



XTE 601E Series Equipment Enclosures

Description and Installation Manual

Specification Number: F2019015, F2019016

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

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Admonishments Used in this Document



DANGER! Warns of a hazard the reader *will* be exposed to that will *likely* result in death or serious injury if not avoided. (ANSI, OSHA)



WARNING! Warns of a potential hazard the reader *may* be exposed to that *could* result in death or serious injury if not avoided. This admonition is not used for situations that pose a risk only to equipment, software, data, or service. (ANSI)



CAUTION! Warns of a potential hazard the reader *may* be exposed to that *could* result in minor or moderate injury if not avoided. (ANSI, OSHA) This admonition is not used for situations that pose a risk only to equipment, data, or service, even if such use appears to be permitted in some of the applicable standards. (OSHA)



ALERT! Alerts the reader to an action that *must be avoided* in order to protect equipment, software, data, or service. (ISO)



ALERT! Alerts the reader to an action that *must be performed* in order to prevent equipment damage, software corruption, data loss, or service interruption. (ISO)



FIRE SAFETY! Informs the reader of fire safety information, reminders, precautions, or policies, or of the locations of fire-fighting and fire-safety equipment. (ISO)



SAFETY! Informs the reader of general safety information, reminders, precautions, or policies not related to a particular source of hazard or to fire safety. (ISO, ANSI, OSHA)

Important Safety Instructions

Safety Admonishments Definitions

Definitions of the safety admonishments used in this document are listed under “Admonishments Used in this Document” on page vi.

Safety and Regulatory Statements

Refer to Section 4154 (provided with your customer documentation) for Safety and Regulatory Statements.

Déclarations de Sécurité et de Réglementation

Reportez-vous à la Section 4154 (fourni avec les documents de votre client) pour les déclarations de sécurité et de réglementation.

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1 Purpose of this Document

This document provides description and installation instructions for the Vertiv™ XTE 601E Series 84" equipment enclosure wired for two (2) -48V strings of Ni-Cd batteries.

Procedures related to the provisioning, start-up, and acceptance of associated telecom equipment are not covered in this document.

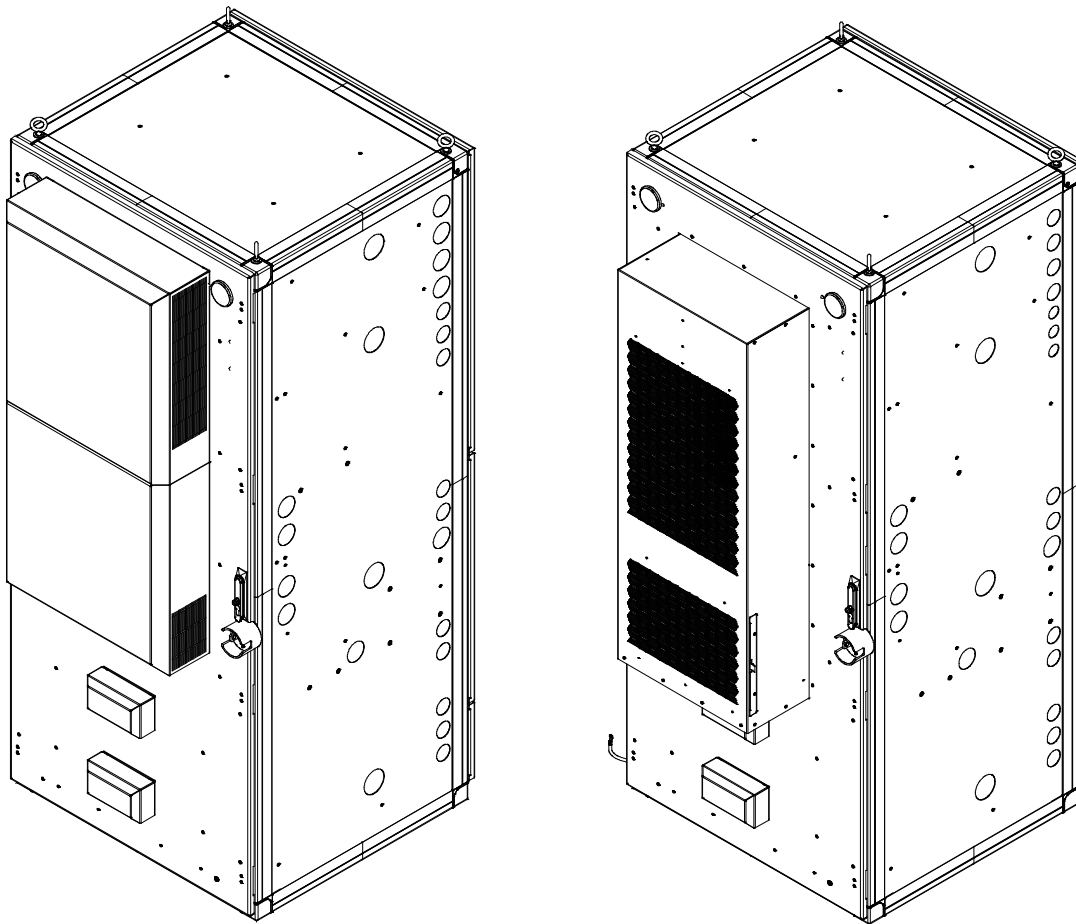
Documents that supplement the information in this document are referenced in "Sequence of Procedures" on page 17.

2 Product Description

2.1 General

The XTE 601E Series 84" equipment enclosures are designed to house DC power, network electronics and battery backup equipment in a single enclosure. See Figure 2.1 for overall views of the enclosure.

Figure 2.1 Overall Views of Enclosure



F2019015

F2019016

2.2 Part Numbers

Refer to Table 2.1 for applicable product part numbers.

Table 2.1 Enclosure Part Number and Description

Part Number	Description
F2019015	XTE 601E Series -48 VDC Equipment Enclosure, 84" H, 3500 W Heat Exchanger, Two (2) Battery Boxes each support 1-battery string, NiCd Only
F2019016	XTE 601E Series -48 VDC Equipment Enclosure, 84" H, 4kW DC Air Conditioner, Two (2) Battery Boxes each support 1-battery string, NiCd Only

2.3 Application

The XTE 601E Series 84" equipment enclosure is a full featured outdoor enclosure ideal for use in macro cell site and C-RAN applications. The XTE 601E Series 84" equipment enclosure...

- provides a stable, secure, and water-tight environment for a -48 VDC power system, RAN equipment, outside plant equipment, and batteries supporting wireless telecommunications applications.
- depends upon a proven structural system, integrated mechanical components, and a sealing system that withstands rain, dust, snow, and hurricane winds.
- provides climate control solutions to keep equipment operating within its optimum temperature range.
- can be pad or platform mounted.

The enclosure has a single large 44RU-tall compartment for installation of power, equipment and batteries.

- The primary equipment compartment may house a -48 VDC power system. Additional space is available for support equipment. The F2019015 provides a 3500 W heat exchanger to cool the compartment. The F2019016 provides a 4kW DC air conditioner to cool the compartment.
- Two (2) "battery boxes" are provided at the bottom of the primary equipment compartment (the top battery box may be removed in the field). Each box houses one (1) -48 VDC string of NiCd batteries.

2.4 Configured Equipment

Equipment from Vertiv and 3rd-party manufacturers may be refurbished and factory-installed in the XTE 601E 84" equipment enclosure. This may include equipment for DC power and distribution, AC power and backup (UPS), site management, RAN surge suppression, DC voltage up conversion, fiber connectivity, etc.

Please consult Vertiv for available options and/or to have new customer-specific equipment integrated.

2.5 Standards Compliance

The XTE 601E Series 84" equipment enclosure is designed to meet the following standards:

- Telcordia, GR-487-CORE, Generic Requirements for Electronic Equipment Cabinets, Issue 5, March 2016.
- UL Listed to UL 2416 (NWIN category) under Vertiv file no. E255047, NEMA type 3R rated.

2.6 Safety Listed AC Components

A typical XTE 601E Series 84" equipment enclosure includes the following listed or recognized components for United States:

- GFI AC Receptacle:
 - Legrand Pass & Seymour 1594-I / 1595-I - UL File E42190
 - Leviton 6599-I / 7599-I / 8599-I - UL File E48380

2.7 Commercial AC Service

AC power to be provided by customer via an upstream power source load center or power pedestal.

2.8 Enclosure Dimensions, Weights, and Physical Specifications

- Illustrations:
 - Figure 2.2 and Figure 2.3 provide enclosure dimensional illustrations.
 - Figure 2.4 provides an enclosure equipment mounting rails identification and locations illustration.
 - Figure 2.5 provides an enclosure base plate dimensional illustration.
 - Figure 2.6 illustrates the pad mounting rubber barrier.
 - Figure 2.7 illustrates the optional re-usable pad mounting template.
 - Figure 2.8 illustrates the optional pour-in-place pad mounting template.



NOTE! The rubberized barrier pad included with the enclosure or the optional re-usable pad mounting template may be used as a template for anchor hole locations in the pad form area when an optional pour-in-place pad mounting template is not used.

- Height: 84.07" (214 cm).
- Width: 36.02" (91 cm).
- Depth:
 - F2019015: 41.24" (105 cm).
 - F2019016: 43.07" (109 cm).
- Equipment and Battery Box Dimensions: Refer to Figure 2.4.
- Typical Weights:
 - F2019015:
 - Shipping weight: 1390 lbs (630.50 kg).
 - Lift weight: 1013 lbs (459.50 kg).
 - On pad weight: 1013 lbs (459.50 kg); not including batteries, power system, customer equipment, and OSP cables.
 - F2019016:
 - Shipping weight: 1390 lbs (630.50 kg).
 - Lift weight: 1033 lbs (468.60 kg).
 - On pad weight: 1033 lbs (468.60 kg); not including batteries, power system, customer equipment, and OSP cables.



NOTE! The enclosure is not to be lifted with batteries in place. All batteries are to be installed once the enclosure is secured to the pad. **BATTERIES CANNOT BE LIFTED WITH THE ENCLOSURE!**



NOTE! Typical battery weights...

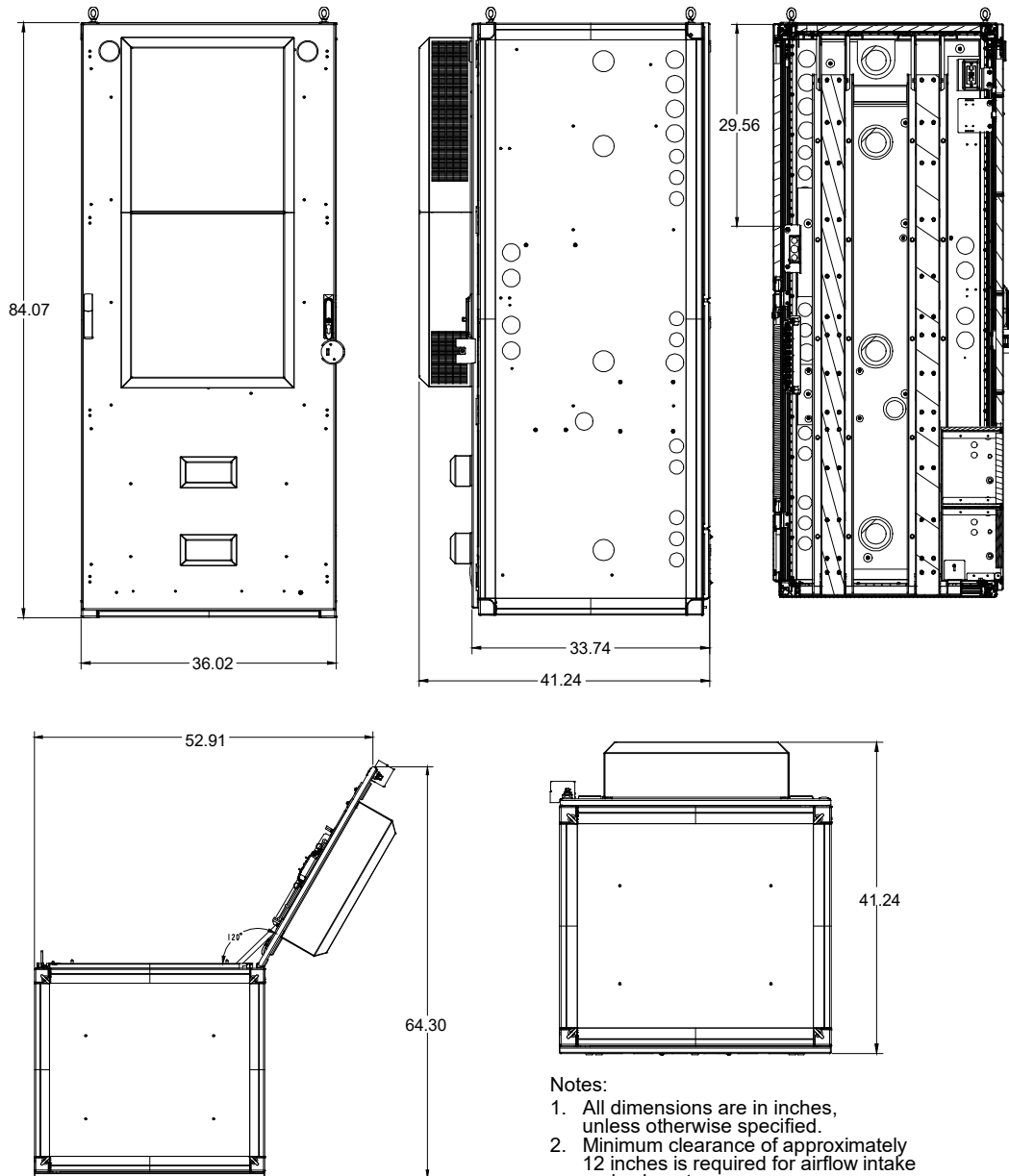
SAFT Tel.X+180, 180 Ah battery: 361 lbs (164kg) each -48V string.

- Color: cool-white.
- Finish: Finished in multistage dry powder polyester paint for maximum durability and performance against corrosion.
- Lifting: The enclosure has four lifting eyebolts on the top that allows it to be lifted and lowered into position.

2.8.1 Typical Pad-Mount Overhead View

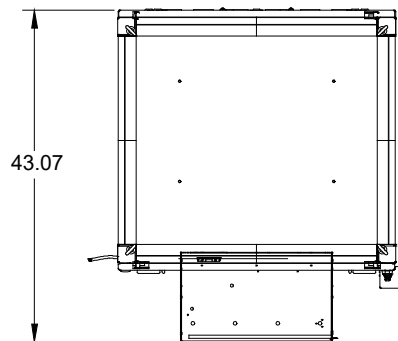
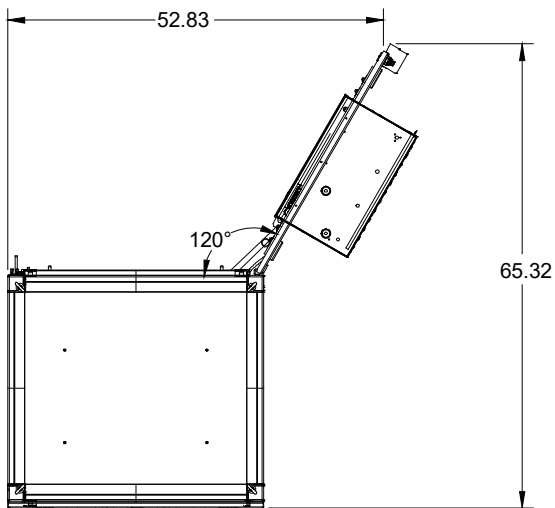
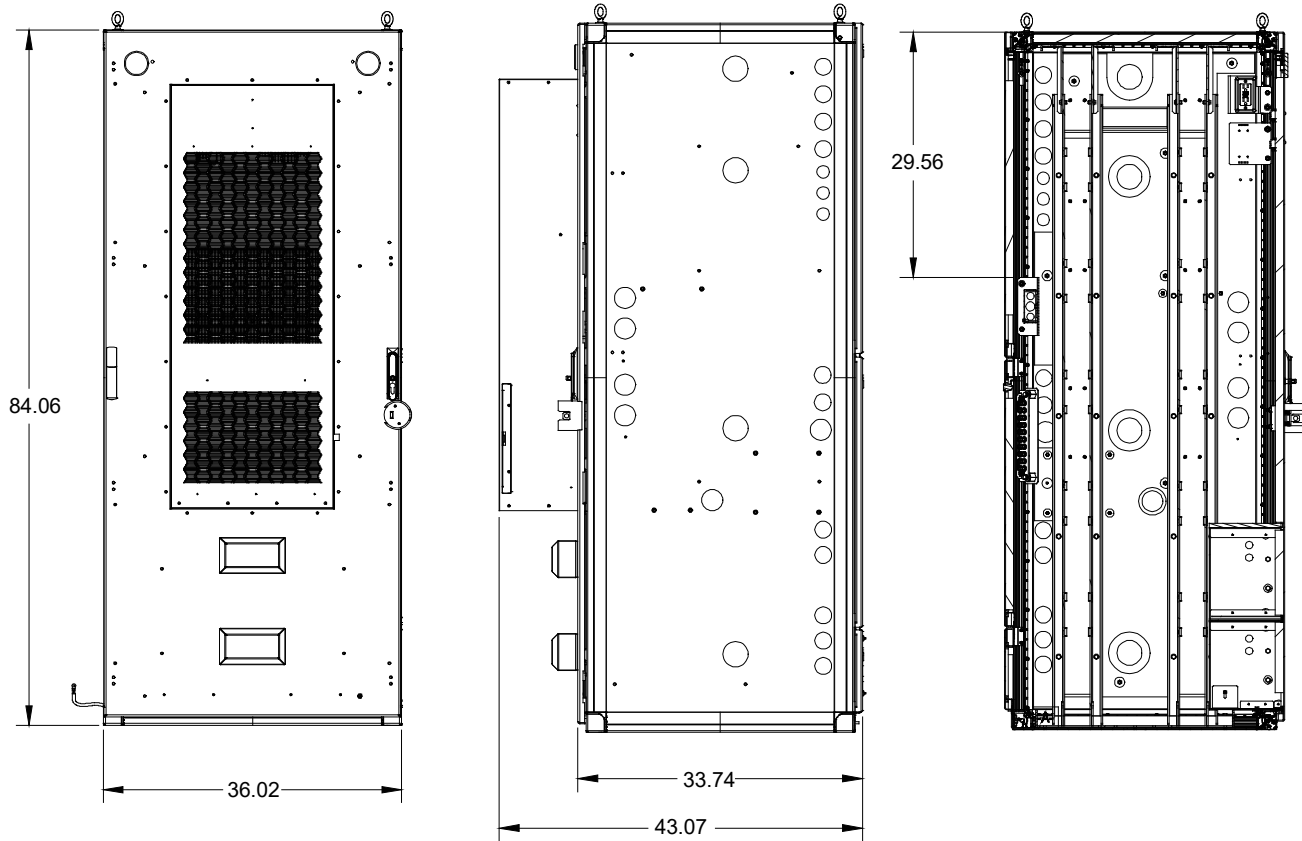
Figure 2.2 and Figure 2.3 provide overhead views with the door open. These views show the enclosure clearance requirements to freely open the door.

Figure 2.2 F2019015 Enclosure Dimensions



- Notes:
1. All dimensions are in inches, unless otherwise specified.
 2. Minimum clearance of approximately 12 inches is required for airflow intake and exhaust.

Figure 2.3 F2019016 Enclosure Dimensions



Notes:

1. All dimensions are in inches, unless otherwise specified.
2. Minimum clearance of approximately 12 inches is required for airflow intake and exhaust.

Figure 2.4 Equipment Mounting Rails Identification and Locations

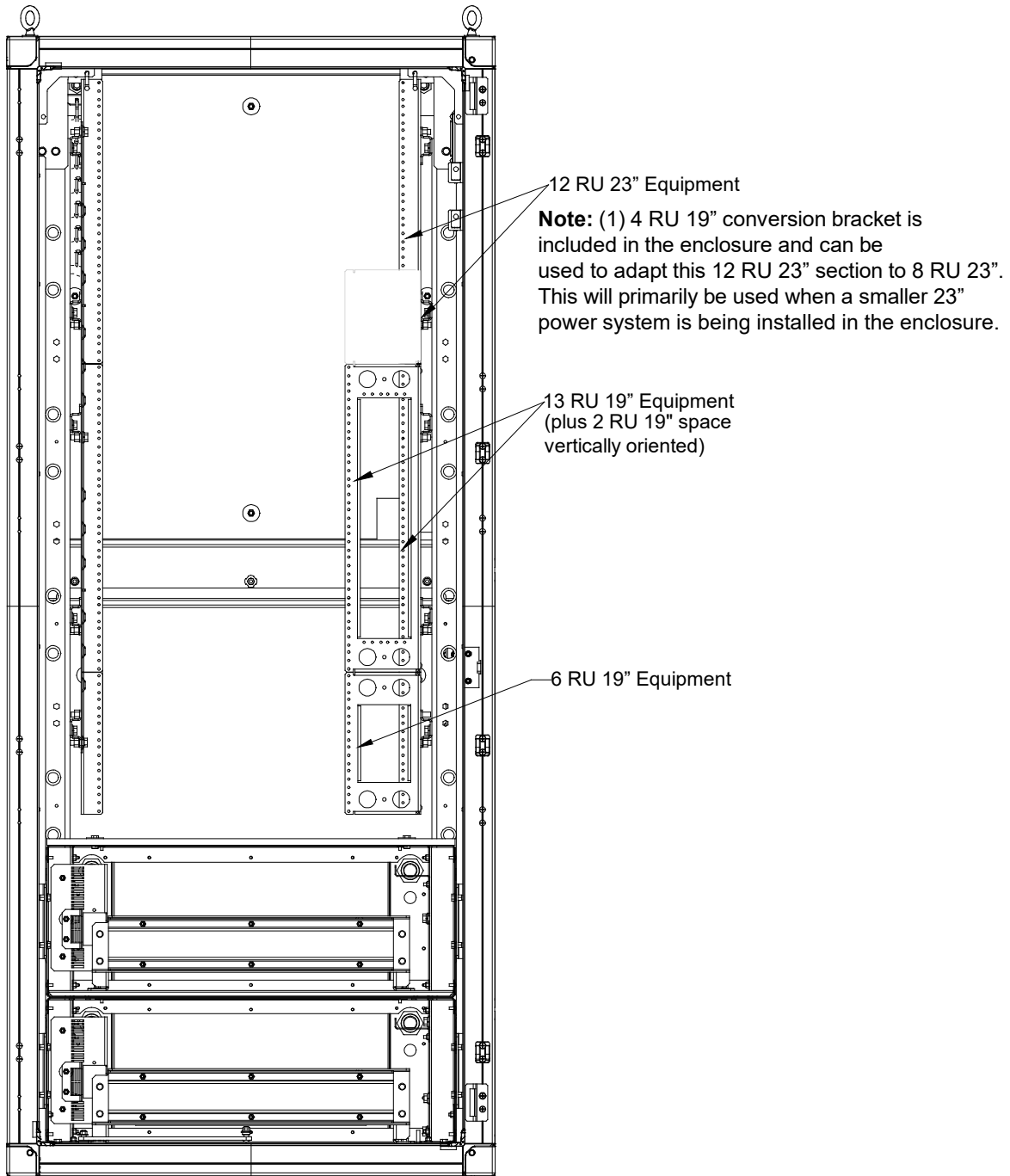
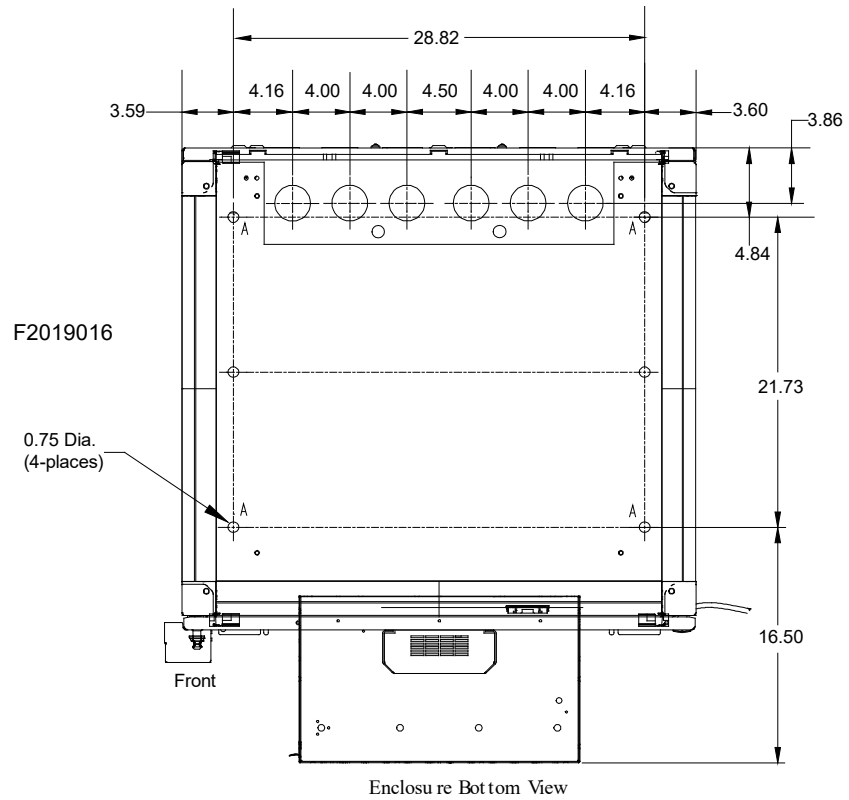
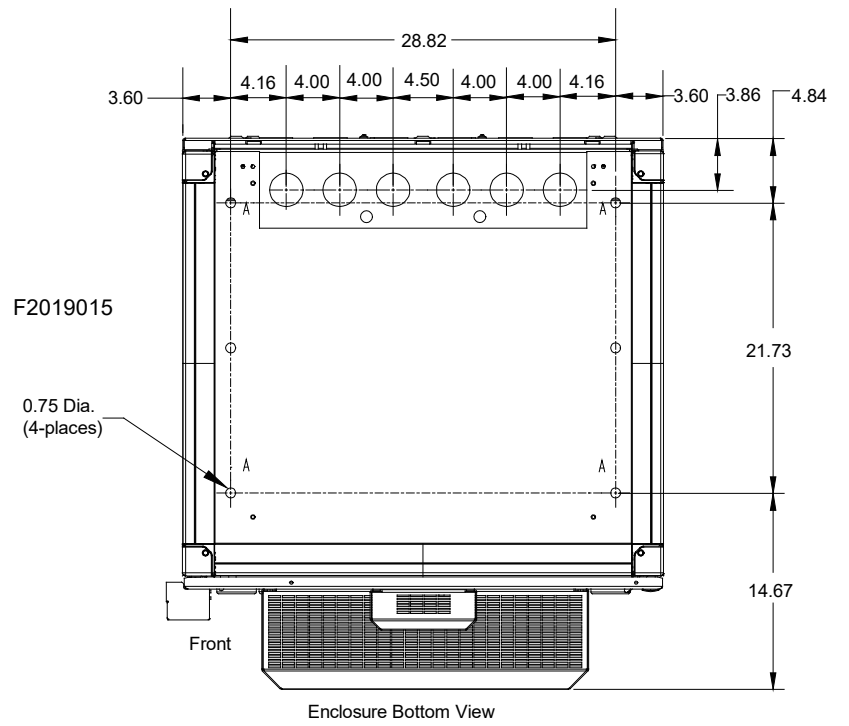
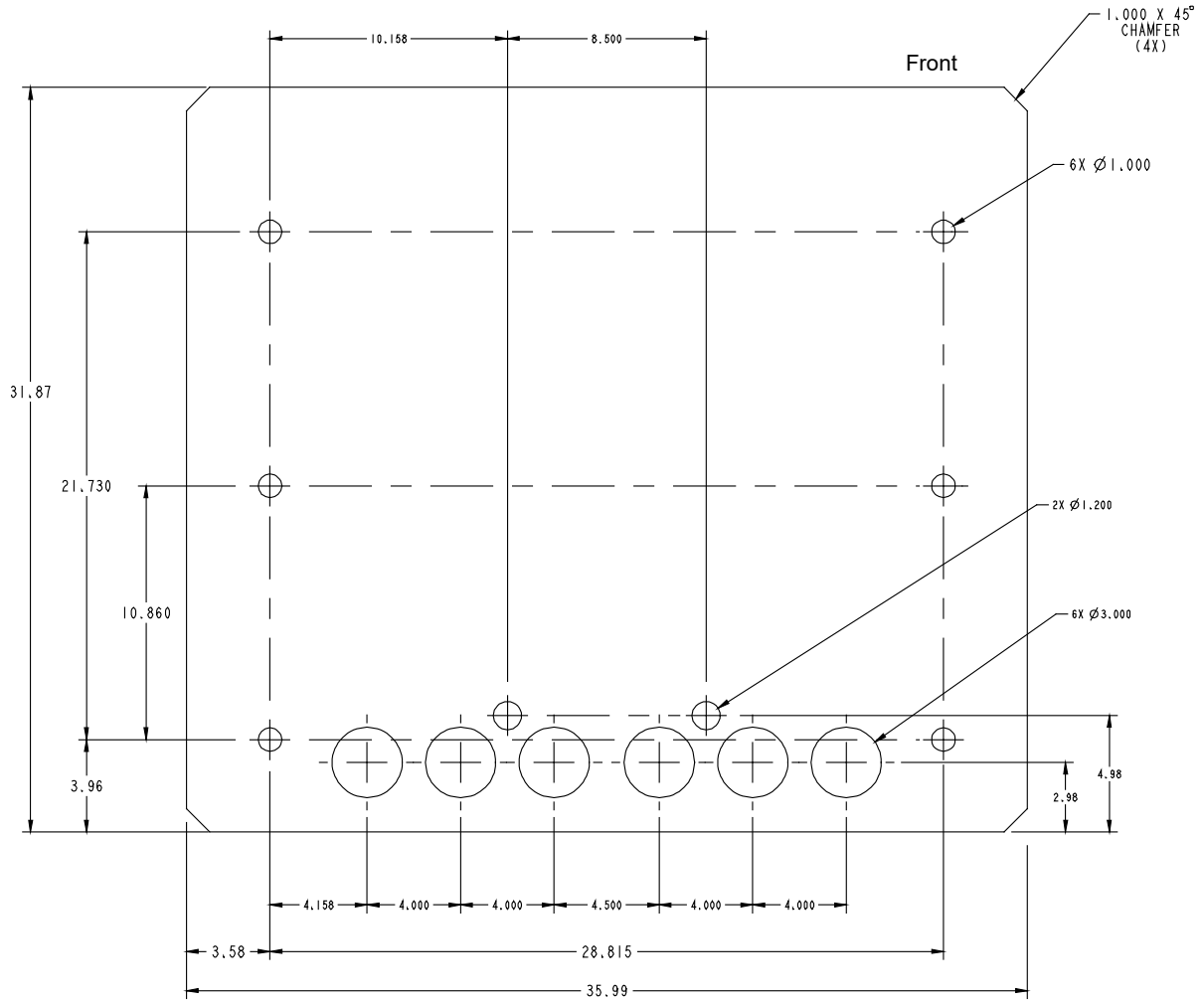


Figure 2.5 Enclosure Base Dimensions



- Note:
1. Dimensions are in inches.
 2. Only the four (4) locations denoted "A" are required to be used in mounting the enclosure.

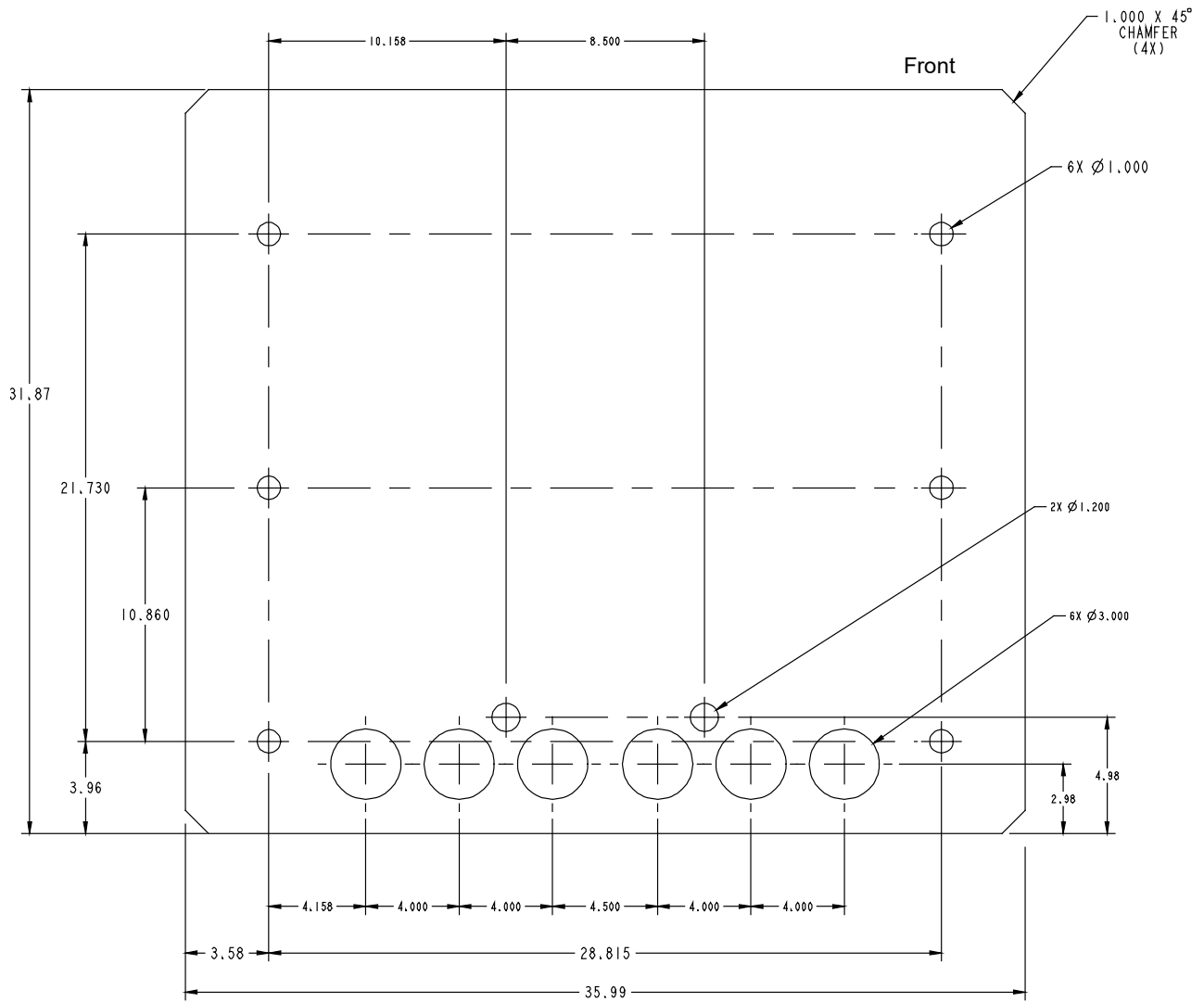
Figure 2.6 Pad Mounting Rubber Barrier Pad (P/N 145396)



Note:
Dimensions are in inches.

Enclosure Bottom View

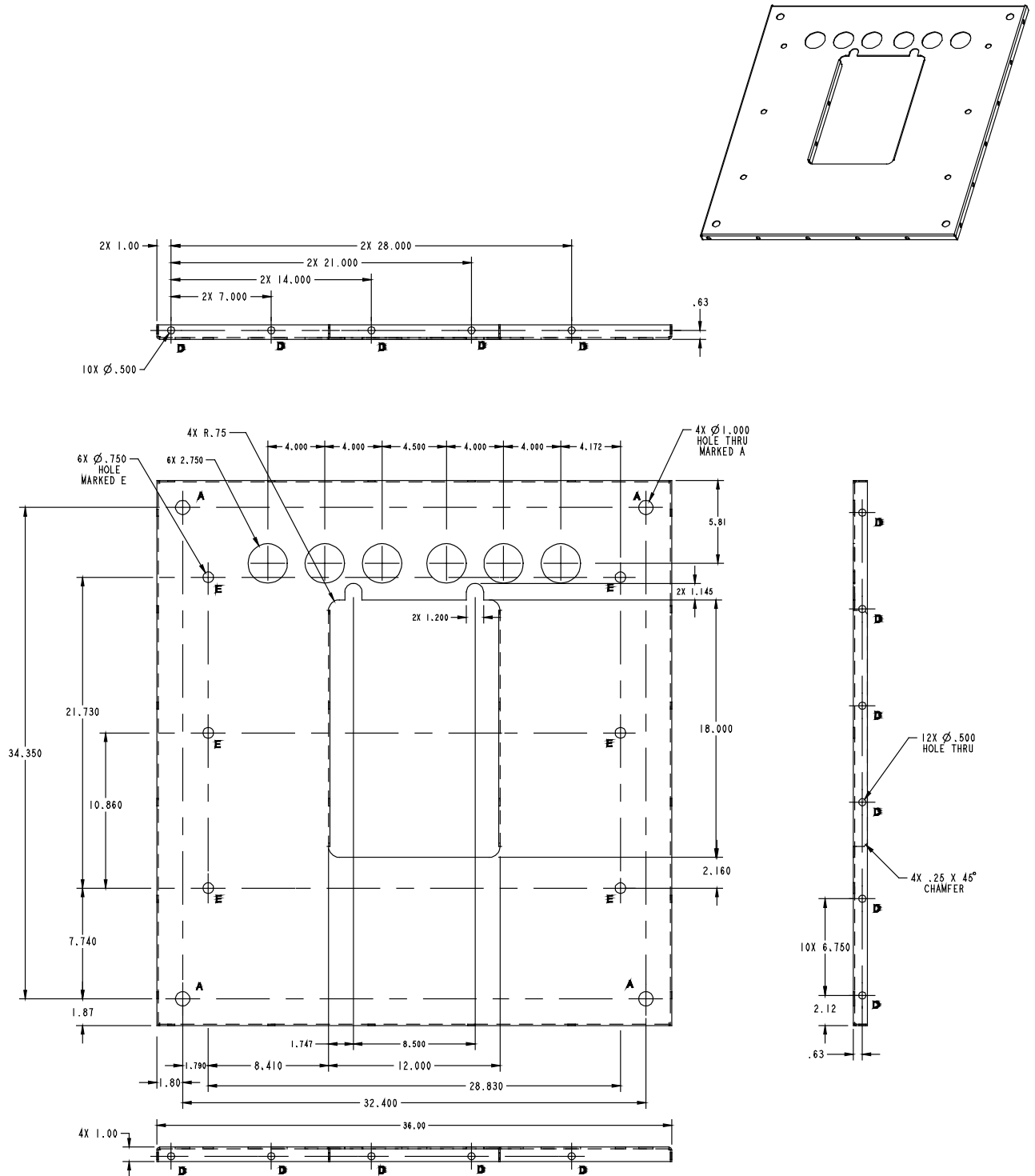
Figure 2.7 Optional Re-Usable Pad Mounting Drill Template (P/N F1010584 [145344])



Note:
Dimensions are in inches.

Enclosure Bottom View

Figure 2.8 Optional Pour-in-Place Mounting Template (P/N F1010585 [554917])



Notes:

1. Dimensions are in inches.
2. "E" size hole position for mounting enclosure to pad.
(Hilti Item # 00371808 Desc: HSL - 3 - B M 12/25)

2.9 Enclosure Features and Options

Perspective Views: Refer to Figure 2.9, Figure 2.10, and Figure 2.11 for enclosure perspective views with major features identified

Mounting Options: The enclosure is designed to be pad or platform mounted. It is to be lifted into place using the lifting eyebolts provided on the top of the enclosure.

Exterior Finish Specifications: The enclosure is finished in multistage dry powder polyester paint (Cool White) for maximum durability and performance against corrosion.

Front Door: The enclosure has a front environmentally sealed door that provides access to the primary equipment compartment and battery boxes. The front door on the F2019015 includes an active heat exchanger (with fans). The front door on the F2019016 includes a DC air conditioner.

- The front door is equipped with mounting brackets for an electronic puck-lock. The puck-lock is purchased separately.
- The front door securing mechanism is a swing handle with multi-point rod-latch mechanism. The swing handle is equipped with a padlock hasp that supports a lock with an arm diameter less than 3/8".
- The front door has an intrusion alarm switch, as well as a self-locking wind latch that secures the door open during installation or maintenance activities. Door wind latch secures at 90° and 120°. The front door has a second intrusion switch which activates the DC light upon door entry.
- Front door and rear access panels have EPDM rubber environmental seals.
- Front door is field hinge side reversible.

Rear Access Panels: Three (3) access panels are located on the rear of the enclosure. Each access panel contains 1/4 turn locks and lift off to be removed. Panels are interlocked and upper panels must be removed before removing lower panels. Top rear access panel cannot be removed until levers inside the primary equipment compartment are automatically disengaged by opening the front door.

Equipment Frame: Constructed of 7 gauge steel (0.187"), welded and painted.

- Different configurations of 19"/23" equipment mounting rails can be configured within the equipment frame. The mounting rails are adjustable front-to-back.
- Single -48V string battery boxes can also be added into the bottom of the equipment frame.
- Equipment frame is electrically-bonded to enclosure shell through mechanical means.
- Refer to Figure 2.4 for an illustration showing the provided 19" and 23" equipment mounting racks.

Primary Equipment Compartment: The primary equipment compartment may house:

- Customer equipment.
- A DC power system and DC distribution.
- Up to two (2) battery boxes.
- F2019015: The Environmental Control Unit (ECU) managing cooling/heating and F2019016: Hi-Temperature Alarm T-Stat.
- A principal ground bar.
- A 120 VAC, 15 A convenience outlet.
- Cable entry for customer cables.

- Door-activated convenience light.
- Intrusion and light switches.
- Alarm block.

Grounding: The 10-position enclosure principal ground bar (alias Master Ground Bar [MGB]) is located at the rear of the primary equipment compartment.

- The MGB ground bar is mounted on isolators.
- The default ground lug geometry is two hole with 1/4" post and 5/8" spacing.

AC Power: See "Commercial AC Service" on page 3.

Convenience Outlet: A GFCI (Ground Fault Circuit Interrupter) protected convenience outlet is provided within the primary equipment compartment.

DC Power: The enclosure may include an integrated DC power system. For additional information, please refer to "DC Power" on page 48.

Battery Box: The battery box houses one (1) -48V string of batteries. Up to two (2) battery boxes may be installed within the equipment frame.

- An optional AC-powered battery heater kit is available.
- Each battery box contains a 250 A battery string disconnect circuit breaker for hi-rate battery discharging.
- For more information, including supported batteries and compartment size, refer to "Batteries" on page 57.

Cable Entry/Exit: Cable entry/exit can be made at the bottom rear of the enclosure (behind the lower battery box, if so equipped). Cable entry can also be made through the floor of the enclosure, or through the sides of the enclosure, through duplicate sets of conduit knockouts. Either entry supports up to 2" trade-size (2.5" actual) conduits. Refer also to Figure 9.1 on page 46 for AC Input Knockout Locations and dimensions of conduits on the side of the cabinet.

Alarms: An "alarm interconnect block" is provided to connect enclosure alarms into customer alarm circuits.

Climate Control (F2019015)

Heat Exchanger (HX): The F2019015 enclosure primary equipment compartment has a front door mounted 3500 W heat exchanger managed by an electronic Environmental Control Unit (ECU). The heat exchanger is designed with two inner loop and two outer loop fans (each having 225 mm diameter impellers), allowing for a single fan to fail, with minimal loss of performance. Thus, a fan failure is not a catastrophic event leading to an immediate shutdown. The heat exchanger properly cools electronics without the mixing of outside air, thus maintaining the enclosure seal from the outside environment. The heat exchanger requires no refrigerant, features low-energy consumption fans, and will continue to function when AC line power is lost because they are DC powered.

Environmental Control Unit (ECU): The ECU in the F2019015 is an intelligent device monitoring internal conditions and adjusting the HX fans accordingly to the needs. The primary equipment compartment HX utilizes thermistor controls and has optimized control logic software via the ECU. As such, the enclosure properly cools/heats the system, and provides a quiet enclosure for the neighborhood. The ECU also provides alarms for:

- ECU Malfunction.
- Fan Malfunction (HX).
- Thermal Sensor (Thermistor) Malfunction

- Over and Under Temperature Conditions.
- Primary Equipment Compartment Intrusion.
- Fan Control Logic: The ECU controls provide independent control of the internal and external HX fans, adapting to the environment and equipment loads, and responding to faults, intrusions, etc. This complex control enables the enclosure to achieve the low acoustic profile and maintain the equipment under proper operating conditions in accordance with the requirements of the carrier.



NOTE! The fan logic is built around equipment designed for operation at 65 °C. Equipment rated to lower than a 65 °C upper limit may still be deployed within the enclosure with careful component placement. Alternatively, the fan logic may be changed -- consult Vertiv Engineering for more details.

Climate Control (F2019016)

Air Conditioner: The F2019016 enclosure's primary equipment compartment has a front door mounted 4kW DC air conditioner. The DC air conditioner has a 900 W heater built-in. It has default control set points for heating and cooling (cool/heat settings are customer requirements). It has a remote temperature sensor placed within the enclosure. It has an internal fan that is always "on", circulating air. It also displays sensed temperature on a front LED display.

Acoustic Performance: The enclosure employs passive and active features, such as adaptive fan control and acoustic dampening, to manage and minimize acoustic noise.

Mounting Accessories: See Table 18.1 for template ordering information.

- A rubber barrier pad is included to prevent corrosion between the concrete pad and the enclosure mounting surfaces, P/N 145396. See Figure 2.6.
- An optional re-usable pad mounting drill template kit is available for marking hole locations to drill holes and set anchors, P/N F1010584 (145344). See Figure 2.7.
- An optional pour-in-place pad template kit is available, P/N F1010585 (554917). See Figure 2.8.
- Optional 6" pad-mount plinth (F1010948) is available to space enclosures off the ground in areas with flooding or drifting snow.

Figure 2.9 Front and Rear Perspective Views with Door Open and Major Features Identified

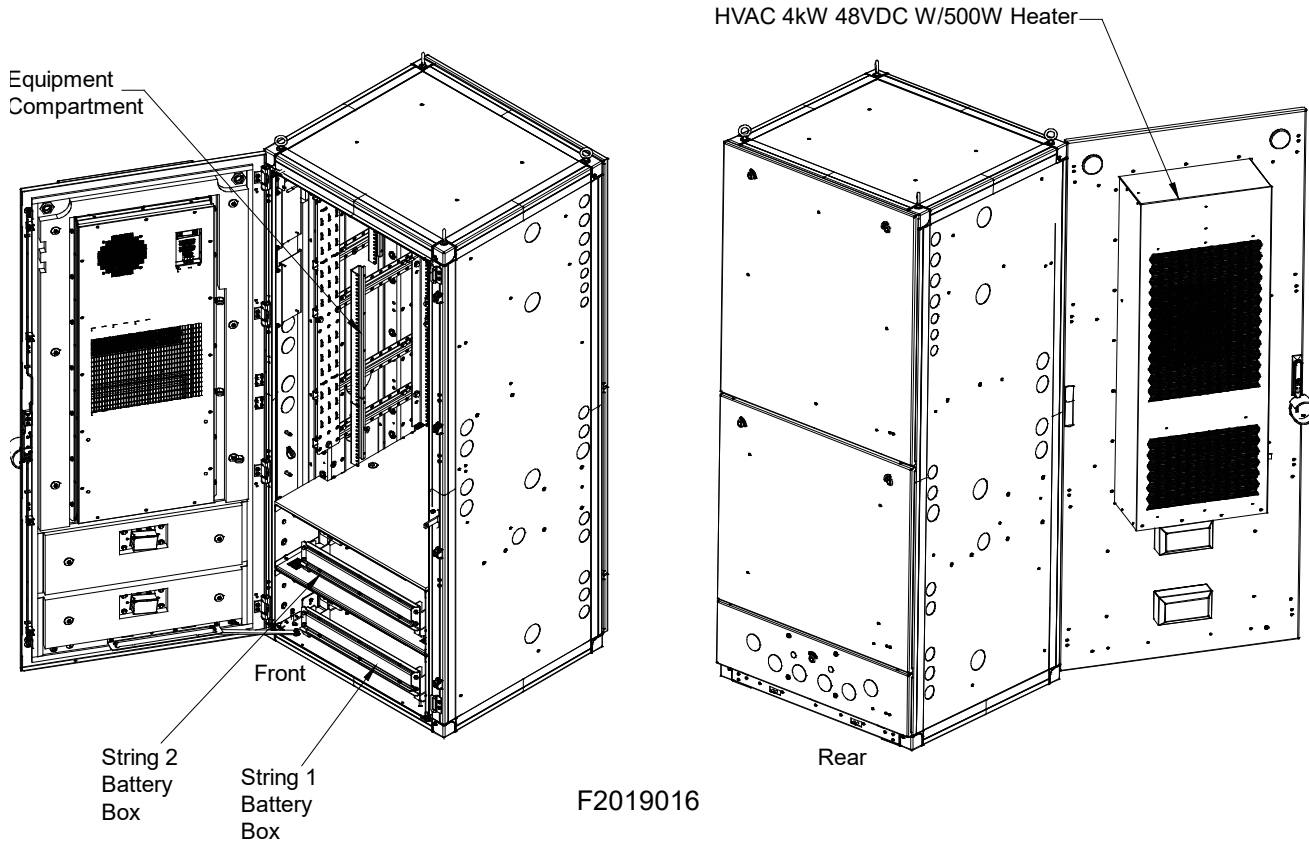
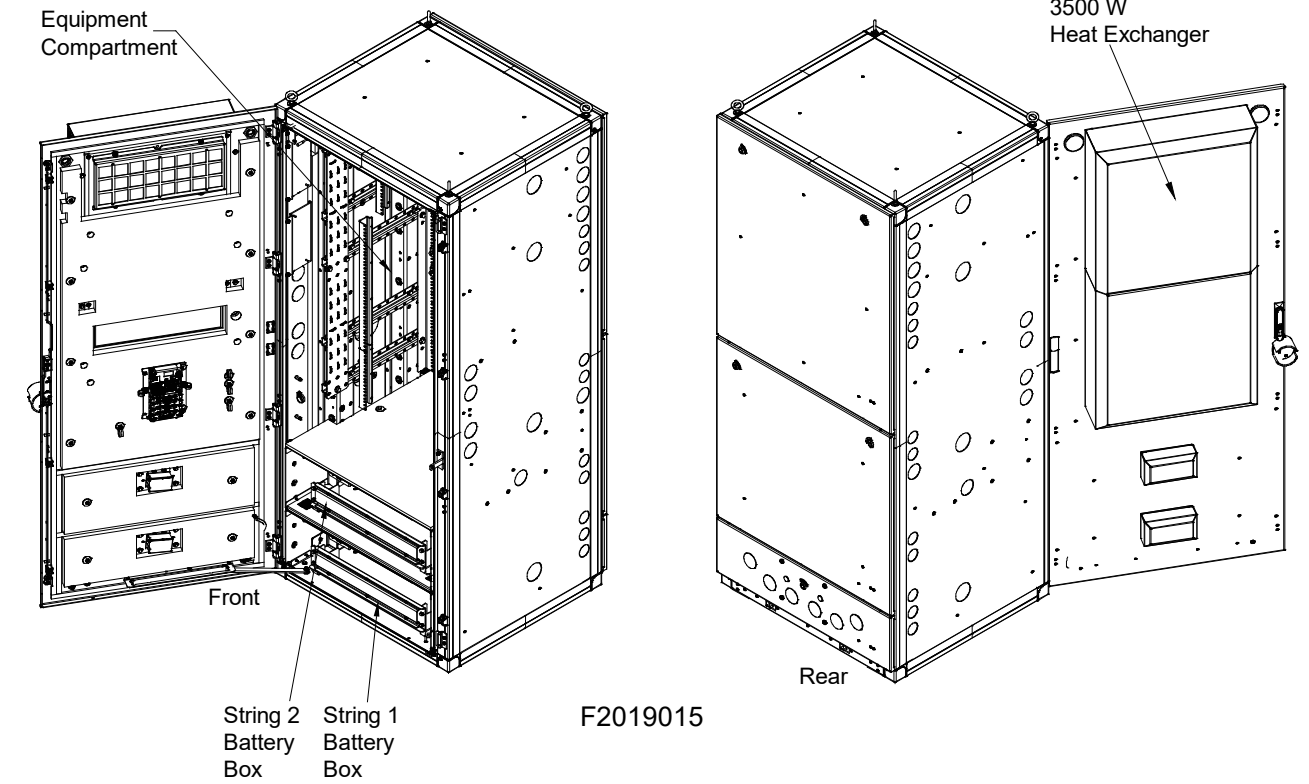


Figure 2.10 F2019015 Perspective Views of Enclosure with Features

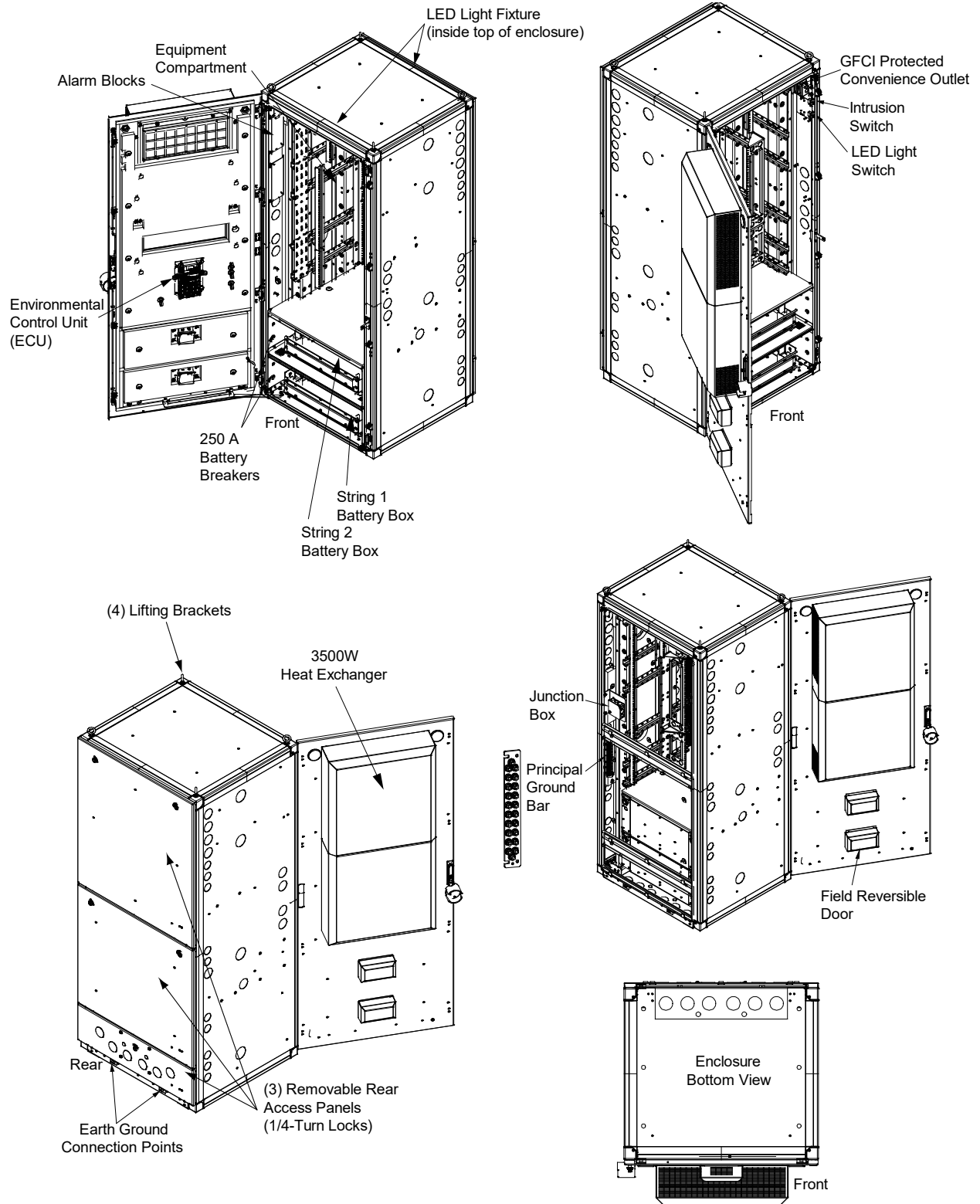
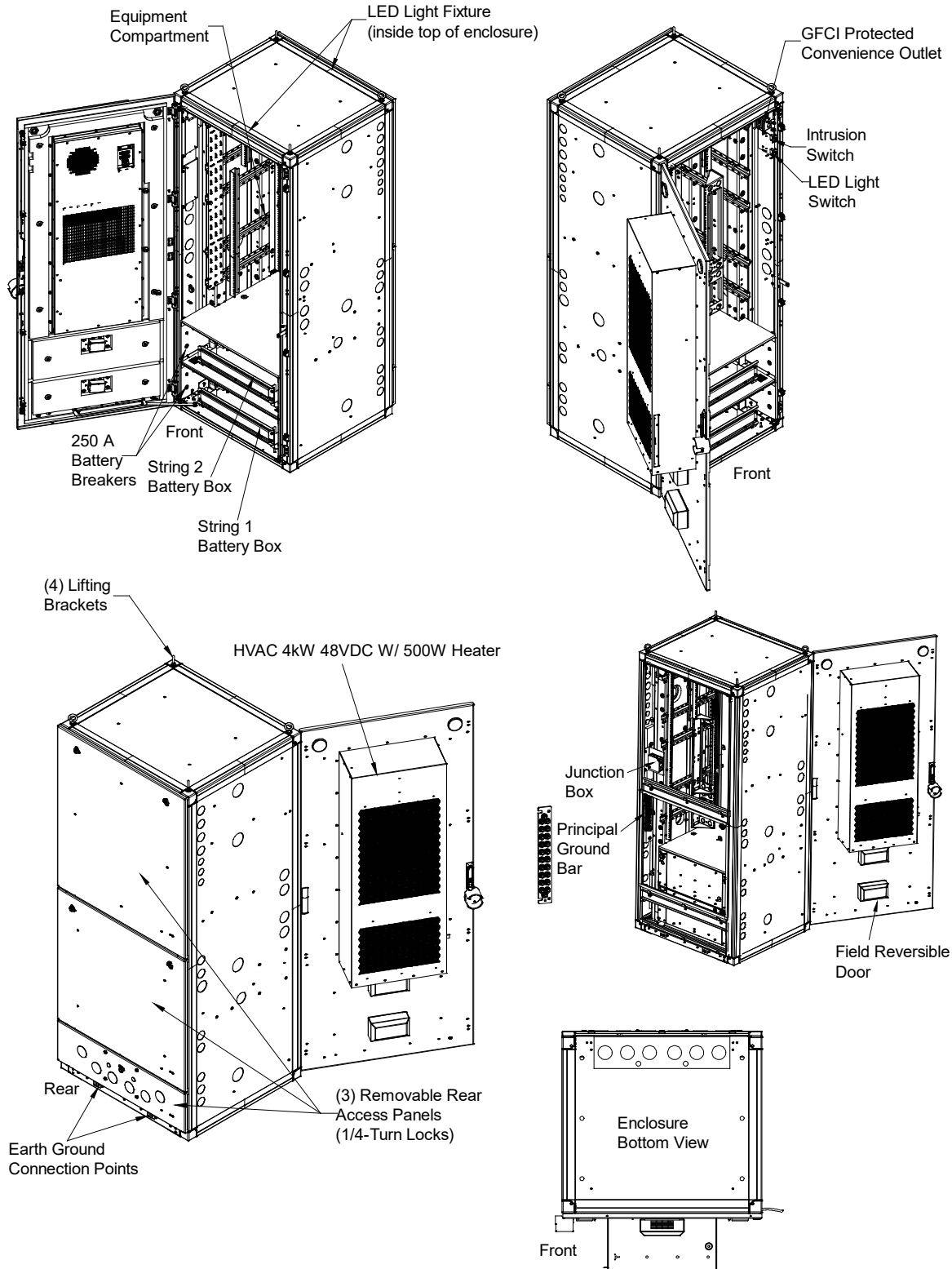


Figure 2.11 F2019016 Perspective Views of Enclosure with Features



3 Sequence of Procedures

3.1 General

The procedures listed in Table 3.1 are required to be performed in the order listed to fully install the enclosure.

Other practices and manufacturer's documents will be required to complete the installation of the system. This includes, but is not limited to:

- Set-up and maintenance of:
 - rectifiers, converters, and controllers (if equipped).
 - batteries.
- OSP cable fishing, sealing, grounding, splicing, and termination.
- Refer also to...
 - SD-2019015-01 (Enclosure schematic drawings).
 - J-2019015-01 (Enclosure job drawings)
 - SD-2019016-01 (Enclosure schematic drawings).
 - J-2019016-01 (Enclosure job drawings)

Table 3.1 Sequence of Procedures

Section in this Document	Starting on Page	Description
Product Description	1	Provides information that will help the project engineer determine an appropriate use and location for the enclosure.
Front Door, Locks, and Removable Panels	18	Describes how to access the internal compartments of the enclosure (equipment, battery, and cable entry compartments). Also provides a door hinge side reversal procedure.
Installation Considerations	24	Provides installation overview, recommended tools and test equipment, required installation materials, and recommended enclosure anchors.
Enclosure Placement	27	Describes the transportation and storage requirements, the safe handling of the enclosure, and the procedures to install the enclosure on a pad.
Sealing Primary Equipment Compartment Cable Entries	42	Provides methods for sealing the primary equipment compartment cable entries.
Grounding the Enclosure	42	Describes the grounding requirements for the enclosure.
AC Power	44	Provides wiring information for the electrician.
DC Power	48	Provides information regarding the DC power system and distribution.
OSP Cables	50	Provides procedures for preparing the cable sheaths and routing the cables within the enclosure.
Alarm Wiring	51	Describes the wiring for the enclosure alarms.
Batteries	57	Provides information and installation instructions for the various models of batteries used in the enclosure.
Initial Power Up	66	Describes the power up sequence for the AC power, the DC power, and the batteries.
Climate Control Options (F2019015)	67	Describes the operation of the F2019015 enclosure Environmental Control Unit (ECU) and thermal components.
Maintenance, Troubleshooting, and Replacement Procedures	78	Provides maintenance, troubleshooting, and replacement information.

4 Front Door, Locks, and Removable Panels

4.1 Safety Precautions



DANGER! RISK OF ELECTRICAL SHOCK, AC

Proper actions, include, but not limited to:

- Verify before contacting the enclosure that no current leakage or ground fault condition is present.
- Verify a proper ground is in place.



WARNING! RISK OF EXPLOSION

For safety reasons, never restrict or block the airflow through the door or entry panel ventilation openings.

4.2 Front Door

The enclosure front door is equipped with a swing handle, multi-point rod-latch system. The swing handle latch includes provisions for a customer supplied padlock.

Front door is equipped with brackets that support the use of an electronic puck lock (puck lock not provided).

A wind latch on the front door of the enclosure keeps the door secure when open.

Refer to the next section for instructions to open and secure the door with the wind latch.

4.3 Opening and Closing the Enclosure Front Door

Open and close the enclosure front door as described in the following procedures.

4.3.1 Opening the Front Door

Procedure

1. Is the environment safe? Use a non-contact voltage detector to assist in determining if access to the enclosure is safe.
2. If required, unlock and remove the padlock from the front door latch. If required, disengage the electronic puck lock, so that the door may be opened.
3. Lift the swing-latch and rotate approximately 90° clockwise to disengage door closing mechanism. Open the door. See Figure 4.1.
4. To secure the door in the open position, swing the enclosure door open wide enough so that the shoulder of the wind latch slides along the bar slot and into the first hole at the other end of the bar. Note that latch will first fall into position at 90-degrees and must be lifted again to open to 120-degrees. See Figure 4.2.



NOTE! To disable the intrusion alarm, refer to “Intrusion Alarm” on page 20.

4.3.2 Closing the Front Door

Procedure

1. Lift the wind latch arm to release the shoulder from the hole in the bar so it can slide along the bar slot as the door is closed. If the door was open to the 120-degree position, the latch must be lifted again at the 90° position to fully close the door. See Figure 4.2.
2. Close the door.

3. While holding the door closed, rotate and lower the swing-latch into the lock bed. See Figure 4.1.
4. If required, replace padlock.

Figure 4.1 Front Door Swing-Latch

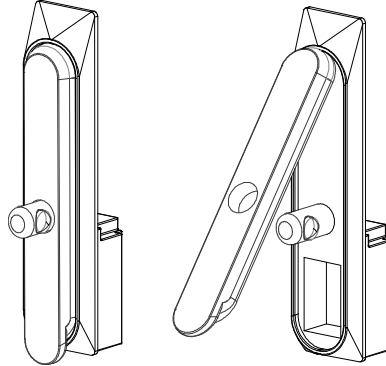
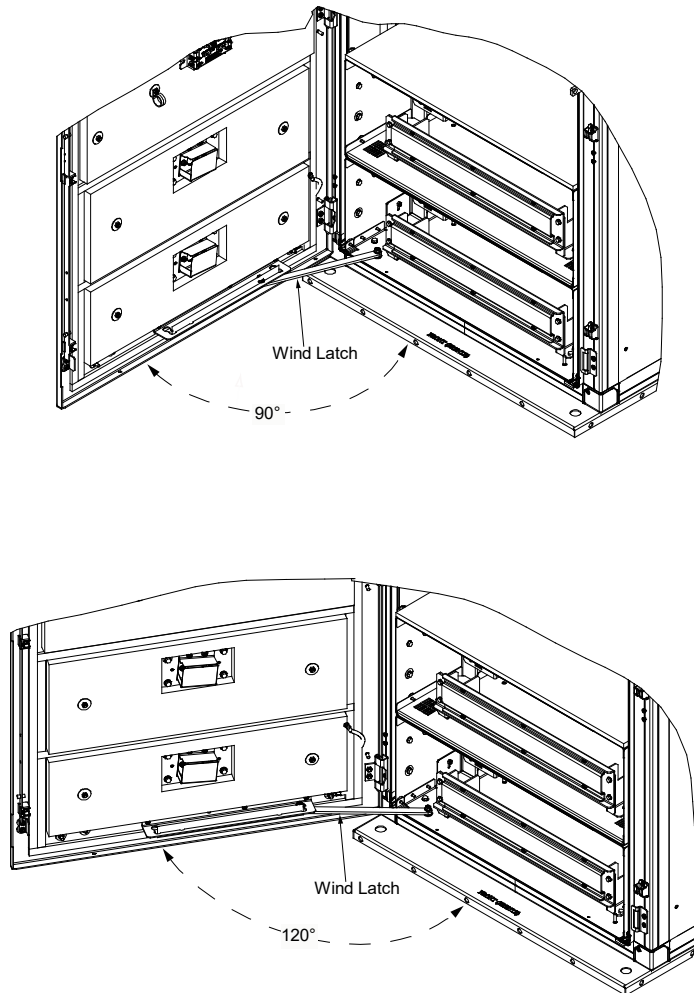


Figure 4.2 Front Door Wind Latch



4.4 Intrusion Alarm

The enclosure is equipped with a front door intrusion alarm switch.

4.4.1 F2019015

The intrusion alarm switch is connected to the ECU. The ECU sends an alarm signal to the alarm block whenever the front door is opened. The intrusion alarm can be disabled while performing routine maintenance as described in the following procedure. Refer to Figure 4.3 for an illustration of the intrusion alarm switch.

Procedure

1. Open the front door, the thermal system components turn off and the intrusion alarm activates.



DANGER! The intrusion switch is wired into the ECU. DO NOT disable an intrusion alarm by pulling the plunger on the intrusion alarm switch. This will silence the intrusion alarm, but the ECU thermal elements also return to normal ECU control and may start.

2. To disable the intrusion alarm, momentarily depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU. See Figure 15.1 for location. Refer to “ECU User Interface” on page 71 for further information. The intrusion alarm is reset by closing the front door.

4.4.2 F2019016

The intrusion alarm switch is connected to the alarm block. If connected to an alarm sending device, an alarm can be sent whenever the front door is opened. The intrusion alarm can be disabled while performing routine maintenance as described in the following procedure. Refer to Figure 4.3 for an illustration of the intrusion alarm switch.

Procedure

1. Open the front door. If connected properly, the intrusion alarm activates.
2. Pull the plunger on the switch to silence the alarm.
3. The intrusion alarm can be reset by pushing the plunger back in, or by closing the front door.

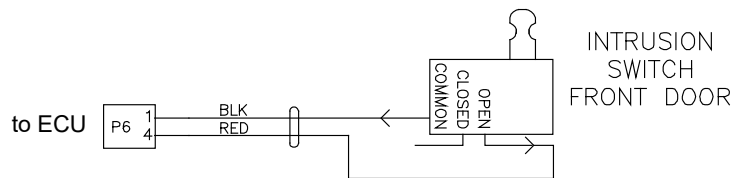
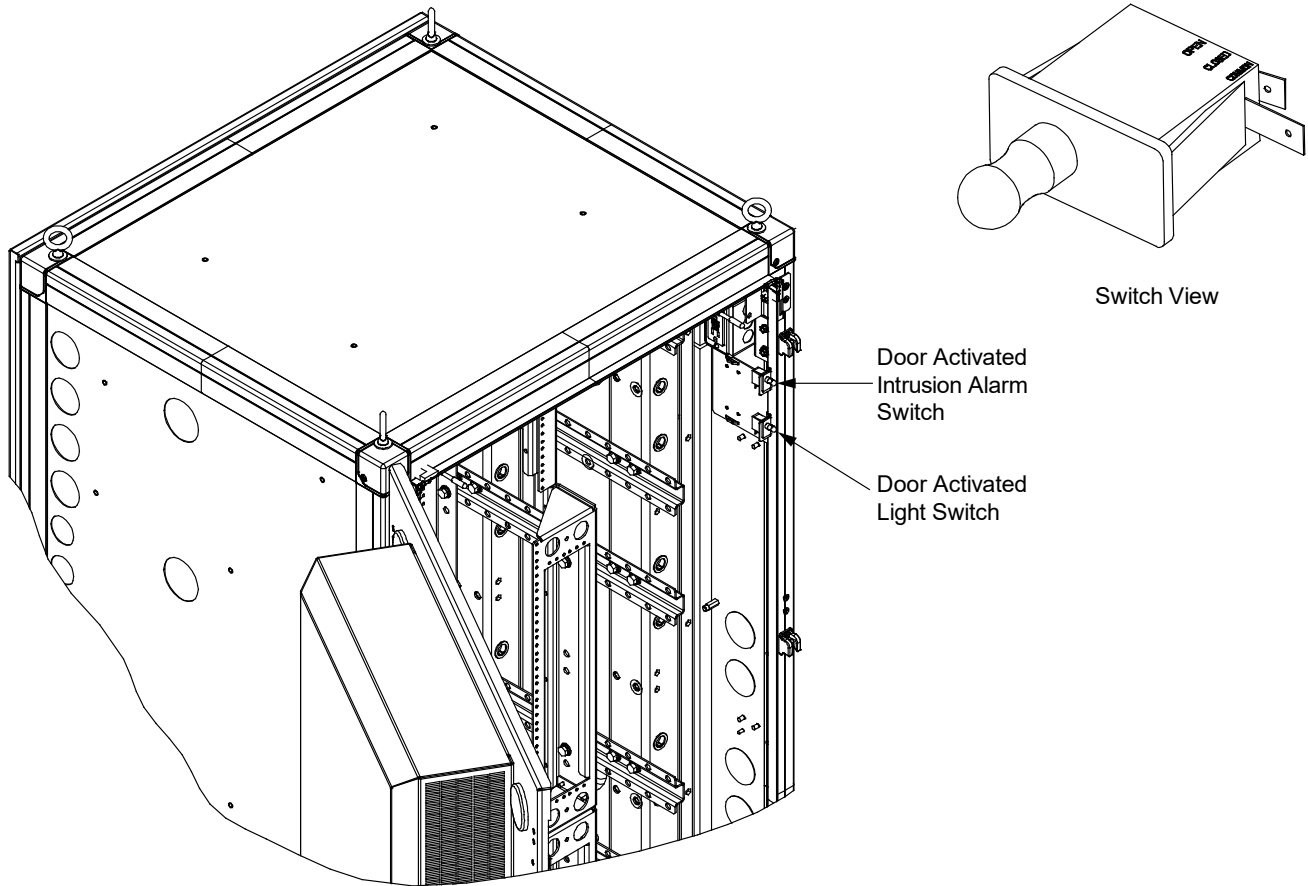
4.5 Door Activated Light Switch

The enclosure is equipped with a door activated light switch. The light can be turned off with the door open as described in the following procedure.

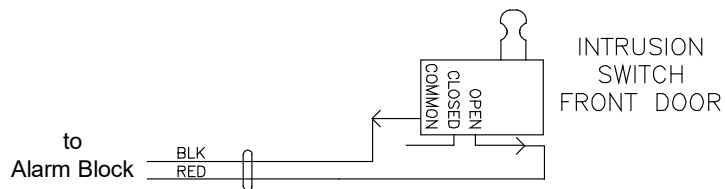
Procedure

1. The light can be turned off by pulling the plunger on the door activated light switch. Refer to Figure 4.3 for location of the door activated light switch.

Figure 4.3 Intrusion Alarm and Light Switches



F2019015



F2019016

Note: This wiring of the intrusion switch results in a Normally Closed (open on alarm) circuit.

4.6 Removing/Installing Rear Access Panels



CAUTION! Spring loaded locking rods prevent opening the rear panels without performing “Opening the Front Door” on page 18, first.

There are three rear access panels.

- Each access panel contains 1/4 turn locks and lift off to be removed.
- Panels are interlocked and upper panels must be removed before removing lower panels.
- The top rear access panel cannot be removed until two rods inside the primary equipment compartment are disengaged. These rods should automatically disengage when the front door is opened.

Refer to the following procedure to remove/install rear access panels.

Procedure

1. Open the front door.
2. From the front of the enclosure, verify that the left-hand and right-hand locking rods are in the forward position which disengages the rods from the top rear access panel 1/4-turn locks. Refer to Figure 4.4.
3. Use a can wrench and turn the 1/4-turn locks (after verifying locking rods in the above step) located at the top corners of the top rear access panel according to the open-close labels. Refer to Figure 4.4.
4. Slowly tilt the top of the top rear access panel down, until the safety chain attached to it can be accessed. Unhook the safety chain from the top corner of the top rear access panel. Refer to Figure 4.4.
5. Lift the top panel to disengage it from the tabs on the panel below it and pull it away from the enclosure.



NOTE! The panel is electrically bonded to the enclosure with a 6 AWG cable. The cable is long enough to allow the panel to be placed on the ground next to the enclosure. The cable should not be disconnected from the panel.

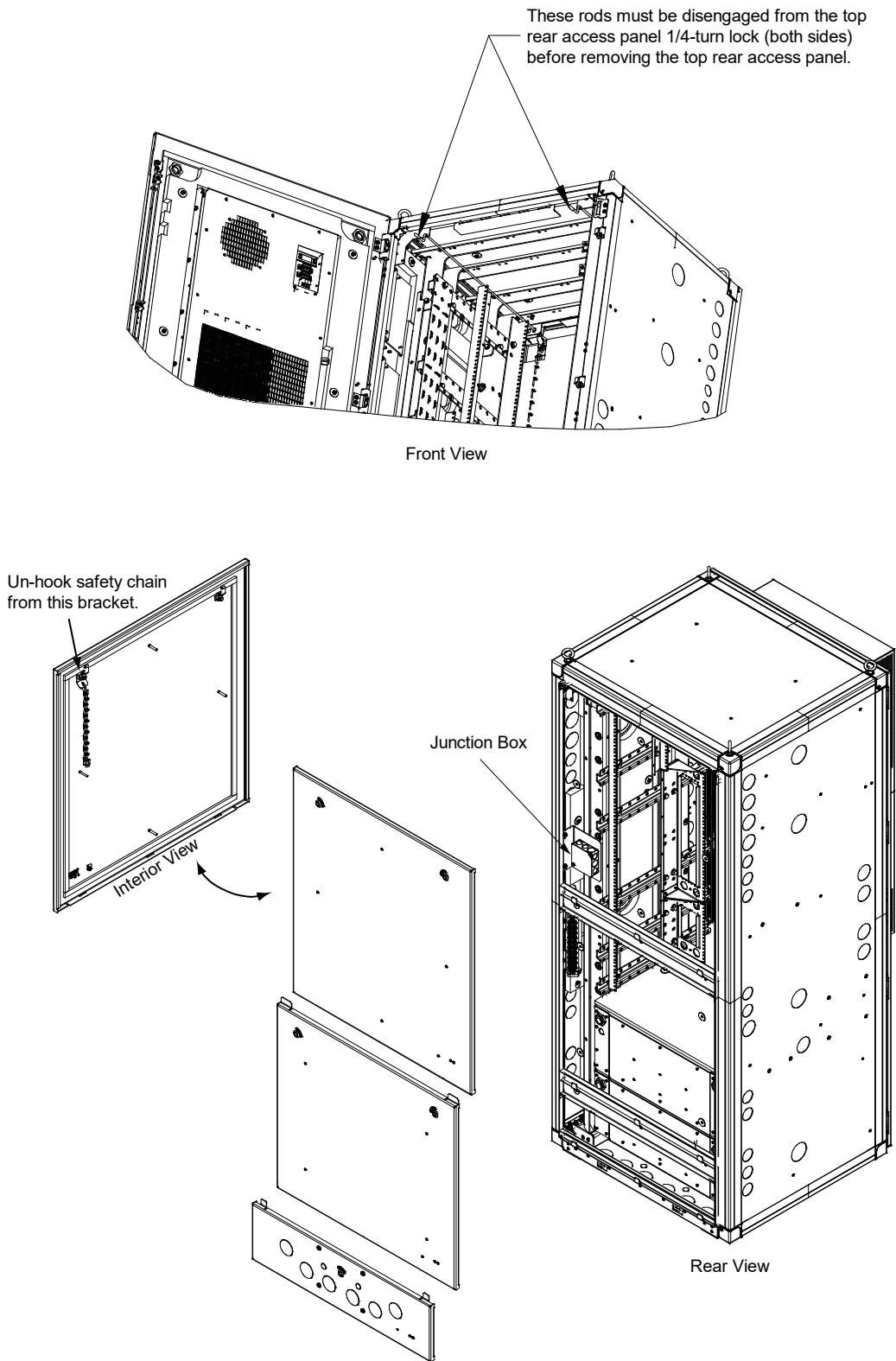
6. To remove the lower panels, use a can wrench and turn the 1/4-turn locks located at the top corners of the rear access panel according to the open-close labels (lowest rear panel only has one lock at the top center of the panel). Refer to Figure 4.4.
7. Lift the panel to disengage it from the tabs on the panel below it and pull it away from the enclosure.



NOTE! The panel is electrically bonded to the enclosure with a 6 AWG cable. The cable is long enough to allow the panel to be placed on the ground next to the enclosure. The cable should not be disconnected from the panel.

8. Reverse the above steps to reinstall the panels. Ensure that you re-attach the safety chain to the top corner of the top rear access panel. Also, ensure the front door is in the open position before replacing the top rear access panel (when the front door is closed, the two locking rods are automatically pushed in to engage the locking mechanism). Turn the 1/4-turn locks according to the open-close labels to secure the access panel.
9. Close and secure the front door.

Figure 4.4 Removing/Installing Rear Access Panels



4.7 Reversing the Hinge Side of the Enclosure's Front Door

Refer to Method of Procedure (MOP13).

5 Installation Considerations



NOTE! If holes are drilled into the exterior of this enclosure and not filled using a seal tight connector, the manufacturer's warranty will be void.

5.1 Important Safety Instructions



DANGER! Adhere to the "Important Safety Instructions" presented at the front of this document.

5.2 Installation Overview

The following is the recommended sequence for the installation and start-up procedures. The sequence may change according to job and site conditions.

- Ensure all site drawings and approvals are in place.
- Obtain the recommended tools and test equipment.
- Read "Important Safety Instructions" starting on page vii carefully.
- Check that all the equipment and materials have been delivered.
- Proceed with the physical installation of the enclosure.
- Install and verify ground cables.
- Install and verify the AC power.
- Install and verify the DC power.
- Route, splice, and verify the OSP cables.
- Install and verify the alarm cables.
- Install and verify the batteries.
- Turn-up, verify, and adjust the system.

5.3 Tools and Test Equipment Required for Installation

The following tools, test equipment and materials are required for the physical installation of the enclosure:

- Can wrench; 3/8" and 7/16" (which is traditionally provided with such enclosures)
- Non-contact voltage detector
- Digital multimeter (DMM), 0 to 200 V dc, 0 to 300 V ac
 - Digital clamp-on meter, 0 to 30 A dc, 0 to 60 V ac, recommended

- Torque wrench, 1/2" drive, recommended
- Ratchet, 1/2" drive, 3/8" drive and 1/4" drive
- Socket, 3/4" deep, 1/2" drive
- Socket set, range from 1/4" to 1"
- 3" and 6" extensions, 1/2" drive
- 5/16" and 7/16" ratchet wrench
- 36" carpenter's level
- Lineman's scissors
- Lineman's strippers
- Lineman's cutters
- Crimping tool with dies from #6 AWG to #2 AWG
- Electrician's insulated screwdrivers, Phillips, No. 1 and 2
- Electrician's insulated screwdrivers, flat-blade, small and large
- Insulated 3/8", M6, M8, M10 nut drivers for battery installation.
- Silicone sealant
- NO-OX-ID-A or approved equivalent

Outside the scope of this document, are the tools to fish, splice and terminate OSP Cables and laptop to setup the power system controller.

Equipment associated with lifting the enclosure by the eyebolts is listed separately, in a subsequent section.

5.4 Materials Required for Installation

The following materials are required to install the enclosure.

Table 5.1 Materials Required for Installation

Description	Part Number	Quantity	Comments
1/2" - 13 x 3.0 Lg SST* Hex Head Screw	140174	4	For Platform Mounting (Included)
1/2" - 13 SST* Hex Nut	P25849	4	For Platform Mounting (Included)
1/2" SST* Lock Washer	P29739	4	For Platform Mounting (Included)
1/2" SST* Flat Washer	P74233	8	For Platform Mounting (Included)
Heavy Duty Load Washer	Andrew P/N MT-25002, or equivalent	4	For Platform Mounting (Available through Distribution)
Leveling Shim Kit	547061	1	(Included)
Pad Mounting Rubber Barrier Pad	145396	1	(Included)
Recommended Anchors	(4) 1/2" Hilti HSL Heavy Duty Expansion Anchor. (Not Included) Note: It is up to the customer to select anchors, to investigate the proper use of the anchors, and to determine the requirements for the concrete pad to work with the anchors. Refer to Figure 2.8 when using the pour-in-place pad template.		
Recommended Ground Bar Lug (2 AWG)	Panduit LCDX2-14A-E P/N 245346901	1	(Not Included)
Recommended Branch Circuit Protection and Wire Size for AC Input to GFCI	External 15 A / 1-Pole Circuit Breaker Wire Size: 14 AWG.	1	(Not Included)
		--	

*SST = Stainless Steel

5.5 Recommended Anchors

Refer to Table 5.2 for recommended anchors.



NOTE! This equipment enclosure requires four (4) of the Hilti HSL-3 anchors, used in the 4 corner positions of the enclosure (two extra middle positions not used).

Table 5.2 Enclosure Recommended Anchors

Enclosure	Recommended Anchors	Notes
Equipment Enclosure (Seismic Zone 4)	(4) 1/2" Hilti HSL	It is up to the customer to select anchors, to investigate the proper use of the anchors, and to determine the requirements for the concrete pad to work with the anchors.

6 Enclosure Placement

6.1 Overview

This section contains the procedures required for physical installation of the enclosure.

6.2 Site Selection

The enclosure may be installed on a new or existing concrete pad, roof top, or metal platform. Obtain rights-of-way and other permits (building permit, electrical permit, etc.), depending on local codes and authorities, prior to installing the enclosure.

The mounting pad or platform must be installed (according to local practices) before the enclosure can be installed.

Roof Top Site Considerations

Consider the following when deciding on the location for the roof top site.

- Obtain all necessary building permits and other local approvals as necessary per local building codes.
- Select locations that will provide enough space to place the mounting platform and enclosure, and provide safe working conditions.
- Select locations where there are no electrical lines that could touch the enclosure and energize it.

Concrete Pad or Platform Considerations

Consider the following when deciding on the location for the concrete pad or platform.

- Place the enclosure on servitudes, on dedicated (recorded) easements, or on property owned by the company. Avoid any unrecorded easements.
- Use public safety road and street rights of way only where there is enough space to place the enclosure and provide safe working conditions. The enclosure should be easily accessible with adequate parking to ensure safety for people and vehicles. Place the enclosure where it will not create a visual or physical obstruction to either vehicles or pedestrians.
- Select locations that will minimize accidental or intentional vandalism. Consider the use of protective posts when the enclosure is located near parking areas where vehicles could back into it. Do not place the enclosure in ditches or areas subject to flooding. Do not place the enclosure in an area where the pad is subject to vehicle loads.
- Place the enclosure at least 42 in (106.68 cm) away from any obstruction, fence, hedge, etc. Include adequate area for craft personnel to perform maintenance procedures.
- Where ordinances or other require that the enclosure be hidden behind natural landscaping plants, preference should be given to evergreens that will produce leaves, sticky pollen or waste that could fall and clog the heat exchanger intakes.
- If an area is subject to frost, choose a site free of heaving. Minimize snow buildup or being plowed into. Placement should support access for snow removal in the event of a snow/ ice storm.

6.3 Site Ground



DANGER! RISK OF ELECTRICAL SHOCK, GENERAL

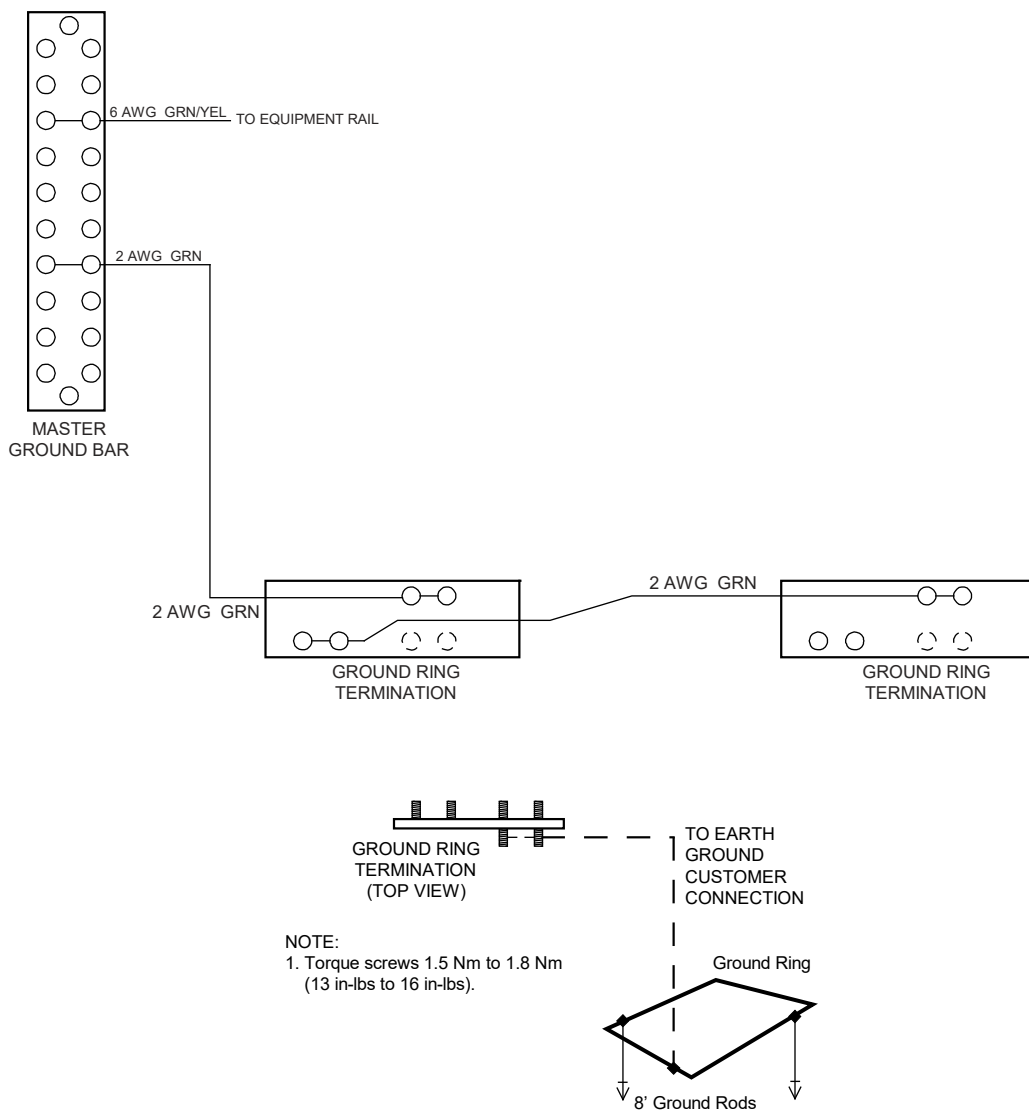
All enclosure grounding and ground ring must be installed and verified prior to connecting any power cables (AC or DC) and turning-up of enclosure.

Ensure that all National Electric Code (NEC) and local codes for safety and wiring are followed. Consideration for corporate standards also apply.

All external ground wires, whether from the ground ring or OSP cables, shall only be dressed to the principle ground bar located on the rear of the primary equipment compartment or ground ring termination block located at lower rear of enclosure.

Before an enclosure is placed, a ground ring supporting the path and conditions shown in Figure 6.1 must be in-place.

Figure 6.1 Site Ground



6.4 Concrete Foundation Pad



CAUTION! The compression strength of the concrete pad used must be a minimum of 4000 psi as determined by ASTM C39 test of compression strength of concrete cylinders.

The enclosure is installed on a concrete foundation pad, which is either cast-in-place or precast. Figure 6.2 shows the general position of the enclosure on the concrete pad.

- Use concrete only for the foundation pad. Do not use substitute materials, such as reinforced plastics, since they lack the rigidity required for enclosure placement. The ideal pad dimension extends two feet beyond the open radius of all doors. The minimum recommended pad size is two feet (24 in or 60.96 cm) beyond the perimeter of the enclosure.
- If not using a metal mounting template, use the mylar-type reusable film template (P/N F1010584 [145344]) or the dimensions in Figure 2.7 to orient the mounting bolt holes and conduit openings in the pad. The metal mounting template (P/N F1010585 [554917]) consists of galvanized metal mounting plates with support rails. A rubber barrier pad is installed between the pad and the enclosure to prevent corrosion.
- For excavated pad applications, excavate a hole for the pad and cable conduits in accordance with the engineering work prints, generally to a depth of 30" (76.20 cm) for standard applications and 60" (115.24 cm) for areas where there is heavy frost.
- Use a minimum of 6" (15.24 cm) of sand or gravel as a base for the foundation pad. This will level the location to accept the pad.
- Use a high-early strength concrete mix so the enclosure may be placed three days following concrete pouring. Coarse aggregate used in the concrete shall be graded from 3/4-in (1.90 cm) to No. 4 only.



NOTE! Referring to Figure 6.2, determine the proper pad size for your application and space available. The **MINIMUM** recommend pad size extends 24" (60.96 cm) past all sides of the enclosure. If space permits and it is desired, a larger pad can be constructed thus providing area to walk around the installed enclosure. Refer to Figure 2.2 and Figure 2.3 for enclosure dimensions.



NOTE! Referring to Figure 2.5, note conduit and mounting locations. Note that conduits may also be run to the rear lower access panel.

Optional Pour-in-Place Pad Template: Referring to Figure 2.8, note conduit and mounting locations for the pour-in-place template assembly.



NOTE! Referring to Figure 6.3 or Figure 6.4, prepare a form per "Form Preparation" on page 31. Follow local practices or building codes if different than the information included in this section.

Figure 6.2 Pad Sizing (from outside perimeter of enclosure to pad edge)

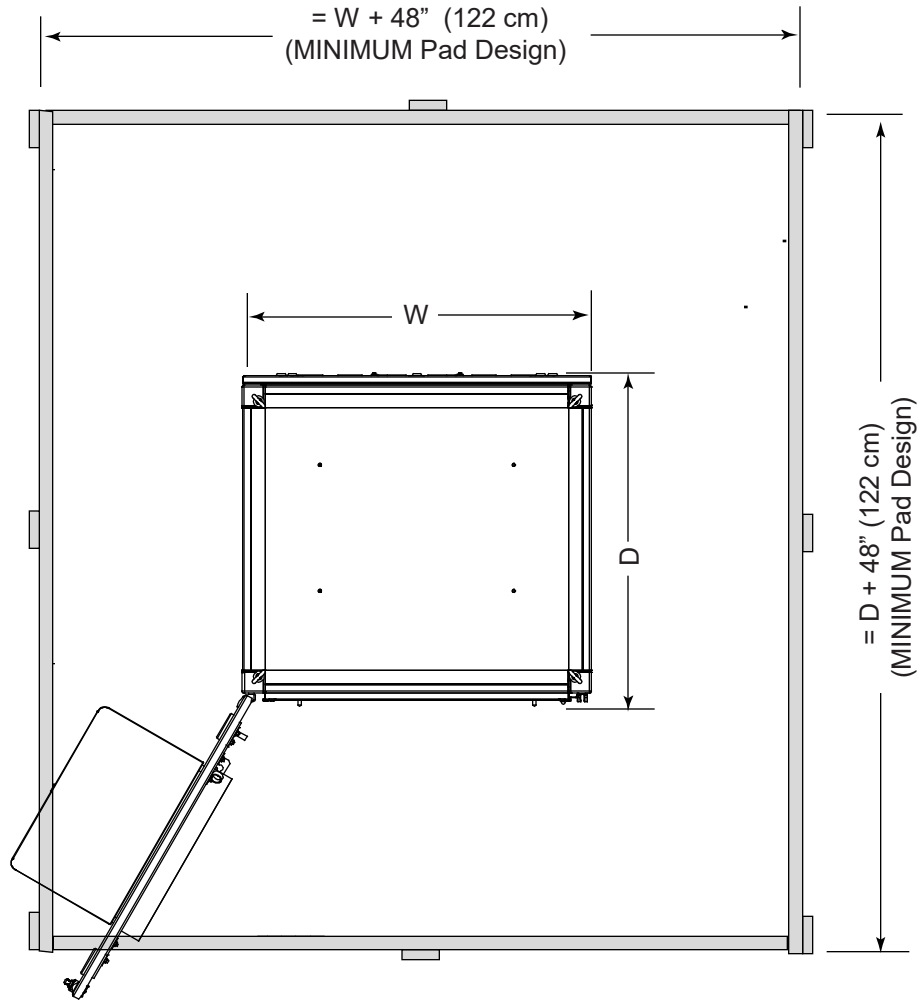


Figure 6.3 Ground Level View of Typical Pad Construction (w/out pour-in-place pad template)

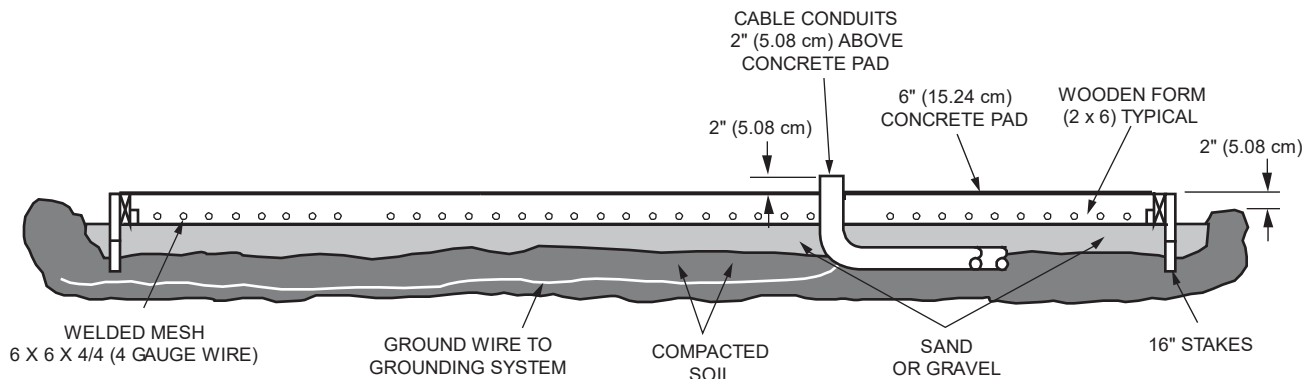
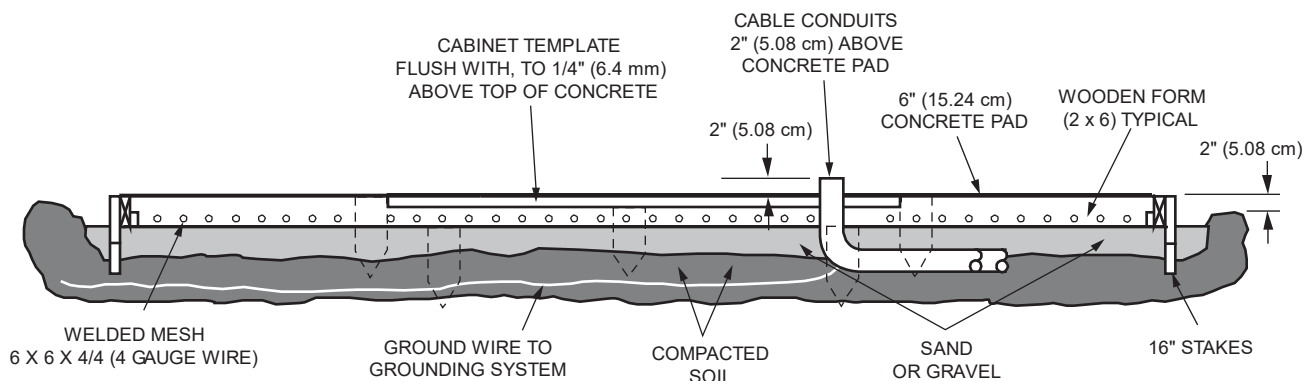


Figure 6.4 Ground Level View of Typical Pad Construction (with pour-in-place pad template)



6.5 Form Preparation

- For excavated pad applications, clear an area for the pad and cable conduits in accordance with the engineering work prints. For a typical installation, excavate the foundation hole to a depth of 12" to 16" (30.48 cm to 40.64 cm). If the soil is not firm, compact it.
- Install a ring ground system around the proposed foundation pad according to local practices and building safety codes. Place the ground rod(s) and ground wire(s) as indicated on the engineering work prints.
- Construct a level base for the pad, using a minimum of 6" (15.2 cm) of sand or gravel. The pad should be level to within 1/4-in (0.63 cm) over the entire length and width. Tamp as needed.
- Dig a trench to the area(s) where the cable and electrical conduit will rise into the enclosure. Excavate the trenches to a depth of 30" (76.2 cm) for a standard installation, and 60" (152.4 cm) for areas where there is heavy frost. Do not damage any installed cables.
- Place all conduits into their approximate position in the form area allowing them to sweep up in their appropriate locations as indicated on the engineering work prints.
- If using a metal template, place the metal mounting template(s) into their approximate final position in the form area allowing the conduits to come up through the template(s) in their appropriate cable entry ports or open areas as indicated on the engineering work prints.

- Backfill and tamp the trench(s) so the conduits remain in their position.
- Remove the template(s) and fasten wooden stakes onto them to reposition them in the form area later.
- Construct a level wooden form frame from using 2x6 materials for the desired pad area and size. Be careful not to damage any installed cables driving stakes into the ground.
- If required, use local practices to treat the area below the pad and for two feet (61 cm) around the perimeter against insect infestation.
- Place a mesh wire (6 x 6, 4 gauge) into the form area. Be sure the mesh wire is centered vertically. In place of using wire mesh No. 3 (3/8 in or 9 mm) or larger, reinforcing rods placed on 15" (381 mm) centers may also be used. Cut or reposition the metal mesh or rods where ever necessary to avoid any conduits or template stakes.
- Place the templates back into their position(s) with the conduits protruding through them. Square and level the templates on the stakes so the tops of the mounting plates are flushed with, or no more than 1/4 in (6 mm) above the top of the pad. Square the template(s) so the diagonal measurement between the anchor bolts is equal.



NOTE! *The enclosure must clear the finished concrete surface so that any base panel below the enclosure or end chamber(s) can be removed.*

- The conduit should extend approximately 2" (50.8 mm) above the template (Figure 6.3 or Figure 6.4). Cover the conduits at the top to keep concrete from entering them during the pour.



NOTE! *Make sure the conduit ends extend vertically through the template (perpendicular to the template surface).*

- Be sure that all the wire mesh or reinforcing bars are set approximately 2" (50.8 mm) off the bottom of the form.
- Use a high-early strength concrete mix so the enclosure may be placed three days following concrete pouring. Coarse aggregate used in the concrete shall be graded from 3/4-in. (18 mm) to No. 4 only. The compression strength of the concrete must be a minimum of 4000 psi as determined by ASTM C39 test of compression strength of concrete cylinders.
- Pour the concrete. Finish the concrete so that the entire surface is flush with or 1/4-in (6 mm) below the top of the template mounting plates.
- Cure the pad for a minimum of three days before enclosure installation, or according to the type of concrete used and/or local practices.
- DO NOT install the enclosure or support any significant load before the pad is completely cured. After the second day, the forms may be removed.
- After the pad has cured, drill appropriately sized pilot holes in the pad for the anchor being used to mount the enclosure to the pad. Note that a re-usable pad mounting hole location template and an optional pour-in-place pad template are available for making hole locations. Refer also to Figure 2.5 and Figure 2.7 for enclosure base mounting hole location dimensions.



NOTE! *Use appropriate anchors to secure enclosure to concrete pad. Refer to Table 5.1 and Table 5.2 for recommended anchors. Refer to Figure 2.8 when using the pour-in-place pad template.*

6.6 Transportation and Storage



DANGER! RISK OF ELECTRICAL SHOCK, GENERAL

Do not install equipment showing any physical damage.

If packaging is damaged, do not accept receipt from the shipper.



CAUTION! PREVENT EQUIPMENT DAMAGE, PROPER HANDLING

Do not stack nor lay the enclosure on its side.

To avoid possible personnel injury or enclosure damage, do not remove it from the pallet until at the installation site, at the point of transfer onto the pad.



WARNING! RISK OF INJURY, FROM UNSECURED ENCLOSURE

Do not push or lean against an unsecured (unbolted) enclosure as it may tip over causing bodily injury.

Do not pull cables, terminate cables, install or place any batteries or rectifiers until enclosure has been secured onto a pad.

Use caution when opening and closing the front door to an enclosure not secured onto a pad.



CAUTION! PREVENT EQUIPMENT DAMAGE, FROM CONDENSATION

Until the enclosure is turned up for service, the bags of desiccant shipped with the enclosure must remain in the enclosure to prevent condensation.

Once service is in-place, remove the desiccant.

Use lifting equipment, such as a crane or forklift, appropriately rated for the weight of the load to move the enclosure.

When moving an enclosure with a forklift, make sure that the fork is of sufficient length for the pallet size (48" minimum) and capable of lifting 4,000 lbs (1814 kg).

For long-term storage, enclosure and packaging should be kept dry and not be exposed to temperatures outside the range of -10 °C (14 °F) to +40 °C (104 °F). Once packaging has been discarded and enclosure has been securely placed on a pad or platform, the enclosure may be exposed to conditions from -40 °C (-40 °F) to +52 °C (126 °F).

Desiccant has been included for the enclosure to prevent condensation in the interior. If the enclosure is to be stored for a period of 3 months or greater, the desiccant should be inspected monthly, and if necessary replaced. Alternatively, a small heat source, such as a 100 W incandescent light bulb, may be securely and safely placed into the enclosure as a continuous source of heat. The desiccant bags are to be discarded once the enclosure is in service.

For short-term storage, the enclosure should not be exposed to temperatures that exceed the temperature range of -40 °C (-40 °F) to +70 °C (158 °F).



NOTE! *The enclosure is shipped in protective packaging on a wooden pallet. Batteries (if ordered) and rectifiers will be shipped on a separate pallet.*

6.7 Unpacking the Enclosure at the Installation Site



CAUTION! Do not open the door with door mounted climate control systems unless the enclosure is secured to the pallet or the mounting surface. An unsecured enclosure is unstable and could tip over causing injury or equipment damage.

Procedure

1. Inspect the exterior packaging for damage. If being received and exterior has been damaged, do not accept shipment.

2. Check the packing slip to make sure all components ordered were received. If there are missing components, notify your supervisor for further instructions.
3. Carefully remove all packaging material from around the enclosure. Dispose of the packaging according to local practices.
4. Inspect the outside of the enclosure to be sure there is no shipping damage. If there is damage, note how much damage there is and where it is located. Notify your supervisor for further instructions.
5. If the enclosure appears undamaged, proceed with the installation. **DO NOT REMOVE THE PALLET UNTIL THE ENCLOSURE IS READY TO BE MOUNTED.**



NOTE! Do not install the enclosure or support any significant load before the pad is completely cured.

6.8 Preparing the Enclosure



CAUTION! The door with the climate control systems is very heavy. Do not lean or pull on it.



NOTE! Refer to “Opening and Closing the Enclosure Front Door” on page 18 and “Removing/Installing Rear Access Panels” on page 22 for opening the front door and removing rear access panel procedures.

Procedure

1. With the enclosure secured to the pallet, open the front door. Secure with the wind latch.
2. Remove the enclosure accessory kit. Key items in the accessory kit include:
 - Protective (barrier) rubber pad.
 - Leveling shims.
 - Can wrench.
3. Inspect enclosure interior, panels, door, and accessory kit for damage. In case of damage, follow local procedures for reporting and resolving damage.
4. Close and latch the front door.

Enclosure Conduit Entry Options

Cables are brought into the enclosure via conduits that either enter the conduit openings on the rear lower access panel or conduit openings located on the bottom panel of the enclosure. See Figure 2.10. There are additional knockouts on both sides of the enclosure that may also be utilized for cable entry, or for passing cables to a nearby cabinet on the site. See “Sealing Primary Equipment Compartment Cable Entries” on page 42.

6.9 Preparing the Concrete Pad

Procedure

1. Clean all debris from the concrete pad or the platform where the enclosure will be placed.
2. If still present, remove any jig alignment tool, bolts, etc.
3. Make sure the four (4) enclosure anchor holes are present and usable before the enclosure is placed. The holes may be more easily located using an optional re-usable drill template.



NOTE! The size of the re-usable drill template matches the perimeter of the enclosure base perfectly. While drilling the anchor holes, use a wax or paint crayon to mark the four edges of the drill template. This will later serve as a guide for placing the rubber barrier pad and aligning the enclosure during placement.

4. From the accessory kit, place the rubber pad (barrier) onto the concrete base, passing any cable present through the appropriate hole in the pad.



NOTE! *If not already done, remove the perforated cutout for the cables from the rubber pad.*



NOTE! *If necessary use tape, such as duct tape, to temporarily hold the edges of the rubber pad down.*

5. Dress any cables/conduits so they will easily enter the enclosure as it is being lowered onto the foundation pad.
6. If present, remove the anchor bolts and washers from the foundation pad. Set the hardware aside to attach the enclosure to the pad.

6.10 Preparing to Lift the Enclosure



WARNING! PREVENT INJURIES, FROM LIFTING THE ENCLOSURE

Follow all local safety practices while lifting the enclosure. Wear all locally approved safety gear. All persons working with lifting equipment must wear standard safety headgear, eye protection, and (when required) gloves.

Keep bystanders away from work operations at all times.

Do not lift the enclosure over people. Do not let anyone work, stand, or pass under a lifted enclosure.

Use all four points (eyebolts) to lift the enclosure.

Do not move or lift the enclosure with the front door open.

Never lift or move the enclosure with batteries or rectifiers installed.

Do not allow the lifting equipment or enclosure to touch any electrical wiring or equipment.

Operate all lifting equipment within safety constraints, as defined by the manufacturer and local practices; for example, do not exceed the capacity of reach.

Do not use slings, clevises or shackles of insufficient capacity.

Crane Operation

Only properly trained operators shall operate the crane.

Do not operate the crane until all stabilizers are extended. The stabilizers must be in firm contact with the ground or other adequate support structure. Do not retract or extend the stabilizers when the enclosure is suspended from the crane.

Do not lift the enclosure over people. Do not let anyone work, stand, or pass under a lifted enclosure.

Only the crane rigging crew should set up the crane and rigging.

Do not exceed the lifting capacity of the crane.

Forklift Operation

The forklift must be rated for a lifting capacity of 4,000 lbs (1814 kg), or greater.

Required Equipment:

One hoist, crane, or forklift capable of lifting 4,000 lbs (1814 kg).

Four wire-rope slings, 8-ft. (2.44 m) long (minimum). Each sling should have 1,500 lb. (700 kg) capacity.

Four connecting links (clevises) (rated for a minimum of 1500 lb), to attach the wire-rope slings to the enclosure lifting eyebolts.

A 75-ft (20 m) rope, 5/8" (1.5 cm) in diameter, to use as a tagline. A tagline is used to guide the enclosure into position while it is lifted and lowered.

6.11 Lifting the Enclosure



ALERT! Do not lift the enclosure with batteries, rectifiers, or converters installed.

Procedure

1. Ensure the front door is closed and latched.
2. Inspect the lifting eyebolts and ensure eyebolts and roof are free of damage.
3. Ensure that the four eyebolts on top of the enclosure have their sides oriented towards the center of the enclosure with no exposed threads as shown in Figure 6.5.
4. Install a clevis and shackle or a threaded shackle in each eyebolt at the top of the enclosure as shown in Figure 6.5.
5. Insert all four (4) 8' minimum lifting slings securely through all four clevises or shackles as shown in Figure 6.5.
6. To prevent the enclosure from tipping when the pallet retaining bolts are removed, slowly take up the slack with the crane.



NOTE! DO NOT tighten the slings so that the pallet lifts. The weight of the pallet will make it difficult to remove the bolts from the pallet brackets.



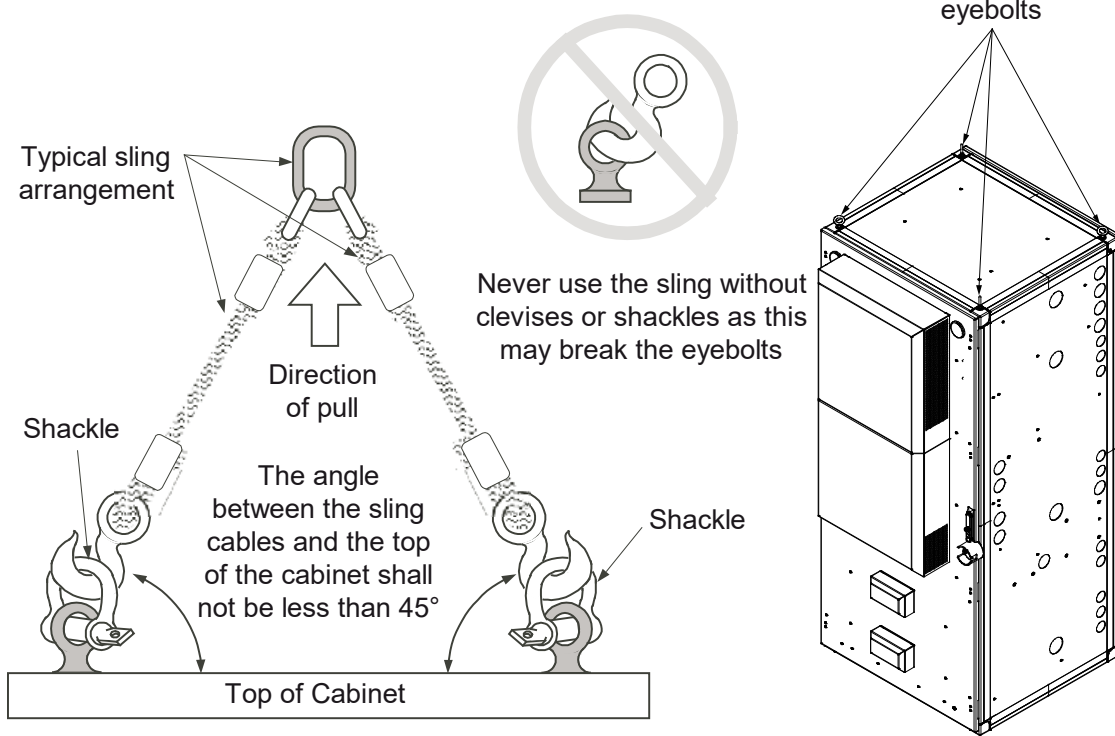
NOTE! It is important that the length of each sling allow for an angle 45° or more.



NOTE! Failure to maintain a 45° angle or greater and using all four eyebolts will void any warranty or service claim.

7. Use a 5/8" (1.5 cm) diameter rope, approximately 75-ft (20 m) long, as a tagline to steady the enclosure during lifting and lowering operations. Attach the tagline to an eyebolt on the right side of the enclosure (looking at the front).
8. Remove the pallet mounting hardware. (Requires 3/4" deep well socket.)
9. Lift the enclosure. The pallet should drop off from its own weight.

Figure 6.5 Lifting the Enclosure



6.12 Placing the Enclosure



ALERT! During lifting and placement, the enclosure must be lowered so that the enclosure is level and parallel to the pad surface. Place the enclosure so that it lines up with the anchors. Make sure the enclosure is clear of the conduits in the foundation pad.

Perform the following procedure to pad or platform mount the enclosure.

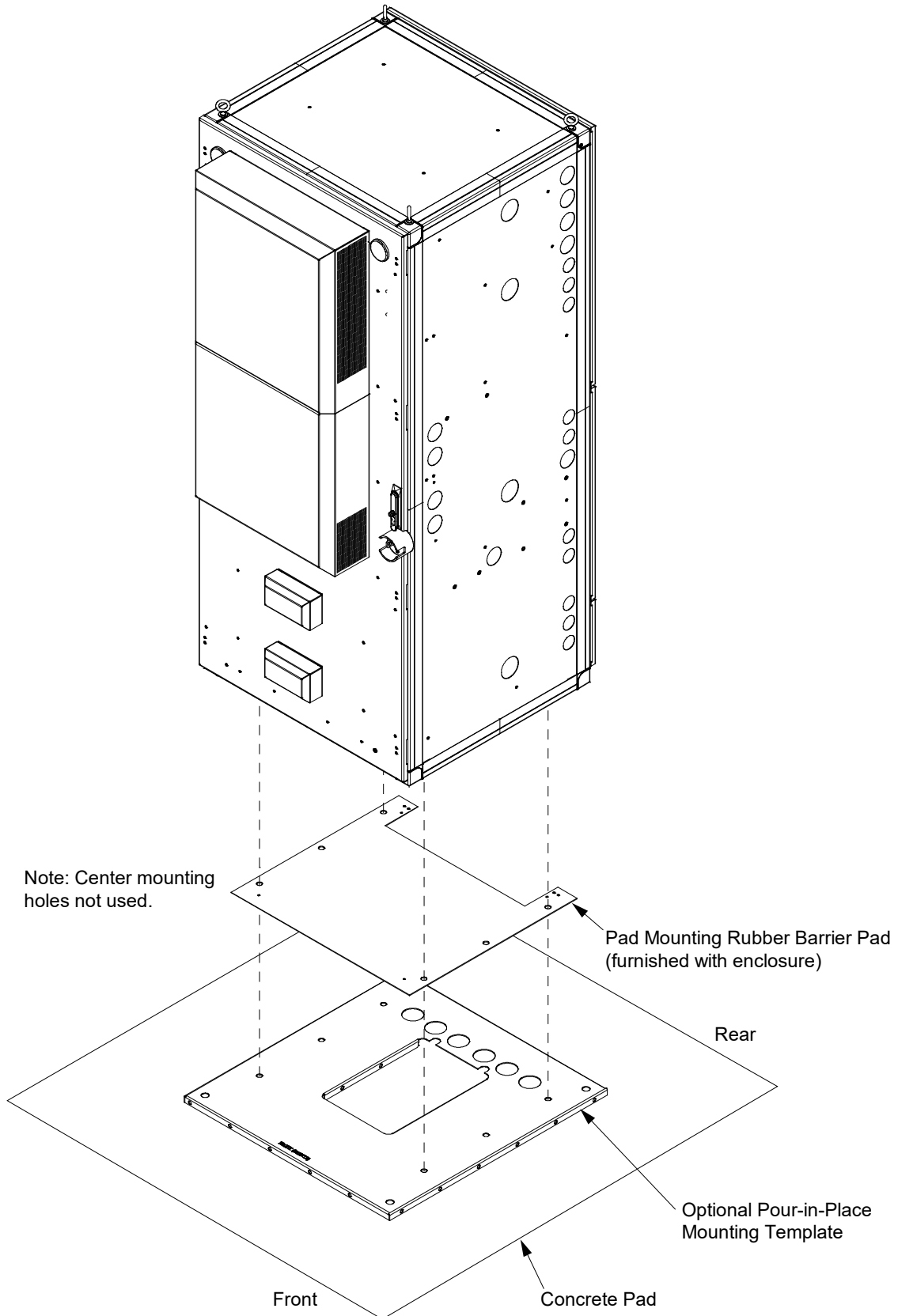
Procedure



NOTE! Refer to Figure 6.6 when using the optional pour-in-place pad template. Refer also to Enclosure Conduit Entry Options” on page 34 before placing the enclosure.

1. Lower the enclosure to approximately 6” above the pad, level and parallel. The enclosure should be lowered towards the front of the enclosure’s final placement, out of the way of all OSP cables that may be present.
2. Shift the enclosure, to the rear, over the final mounting location.
3. As the enclosure is moved into place, verify the enclosure clears cables and conduit.
4. Verify the barrier pad is in place and the enclosure is directly over the mounting holes. It will be easiest to confirm the alignment of enclosure and pad mounting holes, using the holes in the rear of the enclosure.
5. Slowly lower the enclosure in place, until it firmly rests on the pad. Keep the slings on, with a little slack.

Figure 6.6 Attaching Enclosure to Optional Pour-in-Place Pad Template

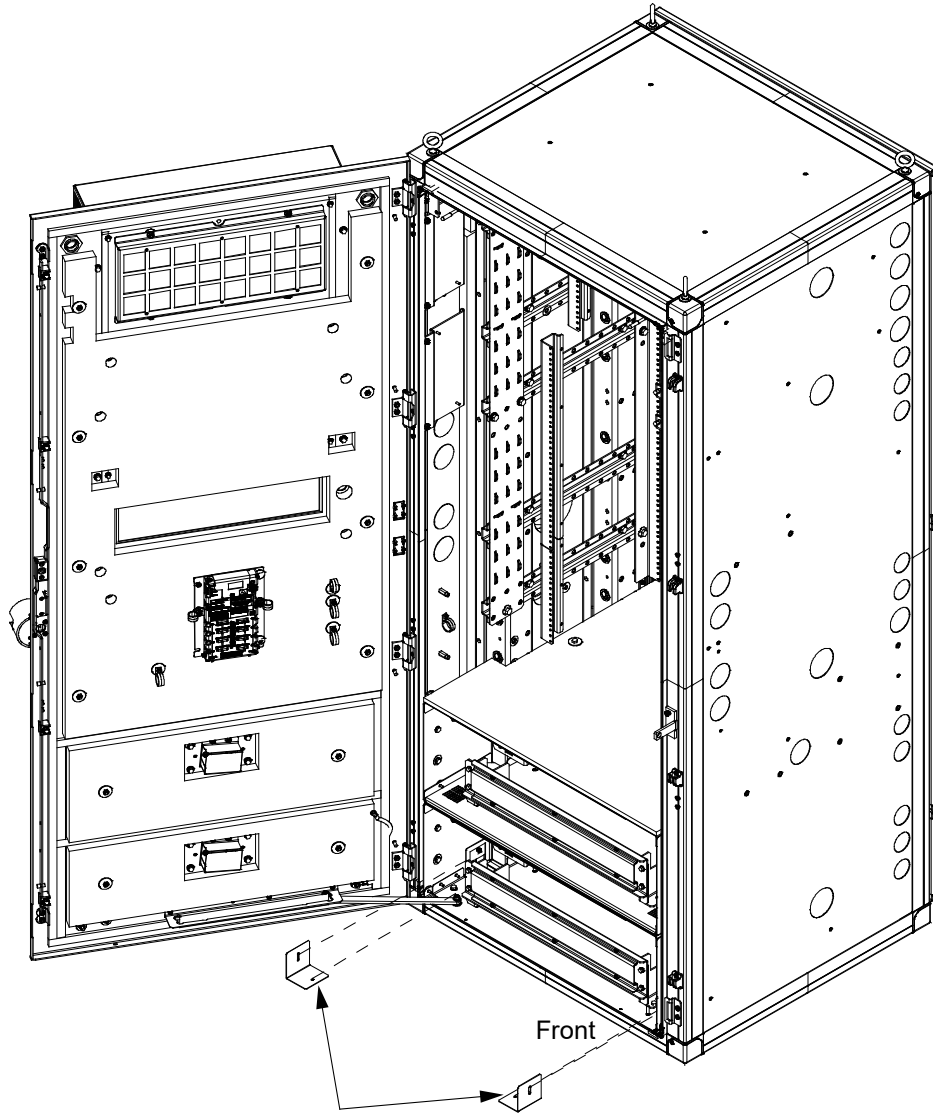


6. Tap enclosure anchors loosely into position, leaving about 3/4" above the enclosure's mounting surface. If a battery box is installed, align and loosely set the rear set of anchors first, then go to the front of the lowest battery box. Remove the L-shaped covers that hide the front anchor positions (refer to Figure 6.7) and tap enclosure anchors loosely into position.
7. Use a level and the shims supplied with the enclosure accessory kit to level the enclosure as required. Slots in shims must be aligned with enclosure mounting holes to work properly for seismic Zone 4 applications.
8. Open and close the front door and verify it will open, close, and lock properly. If not, adjust the shims, until the door functions properly.
9. Complete installation of enclosure anchors. If present, re-install the L-shaped anchor covers in the lowest battery box (refer to Figure 6.7).
10. When the enclosure is secured, remove the slings, the tagline, and the lifting eyebolts.
11. Remove the rear access panels and put to the immediate side. See "Removing/Installing Rear Access Panels" on page 22.
12. If leaving the site or enclosure unattended:
 - Put the accessory kit back into the enclosure.
 - Install all rear access panels.
 - Close and secure the front door.
 - If storing for more than one month, review requirements of long-term storage.

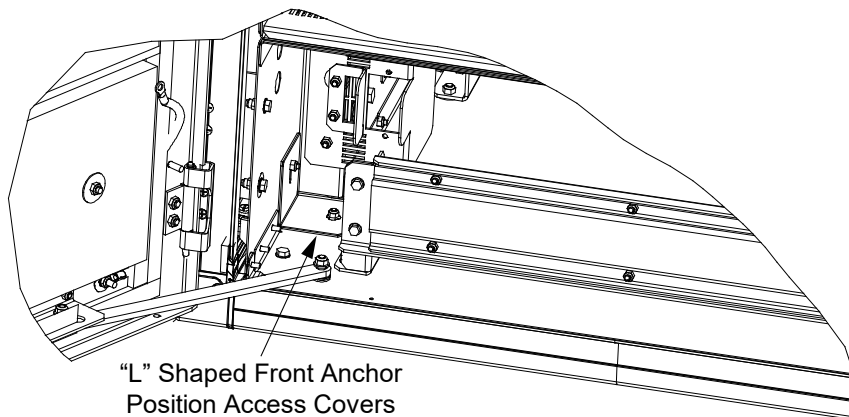


ALERT! If the enclosure will not be powered up for an extended period, place a heat source, such as a 100 W light bulb inside the enclosure to prevent condensation.

Figure 6.7 Enclosure Front Anchor Battery Box Covers



"L" Shaped Front Anchor
Position Access Covers



"L" Shaped Front Anchor
Position Access Covers

7 Sealing Primary Equipment Compartment Cable Entries

In keeping with local practices, seal all cable grommets and cable entry points.

It is extremely important to maintain a well-sealed enclosure primary equipment compartment. Failure to do so can jeopardize the enclosure sensitive electronics, as well as the proper functioning of enclosure systems. All cable interfaces into the primary equipment compartment must be properly sealed after installation of cables.

Conduits Enter the Rear Lower Access Panel or Cabinet Sidewalls Option: No enclosure pre-preparation required, except planning for the conduit runs to the enclosure. It is advised to use LB pull boxes at the enclosure connection to facilitate easier cable pulling. If adjacent LB pull boxes interfere with each other because of conduit routing, it is advised to add a conduit extension off the panel to push one of the LB boxes away from the panel.

If individual cables are being routed directly into the enclosure, straight male watertight cord connectors may be used within the different knockouts. Cables up to 1.88"DIA may be used in cord connectors for the 2" trade-size knockouts (ref Hubbell p/n's SHC1065 - SHC1069). Use the correct cord connector for the diameter of cable being passed into the enclosure.

Conduits Enter the Bottom Panel of the Enclosure: The knockouts in the bottom panel of the enclosure are to be removed as needed so that conduits can be run to the conduit plate and secured with conduit fittings.

- See "Removing/Installing Rear Access Panels" on page 22 to remove the rear access panels.
- Disconnect the bonding cable from the bottom rear access panel (2-hole lug) and set the panel aside.
- The top and middle rear access panels can be re-installed for enclosure installation.

The battery box cable entry fittings have internal rubber collars to aid in sealing against the cables, but additional sealant and/or tape may be required to provide an acceptable seal.

8 Grounding the Enclosure



ALERT! Grounding should be accomplished according to local practices and in accordance with the latest NEC codes.

All enclosure grounding and ground ring must be installed prior to turn up of enclosure.

- The internal enclosure frame and all attached equipment are factory grounded to the enclosure Master Ground Bar (MGB).
- Two ground ring termination blocks are provided at the lower rear of the enclosure. A 2 AWG lead is factory connected from the enclosure Master Ground Bar (MGB) to one of the ground ring termination blocks. The second ground ring termination block is also factory connected to the first with a 2 AWG lead.
- The external enclosure shell is internally grounded to the ground ring termination blocks.

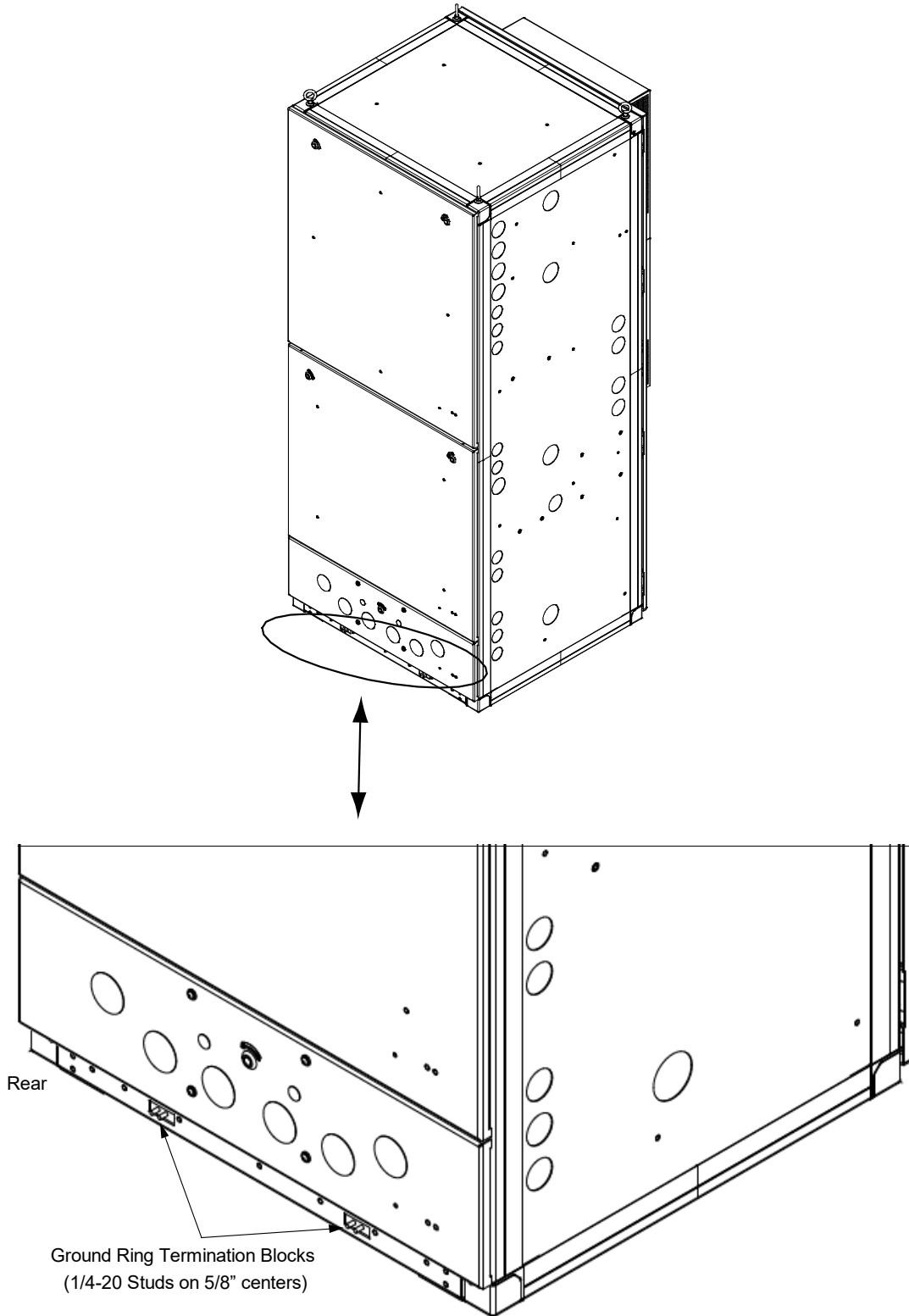
The enclosure should be grounded to an external ground ring using a 2 AWG solid wire. The resistance of the ground ring, as verified with a Megger, shall be less than 25 ohms. Refer to "Site Ground" on page 28 for supporting information.

Procedure

1. Connect a ground ring termination block to site ground per local practices. Refer to Figure 8.1 for location. Refer also to Figure 6.1. The ground ring termination blocks are equipped with 1/4"-20 studs on 5/8" centers for installation of customer provided lugs. Refer to Table 5.1 for recommended lugs. Recommended wire size is 2 AWG.

Alternatively, two ground ring termination blocks are provided, enabling the enclosure to be "daisy-chain" bonded into a series of enclosures utilizing only one (1) earth-ground link for the entire enclosure set.

Figure 8.1 Enclosure Ground Ring Termination Block Locations



9 AC Power

9.1 Safety Precautions



DANGER! RISK OF ELECTRICAL SHOCK, GENERAL

All ground connections must be installed and verified, prior to connecting any power cables (AC or DC) and turning-up of enclosure.

Before installation, the AC grounding electrode system must be bonded to an AC main service power neutral/ground bus. Contact your local power company or local practices for information about codes or restrictions for your installation.

When connecting any discrete power connection, make the connection first with the ground/return and break last with ground/return.

Remove rings, metallic wrist bands, or bracelets, etc.



DANGER! RISK OF ELECTRICAL SHOCK, AC

Proper actions, include, but not limited to:

- a) Verify before contacting the enclosure that no current leakage or ground fault condition is present.
- b) Verify a proper ground is in place.
- c) Verify for AC hook-up, all enclosure circuit breakers are OFF and the utility incoming feed is OFF.

Use a trained licensed electrician.



DANGER! ELECTRICAL HAZARD

Observe all safety precautions as specified by local building codes and the National Electrical Code (NEC). All procedures should be performed by a licensed electrician. If local building codes specify procedures different from those in this section, follow local codes.

9.2 Enclosure Schematic

The complete system schematic is included with each enclosure.

9.3 AC Input Connections

Important Safety Instructions



DANGER! Adhere to the “Important Safety Instructions” presented at the front of this document.

The enclosure requires separate AC feeds for the GFCI outlet and optional AC battery heater kit (p/n 565616). The AC feed is connected directly to the GFCI outlet.



NOTE! If a DC power system is installed in the enclosure, refer to the instructions provided with the DC power system for AC input connection details.

Make connections per the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), and applicable local codes.

The following procedure shall be performed by a trained electrician.

Procedure

1. Use a non-contact voltage detector to verify the enclosure is safe.
2. Verify that the enclosure is properly grounded.
3. Verify that all breakers feeding the enclosure and all breakers within the enclosure are in the OFF position.
4. Refer to the schematic drawings shipped with your enclosure for a detailed AC wiring diagram. See also Figure 9.2.
5. Remove the rear access panels. See “Removing/Installing Rear Access Panels” on page 22.
6. Determine the AC cabling route into the enclosure for your installation site. There are knockouts located on the lower rear access panel, the enclosure sidewalls, and also knockouts on the rear enclosure floor. Refer to Figure 9.1. Refer also to “Enclosure Conduit Entry Options” on page 34.
7. Pull the AC power and ground cables into the enclosure. Refer to Figure 9.1 and Figure 9.2.
 - a) You will need one (1) 120 VAC, 15 A circuit to feed the GFCI outlet.
 - b) You will need Optional Battery Heater Kit (565616).
8. Connect the above feed per Figure 9.2.
9. After cables are installed, refer to “Sealing Primary Equipment Compartment Cable Entries” on page 42 and seal all cable grommets and cable entry points.

Figure 9.1 AC Input Knockout Locations

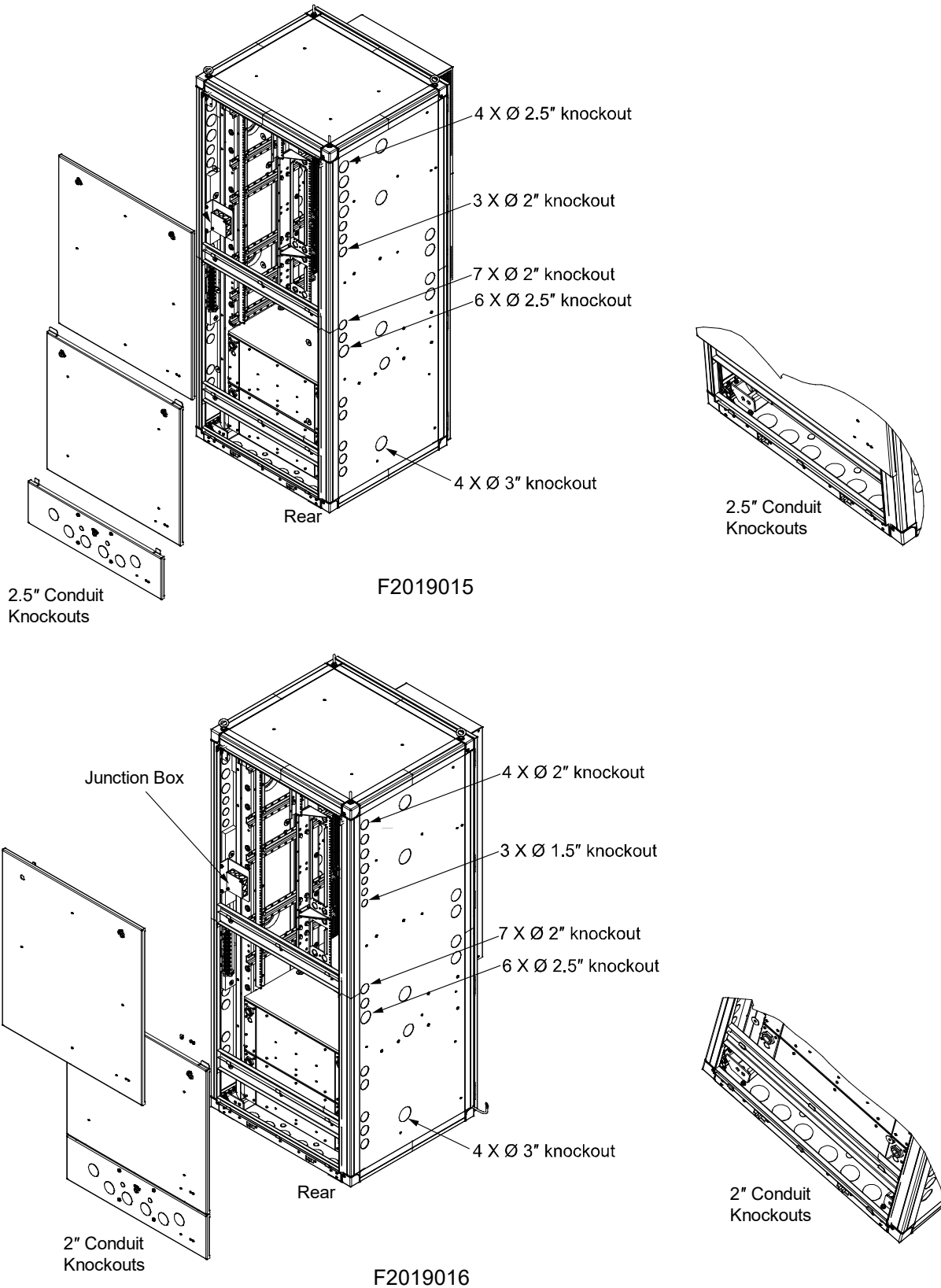
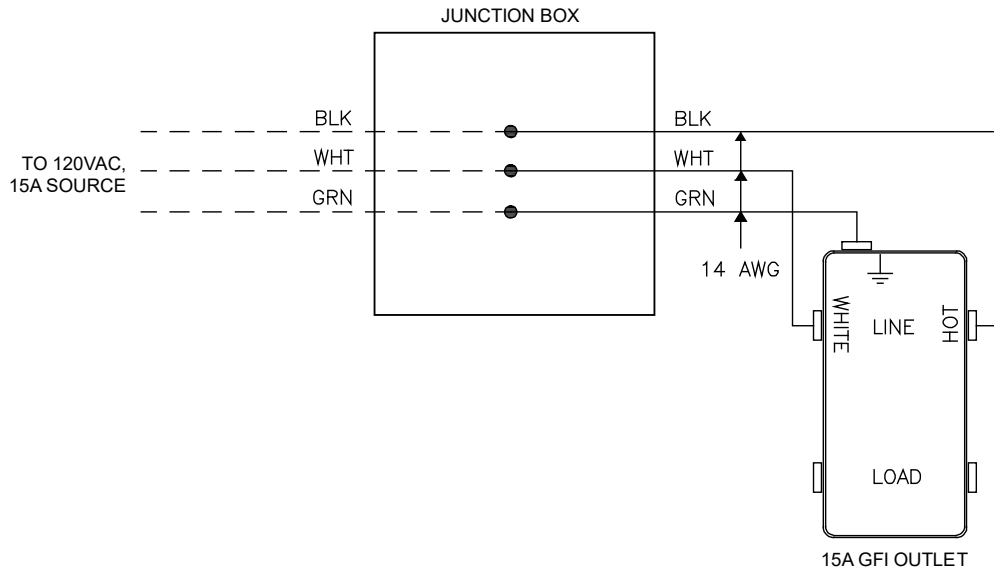


Figure 9.2 AC Input Terminations Location



10 DC Power

10.1 Safety Precautions



DANGER! RISK OF ELECTRICAL SHOCK, GENERAL

All ground connections must be installed and verified prior to connecting any power cables (AC or DC) and turning-up of enclosure.

When connecting any discrete power connection, make the connection first with the ground/return and break last with ground/return.

Remove rings, metallic wrist bands, or bracelets, etc.

Do not install equipment showing any physical damage.



DANGER! RISK OF ELECTRICAL SHOCK, DC

An OFF Battery Switch / Breaker does not isolate the batteries, nor do the batteries have a protective fuse. Thus, handle accordingly and use only insulated tools when working around batteries or any DC potential.

In addition, be sure that all connection points have been de-energized.

GMT fuses can produce sparks during interruption or clearing of a fault, so only use Bussman GMT fuses provided with safety caps.

10.2 General

Refer to “Site Ground” on page 28 and “Grounding the Enclosure” on page 42 for information on site and enclosure ground respectively.

10.3 DC Power Cabling Color Scheme

On the enclosure, the DC power cabling color scheme is:

- BLACK is return
- RED or BLUE is -48 VDC Power.

10.4 DC Power System

The enclosure may include a DC power system and distribution.

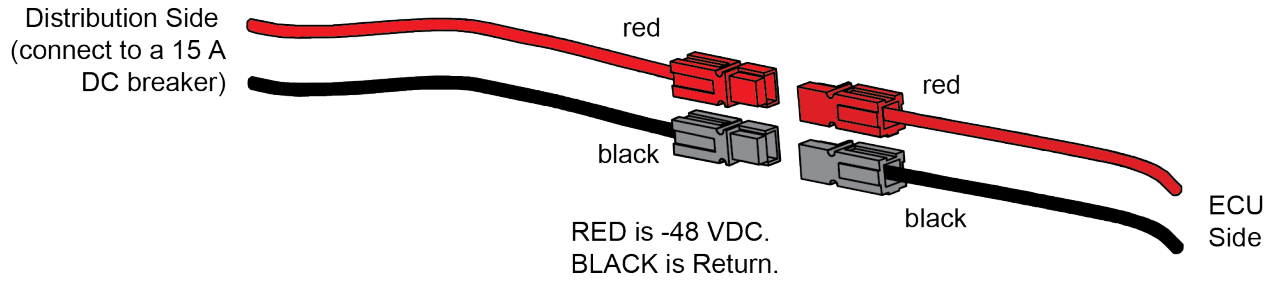
Refer to the documentation furnished with the power system.

10.5 ECU Power Connectors (F2019015 only)

The ECU power connectors are located to the right of the ECU.

NOTE! The ECU power connectors are connected at the factory. These connections should be only temporarily broken and made during a service event.

Figure 10.1 ECU Power Connectors



11 OSP Cables

11.1 General



DANGER! RISK OF ELECTRICAL SHOCK, OSP CABLES

If joint buried cables are used, check the cable sheath for voltage in accordance with local standards. If voltage is detected, do not proceed with the installation. Contact the supervisor and do not proceed until the voltage hazard is eliminated.



NOTE! *The following steps are recommendations only, and are perform in conjunction with procedures and training that adhere to local practices.*



NOTE! *The following instructions assumes the undressed cables have been pulled into the enclosure and sealed.*

11.2 Sealing Cable Entries

After cables are installed, refer to "Sealing Primary Equipment Compartment Cable Entries" on page 42 and seal all cable grommets and cable entry points.

11.3 Installing OSP Cables

OSP cables are run in the conduit openings indicated in Figure 9.1.

12 Alarm Wiring

12.1 Connecting External Alarms

An alarm block is provided for the following purpose.

- Enclosure Alarms

Refer to Figure 12.1 and Figure 12.2 for location.

F2019015 and F2019016: The alarm block is a 50 Pair split center block. Column A is internally connected to column B and Column C is internally connected to column D. Terminate alarms on column A.

12.1.1 Enclosure Alarms

All alarms for customer connections are brought out to an alarm block. Refer to Figure 12.1 and Figure 12.2 for location and pinouts.

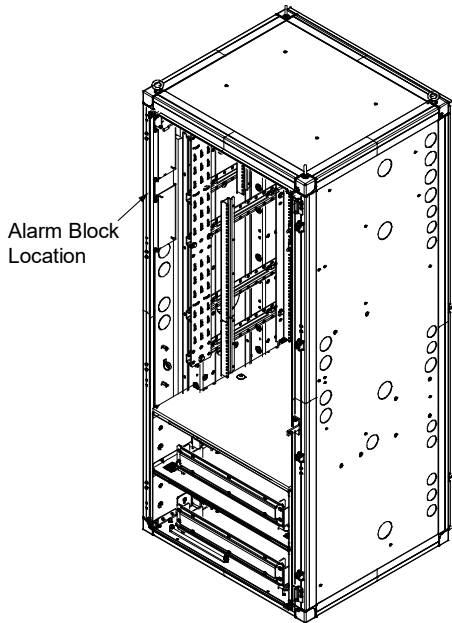
12.1.2 Typical Battery Alarm Wiring

Refer to Figure 12.3.



NOTE! F2019015 and F2019016 battery alarms are configured for two (2) battery strings as shipped from the factory. If only one (1) battery string is utilized, the 2nd circuit breaker will produce an alarm when turned off. See alarm schematic (Figure 12.1 or Figure 12.2) for details on how to reconfigure for one (1) battery string.

Figure 12.1 Local Alarm Block Schedule (F2019015) (cont'd on next page)



Alarm Block Location

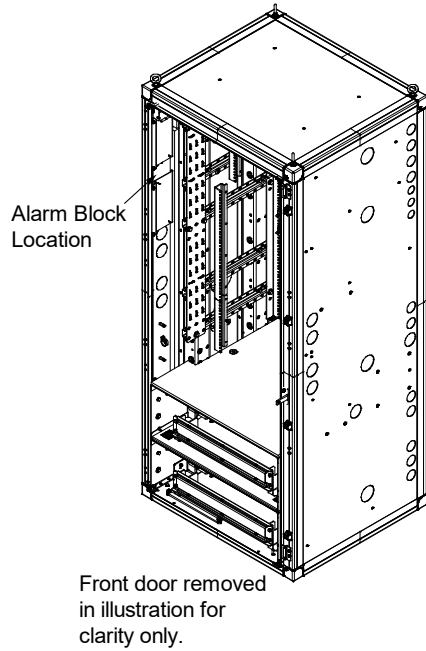
Front door removed in illustration for clarity only.

R66 BLOCK# 1							
ALARM POS	CLIP #	ALARM	SOURCE	A	B	C	D
1	1	DOOR_INTRUSION	ECU/DOOR SWITCH	BLU			
	2			BRN			
2	3	COMMERCIAL_POWER_FAILURE	DC POWER SYSTEM				
	4						
3	5	SURGE_SUPPRESSOR LIGHTNING_ARRESTER	SURGE SUPPRESSOR				
	6						
4	7	RECTIFIER_FAILURE	DC POWER SYSTEM				
	8						
5	9	MULTIPLE RECTIFIER_FAILURE					
	10						
6	11	BATTERY_DISCHARGE					
	12						
7	13	LOW_VOLTAGE					
	14						
8	15	DC_POWER_FAILURE					
	16						
9	17	GENERATOR_RUNNING	GENERATOR				
	18						
10	19	GENERATOR_LOW_FUEL					
	20						
11	21	GENERATOR_FAILURE					
	22						
12	23	HVAC_FAILURE	HVAC/ECU	BLK			
	24			WHT			
13	25	SMOKE_FIRE					
	26						
14	27	HIGH_TEMP	TSTAT/ECU	VIO			
	28			YEL			
15	29	TOWER_LIGHT (REQUIRES FAA NOTAM)					
	30						
16	31	TOWER_LIGHT_SIDE					
	32						
17	33	RRU_UP_CONVERTER_FAILURE	DC/DC CONVERTER				
	34						
18	35	RRU_POWER_FAILURE	OVP SHELF				
	36						
19	37	RRU_HIGH_HUMIDITY					
	38						
20	39	RRU_INTRUSION					
	40						
21	41	SECONDARY_HVAC_RUNNING					
	42						
22	43	FIRE_SUPPRESSION_DISCHARGE					
	44						
23	45	FIRE_SUPPRESSION_TROUBLE					
	46						
24	47	LOW_TEMP					
	48						
25	49	DEHYDRATOR_ALARM					
	50						

Figure 12.1 Local Alarm Block Schedule (F2019015) (cont'd from previous page)

R66 BLOCK# 2							
ALARM CKT	CLIP #	ALARM	SOURCE	A	B	C	D
26	1	BUS_BAR_THEFT					
	2						
27	3	HIGH_HUMIDITY					
	4						
28	5	EXPLOSIVE_GAS					
	6						
29	7	HIGH_WATER					
	8						
30	9	SUMP_PUMP					
	10						
31	11	TOXIC_GAS					
	12						
32	13	BATTERY_BREAKER	BATTERY BREAKERS	WHT/ORG2			
	14						
33	15	HEATER	DC HEATER				
	16						
34	17	MINOR	DC/DC CONVERTER				
	18						
35	19						
	20						
36	21						
	22						
37	23						
	24						
38	25						
	26						
39	27						
	28						
40	29						
	30						
41	31						
	32						
42	33						
	34						
43	35						
	36						
44	37						
	38						
45	39						
	40						
46	41						
	42						
47	43						
	44						
48	45						
	46						
49	47						
	48						
50	49						
	50						

Figure 12.2 Local Alarm Block Schedule (F2019016) (cont'd on next page)

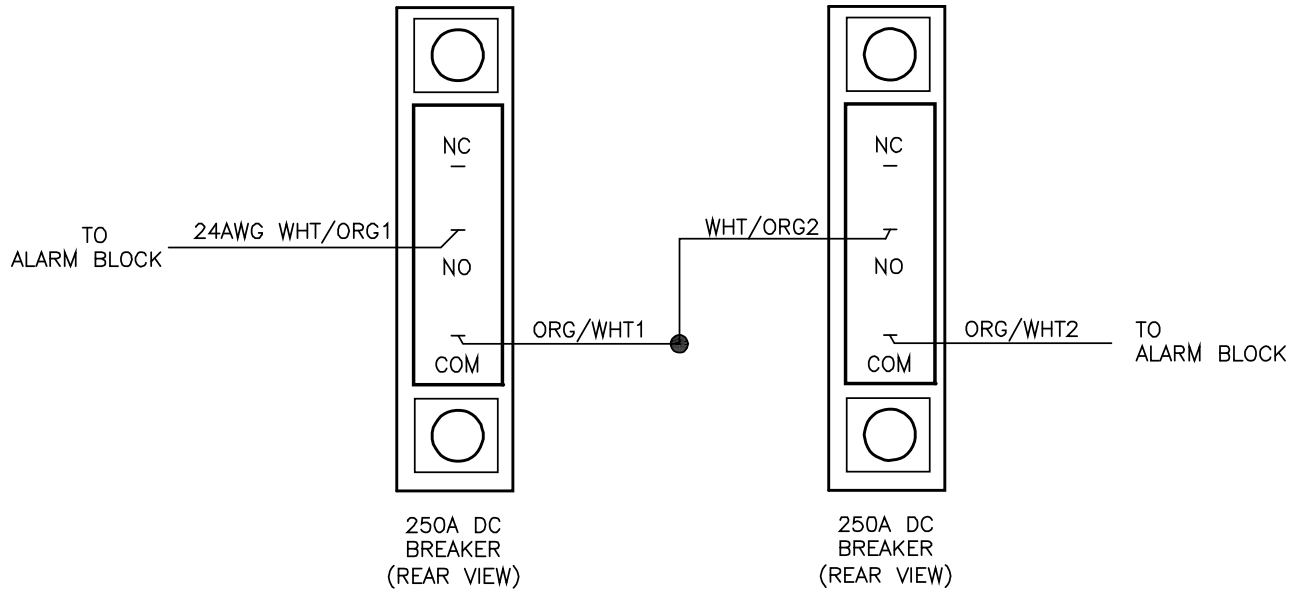


R66 BLOCK# 1								
ALARM POS	CLIP #	ALARM	SOURCE	A	B	C	D	
1	1	DOOR_INTRUSION	ECU/DOOR SWITCH	RED				
	2			BLK				
2	3	COMMERCIAL_POWER_FAILURE	DC POWER SYSTEM					
	4							
3	5	SURGE_SUPPRESSOR LIGHTNING_ARRESTER	SURGE SUPPRESSOR					
	6							
4	7	RECTIFIER_FAILURE	DC POWER SYSTEM					
	8							
5	9	MULTIPLE_RECTIFIER_FAILURE						
	10							
6	11	BATTERY_DISCHARGE						
	12							
7	13	LOW_VOLTAGE						
	14							
8	15	DC_POWER_FAILURE						
	16							
9	17	GENERATOR_RUNNING	GENERATOR					
	18							
10	19	GENERATOR_LOW_FUEL						
	20							
11	21	GENERATOR_FAILURE						
	22							
12	23	HVAC_FAILURE		HVAC/ECU	BLU/WHT			
	24				WHT/BLU			
13	25	SMOKE_FIRE						
	26							
14	27	HIGH_TEMP	T'STAT/ECU	RED				
	28			BLK				
15	29	TOWER_LIGHT (REQUIRES FAA NOTAM)						
	30							
16	31	TOWER_LIGHT_SIDE						
	32							
17	33	RRU_UP CONVERTER_FAILURE	DC/DC CONVERTER					
	34							
18	35	RRU_POWER_FAILURE	OVPSHELF					
	36							
19	37	RRU_HIGH_HUMIDITY						
	38							
20	39	RRU_INTRUSION						
	40							
21	41	SECONDARY_HVAC RUNNING						
	42							
22	43	FIRE_SUPPRESSION_DISCHARGE						
	44							
23	45	FIRE_SUPPRESSION_TROUBLE						
	46							
24	47	LOW_TEMP						
	48							
25	49	DEHYDRATOR_ALARM						
	50							

Figure 12.2 Local Alarm Block Schedule (F2019016) (cont'd on next page)

R66 BLOCK# 2							
ALARM CKT	CLIP #	ALARM	SOURCE	A	B	C	D
26	1	BUS_BAR_THEFT					
	2						
27	3	HIGH_HUMIDITY					
	4						
28	5	EXPLOSIVE_GAS					
	6						
29	7	HIGH_WATER					
	8						
30	9	SUMP_PUMP					
	10						
31	11	TOXIC_GAS					
	12						
32	13	BATTERY_BREAKER	BATTERY BREAKERS	WHT/ORG2			
	14			ORG/WHT1			
33	15	HEATER	DC HEATER				
	16						
34	17	MINOR	DC/DC CONVERTER				
	18						
35	19						
	20						
36	21						
	22						
37	23						
	24						
38	25						
	26						
39	27						
	28						
40	29						
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41	31						
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47	43						
	44						
48	45						
	46						
49	47						
	48						
50	49						
	50						

Figure 12.3 Typical Battery Alarm Wiring



13 Batteries

13.1 Safety Precautions



DANGER! RISK OF ELECTRICAL SHOCK, GENERAL

All ground connections must be installed and verified prior to connecting any power cables (AC or DC) and turning-up of enclosure.

When connecting any discrete power connection, make the connection to the ground/return first.

When disconnecting any discrete power connection, remove the connection to the ground/return last.

Remove rings, metallic wrist bands, or bracelets, etc.

Do not install equipment showing any physical damage.



DANGER! RISK OF ELECTRIC SHOCK

The DC bus may be powered by DUAL power sources – Rectifiers and DC Batteries.

To properly work on the system, de-energize by disconnecting BOTH power sources. Even with the batteries turned off by using a local battery (circuit breaker) disconnect, batteries are still “LIVE” and hazardous, including a voltage >50 VDC, and a source of high short circuit current.

Use extreme caution around the batteries and terminals.

Do not smoke.

Remove all jewelry, use proper Personal Protective Equipment (PPE), and use only insulated tools.



WARNING! RISK OF CHEMICAL EXPOSURE

A battery can present harmful chemicals. Refer to the Battery Installation Manuals and MSDS supplied with the batteries. Work in a ventilated area and follow all safety procedures.

At a minimum, wear safety glasses and gloves when working with batteries.



WARNING! RISK OF HAZARDOUS SUBSTANCES

After handling of the enclosure or any such component; such as batteries, cables, busbars, etc., always wash hands immediately after.



WARNING! RISK OF EXPLOSION

For safety reasons, never restrict or block the airflow through the door or entry panel ventilation openings.



WARNING! RISK OF INJURY, LIFTING BATTERIES

Batteries are heavy, use appropriate techniques and assistance when handling.



CAUTION! PREVENT EQUIPMENT DAMAGE, PROPER HANDLING

Do not stack batteries or lay them on their side. Do not tip batteries -- keep in upright position at all times.



CAUTION! PREVENT EQUIPMENT DAMAGE, MAINTAIN VENTILATION

To optimize the service life of this equipment, make sure there are no obstructions in front of the ventilation openings.



NOTE! Follow all battery manufacturer's and locally approved safety procedures and wear appropriate safety gear when handling the batteries and connecting them.

13.2 Battery Boxes

Up to two (2) battery boxes may be installed within the equipment frame. Each battery box houses one (1) -48V string of NiCd batteries.

13.2.1 Battery Boxes Heating

The batteries may be heated through use of the optional battery heater kit (p/n 565616).

13.2.2 Cabling

One set of 4/0 AWG battery cables are provided for each of the two (2) battery boxes. Battery intercell connectors are not supplied with the enclosure and need to be ordered with the batteries.

13.2.3 Battery Disconnect

A battery disconnect circuit breaker (250 A) is provided in each of the battery boxes.

13.2.4 Anti-Oxidant

Before making any connection, ensure that all contact surfaces have been cleaned and coated with a thin coat of NO-OX-ID-A, or other equivalent anti-oxidant compound.

13.2.5 Physical Battery Placement

Figure 13.5 illustrate the typical placement of batteries in one of the two (2) battery boxes.

13.2.6 Physical Size of Battery Box

The free space available for batteries in each of the two (2) battery boxes is:

- 23.78" (60.40 cm) wide for all four batteries.
- 26.07" (66.21 cm) deep.
- 10.63" (27.00 cm) high.

13.3 Supported Batteries

The enclosure can be equipped with two (2) -48 VDC battery strings, providing emergency backup power in the event that AC service is lost.

The enclosure supports the batteries listed in Table 13.1 at a minimum.

Table 13.1 Supported NiCd Batteries (F2019015, F2019016)

Battery	Amp Hours per String @ 8 hrs	Dimensions (Inches) H x W x D
SAFT Tel.X+180	180 Ah	10.0 x 20.7 x 25.9 (overall)

13.4 Battery Installation and Connection



CAUTION! PROVIDE MOST STABLE LOADING

If only one (1) battery string is installed, install batteries in the bottom battery box. If two (2) battery strings are installed, install batteries in the bottom two battery boxes.



NOTE! The enclosure is not shipped with batteries installed. The batteries are to be installed in the field.

ENCLOSURE IS PRE-WIRED FOR -48 VDC BATTERY INSTALLATION ONLY.

The enclosure includes two (2) battery boxes. Each battery box holds one (1) -48 VDC string of NiCd batteries. Cabling in the enclosure is provided and pre-wired for two (2) -48 VDC battery strings only.



NOTE! Battery cables may be connected to the busbars in the DC power plant as shipped to site. If less than two (2) battery strings to be used, unused battery cables should be disconnected from the power system to avoid an electrical hazard.



DANGER! ELECTRICAL HAZARD. Risk of serious injury and/or equipment damage.

Exercise extreme care when handling the batteries and connecting them to the string. Two people are recommended for lifting and placing batteries. Wear heavy gloves and safety glasses while lifting the batteries. Handle each battery ONLY by its lifting slot. Keep hands well away from the connector posts.

Arcing is possible during battery connection procedures. Use heavy gloves during all procedures involving the batteries to avoid potential injury. Do not wear rings, metallic wrist bands or bracelets when working on batteries. Do not allow metal objects to rest on the batteries or to fall across the terminals.

Make sure the battery disconnect breakers are set to "OFF".

Refer to:

- The schematic drawings shipped with your enclosure for a wiring diagram.
- The battery vendor's documentation set for installation and testing instructions of the string.

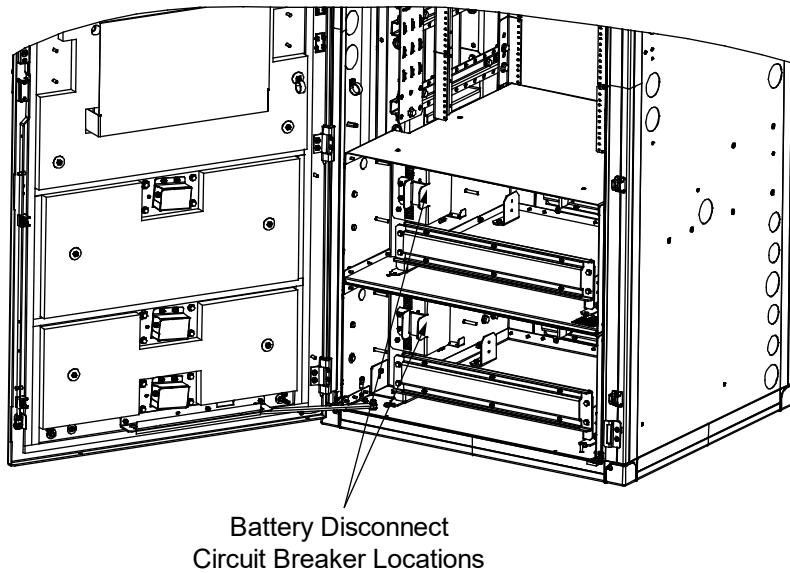
Follow all safety precautions and notices as listed in the battery vendors documentation set.

Perform one of the following procedures to install SAFT NiCd batteries into the lower enclosure battery box. Repeat the steps for other battery boxes.

13.4.1 Installing and Connecting SAFT NiCd Batteries (F2019015, F2019016)

1. Open the front door of the enclosure.
2. Remove the front braces from each battery box and set braces and hardware aside for later use.
3. Before installing the battery string, check the battery cabinet power cables polarity. Using a digital multimeter (DMM), make sure the -48VDC and +0VDC are properly installed and labeled.
4. Ensure all battery disconnect circuit breakers are in the “off” position. See Figure 13.1 for location. Using a DMM, measure the battery power cables: Voltage reading should be +0VDC.

Figure 13.1 Battery Disconnect Circuit Breaker Locations



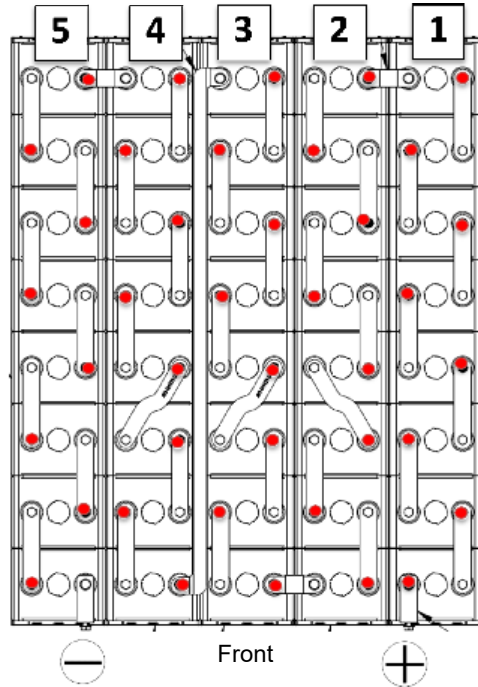
5. Properly insulate the battery power cables prior to installing the batteries.



NOTE! Batteries should be installed one level at a time.

6. Stage the battery blocks in front of the cabinet, as shown in Figure 13.3. Follow the block orientation and polarity as shown in Figure 13.2.

Figure 13.2 SAFT NiCd Battery String Layout and Block Mapping Diagram



7. Place the battery (+) end (Block 1) with a bar code to the rightmost front position. See Figure 13.3.

Figure 13.3 Staging the SAFT Battery Blocks



NOTE: The image shown is from other SAFT battery installations. Use for reference only.

8. Remove all block-end covers (front and back) to access battery block terminals.

Figure 13.4 Removing Block-end covers to Expose Terminals



NOTE: The image shown is from other SAFT battery installations.
Use for reference only.

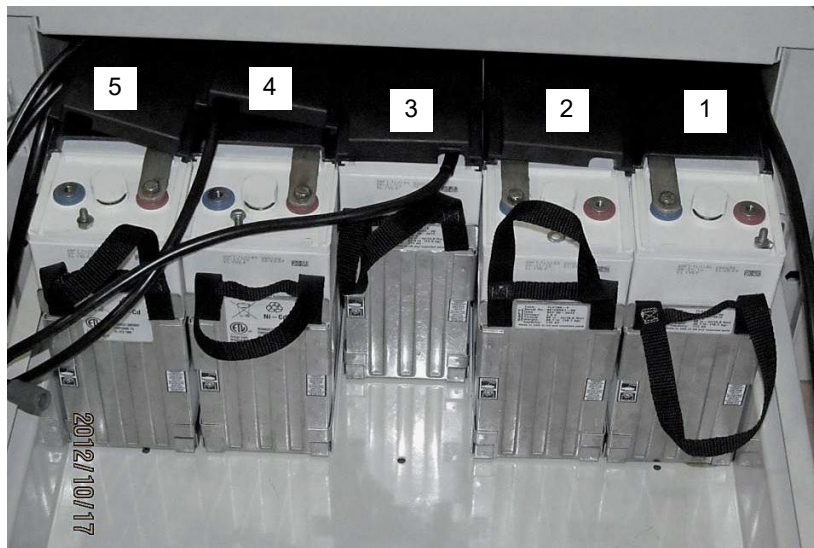
9. Measure and record on the SAFT Installation Instruction Sheet 80-94890-02 I/O sheet all block voltage readings.
10. Remove all end-terminal bolts and wave washers used to connect the blocks and apply No-Ox to terminals surface.
11. Attach long interblock connector to negative terminal of Block 3. Protect front-end with electrical tape or other insulating material before handling battery block.



NOTE! Torque at 96 in-lbs and apply No-Ox to all exposed metal surface.

12. Place blocks 1, 2, 4, and 5 inside the battery shelf. See Figure 13.5.

Figure 13.5 Placing Blocks 1, 2, 4 and 5 on Battery Shelf



- Supporting the front end of the batteries, install the short interconnecting strap across the terminals on the rear of Blocks 1-2. Install the block end cover, and push both batteries to the rear of the shelf. Perform the same steps for Block 4-5.



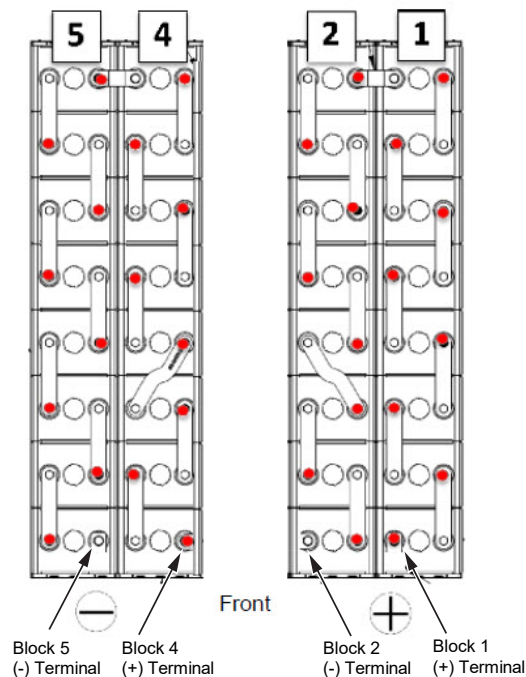
NOTE! Torque at 96 in-lbs and apply No-Ox to all exposed metal surface.



NOTE! Keep battery handles upright for easier installation.

- Using a DMM, measure voltage between the (+) terminal of Block 1 and the (-) terminal of Block 2. Reading should be equal to the sum of the two blocks' total voltage. Perform the same step, measuring across the (+) terminal of Block 4 and the (-) terminal of Block 5. See Figure 13.6.

Figure 13.6 Measuring voltage between the Blocks



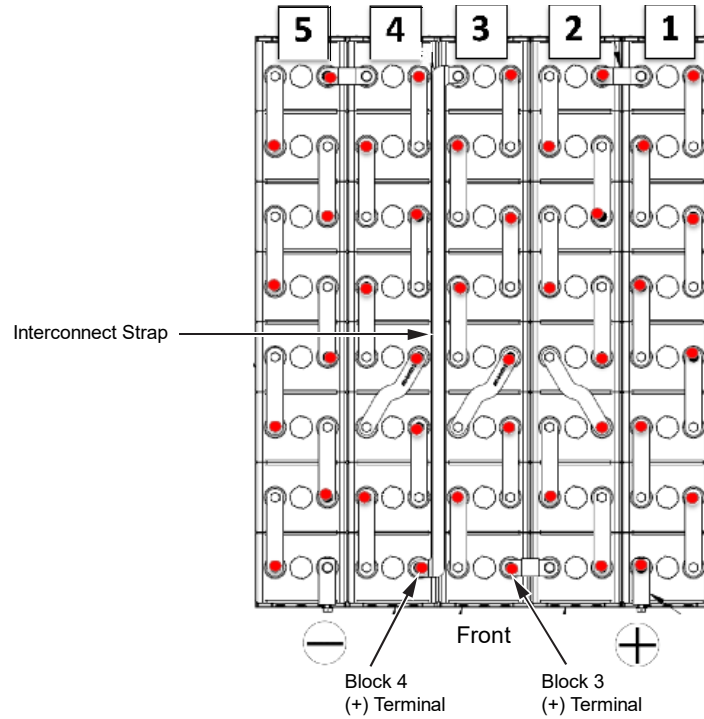
- Install Block 3 (with long interconnect strap attached and insulated, with block end-cover installed) into the shelf; push to the rear of the shelf.



NOTE! Keep battery handles upright for easier installation.

- Carefully removing the insulating material from the long interconnect strap, use a DMM to measure voltage between the (+) terminal of Block 3 and the end of the long interconnect strap. Reading should be equal to the Block 3 voltage.
- Using a DMM, measure the voltage between the (+) terminal of Block 4 and the end of the long interconnect strap connected to Block 3. Reading should be 0VDC.

Figure 13.7 Measuring Voltage between (+) Terminal and Cable



18. Connect Blocks 2-3 (short strap) and 3-4 (long strap) and secure with the bolts and wave washers. Re-install block end covers.



NOTE! Torque at 96 in-lbs and apply No-Ox to all exposed metal surface.

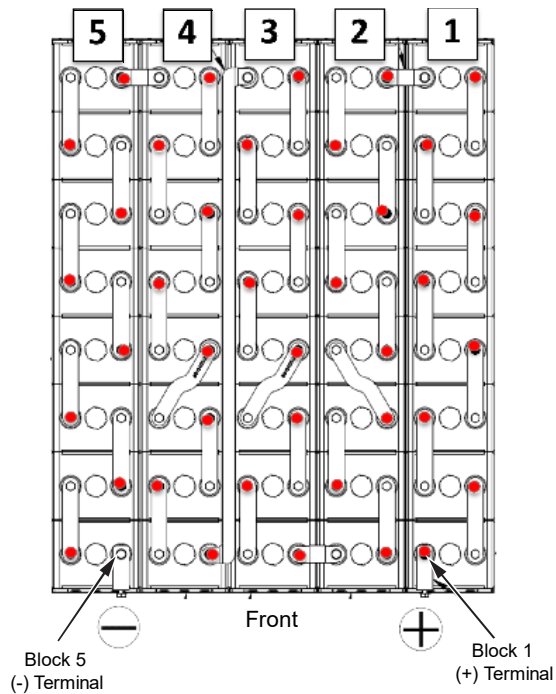
19. Install front-post adapters from SAFT kit to the (+) terminal of Block 1 and the (-) terminal of Block 5. Refer to Figure 13.2 for finished installation.



NOTE! Torque at 96 in-lbs and apply No-Ox to all exposed metal surface.

20. Using a DMM, measure voltage between the (+) terminal of Block 1 and the (-) terminal of Block 5. Reading should be equal to the sum of voltage of all battery blocks previously noted in the I/O sheet. Re-install the rest of the block end-covers.

Figure 13.8 Measuring Voltage between (+) Terminal 1 and (-) Terminal 5



21. Re-install the battery box front braces re-using hardware that was set aside.
22. For each battery box, locate the pre-wired positive (+) battery cable (originating from the power system's battery return busbar). Connect this cable to the positive (+) battery string terminal.



NOTE! Torque at 96 in-lbs and apply No-Ox to all exposed metal surface.

23. For each battery box, ensure the battery disconnect circuit breaker is in the "OFF" position before performing the next step.
24. For each battery box, locate the pre-wired negative (-) battery cable (originating from the respective battery disconnect circuit breaker). Connect this cable to the negative (-) battery string terminal.



NOTE! Torque at 96 in-lbs and apply No-Ox to all exposed metal surface.

25. Close the door of the enclosure.

14 Initial Power Up

14.1 Safety Precautions



DANGER! RISK OF ELECTRICAL SHOCK, GENERAL

All ground connections must be installed and verified prior to turning-up of enclosure.



DANGER! RISK OF ELECTRICAL SHOCK, AC

Proper actions, include, but not limited to:

- a) Verify before contacting the enclosure that no current leakage or ground fault condition is present.
- b) Verify a proper ground is in place.



CAUTION! PREVENT EQUIPMENT DAMAGE, FROM CONDENSATION

Until the enclosure is turned up for service, the bags of desiccant shipped with the enclosure must remain in the enclosure to prevent condensation.

Once service is in-place, remove the desiccant.

14.2 Prerequisite

All procedures and safety notices previous to this section have been observed, with the respect to the installation of the enclosure, ground, AC power, DC power, and batteries.

Similarly, all procedures and safety notices accompanying other installed equipment have been observed.

The enclosure now has a protected connection into the local utility power.

14.3 Initial Power Up Sequence

Checks

1. Use Non-Contact Voltage Detector to verify enclosure is not unsafe.
2. Verify all battery disconnect circuit breakers located on the battery boxes are Off.
3. Verify all other breakers inside the primary equipment compartment are Off.
4. Verify no open power leads are present.
5. Verify all cables and connections are secure.
6. Verify any installed battery, including proper matching of polarity.

Final Set-Up

1. Replace the rear access panels. See “Removing/Installing Rear Access Panels” on page 22. If the bonding cable to the bottom rear access panel was removed (see “Enclosure Conduit Entry Options” on page 34), re-connect the bonding cable to the bottom rear access panel at this time.
2. Install rectifier modules. Refer to the documentation furnished with the power system.

Power Up

1. Enable utility power into the enclosure by closing the external overcurrent protective devices supplying AC input to the enclosure.

- Use Non-Contact Voltage Detector to verify enclosure is not unsafe.
- Close the circuit breaker in the power system supplying power to the ECU.
- Allow ECU (if so equipped) a few minutes to complete start-up sequence.

Power System

1. Refer to the documentation furnished with the power system and perform any initial start-up procedures.

Final Steps

1. Close and secure the front door.

15 Climate Control Options (F2019015)

The enclosure contains a primary equipment compartment. At the bottom of the primary equipment compartment are sealed battery boxes. Two (2) battery boxes are factory installed. The top battery box may be field removed to allow additional equipment space within the enclosure. The primary equipment compartment is equipped with a Heat Exchanger (HX). The primary equipment compartment HX is controlled via thermistor TH1. TH1 must be located on the intake side of a critical piece of equipment mounted in the primary equipment compartment. The default location is 13" from the bottom left equipment rail.

15.1 ECU (Environmental Control Unit) and Thermal Components

15.1.1 ECU Description

Besides controlling all enclosure compartments thermal components, the ECU also provides the following functions:

- monitoring for thermal system component failure (fans and thermistors),
- high and low temperature alarming,
- and intrusion alarming (audible and extended relay contacts).

Refer to Figure 15.1 for an illustration of the ECU used in this enclosure.

THE ECU USED IN THIS ENCLOSURE IS POWERED BY -48 VDC.

THE ECU REQUIRES -48 VDC INPUT POWER. THERMAL SYSTEM IN ENCLOSURE REQUIRES -48 VDC INPUT POWER CONNECTION TO ECU. OBSERVE PROPER POLARITY TO ECU INPUT POWER CONNECTION:

- **RED WIRE: -48 VDC (BATTERY)**
- **BLACK WIRE: BATTERY RETURN / GROUND**

15.1.2 Overview Diagrams

Figure 15.1 ECU and Thermal Components Overview Diagram (cont'd on next page)

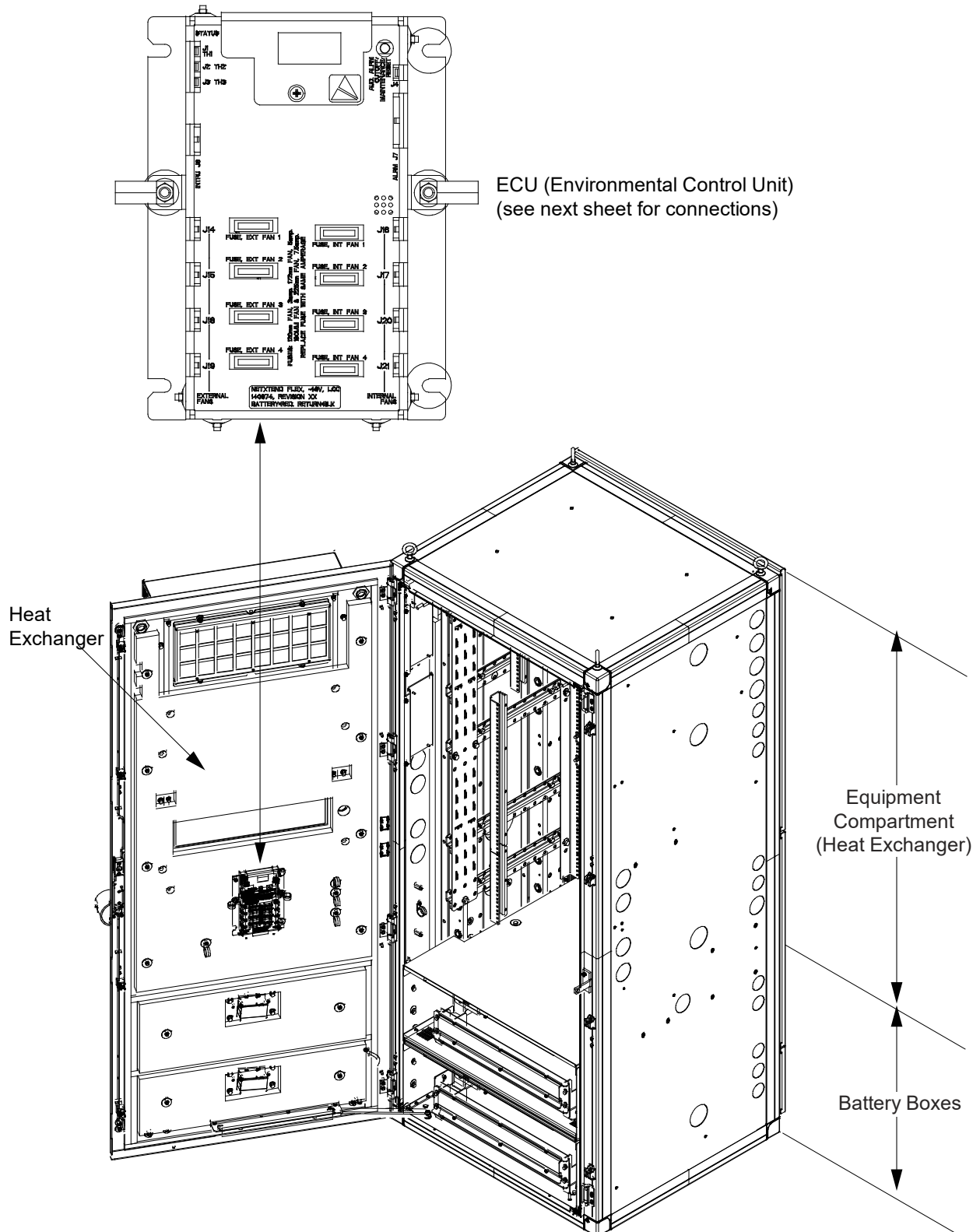
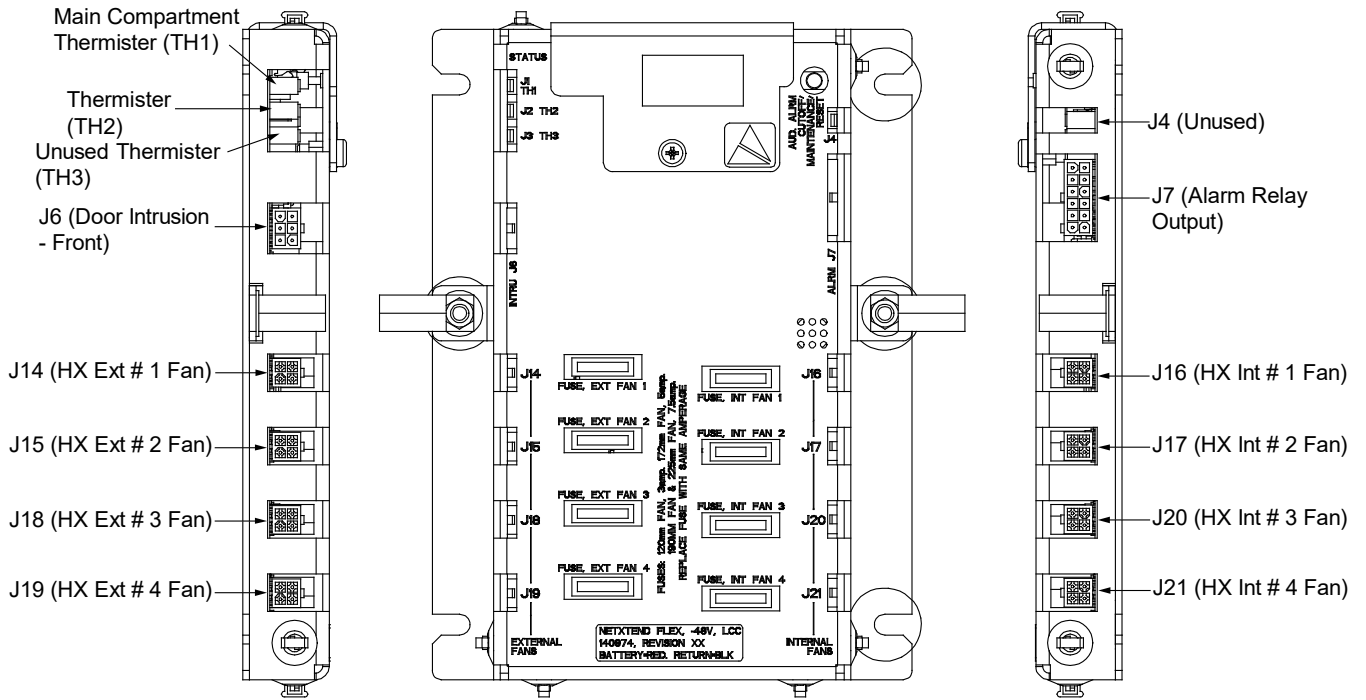


Figure 15.1 ECU and Thermal Components Overview Diagram (cont'd from previous page, cont'd on next page)



Note: CB size for ECU Connection-15 A.

Figure 15.1 ECU and Thermal Components Overview Diagram (cont'd from previous page)

ERROR CODES
UP - Controller OK
d01, d02 - Door Open, Ajar d03 - Maintenance Mode
E01 - Therm 1 Fail (J1), Internal E02 - Therm 2 Fail (J2), Internal E07 - Hi-Temperature 1 E08 - Hi-Temperature 2 E12 - Lo-Temperature 1 E13 - Lo-Temperature 2
F01 - Fan Fail J16 Int.1 F02 - Fan Fail J17 Int. 2 F03 - Fan Fail J14 Ext.1 F04 - Fan Fail J15 Ext. 2

15.1.3 ECU Power Connector

The ECU power connectors are located to the right of the ECU.

The ECU power connectors are pre-connected at the factory. These connections should only be temporarily broken and made during a service event.

15.2 Thermal Components and ECU Operation

15.2.1 Primary Equipment Compartment

The primary equipment compartment contains a heat exchanger to cool the compartment.

Primary Equipment Compartment Heat Exchanger Thermal Components

The HX is a closed loop cooling unit with two (2) fans in the internal loop and two (2) fans in the external loop. The same fans (152224) are used in the internal and external loop.

The inner and outer loop fans operate independently of each other. The use of multiple fans provides redundancy and the failure of any fan will result in a small but acceptable reduction in the thermal performance. The HX fans (internal and external loops) are turned off if the equipment compartment door alarm switch is activated.

ECU Control of the Primary Equipment Compartment Thermal Components

The enclosure has a typical ambient operating temperature range of -40 °C (-40 °F) to +46 °C (+115 °F). The range of operating temperature for the equipment to be housed in the enclosure is -40 °C (-40 °F) to +65 °C (+149 °F). The purpose of the heat exchanger is to remove heat dissipated from equipment while maintaining equipment inlet air temperature. By controlling enclosure air temperature, the ECU maximizes electronic equipment life. In addition, the ECU limits acoustic noise by reducing fan speeds when possible.



NOTE! The fan logic is built around equipment designed for operation at 65 °C. Equipment rated to lower than a 65 °C upper limit may still be deployed within the enclosure with careful component placement. Alternatively, the fan logic may be changed -- consult Vertiv Engineering for more details.

Primary Equipment Compartment Temperature Sensors

The primary equipment compartment thermistor determines the Cabinet Air Temperature (T_{cab}).

15.2.2 Battery Boxes

The enclosure contains two (2) battery boxes. The top battery box may be removed in the field.



NOTE! The battery boxes are nominally sealed except for required hydrogen safety vents.

15.3 ECU User Interface

15.3.1 Initial Start-Up Sequence

When power is first applied to the ECU, the ECU goes through the following Start-Up sequence.

Start-Up Sequence

- a) Product Code # and Firmware Code (Revision) # displays.
- b) All fans run at full speed for approximately 30 seconds to detect any fault conditions, then normal operation resumes.
- c) UP displays if everything is operating as expected.
or
Continuous cycle of error codes if any faults detected.

15.3.2 ECU Display Codes and Alarm Relays

Refer to Table 15.2.



NOTE! Relay #1 activates where “1” has fault. Relay #2 activates where “2” has fault. Relay #3 activates where “3” has fault.



NOTE! Display cycles continuously through all active messages.



NOTE! Fan fail alarms are latched until controller is reset.

15.3.3 External Alarms

The ECU provides the following external alarms. Refer also to the “Connecting External Alarms” on page 51.

- **Fan/ECU Major Alarm (Relay 1):** Activates if any of the following conditions occur.
 - One or more fans failed.
Note that an unplugged fan will not alarm unless the ECU tells it to turn ON.
 - A thermistor failed or is open.
 - ECU board communications failure.
- **Intrusion Alarm (Relay 2):** Activates if the front door is opened or ajar.
- **High / Low Temperature Alarm (Relay 3):** Activates during a high or low temperature condition in either the primary equipment compartment or battery box.

15.3.4 Red and Red/Blue LEDs

Refer to Figure 15.1 for locations and descriptions.

15.3.5 Intrusion Alarm

Whenever the front door is opened; an intrusion alarm activates. The intrusion alarm...

- Displays Code d01 (Door Open) on the ECU LED display.
- Activates an audible alarm.
- Activates an external intrusion alarm, if connected to an alarm sending device.
- Turns all fans off (if there are no alarms).
- Starts an intrusion alarm timer (30 minute timer).

To Disable Audible Alarm

To disable the audible alarm, momentarily depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU. See Figure 15.1 for location. This cancels the intrusion alarm and restarts the intrusion alarm timer, providing the enclosure temperature in any compartment is less than its high temperature alarm limit.

Intrusion Alarm Timer

If the door is not closed or access panel not replaced before the 30 minute timer expires (or 30 minutes elapse after depressing the Audible Alarm Cutoff pushbutton), the following occurs.

- Code d02 (Door Ajar) displays on the ECU LED display.
- Audible alarm (if silenced) re-activates.

- External intrusion alarm (if silenced) re-activates.
- All fans turn on.
- Thermal control is restored.

Table 15.1 ECU Display Codes and Alarm Relays

Description	External Alarm Relay	ECU Display Code
Controller OK	--	UP
Product Code	--	PC
Product Code (follows PC) (xxx = 000-999)	--	xxx
Firmware Code (revision)	--	FC
Firmware Code (revision) (follows FC) (N = 0-9)	--	N.N.N.
Door Open (software does not treat as alarm resulting in a system fault condition)	2	d01
Door Ajar (software does not treat as alarm resulting in a system fault condition)	2	d02
Maintenance Mode	2	d03
Equipment Compartment Thermistor Failure (Note: E07 and E12 inhibited)	1	E01
Equipment Compartment Thermistor 2 Failure	1	E02
Thermistor Connected to Unused Port	n/a	E03
Thermistor Connected to Unused Port	n/a	E04
Thermistor Connected to Unused Port	n/a	E05
Equipment Compartment High Temperature (Note: inhibited by E01)	3	E07
Battery Box High Temperature (Note: inhibited by E02)	3	E08
Equipment Compartment Low Temperature (Note: inhibited by E01)	3	E12
Low Voltage TEC Disconnect	1	E17
Fan Fail HX Internal #1	1	F01
Fan Fail HX Internal #2	1	F02
Fan Fail HX External #1	1	F03
Fan Fail HX External #2	1	F04

15.3.6 Maintenance Mode

The system can be placed into the Maintenance Mode to perform such tasks as fan replacement. To enter the Maintenance Mode, open the front door and depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU for more than 5 seconds but less than 10 seconds. See Figure 15.1 for location. The following occurs.

- The system is placed into the Maintenance Mode for 60 minutes.
- The audible alarm is turned off.
- All thermal devices are turned off.
- Code d03 (Maintenance Mode) displays on the ECU LED display, along with a countdown of the minutes remaining.



NOTE! The display continues to cycle through all other active messages.



NOTE! When the time remaining is down to 1 minute or less, the audible buzzer will beep as a warning that this mode will be exited and the fans may start. The display continues to cycle through all active messages.

Manually Exiting Maintenance Mode

Maintenance Mode can be exited by closing the door or by depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton for more than 10 seconds.

Resetting the Maintenance Mode

To reset the Maintenance Mode for another 60 minutes, depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton for more than 5 seconds but less than 10 seconds.

15.3.7 Resetting the ECU

To reset (restart) the ECU, open the front door, listen for the audible alarm and then depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU for more than 10 seconds. See Figure 15.1 for location. If display starts to countdown from 60, then Maintenance mode was activated and unit was not reset. Close door and reopen, listen for alarm and hold reset button for more than 10 seconds.



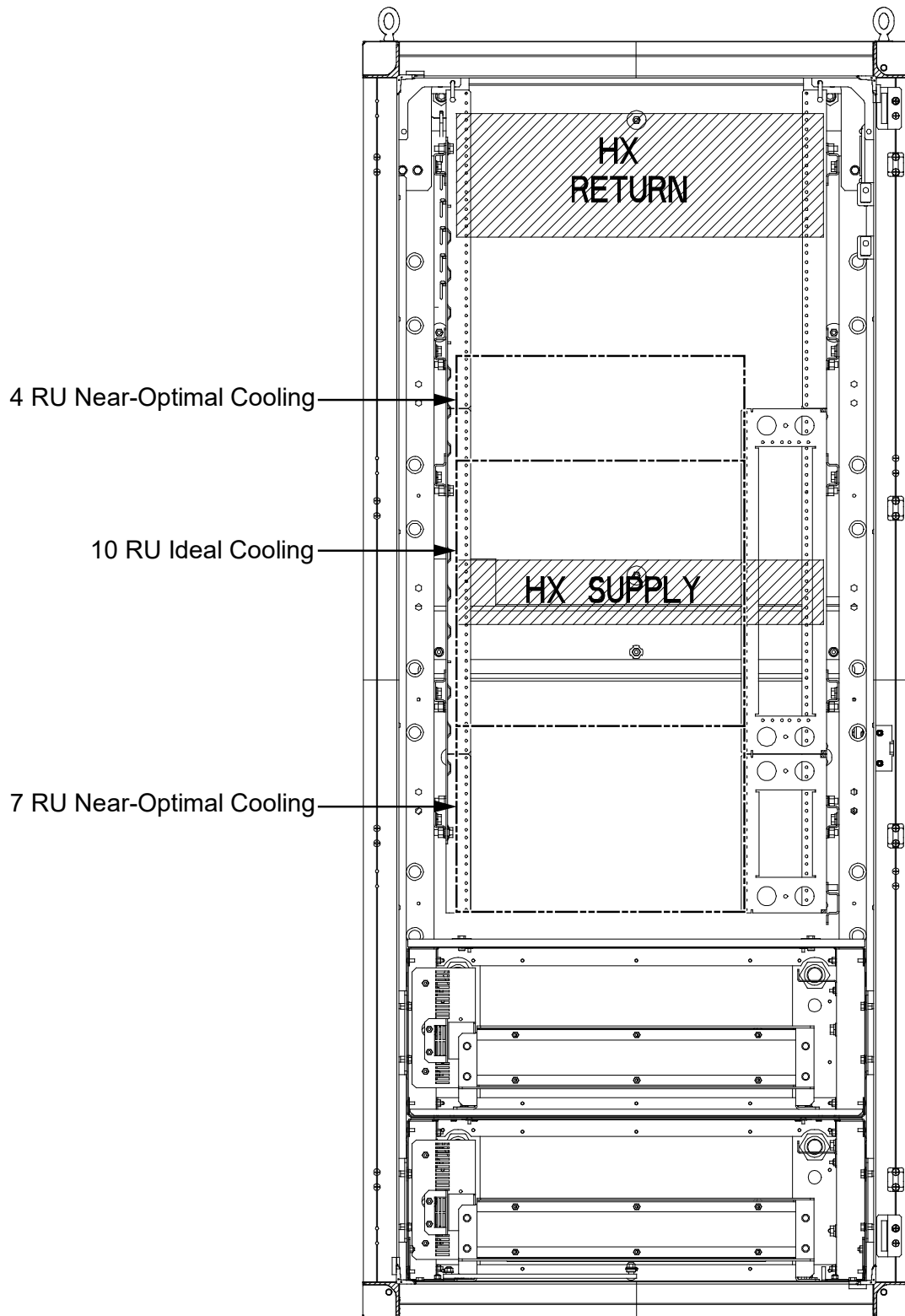
NOTE! The ECU is also reset if a hard power down (remove 48 VDC) and power up occurs.

15.3.8 Optimal Cooling Locations for Rack-Mount Equipment

The ideal cooling location in the equipment rack is RU's 8-17 (from bottom of EQ rack). But near-optimal cooling can be achieved in any location RU's 1-21. See Figure 15.2.

Cooling can always be improved by closing off open areas in the EQ rack with blanking plates, to prevent recirculation of equipment exhaust air directly back into the equipment intakes.

Figure 15.2 Cooling Zones (F2019015)



16 Climate Control Options (F2019016)

NOTE! The F2019016 equipment cabinets are configured for use with Optional Battery Heater Kit. Optional Battery Heater Kit P/N (565616) (ordered separately) can be factory or field installed.

16.1 Air Conditioner

The F2019016 enclosure has a door mounted air conditioner.

16.2 Environmental Controls

The air conditioner is controlled via its own built in internal controls.

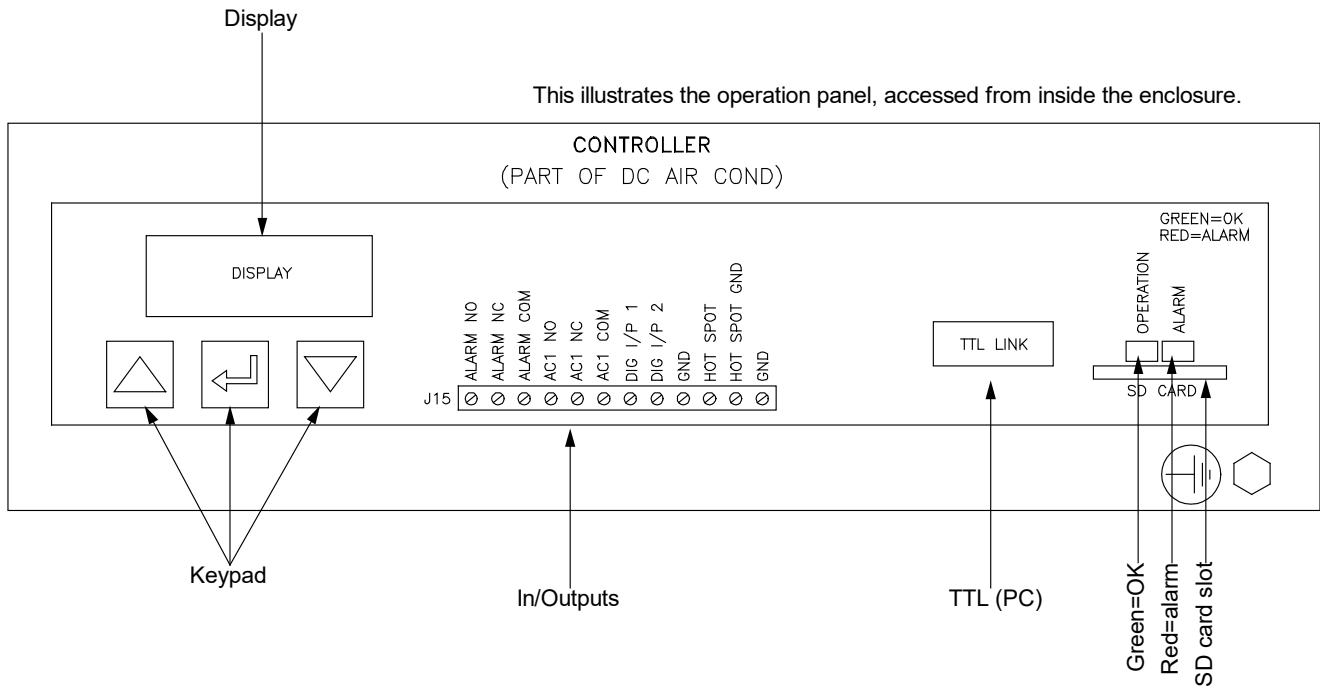
16.3 User Interface

The air conditioner is an independent unit. Refer to the instructions supplied by the air conditioner manufacturer.

An internal thermistor is built into the unit and located on the intake. The internal fan always runs. The default HVAC cool/heat settings are +30 °C (+86 °F) cooling and +10 °C (+50 °F) heating.

The unit has a front LED display panel which displays intake temperature. The unit can display additional information, refer to the instructions supplied with the unit. See Figure 16.1.

Figure 16.1 DC Air Conditioner Operation Panel



16.4 High Temperature Alarm

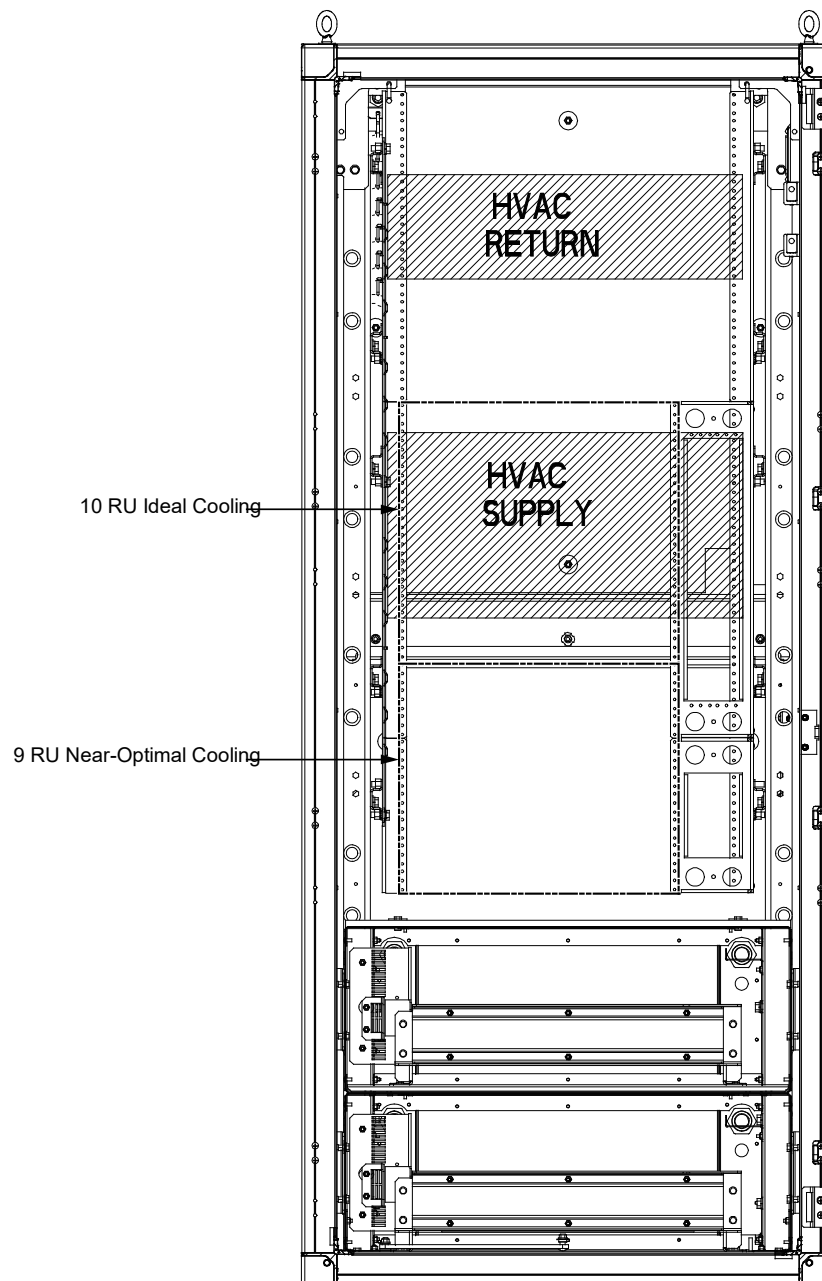
The enclosure is equipped with a high-temperature alarm thermostat. The alarm setting is 65C.

16.5 Optimal Cooling Locations for Rack-Mount Equipment

The ideal cooling location in the equipment rack is RU's 10-19 (from bottom of EQ rack). But near-optimal cooling can be achieved in any location RU's 1-19. See Figure 16.2.

Cooling can always be improved by closing off open areas in the EQ rack with blanking plates, to prevent recirculation of equipment exhaust air directly back into the equipment intakes.

Figure 16.2 Cooling Zones (F2019016)



17 Maintenance, Troubleshooting, and Replacement Procedures

17.1 Important Safety Instructions



DANGER! Adhere to the “Important Safety Instructions” starting on page vii.

17.2 Contact Information

Refer to Section 4154 (provided with your customer documentation) for support contact information.

17.3 Enclosure Identification

Prior to contacting the manufacturer for support and/or replacement parts, note the enclosure part number, serial number and test date which can be found on the ID label located on the inside of the front door.

17.4 Routine Maintenance

17.4.1 DC Power System Maintenance

Refer to the documentation furnished with the power system.

17.4.2 Heat Exchanger Maintenance

At each visit, verify that there is no obstruction outside the enclosure preventing ventilation, and that all fans are clean and operating normally. At 1 to 5-year intervals, based on the location and environmental conditions, use clean compressed air to blow out the dust accumulation from the external loop heat exchanger core per the following procedure. Also blow out the dust accumulation from the Heat Exchanger ventilation openings in the door shroud.

Although not a mandatory preventative maintenance measure, replace the external fans at 5-year intervals, particularly if the enclosure is operating under extreme environmental conditions. See “Heat Exchanger Internal and External Fan Replacement” on page vii for a procedure.

External Loop Heat Exchanger (Hx) Maintenance Procedure

To clean the external loop HX, it is advised to remove the external loop fan assembly per the “Replacing an External Fan” procedure in “Heat Exchanger Internal and External Fan Replacement” on page vii. Then using clean compressed air (DO NOT USE WATER OR SOLVENTS), clean the fins of the HX. Normal compressed air is OK to use, provided that the hose is kept far enough away from the exterior loop fins, so that the air velocity on the fins doesn’t cause the fins to deflect past their elastic limit. That is, they can deflect, but not permanently be bent. You can also use a clean vacuum cleaner with the hose reversed to provide an air stream.

17.4.3 Battery Maintenance

Battery life is determined by a variety of factors, including the technology deployed, the charge/discharge cycle history, operating temperature, peak current draw, etc. Battery string replacement is governed by carrier policies, but should be performed regularly at the end of the expected lifetime of the battery.

Battery health should be checked at regular intervals per battery manufacturer’s instructions, which should include a verification of the float voltage and open circuit voltage.

Battery Maintenance Procedure

1. Make sure that the batteries and battery area are clean and dry.

2. Inspect the battery terminals. Make sure that the battery terminals are clean and the connections are tight. If necessary, clean and tighten the terminals in accordance with local practices, using approved cleaning solution. Reapply antioxidant compound (NO-OX-ID-A or equivalent).
3. In high discharge rate applications, or in areas subject to high vibration, periodically check battery terminal tightness.



NOTE! Tighten all battery terminal adapter post nuts to the torque specifications specified by the battery manufacturer only.

4. Keep records of battery and cell voltages as required by battery manufacturer and local practices to monitor long-term changes in battery condition. To ensure battery warranty protection, keep any additional records as required by the battery manufacturer. Refer to the Battery Installation and Maintenance Record supplied with the batteries.

17.4.4 Battery Replacement

The following considerations must be taken when replacing a battery:

- Follow all previously stated warnings and precautions.
- Review all documentation, including the battery manufacturer's instructions and MSDS.
- Never mix different battery technologies, manufacturers, or models within the enclosure.
- Before proceeding, isolate the battery from the DC Power Plant (open the connecting circuit breaker).
- Though isolated, potential for hazardous current remains, act accordingly.
- The removal procedure is the inverse of an installation.
- Any and all spillage must be dealt with completely and immediately.
- To install the replacement, follow the previous installation and battery manufacturer's instructions.
- Ensure to re-apply NO-OX-ID-A (or approved equivalent) on all terminals and lugs.

17.4.5 Freezing Rain and Ice

The two primary issues with freezing rain and ice are:

- Blocked ventilation, which can impose personnel hazards and potential risk to equipment damage.
- Difficulty of access to the inside of the enclosure.
 - The selected lock hasp has been designed to minimize hidden ice build-up and provide for the removal of ice.

Ice will often break in sheets, so the use of a soft mallet or hand onto a surface will create the stress cracks necessary to push the ice off.

In the unlikely event of a severe freezing rain, immediately followed by severe drop in temperature, the ice may be extremely thick and hard. In this case, it is recommended a tent be used to isolate the enclosure and an external, no spark heat source, be used to warm the enclosure.

Ice and snow should be removed from the front door and all ventilation areas.

Practices and tools to avoid include:

- use of salt,
- use of ice scraper, screwdrivers or other tools that would dig into the ice and ultimately into the metal surface,

- use of an open flame, or any device that may create an open spark, and
- use of de-icing fluid(s).

17.5 Troubleshooting

17.5.1 DC Power System

Refer to the documentation furnished with the power system

17.5.2 Batteries

Refer to the appropriate battery manufacturer's maintenance manual for information on troubleshooting battery problems.

17.5.3 Environmental Control Unit (ECU)

The following provides information to verify and troubleshoot the enclosure's Environmental Control Unit (ECU), heat exchanger (HX), fans, and associated cabling.

The following documents, tools, and parts are required:

- system SD and J drawings (which ship with the enclosure),
- digital multimeter, 0-60 VDC and continuity (Ohmmeter),
- replacement parts as needed.

The troubleshooting person needs to be able to locate:

- the ECU, HX, fans, and associated cabling,



NOTE! Important! All procedure should be done in keeping with safe and local practices.

ECU Display Codes

Refer to Table 15.2 for a list of codes that the ECU may display.



NOTE! Fault conditions are overridden by LVD.

ECU Door “Ajar” Alarm - d02

When “d02” displays on the ECU, there is a door intrusion condition. Two scenarios cause d02 to be displayed.

- A door is left open for more than 30 minutes (a normal condition).
- A broken door intrusion switch or an open in the door intrusion switch wiring (a fault condition).

Scenario 1 (Normal Condition)

No troubleshooting required. A door was simply left open for more than 30 minutes. Close the door, or momentarily depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU to cancel the intrusion alarm and silence the audible alarm for another 30 minutes.

Scenario 2 (Fault Condition - Broken Door Intrusion Switch or an Open in the Door Intrusion Switch Wiring)

If the door has been closed and there is an audible alarm active, you have a broken door intrusion switch or an open in the door intrusion switch wiring.

When you open the front door and observe the ECU, you will see the d02 code displayed. This also indicates that there is a wiring issue with the intrusion switch somewhere.

If you momentarily depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU, the ECU displays “UP” and the audible alarm ceases, but there is still a problem and the alarm will activate again in 30 minutes.

Check for a broken door intrusion switch or an open in the wiring.

Recommended Practice to be Performed after a Door is Open

To check for a broken door intrusion switch or an open in the wiring, perform the following procedure whenever a door has been opened.

1. As a final check, before leaving the site, ensure all panels are properly closed.
2. With the front door open, d01 or d02 should be displayed on the ECU.
3. Pull the front door intrusion switch out. This places this switch in the disabled position.
4. Observe that “UP” is displayed on the ECU. This confirms that the door intrusion wiring has no open conditions.
5. Close the front door.

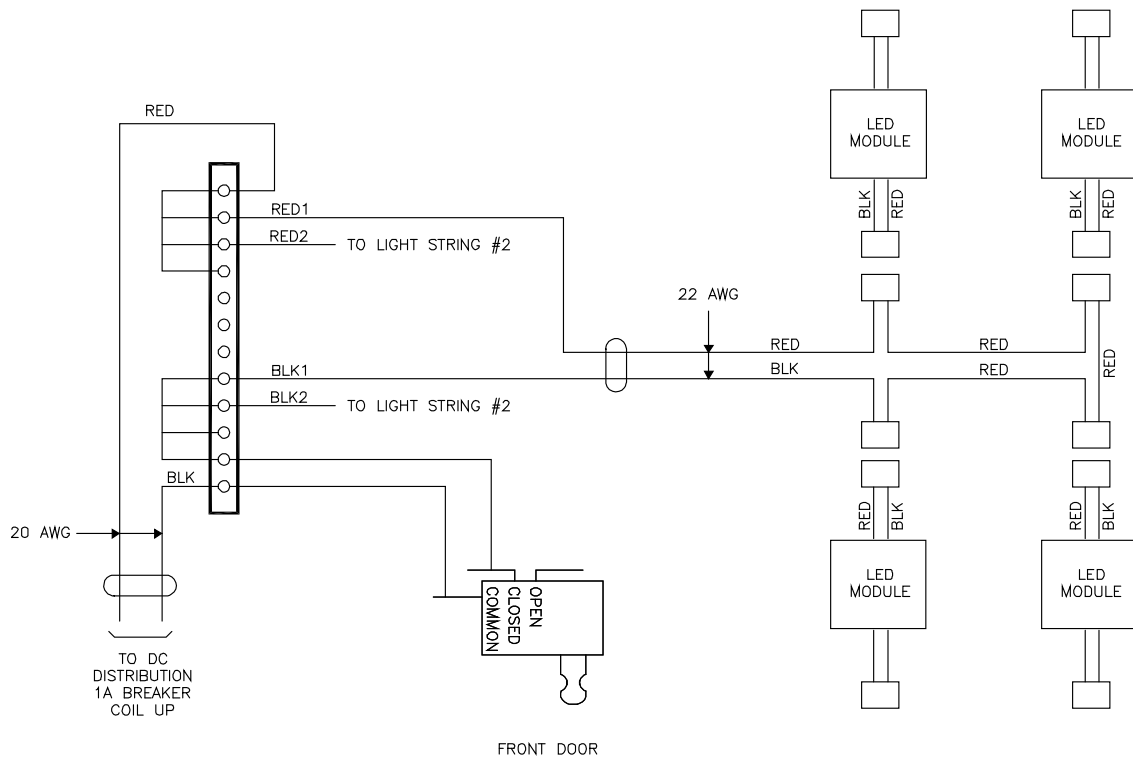
17.6 Replacement Procedures

17.6.1 LED Light Replacement

Procedure

1. Unplug the LED unit that needs to be replaced. See Figure 17.1.
2. Refer to Figure 17.2 and remove the nut securing the LED unit that needs to be replaced.
3. Reverse these steps to re-install the LED unit.

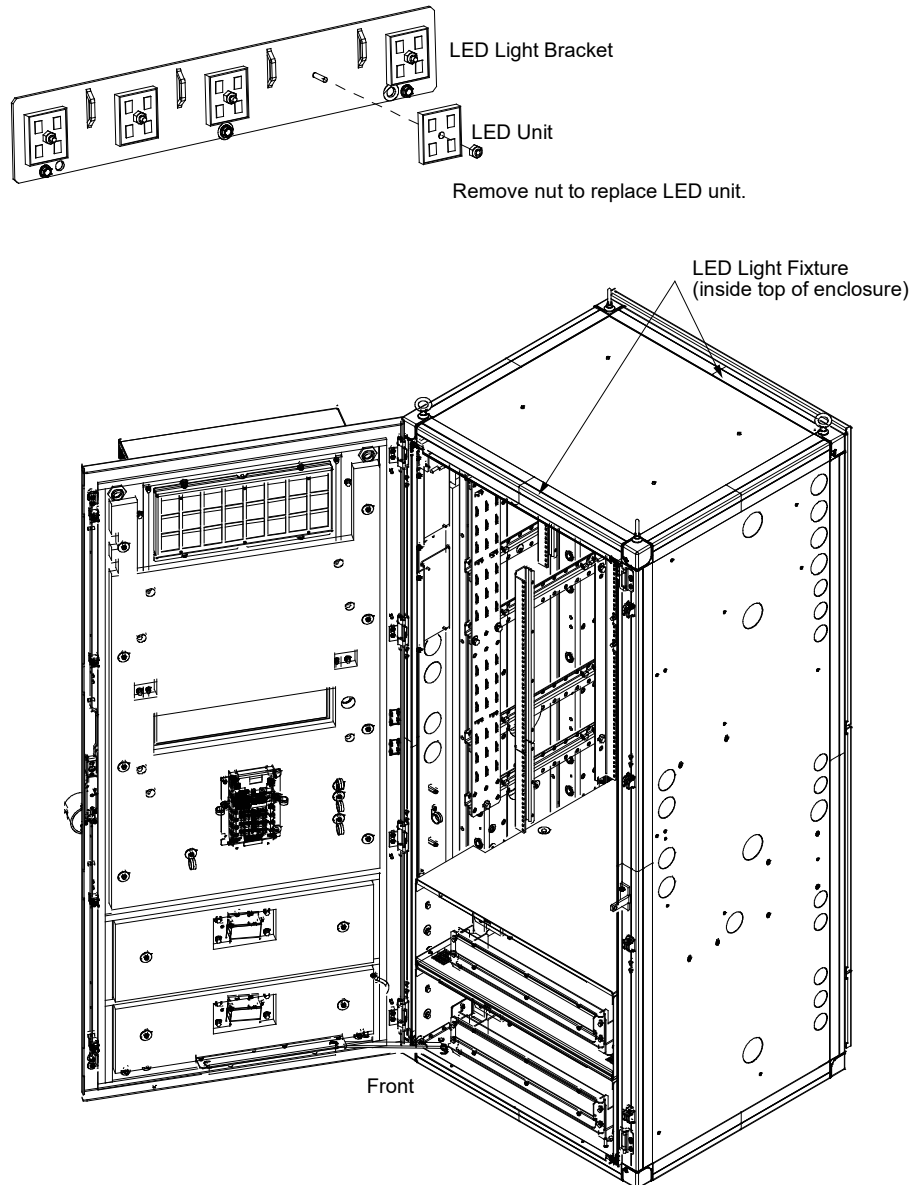
Figure 17.1 LED Light Wiring Diagram



NOTE:

1. LIGHT STRING SHOWN IS REPRESENTATIVE OF STRING 2.

Figure 17.2 LED Light Replacement



17.6.2 Heat Exchanger Internal and External Fan Replacement



DANGER! ELECTRICAL HAZARD/MECHANICAL HAZARD

Risk of electric shock or being cut by moving fan blades. Before replacing any fan, disconnect power to the Environmental Control Unit (ECU).

You Will Need - To replace one of the heat exchanger's fans, you will need the following tools.

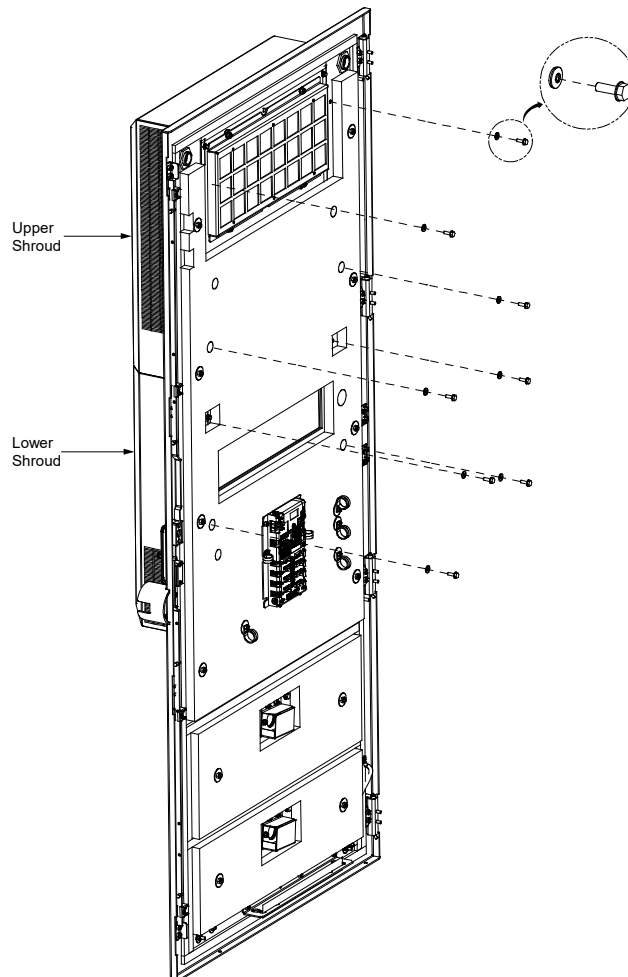
- Standard Telco Socket Wrench Set
- Standard Mechanic Telco Tools
- Replacement Fan

Replacing an Internal or External Heat Exchanger Fan

Perform the following steps to replace an internal or external heat exchanger fan.

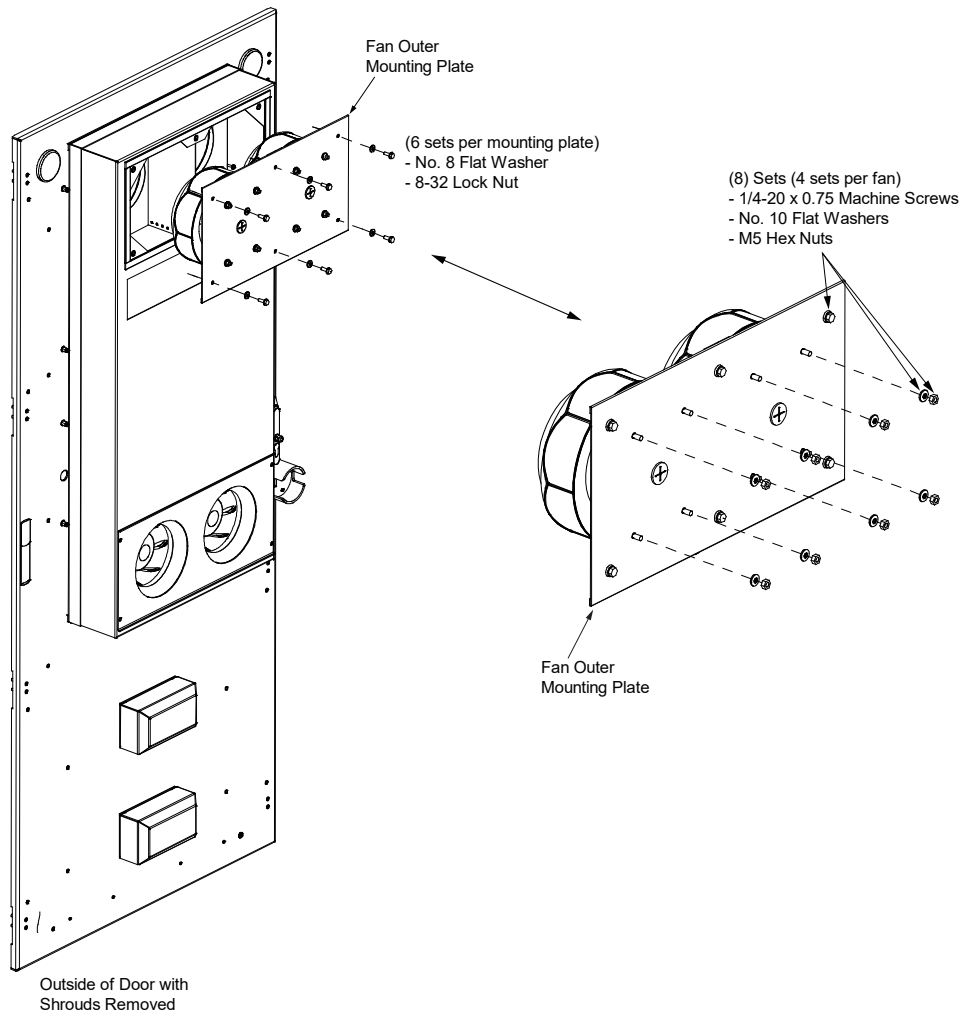
1. Remove the padlock from the enclosure door, if present.
2. Open the enclosure door.
3. Secure the door in the open position with the wind latch.
4. Using the ECU Status, identify the fan to be replaced and its location.
5. Verify that the replacement fan is of the appropriate model.
6. Disable the HX fans by either...
 - a) Placing the ECU in maintenance mode. See “Maintenance Mode” on page 74 for a procedure.
 - b) Placing the ECU circuit breaker in the DC distribution shelf into the “OFF” position, if furnished.
 - c) Temporarily disconnecting power to the ECU by separating the in-line connectors in the ECU power cable.
7. On the inside of the door, remove the bolts securing the heat exchanger’s upper shroud (internal fan) or lower shroud (external fan). Set the shroud and hardware safely aside. Refer to Figure 17.3.

Figure 17.3 Removing the Fan Shroud



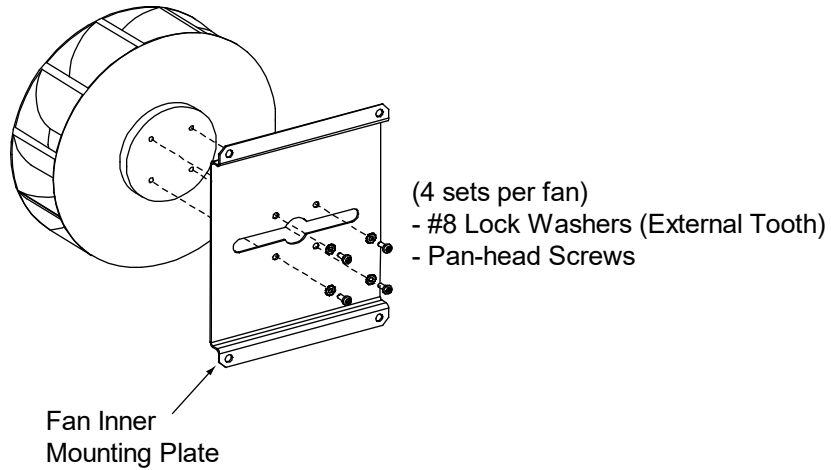
8. For an internal fan, perform the following steps. Save all hardware for re-use.
 - a) Remove the top (3) and bottom (3) sets of bolts and lock washers from the fan outer mounting plate. Refer to Figure 17.4.
 - b) Carefully slide the fan outer mounting plate with fans attached out far enough to disconnect the fan connectors.
 - c) Set the fan outer mounting plate with fans attached on a suitable work surface.
 - d) Remove the defective fan with inner mounting plate attached from the fan outer mounting plate by removing the (4) sets of nuts and lock washers. Refer to Figure 17.4.

Figure 17.4 Removing the Fan Outer Mounting Plate



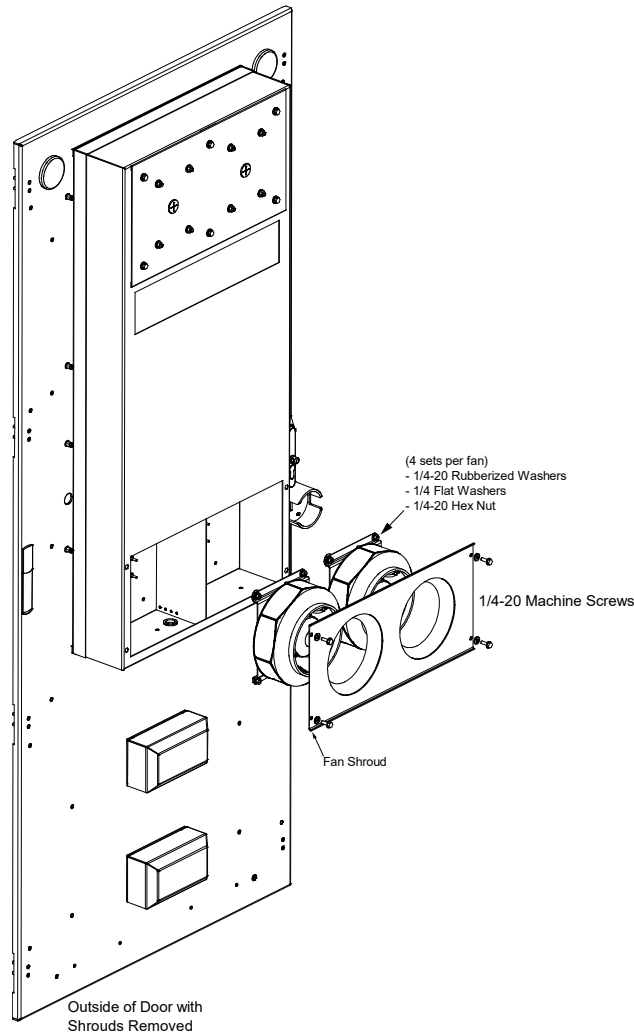
- e) Separate the defective fan from the fan inner mounting plate by removing the (4) sets of screws and star washers. Discard the defective fan. See Figure 17.5.

Figure 17.5 Removing the Fan Inner Mounting Plate



- f) Attach the replacement fan to the fan inner mounting plate with the (4) sets of screws and star washers previously removed.
 - g) Attach the inner mounting plate with replacement fan attached to the fan outer mounting plate with the (4) sets of nuts and lock washers previously removed.
 - h) Carefully slide the fan outer mounting plate with fans attached into the mounting position far enough to reconnect the fan connectors.
 - i) Slide the fan outer mounting plate with fans attached all the way in and secure with the top (3) and bottom (3) sets of bolts and lock washers previously removed.
9. For an external fan, perform the following steps. Save all hardware for re-use.
- a) Remove the fan shroud from the external fans by removing the (4) screws. Save the fan shroud and hardware. Refer to Figure 17.6.
 - b) Remove the defective fan with inner mounting plate attached by removing the (4) sets of flat washers, lock washers, and nuts securing the fan inner mounting plate. Refer to Figure 17.6.

Figure 17.6 Removing the Fan Shroud and Defective Fan



- c) Carefully slide the defective fan with inner mounting plate attached out far enough to disconnect the fan connectors.
 - d) Set the fan inner mounting plate with fans attached on a suitable work surface.
 - e) Separate the defective fan from the fan inner mounting plate by removing the (4) sets of screws and star washers. Discard the defective fan. Refer to Figure 17.5.
 - f) Attach the replacement fan to the fan inner mounting plate with the (4) sets of screws and star washers previously removed.
 - g) Carefully slide the fan inner mounting plate with fans attached into the mounting position far enough to reconnect the fan connectors.
 - h) Slide the fan inner mounting plate with fans attached all the way in and secure with the (4) sets of flat washers, lock washers, and nuts previously removed.
10. Using the hardware previously removed, replace the heat exchanger's upper shroud (internal fan) or lower shroud (external fan).
 11. Enable the HX fans by either...

- a) Exiting the ECU maintenance mode. Maintenance Mode can be exited by closing the door or by depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton for more than 10 seconds.
 - b) Placing the ECU circuit breaker in the DC distribution shelf into the “ON” position.
 - c) Reconnecting power to the ECU by mating the in-line ECU power cable connectors.
12. Monitor the ECU to make sure that the replacement fan is powered up and that it initializes, calibrates, and goes into steady state.
 13. Close the enclosure front door.
 14. Replace the door padlock, if required.

17.7 Configured Equipment

Equipment from Vertiv and 3rd-party manufacturers may be furnished and factory-installed in the XTE 601E 84" equipment enclosure. This may include equipment for DC power and distribution, AC power and backup (UPS), site management, RAN surge suppression, DC voltage up conversion, fiber connectivity, etc.

Please consult Vertiv for available options and/or to have new customer-specific equipment integrated.

18 Accessories and Replacement Parts

Refer to Table 18.1 for list of accessories (AC) and replacement parts (RP).

Table 18.1 Accessories and Replacement Parts

Part Number	Description
145396	Pad Mounting Rubber Barrier Pad (RP)
F1010584 (145344)	Optional Re-Usable Pad Drill Template (AC)
F1010585 (554917)	Optional Pour-in-Place Mounting Template (AC)
10021437	ECU (RP)
564241	ECU Option Jumper (RP)
152224	FAN, BC 225x93.5mm,48V,665CFM,4W
139224	Thermistor Cable (Main Compartment Thermistor) J1 (RP)
P92538	Intrusion Switch and Light Switch (RP)
143136	LED Light Replacement - (1) LED Light (RP)
147333	Gore-Tex Patch - Hydrophobic Air Vent Patch (RP)
147334	Mating Nut for 147333 (RP)
150636	Door Handle (Front Swing Handle) (RP)
150823	Battery Breaker 250 Amp (RP)
565618	AC Junction Box (AC)
565616	Battery Box Heater Kit for F2019016 (AC)
F1011067	19" Rack-Mount Pull-Out Laptop Tray, 1RU, 95 lbs

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