PG-Flex*Plus* *Field Cabinet*

Technical Practice

Model	List	CLEI Code
PG-CAB001	1	VABA1Z0N~~

Section SCP-PGCAB001-010-01H

REVISION HISTORY

Revision	Release Date	Revisions Made
01	July 19, 2004	Initial Release

USING THIS TECHNICAL PRACTICE

The following style conventions and terminology are used throughout this guide.

Reader Alert	Meaning
	Alerts you to supplementary information
	Alerts you to supplementary information that is essential to the completion of a task
	Alerts you to possible equipment damage from electrostatic discharge
CAUTION	Alerts you to possible data loss, service-affecting procedures, or other similar type problems
WARNING	Alerts you that failure to take or avoid a specific action might result in hardware damage or loss of service
DANGER	Alerts you that failure to take or avoid a specific action might result in personal harm

INSPECTING YOUR SHIPMENT

Upon receipt of the equipment:

- Unpack each container and visually inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in Product Support on page 55. If you must store the equipment for a prolonged period, store the equipment in its original container.

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Field Cabinet Description

Introduction

The PG-FlexPlus field cabinet is for North American applications. The field cabinet houses telephony equipment along with batteries to supply backup power.

In a typical application, the PG-FlexPlus field cabinet houses an extension of the central office allowing telephony to be served efficiently to remote business and residential communities. The PG-FlexPlus field cabinet is tested for compliance to Telcordia GR-487.

This section describes the PG-FlexPlus field cabinet system configurations including design highlights, features, and physical specifications.

Features

The field cabinet design includes several attractive features such as:

- Side access splicing
  - Eases installation by separating splicing from the electronics
  - Provides more splicing area
- Field cabinet designed for slide-in placement
- Separate under-cabinet battery compartment
  - Keeps battery temperatures lower for longer battery life
  - Does not occupy valuable equipment space
- Patented enhanced cooling system
  - Allows greater equipment heat dissipation for more equipment or higher traffic rates
  - Eliminates possibility of hydrogen accumulation in battery compartment
  - Cools batteries
- Pad, pole, H-frame, floor or wall mounting options
  - Flexibility for site selection.

Construction and Finish

The PG-FlexPlus field cabinet's features are:

- Rugged heavy-gauge aluminum construction
- Weather, fire, vandal, and corrosion-resistant
- Durable baked-on polyester powder paint in an ultra-light gray color
- High-gloss finish to minimize accumulation of dirt and soot
- Aesthetically pleasing to enhance public acceptance
- Security
  - Special hex key with padlock hasp used to open all doors (standard)

WEIGHT

The approximate weights of the PG-FlexPlus field cabinet are listed in Table 1.

Table 1. PG-Flex*Plus* Field Cabinet

Shipping Weight	Weight Without Plug-Ins or Batteries	Weight With Plug-Ins and Batteries
300 lb (136 kg)	220 lb (100 kg)	700 lb (318 kg)

DIMENSIONS

The dimensions of the PG-FlexPlus field cabinet are listed in Table 2 and illustrated in Figure 1.

Table 2. PG-FlexPlus Dimensions

	External Dimensions	Internal Dimensions
Height	48 inches (1220 mm)	29 inches (737 mm) usable (1 bay)
Width	36 inches (914 mm)	23 inches (584 mm) nominal
Depth	30 inches (762 mm)	22 inches (559 mm) usable

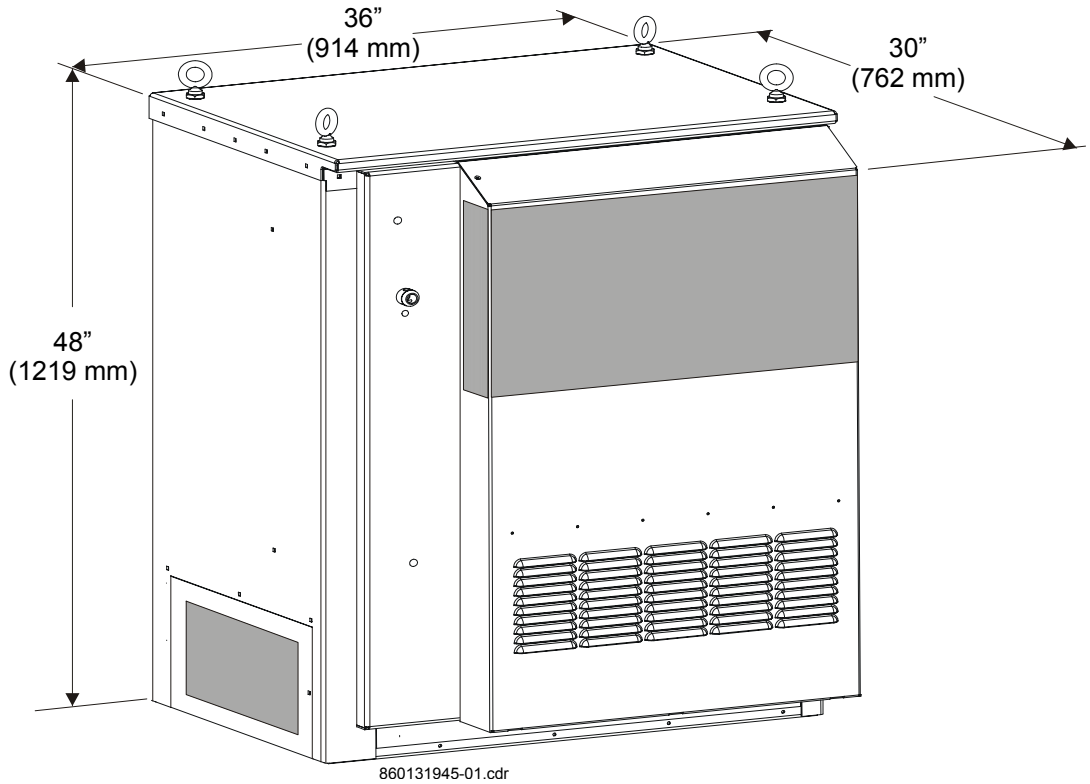


Figure 1. PG-FlexPlus Field Cabinet Dimensions (Shown With Heat Exchanger)

COMPARTMENTS

The PG-FlexPlus field cabinet is divided into two compartments (Figure 2):

- Upper Electronics Compartment
- Lower Battery Compartment

The upper **Electronics Compartment** houses the Bulk Power System and all of the active electronic gear. The **Battery Compartment** is below the Electronics Compartment and is designed to accommodate various types of batteries for back-up power. All copper, fiber, and AC power cables enter the field cabinet at the bottom left-side of the field cabinet. The outside plant copper cable(s) are spliced to the field cabinet cables in the splice chamber.

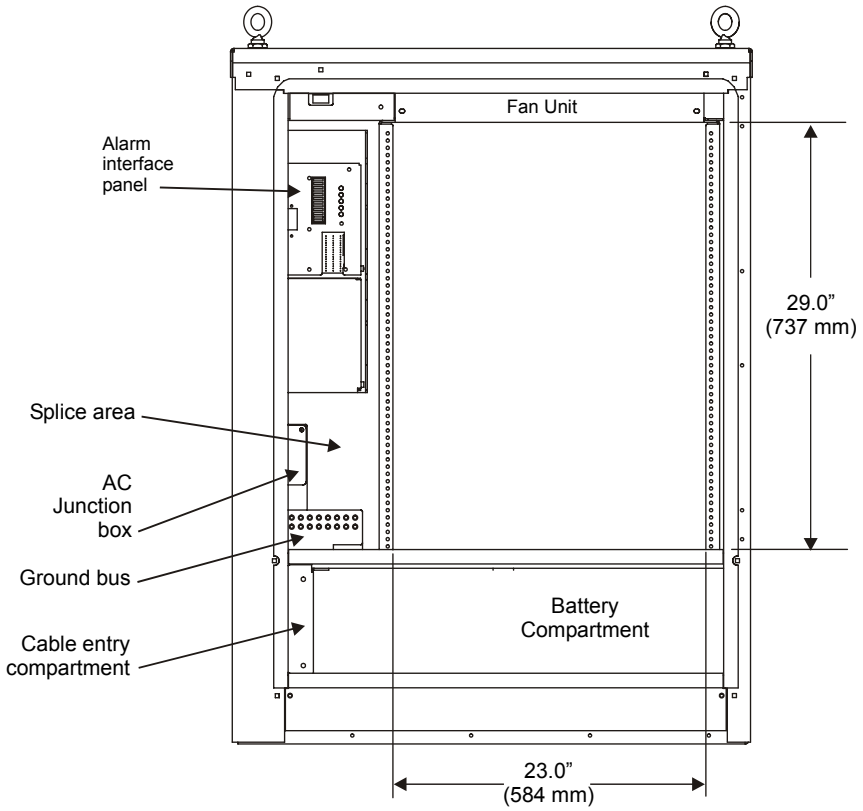


Figure 2. PG-FlexPlus Field Cabinet Layout (Front View – Shown With Field Cabinet Door Removed)

Electronics Compartment

The PG-FlexPlus field cabinet has a one-sided electronics compartment that includes one 23-inch rack, which provides 29 inches (737 mm) of vertical mounting space below the 6F-fan unit. Access to the electronics compartment is obtained by using a special hex key to open the front door of the cabinet (Figure 2).

The electronics compartment also contains the Alarm Interface Panel (AIP) and 307 protector block, located to the left of the rack. The AIP provides an alarm interface and fusing for the field cabinet's fans. The standard layouts of electronic equipment in each field cabinet are shown in Figure 2.

Side Chamber

The side chamber contains:

- AC Power Panel or Junction Box
- 307 Protector Block
- Main Ground Bus for the Cabinet

Rubber cable boots are used to seal the outside plant cables to the entrance ports at the bottom of the side chamber. The grounding of the outside plant cable shields to the field cabinet ground bus also occurs here.

AC service to the field cabinet enters through the bottom of the side chamber and is fed via conduit to the AC power panel. An optional bracket is available for mounting an AC power meter to the outside of the field cabinet.

Battery Compartment

The PG-FlexPlus field cabinet battery compartment houses:

- Multiple 48 V DC strings of batteries for backup power
- Thermostatically-controlled, AC-powered battery heaters that protect the batteries from reduced capacity due to cold temperatures
- Battery temperature probes for monitoring battery temperature
- Heat exchanger and battery cooling fans.

Refer to Table 6 on page 19 for battery options and capacities.

Security

The field cabinet door is accessed using the special hex key and can be padlocked, if required. As an option, a key entry lock may be ordered and installed to secure the door. The battery panel and cable entrance panel can only be removed by first opening the field cabinet door.

Environmental Control

Cooling System

The PG-FlexPlus field cabinet was designed with new enhanced cooling features. The field cabinet uses a patent-pending enhanced cooling system, which includes:

- 6F-fan units
- Door ducts
- Door-mounted heat exchanger

No outside air is introduced into the electronics portion of the field cabinet for cooling purposes.

6F-Fan Unit

A 6F-fan unit is mounted at the top of the electronics compartment to circulate air through the equipment to minimize critical component temperatures. The motors of the fan units remain on at all times, which improves the life of the electronics by minimizing stress due to thermal cycling. This also ensures good thermal coupling between the field cabinet air and the circuit packs, preventing the occurrence of hot spots. Moving the heat from the equipment to the field cabinet air allows the field cabinet to dissipate it to the outside environment.

In the PG-FlexPlus field cabinet, the 6F-fan unit pulls internal field cabinet air upward through the electronic equipment and exhausts the air into the top plenum. This air then enters and travels down the front duct, exiting at the bottom. The cooled air exiting at the bottom of the duct re-enters the equipment stack at the bottom of the rack.

This field cabinet is equipped with a door-mounted heat exchanger. Heat exchanger fans draw outside air through the battery compartment and blows it through the outside heat exchanger plenum, exhausting the warm air through louvers at the top of the door. The high velocity air in the heat exchanger plenum considerably increases the amount of heat eliminated from the field cabinet.

Heat Exchangers

A convoluted-core heat exchanger (highest performing heat exchanger offered by CommScope) is provided with the PG-FlexPlus field cabinet.

The heat exchanger is located on the PG-FlexPlus field cabinet's front door. Two environmentally protected fans are included with this heat exchanger. These fans are environmentally protected to provide long life in corrosive environments.

The fans draw outside air through louvers at the bottom of the front door and exhaust the air into the heat exchanger plenum. The warmed air then exits through vents at the top of the door on the outside of the field cabinet. A small amount of air from the HX intake is vented into the battery compartment which exits through the vents on the left-side of the battery compartment. Equipment heat is brought into the heat exchanger for cooling by the 6F-fan unit mounted at the top the equipment rack.

The two heat exchanger fans on each door are controlled by two separate thermostats. The low-temperature thermostat ensures that heat exchanger fans are off at very cold ambient temperatures, which maximizes the night-time cooling of batteries. The high-temperature thermostat operates the fans only when the equipment compartment is hot which allows the field cabinet to run quieter at night, though night-time battery cooling is sacrificed.

Thermostat set points are listed in Table 3.

Table 3. Thermostat Temperature Set Points

Thermostat Type	Monitored Temperature	Turn ON (±5°F) (±3°C)	Turn OFF (±5°F) (±3°C)
Low	Battery Compartment	55°F (13°C)	37°F (3°C)
High	Equipment Compartment	131°F (55°C)	117°F (47°C)

Battery Heating and Cooling

Battery Heaters

The provided battery heater is located beneath the plate on which the batteries rest. It is designed to prevent the loss of battery reserve capacity that occurs when batteries are exposed to cold temperatures. The heater is connected to a thermostat that is set to operate the heater pad when it senses battery temperatures below 32°F ±5°F (0°C ±3°C) and shut them off when it senses above 50°C ±5°F (10°C ±3°C).

Battery Cooling

Battery cooling is provided by the heat exchanger door. The heat exchanger pushes air through vents in the door of the field cabinet and exhausts the air through vents on the left side of the battery compartment. Outside air, drawn past the batteries by the heat exchanger, reduces the heating of the batteries that otherwise occurs as a result of solar heating of the battery compartment sides, by the equipment heat in the field cabinet, and self-heating due to charging.

This resulting reduction in battery temperature extends the life of batteries.

SITE PLANNING

OVERVIEW

This section describes the selection of PG-FlexPlus field cabinet sites based on existing plant configurations, economics, and functional requirements such as zoning restrictions. The impact of site selection on field cabinet and electronic equipment performance is also discussed. Plan the location of the PG-FlexPlus field cabinet site ahead of time, taking into consideration the requirements described in this section.

SITE SELECTION

The field cabinet site should be selected based on existing plant configurations, economics, permanency, public acceptance, and functional requirements. The final physical location of the field cabinet is determined by a field inspection. Some of the factors in evaluating a possible site are discussed in the following paragraphs.

Functional

Unless a field cabinet is pole-mounted, it should not be located in an area that is prone to flooding or is constantly damp. Soil maps for the area should be checked for subsurface conditions. Whenever possible, a field cabinet should be located in an area that does not require extensive earthwork. Local zoning restrictions should be checked to verify that the field cabinet can be used. Consideration should be given to specific requirements such as easements, minimum lot sizes, and type of landscaping.

Sufficient parking and turnaround space should be allowed for the installation and maintenance vehicles, including trailer-mounted motor-generator sets, if required.

Easement Size

When selecting an installation site, choose a location that has a minimum functional easement large enough to walk around the field cabinet with its doors in their fully open and locked position. Table 4 shows the area required for the field cabinets when the doors are opened to their locked positions. The PG-FlexPlus field cabinet doors extend beyond the standard pad size.

Table 4. Standard Pad and Minimum Functional Easements

Standard Pad Size	Minimal Functional Easement
84 in x 74.5 inches (2133 mm x 1892 mm)	108 in x 102 inches (2740 mm x 2590 mm)

Figure 3 on page 9 shows the clearance areas required by the PG-FlexPlus field cabinet. See Field Cabinet Installation and the field cabinet foundation pad drawing, ED-1T339-01, for additional information.

Thermal Site Considerations

In all but the coldest of climates, proper site selection can improve the life of the electronics and batteries in the field cabinet. This can be done by:

- **Reducing the field cabinet's exposure to the afternoon sun**
  Peak daily ambient temperature is generally attained between 2 p.m. and 3 p.m. The afternoon sun in combination with the high afternoon ambient temperature results in the maximum temperature rise inside of the field cabinet. Situating the field cabinet such that it is only exposed to the early morning and/or evening sun will reduce the maximum temperature of the equipment and batteries inside of the field cabinet, thus extending their life.
- **Increasing the field cabinet's exposure to wind**
  The greater the exposure to wind, the cooler the equipment inside will run, again extending equipment life. Solid fences around the field cabinet are not desirable since they can block wind but not the overhead sun.
- **Placing the field cabinet away from blacktop surfaces**
  Blacktop surfaces will collect and radiate heat onto the field cabinet. Grass or dirt provides a much cooler, more favorable environment for the field cabinet.

Electrical Considerations

The availability of AC service, need for power meter, transfer switch, or generator inlet needs to be factored into the site requirements. Refer to AC Service Installation on page 16 for the field cabinet's requirements for electrical service.

If a power pedestal is required, the size of the concrete pad may need to be larger to accommodate both the field cabinet and the pedestal. As a result, the easement for the field cabinet may also need to be larger.

Safety

Whenever possible, a field cabinet should be located in vacant, unused, and out-of-sight portions of private, public, or commercial property with easy access and adequate parking. If a field cabinet must be located near a street or highway, it should be located away from curves and busy intersections.

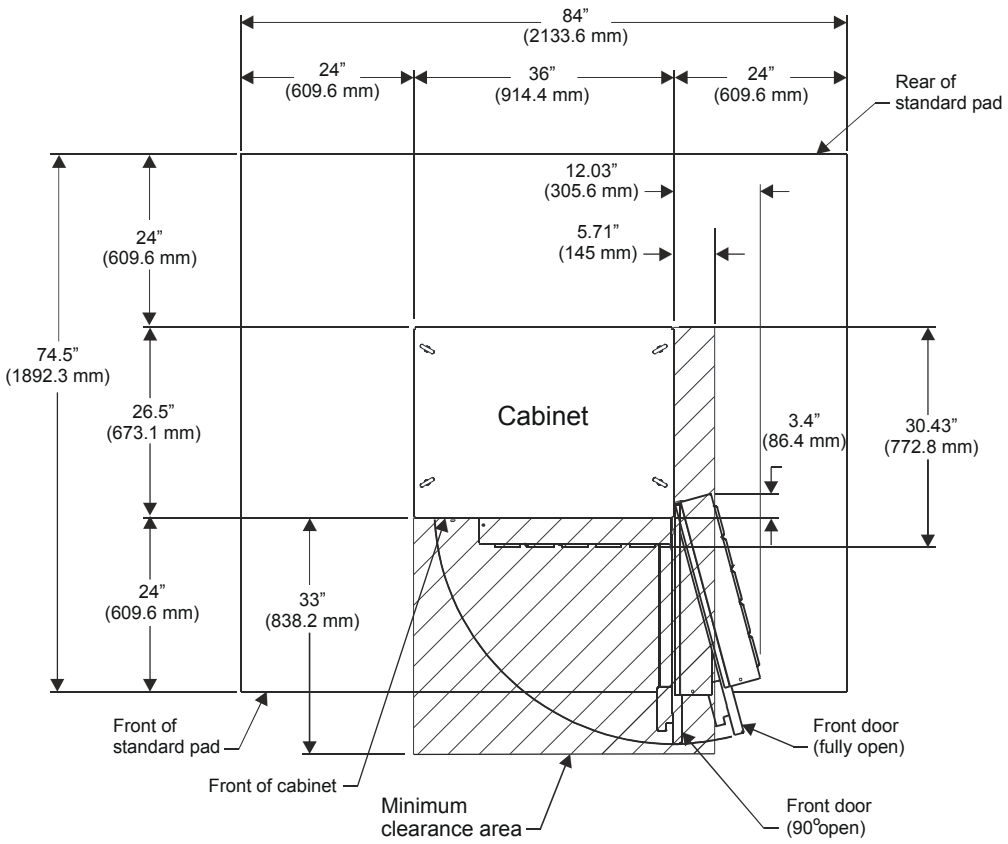


Figure 3. PG-FlexPlus Field Cabinet Clearance Requirements

Right-of-Way

It is recommended that the field cabinet not be located in a public right-of-way. A firm right-of-way agreement, which includes right of access, on private property should be obtained.

When the field cabinet is located in the vicinity of motor traffic, guardrails, concrete pillars, or other protective devices are recommended to ensure safety. The site location and the design should be coordinated with local highway and/or other public officials to ensure public safety.

A right-of-way should be secured that includes right of access and egress. The right-of-way agreement should provide sufficient space for the ultimate requirements in regard to equipment, associated hardware, shrubs, decorative and/or guard fences, and mounting pads.

Site location efforts should be aimed at securing a permanent location that will prevent damage to the equipment and possible expensive relocation costs.

FIELD CABINET INSTALLATION

OVERVIEW

The procedures for handling, storing, placing and grounding of the PG-FlexPlus field cabinet are covered in this section. Complete the operations in this section before proceeding with cable splicing and equipment turn-up.

HANDLING

Field cabinets are usually shipped to the customer via truck and delivered to a staging area (for example, a garage or warehouse). Ensure that the proper equipment is available to unload the delivery truck and to transport the field cabinet to the job site.

At the staging area, a forklift truck may lift the packed field cabinet from front or rear side. The field cabinet is equipped with lifting eyes that may be used for handling the packed field cabinet.

The field cabinet is shipped from the factory with protective packaging. This packaging includes a pallet and multilayer cardboard sides and top. The field cabinet is secured to the bottom pallet with four bolts. The cardboard sides are stapled to the pallet and to the top.

The protective packaging should not be removed until the field cabinet is at the job site. However, the cardboard sides and top may be removed to allow inspection in the staging area prior to shipping to the job site. The field cabinet may be damaged during shipping to the job site if the field cabinet is improperly secured to the factory-provided pallet or if the pallet is not used.

When transporting the field cabinet to the job site, properly secure the field cabinet to the truck or trailer to prevent shifting. Figure 4 on page 11 illustrates the recommended method of securing a packaged field cabinet. Figure 5 on page 11 illustrates the recommended method of securing a field cabinet that has the cardboard sides and top removed.

STORAGE

A substantial portion of the field cabinet's protection against humidity is obtained from the normal heat dissipated by the electronic circuits. A desiccant material protects the field cabinet during shipment and outdoor storage. This material is located at the bottom of the equipment rack and should not be removed until the circuit packs are ready to be installed. Circuit packs should be powered up immediately after installation.

If for some reason the circuit packs cannot be powered up immediately after installation (within a few days of installation), the bay fans should be activated to provide adequate humidity protection. A low-power heat source, such as an incandescent light bulb, located in the rack can also be used to provide humidity protection. A heat source should provide approximately 100 watts of heat.

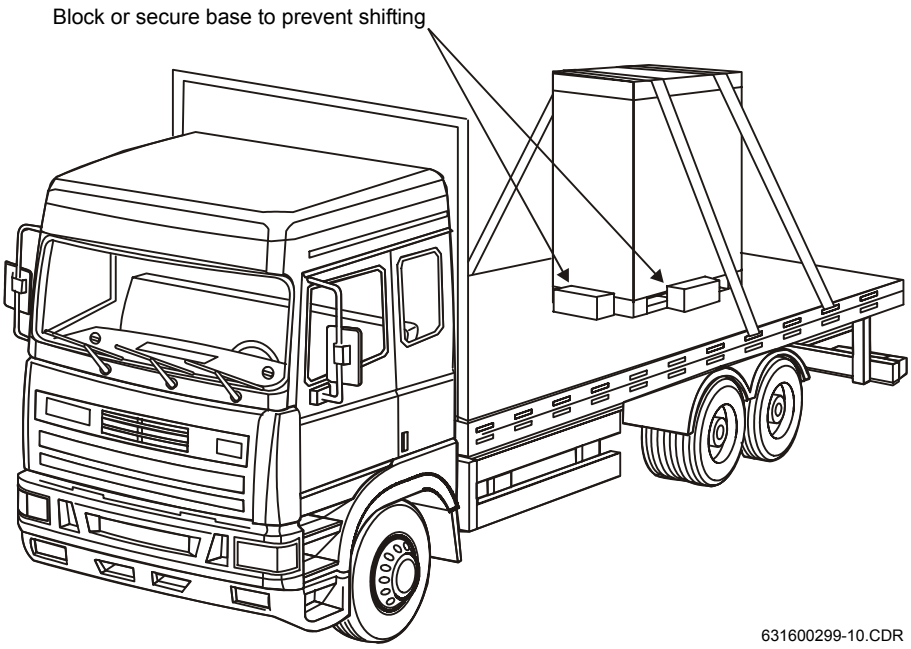


Figure 4. Securing a Packed Field Cabinet for Shipping

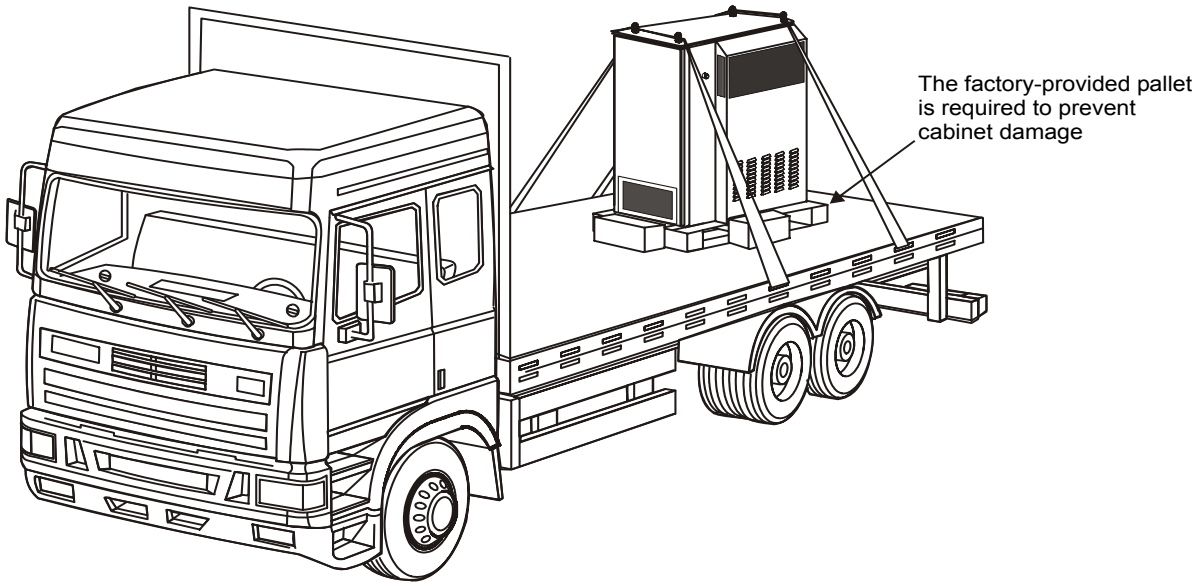


Figure 5. Securing an Unpacked Field Cabinet for Shipping

Field Cabinet Placement

The installation operations that are required before proceeding with cable splicing and equipment turn-up are covered in the following instruction sheets.

860 122 746
PG-FlexPlus Foundation Pad Bracket Kit

ED-1T339-01
PG-FlexPlus Pad Drawing

860 117 746
PG-FlexPlus Pole-Mount Bracket Kit Installation

860 119 403
PG-FlexPlus H-Frame/Wall-Mount Bracket Kit Installation

860 131 390
PG-FlexPlus Cable Seal and Bonding Instructions

Field Cabinet Grounding

This section provides requirements and procedures for grounding a PG-FlexPlus field cabinet in single- or multiple-field cabinet configurations.

The field cabinet grounding system has been designed to protect personnel from shock hazards, to protect the equipment from lightning transients and other electronic noise conducted into the field cabinet, and to reduce electronic noise emissions to the environment. The field cabinet structure serves as a continuous ground bus, providing multiple points for grounding of internal wiring and hardware. The equipment rack uprights are the primary equipment-grounding members of the field cabinet structure.

In most areas, the standard grounding configuration that uses two ground rods is sufficient. In areas of high lightning activity or low ground conductivity, a ground ring or other means should be used to increase the effectiveness of the grounding system.

Equipment and Materials Required for Field Cabinet Grounding

The following materials are required for the standard grounding configuration.

- 2 ground rods, 8 feet (2.4 m) long per NEC Code, Section 250-83
- 20 feet (7 m) of 6 AWG (16 mm^2) bare solid copper ground wire
- 2 ground rod clamps [for 6 AWG (16 mm^2) wire]

The following additional materials are only needed when installing the optional ground ring around a PG-FlexPlus field cabinet.

- 26 feet (8 m) of 2 AWG (35 mm^2) bare solid copper ground wire
- 2 ground rod clamps [for 2 AWG (35 mm^2) wire].

Local practices and requirements may require additional materials.

Field Cabinet Grounding Requirements

Use the following requirements when grounding the PG-FlexPlus field cabinet:

CAUTION

Special attention must be given to the following site grounding details in order to minimize lightning-induced equipment damage in areas of high lightning activity or low ground conductivity.

- ***A minimum of two driven ground rods are required, one at each end of the PG-FlexPlus field cabinet. When driven, the rods should be flush with or slightly below ground level to allow inspection of the attached conductor.***
- ***The ground wire from the left side of the field cabinet (side compartment end) is terminated to the ground bus in the AC power panel. This wire should be run as directly as possible and terminated, unspliced, to the ground rod (Figure 6 on page 14).***

  The ground wire from the right side of the field cabinet is connected to the field cabinet main ground bus located at the bottom of the side compartment, as shown in Figure 6 on page 14. A lug is provided with the field cabinet for this connection.

  For AC grounding purposes, the field cabinet should be treated as a separate "building" even when fed from a power pedestal, if this is acceptable to the local authority. When treated as a separate structure, the neutral bus is bonded to earth ground in the AC power panel per NEC Code Section 250-23. Bonding of the neutral at the field cabinet AC panel provides the best protection against lightning damage to the DC power system.

CAUTION

If the neutral is not bonded to earth ground in the field cabinet, the DC power system is at increased risk of lightning damage. In this situation, common routing of neutral and ground conductors within the power pedestal is critical to minimizing transients.

- ***When installing ground wires in a conduit, use of nonmetallic conduits is required.***
- ***For installations involving multiple field cabinets, 6 AWG (16 mm^2) solid copper ground wires of minimum length should interconnect the field cabinets. Where field cabinets or pedestals are separated by less than 6 feet (1.8 m), they can share a common centrally located ground rod. See Figure 7 on page 15 for a typical grounding arrangement.***

Field Cabinet Grounding Procedures

Use this procedure and refer to Figure 6 on page 14 to ground the PG-FlexPlus field cabinet.

Normally, ground wires are installed beneath the foundation pad prior to pouring the concrete. Leave at least 6 feet (2 m) of ground wire above the pad for ground rod A and at least 3 feet (1 m) for ground rod B. After the pad is constructed and field cabinet is mounted to the pad, connect the ground wires. Pole, H-frame, and wall-mounted field cabinets are grounded in a similar manner; a nonmetallic conduit may be required to protect the ground wires when the field cabinet is mounted above the ground.

1. Route the 6 AWG (16 mm^2) bare solid copper ground wire from ground rod A through the cable entrance opening in the pad. (Install wire in optional ground wire duct, if provided.)
2. Connect ground wire to AC panel ground bus (see wiring diagram inside AC panel). Route the ground wire through the unused strain relief that is provided in the bottom of the AC panel.
3. Route the 6 AWG (16 mm^2) bare solid copper ground wire from ground rod B through the cable entrance opening in the pad. (Install wire in optional ground wire duct, if provided.)
4. Connect ground wire to lug provided on the field cabinet ground bus. Use pliers to twist the self-threading lug onto the ground wire.

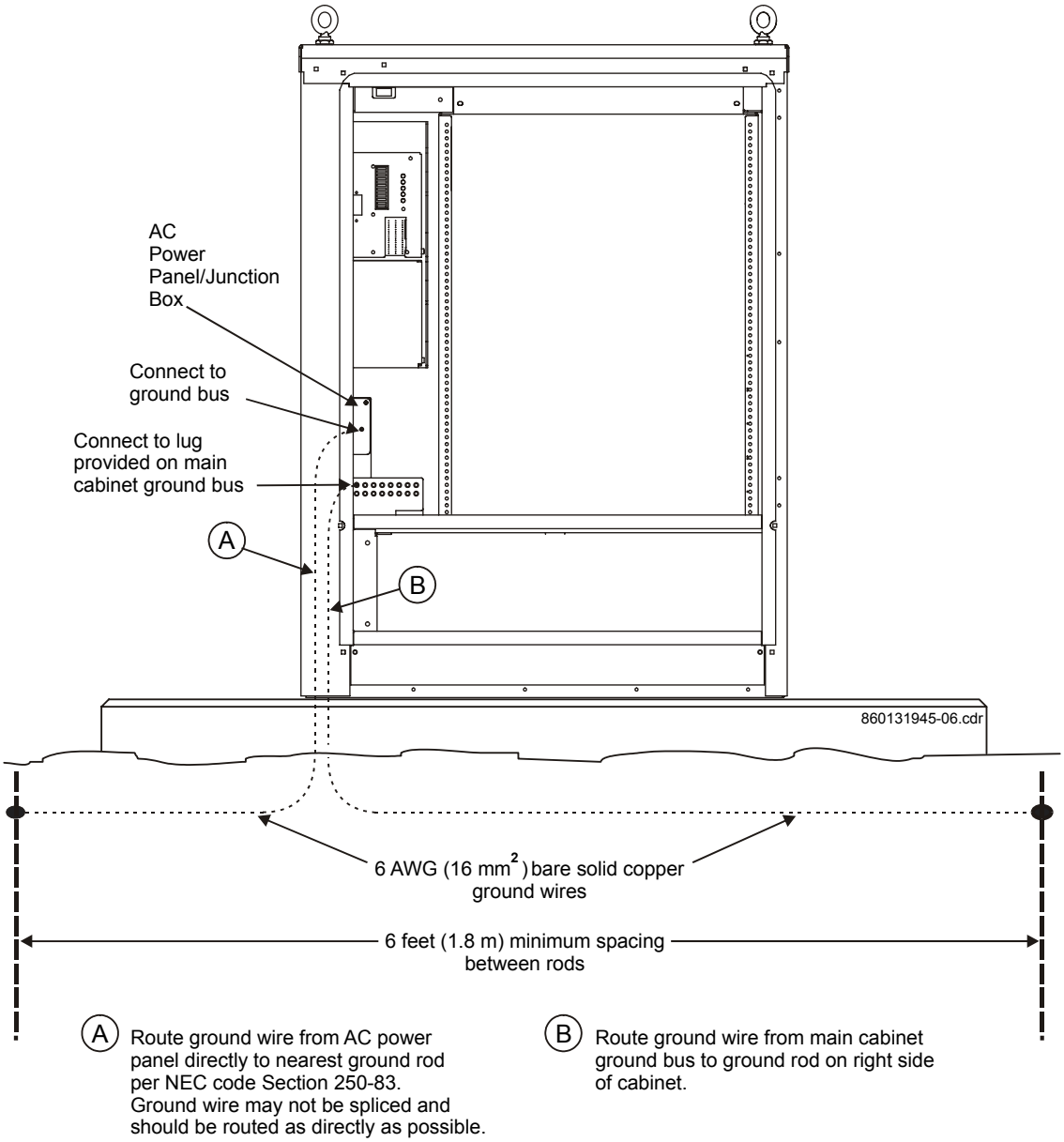
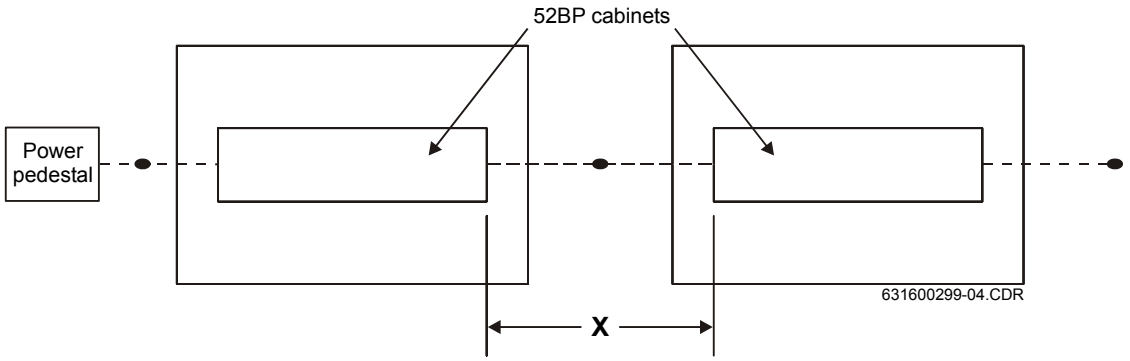


Figure 6. Grounding Requirements for PG-FlexPlus Field Cabinet (Shown With Field Cabinet Door Removed)



SYMBOLS:

- ● Ground rod per NEC Section 250-83, 8 feet (2.4 m) minimum length. Distance between ground rods shall be at least 6 feet (1.8 m).
- – – – 6 AWG (16 mm^2) bare solid copper ground wire. Install using minimum length required to reach connection point.
- **X** When distance “X” exceeds 6 feet (1.8 m), two ground rods are required with a minimum separation of 6 feet (1.8 m) between rods.

Figure 7. Grounding Requirements for Multi-Field Cabinet Installation

AC Service Installation

Overview

This section describes requirements for AC power connections to the local electric utility company and procedures for connecting an auxiliary generator set.

The electrical connections to the field cabinet should be installed by qualified electricians and conform to the NEC and all state and local codes.

Connections between the service entrance, AC power panel, and auxiliary generator inlet (if equipped) for each field cabinet are shown on a decal placed inside the door. This decal provides a wiring diagram of the AC power group(s) ordered.

Precautions

Before working on the cabinet, refer to Using this Technical Practice on page ii and the Warning and Caution below.

WARNING

Only trained service personnel should perform the procedures in this manual. These procedures allow exposure to high electrical energy that may result in electric shock and/or injury to untrained personnel during servicing, maintenance, and installation of this cabinet.

Utility Power Connections

For service entrance applications, arrangements should be made with the local power company to furnish a suitable power drop to the field cabinet site. Field cabinets equipped with the Valere power shelf can use 120 V AC or 120/240 V AC single-phase service or 208Y/120 V AC service using the two 120 V AC lines. When configured for use with 120 V AC service, only one pole of the main breaker is used. Use of 9.5 A rectifiers in the Valere power system requires 208Y/120 V AC service using the two 120 V AC lines.

The maximum input current of the PG-FlexPlus field cabinet is listed in Table 5.

Table 5. Maximum Current Consumption of Standard Field Cabinet Configurations

Field Cabinet Configuration	Maximum Current Consumption (Amps)		
	120 V AC (L1)	120/240 V AC (L1/L2)	208Y/120 V AC (L1/L2)
1 String (120 Amp-hrs)	28	14/14	14/14

BULK POWER SYSTEM

OVERVIEW

This section describes the three major components of the bulk power system: the Valere power system, batteries, and the supplementary distribution circuits on the Alarm Interface Panel (AIP). Also described is the cabinet bulk power system's ability to generate, store, and distribute –48 V DC power.

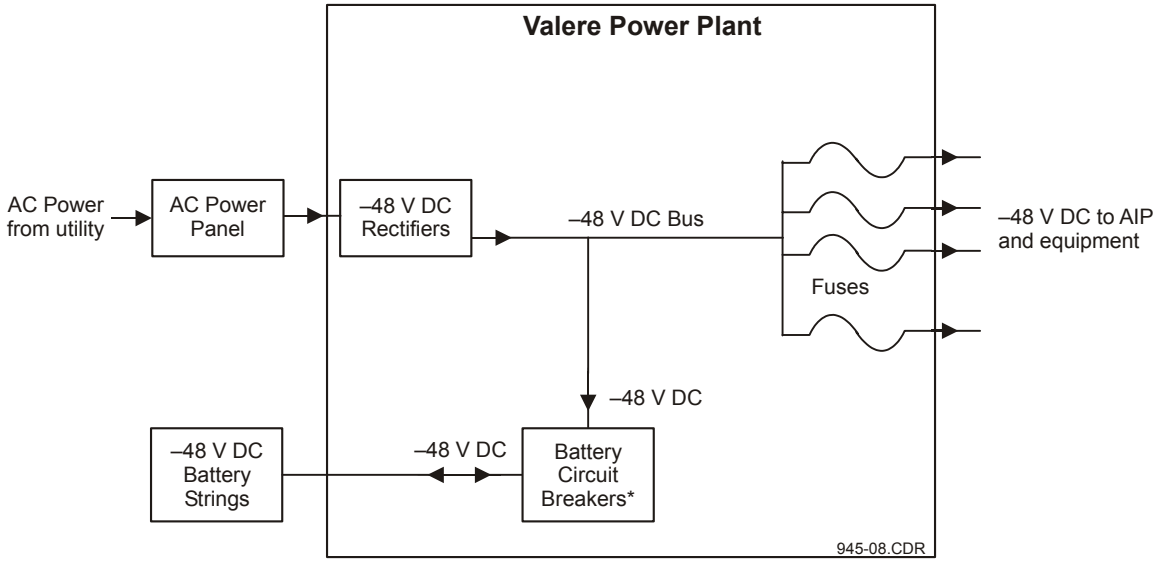
DESCRIPTION

The field cabinet's bulk power system generates, stores, and distributes –48 V DC power.

There are three principal components of the bulk power system:

- Valere Power System shelf
  - Provides fused –48 V DC power to the cabinet electronics
  - Provides a disconnect during servicing of batteries
- Batteries
  - Provides backup power for cabinet equipment
- Alarm Interface Panel (AIP)
  - The AIP provides fused DC power to the cabinet fans and alarm conversions.

A block diagram of the bulk power system is shown in Figure 8. The Valere rectifiers, batteries, and load fuses are connected to a common bus, such that the batteries start supplying load current when the bus voltage drops below the open circuit battery voltage. No switching is required.



* Part of Valere Power System

Figure 8. Bulk Power System Block Diagram

VALERE POWER SYSTEM

The Valere power system is a flexible system that may be equipped with a variety of plug-ins, such as rectifiers and ring generators. The field cabinet uses one Valere shelf configured for a –48 V DC primary output. This shelf is equipped with a Distribution Module, which includes ten fused circuits and four circuit breakers.

The alarms and displays are described in Alarms on page 39. See *Valere Cabinet Power System Product Manual* for a complete description of the Valere Power System Product.

Valere Plug-Ins - System Controller

The System Controller monitors power plant functions and provides visual and electronic alarm information. For lead-acid batteries, the controller can regulate the rectifier bus voltage in response to battery temperature, to prevent battery thermal runaway.

Distribution Module

The Valere Distribution Module provides 10 plug-in (GMT) alarm-indicating fuses for the fused distribution of –48 V DC power and connectors for battery temperature probes.

The Distribution Module includes four battery breakers that are used to manually disconnect the batteries from the bus for installation and service of the batteries.

Placing the battery switch in the OFF position does not isolate the batteries. A short from a battery terminal or bus bar to a grounded cabinet part will create a high-current short circuit. Use caution when working on batteries and follow standard procedures.

Rectifiers

The rectifiers generate –48 V DC from 120/208/240 V AC input. The –48 V DC outputs of all rectifiers are tied together on a backplane bus. A minimum number of rectifiers are required to power the equipment and charge the batteries.

BATTERIES

The field cabinet may be equipped with 48 V DC strings of SAFT NCX80, SAFT NCX-125, Tyco IR-30, IR-40, 12IR125, TEL-12-45 SLC or other batteries. The battery strings provide emergency backup power to continue providing telephone service to customers serviced from the cabinet in the event that AC service is lost. Table 6 describes the battery options.

Table 6. Battery Options

Battery Type	Module Size	No. of Batteries per 48 V String	Amp Hours per String	Max. No. of Strings per Field Cabinet
SAFT NCX-80	Variable	6 (SAFT Part No. D215772)	80	1
SAFT NCX-125	Variable	6 (SAFT Part No. 217711)	125	1
Tyco IR-30	12 volt	4	25	2
Tyco IR-40	12 volt	4	34	2
Tyco 12IR125	12 volt	4	120	1
TEL-12-45 SLC	12 volt	4	184	2

Adjacent batteries are connected with inter-module straps (bus bars).

ALARM INTERFACE PANEL

The Alarm Interface Panel (AIP), located in the electronics compartment of the field cabinet is equipped with four additional plug-in, alarm-indicating fuses for distribution of –48 V DC power to the cabinet's fans and to the control circuitry on the AIP. In some cases, these supplementary fuses may be used to power additional cabinet equipment.

METALLIC CABLE TERMINATION AND WIRING

OVERVIEW

This section provides procedures for metallic cable installation, installing protector units, and connecting alarms in the PG-FlexPlus field cabinet. Refer to the CAD figures on the schematic diagram provided with each field cabinet to identify the field terminations and wiring required.

The metallic outside plant (OSP) cables are spliced to the field cabinet cables in the splice chamber, located in the side chamber.

PRECAUTIONS

Before working on the cabinet, refer to Using this Technical Practice on page ii and the Warning and Caution below.

WARNING ***Only trained service personnel should perform the procedures in this manual. These procedures allow exposure to high electrical energy that may result in electric shock and/or injury to untrained personnel during servicing, maintenance, and installation of this cabinet.***

CAUTION ***Digital transmission systems and associated optical test sets use semiconductor laser transmitters. The lasers emit light waves, at or near infrared wavelengths, into optical fibers. This light is at the red end of the visible spectrum and complies with 21 CFR 1040.10 and 1040.11.***

Weather

For initial splicing during inclement weather conditions, it is recommended that a commercial tent (such as the Model 6508 tent from T. A. Pelsue Company; Englewood, Colorado) be used. The manufacturer should supply installation and maintenance instructions for commercially obtained tents.

PREPARATION

AC Power

Splicing and equipment installation in the PG-FlexPlus field cabinet only requires AC power for electric tools and lighting. Ensure that the utility power connections have been installed conforming to the NEC in addition to state and local codes. If the utility connections have not been installed and electric tools or lighting are required, arrange for a temporary power source to be available at the field cabinet site.

Electric tools and temporary lights may be plugged into the PG-FlexPlus field cabinet's ground fault circuit interrupt (GFCI) protected convenience outlets.

Field Cabinet and Hardware Preparation

Complete the following steps prior to starting cable splicing:

1. Use the special hex key to unlatch and open the field cabinet door.
2. Use a screwdriver to loosen (do not remove) the screws that secure the splice chamber cover; then remove the cover and set it aside.
3. Locate the 710-connector caps that are bagged and tied to the tie bars in the splice chamber and place them aside.

   The field cabinet cables are secured to the tie bars on the rear wall of the splice chamber. The OSP cables, including the fiber cables, should have been pulled into the field cabinet and temporarily secured in the splice chamber. The cable labeling for each specific field cabinet is detailed on a decal on the inside of the door.

Prior to splicing, the cable ports must be properly sealed and each OSP cable grounded to the field cabinet ground bus.

4. Pull the unsheathed portion of the OSP cables out of the splicing chamber.
5. Remove all cable ties securing the field cabinet cables to the tie bars and pull the field cabinet's cable tails out of the splicing chamber.
6. Secure an 890-type splicing tool to a butt box in the front of the splicing chamber.

It is recommended that the digital pairs be spliced before the HDSL and miscellaneous pairs.

7. Mark the OSP pairs to be spliced. The field cabinet pairs are factory marked using the following nomenclature:

Table 7. Sheath Identification and Function

Sheath Identification*	Function
A(x-y)	Digital (T1/HDSL) cable pair—Incoming (Receive)
B(x-y)	Digital (T1/HDSL) cable pair—Outgoing (Transmit)
C(x-y)	PG-FlexPlus HDSL cable pairs—Loop 1 and power pairs
D(x-y)	PG-FlexPlus HDSL cable pairs—Loop 2 and power pairs
* The (x-y) refers to the first and last pairs used in the particular sheath.	

8. When splicing, ensure that the field cabinet pairs to be spliced are routed over previously spliced cables and under any unspliced cables (to prevent tangling).

DIGITAL CABLE PAIR SPLICING AND TERMINATION

The metallic cables which interface with digital extensions (T1 and HDSL - Table 8 on page 23) are typically terminated with either 3M 710 or 3M 4005 connectors.

If these metallic cables are terminated with 710-SC1-25 splicing modules, the mating cables are to be terminated with the 710-BC1-25 bridging modules (using an 890-type tool) prior to dressing the cable into the field cabinet.

If the field cabinet cables are terminated with 3M 4005 or other connector type, refer to connector manufacturer's instructions.

1. Match and route the OSP digital pairs with the associated field cabinet pairs.
2. Pull the OSP and field cabinet pairs to the splicing tool and splice, trimming any excess cable.
3. Shield the OSP digital pairs (T1 and HDSL) by wrapping with one layer of overlapped AT-7165 aluminum tape or heavy-duty aluminum foil.
4. Dress the spliced pairs and secure to the tie bars with wire ties.

   Ensure that the A (incoming) and B (outgoing) digital pair cables are dressed apart from each other. Also, ensure that the cables are secured within the splice chamber so the splice chamber cover can be replaced and so there is no interference with the Mini Fiber Panel, if used.
5. Using wire ties, secure the OSP and field cabinet cables together as necessary.

Table 8. Network T1/HDSL Cable Assignments

Circuit ID	Protector Socket	Tip	Ring	Description	Connector
	1	White	Blue	Receive/Loop 1 HyperEdge 1 position #1	7 1 0 A
	2	White	Orange	Receive/Loop 1 HyperEdge 1 position #2	
	3	White	Green	Receive/Loop 1 HyperEdge 1 position #3	
	4	White	Brown	Receive/Loop 1 HyperEdge 1 position #4	
	5	White	Slate	Receive/Loop 1 HyperEdge 1 position #5	
	6	Red	Blue	Receive/Loop 1 HyperEdge 1 position #6	
	7	Red	Orange	Receive/Loop 1 HyperEdge 2 position #1	
	8	Red	Green	Receive/Loop 1 HyperEdge 2 position #2	
	9*	Red	Brown	Receive/Loop 1 HyperEdge 2 position #3	
	10*	Red	Slate	Receive/Loop 1 HyperEdge 2 position #4	
	11*	Black	Blue	Receive/Loop 1 HyperEdge 2 position #5	
	12*	Black	Orange	Receive/Loop 1 HyperEdge 2 position #6	
	13-25			Not Used	
	26	White	Blue	Transmit/Loop 2 HyperEdge 1 position #1	7 1 0 B
	27	White	Orange	Transmit/Loop 2 HyperEdge 1 position #2	
	28	White	Green	Transmit/Loop 2 HyperEdge 1 position #3	
	29	White	Brown	Transmit/Loop 2 HyperEdge 1 position #4	
	30	White	Slate	Transmit/Loop 2 HyperEdge 1 position #5	
	31	Red	Blue	Transmit/Loop 2 HyperEdge 1 position #6	
	32	Red	Orange	Transmit/Loop 2 HyperEdge 2 position #1	
	33	Red	Green	Transmit/Loop 2 HyperEdge 2 position #2	
	34*	Red	Brown	Transmit/Loop 2 HyperEdge 2 position #3	
	35*	Red	Slate	Transmit/Loop 2 HyperEdge 2 position #4	
	36*	Black	Blue	Transmit/Loop 2 HyperEdge 2 position #5	
	37*	Black	Orange	Transmit/Loop 2 HyperEdge 2 position #6	
	38-50			Not Used	
* Wired for future use					

PG-FLEXPLUS HDSL (TIP/RING) PAIRS AND TEST PAIR SPLICING

The OSP Facility HDSL pairs are spliced to the C(x-y) + D(x-y) connectors.

1. Match and route the OSP HDSL pairs with the field cabinet pairs (Table 9 on page 25).
2. Pull the OSP and field cabinet pairs to the splicing tool and splice, trimming any excess cable. Splice the OSP facility side cables to the field cabinet HDSL pair cables in sequence, starting with C (1-25).
3. Dress the spliced pairs and secure to the tie bars with wire ties. Ensure that the cables are secured within the splice chamber so the splice chamber cover can be installed.
4. Using wire ties, secure the OSP and field cabinet cables as necessary.
5. Refer to the work print to locate the system number (*System ID*) and write this number on the equipment placement labels located on the inside of the front and side doors. Do this for each piece of equipment generating HDSL pairs. This system numbering is for customer record keeping and should not be confused with the field cabinet's internal system designations.
6. The test by-pass pair is spliced to the D (100) connector. Follow general splicing procedure as noted above (refer to Table 11 on page 33).

Splice Completion

After completing all splicing operations, replace the splice chamber cover.

Table 9. PG-FlexPlus HDSL Cable Assignments

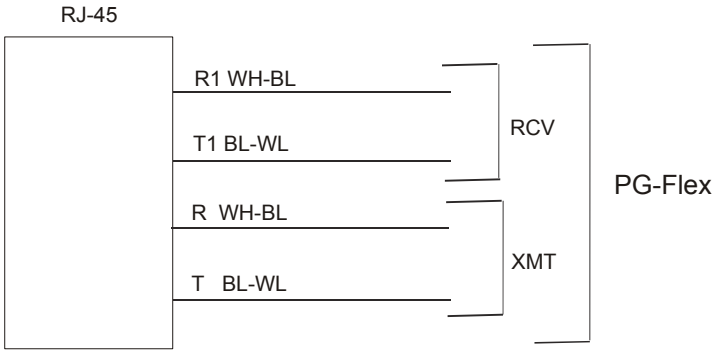
Circuit ID	Protector Socket	Tip	Ring	Description	Connector
	51	White	Blue	Loop 1 Power 1	710C
	52	White	Orange	Loop 1 HDSL 1	
	53	White	Green	Loop 1 Power 2	
	54	White	Brown	Loop 1 HDSL 2	
	55	White	Slate	Loop 1 Power 3	
	56	Red	Blue	Loop 1 HDSL 3	
	57	Red	Orange	Loop 1 Power 4	
	58	Red	Green	Loop 1 HDSL 4	
	59	Red	Brown	Loop 1 Power 5	
	60	Red	Slate	Loop 1 HDSL 5	
	61	Black	Blue	Loop 1 Power 6	
	62	Black	Orange	Loop 1 HDSL 6	
	63	Black	Green	Loop 1 Power 7	
	64	Black	Brown	Loop 1 HDSL 7	
	65	Black	Slate	Loop 1 Power 8	
	66	Yellow	Blue	Loop 1 HDSL 8	
	67-75			Not Used	
	76	White	Blue	Loop 2 Power 1	710D
	77	White	Orange	Loop 2 HDSL 1	
	78	White	Green	Loop 2 Power 2	
	79	White	Brown	Loop 2 HDSL 2	
	80	White	Slate	Loop 2 Power 3	
	81	Red	Blue	Loop 2 HDSL 3	
	82	Red	Orange	Loop 2 Power 4	
	83	Red	Green	Loop 2 HDSL 4	
	84	Red	Brown	Loop 2 Power 5	
	85	Red	Slate	Loop 2 HDSL 5	
	86	Black	Blue	Loop 2 Power 6	
	87	Black	Orange	Loop 2 HDSL 6	
	88	Black	Green	Loop 2 Power 7	
	89	Black	Brown	Loop 2 HDSL 7	
	90	Black	Slate	Loop 2 Power 8	
	91	Yellow	Blue	Loop 2 HDSL 8	
	92-99			Not Used	

Table 10. Test Pair

Circuit ID	Protector Socket	Tip	Ring	Description	Connector
			Test Pair		710D
	100	Black	Red	Bypass/Test pair	

INTRASHELF CONNECTION

Each HyperEdge has an RJ-45 plug that terminates each DS-1 position on the respective PG-FlexPlus DS1 termination (Figure 9).



NOTE: Not field accessible, for reference only.

Figure 9. Intrashelf Cable Assignments

PROTECTOR INSTALLATION

Install protectors into protector blocks per the decal(s) on the inside of the side and/or front compartment doors. The decal(s) identify the function(s) (derived, digital, or misc. pairs) of each protector block. Some protector blocks serve to protect more than one type of pairs.

Protectors ordered with the PG-FlexPlus field cabinet are packed in the battery compartment.

CAUTION ***Do not use protector units equipped with heat coils. Heat-coil type protectors may fail prematurely due to normal operating temperatures in outdoor field cabinets.***

ALARM INTERFACE PANEL

The field cabinet is shipped pre-wired with the standard alarm configuration that is specific to the factory-installed equipment. Refer to the schematic diagram provided with each field cabinet for factory-equipped wiring of alarms and DC Test Pairs. See Test Access and Alarms on page 37 for a complete description of the standard alarm and DC Test Pair wiring for specific model configurations.

WARNING

Under no circumstances should any wiring additions, deletions, or changes be made to the alarm interface panel. Improper or unauthorized changes could damage the power system and/or the PG-Flex^{Plus} PMU-712.

BATTERY INSTALLATION

OVERVIEW

This section describes the installation of Tyco IR30/IR40, Tyco 12IR125, and C&D FA12-125 batteries in a PG-FlexPlus field cabinet equipped with a Valere DC power system.

SUBSTITUTE BATTERY TYPES

A battery type other than Tyco IR-30, IR-40, 12IR125, or C&D FA12-125 may be substituted provided it meets the following criteria:

- Does not exceed the physical dimensions of the relevant Tyco battery type
- Has a terminal bolt- or stud-size compatible with the temperature probes
- Is electrically compatible with the temperature-compensated float charging system of the Valere
- Has the required reserve capacity, expected life, and temperature rating
- (For IR30/IR40 substitutes) is connectorized or can be modified to be connectorized the same as IR-30/IR-40 (see below).

Note that the standard PG-FlexPlus field cabinet is not equipped with any electrolyte containment system for the batteries and is in general suited only for starved electrolyte or “gel cell” type batteries. Do not use flooded-type batteries without the proper electrolyte containment system.

The IR-30 and IR-40 are each equipped with a connectorized cable that allows it to be plugged into the AMP Mate-N-Lok 4-position jack on the Group 65 battery cable. Any substitute battery must be equipped with the same style and length of connectorized cable.

OTHER DC POWER SYSTEMS

The standard factory cabling is connectorized for a specific power system. In general, the AC power, DC power, battery, ringing and alarm cabling of the PG-FlexPlus field cabinet is not reusable if a different power system is substituted. In particular, the temperature probes orderable with the PG-FlexPlus field cabinet are suitable only for Valere power systems. Do not attempt to modify them for use with any other DC power system.

SAFETY PRECAUTIONS

WARNING

When installing batteries and battery cabling, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons. Follow all instructions provided with the batteries. Installation and maintenance procedures must be followed and performed by trained personnel only.

CAUTION

Do not move the field cabinet with batteries in place. Install the batteries only after the field cabinet is installed in its final position. The field cabinet structure can be damaged if the field cabinet is lifted with batteries installed.

IR-30, IR-40, AND TEL-12-45 SLC BATTERY INSTALLATION

This section describes the installation of one or two strings of IR-30 or IR-40 batteries in the field cabinet equipped with the appropriate Group 65 cables and thermal probes. These two models of batteries are identical except that the IR-30 battery is shorter front to back.

Procedure

1. Open the field cabinet's front door.
2. Locate the battery cables and thermal probes in the battery compartment. These cables are packaged in plastic bags and are secured on the right side.
3. Secure the thermal probes to two batteries as shown in Figure 10.
4. If two battery strings (8 batteries) are being installed, place the batteries with thermal probes in the cabinet as shown in Figure 11 on page 30. If one battery string (4 batteries) is being installed, place the batteries with thermal probes in positions 1 and 2 on the left side of the battery compartment.
5. Install the remaining batteries in the positions shown in Figure 11 on page 30.
6. If the optional earthquake restraints were ordered, secure each battery with the factory provided straps.
7. Plug each battery into the battery cable as shown in Figure 11 on page 30.

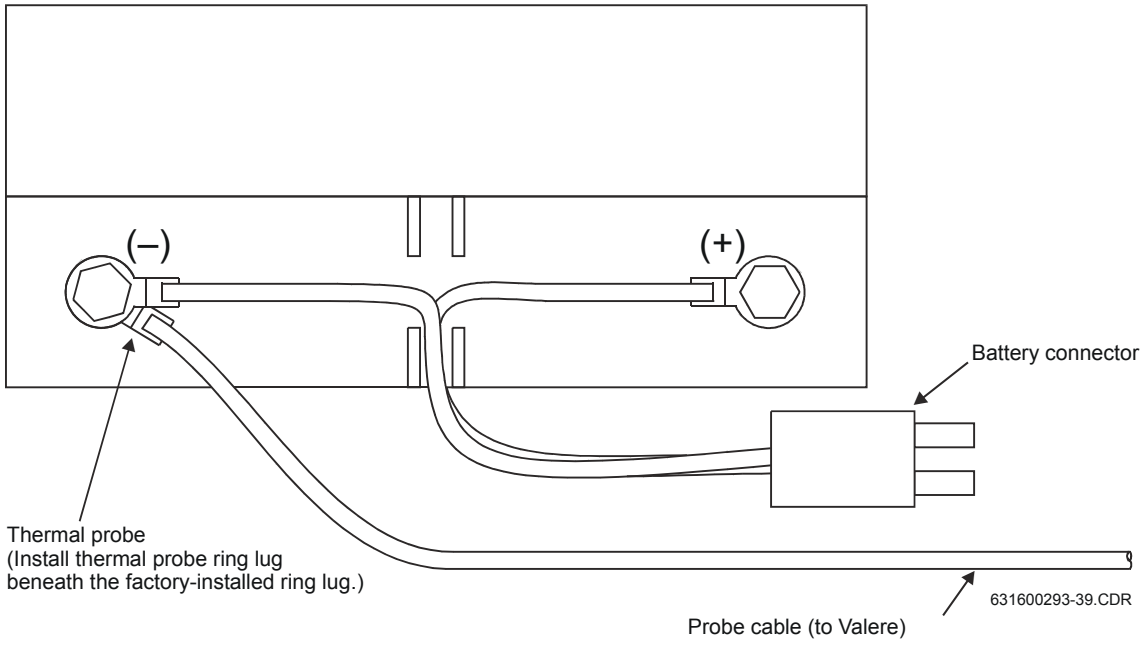


Figure 10. Securing the Thermal Probes to Tyco IR-30 or IR-40 Batteries

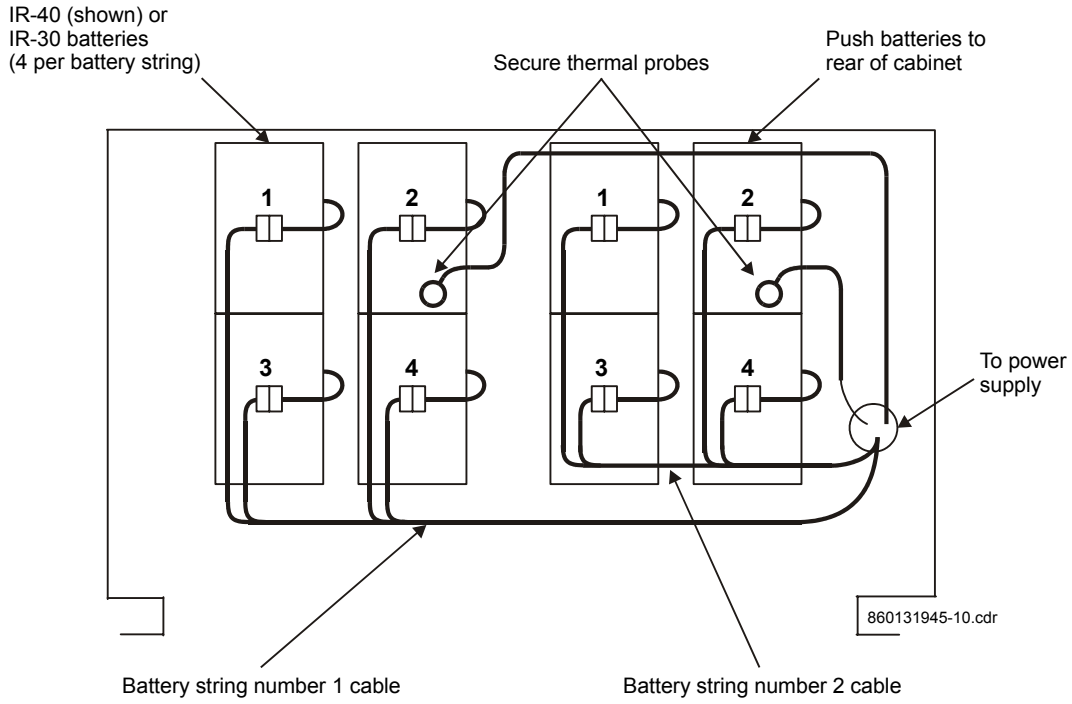


Figure 11. Tyco IR-30 or IR-40 Battery Installation Layout in PG-FlexPlus Field Cabinet

TYCO 12IR125 OR C&D FA12-125 BATTERY INSTALLATION

This section describes the installation of 12IR125 batteries in the field cabinet equipped with the appropriate cables and thermal probes.

Procedure

1. Open the field cabinet's front door.
2. Locate the battery cables and thermal probes in the battery compartment. These cables are packaged in plastic bags and are secured on the right side.
3. Place the batteries in the cabinet as shown in Figure 12 on page 32.
4. Locate the ring lug marked "Batt4(+)" and connect to the positive terminal of right-most battery as follows:

   Carefully remove hex nut and washer from this position.

   Place the ring lug over the stud and reinstall washer and hex nut.
5. Locate the ring lug marked "Batt1(-)' and one of the ring-type thermal probes (not marked) and connect to the negative terminal of the left-most battery as follows:

   Carefully remove hex nut and washer from this position.

   Place the thermal probe lug then the *Batt1(-)* lug over the stud and reinstall washer and nut.
6. Remove the hex nut and washer from the negative (left) terminal of Battery 3. Place the second thermal probe in position. (Do not reinstall nut and washer.)
7. Install the interbattery bus bars as shown in Figure 13 on page 32. Coat all battery connection hardware with **no-oxide** grease. Ensure that the thermal probe on the negative terminal of Battery 3 is seated between the battery and the bus bar.

CAUTION ***Do not connect fewer batteries to a battery string than is required. If fewer batteries are connected, thermal runaway can occur.***

8. Dress the battery and probe cables neatly on the top of the batteries.
9. Locate the battery thermal probe and four battery extension cables in the battery compartment. These cables are packaged in plastic bags and are secured in the battery tray in the bottom of the cabinet.
10. Dress the temperature probe to the side and plug it the Valere Power Shelf.

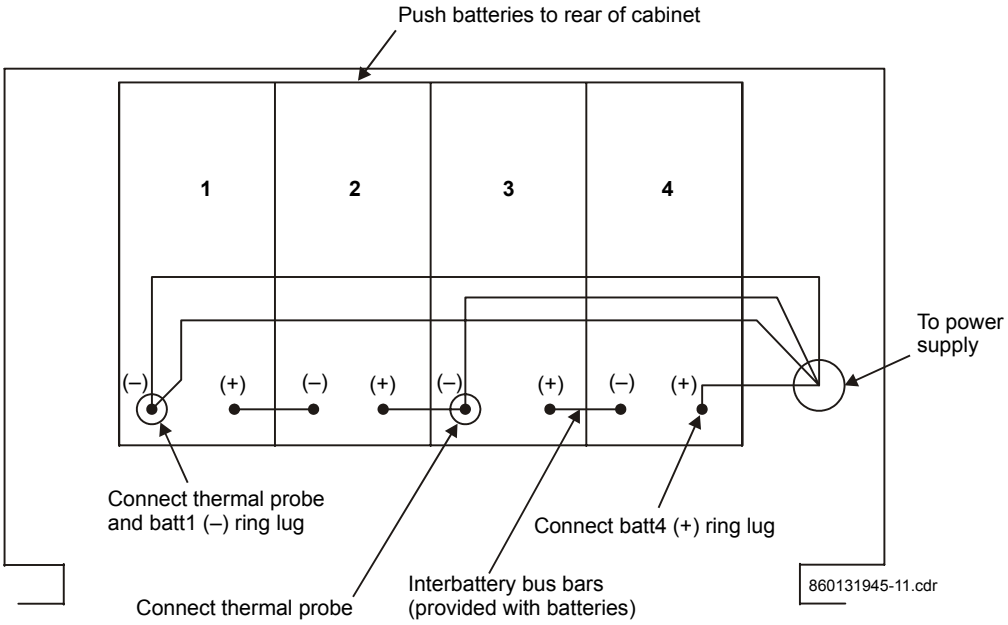


Figure 12. 12IR125 Battery Installation Layout (PG-FlexPlus Field Cabinet Shown)

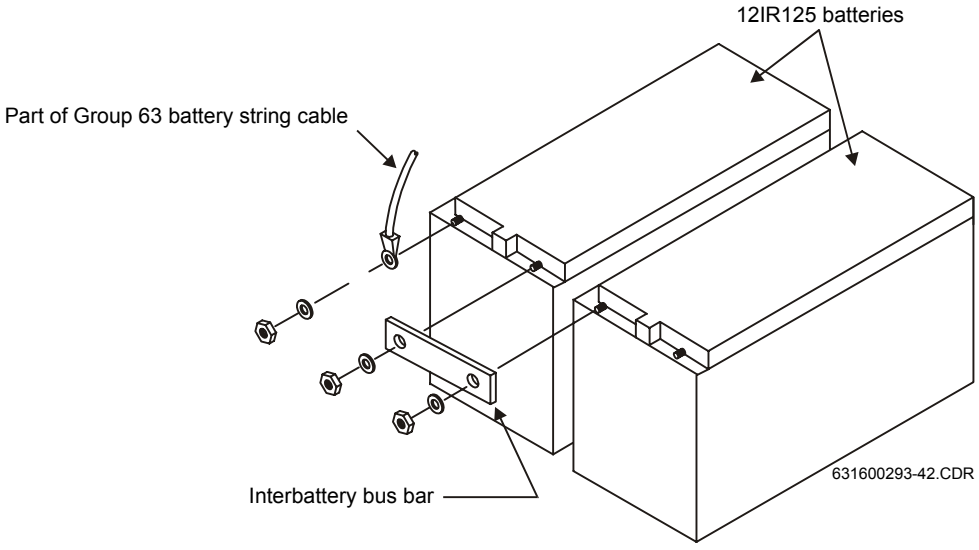


Figure 13. Tyco 12IR125 or C&D FA12-125 Battery Installation and Interconnection

REPLACEMENT AND REPAIR PARTS

Table 11 provides ordering information for repair and maintenance items. Replacement parts that are recommended to be stocked as spares are indicated by an asterisk "*". Additional parts are listed in Table 12 on page 34. Contact ADC customer support for these parts or other parts not listed.

Table 11. Replacement and Repair Parts

Item	Ordering Code[1]	Description
6F1-Fan Unit*	860 019 306	Replacement fan unit (same as Group 50)
6FQ1-Fan Unit*	860 019 389	Replacement low-noise fan unit (same as Group 1050)
6W3E Test Cord Assembly	106 411 325	Test cord used for test access at the protector blocks
AIP Assembly, 307-Mount*	848 228 607	Replacement AIP Assembly for all PG-FlexPlus field cabinets
Fuse, 1A*	406 432 989	1 Amp fuse for AIP and Valere Power System
Fuse, 5A*	406 203 976	5 Amp fuse for AIP and Valere Power System
Fuse, 10A*	406 203 190	10 Amp fuse for Valere Power System
Fuse, 15A*	407 000 421	15 Amp fuse for Valere Power System
Heat Exchanger Fan, Low-noise*	860 116 144	Replacement low-noise fan all heat exchangers in PG-FlexPlus field cabinets
Heater Pad, 120 V AC	847 589 645	Replacement battery heater pad
Heater Pad, 220 V AC	848 228 425	Replacement battery heater pad
HX Fan Thermostat, Standard	860 014 745	Replacement battery compartment thermostat for HX fans
HX Fan Thermostat, Equipment Compartment	860 014 752	Replacement equipment compartment thermostat for HX fans in field cabinets equipped with Group 21
Internal Fan	407 911 593	Replacement fan for 6F-fan units
Paint, Ultra-Light Gray–Aerosol	901 263 384	Field cabinet touch-up paint (spray can)
Paint, Ultra-Light Gray–Bottle	901 285 080	Field cabinet touch-up paint (brush-in-bottle)
Special Hex Key*	846 244 168	Replacement key used for opening field cabinet doors
* Replacement parts recommended to be stocked as spares.		

[1] Avaya part numbers

Table 12. Miscellaneous Supplemental Items

Item	Material ID	Description
Ground Lug, 2-AWG Wire (Panduit LAMA 2-14-Q)	405 733 965	Mechanical-type lug used for connecting a 2-gauge ground wire to the field cabinet ground bus
L-Connector Presser Tool	402 490 064	Used for joining 710 bridging and splicing modules to each other
W4DF Test Cord	105 329 395	Looping test cord. May be used for fault locating T1 extensions via the 307 block protectors

CABINET POWER SYSTEM TURN-UP

OVERVIEW

This section covers the turn-up of the Valere power system including installation of the rectifier modules and procedures for verifying the integrity of the installation.

IMPORTANT **Refer to *Valere Compact DC Power System Installation, Operation, and Maintenance* Manual (provided with the power system) for more details and information on operation, maintenance, and troubleshooting the power system.**

TOOLS AND MATERIALS

You will need the following tools and materials to install and test the Valere modules:

- Digital multimeter with an accuracy of 0.02%
- Small screwdriver (1/16-inch tip)
- Special hex key (used to open field cabinet doors)
- ESD wrist strap

INSTALLATION OF VALERE MODULES

The Valere power system is factory installed in field cabinets. Only the Valere modules are installed in the field.

Module Names

Table 13 lists the various modules and their associated Valere part numbers that are recommended for field cabinet applications. The installation of these modules is covered in this procedure.

Table 13. Standard Modules

Module	Valere Part Number
Rectifier (10A)	V500A
Rectifier (20A)	V1000A
Rectifier (25 A)	V1250A
System Controller	BC1000

Preparing to Install the Modules

1. Ensure that the correct type and quantity of modules for the specific application are available.
2. Open the field cabinet door using the special hex key.
3. Locate the AC service panel in the cabinet and place all AC circuit breakers in the **ON** position except the Auxiliary Generator Breaker (if equipped). A decal in the cabinet identifies the circuit breakers and their positions. If the field cabinet has a power junction box that is fed from a power pedestal, turn the AC circuit breakers in the power pedestal feeding the cabinet in the ON position.
4. Locate the Battery Circuit Breakers and place all breakers in the **OFF** position.
5. Connect your ESD wrist strap to a cabinet grounding point and make sure that it is connected at all times when handling any of the Valere molules or other plug-ins.

Installing the System Controller

1. Unpack the system controller and inspect for damage.
2. Insert the system controller module in the leftmost slot of the shelf, slide it toward the rear and lock it in the slot with the faceplate latch.

Installing the Rectifier Modules

1. Unpack the rectifier modules and inspect for damage.
2. Insert the rectifiers (up to the number of rectifiers required) in slots 1 through 4 of the shelf. Slide each rectifier toward the rear of the shelf and lock it in place with the faceplate latch.

The rectifier latches must be open for installation. Attempting to install the rectifiers with the latches closed will result in mechanical damage to the rectifiers and the self. The rectifiers will start in high fan speed mode and reduce their speed according to the ambient and plant conditions within 10 seconds. As each rectifier is installed, the controller automatically identifies the new rectifier and reconfigures the system. After all rectifiers have been installed, and if there are no alarms present, the controller will display “System OK”. If there are alarms present, refer to *Valere Compact DC Power System Installation, Operation, and Maintenance* Manual for troubleshooting assistance.

Controller Set Up

The controller is factory equipped with default settings to assure safe power up operation. The controller front display and three-button keypad can be used to configure the controller. The UP and DN buttons are used to scroll through the functions and the MENU button is used to select and/or drop down into a sub-menu.

There are three controller menu levels, Basic, Advanced, and Administrator. When the controller displays “System OK”, the controller is at the Basic menu level. The UP/DN buttons can be used to sequentially view basic plant parameters such as float voltage and plant current, temperature compensation state, battery temperature (if thermal probe is equipped), and internal plant temperature. By holding the MENU button down for 5 seconds, the Advanced level is accessed. All plant parameters can be viewed from this level by scrolling to and selecting “Review.” Follow the menu tree for exact navigation directions. By scrolling to and selecting “Log In’, the Administrator level is accessed. The default username is “Admin” (case sensitive) and the default password is “5001”. This level allows you to make changes to all plant settings. Enter the password by using the MENU button to select the number (character to be selected flashes) in the password and using the UP/DN buttons to toggle to the next character. Toggle to the right most arrow key and press MENU to enter.

Verify Plant Voltage and Current

With the display showing “System OK”, press up button once. Controller will display plant voltage and current

Post Test

Check for the following items after the installation and verification procedures have been completed.

1. Verify that each of the rectifiers is operational.
2. Return all Battery Circuit Breakers (with battery strings attached to them) to the **On** position.

If the batteries’ storage temperature exceeds 32°C (90°F), their open circuit time should not exceed 4 months.

For maximum safety, do not handle the batteries during their initial 24 hour charging period.

TEST ACCESS AND ALARMS

OVERVIEW

This section describes the testing of the field cabinet at the transmission equipment. Also described are the administration of alarms within the field cabinet and the transmission of alarms from the field cabinet to the central office (CO) and local office.

TEST ACCESS

Test access in the PG-FlexPlus field cabinet may be obtained at the transmission equipment or 307 protector blocks.

For test access at the transmission equipment, refer to the equipment documents. Refer also to the PG-FlexPlus schematic diagram and field cabinet labeling to determine the location of specific lines and pairs.

DC Test Pair

MLT may be performed remotely via the dedicated outside plant DC test pair to the central office or via a Remote Measurement Unit (RMU). The outside plant DC test pair can be accessed at the protector block, where a Teccor T52300B-N000-GT protector is used for surge protection (Figure 16 on page 38). The 6W3E test cord (Figure 15 on page 38) may be used to access the DC test pair at the protector block. If an RMU is equipped, a 3B2EW service-denied protector replaces the 3C1S protector for the DC test pair, since the outside plant pair is not used.

Digital Pairs

The T1 feeder lines in metallic feeder cabinets or T1 lines from DS1 extensions in fiber-fed cabinets may be accessed at the 307 protector block where the 3C3 or 3B3-type protectors are used to provide surge protection and bridging test access. The 6W3E test cord (Figure 15 on page 38) can be used for test access. A W4DF looping test cord (not provided with cabinet) may be used for fault locating (Figure 14).

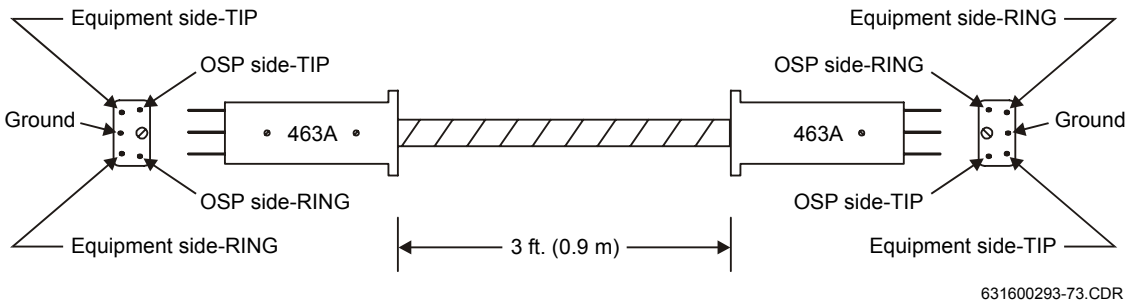


Figure 14. W4DF Looping Test Cord

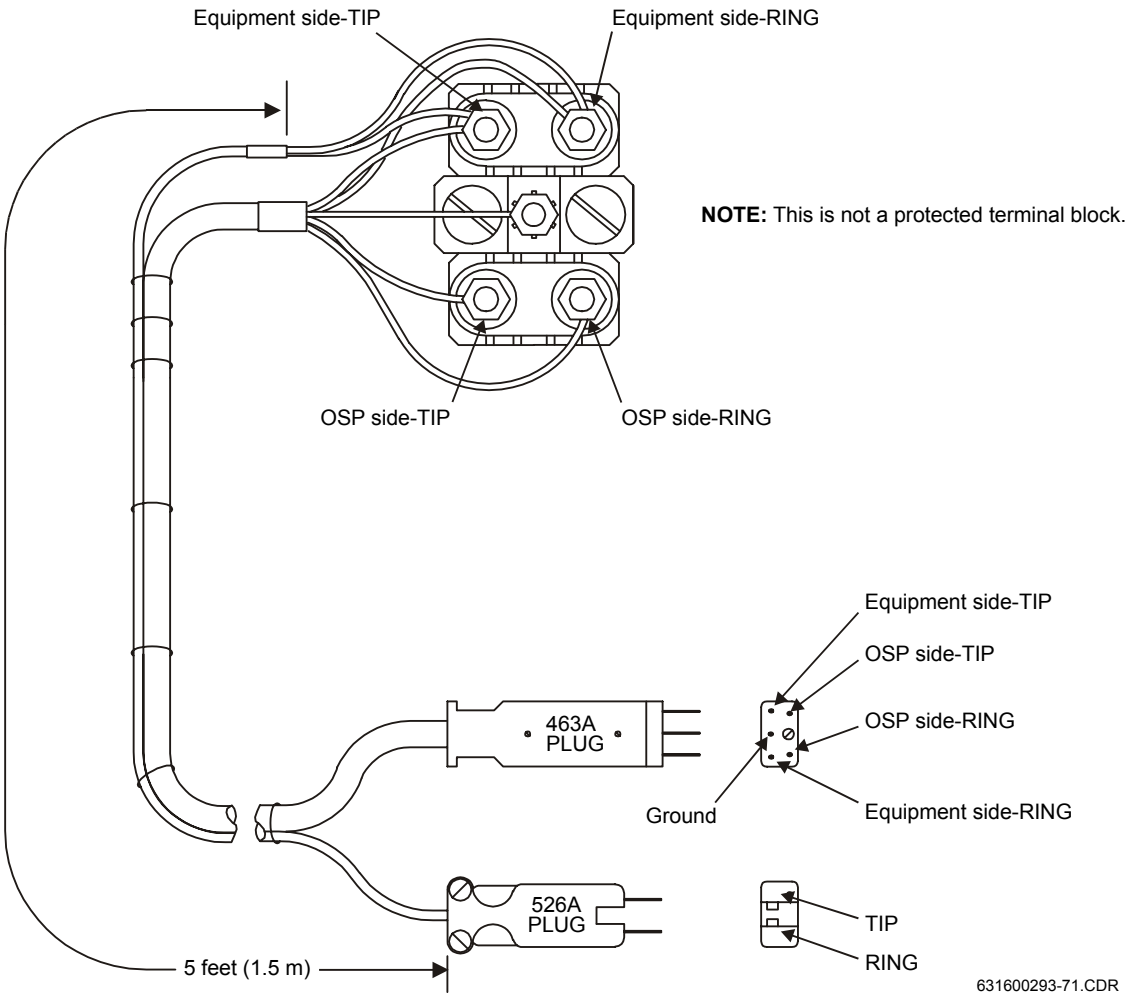


Figure 15. 6W3E Test Cord

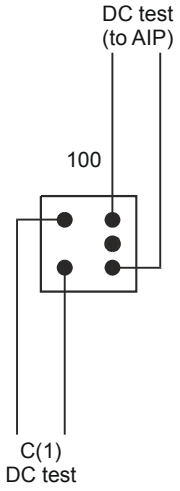


Figure 16. Wiring of Miscellaneous Pairs

ALARMS

This section describes the field cabinet and equipment alarm outputs, distant alarm outputs, alarm inputs, and their interconnection within the PG-FlexPlus field cabinet. Field cabinet and equipment alarm outputs are signals that result from an equipment fault or some other condition within the field cabinet (such as door open or AC power failure). Distant alarm outputs are signals that indicate a problem or condition elsewhere (such as on a multiplexer link). Alarm inputs are ports that accept alarm outputs and create a signal at a distant location (such as a central office or alarm-reporting center). All alarm outputs and alarm inputs available in the field cabinet are wired to the rear side of the AIP wire-wrap field. Cross-connections between the outputs and inputs are factory-installed on the front of the Alarm Interface Panel.

Alarm Interface Panel

The Alarm Interface Panel (Figure 17 on page 40) is a connectorized printed wiring board (PWB) assembly with a wire-wrapped pin field that allows for configuration of alarms. Field cabinet alarms and alarm inputs are factory-wired to the rear of the wire-wrap pin field.

The standard cross-connection of field cabinet alarms to alarm inputs is shown in Figure 18 on page 41 and on the decal located on the front door. Refer to the schematic or to the field cabinet decal for the actual cross-connections for that particular field cabinet.

Under no circumstances should any wiring additions, deletions, or changes be made to the alarm interface panel. Improper or unauthorized changes could damage the power system and/or the PG-Flex^{Plus} PMU-712.

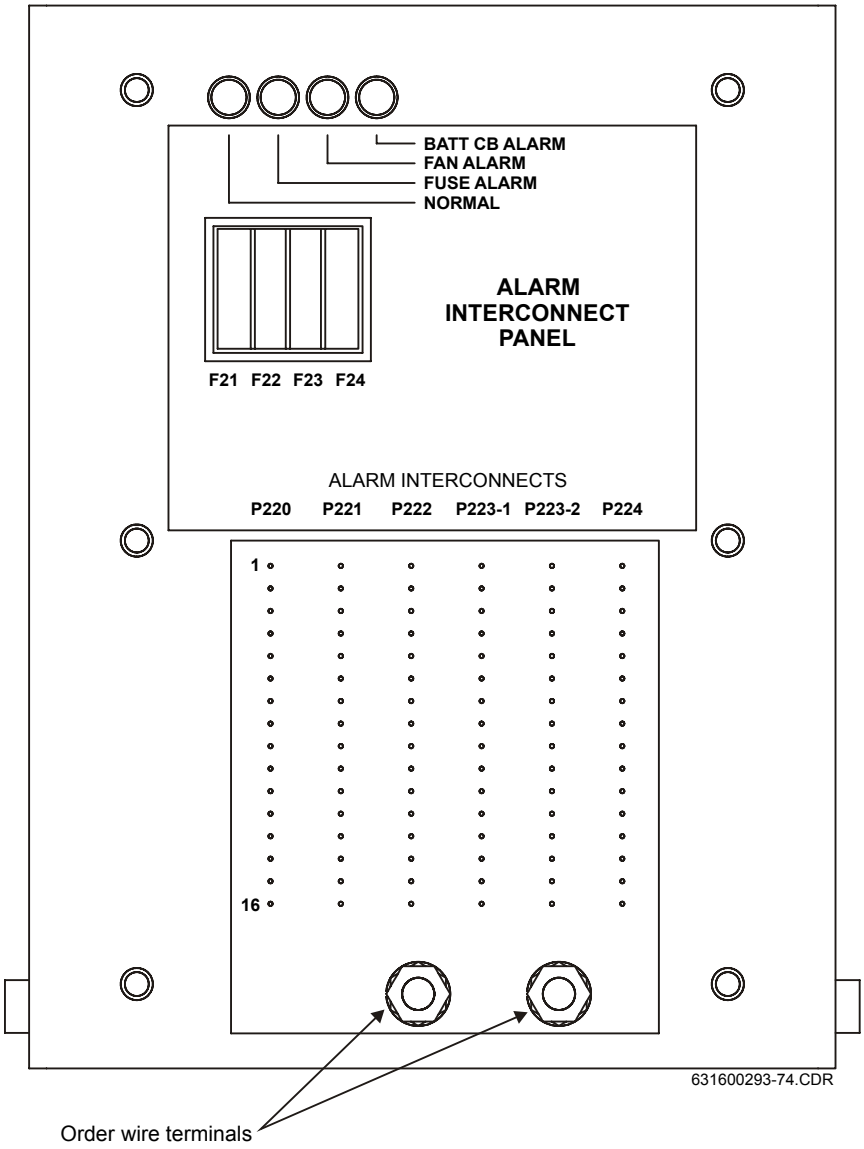
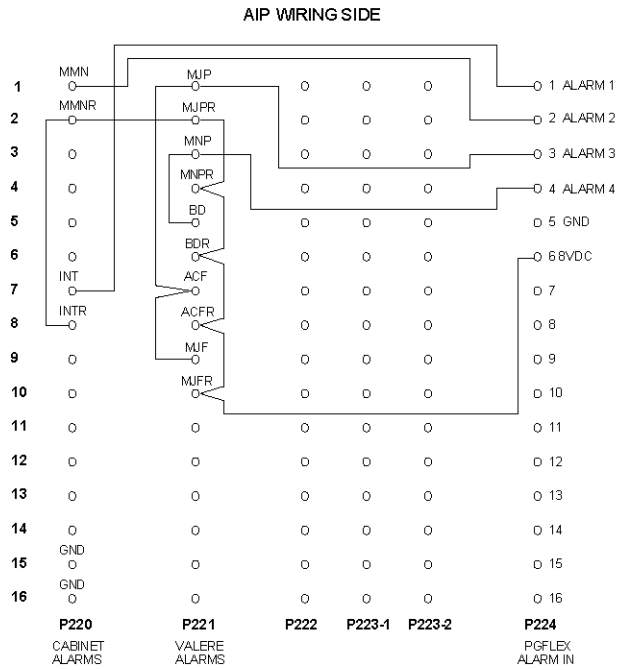


Figure 17. Alarm Interface Panel



ALARM ASSIGMENTS

ALARM	CABINET ALARM
1	INTRUSION (DOOR)
2	BAY / HX FAN FAIL
3	VALERE - MAJOR POWER, VALERE - MAJOR FUSE, VALERE - AC FAIL
4	VALERE - MINOR POWER, VALERE - BATTERY ON DISCHARGE

Figure 18. Front View Cabinet Alarms to Alarm Inputs

Troubleshooting

Follow the generic guideline below for troubleshooting alarms from a field cabinet:

1. Identify the alarm reported.
2. Check the tables below in the *Equipment Alarms* section and find the expected indicators for the reported alarm.
3. Verify that the expected indicators are present on the transmission/field cabinet equipment.
4. Check the alarm assignments on the field cabinet decal or schematic drawing to find possible alarm causes.
5. Identify the cause.
6. Repair or replace.

Equipment Alarms

The alarm information is transmitted from the field cabinet to the central office or Alarm Reporting system via the access equipment. Field cabinet wiring and jumpers on the alarm panel connect field cabinet and equipment alarms to the alarm input ports on the access equipment.

Alarm outputs are also available at the alarm panel, typically as isolated contact closures, to activate local office alarm circuits (e.g., audible and/or visual alarms).

The PG-FlexPlus schematic diagram and field cabinet labeling shows the alarm terminations and fuse assignments that are specific to your field cabinet configuration. When modifying cross-connections, it is important to identify the alarm output format and ensure that it is compatible with the alarm input.

Power System Alarms

The following alarms are available at the Alarm Interface Panel from the DC power and distribution system.

- Power Major: failure of a ring generator pair, low-voltage disconnect, excessive battery temperature, blown fuse in Valere, or battery disconnect open
- Power Minor: failure of at least one rectifier, ring generator, battery temperature probe, or at least one rectifier on Standby
- Major Fuse Alarm: blown fuse, also included Power Major above (See Schematic and/or field cabinet labeling for fuse assignments)
- Battery on Discharge
- AC Failure: loss of AC input voltage to at least one rectifier

Table 14. Power System Alarm Formats, Abbreviations, and Indicators (P221)

Alarm Name	Label Abbreviation	Electrical Format	Indicator(s)
Power Major	MJP, MJPR	Isolated Closure	Red PMJ LED on MCU/ACU
	AUX_MJP	Closure to –48 V	
Power Minor	MNP, MNPR	Isolated Closure	Yellow PMN LED on MCU/ACU
	AUX_MNP	Closure to –48 V	
Battery on Discharge	BD, BDR	Isolated Closure	Red BD LED on Power Shelf
AC Failure	ACF, ACFR	Isolated Closure	Yellow AC Fail LED on MCU/ACU
Major Fuse Fail	MJF, MJFR	Isolated Closure	Red MJF LED on Power Shelf and Blown Fuse (F1-F14)

Field Cabinet Environmental Alarms

The PG-FlexPlus field cabinet produces the following environmental alarms:

- Intrusion (door open)
- Fan Failure - part of Miscellaneous Minor Alarm
- Major Power
- Minor Power

Table 15. Environmental Alarm Formats, Abbreviations, and Indicators

Flex Environ. Alarm Number	Alarm Name	Label Abbreviation	Electrical Format	Indicator(s)
1	Intrusion	INT, INTR	Isolated Closure	None Standard
		AUX_INT	Closure to –48 V	
2	Fan Failure (part of Misc. Minor)	MMN, MMNR	Isolated Closure	Yellow *FAN ALARM* LED on AIP and Red LED on Fan Unit
		AUX_MMN	Closure to –48 V	
3	Power Major	MJP, MJPR	Isolated Closure	Red Fuse Alarm LED on AIP
			Closure to –48 V	
4	Power Minor	MNP, MNPR	Isolated Closure	Yellow *FUSE ALARM* LED on AIP and Blown Fuse (F21-F24)
			Closure to –48 V	

Intrusion Alarm

The door switch can be pulled out to retire the intrusion alarm when servicing the cabinet. The switch will reset when the door is closed.

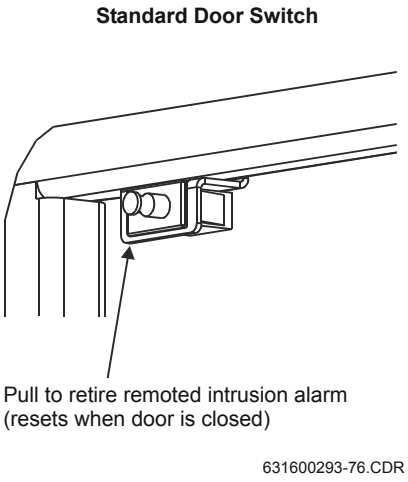


Figure 19. Door Switch

FIELD EQUIPMENT INSTALLATION AND CABINET MAINTENANCE

OVERVIEW

This section covers the field installation of equipment into the cabinet and addresses maintenance items. This section only covers the field installation of equipment into cabinets that have been pre-cabled for that equipment.

FIELD EQUIPMENT INSTALLATION

Tools

The tools and equipment needed for field installation are as follows:

- Blade screwdriver
- Cable ties
- Marker pen
- Metric socket set
- Screw-holding blade screwdriver (optional)

Generic Equipment Installation Procedure

Follow the generic installation procedure for installing equipment shelves or subracks into a cabinet that has been pre-cabled for that equipment. This procedure can also be used if the wiring was not preinstalled at the factory but was ordered and is now on hand for installation into the cabinet. Reference the cabinet Schematic Diagram for a description of how the cables are routed through the cabinet and approximately where interconnections should take place.

Field installation of some cabling is difficult after other equipment has been installed in the rack.

Do not install field installed equipment in a location that blocks airflow to the circuit packs in the access electronics or optical multiplexer.

1. Locate the Schematic Diagram (block wiring diagrams) to determine the factory recommended location and connections for the equipment.
2. If the cabinet was pre-cabled, identify, on the schematic, all of the power, alarm, and transmission connections to be made and locate each of them in the cabinet.
3. If the cabinet was not pre-cabled, install the cabling in the cabinet using the cable routing shown in the schematic as a guide.
4. Unpack the equipment and identify all required connections to cabinet cabling.
5. Install the shelf or subrack into the equipment rack in the location shown on the schematic diagram using at least two screws on each side of the shelf (four total).
6. Mate all cabinet wiring to subrack connectors as shown on the Schematic Diagram.
7. Once the equipment is installed and all connections made, neatly dress and secure all cables.

MAINTENANCE

Certain field cabinet components (fans, batteries, heater pads, etc.) have life expectancies that are shorter than that for the field cabinet structure and wiring and may need periodic maintenance/ replacement for continued trouble-free system functioning.

Routine Inspection Procedure

This section provides the procedures for performing a routine inspection of the PG-FlexPlus field cabinet. These procedures do not include the inspection and/or maintenance required by the battery plant; for those procedures, refer to the manufacturer's service manual for the particular type of battery used in the field cabinet. It is recommended that the maintenance procedures described in this section be coordinated with battery maintenance.

Have trained/qualified technician perform all service. Perform the maintenance activities on the schedule listed in the following table. Review all safety instructions and precautions before attempting to service or repair the field cabinet or any components.

Use this procedure to perform a routine inspection of the field cabinet and specified components. This procedure should be done whenever the field cabinet is visited and at least every 6 months. Service more often if operating in extremely dusty or dirty conditions. Some steps do not apply to all field cabinets.

Check Battery Compartment/HX Air Inlets

See Instruction Sheet 631-600-293-17 *Heat Exchanger Inlet Inspection and Cleaning*.

1. Inspect the battery compartment air outlets to ensure they are clear of debris; clean if necessary. The air outlet is located on the field cabinet's exterior left side near the bottom.
2. Ensure the area near the heat exchanger door air inlets is clear of debris that could possibly clog the inlets.

Check Surge Arrester

1. Open the field cabinet door and locate the surge arrester on the right side of the AC power panel. Verify that the indicator is lit.
2. If the indicator is not lit, have a qualified electrician replace the surge arrester.

Check AC Circuit Breakers

1. Locate the circuit breakers feeding the battery heater on the AC power panel.
2. Verify that the circuit breaker is in the *ON* position.
3. If the circuit breaker is off, reset the circuit breaker. If the circuit breaker trips again, resolve per local procedures.

Check GFCI Outlet

1. Locate the ground fault circuit interrupt (GFCI) outlet on the right side of the AC power panel.
2. Test the outlet per the instructions on the AC power panel label.
3. If the GFCI outlet fails, have a qualified electrician replace the outlet.

Inspect Field Cabinet Mounting Bracket

1. For field cabinets that are mounted on a pole-mount or H-frame/wall-mount bracket, inspect the bracket for rust and/or damage. Pay particular attention to the four inserts in the rear side of the field cabinet.
2. If required, touch-up and/or repair as necessary.

Fan Replacement Procedures

Because the fans used in the field cabinet are a wear item, the standard maintenance procedure for fans is to replace the fan unit assembly when a fan alarm is reported. It is not recommended that an individual fan motor be replaced.

All field cabinet fans exceed the Telcordia required minimum 40,000-hour L10 life rating (90% of fans operating satisfactorily after this time period, approximately 5 years).

6F-type Fan Unit Replacement Procedure

1. Remove the AIP fuse(s) feeding power to the bay fans.
2. Locate the 6F-type Fan Unit at the top of the rack in the electronics compartment, directly above the Valere power system.
3. Using a screwdriver, remove the two screws on the front of the fan unit.
4. Slide the fan unit forward and tilt downwards. Keep the rear tabs engaged so the fan unit is held in place.
5. Unplug the three fan connectors, which are located behind the fans, and remove the fan unit.
6. Position the replacement 6F-type Fan Unit so it is hanging by the rear tabs.
7. Connect the three fan connectors.
8. Slide the fan unit into position and secure the fan unit with the two screws removed in Step 2.
9. Insert the AIP fuse(s) feeding power to the bay fans.
10. Check for airflow at the front of the fan unit to ensure that the fans are functioning.
11. Check to ensure that no fan or fuse alarms are active.

Heat Exchanger Fan Replacement Procedure

1. Remove the AIP fuse(s) feeding power to the HX fans.
2. To access the heat exchanger fans at bottom of the front door, the heat exchanger cover must be opened. Using a Phillips screwdriver, remove two M8 screws with sealer washers (Figure 20 on page 48).
3. Locate and unplug the fan's connector. The fan cable will be routed through a grommet at the bottom right side of the electronics compartment. The connectors are located inside the electronics compartment near this grommet.
4. Using a Phillips screwdriver, remove the two M8 screws that secure each fan-mounting bracket to the door. Make sure the fan assembly is supported when removing the screws.
5. Cut any cable ties and remove the fan assembly.
6. Route the new fan cable through the field cabinet door opening beside the cable tie.
7. Attach the new fan and mounting bracket to the door using two M8 screws.
8. Route the cable through the grommet and reconnect.
9. Properly dress the cable and secure with cable ties. Ensure that the door can open and close completely without damaging the fan cables.
10. Insert the AIP fuse(s) feeding power to the bay fans.
11. Check for airflow at the front of the fan to ensure that the fans are functioning.
12. Check to ensure that no fan or fuse alarms are active.

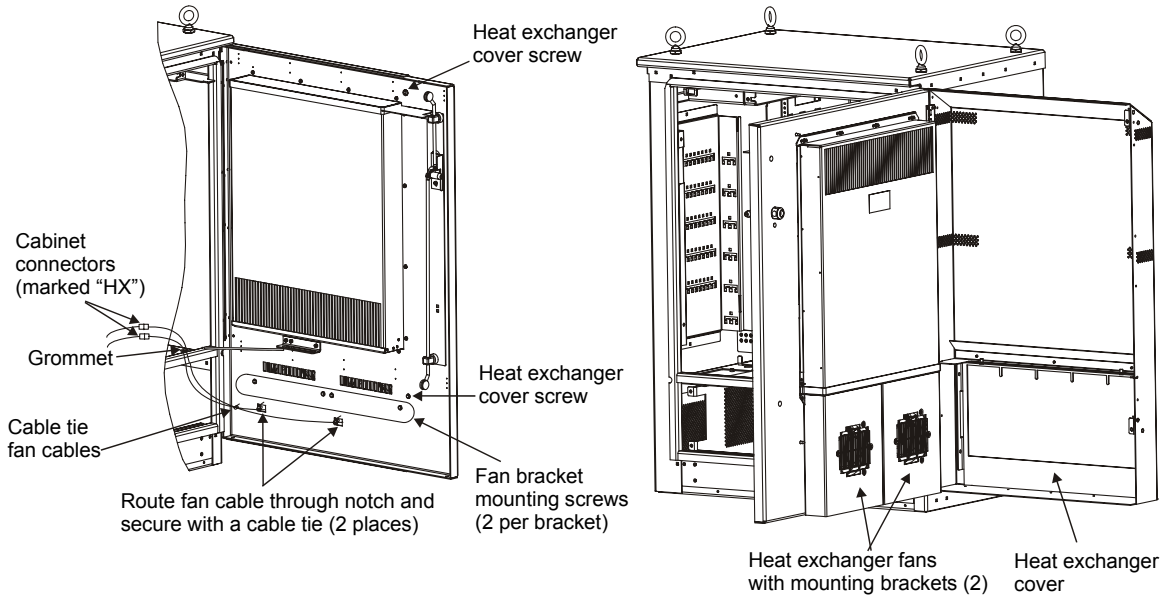


Figure 20. Heat Exchanger Fan Installation

Batteries

WARNING ***Placing the battery switches in OFF position does not provide complete protection for working on batteries. Follow standard safety procedures when inspecting batteries.***

Periodic monitoring of battery condition is necessary to ensure sufficient reserve capacity in an emergency situation. It is recommended that the battery plant in a field cabinet be checked for individual battery condition and capacity every six months.

Replace batteries only as full strings when maintenance indicates that an individual battery or the string it is in does not meet its manufacturer’s recommended requirements for open cell voltage or charge holding capacity.

Battery Heater Pads

Because the battery heater pads do not report an alarm when they are functioning improperly, it is a good idea to test the pads during regular battery maintenance.

Battery Heater Pad Inspection Procedure

1. Locate the heater thermostat located at the left side of the battery compartment.
2. Follow the leads from the thermostat to the connector and disconnect it.
3. Using a VOM set to measure resistance, insert the VOM’s probes into the connector attached to the heater pad and measure its resistance.
4. Verify that the reading is per Table 16 on page 49.

Table 16. Battery Heater Pad Inspection Procedure Test Values

Group	On	Off
14 or 15 (120 V AC heater)	56 ± 15 ohms (Version 1) 78 ± 15 ohms (Version 2)	Open circuit (OL or > 1 M ohm)
Note: The heater pad is designed to turn on at 32 ± 5°F (0 ± 3°C) and not turn off until its thermostat senses 50 ± 5°F (10 ± 3°C).		

5. If the pad is **on**, verify the resistance measurement and turn it **off** by heating the thermostat to verify it opens. (Can be heated by holding an ungloved hand or a heat gun to it until it clicks open.)
6. If the pad is **off**, turn it on by cooling the thermostat to verify it closes and has the correct resistance measurement. (Can be cooled using a freeze spray.)
7. If the pad is operating properly, reconnect its connector to field cabinet wiring.
8. If the pad is not operating properly, replace it using *Battery Heater Pad Replacement* procedures.

Battery Heater Pad Replacement Procedure

Replacing a battery heater pad requires that the batteries on top of the pad be first removed. Remove the batteries and replace the heater pad as follows:

1. Place the battery breakers located on the Valere shelf in **OFF** position.
2. Locate the AC panel and identify the circuit breaker for the battery heaters and turn to the **OFF** position.
3. Disconnect the inter-battery connections and the battery string cables for the batteries.
4. Remove the batteries from the cabinet.
5. Locate the thermostat, which is mounted to the battery heater cover at the left side of the battery compartment. Using a screwdriver, remove the thermostat.
6. Follow the leads from the thermostat to the connector and disconnect it.
7. Using a Phillips screwdriver, remove the four screws that secure the battery heater cover which are located across the front of the cabinet.
8. Lift the front of the battery heater cover and slide the cover forward to remove.
9. Remove the defective pad and replace it with the new replacement heater pad.
10. Reinstall the battery heater cover.
11. Install the thermostat of the new pad as the old thermostat was installed.
12. Connect the new pad to the cabinet wiring.
13. Turn on the battery heater circuit breaker at the AC panel.
14. Reinstall the batteries following the instructions provided in this section.

GLOSSARY

A

ACU – Alarm and Control Unit

Adapter – Typically a nonattenuating fiber optic connector (a zero **buildout**). (Formerly called a coupler.)

Adapter Panel – Bulkhead, sometimes modular, used to mount **adapters** and **buildouts**. Usually means the part unequipped with **adapters** or **buildouts**. (Sometimes called a coupler panel or connector panel.)

ADSL – Asynchronous Digital Subscriber Line

AIP – Alarm Interface Panel

B

Buildout – Attenuation inserted into a transmission/signal path (for example, order wire buildout or fiber optic buildout). Fiber optic buildout is a coupler with attenuation.

Bulk Power – Preferred DC power architecture in which one set of rectifiers and batteries is shared by an entire structure, as distinguished from ***Distributed Power***; sometimes meant as including ***Bulk Ringing***.

Bulk Ringing – Preferred ringing power architecture in which one set of ring generators is shared by many transmission equipment modules; using implied as part of ***Bulk Power***.

C

Central Office – Site of host transmission equipment and/or telephone switching equipment. The central office may also be the location of the alarm monitoring system.

Channel Bank – Transmission equipment shelf which interfaces with customer lines via channel units.

Channel Unit – Service-specific plug-in, assigned to specific customer line(s).

CIC – *Customer Information Center*, location where Outside Plant documents are stocked and distributed.

CCS – Unit of ***DS0*** traffic, specifically hundred call-seconds/hour (see ***Traffic Rate***).

CO – Central Office

COT – *Central Office Terminal*, in ***Universal DLC*** only, the equipment that interfaces DS0 channels from the CO switch to digital carrier for transport to the Remote Terminal.

Coupler – Typically a non-attenuating fiber optic connector, for example a zero **buildout**.

Coupling – Same as coupler.

Coupler Panel – Bulkhead, sometimes modular, used to mount **couplers** and **buildouts**. Usually means the part unequipped with **couplers** or **buildouts**.

Cross-Connect – A wire-termination field that enables administration of telephony, alarm or other circuits with jumper wires. *FDI* are examples of cross-connects.

D

DC ByPass Pair – Same as **DC Test Pair**

DC Test Pair – Circuit used to access customer DS0 circuits to test integrity from the CO, either over dedicated outside plant twisted pair or via ***RMU*** and DS0 circuit.

Derived Pairs – ***DS0*** circuits from a ***channel bank***, also called Voice Frequency (***VF***) Pairs, although not always analog.

Distribution – Cable running toward the customer from an ***RT***, ***ONU***, or ***FDI*** (see also ***Feeder***).

Digital Pairs – ***DS0*** circuits from a ***channel bank***, also called Voice Frequency (***VF***) Pairs, although not always analog. See DS1 or T1.

DS0 – Voice channel, specifically 64 kbit/s equivalent digital bandwidth. Bi-directional, typically carried on one twisted pair.

DS1 – Lowest rate, standard digital telephony rate = 1.544 Mb/s, equivalent to 24 ***DS0***s, occasionally used to mean *T1* format. Carried on separate transmit and receive twisted pairs.

E

E1 – Lowest rate, standard digital telephony rate = 2.048 Mb/s, equivalent to 30 ***DS0***s. Carried on separate transmit and receive twisted pairs

Erlang – Measure of percentage of DS0 lines in use for given system, where 1 Erlang = 100% of lines off-hook. (See also ***Traffic Rate***.)

F

FAP – *Fuse and Alarm Panel*

Fault Locating– Procedure, typically using dedicated twisted pairs from CO to RT, for finding a failure in a T1 carrier in the outside plant.

FDI – *Feeder Distribution Interface*—Also called a cross-connect.

Fiber Feeder– Optical, often SONET, interface from the **CO** to the **RT**.

G

GFCI – *Ground Fault Circuit Interrupt*. Used for AC convenience outlets to provide maximum personal protection from electrical shock. Not suitable, however, for use with certain portable test equipment.

H

Hardened – Designed to higher-than-normal environmental specifications, specifically (for cabinets), designed with -40 to +85°C rated components. (See also ***Uncontrolled environment***.)

HX – *Heat Exchanger*, used in remote terminal cabinets to dissipate equipment heat to the outside environment without mixing outside air with cabinet air.

I

ISDN – *Integrated Services Digital Network*

Integrated DLC – Newer architecture in which digital carrier (e.g. ***DS1***) from remote terminals connects directly to CO digital switch without conversion back to ***DS0***; there is no Central Office Terminal.

L

LED – *Light-emitting diode,* a semi-conductor which emits light, used in displays such as meters, clocks, calculators, etc.

LGX – *Lightguide Cross-Connect*, Lucent product family of fiber termination shelves and hardware.

Loop – The last part of the telecommunications circuit between the switch and the customer.

LVD/R – *Low-Voltage Disconnect/Reconnect*, component of the Cabinet Power System.

LW – Lightwave, typically LW multiplexer.

M

MCU – *Monitor and Control Unit*—A component of the Cabinet Power System.

Metallic – Using twisted pair wires or coax cable.

Metallic Feeder – Typically DS1 rate twisted pair interface from **CO** to **RT**.

Miscellaneous Pairs – Usually refers to dedicated twisted pairs from CO to ***RT*** enclosure which are not in the transmission path and are used for test and troubleshooting. Typically include ***DC Test***, ***Order Wire***, and ***Fault Locate*** Pairs.

MLT – *Mechanized Loop Testing*, a common method for remotely testing the integrity of twisted pair telephony circuits between the ***RT*** and the customer location.

MM – *Multimode*, optical fiber type that allows a large number of optical modes of propagation.

MUX – *Multiplexer*—Typically refers to an optical multiplexer, such as the Lucent ***WaveStar*** ADM 4/1.

N

NC – Normally Closed

NEBS – Network Equipment Building Services

NID – Network Interface Device

NO – Normally Open

O

OC1 – Slowest rate ***SONET*** format, optical equivalent of one ST***S1E***, one ***DS3***, 28 ***DS1***s or 672 ***DS0***s.

OC3 – Next-higher-speed commonly-used ***SONET*** format after ***OC1***, equivalent to three ***OC1***, 84 ***DS1***s, or 2016 ***DS0***s.

OC12 – Next-higher-speed commonly-used ***SONET*** format after ***OC3***, equivalent to four ***OC3***, twelve ***OC1***, 336 ***DS1***s, or 8064 ***DS0***s.

OLIU – *Optical Line Interface Unit*

Order Wire – Dedicated twisted pair circuit, linking many ***RT***s in a daisy-chain, for direct craft communication to CO.

OSP – *Outside Plant*

Overhead – Usually refers to Overhead Telemetry (see ***Telemetry***).

P

POTS – *Plain Old Telephone Service*, basic service as distinguished from **special** services; with bi-directional transmission over one twisted pair.

Protection – Redundancy, also called “Protect”, typically for transmission circuits or circuit packs, generally required for electronics serving 48 or more customers.
2. Electrical overvoltage/overcurrent devices (“Protectors”) used to guard electronics from lightning surges and accidental utility power connection to outside plant cables.

PWB – *Printed Wiring Board*

R

Rectifier – AC-to-DC converter, with output typically connected in parallel with battery backup

RMU – *Remote Measurement Unit*, accesses the ***DC Test*** interface to ***RT*** channel banks in response to commands from the CO transmitted over a dedicated DS0 channel.

RT –*Remote Terminal*, the equipment that interfaces DS0 channels from the customer equipment (e.g. telephones) to digital carrier for transport to the CO.

Ring Generator – Sometimes called a ***Ringer***, a power supply which provides a constant source of ***Ringing*** that may be accessed by channel units.

Ringer – A ***Ring Generator***. The sound-generating device for a telephone.

S

SDH – *Synchronous Digital Hierarchy,* the current European standard signal rates and formats for digital transmission, adopted and renamed by Telcordia as SONET.

SD – *Schematic Drawing*

SM – *Singlemode*, fiber type with a core diameter in which only a single mode, the fundamental mode, is capable of propagation

SLC – LUCENT product name for digital loop carrier transmission systems, stands for Subscriber Loop Carrier (for example, SLC 96, SLC Series 5, SLC 2000).

SONET – *Synchronous Optical Network*, consists of OC***x*** optical signal formats of ***SDH***.

Specials – Special service lines or special service channel units, as distinguished from POTS (for example, coin, data, ISDN).

T

T1 – Lowest speed digital carrier, approx. 1.5 Mb/s, using 130 V amplitude to counteract voltage drop over long distances.

Telemetry – Usually refers to transmitting of alarm and status information by an embedded data channel multiplexed into a digital bit stream.

Tip and Ring – 1. Historical designations for conductors of standard 2-wire telephone circuits.
2. Standard designations incorporated in naming of conductors of any paired wire telephony circuit

Traffic Rate– Measure of percentage of DS0 lines in use for given system; expressed in units of hundred call-seconds/hr or ***CCS***, where 36 CCS = 100% of lines off-hook.

U

Uuncontrolled Environment – In thermal and humidity terms: without active heating or air-conditioning and thus subject to the normal range of outdoor conditions. Electronics must generally be ***hardened*** for use in such an environment.
In safety (for example, ***UL***) terms: a building or space in a building that is accessible by untrained personnel.

V

VF – *Voice Frequency*, refers to analog ***DS0*** services, often used to mean any DS0 service (see ***Derived Pairs***).

PRODUCT SUPPORT

TECHNICAL SUPPORT

Technical Assistance is available 24 hours a day, 7 days a week by the contacting Customer Service Engineering group at:

Telephone:	800.366.3891 The 800 telephone support line is toll-free in the U.S. and Canada.
Email:	wsd_support@adc.com
Knowledge Base:	www.adc.com/Knowledge_Base/index.jsp
Web:	www.adc.com

LIMITED WARRANTY

Product warranty is determined by your service agreement. Refer to the ADC Warranty/Software Handbook for additional information, or contact your sales representative or Customer Service for details.

RETURNS

To return equipment to ADC:

1. Locate the number of the purchase order under which the equipment was purchased. To obtain a return authorization number, you need to provide the original purchase order number to ADC's Return Material Authorization (RMA) Department.
2. Call or write ADC's RMA Department to ask for an RMA number and any additional instructions. Use the telephone number, fax number or email address listed below:
   - Telephone: 800.366.3891
   - Email Address: repair.return@ADC.com
3. Include the following information, in writing, along with the equipment you are returning:
   - Company name and address
   - Contact name and telephone number
   - Shipping address to which ADC should return the repaired equipment
   - Original purchase order number
   - Description of the equipment that includes the model and part number of each unit being returned, as well as the number of units that you are returning.
   - Reason for the return. For example:
     – The equipment needs an ECO/ECN upgrade.
     – The equipment is defective.

If the equipment is defective, please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.

If there is any other reason for returning the equipment, please let us know so we can determine how best to help you.

4. Pack the equipment in a shipping carton.

5. Write ADC's address and the RMA Number you received from the RMA Department clearly on the outside of the carton.

All shipments are to be returned prepaid. ADC will not accept any collect shipments.

FCC CLASS A COMPLIANCE

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

MODIFICATIONS

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by ADC voids the user's warranty.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code.

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ADC Telecommunications, Inc.
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Minneapolis, Minnesota USA 55440-1101

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800.366.3891

ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

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