



# **Clearfield ODC-100 Installation Guide**

**Manual 019562  
Rev B  
April 2019**

---

# Contents

<b>About This Guide.....</b>	<b>7</b>
<b>Chapter 1 ODC-100 Product Overview .....</b>	<b>8</b>
Cabinet Description.....	9
Cabinet Features .....	10
Cabinet Options.....	11
Cabinet Dimensions and Weights.....	13
Cabinet Views .....	14
<b>Chapter 2 Installation Considerations.....</b>	<b>16</b>
Installation Process Overview .....	18
Installation Guidelines .....	19
Space Requirements .....	21
General Safety Recommendations .....	22
Installation Kit.....	23
User-Supplied Items.....	24
Cabling Requirements .....	25
<b>Chapter 3 Preparing the Installation Site .....</b>	<b>26</b>
Installing a Ground Circuit.....	27
Constructing a Concrete Pad .....	30
Pad Construction Guidelines .....	30
Assembling the Cast-In-Place Template.....	33
Preparing the Site .....	35
Casting the Pad .....	36

---

<b>Installing a Pre-Cast Concrete Pad .....</b>	<b>37</b>
Pre-Cast Pad Requirements .....	37
Preparing the Site .....	40
Installing a Pre-Cast Pad .....	41
<b>Installing a Pole-Mount Kit: Remote Power.....</b>	<b>42</b>
Pole Mounting Guidelines .....	42
Preparing the Site .....	45
Installing the Pole-Mount Kit .....	46
<b>Installing a Pole-Mount Kit: Local Power with 60 Ah Battery Base(s) .....</b>	<b>50</b>
Pole Mounting Guidelines .....	50
Preparing the Site .....	54
Installing the Pole-Mount Kit .....	54
<b>Installing a Wall-Mount Kit: Local Power with 60 Ah Battery Base(s) .....</b>	<b>60</b>
Wall/H-Frame Mounting Guidelines .....	60
Preparing the Site .....	64
Installing the Wall-Mount Kit .....	65
<b>Installing a Foundation Vault.....</b>	<b>68</b>
Foundation Vault Requirements .....	68
Preparing the Site .....	71
Installing the Foundation Vault.....	72
<b>Chapter 4 Installing the Cabinet .....</b>	<b>73</b>
Unpacking the Cabinet.....	74
Operating Cabinet Doors .....	75
Preparing the Cabinet for Installation.....	77
Installing the Cabinet on a Concrete Pad.....	78
Installing the Cabinet on a Wall or H-Frame.....	80
Installing the Cabinet on a Pole: Remote Power .....	82
Installing the Cabinet on a Pole: Local Power with 60 Ah Battery Base(s) .....	85
Installing the Cabinet on a Foundation Vault.....	87
Removing the Lifting Details .....	89

---

<b>Chapter 5 Installing Power .....</b>	<b>90</b>
<b>Installing the Cabinet Ground Connection.....</b>	<b>91</b>
<b>Installing AC Power (220-240 VAC).....</b>	<b>93</b>
<b>Installing Remote Power .....</b>	<b>95</b>
Installing Outside Plant Metallic Cable (Power Pairs) .....	95
Checking Line Validity for Remote Power .....	96
Splicing Power Pairs to the Protection Interface .....	97
<b>Chapter 6 Installing and Splicing Outside Plant Cables....</b>	<b>99</b>
<b>Bonding Cable Sheaths .....</b>	<b>100</b>
<b>Installing Fiber Cable .....</b>	<b>101</b>
Installing Outside Plant Fiber Cable.....	101
Splicing Fibers .....	103
Connecting Fibers to the Equipment.....	104
(Optional) Interlinking Collocated Service Units.....	106
<b>Installing Metallic Cables .....</b>	<b>108</b>
Installing Outside Plant Metallic Cables .....	108
Splicing Metallic Cables .....	109
Installing 5-Pin Protection Modules.....	110
<b>Sealing Cable Entry Locations .....</b>	<b>111</b>
<b>Chapter 7 Turning Up the Cabinet Power System .....</b>	<b>112</b>
<b>Turning Up the Power System (Local Power) .....</b>	<b>113</b>
Checking the Ground Connection .....	113
Checking the AC Power Supply Voltage.....	114
Installing the Rectifier Modules .....	115
Installing and Testing Batteries.....	117
Installing Converter Modules .....	125
<b>Turning Up the Power System (Remote Power) .....</b>	<b>137</b>
Checking the Ground Connection .....	137
Checking the Line Power Supply Voltage .....	138
Installing the Converter Shelf Fan Tray.....	139
Installing Converter Modules .....	140
Turning Up and Testing the DC Power System .....	141

---

## **Chapter 8 Installing Equipment and Adding Capacity.....143**

Installing an E7-2 Shelf .....	144
Installing a B6-001 Shelf .....	148
Installing an E5-100 Service Unit .....	151
Installing a Rear Wall Mounted Service Unit .....	154
Installing a Protection Mounting Frame .....	156
Installing a Protection Block .....	159
Installing a Cross-Connect Panel.....	161
Installing a Battery Compartment Riser .....	163
Installing a Battery Heater .....	164
Installing a Seismic Protection Kit.....	167
Installing a Generator Connector .....	169
Installing an Ethernet-over-Copper Trunking Unit .....	171
Installing Fiber Management Options.....	174

## **Chapter 9 Cabinet Maintenance .....176**

<b>Routine Maintenance .....</b>	<b>177</b>
Checking Cabinet Surfaces .....	177
Checking Electrical Components .....	178
Checking Cable Connections.....	179
Checking the Heat Exchanger .....	180
Battery Maintenance .....	181
<b>Replacing Parts and Equipment.....</b>	<b>183</b>
Removing a Cabinet Door.....	183
Installing a Cabinet Door.....	184
Replacing the Cabinet Roof .....	186
Replacing AC Breakers.....	186
Replacing Fuses and DC Breakers.....	187
Replacing Rectifier Modules .....	189
Replacing Converter Modules.....	189
Replacing Batteries.....	191

---

Replacing a Battery Heater .....	192
<b>Appendix A Reference Information .....</b>	<b>193</b>
Specifications .....	194
Copper Access Cable Connections .....	196
Environmental Alarm Mapping to E7-2 .....	198
Environmental Alarm Mapping to B6-001 .....	199
Environmental Alarm Mapping to E5 .....	200
Alpha Cordex HP Rectifier Alarms and Controller Settings .....	202
Supported Batteries .....	202
Wiring Diagrams .....	202

---

# About This Guide

This document provides a general installation practice for the Clearfield ODC-100 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!** Warning indicates the presence of a hazard that can cause severe personal injury if not avoided.



**CAUTION!** Caution indicates the presence of a hazard that can cause minor to moderate personal injury if not avoided.



**ALERT!** Alert indicates the presence of a hazard that can cause damage to equipment or software, loss of data, or service interruption if not avoided.



**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.

---



# Chapter 1

## ODC-100 Product Overview

This chapter provides a general description of the Clearfield ODC-100 outdoor cabinet, including its standard features and options.

### Topics Covered

This chapter covers the following topics:

- A description of the ODC-100 cabinet.
- A list of standard cabinet features.
- A list of cabinet options.
- Listed cabinet dimensions and weights.
- Views of the cabinet compartments.

---

## Cabinet Description

The Clearfield ODC-100 cabinet is an environmentally-controlled outdoor enclosure designed to house and protect network electronics equipment, including the Calix E7-2 Ethernet Service Access Platform (ESAP), B6-001 Ethernet Service Access Node (ESAN), and the E5-100 ESAN product family. Use the ODC-100 to provide services from a remote node location deep inside the customer serving area, beyond the direct reach of the carrier Central Office.



The ODC-100 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 ODC-100 houses up to three Calix E7-2 or B6-001 shelves, or up to two E5-100 service units.

The ODC-100 supports local or remote power configurations. The local power configuration includes an additional base compartment to support battery reserve power.

The modular design of the ODC-100 enables incremental expansion of system capacity, lowering initial deployment costs while maintaining the capacity for future growth. Modular components designed for expansion include the compact Clearfield service units, copper line protection, fiber management capacity, DC power modules, and cooling elements.

## **Cabinet Features**

Standard features of the ODC-100 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)
- Environmental and intrusion alarm systems

### **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)
- ODC-100 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

### **Power (Remote)**

Standard features for the remote power configuration include:

- $\pm 190$  VDC line power supplied over twisted pairs
- Line protection for up to 50 power pairs; MS<sup>2</sup> interface connector
- Tyco  $\pm 190$  VDC to -48 VDC converter shelf (CPS2500D)
- Fuse-protected DC supply to equipment
- Fan tray for cooling converter shelf

---

## Cabinet Options

Common options for the ODC-100 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)
- Adjunct enclosure mounting (ex: 3M 4220 cross-box enclosures)

### Clearfield Platform Equipment

- **Calix E7-2:** Up to 3 shelves; GPON or Active Ethernet fiber access; VDSL2 with POTS (combo or overlay) copper access; 10GE transport & aggregation
- **Calix B6-001:** Up to 3 shelves; GPON or Active Ethernet fiber access; ADSL2+ or VDSL2 with POTS (combo or overlay) copper access; 10GE transport
- **Calix E5-100:** Up to 2 service units; ADSL2+ or VDSL2 with POTS (combo or overlay) copper access
- **Calix E5-400:** Up to 3 transport & aggregation units

### Copper Protection & Trunking, Splicing & Distribution, Cable Management

- Copper line protection for up to 292 lines; MS<sup>2</sup> interface connectors
- Cross-connect panel with MS<sup>2</sup> interface connectors; 2:1 subscriber-to-equipment line counts: 300 pair (200:100) or 150 pair (100:50) options
- Ethernet over Copper (EoCu) trunking kit for copper transport:
  - Integrated Actelis ML600 or Positron/Aktino AK525 trunking unit for up to 8-pair bonded trunks
  - Integrated 25-pair trunk line protection module; RJ-25/MS<sup>2</sup> interface connectors
- Fiber splice trays (up to 3), each holds up to 12 fiber splices (fusion or heat shrink)
- High density fiber management options (48- and 96-position fiber distribution panels, 1:32 PON splitters, management accessories)
- Clearfield xPAK low count fiber distribution with LGX mounting

### Power

- Local power support (commercial AC power supply); additional options include:
  - 220/240 VAC input
  - Generator connector (Hubbell); 30A NEMA twist lock with breaker
- Remote power support ( $\pm 190$  VDC line power supply):
  - N+1 converter module redundancy ( $\pm 190$  to  $-48$  VDC modules)
  - Optional 665W remote power buffer (holdover) capacitor

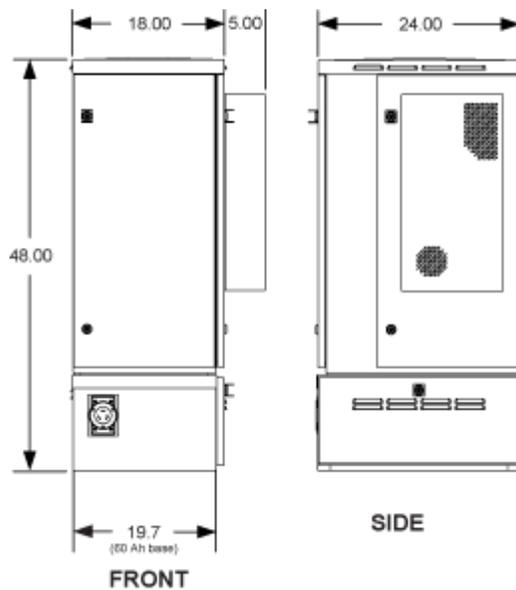
**Battery Support (local power configurations)**

- Northstar or Enersys (OEM) battery string and installation kit (OEM)
- Battery heater kit
- Zone 4 seismic protection kit
- Battery compartment riser (supports second 60 Ah or 62 Ah battery string)

## Cabinet Dimensions and Weights

The external dimensions of the ODC-100 cabinet are shown below.

Dimension	Measurement (SAE)	Measurement (Metric)
Height: Remote Power Local Power	37 inches 48 inches	94 cm 122 cm
Width	18 inches (remote power) 19.7 inches (60 Ah battery base)	46 cm 50 cm
Depth	24 inches	61 cm



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

The approximate weight of the ODC-100 cabinet is shown below.

Configuration	Weight (SAE)	Weight (Metric)
Remote power, 96 copper lines	135 lb	61 kg
Local power (60 Ah batteries), 96 copper lines	222 lb	101 kg

## Cabinet Views

Views of the ODC-100 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 and DC rectifier shelf (local power configurations), or a  $\pm 190/-48$  VDC converter shelf (remote power configurations). The Clearfield equipment typically includes up to two or three Clearfield service units. 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.



**ODC-100 Front  
(local power)**



**ODC-100 Front  
(remote power)**

### 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. For remote power configurations, the power protection block (for the line-power pairs) is accessible from the side compartment.



**ODC-100 Side**



**ODC-100 Side  
(cross-connect)**

### **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.

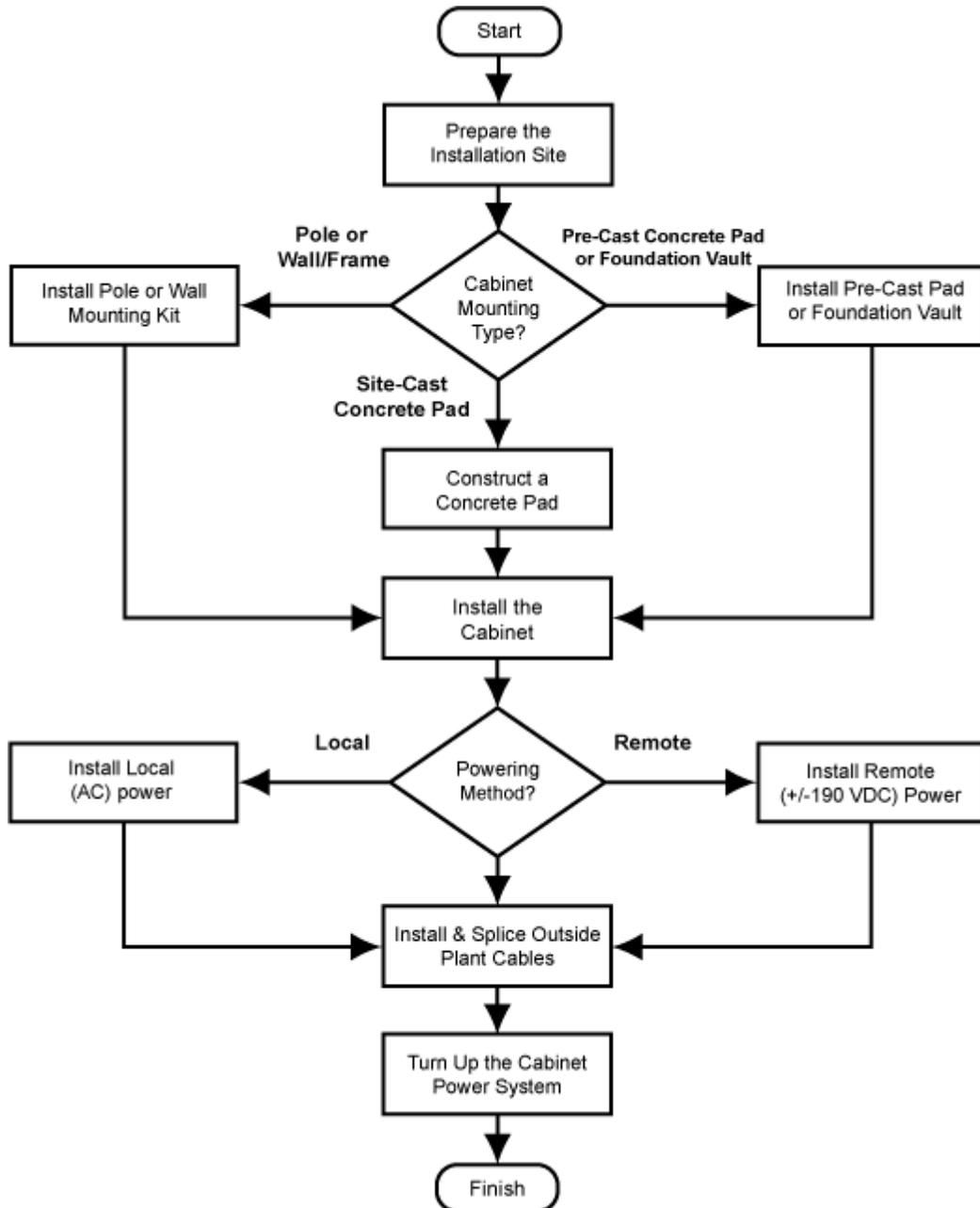
### Topics Covered

This chapter covers the following topics:

- Installation process overview
- Installation guidelines
- Space requirements
- General safety recommendations
- Installation kit contentsUser-supplied items
- Cabling requirements

## Installation Process Overview

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



---

# 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.
- 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:

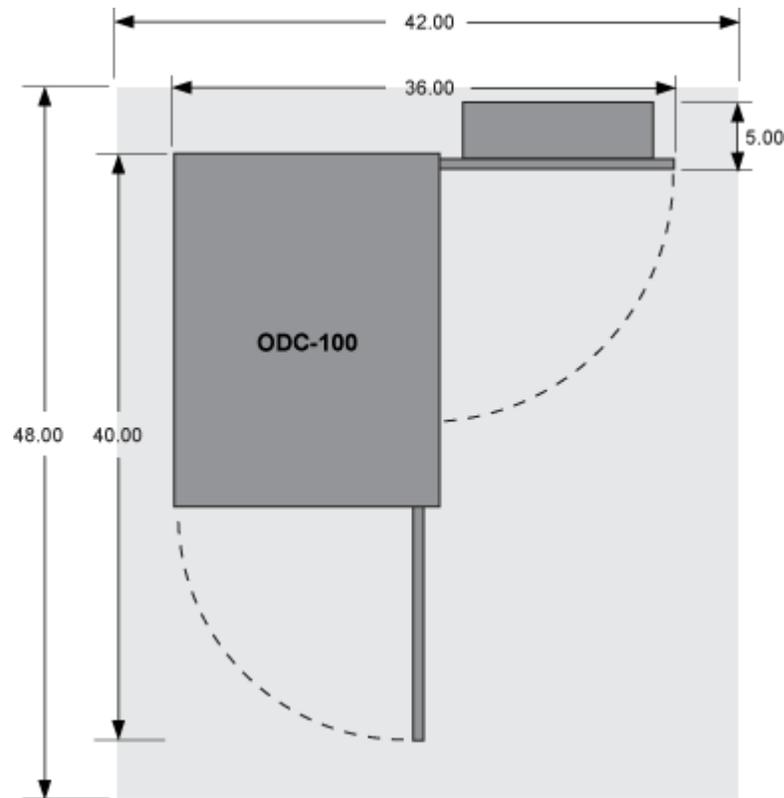
1. Functional requirements:
  - **Suitable terrain.** Whenever possible, the cabinet should be located in an area with a firm flat soil surface that does not require extensive earth work. The location should not be constantly damp or prone to flooding. Check soil maps of potential sites for subsurface conditions.
  - **Grounding properties.** 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.

## 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.

<input checked="" type="checkbox"/>	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)
Supplied Documentation		
	1	Cabinet installation guide (this document)
	1	Diagrams & Worksheets binder (wiring diagrams, pair assignment lists)

## ***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 MS<sup>2</sup> 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
- MS<sup>2</sup> connectors for copper line splicing
- Strain relief for #6-8 AWG wiring
- Red electrical tape (for line power pairs bundle)

### **Equipment**

Bring the following equipment to the installation site:

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

## Cabling Requirements

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

Function	Facility	Requirements
<b>Power</b>		
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
±190 VDC (remote [line] power)	Copper	22 to 24 AWG twisted-pair copper, 25 pair cable(s); terminate with MS <sup>2</sup> connector; 655 Ohms maximum resistance
<b>Transport</b>		
10-Gigabit Ethernet (10GE)	Fiber	OSP: single-mode fiber (SMF-28); splices should not exceed 0.5 dB loss. OSP to equipment (SFP+, XFP): single-mode fiber pigtails with fiber connector options
Gigabit Ethernet (GE optical)	Fiber	OSP: single-mode fiber (SMF-28); splices should not exceed 0.5 dB loss. OSP to equipment (SFP): single-mode fiber pigtails with fiber connector options
Gigabit Ethernet (GE metallic)	Copper	(Jumpers to interlink multiple E5 units only) Shielded CAT-5 Ethernet cable, RJ-45 connectors
Ethernet/Cu (802.3ah)	Copper	22 to 24 AWG twisted-pair copper (bonded); terminate with MS <sup>2</sup> connectors
<b>Subscriber</b>		
xDSL, DS0	Copper	19 to 26 AWG twisted pair copper; terminate with MS <sup>2</sup> connectors
AE, PON	Fiber	19 to 26 AWG twisted pair copper; terminate with MS <sup>2</sup> connectors

**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 kit
- Installing a wall mount kit
- Installing a composite foundation vault

---

## 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.

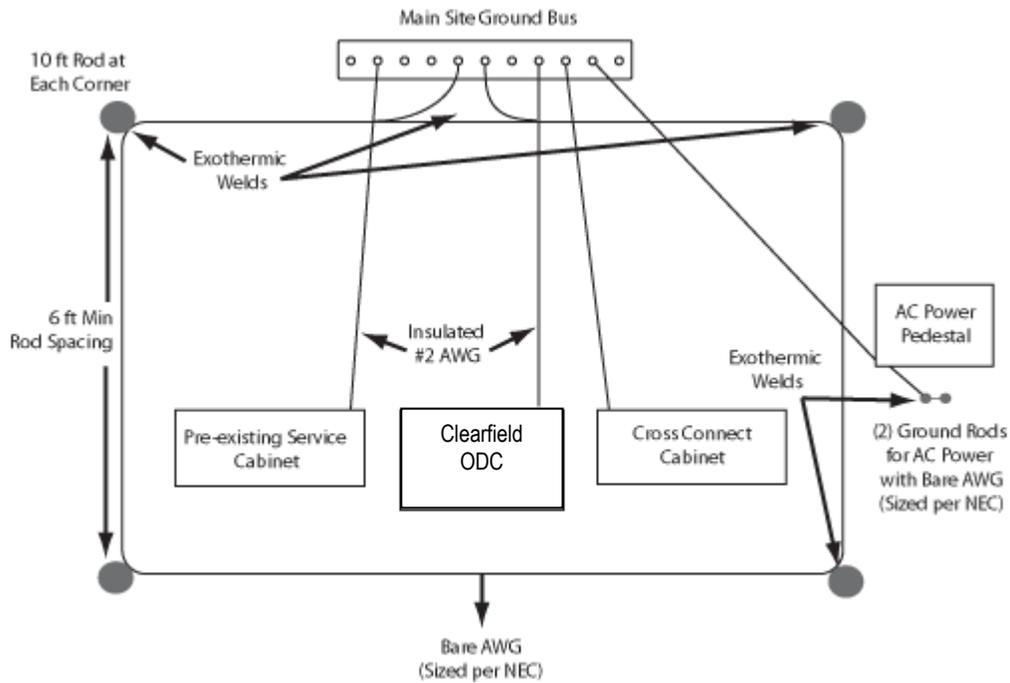
Proper grounding conditions and requirements vary per site. The National Electric Code (NEC) specifies a maximum ground impedance of 25 ohms. Clearfield recommends achieving a ground impedance of no greater than 5 ohms wherever practical. If 5 ohms or less cannot be achieved, the maximum ground impedance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

### Grounding options

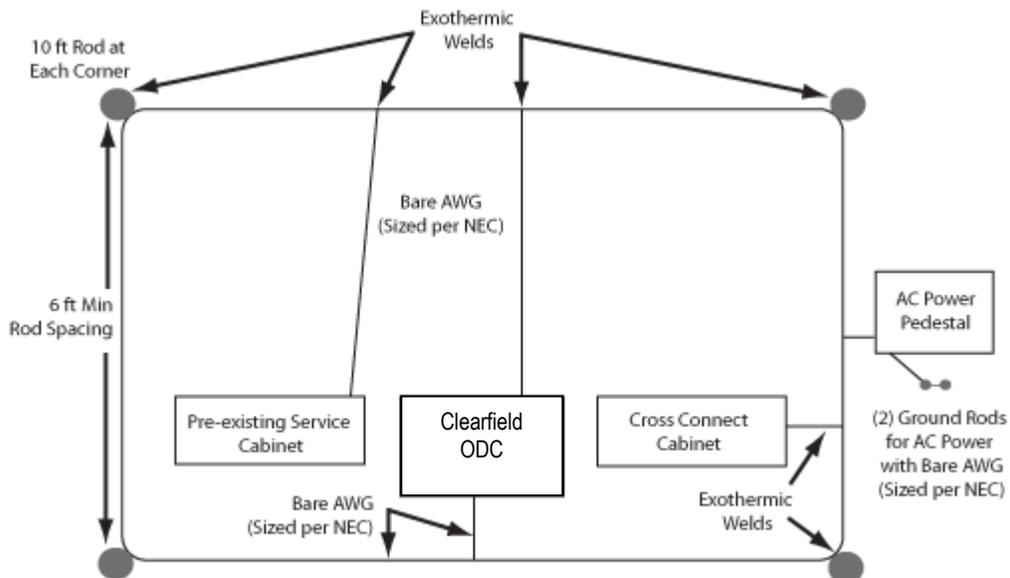
The cabinet main ground system must be bonded to a suitable earth ground circuit, which may include any of the following:

- **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 bus:



## 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:

---

*Proprietary Information: Not for use or disclosure except by written agreement with Clearfield.*

- 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**

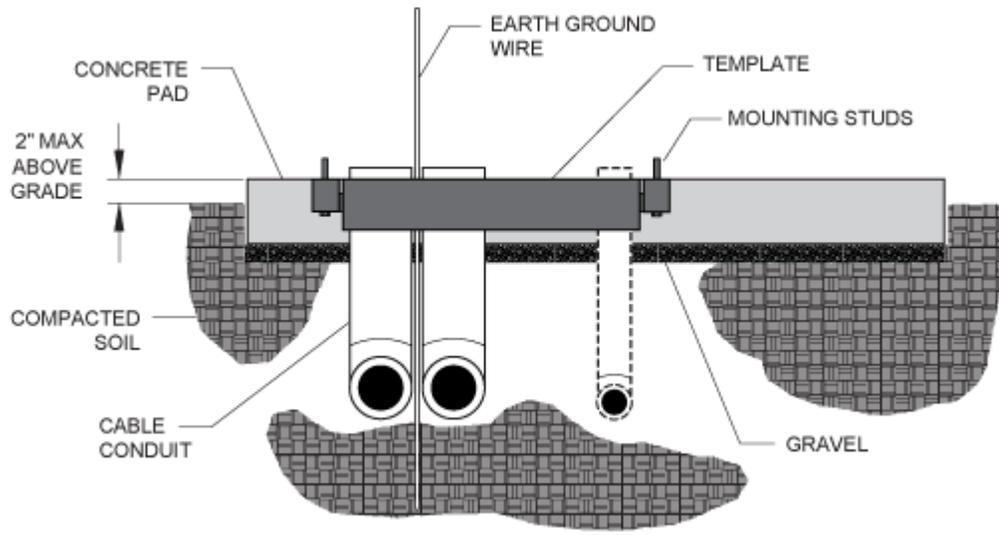
When constructing a concrete pad, observe the following guidelines and refer to the pad drawings for guidance.

#### **Guidelines**

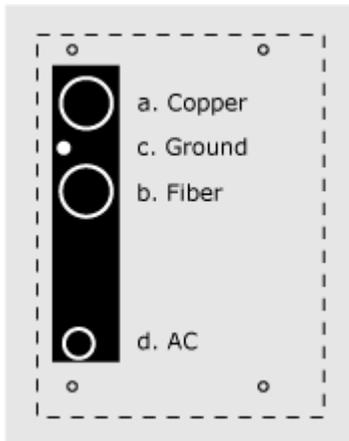
Follow these guidelines to ensure proper pad construction. Adjust for local conditions or practices as required.

- 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 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 (for local power configurations only).

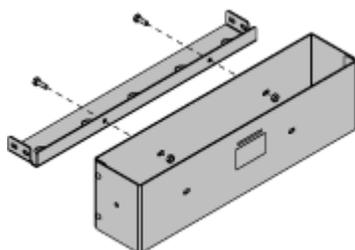
Use the Clearfield cast-in-place template to provide precise conduit orientation.

## Assembling the Cast-In-Place Template

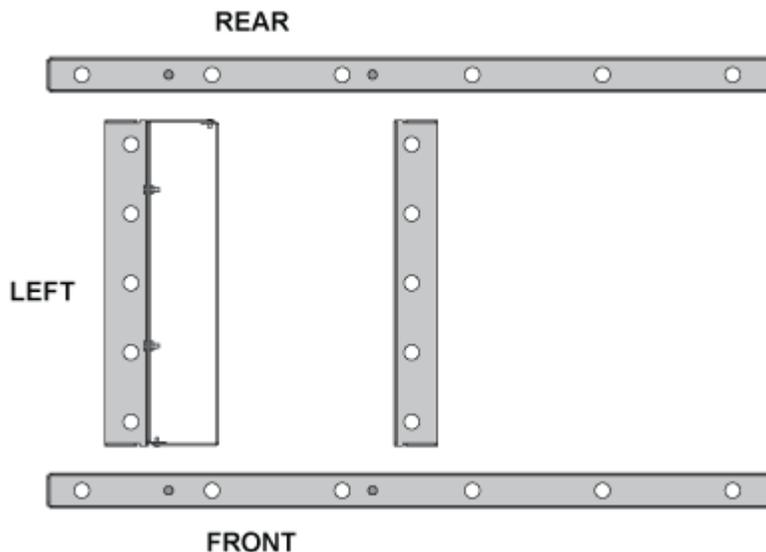
Assemble the Clearfield cast-in-place template as follows.

### To assemble the template

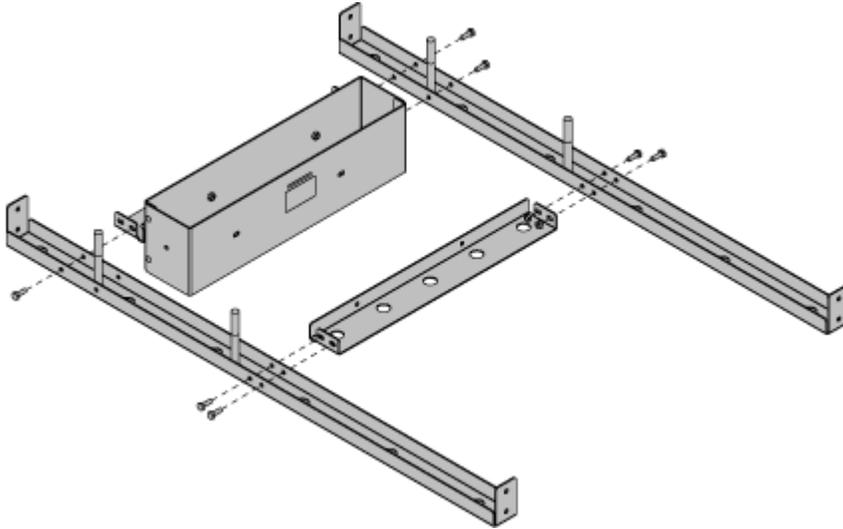
1. Unpack the template hardware from the shipping kit.
2. Attach the conduit entry box to one of the short brackets using two supplied screws and nuts.



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.



4. Attach the short and long brackets together using seven supplied screws and nuts, as shown.



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 excavate the site

1. Excavate the pad area. Dig a foundation hole six inches deep with a perimeter measuring at least 42 x 48 inches.
2. Grade and compact the excavated surface until it is firm and level.
3. Trench out conduit paths through the foundation hole from the cable feeder location. Refer to the *pad drawings* (on page 30) for conduit locations.
4. Place the cable conduits into the conduit trench. Refer to the *pad construction guidelines* (on page 30) for conduit sizes and locations.
5. Route the earth ground wire through the conduit trench (from the ground electrode).

### To construct a concrete form

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.
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.
3. Place and tie rebar inside the form elevated above the gravel.
4. Place the Clearfield cast-in-place template into the form, guiding the cable conduits through the conduit entry ducts in the template.
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.

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

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.

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.
3. Smooth and level the top surface of the concrete.
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.**

5. Remove and discard the form.
6. Backfill the cable conduit trenches with soil or gravel as required.
7. Backfill and grade the perimeter area around the pad with soil, as required.
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**

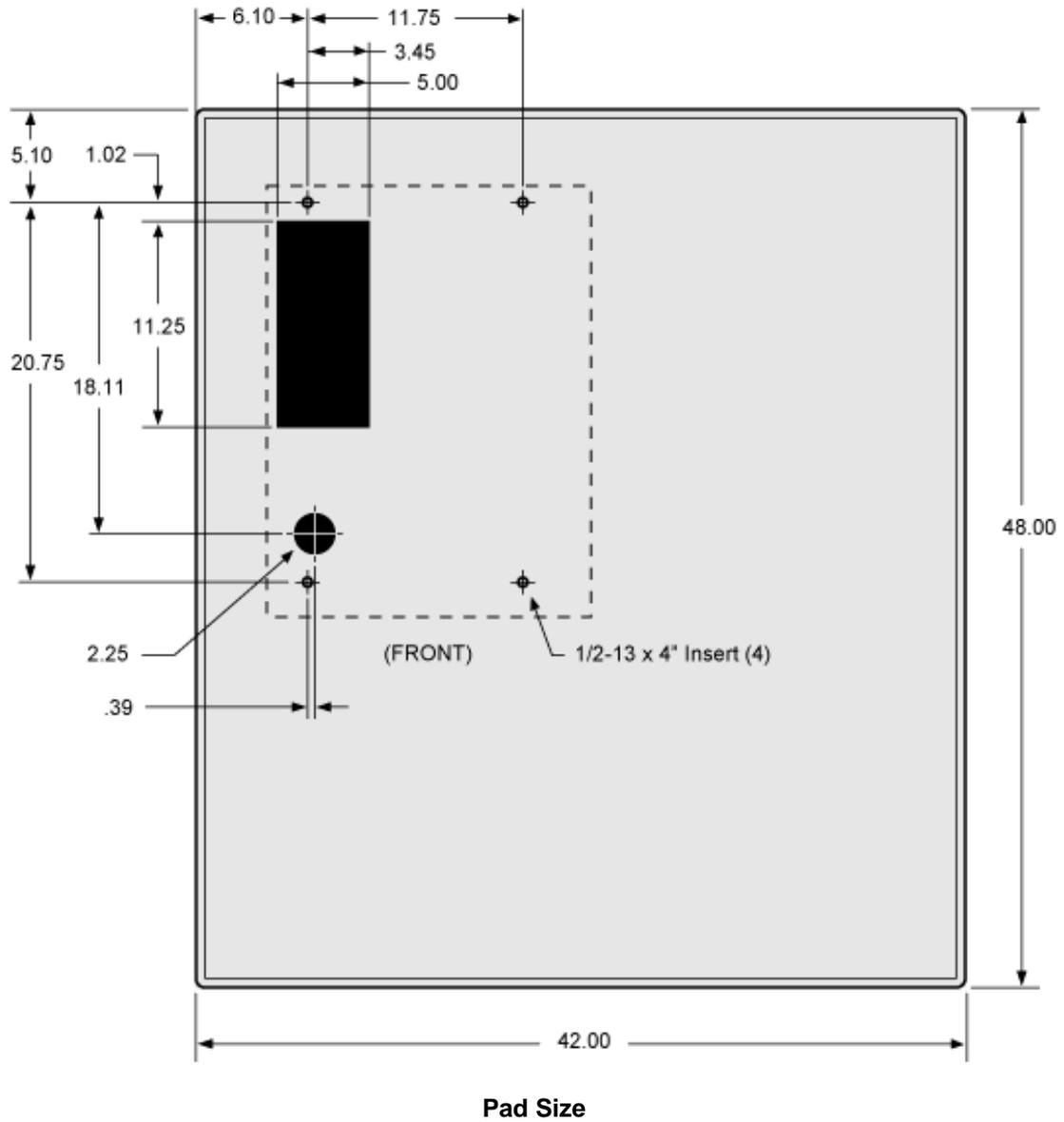
Follow these guidelines to ensure proper pad support for the cabinet. Adjust for local conditions or practices as required.

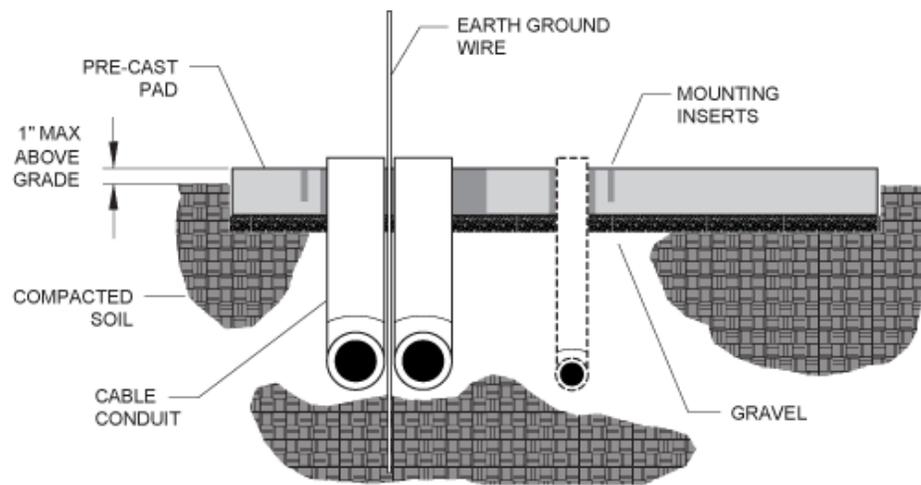
- Use a pad with a minimum height of 3 inches.
- Install the pad with a maximum of 1 inch above-grade exposure.
- Use 2.5-inch conduit (maximum) for outside plant cables. See drawing below for entry locations.
- Use 1-inch conduit (maximum) for AC cable (in local power applications only). See drawing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

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

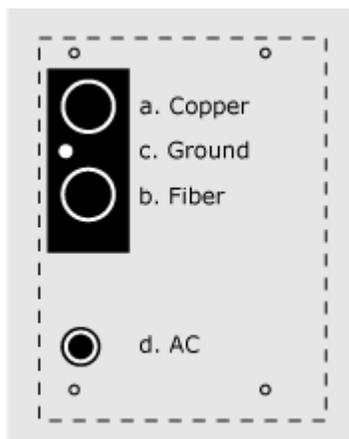
## Pad Drawings

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 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 (for local power configurations only).

## 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

1. Excavate the pad area. Dig a foundation hole six inches deep with a perimeter measuring at least 42 x 48 inches.
2. Grade and compact the excavated surface until it is firm and level.
3. Trench out conduit paths through the foundation hole from the cable feeder location. Refer to the *pad drawings* (on page 37) for conduit locations.
4. Place the cable conduits into the conduit trench. Refer to the *pad guidelines* (on page 37) for conduit sizes and locations.
5. Route the earth ground wire through the conduit trench (from the ground electrode).
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

1. Transport the pre-cast pad to installation site.
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.
3. Lower the pad onto the gravel base, allowing the conduits to pass through the cutout in the pad as it descends.
4. Adjust the pad positioning on the gravel base until it is stable and level.
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.
6. Backfill and grade around the pad perimeter with soil to secure the pad in place.
7. Verify that the pad remains level. Adjust as required.
8. Trim the cable conduits to a height no more than 4 inches above the pad.

## Installing a Pole-Mount Kit: Remote Power

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.

### Pole Mounting Guidelines

When installing the pole-mount kit for ODC-100 configurations with remote power, 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.

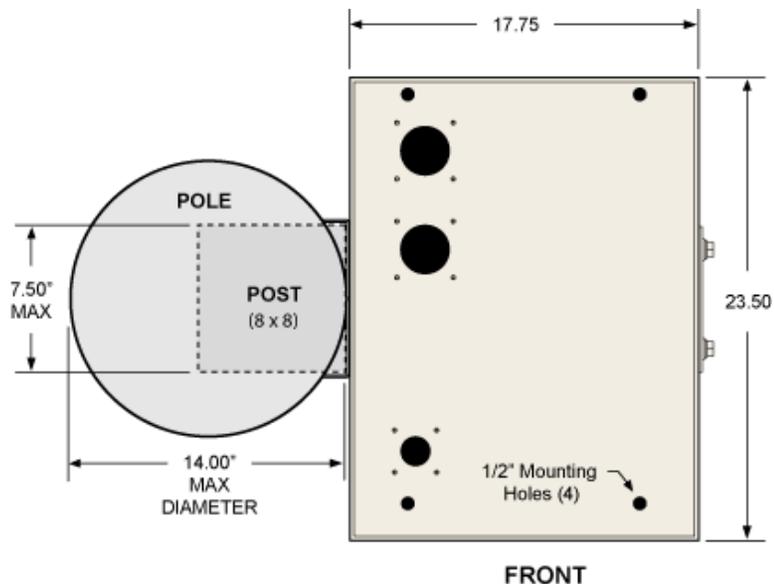
- To use a round pole; the pole must be 8 to 14 inches in diameter.
- To use a square post; the post thickness must be 8 x 8 inches (measures 7.5 wide by 7.5 inches deep).
- The pole/post must stand *at least* 68 inches above grade to support the kit.

**Note:** The minimum height is with the mounting bracket standing flush with the ground (elevates the cabinet approximately 26 inches above the ground). To elevate the cabinet higher than 26 inches above ground, use a pole with sufficient additional height.

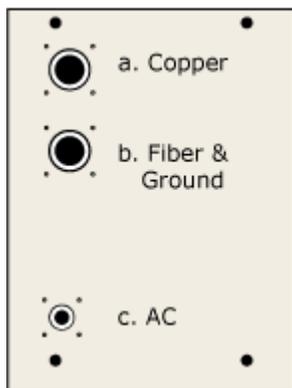
- The pole/post must be vertically plumb.
- The pole/post must support a minimum load weight of 300 lbs.
- Use the Clearfield pole-mount kit to provide the mounting fixture, including exact mounting hardware and conduit entry locations.
- The pole-mount kit includes hardware (5-inch lag bolts) to attach the mounting fixture 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. Actual pole dimensions may vary by site. Defer to local practice where required.



**Top View of Mounted Assembly**

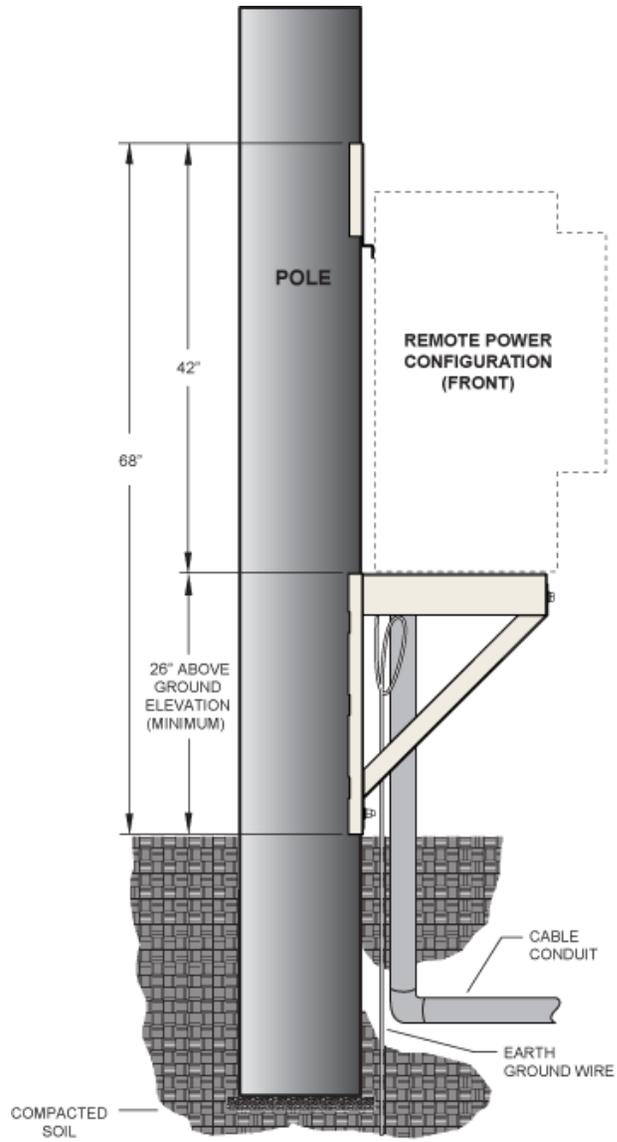


**Conduit Locations**

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.

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



**Minimum Pole Height  
(front view of cabinet position)**

---

## 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.

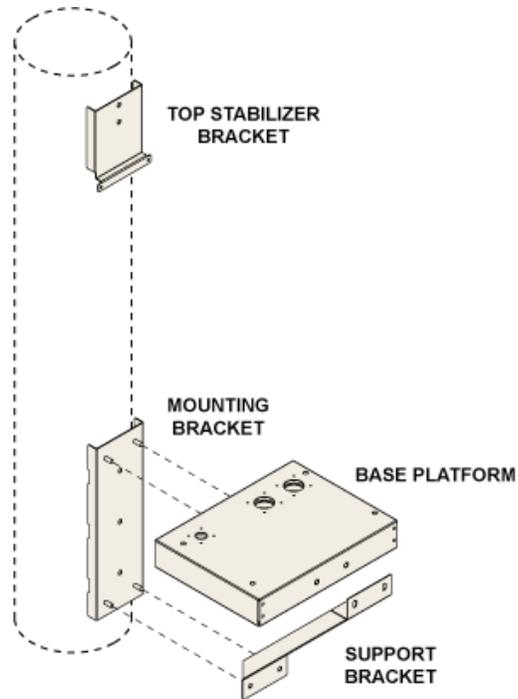
### To prepare the site for a pole mount installation

1. At the installation site, verify the following:
  - The pole is installed and plumb.
  - The pole meets the cabinet mounting *requirements* (on page 42).
2. Trench out conduit paths to the pole from the cable feeder location.
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* (on page 42) for conduit sizes and locations.
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.
5. Backfill the conduit trench with soil.

## Installing the Pole-Mount Kit

Install the Clearfield pole-mount kit for remote power 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.



### To install the pole mounting fixture

1. Determine how high above ground to elevate the cabinet. Mark the identified height on the pole.

**Note:** The identified height is where the top surface of the base platform will sit. This height must be at least 26 inches above the ground.

2. Attach the mounting bracket to the pole as follows:



- a. Position the mounting bracket against the pole, with its top edge at the marked height and studs facing out.
  - b. While holding the mounting bracket in position, drill three 3/8-inch pilot holes into the pole through the three holes in the bracket.
  - c. Install (3) lag bolts into the pilot holes to attach the bracket to the pole. Tighten the bolts completely to secure the bracket in place.
- 3.** Attach the base platform to the mounting bracket as follows:



- a. Orient the base platform with its flat surface up and conduit entry ducts toward the pole.
  - b. Align the two keyholes on the platform's back edge with the top studs on the mounting bracket. Push the platform against the bracket so the studs insert through the keyholes.
  - c. Loosely install a 1/2-inch flat washer, lock washer, and nut on each stud so that the platform can be adjusted for level.
  - d. If necessary, trim the cable conduits to the height of the top studs on the mounting bracket.
- 4.** Attach the support bracket as follows:



- a. Fit the support bracket's bottom end (two holes) onto the mounting bracket's bottom studs.
- b. Loosely install a 1/2-inch flat washer, lock washer, and nut on each stud.
- c. Align the support bracket's top end (two holes) with the counterpart holes on the front edge of base platform.

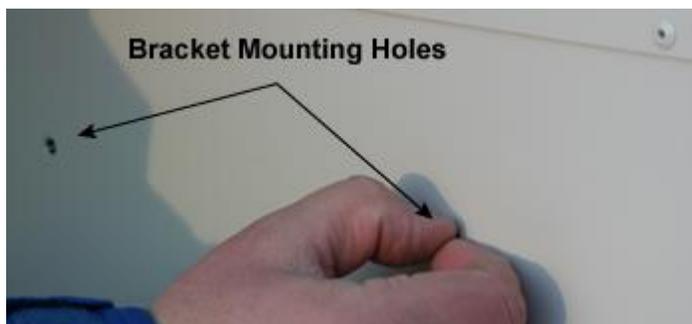
- d. Insert a 1/2-inch screw, flat washer, and lock washer through each of the two aligned holes on the front of the support bracket and platform.
5. Verify that the base platform is level, then tighten all hardware to secure the assembly in place.
6. Underneath the base platform, enable conduit entry as follows:
  - a. Trim the rubber cone gaskets on the entry ducts to the conduit diameter.
  - b. Arrange the conduits into the appropriate entry ducts, fitting the cone gaskets snugly around the conduit.

Completing the fixture installation requires installing the top stabilizer bracket to secure the upper cabinet to the pole. The top stabilizer bracket installs on the cabinet first, and then on the pole. Therefore, installing the top stabilizer bracket must be performed during the cabinet installation procedure.

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

### To install the top stabilizer bracket

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



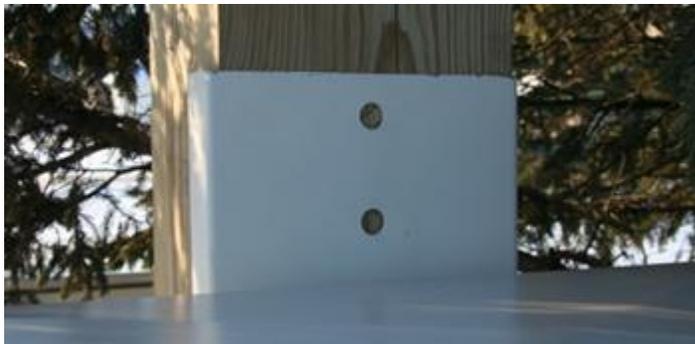
2. Attach the top stabilizer bracket to the cabinet as follows:



- a. Position the stabilizer bracket against the left cabinet wall, aligning the bracket holes with the counterpart holes on the cabinet.
  - b. Insert a 1/4-inch screw, flat washer, and lock washer into each of the two aligned bracket holes.
  - c. Tighten the screws completely to secure the bracket in place.
- 3.** Install the cabinet onto the mounting fixture. See *Installing the Cabinet on a Pole* (on page 82) for instructions.

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

- 4.** Attach the top stabilizer bracket to the pole as follows:



- a. While holding the stabilizer bracket against the pole, drill two 3/8-inch pilot holes into the pole through the holes in the bracket.
- b. Install (2) lag bolts into the pilot holes. Tighten the bolts completely to secure the bracket in place.

## ***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.

ODC-100 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 ODC-100 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.

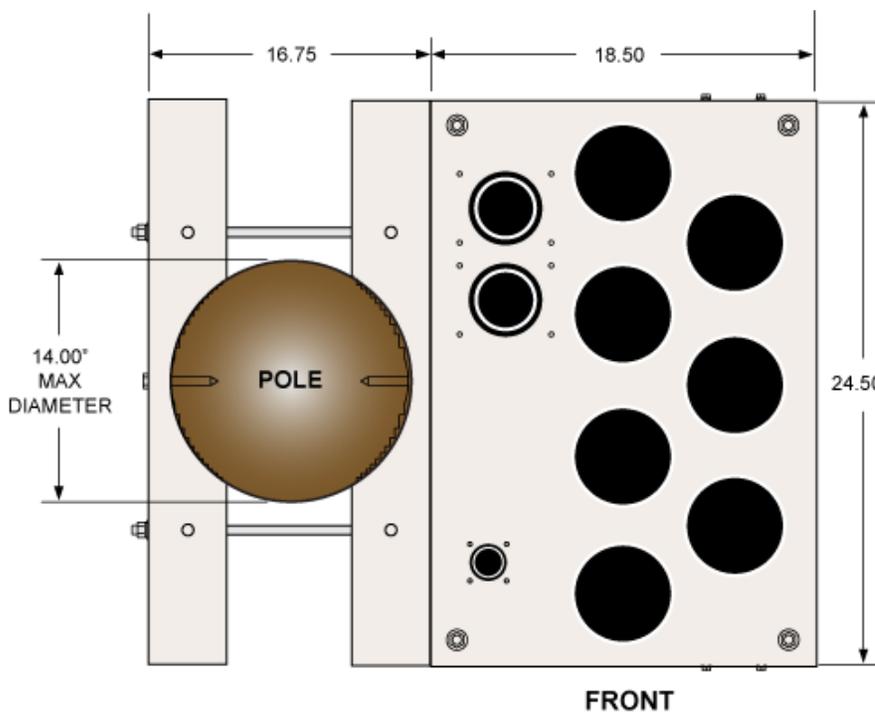
- The pole/post must be vertically plumb.
- The pole/post must support a minimum load weight, as required for the cabinet configuration:
  - **Single 60 Ah battery base:** 450 lbs
  - **Dual 60 Ah battery base:** 680 lbs

**Note:** These weights include a fully loaded cabinet.

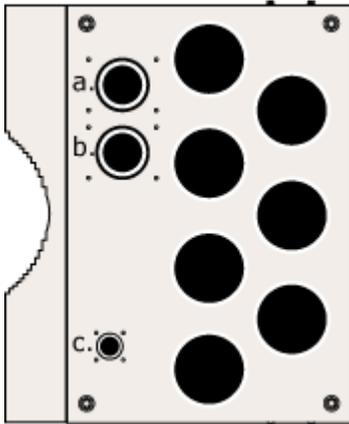
- Use the Clearfield pole-mount kit to provide the mounting fixture, brackets, and hardware, and conduit entry locations.
- The pole-mount kit includes hardware (six 5-inch lag screws, four 18.75-inch threaded rods) to attach the mounting assembly to the pole. You can use a different, *user-supplied* 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**

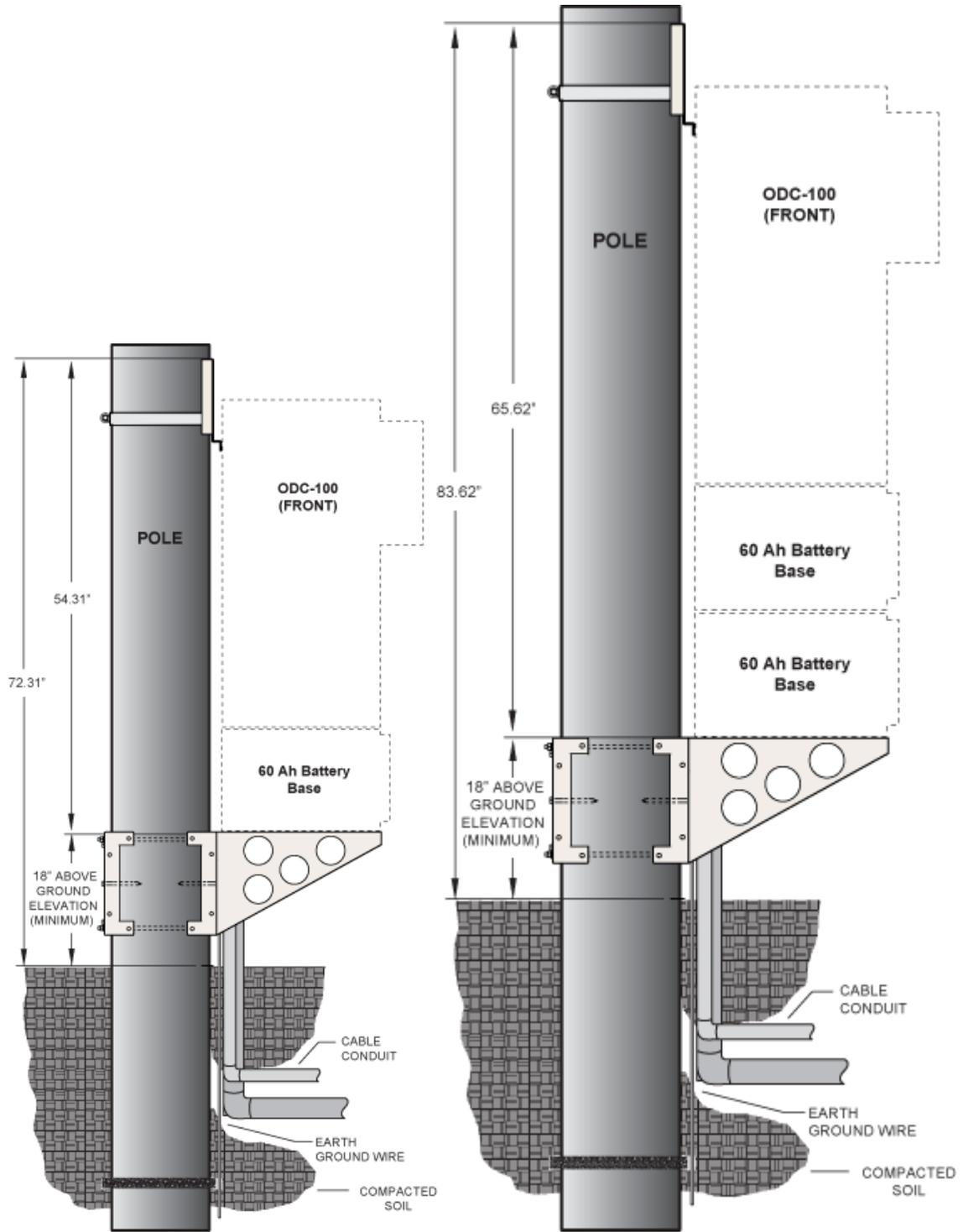


**Conduit Locations**

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.



**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

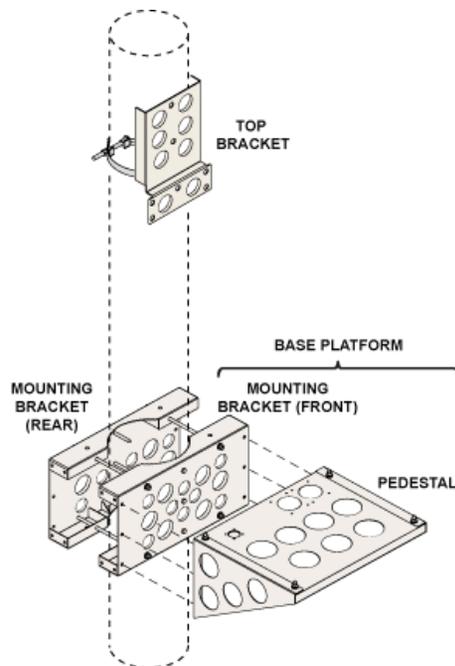
1. At the installation site, verify the following:
  - The pole is installed and plumb.
  - The pole meets the cabinet mounting *requirements* (on page 50).
2. Trench out conduit paths to the pole from the cable feeder location.
3. Place the cable conduits into the conduit trench. At the pole, allow the conduit to extend above ground to the approximate height of the base platform. Refer to the *pole mounting guidelines* (on page 50) for conduit sizes and locations.
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.
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.



## To install the pole mounting fixture

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.



2. Attach the rear mounting bracket to the pole as follows:
  - a. Position the rear mounting bracket against the opposite 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.

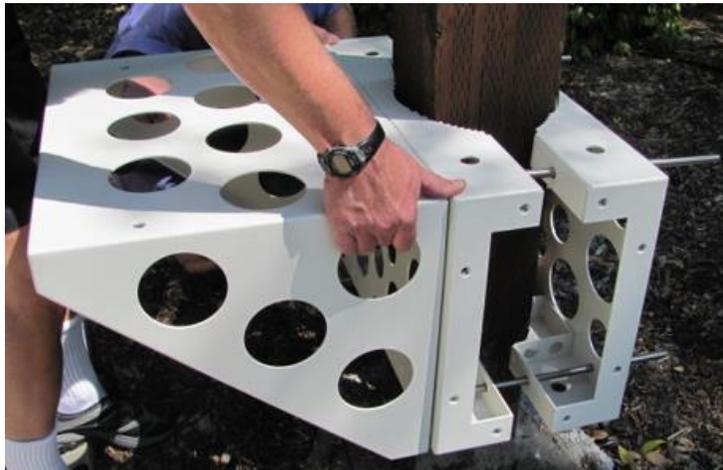
**Note:** Remove the bracket and deepen the pilot holes, if needed.

- 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.

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.

## To install the top bracket

1. On the left side of the cabinet, remove the five plastic caps covering the bracket mounting holes.
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.
3. Install the cabinet onto the mounting fixture.  
**Perform the remaining step only after the cabinet is installed on the mounting fixture.**
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.

ODC-100 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.

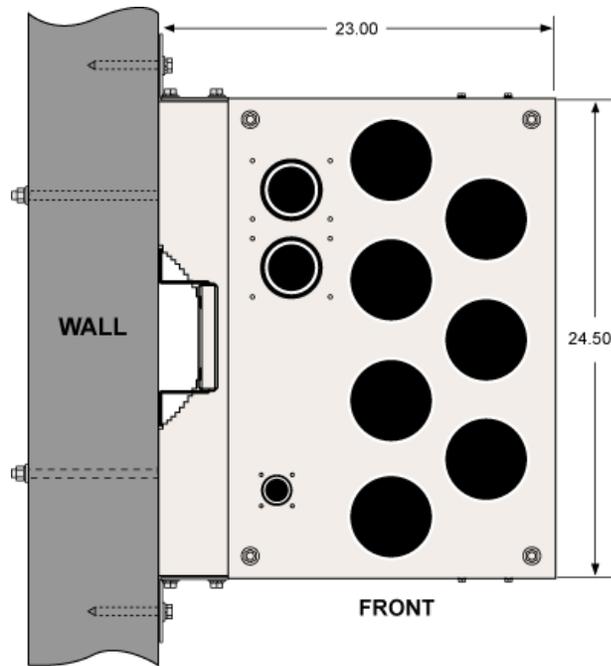
**Note:** The minimum heights assume a distance of 18 inches above the ground to the top of the base platform. To elevate the cabinet higher than 18 inches above ground, use a wall or H-frame with sufficient additional height.

- 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:

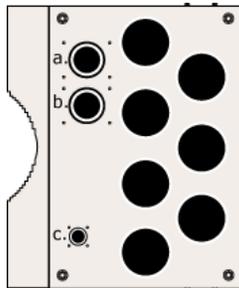
Horizontal Spacing	Vertical Spacing
<p><b>Top bracket:</b> 11 inches on centers</p> <p><b>Bottom bracket:</b> 28 inches on centers</p>	<p><b>To bottom bracket's upper hole set:</b></p> <ul style="list-style-type: none"> <li>• Single battery base: 54.56 inches on centers</li> <li>• Dual battery base: 65.87 inches on centers</li> </ul> <p><b>To bottom bracket's lower hole set:</b></p> <ul style="list-style-type: none"> <li>• Single battery base: 68.56 inches on centers</li> <li>• Dual battery base: 79.87 inches on centers</li> </ul>

## 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**

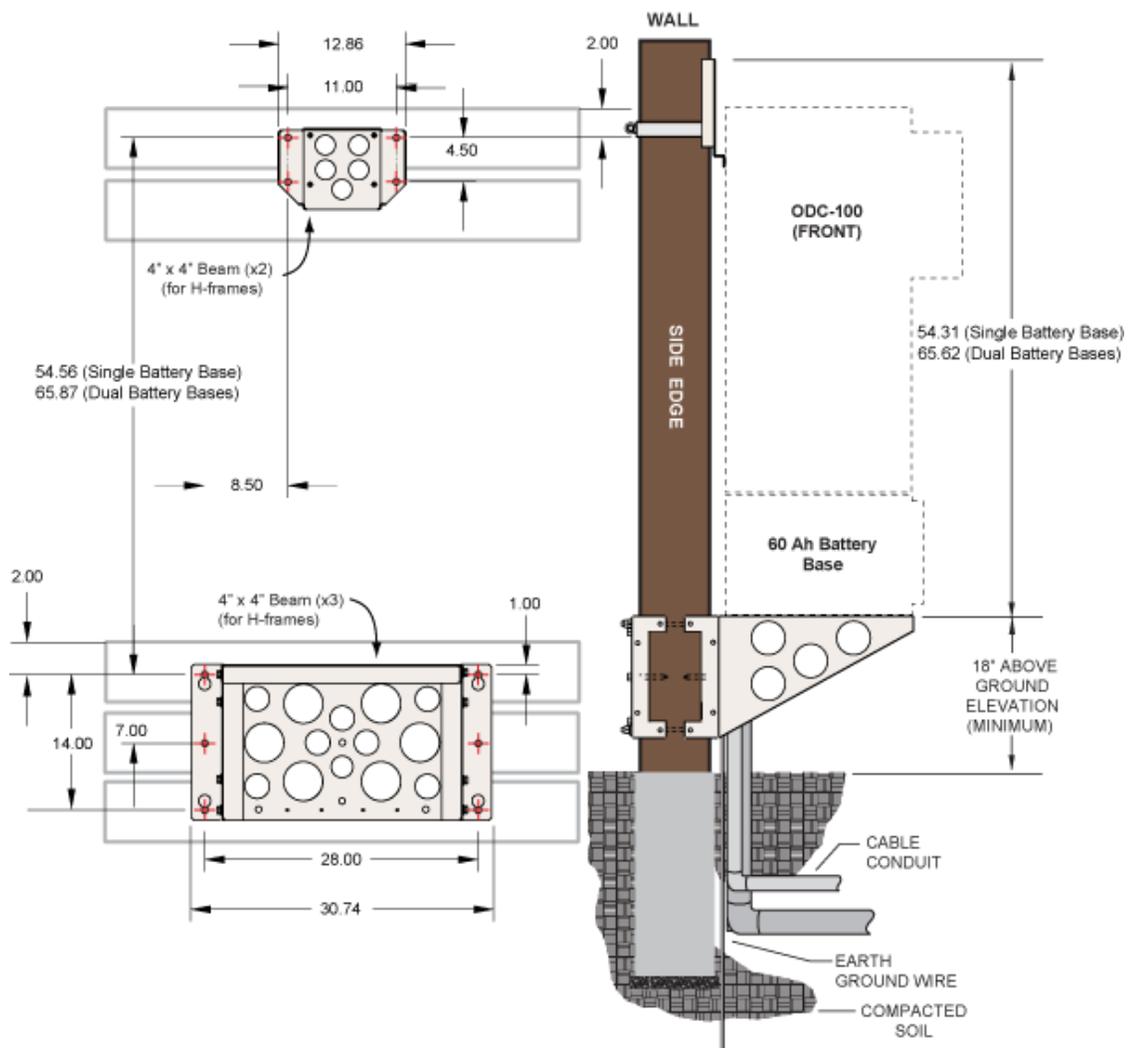


**Conduit Locations**

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.



**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.

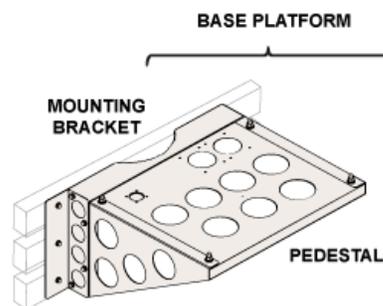
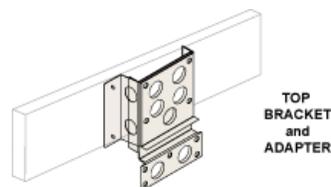
### To prepare the site for a wall mount installation

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* (on page 60).
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* (on page 60) for conduit sizes and locations.
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

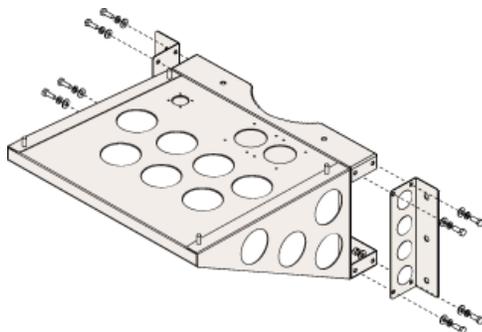
Install the Clearfield wall-mount kit onto a wall or H-frame as described below. Adapt the instructions as needed for local requirements, practices, or conditions.

The primary components of the kit are identified at right.



### To install the wall mounting fixture

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).



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.

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.

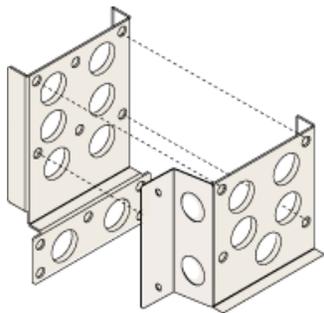
### To install the top bracket

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

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.
4. Install the cabinet on the mounting fixture.

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

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.

## ***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**

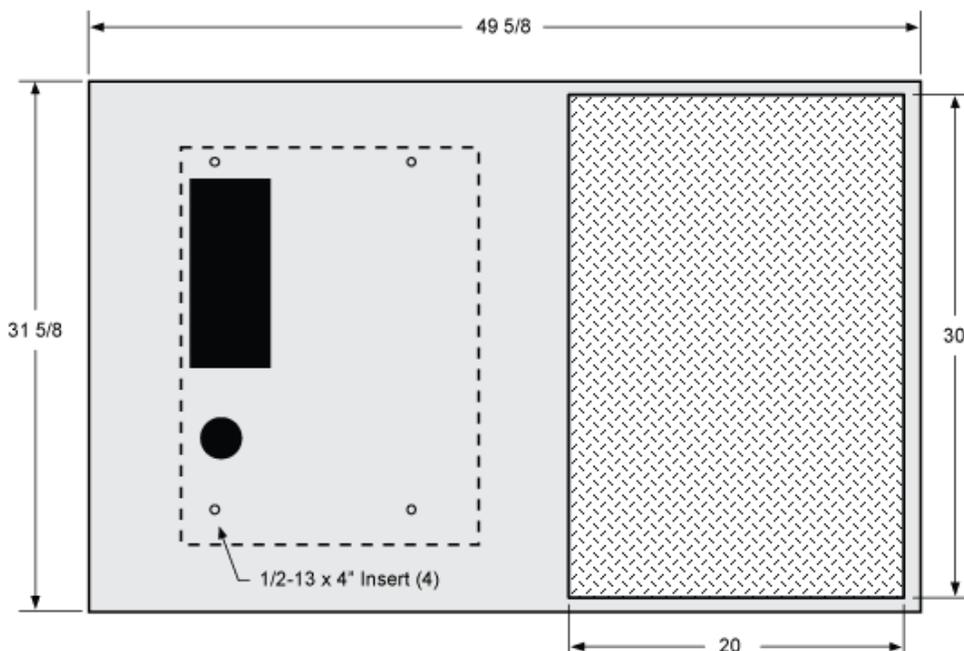
Follow these guidelines to ensure proper foundation support for the cabinet. Adjust for local conditions or practices as required.

- 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 (local power applications only). See drawing below for entry location.
- Include pull cords in all cable conduits.

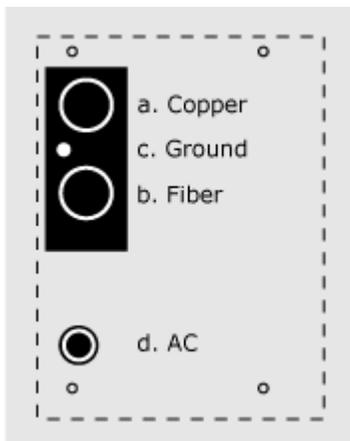
Refer to the vault manufacturer's instructions for additional guidelines.

## 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**

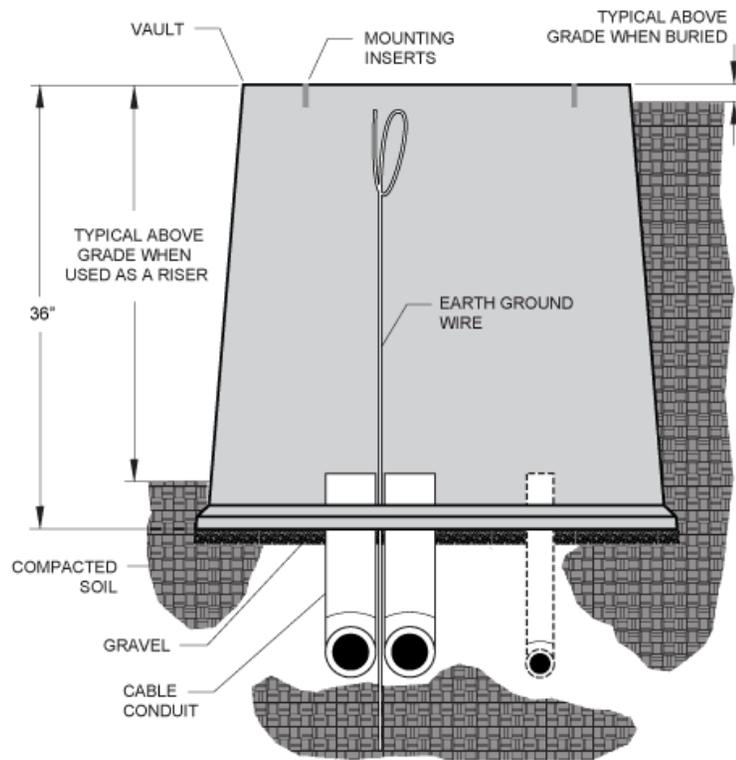


**Conduit Locations**

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 (for local power configurations only).

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



**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

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.
2. Grade and compact the excavated surface until it is firm and level.
3. Trench out conduit paths through the foundation hole from the cable feeder location.
4. Place the cable conduits into the conduit trench. Refer to the *vault guidelines* (on page 68) for conduit sizes and locations.
5. Route the earth ground wire through the conduit trench (from the ground electrode).
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.

## 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

1. Transport the foundation vault to installation site.
2. Using a suitable lifting device, lift the vault into position above the foundation hole.
3. Lower the pad onto the gravel base, making sure the conduits and earth ground wire pass inside the vault as it descends.
4. Adjust the vault positioning on the gravel base until it is stable and level.
5. Backfill and grade around the vault perimeter with soil to secure it in place.
6. Verify that the vault remains level. Adjust as required.



## Chapter 4

# Installing the Cabinet

This chapter describes how to install the Clearfield ODC-100 cabinet onto its permanent mounting location.

### Topics Covered

This chapter covers the following topics:

- 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.

**Note:** For instructions on how to install the ODC-100 with an adjunct mounting kit onto the side of a 3M cross-connect enclosure, please refer to the installation guide: *Clearfield ODC-100 Adjunct Mounting Kit for 3M Enclosures*.

## 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

1. After the cabinet has been delivered to the installation site, remove the cardboard packaging from the cabinet.
2. Review the packing list to verify that all shipped materials are present.
3. Discard the packaging material.
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* (on page 75) 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

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



2. Turn the key counter-clockwise to disengage the latch.
3. Repeat Steps 1 and 2 to disengage the lower latch.
4. Swing the door open until the wind brace engages.
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.

### To close a cabinet door

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



2. Swing the door closed.
3. Insert the telco hex key into the door's upper latch.
4. While holding the door firmly closed, turn the key clockwise to engage the latch.
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

1. Insert the telco hex key into the door's hex-pin latch.
2. Turn the key counter-clockwise to disengage the latch.
3. Tilt and pull the door panel forward, away from the cabinet.

### To close a battery compartment door

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.
2. Insert the telco hex key into the door latch.
3. While holding the door firmly closed, turn the key clockwise to engage the latch.

---

## Preparing the Cabinet for Installation

Complete the following preparations before installing the cabinet.

### To prepare the cabinet for installation

1. Open the front and side cabinet doors.

**Note:** Clearfield recommends completely removing the doors from the cabinet during the installation process. The doors are equipped with quick-disconnect hinges that allow the doors to be easily removed and replaced. See *Removing a Cabinet Door* (on page 183) for instructions.

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

**Perform Steps 3 and 4 on cabinets configured to support local power. Otherwise, skip to Step 5.**

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.
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.
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.
  - **Remote power configuration:** The bolts are located at the bottom four corners of the cabinet.
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.

## Installing the Cabinet on a Concrete Pad

The ODC-100 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* (on page 163).

### 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.

1. Sweep the pad free of dirt and debris.
2. Install the isolation mat onto the concrete pad.

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



- 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.

- Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts.
- Anchor the cabinet or riser to the pad as follows:
  - Site-cast pads with anchor studs:**
    - Get the four hex nuts, four flat washers, and four lock washers from the installation kit.
    - Install one flat washer, lock washer, and hex nut onto each of the four anchor studs.
    - Tighten the hex nuts to secure the cabinet or riser to the pad.
  - Pre-cast pads with threaded inserts:**
    - Get four anchor bolts, four flat washers, and four lock washers from the installation kit.
    - Install one flat washer, lock washer, and anchor bolt into each of the four threaded mounting inserts.
    - Tighten the bolts to secure the cabinet or riser to the pad.
- 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. See *Installing a Cabinet Door* (on page 184) for instructions.

- Apply silicone caulking to the bottom perimeter of the cabinet or riser.

## Installing the Cabinet on a Wall or H-Frame

The ODC-100 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*.

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

1. Verify that the base platform is clean, dry, and free of debris.
2. Install the isolation mat onto the base platform.

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

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: Remote Power***

The ODC-100 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.

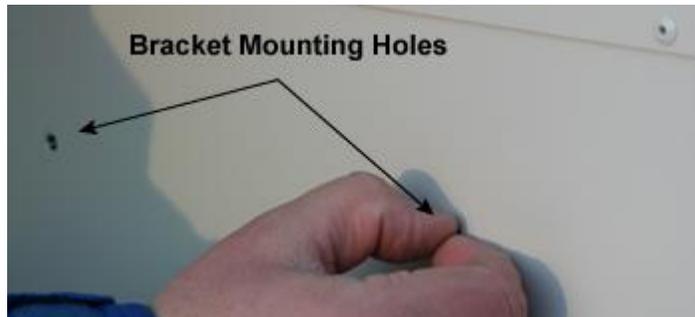
---

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

For pole mount installations, install the pole-mount fixture's top stabilizer bracket on the cabinet before installing the cabinet on the pole.

## To install the cabinet onto the pole-mount fixture

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



2. Attach the top stabilizer bracket to the cabinet as follows:



- a. Position the stabilizer bracket against the left cabinet wall, aligning the bracket holes with the counterpart holes on the cabinet.
  - b. Insert a 1/4-inch screw, flat washer, and lock washer into each of the two aligned bracket holes.
  - c. Tighten the screws completely to secure the bracket in place.
3. Install the isolation mat onto the pole mounting platform.
  4. Using two people, lift the cabinet or riser onto the mounting platform, aligning the mounting holes in the base with the counterpart holes in the platform.
  5. Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts.
  6. Anchor the cabinet or riser to the mounting platform as follows:
    - a. Get four anchor bolts, eight flat washers, four lock washers, and four hex nuts from the installation kit.
    - b. Install one flat washer and anchor bolt into each of the four mounting holes.
    - c. On the underside of the platform, install one flat washer, lock washer, and hex nut onto each of the four installed anchor bolts.

- d. Tighten the bolts to secure the cabinet to the pad.
- 7. Verify that the doors open and close freely. If necessary, use shims to level the cabinet.

**Note:** If you removed the doors previously, re-install them to check door swing alignment. See *Installing a Cabinet Door* (on page 184) for instructions.

- 8. Attach the top stabilizer bracket to the pole as follows:



- a. While holding the stabilizer bracket against the pole, drill two 3/8-inch pilot holes into the pole through the holes in the bracket.
  - b. Install (2) lag bolts into the pilot holes. Tighten the bolts completely to secure the bracket in place.
- 9. Apply silicone caulking to the bottom perimeter of the cabinet.

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

The ODC-100 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*.

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

1. Verify that the base platform is clean, dry, and free of debris.
2. Install the isolation mat onto the pole base platform.

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.



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

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 ODC-100 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* (on page 163).

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

1. Sweep the top surface of the foundation vault free of dirt and debris.
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* (on page 111) after completing Step 5 below.

3. Using two people, lift the cabinet or riser directly above its mounting position on the vault.



4. Slowly lower the cabinet or riser onto the foundation vault, keeping the mounting holes in the base aligned with the anchor holes in the vault.
5. Pull the earth ground wire into the cabinet or riser through one of the cable entry ducts. If the vault is equipped with an underneath access area, you can feed the earth ground wire up into the cabinet or riser from this access area.
6. Anchor the cabinet or riser to the vault 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.
7. Verify that the doors open and close freely. If necessary, use shims to level the cabinet.

**Note:** If you removed the doors previously, re-install them to check door swing alignment. See *Installing a Cabinet Door* (on page 184) for instructions.

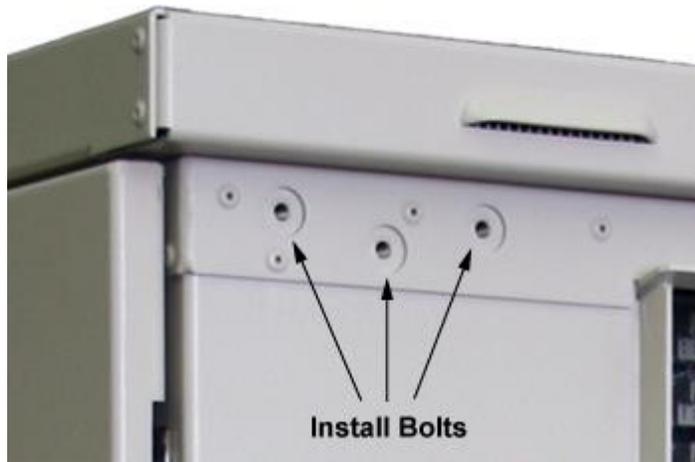
8. Apply silicone caulking to the bottom perimeter of the cabinet or riser.

## Removing the Lifting Details

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

### To remove the lifting details

1. Locate the two lifting details, attached to the upper left corners of the left and right sides of the cabinet.
2. Remove the three bolts securing the first lifting detail to the cabinet.
3. Remove and discard the lifting detail.
4. Insert the three removed bolts back into the vacant bolt holes on the cabinet.



5. Repeat Steps 2 through 4 to remove the other lifting detail.



## Chapter 5

# Installing Power

This chapter describes how to install power to the cabinet. The cabinet supports two different power configurations: locally-supplied commercial AC power, or remote (line-supplied)  $\pm 190$  VDC power.

- For cabinets configured for local power, this process includes installing the cabinet earth ground connection and installing and wiring local AC power.
- For cabinets configured for remote power, this process includes installing the cabinet earth ground connection, and installing and splicing outside plant metallic cables for power (twisted copper pairs) to the cabinet power line protection.

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 remote (line) power

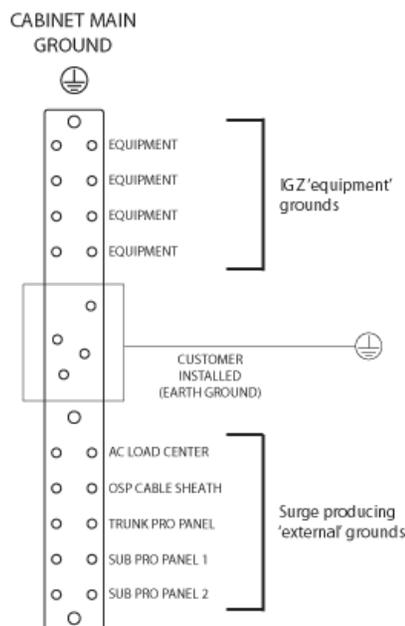
## Installing the Cabinet Ground Connection

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:

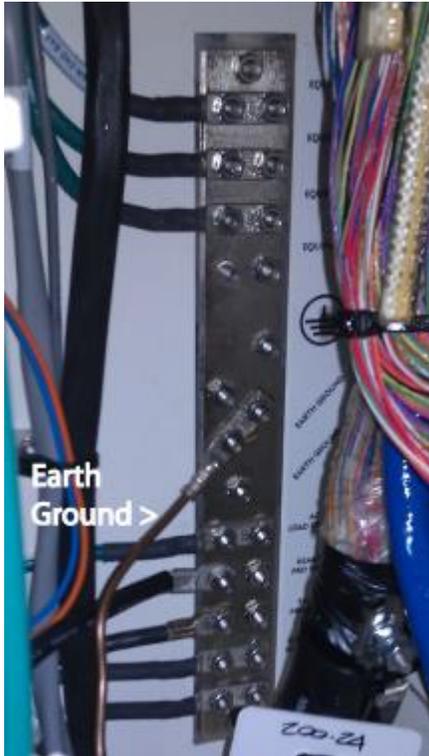
- The PANI system divides the ground bar into sections, with one type of conductor in each section: **P**roducers, surge **A**bsorbers, **N**on-isolated and **I**solated (PANI).
- The ODC-100 cabinet's main earth ground (that connects to the ground field) should bisect the main ground bar, effectively separating ground termination positions into two zones, as follows:
  - **Isolated Ground Zone (IGZ) 'equipment' grounds.** All E-Series and B6 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 ODC-100 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](http://seeclearfield.com).

## To install the cabinet ground connection

1. Open the cabinet's side door.
2. Route the earth ground wire to the main ground bar and cut the wire to length.
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.
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.
5. Attach the earth ground wire's two-hole lug onto the 3/4-inch ground terminal studs per PANI guidelines.



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 AC power (220-240 VAC)

1. Open the front cabinet door.
2. Switch all AC load center breakers to the **OFF** position.
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.



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.

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.
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.

7. Tighten the coupling nut around the AC wires at the bottom of the load center housing.
8. Re-install the cover panel on the AC load center.

---

## Installing Remote Power

This section describes how to install remote (line) power to the cabinet, which includes the following tasks:

- Installing the outside plant metallic cable providing the remote power pairs.
- Qualifying pairs and testing line validity for remote power.
- Splicing the power pairs to the cabinet line protection system.

**Note:** For instructions on how to install a remote power buffer capacitor (to enable a continuous power supply to equipment during brief interruptions), please refer to the installation guide, *Clearfield Installation Guide: Power Buffer Capacitor Kit for Remote Power*.

### Installing Outside Plant Metallic Cable (Power Pairs)

Install outside plant (OSP) metallic cable into the cabinet to provide twisted pairs for line (remote) power.

Whenever possible, Clearfield recommends using a dedicated cable exclusively for power, completely separate from the cable used for telephony signals. Separating the cable plant provides a safer handling environment.

If you cannot provide separate physical cables for power and telephony from the cross-connect location, then you must segregate one 25-pair binder group from the main OSP cable bundle to use for power. All power pairs must belong to the same 25-pair binder group and cannot include pairs for telephony signaling. Mark the binder group with red electrical tape or red cables ties to clearly identify the group as dedicated for power.

**Note:** The number of pairs in the 25-pair binder group to carry power will vary from site to site. For more information, refer to the *Clearfield Application Note: Guidelines for Line Powering the E3-48, E3-48C and E3-12C*, available at [see.clearfield.com](http://see.clearfield.com). The following procedure assumes that the OSP cable pairs you are installing have already been qualified for remote (line) power suitability per the requirements described in the planning tool.

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



**DANGER!** Risk of electrical shock. High voltage may be present. Only a qualified technician should perform this procedure.



**WARNING!** Due to loop capacitance, copper pairs may retain a charge on the line if power was previously applied. Before contacting the pairs, use a volt meter to verify that the lines are not charged.

---

Before continuing, verify that **no** power is applied to the OSP cable pairs.

## To install outside plant cable (power pairs)

1. Open the cabinet's side door.
2. Trim the rubber cone gasket on the cable entry duct to the OSP cable diameter.
3. Route the OSP cable from the feeder location through the conduit and up into the cabinet. Pull approximately six feet of cable up into the cabinet through the entry duct.
4. Strip off the cable's outer sheath and internal metal shielding to a length suitable for splicing. Take care to expose, but not penetrate, the core wrap surrounding the bundled copper pairs.
5. Ground the OSP cable sheath to the cabinet ground bar per local practice.
6. Remove the core wrap from around the bundled copper pairs. Install a red cable tie or red electrical tape around the 25-pair group to identify as power pairs.
7. If splicing will be performed at a later time, arrange and secure the cable inside the compartment per local practice.

## Checking Line Validity for Remote Power

Before splicing the incoming OSP cable (power pairs) to the cabinet protection interface, check that the lines retain validity for use with remote power. Some copper pairs, and splices in particular, may have deteriorated or have otherwise become unsuitable for remote power.

This task assumes that the whole span of copper plant has already been qualified for remote power suitability. This step just verifies that no plant degradation has occurred between qualification and installation, particularly on the final cable segment between the feeder location and the cabinet.

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



**DANGER!** Risk of electrical shock. High voltage may be present. Only a qualified technician should perform this procedure.



**WARNING!** Due to loop capacitance, copper pairs may retain a charge on the line if power was previously applied. Before contacting the pairs, use a volt meter to verify that the lines are not charged.

Before continuing, verify that **no** power is applied to the OSP cable pairs.

## To check line validity for power pairs

1. Using a digital multi-meter, verify that the total loop resistance per pair is between 600 and 800 ohms.

2. Using a digital multi-meter, verify that the loop resistance per pair from wire to wire is within 5% of each other.
3. If resistance levels fall outside the required range, troubleshoot the wiring between the feeder location and the cabinet, including the splices at the cross-connect location. Verify the validity of all pairs before continuing with the installation process.

## Splicing Power Pairs to the Protection Interface

Splice the incoming OSP power pairs to the cabinet's 25-pair protection interface cable. The protection interface cable is factory terminated with an MS<sup>2</sup> connector, marked with red electrical tape, and stubs out to the power protection block. Install a counterpart MS<sup>2</sup> connector on the 25-pair group from the OSP cable to splice it to the protection interface cable.



**DANGER!** Risk of electrical shock. High voltage may be present. Only a qualified technician should perform this procedure. Take precautions and use insulated tools when working with power.



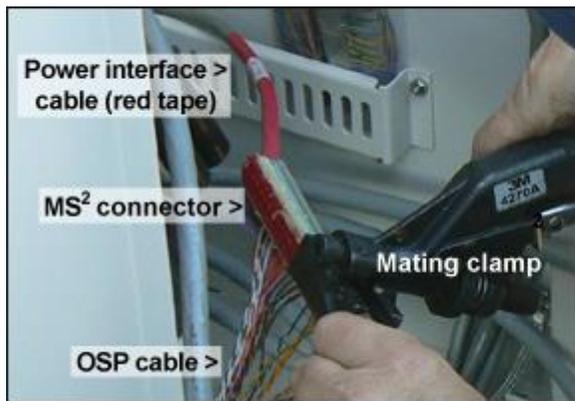
**WARNING!** Due to loop capacitance, copper pairs may retain a charge on the line if power was previously applied. Before contacting the pairs, use a volt meter to verify that the lines are not charged.

Before continuing, verify that **no** power is applied to the OSP cable pairs.

### To splice the OSP cable (power pairs)

1. Open the cabinet's side door.
2. Terminate an MS<sup>2</sup> connector on the end of the OSP cable's 25-pair group.
3. Wrap red electrical tape around the OSP cable (below the MS<sup>2</sup> connector) to mark the cable as line powered.
4. Locate the cabinet's 25-pair power interface cable (identified by red tape wrapped below the MS<sup>2</sup> connector). Remove all ties securing the cable to the tie bars. Remove the protective covers from the connectors.

5. Mate the power interface and OSP MS<sup>2</sup> connectors together using mating clamps.



6. Install a protective cover over the mated MS<sup>2</sup> connectors.
7. Dress and secure the spliced cable to the tie bars with cable ties.



## 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.

## ***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

1. Open the cabinet's side door.
2. Trim the rubber cone gasket on the cable entry duct to the OSP cable diameter.
3. Route the OSP fiber cable from the feeder location through the conduit and up into the cabinet.
4. Pull the fiber cable up into the cabinet through the entry duct. Pull enough cable length to extend to the splice location.
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.

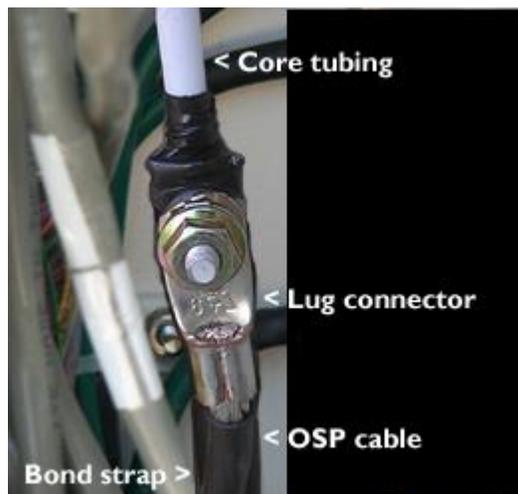
The following steps are general guidelines only. Follow local practice where applicable.

## To prepare outside plant cables for splicing

1. If necessary, untie or cut the bindings temporarily securing the OSP cable inside the cabinet.
2. Strip off the cable's outer sheath to expose the core tubing. Take care not to damage the fibers inside the core tubing.
3. Ground the OSP cable sheath to the cabinet ground bar as follows:
  - 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.



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.
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.

The cabinet supports up to three fiber splice trays, each holding up to 12 individual fiber splices. Splice the OSP fibers to connectorized fiber pigtails or jumpers that will connect to the equipment. Make sure the pigtail/jumper connector type matches the connector type of the Small Form-factor Pluggable (SFP) transceiver modules used on the equipment. Optical SFP modules supplied typically have LC-UPC connectors.

**Note:** For additional fiber management options, see *Installing Fiber Management Options* (on page 174).

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



**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!** Only a qualified technician should perform this procedure.

### To splice fibers

1. Open the cabinet's front door.
2. If necessary, untie or cut any bindings temporarily securing the core fiber tubing near the splice tray.
3. Remove the fiber splice tray from the cabinet wall.
4. Assuming the bare fibers are stored inside the splice tray, remove enough fiber from the tray to perform splicing.
5. Splice the fibers to fiber pigtails or jumpers per local practice.
6. Neatly arrange the finished splices and slack fiber in the splice tray.
7. Replace the splice tray into position on the cabinet wall.
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.** Optical radiation can cause severe eye damage or blindness. Never assume laser power is off. Do not look into the open end of an optical fiber, vacant SFP socket, or an installed transceiver.

### To connect fibers to an E7-2 unit

1. Install the E7-2 line card(s) into the chassis.
2. Install pluggable transceiver modules into the appropriate port sockets on the E7 as follows:
  - To equip 10GE ports:
    - Install XFP modules into sockets labeled **XFP 1** or **XFP 2**, as required.
    - Install SFP+ modules into sockets labeled **SFP+ 1** or **SFP+ 2**, as required.
  - To equip GE ports, insert SFP modules into sockets labeled **SFP 1** to **SFP 12**, as required.
  - To equip GPON ports, insert GPON OIM modules into sockets labeled **GPON 1** to **GPON 4**, as required.
    - a. Orient the module with the exposed PCB side facing down.
    - b. Press the module firmly into the socket until it clicks into place.
3. Connect fibers to the transceiver modules on the E7 unit as required.
4. Neatly dress and secure all fibers/cables per local practice.

**Important:** Route fibers to the left side of the E7 unit to ensure visibility of status LEDs located on the right side of the shelf.

### To connect fibers to a B6-001 unit

1. Install a B6 line card into the chassis.
2. Remove the dust covers from the pluggable transceiver modules.
3. Install pluggable transceiver modules into the appropriate port sockets on the B6 as follows:
  - To equip 10GE ports:

- Install XFP modules into sockets labeled **XFP 3**, **XFP 4**, **XG3**, or **XG4**, as required.
- Install SFP+ modules into sockets labeled **SFP+ 1**, **SFP+ 2**, or **SFP+1** to **SFP+ 4**, as required.

**Note:** For the B6-256 and B6-318 cards, SFP+ modules support GE or 10GE operation.

- To equip GE ports:
    - Insert SFP modules into sockets labeled numerically, as required. B6 line cards use the following numerical labeling: **7** to **10**, **7** to **22**, or **1** to **22**.
    - Insert CSFP modules into sockets labeled **1** to **48**.
  - To equip GPON ports, insert GPON OIM modules into sockets labeled **GPON 1** to **GPON 4**, as required.
    - Orient the module with the exposed PCB side aligning properly to the connector position inside the module cage on the PCB. This orientation could be either with the PCB facing down or up so care should be taken to check the position first.
    - Press the module firmly into the socket until it clicks into place.
    - Discard the transceiver module dust covers.
4. Connect fibers to the transceiver modules on the B6-001 unit as required.
  5. Neatly dress and secure all fibers/cables per local practice.

**Important:** Route the fibers to prevent an excessive bend radius and to avoid blocking removable devices, such as fan trays and other service units.

### To connect fibers to an E5-100 unit

1. Install up to two SFP transceiver modules into the E5-100 as follows:
  - a. Install an SFP module into the Ethernet port 1 socket labeled **SFP 1**.
  - b. To support optional link protection, install an SFP module into the Ethernet port 2 socket labeled **SFP 2**.
2. Connect fibers to the E5-100 as follows:

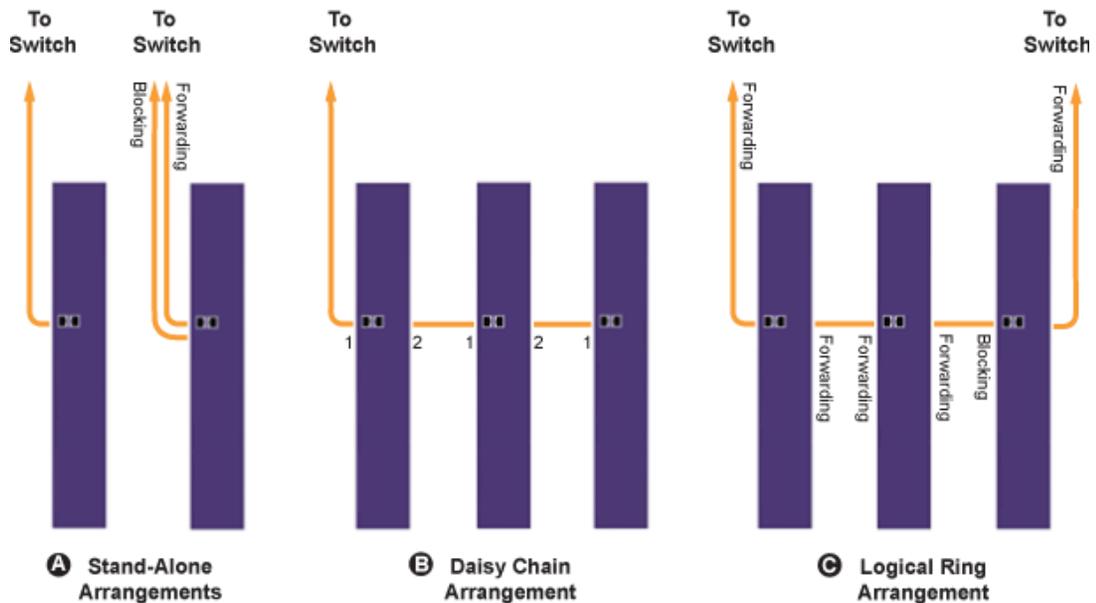


- a. Connect fiber to Ethernet port 1 labeled **SFP 1**.
  - b. To support optional link protection, connect fiber to Ethernet port 2 labeled **SFP 2**.
3. Neatly dress and secure all fibers/cables per local practice.

## (Optional) Interlinking Collocated Service Units

Calix service units support several topology options, based on how you configure the Ethernet links:

- a. Stand-alone:** A stand-alone arrangement provides a dedicated, point-to-point Ethernet link between the service unit and the aggregation switch. RSTP support for link protection is optional. Link bandwidth for each service unit is dedicated, not shared.
- b. Daisy chain:** A daisy chain arrangement interlinks two or more collocated service units together in a linear chain, where Ethernet port 1 points upstream (toward the network), and Ethernet port 2 points downstream (away from the network). Daisy chain arrangements do not support RSTP protection and require traffic aggregation across units in series (link bandwidth toward the switch is shared).
- c. Logical ring:** A logical ring arrangement interlinks two or more collocated service units together, with the end units both linking to the aggregation switch. Logical ring arrangements require RSTP for link protection, so that if any link failure occurs, units downstream of that link can use the reverse path to the switch. Logical rings require traffic aggregation across units in series (link bandwidth to the switch is shared).

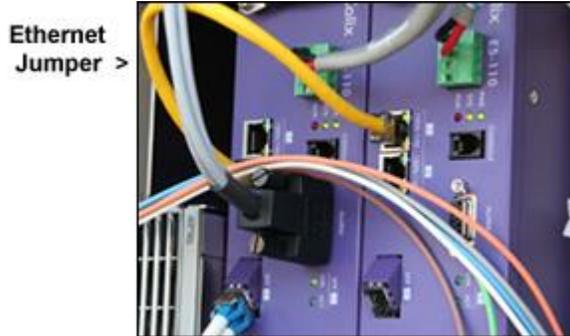


To support logical ring or daisy-chain arrangements, interconnect service units together as described below.

**Note:** You can use either fiber or CAT5e jumpers to interconnect service units. You typically use CAT5e jumpers for collocated units instead of fiber due to the cost savings of not supplying additional SFP modules.

## To interlink Calix service units

1. On the first, upstream-most service unit, verify that a fiber link (back to an aggregation switch) is connected to its Ethernet uplink port.
2. Install a jumper cable between the upstream unit and a downstream unit, as shown in the following example:



- a. On the upstream unit, connect the jumper to a second Ethernet port.
- b. On the downstream unit, connect the jumper to the first Ethernet port.

**Note:** On powered units, the link LEDs should illuminate when the jumper is installed.

3. Repeat Steps 1 and 2 to interlink additional units, as required.
4. Logical ring configurations only: On the last downstream unit in the string, install a fiber link (back to an aggregation switch) to a second Ethernet uplink port. See *Connecting Fibers to the Equipment* for instructions.

## ***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**

Install outside plant (OSP) metallic cables into the cabinet and prepare the cables for splicing. The following steps are general guidelines only. Follow local practice where applicable.

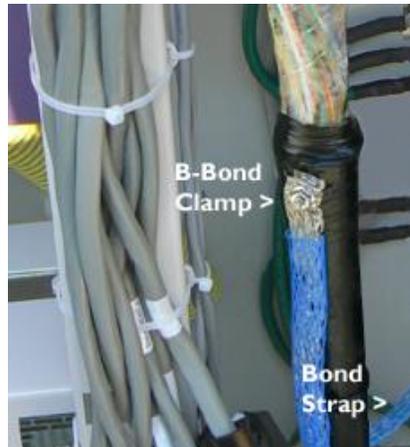
#### **To install outside plant metallic cables**

1. Open the cabinet's side door.
2. Trim the rubber cone gasket on the cable entry duct to the OSP cable diameter.
3. Route the OSP cable from the feeder location through the conduit and up into the cabinet.
4. Pull approximately six feet of cable up into the cabinet through the entry duct.
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**

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



4. Secure the OSP cable to the cabinet tie bars with cable ties.
5. Remove the core wrap from around the bundled copper pairs, then install binder group identification labels on each 25-pair group.
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 MS<sup>2</sup> connectors. Interface cables on the OSP side ('Subscriber' side) of the protection blocks or optional cross-connect panel are factory terminated with MS<sup>2</sup> connectors. You must install counterpart MS<sup>2</sup> 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

1. Open the cabinet's side door.
2. Segregate the bundled pairs from the OSP cable into 25-pair groups.
3. Terminate MS<sup>2</sup> connectors onto the ends of each 25-pair group per local practice.
4. Remove all cable ties securing the cabinet interface cables to tie bars and remove the protective covers from the connectors.
5. For each 25-pair group, mate the OSP and equipment interface cable connectors together using the appropriate mating clamps.
6. Repeat Steps 2 through 5 for each remaining OSP cable.
7. Dress and secure the spliced cables to the tie bars with cable ties.

## 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.

The 50-pair protection blocks support the various copper access units as follows:

### Calix E7-2:

- One 50-pair block supports each VDSL2 combo card, protecting the 48 user lines.
- Two 50-pair blocks support each two-slot VDSL2 overlay card. One block protects the 48 POTS only (PSTN) lines; the other block protects the 48 DSL/POTS (user) lines.

The 50-pair protection blocks support Calix B6-001 service units as follows:

- One 50-pair block supports each xDSL-only or VDSL2 combo card, protecting the 48 user lines.
- Two 50-pair blocks support one xDSL overlay card. One block protects the 48 POTS only (PSTN) lines; the other block protects the 48 DSL/POTS (user) lines.

The 50-pair protection blocks support E5-100 service units as follows:

- **Calix E5-110:** Two 50-pair blocks support each E5-110 unit. One block protects the 48 user lines; the other block protects the 48 PSTN overlay lines.
- **Calix E5-111:** One 50-pair block supports each E5-111 unit, protecting the 48 user lines.
- **Calix E5-120:** Two 50-pair blocks support two E5-120 units. One block protects the (2x) 24 user lines; the other block protects the (2x) 24 PSTN overlay lines.
- **Calix E5-121:** One 50-pair block supports two E5-121 units, protecting the (2x) 24 user 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. Typically, black modules are used for DS0/DSL circuits. 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.

**Note:** Seal the cable entry location immediately after outside cables are installed to prevent ground moisture from condensing inside the cabinet and damaging equipment.

### To seal the cable entry locations

1. Open the cabinet's side door or battery compartment riser door.
2. Adjust or trim the rubber cone gaskets on the cable entry ducts to create a tight seal around the cables, as required.
3. If required, prepare the sealant for application per the manufacturer instructions.
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!** Check to ensure that all gaps are completely sealed. Gaps allow penetration of moisture, insects, rodents, and other contaminants that could impair or damage equipment.

---

## Chapter 7

# Turning Up the Cabinet Power System

This chapter describes how to turn up and test the cabinet power system.

For cabinets configured for local power, this process includes checking the cabinet ground connection, checking the AC power supply voltage, installing rectifier modules into the rectifier shelf, installing batteries for reserve power, and turning up and testing the DC power system.

For cabinets configured for remote power, this process includes checking the cabinet ground connection, checking the line power supply voltage, installing converter modules into the converter shelf, and turning up and testing the DC power system.

### Topics Covered

This chapter covers the following topics:

- Turning up the cabinet power system (local power)
- Turning up the cabinet power system (remote power)

---

## Turning Up the Power System (Local Power)

This section describes how to turn up and test the power system for locally-powered cabinets. The process includes checking the cabinet ground connection, checking the AC power supply voltage, installing rectifier modules into the rectifier shelf, 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 Power Hub 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

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

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

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

## Installing the Rectifier Modules

The ODC-100 Power Hub 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 ODC-100 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 ODC-100 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

1. Unpack the rectifier module.
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.
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.

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* (on page 202) 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

1. Unpack the batteries from the shipping packaging.
2. Remove the terminal caps from the top of each battery.
3. Clean and apply No-Ox anti-corrosion grease to each battery terminal.
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. See *Installing a Seismic Protection Kit* (on page 167) for instructions.

1. At the rectifier shelf, open the fuse panel door. Verify that the battery breaker is **OFF**.
2. Remove the battery compartment door. See *Operating Cabinet Doors* (on page 75) for instructions.
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* (on page 164) for instructions.

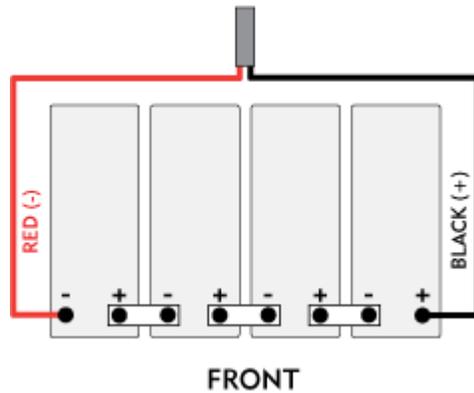
4. In the battery compartment, disconnect the #8 AWG battery power cables from the power supply leads and set the cables aside.
5. Place a string of four batteries partially into the battery compartment, arranged with the terminals accessible in front.

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



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



8. Before connecting the batteries, pull out one rectifier module.
9. Using a digital volt meter, check for correct polarity and test the battery connection between the negative and positive battery leads:
- Place the red voltmeter lead on the red negative (-) battery lead.
  - Place the black voltmeter lead on the black positive (+) battery lead.
  - 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.
- 10.** Install the protective covers (manufacturer-supplied) over the battery terminals.
- 11.** Connect the string of batteries to the power system by plugging the battery string and the rectifier system output Anderson connectors together.
- 12.** Re-install the rectifier module removed in step 8.
- 13.** Verify that the cabinet heat exchanger fans are running (if the temperature is high enough).
- 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.
- 15.** Slide the battery string into the battery tray.
- 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. See *Installing a Seismic Protection Kit* (on page 167) for instructions.

- 17.** Replace the battery compartment door.

## 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* (on page 163) 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. See *Installing a Seismic Protection Kit* (on page 167) for instructions.

1. At the rectifier shelf, open the fuse panel door. Verify that the battery breakers are **OFF**.
2. Remove the upper and lower battery compartment doors. See *Operating Cabinet Doors* (on page 75) for instructions.

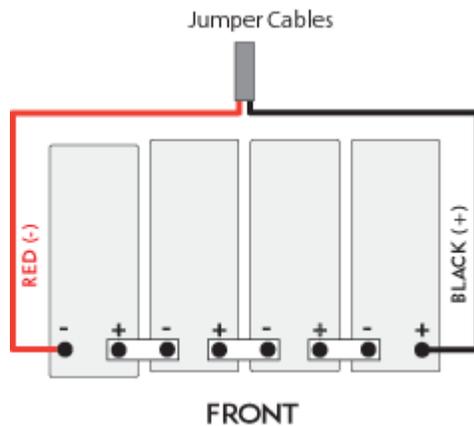
**Note:** If you are using the optional battery heater, install the heaters before installing batteries. See *Installing a Battery Heater* (on page 164) for instructions.

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



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.
6. Install three jumper cables between the battery terminal posts using the supplied flat washers, split lock washers, and bolts.
7. Before connecting the batteries, pull out one rectifier module.
8. Using a digital voltmeter, 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.

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

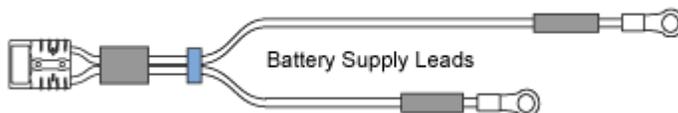


10. In the upper battery compartment, do the following:

- 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* (on page 164) for instructions.

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



The battery supply leads ship in a bag.

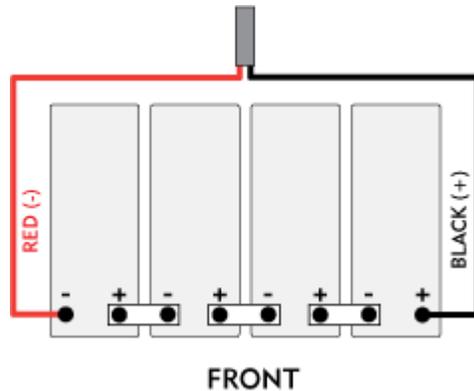
- c. Connect the Anderson connector on the battery supply leads to the Anderson connector on the main secondary battery string.
- d. Route the battery supply leads along the sides of the battery tray and then arrange a string of four batteries with the terminals accessible in front.

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

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.
- 12.** Install three jumper cables between the battery terminal posts using the supplied flat washers, split lock washers, and bolts.
  - 13.** Check for correct polarity and test the battery connection between the negative and positive battery leads (as described in step 7).
  - 14.** Install the protective covers (manufacturer-supplied) over each battery terminal.
  - 15.** Reinstall the rectifier module removed in step 6.
  - 16.** Verify that the cabinet heat exchanger fans are running (if the temperature is high enough).
  - 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 Alpha shelf.
  - 18.** Slide the battery strings into the upper compartment battery tray.
  - 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. See *Installing a Seismic Protection Kit* (on page 167) for instructions.

20. Replace the battery compartment doors.

## Installing Converter Modules

The ODC Power Hub cabinet uses the Alpha Cordex HP LPS36-4 shelf to convert -48 VDC to  $\pm 190$  VDC power to supply the equipment.



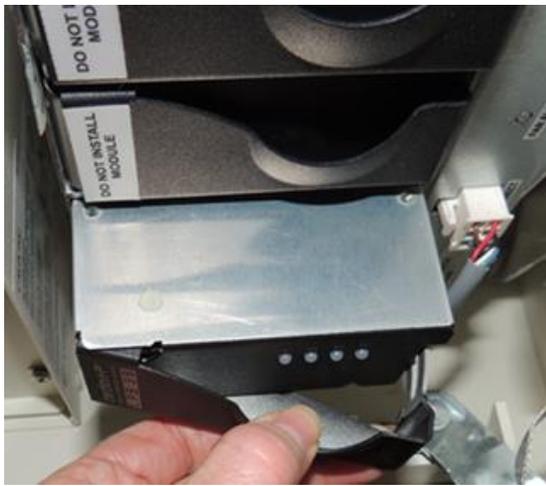
In this specific cabinet deployment model, the LPS36-4 up-converter shelf supports only up to two -48 to  $\pm 190$  VDC modules (eight line powering channels total) in slots 1 and 2. The number of converter modules required for operation varies by site based on several factors.

**Note:** The cabinet ships with blank modules in slots 3 and 4; these slots do not support converter modules.

Refer to the *Clearfield Application Note: Guidelines for Line Powering the E3-48, E3-48C and E3-12C* (available at [see.clearfield.com](http://see.clearfield.com)) for specific information regarding the number of channels and pairs required for a given application. The application note provides predetermined loop lengths based on the number of pairs and the wire gauge for specific deployment models. Using the provided information, you can determine the number of required converter modules for the LPS36 shelf, as one converter module is required for every four channels.

## To install a converter module

1. Unpack the converter module.
2. Slide the converter module into the first or second vacant slot, and then pull the handle on the face plate forward.



3. Push the converter module in, and then release the handle to catch the latch on the left side and secure the module in the slot.
4. Repeat steps 1–3 to install the second converter module.

---

## 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

5. At the AC load center, verify that the Main breaker is **ON**.
6. At the AC load center, switch the (2) 20A Rectifier breaker **ON**.
7. 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*.

8. Verify that the rectifier shelf controller has acquired the rectifier modules as follows:
  - c. Connect a laptop to the CXCM1+ Ethernet port using a standard network cable.
  - d. Laptop IP Network settings (**Start > Control Panel**):
    - IP address: 10.10.10.202
    - Subnet Mask: 255.255.255.0
  - e. Turn off the pop-up blocker.
  - f. **Open an IE browser** and set the browser to run in compatibility mode.
  - g. In the Web address bar, enter the IP address of the Alpha controller module (10.10.10.201).
  - h. Log into the controller module:
    - Username: Your initials or other unique identifier
    - Password: 1234
  - i. Enter the language selection: English
  - j. From the Controller screen (**Controller > Date & Time**), set the correct date and time.

- k. 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".

**System > View Live Status**

Mains	
Avg AC Voltage:	210.9V
Avg. AC Phase R:	---
Avg. AC Phase S:	---
Avg. AC Phase T:	---

Rectifiers	
Output Current:	1.88A
Mode:	FL+TC
# Acquired Rectifiers:	2
# Power Saving Rectifiers:	0

Load	
Load Voltage:	54.31V
Load Current:	1.9A

Converters	
Device Name:	---
Output Current:	---
Output Voltage:	---
# Acquired Conv.:	---

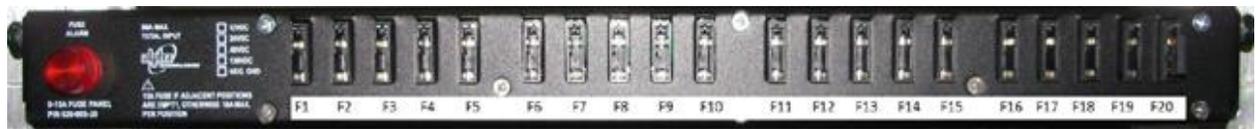
LVD	
Activated LVDs:	0
Enabled LVDs :	0

Batteries	
Battery Voltage:	54.31V
Battery Current:	0.0A
Battery Temperature:	20.38°C
Battery Runtime:	---
Battery Capacity:	100.0%
Battery DOD:	---

LPS	
# Acquired LPS	2

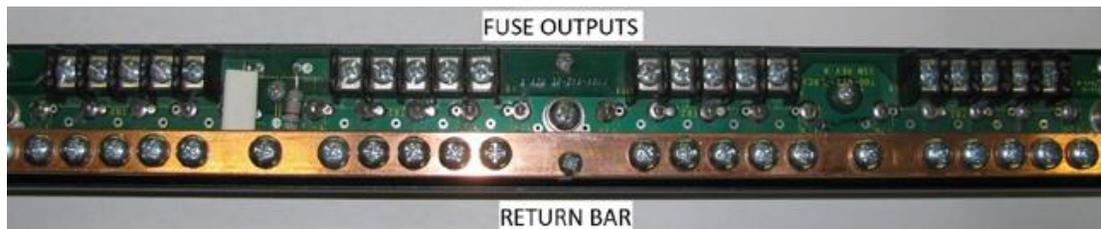
**Note:** Alarm conditions may be present and will not clear due to no load conditions.

9. At the 20 position fuse panel, do the following:



- l. To apply power to the first Clearfield service unit, install a pair of 7.5A GMT fuses in fuse positions 1 and 2. Verify that the unit powers up.
- m. If the cabinet is equipped with additional Clearfield service units, install a pair of 7.5A GMT fuses for each unit as follows:
  - Second service unit: Fuse positions 3 and 4
  - Third service unit: Fuse positions 5 and 6
  - Fourth service unit: Fuse positions 7 and 8
  - Fifth service unit: Fuse positions 9 and 10
  - Sixth service unit: Fuse positions 11 and 12
  - Seventh service unit: Fuse positions 13 and 14
- n. Verify that the additional service unit(s) power up.
- o. Install a 2A GMT fuse in position 20 and verify that the heat exchanger fans start running (if internal temperature is high enough).

10. To test the DC power supply voltage at the GMT fuse panel, pull out the two spring loaded thumbscrews on each side of the fuse panel and swing the panel down to expose the GMT fuse connections. Using a voltmeter, measure the voltage between the fuse panel return bar and one of the GMT fuse outputs that has a fuse populated. Verify that the voltage reads between -48 and -54 VDC.



### 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

11. Using a digital volt meter, test the battery connection between the negative and positive battery leads:
- p. Place the red volt meter lead on the red negative (-) battery lead.
  - q. Place the black volt meter lead on the black positive (+) battery lead.
  - r. Verify that the volt meter reads between -46 and -54 VDC.
  - s. 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.
12. Verify that the cabinet heat exchanger fans are running (if the temperature is high enough).
13. At the AC load center, set the Main breaker to **OFF**. The heat exchanger fans should continue to run.
14. At the AC load center, set the Main breaker to **ON** and verify that power restores to the rectifier shelf.

## 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.

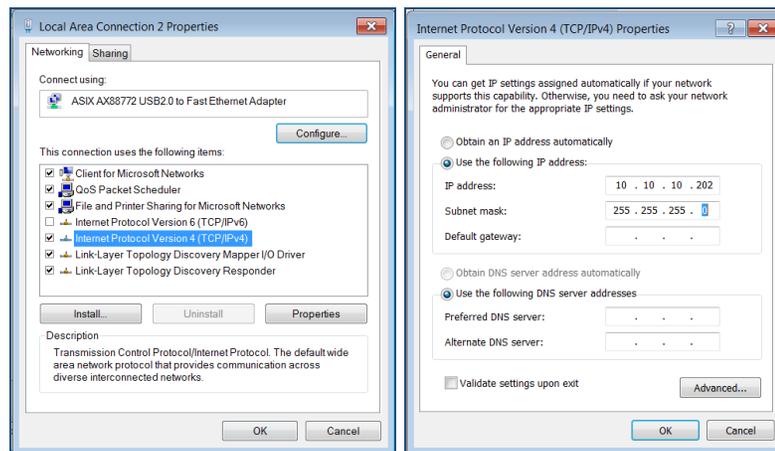
The default controller setting for battery capacity is for the Northstar NSB60FT battery with the charge rate at C/6 (11.3A).

## Changing CXCM1+ Controller Battery Configuration Settings and Alarm Values

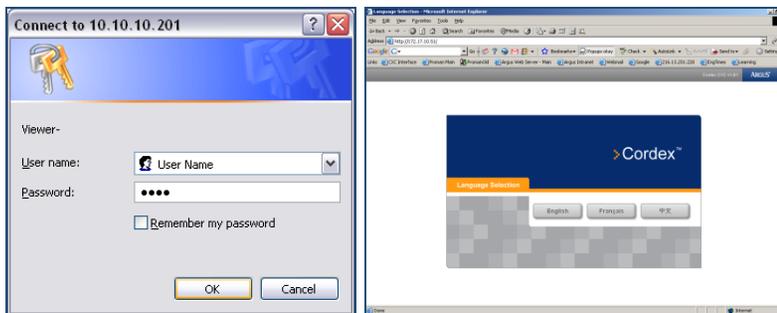
NOTE: Assumption is that the controller's IP address is defaulted to the factory IP address of 10.10.10.201. Also, we highly recommend that the controller's software version is the latest released version. The latest software released can be downloaded here: <http://www.alpha.ca/support/support-main-menu/software-firmware-downloads>

### 15. 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

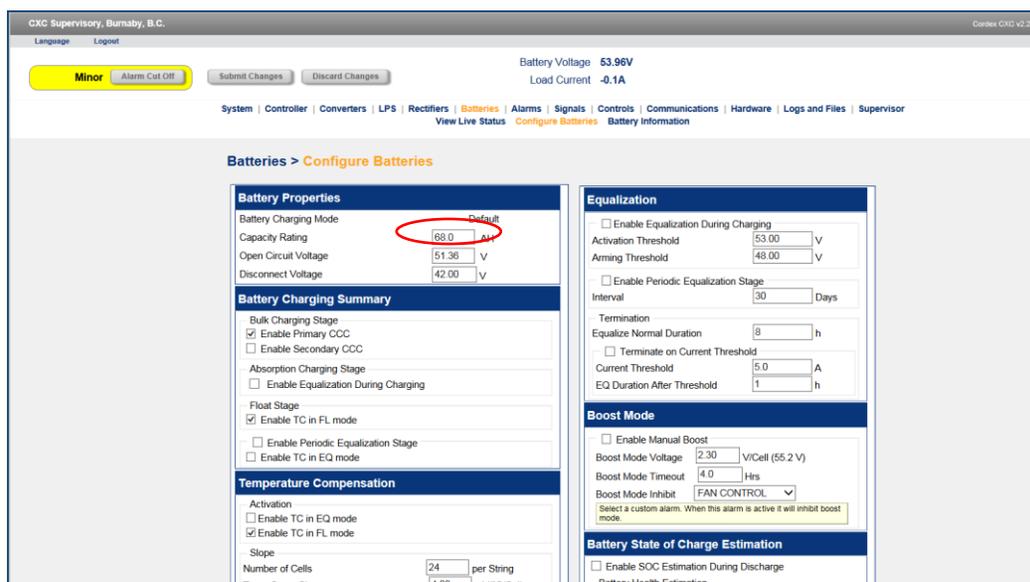


**16. Changing the battery configuration parameters**

- a. Navigate to **Batteries > Configure Batteries**
- b. In the Battery Properties section, enter the battery string capacity into the Capacity Rating box

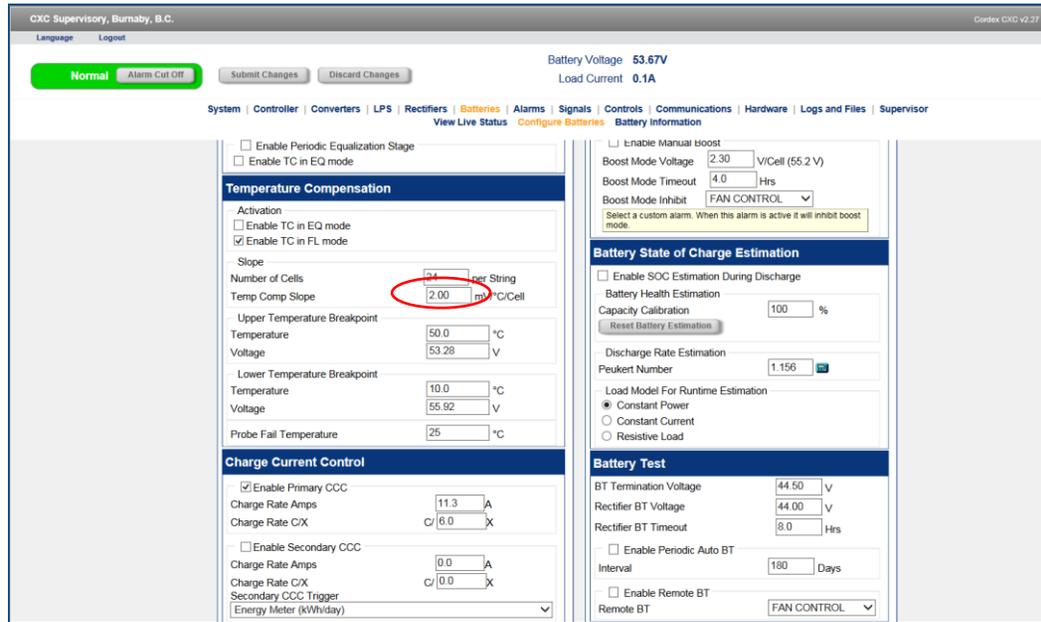
Battery Type	Capacity Value (Ah for One String)*
Northstar NSB60FT Red	68
Energys SBS B14	68
Northstar NSB100FT Red	106
Northstar NSB170FT Red	180
Energys SBS 190F	210

**\*NOTE: For multiple battery strings, increase the capacity value**



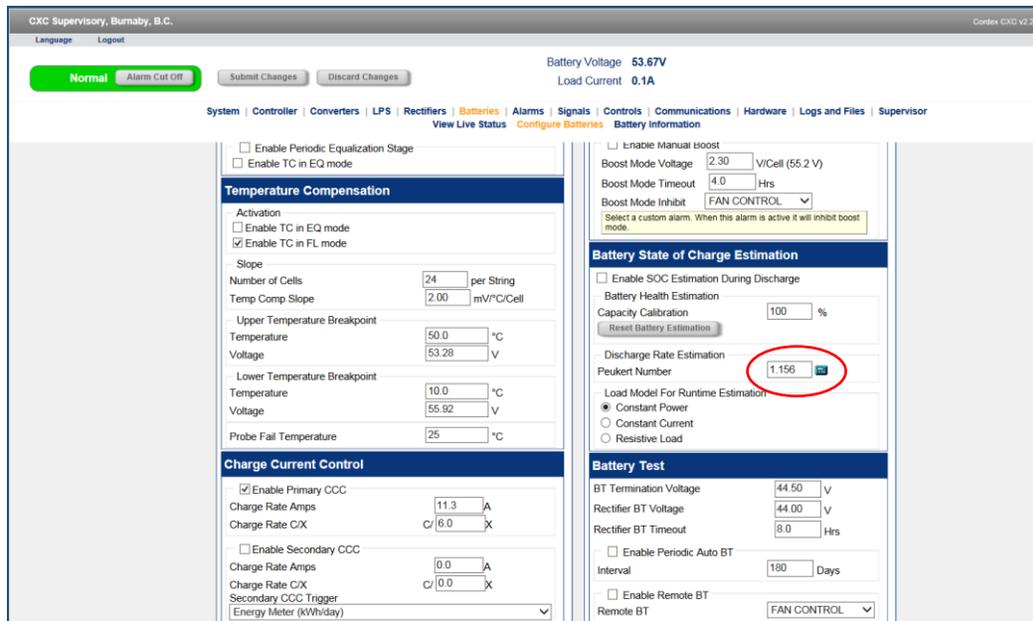
- c. In the Temperature Compensation section, enter temperature compensation slope in the Temp Comp Slope box

Battery Type	Temperature Compensation Slope
Northstar NSB60FT Red	2mV/deg C/Cell (1.1mV/deg F/Cell)
Energys 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)
Energys 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
Energys SBS B14	1.130
Northstar NSB100FT Red	1.131
Northstar NSB170FT Red	1.128
Energys SBS 190F	1.113



- 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
Energys 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
Energys SBS 190F	50 (122)	52.08	10 (50)	55.92

CXC Supervisory, Burnaby, B.C. Context CXG v2.27

Language Logout Battery Voltage 53.67V  
Load Current 0.1A

**Normal** Alarm Cut Off Submit Changes Discard Changes

System | Controller | Converters | LPS | Rectifiers | Batteries | Alarms | Signals | Controls | Communications | Hardware | Logs and Files | Supervisor

View Live Status **Configure Batteries** Battery Information

Enable Periodic Equalization Stage  
 Enable TC in EQ mode

**Temperature Compensation**

Activation  
 Enable TC in EQ mode  
 Enable TC in FL mode

Slope  
Number of Cells: 24 per String  
Temp Comp Slope: 2.00 mV/°C/Cell

Upper Temperature Breakpoint  
Temperature: 50.0 °C  
Voltage: 53.28 V

Lower Temperature Breakpoint  
Temperature: 10.0 °C  
Voltage: 55.92 V

Probe Fail Temperature: 25 °C

**Charge Current Control**

Enable Primary CCC  
Charge Rate Amps: 11.3 A  
Charge Rate C/X: 6.0 X

Enable Secondary CCC  
Charge Rate Amps: 0.0 A  
Charge Rate C/X: 0.0 X

Secondary CCC Trigger  
Energy Meter (KWh/day):

Enable Manual boost  
Boost Mode Voltage: 2.30 V/Cell (55.2 V)  
Boost Mode Timeout: 4.0 Hrs  
Boost Mode Inhibit: FAN CONTROL

Select a custom alarm. When this alarm is active it will inhibit boost mode.

**Battery State of Charge Estimation**

Enable SOC Estimation During Discharge  
Battery Health Estimation  
Capacity Calibration: 100 %  
Reset Battery Estimation

Discharge Rate Estimation  
Peukert Number: 1.156

Load Model For Runtime Estimation  
 Constant Power  
 Constant Current  
 Resistive Load

**Battery Test**

BT Termination Voltage: 44.50 V  
Rectifier BT Voltage: 44.00 V  
Rectifier BT Timeout: 8.0 Hrs

Enable Periodic Auto BT  
Interval: 180 Days

Enable Remote BT  
Remote BT: FAN CONTROL

- 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

CXC Supervisory, Burnaby, B.C. Context CXG v2.27

Language Logout Battery Voltage 53.67V  
Load Current 0.1A

**Normal** Alarm Cut Off Submit Changes Discard Changes

System | Controller | Converters | LPS | Rectifiers | Batteries | Alarms | Signals | Controls | Communications | Hardware | Logs and Files | Supervisor

View Live Status **Configure Batteries** Battery Information

Enable Periodic Equalization Stage  
 Enable TC in EQ mode

**Temperature Compensation**

Activation  
 Enable TC in EQ mode  
 Enable TC in FL mode

Slope  
Number of Cells: 24 per String  
Temp Comp Slope: 2.00 mV/°C/Cell

Upper Temperature Breakpoint  
Temperature: 50.0 °C  
Voltage: 53.28 V

Lower Temperature Breakpoint  
Temperature: 10.0 °C  
Voltage: 55.92 V

Probe Fail Temperature: 25 °C

**Charge Current Control**

Enable Primary CCC  
Charge Rate Amps: 11.3 A  
Charge Rate C/X: 6.0 X

Enable Secondary CCC  
Charge Rate Amps: 0.0 A  
Charge Rate C/X: 0.0 X

Secondary CCC Trigger  
Energy Meter (KWh/day):

Enable Manual boost  
Boost Mode Voltage: 2.30 V/Cell (55.2 V)  
Boost Mode Timeout: 4.0 Hrs  
Boost Mode Inhibit: FAN CONTROL

Select a custom alarm. When this alarm is active it will inhibit boost mode.

**Battery State of Charge Estimation**

Enable SOC Estimation During Discharge  
Battery Health Estimation  
Capacity Calibration: 100 %  
Reset Battery Estimation

Discharge Rate Estimation  
Peukert Number: 1.156

Load Model For Runtime Estimation  
 Constant Power  
 Constant Current  
 Resistive Load

**Battery Test**

BT Termination Voltage: 44.50 V  
Rectifier BT Voltage: 44.00 V  
Rectifier BT Timeout: 8.0 Hrs

Enable Periodic Auto BT  
Interval: 180 Days

Enable Remote BT  
Remote BT: FAN CONTROL

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

Voltage	55.92	V
Probe Fail Temperature	25	°C
<b>Charge Current Control</b>		
<input checked="" type="checkbox"/> Enable Primary CCC		
Charge Rate Amps	11.3	A
Charge Rate C/X	C/ 6.0	X
<input type="checkbox"/> Enable Secondary CCC		

17. 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

Alarm Name	Activation Value	Enable	Priority	Relay Mapping	Alarm Cut Off	Email	SNMP	Severity
AC Mains High	270.0	<input checked="" type="checkbox"/>	Minor	Relay 4 (K4)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
AC Mains Low	180.0	<input checked="" type="checkbox"/>	Minor	Relay 4 (K4)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
High Voltage 1	56.50	<input checked="" type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
High Voltage 2	56.60	<input checked="" type="checkbox"/>	Major	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Low Voltage 1	48.00	<input checked="" type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Low Voltage 2	46.50	<input checked="" type="checkbox"/>	Major	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Midpoint Monitor 1	0.50	<input type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Midpoint Monitor 2	0.50	<input type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Midpoint Monitor 3	0.50	<input type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Midpoint Monitor 4	0.50	<input type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Midpoint Monitor 5	0.50	<input type="checkbox"/>	Minor	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0

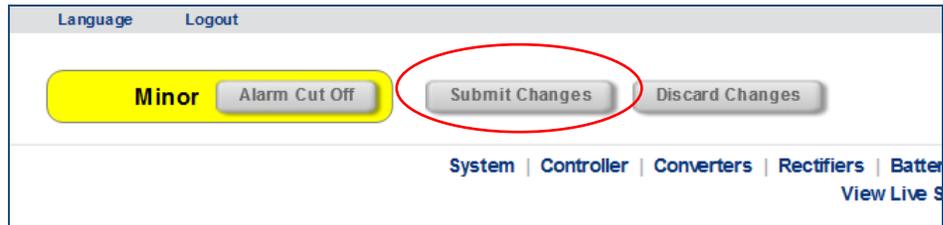
- d. Navigate to **Rectifiers > Configure Rectifiers**
- e. Enter the following in its respective box

Rectifier Setting Name	Value
Float Voltage	54.48
Equalize Voltage	56.3

OVP	57.7
LVA	46.0
HVA	56.5

## 18. 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
<input checked="" type="checkbox"/> <b>Battery Settings</b>		
<input checked="" type="checkbox"/> <b>Enable Feature</b>		
<input checked="" type="checkbox"/> <b>Enable Feature</b>		
<input checked="" type="checkbox"/> Enable Primary CCC	Disabled	Enabled
<input checked="" type="checkbox"/> <b>Battery Monitor</b>		
<input checked="" type="checkbox"/> Capacity Rating	800.0	68.0
<input checked="" type="checkbox"/> Peukert Number	1.167	1.156
<input checked="" type="checkbox"/> Peukert Current 1	82.70	24.90
<input checked="" type="checkbox"/> Peukert Current 2	11.50	3.40
<input checked="" type="checkbox"/> <b>Boost Mode</b>		
<input checked="" type="checkbox"/> <b>Temp Comp</b>		
<input checked="" type="checkbox"/> Temp Comp Slope	2.50	2.00
<input checked="" type="checkbox"/> <b>Breakpoints</b>		
Max value	55.50	55.92
Min Value	52.50	53.28
Lower Temperature Breakpoint	0.0	10.0
<input checked="" type="checkbox"/> <b>Charge Current Control</b>		
<input checked="" type="checkbox"/> <b>Enabled Sensors</b>		
<input checked="" type="checkbox"/> <b>Contact Information</b>		
Select All    Unselect All		
		Cancel    Accept

---

## Turning Up the Power System (Remote Power)

This section describes how to turn up and test the power system for remote-powered cabinets. The process includes checking the cabinet ground connection, checking the  $\pm 190$  VDC power supply voltage, installing converter modules, and turning up and testing the DC power system.

### Topics Covered

This chapter covers the following topics:

- Checking the cabinet ground connection.
- Checking the  $\pm 190$  VDC line power supply voltage at the power protection block.
- Installing the fan tray for the DC converter shelf.
- Installing converter modules into the DC converter shelf.
- 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

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.
2. Verify that the ohm meter reads 5 ohms or less.
3. If the reading is greater than 5 ohms, check the ground wire connection at the main ground bar, then retest.

## Checking the Line Power Supply Voltage

Before turning up power in the cabinet, check the supply voltage on the power pairs to verify that it is within the expected range. Check voltage at the power protection block, located on the rear left wall inside the cabinet.

Performing this task requires two people in separate locations working in coordination:

- One person located at the upstream power source where the CPS3200U supply shelf resides.
- One person located at the cabinet to check the supply voltage on the power pairs.



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

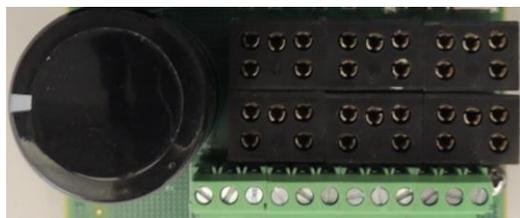
### To check the line power supply voltage

1. At the cabinet, open the side door.
2. Verify that **no** 5-pin protection modules are installed in the power protection block.
3. At the upstream power source, apply  $\pm 190$  VDC power to the lines supplying the ODC-100.

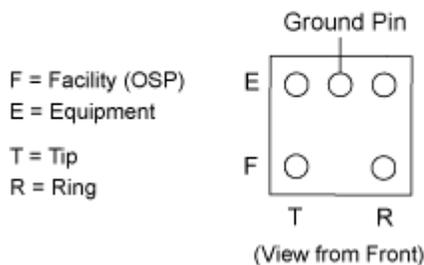
**Note:** Applying power typically involves activating fuses or circuit breakers that serve the CPS3200U upstream shelf.

4. At the cabinet's power protection block, locate position 1.

**Note:** Positions are arranged from left to right, top to bottom on the block.



Protector Block Pin Assignments



5. Using a volt meter, test between the Facility Tip and ground pins:

- a. Place one lead on the Facility Tip pin.
  - b. Place the other lead on the ground pin.
  - c. Verify that the volt meter reads between +180 and +190 VDC.
- 6.** Using a volt meter, test between the Facility Ring and ground pins:
- a. Place one lead on the Facility Ring pin.
  - b. Place the other lead on the ground pin.
  - c. Verify that the volt meter reads between -180 and -190 VDC.
- 7.** Using a volt meter, test between the Facility Tip and Ring pins (line to line).
- a. Place one lead on the Facility Tip pin.
  - b. Place the other lead on the Facility Ring pin.
  - c. Verify that the volt meter reads between  $\pm 360$  and  $\pm 380$  VDC (Tip to Ring).
- 8.** Repeat Steps 5 through 7 for each additional position on the power protection block that supports a powered pair.

**Note:** Do not install 5-pin protection modules into the power protection block at this time.

## Installing the Converter Shelf Fan Tray

Cabinets configured for remote power require a fan tray to cool the CPS2500D converter shelf. Install the fan tray into the converter shelf housing assembly.

### To install the converter shelf fan tray

- 1.** Unpack the fan tray assembly.
- 2.** Orient the fan tray vertically, with the fans on the left side.
- 3.** Insert the fan tray into the converter shelf housing, aligning the edges with the guides in the slot.



- 4.** Slide the fan tray completely into the slot. Push firmly on the front panel to seat it.

## Installing Converter Modules

The ODC-100 cabinet uses the Tyco CPS2500D downstream power system to convert  $\pm 190$  VDC to -48 VDC power to supply the equipment.



The CPS2500D shelf supports up to 10 converter modules, each terminating up to two power pairs. The number of converter modules required for operation varies by site based on several factors.

Clearfield offers a calculator tool to determine your remote power requirements. You input values for the variable factors that affect the power requirements (including the equipment load in the cabinet, and loop length and wire gauge of the copper plant), and the tool calculates the number of copper pairs required for remote power. By extension, you can determine the number of required converter modules for the CPS2500D shelf, as one converter module is required for every two power pairs. For example, if the calculator determines that your application requires 11 pairs for line power, then you should use at least six converter modules in the CPS2500D shelf. (Clearfield would recommend using seven modules in this case, to support N+1 module redundancy.)

**Note:** The *Remote Power Planning Calculator* is accessible at [seeclearfield.com](http://seeclearfield.com). To use the calculator, you must have Microsoft Excel installed on your PC.

The CPS2500D converter shelf and fan tray are housed in a fixture that also provides integrated DC distribution. Install converter modules into the CPS2500D converter shelf as described below.

### To install a converter module

1. Unpack the converter module.
2. Install the converter modules into the CPS2500D shelf following the priority sequence and aligning the right-side plastic edge in the notch at the top right edge of the slot.
3. Push the face plate in until the latch on the top catches.

**Note for cabinets shipped before 06/10:** For each module pair, populate the even-numbered slot before the odd-numbered slot. For example, install a module in slot 6 before slot 5, and install a module in slot 8 before slot 7.



Converter Module Slot	Priority Sequence
4, 6, 5, 8, 7	First
10	Second
9	Third
3	Fourth
2	Fifth
1	Last

**Note:** Refer to the LP/Tyco CPS2500D +/-190V Downstream System product manual for more information.

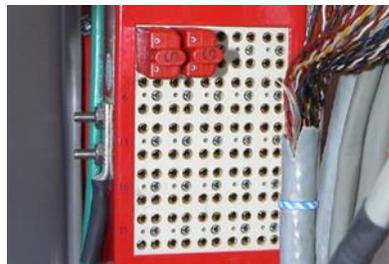
## Turning Up and Testing the DC Power System

Applying power to the CPS2500D converter shelf requires installing 5-pin lightning protection modules into the power protection block for each powered pair. Use 5-pin protection modules consistent with UL 497. The 5-pin protector must be marked as a "special circuit" consistent with local marking practice, typically red in color. Populate the module positions sequentially, beginning at position 1 (one 5-pin module per powered pair).

Turning up power to the equipment requires installing GMT fuses into the DC distribution panel located on the converter shelf housing assembly. The GMT fuses are supplied with the cabinet.

### To turn up and test the DC power system

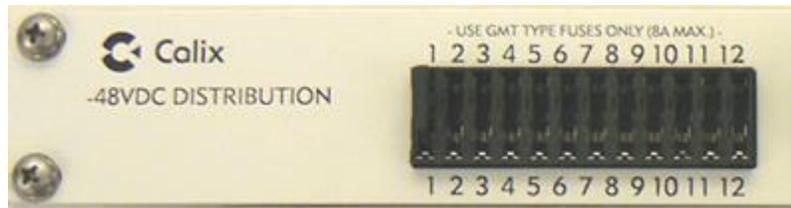
1. Open the front and side cabinet doors.
2. Remove all GMT fuses from the DC distribution panel.
3. At the power protection block, do the following:
  - a. Verify that line power is applied and the voltage is within the required range. See *Checking the Line Power Supply Voltage* (on page 137) for details.



- b. Install 5-pin protection modules into positions 1 and 2.
- c. Verify that the CPS2500D converter shelf powers up and the converter module is operational (indicated by green LEDs on A and B).
- d. Install additional 5-pin protection modules into the protection block. Two 5-pin modules correspond to one slot in the CPS2500D converter shelf. Populate positions as required and verify that additional the converter modules are operational.

**Note:** The converter modules are factory-equipped for safe power up and operation. Refer to the *LP/Tyco CPS2500D +/-190V Downstream System* product manual for more information.

4. At the DC distribution panel, do the following:



- a. To apply power to the first Clearfield service unit, install a pair of 7.5A (E7-2, B6-001) or 5A (E5-100) GMT fuses in fuse positions 1 and 2 (A/B power). Verify that the unit powers up.
  - b. If the cabinet is equipped with additional Clearfield service units, install an appropriately rated pair of GMT fuses in fuse positions 3 and 4 (for the second service unit) and positions 5 and 6 (for the third service unit, as applicable). Verify that the additional unit(s) power up.
  - c. If the cabinet is equipped with additional equipment such as a copper trunking unit, install an appropriately rated pair of GMT fuses (typically 5A) in positions 7 and 8 (A/B power). Verify that the unit powers up.
  - d. Install a 2A GMT fuse in position 11 and verify that the heat exchanger fans start running (if internal temperature is high enough).
  - e. Install a 1A GMT fuse in position 12 and verify that the fans on the power shelf fan tray start running.
5. Using a volt meter, test the DC power supply voltage at the shelf. Verify that the voltage reads between -48 and -54 VDC.



## Chapter 8

# Installing Equipment 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 an expansion E7-2 shelf
- Installing an expansion B6-001 shelf
- Installing an expansion E5-100 service unit
- Installing a rear wall mounted service unit
- 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 Calix E7-2 Shelf

The cabinet supports field expansion of equipment, including adding an E7-2 shelf into cabinets equipped with fewer than the maximum (3).

Follow these guidelines when installing expansion E7-2 shelves:

- Install an expansion E7-2 unit adjacent to the existing unit(s) on the rack.
- In a locally powered cabinet, verify that (2) rectifier modules are installed in the rectifier shelf to support the expansion load.
- In a remote powered cabinet, you may need to install additional converter modules into the 2500D converter shelf to support the expansion load. Consult the *Remote Power Planning Calculator* tool on the Clearfield website for guidance.

Installing an expansion unit does not affect services on the existing equipment.

### To install a Calix E7-2 expansion shelf

1. Unpack the E7-2 unit from the shipping packaging, and open the cabinet's front door.
2. If present, remove any GMT fuses from the distribution positions that will supply the new unit (positions 3 and 4 for shelf #2, or positions 5 and 6 for shelf #3) on the rectifier fuse panel (local power) or DC distribution panel (remote power).
3. Pre-wire the power and ground wires to the E7-2 unit as follows:
  - a. Get the ground and power cables from the E7-2 kit, or for cabinets shipped with the E7-2 power cables pre-terminated to the cabinet power supply system, get the ground cable from the kit.
  - b. Remove the rear cover from the E7-2 chassis.
  - c. Connect the green ground wire to the E7-2 ground terminal as shown.



- d. For cabinets shipped with the E7-2 power cables pre-terminated to the cabinet power supply system, cut the tie wraps and dress cables as needed, and identify the appropriate power cable:
  - For shelf #2, locate the power cable connected to power distribution positions 3 and 4 (A/B power).

- For shelf #3, locate the power cable connected to power distribution positions 5 and 6 (A/B power).
  - e. Terminate the A-side power cables:
    - Connect the black **(A) RTN** wire to the **(A) + RTN** terminal.
    - Connect the red **(A) BATT** wire to the **(A) - BATT** terminal.
  - f. Terminate the B-side power input:
    - Connect the black **(B) RTN** wire to the **(B) + RTN** terminal.
    - Connect the red **(B) BATT** wire to the **(B) - BATT** terminal.
  - g. Tighten the power termination screws to 9 in-lbs.
  - h. Replace the terminal cover and tighten the thumbscrew. Make sure all wires exit cleanly to the left.
- 4.** Install the E7-2 shelf onto the equipment rack as follows:
- a. Attach the mounting ears to the E7-2 shelf in the most forward position and oriented for 19-inch rack. Use supplied hardware.
  - b. Orient the E7-2 shelf vertically, with the left side up and right side down (as viewed from the front). CORRECT PHOTO?



- c. Position the E7-2 shelf against the equipment rack adjacent to the installed unit. Align the mounting ear holes with the counterpart holes on the rack.

- d. While holding the E7-2 against the rack, install four mounting screws (2 per side) to secure the unit to the rack. Tighten the screws to 45 in. lbs. of torque.
5. Route and terminate the ground cable to the cabinet's main ground bar.
6. For cabinets without E7-2 power cables pre-terminated to the cabinet power supply system, route the power cables to the rear of the rectifier shelf (local power) or DC distribution panel (remote power) and connect as follows:



**WARNING!** Hazardous voltages present. Risk of electrical shock. Use extreme caution when connecting to the cabinet power system.

- a. For shelf #2, connect to power distribution positions 3 and 4 (A/B power).
  - b. For shelf #3, connect to power distribution positions 5 and 6 (A/B power).
7. Install the E7-2 fan module into the housing on the right side of the chassis, pushing the module all the way back into the slot.

**Note:** Do not install the air filter into the fan module for OSP installations.

8. To apply power to the expansion E7-2 shelf, install the 7.5A GMT fuse(s) into positions 3 and 4 (for shelf #2) or positions 5 and 6 (for shelf #3) on the rectifier fuse panel (local power) or DC distribution panel (remote power). Verify that the E7-2 fan module powers up.

### To connect interface cables to the E7-2 unit

1. If the E7-2 shelf will provide VDSL2 services, connect the 25-pair equipment interface cables for DSL/DS0 services as follows:

**Note:** This step requires that the copper line protection for the expansion unit is already installed in the cabinet. See *Installing a Protection Block* (on page 159) for instructions.

- a. Verify that the line protection for the expansion unit is installed.
- b. Route the 25-pair equipment interface cables from the back of the protection block(s) to the expansion E7-2 unit.
- c. Connect the interface cable(s) to the appropriate RJ-21 connector(s) on the rear of the E7-2, as follows:

**Note:** Cable assignments vary based on the type of card installed in the unit. For detailed information, see the *Calix E7-2 Installation Guide*.

- For an RJ-21 male connector with a 110-degree exit, tighten the screws on each side to 3–4 inch-lbs of torque.
- For an RJ-21 male connector with a 90-degree exit, tighten the screw at the bottom of the connector to 3–4 inch-lbs of torque, and use a cable tie mount and tie wrap to secure the top of the connector.

2. To connect fibers for transport/uplink or fiber access, first install E7-2 line card(s) into the expansion shelf. Then install pluggable transceiver modules and connect fibers. See the *Calix E7-2 Installation Guide* for instructions.

**Note:** For options and guidance on connecting transport/uplink fibers, see *Connecting Fibers to the Equipment* (on page 104) and/or *(Optional) Interlinking Collocated Service Units* (on page 105)) for instructions.

## ***Installing a B6-001 Shelf***

The cabinet supports field expansion of equipment, including adding a B6-001 shelf into cabinets equipped with fewer than the maximum (3).

Follow these guidelines when installing expansion B6-001 units:

- Install an expansion B6-001 unit adjacent to the existing unit(s) on the equipment rack.
- To support B6 copper access services, the cabinet's copper line protection capacity may need to be increased to support the expansion unit. See *Installing a Protection Block* (on page 159) for installation instructions, as applicable.
- In a locally powered cabinet, verify that at least (2) rectifier modules are installed in the rectifier shelf to support the expansion load.
- In a remote powered cabinet, you may need to install additional converter modules into the 2500D converter shelf to support the expansion load. Consult the *Remote Power Planning Calculator* tool on the Clearfield website for guidance.
- The B6-001 requires manual shelf ID provisioning; the Shelf ID switch is located on the rear of the shelf. From the front of the cabinet, shelves residing in the vertical mounting frame are counted from left to right, starting with shelf 1 on the far left.

Installing an expansion unit does not affect services on the existing equipment.

### **To install a B6-001 expansion shelf**

1. Unpack the B6-001 unit from the shipping packaging, and open the cabinet's front door.
2. If present, remove any GMT fuses from the DC distribution positions that will supply the new unit (positions 3 and 4 for shelf #2, or positions 5 and 6 for shelf #3) on the rectifier fuse panel (local power) or DC distribution panel (remote power).
3. Pre-wire the power and ground wires to the B6-001 unit as follows:
  - a. Get the power and ground cables from the B6 kit, or for cabinets shipped with the B6-001 power cables pre-terminated to the cabinet power supply system, get the ground cable from the kit.
  - b. Remove the plastic protection panel from the back of the B6-001.

- c. Connect the green ground wire to the B6-001 ground terminal as shown.



- d. For cabinets shipped with the B6-001 power cables pre-terminated to the cabinet power supply system, cut the tie wraps and dress cables as needed, and identify the appropriate power cable:
- For shelf #2, locate the power cable connected to power distribution positions 3 and 4 (A/B power).
  - For shelf #3, locate the power cable connected to power distribution positions 5 and 6 (A/B power).
- e. Terminate the A-side power cables:
- Connect the black **RTN** wire to the **RTNA** power terminal.
  - Connect the red **-48V** wire to the **-48VA** power terminal.
- f. Terminate the B-side power cables:
- Connect the black **RTN** wire to the **RTNB** power terminal.
  - Connect the red **-48V** wire to the **-48VB** power terminal.
- g. Replace the terminal cover and tighten the screw.
- 4.** Install the B6-001 shelf onto the equipment rack as follows:
- a. On the rear of the shelf, set the Shelf ID as required.
  - b. Remove the stock mounting ears from the unit and attach the (2) supplied mounting ears to the unit in a flush-mount position using flathead Phillips screws.
  - c. Orient the B6-001 shelf vertically, with the left side up and right side down (as viewed from the front).
  - d. Position the B6-001 shelf against into the equipment rack adjacent to the installed unit. Align the mounting ear holes with the counterpart holes on the rack.
  - e. While holding the B6-001 against the rack, install four mounting screws (2 per side) to secure the unit to the rack. Tighten the screws to 45 in. lbs. of torque.
- 5.** Route and terminate the ground cable to the cabinet's main ground bar.

6. For cabinets without B6-001 power cables pre-terminated to the cabinet power supply system, route the power cables to the rear of the rectifier shelf (local power) or DC distribution panel (remote power) and connect as follows:



**WARNING!** Hazardous voltages present. Risk of electrical shock. Use extreme caution when connecting to the cabinet power system.

- a. For shelf #2, connect to power distribution positions 3 and 4 (A/B power).
  - b. For shelf #3, connect to power distribution positions 5 and 6 (A/B power).
7. To apply power to the expansion B6-001 shelf, install the 7.5A GMT fuse(s) into positions 3 and 4 (for shelf #2) or positions 5 and 6 (for shelf #3) on the rectifier fuse panel (local power) or DC distribution panel (remote power). Verify that the B6-001 fan module powers up.

### To connect interface cables to the B6-001 unit

1. If the B6-001 shelf will provide VDSL2 services, connect the 25-pair equipment interface cables for DSL/DS0 services as follows:

**Note:** This step requires that the copper line protection for the expansion unit is already installed in the cabinet. See *Installing a Protection Block* (on page 159) for instructions.

- a. Verify that the line protection for the expansion unit is installed.
- b. Route the 25-pair equipment interface cables from back of the protection block(s) to the expansion B6-001 unit.
- c. Connect the interface cable(s) to the appropriate RJ-21 connector(s) on the rear of the B6-001, as follows:

**Note:** Cable assignments vary based on the type of card installed in the unit. For detailed information, see the *Calix B6-001 Installation Guide*.

- For an RJ-21 male connector with a 110-degree exit, tighten the screws on each side to secure the connector.
  - For an RJ-21 male connector with a 90-degree exit, tighten the screw at the bottom of the connector, and use a cable tie wrap to secure the top of the connector.
2. To connect fibers for transport/uplink or fiber access, first install the B6-001 line card into the expansion shelf. Then install pluggable transceiver modules and connect fibers. See the *Calix B6-001 Installation Guide* for instructions.

**Note:** For options and guidance on connecting transport/uplink fibers, see *Connecting Fibers to the Equipment* (on page 104) and/or *(Optional) Interlinking Collocated Service Units* (on page 105) for instructions.

## Installing an E5-100 Service Unit

The cabinet supports field expansion of equipment, including adding an E5-100 unit into cabinets equipped with only one.

Follow these guidelines when installing E5-100 expansion units:

- Install an expansion E5-100 unit adjacent to the existing unit on the equipment rack.
- The cabinet's copper line protection capacity may need to be increased to support the expansion unit. The expansion kit includes the required additional protection block(s). See *Installing a Protection Block* (on page 159) for installation instructions.
- In a locally powered cabinet, verify that at least (2) rectifier modules are installed in the rectifier shelf to support an additional E5-100 unit.
- In a remote powered cabinet, you may need to install additional converter modules into the 2500D converter shelf to support an additional E5-100 unit. Consult the *Remote Power Planning Calculator* tool on the Clearfield website for guidance.

Installing an expansion unit does not affect services on the existing equipment.

### To install an E5-100 service unit

1. Unpack the E5-100 unit from the shipping packaging and open the cabinet's front door.
2. If present, remove any GMT fuses from the DC distribution positions 3 and 4 (for A/B power) on the rectifier fuse panel (local power) or DC distribution panel (remote power).
3. Insert the fan cover into the E5-100 chassis, sliding the fan cover under the fan cover retainer and between the guide rails until it is firmly seated.
4. Install the E5-100 unit onto the equipment rack as follows:
  - a. Orient the E5-100 unit vertically, with the left side up (as viewed from the front).
  - b. Position the E5-100 unit onto the equipment rack adjacent to the first unit. Align the mounting ear holes with the counterpart holes on the rack.
  - c. While holding the E5-100 against the rack, install four mounting screws (2 per side) to secure the unit to the rack. Tighten the screws to 45 in. lbs. of torque.
5. Connect the power and ground wires to the E5-100 unit as follows:
  - a. Get the power and ground cables from the E5 kit, or for cabinets shipped with the E5 power cables pre-terminated to the cabinet power supply system, get the ground cable from the kit.

- b. Connect the ground cable lug to the E5-100 ground terminal as shown.



- c. For cabinets shipped with the E5-100 power cables pre-terminated to the cabinet power supply system, cut the tie wraps and dress cables as needed, and identify the power cable connected to distribution positions 3 and 4 (for A/B power), or next available positions.
- d. Terminate the A-side power cables:
- Connect the black **RTN** wire to the "+" terminal on the power block.
  - Connect the red **-48V** wire to the "-" terminal on the power block.
- e. Terminate the B-side power cables:
- Connect the black **RTN** wire to the "+" terminal on the power block.
  - Connect the red **-48V** wire to the "-" terminal on the power block.
- 6.** Route and terminate the ground cable to the cabinet's main ground bar.
- 7.** For cabinets without E5 power cables pre-terminated to the cabinet power supply system, route the power cables to the rear of the rectifier shelf (local power) or DC distribution panel (remote power) and connect to distribution positions 3 and 4 (for A/B power), or next available positions.



**WARNING!** Hazardous voltages present. Risk of electrical shock. Use extreme caution when connecting to the cabinet power system.

- 8.** To apply power to the expansion E5-100 unit, install the 5A GMT fuse(s) into positions 3 and 4 (or next available position) on the rectifier fuse panel (local power) or DC distribution panel (remote power). Verify that the E5-100 fan module powers up.

### To connect interface cables to the E5-100 unit

- 1.** Connect the 25-pair equipment interface cables (for DSL/DS0 services) to the E5-100 unit as follows:

---

**Note:** This step requires that the copper line protection for the expansion unit is already installed in the cabinet. See *Installing a Protection Block* (on page 159) for instructions.

- a. Verify that the line protection for the expansion unit is installed.
  - b. Route the 25-pair equipment interface cables from back of the protection block(s) to the expansion E5-100 unit.
  - c. Connect the labeled subscriber interface cables to the E5-100 front panel. Tighten the screws on each RJ-21 connector to secure the mated connection.
  - d. For overlay units, repeat Step 1 to connect cables from the POTS protection block.
  - e. Use cable ties or Velcro straps to dress and secure the cables to the rack.
- 2.** To connect fibers for transport/uplink or fiber access, first install pluggable transceiver modules into the SFP sockets, and then connect fibers. See the *Calix E5-100 Installation Guide* for instructions.

**Note:** For options and guidance on connecting transport/uplink fibers, see *Connecting Fibers to the Equipment* (on page 104) and/or *(Optional) Interlinking Collocated Service Units* (on page 105) for instructions.

## Installing a Rear Wall Mounted Service Unit

Calix offers an optional kit to mount (hang) one E7-2 or B6-001 service unit on the ODC-100 cabinet interior rear wall. This mounting option allows the ODC-100 to accommodate an additional 1RU service unit to increase system capacity.

**Note:** Cabinets equipped with a cross-connect panel cannot accommodate a rear wall mount.

### To install a rear wall mounting bracket

1. Remove the left and right mounting ears (19/23-inch) from the service unit, if applicable:



2. Attach the wall mounting bracket to the unit:

**Note:** The E7-2 requires (4) screws; the B6-001 requires (2) screws.

- a. Orient the unit vertically, with its left side up and right side (fan tray) down.
- b. Position the mounting bracket against the unit, with the bracket hanger toward the unit's top surface, and the bracket holes aligned with the counterparts on the unit.

**Note:** Bracket hole alignment differs, depending on the unit type.

- c. Secure the bracket to the unit using the pan head screws.



3. Open the cabinet side door.
4. Orient the unit vertically, with its left side up, and position the mounting bracket over the hanger on the interior rear wall.

**Note:** The unit must be mounted to the top bar for correct airflow, as shown below.



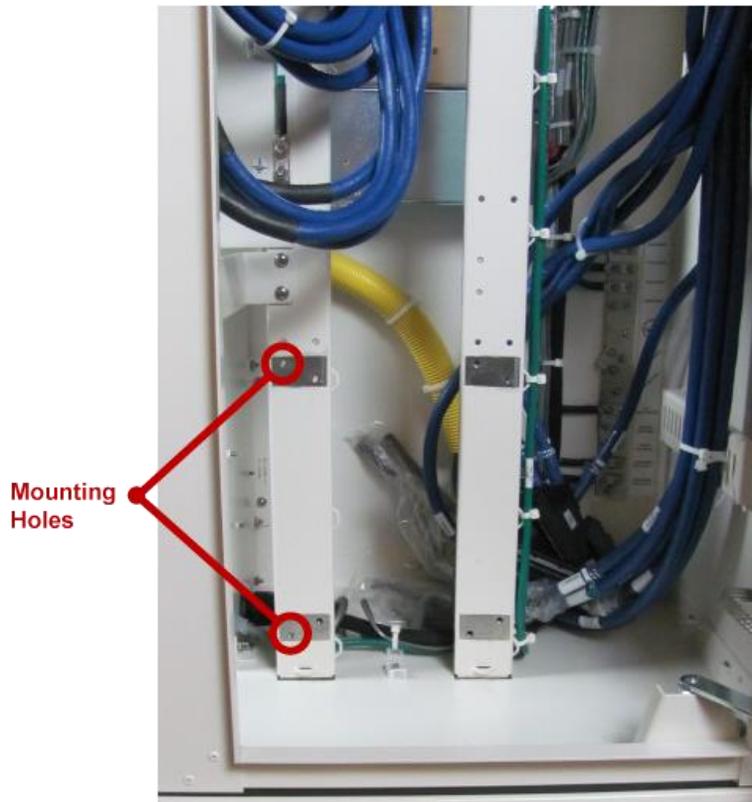
After mounting the service unit on the cabinet wall, you can complete installation of the unit as required. Dress and route all cables/fibers toward the rear of the unit, or secure the cables/fibers to the cable management bar directly beneath the unit. Refer to the product-specific installation guide for installation instructions.

## 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

1. Unpack the protection mounting frame from its packaging.
2. Open the cabinet's front and side doors.
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.



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* (on page 159).

## 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* (on page 156).

**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 (MS<sup>2</sup>) interface cables. On the protection blocks, line identification labels cover the dead pair positions (25 and 50).

### To install a protection block

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 MS<sup>2</sup> 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.

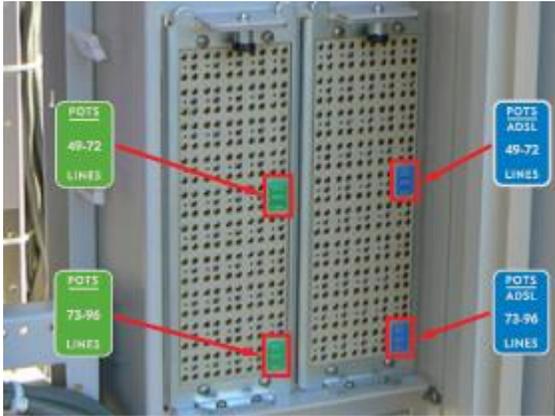
**Note:** On the mounting fixture, the (2) upper positions hold blocks for the first Clearfield service unit, the (2) lower positions hold blocks for the second Clearfield service unit, and if present, the bottom/expansion frame hold blocks for a third Clearfield service unit.

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 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.

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 Clearfield service unit and connect to the appropriate equipment interfaces (RJ-21 connectors).
  - b. Route the two MS<sup>2</sup> subscriber interface cables to the back and mate to the appropriate OSP interface cables (MS<sup>2</sup> connectors).
  - c. Dress and secure the interface cables with cable ties as needed.

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

Refer to *Copper Access Cable Connections* (on page 196) for equipment-side and subscriber-side cable connection assignments for E7-2 and B6-001 DSL cabinet configurations.

## Installing a Cross-Connect Panel

The ODC-100 cabinet supports the following cross-connect options:

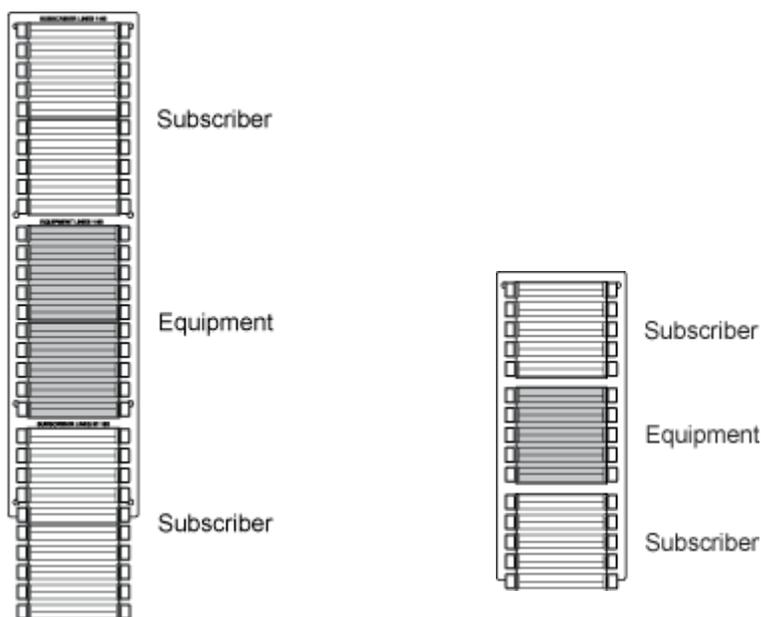
- 300-pair panel (2:1, 200 subscriber/100 equipment pairs).
- 150-pair panel (2:1, 100 subscriber/50 equipment pairs)

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**

**To install a cross-connect panel**

1. Unpack the cross-connect panel from the shipping packaging.
2. Open the cabinet's side door.
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.
4. Secure the cross-connect panel to the rack using the eight supplied mounting screws from the installation kit.
5. Terminate the cross-connect interface cables as follows:
  - Mate the equipment-side cables to the appropriate protection block interface cables (MS<sup>2</sup> connectors).
  - Mate the subscriber-side cables to the appropriate OSP interface cables (MS<sup>2</sup> connectors).
6. Dress and secure all cables with tie-wraps.

---

## Clearfield 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)

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.
2. Install the riser onto the concrete pad, foundation vault, or pole/wall-mount fixture. See *Installing the Cabinet* (on page 73) for detailed instructions.
3. Install the ODC-100 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).
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

1. Unpack the battery heater from the shipping packaging, and then remove the battery compartment door. See *Operating Cabinet Doors* (on page 75) for instructions.
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.
3. Route the power cord to the left compartment wall. Plug the power cord into the supply cable located on the inside wall.
  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.
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*.

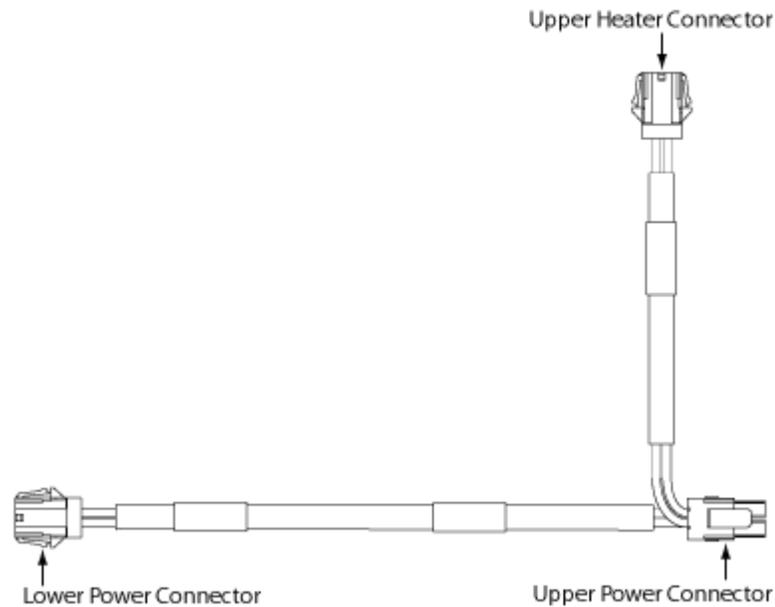
6. Replace the battery compartment door.

### 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.

1. Unpack the battery heater from the shipping packaging, and then remove the upper and lower battery compartment doors. See *Operating Cabinet Doors* (on page 75) for instructions.
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.
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.

- 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).



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.
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*.

6. Replace the battery compartment doors.

## Installing a Seismic Protection Kit

A seismic protection kit option provides enhanced battery protection during an earthquake. The ODC-100 cabinet supports seismic protection kits for 60 Ah and 62 Ah battery strings. See *Supported Batteries* (on page 202) for a list of supported battery types.

### Guidelines

- Use the seismic protection kit for cabinets located in Zone 4 Earthquake environments.
- In regions with lower seismic activity (Zones 0-3), Clearfield recommends using the seismic kit to provide added protection for the batteries, especially for cabinets equipped with a 60 Ah battery base.
- For cabinets with a 60 Ah battery base, install only the rear seismic protection bracket *before* installing the batteries.

### To install seismic protection brackets and stiffener

1. Unpack the seismic protection brackets and stiffener from the shipping packaging.
2. Remove the battery compartment door. See *Operating Cabinet Doors* (on page 75) for instructions.
3. Remove the lower retainer from the battery tray.
4. Install the rear seismic protection bracket as follows:
  - a. Insert the bracket into the battery compartment, with the thumb screws on the bottom.
  - b. Place the bracket against the ridge on the back of the battery tray, aligning the thumb screws with the mounting holes on the tray.
  - c. Tighten the thumb screws on the bracket to secure it in place.



5. Install the battery string, and then reinstall the lower retainer. See *Installing Batteries* for instructions.
6. Install the front seismic protection bracket as follows:
  - a. Position the bracket in front of the batteries, with the (2) tabs and center thumb screw on the bottom.
  - b. Insert the tabs on the bottom of the bracket into the notches on the lower retainer.
  - c. Slide the bracket back toward the batteries, aligning the thumb screws at the right and left ends of the bracket with the counterpart mounting holes on the compartment.
  - d. Tighten the (2) outside and (1) center thumb screws on the bracket to secure it in place.



7. Install the seismic stiffener directly above the front seismic protection bracket as follows:
  - a. With the (2) tabs on the bottom, position the stiffener above the seismic bracket behind the thumb screws on the top of the bracket.
  - b. Insert the tabs on the stiffener into the notches on the seismic bracket.
  - c. Slide the stiffener forward, aligning the (2) thumb screws on the bracket with the counterpart holes on the stiffener.
  - d. Tighten the thumb screws on the bracket to secure the stiffener in place.



8. Replace the battery compartment door.

## 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

1. At the local power transfer switch, disconnect AC power to the cabinet.
2. Open the cabinet's front compartment door.
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.
4. Prepare the battery base compartment for mounting a Gen Conn:
  - a. Remove the battery base door. See *Operating Cabinet Doors* (on page 75) 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* (on page 190) 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.

## To install a generator connector

1. Unpack the generator connector assembly from the shipping package.

**Note:** The connector ships pre-assembled in a mounting housing.

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.
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.



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.

5. Replace the AC load center cover panel.
6. At the AC load center, switch all breakers to **ON**.
7. At the local power transfer switch, restore AC power to the cabinet.

---

## ***Installing an Ethernet-over-Copper Trunking Unit***

This section describes how to install a third party Ethernet-over-Copper (EoCU) trunking unit in the ODC-100 cabinet to provide high-speed Ethernet transport over trunked copper pairs via multi-pair bonding. This solution requires the use of a dedicated 25-pair protection block to terminate and fuse-protect the copper pairs. This topic describes how to install the 25-pair protection block as well as the Clearfield mounting kit for the EoCU trunking unit.

The ODC-100 cabinet supports mounting kits for the following third party EoCU trunking units:

- Actelis ML600 Ethernet Access Device (EAD)
- Positron/Aktino AK525 Compact Remote Unit (CRU)

### **Guidelines**

- The EoCU trunking unit and protection block reside below the standard protection block frame.
- Cabinets equipped with more than four 50-pair protection blocks for Clearfield service lines cannot accommodate an EoCU trunking unit.
- For cabinets equipped with a 300-pair cross-connect panel:
  - The Actelis ML600 EAD cannot be installed due to lack of space.
  - The Positron/Aktino AK525 CRU can be installed.

### **To install a 25-pair trunk protection block assembly**

1. Unpack the trunk protection block assembly from the shipping packaging.

**Note:** The protection block ships pre-assembled in a mounted housing, with the ground and interface cables attached.

2. Remove any cable ties that coil up the ground and interface cables (one with an MS2 connector, one with an RJ-21 connector).

3. From the front of the cabinet, locate the mounting position on the right wall.



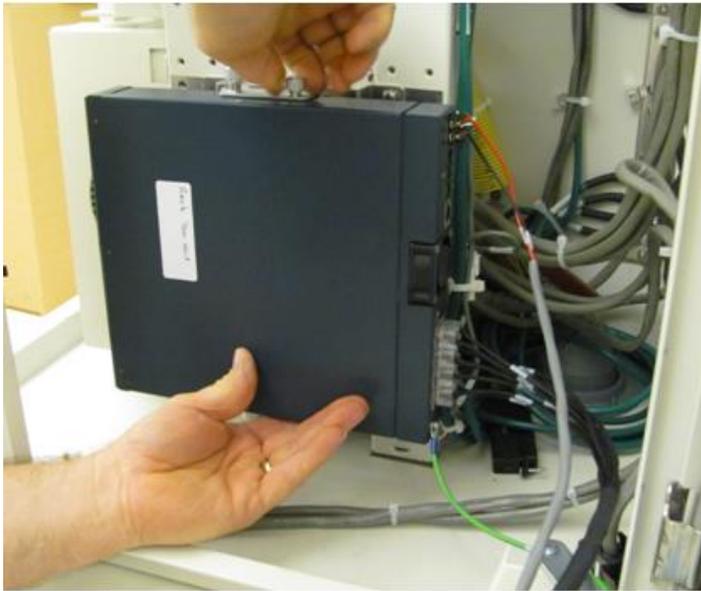
4. Attach the trunk protection block assembly to the cabinet wall as follows:
  - a. From the front of the cabinet, orient the assembly with the cables on the bottom, and align the four studs on the cabinet wall with the counterpart holes on the assembly.
  - b. Install four 10-32 Keys nuts onto the four studs. Tighten the nuts to secure the assembly in place.



5. Terminate the trunk protection block ground and interface cables as follows:
  - a. Connect the ground cable to the main ground bar at rear of the cabinet.
  - b. Route the MS2 subscriber interface cable to the back and mate to the appropriate OSP interface cable (MS2 connector).
  - c. Route the RJ-21 equipment interface cable to the EoCU trunking unit, and connect to the RJ-21 connector from the unit's DSL cable. For detailed instructions, see the *Actelis ML600 EoCU Transport Kit for ODC-100* guide (for example).
  - d. Dress and secure the cables with cable ties as needed.

## To install an EoCU trunking unit

1. Open the cabinet's front and side doors, and unpack the EoCU trunking kit from the shipping packaging.
2. Connect ground, power, and copper line interface cable (8x RJ-45) to the EoCU trunking unit chassis.
3. Attach the mounting bracket to the EoCU trunking unit using supplied hardware.
4. Install the mounting bracket onto the right side of the ODC-100 equipment mounting frame using supplied hardware.



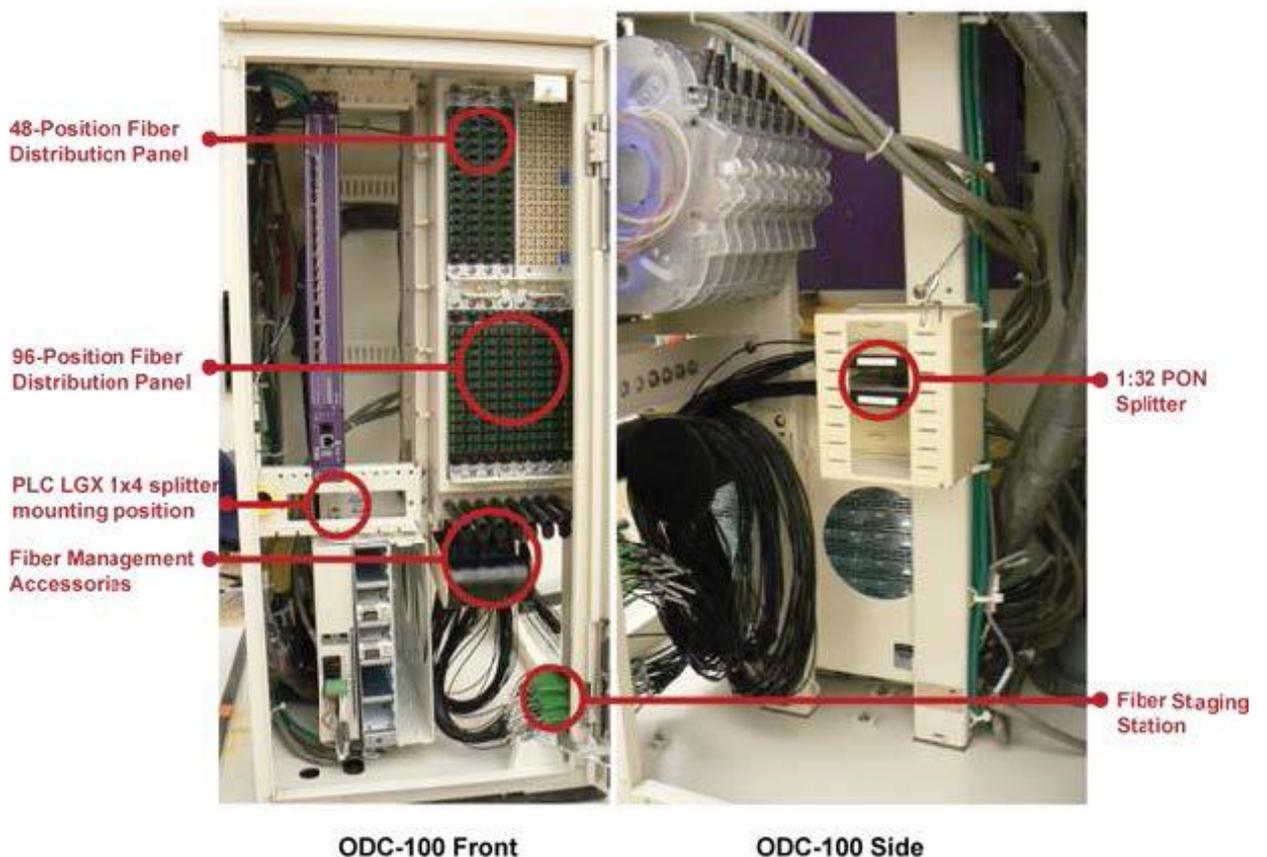
5. Route and terminate cables from the EoCU trunking unit to the cabinet as follows:
  - Route and terminate the ground and power cables to the cabinet's main ground bar and DC power system, respectively.
  - Route the copper line interface cable's RJ-21 connector to the 25-pair protection block and connect to the equipment side cable (counterpart RJ-21 connector)
6. Install the supplied CAT-5 Ethernet patch cable between the Actelis and Clearfield service unit as follows:
  - a. Connect one end of the CAT-5 cable to Ethernet port 1 (RJ-45) on the front of the Actelis unit.
  - b. Connect the other end of the CAT-5 cable to the service unit's Ethernet port.

**Note:** For more detailed instructions on installing the Clearfield mounting kit for the EoCU trunking unit, see the *Actelis ML600 EoCU Transport Kit for ODC-100* guide (for example).

## Installing Fiber Management Options

Clearfield ODC-100 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)



These fiber management solutions are offered as factory and field installed options for the ODC-100. 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 ODC-100*.

If a patch and splice or pigtail fiber splice solution is required, Clearfield offers a field installed Clearfield Clearview xPAK fiber assembly. This third-party solution 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 Note (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

---

## ***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.

In cabinets configured for remote (line) power, inspections include:

- Check the line power protection block. Verify that no 5-pin protection modules are blown.
- Check the converter modules in the converter shelf. Verify that the operational indicators are lit on each module.
- Check the fuses on the distribution panel. Verify that no fuses are blown.
- Check the heat exchanger. Verify that the air intake locations are unobstructed and that the fans are running.
- Check the converter shelf fan tray to verify 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* (on page 183).

## 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.

## 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

1. At the rectifier shelf, open the fuse panel door. Switch the battery breaker to **OFF**.
2. Remove the battery compartment door. See *Operating Cabinet Doors* (on page 75) for instructions.
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.
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* (on page 190) for instructions.

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.
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.
7. Re-install the batteries into the battery compartment. See Installing Batteries for instructions.
8. Re-install the seismic protection bracket, if present.

## 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.

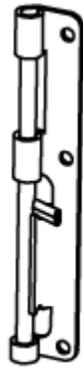
#### To remove a cabinet door

1. For a door (equipped with a heat exchanger), disconnect the heat exchanger cable.
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.
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.



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

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.
6. Lift the door away from the cabinet.

## Installing a Cabinet Door

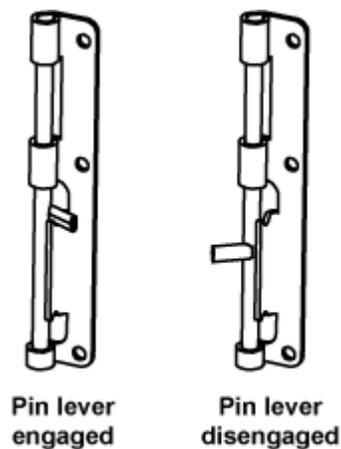
You can quickly install a cabinet door in the field without impacting service.



**CAUTION!** Handle cabinet doors with care to avoid personal injury or damage to the door.

### To install a cabinet door

1. Unpack the new door from its shipping packaging.
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.
  - b. **Bottom hinge:** Press the pin lever down and rotate it away from the cradle.



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.
4. Insert the new door into the door frame. Align the door hinge knuckles with the counterpart hinge knuckles on the door frame.
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.
6. Attach the wind brace bracket to the inside of the door using the three nuts removed from the previous door.
7. Attach the ground strap to the door using the hex nut removed from the previous door.
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

1. Open the cabinet side door.
2. Remove the (3) Keps nuts securing the protection mounting frame to the side of the cabinet.
3. Push the top of the mounting frame toward the front of the cabinet, as far as it will go.
4. Using an offset screwdriver, remove the screw in the interior roof above the mounting frame.



5. Remove the (3) remaining screws in each corner of the interior roof, and set aside.
6. Lift and remove the damaged roof from the cabinet.
7. Place the replacement roof on the cabinet.
8. Secure the roof in place using the screws removed in step 5.

## 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

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.
2. At the AC load center, switch the Main circuit breaker to **OFF**.
3. Remove the cover panel from the AC load center.
4. Remove any wires from the defective circuit breaker.
5. Remove the defective breaker from the load center and replace it with a new breaker of the same type and rating.
6. Reconnect all wiring to the new circuit breaker.
7. Replace the AC load center cover panel.
8. At the AC load center, switch all breakers to **ON**.
9. At the local power transfer switch, restore AC power to the cabinet.

## Replacing Fuses and DC Breakers

If a fuse or DC circuit breaker fails or becomes damaged, you can replace the fuse or breaker in the field as described below.

### Replacing Fuses

Fuses protect the power circuits for the Clearfield service units and heat exchanger. The fuses are located inside the rectifier fuse panel.

Circuit Type	Fuse Rating	Fuse Type
Calix E7-2	7.5 Amp	GMT
Calix B6-001	7.5 Amp	GMT
Calix E5-100	5 Amp	GMT
Heat exchanger	2 Amp	GMT
Fan tray (for converter shelf)*	1 Amp	GMT

\* Remote power configurations only.

## To replace a fuse

1. At the rectifier shelf, open the fuse panel door and identify the defective fuse.

2. Remove the defective fuse from the fuse panel position.
3. Replace the fuse with a fuse of the same rating and type.

If the fuse fails again do not replace it. Troubleshoot to find the cause of the failure.

## Replacing a Circuit Breaker

On cabinets configured for local power, a circuit breaker protects the battery string circuit. The battery breaker is located on the rectifier fuse panel.

Circuit Type	Breaker Rating
Battery string	30 Amp



**DANGER!** High voltage may be present. Only a qualified electrician should perform this task. Follow NEC and local codes when handling power systems.



**WARNING!** Risk of electric shock. The following procedure can be performed with the breaker assembly hot, provided that the new breaker is installed in the **OFF** position.

**Note:** To avoid an interruption of service, you can replace the breaker while the distribution system is hot. The bullet-style breaker can be removed with no wiring disconnections. Refer to the rectifier product manual for more information.

If you elect to replace a breaker with the power off, wait until a maintenance window to minimize service impact. To disconnect power to the breaker, switch the 30A Rectifier breaker **OFF** at the AC load center, switch the 30A battery breaker **OFF** at the rectifier fuse panel, then perform the procedure.

## To replace the battery circuit breaker

1. At the rectifier shelf, open the fuse panel door. Switch the battery breaker to **OFF**.
2. Remove the circuit breaker from the housing. The breaker pulls straight out with no connected wiring.



**WARNING!** Risk of electric shock. Set the new breaker to the **OFF** position before installing it.

3. Install the new breaker into the vacated housing position.
4. Switch the new breaker to **ON**.
5. Close the fuse panel door.

## Replacing Rectifier Modules

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 a rectifier module

1. To remove a module, push up on the locking clip release and slide the module out of the shelf.
2. At the controller web interface initiate an inventory update: **Main Menu > Rectifiers > Inventory Update**.
3. Place the new rectifier module on the shelf bottom and slide the module into the rear connector (inside the shelf).
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.



## Replacing Converter Modules

On cabinets configured for remote power, if a converter module experiences a failure, you can replace the module in the field. Converter modules are hot-swappable and can be replaced without disconnecting power to the CPS2500D converter shelf.

## To replace a converter module

1. Remove an installed converter module as follows:
  - a. Grasp the converter module face plate by the left edge and pull it forward to unseat the module.
  - b. Slide the converter module out of its slot. Set the module aside.
2. Install a new converter module as follows:
  - a. Insert the new converter module into the vacated slot, aligning the right-side plastic edge in the notch at the top right edge of the slot.
  - b. Slide the converter module into the slot until it is fully seated.
  - c. Push the face plate in until the latch on the top catches.
3. Repeat Steps 1 and 2 to replace additional converter modules.

**Note:** For detailed instructions, see the *LP/Tyco CPS2500D +/-190V Downstream System* product manual.

## 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

1. At the rectifier shelf, open the fuse panel door. Switch the battery breaker to **OFF**.
2. Remove the battery compartment door. See *Operating Cabinet Doors* (on page 75) for instructions.
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.
4. Install the new batteries into the battery tray. See *Installing Batteries* for instructions.
5. Re-install the seismic protection bracket, if present.
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

1. At the rectifier shelf, open the fuse panel door. Switch the battery breaker to **OFF**.
2. At the AC load center, switch the Battery Heater breaker to **OFF**.
3. Remove the battery compartment door. See *Operating Cabinet Doors* (on page 75) for instructions.
4. If present, remove the batteries from the battery compartment. See *Replacing Batteries* (on page 190) for battery removal instructions.
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.
6. Install the new battery heater into the battery tray. See *Installing a Battery Heater* (on page 164) for instructions.
7. Re-install and reconnect the batteries. See *Installing Batteries* for instructions.
8. At the AC load center, switch the Battery Heater breaker to **ON**.
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 ODC-100 cabinet.

### Topics Covered

This appendix covers the following topics:

- Cabinet specifications
- Copper access cable connections for DSL cabinet configurations
- Environmental alarm mapping to the Clearfield service equipment (E7, B6, E5)
- Alpha Cordex HP rectifier alarms and controller settings
- Supported batteries
- Wiring diagrams

# Specifications

Specifications for the Clearfield ODC-100 cabinet follow:

<b>Dimensions</b>	
Remote power configuration	37" H x 18" W x 24" D
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.	
<b>Weight</b>	
Remote power configuration	135 lbs
Local power configuration (with 60 Ah battery base)	222 lbs
<b>Enclosure Mounting</b>	
Concrete pad	Clearfield cast-in-place template or pre-cast pad option
Pole	Clearfield pole-mounting kit option
Foundation vault	Third-party supplied
<b>Equipment Mounting</b>	
Equipment mounting space	7 inches (4 RU)
Rack attributes	19-inch EIA standard; oriented for vertical mounting
<b>Access Equipment Configurations</b>	
Calix E7-2, B6-001, E5-100	Refer to planning guide for configurations
<b>Environmental</b>	
Heat exchanger	Door mounted, 300 Watt External fan operation: <ul style="list-style-type: none"> <li>Fans turn on at 30C (1500 RPM)</li> <li>Fan speed increases 40C to 55C (linear ramp from 1500 RPM to 3000 RPM)</li> <li>Fan speed max at 55C and above (3000 RPM)</li> </ul> High temp alarm at 75C
Cooling capacity	20 Watts/°C
Thermal operating range	-40C to +46C
Environmental alarming	Environmental and intrusion alarms
<b>Electrical (Local Power)</b>	
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
<b>Electrical (Remote Power)</b>	
DC power system	Tyco CPS2500D ± 190VDC to -48VDC converter shelf; up to ten 65W converter modules; fuse protected DC distribution
Power pair line protection	(2) 25-pair power line protection blocks, with MS <sup>2</sup> (OSP) and RJ-21 (equipment) connectors
<b>Cable Entrance</b>	
Outside plant entry	(2) 2.5-inch diameter entry ports
AC service entry (local power only)	(1) 1-inch diameter entry port

*Proprietary Information: Not for use or disclosure except by written agreement with Clearfield.*

---

**Compliance**

---

Safety	UL 67
EMC	FCC Part 15, Class A
Telcordia	GR-487-CORE, Issue 2

## Copper Access Cable Connections

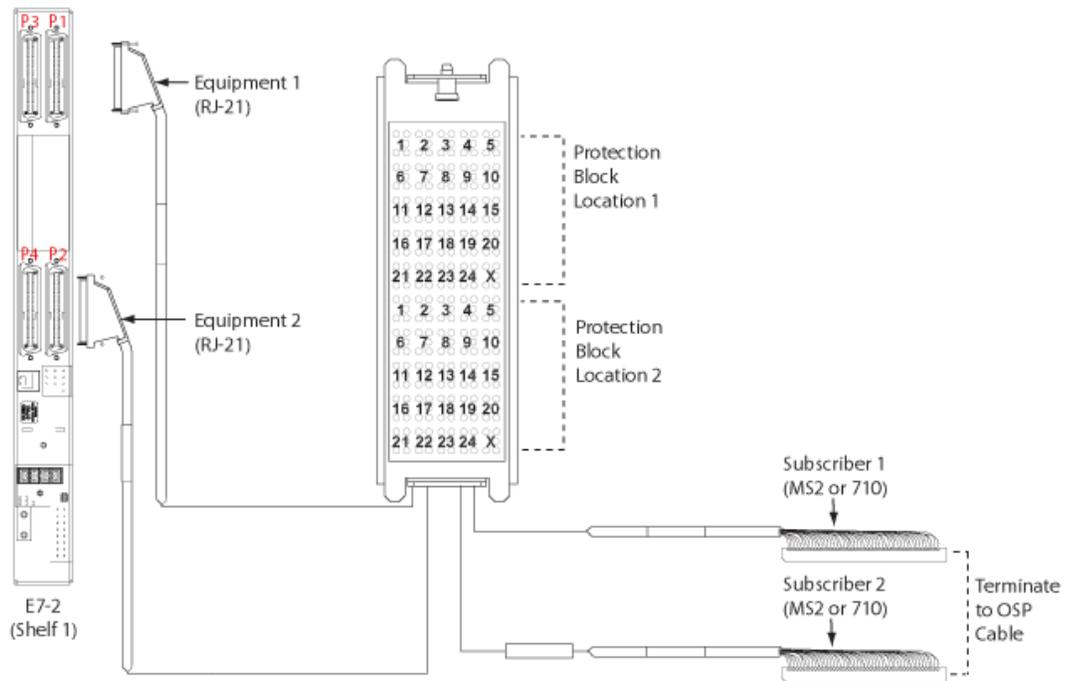
The table below lists the equipment-side and subscriber-side 24-pair group cable connection assignments for E7-2 and B6-001 DSL cabinet configurations.

**Note:** For the B6-001, the connection assignments only apply to the B6-256 and B6-216 DSL cards.

Clearfield Shelf Connector ID <sup>1</sup> (female RJ-21)	Equipment Cable Connector ID (male RJ-21)	Protection Block Location (24 pair group)	Subscriber Cable Connector ID (MS <sup>2</sup> or 710)
1 (Shelf 1)	Equipment 1	1	Subscriber 1
2 (Shelf 1)	Equipment 2	2	Subscriber 2
3 (Shelf 1)	Equipment 3	3	Subscriber 3
4 (Shelf 1)	Equipment 4	4	Subscriber 4
1 (Shelf 2)	Equipment 5	5	Subscriber 5
2 (Shelf 2)	Equipment 6	6	Subscriber 6
3 (Shelf 2)	Equipment 7	7	Subscriber 7
4 (Shelf 2)	Equipment 8	8	Subscriber 8
1 (Shelf 3)	Equipment 9	9	Subscriber 9
2 (Shelf 3)	Equipment 10	10	Subscriber 10
3 (Shelf 3)	Equipment 11	11	Subscriber 11
4 (Shelf 3)	Equipment 12	12	Subscriber 12
1 (Shelf 4)	Equipment 13	13	Subscriber 13
2 (Shelf 4)	Equipment 14	14	Subscriber 14
3 (Shelf 4)	Equipment 15	15	Subscriber 15
4 (Shelf 4)	Equipment 16	16	Subscriber 16

<sup>1</sup> Where 1 = P1 or J1, 2 = P2 or J2, etc.

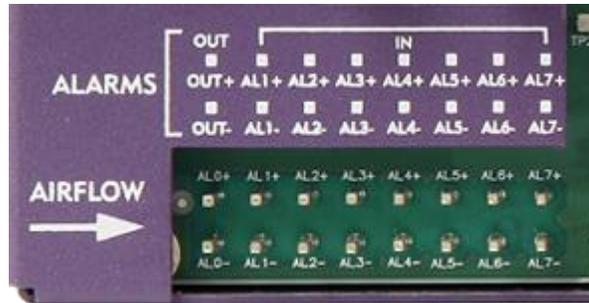
**Example:** The following illustration shows cable connections for the first two rows in the table above, with an E7-2 shelf.



**Note:** For the ODC-100 cabinet, only Shelf 1–Shelf 3 apply.

## Environmental Alarm Mapping to E7-2

When so equipped, ODC-100 environmental alarms are wired to a single Calix E7-2 service unit inside the cabinet. If the cabinet contains a mix of E7 and E5 or B6 units, the alarms will be wired to the E7 (alarm pins located on the E7 rear panel). The table below shows the pin assignments for ODC-100 environmental alarms.



E7 Input (Pin Pair)	Alarm Type*	Alarm Source	Description	Default Severity
AL1	rect-fail	Power MJ	Power supply Major	Major
AL2	rect-fail	Power MN	Power supply Minor	Minor
AL3	comm-pwr-fail	AC Fail	AC power failure	Major
AL4 <sup>1</sup>	batt-discharge	Batt Discharge	Battery discharging	Major
AL5	high-temp	HX Fault	Heat exchanger fail/high temp	Major
AL6	cool-fan-fail	Power Fan Fail	Remote power fan failure	Major
AL7	open-door	Open Door	Open door/security	Major

**Note:** \*Alarm Type values shown are suggested selections and modified from the default setting ('contact-off-normal') in the E7 user interface.

## Environmental Alarm Mapping to B6-001

When equipped with at least two Calix B6-001 units, the ODC-100 environmental alarms are wired to both B6 units, split as follows:

- B6-001 unit 1: **Power alarms**
- B6-001 unit 2: **Thermal & Security alarms**

The N/O alarm leads (white) are wired to alarm **pin 5** on each B6 unit, located on the chassis rear panel (8-pin Molex connector). The RTN leads (black, J1 and J2 spade lugs) both connect to the **-48VDC RETURN A** chassis power terminal on B6 unit 1 only (labeled as RTN A in the image below).



The table below shows the ODC-100 alarm mapping assignments to two B6-001 units.

B6 Unit	Input Pin	Alarm Name*	Alarm	Description
B6-001 unit 1	5	Power Alarm*	Power MJ	Power supply Major
			Power MN	Power supply Minor
			AC Fail	AC power failure
			Battery	Battery discharging
B6-001 unit 2	5	Thermal/Security*	HX Fail	Heat exchanger high temp/fail
			Door	Open door/security

\*You must provision alarm name values in the B6 user interface. Suggested values shown. In addition, you must configure the B6 environmental alarm input for inverse signal detection (for Normally Open contacts; command: **environment alarm in invert**).

Alarms report in the B6 user interface without a severity level.

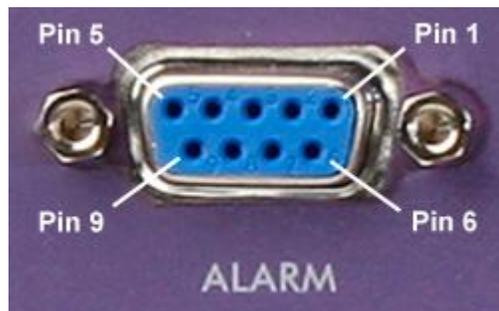
**Note:** Alternatively, for cabinets equipped with only one B6-001 chassis, all alarms are trunked together to the single B6 unit (alarm pin 5).

## Environmental Alarm Mapping to E5

ODC-100 environmental alarms are wired to a single Calix E5 unit inside the cabinet. If the cabinet contains a mix of E5-100 and E5-400 units, the alarms will be wired to an E5-400.

### Alarm mapping to E5-100

Environmental alarms are wired to the E5-100 DB-9 Alarm interface on the front panel. The table below shows the pin assignments for ODC-100 environmental alarms.

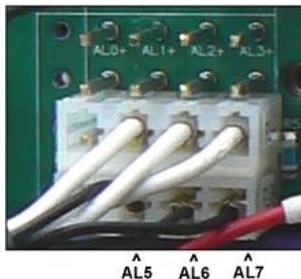


E5-100 Input	Pin Pair	Condition (code)	Name*	Alarm	Description	Default Severity
1	7, 3	alm_input (10007)	Power	Power MJ	Power supply Major	Critical
				Power MN	Power supply Minor	Critical
				AC Fail	AC power failure	Critical
				Fuse Fail	GMT fuse blown	Critical
				Batt Breaker	Battery breaker trip	Critical
2	8, 4	alm_input (10007)	Thermal	HX Fail	Heat exchanger high temp/fail	Critical
				Pwr Fan Fail	Remote power shelf fan failure	Critical
3	9, 5	alm_input (10007)	Security	Door	Open door / security	Critical

**Note:** \*The alarm Name values shown are modified from the defaults (extalm1, extalm2, extalm3) in the user interface.

## Alarm mapping to E5-400

Environmental alarms are wired to the E5-400 alarm pins located on the rear panel. The table below shows the pin assignments for ODC-100 environmental alarms.



E5-400 Input	Pin Pair	Alarm Type*	Alarm	Description	Default Severity
Env 6	AL5+, AL5-	power	Power MJ	Power supply Major	Major
			Power MN	Power supply Minor	Major
			AC Fail	AC power failure	Major
			Batt Discharge	Battery on discharge	Major
Env 7	AL6+, AL6-	thermal	HX Fail	Heat exchanger high temp/fail	Major
			Power Fan Fail	Remote power fan failure	Major
Env 8	AL7+, AL7-	security	Door	Open door/security	Major

**Note:** \*The Alarm Type values shown are modified from the default ('contact-off-normal') in the user interface.

## 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 E7-2: Minor (MN) and Major (MJ). For a list of the alarms reported through the E7-2 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 [seeclarfield.com](http://seeclarfield.com)

## Supported Batteries

The ODC-100 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.

**Note:** For a list of battery distributors, contact your Clearfield sales representative or account manager.

## Wiring Diagrams

For wiring diagrams of the ODC-100 cabinet power, ground, and alarm systems, check [seeclarfield.com](http://seeclarfield.com)

Or alternatively, see the B-sized (11" x 17") wiring diagrams included in the binder that ships with the cabinet.