



NetSure™ X701 Walk-Up-Cabinet (WuC)

Description and Installation Manual

Specification Number: F2020029, F2020030

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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.

TABLE OF CONTENTS

Admonishments Used in this Document.....	vi
Important Safety Instructions.....	vii
Safety Admonishments Definitions.....	vii
Safety and Regulatory Statements.....	vii
Déclarations de Sécurité et de Réglementation.....	vii
1 About this Document.....	1
2 Product Description	1
2.1 General.....	1
2.2 Part Numbers.....	2
2.3 Application.....	2
2.4 Specifications.....	3
2.4.1 Environmental.....	3
2.4.2 Compliance information.....	3
2.4.3 Safety listed AC and DC components.....	3
2.4.4 Enclosure dimensions, weights, and physical specifications.....	4
2.5 Commercial AC Service.....	5
2.6 Enclosure Features and Options.....	11
3 Sequence of Procedures.....	22
3.1 General.....	22
4 Front Doors, Locks, and Removable Panels	23
4.1 Important Safety Instructions.....	23
4.2 Front Doors.....	23
4.2.1 Opening and closing an enclosure front door.....	23
4.3 Rear Access Panels.....	25
4.3.1 Removing/installing rear access panels.....	25
4.4 Door/Panel Activated Intrusion Alarm Switches.....	26
4.5 Door Activated Light Switches.....	26
5 Installation Considerations.....	30
5.1 Installation Overview.....	31
5.2 Site Selection Considerations.....	31
5.3 Tools, Test Equipment, and Materials Recommended for Installation.....	32
5.4 Materials Required for Installation.....	33
6 Transportation and Storage.....	33
6.1 Important Safety Instructions.....	33
6.2 Transportation.....	33
6.3 Storage.....	33
7 Mounting the Enclosure.....	34
7.1 Important Safety Instructions.....	34
7.2 Specific Safety Precautions.....	34
7.3 General.....	34
7.4 Concrete Foundation Pad.....	34
7.5 Preparing the Form and Pouring the Pad.....	35

7.6	Inspecting and Unpacking the Enclosure at the Installation Site	37
7.7	Preparing the Enclosure for Installation.....	37
7.8	Preparing the Concrete Pad.....	38
7.9	Required Equipment to Lift the Enclosure.....	38
7.10	Lifting and Placing the Enclosure.....	39
	7.10.1 Important safety instructions.....	39
	7.10.2 General.....	39
8	Installing GPS Antenna Mounting Bracket Kit.....	44
9	Grounding the Enclosure.....	46
9.1	Important Safety Instructions.....	46
9.2	General.....	46
9.3	Enclosure Ground Bar Schematic.....	46
9.4	Master Ground Bar (MGB) and Equipment Ground Bars.....	46
9.5	Site Ground.....	46
10	Cable Routing.....	50
11	AC Input Power.....	53
11.1	Important Safety Instructions.....	53
11.2	Grounding.....	53
11.3	Enclosure AC Schematic.....	53
11.4	Cable Routing.....	53
11.5	DC Power System.....	53
11.6	AC Input Connections to Automatic Transfer Switch (ATS).....	53
12	DC Power and Batteries.....	57
12.1	Important Safety Instructions.....	57
12.2	Grounding.....	57
12.3	Enclosure DC Schematic.....	57
12.4	DC Power Cabling Color Scheme.....	57
12.5	Cable Routing.....	57
12.6	DC Power System.....	57
12.7	SPD (Surge Protection Device).....	57
12.8	Battery Installation and Wiring.....	57
	12.8.1 Important safety instructions.....	57
	12.8.2 Supported VRLA batteries.....	58
	12.8.3 Battery wiring schematic.....	58
	12.8.4 Battery compartment.....	59
	12.8.5 VRLA battery installation and connection.....	62
13	OSP Cables.....	65
13.1	Important Safety Instructions.....	65
13.2	General.....	65
13.3	Cable Routing.....	65
13.4	Installing Cables.....	65
13.5	Optical Fiber Cables Precautions.....	65
13.6	Sealing Cable Entries.....	65
14	Alarm Wiring.....	66

14.1	Important Safety Instructions.....	66
14.2	Cable Routing.....	66
14.3	General.....	66
14.4	Connecting External Alarms.....	66
15	Sealing Enclosure Cable Entries.....	71
16	Initial Power Up.....	71
16.1	Important Safety Instructions.....	71
16.2	Prerequisite.....	71
16.3	Initial Power Up Sequence.....	71
17	Climate Control.....	72
17.1	Heat Exchanger and Environmental Control Unit (ECU).....	72
17.1.1	General.....	72
17.1.2	ECU wiring schematic.....	72
17.1.3	ECU power connector.....	72
17.1.4	Description of operation.....	72
17.1.5	ECU user interface.....	76
17.2	DC Heaters.....	79
18	Maintenance, Troubleshooting, and Replacement Procedures.....	79
18.1	Important Safety Instructions.....	79
18.2	Contact Information.....	79
18.3	Enclosure Identification.....	79
18.4	Routine Maintenance.....	79
18.4.1	Freezing rain and ice.....	79
18.4.2	DC power system.....	80
18.4.3	Batteries.....	80
18.4.4	Ventilation openings.....	81
18.4.5	Heat exchanger maintenance.....	81
18.4.6	GFCI outlet.....	81
18.5	Troubleshooting.....	81
18.5.1	DC power system.....	81
18.5.2	Batteries.....	81
18.5.3	Environmental control unit (ECU).....	81
18.5.4	Fan alarm test procedure.....	82
18.6	Replacement Procedures.....	83
18.6.1	DC power system.....	83
18.6.2	SPD (Surge Protection Device) replacement.....	83
18.6.3	Battery replacement.....	83
18.6.4	LED light replacement.....	84
18.6.5	Heat exchanger internal and external fan replacement (Power/Battery Bay).....	85
18.6.6	Heat exchanger internal and external fan replacement (Equipment Bays).....	90
19	Accessories and Replacement Parts.....	97

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 About this Document

This document provides description and installation instructions for Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC); Spec. No. F2020029 and F2020030.

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

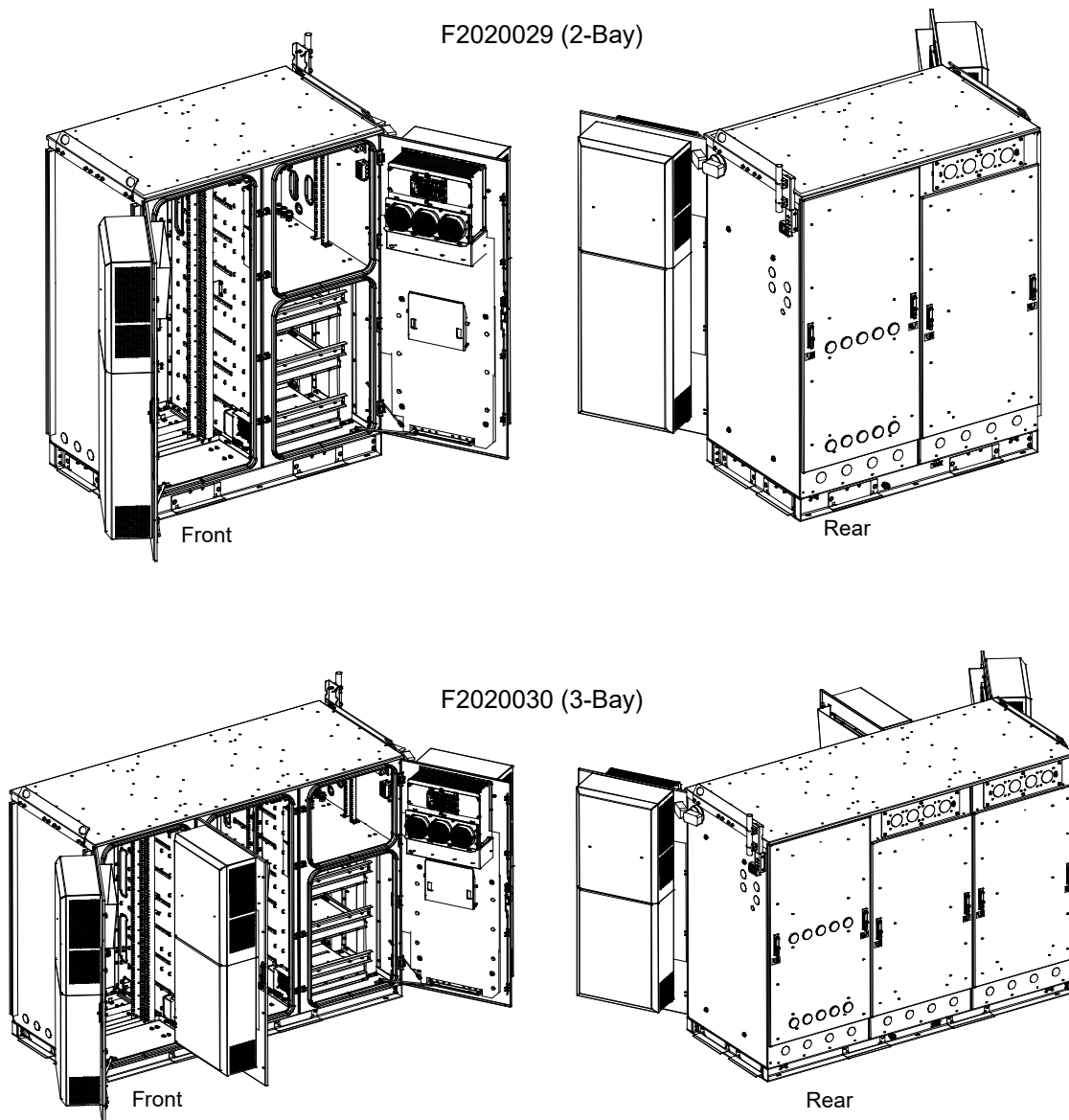
Documents that supplement the information in this document are referenced in “Sequence of Procedures” on page 22.

2 Product Description

2.1 General

The Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC) provides a stable environment for DC power, network electronics, batteries, and other related equipment. Refer to Figure 2.1 for overall views of the enclosure.

Figure 2.1 Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC) Overall Views



2.2 Part Numbers

Refer to Table 2.1 for applicable product part numbers.

Table 2.1 Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC) Part Numbers and Descriptions

2-Bay Model	
Part Number	Description
F2020029	2-Bay Walk-Up-Cabinet, One (1) Equipment Bay and One (1) Power/Battery Bay, 3-String VRLA Batteries, One (1) 6000 W Heat Exchanger on Equipment Bay, One (1) 2800 W Heat Exchanger on Power/Battery Bay, One (1) 1000 W Heater inside Equipment Bay, Two (2) 1000 W Heater inside Power/Battery Bay
3-Bay Model	
Part Number	Description
F2020030	3-Bay Walk-Up-Cabinet, Two (2) Equipment Bays and One (1) Power/Battery Bay, 3-String VRLA Batteries, One (1) 6000 W Heat Exchanger on each Equipment Bay, One (1) 2800 W Heat Exchanger on Power/Battery Bay, One (1) 1000 W Heater inside each Equipment Bay, Two (2) 1000 W Heater inside Power/Battery Bay

2.3 Application

General

The Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC)...

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

The Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC) provides one (1) or two (2) equipment bays and one (1) power/battery bay; all completely factory assembled on a mounting plinth. Also factory assembled is a roof structure spanning all bays.

- One (1) 6000 W Heat Exchanger is furnished on each equipment bay.
- One (1) 2800 W Heat Exchanger is furnished on the power/battery bay.
- One (1) 1000 W heater is furnished inside each equipment bay.
- Two (2) 1000 W heaters are furnished inside the power/battery bay (one per compartment).

Equipment Bay(s)

The system includes one (1) or two (2) equipment bays. Each equipment bay provides a single compartment to house support equipment.

Power/Battery Bay

The system includes one (1) power/battery bay. The power/battery bay provides two compartments.

- An equipment compartment to house a power system.
- A sealed battery compartment with three (3) battery shelves designed to support front post VRLA type batteries. Each shelf provides space for installation of one -48 VDC battery string.

2.4 Specifications

2.4.1 Environmental

- Operating Ambient Temperature Range: -40 °F to +149 °F (-40 °C to +65 °C).
- Storage Ambient Temperature Range: -40 °F to +185 °F (-40 °C to +85 °C).
- Relative Humidity: Capable of operating in an ambient relative humidity range of 0% to 95%, condensing.
- Altitude: Capable of operating in an altitude range of -200 feet to 10,000 feet. The maximum operating ambient temperature should be de-rated by 3 °C per 1000 feet above 6562 feet.

2.4.2 Compliance information

The Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC) is designed to meet the following standards where applicable.

- UL Listed - File E255047.
 - UL CLASS - NWIN - Information Technology and Communication Equipment Cabinet, Enclosure and Racks Systems.
 - Enclosure Type 3R.



NOTE! *The unit is intended for industrial and/or power distribution equipment applications. These components are intended for the installation of industrial electrical equipment and/or power distribution equipment where the complete assembly is approved for installation in non-hazardous locations in accordance with the National Electric Code (NEC) and Canadian Electric Code (CEC).*

APPLICABLE REQUIREMENTS:

- UL 2416 - Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems.
 - UL 62368-1/CSA C22.2 No. 62368-1-14 - Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements.
- ASTM A653 - Galvanized Steel.
 - Welding Conformance to CWB - CSA Standard W47.1 and AWS – D1.2, D1.3 and D1.6.
 - Designed to meet Seismic Zone 4, water intrusion, impact resistance.
 - Telcordia GR487 compliant for corrosion, water intrusion, ultraviolet radiation, and impact resistance.
 - DC Power System - UL Listed 1801, cUL, NEBS Level 3.
 - UL/CSA Compliant Climate and other miscellaneous electrical equipment.
 - Electrical certification as per CSA and NFPA70 (NEC 2020) requirements.
 - Installation method compliant to AT&T TP76300.

2.4.3 Safety listed AC and DC components

A typical Vertiv™ NetSure™ X701 Walk-Up-Cabinet (WuC) utilizes listed or recognized components for the United States and/or Canada.

2.4.4 Enclosure dimensions, weights, and physical specifications

Dimensions

- Refer to Figure 2.2 and Figure 2.3 for overall dimensions.
- Refer to Figure 2.4 and Figure 2.5 for overhead views with the door open. The views show the enclosure clearance requirements to freely open the door.
- Refer to Figure 2.6 for equipment mounting rails dimensions.
- Refer to Figure 2.7 for base and mounting hole dimensions.

Typical Weights

- Shipping Weight:
 - 2-Bay: 1304 lbs.
 - 3-Bay: 1642 lbs.
- Lift Weight (does not include battery weight, includes customer equipment):
 - 2-Bay: 2004 lbs.
 - 3-Bay: 2842 lbs.
- On Pad (with batteries):
 - 2-Bay: 3604 lbs. (includes 700 lbs. customer equipment).
 - 3-Bay: 4442 lbs. (includes 1200 lbs. customer equipment).
- Approved Batteries: Up to 210 Ah batteries; maximum capacity of three (3) -48V strings (12 modules).



NOTE! Pad weight excludes incoming OSP cables.

Physical Specifications (2-Bay)

- Height: 86 inches.
- Width: 68 inches.
- Depth: 53.41 inches.
- Color: Cool White.

Physical Specifications (3-Bay)

- Height: 74 inches.
- Width: 102 inches.
- Depth: 53.41 inches.
- Color: Cool White.

2.5 Commercial AC Service

AC power to be provided by customer via an upstream power source load center or power pedestal. Only load circuits to be brought into AC entry facility. Load circuits in the enclosure requiring power as per the enclosure AC schematic.

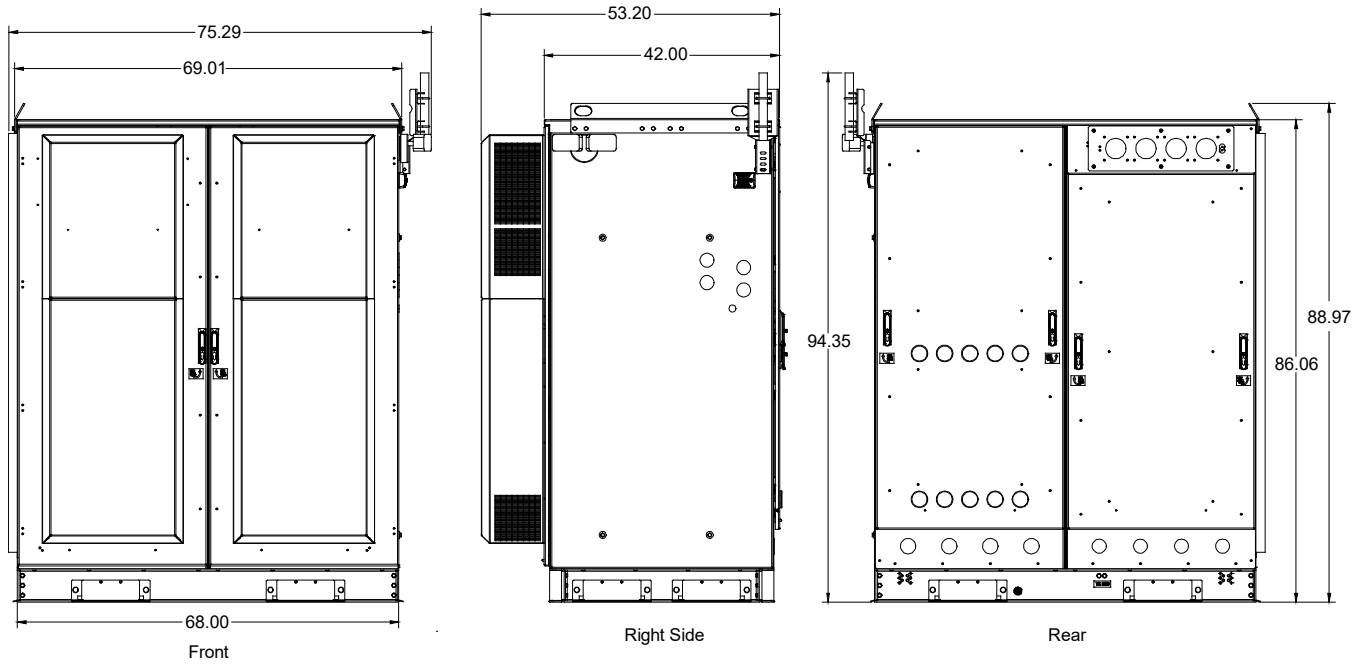
The service entrance system should consist of the following:



NOTE! *The enclosure is designed to accept a side mounted CUSTOMER INSTALLED AC panelboard, service entrance type, with automatic transfer switch per customer requirements. Specifications below are for REFERENCE ONLY.*

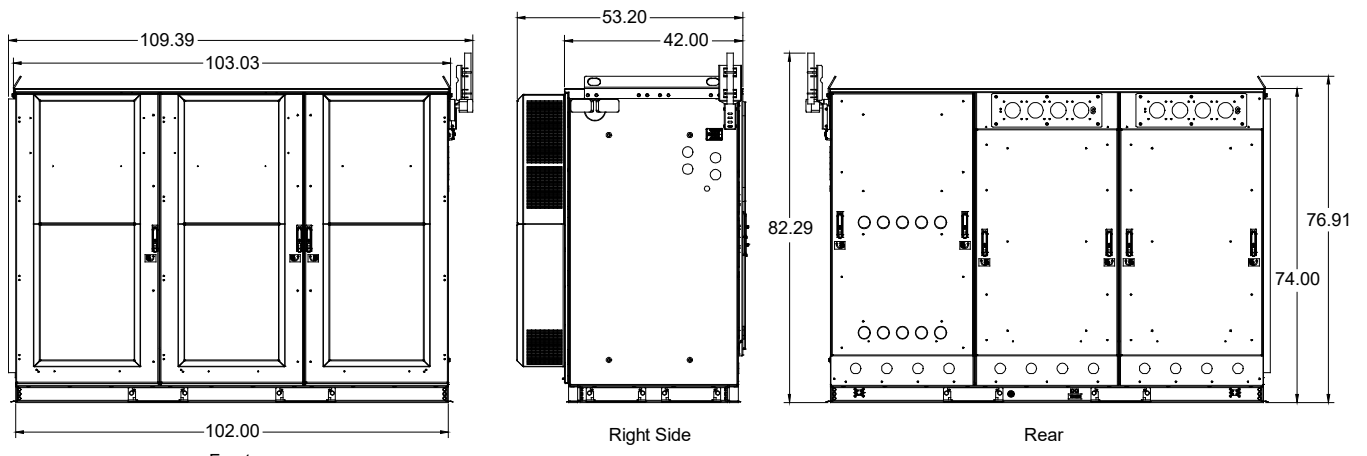
- Power Transfer Load Center constructed in accordance with UL 67 Standard for Panelboards. Suitable for use as service equipment.
- Automatic Power Transfer Switch: ASCO D3ATS, 2 Pole, 200 Amp, 240 VAC maximum. UL Listed to UL 1008, Standard for Transfer Switching Equipment.
 - Transfer Controller – ASCO Group G Automatic Transfer Switch Controller including:
 - Automatic Engine Starting Contacts.
 - Single Phase voltage sensing of Normal and Emergency sources.
 - Frequency sensing of Emergency source.
- Short Circuit Ratings:
 - Main (Normal Source): Utility main disconnect circuit breaker, 2 pole, 200 amp at 240 VAC maximum, 22kA – Square-D Type QD.
 - Main (Normal Source): Utility main disconnect circuit breaker, 2 pole, 200 amp at 240 VAC maximum, 42kA – Square-D Type QG.
 - Permanent Emergency Source: Permanent emergency source circuit breaker, 2 pole, 200 amp at 240 VAC maximum, 10kA – Square-D Type QB.
 - Temporary Emergency Source: Temporary emergency source circuit breaker, 2 pole, 200 amp at 240 VAC maximum, 10kA – Square-D Type QB.
 - Branch: Branch ratings as follows when used with the specified branch devices and in combination with selected optional normal and emergency source short-circuit ratings.
 - 42kA using Square-D QH or QHB rated: 1 pole 15-30A, 2 pole 15-30A, 3 pole 15-30A.
 - 22kA using Square-D QO-VH or QOB-VH rated: 2 pole 150A, 3 pole 35-150A.
 - 10kA using Square-D QO or QOB rated: 1 pole 15-70A, 2 pole 15-125A, 3 pole 15-30A.
- Panelboard: Square-D NQ, 200 Amp maximum, 240 VAC maximum, single phase with 100% rated neutral. 30 circuits, accepts bolt-on or plug-in branch devices.
- Square-D QO120GFI, 20 Amp, 120 VAC Ground Fault Circuit Interrupter (GFCI) circuit breaker, wired to a duplex outlet.
- Transient Surge Protection: Connected to line side of panelboard for L-N (and L-G if used as service equipment) mode protection. ASCO 510 Series TVSS with phase monitoring, alarm module, and load phase voltage availability indicator's (LED) on front of swing panel.
- Enclosure:
 - Type 3R Listed to UL 50/50E. Single compartment wall mount compartment provides Type 1 protection with exterior open and swing panels closed.
 - Box and Doors: Constructed of 0.095 thick aluminum alloy (5052-H32).
 - Finish (all interior and exterior surfaces): Textured polyester powder coat, cool white.
- Alarms – Utility Loss Alarm Monitoring, SPD Fail, and generator.

Figure 2.2 Enclosure Dimensions (F2020029) (2-Bay)



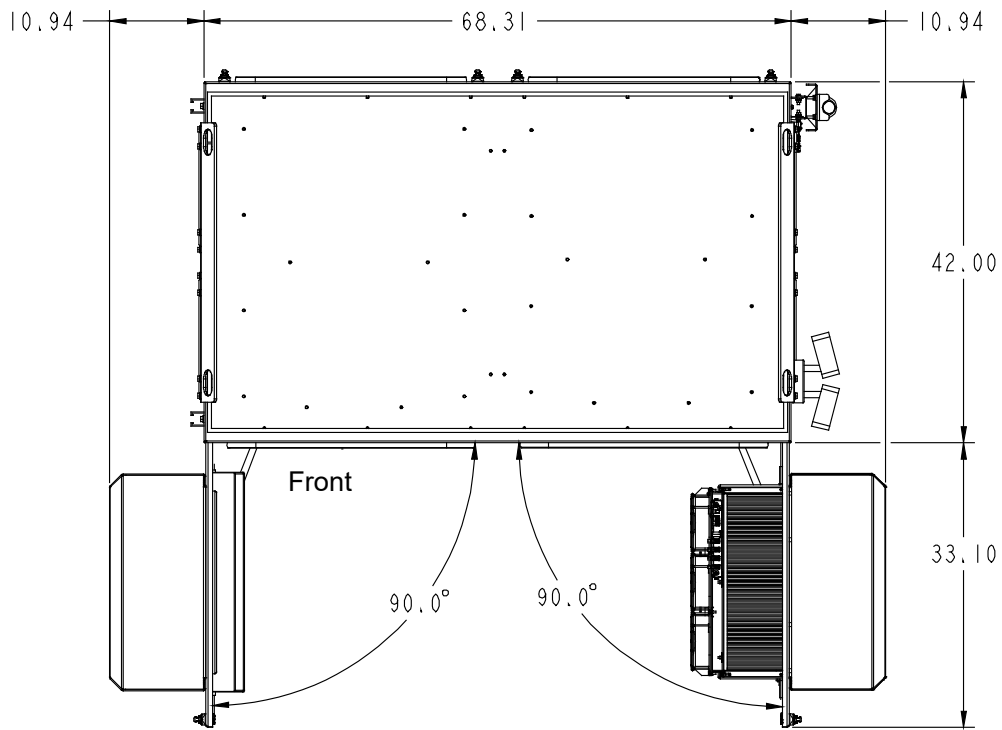
Notes:
 1. All dimensions are in inches.

Figure 2.3 Enclosure Dimensions (F2020030) (3-Bay)



Notes:
 1. All dimensions are in inches.

Figure 2.4 Overhead View with Door Open (F2020029) (2-Bay)



Notes:

- 1. All dimensions are in inches.

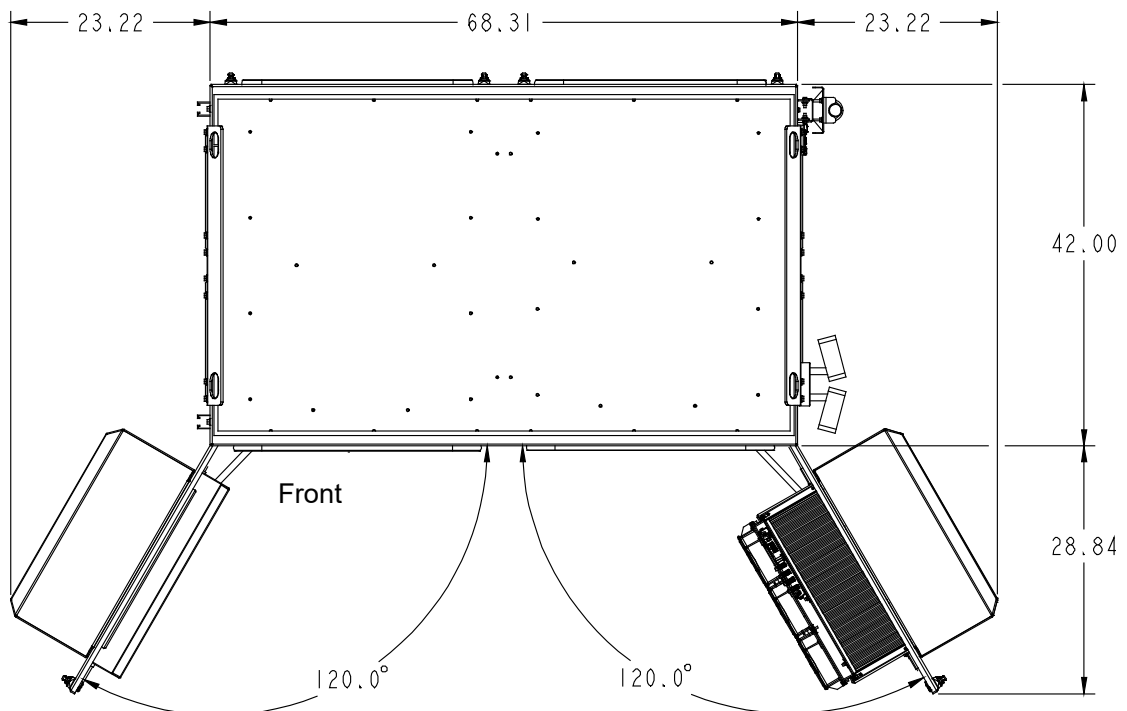
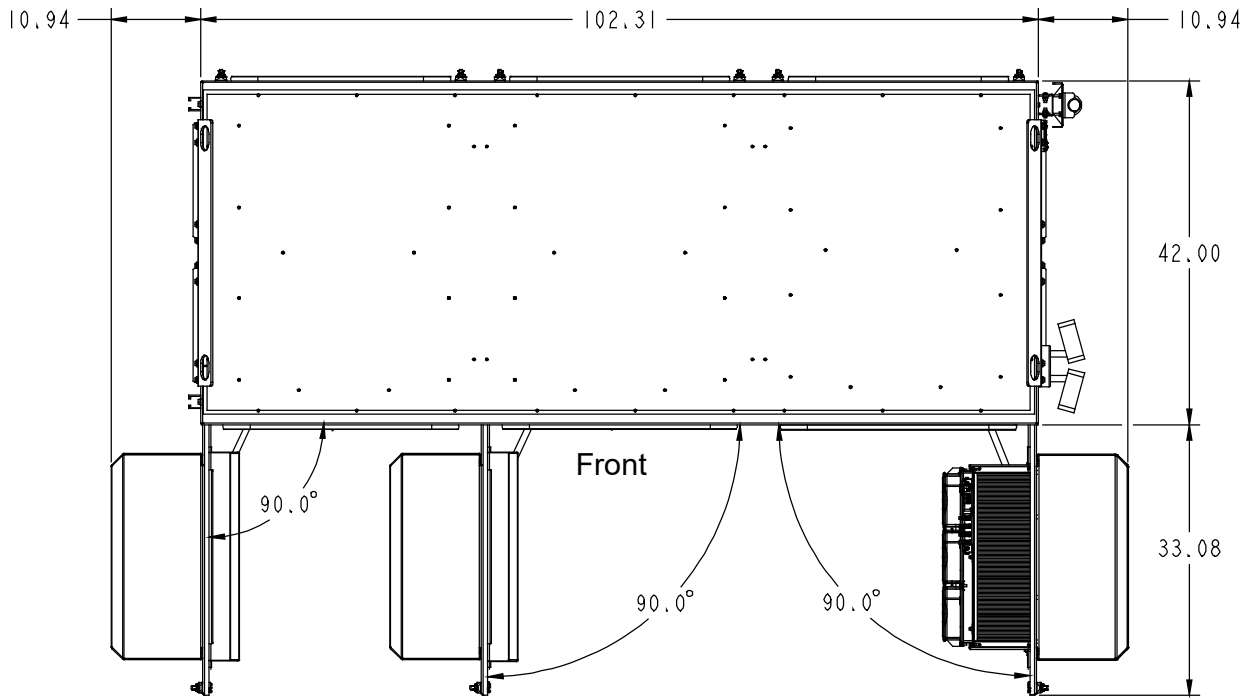


Figure 2.5 Overhead View with Door Open (F2020030) (3-Bay)



Notes:

- 1. All dimensions are in inches.

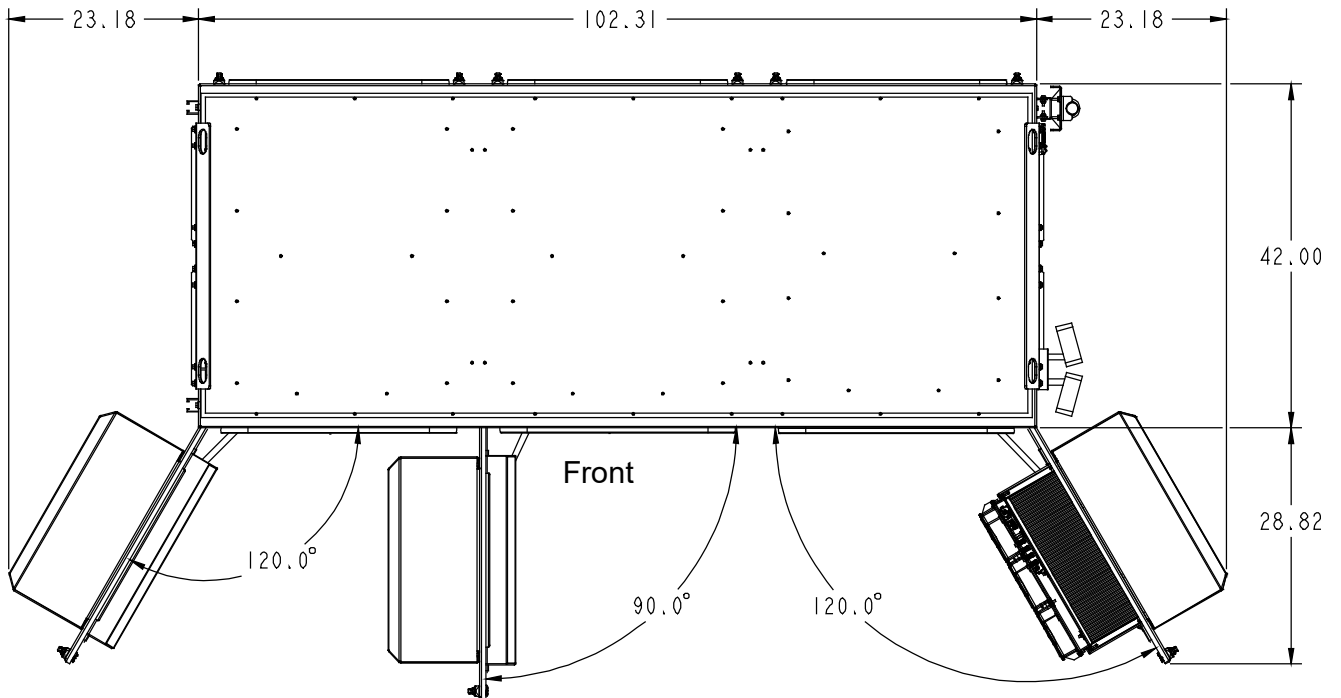


Figure 2.6 Equipment Mounting Rails Dimensions

Typical Equipment Bay

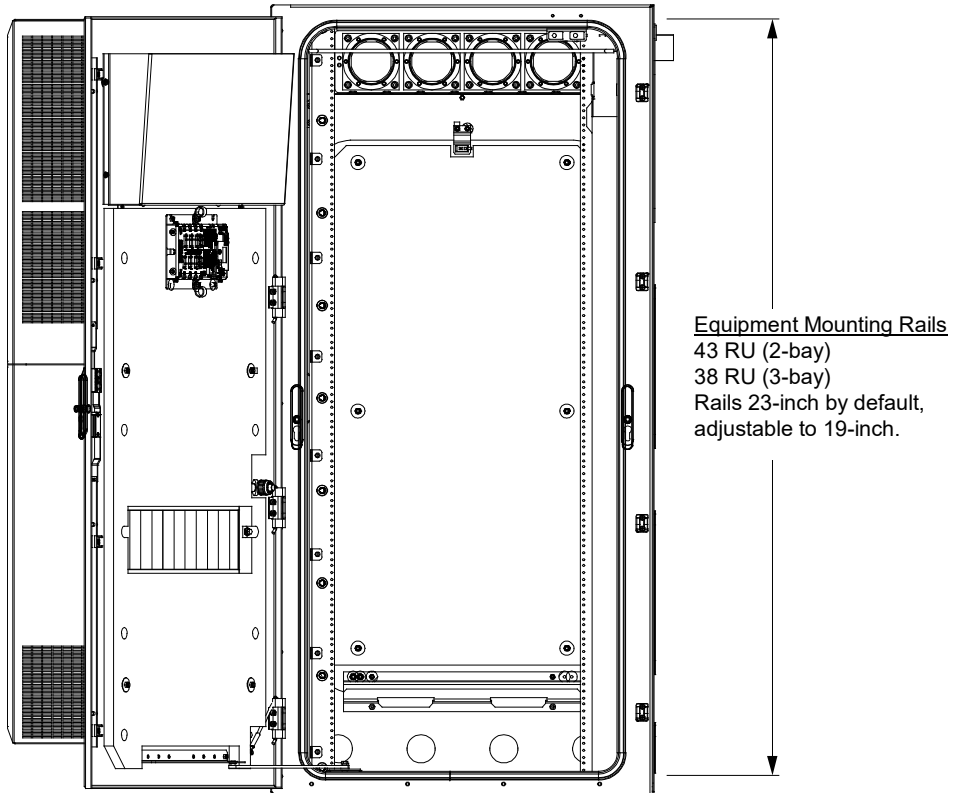
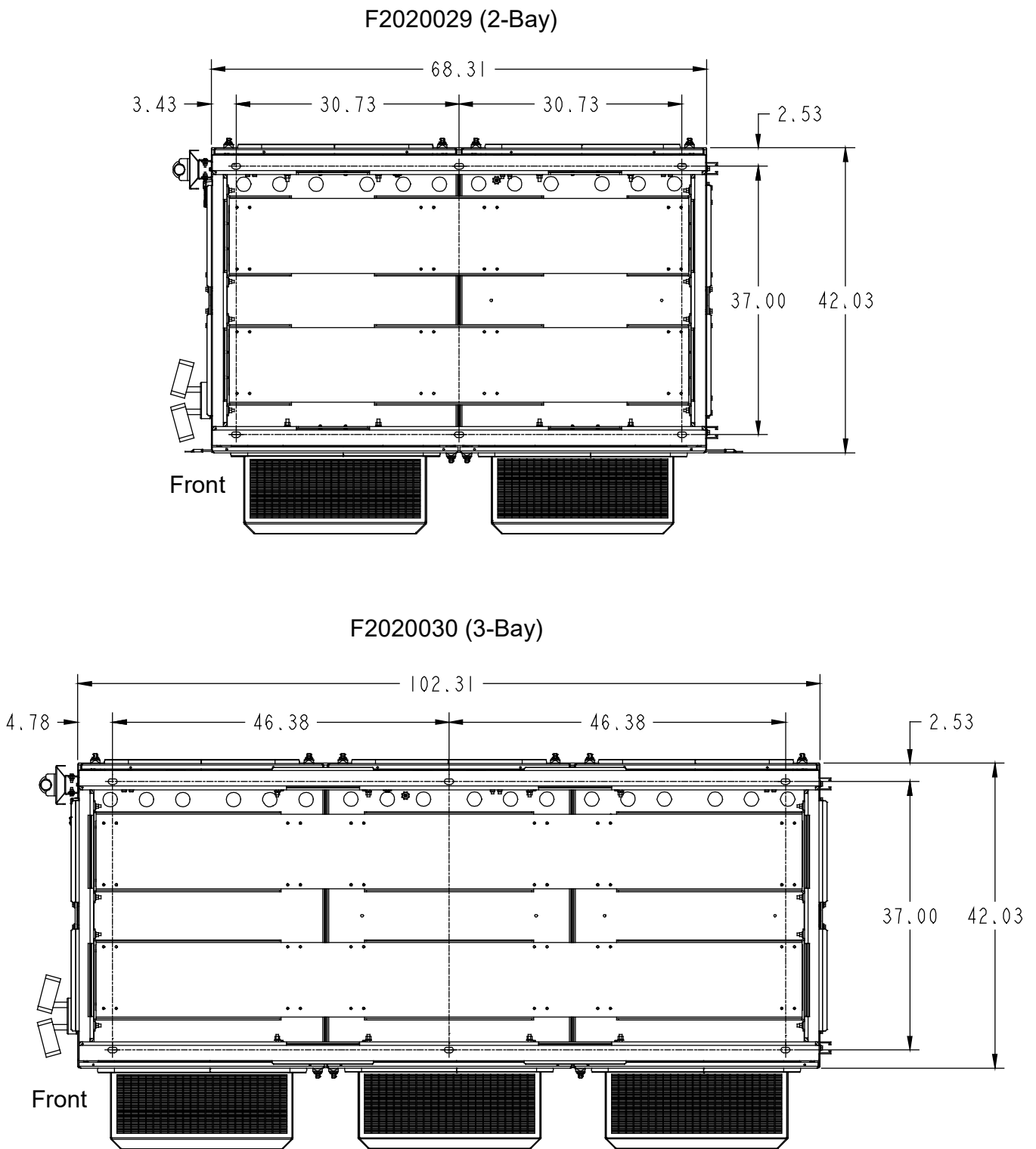


Figure 2.7 Enclosure Base Dimensions



Notes:

- 1. All dimensions are in inches.

Enclosure Bottom Views

2.6 Enclosure Features and Options

Perspective Views: Refer to Figure 2.8 and Figure 2.9 for enclosure perspective views with major features identified.

Mounting Options: The enclosure is designed to be pad or platform mounted.

Mounting Plinth: The enclosure is equipped with a mounting plinth. The mounting plinth provides forklift tubes accessible from all four sides of the enclosure. Removable covers are provided over the forklift access openings.

Lifting: The top is equipped with lifting brackets at each end of the enclosure. These lifting brackets provide four (4) lifting attachment points (one in each corner of the enclosure) that allows the enclosure to be lifted and lowered into position. The base is also equipped with forklift tubes that allow the use of a forklift to offload and lower the enclosure at the site.

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

Security Light: A motion controlled outside light is provided on the right side of the enclosure.

GPS Antenna Mounting Pipe: A GPS antenna mounting pipe is provided on the right side of the enclosure.

Bays: The enclosure includes one (1) or two (2) equipment bays. The enclosure includes one (1) power/battery bay.



NOTE! *The enclosure is furnished in a 2-Bay or 3-Bay configuration. A 2-Bay configuration cannot be converted into a 3-Bay configuration.*

Equipment Bay(s): Each equipment bay provides a single compartment to house support equipment.

- Equipment Mounting Rails: 2-Bay has 43 RU; 3-Bay has 38 RU (23-inch by default, but adjustable to 19-inch).
- LED Light Strip: Each bay contains an internal 48 VDC powered LED light strip.
- Equipment Ground Bar: Each bay contains an internal ten (10) position ground bar. This ground bar is mounted on isolators. The ground bar accepts two-hole lugs with 1/4-inch mounting holes on 5/8-inch spacing.
- Alarm Blocks: Two (2) R66 alarm blocks are provided in one of the equipment bays to connect enclosure alarms into customer alarm circuits.
- Heating: Each bay is equipped with one (1) 48 VDC, 1000 W, heater assembly.
- Each bay includes a front door and rear access panels (refer to “Front Doors” and “Rear Access Panels” below).

Power/Battery Bay: The power/battery bay provides two compartments.

- Equipment Compartment: Includes an equipment compartment to house a power system.
- Sealed Battery Compartment: Includes a sealed battery compartment with three (3) battery shelves designed to support front post VRLA type batteries. Each shelf provides space for installation of one -48 VDC battery string. Each battery shelf is equipped with a 200 ampere battery disconnect circuit breaker. Each circuit breaker provides connection to the shelf's battery string's negative terminal.



NOTE! *Compartment is environmentally sealed but has hydrogen gas vents for VRLA battery outgassing.*

- LED Light Strip: The bay contains an internal 48 VDC powered LED light strip.
- Master Ground Bar (MGB): The bay contains an internal ten (10) position Master Ground Bar (MGB). This ground bar is mounted on isolators. The ground bar accepts two-hole lugs with 1/4-inch mounting holes on 5/8-inch spacing.

- GFCI Protected Convenience Outlet: The bay provides a GFCI (Ground Fault Circuit Interrupter) protected convenience outlet on a 20 A branch circuit.
- Heating: The bay is equipped with two (2) 48 VDC, 1000 W, heater assemblies (one in each compartment).
- The bay includes a front door and rear access panels (refer to “Front Doors” and “Rear Access Panels” below).
- The power/battery bay provides conduit entries for an external ATS.

Front Doors: Each bay has a front environmentally sealed door that provides access to the inside of the bay.

- The front doors securing mechanism is a swing handle with multi-point rod-latch mechanism.
- The swing handle locking mechanism is equipped with a padlock hasp that supports a lock.
- The front doors have a self-locking wind latch that secures the door open during installation or maintenance activities. Door wind latch secures at 90-degree and 120-degree (except the middle door in a 3-bay configuration which can only be secured at 90-degree).
- The front doors have an intrusion alarm switch that is wired into the ECU to send an alarm when a door is opened. The front doors also have a second intrusion switch which activates the DC light upon door entry.
- The front doors have EPDM rubber environmental seals.
- Fold Down Laptop Desk with Document Holder: The front door of the power/battery bay is equipped with a fold down laptop desk with document holder.
- Each front door includes an active heat exchanger (with fans) (refer to “Cooling” below).

Rear Access Panels: Each bay has a rear environmentally sealed removable panel that provides access to the rear of the bay.

- Each rear panel is secured with two (2) swing handles with multi-point rod-latch mechanism.
- The swing handles locking mechanism is equipped with a padlock hasp that supports a lock.
- Each rear panel has an intrusion alarm switch that is wired into the ECU to send an alarm when a panel is removed.
- Each rear panel lifts off to be removed (after opening the two (2) swing handles).

Cooling: Each bay has a heat exchanger managed by an electronic Environmental Control Unit (ECU). The power/battery bay heat exchanger is designed with three inner loop and three outer loop fans. The equipment bay(s) heat exchanger is designed with two inner loop and two outer loop fans. The use of multiple fans allows 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.

Environmental Control Unit (ECU): Each bay has an Environmental Control Unit (ECU). The ECU is an intelligent device monitoring internal conditions and adjusting the heat exchanger fans accordingly to the needs. As such, the bay properly cools the compartment, and provides a quiet enclosure for the neighborhood. The ECU provides individual fan fusing for each fan. The ECU provides an LED display with error codes and status. The ECU also provides alarms for:

- ECU Malfunction.
- Fan Malfunction.
- Thermal Sensor (Thermistor) Malfunction
- Over and Under Temperature Conditions.
- Bay and Rear Panel Intrusion.

- **Fan Control Logic** - The ECU controls provide independent control of the internal and external heat exchanger fans, adapting to the environment, 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.

Internal Grounding: Each bay includes an internal ten (10) position ground bar. The ground bar in the power/battery bay is designated as the Master Ground Bar (MGB).

External Grounding: At the center rear of the enclosure's mounting plinth is a grounding location that provides 3/8-16 threaded holes for installation of a customer provided two-hole lug with 3/8-inch mounting holes on 1-inch spacing. This is used to provide a connection from the mounting plinth to the MGB. Also provided on the rear of the enclosure's mounting plinth, at each end, are ground pad termination points that provide 3/8-16 threaded holes for installation of customer provided two-hole lugs with 3/8-inch mounting holes on 1-inch spacing.

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

DC Power: The enclosure includes an integrated Vertiv™ NetSure™ 512 DC Power System, Spec. No. 582137000501. For additional information, please refer to "DC Power and Batteries" on page 57.

SPD (Surge Protection Device): The SPD (Surge Protection Device) is provided at the rear side of the enclosure.

Cable Entry/Exit: Bottom, sides, and rear conduit knockouts are provided. Refer to Figure 2.8 and Figure 2.9. See also "Cable Routing" on page 50. A Roxtec port is also provided for sealing the antennae cable as it exits the enclosure.

Figure 2.8 Perspective Views with Major Features Identified (F2020029) (2-Bay) (cont'd on next page)

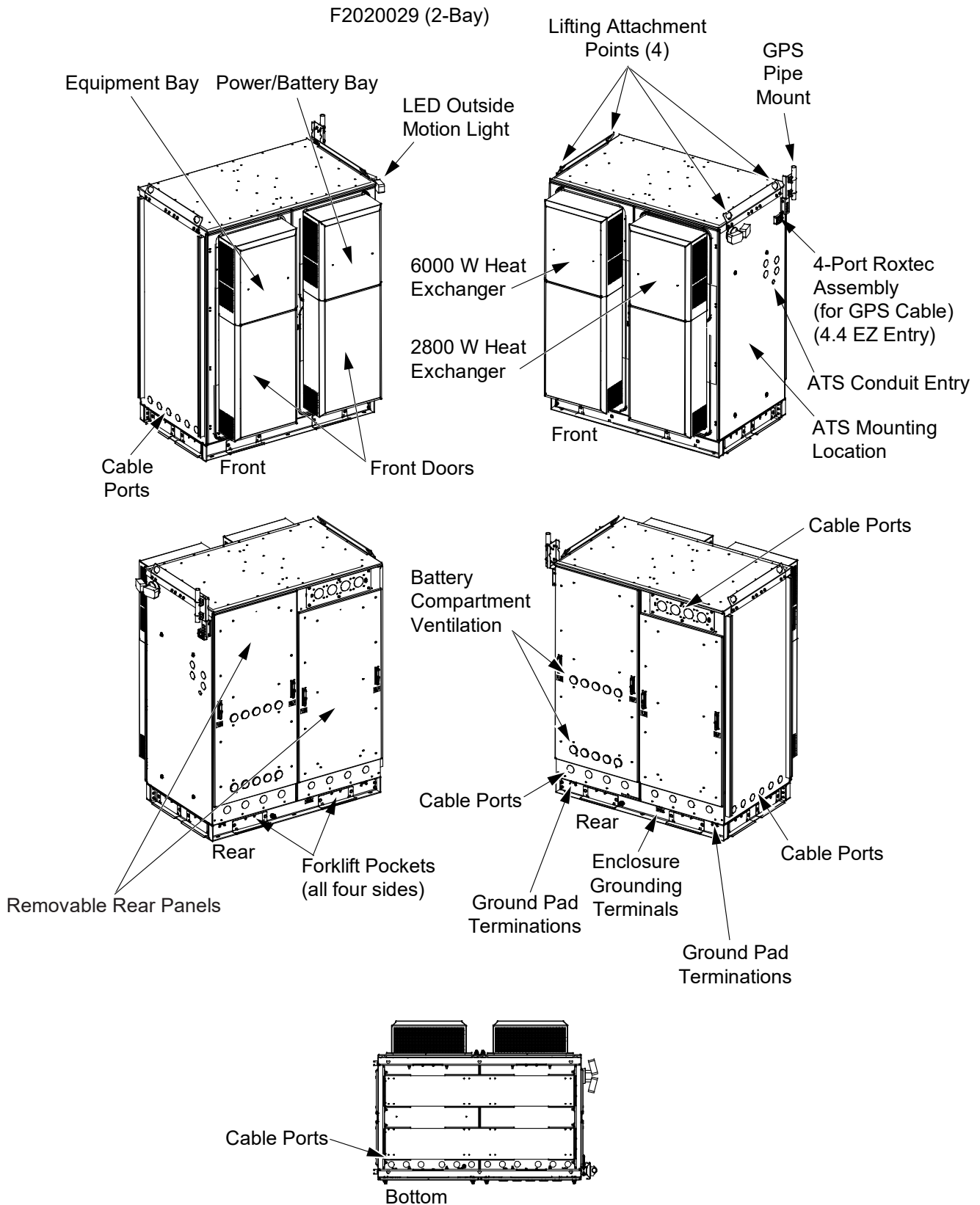


Figure 2.8 Perspective Views with Major Features Identified (F2020029) (2-Bay) (cont'd from previous page, cont'd on next page)

F2020029 (2-Bay)

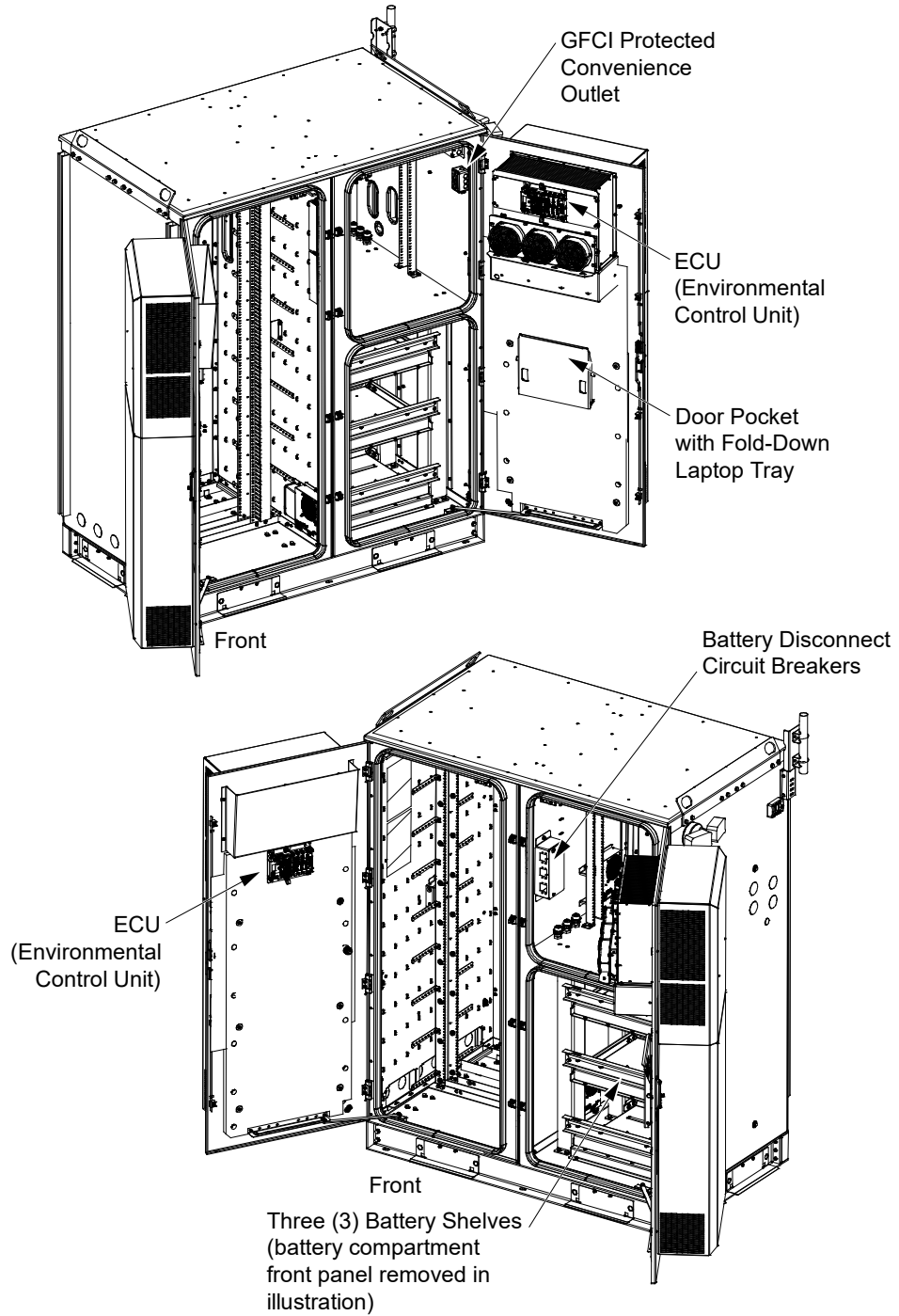


Figure 2.8 Perspective Views with Major Features Identified (F2020029) (2-Bay) (cont'd from previous page, cont'd on next page)

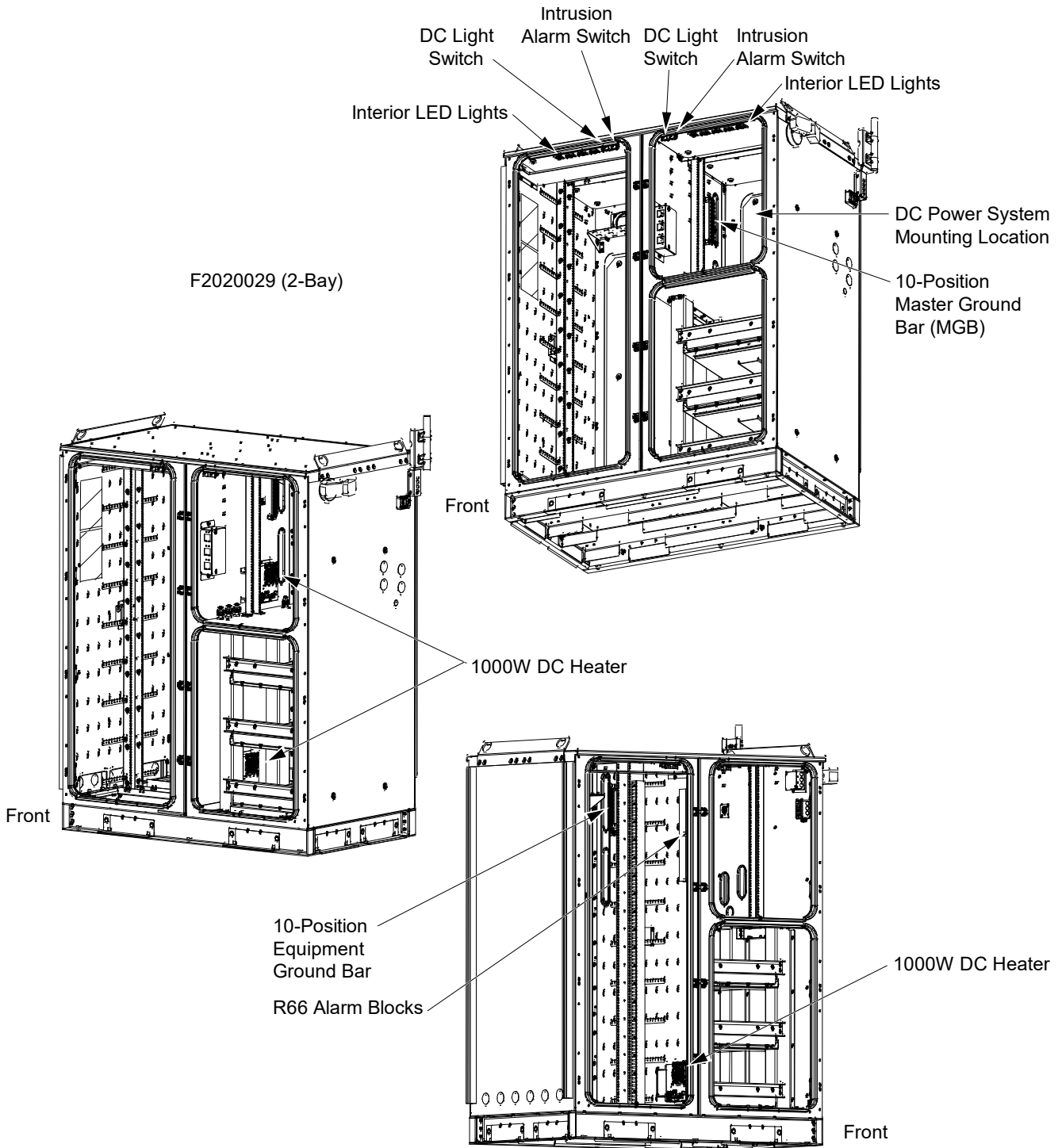


Figure 2.8 Perspective Views with Major Features Identified (F2020029) (2-Bay) (cont'd from previous page)

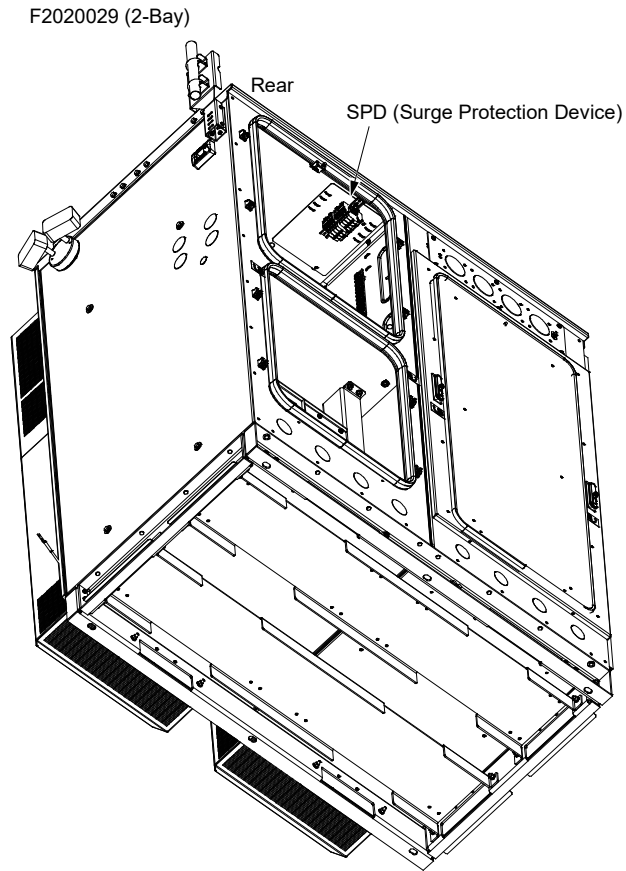


Figure 2.9 Perspective Views with Major Features Identified (F2020030) (3-Bay) (cont'd from previous page, cont'd on next page)

F2020030 (3-Bay)

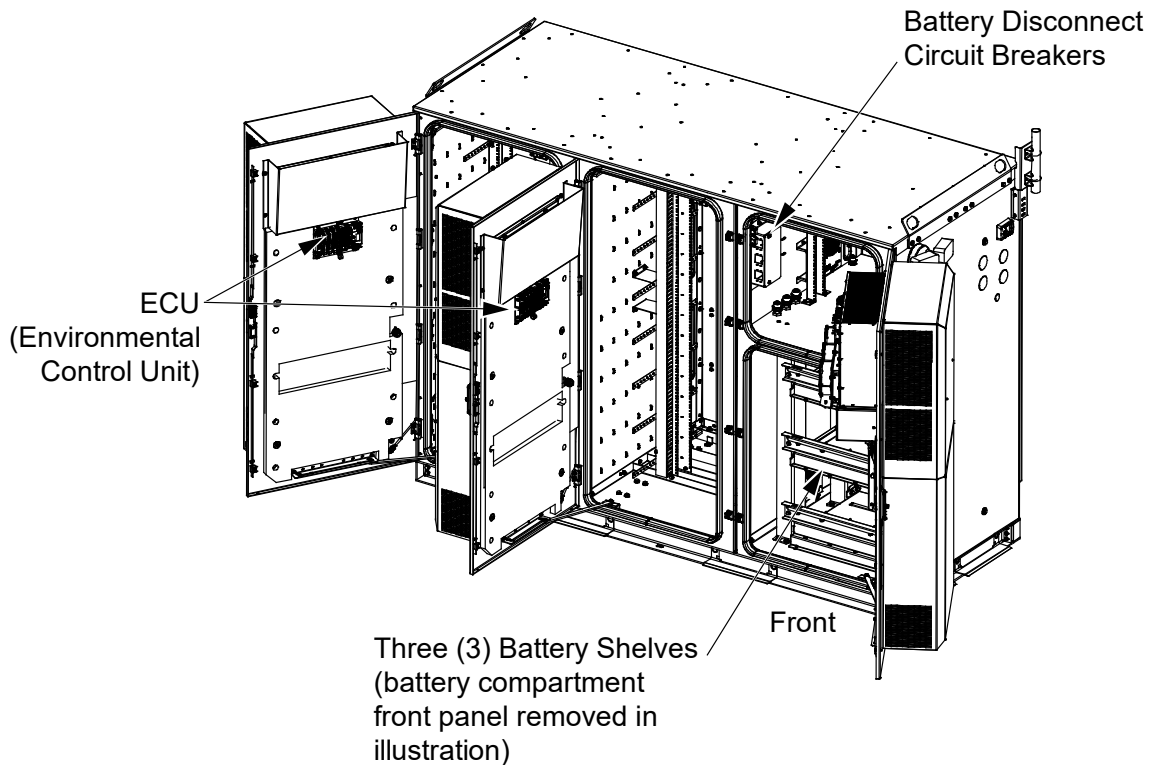
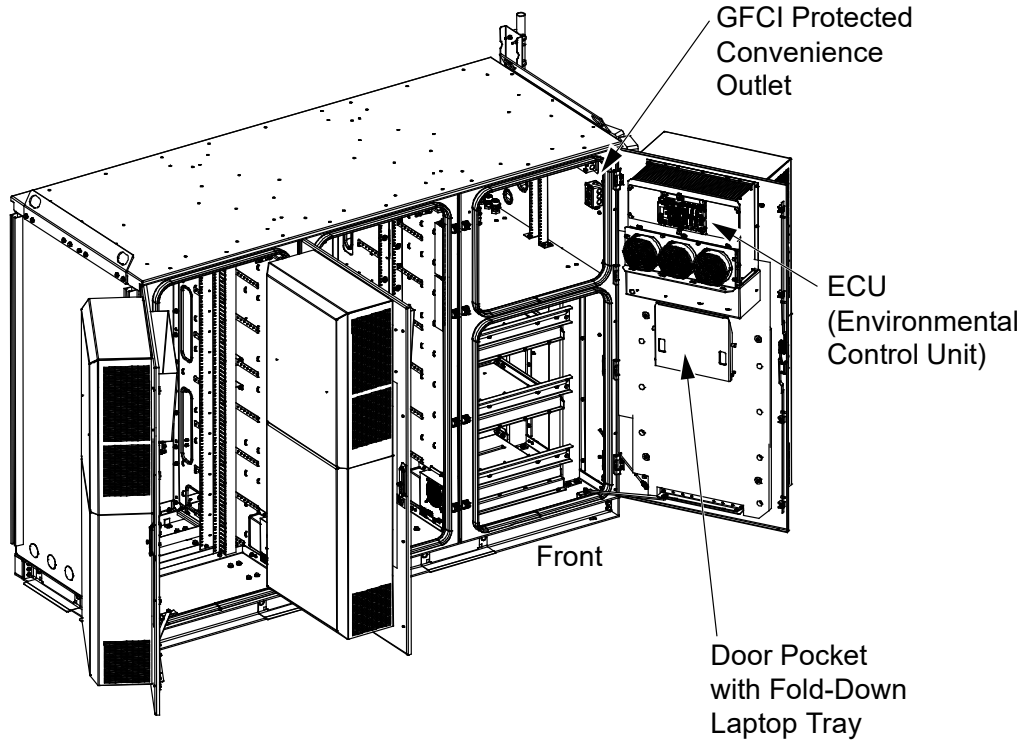


Figure 2.9 Perspective Views with Major Features Identified (F2020030) (3-Bay) (cont'd from previous page, cont'd on next page)

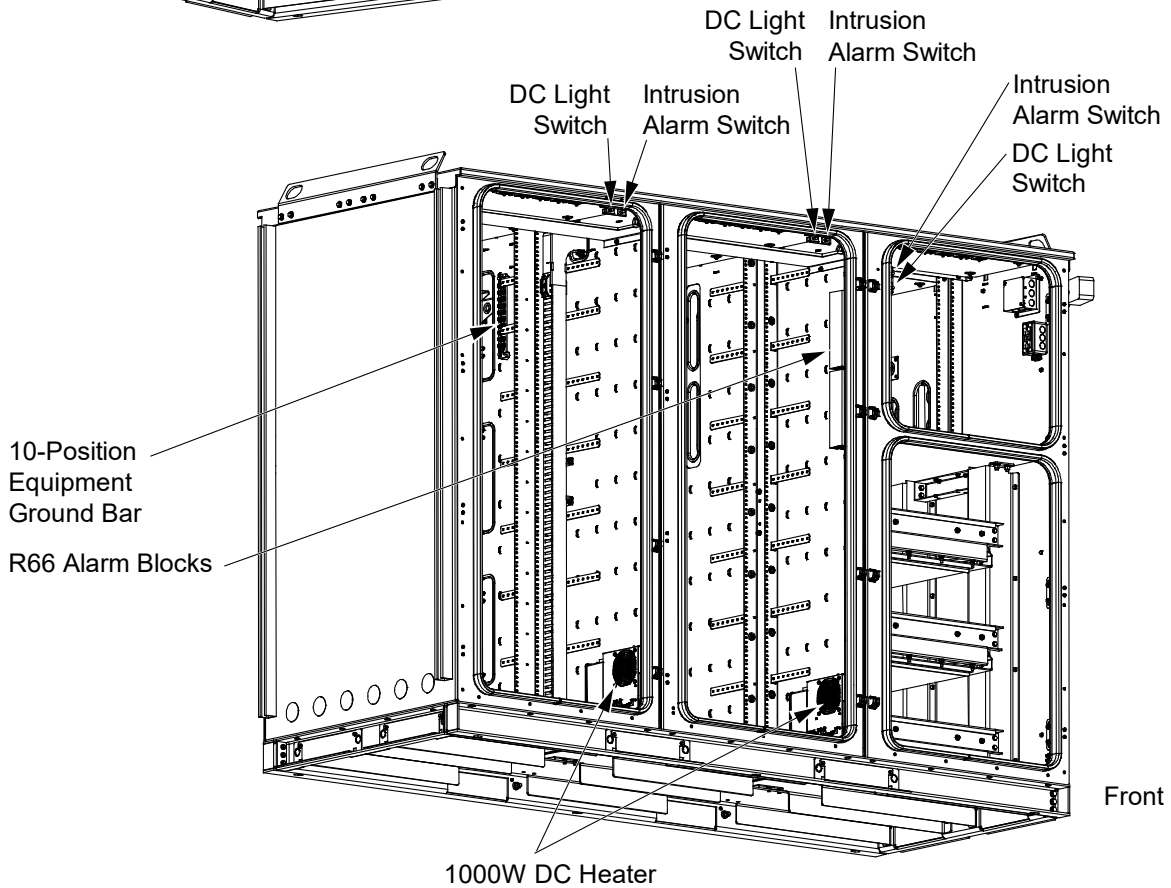
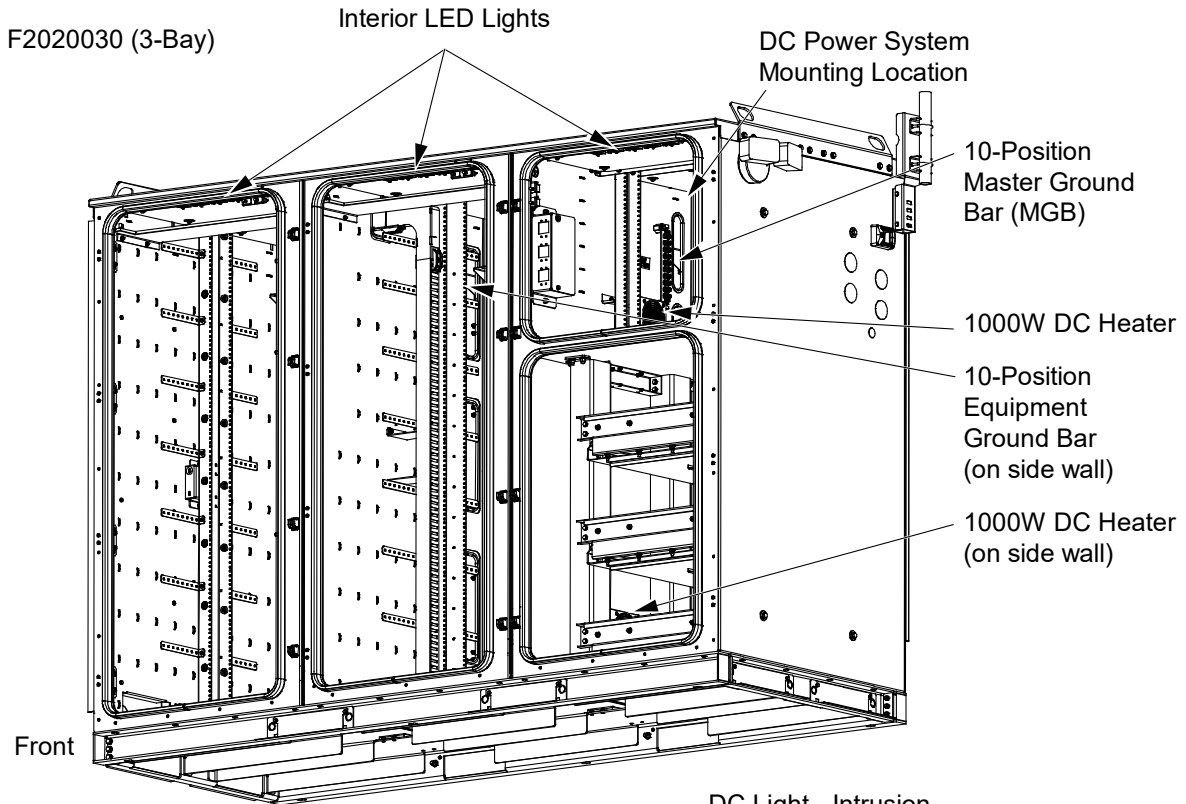
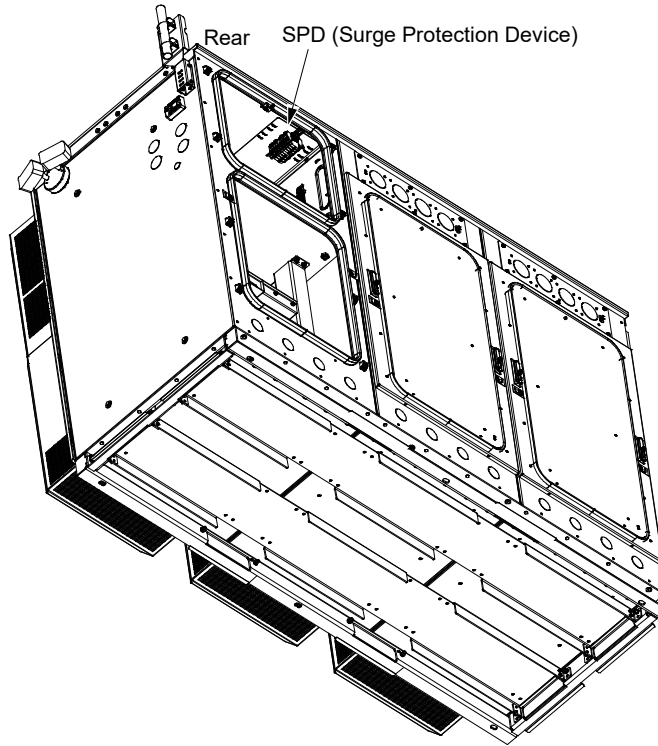


Figure 2.9 Perspective Views with Major Features Identified (F2020030) (3-Bay) (cont'd from previous page)

F2020030 (3-Bay)



3 Sequence of Procedures

3.1 General

Perform the procedures in Table 3.1 (in the order listed) to fully install the enclosure.

Other documents 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 any rectifiers, converters, controllers, batteries, etc.
- OSP cable fishing, sealing, grounding, splicing, and termination.
- Equipment manufacturer's drawings and documentation.
- Refer also to...
 - SD-2020029-01 (enclosure schematic drawing).
 - J-2020029-01 (enclosure job drawing).
 - SD-2020030-01 (enclosure schematic drawing).
 - J-2020030-01 (enclosure job drawing).

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 Doors, Locks, and Removable Panels	23	Describes how to access the inside of the enclosure. Describes the operation of the intrusion alarm and light switches.
Installation Considerations	30	Provides installation overview, recommended tools and test equipment, required installation materials, and recommended enclosure anchors.
Transportation and Storage	33	Describes the transportation and storage requirements
Mounting the Enclosure	34	Describes the safe handling of the enclosure and the procedures to install the enclosure on a pad.
Grounding the Enclosure	46	Describes the grounding requirements for the enclosure.
AC Input Power	53	Provides AC wiring information for the electrician.
DC Power and Batteries	57	Provides information regarding the DC power system and distribution. Provides battery installation and wiring information.
OSP Cables	65	Provides information on running OSP cables within the enclosure.
Alarm Wiring	66	Describes the wiring for the enclosure alarms.
Sealing Enclosure Cable Entries	71	Provides methods for sealing the cable entries.
Initial Power Up	71	Describes the power up sequence for the AC power, the DC power, and the batteries.
Climate Control	72	Describes the operation of the enclosure's climate control systems such as the Environmental Control Unit (ECU) and heat exchanger.
Maintenance, Troubleshooting, and Replacement Procedures	79	Provides maintenance, troubleshooting, and replacement information.

4 Front Doors, Locks, and Removable Panels

4.1 Important Safety Instructions



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

4.2 Front Doors

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

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

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

4.2.1 Opening and closing an enclosure front door

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

Opening a Front Door

Procedure

1. Is the environment safe? Use an approved voltage detector to assist in determining if access to the enclosure is safe.
1. If required, unlock and remove the padlock from the front door latch.
2. Lift the swing-latch and rotate approximately 90-degree clockwise or counterclockwise (depending on door) to disengage door closing mechanism. Open the door. Refer to Figure 4.1.
3. 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-degree and must be lifted again to open to 120-degree. Refer to Figure 4.2. Note that the middle door in a 3-bay configuration can only be secured at 90-degree.



NOTE! To disable the intrusion alarm, refer to “Door/Panel Activated Intrusion Alarm Switch” on page 26.

Closing a 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-degree position to fully close the door. Refer to Figure 4.2.
2. Close the door.
3. While holding the door closed, rotate and lower the swing-latch into the lock bed. Refer to Figure 4.1.
4. If required, replace padlock.

Figure 4.1 Front Door Swing-Latch

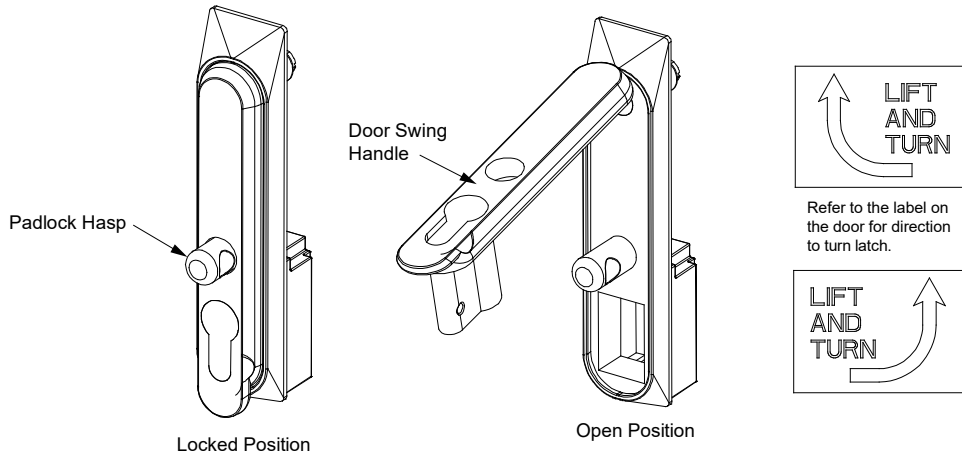
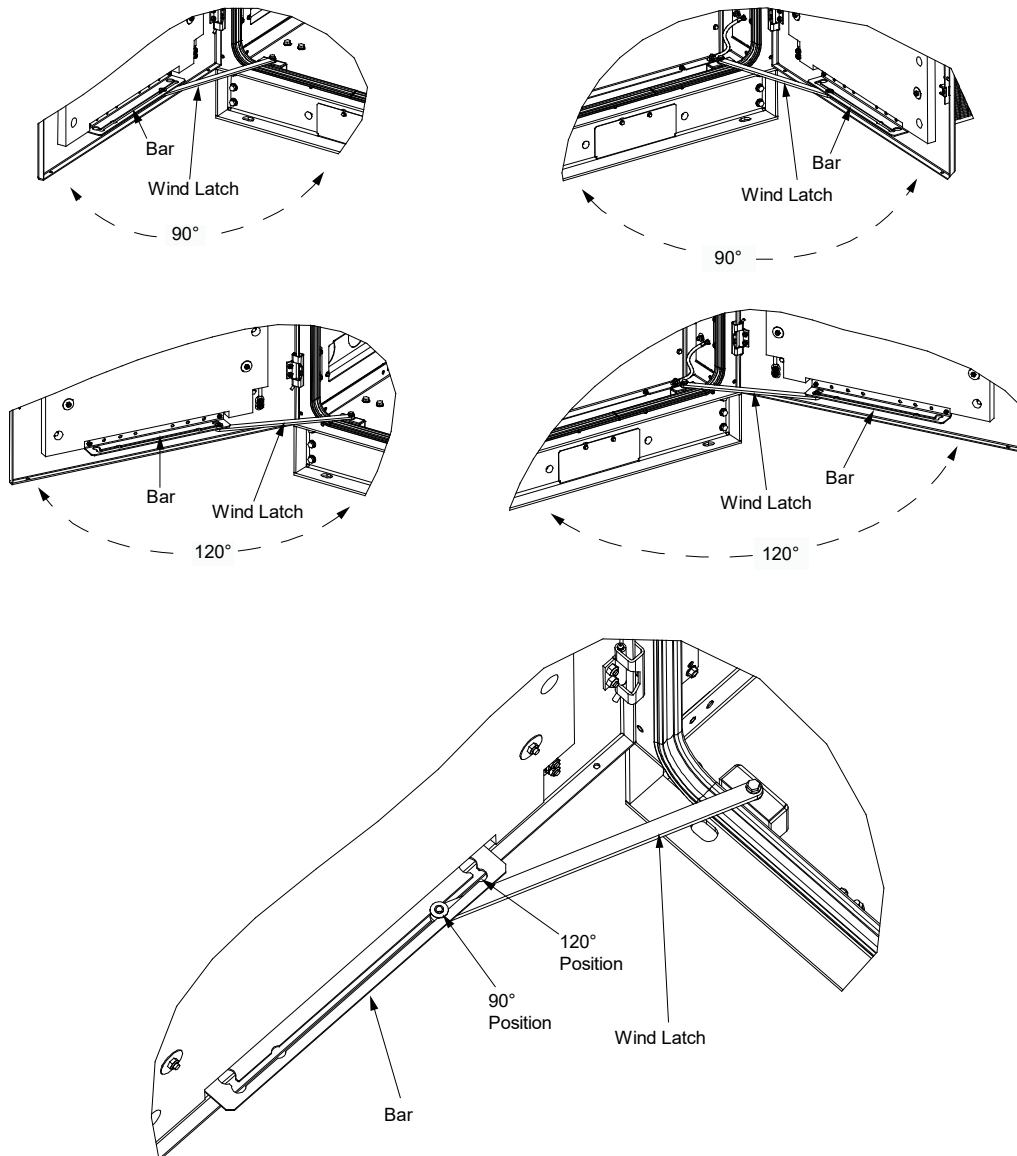


Figure 4.2 Front Door Wind Latch



4.3 Rear Access Panels

Each bay has a rear access panel. Each rear access panel is equipped with two (2) swing handles and multi-point rod-latch systems. The swing handles latches include provision for customer supplied padlocks.

Refer to the next section for instructions to remove/install rear access panels.

4.3.1 Removing/installing rear access panels

Remove and install the rear access panels as described in the following procedures.

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

Removing a Rear Access Panel

Procedure

1. Is the environment safe? Use an approved voltage detector to assist in determining if access to the enclosure is safe.
2. If required, unlock and remove the padlock from the rear access panel latches.
3. Lift the swing-latch and rotate approximately 90-degree clockwise or counterclockwise (depending on latch location) to disengage panel closing mechanism. Note there are two (2) latches per panel. Refer to Figure 4.1 and Figure 4.3.
4. Swing the top of the panel out and lift the panel up and out to remove.

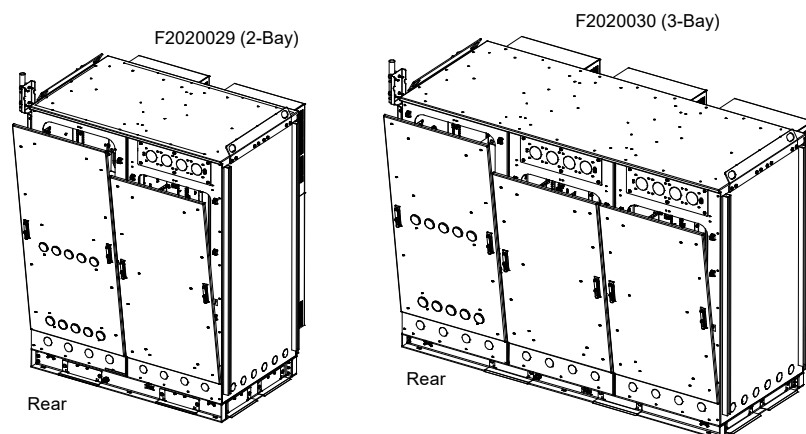
NOTE! *To disable the intrusion alarm, refer to “Door/Panel Activated Intrusion Alarm Switch” on page 26.*

Installing a Rear Access Panel

Procedure

1. Lift the panel up into position, sliding the bottom into position first then rotating the top into position. Note that the bottom of the panel has tabs that slide into cutouts locate inside the enclosure.
2. While holding the panel in closed position, rotate and lower the two (2) swing-latches into the lock beds. Refer to Figure 4.1 and Figure 4.3.
3. If required, replace padlock.

Figure 4.3 Removing/Installing Rear Access Panels



4.4 Door/Panel Activated Intrusion Alarm Switches

The enclosure is equipped with an intrusion alarm system. Each front door and rear access panel has an intrusion alarm switch. The intrusion alarm switches are connected to the bay's ECU. The ECU issues an intrusion alarm when a front door is opened, or a rear access panel is removed. The intrusion alarm can be disabled while performing routine maintenance as described in the following procedure. Refer to Figure 4.4 and Figure 4.5 for location of the intrusion alarm switches. Refer to "Intrusion Alarm" on page 78 for further information.

Procedure

1. When a front door is opened or a rear access panel is removed, the thermal system components turn off and the intrusion alarm activates.



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

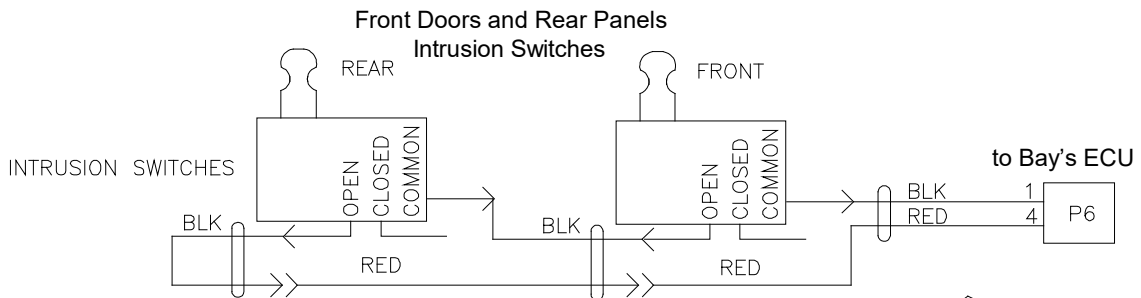
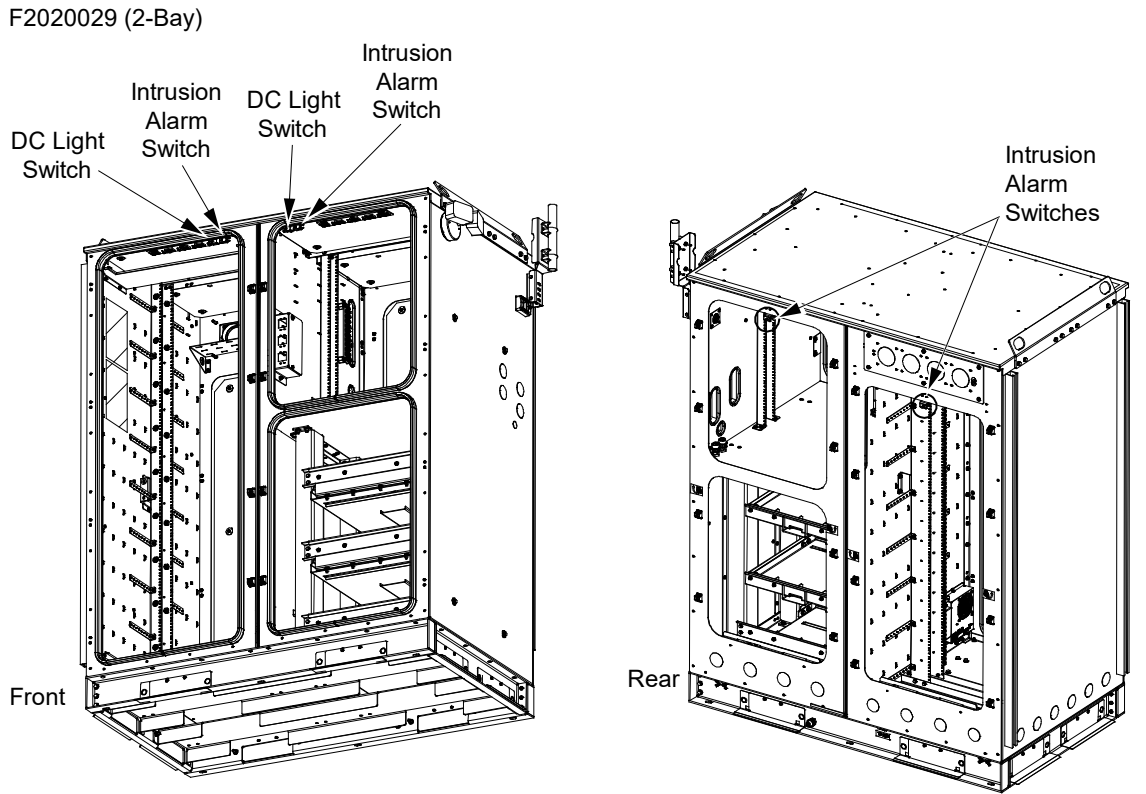
2. To disable the intrusion alarm, momentarily depress the Audible Alarm Cutoff / Maintenance / Reset pushbutton located on the ECU. Refer to Figure 17.1 for location. The intrusion alarm is reset by closing a front door or replacing a rear access panel.

4.5 Door Activated Light Switches

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

1. The light can be turned off by pulling the plunger on the door activated light switch. Refer to Figure 4.6 and Figure 4.7 for location of the door activated light switches.

Figure 4.4 Door/Panel Activated Intrusion Alarm Switches (F2020029) (2-Bay)



Intrusion Alarm Switch Wiring Diagram

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

Note: These switches are reserved for ECU notification, and also affect HEX fan operation as described in the ECU section.

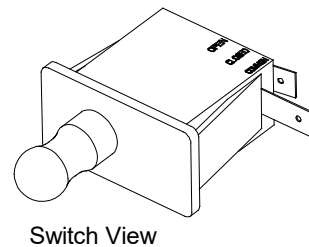
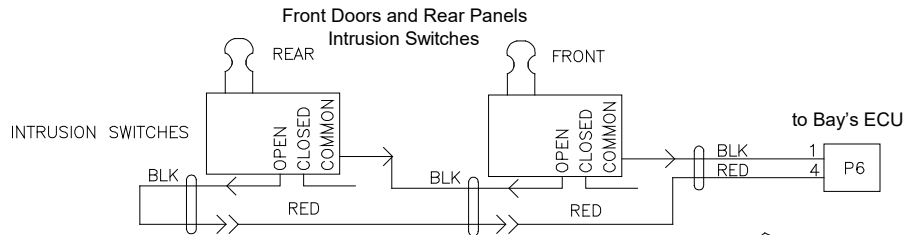
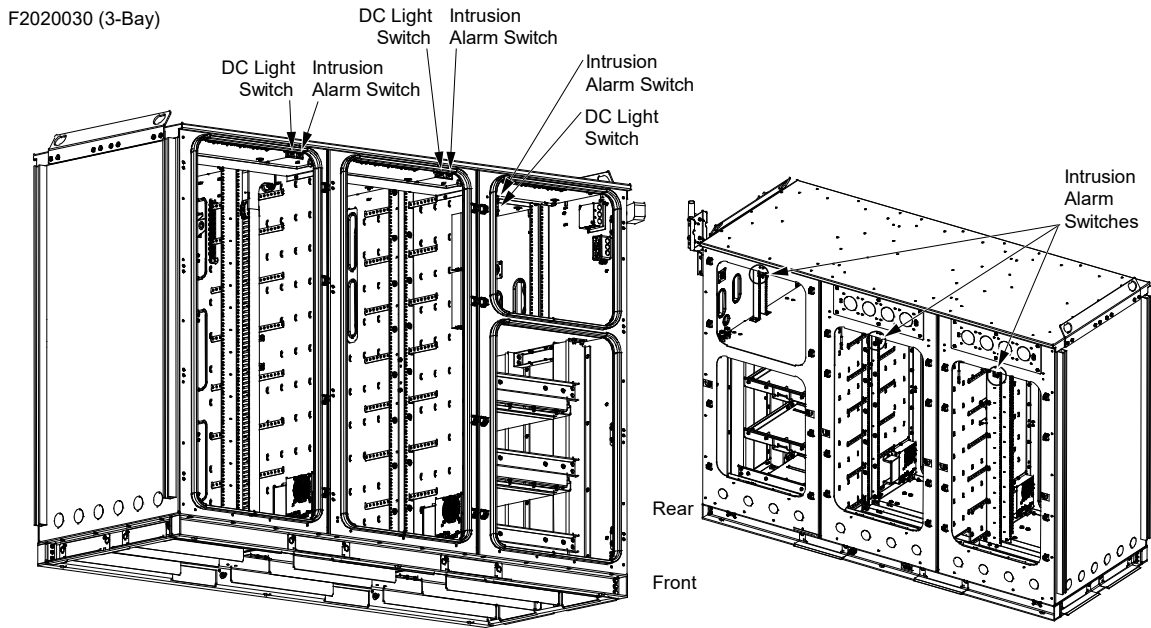


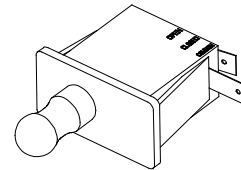
Figure 4.5 Door/Panel Activated Intrusion Alarm Switches (F2020030) (3-Bay)



Intrusion Alarm Switch Wiring Diagram

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

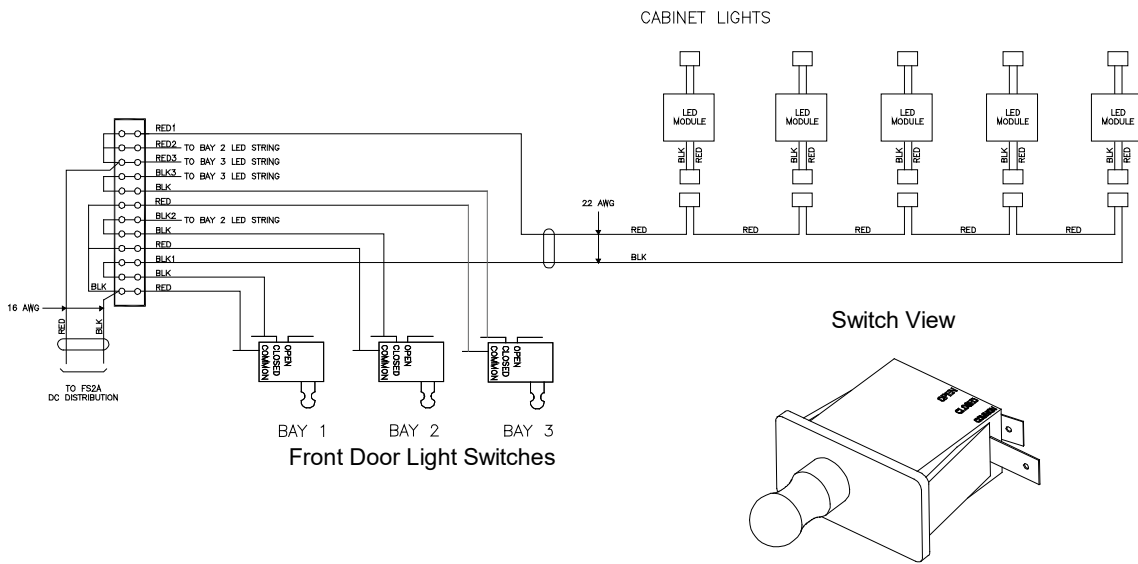
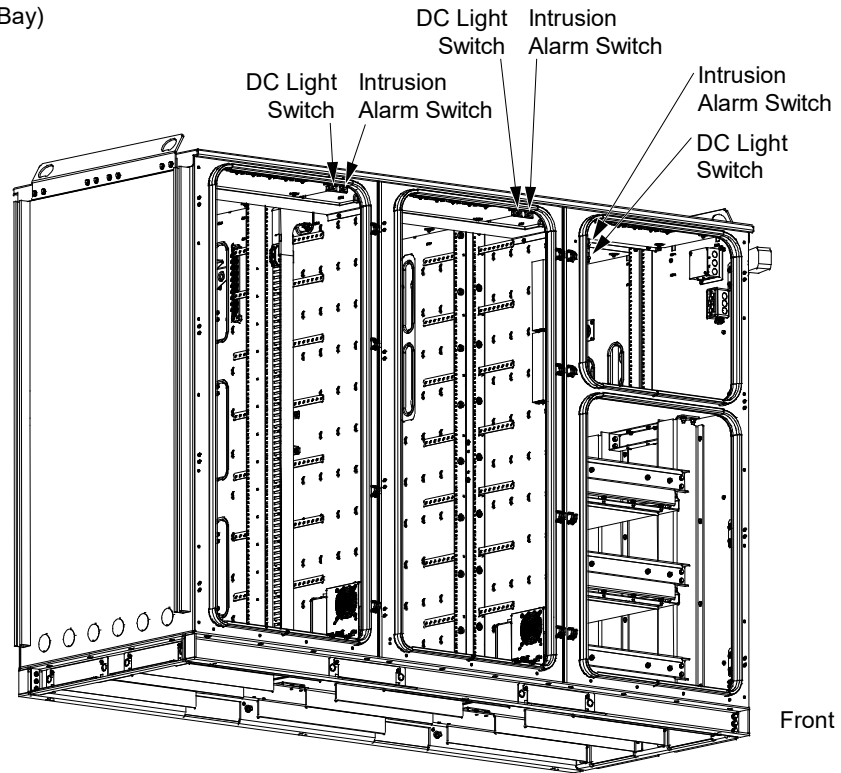
Note: These switches are reserved for ECU notification, and also affect HEX fan operation as described in the ECU section.



Switch View

Figure 4.7 Door Activated Light Switches (F2020030) (3-Bay)

F2020030 (3-Bay)



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 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 AC power.
- Install and verify batteries.
- Route, splice, and verify any OSP cables.
- Install and verify alarm cables.
- Turn-up, verify, and adjust the system.

5.2 Site Selection Considerations

General

Obtain rights-of-way and other permits (building permit, electrical permit, etc.), depending on local codes and authorities, prior to installing the enclosure.

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/bollards 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 inches 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 not produce leaves, sticky pollen or waste that could fall and clog the climate control units' vents.
- If the area is subject to freezing temperatures, be sure to comply with the local building codes and footing requirements to eliminate the possibility of frost heave.
- Minimize snow buildup around the enclosure and its externally mounted components.
- Placement should support access for snow removal in the event of a snow / ice storm.

5.3 Tools, Test Equipment, and Materials Recommended for Installation

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

- Approved voltage detector.
- Digital multimeter (DMM), 0 to 200 VDC, 0 to 300 VAC.
- Torque wrench.
- Ratchet drive, extensions, sockets.
- Carpenter's level.
- Lineman's scissors.
- Lineman's strippers.
- Lineman's cutters.
- Appropriate crimping tool with dies.
- Electrician's insulated screwdrivers, Phillips, No. 1 and 2.
- Electrician's insulated screwdrivers, flat-blade, small and large.
- Insulated nut drivers for battery installation.
- Silicone sealant.
- NO-OX-ID-A or approved equivalent.



NOTE! *Outside the scope of this document, are the tools to fish, splice and terminate OSP cables.*



NOTE! *Equipment associated with lifting the enclosure is listed separately, in a subsequent section.*

5.4 Materials Required for Installation

General

The materials listed in Table 5.1 are required to install the enclosure.

Recommended Anchors

Refer to Table 5.1 for recommended anchors.

Table 5.1 Materials Required for Installation

Description	Part Number	Quantity	Comments
1/2" - 13 x 3.0 Lg SST* Hex Head Screw	140174	6	For Platform Mounting (Included)
1/2" - 13 SST* Hex Nut	P25849	6	For Platform Mounting (Included)
1/2" SST* Lock Washer	P29739	6	For Platform Mounting (Included)
1/2" SST* Flat Washer	P74233	12	For Platform Mounting (Included)
Heavy Duty Load Washer	Andrew P/N MT-25002, or equivalent	6	For Platform Mounting (Available through Distribution)
Leveling Shim Kit	547061	1	(Included)
Recommended Anchors	(6) 1/2" Hilti HSL. (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.		
Recommended Ground Bar Lug (2 AWG)	Panduit LCDX2-14A-E	1	(Not Included)

*SST = Stainless Steel



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.

6 Transportation and Storage

6.1 Important Safety Instructions

Read the "Important Safety Instructions" starting on page vii.

6.2 Transportation

Use lifting equipment such as a crane or forklift (appropriately rated for the weight of the enclosure and pallet) to transport the enclosure to the installation or staging site. Refer to "Required Equipment to Lift the Enclosure" on page 38.

6.3 Storage

Store the enclosure upright to avoid possible damage.

Storage Ambient Temperature Range: See "Environmental" on page 3.

Desiccant has been included for the enclosure to prevent condensation in the interior. If the enclosure is to be stored for a period of three (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.

7 Mounting the Enclosure

7.1 Important Safety Instructions



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

7.2 Specific Safety Precautions



ALERT! To avoid possible damage to the enclosure, do not remove the packaging or pallet from the enclosure until it is delivered to the installation or staging site. Control moisture and condensation inside the enclosure until it is turned up for service.



ALERT! Do not stack enclosures while in transportation or storage as damage may result.



DANGER! Do not install any additional equipment until the enclosure is secured in its mounted position.

7.3 General

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

7.4 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.



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

The enclosure can be installed on a concrete foundation pad, which is either cast-in-place or precast.

- 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 2-feet beyond the open radius of all doors. The minimum recommended pad size is 2-feet beyond the perimeter of the enclosure.
- To orient the mounting bolt holes and conduit openings in the pad, use the dimensions in Figure 2.7.
- 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 inches for standard applications and 60 inches for areas where there is heavy frost.
- Use a minimum of 6 inches 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 inch to No. 4 only.

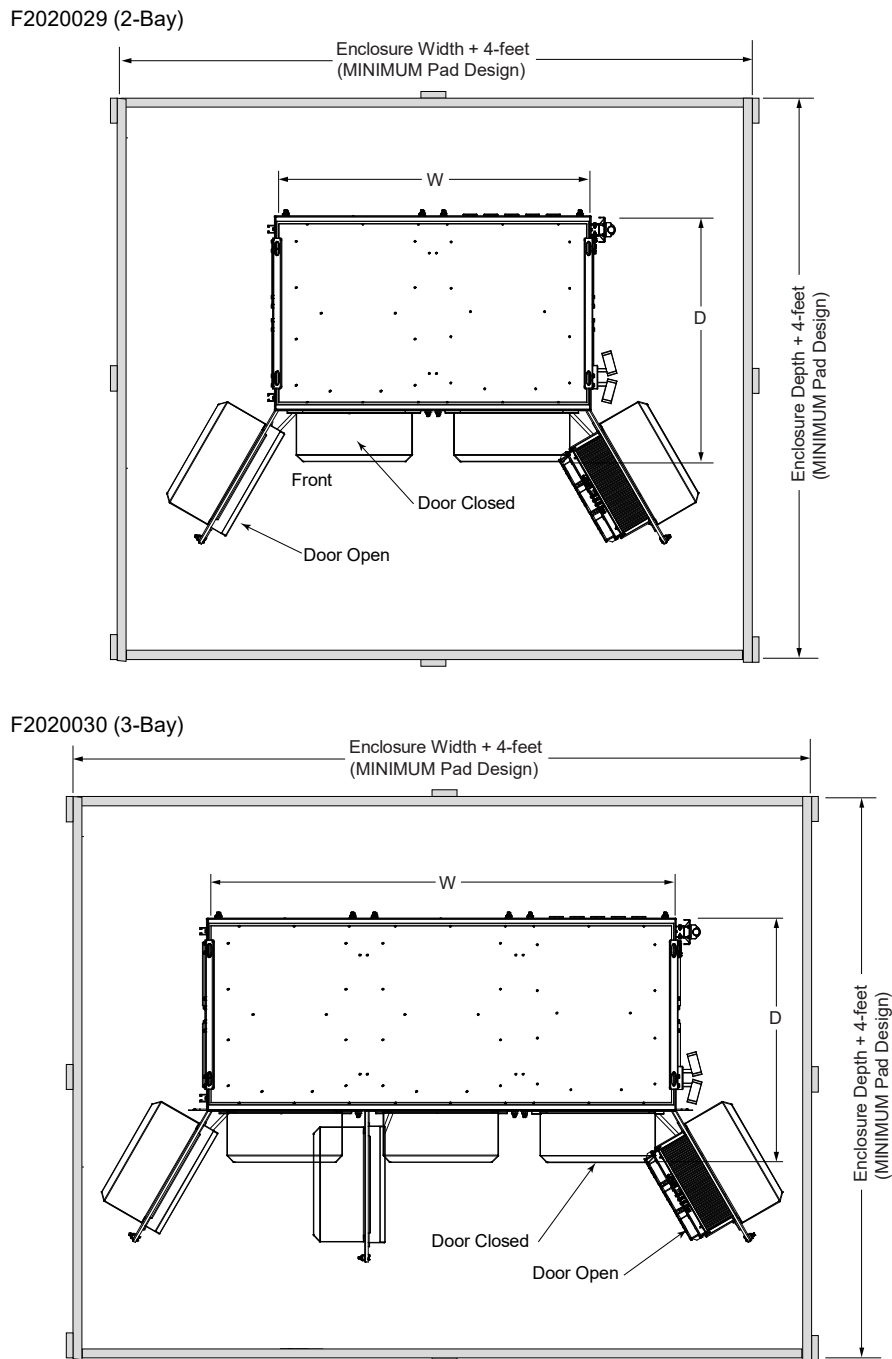
7.5 Preparing the Form and Pouring the Pad

Follow local practices or building codes if different than the information included in this section. Install a ring ground system around the proposed foundation pad in accordance with local practices and safety codes.

Referring to Figure 7.1, determine the proper pad size for your application and space available. The MINIMUM recommend pad size extends 2-feet 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 conduit and mounting locations (refer to Figure 2.7).

Figure 7.1 Pad Sizing



Procedure

1. 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 inches to 16 inches. If the soil is not firm, compact it.
2. 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.
3. Construct a level base for the pad, using a minimum of 6 inches of sand or gravel. The pad should be level to within 1/4 inch over the entire length and width. Tamp as needed.
4. 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 inches for a standard installation, and 60 inches for areas where there is heavy frost. Do not damage any installed cables.
5. 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.
6. Backfill and tamp the trench(s) so the conduits remain in their position.
7. 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.
8. If required, use local practices to treat the area below the pad and for two feet around the perimeter against insect infestation.
9. 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 inch) or larger, reinforcing rods placed on 15 inches centers may also be used. Cut or reposition the metal mesh or rods wherever necessary to avoid any conduits.



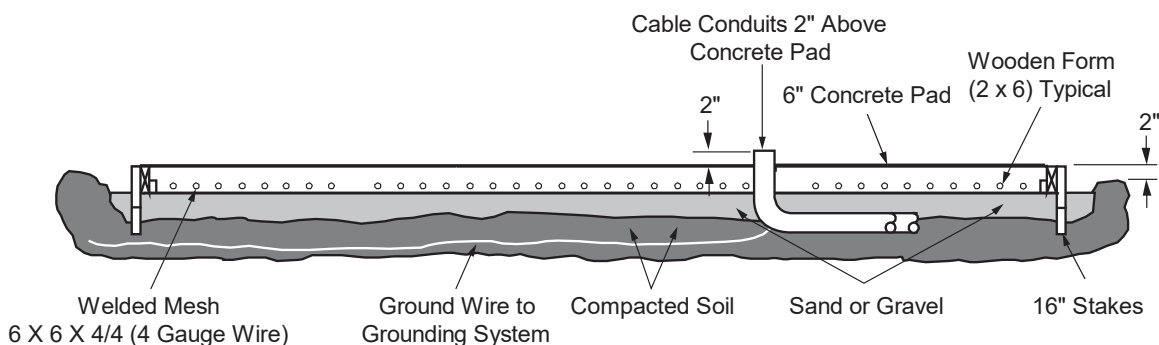
NOTE! The enclosure must clear the finished concrete surface so that any base panel below the enclosure can be removed.

10. The conduit should extend approximately 2 inches above the pad (Figure 7.2). Cover the conduits at the top to keep concrete from entering them during the pour.



NOTE! Make sure the conduit ends extend vertically (perpendicular to the pad surface).

Figure 7.2 Ground Level View of Typical Pad Construction



11. Be sure that all the wire mesh or reinforcing bars are set approximately 2 inches off the bottom of the form.
12. 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 inch 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.
13. Pour the concrete. Finish the concrete so that the entire surface is level to within 1/4 inch over the entire length and width.
14. Cure the pad for a minimum of three days before enclosure installation, or according to the type of concrete used and/or local practices.
15. 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.
16. 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. To orient the mounting bolt holes, use the dimensions in Figure 2.7.



NOTE! Use appropriate anchors to secure enclosure to concrete pad. Refer to Table 5.1 for recommended anchors. 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.

7.6 Inspecting and Unpacking the Enclosure at the Installation Site

General

The enclosure is shipped in protective packaging on a wooden pallet.

Procedure

1. Check the packing slip to make sure all components ordered were received. Report any missing items to the carrier and your local sales representative immediately.
2. Inspect the outside of the enclosure to be sure there is no shipping damage. If there is damage, note where the damage is and how much damage there is. Follow local practices for reporting and handling damaged goods. Do not proceed with the installation. If the cabinet appears undamaged, go on to the next step.
3. Carefully remove all packaging material from around the enclosure and the pallet. Dispose of the packaging according to local practices.
4. Repeat "Step 2." with the packaging material removed.
5. If the enclosure appears undamaged, proceed with the installation. DO NOT REMOVE THE PALLET UNTIL THE ENCLOSURE IS READY TO BE MOUNTED.

7.7 Preparing the Enclosure for Installation



CAUTION! Do not open a door on the enclosure unless the enclosure is secured to the pallet or the mounting surface.



NOTE! Refer to "Opening and closing an enclosure front door" on page 23 for a procedure to open the front door.

Procedure

1. With the enclosure secured to the pallet, open the front doors. Secure with the wind latches.

2. Remove the accessory kit from inside the enclosure.
3. Inspect enclosure interior, panels, doors, and accessory kit for damage. In case of damage, follow local procedures for reporting and resolving damage.
4. Note that the enclosure's mounting holes are accessed from outside the enclosure.
5. Close and latch the front doors.

7.8 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. Install the anchors per manufacturer directions. Make sure all enclosure anchor holes are present and usable before the enclosure is placed. If present, remove the anchor bolts and washers from the foundation pad. Set the hardware aside to attach the enclosure to the pad.
4. Dress any cables/conduits so they will easily enter the enclosure as it is being lowered onto the foundation pad.
5. Place mounting hole guide pins (if furnished) at mounting locations.

7.9 Required Equipment to Lift the Enclosure

When Using a Crane

- A crane capable of lifting the fully loaded weight of the enclosure plus a safety margin (see “Enclosure dimensions, weights, and physical specifications” on page 4).
 - Crane Capacity: 6000 lbs. or greater.
- Four (4) wire-rope slings, 8-feet long (minimum). Slings should each have the capacity to support the entire fully loaded weight of the enclosure to prevent potential cascading failures (see “Enclosure dimensions, weights, and physical specifications” on page 4).
 - Wire Rope Slings Capacity: Minimum capacity of 3200 lbs. each.
- Spreader frames are required for shorter slings to prevent enclosure framework damage due to side-loading forces at the top corner lifting eyes. Lifting forces shall be vertical only and applied only at the lifting eyes.
- Four (4) connecting links (clevises), to attach the wire-rope slings to the enclosure lifting eyebolts. Connecting links should each have the capacity to support the entire fully loaded weight of the enclosure to prevent potential cascading failures (see “Enclosure dimensions, weights, and physical specifications” on page 4).
 - Clevises Capacity: 3200 lbs. each.
- A 75 feet rope, 5/8 inch in diameter, to use as a tagline. A tagline is used to guide the enclosure into position while it is lifted and lowered.

When Using a Forklift

- A forklift capable of lifting the fully loaded weight of the enclosure plus a safety margin (see “Enclosure dimensions, weights, and physical specifications” on page 4).
 - Forklift Capacity: 6000 lbs. or greater.

- Forklifts shall have a minimum fork length as listed below:
 - 2-Bay Side or Front Entry: Minimum fork length of 72 inches.
 - 3-Bay Front Entry: Minimum fork length of 72 inches.
 - 3-Bay Side Entry: Minimum fork length of 96 inches.

7.10 Lifting and Placing the Enclosure

7.10.1 Important safety instructions



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



DANGER! The maximum enclosure weight when lifted shall not exceed equipment ratings!



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.

7.10.2 General

Use lifting equipment, such as a crane or forklift, appropriately rated for the weight of the load to move the enclosure. See “Required Equipment to Lift the Enclosure” on page 38.

Procedure (When Using a Crane)

1. Close and latch all doors before lifting and placing the enclosure.
2. Inspect the lifting brackets and ensure brackets and roof are free of damage.
3. Install a clevis and shackle or a threaded shackle in each lifting location in the lifting brackets at the top of the enclosure as shown in Figure 7.3.
4. Insert all four (4) 8 feet minimum lifting slings securely through all four clevises or shackles as shown in Figure 7.3. Never route straps, cables or chains through the forklift channels in the base for a vertical crane lift.
5. Use a 5/8 inch diameter rope, approximately 75 feet long, as a tagline to steady the enclosure during lifting and lowering operations.



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! *If* slings are not long enough (8 feet or longer), use a spreader bar to be sure the cables pull on the lifting eyebolts in a vertical direction.



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



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

6. Slowly take up the slack with the crane.
7. Remove the pallet mounting hardware.
8. Lift the enclosure until the pallet drops off from its own weight.

9. Place the enclosure into its mounted position using the tagline to guide it into position.
10. Lower the enclosure to approximately 6 inches 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.
11. Shift the enclosure, to the rear, over the final mounting location.
12. As the enclosure is moved into place, verify the enclosure clears cables and conduit.
13. Slowly lower the enclosure in place, until it firmly rests on the pad. Keep the slings on, with a little slack.
14. 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.
15. Open and close the front doors and verify they will open, close, and lock properly. If not, adjust the shims, until the doors function properly.
16. Complete installation of enclosure anchors. Use appropriate methods to secure the enclosure base to the platform or pad. Secure the enclosure by installing the mounting hardware through the mounting holes in the enclosure base and into the platform or pad (Figure 7.4). A heavy-duty load washer is required between the enclosure floor and the head of the anchor at all anchor locations.



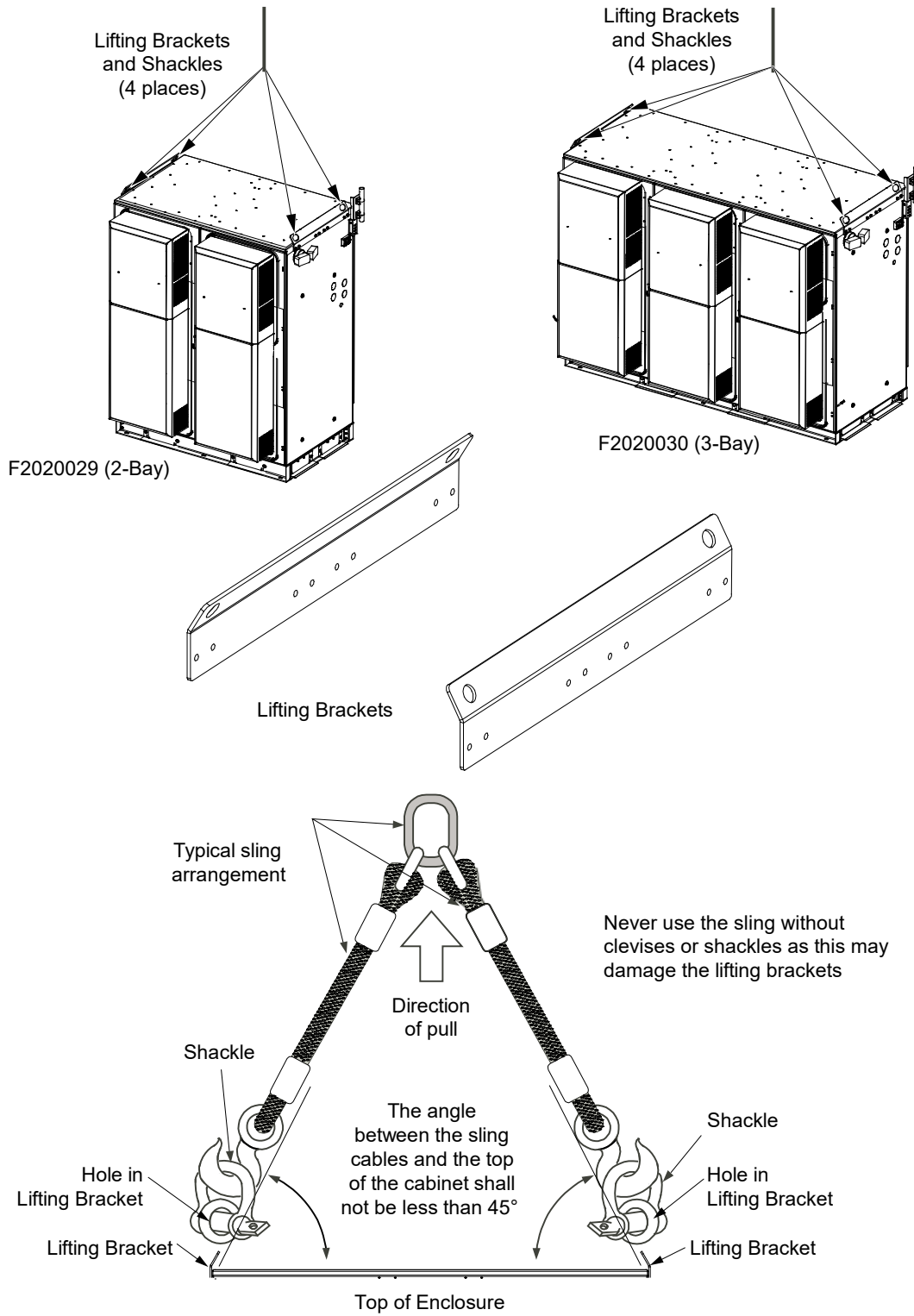
NOTE! Refer to Table 5.1 for recommended mounting hardware or anchors.

17. When the enclosure is secured, remove the slings, the tagline, and the lifting eyebolts.
18. If leaving the site or enclosure unattended:
 - Close and secure the front doors.
 - 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 100W light bulb inside the enclosure to prevent condensation.

Figure 7.3 Lifting the Enclosure with a Crane



Procedure (When Using a Forklift)

1. Close and latch all doors before lifting and placing the enclosure
2. Lift the enclosure using the forklift pockets located in the base of the enclosure.
3. Lift the enclosure off the truck.
4. Lower the enclosure to the ground.
5. Remove the pallet mounting hardware.
6. Lift the enclosure until the pallet drops off from its own weight.
7. Place the enclosure into its mounted position.
8. Lower the enclosure to approximately 6 inches 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.
9. Shift the enclosure, to the rear, over the final mounting location.
10. As the enclosure is moved into place, verify the enclosure clears cables and conduit.
11. Slowly lower the enclosure in place, until it firmly rests on the pad.
12. 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.
13. Open and close the front doors and verify they will open, close, and lock properly. If not, adjust the shims, until the doors function properly.
14. Complete installation of enclosure anchors. Use appropriate methods to secure the enclosure base to the platform or pad. Secure the enclosure by installing the mounting hardware through the mounting holes in the enclosure base and into the platform or pad (Figure 7.4). A heavy-duty load washer is required between the enclosure floor and the head of the anchor at all anchor locations.



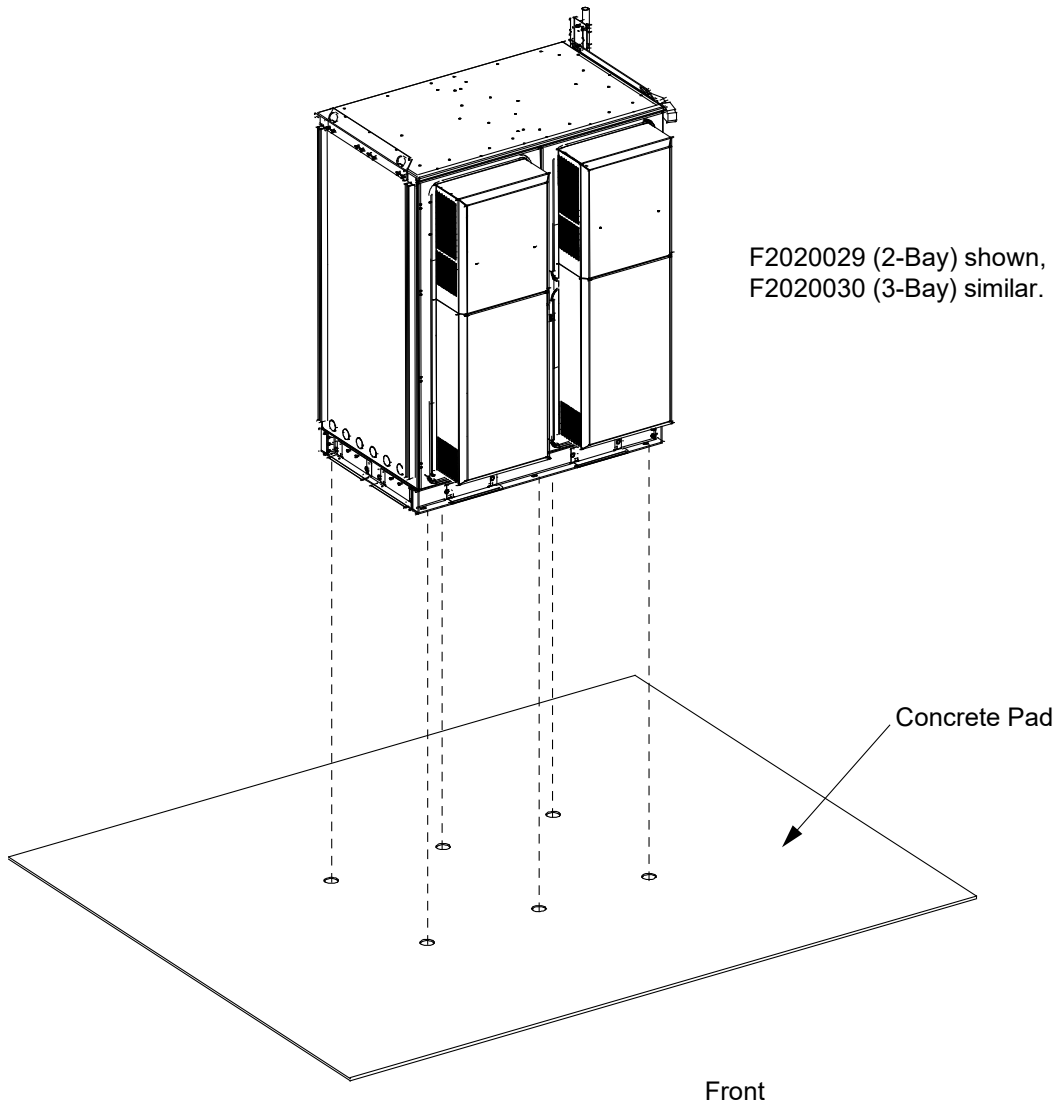
NOTE! Refer to Table 5.1 for recommended mounting hardware or anchors.

15. When the enclosure is secured, remove the forklift.
16. If leaving the site or enclosure unattended:
 - Close and secure the front doors.
 - 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 100W light bulb inside the enclosure to prevent condensation.

Figure 7.4 Mounting the Enclosure to the Pad



8 Installing GPS Antenna Mounting Bracket Kit

The GPS antenna mounting bracket kit can be install on the right side of the enclosure, at the back. A mounting bracket is provided for attaching the GPS antenna mounting bracket kit. A Roxtec port is also provided for sealing the antenna cable as it exits the enclosure.

Refer to Figure 8.1 for an illustration of the GPS antenna mounting bracket kit P/N 564693. Attach the GPS antenna mounting bracket kit to the mounting bracket already installed on the enclosure as shown in Figure 8.2, using the provided hardware.

NOTE! The tape covering the paint free areas on the mounting bracket already installed on the enclosure must be removed prior to GPS antenna mounting bracket kit installation.

Figure 8.1 GPS Antenna Mounting Bracket Kit P/N 564693

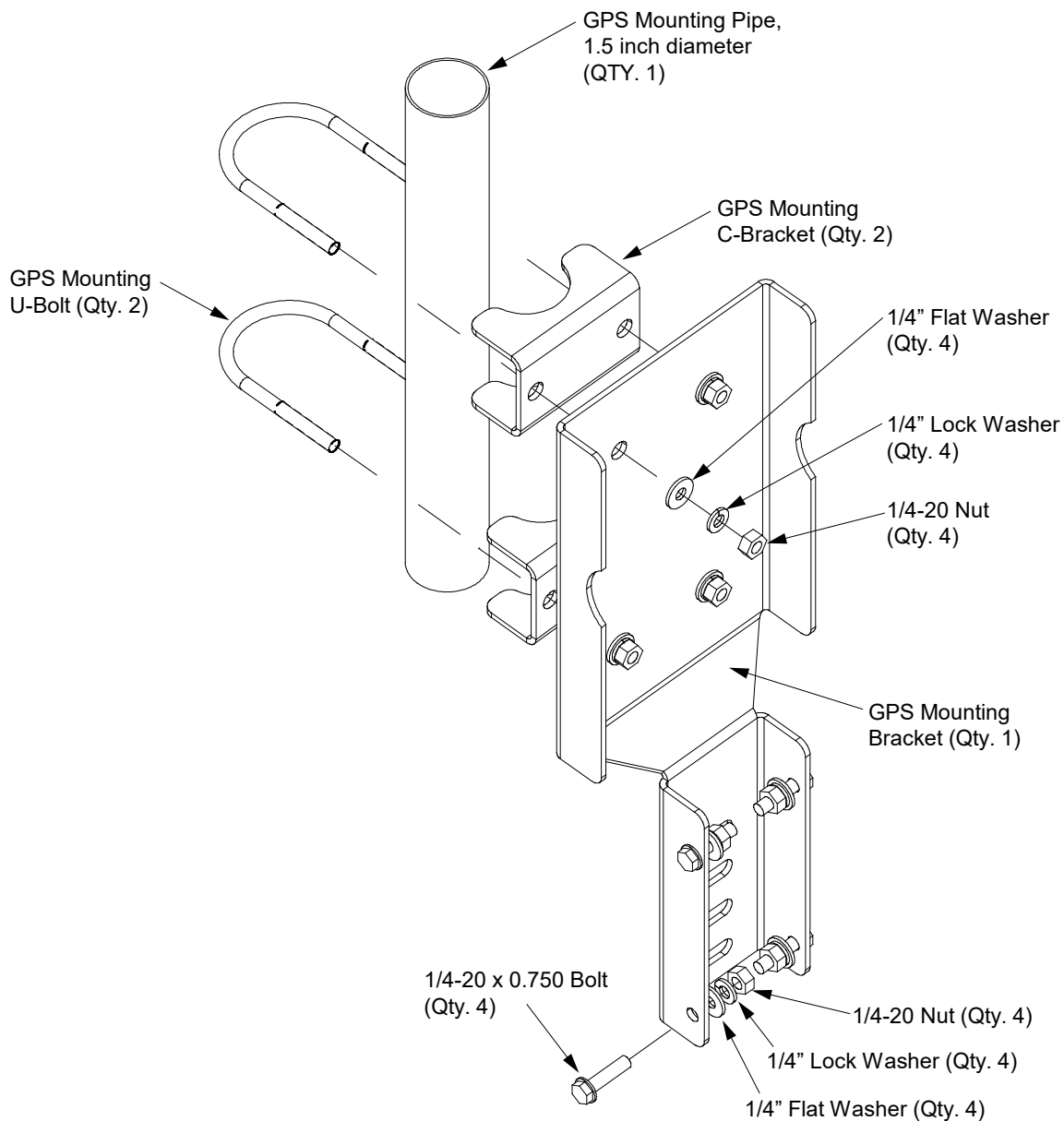
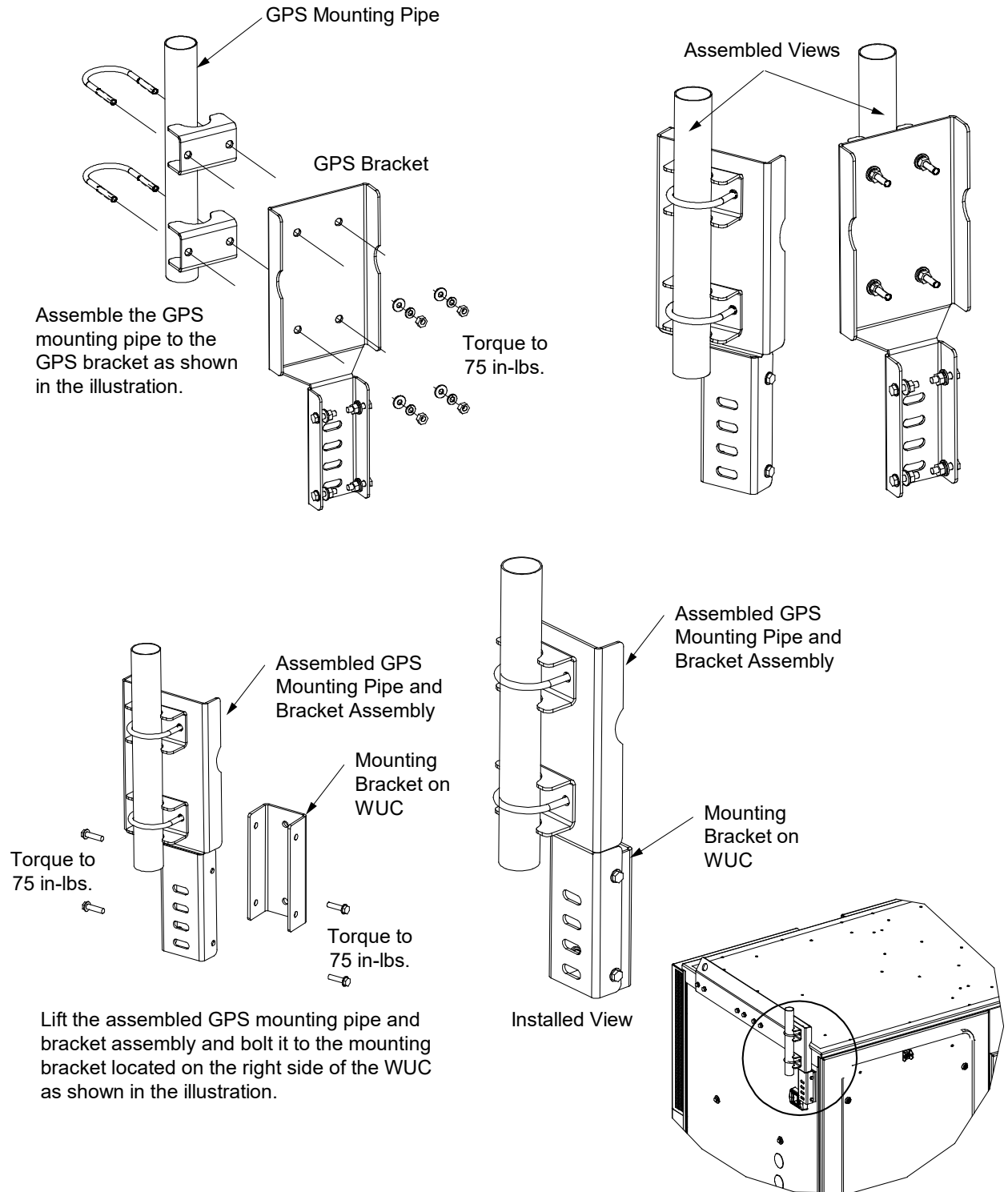


Figure 8.2 Installing the GPS Antennae Mounting Bracket Kit P/N 564693



9 Grounding the Enclosure

9.1 Important Safety Instructions



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

9.2 General

All external ground wires shall only be terminated to the exterior “Ground Ring Termination” blocks located at the rear base of the enclosure (refer to Figure 9.1).

All internal ground wires shall be terminated to the “Master Ground Bar (MGB)” and “Equipment Ground Bars” located inside each bay comprising the enclosure (refer to Figure 9.2).

9.3 Enclosure Ground Bar Schematic

The complete system schematics are included with each enclosure. Refer to Figure 9.3 for a typical enclosure ground bar schematic diagram.

9.4 Master Ground Bar (MGB) and Equipment Ground Bars

The Master Ground Bar (MGB) and Equipment Ground Bars are equipped with 1/4-inch studs on 5/8-inch centers for installation of customer provided lugs. Refer to Figure 9.2. Refer to Table 5.1 for recommended lugs.



NOTE! *Equipment bay ground bars are factory bonded to the MGB located in the power bay via 2 AWG wires per Figure 9.3.*

9.5 Site Ground

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 “Master Ground Bar (MGB)” and “Equipment Ground Bars” located inside each bay comprising the enclosure.
- The external enclosure shell is internally grounded to the enclosure’s Master Ground Bar (MGB).
- Two ground ring termination blocks are provided at the lower rear of the enclosure.

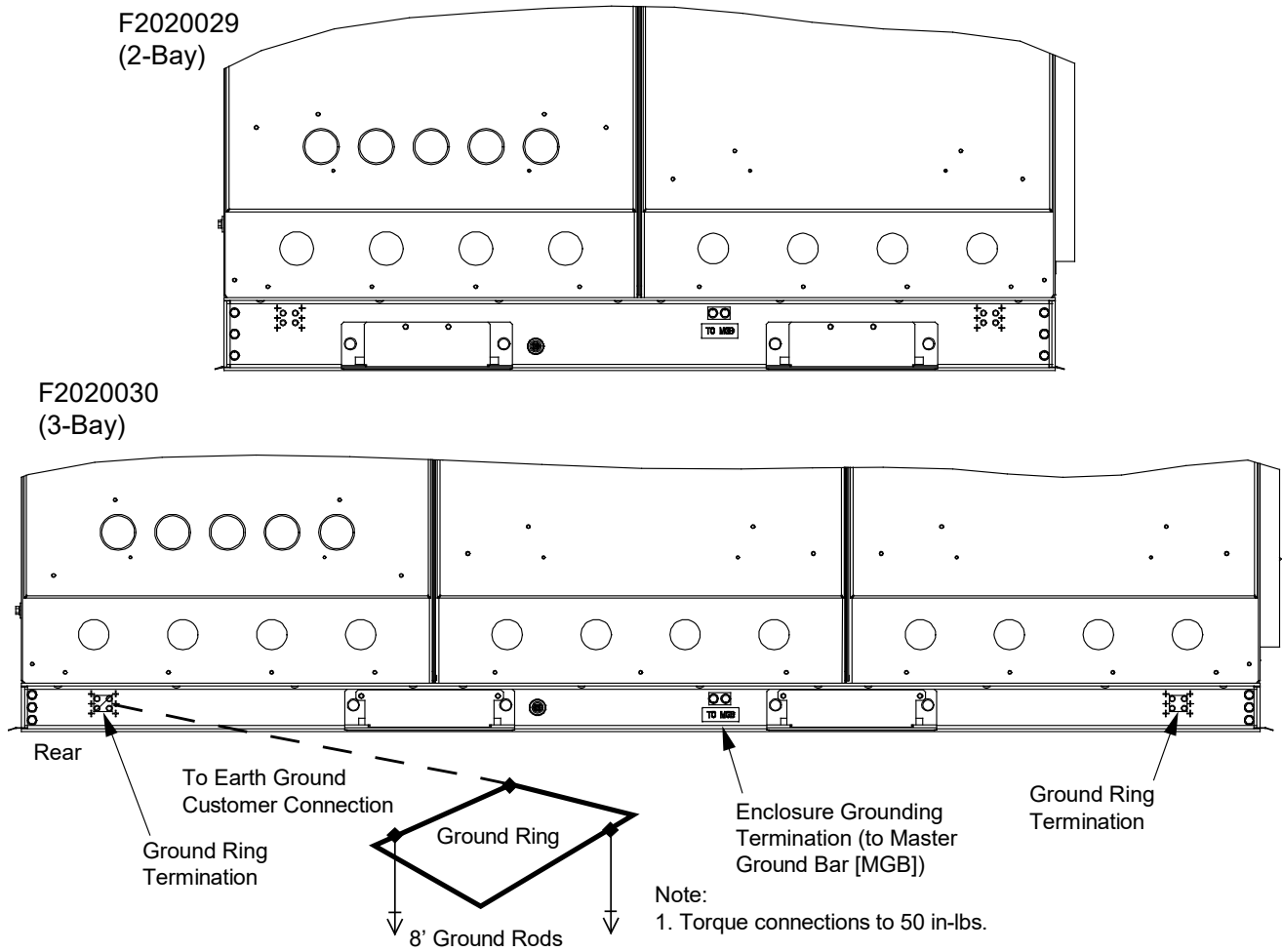
The enclosure should be grounded to an external ground ring using a #2 AWG solid wire. The resistance of the ground ring, as verified with a Megger, shall be less than 25 ohms.

Procedure

1. Connect a ground ring termination block to site ground per local practices. Refer to Figure 9.1 for location. The ground ring termination blocks provide 3/8-16 threaded holes for installation of customer provided two-hole lugs with 3/8-inch mounting holes on 1-inch spacing. Recommended wire size is 2 AWG.

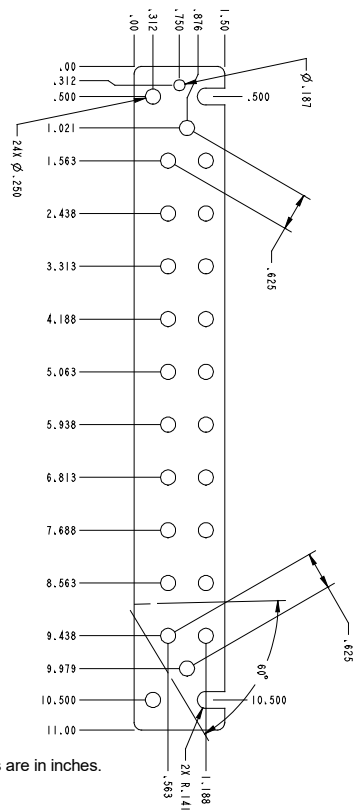
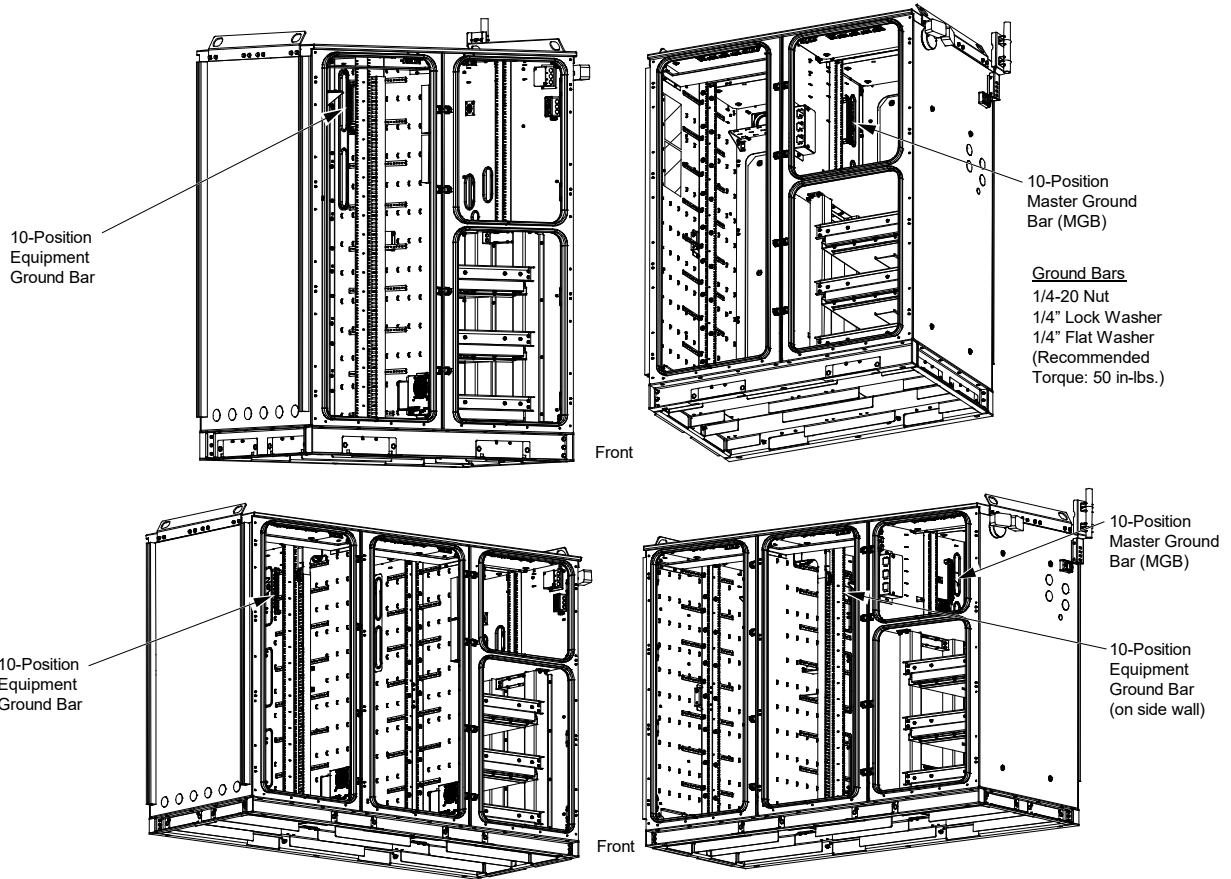
Alternatively, two ground ring termination blocks are provided, enabling the enclosure to be “daisy-chain” bonded into a series of enclosures utilizing only one (1) earth-ground link for the entire enclosure set.

Figure 9.1 Enclosure Ground Ring Termination Locations and Site Ground



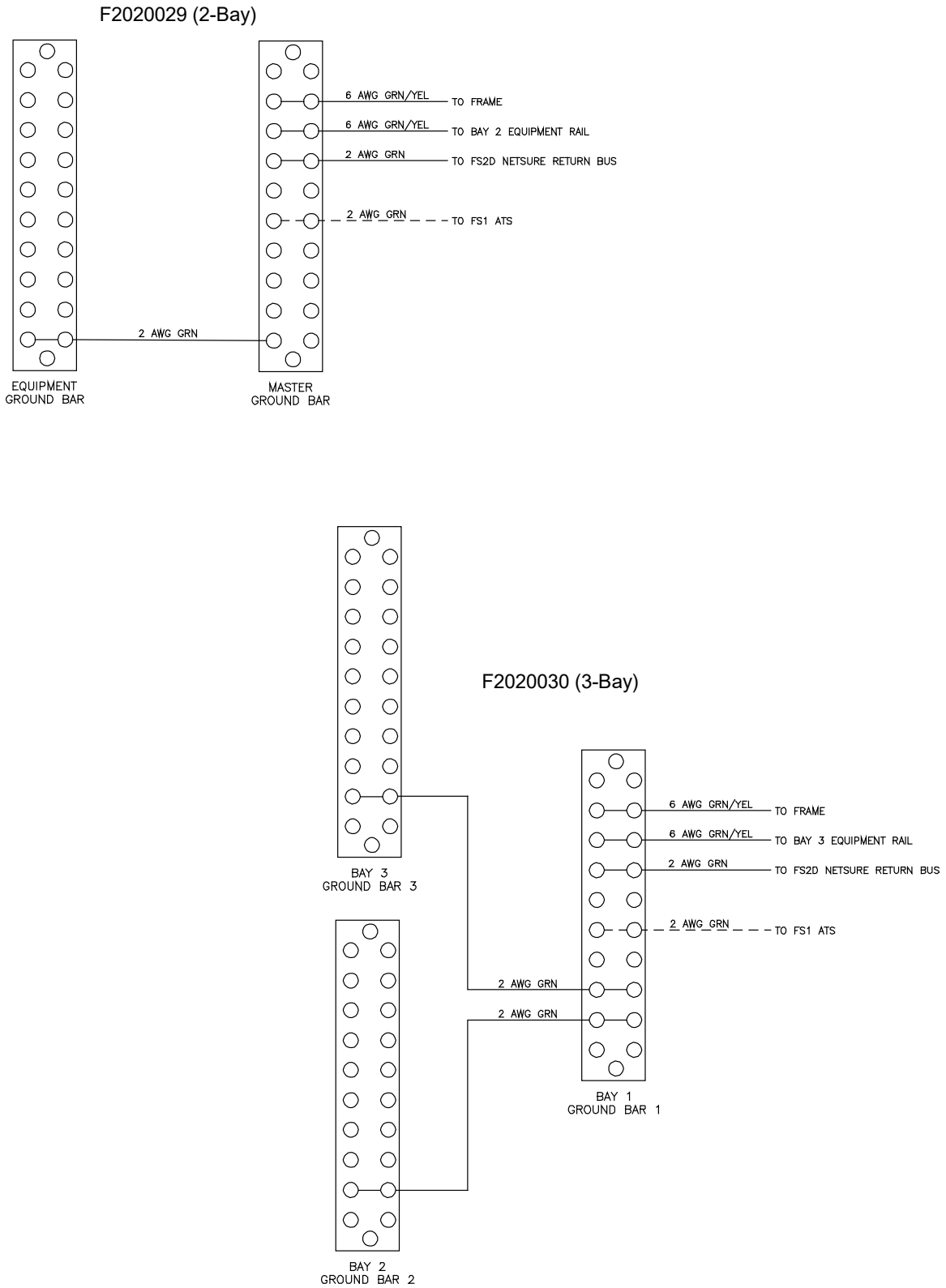
External Grounding: At the center rear of the enclosure's mounting plinth is a grounding location that provides 3/8-16 threaded holes for installation of a customer provided two-hole lug with 3/8-inch mounting holes on 1-inch spacing. This is used to provide a connection from the mounting plinth to the MGB. Also provided on the rear of the enclosure's mounting plinth, at each end, are ground pad termination points that provide 3/8-16 threaded holes for installation of customer provided two-hole lugs with 3/8-inch mounting holes on 1-inch spacing.

Figure 9.2 Enclosure Master Ground Bar (MGB) and Equipment Ground Bars Locations



Notes:
 1. All dimensions are in inches.

Figure 9.3 Typical Ground Bar Schematic Diagram



10 Cable Routing

The enclosure provides for cable entrance/exit as shown in Figure 10.1. See Figure 10.2 for cable routing details. Refer to the external ATS for suggested ports for power and fiber cables. Power cables are typically routed to the power plant. Fiber "feeder cables" or "external cables" are typically routed to a rack mounted patch panel, and fiber "distribution cables" are typically routed from the patch panel to the fiber troughs for distribution to all necessary equipment.

Figure 10.1 Cable Entrance/Exit Points

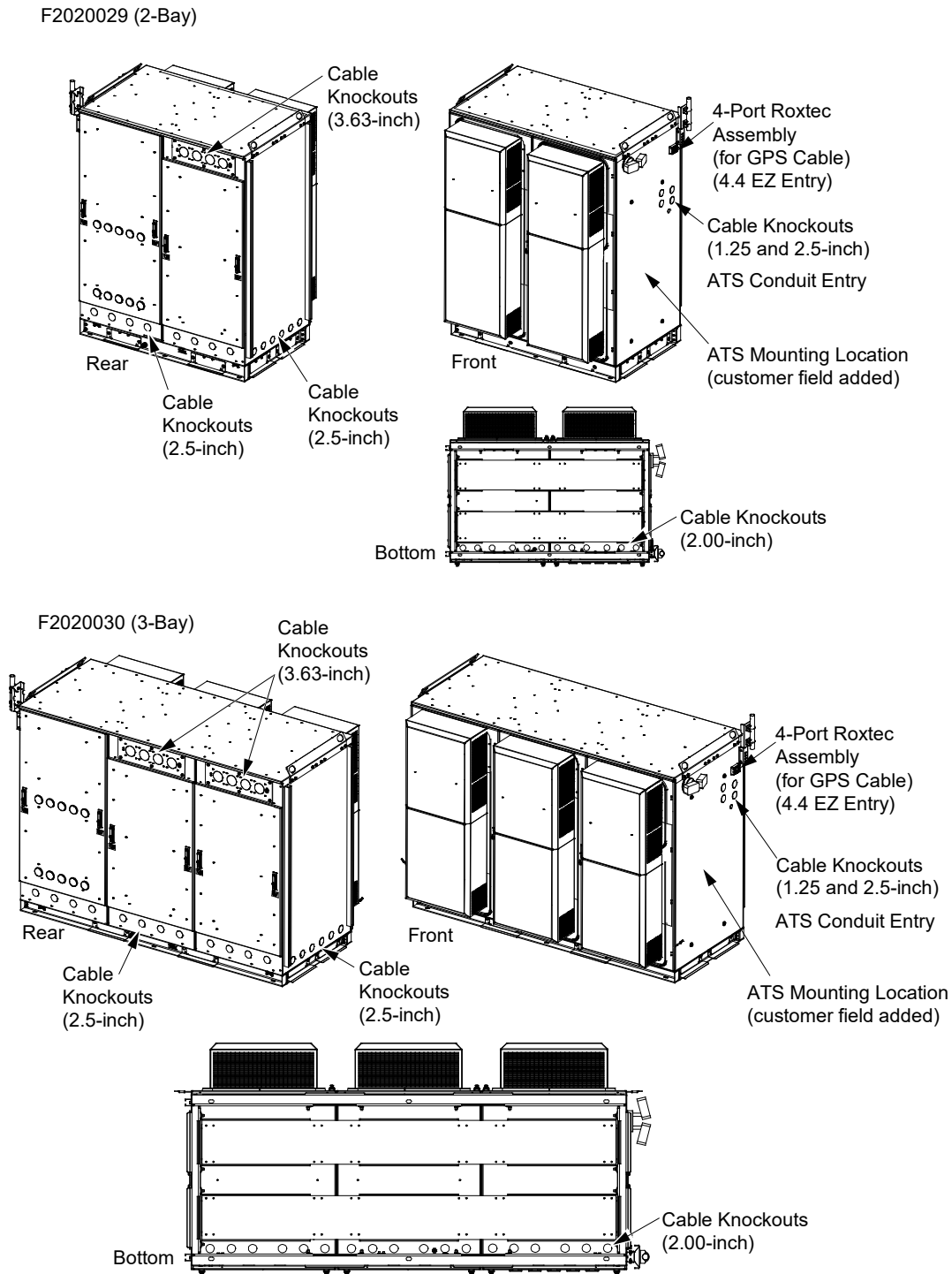


Figure 10.2 Cable Routing Details (cont'd on next page)

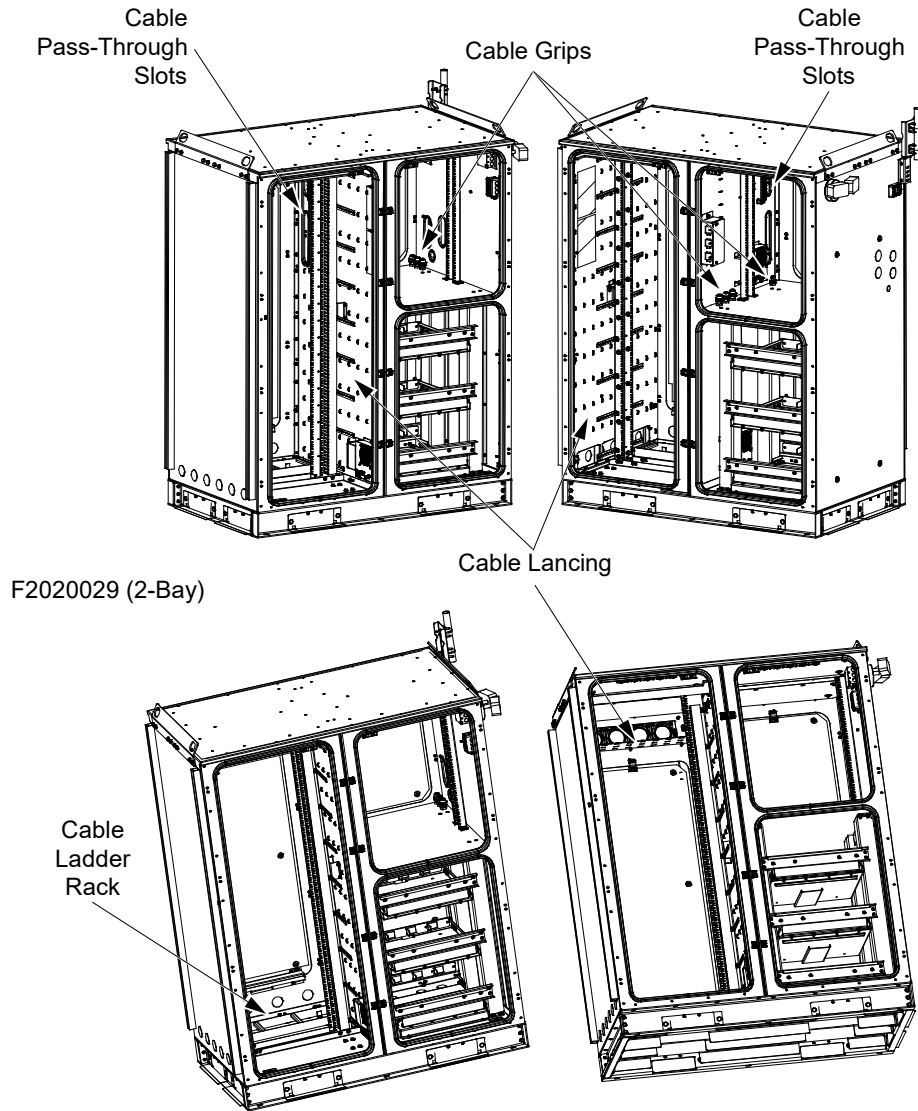
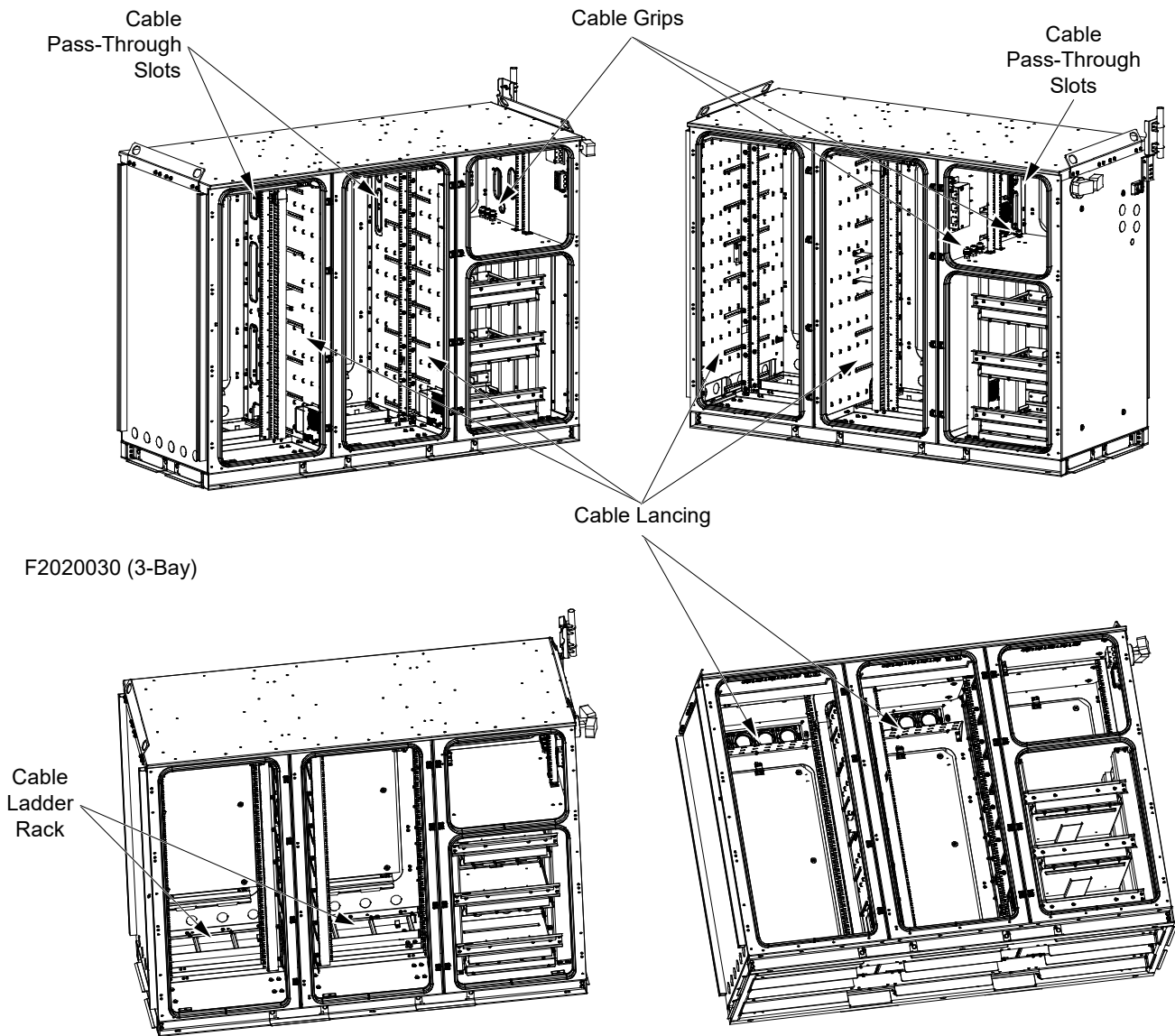


Figure 10.2 Cable Routing Details (cont'd from previous page)



11 AC Input Power

11.1 Important Safety Instructions



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

11.2 Grounding

Refer to “Grounding the Enclosure” on page 46 for information on enclosure grounding.

11.3 Enclosure AC Schematic

The complete system schematics are included with each enclosure. Refer to Figure 11.1 and Figure 11.2 for typical enclosure AC schematic diagrams.

11.4 Cable Routing

See “Cable Routing” on page 50.

11.5 DC Power System

The enclosure includes a DC power system and distribution. Refer to the DC power system instruction manual(s) for AC input connection details.

11.6 AC Input Connections to Automatic Transfer Switch (ATS)

The enclosure requires separate AC feeds for the rectifiers, AC outlets, and external lighting. An Automatic Transfer Switch (ATS) is field installed and wired to the rectifiers, AC outlets, and external lighting.

Make connections to the Automatic Transfer Switch (ATS) 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.

Refer to the schematic drawings shipped with your enclosure for a detailed AC wiring schematic. Refer to Figure 11.1 and Figure 11.2 for typical enclosure AC schematic diagrams.

The following procedure shall be performed by a trained electrician.

Procedure

1. Use an approved voltage detector to verify the enclosure is safe.
2. Verify that the enclosure is properly grounded.
3. Verify that all breakers in the external Automatic Transfer Switch (ATS) are in the OFF position.
4. Open the Automatic Transfer Switch (ATS) doors for access to AC utility input terminals.



CAUTION! The Automatic Transfer Switch (ATS) and the enclosure are configured for a 200 A, 240 VAC single phase supply ONLY. Connection of other voltages or phase sources will cause damage to the enclosure and its components.

5. Determine the AC cabling route into the Automatic Transfer Switch (ATS) for your installation site. The site installation electrician must use a suitably sized conduit hole punch to make a sealable conduit entry into the bottom left of the NEMA 3R weatherproof Automatic Transfer Switch (ATS) cabinet to access the site utility feed terminals. Only weather-rated compression conduit fittings are permitted for use.

6. Route the site AC utility, 200 A, 240 VAC, 1-Ph, 3-wire plus ground conductors from the utility metering cabinet to the enclosure external Automatic Transfer Switch (ATS) via a sealed conduit connection.



NOTE! All green/yellow terminals are bonded to the Neutral/Ground bus in the Automatic Transfer Switch (ATS). The site electrician shall provide ground wires per NFPA 70 (NEC) and applicable codes and standards.

7. Connect the above feeds as required. Strip the leads before inserting into terminal block. Apply a coating of anti-oxidation paste (i.e.: "No-Ox") to the conductors before inserting them into the terminal block. Torque the fasteners as required. Test the lead connections by gently pulling on them.
8. After cables are installed, refer to the "Sealing Enclosure Cable Entries" on page 71 and seal all cable entries and conduits.

Figure 11.1 Typical Enclosure AC Schematic Diagram (F2020029)

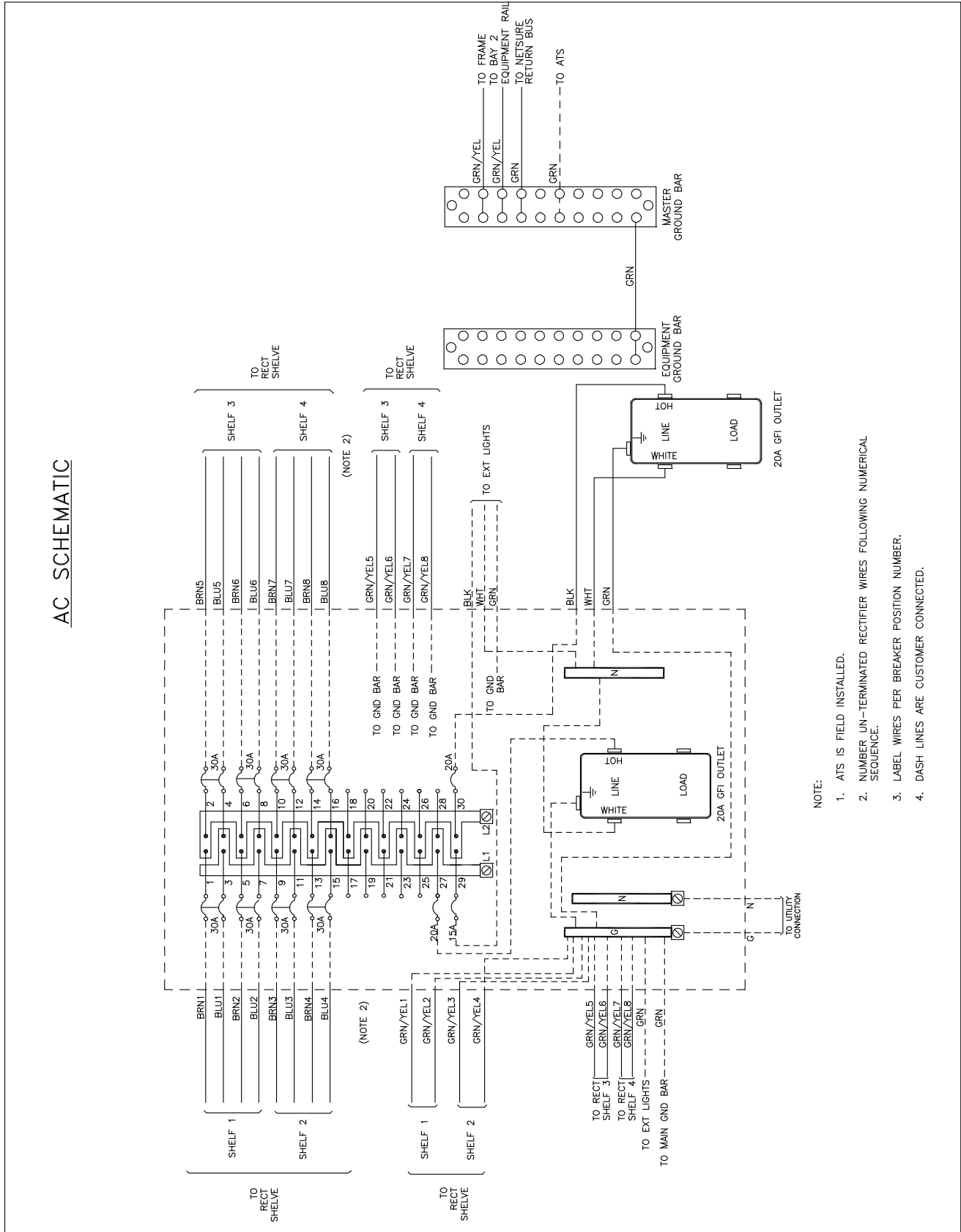
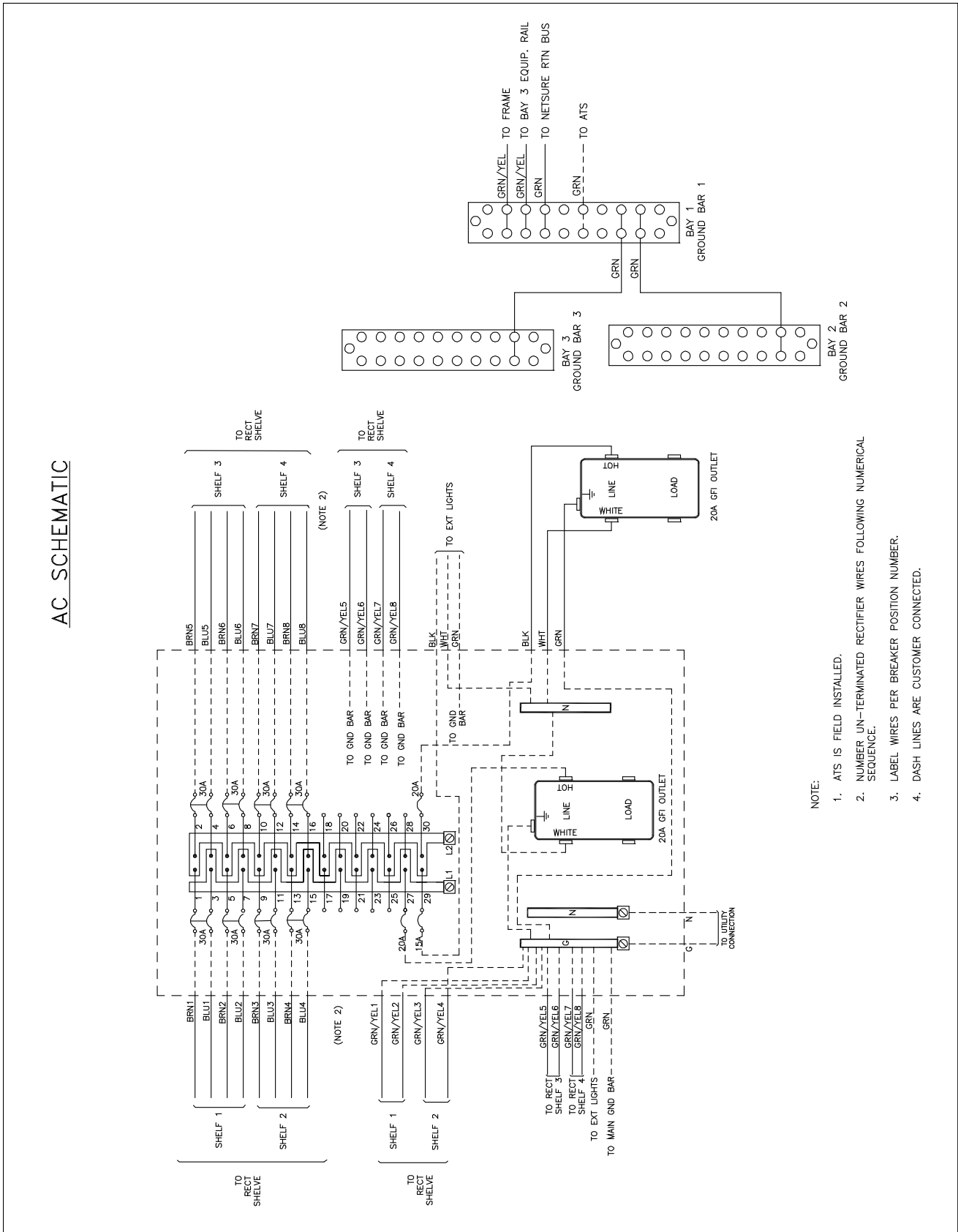


Figure 11.2 Typical Enclosure AC Schematic Diagram (F2020030)



12 DC Power and Batteries

12.1 Important Safety Instructions



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

12.2 Grounding

Refer to “Grounding the Enclosure” on page 46 for information on enclosure grounding.

12.3 Enclosure DC Schematic

The complete system schematics are included with each enclosure.

12.4 DC Power Cabling Color Scheme

The DC power cabling color scheme is:

- -48 VDC Distribution: Blue or Blue Tape at End
- -48 VDC Battery: Red or Red Tape at End
- Return: Gray or Black.

Refer to the schematic diagram provided with your system.

12.5 Cable Routing

See “Cable Routing” on page 50.

12.6 DC Power System

The enclosure includes a DC power system and distribution (Vertiv™ NetSure™ 512, Spec. No. 582137000501). Refer to the DC power system instruction manuals (IM582137000 and UM582137000) for information regarding the wiring, powering and operation of the power system.



NOTE! *The DC power system +RTN busbar shall be bonded to the MGB with properly sized bonding wire per customer requirements and local practice, for -48 VDC operation.*

12.7 SPD (Surge Protection Device)

The SPD (Surge Protection Device) for the -48 VDC and -54 VDC busses is installed at the rear side of the enclosure as shown in Figure 2.8 and Figure 2.9. Refer to the schematic drawings shipped with your enclosure for a detailed wiring schematic.

12.8 Battery Installation and Wiring

12.8.1 Important safety instructions



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



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

12.8.2 Supported VRLA batteries

The power/battery bay can be equipped with three (3) 48Vdc battery strings, providing emergency backup power in the event that AC service is lost. Each string consists of four 6-cell 12V modules.

The system will support the batteries listed in Table 12.1, at a minimum.

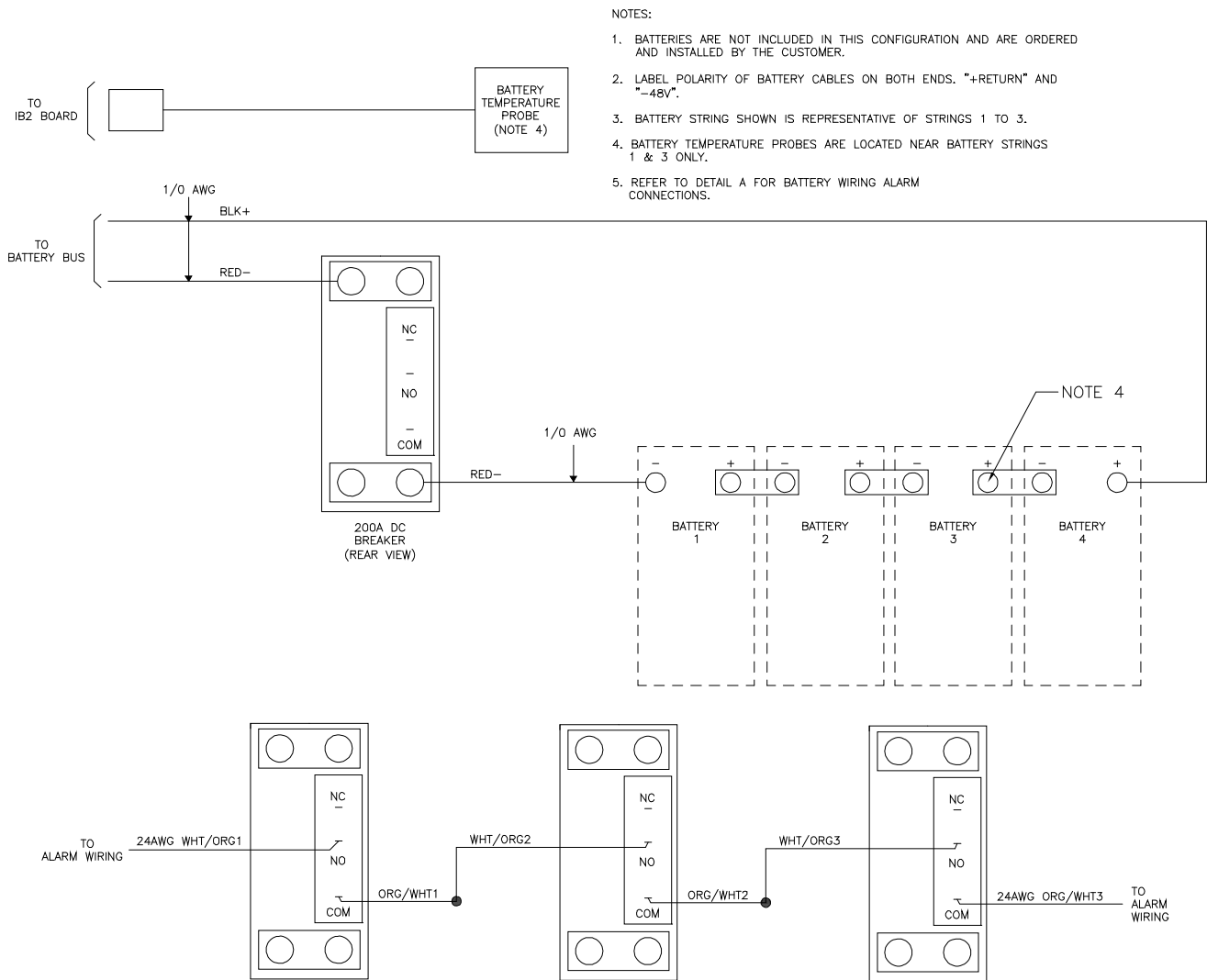
12.8.3 Battery wiring schematic

Refer to the schematic drawings shipped with your system for a detailed battery wiring schematic. Refer also to Figure 12.1 for a typical enclosure battery wiring schematic diagram.

Table 12.1 Supported VRLA Batteries

Battery	Amp Hours per String @ 8 hrs	Dimensions (inches) H x W x D
CD TEL12-210F	202 Ah	12.6 x 4.9 x 22
DEKA 12AVR170ET	170 Ah	12.6 x 4.9 x 22.1
EnerSys SBS 190F	190 Ah	12.64 x 4.96 x 21.97
FIAMM UMTX 180FT	180 Ah	12.5 x 4.9 x 22
GNB M12V180FT	180 Ah	12.6 x 4.9 x 22
Northstar NSB 180FT	179Ah	12.60 x 19.6 x 22.6

Figure 12.1 Typical Battery Wiring Schematic



- NOTES:
1. BATTERIES ARE NOT INCLUDED IN THIS CONFIGURATION AND ARE ORDERED AND INSTALLED BY THE CUSTOMER.
 2. LABEL POLARITY OF BATTERY CABLES ON BOTH ENDS. "+RETURN" AND "-48V".
 3. BATTERY STRING SHOWN IS REPRESENTATIVE OF STRINGS 1 TO 3.
 4. BATTERY TEMPERATURE PROBES ARE LOCATED NEAR BATTERY STRINGS 1 & 3 ONLY.
 5. REFER TO DETAIL A FOR BATTERY WIRING ALARM CONNECTIONS.

12.8.4 Battery compartment

Battery Shelves

Three (3) battery shelves are provided in the battery compartment of the power/battery bay. Refer to Figure 12.2 for location.

Battery Disconnect Circuit Breakers

A battery disconnect circuit breaker (200A) is provided in the power/battery bay for each of the three (3) battery compartment's battery shelves. Refer to Figure 12.2 for location.

Cabling

One set of 1/0 AWG (+) and (-) battery cables are provided for each of the three (3) battery shelves. Battery intercell connectors are not supplied with the enclosure and need to be ordered with the batteries. Torque factory supplied terminal to battery posts per battery manufacturer recommendations.

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.

Physical Battery Placement

Figure 12.3 illustrates the typical placement of batteries in one of the three (3) battery shelves.

Physical Size of Battery Shelf

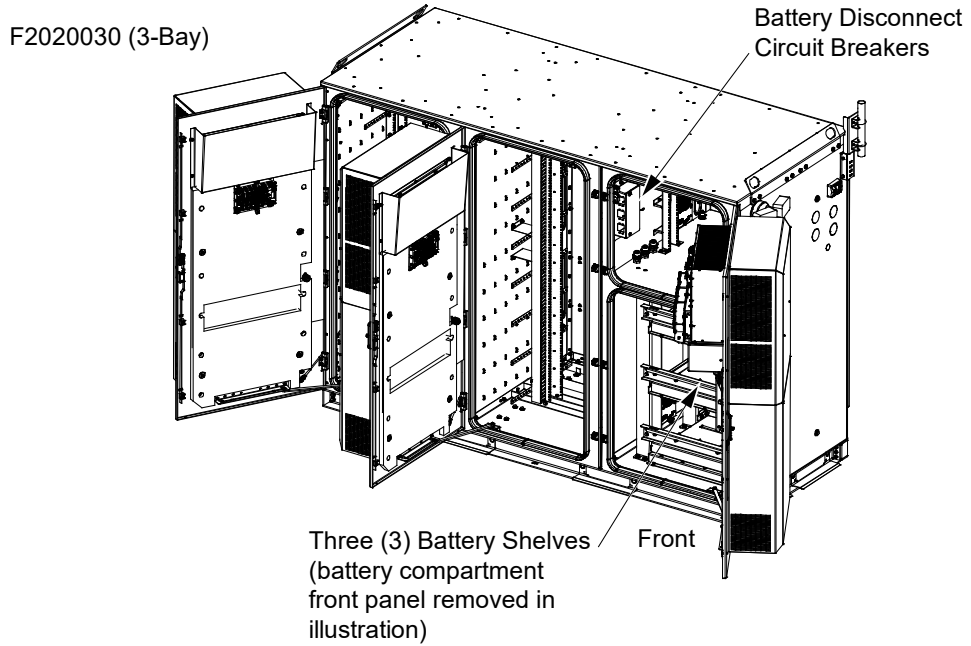
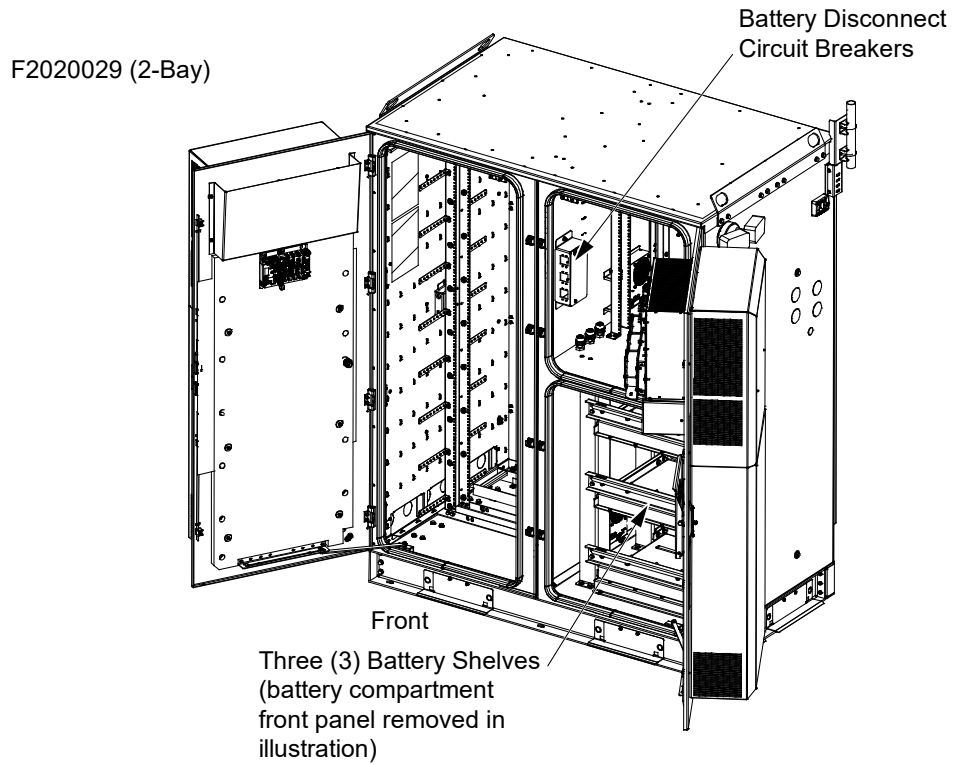
The free space available for batteries in each of the three (3) battery shelves:

- 20.71 inches wide for all four batteries
- 21.11 inches deep
- 13.0 inches high.

Maximum Battery Dimensions: 12.64 inches (depth) x 4.96 inches (width) x 22.6 inches (height).

Maximum Battery Weight: 125 lbs each.

Figure 12.2 Battery Breakers and Battery Shelves Locations



12.8.5 VRLA battery installation and connection

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

The battery compartment holds twelve (12) 12 VDC 210 Ah (maximum) front post batteries. Cabling in the enclosure is provided and pre-wired for three (3) -48VDC battery strings only (twelve [12] batteries total).



NOTE! The maximum battery rating, that the system has been designed and tested to, is 210 Ah per battery.



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 in the “OFF” position.

Refer to:

- The schematic drawings shipped with your enclosure for a wiring schematic.
- 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 the following procedure to install batteries into the enclosure.



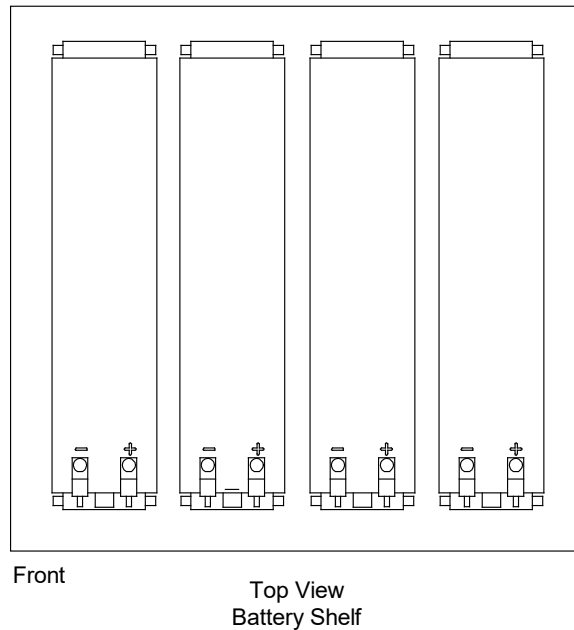
CAUTION! PROVIDE MOST STABLE LOADING

Install batteries starting with the bottom battery shelf.

Procedure

1. Open the power/battery bay’s front door and secure with the wind latch.
2. Remove any front cover, braces, and battery retaining brackets as required. Set these and the hardware aside for re-use.
3. Ensure all battery disconnect circuit breakers are in the “off” position.
4. Using a Digital Multimeter (DMM), measure the battery voltages to make sure all batteries are in good condition. A good battery will indicate approximately 12.5 VDC. Per internal battery procedures, replace any battery measured at less than 11.0 VDC.
5. If necessary, remove all the connecting hardware from the battery terminals.
6. Coat all battery terminals with an anti-oxidation compound.
7. Locate the interconnect busbars, covers, and lug bolts in the battery kit.
8. Ensure factory battery cables will be in an accessible position after batteries are installed.
9. Install the batteries into each battery shelf. Refer to Figure 12.3. Ensure the battery lifting handle straps are kept clear of the battery shelf "clamps" front and back.

Figure 12.3 Battery Placement in Battery Shelves



10. Secure batteries within the battery shelf with the previously removed restraint brackets.



NOTE! Install battery temperature probes as the batteries are being cabled. Probes are located near battery strings 1 and 3 only.



NOTE! Coat all battery interconnect busbars with an anti-oxidation compound as the next steps are performed.

11. For each battery shelf, connect a battery interconnect busbar between the left two batteries as shown in Figure 12.4.



NOTE! When ordered, batteries are generally shipped with battery interconnect busbars. The battery interconnect busbars are approximately 3.25 inches in length.

12. For each battery shelf, connect a battery interconnect busbar between the middle two batteries as shown in Figure 12.4.
13. For each battery shelf, connect a battery interconnect busbar between the right two batteries as shown in Figure 12.4.



CAUTION! To prevent arcing, the positive (+) battery cables must be connected to the positive (+) battery terminals and the negative (-) battery cables must be connected to the negative (-) battery terminals.

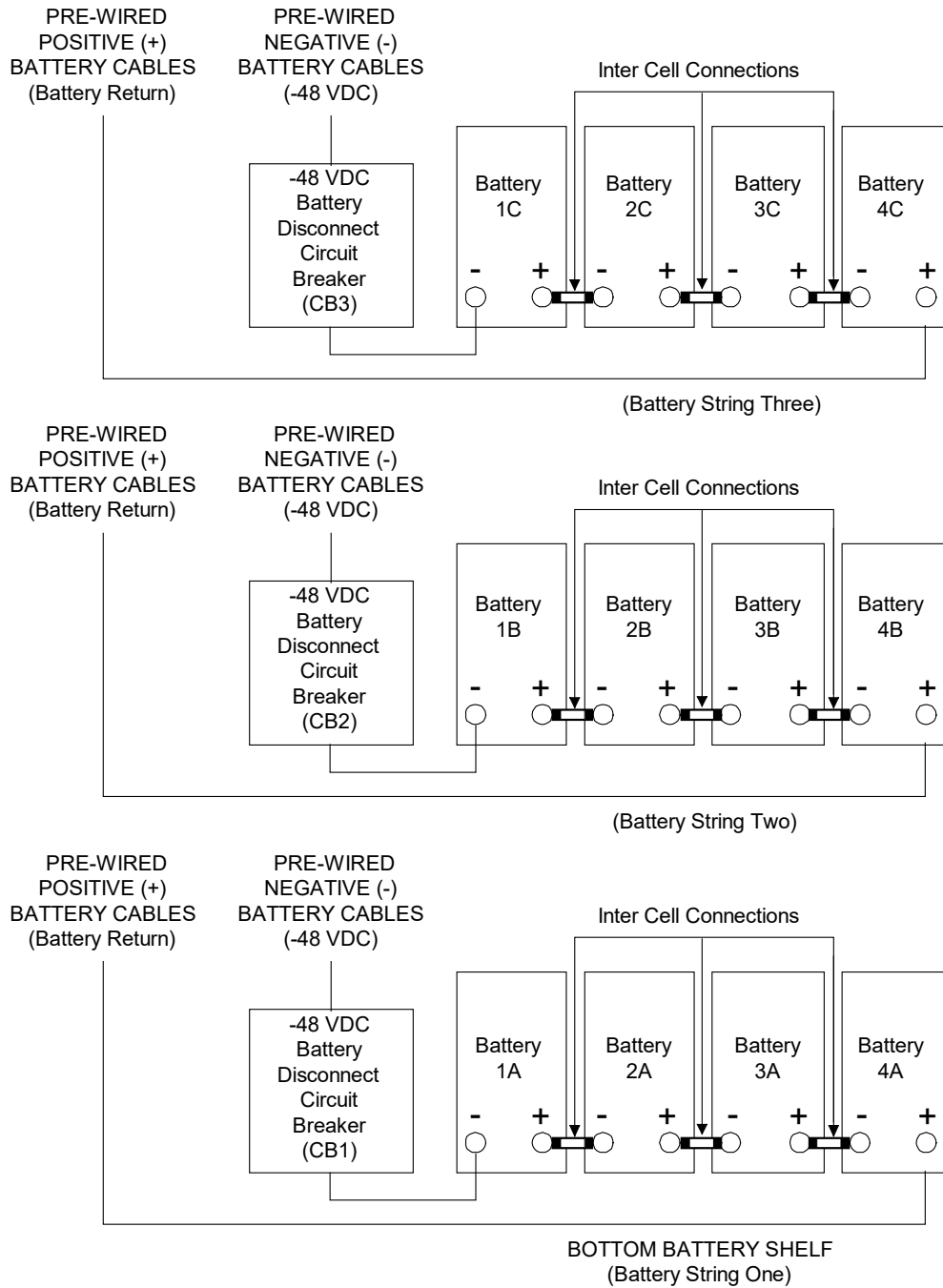
14. For each battery shelf, locate the pre-wired positive (+) battery cable (originating from the power system's Battery Return Busbar). Connect this cable to the positive (+) battery terminal of the fourth battery (right most). Refer to Figure 12.4.
15. For each battery shelf, ensure the battery disconnect circuit breaker is in the "OFF" position before performing the next step. Refer to Figure 12.3.
16. For each battery shelf, locate the pre-wired negative (-) battery cable factory (originating from the respective battery disconnect circuit breaker). Connect this cable to the negative (-) battery terminal of the first battery (left most). Refer to Figure 12.4.
17. Using a torque wrench, tighten all battery hardware per manufacturer's specifications.
18. Re-install any front cover, braces, and battery retaining brackets removed in a previous step.

19. Close and secure the front door.

Figure 12.4 Typical -48 VDC Battery String Wiring Diagram

-48 VDC BATTERY WIRING

Note: One battery string per tray.



13 OSP Cables

13.1 Important Safety Instructions



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

13.2 General



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.*

13.3 Cable Routing

See “Cable Routing” on page 50.

13.4 Installing Cables

Install OSP cables as required per site requirements.

13.5 Optical Fiber Cables Precautions

When you work with optical fibers, you must take the following precautions:

- Wear safety glasses when you install optical fibers.
- Do not look into the opening of an optical fiber, or the opening of an optical fiber connector, if the optical fiber is active or the unit has the power turned on.
- Avoid direct exposure to optical fiber ends or optical connector ends where you can access the laser signal directly.
- Clean your hands after you handle optical fibers. Small pieces of glass are not always visible and can damage your eyes.
- Protect all optical fiber connectors with clean dust caps at all times.
- Follow the bend radius rule when you route the fibers or store excess slack. Do not exceed the minimum bend radius for the type of fibers being installed. Refer to manufacturer recommendations.
- Do not stretch fibers when wrapping them around the fiber storage spools.

13.6 Sealing Cable Entries

After cables are installed, refer to “Sealing Enclosure Cable Entries” on page 71 and seal all cable grommets and cones.

14 Alarm Wiring

14.1 Important Safety Instructions



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

14.2 Cable Routing

See “Cable Routing” on page 50.

14.3 General

Refer to Figure 2.8 starting on page 14 and Figure 2.9 starting on page 18 for alarm block location. Refer to Figure 14.1 and Figure 14.2 for alarm block wiring.

14.4 Connecting External Alarms



NOTE! The customer-connection alarm blocks are punch-down, insulation displacement, split center, often referred to as telecommunications “66” blocks. Do not exceed the manufacturer recommended wire size. Normally, 20 AWG to 24 AWG solid twisted-pair copper conductor cables are used for alarm signals. Wire should NOT be stripped before inserting into block. Use the appropriate tools to insert wires into the connection points on the alarm blocks.

Alarm blocks are provided for the following purposes.

Enclosure Alarms

All alarms for customer connections are brought out to an alarm block. For alarm pinout locations on the block, refer to the Schematic Drawings (SD) either supplied in the enclosure and/or as labels on the alarm block housing. Refer also to Figure 14.1 and Figure 14.2 for typical alarm block wiring. The two (2) alarm blocks are punch-down, insulation displacement type. The alarms from the Vertiv™ NetSure™ DC plant, as well as the AC utility and TVSS failure alarms from the ATS, and the ECU are all factory connected to the alarm blocks.

Site Equipment Alarms

Alarms from customer-provided equipment installed in the equipment bay(s) can be cabled and connected to the alarm blocks by the customer, as required for the specific site installation.

Alarm Collection and Aggregation

Equipment and connection for alarm collection and aggregation or multiplexing for remote reporting to a customer Network Operations Center (NOC) shall be specified and installed by the customer as required for the specific site capabilities and installation.

Typical Battery Disconnect Circuit Breaker Alarm Wiring

Refer to Figure 12.1 on page 59 for a typical battery disconnect circuit breaker alarm wiring diagram.

Figure 14.1 Typical Alarm Block Wiring (F2020029)

ALARM TABLE

66 BLOCK 1							
ALARM CKT	CLIP	ALARM	SOURCE	A	B	C	D
1	1	MAJOR	HEX/ECU FAIL	WHT1			
	2			BLK2			
2	3	MINOR	INTRUSION	BRN1			
	4			BLU2			
3	5	HEATER FAIL	DC HEATER FAILURE	ORG/WHT3			
	6			BLU/WHT1			
4	7	T-SIPHON FAIL	HEATER 1-4 FAIL, H1-H4 CAP ALARM F				
	8						
5	9	TA HIGH	T-SIPHON 1-T-SIPHON 3 FAIL				
	10						
6	11	T BATTERY HIGH	BAY 1-T BAY 3 HIGH, T BATT ZONE HIGH				
	12						
7	13	RBS DC CR	DC PLANT PCR IB2-1	BLU/WHT			
	14			WHT/BLU			
8	15	RBS DC MJ	DC PLANT PMJ IB2-2	WHT/GRN			
	16			GRN/WHT			
9	17	RBS DC HIGH VOLT	DC PLANT HV1				
	18						
10	19	RBS DC LOW VOLT	DC PLANT LV1				
	20						
11	21	RBS FUSE FAIL	DC PLANT FA IB2-7	SLT/RED			
	22			BLK/BLU			
12	23	RBS DC RECT MJ	DC PLANT RFA IB2-8	BLK/ORG			
	24			ORG/BLK			
13	25	RBS DC RECT CR	DC PLANT RFA(MULT)				
	26						
14	27	RBS BATT TEMP HIGH	DC PLANT HITEMP1				
	28						
15	29	BATT ON DISCHARGE	DC POWER SYSTEM IB2-4	RED/BLU			
	30			BLU/RED			
16	31	BATTERY BREAKER	BATTERY BREAKER	WHT/ORG3			
	32			ORG/WHT1			
17	33	TEMP	ECU	YEL1			
	34			VIO2			
18	35						
	36						
19	37						
	38						
20	39						
	40						
21	41						
	42						
22	43						
	44						
23	45						
	46						
24	47						
	48						
25	49						
	50						

NOTE:
 1. TERMINATE ALARMS ON COLUMN A.
 2. 50 PR COLUMNS INTERNALLY CONNECTED.

Figure 14.1 Typical Alarm Block Wiring (F2020029)

ALARM TABLE

66 BLOCK 2							
ALARM CKT	CLIP	ALARM	SOURCE	A	B	C	D
1	1	RBS LTE RRU AT DC SYS SPD	RAYCAP#1 ALARM				
	2						
2	3	RBS LTE RRU AT DC SYS SPD	RAYCAP#2 ALARM				
	4						
3	5	RBS LTE RRU AT DC SYS SPD	RAYCAP#3 ALARM				
	6						
4	7	RBS FIF PDU FUSE 1 FAIL	FIF FF FUSE 1 FAIL, RF B ONLY				
	8						
5	9	RBS FIF PDU FUSE 1 FAIL	FIF FF FUSE 2 FAIL, RF B ONLY				
	10						
6	11						
	12						
7	13						
	14						
8	15	RBS COMMERCIAL POWER FAIL	DC POWER SYSTEM IB2-6	RED/BRN			
	16			BRN/RED			
9	17	RBS PWR AC SPD	FROM PTLC SURGE PROTECTOR				
	18						
10	19	RBS GENERATOR RUNNING	GEN RUN				
	20						
11	21	RBS GENERATOR MJ	GEN MAJOR				
	22						
12	23	RBS GENERATOR SHUT DOWN	GEN SHUTDOWN				
	24						
13	25	RBS GENERATOR FUEL LOW	GEN LOW FUEL				
	26						
14	27	RBS GENERATOR FUEL LEAK	FUEL BASIN RUPTURE				
	28						
15	29	RBS GEN TRANSFER SW FAIL	350A (-48VDC) CB AUX CONTACTS				
	30						
16	31						
	32						
17	33						
	34						
18	35						
	36						
19	37						
	38						
20	39						
	40						
21	41						
	42						
22	43						
	44						
23	45						
	46						
24	47						
	48						
25	49						
	50						

NOTE:
 1. TERMINATE ALARMS ON COLUMN A.
 2. 50 PR COLUMNS INTERNALLY CONNECTED.

Figure 14.2 Typical Alarm Block Wiring (F2020030)

ALARM TABLE

66 BLOCK 1							
ALARM CKT	CLIP	ALARM	SOURCE	A	B	C	D
1	1	MAJOR	HEX/ECU FAIL	WHT1			
	2			BLK3			
2	3	MINOR	INTRUSION	BRN1			
	4			BLU3			
3	5	HEATER FAIL	DC HEATER FAILURE	BLK			
	6			RED			
4	7	T-SIPHON FAIL	HEATER 1-4 FAIL, H1-H4 CAP ALARM F				
	8						
5	9	TA HIGH	T-SIPHON 1-T-SIPHON 3 FAIL				
	10						
6	11	T BATTERY HIGH	BAY 1-T BAY 3 HIGH, T BATT ZONE HIGH				
	12						
7	13	RBS DC CR	DC PLANT PCR IB2-1	BLU/WHT			
	14			WHT/BLU			
8	15	RBS DC MJ	DC PLANT PMJ IB2-2	WHT/GRN			
	16			GRN/WHT			
9	17	RBS DC HIGH VOLT	DC PLANT HV1				
	18						
10	19	RBS DC LOW VOLT	DC PLANT LV1				
	20						
11	21	RBS FUSE FAIL	DC PLANT FA IB2-7	SLT/RED			
	22			BLK/BLU			
12	23	RBS DC RECT MJ	DC PLANT RFA IB2-8	BLK/ORG			
	24			ORG/BLK			
13	25	RBS DC RECT CR	DC PLANT RFA(MULT)				
	26						
14	27	RBS BATT TEMP HIGH	DC PLANT HITEMP1				
	28						
15	29	BATT ON DISCHARGE	DC POWER SYSTEM IB2-4	RED/BLU			
	30			BLU/RED			
16	31	BATTERY BREAKER	BATTERY BREAKER	WHT/ORG			
	32			ORG/WHT			
17	33	TEMP	ECU	YEL1			
	34			VIO3			
18	35						
	36						
19	37						
	38						
20	39						
	40						
21	41						
	42						
22	43						
	44						
23	45						
	46						
24	47						
	48						
25	49						
	50						

NOTE:
 1. TERMINATE ALARMS ON COLUMN A.
 2. 50 PR. COLUMNS INTERNALLY CONNECTED.

Figure 14.2 Typical Alarm Block Wiring (F2020030)

ALARM TABLE

66 BLOCK 2							
ALARM CKT	CLIP	ALARM	SOURCE	A	B	C	D
1	1	RBS LTE RRU AT DC SYS SPD	RAYCAP#1 ALARM				
	2						
2	3	RBS LTE RRU AT DC SYS SPD	RAYCAP#2 ALARM				
	4						
3	5	RBS LTE RRU AT DC SYS SPD	RAYCAP#3 ALARM				
	6						
4	7	RBS FIF PDU FUSE 1 FAIL	FIF FF FUSE 1 FAIL, RF B ONLY				
	8						
5	9	RBS FIF PDU FUSE 1 FAIL	FIF FF FUSE 2 FAIL, RF B ONLY				
	10						
6	11						
	12						
7	13						
	14						
8	15	RBS COMMERCIAL POWER FAIL	DC POWER SYSTEM IB2-6	RED/BRN			
	16			BRN/RED			
9	17	RBS PWR AC SPD	FROM PTLC SURGE PROTECTOR				
	18						
10	19	RBS GENERATOR RUNNING	GEN RUN				
	20						
11	21	RBS GENERATOR MJ	GEN MAJOR				
	22						
12	23	RBS GENERATOR SHUT DOWN	GEN SHUTDOWN				
	24						
13	25	RBS GENERATOR FUEL LOW	GEN LOW FUEL				
	26						
14	27	RBS GENERATOR FUEL LEAK	FUEL BASIN RUPTURE				
	28						
15	29	RBS GEN TRANSFER SW FAIL	350A (-48VDC) CB AUX CONTACTS				
	30						
16	31						
	32						
17	33						
	34						
18	35						
	36						
19	37						
	38						
20	39						
	40						
21	41						
	42						
22	43						
	44						
23	45						
	46						
24	47						
	48						
25	49						
	50						

NOTE:
 1. TERMINATE ALARMS ON COLUMN A.
 2. 50 PR. COLUMNS INTERNALLY CONNECTED.

15 Sealing Enclosure Cable Entries

In keeping with best industry practices, seal all cable grommets against weather, rodent and insect intrusions.

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

16 Initial Power Up

16.1 Important Safety Instructions



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

16.2 Prerequisite

Verify that all procedures and safety notices previous to this section have been applied regarding the enclosure, system grounding, AC power, DC power, and battery installation.

Verify that all procedures and safety notices accompanying customer-installed equipment have been applied.

Verify that the enclosure has an approved connection to the local utility power supply.

16.3 Initial Power Up Sequence

Checks

1. Use an approved voltage detector to verify enclosure is not unsafe.
2. Verify all battery disconnect circuit breakers located in the enclosure are OFF.
3. Verify all other breakers inside the enclosure are OFF.
4. Verify no open power leads are present.
5. Verify all cables and connections are secure.
6. Verify any installed batteries, including proper matching of polarity.
7. Turn-up the DC power system, one rectifier at a time, by closing the external overcurrent protective devices supplying AC input to the rectifier system.
8. Close any other external overcurrent protective devices supplying AC input to the enclosure.
9. Use an approved voltage detector to verify enclosure safety after closing the external overcurrent protective devices supplying AC input to the enclosure.



CAUTION! Always allow components like rectifiers and the ECU a few minutes to complete their start-up sequences.

10. Verify DC power system controller float setting, per site requirements
11. For each battery shelf, switch the battery disconnect circuit breakers to the ON position.
12. Verify battery state, as per manufacturer’s instructions. Refer to battery manufacturer’s documentation for any battery tests.

13. Connect power to the loads.
14. Refer to the power system instruction manual(s) supplied with the enclosure or by the manufacturer for field-installed systems.
15. Refer to the instruction manuals supplied with the equipment installed inside the enclosure for additional initial startup and check out procedures.
16. Verify there are no alarms being generated by the system.
17. Close and secure the front doors.

17 Climate Control

17.1 Heat Exchanger and Environmental Control Unit (ECU)

17.1.1 General

Each bay comprising the system is equipped with a heat exchanger controlled by an Environmental Control Unit (ECU). The ECU controls the bay's heat exchanger fans. Fans turn off at low internal temperatures. DC heater in each bay have internal on/off control independent of the ECU (the ECU does not control the DC heaters - they run independently at low temperatures only). Besides controlling the bay's heat exchanger fans, each 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 2.8 starting on page 14 and Figure 2.9 starting on page 18 for location of each bay's ECU and heat exchanger. Refer to Figure 17.1 and Figure 17.2 for a diagram of an ECU.

17.1.2 ECU wiring schematic

Refer to the schematic drawings shipped with your system for a detailed ECU wiring schematic.

17.1.3 ECU power connector

Power cable and appropriate circuit breaker for each ECU (one in each bay) are provided and factory connected.



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

17.1.4 Description of operation

The heat exchanger is a closed loop cooling unit with two (2) (equipment bays) or three (3) (power/battery bay) fans in the internal loop and two (2) (equipment bays) or three (3) (power/battery bay) fans in the external loop. The internal and external fans are of the same style and type.

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 heat exchanger fans (internal and external loops) are turned off if the bay's front door or rear panel alarm switch is activated (temporarily, as described in ECU section on door open/door ajar operation). See alarm code d01, d02 in Figure 17.1 and Figure 17.2.

The enclosure has a typical ambient operating temperature range of -40 °F to +149 °F (-40 °C to +65 °C). DC power equipment is rated for -40 °C to +65 °C operation. Customer equipment is rated for 0 °C to +55 °C operation, approximately. 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.

Each bay is equipped with its own ECU, and each ECU is equipped with two (2) temperature sensors, located in the top left and top right areas of the bay. Equipment bay ECU operates an equipment cooling profile, and the power bay ECU operates a power bay cooling profile. Refer to Table 17.1 for a summary of the temperature alarms setpoints.

Failures of thermal components and effects on ECU operation are noted below (ECU in each bay is isolated control from adjacent bay):

- Single thermistor failure causes fans to RUN FULL SPEED fault mode in that bay.
- Single fan loss or low speed - does NOT affect other fans - does not go into full speed fault mode.
- Low temperature - fans turn OFF.
- High temperature - fans go to high speed.

Figure 17.1 ECU Diagram (Power/Battery Bay)

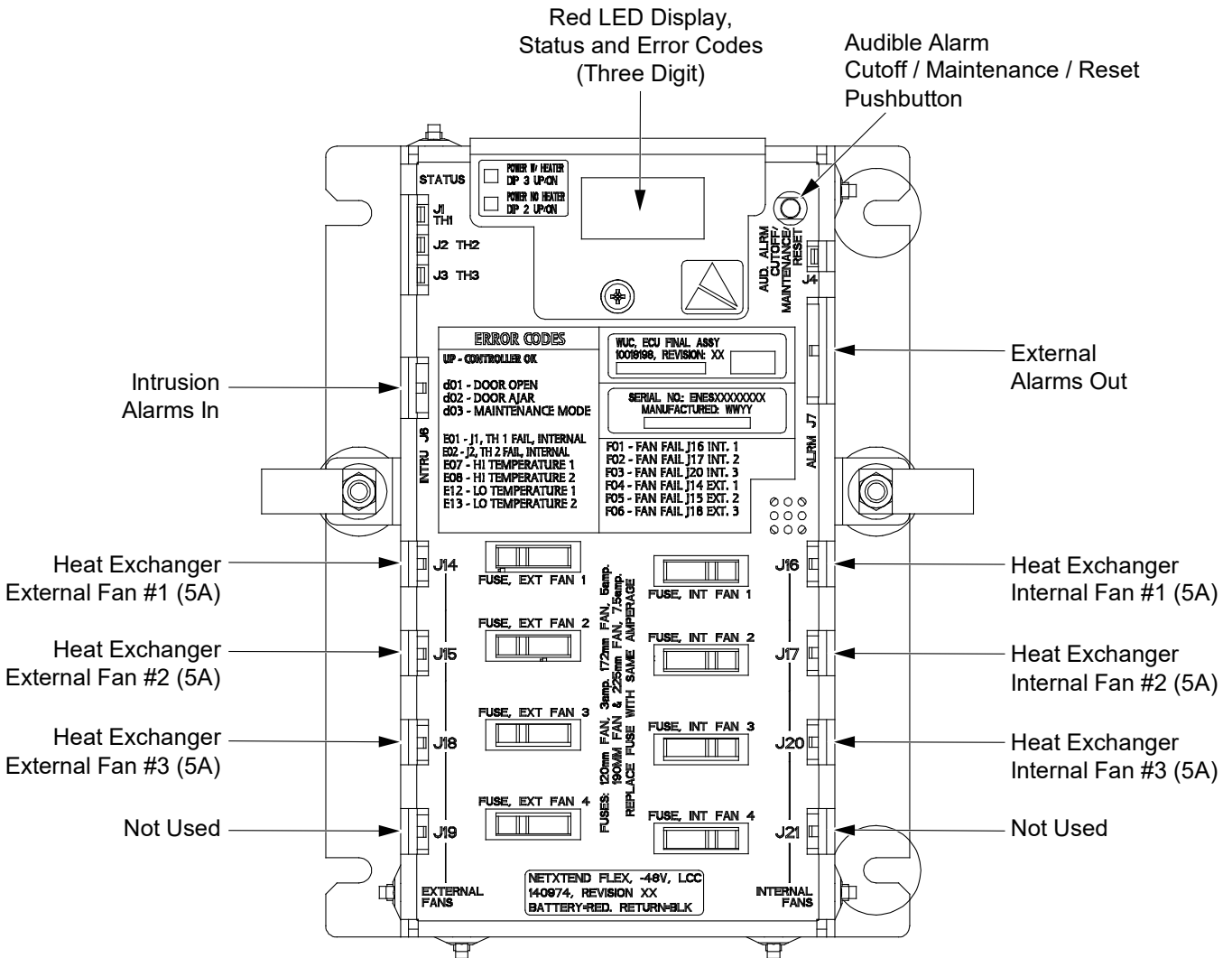
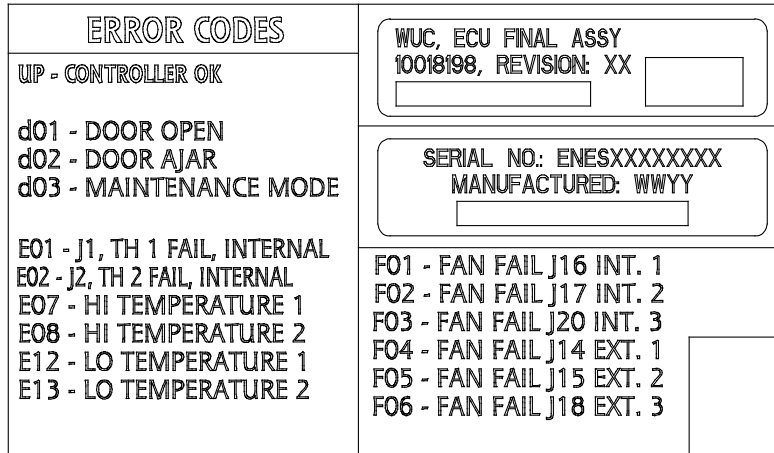


Figure 17.2 ECU Diagram (Equipment Bay)

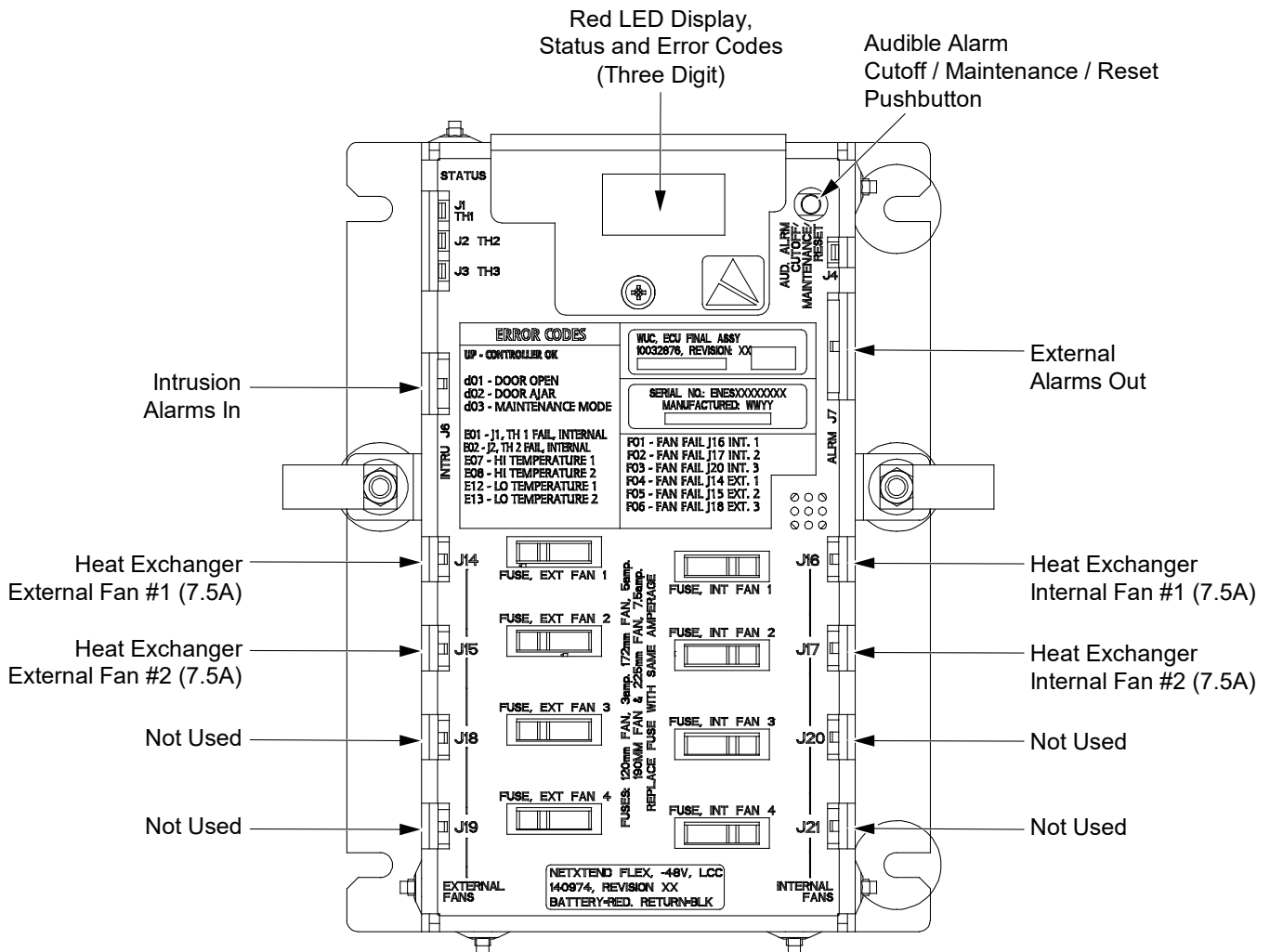
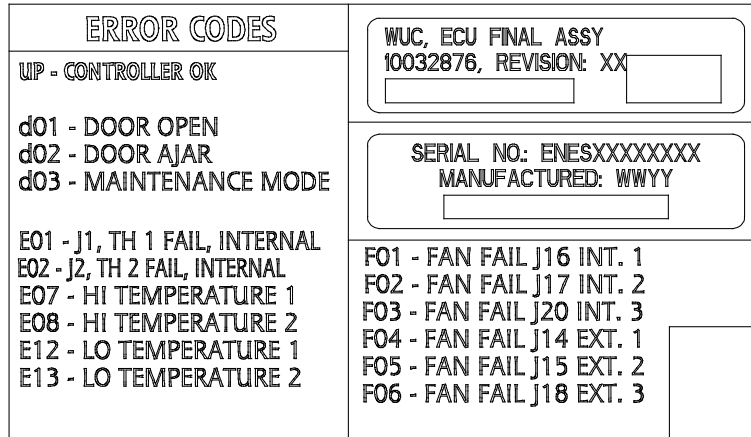


Table 17.1 Temperature Alarm Setpoint Summary (Power/Battery Bay)

Port	Temp Input Description	Alarm Hi	Alarm Lo	LED Display	Remote Alarm
J1	Cabinet Air 1	+67 °C (+153 °F) retires at +62 °C (+144 °F)	-45 °C (-49 °F), retires at -40 °C (-40 °F)	E07: High Temperature E12: Low Temperature	Temperature Alarm Relay
J2	Cabinet Air 2	+67 °C (+153 °F) retires at +62 °C (+144 °F)	-45 °C (-49 °F), retires at -40 °C (-40 °F)	E08: High Temperature E13: Low Temperature	Temperature Alarm Relay

Table 17.2 Temperature Alarm Setpoint Summary (Equipment Bay)

Port	Temp Input Description	Alarm Hi	Alarm Lo	LED Display	Remote Alarm
J1	Cabinet Air 1	+57 °C (+135 °F) retires at +52 °C (+126 °F)	-45 °C (-49 °F), retires at -40 °C (-40 °F)	E07: High Temperature E12: Low Temperature	Temperature Alarm Relay
J2	Cabinet Air 2	+57 °C (+135 °F) retires at +52 °C (+126 °F)	-45 °C (-49 °F), retires at -40 °C (-40 °F)	E08: High Temperature E13: Low Temperature	Temperature Alarm Relay

Table 17.3 Fault Conditions (Power/Battery Bay and Equipment Bay)

Fault Condition Summary						
Description	Loss of Thermistor				High Temp	Low Temp
	Fan Failure	Cabinet Air 1 (J1)	Cabinet Air 1 (J2)			
Heat Exchanger Fans	Remaining fans operate normally.	All fans full speed.	All fans full speed.	All fans full speed.	All fans off.	

17.1.5 ECU user interface

Initial Start-Up Sequence

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

Start-Up Sequence

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

ECU Display Codes

Refer to Table 17.4 for a list of ECU display codes.



NOTE! NORMAL OPERATION OF THE ECU LED DISPLAY IS "UP".

External Alarms

The ECU provides the following external alarms. Refer also to the "Connecting External Alarms" on page 66.

- Intrusion Alarm: Activates if the front door is opened or the rear access panel is removed.
- High / Low Temperature Alarm: Activates during a high or low temperature condition in either the Equipment and/or Battery Compartment.
- HVAC Major Alarm: 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.

Table 17.4 ECU Display Codes (Power/Battery Bay and Equipment Bay)

Code ¹	Description	ECU External Alarm
UP	Controller OK	--
PC	Product Code	--
xxx	Product Code (follows PC) (xxx = 000-999) (In this enclosure it is 061 for equipment bay ECU and 062 for power/battery bay ECU.)	--
FC	Firmware Code (Revision)	--
N.N.N	Firmware Code (Revision) (follows FC) (N = 0-9) (In this enclosure it is 2.0.0.)	--
d01	Door Open (software does not treat as alarm resulting in a system fault condition)	Intrusion Alarm
d02	Door Ajar (software does not treat as alarm resulting in a system fault condition)	Intrusion Alarm
d03 (followed by minutes remaining in maintenance mode or seconds remaining if less than 1 minute)	Maintenance Mode	--
E01	TH1 (Thermistor) Fail (J1) - Cabinet Air 1 (Note: E07 and E12 inhibited)	HVAC Major Alarm
E02	TH2 (Thermistor) Fail (J2) - Cabinet Air 2 (Note: E08 and E13 inhibited)	HVAC Major Alarm
E07	High Temperature 1 (inhibited by E01)	Temperature Alarm
E08	High Temperature 2 (inhibited by E02)	Temperature Alarm
E12	Low Temperature 1 (inhibited by E01)	Temperature Alarm
E13	Low Temperature 2 (inhibited by E02)	Temperature Alarm
F01	Internal HX Fan #1 Fail (J16) ²	HVAC Major Alarm
F02	Internal HX Fan #2 Fail (J17) ²	HVAC Major Alarm
F03	Internal HX Fan #3 Fail (J20) ² (Power/Battery Bay Only)	HVAC Major Alarm
F04	External HX Fan #1 Fail (J14) ²	HVAC Major Alarm
F05	External HX Fan #2 Fail (J15) ²	HVAC Major Alarm
F06	External HX Fan #3 Fail (J18) ² (Power/Battery Bay Only)	HVAC Major Alarm

¹ Display cycles continuously through all active messages.

² Fan fail alarms are latched until controller is reset.
All other alarms are retired when the alarm condition is removed.

Intrusion Alarm

Whenever the front door is opened, or rear access panel removed; 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. Refer to Figure 17.1 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.

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. Refer to Figure 17.1 and Figure 17.2 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.

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. Refer to Figure 17.1 and Figure 17.2 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.

17.2 DC Heaters

Each power/battery bay comprising the system is equipped with two (2) 48 VDC, 1000 W, heater assemblies (one in each compartment). Each equipment bay comprising the system is equipped with one (1) 48 VDC, 1000 W, heater assembly. Refer to Figure 2.8 starting on page 14 and Figure 2.9 starting on page 18 for location of each bay's DC heater.

DC heaters are not controlled by the ECU. DC heaters circulate a small amount of air even when not heating. DC heater ON/OFF is 5 °C ON, 15 °C OFF as fixed operation.

Refer to the manufacturer instructions for operating information on the DC heaters.

18 Maintenance, Troubleshooting, and Replacement Procedures**18.1 Important Safety Instructions**

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

18.2 Contact Information

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

18.3 Enclosure Identification

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

18.4 Routine Maintenance**18.4.1 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).

18.4.2 DC power system

Refer to the documentation furnished with the power system.

18.4.3 Batteries

General

Inspect the batteries according to battery manufacturer's instructions. Maintain records as required by the battery manufacturer to maintain the battery warranty.

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

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 (customer should look into a preventative maintenance plan and should replace VRLA batteries BEFORE they fail).

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.

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.

18.4.4 Ventilation openings

At each visit, verify that there is no obstruction outside the enclosure blocking any ventilation opening. At 1-year to 5-year intervals, based on the location and environmental conditions, use clean compressed air to blow out the dust accumulation from the ventilation openings in the door shroud, door, and back panel.

18.4.5 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-year 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.

18.4.6 GFCI outlet

Periodically test the GFCI outlet per site practices. Test the outlet by depressing the TEST button. Verify the GFCI trips to remove power from the outlet. Reset the GFCI by depressing the RESET button.

18.5 Troubleshooting

18.5.1 DC power system

Refer to the documentation furnished with the power system.

18.5.2 Batteries

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

18.5.3 Environmental control unit (ECU)

General

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

ECU Display Codes

Refer to Table 17.4 for a list of codes that the ECU may display.

The ECU upon turn-up displays a software revision number on the LED display. It is good practice to verify software version required to match cabinet hardware. Also verify part number on ECU manufacturing label is the same as being replaced (two different ECUs are used). When the controller is started either through power up or reset, the display shows PC followed by the product code, then FC followed by the firmware code. Note these display codes as the ECU is started. Refer also to Table 17.4.

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 or panel 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 or panel was simply left open for more than 30 minutes. Close the door or panel, 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 and all panels have 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 switches 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. Refer to Figure 4.4 on page 27 for wiring illustration.

Recommended Practice to be Performed after a Door or Panel is Open

To check for a broken door intrusion switch or an open in the wiring, perform the following procedure whenever a door or panel 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 other switches and door intrusion wiring has no open conditions.
5. Close the front door.

18.5.4 Fan alarm test procedure

This test method is to validate alarms back to the NOC during the initial commissioning and is not intended for routine maintenance.

- Refer to Figure 17.1 and Figure 17.2 for location of ECU temperature sensor and fan ports.
- Field technician requires a 10k Ohm ECU Temp Sensor Bypass Resistor Plug using AMP Parts 172165-1 (Connector, Qty 1) and 770904-3 (Pins, Qty 2) and a 10k Ohm Resistor.
 - This 10k Plug simulates a Temp Sensor setting for a warm summer day, which drives the Heat Exchanger (HX) Fans. Please note that HX Fans at this speed is barely audible and may be masked by the noise of other equipment.
- Unplug the temperature sensor from the ECU J1 port.
 - ECU should display the E01 error code.
 - To this ECU alarm condition, the HX Fans will ramp up.

- Connect the temporary 10k Plug into ECU J1 port.
 - No error codes should be displayed on the ECU display.
- Unplug the fan connected to the ECU J14 port.
 - The ECU should display the F04 error code.
- Reconnect the fan to the ECU J14 port.
 - No error codes should be displayed on the ECU display.
- Repeat the above 2 steps for all remaining fans (ECU ports J15 - J21).
 - The ECU error codes should be F01 and Fxx, with xx being the next fan fail number.
- Replace the temporary resistor plug in the ECU J1 port with the original temperature sensor that was connected to this port before the procedure was started.
 - During this change over, an error may temporarily be reported.

18.6 Replacement Procedures

18.6.1 DC power system

Refer to the documentation furnished with the power system.

18.6.2 SPD (Surge Protection Device) replacement

The SPD (Surge Protection Device) is located at the rear side of the enclosure. See Figure 2.8 and Figure 2.9 for location of the SPD (Surge Protection Device). Refer to the DC power system user manual (UM582137000) for the replacement procedure.

18.6.3 Battery replacement

The following considerations must be taken when replacing a battery:

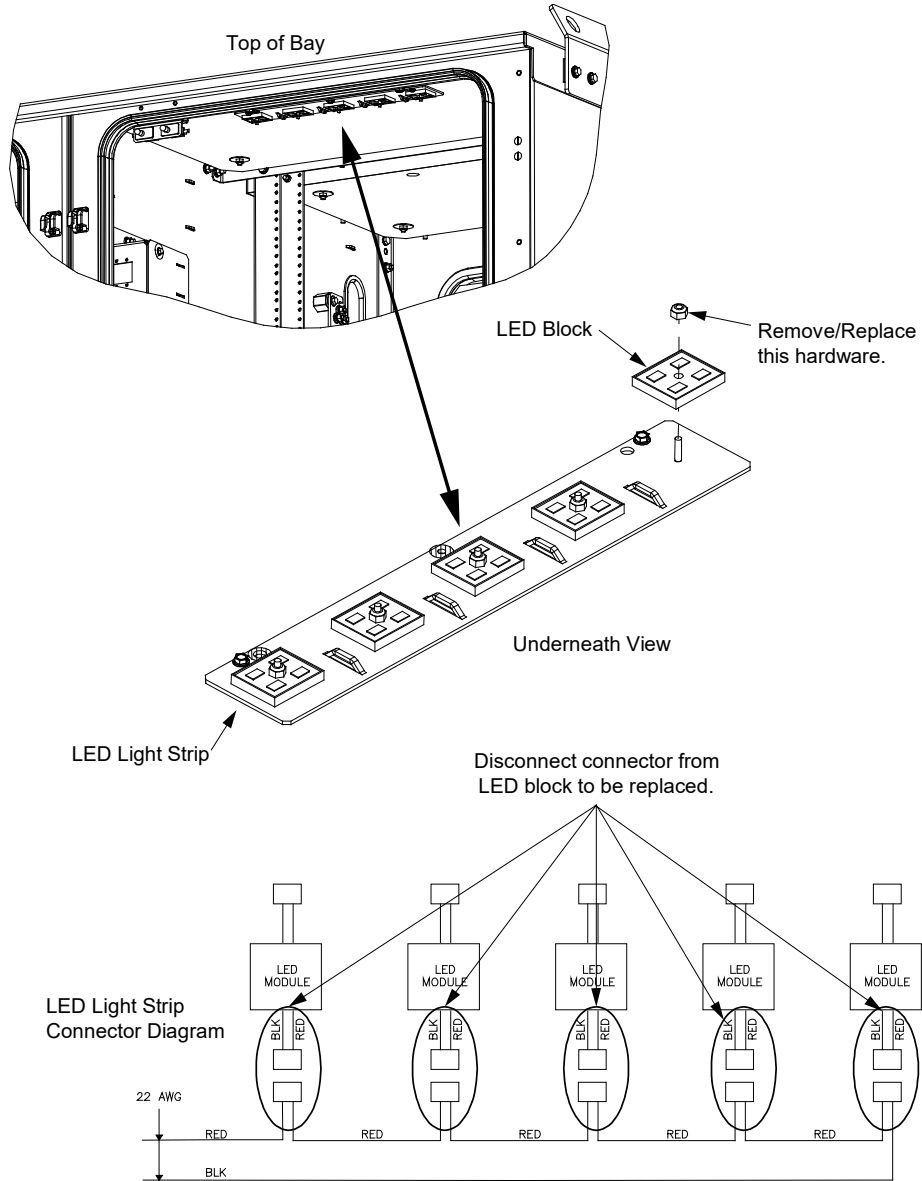
- Follow all previously stated warnings and precautions.
- Review all documentation, including the battery manufacturer's instructions and MSDS.
- Never mix different battery technologies, manufacturers, or models within the enclosure.
- Before proceeding, isolate the battery from the DC power plant (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.
- Ensure to re-apply NO-OX-ID-A (or approved equivalent) on all terminals and lugs.
- To install the replacement, follow the previous installation instructions and battery manufacturer's instructions.
- If a battery or batteries need replacement, refer to the instructions in "DC Power and Batteries" on page 57.

18.6.4 LED light replacement

Procedure

1. Unplug the LED unit that needs to be replaced. Refer to Figure 18.1.
2. Refer to Figure 18.1 and remove the nut securing the LED unit that needs to be replaced.
3. Reverse these steps to re-install the LED unit.

Figure 18.1 LED Light Replacement



18.6.5 Heat exchanger internal and external fan replacement (Power/Battery Bay)



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 Fan

Perform the following steps to replace an internal heat exchanger fan. Refer to Figure 18.2 as this procedure is performed.

1. Open the bay's front door. Refer to "Opening and closing an enclosure front door" on page 23.
2. Secure the door in the open position with the wind latch.
3. Using the ECU status, identify the fan to be replaced and its location.
4. Verify that the replacement fan is of the appropriate model.
5. Disable the HX fans by either...
 - a) Placing the ECU in maintenance mode. See "Maintenance Mode" on page 78 for a procedure.
 - a) Placing the ECU circuit breaker in the DC distribution shelf into the "OFF" position.
 - b) Temporarily disconnecting power to the ECU by separating the in-line connectors in the ECU power cable.
6. Disconnect the defective fan's power lead connector.
7. For proper orientation of the replacement fan, note the location of the fan wires and the air flow arrows on the defective fan. Remove the two sets of screws and lock washers securing the finger guard on the defective fan. Remove the two sets of screws and lock washers securing the defective fan in place. Remove the fan and discard. Save the fan mounting hardware for re-use.

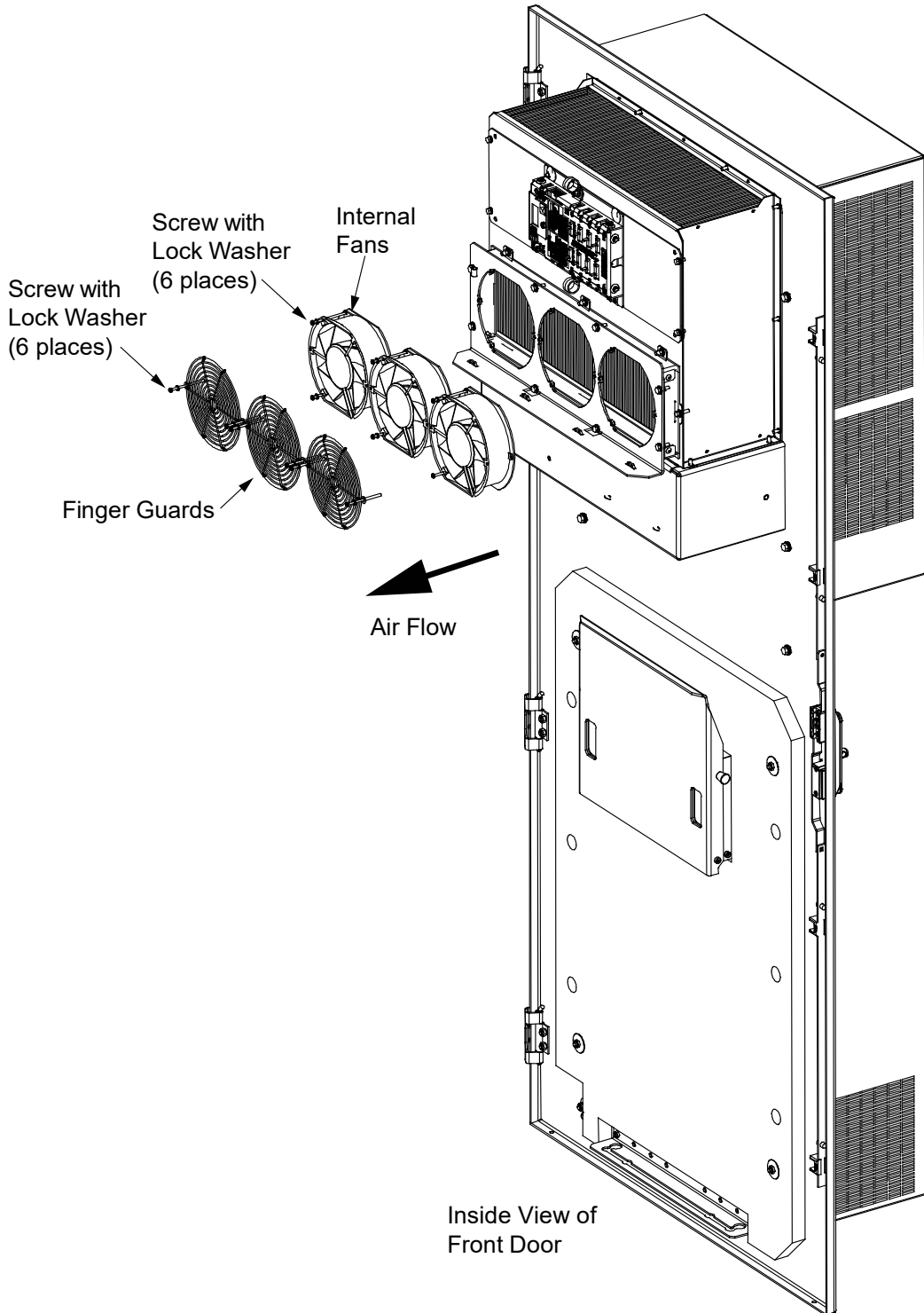


NOTE! FAN MUST BE REPLACED in same orientation/flow direction as removed fan. Use label or arrow on side of fan to re-install in correct flow direction.

8. Install the replacement fan and secure it in place using the hardware removed above. Ensure the fan wires and air flow arrows match the orientation noted above.
9. Install the finger guard onto the new fan and secure it in place using the hardware removed above.
10. Plug the connector of the replacement fan into the connector vacated when disconnecting the defective fan. Verify that the connector is fully seated in the mating connector.
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 bay's front door. Refer to "Opening and closing an enclosure front door" on page 23.

Figure 18.2 Heat Exchanger Internal Fan Replacement



Replacing an External Fan

Perform the following steps to replace an external heat exchanger fan. Refer to Figure 18.3, Figure 18.4, and Figure 18.5 as this procedure is performed.

1. Open the bay's front door. Refer to "Opening and closing an enclosure front door" on page 23.
2. Secure the door in the open position with the wind latch.
3. Using the ECU status, identify the fan to be replaced and its location.
4. Verify that the replacement fan is of the appropriate model.
5. Disable the HX fans by either...
 - a) Placing the ECU in maintenance mode. See "Maintenance Mode" on page 78 for a procedure.
 - b) Placing the ECU circuit breaker in the DC distribution shelf into the "OFF" position.
 - c) Temporarily disconnecting power to the ECU by separating the in-line connectors in the ECU power cable.
6. On the inside of the front door, remove the bolts and rubber washers securing the heat exchanger's shroud (door top shroud). Set the shroud and hardware safely aside. Refer to Figure 18.3.



NOTE! All three external fans will be removed as an assembly.

7. Separate all external fan power connectors (ensure each half of the in-line external fan power connectors are marked so they can be properly plugged back together).
8. Loosen (or remove if preferred) the bottom four nuts and hardware securing the fan assembly. See Figure 18.4.
9. Remove the top four nuts and hardware securing the fan assembly. Save the plastic p-clips securing the fan cabling. It may be necessary to cut one cable tie securing the cables. See Figure 18.4.
10. Remove the fan assembly by tilting the top of the assembly down, while lifting the bottom from the hardware loosened at the bottom of the fan assembly. Set the fan assembly on a suitable work area.
11. For proper orientation of the replacement fan, note the location of the fan wires and the air flow arrows on the defective fan. Remove the two sets of screws and lock washers securing the finger guard on the defective fan. Remove the two sets of screws and lock washers securing the defective fan in place. Remove the fan and discard. Save the fan mounting hardware for re-use. See Figure 18.5.



NOTE! FAN MUST BE REPLACED in same orientation/flow direction as removed fan. Use label or arrow on side of fan to re-install in correct flow direction.

12. Install the replacement fan and secure it in place using the hardware removed above. Ensure the fan wires and air flow arrows match the orientation noted above.
13. Install the finger guard onto the new fan and secure it in place using the hardware removed above.
14. Re-install the fan assembly. Tighten (or replace) the bottom set of nuts and replace the top set of screws to secure the fan assembly.
15. Re-connect the power lead connectors for all external fans. Verify that the connectors are fully seated in the mating connector.
16. Replace the heat exchanger's shroud, and secure with the bolts and hardware previously removed.

17. 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.
18. Monitor the ECU to make sure that the replacement fan is powered up and that it initializes, calibrates and goes into steady state.
19. Close the bay's front door. Refer to "Opening and closing an enclosure front door" on page 23.

Figure 18.3 Heat Exchanger External Fan Replacement (Removing Shroud)

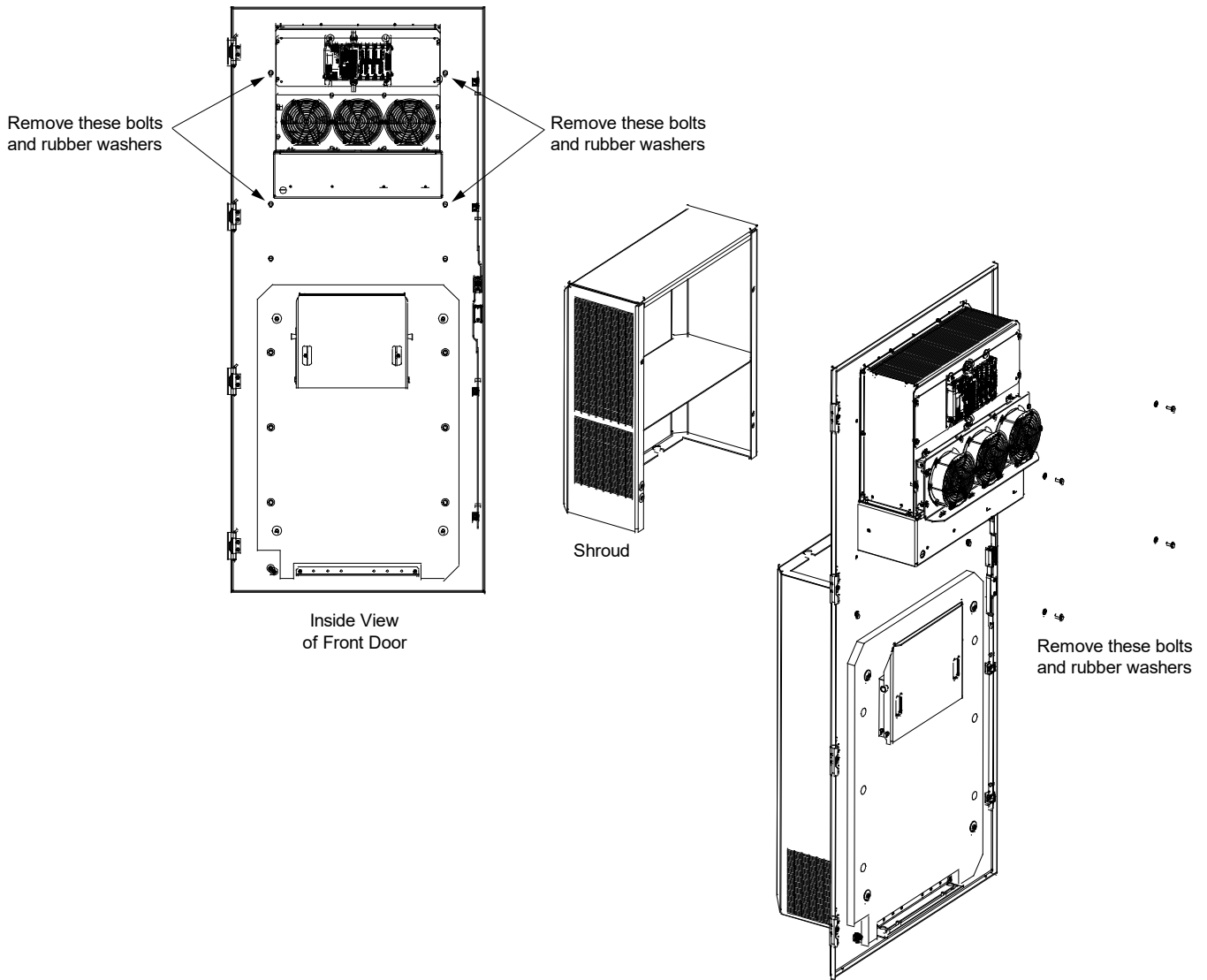


Figure 18.4 Heat Exchanger External Fan Replacement (Removing External Fan Assembly)

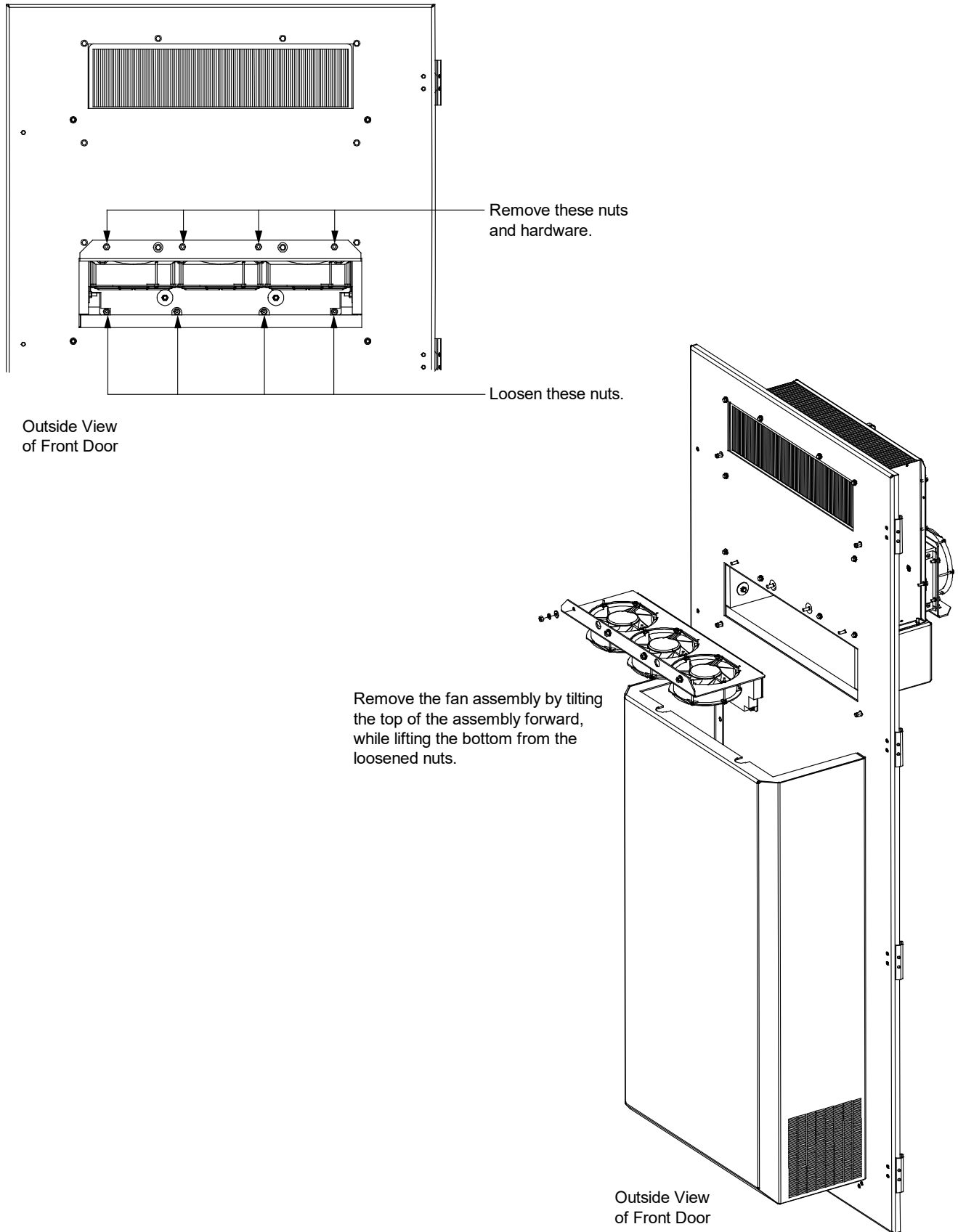
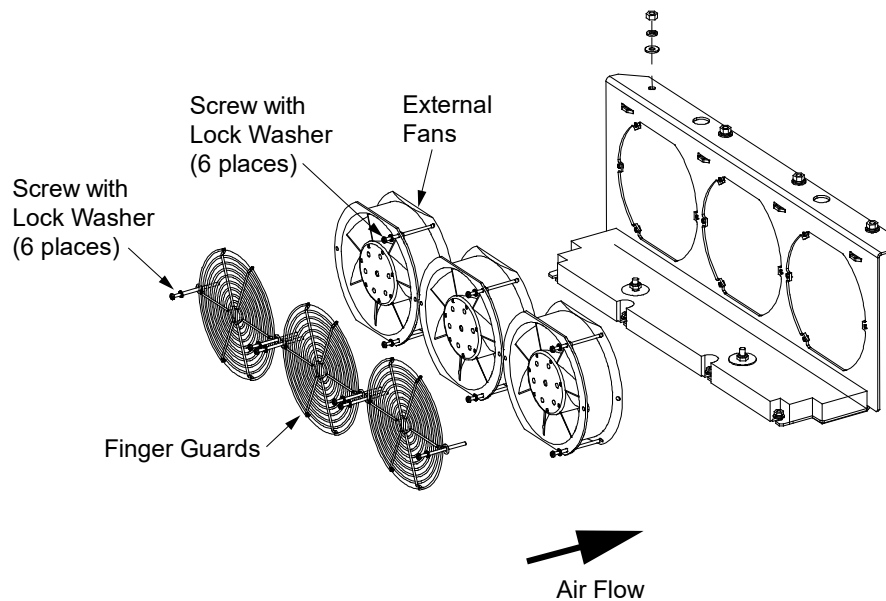


Figure 18.5 Heat Exchanger External Fan Replacement (Removing External Fans)

18.6.6 Heat exchanger internal and external fan replacement (Equipment Bays)



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

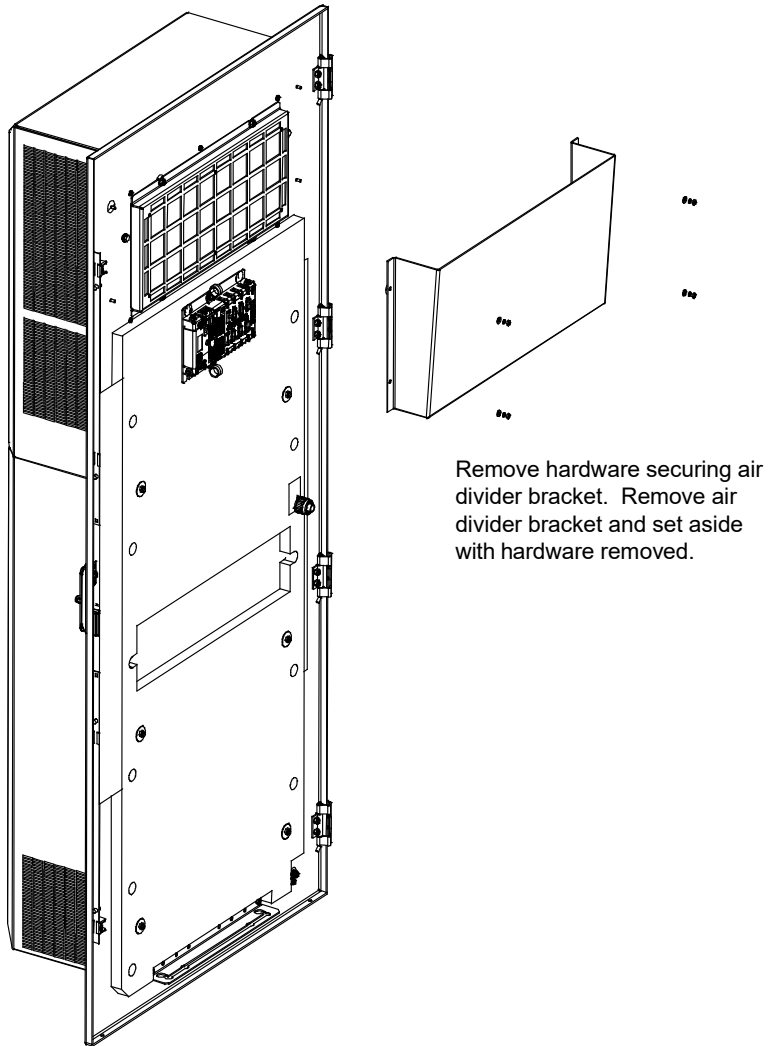
Replacing an Internal or External Heat Exchanger Fan

Perform the following steps to replace an internal or external heat exchanger fan. Refer to Figure 18.6, Figure 18.7, Figure 18.8, Figure 18.9, and Figure 18.10 as this procedure is performed.

1. Open the bay's front door. Refer to "Opening and closing an enclosure front door" on page 23.
2. Secure the door in the open position with the wind latch.
3. Using the ECU status, identify the fan to be replaced and its location.
4. Verify that the replacement fan is of the appropriate model.
5. Disable the HX fans by either...
 - a) Placing the ECU in maintenance mode. Refer to "Maintenance Mode" on page 78 for a procedure.
 - b) Placing the ECU circuit breaker in the associated DC power system into the "OFF" position.
 - c) Temporarily disconnecting power to the ECU by separating the in-line connectors in the ECU power cable.

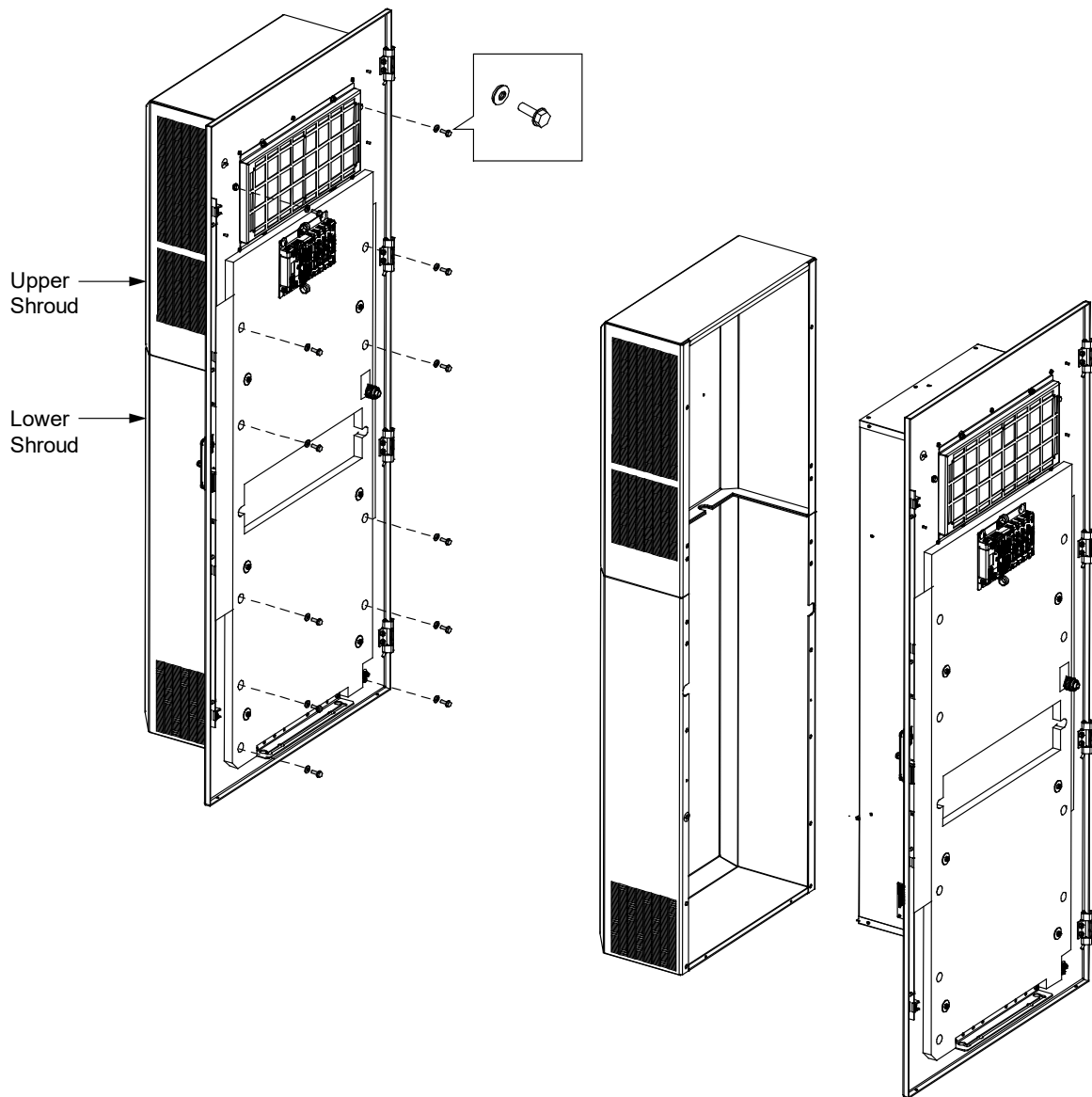
6. On the inside of the door, remove the hardware securing the air divider bracket. Remove the air divider bracket and set aside with hardware removed. Refer to Figure 18.6.

Figure 18.6 Removing the Air Divider Bracket



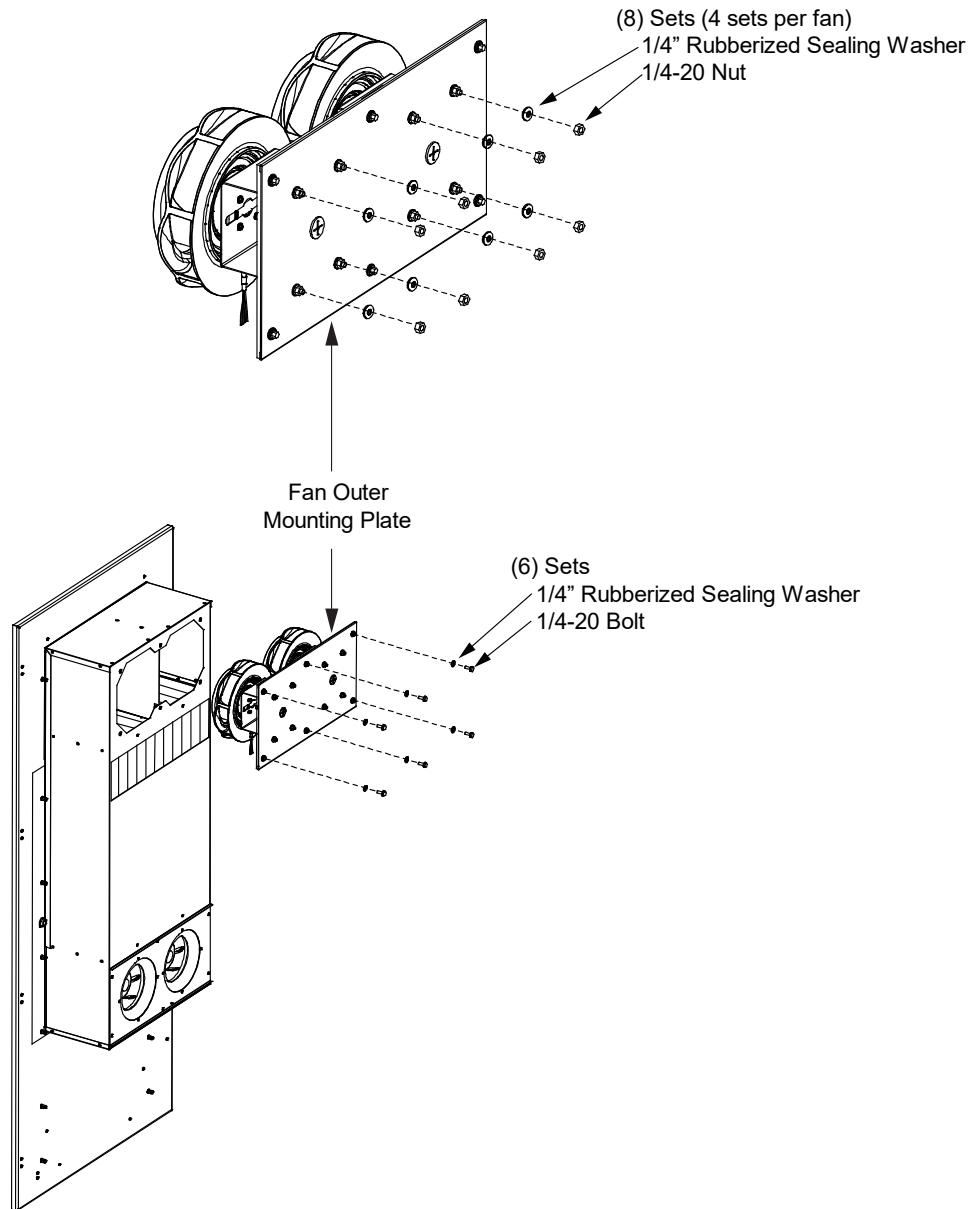
7. On the inside of the door, remove the bolts securing the heat exchanger's upper shroud (internal fan) or lower shroud (external fan). Set the shroud and hardware safely aside. Refer to Figure 18.7.

Figure 18.7 Removing the Fan Shrouds



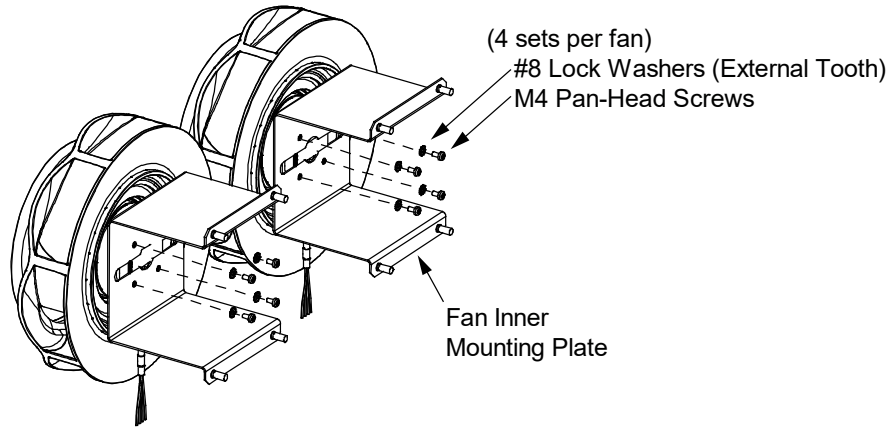
8. For an internal fan, perform the following steps. Save all hardware for re-use.
 - a) Remove the top three (3) and bottom three (3) sets of bolts and rubberized sealing washers from the fan outer mounting plate. Refer to Figure 18.8.
 - b) Carefully slide the fan outer mounting plate with fans attached 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 four (4) sets of nuts and rubberized sealing washers. Refer to Figure 18.8.

Figure 18.8 Removing the Fan Outer Mounting Plate



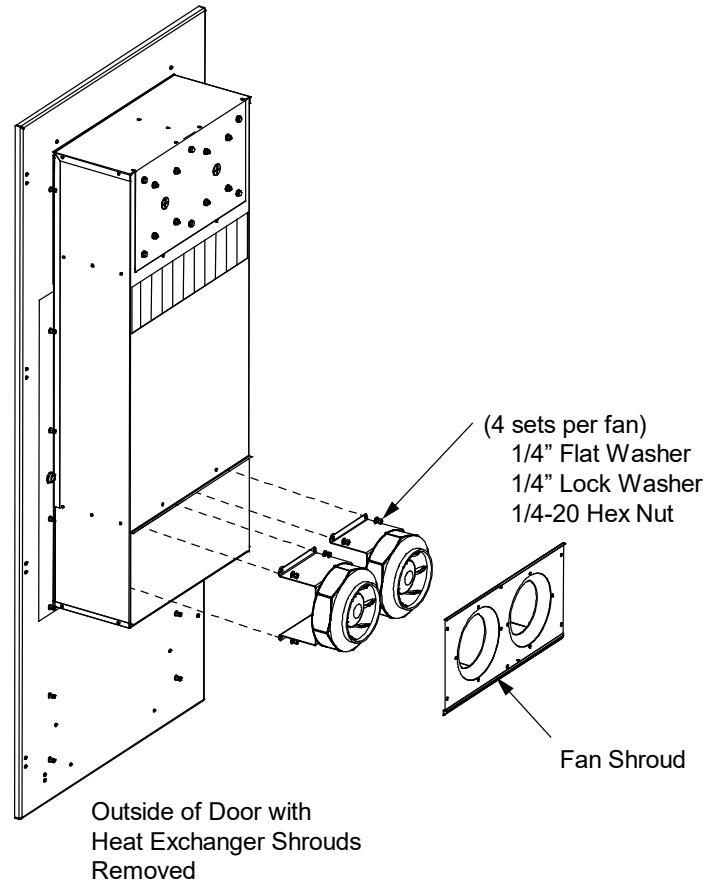
- e) Separate the defective fan from the fan inner mounting plate by removing the four (4) sets of screws and star washers. Discard the defective fan. Refer to Figure 18.9.

Figure 18.9 Removing the Fan Inner Mounting Plate



- f) Attach the replacement fan to the fan inner mounting plate with the four (4) sets of screws and star washers previously removed. Refer to Figure 18.9.
 - g) Attach the inner mounting plate with replacement fan attached to the fan outer mounting plate with the four (4) sets of nuts and rubberized sealing washers previously removed. Refer to Figure 18.8.
 - 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 three (3) and bottom three (3) sets of bolts and rubberized sealing washers previously removed. Refer to Figure 18.8.
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 six (6) screws. Save the fan shroud and hardware. Refer to Figure 18.10.
 - b) Remove the defective fan with inner mounting plate attached by removing the four (4) sets of flat washers, lock washers, and nuts securing the fan inner mounting plate. Refer to Figure 18.10.

Figure 18.10 Removing the Fan Shroud and Defective Fan



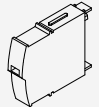
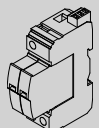
- c) Carefully slide the defective fan with inner mounting plate attached out far enough to disconnect the fan connectors.
 - d) Set the fan inner mounting plate with fans attached on a suitable work surface.
 - e) Separate the defective fan from the fan inner mounting plate by removing the four (4) sets of screws and star washers. Discard the defective fan. Refer to Figure 18.9.
 - f) Attach the replacement fan to the fan inner mounting plate with the four (4) sets of screws and star washers previously removed. Refer to Figure 18.9.
 - 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. Refer to Figure 18.10.
 - i) Replace the fan shroud to the external fans and secure with the six (6) screws previously removed. Refer to Figure 18.10.
10. Using the hardware previously removed, replace the heat exchanger's upper shroud (internal fan) or lower shroud (external fan). Refer to Figure 18.7.

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 associated DC power system 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 bay's front door. Refer to “Opening and closing an enclosure front door” on page 23.

19 Accessories and Replacement Parts

Refer to Table 19.1 for list of accessories (AC) and replacement parts (RP).

Table 19.1 Accessories and Replacement Parts

Part Number	Description	Type	
10018198	Environmental Control Unit (Power/Battery Bay)	RP	
10032876	Environmental Control Unit (Equipment Bay)	RP	
P92538	Intrusion Switch	RP	
P92538	Light Switch	RP	
10017757	Interior LED Light	RP	
151083	Exterior LED Light	RP	
10024992	Equipment Chamber Fan - 48V, 250 mm	RP	
137973	Power/Battery Chamber Fan - 48V, 172 mm	RP	
130471	Thermistor, 30kohm, J1 port	RP	
139224	Thermistor, 30kohm, J2 port	RP	
147333	Gore-Tex Vent	RP	
147334	Gore-Tex Hardware (Locknut)	RP	
248611300	ECU Fuse - 7.5A	RP	
248611000	ECU Fuse - 5A	RP	
248872600	ECU Fuse - Dummy Fuse	RP	
150636	Door Handle (front and rear)	RP	
10025828	Battery Circuit Breaker 200A	RP	
10018244	Equipment Heater	RP	
548599L	Laptop Tray	RP	
10017994	Cable Port Plate (Rear)	RP	
564693	GPS Pipe Mount Kit	RP	
564422W3	Fork Tube Cover	RP	
1R482000E3	Rectifier, High Efficiency, -48 VDC, 41.7 A / 2000 W	RP, AC	
1C48582000P3	Converter, High Efficiency, -48 VDC to -58 VDC, 2000 W Peak, 1600 W Average	RP, AC	
1M830DNA10024046	NCU Controller for WUC DC Power System e/w 10024046 Configuration File	RP, AC	
556155	3M Temperature Probe e/w Battery Terminal Tab	RP, AC	
MA4C5U31	IB2, Customer I/O Board	RP, AC	
548120	EIB, Extended Interface Board	RP, AC	
559803	Busbar Adapter Kit Converts (1) Load Position (1/4-20 on 5/8" Centers) to (1) Load Landing (1/4-20 on 5/8" Centers), 90 Degree	AC	
559804	Busbar Adapter Kit Converts (2) Load Positions (1/4-20 on 5/8" Centers) to (1) Landing (3/8-16 on 1" Centers); 90 Degree Load Busbar and Straight Return Busbar for Rear Wiring Egress	AC	
10035033	SPD (Surge Protection Device) Replacement Plug-in Module (Replacement module for SPD P/N 10034885. Each SPD P/N 10034885 has two P/N 10035033 replacement modules. Both modules should be replaced at the same time.)	RP	
10034885	SPD (Surge Protection Device) Replacement Assembly (includes SPD mounting base with two installed P/N 10035033 SPD plug-in modules.)	RP	

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