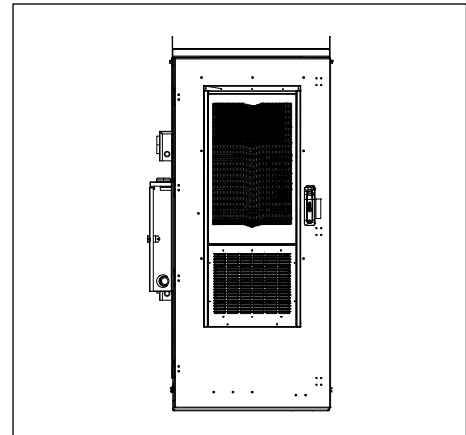


# Charles Universal Broadband Enclosure

## CUBE-PM63912ZN2 and CUBE-PM63912ZN3

### 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-PM63912ZN2 and CUBE-PM63912ZN3 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-PM63912ZN2 and CUBE-PM63912ZN3 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. 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 39RU of 23" horizontal rack spacing and two 12k BTU 230VAC powered HVAC units. Three shelves inside the cabinet allow for easy installation of customer supplied server equipment. The CUBE is designed for connection to a customer supplied battery energy storage system (BESS) for use in the event of a power failure. The PM63912ZN3 model has provisions for mounting a secondary power supply for a camera and a pair of card readers.

Figure 2 shows the CUBE dimensions. Figures 3 and 4 show the main components of the CUBE.

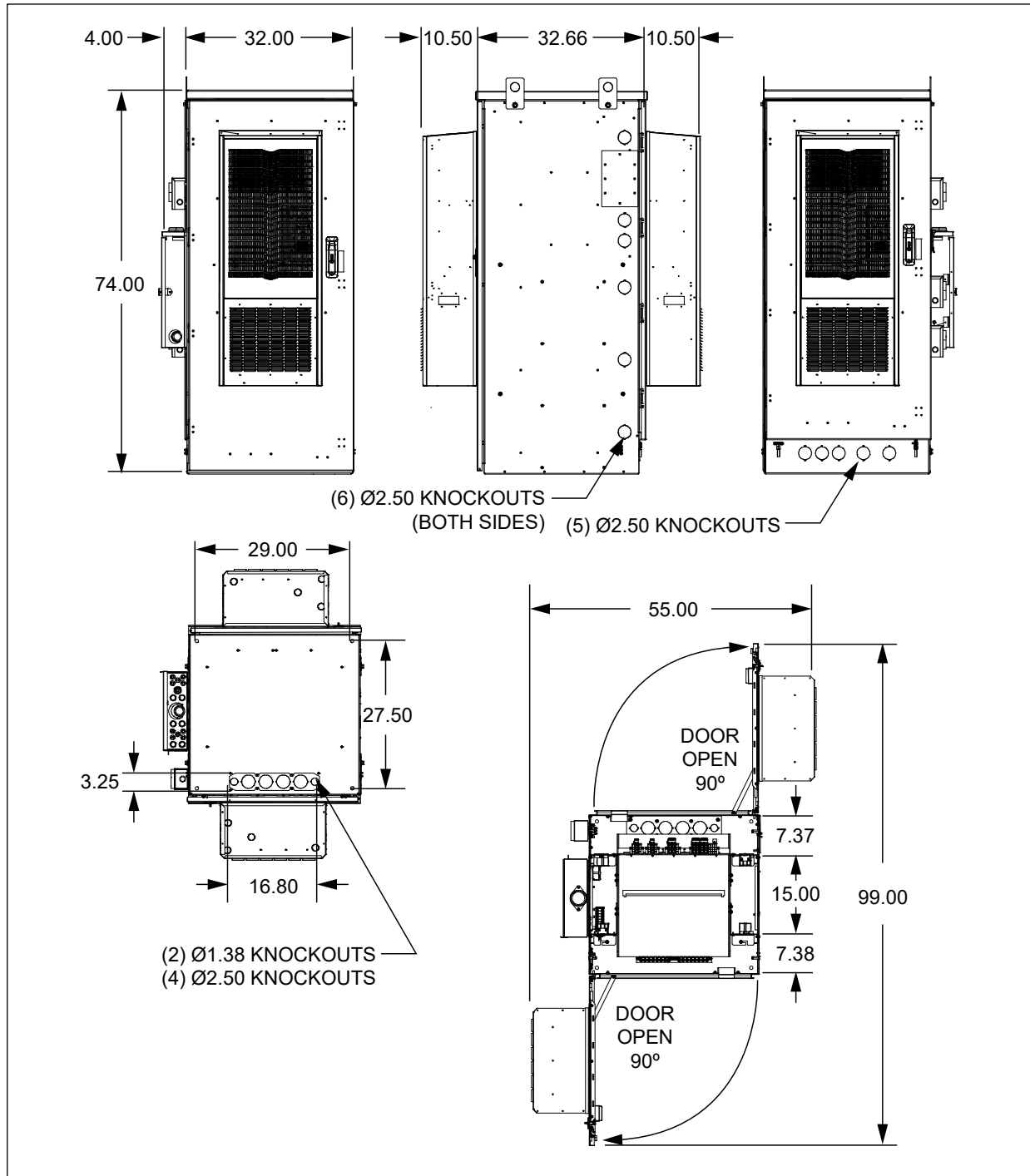
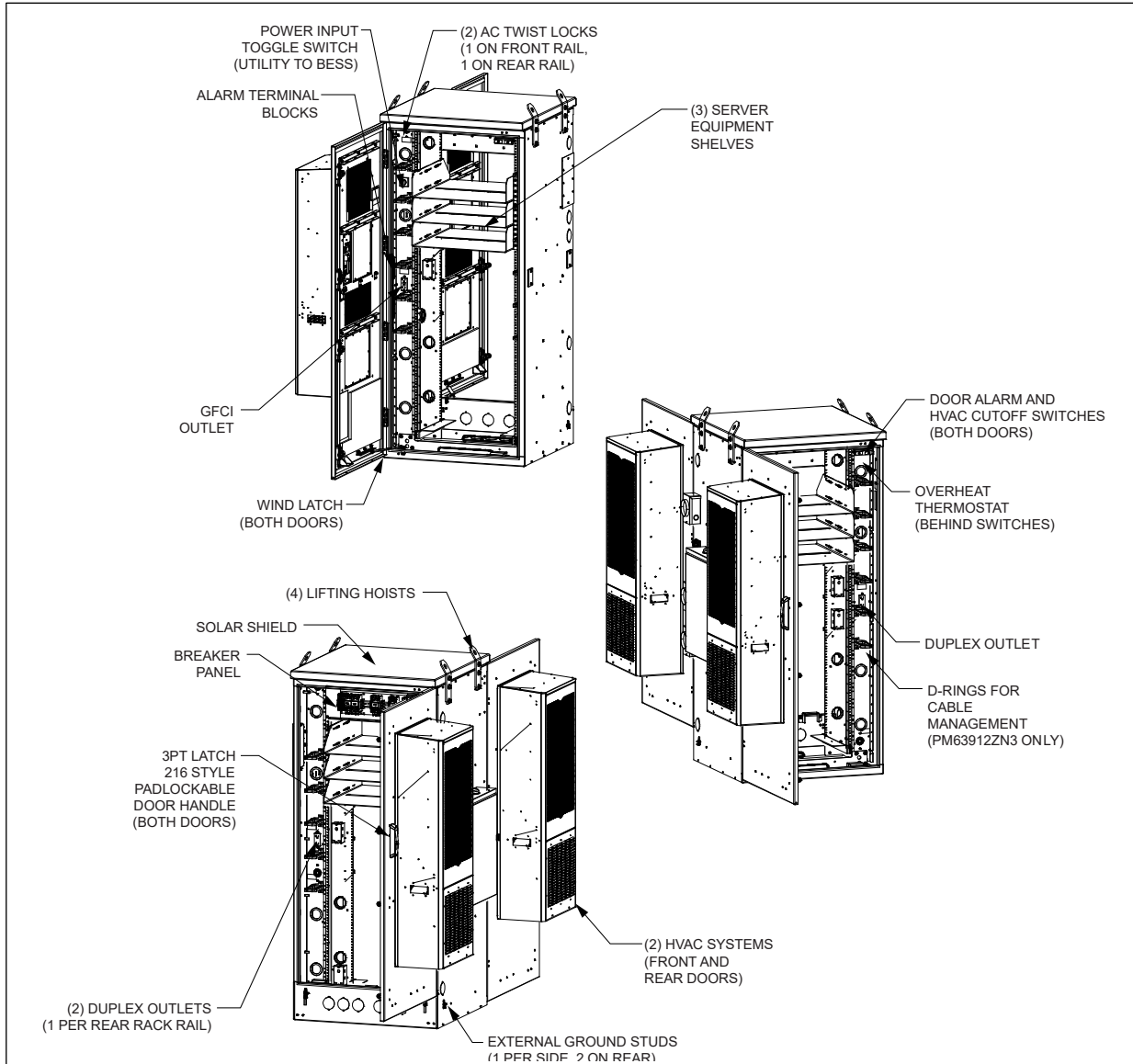
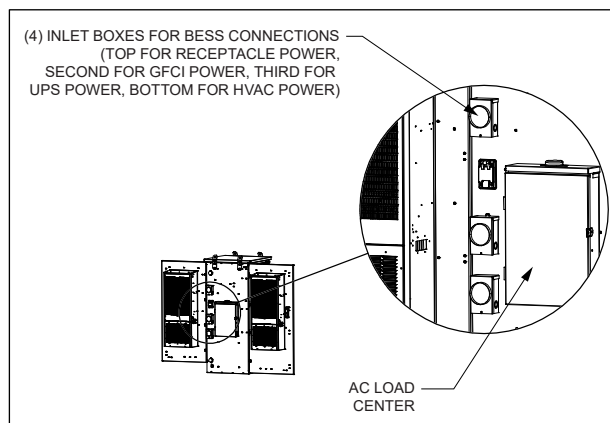


Figure 2 CUBE Dimensions (in inches)



**Figure 3 CUBE Components**  
(PM63912ZN3 shown. Rear door of PM63912ZN2 swings in the opposite direction)



**Figure 4 Left Side 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 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.

Some models have vertical (straight) lifting hoists, while others have angled lifting hoists. The lifting procedures are slightly different for each style of hoist.

	<b>WARNING</b>	<b>Prior to lifting, remove the lifting hoists that hold the mounting gasket in place. Set aside the gasket, and then replace the hoists. Failure to do so can result in a failure of the lifting bracket assembly.</b>
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#### 3.5.1. Required Equipment

- One derrick (crane) capable of lifting the CUBE
- Spreader bars (for models with straight lifting hoists)
- 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 5 (for straight hoists) or Figure 6 (for angled hoists).

#### 3.5.2. Warnings and Specific Safety Precautions

	<b>WARNING</b>	<b>Improper hoisting equipment and unsafe lifting procedures can result in serious injury or death</b>
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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.

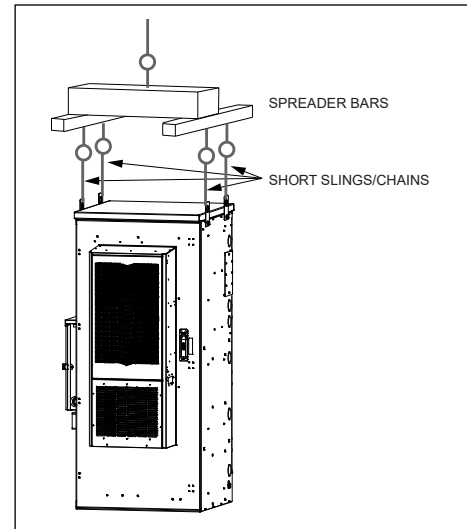
### 3.6. Mounting the CUBE

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 80-005300-A. Ensure that the unit is level.

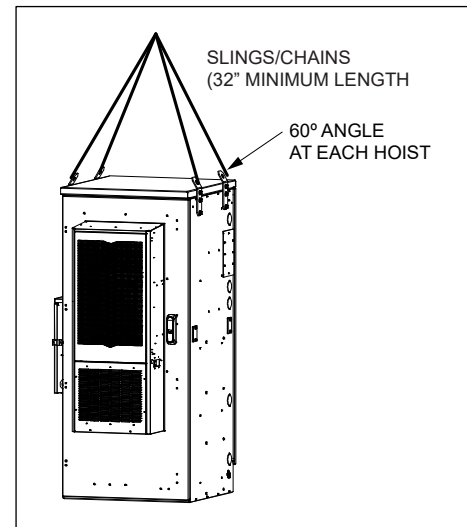
#### 3.6.1. Torque Requirements

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 5**  
Lifting the CUBE, Straight Hoists

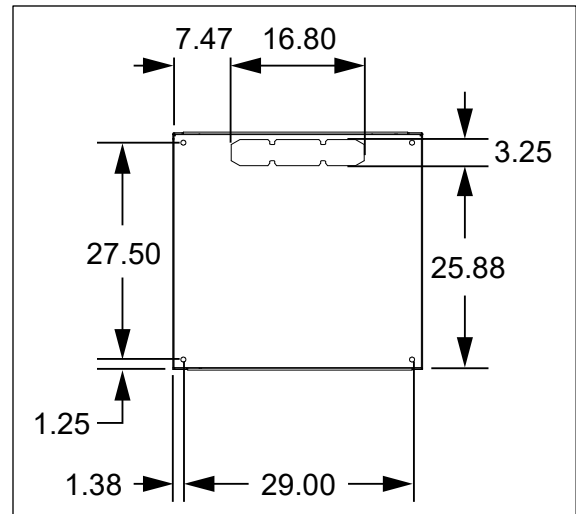


**Figure 6**  
Lifting the CUBE, Angled Hoists

**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 7 shows the required conduit openings and mounting hole dimensions for entering/mounting the bottom of the CUBE. Use these dimensions when designing the pad.

	<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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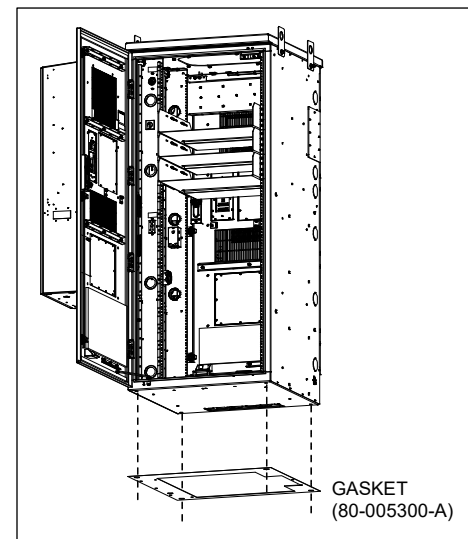


**Figure 7**  
**Mounting Hole Dimensions (in inches),**  
**Viewed from Top of CUBE**

**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 8.
4. Open the cabinet door 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. Close the door.



**Figure 8**      **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.

	<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. Basic electrical diagrams are shown in Figures 9 and 10.

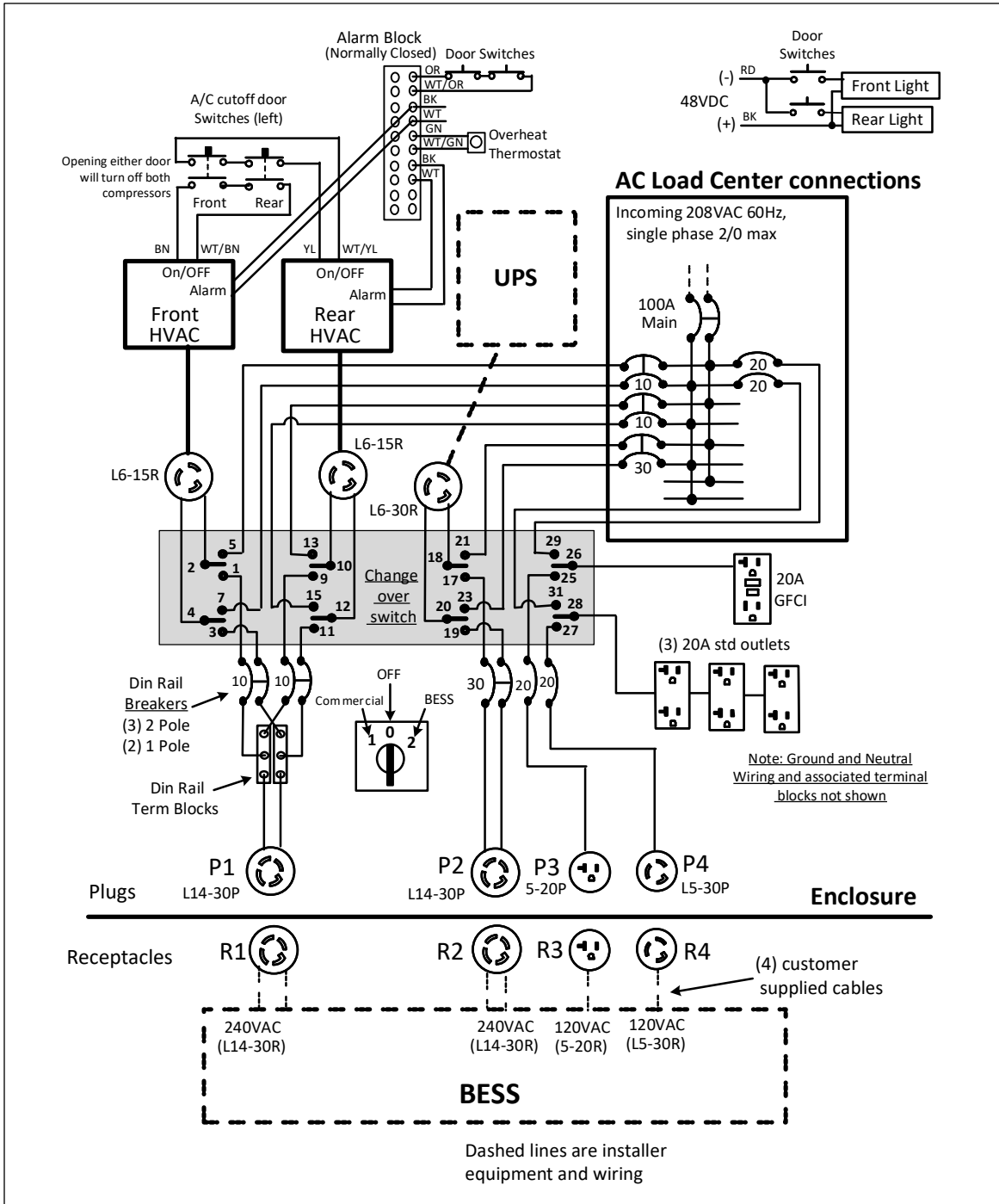


Figure 9 PM63912ZN2 Electrical Diagram

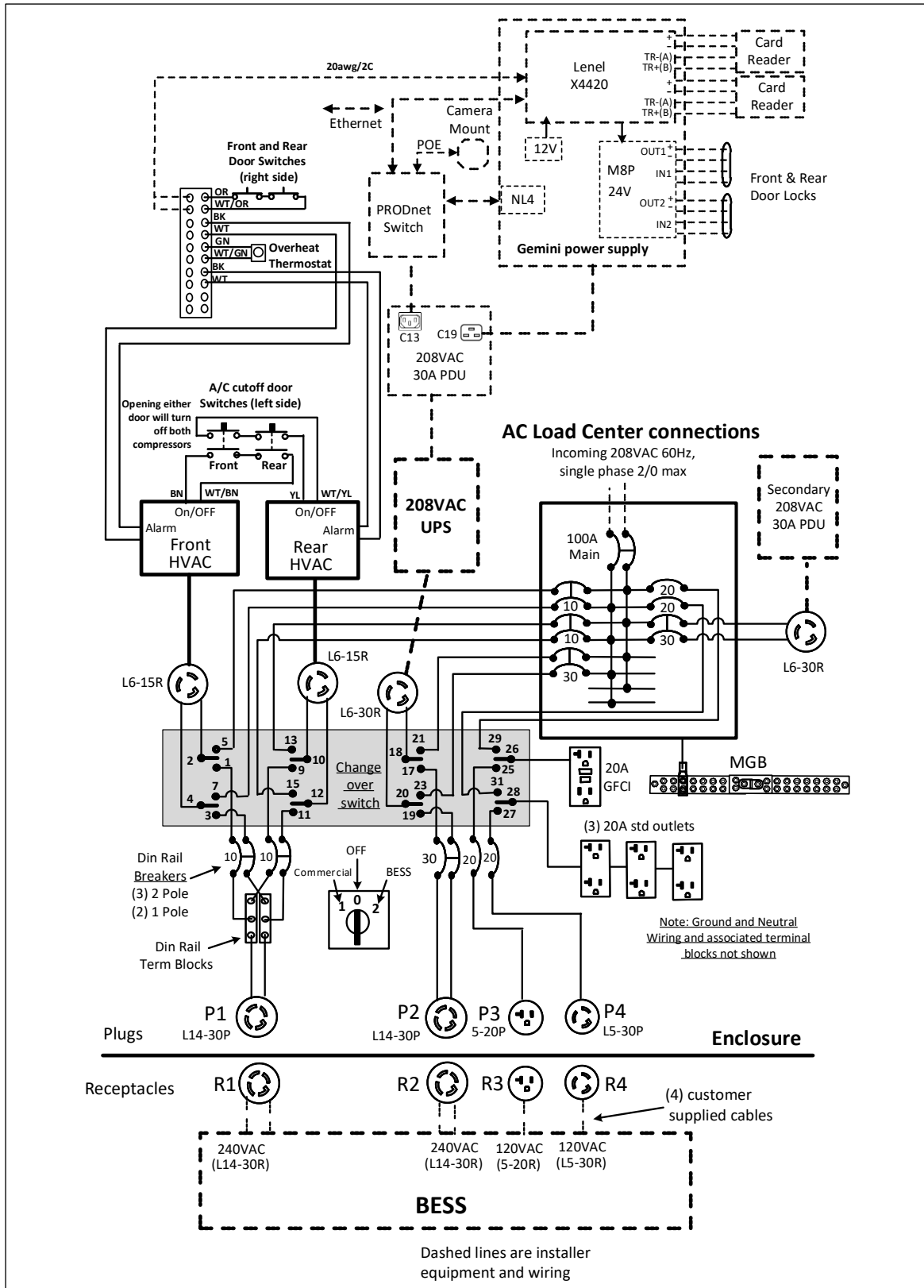


Figure 10 PM63912ZN3 Electrical Diagram

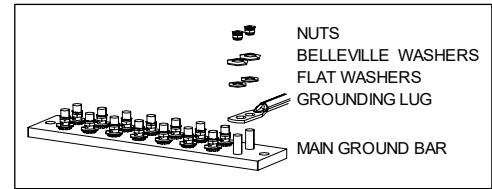


### 3.8.1. Ground Connection

Use the two 2x8 position ground bars provided in the equipment compartment for all grounding of internal equipment. Stack hardware as shown in Figure 11. External ground lugs are available on the sides and rear for connecting a site ground wire.

### 3.8.2. AC Voltage Connection

	<b>WARNING</b>	<b>Before connecting the CUBE to the utility, ensure that all DIN rail breakers are off and any temporary AC power source is fully disconnected.</b>
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**Figure 11**  
**Ground Bar Hardware Stack**

The CUBE can be powered from either a 208/240V at 60Hz utility connection or a battery energy storage system (BESS). A rotary toggle switch is used to switch between the two power sources and is shown in the upper left of Figure 3.

The utility power connects to the 100A main circuit breaker in the 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.

For BESS power, connect the four plugs to the inlet receptacle boxes on the left side of the CUBE as shown in the electrical diagram. See Figure 3 for inlet box locations. When disconnecting the BESS, remove the cables from the CUBE completely.

	<b>WARNING</b>	<p><b>When connecting to the BESS, first move the rotary toggle switch to the OFF position. Then connect the BESS cables to the inlet boxes, then move the toggle switch to the BESS position. Turn off the main breaker in the load center.</b></p> <p><b>When returning to utility power, first move the rotary toggle switch to the OFF position. Turn off DIN rail breakers and disconnect the BESS cables, then move the toggle switch to the COMMERCIAL position. Turn on the main breaker.</b></p>
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### 3.8.3. HVAC Operation

The two 12000BTU AC powered HVAC compressors and fans are PID (proportional integral derivative) controlled. The front 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 rear compressor turns on at 38°C and turns off at 33°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 cutoff switches that shut off the HVAC compressors when a door is opened to minimize condensation buildup on the coils.

The maximum airflow amount supplied to the equipment by the HVAC is 500CFM. For further information, refer to the HVAC documentation that ships with the CUBE

<i>-NOTE-</i>	
<i>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.</i>	
<i>Avoid placing items in front of the HVAC's return and supply vents. Maintain a minimum of 2" clearance to enable proper air flow.</i>	

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

**3.8.4. 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.*

**3.8.5. Alarm Block Connections**

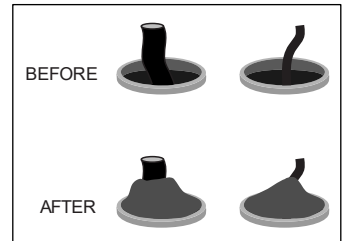
A pair of 10-position, labeled alarm blocks monitor components in the equipment compartment. See the electrical diagram for information about alarm connections. All connections are normally closed and will open on alarm.

**3.8.6. Fiber and Copper Entry**

The CUBE has multiple Ø2.50” knockouts on both sides and on the bottom that accommodate Ø2.00” conduit fittings. A Roxtec cable entry port on the left side accommodates nine smaller cables. See Figures 2 and 3 for cable entry 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 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 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](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 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](mailto:mktserv@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
- 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

<b>Physical</b>	
Dimensions	74"Hx32"Wx32"D
Weight	PM63912ZN2: Approx. 585 lbs. as shipped PM63912ZN3: Approx. 585 lbs. as shipped
19" Equipment Rack Space and Hole Spacing	68.25" (39RU) rack spacing with tapped EIA #12-24 mounting holes
Maximum Supported Weight	Rack Rails: 429 lbs.
Materials	0.125" aluminum
Color	Off-white
<b>Electrical</b>	
AC Load Center	Square D QO116L125PGRB
Bonding and Grounding	(2) 2x8 position ground bars inside cabinet, external grounds on sides and rear
Cable Entry	See Figure 2
<b>Thermal</b>	
HVAC System	(2) 230VAC, Vikinor VAK-3000-AC
Cooling Capacity	3500W (12k BTU)
<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	80-005300-A
Shim Kit for Leveling	97-000010-0
Lift-Up Handle	39-000335-0
Door Rod Latch	39-000336-0
4-Wire Door Alarm Switch	17-400329-0
HVAC Cutoff Switch	17-400328-0
GFCI Outlet	20A, 04-100186-0
Duplex Outlet	20A, 04-100416-0
Overheat Thermostat	99-004548-0

**Table 1 CUBE Specifications**