FieldSmart® Fiber Active Cabinet (FAC) 400
Installation Manual

CLEARFIELD

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Installation Manual

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About This Guide

This document provides a general installation practice for the Clearfield FAC 400 outdoor cabinet. This document also provides a general description of the cabinet and its subsystems, guidance for planning, site preparation, power installation, splicing to the outside plant, component installation and expansion, and cabinet maintenance.

Intended Audiences

This document is intended for use by network planning engineers, outside plant engineers, field support personnel, and craft personnel responsible for cabinet installation, splicing, equipment installation, and maintenance.

Federal Communications Commission (FCC) Statement

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 interference to radio communications. Operation of this equipment in a residential area may cause harmful interference; the user will be required to correct the interference at his expense.

Safety Notices

This document uses the following safety notice conventions.

DANGER! Danger indicates the presence of a hazard that will cause severe personal injury or death if not avoided.

WARNING! Danger indicates the presence of a hazard that will cause severe personal injury or death if not avoided.

CAUTION! Danger indicates the presence of a hazard that will cause severe personal injury or death if not avoided.

ALERT!   Danger indicates the presence of a hazard that will cause severe personal injury or death if not avoided.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT
Danger indicates the presence of a hazard that will cause severe personal injury or death if not avoided.

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Chapter 1: Fiber Active Cabinet 400 Product Overview

This chapter provides a general description of the Clearfield FAC 400 outdoor cabinet, including its standard features and options.

Topics Covered

This chapter provides a general description of the Clearfield FAC 400 outdoor cabinet, including its standard features and options.

- A description of the FAC 400 cabinet.
- A list of standard cabinet features.
- A list of cabinet options.
- Listed cabinet dimensions and weights
- A Views of the cabinet compartment.

Cabinet Description

The Clearfield FAC 400 cabinet is an environmentally-controlled outdoor enclosure designed to house and protect network electronics equipment. Use the FAC 400 to provide services from a remote node location deep inside the customer serving area, beyond the direct reach of the carrier Central Office.

The FAC 400 cabinet has a single compartment that houses electronics equipment together with fiber and copper plant terminations, enabling deployment of multiple applications from one node. The electronics area is equipped with a vertically-oriented 19-inch equipment rack that provides 4 RU of mounting space.

The FAC 400 supports local power configurations. The local power configuration includes an additional base compartment to support battery reserve power.

The modular design of the FAC 400 enables incremental expansion of system capacity, lowering initial deployment costs while maintaining the capacity for future growth. Modular components designed for expansion include compact service units, fiber management capacity, copper line protection, DC power modules, and cooling elements.

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Cabinet Features

Standard features of the FAC 400 cabinet include:

Enclosure Design

- Environmentally sealed design protects from dust and water intrusion
- GR-487 compliant and UL-67 spec
- Environmentally rated from -40C to +46C (per GR-487)

Equipment Support

- 19-inch equipment rack provides 4 RU of mounting space
- Mechanical support for fiber and copper plant terminations
- Modular, scalable copper line protection (50-pair block increments, 300 pairs maximum)
- Door-mounted 300W heat exchanger

Power (Local)

Standard features for the local power configuration include:
- 240 VAC load center (ETL-listed); 30 Amp capacity
- AC main/service disconnect breaker
- AC surge suppressor
- Duplex convenience outlet (GFCI protected)
- FAC 400 Power Hub compact DC rectifier shelf
- Fuse-protected DC supply to equipment
- Low voltage DC disconnect (-42 VDC)
- Battery backup in separate vented compartment
- Up to 62 Ah battery reserve capacity (breaker-protected); up to 124 Ah capacity with second-string riser option

Cabinet Options

Common options for the FAC 400 cabinet include:

Enclosure Mounting

- Concrete pad mounting: pre-cast or site-cast pad (using Clearfield pad template)
- Pole, wall, or frame mounting (using Clearfield mounting kits)
- Foundation vault mounting (third-party supplied)

Copper Protection & Trunking, Splicing & Distribution, Cable Management

- High density fiber management options (48- and 96-position fiber distribution panels, 1:32 PON splitters, management accessories), up to 192 ports of internal distribution
- Copper line protection for up to 288 lines; MS2 or 710 interface connectors
- Cross-connect panel with MS2 or 710 interface connectors; 2:1 subscriber-to-equipment line counts: 300 pair (200:100)
- Clearfield xPAK low count fiber distribution with LGX mounting

Power

Local power support (commercial AC power supply); additional options include:
- 110/120 and 220/240 VAC input
- Generator connector (Hubbell); 30A NEMA twist lock with breaker

Battery Support (local power configurations)

- Northstar or Enersys (OEM) battery string and installation kit (OEM)
- Battery heater kit
- Battery compartment riser (supports second 60 Ah or 62 Ah battery string)

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Cabinet Dimensions and Weights

The external dimensions of the FAC 400 cabinet are shown below.

Dimension	Measurement (SAE)	Measurement (Metric)
Height: Local Power	48 inches	122 cm
Width	19.7 inches (60 Ah battery base)	50 cm
Depth	24 inches	61 cm

FRONT

SIDE
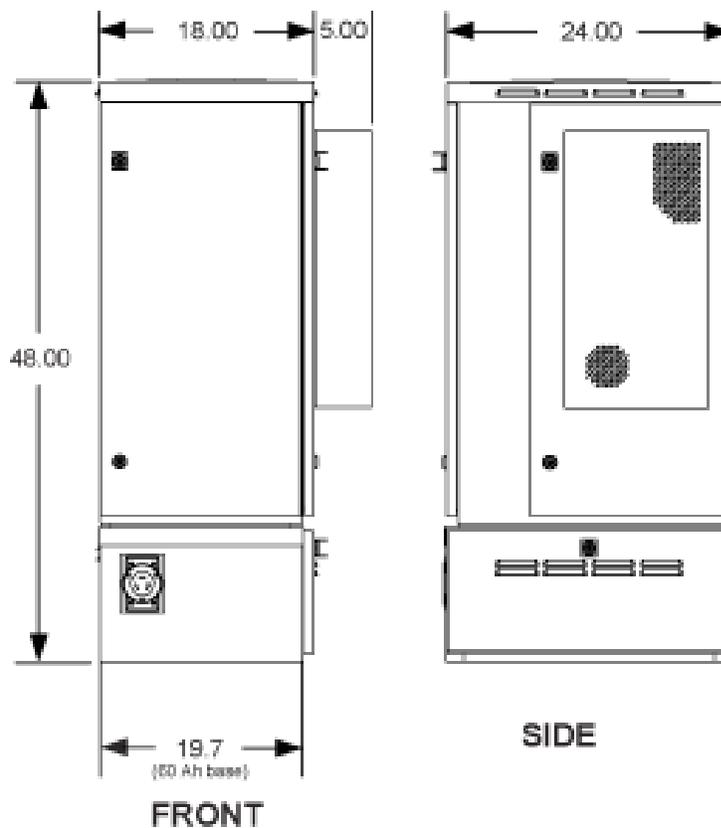
Note: *Based on the dimensions, the cabinet can withstand 79.5 lbs of wind force.*

The approximate weight of the FAC 400 cabinet is shown below.

Configuration	Weight (SAE)	Weight (Metric)
Local power (60 Ah batteries), 96 copper lines	222 lb	101 kg

Cabinet Views

Views of the FAC 400 cabinet follow.

Front Compartment

The front compartment provides access to the electronics equipment, cabinet power system, and fiber management or copper line protection. The cabinet power system consists of an AC load center. For fiber access, the fiber management accessories may vary greatly according to the ordered options. For copper access, the line protection may include up to six 50-pair protection blocks.

FAC 400 Front
(local power)

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Side Compartment

The side compartment provides access to the cable entry and splice locations and the main ground bar. The side compartment also houses an optional cross-connect panel for copper access systems.

FAC 400 Side

Battery Compartment (Local Power)

Cabinets configured for local power include a battery base compartment for housing one string of front-access VRLA batteries.

Battery compartment interior dimensions (for batteries): 10.3 (H) x 18.6 (W) x 11.5 (D) inches (26.2 x 47.2 x 29.2 cm)

Note: Batteries fit compactly in the 60 Ah base. Use only approved batteries to meet seismic compliance and follow the installation instructions to ensure a proper fit in the compartment.

Chapter 2: Installation Considerations

This chapter provides general considerations for cabinet installation. Review this information before starting the cabinet installation process.

Topics Covered

This chapter covers the following topics:
- Installation process overview
- Installation guidelines
- Space requirements
- General safety recommendations
- Installation kit contents
- User-supplied items
- Cabling requirements

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Installation Process Overview

The cabinet installation process involves the following high-level steps:

```
                          ┌──────────┐
                          │  Start   │
                          └────┬─────┘
                               ▼
                     ┌───────────────────┐
                     │   Prepare the     │
                     │ Installation Site │
                     └─────────┬─────────┘
                               ▼
   Pole or              ◇ Cabinet ◇           Pre-Cast Concrete Pad
   Wall/Frame           Mounting              or Foundation Vault
┌──────────────┐        Type?              ┌──────────────────────┐
│ Install Pole │◄───────                 ─►│ Install Pre-Cast Pad │
│ or Wall      │                           │ or Foundation Vault  │
│ Mounting Kit │                           └──────────────────────┘
└──────┬───────┘     Site-Cast
                     Concrete Pad
                               ▼
                     ┌──────────────────┐
                     │  Construct a     │
                     │  Concrete Pad    │
                     └─────────┬────────┘
                               ▼
                     ┌──────────────────┐
         ──────────► │  Install the     │ ◄──────────
                     │  Cabinet         │
                     └─────────┬────────┘
                               ▼
   Local              ◇ Powering ◇
┌──────────────┐        Method?
│ Install Local│◄───────
│ (AC) power   │
└──────┬───────┘
                               ▼
                     ┌──────────────────┐
         ──────────► │ Install & Splice │
                     │ Outside Plant    │
                     │ Cables           │
                     └─────────┬────────┘
                               ▼
                     ┌──────────────────┐
                     │ Turn Up the      │
                     │ Cabinet Power    │
                     │ System           │
                     └─────────┬────────┘
                               ▼
                          ┌──────────┐
                          │  Finish  │
                          └──────────┘
```
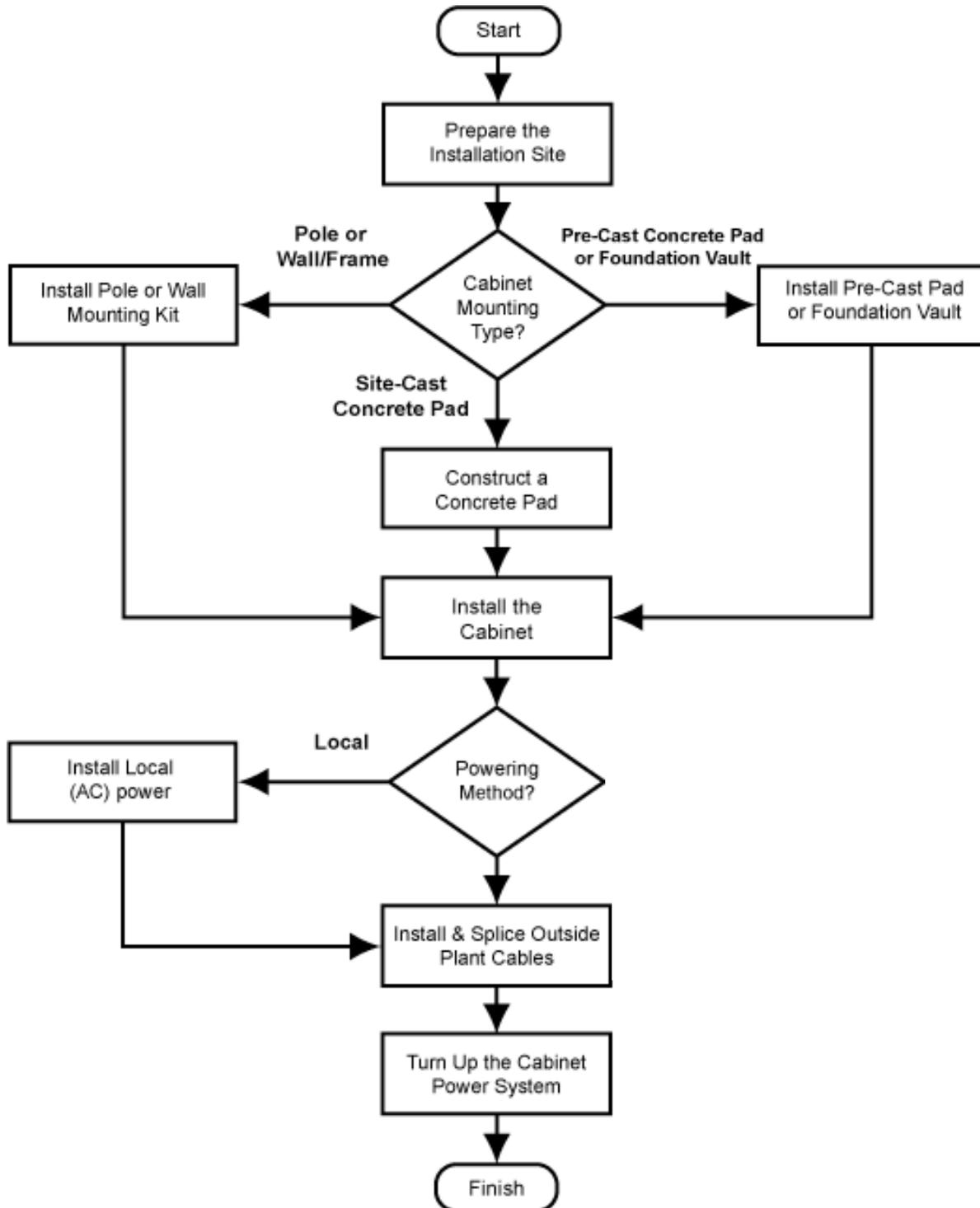
Installation Guidelines

Review the following guidelines before starting installation activities.

General Guidelines
Follow these general guidelines and practices:
- Read this document completely before starting any installation activities.
- Only qualified personnel should perform the procedures described in this document.
- Follow standard safety precautions when performing installation and maintenance tasks.
- Always wear standard safety gear when performing installation and maintenance tasks (hard hats/safety headgear, eye protection, insulated gloves).
- For safety, keep bystanders and other unauthorized personnel away from work operations at all times.
- Do not perform installation activities when the threat of lightning is present.
- **Warning!** - Seal all cable entry locations immediately after the cabinet is installed to prevent ground moisture from condensing inside the cabinet and damaging equipment.

Site Selection
The location of a cabinet installation site should be carefully planned in advance. Consider the following factors when selecting an installation site:

1. Functional requirements
- **Suitable terrain.** Whenever possible, the cabinet should be located in an area with a firm flat soil surface that does not require extensive earth work. The location should not be constantly damp or prone to flooding. Check soil maps of potential sites for subsurface conditions.
- **Grounding properties.** Grounding properties. The earth at the cabinet location should have a low ground impedance to provide an effective grounding system for lightning protection and safety. Perform ground testing to determine the grounding requirements.
- **Safety.** Whenever possible, the cabinet should be located on vacant property away from motor traffic to reduce injury risks to maintenance personnel or damage to equipment. On streets and highways, avoid locations near busy intersections or curves in the road. Erecting guard rails or concrete pillars can provide additional safety barriers against motor traffic.
- **Solar exposure.** Whenever possible in hot or warm climates, avoid locations with heavy exposure to direct afternoon sun, so as to maximize the life of electronics equipment in the cabinet. High outdoor temperatures and heavy solar exposure raise temperatures inside cabinets, a condition that can reduce the life span of equipment. Conversely, wind exposure improves thermal conditions in a cabinet, so locations that do not block wind are desirable.

2. Accessibility requirements:
- **Easement size.** Select a location with an easement that provides enough space to walk around the perimeter of the cabinet with its doors open.
- **Right-of-Way.** Secure a permanent location on private property, whenever possible. Obtain a firm right-of-way agreement that includes right of access. Avoid locations in public rights-of-way.
- **Electrical access.** Locally-powered cabinets must have access to commercial AC power. Verify the availability of AC service at potential cabinet locations.
- **Parking.** Whenever possible, the cabinet should be located in an area that provides sufficient parking space for
- installation and maintenance vehicles.

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Space Requirements

The illustration below shows the cabinet clearance and space requirements.
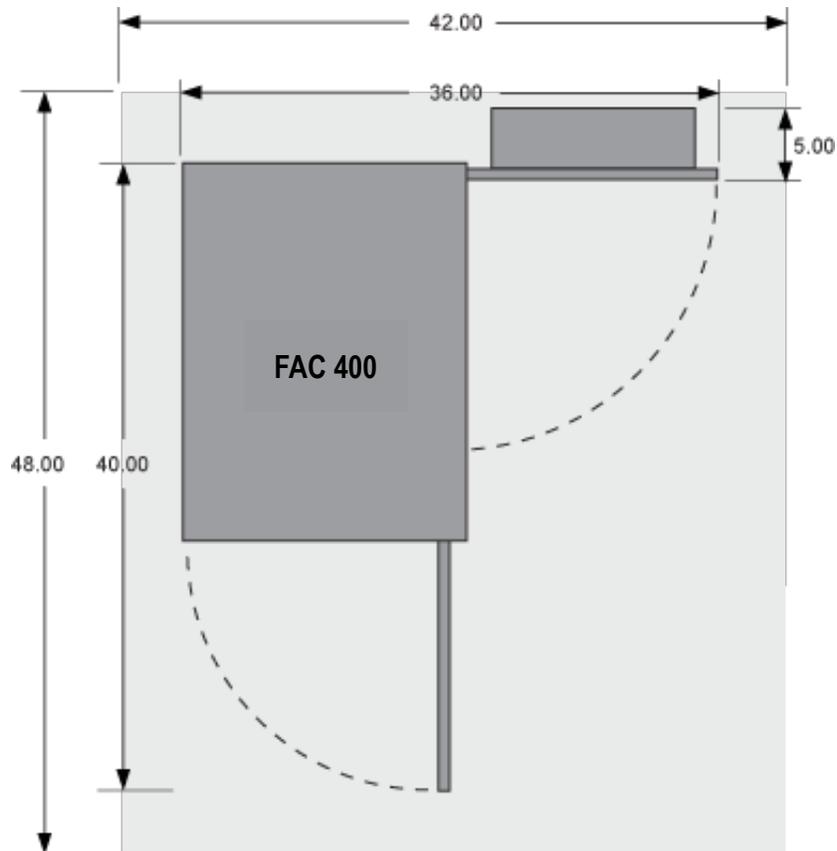
The minimum clearance area around the cabinet site must be free of permanent impediments to allow full swing of the cabinet doors. This area must be kept clear of obstructions at all times to provide adequate access for all installation and maintenance activities.

General Safety Recommendations

WARNING! Only trained, qualified technical personnel should perform the procedures described in this document. These procedures involve potentially hazardous activities, including handling of heavy equipment and exposure to high electrical energy, which could cause injury to untrained personnel.

DANGER! Risk of high power current surge and electric shock. Read and understand all power procedures before performing tasks. Take necessary precautions and use appropriate insulated tools when working with power. This equipment must be installed, operated, and serviced by qualified technical personnel only.

WARNING! The cabinet and its components are heavy. Handle with care to avoid personal injury or damage to the equipment.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT.
Fiber optic radiation can cause severe eye damage or blindness. Do not look into the open end of an optical fiber.

CAUTION! Batteries contain a stored charge. Handle batteries with care.

ESD ALERT! Beware of electrostatic discharge. Follow standard ESD precautions. Always wear a grounded ESD wristband to avoid damaging the electronic equipment.

Installation Kit

Clearfield supplies an installation kit with the cabinet that includes materials required for installation. The installation kit contents are listed below. Check to verify that your kit contains all of the listed items.:

☑	Qty	Item Description
	1	Telco hex key, 5/16"
	1	Isolation mat
	4	Hex nuts (for mounting)
	8	Flat washers (for mounting)
	4	Split lock washers (for mounting)
	4	1/2" hex head bolts (for mounting)

User-Supplied Items

Supply the following items for cabinet installation.

Tools
Bring the following tools to the installation site:

- Power drill with universal socket and screwdriver bit sets
- Socket wrench/nut driver set (standard)
- Box wrench set (standard)
- Screwdriver set (standard)
- Beam Level
- Insulated needle-nose pliers
- Wire stripper
- Compression crimping tool
- Fiber cleaver
- Fiber splicer
- Modular MS2 or 710 splicing tool
- RB Razor-Sharp Cutting Edge knife, or another similar tool

Materials
Bring the following materials to the installation site:

- Leveling shims
- Silicone sealant
- MS2 or 710 connectors for copper line splicing
- Strain relief for #6-8 AWG wiring.

Equipment
Bring the following equipment to the installation site:

- Digital multi-meter
- Optical power meter
- Digital multi-function test set

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Cabling Requirements

Cables supplied to the cabinet must meet the following minimum requirements.

Function	Facility	Requirements
Power		
Ground	Copper	6 AWG solid bare copper wire (to earth ground circuit); terminates to ground bar with screw lug
AC (local power)	Copper	8–10 AWG stranded copper; Follow National Electric Code (NEC) and local codes

Note: *Local climatic conditions, site conditions, or local practices may require adjustments to cabling requirements.*

Chapter 3: Preparing the Installation Site

This chapter describes how to prepare the installation site for cabinet placement, including establishing the cabinet mounting structure. You can install the cabinet onto a concrete foundation pad, a pole, or a foundation vault.

For pad-mount applications, you can construct a concrete pad using the Clearfield cast-in-place template or use a pre-cast concrete pad. For pole mounting, use the Clearfield pole-mount kit to provide the cabinet mounting fixture. A composite foundation vault, available from a third-party supplier, can provide easy under-cabinet access or serve as a riser.

For all mounting configurations, Clearfield requires installation of an earth ground circuit at the installation site to provide lightning protection.

Topics Covered

This chapter covers the following topics:
- Installing a ground circuit at the installation site
- Constructing a concrete pad
- Installing a pre-cast concrete pad
- Installing a pole mount kits
- Installing a wall mount kit
- Installing a composite foundation vault

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Installing a Ground Circuit

Clearfield requires installing an earth ground circuit (earth electrode) at the installation site to provide protection from electric shock for equipment and personnel. The ground circuit may consist of a simple copper rod driven into the earth or a complex system of buried rods and wires. The lower the resistance of the electrode-to-earth connection, the more effective the ground system for safety and lightning protection.

Proper grounding conditions and requirements vary per site. The National Electric Code (NEC) specifies a maximum ground impedance of 25 ohms. Clearfield recommends achieving a ground impedance of no greater than 5 ohms wherever practical. If 5 ohms or less cannot be achieved, the maximum ground impedance should meet local codes or the NEC requirement of 25 ohms, whichever is less.

Grounding options

The cabinet main ground system must be bonded to a suitable earth ground circuit, which may include any of the following:

- **Ground rod(s):** A ground rod consists of a simple copper rod driven into the earth. A ground rod connects to the main cabinet or enclosure ground via an earth ground wire bonded to the ground rod and buried at the site. Multiple inter-connected ground rods provide increased ground electrode-to-earth conductivity (ground grid). You can add supplemental ground rods to a single ground grid in several arrangements, including a linear chain, fan array, or ring configuration. Refer to the NEC or local regulations for restrictions and details. All bonds to grounding electrodes must be suitable for direct burial using irreversible mechanical connections or exothermic welds. Follow local code or site practice to satisfy any additional grounding requirements.
- **Ground ring:** A ground ring consists of multiple ground electrodes that encircle the perimeter of a site. Ground rings represent the preferred earth grounding system for cabinet deployments. Ground rings follow the NEC provisions for multiple ground electrodes.

Example of PANI-compliant ground ring with main site ground buss:
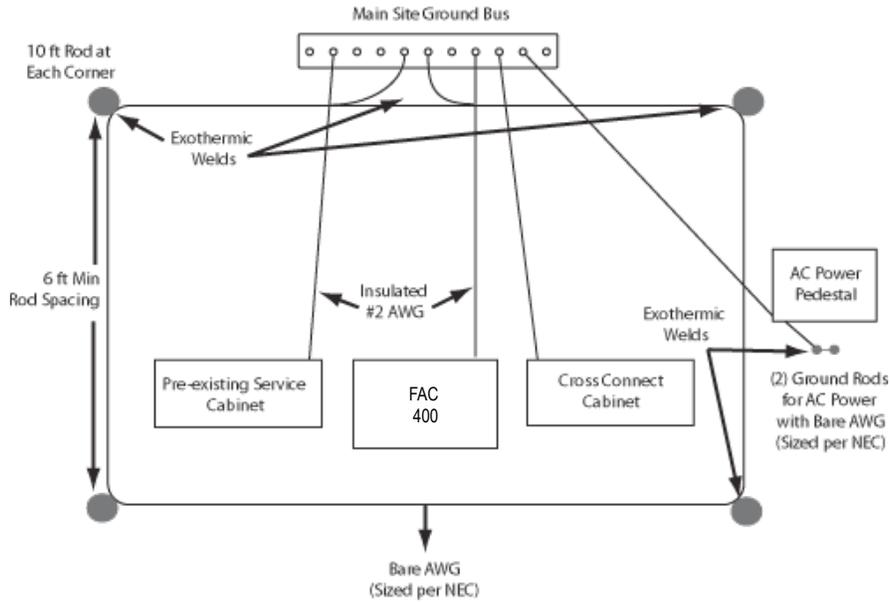
Example of PANI-compliant ground ring without a main site ground buss:
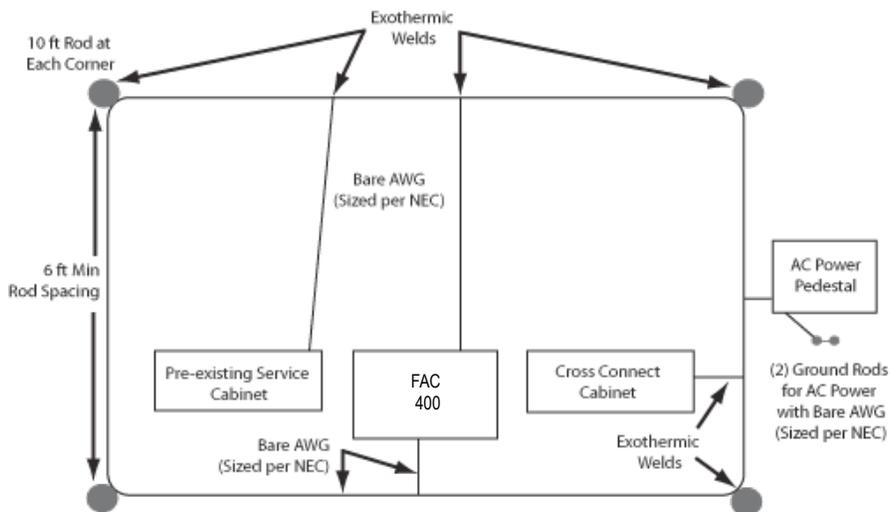
Ground Circuit Considerations

Following local codes and practices, install a ground circuit at the installation site. Consider the following factors when constructing the ground circuit:

- The ground electrode(s) should be copper-clad steel at least 5/8-inch in diameter.
- The ground rod or pipe electrode(s) should have a minimum of 8 feet of direct contact with earth.
- The wire connecting multiple electrodes should be bare copper sized per NEC, and should be buried at least 30 inches deep or below the frost line (whichever depth is greater).
- The wire connecting multiple electrodes should be connected with an exothermic weld or irreversible mechanical connector suitable for direct burial.
- The wire connecting the cabinet main ground bar to the initial ground electrode should be a 6 AWG or larger bare copper ground wire.
- The ground wire should enter the cabinet separated from power or copper transmission cables. Never bundle the ground wire together with other copper cables.
- Connect the ground wire to the main ground bar.
- Follow the PANI organization for all connections made to the equipment cabinet/enclosure ground bar as shown in Clearfield documentation.
- Measurements of the site ground circuit should be conducted to gauge achievement of 5 Ohms or less.

Note: You must install the cabinet's connection to the earth ground circuit before you connect commercial power to the cabinet.

Environmental factors

Environmental factors that may affect grounding conditions include:

- Type and size of an electrical surge; a lightning-induced current surge, voltage spike during an electrical storm, or static build-up from power utility lines may overwhelm the earth ground.
- Wet soil provides low resistance ground, with resistance increasing as the soil dries. Rock, gravel, sand, loam and clay react differently to wet/dry conditions.

Follow local code to satisfy additional requirements, if applicable.

Constructing a Concrete Pad

A concrete pad provides a permanent foundation to anchor the cabinet to the ground while protecting the cabinet from water damage and other outdoor surface conditions.

Construct a concrete foundation pad for the cabinet at the installation site. Pad construction requires excavating the site, trenching cable conduit, constructing a form, and casting concrete. Use the Clearfield -supplied cast-in-place template to provide exact locations for the mounting studs that anchor the cabinet to the pad and to provide the cable conduit locations.

Pad Construction Guidelines

When constructing a concrete pad, observe the following guidelines and refer to the pad drawings for guidance.
Follow these guidelines to ensure proper pad construction. Adjust for local conditions or practices as required.

- Construct the pad with minimum perimeter dimensions of 42 x 48 inches.
- Construct the pad with a minimum height of 6 inches.
- Construct the pad with a maximum of 2 inches above-grade exposure.
- Use the Clearfield cast-in-place template to provide exact mounting stud and conduit locations.
- Use rebar or wire mesh inside the form to improve pad strength.
- Cast the pad from a single concrete pour. Do not make multiple pours.
- Ensure that the pad is smooth and level across its entire surface.
- Use 2.5-inch conduit (maximum) for outside plant cables. See drawing below for entry locations.
- Use 1-inch conduit (maximum) for AC cable (local power applications only). See drawing below for entry location.
- Include pull cords in all cable conduits.

Pad Drawings

Use the following drawings for reference during pad construction.
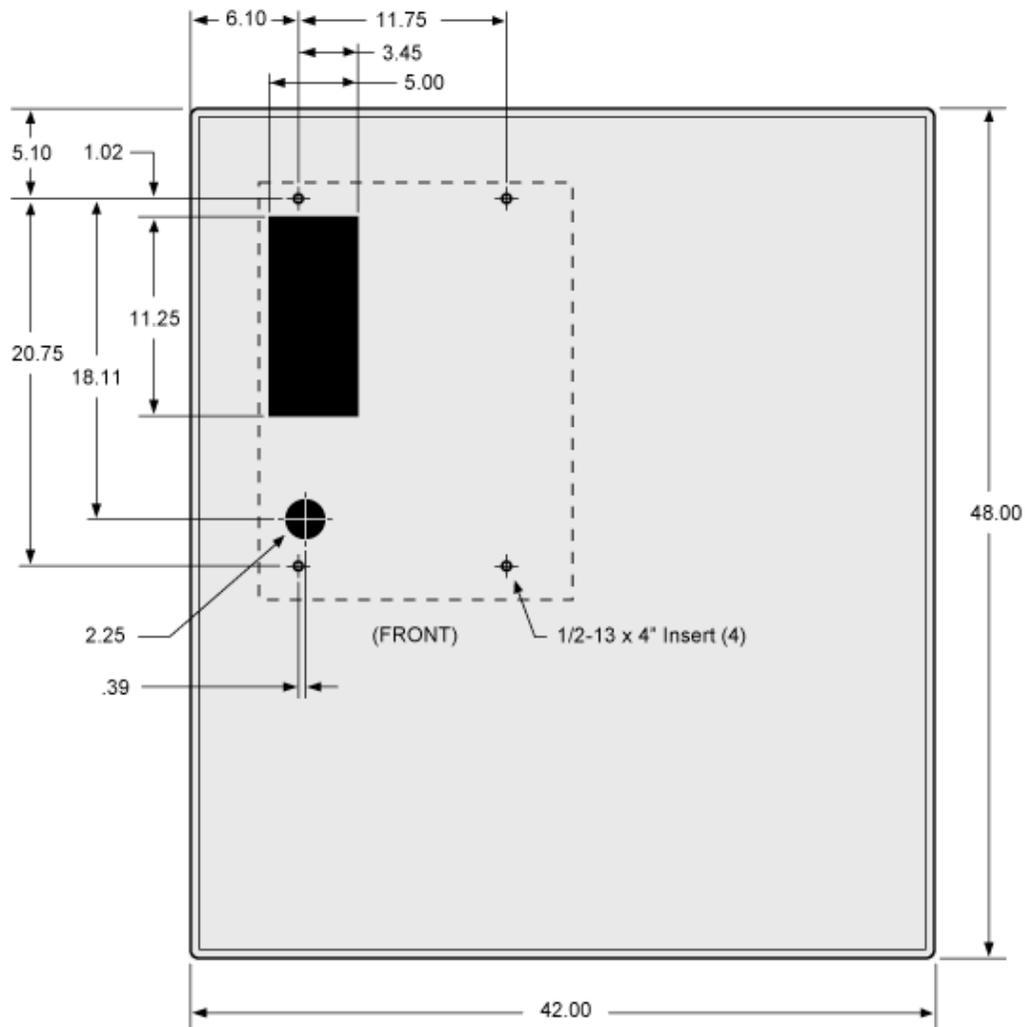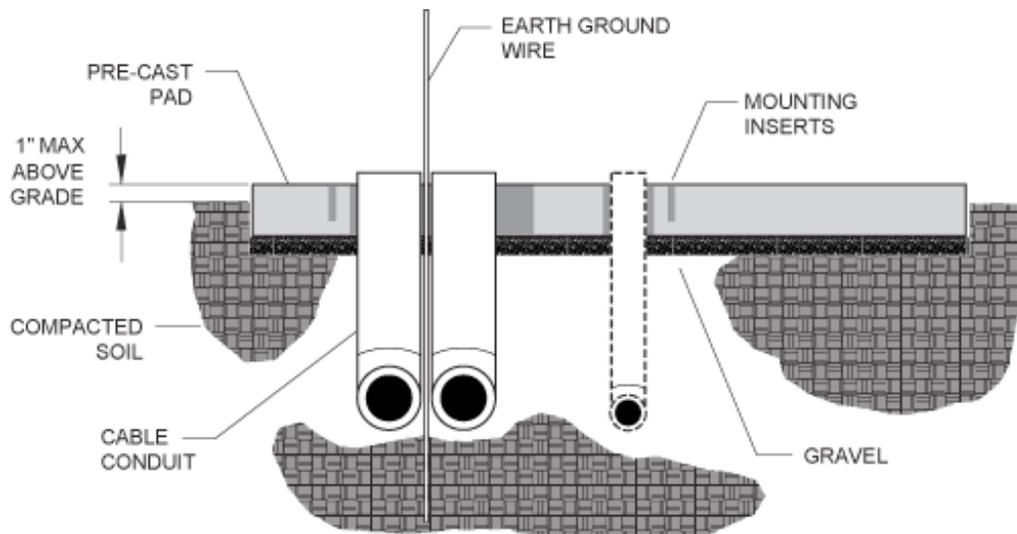
**Pad Cross-Section
(from left side)**
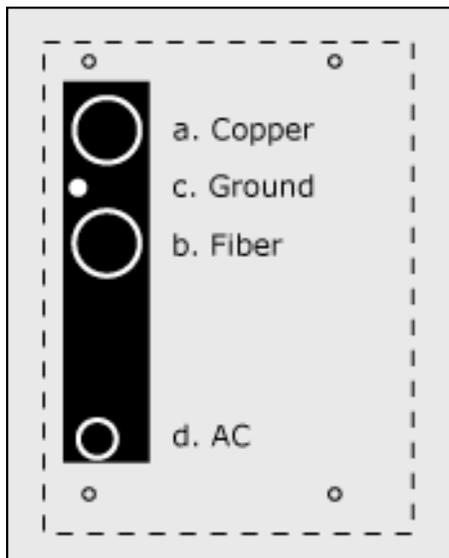
Conduit Locations

For proper cable entry into the cabinet, place conduit into the following locations.

a. Conduit for outside plant cable (copper).
b. Conduit for outside plant cable (fiber).
c. Earth ground wire.
d. Conduit for AC cable.

Use the Clearfield cast-in-place template to provide precise conduit orientation.

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Assembling the Cast-In-Place Template

Assemble the Clearfield cast-in-place template as follows.

To assemble the template

Step 1: Unpack the template hardware from the shipping kit.

Step 2: Attach the conduit entry box to one of the short brackets using two supplied screws and nuts.
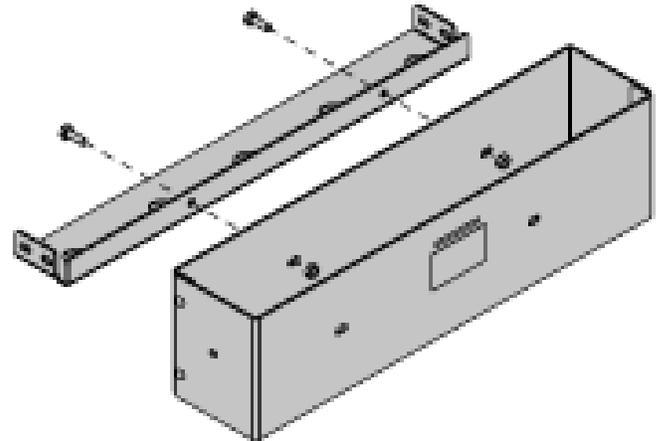
Step 3: Place the four bracket members on the ground, arranged as follows:

- Place the two long brackets parallel with each other, flat side down.
- Place the two short brackets between (and perpendicular to) the long members, flat side down, with the conduit entry box bracket on the left.
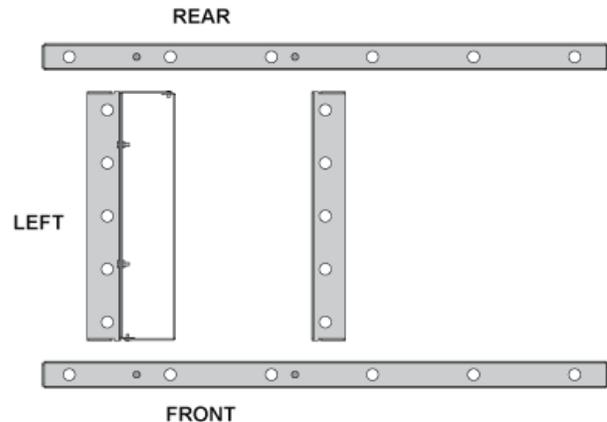
Step 4: Attach the short and long brackets together using seven supplied screws and nuts, as shown.

Step 5: Tighten all screws to complete the template assembly.
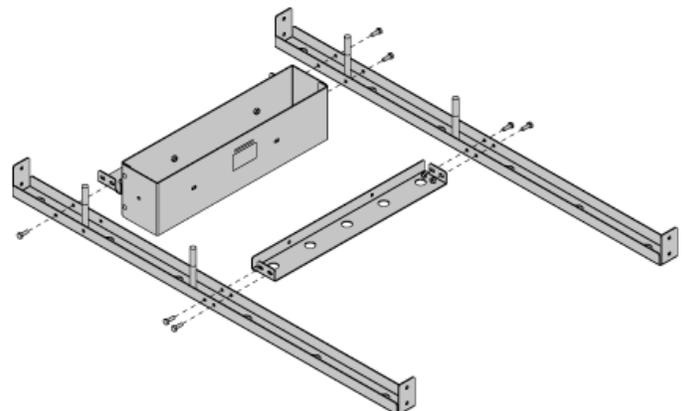
Preparing the Site

Prepare the site for pad construction as described below. Adapt the instructions as needed for local requirements, practices, or conditions.

To assemble the template

Step 1: Excavate the pad area. Dig a foundation hole six inches deep with a perimeter measuring at least 42 x 48 inches.

Step 2: Grade and compact the excavated surface until it is firm and level.

Step 3: Trench out conduit paths through the foundation hole from the cable feeder location. Refer to the pad drawings for conduit locations.

Step 4: Place the cable conduits into the conduit trench. Refer to the pad construction guidelines for conduit sizes and locations.

Step 5: Route the earth ground wire through the conduit trench (from the ground electrode).

To construct a concrete form

Step 1: Using 2 x 6 boards and stakes, construct a concrete form with interior dimensions of 42 x 48 inches inside the foundation hole. Make sure that the top edge of the form is level.

Step 2: Place gravel into the foundation hole to create a level base. The gravel layer should be at least two inches deep, compacted and leveled.

Step 3: Place and tie rebar inside the form elevated above the gravel.

Step 4: Place the Clearfield cast-in-place template into the form, guiding the cable conduits through the conduit entry ducts in the template.

Step 5: Align the template mounting brackets flush with the top of the form, then nail the template to the form to secure it in place.

> **Note:** *The mounting studs should protrude approximately one inch above the form.*

Step 6: Verify that the form remains level across the entire surface. Adjust as required.

Step 7: Pull the earth ground wire (from the conduit trench) through the entry duct in the template, allowing at least three feet of wire to extend above the top of the form.

Step 8: Mask the four mounting studs on the template to protect the threads from concrete.

Casting the Pad

Cast the concrete foundation pad as described below. Adapt the instructions as needed for local requirements, practices, or conditions.

To cast the concrete pad

Step 1:   Prepare the concrete mix. Be sure to mix enough concrete to cast the entire pad in a single pour.

> **Note:** *To avoid structural weakening, do not cast a pad from multiple concrete pours.*

Step 2:   Pour the concrete into the form. Do not allow the cast-in-place template to bend or twist out of shape during the pour.

Step 3:   Smooth and level the top surface of the concrete.

Step 4:   Leave the pad to cure. Do not remove the form until the concrete has fully cured (at least 72 hours). Perform the remaining steps only after the concrete has cured.

Step 5:   Remove and discard the form.

Step 6:   Backfill the cable conduit trenches with soil or gravel as required.

Step 7:   Backfill and grade the perimeter area around the pad with soil, as required.

Step 8:   Trim the cable conduits to a height no more than 4 inches above the pad.

Installing a Pre-Cast Concrete Pad

A concrete pad provides a permanent foundation to anchor the cabinet to the ground while protecting the cabinet from water damage and other outdoor surface conditions.

Install a pre-cast concrete pad for the cabinet at the installation site. Installation requires excavating the site, trenching cable conduit, creating a gravel foundation base, and placing the pre-cast pad on the foundation base.

Pre-cast pads ship configured with conduit entry cutouts and mounting fixtures (threaded inserts) for anchoring the cabinet to the pad. Specific features and dimensions vary by manufacturer. Contact your sales representative for a list of Clearfield -certified suppliers.

Pre-Cast Pad Requirements

When preparing for and installing a pre-cast concrete pad, observe the following guidelines. Refer to the pad drawings for guidance.

Guidelines

Follow these guidelines to ensure proper pad support for the cabinet. Adjust for local conditions or practices as required.

- Use a pad with a minimum height of 3 inches.
- Install the pad with a maximum of 1 inch above-grade exposure.
- Use 2.5-inch conduit (maximum) for outside plant cables. See drawing below for entry locations.
- Use 1-inch conduit (maximum) for AC cable (in local power applications only). See drawing below for entry location.
- Include pull cords in all cable conduits.

Refer to the pad manufacturer's instructions for additional guidelines.

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Pad Drawings

Use the following drawings for reference during site preparation. Actual pad dimensions may vary by manufacturer. Refer to the manufacturer's documentation for more information.
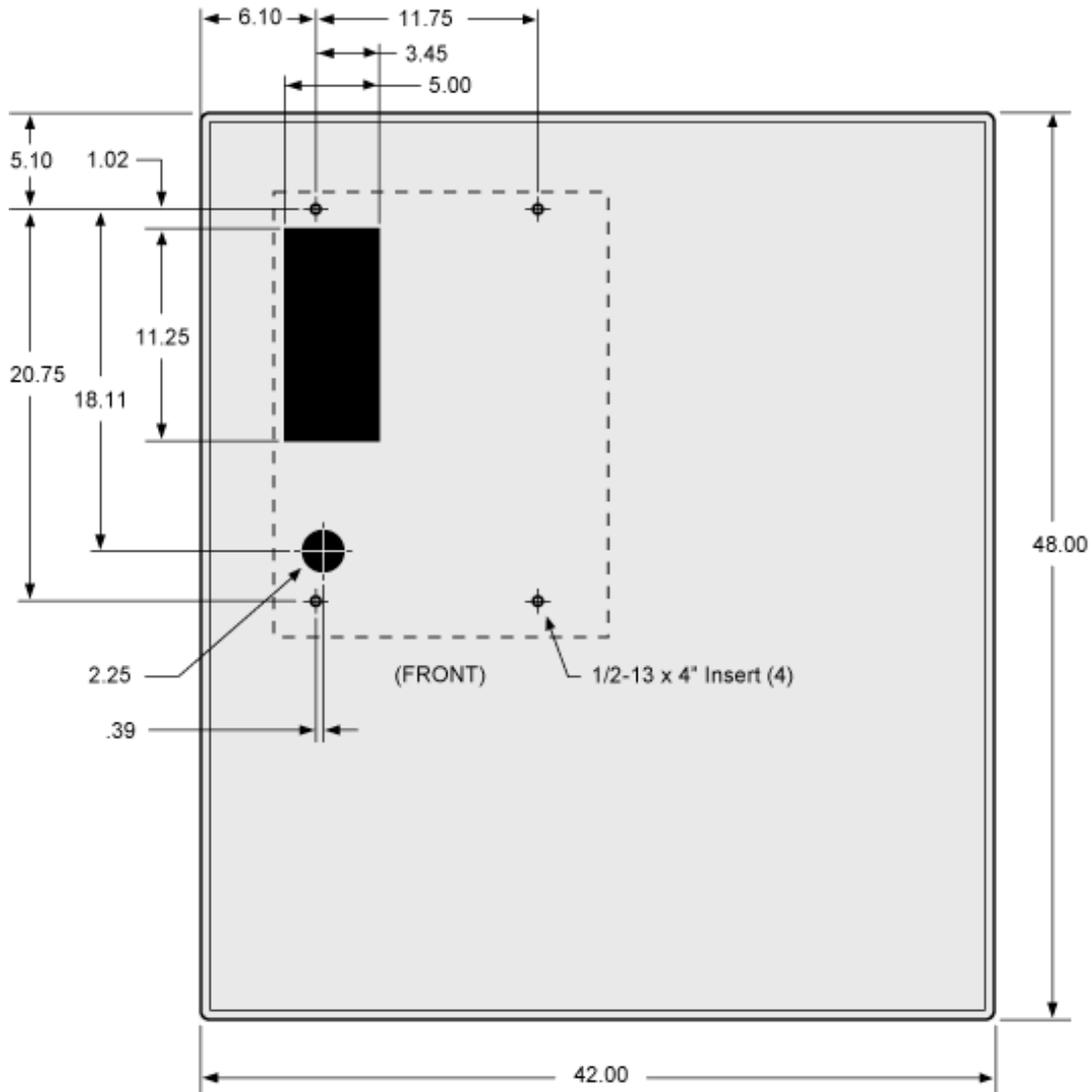
Pad Size
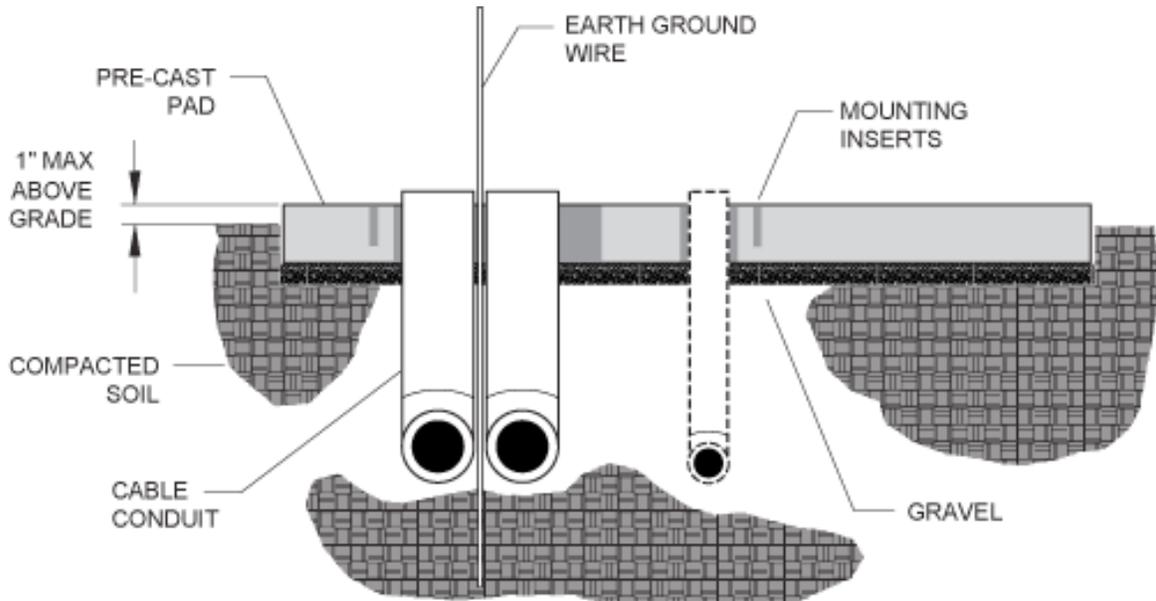
Pad Cross-Section
(from left side)
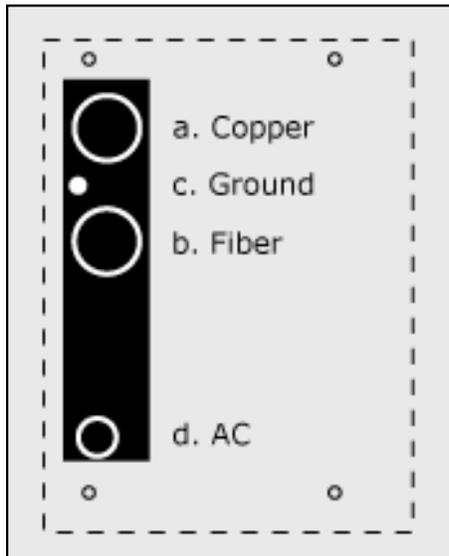
Conduit Locations

For proper cable entry into the cabinet, place conduit into the following locations.

a. Conduit for outside plant cable (copper).
b. Conduit for outside plant cable (fiber).
c. Earth ground wire.
d. Conduit for AC cable.

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Preparing the Site

Prepare the site for installation of a pre-cast pad. Some pads may require custom preparations. Refer to the manufacturer's instructions for more information.

A general practice is described below for reference. Adapt the instructions as needed for local requirements, practices, or conditions.

DANGER! Do not place outside plant cables into conduits at the pad site before installing the pre-cast pad. Attempting to install a pre-cast pad over existing cables becomes hazardous if a person must reach underneath a lowered pad to feed cables through its entry cutout.

To prepare the site for pad installation

Step 1: Excavate the pad area. Dig a foundation hole six inches deep with a perimeter measuring at least 42 x 48 inches.

Step 2: Grade and compact the excavated surface until it is firm and level.

Step 3: Trench out conduit paths through the foundation hole from the cable feeder location. Refer to the pad drawings for conduit locations.

Step 4: Place the cable conduits into the conduit trench. Refer to the pad guidelines for conduit sizes and locations.

Step 5: Route the earth ground wire through the conduit trench (from the ground electrode).

Step 6: Place gravel into the foundation hole to create a level base. The gravel layer should be at least two inches deep, compacted and leveled.

Note: When installed, the pad should stand at least one inch above grade. Adjust the compaction and gravel depth accordingly, based on the pad height.

Installing a Pre-Cast Pad

Install the pre-cast pad according to the manufacturer's instructions (typically supplied with the pad).

A general installation practice is described below for reference. Adapt the instructions as needed for local requirements, practices, or conditions.

WARNING! The pre-cast concrete pad is extremely heavy. Do not place any part of your body under the pad during lifting. Handle with care to avoid personal injury or damage to the pad.

To install a pre-cast pad

Step 1:   Transport the pre-cast pad to installation site.

Step 2:   Using a suitable lifting device (such as a backhoe equipped with lifting slings), lift the pad into position above the gravel base inside the foundation hole.

Step 3:   Lower the pad onto the gravel base, allowing the conduits to pass through the cutout in the pad as it descends.

Step 4:   Adjust the pad positioning on the gravel base until it is stable and level.

Step 5:   Pull the earth ground wire through the cutout in the pad, allowing at least four feet of wire to extend above the top of the pad.

Step 6:   Backfill and grade around the pad perimeter with soil to secure the pad in place.

Step 7:   Verify that the pad remains level. Adjust as required.

Step 8:   Trim the cable conduits to a height no more than 4 inches above the pad.

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Installing a Pole-Mount Kit: Local Power with 60 Ah Battery Base(s)

A vertical wooden pole or post can provide a useful mounting structure for elevating the cabinet above the ground, particularly in areas subject to severe surface conditions such as flooding, mud, or heavy snow. Pole mounting also allows cabinets to be installed in locations where the required terrestrial right-of-way may be unavailable.

Use the Clearfield pole-mounting kit to provide the mounting fixture. The pole-mounting kit consists of a support frame that attaches directly to the pole, including a base platform that provides exact entry locations for the cable conduits. You can install the mounting kit onto an existing pole, or you can install a new pole at the installation site to support the cabinet. Installing the pole-mounting kit requires trenching cable conduit to the pole location and installing the mounting fixture on the pole.

FAC 400 pole-mount kits are available for local power cabinet configurations with a single or dual 60 Ah battery base.

Pole Mounting Guidelines

When installing the FAC 400 pole-mount kit for local power configurations with a 60 Ah battery base(s), observe the following guidelines. Refer to the pole-mount drawings for guidance.

Guidelines
Follow these guidelines to ensure proper mounting support for the cabinet. Adjust for local conditions or practices as required.

- To use a round pole; the pole must be 8 to 14 inches in diameter.
- To use a square post; the post thickness must be 8 x 8 inches (measures 7.5 wide by 7.5 inches deep).
- The top of the base platform must be a minimum of 18 inches above the ground for both single and dual 60 Ah battery base configurations.
- The pole/post must stand a minimum height above grade to support the kit, as required for the cabinet configuration:

    - **Single 60 Ah battery base**: The pole must stand at least 75 inches above ground.
    - **Dual 60 Ah battery base**: The pole must stand at least 86 inches above ground.

    Note: The minimum heights assume a distance of 18 inches above the ground to the top of the base platform. To elevate the cabinet higher than 18 inches above ground, use a pole with sufficient additional height.

- The pole/post must be vertically plumb.
- The pole/post must support a minimum load weight, as required for the cabinet configuration:

    - **Single 60 Ah battery base:** 450 lbs
    - **Dual 60 Ah battery base:** 680 lbs

    Note: These weights include a fully loaded cabinet.

- Use the Clearfield pole-mount kit to provide the mounting fixture, brackets, and hardware, and conduit entry locations.
- The pole-mount kit includes hardware (six 5-inch lag screws, four 18.75-inch threaded rods) to attach the mounting assembly to the pole. You can use a different, user-supplied hardware option instead per local practice (such as clear-through bolts).
- Use 2.5-inch conduit (maximum) for outside plant cables. See drawing below for entry locations.
- Use 1-inch conduit (maximum) for AC cable (local power applications only). See drawing below for entry location.
- Include pull cords in all cable conduits.

Pole-Mount Drawings

Use the following drawings for reference during site preparation (round pole shown). Actual pole dimensions may vary by site. Defer to local practice where required.
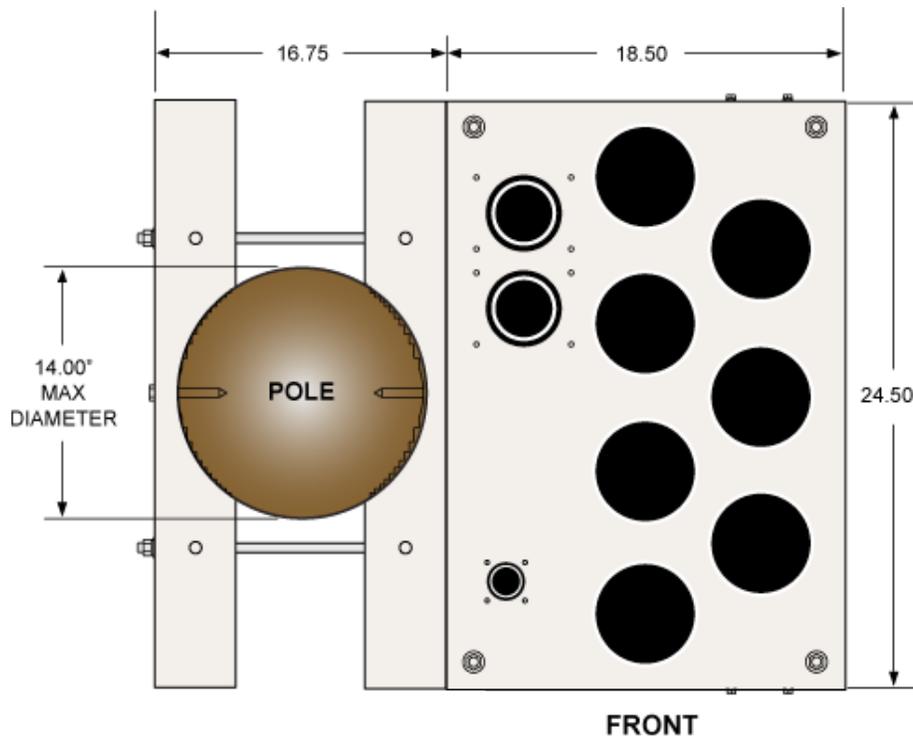
Top View of Mounted Assembly

Conduit Locations

For proper cable entry into the cabinet, place conduit into the following locations.

> **a.** Conduit for outside plant cable (copper).
> **b.** Conduit for outside plant cable (fiber) and the earth ground wire.
> **c.** Conduit for AC cable.

Use the Clearfield pole-mount kit to provide precise conduit orientation.

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CLEARFIELD

POLE

FAC 400 (Front)

54.31"

72.31"

60 Ah Battery Base

18" ABOVE GROUND ELEVATION (MINIMUM)

CABLE CONDUIT

EARTH GROUND WIRE

COMPACTED SOIL

POLE

FAC 400 (Front)

65.62"

83.62"

60 Ah Battery Base

60 Ah Battery Base

18" ABOVE GROUND ELEVATION (MINIMUM)

CABLE CONDUIT

EARTH GROUND WIRE

COMPACTED SOIL
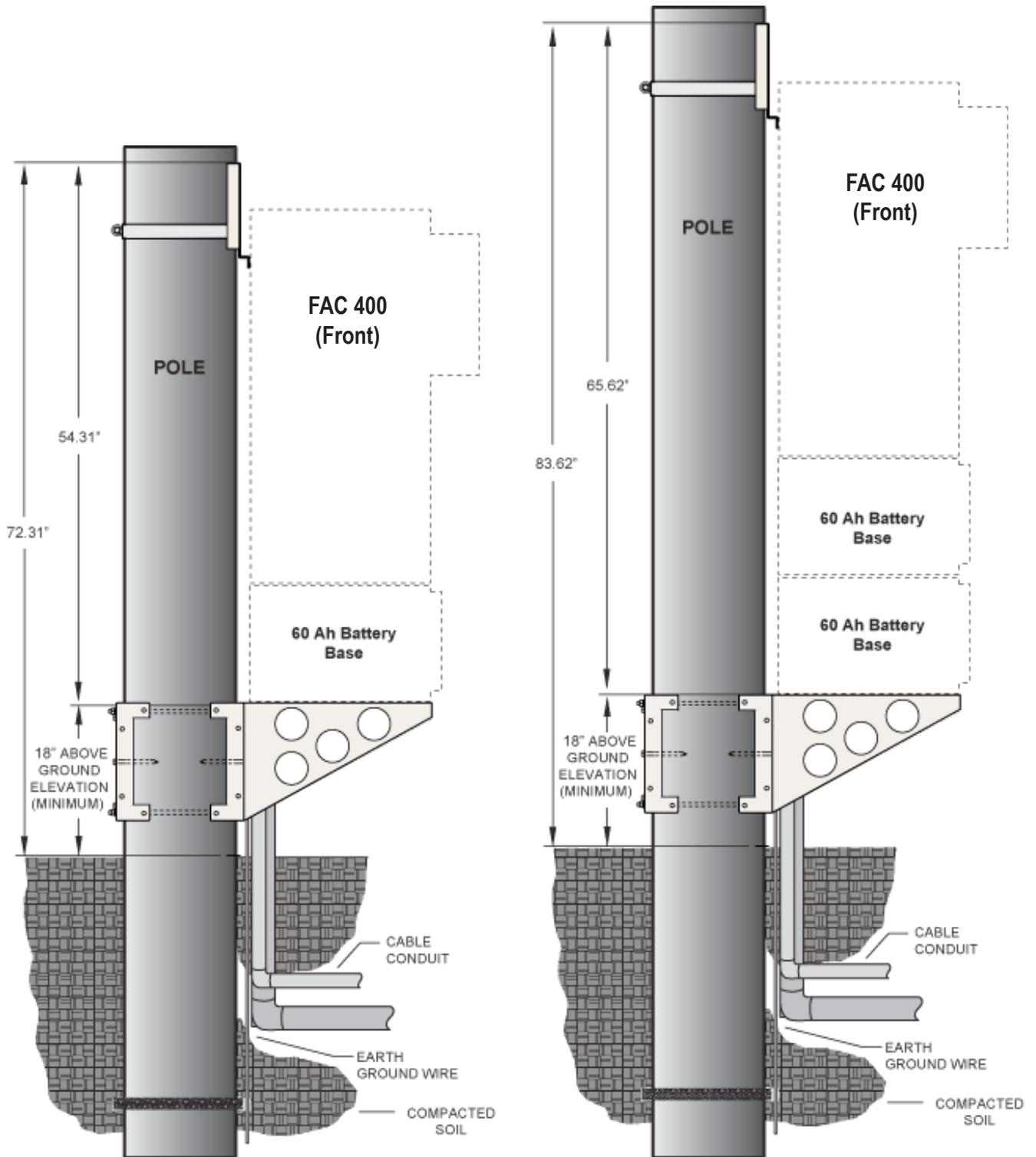
Minimum Pole Height
(single and dual 60 Ah battery base configurations)

Preparing the Site

Prepare the site for installation of a pole-mounting kit. A general practice is described below for reference. Adapt the instructions as needed for local requirements, practices, or conditions.

To prepare the site for a pole mount installation

Step 1: At the installation site, verify the following:
- The pole is installed and plumb.
- The pole meets the cabinet mounting requirements.

Step 2: Trench out conduit paths to the pole from the cable feeder location.

Step 3: Place the cable conduits into the conduit trench. At the pole, allow the conduit to extend above ground to the approximate height of the base platform. Refer to the pole mounting guidelines for conduit sizes and locations.

Step 4: Route the earth ground wire through the conduit trench (from the ground electrode). Pull six feet of wire above ground and position it adjacent to the pole.

Step 5: Backfill the conduit trench with soil.

Installing the Pole-Mount Kit

Install the Clearfield pole-mount kit for local power configurations with a 60 Ah battery base(s) onto a pole or post, as described below. Adapt the instructions as needed for local requirements, practices, or conditions.

The primary components of the kit are identified at right.

Note: The front and rear mounting brackets are interchangeable.

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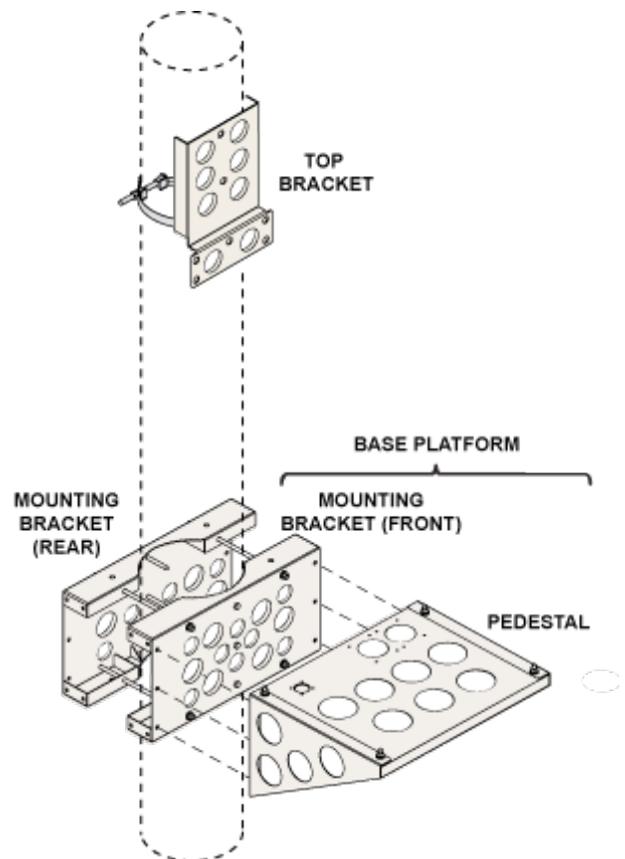
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To install the pole mounting fixture

Step 1:   Attach the front mounting bracket to the pole as follows:

> *Note: Clearfield recommends using two people to perform this task: One to hold the mounting bracket in position against the pole, and one to install the mounting hardware.*

a. Determine how high above ground to elevate the cabinet. Mark a height at the center of the pole, two inches below where the top surface of the base platform will sit.

> *Note: The top of the base platform must be at least 18 inches above the ground.*

b. Drill a 3/8-inch pilot hole into the pole at the marked height location.

c. Position the front mounting bracket against the pole, aligning the top bracket hole with the drilled hole.

d. Install (1) 1/2 x 5-inch lag screw and 1/2-inch flat washer to attach the front bracket to the pole. Verify that the bracket is level, and then tighten the screw.

e. Drill (2) 3/8-inch pilot holes into the pole through the remaining holes in the center of the front bracket.

f. Verify that the bracket is level, and then install (2) 1/2 x 5-inch lag screws and flat washers into the pilot holes to attach the bracket to the pole. Tighten the screws to secure the bracket in place.

g. Install (4) 1/2 x 18.75-inch threaded rods through the front bracket from behind. Loosely install a 1/2-inch flat washer, lock washer, and nut onto each rod to secure it in place.

> *Note: The upper right rod must not protrude more than 3/4-inch past the tightened nut to prevent interference with cable entry.*

Step 2: Attach the rear mounting bracket to the pole as follows:

a. Position the rear mounting bracket against the oppo site side of the pole, fitting the (4) threaded rods through the counterpart holes in the rear bracket.

b. Loosely install a 1/2-inch flat washer, lock washer, and nut onto each rod.

c. Verify that the bracket is level, and then drill (3) 3/8-inch pilot holes into the pole through the holes in the center of the rear bracket.

> *Note: Remove the bracket and deepen the pilot holes, if needed.*

d. Install (3) 1/2 x 5-inch lag screws (with 1/2-inch flat washers) into the pilot holes to attach the rear bracket to the pole. Tighten the screws to secure the bracket in place.

e. Verify that the mounting brackets are level, and then tighten all hardware to secure in place.

Step 3: Attach the pedestal to the front mounting bracket as follows:

a. Position the pedestal against the front bracket, as shown below.

b. Attach the pedestal to the bracket using (6) 1/2-inch hex head screws, (6) flat washers, and (6) lock washers.

c. Verify that the fixture is level, and then tighten all hardware to secure in place.
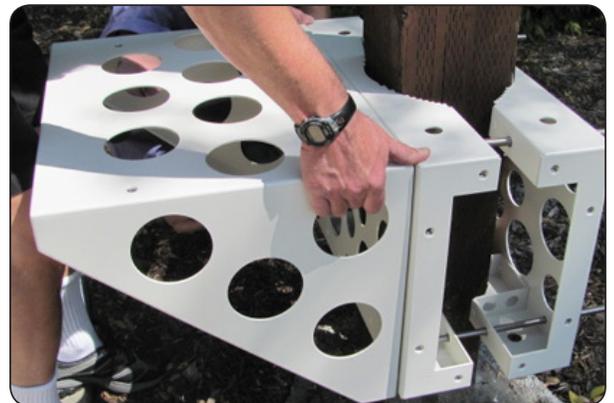
> *Note: Clearfield recommends using cold-shrink tubing on the conduit entry ducts to seal the conduit entry. If any of the individual conduit entry ducts are not used, remove and replace the duct plates with blank plates from the installation kit.*

Perform the following task only after the cabinet is onsite and ready to install on the mounting fixture.

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To install the top bracket

Step 1:   On the left side of the cabinet, remove the five plastic caps covering the bracket mounting holes.

Step 2:   Attach the top bracket to the cabinet as follows:

a. Position the top bracket against the left cabinet wall, aligning the bracket holes with the counterpart holes on the cabinet.

b. Insert (5) 1/4-inch hex head screws (with flat and lock washers) into the bracket holes.

c. Tighten the screws completely to secure the bracket in place.

Step 3:   Install the cabinet onto the mounting fixture.

Perform the remaining step only after the cabinet is installed on the mounting fixture.

Step 4:   Attach the top bracket to the pole as follows:

a. While holding the top bracket against the pole, drill (2) 3/8-inch
    pilot holes into the pole through the holes in the bracket.

b. Install (2) 1/2 x 5-inch lag screws (with 1/2-inch flat washers) into the pilot holes. Tighten the bolts completely to secure the bracket in place.

c. Install the steel bolt-a-band through the slots in the top bracket, around the pole, and back into the band retainer.

d. Pull the band tight (to 20 ft-lbs.) and tighten the nut on the bolt to secure it in place as shown below.
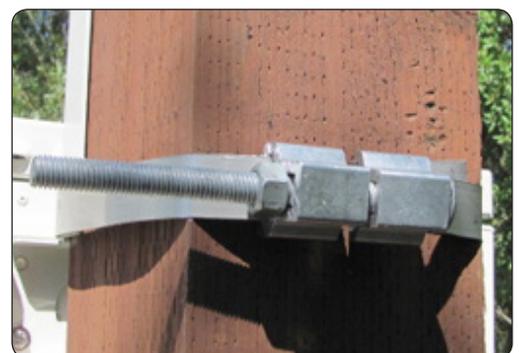
Installing a Wall-Mount Kit: Local Power with 60 Ah Battery Base(s)

A sturdy, plumb wall or H-frame can provide an effective mounting structure for elevating the cabinet above the ground, particularly in areas subject to severe surface conditions such as flooding, mud, or heavy snow. Wall mounting also allows cabinets to be installed in locations where the required terrestrial right-of-way may be unavailable.

Use the Clearfield wall-mount kit to provide the mounting fixture. The wall-mount kit consists of a support frame that attaches directly to the wall or H-frame, including a base platform that provides exact entry locations for the cable conduits.

You can install the mounting kit onto an existing wall, or you can construct an H-frame at the installation site to support the cabinet. Installing the wall-mount kit requires trenching cable conduit to the site and installing the mounting fixture on the wall or H-frame.

FAC 400 wall-mount kits are available for local power cabinet configurations with a single or dual 60 Ah battery base.

Wall/H-Frame Mounting Guidelines

When installing the wall-mount kit, observe the following guidelines. Refer to the wall-mount drawings for guidance.

Guidelines

Follow these guidelines to ensure proper mounting support for the cabinet. Adjust for local conditions or practices as required.

- The pole/post must be vertically plumb.
- The pole/post must support a minimum load weight, as required for the cabinet configuration:

  - **Single 60 Ah battery base**: 450 lbs
  - **Dual 60 Ah battery base**: 680 lbs

  Note: These weights include a fully loaded cabinet.

- The top of the base platform must be a minimum of 18 inches above the ground for both single and dual 60 Ah battery base configurations.
- The wall or H-frame must stand a minimum height above the ground, as required for the cabinet configuration:

  - **Single 60 Ah battery base:** The wall or H-frame must stand at least 75 inches above ground.
  - **Dual 60 Ah battery base:** The wall or H-frame must stand at least 86 inches above ground.

  Note: The minimum heights assume a distance of 18 inches above the ground to the top of the base platform. To elevate the cabinet higher than 18 inches above ground, use a wall or H-frame with sufficient additional height.

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- Use the Clearfield wall-mount kit to provide the mounting fixture and conduit entry locations.
- The Clearfield wall-mount kit provides assembly hardware for a wall or wooden H-frame, however you must provide the hardware to attach the mounting fixture, as appropriate for your site requirements. For example, attaching the fixture to a concrete wall requires different hardware (anchors). Follow local codes and practices to supply the required mounting hardware.
- Use cold-shrink tubing on the conduit entry ducts to seal the conduit entry.
- Use 4-inch conduit (maximum) for outside plant cables. See figure for entry locations.
- Use 2.5-inch conduit (maximum) for AC cable. See figure for entry location.
- Include pull cords in all cable conduits.
- For H-frames, Clearfield recommends using (2) 4" x 4" x 4.0' horizontal members on the top and (3) 4" x 4" x 4.0' horizontal members on the bottom to support the fixture, positioned for the following mounting hardware locations:

| Horizontal Spacing	Vertical Spacing
Top bracket: 11 inches on centers	**To bottom bracket's upper hole set:** Single battery base: 54.56 inches on centers Dual battery base: 65.87 inches on centers
Bottom bracket: 28 inches on centers	**To bottom bracket's lower hole set:** Single battery base: 68.56 inches on centers Dual battery base: 79.87 inches on centers

## Wall-Mount Drawings

Use the following drawings for reference during site preparation. Wall dimensions may vary by site. Defer to local practice where required.
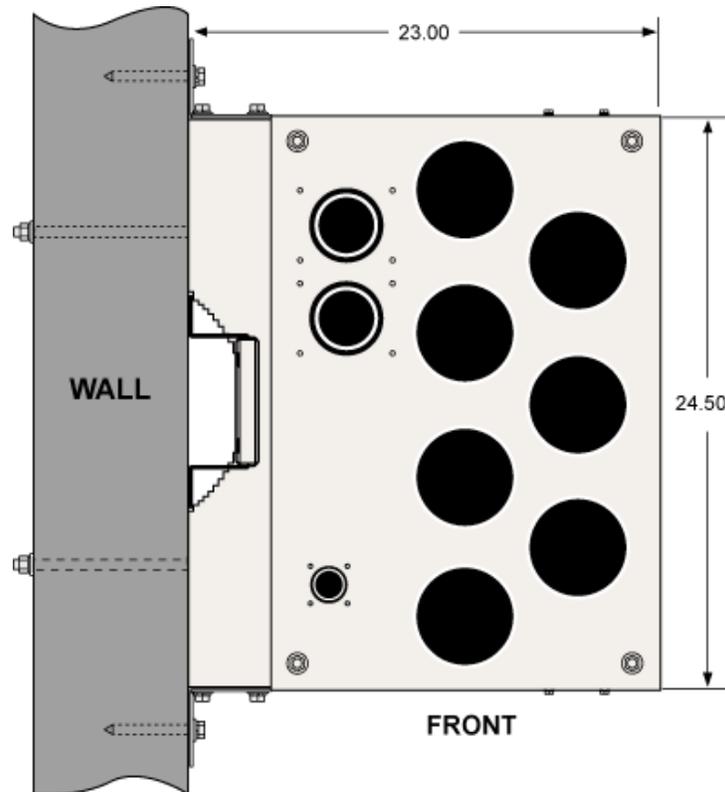
**Top View of Mounted Assembly**

Conduit Locations

For proper cable entry into the cabinet, place conduit into the following locations.

a. Conduit for outside plant cable (copper).
b. Conduit for outside plant cable (fiber) and the earth ground wire.
c. Conduit for AC cable.

Use the Clearfield pole-mount kit to provide precise conduit orientation.

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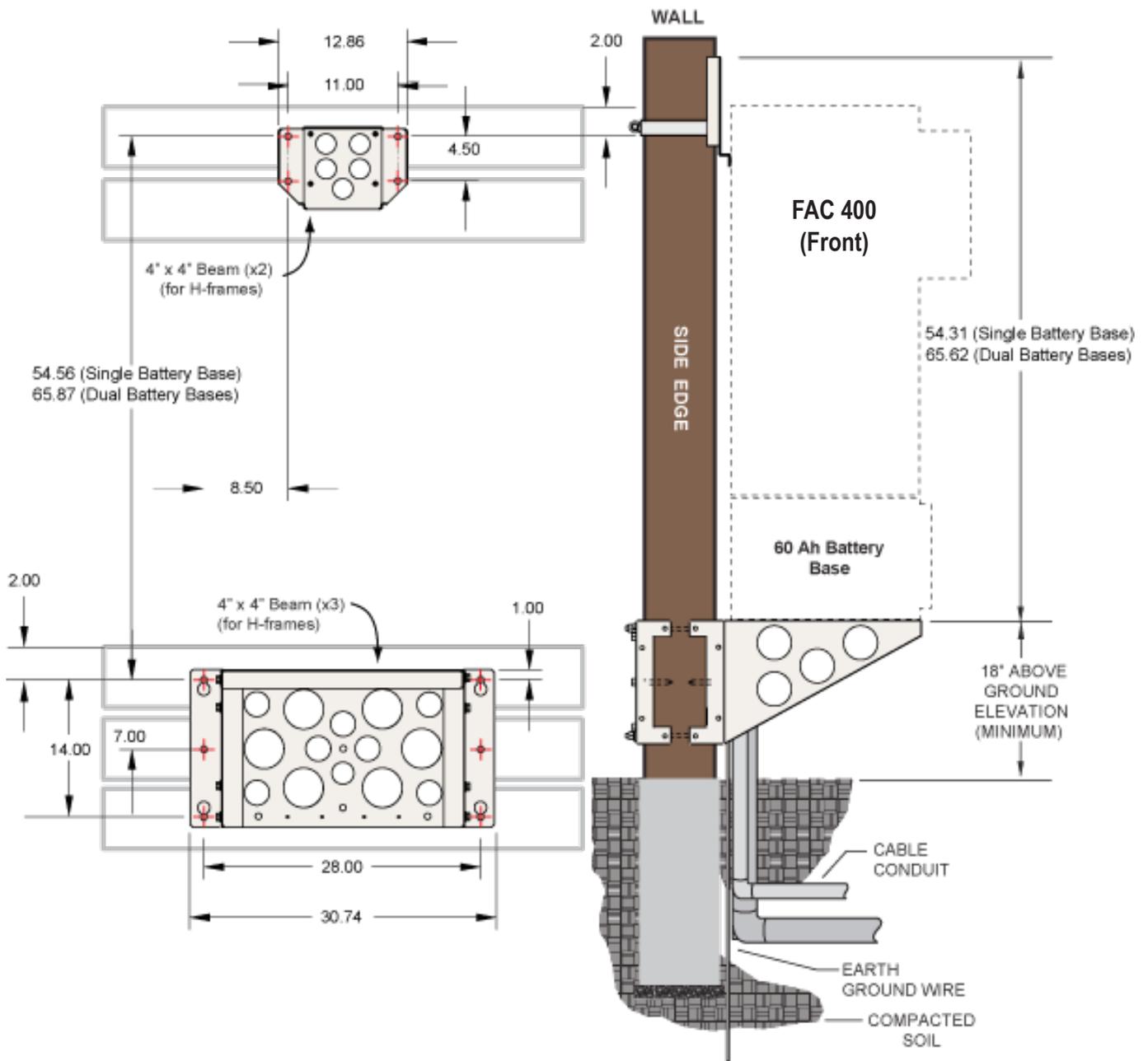
Wall-Mount Kit Dimensions

Preparing the Site

Prepare the site for installation of a wall-mount kit. A general practice is described below for reference. Adapt the instructions as needed for local requirements, practices, or conditions.

To prepare the site for a wall mount installation

Step 1: At the installation site, verify the following:
- The wall or H-frame is installed and plumb.
- The wall or H-frame meets the cabinet mounting requirements.

Step 2: Trench out conduit paths to the wall or H-frame from the cable feeder location. Place the cable conduits into the conduit trench. At the wall or H-frame, allow the conduit to extend above ground to the approximate height of the base platform. Refer to the wall mounting guidelines for conduit sizes and locations.

Step 3: Route the earth ground wire through the conduit trench (from the ground electrode). Pull six feet of wire above ground and position it adjacent to the wall or H-frame. Backfill the conduit trench with soil.

Installing the Wall-Mount Kit

Install the Clearfield wall-mount kit onto a wall or H-frame as described below. Adapt the instructions as needed for local requirements, practices, or conditions.
The primary components of the kit are identified at right.

TOP BRACKET and ADAPTER

BASE PLATFORM
MOUNTING BRACKET
PEDESTAL

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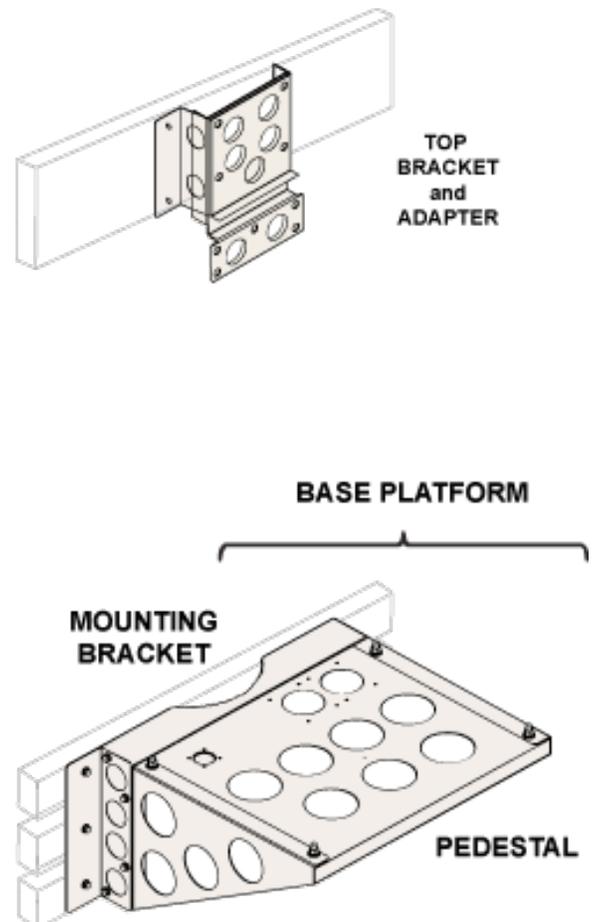
To install the wall mounting fixture

Step 1:   Attach two mounting ears to the pedestal using (8) 1/2-inch hex head screws, (8) flat washers, and (8) lock washers (four sets per side).
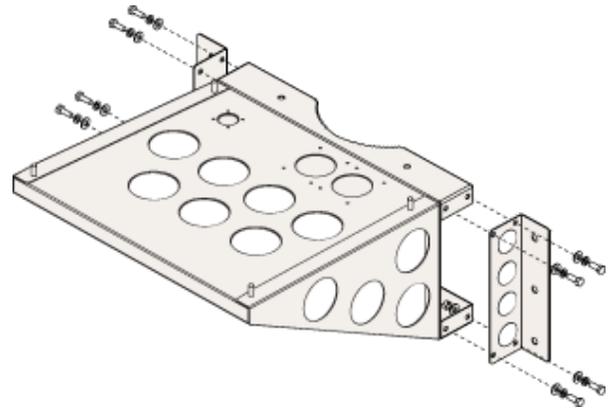
Step 2:   Attach the base platform to the wall or H-frame as follows:

Note: Clearfield recommends using two people to perform this task: One to hold the base platform in position against the wall or H-frame, and one to install the mounting hardware.

a. For wall-mount installations, determine how high above ground to elevate the cabinet. Mark the identified height on the wall. For H-frame installations, mark the higher of the three bottom beams at 2-inches above the center line.

Note: The identified height is where the top surface of the base platform will sit. This height must be at least 18 inches above the ground.

b. Position the base platform against the wall or frame, with its top edge at the marked height. If necessary, arrange the cable conduits underneath the platform into the appropriate entry ducts.

c. Verify that the base platform is level.

d. While holding the platform in position, drill (6) 3/8-inch pilot holes into the wall or frame through the holes in the mounting ears (three holes per side).

e. Install the appropriate mounting hardware into the pilot holes to attach the bracket to the wall or frame. For example, use 1/2x 3-inch lag screws and 1/2-inch flat washers for wood walls or H-frames, or user-supplied concrete anchors for brick or stone walls.

Note: Clearfield recommends using cold-shrink tubing on the conduit entry ducts to seal the conduit entry. If any of the individual conduit entry ducts are not used, remove and replace the duct plates with blank plates from the installation kit.

Step 3:   Verify that the base platform is level, and then tighten all hardware to secure the assembly in place.

**Perform the following task only after the cabinet is onsite and ready to install on the mounting fixture.**

To install the top bracket

Step 1: On the left side of the cabinet, remove the five plastic caps covering the bracket mounting holes.

Step 2: Attach the top bracket to the cabinet as follows:

a. Position the top bracket against the left cabinet wall, aligning the bracket holes with the counterpart holes on the cabinet.

b. Insert (5) 1/4-inch hex screws (with flat and lock washers) into the bracket holes.

c. Tighten the screws completely to secure the bracket in place.
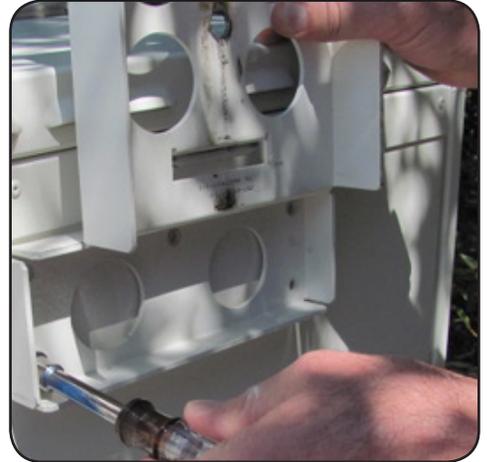
Step 3: Attach the adapter to the top bracket as follows:

a. Place the adapter over the top bracket, aligning the (4) holes with the counterpart holes on the bracket.

b. Insert (4) 1/4-inch hex screws (with flat and lock washers) into the adapter holes.

c. Tighten the screws completely to secure the adapter in place.
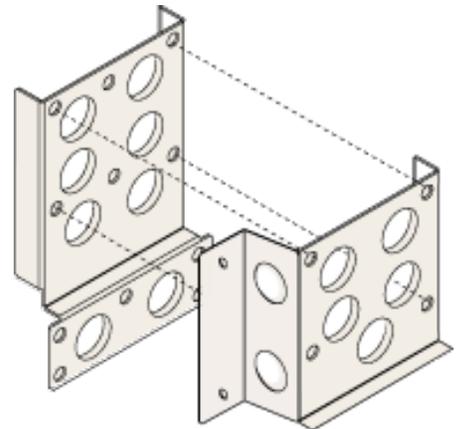
Step 4: Install the cabinet on the mounting fixture.

Perform the remaining steps only after the cabinet is installed on the mounting fixture.

Step 5: Attach the adapter and top bracket to the wall or H-frame as follows:

a. While holding the adapter and top bracket against the wall or frame, drill (4) 3/8-inch pilot holes into the wall or frame through the holes in the adapter (two holes per side).

b. Install (4) 1/2 x 3-inch lag screws (with 1/2-inch flat washers) into the pilot holes. Tighten the bolts completely to secure the bracket in place.

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Installing a Foundation Vault

A foundation vault constructed of composite materials provides a flexible cabinet mounting option. Because foundation vaults stand approximately three feet tall, you can either bury the vault below ground to provide a pad-like mounting fixture with underneath access for maintenance and splice case storage, or you can install the vault above ground to serve as a riser in areas subject to heavy snow, mud, or flooding.

Installing a foundation vault requires excavating the installation site, trenching cable conduit, creating a gravel foundation base, and placing the vault on the foundation base.

Foundation vaults ship configured with knockouts for conduit entry and mounting fixtures (threaded inserts) for anchoring the cabinet to the top of the vault. Specific features and dimensions vary by manufacturer and model. Contact your sales representative for Clearfield -certified supplier information.

Foundation Vault Requirements

When preparing for and installing a foundation vault, observe the following guidelines. Refer to the vault drawings for guidance.

Guidelines
Follow these guidelines to ensure proper foundation support for the cabinet. Adjust for local conditions or practices as required.

*   Foundation vaults have a typical height of 36 inches, the depth of which to bury can vary:

    *   When serving as an above-ground riser, install the vault at least 6 inches below-grade (typical).
    *   When serving as a pad-like fixture, install the vault with a minimum of 1 inch above-grade exposure (typical).

*   Use 2.5-inch conduit (maximum) for outside plant cables. See drawing below for entry locations.
*   Use 1-inch conduit (maximum) for AC cable. See drawing below for entry location.
*   Include pull cords in all cable conduits.

Refer to the vault manufacturer's instructions for additional guidelines

Vault Drawings

Use the following drawings for reference during site preparation. Actual pad dimensions may vary by manufacturer. Refer to the manufacturer's documentation for more information.
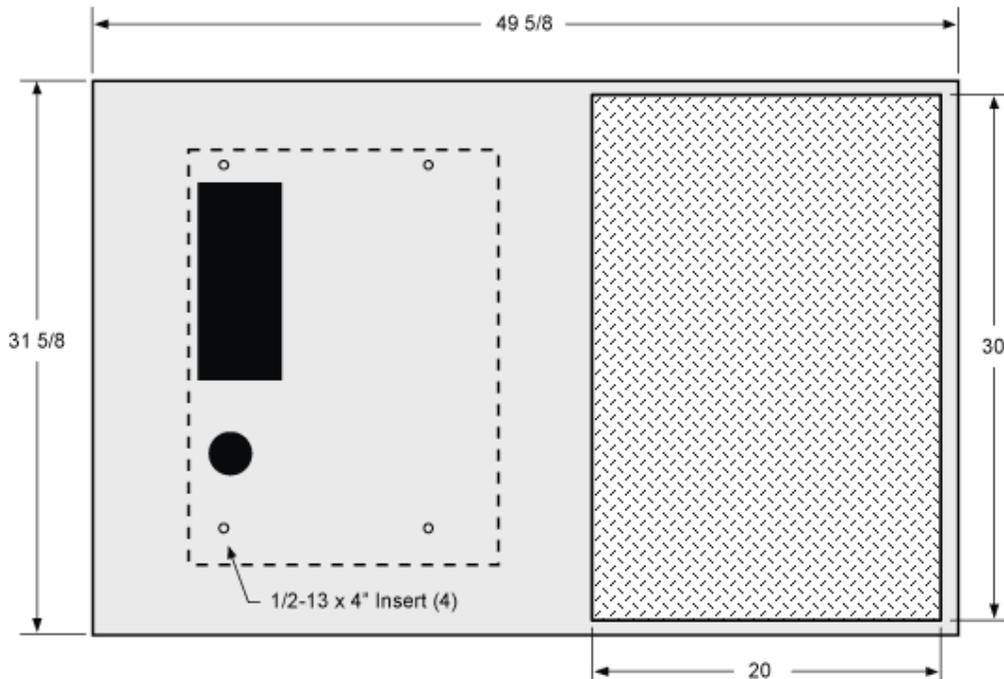
Typical Foundation Vault Size
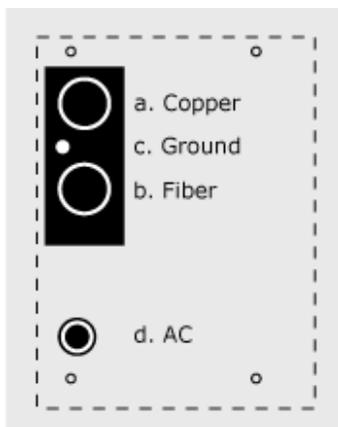
For proper cable entry into the cabinet, place conduit into the following locations.

a. a. Conduit for outside plant cable (copper).
b. b. Conduit for outside plant cable (fiber).
c. c. Earth ground wire.
d. d. Conduit for AC cable.

Note: Cable entry through the vault's top mounting surface requires punching out the knockout area with appropriate tools.

Conduit Locations
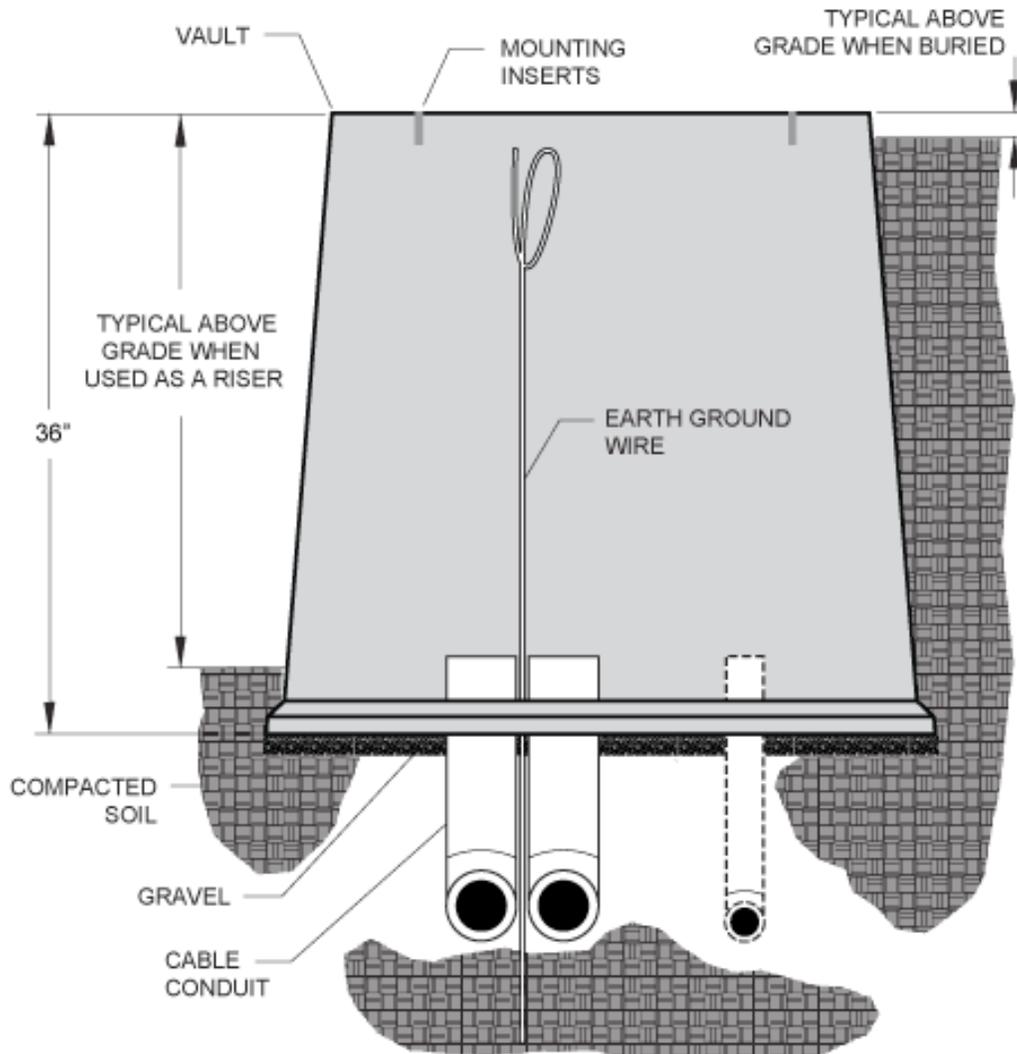
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**Vault Cross-Section
(from left side)**

Preparing the Site

Prepare the site for installation of a foundation vault. Some vaults may require custom preparations. Refer to the manufacturer's instructions for more information.

A general practice is described below for reference. Adapt the instructions as needed for local requirements, practices, or conditions.

To prepare the site for foundation vault installation

Step 1: Excavate the pad area. Dig a foundation hole to the required depth (six inches deep minimum), with a perimeter measuring at least 50 x 32 inches.

Step 2: Grade and compact the excavated surface until it is firm and level.

Step 3: Trench out conduit paths through the foundation hole from the cable feeder location.

Step 4: Place the cable conduits into the conduit trench. Refer to the vault guidelines for conduit sizes and locations.

Step 5: Route the earth ground wire through the conduit trench (from the ground electrode).

Step 6: Place gravel into the foundation hole to create a level base. The gravel layer should be at least one inch deep, compacted and leveled.

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Installing the Foundation Vault

Install the foundation vault according to the manufacturer's instructions (typically supplied with the vault).

A general installation practice is described below for reference. Adapt the instructions as needed for local requirements, practices, or conditions.

WARNING! The foundation vault may be very heavy. Do not place any part of your body under the vault during lifting. Handle with care to avoid personal injury or damage to the vault.

To install a foundation vault

Step 1:   Transport the foundation vault to installation site.

Step 2:   Using a suitable lifting device, lift the vault into position above the foundation hole.

Step 3:   Lower the pad onto the gravel base, making sure the conduits and earth ground wire pass inside the vault as it descends.

Step 4:   Adjust the vault positioning on the gravel base until it is stable and level.

Step 5:   Backfill and grade around the vault perimeter with soil to secure it in place.

Step 6:   Verify that the vault remains level. Adjust as required.

Chapter 4: Installing the Cabinet

This chapter describes how to install the Clearfield FAC 400 cabinet onto its permanent mounting location.

Topics Covered

This chapter covers the following topics:
- Installing a ground circuit at the installation site
- Unpacking the cabinet from its shipping crate.
- Operating the cabinet doors.
- Preparing the cabinet for installation.
- Installing the cabinet onto a concrete pad
- Installing the cabinet on a wall or H-frame
- Installing the cabinet onto a pole.
- Installing the cabinet onto a foundation vault.
- Replacing the cabinet lifting detail brackets.

Unpacking the Cabinet

The cabinet ships from the factory on a wooden pallet and is enclosed in cardboard crating for protection. The cabinet is secured to the pallet by four bolts.

Do not remove the cabinet from the pallet until after it has been delivered to the installation site. However, you can remove the cardboard crating to inspect the cabinet at the staging area, if required. Clearfield recommends keeping the protective packaging in place for transportation.

When transporting the cabinet to the installation site, strap down the cabinet securely to the truck or trailer to prevent shifting or tipping. Unpack the cabinet at the installation site.

To unpack the cabinet

Step 1: After the cabinet has been delivered to the installation site, remove the cardboard packaging from the cabinet.

Step 2: Review the packing list to verify that all shipped materials are present.

Step 3: Discard the packaging material.

Step 4: Retrieve the telco hex key tied or taped to one of the cabinet doors.

Note: Use the supplied telco hex key to unlock the cabinet doors. See Operating Cabinet Doors for instructions.

Note: Do not remove the bolts securing the cabinet to the pallet until the cabinet is ready for placement.

Operating Cabinet Doors

Cabinet Doors

The cabinet has hinged front and side doors, each equipped with two telco hex-pin latches and a padlock hasp for security. Open and close doors using a Clearfield -supplied telco hex key.

Each door is equipped with an alarm switch that monitors the position of the door. When a door on an in-service cabinet is opened, an intrusion alarm reports through the equipment. Pull the switch plunger to disable the alarm reporting while you are working on the cabinet. The alarm switch is located at the upper right corner of the door frame.

To open a cabinet door

Step 1:   Insert the telco hex key into the door's upper hex-pin latch.

Step 2:   Turn the key counter-clockwise to disengage the latch.

Step 3:

Repeat Steps 1 and 2 to disengage the lower latch.

Step 4:

Swing the door open until the wind brace engages.

Step 5:

On a powered cabinet, pull the alarm switch plunger to disable reporting of the intrusion alarm.
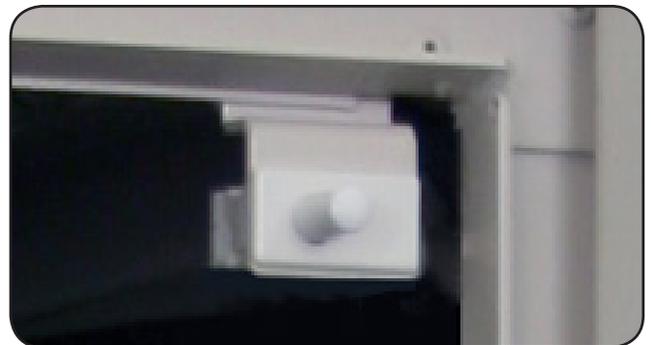
Note: Do not rotate the switch plunger. Rotating the plunger may damage the switch.

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To close a cabinet door

Step 1:   Push up on the wind brace to disengage it.

Step 2:   Swing the door closed.

Step 3:   Insert the telco hex key into the door's upper latch.

Step 4:   While holding the door firmly closed, turn the key clockwise to engage the latch.

Step 5:   Repeat Steps 3 and 4 to engage the lower latch.

Battery Compartment Door

Locally-powered cabinets have a battery compartment with a removable access door. The battery compartment door is secured at the top by a telco hex-pin latch, and it has a padlock hasp for security. Use a Clearfield -supplied telco hex key to open and close the door.

To open a battery compartment door

Step 1:   Insert the telco hex key into the door's hex-pin latch.

Step 2:   Turn the key counter-clockwise to disengage the latch.

Step 3:   Tilt and pull the door panel forward, away from the cabinet.

To close a battery compartment door

Step 1:   Insert the tabs on the back of the door onto the bottom lip of the door frame. Tilt and push the door panel closed.

Step 2:   Insert the telco hex key into the door latch.

Step 3:   While holding the door firmly closed, turn the key clockwise to engage the latch.

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Preparing the Cabinet for Installation

Complete the following preparations before installing the cabinet.

To prepare the cabinet for installation

Step 1: Open the front and side cabinet doors.

Step 2: From the side compartment, remove the isolation mat and the bag containing the installation hardware. Set them aside for use during installation.

Step 3: Prepare the battery compartment as follows:

a. Remove the battery compartment door.

b. Remove the optional battery heater, if present:
- Disconnect the power cord from the supply lead on the left compartment wall.
- Remove the battery heater from the battery tray. Set it aside for later re-installation.

Step 4: Prepare the AC load center as follows:

a. Remove the four screws from the AC load center's front (breaker) panel, and then remove the panel from the load center housing. Retain the hardware for re-installation.

b. Loosen the coupling nut at the bottom of the housing to allow AC wires to pass into the load center.

Step 5: Remove the nuts from the four bolts securing the cabinet to the pallet:
Local power configuration: The bolts are located at the bottom four corners of the battery compartment.

Step 6: On the cable entry ducts, trim the rubber cone gaskets to the OSP cable diameter that will enter the cabinet (when installed). Be careful not to trim too much, as the gaskets should fit snugly around the cable.
When the tasks above are complete, the cabinet is ready for installation.

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Installing the Cabinet on a Concrete Pad

The FAC 400 cabinet's compact design allows you to install it without the use of heavy lifting machinery. Clearfield recommends using two people to install the cabinet (to lift, move, and lower the cabinet onto the pad).

If the required manpower is not available, or local practice requires the use of a lifting device, the cabinet is equipped with two lifting details on which to attach slings to lift and move the cabinet using a boom crane, derrick, or backhoe. Use wire rope slings and appropriately rated connecting links or lifting hooks. The lifting device and slings you use must be capable of lifting at least a 200 lb. working load. When using a lifting device to place the cabinet, follow these guidelines:

*   Check the two lifting details on top of the cabinet to ensure that they are securely attached.
*   Attach the lifting slings to the lifting device; attach the other sling ends to the cabinet lifting details with connecting links or hooks.
*   Do not disconnect the slings from the cabinet until after it rests securely on the pad.

⚠️ **CAUTION!** Installing the cabinet requires safe handling to ensure that no injury to personnel or damage to the cabinet occurs. Do not place any part of your body under the load during lifting. Follow local safety practices for lifting and moving heavy loads.

🛈 **ALERT!** Isolation mat usage is mandatory for concrete pad installations. Failure to use the supplied isolation mat can accelerate cabinet corrosion and may void the Clearfield cabinet warranty.

Before installing the cabinet, verify that the doors have been removed or are locked in the open position (wind brace engaged). For cabinets configured for local power, verify that the battery compartment door and battery tray have been removed.

Note: If you are installing the optional battery compartment riser to support a second 60 Ah or 62 Ah battery string, install the riser onto the concrete pad first, and then mount the cabinet (with battery compartment) onto the riser. For detailed instructions on installing the cabinet onto the riser, see Installing a 60 Ah Battery Compartment Riser.

To install the cabinet (or riser) on a concrete pad

Note: The following procedure also applies to installing the optional battery compartment riser onto a concrete pad).

Step 1:   Sweep the pad free of dirt and debris.

Step 2:   Install the isolation mat onto the concrete pad.

Step 3:   Using two people, lift the cabinet or battery compartment riser directly above its mounting position on the pad.

Step 4:   Slowly lower the cabinet or riser onto the pad, keeping the mounting holes in the cabinet base aligned with the anchor studs (or holes) in the pad.

Note: If properly aligned, the entry ducts should slide down over the conduits as the cabinet or riser lowers. If necessary, trim the conduit down to a height that enables it to pass into the entry duct.

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Step 5:   Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts.

Step 6:   Anchor the cabinet or riser to the pad as follows:

Site-cast pads with anchor studs:

a. Get the four hex nuts, four flat washers, and four lock washers from the installation kit.

b. Install one flat washer, lock washer, and hex nut onto each of the four anchor studs.

c. Tighten the hex nuts to secure the cabinet or riser to the pad.

Pre-cast pads with threaded inserts:

a. Get four anchor bolts, four flat washers, and four lock washers from the installation kit.

b. Install one flat washer, lock washer, and anchor bolt into each of the four threaded mounting inserts.

c. Tighten the bolts to secure the cabinet or riser to the pad.

Step 7:   Verify that the doors open and close freely. If necessary, use shims to level the cabinet or riser.

Step 8:   Apply silicone caulking to the bottom perimeter of the cabinet or riser.

Installing the Cabinet on a Wall or H-Frame

The FAC 400 cabinet's compact design allows you to install it without the use of heavy lifting machinery. Clearfield recommends using two people to install the cabinet (to lift, move, and lower the cabinet onto the pole-mount fixture).

If the required manpower is not available, or local practice requires the use of a lifting device, the cabinet is equipped with two lifting details on which to attach slings to lift and move the cabinet using a boom crane, derrick, or backhoe. Use wire rope slings and appropriately rated connecting links or lifting hooks. The lifting device and slings you use must be capable of lifting at least a 200 lb. working load. When using a lifting device to place the cabinet, follow these guidelines:

- Check the two lifting details on top of the cabinet to ensure that they are securely attached.
- Attach the lifting slings to the lifting device; attach the other sling ends to the cabinet lifting details with connecting links or hooks.
- Do not disconnect the slings from the cabinet until after it rests securely on the fixture.

CAUTION! Installing the cabinet requires safe handling to ensure that no injury to personnel or damage to the cabinet occurs. Do not place any part of your body under the load during lifting. Follow local safety practices for lifting and moving heavy loads.

ALERT! Isolation mat usage is required. Failure to use the supplied isolation mat can accelerate cabinet corrosion and may void the Clearfield cabinet warranty.

Before installing the cabinet, verify that the doors have been removed or are locked in the open position (wind brace engaged), and the battery compartment door has been removed.

Install the mount fixture's top bracket on the cabinet before installing the cabinet on the wall or H-frame.

Note: If you are installing the optional battery compartment riser to support a second 60 Ah or 62 Ah battery string, install the riser onto the wall-mount base platform first, and then mount the cabinet (with battery compartment) onto the riser. For detailed instructions on installing the cabinet onto the riser, see Installing a 60 Ah Battery Compartment Riser.

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To install the cabinet (or riser) on a wall or H-frame

Step 1:   Sweep the pad free of dirt and debris.

Step 2:   Install the isolation mat onto the base platform.

Step 3:   Using two people, lift the cabinet (with battery compartment) or battery compartment riser onto the base plat-form, aligning the mounting holes in the base with the counterpart holes in the platform.

Step 4:   Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts.

Step 5:   Anchor the cabinet or riser to the base platform as follows:

      a. Get (4) anchor bolts, (4) flat washers, and four lock washers from the installation kit.

      b. Install one anchor bolt, one flat washer and one lock washer into each of the four mounting holes.

      c. Tighten the bolts to secure the cabinet or riser to the pad.

Step 6:   Verify that the doors open and close freely. If necessary, use shims to level the cabinet or riser.

Step 7:   Apply silicone caulking to the bottom perimeter of the cabinet or riser.

Note: To complete the installation, install the top bracket to secure the cabinet to the wall or H-frame. See *Installing the Mounting Fixture on a Wall/H-Frame* for instructions.

Installing the Cabinet on a Pole: Local Power with 60 Ah Battery Base(s)

The FAC 400 cabinet's compact design allows you to install it without the use of heavy lifting machinery. Clearfield recommends using two people to install the cabinet (to lift, move, and lower the cabinet onto the pole-mount fixture).

If the required manpower is not available, or local practice requires the use of a lifting device, the cabinet is equipped with two lifting details on which to attach slings to lift and move the cabinet using a boom crane, derrick, or backhoe. Use wire rope slings and appropriately rated connecting links or lifting hooks. The lifting device and slings you use must be capable of lifting at least a 200 lb. working load. When using a lifting device to place the cabinet, follow these guidelines:

- Check the two lifting details on top of the cabinet to ensure that they are securely attached.
- Attach the lifting slings to the lifting device; attach the other sling ends to the cabinet lifting details with connecting links or hooks.
- Do not disconnect the slings from the cabinet until after it rests securely on the fixture.

CAUTION! Installing the cabinet requires safe handling to ensure that no injury to personnel or damage to the cabinet occurs. Do not place any part of your body under the load during lifting. Follow local safety practices for lifting and moving heavy loads.

ALERT! Isolation mat usage is required. Failure to use the supplied isolation mat can accelerate cabinet corrosion and may void the Clearfield cabinet warranty.

Before installing the cabinet, verify that the doors have been removed or are locked in the open position (wind brace engaged), and the battery compartment door has been removed.

Install the pole-mount fixture's top bracket on the cabinet before installing the cabinet on the pole.

Note: If you are installing the optional battery compartment riser to support a second 60 Ah battery string, install the riser onto the pole/wall mount base platform first, and then mount the cabinet (with battery compartment) onto the riser. For detailed instructions on installing the cabinet onto the riser, see Installing a 60 Ah Battery Compartment Riser.

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To install the cabinet (or riser) onto the pole-mount fixture

Step 1:   Verify that the base platform is clean, dry, and free of debris.

Step 2:   Install the isolation mat onto the pole base platform.

Step 3:   Using two people, lift the cabinet (with battery compartment) or battery compartment riser onto the base platform, aligning the mounting holes in the base with the counterpart holes in the platform.

Step 4:   Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts.

Step 5:   Anchor the cabinet or riser to the base platform as follows:

      a. Get (4) anchor bolts, (4) flat washers, and (4) lock washers from the installation kit.

      b. Install (1) anchor bolt, (1) flat washer and (1) lock washer into each of the four mounting holes.

      c. Tighten the bolts to secure the cabinet to the pad.

Step 6:   Verify that the doors open and close freely. If necessary, use shims to level the cabinet or riser.

> *Note: If you removed the doors previously, re-install them to check door swing alignment.*

Step 7:   Apply silicone caulking to the bottom perimeter of the cabinet or riser.

> *Note: To complete the installation, install the top bracket to secure the cabinet to the pole. See Installing the Mounting Fixture on a Pole for instructions.*

Installing the Cabinet on a Foundation Vault

The FAC 400 cabinet's compact design allows you to install it without the use of heavy lifting machinery. Clearfield recommends using two people to install the cabinet (to lift, move, and lower the cabinet onto the foundation vault).

If the required manpower is not available, or local practice requires the use of a lifting device, the cabinet is equipped with two lifting details on which to attach slings to lift and move the cabinet using a boom crane, derrick, or backhoe. Use wire rope slings and appropriately rated connecting links or lifting hooks. The lifting device and slings you use must be capable of lifting at least a 200 lb. working load. When using a lifting device to place the cabinet, follow these guidelines:

- Check the two lifting details on top of the cabinet to ensure that they are securely attached.
- Attach the lifting slings to the lifting device; attach the other sling ends to the cabinet lifting details with connecting links or hooks.
- Do not disconnect the slings from the cabinet until after it rests securely on the vault.

CAUTION! Installing the cabinet requires safe handling to ensure that no injury to personnel or damage to the cabinet occurs. Do not place any part of your body under the load during lifting. Follow local safety practices for lifting and moving heavy loads.

ALERT! Isolation mat usage is mandatory for concrete pad installations. Failure to use the supplied isolation mat can accelerate cabinet corrosion and may void the Clearfield cabinet warranty.

Before installing the cabinet, verify that the doors have been removed or are locked in the open position (wind brace engaged). For cabinets configured for local power, verify that the battery compartment door and battery tray have been removed.

Note: If you are installing the optional battery compartment riser to support a second 60 Ah battery string, install the riser onto the foundation vault first, and then mount the cabinet (with battery compartment) onto the riser. For detailed instructions on installing the cabinet onto the riser, see Installing a 60 Ah Battery Compartment Riser.

To install the cabinet (or riser) on a foundation vault

Step 1:   Sweep the top surface of the foundation vault free of dirt and debris.

Step 2:   Install the isolation mat onto the top surface of the vault
Note: For improved cabinet sealing, you can flip the isolation mat so that it covers the large rectangular and AC cut outs in the base of the cabinet or riser, cut holes in the mat where the cables/conduit enter, and then seal the cable entry locations after completing Step 5 below.

Step 3:   Using two people, lift the cabinet or battery compartment riser directly above its mounting position on the pad.

Step 4:   Slowly lower the cabinet or riser onto the pad, keeping the mounting holes in the cabinet base aligned with the anchor studs (or holes) in the pad.
Note: If properly aligned, the entry ducts should slide down over the conduits as the cabinet or riser lowers. If necessary, trim the conduit down to a height that enables it to pass into the entry duct.

Step 5:   Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts.

Step 6:   Anchor the cabinet or riser to the pad as follows:

   a. Get four anchor bolts, four flat washers, and four lock washers from the installation kit.

   b. Install one flat washer, lock washer, and anchor bolt into each of the four threaded mounting inserts.

   c. Tighten the bolts to secure the cabinet to the pad.

Step 7:   Verify that the doors open and close freely. If necessary, use shims to level the cabinet or riser.

Step 8:   Apply silicone caulking to the bottom perimeter of the cabinet or riser.

## Removing the Lifting Details

After the cabinet is installed, remove the two lifting details from the cabinet.

To remove the lifting details

Step 1:   Locate the two lifting details, attached to the upper left corners of the left and right sides of the cabinet.

Step 2:   Remove the three bolts securing the first lifting detail to the cabinet.

Step 3:   Remove and discard the lifting detail.

Step 4:   Insert the three removed bolts back into the vacant bolt holes on the cabinet.
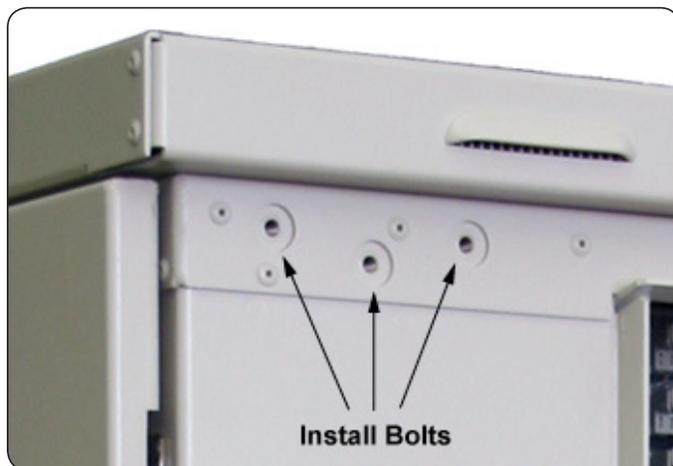
Step 5:   Repeat Steps 2 through 4 to remove the other lifting detail.

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Chapter 5: Installing Local AC Power

This chapter describes how to install AC local power to the cabinet.

- This process includes installing the cabinet earth ground connection and installing and wiring local AC power.

Install power according to your cabinet configuration type.

Topics Covered

This chapter covers the following topics:

- Installing the cabinet ground connection
- Installing local AC power

Installing the Cabinet Ground Connection

You must install the cabinet's connection to the earth ground circuit before you connect commercial power to the cabinet.

Guidelines

Clearfield recommends adhering to PANI grounding methods to reduce ground current interaction:

- The PANI system divides the ground bar into sections, with one type of conductor in each section: Producers, surge Absorbers, Non-isolated and Isolated (PANI).
- The FAC 400 cabinet's main earth ground (that connects to the ground field) should bisect the main ground bar, effectively separating ground termination positions into two zones, as follows:

  - **Isolated Ground Zone (IGZ) 'equipment' grounds:** Active equipment ground terminations—as well as grounds for any DC power system(s), if collocated in the same enclosure—should be isolated from surge producing 'external' grounds.
  - **Surge producing 'external' grounds:** External interface ground connections (OSP cable sheath ground bonds, subscriber line protection panels, AC feeds, etc.) are considered surge producers and should be isolated from equipment grounds.

- The earth ground connection (middle position) on the FAC 400 cabinet ground bar serves as the primary surge absorber to isolate the equipment grounds from the surge-producing external grounds.
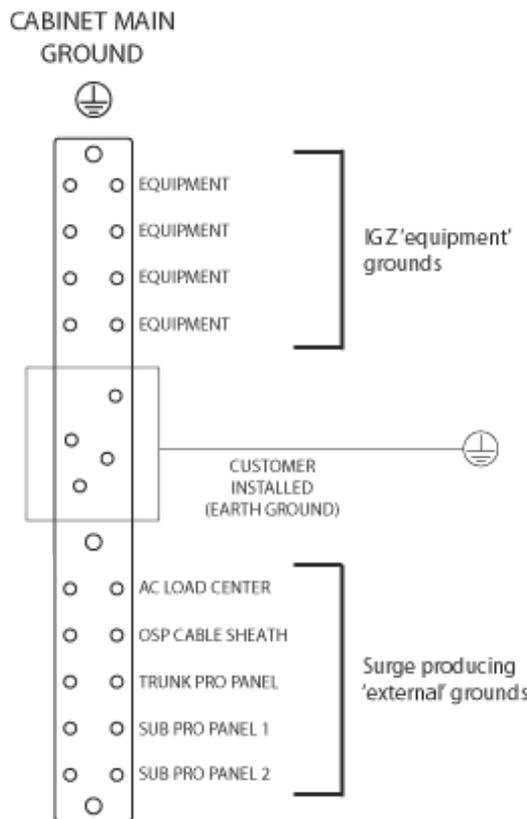
**Note:** *Cabinet ground wiring diagrams are available at* seeclearfield.com.

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To install the cabinet ground connection

Step 1:   Open the cabinet's side door.

Step 2:   Route the earth ground wire to the main ground bar and cut the wire to length.

Step 3:   Using a ratcheting crimp tool with embossing dies, attach a two-hole compression lug (#2– #6 AWG, 3/4-inch hole spacing) to the earth ground wire. Ensure that the correct lug is used to match the earth ground wire.

Step 4:   At the middle of the ground bar, locate a ground position with 3/4-inch stud spacing. Remove the nuts from the identified terminal studs.

Step 5:   Attach the earth ground wire's two-hole lug onto the 3/4-inch ground terminal studs per PANI guidelines.

Step 6:   Re-connect the nuts to the ground terminal studs and tighten to 26 inch-lbs. of torque.
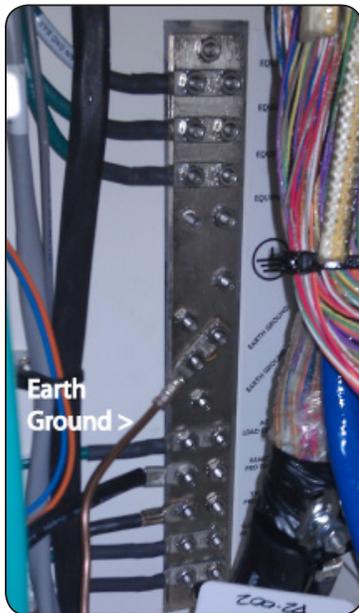
Installing AC Power (220-240 VAC)

Install 220-240 VAC power as described below.

DANGER! High voltage may be present. Risk of electrical shock. Do not apply AC power to the cabinet until the installation process is complete.

WARNING! Electrical hazard. Only a qualified electrician should perform this procedure.

Before proceeding, verify that AC service to the cabinet site is OFF at the local power transfer switch.

To install the cabinet ground connection

Step 1:   Open the front cabinet door.

Step 2:   Switch all AC load center breakers to the OFF position.

Step 3:   If not done previously, prepare the AC load center for wiring as follows:

   a. Remove the four screws from the AC load center's front (breaker) panel, and then remove the panel from the load center housing. Retain the hardware for re-installation.

   b. Loosen the coupling nut at the bottom of the housing to allow AC wires to pass into the load center.
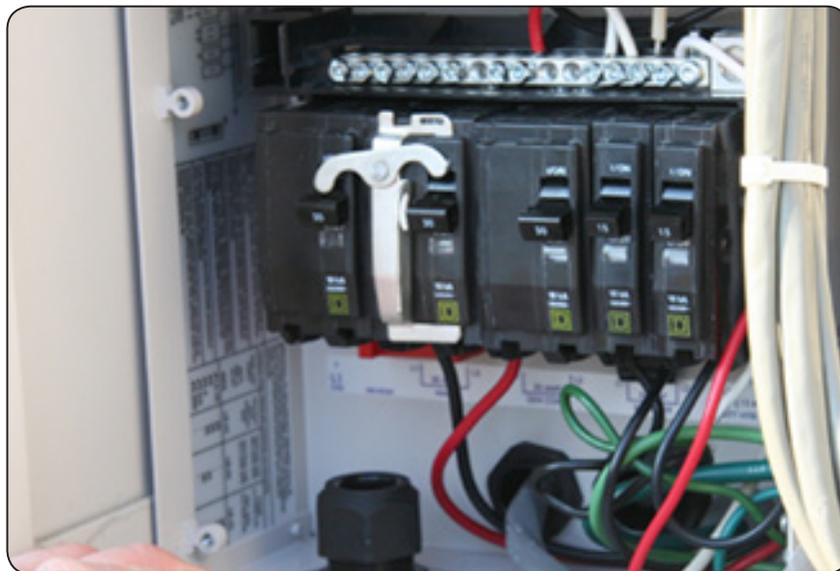
Step 4:   Install a user-supplied AC conduit into the battery compartment, between the outside entry duct (in the compartment floor) and the load center entry location (in the compartment ceiling). Install the conduit per local practice. Make sure the conduit is rated for AC cabling.

Step 5:   Pull the AC wires (8–10 AWG) into the cabinet through the entry duct in the battery compartment and up into the AC load center.

Step 6:   Connect the AC wires to the load center:
  • Connect the ground (green) lead to the ground bus bar.
  • Connect the neutral (white) lead to the neutral bar.
  • Connect the L1 (black) lead to the left side of the Main breaker.
  • Connect the L2 (red) lead to the right side of the Main breaker.

  Note: An AC wiring label is attached behind the load center front panel for reference.

Step 7:   Tighten the coupling nut around the AC wires at the bottom of the load center housing.

Step 8:   Re-install the cover panel on the AC load center.

Chapter 6: Installing and Splicing Outside Plant Cables

This chapter describes how to install and splice outside plant cables into the cabinet, including fiber plant (fiber-optic cables for transport/uplink) and metallic plant (copper twisted pairs for subscriber drops and/or Ethernet-over-copper transport).

Topics Covered

This chapter covers the following topics:

- Installing fiber cables.
- Installing metallic cables.
- Sealing cable entry locations.

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Bonding Cable Sheaths

The subscriber and optical cable sheaths must be bonded as follows:

* Bond the metallic sheaths of all subscriber and optical cables to a grounding rod or system at their first appearance at the cabinet/enclosure site (at the copper pedestal or splice case, and so forth). If this point is close enough to bond to the cabinet/enclosure grounding system, bond to the same point on the main site ground bar (SPGP or equivalent) that the cross-connect bonds to.
* Bond the metallic sheaths of all subscriber and optical cables to a grounding rod or system at regular intervals along the entire run external to the cabinet/enclosure site, per RUS guidelines.
* Clearfield recommends that you bond optical fiber cable sheaths at the first entrance to the cabinet/enclosure site only (the splice case, or similar), and then isolate the sheaths in the short run between splice point and the Clearfield equipment cabinet/enclosure ground. The short run can then be bonded on either side (the Clearfield ground bar side or splice point side, but not both) per local practice.
* Clearfield recommends that you bond the subscriber cable sheaths at the first entrance to the cabinet/enclosure site (the copper pedestal, and the ground bar of any cross-connect cabinet), and then isolate the sheaths in the short run between cross-connect cabinet and the Clearfield equipment cabinet/enclosure ground. The short run can then be bonded on either side (Clearfield ground bar side or cross-connect side, but not both) per local practice.

Installing Fiber Cable

This section describes how to install fiber optic cable into the cabinet, including how to route and groom the outside plant cable and splice fibers for terminating to the equipment.

Fiber management guidelines

When installing, splicing, and routing fibers in the cabinet, follow these guidelines:
- Avoid tight bend radii for fibers and provide adequate strain relief.
- Dress and secure fiber jumpers using Velcro straps or other soft-tie method designed for fiber. Avoid using plastic cable ties, which can damage a fiber.
- Label jumpers to simplify identification at splice and distribution locations.

Installing Outside Plant Fiber Cable

Install outside plant (OSP) fiber cable into the cabinet and prepare it for splicing. The following steps are general guidelines only. Follow local practice wherever applicable.

If the fiber splices will not reside in the cabinet (such as when located in an external splice case or fiber hand-hole), then adjust the installation procedure accordingly. In such cases, installation typically involves finished, individually jacketed fibers instead of OSP cable. Install this fiber per local practice.

To install outside plant fiber cable

Step 1:   Open the cabinet's side door.

Step 2:   Trim the rubber cone gasket on the cable entry duct to the OSP cable diameter.

Step 3:   Route the OSP fiber cable from the feeder location through the conduit and up into the cabinet.

Step 4:   Pull the fiber cable up into the cabinet through the entry duct. Pull enough cable length to extend to the splice location.

Step 5:   If splicing shall be performed at a later time, do the following:
- Using rope or cable ties, temporarily hang and secure the OSP cable inside the cabinet.
- Make sure the cable arrangement allows the door to close. Take care to not violate the cable bend radius requirements.

The following steps are general guidelines only. Follow local practice where applicable.

To prepare outside plant cables for splicing

Step 1:   If necessary, untie or cut the bindings temporarily securing the OSP cable inside the cabinet.

Step 2:   Strip off the cable's outer sheath to expose the core tubing. Take care not to damage the fibers inside the core tubing.

Ground the OSP cable sheath to the cabinet ground bar as follows:

Step 3:   **a.** Twist the OSP cable's metal strength members together into a single strand.

b. Install a lug connector on the twisted end of the strength members.
Note: Clearfield recommends using a two-hole lug connector, unless local practice indicates otherwise.

c. Install a #6 AWG bond strap onto the lug connector together with the twisted strength members and tighten the lug connector.

d. Terminate the other end of the bond strap to the main ground bar in a position below the AC load center ground.
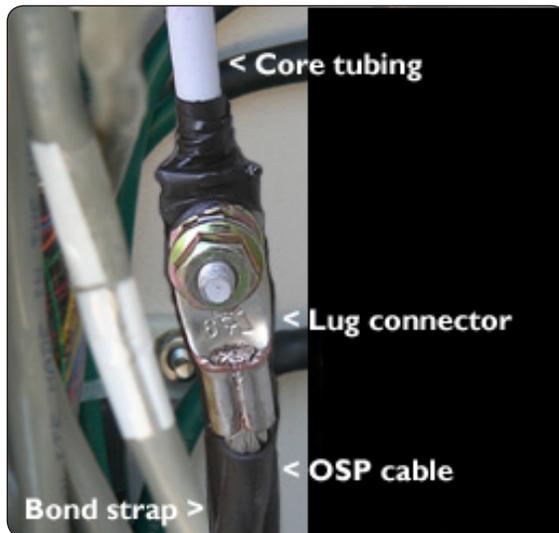
Step 4:   Route fiber to the splice tray:

a. Insert the core tubing into the fiber routing duct and feed it through the duct to front of the cabinet.

b. Route the core tubing to the splice tray to determine the required length.

c. Strip off the core tubing to an appropriate length. Take care not to sever or nick the bare fibers.

Step 5:   If splicing shall be performed at a later time, neatly coil the bare fibers inside the splice tray. Secure the core tubing in place with cable ties.

Splicing Fibers

Note: If fiber splices will not reside in the cabinet, such as when using an external splice case or fiber hand-hole, skip this section. Splice fibers per local practice.

Note: For additional fiber management options, see Installing Fiber Management Options.

The following steps are general splicing guidelines only. Follow local practice wherever applicable.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT. High voltage may be present. Risk of electrical shock. Do not apply AC power to the cabinet until the installation process is complete.

CAUTION! Only a qualified technician should perform this procedure.

To splice fibers

Step 1:   Open the cabinet's front door.

Step 2:   If necessary, untie or cut any bindings temporarily securing the core fiber tubing near the splice tray.

Step 3:   Remove the fiber splice tray from the cabinet wall.

Step 4:   Assuming the bare fibers are stored inside the splice tray, remove enough fiber from the tray to perform splicing.

Step 5:   Splice the fibers to fiber pigtails or jumpers per local practice.

Step 6:   Neatly arrange the finished splices and slack fiber in the splice tray.

Step 7:   Replace the splice tray into position on the cabinet wall.

Step 8:   Dress any slack fiber from the pigtails or jumpers around the dressing assembly below the splice tray. Secure the fibers in place with a Velcro strap.

Connecting Fibers to the Equipment

Before you can connect fibers to the equipment, you must first install one or more pluggable transceiver modules into the optical Ethernet port sockets. If the laser at the far end is enabled, you can use an optical power meter to test the signal strength on the fibers before connecting to the equipment. Defer to local practice wherever applicable.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT. High voltage may be present. Risk of electrical shock. Do not apply AC power to the cabinet until the installation process is complete.

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Installing Metallic Cables

This section describes how to install metallic signal cables into the cabinet, including how to route and groom the outside plant cables and splice to the equipment cables.

Installing Outside Plant Metallic Cables

Step 1:   Open the cabinet's side door.

Step 2:   Trim the rubber cone gasket on the cable entry duct to the OSP cable diameter.

Step 3:   Route the OSP cable from the feeder location through the conduit and up into the cabinet.

Step 4:   Pull approximately six feet of cable up into the cabinet through the entry duct.

Step 5:   If splicing shall be performed at a later time, do the following:
- Using rope or cable ties, temporarily hang and secure the OSP cable inside the cabinet.
- Make sure the cable arrangement allows the door to close. Take care to not violate the cable bend radius requirements.

The following steps are general guidelines only. Follow local practice where applicable.

To prepare outside plant cables for splicing

Step 1:   Untie the rope or cut the cable ties that temporarily secure the OSP cable inside the cabinet.

Step 2:   Strip off the cable's outer sheath and internal metal shielding down to 6 inches above where the cable enters the cabinet. Take care to expose, but not penetrate, the core wrap surrounding the bundled copper pairs.

Step 3:   Ground the OSP cable sheath to the cabinet ground bar as follows:

        a. Install a B-bond clamp onto the cut end of the OSP cable's outer sheath. Wrap the connection with electrical tape.

        b. Attach a #6 AWG bond strap to the B-bond clamp.

        c. Terminate the other end of the bond strap to the main ground bar in a position below the AC load center ground.
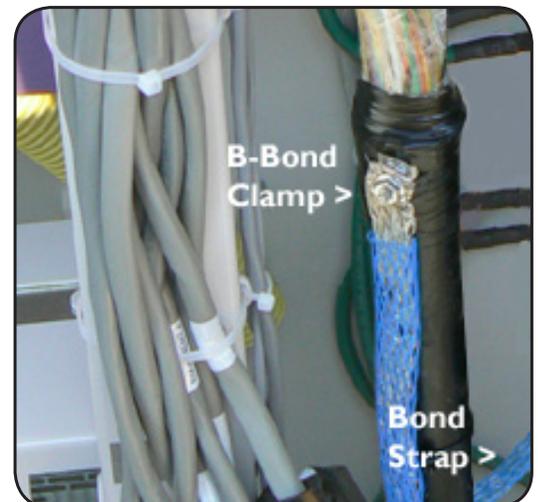
Step 4:   Secure the OSP cable to the cabinet tie bars with cable ties.

Step 5:   Remove the core wrap from around the bundled copper pairs, then install binder group identification labels on each 25-pair group.

Step 6:   If splicing shall be performed at a later time, make sure the cable arrangement allows the door to close. Take care to not violate the cable bend radius requirements.

Splicing Metallic Cables

Mate the outside plant (OSP) cables to the equipment interface cables using MS2 connectors. Interface cables on the OSP side ('Subscriber' side) of the protection blocks or optional cross-connect panel are factory terminated with MS2 or 710 connectors. You must install counterpart MS2 or 710 connectors on each 25-pair group of OSP cables before mating.

Note: Clearfield equipment uses a 'dead pair' scheme, where the 25th pair in each 25-pair cable group is unterminated and not used (dead).

To splice the metallic cables

Step 1:   Open the cabinet's side door.

Step 2:   Segregate the bundled pairs from the OSP cable into 25-pair groups.

Step 3:   Terminate MS2 or 710 connectors onto the ends of each 25-pair group per local practice.

Step 4:   Remove all cable ties securing the cabinet interface cables to tie bars and remove the protective covers from the connectors.

Step 5:   For each 25-pair group, mate the OSP and equipment interface cable connectors together using the appropriate mating clamps.

Step 6:   Repeat Steps 2 through 5 for each remaining OSP cable.

Step 7:   Dress and secure the spliced cables to the tie bars with cable ties.

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Installing 5-Pin Protection Modules

To complete the circuit connections between the metallic outside plant cables and equipment, you must install 5-pin protection modules into the 50-pair protection blocks. The 5-pin protection modules serve as fuses to protect the equipment from electrical surges on the lines.

Each 5-pin position on the block protects one wire pair (one 2-wire circuit). Install a 5-pin protection module into each block position (circuit) that will be equipped for service. Refer to the cabinet pair assignment list for more information.

Note: Clearfield equipment uses a 'dead pair' scheme, where the 25th pair in each 25-pair cable group is unterminated (dead). Therefore, on each protection block, positions 25 and 50 are not wired. Line identification labels cover the dead pair positions.

Sealing Cable Entry Locations

Seal the cable entry locations to protect the cabinet and riser against moisture, dust, pests, and other contaminants. Use a silicon-based sealant or comparable compound.

Warning! - Seal all cable entry locations immediately after the cabinet is installed to prevent ground moisture from condensing inside the cabinet and damaging equipment. Failure to take these preventive measures will void cabinet warranty.

To seal the cable entry locations

Step 1: Open the cabinet's side door or battery compartment riser door.

Step 2: Adjust or trim the rubber cone gaskets on the cable entry ducts to create a tight seal around the cables, as required.

Step 3: If required, prepare the sealant for application per the manufacturer instructions.

Step 4: Apply the sealant around any open areas on the entry ducts where cables enter the cabinet or riser. Seal all gaps around the cables per the manufacturer instructions.

Note: Alternatively for cabinets with a battery compartment, you may invert the rubber cone gaskets and then inject a foam-type sealant into the cones around the cabling.

CAUTION! Only a qualified technician should perform this procedure.

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Turning Up the Power System

This section describes how to turn up and test the power system for locally-powered AC cabinets. The process includes checking the cabinet ground connection, checking the AC power supply voltage, installing batteries for reserve power, and turning up and testing the DC power system.

Topics Covered

This chapter covers the following topics:
- Checking the cabinet ground connection
- Checking the AC power supply voltage
- Installing rectifier modules into the Rectifier shelf
- Installing batteries for reserve power
- Turning up and testing the DC power system

Checking the Ground Connection

Check the impedance of the cabinet ground connection before turning up the cabinet power system.

Note: The following procedure does not test the quality of the earth ground circuit (earth electrode), which should have been installed and tested before the cabinet was installed.

To check the cabinet ground connection

Step 1: Using an ohm meter, test between the main ground bar and the earth ground wire:

      a. Place one lead on the main cabinet ground bar.

      b. Place the other lead on the earth ground wire.

Step 2: Verify that the ohm meter reads 5 ohms or less.

Step 3: If the reading is greater than 5 ohms, check the ground wire connection at the main ground bar, then retest.

Checking the AC Power Supply Voltage

The cabinet ships from the factory equipped to support 220-240 VAC service. Check the AC power supply voltage as follows.

DANGER! High voltage may be present. Only a qualified electrician should perform these procedures.

To check 220-240 VAC power supply voltage

Step 1: Apply AC power to the cabinet at the local power transfer switch.

Step 2: At the cabinet AC load center, do the following:

a. Remove the front panel from the AC load center.

b. Switch the 30A Main breaker to ON.

Step 3: Using a volt meter, test between the L1 and neutral busses:

a. Place one lead on the L1 buss.

b. Place the other lead on the neutral buss.

c. Verify that the volt meter reads between 110 and 120 VAC.

Step 4: Using a volt meter, test between the L2 and neutral busses:

a. Place one lead on the L2 buss.

b. Place the other lead on the neutral buss.

c. Verify that the volt meter reads between 110 and 120 VAC

Step 5: Using a volt meter, test between the L1 and L2 busses.

a. Place one lead on the L1 buss.

b. Place the other lead on the L2 buss.

c. Verify that the volt meter reads between 220 and 240 VAC.

Step 6: Switch the branch breakers on as follows:
- Switch the 15A Conv Outlet breaker to ON.
- If you are using an optional battery heater, switch the 15A Battery Heater breaker to ON.
Note: Do not switch on the 40A Rectifier breaker at this time.

Step 7: Re-attach the front panel on the AC load center.

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Installing the Rectifier Modules (Alpha Cordex Rectifier Option)

The FAC 400 Rectifier shelf uses the 19-inch Alpha Cordex HP 1.2kW 1RU rectifier shelf to generate and distribute -48 VDC bulk power.

The Alpha shelf supports up to two rectifier modules. Normal operation for the FAC 400 Power Hub requires two 25A rectifier modules.

Note: The far right slot does not support a rectifier module.

The Alpha shelf provides integrated distribution, with 8 GMT fuse positions for equipment. The Alpha shelf is equipped with a Cordex CXCM1+ controller module that monitors power functions and alarm information and regulates voltage in response to battery temperature. The controller module ships pre-programmed for operation in the FAC 400 Power Hub. For a complete description of the controller module, refer to the Cordex Controller Software Manual.

CXCM1+Controller

48v 1.2kW Rectifier Module

Install Alpha rectifier modules into the shelf as described below.

Note: The controller module ships installed in the rectifier shelf. Push firmly on the controller module to verify that it is fully seated in the slot.

To install a rectifier module

Step 1:   Unpack the rectifier module.

Step 2:   Insert the module in the first or second vacant slot, sliding the module into the rear connector (inside of the shelf). Populate slots top to bottom (shelf oriented vertically), leaving the third slot empty.

Step 3:   Apply pressure on the front of the module to engage the rear connector in the shelf receptacle. The module has a locking latch to secure the rectifier into the shelf.

> *Note: Do not force a module into position if it does not seat properly. All modules are keyed to ensure that the correct module type is used.*

Step 4:   Repeat steps 1–3 to install an additional rectifier module.

Installing and Testing Batteries

The cabinet can house a single string of front-terminal VRLA batteries (four batteries per string). A cabinet can also be equipped with an optional riser compartment to support a second battery string. See Supported Batteries for a list of supported battery types.

This topic provides instructions for the following tasks:
- Installing and testing a single string of 60Ah or 62Ah batteries
- Installing and testing two strings of 60Ah or 62Ah batteries (with optional second riser compartment)

⚠️ **WARNING!** Electrical hazard. Batteries contain a stored charge. Only a qualified technician should perform this procedure.

⚠️ **CAUTION!** Electrical, chemical, fire, and heat hazard. Handle batteries with care to avoid personal injury or damage to the equipment.

🛈 **ALERT!** Read the battery manufacturer's instructions before installing batteries. Follow the manufacturer guidelines and local safety practices.

To prepare batteries for installation

Step 1:   Unpack the batteries from the shipping packaging.

Step 2:   Remove the terminal caps from the top of each battery.

Step 3:   Clean and apply No-Ox anti-corrosion grease to each battery terminal.

Step 4:   Locate the bagged kit containing the string jumper straps and other materials. Set the kit aside for use during installation.

Note: If the batteries are not fully charged, perform these procedures after charging the batteries.

⚠️ **WARNING!** In -48V telecom systems, red leads connect to the negative terminal and black leads connect to the positive terminal. Do not reverse the wiring polarities.

To install a single string of 60 Ah or 62 Ah batteries

Note: *If you plan to install a second battery string in the riser compartment, go to the next procedure. If you do not plan to install a second battery string, locate the Anderson connector for the second battery string and disconnect if required.*

Note: *Before installing battery strings, install the rear seismic retainer. Use a seismic protection kit for cabinets located in up to Zone 4 Earthquake environments.*

Step 1: At the rectifier shelf, open the fuse panel door. Verify that the battery breaker is OFF.

Step 2: Remove the battery compartment door. See Operating Cabinet Doors for instructions.

Step 3: Remove the front retainer bracket from the battery tray.

> *Note:* *If you are using the optional battery heater, install the heater before installing batteries. See Installing a Battery Heater for instructions.*

Step 4: In the battery compartment, disconnect the #8 AWG battery power cables from the power supply leads and set the cables aside.

Step 5: Place a string of four batteries partially into the battery compartment, arranged with the terminals accessible in front.

> *Note:* *You will slide the batteries into the battery tray after installing the cables and protective covers.*

Step 6: Connect the battery power cables as follows:

a. Remove the protective caps from the cable ring lugs.

b. Attach the black cable to the positive (+) terminal post at the positive end of the string.

c. Attach the red cable to the negative (-) terminal post at the negative end of the string.

ALERT! Check all connections carefully to verify correct wiring polarities.

d. Install the temperature sensor cable lug onto the string's negative (-) terminal post.

e. Tighten the hardware on the terminal posts to the torque specified by the manufacturer.
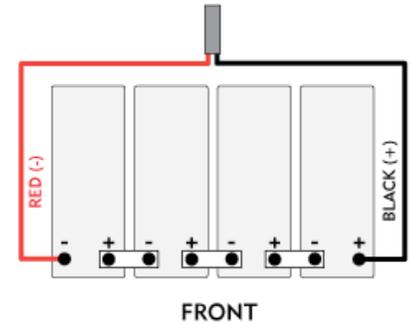
Step 7: Install the three jumper cables between the battery terminal posts using the supplied flat washers, split lock washers, and bolts.

Step 8: Before connecting the batteries, pull out one rectifier module.

Step 9: Using a digital volt meter, check for correct polarity and test the battery connection between the negative and positive battery leads:

a. Place the red voltmeter lead on the red negative (-) battery lead.

b. Place the black voltmeter lead on the black positive (+) battery lead.

c. Verify that the voltmeter reads between -46 and -54 VDC.

d. Measure the voltage difference between the power system and the battery string. The voltage difference should be less than 3V. If the voltage difference is greater than 3V, check for connection integrity, replace bad battery cell as applicable, and retest the voltage. Reconnect the battery power cables to the power supply leads.

Step 10:   Install the protective covers (manufacturer-supplied) over the battery terminals.

Step 11:   Connect the string of batteries to the power system by plugging the battery string and the rectifier system output Anderson connectors together.

Step 12:   Re-install the rectifier module removed in step 8.

Step 13:   Verify that the cabinet heat exchanger fans are running (if the temperature is high enough).

Step 14:   At the AC load center, do the following:

a. Set the Main breaker to OFF. The heat exchanger fans should continue to run.

b. Set the Main breaker to ON and verify that power restores to the Alpha shelf.

Step 15:   Slide the battery string into the battery tray.

Step 16:   Install the lower retainer as follows:

a. Slide the lip of the retainer flush against the bottom edge of the compartment, and then align the holes at the right and left ends of the retainer with the counterpart mounting holes on the compartment.

b. Tighten the thumb screws on the compartment to secure the retainer in place.
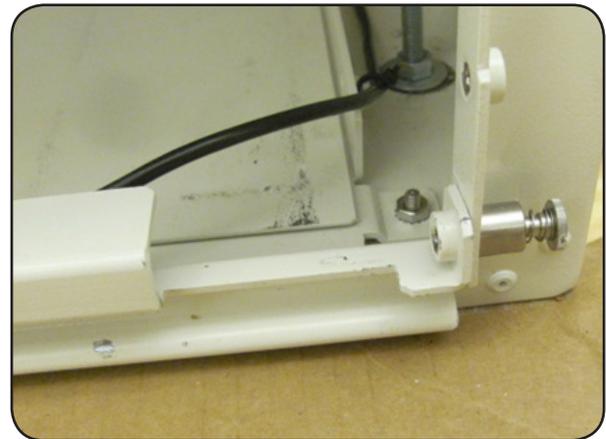
**Note:** If you are using the optional seismic protection kit, install the front seismic bracket and stiffener above the lower retainer.

Step 17:   Replace the battery compartment door.

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To install two strings of 60 Ah or 62 Ah batteries (with riser compartment)

Note: To install the battery compartment riser, see Installing a Battery Compartment Riser for instructions. The rear optional seismic protection bracket must be installed before installing the battery string. Use a seismic protection kit for cabinets located in Zone 4 Earthquake environments.

Step 1: At the rectifier shelf, open the fuse panel door. Verify that the battery breakers are OFF.

Step 2: Remove the upper and lower battery compartment doors. See Operating Cabinet Doors for instructions.

> *Note: If you are using the optional battery heater, install the heaters before installing batteries. See Installing a Battery Heater for instructions.*

Step 3: In the upper battery compartment, locate the secondary battery supply leads and route down into the riser compartment.

Step 4: In the riser compartment, route the battery supply leads along the sides of the battery tray and then arrange a string of four batteries with the terminals accessible in front.

> *Note: You will slide the batteries into the battery trays after installing the cables and protective covers.*

Step 5:   Connect the second-string battery power cables to the string in the riser compartment as follows:

a. Attach the black power jumper cable to the positive (+) terminal post at the positive end of the string.

b. Attach the red power jumper cable to the negative (-) terminal post at the negative end of the string.
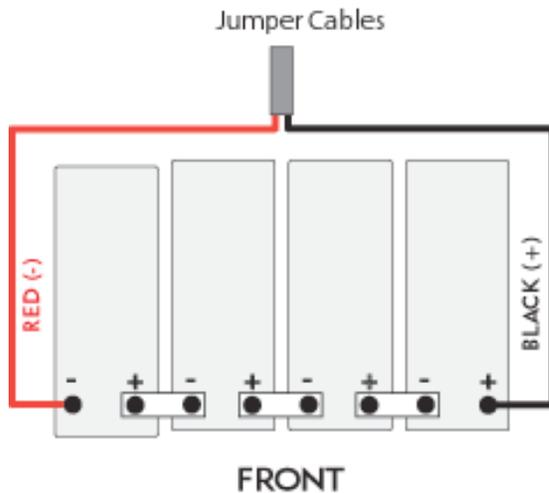
ALERT! Check all connections carefully to verify correct wiring polarities.

c. Tighten the hardware on the terminal posts to the torque specified by the manufacturer.

Step 6:   Install the three jumper cables between the battery terminal posts using the supplied flat washers, split lock washers, and bolts.

Step 7:   Before connecting the batteries, pull out one rectifier module.

Step 8:   Using a digital volt meter, check for correct polarity and test the battery connection between the negative and positive battery leads:

a. Place the red voltmeter lead on the red negative (-) battery lead.

b. Place the black voltmeter lead on the black positive (+) battery lead.

c. Verify that the voltmeter reads between -46 and -54 VDC.

d. Measure the voltage difference between the power system and the battery string. The voltage difference should be less than 3V. If the voltage difference is greater than 3V, check for connection integrity, replace bad battery cell as applicable, and retest the voltage. Reconnect the battery power cables to the power supply leads.

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Step 9: Install the protective covers (manufacturer-supplied) over each battery terminal, and then slide the battery string into the riser compartment battery tray.

Step 10: In the upper battery compartment, do the following:

a. Remove the front retainer bracket from the battery tray.

Note: If you are using the optional battery heater, install the heater before installing batteries. See Installing a Battery Heater for instructions.

b. Locate the secondary battery supply leads and the (installed) main secondary battery string.

The battery supply leads ship in a bag.

c. Connect the Anderson connector on the battery supply leads to the Anderson connector on the main secondary battery string.

d. Route the battery supply leads along the sides of the battery tray and then arrange a string of four batteries with the terminals accessible in front.

Note: You will slide the batteries into the battery tray after installing the cables and protective covers.

Step 11:   Connect the battery power cables in the upper battery compartment as follows:

a. Remove the protective caps from the cable ring lugs.

b. Attach the black cable to the positive (+) terminal post at the positive end of the string.

c. Attach the red cable to the negative (-) terminal post at the negative end of the string.
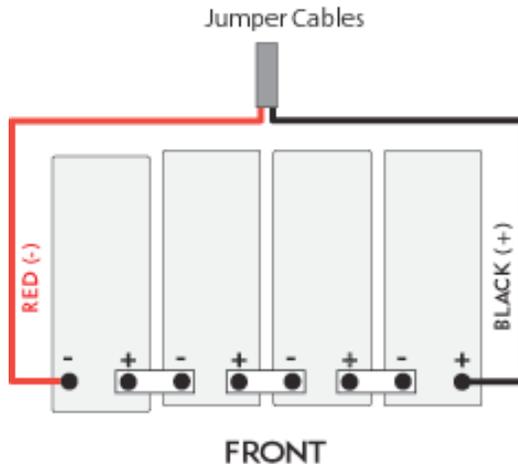
ALERT! Check all connections carefully to verify correct wiring polarities.

d. Install the temperature sensor cable lug onto the string's negative (-) terminal post.

e. Tighten the hardware on the terminal posts to the torque specified by the manufacturer.

Step 12:   Install three jumper cables between the battery terminal posts using the supplied flat washers, split lock washers, and bolts.

Step 13:   Check for correct polarity and test the battery connection between the negative and positive battery leads (as described in step 7).

Step 14:   Install the protective covers (manufacturer-supplied) over each battery terminal.

Step 15:   Reinstall the rectifier module removed in step 6.

Step 16:   Verify that the cabinet heat exchanger fans are running (if the temperature is high enough).

Step 17:   At the AC load center, do the following:

      a. Set the Main breaker to OFF. The heat exchanger fans should continue to run.

      b. Set the Main breaker to ON and verify that power restores to the rectifier shelf.

Step 18:   Slide the battery strings into the upper compartment battery tray.

Step 19:   Install a lower retainer for each string as follows:

      a. Slide the lip of the retainer flush against the bottom edge of the compartment, and then align the holes at the right and left ends of the retainer with the counterpart mounting holes on the compartment.

      b. Tighten the thumb screws on the compartment to secure the retainer in place.

Note: *If you are using the optional seismic protection kit, install the front seismic bracket and stiffener above the lower retainer.*

Step 20:   Replace the battery compartment doors.

Turning Up and Testing the DC Power System

Turn up and test the cabinet DC bulk power system as described below.

To turn up and test the DC power system

Step 1:   At the AC load center, verify that the Main breaker is **ON**.

Step 2:   At the AC load center, switch the (2) 20A Rectifier breaker **ON**.

Step 3:   Verify that the rectifier shelf boots up and the rectifier modules are operational.

> *Note: The Alpha shelf controller is factory programmed with default settings that enable safe power up and operation. You can modify the settings for system voltages, battery configuration, temperature compensation, and so forth, if required. For programming instructions, refer to the Alpha Cordex Controller Software Manual.*

Step 4:   Verify that the rectifier shelf controller has acquired the rectifier modules as follows:

a. Connect a laptop to the CXCM1+ Ethernet port using a standard network cable.

b. Laptop IP Network settings (**Start > Control Panel**):

- IP address: 10.10.10.202
- Subnet Mask: 255.255.255.0

c. Turn off the pop-up blocker.

d. Open an IE browser and set the browser to run in compatibility mode.

e. In the Web address bar, enter the IP address of the Alpha controller module (10.10.10.201).

f. Log into the controller module:

- Username: Your initials or other unique identifier
- Password: 1234

g. Enter the language selection: English

h. From the Controller screen (Controller > Date & Time), set the correct date and time.

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i. On the System screen (System > View Live Status), check that the installed rectifiers have been acquired by the controller by verifying the number associated with "# Acquired Rectifiers".

Note: Alarm conditions may be present and will not clear due to no load conditions.

Testing Batteries

If the batteries are not fully charged, perform this procedure after charging the batteries

WARNING! Electrical hazard. Only a qualified technician should perform these procedures.

To test the batteries

Step 1: Using a digital volt meter, test the battery connection between the negative and positive battery leads:

a. Place the red volt meter lead on the red negative (-) battery lead.

b. Place the black volt meter lead on the black positive (+) battery lead.

c. Verify that the volt meter reads between -46 and -54 VDC.

d. Measure the voltage difference between the power system and the battery string. The voltage difference should be less than 3V. If the voltage difference is greater than 3V, check for connection integrity, replace bad battery cell as applicable, and retest the voltage.

Step 2: Verify that the cabinet heat exchanger fans are running (if the temperature is high enough).

Step 3: At the AC load center, set the Main breaker to **OFF**. The heat exchanger fans should continue to run.

Step 4: At the AC load center, set the Main breaker to **ON** and verify that power restores to the rectifier shelf.

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CXCM1+ Controller Battery Charge Current Settings and Alarm Values

The CXCM1+ battery charge current control algorithm limits the amount of charge current available to the batteries. It is imperative that the battery parameters and charge current are set appropriately relative to the installed battery capacity. The default controller setting for battery capacity is for the Northstar NSB60FT battery with the charge rate at C/6 (11.3A).

Changing CXCM1+ Controller Battery Configuration Settings and Alarm Values

Note: Assumption is that the controller's IP address is defaulted to the factory IP address of 10.10.10.201. Also, we highly recommend that the controller's software version is the latest released version. The latest software released can be downloaded here: http://www.alpha.ca/support/support-main-menu/software-firmware-downloads

Step 1:   Connecting to the CXCM1+ controller

a. Connect a laptop to the CXCM1+ Ethernet port using a standard network cable.

b. Change laptop IP network settings (**Start > Control Panel > Network and Internet > Network and Sharing Center > Local Area Connection > Properties > Internet Protocol Version 4 (TCP/IPv4)**):

- IP address: 10.10.10.202
- Subnet Mask: 255.255.255.0
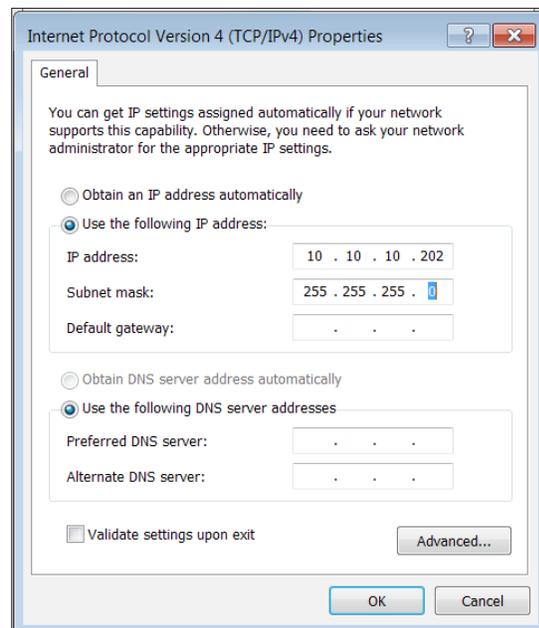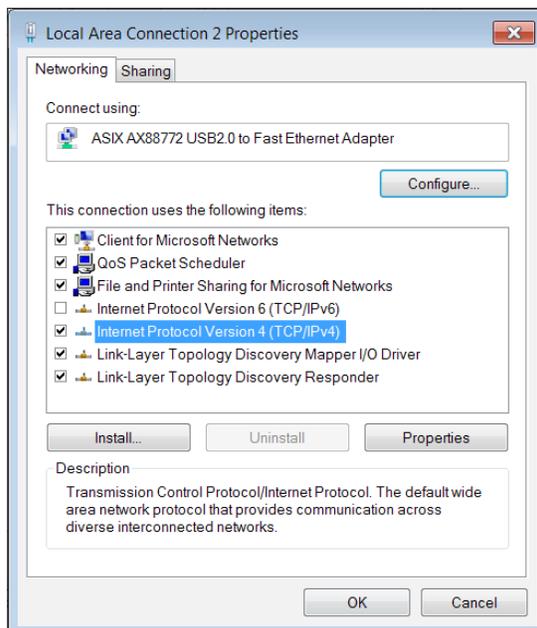
c. Turn off the pop-up blocker.

d. Open an IE browser and set the browser to run in compatibility mode.

e. In the IE address bar, enter the IP address of the Alpha controller module (10.10.10.201).

f. Log into the controller module with the following:

- Username: Your initials or other unique identifier
- Password: 1234
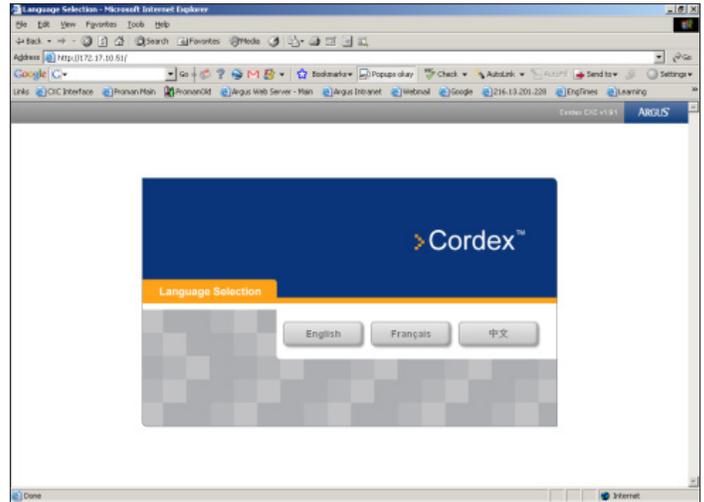
Step 2:   Changing the battery configuration parameters

a. Navigate to **Batteries > Configure Batteries**

b. In the Battery Properties section, enter the battery string capacity into the Capacity Rating box .

Battery Type	Capacity Value (Ah for One String)*
Northstar NSB60FT Red	68
Enersys SBS B14	68
Northstar NSB100FT Red	106
Northstar NSB170FT Red	180
Enersys SBS 190F	210

***Note:** For multiple battery strings, increase the capacity value.*
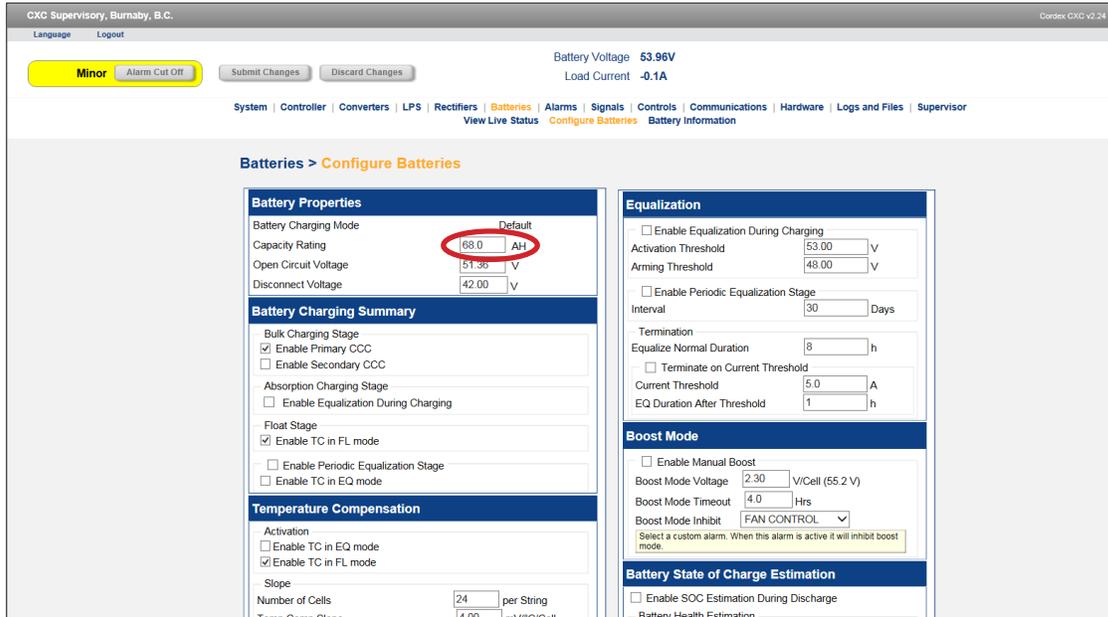
c. In the Temperature Compensation section, enter temperature compensation slope in the Temp Comp Slope box.

Battery Type	Temperature Compensation Slope
Northstar NSB60FT Red	2mV/deg C/Cell (1.1mV/deg F/Cell)
Enersys SBS B14	4mV/deg C/Cell (2.2mV/deg F/Cell)
Northstar NSB100FT Red	2mV/deg C/Cell (1.1mV/deg F/Cell)
Northstar NSB170FT Red	2mV/deg C/Cell (1.1mV/deg F/Cell)
Enersys SBS 190F	4mV/deg C/Cell (2.2mV/deg F/Cell)
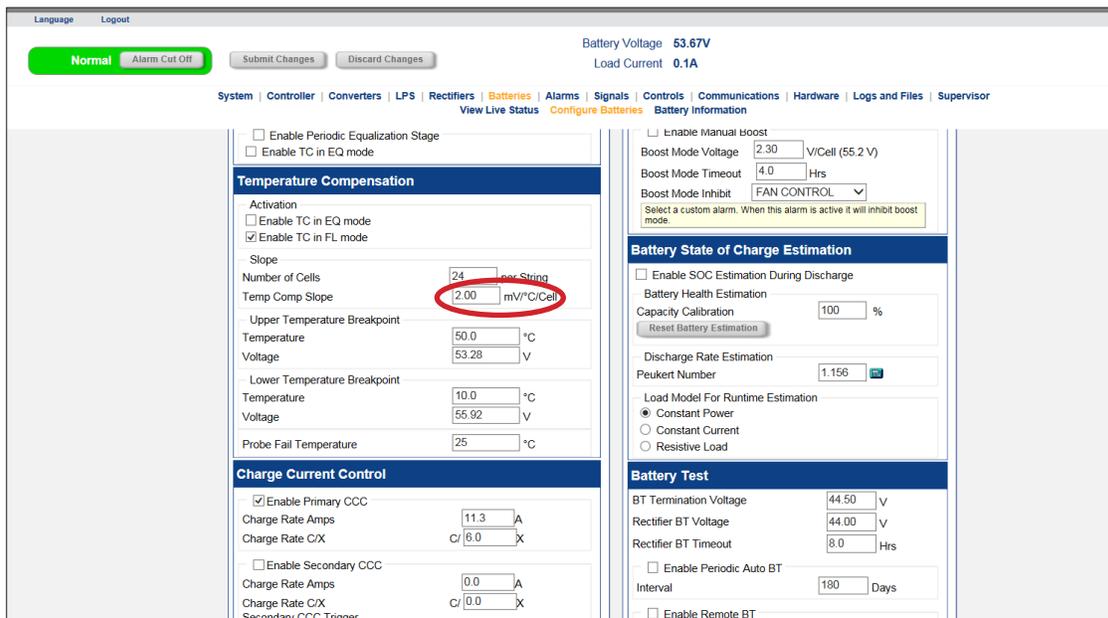
d. In the Battery State of Charge Estimation section, enter the peukert number in the Peukert Number box.

Battery Type	Peukert Value
Northstar NSB60FT Red	1.156
Enersys SBS B14	1.130
Northstar NSB100FT Red	1.131
Northstar NSB170FT Red	1.128
Enersys SBS 190F	1.113

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e. In the Temperature Compensation section, enter the upper/lower temperature breakpoint temperature and voltage in the respective boxes.

Battery Type	Upper Temperature Breakpoint		Lower Temperature Breakpoint	
	Temperature in C (in F)	Voltage	Temperature in C (in F)	Voltage
Northstar NSB60FT Red	50 (122)	53.28	10 (50)	55.2
Enersys SBS B14	50 (122)	52.08	10 (50)	55.92
Northstar NSB100FT Red	50 (122)	53.28	10 (50)	55.2
Northstar NSB170FT Red	50 (122)	53.28	10 (50)	55.2
Enersys SBS 190F	50 (122)	52.08	10 (50)	55.92

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f. In the Charge Current Control section, the charge rate can be entered either in terms of Charge Rate Amps or the C/X charge rate. Enter the desired charge rate in either format into the respective box.

g. Ensure the Enable Primary CCC check box is checked.

Step 3:   Changing the alarm setting:

a. Navigate to **Alarms > Configure Alarms.**

b. In the Alarm Configuration drop down box, select Voltage Alarms.

c. Enter the High Voltage 1 and High Voltage 2 in the Activation Value box.

Alarm Name	Activation Value
High Voltage 1	56.5
High Voltage 2	56.6

d. Navigate to **Rectifiers > Configure Rectifiers**.

e. Enter the following in its respective box.

Rectifier Setting Name	Value
Float Voltage	54.48
Equalize Voltage	56.3
OVP	57.7
LVA	46.0
HVA	56.5

Step 4: Submitting and saving the changes

a. At the top left side of the page, click the Submit Changes button. A pop-up window will be displayed comparing the old settings and the new settings.
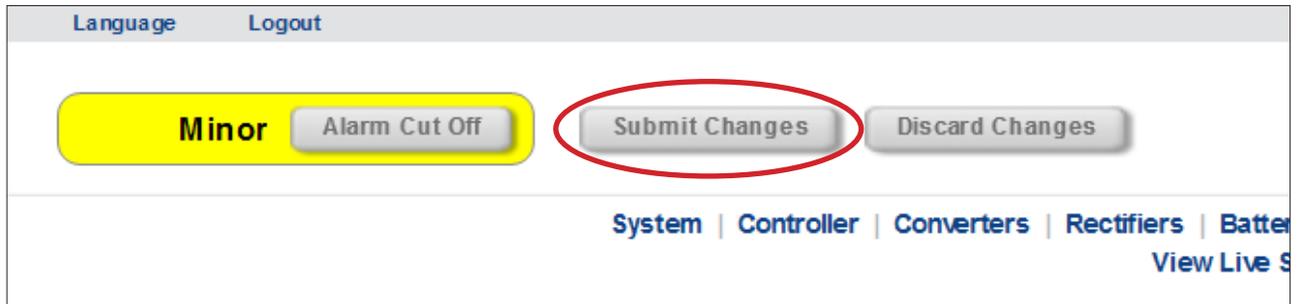
b. Select all the changes and click the Accept button to save all the necessary changes.

Setting Name	Controller Value	New Value
▼ ☑ **Battery Settings**		
▼ ☑ **Enable Feature**		
▼ ☑ **Enable Feature**		
☑ Enable Primary CCC	**Disabled**	**Enabled**
▼ ☑ **Battery Monitor**		
☑ Capacity Rating	**800.0**	**68.0**
☑ Peukert Number	**1.167**	**1.156**
☑ Peukert Current 1	**82.70**	**24.90**
☑ Peukert Current 2	**11.50**	**3.40**
▸ ☑ **Boost Mode**		
▼ ☑ **Temp Comp**		
☑ Temp Comp Slope	**2.50**	**2.00**
▼ ☑ **Breakpoints**		
Max value	**55.50**	**55.92**
Min Value	**52.50**	**53.28**
Lower Temperature Breakpoint	**0.0**	**10.0**
▸ ☑ **Charge Current Control**		
▸ ☑ **Enabled Sensors**		
▸ ☑ **Contact Information**		

Select All   Unselect All   Cancel   Accept

Chapter 8: Installing Equipment, Options and Adding Capacity

This chapter describes how to install optional equipment and components into the cabinet, including expansion components to increase system capacity. The cabinet allows for modular growth of line capacity and supports field installation of all factory options.

Topics Covered

This chapter covers the following topics:
- Installing a protection block mounting frame
- Installing a protection block
- Installing a cross-connect panel
- Installing a 60 Ah battery compartment riser
- Installing a battery heater
- Installing a seismic protection kit for batteries
- Installing a generator connector
- Installing an Ethernet over Copper (EoCu) trunking unit
- Installing fiber management options

Installing a Protection Mounting Frame

The cabinet's copper line protection system allows you to expand line capacity incrementally. Protection blocks reside in a factory-equipped mounting frame that holds up to four 50-pair blocks. You can field-install an additional mounting frame that holds up to two protection blocks to expand system capacity.

To install a 100 pair protection mounting frame

Step 1:   Unpack the protection mounting frame from its packaging.

Step 2:   Open the cabinet's front and side doors.

Step 3:   From the side compartment, install the mounting plate as follows.

   a. Locate the mounting holes on the equipment mounting rail.
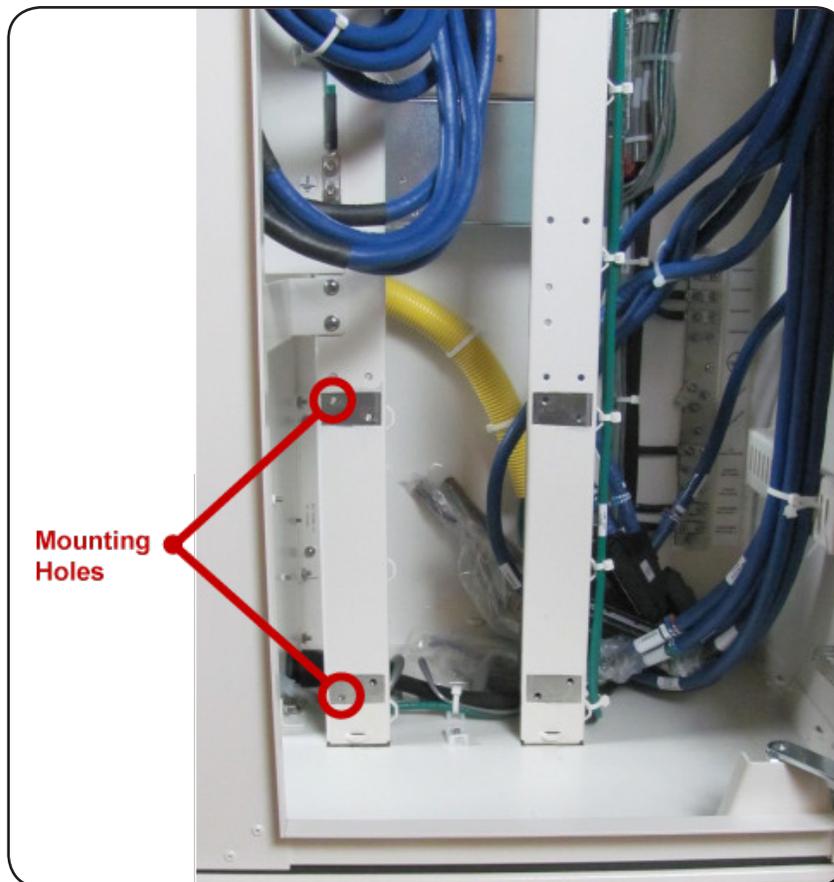
   b. Position the mounting plate against the rail, aligning mounting plate mounting holes with the counterpart holes in the rail.

c. Secure the mounting plate to the rail using (2) 10-32 X .38 screws.

Step 4: From the front of the cabinet, install the mounting frame as follows.

a. Locate the four threaded studs.

Note: The two studs on the left are attached to the mounting plate.

b. Place the mounting frame on the four threaded studs, and install nuts onto the studs using a 3/8 inch nut driver or socket. Tighten the nuts to secure the mounting frame in place.

For instructions on installing 50-pair protection blocks into the additional mounting frame, see Installing a Protection Block.

Installing a Protection Block

You can increase the cabinet's copper line protection capacity in the field to support expansion equipment. The protection blocks reside in a mounting fixture that holds up to four blocks, or up to six blocks if the cabinet is configured with the expansion frame.

Note: All Clearfield protection blocks use dead pair wiring, with a dead pair at the 25th position on both the equipment side (RJ-21) and subscriber side (MS2 or 710) interface cables. On the protection blocks, line identification labels cover the dead pair positions (25 and 50).

To install a protection block

Step 1:   Prepare the expansion protection block(s) for installation as follows:

a. Unpack the protection block from the shipping packaging.

b. On the back of the protection block, remove any cable ties that coil up the interface cables (two with MS2or 710) connectors, two with RJ-21 connectors).

c. Open the cabinet's front and side doors.

d. Locate the open position(s) on the mounting fixture, and then feed the protection block's interface cables through the fixture into the area behind it.

Note: On the mounting fixture, the (2) upper positions hold blocks for the first active service unit, the (2) lower positions hold blocks for the second active service unit, and if present, the bottom/expansion frame hold blocks for a third active service unit.

Step 2:   Attach the protection block to the mounting fixture as follows:

a. Insert the tabs on the bottom of the protection block into the slots on the frame.

b. Pull down the spring-loaded plunger latch at the top of the protection block. While holding the plunger down, rotate the block back into its mounting position. Release the plunger latch to secure it in to the mounting fixture.

c. Install two supplied screws into the base of the block to secure it to the frame.

Note: The screws provide a critical ground path to the cabinet's main ground bar.

Step 3:   Terminate the protection block interface cables as follows:

a. Route the two RJ-21 equipment interface cables from the back of the block to the active service unit and connect to the appropriate equipment interfaces (RJ-21 connectors).

b. Route the two MS2 or 710 subscriber interface cables to the back and mate to the appropriate OSP interface cables (MS2 or 710 connectors).

c. Dress and secure the interface cables with cable ties as needed.

Step 4:   Apply line identification labels over the dead pair positions (25 and 50) on the protection block.
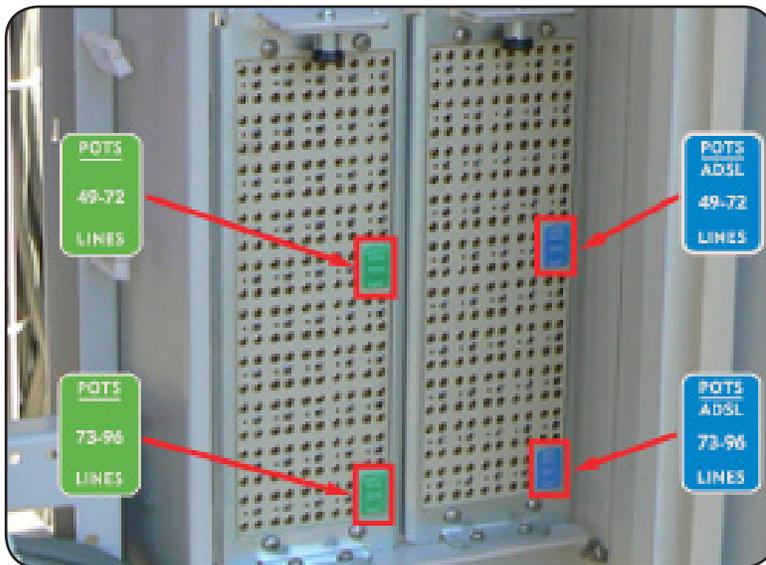
- Use the blue labels to identify the xDSL or combo lines.
- If applicable, use the green labels to identify overlay POTS lines (to PSTN).

Step 5:   Repeat Steps 1–4 to install additional protection blocks for lines served, as needed.

Installing a Cross-Connect Panel

The FAC 400 cabinet supports the following cross-connect option:

• 300-pair panel (2:1, 200 subscriber/100 equipment pairs).

The cross-connect systems are arranged in 50-pair blocks as shown below. Equipment-side blocks have dead pairs at the 25th and 50th positions.

This section describes how to install a cross-connect panel into a cabinet not factory-equipped with the option. The cross-connect panel resides in the side compartment, behind the protection blocks.

For cabinets already in service, installing a cross-connect panel will affect service to subscribers, because the cross-connect panel sits inline between the cabinet's copper line protection and the OSP ('Subscriber' side) cables. Clearfield recommends performing the installation during a maintenance window to minimize the service impact.

Note: All Clearfield equipment uses a 'dead pair' scheme, where the 25th pair in each 25-pair cable group is unterminated and not used (dead).

300-pair cross-connect panel   **150-pair cross-connect panel**

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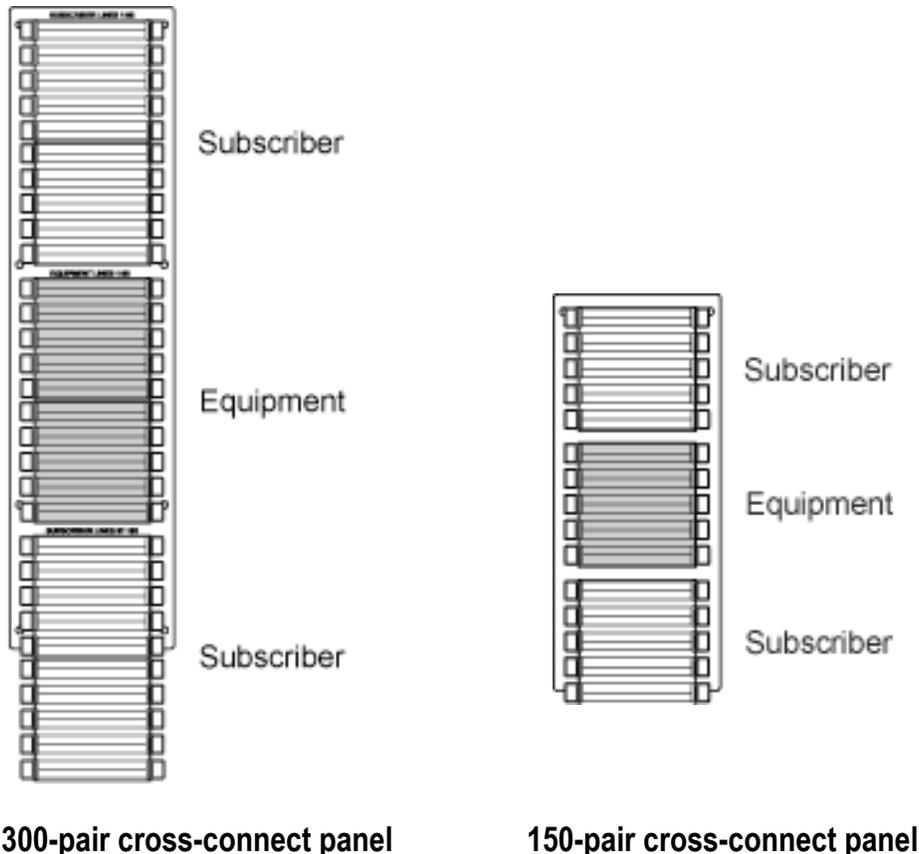
To install a cross-connect panel

Step 1:   Unpack the cross-connect panel from the shipping packaging.

Step 2:   Open the cabinet's side door.

Step 3:   Position the cross-connect panel against the mounting fixture, with the cables toward the back. Align the eight mounting holes in the cross-connect panel with the counterpart holes in the mounting fixture.

Step 4:   Secure the cross-connect panel to the rack using the eight supplied mounting screws from the installation kit.

Step 5:   Terminate the cross-connect interface cables as follows:

- Mate the equipment-side cables to the appropriate protection block interface cables (MS2 connectors).
- Mate the subscriber-side cables to the appropriate OSP interface cables (MS2 or 710 connectors).

Step 6:   Dress and secure all cables with tie-wraps.

Installing a Battery Compartment Riser

Clearfield offers an optional battery compartment riser to support a second 60 Ah battery string. The battery compartment riser ships detached from the cabinet, even when ordered as a factory option. Install the battery compartment riser onto a concrete pad, foundation vault, or pole/wall mount pedestal, and then mount the cabinet assembly (with battery compartment) onto the riser.

To install a 60 Ah battery compartment riser (under the cabinet)

Step 1:   Prepare the riser compartment for installation as follows:

a. Unpack the battery compartment riser from its shipping packaging.

b. Remove the riser's compartment door. See Operating Cabinet Doors for instructions.

c. From inside the compartment, remove the hex nuts from the five studs anchoring the splash guard to the top of the compartment.

Step 2:   Install the riser onto the concrete pad, foundation vault, or pole/wall-mount fixture. See Installing the Cabinet for detailed instructions.

Step 3:   Install the FAC 400 cabinet onto the riser compartment as follows:

a. Using two people, lift the cabinet onto the riser, keeping the (4) anchor holes in the cabinet base aligned with the counterpart holes in the riser.

b. Attach the cabinet base to the riser using (4) anchor bolts, (8) flat washers, (4) lock washers, and (4) nuts (one set per each of the four anchor holes).

Step 4:   Tighten all hardware to secure the cabinet to the riser.

For battery installation instructions, see Installing Batteries.

Installing a Battery Heater

For colder climates, Clearfield recommends using an optional battery heater to prevent batteries from freezing and to prolong battery life. The battery heater is controlled by a thermostat set for the following operation:

- **4° C** – Battery heater turns On.
- **16° C** – Battery heater turns Off.

Note: The battery heater sits directly underneath the battery string, so you must install a heater into the battery tray before installing batteries.

To install a battery heater in a battery compartment

Step 1: Unpack the battery heater from the shipping packaging, and then remove the battery compartment door. See Operating Cabinet Doors for instructions.

Step 2: Install the battery heater into the battery tray as follows:

a. Facing the battery compartment, orient the battery heater with its heating element and alignment tabs on the bottom (face down) and the power and thermostat cords on the left side.

b. Place the heater into the battery tray, aligning the heater tabs into the slots in the tray.

c. Attach the heater ground wire to the two mounting studs located at the center of the battery tray and heater using the supplied Keps nuts and star washers.

d. Route the power and thermostat cords through the cutout at the left rear corner of the battery tray.

Step 3: Route the power cord to the left compartment wall. Plug the power cord into the supply cable located on the inside wall.

Step 4: Mount the thermostat to the side of the battery tray as follows:

    a. Route the thermostat wire to the outer left side of the battery tray.

    b. Attach the thermostat to the two mounting studs on the side of the tray.

    c. Install a nut onto each of the two mounting studs to secure the thermostat in place.

Step 5: After batteries are installed, switch ON the 15A Battery Heater breaker at the AC load center to apply power. ***Note:*** *For battery installation instructions, see Installing Batteries.*

Step 6: Replace the battery compartment door.

To install a battery heater in a secondary 60 Ah battery compartment (riser)

Note: *Install the battery heater in the (upper) battery compartment before installing the battery heater in the riser.*

Step 1: Unpack the battery heater from the shipping packaging, and then remove the upper and lower battery compartment doors. See Operating Cabinet Doors for instructions.

Step 2: Install the battery heater into the battery tray in the riser compartment as follows:

    a. Facing the battery compartment, orient the battery heater with its heating element and alignment tabs on the bottom (face down) and the power and thermostat cords on the left side.

    b. Place the heater into the battery tray, aligning the heater tabs into the slots in the tray.

    c. Attach the heater ground wire to the two mounting studs located at the center rear of the battery tray and heater using the supplied Keps nuts and star washers.

Step 3: Install the battery heater jumper cable as follows:

    a. Plug the jumper cable's upper power connector into the supply cable located in the upper battery compartment on the left inside wall.

    b. Plug the jumper cable's upper heater connector into the battery heater installed in the upper battery compartment.

    c. Route the jumper cable's lower power connector into the riser compartment through the left rear hole of the upper battery compartment, and insert the connector into the panel mount bracket on the left inside wall.

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d. Plug the power cord from the riser's battery heater into the jumper cable's lower connector (inserted into the panel mount bracket in step 4c).
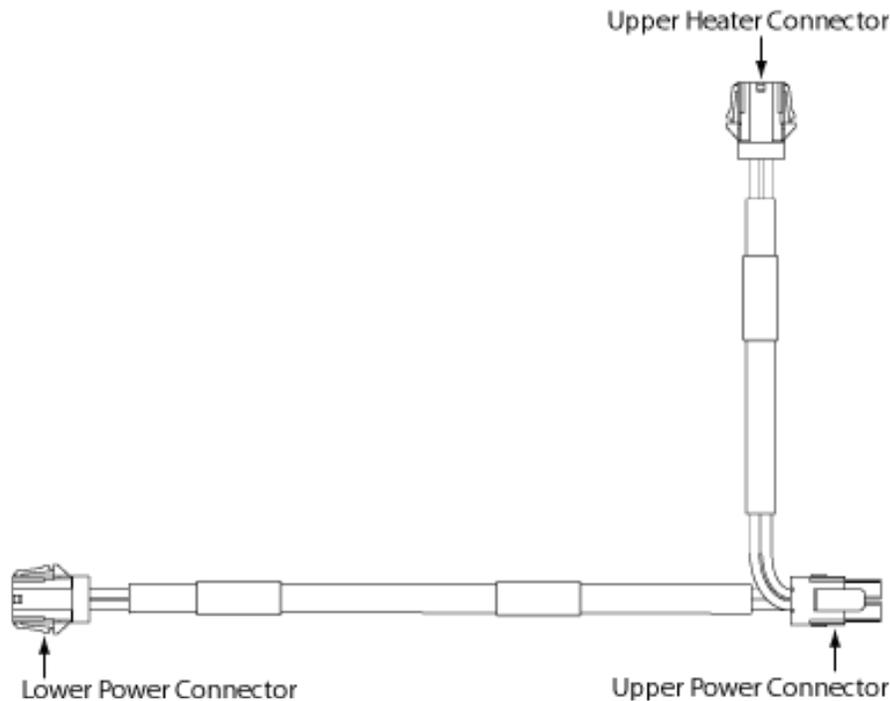
Step 4: Mount the thermostat to the side of the battery tray as follows:

a. Route the thermostat wire to the outer left side of the battery tray.

b. Attach the thermostat to the two mounting studs on the side of the tray, as shown above.

c. Install a nut onto each of the two mounting studs to secure the thermostat in place.

Step 5: After batteries are installed, switch ON the 15A Battery Heater breaker at the AC load center to apply power.

Note: For battery installation instructions, see Installing Batteries.

Step 6: Replace the battery compartment doors.

Installing a Generator Connector

A generator connector (Gen Conn) allows you to connect an external power generator to the cabinet to sustain services during an AC power outage. The cabinet supports a 30 Amp generator connector option, which you can install in the field.

Note: This procedure is service-affecting for cabinets in service.

⚠ **DANGER!** High voltage may be present. Only a qualified electrician should perform this task. Follow NEC and local codes when handling power systems. Do not restore AC power until the task is complete.

To prepare for generator connector installation

Step 1: At the local power transfer switch, disconnect AC power to the cabinet.

Step 2: Open the cabinet's front compartment door.

Step 3: Install a circuit breaker for the Gen Conn circuit into the load center as follows:

a. Remove the front panel from the AC load center.

b. At the AC load center, switch the Gen Conn (if present) and Main circuit breakers to OFF.

c. Install the Gen Conn circuit breaker:
- Get the Gen Conn breaker from the shipping package.
- Set the switch to OFF.
- Insert the breaker to the right of the Main breaker.

Step 4: Prepare the battery base compartment for mounting a Gen Conn:

a. Remove the battery base door. See Operating Cabinet Doors for instructions.

b. Remove equipment from the battery base to gain access to the connector mounting location, as needed:
- If batteries are present, remove the batteries. See Replacing Batteries for instructions.
- (Optional) Remove the battery tray.

c. Remove the blank plate that covers the generator connector mounting location. From inside the battery compartment, remove the nuts from the four studs anchoring the blank plate to the compartment wall.

Note: Do not discard the four mounting nuts. The nuts will be reused to install the generator connector.

d. Pull the blank plate away from the wall to expose the connector mounting location.

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To install a generator connector

Step 1: Unpack the generator connector assembly from the shipping package.
Note: The connector ships pre-assembled in a mounting housing.

Step 2: Attach the generator connector assembly to the mounting fixture as follows:

a. From inside the battery base, insert the connector plate cover through the mounting fixture, and align the four studs on the housing with the counterparts holes in the fixture.

b. Install the four nuts onto the four studs and tighten the nuts to secure the assembly in place.

Step 3: Connect the generator connector wires to the AC load center as follows:

a. Remove the locking nut from the conduit, and set aside.

b. Route the conduit with the Gen Conn wiring up into the AC load center (though the hole directly below the breaker space labeled Gen Conn) and attach the locking nut from inside of the AC load center to the conduit fitting by tightening it clockwise.

Step 4: Terminate the generator connector wires to the load center as follows:
- Connect the ground (green) lead to the ground bus bar.
- Connect the neutral (white) lead to the neutral bar.
- Connect the L1 (black) lead to the left side of the Gen Conn breaker.
- Connect the L2 (red) lead to the right side of the Gen Conn breaker.

Note: An AC wiring label is attached behind the load center front panel for reference.

Step 5: Replace the AC load center cover panel.

Step 6: At the AC load center, switch all breakers to ON.

Step 7: At the local power transfer switch, restore AC power to the cabinet.

Installing Fiber Management Options

Clearfield FAC 400 cabinets support high-density fiber applications within the enclosure, including the following fiber management solutions:

- 48- and 96-position fiber distribution panels (with pre-terminated, 100-foot OSP fiber cable) for high-density fiber transport, aggregation, point-to-point Ethernet, and GPON applications
- Up to four 1:32 PON splitters (and mounted cage) for GPON applications
- Montclair polarization dependent loss (PLC) LGX 1x4 module optical splitter
- Fiber management accessories (fiber dressing spools and comb)
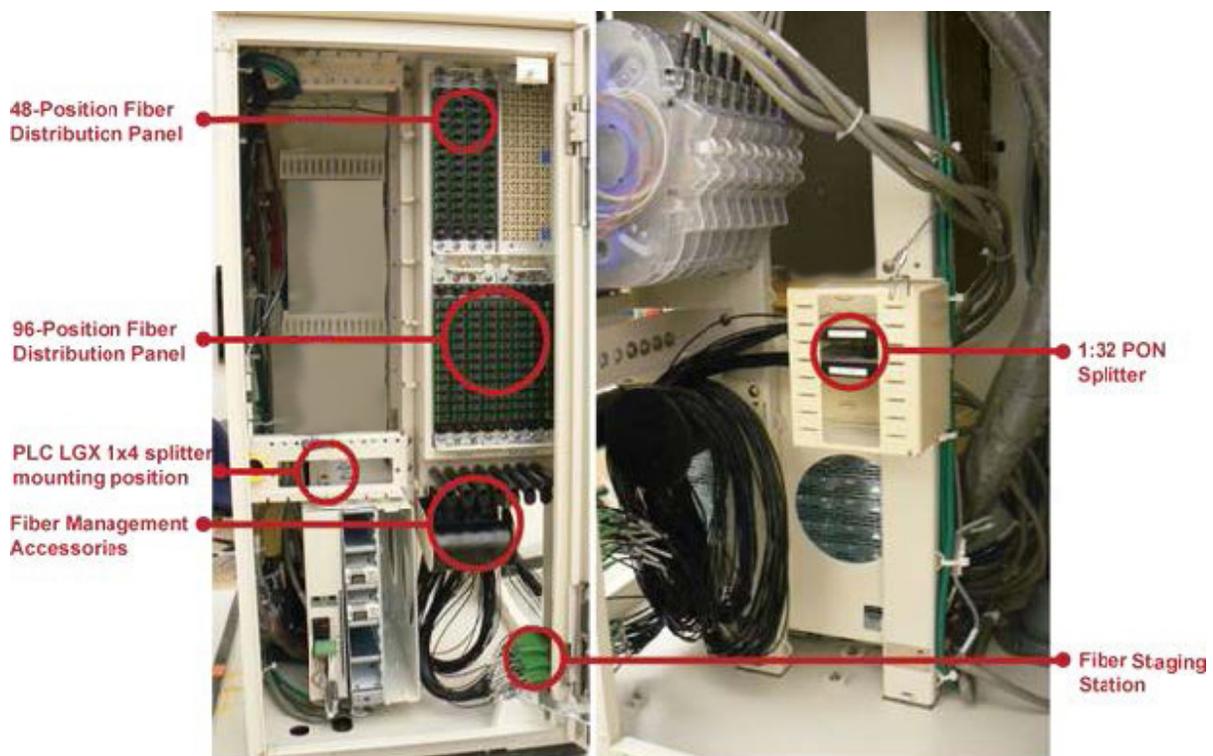
FAC 400 front   **FAC 400 side**

These fiber management solutions are offered as factory and field installed options for the FAC 400. For cabinet orders with factory-installed options, only the management accessories and splitter cage are installed at the factory. The distribution panels and PON splitters are always user-installed. You can order and install individual components to scale support as required. For more information and detailed installation instructions, refer to the Clearfield Installation Guide: Fiber Management Solutions for FAC 400.

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Installing a 48-Position Fiber Distribution Panel

This topic describes how to install a 48-position fiber distribution panel. The 48-position distribution panel is comprised of (4) 12-position cassettes, pre-terminated to a 100-foot OSP fiber cable. The distribution cassettes install onto a mounting bracket that attaches to the cabinet's protection panel mounting frame. Note that the fiber distribution panel and the mounting brackets are ordered and packaged separately but installed together in the field.

Clearfield also offers a 96-position distribution panel, which is comprised of (8) 12-position cassettes, also pre-terminated to a 100-foot OSP fiber cable. For 96-position panels, simply repeat the procedure for the 48-position panel below to install the second set of (4) cassettes into the adjacent space using a second mounting bracket. For the 96-position panel, because the cassettes are pre-terminated to an OSP fiber cable, the cassettes must be fed through the bracket from behind before the assembly is mounted.

To install a 48-position fiber distribution panel

Step 1:   Install the bottom piece of the mounting bracket.

Bottom Bracket Piece

a. Position the bottom bracket piece on the mounting frame, aligning the holes.

b. Secure the bottom bracket piece in place using two supplied screws.

Step 2:   Feed the 48-position fiber distribution panel (four 12-position cassettes) through the frame opening from behind, as shown.

Pull through

Pull through

a. Feed the bottom edge of the assembly through the space first.

b. When the bottom edge is clear, continue to bring the top of the assembly through the space until it is completely through.

Step 3:   Install the top piece of the mounting bracket.

a. While the distribution panel temporarily hangs forward through the opening, position the top bracket piece against the mounting frame, aligning the thumbscrew hole with the hole in the frame.
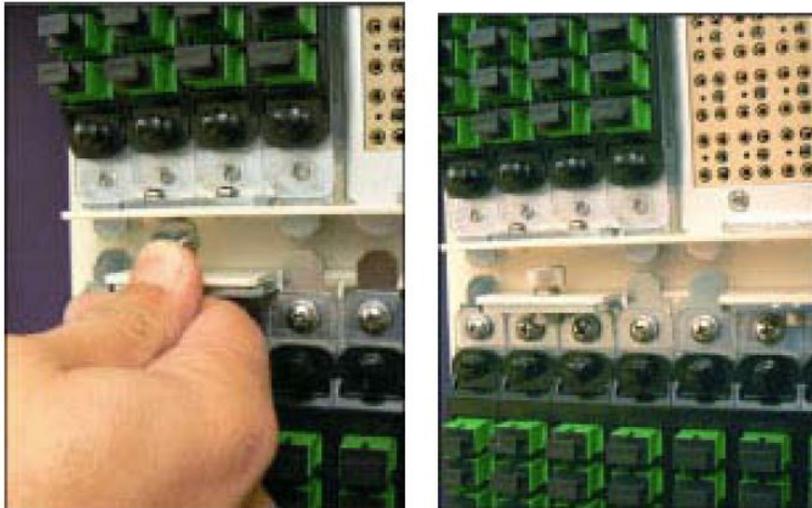
b. Insert the supplied thumbscrew through the hole and bracket from the top. Tighten the screw to secure the bracket in place.

Step 4:   Secure the distribution cassettes to the bracket using (8) supplied screws (2 per cassette, top and bottom).

Note: For a 96-position fiber distribution panel, repeat the procedure above to install the second set of (4) cassettes into the adjacent space on the mounting frame.

Step 5:   From the back of the distribution panel, carefully feed the OSP cable down through the cabinet's cable-entry duct. Route the OSP cable out to the splicing location.

Bundle DP Cables

Feed OSP Cable
Through Entry Duct
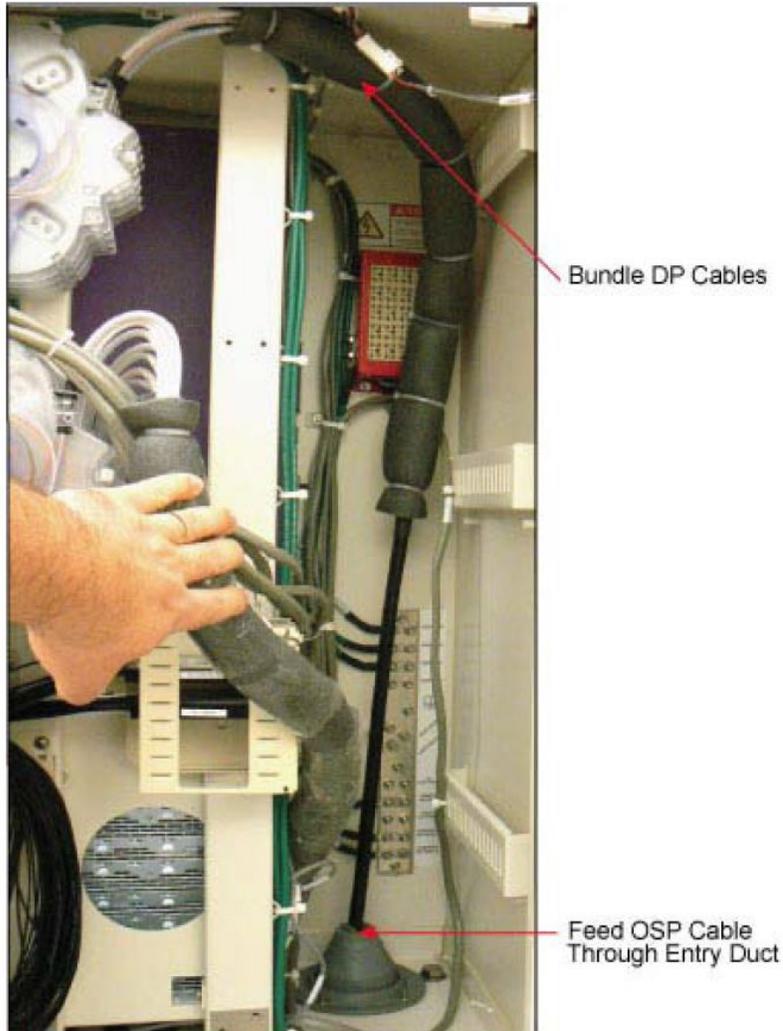
Installing the Fiber Management Accessories

This topic describes how to install the fiber management accessories kit, comprised of a spool bracket and a comb bracket for dressing fiber.

Note: When the accessory kit is ordered as an FAC 400 factory option, these items are installed in the cabinet at the factory.

To install the FAC 400 fiber management accessories

Step 1: Accessing the compartment from the side door, remove the bracket that is located directly below the protection panel mounting frame.

a. Remove the (2) screws on the vertical-rail side of the frame. Remove the (2) nuts on the wall side of the frame.

b. Remove and discard the bracket, but retain the hardware for reuse.

Step 2: Install the comb bracket into the vacant position on the mounting frame.

a. Position the comb bracket on the mounting frame as shown, aligning with the (2) holes in the frame.

b. Secure the comb bracket in place reusing the (2) screws and nuts removed in Step 1.

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Step 3:   Install the spool bracket on the mounting frame.

a. Position the spool bracket on the mounting frame as shown, aligning with the (2) holes in the frame.

b. Secure the spool bracket in place using (2) supplied screws.

IMPORTANT! When routing optic fibers, be careful to avoid bending fibers beyond the manufacturer recommended 1 inch (2.54 cm) bend radius. Exceeding the bend radius can cause excess attenuation and possibly break the fiber.

Installing a 1:32 Splitter and Integration Kit

This topic describes how to install the 1:32 PON fiber splitter and the splitter integration kit. The integration kit includes the splitter mounting cage, retaining pin, and mounting hardware. The mounting cage can house up to (6) 1:32 splitters. The splitter assembly and the integration kit are ordered and packaged separately but installed together in the field.

Note: When the integration kit is ordered as an FAC 400 factory option, it is installed in the cabinet at the factory.

To install the splitter mounting cage

Step 1:   Install the splitter mounting cage.

a. Position the mounting cage against the vertical rail behind the mounting frame as shown, aligning the (2) holes.

b. Attach the mounting cage to the vertical rail using (2) supplied screws. Tighten the screws to secure the assembly in place.

Step 2:   Install the splitter retaining pin assembly.

a. Hold the retaining pin lanyard against the vertical rail, above the splitter cage.

b. Attach the lanyard to the vertical rail using (1) supplied screw. Tighten the screw to secure the lanyard in place.

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To install a 1:32 fiber splitter assembly

Step 1: Insert a 1:32 fiber splitter into any vacant position in the mounting cage.
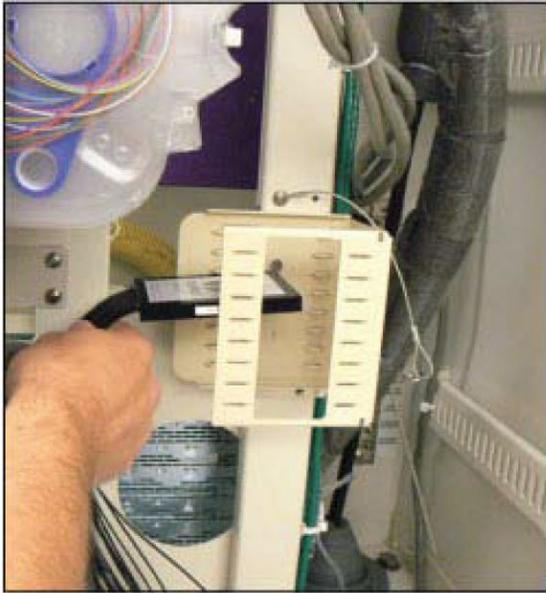
Step 2: Insert the retaining pin through the bracket (and corner of the splitter) to secure the splitter in place.

⚠ **IMPORTANT!** When routing optic fibers, be careful to avoid bending fibers beyond the manufacturer recommended 1 inch (2.54 cm) bend radius. Exceeding the bend radius can cause excess attenuation and possibly break the fiber.

Step 3: Dress the fibers from the splitter forward, making one loop over the first spool.

Step 4: Hang the staging plate on a stud on the inside corner wall.

Step 5: Organize and dress the fibers with enough slack to accommodate the staging area position.

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If a patch and splice or pigtail fiber splice solution is required, Clearfield offers a field installed Clearview xPAK fiber assembly. This module supports low count fiber distribution with Light Guide Cross Connect (LGX) 6- or 12-position cassettes. The Clearfield xPAK cassette mounts directly under the chassis as shown below.

For installation instructions, see the Clearfield Clearview xPAK Installation Manual (LGX option).

Chapter 9: Cabinet Maintenance

This chapter describes how to perform cabinet maintenance, including routine maintenance and corrective maintenance to replace worn or failed parts and equipment.

Topics Covered

This chapter covers the following topics:
- Routine cabinet maintenance
- Replacing parts and equipment

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Routine Maintenance

This section describes how to perform routine maintenance on the cabinet.

Checking Cabinet Surfaces

Clean and inspect the cabinet for contaminants, damage, and wear once a year. Items to check include the following:

Inspect interior surfaces

Items to check inside the cabinet include the following:

- Inspect the interior of the cabinet for signs of visible damage to the metal or paint.
- Note any damage to the metal work. If the damaged area interferes with operation of the cabinet or electronics, contact Clearfield support for assistance with a resolution.
- Repair damage to the paint using touch-up paint available from Clearfield after cleaning the surface and removing rust.
- Inspect all gaskets around the doors and the roof to ensure a tight secure fit.

Inspect exterior surfaces

Items to check outside the cabinet include the following:

- Inspect the exterior of the cabinet for signs of damage to the metal work or paint.
- Repair damage to the paint using approved type touch-up paint after cleaning the surface and removing rust.
- Note damage to the metal work. If the damaged area interferes with operation of the cabinet or electronics, contact Clearfield support for assistance with a resolution.
- Clean all surfaces so that they are free of dirt, dust, and foreign material.
- Remove all material from air intake screens and louvers (i.e. spider webs, leaves, etc.).
- Clean the air vents on the heat exchangers and the battery compartment with a dry, soft brush to ensure optimal airflow.

Checking Electrical Components

Check all electrical components in the cabinet for wear at least once a year.

In cabinets configured for local power, inspections include:

- Check the circuit breakers on the AC load center. Verify that all breakers are in the ON position.
- Check the AC surge arrestor on the AC load center. Verify that the operational indicators are lit.
- Check the GFCI convenience outlet. Test the outlet per local code.
- Check the controller module on the rectifier shelf. Verify that the controller operational indicator is lit.
- Check the rectifier modules in the rectifier shelf. Verify that the operational indicators are lit on each module.
- Check the circuit breaker and fuses on the rectifier shelf. Verify that the breaker is in the ON position and that no fuses are blown.
- Check the heat exchanger. Verify that the air intake locations are unobstructed and that the fans are running.

If any of the inspected items requires replacement due to failure or damage, replace the item as described in Replacing Parts and Equipment.

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FieldSmart® Fiber Active Cabinet (FAC) 400
Installation Manual —————————————————————————————

Checking Cable Connections

Check external cable connections at least once a year. External cables are any cable that enters the cabinet from the outside plant.

- Visually inspect all cables for signs of physical damage. If damage is present, cables should be repaired or replaced per local practice.
- Check all outside plant copper connections for complete and secure connection.
- Ensure that all cable management accessories provide a clean appearance. Replace any fastening devices (i.e. cable ties) so that they include all cables being secured.
- Check all fiber optic connectors to ensure that they are securely fastened.
- Check all connections on the cabinet ground bar for a tight and secure fit.
- Check all protector modules to ensure that all devices are securely seated.
- Check all conduits to ensure that any material used to seal between the cable and the conduit is still present and providing a complete seal.

Checking the Heat Exchanger

⚠️ **CAUTION!** Always disconnect power to the heat exchanger prior to servicing.

Check the heat exchanger for proper functioning at least once a year.

- Verify that no fan failure ENV alarms are present on the Clearfield equipment.
- Verify fan operation, including visual inspection the following:

  - Verify that all fans are spinning with no obstructions or odd noises.
  - Verify that the heat exchanger is secured to the cabinet and all gasket material is intact and adhered to the cabinet door surface.

Check the heat exchanger for required cleaning based on the environmental conditions (typically once a year).
- Verify that no debris is blocking the inlet and outlet vent screens. Place a piece of paper against the inlet vent and verify that the paper is drawn in; place a piece of paper against the outlet vent and verify that the paper is blown out. Use a whisk broom or other device to clear the vents if debris is present.
- Use a soft bristle brush to remove dust or debris from the fans and heat exchanger core as needed.

Note: If available, you may use low pressure compressed air (up to 30 PSI) in addition to, or in place of, a soft bristle brush. Compressed air should only be used with cabinet doors closed and only on the external sides of the heat exchanger core. Be sure to use appropriate eye protection.

- For more extensive cleaning, you can remove the exterior heat exchanger cover (by removing the two screws at base of the cover) and the individual cover plates behind the main cover.

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Battery Maintenance

Battery maintenance applies to locally powered cabinets only. Perform routine inspection and maintenance of batteries to improve battery life. Follow the manufacturer's maintenance recommendations. Additional general maintenance guidelines are provided below.

Battery maintenance does not impact cabinet service, provided that an AC power failure does not occur during the maintenance process. Clearfield recommends connecting an external generator to the cabinet while performing battery maintenance to ensure service continuity in the event of an AC outage.

WARNING! Electrical hazard. Batteries contain a stored charge. Only a qualified technician should perform this procedure.

CAUTION! Electrical, chemical, fire, and heat hazard. Handle batteries with care to avoid personal injury or damage to the equipment.

ALERT! To ensure service continuity in the event of an AC outage, connect an external generator to the cabinet while performing battery maintenance.

To perform battery maintenance

Step 1:   At the rectifier shelf, open the fuse panel door. Switch the battery breaker to OFF.

Step 2:   Remove the battery compartment door. See Operating Cabinet Doors for instructions.

Step 3:   To remove the batteries from the battery compartment:

a. If present, remove the seismic protection bracket from the front of the batteries.

b. Remove the lower retainer bracket from the frame of the battery compartment.

c. Disconnect the battery power cables from the power supply terminals.

d. Slide the batteries out of the battery compartment.

e. Remove the protective covers from the battery terminals.

f. Remove the red and black battery power cables from the terminals at each end of the string.

g. Remove the jumper straps from between the terminals of the batteries in the string.

Step 4: Visually inspect each battery for defects such as:
- Fractured housing or other physical damage
- Leakage
- Bulging

Note: Replace any battery that displays a defect. See Replacing Batteries for instructions.

Step 5: Perform the following maintenance tasks:

a. Load test each battery to verify that ample current is available to maintain the system.

b. Ensure that each battery provides 13.5 VDC (plus or minus .2 VDC).

c. Clean each battery to remove dust, dirt, or corrosion from the battery surface.

Note: Only use water for cleaning the battery surface. Do not use any chemicals.

d. Clean the battery terminals and apply No-Ox anti-corrosion grease to each.

e. Record the inspection and maintenance details in the cabinet records per local practice.

Step 6: Inspect the battery compartment for any signs of damage. Clean the compartment and fix any damage to painted areas by removing all rust and dirt from the affected area, and then applying touch-up paint to the area to prevent future corrosion.

Step 7: Re-install the batteries into the battery compartment. See Installing Batteries for instructions.

Step 8: Re-install the seismic protection bracket, if present.

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Replacing Parts and Equipment

This section describes how to replace worn or failed parts and equipment in the cabinet.

Removing a Cabinet Door

You can remove the cabinet doors for convenience during cabinet installation or maintenance activities, or to replace a door.

Replacing a cabinet door may become necessary if:
- A door becomes damaged.
- The heat exchanger fails or becomes damaged.

You can replace cabinet doors in the field without impacting service.

⚠️ **CAUTION!** Handle detached cabinet doors with care to avoid personal injury or damage to the door.

To remove a cabinet door

Step 1: For a door (equipped with a heat exchanger), disconnect the heat exchanger cable.

Step 2: Disconnect the ground strap from the door by removing the hex nut. Save the nut to re-attach the strap to the new door.

Step 3: Disconnect the wind brace bracket from the door:

a. Remove the three nuts securing the wind brace bracket to the door. Save the nuts to re-attach the bracket to the new door.

b. Detach the wind brace bracket from the three studs on the door.

Step 4:   On the door hinges, disengage the hinge pin lever from its cradle:

       a. Top hinge: Lift the pin lever up and rotate it away from the cradle.

       b. Bottom hinge: Press the pin lever down and rotate it away from the cradle.
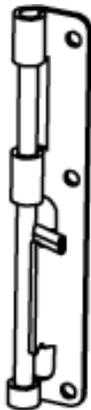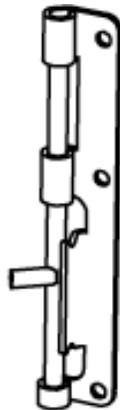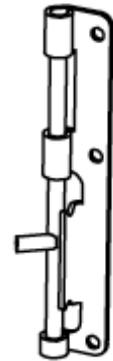
Pin lever engaged   Pin lever disengaged

Step 5:   Release the hinge pins from the hinge pin channels as follows:

       a. Top hinge: Press down on the pin lever until the pin slides free from the channel.

       b. Bottom hinge: Lift up on the pin lever until the pin slides free from the channel.

Installing a Cabinet Door

You can quickly install a cabinet door in the field without impacting service.

 CAUTION! Handle cabinet doors with care to avoid personal injury or damage to the door.

To install a cabinet door

Step 1:   Unpack the new door from its shipping packaging.

Step 2:   On the new door hinges, disengage the hinge pin lever from its cradle:

       a. Top hinge: Lift the pin lever up and rotate it away from the cradle.

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Step 2:   **b. Bottom hinge:** Press the pin lever down and rotate it away from the cradle.

Step 3:   Release the hinge pins from the hinge pin channels:

       a. Top hinge: Press down on the pin lever until the pin slides free from the channel.

       b. Bottom hinge: Lift up on the pin lever until the pin slides free from the channel.

Step 4:   Insert the new door into the door frame. Align the door hinge knuckles with the counterpart hinge knuckles on the door frame.

Step 5:   Engage the hinge pins to secure the door in place as follows:

       a. Top hinge: Lift up on the pin lever until the pin slides completely into the pin channel.

       b. Bottom hinge: Press down on the pin lever until the pin slides completely into the pin channel.

       c. Rotate the pin levers into the cradles to secure the hinges.

Step 6:   Attach the wind brace bracket to the inside of the door using the three nuts removed from the previous door.

Step 7:   Attach the ground strap to the door using the hex nut removed from the previous door.

Step 8:   For a heat exchanger door, connect the heat exchanger power (and alarm) cable to the cabinet wiring:

       a. Locate the heat exchanger cable on the inside of the door.

       b. Route and connect the heat exchanger cable to the cabinet extension cable.
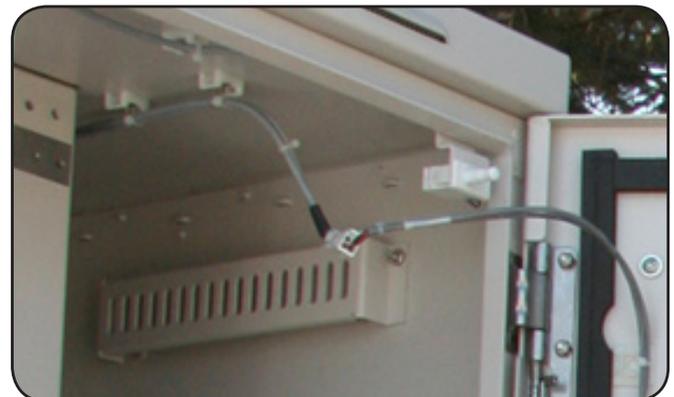
Replacing the Cabinet Roof

If the cabinet roof becomes damaged, you can replace the roof in the field as described below.

To replace the cabinet roof

Step 1:   Open the cabinet side door.

Step 2:   Remove the (3) Keps nuts securing the protection mounting frame to the side of the cabinet.

Step 3:   Push the top of the mounting frame toward the front of the cabinet, as far as it will go.

Step 4:   Using an offset screwdriver, remove the screw in the interior roof above the mounting frame.

Step 5:   Remove the (3) remaining screws in each corner of the interior roof, and set aside.

Step 6:   Lift and remove the damaged roof from the cabinet.

Step 7:   Place the replacement roof on the cabinet.

Step 8:   Secure the roof in place using the screws removed in step 5.

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Replacing AC Breakers

On cabinets configured for local power, if a circuit breaker in the AC load center fails or becomes damaged, you can replace the breaker in the field as described below. If the cabinet is equipped with charged batteries, this procedure does not affect service.

⚠️ **DANGER!** High voltage may be present. Only a qualified electrician should perform this task. Follow NEC and local codes when handling power systems. Do not restore AC power until the task is complete.

To replace an AC circuit breaker

Step 1:   At the local power transfer switch, disconnect AC power to the cabinet.

> *Note: If the cabinet is equipped with charged batteries, this action does not affect service. The equipment automatically switches to battery reserve power.*

Step 2:   At the AC load center, switch the Main circuit breaker to OFF.

Step 3:   Remove the cover panel from the AC load center.

Step 4:   Remove any wires from the defective circuit breaker.

Step 5:   Remove the defective breaker from the load center and replace it with a new breaker of the same type and rating.

Step 6:   Reconnect all wiring to the new circuit breaker.

Step 7:   Replace the AC load center cover panel.

Step 8:   At the AC load center, switch all breakers to ON.

Step 9:   At the local power transfer switch, restore AC power to the cabinet.

Replacing Rectifier Modules (Alpha Cordex Rectifier Option)

Rectifier modules are hot-swappable and can be replaced without disconnecting power to the Alpha shelf. Replacing an installed rectifier requires a manual inventory update at the controller to clear the removed rectifier from its current list of rectifiers.

To replace the battery circuit breaker

Step 1: To remove a module, push up on the locking clip release and slide the module out of the shelf.

Step 2: At the controller web interface initiate an inventory update: Main Menu > Rectifiers > Inventory Update.

Step 3: Place the new rectifier module on the shelf bottom and slide the module into the rear connector (inside the shelf).

Step 4: Apply pressure to the module front panel to engage the rear connector in the shelf receptacle. The locking clip automatically secures the rectifier to the shelf.

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Replacing Batteries

If a battery or string of batteries fails, becomes damaged, or wears out its life, you can replace the battery or string as described below. Replacing batteries does not impact cabinet service, provided that an AC power failure does not occur during the replacement process. Clearfield recommends connecting an external generator to the cabinet while performing battery maintenance to ensure service continuity in the event of an AC outage.

> **WARNING!** Electrical hazard. Batteries contain a stored charge. Only a qualified technician should perform this procedure.

> **CAUTION!** Electrical, chemical, fire, and heat hazard. Handle batteries with care to avoid personal injury or damage to the equipment.

> **ALERT!** To ensure service continuity in the event of an AC outage, connect an external generator to the cabinet while performing battery maintenance.

To replace batteries

Step 1: At the rectifier shelf, switch the battery breaker to OFF.

Step 2: Remove the battery compartment door. See Operating Cabinet Doors for instructions.

Step 3: To remove an old 60 Ah battery string:

a. If present, remove the seismic protection bracket from the front of the batteries.

b. Remove the lower retainer bracket from the frame of the battery compartment.

c. Disconnect the battery power cables from the power supply terminals.

d. Slide the batteries out of the battery compartment.

e. Remove the protective covers from the battery terminals.

f. Remove the red and black battery power cables from the terminals at each end of the string.

g. Remove the jumper straps from between the terminals of the batteries in the string.

Step 4: Install the new batteries into the battery tray. See Installing Batteries for instructions.

Step 5: Re-install the seismic protection bracket, if present.

Step 6: Replace the battery compartment door and switch the battery breaker to ON.

Replacing a Battery Heater

If the optional battery heater fails or becomes damaged, you can replace it in the field. Replacing a battery heater requires removing the batteries from the battery compartment.

To replace a battery heater

Step 1:   At the rectifier shelf, switch the battery breaker to OFF.

Step 2:   At the AC load center, switch the Battery Heater breaker to OFF.

Step 3:   Remove the battery compartment door. See Operating Cabinet Doors for instructions.

Step 4:   If present, remove the batteries from the battery compartment. See Replacing Batteries for battery removal instructions.

Step 5:   Remove the battery heater from the battery tray:

        a. Disconnect the heater power cord from the supply lead, located on the left compartment wall.

        b. Disconnect the thermostat from the side of the battery tray.

        c. Lift the battery heater out of the battery tray.

Step 6:   Install the new battery heater into the battery tray. See Installing a Battery Heater for instructions.

Step 7:   Re-install and reconnect the batteries. See Installing Batteries for instructions.

Step 8:   At the AC load center, switch the Battery Heater breaker to ON.

Step 9:   Replace the battery compartment door and switch the battery breaker to ON.

Appendix A: Reference Information

This appendix provides general reference information about the FAC 400 cabinet.

Topics Covered

This chapter covers the following topics:
* Cabinet specifications
* Optional Alpha Cordex HP rectifier alarms and controller settings
* Supported batteries
* Wiring diagrams

Specifications

Specifications for the Clearfield FAC 400 cabinet follow:

Dimensions	
Local power configuration (with 60 Ah battery base)	48" H x 19.7" W* x 24" D * The 60 Ah battery compartment is 1.7" wider than the cabinet
Weight	
Local power configuration (with 60 Ah battery base)	222 lbs
Enclosure Mounting	
Concrete pad	Clearfield cast-in-place template or pre-cast pad option
Pole	Clearfield pole-mounting kit option
Foundation vault	Third-party supplied
Equipment Mounting	
Equipment mounting space	7 inches (4 RU)
Rack attributes	19-inch EIA standard; oriented for vertical mounting
Environmental	
Heat exchanger	Door mounted, 300 Watt External fan operation: Fans turn on at 30C (1500 RPM) Fan speed increases 40C to 55C (linear ramp from 1500 RPM to 3000 RPM) Fan speed max at 55C and above (3000 RPM) High temp alarm at 75C
Cooling capacity	20 Watts/°C
Thermal operating range	-40C to +46C
Environmental alarming	Environmental and intrusion alarms
Electrical (Local Power)	
AC power system	220-240 VAC load center Duplex convenience outlet (GFCI protected)
Generator connector (option)	30 Amp NEMA twist-lock (Hubbell)
DC power system	Two 25 Amp rectifier modules, autosenses and adjusts for low and high AC input
Battery backup	Support for (1) 60 Ah string of front post VRLA batteries (up to (2) 60 Ah strings with optional riser compartment); battery heater and seismic protection options available
Cable Entrance	
Outside plant entry	(2) 2.5-inch diameter entry ports
AC service entry (local power only)	(1) 1-inch diameter entry port
Compliance	
Safety	UL 67
EMC	FCC Part 15, Class A
Telcordia	GR-487-CORE, Issue 2

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Optional Alpha Cordex HP Rectifier Alarms and Controller Settings

The Alpha rectifier shelf detects and reports multiple alarm conditions in the cabinet, but only two umbrella alarms are reported through the active equipment: Minor (MN) and Major (MJ). For a list of the alarms reported through the active equipment as well as parameters and default settings for the Alpha rectifier shelf controller, refer to the Alpha Cordex Controller Default Configuration document or for more detailed information refer to the Alpha Cordex Controller Software Manual— both available at seeclearfield.com

Supported Batteries

The FAC 400 supports the following battery string with the 60 Ah battery base.

Manufacturer	Model	Capacity (Ah) per String	Max # of Strings
Enersys	SBS B14	62 Ah	1*
Northstar	NSB 60FT	60 Ah	1*

* 2 strings are supported when the cabinet is equipped with an optional battery compartment riser.

Wiring Diagrams

For wiring diagrams of the FAC 400 cabinet power, ground, and alarm systems, check seeclearfield.com.

Standard Warranty

Clearfield warrants to the original purchaser of the Product sold hereunder is free from defects in material and workmanship under normal use and service, subject to exceptions stated herein. Product purchased is warranted as follows: Clearfield designed and branded Products are warranted for three (3) years: Products manufactured by Clearfield to customer prints and/or specifications are warranted for one (1) year; and any Product Clearfield acquires from or through a third-party manufacturer or distributor and resells to Customer as the original customer will carry the manufacturer's pass-through warranty, if any. In all cases, the warranty period commences on the date of shipment to the original purchaser.

Warranty Claim Procedure

If any Product purchased from Clearfield is found defective under the above warranty, the following basic procedure must be followed:

1. Customer must contact Clearfield and obtain a Return Materials Authorization
2. Following authorization, the Customer ships the product-freight collect-to Clearfield's manufacturing facility
3. Clearfield shall repair or replace the defective Product at its sole option and discretion, and return the repaired or replacement Product to Customer's site, freight prepaid

Note: If the Product is not found to be defective by Clearfield, the product will be returned to the Customer and the customer billed for freight in both directions.

View our warranty policy here: https://www.seeclearfield.com/warranty.html

Limitations of Warranty

Correction of defects by repair or replacement, at the option of Clearfield Inc, shall constitute the exclusive sole remedy for a breach of this limited warranty. Clearfield shall not be liable under any circumstances for any special, consequential, incidental, punitive, or exemplary damages arising out of or in any way connected with the product or with agreement to sell product to buyer, including, but not limited to damages for lost profits, loss of use, or for any damages or sums paid by buyer to third parties. The foregoing limitation of liability shall apply whether the claim is based upon principles of contract, warranty, negligence or other tort, breach of statutory duty, principles of indemnity or contribution, the failure of any limited or exclusive remedy to achieve its essential purpose, or otherwise.

Clearfield will not be responsible for any labor or materials costs associated with installation or incorporation of Clearfield products at customer sites, including any costs of alteration, replacement or defective product, or any field repairs.

Other Limitations

Clearfield assumes no warranty liability regarding defects caused by:

1. Customer's modification of Product, excepting installation activities described in Clearfield documentation
2. Customer re-packaging of Product for shipment to third parties or destinations other than those originally shipped to by Clearfield, or any defects suffered during shipping where the Product has been re-packaged
3. Customer's installation or maintenance, excepting activities described in and performed in accordance with Clearfield documentation
4. Customer's improper or negligent use or application of Product
5. Other causes external to the Product, including but not limited to accidents, catastrophe, acts of God, government action, war, riot, strikes, civil commotion, sovereign conduct, or the acts or conduct of any person or persons not party to or associated with Clearfield
6. Environmental factors and weathering resulting in aging and damage not necessary or applicable to the function of the product

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However, no guarantee is given or implied that the document is error free or that it is accurate with regard to any specification.

Technical Support

Clearfield, Inc. can be contacted for any issues that arise with the supplied product.

If you need to return the supplied product, you must contact the Clearfield, Inc. Customer Service Department to request a Returned Materials Authorization (RMA) number.

Clearfield, Inc.
7050 Winnetka Ave N
Minneapolis, MN 55428

Toll Free: 800.422.2537
Phone: 763.476.6866
Fax: 763.475.8457

Customer Support: sales@clfd.net
Technical Support: techsupport@clfd.net