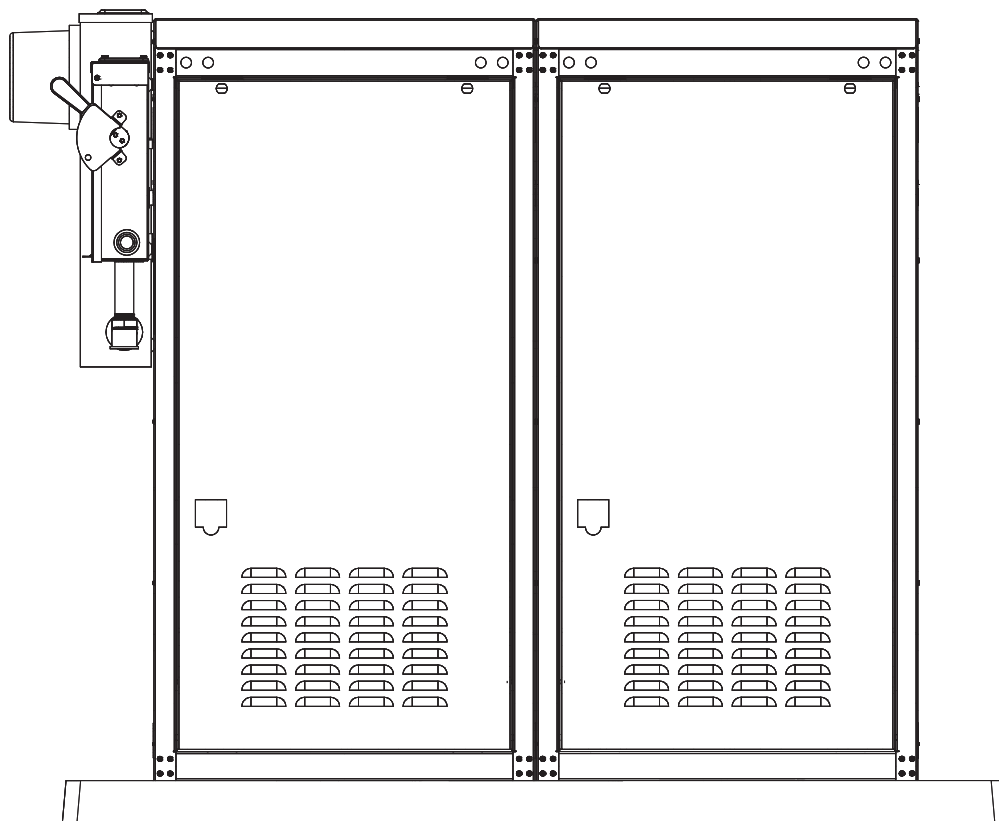




an EnerSys® company

# Alpha® XRT-TPPL Extended Runtime Power System Technical Manual

Effective: June 2023



## Safety Notes

Review the drawings and illustrations contained in this manual before proceeding. If there are any questions regarding the safe installation or operation of the system, contact Alpha Technologies Services, Inc. or the nearest Alpha® product sales representative. Save this document for future reference.

To reduce the risk of injury or death and to ensure the continued safe operation of this product, the following symbols have been placed throughout this manual. Where these symbols appear, use extra care and attention.



### **WARNING! CALIFORNIA PROPOSITION 65**

This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.



### **WARNING! GENERAL HAZARD**

GENERAL HAZARD WARNING provides safety information to PREVENT INJURY OR DEATH to the technician or user.



### **WARNING! ELECTRICAL HAZARD**

ELECTRICAL HAZARD WARNING provides electrical safety information to PREVENT INJURY OR DEATH to the technician or user.



### **WARNING! FUMES HAZARD**

FUMES HAZARD WARNING provides fumes safety information to PREVENT INJURY OR DEATH to the technician or user.



### **WARNING! FIRE HAZARD**

FIRE HAZARD WARNING provides flammability safety information to PREVENT INJURY OR DEATH to the technician or user.

There may be multiple warnings associated with the call out. Example:



### **WARNING! ELECTRICAL & FIRE HAZARD**

This WARNING provides safety information for both Electrical AND Fire Hazards.



### **CAUTION!**

CAUTION provides safety information intended to PREVENT DAMAGE to material or equipment.



### **NOTICE:**

NOTICE provides additional information to help complete a specific task or procedure.

### **ATTENTION:**

ATTENTION provides specific regulatory/code requirements that may affect the placement of equipment and /or installation procedures.

# Alpha® XRT-TPPL Extended Runtime Power System

Technical Manual

031-00014-B0-001, Rev. A1

Effective Date: June 2023

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## Disclaimer

Images contained in this manual are for illustrative purposes only. These images may not match your installation.

Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this powering system, please contact Alpha Technologies Services, Inc. or your nearest Alpha® product sales representative.

Alpha shall not be held liable for any damage or injury involving its enclosures, power supplies, generators, batteries or other hardware if used or operated in any manner or subject to any condition not consistent with its intended purpose or is installed or operated in an unapproved manner or improperly maintained.

### Notice of FCC Compliance

**Per FCC 47 CFR 15.21:**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**Per FCC 47 CFR 15.105:**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

## Contact Information

Sales information and customer service in USA

(7AM to 5PM, Pacific Time):

+1 800-322-5742

Complete technical support in USA

(7AM to 5PM, Pacific Time or 24/7 emergency support):

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Website:

[www.alpha.com](http://www.alpha.com)

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# Important Notes About Installation

- The system **MUST** be installed by qualified service personnel.
- Always consult local codes for mounting pad requirements.
- Consult local utility codes for additional cabinet grounding and utility requirements.
- Consult the local gas company for correct meter type and riser location.
- Whenever possible, it is best that the enclosure be installed above flood zones.
- Precast mounting pads may either be purchased from EnerSys® or Alpha® or poured in place. The pad must be capable of holding 3,000 lbs (minimum) per PN-4 FT enclosure. Rebar may be placed in a crosshatch pattern for pad reinforcement, as needed.
- If the pad is to be located in an area with a deep frost line or unstable soil, concrete pylon footings (4" diameter × 4' deep, or 1' deeper than the regional frost line) can be placed below the concrete pad, in front of and below the four mounting features.
- The top of the pad must be above grade to reduce the buildup of debris around the base of the cabinet.
- Adequate space must be allowed for cable TV input/output conduit; plant grounding electrode conductor(s); RF cable entrance via (1) 4", (2) 3" or (3) 2½" rigid conduit sweep(s) with 2' bend radius (minimum); and fiber optic cable entrance (refer to fiber manufacturer's specification for minimum bend radius requirements).
- Prior to pouring concrete, any wire running through the pad must have a thermal expansion jacket (i.e., PVC) to prevent cracking of the concrete during lightning strikes.
- Alpha Technologies Services, Inc. is not responsible for broken welds or other damage to the cabinet caused by improper installation.
- A 25+ year vapor barrier must be used between the concrete pad and the base of the enclosure to further inhibit the ingress of moisture. Alpha Technologies Services, Inc. is not responsible for water damage or moisture damage resulting from improper installation.
- Concrete filled, 6" diameter steel posts (or equivalent) can be placed at the corners of the pad to reduce exposure to accidental traffic damage.
- All dimensions are given in inches.
- For further information regarding this installation, contact Alpha Technologies Services, Inc. or your nearest Alpha® product sales representative.

## Unpacking and Inspection

### To ensure operator safety:

- Enclosures must be installed only by qualified personnel and in accordance with all applicable electrical codes.
- Use eye protection whenever working with batteries.
- Use only PowerSafe® SBS190F or AlphaCell® 210FTX batteries, or Alpha Technologies Services, Inc. approved equivalent.

### Unpacking and Inspection:

Carefully remove the enclosure from the shipping container. Verify that:

- The correct unit was shipped.
- Ordered options have been included. (Refer to packing label details located on wooden pallet. See Fig. 0-2).



### **NOTICE:**

Batteries are shipped separately.

Inspect the contents. If items are damaged or missing, contact Alpha Technologies Services, Inc. (Sales +1 800-322-5742) and the shipping company immediately. Most shipping companies have only a short claim period.



**Fig. 0-1, Enclosure as it Arrives from Alpha**



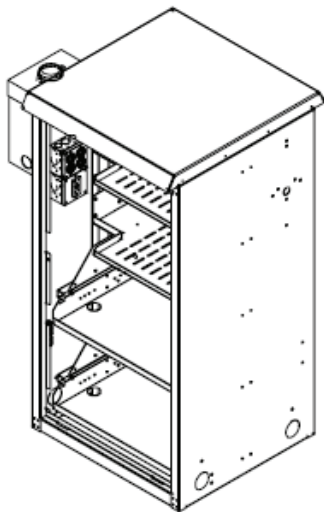
**Fig. 0-2, Packing Label Location**

# 1.0 Introduction

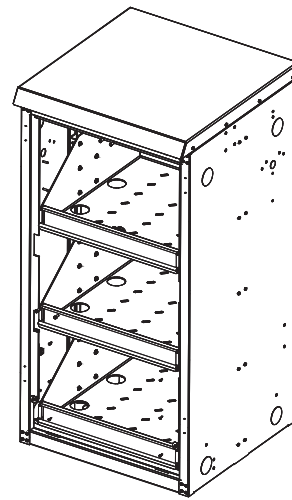
The Alpha® XRT-TPPL extended runtime power system offers extended runtime for XM3.1-HP™ power supply cable TV powering applications and solutions based on power supply loading that can be supported using two, four or six battery string configurations. This guide briefly describes the XM3.1-HP power supply's extended runtime mode (XRT) mode and provides procedures with regard to the installation of the power supply, battery connection and initial start-up. Firmware for this specific system is necessary. Additional XRT-TPPL power systems documentation such as the quick start guide (p/n 031-00014-B1-001) is available at [www.alpha.com](http://www.alpha.com).

Specifications		
Enclosures	PN-4 FT	PN-4 FTB
Dimensions (W × H × D)	26" × 52" × 24"	26" × 52" × 24"
Power Supply Capacity	One power supply (XM3.1-HP XRT) (2kW)	N/A
Battery Capacity	Up to 6 AlphaCell® 210FTX batteries	Up to 12 AlphaCell® 210FTX batteries
Weight	110 - 180 lbs (depending on options)	250 lbs
Material	Aluminum, 0.080 - 0.125"	Aluminum and steel, 0.080 - 0.125"

**Table 1-1, PN-4 FT and FTB Enclosure Specifications**



**Fig. 1-1, PN-4 FT Enclosure**



**Fig. 1-2, PN-4 FTB Enclosure**



## WARNING! ELECTRICAL & FIRE HAZARD

- Failure to install and/or use this equipment as instructed in the system documents can result in a hazard to personnel or damage to the equipment. This system is only serviceable by qualified personnel.
- Maximum site load must not exceed the values in the table below:

Battery Configurations			
Number of PN-4 Battery Enclosures	Battery Type	Quantity	P/S Output Current
1 or 2	PowerSafe® SBS190F TPPL	12	1 - 3 A
	AlphaCell® 210FTX TPPL	12	3.1 - 4 A
2	PowerSafe® SBS190F TPPL	18	4.1 - 5 A
	AlphaCell® 210FTX TPPL	18	5.1 - 6 A

**Table 1-2, Battery Configurations**



## 2.0 Pre-Installation

### 2.1 Site Preparation

Site location and enclosure orientation must conform to local codes and permits. Each site may have unique requirements that need to be met and evaluated on an individual bases

The site must be planned so that the enclosure will receive good air flow. If possible, in areas of extreme heat, it is best to position the enclosure so that it will be shaded from the afternoon sun. In areas of prevailing winds, it is best that the enclosure be located so that the sides of the cabinet face the winds instead of the doors. This will greatly reduce the buildup of sand or snow against the enclosure's air vents.

In areas of potential flooding, the geographical site and concrete pad must be located above the flood plain. Pedestals are available to raise the powernode (PN) enclosures above expected snow and water levels.

The enclosure must be placed where it will be free of obstructions, allowing easy access to the doors for service or equipment access. For ventilation and maintenance, allow a minimum space of 36 inches in the front and 36 inches in the rear, between the enclosure and other solid structures.

Place the enclosure well away from ground level sources of forced water, such as underground sprinkler systems and direct roadway splash.

The concrete pad drawing is provided in this section of this manual contains all of the required mounting details, including electrical service and cable plant entrances.

The vapor barrier material (such as 30 lb. felt, neoprene pond liner, or heavy grade tar paper) must initially extend at least 6" in all directions around the perimeter of the enclosure and be trimmed closer to the enclosure, using the appropriate utility knife or cutting tool.

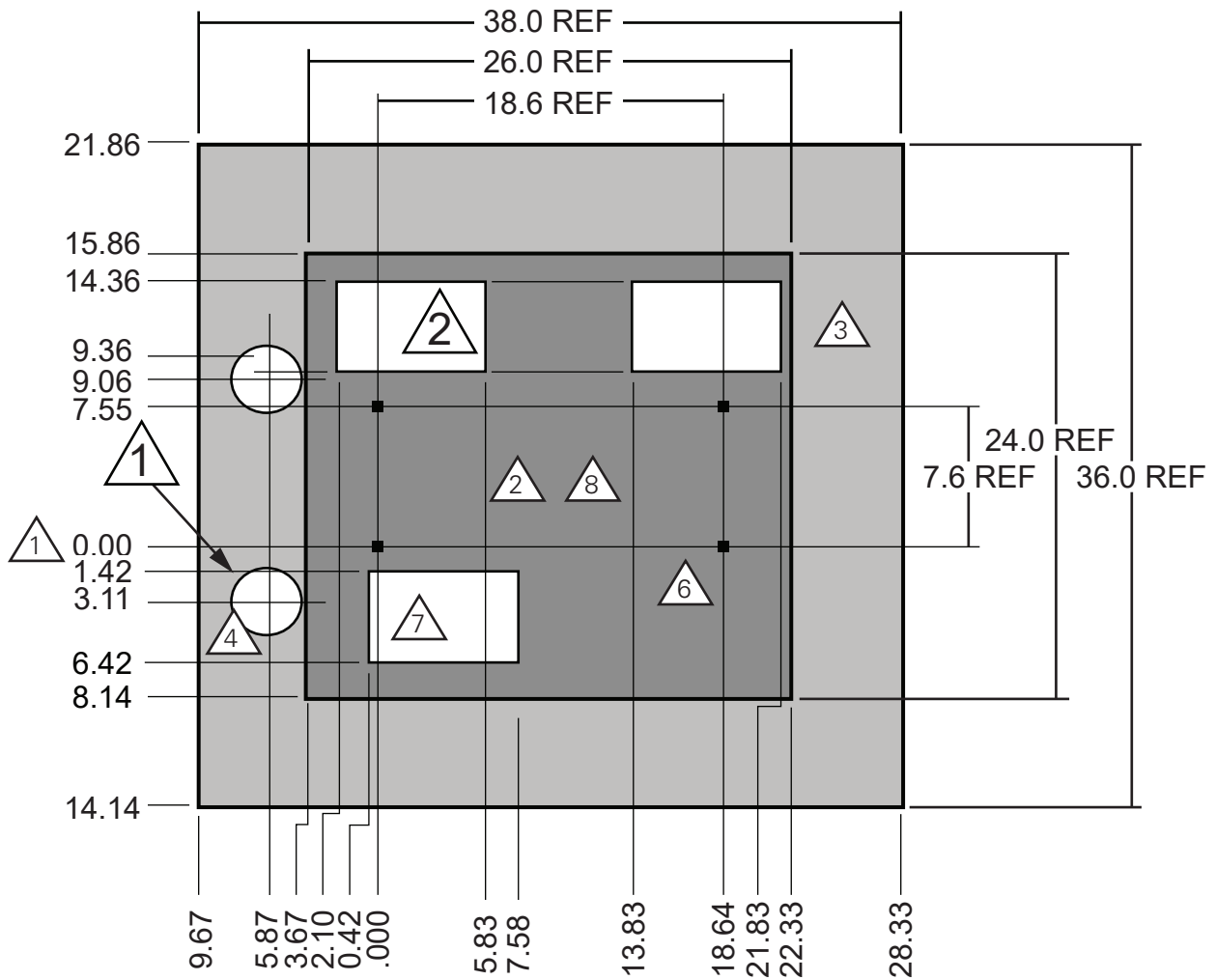


#### **CAUTION!**

**Never transport the unit with batteries installed.** Batteries must ONLY be installed after the unit is transported to the site and secured to the pad. Transporting the unit with batteries installed may cause a short circuit, fire, explosion, and/or damage to the battery pack, enclosure and installed equipment. Damage caused by improper shipping or transporting a unit with batteries installed is not covered under warranty.

## 2.2 Concrete Pad Preparation

Pads can either be poured on site, or precast by Alpha Technologies Services, Inc. Available concrete pad configurations and part numbers can be found in **Section 2.2.1, Pre-Cast Concrete Pads**. Note the dimensions below are in inches.



**Fig. 2-1, Single-Wide Concrete Pad for PN-4 FT or PN-4 FTB Enclosures**

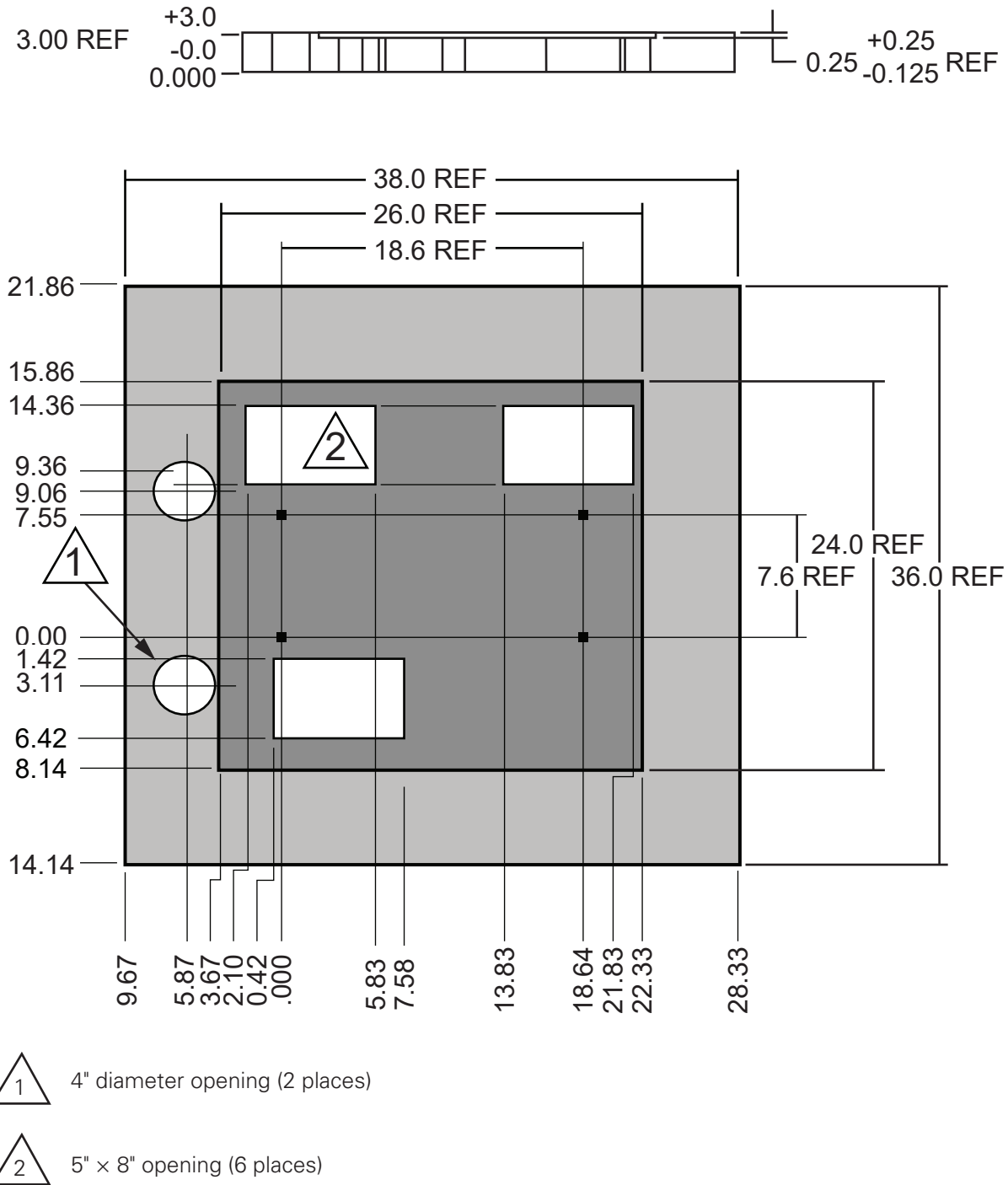
- ① All dimensions shown in inches. Mounting holes and sweeps indexed from this position.
- ② Indicates PN-4 FT pedestal enclosure mating surface.
- ③ Alpha® standard; recommended distance (6" minimum) between edge of pad and cabinet.
- ④ Four inch diameter hole for AC power IN (non-metered installation).
- ⑤ Four inch diameter opening for DC output cable and status monitoring harness.
- ⑥ All mounting hardware must be stainless, galvanized, or better to prevent corrosion.
- ⑦ 5" × 8" rectangular cutout (2 places), open area for all internal connections including: generator power and/or coax cable conduit sweeps.
- ⑧ A 25+ year continuous vapor barrier must be used between the enclosure and the pad to prevent moisture ingress and possible corrosion caused by metal to concrete contact. The vapor barrier material (such as 30 lb felt, neoprene pond liner, or heavy grade tar paper) must be initially extended at least 6" in all directions around the perimeter of the enclosure. After the enclosure is secured to the pad, the material can be cut closer to the enclosure, using the appropriate knife or cutting tool.

### 2.2.1 Precast Concrete Pads

Alpha® offers a precast concrete pad for the powernode (PN) series enclosures. Contact your nearest Alpha product sales representative for additional information. Note the dimensions below are in inches.

**Part Number:**

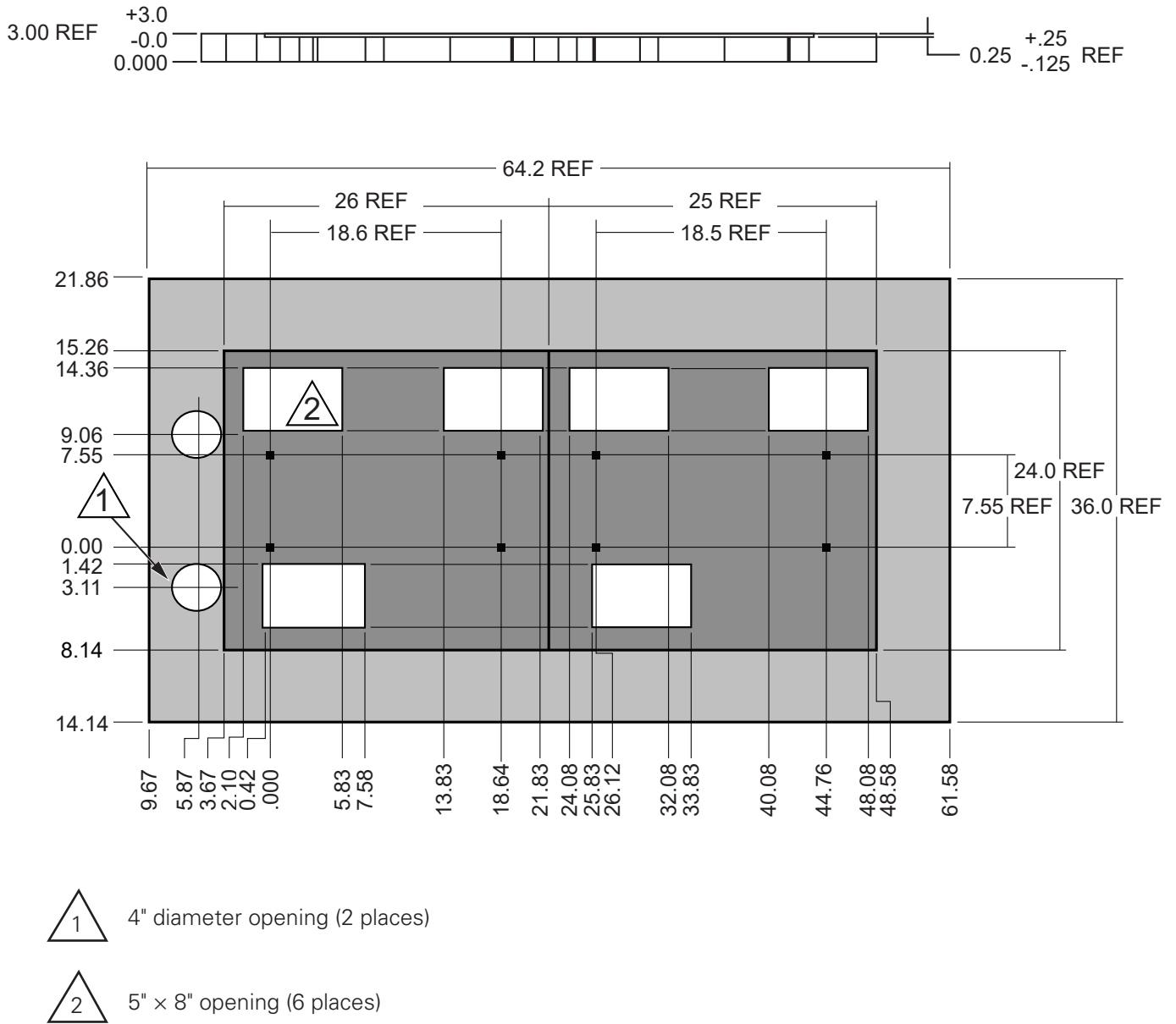
PCO-3: 649-00002-10-001 (Precast pad)



**Fig. 2-2, Single-Wide Pad for PN-4 FT or PN-4 FTB Enclosures**

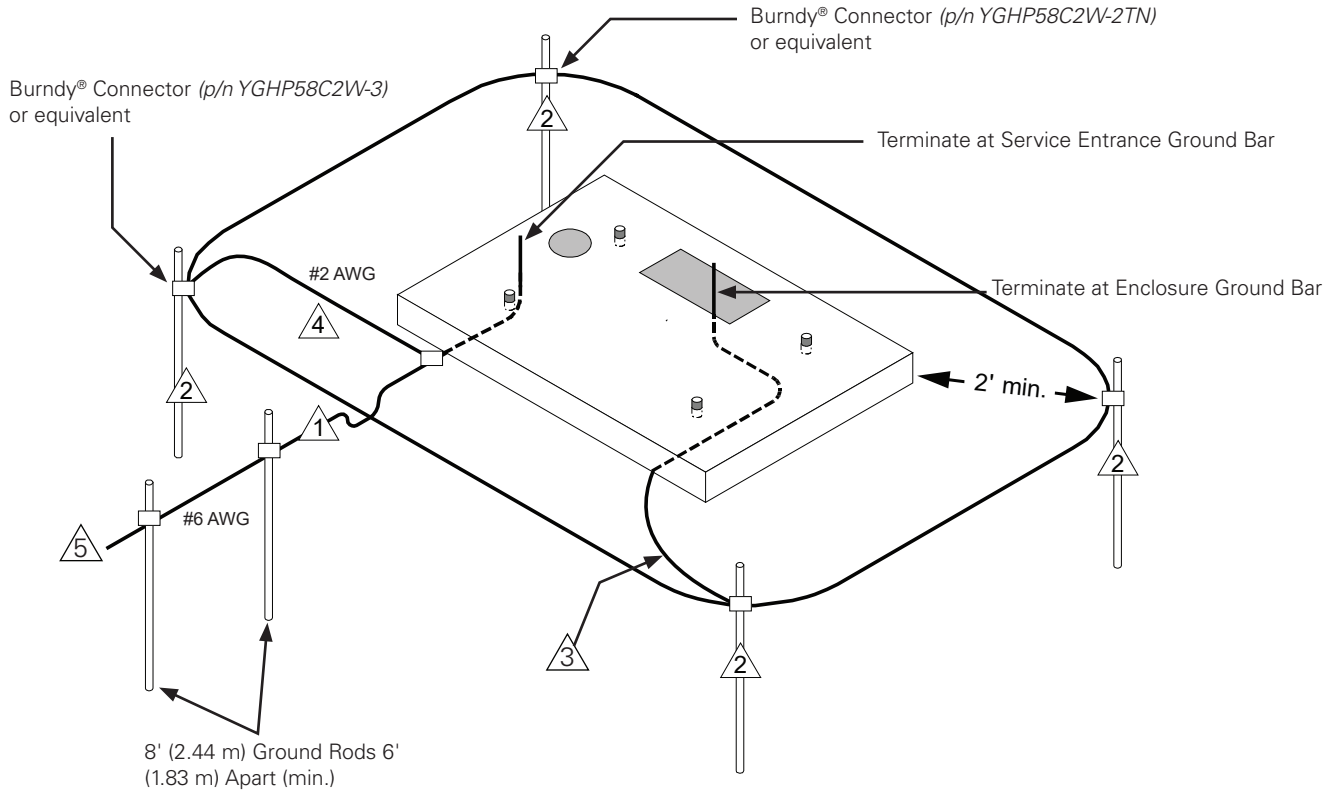
**NOTICE:**

Precast double-wide pads are not available for order. The layout below provides dimensions for double-wide concrete pour in pads.



**Fig. 2-3, Double-Wide Pad for PN-4 FT and PN-4 FTB Enclosures**

## 2.3 Enclosure Grounding



**Fig. 2-4, Suggested Grounding, PN-4 FT/FTB Enclosures**

### Lightning Protection (optional)

- ① 1/2" × 8' copper ground rod, four places, driven about 2 feet (typical) from the corners of the pad.
- ② #2 bare copper wire loop terminated to each ground rod and buried below grade 2 to 12 inches. Corrosion-proof connections (25+ year life-span) and hardware suitable for direct burial MUST be used.
- ③ #2 bare copper wire from loop to enclosure.
- ④ When the electrical supply is a primary service (not a secondary or feeder service), a #2 bare copper wire must bond the lightning protection loop to the grounding electrode conductor where they are closest.

### Service Grounding (required)

- ⑤ #6 bare copper wire from service neutral / ground bar with two ground rods located 6' apart.

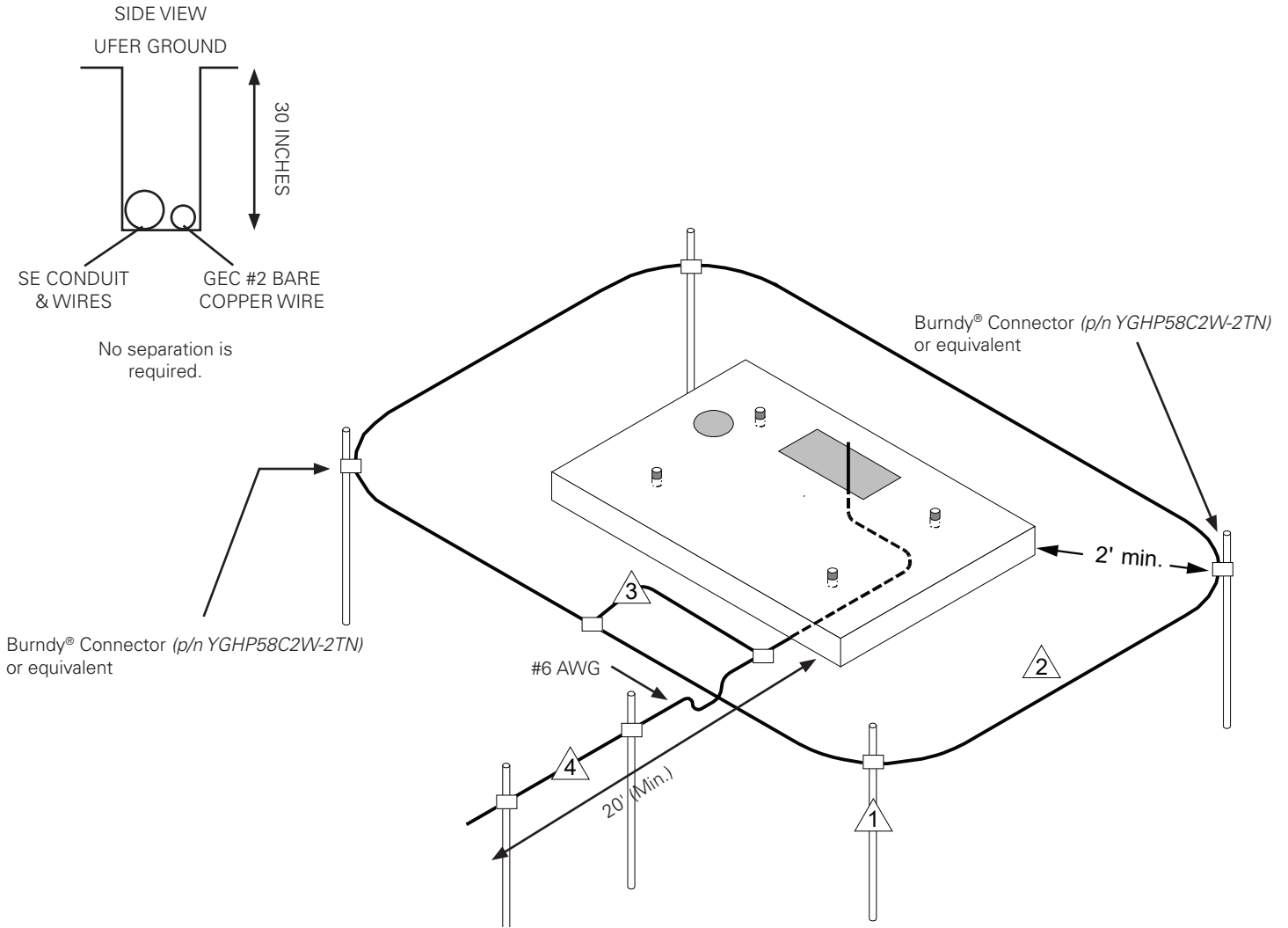


Fig. 2-5, Alternate Grounding, PN-4 FT/FTB Enclosures

**Lightning Protection (optional)**

- 1 1/2" × 8' copper ground rod, four places, driven about 2 feet (typical) from the corners of the pad.
- 2 #2 bare copper wire loop terminated to each ground rod and buried below grade 2 to 12 inches. Corrosion-proof connections (25+ year life-span) and hardware suitable for direct burial MUST be used.
- 3 When the electrical supply is a primary service (not a secondary or feeder service), a #2 bare copper wire must bond the lightning protection loop to the grounding electrode conductor where they are closest.

**Service Grounding (required)**

- 4 #6 bare copper wire from service neutral / ground bar down 30 inches and out 20 feet beyond the pad edge. This is often called a UFER ground or ground ring in the National Electrical Code® (NEC®).

## 3.0 Installation

### 3.1 Transportation and Lifting

The PN-4 cabinet as shipped weighs approximately 100-250 lbs. A safe means of transportation to the site and a safe procedure for unloading the enclosure is necessary. Do not transport or lift with a device that may not be able to bear the unit's weight, and do not place the unit upon a surface that will not be able to fully support it. Optional lifting ears are available for the PN-4 FTB enclosure (see **Section 6.2, PN-4 FT/FTB Enclosure Spare Part List**).

✓ **NOTICE:**

Enclosure must always remain in the upright position during the shipping, storage and installation process. Damage may result from enclosure being shipped, stored on its side or stacked.

✓ **NOTICE:**

Electronic modules, batteries or other components must not be installed until the enclosure is securely set in place at its permanent location.

### 3.2 Enclosure Mounting Procedure

**ATTENTION:**

Seismic rated anchors **MUST** be used when securing the enclosure to the pad, and there must be at least 3 feet between the co-located PN-4 FT and PN-4 FTB cabinets and other structures. Alpha® recommends using seismic rated anchors such as the HILTI® HSL4/HSL4-G (or equivalent). Contact your Alpha product sales representative for more information.

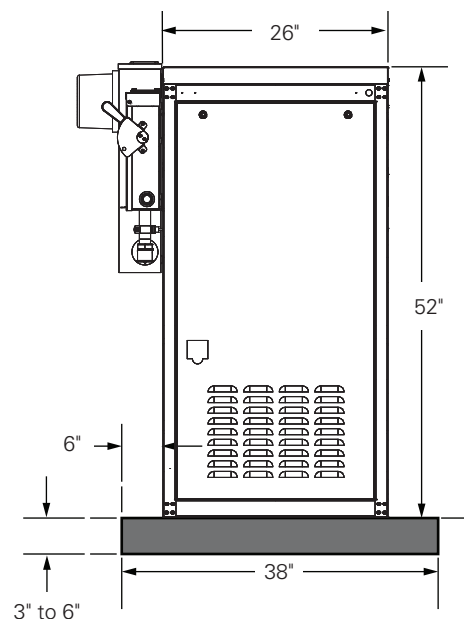
The enclosure bolts directly to the concrete pad. Mounting holes are provided in the base of the internal enclosure rack to accommodate the pad's 3/8" stainless or galvanized anchor bolts. If installing flat security bars, see **Section 5.1, Flat Security Bars**.

1. Place vapor barrier material on pad and make cutouts for anchoring hardware and other openings as necessary. A 25+ year vapor barrier **MUST** be used between the concrete and enclosure base to inhibit moisture ingress and to prevent corrosion caused by concrete-to-metal contact.
2. With no less than two field personnel lifting the enclosure, position it above the concrete pad and slowly lower it into position over the pad's 3/8" anchor bolts.
3. Secure the enclosure using stainless, galvanized (or better) flat washers, lock washers and 3/8" nuts at each mounting bolt.

✓ **NOTICE:**

Enclosures must be mounted flush with a smooth surface. If the concrete pad is uneven or has bumps, cracks or other imperfections, the installer is responsible for correcting these defects prior to installing the enclosure.

4. Install electronic modules and batteries at this time.




**Fig. 3-1, PN-4 FT Enclosure Mounted to Prepared Pad**


### 3.3 Utility Powering


The XM3.1-HP™ power supplies are powered by either 120VAC or 240VAC (depending upon the model), attached to an external service entrance. The size of the service conductors must be based upon the actual size of the utility service and be in accordance with applicable electrical code requirements.

The utility conduit may be placed in one of two locations, depending upon the utility service entrance requirements. Note the optional conduit location for use with meter base and the standard location for entry directly to the load center.

Proper grounding is critical. The enclosure **MUST** have a hard-wired ground to the service entrance. A qualified electrician will need to verify that grounding is in compliance with applicable electrical codes. (Refer to **Section 2.3, Enclosure Grounding.**)

 **NOTICE:**  
All applicable codes must be adhered to when installing a system, pouring concrete, or placing a preformed pad. These codes supersede any procedures outlined in this document.

 **NOTICE:**  
All mounting hardware must be *stainless* or *galvanized*, depending on local environmental conditions. Use of improper hardware may cause corrosion, which is not covered under the warranty.

 **NOTICE:**  
Soil conditions vary and may affect the integrity of the pad. Alpha Technologies Services, Inc. recommends that proper steps be taken to ensure that the soil supporting the pad is stable. Improper installation of the pad may cause uneven settling or cracking, which is not covered under warranty.

Both standard and Electric Utility Service Equipment Requirements Committee (EUSERC) style meter bases are available for some configurations as illustrated in the following figures. Consult Alpha Technologies Services, Inc. or your local representative regarding compatibility with your specific application.

#### **WARNING! ELECTRICAL HAZARD**

The following utility powering procedures must be performed only by qualified service personnel and in compliance with local electrical codes.

Verify electrical codes prior to installation. Codes may vary and contain specific conduit and wire sizes for connection to the service entrance.

Connection to utility power must be approved by the local utility before installing the power supply.

The enclosure is equipped with a Square D™, rainproof rated Suitable for Use for Service Entrance (SUSE). The service entrance is equipped with a circuit breaker for a 120/240VAC, split phase, 3-wire w/GND source.

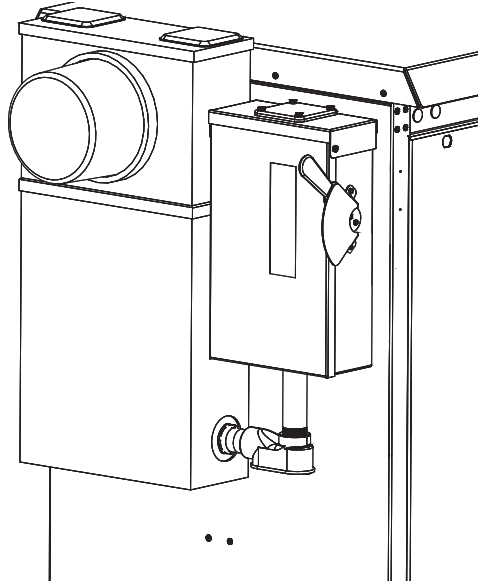
#### **Materials Required:**

- 1" diameter conduit (or larger) - PVC or galvanized steel (threaded)
- #6 AWG - Red / stranded insulated wire
- #6 AWG - Black / stranded insulated wire
- #6 AWG - White / stranded insulated wire
- #2 AWG or larger - stranded copper ground wire



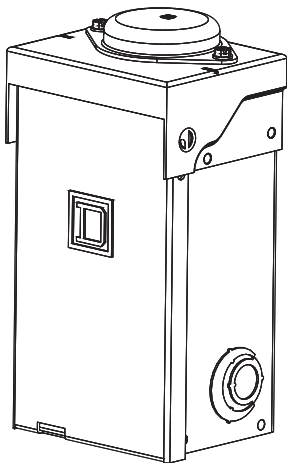
### 3.3.1 Service Disconnects

The PN-4 FT enclosure is equipped with a fused safety switch disconnect box (FBX-60A), which is for applications with high ampere interrupting capacity (AIC) rating requirements.



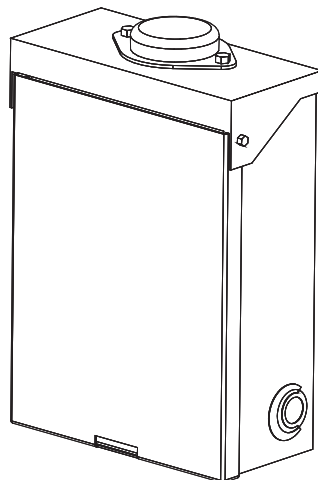
**Fig. 3-2, FBX-60A on PN-4 FT Enclosure**

Three other service disconnects may be available for future applications.



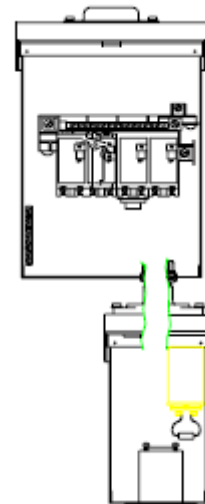
**Fig. 3-3, BBX 70A (BBX-F12)**

Square-D, 2-position  
For single power supply  
applications.



**Fig. 3-4, BBX 100A (BBX-F18)**

Square-D, 8-position  
For multiple power supply  
applications.

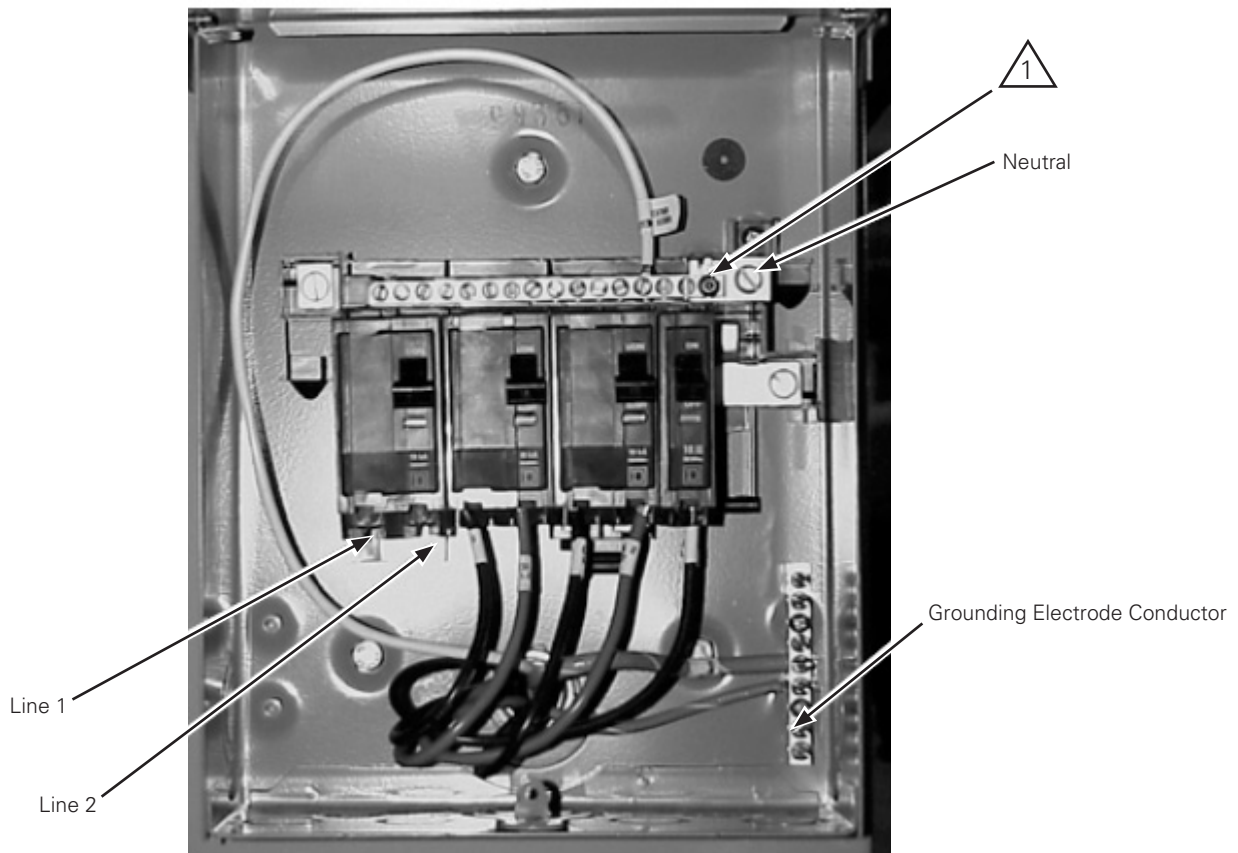


**Fig. 3-5, MTS (Showing 100A  
and 60A boxes)**


For applications requiring a  
protected AC generator.

### 3.3.2 Connection Procedure for the BBX-100A-8P0S Service Disconnect

1. Locate the service entrance panel on the enclosure (exterior). Remove the cover to access the circuit breaker assembly. If this service panel is to be used as the primary service entrance, neutral must be bonded to ground by installing the green ground screw (provided) in the hole in the neutral bus.
2. Remove the knockout located at the base of the service entrance to accept the conduit.
3. Install the conduit nipple into the service entrance via the knockout and secure with the appropriate threaded conduit locknut.
4. Locate the two screw terminals (L1 and L2) on the bottom of the input circuit breaker.
5. Connect one of the incoming black #6 AWG wires to L1 (left terminal). Connect the remaining black (or red) #6 AWG wire to L2 (right terminal). **NOTE:** If the wire at L2 is black, mark it with red tape (or label).
6. Connect the #6 AWG white wire to the neutral (N) bus lug located to the top right of the circuit breaker assembly.
7. Connect the #6 bare solid or stranded for grounding electrode conductor (Earth ground) to the ground and neutral bus located to the right side of the circuit breaker assembly.
8. Notify the electrical inspector to approve the service entrance wiring. Once approved, contact the local power utility for electrical service.



**Fig. 3-6, BBX-100A-8P0S Service Disconnect**

 Bond made by bonding screw only if no other service panel is used. (Must be installed on site only if this is the primary service entrance.)

### 3.3.3 Connection Procedure for the BBX-70A Service Disconnect

1. Locate the service entrance panel on the enclosure (exterior). Remove the cover to access the circuit breaker assembly. If this service panel is to be used as the primary service entrance, neutral must be bonded to ground by installing the green ground screw (provided) in the hole in the neutral bus.
2. Remove the knockout located at the base of the service entrance to accept the conduit.
3. Install the conduit nipple into the service entrance via the knockout and secure with the appropriate threaded conduit locknut.
4. Locate the two screw terminals (L1 and L2) on the top of the input circuit breaker.
5. Connect one of the incoming black #6 AWG wires to L1 (left terminal). Connect the remaining black (or red) #6 AWG wire to L2 (right terminal). **NOTE:** If the wire at L2 is black, mark it with red tape (or label).
6. Connect the #6 AWG white wire to the neutral (N) bus lug located to the top right of the circuit breaker assembly.
7. Connect the #6 bare solid or stranded for grounding electrode conductor (Earth ground) to the ground and neutral bus located to the right side of the circuit breaker assembly.
8. Notify the electrical inspector to approve the service entrance wiring. Once approved, contact the local power utility for electrical service.

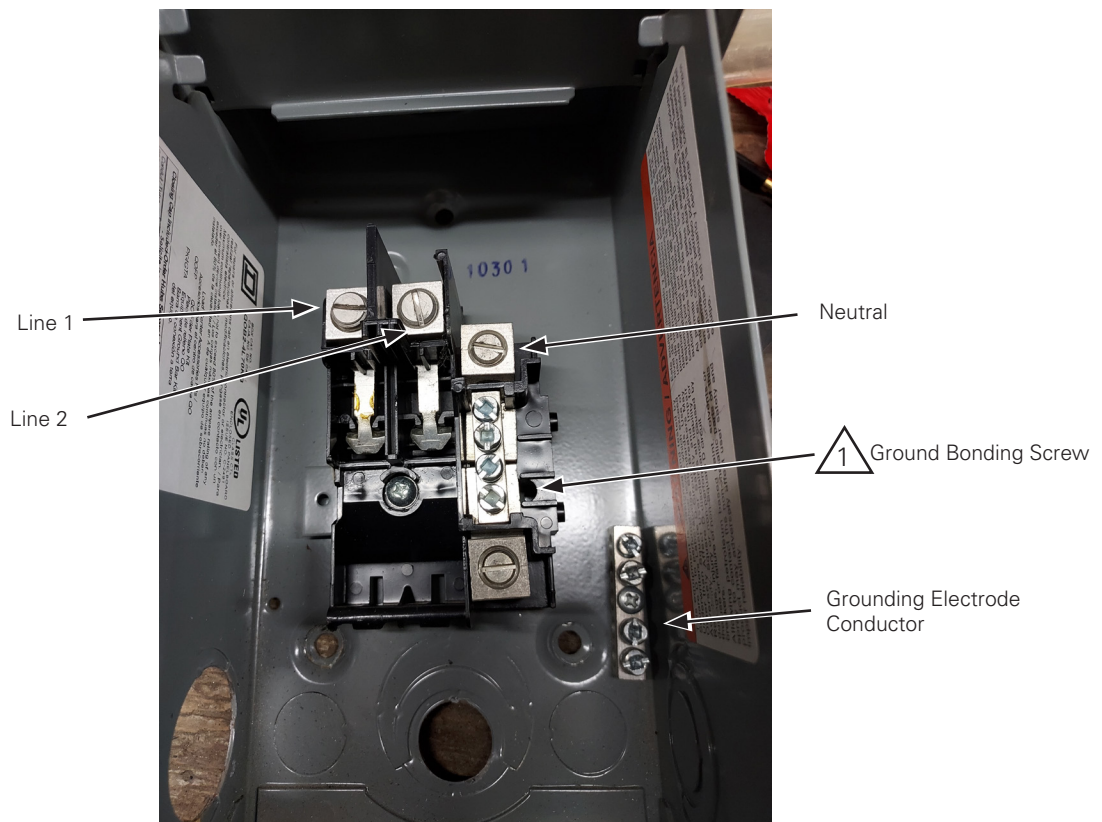



Fig. 3-7, BBX-70A Service Disconnect

 Bond made by bonding screw only if no other service panel is used. (Must be installed on site only if this is the primary service entrance.)

### 3.3.4 Sample Input Power Panels

For more information on available models of the Input Power Panel, refer to **Section 6.1, Part Number Series Options**.

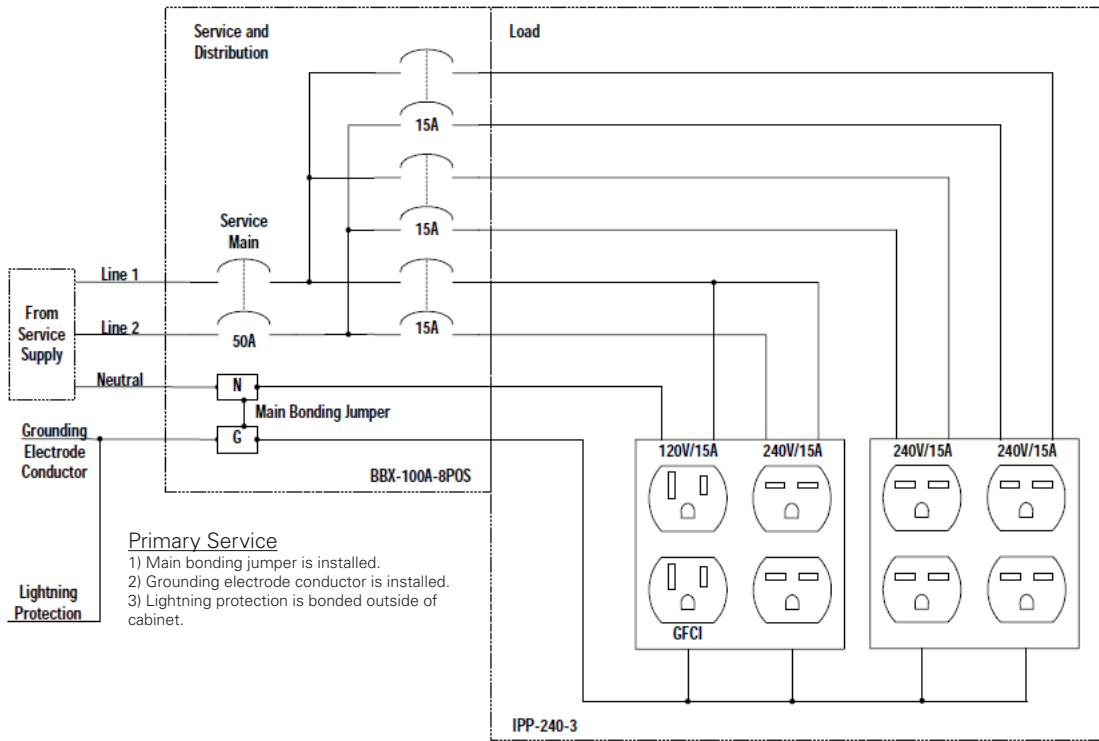


Fig. 3-8, Schematic: Primary Service BBX-100A-8POS with IPP-240-3

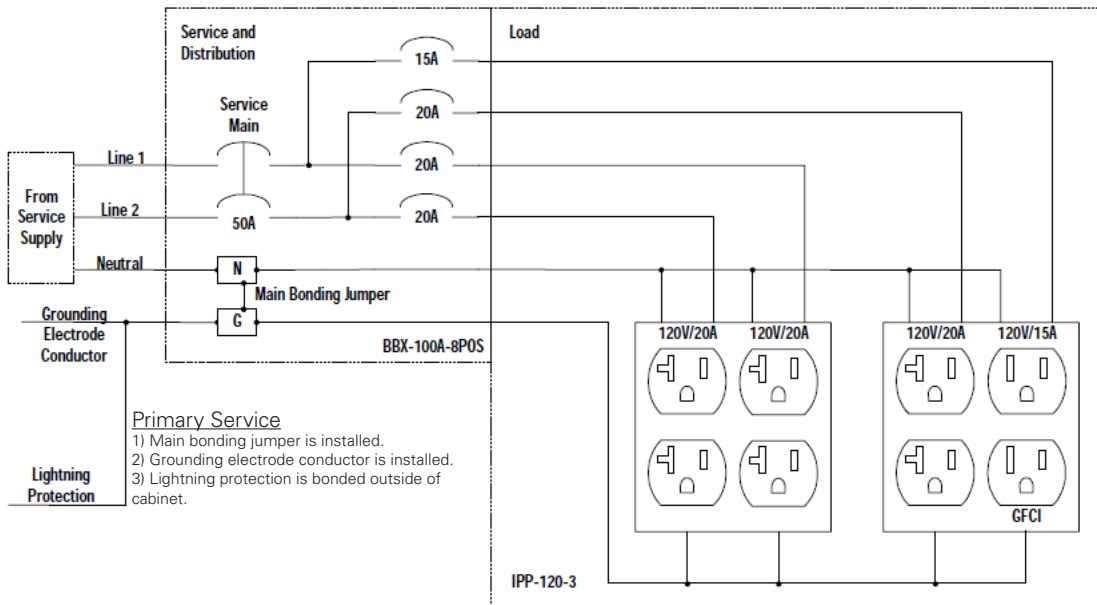
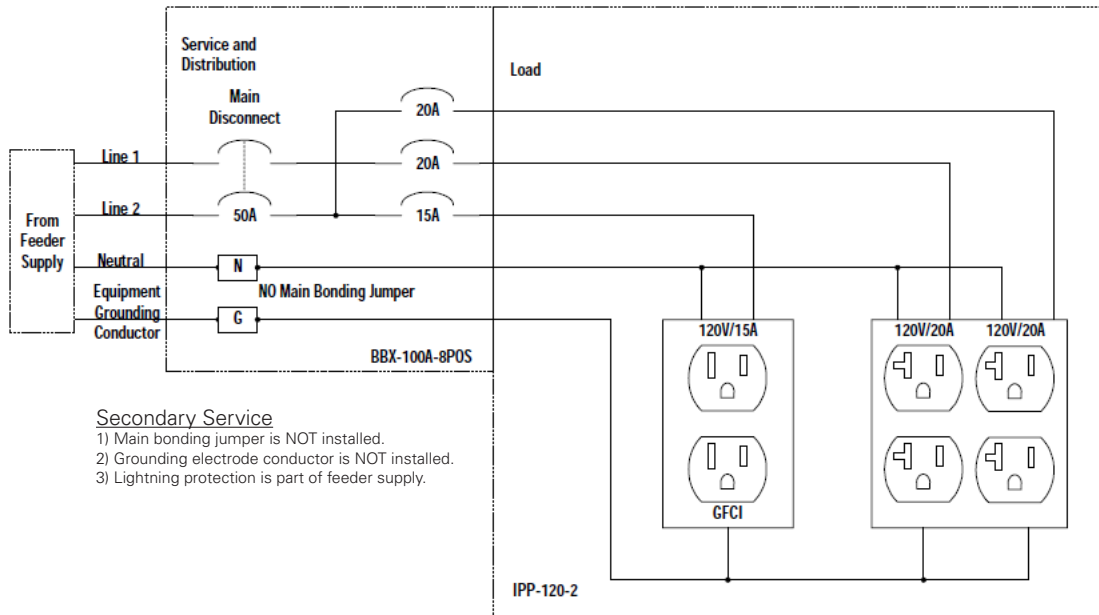
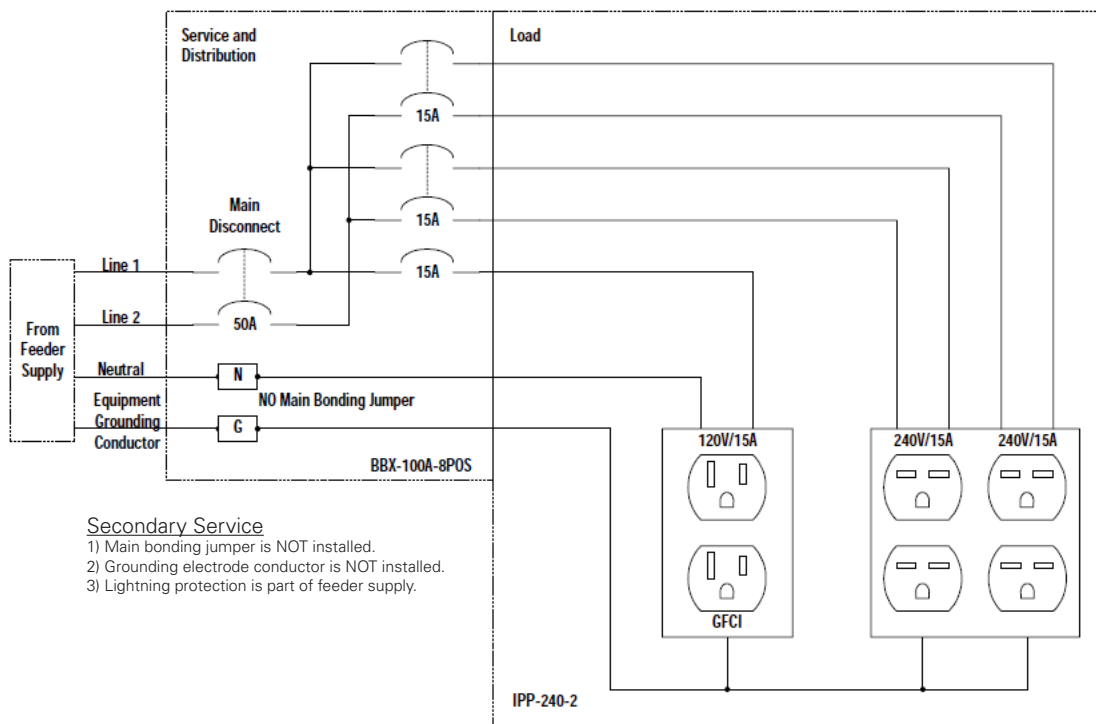


Fig. 3-9, Schematic: Primary Service BBX-100A-8POS with IPP-120-3



**Fig. 3-10, Schematic: Secondary Service BBX-100A-8P0S with IPP-120-2**



**Fig. 3-11, Schematic: Secondary Service BBX-100A-8P0S with IPP-240-2**

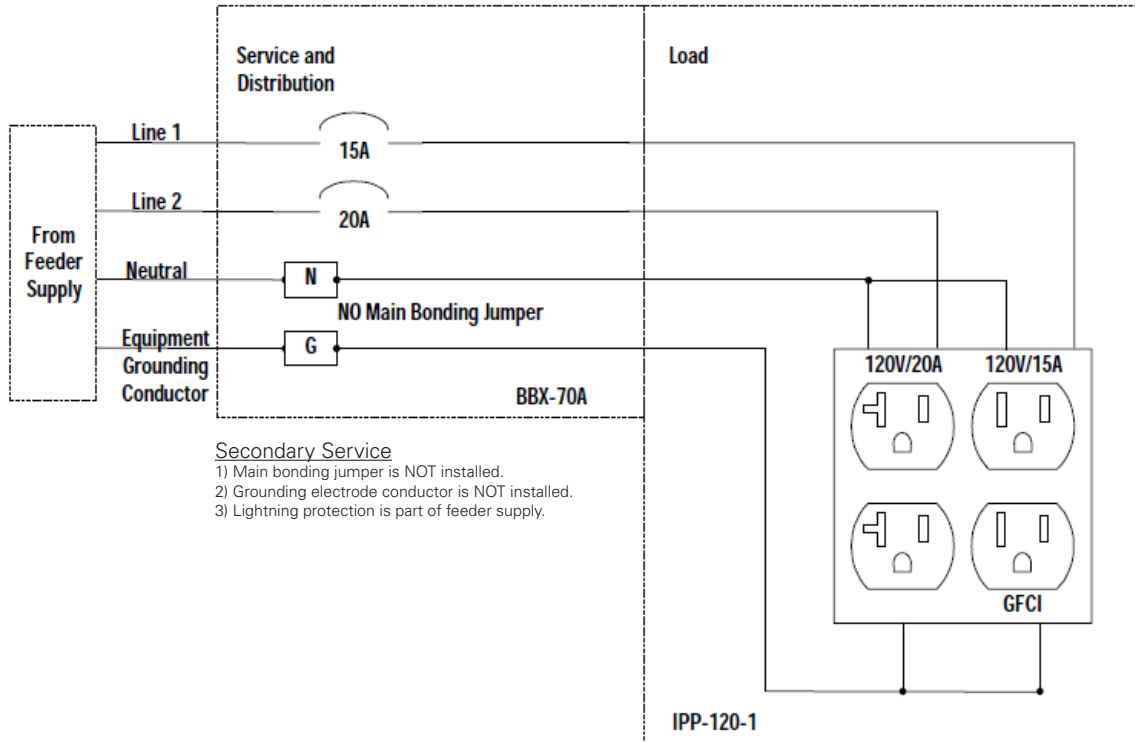


Fig. 3-12, Schematic: Secondary Service BBX-70A with IPP-120-1

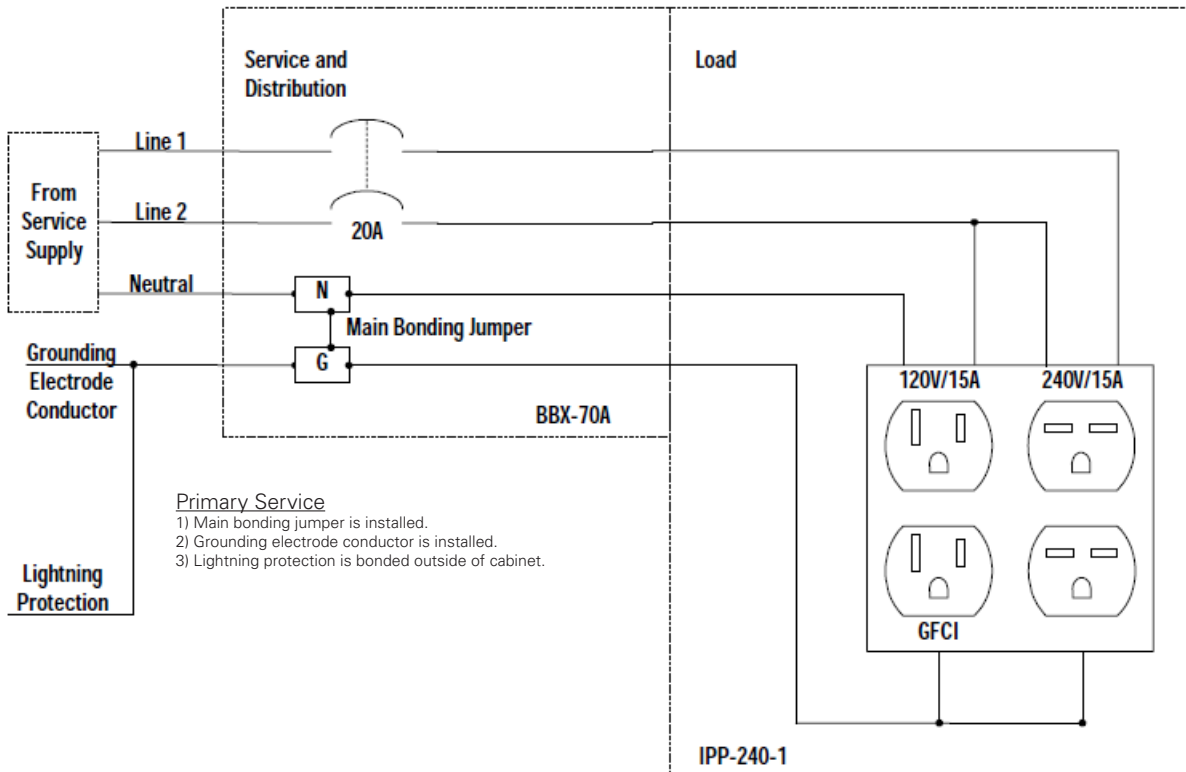


Fig. 3-13, Schematic: Primary Service BBX-70A with IPP-240-1

## 3.4 Coaxial Cable to Service Power Inserter (SPI) Installation

In most cases, the SPI will already be installed in the cabinet. If it is, skip to **Section 3.4.2, Conduit Placement**. If it is not, refer to Section 3.4.1, SPI to Ground Bar Connection Procedure. For further detailed installation instructions for an SPI unit, refer to the SPI-20, SPI-25 & SPI-RF Installation Instructions (*Alpha p/n 745-997-C0-001*) on [www.alpha.com](http://www.alpha.com).

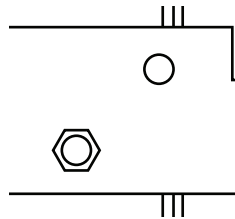
### 3.4.1 SPI to Ground Bar Connection Procedure

**Tools List:**

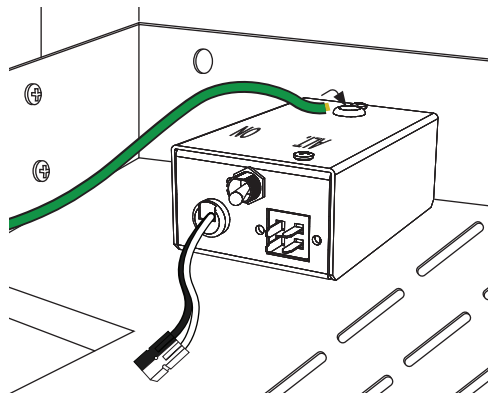
- 1" Socket (3/8" drive)
- 3/8" Ratchet
- #2 Phillips Screwdriver
- Zip Tie Gun

**Procedure:**

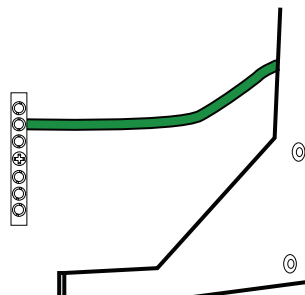
1. Install SPI by tightening the attached coaxial connector to the equipment tray.
2. Secure SPI ground wire to the SPI with attached screw, and connect to enclosure ground bar.
3. Terminate stripped end of wire at enclosure ground bar.



**Fig. 3-14, Connector Fitting in Rear of Equipment Tray**



**Fig. 3-15, Location of SPI in Equipment Tray**



**Fig. 3-16, SPI Ground Wire Connected to Enclosure Ground Bar**

### 3.4.2 Conduit Placement

Conduit location is in the back of the enclosure, on the right side. (Location is specified on concrete pad.)

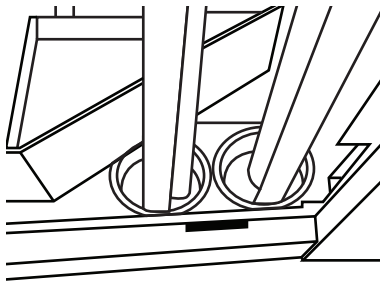


Fig. 3-17, Conduit Location

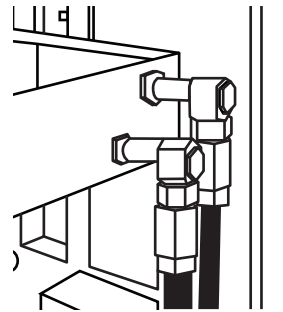


Fig. 3-18, Coaxial Connectors

## 3.5 Battery Installation

### 3.5.1 Battery Safety Notes



#### **WARNING! ELECTRICAL HAZARD**

Battery systems represent a risk of electrical shock and high short circuit currents. The following precautions must be observed when maintaining batteries:

- Remove all personal metal objects (watches, rings, etc.)
- Use insulated tools.
- Wear eye protection and rubber gloves.
- Observe circuit polarities.
- Do not make or break live circuits.
- Do not lay metal tools and hardware on top of the batteries.

The battery is enclosed in cabinets with limited access. Again, extreme caution must be exercised when maintaining and collecting data on the battery system.



#### **WARNING! CHEMICAL HAZARD**

- Any gelled or liquid emission from a battery is electrolyte, and contains dilute sulfuric acid which is harmful to the skin and eyes; is electrically conductive; and is corrosive.
- If electrolyte contacts the skin, wash immediately and thoroughly with water. If electrolyte enters the eyes, wash thoroughly for 10 minutes with clean water or a special neutralizing eye wash solution and seek immediate medical attention.
- Neutralize any spilled electrolyte with the special solutions contained in a "spill kit" or with a solution of 1 lb. sodium bicarbonate to 1 gallon of water.

#### **ATTENTION: DISPOSAL**

Lead acid batteries are to be recycled. Batteries contain lead and dilute sulfuric acid. Dispose of in accordance with federal, state, and local regulations. Do not dispose of in a landfill, lake or other unauthorized location.





**WARNING! FIRE, EXPLOSION AND HEAT HAZARD**

- Lead acid batteries can contain an explosive mixture of hydrogen gas which can vent under overcharging conditions.
- Do not smoke or introduce sparks in the vicinity of the battery.
- Do not charge batteries in a sealed container. The individual batteries must have ½" of space between them to allow for convection cooling. If contained, assure the container or cabinet and room have adequate ventilation to prevent an accumulation of potentially vented gas.

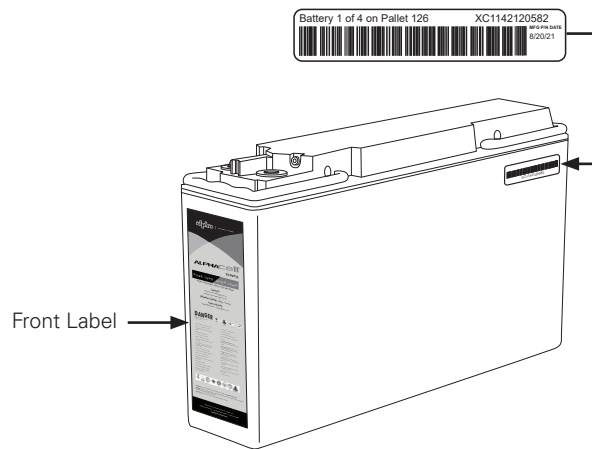


**WARNING! CALIFORNIA PROPOSITION 65**

This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

**3.5.2 Battery Identification**

The battery serial numbers are located in two places on the battery case. The first is on the front of the battery. The manufacturing date is also located on this label below the serial number. The second is on the positive terminal side towards the rear of the battery. If batteries other than those installed by Alpha® are used, consult the battery manufacturers' documentation for date code type and placement.



**Fig. 3-19, AlphaCell® 210 FTX Battery Date Code**

**3.5.3 Battery Terminal Connections**

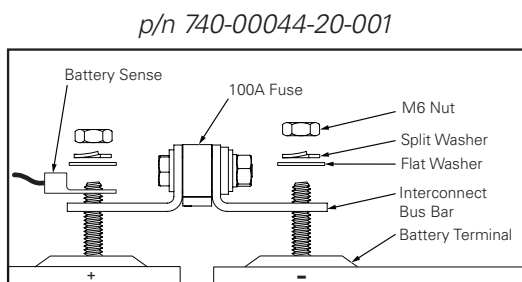
The accompanying drawings are for illustrative purposes only. Various types of batteries with different mounting styles and hardware may be shipped with the system. ALWAYS refer to the battery manufacturer's specifications for correct mounting hardware and torque requirements. During maintenance procedures, refer to the manufacturer's specifications for the maintenance torque requirements.

Mounting hardware requirements may vary with battery manufacturers. Use only the hardware recommended by your particular battery manufacturer.



**NOTICE:**

Use a corrosion inhibitor (such as NO-OX® electrical contact grease) on battery terminals.



**Fig. 3-20, In-Line Fuse Link Mounting**



**Fig. 3-21, In-Line Fuse Cable**

### 3.5.4 Battery Installation Procedure

#### **WARNING! ELECTRICAL HAZARD**

Installer must wear the correct PPE when installing batteries. Failure to do so may result in injury or death.

**Required Tools:**

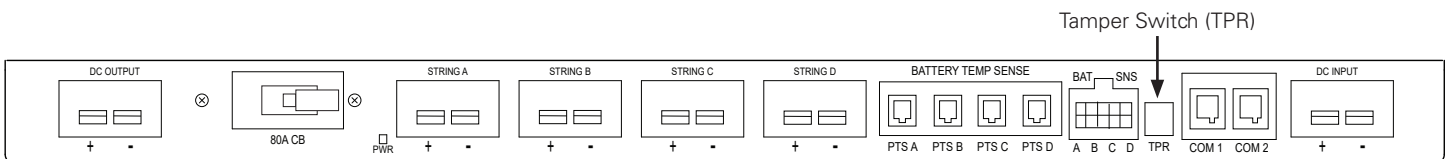
- Insulated tools (size and setting based on battery manufacturer torque specification)
- Safety glasses or face shield
- Rubber gloves
- Chest shield
- Box or bag for storing cables and hardware while out in the field
- True RMS voltmeter

 **NOTICE:**

Battery string locations for an 18-battery configuration are noted in Fig. 3-29 and Fig. 3-30. Each string uses three batteries. String D consists of the fourth battery on each row in the PN-4 FTB enclosure. Review hardware stack-up and wiring diagram to see the recommended layout and set up, then proceed with the installation procedure below.

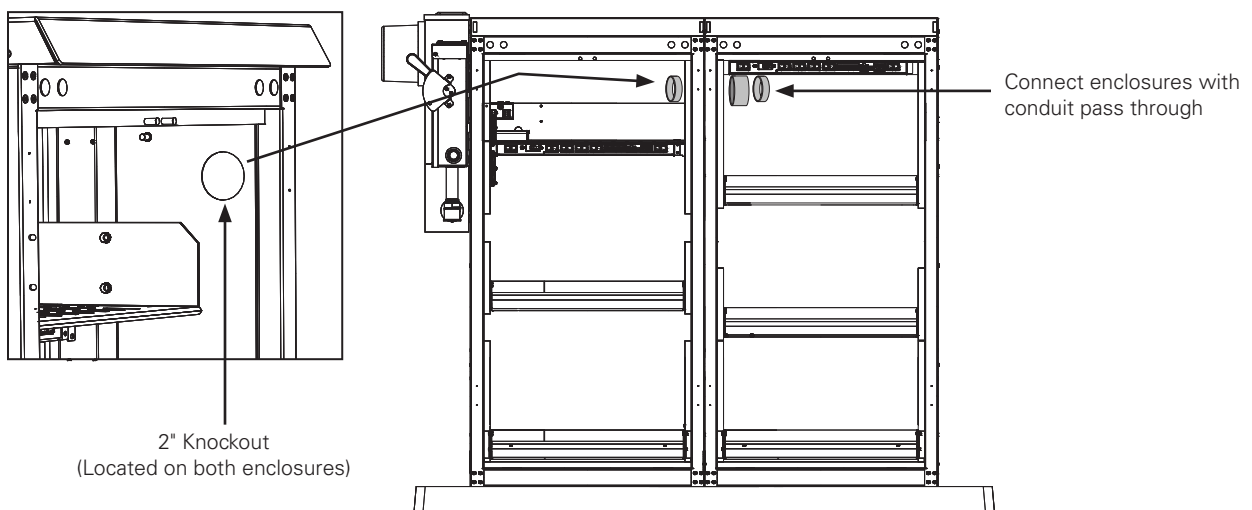
**Procedure:**

1. Before installing the batteries, ensure the enclosure(s) are set and bolted to pad. Remove bottom battery tray if necessary.
2. Ensure enclosure grounding is in place.
3. Ensure Battery Interface Unit (BIU) is installed (see **Section 5.2, Battery Interface Unit (BIU)** for mounting locations) and verify the tamper switch (TPR) is plugged in.



**Fig. 3-22, BIU Tamper Switch Location**

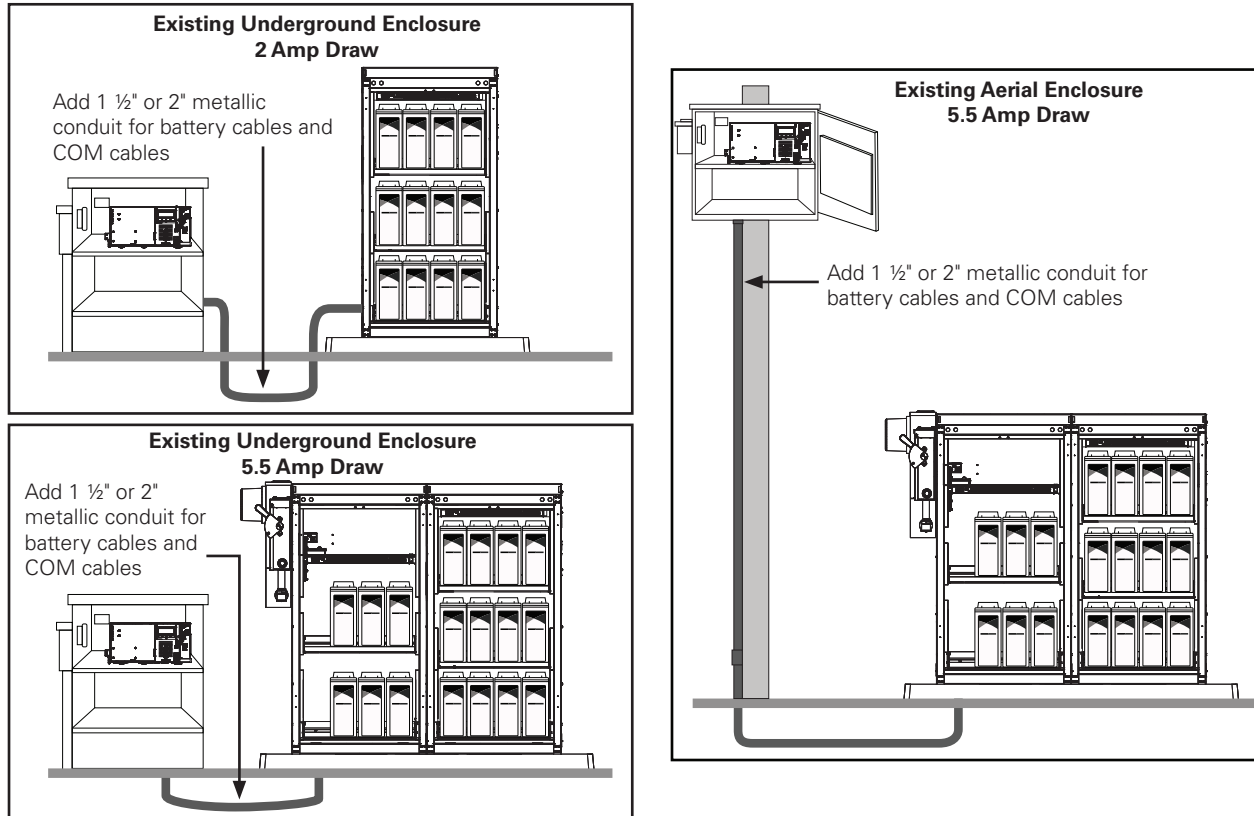
4. Install conduit pass-through if side by side PN-4 enclosures are used. Use 2" conduit knockout on the side top front of enclosure.



**Fig. 3-23, Conduit Pass Through**

### 3.0 Installation, continued

- If integrating an existing ground mounted Universal Pedestal Enclosure (UPE) or Pole Westinghouse® Enclosure (PWE), install metallic conduit run from the PN-4 FT to existing enclosure (see figure below). Remove PN-4 bottom battery tray if necessary. Use 2" conduit knockout on front side bottom of PN-4 or 2" knockout in bottom under battery tray to go under the pad. Metallic conduit must be used above ground to prevent radiated emissions. Metallic conduit must be ground bonded.
- If integrating a pole mounted enclosure, remove existing PWE batteries and slide trays so conduit can enter the bottom of the enclosure. BIU Integration wires should be long enough to route to XM3.1-HP™ power supply battery and RS485 COM connectors. Excess wire can be looped in the bottom of the PWE.



**Fig. 3-24, Routing Conduit Underground Examples**

- Install grouped BIU extension, #6 AWG battery and COM cables in conduit run. Remove 75A Anderson™ connector housing on the end to be pulled through the conduit. Use appropriate wire pulling grip techniques to protect Anderson terminals and RS485 COM connector. When in place, BIU extension wires must be long enough to route from the XM3.1-HP power supply to BIU1 connectors after batteries are installed. Re-install 75A Anderson connector housing on battery cables.
- Ensure all PN-4 battery trays are installed correctly.
- Verify XM3.1-HP power supply battery breaker and BIU circuit breakers are off.
- With battery covers on, place batteries on shelves using proper lifting procedure. This is a two-person operation. When installing AlphaCell® 210FTX batteries, leave the rear handle flipped forward to aid in future removal. Use approximately 1/2" spacing between batteries. In the PN-4 FTB enclosure, leave more space (approximately 3/4") between last battery in the first three string and the D string battery. This will help with wiring the D string batteries.
- Remove all battery covers.



#### **NOTICE:**

When installing PowerSafe® SBS190F batteries, leave approximately 1/2" of space behind the batteries on the shelf. Always install batteries with the rear door removed to avoid slamming the batteries into the rear door and causing damage.

### 3.0 Installation, continued

12. Remove all hardware from battery terminals and store in a bag or convenient place.
13. Install wiring harness kit (876-00059-20 BAT,INTG,36VDC,2STRG,PN4FT,W/BIU,PTS,BS) in the PN-4 FT enclosure with two battery trays. (See Fig. 3-29 and *p/n 031-00014-08* System Wire Diagram available on Alpha's website for reference.)
  - A. Start with A string battery cables on the bottom tray of the PN-4 FT enclosure. Route the black wire through the hole in left side of the top tray as seen in Fig. 3-26. Route the red wire along the right side of the enclosure.
  - B. Install B string battery cables on middle tray.
  - C. Install intercell fuses on batteries 2A and 3A, and 2B and 3B. (On AlphaCell® 210FTX batteries the fuse can be offset to the back. On PowerSafe® SBS190F batteries the fuse must be offset to the front.)
  - D. Install interconnect bus bars on batteries 1A and 2A, and 1B and 2B.
  - E. Install Precision Temperature Sensors (PTS). Plug in to appropriate BIU1 port (ex: PTS A cable into the PTS A BIU1 port) in turn so they don't get mixed up. Route wires down the right side. Use wire label A & B provided by installer to mark both ends of PTS.  
**Note:** The PTS are 4ft long.
  - F. Install battery voltage sense wires. Route wires down the right side.
  - G. Torque battery terminals to battery manufacturer's specifications.
  - H. Check battery cable connectors for correct polarity and voltage. Verify connector color, orientation and wire labels, then fully insert into BIU1.  
**Note:** The BIU will power up as soon as the batteries are connected, regardless of circuit breaker position.
  - I. Before installing covers, use a corrosion inhibitor such as NO-OX® electrical contact grease on battery terminals. Install battery covers. **Note:** PowerSafe® SBS190F battery covers must be trimmed with side cutters to fit around the intercell fuses. See Fig. 3-27. Trim side needed.
14. Plug in battery voltage sense connector into BIU1.
15. Connect BIU1 extension cable from BIU DC Output to XM3.1-HP™ power supply battery input.
16. Connect RS485 COM cable from BIU1 COM1 to XM3.1-HP power supply BIU connection.

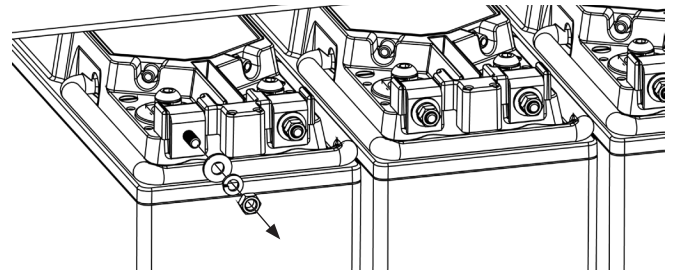


Fig. 3-25, Removing Battery Hardware

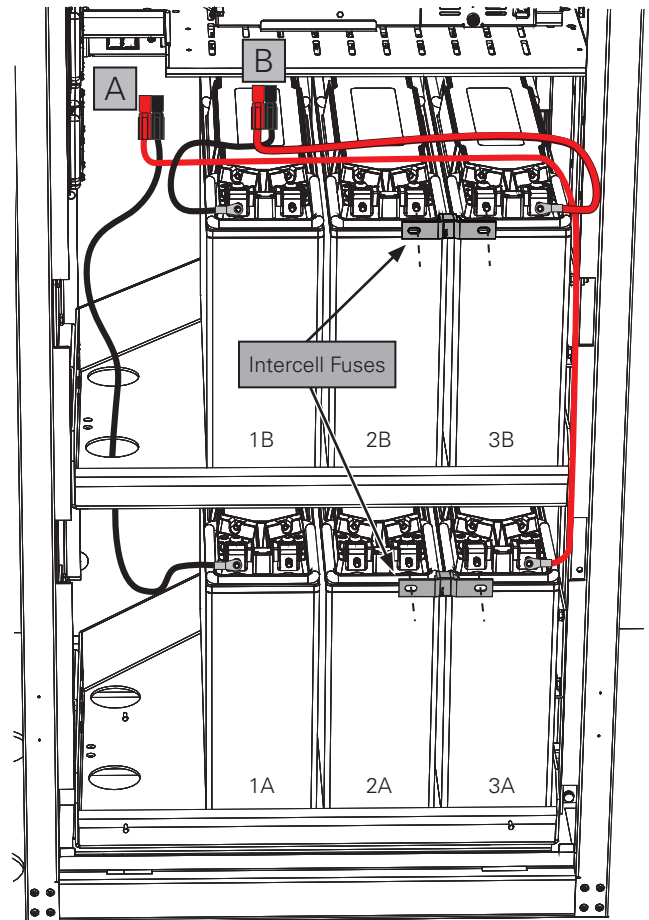


Fig. 3-26, Installing Battery Cables and Intercell Fuses

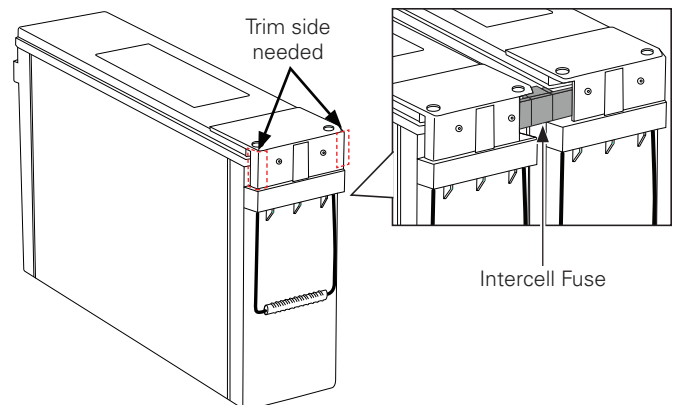


Fig. 3-27, Trimming Battery Cover on PowerSafe® SBS190F Batteries

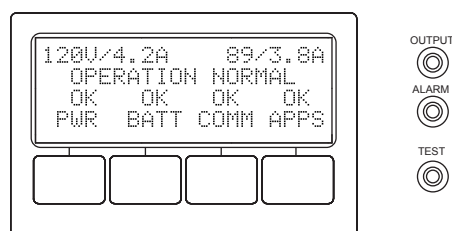
### 3.0 Installation, continued

17. Install wire harness kit (876-00059-22 BAT,INTG,36VDC,4STRG,PN4FT,W/BIU,PTS,BS) in PN-4 FTB enclosure with 3 battery trays. (See Fig. 3-30 and *p/n 031-00014-08 System Wire Diagram* available on Alpha's website for reference.)
  - A. Start with A string battery cables on the bottom tray.
  - B. Install B string battery cables on middle tray.
  - C. Install C string battery cables on top tray.
  - D. Install D string battery cables.

#### **NOTICE:**

If only three battery strings are required, don't install the D string wires, F4 fuse wire kit or PTS. D string battery voltage sense wires GRY and WHT ring lugs **must** be taped up and wires coiled with wire tie to prevent shorting.

- E. Install intercell fuses on batteries 2A and 3A, 2B and 3B, and 2C and 3C. (On AlphaCell® 210FTX batteries, the fuse can offset to the back. On PowerSafe® SBS190F batteries, the fuse must offset to the front.) If installing D string batteries, use the F4 fuse wire kit between batteries 2D and 3D.
  - F. Install interconnect bus bars on batteries 1A and 2A, 1B and 2B and 1C and 2C. If installing D string batteries, install an intercell jumper between batteries 1D and 2D.
  - G. Install PTS. Plug in to appropriate BIU2 port (ex: PTS A cable into the PTS A BIU2 port) in turn so they don't get mixed up. Route wires down the right side. Use wire label A, B, C & D provided by installer to mark both ends of PTS. **Note:** PTS A is 12ft. The rest are 4ft.
  - H. Install battery voltage sense wires. Route wires down the right side.
  - I. Torque battery terminals to battery manufacturer's specifications.
  - J. Check battery cable connectors for correct polarity and voltage. Verify connector color, orientation and wire labels then fully insert into BIU2.
  - K. Before installing covers, use a corrosion inhibitor such as NO-OX® electrical contact grease on battery terminals. Install battery covers. **Note:** PowerSafe® SBS190F battery covers must be trimmed with side cutters to fit around the intercell fuses. See Fig. 3-27. Trim side needed.
18. Plug in Battery Voltage Sense connector to BIU2.
  19. Connect BIU2 extension cable from BIU2 DC Output to BIU1 DC Input.
  20. Connect RS485 COM cable from BIU2 COM1 to BIU1 COM2.
  21. Verify communication termination is installed in BIU2 COM2.
  22. Turn on BIU breakers one at a time, then turn on XM3.1-HP power supply battery breaker.
  23. On the XM3.1-HP™ power supply Smart Display, select **BATT** and choose the battery model that corresponds with the configuration. Check individual battery voltage via the Smart Display.
  24. Verify BIU is configured correctly by selecting **BIU INFO** and all menus are "OK". If any menus have **ALM** flashing, identify the alarm and fix the problem.
  25. Verify proper operation. **Site must be alarm-free after running self-test. This can be accomplished manually or by using the Spotlight360™ software.**



**Fig. 3-28, XM3.1-HP Power Supply Smart Display**

### 3.5.5 Battery Installation Layout

#### PN-4 FT BATTERY ENCLOSURE FOR XRT-TPPL POWER SYSTEM

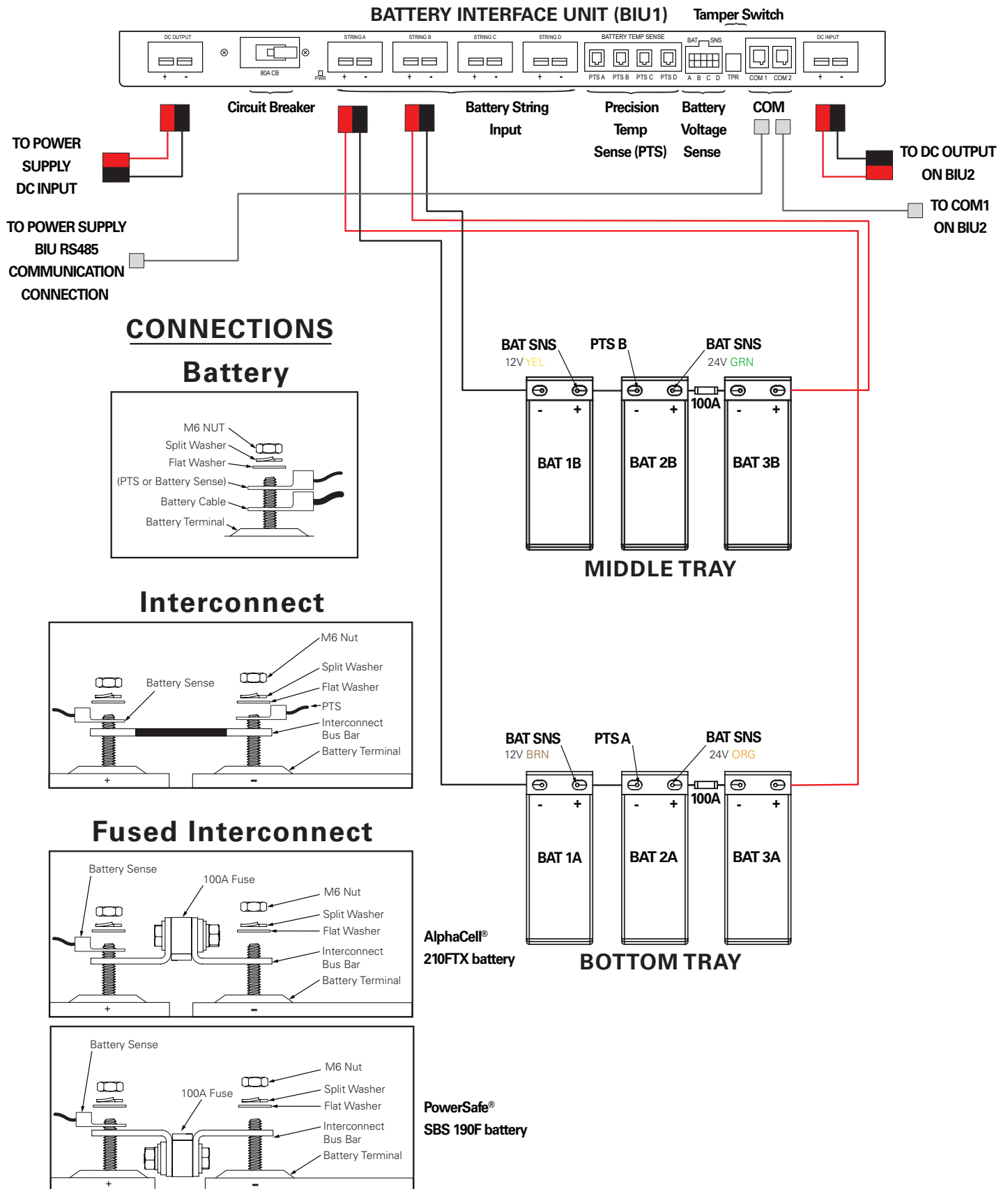


Fig. 3-29, PN-4 FT XRT-TPPL Power System Wiring Diagram

### PN-4 FTB BATTERY ENCLOSURE FOR XRT-TPPL POWER SYSTEM

#### BATTERY INTERFACE UNIT (BIU2)

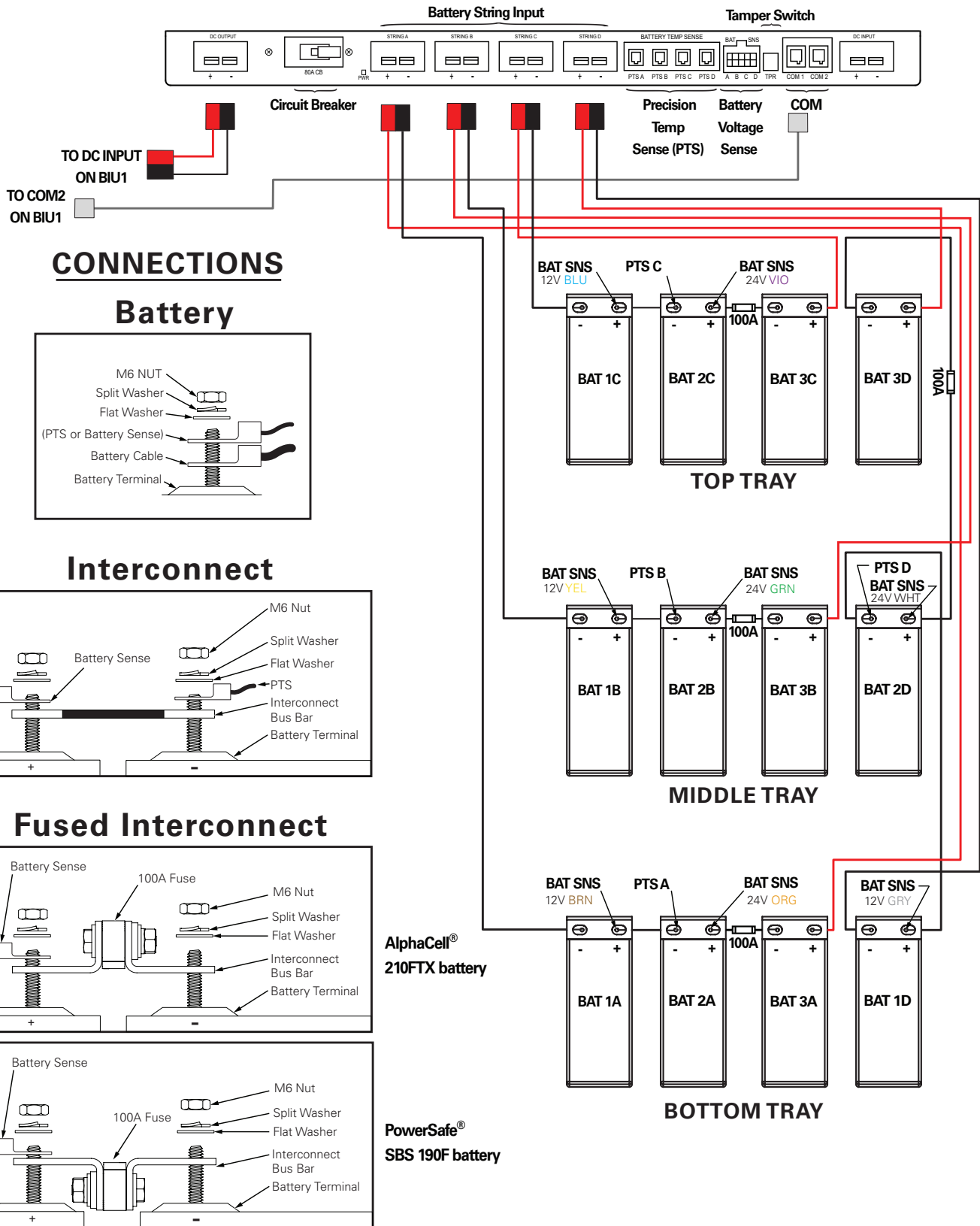


Fig. 3-30, PN-4 FTB XRT-TPPL Power System Wiring Diagram

### 3.5.6 Precision Temperature Sensor

Precision Temperature Sensors (PTS) are mounted to specific battery terminals. Refer to Fig. 3-29 and Fig. 3-30 for hardware stack up and specific battery terminal placement. Connect the corresponding PTS cable to the BIU. Ensure the COM1 cable is connected to BIU communication connection on the XM3.1-HP™ power supply.

**NOTICE:**  
 There is no need to connect any PTS directly to the XM3.1-HP power supply. All communication is run from the BIU to the power supply via the COM1 RS485 communication connection.

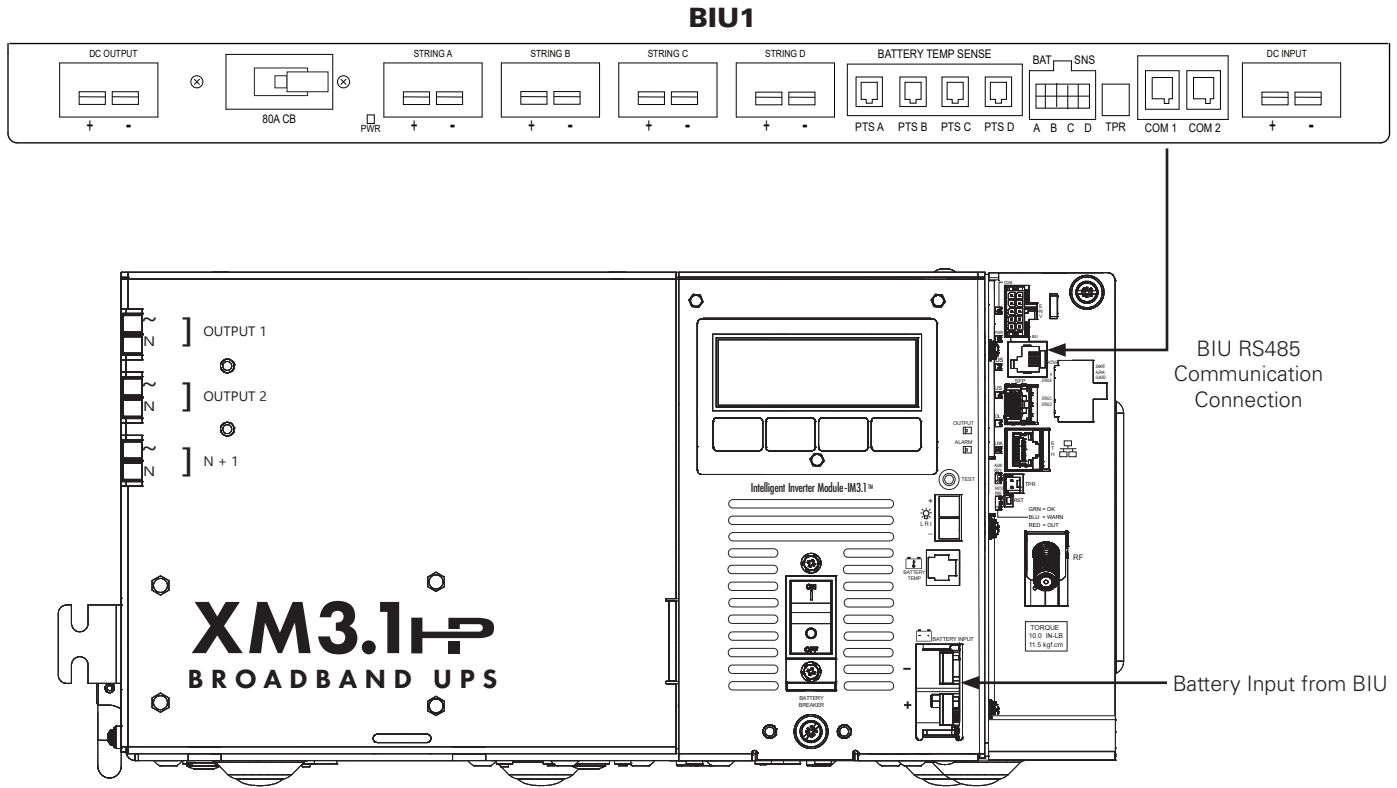


Fig. 3-31, BIU Extension Connections to XM3.1-HP Power Supply



## 4.0 XM3.1-HP™ Power Supply

### 4.1 Battery Support

The XM3.1-HP™ power supply enters the extended runtime mode when one of the large capacity battery models are chosen. The two currently supported models are PowerSafe® SBS190F batteries and AlphaCell® 210FTX batteries. These battery models are only available for selection from the Smart Display LCD when a BIU is detected in the power system. The Smart Display LCD control will also require that one of these battery models be chosen when a BIU is present.

The high system capacity and long run time nature of this application requires that some of the operating parameters of the batteries differ from more traditional applications. The End of Discharge (EOD) voltage is set at 1.80V/cell (32.4V), which is slightly higher than what would be used in shorter run time applications. The reason for this is that the relatively lower currents, as compared to the capacity of the battery, result in lower resistive voltage drop during discharge. The battery reflects a higher voltage at the point where it is exhausted. Additionally, REST mode is not utilized in this high capacity, multi-string configuration.

The BIU sends the following battery information to the PCM via the EMM. All this information has a timeout of 5 seconds. If the PCM does not receive this information at least every 5 seconds, the PCM will revert to its normal operation.

1. Battery string voltages
2. Battery string current
3. Battery temperature probes, these are averaged for the purpose of the charger mode targets
4. Individual battery voltages (not currently used by the PCM)

Once in extended runtime mode, the power supply will behave differently. The maximum allowed charge current is increased from 10.5A to 35A. The charger is still limited by the following constraints:

- a. Heat sink temperature must not exceed 90°C
- b. Output voltage must not go below 95% of the rated voltage
- c. Input current must not exceed the line cord limit (17A for a 915/918)

The EOD voltage will be measured by the BIU. Therefore, the voltage drop across the cabling will not affect the standby runtime. Once any of the strings reports a voltage below the EOD voltage, the inverter will shut down. The inverter will also shut down once the battery voltage measured at the power supply drops below a failsafe level of 1.70V/cell (string voltage of 30.6V).

The power supply will run a maximum of 72.5 hours even if the battery voltages are above the EOD voltage. In addition to the normal transition logic, the charger will transition from ACCEPT to FLOAT once all the strings reported by the BIU are below 200 mA for 30 minutes or the total accept time is  $1.75 \times \text{battery capacity} \times \text{number of strings}$  (in minutes).

The BIU provides status monitoring information to detect and report on the under charging of the battery strings. It does this by counting centiamp (0.01A) seconds going into/out of the battery. Then every minute these are averaged and reported as centiamp minutes to the EMM/cable modem. At transitions to and from FLOAT mode, decisions are made. When the charger is in FLOAT mode and transitions to OFF, this indicates that the batteries are going to start a discharge cycle. The BIU resets the total amp minutes in the batteries to 100% of the battery capacity. When the charger transitions from ACCEPT to FLOAT, the batteries are considered fully charged. If the amp minutes put back into the batteries at this point is not at the 100% or greater level of the battery string, the under charged counter is adjusted incrementally for that string.

# 5.0 Powernode (PN) Series Enclosure Options

## 5.1 Flat Security Bars

This section covers the installation of flat security bars in the enclosure. See **Section 6.0, Alpha Part Numbers** for part number series options shown in this section.



### CAUTION!

Remove or protect any equipment in the enclosure before performing the installation. DO NOT install the security bar over any ventilation louvres. This will hamper enclosure ventilation. Failure to follow these precautions may result in equipment damage that is not covered under warranty.

#### Parts/Materials (Qty):

- Drill hole template/instructions
- Security bar (1)
- Side bracket (2)
- Center bracket (1)
- Carriage bolt 1/4"-20 x 1" (4)
- Flat washer 1/4" (4)
- Hex nut 1/4"-20 (4)

#### Required Tools (Qty):

- Center punch
- Drill
- 19/64" Drill bit
- 3/8" Drill bit
- 7/16" Socket or hex driver
- Torque wrench
- Alpha® security screw (5)\*
- Security screw key (1)\*

\*Customers may supply their own security screws; see dimension specifications for more detail.

#### Procedure:

1. Tape the template to the enclosure at the desired height for installing the security bar.



### CAUTION!

Ensure the template is placed at a desired height where the security bar won't interfere with the shelving or fuse assembly on the batteries. Failure to do so may result in damage to the enclosure or batteries.

2. Center punch holes for carriage and Alpha® security bolts. Alpha recommends removing the doors after center punching.
3. Drill holes marked with CB with 19/64" or 7.5 mm drill bit.

#### Security Screw Dimensions:

5/16"-18 x 1"

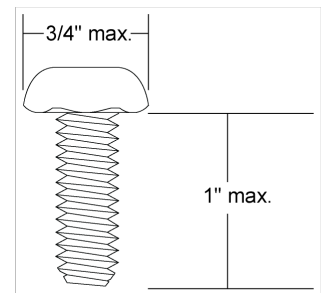


Fig. 5-1, Security Screw Dimensions

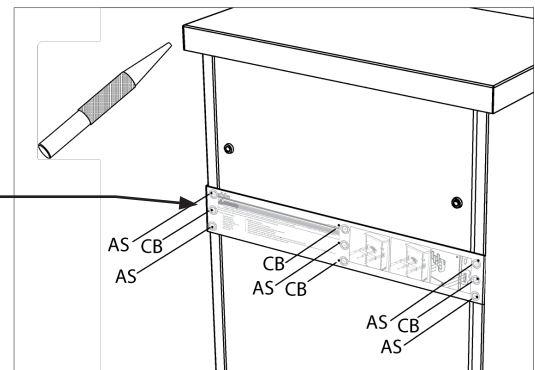
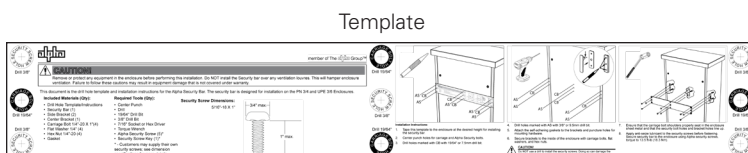


Fig. 5-2, Template Placement on Enclosure

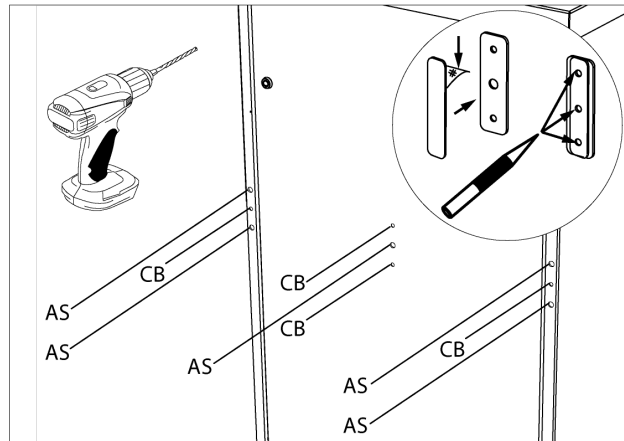
## 5.0 PN Series Options, continued

4. Drill holes marked with AS with 3/8" or 9.5 mm drill bit.
5. Attach the self-adhering gaskets to the brackets and puncture holes for mounting hardware.
6. Secure brackets to the inside of the enclosure with carriage bolts, flat washers, and hex nuts.



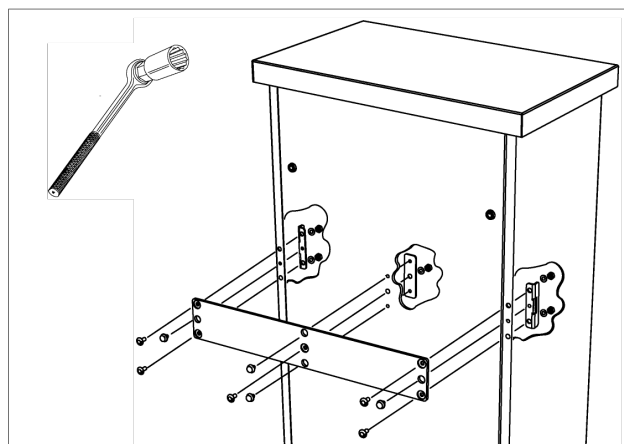
### CAUTION!

DO NOT use a drill to install the security screws. Doing so can damage the mounting threads.



**Fig. 5-3, Installing Brackets**

7. Ensure that the carriage bolt shoulders properly seat in the enclosure sheet metal and that the security bolt holes and bracket holes line up.
8. Apply anti-seize lubricant to the security screws before fastening. Secure security bar to the enclosure using Alpha® security screws, torque to 13.5 ft-lb (18.3 Nm).



**Fig. 5-4, Installing Security Bar**

## 5.2 Battery Interface Unit (BIU)

The Battery Interface Unit (BIU) is used in povernode systems with multiple power supplies and/or multiple battery strings. The BIU provides a parallel DC bus with convenient connectors for each power supply and battery string.

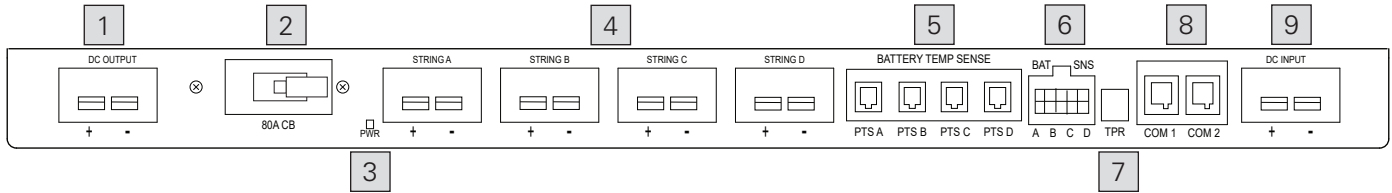


Fig. 5-5, Battery Interface Unit Front

- 1 **DC Output:** Connects to the power supply or is used to link two BIUs.
- 2 **80A CB (Circuit Breaker) Switch:** Turns the BIU on/off.
- 3 **Power LED:** Indicates the position of the circuit breaker switch. A solid LED means the breaker is on (closed). A flashing LED means the breaker is off (open).
- 4 **Battery String Ports:** Connect battery strings.
- 5 **Battery Temperature Sensor Ports:** Connect PTS from corresponding battery strings.
- 6 **Battery Sense Cable Port:** Connect battery sense cable.
- 7 **Tamper Switch Port:** Connect Tamper Switch from enclosure to the BIU.
- 8 **COM 1 / COM 2 Port:** Used for communication between BIUs and the XM3.1-HP™ power supply.
- 9 **DC Input:** Used to connect the BIU in the PN-4 FTB cabinet to the DC Output of the BIU in the PN-4 FT cabinet.

### 5.2.1 BIU Installation

The BIU is a replaceable component. In a PN-4 FT enclosure, the BIU may be mounted on the shelf under the power supply using the horizontal position of the mounting ears (Fig. 5-6). In a PN-4 FTB enclosure, the BIU can be installed on the designated BIU shelf located above the first battery rack by using the vertical position of the mounting ears (Fig. 5-7). An alternate position (Fig. 5-8) is used with a PN-4 FT enclosure that doesn't have a power supply in it, and it uses a 19" rack mount adapter kit (p/n 740-00049-20). See Fig. 5-9 for optional mounting locations in the enclosures.

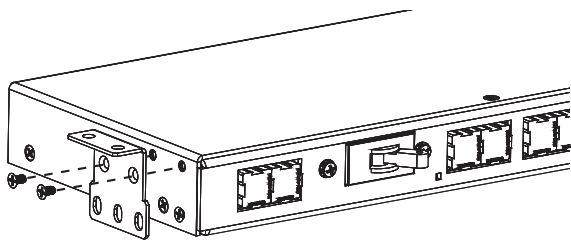


Fig. 5-6, BIU Mounting Ear (Horizontal Position)

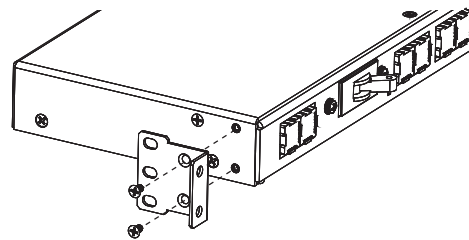


Fig. 5-7, BIU Mounting Ear (Vertical Position)

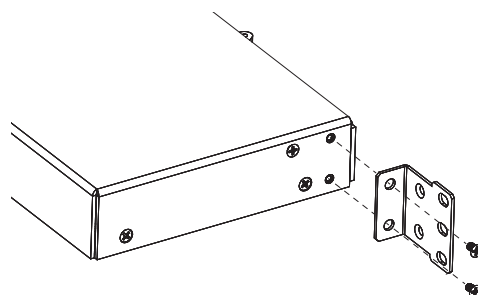


Fig. 5-8, BIU Mounting Ear (Alternate Position)

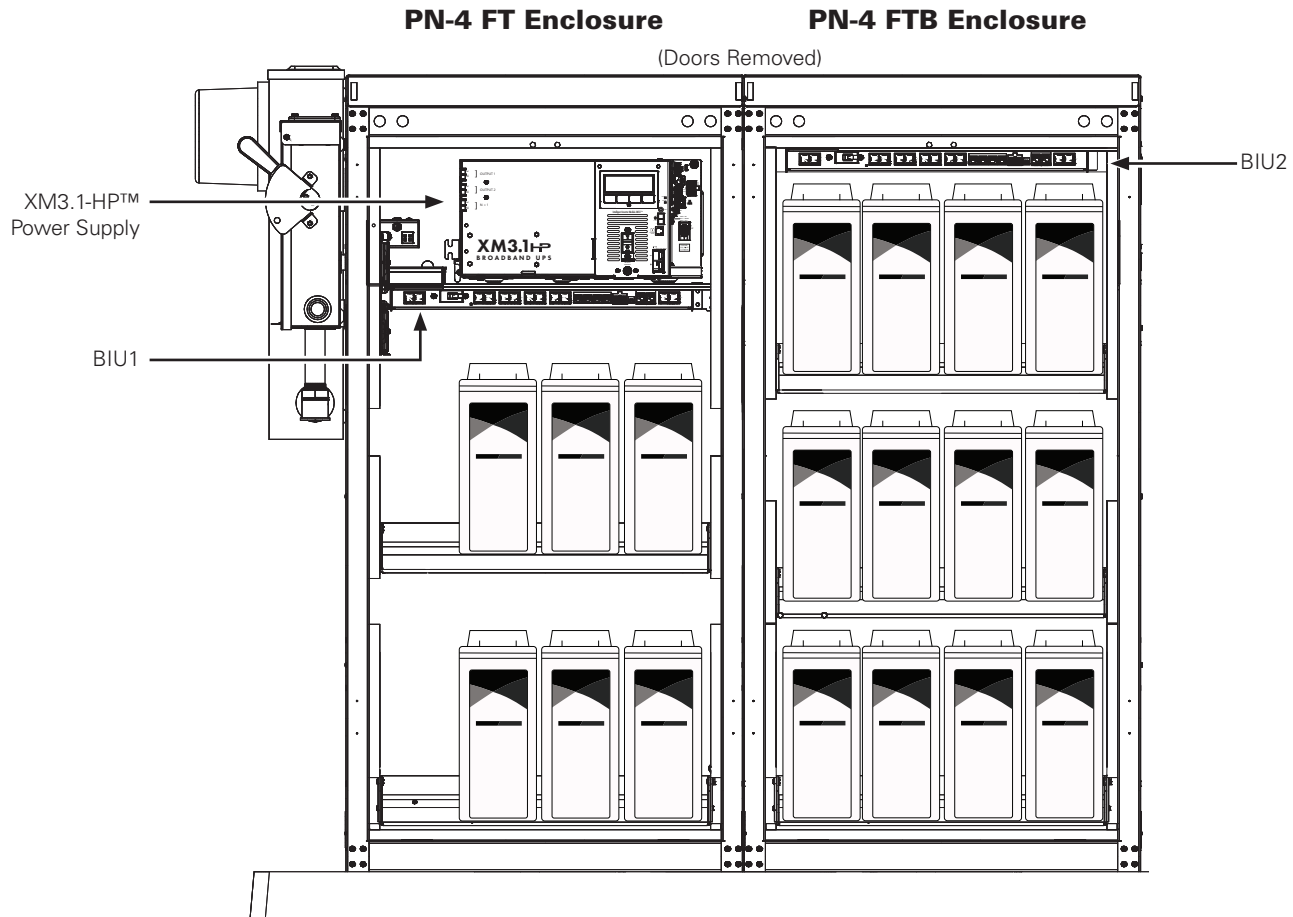


Fig. 5-9, BIU Mounting Locations

### 5.3 Input Power Panel (IPP)

There are two basic configurations of the IPP, 120V and 240V. Units are factory pre-wired, include Square-D high-magnetic breakers for each power supply, and provide a GFCI convenience outlet.

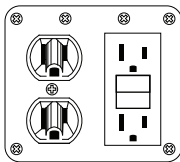


Fig. 5-10, IPP for One Power Supply

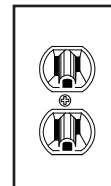


Fig. 5-11, Breaker Duplex Option (BDO) for One Power Supply (NOT factory pre-wired)

## 5.4 Lightning Arrester (LA-P+)

The lightning arrester is available in 120VAC and 240VAC, and installed by plugging into an IPP or BDO. The unit is operating properly when the green LED is lit.

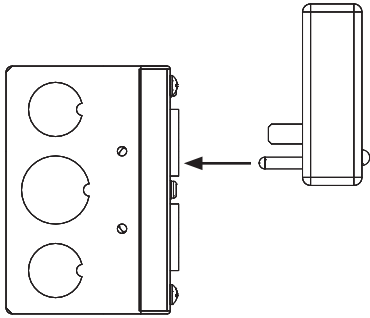


Fig. 5-12, LA-P+ Installed in BDO

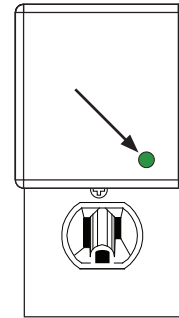


Fig. 5-13, Location of LED on LA-P+

## 6.0 Alpha Part Numbers

### 6.1 Part Number Series Options

Item	Part Number
Security Key	647-089-10
Service Disconnects	
BBX-70A	744-656-20
BBX-100A-8POS	744-657-20
FBX-60A	744-534-20
Replacement Fuse for FBX-60A (FU, 9/16X2 20A 250V CURRENT LIMITING)	460-192-10
Input Power Panels (IPP) (Pre-Wired)	
IPP-PN, 1x120 1xGFCI (FBX Only)	745-080-20
Cooling Fan Kit	
Replacement Fuse	744-839-20
Replacement Filter	460-025-10
Lightning Arrester	
LA-P+ 120V (L-N, L-G, N-G)	020-098-24
LA-PC+ 120V (L-N, L-G, N-G)	020-098-26
LA-PE+ 240V (L1-L2, L1-G, L2-G)	020-098-25
SPI	
Extra SPI (15 Amp)	744-279-22
Extra SPI (25 Amp)	744-789-21

**Table 6-1, Part Number Series Options**



**NOTICE:**

Alpha® part numbers are correct at the time of printing. As part numbers are subject to change, please contact your Alpha® product sales representative prior to ordering to ensure that numbers are correct.

## 6.2 PN-4 FT/FTB Enclosure Spare Part List

Item	Part Number
Battery Interface Unit (BIU)	
ASSY,BIU,XM3.1HP	740-00045-20
CAN TERM,120OHM,OFFSET,6P6C	ATL7400644-001
Grouped BIU Extension Cable Sets	
BIU-EXT,5',6AWG,W/COM,PN4FT	876-00061-20
BIU-EXT,15',6AWG,W/COM,PN4FT	876-00061-21
BIU-EXT,20',6AWG,W/COM,PN4FT	876-00061-22
BIU-EXT,50',6AWG,W/COM,PN4FT	876-00061-23
BIU-EXT,2.5',6AWG,W/COM,PN4FT	876-00061-24
Battery Cable Kit Extensions (One is included in Grouped BIU Extension Cable Sets)	
BCK-EXT,6AWG,5',PN4FT	876-00060-20-001
BCK-EXT,6AWG,15',PN4FT	876-00060-21-001
BCK-EXT,6AWG,20',PN4FT	876-00060-22-001
BCK-EXT,6AWG,50',PN4FT	876-00060-23-001
BCK-EXT,6AWG,2.5',PN4FT	876-00060-24-001
Alpha Bus Communication Cables (One is included in Grouped BIU Extension Cable Sets)	
WR KT,SYS COMM, PLZD ALPHA BUS CBL,6'	875-190-20-001
WR KT,SYS COMM, PLZD ALPHA BUS CBL,18'	875-190-22-001
WR KT,SYS COMM, PLZD ALPHA BUS CBL,50'	875-190-24-001
WR KT,SYS COMM, PLZD ALPHA BUS CBL,4'	875-190-25-001
WR KT,SYS COMM, PLZD ALPHA BUS CBL,25'	875-190-27-001
Alpha Bus Communication Cable Components	
CONN,TEL,MDLR,6POSN/6CNTCT LN PLG,OFS	545-275-19
CBL,TEL,6C FLAT,#26 AWG STD,GRA VNYL	858-042-19
PN-4 FT, 2 Battery String Integration Kit	
BAT,INTG,36VDC,2STRG,PN4FT,W/BIU,PTS,BS	876-00059-20
PN-4 FTB, 4 Battery String Integration Kit	
BAT,INTG,36VDC,4STRG,PN4FT,W/BIU,PTS,BS	876-00059-22
Battery Temperature Sensors	
ASSY,PTS,4',BAT TERM MNT,XM3	746-331-20-001
ASSY,PTS,12',BAT TERM MNT,XM3	746-331-21-001
Battery Fuse Assemblies	
KT, FU, INTERCELL, 100A, FRNT TERM	740-00044-20-001
WR KT,FU,INTERCELL,100A,F4,6AWG,PN4FT	876-00058-20-001
2" Conduit Pass Through With 8AWG GND Wire	
ASSY,CND,PN-4FT TO PN-4FTB	744-793-25
Lifting Ears for PN-4 FTB	
KT,LFT,5K GEN,SFG	744-941-27

**Table 6-2, PN-4 FT/FTB Enclosure Spare Part List**





an EnerSys® company

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