINTENANCE	11
5. TECHNICAL ASSISTANCE AND REPAIR SERVICE	11
6. WARRANTY & CUSTOMER SERVICE	11
7. SPECIFICATIONS	12
7.1. Regulatory Specifications	12
7.2. Product Specifications	12

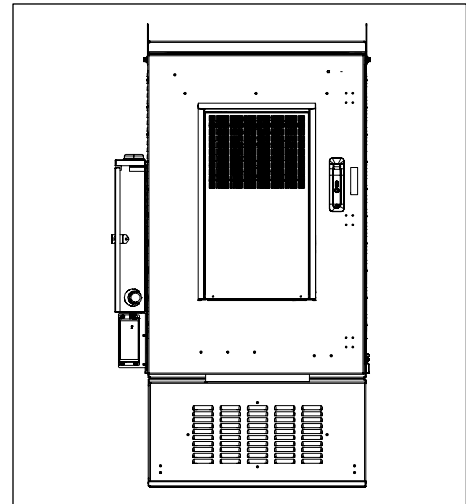


Figure 1 Front View of the CUBE

1. GENERAL INTRODUCTION

1.1. Document Purpose

This document provides general information for the CUBE-PM62422KE2 and CUBE-PM62422KE3 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-PM62422KE2 and CUBE-PM62422KE3 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 pad. The installer connects the power, fiber, and copper connections. Detailed mounting and installation information is covered in Section 3.

2. PRODUCT DESCRIPTION

The CUBE has two compartments. The equipment compartment includes 24RU of 23" horizontal rack space and an ABB power shelf with two rectifiers. The battery compartment supports one string of 200Ah VRLA customer supplied batteries.

The KE2 model includes a 4000BTU AC powered HVAC system and a 16-position AC load center. The KE3 model includes a 5000BTU DC powered HVAC system, two CFRS fiber panels, and a 12-position AC load center.

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

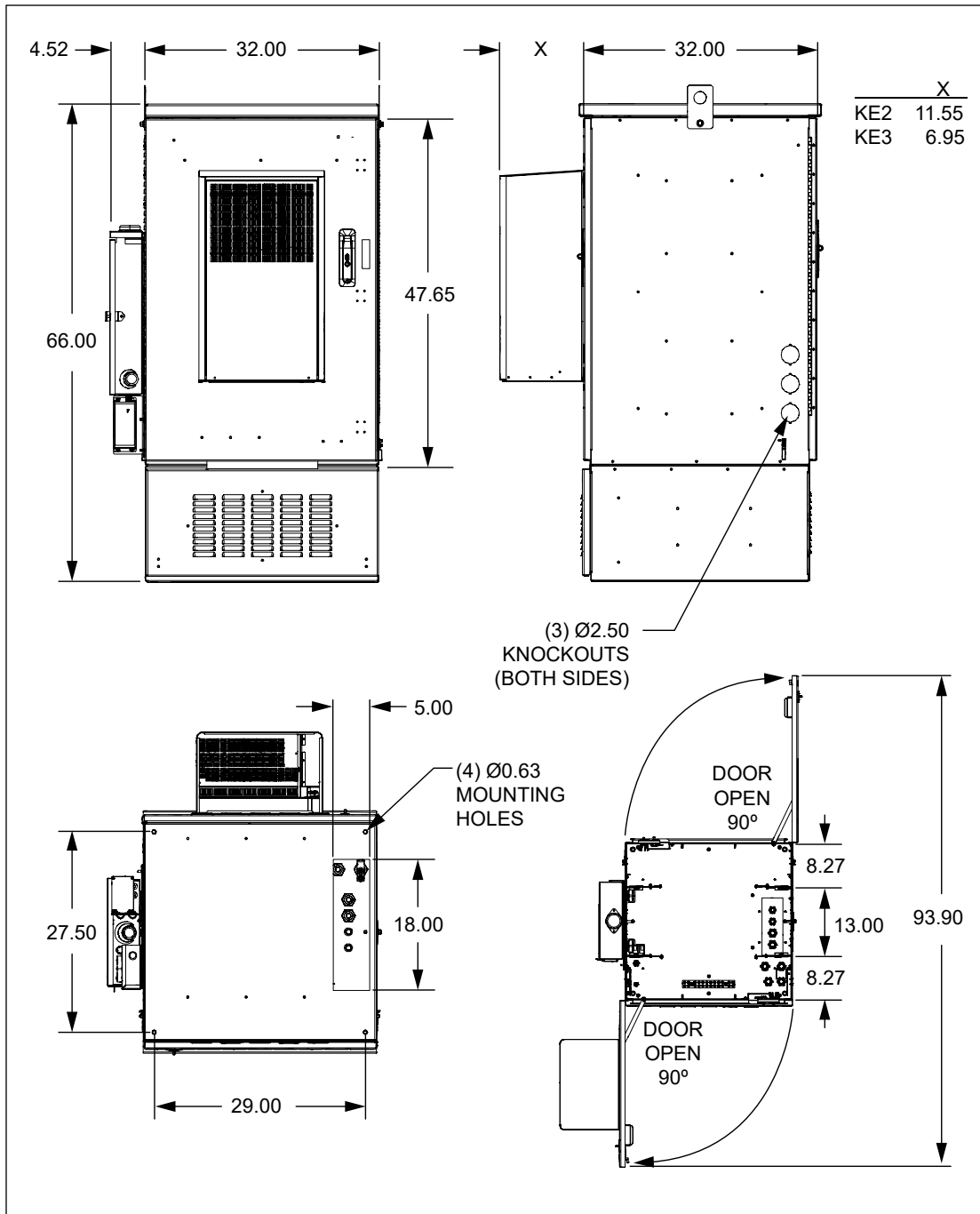


Figure 2 CUBE Dimensions (in inches)

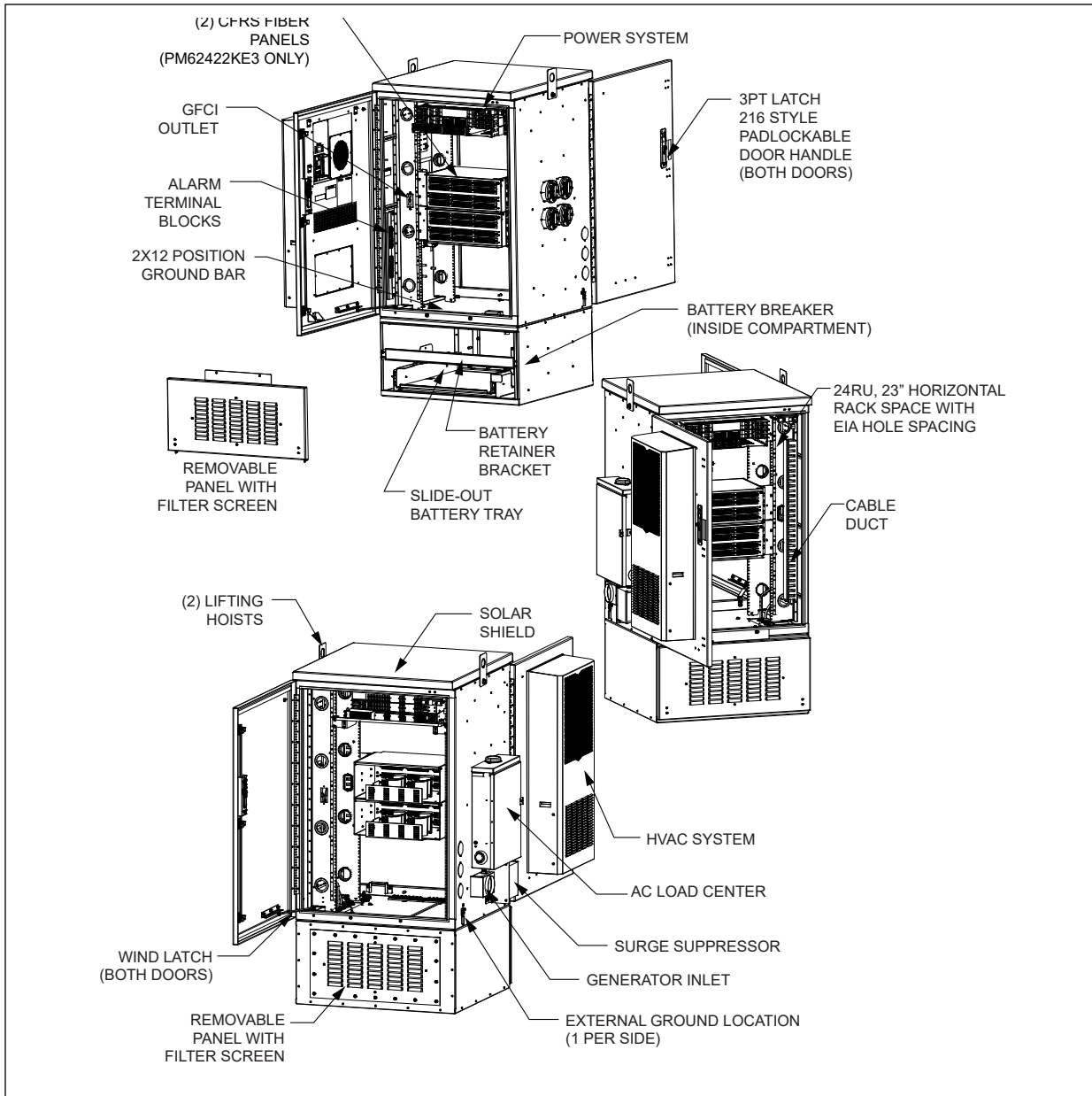


Figure 3 CUBE Components
KE3 model shown. The HVAC and the load center look different on the KE2 model.

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.

	WARNING	Prior to lifting, remove the lifting brackets that hold the mounting gasket in place. Set aside the gasket, and then replace the brackets. Failure to do so can result in a failure of the lifting bracket assembly.
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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.

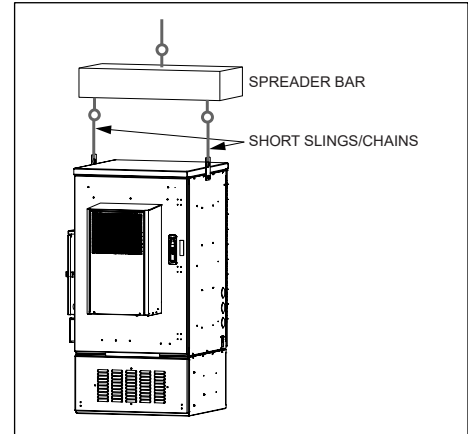



Figure 4 Lifting the CUBE

3.5.2. Warnings and Specific Safety Precautions

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

3.6. Mounting the CUBE

The CUBE can be mounted on a new or existing concrete pad. A loose gasket is provided for placing the CUBE on a concrete pad. If the gasket becomes damaged during installation, order a replacement under part number 39-000598-0. The gasket is not needed if mounting on a CPAD. 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%

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>
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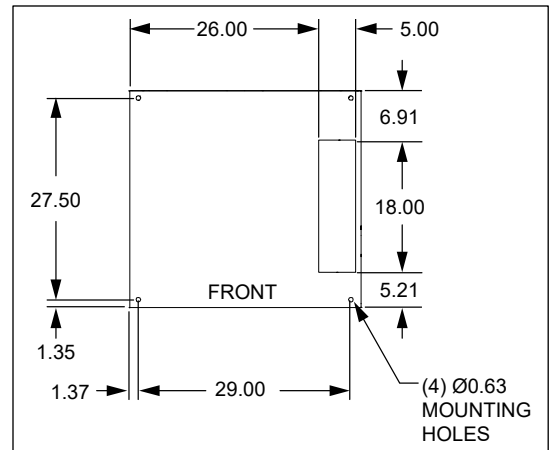


Figure 5
Mounting Hole Dimensions (in inches), Top View

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”. 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 compartment 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 equipment compartment door.

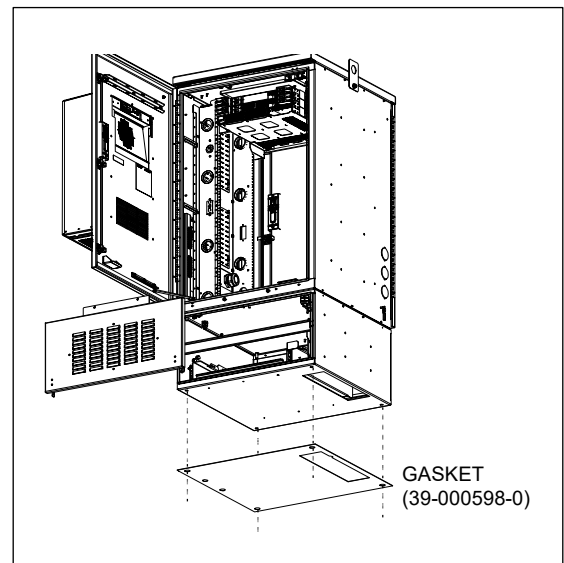


Figure 6 Gasket Installation

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 and 8.

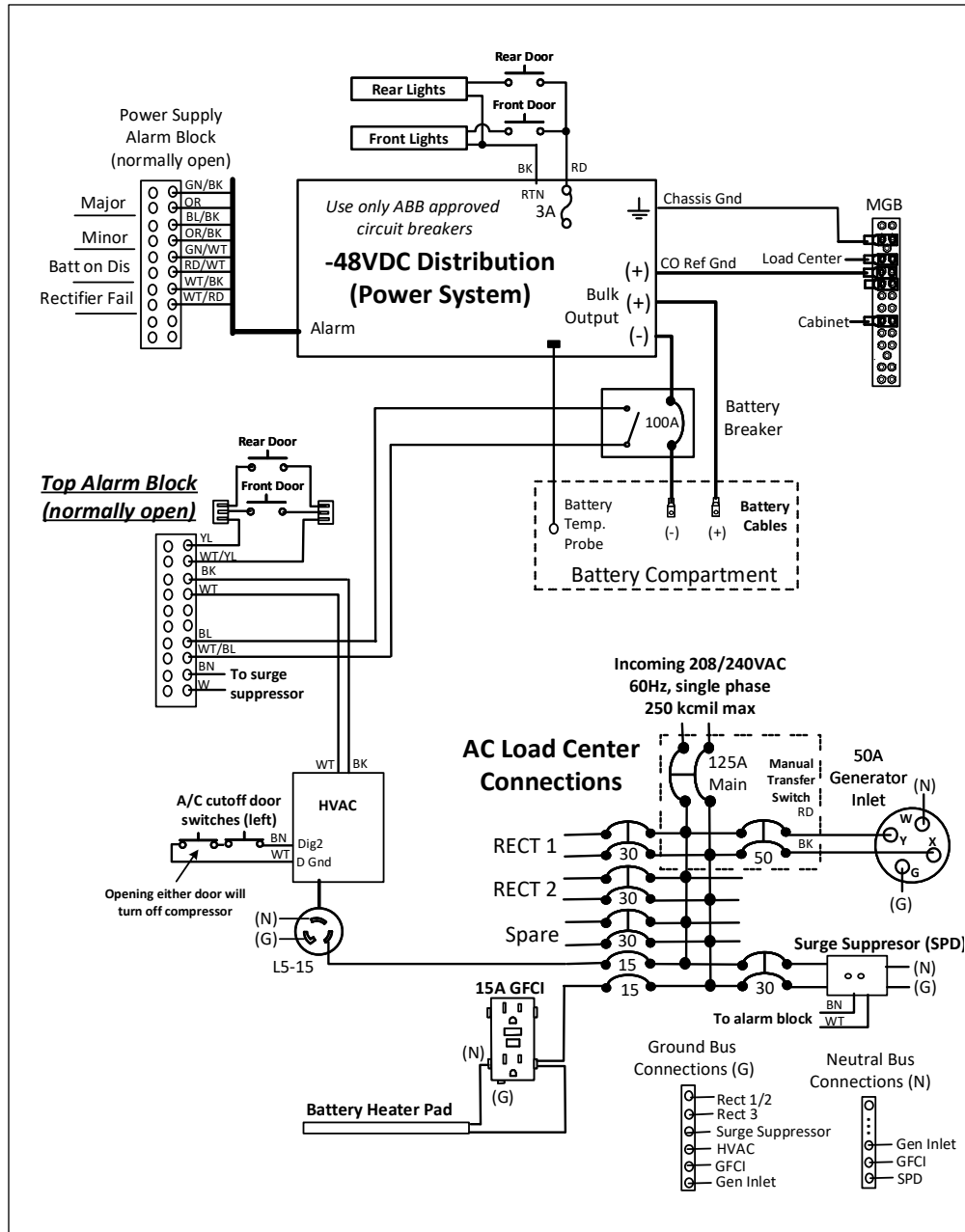


Figure 7 PM62422KE2 Electrical Diagram

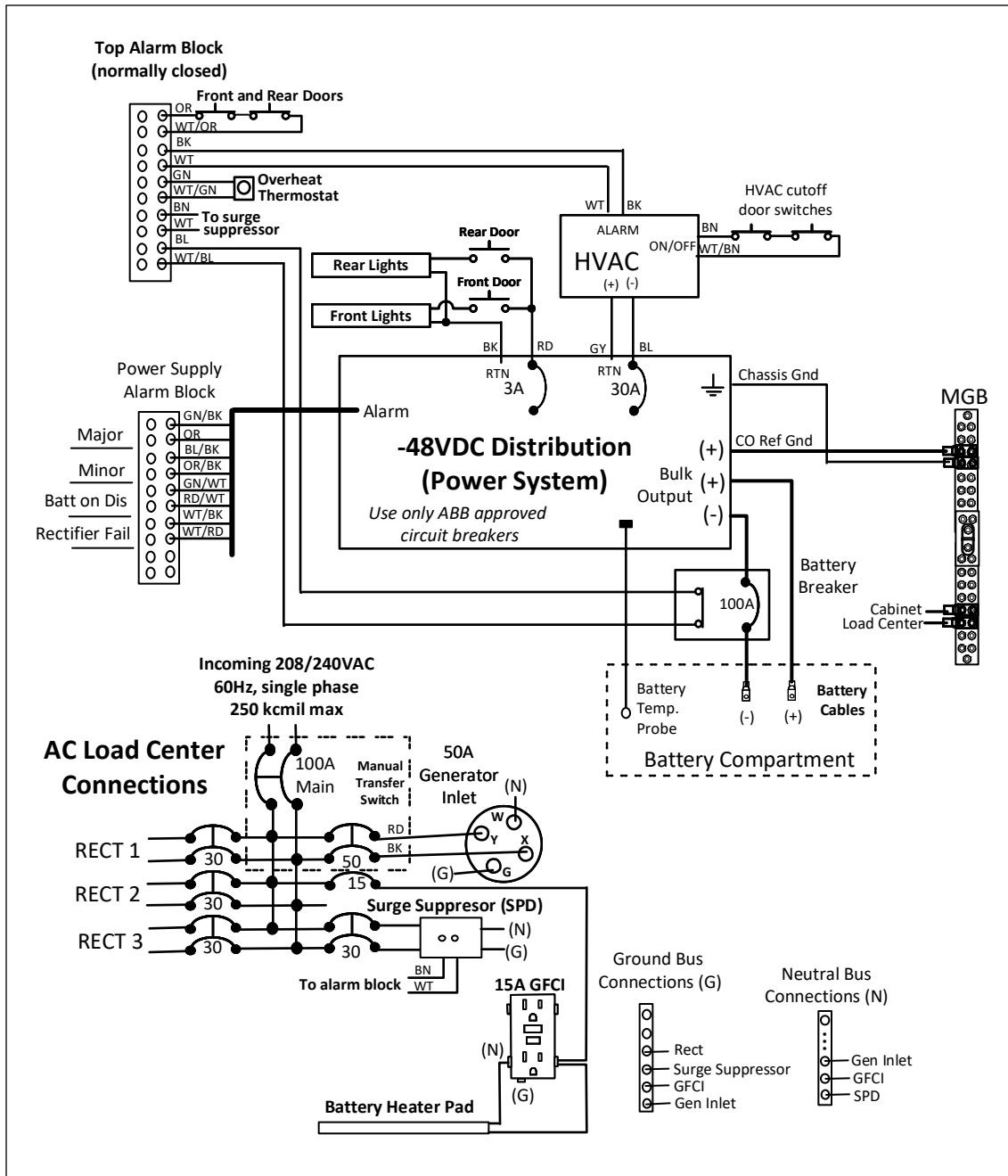
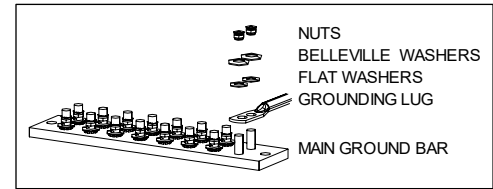


Figure 8 PM62422KE3 Electrical Diagram

3.8.1. Ground Connection

Use the ground bar provided in the equipment compartment for all grounding of internal equipment. Stack hardware as shown in Figure 9. External ground lugs are available on the sides of the CUBE for connecting a site ground wire. The KE2 ground bar has 2x12 positions, and the KE3 ground bar has two 2x8 positions.



**Figure 9
Ground Bar Hardware Stack**

3.8.2. AC Voltage Connection


The incoming AC voltage is a single phase 208/240V at 60Hz and is connected to the 125A main circuit breaker in the AC load center. The maximum wire size is 2/0AWG. The installer connects the two hot (line) wires to the breaker, the neutral wire to the neutral bus and the ground wire to the ground bus. Use wire that is sized per National Electrical Code NFPA70 table 310.16.

The CUBE is normally powered from the 208/240VAC from the utility. In the event of a power outage, a 50A generator inlet is provided in the AC load center. The generator inlet is connected to the 2-pole 50A breaker. When power from the main utility is off, slide the main breaker to the “OFF” position. If necessary, reposition the manual transfer switch in the load center into the generator position, and turn on the generator breaker. When power from the main utility is restored, slide the generator breaker into the “OFF” position, slide the manual transfer switch back to the normal position, and turn the main breaker back on.

3.8.3. -48VDC Power System

The -48VDC power system includes a controller and two rectifiers. Connect batteries to the bulk output. See the GE documentation that ships with the CUBE for more information.

3.8.4. Battery Connection

	WARNING	<p>Always turn off battery breakers prior to servicing batteries.</p> <p>If using VRLA batteries, ensure that the power system is set up for VRLA batteries with temperature compensation enabled.</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. Switch off the battery breaker located in the battery compartment.
2. Open the equipment chamber door and remove the two screws at the top of the battery compartment cover panel, then set aside the panel. Then remove the four screws on the retaining bracket in front of the battery tray and set the bracket aside. To unlock the battery tray, press down on the left side lever and slide the battery tray forward.
3. If replacing batteries, disconnect battery cables from terminals and loosen the battery retaining strap(s).
4. Remove the battery temperature probe.
5. Remove the interconnecting straps from the batteries. Remove batteries.
6. Carefully position the new batteries on the battery tray. Connect the interconnecting straps to each battery string. Slide the battery tray back into the locked position and replace the battery bracket using the four screws removed previously. Fasten the door back on using the two screws.
7. Replace battery temperature probe to the closest battery.
8. Connect the battery cables to the appropriate terminals.
9. Secure the battery retaining straps and reinstall the battery retainer brackets using hardware from step 2.
10. 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.
11. Switch on the battery breaker.

Notes:

- Battery breakers terminate at the power shelf.
- Ensure temperature compensation probes are installed per power system guidelines.
- 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. Battery Temperature Probe

The CUBE includes a battery temperature probe, wired in series and connected to the power system. When the batteries are installed, connect the probe to the nearest battery on the battery tray. The probe monitors the temperature of the batteries and sends the information to the power system, which adjusts the voltage draw from the batteries in response to thermal changes.

3.8.6. Battery Heater Pad

The 100W heater pad in the bottom of the battery compartment is controlled by an internal thermostat that turns on at 15°C and turns off at 24°C. The heater pad is connected the GFCI outlet.

3.8.7. HVAC Operation

KE2:

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 a door is opened to minimize condensation buildup on the coils. See the label on the HVAC 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.

KE3:

The 5100BTU (5kBTU) DC powered HVAC compressor and fans are PID (proportional integral derivative) controlled. The compressor turns on at 33°C at low speed and will increase/decrease speed as needed to maintain this temperature. The compressor turns off when the internal temperature reaches 28°C. The internal fan is always on at low speed (30%) to continually circulate heat within the cabinet. The external fan turns on/off with the compressor. Both fans' speed increase as needed with increasing internal cabinet temperature. In addition, the HVAC includes a built-in 1000W heater for cold temperature operation. HVAC settings for the compressor, fans, heater, and temperature alarms are defined below and are based off the cabinet's interior temperature. 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.

The maximum airflow amount supplied to the equipment by the HVAC is 306CFM. 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.

HVAC Compressor/Fans/Heater/Alarms Setting	Internal	External
Compressor Turn-on Setting	33°C	N/A
Compressor Turn-off Setting	28°C	N/A
Fan Turn-on Setting	-40°C	38°C
Heater ON Setting (70% Fan Speed)	8°C	N/A
Heater OFF Setting	13°C	N/A
High Temp Alarm Setting	65°C	N/A
Low Temp Alarm Setting	0°C	N/A

3.8.8. Alarm Block Connections

A pair of 10-position, labeled alarm block monitor components in the equipment compartment. See the electrical diagram for information about alarm connections. The KE2 connections are normally open and will close upon alarm. The KE3 connections are normally closed and will open upon alarm.

3.8.9. Fiber and Copper Entry

The sides of the CUBE have Ø2.50" knockouts 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. 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 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.

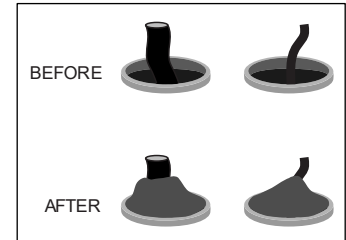


Figure 10 Applying Putty Seal

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 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 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.

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 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 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

Physical	
Dimensions	66"Hx32"Wx32"D
Weight	Approx. 580 lbs. as shipped
23" Equipment Rack Space and Hole Spacing	42" (24RU) rack spacing with tapped EIA #12-24 mounting holes
Battery Tray Size	12.75"Hx21"Wx24"D
Materials	0.125" aluminum
Color	Off-white
Electrical	
Power System	48VDC, ABB NES-3U-AC5-PS3-8DC12BR
Rectifiers	ABB CC109163473
AC Load Center	KE2: Square D QO116L125PGRB KE3: Square D QO112L125PGRB
Supported Batteries	200Ah, VRLA
Bonding and Grounding	One 2x12 position ground bar in equipment compartment, 2 external lugs
Cable Entry	See Figure 2 and section 3.8.9
Thermal	
HVAC System	KE2: 4000BTU, 115VAC, Dantherm 708341 KE3: 5100BTU, 48VDC, Vikinor VAK-1500
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	39-000598-0
Shim Kit for Leveling	97-000010-0
Lift-Up Handle	39-000335-0
Door Rod Latch	39-000336-0
4-Wire Door Alarm Switch (Black)	17-400329-0
HVAC Cutoff Switch (Black with White Button)	17-400322-0
GFCI Outlet	15A 04-100207-0

Table 1 CUBE Specifications