Ferroresonant Switchgear Regulator System (SGRS)
Removable Constant Current Regulator Powerpack

User Manual

96A0303, Rev. H, 2020/06/26

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and FAA Airfield regulations. The FAA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

All Products Guarantee

ADB SAFEGATE will correct by repair or replacement per the applicable guarantee above, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, and provided further that Buyer gives ADB SAFEGATE written notice of such defects after delivery of the goods to Buyer. Refer to the Safety section for more information on Material Handling Precautions and Storage precautions that must be followed.

ADB SAFEGATE reserves the right to examine goods upon which a claim is made. Said goods must be presented in the same condition as when the defect therein was discovered. ADB SAFEGATE furthers reserves the right to require the return of such goods to establish any claim.

ADB SAFEGATE's obligation under this guarantee is limited to making repair or replacement within a reasonable time after receipt of such written notice and does not include any other costs such as the cost of removal of defective part, installation of repaired product, labor or consequential damages of any kind, the exclusive remedy being to require such new parts to be furnished.

ADB SAFEGATE's liability under no circumstances will exceed the contract price of goods claimed to be defective. Any returns under this guarantee are to be on a transportation charges prepaid basis. For products not manufactured by, but sold by ADB SAFEGATE, warranty is limited to that extended by the original manufacturer. This is ADB SAFEGATE's sole guarantee and warranty with respect to the goods; there are no express warranties or warranties of fitness for any particular purpose or any implied warranties of fitness for any particular purpose or any implied warranties other than those made expressly herein. All such warranties being expressly disclaimed.

Standard Products Guarantee

Products of ADB SAFEGATE manufacture are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

Note

See your sales order contract for a complete warranty description.

FAA Certified product installed in the United States and purchased or funded with monies through the Airport Improvement Program (AIP) installations guarantee

ADB SAFEGATE L858 Airfield Guidance Signs are warranted against mechanical and physical defects in design or manufacture for a period of 2 years from date of installation, per FAA AC 150/5345-44 (applicable edition).

ADB SAFEGATE L858(L) Airfield Guidance Signs are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition).

ADB SAFEGATE LED light fixtures (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). .

Note

See your sales order contract for a complete warranty description.

Liability

WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

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1.0 Safety

Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

1.1 Safety Messages

HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.

	WARNING Failure to observe a warning may result in personal injury, death or equipment damage.
	DANGER - Risk of electrical shock or ARC FLASH Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.
	WARNING - Wear personal protective equipment Failure to observe may result in serious injury.
	WARNING - Do not touch Failure to observe this warning may result in personal injury, death, or equipment damage.
	CAUTION Failure to observe a caution may result in equipment damage.

Qualified Personnel

	Important Information The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements. Always use required personal protective equipment (PPE) and follow safe electrical work practice.

1.1.1 Introduction to Safety

CAUTION

Unsafe Equipment Use
This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow this instruction can result in serious injury or equipment damage

Additional Reference Materials

Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 - Electrical Installations in Buildings.
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

1.1.2 Intended Use

CAUTION

Use this equipment as intended by the manufacturer
This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

Failure to follow this instruction can result in serious injury or equipment damage

1.1.3 Material Handling Precautions: Storage

CAUTION

Improper Storage
Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

Failure to follow this instruction can result in equipment damage

1.1.4 Material Handling: Heavy Equipment

DANGER

Unstable load
Use caution when moving heavy equipment

- Use extreme care when moving heavy equipment.
- Verify that the moving equipment is rated to handle the weight.
- When removing equipment from a shipping pallet, carefully balance and secure it using a safety strap.

Failure to follow this instruction can result in death, serious injury, or equipment damage

1.1.5 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

Failure to follow these instructions can result in death or equipment damage

1.1.6 Material Handling Precautions, ESD

CAUTION

Electrostatic Sensitive Devices
This equipment may contain electrostatic devices

- Protect from electrostatic discharge.
- Electronic modules and components should be touched only when this is unavoidable e.g. soldering, replacement.
- Before touching any component of the cabinet you shall bring your body to the same potential as the cabinet by touching a conductive earthed part of the cabinet.
- Electronic modules or components must not be brought in contact with highly insulating materials such as plastic sheets, synthetic fiber clothing. They must be laid down on conductive surfaces.
- The tip of the soldering iron must be grounded.
- Electronic modules and components must be stored and transported in conductive packing.

Failure to follow this instruction can result in equipment damage

1.1.7 Arc Flash and Electric Shock Hazard

DANGER

Series Circuits have Hazardous Voltages
This equipment produces high voltages to maintain the specified current - Do NOT Disconnect while energized.

- Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.
- Only persons who are properly trained and familiar with ADB SAFEGATE equipment are permitted to service this equipment.
- An open airfield current circuit is capable of generating >5000 Vac and may appear OFF to a meter.
- Never unplug a device from a constant current circuit while it is operating; Arc flash may result.
- Disconnect and lock out electrical power.
- Always use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in the product manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved ADB SAFEGATE replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.
- Check the interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with airfield electrical equipment.

Failure to follow these instructions can result in death or equipment damage

2.0 Ferroresonant Switchgear Regulator System

2.1 About this manual

The manual shows the information necessary to:

- Install
- Carry Out Maintenance
- Carry Out Troubleshooting on the SGRS.

2.2 How to work with the manual

1. Familiarize yourself with the structure and content.
2. Carry out the actions completely and in the given sequence.

3.0 SGRS Overview

The ADB Airfield Solutions L-828/L-829 Switchgear Regulator System (SGRS) supply either three or five precision output current levels (6.6 A/20 A maximum) for series lighting circuits on airport runways and taxiways. The SGRS Constant Current Regulators (CCRs) referred to as Powerpacks™ are available in 4 kW through 30 kW sizes.

The ADB Airfield Solutions L-828 air-cooled SGRS CCRs are designed to...

- Accurately regulate the output current to within ±3% of the adjustable nominal level from no load to full load and with input voltage variations of -5% to +10% of nominal (-40 °C to +55 °C)
- Maintain the nominal output current levels even when 30 percent of the isolation transformers in the series lighting circuit supplied by the regulator have open secondaries

The SGRS system provides for maximum safety and maintainability by...

- Providing the industry's only slide-out Powerpack™ design
- Separating high voltage and low voltage components
- Mounting only low voltage components to the doors, for example, printed circuit boards
- Placing high voltage components behind an additional clear polycarbonate shield
- Using color warning labels throughout the system for technical safety

3.1 SwitchGear Regulator System

Compliance with Standards

FAA:	L-828/L-829 AC 150/5345-10 (Current Edition). Monitoring according to AC 150/5345-10 (Current Edition). Ferroresonant powerpacks are ETL Certified.
ICAO:	Aerodrome Design Manual Part 5, para. 3.2.1.4 to 3.2.1.6
Military:	UFC 3-535-01; NAVAIR 51-50AAA-2

Uses

Supplies three or five precision output currents to power series lighting circuits on airport runways and taxiways. The SwitchGear Regulator System is available in a ferroresonant design, which is optimized for lowest EMI and best power factor.

Features

- Integrated Advanced Control Equipment (ACE™) system provides full control and L-827/L-829 capabilities. See data sheet 2084 for additional information.
- Uses up to 67% less space in the airfield vault
- All wiring goes into an incoming power bay and is transferred via bus bars to the powerpacks, eliminating the need for separate input power wiring to individual Constant Current Regulators (CCRs)
- Front doors have a two-point latching system for smooth operation and positive seal
- Built-in True-RMS reading ammeter
- Available in two classes and styles:

  Class 1 = 6.6 A max. output current from 2.5 kW to 30 kW

  Class 2 = 20 A max. output current from 15 kW to 70 kW

  Style 1 = 3 Brightness Step CCR (6.6 A only)

  Style 2 = 5 Brightness Step CCR (6.6 A or 20 A)
- Air-cooled to allow more efficient transfer of heat from the power core and eliminate the need for oil containment reservoirs in the vault

- Accurately regulates the output current to within ±3% of the adjustable nominal level from no load to full load and with an input voltage variation of -5% to +10%
- Nominal output current levels are maintained even when 30% of the isolation transformers have open secondaries
- If input power loss occurs, operation will resume within five seconds after restoration of input power
- A gray polyester paint is electrostatically applied over a zinc undercoat to the NEMA 12-rated enclosure.

Ordering Information

To order a SwitchGear Regulator System, contact the ADB SAFEFGATE Sales Department.

Protection

L-828 SGRS CCRs have the following protection devices:

- Output overcurrent
- Output open-circuit
- Lightning and transient protection on output terminals
- Fuse protection: Remote control supply voltage (+48 VDC or 120 VAC) and power supply for control board
- Input breaker for supply voltage
- Input lightning protection

Control

L-828 SGRS CCRs have the following controls:

- Local operation using a front panel rotary switch
- Remote operation using either +48 VDC or 120 VAC signals
- Optional remote operation via an Airport Lighting Control & Monitoring System (ALCMS) using ADB SAFEGATE's integrated ACE system

Theory of Operation

Ferroresonant

The regulator consists of a ferroresonant transformer, capacitors, and control circuitry. Output current regulation is accomplished by adjusting the ferroresonance in the capacitor bank using an electronic feedback network.

Operating Conditions

Temperature:	-40 °F to +131 °F (-40 °C to +55 °C)
Humidity:	10 to 95%
Altitude:	0 to 6,600 ft (2,000 m)

Optional Equipment

Ferroresonant SGRS Lift, Battery Operated (Requires 11 feet of space in front of lineup)	44A7027

SGRS Electrical Supply

Power Input:	480 VAC, 60 Hz, three-phase Each individual CCR is powered by 480 VAC, 60 Hz, single-phase
PSF Power Factor [1]	0.99 or more for 2.5 to 30 kW 0.95 or more for 50 and 70 kW
PSF Efficiency [1]	90% minimum for 2.5 to 25 kW 92% minimum for 30 kW 93% minimum for 50 kW 94% minimum for 70 kW

Notes

[1] Tested with 100% resistive load according to FAA AC 150/5345-10 (current edition)

Options

- Built-in LED True-RMS output current digital meter can optionally display output True-RMS voltage and VA
- Custom fault current ratings available, 65K AIR standard
- Temperature alarm
- Double bus for large systems
- Fan ON indicator
- Seismic zone 4 rated systems
- Door interlock LED indicates door not properly closed
- Airfield insulation resistance measurement system (see data sheet 1218 for details)

SGRS CCR Dimensions/Weight

Ferroresonant H × W × D
Powerpack Bay 102 × 38.5 × 48 in (259 × 97.79 × 121.92 cm)
Cutout Bay 102 × 38.5 × 48 in (259 × 97.79 × 121.92 cm)
Power Bay 102 × 24 × 48 in (259 × 61 × 121.92 cm)
Interface Bay 102 × 24 × 48 in (259 × 61 × 121.92 cm)
Maximum Weight - 30kW Powerpack 1300 lb (590 kg)

Notes

- Ferroresonant SGRS is certified under part number PSFXXXX-XXX for 2.5 to 30 kW powerpacks and PHFXXXX-XXX for 50 to 70 kW powerpacks.
- Seismic ferroresonant SGRS is certified under part number PSSFXXXX-XXXX for 2.5 to 30 kW powerpacks and PHSFXXXX-XXXX for 50 to 70 kW powerpacks, and is verified to 1997 Uniform Building Code (UBC)/2001 California Building Code (CBC) Earthquake Simulation Test.

3.2 SGRS Configuration Options

The SGRS consists of a multipurpose indoor enclosure system designed to use a bus bar style system to distribute input power to a series of regulator bays. The enclosure integrates the input power, control signal wiring connections and airfield series circuit output cables in a single station. The SGRS system consists of a combination of several possible types of bays:

- Incoming Power Bay
- Remote Lighting Control Bay
- S1 Series Circuit Cutout Bay
- L-847 Circuit Selector Bay
- L-828 / L-829 PowerPack™ Bay)

Note

SGRS Systems are designed to the requirements of each airport. Please refer to the system prints package supplied with the SGRS system for the bay configuration of a particular SGRS.

3.3 SwitchGear Regulator System

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Supplies three or five precision output currents to power series lighting circuits on airport runways and taxiways. The SwitchGear Regulator System is available in a ferroresonant design, which is optimized for lowest EMI and best power factor.

Features

- Integrated Advanced Control Equipment (ACE™) system provides full control and L-827/L-829 capabilities. See DS-3097 for additional information.
- Uses up to 67% less space in the airfield vault
- All wiring goes into an incoming power bay and is transferred via bus bars to the powerpacks, eliminating the need for separate input power wiring to individual Constant Current Regulators (CCRs)
- Front doors have a two-point latching system for smooth operation and positive seal
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- Available in two classes and styles:

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4.0 Installation

Refer to the system print package. The system print package supplied with the Small-frame SGRS system provides detailed information about the system components, and wiring.

Assembly prints reflect the actual built unit and also includes the Bill of Material including all of the components used to assemble the final product.

System externals generally show the connections exterior to the enclosures. These prints illustrate the connections typically performed by the electrical contractor. This includes regulator control wiring, airfield circuit cable wiring, and optional monitoring wiring. Internal wiring diagrams illustrate how the components are wired and connected within the enclosures.

4.1 Installation Overview

The purpose of this section is to provide an installation overview on how the SGRS system should be assembled by the installing contractor upon arrival of equipment on site.

This document is not intended to substitute for knowledge of electrical systems, assemblies, or electrical safety. The SGRS is powered by and produces lethal voltages and currents. The procedures in this manual should only be performed by qualified personnel.

A basic outline of the assembly procedures performed is listed below with a more detailed discussion of each step later in this section:

1. SGRS Enclosure Bay alignment and set-up.
2. Pagoda Top installation.
3. Joining and securing SGRS Enclosure Bays.
4. SGRS Line-up securing to floor/wall as required by local code/engineer.
5. Earth grounds connections.
6. Low voltage power connections (fans, interface bays, and S1 cutout bays).
7. Bus bar installation.
8. Torque requirements and specifications.
9. Preliminary Testing (impedance testing).
10. Bus bar shield installation.
11. Series circuit airfield cable installation from regulator cabinets to S1 cut out cabinet / airfield circuits.
12. UPS power installation.
13. Communication cable installation.
14. ACE™ circuit boards installation in each Powerpack bay.
15. Main Incoming Power Bay connections
16. Initial SGRS Power up.
17. Installation of Powerpack Regulators.

4.2 Lining Up Enclosures Per System Prints

The SGRS enclosures are typically shipped in sections. Building clearances and entrance door dimensions determine how many sections the SGRS will be broken into prior to shipment.

Once the enclosures have arrived, the Contractor positions and secures them in place per the airport drawing specifications see Figure 1.

Figure 1: SGRS Lineup

Note

Take care to maintain the unit in an upright position when handling.

4.2.1 Airfield Lighting Vault Temperature Range

CAUTION

The ambient temperature of the room must be -40 to +55 °C (-40 to +131 °F). The regulator may not operate properly if the ambient temperature goes above or the below this range.

4.3 Pagoda Top Installation

The SGRS enclosures are typically shipped without the pagota tops due to shipping height restrictions. The pagoda top kits are easily assembled onto the SGRS in the following manner.

1. Unpack the ventilation screen, pagoda top, and hardware kits.
2. Mounted the screen on the top of the SGRS bay and secure it with the provided hardware.
   See Figure 2.
3. Using stand-off hardware provided, attached the pagoda top to the ventilation screen as seen in Figure 3 using the Mounting Clips seen in Figure 4 located as shown in Figure 5.

Figure 2: Top of SGRS Ventilation Screen Installed

Figure 3: Ventilation/Pagoda Installed

Figure 4: Mounting Clips for Ventillation Screens

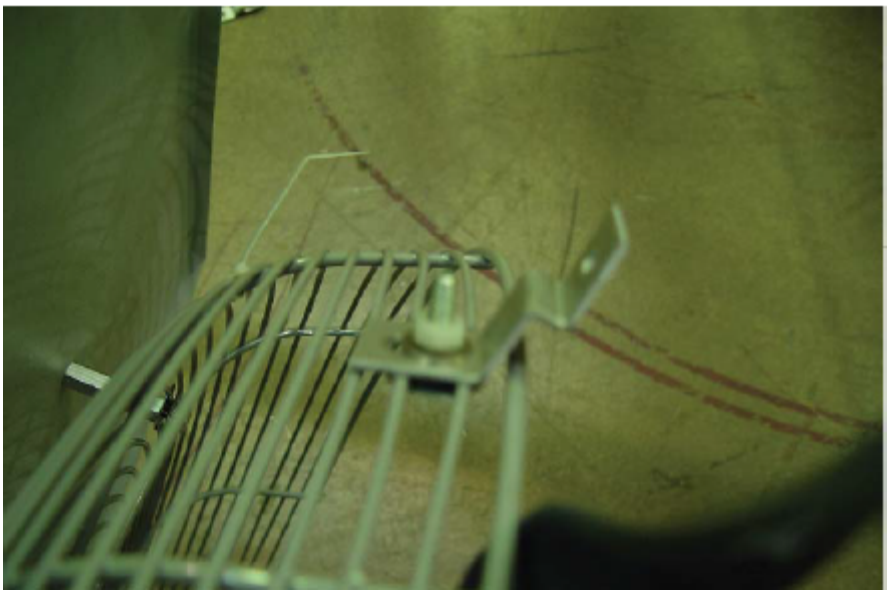


Figure 5: Mounting Clip Location

4.3.1 Joining SGRS Enclosure Bays

Refer to the drawing package for SGRS enclosure lineup order. Join each cabinet to the next with eight 5/16" X 1" bolts. There are approximately ten (10) connections needed to secure each bay to the next bay.

1. Align adjoining bays such that the joining holes line up.

   There are six (6) holes along the top and the bottom, and four (4) holes along the front and the back. See Figure 6 and Figure 7.

Figure 6: Top and Middle Cabinet Joining Locations

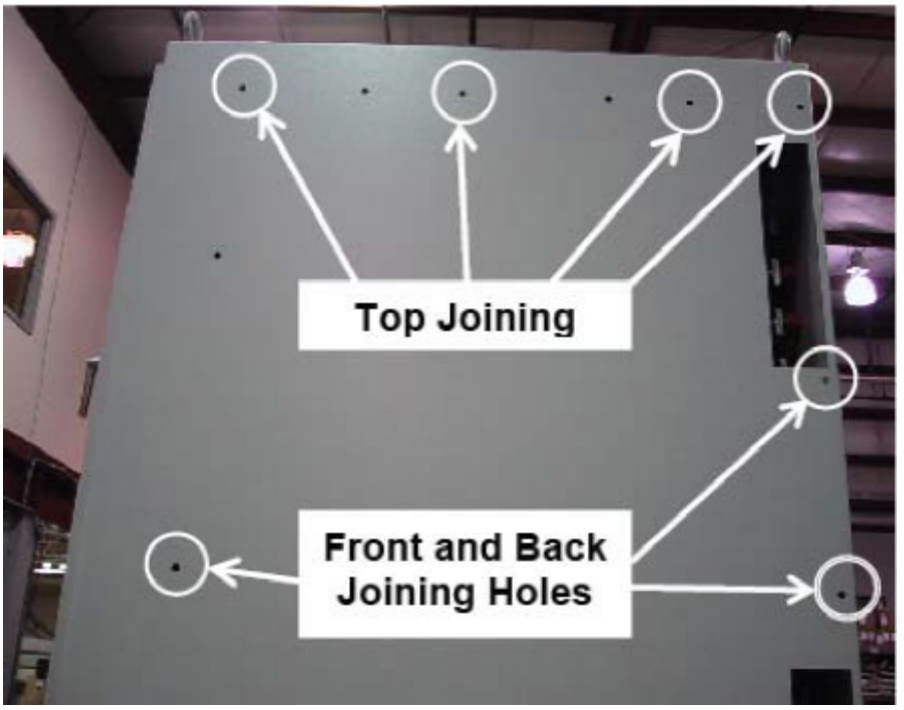
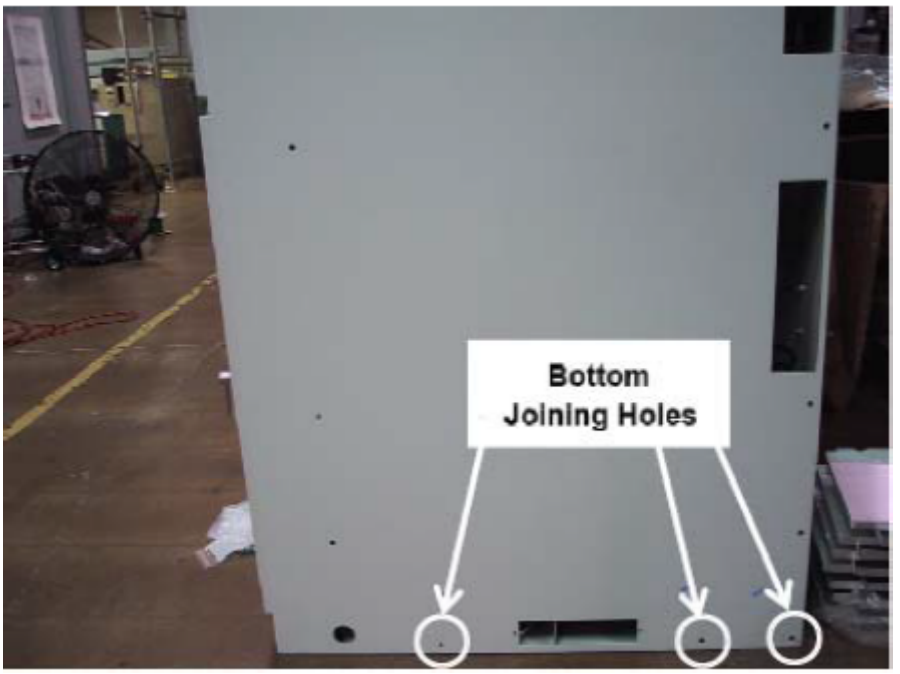


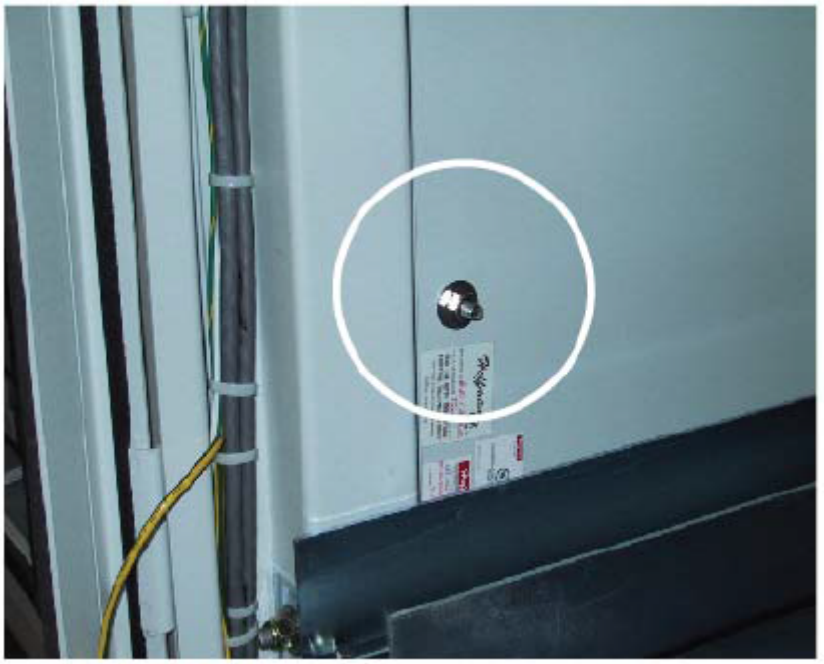
Figure 7: Bottom Cabinet Joining Locations



2. Insert screen from inside of left SGRS bay through the two (2) walls and into the adjoining SGCS Bay.
3. Secure with provided washer and nut hardware.

The bolts require a 9/16 socket to tighten. See Figure 8.

Figure 8: Inside of Cabinet Looking Left



4. Close tolerence holes are provided around the bus bar through-holes shown in Figure 9.
5. Use pilot holes to drill 0.386 holes, 10 places, and install 3/8-19 hardware.

Figure 9: Close Tollerance Holes

4.3.2 Secure SGRS Line-up

Once the enclosure bays are attached and lined up in final location, secure the SGRS lineup to the floor and/or to the wall as outlined in the contract specifications.

Include all appropriate bracing to meet local code and Siesmic zone requirements.

4.3.3 Earth Ground Connections

All doors, panels, and tops have ground leads which terminate on the ground bus. Cabinets without a ground bus acquire their ground via ground connections fed through the firewall to adjacent cabinets with a ground bus allowing proper grounding.

Connect Ground Bus in the Incoming Power Bay to the building's earth ground using appropriate AWG cable.

4.3.4 Low Voltage Power Connections

Bays Without Bus Bars

In some instances, there may be bays that do not have a bus bar like S1 cut out bays, circuit selector cabinets, and interface bays. In this situation, connect the internal fans of these bays to the nearest bay with a bus bar.

Locate all bays without a bus bar and locate wiring that has been temporarily pulled into the bay for shipment.

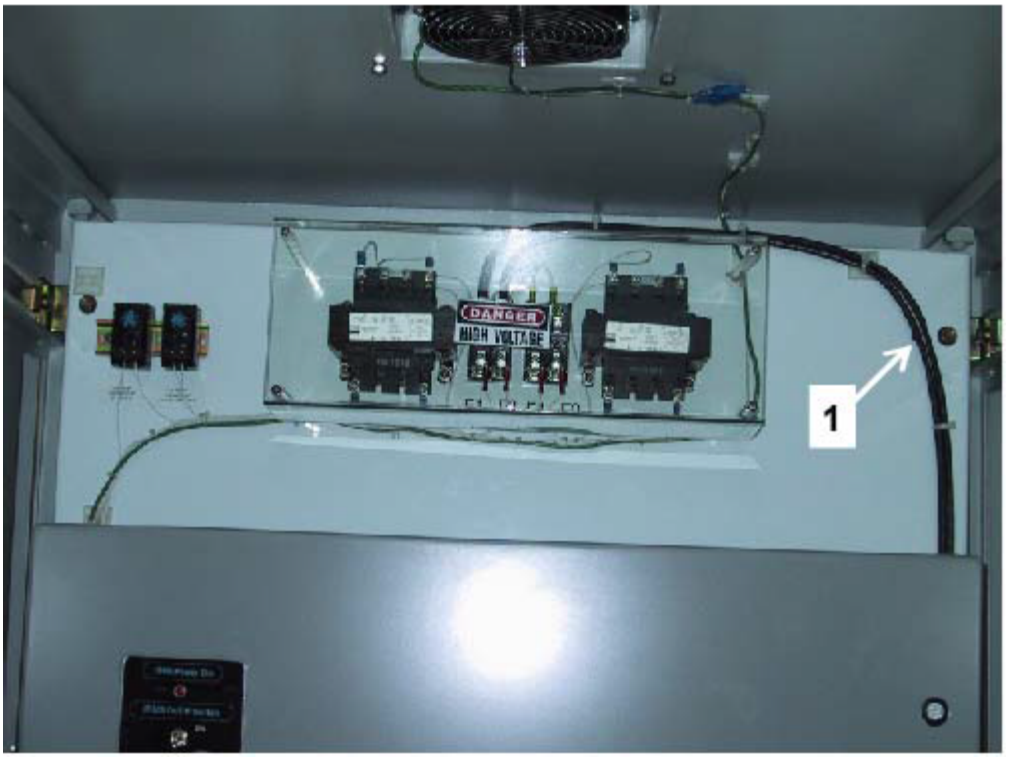
Route the cabling from the bay into nearest bay with a bus bar. Refer to system wiring diagrams for more detail.

Using the provided hardware kits, terminate wiring to appropriate bus bar phase. See system wiring diagrams.

Circuit Selector Power (Optional equipment)

The Circuit Selectors are powered by the step-down transformers shown in Figure 10. The 480VAC is brought in from the first Powerpack Cabinet. The wires are shown marked 1. These wires are pulled through the back of the cabinets and landed on the fuse block F1 and F2.

Figure 10: Circuit Selector Power Connections



4.3.5 Bus Bar Installation

Power is fed from cabinet to cabinet through interconnecting bus bars with high voltage 3M heat shrink over the middle section. These are mounted as shown in Figure 11. See the next section for torque specifications for tightening down the bus bar.

The bus bar for the SGRS is mounted to a back panel with glastic insulators and 3/8"-16 stainless steel bolts, Belleville washers, and stainless steel washers. This hardware is on the bus bar pieces in the enclosure circled in Figure 12.

Note

IMPORTANT When removing the hardware to attach interconnecting bus bar, pay attention to the order of the hardware. The Belleville washers are a spring washer designed to take up load, and slack during the heating and cooling cycles that occur on a bus system. The Belleville goes on the bolt first, followed by the flat washer, which lies on the bus.

Figure 11: Bus Bar Hardware Order

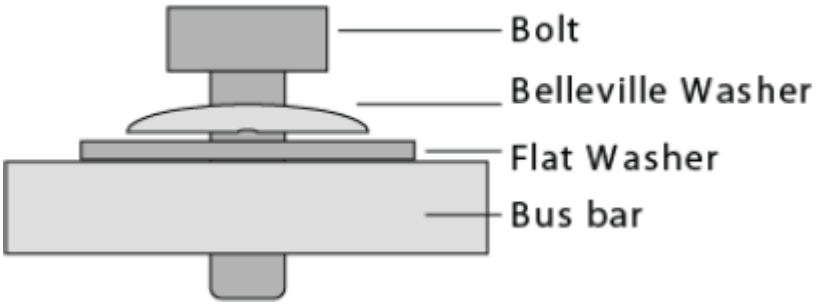


Figure 12: Bus Bar Installation Between Cabinets

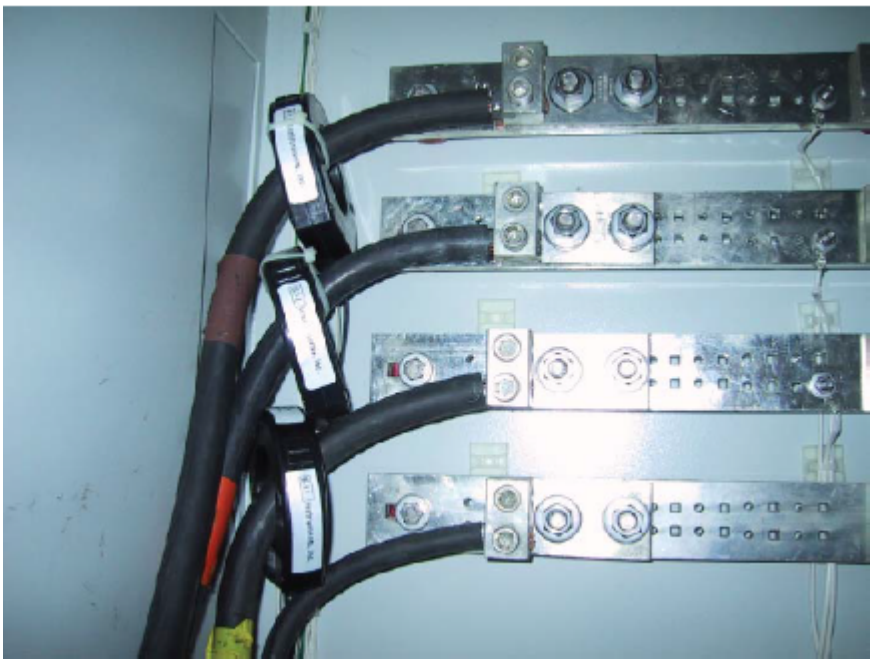
4.3.6 Digital Voltage and Current Meter

See Figure 13. As an option, the Incoming Power Bay may have an input digital voltage and current meter. The meter is located on the front door of the Incoming Power Bay and interfaces with the incoming power bay bus bar and the installed Current Transformers (CT).

Figure 13: Digital Voltage and Current Meter

See Figure 14. The incoming power cable is routed through the CTs before being attached to each phase of the incoming power. The secondary side of each CT is interfaced to the digital meter.

Figure 14: Current Transformer Installation



4.3.7 Fused Disconnect

If the SGRS has an incoming fused disconnect, verify the torque of existing connections and torque the new connections' hex screw on the Fused Disconnect to 370 in-lb. See Figure 12 for hex screw location.

Figure 15: Fused Disconnect Switch

4.3.8 Torquing Specifications

The following pictures show hardware locations having torque requirements for the SGRS.

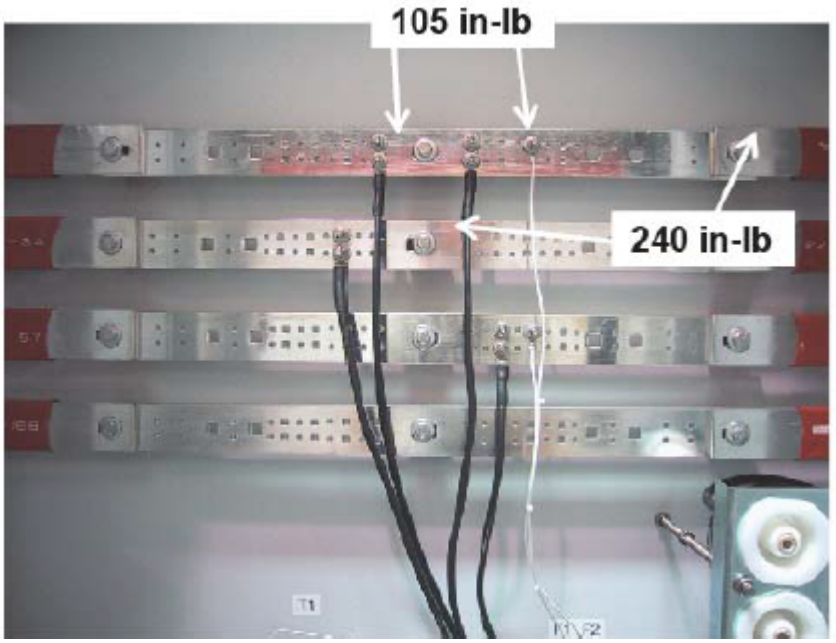
4.3.9 Bus Bar

Torque connections on the bus bar according to Table 1 and see hardware locations in Figure 16.

Table 1: Bus Bar Torque Specifications

Description	Torque Value
¼" – 20 bolt	105 in-lb
3/8" – 16 bolt	240 in-lb

Figure 16: Powerpack Cabinets



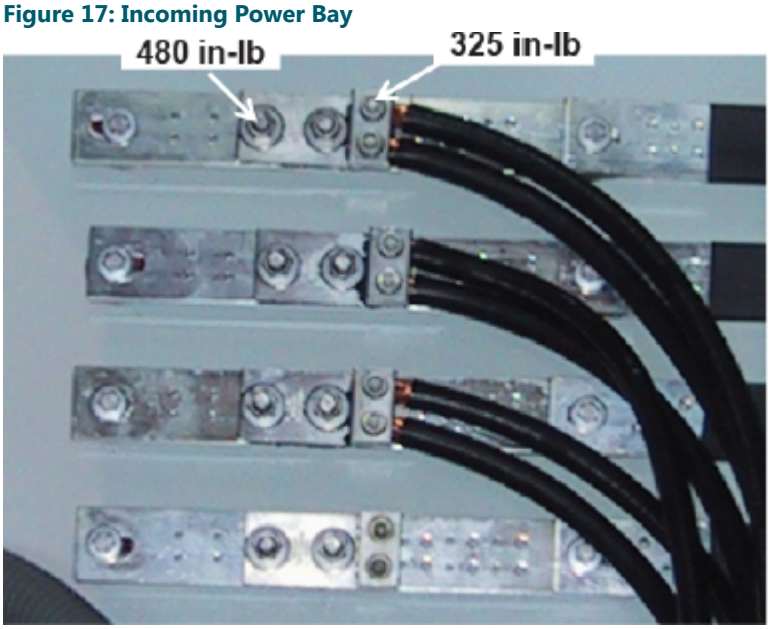
4.3.10 Incoming Power Bay

Torque connections on the bus bar according to Table 2 and see hardware locations in Figure 14.

Table 2: Incoming Power Bay Torque Specifications

Description	Torque Value
½" – 13 bolt	480 in-lb
350mcmHex Set screw	325 in-lb

Figure 17: Incoming Power Bay



4.3.11 Impedance Testing

Note

IMPORTANT DO NOT INSTALL Powerpacks at this time. Remove all fuses from fuse holders. Impedance Testing will FAIL if Powerpacks and fuses are installed.

1. Verify all fuses have been removed.
2. Verify NO Powerpacks have been installed.
3. Using an Ohm meter, measure the impedance between the phases and ground.
   All impedances should read as open. Complete the following table.
4. Replace fuses in fuse holders.

Table 3: Impedance Test Table

Lines	Impedance (Ohms)
Ø1-GND	
Ø 2-GND	
Ø 1- Ø 2	
Ø 1- Ø 3	
Ø 2- Ø 3	
Ø 1-N	

Table 3: Impedance Test Table (continued)

Lines	Impedance (Ohms)
Ø 2-N	
Ø 3-N	
N-GND	

4.3.12 Install Bus Bar Shield

A bus bar shield is included to provide protection from accidental contact with the bus bar, while allowing easy access to the bus bar for inspection and preventive maintenance.

Figure 15 and Figure 16 show the glastic shield (1) mounted on four standoffs (2) located above and below the buss bar. The shield is mounted using 4, 3/8-16 bolts. The bus bar shield is installed in the upper bay and lower bay if the system is a dual bus bar system.

Figure 18: Glastic Shield

Figure 19: Glastic Shield Stand-Offs

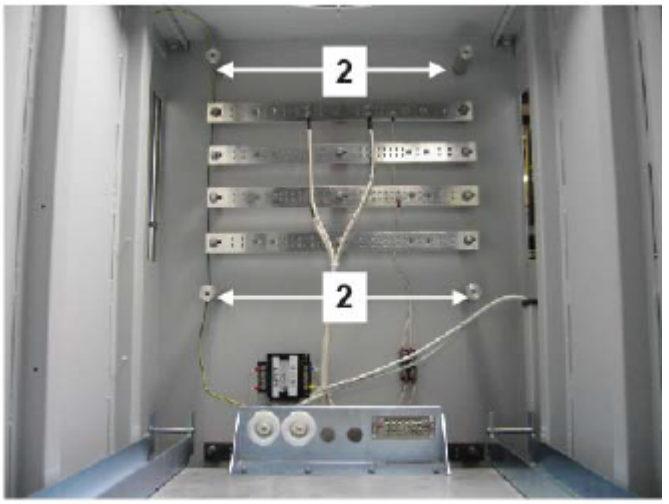


Figure 20: Shield Standoffs

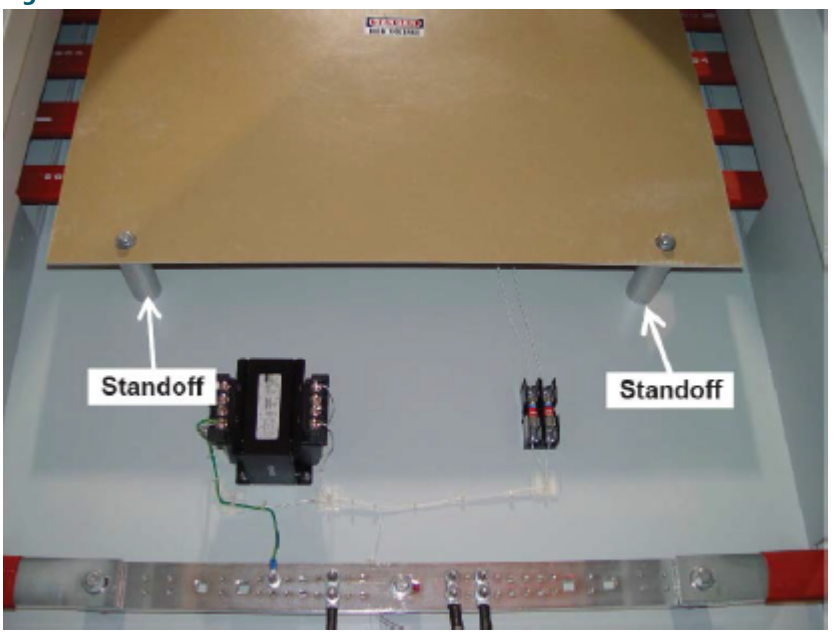
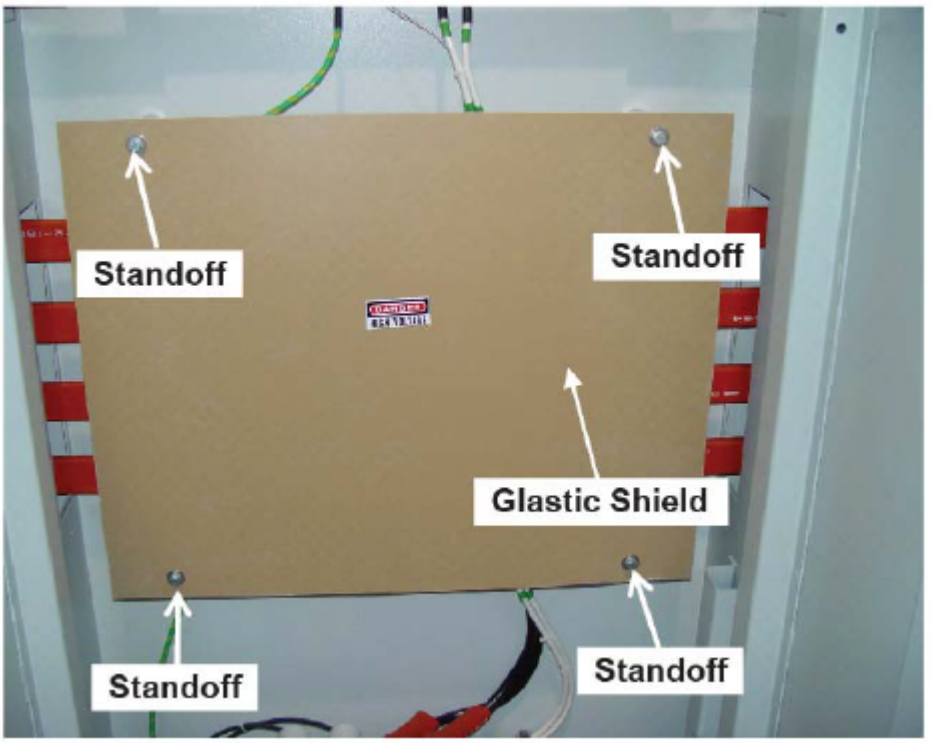


Figure 21: Glastic Shield/Standoff Locations



4.3.13 Series Circuit Cable (High Voltage)

The wire way in the base of the cabinet is separated into 3 sections as shown in Figure 21. The front wire way (1) is used for communications. The middle section (2) is for the UPS power to the control hardware. The rear section (3) is dedicated to the high voltage cables.

See Figure 21, Figure 22, Figure 23, and Figure 24. The contractor supplied high voltage cable is coiled in the base of each regulator cabinet until all other wiring is complete. Pull it along the bottom of the high voltage wireway (3) to the S1 Series Cut Out (SCO) bay and land on the SCO labeled with the appropriate bay number. The side of the SCO with the copper ground bar is for the field cable. This is included to allow grounding of the shielded field cable.

Figure 22: Wireway Separations (Side View)

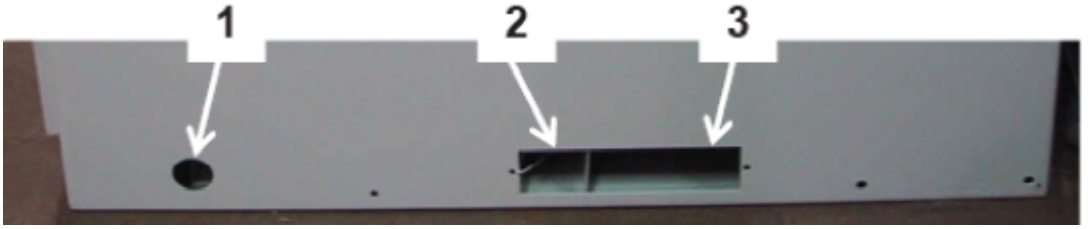


Figure 23: S1 Cabinet Terminations

Figure 24: Powerpack™ Output

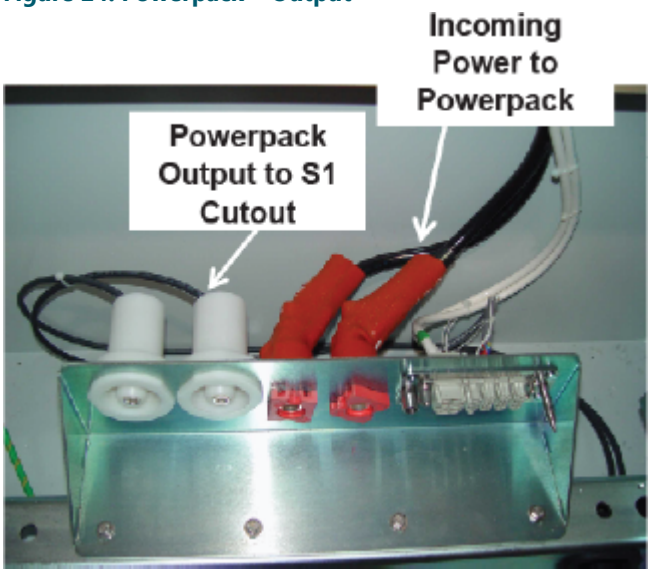


Figure 25: S1 Terminations

4.3.14 UPS Power Installation

Refer to System Drawings for details regarding power connections. Power to the control system is supplied from the Uninterruptible Power Supply (UPS) in the computer cabinet and landed in the Interface bay.

UPS power (1) is jumpered through the SGRS in the base and is landed in all of the Power pack bays on green phoenix connectors. The jumpers are in place. Pull them from cabinet to cabinet and connect each plug as in Figure 21.

Figure 26: UPS Power Connections

4.3.15 Commumnication Cable Installation

There are two communication cables that communicate with the ACE™ equipment. These are referred to as Channels A and B as called-out in Figure 26. The path for these channels is through the communication wire way connected in the base of the SGRS enclosures. Jumpers extend from the green phoenix connector to each ACE unit and continue to the opposite side of the cabinet. here These are daisy chained to the next SGRS bay until reaching the final destination in the computer system enclosure. Pull both the A and B communication cables from cabinet to cabinet and connect each plug, verifying with the label that communication channel A is plugged into A and B into B, respectively.

Figure 27: Communication Wiring

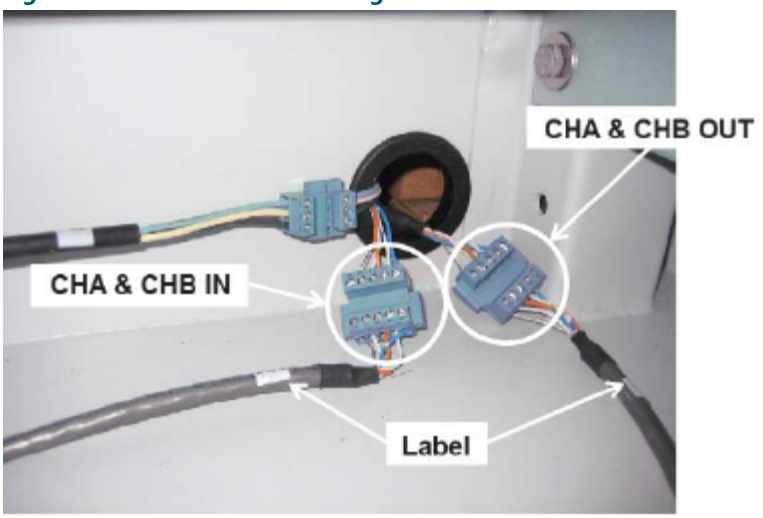
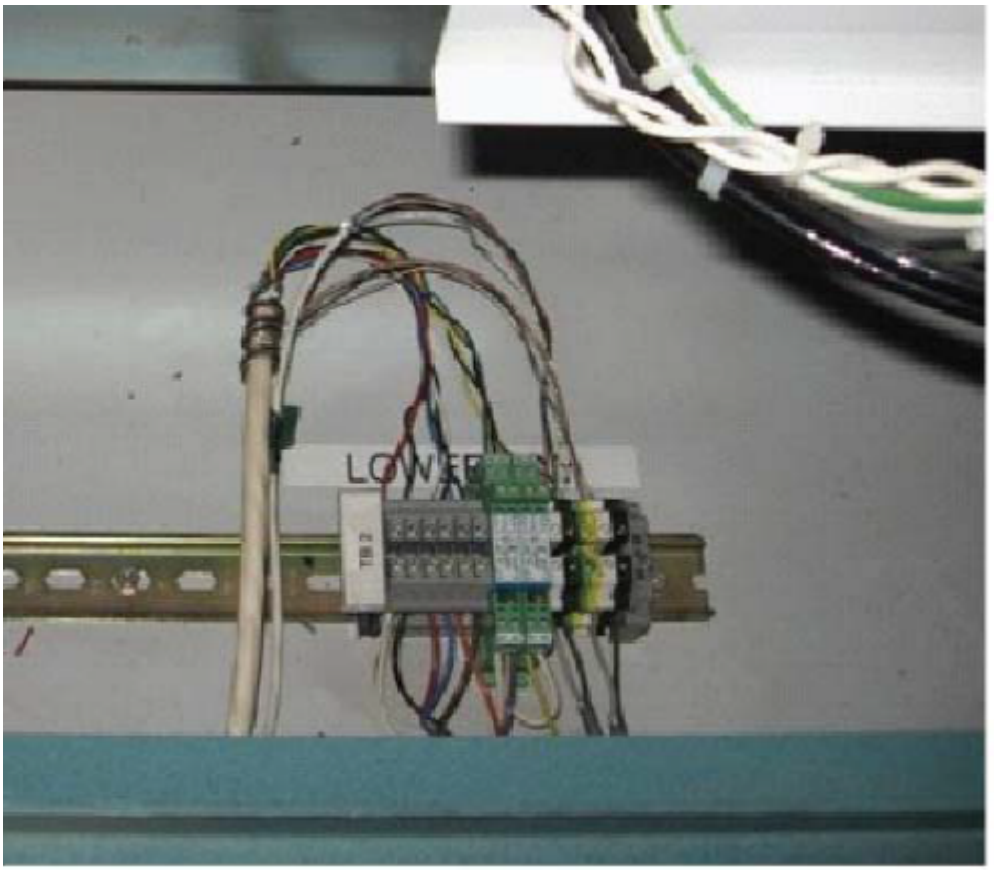


Figure 28: Optimal Communications/Routing

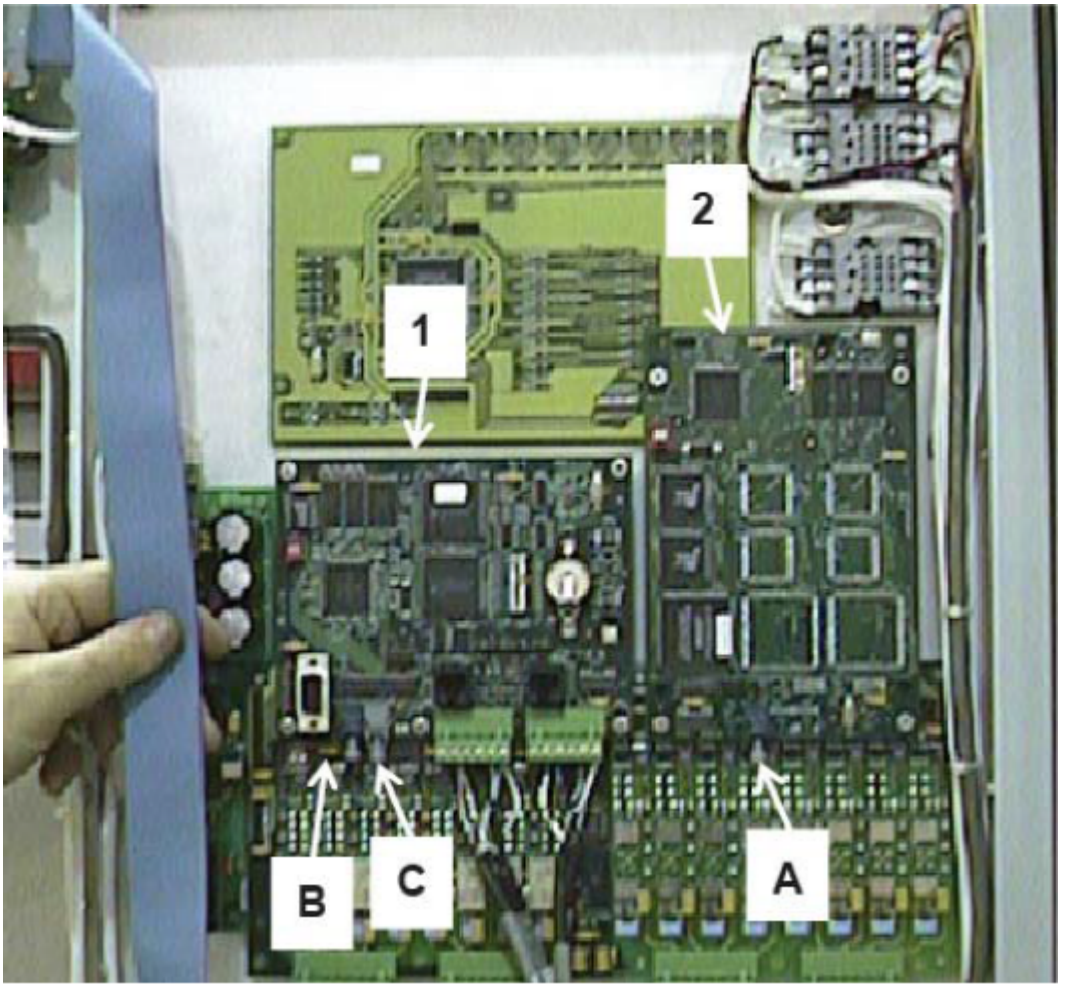


4.3.16 Installing ACE Circuit Boards

The ACE™ control system is a collection of circuit cards mounted in an aluminum cabinet on the inside of the door of each regulator bay. The circuit boards are protected with packing material inside the ACE enclosure during shipping to reduce the chances of shipping damage.

Open up all ACE enclosures and confirm circuit boards are installed according as seen in Figure 23. Check snugness of circuit boards to make sure they did not loosen during shipment.

Figure 29: ACE Circuit Board Installation



1. Computer Board

2. Lamps-Out Monitoring Board

The color-coded fiber optic cable for the Lamps-Out Board (Current and Voltage monitoring) connects into its mating connector A as seen in the Figure 28.

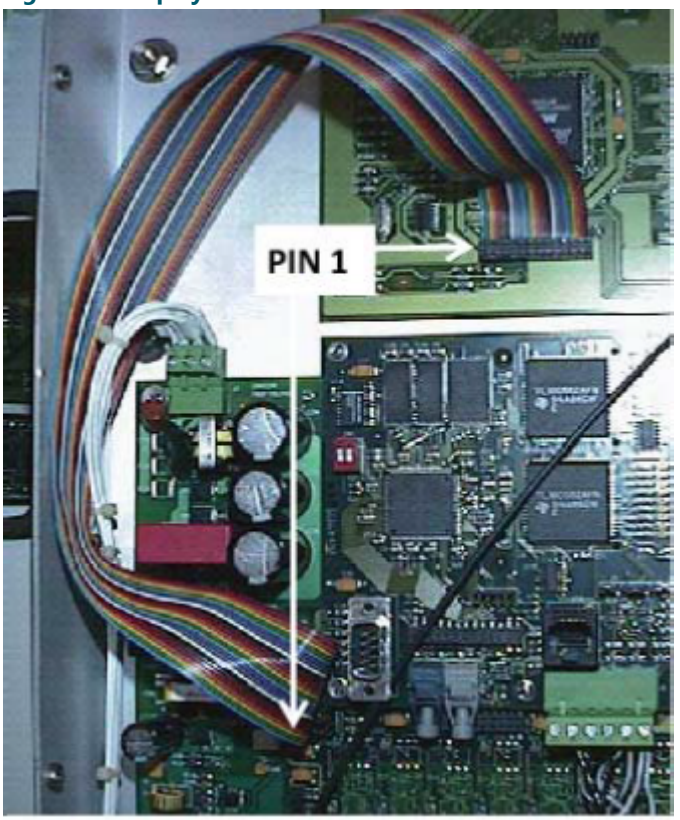
The color-coded pair of Insulation Resistance Monitoring fiber optic cables connects into their mating connectors B and C as seen in Figure 28.

Once the cards are installed into the cabinet, install the multicolored ribbon cable from the Processor Board to the Display Board as seen in Figure 29.

Note

Important: The silk screen on both boards indicate PIN 1 location. Put the ribbon cable in the same orientation in PIN 1 of the Processor Board to PIN 1 of the Display Board.

Figure 30: Display Board Ribbon Connector



4.3.17 Main Incoming Power Connections

SGRS With Fused Disconnect Option

This section illustrates how to connect the SGRS main incoming power if the SGRS HAS a fused disconnect.

See Figure 30. Follow the instructions for connecting the main incoming power to the fused disconnect:

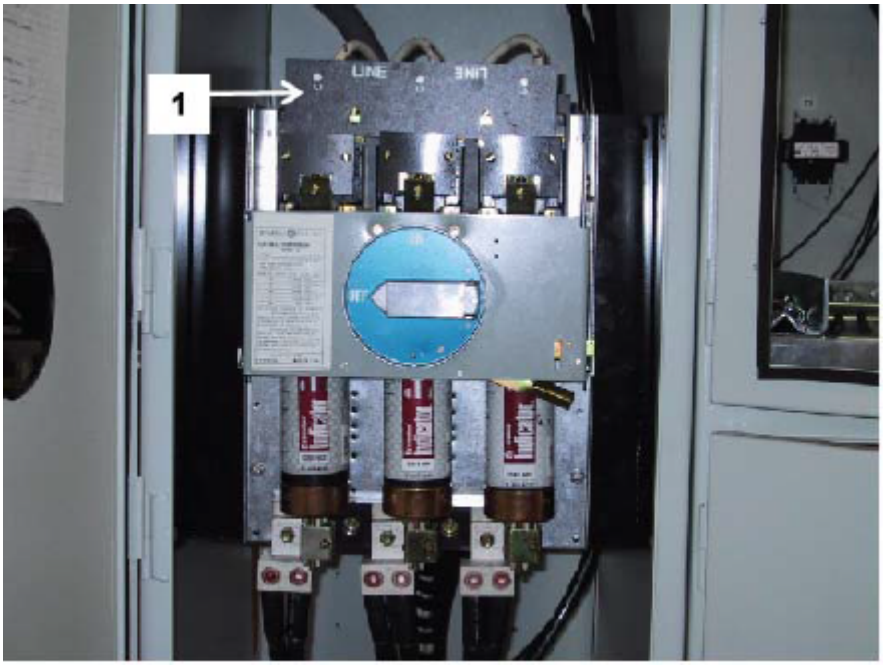
1. Pull appropriately sized cable into Incoming Power Bay.
   Cables should be 350mcm or sized according to contract specifications.
2. Remove glastic shield (1) from the top of the fused disconnect.
3. Strip wire immediately prior to installation.
   DO NOT SCORE STRANDS.

4. Clean wire with a wire brush or abrasive cloth.
5. Insert cable into the Fused Disconnect hex set screw and torque to 370 in-lbs.

Table 4: Fused Disconnect Torque Specifications

Description	Torque Value
Fused Disconnect hex set screw	370 in-lb

Figure 31: Fused Disconnect Main Power Connection



4.3.18 SGRS Without Fused Disconnect Option

This section illustrates how to connect the SGRS main incoming power if the SGRS DOES NOT have a fused disconnect.

See Figure 31 and follow the instructions for connecting the main incoming power to the bus bar:

1. Pull appropriately sized cables into Incoming Power Bay.
   Each phase requires two cables (350mcm or sized according to contract specifications).
2. Locate dual-hole lug attached to bus bar.
3. Strip wire immediately prior to installation.
   DO NOT SCORE STRANDS.
4. Clean wire with a wire brush or abrasive cloth.

5. Insert cables into hex screw set and tighten according to torque specifications in Table 5.
6. Verify torque connections of other lug nuts.

Table 5: Fused Disconnect Torque Specifications

Description	Torque Value
Hex set screw on lug	325 in-lb
Lug nut	480 in-lb

Figure 32: Incoming Power Bay

4.3.19 Initial SGRS Power-Up

See Figure 32 and ensure the Switch is in the OFF position. Turn the fused disconnect on the power bay to the OFF position. Turn on power at the service disconnect. Verify that there is 277 VAC between all phases and both ground and neutral. Verify there is 480VAC between any 2 phases.

Figure 33: Disconnect Switch in OFF Position

Use the Table below and see Figure 28. Turn ON the fused disconnect power to the bus bar and verify that there is 277 VAC between all phases and both ground and neutral, and ensure there is 480VAC between any 2 phases. Record information in Table 6.

Table 6: Voltage Verification

Lines	Expected Voltage	Actual Voltage
Ø1-GND	277VAC	
Ø 2-GND	277VAC	
Ø 3-GND	277VAC	
Ø 1- Ø 2	480VAC	
Ø 1- Ø 3	480VAC	
Ø 2- Ø 3	480VAC	
Ø 3-N	480VAC	
N-GND	0VAC	

Figure 34: Incoming Power Bay with Door Open

4.3.20 Installation of Powerpacks

CAUTION

Improper Handling

- Use a SGRS lift device specifically designed to Powerpack™ insertion. This lift is available through ADB Safegate.
- Any damage done to the Powerpacks occurring through mishandling or installing SGRS without appropriate lifting equipment, is not covered under the warranty and is the responsibility of the installing Contractor.

Failure to follow these instructions may result in equipment damage or personnel injury.

The Powerpack regulators are designed with high-quality wheel bearings to facilitate easy installation and removal of the Powerpack™(s) from the SGRS system.

To install the Powerpacks into the enclosure bay, perform the following procedure:

1. Open the door to the bay to be loaded and lift up the Powerpack until the wheels are level with the rails.

   See Figure 34.

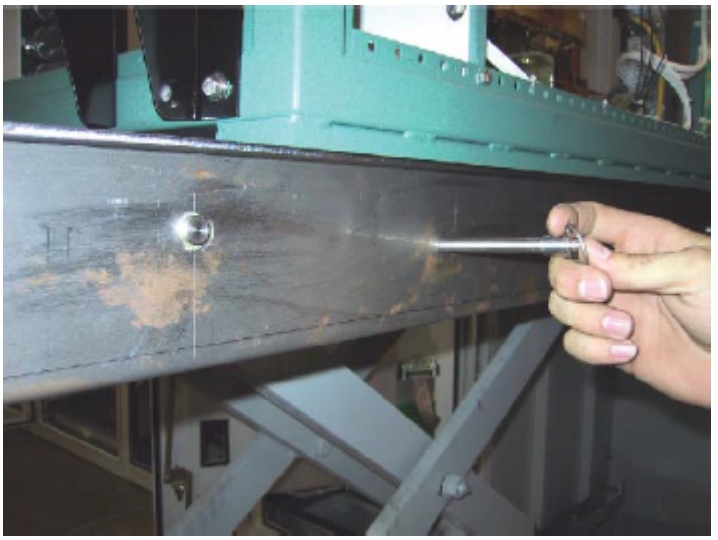
   Figure 35: Empty Upper Powerpack Bay

2. Remove the safety pin on the lift table and slide the Powerpack onto the rails.

   See Figure 35.

   Figure 36: Removing Safety Pin from the Lift Table

3. Slide the Powerpack into the enclosure and firmly connect the Powerpack stab connector into the mating connector at the rear of the enclosure.

   CAUTION

   IMPORTANT that the stab connectors are mated tightly together. All the control, the monitoring and the input voltage wiring runs through this connector..

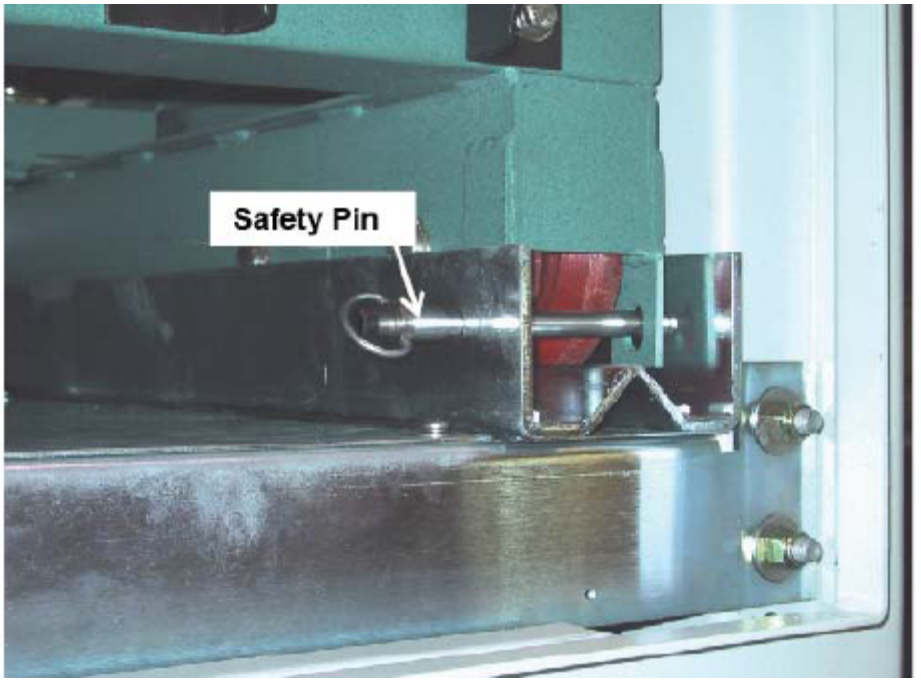
Figure 37: Powerpack Half Way In

Figure 38: Powerpack Fully Inserted

4. See Figure 38.

Once the Powerpack is in place, secure the locking pin in the rails.

Figure 39: Securing Powerpack in Enclosure Bay



Note

The locking pins are shipped with the system. There are two pin locations in which the Powerpack can be locked. During normal operation, the Powerpack must be slid all the way in for the Harting stab connectors to mate. The locking pin is inserted at this position.

Note

For testing purposes, the Powerpack can be unstabbed and pulled forward several inches with the locking pin securely inserted at the test position. In the test position, the stab connections are not connected to prevent the Powerpack from being powered up when performing maintenance.

5. Refer to Figure 39 and Figure 40.

   When the safety pin is in place, the power pack needs to be secured to the channel frame using the ½-inch hardware provided.

Figure 40: Core Without Spacers

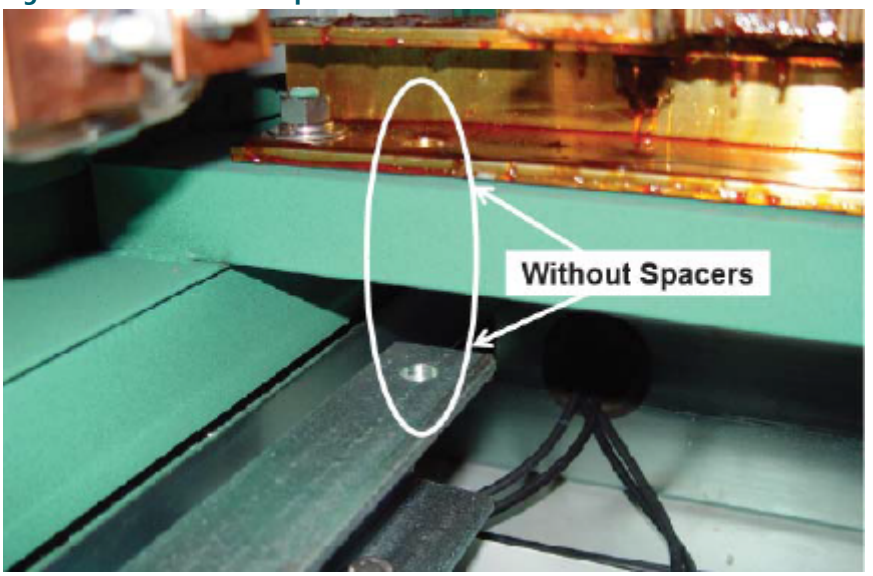
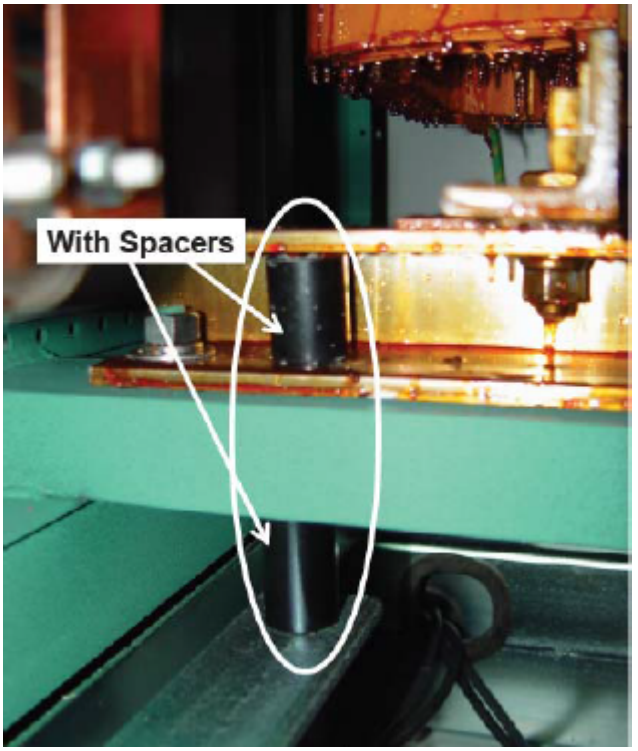


Figure 41: Core With Spacers



6. After the core tie downs are in place, install the front angle tie down.

   See Figure 41, Figure 42, and Figure 43.

Figure 42: Left Core Angle

Figure 43: Right Core Angle

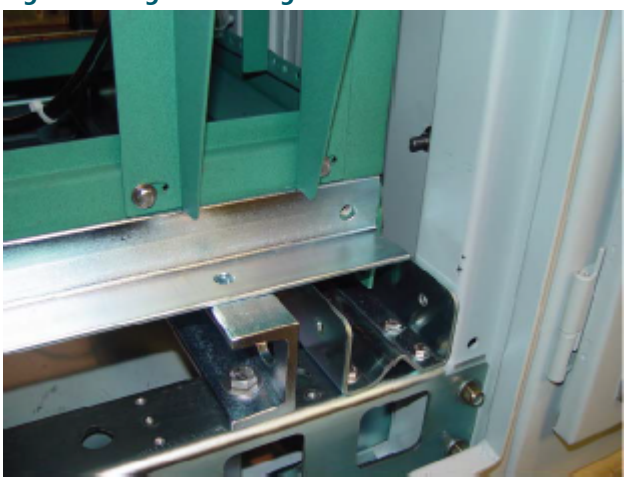
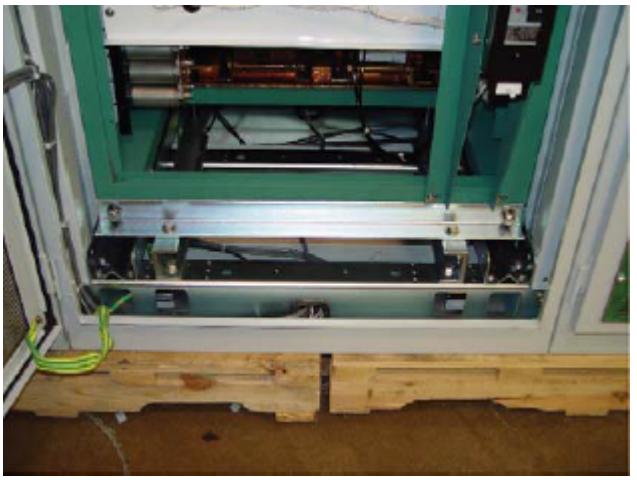


Figure 44: Installed Angle



7. See Figure 44.

   For 50 and 70 kW regulators only, hat rail tie downs have been provided. Once the 50 and 70 kW CCRs have been installed per the previous instructions, use an allen wrench to secure the side bracing. Typically, 4 side bracings are used for each power pack.

8. Close the Powerpack bay door.
9. Turn on the Powerpack circuit breaker.

10. Turn the Fused Disconnect to the ON position.
11. Test the brightness step controls of the Powerpack locally at the Regulator.
    Confirm the Powerpack handles airfield lighting load and is outputting the correct current.

5.0 Operation

Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.

Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.

- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

6.0 System or Component Malfunction

Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.

- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

6.1 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

Failure to follow these instructions can result in death or equipment damage

6.2 Incoming Power Bay

The Incoming Power Bay houses terminals for the input electrical power wiring and a step-down power transformer and protective fuses.

The optional main fuseable disconnect for the SGRS is located on the front door of the Incoming Power Bay. By transferring the disconnect to the ON or OFF position, power to the entire SGRS can be turned on or off. Refer to Figure 45.

Figure 45: Fuseable Disconnect

From the main fuseable disconnect (optional) the power is then distributed to the bus bar located at the back of the SGRS enclosure.

6.3 Single Main Fuseable Disconnect

CAUTION

If the disconnect option is not included in your system configuration, you must provide adequate rated overcurrent protection prior to incoming service to the SGRS. Failure to observe this warning may result in personal injury, death, or equipment damage.

The optional main fuseable disconnect provides proper rated overcurrent protection and the ability to disconnect incoming service to the SGRS. Two options exist in the Incoming Power Bay; a single disconnect (discussed in this section) and a dual disconnect (discussed in next section).

Table 7: Single Disconnect Operation

Single Disconnect Position	Function
ON	Incoming service is supplied to entire SRGS
OFF	Incoming service is disconnected to entire SRGS

Refer to Operation for summary of operation. When the disconnect is set to the ON position:

Input power from the disconnect is routed to bus bars (A, B, C) run in back of the SGRS enclosure.

Bars A, B, C, N (neutral) and GND (Ground) run horizontally across the top and back of the enclosure.

Power to lower bays is via electrical wiring from upper bus bar to lower bay regulators.

Input power is also routed to an auxiliary step-down Transformer T1 (480 V/120 VAC) which provides dedicated 120 VAC power for other auxiliary equipment. Refer to wiring diagrams in the SGRS system drawings for more information.

6.4 Dual Main Fuseable Disconnect

CAUTION

If the disconnect option is not included in your system configuration, you must provide adequate rated overcurrent protection prior to incoming service to the SGRS. Failure to observe this warning may result in personal injury, death, or equipment damage.

The optional dual main fuseable disconnect provides proper rated overcurrent protection and the ability to disconnect incoming service to both the upper and lower SGRS independently of each other.

Table 8: Dual Disconnect Operation

Upper disconnect position	Upper disconnect position	Function
OFF	OFF	Incoming Service is Disconnected from Both Upper and Lower SRGS
OFF	ON	Incoming Service is Connected to Lower SRGS only
ON	OFF	Incoming Service is Connected to Upper SRGS only
ON	ON	Incoming Service is Connected to Both Upper and Lower SRGS

WARNING

Always confirm power is disconnected with a proper votage tester prior to working in the SRGS.

Refer to Operation for summary of operation. When the corresponding disconnect is set to the ON position:

Input power from the corresponding disconnect is routed to bus bars (A, B, C) run in back of the SGRS enclosure.

Upper bus bars A, B, C, N (neutral) are run horizontally across the top and back of the enclosure.

Lower bus bars A, B, C, N (neutral) are run horizontally across the bottom back of the enclosure.

The GND (Ground) bus is run approximately in the back-middle of the enclosure and provides ground connections for both upper and lower cabinets.

Input power is also routed to an auxiliary step-down Transformer T1 (480 V/120 VAC) which provides dedicated 120 VAC power for other auxiliary equipment. Refer to wiring diagrams in the SGRS system drawings for more information.

WARNING

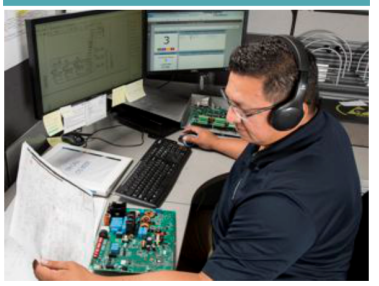
Operating the upper bank of CCRs with the lower main breaker off could cause the CCRs to overheat. It is recommended that if the lower circuit breaker is off, the CCRs should not be run.

Appendix A: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

ADB SAFEGATE Support

Live Technical Support - Americas
If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.
ADB SAFEGATE **Americas Technical Service & Support (US & Canada): +1-800-545-4157**
ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304
During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!
Before You Call
When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.



- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot

Note
For more information, see www.adbsafegate.com, or contact ADB SAFEGATE Support via email at support@adbsafegate.com or
Brussels: +32 2 722 17 11
Rest of Europe: +46 (0) 40 699 17 40
Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.
China: +86 (10) 8476 0106

A.1 ADB SAFEGATE Website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

A.2 Recycling

A.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

A.2.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

Company Addresses

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